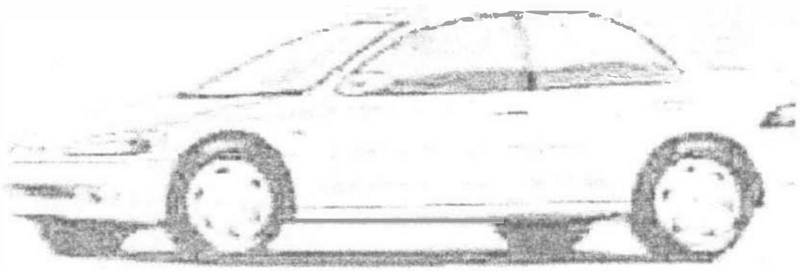
Impreza 1997-1998

SUBARU

Exit

SERVICE MANUAL

SUBARU IMPREZA



Service manual

General information

1. 4-door Sedan

A: DIMENSIONS

Model			1600		1800	2000 Non TURBO		2000 TURBO
			FWD	AWD	AWD	FWD	AWD	AWD
Overall length		mm (in)	4,350 (171.3), 4,375 (172.2)*1					4,340 (170.9)
Overall width		mm (in)	1,690 (66.5)					
Overall height (at CW)		mm (in)	1,400 (55.1)*2, 1,405 (55.3) 1,415 (55.7)*3	1,415 (55.7)	1,415 (55.7)	1,415 (55.7)	1,415 (55.7)	1,400 (55.1)
Compartment	Length	mm (in)	1,820 (71.7)					
	Width	mm (in)	1,385 (54.5)					
	Height	mm (in)	1,170 (46.1)					
Wheelbase		mm (in)	2,520 (99.2)					
Tread	Front	mm (in)	1,475 (58.1)*2 1,465 (57.7) 1,460 (57.5)*3	1,460 (57.5)	1,460 (57.5)	1,460 (57.5)	1,460 (57.5)	1,465 (57.7)
	Rear	mm (in)	1,465 (57.7)*2 1,455 (57.3) 1,450 (57.1)*3	1,455 (57.3)	1,455 (57.3)	1,455 (57.3) 1,450 (57.1)*3	1,455 (57.3)	1,455 (57.3)
Minimum road clearance		mm (in)	150 (5.9)	160 (6.3)	160 (6.3)	145 (5.7) 155 (6.1)*3	145 (5.7) 155 (6.1)*3	150 (5.9)

*1 : G.C.C. Countries
*2 : with 13 inch wheel
*3 : Australian model

B: ENGINE

Model — With catalyst vehicles —		1600	1800	2000 Non TURBO	2000 TURBO
Engine type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine			
Valve arrangement		Overhead camshaft type			
Bore x Stroke	mm (in)	87.9 x 65.8 (3.461 x 2.591)	87.9 x 75 (3.461 x 2.95)	92 x 75 (3.62 x 2.95)	
Displacement	cm^3 (cu in)	1,597 (97.45)	1,820 (111.06)	1,994 (121.67)	
Compression ratio		9.7			8.0
Firing order		1 — 3 — 2 — 4			
Idle speed at Park/Neutral position	rpm	700 ± 100		800 ± 100	
Maximum output	kW (PS)/rpm	66 (90)/5,600	79 (107)/5,600	85 (115)/5,600	155 (211)/5,600
Maximum torque	N.m (kg-m, ft-lb)/rpm	137 (14.0, 101)/ 4,000	157 (16.0, 115)/ 4,000	172 (17.6, 127)/ 4,000	290 (29.6, 213)/ 4,000

Model — Without catalyst vehicles —		1600	1800
Engine type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
Valve arrangement		Overhead camshaft type	
Bore x Stroke	mm (in)	87.9 x 65.8 (3.461 x 2.591)	87.9 x 75 (3.461 x 2.95)
Displacement	cm^3 (cu in)	1.597 (97.45)	1,820 (111.06)
Compression ratio		9.7	
Firing order		1 — 3 — 2 — 4	
Idle speed at Park/Neutral position	rpm	700 ± 100	
Maximum output	kW (PS)/rpm	70 (95)/5,600	79 (107)/5,600
Maximum torque	N.m (kg-m, ft-lb)/rpm	137 (14.0, 101)/4,000	157 (16.0, 115)/4,000

Model — Australia spec. vehicles —	1600	2000 Non TURBO	2000 TURBO
Engine type	Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine		
Valve arrangement	Overhead camshaft type		
Bore x Stroke mm (in)	87.9 x 65.8 (3.461 x 2.591)	92 x 75 (3.62 x 2.95)	
Displacement cm^3 (cu in)	1,597 (97.45)	1,994 (121.67)	
Compression ratio	9.7		8.0
Firing order	1 — 3 — 2 — 4		
Idle speed at Park/Neutral position rpm	700 ± 100	800 ± 100	
Maximum output kW (PS)/rpm	70 (95)/5,600	88 (120)/5,600	155 (211)/5,600
Maximum torque N.m (kg-m, ft-lb)/rpm	137 (14.0, 101)/4,000	175 (17.9, 129)/4,000	290 (29.6, 214)/4,000

C: ELECTRICAL

Model			1600	1800	2000 Non TURBO	2000 TURBO
Ignition timing at idling speed BTDC/rpm			5° ± 10°/700	10° ± 10°/700	20° ± 10°/800 (MT), 15° ± 10°/800 (AT)	12° ± 10°/800
Spark plug	Type and manufacturer		NGK: BKR6E (without catalyst) NGK: BKR6E-11 (with catalyst) CHAMPION: RC8YC4 (with catalyst)		NGK: BKR6E (without catalyst) NGK: BKR6E-11 (with catalyst) CHAMPION: RC10YC4 (with catalyst)	NGK: PFR6B
Generator			12V — 75A			
Battery	Type and capacity (5HR)	For Europe	5MT: 12V — 48AH 4AT: 12V — 52AH			
		Others	5MT: 12V — 27AH 4AT: 12V — 40AH			

D: TRANSMISSION

Model			1600		2000	
			FWD			
Transmission type			5MT*1	4AT*1	5MT*1	4AT*1
Clutch type			DSPD	TCC	DSPD	TCC
Gear ratio		1st	3.545	2.785	3.545	2.785
		2nd	2.111	1.545	2.111	1.545
		3rd	1.448	1.000	1.448	1.000
		4th	1.088	0.694	1.088	0.694
		5th	0.825	—	0.871	—
		Reverse	3.416	2.272	3.416	2.272
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical	—	Helical
		Gear ratio	—	1.000	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	3.900	4.444	3.700	4.111

5MT*1: 5-forward speeds with synchromesh and 1-reverse
4AT*1: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse
DSPD: Dry Single Plate Diaphragm
TCC: Torque Converter Clutch

SPECIFICATIONS

odel			1600	1800	
			AWD		
·ansmission type			5MT*2	5MT*2	4AT*2
lutch type			DSPD	DSPD	TCC
ear ratio		1st	3.545	3.545	2.785
		2nd	2.111	2.111	1.545
		3rd	1.448	1.448	1.000
		4th	1.088	1.088	0.694
		5th	0.825	0.825	—
		Reverse	3.416	3.416	2.272
.uxiliary transmission gear atio		High	—	—	—
		Low	—	—	—
ꞁeduction gear Front drive)	1st reduction	Type of gear	—	—	Helical
		Gear ratio	—	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid
		Gear ratio	3.900	3.900	4.111
ꞁeduction gear Rear drive)	Transfer reduction	Type of gear	Helical	Helical	—
		Gear ratio	1.000	1.000	—
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid
		Gear ratio	3.900	3.900	4.111

Model			2000 Non TURBO		2000 TURBO	
			AWD			
Transmission type			5MT*2	4AT*2	5MT*2	4AT*2
Clutch type			DSPD	TCC	DSPD	TCC
Gear ratio		1st	3.545	2.785	3.454	2.785
		2nd	2.111	1.545	1.947	1.545
		3rd	1.448	1.000	1.366	1.000
		4th	1.088	0.694	0.972	0.694
		5th	0.871	—	0.738	—
		Reverse	3.416	2.272	3.416	2.272
Auxiliary ratio		High	—	—	—	—
		Low	—	—	—	—
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical	—	Helical
		Gear ratio	—	1.000	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	3.900	4.111	3.900	4.111
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—	Helical	—
		Gear ratio	1.000	—	1.100	—
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	3.900	4.111	3.545	4.111

MT*2: 5-forward speeds with synchromesh and 1-reverse – with center differential and viscous coupling
AT*2: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse – with hydraulically controlled transfer clutch
ƆSPD: Dry Single Plate Diaphragm
CC: Torque Converter Clutch

E: STEERING

Model	Non TURBO	TURBO	
		RHD	LHD
Type	Rack and Pinion		
Turns, lock to lock	3.2	2.8	3.0
Minimum turning circle m (ft)	Curb to curb: 10.2 (33.5)	Curb to curb: 10.4 (34.1)	Curb to curb: 10.8 (35.4)

F: SUSPENSION

Front	Macpherson strut type, Independent, Coil spring
Rear	Dual link strut type, Independent, Coil spring

G: BRAKE

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

H: TIRE

Model	Non TURBO				TURBO
Rim size	13 x 5.00B	14 x 5-1/2JJ		15 x 6JJ	15 x 6JJ
Tire size	165R13	175/70R14	185/70R14	195/60R15	205/55R15
Type	Steel belted radial, Tubeless				

I: CAPACITY

Model			Non TURBO				TURBO	
			FWD		AWD			
			5MT	4AT	5MT	4AT	5MT	4AT
Fuel tank		ℓ (US gal, Imp gal)	50 (13.2, 11.0)				60 (15.9, 13.2)	
Engine oil	Upper level	ℓ (US qt, Imp qt)	4.0 (4.2, 3.5)				4.5 (4.8, 4.0)	
	Lower level	ℓ (US qt, Imp qt)	3.0 (3.2, 2.6)				3.5 (3.7, 3.1)	
Transmission gear oil		ℓ (US qt, Imp qt)	3.3 (3.5, 2.9)	—	3.5 (3.7, 3.1)	—	4.0 (4.2, 3.5)	—
Automatic transmission fluid		ℓ (US qt, Imp qt)	—	7.9 (8.4, 7.0)	—	7.9 (8.4, 7.0)	—	9.5 (10.0, 8.4)
AT differential gear oil		ℓ (US qt, Imp qt)	—	1.2 (1.3, 1.1)	—	1.2 (1.3, 1.1)	—	1.2 (1.3, 1.1)
AWD rear differential gear oil		ℓ (US qt, Imp qt)	—		0.8 (0.8, 0.6)			
Power steering fluid		ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)					
Engine coolant		ℓ (US qt, Imp qt)	1600: 6.4 (6.8, 5.6), 1800: 6.2 (6.6, 5.5), 2000: 6.0 (6.3, 5.2)				7.2 (7.6, 6.3)	

J: WEIGHT

1. EUROPE, GENERAL SPEC. VEHICLE

Model			1600						1800	
			FWD				AWD		AWD	
			LX		GL		LX	GL	GL	
			5MT	4AT	5MT	4AT	5MT	5MT	5MT	4AT
Curb weight (C.W.)	Front	kg (lb)	615 (1,355)	660 (1,455)	625 (1,380)	670 (1,475)	645 (1,420)	650 (1,435)	655 (1,445)	685 (1,510)
	Rear	kg (lb)	410 (905)	415 (915)	425 (935)	430 (950)	470 (1,035)	475 (1,045)	475 (1,045)	480 (1,060)
	Total	kg (lb)	1,025 (2,260)	1,075 (2,370)	1,050 (2,315)	1,100 (2,425)	1,115 (2,460)	1,125 (2,480)	1,130 (2,490)	1,165 (2,570)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	790 (1,750)	830 (1,830)	810 (1,785)	850 (1,875)	810 (1,785)	830 (1,830)	840 (1,850)	860 (1,895)
	Rear	kg (lb)	760 (1,675)	790 (1.740)	770 (1,700)	800 (1,765)	830 (1,830)	840 (1,850)	840 (1,850)	840 (1,850)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1,520 (3,350)	1,590 (3.505)	1,580 (3,485)	1,640 (3,615)	1,620 (3,570)	1,640 (3.615)	1,680 (3.705)	1,680 (3,705)

Model			2000 Non TURBO						2000 TURBO
			FWD		AWD				AWD
			GL		GL		RX		TURBO
			5MT	4AT	5MT	4AT	5MT	4AT	5MT
Curb weight (C.W.)	Front	kg (lb)	640 (1,410)	680 (1,500)	660 (1,455)	690 (1,520)	660 (1,455)	690 (1,520)	725 (1,600)
	Rear	kg (lb)	425 (935)	430 (950)	475 (1,045)	480 (1,060)	475 (1,045)	480 (1,060)	510 (1,125)
	Total	kg (lb)	1,065 (2,350)	1,110 (2,450)	1,135 (2,505)	1,170 (2,580)	1,135 (2,505)	1,170 (2,580)	1,235 (2,725)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	810 (1,785)	850 (1.875)	840 (1,850)	860 (1,895)	840 (1,850)	860 (1,895)	900 (1,985)
	Rear	kg (lb)	770 (1,700)	800 (1,765)	840 (1,850)	840 (1,850)	840 (1,850)	840 (1,850)	850 (1,875)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1.580 (3.485)	1,640 (3.615)	1,680 (3.705)	1,680 (3,705)	1,680 (3,705)	1,680 (3.705)	1,750 (3,860)

NOTE:
When any of the following optional parts are installed, add the weight to the curb weight.

Weight of optional parts	Power window	Power door lock	ABS			Air conditioning	Sun roof	Without power steering	SRS Airbag (Driver)	SRS Air bag (Driver & Passenger)
			13 in*	14 in	15 in					
Front kg (lb)	1 (2)	0 (0)	13 (29)	8 (18)	7 (15)	19 (42)	5 (11)	–8 (–18)	5 (11)	11 (24)
Rear kg (lb)	2 (4)	1 (2)	6 (13)	4 (9)	1 (2)	–2 (–4)	8 (18)	1 (2)	1 (2)	2 (4)
Total kg (lb)	3 (7)	1 (2)	19 (42)	12 (26)	8 (18)	17 (37)	13 (29)	–7 (–15)	6 (12)	13 (29)

*: In case that the ABS is installed on 13 in.-wheel equipped vehicles, the wheels and brakes must be exchanged for 14 in. ones.

1. General Precautions

A: BEFORE STARTING SERVICE

1) Be sure to perform the jobs listed in the Periodic Maintenance Schedule.
2) When a vehicle is brought in for maintenance, carefully listen to the owner's explanations of the symptoms exhibited by the vehicle. List the problems in your notebook, and refer to them when trying to diagnose the trouble.
3) All jewelry should be removed. Suitable work clothes should be worn.
4) Be sure to wear goggles.
5) Use fender, floor and seat covers to prevent the vehicle from being scratched or damaged.
6) Never smoke while working.
7) Before removing underfloor bolts (including the rear differential filler plug) coated with bituminous wax, remove old wax. Re-coat with new wax after reinstallation.

B: WHILE WORKING

1) When jacking up the vehicle, be sure to use safety stands.
2) When jacking up the front or rear end of the car body, be sure to chock the tires remaining in contact with the ground.
3) Keep the parking brake applied when working on the vehicle. Chock the tires remaining in contact with the ground (and set the selector lever to "P" position in AT vehicle), when the parking brake cannot be applied, such as when the brakes are being worked on.
4) Keep the ignition key turned "OFF" if at all possible.
5) Be cautious while working when the ignition key is "ON"; if the engine is hot, the cooling fan may start to operate.
6) While the engine is in operation, properly ventilate the workshop.
7) While the engine is in operation, be aware of any moving parts, such as the cooling fan and the drive belt.
8) Keep your hands off any metal parts such as the radiator, exhaust manifold, exhaust pipe, and muffler to prevent burning yourself.
9) When servicing the electrical system or the fuel system, disconnect the ground cable from the battery.
10) When disassembling, arrange the parts in the order that they were disassembled.
11) When removing a wiring connector, do not pull the wire but pull the connector itself.
12) When removing a hose or tube, remove the clip first. Then, pull the hose or tube while holding its end fitting.
13) Replace gaskets, O-rings, snap rings, lock washers, etc. with new ones.
14) When tightening a bolt or nut, tighten it to the specified torque.
15) When performing work requiring special tools, be sure to use the designated ones.
16) After completing work, make certain that the hoses, tubes and wiring harnesses are securely connected.
17) After completing work, be sure to wash the vehicle.

C: TREATMENT FOR USED ENGINE OIL

1. ENGINE OILS

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities should be provided.

2. HEALTH PROTECTION PRECAUTIONS

1) Avoid prolonged and repeated contact with oils, particularly used engine oils.
2) Wear protective clothing, including impervious gloves where practicable.
3) Do not put oily rags in pockets.
4) Avoid contaminating clothes, particularly underpants, with oil.
5) Overalls must be cleaned regularly. Discard unwashable clothing and oil impregnated footwear.
6) First aid treatment should be obtained immediately for open cuts and wounds.
7) Use barrier creams, applying them before each work period, to help the removal of oil from the skin.
8) Wash with soap and water to ensure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed.
9) Do not use petrol, kerosene, diesel fuel, gas oil, thinners or solvents for washing skin.

10) If skin disorders develop, obtain medical advice.
11) Where practicable, degrease components prior to handling.
12) Where there is a risk of eye contact, eye protection should be worn, for example, chemical goggles or face shields; in addition an eye wash facility should be provided.

3. ENVIRONMENTAL PROTECTION PRECAUTIONS

It is illegal to pour used oil on to the ground, down sewers or drains, or into water courses. The burning of used engine oil in small space heaters or boilers is not recommended unless emission control equipment is fitted. If in doubt, check with the Local Authority.
Dispose of used oil through authorized waste disposal contractors, licensed waste disposal sites, or to the waste oil reclamation trade. If in doubt, contact the Local Authority for advice on disposal facilities.

D: HANDLING AN AT VEHICLE

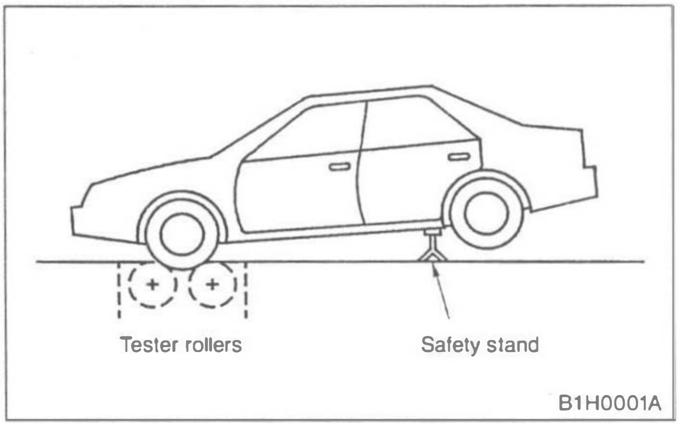
1) The engine cannot be started by pushing the vehicle, and also the vehicle cannot be moved by operating the starter motor.
2) Be sure to release the accelerator pedal before shifting from the "R" to the "N" range and from the "N" to the "D" range, or vise versa even when the vehicle is stopped.
3) Do not maintain the vehicle in a stall operation for more than five seconds as this may overheat the clutch excessively.
4) When the speedometer malfunctions, a vehicle-speed signal will no longer be emitted. Immediately have it repaired.
5) Use only genuine SUBARU AT fluid in the transmission.

E: FULL-TIME AWD MT MODELS

1. SPEEDOMETER TEST (Jack-up method)

1) Position vehicle so that front wheels are placed between rollers of speedometer test machine.
2) Jack up vehicle until rear wheels clear the floor, and support with safety stands.
3) Start engine with shift lever set in 2nd gear (for safety considerations). Perform speedometer tests.

WARNING:
- **Secure a rope or wire to the front towing hook to prevent the lateral runout of front wheels.**
- **Do not abruptly depress/release clutch pedal or accelerator pedal during tests even when engine is operating at low speeds since this may cause vehicle to jump off test machine.**
- **Avoid abrupt braking after tests.**
- **In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.**
- **Since the rear wheels will also be rotating, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.**

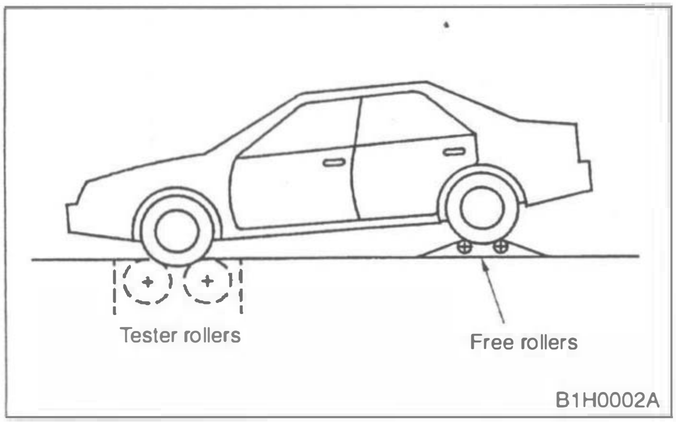


2. SPEEDOMETER TEST (Free roller method)

1) Position vehicle so that front wheels are placed between rollers of test machine.
2) Scribe alignment mark corresponding with centerline of rear wheels on floor.
3) Back up vehicle so that centerline of free rollers are aligned with mark scribed in step 2 above.
4) Drive vehicle onto free rollers.
5) Perform speedometer tests.

WARNING:
- **Secure a rope or wire to the front towing hook to prevent the lateral runout of front wheels.**
- **Do not abruptly depress/release clutch pedal or accelerator pedal during tests even when engine is operating at low speeds**

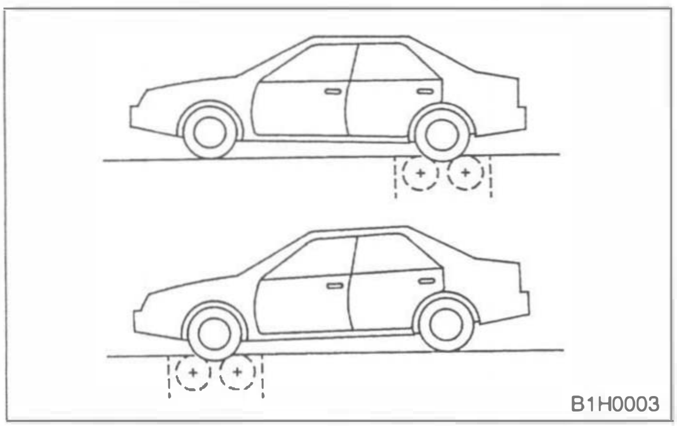
since this may cause vehicle to jump off test machine.
- **Avoid abrupt braking after tests.**



3. BRAKE TEST

1) Drive vehicle for a distance of several kilometers (miles) to stabilize dragging force of viscous coupling.
2) Place vehicle onto brake tester.
3) Perform brake tests.

Effect of braking force on viscous coupling torque: Approx. 245 N (25 kg, 55 lb)



NOTE:
If dragging force exceeds specifications, check brake pad or brake shoe for dragging. Abnormalities related to the viscous torque of viscous coupling unit may cause excessive dragging force. At this point, raise vehicle so that two front or rear wheels clear floor, remove cause of abnormality and check wheel rotation.

4. CHASSIS DYNAMOMETER TEST

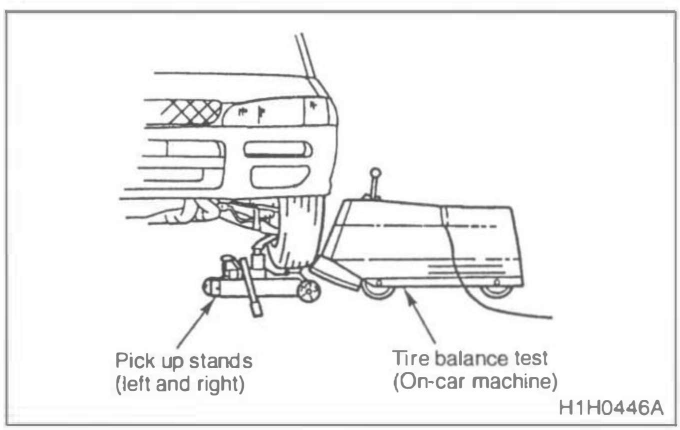
1) Locate vehicle onto chassis dynamometer tester.
2) Locate rear wheels onto free rollers.
3) Perform dynamic performance tests.

WARNING:
- **Do not abruptly depress/release clutch pedal or accelerator pedal during tests.**
- **Avoid abrupt braking tests after tests.**

5. TIRE BALANCE TEST (ON-car machine)

1) Raise vehicle so that left and right wheels to be checked clear the floor. Support wheels using pick-up stands.
2) Raise the other two wheels off the ground and support with a safety stand.
3) Attach on-car machine to wheels to be checked.
4) Drive wheel with engine and perform tire balance tests.

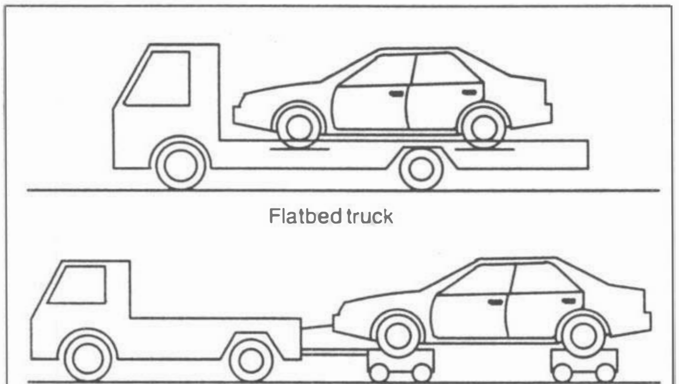
CAUTION:
- **Perform tire balance tests after each tire balance has been measured.**
- **Locate the vehicle so that its front and rear sides are equal in height.**
- **Release parking brake.**
- **Manually rotate each tire and check for drag.**
- **Do not operate clutch and do not accelerate the engine abruptly.**
- **If error occurs due to engine operation, do not operate balance's motor.**



6. TOWING

1) Loading vehicle onto dolly or flat-bed truck

CAUTION:
- **Transport vehicle using a dolly or flat-bed truck whenever possible.**
- **Move shift lever to "1st" position and apply parking brake.**
- **When you unload a vehicle from a flat-bed truck, do as follows:**
  - **run the engine of the unloaded vehicle,**
  - **shift into reverse gear when unloading the vehicle as it faces the same direction as that in which the truck travels,**
  - **shift into 1st gear when unloading the vehicle as it faces the opposite direction to that in which the truck travels.**



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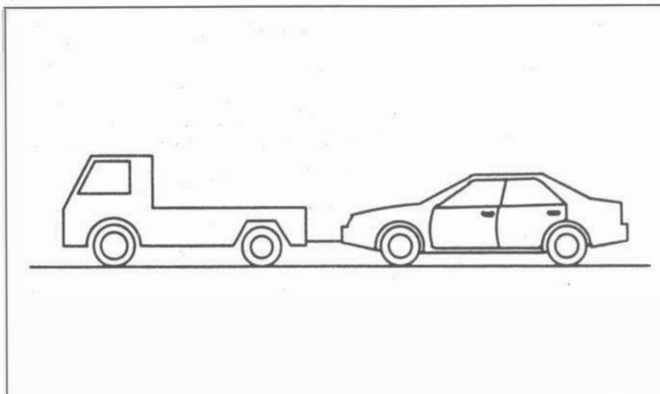
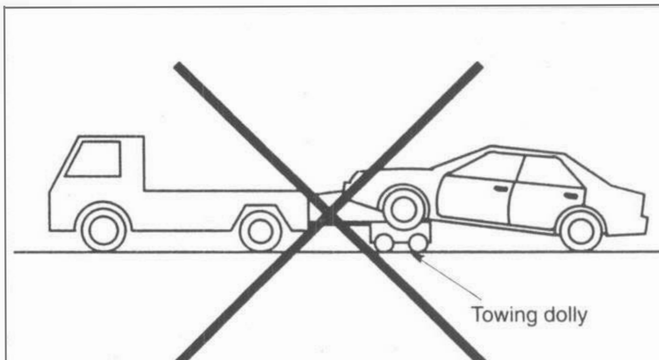
2) Towing with a rope

CAUTION:
- **Use a rope only when power train and all wheels are operating properly.**
- **The ignition switch should be in the "ACC" position. Never have the ignition switch on "LOCK" while the vehicle is being towed because steering will not be possible, since the direction of the wheels will be locked.**
- **Put the transmission in neutral.**
- **Never use the tie down hooks for towing.**
- **Remember that brake booster and power steering will not work when engine is "OFF". You will have to use greater effort for the brake pedal and steering wheel.**
- **Before towing, check transmission oil and differential oil levels and top up to the specified level if necessary.**


B1H0006

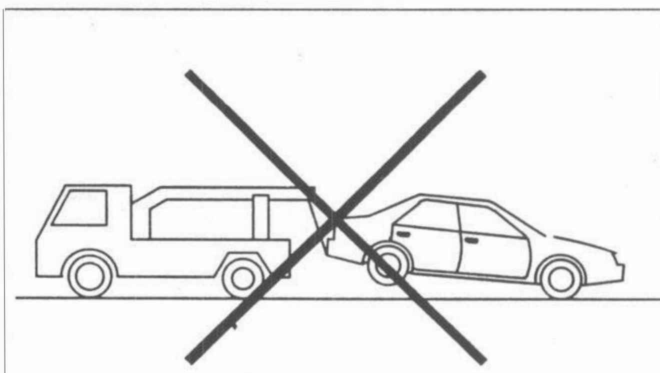
3) Towing with front or rear wheels raised

CAUTION:
- **Do not tow vehicle with only front or rear wheels placed on towing dolly or flat-bed truck. This may degrade viscous coupling performance or cause vehicle to jump off dolly or truck.**

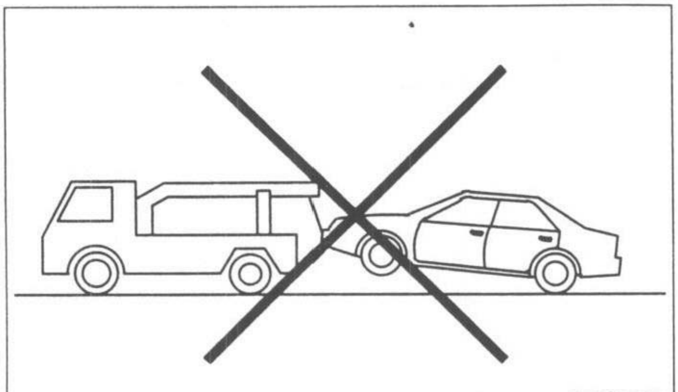


B1H0007A

- **Do not tow vehicle with rear wheels raised under any circumstances since this will damage bumper.**


B1H0008

• Do not tow vehicle with front wheels raised under any circumstances since this will damage bumper.



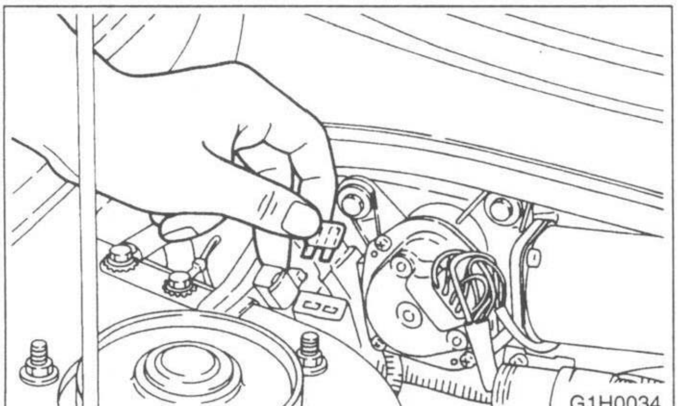
B1H0009

F: NON-TURBO FULL TIME AWD AT MODELS

1. BEFORE CHECKING OR SERVICING CARS WITH THE FRONT WHEELS RAISED OR ON ROLLERS (BRAKE TESTER, CHASSIS DYNAMOMETER, ETC.)

Always set the car in the FWD mode.
To set the car in the FWD mode, disconnect the AWD circuit by inserting a fuse in the FWD connector inside the engine compartment. Also chock the rear wheels firmly.

CAUTION:
Ensure that the FWD pilot light is on. If the car is left in the AWD mode, it will surge abruptly when the wheels turn, possibly damaging the transfer clutch.

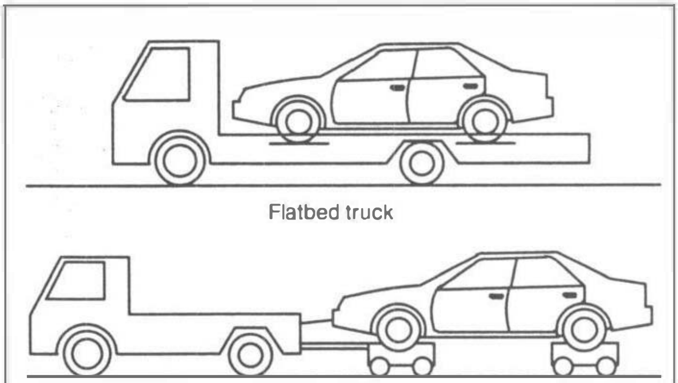


G1H0034

2. TOWING

1) Loading vehicle onto dolly or flat-bed truck

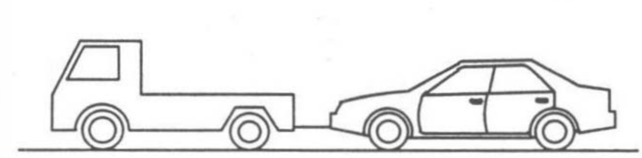
CAUTION:
• Transport vehicle using a dolly or flat-bed truck whenever possible.
• Place the selector lever in "P" position and apply the parking brake.



B1H0005A

2) Towing with a rope

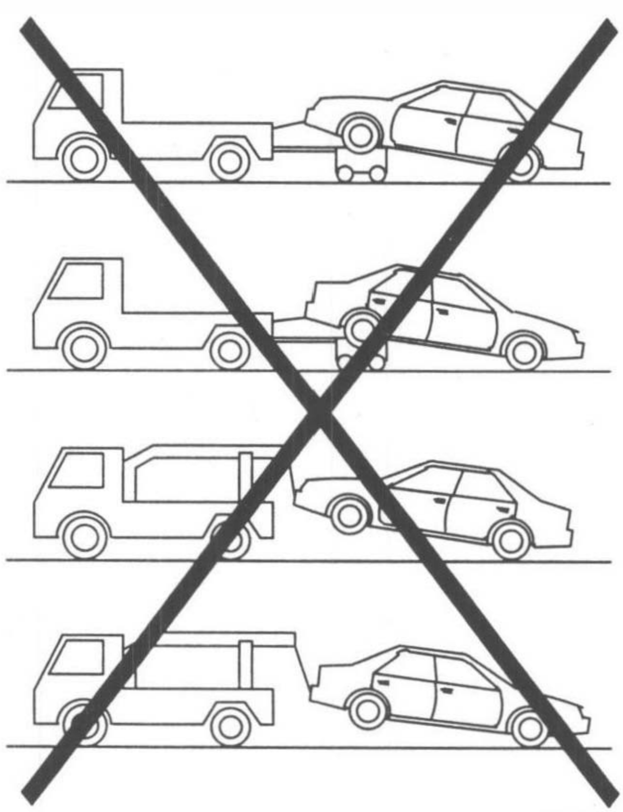
CAUTION:
• Tow vehicle with a rope only when power train and all wheels are operating properly.
• Put a spare fuse inside the FWD connector and never exceed 30 km/h (19 MPH). Also, do not tow for more than 50 km (31 miles).
• Place the selector lever in "N" position.
• The ignition switch should be in the "ACC" position while the vehicle is being towed.
• Never use the tie down hooks for towing.
• Remember that brake booster and power steering will not work when the engine is "OFF". You will have to use greater effort for the brake pedal and steering wheel.
• Before towing, check transmission oil and differential oil levels and top up to the specified level if necessary.



B1H0006

3) Towing with front or rear wheels raised

CAUTION:
Do not tow vehicle with front or rear wheels raised under any circumstances since this will damage bumper.



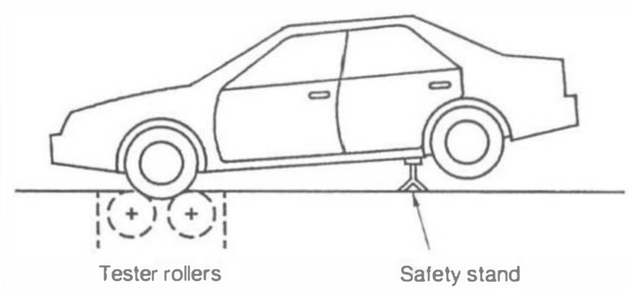
B1H0010

G: TURBO AT MODELS

1. SPEEDOMETER TEST (Jack-up method)

1) Position vehicle so that front wheels are between rollers of speedometer test machine.
2) Jack up vehicle until rear wheels clear the floor, support with safety stands.
3) Start engine with selector lever set in "2nd." (for added safety).
4) Perform speedometer tests.

WARNING:
- **Secure a rope or wire to the front and rear towing or tie-down hook to prevent lateral runout of front wheels.**
- **Do not abruptly push down on accelerator pedal during tests even when engine is operating at low speeds since this may cause vehicle to jump off test machine.**
- **Avoid abrupt braking after tests.**
- **In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.**
- **Since the rear wheels will also be rotating, do not place anything near them. Also, make sure that nobody gets in front of the vehicle.**

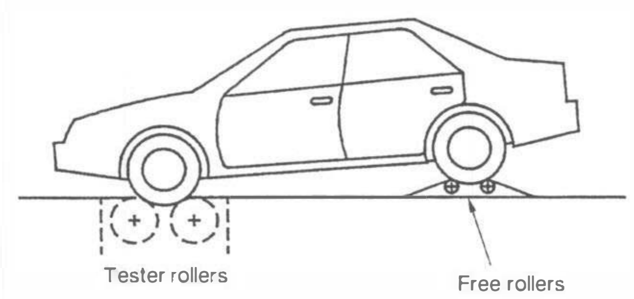


B1H0001A

2. SPEEDOMETER TEST (Free roller method)

1) Position vehicle so that front wheels are between rollers of speedometer test machine.
2) Make an alignment mark corresponding with centerline of rear wheels on floor.
3) Back up vehicle so that centerline of free rollers are aligned with mark described in step 2 above.
4) Drive vehicle onto free rollers.
5) Perform speedometer tests.

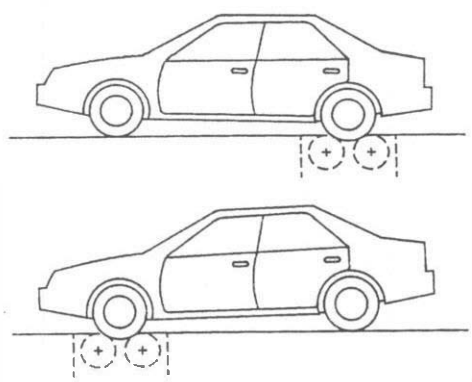
WARNING:
- **Secure a rope or wire to the front and rear towing or tie-down hook to prevent the lateral runout of front wheels.**
- **Do not abruptly push down on accelerator pedal during tests even when engine is operating at low speeds since this may cause vehicle to jump off test machine.**
- **Avoid abrupt braking.**



B1H0002A

3. BRAKE TEST

1) Place vehicle onto brake tester.
2) Perform brake tests.

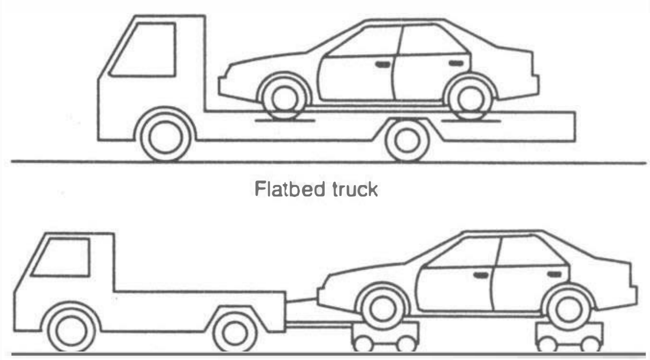

B1H0003

NOTE:
- Ensure front or rear wheels are in contact with the ground during tests.
- If dragging force exceeds specifications, check brake pad or shoe for dragging.

4. TOWING

1) Loading vehicle onto dolly or flat-bed truck

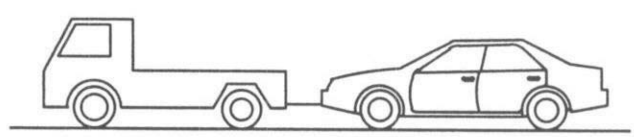
CAUTION
- **Transport vehicle using a dolly or flat-bed truck whenever possible.**
- **Place the selector lever in "P" position and apply the parking brake.**



B1H0005A

2) Towing with rope

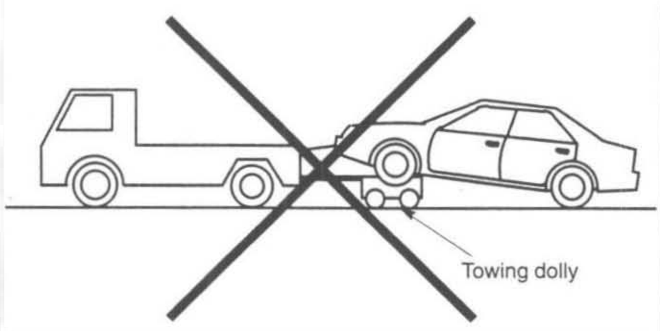
CAUTION:
- **Tow vehicle with a rope only when power train and all wheels are operating properly.**
- **Never exceed 30 km/h (19 MPH). Also, do not tow for more than 10 km (6 miles).**
- **Place the selector lever in "N" position.**
- **The ignition switch should be in the "ACC" position while the vehicle is being towed.**
- **Remember that brake booster and power steering will not work when the engine is "OFF". You will have to use greater effort for the brake pedal snd steering wheel.**
- **Before towing, check transmission oil and differential oil levels and top up to the specified level if necessary.**


B1H0006

3) Towing with front or rear wheels raised

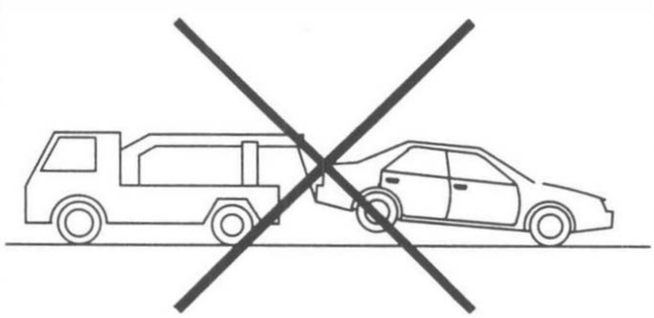
CAUTION:

- **Do not tow vehicle with only front or rear wheels placed on towing dolly or flat-bed truck. This may degrade multi-plate clutch (L.S.D.) performance or cause vehicle to jump off dolly or truck.**



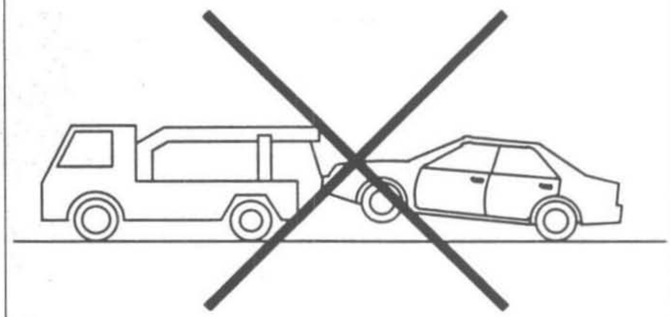
B1H0007A

- **Do not tow vehicle with rear wheels raised under any circumstances since this will damage bumper.**



B1H0008

- **Do not tow vehicle with front wheels raised under any circumstances since this will damage bumper.**



B1H0009

2. Precaution for Supplemental Restraint System (Airbag)

The Supplemental Restraint System (Airbag) has been implemented in some Subaru vehicles. For proper and safe maintenance of this system, please ensure that you carefully read the precautionary notes given in "5-5 SUPPLEMENTAL RESTRAINT SYSTEM" in the Service Manual before servicing.
It should also be noted that in the SM table of contents, an AIRBAG mark is added to each of the items which do not directly concern the airbag system but need to be considered in their relationship to it. So, during the service work for such items, make sure you refer to "5-5 SUPPLEMENTAL RESTRAINT SYSTEM".

- **Take utmost care to follow faithfully the service procedures specified for the airbag, since otherwise it might deploy unexpectedly.**
- **With the airbag system, failures such as faulty connection of harness connectors or neglect of tightening sensor mounting bolts can lead to failure of deployment in an accident. Recheck each check point after maintenance work and use the on-board self-diagnosis to ensure there is nothing wrong with the system.**
- **All wire harnesses of the airbag system are encased in a yellow cover to make them distinct from those of other systems.**

The following are the parts involved in the airbag installation:
1) Steering wheel
2) Steering column
3) Toe-board (center, left & right ends)
4) Front seat floor and side seal
5) Inside left and right front fenders
6) Front pillar (left, lower)
7) Combination meter
8) Steering support beam
9) Instrument panel

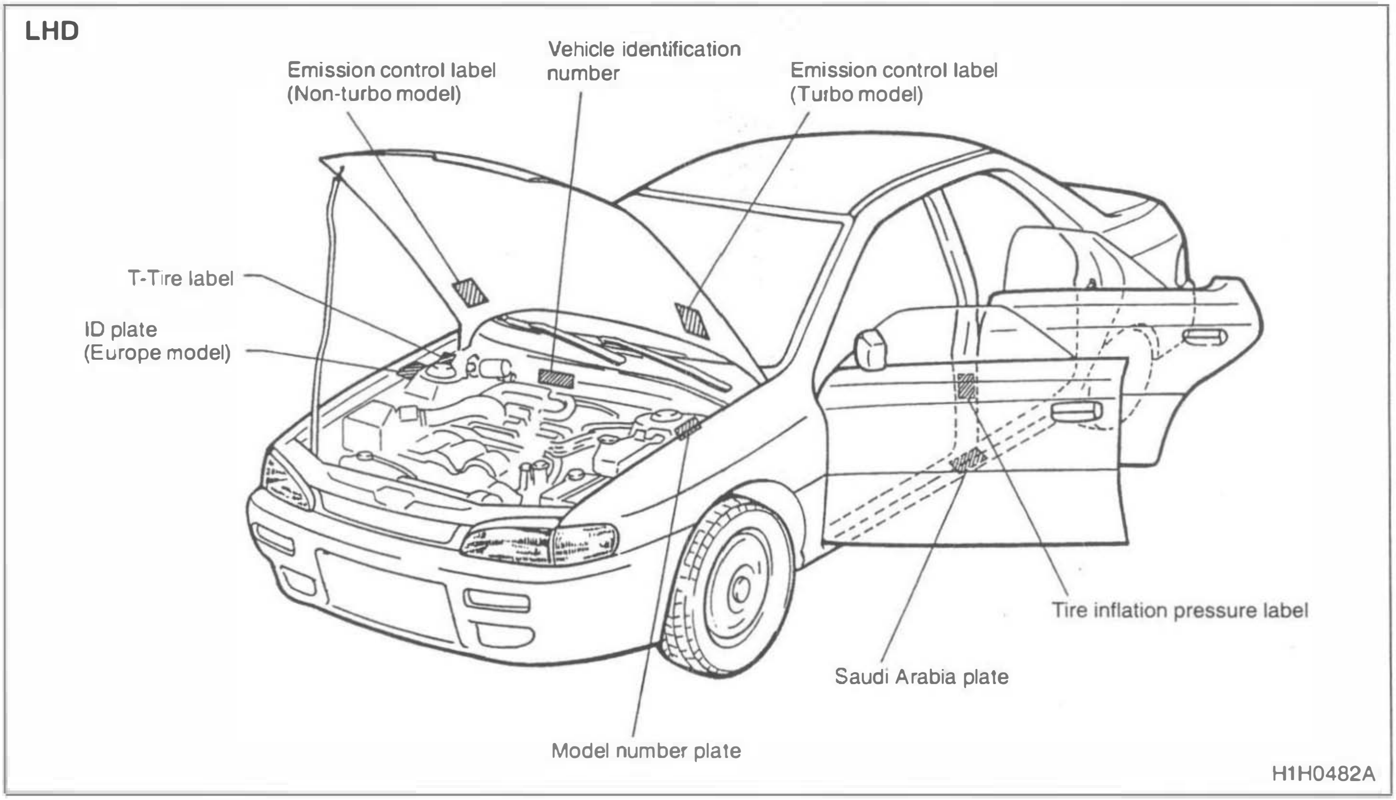
Care should be taken when servicing in areas where the above parts are installed since it can affect the airbag system.

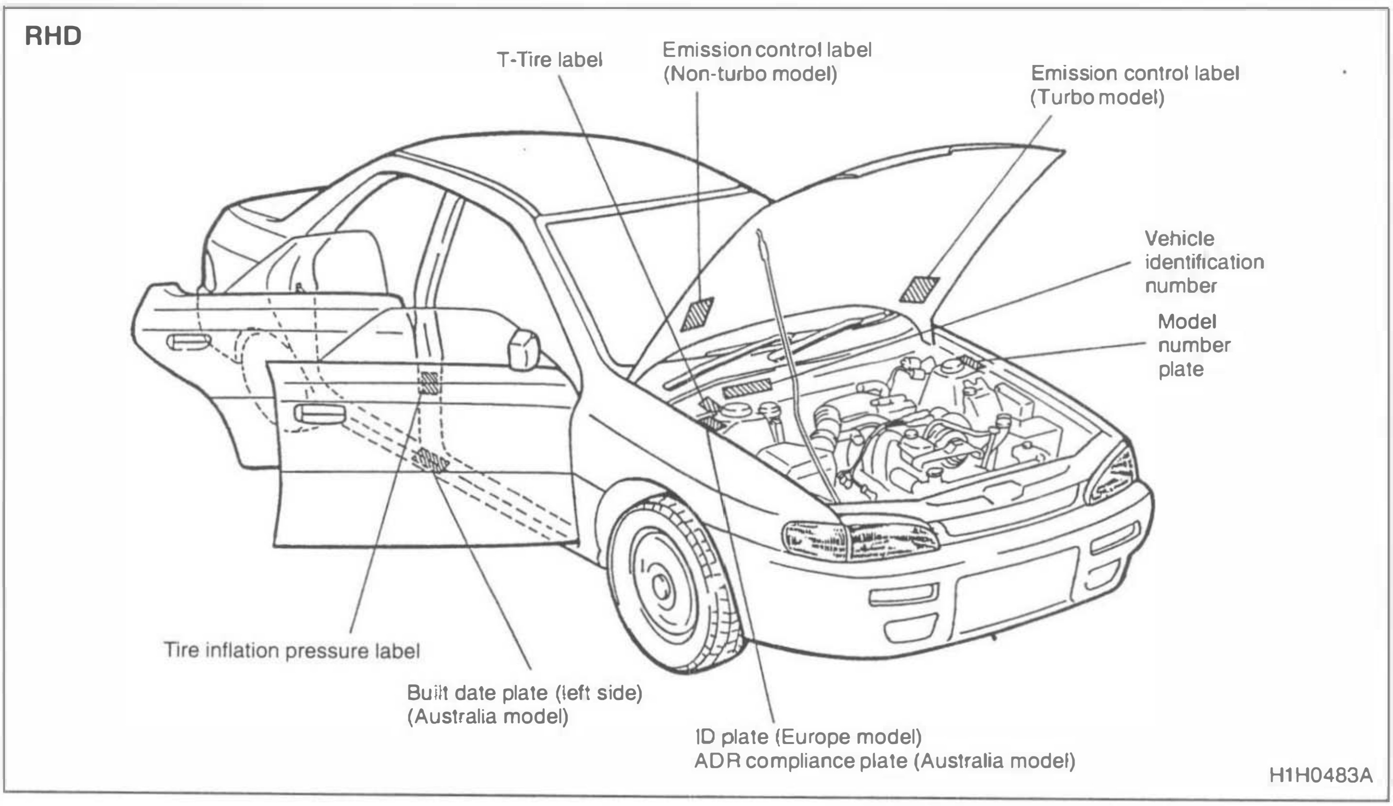
- Examples of service work involving the airbag system:

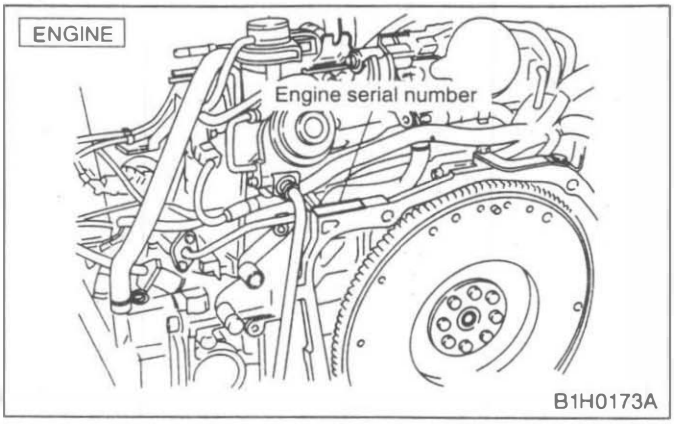
1) Replacement of steering gear
2) Steering maintenance and repair of the area adjoining toe-board
3) Removal and installation of combination meter
4) Installation of car stereo and other optional extras
5) Sheet metal repair paint work on the body front

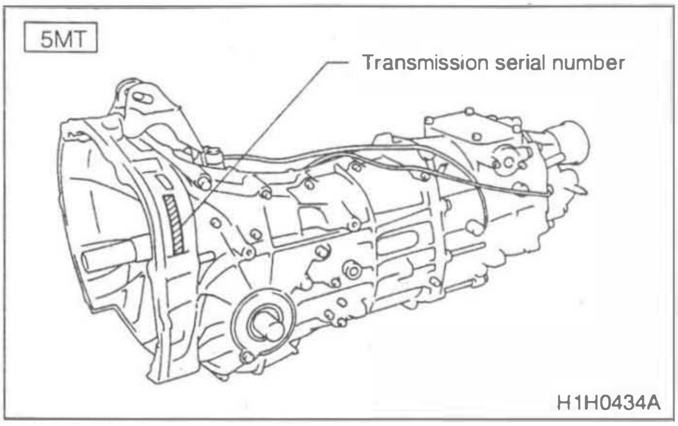
4. Identification Number and Label Locations

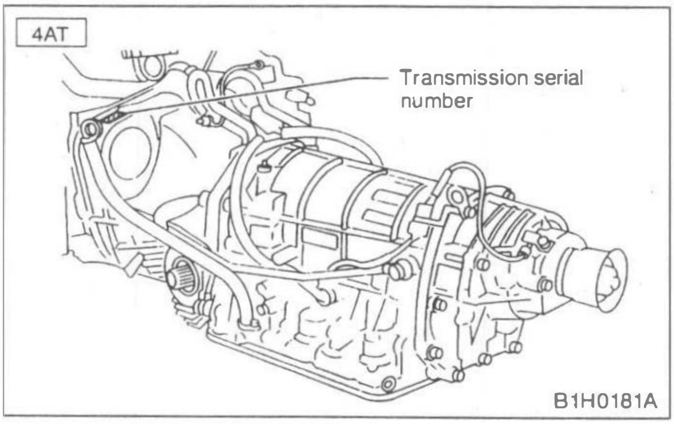
Engine, transmission and vehicle identification numbers are used for factory communications such as Technical Information, Service Bulletins and other information.






ENGINE
Engine serial number
B1H0173A


5MT
Transmission serial number
H1H0434A


4AT
Transmission serial number
B1H0181A

5. Recommended Fuel, Lubricants, Sealants and Adhesives

A: FUEL

1) With catalytic convertor
   - Non-turbo model

   The engine is designed to provide satisfactory performance while producing low exhaust emissions by using **unleaded** gasoline with an octane rating 90 or above (the octane rating selected by the Research Methos).
   - Turbo model

   The engine is designed to provide satisfactory performance while producing low exhaust emissions by using **unleaded** gasoline with an octane rating 95 or above (the octane rating selected by the Research Methos).
2) Without catalytic convertor

   The engine is designed to provide satisfactory performance while producing low exhaust emissions by using gasoline with an octane rating 90 or above (the octane rating selected by the Research Methos).

B: FUELS CONTAINING ALCOHOL

Some gasoline blends sold at service stations contain alcohol or other oxygenates even though that fact may not be fully disclosed. If you are not sure whether there is alcohol present in the fuel, ask your service station operator. Do not use such fuels unless the gasoline/alcohol blend is suitable for your vehicle as explained at right:

- The fuel should be unleaded and have an octane rating no lower than that recommended below.
- Never use fuel containing more than 10% ethanol (ethyl or grain alcohol).
- Methanol (methyl or wood alcohol) is sometimes mixed with unleaded gasoline. Methanol can be used in your vehicle ONLY if it does not exceed 5% of the fuel mixture AND it is accompanied by sufficient quantities of the proper cosolvents and corrosion inhibitors required to prevent fuel system damage. Otherwise, fuel containing methanol should not be used.
- Unleaded fuel blends which contain no more than 15% MTBE (methyl tertiary butyl ether) or other oxygenates and which are approved by the Environmental Protection Agency may be used.
- You should avoid using fuels mixed with alcohol or other oxygenates on an exclusive basis. If driving problems such as engine stalling or hard starting result when such fuels are used, immediately discontinue their use and switch back to unleaded gasoline that does not contain alcohol or other oxygenates.

CAUTION:

Take care not to spill fuel during refueling. Fuels containing alcohol may cause paint damage.

C: LUBRICANTS

Lubricants	Specifications	Remarks
• Engine oil	• API Classification: SH or SG • ILSAC Certified • CCMC Specification: G4 or G5 • ACEA Specification: A1 or A2 or A3	• For SAE viscosity number, refer to the following table. • If it is impossible to get SH or SG grade, you may use SF grade.
• Transmission and differential gear oil • AWD rear differential gear oil	• API Classification: GL-5	• For SAE viscosity number, refer to the following table.
• Automatic transmission fluid	• DEXRON II or III type	—
• Power steering fluid	• DEXRON II or IIE or III type	—
• Coolant	• Genuine SUBARU Coolant (Part No. 000016218) (Anti-freeze, anti-corrosive ethylene glycol base)	• For further coolant specifications, refer to the following table.
• Brake fluid	• DOT3 or DOT4	• FMVSS NO. 116 • Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading. • When brake fluid is added, be careful not to allow any dust into the reservoir.
• Clutch fluid	• DOT3 or DOT4	• FMVSS NO. 116 • Avoid mixing clutch fluid of different brands to prevent the fluid performance from degrading. • When clutch fluid is added, be careful not to allow any dust into the reservoir.

Lubricants	Recommended	Application	Equivalent
• Spray lubricants	SUBARU CRC (P/N 004301003)	O_2 sensor	
• Grease	SUNLIGHT 2 (P/N 003602010)	Steering shaft bearing, bushing for manual transmission gear shift system	—
	Valiant grease M-2 (P/N 003608001)	Steering gearbox	—
	Niglube RX-2 (P/N 003606000 or 725191040)	Piston boot of disc brake and sliding pin	—
	Molykote No. 7439 (P/N 725191460)	Contacting surfaces of drum brake shoes and shoe clearance adjuster	—
	Molylex No.2 (P/N 723223010)	BJ of rear axle shaft	—
	VU-3A702 (P/N 23223GA050)	DOJ of axle shaft	—
	NTG2218 (P/N 28093AA020)	BJ of front axle shaft	—
	FX clutch grease (P/N 000040901)	Splines of transmission main shaft	—
	Slicolube G-30M (P/N 004404002)	Control cables and throttle linkages subject to cold weather, water-pump impeller, door latch, striker, battery terminals, etc.	—

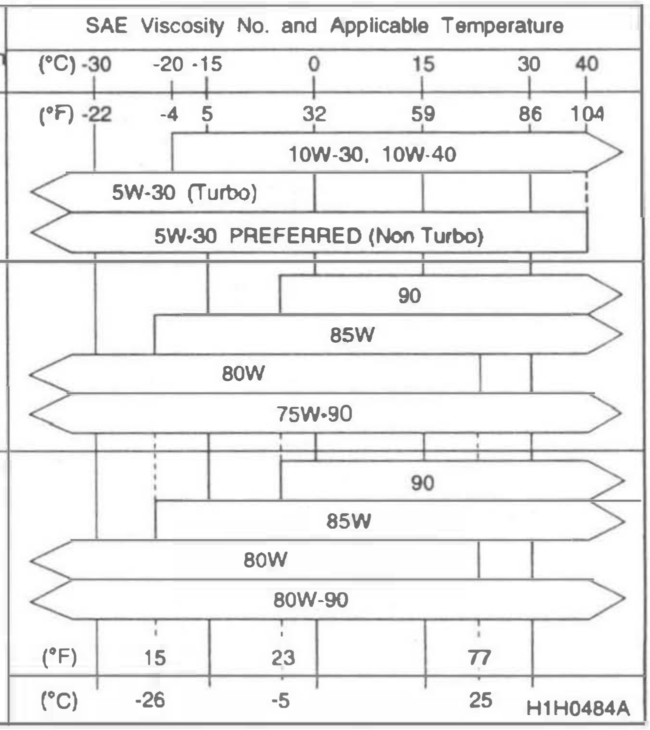
D: FLUID

CAUTION:

- **Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands (Except engine oil).**
- **When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API classification and SAE viscosity No. designated by SUBARU.**
- **As for the turbo models, SAE 5W-30 is not recommended for sustained high speed driving.**

NOTE:
If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used:
30, 40, 10W-50, 20W-40, 20W-50

ITEM	API Classification	ILSAC Certification Mark	CCMC Specification	ACEA Specification	SAE Viscosity No. and Applicable Temperature
Engine oil	SH or SG with the words "Energy Conserving II"	FOR GASOLINE ENGINES	G4 or G5	A1 or A2 or A3	See chart
•Transmission gear oil	GL-5	—	—	—	See chart
•AWD rear differential gear oil •Front differential gear oil for automatic transmission	GL-5	—	—	—	See chart



E: COOLANT

CAUTION:

- **Avoid using any coolant or only water other than this designated type to prevent corrosion.**
- **SUBARU's engine is aluminum alloy, and so special care is necessary.**

Coolant Specifications							
Lowest anticipated atmospheric temperature	SUBARU coolant-to-*water ratio (Volume) %	Specification gravity					Freezing point
		at 10°C (50°F)	at 20°C (68°F)	at 30°C (86°F)	at 40°C (104°F)	at 50°C (122°F)	
Above −30°C (−22°F)	50 — 50	1.084	1.079	1.074	1.068	1.062	−36°C (−33°F)
Above −15°C (5°F)	30 — 70	1.050	1.049	1.042	1.037	1.032	−16°C (3°F)

* It is recommended that distilled water be used.

F: SEALANTS

	Recommended	Application	Equivalent
Sealant	Three Bond 1105 (P/N 004403010)	Rear differential oil drain plug, bearing cap (#5), etc.	Dow Corning's No. 7038
	Three Bond 1215 (P/N 004403007)	Matching surface of oil pump, transmission case, etc. Flywheel and drive plate tightening bolts, etc.	Dow Corning's No. 7038
	Starcalking B-33A (P/N 000018901)	Sealing against water and dust entry through weatherstrips, grommets, etc.	Butyl Rubber Sealant
	Three Bond 1207C (P/N 004403012)	Matching surface of oil pan, oil pressure switch	—
	Three Bond 1102 (P/N 004403006)	Steering gear box adjust screw	—

G: ADHESIVES

Adhesive	Cemedine 5430L	Weatherstrips and other rubber parts, plastics and textiles except soft vinyl parts.	3M's EC-1770 EC-1368
	Cemedine 540	Soft vinyl parts, and other parts subject to gasoline, grease or oil, e.g. trim leather, door inner remote cover, etc.	3M's EC-776 EC-847 EC-1022 (Spray Type)
	Cemedine 3000	Bonding metals, glass, plastic and rubber parts. Repairing slightly torn weatherstrips, etc.	Armstrong's Eastman 910
	Essex Chemical Crop's Urethane E	Windshield to body panel.	Sunstar 580

6. Tightening Torque of Standard Bolts and Nuts

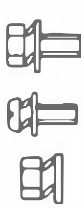
A: ENGINE AND TRANSMISSION

Unit: N.m (kg-m, ft-lb)

Dia. x Pitch (mm)	5T	7T	9T	10T
4 x 0.75	1.0 — 1.5 (0.105 — 0.155, 0.8 — 1.1)	1.5 — 2.0 (0.155 — 0.205, 1.1 — 1.5)	2.5 — 3.0 (0.255 — 0.305, 1.8 — 2.2)	3.0 — 3.5 (0.305 — 0.355, 2.2 — 2.6)
5 x 0.9	2.5 — 3.0 (0.255 — 0.305, 1.8 — 2.2)	2.9 — 3.9 (0.30 — 0.40, 2.2 — 2.9)	4.9 — 5.9 (0.50 — 0.60, 3.6 — 4.3)	5.4 — 6.4 (0.55 — 0.65, 4.0 — 4.7)
6 x 1.0	4.4 — 5.4 (0.45 — 0.55, 3.3 — 4.0)	5.9 — 6.9 (0.60 — 0.70, 4.3 — 5.1)	9.4 — 10.8 (0.955 — 1.105, 6.9 — 8.0)	10 — 12 (1.0 — 1.2, 7 — 9)
8 x 1.25	12 — 14 (1.2 — 1.4, 9 — 10)	14.2 — 17.2 (1.45 — 1.75, 10.5 — 12.7)	23 — 26 (2.3 — 2.7, 17 — 20)	25 — 28 (2.5 — 2.9, 18 — 21)
10 x 1.25	25 — 28 (2.5 — 2.9, 18 — 21)	30 — 36 (3.1 — 3.7, 22 — 27)	46 — 54 (4.7 — 5.5, 34 — 40)	49.5 — 58.4 (5.05 — 5.95, 36.5 — 43.0)
12 x 1.5	41 — 49 (4.2 — 5.0, 30 — 36)	53 — 63 (5.4 — 6.4, 39 — 46)	84 — 98 (8.6 — 10.0, 62 — 72)	88 — 106 (9.0 — 10.8, 65 — 78)
14 x 1.6	71 — 84 (7.2 — 8.6, 52 — 62)	88 — 106 (9.0 — 10.8, 65 — 78)	139 — 165 (14.2 — 16.8, 103 — 122)	147 — 175 (15.0 — 17.8, 108 — 129)

B: BODY

Unit: N.m (kg-m, ft-lb)

	Dia. (mm)	4T	7T	9T
	4	1.7 — 2.6 (0.17 — 0.27, 1.2 — 2.0)	—	—
	5	2.9 — 5.9 (0.30 — 0.60, 2.2 — 4.3)	—	—
	6	5.4 — 9.3 (0.55 — 0.95, 4.0 — 6.9)	—	—
	8	12.7 — 22.6 (1.30 — 2.30, 9.4 — 16.6)	22.6 — 42.2 (2.30 — 4.30, 16.6 — 31.1)	31.4 — 51.0 (3.20 — 5.20, 23.1 — 37.6)
	10	27.5 — 47.1 (2.80 — 4.80, 20.3 — 34.7)	51.0 — 86.3 (5.20 — 8.80, 37.6 — 63.7)	62.8 — 107.9 (6.40 — 11.00, 46.3 — 79.6)
G1H0041	12	52.0 — 85.3 (5.30 — 8.70, 38.3 — 62.9)	88.3 — 156.9 (9.00 — 16.00, 65.1 — 115.7)	117.7 — 196.1 (12.00 — 20.00, 86.8 — 144.7)
In case bolt or nut with washer or spring washer 	4	1.2 — 2.2 (0.12 — 0.22, 0.9 — 1.6)	—	—
	5	2.5 — 4.4 (0.25 — 0.45, 1.8 — 3.3)	—	—
	6	4.4 — 7.4 (0.45 — 0.75, 3.3 — 5.4)	—	—
	8	9.8 — 17.7 (1.10 — 1.80, 7.2 — 13.0)	17.7 — 31.4 (1.80 — 3.20, 13.0 — 23.1)	23.5 — 39.2 (2.40 — 4.00, 17.4 — 28.9)
	10	22.6 — 36.3 (2.30 — 3.70, 16.6 — 26.8)	37.3 — 66.7 (3.80 — 6.80, 27.5 — 49.2)	48.1 — 83.4 (4.90 — 8.50, 35.4 — 61.5)
G1H0042	12	39.2 — 64.7 (4.00 — 6.60, 28.9 — 47.7)	68.6 — 117.7 (7.00 — 12.00, 50.6 — 86.8)	88.3 — 147.1 (9.00 — 15.00, 65.1 — 108.5)

NOTE:
The mark is embossed on the bolt head as follows:

4T — 4
5T — 5
7T — 7
9T — 9
10T — 10

7. Lifting, Towing and Tie-down Points

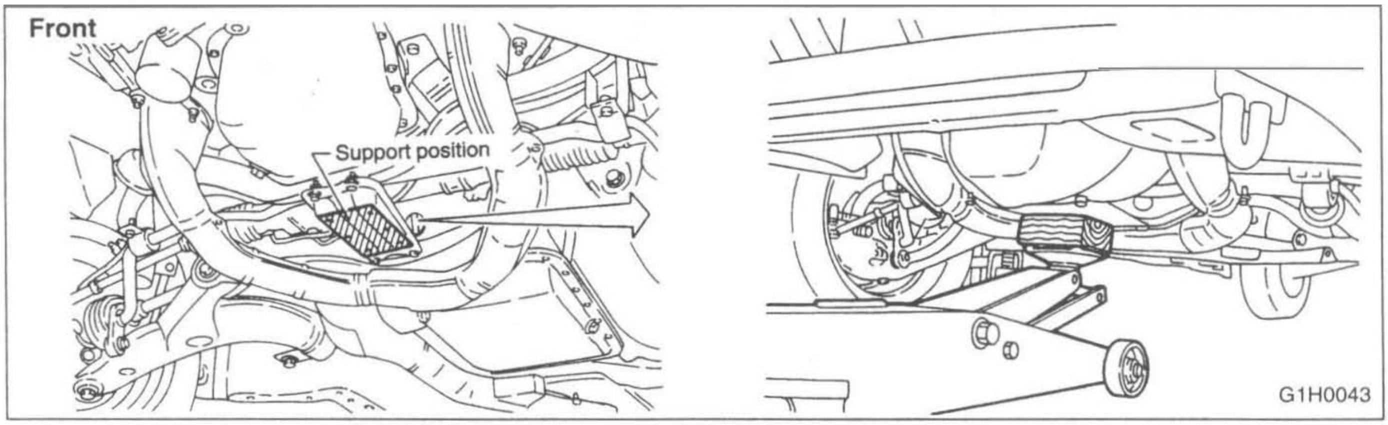
WARNING:

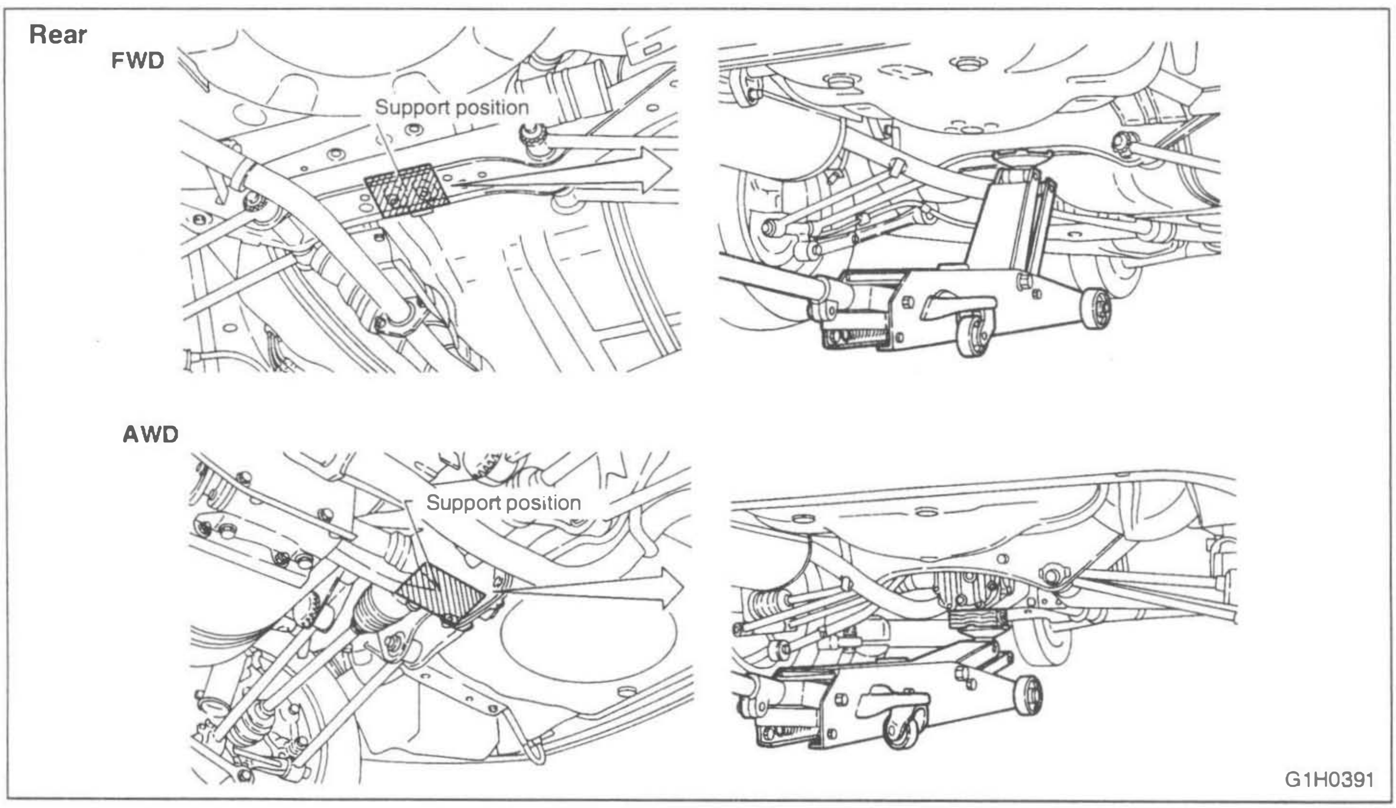
- **Never get under the vehicle while it is supported by a jack.**
- **When jacking up the vehicle, place chocks to hold wheels.**
- **After jacking up the vehicle with garage jack, be sure to support the vehicle with stands for safety.**
- **Be sure to lift vehicle at the same four positions as those for pantograph jack.**

CAUTION:

Be sure to lift, tow and tie-down the vehicle at the designated positions.

A: GARAGE JACK





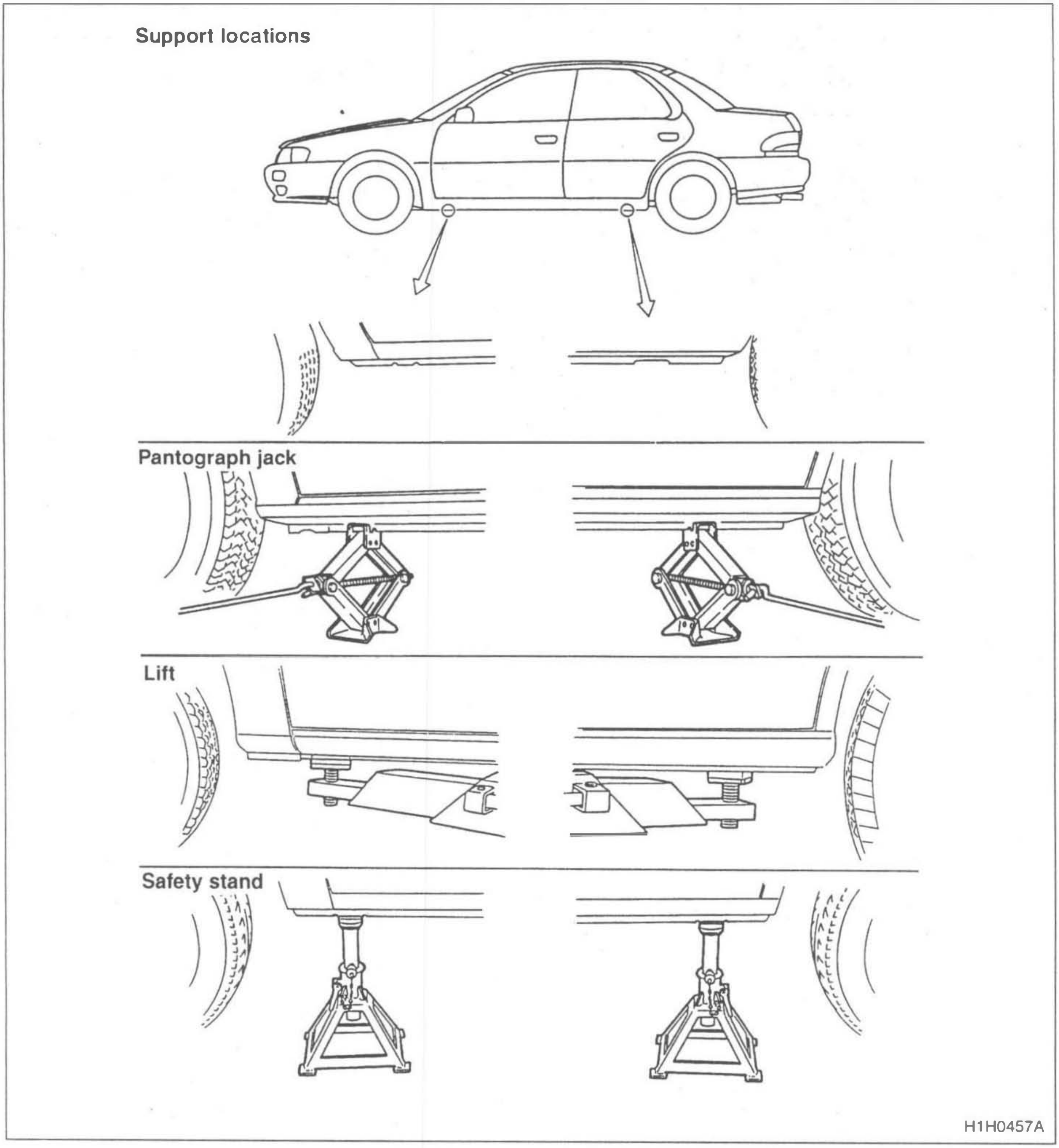
B: PANTOGRAPH JACK, SAFETY STAND AND LIFT

WARNING:

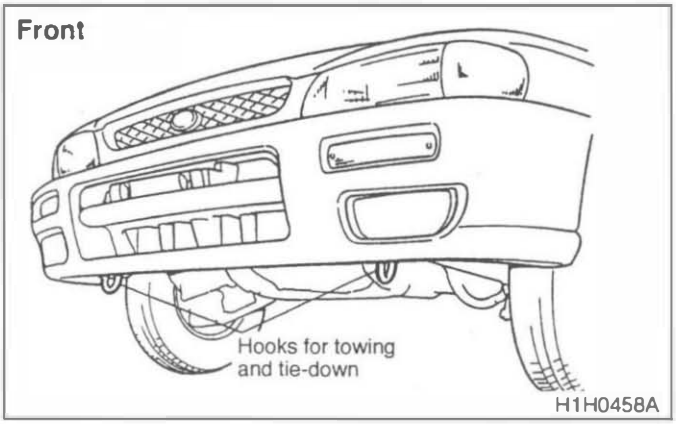
- **Never get under the vehicle while it is supported only by the jack. Always use safety stands to support body when you have to get under the car.**
- **Block the wheels diagonally by wheel chocks.**

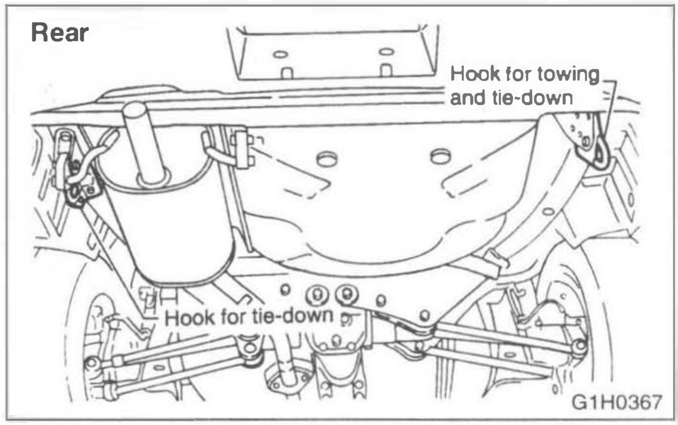
CAUTION:

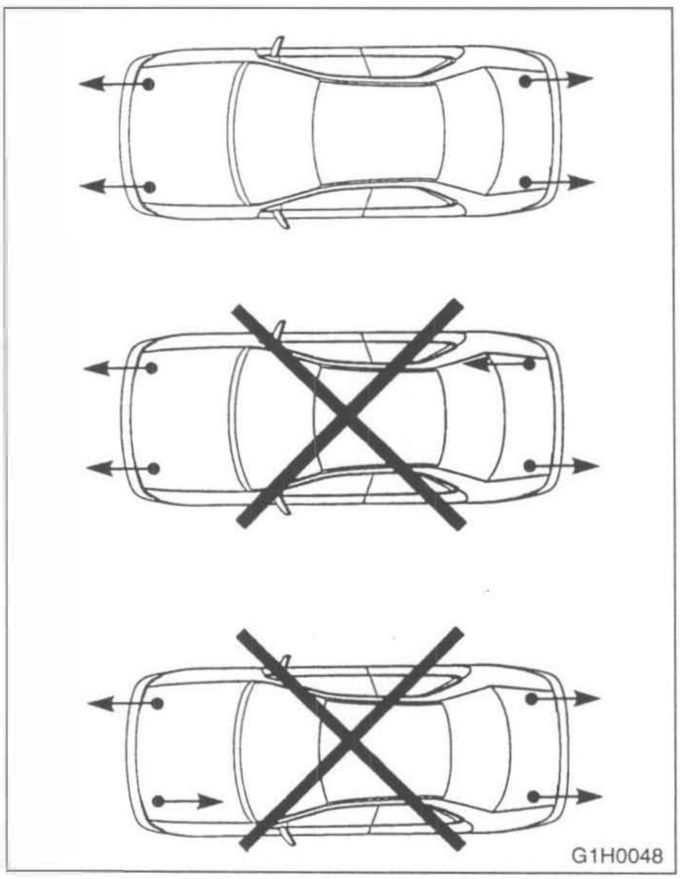
- **Make sure the jack is set at the correct position on the flange of side sill.**
- **Be careful not to set the jack at the air flap portion.**


Support locations
Pantograph jack
Lift
Safety stand
H1H0457A

C: TOWING AND TIE-DOWN HOOKS



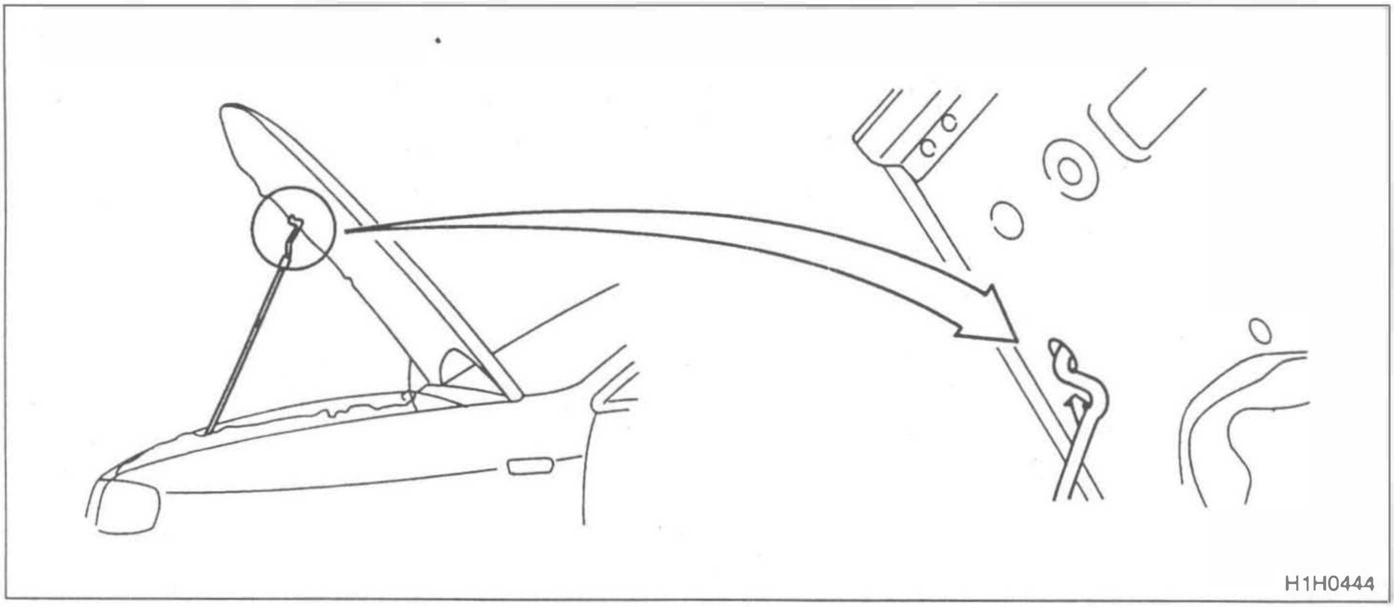




CAUTION:
- **Avoid towing another car with front towing hooks.**
- **Do not tow a vehicle which is heavier than towing vehicle.**
- **Do not apply excessive lateral load to towing hook.**
- **Wrap the towing rope with cloth to prevent damaging bumper, etc.**
- **Keep the vehicle level during towing.**
- **Tie the front and rear tie-down hooks in the same direction.**

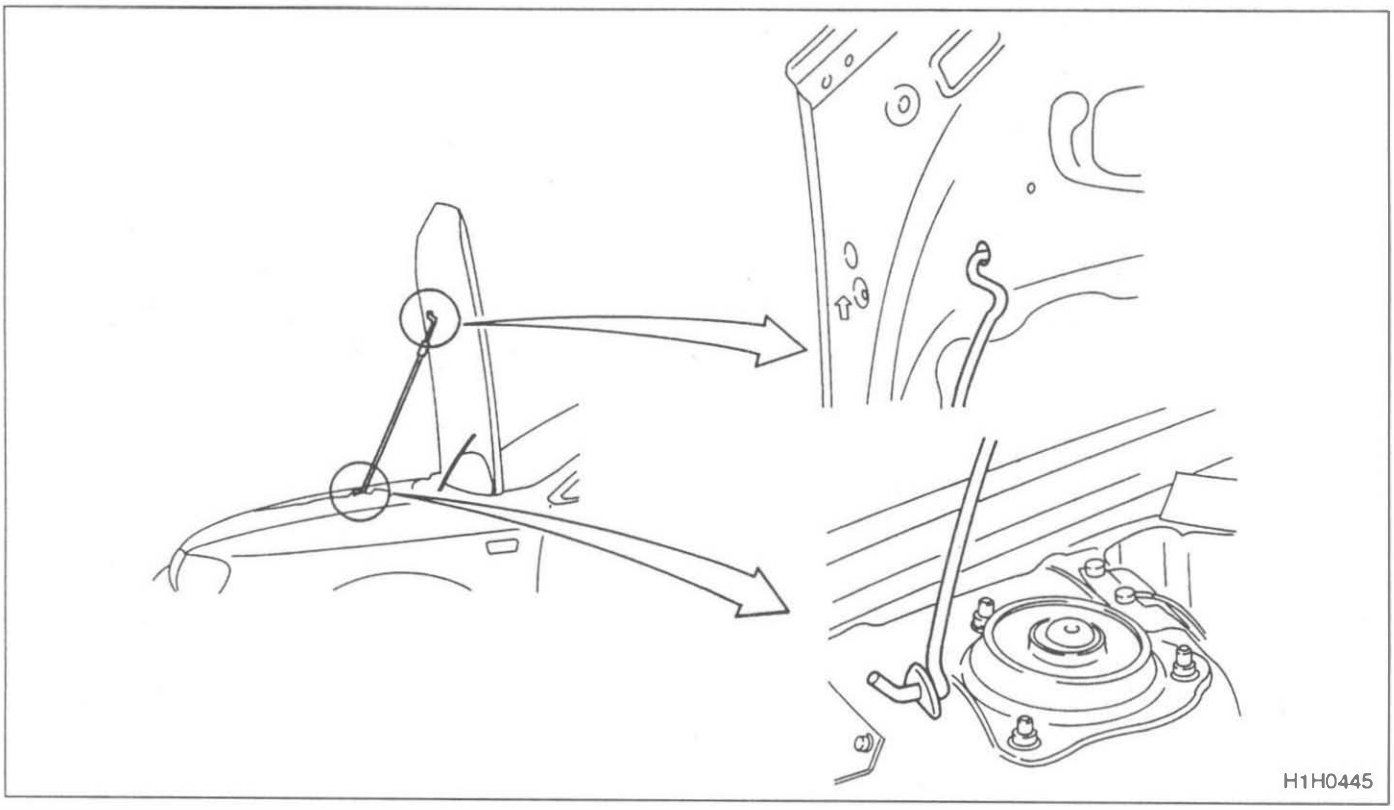
8. Front Hood Stay Installation

A: AT THE CHECK AND GENERAL MAINTENANCE



B: WHEN WIDER HOOD OPENING IS NECESSARY

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



SCHEDULE OF INSPECTION AND MAINTENANCE SERVICES

Continue periodic maintenance beyond 100,000 km (60,000 miles) or 48 months by returning to the first column of the maintenance schedule and adding 100,000 km (60,000 miles) or 48 months to the column headings.

Symbols used:
R: Replace
I: Inspect, and then adjust, correct or replace if necessary.
P: Perform
(I): Recommended service for safe vehicle operation

	MAINTENANCE ITEM		MAINTENANCE INTERVAL (Number of months or km (miles), whichever occurs first)					REMARKS
		Months		12	24	36	48	
		x 1,000 km	1.6	25	50	75	100	
		x 1,000 miles	1	15	30	45	60	
1	Drive belt(s) (Except camshaft)			I	I	I	I	
2	Camshaft drive belt (Timing belt)						R	
3	Engine oil		Change every 12,500 km (7,500 miles) or 6 months whichever occurs first.					See NOTE 1)
4	Engine oil filter		Change every 12,500 km (7,500 miles) or 6 months whichever occurs first.					See NOTE 1)
5	Replace engine coolant and inspect cooling system, hoses and connections				P		P	
6	Replace fuel filter and inspect fuel system, line and connections				P		P	See NOTE 3)
7	Air cleaner element			I	R	I	R	See NOTE 2)
8	Spark plugs	For Non-Turbo		R	R	R	R	
		For Turbo					R	
9	Idle mixture [Except for catalyst model]		I	I	I	I	I	
10	Transmission/differential (Front & rear) lubricants (Gear oil)				R		R	See NOTE 4)
11	Automatic transmission fluid				R		R	See NOTE 4)
12	Brake fluid				R		R	See NOTE 5)
13	Disc brake pads and discs/Front and rear axle boots and axle shaft joint portions			I	I	I	I	See NOTE 3)
14	Brake linings and drums (Parking brake)				I		I	See NOTE 3)
15	Inspect brake lines and check operation of parking and service brake system			P	P	P	P	See NOTE 3)
16	Clutch and Hill-holder system			I	I	I	I	Adjust pedal free play at 1,600 km (1,000 miles)
17	Steering and suspension system			I	I	I	I	See NOTE 3)
18	Front and rear wheel bearing lubricant						(I)	
19	Valve clearance	For Europe	Inspect every 100,000 km (60,000 miles)					
		Except Europe	Inspect every 160,000 km (100,000 miles)					

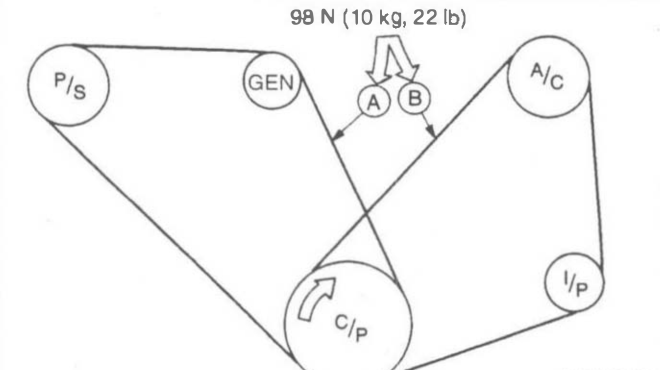
NOTES:

1) **When the vehicle is used under severe driving conditions mentioned below*, the engine oil and oil filter should be changed more frequently.**
2) **When the vehicle is used under severe driving conditions mentioned below*, the air cleaner element should be replaced more frequently.**
3) **When the vehicle is used under severe driving conditions mentioned below*, inspection should be performed at every 12,500 km (7,500 miles) or 6 months whichever occurs first.**
4) **When the automatic transmission vehicle is frequently operated under severe conditions, such as pulling trailer or driving on sand, replacement of automatic transmission fluid and front differential gear oil should be performed more frequently.**
5) **When the vehicle is used under following areas, change fluid every 25,000 km (15,000 miles) or 12 months whichever occurs first.**
   (1) High humidity areas
   (2) Mountainous areas

* Severe driving conditions:
(1) Operating in extremely cold weather (Items 3, 4 and 17 only)
(2) Pulling trailer (Items 3, 4, 13 and 14 only)
(3) Repeated short trips (Items 3, 4, 13 and 14 only)
(4) Driving in dusty roads (Items 7, 13, 14 and 17 only)
(5) Driving in rough and/or muddy roads (Items 13, 14 and 17 only)
(6) Driving in areas using road salt or other corrosive materials (Items 6, 13, 14, 15 and 17 only)
(7) Living in coastal areas (Items 6, 13, 14, 15 and 17 only)

1. Drive Belt(s) [Except Camshaft] (Inspect drive belt tension)

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
		I	I	I	I



G1H0062

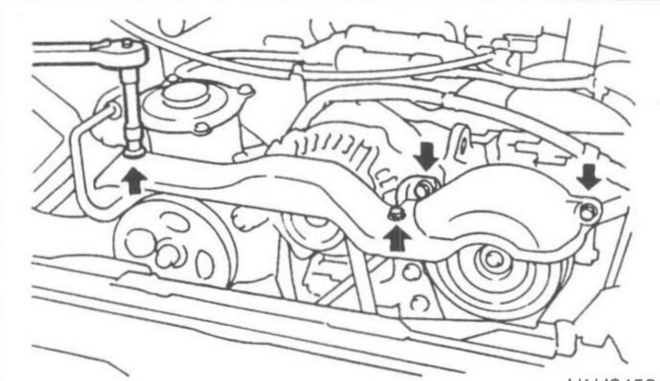
A: INSPECTION

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

Belt tension

Ⓐ	***replaced:***	***7 — 9 mm (0.276 — 0.354 in)***
	reused:	***9 — 11 mm (0.354 — 0.433 in)***
*Ⓑ	***replaced:***	***7.5 — 8.5 mm (0.295 — 0.335 in)***
	reused:	***9.0 — 10.0 mm (0.354 — 0.394 in)***

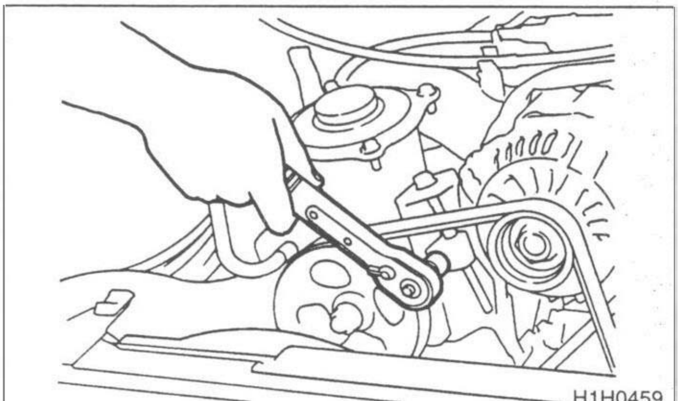
C/P: Crankshaft pulley
GEN: Generator
P/S: Power steering oil pump pulley
A/C: Air conditioning compressor pulley
I/P: Idler pulley
*: There is no belt [B] on models without an air conditioning.


H1H0458

B: REPLACEMENT

1. V-BELT COVER

1) Remove V-belt cover.

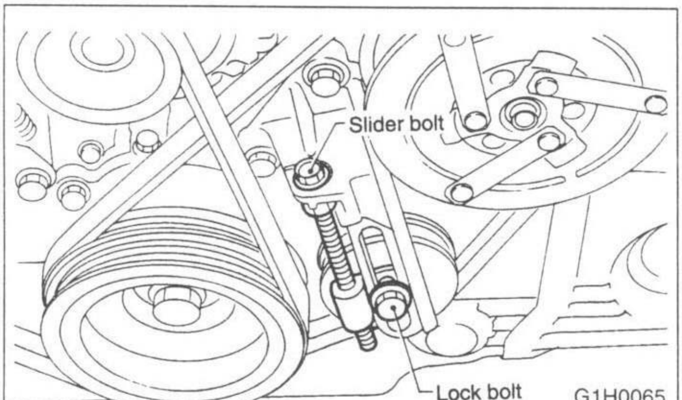

H1H0459

2. FRONT SIDE BELT
(Driving Power Steering Oil Pump and Generator)

1) Loosen the lock bolt on the slider bolt.
2) Loosen the slider bolt.
3) Remove the front side belt.
4) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension shown on the previous page.
5) Tighten the lock bolt.
6) Tighten the slider bolt.

CAUTION:
Wipe off any oil or water on the belt and pulley.

Tightening torque:
Lock bolt, through bolt: 25 ± 2 N.m (2.5 ± 0.2 kg-m, 18 ± 1.5 ft-lb)
Slider bolt: 8 ± 2 N.m (0.8 ± 0.2 kg-m, 5.5 ± 1.5 ft-lb)



G1H0065

3. REAR SIDE BELT
(Driving Air Conditioning)
Before removing the rear side belt, remove the front side belt.

1) Loosen the lock bolt on the slider bolt.
2) Loosen the slider bolt.
3) Remove the rear side belt.
4) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension shown on the previous page.
5) Tighten the lock nut.
6) Tighten the slider bolt.

CAUTION:
Wipe off any oil or water on the belt and pulley.

Tightening torque (Lock bolt):
22.6 ± 2.9 N.m (2.3 ± 0.3 kg-m, 16.6 ± 2.2 ft-lb)

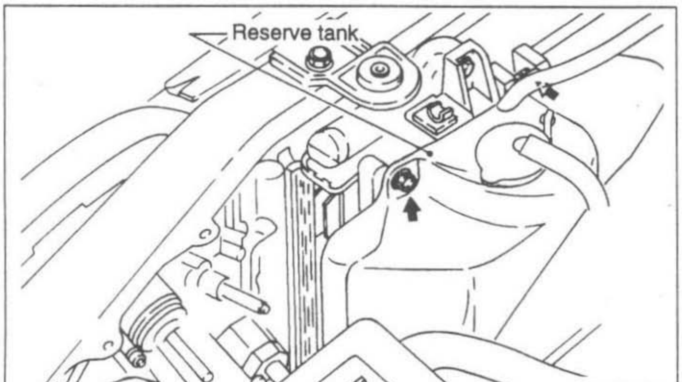
2. Camshaft Drive Belt (Timing Belt)

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
					R

A: REPLACEMENT

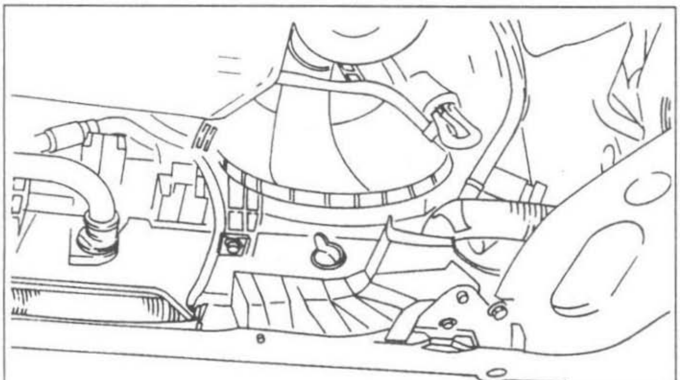
1. SOHC MODEL

1) Disconnect ground cable (-) from battery.
2) Remove reserve tank.



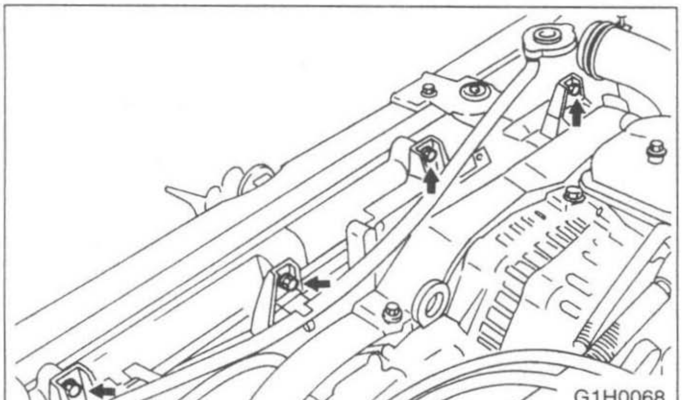
G1H0066

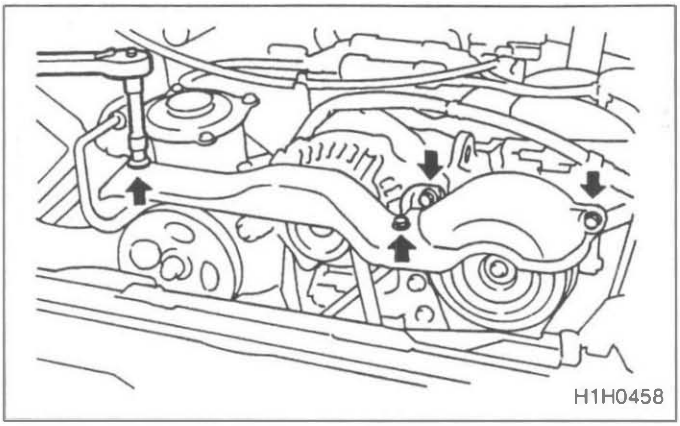
3) Remove radiator fan motor connector and air conditioning fan motor connector.


G1H0067

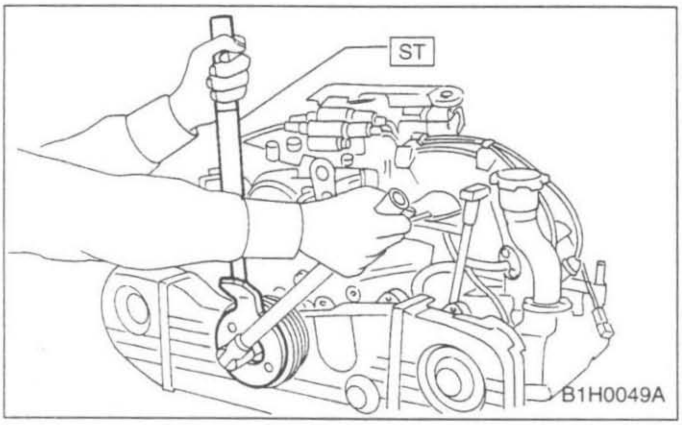
4) Remove radiator fan.
   (1) Remove the two bolts from the upper side of the shroud.
   (2) Remove radiator fan.

CAUTION:
Remove air conditioning fan in same steps described in the removal of radiator.


G1H0068



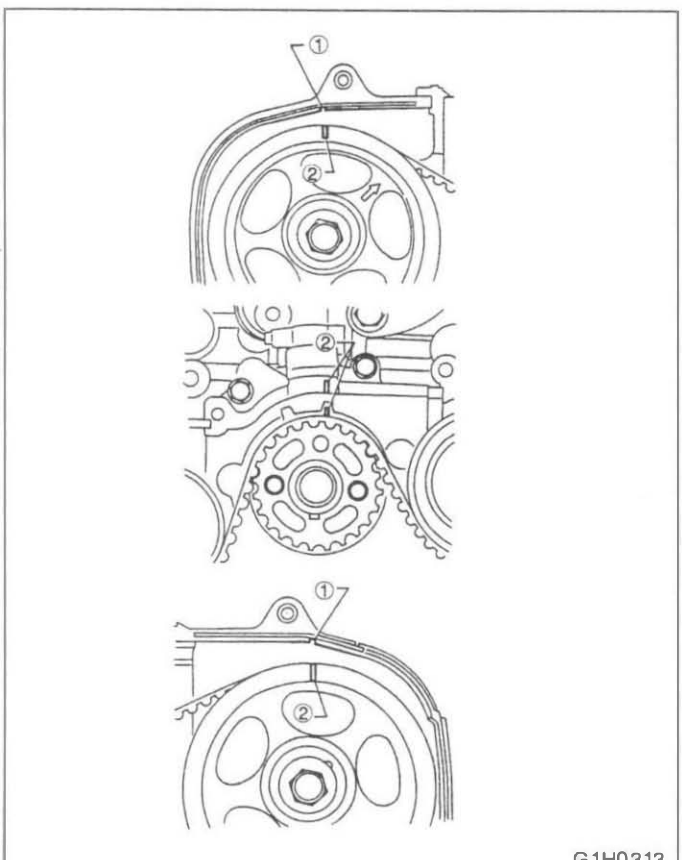
5) Remove V-belt cover.
6) Remove V-belts.
[Refer to “Drive Belt(s)”.]
7) Remove air conditioning compressor drive belt tensioner.



8) Remove pulley bolt. To lock crankshaft use ST.

ST 499977000 CRANKSHAFT PULLEY WRENCH

9) Remove crankshaft pulley.
10) Remove left side belt cover.
11) Remove right side belt cover.
12) Remove front belt cover.

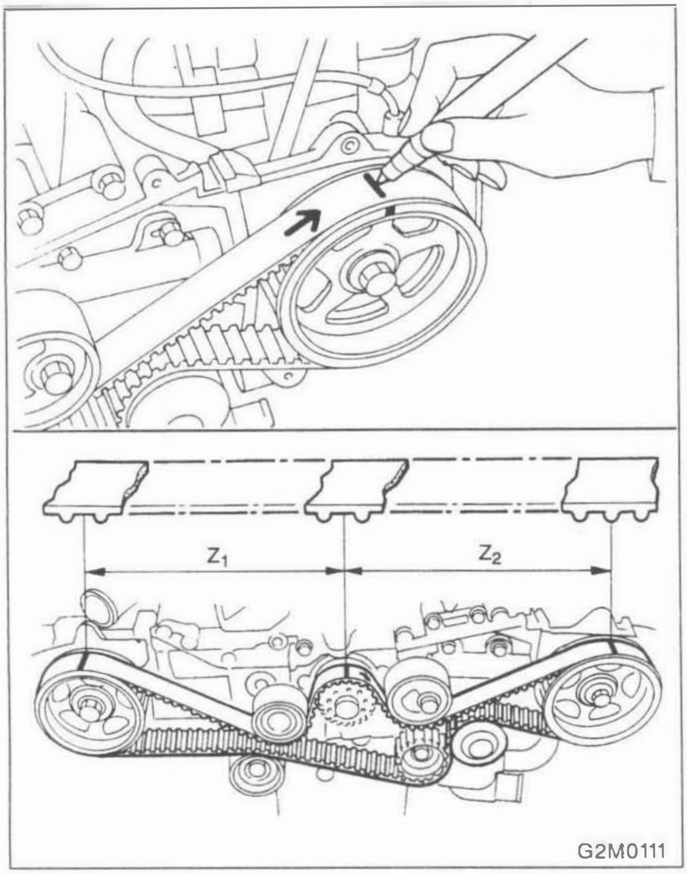


13) If alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing timing belt as follows:

(1) Turn crankshaft and align alignment marks on crankshaft, and left and right camshaft sprockets with notches of belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET

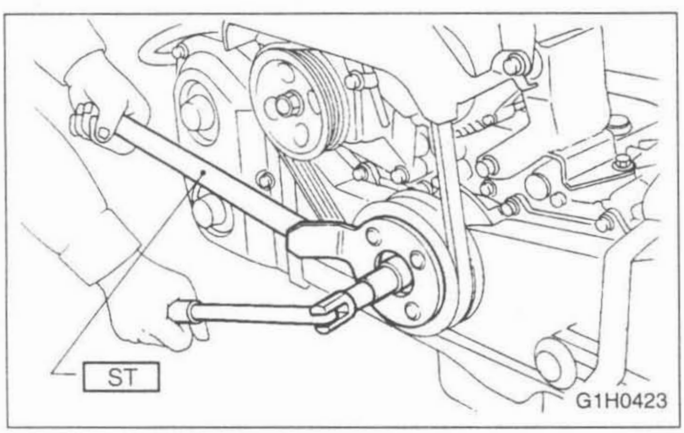
① Notch
② Alignment mark



(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the sprockets.

11) Loosen tensioner adjuster mounting bolts.
12) Remove belt idler.
13) Remove belt idler No. 2.
14) Remove timing belt.

Z_1, 44 tooth length
Z_2, 40.5 tooth length



2. DOHC MODEL

1) Refer to 1) to 7) of camshaft drive belt. <Ref. to 1-5 [02A1]>
2) Remove pulley bolt. To lock crankshaft use ST.

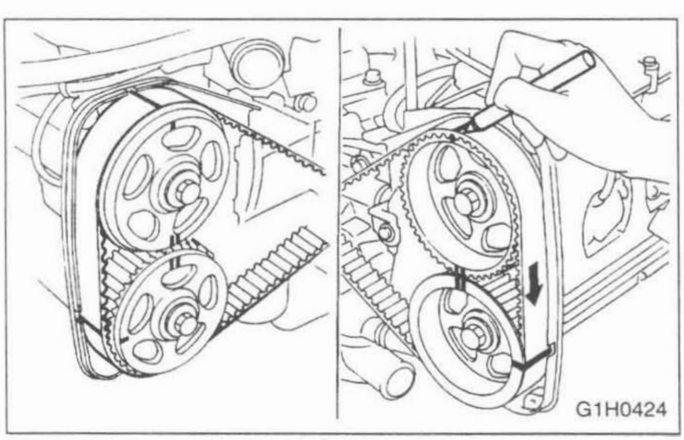
ST 499977000
CRANKSHAFT PULLEY WRENCH

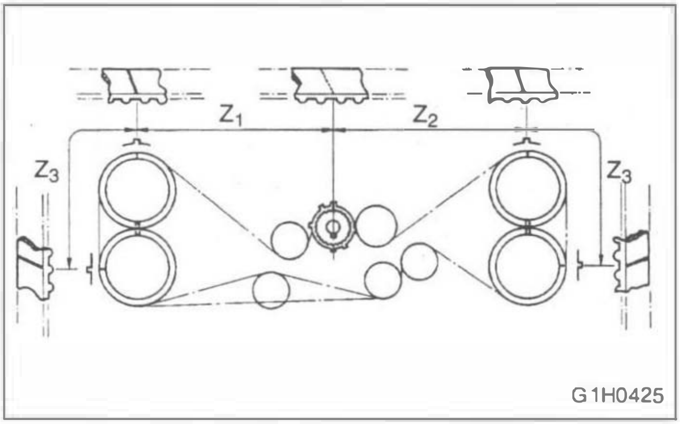
3) Remove crankshaft pulley.
4) Remove left side belt cover.
5) Remove right side belt cover.
6) Remove front belt cover.
7) If alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing timing belt as follows:

(1) Turn crankshaft and align alignment marks on crankshaft, and left and right camshaft sprockets with notches of belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET

(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the sprockets.





8) Loosen tensioner adjuster mounting bolts.
9) Remove belt idler.
10) Remove belt idler No.2.
11) Remove timing belt.

Z_1, 54.5 tooth length
Z_2, 51 tooth length
Z_3, 28 tooth length

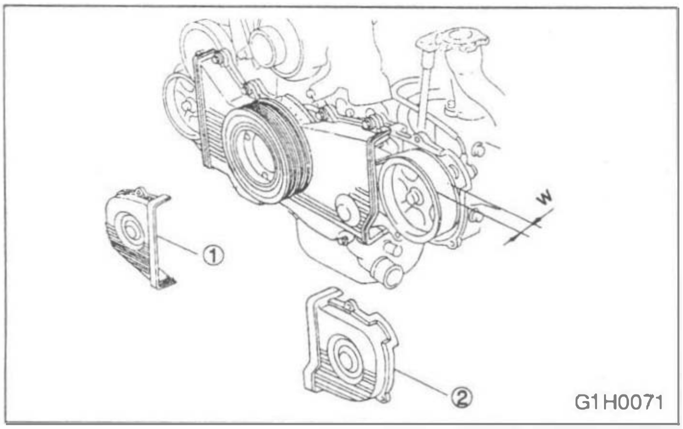
B: INSTALLATION

1. SOHC MODEL

To install, reverse order of removal procedures. For installation of tensioner adjuster and camshaft drive belt, refer to "2-3 ENGINE" [W3C0].

2. DOHC MODEL

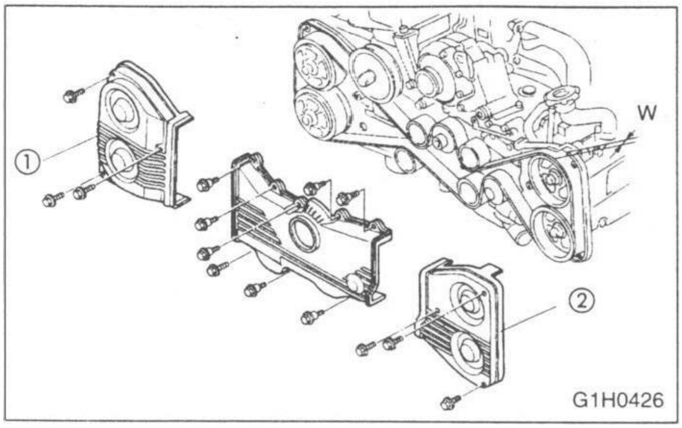
To install, reverse order of removal procedures. For installation of tensioner adjuster and camshaft drive belt, refer to "2-3b ENGINE" [W2C0].



C: INSPECTION

1. SOHC MODEL

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



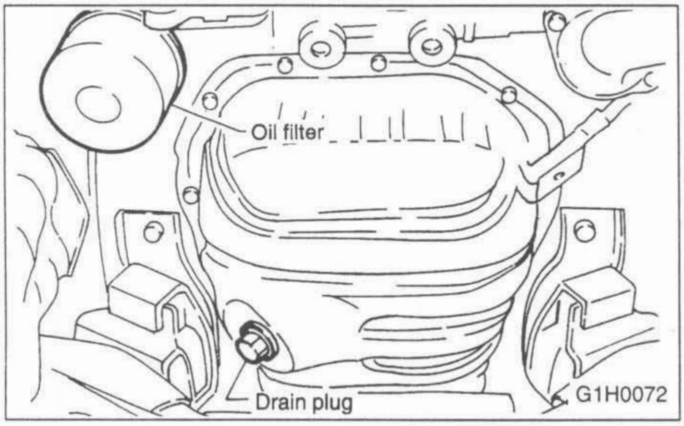
2. DOHC MODEL

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

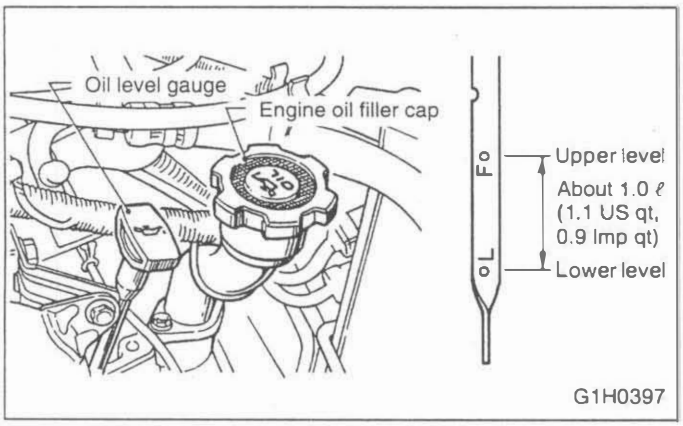
3. Engine Oil

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
	Change every 12,500 km (7,500 miles) or 6 months. Whichever occurs first				

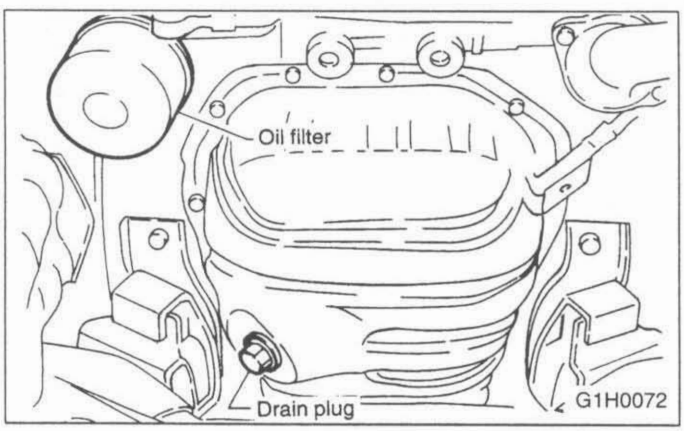
A: REPLACEMENT



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

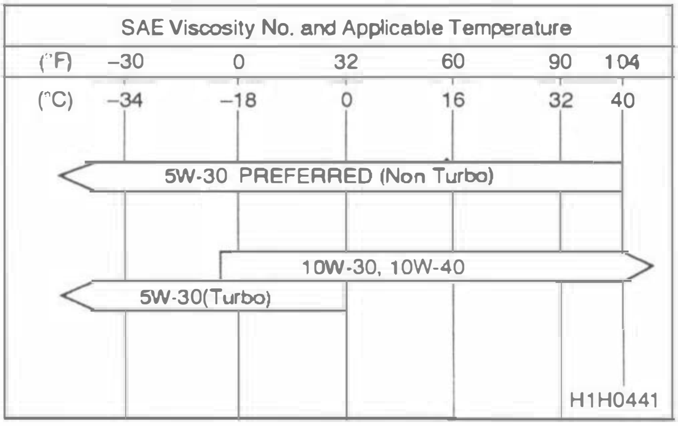


2) Open engine oil filler cap for quick draining of the engine oil.
Replace drain plug gasket.



3) Tighten engine oil drain plug after draining engine oil.

Tightening torque:
44 N.m (4.5 kg-m, 33 ft-lb)



H1H0441

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

Recommended oil

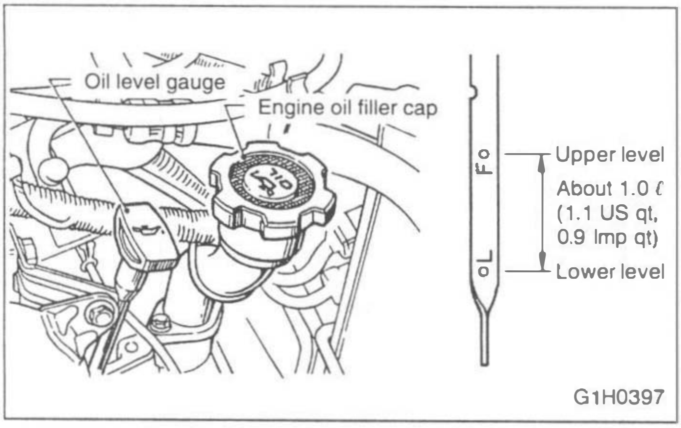
API classification: SH or SG,
CCMC specification G4 or G5,
ACEA specification A1 or A2 or A3,
or ILSAC certification mark is displayed on the container
(If it is impossible to get SH or SG grade, you may use SF grade.)

OM-H1027

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

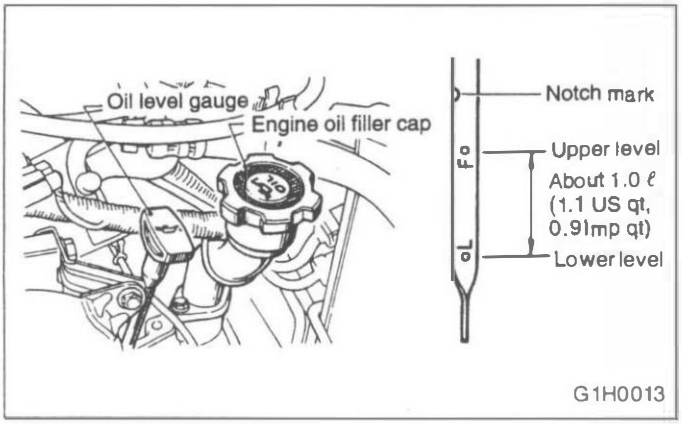
CAUTION:

- **When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API classification and SAE viscosity No. designated by SUBARU.**
- **As for the turbo models, SAE 5W-30 is not recommended for sustained high speed driving.**



G1H0397

5) Close engine oil filler cap.
6) Start engine and warm it up for a time.
7) After engine stops, recheck the oil level. If necessary, add engine oil up to upper level on level gauge.



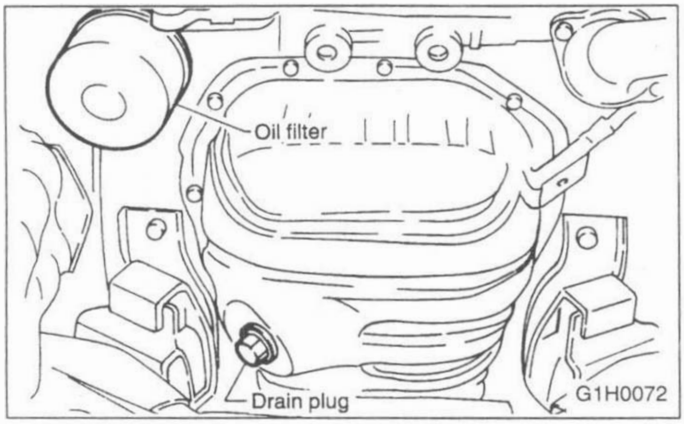
B: INSPECTION

1) Park vehicle on a level surface.
2) Remove oil level gauge and wipe it clean
3) Reinsert the level gauge all the way. Be su that the level gauge is correctly inserted and the proper orientation.
4) Remove it again and note the reading. If th engine oil level is below the "L" line, add oil bring the level up to the "F" line.
5) After turning off the engine, wait a few mi utes for the oil to drain back into the oil pan b fore checking the level.
6) Just after driving or while the engine warm, engine oil level may show in the ranc between the "F" line and the notch mark. This caused by thermal expansion of the engine o
7) To prevent overfilling the engine oil, do n add oil above the "F" line when the engine cold.

Engine oil capacity (Non-Turbo model):
Upper level
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Lower level
3.0 ℓ (3.2 US qt, 2.6 Imp qt)
Engine oil capacity (Turbo model):
Upper level
4.5 ℓ (4.8 US qt, 4.0 Imp qt)
Lower level
3.5 ℓ (3.7 US qt, 3.1 Imp qt)

4. Engine Oil Filter

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
	Change every 12,500 km (7,500 miles) or 6 months. Whichever occurs first				



A: REPLACEMENT

1) Remove oil filter with ST.

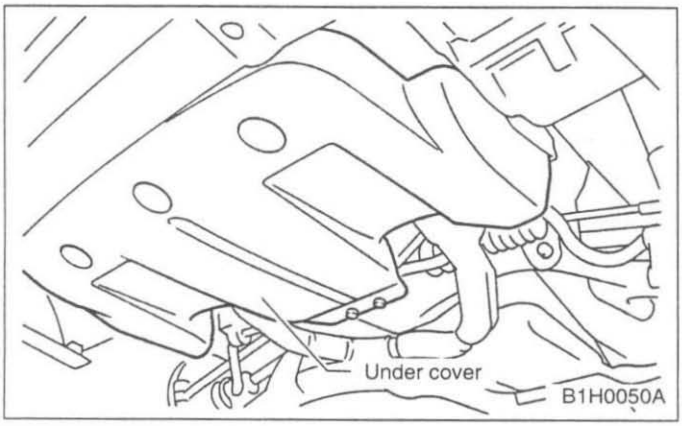
ST 498547000 OIL FILTER WRENCH

2) Get a new oil filter and apply a thin coat of engine oil to the seal rubber.
3) Install oil filter by turning it by hand, being careful not to damage seal rubber.
4) Tighten more (approximately 2/3 to 3/4 turn) after the seal rubber contacts the oil pump case. Do not tighten excessively, or oil may leak.
5) After installing oil filter, run engine and make sure that no oil is leaking around seal rubber.

NOTE:
The filter element and filter case are permanently joined; therefore, interior cleaning is not necessary.

5. Replace Engine Coolant and Inspect Cooling System, Hoses and Connections

MAINTENANCE INTERVAL [Number of months or km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
			P		P

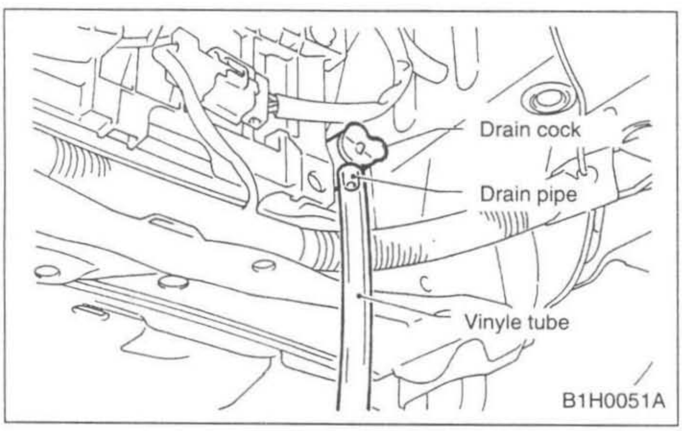


A: REPLACEMENT

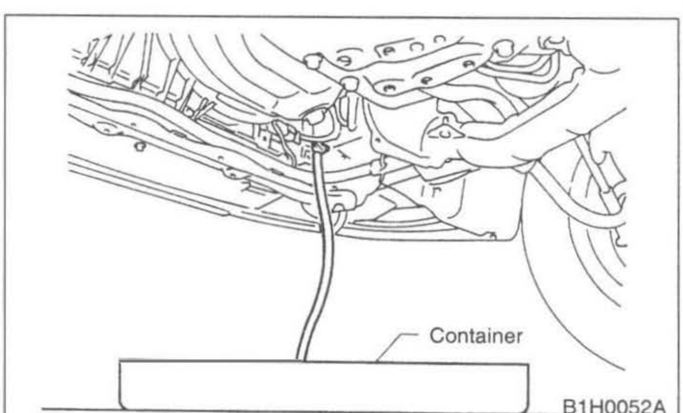
1. REPLACEMENT OF COOLANT (NON-TURBO MODEL)

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

1) Lift up the vehicle.
2) Remove under cover.



3) Fit vinyle tube to drain pipe.
4) Place a container under vinyle tube.



5) Loosen drain cock to drain engine coolar into container.
6) For quick draining, open radiator cap.

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

7) Drain coolant from reservoir tank.
8) Tighten radiator drain plug securely afte draining coolant. (Drain tube may face down ward.)

9) Install reservoir tank to original position.
10) Slowly pour prepared coolant from radiator filler port to neck of filler, then pour into reservoir tank up to "FULL" level.

Coolant capacity (fill up to "FULL" level)
1,600 cc:
Approx. 6.4 ℓ (6.8 US qt, 5.6 Imp qt)
1,800 cc:
Approx. 6.2 ℓ (6.6 US qt, 5.5 Imp qt)
2,000 cc:
Approx. 6.0 ℓ (6.3 US qt, 5.3 Imp qt)

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

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

2. REPLACEMENT OF COOLANT (TURBO MODEL)

1) Loosen radiator drain plug after following the same procedures 1) as described for the Non-TURBO model.
2) Loosen coolant flow tank cap to drain coolant.
3) Tighten radiator drain plug securely.
4) Slowly pour prepared coolant from coolant flow tank filler port up to the brim of port, and install cap, then pour coolant into reserve tank up to "FULL" level.
5) Run engine for about 15 minutes, not exceeding 2,000 rpm. (Run engine until radiator becomes hot in order to purge air trapped in cooling system.)
6) Stop engine and wait until coolant temperature lowers. [below 50°C (122°F) or 60°C (140°F)] Open coolant flow tank cap and add

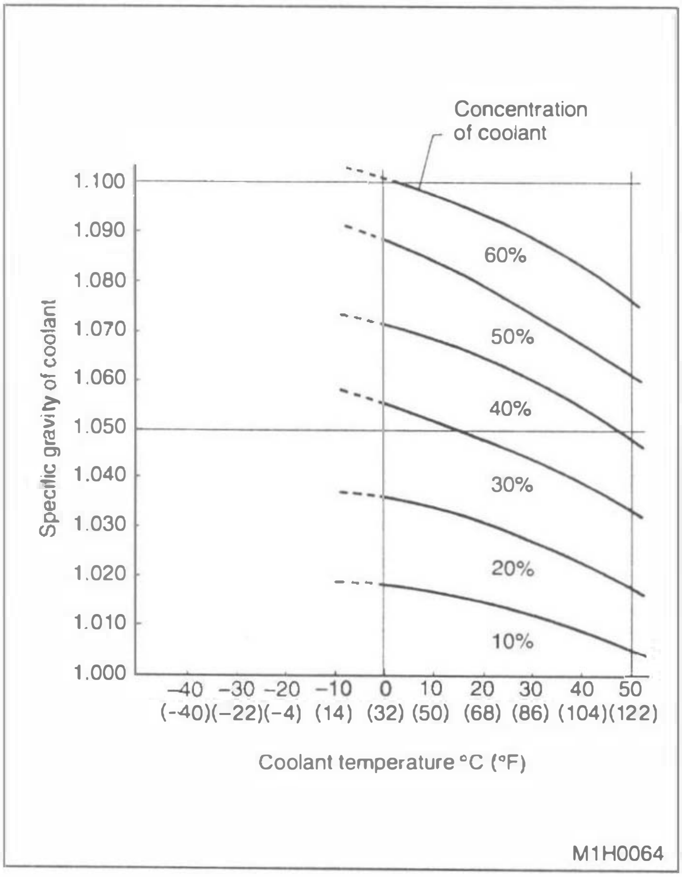
coolant up to the brim of the port.

7) Wait until coolant temperature lowers further [below 30°C (86°F)], then pour into reserve tank up to the "FULL" level.

8) Run the vehicle until the coolant temperature rises to 80°C (176°F) and check the level in the coolant flow tank, add coolant up to the "FULL" level.

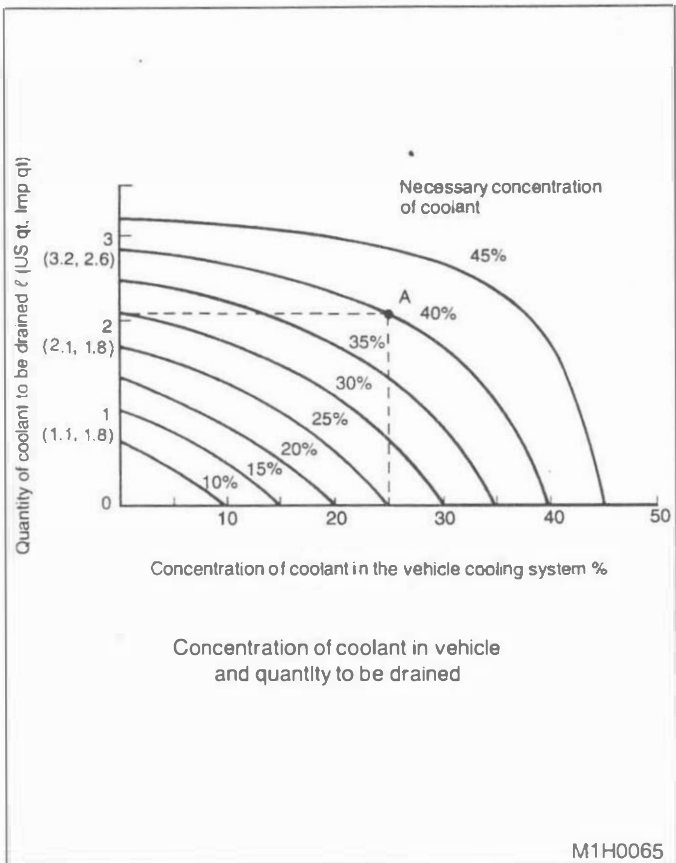
Coolant capacity (fill up to "FULL" level):
Approx. 7.2 ℓ (7.6 US qt, 6.3 Imp qt)

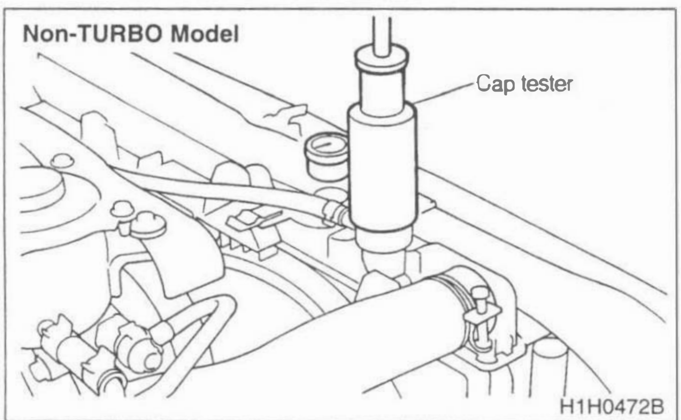
CAUTION:
The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

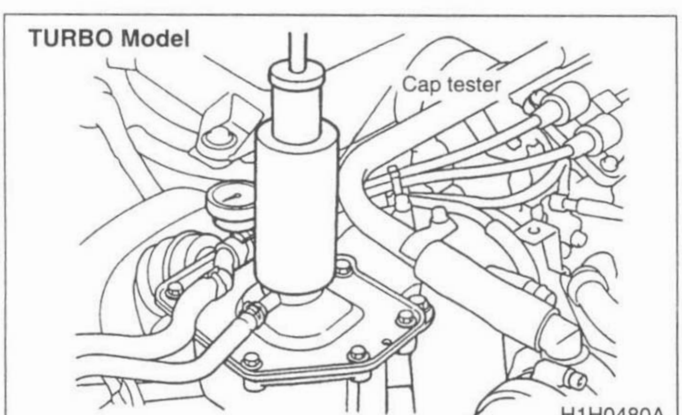


3. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.







4. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50).

The amount of coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.

B: INSPECTION

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

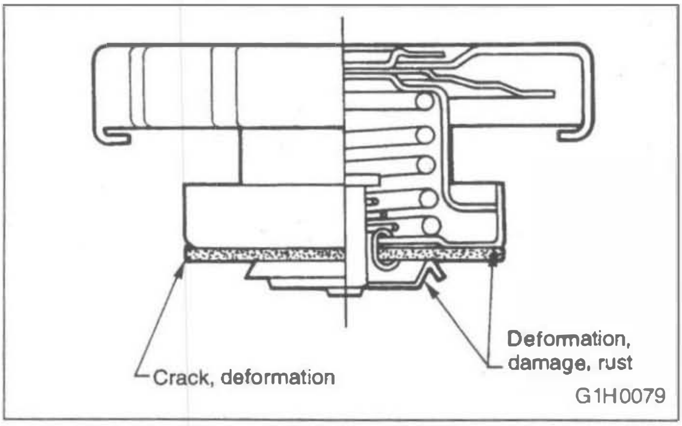
- Each portion of radiator for leakage
- Hose joints and other connections for leakage

CAUTION:

When attaching or detaching tester and when operating tester, use special care not to deform radiator filler neck.

NOTE:

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



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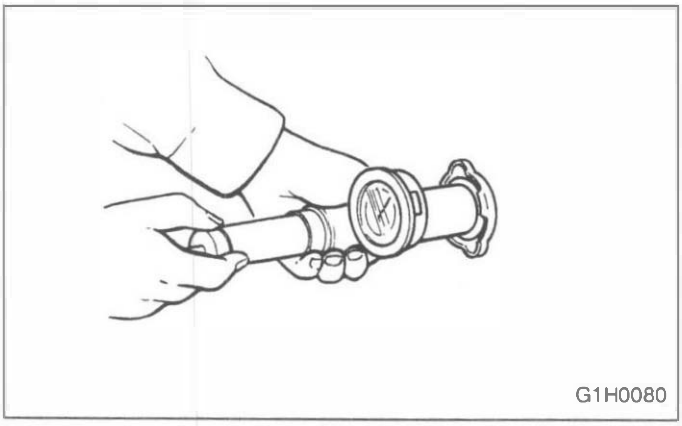

G1H0080

2) Check the radiator cap valve open pres using radiator cap tester.
Raise the pressure until the needle of ga stops and see if the pressure can be retaine five to six seconds. The radiator cap is no if a pressure above the service limit value been maintained for this period.

Radiator cap valve open pressure
Standard value:
78 — 98 kPa
(0.8 — 1.0 kg/cm^2, 11 — 14 psi)
Service limit: 69 kPa (0.7 kg/cm^2, 10 p

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

3) If the coolant temperature exceeds 76.(80.0°C (169 to 176°F) while radiator is not hot, check thermostat. If thermostat does open at 76.0 to 80.0°C (169 to 176°F), repl it with a new one.
4) If electric fan does not operate when cool temperature exceeds 90 to 94°C (194 to 201 check thermoswitch or fan motor.

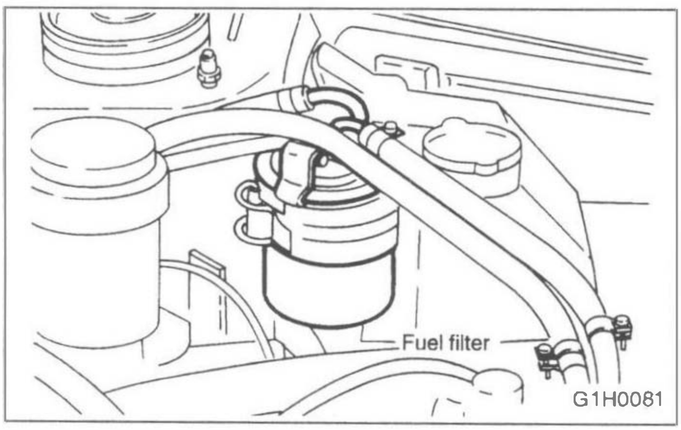
6. Replace Fuel Filter and Inspect Fuel System, Lines and Connections

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
			P		P

A: REPLACEMENT

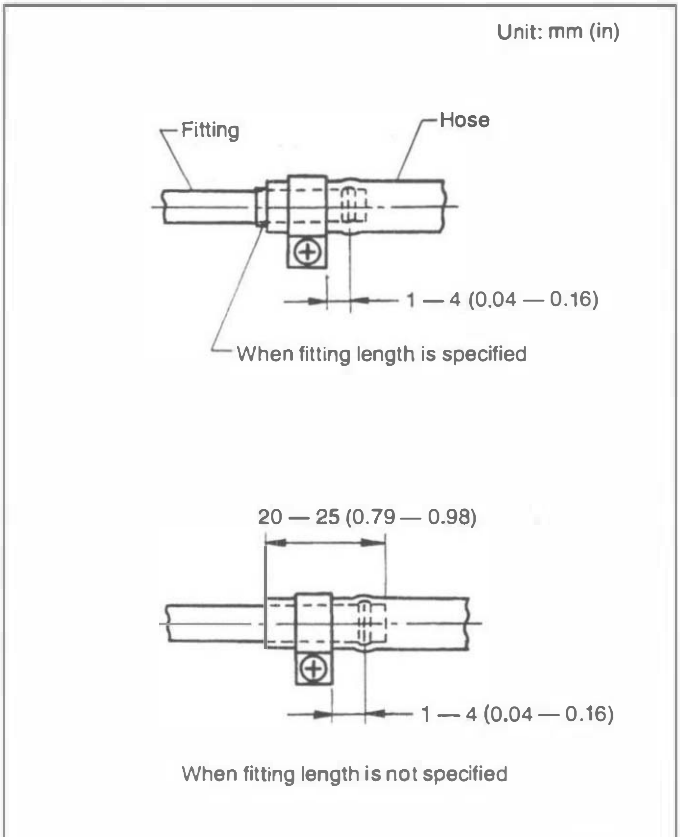
WARNING:
- **Place "No fire" signs near the working area.**
- **Disconnect ground cable from battery.**

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



1) Before removing the hose, filter, pump, etc., be sure to release the fuel pressure, as follows:
- Disconnect the wiring connector of the fuel pump.
- Crank the engine for more than five seconds. If the engine starts, let the engine run until it stops.
- After turning IG switch OFF, connect the wiring connector of the fuel pump.

2) Loosen the screw of the hose clamp and pull off the hose from the filter.
3) Remove the filter from the holder.

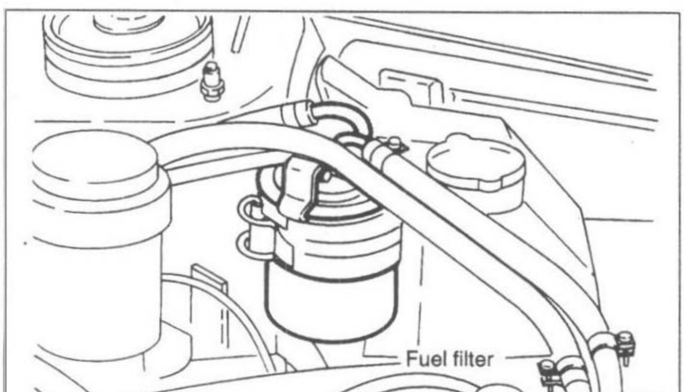


G1H0082

4) Replace fuel filter with a new one.
5) Install the hoses as shown in the figure.

Tightening torque:
1.0 — 1.5 N.m
(0.1 — 0.15 kg-m, 0.7 — 1.1 ft-lb)

CAUTION:
- **If the hose is damaged at the clamping portion, replace the hose with a new one.**
- **If the hose clamp is deformed too much, replace with a new one.**
- **Correct the hose position by removing any twist so that it will not interfere with the filter body or washer tank, before tightening the screw of the hose clamp.**



G1H0081

6) Install the fuel filter bracket to the vehicle body. And tighten the bolts to the specified torque.

Tightening torque:
5.4 — 9.3 N.m
(0.55 — 0.95 kg-m, 4.0 — 6.9 ft-lb)

CAUTION:
Make sure that the clamp screw is not loose.

B: INSPECTION

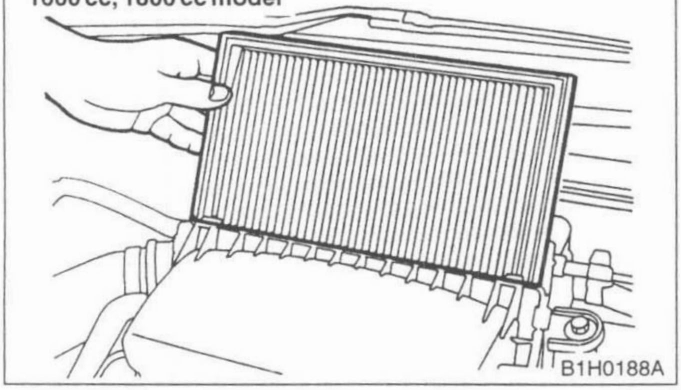
1. FUEL PIPING AND CONNECTIONS

Check fuel piping and connections for leakage, scratches, swelling and corrosion.

7. Air Cleaner Element

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
		I	R	I	R

1600 cc, 1800 cc model



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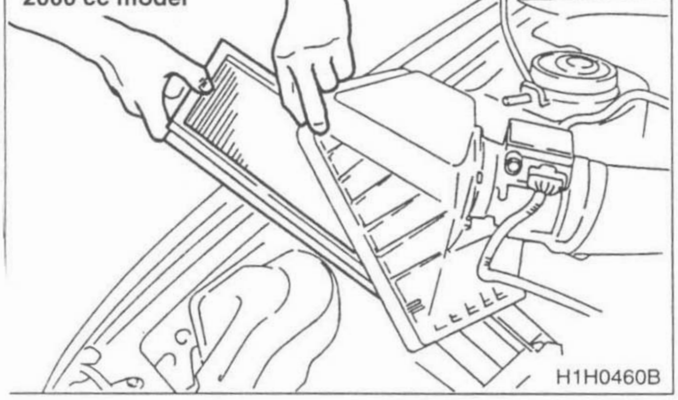
2000 cc model

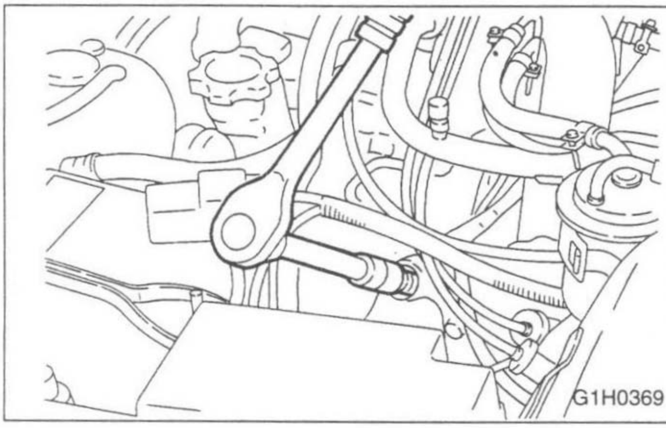


H1H0460B

A: REPLACEMENT

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

8. Spark Plugs



G1H0369

Spark plug thread
Dia. = 12 mm (0.47 in)
Pitch = 1.25 mm

G1H0084

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
For Non-Turbo		R	R	R	R
For Turbo					R

A: REPLACEMENT

1. NON-TURBO MODEL

1) Disconnect spak plug cord.
2) Remove spark plug with a plug-wrench.
3) Set new spark plug.
4) Tighten spark plug lightly with hand, and then secure with a plug-wrench to the specified torque.

Tightening torque:
20.6 ± 2.9 N.m
(2.10 ± 0.30 kg-m, 15.19 ± 2.14 ft-lb)

CAUTION:
Be sure to place the gasket between the cylinder head and spark plug.

NOTE:
If torque wrench is not available, tighten spark plug until gasket contacts cylinder head; then tighten further 1/4 to 1/2 turns.

Recommended spark plug:
- ***With catalyst***
  NGK BKR6E-11
  CHAMPION RC8YC4
  (1600 cc and 1800 cc model)
  CHAMPION RC10YC4 (2000 cc model)

Spark plug gap
1.0 — 1.1 mm (0.039 — 0.043 in)
- ***Without catalyst***
  NGK BKR6E

Spark plug gap
0.7 — 0.8 mm (0.028 — 0.031 in)

NOTE:
<Ref. to 6-1 [W3A0]>

2. TURBO MODEL

For the replacement procedures of the spark plugs on TURBO models, refer to 6-1 [W3D0].

9. Idle Mixture [Except for Catalyst Model]

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
	I	I	I	I	I

A: INSPECTION AND ADJUSTMENT

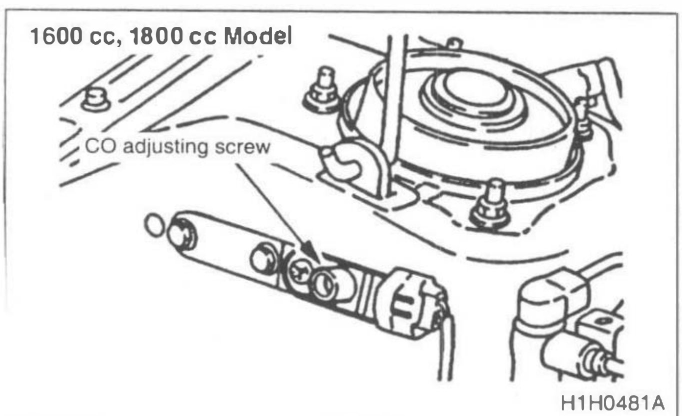
1. IDLE MIXTURE (Not necessary for catalytic converter equipped vehicle)

Before measuring the idle mixture, make sure that the ignition timing and the engine idle speed are within specifications.

1) Set the gear position at "Neutral" for MT, or "N" or "P" for AT.
2) Warm up engine sufficiently until cooling fan starts to operate.
3) Measure the idle mixture with the CO meter.

Engine idle speed	CO
1600 cc and 1800 cc model: 700 ± 100 rpm 2000 cc model: 800 ± 100 rpm	1.0 ± 0.5 %

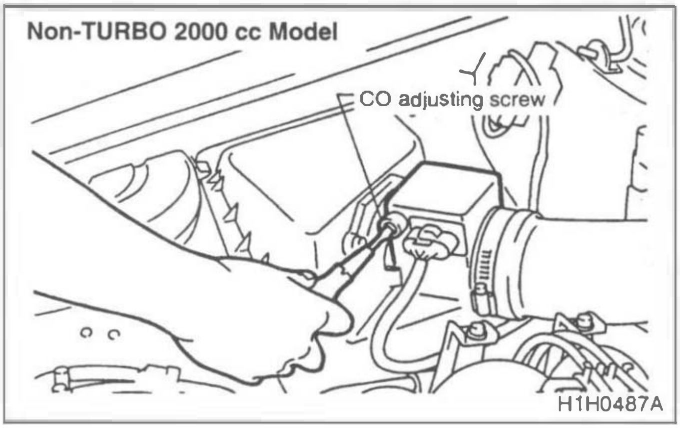
4) If out of specification, adjust the idle mixture using CO adjusting screw of mass air flow sensor.
5) After adjusting the CO value, check and adjust increment coeficient of CO resistor by using Select Monitor.



1600 cc and 1800 cc model:
<Ref. to "Troubleshooting Section" 2-7a [T11P0] or [T12P0]>

(1) Select function mode "F25".
(2) If out of specified data, adjust the increment coefficient of CO resistor while rotating CO adjusting screw.

Specified data: 0.28 to 4.22 V



Non-TURBO 2000 cc model:
<Ref. to "Troubleshooting Section" 2-7b [T11P0] or [T12Q0]>

(1) Select function mode "F25".

(2) If out of specified data, adjust the increment coefficient of CO resistor while rotating CO adjusting screw.

Specified data: –1.52 to +1.49 kg/h

NOTE:
If driving the vehicle on out of specified data, the "trouble code 49" is indicated in many case.

10. Transmission/Differential (Front and rear) Lubricants (Gear oil)

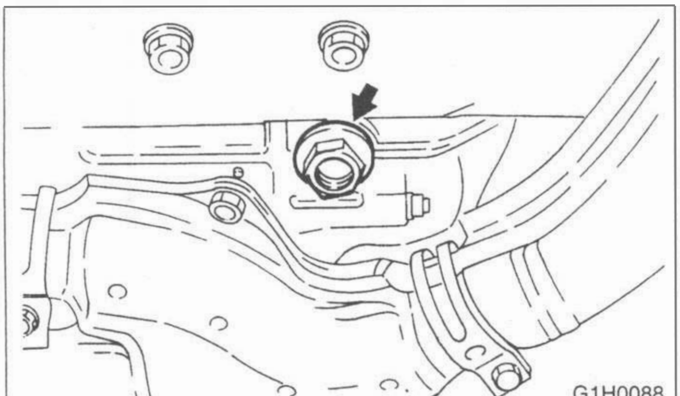
MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
			R		R

A: REPLACEMENT

1. MANUAL TRANSMISSION

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

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

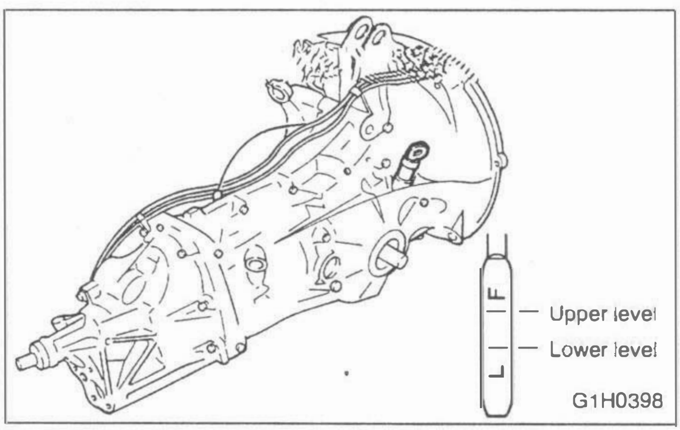


G1H0088

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

Tightening torque:
41 — 47 N.m (4.2 — 4.8 kg-m, 30 — 35 ft-lb)

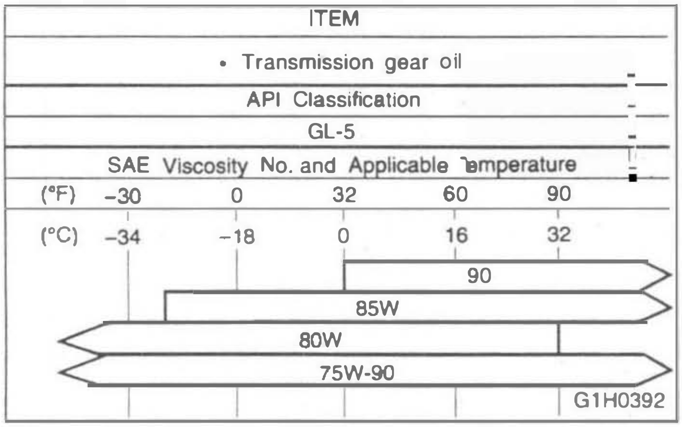
CAUTION:
- **Be sure to place a gasket between the transmission case and drain plug.**
- **Replace the gasket with a new one.**



G1H0398

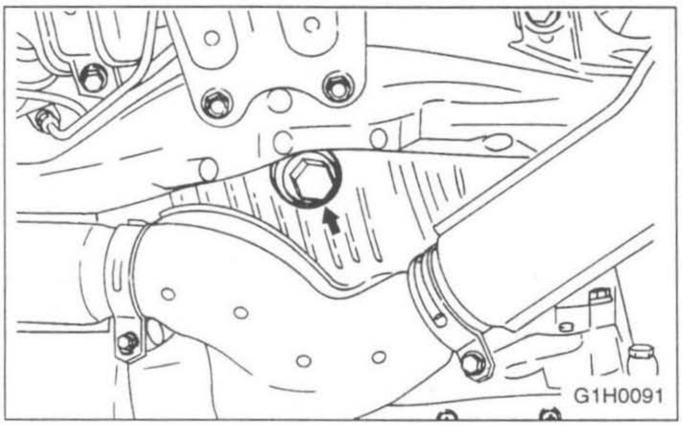
NOTE:
Inspect the transmission gear oil level. If the oil level is at the lower point or below, add some oil through the oil level gauge hole up to the upper point of gauge.

Gear oil capacity:
FWD model: 3.3 ℓ (3.5 US qt, 2.9 Imp qt)
AWD Non turbo single range model:
3.5 ℓ (3.7 US qt, 3.1 Imp qt)
AWD dual range model:
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
AWD Turbo model:
4.0 ℓ (4.2 US qt, 3.5 Imp qt)



• **Recommended oil**

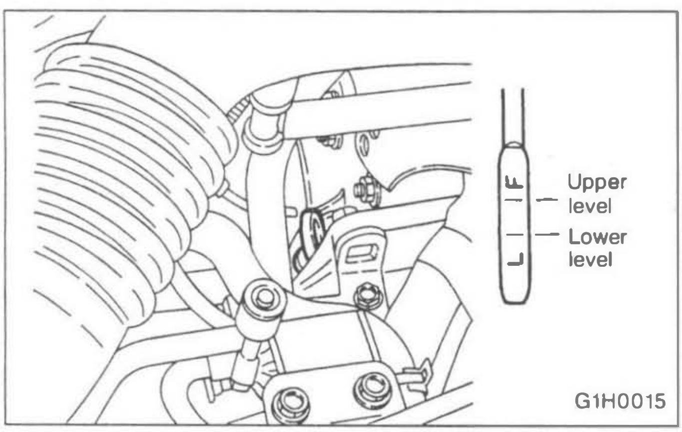
CAUTION:
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.



2. FRONT DIFFERENTIAL (AUTOMATIC TRANSMISSION)

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

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



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

Tightening torque:
41.2 — 47.1 N.m
(4.2 — 4.8 kg-m, 30.4 — 34.7 ft-lb)

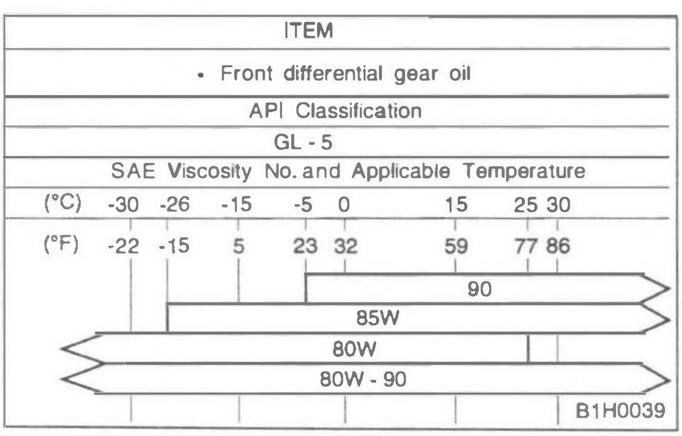
CAUTION:
• **Be sure to place a gasket between the transmission case and drain plug.**
• **Replace the gasket with a new one.**

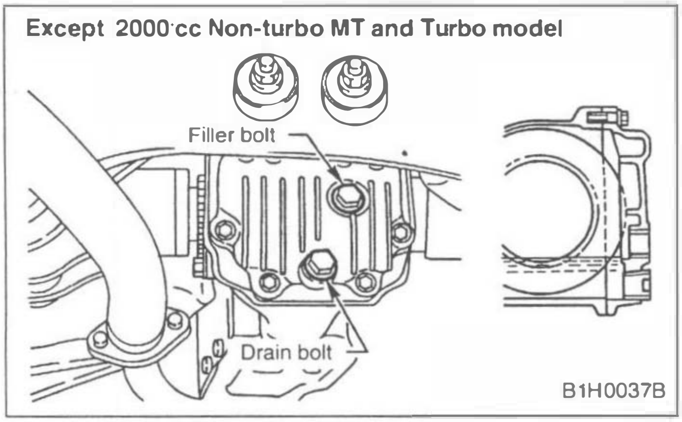
3) Fill differential gear oil through the oil level gauge hole up to upper point level gauge.

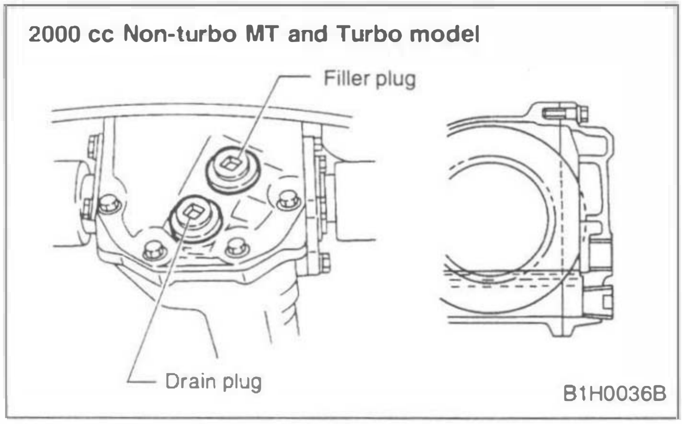
Differential gear oil capacity:
1.1 — 1.3 ℓ
(1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)

• **Recommended front differential gear oil**

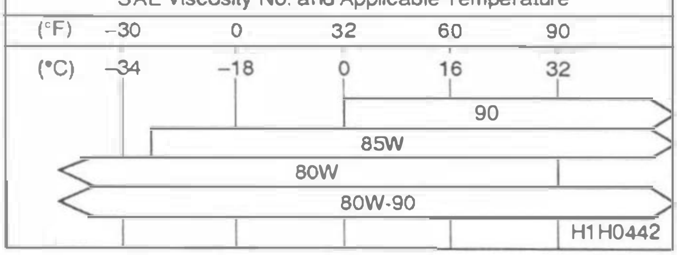
CAUTION
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.







ITEM
• Rear differential gear oil
API Classification
GL-5
SAE Viscosity No. and Applicable Temperature



3. REAR DIFFERENTIAL (AWD MODEL)

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

CAUTION:
• Except 2000 cc Non-turbo MT and Turbo model
Always use a new aluminum gasket.

Tightening torque:
34 ± 4 N.m (3.5 ± 0.4 kg-m, 25.3 ± 2.9 ft-lb)

• 2000 cc Non-turbo MT and Turbo model
Apply fluid packing to drain plug threads before installation.

Fluid packing:
Three Bond 1205 or equivalent
Tightening torque:
49 ± 9.8 N.m (5 ± 1 kg-m, 36 ± 7.2 ft-lb)

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

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

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

CAUTION:
• Non-Turbo model
Always use a new aluminum gasket.

Tightening torque:
34 ± 4 N.m (3.5 ± 0.4 kg-m, 25.3 ± 2.9 ft-lb)

• Turbo model
Apply fluid packing to filler plug threads before installation.

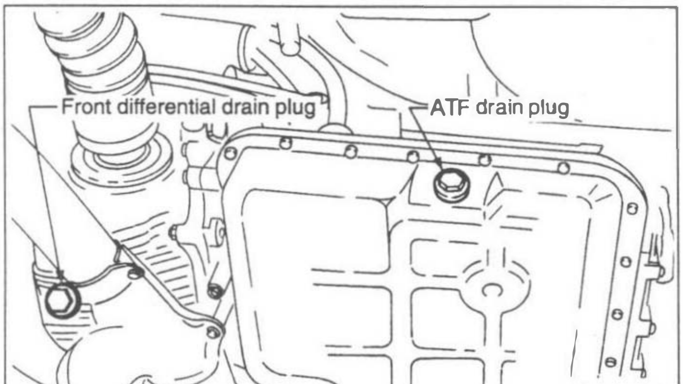
Fluid packing:
Three Bond 1205 or equivalent
Tightening torque:
49 ± 9.8 N.m (5 ± 1 kg-m, 36 ± 7.2 ft-lb)

• Recommended rear differential gear oil

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

11. Automatic Transmission Fluid

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs firs					
Months		12	24	36	4
x1,000 km	1.6	25	50	75	1(
x1,000 miles	1	15	30	45	6
			R		F



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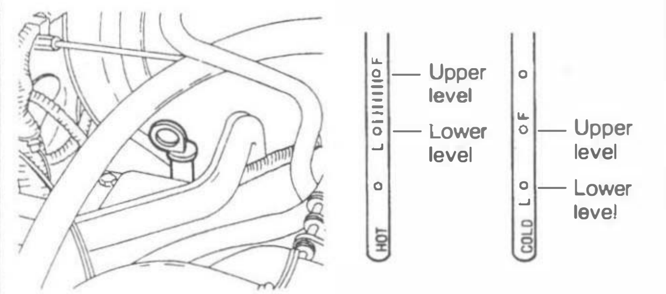


G1H0061

A: REPLACEMENT

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

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

Tightening torque:
25 N.m (2.5 kg-m, 18 ft-lb)

CAUTION:
Before starting work, cool off the eng well.

3) Fill ATF up to the middle of the "COOL" s on level gauge by using the gauge hole.

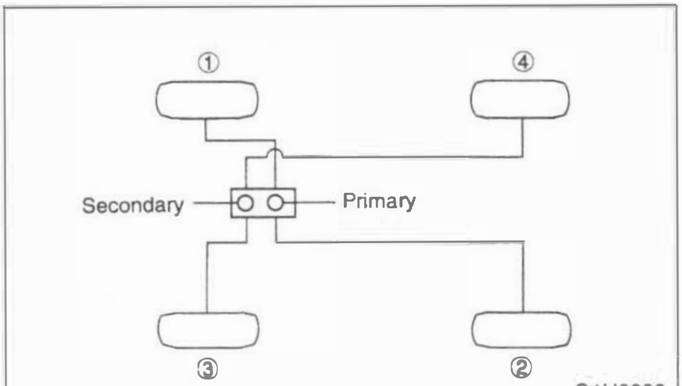
Fluid capacity (Non-turbo model):
7.9 — 8.2 ℓ
(8.4 — 8.7 US qt, 7.0 — 7.2 Imp qt)
Fluid capacity (Turbo model):
9.5 — 9.8 ℓ
(10.0 — 10.4 US qt, 8.4 — 8.6 Imp qt)

4) Run the vehicle until the ATF tempera rises to 60 to 80°C (140 to 176°F) and check ATF level.

Recommended automatic transmission fluid: Dexron II or III

12. Brake Fluid

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
			R		R



G1H0092

A: REPLACEMENT

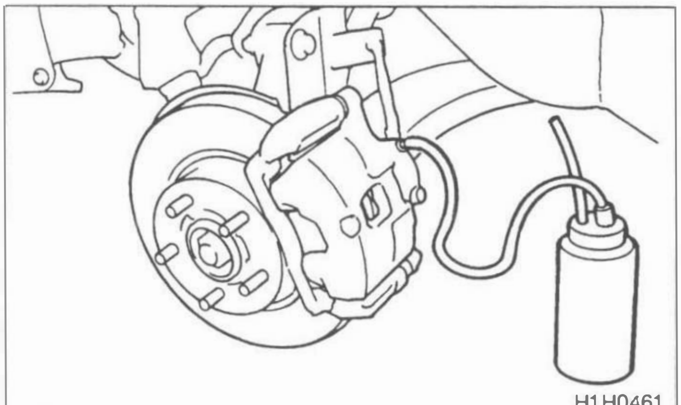
1) Either jack up vehicle and place a safety stand under it, or lift up vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill reservoir tank with recommended brake fluid.

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

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

Bleeding sequence ① → ② → ③ → ④

① Front right ③ Front left
② Rear left ④ Rear right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5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.

NOTE:
- Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
- During bleeding operation, keep the brake reserve tank filled with brake fluid to eliminate entry of air.
- Brake pedal operation must be very slow.

- For convenience and safety, it is advisable to have two men working.
- The amount of brake fluid required is approximately 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

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

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

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

Tightening torque:
8 ± 1 N.m (0.8 ± 0.1 kg-m, 5.8 ± 0.7 ft-lb)

10) Bleed air from each wheel cylinder using the same procedures as described in steps 5) through 9) above.
11) Depress brake pedal with a force of approximately 294 N (30 kg, 66 lb) and hold it there for approximately 20 seconds. At this time check pedal to see if it makes any unusual movement. Visually inspect bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
12) Install wheels, and drive car for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

13. Disc Brake Pads and Discs/Front and Rear Axle Boots and Axle Shaft Joint Portions

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
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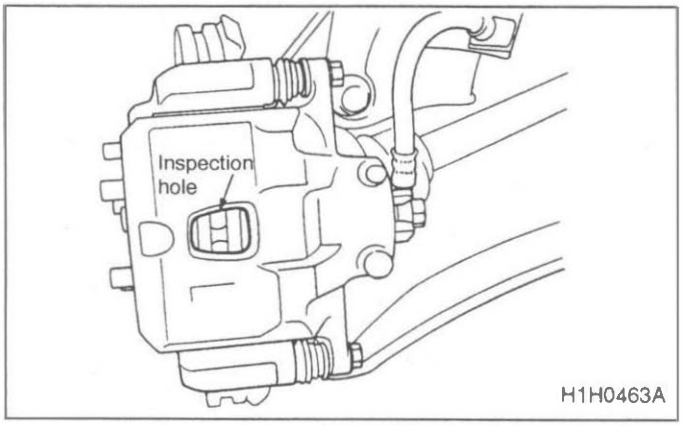

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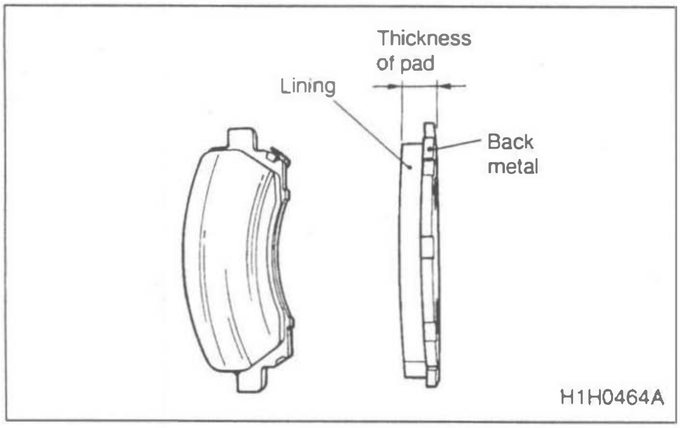

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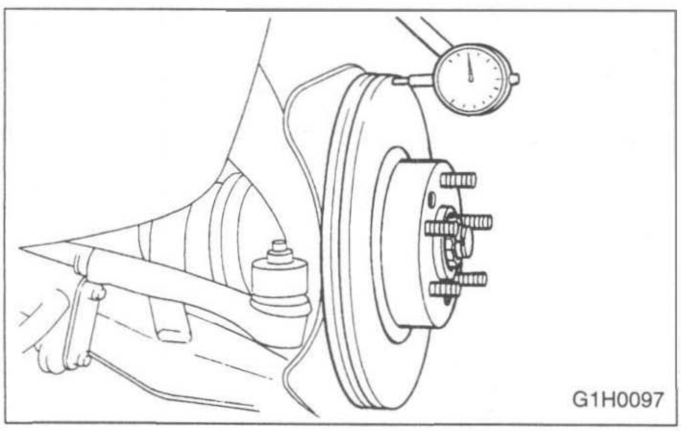


G1H0097

A: INSPECTION

1. DISC BRAKE PAD AND DISC

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

Pad thickness including back metal mm (in)		
	Front	Rear
Standard	17 (0.67)	15 (0.59)
Service limit	7.5 (0.295)	6.5 (0.256)
Service limit (exclude back metal)	1.5 (0.059)	1.5 (0.059)

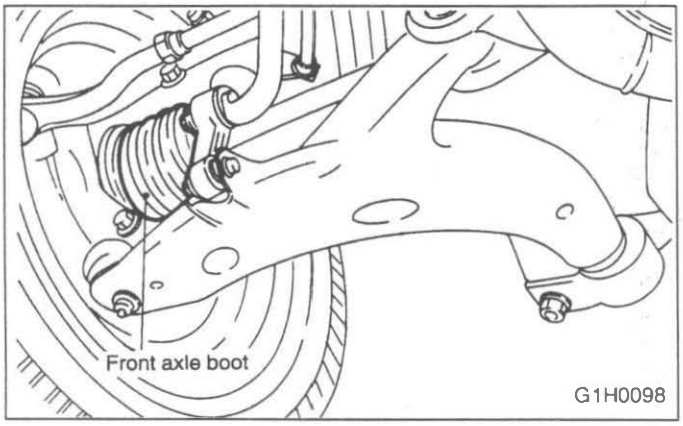
3) Check the disc rotor, and correct or replace if it is damaged or worn.

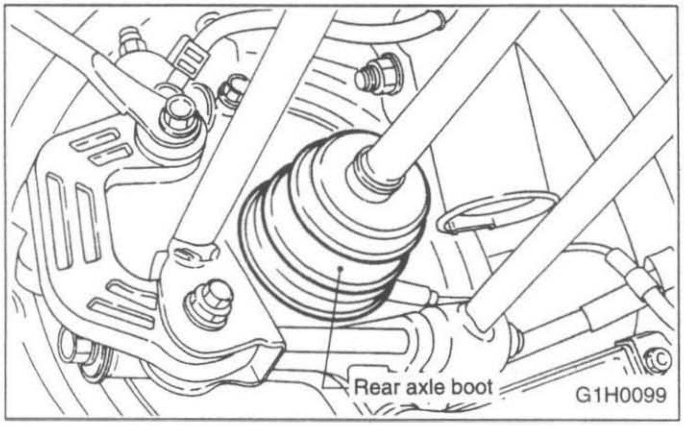
Brake disc thickness mm (in)			
	Front		Rear
	15" & 14"	13"	
Standard	24 (0.94)	18 (0.71)	10 (0.39)
Wear limit	22 (0.87)	16 (0.63)	8.5 (0.335)

Measure the disc rotor runout at a point less than 5 mm (0.20 in) from the outer periphery of the rotor.

Disc rotor runout limit:
Front: 0.075 mm (0.00295 in)
Rear: 0.100 mm (0.00394 in)

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





2. FRONT AND REAR AXLE BOOTS

Inspect front and rear axle boots for deformε tion, damage or failure. If faulty, replace ther with new ones.

14. Brake Linings and Drums

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
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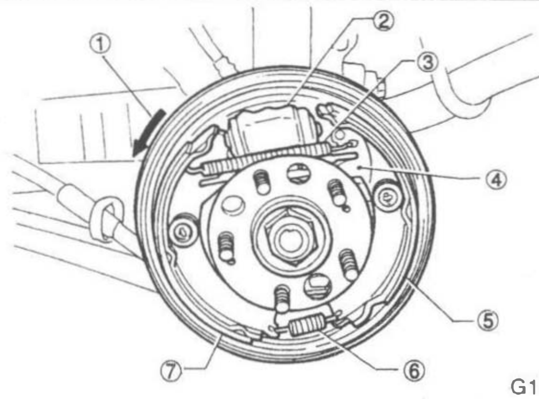


G1H0100

A: INSPECTION

1. REAR DRUM BRAKE

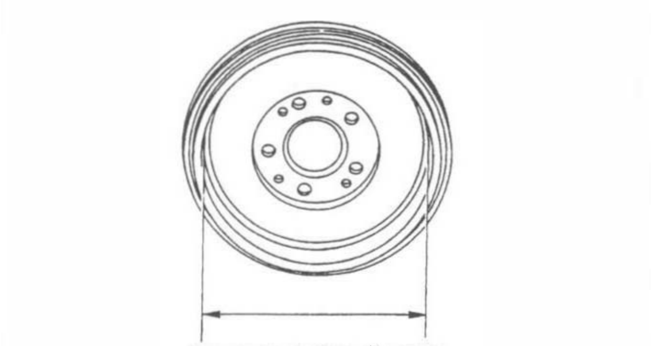
1) Remove brake drum, and check that there is no fluid leakage from wheel cylinder.
If there is fluid leakage from wheel cylinder, replace it.
2) Inspect brake shoes for damage or deformities and check brake linings for wear.

① Rotational direction of drum (Forward)
② Wheel cylinder
③ Upper shoe return spring
④ Adjusting lever
⑤ Trailing shoe
⑥ Lower shoe return spring
⑦ Leading shoe

CAUTION:
- **Always replace both leading and trailing brake shoes for the left and right wheels at the same time.**
- **When either the left or the right brake assembly is replaced, always replace the leading shoe and trailing shoe of the other.**
- **The cotter pin, once removed, cannot be reused.**

Thickness of lining (except back metal)
Standard value: 4.1 mm (0.161 in)
Service limit: 1.5 mm (0.059 in)

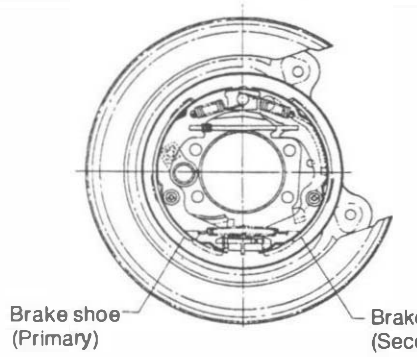
To replace trailing shoe, remove cotter pin. Clevis pin should also be replaced if worn.
3) Check brake drum for wear, dents or other damage.
If the inside surface of brake drum is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn, tapered, or the outside surface of brake drum is damaged, correct or replace it.



G1H0101

Brake drum inner diameter
Standard value: 228.6 mm (9.000 in)
Service limit: 230.6 mm (9.079 in)

If deformation or wear of back plate, shoe, etc. is noticeable, replace the affected parts.



G1H0102

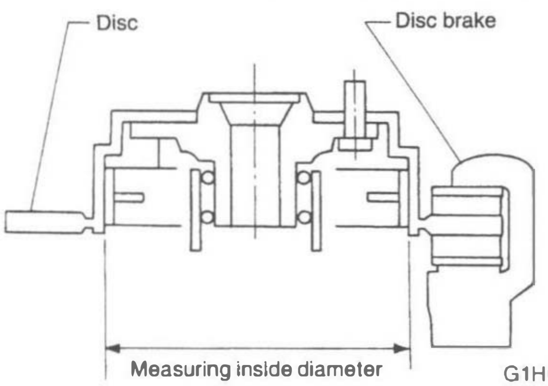
2. PARKING BRAKE

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

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

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

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



G1H0103

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

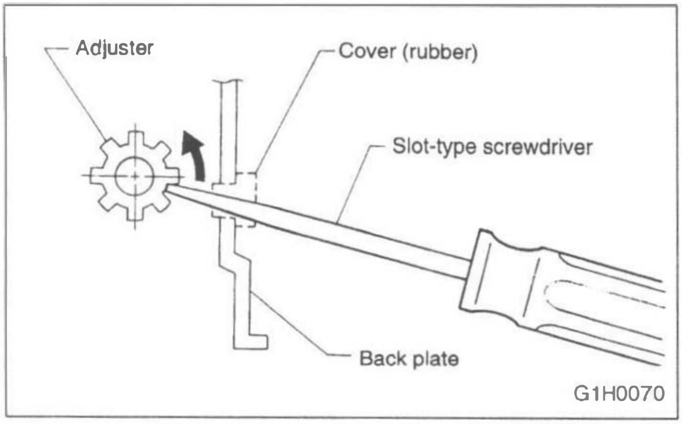
Brake drum inside diameter
Standard value: 170 mm (6.69 in)
Wear limit: 171 mm (6.73 in)

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

B: ADJUSTMENT

1. REAR DRUM BRAKE

The main brake is adjusted automatically, and so there is no need to adjust it.

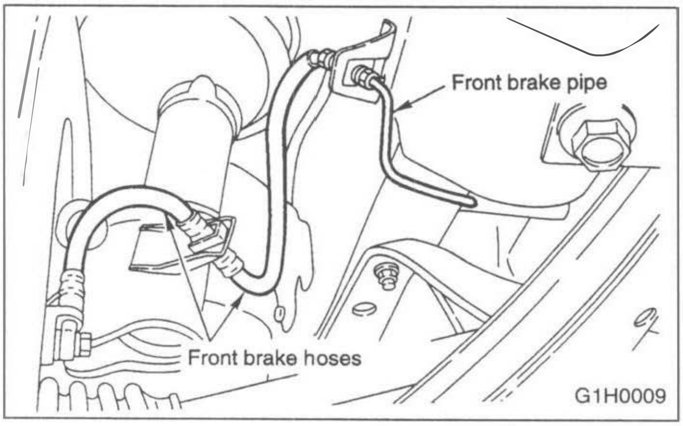


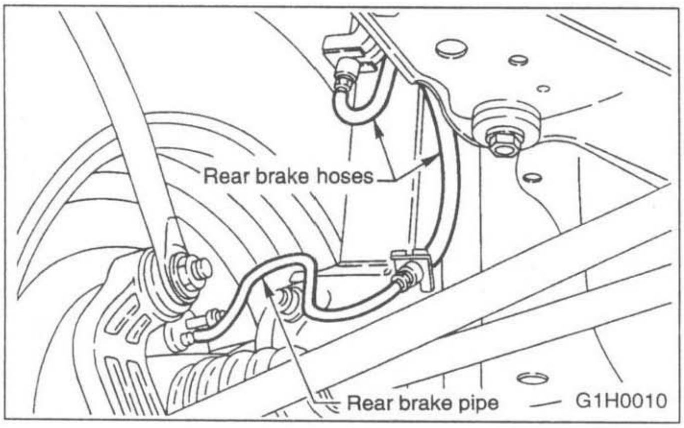
2. PARKING BRAKE

For rear disc brake, adjust parking brake after bleeding the air.
1) Remove rear cover (rubber) installed at back plate.
2) Turn adjuster toward arrow mark (upward) until it is locked slightly, by using slot-type screwdriver as shown in illustration.
3) Turn back (downward) adjuster 3 to 4 notches.
4) Install cover (rubber) at original position correctly.

15. Inspect Brake Lines and Check Operation of Parking and Service Brake System

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
		P	P	P	P



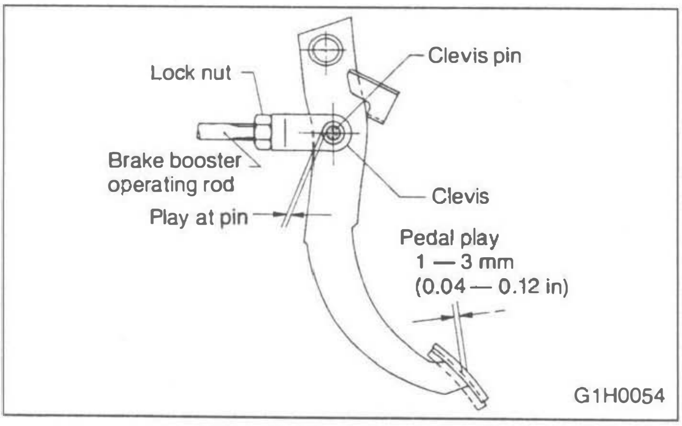


A: INSPECTION

1. BRAKE LINE

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

NOTE:
When the brake fluid level in the reservoir tank is lower than the specified limit, the brake fluid warning light on the combination meter will come on.

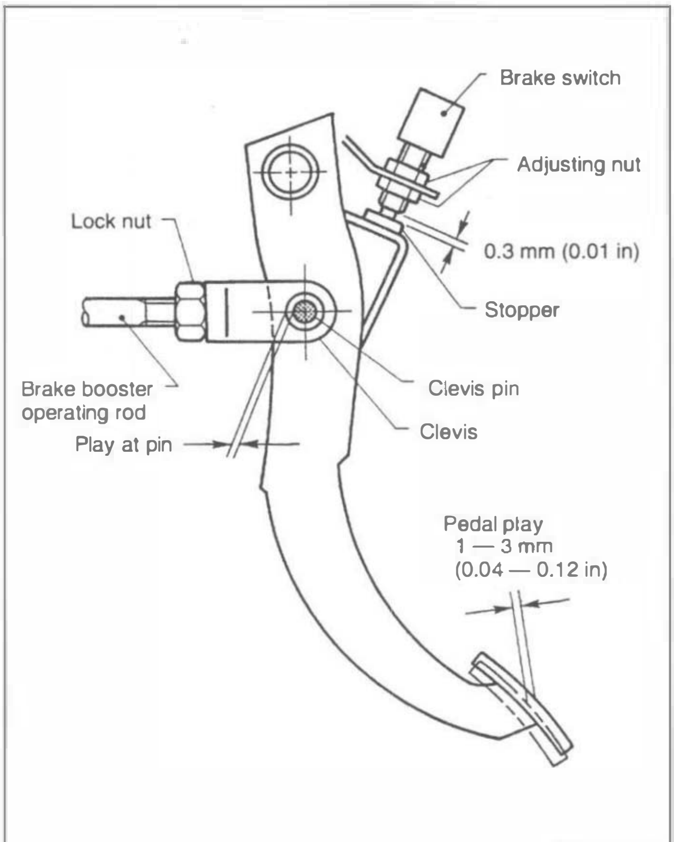


B: CHECKING

1. SERVICE BRAKE

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

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



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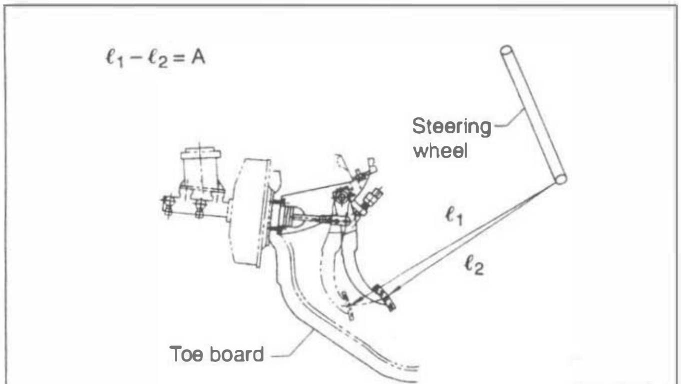
If the free play is out of specifications above, adjust the brake pedal as follows:

(1) Be sure engine is off. (No vacuum is applied to brake booster.)

(2) There should be play between brake booster clevis and pin at brake pedal installing portion.
[Depress brake pedal pad with a force of less than 10 N (1 kg, 2 lb) to a stroke of 1 to 3 mm (0.04 to 0.12 in).]

(3) Depress the surface of brake pad by hand.

(4) If there is no free play between clevis pin and clevis, turn brake switch adjusting nut until the clearance between stopper and screw of brake switch becomes 0.3 mm (0.01 in).

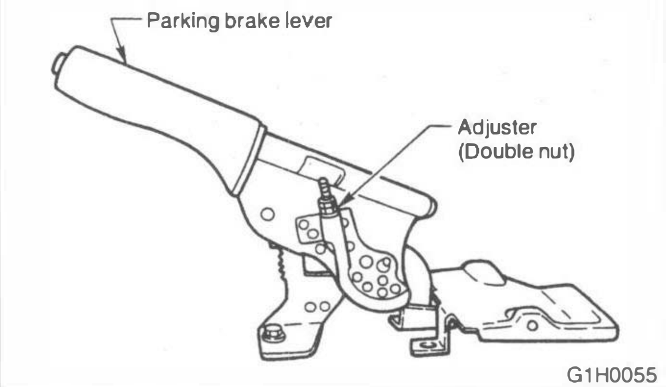


G1H0104

2) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 490 N (50 kg, 110 lb) load and measure the distance between the brake pedal and steering wheel. With the brake pedal released, measure the distance between the pedal and steering wheel again. The difference between the two measurements must be less than 90 mm (3.54 in) [with ABS, 95 mm (3.74 in)]. If the distance is more than specified, there is a possibility air is in the inside of the hydraulic unit.

Brake pedal reserve distance: A
With ABS
more than 95 mm (3.74 in)/
490 N (50 kg, 110 lb)
Without ABS
more than 90 mm (3.54 in)/
490 N (50 kg, 110 lb)

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



G1H0055

2. PARKING BRAKE SYSTEM

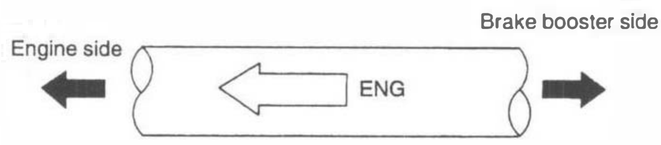
1) Operation of parking brake is normal if is applied at sixth notch of ratchet when brake lever is pulled by force of about 196 N (20 kg, 44 lb). Total number of the notches is 21.

Parking brake lever stroke:
7 to 8th notch/196 N (20 kg, 44 lb)

2) Parking brake should be adjusted after adjusting the shoe clearance of rear brakes.
3) Remove rear console cover.
4) Adjust parking brake lever by turning adjuster (double nut) until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kg, 44 lb).

3. BRAKE SERVO SYSTEM

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



G1H0106

5) Check vacuum hose for cracks or other damage.

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

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

16. Clutch and Hill-holder System

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
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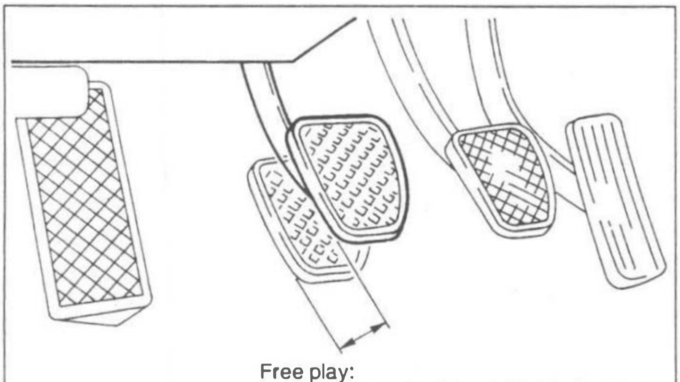

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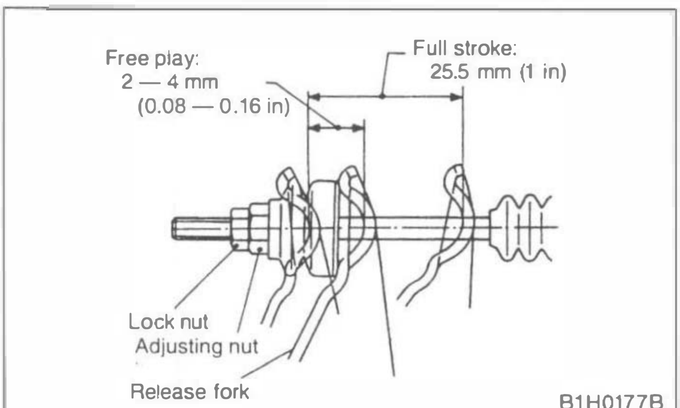


B1H0177B

A: INSPECTION AND ADJUSTMENT

1. MECHANICAL CLUTCH TYPE

1) Inspect free play of clutch pedal by operating pedal by hand.
If it is out of the specified value, adjust it by turning wing nut on engine side of clutch cable at release fork.

Tightening torque (Adjusting nut on release fork):
6 ± 1.5 N.m
(0.61 ± 0.15 kg-m, 4.4 ± 1.1 ft-lb)

Standard free play:
At clutch pedal
10 — 20 mm (0.39 — 0.79 in)

Fork lever free play allowance:
2 — 4 mm (0.08 — 0.16 in)

NOTE:
When replacing clutch cable with new one and/or marking free play adjustment of clutch pedal, make adjustment of hill-holder system without fail as follows.
After replacing clutch cable [and/or pressure hold valve (PHV) cable] with a new one, depress clutch pedal about thirty (30) times as a running-in operation prior to this adjustment.

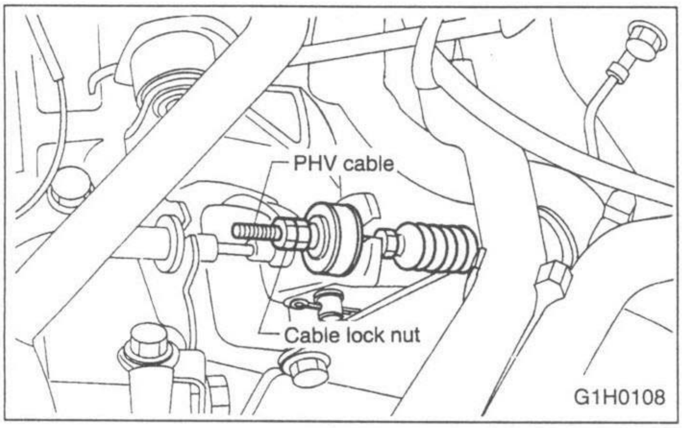
2) Pedal-to-floor plate gap in disengaged position

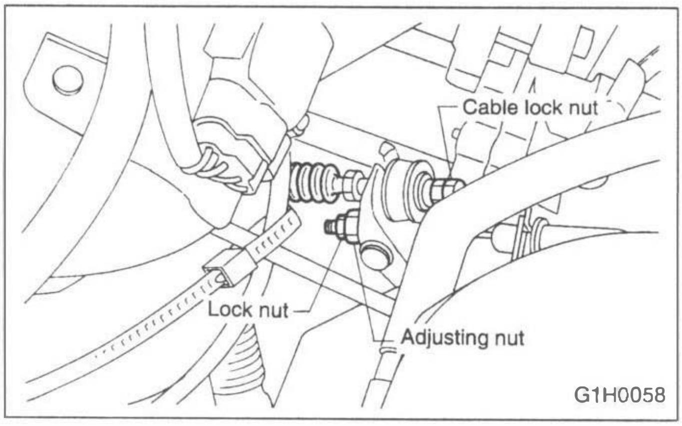
(1) With the engine idling, pull parking brake lever completely.
(2) Slowly depress clutch pedal while moving shift lever into reverse.
(3) Stop depressing clutch pedal when gearshifting is complete. With clutch pedal in this position, measure the distance between the upper side of pedal pad and the

lower end of front panel (intersection of front panel with floor). Check that the measured value is within the specified standard.

Standard:
80 mm (3.15 in) or more

3) Pedal height
Check that the clutch pedal pad surface is level with or higher than brake pedal pad surface.



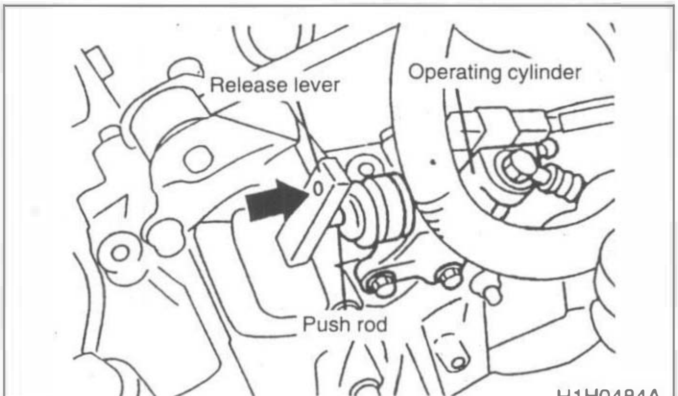


2. HILL-HOLDER

1) Confirm stopping and starting performance by activating hill-holder on an uphill road of 3° or higher inclination.

CAUTION:
(1) If vehicle does not stop;
Tighten adjusting nut of PHV cable.
(2) If vehicle does not start properly;
- **Case A – When hill-holder is released later than engagement of clutch (engine tends to stall):**
Loosen adjusting nut gradually until smooth starting is enabled.
- **Case B – When hill-holder is released earlier than engagement to clutch (vehicle slips down slightly):**
Tighten adjusting nut so that hill-holder is released later than engagement of clutch (status in Case A).
Then make adjustment the same as in Case A.

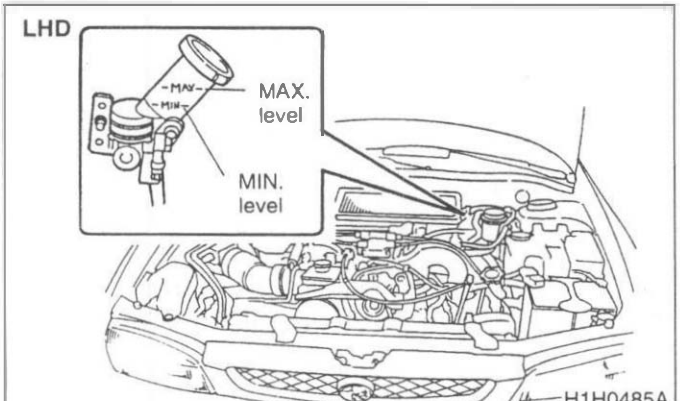
NOTE:
- Whenever turning adjusting nut, hold inner cable with pliers to prevent it from turning.
- Replace pressure hold valve (PHV), return spring of PHV or PHV cable with new one, if they are defective and/or damaged.



H1H0484A

3. HYDRAULIC CLUTCH TYPE

1) Push the release fork to retract the push rod of the operating cylinder and check if the fluid level in the clutch reservoir tank rises or not.
2) If the fluid level rises, pedal free play is correct.
3) If the fluid level does not rise, or the push rod cannot be retracted, adjust the clutch pedal. <Ref. to 4-5 [W1F1]>
4) Inspect the underside of master cylinder, clutch damper and operating cylinder for clutch system, hoses, piping and their couplings for fluid leaks.
If fluid leaks are found, correct them by retightening their fitting bolt and/or replacing their parts.



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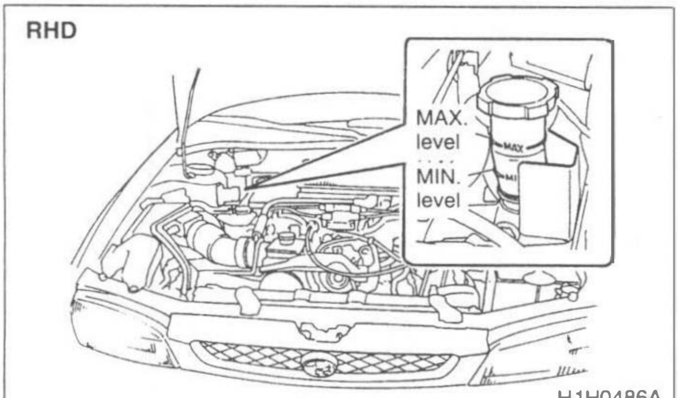

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5) Check the fluid level using the scale on the outside of the clutch master cylinder tank. If the level is below "MIN", add clutch fluid to bring it up to "MAX".

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

CAUTION
- **Avoid mixing different brakes of brake fluid to prevent degradation of the fluid.**
- **Be careful not to allow dirt or dust to get into the reservoir tank.**
- **Use fresh DOT3 or DOT4 brake fluid when refilling fluid.**

17. Steering and Suspension System

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
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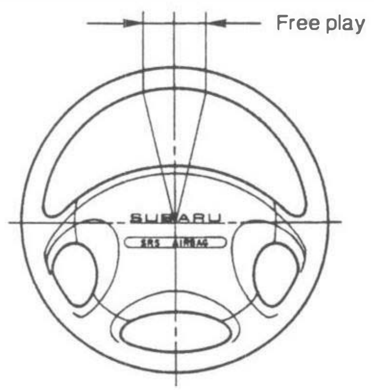


H1H0438

A: INSPECTION

1. STEERING WHEEL

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

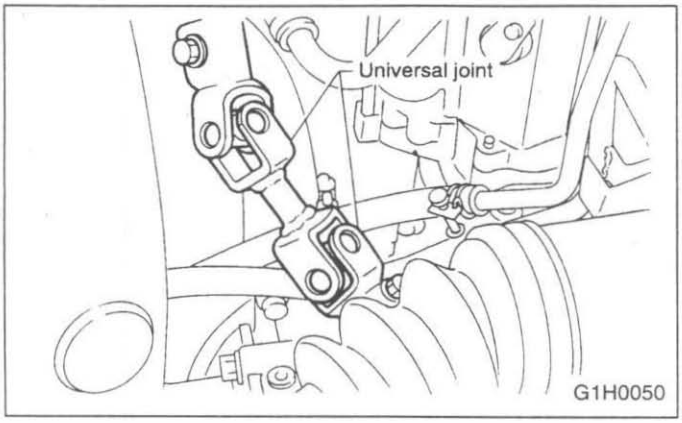
Steering wheel free play:
0 — 17 mm (0 — 0.67 in)

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

Maximum permissible play:
0.5 mm (0.020 in)

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

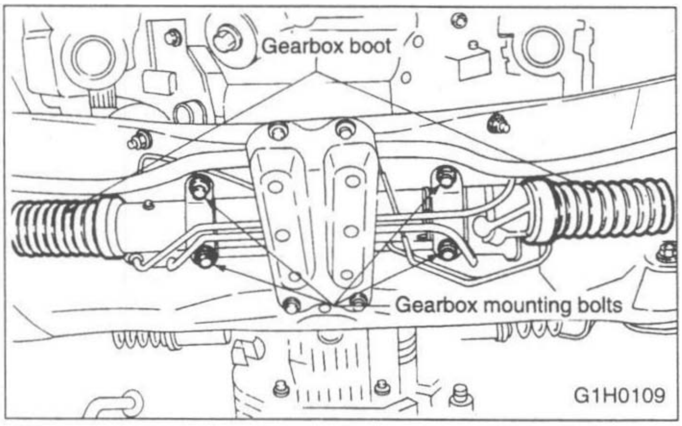
Maximum permissible play:
0.5 mm (0.020 in)



2. STEERING SHAFT JOINT

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

Tightening torque:
24 ± 3 N.m (2.4 ± 0.3 kg-m, 17 ± 2.2 ft-lb)

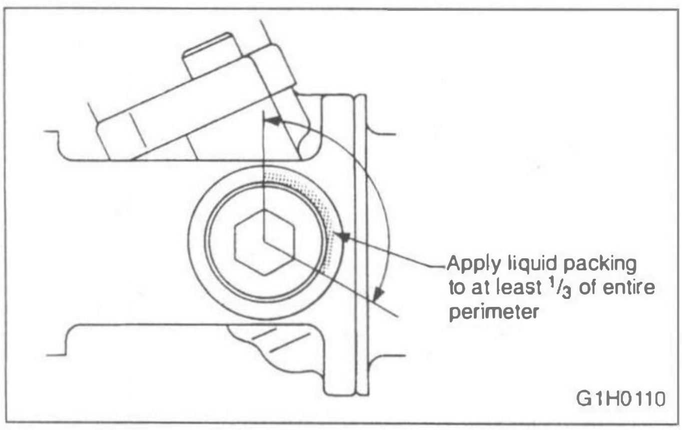


3. GEARBOX

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

Tightening torque:
59 ± 12 N.m
(6.0 ± 1.2 kg-m, 43.5 ± 8.5 ft-lb)

2) Check boot for damage, cracks or deterioration.

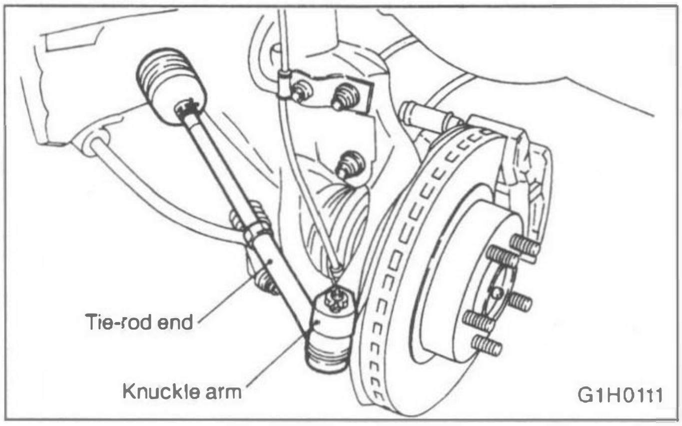


3) With vehicle on a level surface, quickly turn steering wheel to the left and right.
While steering wheel is being rotated, check the gear backlash. If any unusual noise is noticed, adjust the gear backlash in the following manner.

(1) Tighten adjusting screw to 5 N.m (0.5 kg-m, 3.6 ft-lb) and then loosen. Repeat this operation twice.
(2) Retighten adjusting screw to 5 N.m (0.5 kg-m, 3.6 ft-lb) and back off 30°.
(3) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.
(4) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using SPANNER (926230000).

Tightening torque (Lock nut):
39 ± 10 N.m (4.0 ± 1.0 kg-m, 29 ± 7 ft-lb)

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



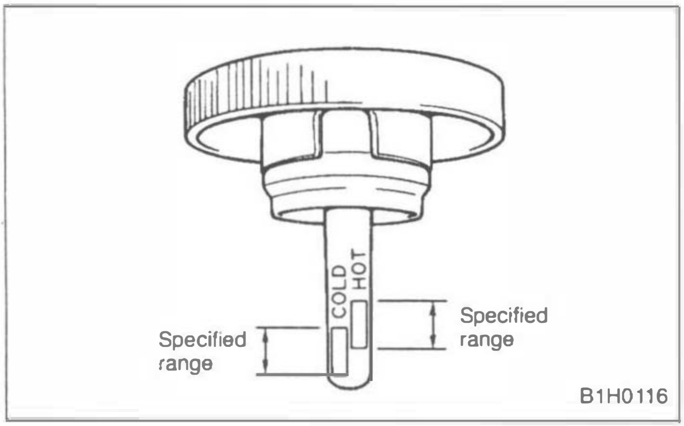
4. TIE-ROD

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

Tightening torque:
27 ± 2 N.m (2.75 ± 0.75 kg-m, 20 ± 2 ft-lb)

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

Tightening torque:
83 ± 5 N.m (8.5 ± 0.5 kg-m, 61.5 ± 3.5 ft-lb)



5. POWER STEERING FLUID LEVEL

1) Place vehicle with engine "off" on the flat and level surface.
2) Check the fluid level by removing filler cap of oil pump.
(1) Check by "COLD" range at temperature 21°C (70°F) of fluid temperature.
(2) Check by "HOT" range at temperature 60°C (140°F) of fluid temperature.

3) Fluid level should be maintained in the each specified range on the indicator of filler cap.
If fluid level is at lower point or below, add fluid to keep the level in the specified range of indicator.
If fluid level is at upper point or above, drain fluid to keep the level in the specified range of indicator by using a syringe or the like.

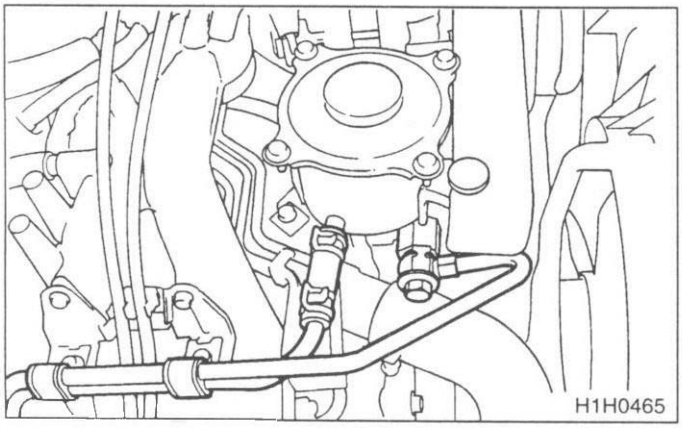
Recommended fluid	Manufacturer
"Dexron II, IIE or III" type	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

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

6. POWER STEERING FLUID FOR LEAKS

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

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



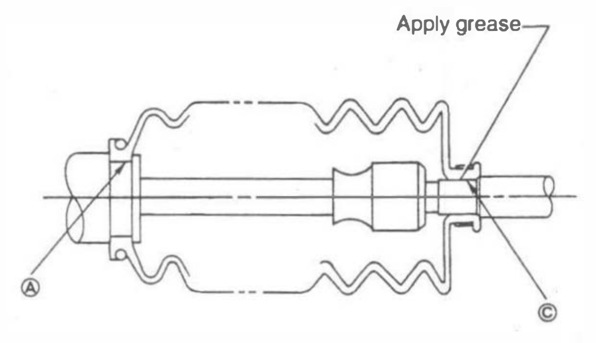
7. HOSES OF OIL PUMP FOR DAMAGES

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

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

8. POWER STEERING PIPES FOR DAMAGE

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



G1H0115

9. GEARBOX BOOTS

Inspect both sides of gearbox boots as follows, and correct the defects if necessary.

1) Ⓐ and Ⓒ positions of gearbox boot are fitted correspondingly in Ⓐ and Ⓒ grooves of gearbox and the rod.

2) Clips are fitted outside of Ⓐ and Ⓒ positions of boot.

3) Boot does not have crack and hole.

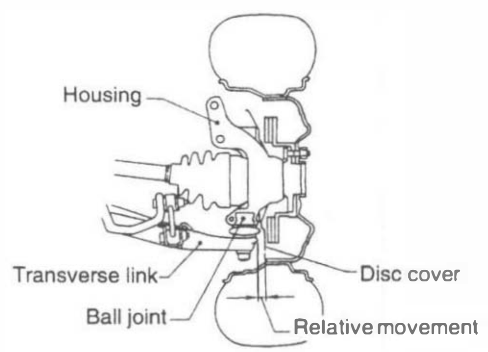
NOTE:

Rotate Ⓒ position of gearbox boot against twist of it produced by adjustment of toe-in, etc.

10. FITTING BOLTS AND NUTS

Inspect fitting bolts and nuts of oil pump and bracket for looseness, and retighten them if necessary.

Inspect and/or retighten them when engine is cold. <Ref to 4-3 [C200].>



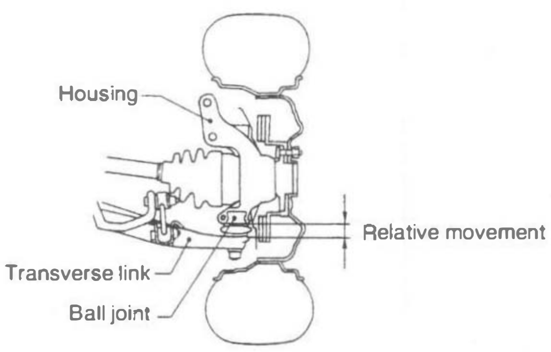
G1H0117

11. SUSPENSION SYSTEM

1) Play of front ball joint ..... Inspect every 25,000 km (15,000 miles) or 12 months, whichever occurs first.

(1) Jack up vehicle until front wheels are off ground.

(2) Next, grasp bottom of tire and move it in and out. If relative movement is observed between brake disc cover and end of transverse link, ball joint may be excessively worn.



G1H0118

(3) Next, grasp end of transverse link and move it up and down. Relative movement between housing and transverse link boss indicates ball joint may be excessively worn.

(4) If relative movement is observed in tests (2) and (3) above, remove and inspect ball joint according to chapter 4-1. If free play exceeds standard, replace ball joint.

2) Damage of dust seal ..... Inspect every 25,000 km (12,000 miles) or 12 months, whichever occurs first.
Visually inspect ball joint dust seal. If it is damaged, remove transverse link as instructed in chapter 4-1 and measure free play of ball joint.

(1) When looseness exceeds standard value, replace ball joint.
(2) If the dust seal is damaged, replace with the new ball joint.

NOTE:
When transverse link ball joint has been removed or replaced, check toe-in of front wheel. If front wheel toe-in is not at specified value, adjust according to chapter 4-1 so that toe-in conforms to service standard.

Transverse link's liquid-filled bushing
Check oil leaks at or around liquid-filled bushing if oil leaks replace bushing.

3) Wheel alignment and ground clearance (wheel arch height) ..... Inspect every 50,000 km (30,000 miles) or 24 months, whichever occurs first.

(1) Unload cargoes and set vehicle in curb weight (empty) condition.
(2) Then, check ground clearance (wheel arch height) of front and rear suspensions to ensure that they are within specified values.

(Adjusting procedure) — Ground clearance (wheel arch height)

When ground clearance (wheel arch height) is out of standard, visually inspect following components and replace deformed parts.

- Suspension components [Front and rear: strut assembly]
- Body parts to which suspensions are installed.

When no components are deformed, adjust ground clearance (wheel arch height) by replacing coil spring in the suspension whose ground clearance is out of standard.

(3) Check alignment of front suspension to ensure that following items conform to standard values provided in chapters 4-1 and 4-3.

- Toe-in
- Camber angle
- Caster angle
- Steering angle

(Adjusting procedure) — Front suspension alignment

(a) Caster angles are not adjustable. When caster angle does not conform to standard value, visually inspect following components and replace deformed parts.

- Suspension components [Strut assembly, crossmember, transverse link, etc.]
- Body parts to which suspensions are installed.

(b) When toe-in and camber is out of standard value, adjust by the method described in chapter 4-1 so that it conforms to service standard.

(c) When right-and-left turning angles of tire are out of standard, adjust to standard value by method described in chapter 4-3.

(4) Check alignment of rear suspension to ensure that following items are within standard values.

- Toe-in
- Camber angle

(Adjusting procedure) — Rear suspension alignment

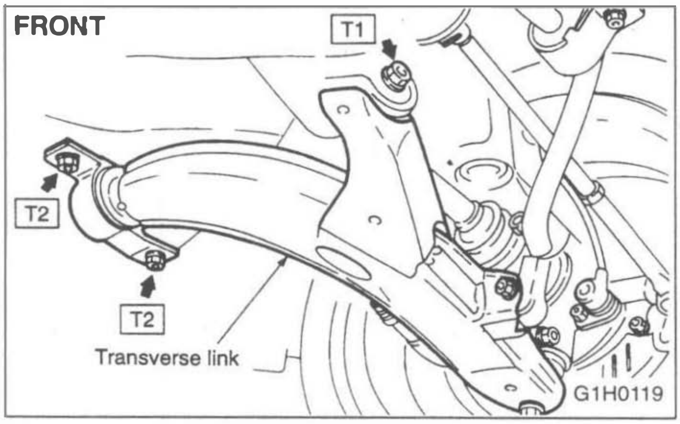
When toe or camber angle does not conform to standard value, visually inspect parts listed below. If deformation is observed, replace damaged parts.

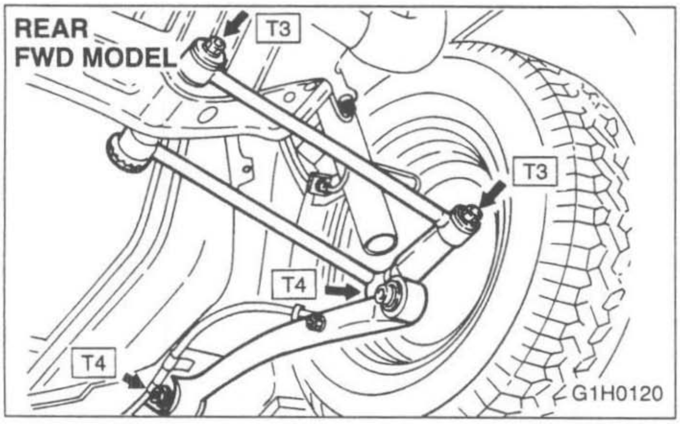
- Suspension components [Strut assembly, lateral links, trailing link, crossmember, etc.]
- Body parts to which suspensions are installed.

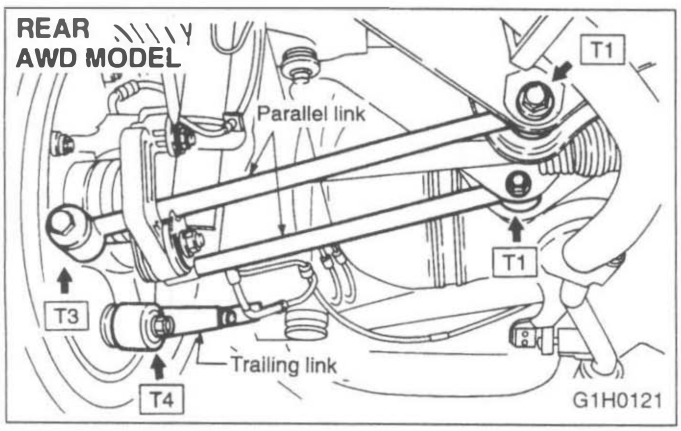
When no components are deformed, adjust toe-in by the method described in chapter 4-1 so that it conforms to service standard.

4) Oil leakage of strut CP ..... Inspect every 50,000 km (30,000 miles) or 24 months, whichever occurs first.

Visually inspect strut CP for oil leakage as instructed in chapter 4-1. Replace strut if oil leaks excessively.







5) Tightness of bolts and nuts ..... Inspect every 50,000 km (30,000 miles) or 24 months, whichever occurs first. Check bolts shown in the figure for looseness. Retighten bolts to specified torque. If self-lock nuts and bolts are removed, replace them with new ones.

Tightening torque:
- ***T1:*** ***98 ± 15 N.m (10 ± 1.5 kg-m, 72 ± 11 ft-lb)***
- ***T2:*** ***245 ± 49 N.m (25 ± 5 kg-m, 181 ± 36 ft-lb)***
- ***T3:*** ***139 ± 21 N.m (14 ± 2 kg-m, 101.5 ± 14.5 ft-lb)***
- ***T4:*** ***112.5 ± 14.5 N.m (11.5 ± 1.5 kg-m, 83 ± 11 ft-lb)***

6) Damage to suspension parts
Check the following parts and the fastening por tion of the car body for deformation or excessive rusting which impairs the suspension. If neces sary, replace damaged parts with new ones. I minor rust formation, pitting, etc. are noted, re move rust and apply remedial anti-corrosior measures.

(1) Front suspension
- Transverse link
- Crossmember
- Strut

(2) Rear suspension
- Crossmember
- Lateral links
- Trailing link
- Strut

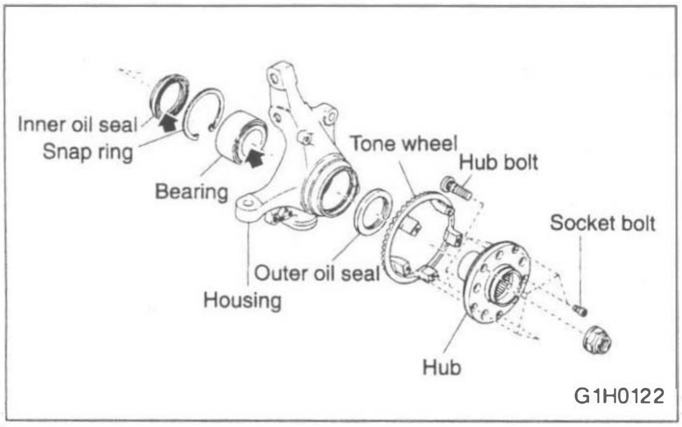
(3) In the district where salt is sprayed tc melt snow on a road in winter, check suspen sion parts for damage caused by rust every 12 months after lapse of 60 months. Take rust prevention measure as required.

18. Front and Rear Wheel Bearing Lubricant

MAINTENANCE INTERVAL [Number of months of km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
					(I)

A: INSPECTION

Inspect the condition of front and rear wheel bearing grease.

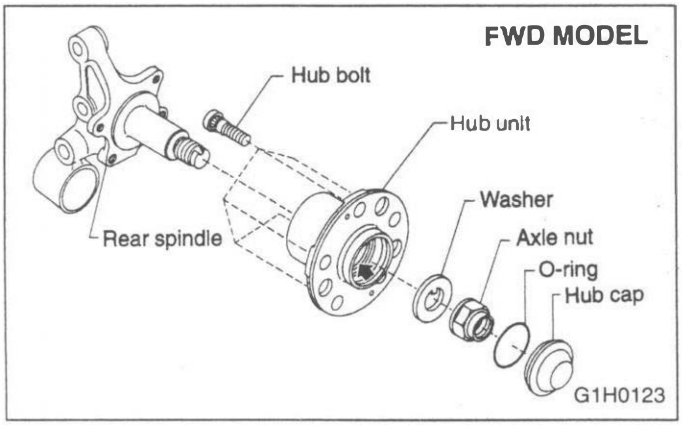


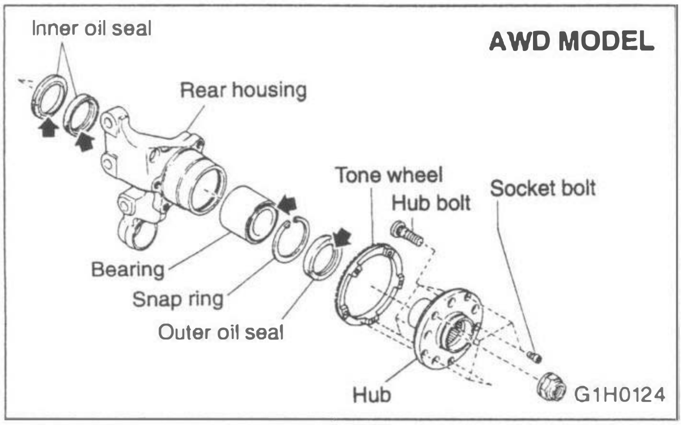
1. FRONT WHEEL BEARING

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

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

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





2. REAR WHEEL BEARING

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

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

5) Turn hub by hand to check for noise or binding. If hub is noisy or binds, disassemble rear axle and check condition of oil seals, bearings, etc.
6) When the vehicle is an AWD vehicle, remove bolts and self-locking nuts, and remove front lateral link from cross member.
Remove the DOJ of rear drive shaft from rear differential.
For removal of DOJ, refer to "WHEELS AND AXELS".
While supporting rear drive shaft horizontally with one hand, turn hub with the other to check for noise or binding.
If hub is noisy or binds, disassemble rear axle and check condition of oil seals, bearings, etc.

19. Valve Clearance

MAINTENANCE INTERVAL [Number of months or km (miles) whichever occurs first]					
Months		12	24	36	48
x1,000 km	1.6	25	50	75	100
x1,000 miles	1	15	30	45	60
For Europe	Inspect every 100,000 km (60,000 miles)				
Except Europe	Inspect every 100,000 km (60,000 miles)				

A: INSPECTION

1. SOHC MODEL

For the inspection procedures of the valve clearance on SOHC models, refer to "ON-CAR SERVICE". <Ref. to 2-2 [07A1].>

2. DOHC MODEL

For the inspection procedures of the valve clearance on DOHC models, refer to "ON-CAR SERVICE". <Ref. to 2-2 [07A2].>

1. System Application

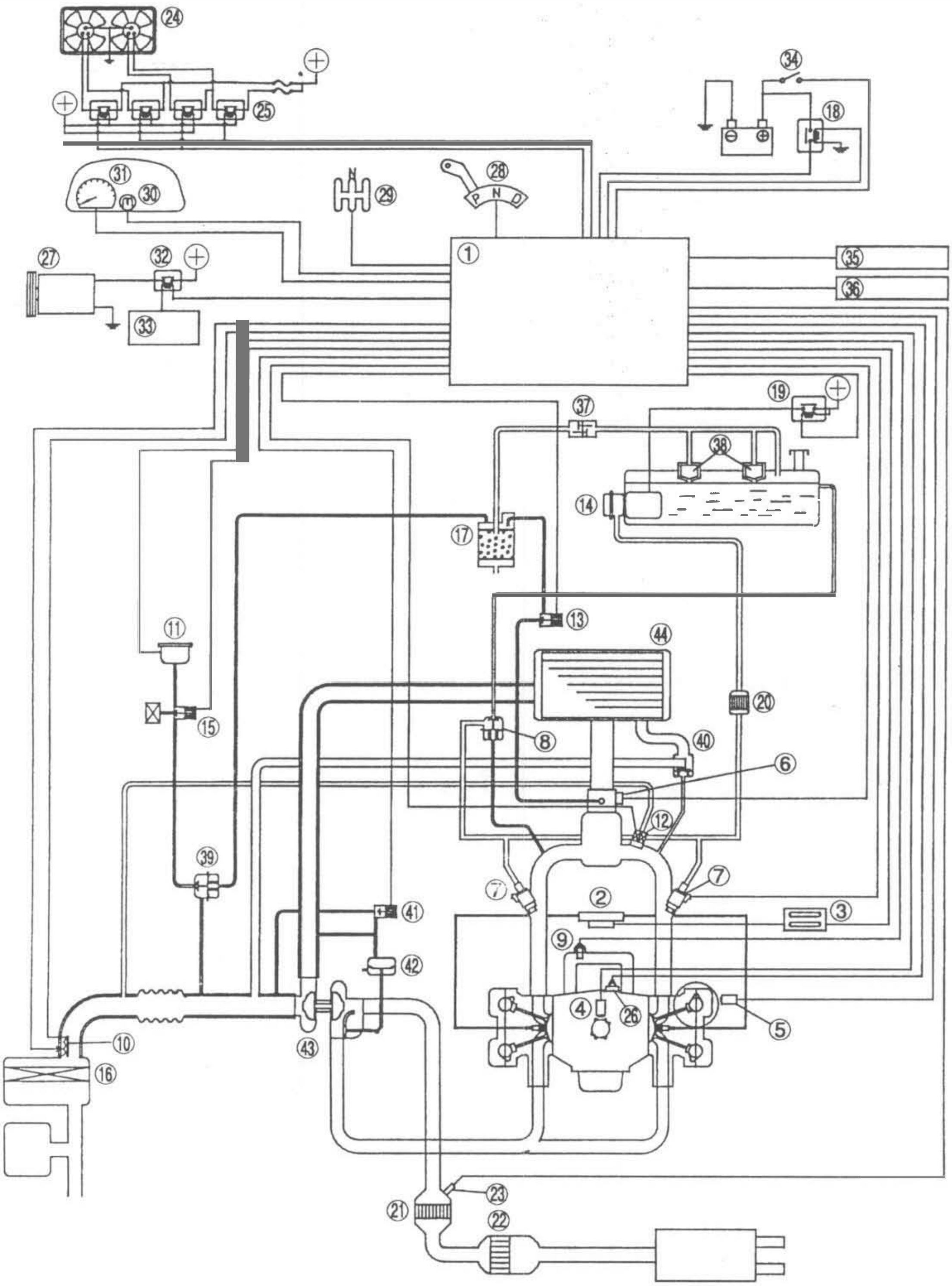
There are three emission control systems which are as follows:

1) Crankcase emission control system
2) Exhaust emission control system
   - Three-way catalyst system
   - A/F control system
   - Ignition control system
3) Evaporative emission control system

Item			Main components	Function
Crankcase emission control system			PCV valve	Draws blow-by gas into intake manifold from crankcase and burns it together with air-fuel mixture. Amount of blow-by gas to be drawn in is controlled by intake manifold pressure.
Exhaust emission control system	Catalyst system*1	Front	Three-way catalyst	Oxidizes HC and CO contained in exhaust gases as well as reducing NOx.
		Rear*2		
	A/F control system		ECM (Engine control module)	Receives input signals from various sensors, compares signals with stored data, and emits a signal for optimal control of air-fuel mixture ratio.
			Oxygen sensor*1	Detects density of oxygen contained exhaust gases.
			Mass air flow sensor (2000 cc model)	Detects amount of intake air.
			Pressure sensor (1600 cc and 1800 cc models)	Detects absolute pressure of intake manifold.
			Intake air temperature sensor (1600 cc and 1800 cc models)	Detects intake air temperature of air cleaner case.
			Throttle position sensor	Detects throttle position.
	Ignition control system		ECM	Receives various signals, compares signals with basic data stored in memory, and emits a signal for optimal control of ignition timing.
			Crankshaft position sensor	Detects engine speed (Revolution).
			Camshaft position sensor (2000 cc model)	Detects reference signal for combustion cylinder discrimination.
			Engine coolant temperature sensor	Detects coolant temperature.
			Knock sensor	Detects engine knocking.
Evaporative emission control system			Canister	Absorbs evaporative gas which occurs in fuel tank when engine stops, and sends it to combustion chambers for a complete burn when engine is started. This prevents HC from being discharged into atmosphere.
			Purge control solenoid valve	Receives a signal from ECM and controls purge of evaporative gas absorbed by canister.

*1 : Except General model
*2 : Except Australia model

C: 2000 cc TURBO MODEL

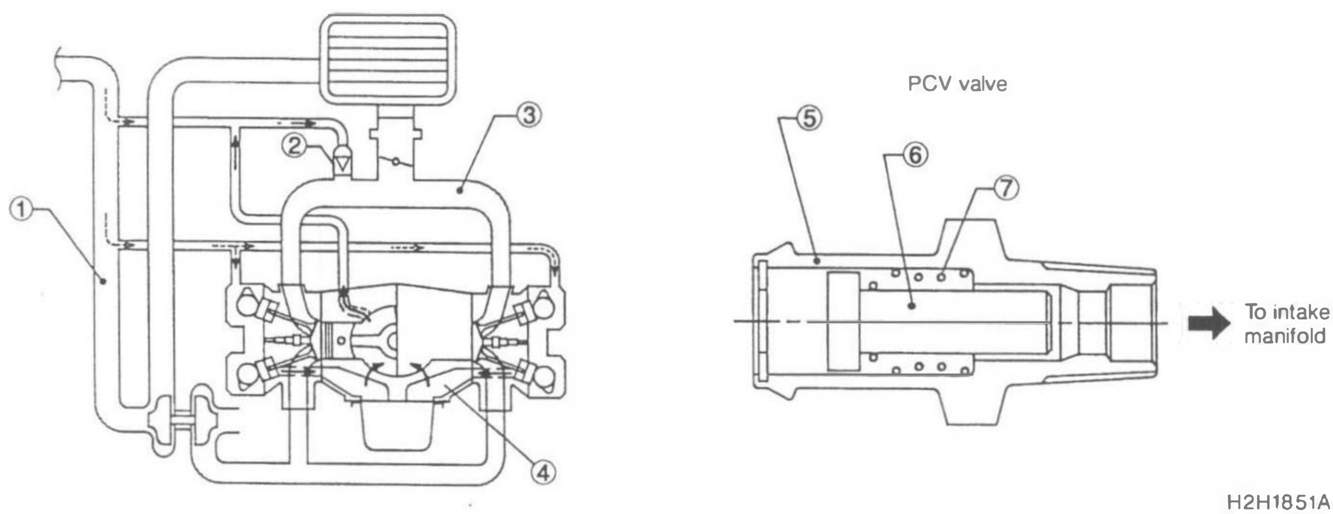


H2H1849A

① Engine control module (ECM)
② Ignition coil
③ Ignitor
④ Crankshaft position sensor
⑤ Camshaft position sensor
⑥ Throttle position sensor
⑦ Fuel injectors
⑧ Pressure regulator
⑨ Engine coolant temperature sensor
⑩ Mass air flow sensor
⑪ Pressure sensor
⑫ Idle air control solenoid valve
⑬ Purge control solenoid valve
⑭ Fuel pump
⑮ Pressure sources switching solenoid valve
⑯ Air cleaner
⑰ Canister
⑱ Main relay
⑲ Fuel pump relay
⑳ Fuel filter
㉑ Front catalytic converter
㉒ Rear catalytic converter (Except Australia spec. vehicles)
㉓ Oxygen sensor
㉔ Radiator fan
㉕ Radiator fan relay
㉖ Knock sensor
㉗ A/C compressor
㉘ Inhibitor switch (AT vehicle only)
㉙ Neutral position switch (MT vehicle only)
㉚ CHECK ENGINE malfunction indicator lamp (MIL)
㉛ Tachometer
㉜ A/C relay
㉝ A/C control module
㉞ Ignition switch
㉟ Vehicle speed sensor 2
㊱ Data link connector
㊲ Tow way valve
㊳ Fuel cut valve
㊴ Auxiliary purge control valve
㊵ Air vent valve
㊶ Wastegate control solenoid valve
㊷ Wastegate controller
㊸ Turbocharger
㊹ Intercooler

B: TURBO MODEL

- The positive crankcase ventilation (PCV) system is employed to prevent air pollution which will be caused by blow-by gas being emitted from the crankcase.
The system consists of a sealed oil filler cap, rocker covers with fresh air inlet, connecting hoses, PCV valve and an air intake duct.
- At the part throttle, the blow-by gas in the crankcase flows into the intake manifold through the connecting hose of crankcase and PCV valve by the strong vacuum of the intake manifold. Under this condition, the fresh air is introduced into the crankcase through connecting hose of rocker cover.
- At wide open throttle, a part of blow-by gas flows into the air intake duct through the connecting hose and is drawn to the throttle chamber, because under this is condition, the intake manifold vacuum is not so strong as to introduce all blow-by gases increasing with engine speed directly through the PCV valve.



① Air intake duct
② PCV valve
③ Intake manifold
④ Crankcase
⑤ Case
⑥ Valve
⑦ Spring

4. Three-way Catalyst

- The basic material of three-way catalyst is platinum (Pt) and rhodium (Rh), and a thin film of their mixture is applied onto honeycomb or porous ceramics of an oval shape (carrier). To avoid damaging the catalyst, only unleaded gasoline should be used.
- The catalyst is used to reduce HC, CO and NOx in exhaust gases, and permits simultaneous oxidation and reduction. To obtain an excellent purification efficiency on all components HC, CO and NOx, a balance should be kept among the concentrations of the components. These concentrations vary with the air-fuel ratio.
- The air-fuel ratio needs to be controlled to a value within the very narrow range covering around the stoichiometric mixture ratio to purify the components efficiently.

5. A/F Control System

• The air/fuel control system compensates for the basic amount of fuel injection in response to a signal sent from the oxygen sensor to provide proper feedback control of the mixture. Thus, the theoretical air-fuel ratio is maintained to provide effective operation of the three-way catalyst. The basic amount of fuel injection is preset according to engine speed and loads, as well as the amount of intake air.

• This system also has a "learning" control function which stores the corrected data in relation to the basic amount of fuel injection in the memory map. A new air-fuel ratio correction is automatically added for quick response to the deviation of the air-fuel ratio. Thus, the air-fuel ratio is optimally maintained under various conditions while stabilizing exhaust gases, improving driving performance and compensating for changes in sensors' performance quality with elapse of time.

Refer to 2-7 "FUEL INJECTION SYSTEM".

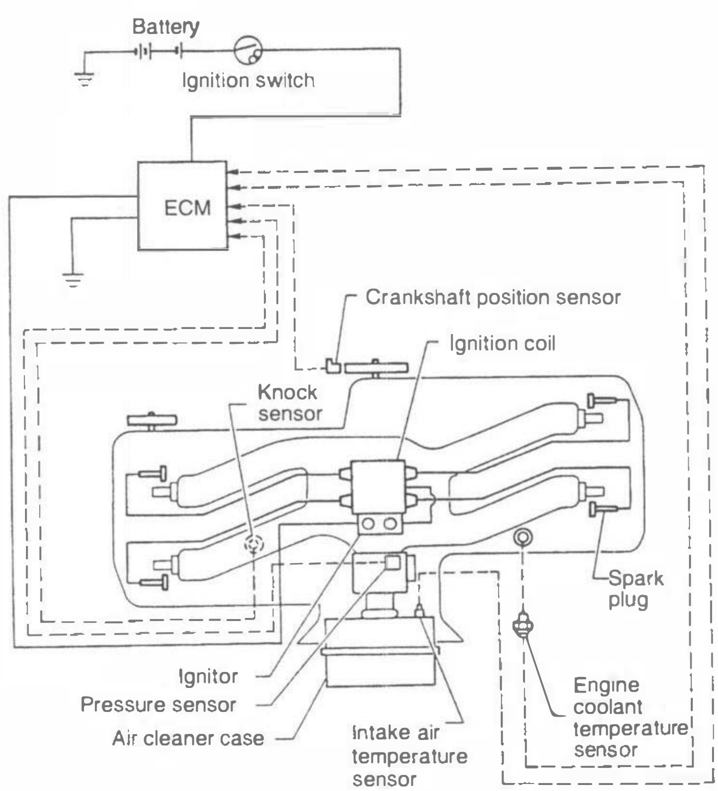
6. Ignition Control System

A: 1600 cc AND 1800 cc MODEL

• The ignition control system is controlled by the ECM.
The ECM determines the optimal ignition timing according tc signals sent from various sensors (which monitor the operating conditions of the engine), and sends a signal to the igniters.

• The ECM has a "closed-roof" control function with map which provides superb transient characteristics for responsive ignition timing control.

Refer to 2-7 "FUEL INJECTION SYSTEM".



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'. Evaporative Emission Control System

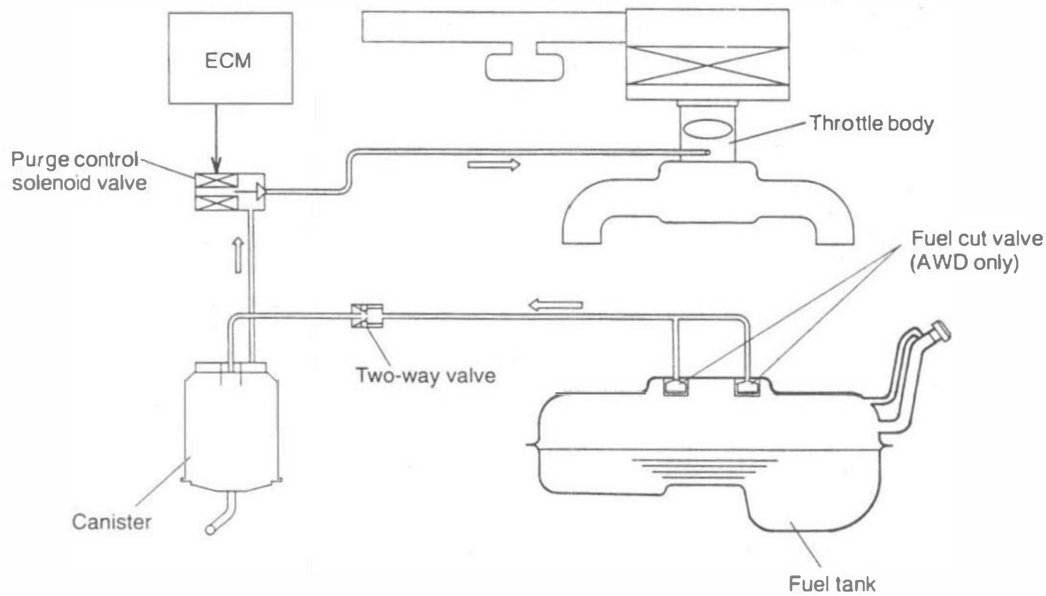
\: GENERAL

The evaporative emission control system is employed to prevent evaporative fuel from being dis-harged into ambient atmosphere. This system includes a canister, purge control solenoid valve, uel cut valve, their connecting lines, etc.

Gasoline vapor evaporated from the fuel in the fuel tank is introduced into the canister located 1 the engine compartment through the evaporation line, and is absorbed on activated carbon in : A fuel cut valve is also incorporated on the fuel tank line.

The purge control solenoid valve is controlled by the ECM and provides optimal purge control according to the engine condition.

. 1600 cc AND 1800 cc MODELS



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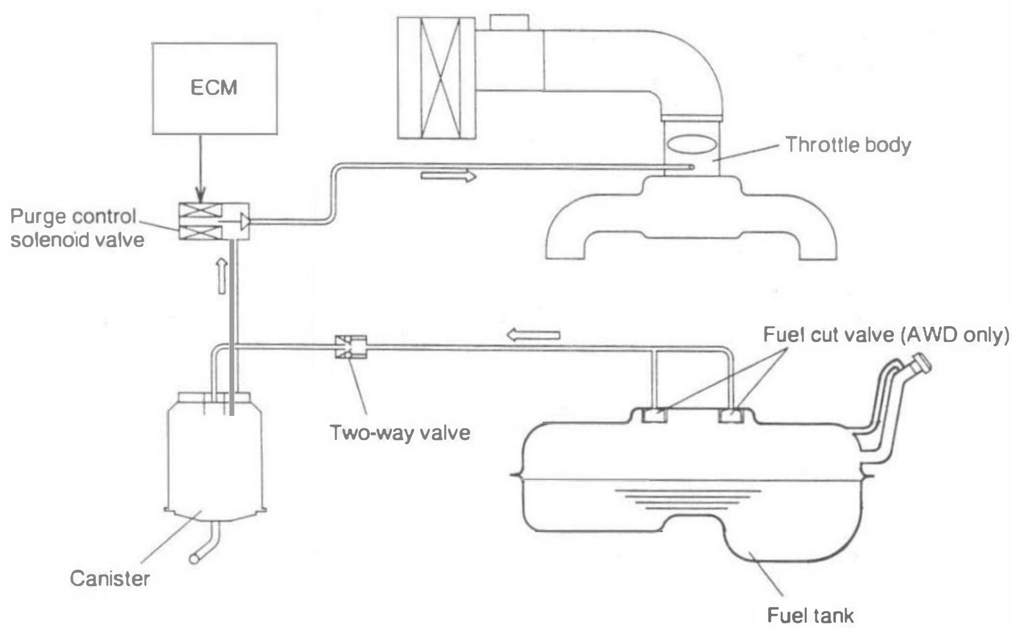
2. 2000 cc NON-TURBO MODEL



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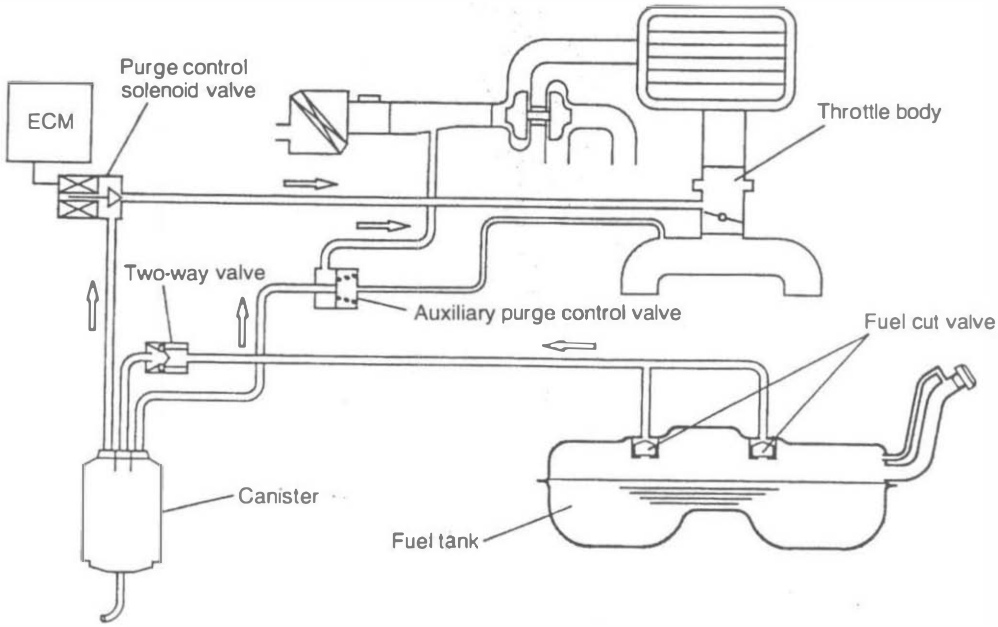
3. 2000 cc TURBO MODEL



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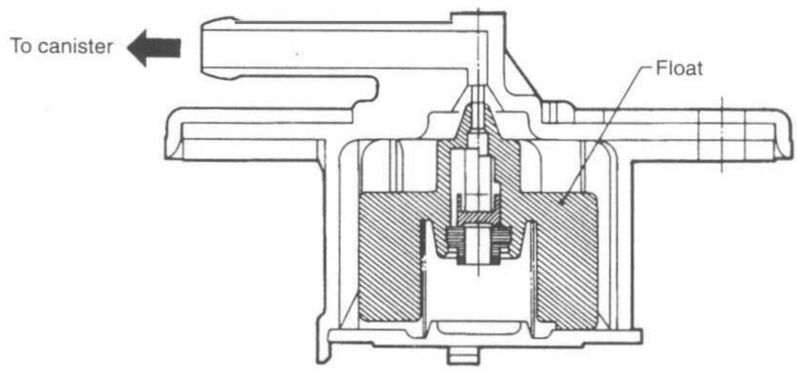
B: FUEL CUT VALVE

On AWD model, the fuel cut valve is built onto the evaporation pipe of the fuel tank cap. The rising level of the fuel from the fuel tank causes the float to move up and close the cap hole so that no fuel can enter during evaporation line.



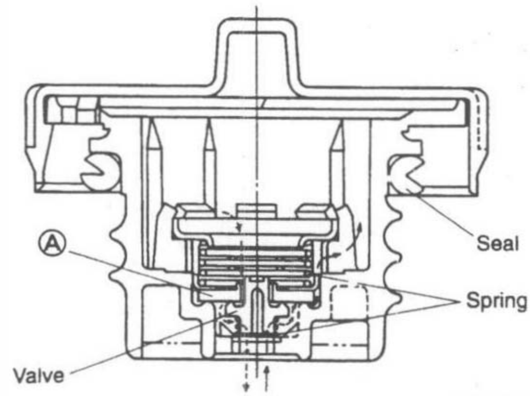
G2H0008

C: FUEL CAP

The relief valve is adopted to prevent the development of vacuum in the fuel tank which may occur in case of trouble in the fuel vapor line.

In normal condition, the filler pipe is sealed at Ⓐ and at the packing pressed against the filler pipe end. As vacuum develops in the fuel tank, atmospheric pressure forces the spring down to open the valve; consequently air is led into the fuel tank controlling the inside pressure.

1. UNLEADED GASOLINE SPEC. VEHICLES



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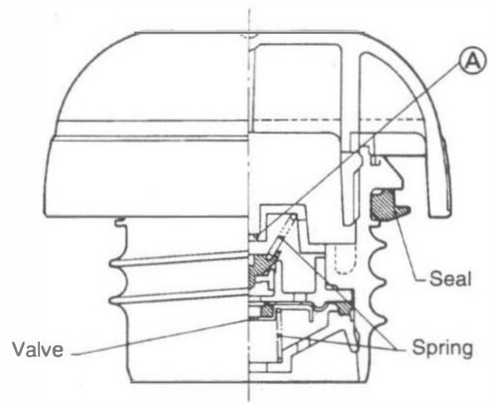
2. LEADED GASOLINE SPEC. VEHICLES

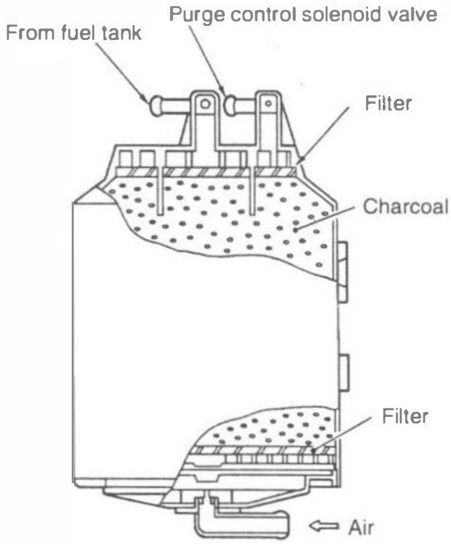


G2H0009

D: CANISTER

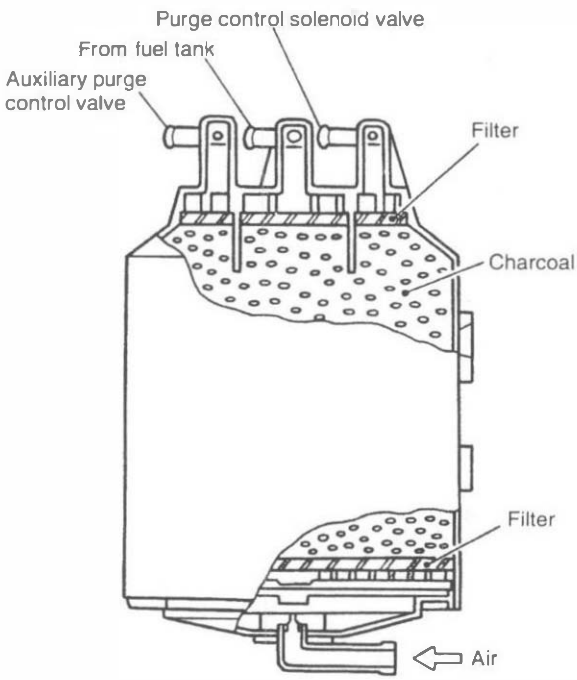
The canister temporarily stores the evaporation gas. When the purge control solenoid valve is opened from a signal sent from the ECM, the evaporation gas is sent into the collector chamber after being mixed with fresh external air.

1. NON-TURBO MODEL



G2H0010

2. TURBO MODEL



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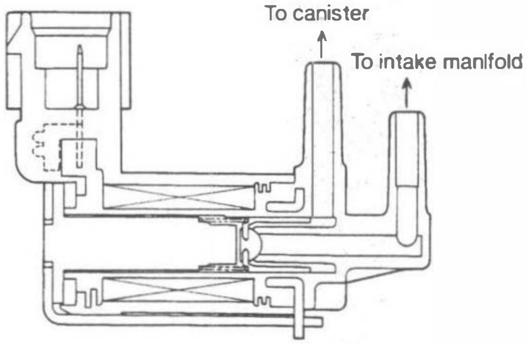
E: PURGE CONTROL SOLENOID VALVE

The purge control solenoid valve is on the evaporation line between canister and throttle body. It is built on the inside of intake manifold.



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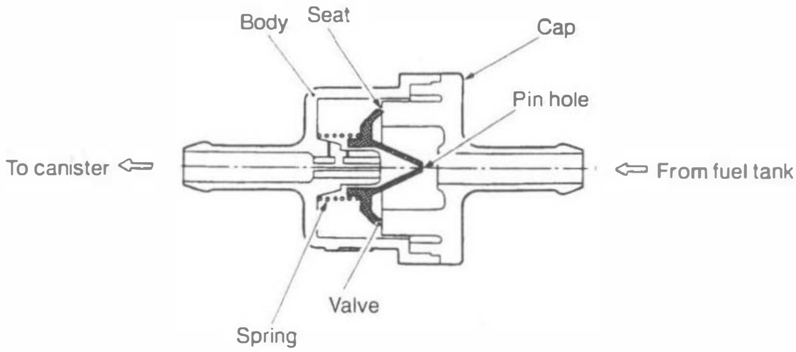
F: TWO-WAY VALVE

- The two-way valve is located in the evaporation line between the fuel tank and canister. When evaporation gas pressure in fuel tank exceeds the specified value, the valve is pressurized to push the spring. This lifts the valve seat so that evaporative gas is discharged to the canister.
- When evaporation gas pressure in fuel tank drops specified value, the valve move to close the valve seat. However, air which enters from the inlet port of the canister is introduced into the fuel tank through the pin hole located at end of the valve.



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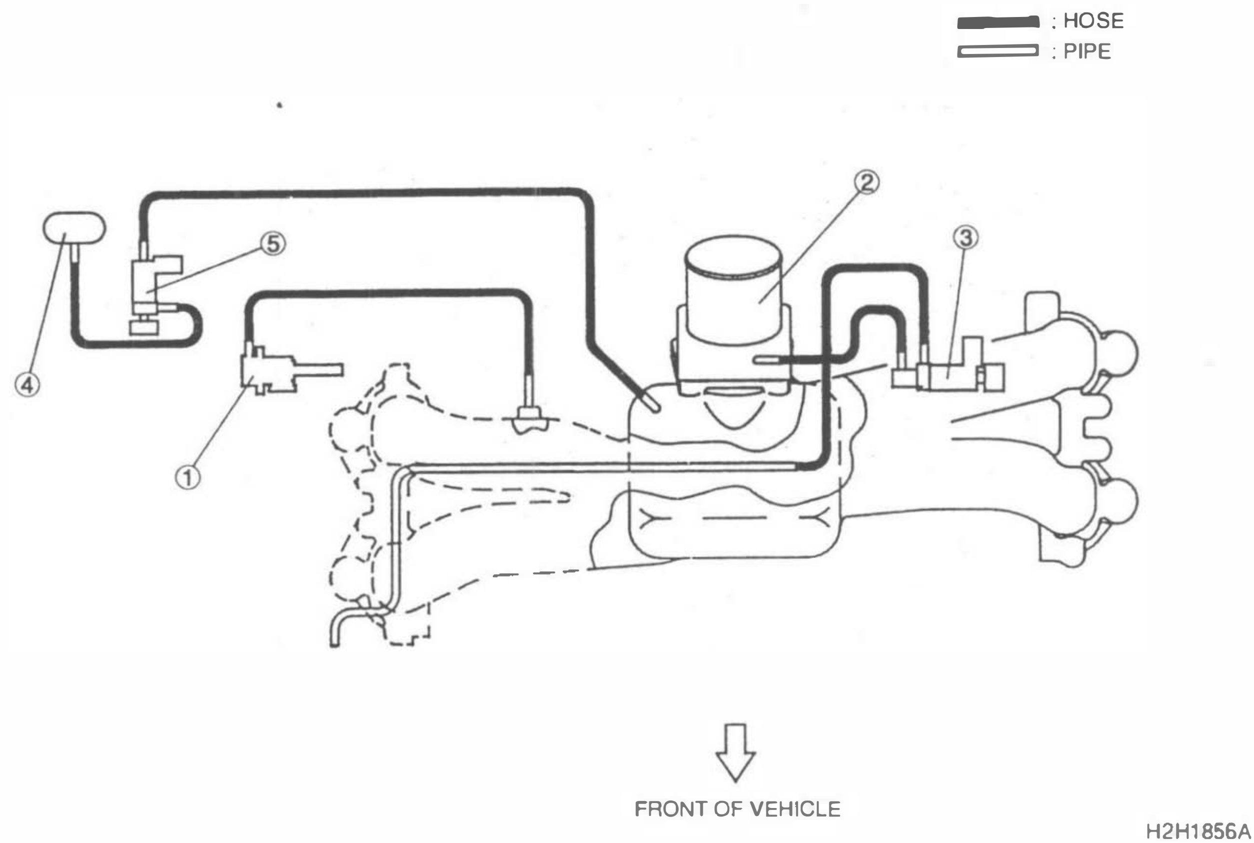
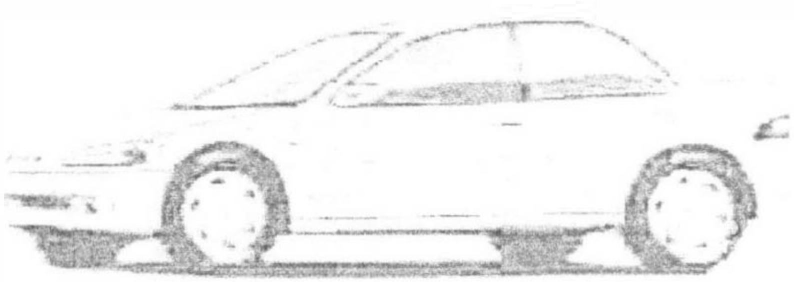
C: 2000 cc TURBO MODEL



① Pressure regulator
② Throttle body
③ Purge control solenoid valve
④ Pressure sensor
⑤ Pressure sources switching solenoid valve

SERVICE MANUAL

SUBARU IMPREZA



ENGINE SECTION

Technical description

- Mechanism and function

ENGINE (DOHC) 2-3b

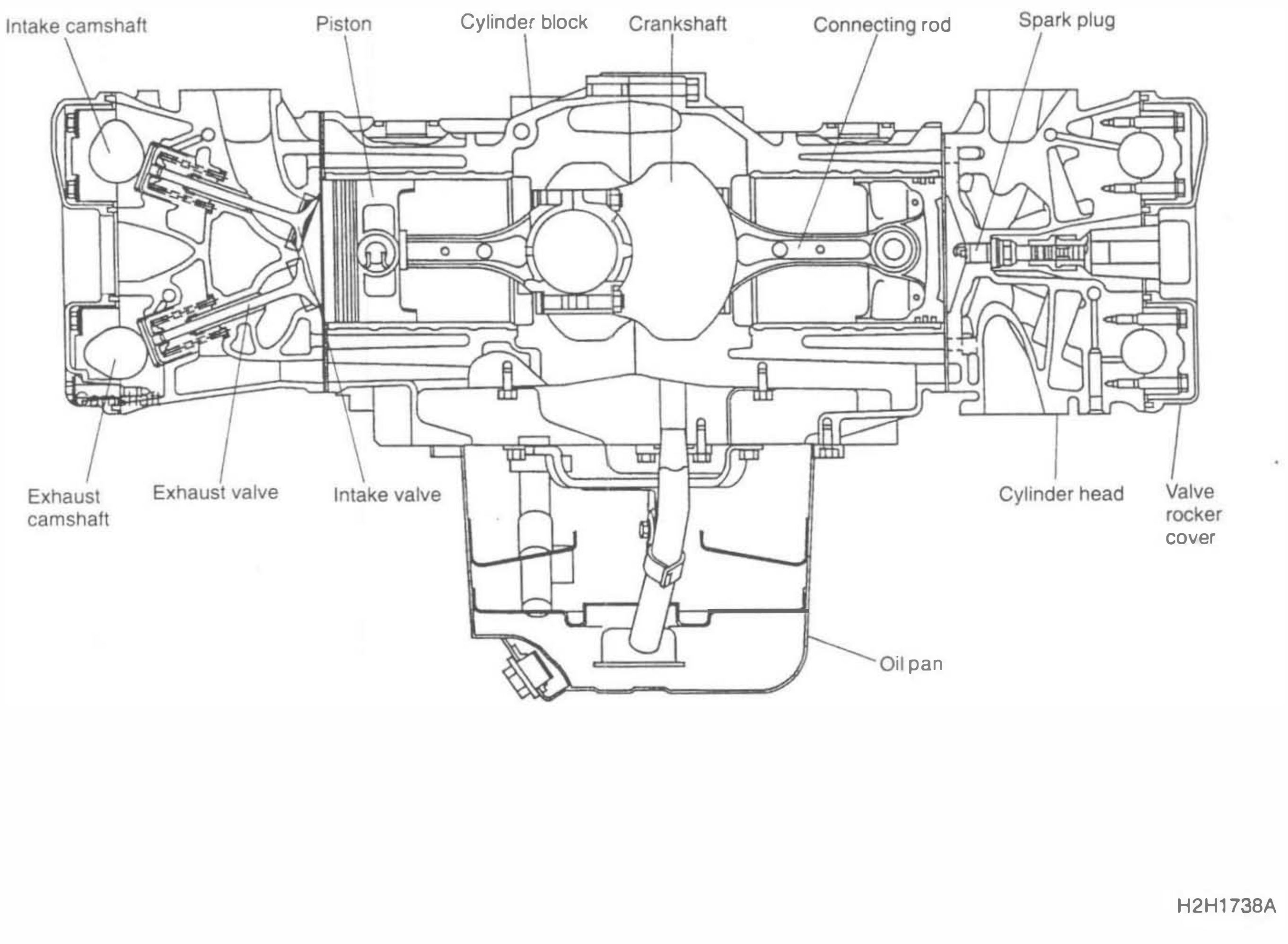
Page

1. General

The engine is made from aluminum alloy and is horizontally opposed, it is a 4-stroke cycle, water-cooled, DOHC 16-valve, turbocharged engine. The fuel injection system utilizes an MFI design.

A summary of the major construction and function features is as follows:

- The cylinder head is a center-plug type that utilizes pentroof combustion chambers. The four-valve design is provided with two intake valves and two exhaust valves per cylinder. The intake and exhaust ports are arranged in a cross-flow design.
- A single timing belt drives four camshafts on the left and right banks and the water pump on the left bank. Belt tension is automatically adjusted to eliminate maintenance.
- The crankshaft is supported by five bearings to provide high rigidity and strength.
- The cylinder block is made from aluminum diecast which is integrated with cast-iron cylinder liners.



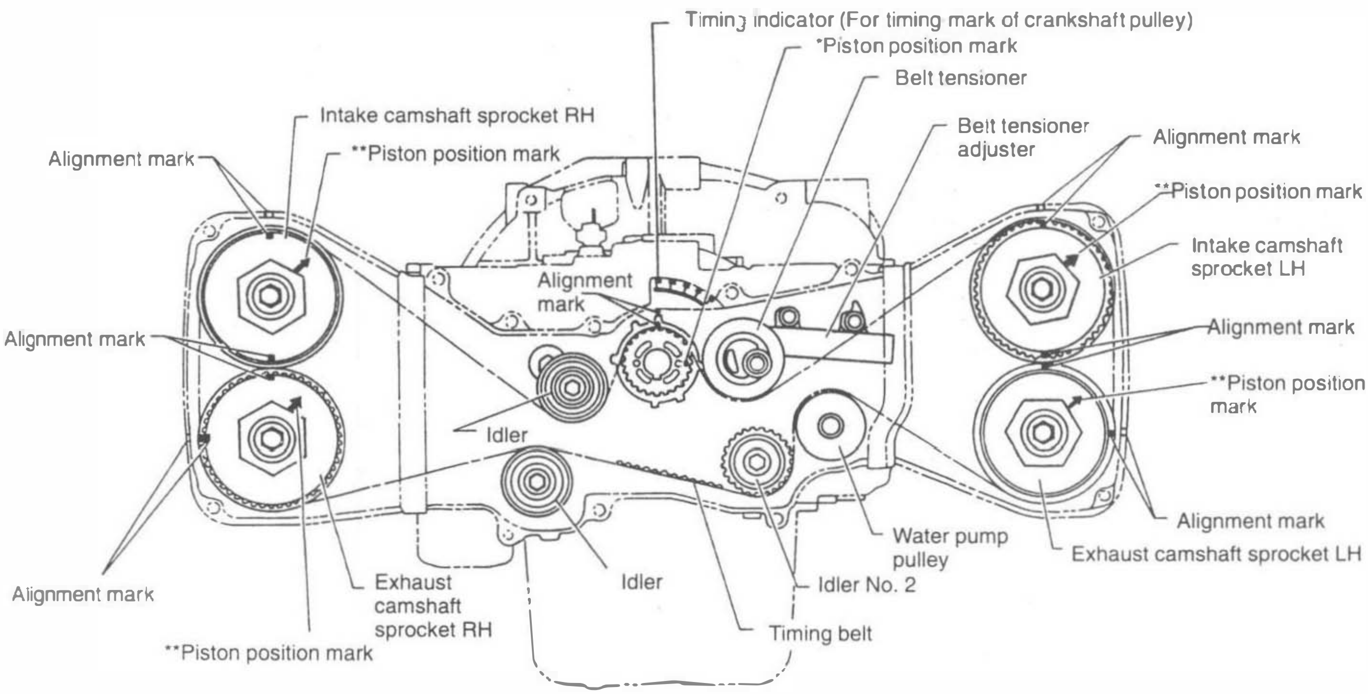
2. Timing Belt

A single timing belt drives four camshafts (intake and exhaust camshafts on each bank). The back of the belt also drives the water pump.

The timing belt teeth have a specially designed round profile to provide quiet operation. The timing belt is composed of a strong and inflexible core wire, a wearresistant canvas and heat-resistant rubber material.

A hydraulic belt-tensioner adjuster constantly maintains specified belt tension to properly drive the camshafts, as well as to provide a "maintenance-free" advantage.

The camshaft sprocket is made of resin. Compared with the alloy type one, it is lighter in weight.



NOTE:
*: #1 piston is set at TDC when piston-position mark on crankshaft sprocket is aligned with mark on cylinder block
**: #1 piston is set at TDC on compression stroke when piston-position mark on camshaft sprocket is facing directly upward.

3. Belt Tensioner Adjuster

The belt tensioner adjuster provides a constant value of tension for the timing belt. Proper belt tension is maintained using an adjuster rod to push the timing belt via tensioner pulley. The location of the tensioner pulley shaft center is offset in relation to the center of the pulley's outside diameter.

The adjuster rod provides a rotary movement for the tensioner pulley by both tension of the spring housed in the adjuster.

- Belt tension action

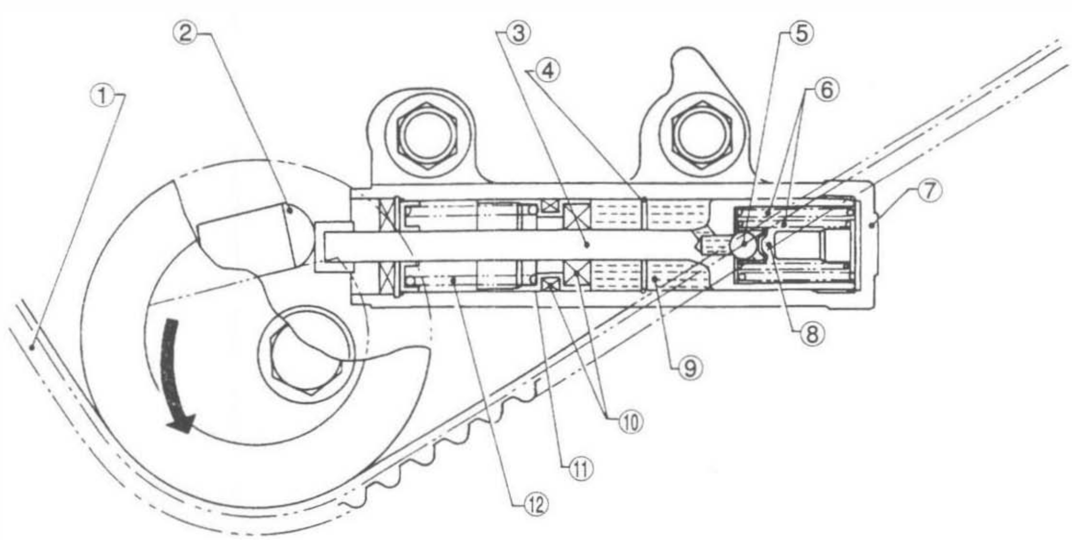
The adjuster rod is moved to the left by the force of the main spring. This causes silicone oil (which is held to constant pressure by compression-spring tension inside the reservoir chamber) to push the check ball so that silicone oil flows into the oil-pressure chamber.

The momentum which forces the adjuster rod out acts upon the tensioner arm so that the pulley is turned counterclockwise. Thus, timing belt tension is properly maintained.

- Balance to belt tension

When the timing belt reaction force is balanced by the main spring tension (to push the adjuster rod), the arm is held stationary to maintain constant belt tension.

When the timing belt reaction force increases to such an extent that the belt will be too tight, a small quantity of oil in the oil-pressure chamber gradually returns to the reservoir chamber via the adjuster body-to-rod clearance. This return of oil continually moves the rod until the reaction force of the timing belt balances with main spring force and oil pressure inside the oil-pressure chamber. Thus, belt tension is constantly maintained.



① Timing belt
② Tension arm
③ Adjuster rod
④ Stopper
⑤ Check ball
⑥ Main spring
⑦ Adjuster body
⑧ Oil pressure chamber
⑨ Oil pressure chamber (Silicone oil)
⑩ Oil seal
⑪ Piston
⑫ Compression spring

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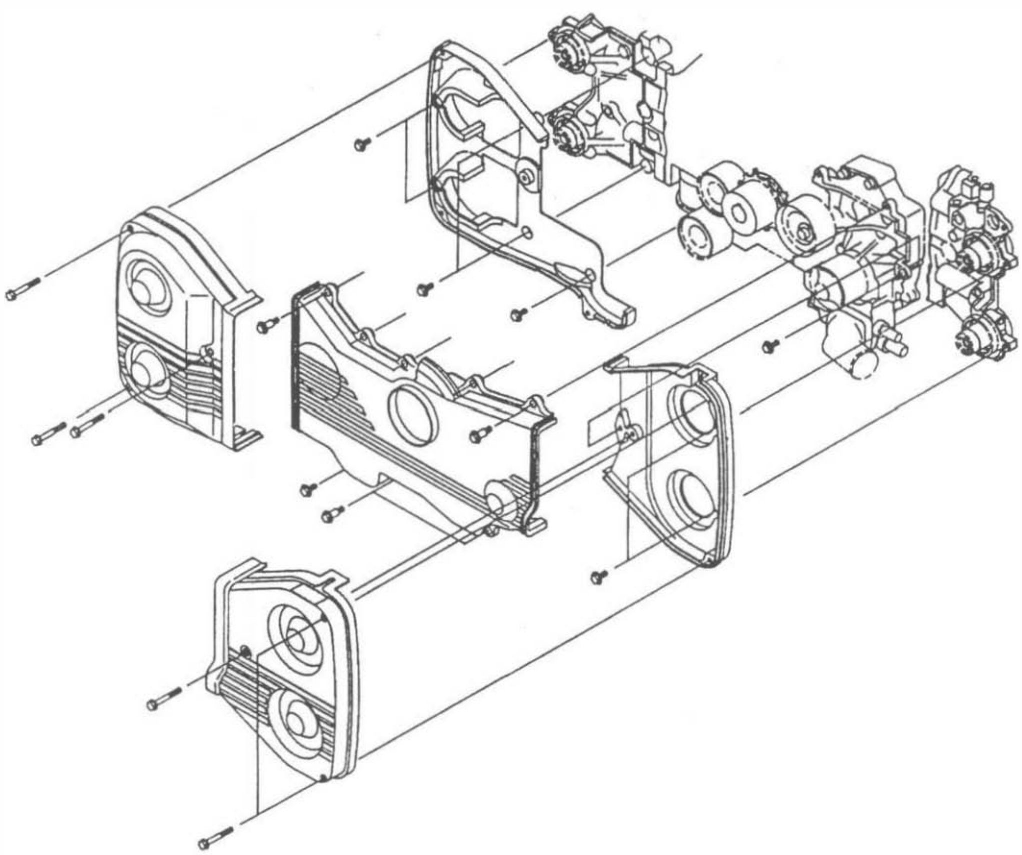
4. Belt Cover

- The belt cover is made of synthetic resin molding which is lightweight and heat resistant. It has a totally enclosed design that utilizes rubber packing at the mating surface of the cylinder block. This eliminates the chance of dust and liquid from entering the interior.
- A floating design is utilized by placing rubber mounting between the cylinder block and belt cover to prevent the transmission of noise and vibration.
- The front belt cover has a graduated line for ignition-timing confirmation.



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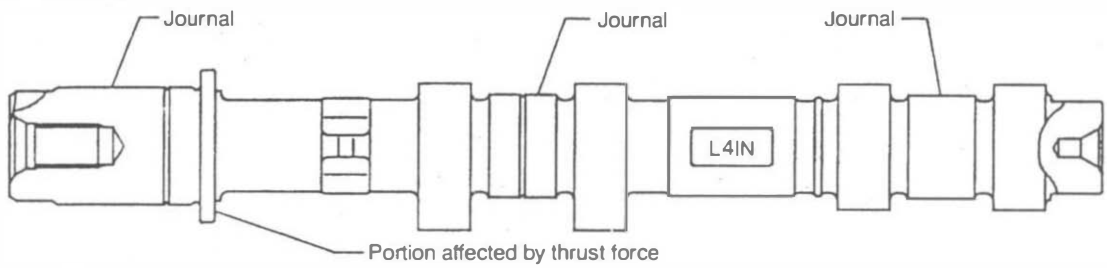
5. Camshaft

The DOHC engine uses four camshafts in all; intake and exhaust camshafts on the RH bank and intake and exhaust camshafts on the LH bank.

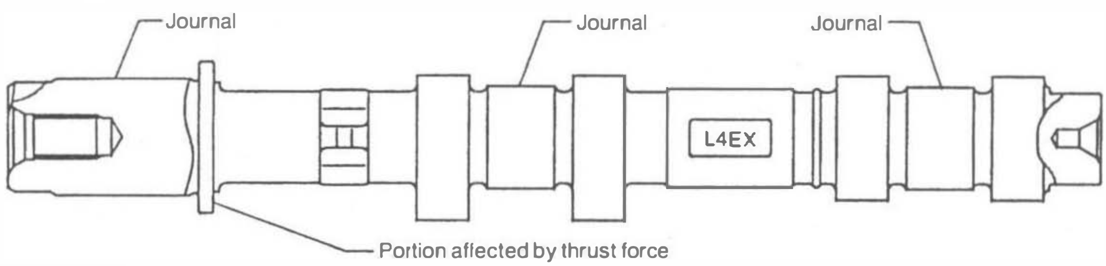
The cam nose part is finished with "chill" treatment to increase wear resistance and anti-scuffing properties.

Each camshaft is supported by three journals with three camshaft caps. Each camshaft flange is supported by a groove provided in the cylinder head to receive thrust force.

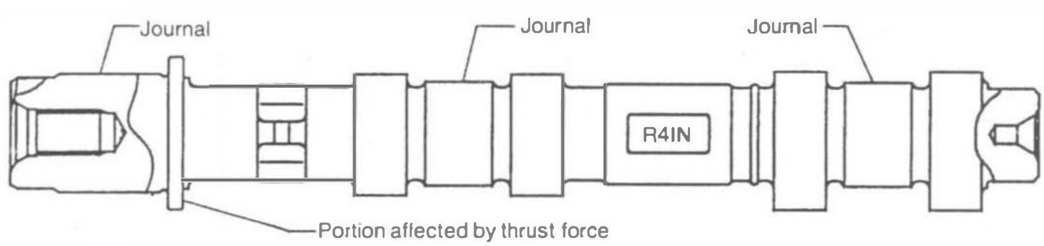
Intake camshaft (LH)



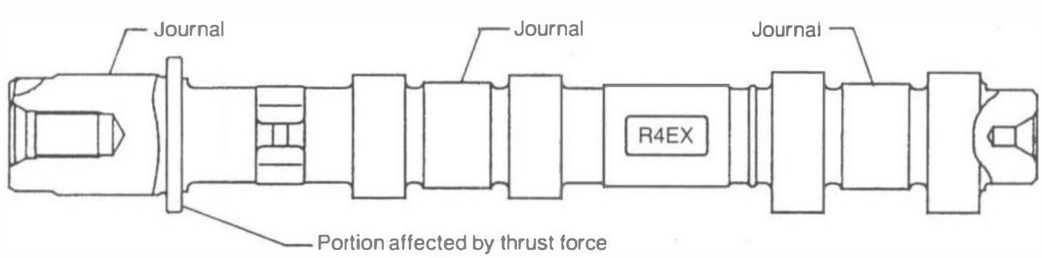
Exhaust camshaft (LH)



Intake camshaft (RH)



Exhaust camshaft (RH)



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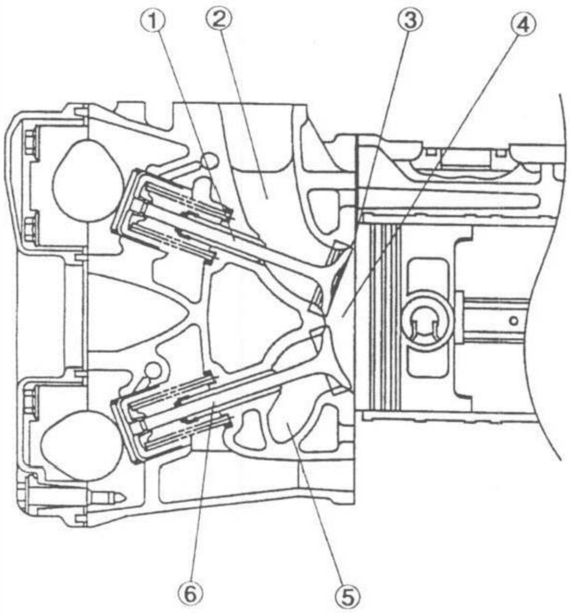
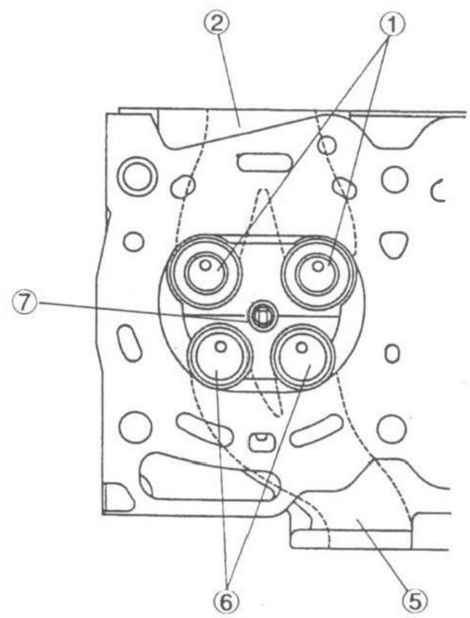
6. Cylinder Head

- The cylinder head is made from aluminium die casting.
- Combustion chamber in the cylinder head is a compact, pentroof design and spark plug is located at the center of combustion chamber which feature a wide "squish" area for increased combustion efficiency.
- Four valves (two intake and two exhaust), which are arranged in a cross-flow design, are used per cylinder.
- The cylinder head gasket is a metallic one consisting of three layers of the stainless steel sheets. It has better heat resistance and gas sealability and higher reliability.





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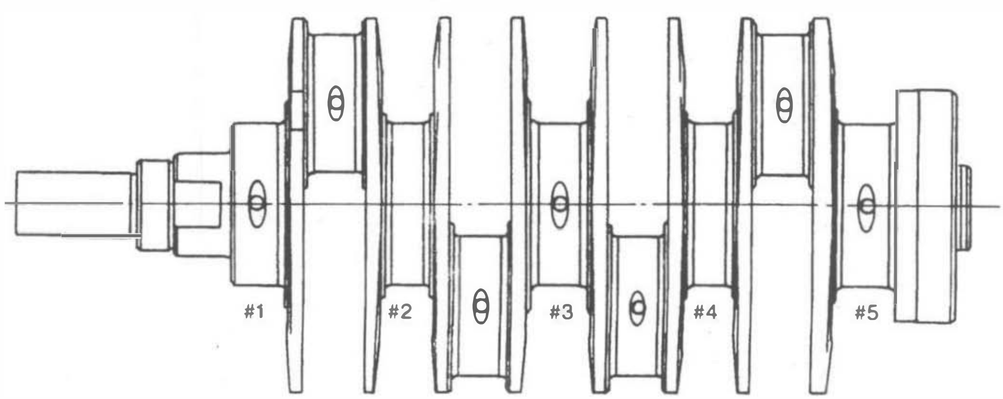
1 Intake valve
2 Intake port
3 Squish area
4 Combustion chamber
5 Exhaust port
6 Exhaust valve
7 Spark plug

7. Cylinder Block

- The cylinder block is made from aluminum die casting. The cylinder perimeter has an open-deck design which is lightweight, highly rigid and has superb cooling efficiency.
- The cylinder liners are made from cast iron and are dry types which are totally cast with aluminum cylinder block. Five main journal block designs are employed to increase stiffness and quiet operation.
- The oil pump is located in the front center of the cylinder block and the engine coolant pump is located at the front of the right-cylinder bank. At the rear of the right-cylinder block is a separator which eliminates oil mist contained in the blow-by gas.

8. Crankshaft

The crankshaft is supported by five bearings to provide high rigidity and strength. The corners of the crankshaft journals and webs, as well as the crank pins and webs, are finished with fillet-roll work to increase stiffness. The five crankshaft bearings are made from aluminum alloy and the No. 3 bearing is provided with a flanged metal to receive thrust force.



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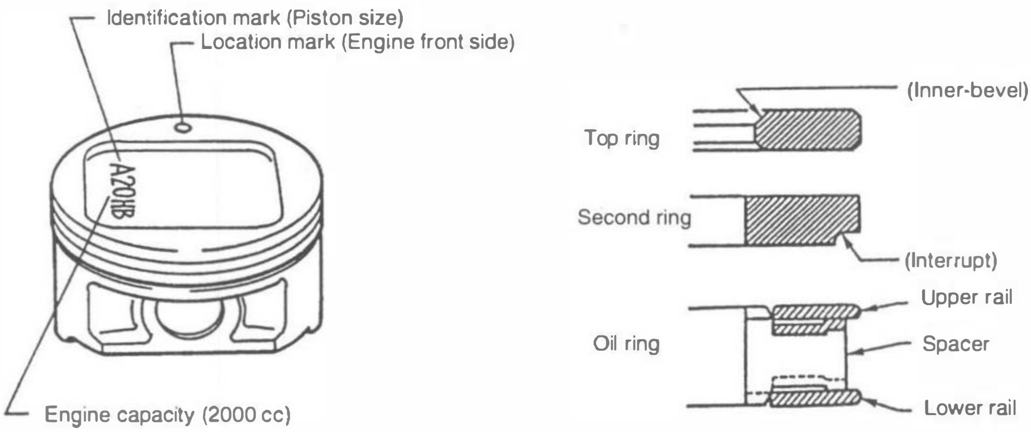
9. Piston

- The piston skirt has a "slipper" design to reduce weight and sliding. The oil control ring groove utilizes a slit design.
- The piston pin is located in an offset position. The Nos. 1 and 3 pistons are offset in the lower direction while the Nos. 2 and 4 pistons are offset in the upper direction.
- The piston head is recessed for both the intake and exhaust valves. It also has symbols used to identify the location and the direction of installation.
- Three piston rings are used for each piston-two compression rings and one oil ring. The top piston ring has an inner-bevel design and the second piston ring has an interrupt design to reduce oil consumption.



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ENGINE COOLING SYSTEM 2-5

Page

1. General

- The engine cooling system consists of a down-flow radiator which features high heat-dissipation performance, an electric motor fan, a water pump, a thermostat, and an engine coolant temperature sensor.
- The reserve tank is designed to eliminate the need for replenishing coolant.
- On models without an air conditioner, the ECM or ECM/TCM sends an ON or OFF switch signal to the radiator fan in response to signals from the engine coolant temperature sensor. On models with an air conditioner, the ECM or ECM/TCM sends ON or OFF (and LO or HI: Turbo model) switch signals to the radiator main fan and sub fan in response to signals from the engine coolant temperature sensor, vehicle speed sensor 2 and A/C switch.

2. Cooling Lines

This cooling system operates in three steps depending on the temperature of the engine coolant flowing through the cooling circuit.

- 1st step ... With thermostat closed

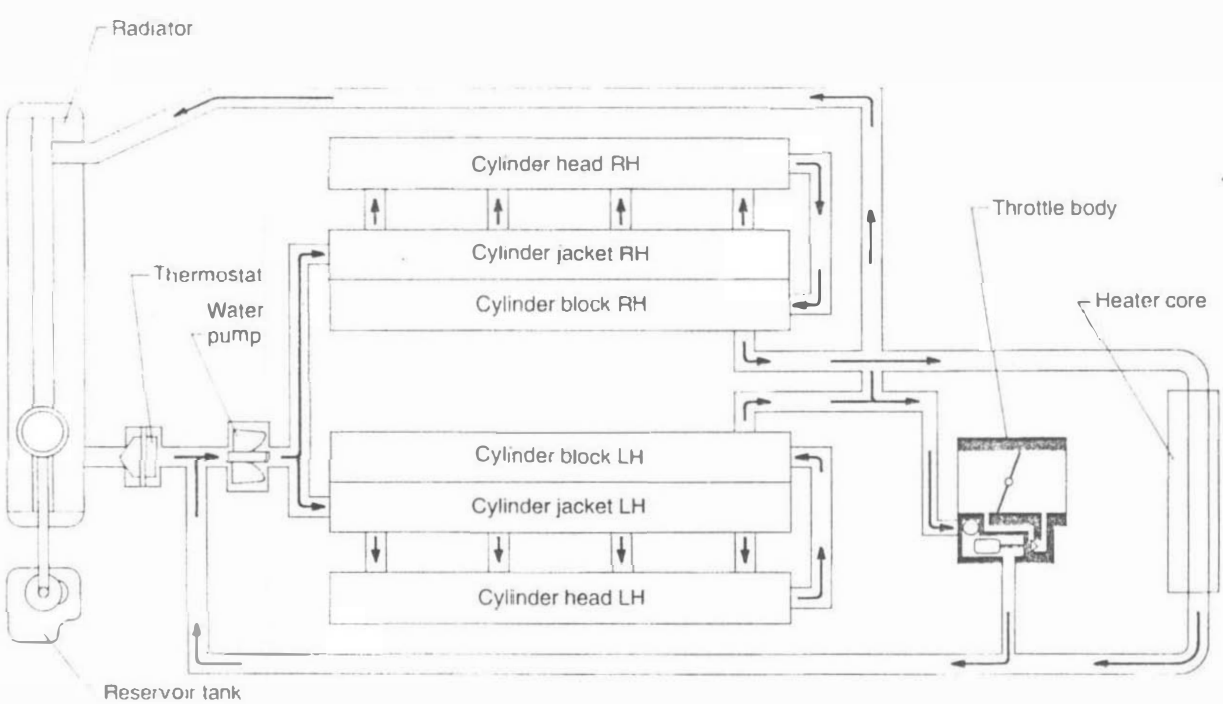
At the engine coolant temperature of below 76°C (169°F), the thermostat remains closed and the engine coolant flows through the bypass and heater circuits.
This permits the engine to warm up quickly.

- 2nd step ... With thermostat opened

When the engine coolant temperature is above 76 – 80°C (169 – 176°F), the thermostat opens and the engine coolant flows through the radiator where it is cooled.

- 3rd step ... With radiator fan operating

When the engine coolant temperature rises above 95°C (203°F), the ECM or ECM/TCM sends ON signal to the radiator fan in response to signal from the engine coolant temperature sensor and the radiator fan rotates.



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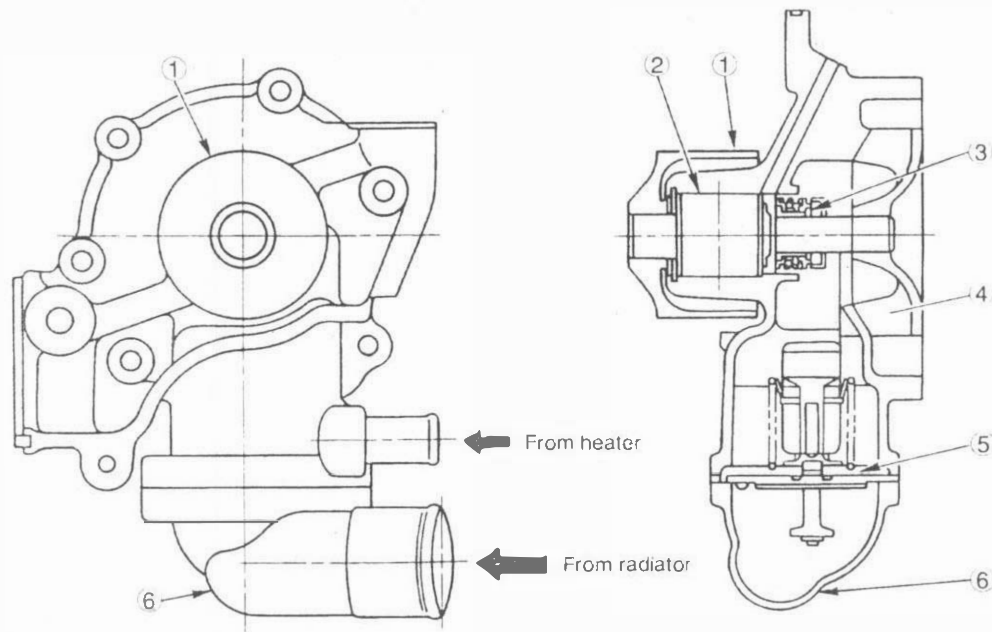
3. Water Pump

A: MECHANISM

The water pump is located on the left front portion of the cylinder block and is driven by the timing belt. The thermostat is built into the engine coolant inlet located on the lower side of the water pump. When the impeller rotates, engine coolant is drawing into the water pump from the lower pipe (which is connected to the radiator hose) via the thermostat. It then flows along the perimeter of the impeller and is delivered to the engine's engine coolant passage.

B: NON-TURBO MODEL



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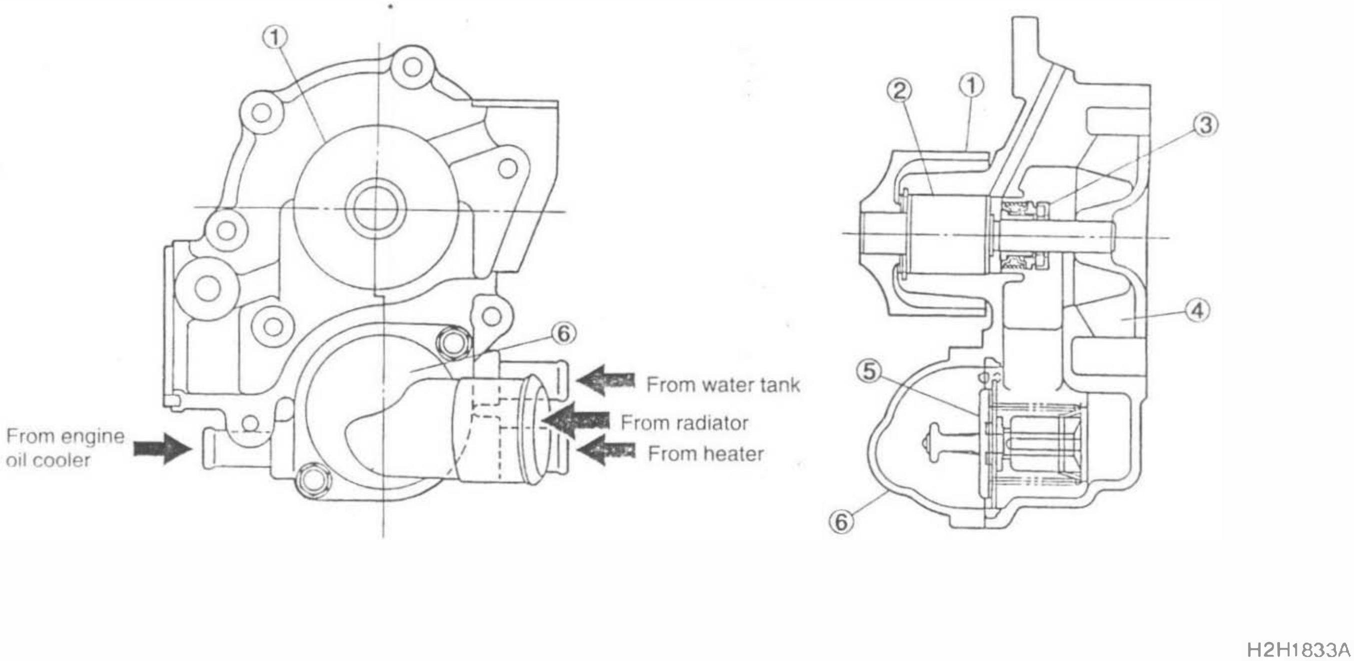
1 Pulley
2 Ball bearing
3 Mechanical seal
4 Impeller
5 Thermostat
6 Thermostat case

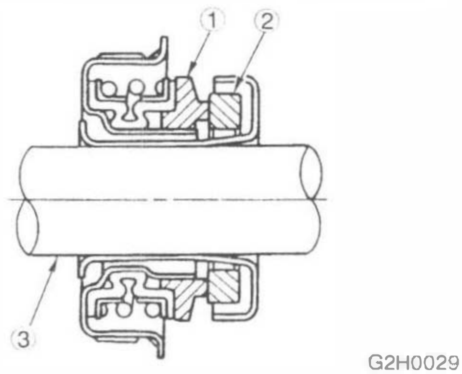
C: TURBO MODEL



1 Pulley
2 Ball bearing
3 Mechanical seal
4 Impeller
5 Thermostat
6 Thermostat case

4. Mechanical Seal

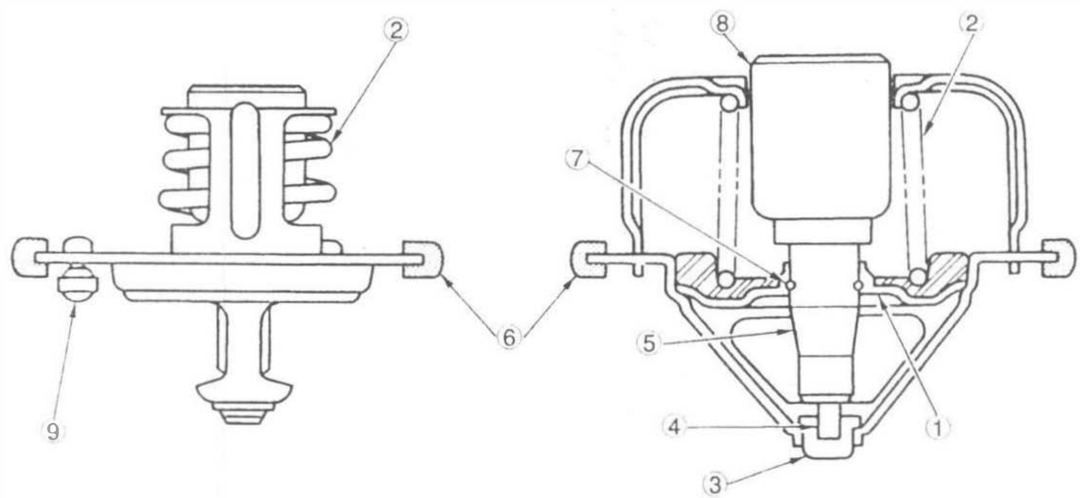
The mechanical seal has its seat pressed into the water pump shaft to form the seal and water pump as a single unit. With this design, the water pump cannot be disassembled.



1 Carbon seal
2 Ceramics seat
3 Water pump shaft

5. Thermostat

The thermostat is powered to open the valve by a totally-enclosed wax pellet which expands with increased temperature. It provides the sure open-close operation of the valve and features high durability.



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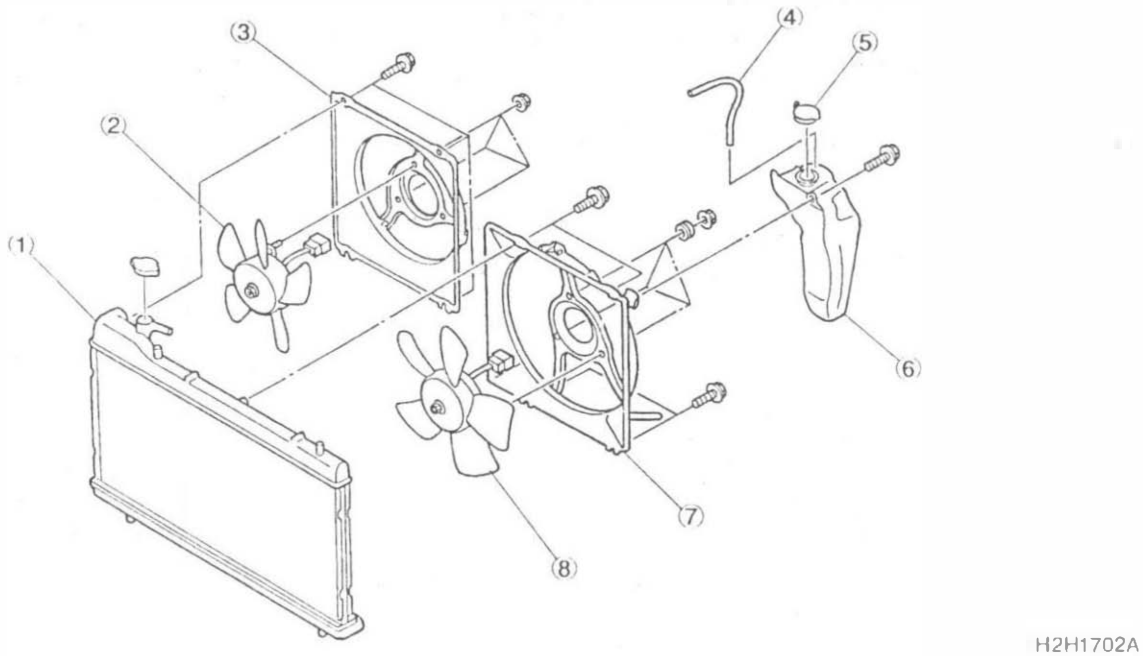
1 Valve
2 Spring
3 Stopper
4 Piston
5 Guide
6 Gum packing
7 Stop ring
8 Wax element
9 Jiggle valve

6. Radiator Fan

A: DESCRIPTION

- The radiator fan is made of plastic. That is installed to the electric motor, and is located onto radiator straight by shroud.
- The vehicle without air conditioning has the radiator main fan only. Thus, the vehicle with air conditioning has the radiator sub fan, too.



(1) Radiator
(2) Radiator sub fan & motor
(3) Radiator sub fan shroud
(4) Over flow hose
(5) Reservoir tank cap
(6) Reservoir tank
(7) Radiator main fan shroud
(8) Radiator main fan & motor

B: FUNCTION

1. WITHOUT A/C MODEL

The ON-OFF (and Hi-Low: Turbo model) control of the radiator fan is governed by the ECM or ECM/TCM which receives signals sent from the engine coolant temperature sensor.

Non-turbo model

Vehicle speed	Engine coolant temperature		
	Less than 95°C (Less than 203°F)	Between 95 and 99°C (Between 203 and 210°F)	More than 100°C (More than 212°F)
	Operation of radiator main fan	Operation of radiator main fan	Operation of radiator main fan
Less than 19 km/h (Less than 12 MPH)	OFF	ON	ON
Between 20 and 69 km/h (Between 12 and 43 MPH)	OFF	ON	ON
Between 70 and 89 km/h (Between 43 and 55 MPH)	OFF	OFF	ON
More than 90 km/h (More than 56 MPH)	OFF	OFF	ON

Turbo model

Vehicle speed	Engine coolant temperature		
	Less than 92°C (Less than 198°F)	Between 92 and 95°C (Between 198 and 203°F)	More than 96°C (More than 205°F)
	Operation of radiator main fan	Operation of radiator main fan	Operation of radiator main fan
Less than 19 km/h (Less than 12 MPH)	OFF	OFF	Low
Between 20 and 69 km/h (Between 12 and 43 MPH)	OFF	OFF	Hi
Between 70 and 105 km/h (Between 43 and 65 MPH)	OFF	OFF	Hi
More than 106 km/h (More than 66 MPH)	OFF	OFF	Hi

2. WITH A/C MODEL

On models which are equipped with an air conditioning system, the ECM or ECM/TCM receives signals sent from the engine coolant temperature sensor, vehicle speed sensor 2 and A/C switch. These signals simultaneously turn ON or OFF (and Hi or Low: Turbo model) the radiator main fan and radiator sub fan.

Non-turbo model

Vehicle speed	A/C compressor	Engine coolant temperature					
		Less than 95°C (Less than 203°F)		Between 95 and 99°C (Between 203 and 210°F)		More than 100°C (More than 212°F)	
		Operation of radiator fan		Operation of radiator fan		Operation of radiator fan	
		Main	Sub	Main	Sub	Main	Sub
Less than 19 km/h (Less than 12 MPH)	OFF	OFF	OFF	ON	OFF	ON	ON
	ON	ON	ON	ON	ON	ON	ON
Between 20 and 69 km/h (Between 12 and 43 MPH)	OFF	OFF	OFF	ON	OFF	ON	ON
	ON	ON	ON	ON	ON	ON	ON
Between 70 and 89 km/h (Between 43 and 55 MPH)	OFF	OFF	OFF	OFF	OFF	ON	ON
	ON	ON	OFF	ON	ON	ON	ON
More than 90 km/h (More than 56 MPH)	OFF	OFF	OFF	OFF	OFF	ON	ON
	ON	OFF	OFF	ON	OFF	ON	ON

Turbo model

Vehicle speed	A/C compressor	Engine coolant temperature					
		Less than 92°C (Less than 198°F)		Between 92 and 95°C (Between 198 and 203°F)		More than 96°C (More than 205°F)	
		Operation of radiator fan		Operation of radiator fan		Operation of radiator fan	
		Main	Sub	Main	Sub	Main	Sub
Less than 19 km/h (Less than 12 MPH)	OFF	OFF	OFF	OFF	OFF	Low	Low
	ON	Low	Low	Hi	Hi	Hi	Hi
Between 20 and 69 km/h (Between 12 and 43 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	Hi	Hi	Hi	Hi	Hi	Hi
Between 70 and 105 km/h (Between 43 and 65 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	Low	Low	Low	Low	Hi	Hi
More than 106 km/h (More than 66 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	OFF	OFF	Low	OFF	Hi	Hi

1. General

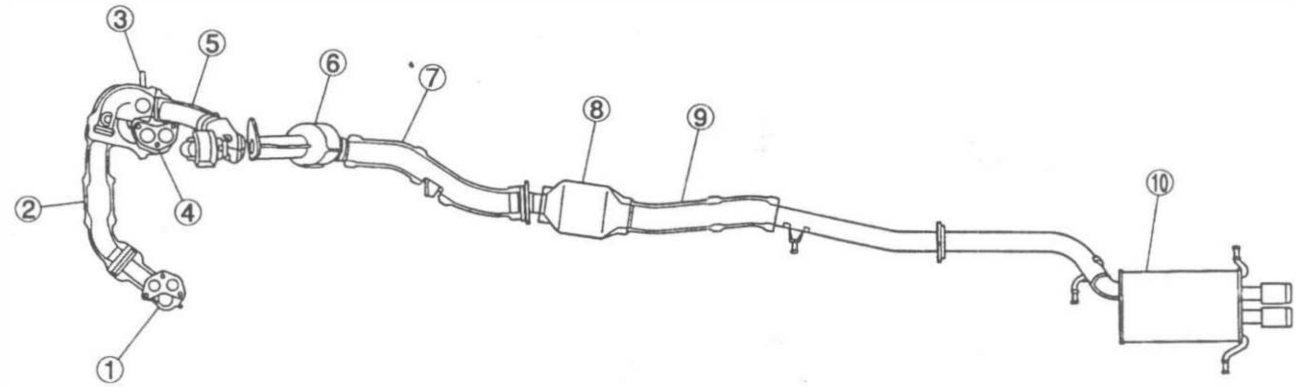
A: NON-TURBO MODEL

- The exhaust system consists of a front exhaust pipe, a front catalytic converter, a center exhaust pipe, a rear exhaust pipe and a muffler. The front catalytic converter is located immediately behind the front exhaust pipe, and the rear catalytic converter is incorporated in the center exhaust pipe.
- The exhaust system features an improved sound suppression design; the two branches of the front exhaust pipe join at a point almost equal in distance from the engine's exhaust ports and the rear exhaust pipe has a resonance chamber in addition to a muffler of 13 liters (793.3 cu in) capacity.

B: TURBO MODEL

- The exhaust system consists of a exhaust manifold LH and RH, a front joint pipe, a turbocharger joint pipe, a center exhaust pipe, a rear exhaust pipe and a muffler. The front catalytic converter is incorporated in the center exhaust pipe, and the rear catalytic converter is incorporated in the rear exhaust pipe.
- The exhaust system features an improved sound suppression design; the rear exhaust pipe has a resonance chamber in addition to a muffler of 14 liters (854.3 cu in) capacity.

B: TURBO MODEL



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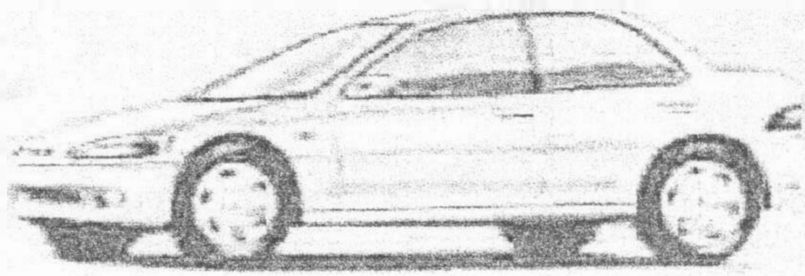
① Exhaust manifold LH
② Front joint pipe
③ Oxygen sensor
④ Exhaust manifold RH
⑤ Turbocharger joint pipe
⑥ Front catalytic converter
⑦ Center exhaust pipe
⑥ Rear catalytic converter
⑨ Rear exhaust pipe
⑩ Muffler

SERVICE MANUAL

SUBARU IMPREZA



FUEL INJECTION SYSTEM (TURBO MODEL) 2-7c

SERVICE MANUAL

- Diagnostics section

FUEL INJECTION SYSTEM [TURBO MODEL]

2-7c

Page

1. General

- The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.

With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

- Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
- The MFI system also has the following features:
  - Reduced emission of harmful exhaust gases.
  - Reduced in fuel consumption.
  - Increased engine output.
  - Superior acceleration and deceleration.
  - Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.
  - Suitable to turbocharged engine.

2. Air Line

A: GENERAL

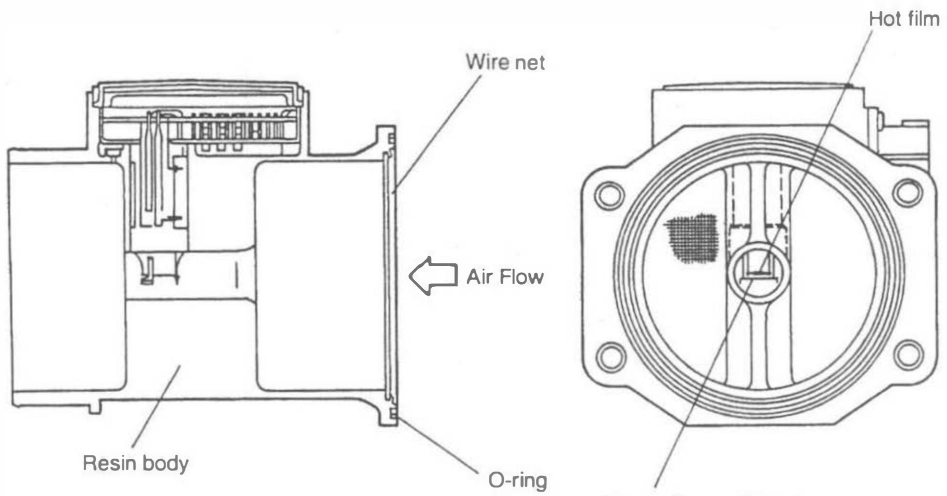
Air which is drawn in and filtered by the air cleaner is metered by the mass air flow sensor. Air is the supercharged by the turbocharger and cooled down by the intercooler, and sent to the throttle body. From the throttle body, the air is regulated by the open-close operation of the throttle valve and is delivered to the intake manifold. It is then distributed to the respective cylinders to mix with fuel injected by the fuel injectors. Thus, the air-fuel mixture is delivered into the cylinder. Part of the air branched at the upstream of the throttle body is sent to the idle air control solenoid valve which regulates engine idle speed.

B: MASS AIR FLOW SENSOR

- The MFI system employs a hot-film type mass air flow sensor.

These mass air flow sensors convert the amount of air taken into the engine into an electric signal by utilizing the heat transfer phenomenon between the incoming air and a heating resistor (hot film) located in the air intake.

- The features of these flow sensor types are as follows:
  - High-altitude compensation is made automatically.
  - Quick response.
  - These are no moving parts.
  - They are compact.



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C: THROTTLE BODY

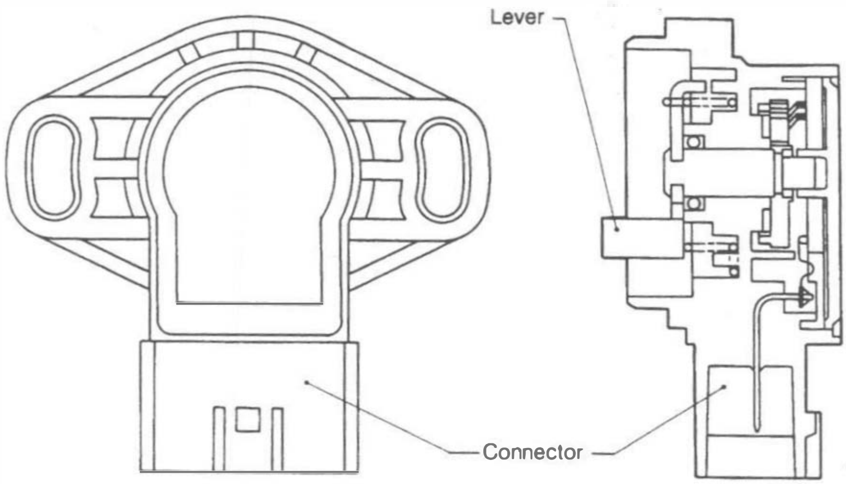
In response to the depressing stroke of the throttle pedal, the throttle body opens/closes its valve to regulate the air volume to be taken in the combustion chamber.

During idling, the throttle valve is almost fully closed and the air flow through the throttle body is less than that passing through the carburetor.

More than half of the air necessary for idling is supplied to the intake manifold via the idle air control solenoid valve.

D: THROTTLE POSITION SENSOR

- A throttle position sensor is provided with a potentiometer which is interlocked with the throttle valve shaft.
- This throttle position sensor sends the ECM a potentiometer output signal corresponding to the opening of the throttle valve. When the level of this signal exceeds a predetermined value, the ECM interprets it as complete closure of the throttle valve and makes a control most suitable for the engine operation with the throttle valve fully closed. For correcting error of this signal, the ECM is provided with a learning function.
- Thus, the ECM precisely controls the air-fuel ratio during acceleration and deceleration as well as engine idling.



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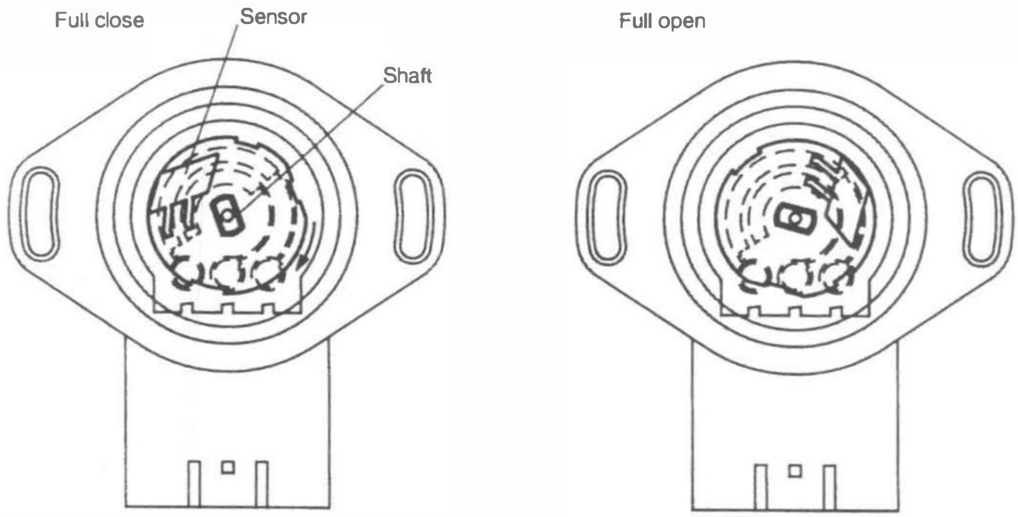

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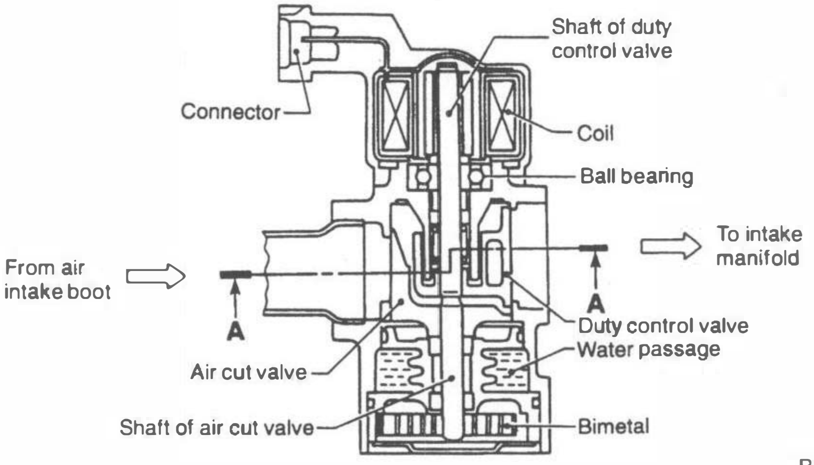
E: IDLE AIR CONTROL SOLENOID VALVE

- Idle air control solenoid valve consists of an air cut valve, duty control valve, intake air passage and a coolant passage.
- Air cut valve contains a bimetallic substance which responds to coolant temperature, and a duty control valve which is operated by a signal sent from ECM.
- When engine coolant temperature is low, air cut valve is fully opened by the action of the bimetallic substance so that the air flow required for low engine coolant temperatures is maintained.
- ECM controls duty control valve to bring the operating engine speed as close to preset idle speed as possible.



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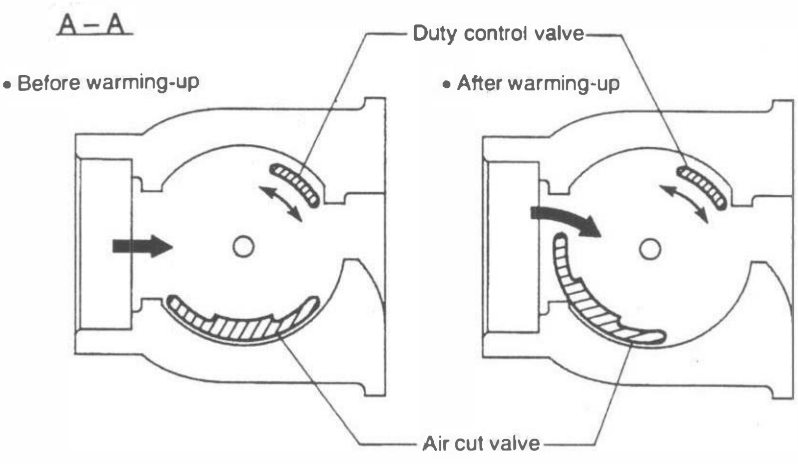

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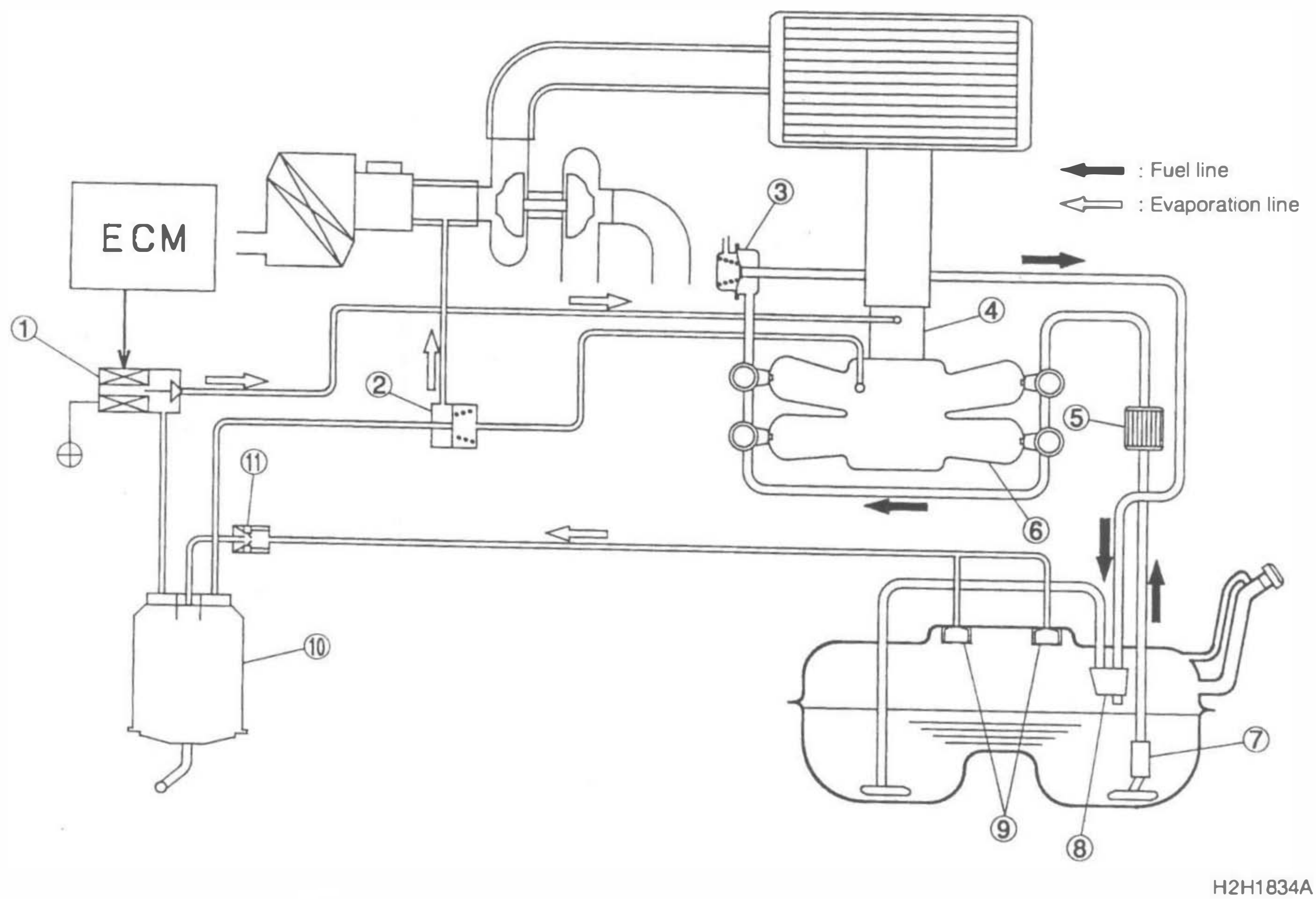
3. Fuel Line

A: GENERAL

- Fuel pressurized by the fuel pump built into the fuel tank is delivered to fuel injectors by way of the fuel pipe and fuel filter. Fuel is regulated to the optimum pressure level by the pressure regulator on the way to the injectors.
- From the injectors, fuel is injected into the intake manifold where it is mixed with intake air, and is then delivered to the respective cylinders.

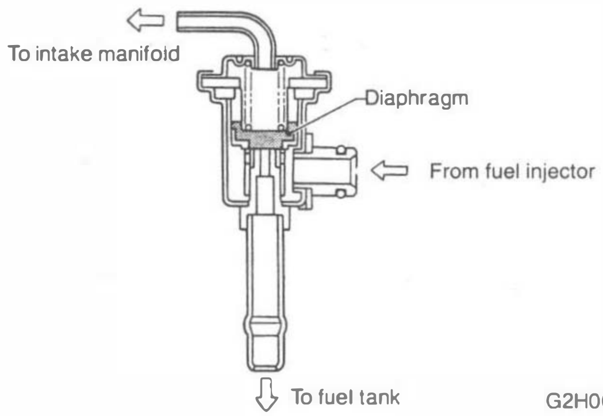
Fuel injection timing and the amount of fuel injected is regulated by the ECM.



① Purge control solenoid valve
② Auxiliary purge control valve
③ Pressure regulator
④ Throttle body
⑤ Fuel filter
⑥ Intake manifold
⑦ Fuel pump
⑧ Jetpump
⑨ Fuel cut valve
⑩ Canister
⑪ Two-way valve

B: PRESSURE REGULATOR

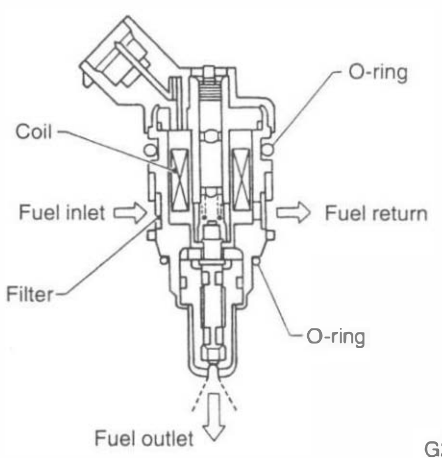
- The pressure regulator is divided into the fuel chamber and the spring chamber by the diaphragm as illustrated below. Fuel is fed to the fuel chamber through the fuel inlet connected with the injector. A difference in pressure between the fuel chamber and the spring chamber connected with the intake manifold causes the diaphragm to be pushed down, and fuel is fed back to the fuel tank through the return line.
- By returning fuel so as to balance the above pressure difference and the spring force, the fuel pressure is kept at a constant level 299.1 kPa (3.05 kg/cm^2, 43.4 psi) against the intake manifold pressure.



G2H0678

C: FUEL INJECTOR

- The MFI system employs a gallery type (side-feed type) fuel injector.
- The gallery type fuel injector is installed in the fuel pipe to allow cooling of the injector by the fuel.
- The features of this type of fuel injector are as follows:
  - High heat resistance
  - Low driving noise
  - Easy to service
  - Small size
- The fuel injector injects fuel according to the valve open signal received from the ECM.
- The nozzle is attached on the top of the fuel injector. The ball valve is lifted by the solenoid coil through the plunger on arrival of the valve open signal.
- Since the injection opening, the lifted level of valve and the regulator-controlled fuel pressure are kept constant, the amount of fuel to be injected can be controlled only by the valve open signal from the ECM.

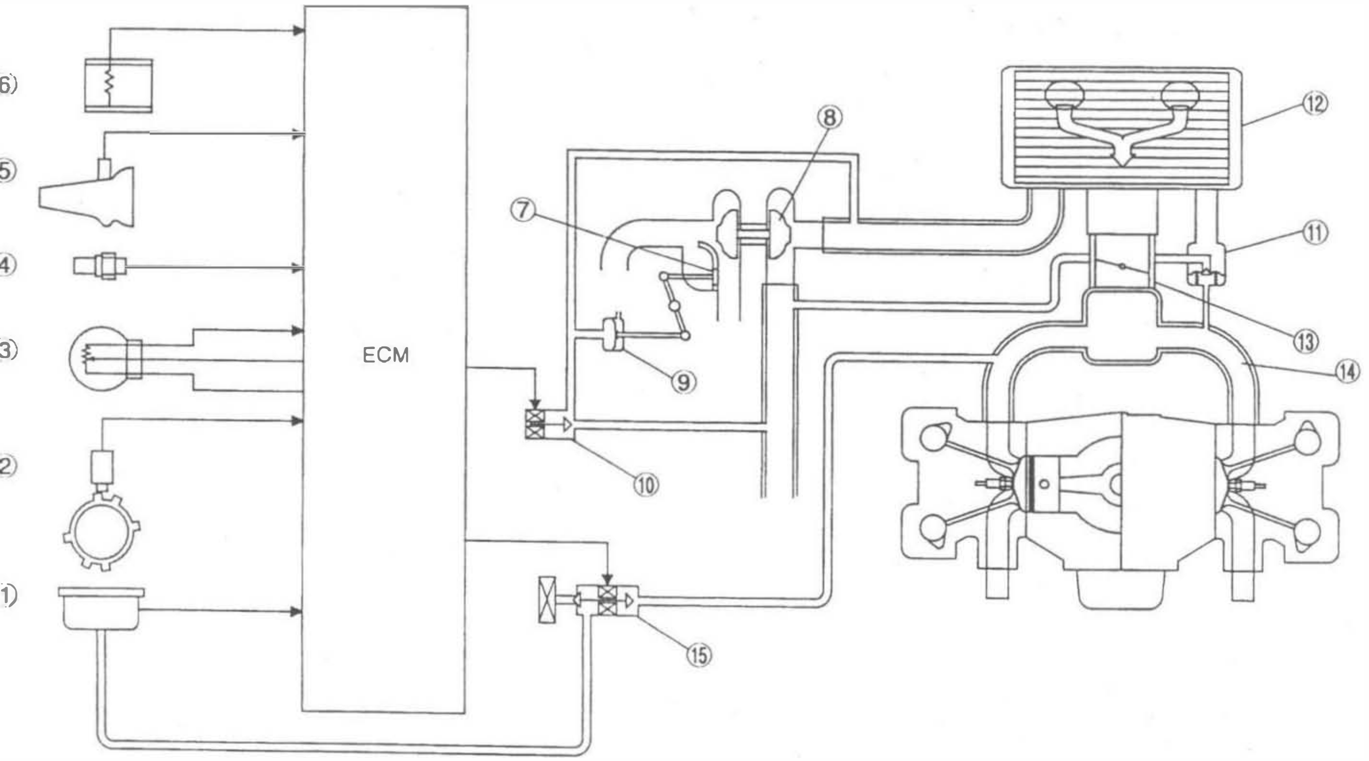


G2H0679

4. Turbocharger System

A: GENERAL

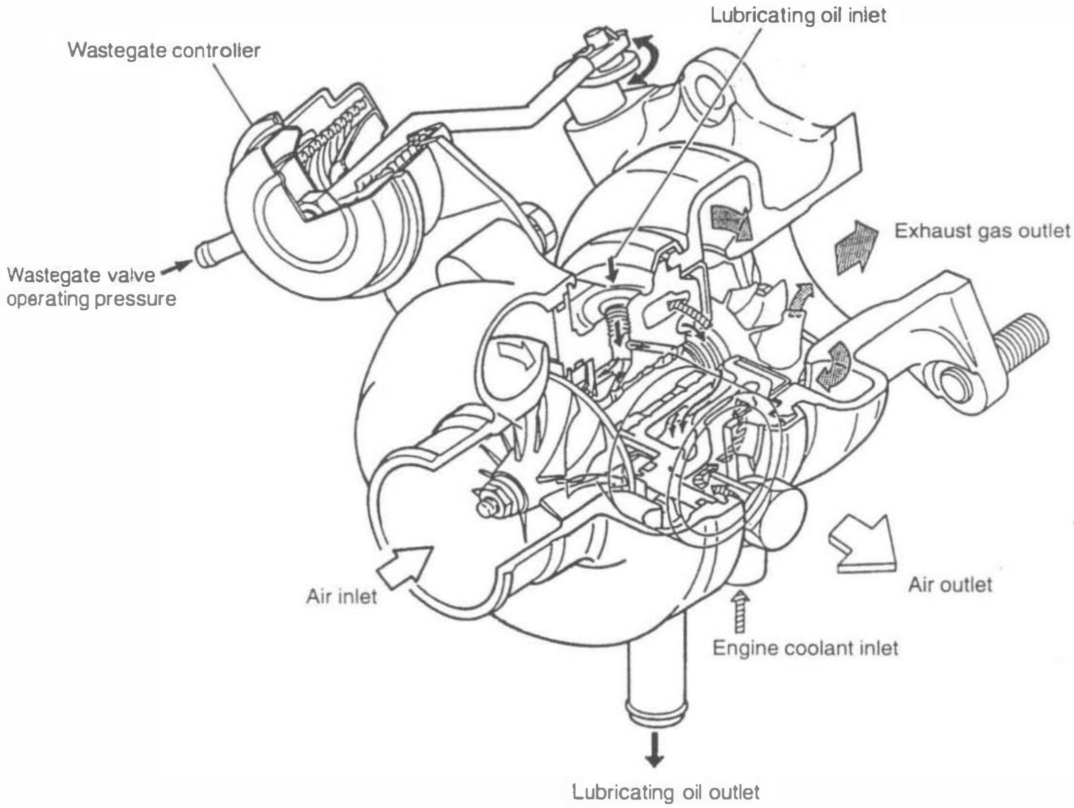
- This turbocharger system consists of a water-cooled turbocharger, air-cooled intercooler, wastegate control solenoid valve, pressure sources switching solenoid valve, etc.
- The outlet side turbine, rotated by the energy of exhaust gas it receives, rotates the inlet side turbine. As a result, the intake air is compressed before it is delivered to the intake manifold.
- The intake air, heated when passed through the turbocharger unit, is cooled as it passes through the intercooler.
- This turbocharger system controls supercharging pressure on the basis of the difference from the atmospheric pressure. Even at a high altitude, therefore, the system offers stable performance without being affected by variations in atmospheric pressure.



(1) Pressure sensor
(2) Crankshaft position sensor
(3) Throttle position sensor
(4) Engine coolant temperature sensor
(5) Vehicle speed sensor 2
(6) Mass air flow sensor
(7) Wastegate valve
(8) Turbocharger unit
(9) Wastegate controller
(10) Wastegate control solenoid valve
(11) Air by-pass valve
(12) Intercooler
(13) Throttle body
(14) Intake manifold
(15) Pressure sources switching solenoid valve

B: TURBOCHARGER UNIT

The turbocharger is water-cooled, and utilizes a wastegate valve to normalize supercharged pressure. The turbine is constructed of a lightweight, thin walled, and heat-resistant casting. The compressor is a thin wall aluminum alloy casting. The bearing section uses a full-floating metal system.

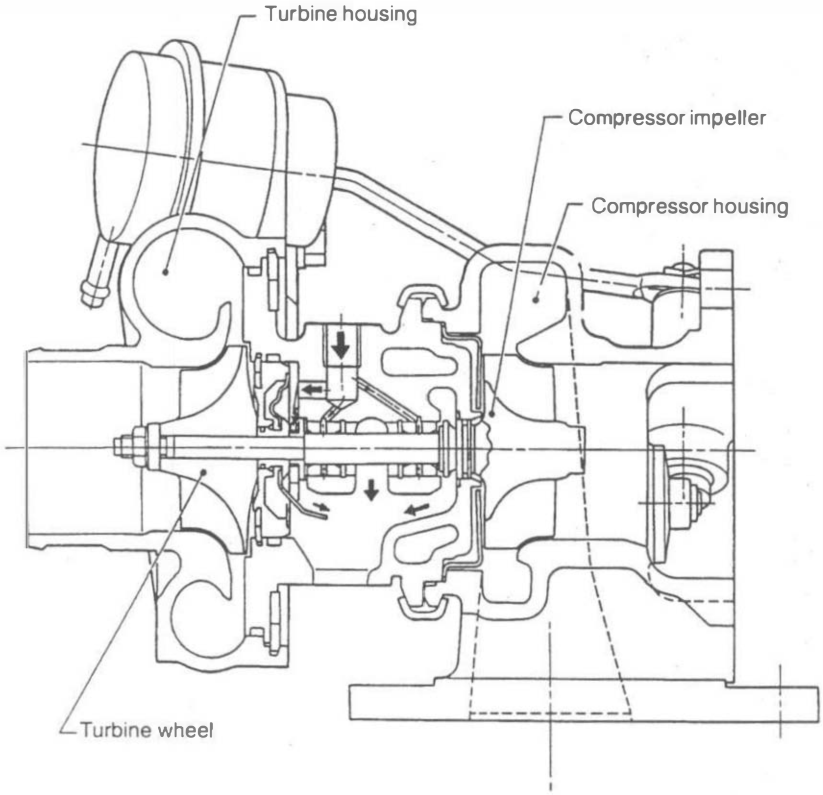


H2H1864A

C: LUBRICATION OF TURBOCHARGER

The turbocharger is lubricated by the engine oil branched out from the oil pump. Since the turbocharger turbine and the compressor shaft reach a maximum of several hundred thousand revolutions per minute, the full-floating type bearings are used to form desirable lubrication films on their inside and outside during running.

Further the oil supplied to the turbocharger also plays an important role of cooling the heat from exhaust gas in the turbine not to propagate to the bearings.



H2H1865A

D: COOLING OF TURBOCHARGER

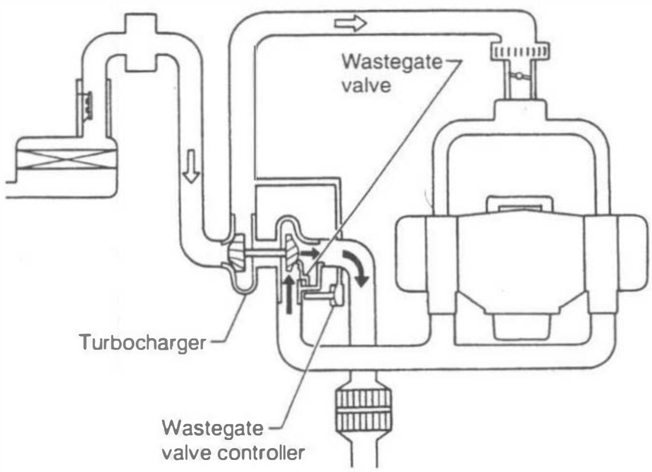
The turbocharger unit is water cooled for higher reliability and durability. The engine coolant from the coolant drain hose under the engine cylinder head is led to the coolant passage, through a pipe, provided in the turbocharger bearing housing. After cooling the bearing housing, the engine coolant is led into the coolant filler tank through a pipe.

E: REGULATION OF SUPERCHARGING PRESSURE

1. BASIC FUNCTION OF THE WASTEGATE VALVE

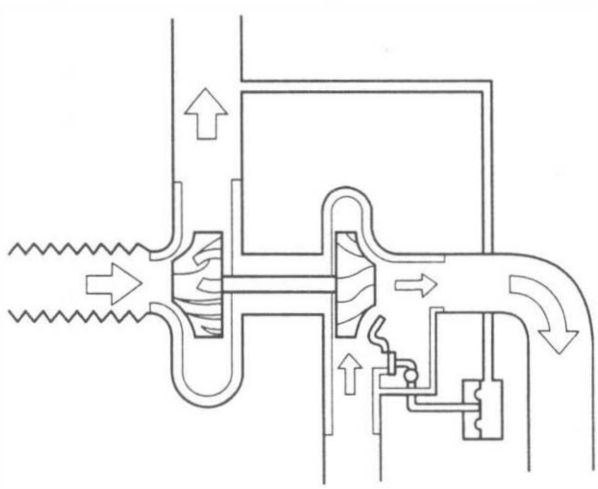
As the engine speed increases with the opening of the throttle valve, the amount of exhaust gas increases. This leads to increase in the rotational speed of turbine (approx. 20,000 to 150,000 rpm), the supercharging pressure and the output.

However, excessive supercharging pressure may cause occurrence of the knocking and heavier thermal load on such a part as piston. In the worst case, the engine may be damaged or broken. To prevent this, the wastegate valve and its controller are equipped. By sensing the supercharging pressure, the wastegate valve restricts it below a predetermined level.



G2H0684

While the supercharging pressure is lower than the predetermined level, the wastegate valve is closed so that all the exhaust gas is carried through the turbine.



G2H0685

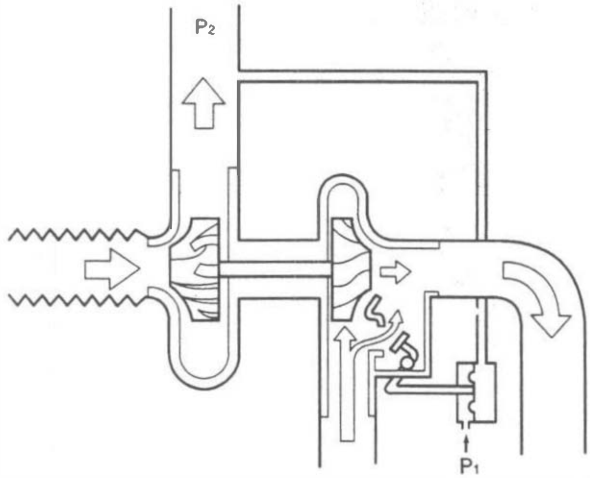
When it reaches the predetermined level, the wastegate controller lets the supercharging pressure to press the diaphragm, causing the linked wastegate valve to open. With the wastegate-valve opened, a part of the exhaust gas is allowed to flow into the exhaust gas pipe by bypassing the turbine.

This decreases the turbine rotating energy to keep the supercharging pressure constant.

It means $P_2 - P_1$ = constant

P_1: Atmospheric pressure

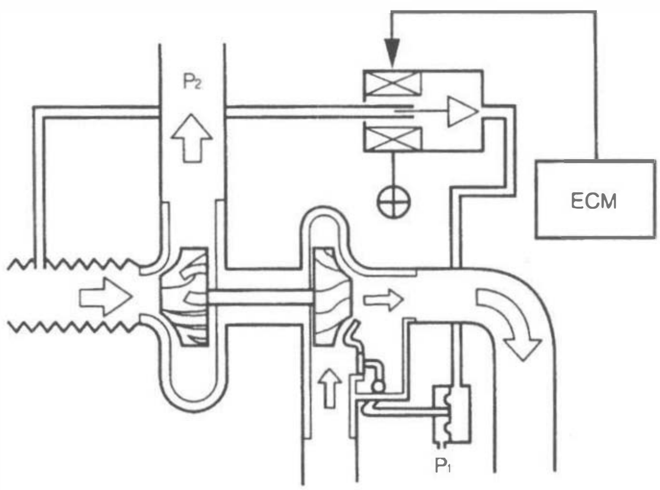
P_2: Supercharging pressure



G2H0686

2. CONCEPT OF THE WASTEGATE VALVE CONTROL

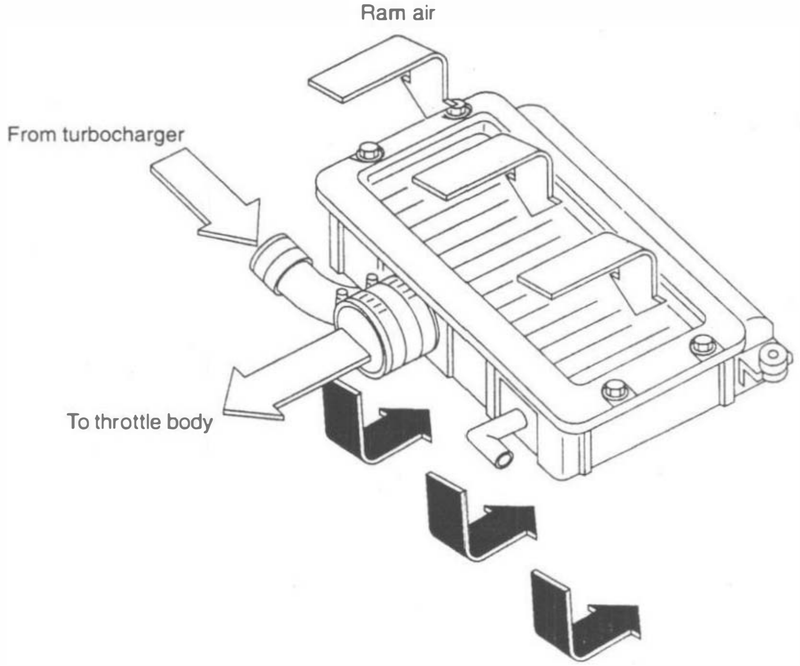
The higher the altitude, the lower the atmospheric pressure (P_1) and supercharging pressure (P_2). The duty solenoid valve acts as a control to maintain maximum supercharging pressure (P_2) under absolute pressure.



H2H1866A

F: INTERCOOLER

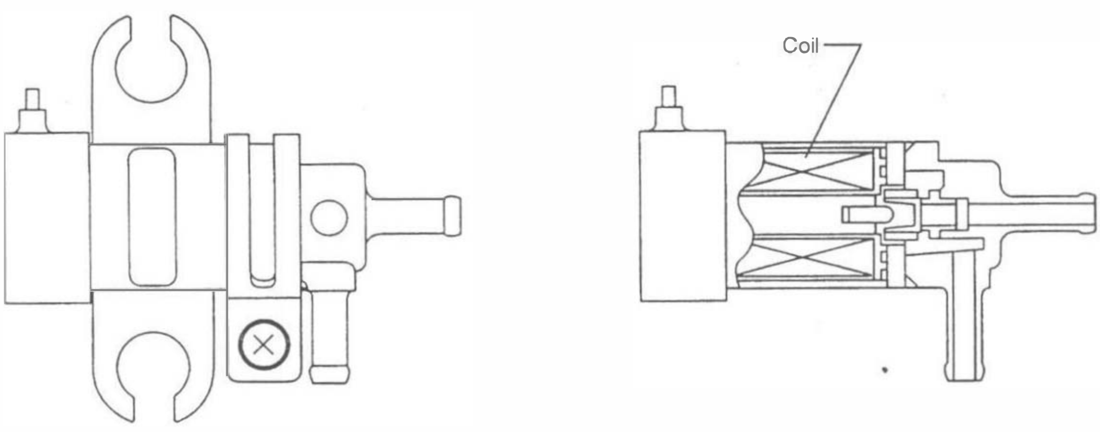
- Since the intake air passed through the turbocharger unit is heated to a very high temperature, the air itself is expanded, resulting in a lower engine charging efficiency. To lower the temperature of the intake air, therefore, the intercooler is provided just before the throttle body.
- The intercooler is an air cooled type. The air delivered from the air duct provided at the engine hood flows through the core and cools the intake air passing through the intercooler.



H2H1867A

G: WASTEGATE CONTROL SOLENOID VALVE

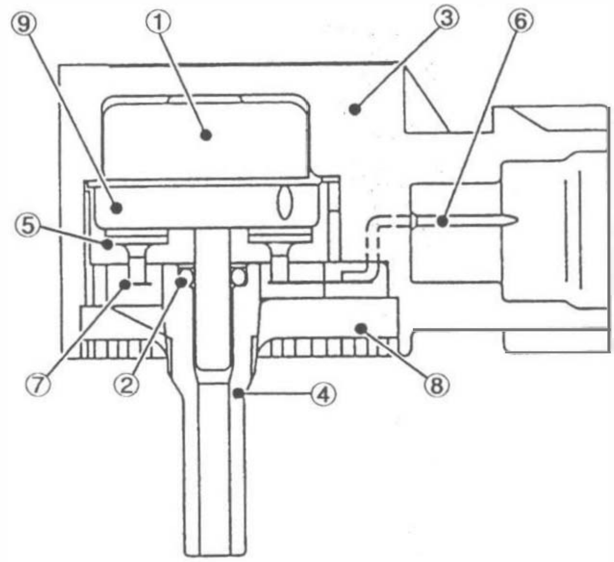
The wastegate control solenoid valve, coupled with the wastegate controller, switches the intake air pressure to be delivered to the wastegate controller in response to a signal from ECM. When the solenoid valve is closed, the intake air pressure upstream of the turbocharger unit is delivered to the wastegate controller, When the solenoid valve is opened, the intake air pressure downstream of the turbocharger unit (supercharged air pressure) is delivered to the wastegate controller.



H2H1868A

H: PRESSURE SENSOR

The pressure sensor alternately receives the intake air pressure in the collector chamber and the atmospheric pressure, converts the pressure values into signals, and sends the signals to ECM. Switchover between the intake air pressure and atmospheric pressure is accomplished by the pressure exchange solenoid valve.

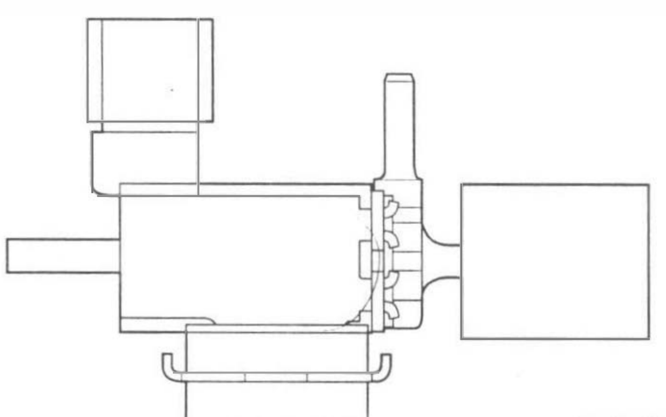


H2H1869A

① Sensor unit
② O-ring
③ Case
④ Pipe
⑤ Through capacity
⑥ Terminal
⑦ Inner lead
⑥ Resin
⑨ Metal lid

I: PRESSURE SOURCES SWITCHING SOLENOID VALVE

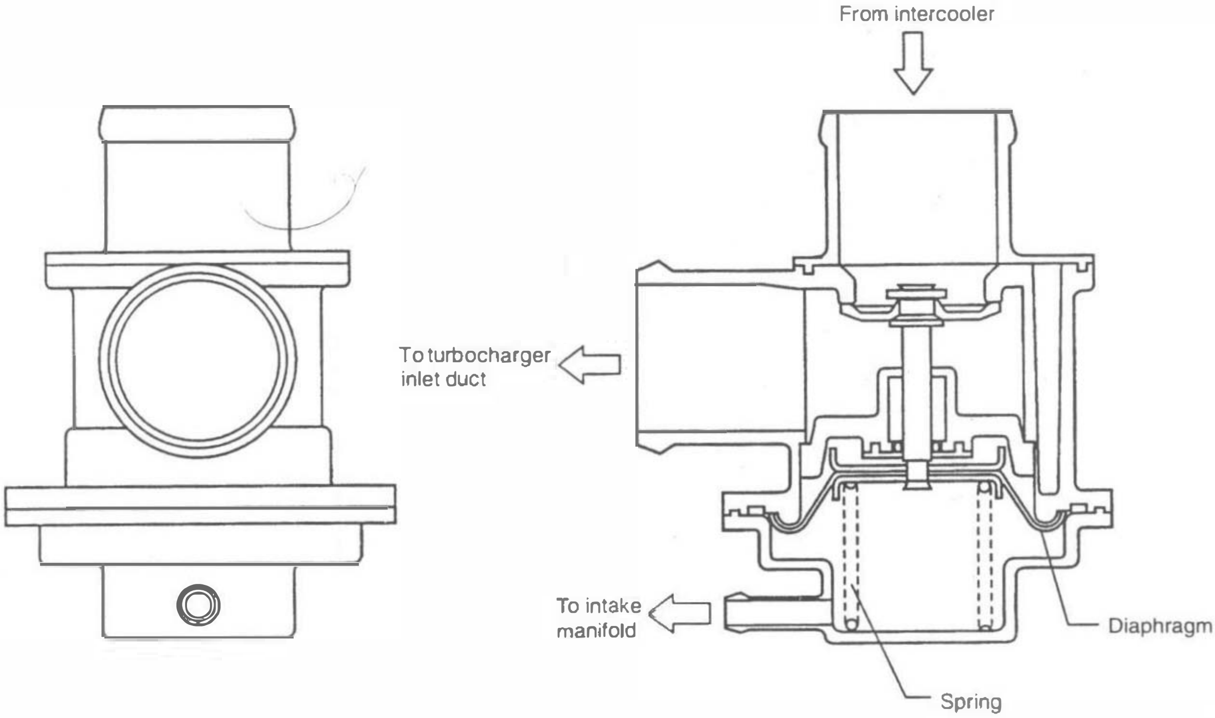
Located at an intermediate point of the line between the collector chamber and pressure sensor, the pressure sources switching solenoid valve switches between the intake air pressure and atmospheric pressure from which the pressure sensor produces signals.



G2H0691

J: AIR BY-PASS VALVE

When a throttle valve is suddenly closed, low air suction noise may occur due to a sudden rise of the air pressure in the passage between the turbocharger and throttle body. To prevent this, an air by-pass valve and air passage are provided. The air by-pass valve, actuated by the vacuum created by a sudden closure of the throttle valve, allows the suction air to by-pass the turbocharger and pass directly upstream, thus lowering the pressure in the air passage.

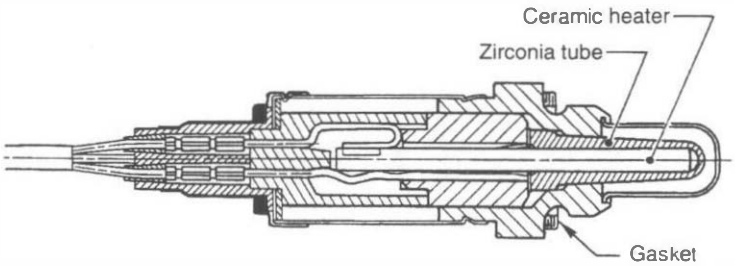


H2H1870A

5. Sensor and Switch

A: OXYGEN SENSOR

- The oxygen sensor is used to sense oxygen concentration in the exhaust gas. If the fuel ratio is leaner than the stoichiometric ratio in the mixture (i.e. excessive amount of air), the exhaust gas contains more oxygen. To the contrary, if the fuel ratio is richer than the stoichiometric ratio, the exhaust gas contains hardly any oxygen.
- Therefore, examination of the oxygen concentration in exhaust gas makes it possible to show whether the air/fuel ratio is leaner or richer than the stoichiometric ratio.
- The oxygen sensor has a zirconia tube (ceramic) which generates voltage if there is a difference in oxygen concentration between the inside and outside of the tube. Platinum is coated on the inside and outside of the zirconia tube for the purpose of catalysis and electrode provision. The hexagon screw on the outside is grounded to the exhaust pipe, and the inside is connected to the ECM through the harness.
- A ceramic heater is employed to improve performance at low temperature.

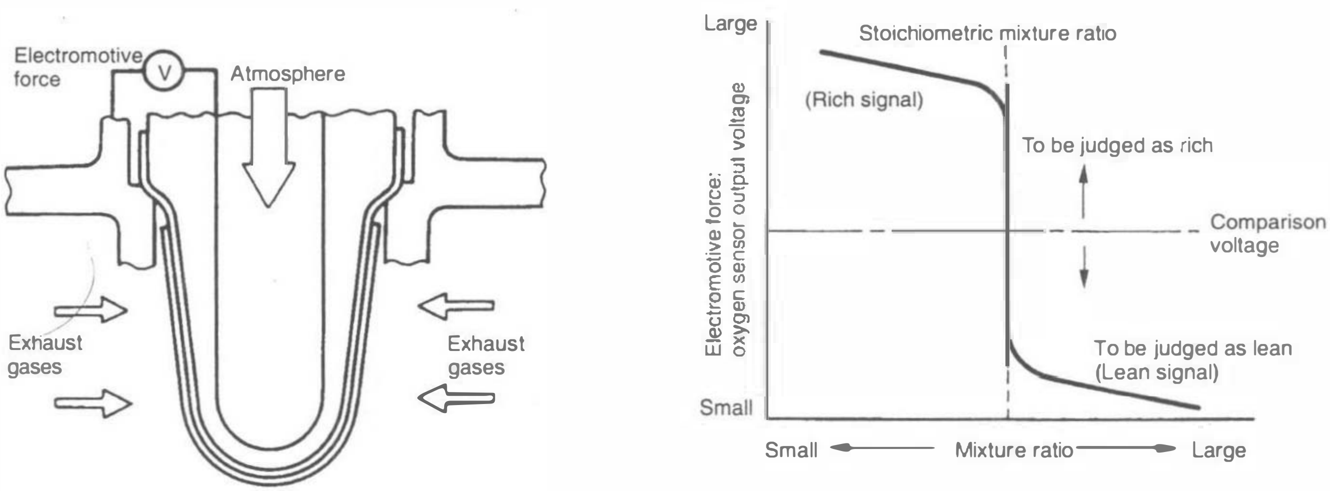


G2H0037

• When rich air-fuel mixture is burnt in the cylinder, the oxygen in the exhaust gases reacts almost completely through the catalytic action of the platinum coating on the surface of the zirconia tube. This results is a very large difference in the oxygen concentration between the inside and outside, and the electromotive force generated is large.

• When a lean air-fuel mixture is burnt in the cylinder, oxygen remains in the exhaust gases even after the catalytic action, and this results in a small difference in the oxygen concentration. The electromotive force is very small.

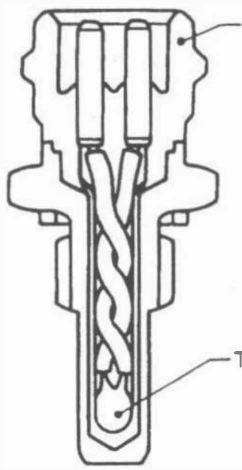
• The difference in oxygen concentration changes greatly in the vicinity of the optimum air-fuel ratio, and hence the change in the electromotive force is also large. By inputting this information into the MFI control unit, the air-fuel ratio of the supplied mixture can be determined easily. The oxygen sensor does not generate much electromotive force when the temperature is low. The characteristics of the electromotive force stabilize at temperature of approximately 300 to 400°C (572 to 752°F).

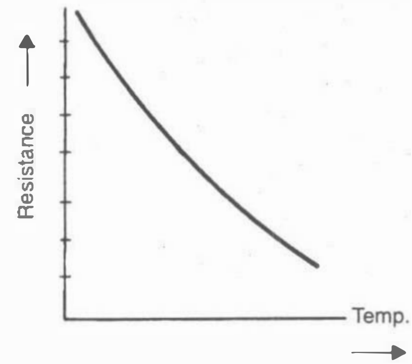


G2H0038

B: ENGINE COOLANT TEMPERATURE SENSOR

The engine coolant temperature sensor is located on the engine coolant pipe which is made of aluminum alloy. Its thermistor changes resistance with respect to temperature. A engine coolant temperature signal converted into resistance is transmitted to the ECM to control the amount of fuel injection, ignition timing, etc.

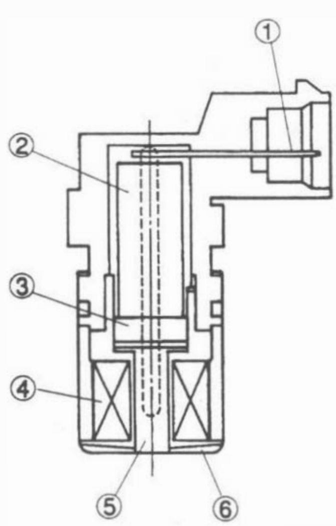




B2H0406A

C: CRANKSHAFT POSITION SENSOR

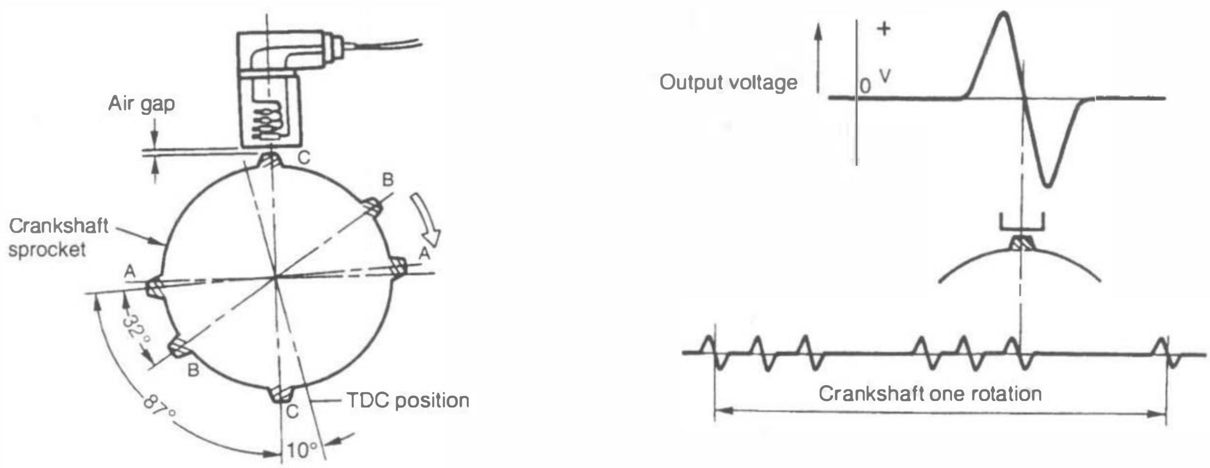
- The crankshaft position sensor is installed on the oil pump, located in the front center portion of the cylinder block, to detect the crankshaft position. It is designed so that the ECM accurately reads the number of pulses which occur when protrusions provided at the perimeter of the crankshaft sprocket (rotating together with the crankshaft) cross the crankshaft position sensor.
- The crankshaft position sensor is a molded type which consists of a magnet, core, coil, terminals, etc.



B2H0407A

① Terminal
② Yoke core
③ Magnet
④ Coil
⑥ Core
⑥ Cover

• The crankshaft sprocket is provided with six protrusions. Crankshaft rotation causes these protrusions to cross the crankshaft position sensor so that magnetic fluxes in the coil change with the change in air gap between the sensor pickup and the sprocket. The change in air gap induces an electromotive force which is transmitted to the ECM.

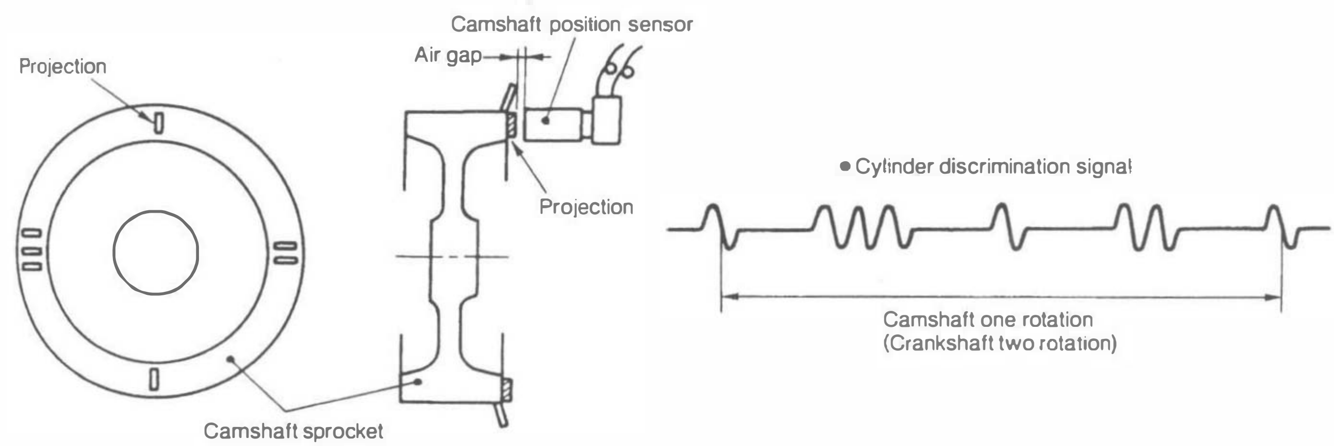


G2H0041

D: CAMSHAFT POSITION SENSOR

• The camshaft position sensor is located on the left-hand camshaft support to detect the combustion cylinder at any one moment.

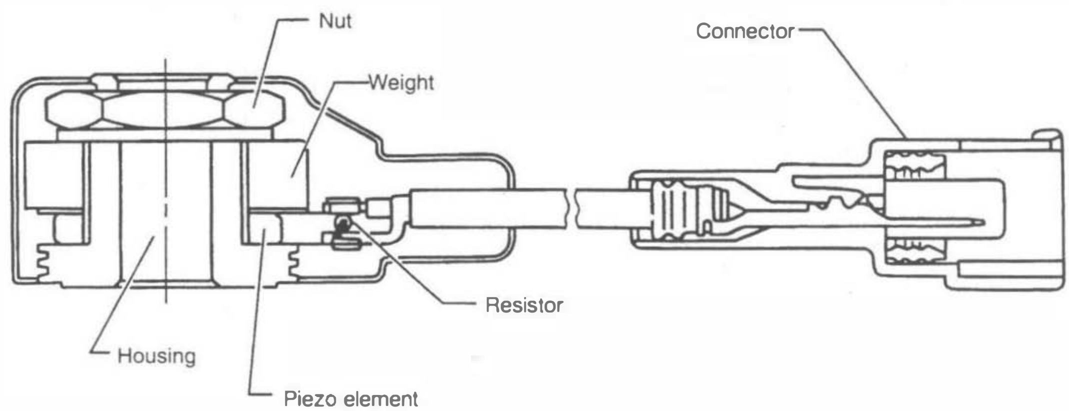
• It is designed so that the ECM accurately reads the number of pulses which occur when protrusions provided on the back of the LH camshaft-drive sprocket cross the sensor.
Internal construction and the basic operating principle of the camshaft position sensor are similar to those of the crankshaft position sensor. A total of seven protrusions (one each at two locations, two at one location and three at one location) are arranged in four equal parts of the sprocket, as shown below.



G2H0693

E: KNOCK SENSOR

- The knock sensor is installed on the cylinder block, and senses knocking signals.
- This knock sensor is a piezo-electric type which converts knocking vibrations into electric signals.
- It consists of a piezo-electric element, weight, and case. If knocking occurs in the engine, the weight in the case moves causing the piezo-electric element to generate a voltage.



G2H0681

F: VEHICLE SPEED SENSOR 2

- Vehicle speed sensor 2 is installed onto transmission case, the signal emitted from it is sent to the ECM and speedometer.
- The inner shaft in vehicle speed sensor 2 is connected to speedometer shaft in transmission with plate. The pick-up signal is emitted by rotation of the shaft.

6. Control System

A: GENERAL

The ECM (Engine Control Module) receives signals sent from various sensors and switches to judge the engine operating condition and emits output signals to provide the optimum control and/or functioning of various systems.

Major items governed by the ECM are as follow:

- Fuel injection control
- Ignition system control
- Idle air control
- Wastegate control
- Canister purge control
- Radiator fan control
- Fuel pump control
- Air conditioner cut control
- On-board diagnosis function
- Fail-safe function

B: INPUT AND OUTPUT SIGNALS

	Unit	Function
Input signal	Mass air flow sensor	Detects the amount of intake air.
	Throttle position sensor	Detects the throttle position.
	Oxygen sensor	Detects the density of oxygen in exhaust gases.
	Crankshaft position sensor	Detects engine speed and crankshaft position.
	Camshaft position sensor	Detects relative cylinder position.
	Engine coolant temperature sensor	Detects the coolant temperature.
	Knock sensor	Detects engine knocking.
	Vehicle speed sensor 2	Detects vehicle speed.
	Ignition switch	Detects ignition switch operation.
	Starter switch	Detects the condition of engine cranking.
	A/C switch	Detects the ON-OFF operation of the A/C switch.
	Neutral switch	Detects gear shift in neutral position.
	Pressure sensor	Detects atmospheric pressure and intake manifold pressure.

	Unit	Function
Output signal	Fuel Injector	Inject fuel.
	Ignition signal	Turns primary ignition current ON or OFF.
	Fuel pump relay	Turns the fuel pump relay ON or OFF.
	A/C control relay	Turns A/C control relay ON or OFF.
	Radiator fan control relay	Turns radiator fan control relay ON or OFF.
	Idle air control solenoid valve	Adjusts the amount of idle air flowing through the throttle valve.
	Malfunction indicator lamp	Indicates trouble.
	Purge control solenoid valve	Controls the amount of canister purge through the throttle body.
	Pressure sources switching solenoid valve	Switches pressure detection line between atmospheric pressure and intake manifold pressure.
	Wastegate control solenoid valve	Controls the supercharging pressure.

C: FUEL INJECTION CONTROL

- The ECM receives signals emitted from various sensors to control the amount of fuel injected and the fuel injection timing. Sequential fuel injection control is utilized over the entire engine operating range except during standing starts.
- The amount of fuel injected by the injector valve is dependent upon the length of time it remains open. The optimum fuel injection timing is determined by transmitting a signal to the injector from the ECM according to varying engine operations. Feedback control is also accomplished by means of a learning control. As a result, the fuel injection control system is highly responsive and accurate in design and structure.
- The sequential fuel injection system is designed so that fuel is injected at a specific time to provide maximum air intake efficiency for each cylinder. In other words, fuel injection is completed just before the intake valve begins to open.

1. FUEL INJECTION CHARACTERISTICS

Fuel injection timing is basically expressed as indicated below:

1) During engine starts:
   Duration of fuel injection = Duration of fuel injection during engine starts
2) During normal operation:
   Basic duration of fuel injection x correction factor + voltage correction time

- Basic duration of fuel injection ..... The basic length of time fuel is injected. This is determined by two factors — the amount of intake air detected by the mass air flow sensor and the engine speed (rpm) monitored by the crankshaft position sensor.
- Duration of fuel injection during engine starts ..... Determined according to the engine coolant temperature detected by a signal emitted from the engine coolant temperature sensor to improve starting ability.
- Voltage correction time ..... Compensates for the fuel injector's time lag affected by the battery voltage.

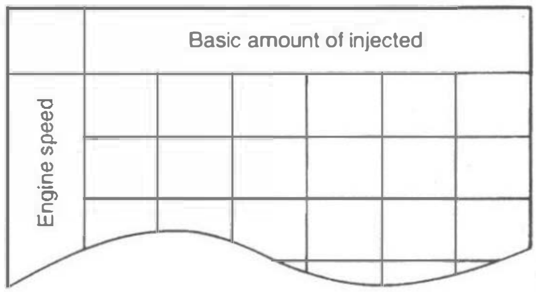
2. CORRECTION COEFFICIENTS

Correction coefficients are used to correct the basic duration of fuel injection so that the air-fuel ratio meets the requirements of varying engine operations.

These correction coefficients are classified as follows:

1) Air-fuel ratio coefficient:

Allotted to provide the optimum air-fuel ratio in relation to engine speed and the basic amount of fuel injected.

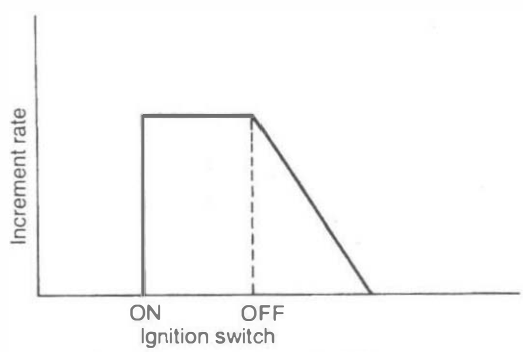


Air-fuel ratio characteristic

G2H0044

2) Start increment coefficient:

Increases the amount of fuel injected only when cranking the engine, which improves starting ability.

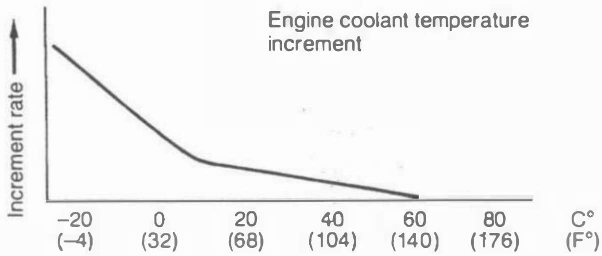


Start increment characteristic

G2H0045

3) Engine coolant temperature increment coefficient:

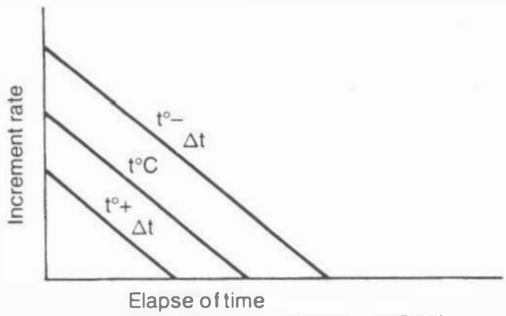
Used to increase the amount of fuel injected in relation to a signal emitted from the engine coolant temperature sensor for easier starting of a cold engine. The lower the engine coolant temperature, the greater the increment rate.



Engine coolant temperature increment characteristic
G2H0046

4) After-start increment coefficient:

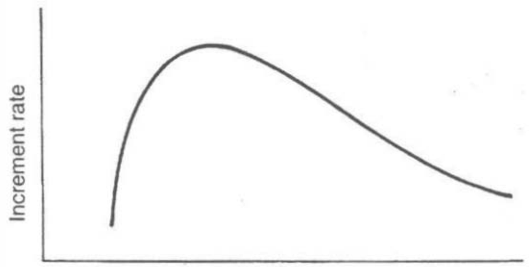
Increases the amount of fuel injected for a certain period of time immediately after the engine starts to stabilize engine operation.



After-start increment characteristic G2H0047

5) Full increment coefficient:

Increases the amount of fuel injected by a signal emitted from the throttle position sensor in relation to 'a signal emitted from the mass air flow sensor.

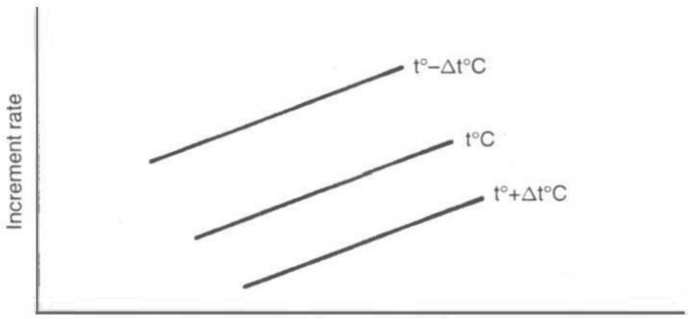


Full increment characteristic

G2H0048

6) Acceleration increment coefficient:

Compensates for time lags of air flow measurement and/or fuel injection during acceleration to provide quick response.

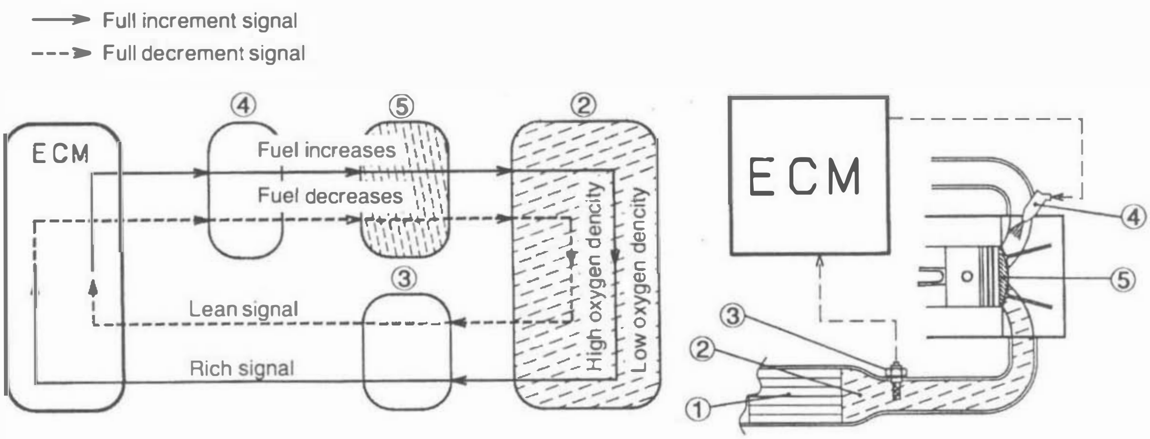


Acceleration increment characteristic

G2H0049

3. AIR-FUEL RATIO FEEDBACK COEFFICIENT "ALPHA"

This feedback coefficient utilizes the oxygen sensor's electromotive force (voltage) as a signal to be entered into the ECM. When low voltage is entered, the ECM judges it as a lean mixture, and when high voltage is entered, it is judged as a rich mixture. In other words, when the air-fuel ratio is richer than the stoichiometric mixture ratio, the amount of fuel injected is decreased. When it is leaner, the amount of fuel injected is increased. In this way, the air-fuel ratio is compensated so that it comes as close to the stoichiometric mixture ratio as possible on which the three-way catalyst acts most effectively. (CO, HC and NOx are also reduced when the air-fuel ratio is close to stoichiometric mixture ratio.)



① Front catalyst
② Exhaust gas
③ Oxygen sensor
④ Fuel injector
⑤ Combustion chamber

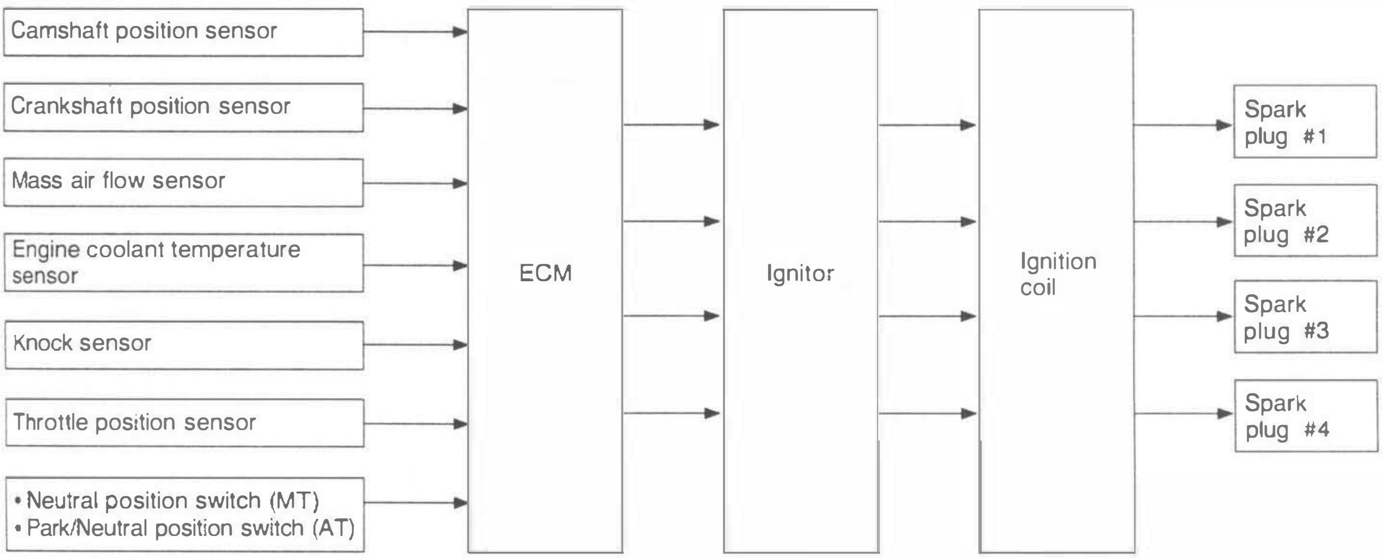
G2H0050

4. LEARNING CONTROL SYSTEM

- In a conventional air-fuel feedback control system, the basic amount of fuel injected (according to engine speed and various loads) is stored in the memory. After the ECM receives a signal emitted from the oxygen sensor, the basic amount of fuel injected is corrected so that it is close to the stoichiometric mixture ratio. This means that the greater the air-fuel ratio is corrected, the lesser the control accuracy.
- In SUBARU engines, however, an air-fuel ratio learning control system constantly memorizes the amount of correction required in relation to the basic amount of fuel to be injected (the basic amount of fuel injected is determined after several cycles of fuel injection), so that the correction affected by feedback control is minimized. Thus, quick response and accurate control of variations in air-fuel ratio, sensors' and actuators' characteristics during operation, as well as in the air-fuel ratio with the time of engine operation, are achieved. In addition, accurate control contributes much to stability of exhaust gases and driving performance.

D: IGNITION SYSTEM CONTROL

- The ECM receives signals emitted from the mass air flow sensor, engine coolant temperature sensor, crankshaft position sensor, camshaft position sensor, etc., to judge the operating condition of the engine. It then selects the optimum ignition timing stored in the memory and immediately transmits a primary current OFF signal to the ignitor to control the ignition timing.
- This system control type features a quick-to-response learning control method by which data stored in the ECM memory is processed in comparison with information emitted from various sensors and switches.
- Thus, the ECM constantly provides the optimum ignition timing in relation to output, fuel consumption, exhaust gas, etc., according to various engine operating conditions, etc.

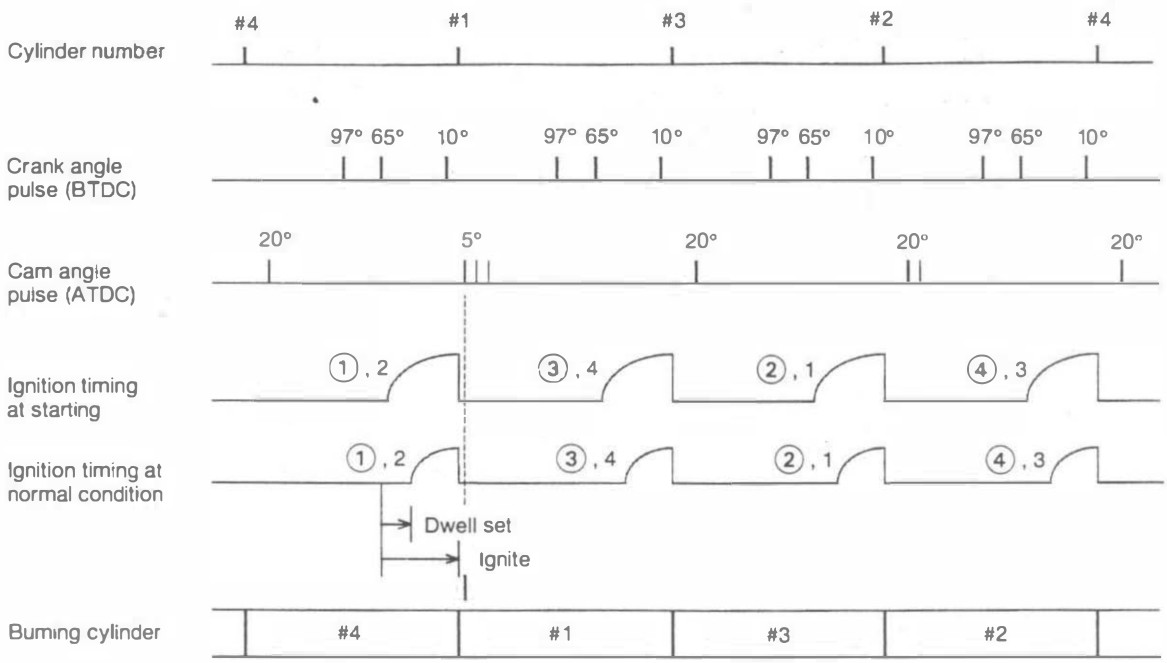


- Ignition control under normal engine conditions

Between the 97° signal and the 65° signal, the ECM measures the engine speed, and by using this data it decides the dwell set timing and ignition timing according to the engine condition.

- Ignition control under starting conditions

Engine speed fluctuate at the starting condition, so the ECM cannot control the ignition timing. When such a condition exists, ignition timing is fixed at 10° BTDC by using the 10° signal.


Cylinder number
#4
#1
#3
#2
#4
Crank angle pulse (BTDC)
97° 65° 10°
97° 65° 10°
97° 65° 10°
97° 65° 10°
Cam angle pulse (ATDC)
20°
5°
20°
20°
20°
Ignition timing at starting
1, 2
3, 4
2, 1
4, 3
Ignition timing at normal condition
1, 2
3, 4
2, 1
4, 3
Dwell set
Ignite
Burning cylinder
#4
#1
#3
#2

G2H0051

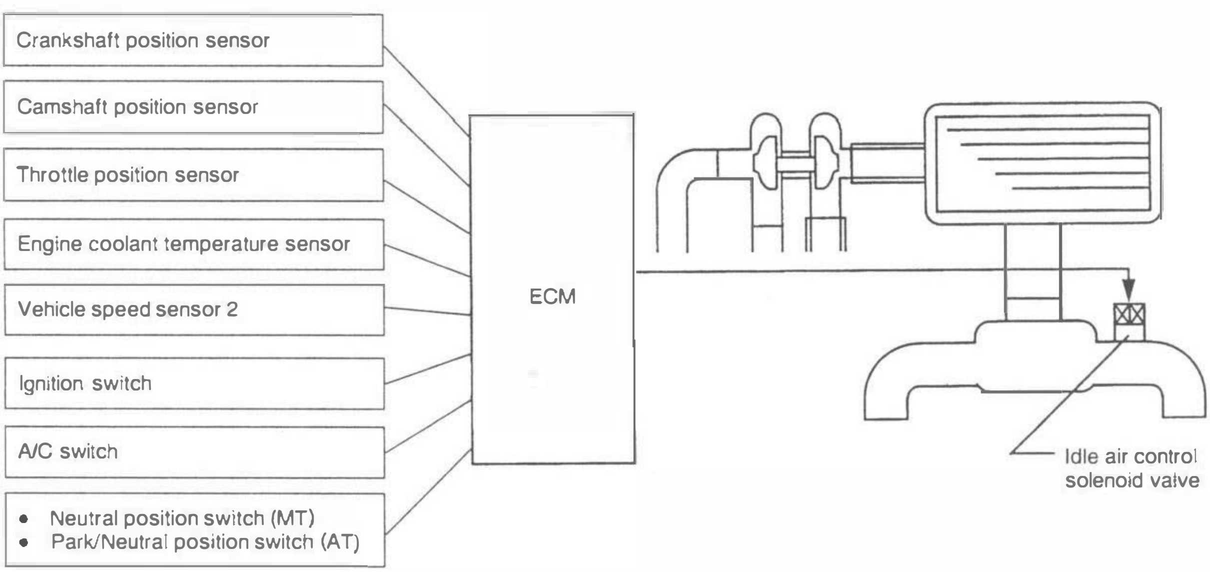
E: IDLE AIR CONTROL

- The ECM activates the idle air control solenoid valve in advance to control the amount of by-pass air flowing through the throttle valve in relation to signals emitted from the crankshaft position sensor, camshaft position sensor, engine coolant temperature sensor and A/C switch, so that the proper idle speed specified for each engine load is achieved.
- The idle air control solenoid valve utilizes a duty solenoid design so that the amount of valve "lift" is determined by a certain operating frequency. For this reason, the by-pass air flow is regulated by controlling the duty ratio. The relationship between the duty ratio, valve lift and by-pass air flow is as follows:

Duty ratio (high) → Increases valve lift and by-pass air flow.
Bypass air control features the following advantages:

1. Compensation for engine speed under A/C (air conditioning) system and electrical loads.
2. Increase in idle speed during early stage of warm up period.
3. A dashpot function during the time the throttle valve is quickly closed.
4. Prevention of engine speed variations over time.

Diagram



H2H1871A

F: CANISTER PURGE CONTROL

- The ECM receives signals emitted from the engine coolant temperature sensor, vehicle speed sensor 2 and crankshaft position sensor to control the purge control solenoid.
Canister purge takes place during operation of the vehicle except under certain conditions (during idle, etc.).
- The purge line is connected to the throttle chamber to purge fuel evaporation gas from the canister according to the amount of intake air.

G: RADIATOR FAN CONTROL

- The Hi-Low control of the radiator fan is governed by the ECM which receives signals sent from the engine coolant temperature sensor and vehicle speed sensor 2.

Vehicle speed	Engine coolant temperature		
	Less than 92°C (Less than 198°F)	Between 92 and 95°C (Between 198 and 203°F)	More than 96°C (More than 205°F)
	Operation of radiator main fan	Operation of radiator main fan	Operation of radiator main fan
Less than 19 km/h (Less than 12 MPH)	OFF	OFF	Low
Between 20 and 69 km/h (Between 12 and 43 MPH)	OFF	OFF	Hi
Between 70 and 105 km/h (Between 43 and 65 MPH)	OFF	OFF	Hi
More than 106 km/h (More than 66 MPH)	OFF	OFF	Hi

- On models which are equipped with an air conditioning system, the ECM receives signals sent from the engine coolant temperature sensor, vehicle speed sensor 2 and A/C switch. These signals simultaneously turn ON or OFF the radiator main fan and radiator sub fan as well as setting them at "Hi" or "Low" speed.

Vehicle speed	A/C compressor	Engine coolant temperature					
		Less than 92°C (Less than 198°F)		Between 92 and 95°C (Between 198 and 203°F)		More than 96°C (More than 205°F)	
		Operation of radiator fan		Operation of radiator fan		Operation of radiator fan	
		Main	Sub	Main	Sub	Main	Sub
Less than 19 km/h (Less than 12 MPH)	OFF	OFF	OFF	OFF	OFF	Low	Low
	ON	Low	Low	Hi	Hi	Hi	Hi
Between 20 and 69 km/h (Between 12 and 43 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	Hi	Hi	Hi	Hi	Hi	Hi
Between 70 and 105 km/h (Between 43 and 65 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	Low	Low	Low	Low	Hi	Hi
More than 106 km/h (More than 66 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	OFF	OFF	Low	OFF	Hi	Hi

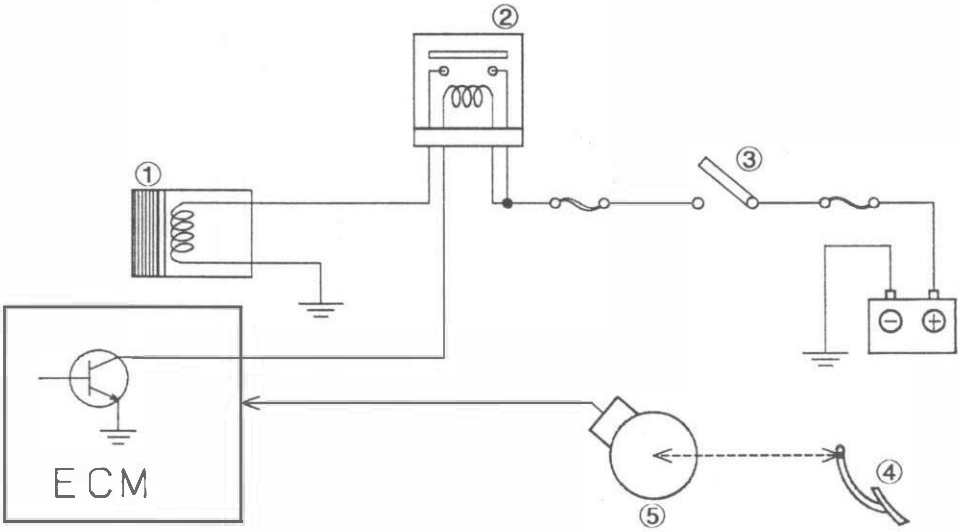
H: FUEL PUMP CONTROL

The ECM receives a signal emitted from the crankshaft position sensor and turns the fuel pump relay ON or OFF to control fuel pump operation. To improve safety, the fuel pump will stop if the engine stalls with the ignition switch ON.

Ignition switch ON	Fuel pump relay	Fuel pump
A certain period of time (after ignition switch is turned ON)	ON	Operates
While cranking the engine	ON	Operates
While engine is operating	ON	Operates
When engine stops	OFF	Does not operate

I: A/C CUT CONTROL

When the ECM receives a “full-open” signal emitted from the throttle position sensor while the air conditioning system is operating, the A/C cut relay turns off for a certain period of time to stop the compressor. This prevents degradation of output during acceleration and stabilizes driveability.



G2H0053

① A/C compressor
② A/C cut relay
③ Ignition switch
④ Accelerator pedal
⑥ Throttle position sensor

J: POWER SUPPLY CONTROL

• When the ECM receives an ON signal emitted from the ignition switch, current flows through the main relay. This turns the ignition relay ON so that power is supplied to the ignition coil, mass air flow sensor, idle air control solenoid valve, etc.

• Power to the above parts is turned off five seconds after the ECM receives an OFF signal from the ignition switch. The fuel injectors stop fuel injection immediately after the ignition switch is turned OFF because the injection signal is cut off.

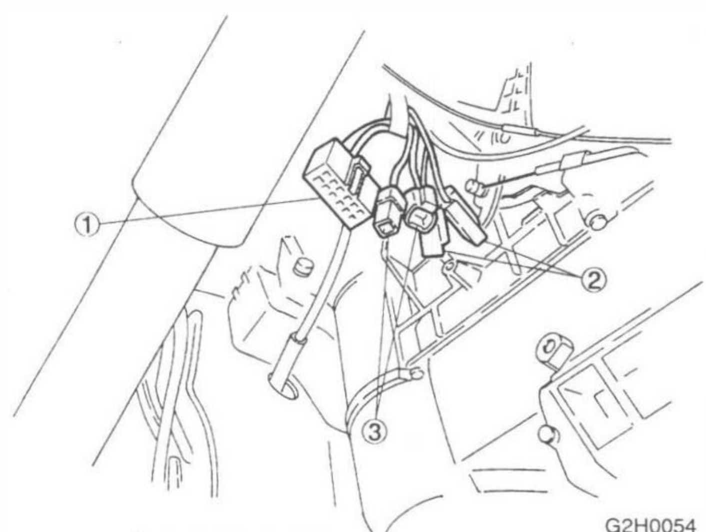
7. On-board Diagnosis System

A: GENERAL

- The on-board diagnosis system detects and indicates a fault in various inputs and outputs of the complex electronic control. The malfunction indicator lamp (CHECK ENGINE light) on the instrument panel indicates occurrence of a fault or trouble.
- Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.

B: FUNCTION OF ON-BOARD DIAGNOSIS

The on-board diagnosis function has four modes: U-check mode, Read memory mode, D-check mode and Clear memory mode. Two connectors (Read memory and Test mode) and a light (CHECK ENGINE light) are used. The connectors are for mode selection and the light monitors, the type of problem.



1. Data link connector
2. Test mode connector
3. Read memory connector

- Relationship between modes and connectors

Mode	Condition	Read memory connector	Test mode connector
U-check	Ignition ON (engine on)	DISCONNECT	DISCONNECT
Read memory	Ignition ON	CONNECT	DISCONNECT
D-check	Ignition ON (engine on)	DISCONNECT	CONNECT
Clear memory	Ignition ON (engine on)	CONNECT	CONNECT

- U-check mode

The U-check is a user-oriented mode in which only the MFI system components necessary for start-up and drive are diagnosed. On occurrence of a fault, the malfunction indicator lamp (CHECK ENGINE light) is lighted to indicate to the user that the dealer's inspection is necessary. The diagnosis of other parts which do not give significant adverse effect to start-up and drive are excluded from this mode in order to avoid unnecessary uneasiness to be taken by the user.

- Read memory mode

This mode is used by the dealer to read past problems (even when the vehicle's monitor lights are off). It is most effective in detecting poor contact or loose connections of connectors, harnesses, etc.

- D-check mode

This mode is used by the dealer to check the entire MFI system and detect faulty parts.

- Clear memory mode

This mode is used by the dealer to clear the trouble code from the memory after the affected part is repaired.

C: BASIC OPERATION OF ON-BOARD DIAGNOSIS SYSTEM

• NO TROUBLE

Mode	Read memory connector	Test mode connector	Condition	CHECK ENGINE light
U-check	DISCONNECT	DISCONNECT	Ignition switch ON (Engine OFF)	ON
			Engine ON	OFF
Read memory	CONNECT	DISCONNECT	Ignition switch ON (Engine OFF)	Blink
			Engine ON	ON
D-check	DISCONNECT	CONNECT	Ignition switch ON (Engine OFF)	ON
			Engine ON	OFF → Blink*
Clear memory	CONNECT	CONNECT	Ignition switch ON (Engine OFF)	ON
			Engine ON	OFF → Blink*

• TROUBLE

Mode	Read memory connector	Test mode connector	Condition	CHECK ENGINE light
U-check	DISCONNECT	DISCONNECT	Engine ON	ON
Read memory	CONNECT	DISCONNECT	Ignition switch ON	Trouble code (memory)
D-check	DISCONNECT	CONNECT	Engine ON	Trouble code**
Clear memory	CONNECT	CONNECT	Engine ON	Trouble code**

* When the engine operates at a speed greater than 2,000 rpm for more than 40 seconds, the check engine light blinks. However, when all check items check out "O.K.", even before the 40 seconds is reached, the check engine light blinks.
** When the engine operates at a speed greater than 2,000 rpm for more than 40 seconds, a trouble code is emitted.

D: FAIL-SAFE FUNCTION

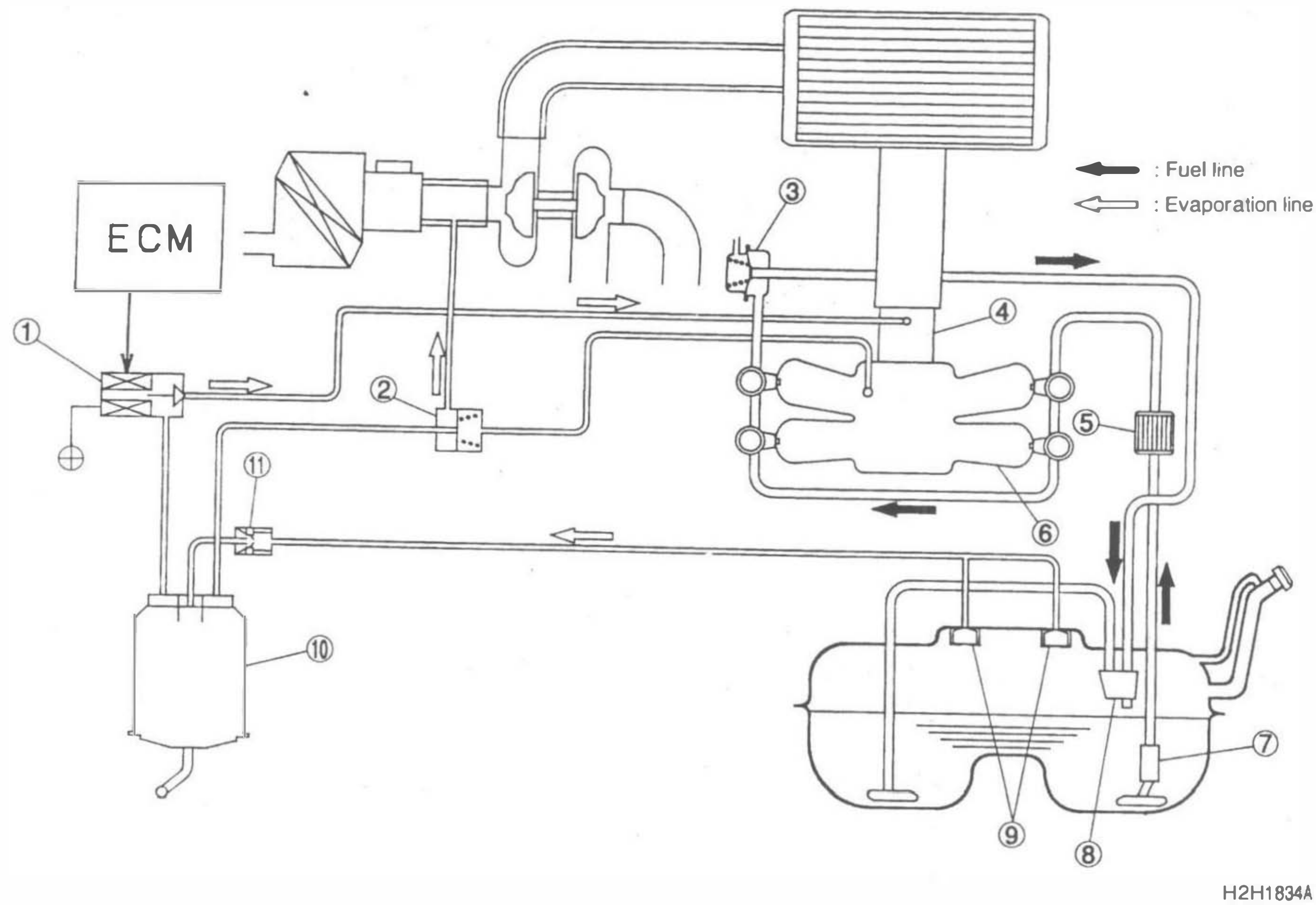
For the part which has been judged faulty in the on-board diagnosis, the ECM generates the associated pseudo signal (only when convertible to electric signal) and carries out the computational processing. In this fashion, the fail-safe function is performed.

E: TROUBLE CODES AND FAIL-SAFE OPERATION

Trouble code	Item	Contents of diagnosis	Fail-safe operation
11	Crankshaft position sensor	No signal entered from crankshaft position sensor, but signal (corresponding to at least one rotation of crankshaft) entered from camshaft position sensor.	–
12	Starter switch	Abnormal signal emitted from starter switch.	Turns starter switch signal OFF.
13	Camshaft position sensor	No signal entered from camshaft position sensor, but signal (corresponding to at least two rotations of camshaft) entered from crankshaft position sensor.	–
21	Engine coolant temperature sensor	Abnormal signal emitted from engine coolant temperature sensor.	Adjusts engine coolant to a specific temperature. Maintains radiator fan "ON" to prevent overheating.
22	Knock sensor	Abnormal voltage input entered from knock sensor.	Sets in regular fuel map, and retards ignition timing by 5°.
23	Mass air flow sensor	Abnormal voltage input entered from mass air flow sensor.	Controls the amount of fuel (injected) in relation to engine speed and throttle valve position.
24	Idle air control solenoid valve	Idle air control valve inoperative. (Abnormal signal produced in monitor circuit.)	Prevents abnormal engine speed using "fuel cut" in relation to engine speed, vehicle speed and throttle valve position.
31	Throttle position sensor	Abnormal voltage input entered from throttle position sensor.	Sets throttle position sensor's voltage output to a fixed value.
32	Oxygen sensor	Oxygen sensor inoperative.	–
33	Vehicle speed sensor 2	Abnormal voltage input entered from vehicle speed sensor 2.	Sets vehicle speed signal to a fixed value.
38	Torque control signal (AT)	Abnormal signal entered from TCM.	–
44	Wastegate control solenoid valve	Solenoid valve inoperative.	Cut off the fuel when throttle valve is fully opened under heavy loads.
45	• Pressure sensor • Pressure sources switching solenoid valve	Abnormal signal entered from pressure sensor, or pressure exchange solenoid valve inoperative.	Cut off the fuel when throttle valve is fully opened under heavy loads.
51	Neutral position switch (MT)	Abnormal signal entered from neutral position switch.	–
51	Park/Neutral position switch (AT)	Abnormal signal entered from inhibitor switch.	–
53*	Immobiliser system	Faulty immobiliser system.	–

*: Immobiliser system equipped model only

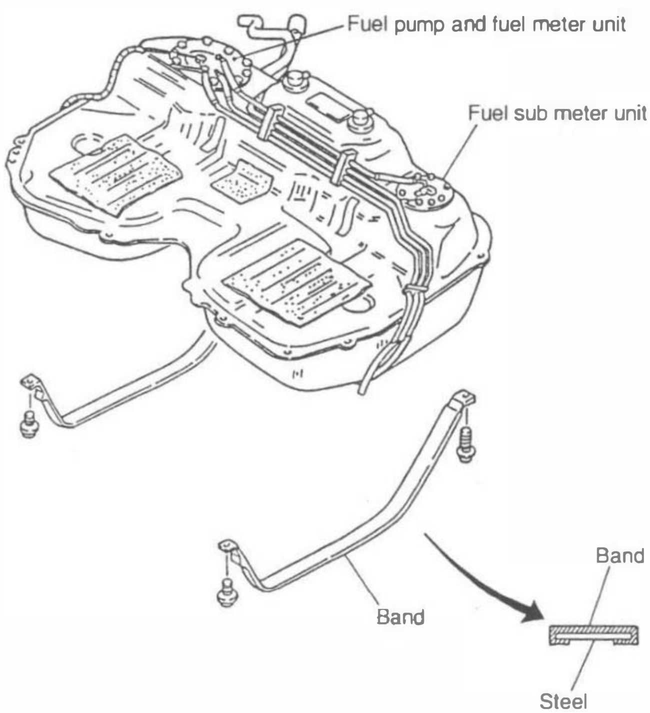
2. TURBO MODEL



① Purge control solenoid valve
② Auxiliary purge control valve
③ Pressure regulator
④ Throttle body
⑤ Fuel filter
⑥ Intake manifold
⑦ Fuel pump
⑨ Jet pump
⑨ Fuel cut valve
⑩ Canister
⑪ Two-way valve

B: TURBO MODEL

- The fuel tank is located under the rear seat and secured with hold down bands. The fuel tank utilizes a dented design to prevent interference with the rear differential.
- The fuel tank has two chambers, and is provided with a suction jet pump which transfers fuel from one chamber to another. Each fuel chamber has a built-in fuel sub meter unit.



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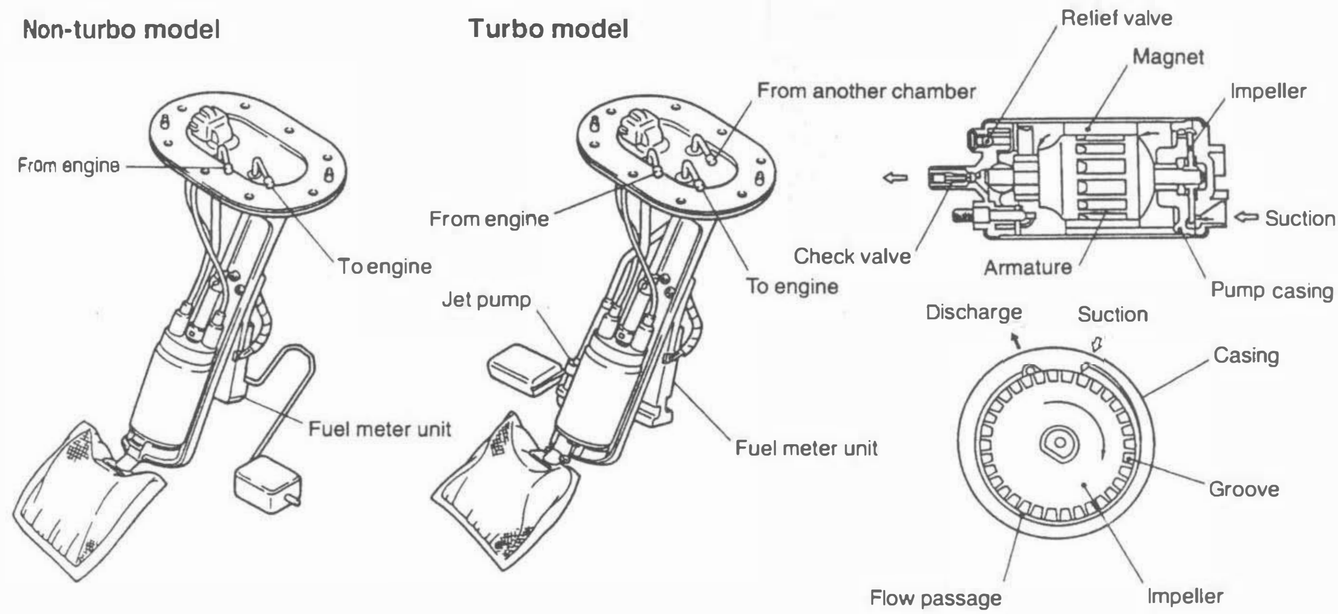
3. Fuel Pump

The impeller type fuel pump consists of a motor, impeller, pump casing, pump cover, relief valve, check valve and pump filter. It is built into the fuel tank together with the fuel meter unit to provide quiet operation.

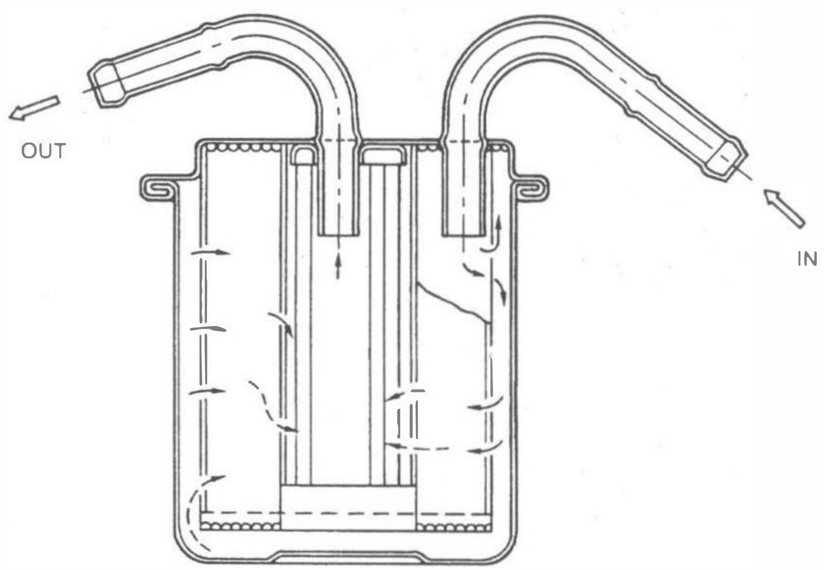


B2H0011B

- When the engine starts, fuel pump relay activates. This operates the motor to rotate the impeller.
- Fuel entering a vane groove of the impeller flows along the fuel passage and into the next vane groove by centrifugal force. During the time fuel flows from one groove to the next, a pressure differential is produced by friction of the flow.
- Thus, fuel pressure increases while the action is described in step 2) above is repeated, and fuel is discharged from the pump casing. Fuel under pressure then passes through the clearance between the armature and the magnet and is discharged from the fuel pump.
- As fuel discharge pressure reaches the specified value, the relief valve opens. This discharges fuel under pressure into the fuel tank. Fuel from the fuel tank then returns to the suction port and passes through the fuel pump. This action of fuel flow is repeated. In this manner, the relief valve prevents an abnormal increase in fuel pressure.
- When the engine and fuel pump stop, spring force acts on the check valve to close the discharge port so that fuel pressure remains in the fuel delivery line.

4. Fuel Filter

The fuel filter utilizes a pressure-withstanding, cartridge design. It has a filter element built into the metal case. With this design, fuel flows from the perimeter of the element to the interior of the filter.



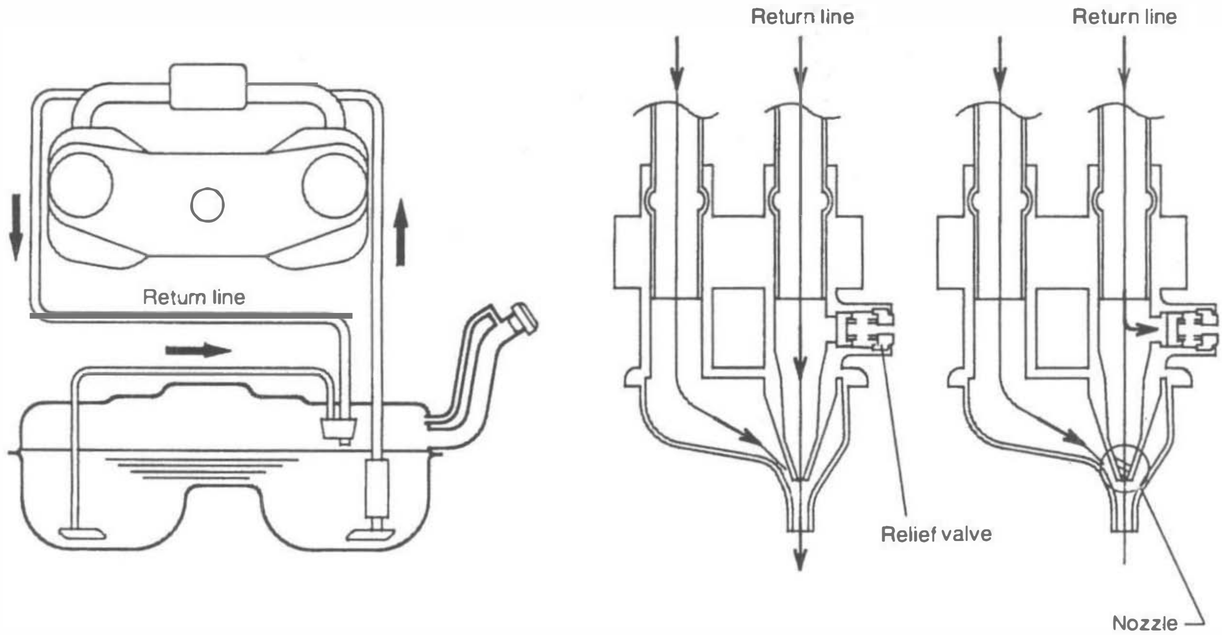
G2H0059

et Pump (Turbo model)

e jet pump utilizes the velocity of fuel returning from the engine to produce negative pressure e the jet pump.

is negative pressure allows fuel to be sucked up.

ıen the return line nozzle is clogged, the fuel sent back through the return line flows back into ȷel tank via the relief valve.



B2H0012A

FUEL INJECTION SYSTEM [TURBO MODEL] 2-7c

Page

1. Supplemental Restraint System "Airbag"

Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

CAUTION:

- **All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.**
- **Be careful not to damage Airbag system wiring harness when servicing the engine control module (ECM), main relay and fuel pump relay.**

2. Pre-inspection

Before performing diagnostics, check the following items which might affect engine problems:

1. POWER SUPPLY

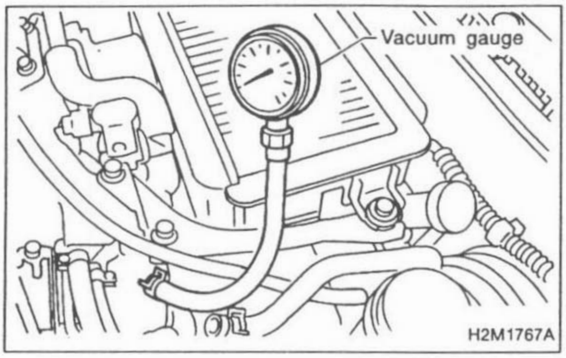
1) Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V
Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. CAPS AND PLUGS

1) Check that the fuel cap is properly closed.
2) Check that the oil filler cap is properly closed.
3) Check that the oil level gauge is properly inserted.



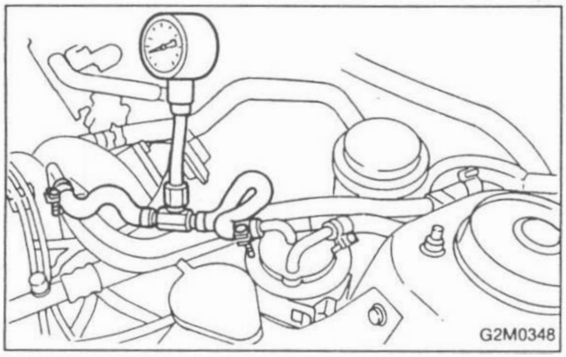
3. INTAKE MANIFOLD VACUUM PRESSURE

1) After warming-up the engine, measure intake manifold vacuum pressure while at idle.

Standard vacuum pressure:
More than –60.0 kPa (–450 mmHg, –17.72 inHg)

<Ref. to 2-2 [W5A0].>

2) Unusual vacuum pressure occurs because of air leaks, fuel or engine problems. In such a case, engine idles roughly.



4. FUEL PRESSURE

1) Release fuel pressure.
<Ref. to 2-8 [W1A0].>
2) Connect fuel pressure gauge between fuel filter and hose, and measure fuel pressure at idling.
<Ref. to 2-8 [W2A0].>

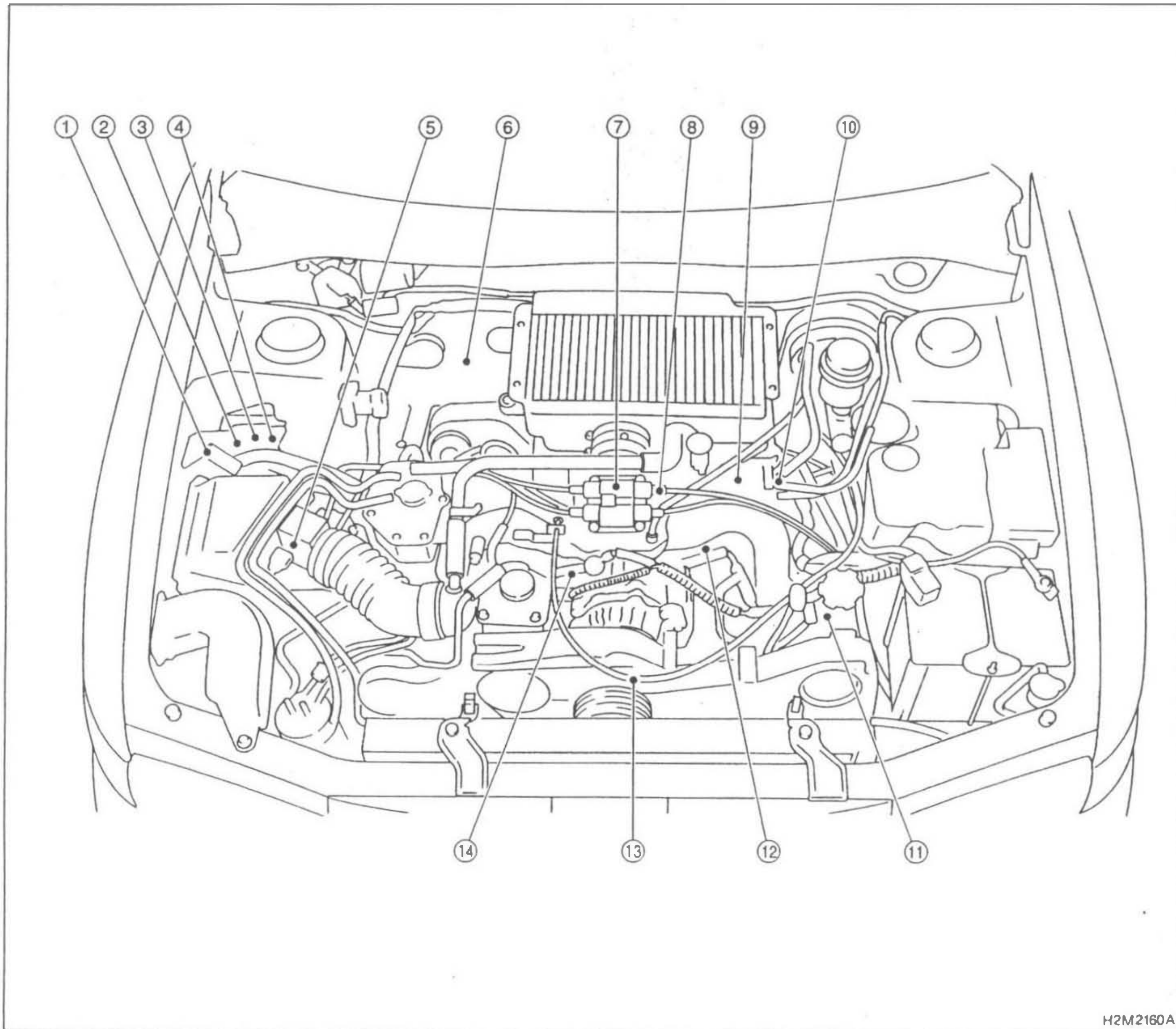
Fuel pressure:
284 - 314 kPa (2.9 - 3.2 kg/cm^2, 41 - 46 psi)

5. ENGINE GROUNDING

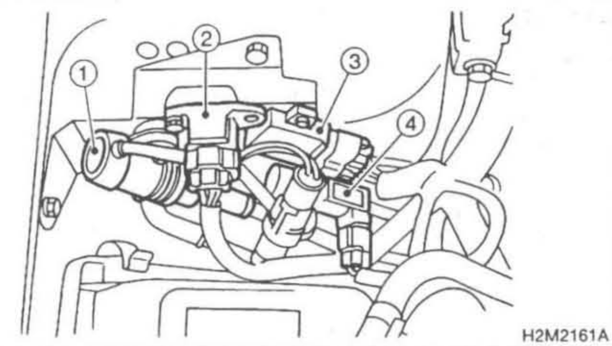
Make sure the engine grounding terminal is properly connected to the engine.

3. Electrical Unit Location

A: SENSOR AND SOLENOID VALVE



(1) Wastegate control solenoid valve
(2) Pressure sensor
(3) Ignitor
(4) Pressure sources switching solenoid valve
(5) Mass air flow sensor
(6) Vehicle speed sensor 2
(7) Ignition coil
(8) Throttle position sensor
(9) Idle air control solenoid valve
(10) Purge control solenoid valve
● Camshaft position sensor
(12) Knock sensor
(13) Crankshaft position sensor
(14) Engine coolant temperature sensor



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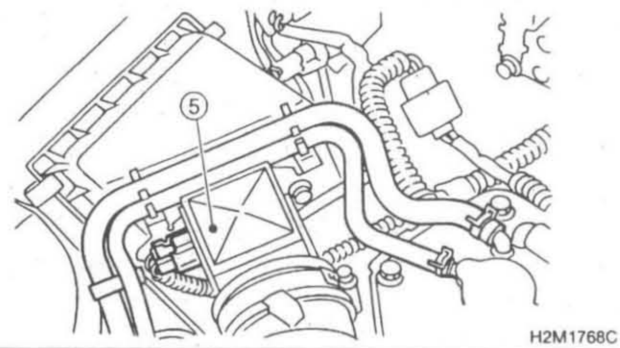

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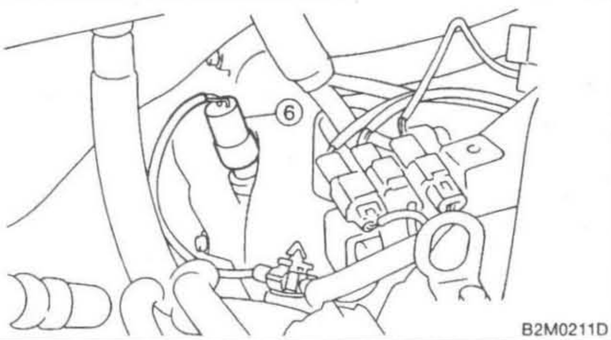

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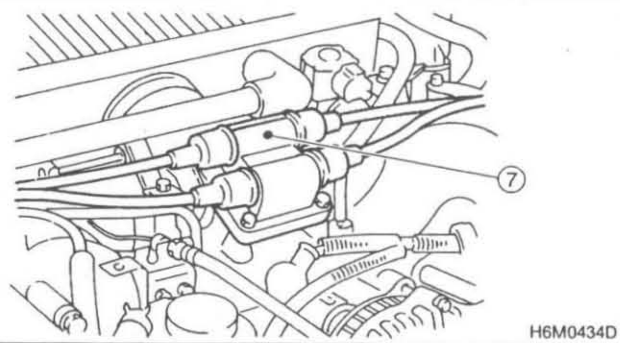

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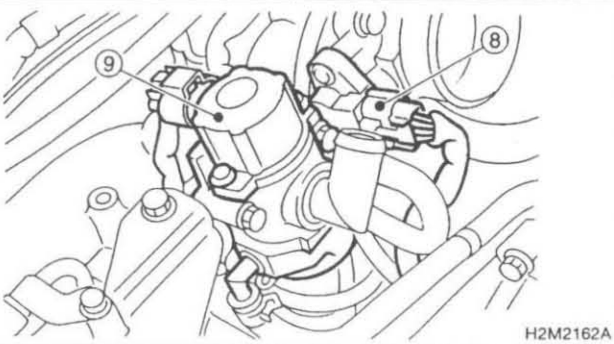

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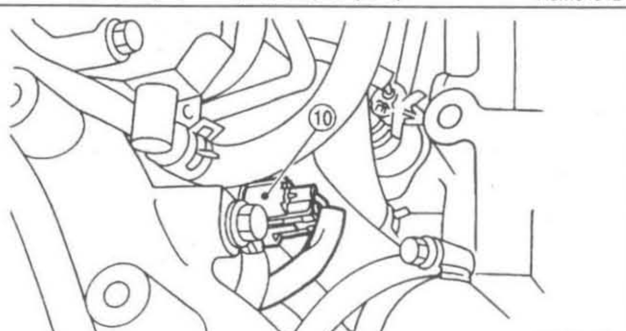

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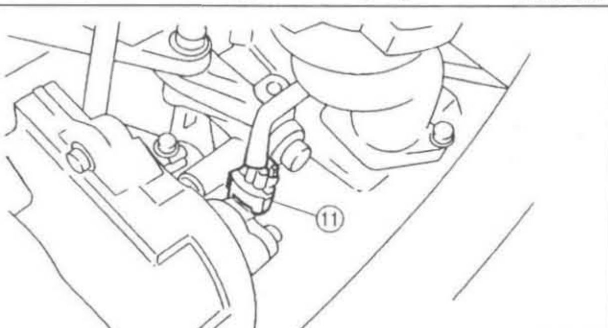

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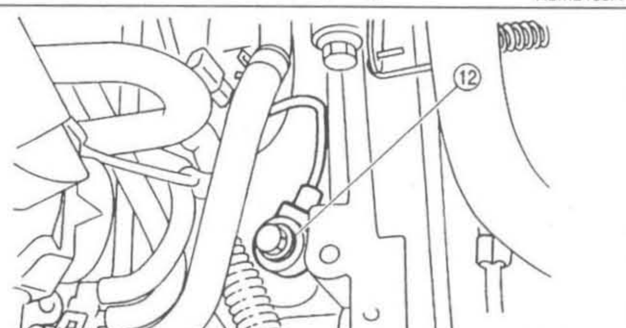

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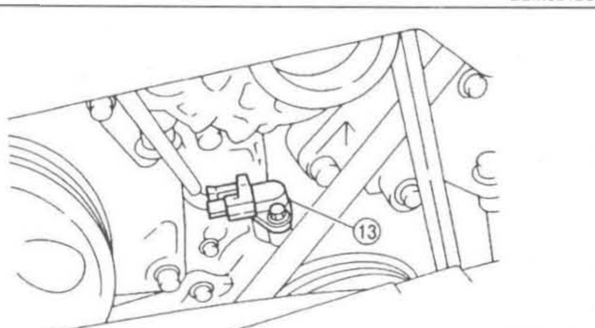

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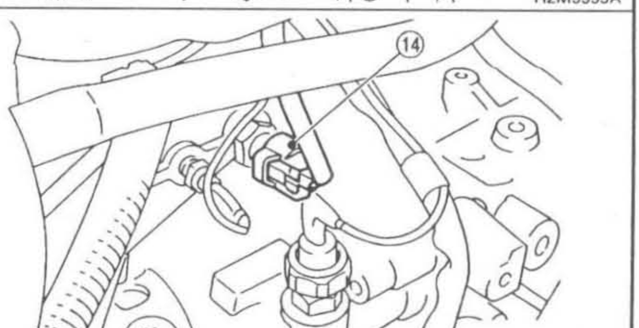

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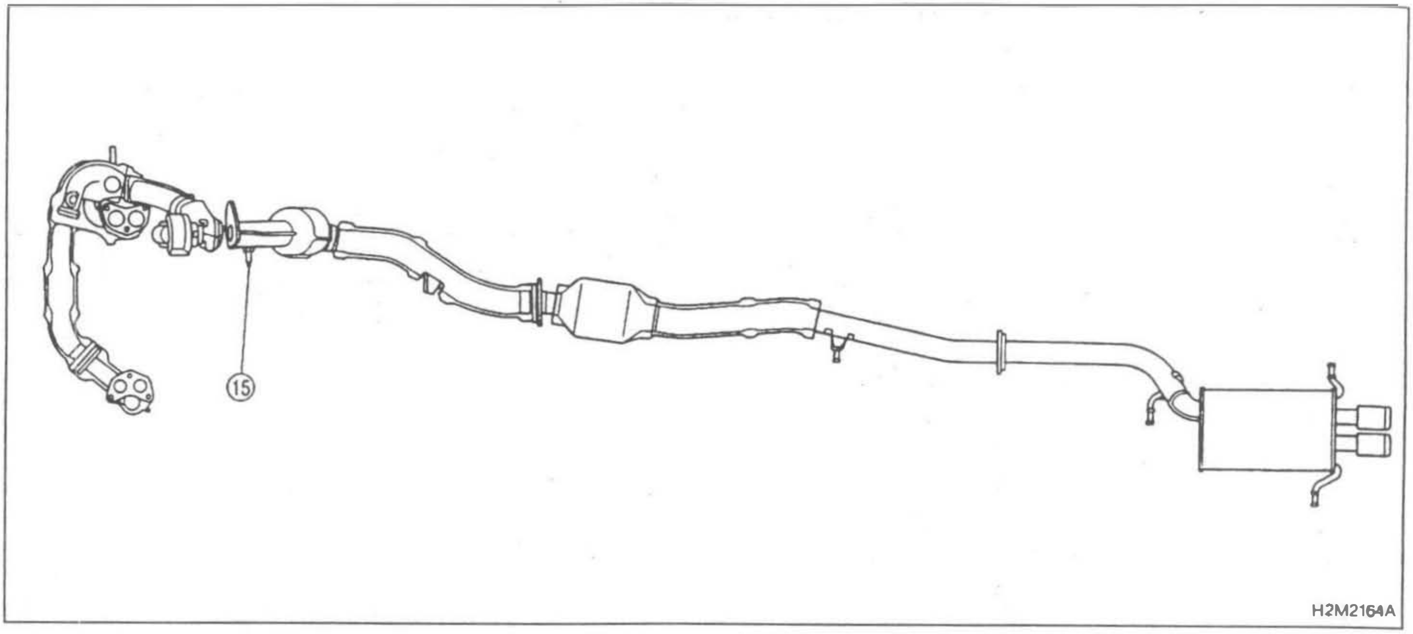
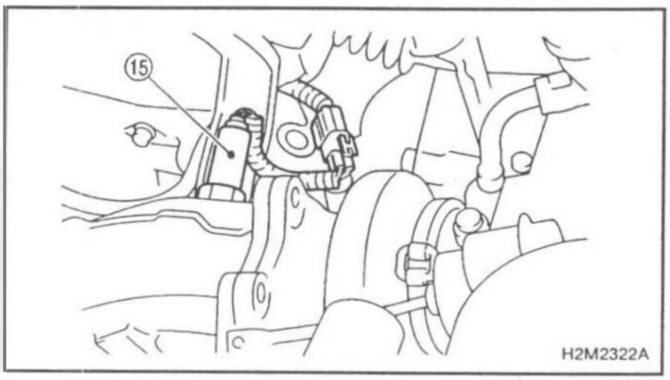
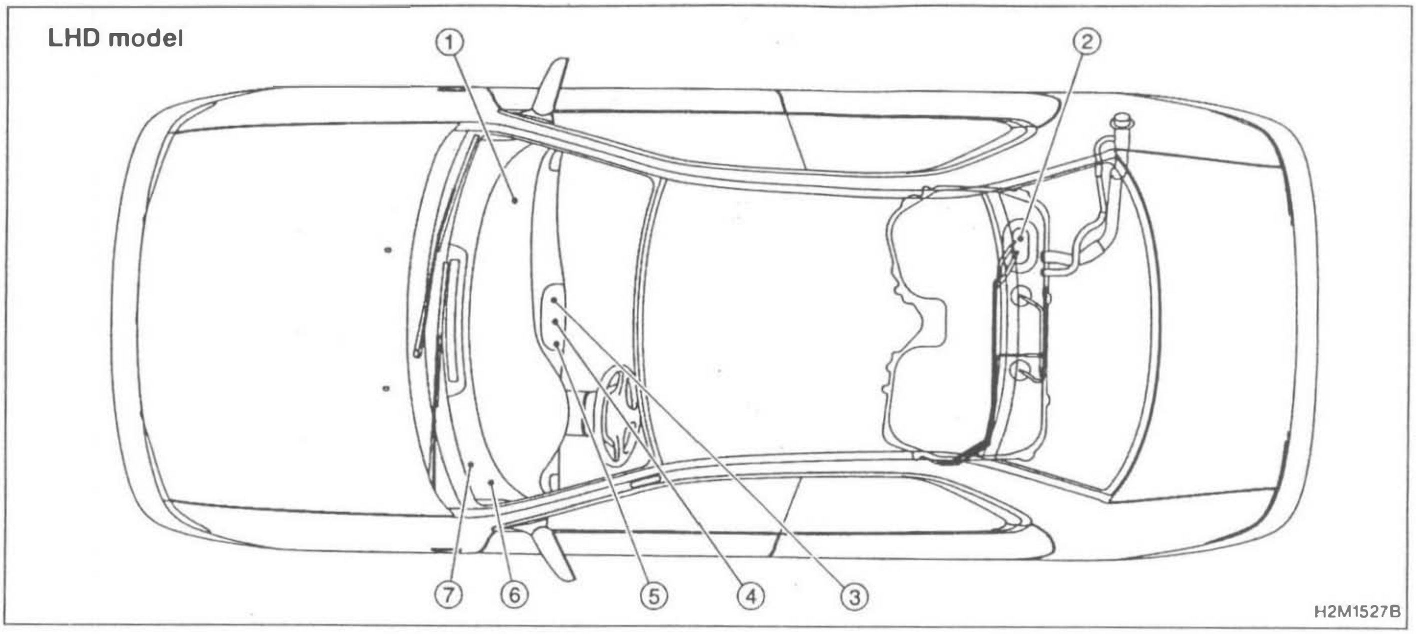
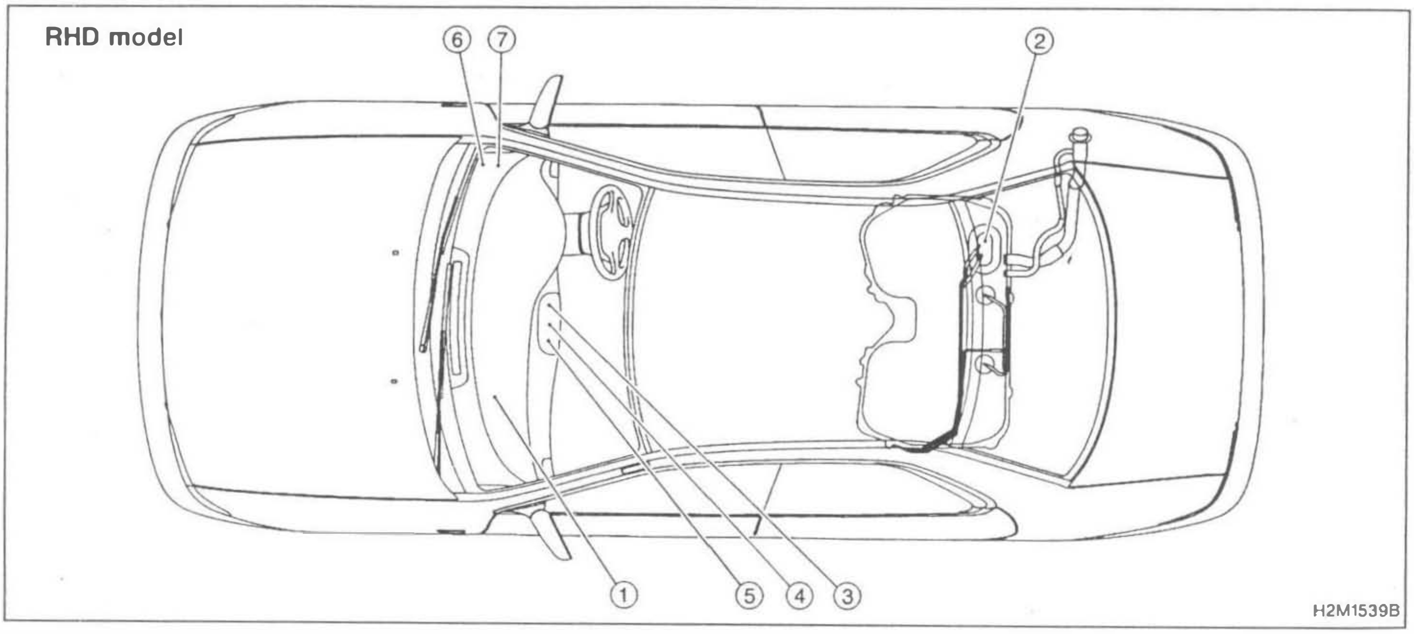


⑮ Oxygen sensor

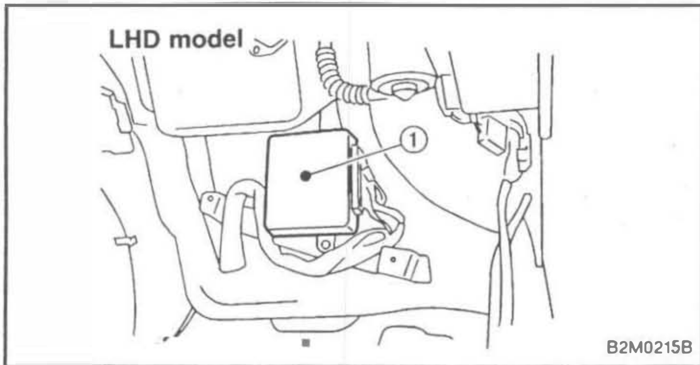


B: MODULE AND RELAY





① ECM
② Fuel pump
③ Read memory connector
④ Test mode connector
⑤ Data link connector
⑥ Main relay
⑦ Fuel pump relay



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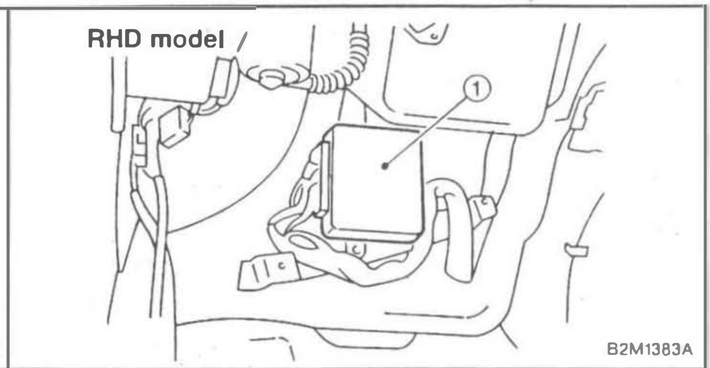

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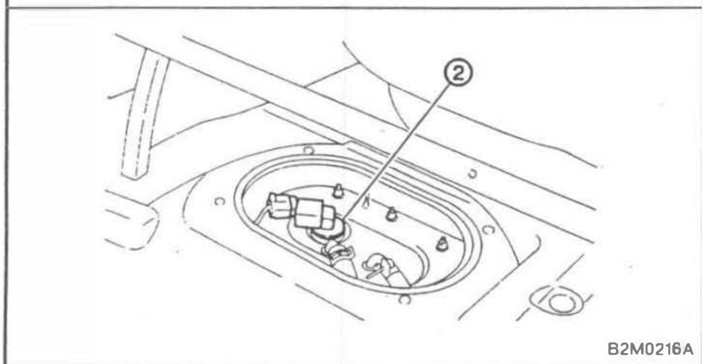

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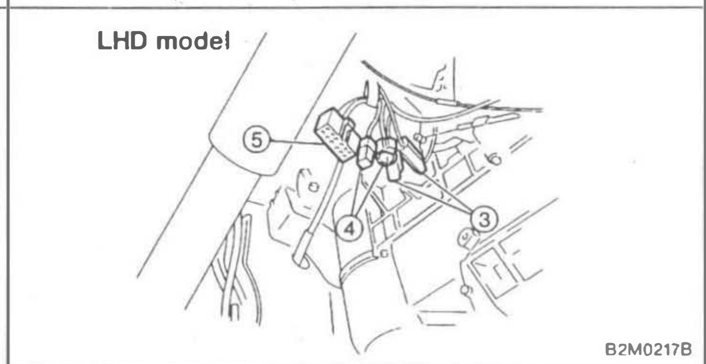

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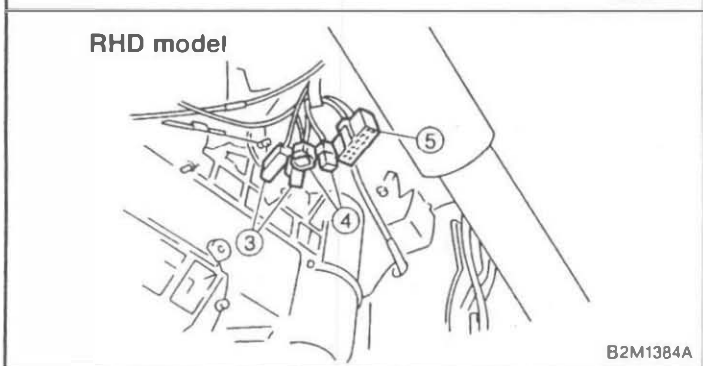

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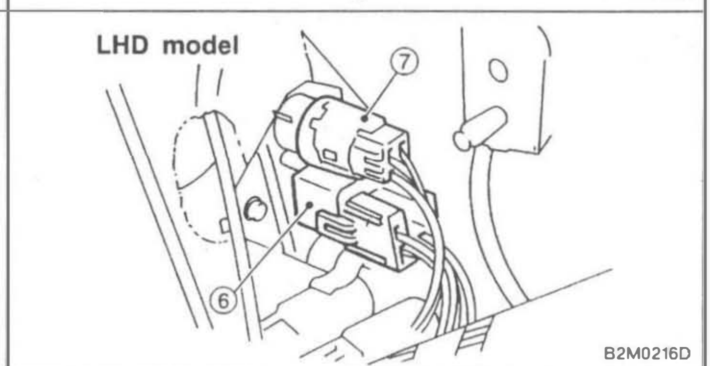

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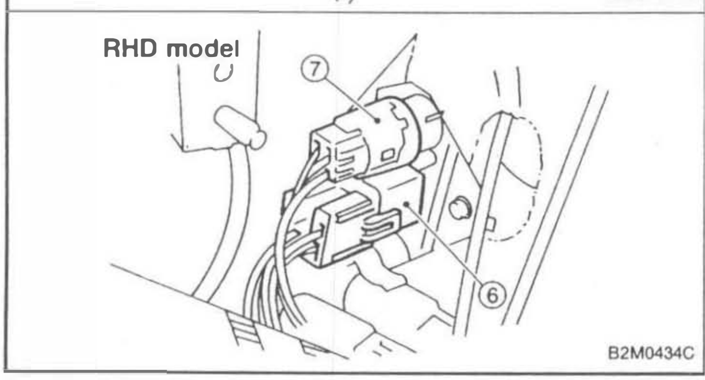

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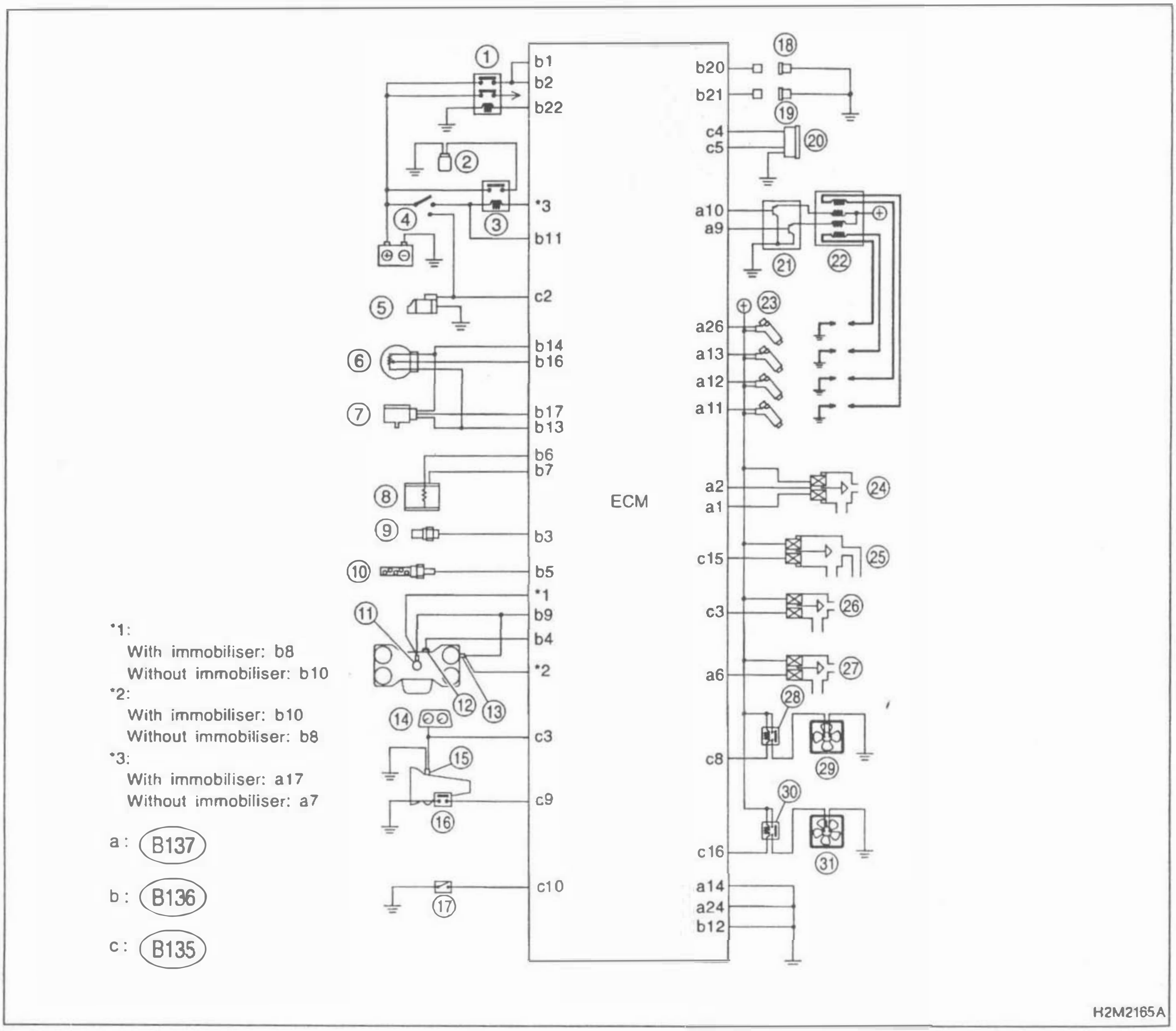
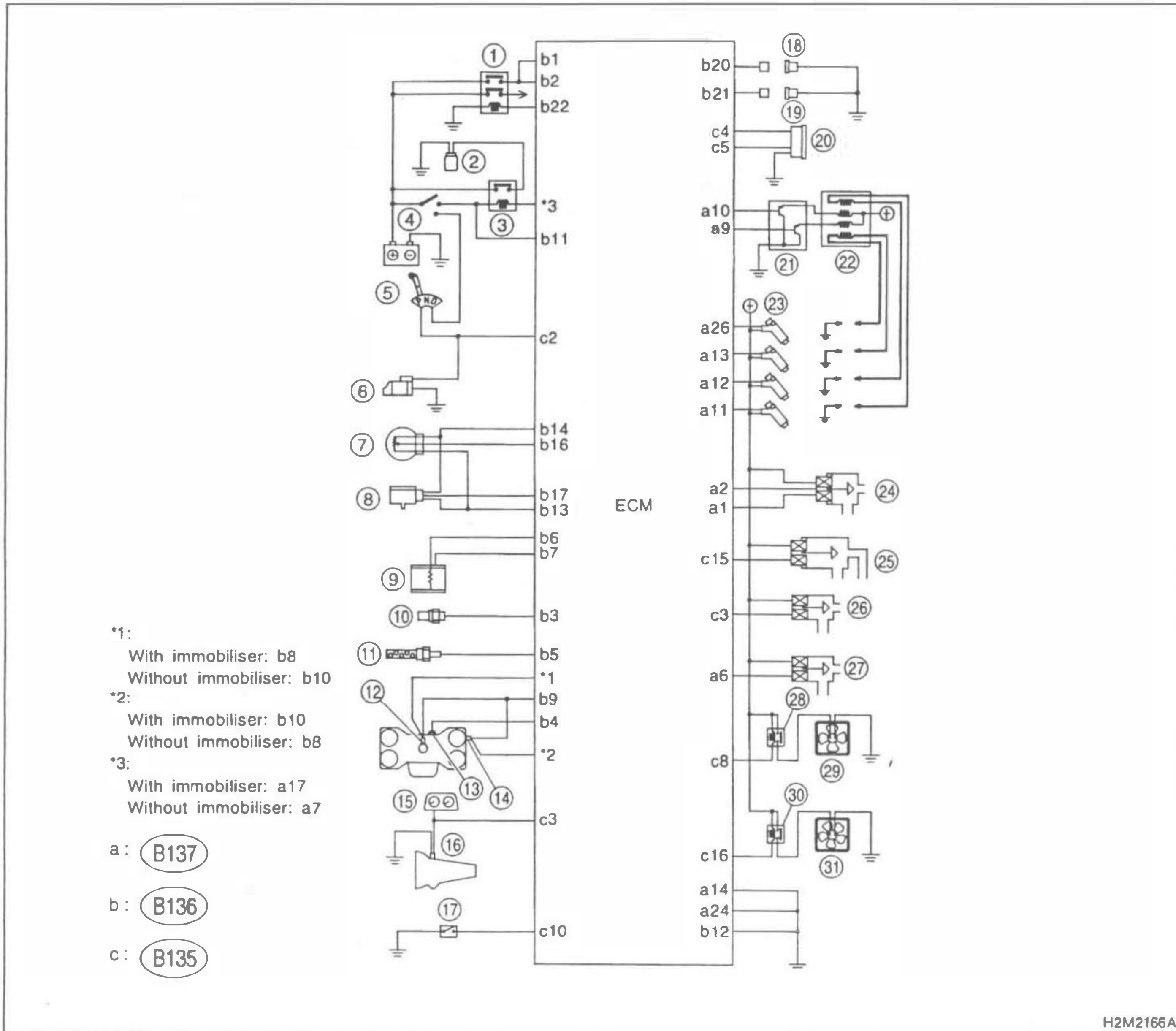
4. Schematic

A: MT VEHICLES



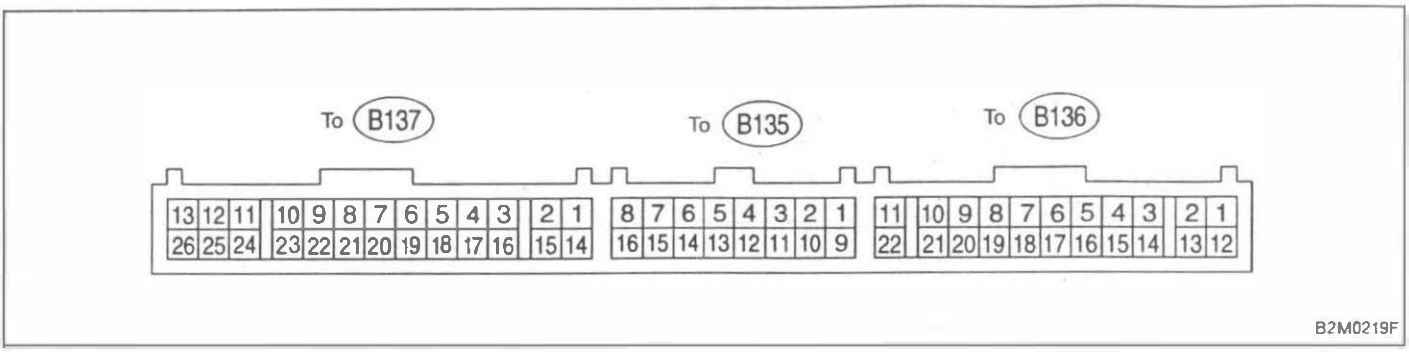
(1) Main relay
(2) Fuel pump
(3) Fuel pump relay
(4) Ignition switch
(5) Starter
(6) Throttle position sensor
(7) Pressure sensor
(8) Mass air flow sensor
(9) Engine coolant temperature sensor
(10) Oxygen sensor
(11) Crankshaft position sensor
(12) Knock sensor
(13) Camshaft position sensor
(14) Combination meter
(15) Vehicle speed sensor 2
(16) Neutral position switch
(17) A/C switch
(18) Read memory connector
(19) Test mode connector
(20) Data link connector
(21) Ignitor
(22) Ignition coil
(23) Fuel injector
(24) Idle air control solenoid valve
(25) Purge control solenoid valve
(26) Wastegate control solenoid valve
(27) Pressure sources switching solenoid valve
(28) Radiator main fan relay
(29) Radiator main fan
(30) Radiator sub fan relay
(31) Radiator sub fan

B: AT VEHICLES



(1) Main relay
(2) Fuel pump
(3) Fuel pump relay
(4) Ignition switch
(5) Park/Neutral position (inhibitor) switch
(6) Starter
(7) Throttle position sensor
(8) Pressure sensor
(9) Mass air flow sensor
(10) Engine coolant temperature sensor
(11) Oxygen sensor
(12) Crankshaft position sensor
(13) Knock sensor
(14) Camshaft position sensor
(15) Combination meter
(16) Vehicle speed sensor 2
(17) A/C switch
(18) Read memory connector
(19) Test mode connector
(20) Data link connector
(21) Ignitor
(22) Ignition coil
(23) Fuel injector
(24) Idle air control solenoid valve
(25) Purge control solenoid valve
(26) Wastegate control solenoid valve
(27) Pressure sources switching solenoid valve
(28) Radiator main fan relay
(29) Radiator main fan
(30) Radiator sub fan relay
(31) Radiator sub fan

5. Control Module I/O Signal



Content		Connector No.	Terminal No.	Signal (V) Ignition SW ON (Engine OFF)	Signal (V) Engine ON (Idling)	Note
Crankshaft position sensor	Signal (+)	B136	*1	0	±6	Sensor output waveform
	Signal (–)	B136	9	0	0	—
	Shield	B136	13	0	0	—
Camshaft position sensor	Signal (+)	B136	*2	0	±6	Sensor output waveform
	Signal (–)	B136	9	0	0	—
	Shield	B136	13	0	0	—
Mass air flow sensor	Signal	B136	6	0 — 0.3	0.8 — 1.2	—
	Shield	B136	13	0	0	—
	GND	B136	7	0	0	—
Throttle position sensor	Signal	B136	16	Fully closed: 0.5±0.3 Fully opened: 4.3±0.3		—
	Power supply	B136	14	5	5	—
	GND	B136	13	0	0	—
Oxygen sensor	Signal	B136	5	0	Rich mixture: 0.7 Lean mixture: 0	
	Shield	B136	13	0	0	—
Engine coolant temperature sensor	Signal	B136	3	0.6 — 1.0	0.6 — 1.0	After warm-up
	GND	B136	13	0	0	—
Vehicle speed sensor 2		B135	3	0 or 5	0 or 5	"5" and "0" are repeatedly displayed when vehicle is driven.
Starter switch		B135	2	0	0	Cranking: 10 to 14
A/C switch		B135	10	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B136	11	10 — 13	13 — 14	—
Neutral position switch (MT)		B135	9	ON: 5 OFF: 0		Switch is ON when gear is in neutral position.
Park/Neutral position switch (AT)		B135	9	ON: 0 OFF: 5		Switch is ON when shift lever is in "P" or "N" position.
Test mode connector		B136	21	5	5	When connected: 0

*1: With immobiliser: 8
Without immobiliser: 10
*2: With immobiliser: 10
Without immobiliser: 8

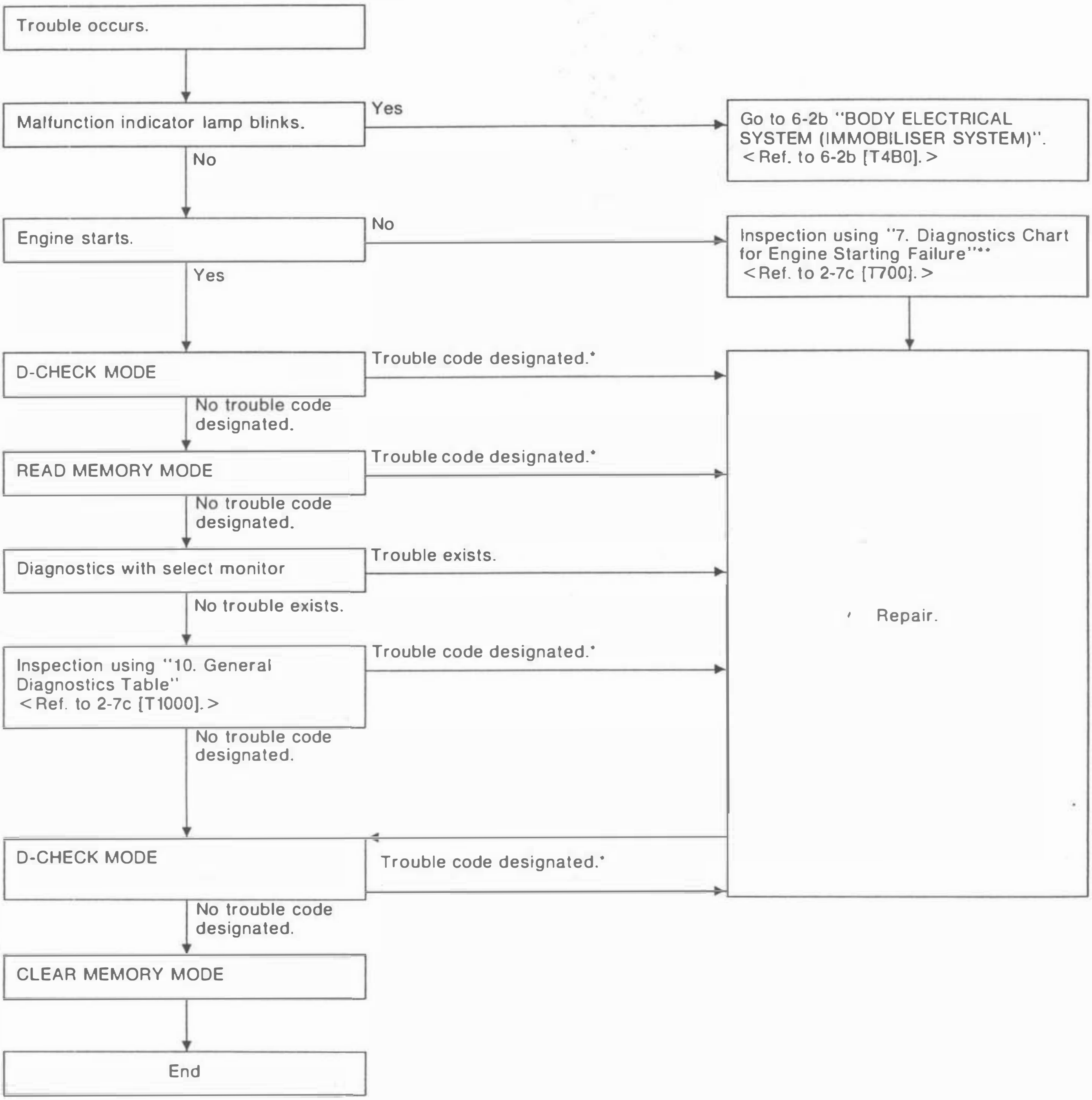
Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Read memory connector		B136	20	5	5	When connected: 0
Back-up power supply		B137	15	10 — 13	13 — 14	—
Control unit power supply		B136	1 2	10 — 13	13 — 14	—
Ignition control	# 1, # 2	B137	10	0	3.4, max.	—
	# 3, # 4	B137	9	0	3.4, max.	—
Fuel injector	# 1	B137	26	10 — 13	13 — 14	Waveform
	# 2	B137	13	10 — 13	13 — 14	Waveform
	# 3	B137	12	10 — 13	13 — 14	Waveform
	# 4	B137	11	10 — 13	13 — 14	Waveform
Idle air control solenoid valve	OPEN end	B137	2	—	1, max. — 13, min.	Waveform
	CLOSE end	B137	1	—	13, min. — 1, max.	Waveform
Torque control signal*4		B135	11	0	5	—
Fuel pump relay control		B137	*3	ON: 0 OFF: 10 — 13	0	—
A/C relay control		B137	21	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Radiator fan relay 1 control		B135	8	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Radiator fan relay 2 control		B135	16	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Self-shutoff control		B136	22	10 — 13	13 — 14	—
Malfunction indicator lamp		B137	8	—	—	Light "ON": 1, max. Light "OFF": 10 — 14
Engine speed output		B135	14	—	0 — 13, min.	Waveform
Knock sensor	Signal	B136	4	2.8	2.8	—
	Shield	B136	13	0	0	—
Wastegate control		B137	3	10 — 13	13 — 14	—
Pressure sources switching solenoid valve		B137	6	10 — 13	13 — 14	—
Purge control solenoid valve		B135	15	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
GND (sensors)		B136	13	0	0	—
GND (injectors)		B137	25	0	0	—
GND (ignition system)		B137	24	0	0	—
GND (power supply)		B137	14	0	0	—
GND (control systems)		B136	12	0	0	—
Select monitor signal		B135	4	—	—	—
			5	—	—	—

*3: With immobiliser: 17
Without immobiliser: 7

*4: AT model only

6. Diagnostics Chart for On-board Diagnosis System

A: BASIC DIAGNOSTICS PROCEDURE



*: When more than one trouble code is out-putted, begin diagnostics with the smallest trouble code number and proceed to the next higher code. After correcting each problem, conduct the D-CHECK and ensure that the corresponding trouble code no longer appears.

**: When a trouble code is displayed in the READ MEMORY MODE, conduct diagnostics measures which correspond with the code.

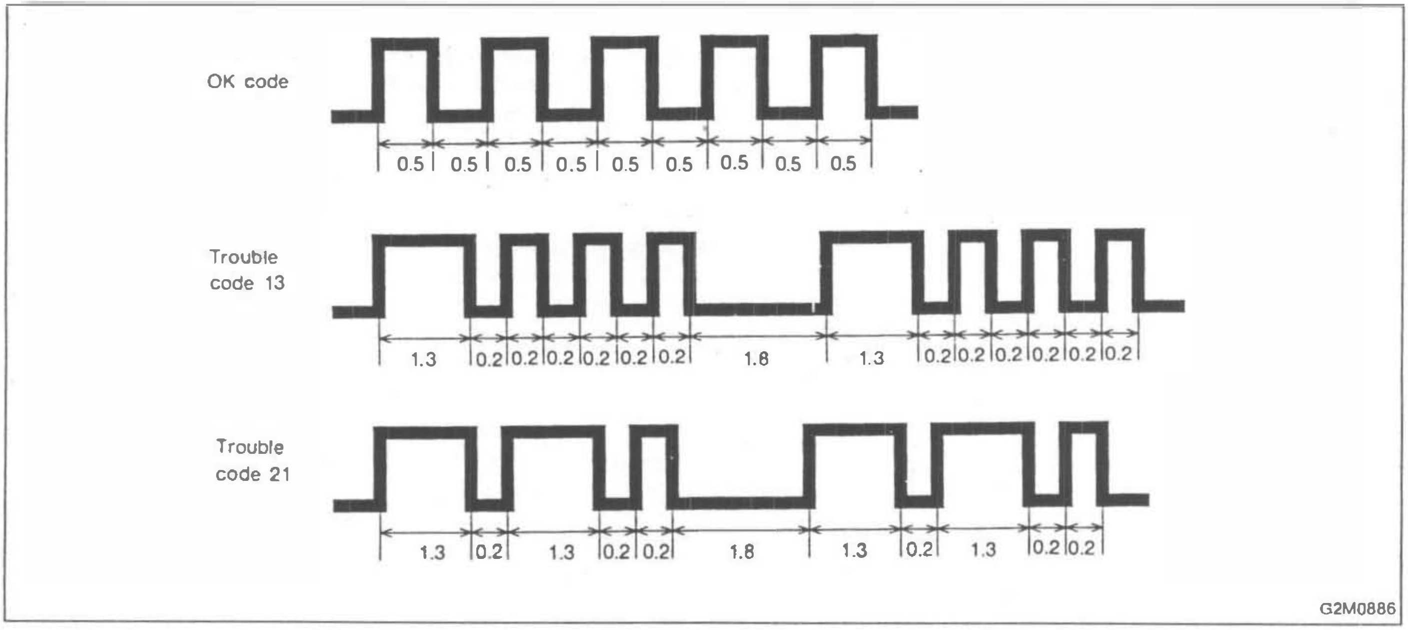
CAUTION:

- **Check the connector while it is connected unless specified otherwise.**
- **Be sure to check again from the beginning in order to prevent secondary trouble caused by repair work.**

B: TROUBLE CODE

1. HOW TO READ TROUBLE CODE

The malfunction indicator lamp flashes the code corresponding to the faulty parts. The long segment (1.3 seconds ON) indicates a "ten", and the short segment (0.2 seconds ON) signifies "one". And middle segment (0.5 seconds ON) means OK code.



2. LIST OF TROUBLE CODE

Trouble code	Item	Contents of diagnosis
11	Crankshaft position sensor	• No signal entered from crankshaft position sensor when starter switch is ON. • The harness connector between ECM and crankshaft position sensor is in short or open.
12	Starter switch	• The starter switch signal is abnormal. • The harness connector between ECM and starter switch is in short or open.
13	Camshaft position sensor	• No signal entered from camshaft position sensor, but signal entered from crankshaft position sensor. • The harness connector between ECM and camshaft position sensor is in short or open.
21	Engine coolant temperature sensor	• The engine coolant temperature sensor signal is abnormal. • The harness connector between ECM and engine coolant temperature sensor is in short or open.
22	Knock sensor	• The knock sensor signal is abnormal. • The harness connector between ECM and knock sensor is in short or open.
23	Mass air flow sensor	• The mass air flow sensor signal is abnormal. • The harness connector between ECM and mass air flow sensor is in short or open.
24	Idle air control solenoid valve	• The idle air control solenoid valve is not in function. • The harness connector between ECM and idle air control solenoid valve is in short or open.
31	Throttle position sensor	• The throttle position sensor signal is abnormal. • The throttle position sensor is installed abnormally. • The harness connector between ECM and throttle position sensor is in short or open.
32	Oxygen sensor	• The oxygen sensor is not in function. • The harness connector between ECM and oxygen sensor is in short or open.
33	Vehicle speed sensor 2	• The vehicle speed sensor 2 is not in function. • The harness connector between ECM and vehicle speed sensor 2 is in short or open.
38	Torque control signal (AT)	• Abnormal signal is entered from TCM. • The harness connector between ECM and TCM is in short or open.
44	Wastegate control solenoid valve	• The wastegate control solenoid valve is not in function. • The harness connector between ECM and wastegate control solenoid valve is in short or open.
45	• Pressure sensor • Pressure sources switching solenoid valve	• The pressure sensor signal is abnormal. • The pressure sources switching solenoid valve is not in function. • The intake manifold pressure is not transmitted to pressure sensor. • The harness connector between ECM and pressure sensor, and pressure sources switching solenoid valve is in short or open.
51	Neutral position switch (MT)	• The neutral position switch signal is abnormal. • The harness connector between ECM and neutral position switch is in short or open.
	Park/Neutral position switch (AT)	• The park/neutral position switch signal is abnormal. • The shift cable is connected abnormally. • The harness connector between ECM and inhibitor switch is in short or open.
53*	Immobiliser system	Faulty immobiliser system. <Refer to 6-2b [T100].>

*: Immobiliser system equipped model only

C: READ MEMORY MODE

Vehicle returned to dealer.

↓

Turn ignition switch to OFF.

↓

Connect read memory connector.

↓

Turn ignition switch to ON (engine OFF).

↓

Malfunction indicator lamp is turned ON.

- NO → Inspect control module power supply any ground line, and malfunction indicator lamp line.
- YES ↓

Trouble code is indicated on malfunction indicator lamp.

- NO (OK code) → Turn ignition switch to OFF. → Disconnect read memory connector. → On-board diagnosis systems have no trouble. Trouble is in a system other than the on-board diagnosis system.
- YES ↓

Confirm trouble code.

↓

Disconnect read memory connector.

↓

Conduct D-check.

D: D-CHECK MODE

Start and warm-up the engine.

↓

Turn ignition switch to OFF.

↓

- Set shift lever to neutral position. (MT vehicles)
- Set selector lever to "P" position. (AT vehicles)

↓

Connect test mode connector.

↓

Turn ignition switch to ON (engine OFF).

↓

Malfunction indicator lamp is turned ON.
- NO → Inspect ECM power supply and ground line, and malfunction indicator lamp line.
- YES ↓

Move selector lever to "N" position. (AT vehicles)

↓

Move selector lever to "P" position. (AT vehicles)

↓

Start the engine.

↓

Trouble code is indicated on malfunction indicator lamp.
- YES → Confirm trouble code.
- NO ↓

Drive at speed greater than 11 km/h (7 MPH) for at least one minute.

↓

Warm-up engine above 2,000 rpm.

↓

OK code is indicated on malfunction indicator lamp.
- NO → Trouble code is indicated on malfunction indicator lamp.
  - NO → Drive at speed greater than 11 km/h (7 MPH) for at least one minute.
  - YES → Confirm trouble code. → Make sequential checks of trouble codes.
- YES ↓

Turn ignition switch to OFF.

↓

Disconnect test mode connector.

↓

Trouble is in a system other than the on-board diagnosis system.

E: CLEAR MEMORY MODE

Start and warm-up the engine.

↓

Turn ignition switch to OFF.

↓

- Set shift lever to neutral position. (MT vehicles)
- Set selector lever to "P" position. (AT vehicles)

↓

Connect test mode connector and read memory connector.

↓

Turn ignition switch to ON (engine OFF).

↓

Malfunction indicator lamp is turned ON.

NO → Inspect ECM power supply and ground line, and malfunction indicator lamp line.

YES ↓

Move selector lever to "N" position. (AT vehicles)

↓

Move selector lever to "P" position. (AT vehicles)

↓

Start the engine.

↓

Drive at speed greater than 11 km/h (7 MPH) for at least one minute.

↓

Warm-up engine above 2,000 rpm.

↓

OK code is indicated on malfunction indicator lamp.

NO → Trouble code is indicated on malfunction indicator lamp.

- NO → Drive at speed greater than 11 km/h (7 MPH) for at least one minute.
- YES ↓ Confirm trouble code.
- ↓ Make sequential checks of trouble codes.
- ↓ After sequential checks, go to D-check mode again.

YES ↓

Turn ignition switch to OFF.

↓

Disconnect test mode connector and read memory connector.

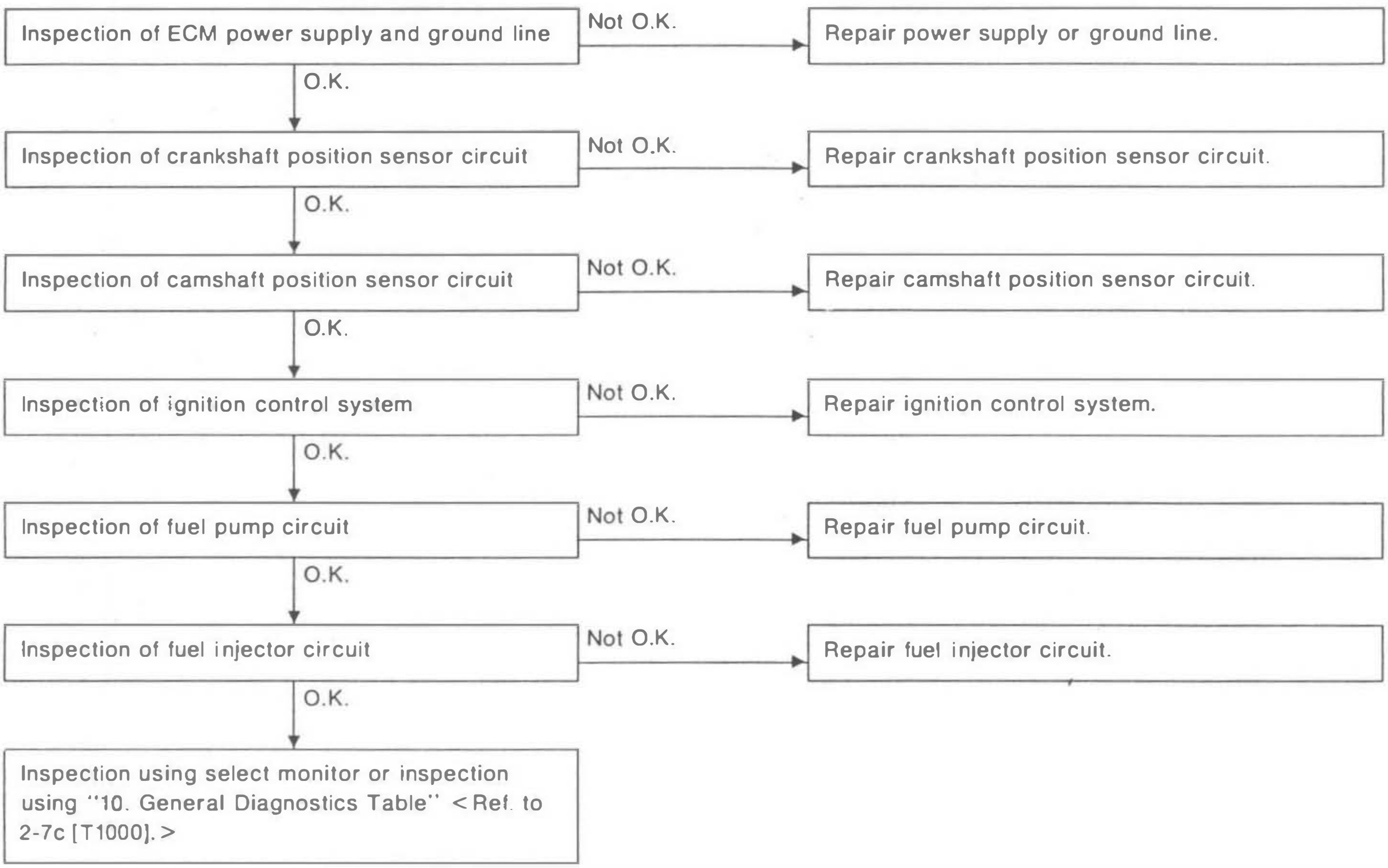
↓

End

7. Diagnostics Chart for Engine Starting Failure

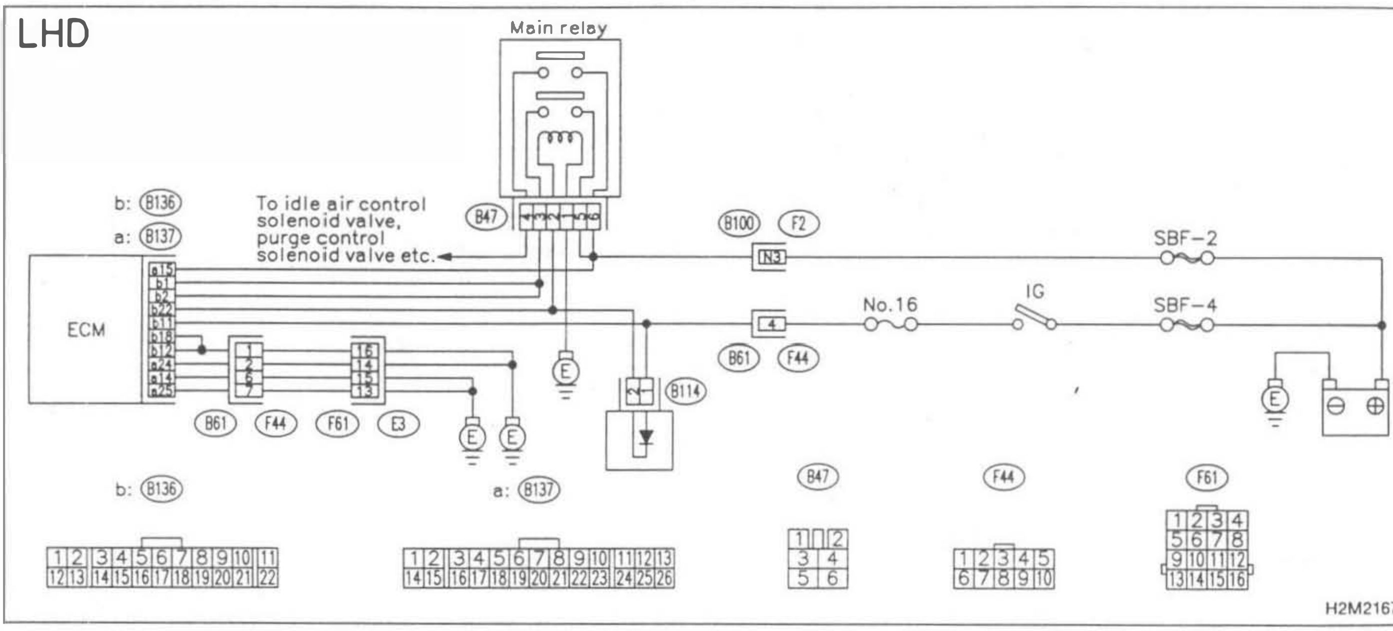
A: BASIC DIAGNOSTICS CHART

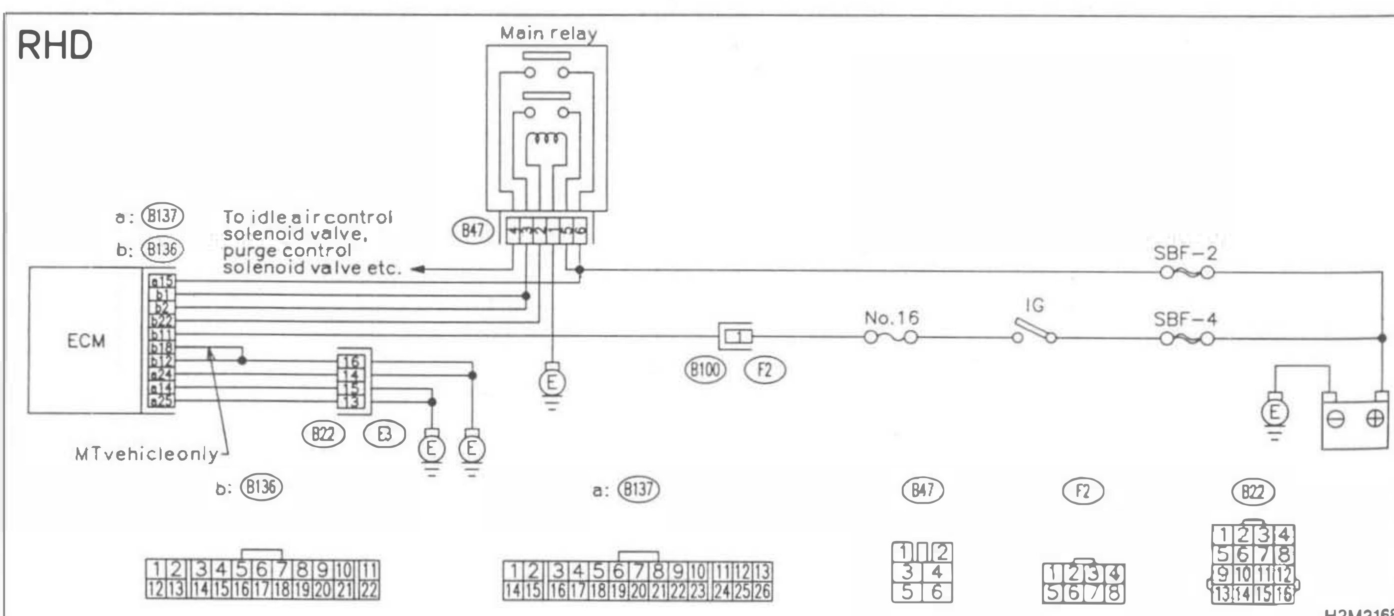
When engine cranks but does not start, perform diagnostics in accordance with the following chart.

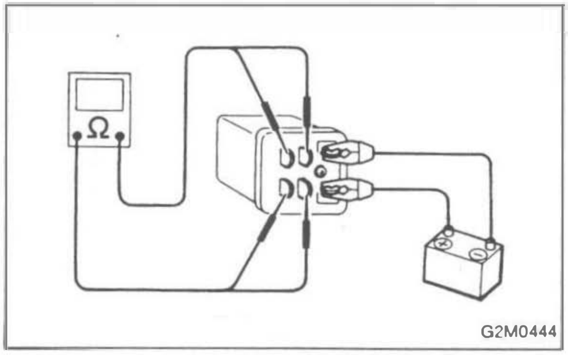


B: CONTROL UNIT POWER SUPPLY AND GROUND LINE

1. **Check main relay.**	Not O.K.	Replace main relay.
O.K. ↓		
2. **Check power supply circuit of ECM.**	Not O.K.	Repair or replace harness connector of power supply circuit.
O.K. ↓		
3. **Check ground circuit of ECM.**	Not O.K.	Repair or replace harness connector of ground circuit.
O.K. ↓		
Check ignition system.		



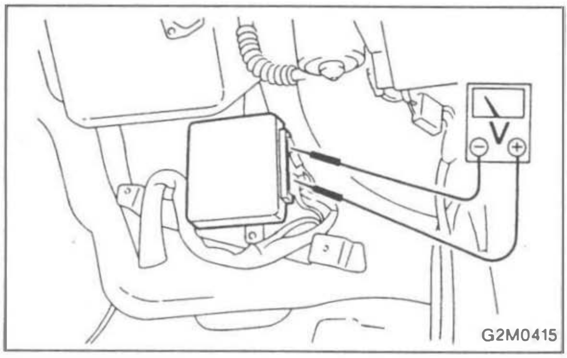




1. CHECK MAIN RELAY.

1) Turn the ignition switch to OFF.
2) Remove main relay.
3) Connect battery to main relay terminals No. 1 and No. 2.
4) Measure resistance between main relay terminals.

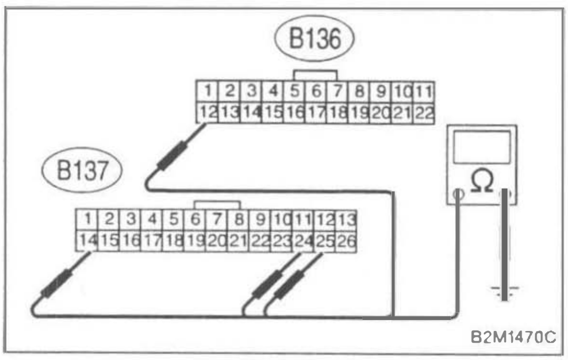
Terminals / Specified resistance:
No. 3 — No. 5 / Less than 10 Ω
No. 4 — No. 6 / Less than 10 Ω



2. CHECK POWER SUPPLY CIRCUIT OF ECM.

1) Install main relay.
2) Turn ignition switch to ON.
3) Measure power supply voltage between ECM connector terminals and body.

Connector & terminal / Specified voltage:
(B136) No. 1 — (B137) No. 14 / More than 10 V
(B136) No. 2 — (B137) No. 14 / More than 10 V
(B136) No. 11 — (B137) No. 14 / More than 10 V



3. CHECK GROUND CIRCUIT OF ECM.

1) Turn ignition switch to OFF.
2) Measure resistance of harness connector between ECM and body.

Connector & terminal / Specified resistance:
(B136) No. 12 — Body / Less than 5 Ω
(B137) No. 14 — Body / Less than 5 Ω
(B137) No. 24 — Body / Less than 5 Ω
(B137) No. 25 — Body / Less than 5 Ω

C: CRANKSHAFT POSITION SENSOR CIRCUIT

1. Check input signal for ECM.
- O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
- Not O.K. → 2.

2. Check harness connector between ECM and crankshaft position sensor.
- Not O.K. → Repair or replace harness connector.
- O.K. → 3.

3. Check crankshaft position sensor.
- Not O.K. → Replace crankshaft position sensor.
- O.K. → Mechanical trouble between crankshaft position sensor and crankshaft sprocket.

NOTE:
Check crankshaft position sensor circuit.
<Ref. to 2-7c [T8B0].>

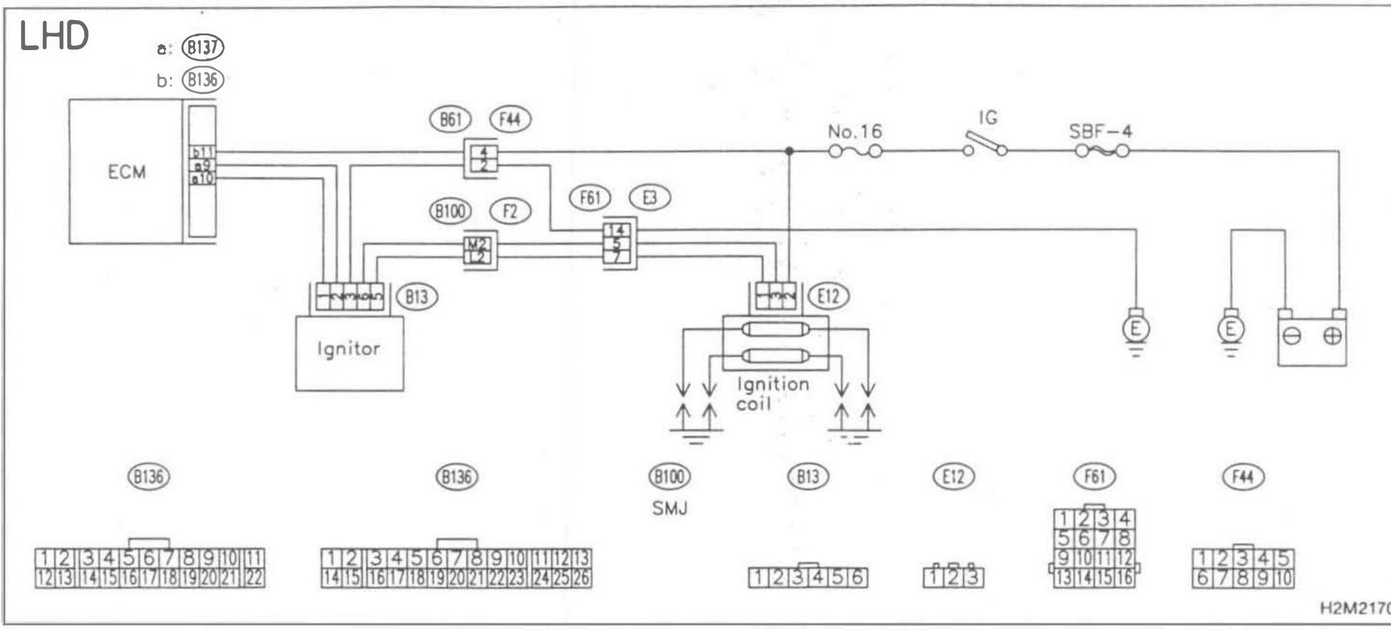
D: CAMSHAFT POSITION SENSOR CIRCUIT

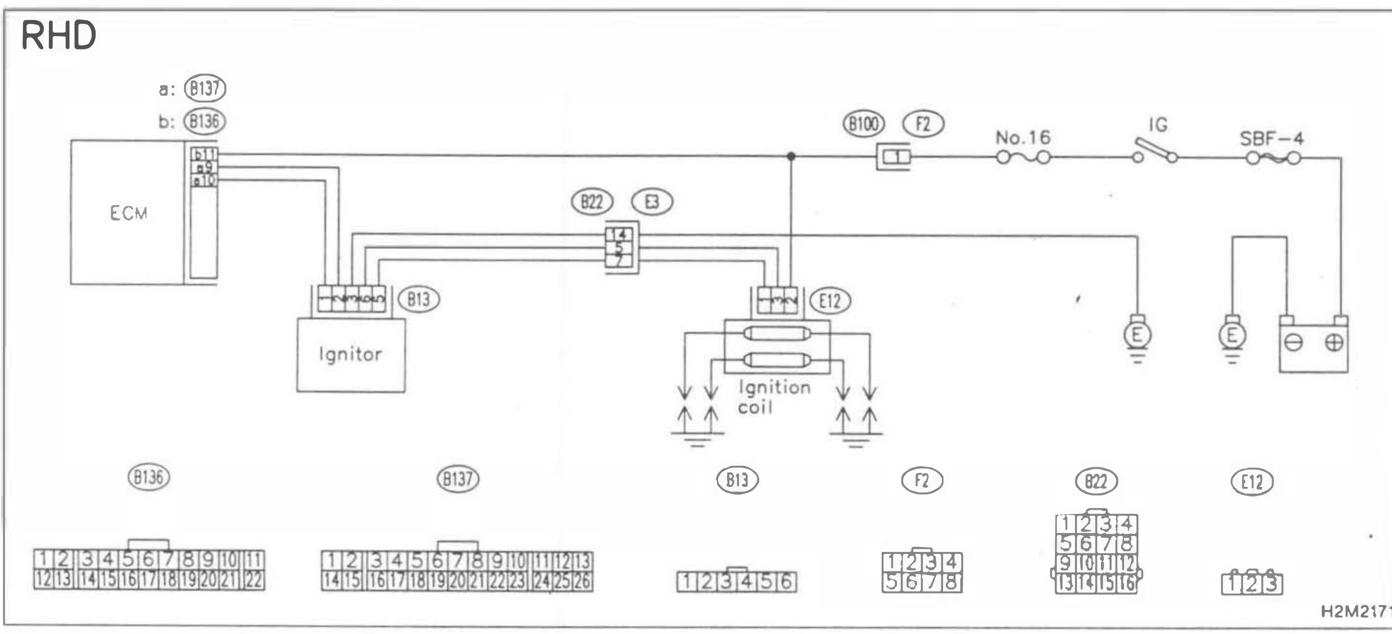
1. **Check input signal for ECM.**
   - O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
   - Not O.K. → go to 2.
2. **Check harness connector between ECM and camshaft position sensor.**
   - Not O.K. → Repair or replace harness connector.
   - O.K. → go to 3.
3. **Check camshaft position sensor.**
   - Not O.K. → Replace camshaft position sensor.
   - O.K. → Mechanism trouble between camshaft position sensor and camshaft sprocket RH.

NOTE:
Check camshaft position sensor circuit.
<Ref. to 2-7c [T8D0].>

E: IGNITION CONTROL SYSTEM

1. Check ignition system for sparks.	O.K.	Check fuel pump system.
	Not O.K.	Go to 2.
2. Check each spark plug cord.	Not O.K.	Replace each spark plug cord.
	O.K.	Go to 3.
3. Check power supply circuit for ignition coil.	Not O.K.	Repair or replace harness connector.
	O.K.	Go to 4.
4. Check ignition coil.	Not O.K.	Replace ignition coil.
	O.K.	Go to 5.
5. Check harness connector between ignitor and ignition coil.	Not O.K.	Repair or replace harness connector.
	O.K.	Go to 6.
6. Check input signal for ignitor.	Not O.K.	Replace ignitor.
	O.K.	Go to 7.
7. Check harness connector of ignitor ground circuit.	Not O.K.	Repair or replace harness connector.
	O.K.	Go to 8.
8. Check harness connector between ECM and ignitor.	Not O.K.	Repair or replace harness connector.
	O.K.	Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>


LHD
a: B137
b: B136
ECM
b11
a9
a10
B61
F44
No.16
IG
SBF-4
B100
F2
F61
E3
B13
Ignitor
E12
Ignition coil
E
B136
B136
B100
SMJ
B13
E12
F61
F44
H2M2170


RHD
a: B137
b: B136
ECM
b11
a9
a10
B100
F2
No.16
IG
SBF-4
B22
E3
B13
Ignitor
E12
Ignition coil
E
B136
B137
B13
F2
B22
E12
H2M2171

1. CHECK IGNITION SYSTEM FOR SPARKS.

1) Remove plug cord cap from each spark plug.
2) Install new spark plug on plug cord cap.

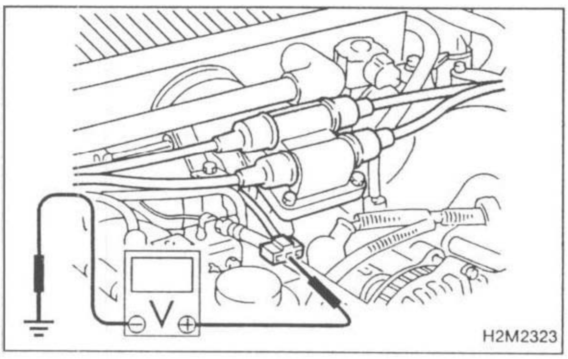
CAUTION:
Do not remove spark plug from engine.

3) Contact spark plug's thread portion on engine.
4) While opening throttle valve fully, crank engine to check that spark occurs at each cylinder.

2. CHECK EACH SPARK PLUG CORD.

1) Remove each spark plug cord.
2) Measure resistance of each spark plug cord.

	Resistance value: kΩ
#1 cord	7.40 — 17.27
#2 cord	6.24 — 14.56
#3 cord	6.54 — 15.25
#4 cord	6.59 — 15.37



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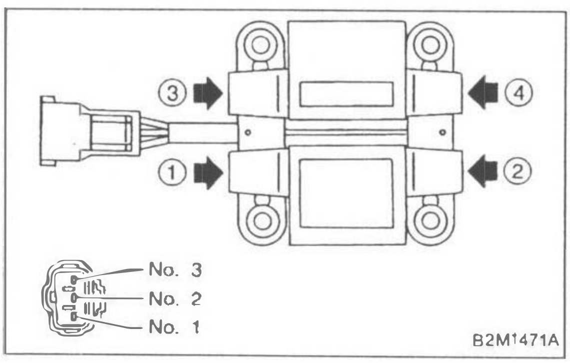
3. CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL.

1) Turn ignition switch to OFF.
2) Disconnect connector from ignition coil.
3) Turn ignition switch to ON.
4) Measure power supply voltage between ignition coil connector terminal and body.

Connector & terminal / Specified voltage:
(E12) No. 2 — Body / More than 10 V



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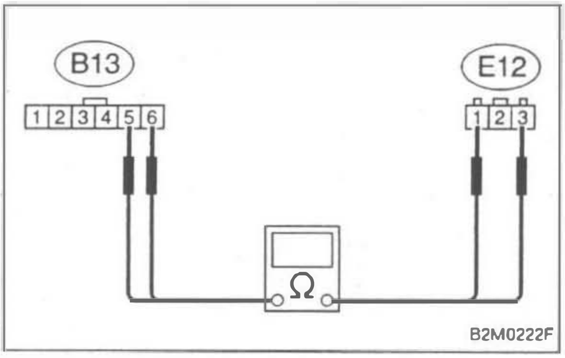
4. CHECK IGNITION COIL.

1) Measure resistance between ignition coil terminals to check primary coil.

Terminals / Specified resistance:
No. 2 — No. 1 / About 1 Ω
No. 2 — No. 3 / About 1 Ω

2) Measure resistance between spark plug cord contact portions to check secondary coil.

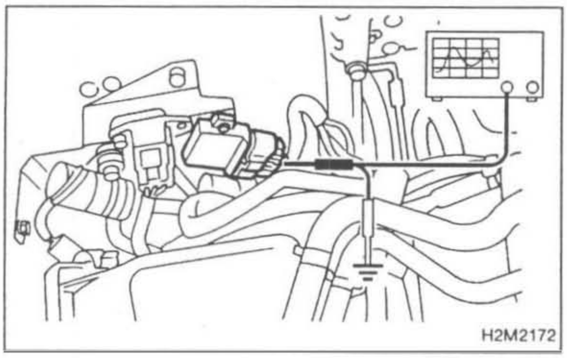
Connector & terminal / Specified resistance:
① — ② / 21±3 kΩ
③ — ④ / 21±3 kΩ



5. CHECK HARNESS CONNECTOR BETWEEN IGNITOR AND IGNITION COIL.

1) Turn ignition switch to OFF.
2) Disconnect connector from ignitor.
3) Measure resistance of harness connector between ignition coil and ignitor.

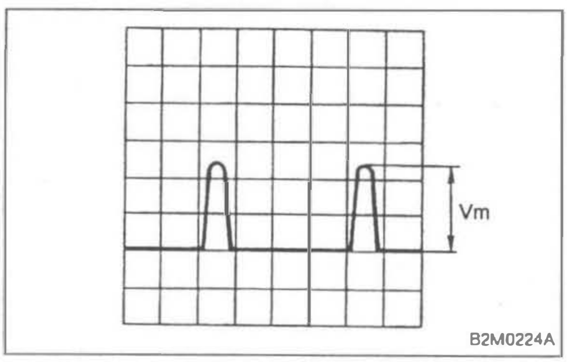
Connector & terminal / Specified resistance:
(B13) No. 5 — (E12) No. 1 / Less than 1 Ω
(B13) No. 6 — (E12) No. 3 / Less than 1 Ω



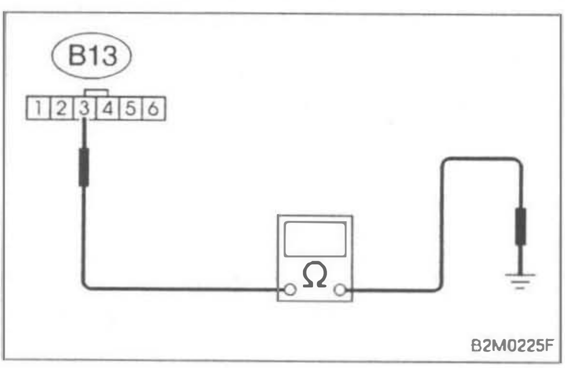
6. CHECK INPUT SIGNAL FOR IGNITOR.

Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignitor connector and body.

Connector & terminal
(B13) No. 1 — Body
(B13) No. 2 — Body



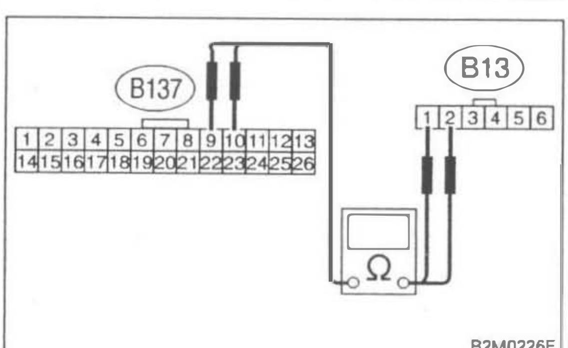
Specified voltage: More than 10 V



7. CHECK HARNESS CONNECTOR OF IGNITOR GROUND CIRCUIT.

1) Turn ignition switch to OFF.
2) Measure resistance between ignitor and body.

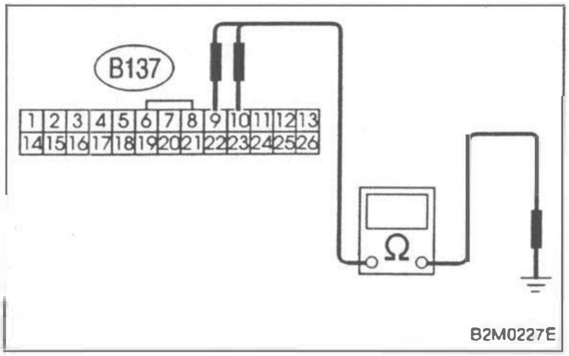
Connector & terminal / Specified resistance:
(B13) No. 3 — Body / Less than 1 Ω



8. CHECK HARNESS CONNECTOR BETWEEN ECM AND IGNITOR.

1) Disconnect connector from ECM.
2) Measure resistance of harness connector between ECM and ignitor.

Connector & terminal / Specified resistance:
(B137) No. 10 — (B13) No. 1 / Less than 1 Ω
(B137) No. 9 — (B13) No. 2 / Less than 1 Ω



3) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

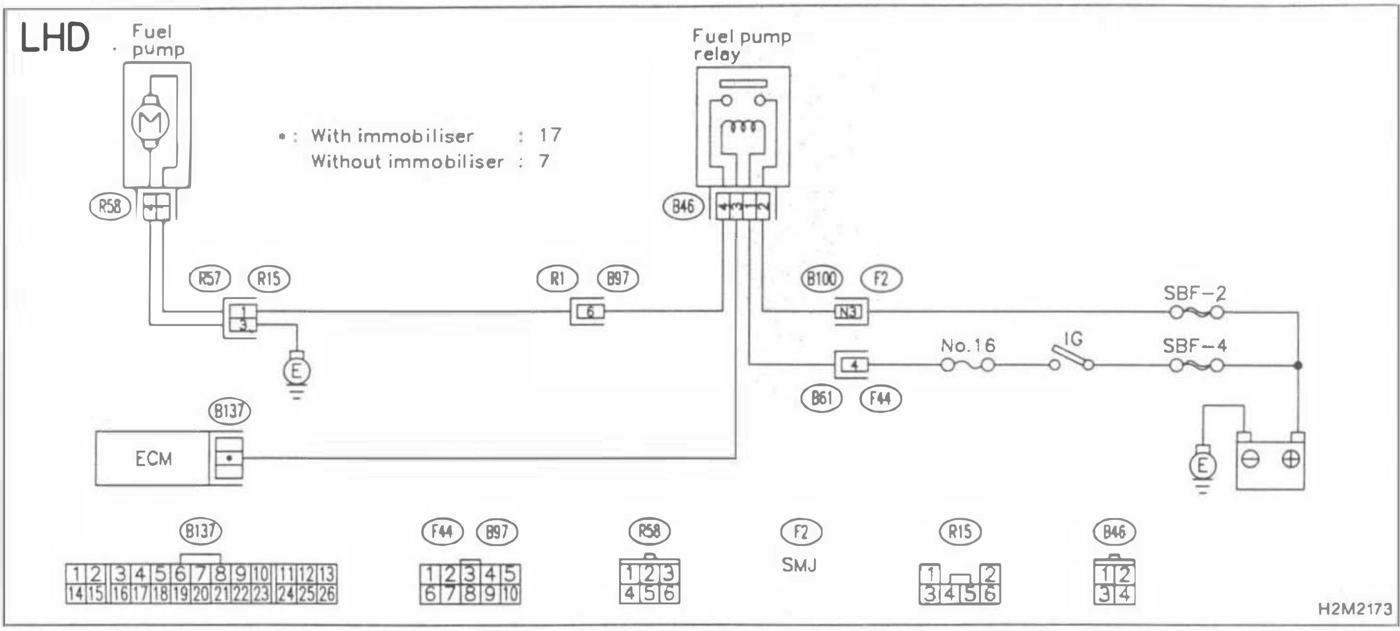
Connector & terminal / Specified resistance:

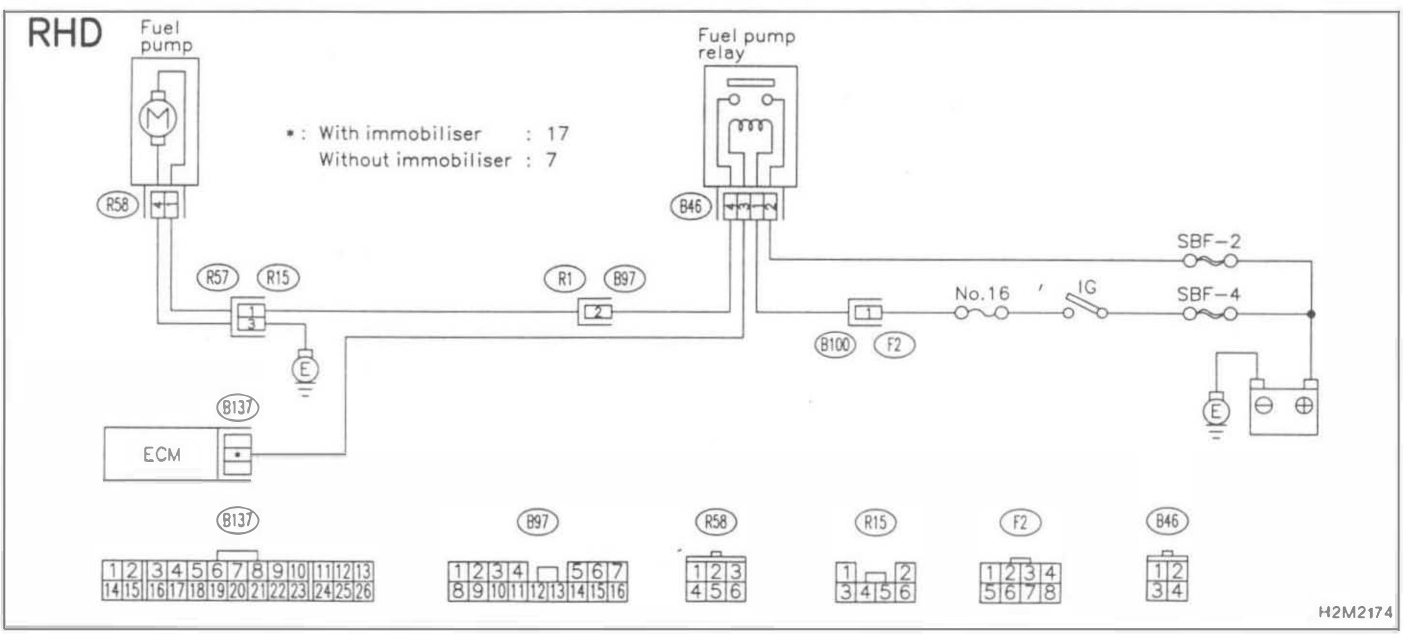
(B137) No. 10 — Body / More than 1 MΩ

(B137) No. 9 — Body / More than 1 MΩ

F: FUEL PUMP CIRCUIT

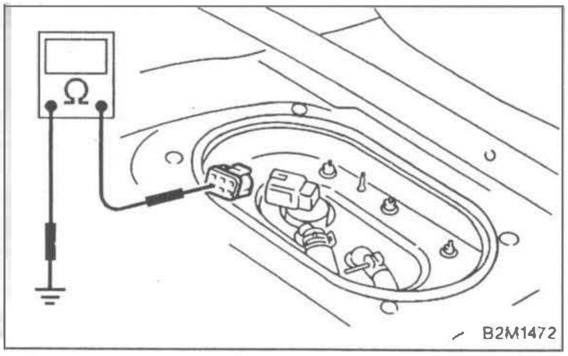
1. Check operating sound of fuel pump.	O.K.	Fuel injector circuit.
	Not O.K.	Go to step 2.
2. Check ground circuit of fuel pump.	Not O.K.	Repair or replace harness connector.
	O.K.	Go to step 3.
3. Check power supply to fuel pump.	O.K.	Replace fuel pump.
	Not O.K.	Go to step 4.
4. Check harness connector between fuel pump and fuel pump relay.	Not O.K.	Repair or replace harness connector.
	O.K.	Go to step 5.
5. Check fuel pump relay.	Not O.K.	Replace fuel pump relay.
	O.K.	Go to step 6.
6. Check harness connector between ECM and fuel pump relay.	Not O.K.	Repair or replace harness connector.
	O.K.	Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>


LHD
Fuel pump
Fuel pump relay
*: With immobiliser : 17
Without immobiliser : 7
R58
B46
R57
R15
R1
B97
B100
F2
SBF−2
No.16
IG
SBF−4
B61
F44
B137
ECM
SMJ
H2M2173


RHD
Fuel pump
Fuel pump relay
*: With immobiliser : 17
Without immobiliser : 7
R58
B46
SBF−2
R57
R15
R1
B97
No.16
IG
SBF−4
B100
F2
B137
ECM
H2M2174

1. CHECK OPERATING SOUND OF FUEL PUMP.

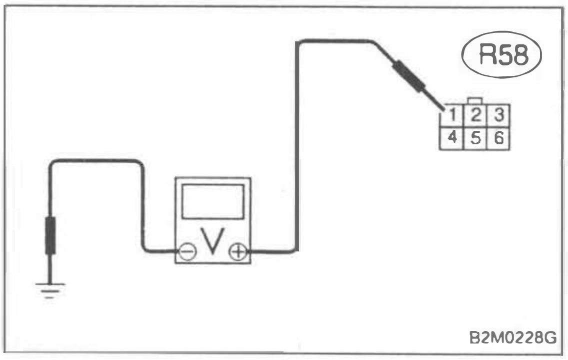
Make sure that fuel pump is in operation for two seconds when turning ignition switch to ON.



2. CHECK GROUND CIRCUIT OF FUEL PUMP.

1) Turn ignition switch to OFF.
2) Disconnect connector from fuel pump.
3) Measure resistance of harness connector between fuel pump and body.

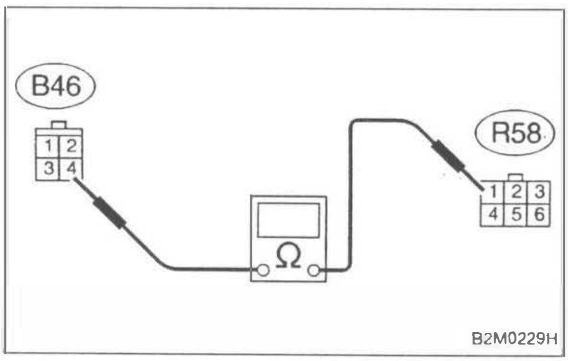
Connector & terminal / Specified resistance:
(R58) No. 4 — Body / Less than 5 Ω



3. CHECK POWER SUPPLY TO FUEL PUMP.

1) Turn ignition switch to ON.
2) Measure voltage of power supply circuit between fuel pump connector and body.

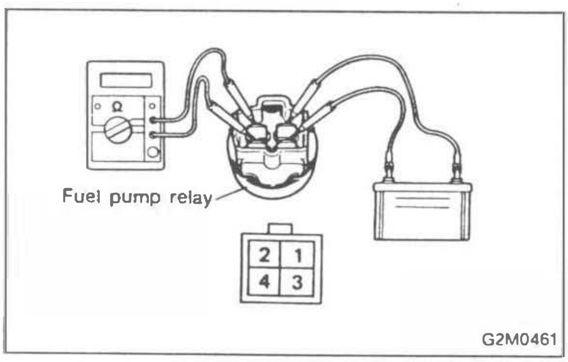
Connector & terminal / Specified voltage:
(R58) No. 1 — Body / More than 10 V



4. CHECK HARNESS CONNECTOR BETWEEN FUEL PUMP AND FUEL PUMP RELAY.

1) Turn ignition switch to OFF.
2) Measure resistance of harness connector between fuel pump and fuel pump relay.

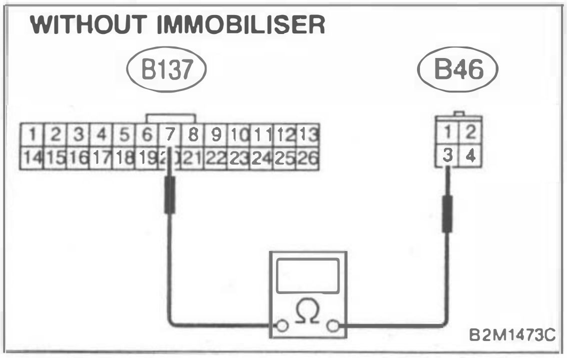
Connector & terminal / Specified resistance:
(R58) No. 1 — (B46) No. 4 / Less than 1 Ω



5. CHECK FUEL PUMP RELAY.

1) Disconnect connectors from fuel pump relay and main relay.
2) Remove fuel pump relay and main relay with bracket.
3) Connect battery to fuel pump relay connector terminals No. 1 and No. 3.
4) Measure resistance between connector terminals of fuel pump relay.

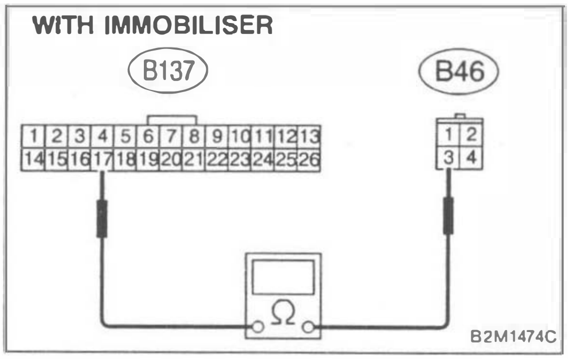
Terminals / Specified resistance:
No. 2 — No. 4 / Less than 1 Ω



6. CHECK HARNESS CONNECTOR BETWEEN ECM AND FUEL PUMP RELAY.

1) Disconnect connectors from ECM.
2) Measure resistance of harness connector between ECM and fuel pump relay.

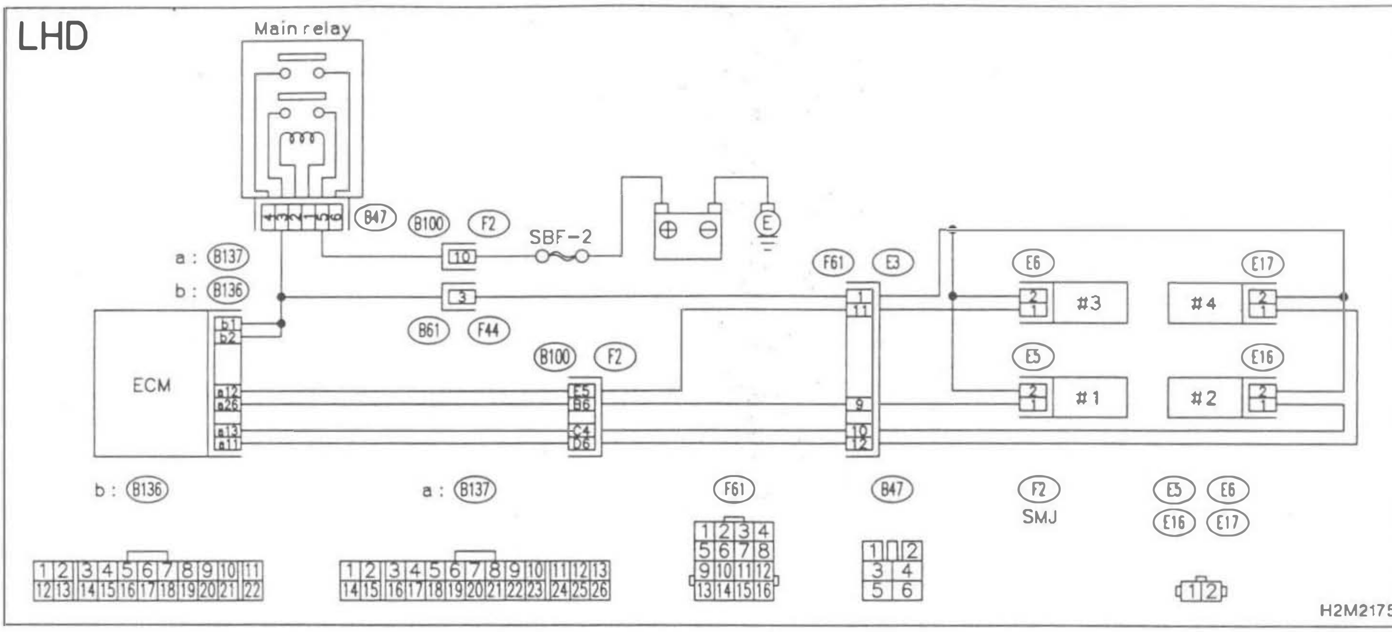
Connector & terminal / Specified resistance:
Without immobiliser:
(B137) No. 7 — (B46) No. 3 / Less than 1 Ω

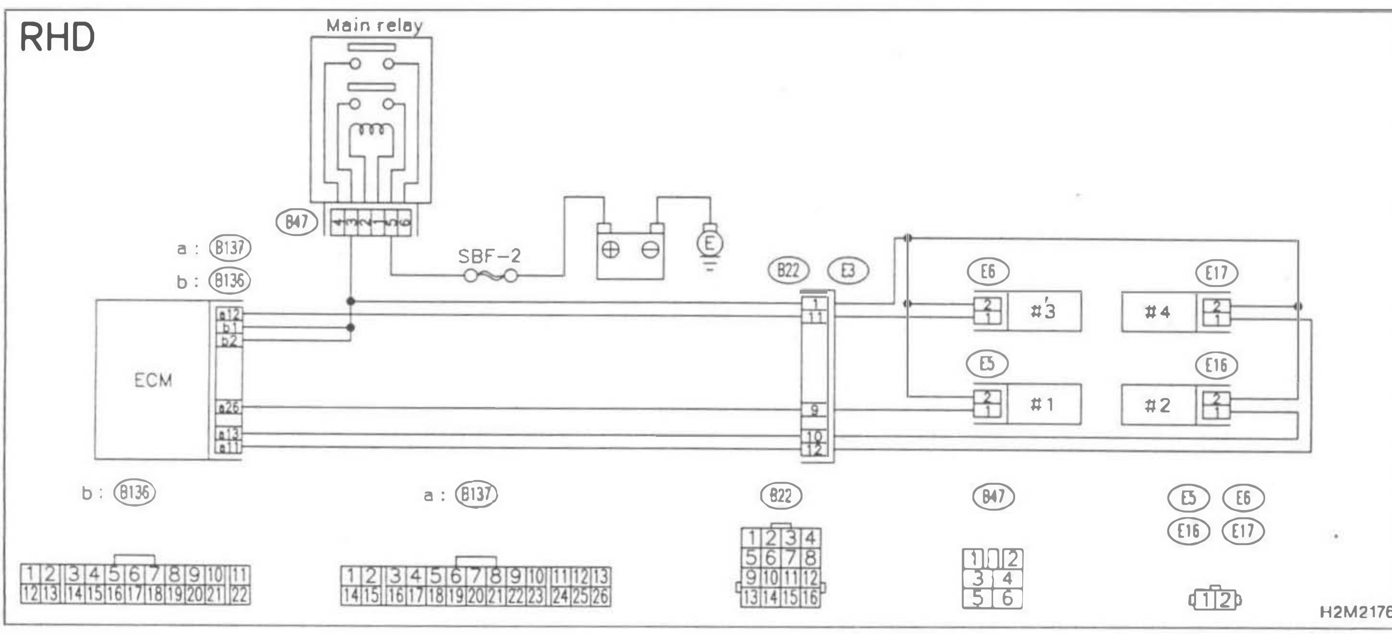


Connector & terminal / Specified resistance:
With immobiliser:
(B137) No. 17 — (B46) No. 3 / Less than 1 Ω

G: FUEL INJECTOR CIRCUIT

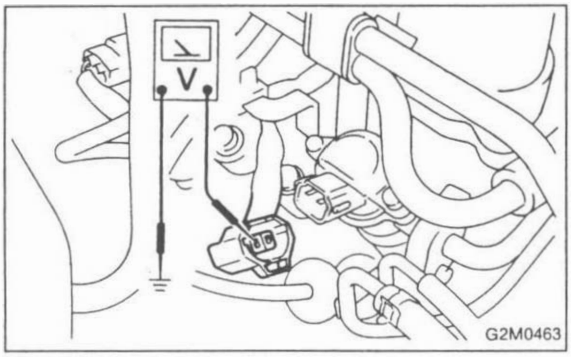
1. **Check operation of each fuel injector.**
   - O.K. → Check fuel pressure. <Ref. to 2-8 [W2A0].>
   - Not O.K. → Go to 2.
2. **Check power supply to fuel injector.**
   - Not O.K. → Repair or replace harness connector.
   - O.K. → Go to 3.
3. **Check each fuel injector.**
   - Not O.K. → Replace fuel injectors.
   - O.K. → Go to 4.
4. **Check harness connector between ECM and each fuel injector.**
   - Not O.K. → Repair or replace harness connector.
   - O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>


LHD
Main relay
B47
B100
F2
SBF-2
E
a : B137
b : B136
10
3
B61
F44
F61
E3
E6
E17
#3
#4
ECM
B100
F2
E5
E16
#1
#2
b : B136
a : B137
F61
B47
F2
SMJ
E5
E6
E16
E17
H2M2175


RHD
Main relay
B47
a : B137
b : B136
SBF-2
E
B22
E3
E6
E17
#3
#4
ECM
E5
E16
#1
#2
b : B136
a : B137
B22
B47
E5
E6
E16
E17
H2M2176

1. CHECK OPERATION OF EACH FUEL INJECTOR.

While cranking the engine, check that each fuel injector emits "operating" sound. Use a sound scope or attach a screwdriver to injector for this check.

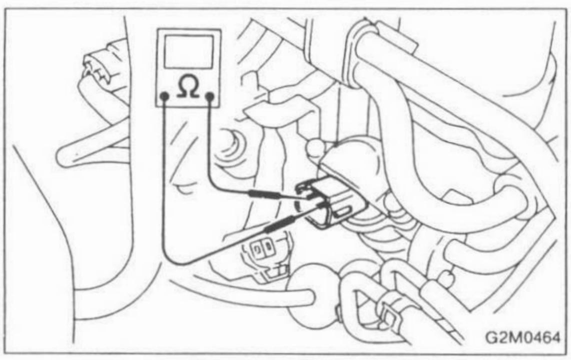


G2M0463

2. CHECK POWER SUPPLY TO FUEL INJECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from each injector.
3) Turn ignition switch to ON.
4) Measure voltage between each fuel injector connector terminal and body.

Connector & terminal / Specified voltage:
#1 (E5) No. 2 — Body / More than 10 V
#2 (E16) No. 2 — Body / More than 10 V
#3 (E6) No. 2 — Body / More than 10 V
#4 (E17) No. 2 — Body / More than 10 V

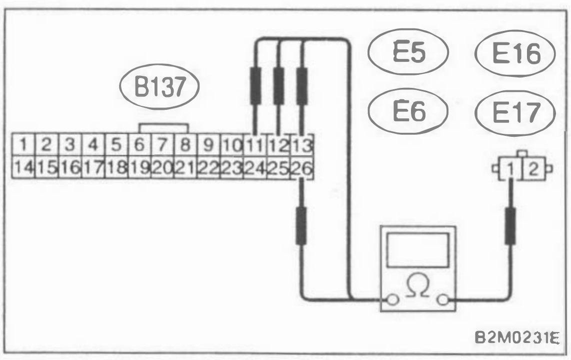


G2M0464

3. CHECK EACH FUEL INJECTOR.

Measure resistance between fuel injector terminals.

Terminals / Specified resistance:
No. 1 — No. 2 / 11.5±0.5 Ω



B2M0231E

4. CHECK HARNESS CONNECTOR BETWEEN ECM AND EACH FUEL INJECTOR.

1) Disconnect connector from ECM.
2) Measure resistance of harness connector between ECM and each fuel injector.

Connector & terminal / Specified resistance:
(B137) No. 26 — (E5) No. 1 / Less than 1 Ω
(B137) No. 13 — (E16) No. 1 / Less than 1 Ω
(B137) No. 12 — (E6) No. 1 / Less than 1 Ω
(B137) No. 11 — (E17) No. 1 / Less than 1 Ω

8. Diagnostics Chart with Trouble Code

A: TROUBLE CODE

Trouble code	Item	Contents of diagnosis	Page
11	Crankshaft position sensor	● No signal entered from crankshaft position sensor when starter switch is ON. ● The harness connector between ECM and crankshaft position sensor is in short or open.	40
12	Starter switch	● The starter switch signal is abnormal. ● The harness connector between ECM and starter switch is in short or open.	44
13	Camshaft position sensor	● No signal entered from camshaft position sensor, but signal entered from crankshaft position sensor. ● The harness connector between ECM and camshaft position sensor is in short or open.	48
21	Engine coolant temperature sensor	● The engine coolant temperature sensor signal is abnormal. ● The harness connector between ECM and engine coolant temperature sensor is in short or open.	52
22	Knock sensor	● The knock sensor signal is abnormal. ● The harness connector between ECM and knock sensor is in short or open.	56
23	Mass air flow sensor	● The mass air flow sensor signal is abnormal. ● The harness connector between ECM and mass air flow sensor is in short or open.	60
24	Idle air control solenoid valve	● The idle air control solenoid valve is not in function. ● The harness connector between ECM and idle air control solenoid valve is in short or open.	64
31	Throttle position sensor	● The throttle position sensor signal is abnormal. ● The throttle position sensor is installed abnormally. ● The harness connector between ECM and throttle position sensor is in short or open.	66
32	Oxygen sensor	● The oxygen sensor is not in function. ● The harness connector between ECM and oxygen sensor is in short or open.	70
33	Vehicle speed sensor 2	● The vehicle speed sensor 2 is not in function. ● The harness connector between ECM and vehicle speed sensor 2 is in short or open.	74
38	Torque control signal (AT)	● Abnormal signal is entered from TCM. ● The harness connector between ECM and TCM is in short or open.	78
44	Wastegate control solenoid valve	● The wastegate control solenoid valve is not in function. ● The harness connector between ECM and wastegate control solenoid valve is in short or open.	80
45	● Pressure sensor ● Pressure sources switching solenoid valve	● The pressure sensor signal is abnormal. ● The pressure sources switching solenoid valve is not in function. ● The intake manifold pressure is not transmitted to pressure sensor. ● The harness connector between ECM and pressure sensor, and pressure sources switching solenoid valve is in short or open.	82
51	Neutral position switch (MT)	● The neutral position switch signal is abnormal. ● The harness connector between ECM and neutral position switch is in short or open.	86
	Park/Neutral position switch (AT)	● The park/neutral position switch signal is abnormal. ● The shift cable is connected abnormally. ● The harness connector between ECM and inhibitor switch is in short or open.	88
53*	Immobiliser system	Faulty immobiliser system. <Ref. to 6-2b [T100].>	—

*: Immobiliser system equipped model only

B: TROUBLE CODE (11)
— CRANKSHAFT POSITION SENSOR —

DIAGNOSIS:

- No signal entered from crankshaft position sensor when starter switch is ON.
- The harness connector between ECM and crankshaft position sensor is in short or open.

TROUBLE SYMPTOM:

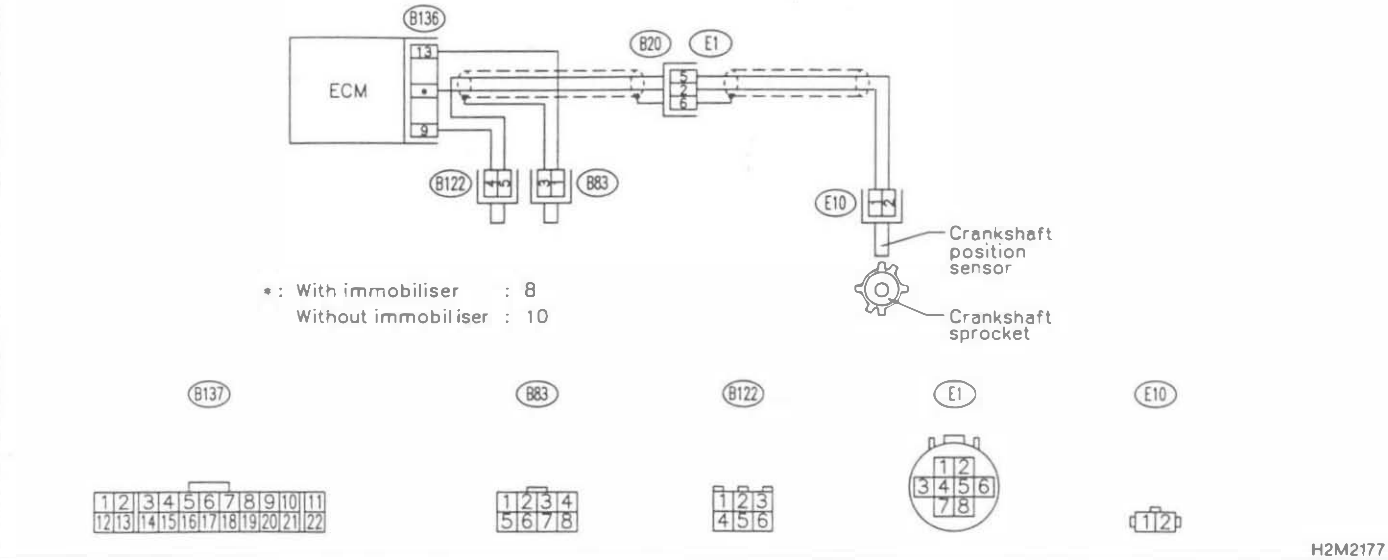
- Engine stalls.
- Restarting impossible

1. Check input signal for ECM.
- O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
- Not O.K. → 2.

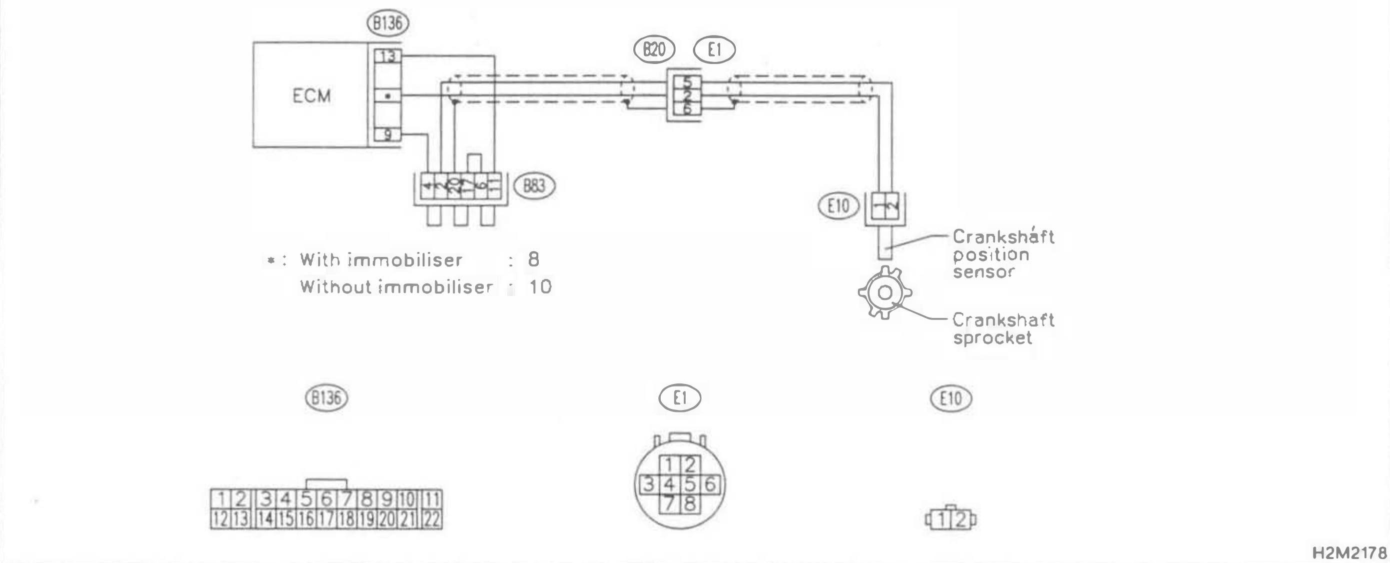
2. Check harness connector between ECM and crankshaft position sensor.
- Not O.K. → Repair or replace harness connector.
- O.K. → 3.

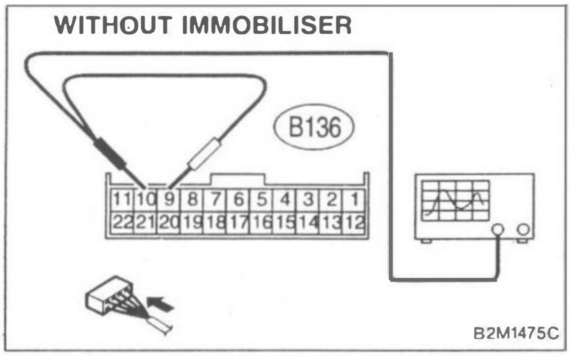
3. Check crankshaft position sensor.
- Not O.K. → Replace crankshaft position sensor.
- O.K. → Mechanical trouble between crankshaft position sensor and crankshaft sprocket.

LHD


B136
B20
E1
ECM
13
9
5
2
6
B122
B83
E10
Crankshaft position sensor
Crankshaft sprocket
*: With immobiliser : 8
Without immobiliser : 10
B137
B83
B122
E1
E10
H2M2177

RHD

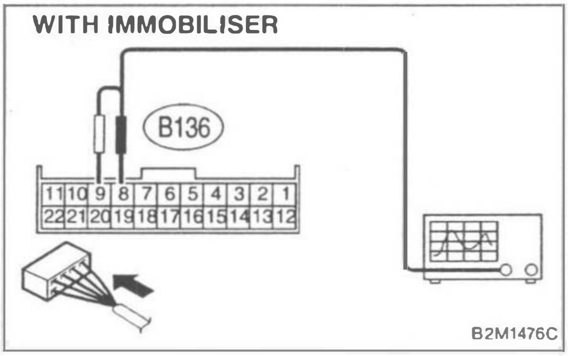

B136
B20
E1
ECM
13
9
5
2
6
B83
E10
Crankshaft position sensor
Crankshaft sprocket
*: With immobiliser : 8
Without immobiliser : 10
B136
E1
E10
H2M2178



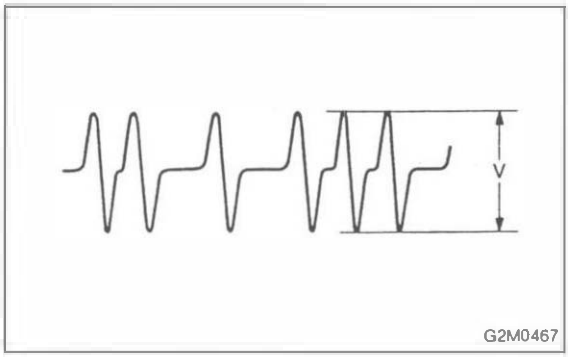
1. CHECK INPUT SIGNAL FOR ECM.

1) Set the positive (+) probe and earth lead of oscilloscope at ECM connector terminals.

Connector & terminal:
Without immobiliser:
Positive probe; (B136) No. 10
Earth lead; (B136) No. 9

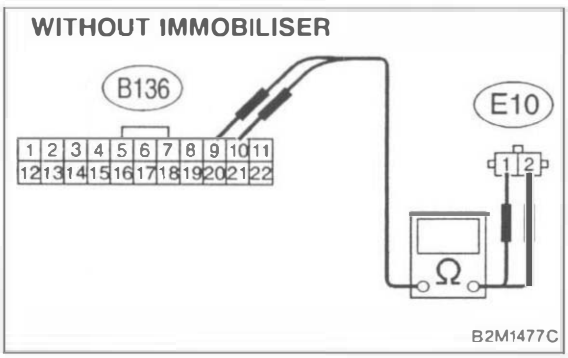


Connector & terminal:
With immobiliser:
Positive probe; (B136) No. 8
Earth lead; (B136) No. 9



2) Measure signal voltage indicated on oscilloscope while cranking the engine.

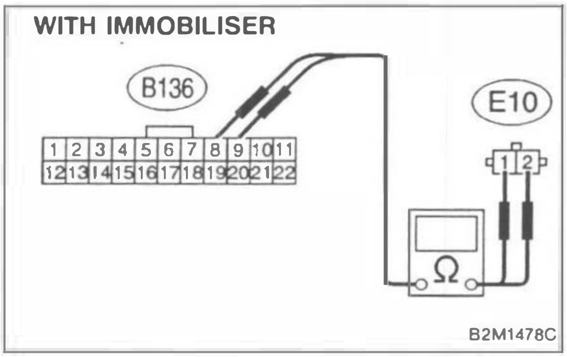
Specified voltage: More than 400 mV



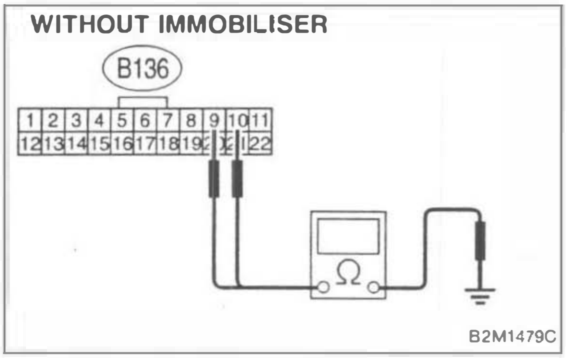
2. CHECK HARNESS CONNECTOR BETWEEN ECM AND CRANKSHAFT POSITION SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and crankshaft position sensor.
3) Measure resistance of harness connector between ECM and crankshaft position sensor.

Connector & terminal / Specified resistance:
Without immobiliser:
(B136) No. 10 — (E10) No. 1 / Less than 1 Ω
(B136) No. 9 — (E10) No. 2 / Less than 1 Ω

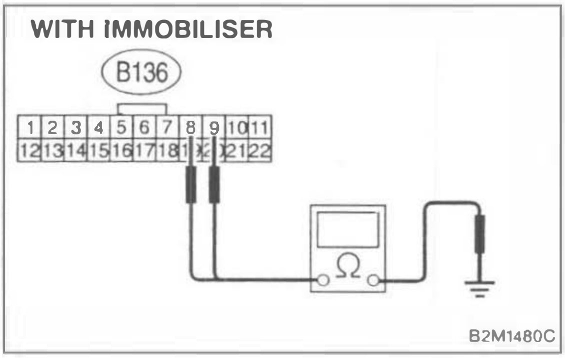


Connector & terminal / Specified resistance:
With immobiliser:
(B136) No. 8 — (E10) No. 1 / Less than 1 Ω
(B136) No. 9 — (E10) No. 2 / Less than 1 Ω

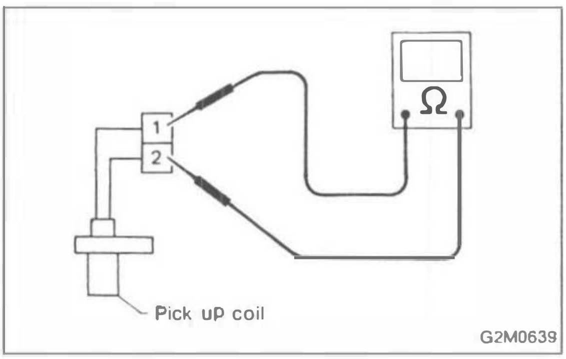


4) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
Without immobiliser:
(B136) No. 10 — Body / More than 1 MΩ
(B136) No. 9 — Body / More than 1 MΩ



Connector & terminal / Specified resistance:
With immobiliser:
(B136) No. 8 — Body / More than 1 MΩ
(B136) No. 9 — Body / More than 1 MΩ



3. CHECK CRANKSHAFT POSITION SENSOR.

1) Remove crankshaft position sensor.
2) Measure resistance between connector terminals of crankshaft position sensor.

Terminals / Specified resistance:
No. 1 — No. 2 / 2,040 ± 200 Ω

C: TROUBLE CODE (12) — STARTER SWITCH —

DIAGNOSIS:

- The starter switch signal is abnormal.
- The harness connector between ECM and starter switch is in short or open.

TROUBLE SYMPTOM:

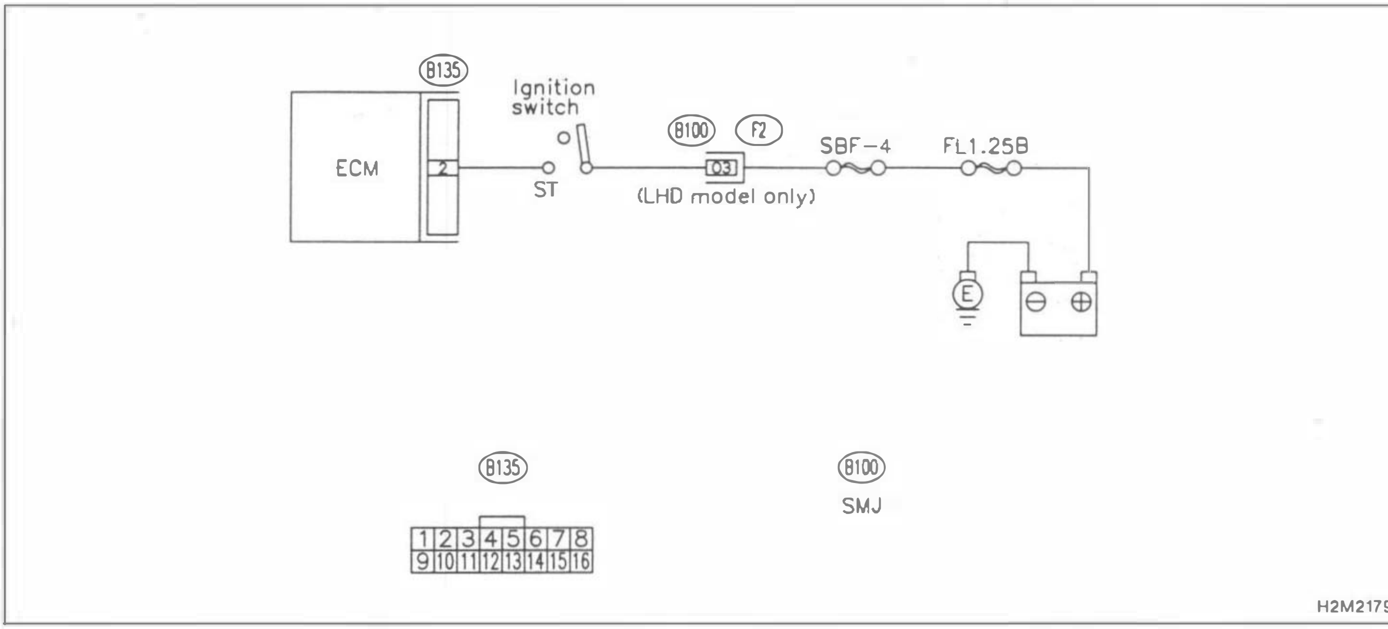
- Failure of engine to start.

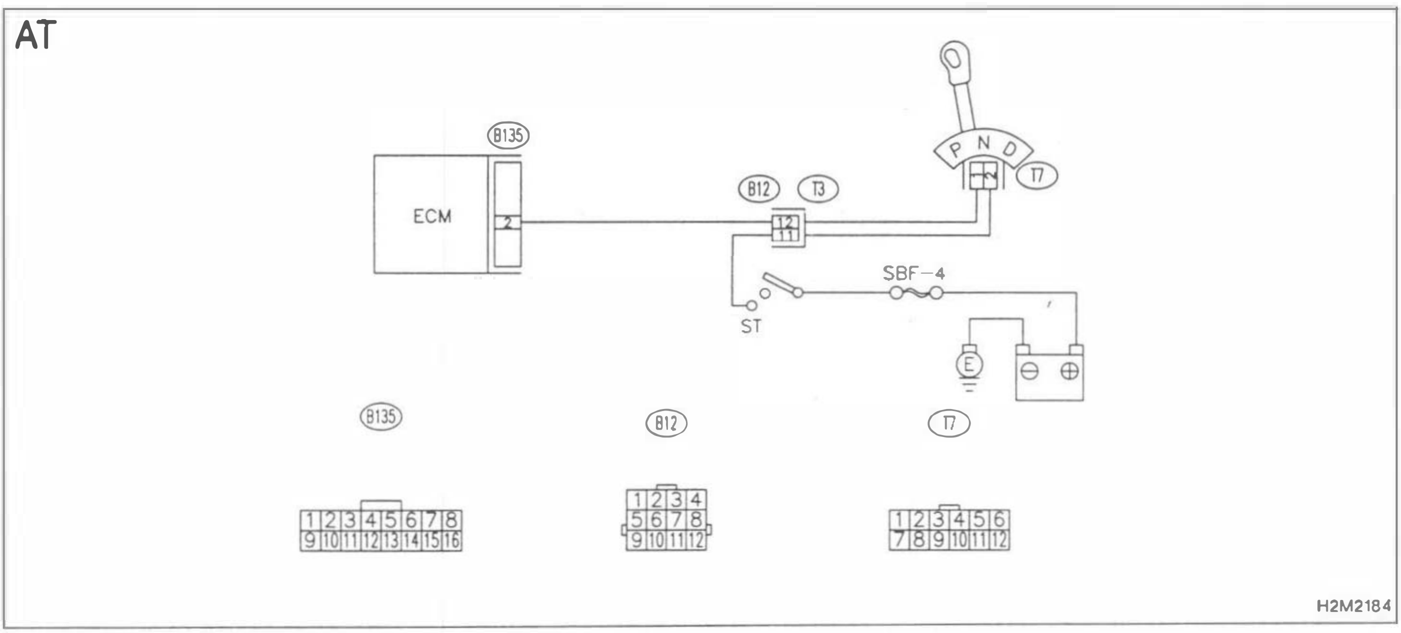
1. Check operation of starter motor.
- Not O.K. → Repair starter motor circuit or replace starter motor.
- O.K. ↓

2. Check input signal for ECM.
- O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
- Not O.K. ↓

3. Check harness connector between ECM and ignition switch.
- Not O.K. → Repair or replace harness connector.
- O.K. ↓

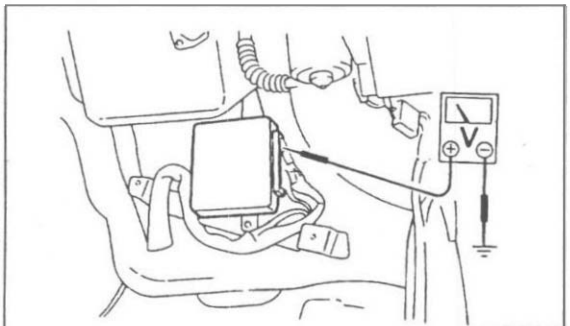
Repair or replace ignition key switch.
<Ref. to 6-2 [W8C0].>


B135
Ignition switch
ECM
2
ST
B100
F2
03
(LHD model only)
SBF−4
FL1.25B
E
B135
B100
SMJ
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
H2M2179


AT
B135
ECM
2
B12
T3
12
11
P N D
T7
SBF−4
ST
E
B135
B12
T7
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
1 2 3 4
5 6 7 8
9 10 11 12
1 2 3 4 5 6
7 8 9 10 11 12
H2M2184

1. CHECK OPERATION OF STARTER MOTOR.

Turn ignition switch to "ST" to ensure that starter motor functions.

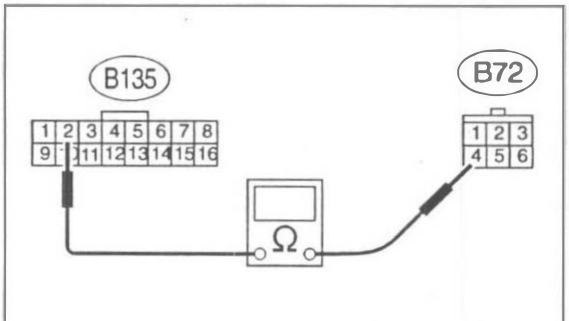


B2M0220

2. CHECK INPUT SIGNAL FOR ECM.

Measure voltage between ECM and body while cranking the engine.

Connector & terminal / Specified voltage:
(B135) No. 2 — Body / More than 9 V

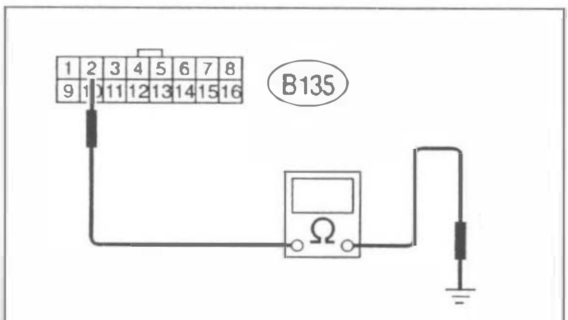


B2M1485C

3. CHECK HARNESS CONNECTOR BETWEEN ECM AND IGNITION SWITCH.

1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and ignition switch.
3) Measure resistance of harness connector between ECM and ignition switch.

Connector & terminal / Specified resistance:
(B135) No. 2 — (B72) No. 4 / Less than 1 Ω



B2M1486C

4) Measure resistance of harness connector between starter motor and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B135) No. 2 — Body / More than 1 MΩ

D: TROUBLE CODE (13)
— CAMSHAFT POSITION SENSOR —

DIAGNOSIS:

- No signal entered from camshaft position sensor, but signal entered from crankshaft position sensor.
- The harness connector between ECM and camshaft position sensor is in short or open.

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start.

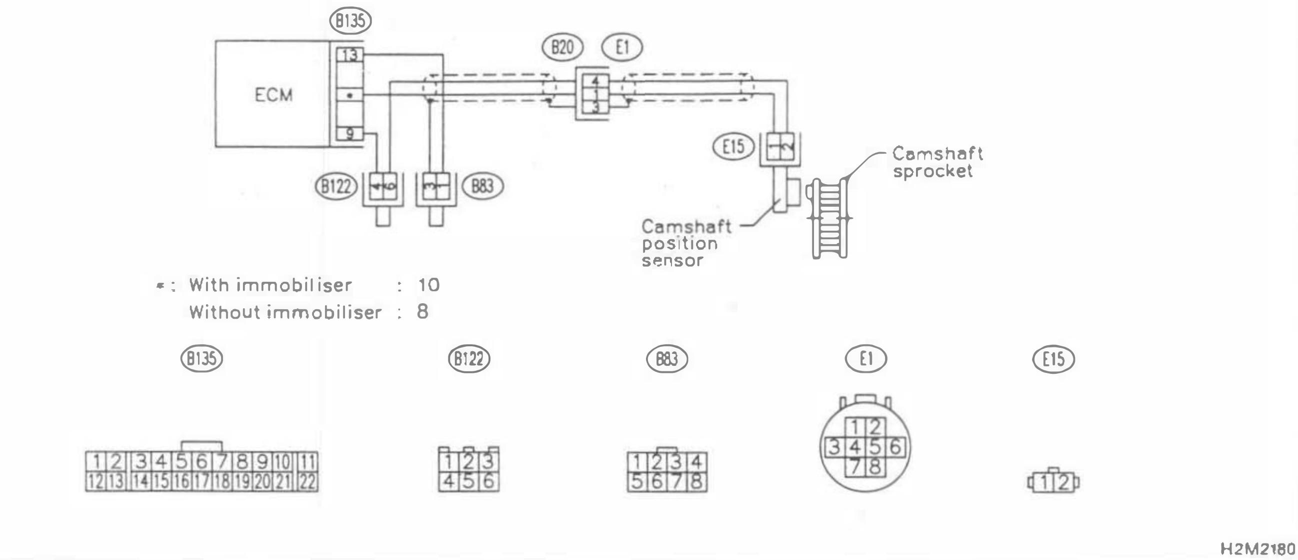
1. Check input signal for ECM.
- O.K. → Check poor contact in ECM connectors. < Ref. to FOREWORD [T3C1]. >
- Not O.K. ↓

2. Check harness connector between ECM and camshaft position sensor.
- Not O.K. → Repair or replace harness connector.
- O.K. ↓

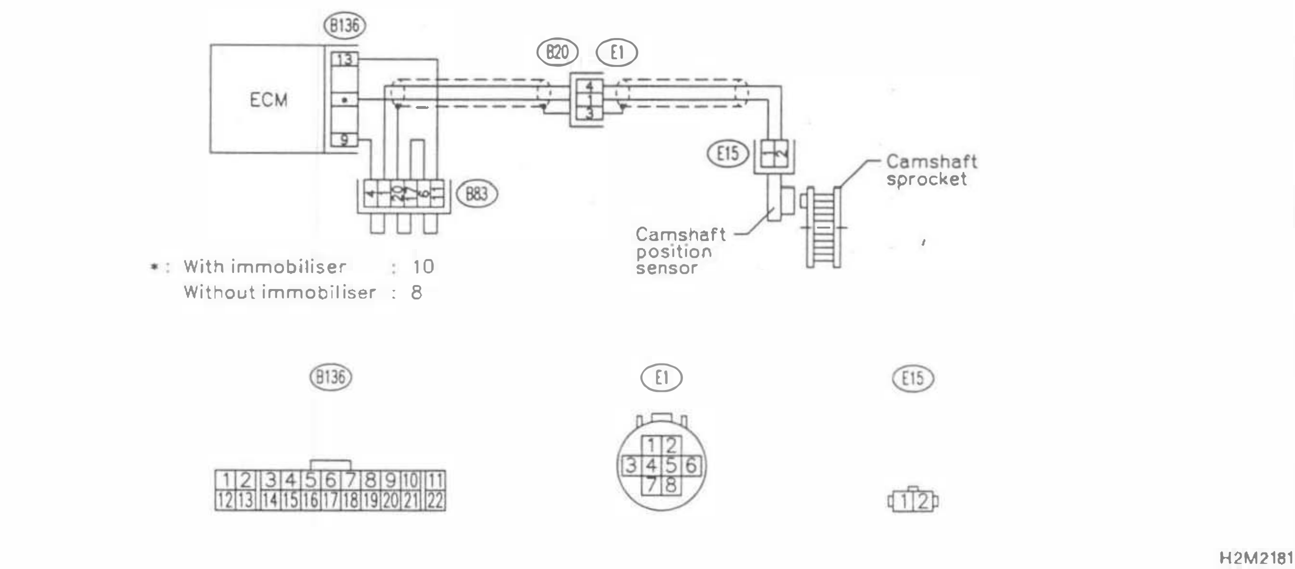
3. Check camshaft position sensor.
- Not O.K. → Replace camshaft position sensor.
- O.K. ↓

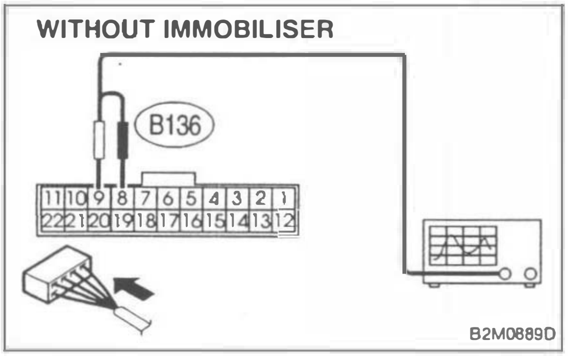
Mechanism trouble between camshaft position sensor and camshaft sprocket RH.

LHD


B135
ECM
13
*
9
B20
E1
4
1
3
E15
B122
B83
Camshaft sprocket
Camshaft position sensor
*: With immobiliser : 10
Without immobiliser : 8
B135
B122
B83
E1
E15
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
1 2 3
4 5 6
1 2 3 4
5 6 7 8
1 2
3 4 5 6
7 8
1 2
H2M2180

RHD

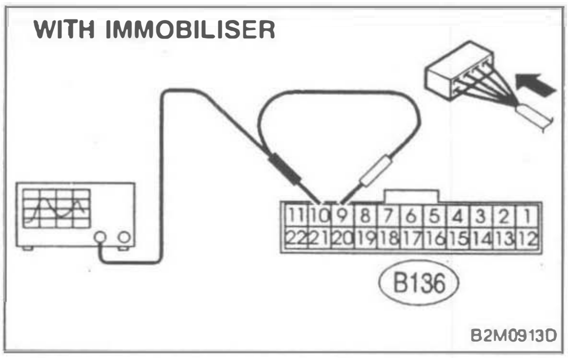

B136
ECM
13
*
9
B20
E1
4
1
3
E15
B83
Camshaft sprocket
Camshaft position sensor
*: With immobiliser : 10
Without immobiliser : 8
B136
E1
E15
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
1 2
3 4 5 6
7 8
1 2
H2M2181



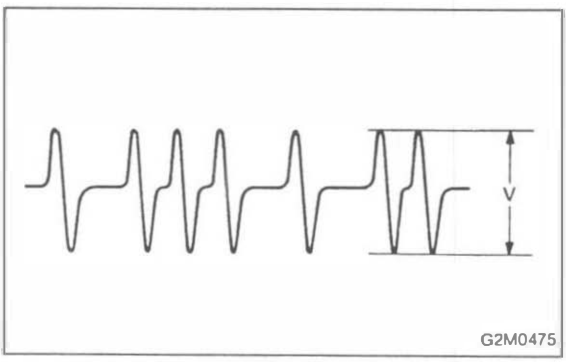
1. CHECK INPUT SIGNAL FOR ECM.

1) Set the positive (+) probe and earth lead of oscilloscope at ECM connector terminals.

Connector & terminal:
Without immobiliser:
Positive probe; (B136) No. 8
Earth lead; (B136) No. 9

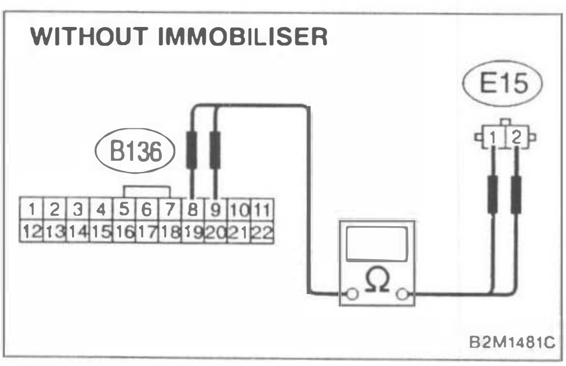


Connector & terminal:
With immobiliser:
Positive probe; (B136) No. 10
Earth lead; (B136) No. 9



2) Measure signal voltage indicated on oscilloscope, while cranking the engine.

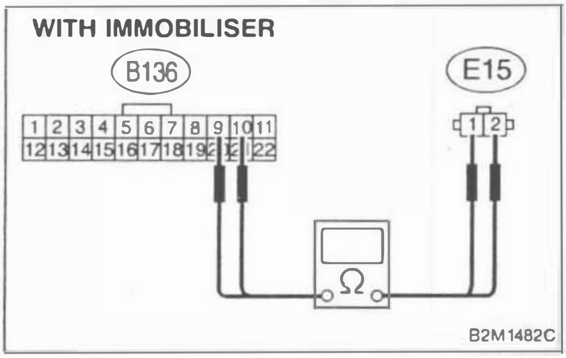
Specified voltage: More than 400 mV



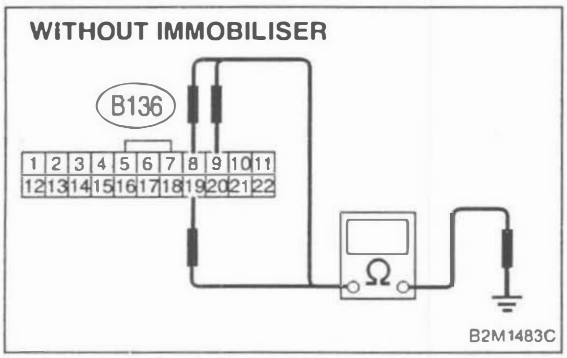
2. CHECK HARNESS CONNECTOR BETWEEN ECM AND CAMSHAFT POSITION SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and camshaft position sensor.
3) Measure resistance of harness connector between ECM and camshaft position sensor.

Connector & terminal / Specified resistance:
Without immobiliser:
(B136) No. 8 — (E15) No. 1 / Less than 1 Ω
(B136) No. 9 — (E15) No. 2 / Less than 1 Ω

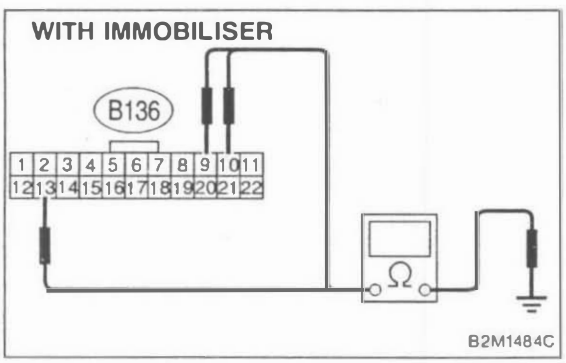


Connector & terminal / Specified resistance:
With immobiliser:
(B136) No. 10 — (E15) No. 1 / Less than 1 Ω
(B136) No. 9 — (E15) No. 2 / Less than 1 Ω

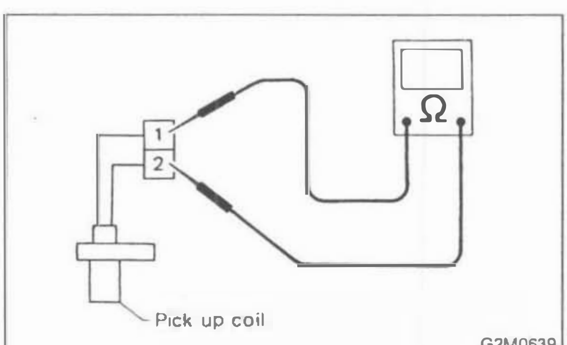


4) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
Without immobiliser:
(B136) No. 8 — Body / More than 1 MΩ
(B136) No. 9 — Body / More than 1 MΩ
(B136) No. 13 — Body / More than 1 MΩ



Connector & terminal / Specified resistance:
With immobiliser:
(B136) No. 9 — Body / More than 1 MΩ
(B136) No. 10 — Body / More than 1 MΩ
(B136) No. 13 — Body / More than 1 MΩ



3. CHECK CAMSHAFT POSITION SENSOR.

1) Remove camshaft position sensor.
2) Measure resistance between connector terminals of camshaft position sensor.

Terminals / Specified resistance:
No. 1 — No. 2 / 2,040 ± 200 Ω

E: TROUBLE CODE (21) — ENGINE COOLANT TEMPERATURE SENSOR —

DIAGNOSIS:

- The engine coolant temperature sensor signal is abnormal.
- The harness connector between ECM and engine coolant temperature sensor is in short or open.

TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

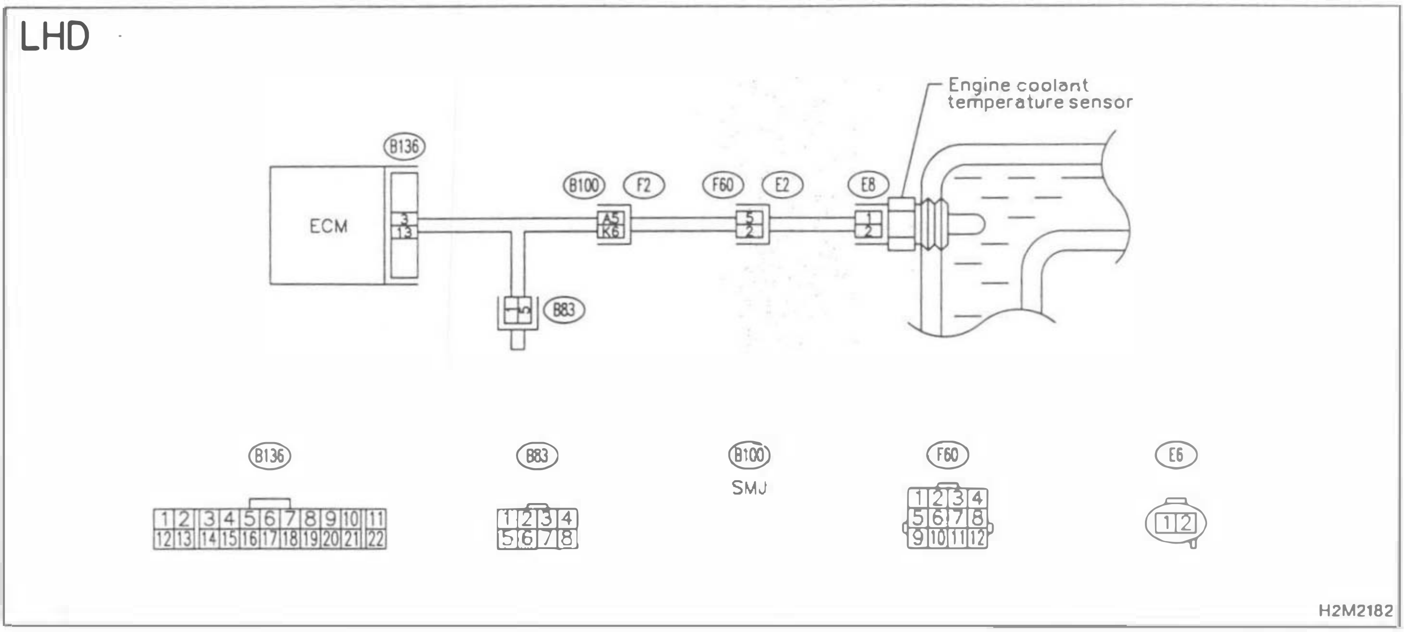
1. Check engine coolant temperature sensor.

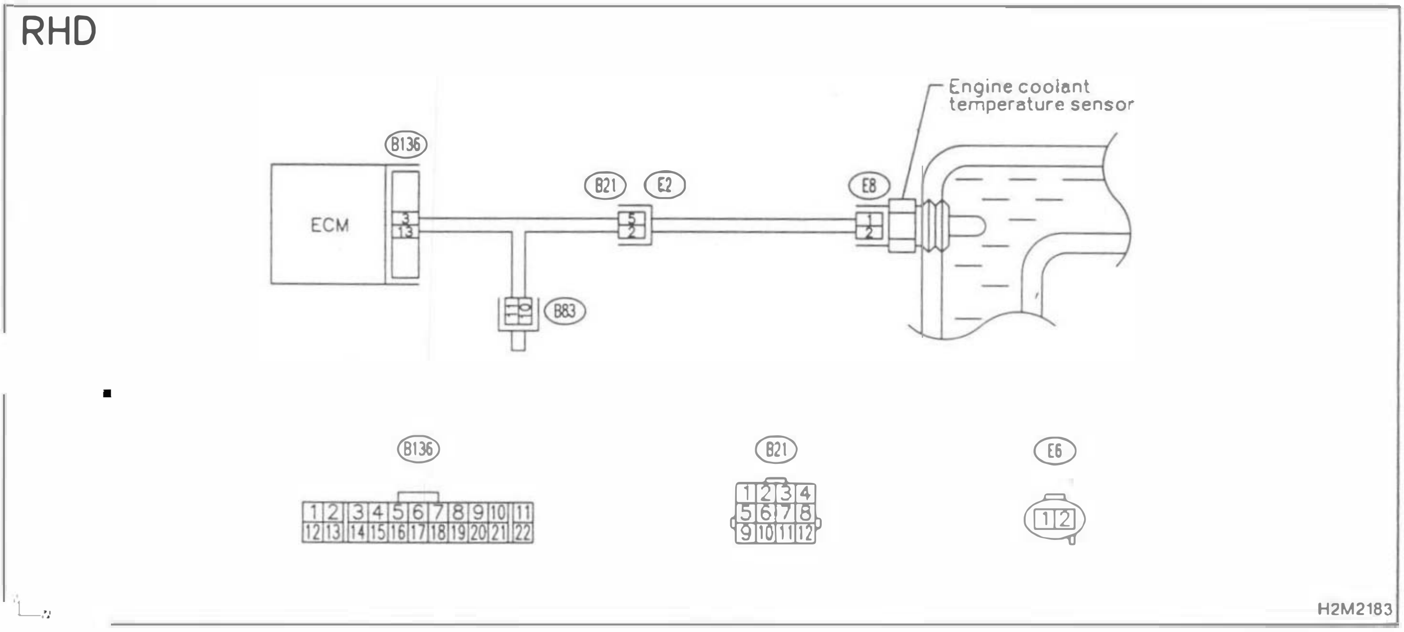
- Not O.K. → Replace engine coolant temperature sensor.
- O.K. ↓

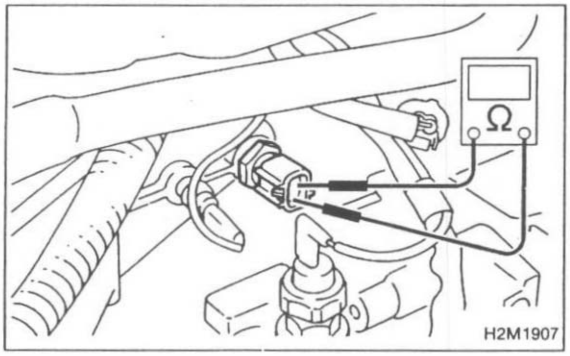
2. Check harness connector between ECM and engine coolant temperature sensor.

- Not O.K. → Repair or replace harness connector.
- O.K. ↓

Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>


LHD
Engine coolant temperature sensor
ECM
B136
B100
F2
F60
E2
E8
B83
SMJ
E6
H2M2182

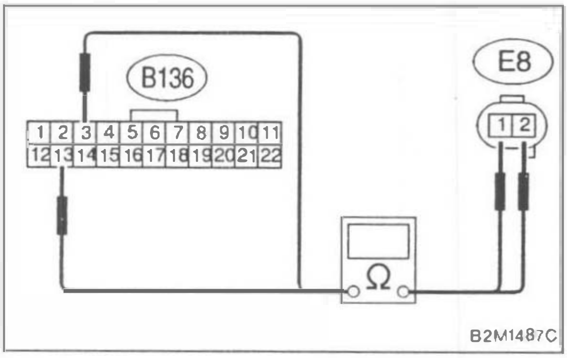

RHD
Engine coolant temperature sensor
ECM
B136
B21
E2
E8
B83
E6
H2M2183



1. CHECK ENGINE COOLANT TEMPERATURE SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from engine coolant temperature sensor.
3) Measure resistance between engine coolant temperature sensor terminals.

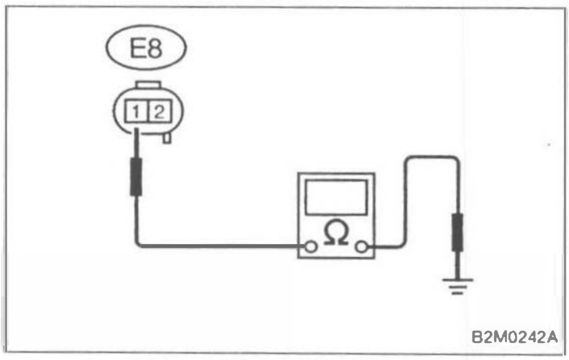
Terminals / Specified resistance:
No. 1 — No. 2 / 2.5 ± 0.4 kΩ at 20°C (68°F)
No. 1 — No. 2 / 0.37 ± 0.002 kΩ at 80°C (176°F)
No. 1 — No. 2 / 0.25 ± 0.02 kΩ at 90°C (194°F)



2. CHECK HARNESS CONNECTOR BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR.

1) Disconnect connector from ECM.
2) Measure resistance of harness connector between ECM and engine coolant temperature connector.

Connector & terminal / Specified resistance:
(B136) No. 3 — (E8) No. 1 / Less than 1 Ω
(B136) No. 13 — (E8) No. 2 / Less than 1 Ω



3) Measure resistance of harness connector between engine coolant temperature sensor and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(E8) No. 1 — Body / More than 1 MΩ

F: TROUBLE CODE (22) — KNOCK SENSOR —

DIAGNOSIS:

- The knock sensor signal is abnormal.
- The harness connector between ECM and knock sensor is in short or open.

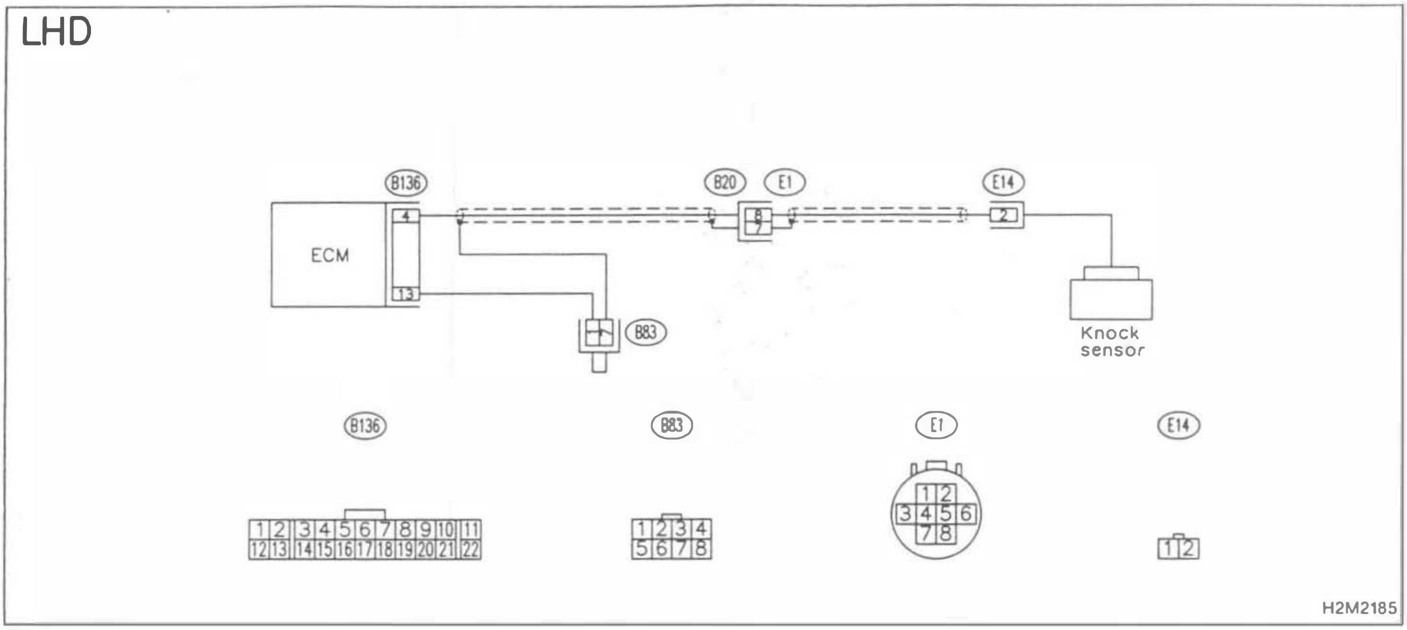
TROUBLE SYMPTOM:

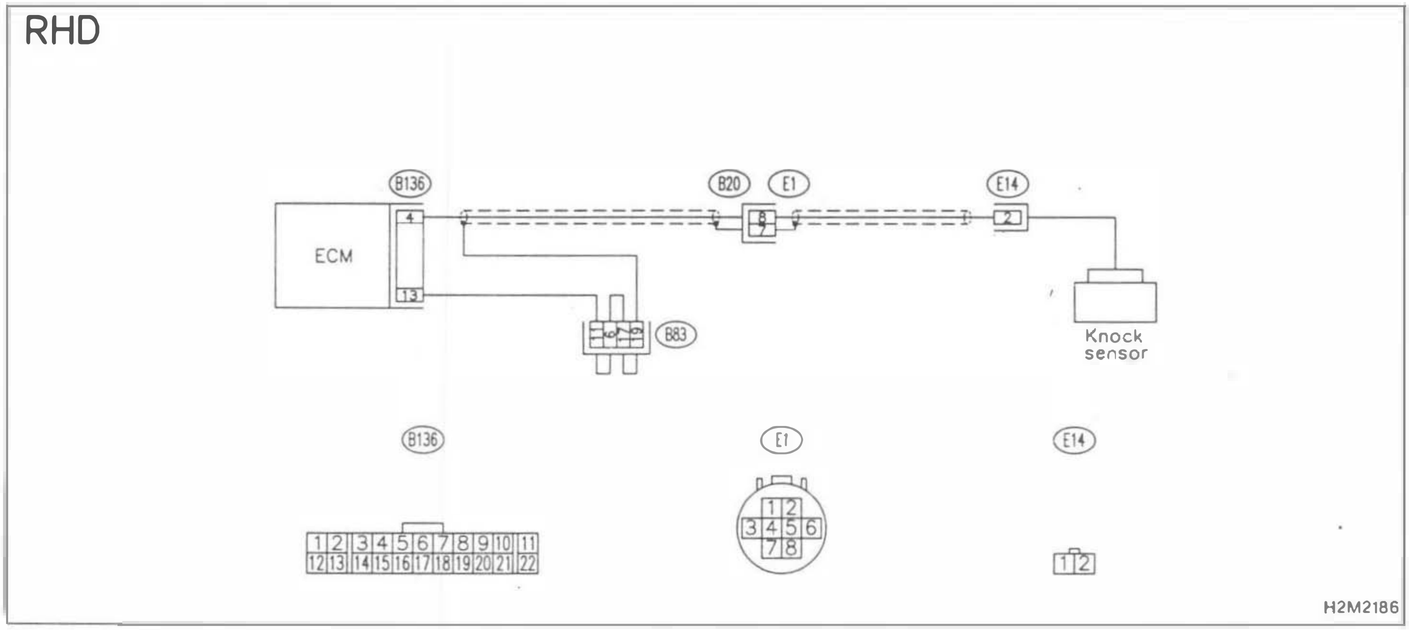
- Poor driving performance

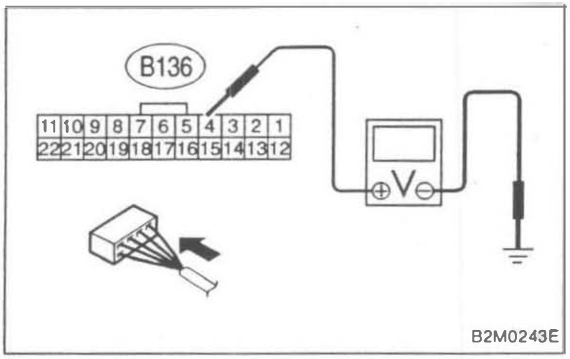
1. Check input signal for ECM.
- O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
- Not O.K. → go to 2.

2. Check knock sensor.
- Not O.K. → Replace knock sensor.
- O.K. → go to 3.

3. Check harness connector between ECM and knock sensor.
- Not O.K. → Repair or replace harness connector.
- O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>


LHD
B136
B20
E1
E14
ECM
4
13
8
7
2
B83
Knock sensor
B136
B83
E1
E14
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
1 2 3 4
5 6 7 8
1 2
3 4 5 6
7 8
1 2
H2M2185

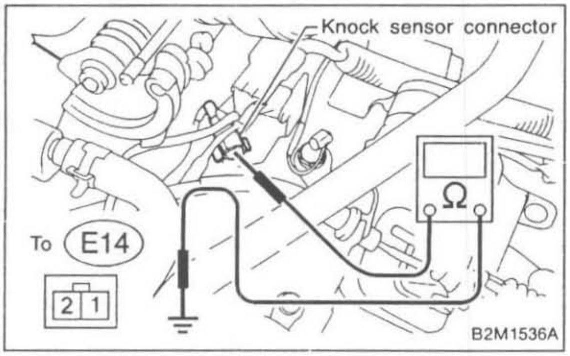

RHD
B136
B20
E1
E14
ECM
4
13
8
7
2
B83
Knock sensor
B136
E1
E14
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
1 2
3 4 5 6
7 8
1 2
H2M2186



1. INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM connector terminal and body.

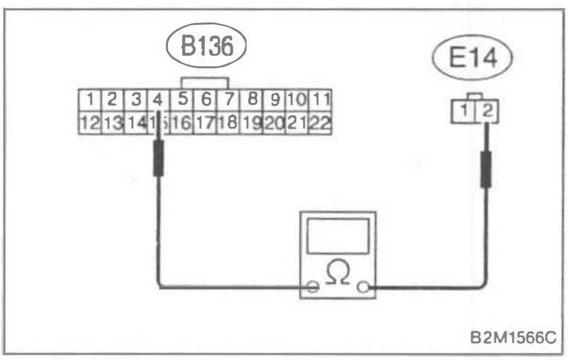
Connector & terminal / Specified voltage:
(B136) No. 4 — Body / About 2.8 V



2. CHECK KNOCK SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from knock sensor.
3) Measure resistance between knock sensor terminal and body.

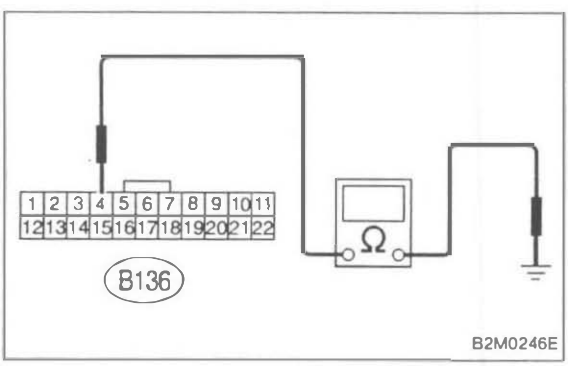
Connector & terminal / Specified resistance:
No. 2 — Body / Approx. 560 kΩ



3. CHECK HARNESS CONNECTOR BETWEEN ECM AND KNOCK SENSOR.

1) Disconnect connectors from ECM.
2) Measure resistance of harness connector between ECM and knock sensor.

Connector & terminal / Specified resistance:
(B136) No. 4 — (E14) No. 2 / Less than 1 Ω



3) Measure resistance of harness connector between ECM connector and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B136) No. 4 — Body / More than 1 MΩ

G: TROUBLE CODE (23) — MASS AIR FLOW SENSOR —

DIAGNOSIS:

- The mass air flow sensor signal is abnormal.
- The harness connector between ECM and mass air flow sensor is in short or open.

TROUBLE SYMPTOM:

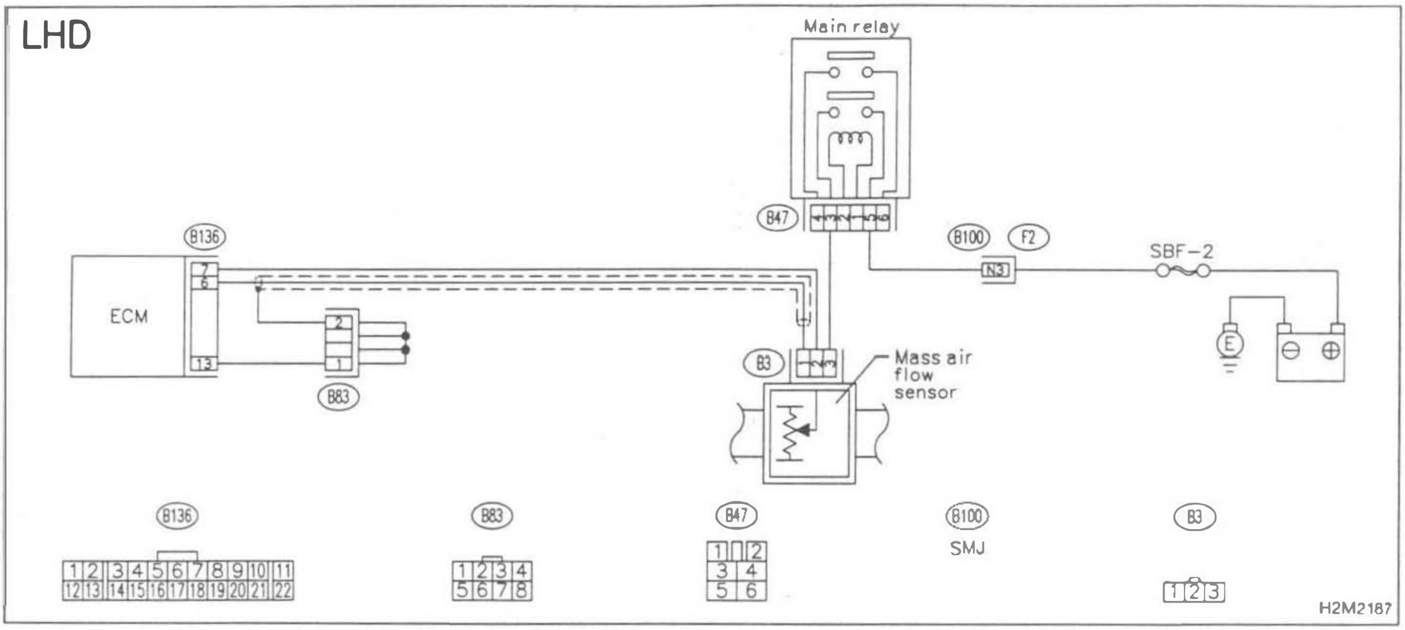
- Erroneous idling
- Engine stalls.
- Poor driving performance

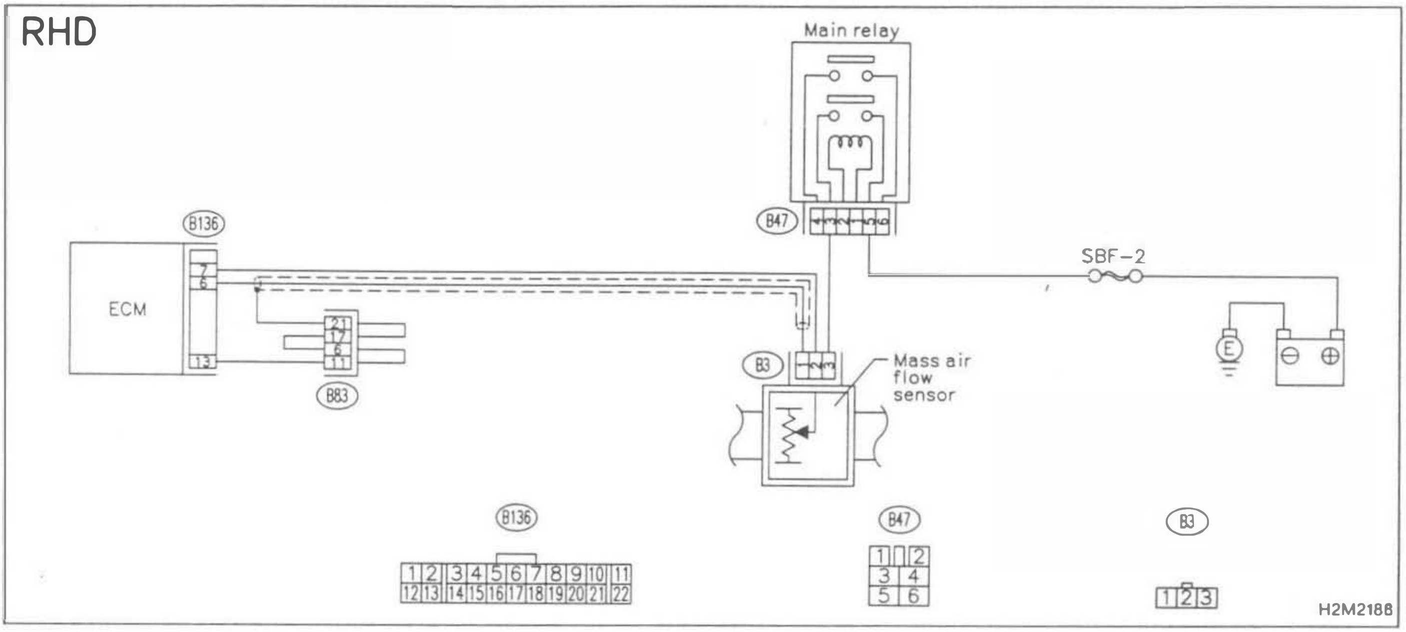
1. Check input signal for ECM.
- O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
- Not O.K. ↓

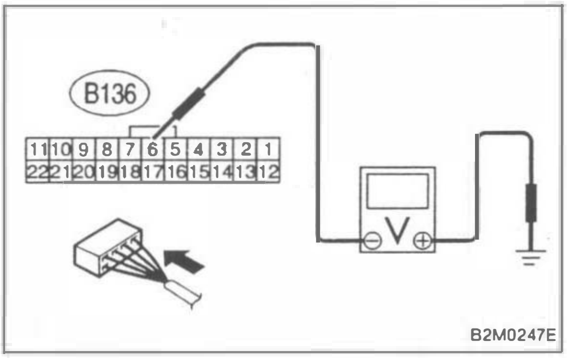
2. Check power supply to mass air flow sensor.
- Not O.K. → Repair or replace harness connector.
- O.K. ↓

3. Check harness connector between ECM and mass air flow sensor.
- Not O.K. → Repair or replace harness connector.
- O.K. ↓

Replace mass air flow sensor.


LHD
Main relay
B47
B136
B100
F2
SBF-2
ECM
N3
B3
Mass air flow sensor
B83
B136
B83
B47
B100
SMJ
B3
H2M2187


RHD
Main relay
B47
B136
SBF-2
ECM
B3
Mass air flow sensor
B83
B136
B47
B3
H2M2188



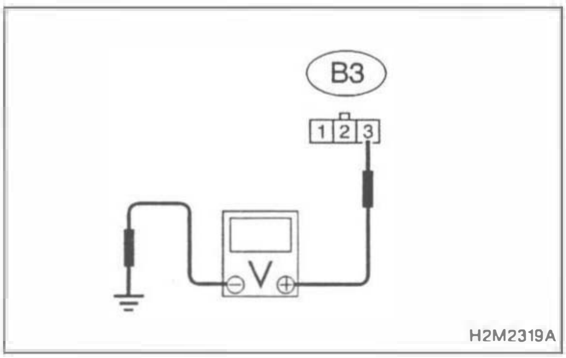
1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

Connector & terminal / Specified voltage:
(B136) No. 6 — Body / 0.26 V

3) Start engine, and idle it.
4) Measure voltage between ECM and body while engine is idling.

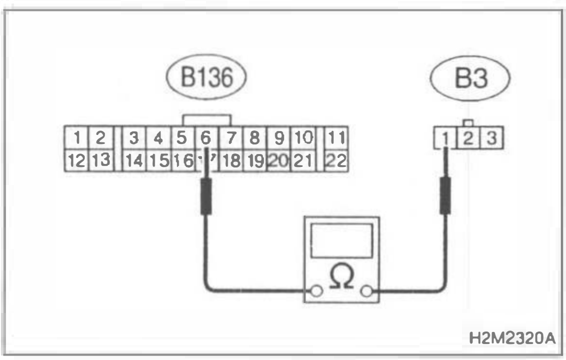
Connector & terminal / Specified voltage:
(B136) No. 6 — Body / 1.1 ± 0.3 V



2. CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from mass air flow sensor.
3) Turn ignition switch to ON.
4) Measure voltage between mass air flow sensor connector and body.

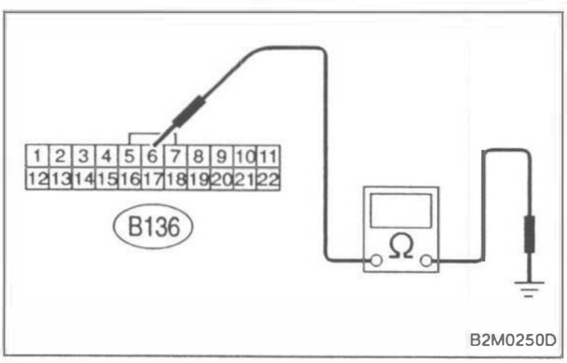
Connector & terminal / Specified voltage:
(B3) No. 3 — Body / More than 10 V



3. CHECK HARNESS CONNECTOR BETWEEN ECM AND MASS AIR FLOW SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM.
3) Measure resistance of harness connector between ECM and mass air flow sensor.

Connector & terminal / Specified resistance:
(B136) No. 6 — (B3) No. 1 / Less than 1 Ω



4) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B136) No. 6 — Body / More than 1 MΩ

H: TROUBLE CODE (24) — IDLE AIR CONTROL SOLENOID VALVE —

DIAGNOSIS:

- The idle air control solenoid valve is not in function.
- The harness connector between ECM and idle air control solenoid valve is in short or open.

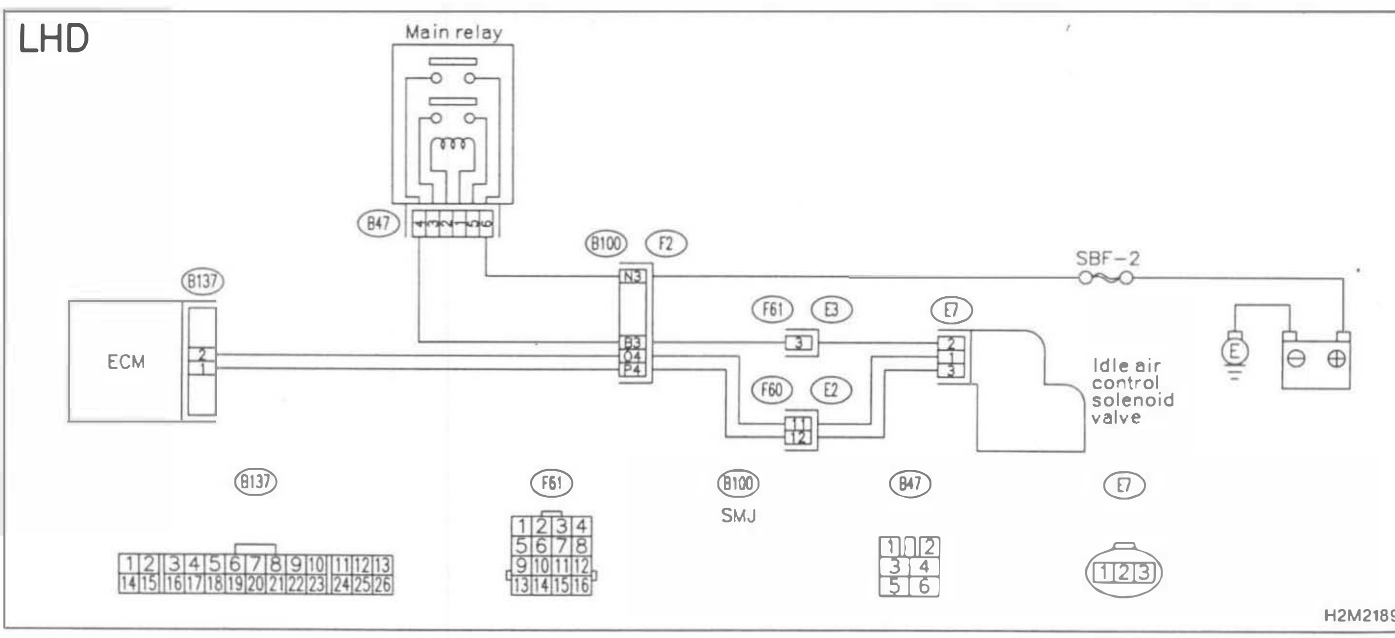
TROUBLE SYMPTOM:

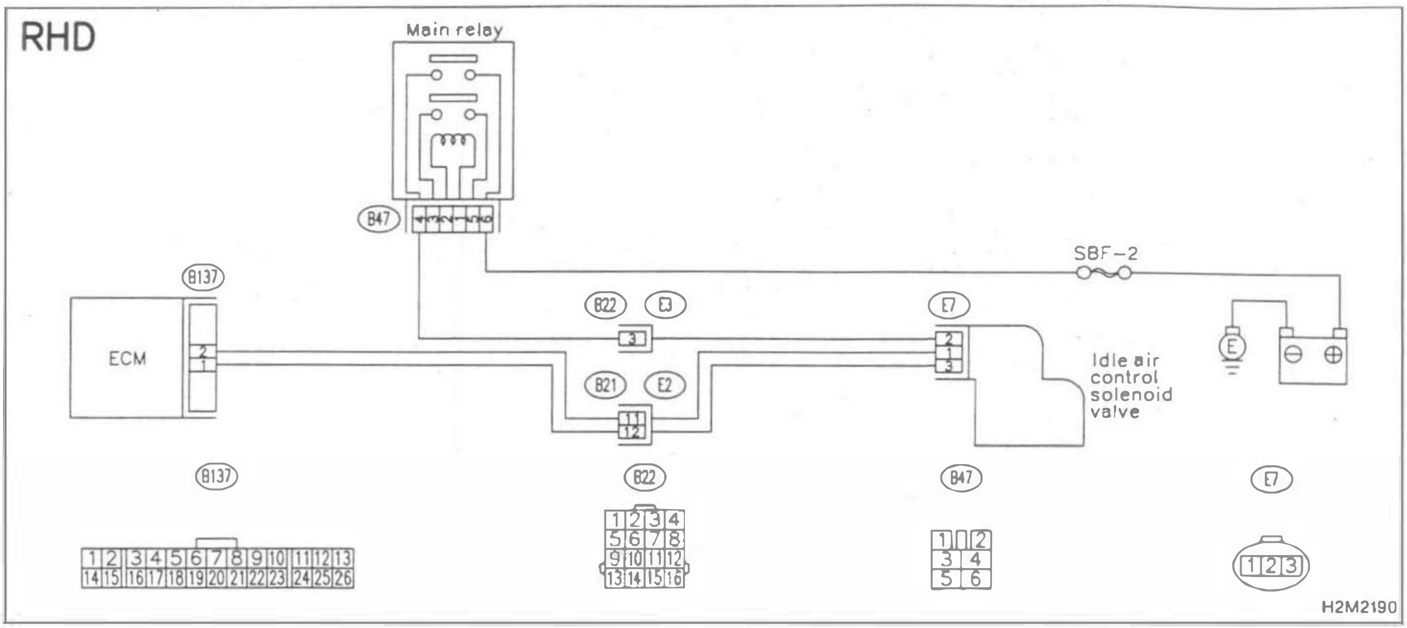
- Erroneous idling
- Engine stalls.
- Engine breathing

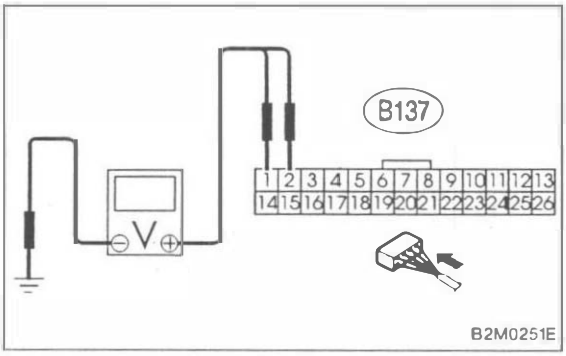
1. Check input signal for ECM.
- O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
- Not O.K. → 2

2. Check idle air control solenoid valve.
- Not O.K. → Replace idle air control solenoid valve.
- O.K. → 3

3. Check power supply line to idle air control solenoid valve.
- Not O.K. → Repair or replace harness connector.
- O.K. → Repair or replace harness connector between ECM and idle air control solenoid valve.



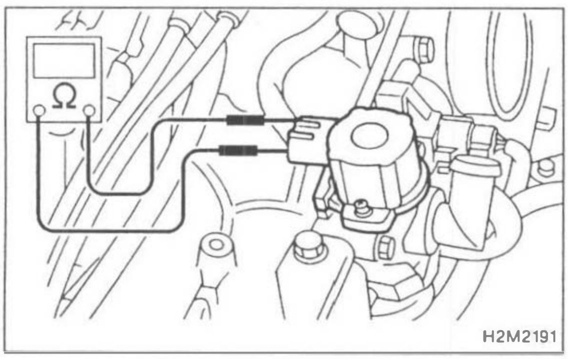




1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

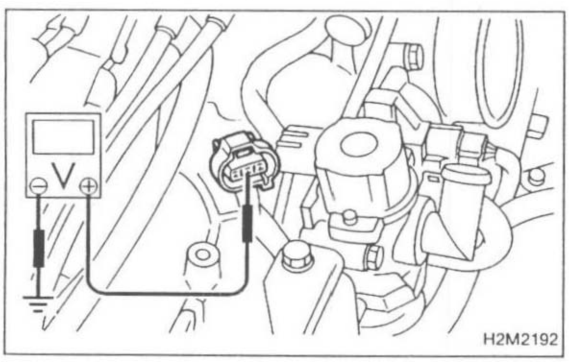
Connector & terminal / Specified voltage:
(B137) No. 1 — Body / More than 10 V
(B137) No. 2 — Body / More than 10 V



2. CHECK IDLE AIR CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connector from idle air control solenoid valve.
3) Measure resistance between solenoid valve terminals.

Terminals / Specified resistance:
No. 1 — No. 2 / 9.5±1.5 Ω
No. 3 — No. 2 / 9.5±1.5 Ω



3. CHECK POWER SUPPLY LINE TO IDLE AIR CONTROL SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure power supply voltage idle air control solenoid valve.

Connector & terminal / Specified voltage:
(E7) No. 2 — Body / More than 10 V

I: TROUBLE CODE (31) — THROTTLE POSITION SENSOR —

DIAGNOSIS:

- The throttle position sensor signal is abnormal.
- The throttle position sensor is installed abnormally.
- The harness connector between ECM and throttle position sensor is in short or open.

TROUBLE SYMPTOM:

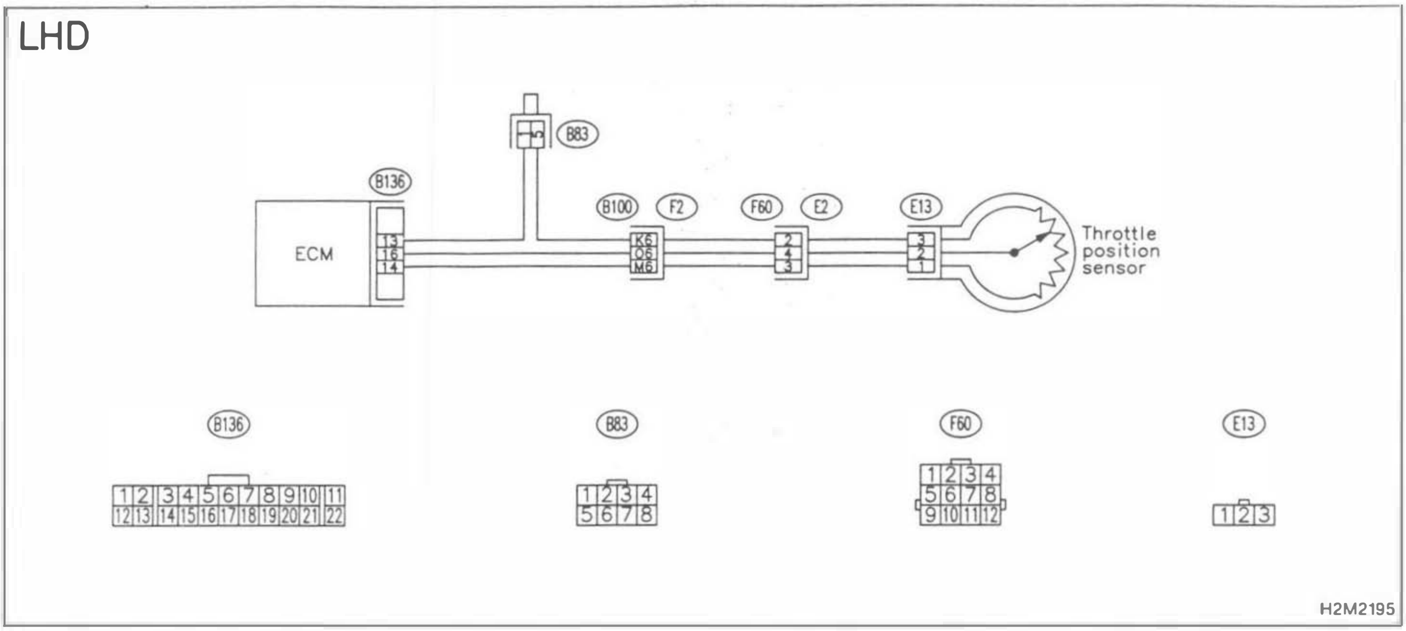
- Erroneous idling
- Engine stalls.
- Poor driving performance

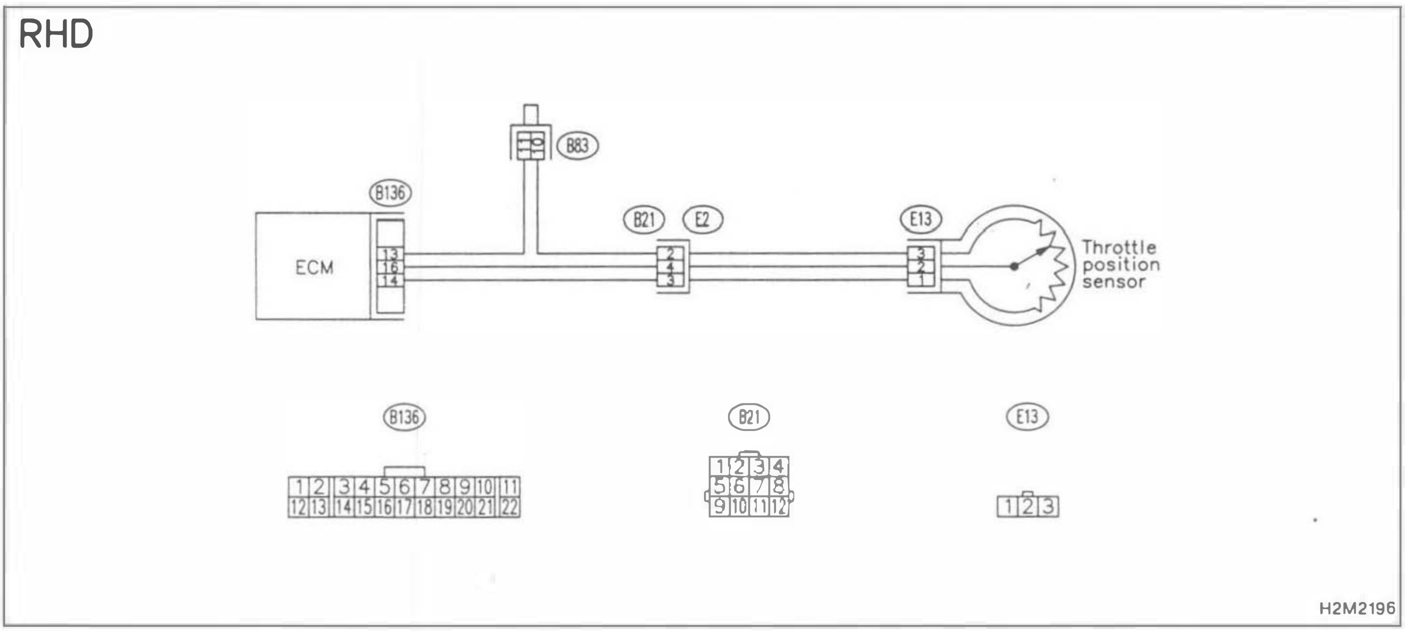
1. Check input signal for ECM.
- O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
- Not O.K. → 2

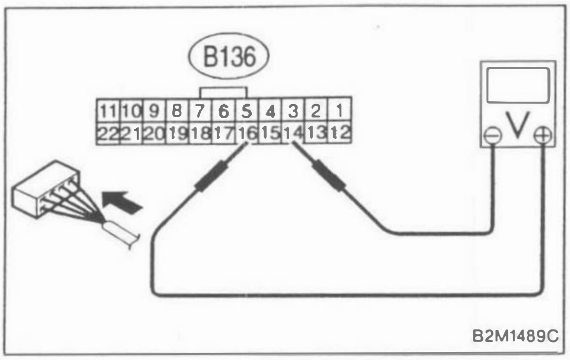
2. Check harness connector between ECM and throttle position sensor.
- Not O.K. → Repair or replace harness connector.
- O.K. → 3

3. Check and adjust throttle position sensor.
- Not O.K. → Replace throttle position sensor.
- O.K. → END

END


LHD
B83
B136
B100
F2
F60
E2
E13
ECM
13
16
14
K6
O6
M6
2
4
3
3
2
1
Throttle position sensor
B136
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
B83
1 2 3 4
5 6 7 8
F60
1 2 3 4
5 6 7 8
9 10 11 12
E13
1 2 3
H2M2195


RHD
B83
B136
B21
E2
E13
ECM
13
16
14
2
4
3
3
2
1
Throttle position sensor
B136
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
B21
1 2 3 4
5 6 7 8
9 10 11 12
E13
1 2 3
H2M2196



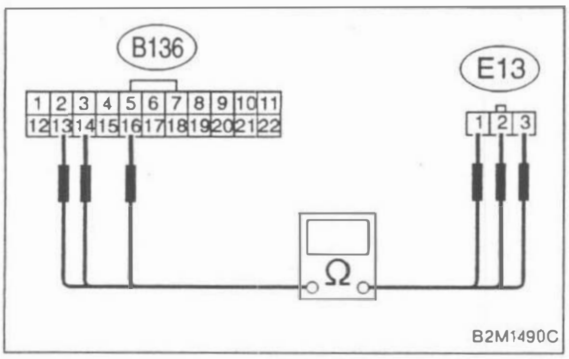
1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure signal voltage between ECM terminals while throttle valve is fully closed.

Connector & terminal / Specified voltage:
(B136) No. 16 — (B136) No. 14 / 0.5 ± 0.3 V

3) Measure signal voltage between ECM terminals while throttle valve is fully opened.

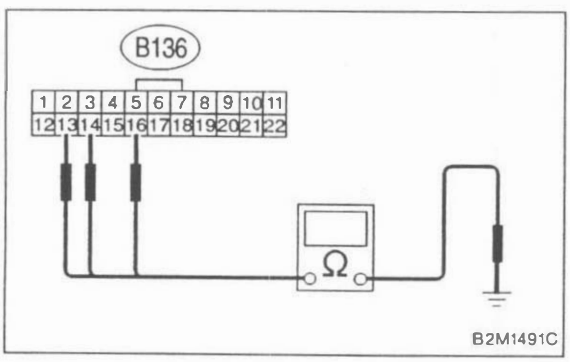
Connector & terminal / Specified voltage:
(B136) No. 16 — (B136) No. 14 / 4.3 ± 0.3 V



2. CHECK HARNESS CONNECTOR BETWEEN ECM AND THROTTLE POSITION SENSOR.

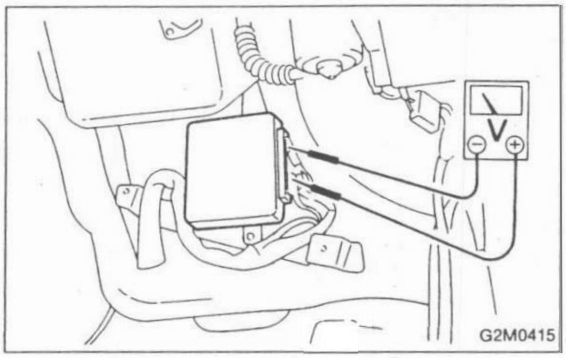
1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and throttle position sensor.
3) Measure resistance of harness connector between ECM and throttle position sensor.

Connector & terminal / Specified resistance:
(B136) No. 16 — (E13) No. 2 / Less than 1 Ω
(B136) No. 13 — (E13) No. 3 / Less than 1 Ω
(B136) No. 14 — (E13) No. 1 / Less than 1 Ω



4) Disconnect connectors from TCM. (AT vehicle only)
5) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B136) No. 16 — Body / More than 1 MΩ
(B136) No. 13 — Body / More than 1 MΩ
(B136) No. 14 — Body / More than 1 MΩ

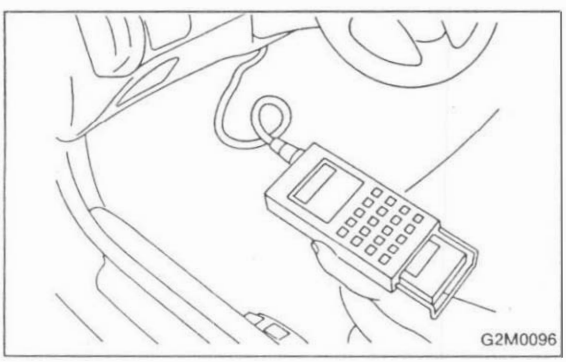


3. CHECK AND ADJUST THROTTLE POSITION SENSOR.

1) Connect all connectors.
2) Loosen throttle position sensor installing screws.
3) Adjust throttle position sensor while throttle valve is fully opened.

- Using voltage meter:
  (1) Turn ignition switch to ON.
  (2) Adjust throttle position sensor to specified voltage between ECM connector terminals.

Connector & terminal / Specified voltage:
(B136) No. 16 — (B136) No. 14 / 4.3 ± 0.3 V
(3) Tighten throttle position sensor installing screws.



- Using select monitor:
  (1) Attach select monitor.
  (2) Turn ignition switch to ON.
  (3) Select mode "F07".
  (4) Adjust throttle position sensor to specified data.

Conditions / Specified data:
Throttle valve fully opened / 4.3 ± 0.3 V
(5) Tighten throttle position sensor installing screws.

J: TROUBLE CODE (32)
— OXYGEN SENSOR —

DIAGNOSIS:

- The oxygen sensor is not in function.
- The harness connector between ECM and oxygen sensor is in short or open.

TROUBLE SYMPTOM:

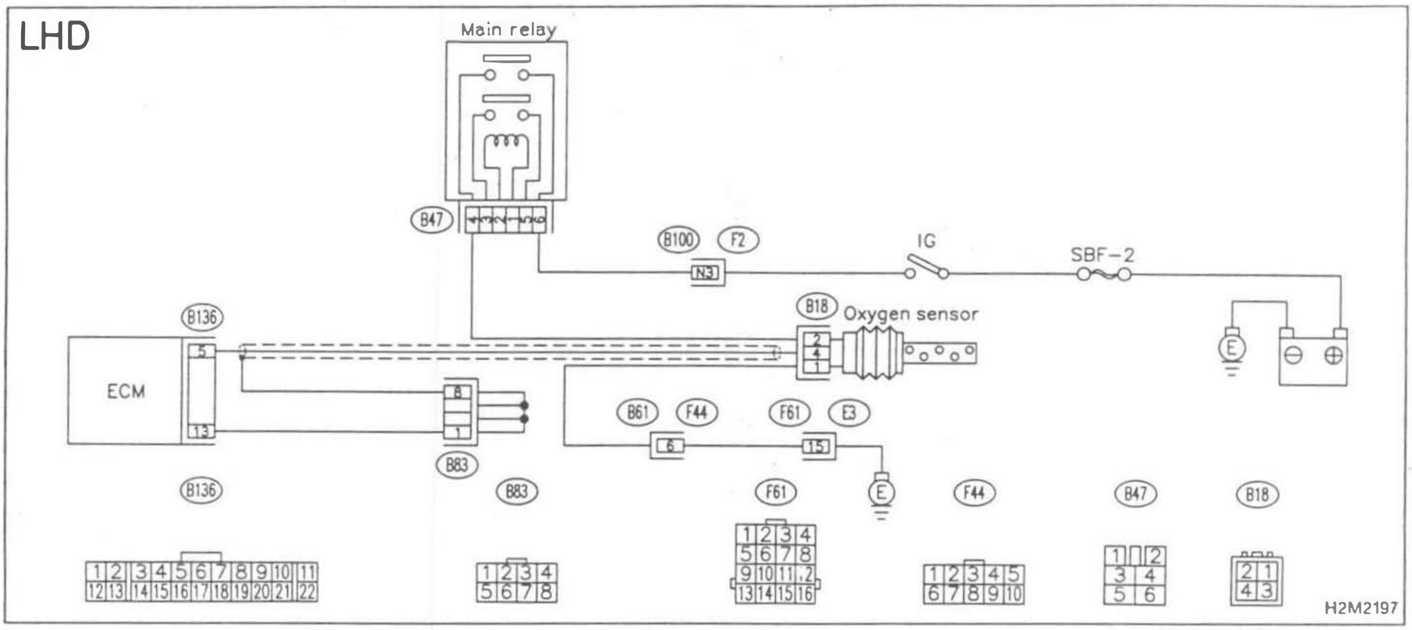
- Failure of engine to start.
- Erroneous idling
- Poor driving performance
- Engine stalls.
- Idle mixture is out of specifications.

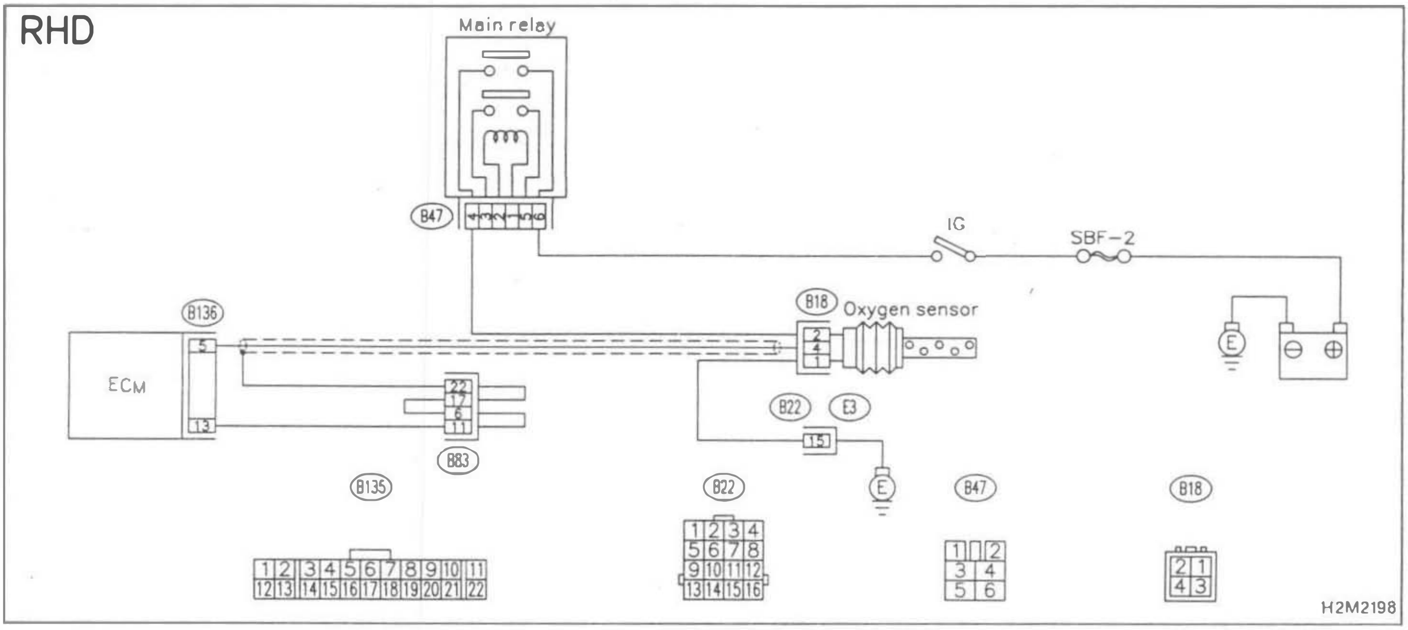
1. Check harness connector between ECM and oxygen sensor.
- Not O.K. → Repair or replace harness connector.
- O.K. ↓

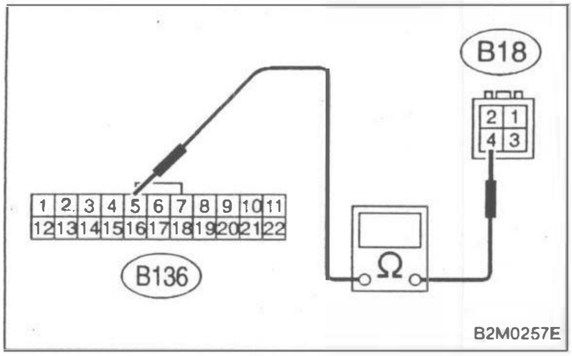
2. Check oxygen sensor heater circuit.
- Not O.K. → Repair or replace oxygen sensor heater circuit.
- O.K. ↓

3. Check oxygen sensor.
- Not O.K. → Replace oxygen sensor.
- O.K. ↓

Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>


LHD
Main relay
B47
B100
F2
N3
IG
SBF-2
B136
B18
Oxygen sensor
ECM
5
13
8
1
2
4
1
B61
F44
F61
E3
6
15
B83
E
B136
B83
F61
F44
B47
B18
H2M2197

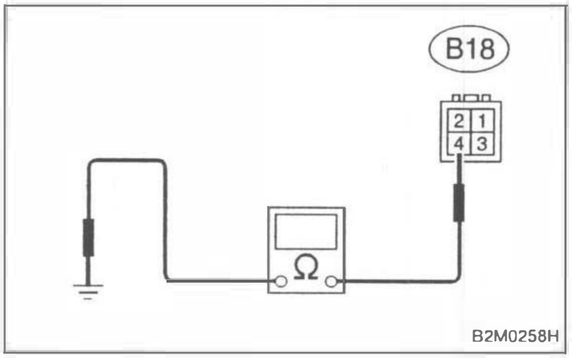

RHD
Main relay
B47
IG
SBF-2
B136
B18
Oxygen sensor
ECM
5
13
22
17
6
11
B83
B22
E3
15
E
B135
B22
B47
B18
H2M2198



1. CHECK HARNESS CONNECTOR BETWEEN ECM AND OXYGEN SENSOR.

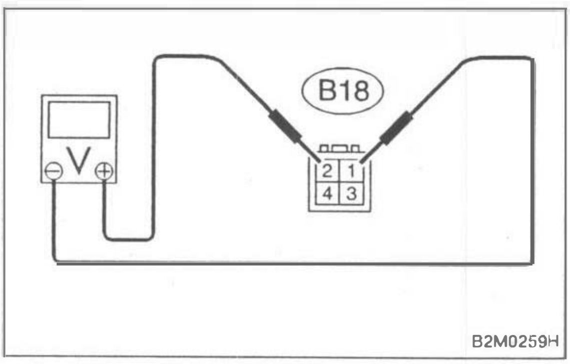
1) Disconnect connectors from ECM and oxygen sensor.
2) Measure resistance of harness connector between ECM and oxygen sensor.

Connector & terminal / Specified resistance:
(B136) No. 5 — (B18) No. 4 / Less than 1 Ω



3) Measure resistance of harness connector between oxygen sensor and body to make sure that circuit does not short.

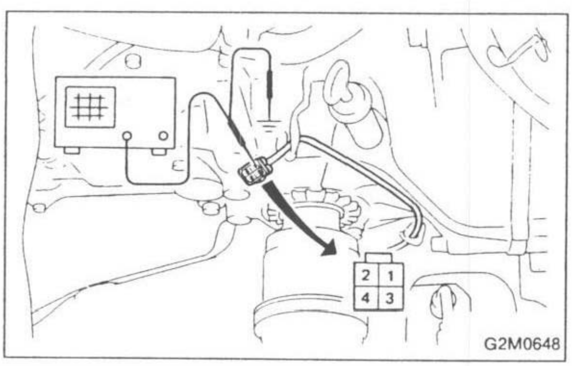
Connector & terminal / Specified resistance:
(B18) No. 4 — Body / More than 1 MΩ



2. CHECK OXYGEN SENSOR HEATER CIRCUIT.

1) Connect ECM connectors.
2) Turn ignition switch to ON.
3) Measure voltage between connector terminals of oxygen sensor.

Connector & terminal / Specified voltage:
(B18) No. 1 — (B18) No. 2 / More than 10 V



3. CHECK OXYGEN SENSOR.

1) Connect oxygen sensor.
2) Idle engine.
3) Disconnect oxygen sensor connector.
4) Measure voltage between oxygen sensor terminal and body by using oscilloscope.

Connector & terminal / Specified voltage:
No. 4 — Body / 0.1 — 1.0 V

K: TROUBLE CODE (33) — VEHICLE SPEED SENSOR 2 —

DIAGNOSIS:

- The vehicle speed sensor 2 is not in function.
- The harness connector between ECM and vehicle speed sensor 2 is in short or open.

TROUBLE SYMPTOM:

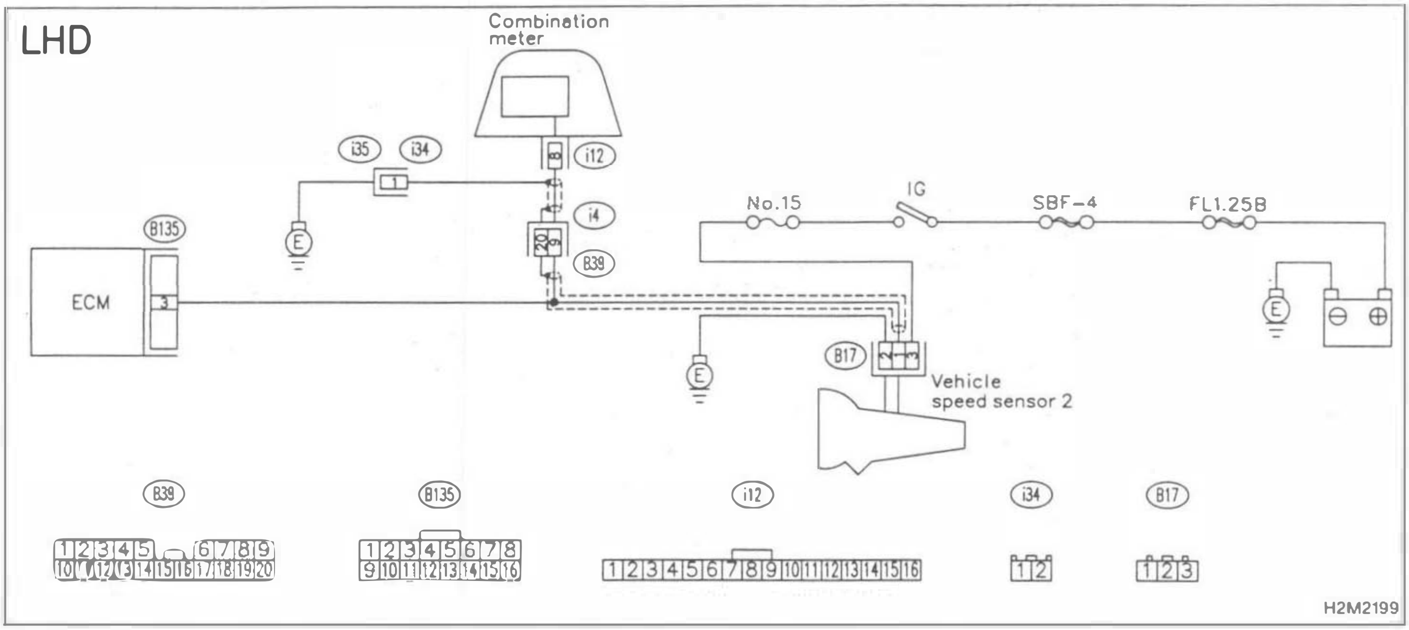
- Erroneous idling
- Engine stalls.
- Poor driving performance

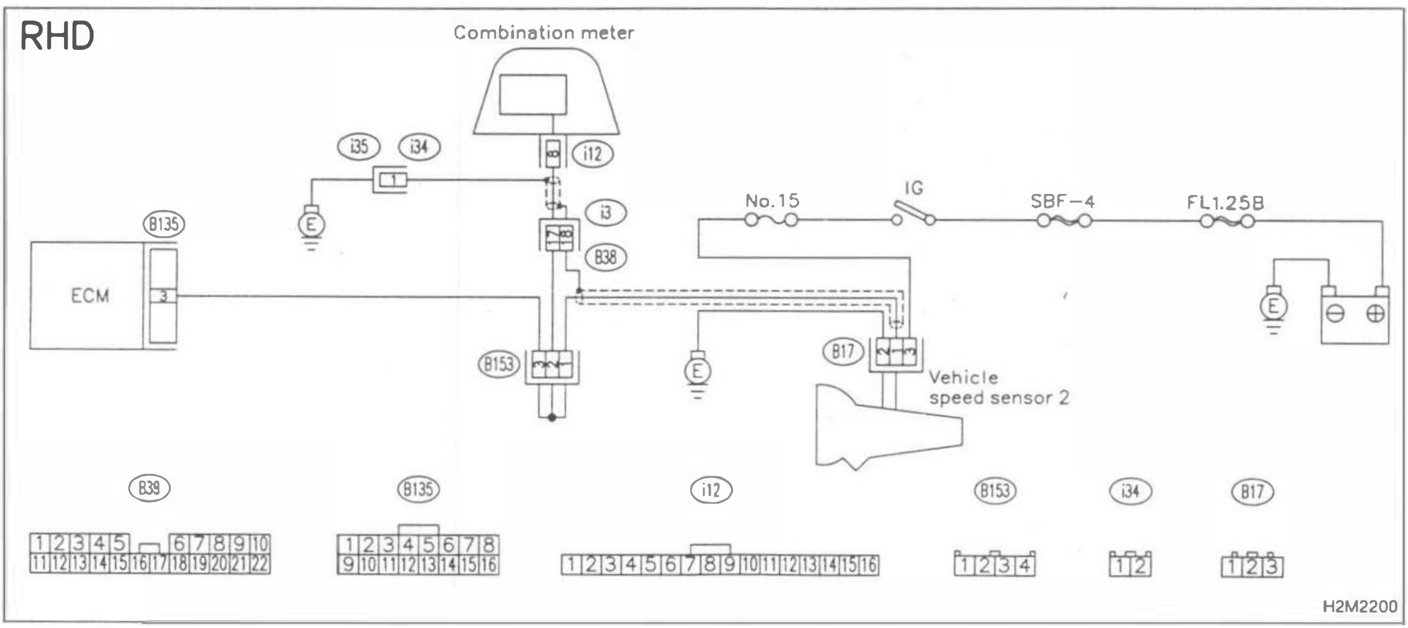
1. Check input signal for ECM.
- O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
- Not O.K. → go to 2.

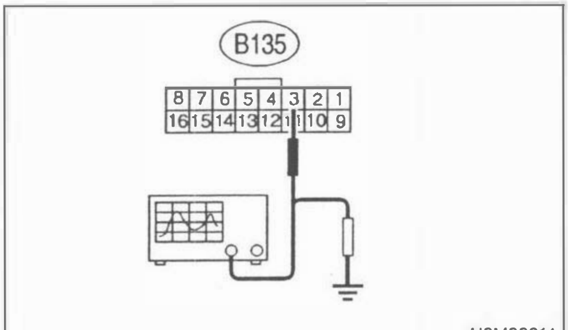
2. Check harness connector between ECM and vehicle speed sensor 2.
- Not O.K. → Repair or replace harness connector.
- O.K. → go to 3.

3. Check ground circuit of vehicle speed sensor 2.
- Not O.K. → Repair or replace harness connector.
- O.K. → go to 4.

4. Check power supply circuit of vehicle speed sensor 2.
- Not O.K. → Repair or replace harness connector.
- O.K. →
  - Mechanical trouble between vehicle speed sensor 2 and speedometer shaft in transmission.
  - Failure of the vehicle speed sensor 2
    → Replace vehicle speed sensor 2.


LHD
Combination meter
ECM
Vehicle speed sensor 2
No.15
IG
SBF-4
FL1.25B
B135
i35
i34
i12
i4
B39
B17
H2M2199


RHD
Combination meter
ECM
Vehicle speed sensor 2
No.15
IG
SBF-4
FL1.25B
B135
i35
i34
i12
i3
B38
B153
B17
B39
H2M2200

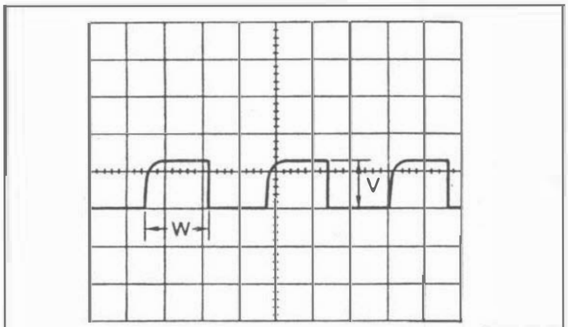


H2M2201A

1. CHECK INPUT SIGNAL FOR ECM.

1) Lift-up the vehicle, or set the vehicle on free roller.
2) Set the positive (+) terminal and earth lead of oscilloscope at ECM connector terminals.

Connector & terminal / (B135) No. 3 — Body

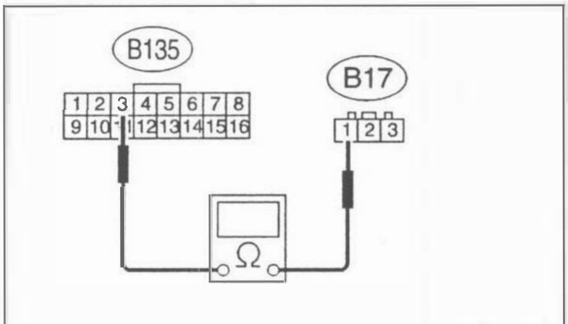


G2M0931

3) Start the engine.
4) Shift on the gear position, and be constant the vehicle speed.
5) Measure signal voltage indicated on oscilloscope.

Specified voltage / More than 3 V

NOTE:
If vehicle speed increases, the width of amplitude (W) decreases.

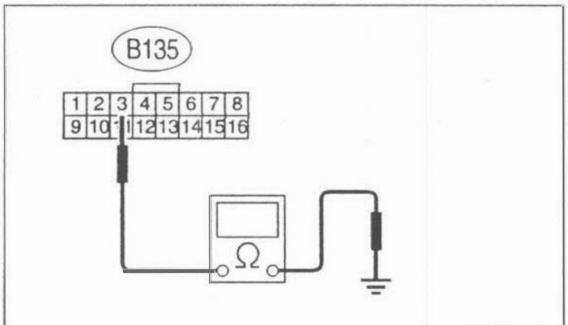


H2M2202A

2. CHECK HARNESS CONNECTOR BETWEEN ECM AND VEHICLE SPEED SENSOR 2.

1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and vehicle speed sensor 2.
3) Measure resistance of harness connector between ECM and vehicle speed sensor 2.

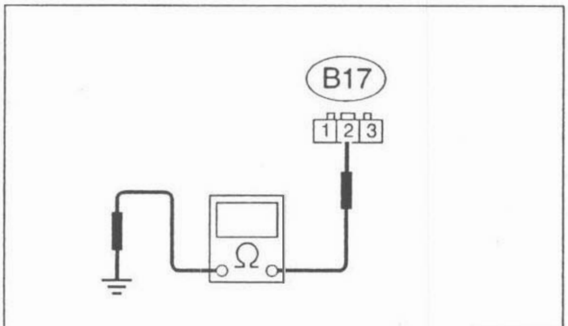
Connector & terminal / Specified resistance:
(B135) No. 3 — (B17) No. 1 / Less than 1 Ω



H2M2203A

4) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B135) No. 3 — Body / More than 1 MΩ

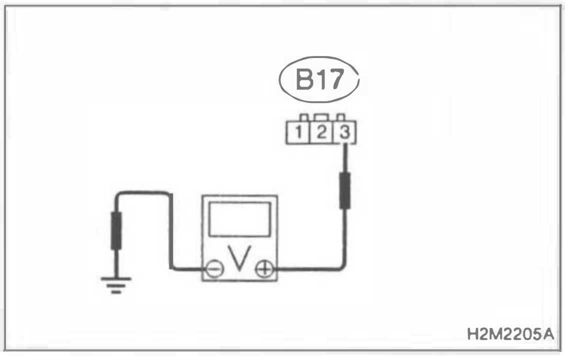


H2M2204A

3. CHECK GROUND CIRCUIT OF VEHICLE SPEED SENSOR 2.

Measure resistance of harness connector between vehicle speed sensor 2 and body.

Connector & terminal / Specified resistance:
(B17) No. 2 — Body / Less than 5 Ω



4. CHECK POWER SUPPLY CIRCUIT OF VEHICLE SPEED SENSOR 2.

1) Turn ignition switch to ON.
2) Measure power supply voltage to vehicle speed sensor 2.

Connector & terminal / Specified voltage:
(B17) No. 3 — Body / More than 0 V

L: TROUBLE CODE (38) — TORQUE CONTROL SIGNAL —

DIAGNOSIS:

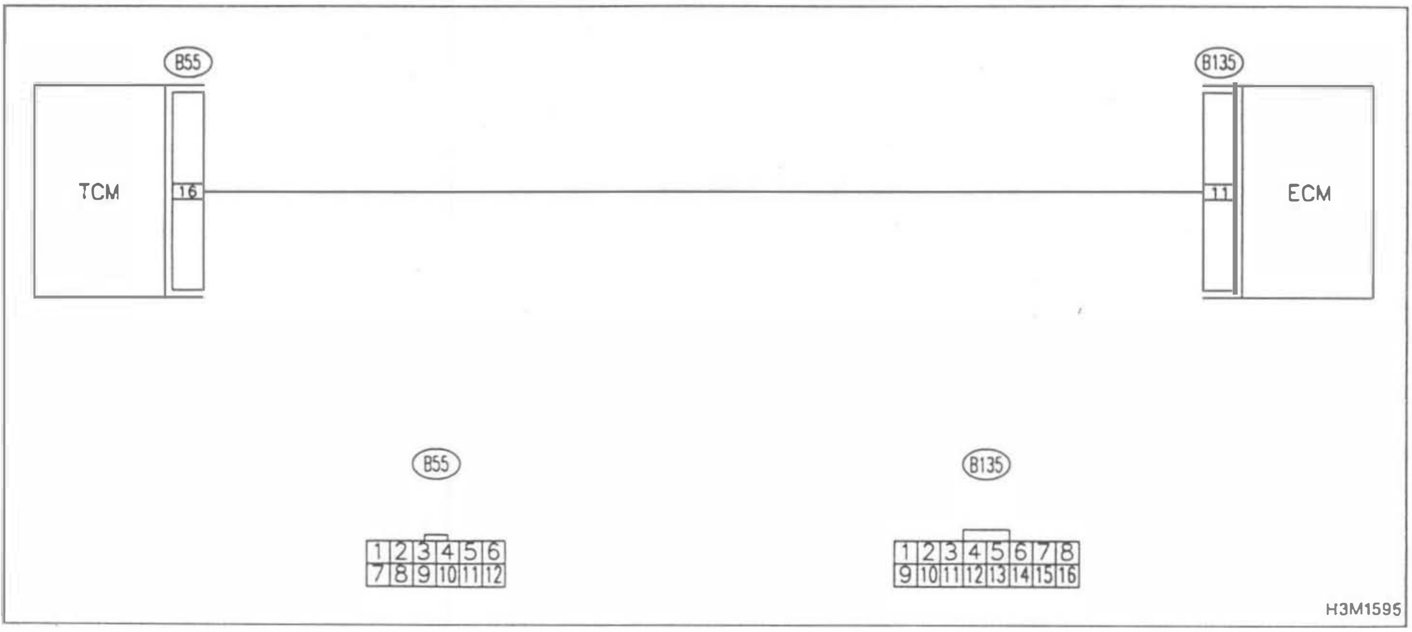
- Abnormal signal is entered from TCM.
- The harness connector between ECM and TCM is in short or open.

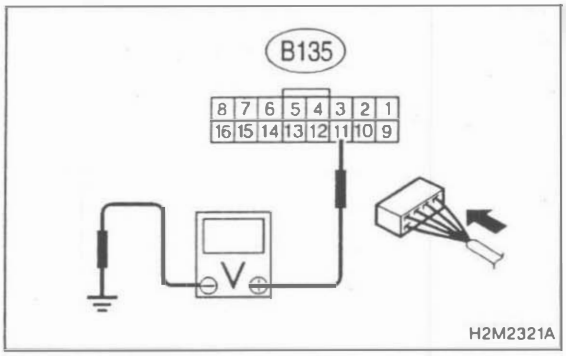
1. Check output signal from ECM.

- O.K. → Repair poor contact in ECM connector terminal. <Ref. to FOREWORD [T3C1].>
- Not O.K. → 2.

2. Check harness connector between ECM and TCM.

- Not O.K. → Repair or replace harness connectors.
- O.K. → Repair poor contact in TCM connector terminal. <Ref. to FOREWORD [T3C1].>

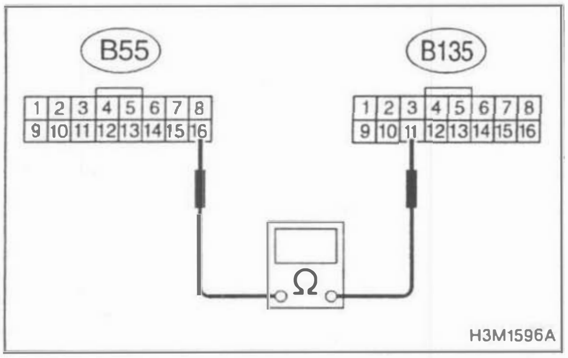




1. CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure signal voltage between ECM and body.

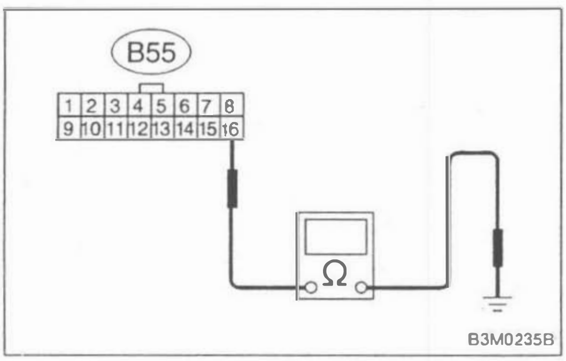
Connector & terminal / Specified voltage:
(B135) No. 11 — Body / 5±1 V



2. CHECK HARNESS CONNECTOR BETWEEN ECM AND TCM.

1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and ECM.
3) Measure resistance of harness connector between ECM and TCM.

Connector & terminal / Specified resistance:
(B135) No. 11 — (B55) No. 16 / Less than 1 Ω



4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B55) No. 16 — Body / More than 1 MΩ

M: TROUBLE CODE (44) — WASTEGATE CONTROL SOLENOID VALVE —

DIAGNOSIS:

- The wastegate control solenoid valve is not in function.
- The harness connector between ECM and wastegate control solenoid valve is in short or open.

TROUBLE SYMPTOM:

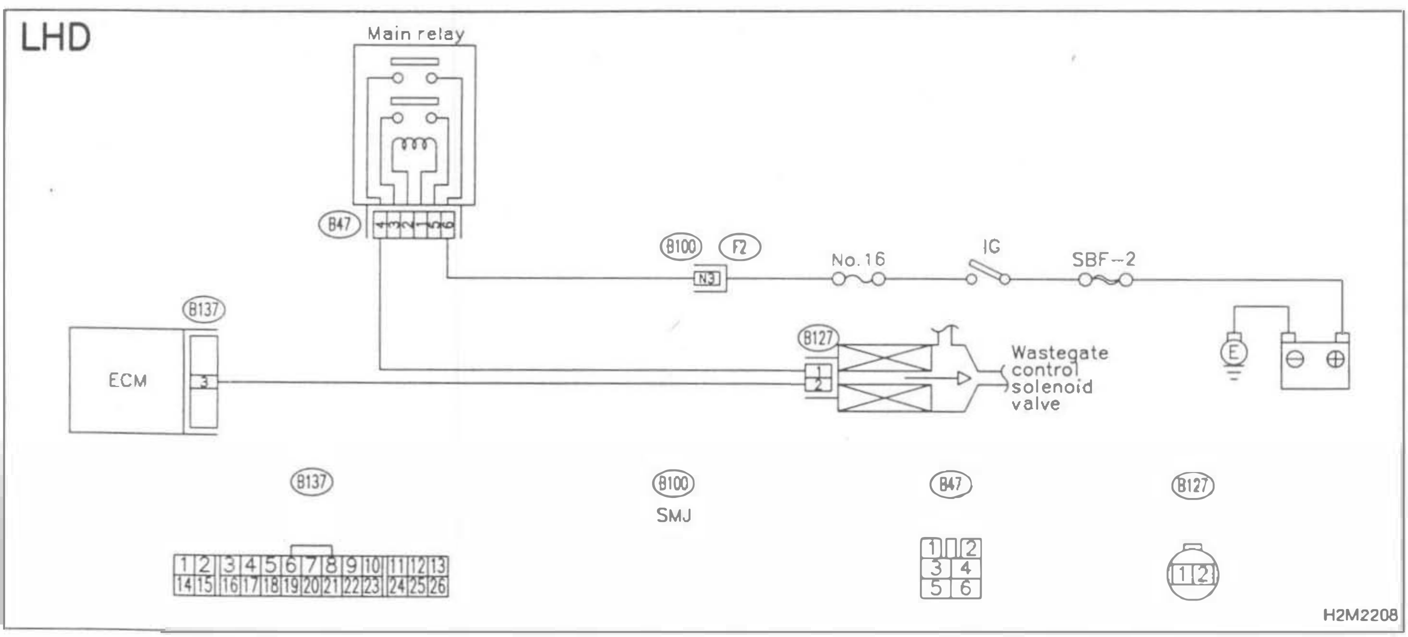
- Poor driving performance

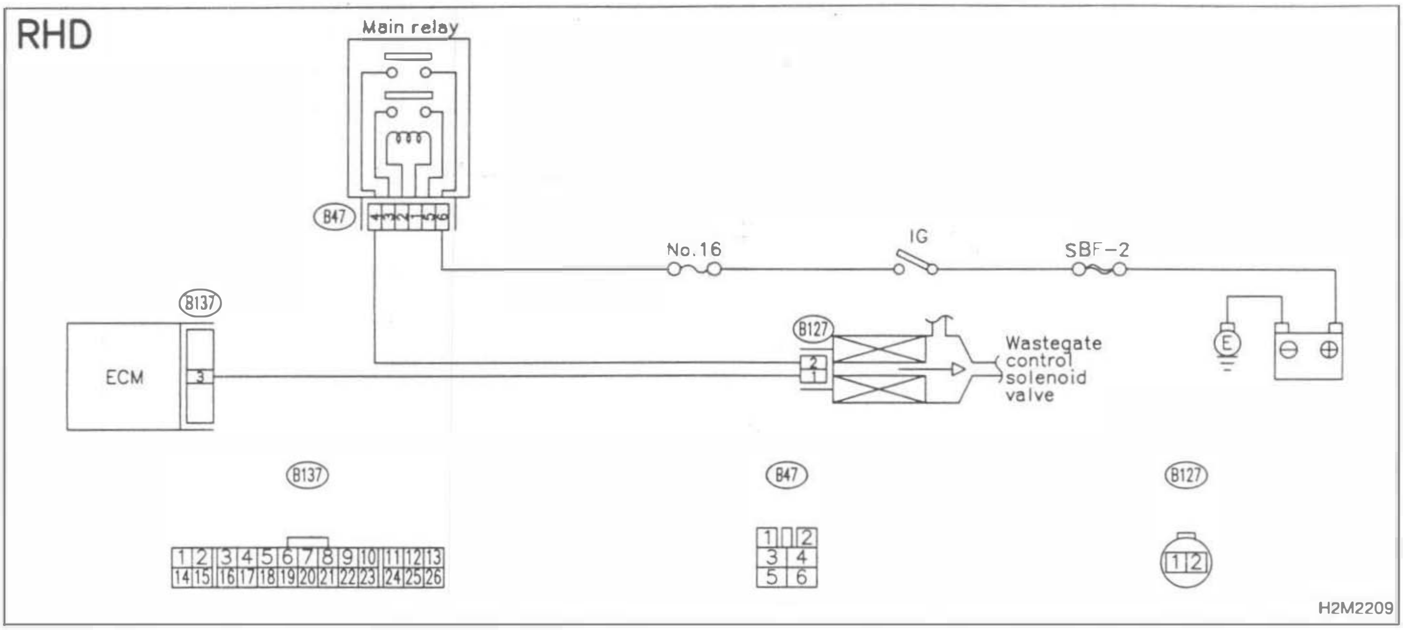
1. Check input signal for ECM.
- O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
- Not O.K. ↓

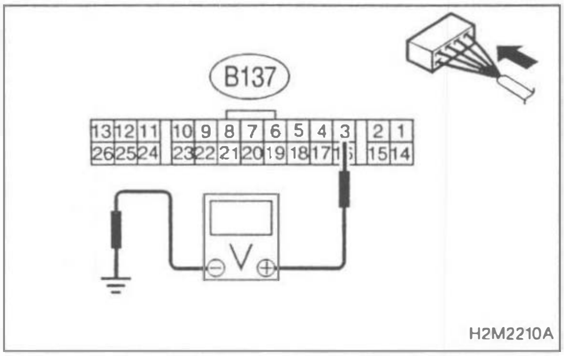
2. Check wastegate control solenoid valve.
- Not O.K. → Replace wastegate control solenoid valve.
- O.K. ↓

3. Check power supply circuit of wastegate control solenoid valve.
- Not O.K. → Repair or replace power supply circuit.
- O.K. ↓

Repair or replace harness connector between ECM and wastegate control solenoid valve.



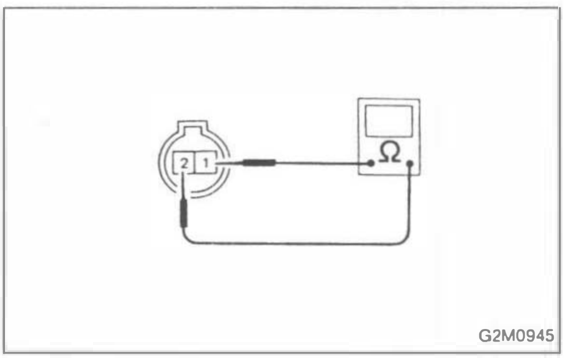




1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure signal voltage between ECM and body.

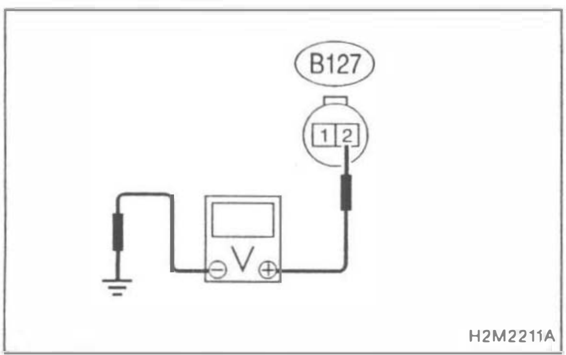
Connector & terminal / Specified voltage:
(B137) No. 3 — Body / More than 10 V



2. CHECK WASTEGATE CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connector from wastegate control solenoid valve.
3) Measure resistance between connector terminals of wastegate control solenoid valve.

Terminals / Specified resistance:
No. 1 — No. 2 / 20 Ω



3. CHECK POWER SUPPLY CIRCUIT OF WASTEGATE CONTROL SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between wastegate control solenoid valve connector and body.

Connector & terminal / Specified voltage:
(B127) No. 2 — Body / More than 10 V

N: TROUBLE CODE (45) — PRESSURE SENSOR, PRESSURE SOURCES SWITCHING SOLENOID VALVE —

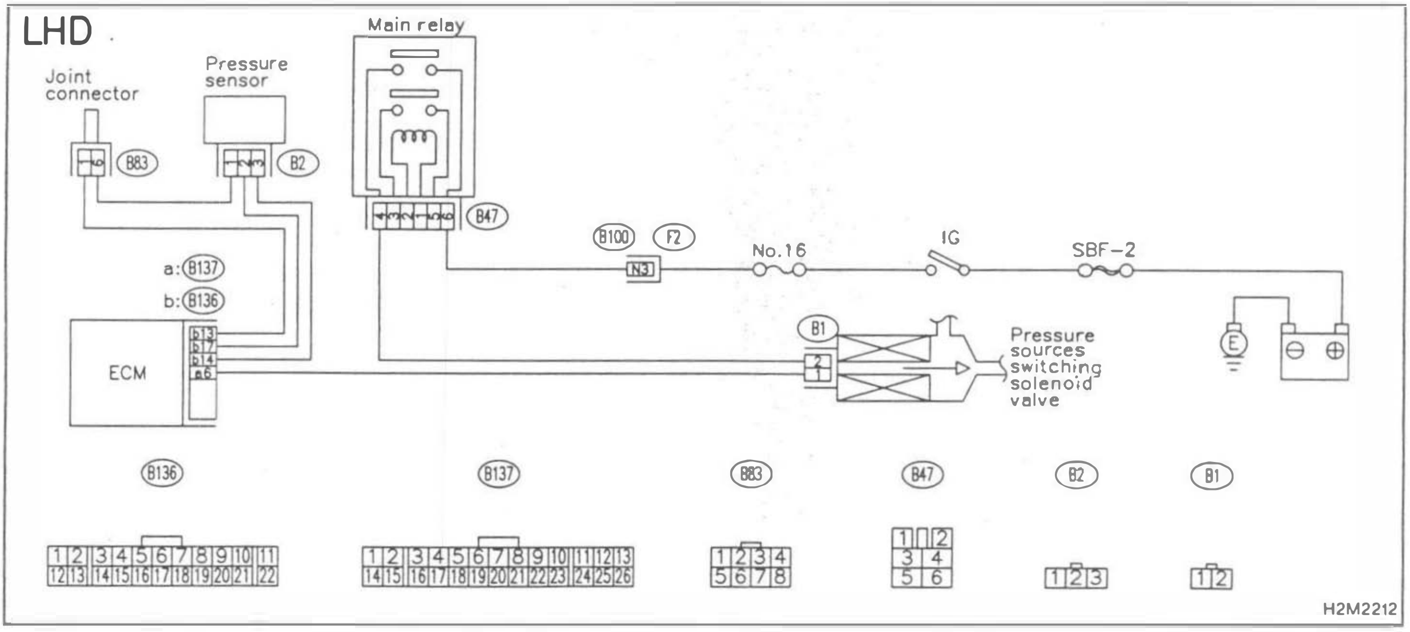
DIAGNOSIS:

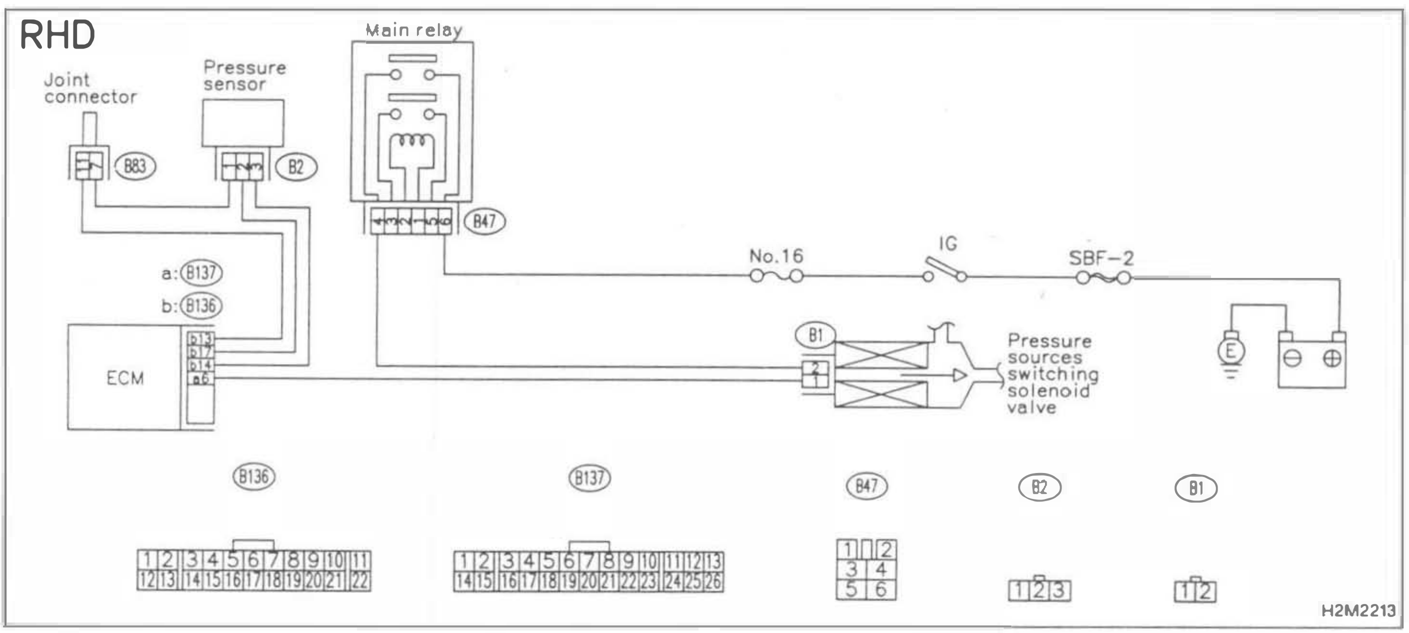
- The pressure sensor signal is abnormal.
- The pressure sources switching solenoid valve is not in function.
- The intake manifold pressure is not transmitted to pressure sensor.
- The harness connector between ECM and pressure sensor, and pressure sources switching solenoid valve is in short or open.

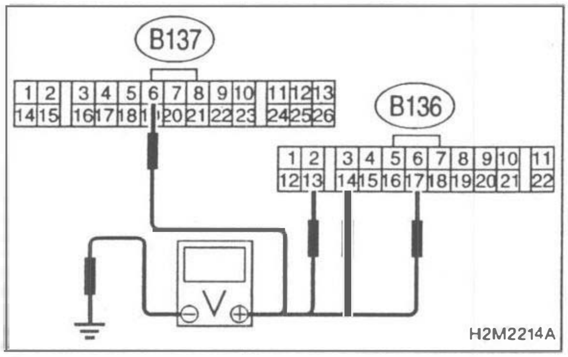
TROUBLE SYMPTOM:

- Poor driving performance

1. Check input and output signals on ECM.	O.K.	Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
↓ Not O.K.		
2. Check rubber hose to contact intake manifold pressure.	Not O.K.	Repair or replace rubber hose.
↓ O.K.		
3. Check pressure sensor.	Not O.K.	Replace pressure sensor.
↓ O.K.		
4. Check pressure sources switching solenoid valve.	Not O.K.	Replace pressure sources switching solenoid valve.
↓ O.K.		
5. Check harness connector between ECM and pressure sensor.	Not O.K.	Repair or replace harness connector.
↓ O.K.		
6. Check harness connector between ECM and pressure sources switching solenoid valve.	Not O.K.	Repair or replace harness connector.
↓ O.K.		
7. Check power supply to pressure sources switching solenoid valve.	Not O.K.	Repair or replace harness connector.
↓ O.K.		
Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>		


LHD
Main relay
Joint connector
Pressure sensor
B83
B2
B47
B100
F2
N3
No.16
IG
SBF-2
a: B137
b: B136
b13
b17
b14
a6
ECM
B1
Pressure sources switching solenoid valve
E
B136
B137
B83
B47
B2
B1
H2M2212


RHD
Main relay
Joint connector
Pressure sensor
B83
B2
B47
No.16
IG
SBF-2
a: B137
b: B136
b13
b17
b14
a6
ECM
B1
Pressure sources switching solenoid valve
E
B136
B137
B47
B2
B1
H2M2213



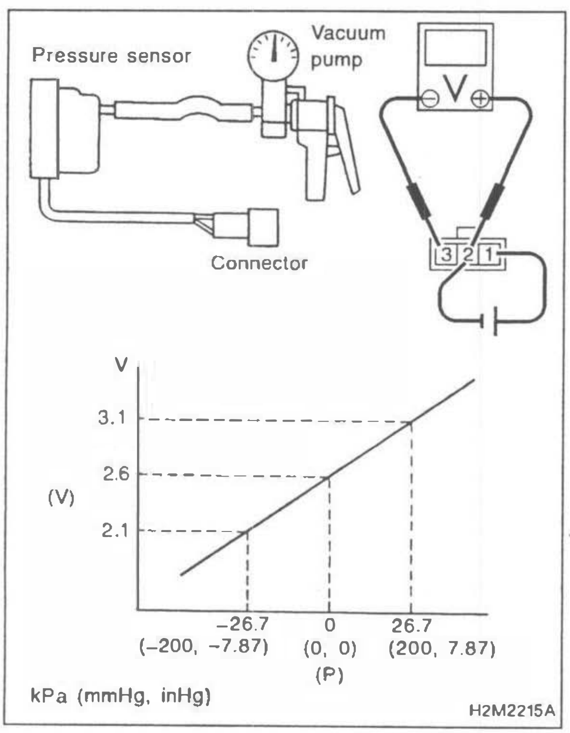
1. CHECK INPUT AND OUTPUT SIGNALS ON ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM connector terminal and body.

Connector & terminal / Specified voltage:
(B136) No. 13 — Body / 5 V
(B136) No. 14 — Body / 2.4 — 2.7 V
(B136) No. 17 — Body / 0 V
(B137) No. 6 — Body / 0 V or 10 — 13 V

2. CHECK RUBBER HOSE TO CONTACT INTAKE MANIFOLD PRESSURE.

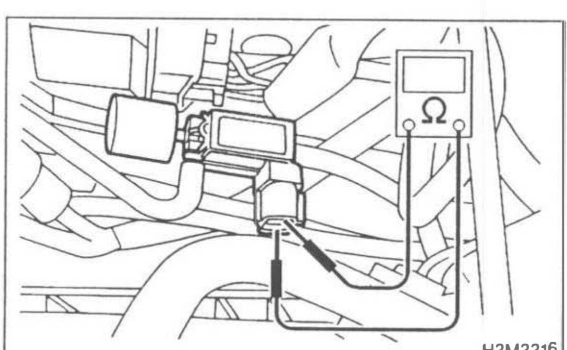
1) Visually check the connection between pressure sensor and rubber hose, between pressure sources switching solenoid valve and rubber hose, and between intake manifold and rubber hose.
2) Check rubber hose for cracks and damage.



3. CHECK PRESSURE SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from pressure sensor.
3) Apply 5 volt voltage across terminals No. 1 and No. 2, then connect terminal No. 1 to positive side and terminal No. 2 to negative side.
4) Install vacuum pump to hose fitting on pressure sensor.
5) Measure voltage across terminals when pressure is applied to pressure sensor.

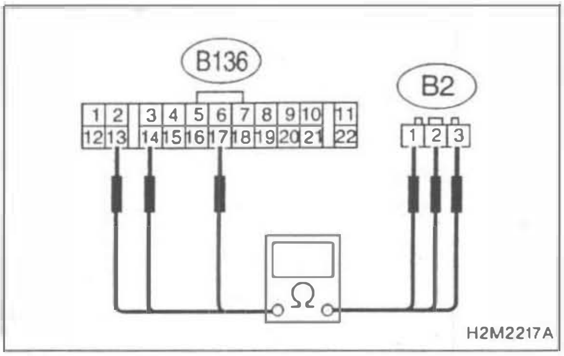
Terminals / Specified voltage:
No. 2 — No. 3 / 3.1 V at 26.7 kPa (200 mmHg, 7.87 inHg)
2.6 V at 0 kPa (0 mmHg, 0 inHg)
2.1 V at –26.7 kPa (–200 mmHg, –7.87 inHg)



4. CHECK PRESSURE SOURCES SWITCHING SOLENOID VALVE.

1) Disconnect connector from pressure sources switching solenoid valve.
2) Measure resistance across terminals.

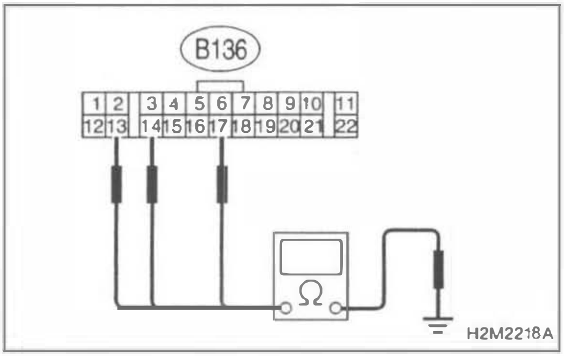
Terminals / Specified resistance:
No. 1 — No. 2 / 37 — 48 Ω



5. CHECK HARNESS CONNECTOR BETWEEN ECM AND PRESSURE SENSOR.

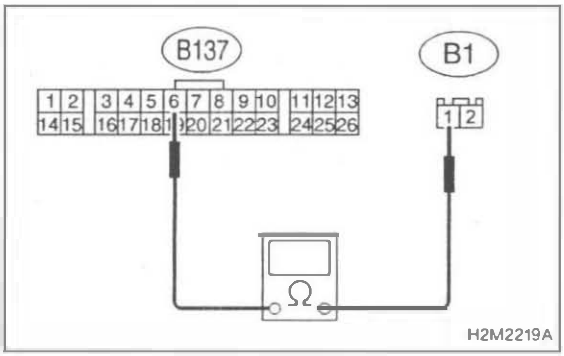
1) Disconnect connectors from ECM.
2) Measure resistance of harness connector between ECM and pressure sensor connector.

Connector & terminal / Specified resistance:
(B136) No. 13 — (B2) No. 1 / Less than 1 Ω
(B136) No. 14 — (B2) No. 3 / Less than 1 Ω
(B136) No. 17 — (B2) No. 2 / Less than 1 Ω



3) Measure resistance between ECM connector terminal and body to make sure that circuit does not short.

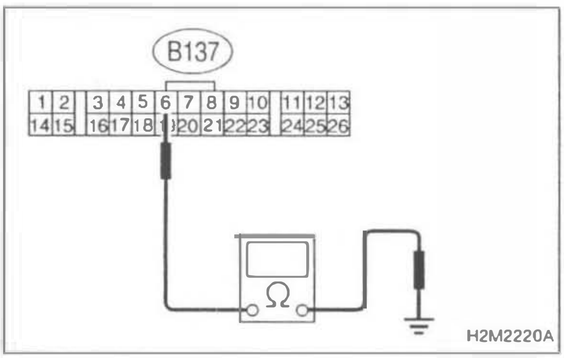
Connector & terminal / Specified resistance:
(B136) No. 13 — Body / More than 1 MΩ
(B136) No. 14 — Body / More than 1 MΩ
(B136) No. 17 — Body / More than 1 MΩ



6. CHECK HARNESS CONNECTOR BETWEEN ECM AND PRESSURE SOURCES SWITCHING SOLENOID VALVE.

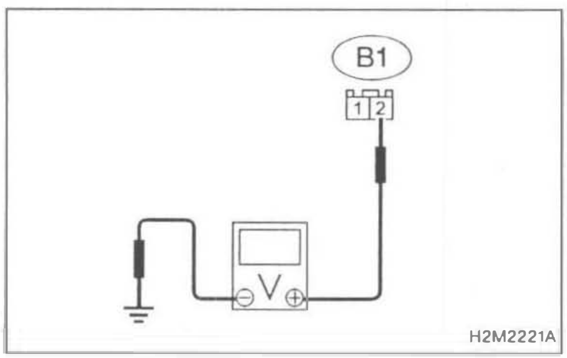
1) Measure resistance of harness connector between ECM and pressure sources switching solenoid valve connector.

Connector & terminal / Specified resistance:
(B137) No. 6 — (B1) No. 1 / Less than 1 Ω



2) Measure resistance of harness connector between ECM terminal and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B137) No. 6 — Body / More than 1 MΩ



7. CHECK POWER SUPPLY TO PRESSURE SOURCES SWITCHING SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between connector terminal of pressure sources switching solenoid valve and body.

Connector & terminal / Specified voltage:
(B1) No. 2 — body / More than 10 V

O: TROUBLE CODE (51) — NEUTRAL POSITION SWITCH (MT VEHICLE) —

DIAGNOSIS:

- The neutral position switch signal is abnormal.
- The harness connector between ECM and neutral position switch is in short or open.

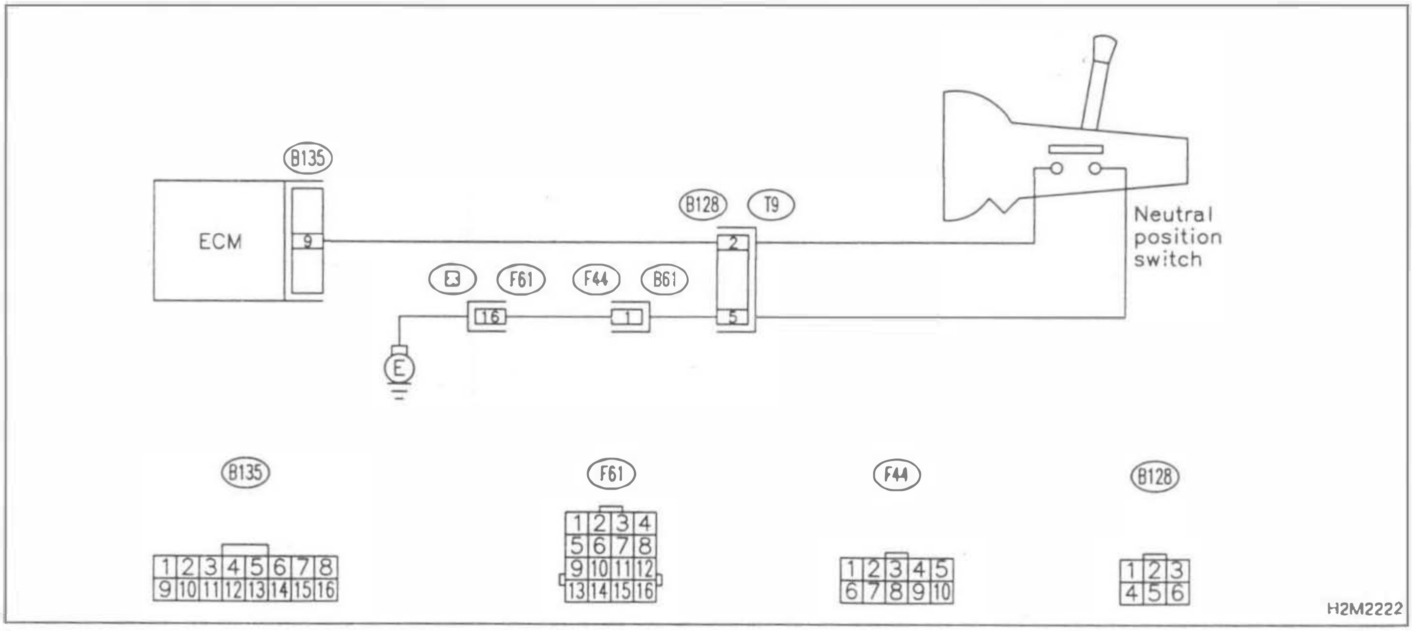
TROUBLE SYMPTOM:

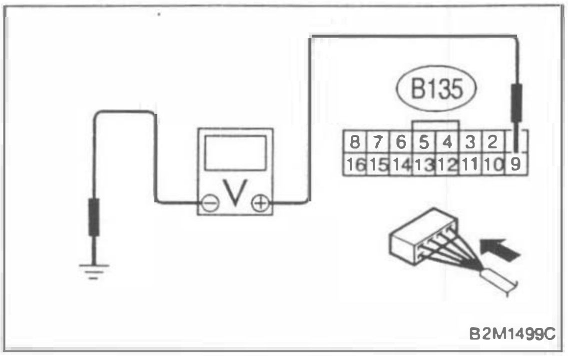
- Erroneous idling

1. Check input signal for ECM.
- O.K. → Check poor contact in ECM connectors. <Ref. to FOREWORD [T3C1].>
- Not O.K. → go to 2.

2. Check neutral position switch.
- Not O.K. → Replace neutral position switch.
- O.K. → go to 3.

3. Check harness connector between ECM and neutral position switch.
- Not O.K. → Repair or replace harness connector.
- O.K. → Repair or replace harness connector of ground line.

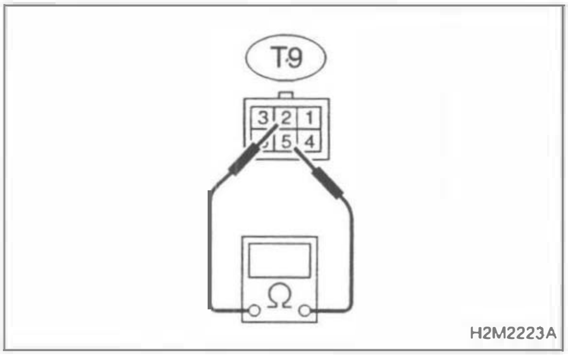




1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

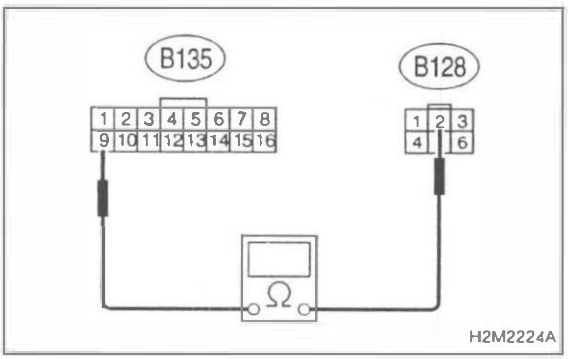
Connector & terminal / Specified voltage:
(B135) No. 9 — Body / 5 V (Neutral position) / 0 V (Other positions)



2. CHECK NEUTRAL POSITION SWITCH.

1) Turn ignition switch to OFF.
2) Disconnect connector from transmission harness.
3) Measure resistance between connector terminals of transmission harness.

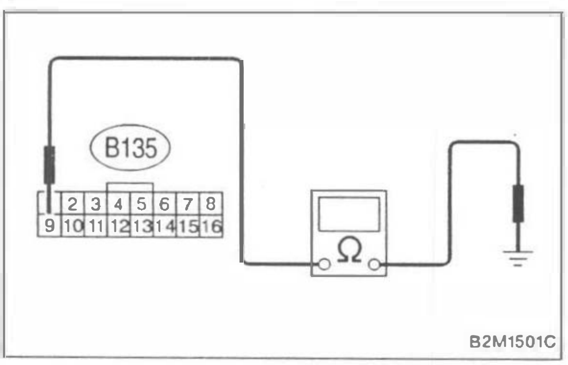
Connector & terminal / Specified resistance:
(T9) No. 2 — (T9) No. 5 / More than 1 MΩ (Neutral position) / Less than 10 Ω (Other positions)



3. CHECK HARNESS CONNECTOR BETWEEN ECM AND NEUTRAL POSITION SWITCH.

1) Disconnect connectors from ECM.
2) Measure resistance of harness connector between ECM and neutral position switch.

Connector & terminal / Specified resistance:
(B135) No. 9 — (B128) No. 2 / Less than 1 Ω



3) Measure resistance of harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B135) No. 9 — Body / More than 1 MΩ

P: TROUBLE CODE (51) — PARK/NEUTRAL POSITION SWITCH (AT) —

DIAGNOSIS:

- The park/neutral position switch signal is abnormal.
- The shift cable is connected abnormally.
- The harness connector between ECM/TCM and inhibitor switch is in short or open.

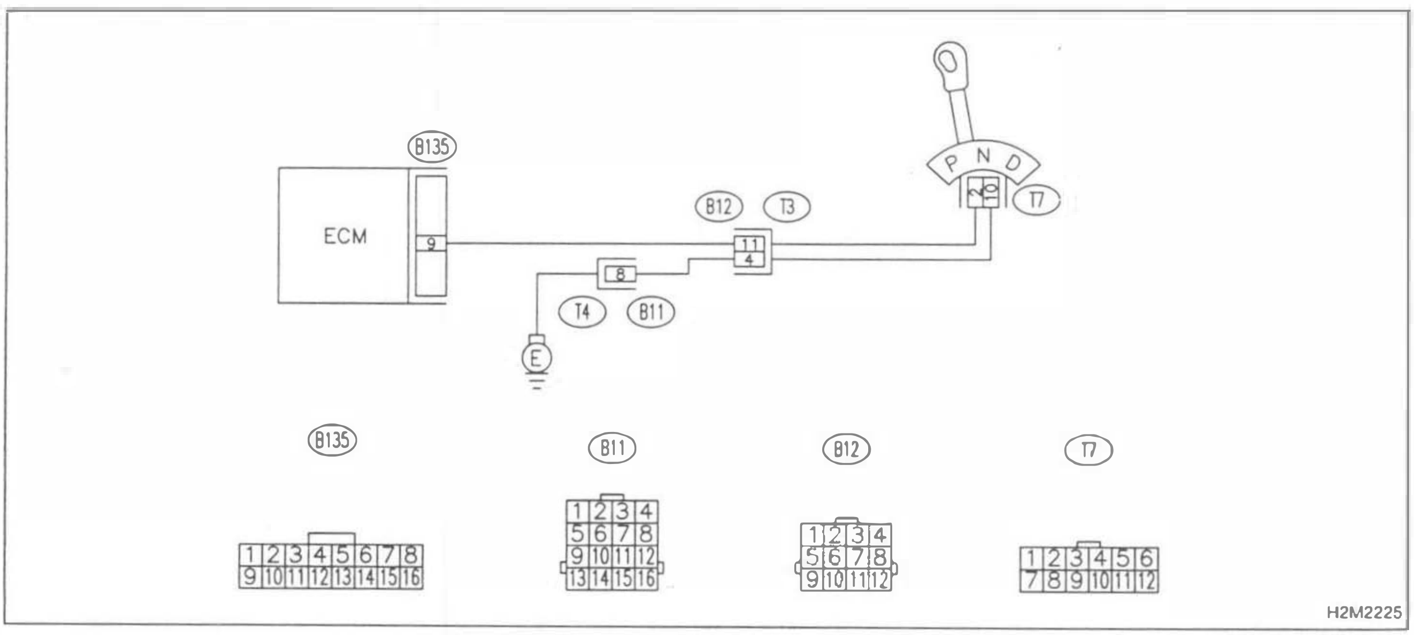
TROUBLE SYMPTOM:

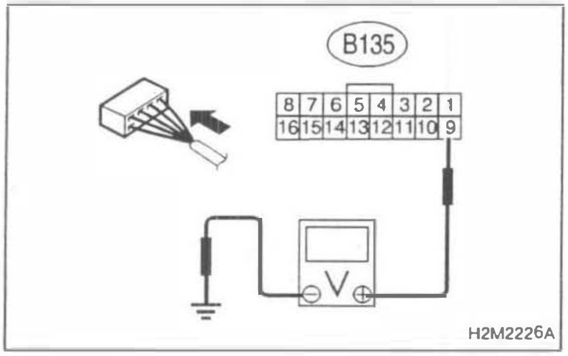
- Erroneous idling

1. Check input signal for ECM.
- O.K. → Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>
- Not O.K. → go to step 2.

2. Check harness connector between ECM and inhibitor switch.
- Not O.K. → Repair or replace harness connector.
- O.K. → go to step 3.

3. Check inhibitor switch ground circuit.
- Not O.K. → Repair or replace harness connector.
- O.K. →
  - Check selector cable connection to inhibitor switch.
  - Replace inhibitor switch.

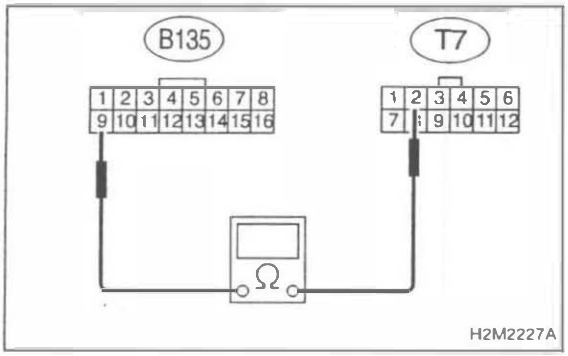




1. CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and body.

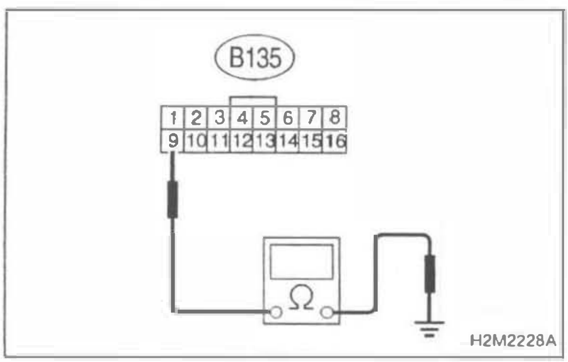
Connector & terminal / Specified voltage:
(B135) No. 9 — Body / 0 V ("P" or "N" position)



2. CHECK HARNESS CONNECTOR BETWEEN ECM AND INHIBITOR SWITCH.

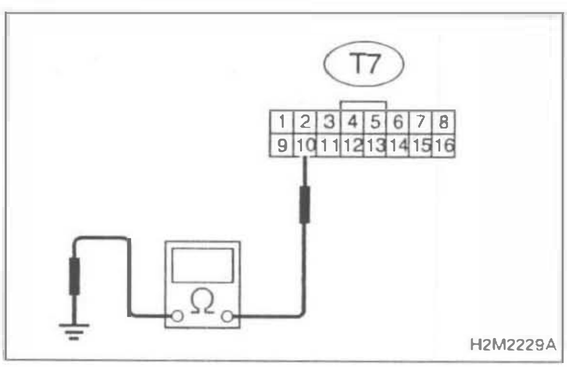
1) Turn ignition switch to OFF.
2) Disconnect connector from ECM and transmission harness or inhibitor switch.
3) Measure resistance of harness connector between ECM and transmission harness or inhibitor switch.

Connector & terminal / Specified resistance:
(B135) No. 9 — (T7) No. 2 / Less than 1 Ω



4) Measure resistance harness connector between ECM and body to make sure that circuit does not short.

Connector & terminal / Specified resistance:
(B135) No. 9 — Body / More than 1 MΩ



3. CHECK INHIBITOR SWITCH GROUND CIRCUIT.

Measure resistance of harness between transmission harness or inhibitor switch connector and body.

Connector & terminal / Specified resistance:
(T7) No. 10 — Body / Less than 5 Ω

SERVICE MANUAL

SUBARU IMPREZA

TRANSMISSION AND DIFFERENTIAL SECTION

Technical description

- Mechanism and function

1. Outline

A: NON-TURBO MODEL

- The clutch control is of a simple yet reliable design using a cable which directly moves the release fork back and forth. This ensures smooth and reliable clutch control with minimum frictional resistance.
- The clutch itself is a push type clutch. When the clutch pedal is depressed, the self-aligning release bearing is caused to slide on a guide pressing the center of the diaphragm spring. The warped diaphragm spring disengages the pressure plate from the clutch disc.
The clutch using a diaphragm spring has the advantage of little variation in push load even when the clutch disc facing is worn.
The diaphragm spring is located inside the clutch cover.
- The clutch has a clutch disc between the flywheel and the pressure plate.
- Inside the clutch cover, there is a diaphragm spring and a pressure plate combined with each other by means of strap plates, which also serve to prevent the pressure plate from turning.
- The flywheel, whose outer diameter is 314.8 mm (12.394 in), is of flat design for better heat radiation and abrasion powder removal.

B. TURBO MODEL

- The turbo model adopts a hydraulic control due to increased clutch load.
- The clutch control operates the release fork using the hydraulic pressure which the master cylinder generates by converting the pedal depressing force.
- The clutch itself is a pull type clutch. When the clutch pedal is depressed, the self-aligning release bearing is caused to slide on a guide pulling the center of the diaphragm spring. The warped diaphragm spring disengages the pressure plate from the clutch disc.
The clutch using a diaphragm spring has the advantage of little variation in push load even when the clutch disc facing is worn.
The diaphragm spring is located inside the clutch cover.
- The clutch has a clutch disc between the flywheel and the pressure plate.
- Inside the clutch cover, there is a diaphragm spring and a pressure plate combined with each other by means of strap plates, which also serve to prevent the pressure plate from turning with respect to the clutch cover.

2. Operation

A: NON-TURBO MODEL

Applying foot pressure to the clutch pedal moves the release lever. This causes the release bearing to slide on the guide, pressing the diaphragm spring in the center. The spring is warped and the force having pressed the pressure plate is lost. As a result, the flywheel, clutch disc and pressure plate are disengaged, disconnecting the driving power.

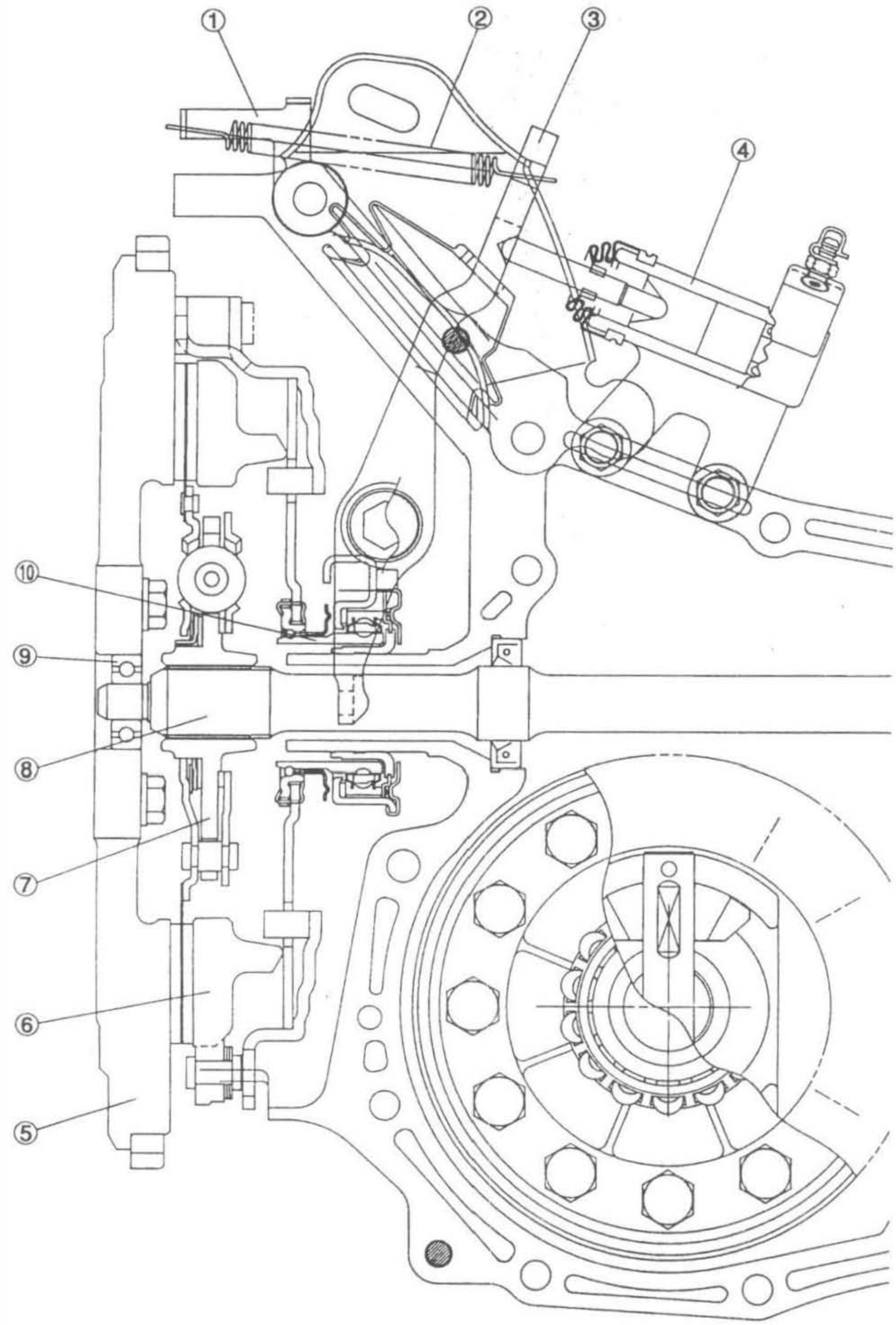
The push type clutch has the point of action at the tips of the diaphragm spring fingers, through which the pressure plate is pressed to the clutch disc. When the power transmission is to be interrupted, the diaphragm spring is forced to warp using the pivots established on the inward side of the spring finger tips (on the principle of the lever and fulcrum) to disengage the pressure plate from the clutch disc.

B. TURBO MODEL

Applying foot pressure to the clutch pedal moves the release lever. This causes the release bearing to slide on the guide, pulling the diaphragm spring at the center. The spring is warped and the force having pressed the pressure plate is lost. As a result, the flywheel, clutch disc and pressure plate are disengaged, disconnecting the driving power.

On the pull type clutch, the diaphragm spring has the point of action at the inward part distant from the tip, through which the pressure plate is pressed against the clutch disc. When the power transmission is to be interrupted, the diaphragm spring is forced to pivot on the tip and warp away from the pressure plate (on the principle of lever and fulcrum).

B. HYDRAULIC APPLICATION TYPE



H2H1736A

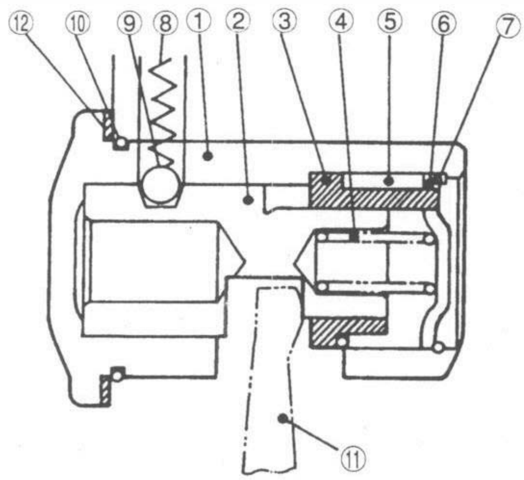
① Spring bracket
② Spring
③ Release lever
④ Operating cylinder
⑤ Flywheel
⑥ Clutch cover
⑦ Clutch disc
⑧ Transmission main shaft
⑨ Ball bearing
⑩ Release bearing

3. Reverse Check Mechanism

A: CONSTRUCTION

The sleeve ① is bolted to the transmission case. The shaft ② is inserted in the sleeve ①. On the smaller-diameter side of this shaft ②, the cam ③ is loosely mounted so that it can rotate, and the sleeve ① holds the cam in place with its stepped part.

The spring ④, which is inserted in the shaft ② presses the shaft to the left. Further, the spring ⑤ is placed in between the cam ③ and sleeve ①, which forces the cam ③ to the left and in the direction of rotation. Both springs are held down with the plate ⑥ that is attached to the sleeve ① with the snap ring ⑦. The shaft ② has a groove for reverse accent, in which the ball ⑨ and spring ⑥ are put through a hole drilled in the sleeve ①.

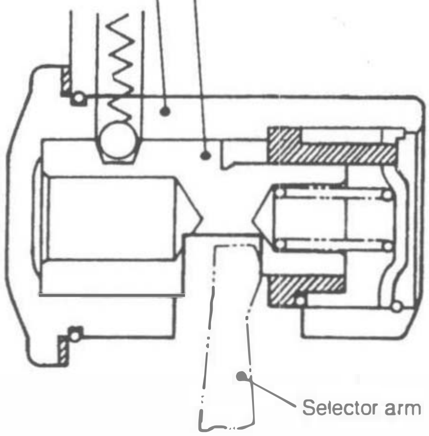


B3H0479B

① Reverse check sleeve
② Reverse accent shaft
③ Reverse check cam
④ Reverse return spring
⑤ Reverse check spring
⑥ Reverse check plate
⑦ Snap ring
⑧ Reverse accent spring
⑨ Ball
⑩ O-ring
⑪ Selector arm
⑫ Select adjust shim

B: OPERATION

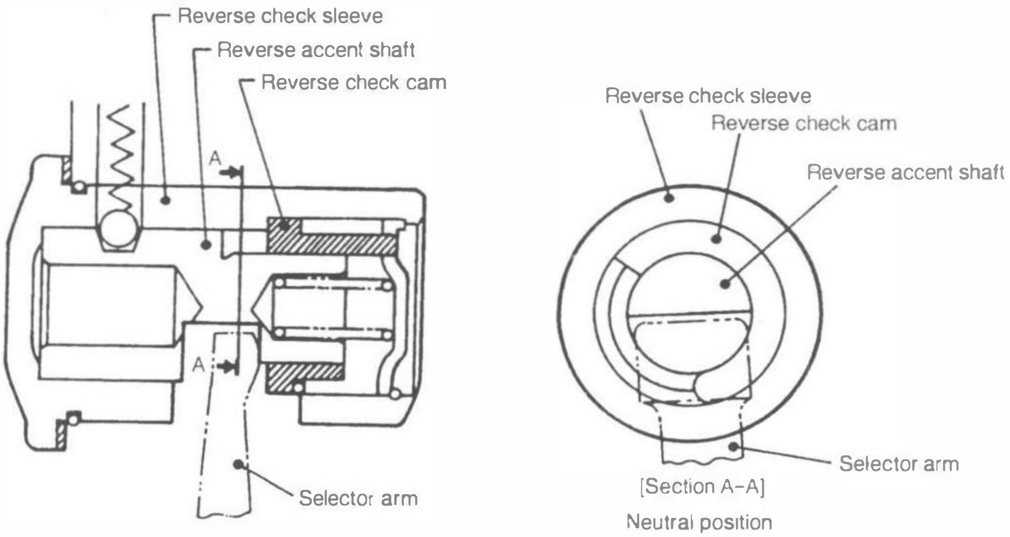
As shown in the previous figure, the sleeve and shaft have a notch, and the arm is placed between the notches. The position of the arm shown is the neutral position (hereafter referred to as (N) position). The point where the arm stops when moved to the left is the 1st and 2nd position. Opposite this, the point where the arm stops when moved to the right is the 5th and reverse position.



B3H0479A

1. WHEN 5TH AND REVERSE SIDE IS SELECTED

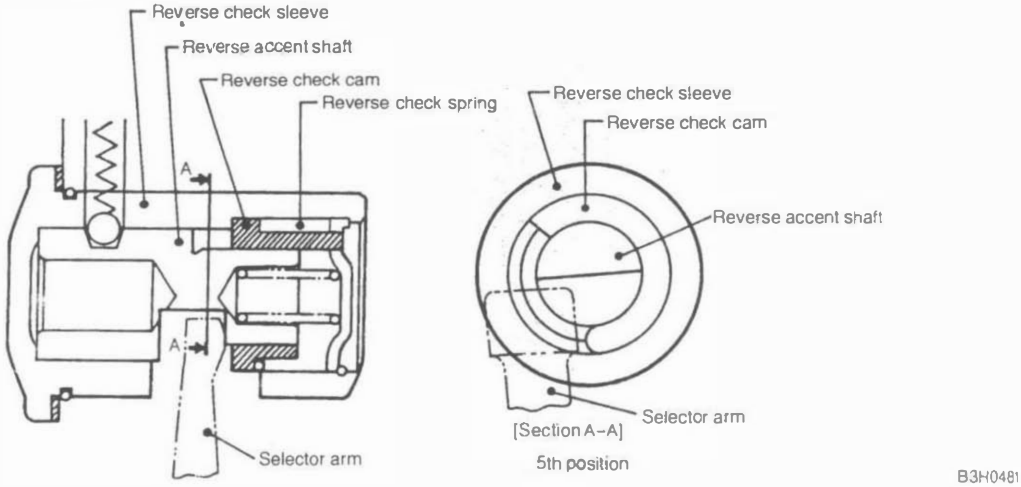
The arm pushes the shaft and cam simultaneously and moves to the 5th and reverse side.



B3H0480

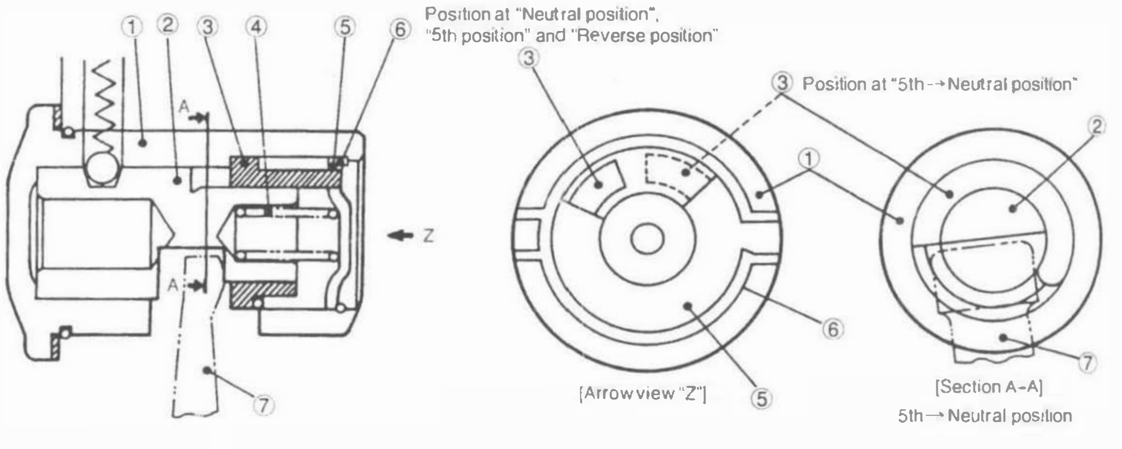
2. WHEN SHIFT IS MADE TO 5TH

The arm moves to the 5th side pushing the shaft. When the arm pulls out of the cam, the cam is returned to the original position by the spring.



3. WHEN SHIFT IS MADE FROM 5TH TO REVERSE

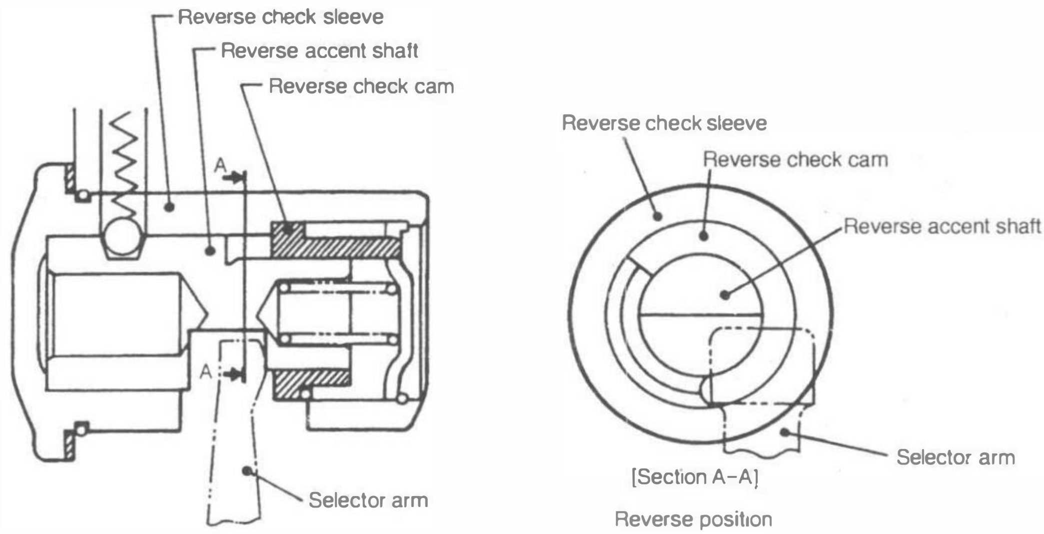
The arm moves to the reverse side pushing the shaft and runs against the cam that has already returned. The cam has, as shown in figure [Arrow view "Z"], a stopper, which hits against the plate. Thus, the cam cannot rotate further. Accordingly, the arm comes to a stop at a point where it has turned the cam to a certain degree (i.e., (N) position), and the cam is pushed back to the (N) position by the shaft (i.e., the spring).



1 Reverse check sleeve
2 Reverse accent shaft
3 Reverse check cam
4 Reverse return spring
5 Reverse check plate
6 Snap ring
7 Selector arm

. WHEN SHIFT IS MADE TO REVERSE

he arm again moves to the 5th and reverse side. When the shift is made to reverse, the arm moves
the reverse position while pushing the shaft and cam together.



B3H0483

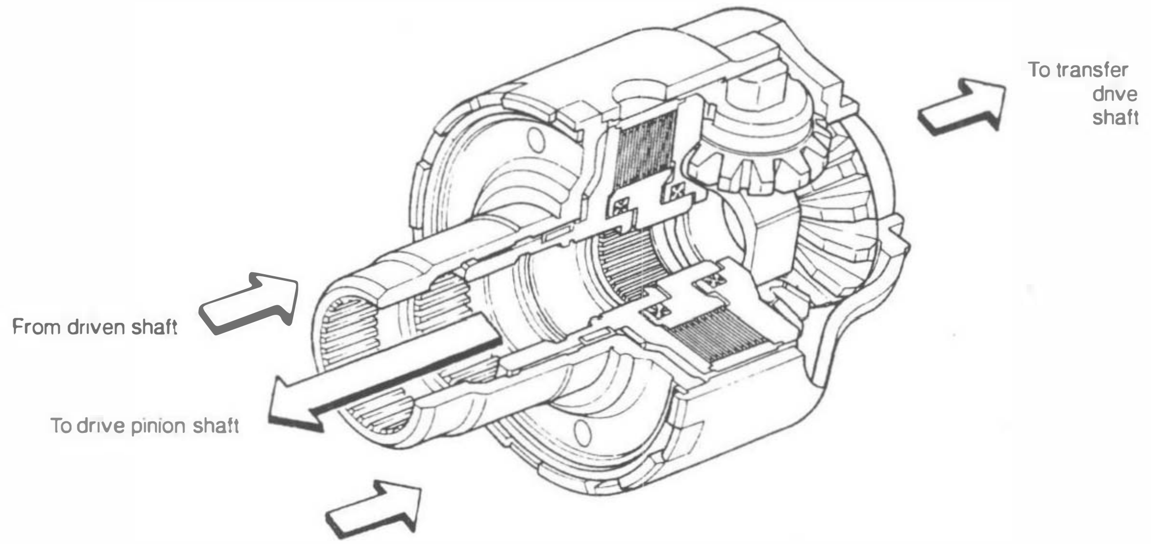
4. Center Differential

A: CONSTRUCTION

The center differential utilizes a "shaft-to-shaft" design which connects the front-wheel drive pinion shaft and the rear-wheel drive.transfer drive gear shaft via viscous coupling to achieve compact construction. With this arrangement, viscous torque is generated by a difference in rotating speed between the two shafts so that both differential action and drive torque distribution are properly controlled.

The center differential provides a means of distributing engine torque (transmitted to the tubular driven shafts by way of the clutch, mainshaft and various gears) to the front- and rear-wheel drive shafts equally, as well as absorbing the difference in rotating speed between the front and rear wheels during turns.

When the front and/or rear wheels spin on muddy roads, etc., viscous coupling controls the differential action so that the optimum drive torque is automatically distributed to these wheels.

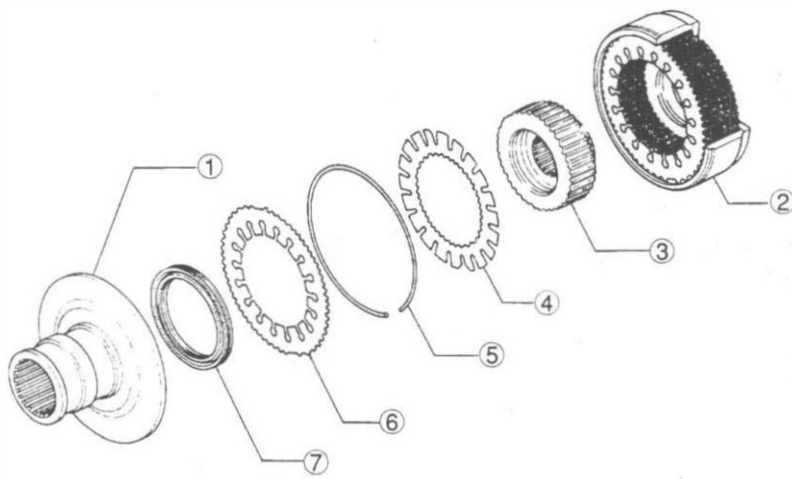


G3H0163

B: MECHANISM OF VISCOUS COUPLING

The viscous coupling housing contains a number of inner and outer plates which are arranged alternately. The inner plate has its internal perimeter fitted to the external hub splines while the outer plate has its external perimeter fitted to the internal housing splines. A spacer ring is provided to position the perimeter of the outer plate. The inner plate has no spacer ring and moves slightly between the adjacent outer plates, along the hub splined in the axial direction.

A mixture of silicone oil and air is sealed in the space inside the viscous coupling housing. An "X" seal ring prevents silicone oil from entering the transmission. This could occur when silicone oil is highly pressurized due to an increase in rotating speed difference between the front and rear wheels.



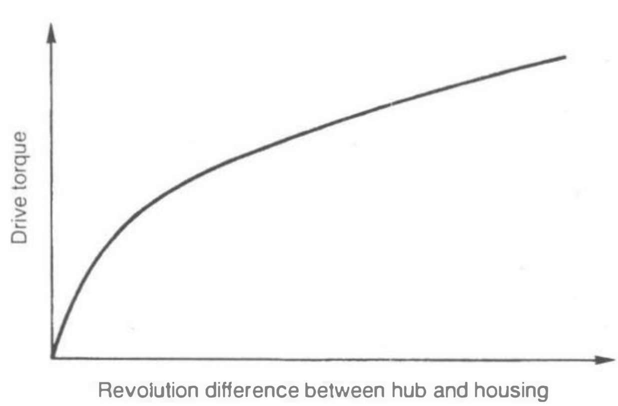
G3H0164

1. Cover
2. Housing
3. Hub
4. Inner plate
5. Spacer ring
6. Outer plate
7. Oil seal

1. TORQUE CHARACTERISTICS

When a difference in rotating speed between the viscous coupling housing and the hub occurs, a viscous shearing force is generated in the silicone oil placed between the outer and inner plates. The torque is then transmitted by the silicone oil between the housing and the hub.

The greater the difference in rotating speed between the viscous coupling housing and the hub, the greater the shearing force of the silicone oil. The relationship between the torque transmission and rotation speed difference is shown in the figure. As can be seen from the figure, the smaller the rotating speed difference, the lesser the torque transmission and the differential-action.



G3H0165

. "HUMP" PHENOMENON

ilicone oil is heated and expands as differential action continues. This crushes air inside the vis-ous coupling so that the silicone oil "charging rate" will increase. As differential action continues, nternal pressure will abruptly increase so that inner and outer plates (alternately arranged) come contact. This causes quick torque transmission to occur, which is called a "hump" phenomenon.

he "hump" phenomenon eliminates the rotating speed difference between the housing and hub which results in a state similar to "direct coupling"). This in turn decrease internal pressure and emperature. The viscous coupling returns to the normal operation. (The "hump" phenomenon loes not occur under normal operating conditions.)

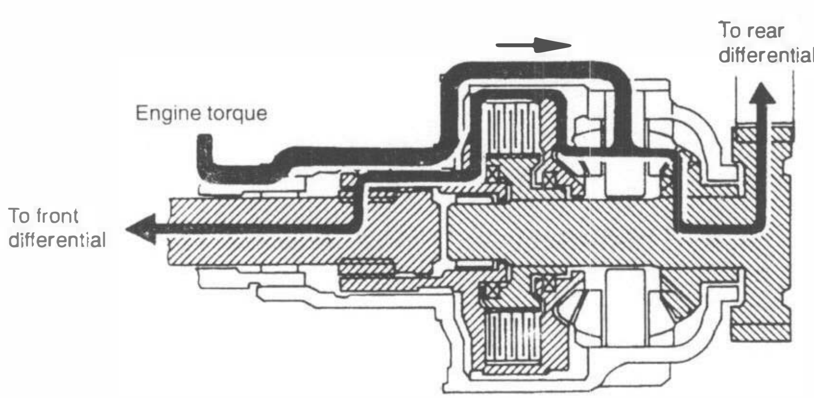
: FUNCTION

During normal driving (when there is no speed difference between the front and rear wheels), the center differential delivers drive power to the front and rear wheels at a torque ratio of 50:50.

Vhen a rotating speed difference occurs between the front and rear wheels, the center differential ction is controlled by viscous coupling so that optimum drive forces are automatically distributed the two.

. DURING NORMAL DRIVING

During normal straight driving (on flat roads at constant speed), all four wheels rotate at the same speed. The center differential delivers engine torque to the front and rear drive axles. The viscous coupling does not perform the differential-action control because there is no rotating speed differ-ence between the front and rear drive shafts.

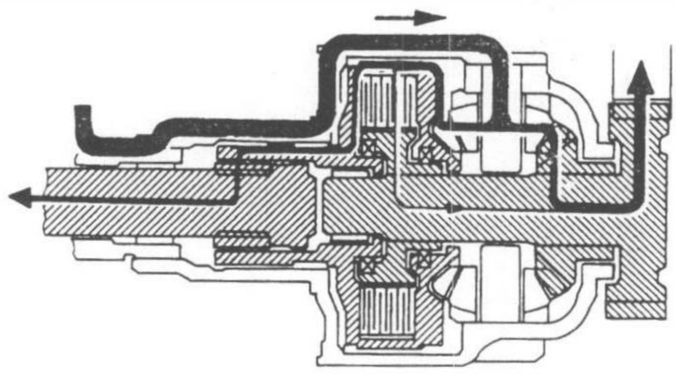


G3H0166

2. DURING TURNS AT LOW SPEEDS

During turns at low speeds, a rotating speed difference occurs between the front and rear wheels, as well as the left and right wheels. In other words, the front wheels rotate faster than the rear wheels. When there is a small rotating speed difference (when vehicle speed is low), the center differential acts to absorb the rotating speed difference, making it possible to drive smoothly.

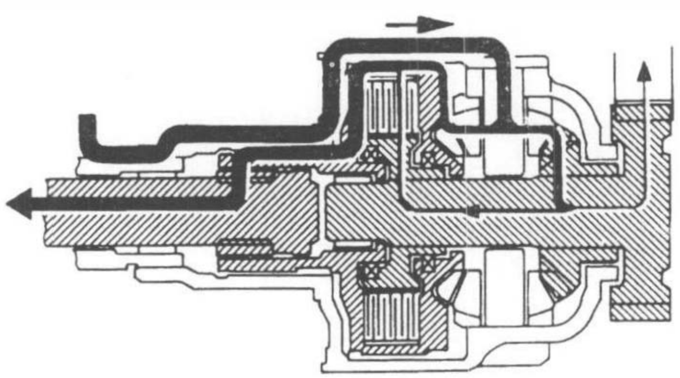
Although a slight rotating speed difference is transmitted to the viscous coupling, less torque transmission occurs because of the small rotating speed difference.



G3H0167

3. ACCELERATION DURING STANDING STARTS ON A LOW "μ" ROAD

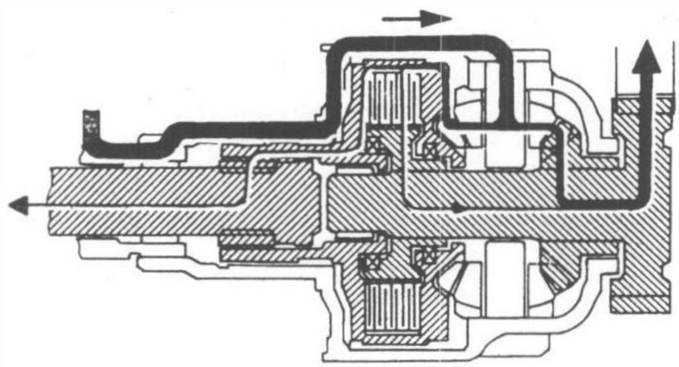
During rapid acceleration from standing starts on a slippery (low "μ") road, front and rear wheel weight distribution changes. When the rear wheels begin to spin, the rotating speed difference between the two shafts increase simultaneously. This causes the viscous coupling to activate to that more torque is transmitted to the front wheels than to the rear. In addition, the center-differential's action is also restricted. In this way, acceleration performance during standing starts on low "μ" roads is greatly enhanced.



G3H0168

4. DRIVING ON ROUGH ROADS

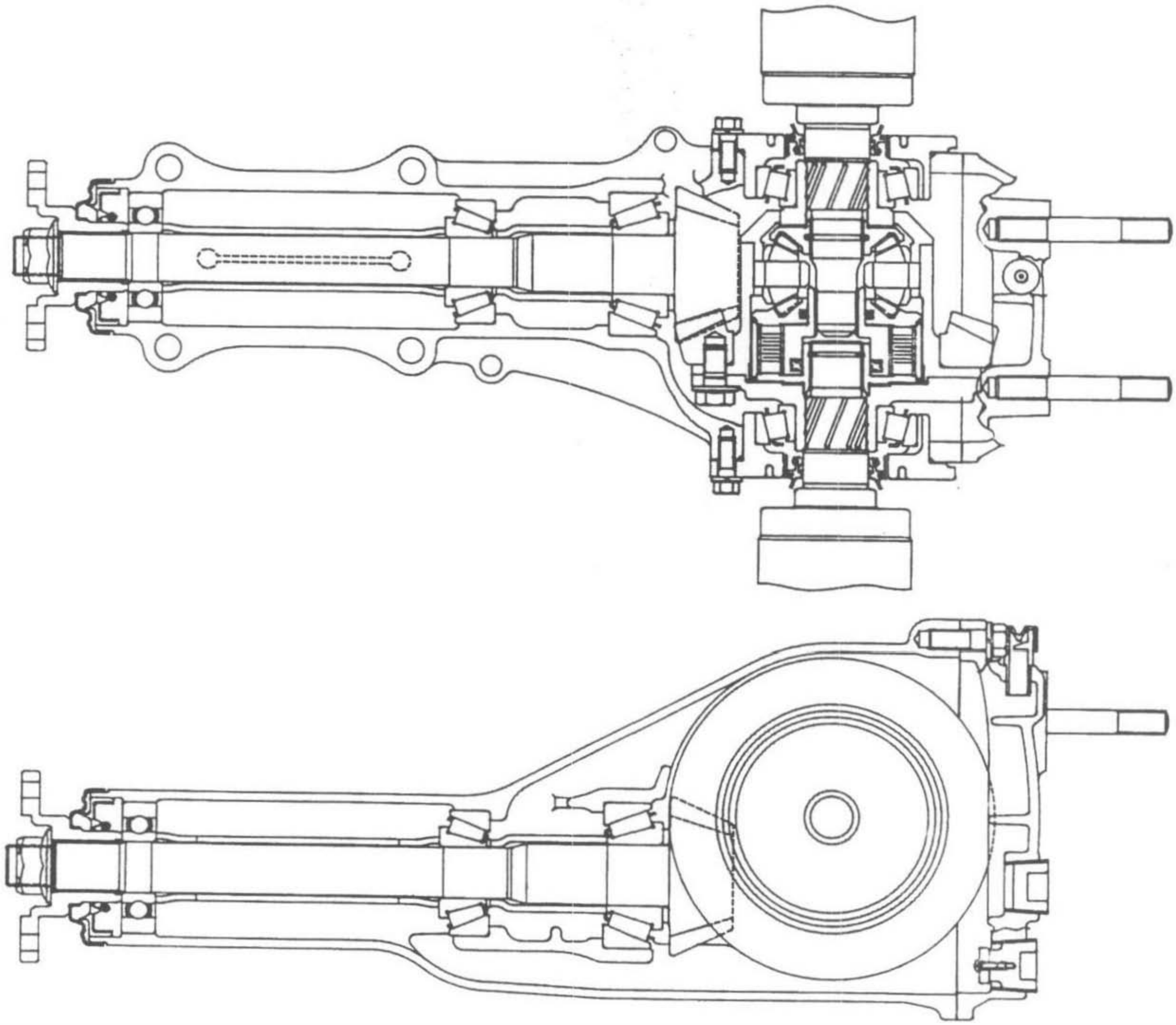
When one of the wheels begins to spin during rough-road driving, the rotating speed difference between the shafts is increased by the differential's action. At this point, the viscous coupling delivers large torque to the differential on the side which is not spin ring. In this way, driving stability on rough roads is increased. (The figure below shows an example of front wheel slip.)



G3H0169

C: T-TYPE (TURBO MODEL)

The rear differential is a limited slip differential (LSD) incorporating outer plates, inner plates, and viscous coupling with silicon oil.



H3H1409

3. Limited Slip Differential (LSD)

A viscous coupling (VC) type LSD has been adopted so as to ensure safe and smooth transfer of increased power under various driving conditions. This VC type LSD features ease of turning while maintaining excellent stability when driving over slippery roads or when using engine brake, thus enabling engine power to be utilized efficiently. Smooth restriction of differential operation of the left and right wheels results in improved running stability on bad roads, snowy roads, and also on muddy roads.

A: STRUCTURE

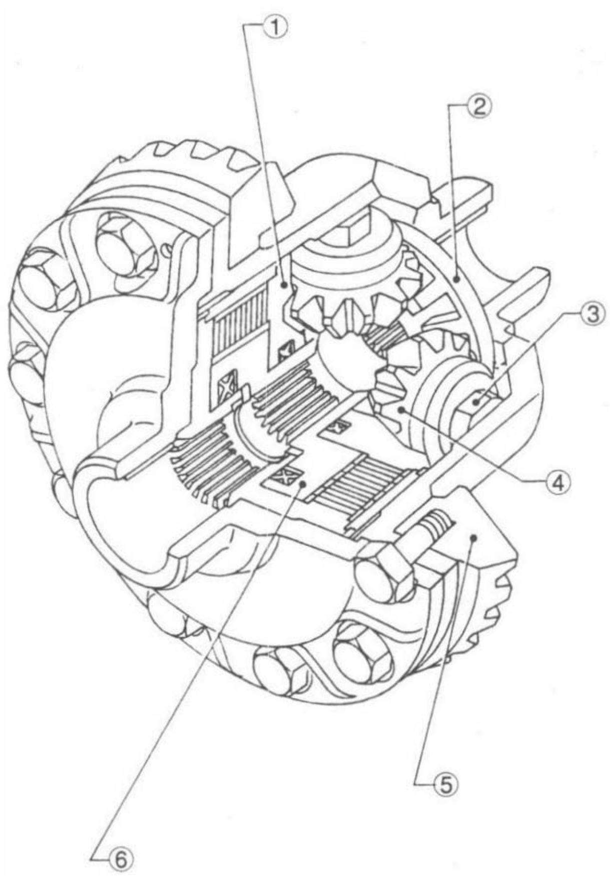
The VC type LSD adopts a "shaft to shaft system" in which the RH and LH rear drive shafts are coupled by a VC.

This results in a compact structure with high performance.

The inside of the VC housing is formed by alternately combining the outer plates (the outer periphery of each plate engages with the internal spline of the housing) and inner plates (the inner periphery of each plate engages with the outer spline of the hub).

On the outer periphery of the outer plate, the spacer ring is fitted and set in position. On the inner plate, no positioning ring is used: The plate can be moved a certain amount on the hub spline in the axial direction.

Sealed inside the housing is a mixture of high viscosity silicon oil and air. The housing is sealed by X-rings so that silicon oil will not leak into the rear final drive even when the pressure increases due to a greater difference in the rotation speed between LH and RH wheels.



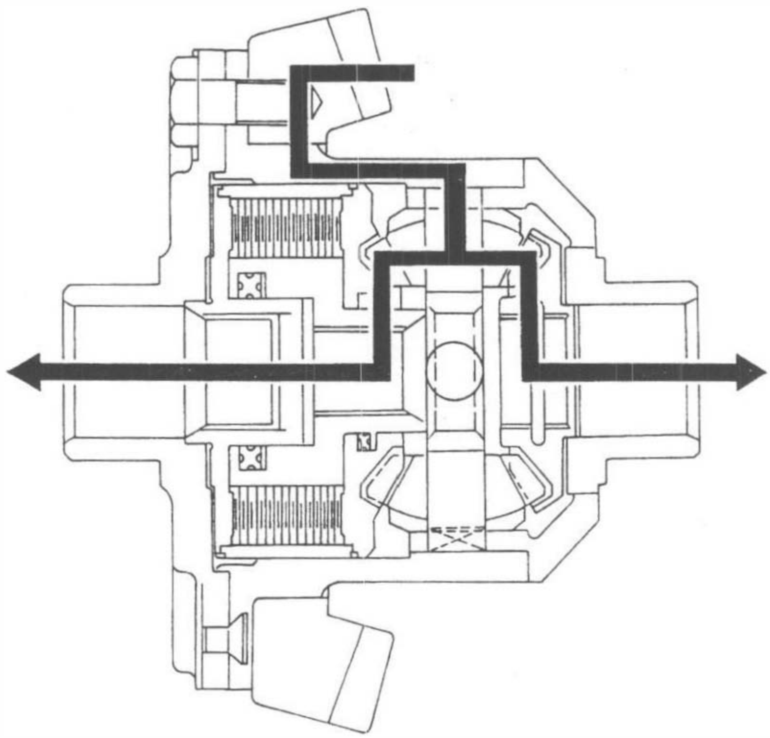
G3H1008

① Side gear (LH)
② Side gear (RH)
③ Pinion shaft
④ Pinion gear
⑤ Drive gear
⑥ Viscous coupling

B: OPERATION

1. WHEN RIGHT AND LEFT WHEELS TURN AT EQUAL SPEED.

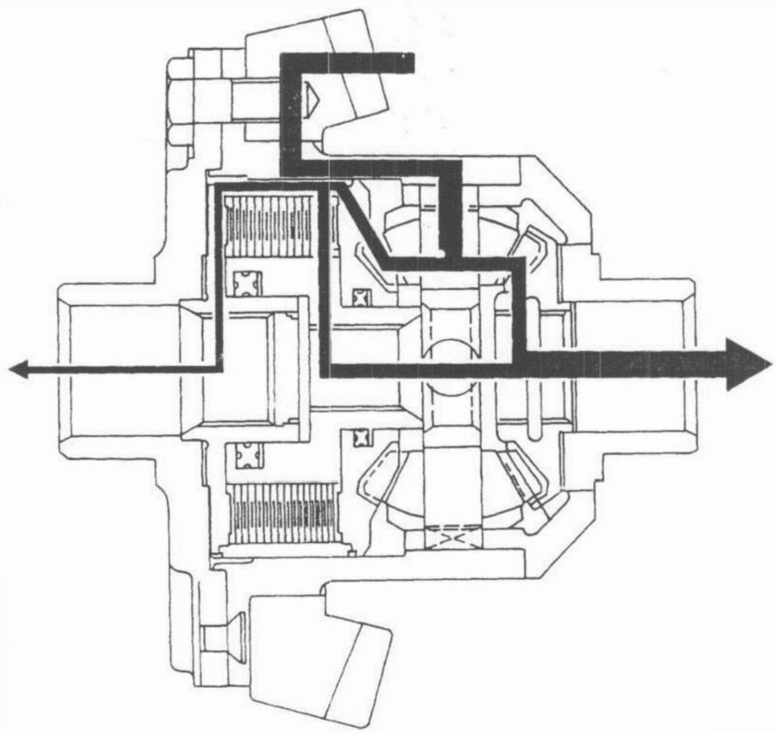
During normal straight-road driving where the right and left wheels run at an equal speed, the differential case and side gears rotate together, just as in conventional differentials. As a result, driving torque is transmitted equally to the right and left side gears.



G3H1099

2. WHEN RIGHT AND LEFT WHEELS TURN AT DIFFERENT SPEEDS.

When a speed difference occurs between the right and left wheels, the VC housing and VC hub turn relatively at the same speed difference occurs as that of the rear dirve shaft. Because of the shearing force caused in the silicon oil, a differential torque is generated, which controls differential operation (idle rotation). For example, if the left wheel turns idle due to a difference in the road resistance, a speed difference occurs between the right and left wheels. Since the VC is installed between the right and left wheels, a differential torque is generated in the VC corresponding to this speed difference, and this differential torque is transferred from the left wheel to the right wheel. Accordingly, a greater driving force is transferred to the right wheel which is rotating at a lower speed.



G3H1010

C: SERVICE PROCEDURES FOR LSD

The component parts of LSD assembly are not available as piece parts.
Therefore, it is recommended to not disassemble LSD assembly.

1. Front Suspension

A: OUTLINE

The front suspension is a strut-type independent suspension, with cylindrical double-acting oil damper and coil spring. The top of the strut assembly's is mounted on the body through the cushion rubber, which has resulted in elimination of any vibration by combined use of other rubbers to improve passenger comfort. This type also maintains a wide distance between the upper and lower supporting points and makes adjustment of the caster unnecessary.

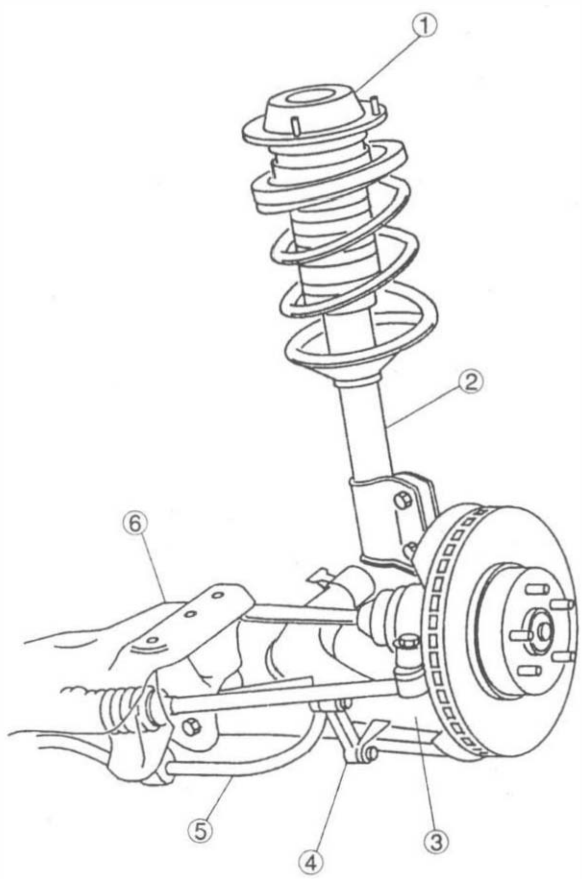
The transverse link utilizes an "L" arm design to increase steering stability and reduce road noise. The transverse link has a maintenance free ball joint with a nut fitting at the outer end, and the inner end front side fitted to the front crossmember through the cushion rubber. The rear side of the inner end is bolted to the vehicle body through a fluid-filled bushing.

The front crossmember is bolted to the vehicle body.

The stabilizer is attached to the front crossmember through the cushion rubbers and its ends are connected to the stabilizer links through the rubber bushings.

The lower end of the stabilizer link is connected to the transverse link through rubber bushings.

A camber angle adjustment mechanism, which uses eccentric bolts, is provided at the joint of the damper strut and housing.



H4H1040A

(1) Strut mount
(2) Strut
(3) Transverse link
(4) Stabilizer link
(5) Stabilizer
(6) Front crossmember

2. Rear Suspension

A: OUTLINE

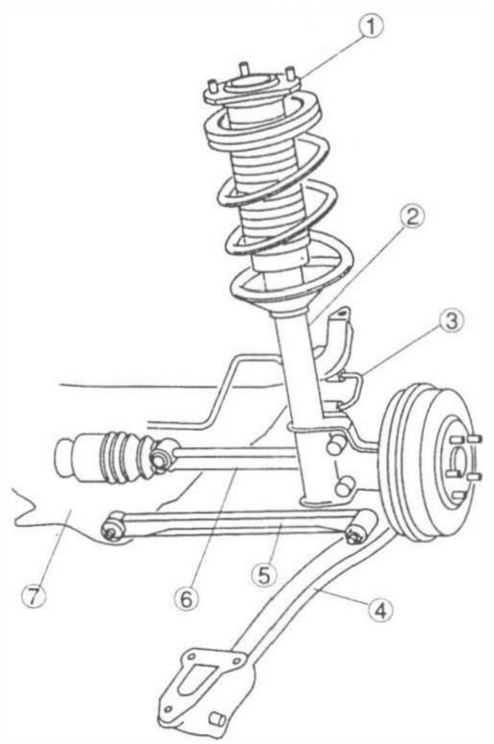
The rear suspension is an independent, dual link strut type. It consists of two parallel lateral links, a trailing link, and strut assembly's. The strut assembly consists of a cylindrical double-acting oil damper and coil spring.

The respective component parts of this suspension are optimally designed to act in response to vertical, lateral and longitudinal loads transmitted from the tires. Thus, riding comfort and steering stability are substantially enhanced.

- Longitudinal loads act on the trailing link.
- Vertical loads act on the coil spring, strut and rubber mount (which is located on the top of strut).
- Lateral loads act on the two lateral links.

The crossmember is installed on the body frame via bushings. (AWD model)

The stabilizer that extends to the rear of the crossmember, is installed on the body frame via a bracket and to the rear lateral link on the wheel side via stabilizer link.



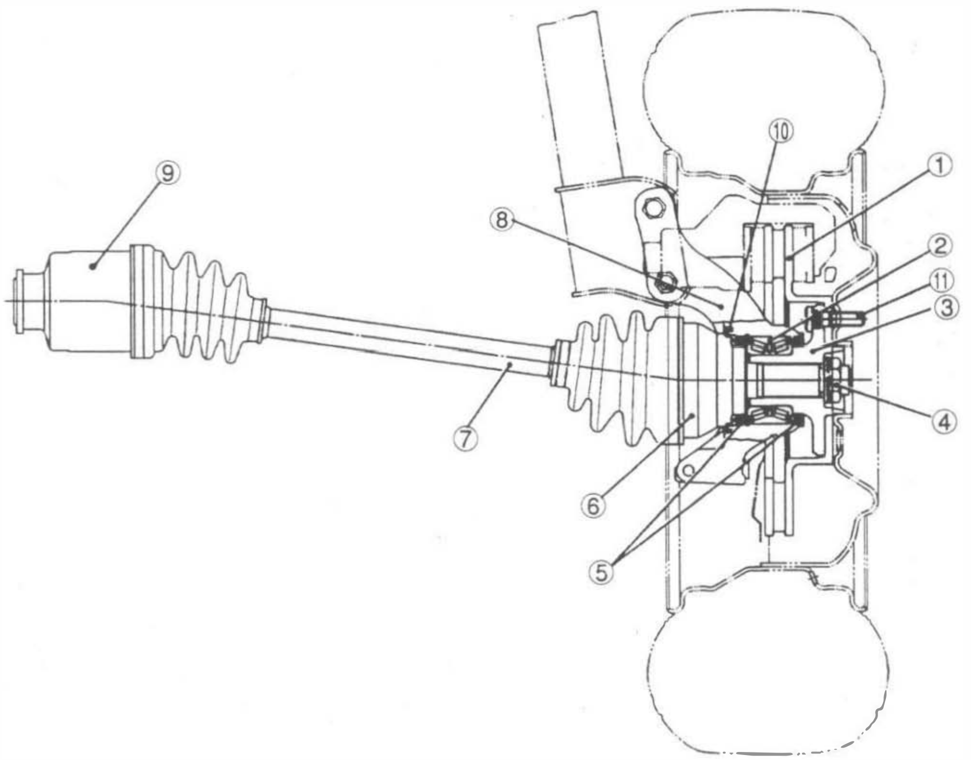
H4H1039A

1. Strut mount
2. Strut
3. Stabilizer
4. Trailing link
5. Front lateral link
6. Rear lateral link
7. Rear crossmember

1. Front Axle

A: GENERAL

- The inboard end of the axle shaft is connected to the transmission via a constant velocity joint (double offset joint: DOJ) which provides flexible capabilities in the longitudinal direction while the outboard end is supported by taper roller bearings located inside the housing via a bell joint (BJ) which features a large operating angle.
Since the drive shaft employs constant velocity joints, it provides smooth, even rotation of the drive wheels without any vibration.
- The bearing utilizes a preloaded, non-adjustable tapered roller unit design.
The hub is fitted to the tapered roller bearing inside the housing.
- The BJ's spindle is "serration-fitted" to the hub and is clinched to it with axle nuts.
- The disc rotor is an external mounting type. It is secured together with the disc wheel using hub bolts to facilitate maintenance of the disc rotor.

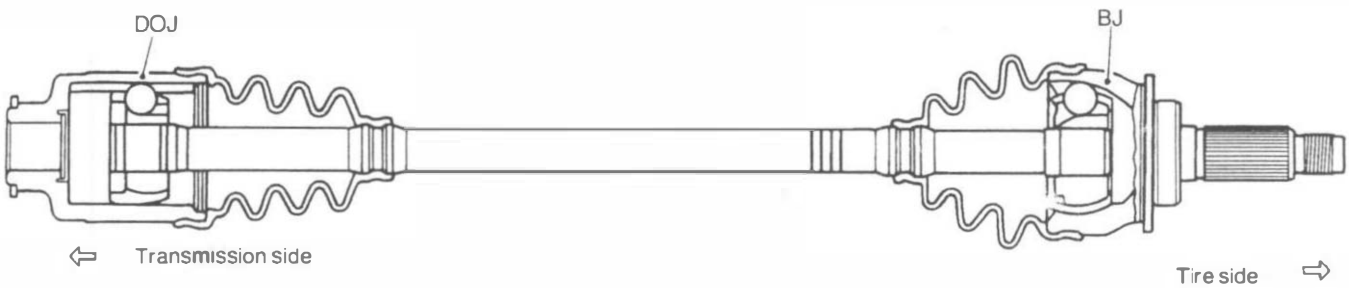


G4H0019

① Disc rotor
② Bearing
③ Hub
④ Axle nut
⑤ Oil seal
⑥ BJ (Bell Joint)
⑦ Front drive shaft
⑥ Housing
⑨ DOJ (Double Offset Joint)
⑩ Baffle plate
⑪ Hub bolt

B: FRONT DRIVE SHAFT

- The constant-velocity joint on the differential side is a double offset joint (DOJ) which can be disassembled for maintenance. It provides the maximum operating angle of 23° and can also be moved in the axial direction.
- The constant-velocity joint on the tire side is an extra-wide, bell joint (BJ) which provides a maximum operating angle of 47.5°.

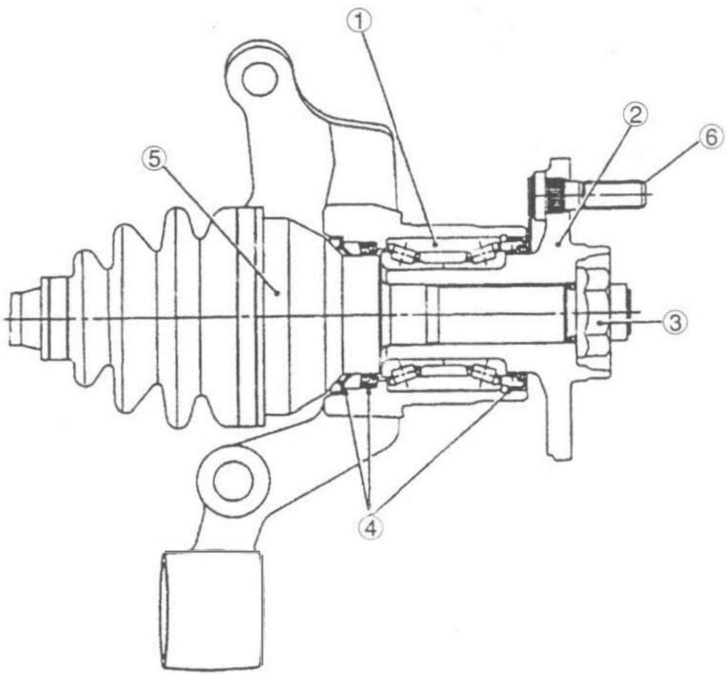


B4H1066B

C: AWD TURBO MODEL

- The inboard end of the axle shaft is connected to the transmission via a constant velocity joint (double offset joint: DOJ) which provides flexible capabilities in the longitudinal direction.
- The outboard end is supported by taper roller bearings located inside the housing via a bell joint (BJ) which features a large operating angle. Since the drive shaft employs constant velocity joints, it provides smooth, even rotation of the drive wheels without any vibration.
- The bearing is a preloaded, non-adjustable taper roller unit type.
The hub is fitted to the taper roller bearing inside the housing.
- The BJ's spindle is "serration-fitted" to the hub and is clinched to it with axle nuts.
- The disc rotor is externally mounted to facilitate maintenance. Hub bolts and axle nuts are also used to secure the front axle.

AWD TURBO Vehicle

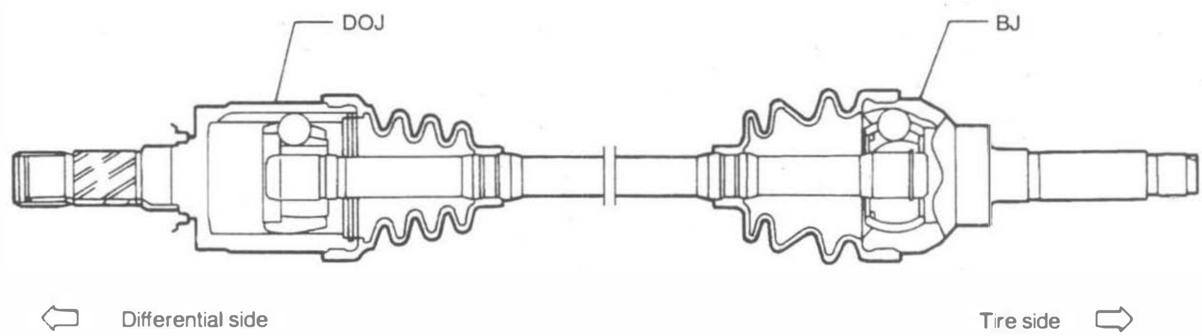


1 Bearing
2 Hub
3 Axle nut
4 Oil seal
5 BJ (Ball Joint)
6 Hub bolt

G4H0982

D: REAR DRIVE SHAFT

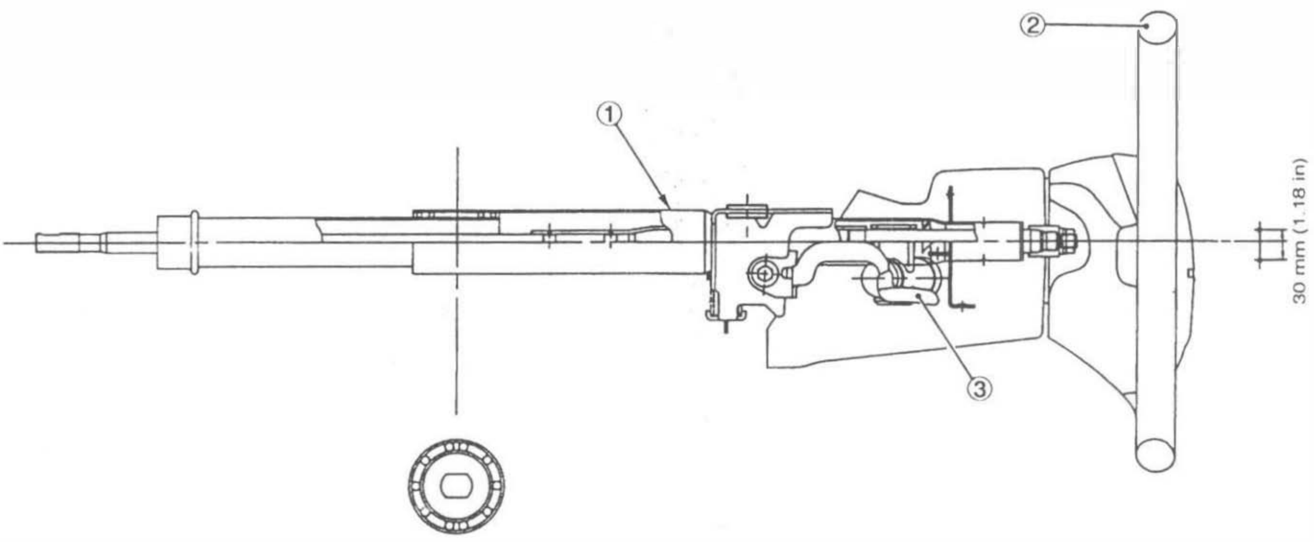
- The constant-velocity joint on the differential side is a double offset joint (DOJ) which can be dis-assembled for maintenance. It provides the maximum operating angle of 23° and can be moved in the axial direction.
- DOJ outer race and the rear differential spindle are combined in order to improve resistance to corrosion.
- The constant-velocity joint on the tire side is a bell joint (BJ) which provides a maximum operating angle of 46°.



1. Tilt Steering Column

A: TILT MECHANISM

- The steering wheel vertical position can easily be adjusted within 30 mm (1.18 in) range, by using the tilt lever to release the steering column and locking it at the desired position.



H4H1132A

① Tilt steering column
② Steering wheel
③ Tilt lever

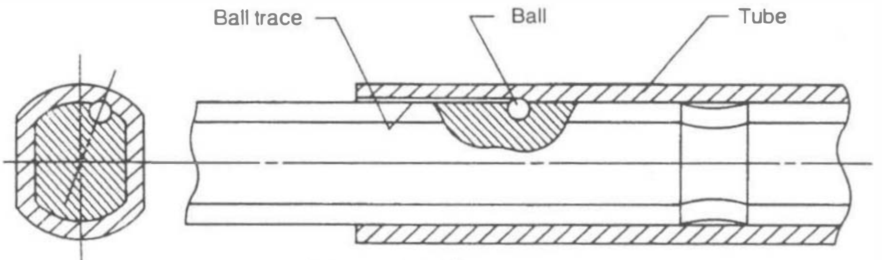
B: IMBEDDED BALL TYPE ENERGY-ABSORBING MECHANISM

1) Construction of the steering column is simplified to reduce weight since energy absorption is no longer required for the steering column.

2) The energy-absorbing characteristic is regulated by imbedded ball height.

1. VEHICLES WITHOUT AIRBAG

The protrusion of the ball imbedded in the steering shaft provides plastic deformation of the tube's inner wall to effectively absorb energy encountered.

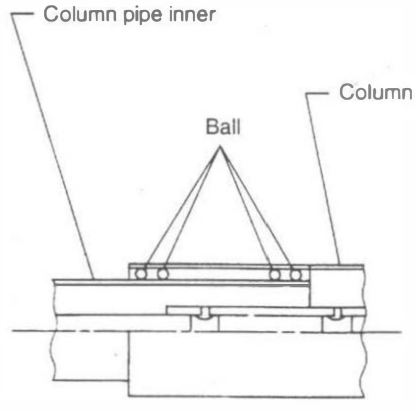


Collapsed condition

G4H0005

2. VEHICLES WITH AIRBAG

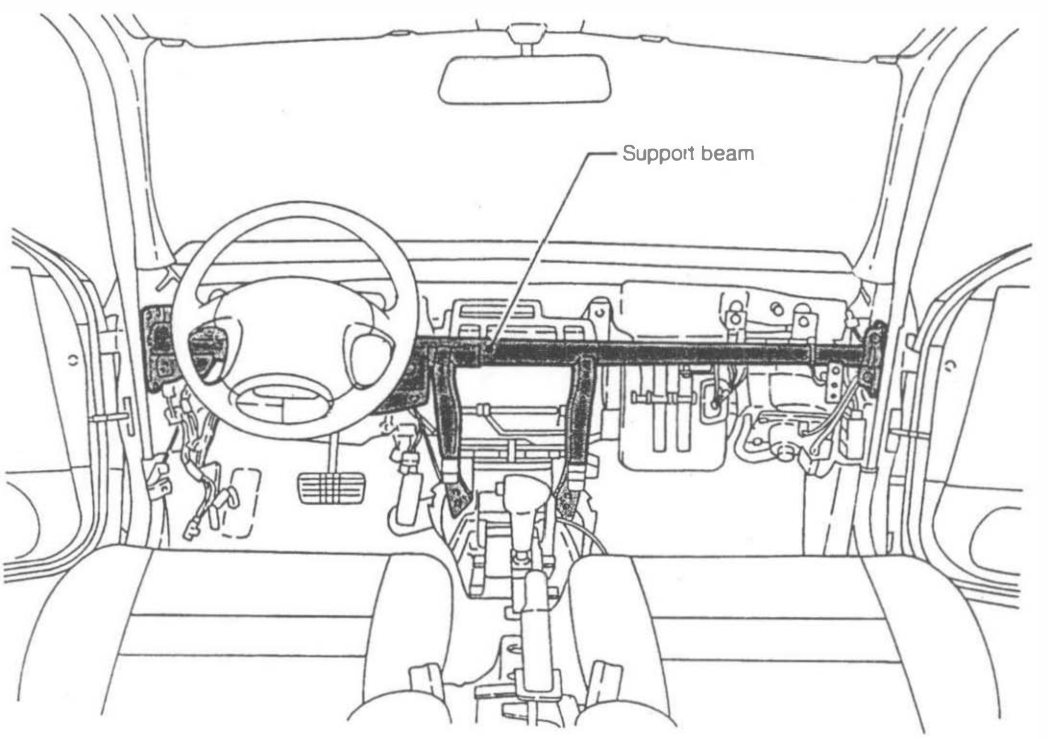
When vehicle is involved in a frontal collision, the bolt located between outer and inner column pipes acts to give plastic strain to the two pipes in relation to relative movement of the two pipes. The result is effective collision absorption.



G4H0006

C: STEERING SUPPORT BEAM

The steering column is held by a support beam located close to the steering wheel to reduce the overhang. The upper bearing is also located close to the steering wheel to increase supporting rigidity, as well as to reduce the problem of a shaking or shimmying wheel.



H4H1133A

2. Power Steering System

A: HYDRAULIC SYSTEM

1) Vane pump ① is belt-driven from the engine to discharge oil under pressure.

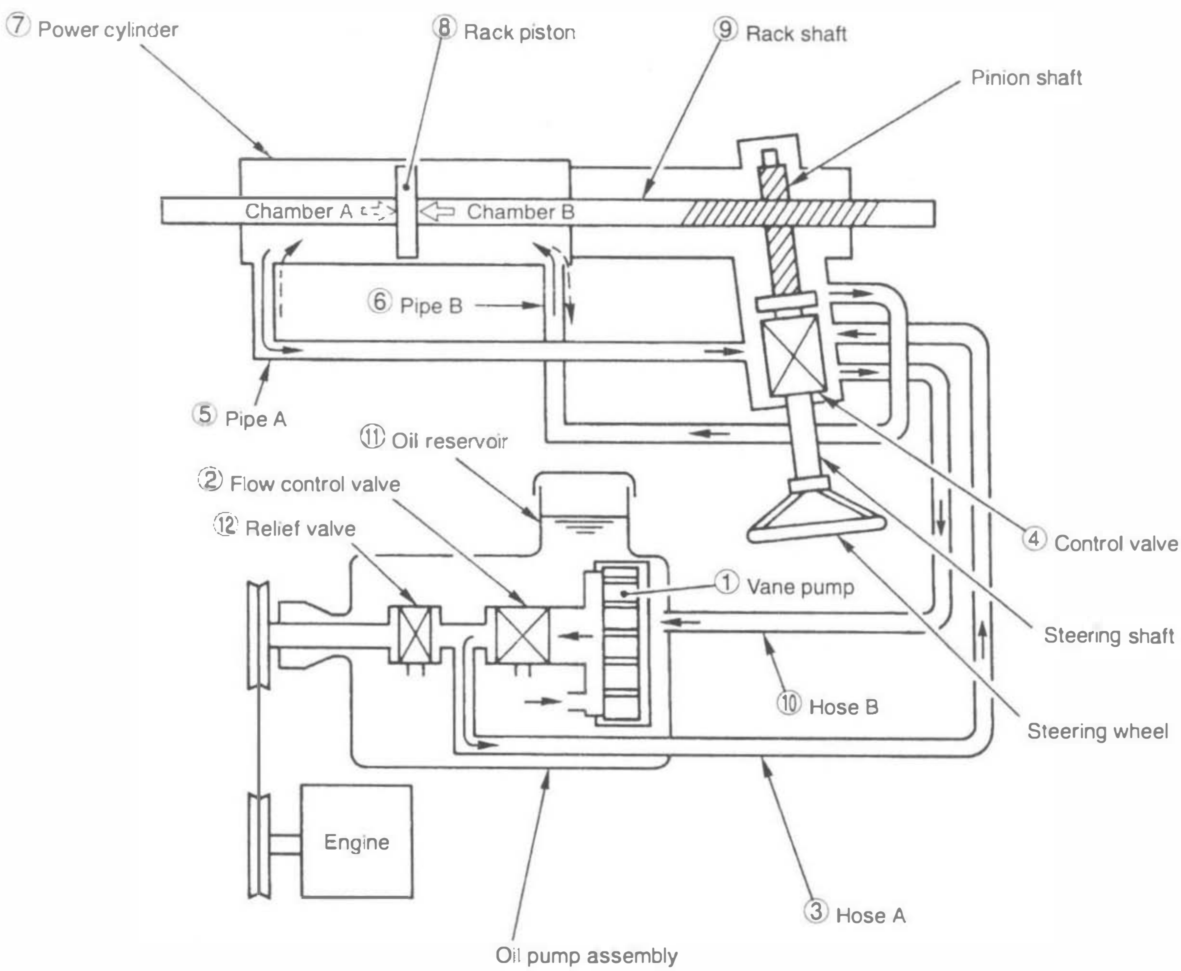
2) Oil under pressure is controlled by the flow control valve ② located inside the oil pump assembly in response to engine speed and is delivered to control valve ④ via hose A ③.

3) When the steering wheel is turned, control valve ④ connected to the pinion shaft activates to form an oil flow circuit corresponding to the rotation direction of the steering wheel. Oil will then be delivered to chamber A or B via pipe A ⑥ or B ⑥.

4) Oil in chamber A or B acts on rack pinion ⑥ to produce the force required to move rack shaft ⑨ to the left or the right. This helps reduce the effort required to operate the steering wheel.

5) Movement of rack piston ⑥ in turn causes oil in the other chamber to return to oil reservoir ⑪ via pipe A ⑥ or B ⑥, control valve ④ and hose B ⑩.

- If the hydraulic system becomes inoperative, the steering shaft will then be connected to the pinion shaft mechanically via control valve ④. Thus, the steering shaft can act as one similar to a manual steering system to move the rack and pinion.
- To control the maximum oil pressure setting, relief valve ⑫ is built into flow control valve ② of the oil pump assembly to release excess oil pressure.



System operation

G4H0854

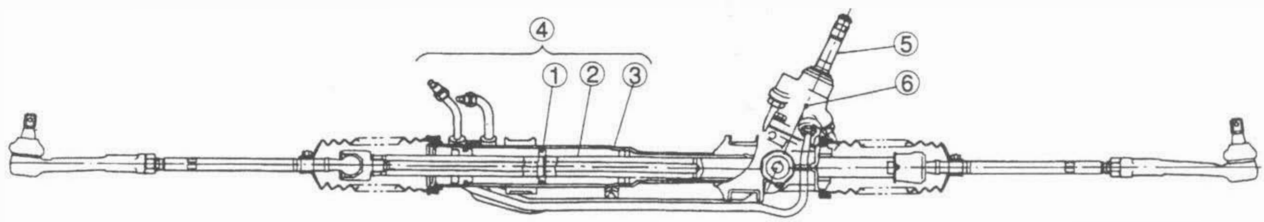
B: GEARBOX ASSEMBLY

1. POWER CYLINDER

The gearbox is integrated with a built-in control valve and power cylinder. The rack shaft is used as a power cylinder piston and a rotary control valve is located in such a manner as to enclose the pinion shaft.

The control valve and power cylinder are connected to each other by two pipes through which hydraulic oil flows.

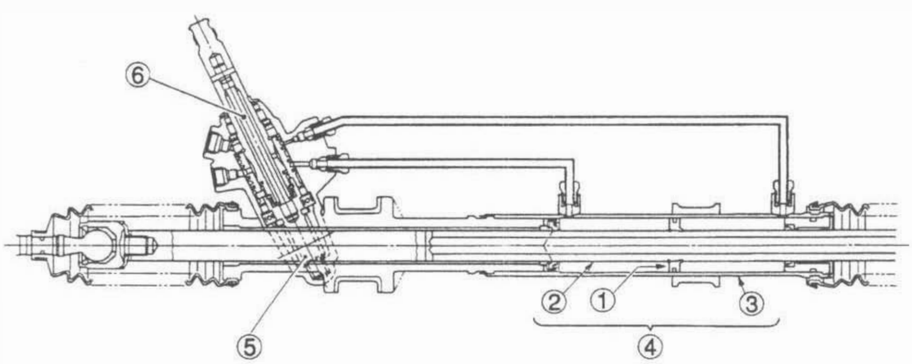
LHD model



G4H0009

① Piston
② Rack shaft
③ Cylinder
④ Power cylinder
⑤ Pinion shaft
⑥ Control valve

RHD model



G4H0774

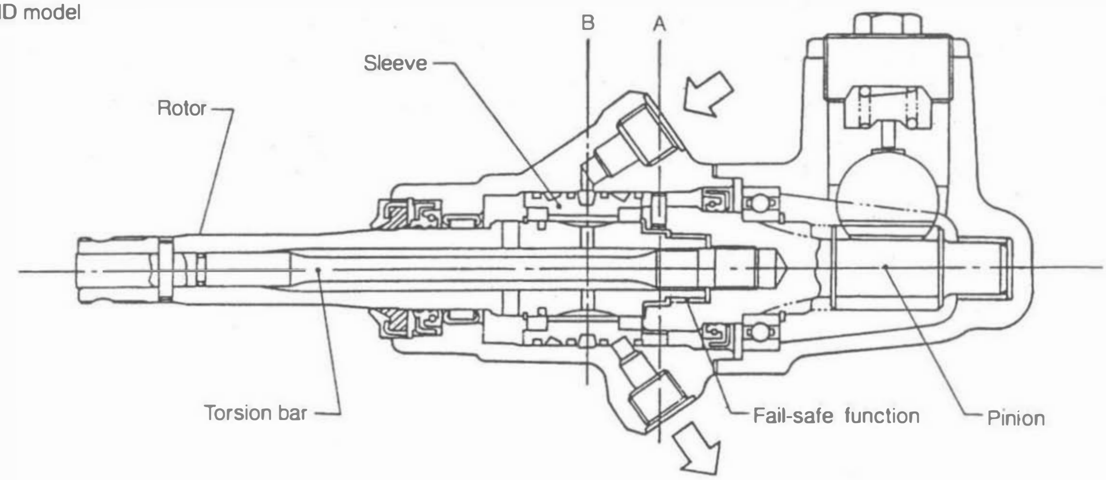
① Piston
② Rack shaft
③ Cylinder
④ Power cylinder
⑤ Pinion shaft
⑥ Control valve

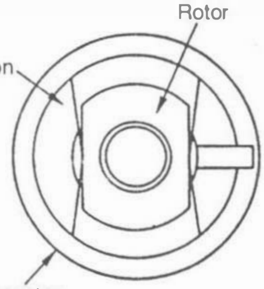
2. CONTROL VALVE

The control valve consists of a rotor (which rotates together with the steering shaft), a pinion (which is connected to the rotor and torsion bar), and a sleeve (which rotates together with the pinion). Oil grooves C and D are located in the rotor and sleeve to form oil flow passages V_1 through V_4.

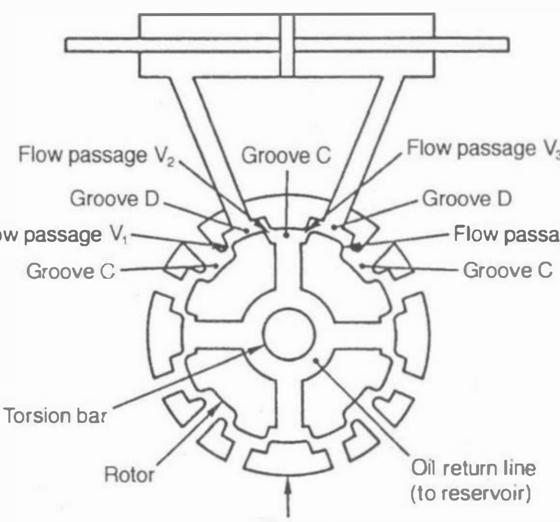
The pinion and rotor are meshed with adequate clearance. They utilize a fail-safe design.

LHD model





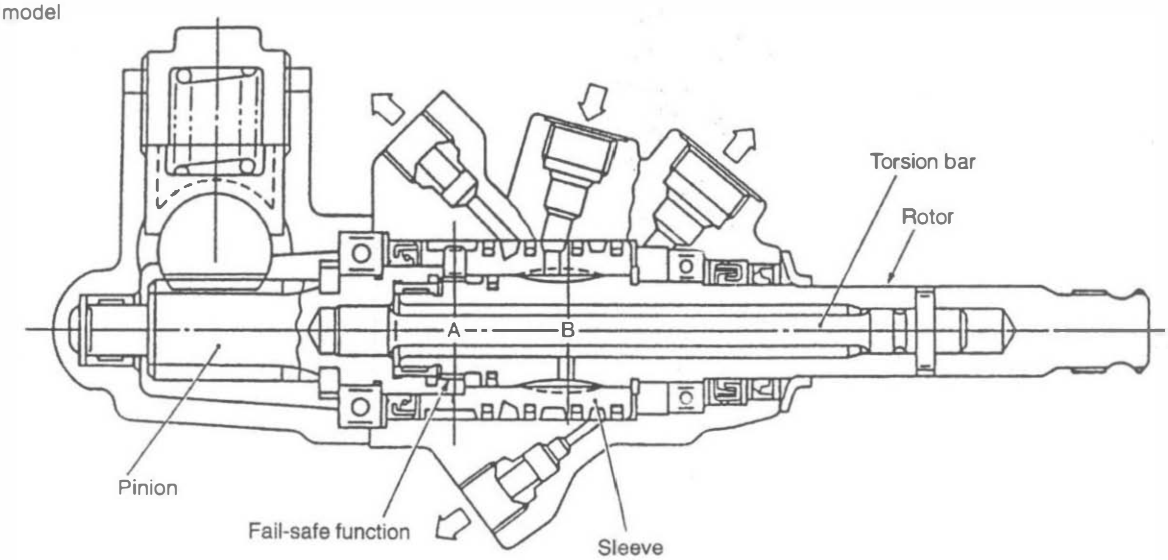
Fail-safe function

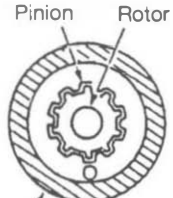


Cross-section view B of oil passage switching curcuit

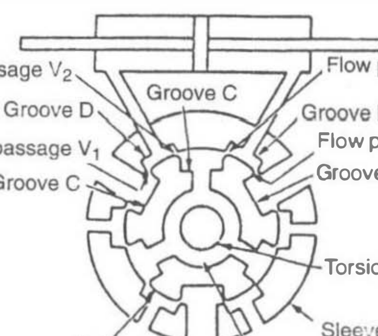
H4H1134B

RHD model





Cross-section view A of fail-safe function



Cross-section view B of oil passage switching circuit

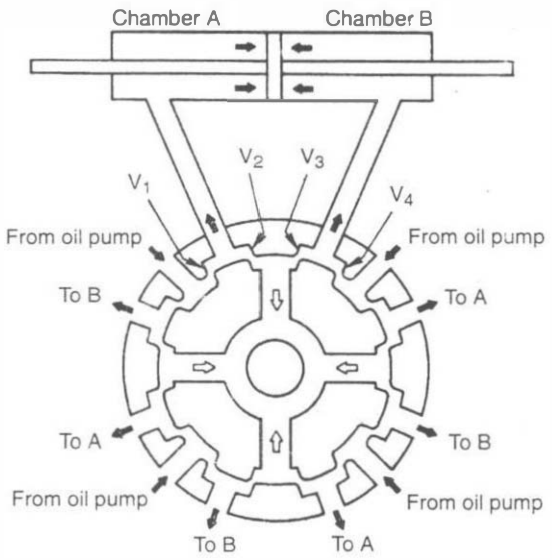
G4H0775

1) Operating principle

When the torsion bar twists in relation to the steering force, a relative rotational displacement occurs between the rotor and sleeve. This displacement changes the cross-sectional area of oil passages V_1, V_2, V_3 and V_4, which in turn switches oil passages and controls oil pressure.

(1) When no steering force is applied:
The rotor and sleeve are held at the neutral position. Oil passages V_1, V_2 and V_3, which are formed by valve grooves C and D are open equally. Under this condition, oil delivered from the oil pump returns to the oil reservoir so that neither oil pressure builds up nor does the power cylinder activate.

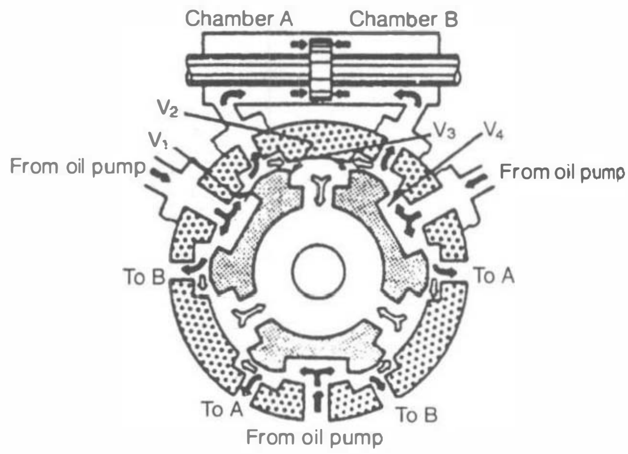
LHD model



When no steering force is applied.

G4H0011

RHD model

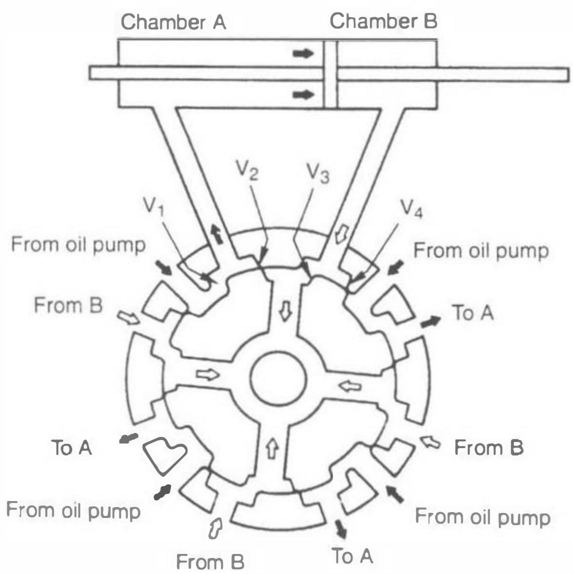


When no steering force is applied.

G4H0776

(2) When steering force is applied:
When the steering wheel is turned to the right, for example, oil passages V_1 and V_2 open while oil passages V_2 and V_4 nearly close.
At this point, oil under pressure in chamber A increases in response to the throttle position of oil passages V_2 and V_4 so that the rack piston moves to the right. Oil in chamber B, on the other hand, is discharged through oil passage V_3, returning to the oil reservoir.

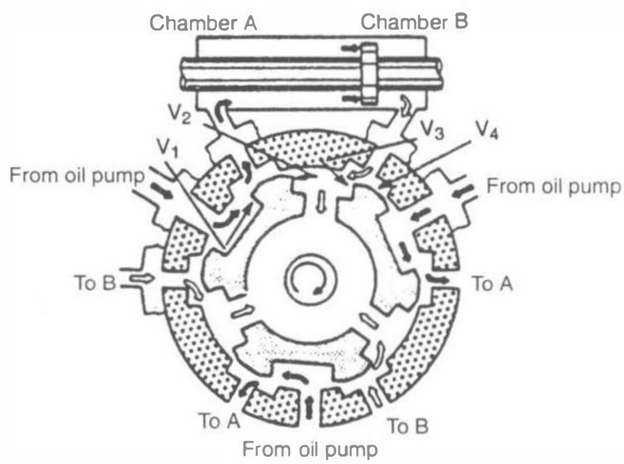
LHD model



When steering force is applied.

G4H0012

RHD model



When steering force is applied.

G4H0777

2) Fail-safe function

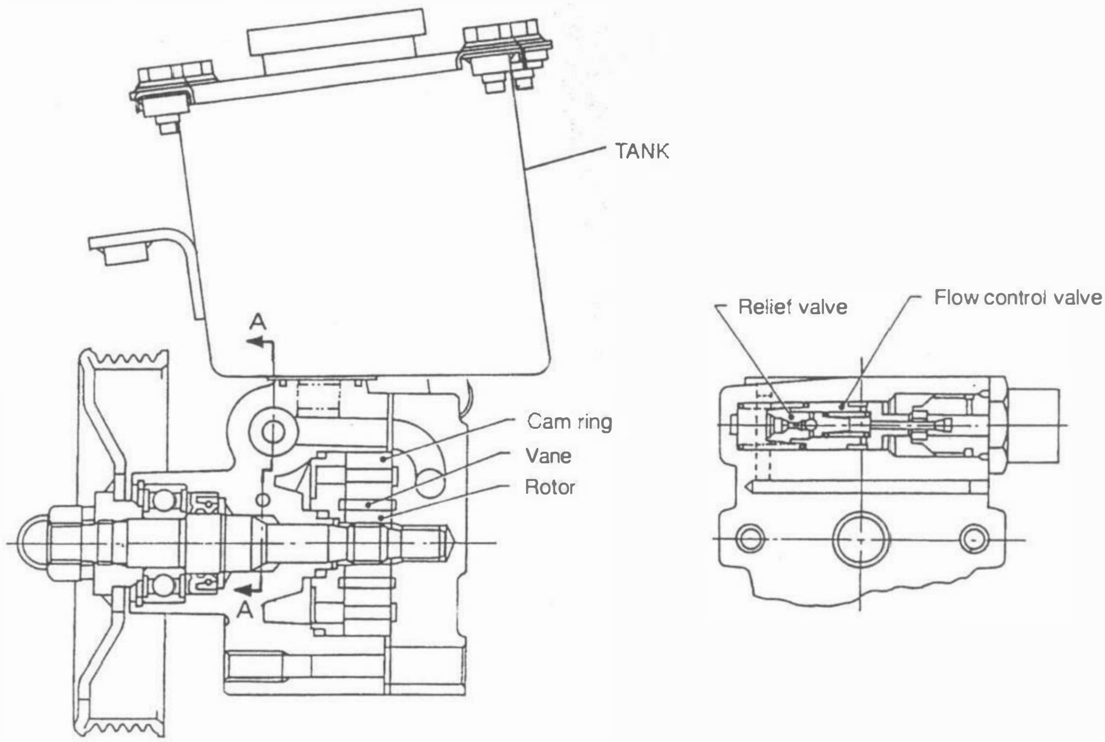
If oil pressure fails to build up due to a broken oil pump drive belt, torque is transmitted from the valve rotor to the pinion by way of the fail-safe function.

C: OIL PUMP & TANK

The oil pump is belt-driven from the engine. The oil flow is controlled in response to engine speed so that an adequately "heavy" steering effort is maintained during high-speed operation.

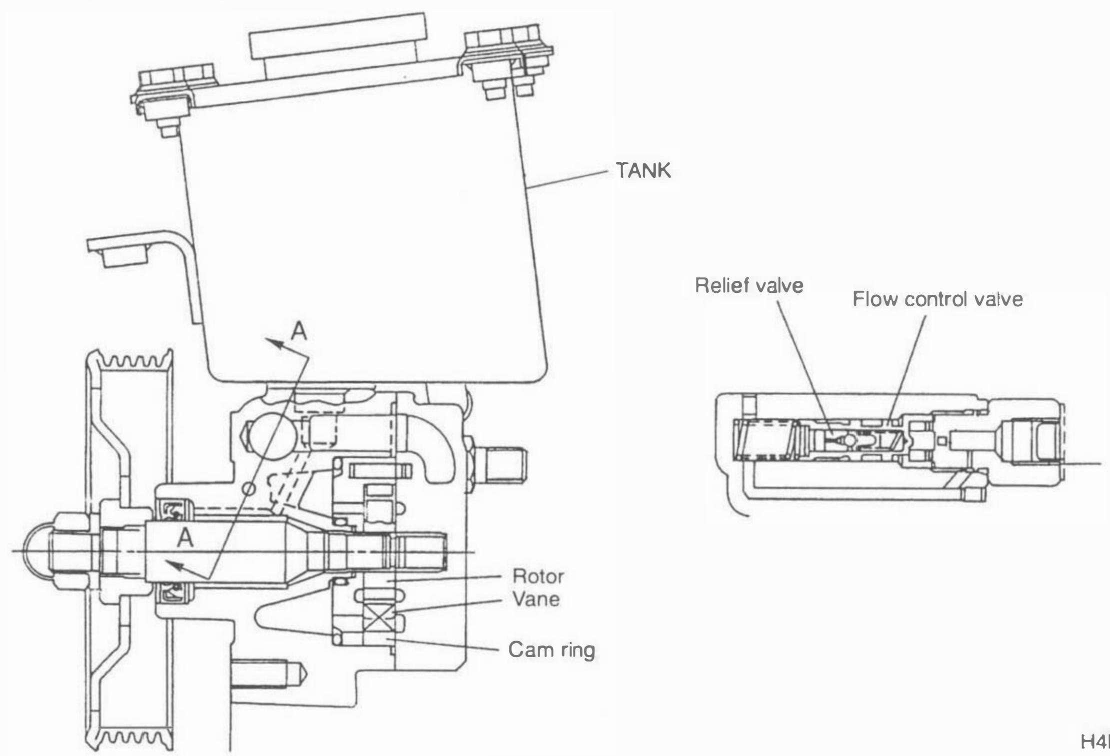
The oil pump is a vane type. It is integrated with a tank and houses the flow control and relief-valves.

2000 cc and LHD TURBO model



H4H1044B

1600 cc, 1800 cc and RHD TURBO model



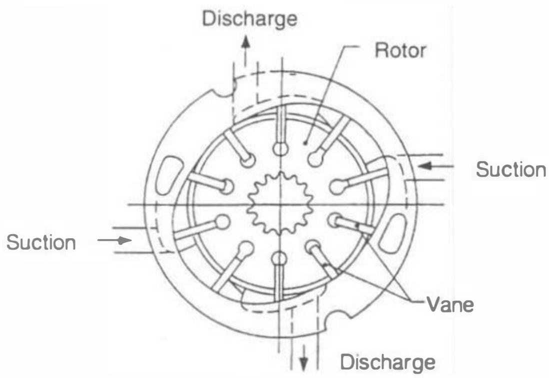
H4H1180A

1. VANE PUMP

The vane pump consists of a rotor, cam rings, and ten vanes.

When the rotor rotates, the vane located in each groove of the rotor is radially swung out by centrifugal force and pressed against the cam ring. The tip of the vane slides along the inner oval wall of the cam ring so that oil is delivered to the chamber formed by the rotor, cam ring and vane by way of a pea-shaped groove. Oil from the chamber is discharged into the oil circuit via the discharge port.

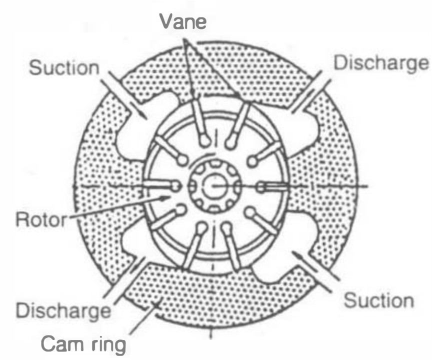
2000 cc and LHD TURBO model



Vane pump

H4H1188A

1600 cc, 1800 cc and RHD TURBO model

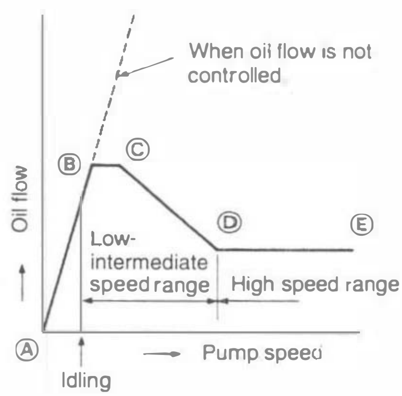


Vane pump

H4H1181A

2. FLOW CONTROL VALVE

The flow control valve adequately regulates the discharge flow of oil which increases in proportion to pump speed and delivers it to the gearbox. It consists of orifices 1 and 2, valve spool, return port and flow control spring. When a pressure differential occurs between the front and rear of orifice 2 in response to increases in discharge flow, the valve spool moves against the tension of the flow control spring so that the oil flow is controlled by the open and close operation of the return port and orifice 2.

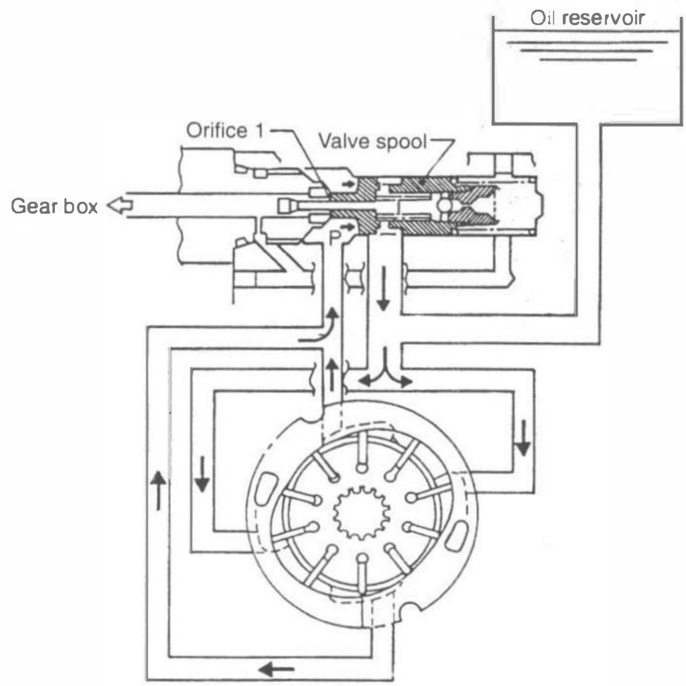


G4H0015

1) When the pump begins to rotate, P increases, and the valve spool is moved to the right by this pressure. In the pump speed range A to B, the total amount of oil delivered by the pump is sent to the gear box through orifice 1.

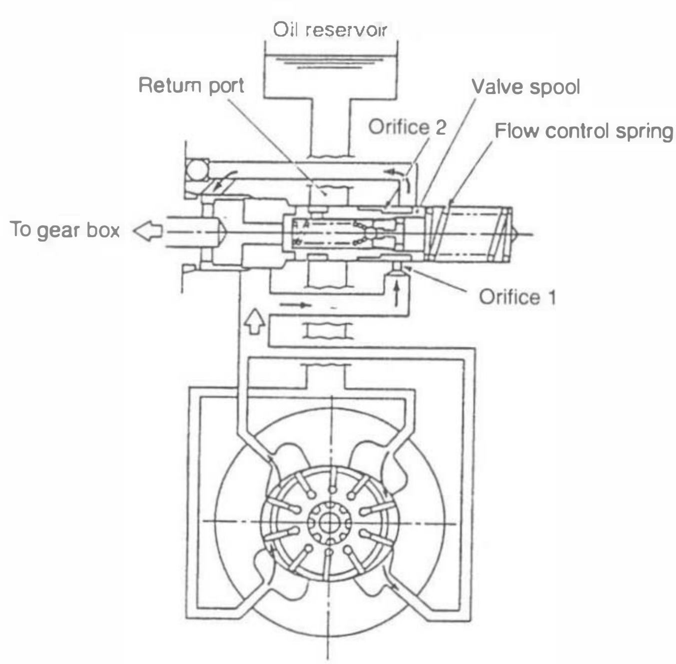
- Pump speed range A to B

2000 cc and LHD TURBO model



H4H1182A

1600 cc, 1800 cc and RHD TURBO model

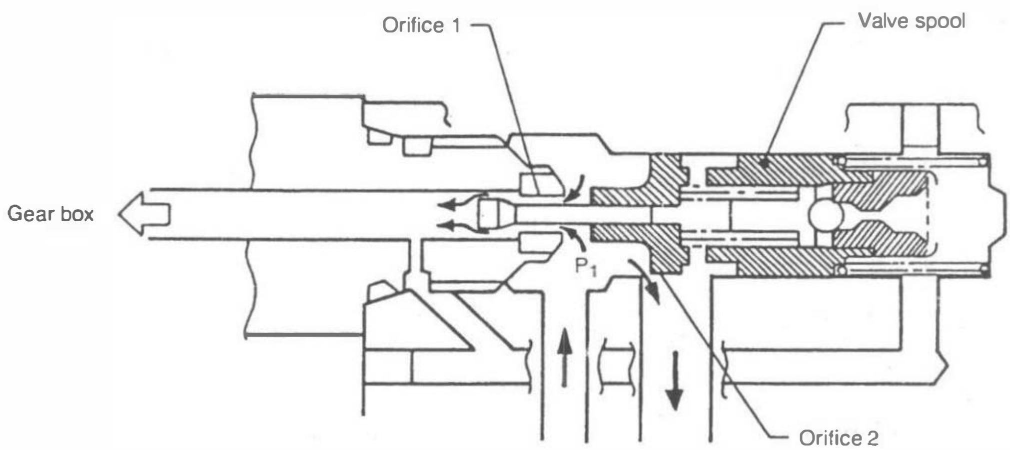


H4H1183A

2) As the pump speed increases, P_1 increases further, and the valve spool is pushed further to the right. As a result, orifice 2 opens. Accordingly, a constant flow of oil is maintained.

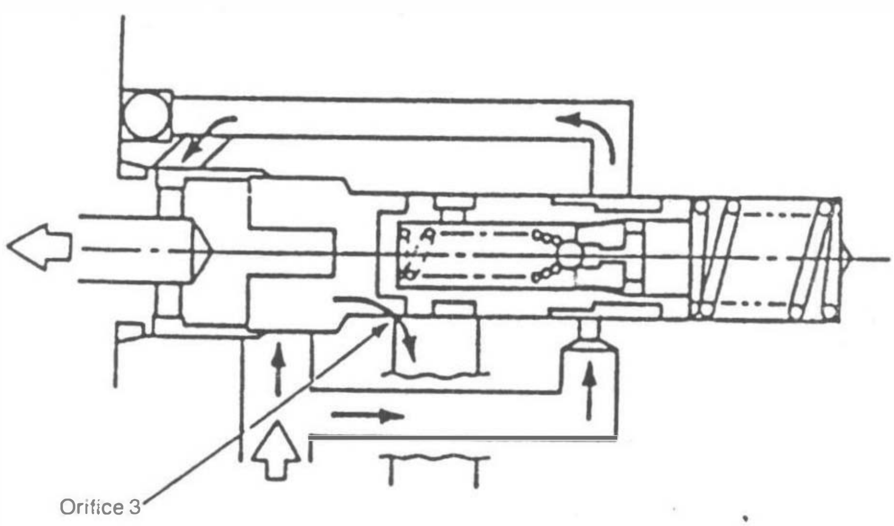
- Pump speed range B to D

2000 cc and LHD TURBO model



H4H1184A

1600 cc, 1800 cc and RHD TURBO model

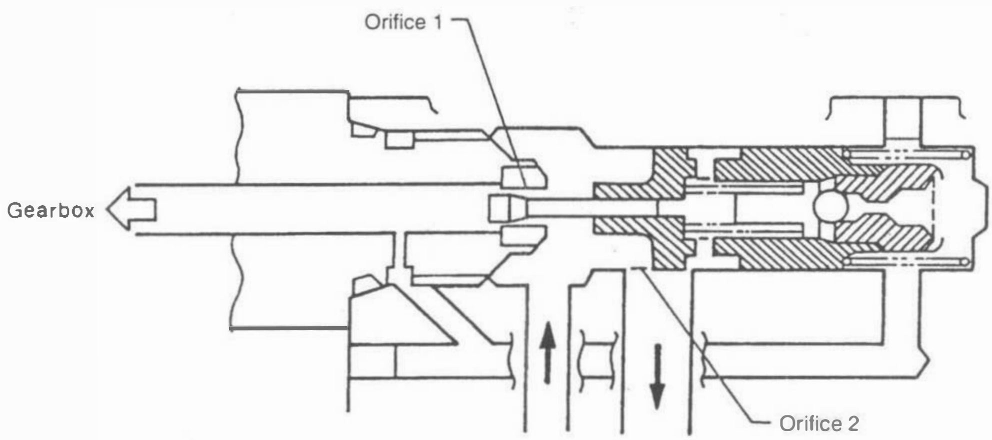


H4H1185A

3) When the pump speed increases further, the valve spool is pushed to the far right position. At this spool position, orifice 1 is restricted while orifice 2 opens wide.
Accordingly, the oil flow decreases.

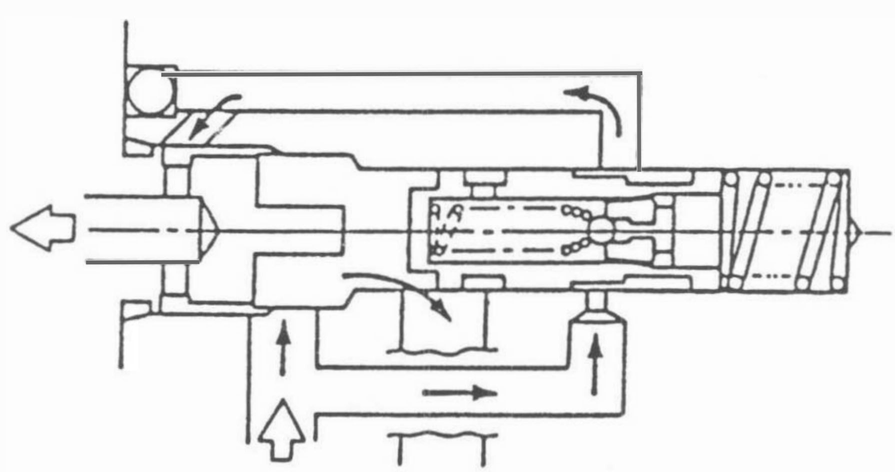
- Pump speed range D to E

2000 cc and LHD TURBO model



H4H1186A

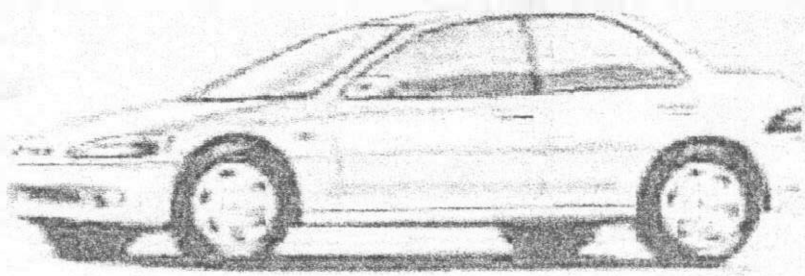
1600 cc, 1800 cc and RHD TURBO model



H4H1187A

SERVICE MANUAL

SUBARU IMPREZA

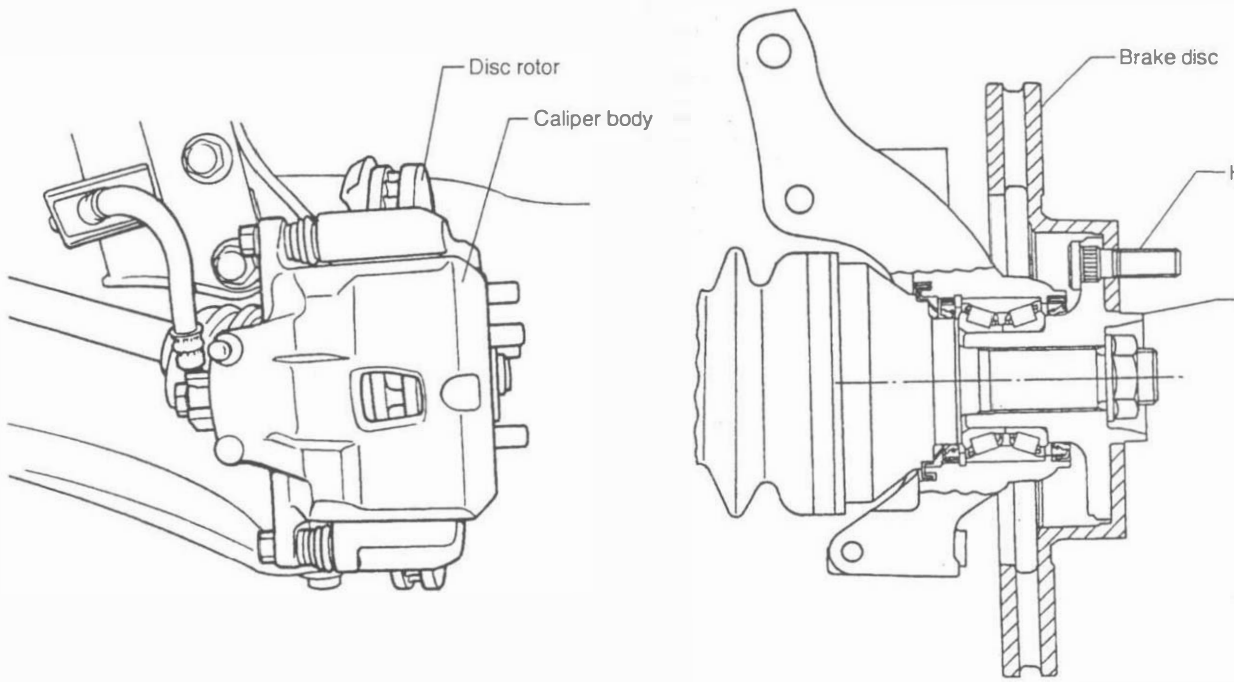


SERVICE MANUAL

BRAKES 4-4

1. Disc Brake

- The front brakes are ventilated disc types which feature high heat dissipation and superb braking stability. In addition, the front brake quickly restores the original braking performance even when wet.
- The brake disc, which is externally mounted, is secured together with the disc wheel using the hub bolts, to facilitate removal or installation when servicing the vehicle.
- The inner brake pad is provided with an indicator which indicates pad wear limits.

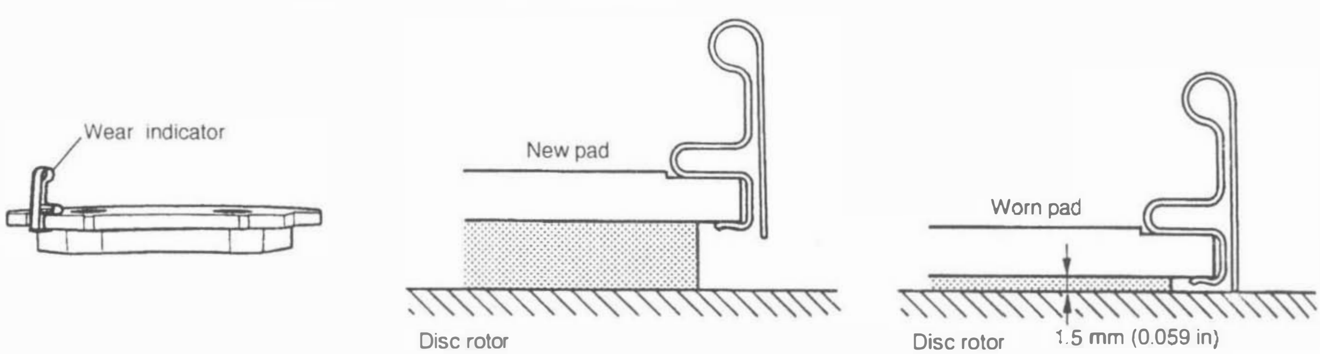


H4H1055A

A: PAD WEAR INDICATOR

A wear indicator is provided on the inner disc brake pads. When the pad wears down to 1.5 mm (0.059 in) the tip of the wear indicator comes into contact with the disc rotor, and makes a squeaking sound as the wheel rotates.

This indicates that the pad needs to be replaced.



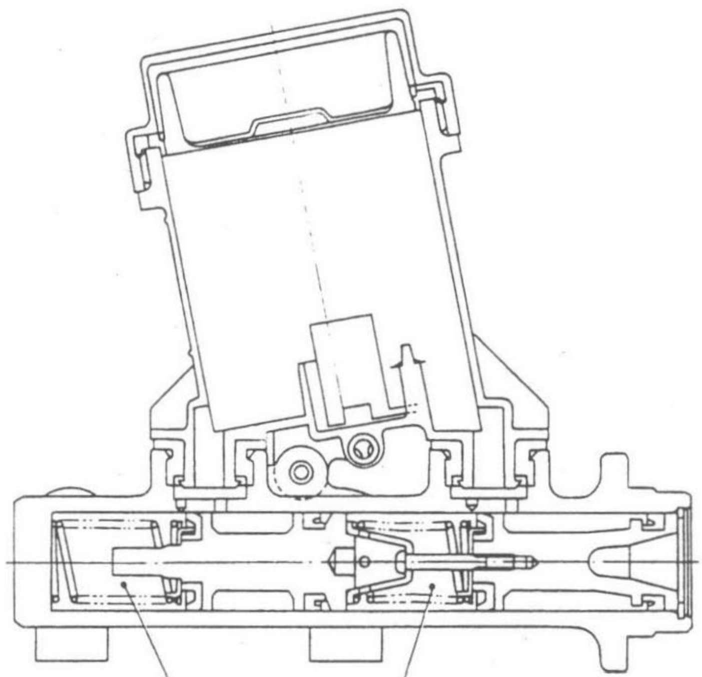
H4H1056A

B: FRICTIONAL MATERIAL OF BRAKE PADS

Frictional brake pad materials do not contain asbestos and are not harmful.

3. Master Cylinder

- A sealed reservoir tank is adopted to extend the service life of the brake fluid.
- The fluid level indicator is built into the reservoir tank for easy and correct monitoring of the fluid level when adding brake fluid.

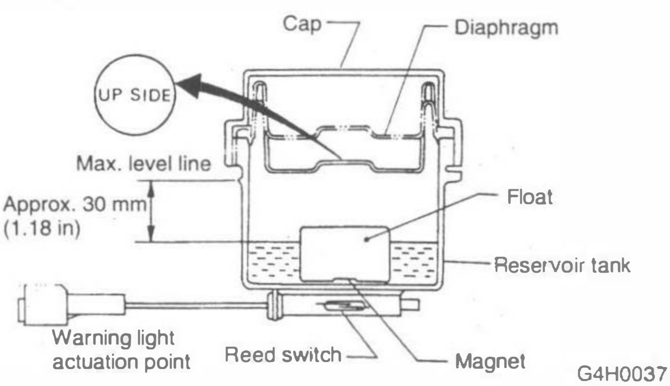


G4H0036

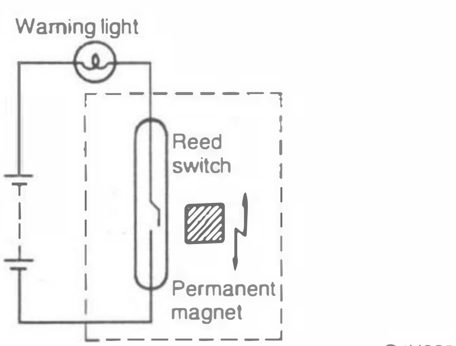
A: BRAKE FLUID LEVEL INDICATOR

Under normal conditions, the float remains above the reed switch, and the magnetic force from the permanent magnet in the float is unable to activate it. Therefore, the circuit is kept open, and the warning light remains off. The float lowers as the brake fluid level lowers, and if it falls below the specified fluid level [approx. 30 mm (1.18 in) below the MAX level line], the reed switch will be activated by the permanent magnet, closing the circuit. In this event, the warning light comes on and warns the driver of a reduction of the brake fluid level.

However, the warning light may be lighted momentarily even when the brake fluid surface is still above the specified level, if the vehicle body tilts or swings largely.



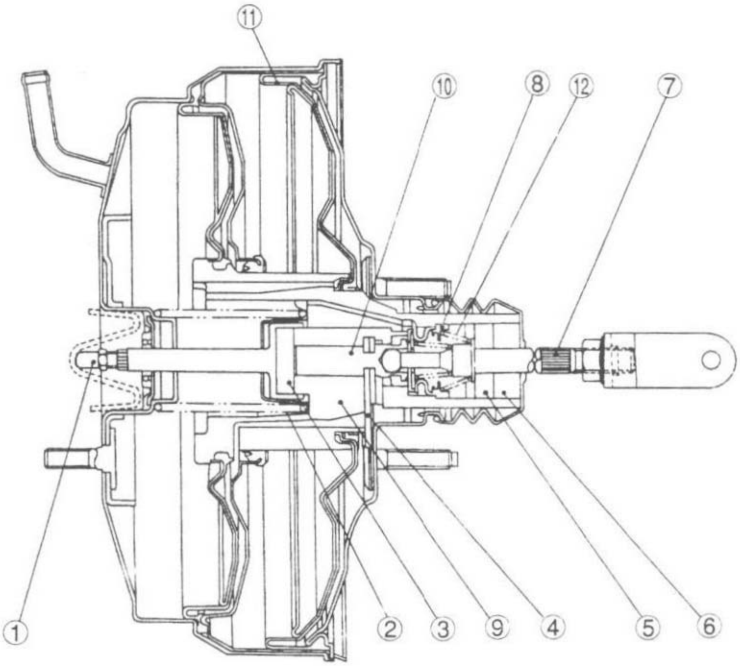
G4H0037



G4H0038

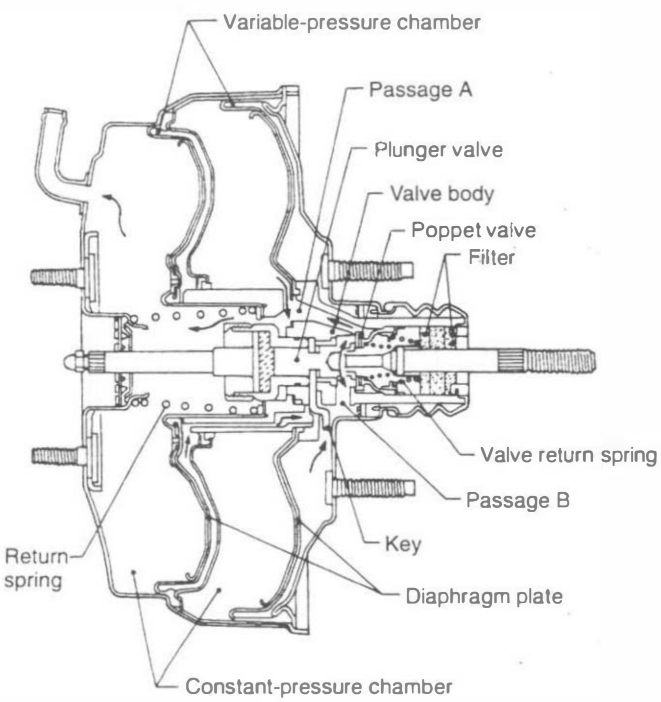
4. Brake Booster

The brake booster is a tandem type that utilizes two small diameter diaphragms to provide high brake boosting effects.



G4H0039

(1) Push rod
(2) Return spring
(3) Reaction disc
(4) Key
(5) Filter
(6) Silencer
(7) Operating rod
(8) Poppet valve
(9) Valve body
(10) Plunger valve
(11) Diaphragm plate
(12) Valve return spring



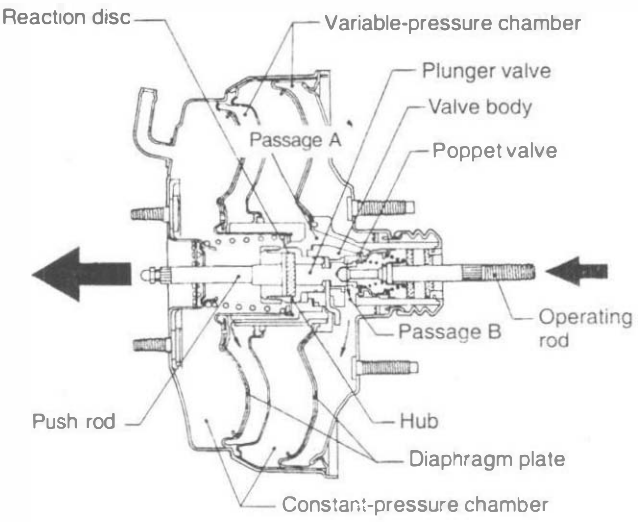
G4H0040

A: OPERATION

1. BRAKE BOOSTER "OFF"

The plunger valve comes in contact with the poppet valve so that atmospheric air passing through the filter and silencer is shut out by the atmospheric valve (of the poppet valve).

The plunger valve is moved to the key at the right by the return spring so that the poppet valve is held at the right. Since the vacuum valve of the valve body and the poppet valve are kept away from each other, passage A is linked with passage B and the constant-pressure chamber is also linked with the variable-pressure chamber. At this point, pressure differential does not occur between the two chambers; the diaphragm plate is moved back to the right by return spring tension.



G4H0041

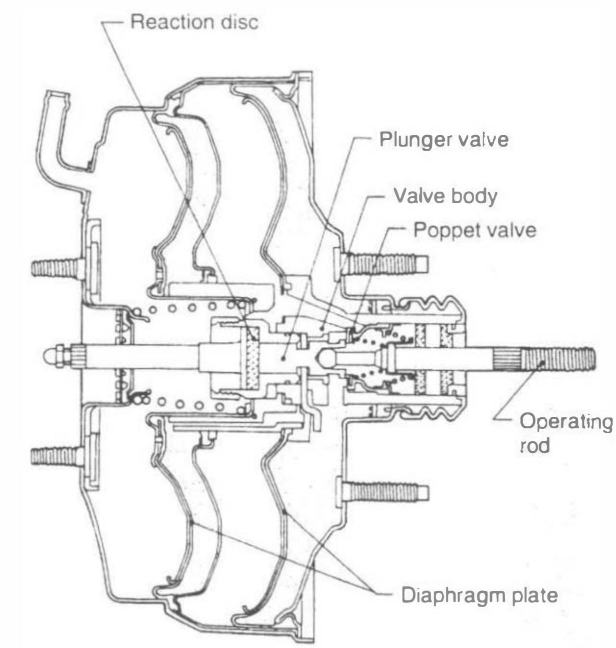
2. BRAKE BOOSTER "ON"

When the brake pedal is depressed, the operating rod pushes the plunger valve so that the poppet valve comes in contact with the vacuum valve of the valve body. This shuts off the circuit between passages A and B, as well as the circuit between the constant- and variable-pressure chambers.

Further movement of the plunger valve moves the atmospheric valve away from it so that atmospheric air is directed to the variable-pressure chamber via passage B. This produces a pressure differential between the constant- and variable-pressure chambers.

As a result, the diaphragm and its plate are moved to the left as a single unit.

The power applied to the diaphragm plate by the pressure differential is then transmitted to the reaction disc via a hub, as well as to the push rod, and produces a booster output.

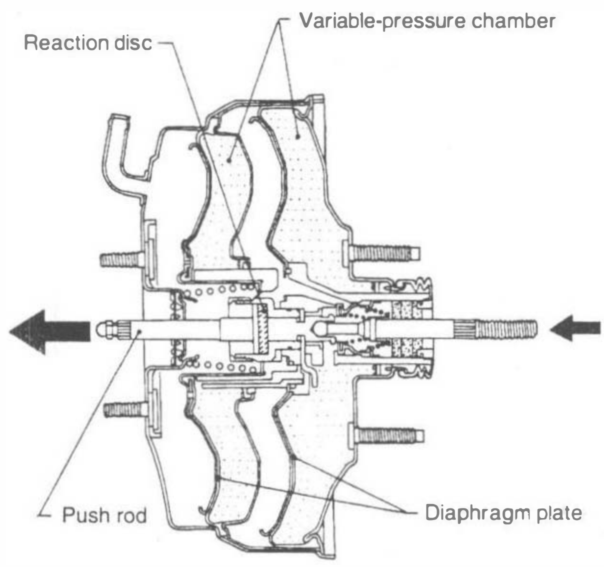


G4H0042

3. BRAKE BOOSTER UNDER MEDIUM LOAD

The poppet valve comes in contact with the plunger valve and valve body when a force pushes the center of the reaction disc (at the contact portion of the plunger valve) via the operating rod and plunger valve. This occurs when brake pedal depression is balanced with a force pushing the plunger valve (via the push rod and reaction disc) due to the reaction force of oil pressure delivered from the master cylinder.

As a result, pressure differential is maintained between the constant-pressure chamber and variable-pressure chamber unless the pedal depression force is changed.

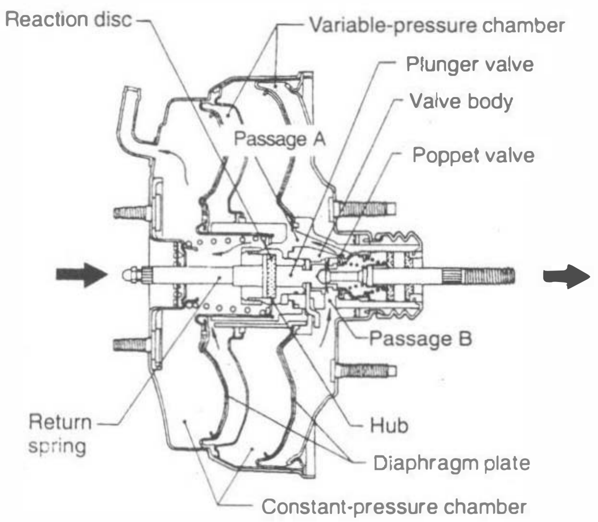


G4H0043

4. BRAKE BOOSTER UNDER FULL-LOAD CONDITIONS

When pedal depression increases to such an extent that the variable-pressure chamber is maintained at atmospheric pressure, the maximum pressure differential acts on the diaphragm plate.

Further pedal depression does not act on the diaphragm plate but rather on the push rod.



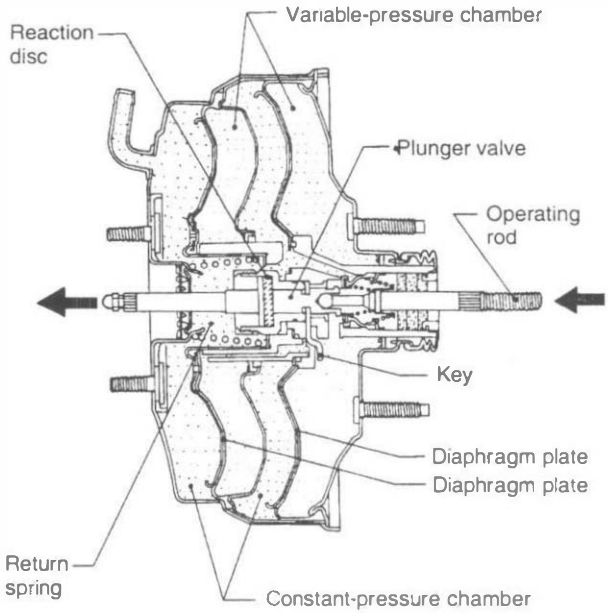
G4H0044

5. BRAKE BOOSTER RELEASED

When the force of brake pedal depression decreases, the forces acting on the reaction disc and plunger valve are unbalanced, so that the plunger valve is moved to the right.

The plunger valve then comes in contact with the atmospheric valve of the poppet valve to shut off the passage between the variable-pressure chamber and atmospheric air and, at the same time, moves the poppet valve back. Movement of the poppet valve opens the vacuum valve so that passages A and B are linked with each other.

Air from the variable-pressure chamber is then delivered to the constant-pressure chamber. This eliminates any pressure differential between the two chambers. As a result, the diaphragm plate is pushed back to the "release" position by the return spring.



G4H0045

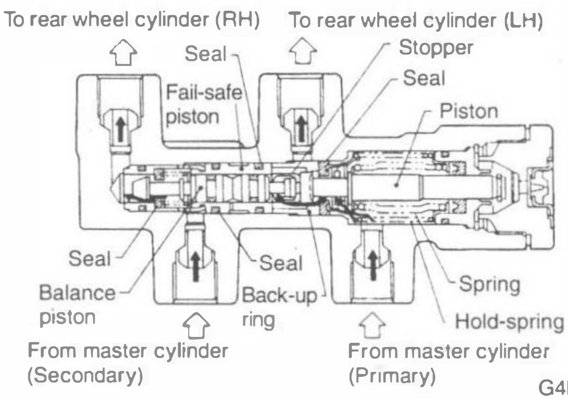
6. BRAKE BOOSTER WITH NO VACUUM

When the brake pedal is depressed while the constant- and variable-pressure chambers are held at atmospheric pressure, the operating rod moves to the left. This moves the plunger valve which in turn pushes the hub via the key.

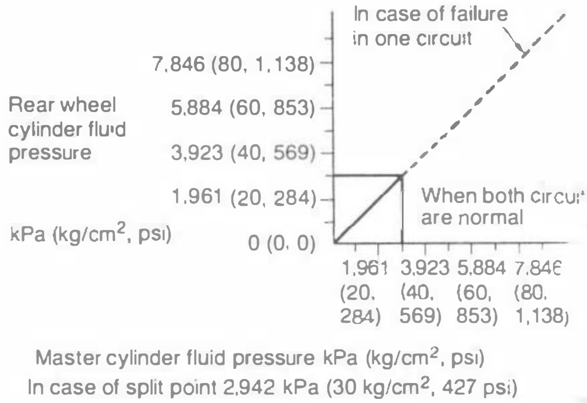
The reaction disc (which is built into the hub) then moves the master cylinder piston via the push rod. At this point a boosting force does not occur, but oil pressure is produced by movement of the master cylinder piston. As a result, the system serves as a hydraulic brake.

5. Proportioning Valve

The proportioning valve for dual piping systems is adopted for controlling the braking forc



G4H0046



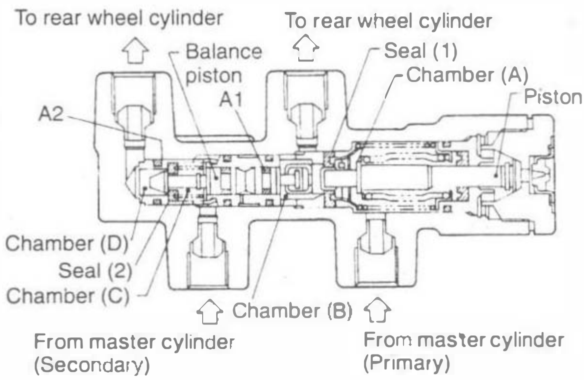
A: OPERATION DURING NORMAL CONDITIONS

When the fluid pressure in the master cylinder is low (the fluid pressure before the split poi piston is pressed by the spring load and the valve remains inoperative. As a result, the fluic sure in the master cylinder is held equal to the fluid pressure in the rear wheel cylinder.

1) When the master cylinder fluid pressure rises, the piston in the primary circuit is movec ward against the spring load, and brought into contact with the seal (1) (as shown in the The master cylinder fluid pressure chamber (chamber A) is therefore cut off from the rear cylinder fluid pressure chamber (chamber B), and the fluid pressure to the rear wheel cylir thus controlled. (The pressure at this moment is the split point pressure.)

If the fluid pressure in chamber A rises further, the piston is moved leftward, off the seal (this causes the fluid pressure in chamber B to rise. The piston is then moved rightwar brought into contact with the seal (1) again. After this, the piston repeats this contact with th (1) in this way, thereby controlling the fluid pressure in the rear wheel cylinder.

2) When the fluid pressure in chamber B is controlled in the secondary circuit, the balance is moved rightward by the fluid pressure difference between chamber B and chamber brought into contact with the seal (2), and the fluid pressure in chamber D is controlled. Sinc tional areas A1 and A2 are equal, the balance piston is pushed by equal forces from the rig left. If the fluid pressure rises in chamber B, the balance piston performs control to equaliz fluid pressure in chamber D and chamber B by repeating open-close operation with the se

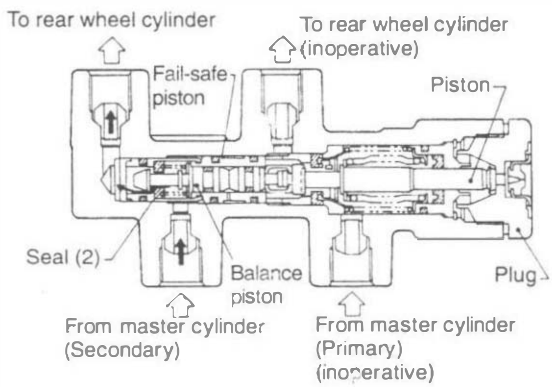


G4H0050

B: OPERATION IN CASE OF CIRCUIT FAILURE

1. FAILURE OF PRIMARY CIRCUIT

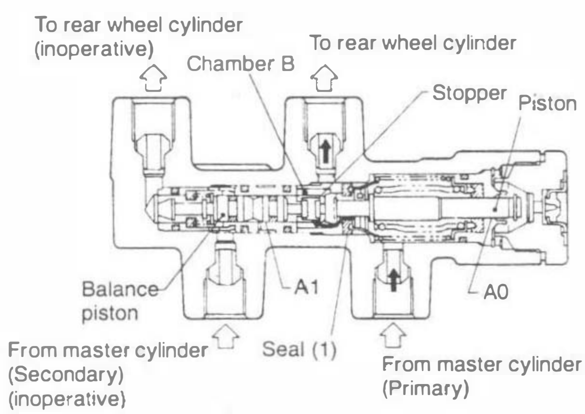
If the primary circuit fails, the fail-safe piston and balance piston are moved rightward by the fluid pressure in the master cylinder in the secondary circuit until the piston contacts the plug. In this case, the balance piston remains off the seal (2), and no split point is created in the graph. That is, the fluid pressure in the secondary side rear wheel cylinder is equal to the fluid pressure in the master cylinder.



G4H0049

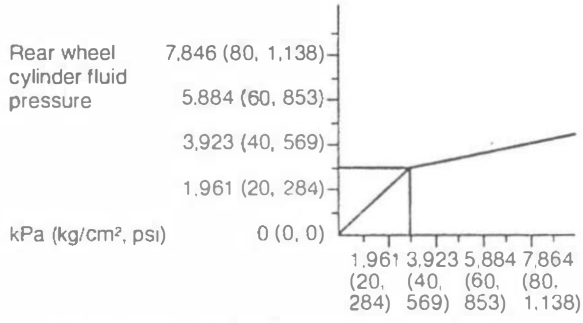
2. FAILURE OF SECONDARY CIRCUIT

If the secondary circuit fails, the balance piston is moved leftward by the fluid pressure in chamber B until the end of the piston contacts the stopper. Since sectional area A1 is greater than A2, the piston remains unmoved even after the master cylinder fluid pressure has reached the split point, and the piston is kept off the seal (1). Hence, no split point is created in the graph, and the rear wheel cylinder fluid pressure of the primary circuit is kept equal to the master cylinder fluid pressure.



G4H0048

6. Proportioning Valve (with ABS models)



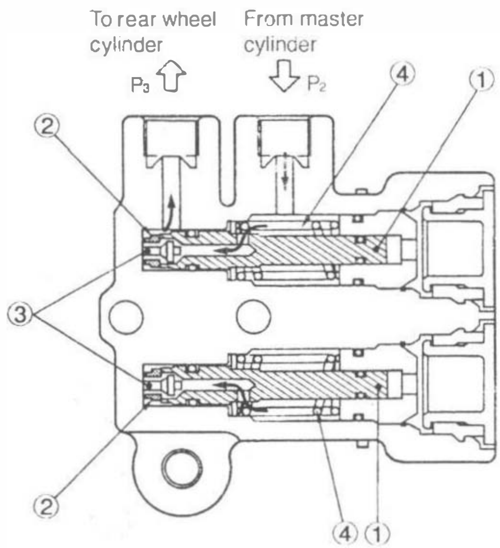
H4H1130

A: OPERATION DURING NORMAL CONDITIONS

1) Operation before the split point

Piston ① is held by spring ④ so that valve ③ is kept away from valve seat ②.

Under this condition, fluid pressure "P_3" to rear wheel cylinders equals fluid pressure "P_2" from master cylinder.



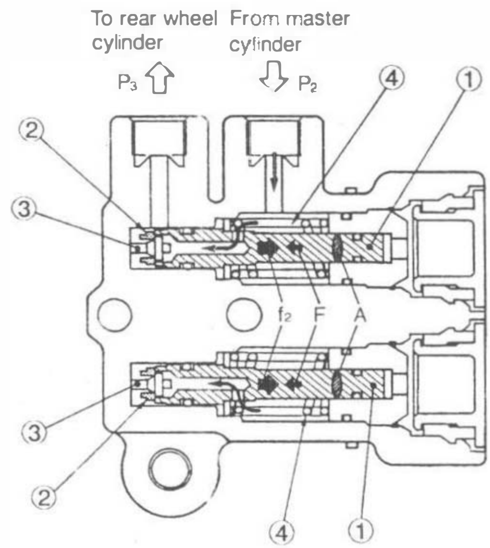
H4H1127A

2) Operation near the split point

Force "f_1", applied to piston ① by spring ④, is one-half of spring force "F". In other words, "f_1" = "F".

Force "f_2" is also applied to piston ① in the direction opposite to spring force "F" due to fluid pressure "P_2" generated by master cylinder according to cross sectional area "A".

Spring force "f_2" increases respondingly with fluid pressure "P_2". When "f_2" is greater than "f_1", piston ① moves in direction opposite to spring force "F". This causes valve ② to come in contact with valve seat ③, blocking fluid passage.



H4H1128A

3) Immediately before fluid passage is closed, fluid pressure "P_2" is held equal to pressure "P_3". When brake pedal is depressed to increase fluid pressure "P_2", piston ① moves in the same direction as spring force "F", opening fluid passage.

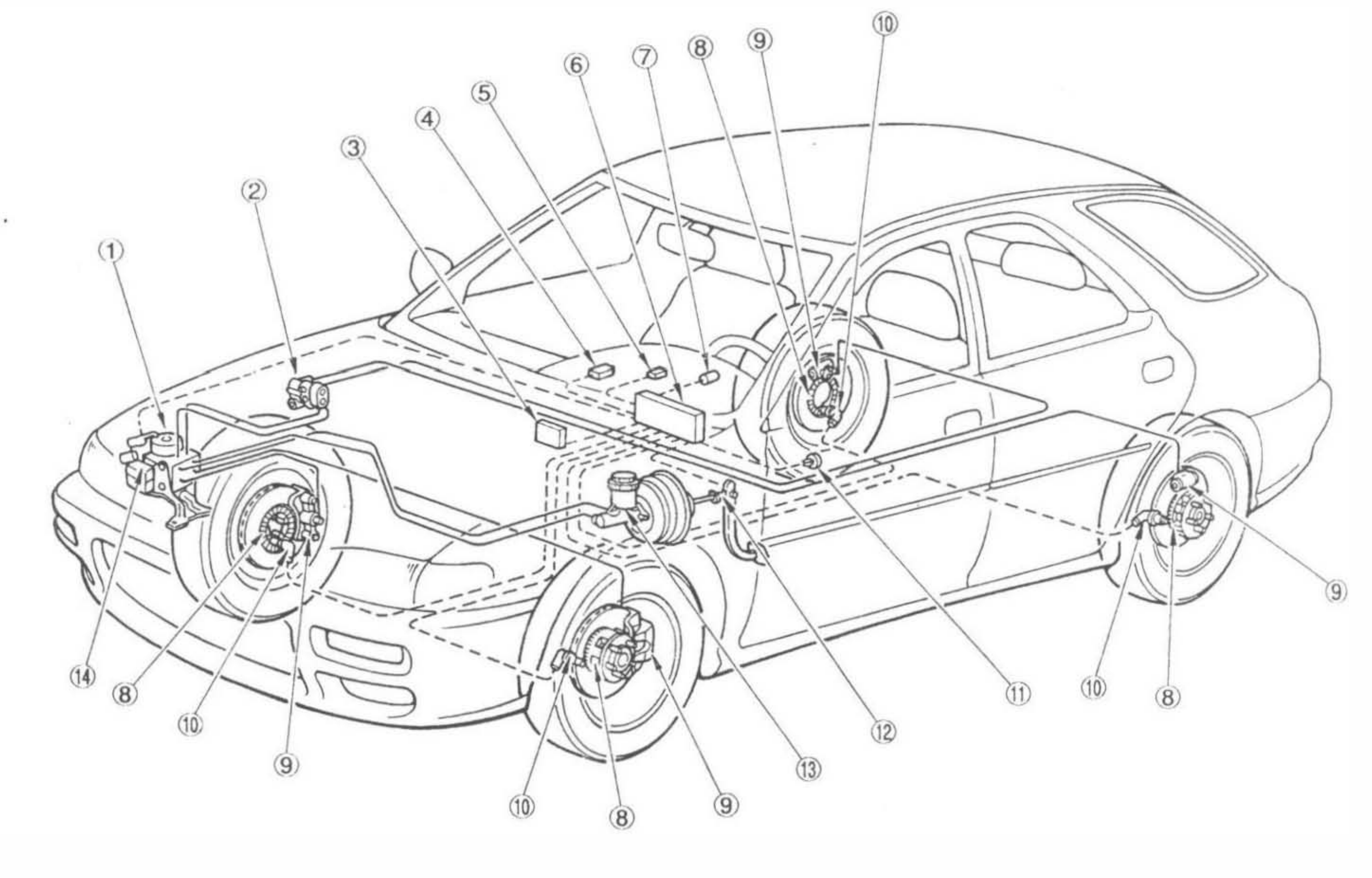
However, since fluid passage is closed again immediately after pressure "P_2" equals "P_3", pressure "P_3" is held at a value of less than pressure "P_2".

8. Anti-lock Brake System (ABS)

A: FEATURE

- The ABS (Anti-lock brake system) electrically controls brake fluid pressure to prevent wheel "lock" during braking on slippery road surfaces, thereby improving directional/steering stability as well as shortening the braking distance.
- If the ABS becomes inoperative, the fail-safe system activates to ensure it acts as a conventional brake system. The warning light also comes on to indicate that the ABS is malfunctioning.
- The front-and-rear wheels utilize a 4-sensor, 4-channel control design: the front wheels have an independent control design*1 and the rear wheels have a select low control design*2.

*1: A system which independently controls fluid pressure to left and right front wheels.
*2: A system which provides the same fluid pressure control for the two rear wheels if either wheel starts to "lock."

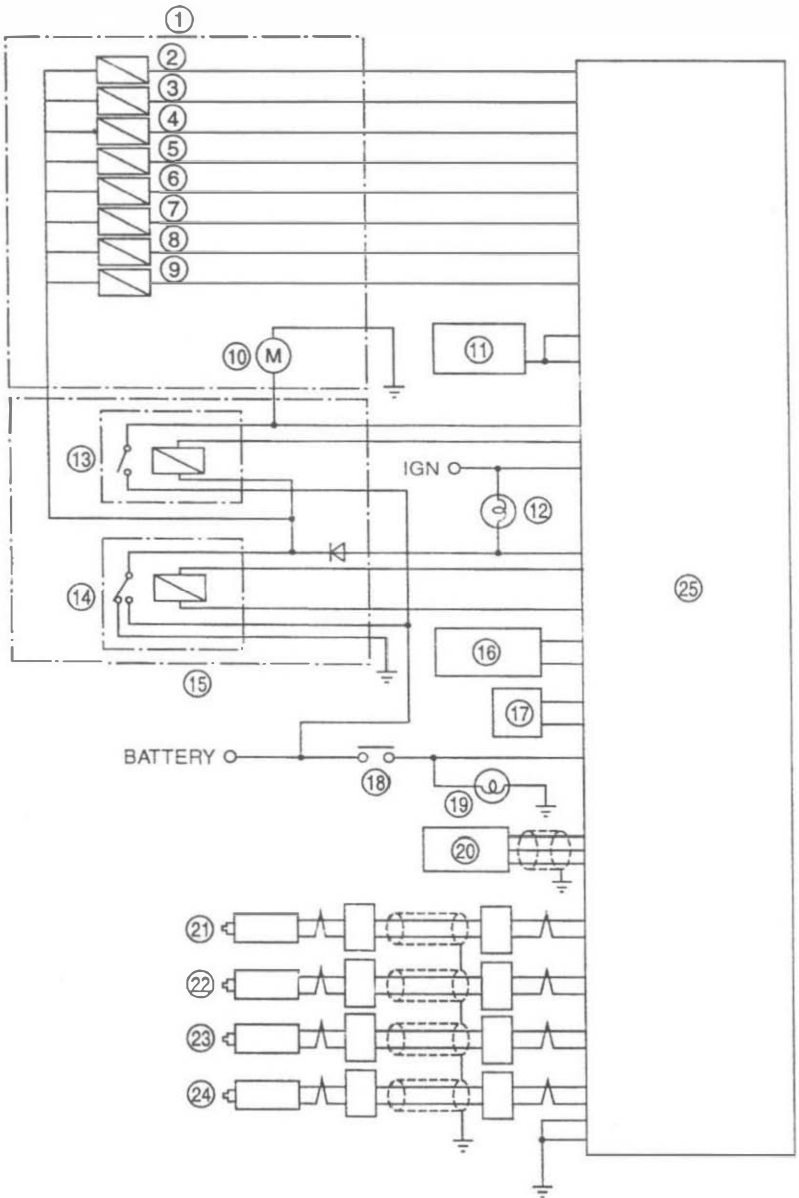


H4H1057A

1. Hydraulic control unit
2. Proportioning valve
3. Transmission control module (only AT vehicle)
4. Data link connector (for SUBARU selecor monitor)
5. ABS diagnosis connector
6. ABS control module
7. ABS warning light
8. Tone wheel
9. Wheel cylinder
10. ABS sensor
11. G sensor (only AWD vehicle)
12. Brake switch
13. Master cylinder
14. Relay box

B: FUNCTIONS OF SENSORS AND ACTUATORS

Name	Function
ABS control module (ABSCM)	• Calculates and determine the conditions of the wheels and body from the wheel speeds and makes a proper decision suitable for the current situation to control the hydraulic unit. • In the ABS operation mode, the module outputs a cooperative control signal to the AT control module. (AT vehicles only) • Whenever the ignition switch is placed at ON, the module makes a self diagnosis. When anything wrong is detected, the module cuts off the system. • Communicates with the Subaru select monitor.
Hydraulic unit (H/U)	In the ABS operation mode, the H/U changes fluid passages to control the fluid pressure of the wheel cylinders in response to an instruction from the ABSCM. The H/U also constitutes the brake fluid passage from the master cylinder to the wheel cylinders together with pipings.
Wheel speed sensor (ABS sensor)	Detects the wheel speed in terms of a change in the magnetic flux density passing through the sensor, converts it into an electrical signal, and outputs the electrical signal to the ABSCM.
Tone wheel	Gives a change in the magnetic flux density by the teeth around the tone wheel to let the ABS sensor generate an electrical signal.
G sensor (AWD vehicle only)	Detects a change in G in the longitudinal direction of the vehicle and outputs it to the ABSCM in terms of a change in voltage.
Relay box	Accommodates the valve relay and motor relay.
Valve relay	Serves as a power switch for the solenoid valve and motor relay coil in response to an instruction from the ABSCM. The valve relay also constitutes one of the duplicated ABS warning light drive circuits.
Motor relay	Serves as a power switch for the pump motor in response to an instruction from the ABSCM.
Stop light switch	Transmits the information on whether the brake pedal is depressed or not to the ABSCM for use as a condition in determining ABS operation.
ABS warning light	Alerts the driver to an ABS fault. When the diagnosis connector and diagnosis terminal are connected, the light flashes to indicate a trouble codes in response to an instruction from the ABSCM.
AT control module (TCM) (AT vehicles only)	Provides shift controls (fixing the speed at 3rd or changing front and rear wheel transmission characteristics on 4WD vehicle) in response to an instruction from the ABSCM.



B4M0787A

1 Hydraulic control unit
2 Front left inlet solenoid valve
3 Front left outlet solenoid valve
4 Front right inlet solenoid valve
5 Front right outlet solenoid valve
6 Rear left inlet solenoid valve
7 Rear left outlet solenoid valve
8 Rear right inlet solenoid valve
9 Rear right outlet solenoid valve
10 Motor
11 Transmission control module (only AT module)
12 ABS warning light
13 Motor relay
14 Valve relay
15 Relay box
16 Data link connector
17 ABS diagnosis connector
18 Stop light switch
19 Stop light
20 G sensor (only AWD model)
21 Front left ABS sensor
22 Front right ABS sensor
23 Rear left ABS sensor
24 Rear right ABS sensor
25 ABS control module

C: THEORY OF ABS CONTROL

When the brake pedal is depressed during operation, wheel speed as well as vehicle speed decreases. The difference which occurs between wheel speed and vehicle speed is called the "slip" phenomenon. The magnitude of this action is expressed by "slip" the ratio which is determined by the following equation:

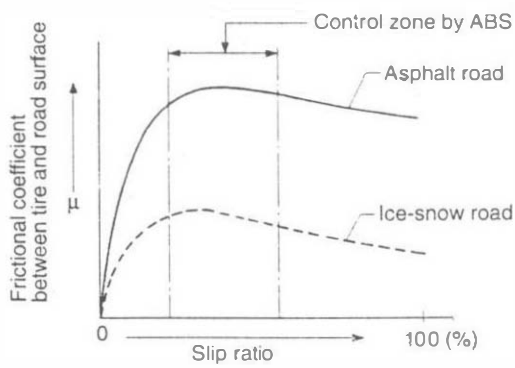
$$\text{Slip ratio} = \frac{\text{Vehicle speed} - \text{Wheel speed}}{\text{Vehicle speed}} \times 100\ \%$$

When the "slip" ratio is 0 % vehicle speed equals wheel speed and the wheel rotates without any slippage. When the "slip" is 100 % the wheel locks and does not rotate (wheel speed = 0) although vehicle speed exists.

The relationship between the frictional force of a wheel in the fore-and-aft direction and the "slip" ratio is shown by two characteristic curves in figure.

These curves are determined by the relationship between the wheel and road surface. Where the same type of wheel are used; the curve shown by a solid line indicates wheels driven on asphalt or paved roads, the curve shown by dotted lines refers wheels subjected to slippery (snowy or icy) roads.

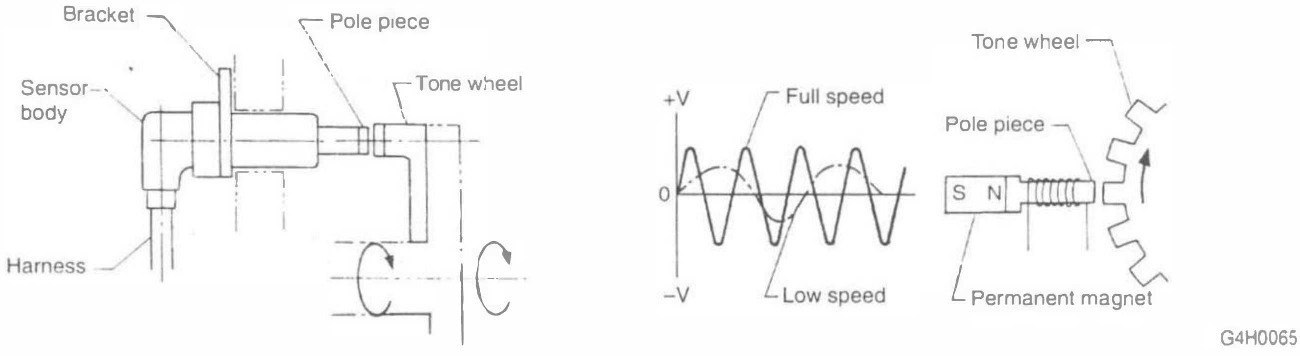
When different types of wheels are used, although the road surface is the same, these curves will change. In general, the frictional coefficient between wheel and road surface in relation to an increase in the "slip ratio" will reach the maximum value in the 8 – 30 % range and will tend to decrease after that.



G4H0064

D: ABS SENSOR

The ABS sensor detects wheel speed and consists of a permanent magnet, coil, tone wheel, etc. The magnetic flux produced by the permanent magnet varies with the tone wheel (which rotates together with the wheel) and the sensor emits an alternating voltage corresponding with the wheel speed by electromagnetic induction.



E: ABS CONTROL MODULE (ABSCM)

The ABSCM is a digital control type electronic control module accommodating two microcontrol modules (MCMs); master and slave. Both MCMs process the same program and monitor the respective outputs, and when a mismatch occurs, cut off the system to activate the fail-safe function.

A maximum of 3 trouble codes are stored in the EEP ROM and if 3 or more areas fail, then only the 3 most recent failures are stored. The trouble codes remain stored until they are erased.
This ABSCM induces a sequence control pattern and facilitates the checking of the hydraulic unit

- ABS control

Based on the four wheel speed signals, the ABSCM calculates a simulated body speed or body deceleration rate, while referencing the G sensor output as an auxiliary means, and compares them with the wheel speeds and wheel deceleration rates. If it determines that the wheels are about to lock, it controls the solenoid valve or motor pump of the H/U to adjust the brake fluid pressures that act on the wheel cylinders, thereby preventing the wheels from locking.
The ABSCM controls the right and left front wheel fluid pressures independently and controls the rear wheel fluid pressures on the basis of the wheel which is more likely to lock (Select-low control)

- Select monitor associated functions

The Subaru select monitor may be used to perform the following operations.
① To read out analog data
② To read out ON/OFF data
③ To read out or erase trouble code
④ To read out status information in the event of trouble (Freeze frame data)
⑤ To initiate ABS sequence control pattern

- Indication functions

The ABS warning light can be made to indicate the following three states.
① ABS trouble
② Flashes to indicate trouble codes in diagnosis mode.
③ Valve ON/OFF when sequence control pattern is in effect

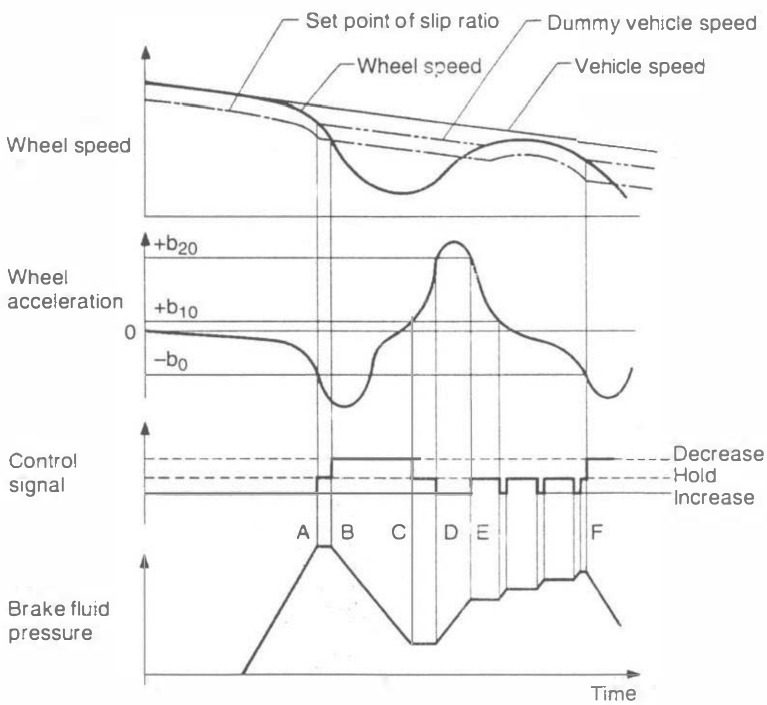
F: ABS CONTROL CYCLE CURVES

As the brake pedal is depressed, brake fluid pressure increases correspondingly, which in turn decreases wheel speed. When brake fluid pressure reaches point "A" (where wheel deceleration exceeds "$-b_0$"), the control module transmits a "hold" signal to hold the brake fluid pressure in wheel cylinder at that point. At the same time, the control module computes a "dummy" vehicle speed. When the wheel speed drops below the slip ratio setting (= speed less than the dummy vehicle speed based on the predetermined value) at point "B" of the brake fluid pressure, the control module then transmits a "decrease" signal to prevent wheel lock-up. This causes the brake fluid pressure to decrease.

After brake fluid pressure is decreased, wheel acceleration increases. When it exceeds the wheel acceleration setting "$+b_{10}$" at point "C" (brake fluid pressure), the control module transmits a "hold" signal to hold the brake fluid pressure at that point. When wheel acceleration setting value "$+b_{20}$" is exceeded and when brake fluid pressure is at point "D", the control module judges that wheel lock-up will not occur and then transmits an "increase" signal to increase brake fluid pressure.

When wheel acceleration drops below "$+b_{20}$" at point "E" (which occurred due to a brake fluid pressure increase), the repetition of the "hold" and "increase" signals takes place at constant cycle.

When wheel deceleration exceeds "$-b_0$", at point "F" of the brake fluid pressure, the control module immediately transmits a "decrease" signal to decrease brake fluid pressure.

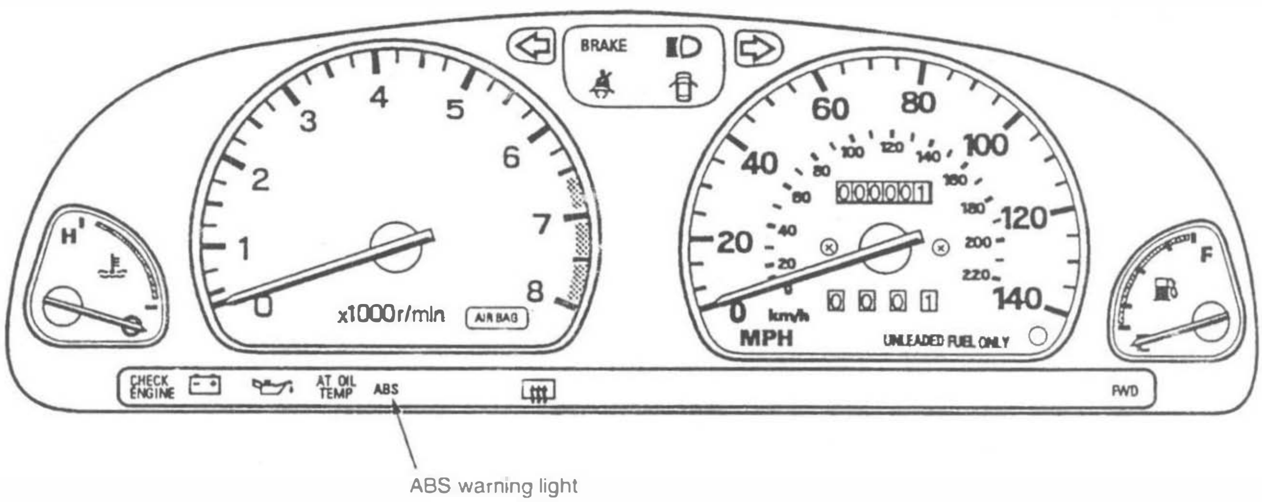


G4H0067

G: ABS WARNING LIGHT

When a signal system or the ABS control module becomes inoperative, the warning light in the combination meter comes on to indicate that the system or control module is malfunctioning. At the same time, current flowing through the hydraulic control unit is interrupted so that the brake system functions as a conventional brake system. The circuit through which the warning light comes on utilizes a dual system design.

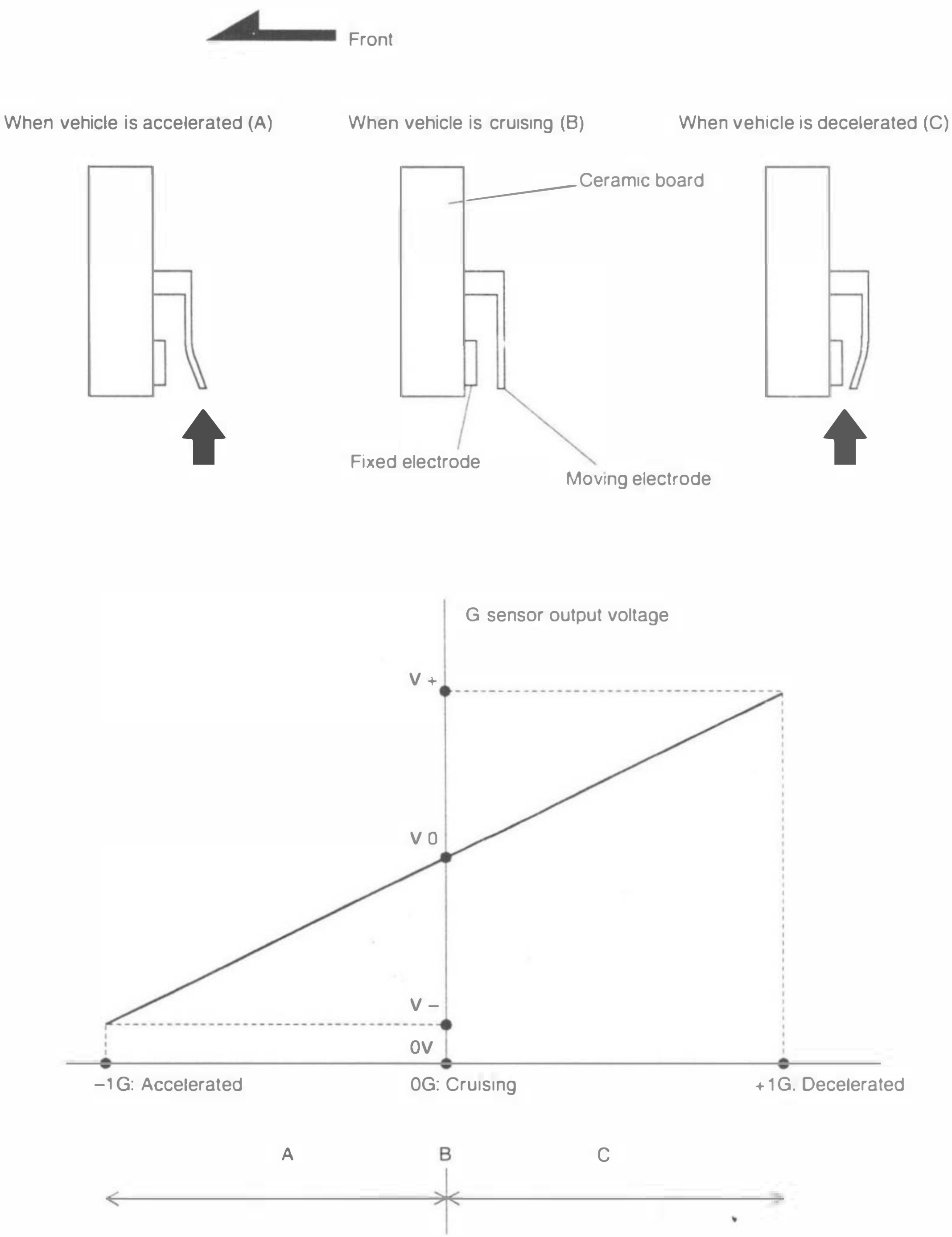
If the warning light comes on upon detection of a system malfunction, call a trouble code and identify it using the warning light.



H4H1129A

H: G SENSOR

The G sensor detects a change in G in the longitudinal direction.
It detects the motion of the moving electrode built into the sensor in terms of a change in the capacitance of the capacitor and outputs it to the ABSCM in terms of a change in voltage.



G Sensor Output Characteristics

B4H0988

I: HYDRAULIC CONTROL UNIT (H/U)

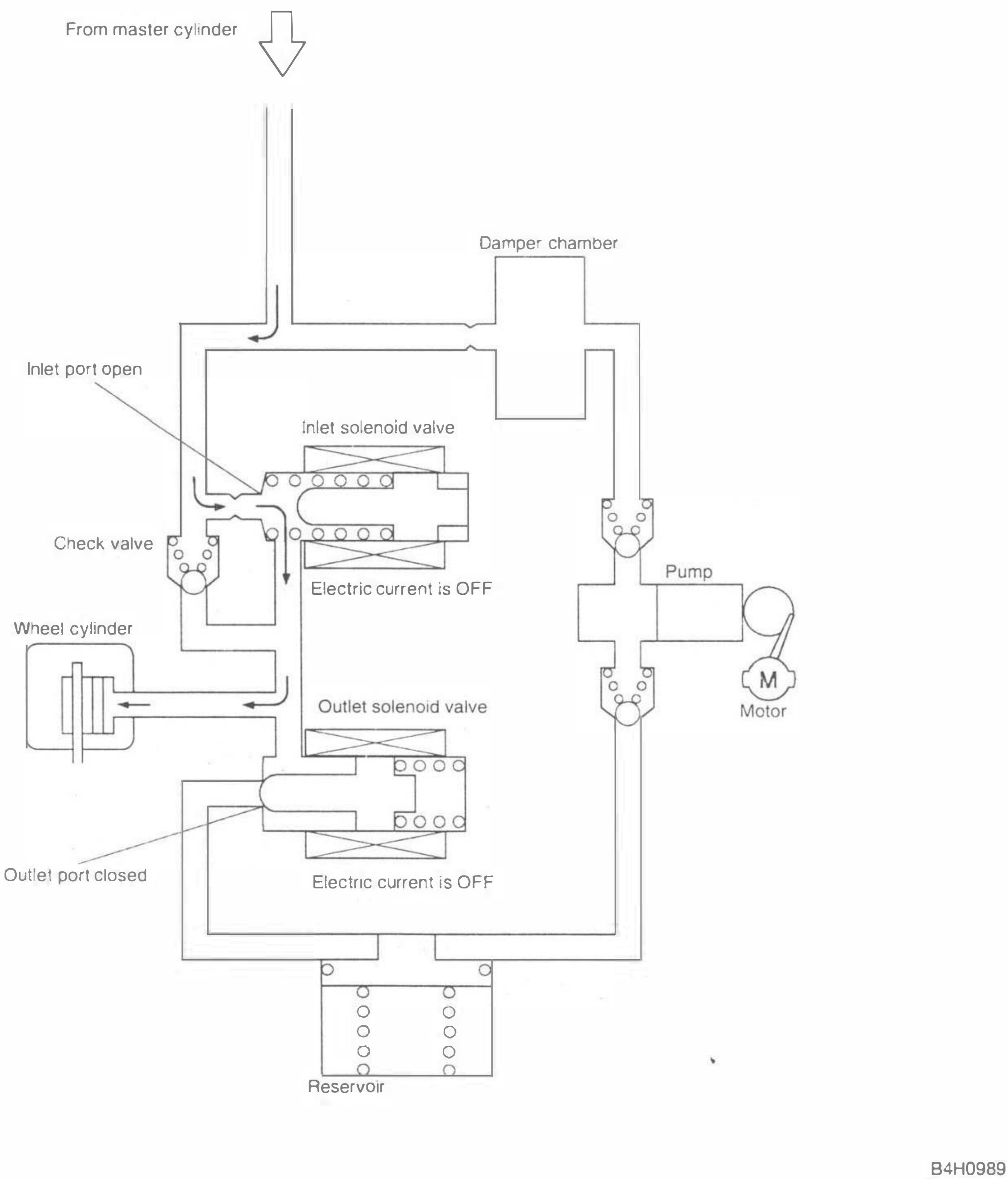
The H/U is a fluid pressure controller comprising a motor, solenoid valve, housing, relay, etc. It constitutes two diagonally independent brake fluid circuits for a cross piping vehicle.

- The pump motor rotates an eccentric cam to let the plunger pump generate a hydraulic pressure.
- The housing accommodates the pump motor, solenoid valve, reservoir, etc., and also constitutes a brake fluid passage.
- The plunger pump is a hydraulic pump which drains off the brake fluid which, when the pressure is reduced, is discharged to the reservoir, and sends it toward the master cylinder.
- The solenoid valve is a 2-position type solenoid valve which switches the brake fluid passages between the wheel and master cylinder and reservoir sides in response to an instruction from the ABSCM.
For each wheel cylinder, a pair of normally-closed and -opened solenoid valves are provided.
- The reservoir is a fluid chamber which temporarily stores the brake fluid to be discharged from the wheel cylinder when the pressure is reduced.
- The damper chamber suppresses the pulsation of the brake fluid which, when the pressure is reduced, is discharged from the plunger pump, thereby minimizing the kickbacks to the brake pedal.
- The valve relay controls the solenoid valve and motor relay energizing power supply in response to an instruction from the ABSCM. In normal (IG ON) condition, the relay is actuated to supply power to the solenoid valve and motor relay. When an error occurs in the system, the valve relay is forced to OFF to keep the fluid pressure circuit in the normal mode (normal brake mode) and also constitute the ABS warning light operating circuit.
- The motor relay supplies power to the pump motor to operate the plunger pump in response to an instruction from the ABSCM in the ABS control mode.

The H/U has four operating modes; normal mode (control OFF: normal brake mode), "increase", "hold" and "decrease" modes (control ON in all the three modes).

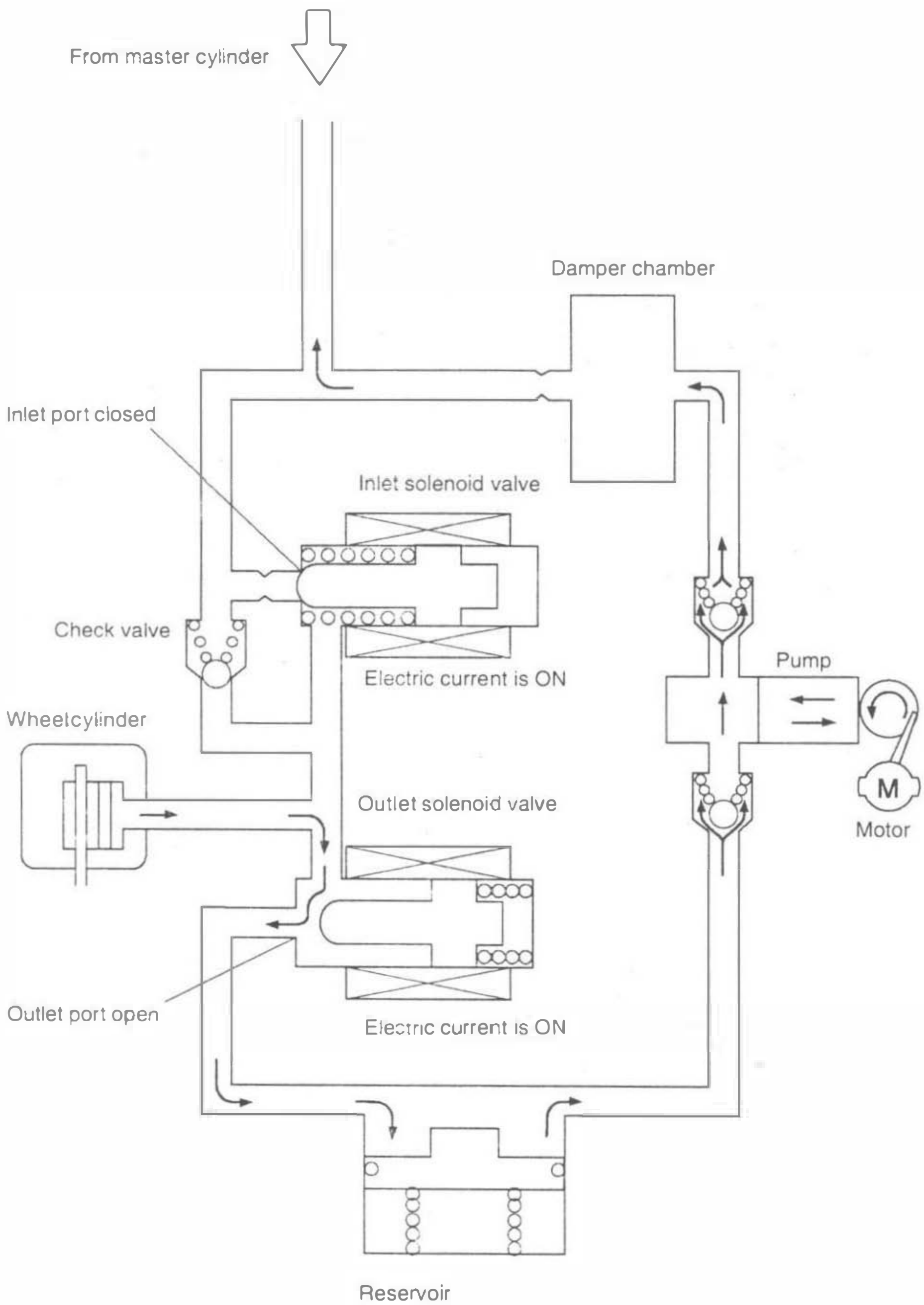
1. DURING NORMAL BRAKING (EXPLAINED WITH ONE WHEEL'S CONTROL AS AN EXAMPLE)

Since no current is supplied to the inlet and outlet solenoid valves, no solenoid valve attracting force is generated. So the valves remain stationary.
Accordingly, the inlet port of the inlet solenoid valve is in an opened state, whereas the outlet port of the outlet solenoid valve is in a closed state. So the fluid pressure of the master cylinder is transmitted to the wheel cylinder to produce a brake force in the wheel cylinder.



2. PRESSURE "DECREASE" ACTION WITH ABS IN OPERATION (EXPLAINED WITH ONE WHEEL'S CONTROL AS AN EXAMPLE)

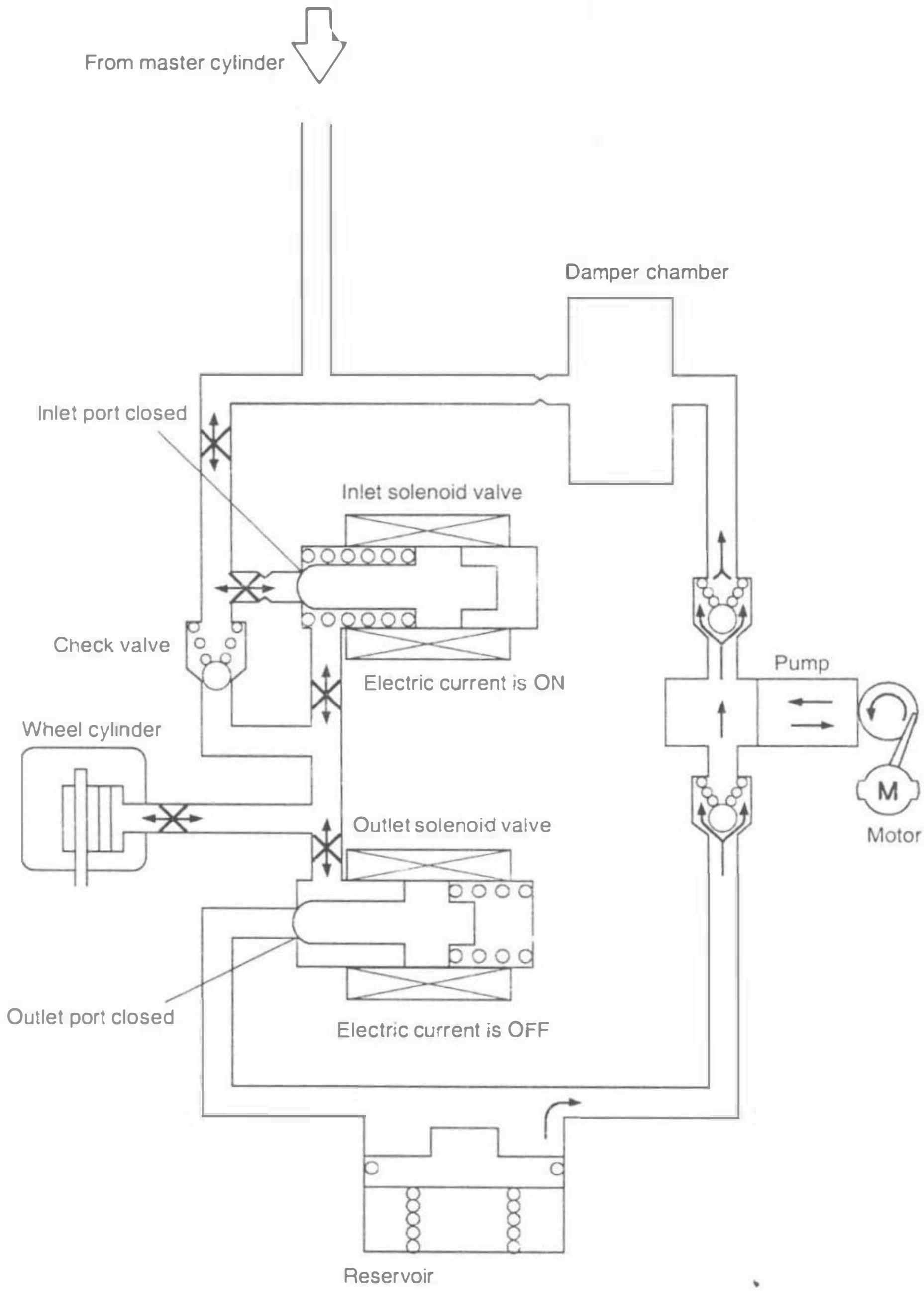
Current is supplied to the inlet and outlet solenoid valves, and the generated solenoid valve attracting forces close the inlet port and open the outlet port.
Accordingly, the wheel cylinder is isolated from the master cylinder and becomes clear to the reservoir, allowing the brake fluid to flow to the reservoir. So the fluid pressure of the wheel cylinder is decreased.
The brake fluid collected in the reservoir is fed to the master cylinder by the pump.



B4H0990

3. PRESSURE "HOLD" ACTION WITH ABS IN OPERATION (EXPLAINED WITH ONE WHEEL'S CONTROL AS AN EXAMPLE)

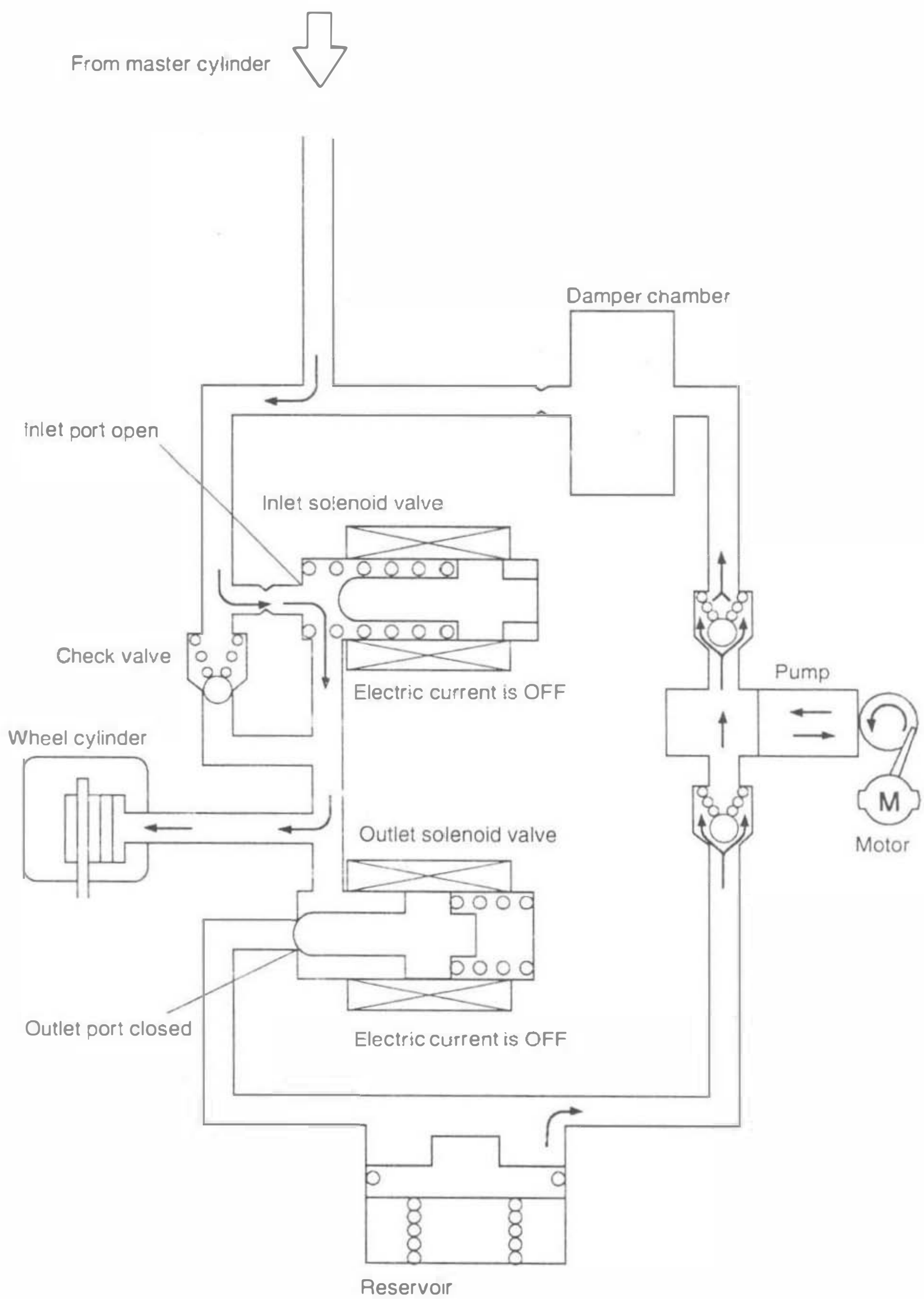
Current is supplied to the inlet solenoid valve, and the generated solenoid valve attracting force closes the inlet port.
Since no current is supplied to the outlet solenoid valve, the output port remains in a closed state.
As a result, the wheel cylinder, master cylinder and reservoir are blocked, and the fluid pressure of the wheel cylinder is maintained constant.
During ABS operation, the pump motor continues to operate.



B4H0991

4. PRESSURE "INCREASE" ACTION WITH ABS IN OPERATION (EXPLAINED WITH ONE WHEEL'S CONTROL AS AN EXAMPLE)

Since no current is supplied to the inlet and outlet solenoid valves, no solenoid valve attracting force is generated. So the valves remain stationary.
Accordingly, the inlet port of the inlet solenoid valve is in an opened state, whereas the outlet port of the outlet solenoid valve is in a closed state. So the fluid pressure of the master cylinder is transmitted to the wheel cylinder to increase the brake force in the wheel cylinder.
During ABS operation, the pump motor continues to operate.



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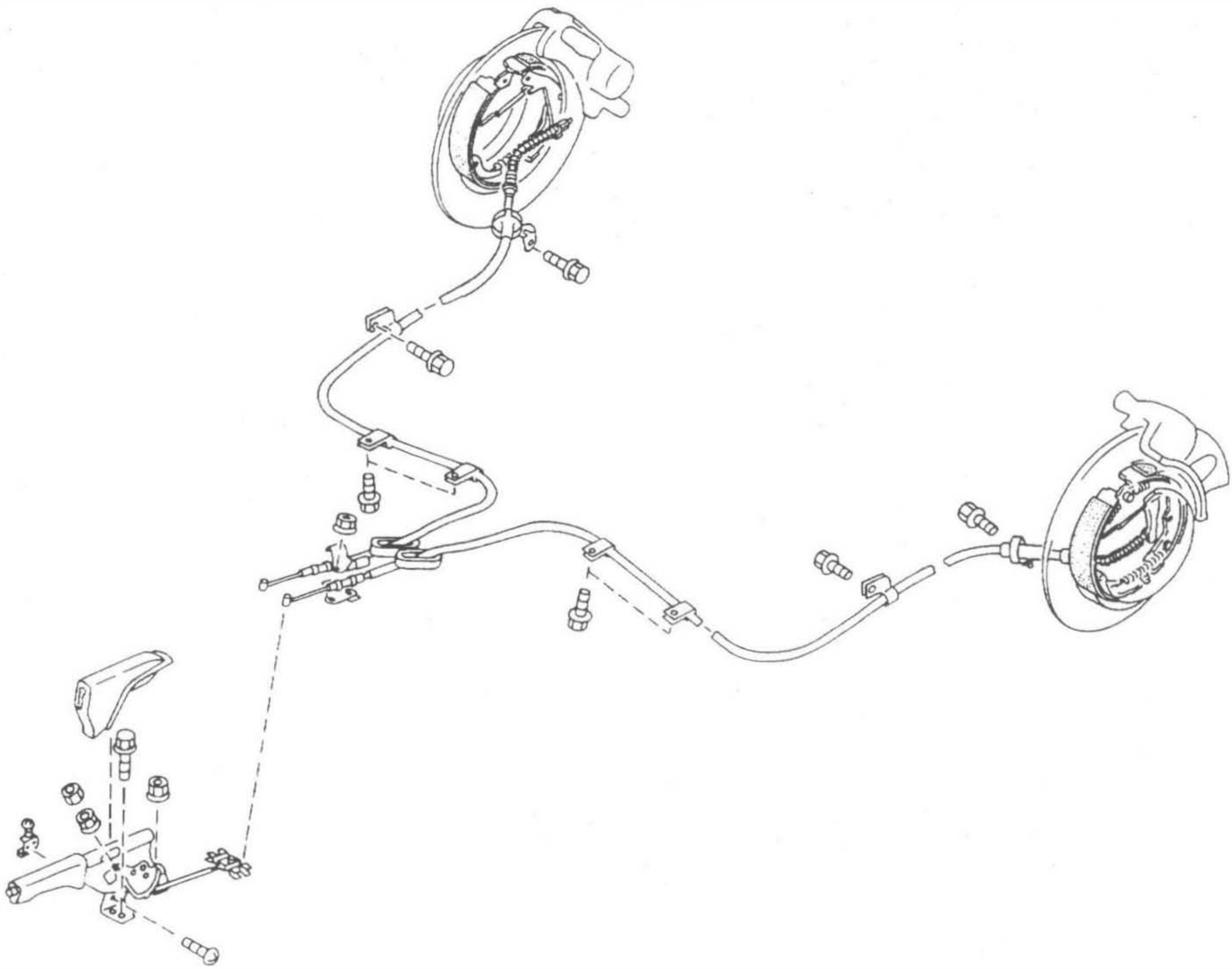
9. Parking Brake (Rear Disc Brake)

The rear disc brake has its parking brake drum housed in the disc rotor for improved performance.



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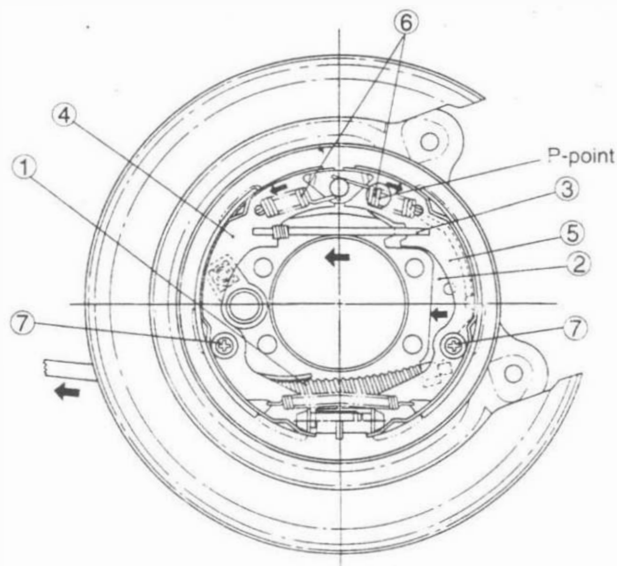


① Parking brake cable
② Lever
③ Strut
④ Brake shoe A
⑤ Brake shoe B
⑥ Shoe return spring
⑦ Shoe holo down pin

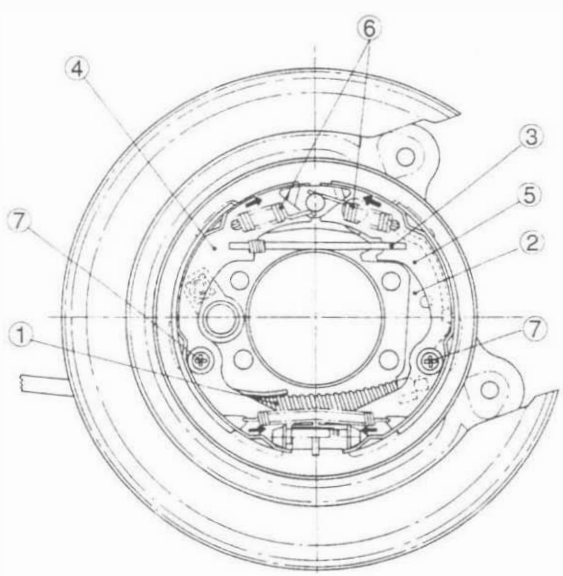
G4H0075

A: OPERATION

1. SET PARKING BRAKE

When the parking brake lever is moved back, lever ② located on the end of the parking brake cable ① moves strut ③ in the direction of "A" with point "P" utilized as a fulcrum.

The strut then presses brake shoes ④ and ⑤ against the drum. These brake shoes utilize a floating design and are lightly supported by hold-down pins ⑦. The force applied to brake shoe ④, and the reaction force of "A" applied to brake shoe ⑥ via point "P" provide brake application when the shoes are pressed against the brake drum.



① Parking brake cable
② Lever
③ Strut
④ Brake shoe A
⑤ Brake shoe B
⑥ Shoe return spring
⑦ Shoe hold down pin

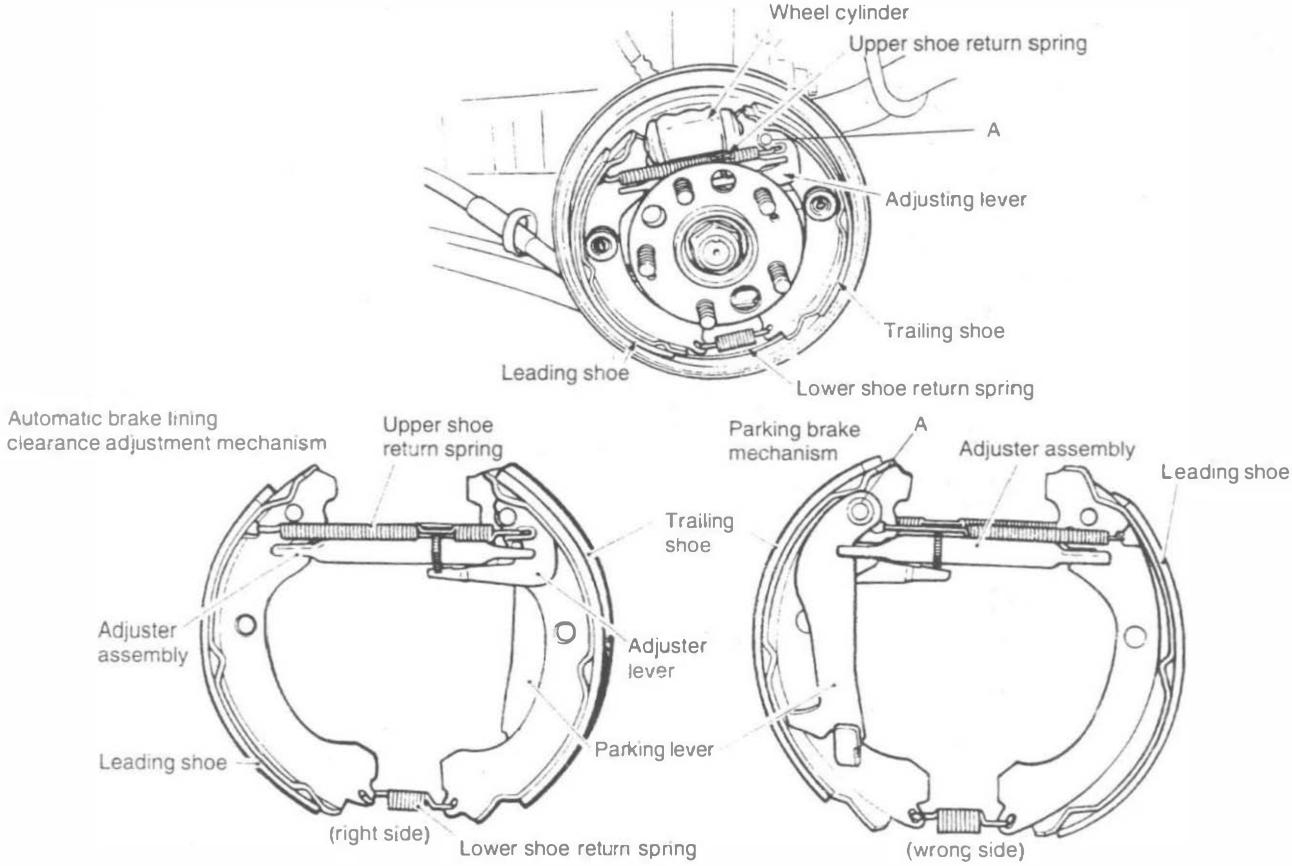
G4H0076

2. RELEASE PARKING BRAKE

When the parking brake lever is moved forward, parking brake cable ① is loosened. This returns brake shoes ④ and ⑥ to their original position from the tension of return spring ⑥ so that the parking brake is released.

10. Parking Brake (Rear Drum Brake)

When the parking brake lever is moved up, a lever in the drum brake moves with point "A" as a fulcrum so that the trailing shoe expands. The leading shoe also expands by way of the adjuster assembly. In this way, braking force will occur.



G4H0077

BRAKES 4-4

Page

1. Supplemental Restraint System "Airbag"

Airbag system wiring harness is routed near the ABS control module, ABS sensor and hydraulic control unit.

CAUTION:

- **All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.**
- **Be careful not to damage Airbag system wiring harness when servicing the ABS control module, ABS sensor and hydraulic control unit.**

2. Pre-inspection

Before performing diagnostics, check the following items which might affect ABS problems:

A: MECHANICAL INSPECTION

1. POWER SUPPLY

1) Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more
Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. BRAKE FLUID

1) Check brake fluid level.
2) Check brake fluid leakage.

3. BRAKE DRAG

Check brake drag. <Ref. to 4-4 [K100].>

4. BRAKE PAD AND ROTOR

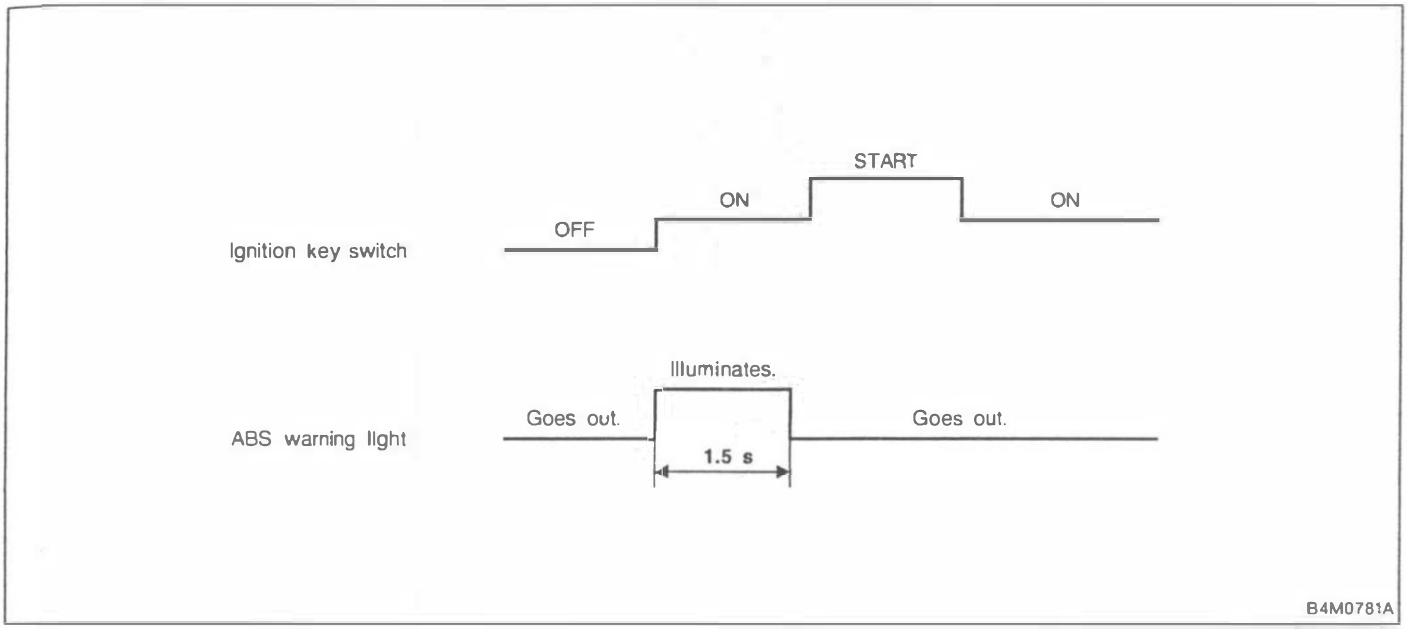
Check brake pad and rotor. <Ref. to 4-4 [K100].>

5. TIRE SPECIFICATIONS, TIRE WEAR AND AIR PRESSURE

Check tire specifications, tire wear and air pressure. <Ref. to 4-2 [S1A1], [S1A2].>

B: ELECTRICAL INSPECTION

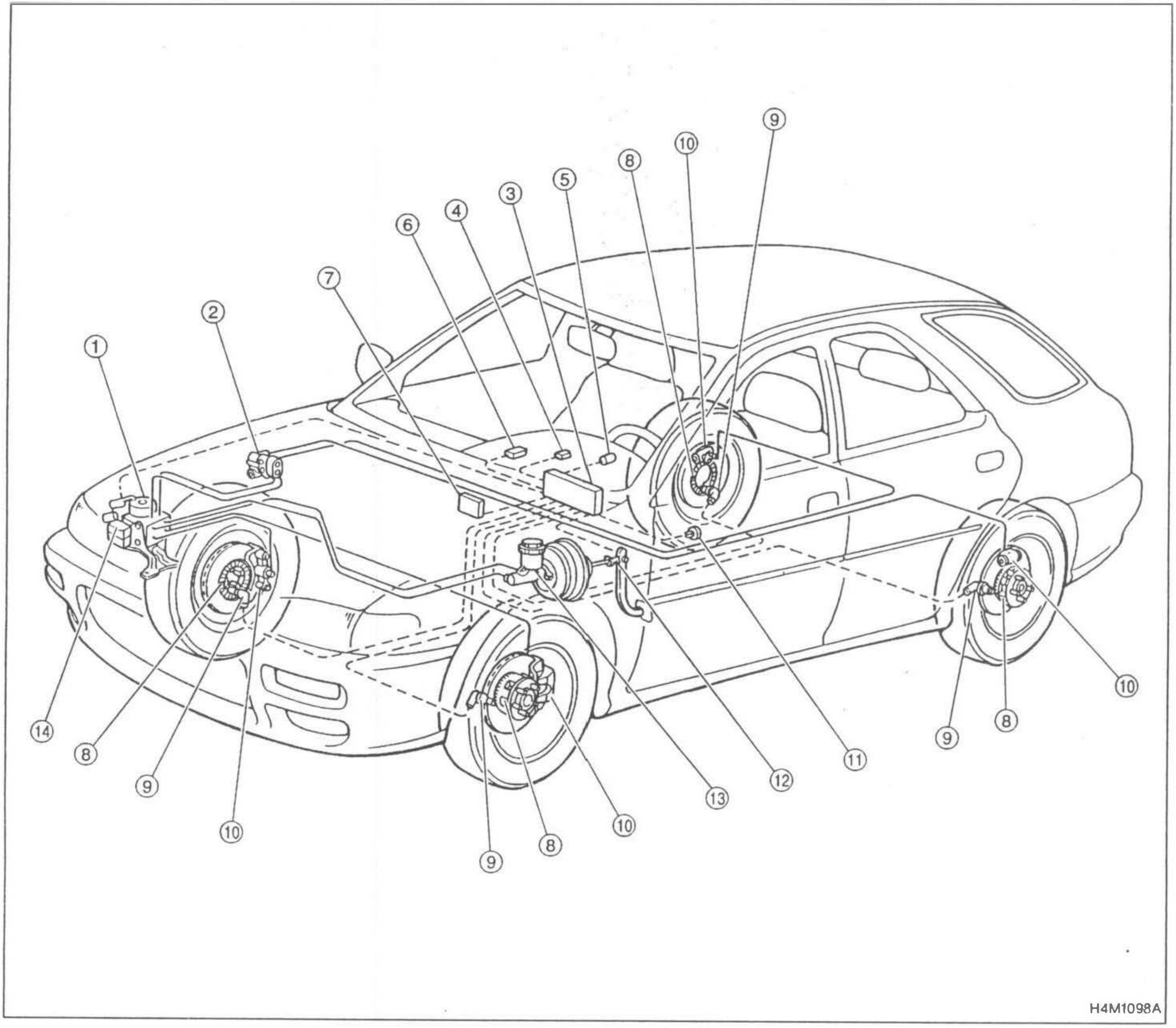
1. WARNING LIGHT ILLUMINATION PATTERN



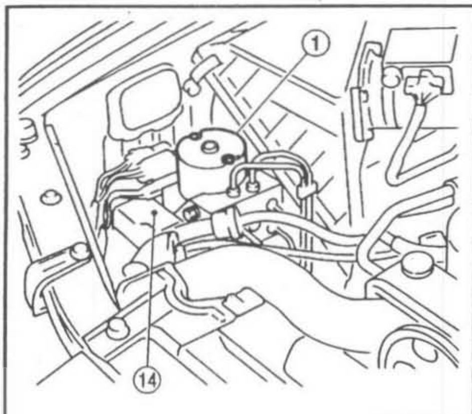
1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit. <Ref. to 4-4 [T7A0].>

NOTE:
Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approximately 12 km/h (7 MPH). However, the Anti-lock brakes do not work while the ABS warning light is illuminated.

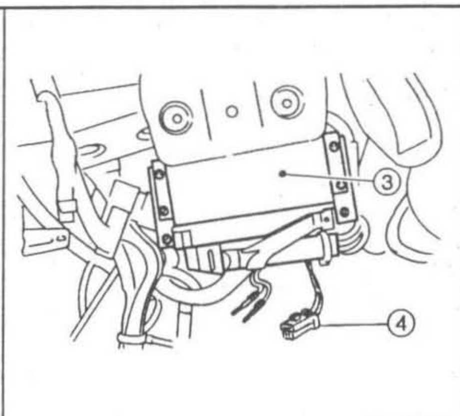
3. Electrical Components Location



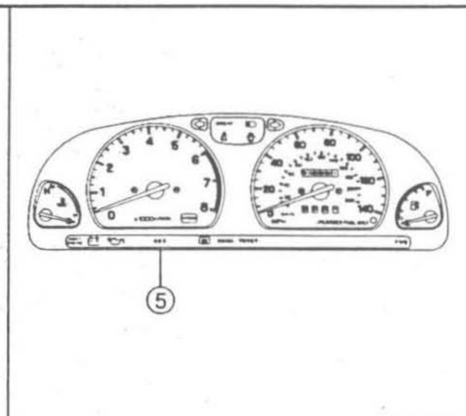
(1) Hydraulic control unit (H/U)
(2) Proportioning valve
(3) ABS control module (ABSCM)
(4) ABS diagnosis connector
(5) ABS warning light
(5) Data link connector (for Subaru select monitor)
(7) Transmission control module (only AT vehicle)
(8) Tone wheel
(9) ABS sensor
● Wheel cylinder
(11) G sensor (only AWD vehicle)
(12) Brake switch
(13) Master cylinder
(14) Relay box



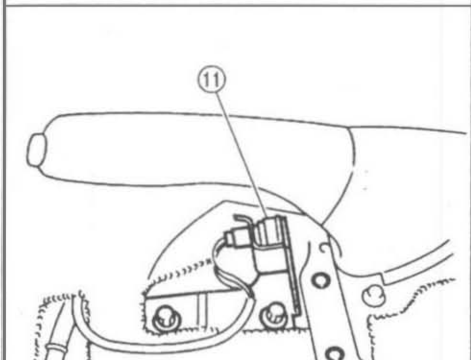
B4M0783A



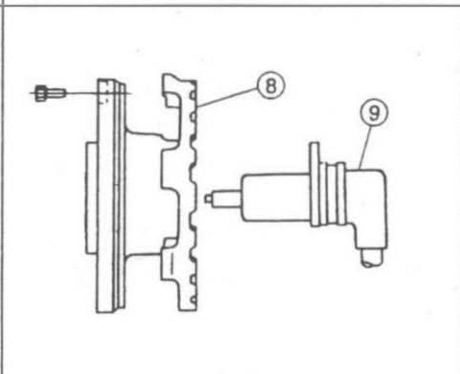
H4M1099A



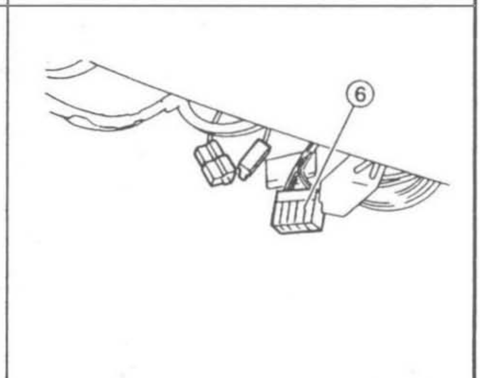
H4M1100A



H4M1152A



B4M0646B



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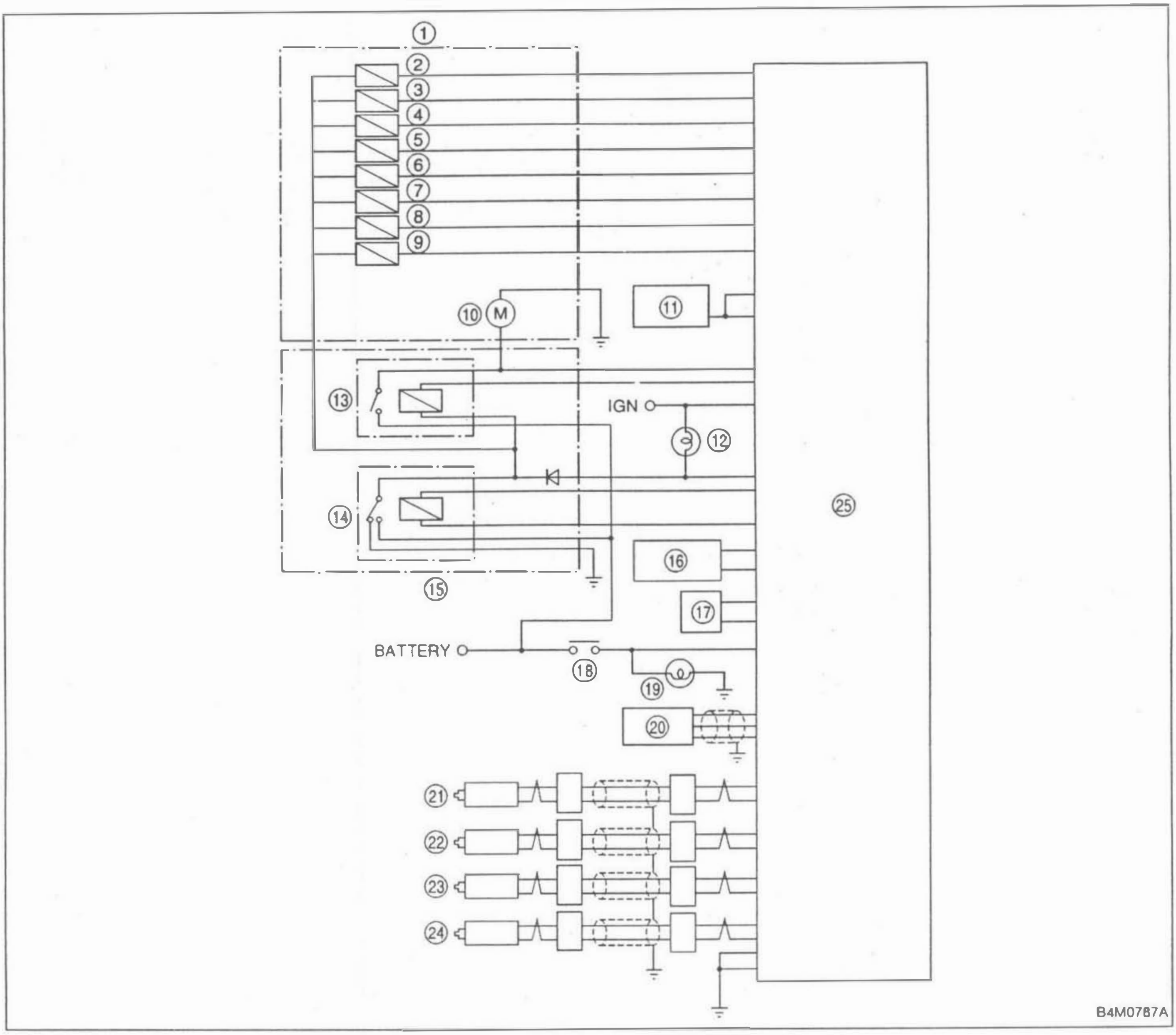
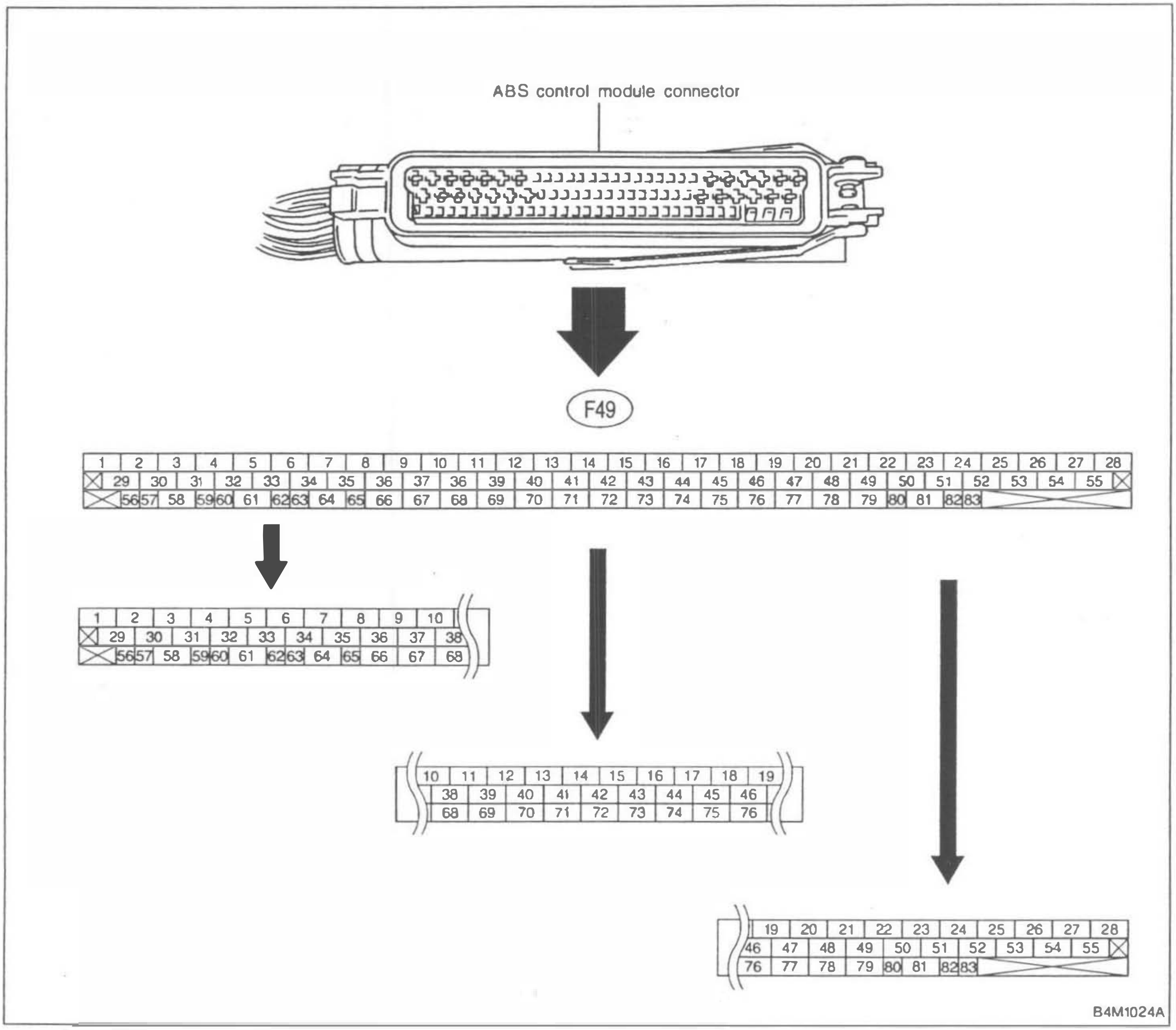
4. Schematic



1. Hydraulic control unit (H/U)
2. Front left inlet solenoid valve
3. Front left outlet solenoid valve
4. Front right inlet solenoid valve
5. Front right outlet solenoid valve
6. Rear left inlet solenoid valve
7. Rear left outlet solenoid valve
8. Rear right inlet solenoid valve
9. Rear right outlet solenoid valve
10. Motor
11. Transmission control module (only AT model)
12. ABS warning light
13. Motor relay
14. Valve relay
15. Relay box
16. Data link connector
17. ABS diagnosis connector
18. Stop light switch
19. Stop light
20. G sensor (only AWD model)
21. Front left ABS sensor
22. Front right ABS sensor
23. Rear left ABS sensor
24. Rear right ABS sensor
25. ABS control module (ABSCM)

5. Control Module I/O Signal

1. I/O SIGNAL VOLTAGE

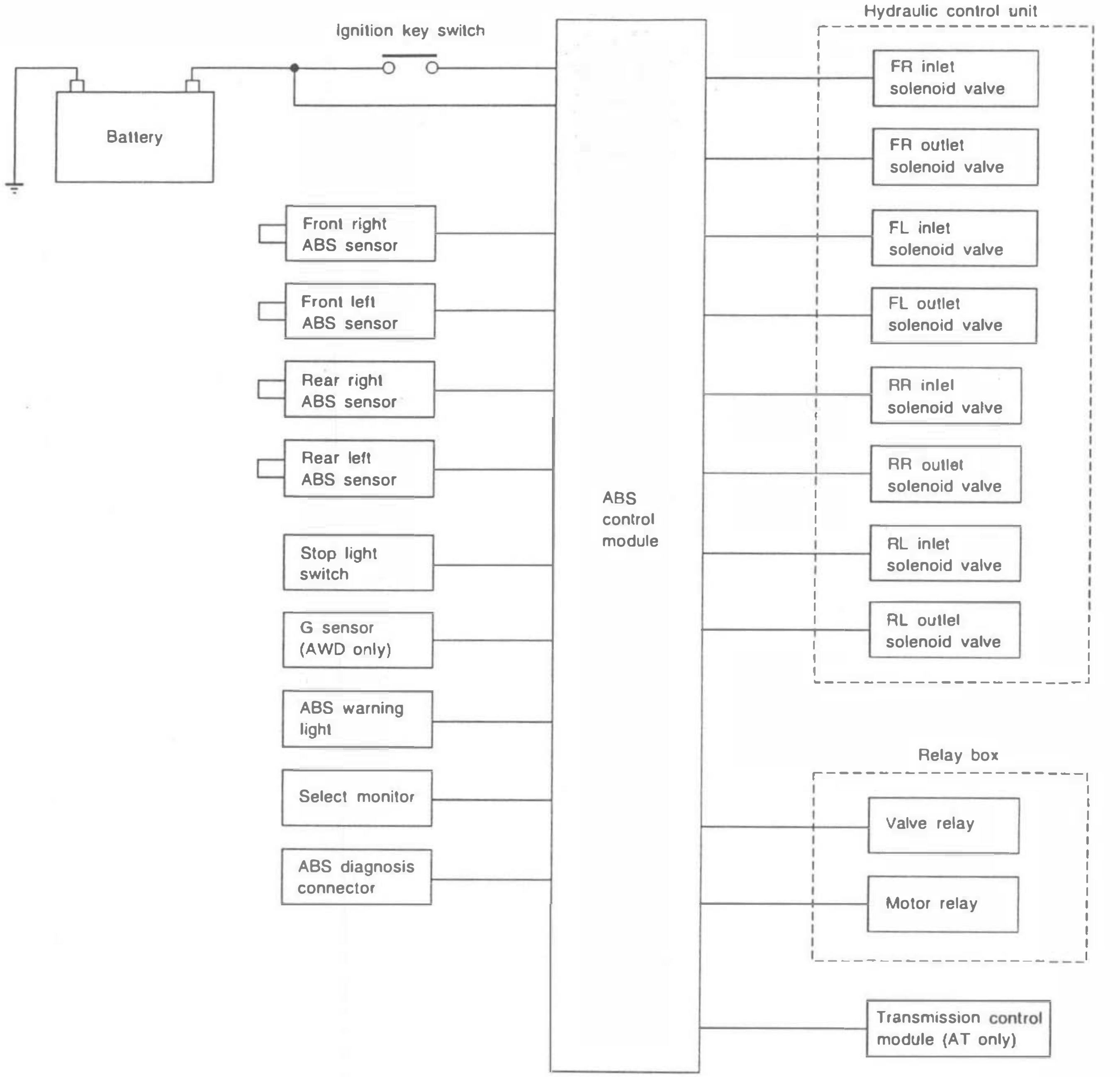


NOTE:

- The connector covers of LHD and RHD vehicles are in the reverse directions.
- The terminal numbers in the ABS control module connector are as shown in the figure.

Contents			Terminal No.	Input/Output signal Measured value and measuring conditions
ABS sensor (Wheel speed sensor)	Front left wheel		49—19	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel		14—15	
	Rear left wheel		16—17	
	Rear right wheel		18—46	
Hydraulic control unit	Solenoid valve	Front left outlet	51—1	10 — 13 V when the valve is OFF and less than 1.5 V when the valve is ON.
		Front right outlet	3—1	
		Rear left outlet	4—1	
		Rear right outlet	50—1	
		Front left inlet	24—1	
		Front right inlet	30—1	
		Rear left inlet	31—1	
		Rear right inlet	23—1	
Relay box	Valve relay power supply		27—1	10 — 13 V when ignition switch is ON.
	Valve relay coil		47—1	Less than 1.5 V when ignition switch is ON.
	Motor relay coil		22—1	More than 10 V when the ABS control does not operate still and less than 1.5 V when ABS operates.
	Motor monitoring		10—1	Less than 1.5 V when the ABS control does not operate still and more than 10 V when ABS operates.
G sensor (AWD model only)	power supply		8—45	4.75 — 5.25 V
	ground		45	—
	output		7—45	2.3±0.2 V when vehicle is in horizontal position.
Stop light switch			36—1	Less than 1.5 V when the stop light is OFF and more than 4.5 V when the stop light is ON.
ABS warning light			54—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 14 V after 1.5 seconds.
AT ABS signal (AT model only)			12—1	Less than 1.5 V when the ABS control does not operate still and more than 5.5 V when ABS operates.
ABS operation signal monitor			39—1	Less than 1.5 V when the ABS control does not operate still and more than 5.5 V when ABS operates.
Select monitor	Data is received.		11—1	Less than 1.5 V when no data is received.
	Data is sent.		38—1	4.75 — 5.25 V when no data is sent.
ABS diagnosis connector	Terminal No. 1		5—1	10 — 14 V when ignition switch is ON.
	Terminal No. 2		13—1	10 — 14 V when ignition switch is ON.
Power supply			28—1	10 — 14 V when ignition switch is ON.
Grounding line			1	—
Grounding line			55	—

2. I/O SIGNAL DIAGRAM



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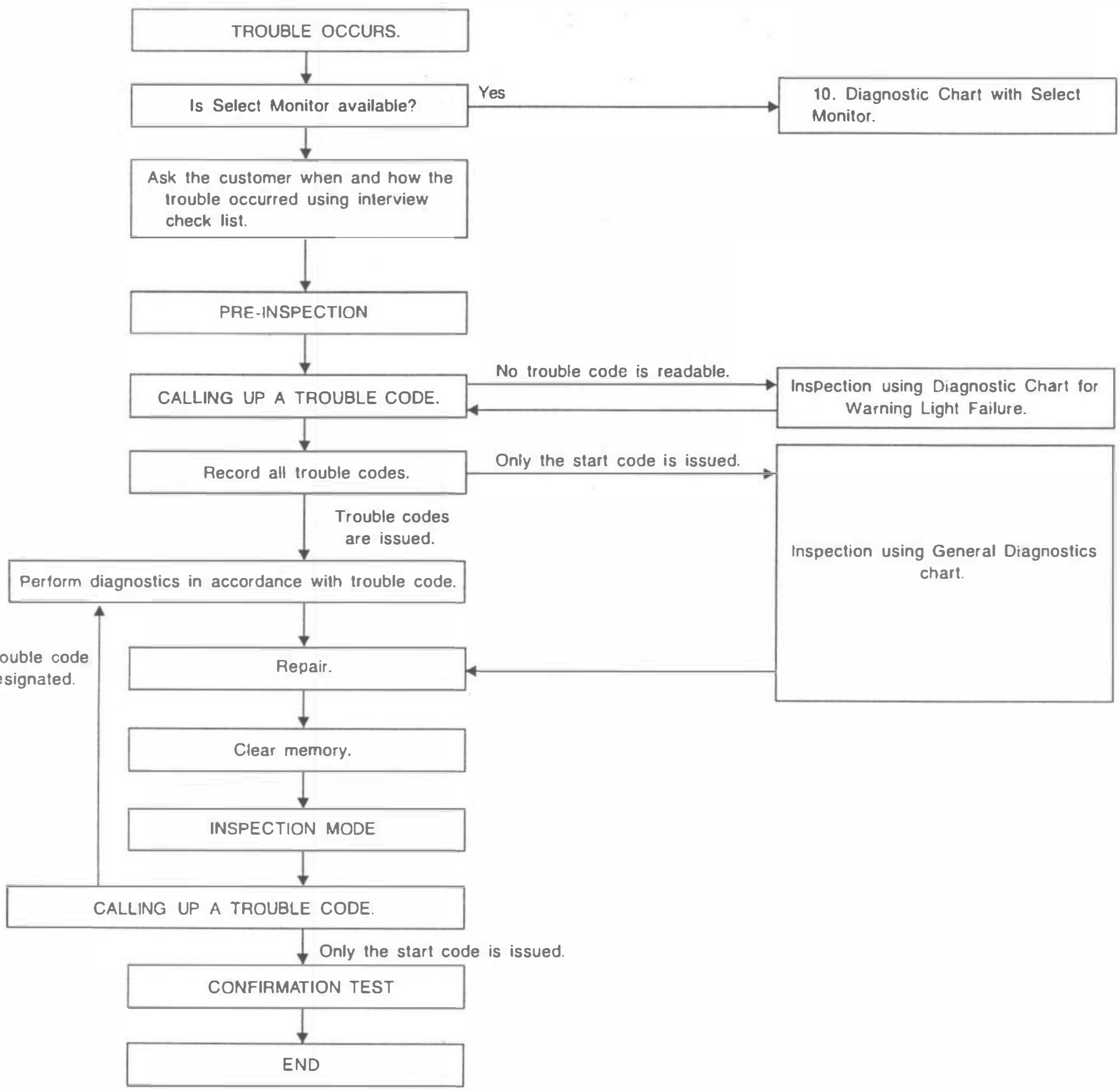
6. Diagnostics Chart for On-board Diagnosis System

A: BASIC DIAGNOSTICS PROCEDURE



B4M1051A

NOTE:
- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- When ABS warning light illuminates, read and record trouble code indicated by ABS warning light.

B: CHECK LIST FOR INTERVIEW

Check the following items about the vehicle's state.

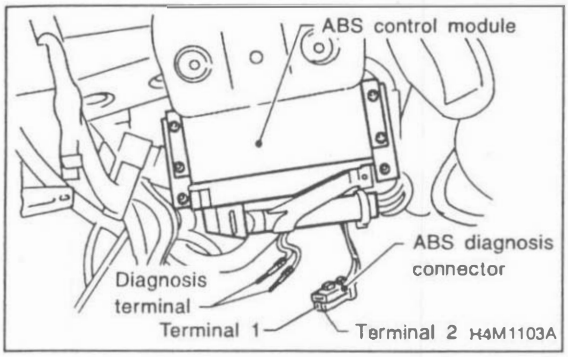
1. THE STATE OF THE ABS WARNING LIGHT			
ABS warning light comes on.	☐ Always ☐ Sometimes ☐ Only once ☐ Does not come on ● When /how long does it come on?:		
Ignition key position	☐ LOCK ☐ ACC ☐ ON (before starting engine) ☐ START ☐ On after starting (Engine is running) ☐ On after starting (Engine is stop)		
Timing	☐ Immediately after ignition is ON. ☐ Immediately after ignition starts.		
	☐ When advancing	km/h to	km/h
		MPH to	MPH
	☐ While traveling at a constant speed	km/h	MPH
	☐ When decelerating	km/h to	km/h
		MPH to	MPH
	☐When turning to right	Steering angle :	deg
		Steering time :	sec
	☐ When turning to left	Steering angle :	deg
		Steering time :	sec
	☐ When moving other electrical parts		
	● Parts name : ● Operating condition :		
2. SYMPTOMS			
ABS operating condition	☐ Performs no work.		
	☐ Operates only when abruptly applying brakes.	Vehicle speed :	km/h
			MPH
	● How to step on brake pedal :		
	a) Operating time :		sec
	b) Operating noise : ☐ Produce / ☐ Does not produce		
	● What kind of noise?	☐ Knock ☐ Gong gong ☐ Bong ☐ Buzz ☐ Gong gong buzz ☐ Others :	
	c) Reaction force of brake pedal		
		☐ Stick ☐ Press down once with a clunk ☐ Press and released ☐ Others :	

Behavior of vehicle	a) Directional stability cannot be obtained or steering arm refuses to work when applying brakes : ☐ Yes / ☐No	
	● When :	☐ Vehicle turns to right ☐ Vehicle turns to left ☐ Spins ☐ Others :
	b) Directional stability cannot be obtained or steering arm refuses to work when accelerating : ☐ Yes / ☐No	
	● When :	☐ Vehicle turns to right ☐ Vehicle turns to left ☐ Spins ☐ Others :
	c) Brakes are out of order : ☐ Yes / ☐No	
	● What :	☐ Braking distance is long ☐ Brakes lock or drag ☐ Pedal stroke is long ☐ Pedal sticks ☐ Others :
	d) Poor acceleration : ☐ Yes / ☐No	
	● What :	☐ Fails to accelerate ☐ Engine stalls ☐ Others :
	e) Occurrence of vibration : ☐ Yes / ☐No	
	● Where ● What kind :	
	f) Occurrence of abnormal noise : ☐ Yes / ☐No	
	● Where ● What kind :	
	g) Occurrence of other phenomena : ☐ Yes / ☐No	
	● What kind :	
3. CONDITIONS UNDER WHICH TROUBLE OCCURS		
Environment	a) Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others :
	b) Ambient temperature	°C (°F)
	c) Road	☐ Urban area ☐ Suburbs ☐ Highway ☐ General road ☐ Ascending slope ☐ Descending slope ☐ Paved road ☐ Gravel road ☐ Muddy road ☐ Sandy place ☐ Others :
	d) Road surface	☐ Dry ☐ Wet ☐ New-fallen snow ☐ Compressed snow ☐ Frozen slope ☐ Others :

Condition	a) Brakes	Deceleration : g
		☐ Continuous / ☐Intermittent
	b) Accelerator	Acceleration : g
		☐ Continuous / ☐ Intermittent
	c) Vehicle speed	km/h MPH
		☐ Advancing ☐ Accelerating ☐ Reducing speed ☐ Low speed ☐ Turning ☐ Others :
	d) Tire inflation pressure	Front RH tire : kPa
		Front LH tire : kPa
		Rear RH tire : kPa
		Rear LH tire : kPa
	e) Degree of wear	Front RH tire :
		Front LH tire :
		Rear RH tire :
		Rear LH tire :
	f) Genuine parts are used. : ☐Yes / ☐No	
	g) Chain is passed around tires. : ☐Yes / ☐No	
	h) T tire is used. : ☐Yes / ☐No	
	i) Condition of suspension alignment :	
	j) Loading state :	
	k) Repair parts are used. : ☐Yes / ☐No	
	● What :	
	l) Others :	

C: INSPECTION MODE

Reproduce the condition under which the problem has occurred as much as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.

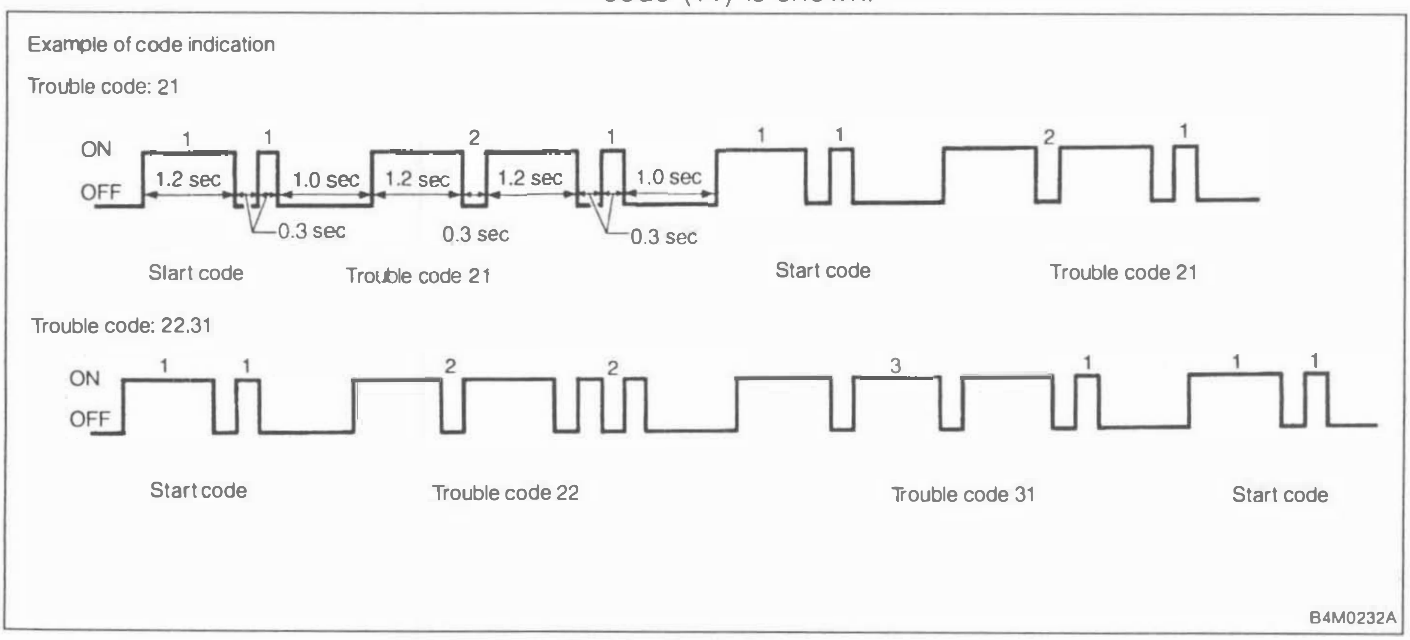


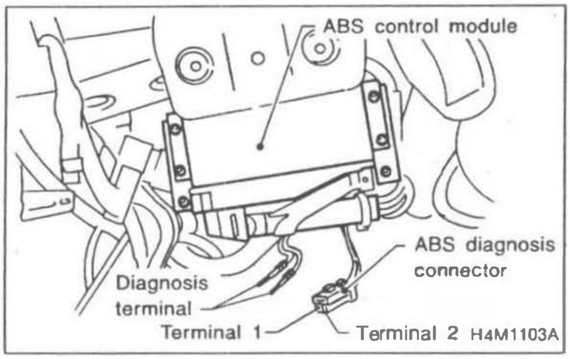
D: TROUBLE CODES

When on-board diagnosis of the ABS control module detects a problem, the information (up to a maximum of three) will be stored in the EEP ROM as a trouble code. When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)

1. CALLING UP A TROUBLE CODE

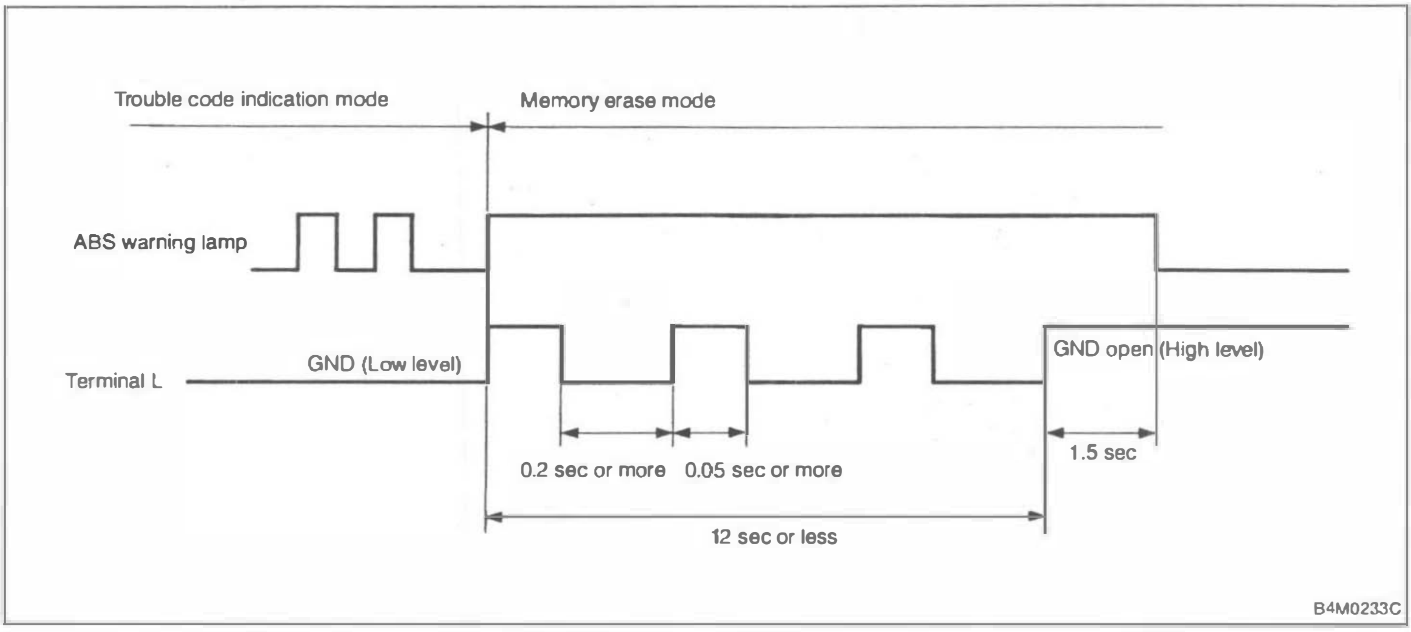
1) Take out ABS diagnosis connector from side of driver's seat heater unit.
2) Turn ignition switch OFF.
3) Connect ABS diagnosis connector terminal 2 to diagnosis terminal.
4) Turn ignition switch ON.
5) ABS warning light is set in the diagnostic mode and blinks to identify trouble code.
6) After the start code (11) is shown, the trouble codes will be shown in order of the last information first.
These repeat for a maximum of 5 minutes.
NOTE:
When there are no trouble codes in memory, only the start code (11) is shown.





2. CLEARING MEMORY

1) After calling up a trouble code, disconnect ABS diagnosis connector terminal 2 from diagnosis terminal.
2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 2 and diagnosis terminal for at least 0.05 seconds each time.



NOTE:
After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

7. Diagnostics Chart for ABS Warning Light Circuit and Diagnosis Circuit Failure

A: ABS WARNING LIGHT DOES NOT COME ON.

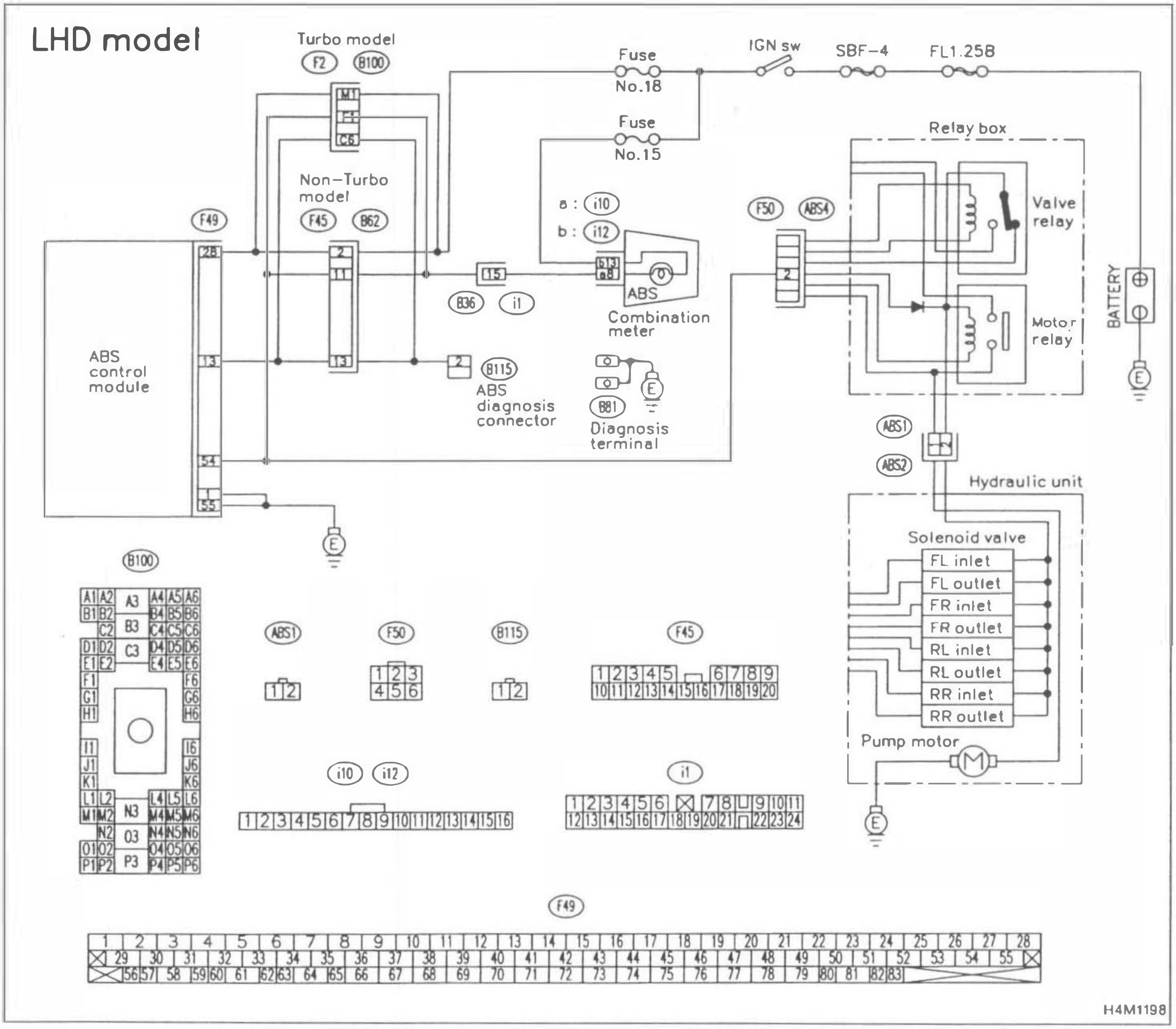
DIAGNOSIS:

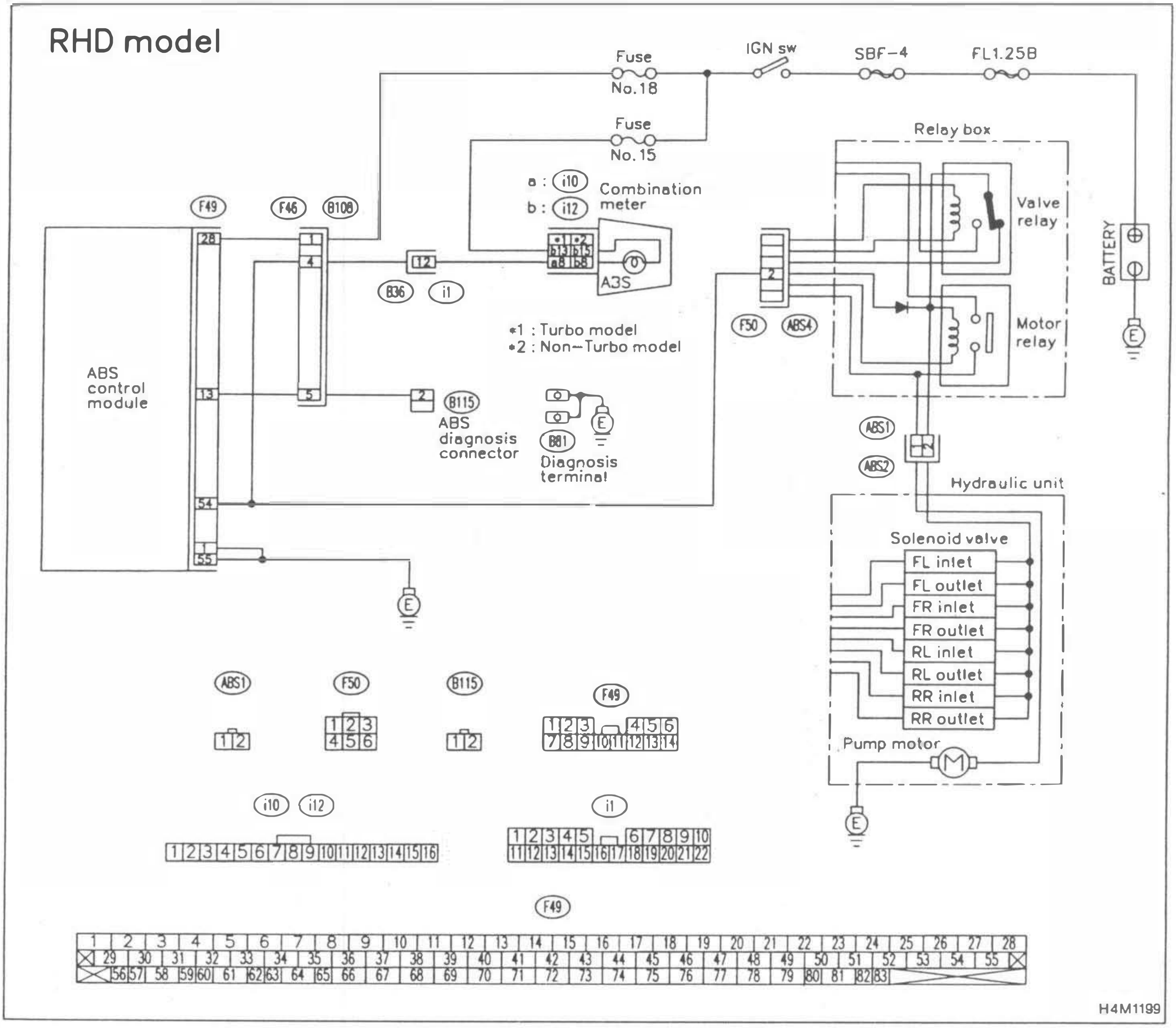
- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When ignition switch is turned ON (engine OFF), ABS warning light does not come on.

WIRING DIAGRAM:




RHD model
Fuse No.18
IGN sw
SBF-4
FL1.25B
Fuse No.15
a : i10
b : i12
Combination meter
Relay box
Valve relay
Motor relay
BATTERY
F49
F46
B108
ABS control module
B36
i1
A3S
*1 : Turbo model
*2 : Non-Turbo model
F50
ABS4
B115
ABS diagnosis connector
B81
Diagnosis terminal
ABS1
ABS2
Hydraulic unit
Solenoid valve
FL inlet
FL outlet
FR inlet
FR outlet
RL inlet
RL outlet
RR inlet
RR outlet
Pump motor
H4M1199

7A1	CHECK IF OTHER WARNING LIGHTS TURN ON.

Turn ignition switch to ON (engine OFF).

CHECK : ***Do other warning lights turn on?***

YES : Go to step **7A2.**

NO : Repair combination meter.

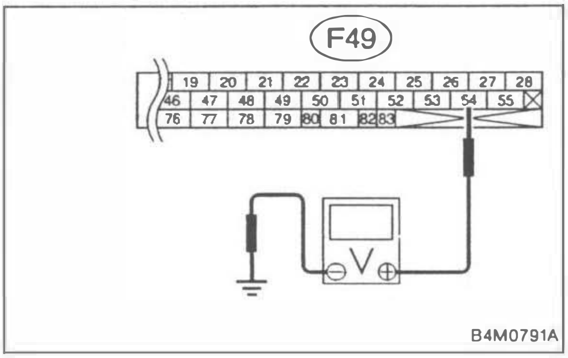
7A2	CHECK ABS WARNING LIGHT BULB.

1) Turn ignition switch to OFF.
2) Remove combination meter.
3) Remove ABS warning light bulb from combination meter.

CHECK : ***Is ABS warning light bulb OK?***

YES : Go to step **7A3.**

NO : Replace ABS warning light bulb.



B4M0791A

7A3	CHECK WIRING HARNESS.

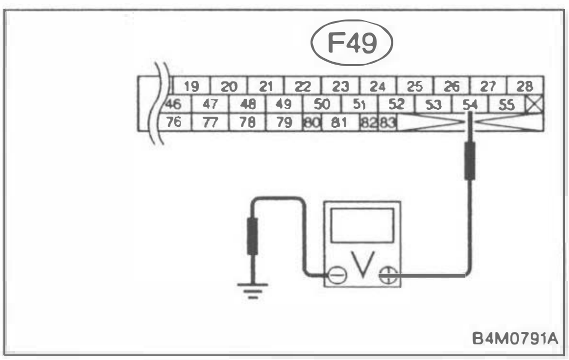
1) Disconnect connector from ABSCM.
2) Disconnect connector (F50) from relay box.
3) Turn ignition switch to ON.
4) Measure voltage between connector (F49) and chassis ground.

Connector & terminal
(F49) No. 54 (+) — Chassis ground (−):

CHECK : ***Is the voltage more than 10 V?***

YES : Go to step **7A4**.

NO : Repair broken wire in harness or connector.



B4M0791A

7A4	CHECK WIRING HARNESS.

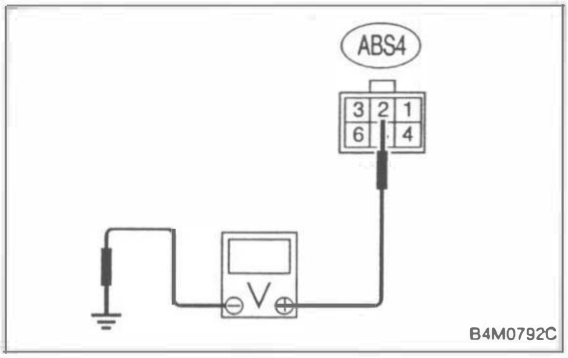
1) Turn ignition switch to OFF.
2) Measure voltage between ABSCM connector (F49) and chassis ground.

Connector & terminal
(F49) No. 54 (+) — Chassis ground (−):

CHECK : ***Is voltage less than 3 V?***

YES : Go to step **7A5**.

NO : Repair battery short of harness.

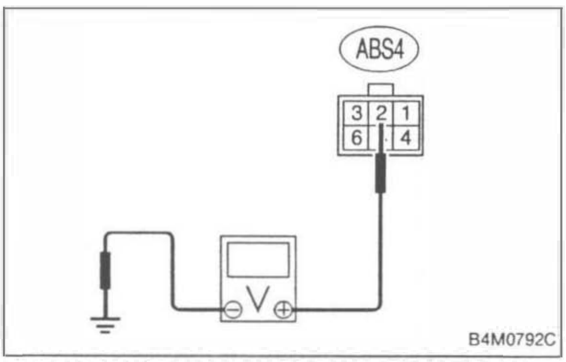


7A5	CHECK BATTERY SHORT OF RELAY BOX.

1) Disconnect connector from relay box.
2) Measure voltage between relay box and chassis ground.

Connector & terminal
(ABS4) No. 2 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **7A6**.
NO : Replace relay box.



7A6	CHECK BATTERY SHORT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between relay box and chassis ground.

Connector & terminal
(ABS4) No. 2 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **7A7**.
NO : Replace relay box.

7A7	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK : ***Is there poor contact in connectors between combination meter and ABSCM? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Replace ABSCM.

B: ABS WARNING LIGHT DOES NOT GO OFF.

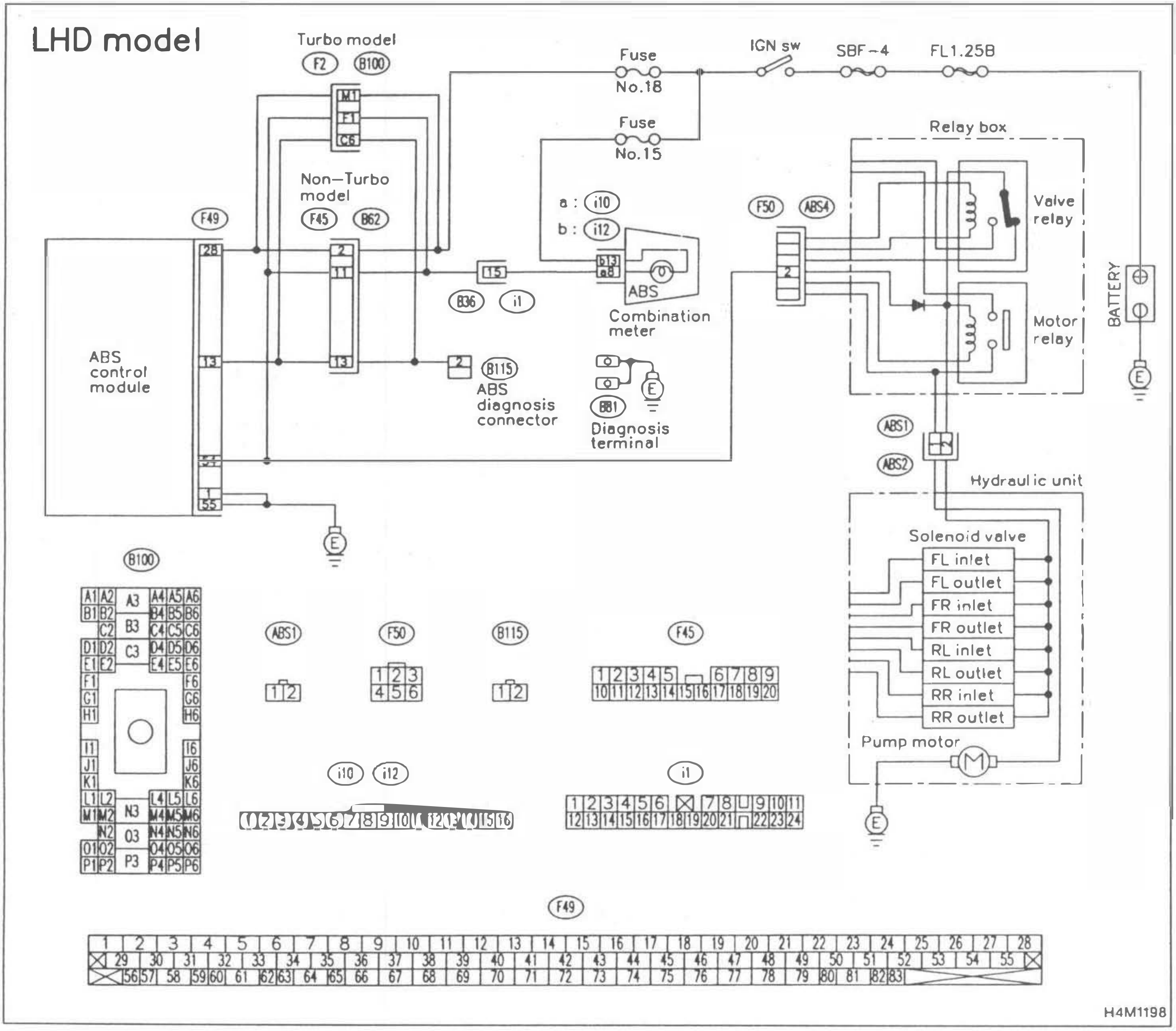
DIAGNOSIS:

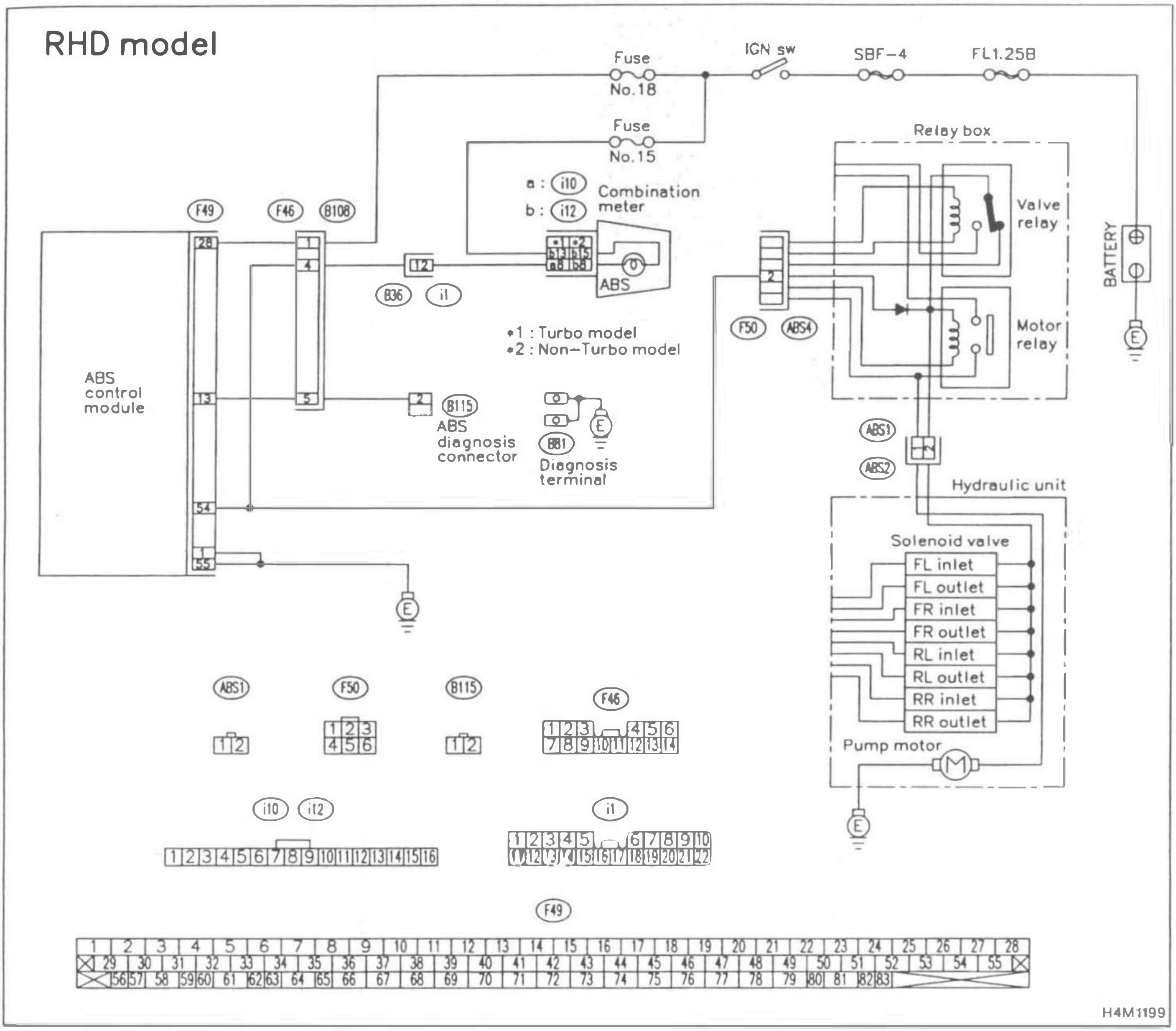
- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When starting the engine and while ABS warning light is kept ON.

WIRING DIAGRAM:




RHD model
Fuse No.18
IGN sw
SBF-4
FL1.25B
Fuse No.15
Relay box
a : i10
b : i12
Combination meter
Valve relay
Motor relay
BATTERY
F49
F46
B108
B36
i1
ABS
•1 : Turbo model
•2 : Non-Turbo model
F50
ABS4
ABS control module
B115
ABS diagnosis connector
B81
Diagnosis terminal
ABS1
ABS2
Hydraulic unit
Solenoid valve
FL inlet
FL outlet
FR inlet
FR outlet
RL inlet
RL outlet
RR inlet
RR outlet
Pump motor
H4M1199

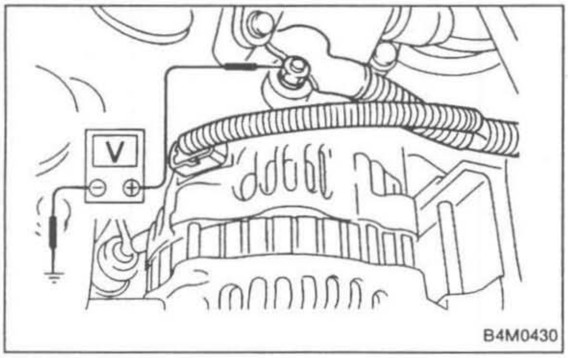
7B1	CHECK INSTALLATION OF ABSCM CONNECTOR.

Turn ignition switch to OFF.

CHECK : ***Is ABSCM connector inserted into ABSCM until the clamp locks onto it?***

YES : Go to step **7B2.**

NO : Insert ABSCM connector into ABSCM until the clamp locks onto it.



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7B2	CHECK GENERATOR.

1) Start the engine.
2) Idle the engine.
3) Measure voltage between generator and chassis ground.

Terminal
Generator B terminal (+) — Chassis ground (–):

CHECK : ***Is the voltage between 10 and 15 V?***

YES : Go to step **7B3**.

NO : Repair generator.

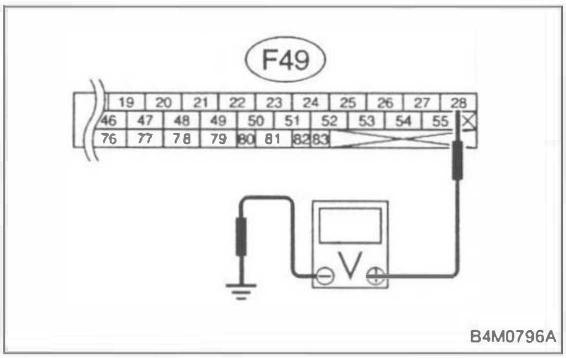
7B3	CHECK BATTERY TERMINAL.

Turn ignition switch to OFF.

CHECK : ***Is there poor contact at battery terminal?***

YES : Repair battery terminal.

NO : Go to step **7B4**.



B4M0796A

7B4	CHECK POWER SUPPLY OF ABSCM.

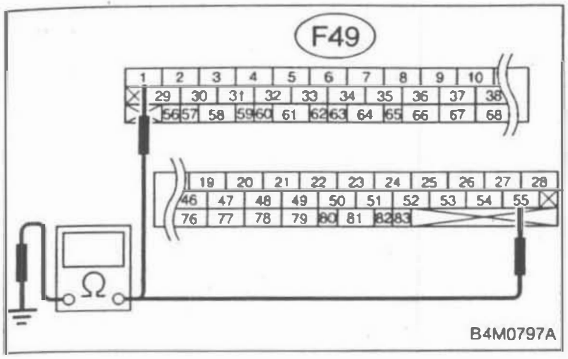
1) Disconnect connector from ABSCM.
2) Start engine.
3) Idle the engine.
4) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 28 (+) — Chassis ground (–):

CHECK : ***Is the voltage between 10 and 15 V?***

YES : Go to step **7B5**.

NO : Repair ABSCM power supply circuit.



7B5 CHECK GROUND CIRCUIT OF ABSCM.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 1 — Chassis ground:
(F49) No. 55 — Chassis ground:

CHECK : ***Is the resistance less than 0.5 Ω?***
YES : Go to step **7B6**.
NO : Repair ABSCM ground harness.

7B6 CHECK WIRING HARNESS.

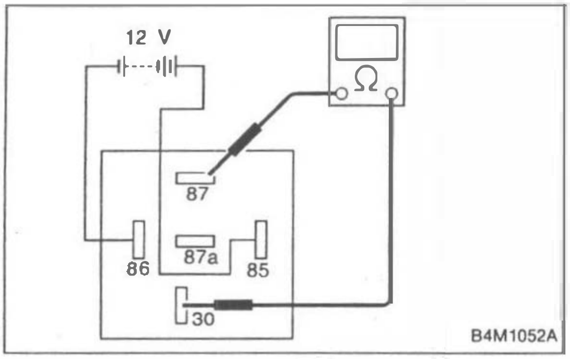
1) Disconnect connector (F50) from relay box.
2) Turn ignition switch to ON.

CHECK : ***Does the ABS warning light remain off?***
YES : Go to step **7B7**.
NO : Repair front wiring harness.

7B7 CHECK RELAY BOX.

1) Turn ignition switch to OFF.
2) Connect connector (F50) to relay box.
3) Remove valve relay from relay box.
4) Disconnect connector (ABS1) from hydraulic control unit.
5) Turn ignition switch to ON.

CHECK : ***Does the ABS warning light remain off?***
YES : Go to step **7B8**.
NO : Repair relay box and check fuse.

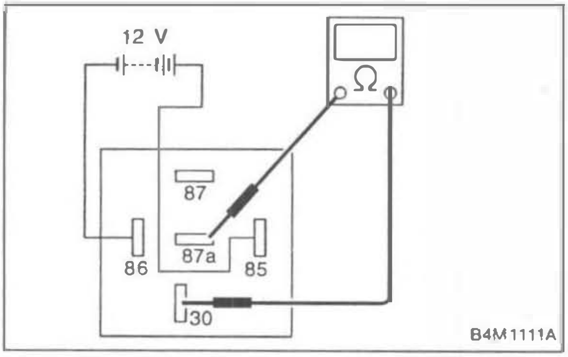


7B8	CHECK CONTACT POINT OF VALVE RELAY.

1) Connect battery to valve relay terminals No. 85 and No. 86.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK **: *Is the resistance less than 0.5 Ω?***
YES : Go to step **7B9**.
NO : Replace valve relay.

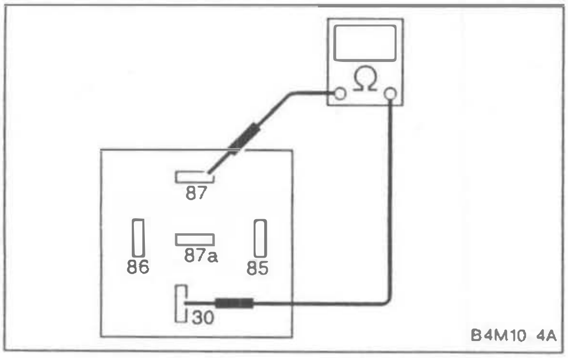


7B9	CHECK CONTACT POINT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:
Is the resistance more than 1 MΩ?

YES : Go to step **7B10**.
NO : Replace valve relay.

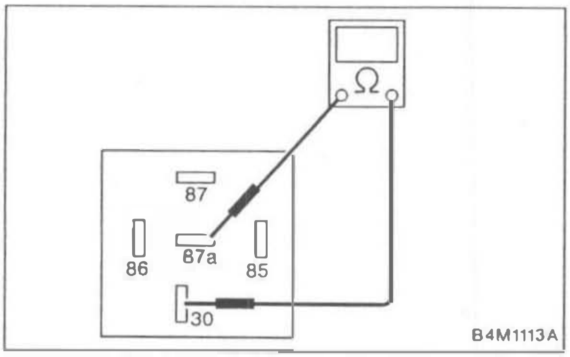


7B10	CHECK CONTACT POINT OF VALVE RELAY.

1) Disconnect battery from valve relay terminals.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK **: *Is the resistance more than 1 MΩ?***
YES : Go to step **7B11**.
NO : Replace valve relay.



7B11	CHECK CONTACT POINT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:

CHECK **: *Is the resistance less than 0.5 Ω?***
YES : Go to step **7B12**.
NO : Replace valve relay.

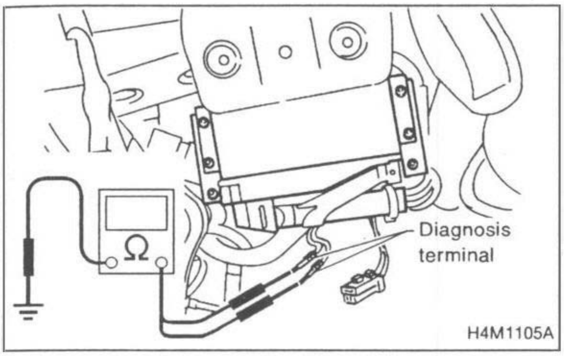
7B12	CHECK HYDRAULIC CONTROL UNIT.

1) Turn ignition switch to OFF.
2) Connect connector (ABS1) to hydraulic control unit.
3) Turn ignition switch to ON.

CHECK : ***Is the ABS warning light off?***

YES : Go to step **7B13**.

NO : Replace hydraulic control unit and check fuse No. 19.



7B13	CHECK DIAGNOSIS TERMINAL.

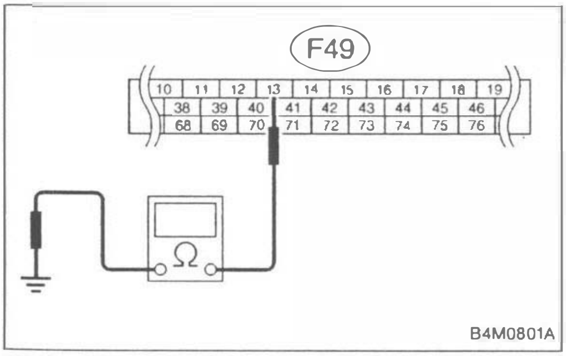
Measure resistance between diagnosis terminals (B81) and chassis ground.

Terminals
Diagnosis terminal (A) — Chassis ground:
Diagnosis terminal (B) — Chassis ground:

CHECK : ***Is the resistance less than 1 Ω?***

YES : Go to step **7B14**.

NO : Repair diagnosis terminal harness.



7B14	CHECK DIAGNOSIS LINE.

1) Turn ignition switch to OFF.
2) Connect diagnosis terminal to ABS diagnosis connector (B115) No. 2.
3) Disconnect connector from ABSCM.
4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 13 — Chassis ground:

CHECK : ***Is the resistance less than 1 Ω?***

YES : Go to step **7B15**.

NO : Repair harness connector between ABSCM and ABS diagnosis connector.

7B15	**CHECK POOR CONTACT IN ABSCM CONNECTOR.**

CHECK : ***Is there poor contact in ABSCM connector? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Replace ABSCM.

C: TROUBLE CODE DOES NOT APPEAR.

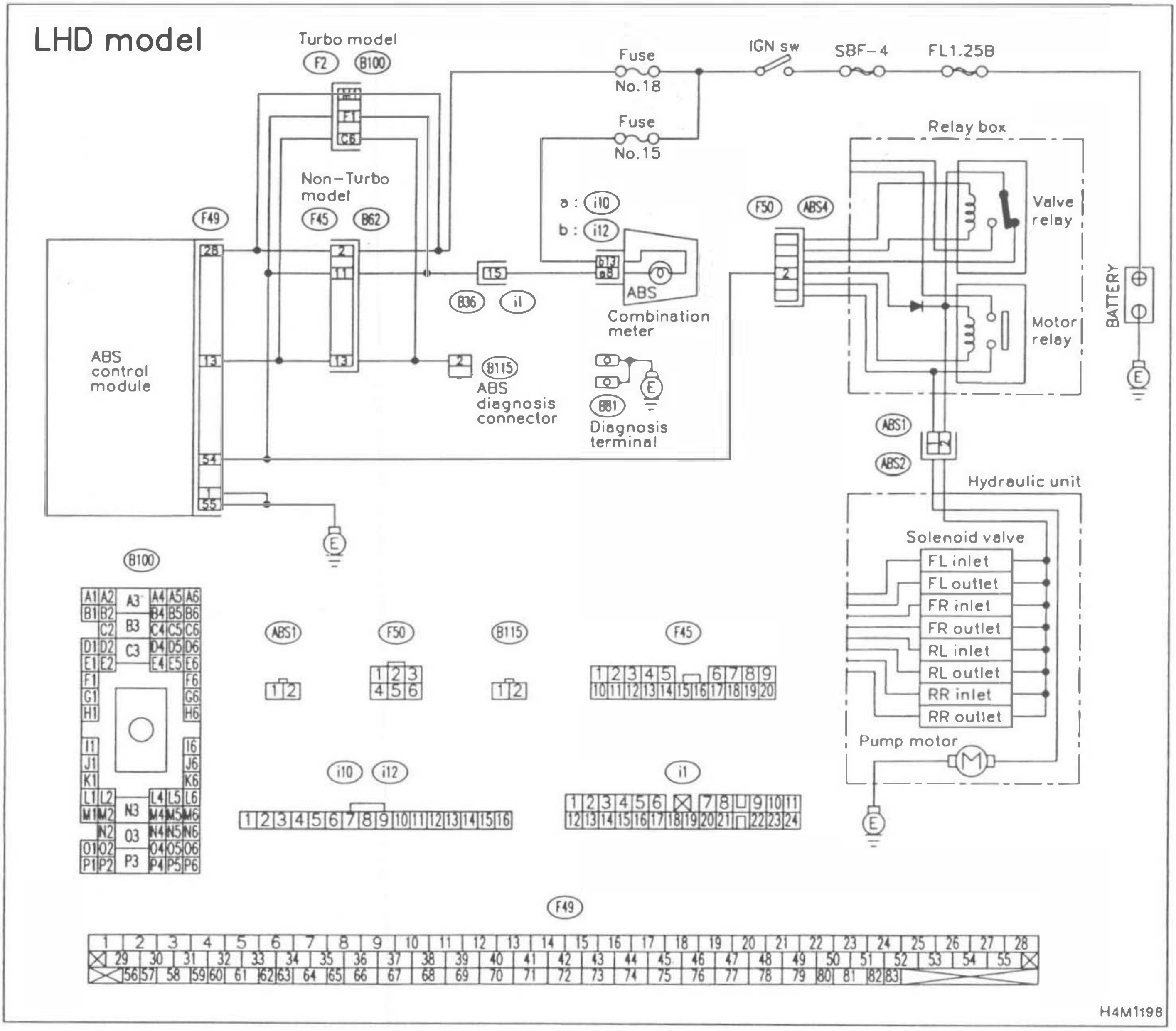
DIAGNOSIS:

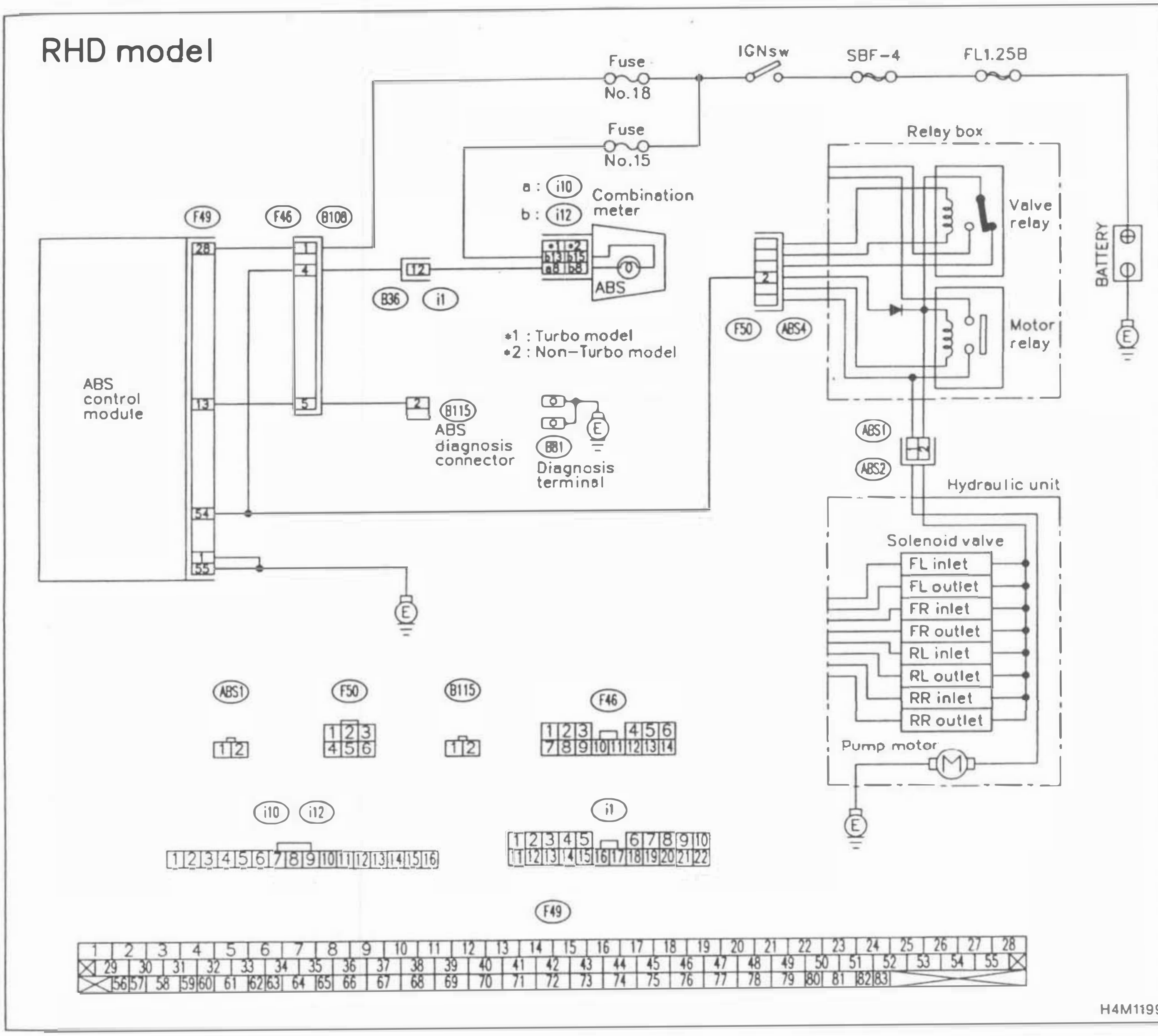
- Diagnosis circuit is open.

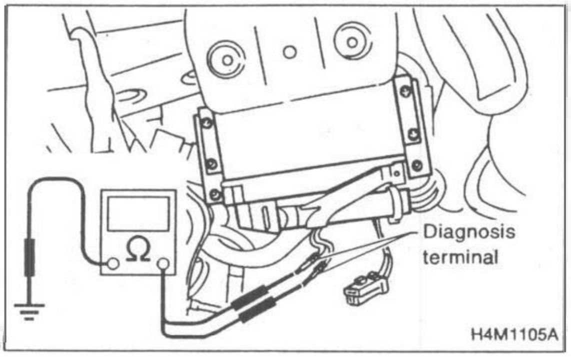
TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in the diagnostic mode.

WIRING DIAGRAM:




RHD model
Fuse
No.18
IGNsw
SBF-4
FL1.25B
Fuse
No.15
Relay box
a : i10
b : i12
Combination meter
Valve relay
BATTERY
F49
F46
B108
B36
i1
ABS
F50
ABS4
Motor relay
*1 : Turbo model
*2 : Non-Turbo model
ABS control module
B115
ABS diagnosis connector
B81
Diagnosis terminal
ABS1
ABS2
Hydraulic unit
Solenoid valve
FL inlet
FL outlet
FR inlet
FR outlet
RL inlet
RL outlet
RR inlet
RR outlet
Pump motor
H4M1199



7C1	CHECK DIAGNOSIS TERMINAL.

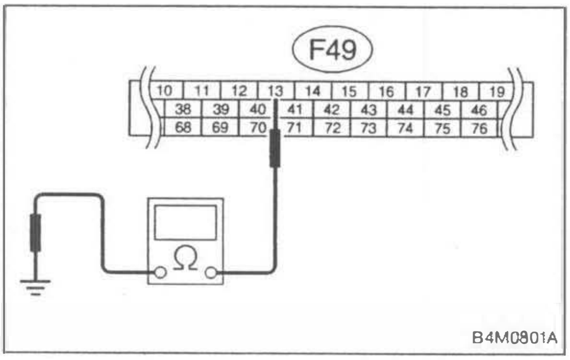
Measure resistance between diagnosis terminals (B81) and chassis ground.

Terminals
Diagnosis terminal (A) — Chassis ground:
Diagnosis terminal (B) — Chassis ground:

CHECK : ***Is the resistance less than 0.5 Ω?***

YES : Go to step **7C2**.

NO : Repair diagnosis terminal harness.



7C2	CHECK DIAGNOSIS LINE.

1) Turn ignition switch to OFF.
2) Connect diagnosis terminal to ABS diagnosis connector (B115) No. 2.
3) Disconnect connector from ABSCM.
4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 13 — Chassis ground:

CHECK : ***Is the resistance less than 0.5 Ω?***

YES : Go to step **7C3**.

NO : Repair harness connector between ABSCM and ABS diagnosis connector.

7C3	CHECK POOR CONTACT IN ABSCM CONNECTOR.

CHECK : ***Is there poor contact in ABSCM connector?*** ***<Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Replace ABSCM.

8. Diagnostics Chart with Trouble Code by ABS Warning Light

A: LIST OF TROUBLE CODE

Trouble code	Contents of diagnosis		Ref. to
11	Start code ● Trouble code is shown after start code. ● Only start code is shown in normal condition.		—
21	Abnormal ABS sensor (Open circuit or input voltage too high)	Front right ABS sensor	[T8B0]
23		Front left ABS sensor	[T8C0]
25		Rear right ABS sensor	[T8D0]
27		Rear left ABS sensor	[T8E0]
22	Abnormal ABS sensor (Abnormal ABS sensor signal)	Front right ABS sensor	[T8F0]
24		Front left ABS sensor	[T8G0]
26		Rear right ABS sensor	[T8H0]
28		Rear left ABS sensor	[T8I0]
29		Any one of four	[T8J0]
31	Abnormal solenoid valve circuit(s) in hydraulic unit	Front right inlet valve	[T8K0]
32		Front right outlet valve	[T8O0]
33		Front left inlet valve	[T8L0]
34		Front left outlet valve	[T8P0]
35		Rear right inlet valve	[T8M0]
36		Rear right outlet valve	[T8Q0]
37		Rear left inlet valve	[T8N0]
38		Rear left outlet valve	[T8R0]
41	Abnormal ABS control module		[T8S0]
42	Source voltage is low.		[T8T0]
44	A combination of AT control abnormal		[T8U0]
46	Abnormal G sensor power supply voltage		[T8V0]
51	Abnormal valve relay		[T8W0]
52	Abnormal motor and/or motor relay		[T8X0]
54	Abnormal stop light switch		[T8Y0]
56	Abnormal G sensor output voltage		[T8Z0]

B: TROUBLE CODE 21 (FRONT RH)
C: TROUBLE CODE 23 (FRONT LH)
D: TROUBLE CODE 25 (REAR RH)
E: TROUBLE CODE 27 (REAR LH)
— ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) —

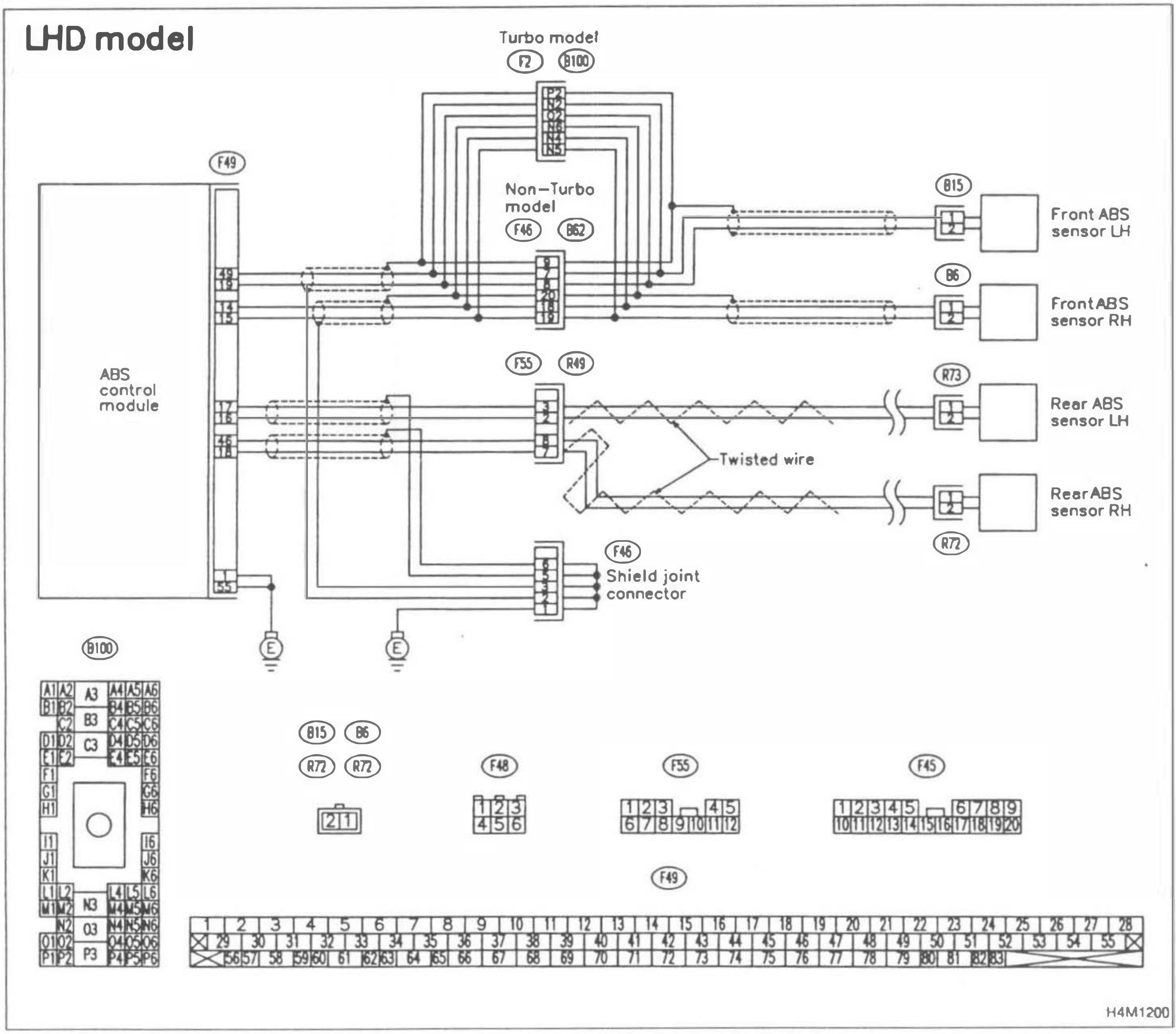
DIAGNOSIS:

- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

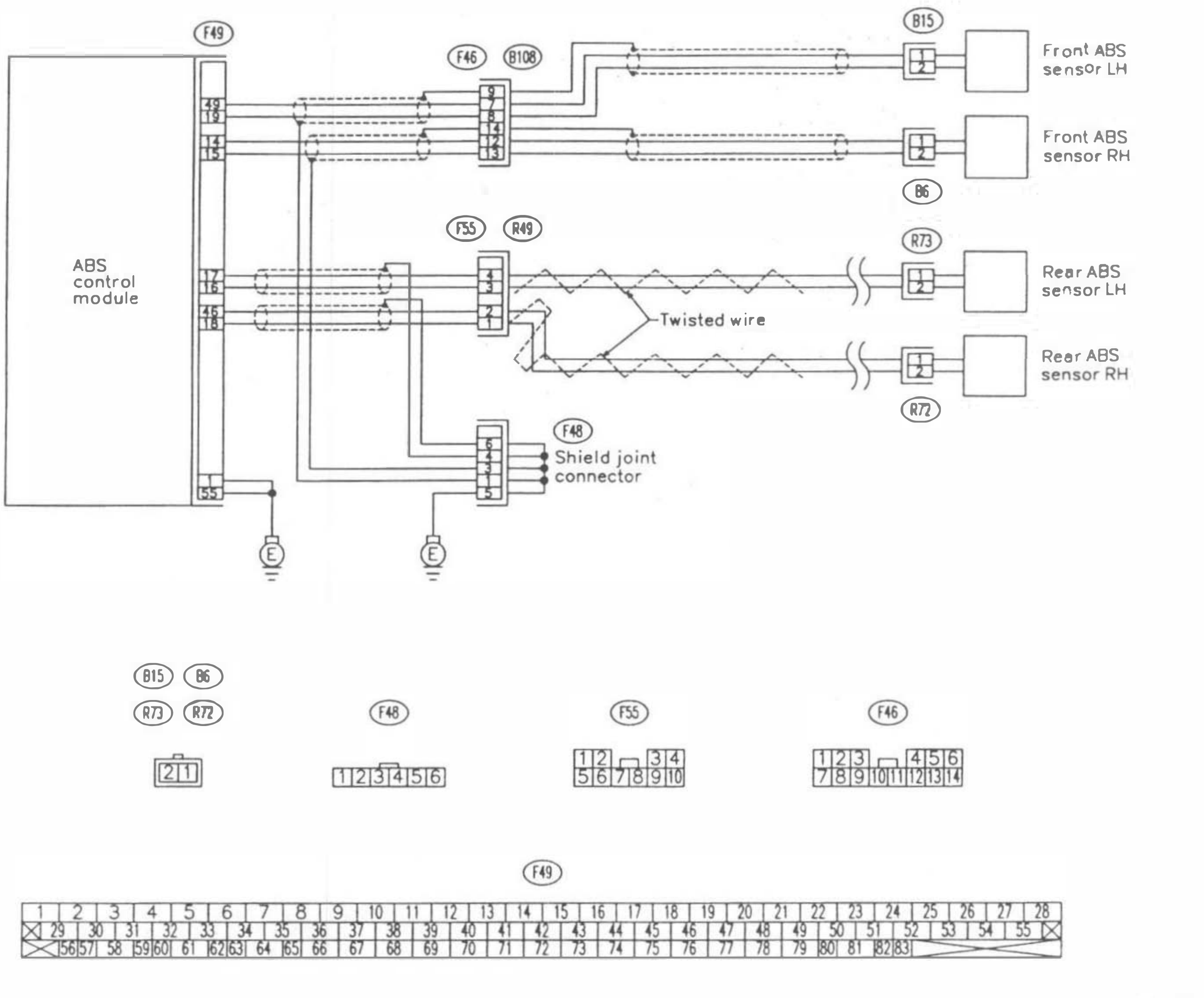
TROUBLE SYMPTOM:

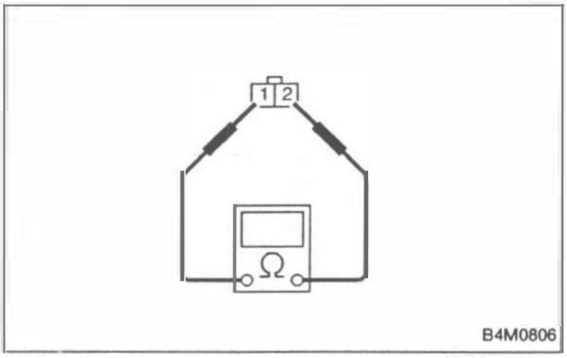
- ABS does not operate.

WIRING DIAGRAM:



RHD model


F49
F46
B108
B15
Front ABS sensor LH
Front ABS sensor RH
B6
F55
R49
R73
ABS control module
Twisted wire
Rear ABS sensor LH
Rear ABS sensor RH
R72
F48
Shield joint connector
B15
B6
R73
R72
F48
F55
F46
F49
H4M1201

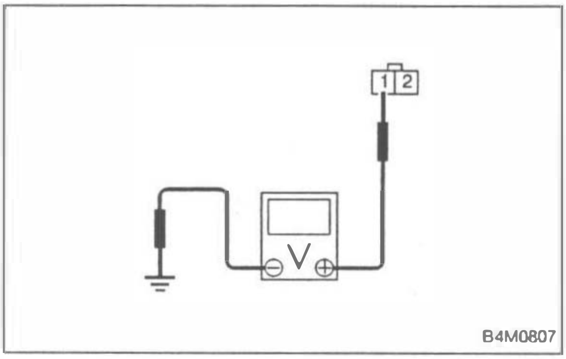


8E1	CHECK ABS SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ABS sensor.
3) Measure resistance of ABS sensor connector terminals.

Terminal
Front RH No. 1 — No. 2:
Front LH No. 1 — No. 2:
Rear RH No. 1 — No. 2:
Rear LH No. 1 — No. 2:

CHECK ***: Is the resistance between 0.8 and 1.2 kΩ?***
YES : Go to step **8E2**.
NO : Replace ABS sensor.

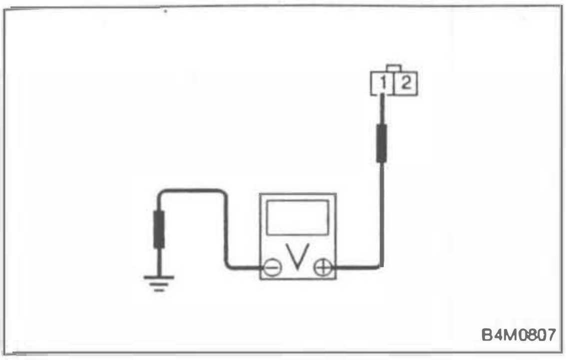


8E2	CHECK BATTERY SHORT OF ABS SENSOR.

1) Disconnect connector from ABSCM.
2) Measure voltage between ABS sensor and chassis ground.

Terminal
Front RH No. 1 (+) — Chassis ground (–):
Front LH No. 1 (+) — Chassis ground (–):
Rear RH No. 1 (+) — Chassis ground (–):
Rear LH No. 1 (+) — Chassis ground (–):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8E3**.
NO : Replace ABS sensor.



8E3	CHECK BATTERY SHORT OF ABS SENSOR.

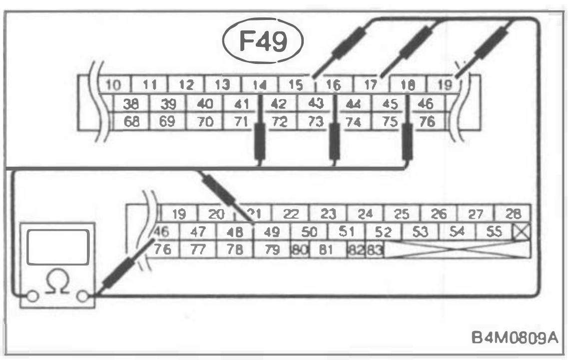
1) Turn ignition switch to ON.
2) Measure voltage between ABS sensor and chassis ground.

Terminal
Front RH No. 1 (+) — Chassis ground (–):
Front LH No. 1 (+) — Chassis ground (–):
Rear RH No. 1 (+) — Chassis ground (–):
Rear LH No. 1 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***

YES : Go to step **8E4**.

NO : Replace ABS sensor.



8E4	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND ABS SENSOR.

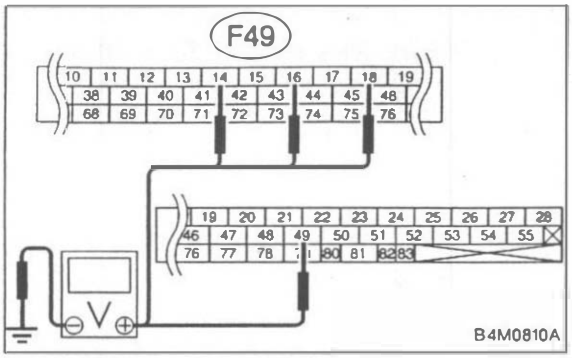
1) Turn ignition switch to OFF.
2) Connect connector to ABS sensor.
3) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 21 / (F49) No. 14 — No. 15:
Trouble code 23 / (F49) No. 49 — No. 19:
Trouble code 25 / (F49) No. 18 — No. 46:
Trouble code 27 / (F49) No. 16 — No. 17:

CHECK : ***Is the resistance between 0.8 and 1.2 kΩ?***

YES : Go to step **8E5**.

NO : Repair harness/connector between ABSCM and ABS sensor.

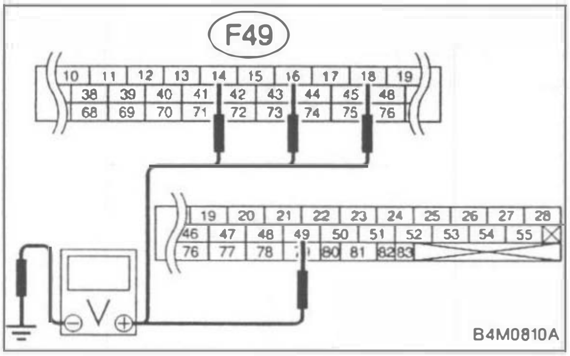


8E5	CHECK BATTERY SHORT OF HARNESS.

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 21 / (F49) No. 14 (+) — Chassis ground (−):
Trouble code 23 / (F49) No. 49 (+) — Chassis ground (−):
Trouble code 25 / (F49) No. 18 (+) — Chassis ground (−):
Trouble code 27 / (F49) No. 16 (+) — Chassis ground (−):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8E6**.
NO : Repair harness between ABSCM and ABS sensor.



8E6	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 21 / (F49) No. 14 (+) — Chassis ground (−):
Trouble code 23 / (F49) No. 49 (+) — Chassis ground (−):
Trouble code 25 / (F49) No. 18 (+) — Chassis ground (−):
Trouble code 27 / (F49) No. 16 (+) — Chassis ground (−):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8E7**.
NO : Repair harness between ABSCM and ABS sensor.

8E7	CHECK INSTALLATION OF ABS SENSOR.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

CHECK : ***Are the ABS sensor installation bolts tightened securely?***
YES : Go to step **8E8**.
NO : Tighten ABS sensor installation bolts securely.

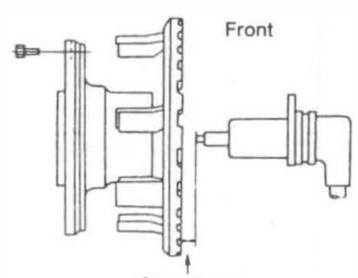
8E8	CHECK INSTALLATION OF TONE WHEEL.

Tightening torque:
13 ± 3 N·m (1.3 ± 0.3 kg-m, 9 ± 2.2 ft-lb)

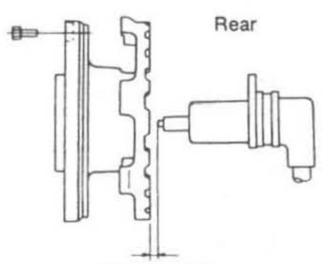
CHECK : ***Are the tone wheel installation bolts tightened securely?***

YES : Go to step **8E9**.

NO : Tighten tone wheel installation bolts securely.



G4M0700



G4M0701

8E9	CHECK ABS SENSOR GAP.

Measure tone wheel-to-pole piece gap over entire perimeter of the wheel.

CHECK : ***Is the gap within the specifications shown in the following table?***

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)

YES : Go to step **8E10**.

NO : Adjust the gap.

NOTE:
Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

8E10	CHECK HUB RUNOUT.

Measure hub runout.

CHECK : ***Is the runout less than 0.05 mm (0.0020 in)?***

YES : Go to step **8E11**.

NO : Repair hub.

8E11	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between ABSCM and ABS sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8E12**.

8E12	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8E13**.

8E13	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

NOTE:
Check harness and connectors between ABSCM and ABS sensor.

F: TROUBLE CODE 22 (FRONT RH)
G: TROUBLE CODE 24 (FRONT LH)
H: TROUBLE CODE 26 (REAR RH)
I: TROUBLE CODE 28 (REAR LH)
— ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) —

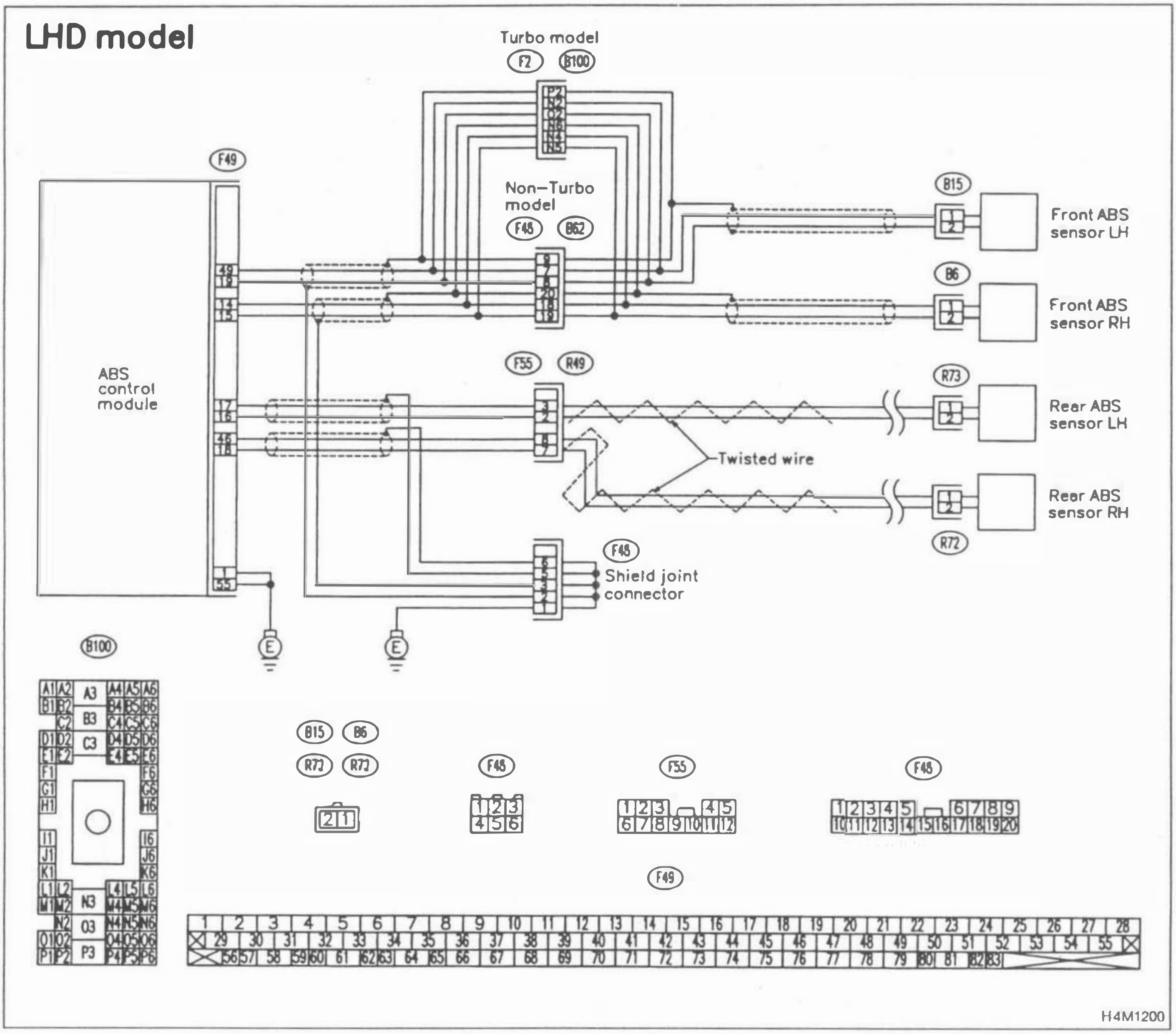
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

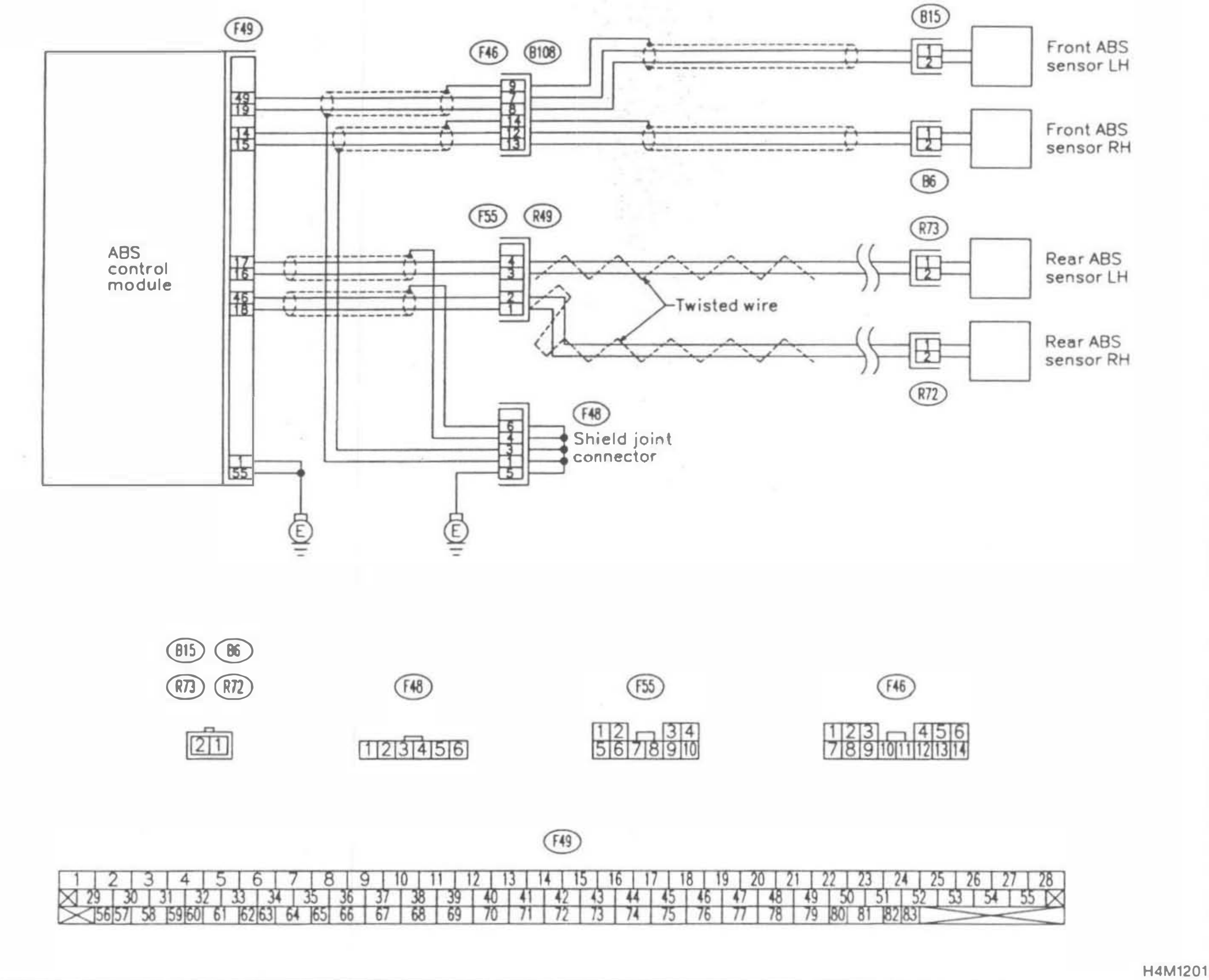
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



RHD model


F49
F46
B108
B15
Front ABS sensor LH
Front ABS sensor RH
B6
F55
R49
R73
ABS control module
Rear ABS sensor LH
Twisted wire
Rear ABS sensor RH
R72
F48
Shield joint connector
E
E
B15
B6
R73
R72
F48
F55
F46
F49
H4M1201

811	CHECK INSTALLATION OF ABS SENSOR.

Tightening torque:
32 ± 10 N·m (3.3 ± 1.0 kg-m, 24 ± 7 ft-lb)

CHECK : ***Are the ABS sensor installation bolts tightened securely?***

YES : Go to step **812**.

NO : Tighten ABS sensor installation bolts securely.

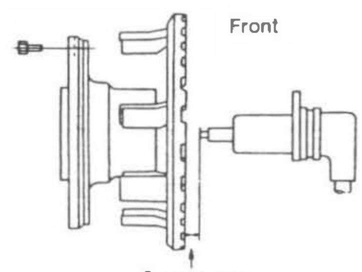
812	CHECK INSTALLATION OF TONE WHEEL.

Tightening torque:
13 ± 3 N·m (1.3 ± 0.3 kg-m, 9 ± 2.2 ft-lb)

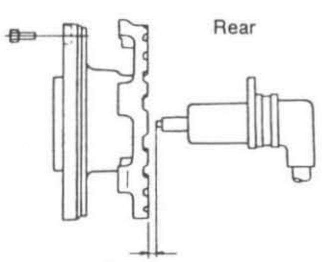
CHECK : ***Are the tone wheel installation bolts tightened securely?***

YES : Go to step **813**.

NO : Tighten tone wheel installation bolts securely.



G4M0700



G4M0701

813	CHECK ABS SENSOR GAP.

Measure tone wheel to pole piece gap over entire perimeter of the wheel.

CHECK : ***Is the gap within the specifications shown in the following table?***

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)

YES : Go to step **814**.

NO : Adjust the gap.

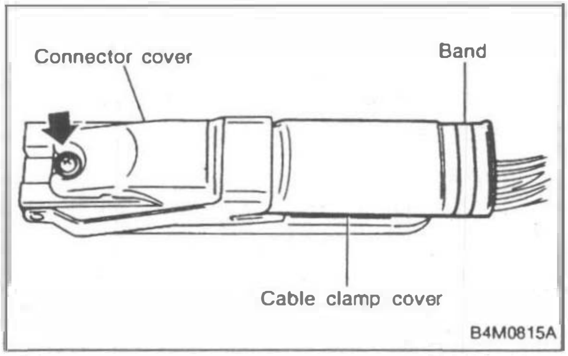
NOTE:
Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

814	CHECK OSCILLOSCOPE.

CHECK : ***Is an oscilloscope available?***

YES : Go to step **815**.

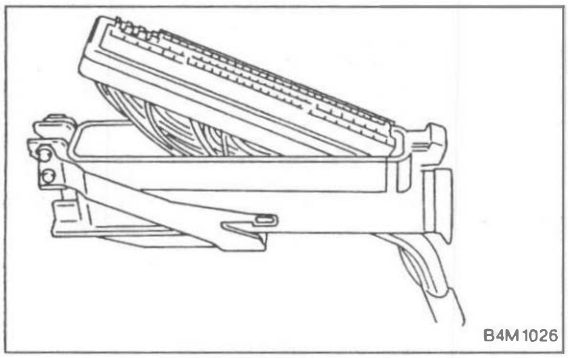
NO : Go to step **816**.



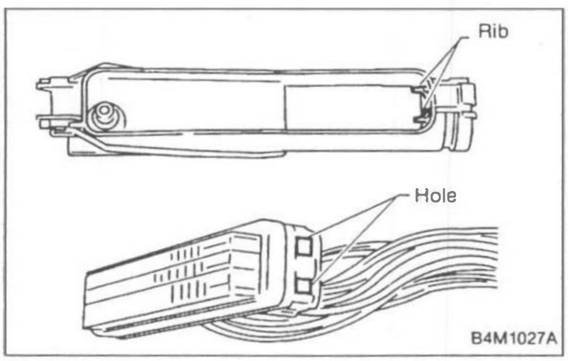
815	CHECK ABS SENSOR SIGNAL.

1) Raise all four wheels of ground.
2) Turn ignition switch OFF.
3) Disconnect connector from ABS control module.
4) Remove band.
5) Remove cable clamp cover.
6) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.

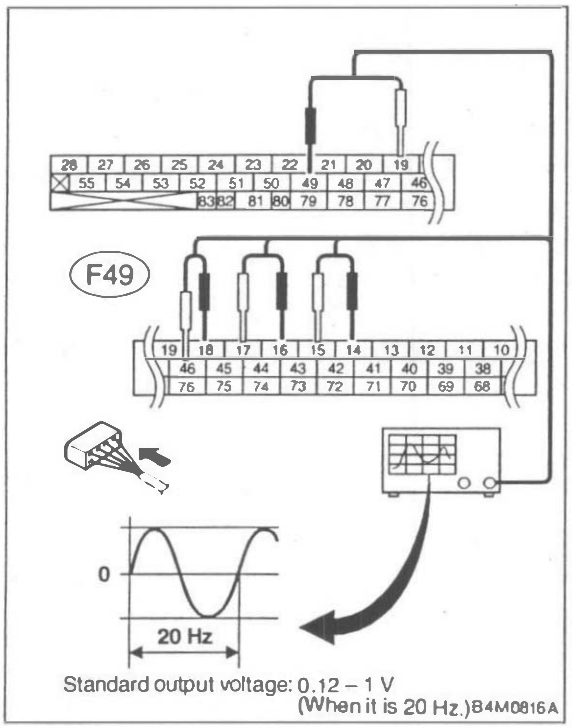


7) Remove connector cover.



NOTE:
- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

8) Connect connector to ABS control module.
9) Connect the oscilloscope to the ABS control module connector in accordance with trouble code.
10) Turn ignition switch ON.



11) Rotate wheels and measure voltage at specified frequency.

NOTE:
When this inspection is completed, the ABS control module sometimes stores the trouble code 29.

Connector & terminal
Trouble code 22 / (F49) No. 14 (+) — No. 15 (–):
Trouble code 24 / (F49) No. 49 (+) — No. 19 (–):
Trouble code 26 / (F49) No. 18 (+) — No. 46 (–):
Trouble code 28 / (F49) No. 16 (+) — No. 17 (–):
Specified voltage: 0.12 — 1 V (When it is 20 Hz.)

CHECK : ***Is oscilloscope pattern smooth, as shown in figure?***

YES : Go to step **8I9**.

NO : Go to step **8I6**.

8I6	CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.

Remove disc rotor or drum from hub in accordance with trouble code.

CHECK : ***Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?***

YES : Thoroughly remove dirt or other foreign matter.

NO : Go to step **8I7**.

8I7	CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.

CHECK : ***Are there broken or damaged in the ABS sensor pole piece or the tone wheel?***

YES : Replace ABS sensor or tone wheel.

NO : Go to step **8I8**.

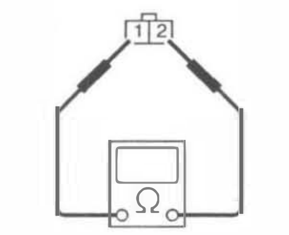
8I8	CHECK HUB RUNOUT.

Measure hub runout.

CHECK : ***Is the runout less than 0.05 mm (0.0020 in)?***

YES : Go to step **8I9**.

NO : Repair hub.



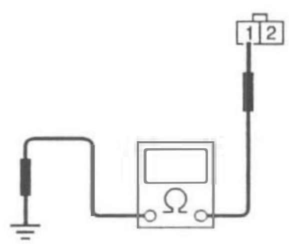
B4M0806

8I9	CHECK RESISTANCE OF ABS SENSOR.

1) Turn ignition switch OFF.
2) Disconnect connector from ABS sensor.
3) Measure resistance between ABS sensor connector terminals.

Terminal
Front RH No. 1 — No. 2:
Front LH No. 1 — No. 2:
Rear RH No. 1 — No. 2:
Rear LH No. 1 — No. 2:

CHECK : ***Is the resistance between 0.8 and 1.2 kΩ?***
YES : Go to step **8I10**.
NO : Replace ABS sensor.



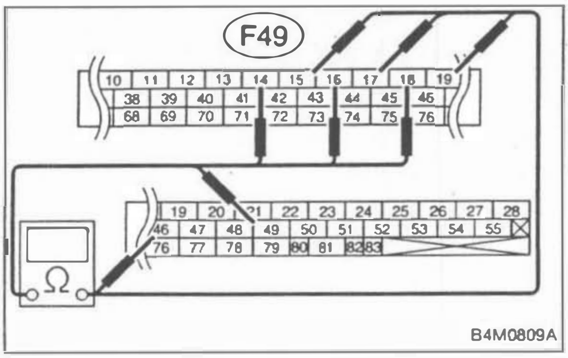
B4M0818D

8I10	CHECK GROUND SHORT OF ABS SENSOR.

Measure resistance between ABS sensor and chassis ground.

Terminal
Front RH No. 1 — Chassis ground:
Front LH No. 1 — Chassis ground:
Rear RH No. 1 — Chassis ground:
Rear LH No. 1 — Chassis ground:

CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **8I11**.
NO : Replace ABS sensor.

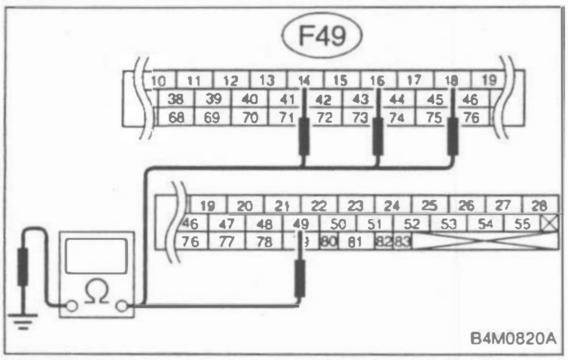


8I11	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND ABS SENSOR.

1) Connect connector to ABS sensor.
2) Disconnect connector from ABS control module.
3) Measure resistance at ABSCM connector terminals.

Connector & terminal
Trouble code 22 / (F49) No. 14 — No. 15:
Trouble code 24 / (F49) No. 49 — No. 19:
Trouble code 26 / (F49) No. 18 — No. 46:
Trouble code 28 / (F49) No. 16 — No. 17:

CHECK : ***Is the resistance between 0.8 and 1.2 kΩ?***
YES : Go to step **8I12**.
NO : Repair harness/connector between ABSCM and ABS sensor.

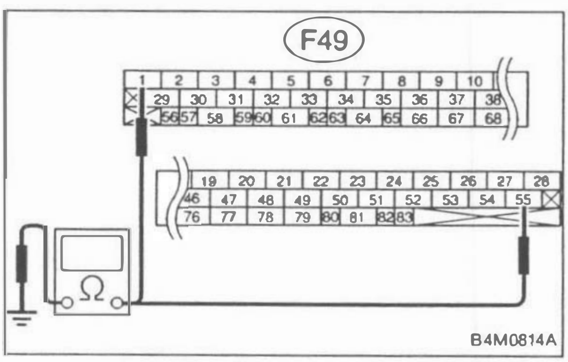


8I12	CHECK GROUND SHORT OF HARNESS.

Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 22 / (F49) No. 14 — Chassis ground:
Trouble code 24 / (F49) No. 49 — Chassis ground:
Trouble code 26 / (F49) No. 18 — Chassis ground:
Trouble code 28 / (F49) No. 16 — Chassis ground:

CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **8I13**.
NO : Repair harness/connector between ABSCM and ABS sensor.



8I13	CHECK GROUND CIRCUIT OF ABSCM.

Measure resistance between ABSCM and chassis ground.

Connector & terminal
(F49) No. 1 — GND:
(F49) No. 55 — GND:

CHECK : ***Is the resistance less than 0.5 Ω?***
YES : Go to step **8I14**.
NO : Repair ABSCM ground harness.

8I14	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between ABSCM and ABS sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8I15**.

8I15	CHECK SOURCES OF SIGNAL NOISE.

CHECK : ***Is the car telephone or the wireless transmitter properly installed?***

YES : Go to step **8I16**.

NO : Properly install the car telephone or the wireless transmitter.

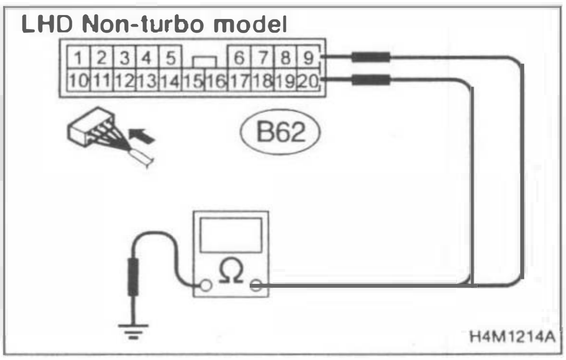
8I16	CHECK SOURCES OF SIGNAL NOISE.

CHECK : ***Are noise sources (such as an antenna) installed near the sensor harness?***

YES : Install the noise sources apart from the sensor harness.

NO : Go to step **8I17**.

LHD turbo model
Trouble code 22 / (B100) No. N6 — Chassis ground:
Trouble code 24 / (B100) No. P2 — Chassis ground:
Trouble code 26 / (F55) No. 6 — Chassis ground:
Trouble code 28 / (F55) N0. 1 — Chassis ground:

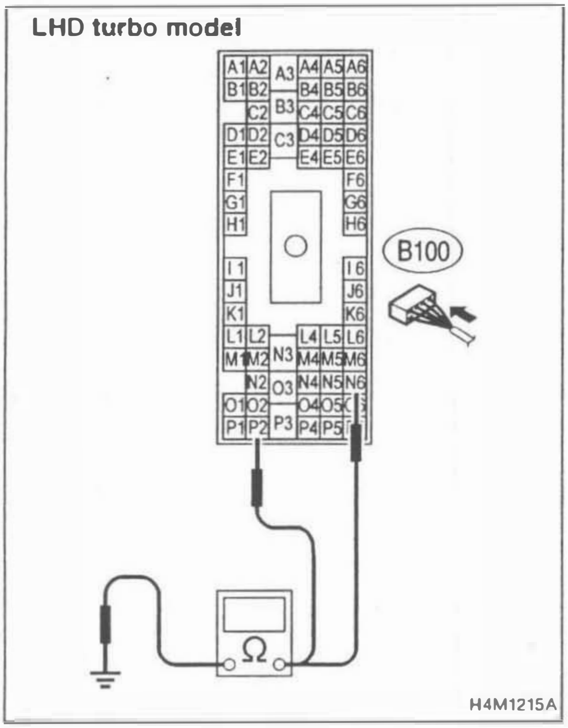


8I17	CHECK SHIELD CIRCUIT.

1) Connect all connectors.
2) Measure resistance between shield connector and chassis ground.

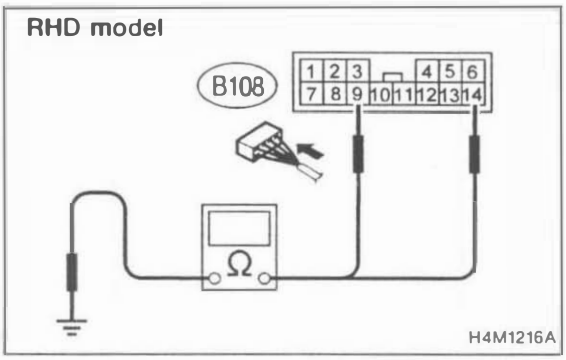
Connector & terminal
- ***LHD Non-turbo model***

Trouble code 22 / (B62) No. 20 — Chassis ground:
Trouble code 24 / (B62) No. 9 — Chassis ground:
Trouble code 26 / Go to step 8I18.
Trouble code 28 / Go to step 8I18.



- ***LHD turbo model***

Trouble code 22 / (B100) No. N6 — Chassis ground:
Trouble code 24 / (B100) No. P2 — Chassis ground:
Trouble code 26 / Go to step 8I18.
Trouble code 28 / Go to step 8I18.



- ***RHD model***

Trouble code 22 / (B108) No. 9 — Chassis ground:
Trouble code 24 / (B108) No. 14 — Chassis ground:
Trouble code 26 / Go to step 8I18.
Trouble code 28 / Go to step 8I18.

CHECK : ***Is the resistance less than 0.5 Ω?***
YES : Go to step **8I18**.
NO : Repair shield harness.

8I18	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***
YES : Replace ABSCM.
NO : Go to step **8I19**.

8I19	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary noise interference.

J: TROUBLE CODE 29
— ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR) —

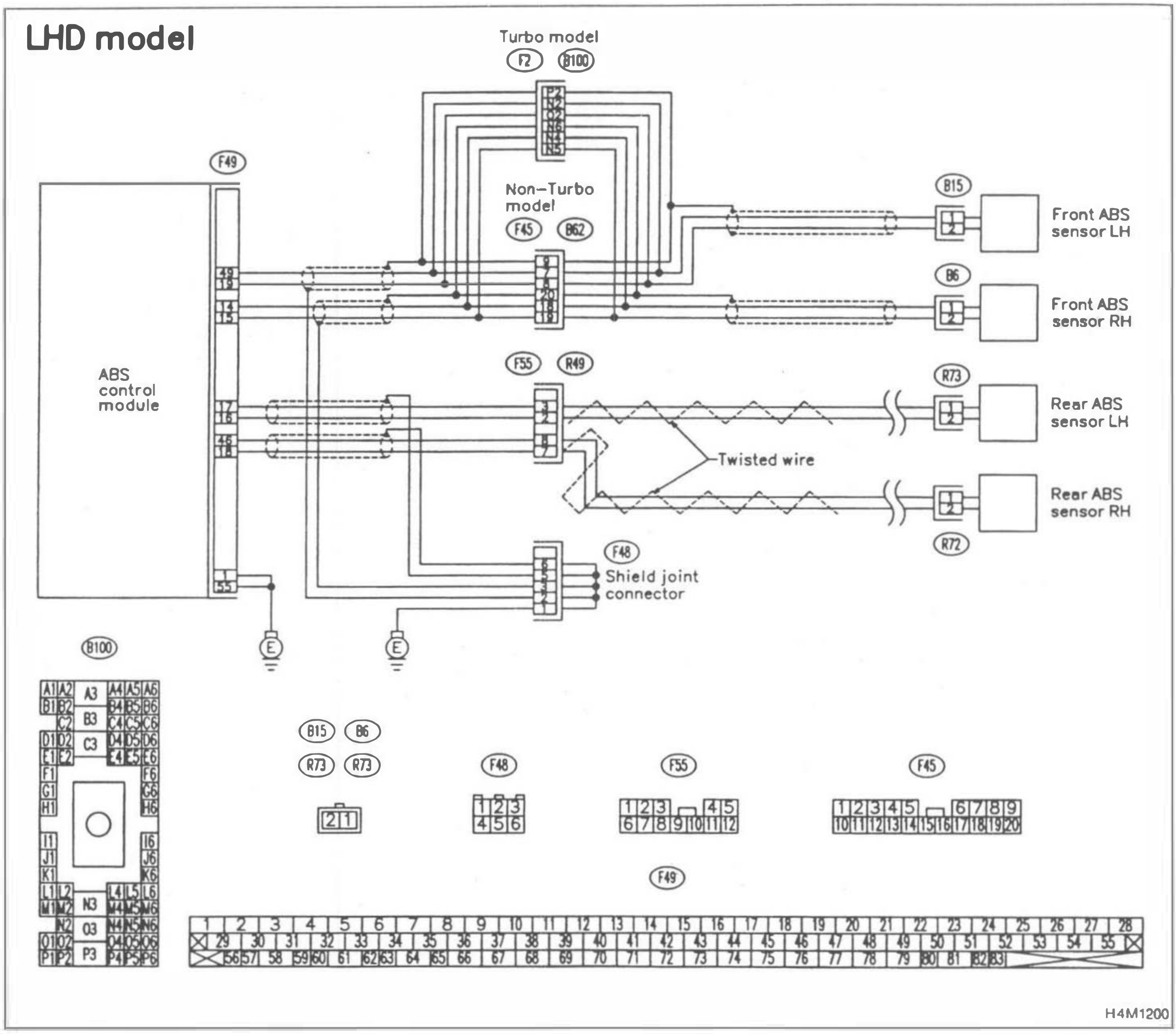
DIAGNOSIS:

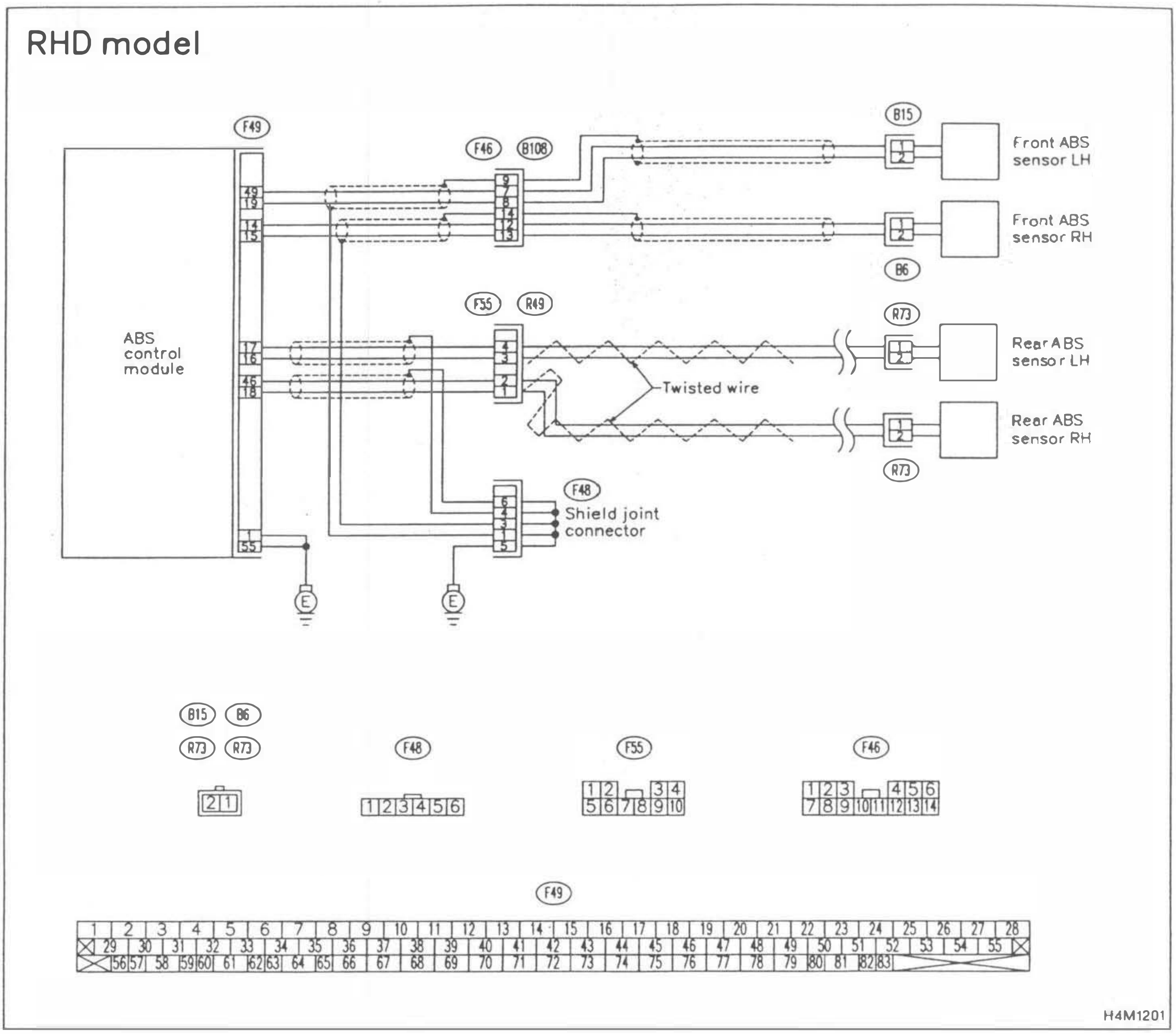
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:




RHD model
F49
F46
B108
B15
Front ABS sensor LH
Front ABS sensor RH
B6
F55
R49
R73
ABS control module
Rear ABS sensor LH
Twisted wire
Rear ABS sensor RH
F48
Shield joint connector
E
E
B15
B6
R73
R73
F48
F55
F46
F49
H4M1201

8J1	CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.

CHECK : ***Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.***

YES : The ABS is normal. Erase the trouble code.

NOTE:
When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur.

NO : Go to step **8J2**.

8J2	CHECK TIRE SPECIFICATIONS.

CHECK : ***Are the tire specifications correct?***

YES : Go to step **8J3**.

NO : Replace tire.

8J3	CHECK WEAR OF TIRE.

CHECK : ***Is the tire worn excessively?***

YES : Replace tire.

NO : Go to step **8J4**.

8J4	CHECK TIRE PRESSURE.

CHECK : ***Is the tire pressure correct?***

YES : Go to step **8J5**.

NO : Adjust tire pressure.

8J5	CHECK INSTALLATION OF ABS SENSOR.

Tightening torque:
32 ± 10 N·m (3.3 ± 1.0 kg-m, 24 ± 7 ft-lb)

CHECK : ***Are the ABS sensor installation bolts tightened securely?***

YES : Go to step **8J6**.

NO : Tighten ABS sensor installation bolts securely.

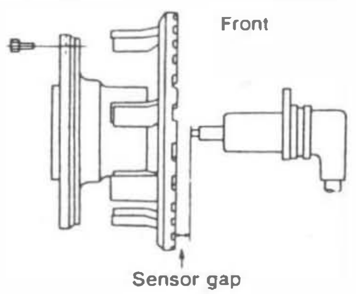
8J6	CHECK INSTALLATION OF TONE WHEEL.

Tightening torque:
13 ± 3 N·m (1.3 ± 0.3 kg-m, 9 ± 2.2 ft-lb)

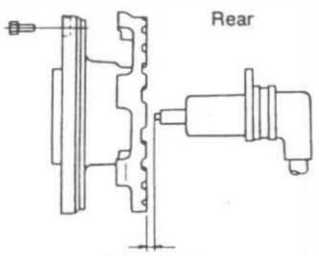
CHECK : ***Are the tone wheel installation bolts tightened securely?***

YES : Go to step **8J7**.

NO : Tighten tone wheel installation bolts securely.



G4M0700



G4M0701

8J7	CHECK ABS SENSOR GAP.

Measure tone wheel to pole piece gap over entire perimeter of the wheel.

CHECK : ***Is the gap within the specifications shown in the following table?***

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)

YES : Go to step **8J8**.

NO : Adjust the gap.

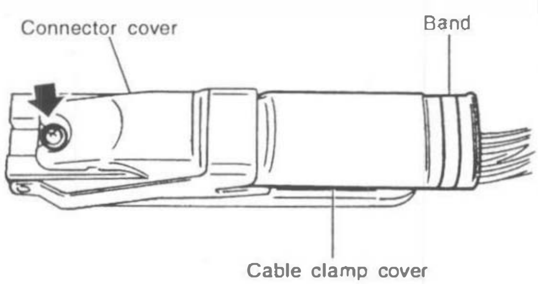
NOTE:
Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

8J8	CHECK OSCILLOSCOPE.

CHECK : ***Is an oscilloscope available?***

YES : Go to step **8J9**.

NO : Go to step **8J10**.

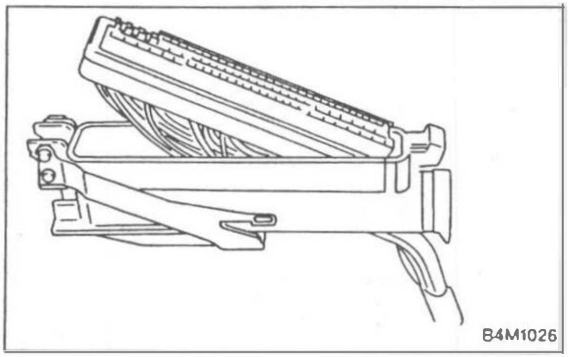


B4M0815A

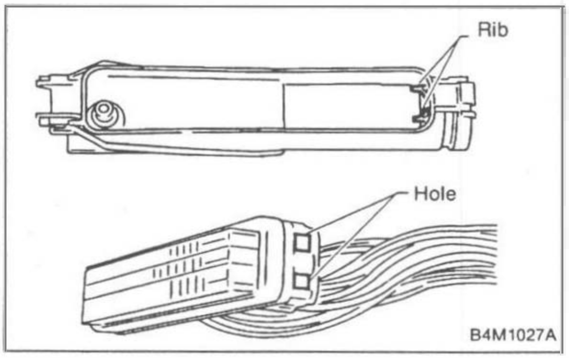
8J9	CHECK ABS SENSOR SIGNAL.

1) Raise all four wheels of ground.
2) Turn ignition switch OFF.
3) Disconnect connector from ABS control module.
4) Remove band.
5) Remove cable clamp cover.
6) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.

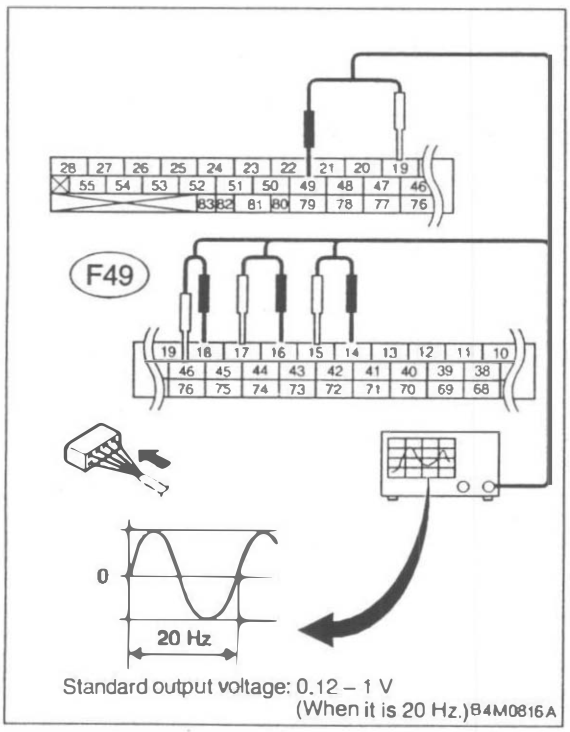


7) Remove connector cover.



NOTE:
- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

8) Connect connector to ABS control module.
9) Connect the oscilloscope to the ABS control module connector in accordance with trouble code.
10) Turn ignition switch ON.



11) Rotate wheels and measure voltage at specified frequency.
NOTE:
When this inspection is completed, the ABS control module sometimes stores the trouble code 29.

Connector & terminal
(F49) No. 14 (+) — No. 15 (–) (Front RH):
(F49) No. 49 (+) — No. 19 (–) (Front LH):
(F49) No. 18 (+) — No. 46 (–) (Rear RH):
(F49) No. 16 (+) — No. 17 (–) (Rear LH):
Specified voltage: 0.12 — 1 V (When it is 20 Hz.)

CHECK : ***Is oscilloscope pattern smooth, as shown in figure?***

YES : Go to step **8J13**.

NO : Go to step **8J10**.

8J10	CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.

Remove disc rotor from hub.

CHECK : ***Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?***

YES : Thoroughly remove dirt or other foreign matter.

NO : Go to step **8J11**.

8J11	CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.

CHECK : ***Are there broken or damaged teeth in the ABS sensor pole piece or the tone wheel?***

YES : Replace ABS sensor or tone wheel.

NO : Go to step **8J12**.

8J12	CHECK HUB RUNOUT.

Measure hub runout.

CHECK : ***Is the runout less than 0.05 mm (0.0020 in)?***

YES : Go to step **8J13**.

NO : Repair hub.

8J13	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.
5) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8J14**.

8J14	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

K: TROUBLE CODE 31 (FRONT RH)
L: TROUBLE CODE 33 (FRONT LH)
M: TROUBLE CODE 35 (REAR RH)
N: TROUBLE CODE 37 (REAR LH)
— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN HYDRAULIC UNIT —

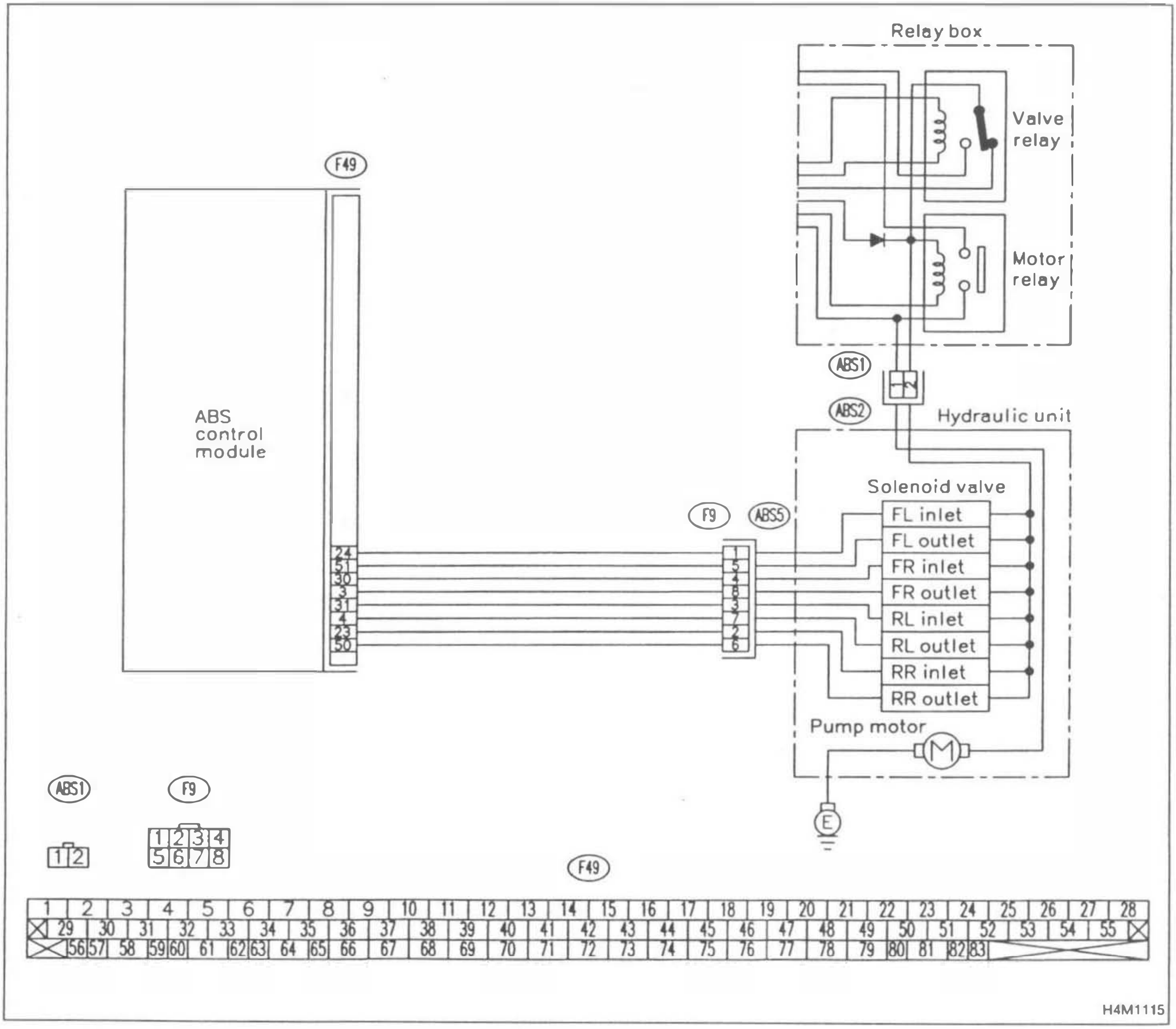
DIAGNOSIS:

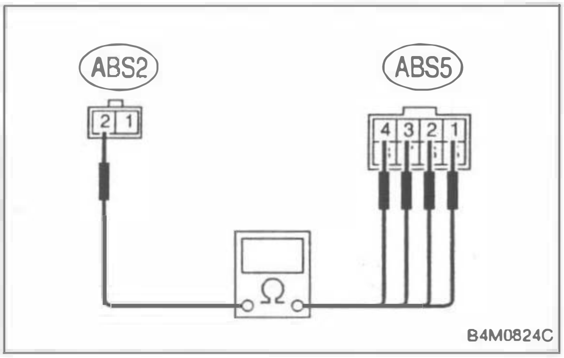
- Faulty harness/connector
- Faulty inlet solenoid valve in hydraulic unit

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



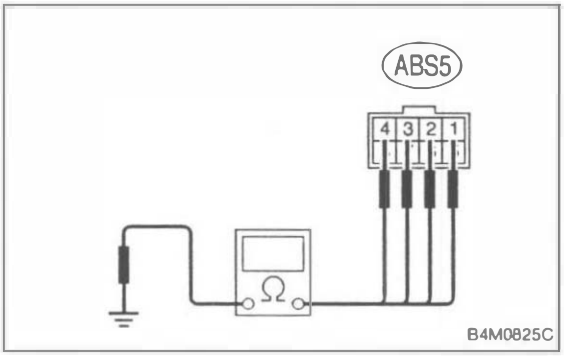


8N1	CHECK RESISTANCE OF SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 — (ABS2) No. 2:
Trouble code 33 / (ABS5) No. 1 — (ABS2) No. 2:
Trouble code 35 / (ABS5) No. 2 — (ABS2) No. 2:
Trouble code 37 / (ABS5) No. 3 — (ABS2) No. 2:

CHECK ***: Is the resistance between 7.8 and 9.2 Ω?***
YES : Go to step **8N2**.
NO : Replace hydraulic unit.

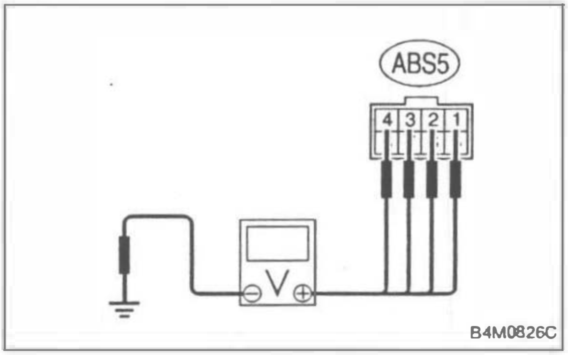


8N2	CHECK GROUND SHORT OF SOLENOID VALVE.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 — Chassis ground:
Trouble code 33 / (ABS5) No. 1 — Chassis ground:
Trouble code 35 / (ABS5) No. 2 — Chassis ground:
Trouble code 37 / (ABS5) No. 3 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8N3**.
NO : Replace hydraulic unit.

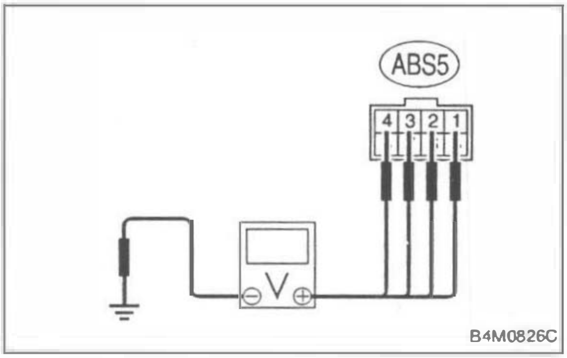


8N3	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Disconnect connector from ABSCM.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 (+) — Chassis ground (−):
Trouble code 33 / (ABS5) No. 1 (+) — Chassis ground (−):
Trouble code 35 / (ABS5) No. 2 (+) — Chassis ground (−):
Trouble code 37 / (ABS5) No. 3 (+) — Chassis ground (−):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8N4**.
NO : Replace hydraulic unit.

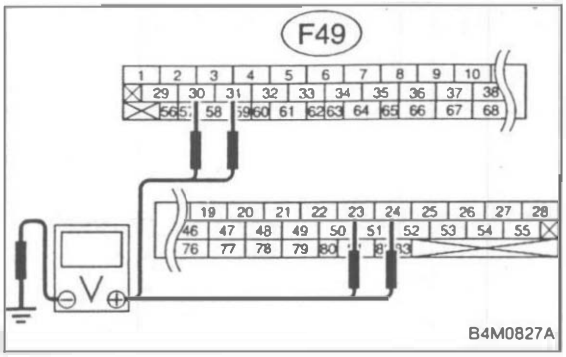


8N4	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 (+) — Chassis ground (−):
Trouble code 33 / (ABS5) No. 1 (+) — Chassis ground (−):
Trouble code 35 / (ABS5) No. 2 (+) — Chassis ground (−):
Trouble code 37 / (ABS5) No. 3 (+) — Chassis ground (−):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8N5**.
NO : Replace hydraulic unit.

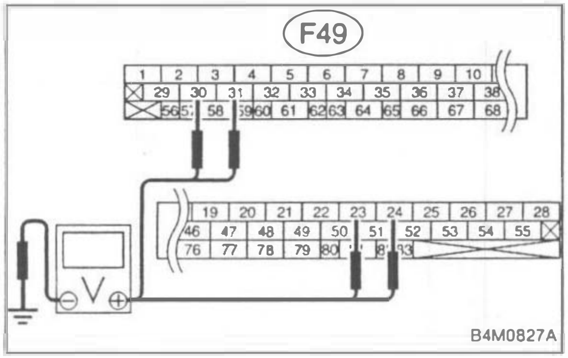


8N5	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to OFF.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 (+) — Chassis ground (−):
Trouble code 33 / (F49) No. 24 (+) — Chassis ground (−):
Trouble code 35 / (F49) No. 23 (+) — Chassis ground (−):
Trouble code 37 / (F49) No. 31 (+) — Chassis ground (−):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8N6**.
NO : Repair harness between ABSCM and hydraulic unit.

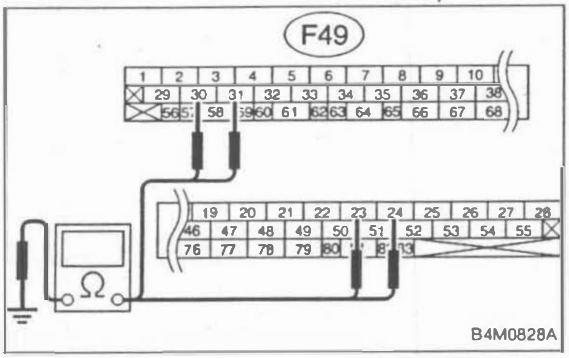


8N6	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 (+) — Chassis ground (−):
Trouble code 33 / (F49) No. 24 (+) — Chassis ground (−):
Trouble code 35 / (F49) No. 23 (+) — Chassis ground (−):
Trouble code 37 / (F49) No. 31 (+) — Chassis ground (−):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8N7**.
NO : Repair harness between ABSCM and hydraulic unit.

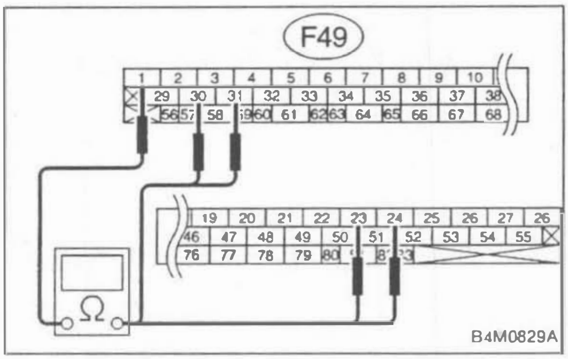


8N7	CHECK GROUND SHORT OF HARNESS.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 — Chassis ground:
Trouble code 33 / (F49) No. 24 — Chassis ground:
Trouble code 35 / (F49) No. 23 — Chassis ground:
Trouble code 37 / (F49) No. 31 — Chassis ground:

CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **8N8**.
NO : Repair harness between ABSCM and hydraulic unit.



8N8	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

1) Connect connector to hydraulic unit.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 31 / (F49) No. 30 — No. 1:
Trouble code 33 / (F49) No. 24 — No. 1:
Trouble code 35 / (F49) No. 23 — No. 1:
Trouble code 37 / (F49) No. 31 — No. 1:

CHECK : ***Is the resistance between 8.3 and 9.7 Ω?***
YES : Go to step **8N9**.
NO : Repair harness/connector between ABSCM and hydraulic unit.

8N9	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Go to step **8N10**.

8N10	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8N11**.

8N11	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

O: TROUBLE CODE 32 (FRONT RH)
P: TROUBLE CODE 34 (FRONT LH)
Q: TROUBLE CODE 36 (REAR RH)
R: TROUBLE CODE 38 (REAR LH)
— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN HYDRAULIC UNIT —

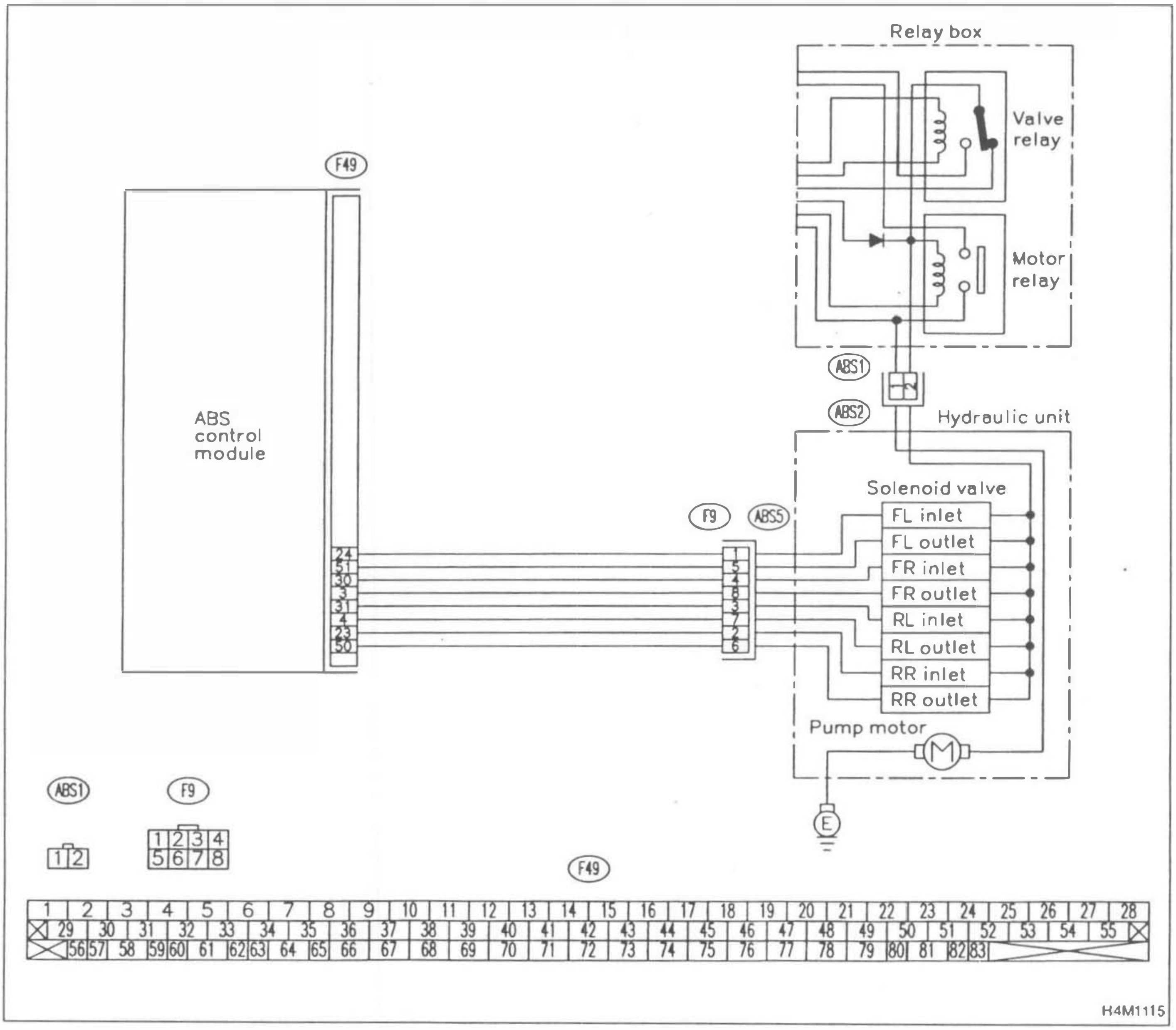
DIAGNOSIS:

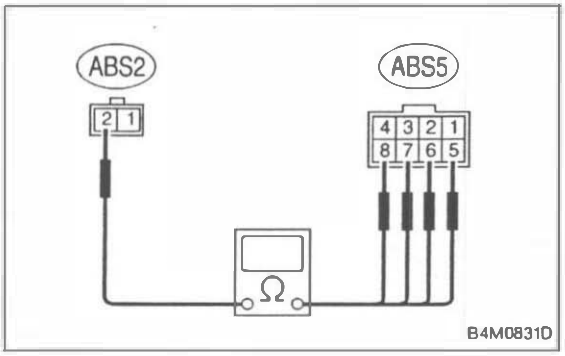
- Faulty harness/connector
- Faulty outlet solenoid valve in hydraulic unit

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



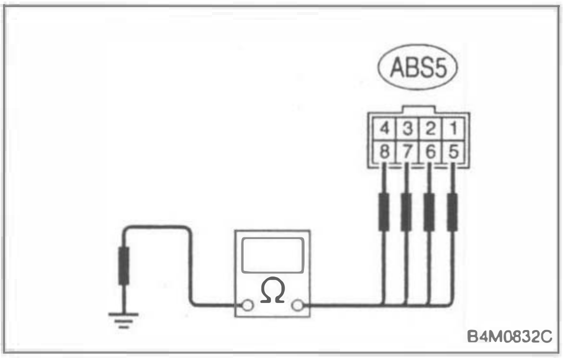


8R1	CHECK RESISTANCE OF SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 — (ABS2) No. 2:
Trouble code 34 / (ABS5) No. 5 — (ABS2) No. 2:
Trouble code 36 / (ABS5) No. 6 — (ABS2) No. 2:
Trouble code 38 / (ABS5) No. 7 — (ABS2) No. 2:

CHECK ***: Is the resistance between 3.8 and 4.8 Ω?***
YES : Go to step **8R2**.
NO : Replace hydraulic unit.

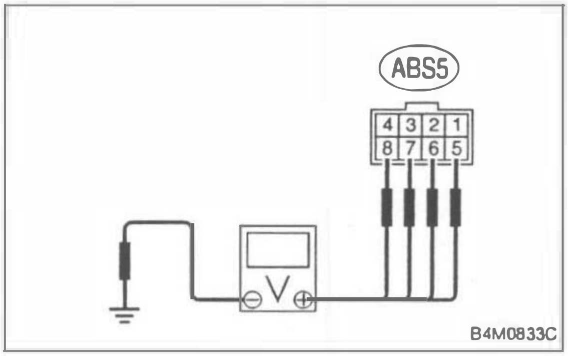


8R2	CHECK GROUND SHORT OF SOLENOID VALVE.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 — Chassis ground:
Trouble code 34 / (ABS5) No. 5 — Chassis ground:
Trouble code 36 / (ABS5) No. 6 — Chassis ground:
Trouble code 38 / (ABS5) No. 7 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8R3**.
NO : Replace hydraulic unit.

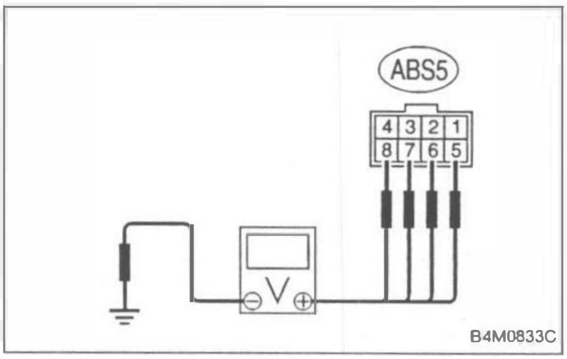


8R3	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Disconnect connector from ABSCM.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 (+) — Chassis ground (−):
Trouble code 34 / (ABS5) No. 5 (+) — Chassis ground (−):
Trouble code 36 / (ABS5) No. 6 (+) — Chassis ground (−):
Trouble code 38 / (ABS5) No. 7 (+) — Chassis ground (−):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8R4**.
NO : Replace hydraulic unit.

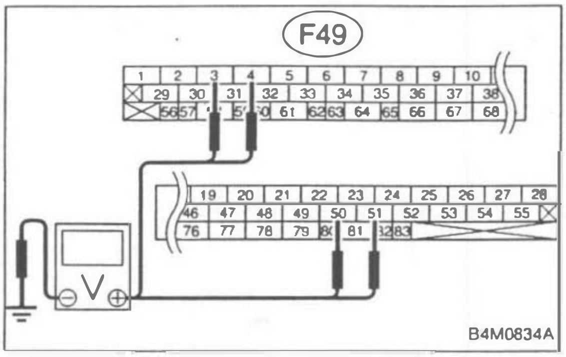


8R4	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 (+) — Chassis ground (−):
Trouble code 34 / (ABS5) No. 5 (+) — Chassis ground (−):
Trouble code 36 / (ABS5) No. 6 (+) — Chassis ground (−):
Trouble code 38 / (ABS5) No. 7 (+) — Chassis ground (−):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8R5**.
NO : Replace hydraulic unit.

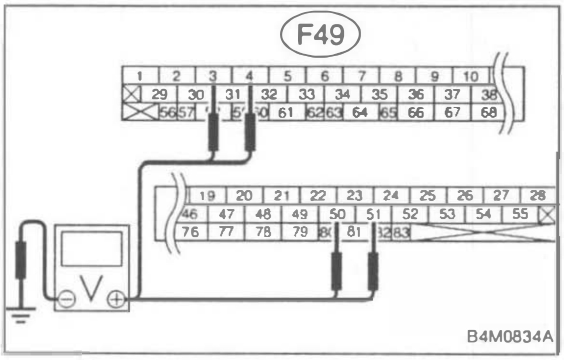


8R5	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to OFF.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 (+) — Chassis ground (–):
Trouble code 34 / (F49) No. 51 (+) — Chassis ground (–):
Trouble code 36 / (F49) No. 50 (+) — Chassis ground (–):
Trouble code 38 / (F49) No. 4 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8R6**.
NO : Repair harness between ABSCM and hydraulic unit.

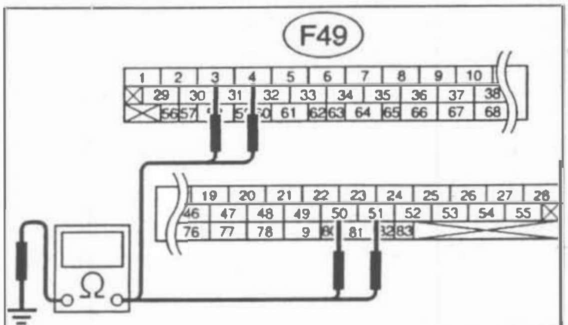


8R6	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 (+) — Chassis ground (–):
Trouble code 34 / (F49) No. 51 (+) — Chassis ground (–):
Trouble code 36 / (F49) No. 50 (+) — Chassis ground (–):
Trouble code 38 / (F49) No. 4 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8R7**.
NO : Repair harness between ABSCM and hydraulic unit.



B4M0835A

8R7	CHECK GROUND SHORT OF HARNESS.

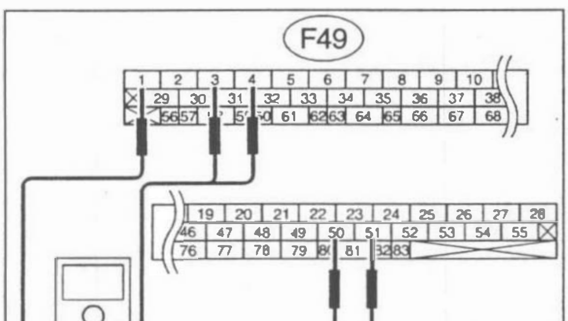
1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 — Chassis ground:
Trouble code 34 / (F49) No. 51 — Chassis ground:
Trouble code 36 / (F49) No. 50 — Chassis ground:
Trouble code 38 / (F49) No. 4 — Chassis ground:

CHECK : ***Is the resistance more than 1 MΩ?***

YES : Go to step **8R8**.

NO : Repair harness between ABSCM and hydraulic unit.



B4M0836A

8R8	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

1) Connect connector to hydraulic unit.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 32 / (F49) No. 3 — No. 1:
Trouble code 34 / (F49) No. 51 — No. 1:
Trouble code 36 / (F49) No. 50 — No. 1:
Trouble code 38 / (F49) No. 4 — No. 1:

CHECK : ***Is the resistance between 4.3 and 5.3 Ω?***

YES : Go to step **8R9**.

NO : Repair harness/connector between ABSCM and hydraulic unit.

8R9	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8R10**.

8R10	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8R11**.

8R11	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

S: TROUBLE CODE 41
— ABNORMAL ABS CONTROL MODULE —

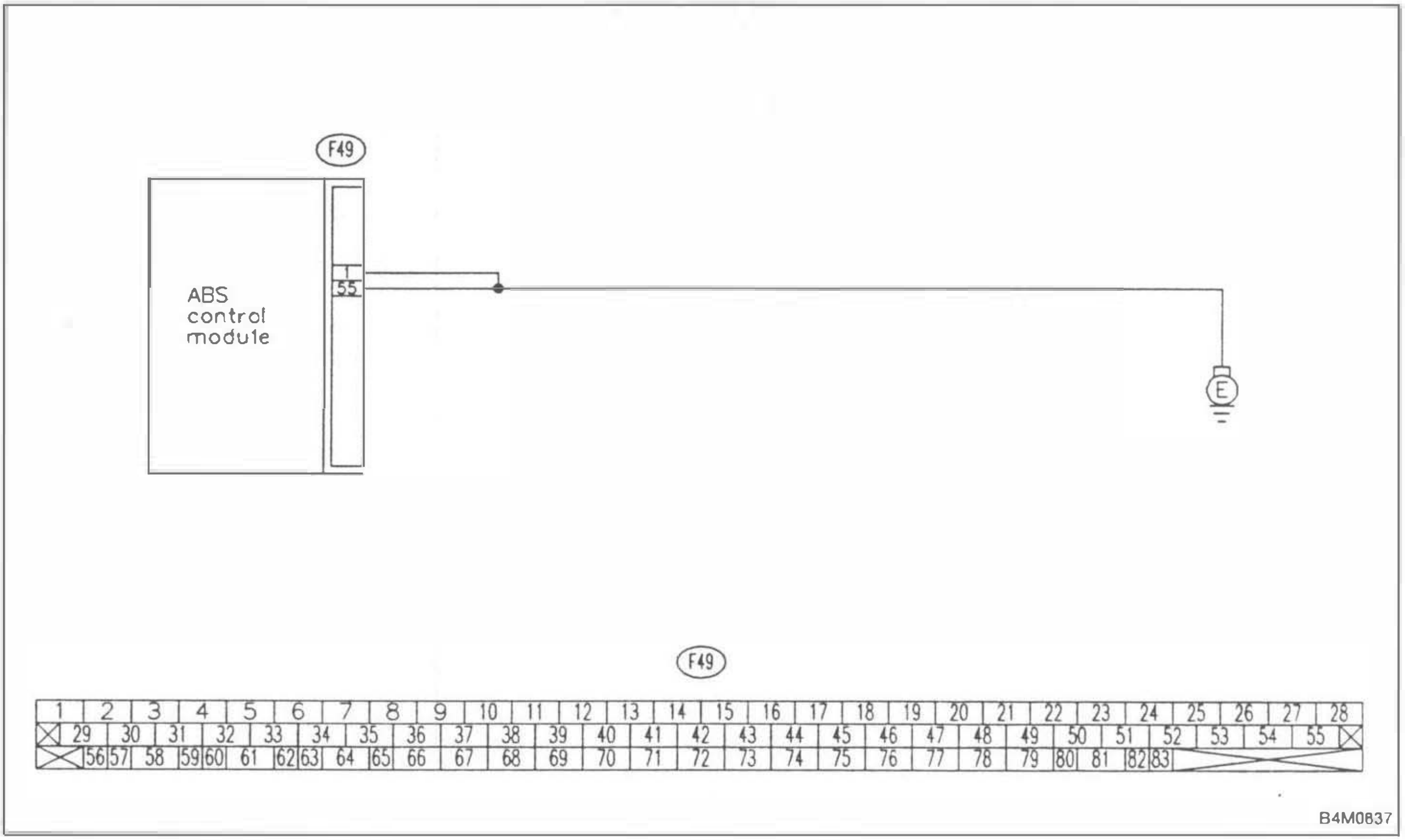
DIAGNOSIS:

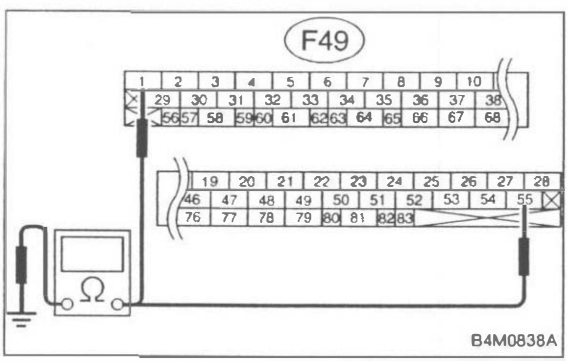
- Faulty ABSCM

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





8S1	CHECK GROUND CIRCUIT OF ABSCM.

1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Measure resistance between ABSCM and chassis ground.

Connector & terminal
(F49) No. 1 — Chassis ground:
(F49) No. 55 — Chassis ground:

CHECK : ***Is the resistance less than 0.5 Ω?***

YES : Go to step **8S2**.

NO : Repair ABSCM ground harness.

8S2	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between battery, ignition switch and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8S3**.

8S3	CHECK SOURCES OF SIGNAL NOISE.

CHECK : ***Is the car telephone or the wireless transmitter properly installed?***

YES : Go to step **8S4**.

NO : Properly install the car telephone or the wireless transmitter.

8S4	CHECK SOURCES OF SIGNAL NOISE.

CHECK : ***Are noise sources (such as an antenna) installed near the sensor harness?***

YES : Install the noise sources apart from the sensor harness.

NO : Go to step **8S5**.

8S5	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8S6**.

8S6	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

T: TROUBLE CODE 42
— SOURCE VOLTAGE IS LOW. —

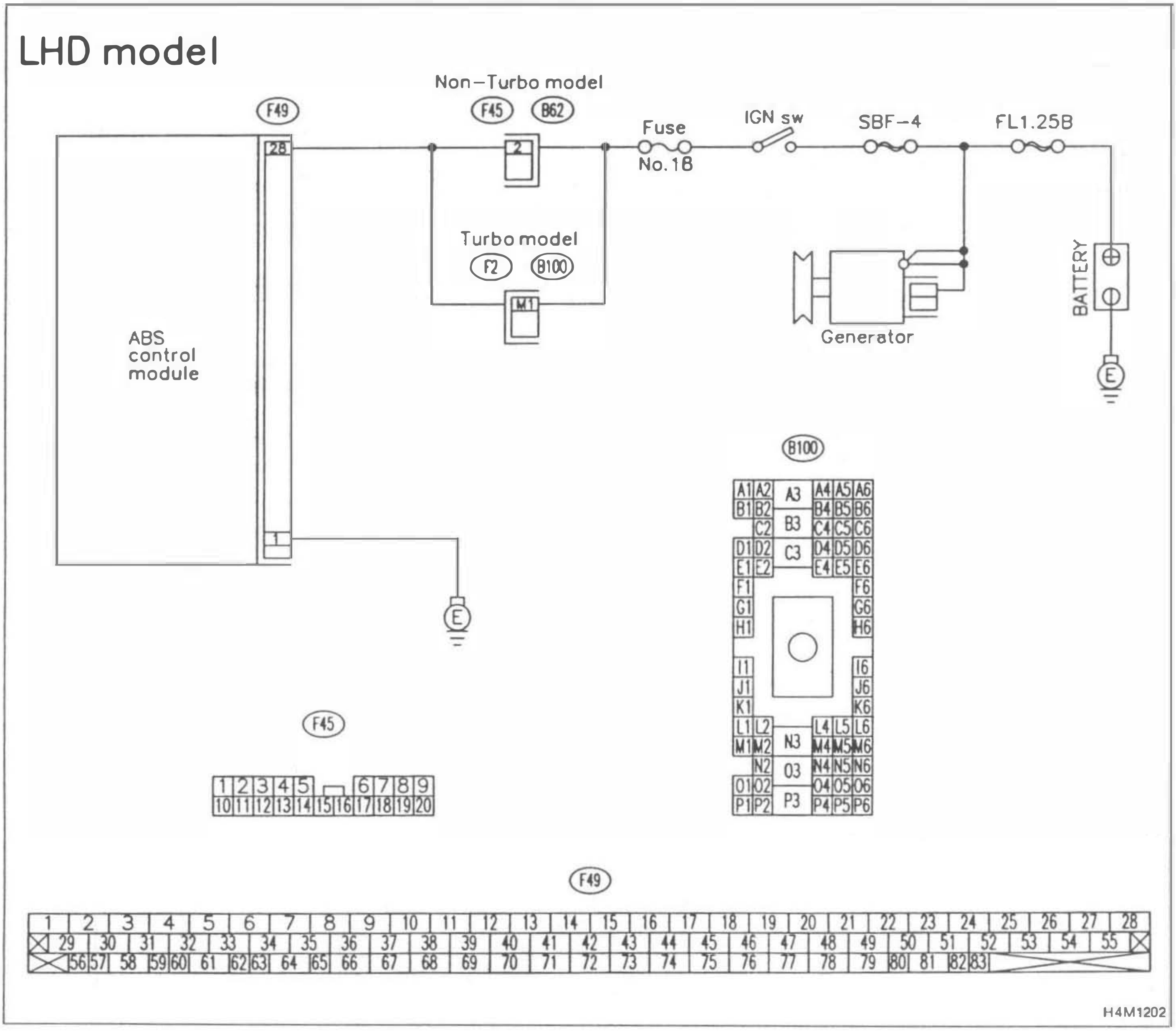
DIAGNOSIS:

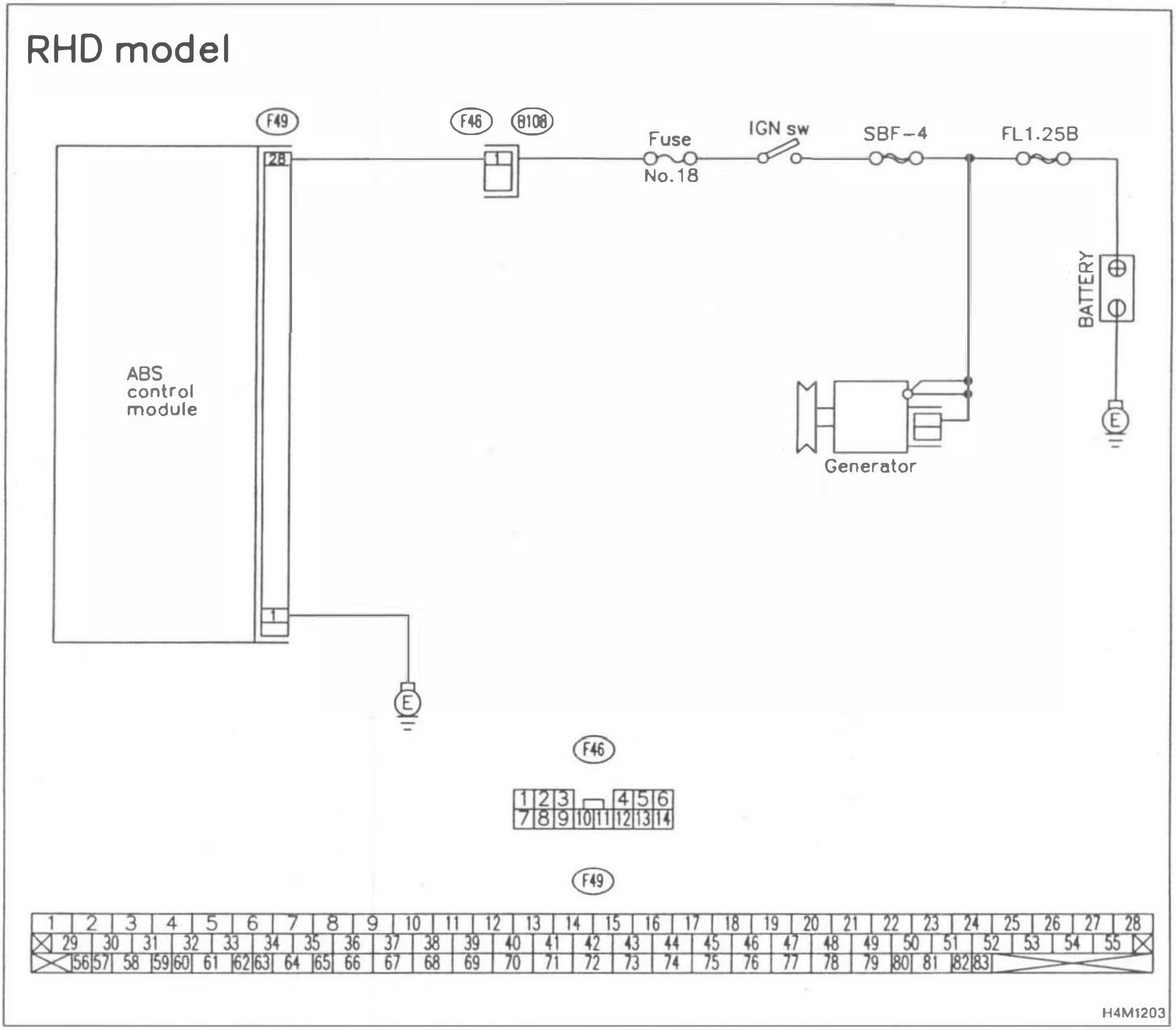
- Power source voltage of the ABSCM is low.

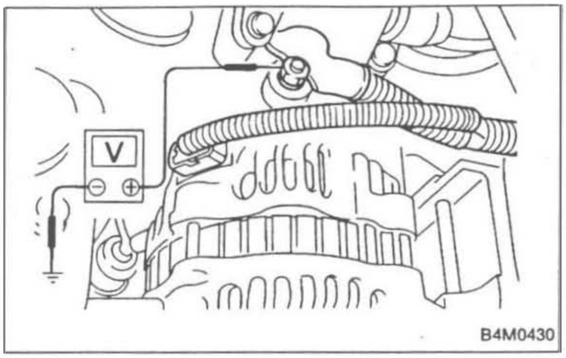
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:




RHD model
F49
F46
B108
28
1
Fuse
No.18
IGN sw
SBF-4
FL1.25B
BATTERY
ABS
control
module
Generator
E
1
E
F46
1 2 3 4 5 6
7 8 9 10 11 12 13 14
F49
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83
H4M1203



8T1	CHECK GENERATOR.

1) Start engine.
2) Idling after warm-up.
3) Measure voltage between generator B terminal an chassis ground.

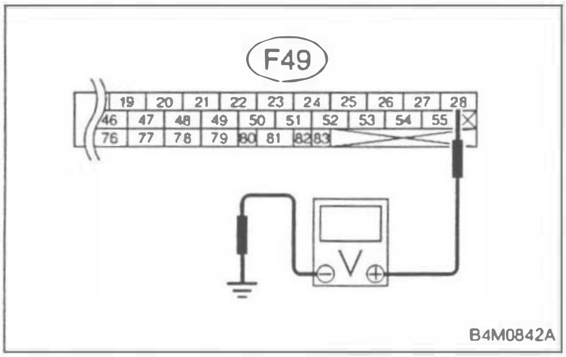
Terminal
Generator B terminal — Chassis ground:

CHECK : ***Is the voltage between 10 V and 15 V?***
YES : Go to step **8T2**.
NO : Repair generator.

8T2	CHECK BATTERY TERMINAL.

Turn ignition switch to OFF.

CHECK : ***Are the positive and negative battery terminals tightly clamped?***
YES : Go to step **8T3**.
NO : Tighten the clamp of terminal.

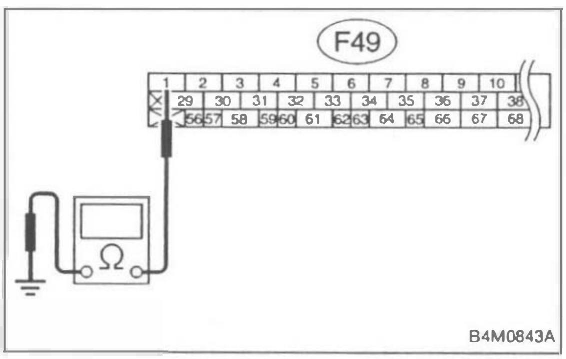


8T3	CHECK INPUT VOLTAGE OF ABSCM.

1) Disconnect connector from ABSCM.
2) Run the engine at idle.
3) Measure voltage between ABSCM connector and chas sis ground.

Connector & terminal
(F49) No. 28 (+) — Chassis ground (–):

CHECK : ***Is the voltage between 10 V and 15 V?***
YES : Go to step **8T4**.
NO : Repair harness connector between battery, igni tion switch and ABSCM.



8T4	CHECK GROUND CIRCUIT OF ABSCM.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector anc chassis ground.

Connector & terminal
(F49) No. 1 — Chassis ground:

CHECK : ***Is the resistance less than 0.5 Ω?***
YES : Go to step **8T5**.
NO : Repair ABSCM ground harness.

8T5	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between generator, battery and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8T6**.

8T6	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8T7**.

8T7	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

U: TROUBLE CODE 44 — A COMBINATION OF AT CONTROL ABNORMAL —

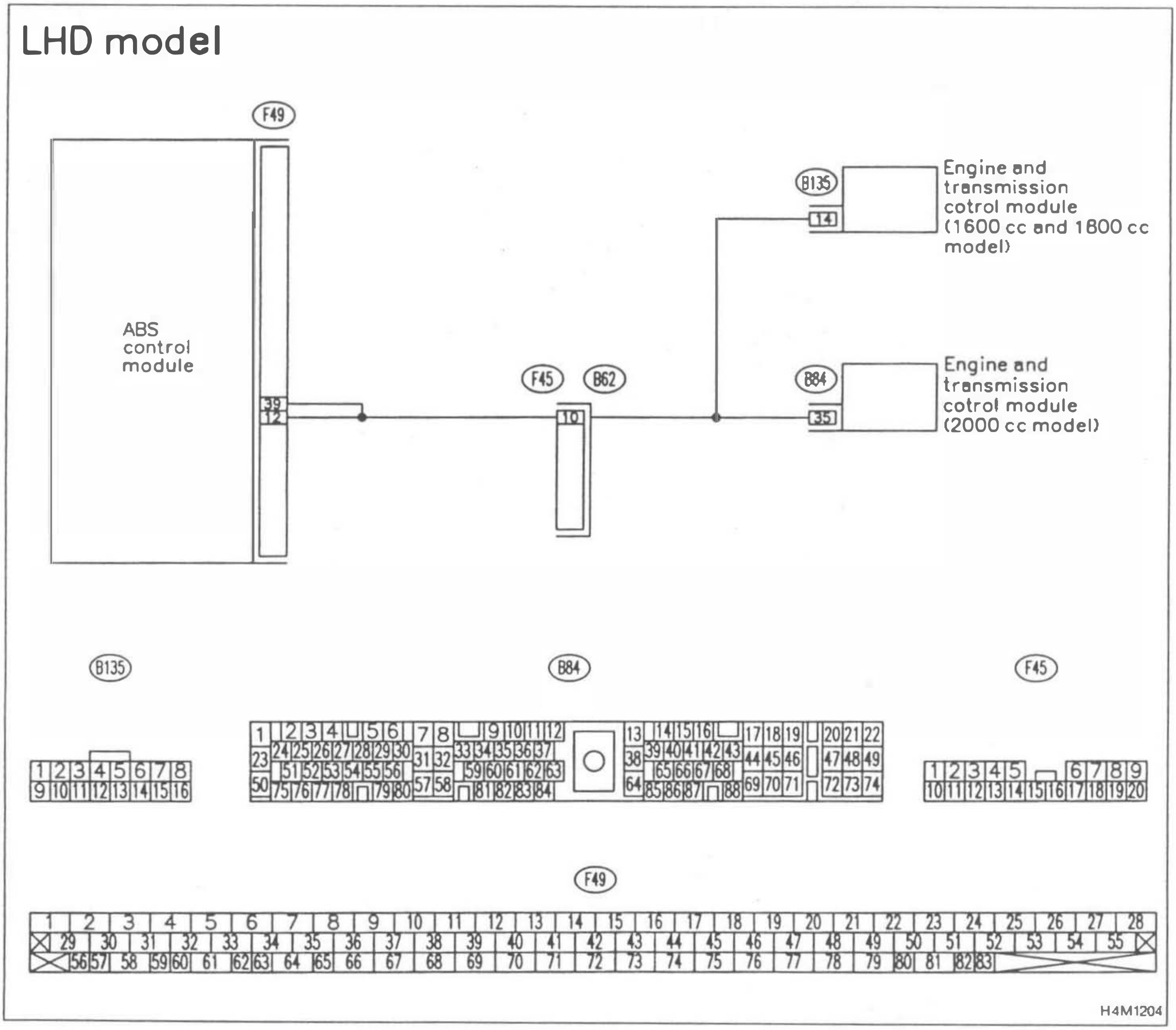
DIAGNOSIS:

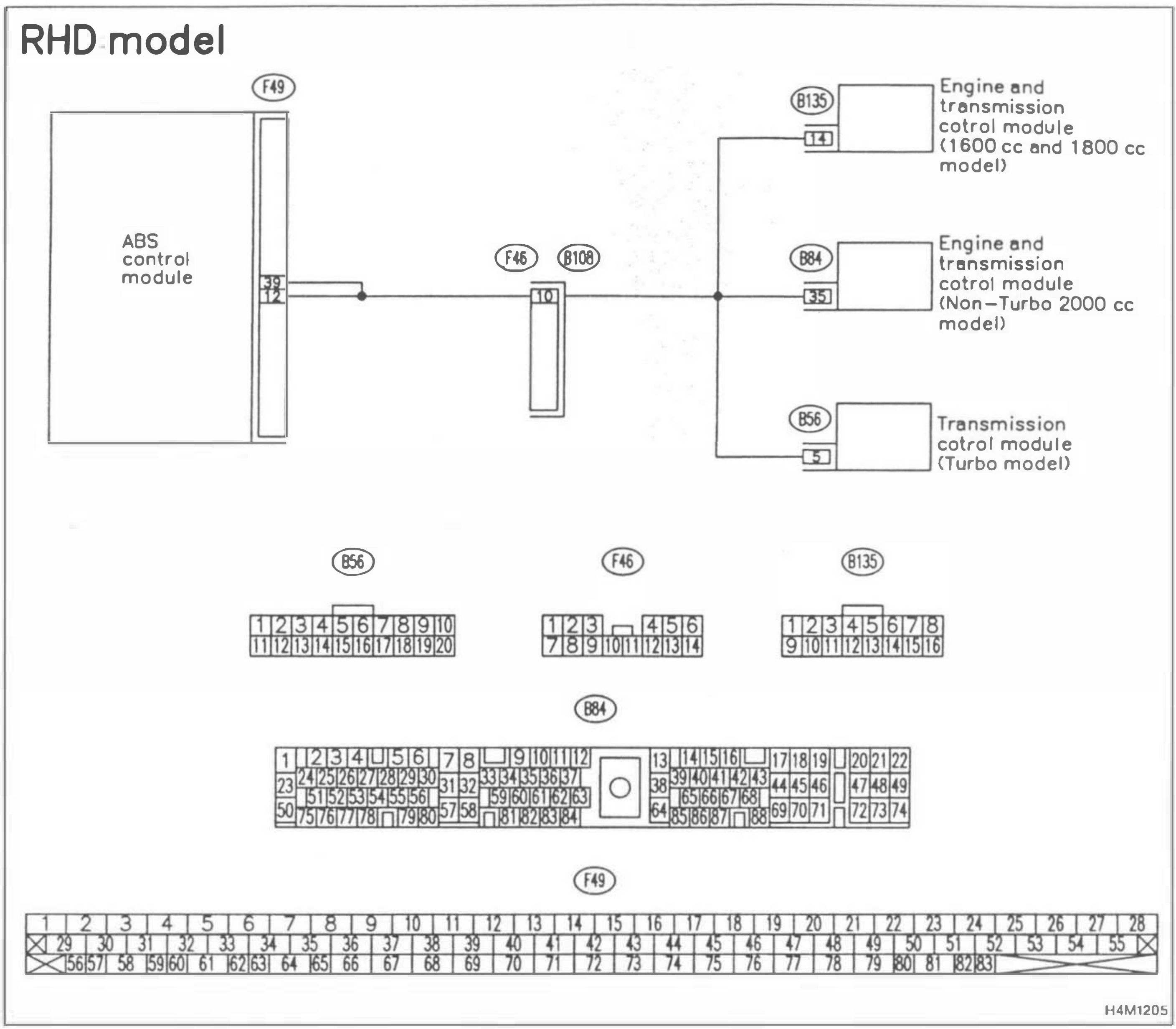
- Combination of AT control faults

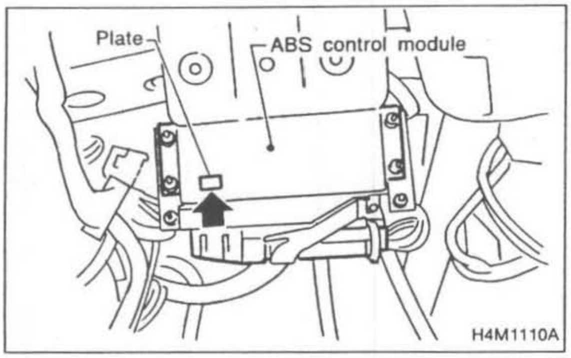
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:




RHD model
F49
ABS control module
39
12
F46
B108
10
B135
14
Engine and transmission cotrol module (1600 cc and 1800 cc model)
B84
35
Engine and transmission cotrol module (Non−Turbo 2000 cc model)
B56
5
Transmission cotrol module (Turbo model)
B56
F46
B135
B84
F49
H4M1205



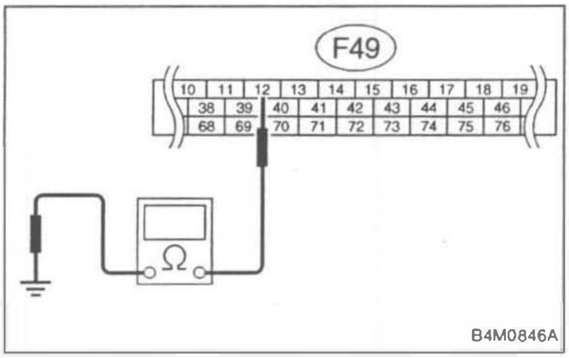
8U1	CHECK SPECIFICATIONS OF THE ABSCM.

Check specifications of the plate attached to the ABSCM

CHECK **: *Is an ABSCM for AT model installed on a MT model?***

YES : Replace ABSCM.

NO : Go to step **8U2**.



8U2	CHECK GROUND SHORT OF HARNESS.

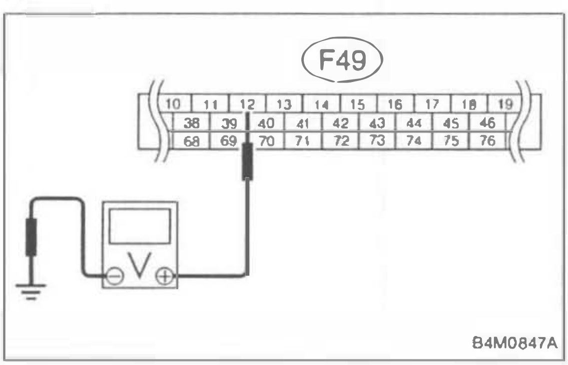
1) Turn ignition switch to OFF.
2) Disconnect two connectors from TCM.
3) Disconnect connector from ABSCM.
4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 — Chassis ground:

CHECK **: *Is the resistance more than 1 MΩ?***

YES : Go to step **8U3**.

NO : Repair harness between TCM and ABSCM.



8U3	CHECK BATTERY SHORT OF HARNESS.

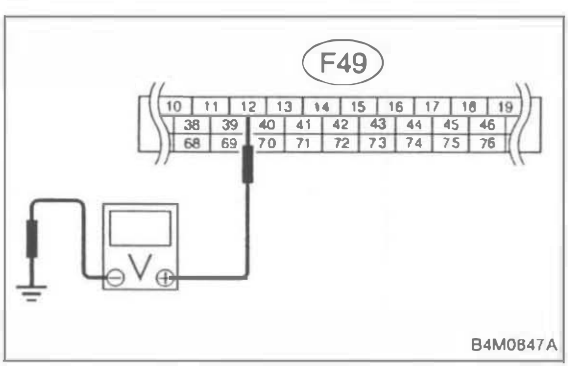
Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 (+) — Chassis ground (–):

CHECK **: *Is the voltage less than 1 V?***

YES : Go to step **8U4**.

NO : Repair harness between TCM and ABSCM.



8U4	CHECK BATTERY SHORT OF HARNESS.

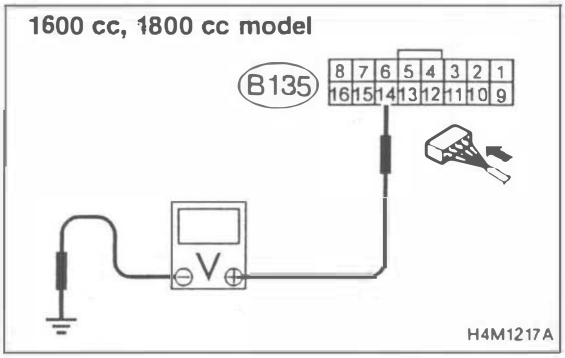
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

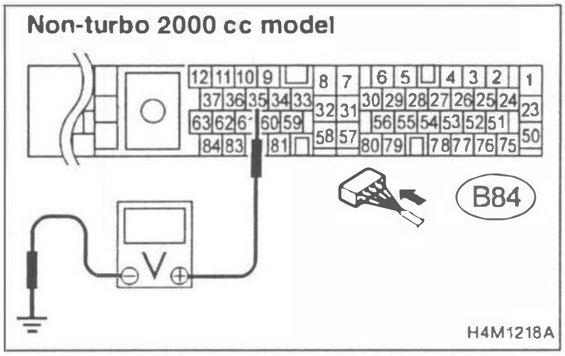
Connector & terminal
(F49) No. 12 (+) — Chassis ground (–):

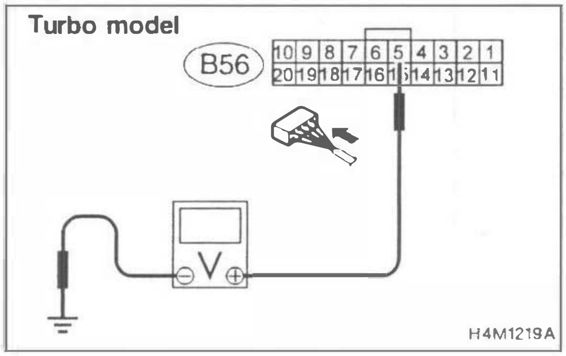
CHECK **: *Is the voltage less than 1 V?***

YES : Go to step **8U5**.

NO : Repair harness between TCM and ABSCM.







8U5	CHECK TCM.

1) Turn ignition switch to OFF.
2) Connect all connectors to TCM.
3) Turn ignition switch to ON.
4) Measure voltage between TCM connector and chassis ground.

Connector & terminal
- ***1600 cc, 1800 cc model***
(B135) No. 14 (+) — Chassis ground:

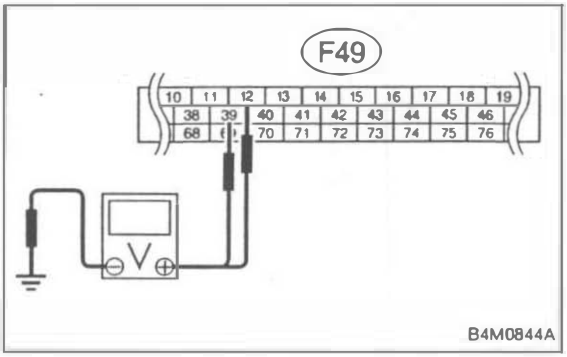
- ***Non-turbo 2000 cc model***
(B84) No. 35 (+) — Chassis ground (–):

- ***Turbo model***
(B56) No. 5 (+) — Chassis ground (–):

CHECK : ***Is the voltage between 10 V and 13 V?***
YES : Go to step **8U7**.
NO : Go to step **8U6**.

8U6	CHECK AT.

CHECK : ***Is the AT functioning normally?***
YES : Replace TCM.
NO : Repair AT.



8U7	CHECK OPEN CIRCUIT OF HARNESS.

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 (+) — Chassis ground (–):
(F49) No. 39 (+) — Chassis ground (–):

CHECK : ***Is the voltage between 10 V and 13 V?***

YES : Go to step **8U8**.

NO : Repair harness/connector between TCM and ABSCM.

8U8	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between TCM and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8U9**.

8U9	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.
5) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8U10**.

8U10	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

V: TROUBLE CODE 46
— ABNORMAL G SENSOR POWER SUPPLY VOLTAGE —

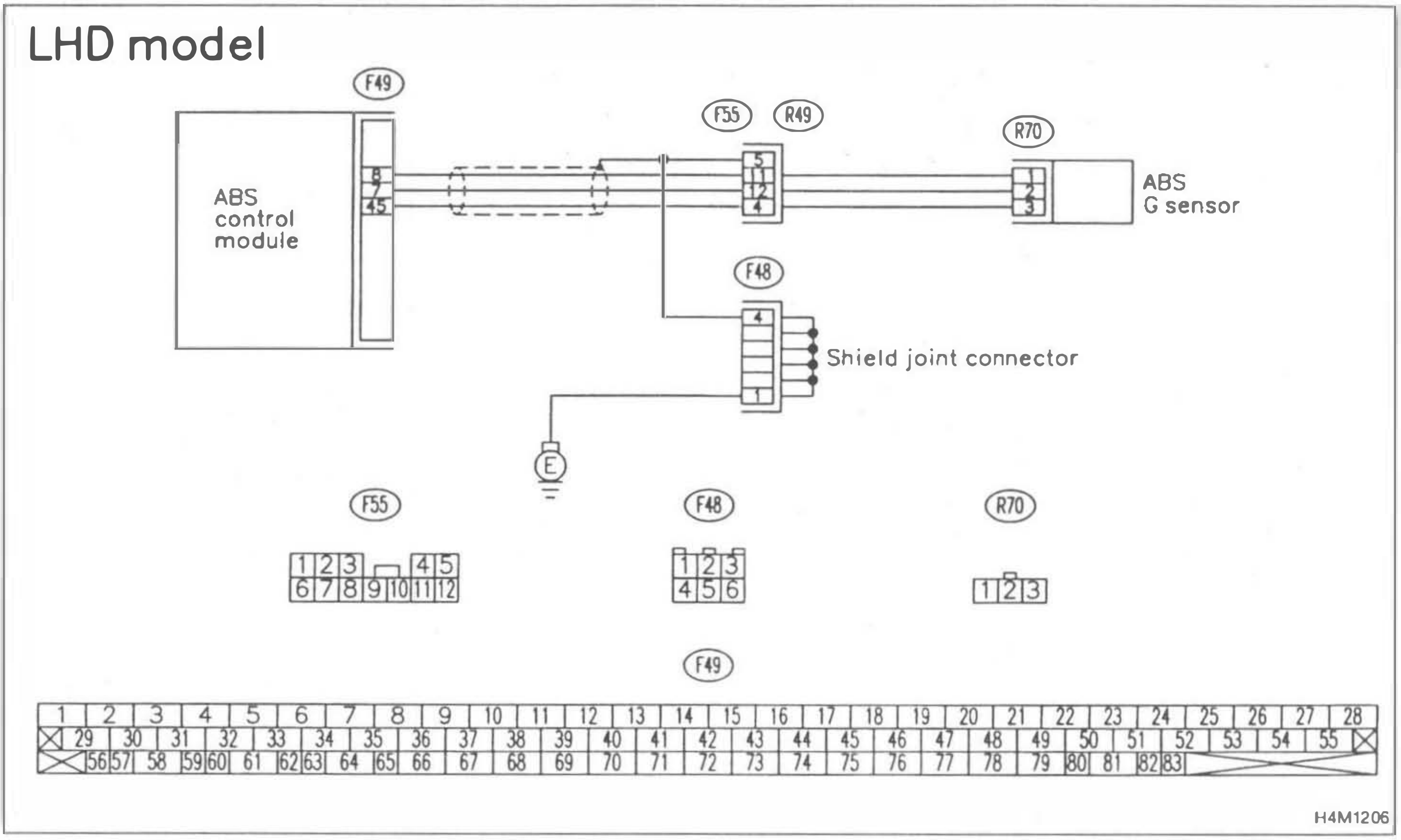
DIAGNOSIS:

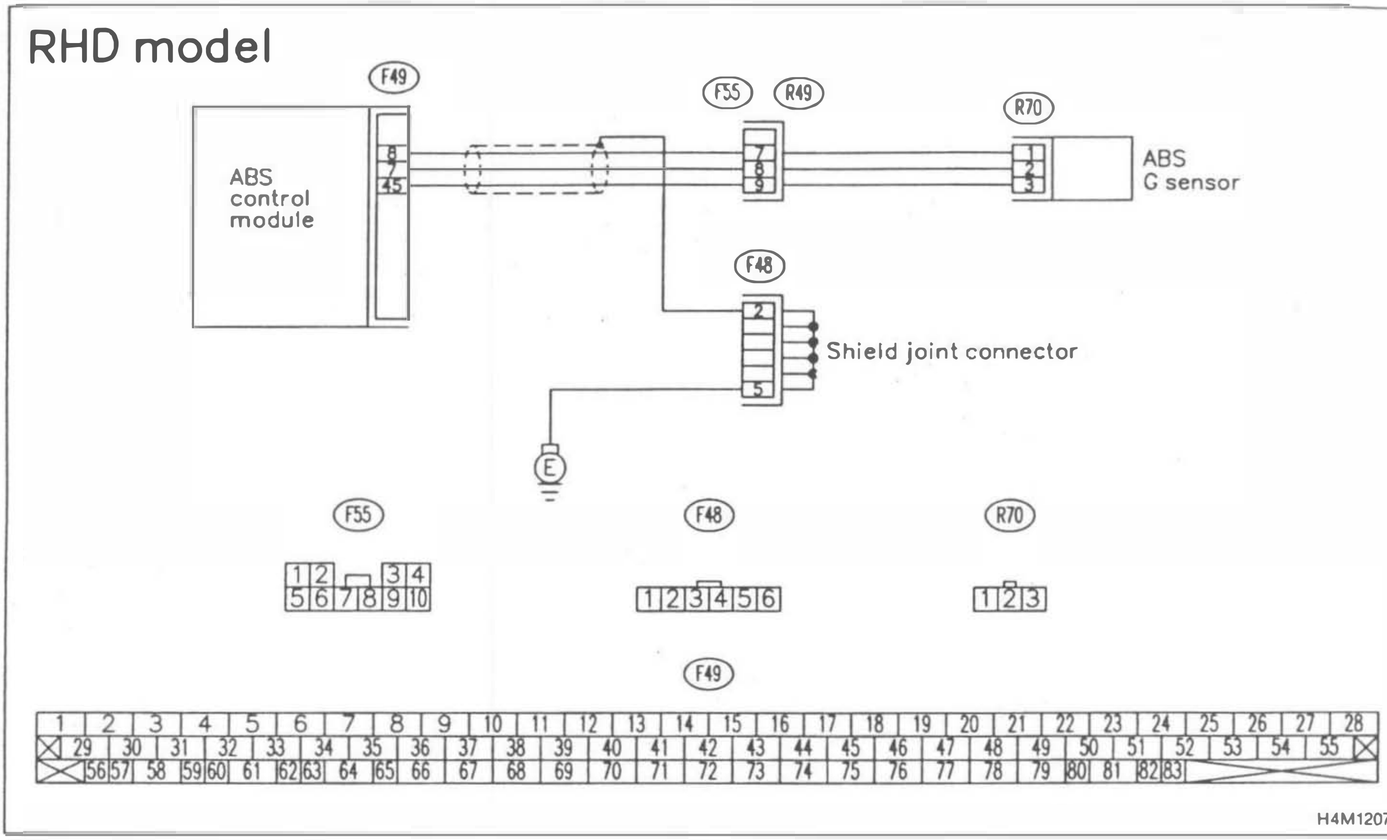
- Faulty G sensor power supply voltage

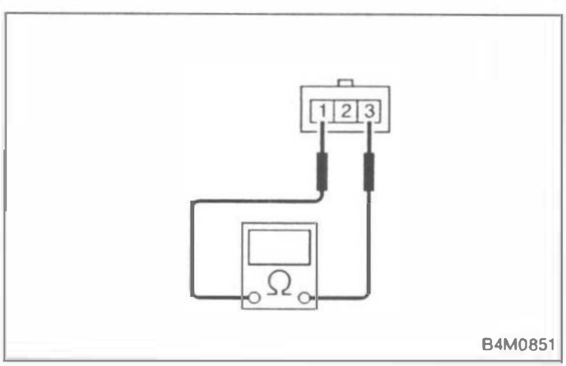
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:







8V1	CHECK G SENSOR.

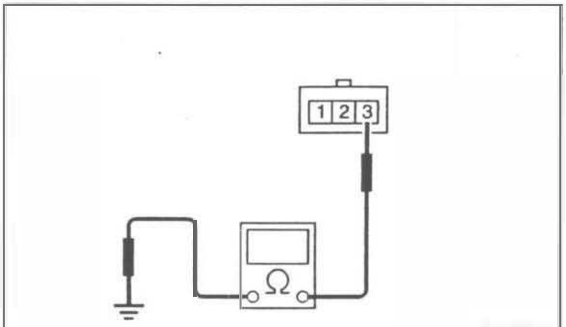
1) Turn ignition switch to OFF.
2) Remove console box.
3) Disconnect connector from G sensor.
4) Measure resistance of G sensor.

Terminal
No. 1 — No. 3:

CHECK : ***Is the resistance between 42 and 58 kΩ?***

YES : Go to step **8V2**.

NO : Replace G sensor.



B4M0852

8V2	CHECK GROUND SHORT OF G SENSOR.

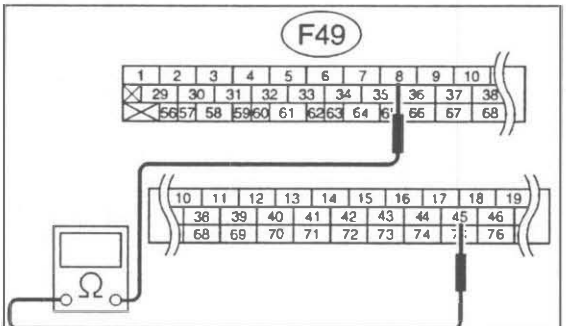
Measure resistance between G sensor and bracket.

Terminal
No. 3 — Bracket:

CHECK **: *Is the resistance more than 1 MΩ?***

YES : Go to step **8V3**.

NO : Replace G sensor.



B4M0853A

8V3	CHECK SHORT CIRCUIT IN HARNESS BETWEEN ABSCM AND G SENSOR.

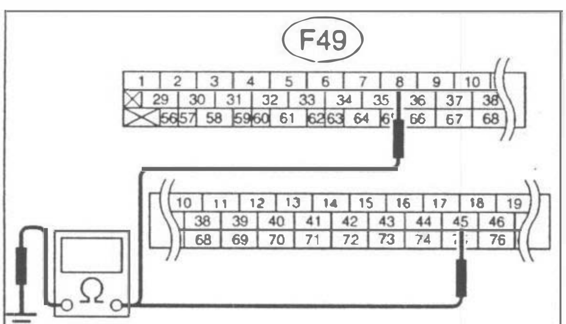
1) Disconnect connector from ABSCM.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 45 — No. 8:

CHECK **: *Is the resistance more than 1 MΩ?***

YES : Go to step **8V4**.

NO : Repair harness between ABSCM and G sensor.



B4M0854A

8V4	CHECK GROUND SHORT OF HARNESS.

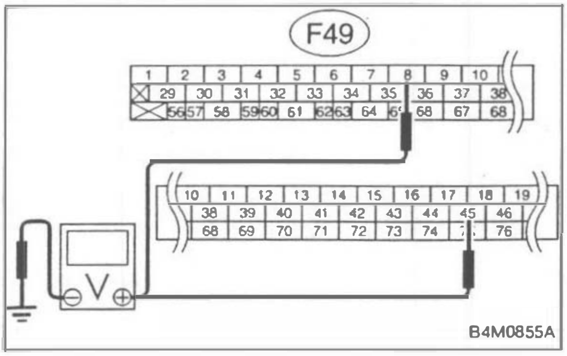
Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 8 — Chassis ground:
(F49) No. 45 — Chassis ground:

CHECK **: *Is the resistance more than 1 MΩ?***

YES : Go to step **8V5**.

NO : Repair harness between ABSCM and G sensor.



8V5	CHECK BATTERY SHORT OF HARNESS.

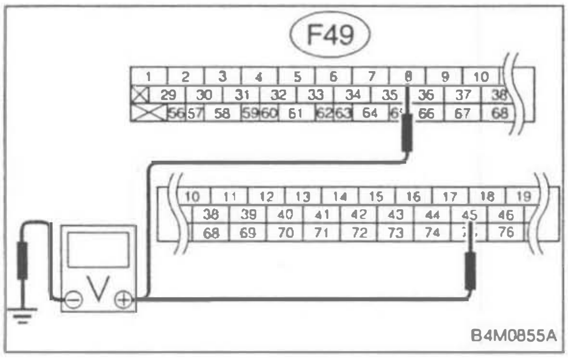
Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 8 (+) — Chassis ground (–):
(F49) No. 45 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***

YES : Go to step **8V6**.

NO : Repair harness between ABSCM and G sensor.



8V6	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM and chassis ground.

Connector & terminal
(F49) No. 8 (+) — Chassis ground (–):
(F49) No. 45 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***

YES : Go to step **8V7**.

NO : Repair harness between ABSCM and chassis ground.

8V7	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8V8**.

8V8	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.
5) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8V9**.

8V9	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

W: TROUBLE CODE 51
— ABNORMAL VALVE RELAY —

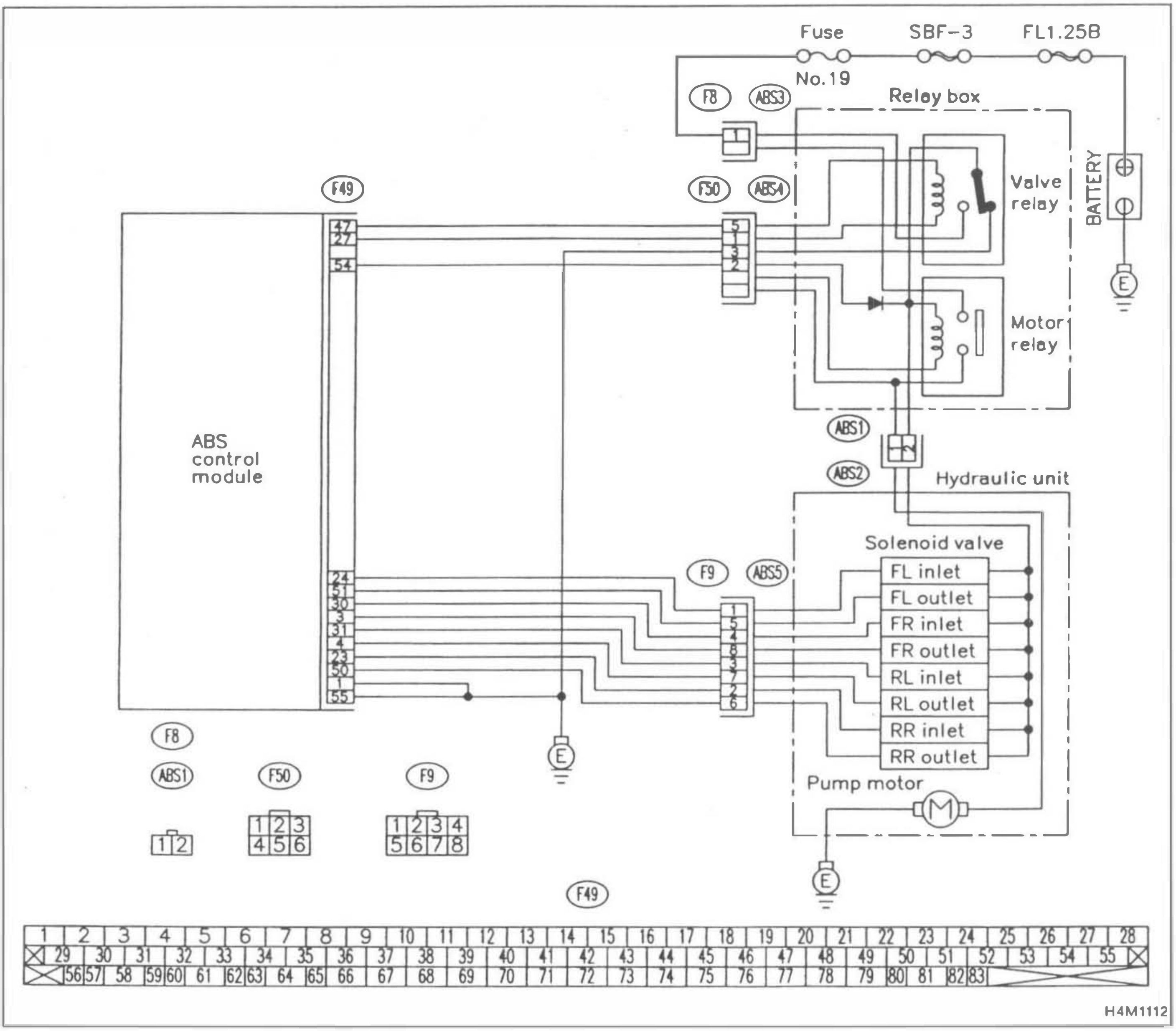
DIAGNOSIS:

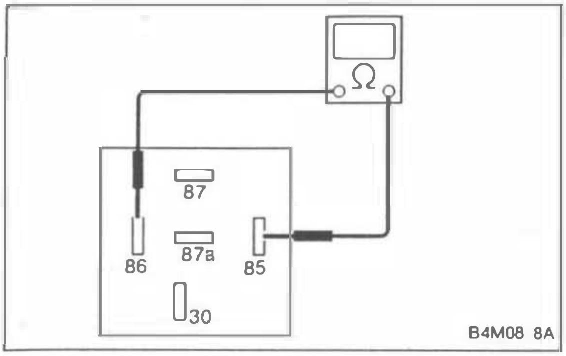
- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





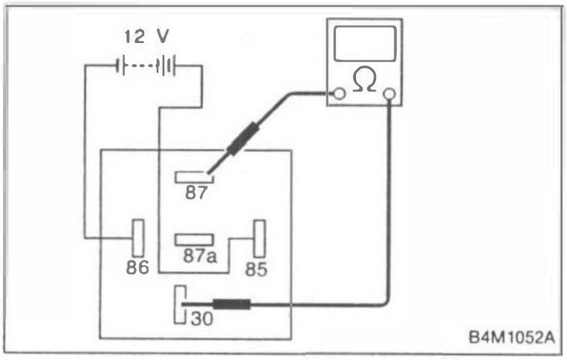
B4M08 8A

8W1	CHECK RESISTANCE OF VALVE RELAY.

1) Turn ignition switch to OFF.
2) Remove valve relay from relay box.
3) Measure resistance between valve relay terminals.

Terminals
No. 85 — No. 86:

CHECK : ***Is the resistance between 93 and 113 Ω?***
YES : Go to step **8W2**.
NO : Replace valve relay.



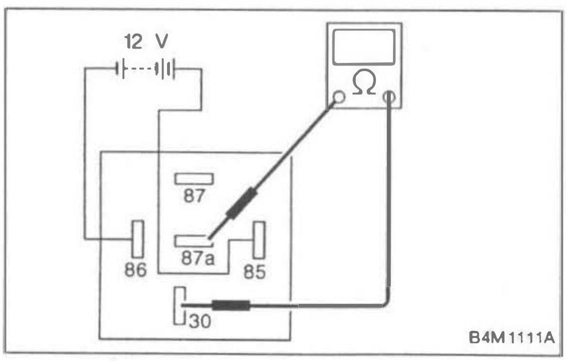
B4M1052A

8W2	CHECK CONTACT POINT OF VALVE RELAY.

1) Connect battery to valve relay terminals No. 85 and No. 86.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK : ***Is the resistance less than 0.5 Ω?***
YES : Go to step **8W3**.
NO : Replace valve relay.



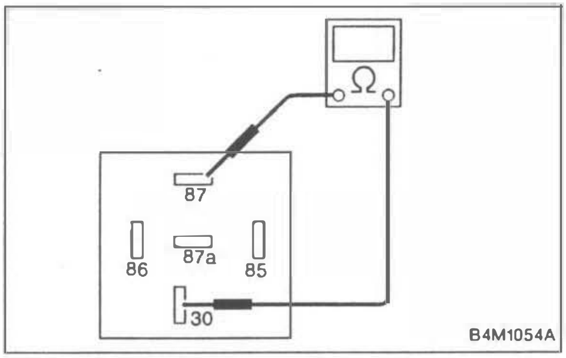
B4M1111A

8W3	CHECK CONTACT POINT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:
Is the resistance more than 1 MΩ?

YES : Go to step **8W4**.
NO : Replace valve relay.

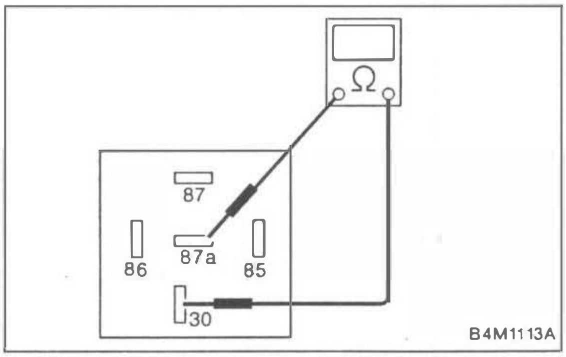


8W4	CHECK CONTACT POINT OF VALVE RELAY.

1) Disconnect battery from valve relay terminals.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **8W5**.
NO : Replace valve relay.

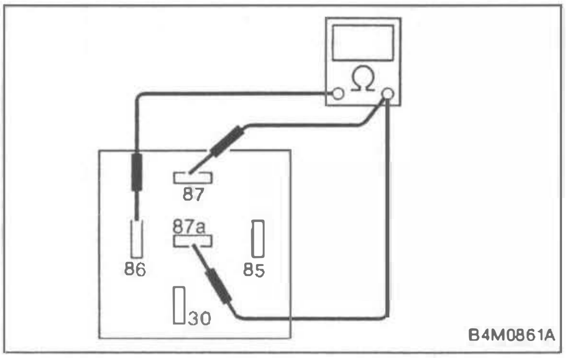


8W5	CHECK CONTACT POINT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:

CHECK : ***Is the resistance less than 0.5 Ω?***
YES : Go to step **8W6**.
NO : Replace valve relay.

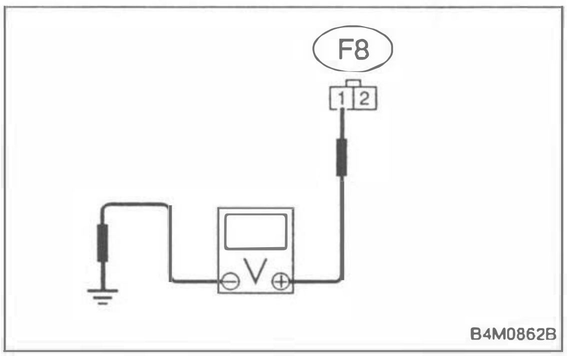


8W6	CHECK SHORT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 86 — No. 87:
No. 86 — No. 87a:

CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **8W7**.
NO : Replace valve relay.

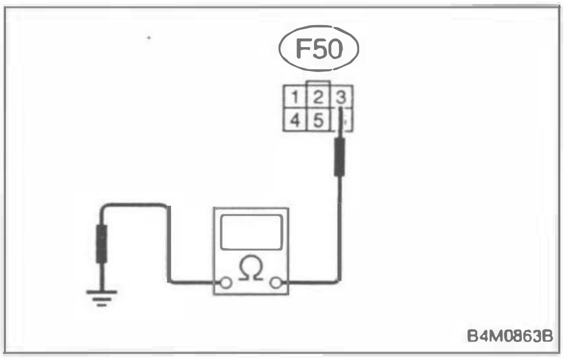


8W7	CHECK POWER SUPPLY FOR VALVE RELAY.

1) Disconnect connector (F8) from relay box.
2) Turn ignition switch to ON.
3) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(F8) No. 1 (+) — Chassis ground (–):

CHECK : ***Is the voltage between 10 V and 13 V?***
YES : Go to step **8W8**.
NO : Repair harness between battery and relay box connector. Check fuse No. 19.

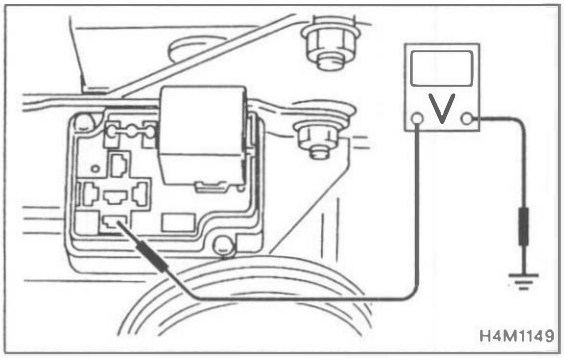


8W8	CHECK GROUND CIRCUIT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Disconnect connector (F50) from relay box.
3) Measure resistance between relay box connector and chassis ground.

Connector & terminal
(F50) No. 3 — Chassis ground:

CHECK : ***Is the resistance less than 0.5 Ω?***
YES : Go to step **8W9**.
NO : Repair relay box ground harness.

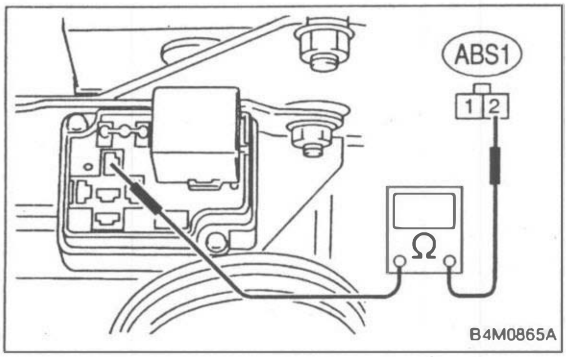


8W9	CHECK OPEN CIRCUIT AND GROUND SHORT IN POWER SUPPLY CIRCUIT OF RELAY BOX.

1) Disconnect connector (ABS1) from hydraulic unit.
2) Connect connector (F8) to relay box.
3) Turn ignition switch to ON.
4) Measure voltage of relay box.

Connector & terminal
Valve relay installing point No. 87 — Chassis ground:

CHECK : ***Is the voltage between 10 V and 13 V?***
YES : Go to step **8W10**.
NO : Replace relay box and check fuse No. 19.

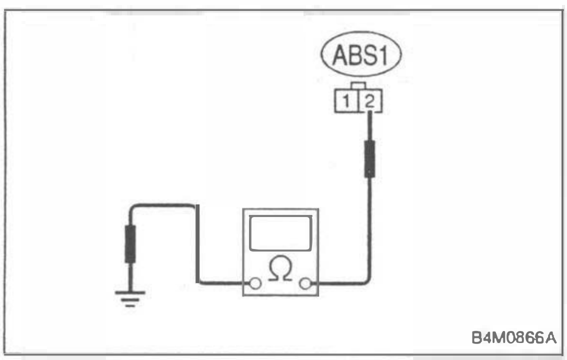


8W10	CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Measure resistance between hydraulic unit connector and valve relay installing point.

Connector & terminal
(ABS1) No. 2 — Valve relay installing point No. 30:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8W11**.
NO : Replace relay box.

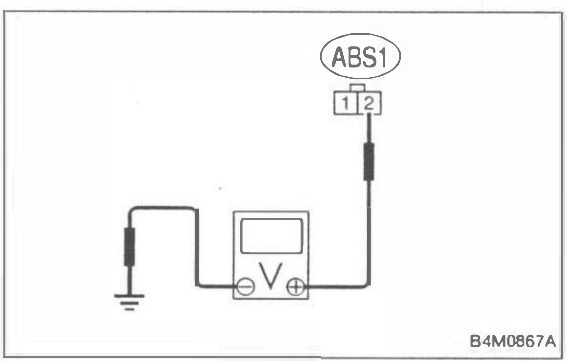


8W11	CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS1) No. 2 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8W12**.
NO : Replace relay box and check fuse SBF6.

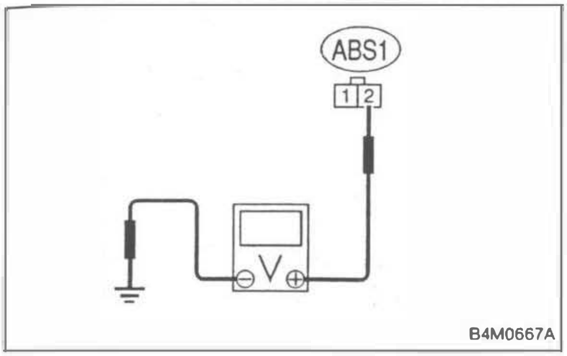


8W12	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Disconnect connector from ABSCM.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS1) No. 2 (+) — Chassis ground (–):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8W13**.
NO : Replace relay box. Check fuse No. 19 and SBF6.

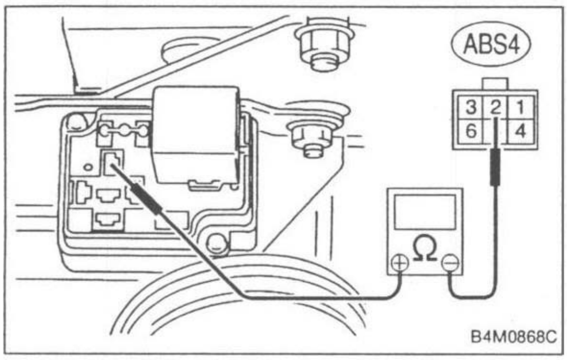


8W13	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS1) No. 2 (+) — Chassis ground (–):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8W14**.
NO : Replace relay box. Check fuse No. 19 and SBF6.

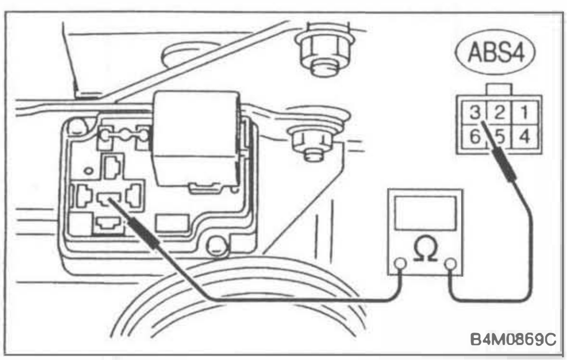


8W14	CHECK DIODE OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Measure resistance between relay box connector and valve relay installing point.

Connector & terminal
Valve relay installing point No. 30 (+) — (ABS4) No. 2 (–):

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8W15**.
NO : Replace relay box.

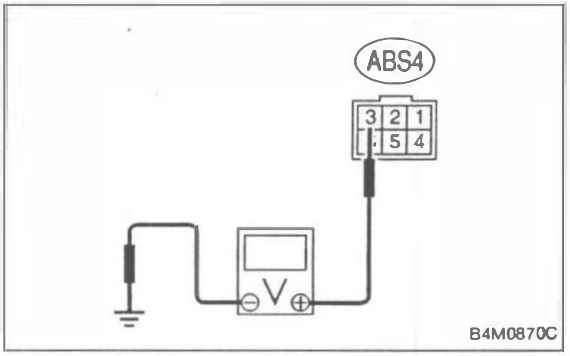


8W15	CHECK OPEN CIRCUIT IN GROUND CIRCUIT OF RELAY BOX.

Measure resistance between relay box connector and valve relay installing point.

Connector & terminal
(ABS4) No. 3 — Valve relay installing point No. 87a:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8W16**.
NO : Replace relay box.

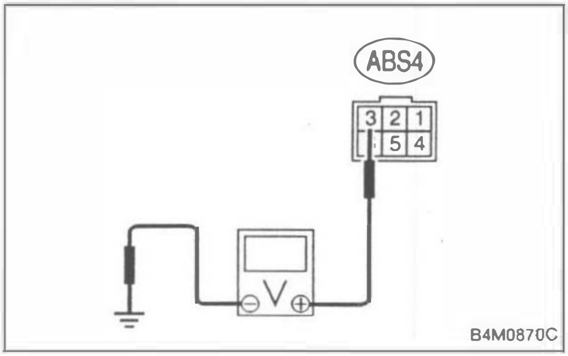


8W16	CHECK BATTERY SHORT IN GROUND CIRCUIT OF RELAY BOX.

Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 3 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8W17**.
NO : Replace relay box and check all fuses.

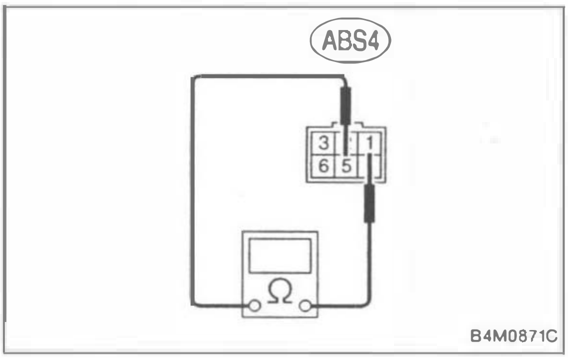


8W17	CHECK BATTERY SHORT IN GROUND CIRCUIT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 3 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8W18**.
NO : Replace relay box and check all fuses.

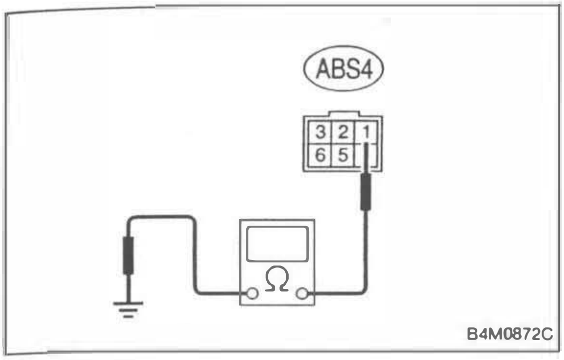


8W18	CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Install valve relay to relay box.
3) Measure resistance between relay box connector terminals.

Connector & terminal
(ABS4) No. 1 — No. 5:

CHECK : ***Is the resistance between 93 and 113 Ω?***
YES : Go to step **8W19**.
NO : Replace relay box.



8W19	CHECK GROUND SHORT IN CONTROL CIRCUIT OF RELAY BOX.

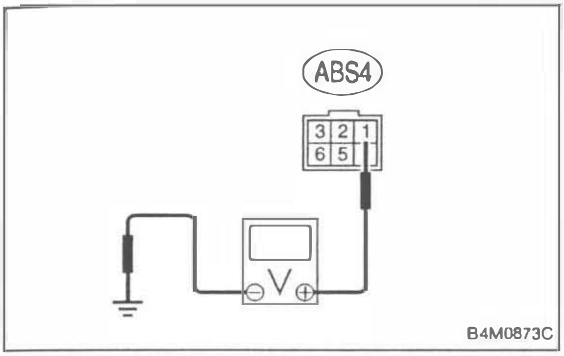
Measure resistance between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 1 — Chassis ground:

CHECK : ***Is the resistance more than 1 MΩ?***

YES : Go to step **8W20**.

NO : Replace relay box and check all fuses.



8W20	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

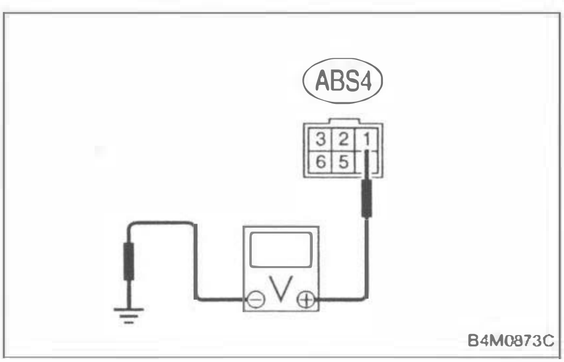
Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 1 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***

YES : Go to step **8W21**.

NO : Replace relay box. Check fuse No. 19 and SBF45A.



8W21	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

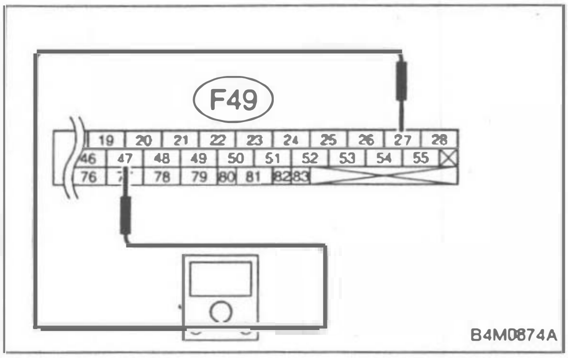
1) Turn ignition switch to ON.
2) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 1 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***

YES : Go to step **8W22**.

NO : Replace relay box. Check fuse No. 19 and SBF45A.



8W22	CHECK OPEN CIRCUIT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

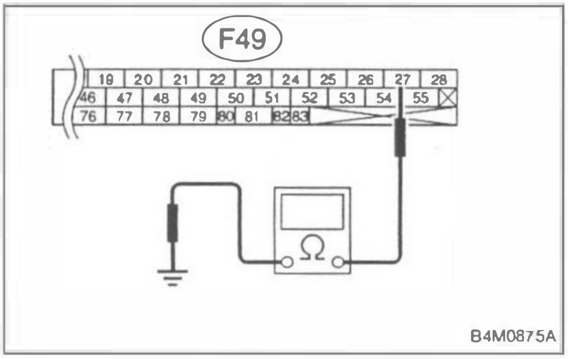
1) Turn ignition switch to OFF.
2) Connect connector (F50) to relay box.
3) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 27 — No. 47:

CHECK ***: Is the resistance between 93 and 113 Ω?***

YES : Go to step **8W23**.

NO : Repair harness between ABSCM and relay box. Check fuse No. 18.



8W23	CHECK GROUND SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

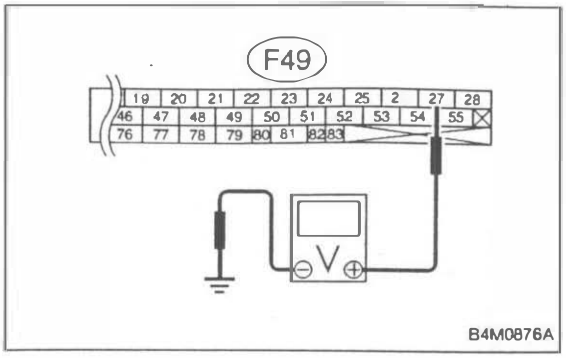
Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 27 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8W24**.

NO : Repair harness between ABSCM and relay box. Check fuse No. 18.



8W24	CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

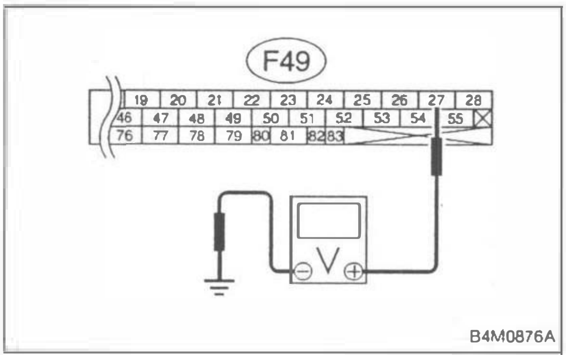
Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 27 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***

YES : Go to step **8W25**.

NO : Repair harness between ABSCM and relay box and check all fuses.



8W25	CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

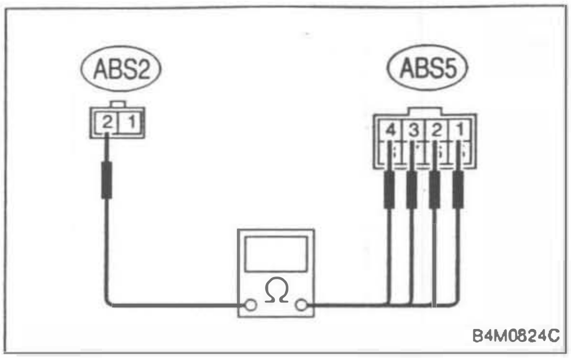
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 27 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***

YES : Go to step **8W26**.

NO : Repair harness between ABSCM and relay box and check all fuses.

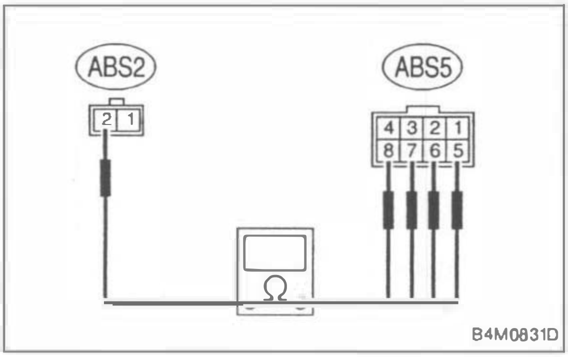


8W26	CHECK RESISTANCE OF INLET SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connector from hydraulic unit.
3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
(ABS5) No. 4 — (ABS2) No. 2:
(ABS5) No. 1 — (ABS2) No. 2:
(ABS5) No. 2 — (ABS2) No. 2:
(ABS5) No. 3 — (ABS2) No. 2:

CHECK : ***Is the resistance between 7.8 and 9.2 Ω?***
YES : Go to step **8W27**.
NO : Replace hydraulic unit.

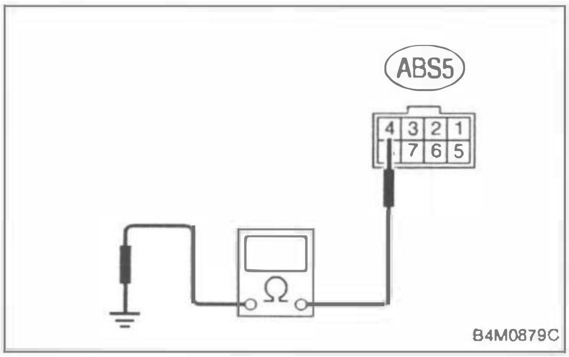


8W27	CHECK RESISTANCE OF OUTLET SOLENOID VALVE.

Measure resistance between hydraulic unit connector terminals.

Connector & terminal
(ABS5) No. 8 — (ABS2) No. 2:
(ABS5) No. 5 — (ABS2) No. 2:
(ABS5) No. 6 — (ABS2) No. 2:
(ABS5) No. 7 — (ABS2) No. 2:

CHECK : ***Is the resistance between 3.8 and 4.8 Ω?***
YES : Go to step **8W28**.
NO : Replace hydraulic unit.

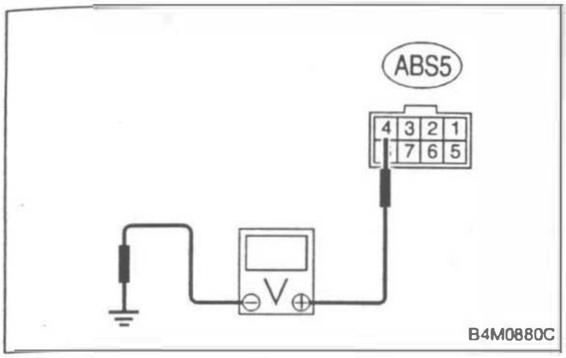


8W28	CHECK GROUND SHORT OF SOLENOID VALVE.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS5) No. 4 — Chassis ground:

CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **8W29**.
NO : Replace hydraulic unit and check all fuses.



8W29	CHECK BATTERY SHORT OF SOLENOID VALVE.

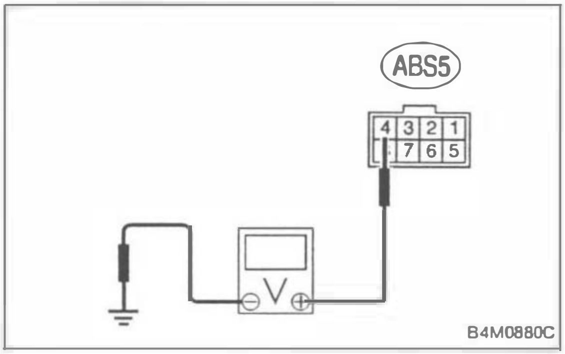
Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS5) No. 4 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***

YES : Go to step **8W30**.

NO : Replace hydraulic unit and check all fuses.



8W30	CHECK BATTERY SHORT OF SOLENOID VALVE.

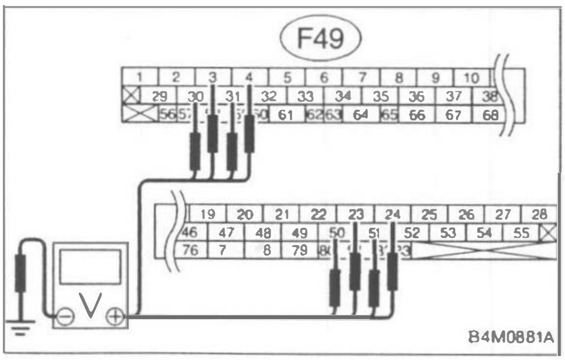
1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS5) No. 4 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***

YES : Go to step **8W31**.

NO : Replace hydraulic unit and check all fuses.



8W31	CHECK BATTERY SHORT OF HARNESS.

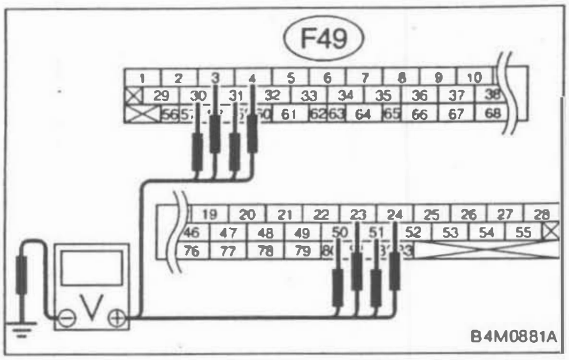
1) Turn ignition switch to OFF.
2) Disconnect connector from hydraulic unit.
3) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 30 (+) — Chassis ground (–):
(F49) No. 24 (+) — Chassis ground (–):
(F49) No. 23 (+) — Chassis ground (–):
(F49) No. 31 (+) — Chassis ground (–):
(F49) No. 3 (+) — Chassis ground (–):
(F49) No. 51 (+) — Chassis ground (–):
(F49) No. 50 (+) — Chassis ground (–):
(F49) No. 4 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***

YES : Go to step **8W32**.

NO : Repair harness between hydraulic unit and ABSCM and check all fuses.

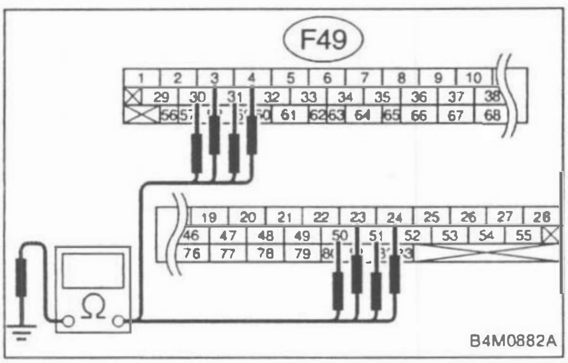


8W32	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 30 (+) — Chassis ground (–):
(F49) No. 24 (+) — Chassis ground (–):
(F49) No. 23 (+) — Chassis ground (–):
(F49) No. 31 (+) — Chassis ground (–):
(F49) No. 3 (+) — Chassis ground (–):
(F49) No. 51 (+) — Chassis ground (–):
(F49) No. 50 (+) — Chassis ground (–):
(F49) No. 4 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8W33**.
NO : Repair harness between hydraulic unit and ABSCM and check all fuses.

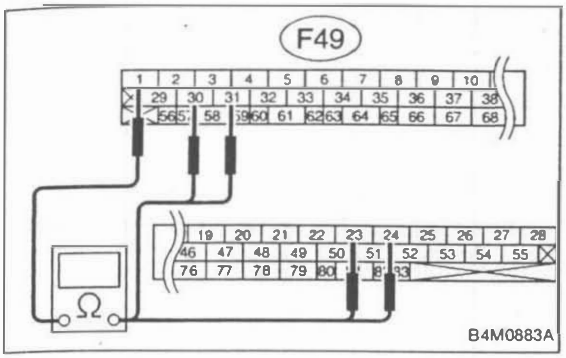


8W33	CHECK GROUND SHORT OF HARNESS.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 30 — Chassis ground:
(F49) No. 24 — Chassis ground:
(F49) No. 23 — Chassis ground:
(F49) No. 31 — Chassis ground:
(F49) No. 3 — Chassis ground:
(F49) No. 51 — Chassis ground:
(F49) No. 50 — Chassis ground:
(F49) No. 4 — Chassis ground:

CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **8W34**.
NO : Repair harness between hydraulic unit and ABSCM.

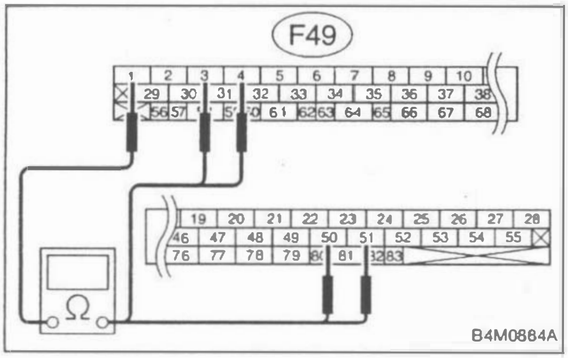


8W34	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

1) Connect connector to hydraulic unit.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 30 — No. 1:
(F49) No. 24 — No. 1:
(F49) No. 23 — No. 1:
(F49) No. 31 — No. 1:

CHECK : ***Is the resistance between 8.3 and 9.7 Ω?***
YES : Go to step **8W35**.
NO : Repair harness/connector between hydraulic unit and ABSCM.



8W35	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 3 — No. 1:
(F49) No. 51 — No. 1:
(F49) No. 50 — No. 1:
(F49) No. 4 — No. 1:

CHECK : ***Is the resistance between 4.3 and 5.3 Ω?***
YES : Go to step **8W36**.
NO : Repair harness/connector between hydraulic unit and ABSCM.

8W36	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connector between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Go to step **8W37**.

8W37	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8W38.**

8W38	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

X: TROUBLE CODE 52 — ABNORMAL MOTOR AND/OR MOTOR RELAY —

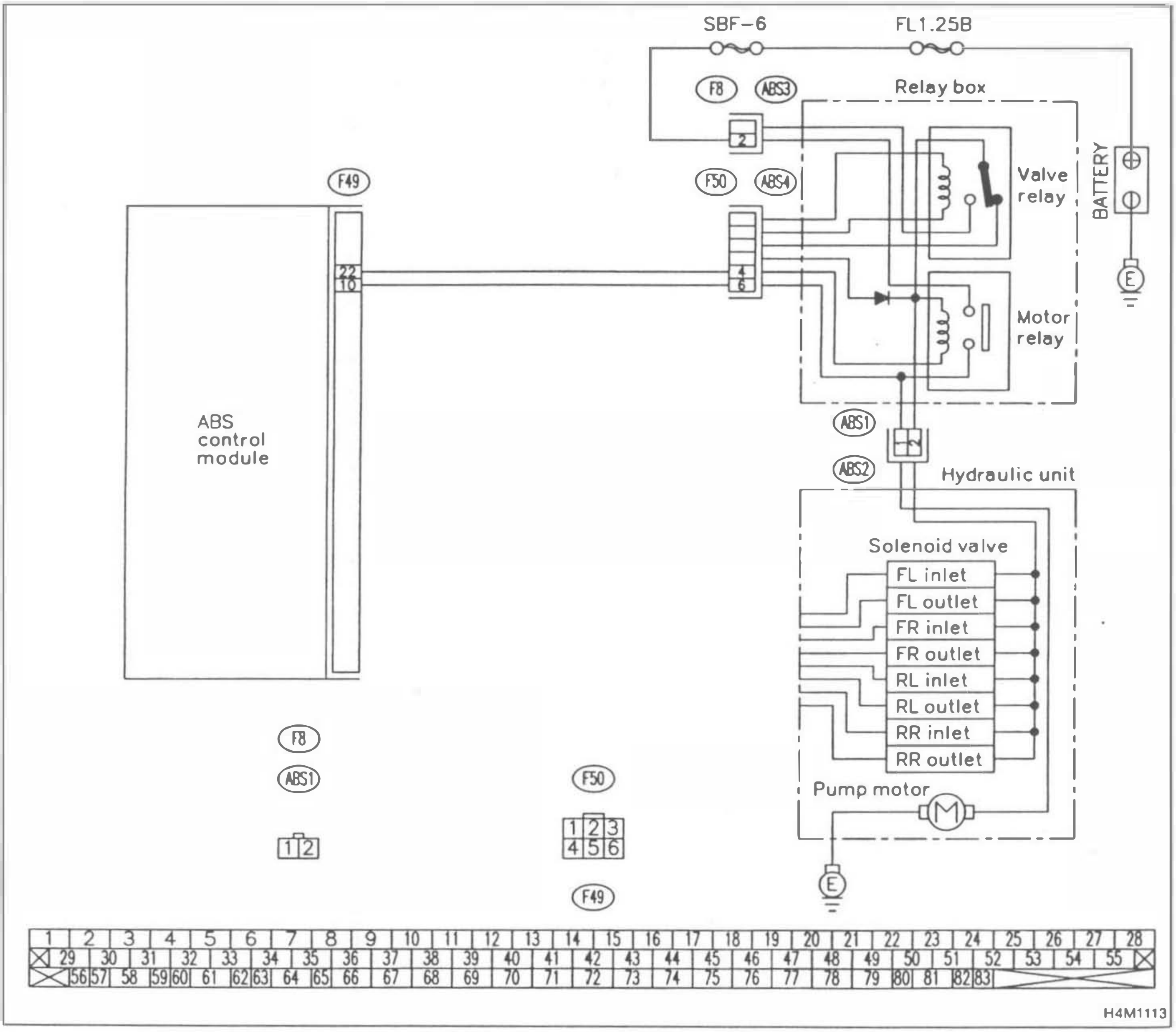
DIAGNOSIS:

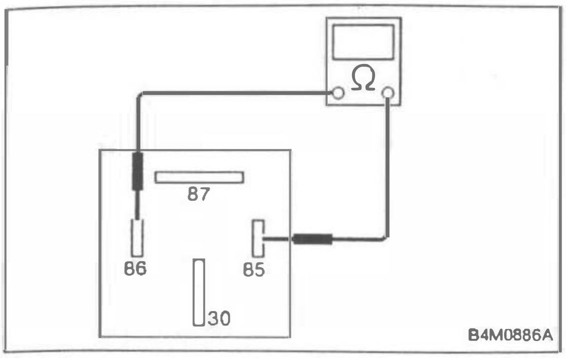
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



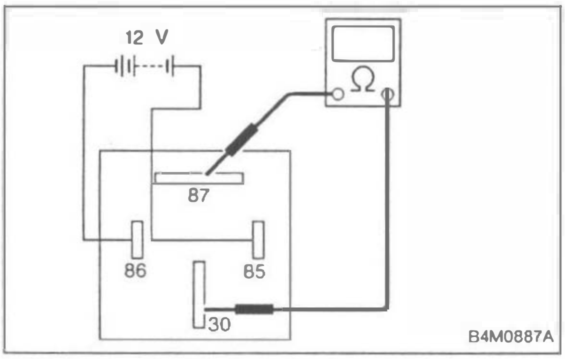


8X1	CHECK RESISTANCE OF MOTOR RELAY.

1) Turn ignition switch to OFF.
2) Remove motor relay from relay box.
3) Measure resistance between motor relay terminals.

Terminals
No. 85 — No. 86:

CHECK : ***Is the resistance between 70 and 90 Ω?***
YES : Go to step **8X2**.
NO : Replace motor relay.

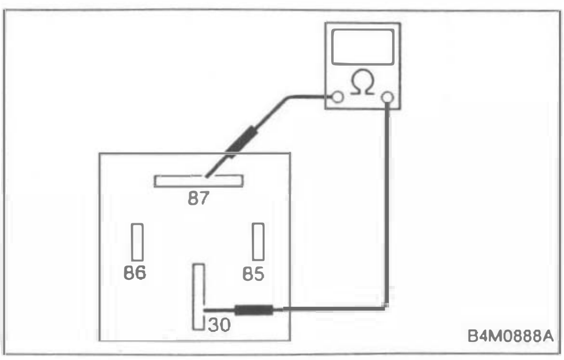


8X2	CHECK CONTACT POINT OF MOTOR RELAY.

1) Connect battery to motor relay terminals No. 85 and No. 86.
2) Measure resistance between motor relay terminals.

Terminals
No. 30 — No. 87:

CHECK : ***Is the resistance less than 0.5 Ω?***
YES : Go to step **8X3**.
NO : Replace motor relay.

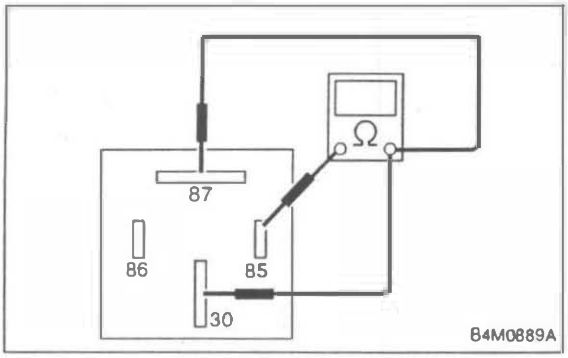


8X3	CHECK CONTACT POINT OF MOTOR RELAY.

1) Disconnect battery from motor relay terminals.
2) Measure resistance between motor relay terminals.

Terminals
No. 30 — No. 87:

CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **8X4**.
NO : Replace motor relay.

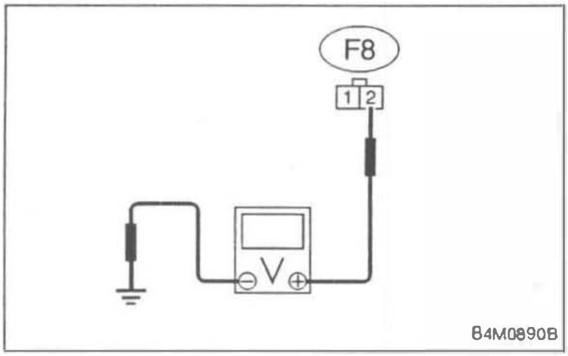


8X4	CHECK SHORT OF MOTOR RELAY.

Measure resistance between motor relay terminals.

Terminals
No. 85 — No. 30:
No. 85 — No. 87:

CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **8X5**.
NO : Replace motor relay.

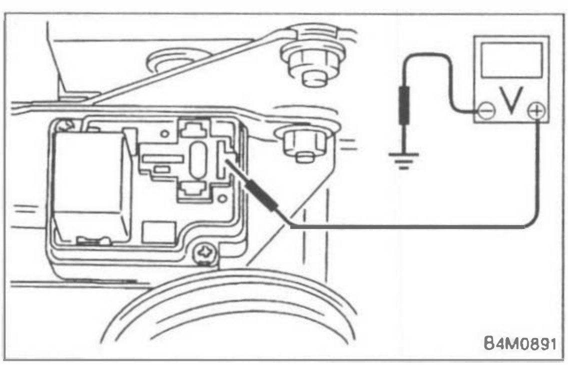


8X5	CHECK INPUT VOLTAGE OF RELAY BOX.

1) Disconnect connector (F8) from relay box.
2) Turn ignition switch to ON.
3) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(F8) No. 2 (+) — Chassis ground (−):

CHECK : ***Is the voltage between 10 V and 13 V?***
YES : Go to step **8X6**.
NO : Repair harness/connector between battery and relay box, and check fuse SBF6.

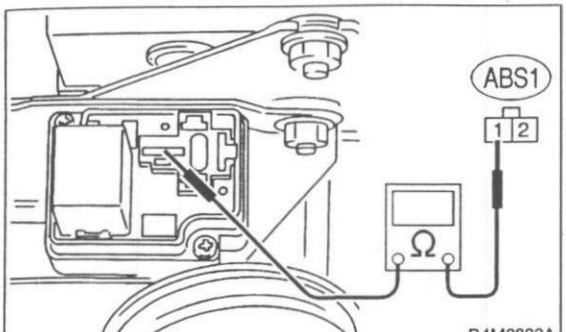


8X6	CHECK INPUT VOLTAGE OF MOTOR RELAY.

1) Turn ignition switch to OFF.
2) Connect connector (F8) to relay box.
3) Turn ignition switch to ON.
4) Measure voltage between relay box and chassis ground.

Connector & terminal
Relay installing point No. 87 (+) — Chassis ground (−):

CHECK : ***Is the voltage between 10 V and 13 V?***
YES : Go to step **8X7**.
NO : Replace relay box, and check fuse SBF6.



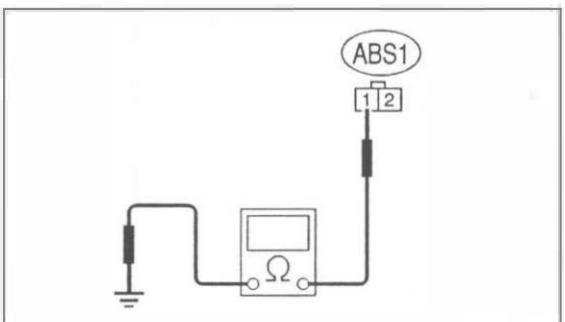
B4M0892A

8X7	CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Disconnect connector (ABS1) from hydraulic unit.
3) Measure resistance between hydraulic unit and motor relay installing portion.

Connector & terminal
(ABS1) No. 1 — Motor relay installing portion No. 30:

CHECK : ***Is the resistance less than 0.5 Ω?***
YES : Go to step **8X8**.
NO : Replace relay box.



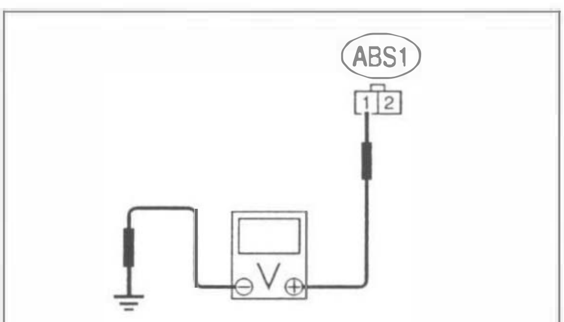
B4M0893A

8X8	CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

Measure resistance between hydraulic unit and chassis ground.

Connector & terminal
(ABS1) No. 1 — Chassis ground:

CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **8X9**.
NO : Replace relay box. Check fuse No. 19.



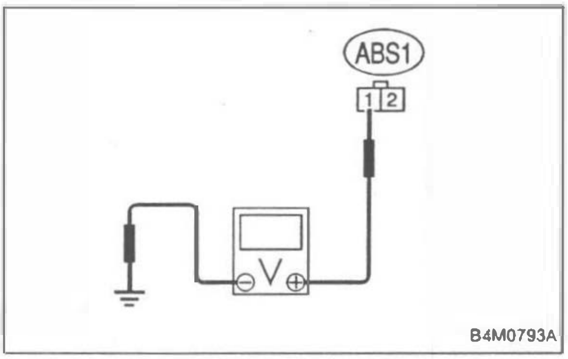
B4M0793A

8X9	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Disconnect connector from ABSCM.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(ABS1) No. 1 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8X10**.
NO : Replace relay box.

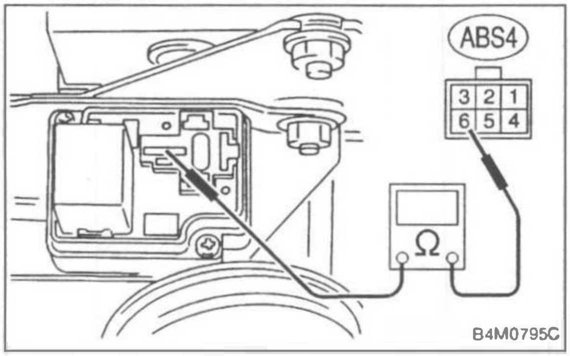


8X10	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(ABS1) No. 1 (+) — Chassis ground (–):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8X11**.
NO : Replace relay box.

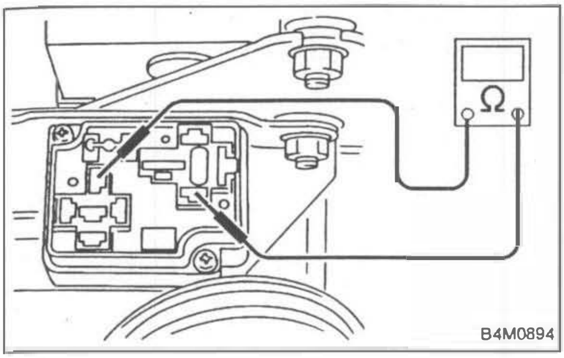


8X11	CHECK OPEN CIRCUIT IN MONITOR SYSTEM CIRCUIT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Disconnect connector (F50) from relay box.
3) Measure resistance between relay box connector and motor relay installing point.

Connector & terminal
(ABS4) No. 6 — Motor relay installing point No. 30:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8X12**.
NO : Replace relay box.

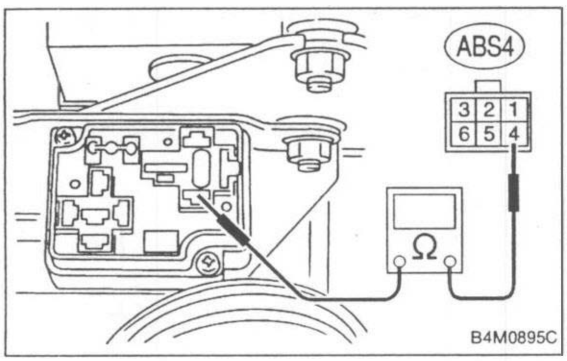


8X12	CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.

1) Remove valve relay from relay box.
2) Measure resistance between motor relay installing point and valve relay installing point.

Connector & terminal
Motor relay installing point No. 86 — Valve relay installing point No. 30:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8X13**.
NO : Replace relay box.

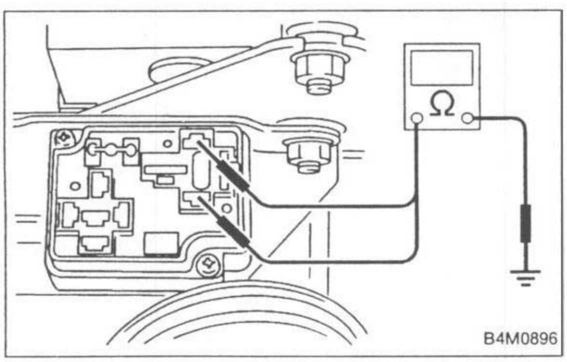


8X13	CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.

Measure resistance between motor relay installing point and relay box connector.

Connector & terminal
Motor relay installing point No. 86 — (ABS4) No. 4:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8X14**.
NO : Replace relay box.

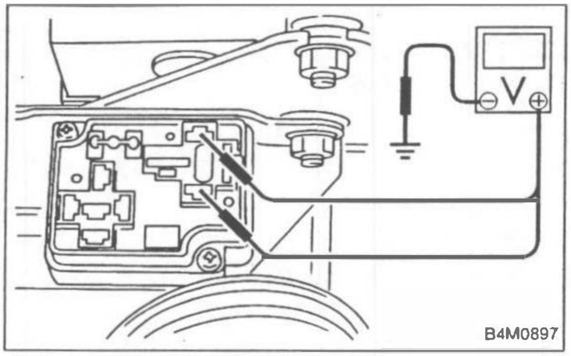


8X14	CHECK GROUND SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure resistance between relay box and chassis ground.

Connector & terminal
Motor relay installing point No. 86 — Chassis ground:
Motor relay installing point No. 85 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8X15**.
NO : Replace relay box. Check fuse No. 19.

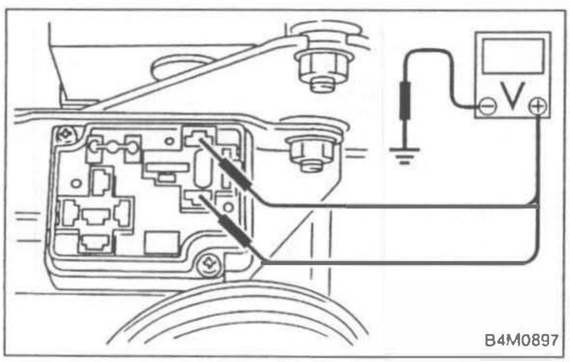


8X15	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure voltage between motor relay installing point an chassis ground.

Connector & terminal
Motor relay installing point (+) No. 86 — Chassis ground (–):
Motor relay installing point (+) No. 85 — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8X16**.
NO : Replace relay box and check all fuses.

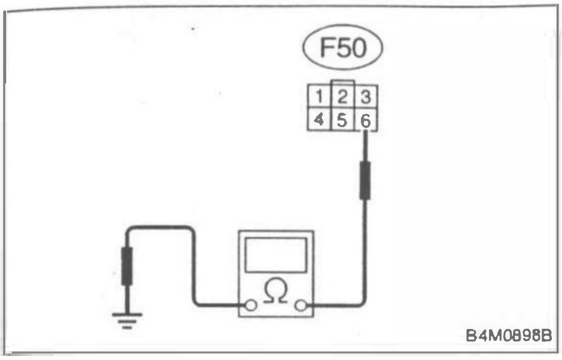


8X16	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between motor relay installing poin and chassis ground.

Connector & terminal
Motor relay installing point (+) No. 86 — Chassis ground:
Motor relay installing point (+) No. 85 — Chassis ground:

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8X17**.
NO : Replace relay box and check all fuses.



8X17	CHECK OPEN CIRCUIT IN MONITOR SYSTEM HARNESS.

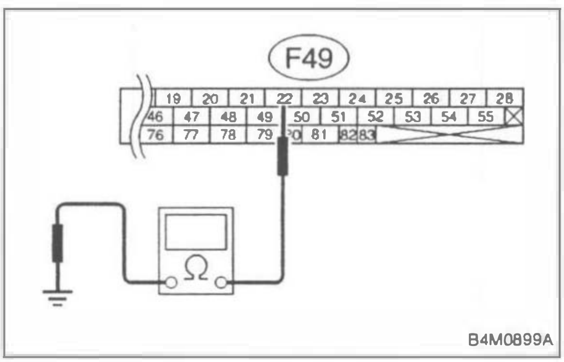
1) Turn ignition switch to OFF.
2) Connect between terminals No. 10 and No. 1 of ABSCM connector (F49) with a lead wire.
3) Measure resistance between relay box connector and chassis ground.

Connector & terminal
(F50) No. 6 — Chassis ground:

CHECK : ***Is the resistance less than 0.5 Ω?***

YES : Go to step **8X18**.

NO : Repair harness/connector between ABSCM and relay box.



8X18	CHECK OPEN CIRCUIT IN RELAY CONTROL SYSTEM HARNESS.

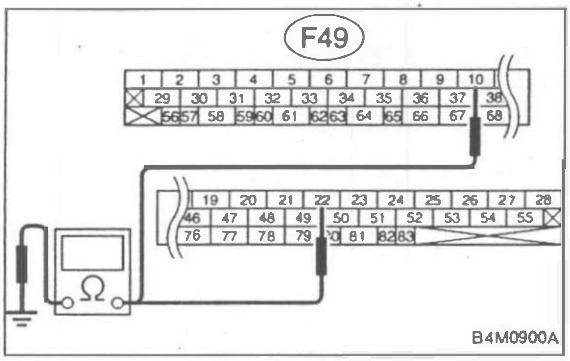
1) Connect valve relay and motor relay to relay box.
2) Connect connector (F50) to relay box.
3) Connect connector to hydraulic unit.
4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 — Chassis ground:

CHECK : ***Is the resistance between 70 and 90 Ω?***

YES : Go to step **8X19**.

NO : Repair harness/connector between ABSCM and relay box.

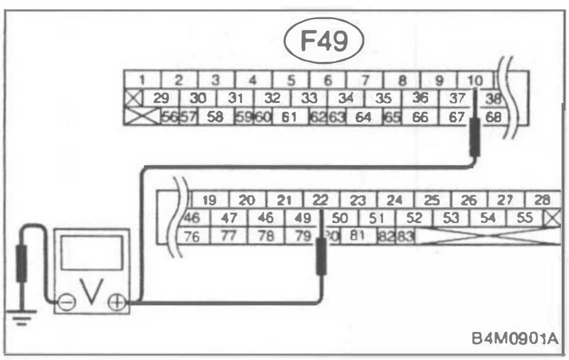


8X19	CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

1) Disconnect connector (F50) from relay box.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 — Chassis ground:
(F49) No. 10 — Chassis ground:

CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **8X20.**
NO : Repair harness between ABSCM and relay box. Check fuse No. 19 and SBF6.

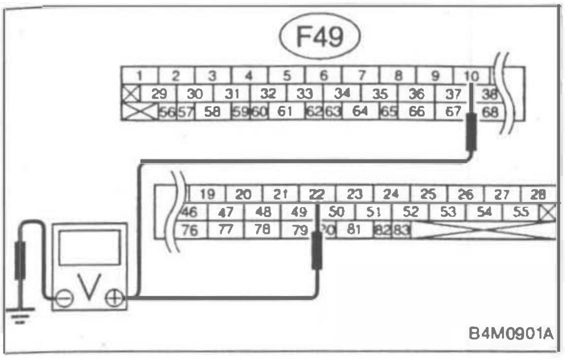


8X20	CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 (+) — Chassis ground (–):
(F49) No. 10 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8X21**.
NO : Repair harness between relay box and ABSCM. Check fuse SBF6.

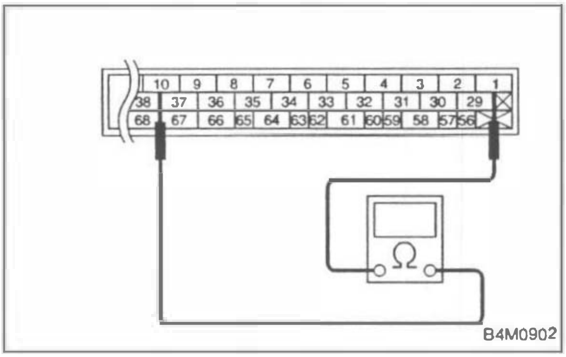


8X21	CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 (+) — Chassis ground (–):
(F49) No. 10 (+) — Chassis ground (–):

CHECK : ***Is the voltage less than 1 V?***
YES : Go to step **8X22**.
NO : Repair harness between relay box and ABSCM. Check fuse SBF6.

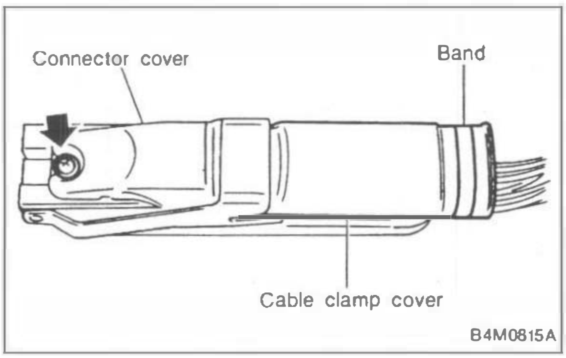


8X22	CHECK GROUND SHORT AT ABSCM MONITOR TERMINAL.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM terminals.

Terminal
No. 10 — No. 1:

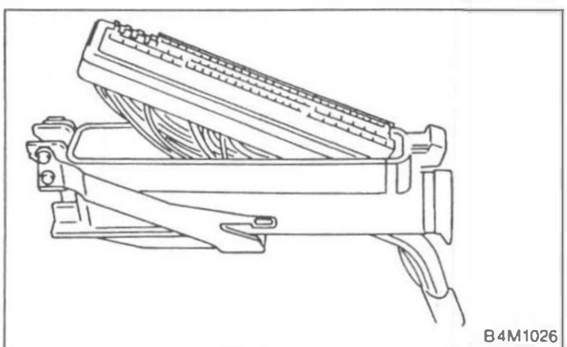
CHECK : ***Is the resistance less than 0.5 Ω?***
YES : Go to step **8X23**.
NO : Replace ABSCM.



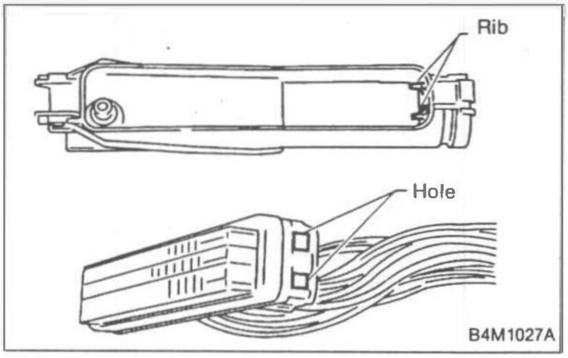
8X23	CHECK BATTERY SHORT IN ABSCM CONNECTOR TERMINAL.

1) Remove band.
2) Remove cable clamp cover.
3) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.

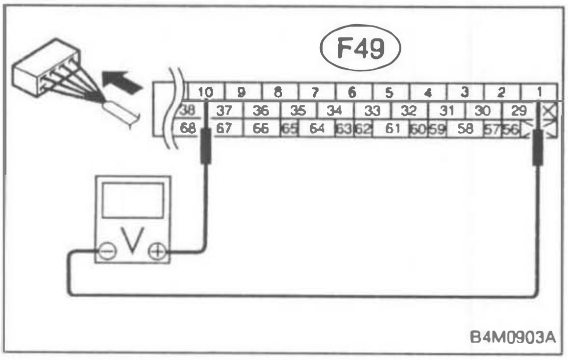


4) Remove connector cover.



NOTE:
- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

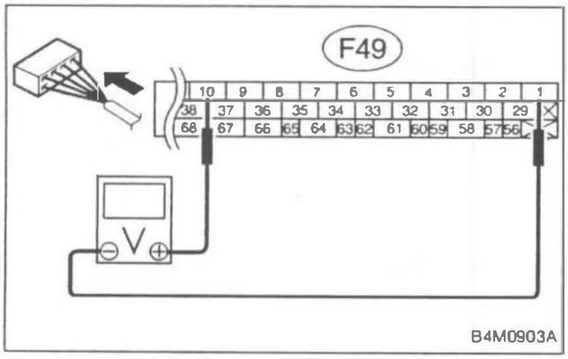
5) Connect all connectors.



6) Measure voltage between ABSCM connector terminals.

Connector & terminal
(F49) No. 10 (+) — No. 1 (–):

CHECK : ***Is the voltage less than 2 V?***
YES : Go to step **8X24**.
NO : Replace ABSCM.

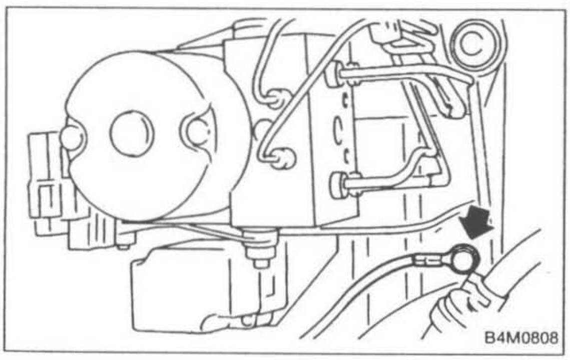


8X24	CHECK BATTERY SHORT IN ABSCM CONNECTOR TERMINAL.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector terminals.

Connector & terminal
(F49) No. 10 (+) — No. 1 (–):

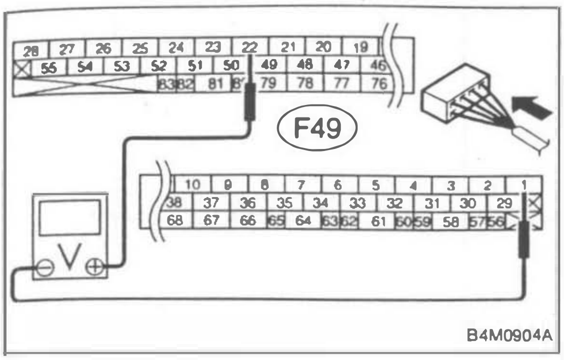
CHECK : ***Is the voltage less than 2 V?***
YES : Go to step **8X25**.
NO : Replace ABSCM.



8X25	CHECK CONDITION OF MOTOR GROUND.

Tightening torque:
32 ± 10 N·m (3.3 ± 1.0 kg-m, 24 ± 7 ft-lb):

CHECK : ***Is the motor ground terminal tightly clamped?***
YES : Go to step **8X26**.
NO : Tighten the clamp of motor ground terminal.



8X26	CHECK ABSCM MOTOR DRIVE TERMINAL.

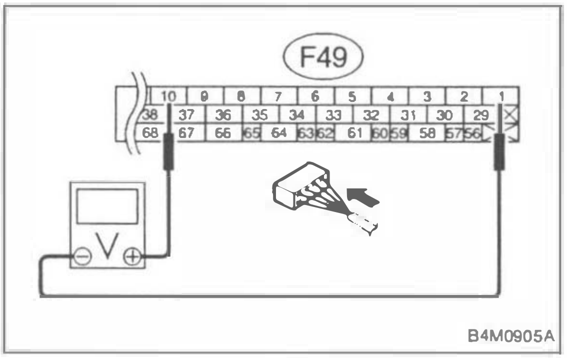
1) Operate the check sequence. <Ref. to 4-4 [W15D1].>
2) Measure voltage between ABSCM connector terminals.

Connector & terminal
(F49) No. 22 (+) — No. 1 (–):

CHECK : ***Does the voltage drop from between 10 V and 13 V to less than 1.5 V, and rise to between 10 V and 13 V again when carrying out the check sequence?***

YES : Go to step **8X27**.

NO : Replace ABSCM.



8X27	CHECK MOTOR OPERATION.

1) Operate the check sequence. <Ref. to 4-4 [W15D1].>
2) Measure voltage between ABSCM connector terminals.

Connector & terminal
(F49) No. 10 (+) — No. 1 (–):

CHECK : ***Does the voltage raise from less than 1.5 V to between 10 V and 13 V, and return to less than 1.5 V again when carrying out the check sequence?***

YES : Go to step **8X28**.

NO : Replace hydraulic unit.

8X28	CHECK MOTOR OPERATION.

Operate the check sequence. <Ref. to 4-4 [W15D1].>

CHECK : ***Can motor revolution noise (buzz) be heard when carrying out the check sequence?***

YES : Go to step **8X29**.

NO : Replace hydraulic unit.

8X29	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK : ***Is there poor contact in connector between hydraulic unit, relay box and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8X30**.

8X30	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8X31**.

8X31	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

Y: TROUBLE CODE 54
— ABNORMAL STOP LIGHT SWITCH —

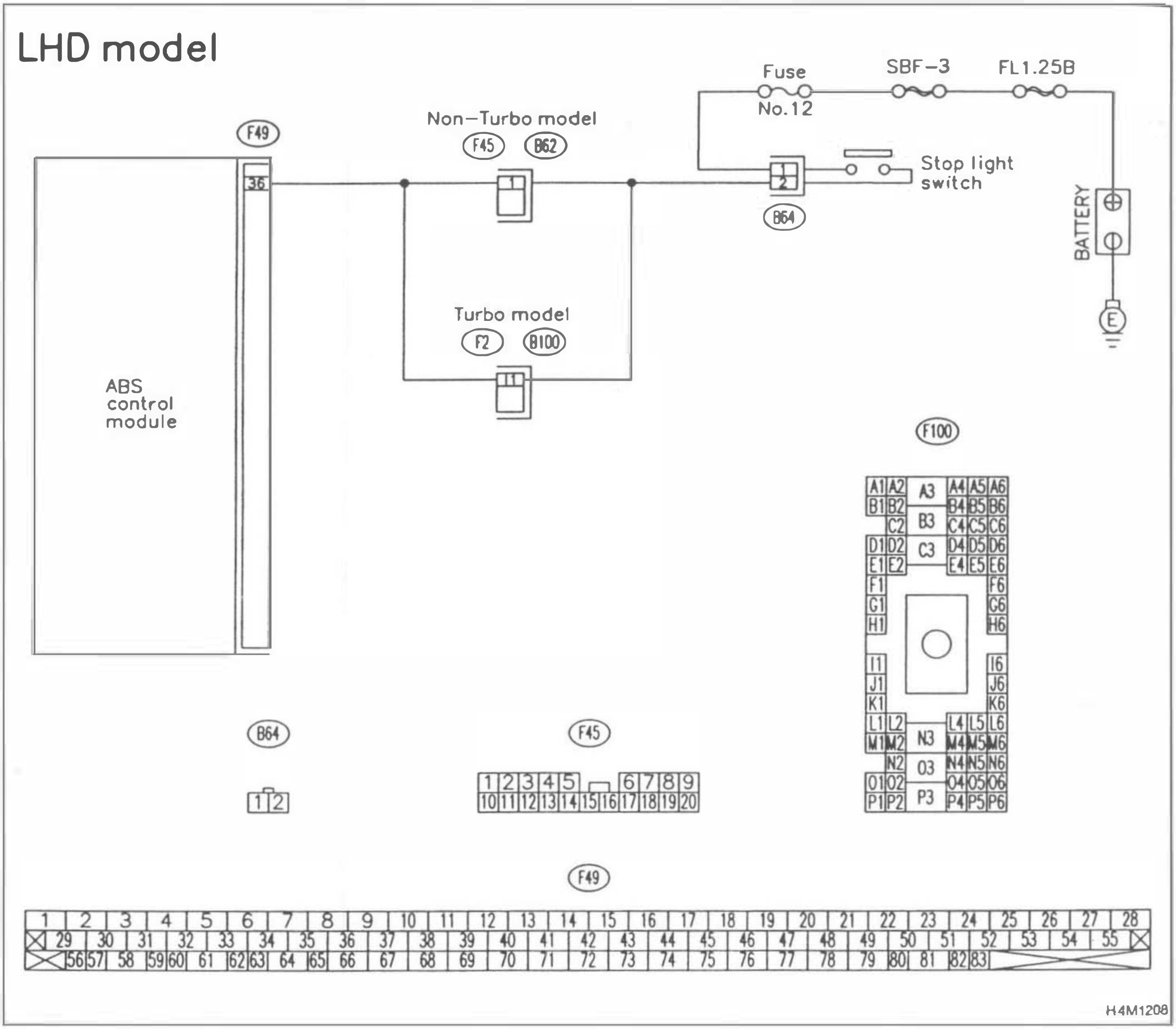
DIAGNOSIS:

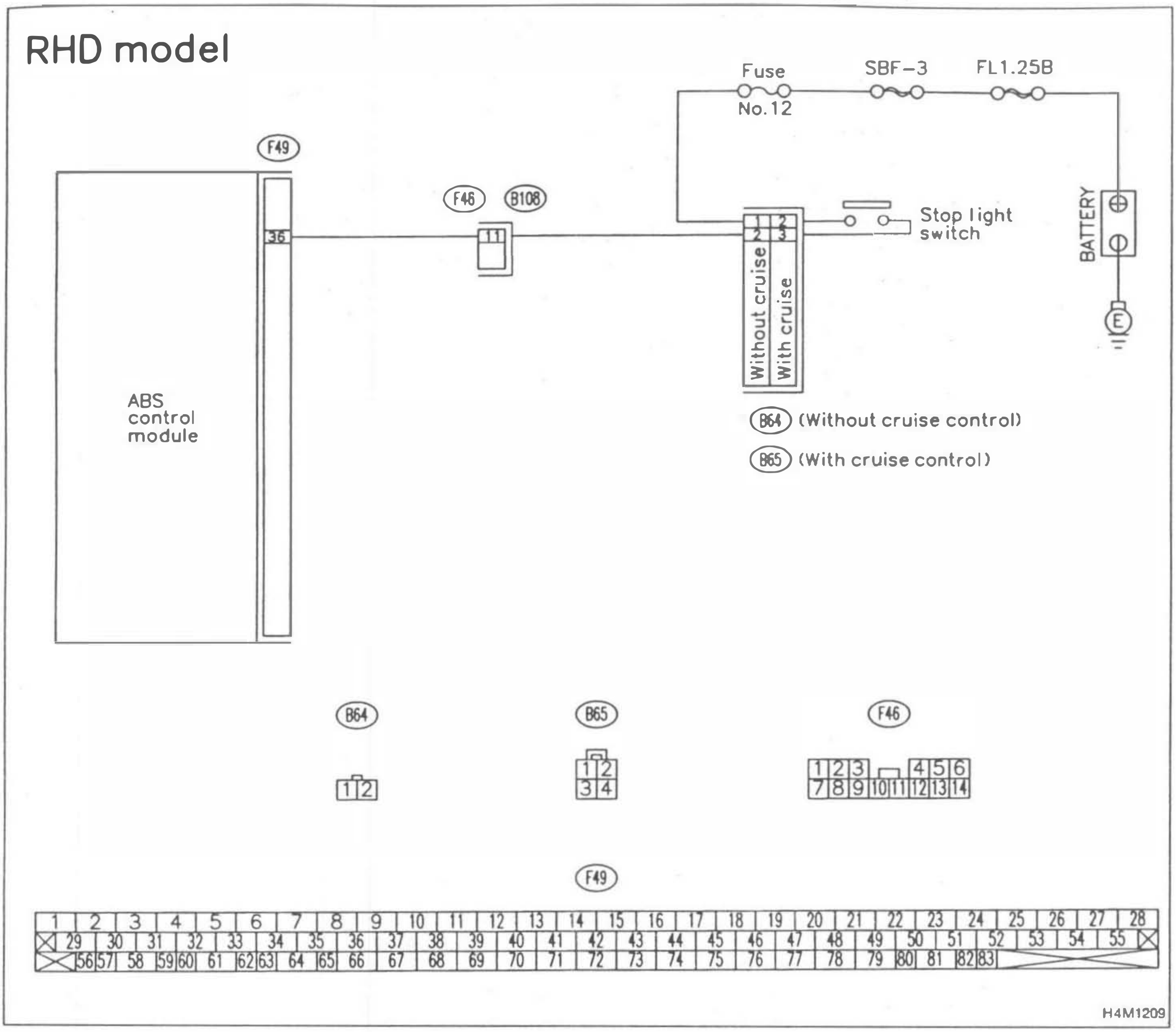
- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:




RHD model
Fuse
No.12
SBF-3
FL1.25B
F49
F46
B108
36
11
Stop light switch
BATTERY
E
Without cruise
With cruise
ABS control module
B64 (Without cruise control)
B65 (With cruise control)
B64
B65
F46
F49
H4M1209

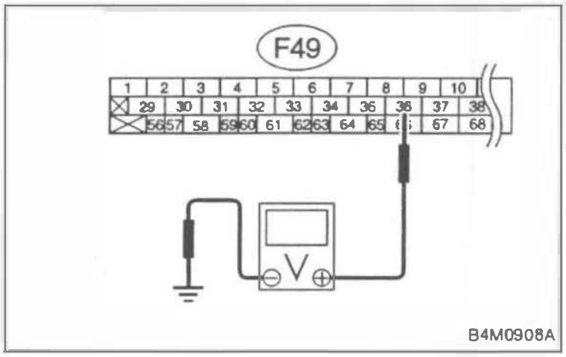
8Y1	CHECK STOP LIGHTS COME ON.

Depress the brake pedal.

CHECK : ***Do stop lights come on?***

YES : Go to step **8Y2.**

NO : Repair stop lights circuit.



8Y2	CHECK OPEN CIRCUIT IN HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Depress brake pedal.
4) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 36 — Chassis ground:

CHECK : ***Is the voltage between 10 V and 13 V?***

YES : Go to step **8Y3**.

NO : Repair harness between stop light switch and ABSCM.

8Y3	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connector between stop light switch and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8Y4**.

8Y4	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8Y5**.

8Y5	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

Z: TROUBLE CODE 56 — ABNORMAL G SENSOR OUTPUT VOLTAGE —

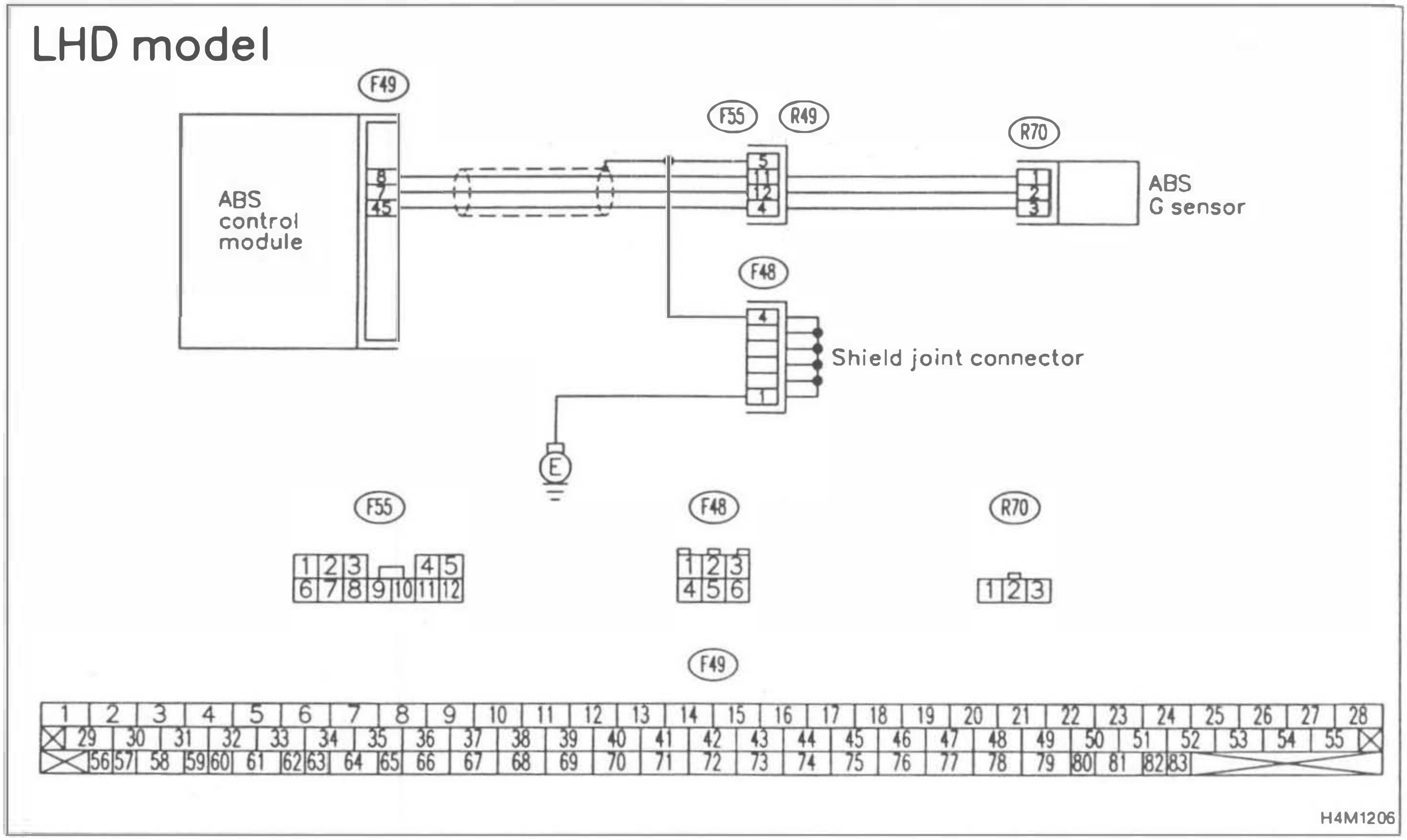
DIAGNOSIS:

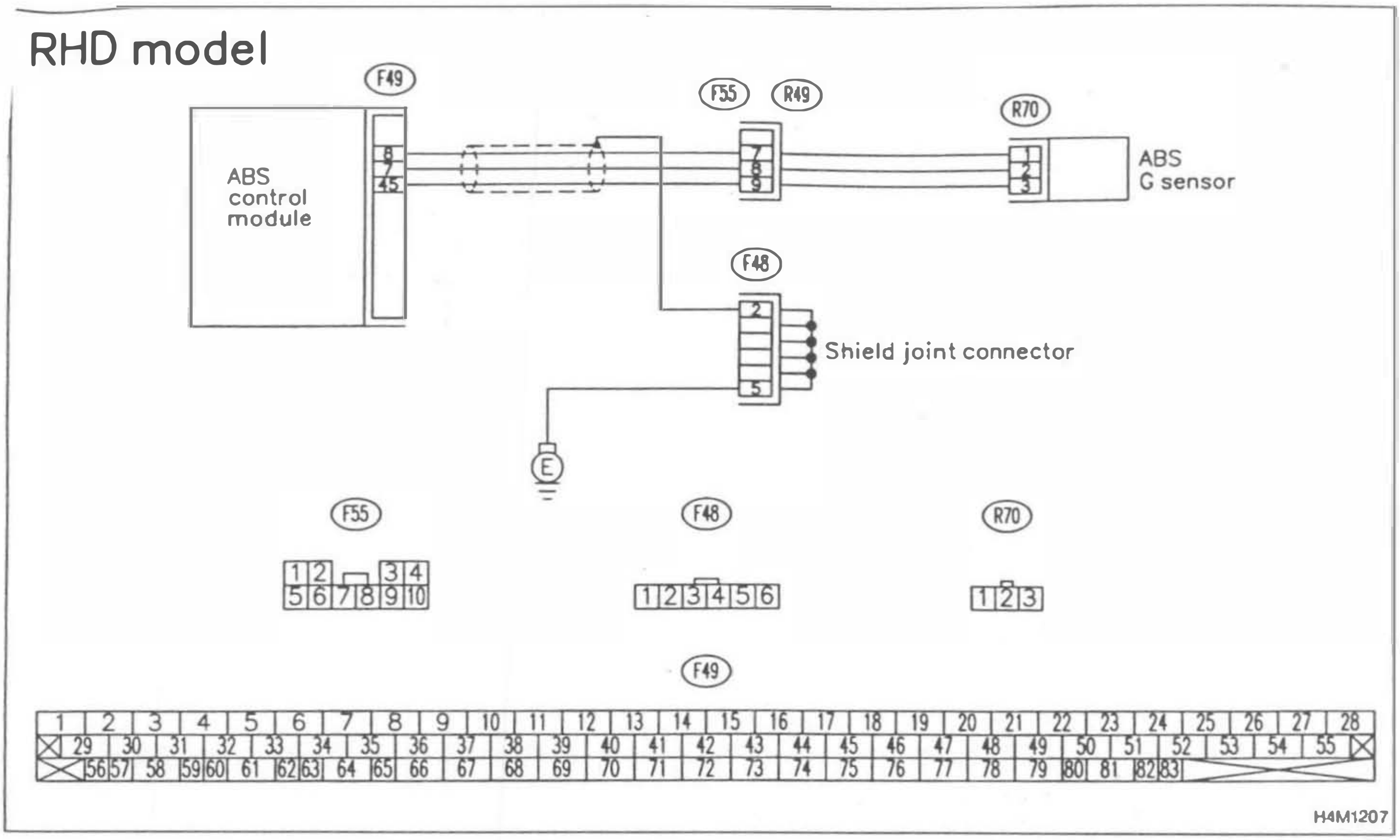
- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



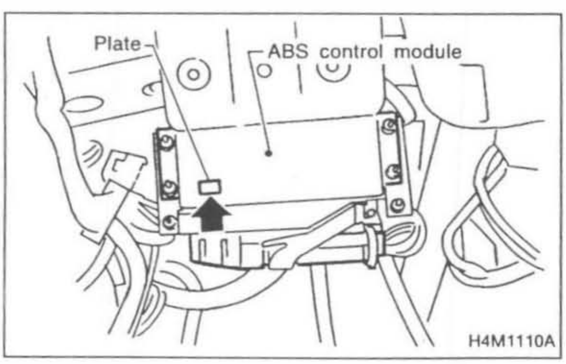


8Z1	CHECK ALL FOUR WHEELS FOR FREE TURNING.

CHECK : ***Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a rolling road?***

YES : The ABS is normal. Erase the trouble code.

NO : Go to step **8Z2**.



8Z2	CHECK SPECIFICATIONS OF ABSCM.

Check specifications of the plate attached to the ABSCM.

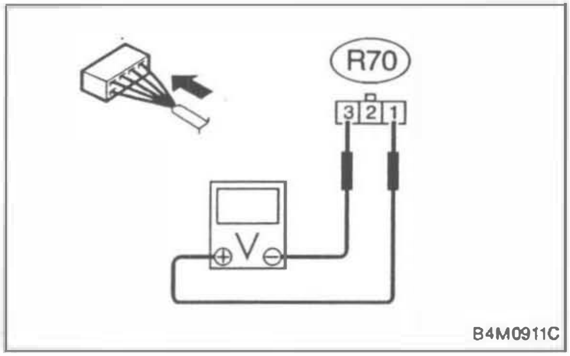
CHECK : ***Is an ABSCM for 4WD model installed on a FWD model?***

CAUTION:

Be sure to turn ignition switch to OFF when removing ABSCM.

YES : Replace ABSCM.

NO : Go to step **8Z3**.



8Z3	CHECK INPUT VOLTAGE OF G SENSOR.

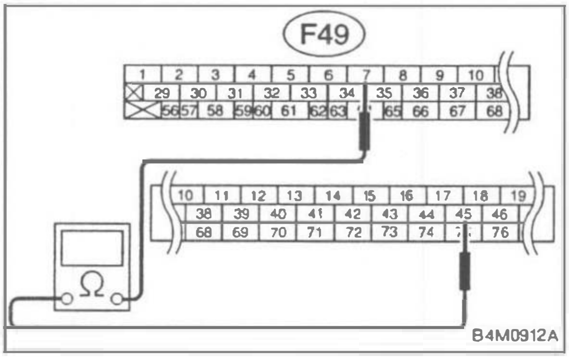
1) Turn ignition switch to OFF.
2) Remove console box.
3) Disconnect G sensor from body. (Do not disconnect connector.)
4) Turn ignition switch to ON.
5) Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 1 (+) — No. 3 (–):

CHECK : ***Is the voltage between 4.75 and 5.25 V?***

YES : Go to step **8Z4**.

NO : Repair harness/connector between G sensor and ABSCM.



8Z4	CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.

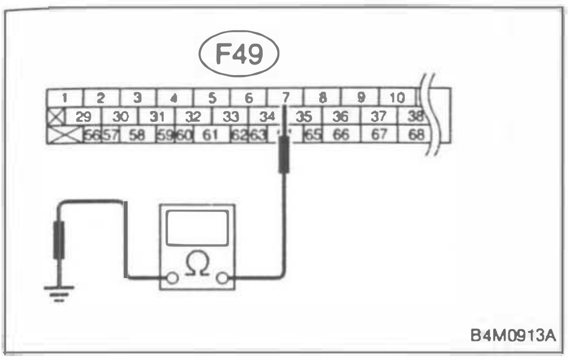
1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 7 — No. 45:

CHECK : ***Is the resistance between 4.3 and 4.9 kΩ?***

YES : Go to step **8Z5**.

NO : Repair harness/connector between G sensor and ABSCM.

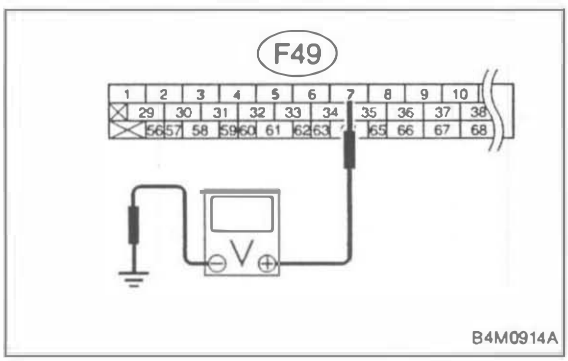


8Z5	CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.

1) Disconnect connector from G sensor.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 — Chassis ground:

CHECK **: *Is the resistance more than 1 MΩ?***
YES : Go to step **8Z6**.
NO : Repair harness between G sensor and ABSCM.

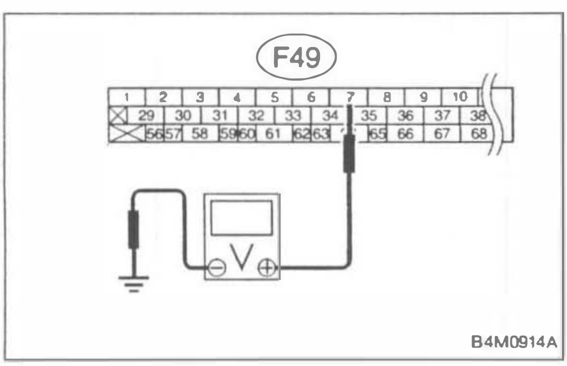


8Z6	CHECK BATTERY SHORT OF HARNESS.

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 (+) — Chassis ground (–):

CHECK **: *Is the voltage less than 1 V?***
YES : Go to step **8Z7**.
NO : Repair harness between G sensor and ABSCM.

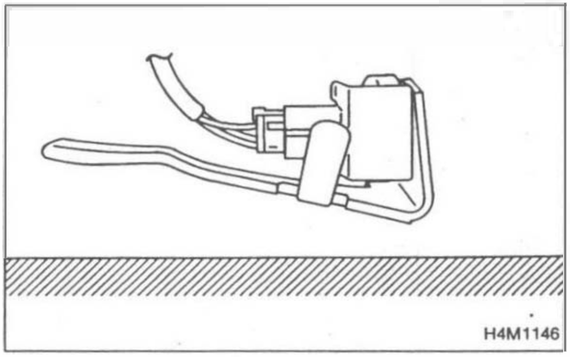


8Z7	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 (+) — Chassis ground (–):

CHECK **: *Is the voltage less than 1 V?***
YES : Go to step **8Z8**.
NO : Repair harness between G sensor and ABSCM.



8Z8	CHECK G SENSOR.

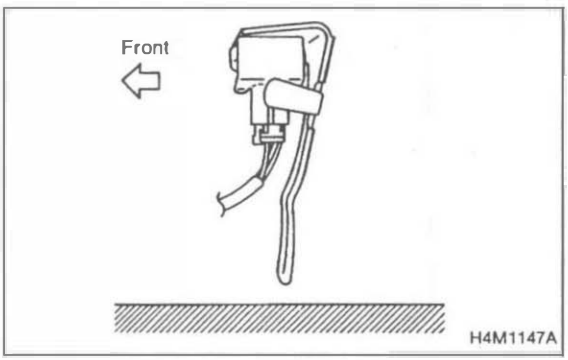
1) Turn ignition switch to OFF.
2) Remove G sensor from vehicle.
3) Connect connector to G sensor.
4) Connect connector to ABSCM.
5) Turn ignition switch to ON.
6) Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (–):

CHECK : ***Is the voltage between 2.1 and 2.5 V when G sensor is horizontal?***

YES : Go to step **8Z9**.

NO : Replace G sensor.



8Z9	CHECK G SENSOR.

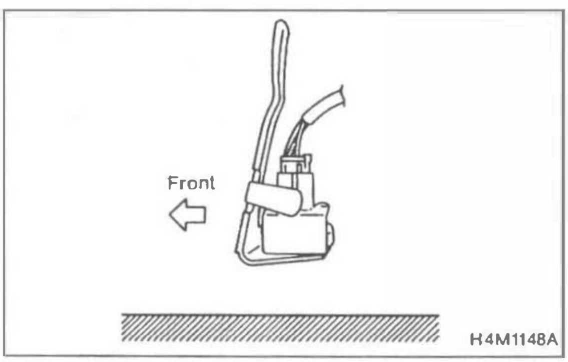
Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (–):

CHECK : ***Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?***

YES : Go to step **8Z10**.

NO : Replace G sensor.



8Z10	CHECK G SENSOR.

Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (–):

CHECK : ***Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?***

YES : Go to step **8Z11**.

NO : Replace G sensor.

8Z11	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connector between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8Z12**.

8Z12	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8Z13.**

8Z13	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

1. Pedal Effort Reducing Mechanism

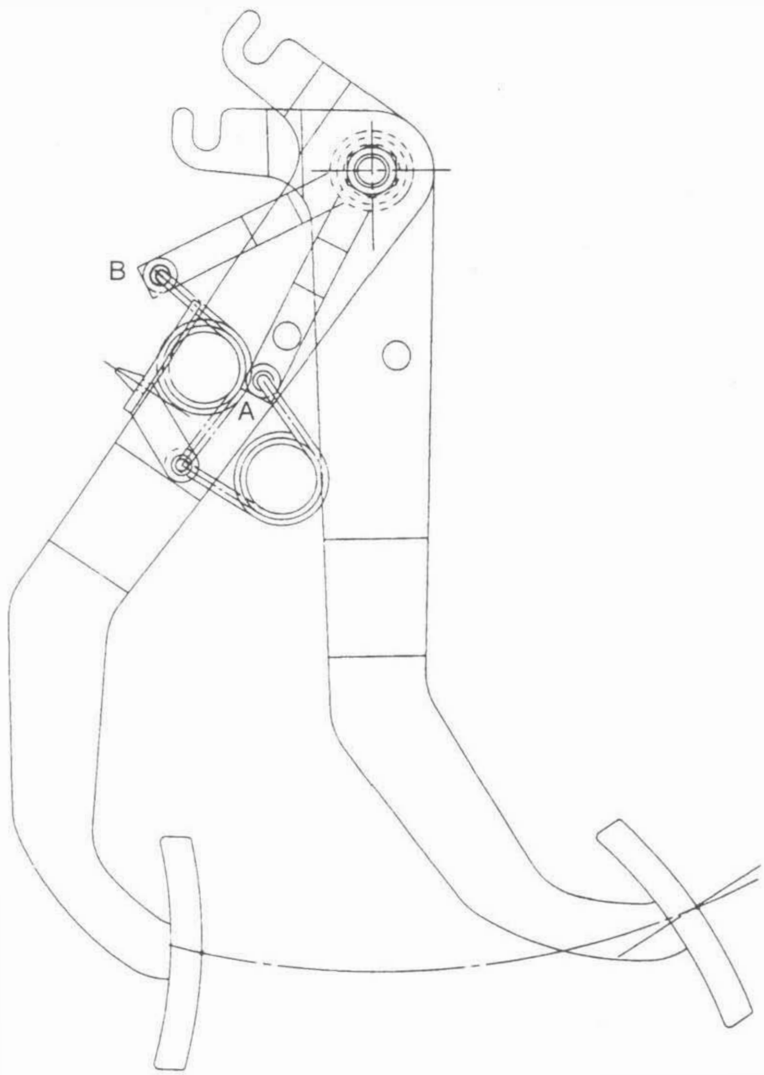
The pedal effort reducing mechanism uses a mechanical turnover system as shown below. It is installed on vehicles which require a large force for the clutch pedal.

A: CONSTRUCTION

An arm is made integral with the clutch pedal, and spring-hook is connected to the arm end bushing.

B: OPERATION

When the clutch pedal is depressed, point A moves toward point B, spring-hook makes a swing. The pedal depressing effort becomes small when the prolonged line of the spring-hook passes over the center of the pedal shaft.



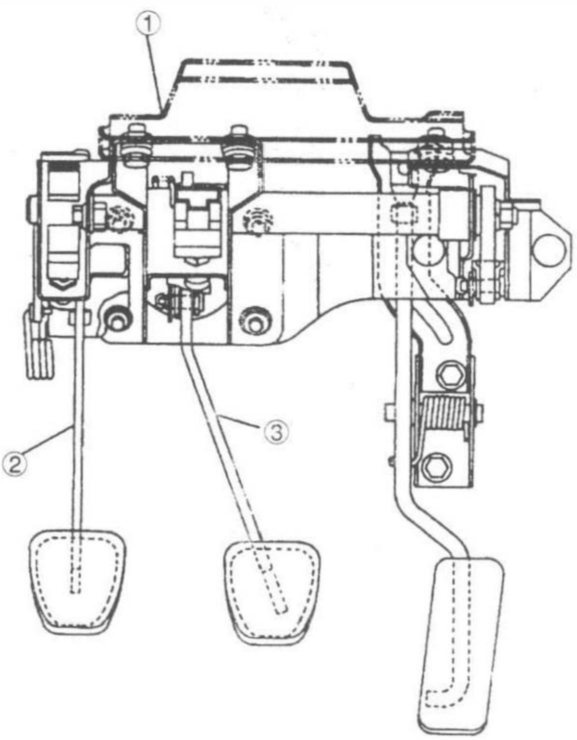
G4H0001

2. Hydraulic Clutch Pedal System [TURBO]

A: CONSTRUCTION

- LHD model

The hydraulic clutch pedal is connected to the master cylinder (which produces oil pressure) a rod. The accelerator pedal and brake pedal are secured to the same bracket.



1. Brake and clutch pedal bracket
2. Clutch pedal
3. Brake pedal

1. Heater System

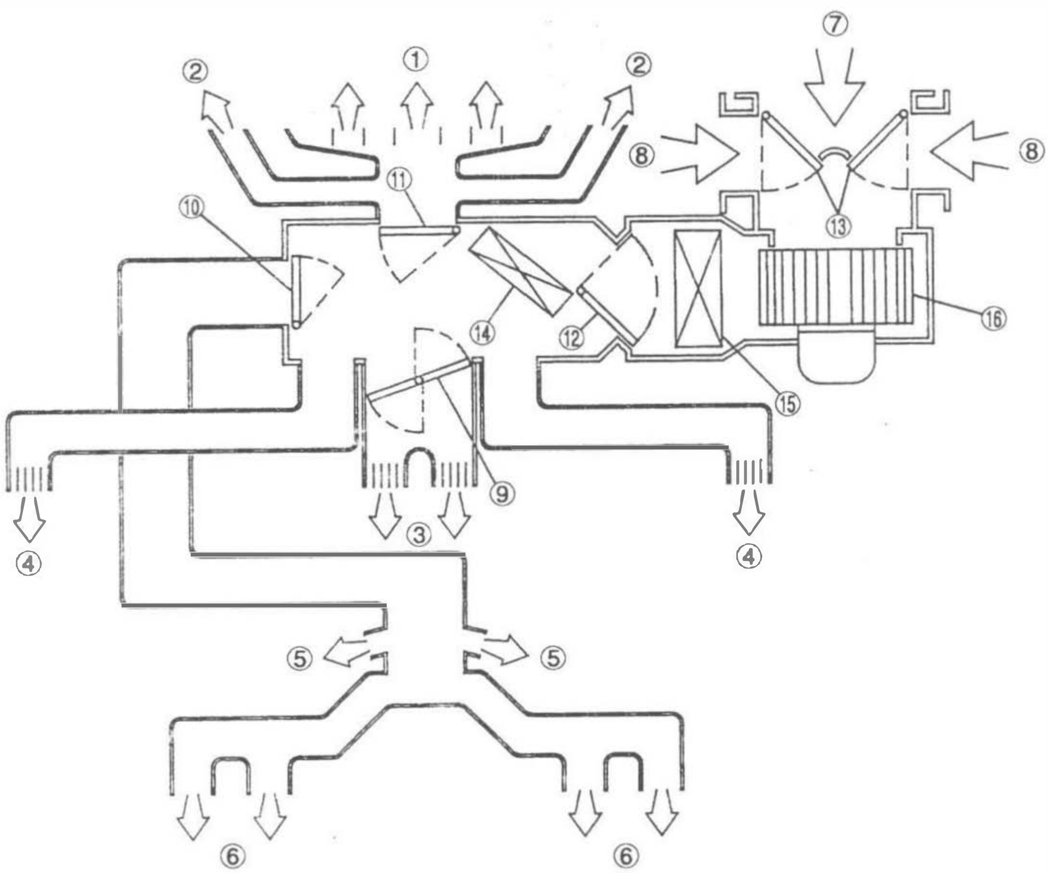
The heater control unit is located in the middle portion of the instrument panel.

The heater unit is provided with mode doors and an air mix door. The intake unit is provided with an intake door and blower motor. The heater unit and the intake unit are regulated by their control units.

Fresh outside air is introduced into the compartment through the center and side ventilator grilles when the blower fan is operated.

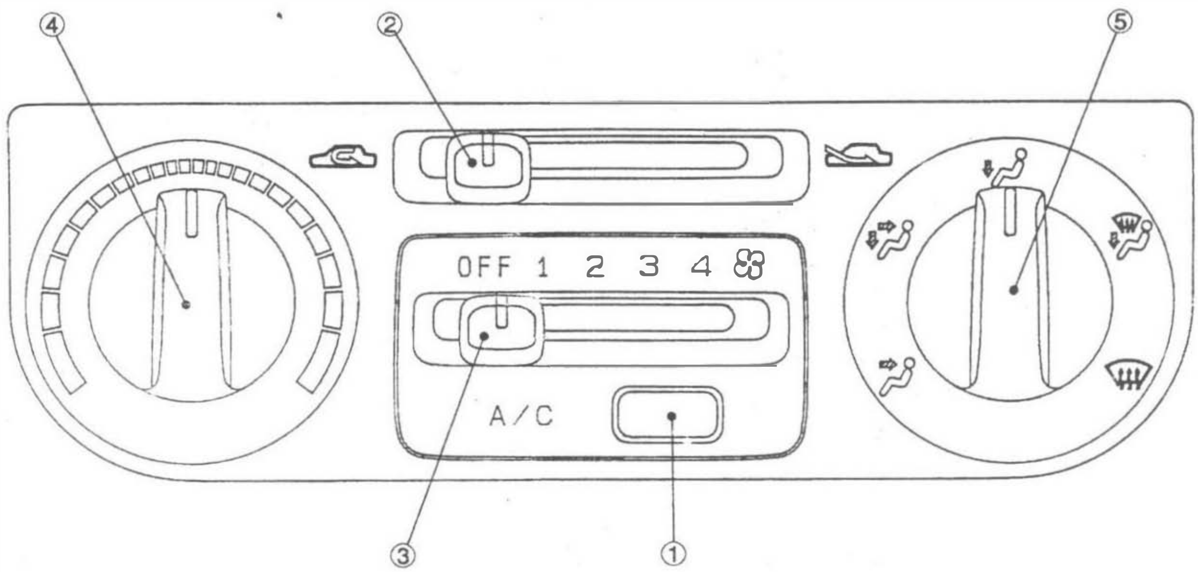
All models are equipped with the front side window defroster.

A: LHD MODEL



① Front defroster outlet
② Side defroster outlet
③ Center outlet
④ Side outlet
⑤ Front heater outlet
⑥ Rear heater outlet
⑦ Fresh inlet air
⑧ Recirc air
⑨ Vent door
⑩ Heater door
⑪ Defroster door
⑫ Air mix door
⑬ Intake door
⑭ Heater core
⑮ Evaporator (A/C model)
⑯ Blower fan

2. Switch Function

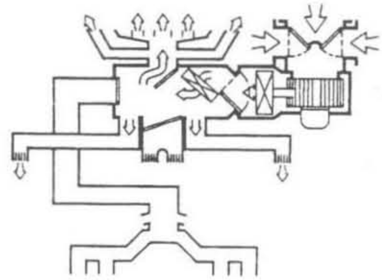
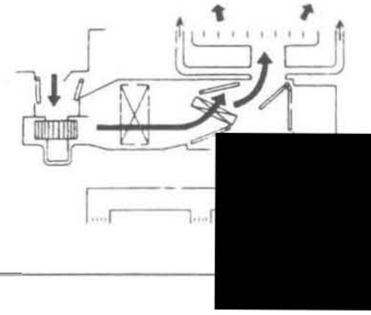
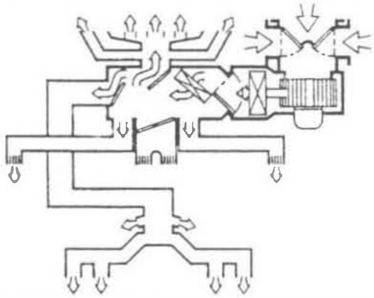
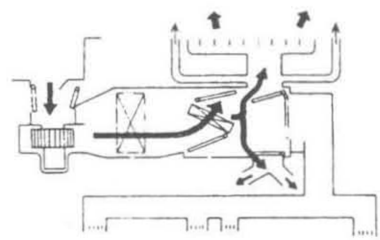
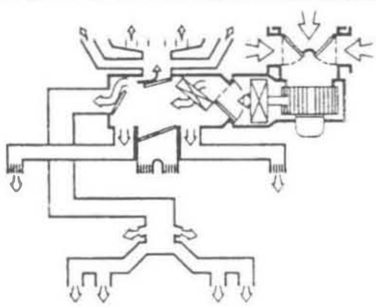
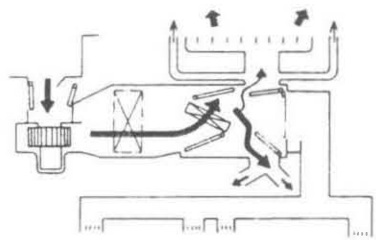
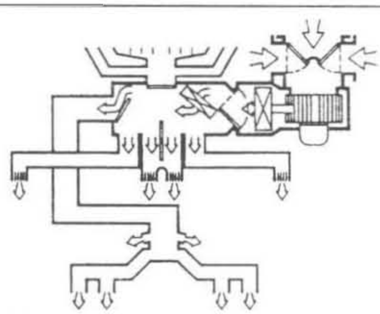
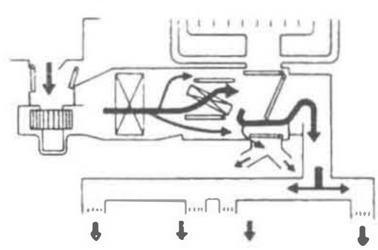
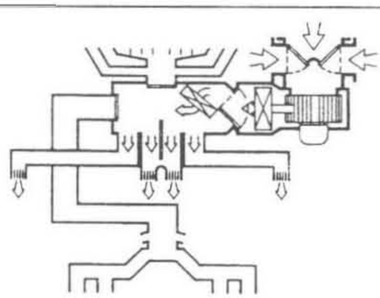
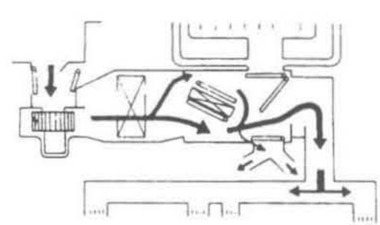


1	A/C switch	Indicator	*ON		OFF		
		Compressor	ON		OFF		
		*: When fan switch is "ON", indicator light and compressor turn "ON".					
2	Recirc switch	Switch position					
		Intake door position	Recirc		Fresh		
3	Fan switch	Switch position	**1**	**2**	**3**	**4**	
		Fan speed	1st	2nd	3rd	4th	
4	Temperature control switch	Outlet air temperature can be variably controlled from COLD to HOT.					
5	Mode selector switch	Switch position					
		Air outlet	Vent	Vent Heat	Heat	DEF Heat	DEF

H4H1036

3. Mode Selector Switch and Air Flow

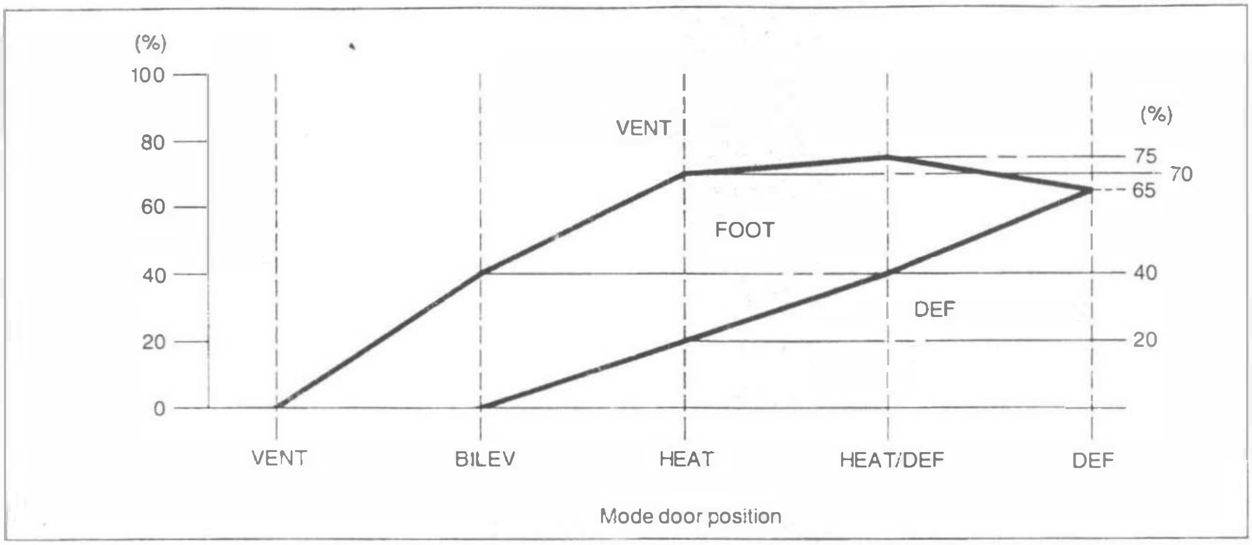
A: AIR FLOW

Mode selector switch position	Air flow	
	LHD model	RHD model
 DEF		
 DEF/HEAT		
 HEAT		
 BI – LEVEL		
 VENT		

H4H1

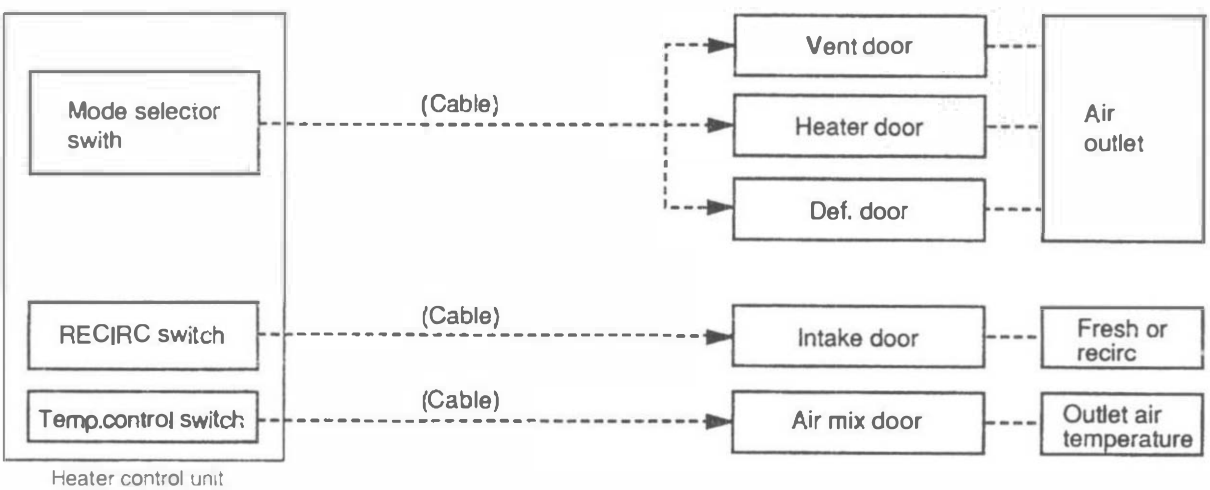
B: AIR DISTRIBUTION RATIO

Figure shows air distribution ratios corresponding to mode door position.



G4H0030

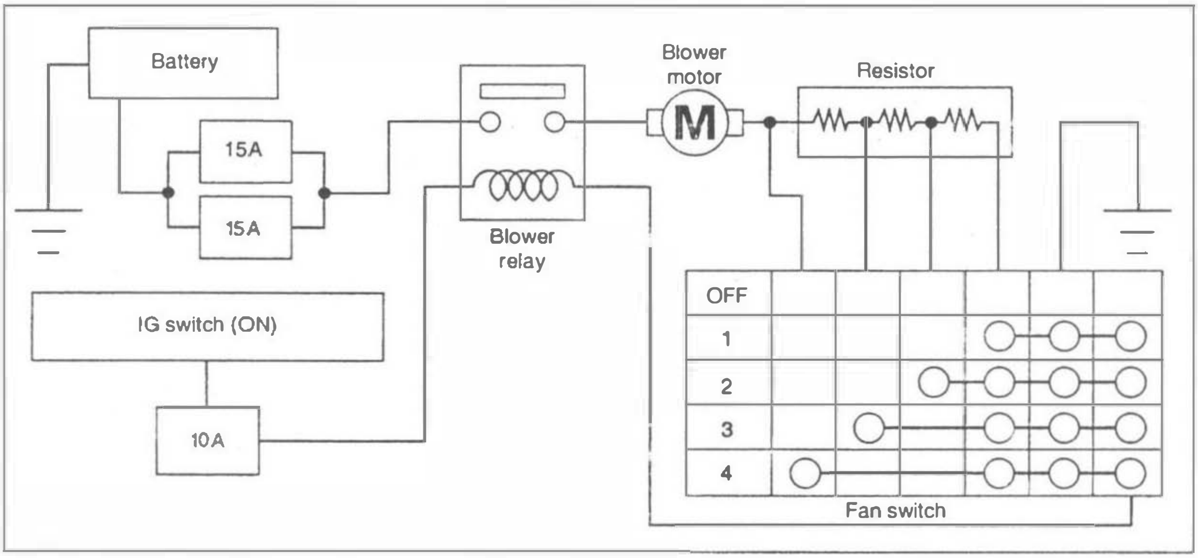
C: SYSTEM FLOW



H4H1038

4. Blower System

Operation of the blower relay is controlled by turning ON and OFF the ignition switch. When the ignition switch is ON and the fan switch is operated from 1st to 4th speed, electric current from the battery goes through the blower motor, the resistor, the fan switch and ground. The resistor is switched by the position of the fan switch, and controls the blower motor speed from 1st to 4th.



H4H1097

1. Air Conditioning Cycle

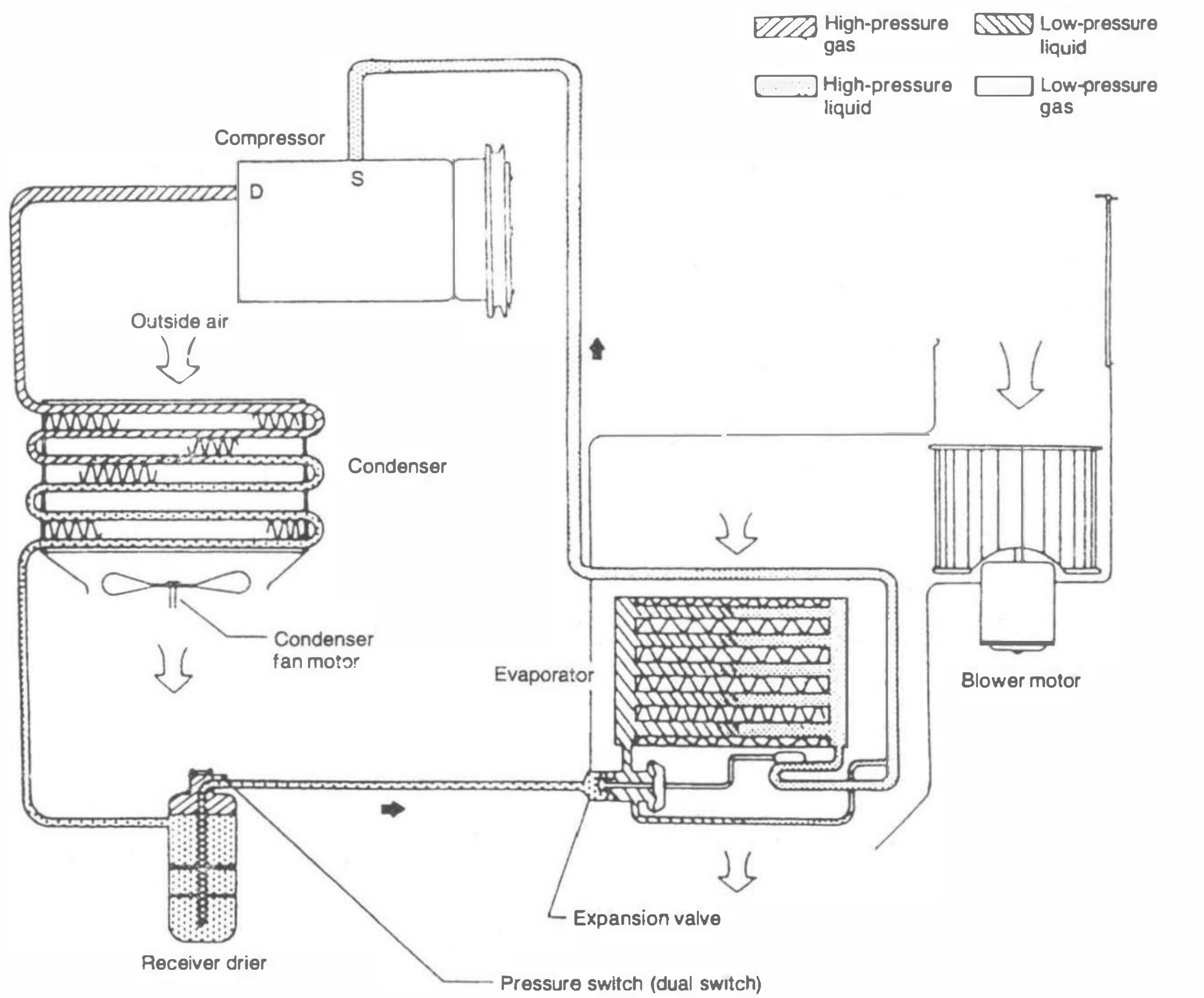
A: GENERAL

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the receiver drier, through the evaporator, and back to the compressor.

The refrigerant flow through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

The compressor repeats on and off to maintain the evaporator temperature within a specified range. When the evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts the compressor operation. When the evaporator coil temperature rises above the specification, the thermo control amplifier allows compressor operation.

The refrigerant system is protected against excessively high or low pressures by the dual switch, located on the receiver drier. If the system pressure rises above, or falls below the specifications, the dual switch opens to interrupt compressor operation.



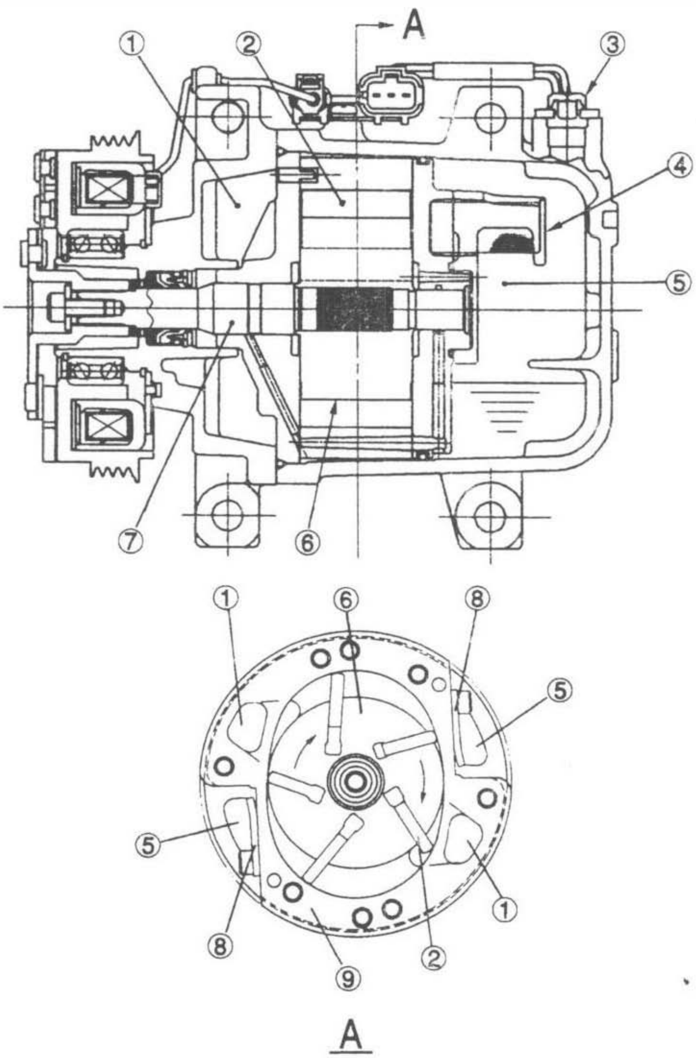
G4H0302

2. Compressor

A: LHD MODEL

1. GENERAL

The vane rotor type compressor turns around the center axis of the elliptical cylinder, and the vanes, with their ends in contact with the inside wall of the cylinder, move up and down the rotor grooves. The vanes are positioned around the rotor, each equally spaced apart from another. Both sides of the cylinder are sealed by side blocks. The space, enclosed by the neighboring vanes, two side blocks, outer circumference of the rotor and inside wall of the cylinder, becomes smaller as the rotor turns, thereby compressing the internal gas. When the end of a vane sliding on the inside wall of the cylinder goes past the suction port, the vane closes the suction port. The compression stroke starts at the position. When the gas ahead of the vane is compressed and discharged through the discharge valve, the next vane is already on the suction stroke. Since suction and compression of the gas are separately performed in this manner, the compressed gas left behind in the discharge port never returns to the suction port. Since no suction valve is required, there is no loss caused by a suction valve. (A low pressure check valve is provided on the front head and a high pressure trigger valve provided on the rear head to apply a pressure to the back plane of vane.)



G4H0303

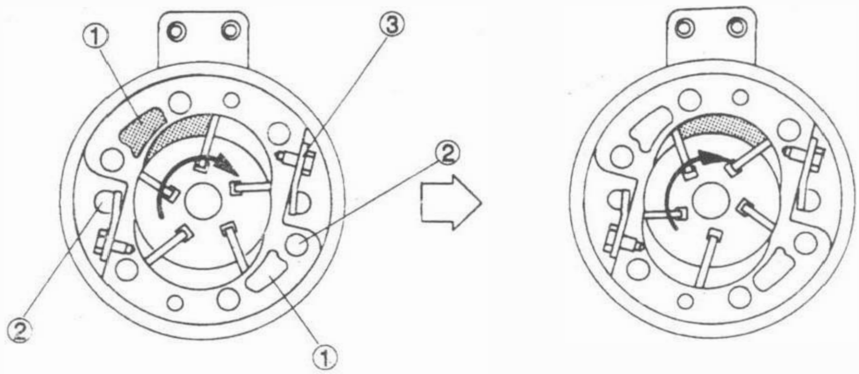
1. Suction port
2. Vane
3. Thermal protector
4. Oil separator
5. Discharge port
6. Rotor
7. Rotor shaft
8. Discharge valve
9. Cylinder

2. FUNCTION

During the period the truly round rotor turns through half a rotation (180 degrees), a cycle of the suction, compression and discharge strokes is completed. Each time the rotor turns through a rotation (360 degrees), the vanes complete two cycles each, or 10 cycles in total.

1) Suction

The refrigerant gas, that leaves the evaporator as the compressor turns, enters the low pressure chamber of the compressor, and is drawn in from the suction port as the vanes turn.

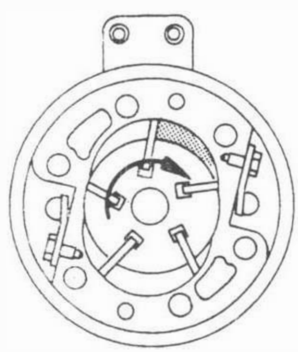


G4H0304

① Suction port
② Discharge port
③ Discharge valve

2) Compression

When suction is completed, the refrigerant gas in the cylinder chamber enclosed by the vanes is compressed as the vanes rotate. In this case, air tightness between the vane ends and cylinder inside surface is maintained by a lubricant.

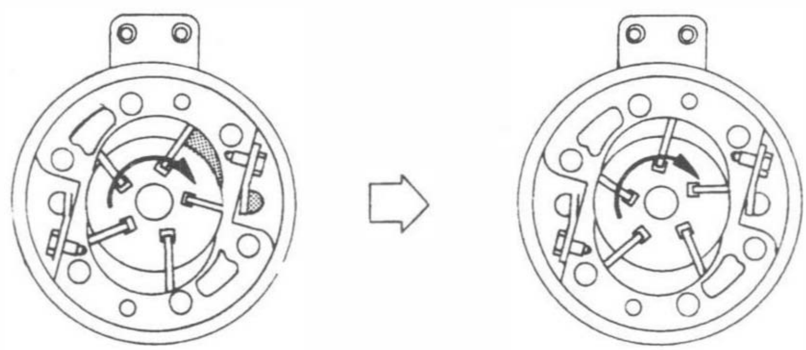


G4H0305

3) Discharge

When continuous compression causes the pressure in the cylinder chamber to rise to the extent that the pressure exceeds the pressure in the high pressure chamber, the refrigerant gas is discharged. Even when the pressure in the cylinder chamber is lower than that in the high pressure chamber, the cylinder gas never flows back to the cylinder chamber, as the discharge valve is pressed into the closed position by the pressure in the high pressure chamber.

The compressor repeated the above-mentioned cycle. Each time the rotor turns through a rotation, the five chambers partitioned by the vanes in the cylinder go through the suction, compression and discharge strokes twice each.



G4H0306

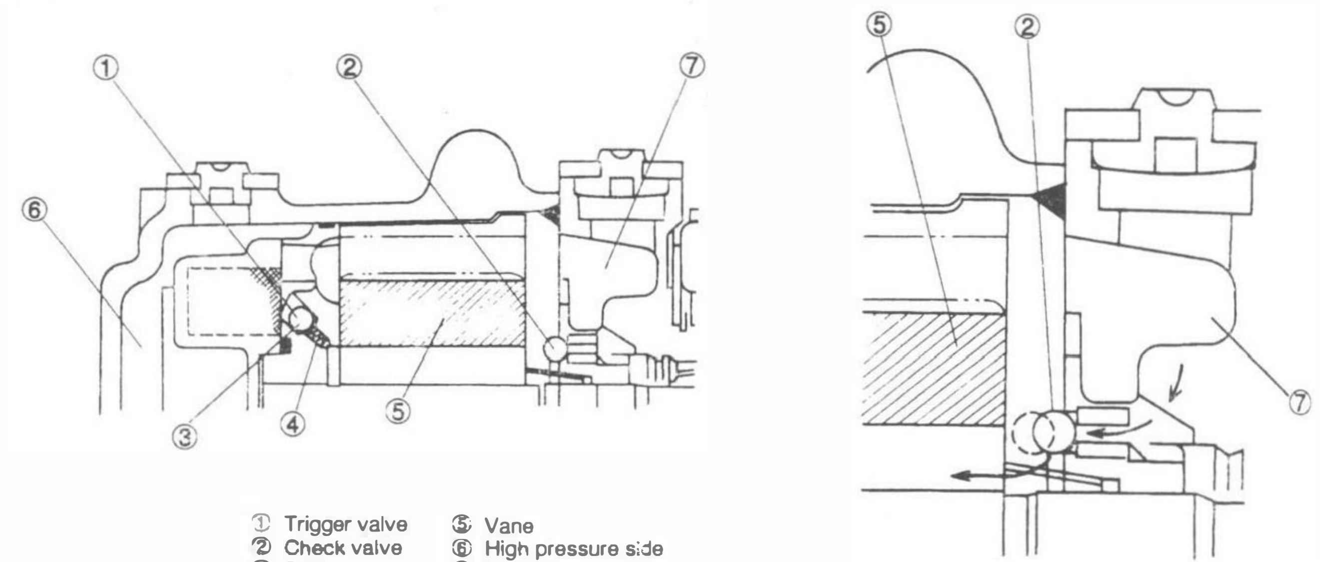
3. TRIGGER VALVE

To ensure that when the compressor is started, the vanes move out smoothly under all conditions. and minimize the noise that will be produced when the vanes strike the cylinder at the time, a mechanism combining the low pressure side check valve and high pressure side trigger valve has been adopted. When the vehicle is parked for a long period in the middle of summer for example, the suction side pressure may be slightly higher than the discharge side pressure. When the compressor is started under such a condition, the low pressure side check valve introduces the low pressure side gas to the back plane of vane, thereby causing the vane to move out.

When the compressor starts compression, the check valve is closed by the vane back pressure.

When the balance pressure or discharge side pressure is slightly higher, the high pressure side trigger valve, immediately after the compressor has been started, introduces the high pressure side pressure to the back plane of vane, thereby causing the vane to move out.

When the compressor normally starts compression and causes the discharge pressure to rise, the trigger valve closes.



① Trigger valve
② Check valve
③ Ball
④ Spring
⑤ Vane
⑥ High pressure side
⑦ Low pressure side

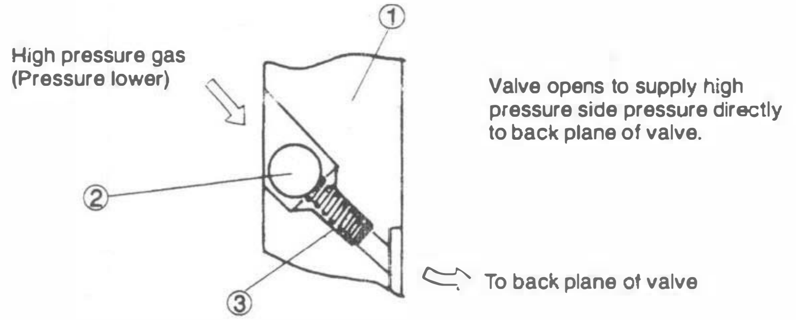
G4H0307

1) When compressor is stopped

The pressure in the compressor is maintained constant, as the valves are kept in the opened state by springs.

2) When compressor is restarted

When the compressor resumes rotation, the high pressure side trigger valve is placed in the opened state, thereby applying the high pressure side pressure directly to the back plane of vane to cause the vane to move out.

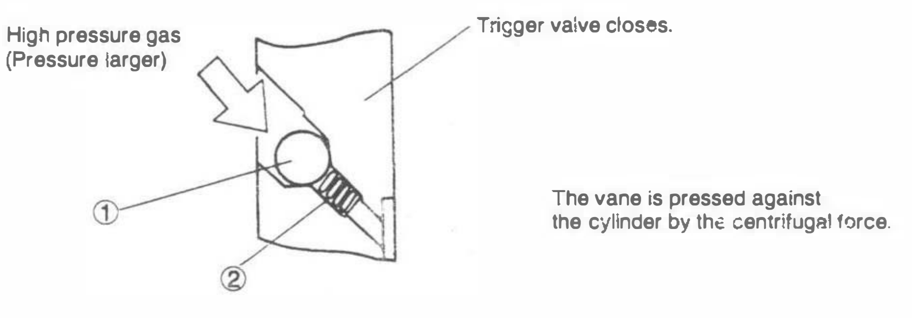


① Trigger valve
② Ball
③ Spring

G4H0308

3) When compressor is in regular operation

When the high pressure side pressure rises to the extent that it overcomes spring action, the valve closes, and the centrifugal force causes the vane to move out.



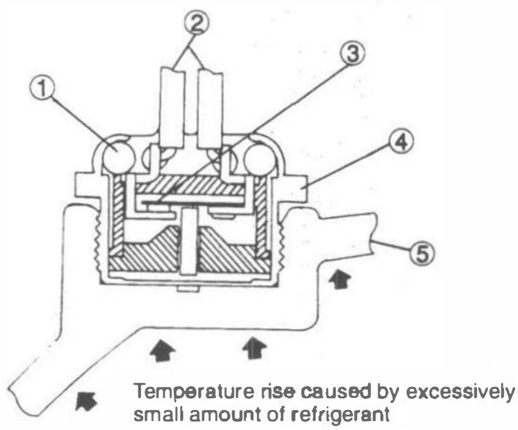
① Ball
② Spring

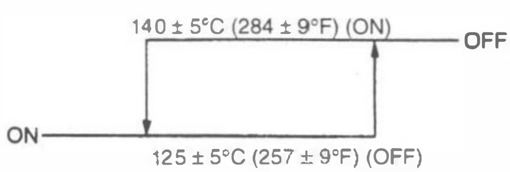
G4H0309

4. COMPRESSOR SAVING SENSOR

The compressor saving sensor, mounted on the surface of the compressor case, forces the compressor to the OFF state when the gas temperature rises or the case surface temperature becomes abnormally high due to poor lubrication.

When the compressor case surface temperature falls, the compressor restarts.





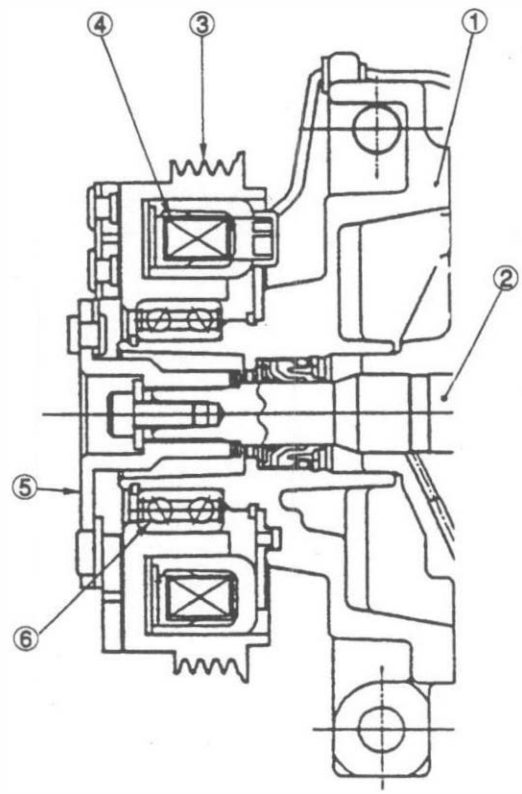
Operating characteristics

H4H1119A

1. O-ring
2. Harness
3. Point
4. Case
5. Compressor shell

5. MAGNET CLUTCH

The magnet clutch serve to transmit engine power to the compressor unit. It is built into the compressor shaft. When current flow through the magnet clutch coil, the drive plate is attracted so that the pulley and compressor shaft rotate as a unit. When the compressor is not in use, the pulley alone rotates freely.



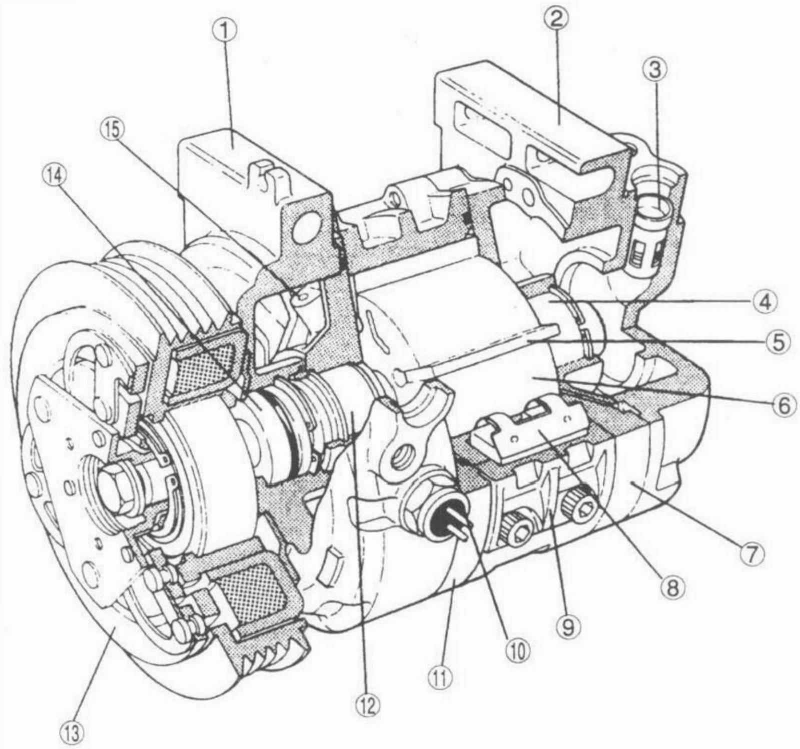
G4H0311

① Compressor unit
② Rotor shaft
③ Clutch pulley
④ Magnet clutch coil
⑤ Drive plate
⑥ Front bearing

B: RHD MODEL

1. GENERAL

The vane rotary type compressor has five vanes fitted in the rotor mounted on the shaft. The centrifugal force produced by rotation of the rotor in the elliptical cylinder causes the vanes to move out and change the volumes in the areas surrounded by the rotor and cylinder. Suction, compression and discharge take place 10 times per rotation. A roll type valve is used on the discharge side only. Shaft seals are provided for the shaft and front head to maintain air tightness in the compressor. A trigger valve is provided in the front head to apply a back pressure to the vanes. The compressor is charged with the specified quantity of compressor oil which is forced to all the parts for lubrication by the discharge pressure of the refrigerant.



B4H0744

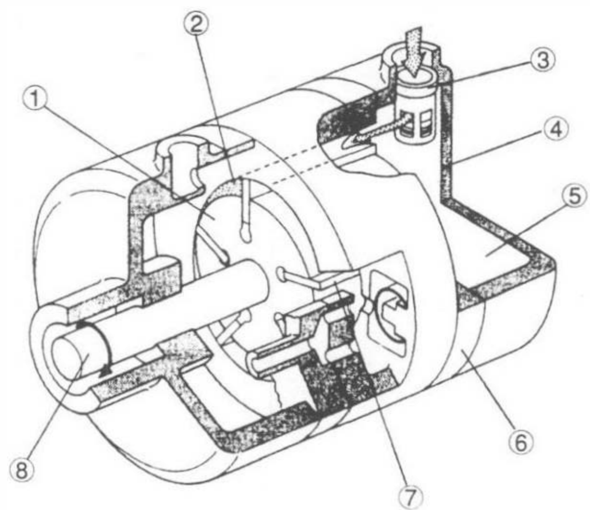
(1) Front head
(2) Rear head
(3) Check valve
(4) Rear bearing
(5) Vane
(6) Rotor
(7) Rear side block
(8) Roll valve
(9) Cylinder
(10) Temperature sensor
(11) Front side block
(12) Front bearing
(13) Magnet clutch
(14) Shaft seal
(15) Trigger valve

2. FUNCTION

Rotation of the shaft changes the volumes in the areas surrounded by the rotor, vanes, cylinder and side block, thereby accomplishing the functions of suction, compression and discharge.

1) Suction

The low-pressure gaseous refrigerant forced out from the evaporator by rotation of the compressor passes from the suction side of the rear head through the check valve and enters the low pressure chamber in the rear head. The gaseous refrigerant is drawn into the cylinder by rotation of the vanes from the two suction ports provided in the side block. Air tightness in the cylinder chamber is maintained by the compressor oil.

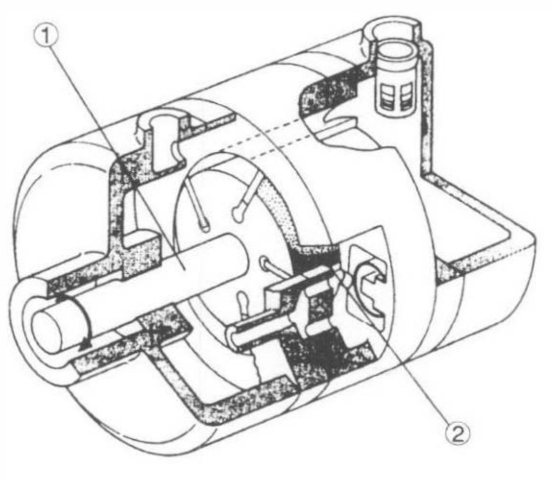


① Rotor
② Refrigerant
③ Check valve
④ Rear head
⑤ Low-pressure chamber
⑥ Rear side block
⑦ Vane
⑧ Drive shaft

B4H0745

2) Compression

Further rotation after suction makes the cylinder chamber smaller, thus the compression starts.

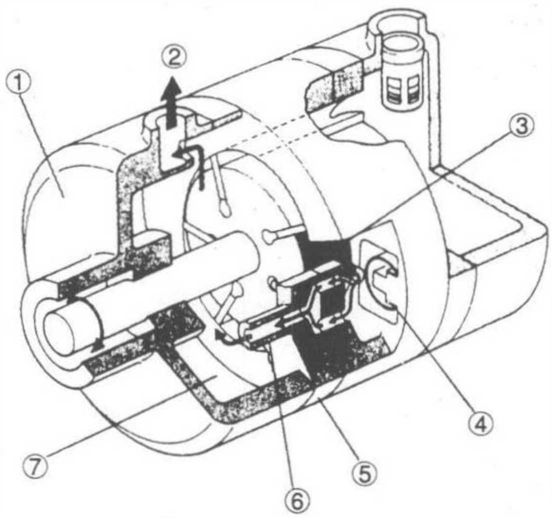


① Drive shaft
② Refrigerant

B4H0746

3) Discharge

When the refrigerant pressure in the cylinder chamber exceeds the high pressure value, the roll valve opens to discharge the refrigerant through the pipe portion jointly provided in the front side block into the high pressure chamber in the front head. The gaseous refrigerant in the high pressure chamber is led through a baffle to separate the compressor oil contained in the gaseous refrigerant before it is forced to the high pressure piping.

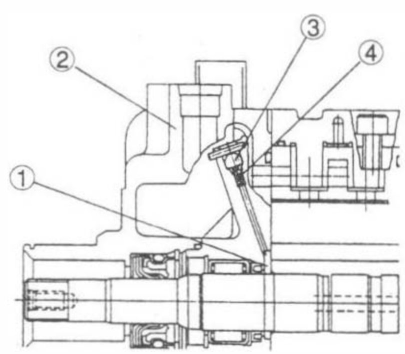


① Front head
② Refrigerant (Discharging)
③ Refrigerant (High-pressure)
④ Roll valve
⑥ Front side block
⑥ Pipe
⑦ High-pressure chamber

B4H0747

3. TRIGGER VALVE

This mechanism is designed to maintain proper vane back pressure to allow the vanes to move out with ease when the compressor starts. The trigger valve is provided in the side block, and a ditch called the K-ditch is provided in the side block rotor surface. The trigger valve has a ball combined with a spring. When vane chattering readily occurs like when the compressor starts or when the difference between the high and low pressures is small, spring action causes the valve to open to provide additional back pressure to the vanes, thereby assuring smooth operation.

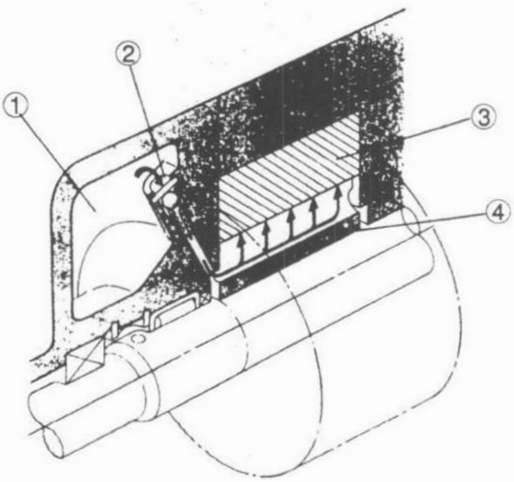


① K-ditch
② Front head
③ Check ball
④ Spring

B4H0748

1) When compressor starts or when load is low

When the compressor starts or when the load is low (the high pressure value is low), the trigg valve is opened by spring action to apply the pressure of the high pressure chamber to the ba plane of vane to prevent vane chattering.

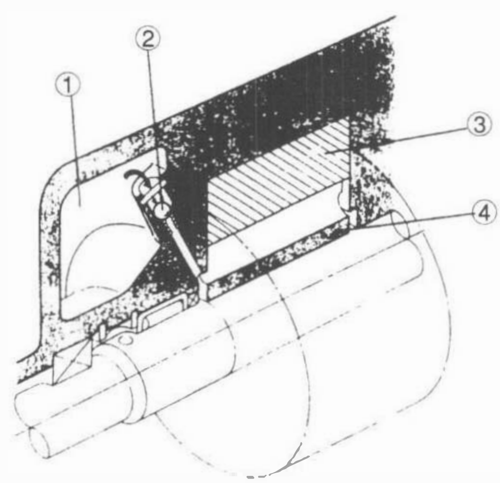


① High-pressure chamber
② Trigger valve (Open)
● Valve
④ Rotor

B4H074

2) When compressor is in regular operation

When the pressure in the high pressure chamber of the compressor increases, the pressure diff ence closes the trigger valve against spring action. The oil port pressure of the side block is a plied to the back plane of vane to maintain proper back pressure.

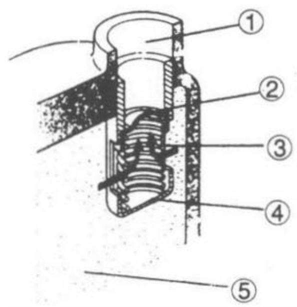


① High-pressure chamber
② Trigger valve (Shut)
③ Valve
④ Rotor

B4H075

4. CHECK VALVE

A plate and spring are provided on the suction side of the rear head. When there is a large difference between the high and low pressures immediately after the compressor has stopped, reverse rotation of the compressor could cause counter flow to the evaporator, as no suction valve is provided. For this reason, a check valve is provided to prevent counter flow. Immediately after the compressor has stopped, the high pressure refrigerant forces the check valve up to close the suction side piping passage and prevent counter flow from the high to low pressure side.

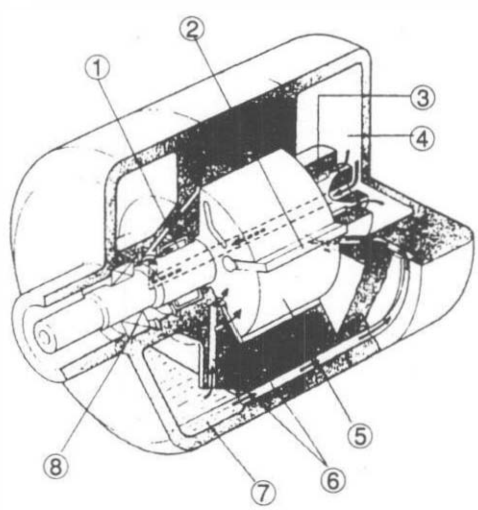


① Refrigerant suction port
② Plate
③ Spring
④ Check valve
⑤ Refrigerant

B4H0751

5. LUBRICATION

The oil in all the parts is forced up from the bottom of the front side block along the oil passages by the pressure on the high pressure side to lubricate the rotor front end. The oil passed through the oil port at the bottom of the cylinder lubricates the rear end of the rotor. The oil that has lubricated each of the ends of the rotor is returned to the low pressure side by the internal pressure of the compressor.
The oil contained in the gaseous refrigerant returned from the evaporator passes through the low pressure chamber and lubricates the rear bearing. Furthermore, the oil passes through the guide hole provided in the drive shaft and lubricates the front bearing and shaft seal before returning to the suction portion of the cylinder.
Since the pressure in the suction portion of the cylinder is slightly lower than that in the low pressure side, the oil that has lubricated all the parts is returned to the suction chamber.

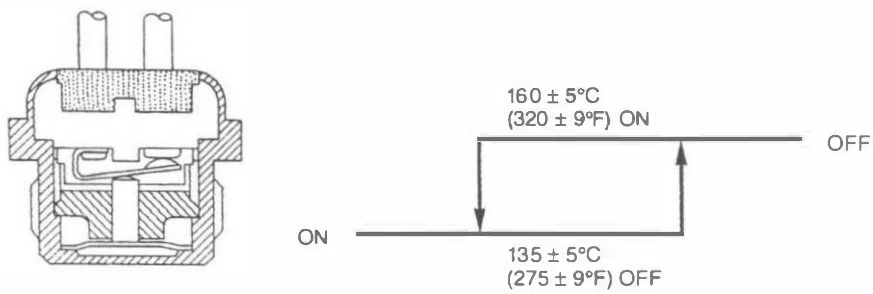


① Front bearing
② Vane
③ Rear bearing
④ Low-pressure chamber
⑤ Rotor
⑥ Oil port
⑦ High-pressure chamber
⑧ Shaft seal

B4H0752

6. TEMPERATURE SENSOR

The temperature sensor is provided on the front head. When the compressor becomes abnormally hot because of shortage of the refrigerant, etc., the magnetic clutch is caused to disengage to stop the compressor for protection. When the temperature in the compressor falls, a reset is made to let the compressor resume operation.



B4H0753A

3. Condenser

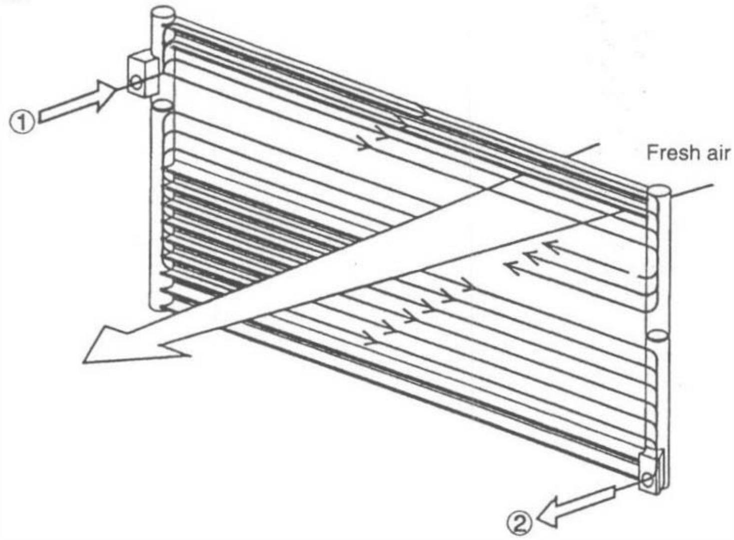
A: MECHANISM

The high-temperature and high-pressure gaseous refrigerant discharged from the compressor is cooled down and turned into the liquid state in the condenser which is cooled by the ambient air delivered by the cooling fan.

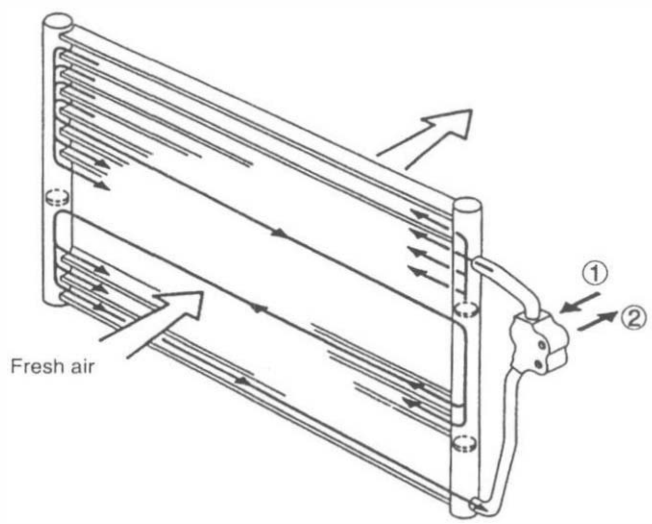
The condenser is composed of tubes and radiating fins.

The heat from hot refrigerant radiates to the ambient air when high-temperature gaseous refrigerant passes through the condenser tubes.

LHD model



RHD model



H4H1170A

① Refrigerant inlet (High pressure gas refrigerant)
② Refrigerant outlet (High pressure liquid refrigerant)

4. Receiver Drier

A: MECHANISM

The amount of refrigerant circulating varies with the heat load changes. The receiver drier supplies the amount of refrigerant necessary for the cycle according to such changes.

1) It removes bubbles from the condensed refrigerant so that only liquid refrigerant may be delivered to the expansion valve. (If bubbles are present, the refrigerant passing through the expansion valve varies in quantity, temperature, and pressure, resulting in insufficient cooling.)

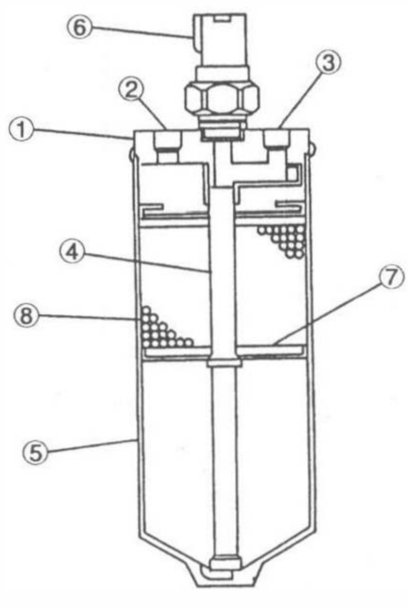
2) It removes moisture from the refrigerant.

3) It removes foreign substance from the refrigerant.

4) When abnormal high temperature <More than 105°C (221°F)> in A/C system melt the fusible plug and then release the refrigerant from receiver drier. (RHD model)

The receiver-drier consists of a strainer to remove foreign substance, desiccant to absorb moisture from refrigerant.

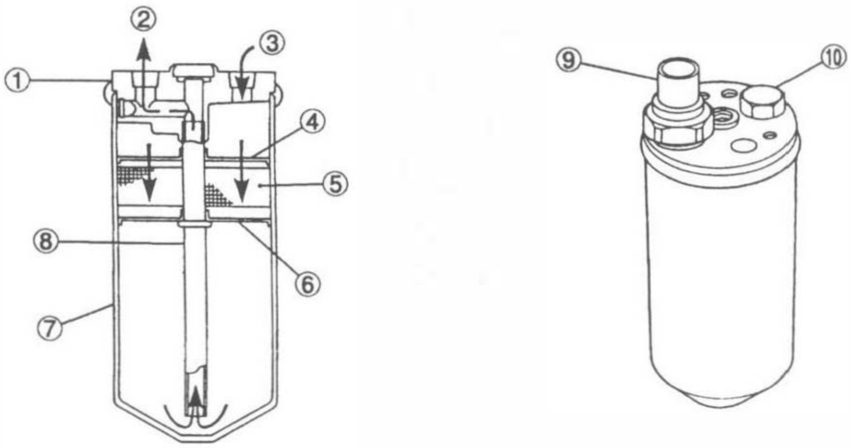
1. LHD MODEL



H4H1120A

① Head block – flat
② Inlet
③ Outlet
④ Inside pipe
⑤ Body
⑥ Dual switch
⑦ Strainer
⑧ Desiccant

2. RHD MODEL



H4H1171A

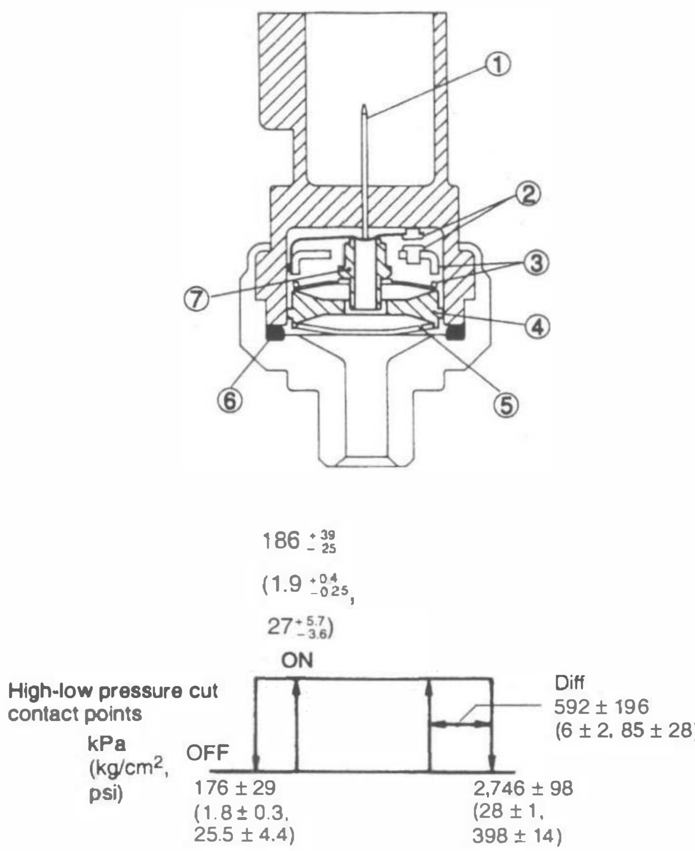
① Head block – flat
② Outlet
③ Inlet
④ Retainer upper
⑤ Desiccant
⑥ Retainer lower
⑦ Body
⑧ Inside pipe
⑨ Pressure switch
⑩ Fusible plug

B: DUAL SWITCH

1. LHD MODEL

The dual switch is located in the high-pressure line of the refrigeration cycle. It consists of a diaphragm which receives pressure, diaphragm springs, pin and contact points. Two types of contact points are used. One type activates when the internal pressure is low or when it is too high while the other type controls the operation of the condenser fan.

- Prevention of operation when there is no gases in the line due to absence of refrigerant — (during low-pressure operation)
- Protection of refrigeration cycle from abnormal refrigerant pressure rise — (during high-pressure operation)



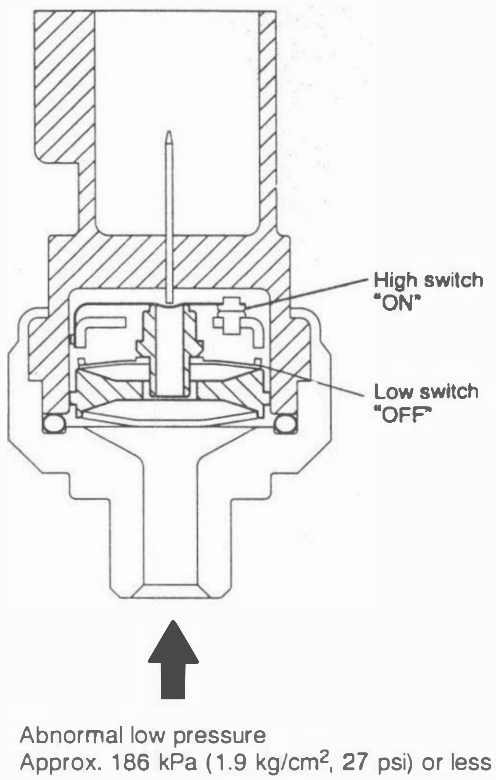
H4H1026A

① Point terminal
② High switch
③ Low switch
④ Disc
⑤ Diaphragm
⑥ O-ring
⑦ Rod

Abnormal low-pressure operation

- All contact points are open (OFF) since the tension of the diaphragm springs is greater than refrigerant pressure.
- Approx. 186 kPa (1.9 kg/cm^2, 27 psi) < P < approx. 1,471 kPa (15 kg/cm^2, 213 psi)

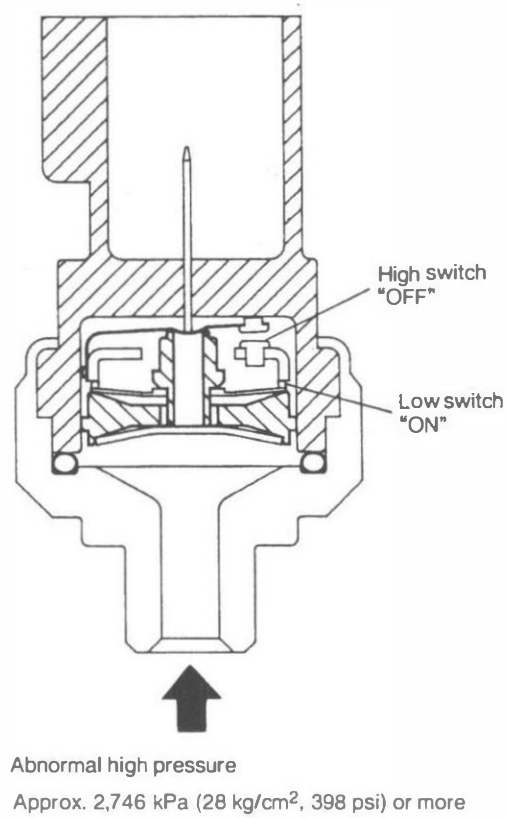
When refrigerant pressure is greater than 186 kPa (1.9 kg/cm^2, 27 psi), diaphragm spring is inverted so that low switch is opened (OFF).



G4H0976

Abnormal high-pressure operation

When refrigerant pressure is greater than 2,746 kPa (28 kg/cm^2, 398 psi), diaphragm spring is inverted so that high switch is opened (OFF) and low switch is closed (ON).

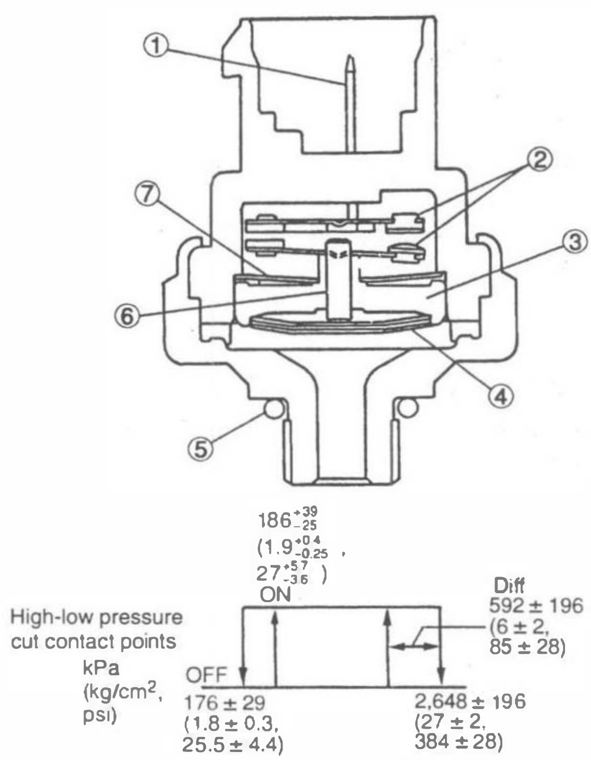


H4H1121A

2. RHD MODEL

The dual switch is located in the high-pressure line of the refrigeration cycle. It consists of a diaphragm which receives pressure, diaphragm springs, pin and contact points. Contact point activates when the internal pressure is low or when it is too high.

- Prevention of operàtion when there is no gases in the line due to absence of refrigerant — (during low-pressure operation)
- Protection of refrigeration cycle from abnormal refrigerant pressure rise — (during high-pressure operation)

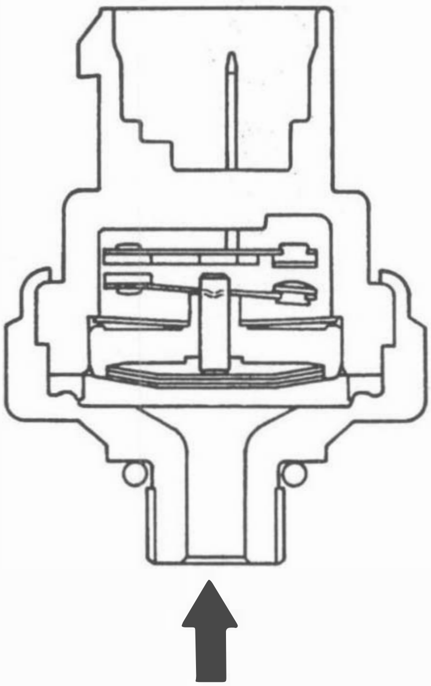


H4H1172A

① Point terminal
② Contact
③ Disc
④ Diaphragm spring B
⑤ O-ring
⑤ Rod
⑦ Diaphragm spring A

Abnormal low-pressure operation

Contact point is open (OFF) since the tension of the diaphragm spring A is greater than refrigerant pressure. [P < approx. 176 kPa (1.8 kg/cm^2, 26 psi)]

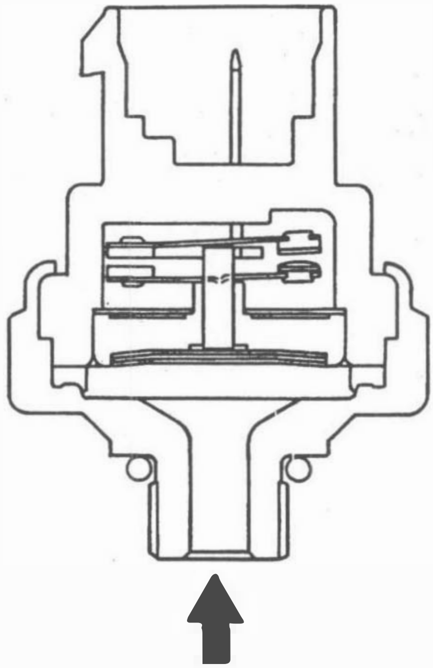


Abnormal low pressure
Approx. 176 kPa (1.8 kg/cm^2, 26 psi) or less
(Low pressure "OFF")

H4H1173A

Abnormal high-pressure operation

When refrigerant pressure is greater than 2,648 kPa (27 kg/cm^2, 384 psi), diaphragm spring B is inverted so that switch is opened (OFF).



Abnormal high pressure
Approx. 2,648 kPa (27 kg/cm^2, 384 psi) or more
(High pressure "OFF")

H4H1174A

5. Evaporator

A: MECHANISM

An airstream produced by a blower passes through the cooling fins and tubes. This air is warmer than the refrigerant and gives up its heat to the fins, tubes and then to the refrigerant itself. As the low pressure refrigerant moves through the evaporator, heat given up by the air passing through the evaporator causes the refrigerant to begin to boil. By the time the refrigerant has passed through the evaporator, it becomes a vapor. As the heat is absorbed by the boiling refrigerant, the fins and tubes turn cold and in turn cool the air passing over them. Moisture contained in the air condenses to water drops as it passes around the cooling tubes and fins of the evaporator. Water and dirt are then discharged outside the vehicle through the drain hose.

The evaporator is a laminated type and consists of thin, rectangular aluminum plates arranged in many layers and fins that are attached between them. The operation of the evaporator is as follows:

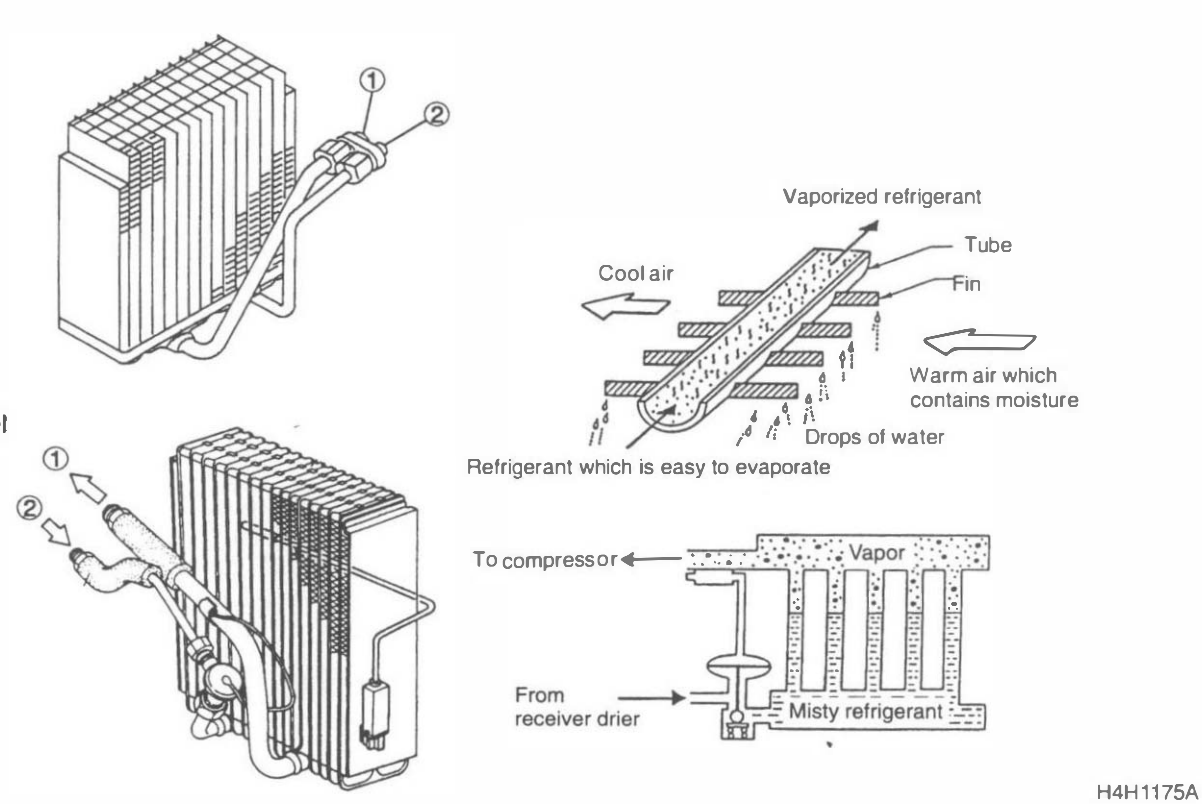
Misty refrigerant (very close to liquid form) from the expansion valve at a low pressure, enters the lower tube of the evaporator, where it soaks up heat from the compartment. The refrigerant boils and vaporizes quickly due to the rapid heat exchange. Then the refrigerant is pushed upward by the force of the bubble generated during the exchange and passes evaporating into the upper tube. When it reaches to upper tank, the refrigerant is in a thoroughly vaporized form.

The evaporator has a single tank, and its surface has been given a multiple treatment.

- Rustproof treatment
- Waterproof treatment
- Moldproof treatment

LHD model

RHD model



H4H1175A

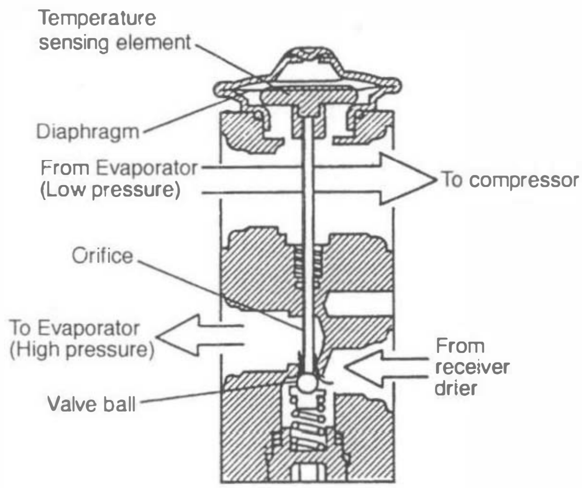
① Outlet
② Inlet

6. Expansion Valve

A: LHD MODEL

1. MECHANISM

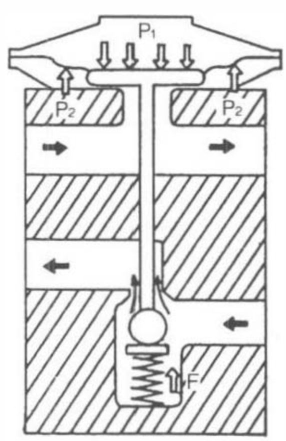
The expansion valve is attached to the evaporator inlet and outlet pipe. It converts high pressure liquid refrigerant which comes from the liquid tank to misty, low pressure refrigerant, and delivers to the evaporator. Being at low pressure and low temperature, the liquid refrigerant evaporates in the evaporator removing heat from the compartment. It automatically controls the flow rate of refrigerant to obtain the necessary cooling ability required by the fluctuating heat load.
The refrigerant temperature is sensed by the temperature sensing element installed at the low pressure refrigerant passage in the expansion valve, and the flow rate of the refrigerant is controlled by changing the lift of the valve ball at the high pressure side.



H4H1123A

2. FUNCTION

If the heat load of the air conditioner system increases, the refrigerant temperature at the evaporator outlet rises and therefore increases the pressure P_1 at around the temperature sensing area. As this pressure P_1 becomes higher than the resultant force of evaporator outlet (low pressure side) pressure P_2 and the spring force F ($P_1 > P_2 + F$), the diaphragm is pressed down, opening the valve ball connected to the diaphragm to increase the flow of the refrigerant.
If the heat load decreases, the action contrary to the one mentioned above takes place, closing the valve to decrease the flow of the refrigerant.

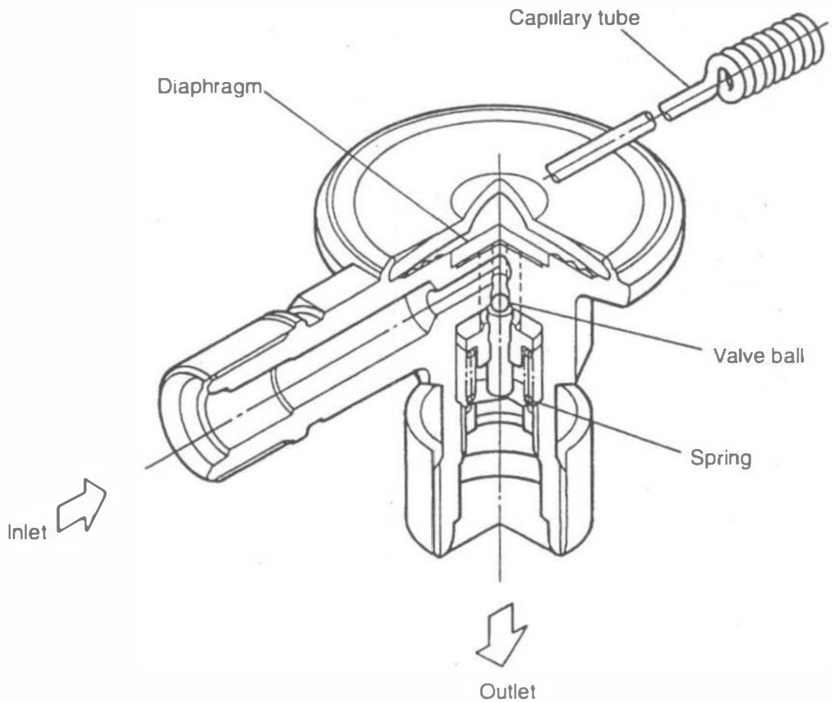


H4H1124

B: RHD MODEL

1. MECHANISM

The expansion valve atomizes the high pressure liquid refrigerant from the receiver/drier by the throttle orifice. It controls the orifice valve (needle valve) opening to obtain the optimum heat exchange in the evaporator.
The expansion valve consists of the heat sensitive tube, diaphragm, needle valve (ball), ball seat and adjusting screw.
The heat sensitive tube (refrigerant is filled) is installed directly on the evaporator outlet pipe.



H4H1176A

2. FUNCTION

The operation of the external equalizer type is as follows.

The expansion valve opening is automatically controlled by the functions of three force: the pressure of the temperature-sensing bulb (P_1) containing gas, the pressure at the evaporator inlet (P_2), and the force of the spring (F).

Temperature-sensing bulb pressure (P_1)
.... Forces the diaphragm downward (opens the valve).

Pressure at the evaporator inlet (P_2)
.... Forces the diaphragm upward (closes the valve).

Force of the spring (F)
.... Forces the ball upward (closes the valve).

A: Condition of the valve with the compressor in off.
Since the temperature around the evaporator is constant, the pressure in the evaporator is equal to that of the temperature-sensing bulb. Therefore, the force of the spring is greater than these pressures and the pressures are in the following condition:

$P_1 = P_2$
$P_1 < P_2 + F$

That means, the valve is closed with the ball pushed upward.

B: Operation of the valve with the sensing bulb at low temperatures
(When the temperature is low at evaporator outlet)
As the temperature of the compartment decreases, the heat load applied to the evaporator becomes less, and the temperatures at the evaporator outlet, and the sensing bulb drop. Accordingly, the valve tends to close, reducing the amount of refrigerant.

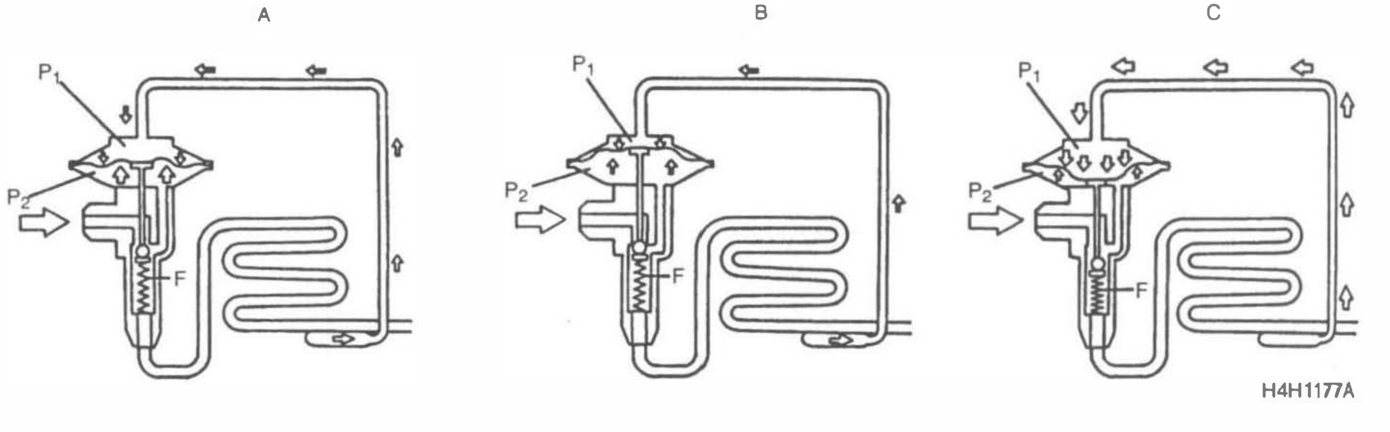
$P_1 < P_2 + F$

The amount of refrigerant is reduced.

C: Operation of valve with the sensing bulb at high temperatures
(When the temperature is high at evaporator outlet)
As the temperature of the compartment rises, the heat load applied to the evaporator becomes greater, and the temperatures at the evaporator outlet, and the sensing bulb increase. Therefore, the valve tends to open, allowing more refrigerant to flow.

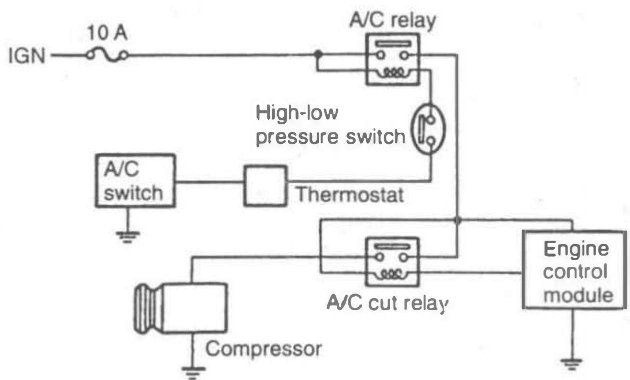
$P_1 > P_2 + F$

The amount of refrigerant is increased.



7. Compressor Clutch "ON" Delay System

When air conditioning system relay operates, a signal is entered into engine control module. Engine control module then judges engine operation and activates A/C cut relay. Maximum clutch "ON" delay occurs 0.8 seconds after A/C cut relay activates.



H4H1178A

8. Compressor Control System

A: GENERAL

NOTE:
Circuit diagram of air conditioning system. <Ref.to 6-3 [D5003]>

1) When the A/C switch and fan switch are turned ON, the A/C relay activates. The compressor and F.I.C.D. are turned on, and then the main and sub fans also operate. Blower relay operates to direct the air flowrate determined by FAN switch position.

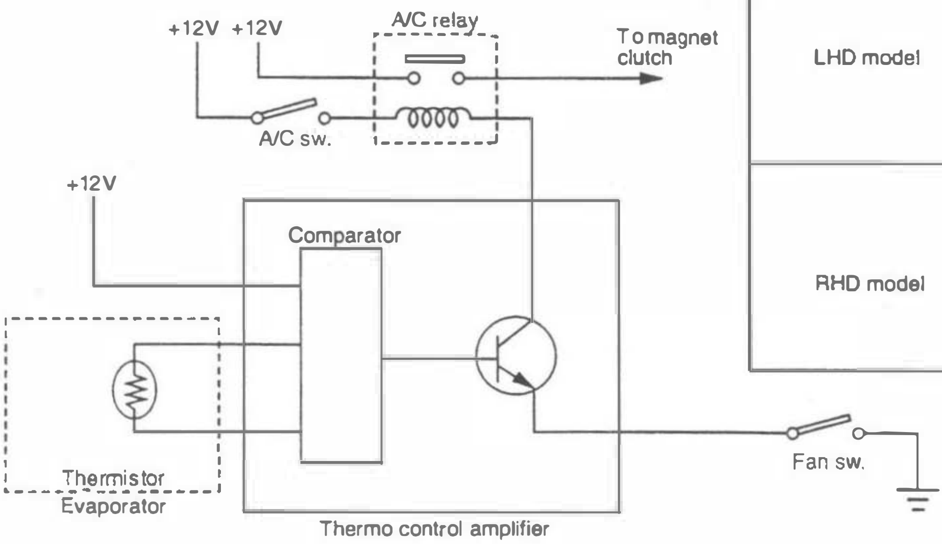
2) The thermo amplifier activates to stop the compressor clutch, F.I.C.D., and main and sub fans.

3) When the "High-Low" pressure switch operates, the compressor clutch and F.I.C.D. stop but the main and sub fans are operating.

4) When the fan control switch operates, both the main and sub fans operate.

B: THERMO CONTROL AMPLIFIER

The thermo control amplifier disconnects the magnet clutch circuit to prevent the evaporator from becoming frosted when the temperature of the evaporator fin drops close to "2°C (36°F)". As the evaporator is cooled, the thermistor (located on the evaporator fin) interrupts the "base" current of the amplifier. This in turn deenergizes the A/C relay coil, which in turn disconnects the magnet clutch circuit.



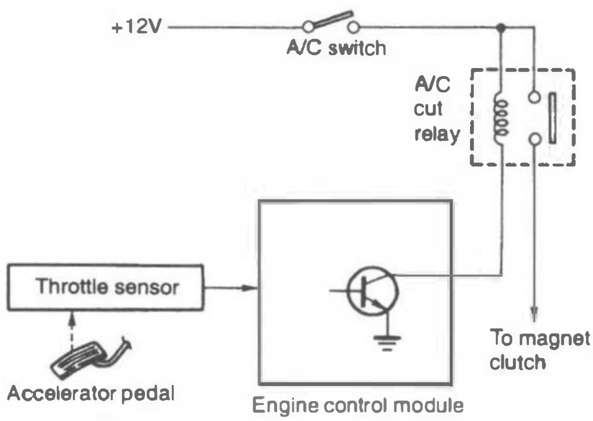
	Thermo control amp. operation °C (°F)
LHD model	1.5 ± 0.5 (2.7 ± 0.9) ON OFF 3.0 ± 0.5 (5.4 ± 0.9)
RHD model	3.5 ± 0.5 (6.3 ± 0.9) ON OFF 5.0 ± 0.3 (9.0 ± 0.5)

H4H1179A

C: ACCELERATION CUT SYSTEM

The A/C switch turns the A/C system on or off. The on-off operation of the switch is transmitted to the ECM.

The A/C cut relay breaks the current flow to the compressor, through the use of an output signal from the ECM, for a certain period of time when a "full-throttle" signal (emitted from the throttle sensor) enters the ECM while the compressor is operating. This prevents the degradation of acceleration performance and stabilizes the main fuse box located on the left side of the engine compartment.

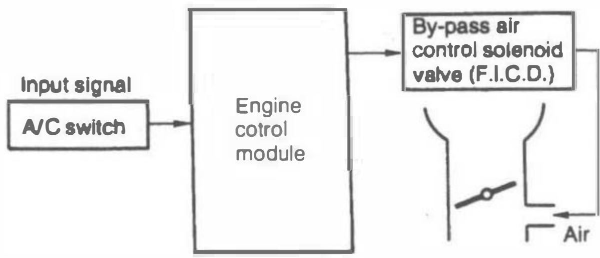


G4H0346

D: F.I.C.D.

The F.I.C.D. increases engine idle speed when the compressor is turned ON.

The Engine Control module activates the by-pass air control solenoid valve in advance to control the amount of by-pass air flowing through the throttle body in relation to the signal emitted from the A/C switch, so that the proper idle speed specified for each engine load is achieved.



G4H0347

Idle speed				
	F.I.C.D. in operation		F.I.C.D. not in operation	
	Neutral	D-range	Neutral	D-range
MT	850 ± 50	–	700 ± 50	–
AT	850 ± 50	700 ± 50	700 ± 50	650 ± 50

E: FAN CONTROL

The main fan and sub fan are switch turn ON and OFF, according to the operating modes shown in the following table.

1. NON-TURBO MODEL

Vehicle speed	A/C compressor	Engine coolant temperature					
		Less than 95°C (Less than 203°F)		Between 95 and 99°C (Between 203 and 210°F)		More than 100°C (More than 212°F)	
		Operation of radiator fan		Operation of radiator fan		Operation of radiator fan	
		Main	Sub	Main	Sub	Main	Sub
Less than 19 km/h (Less than 12 MPH)	OFF	OFF	OFF	ON	OFF	ON	ON
	ON	ON	ON	ON	ON	ON	ON
Between 20 and 69 km/h (Between 12 and 43 MPH)	OFF	OFF	OFF	ON	OFF	ON	ON
	ON	ON	ON	ON	ON	ON	ON
Between 70 and 89 km/h (Between 43 and 55 MPH)	OFF	OFF	OFF	OFF	OFF	ON	ON
	ON	ON	OFF	ON	ON	ON	ON
More than 90 km/h (More than 56 MPH)	OFF	OFF	OFF	OFF	OFF	ON	ON
	ON	OFF	OFF	ON	OFF	ON	ON

2. TURBO MODEL

Vehicle speed	A/C compressor	Engine coolant temperature					
		Less than 92°C (Less than 198°F)		Between 92 and 95°C (Between 198 and 203°F)		More than 96°C (More than 205°F)	
		Operation of radiator fan		Operation of radiator fan		Operation of radiator fan	
		Main	Sub	Main	Sub	Main	Sub
Less than 19 km/h (Less than 12 MPH)	OFF	OFF	OFF	OFF	OFF	Low	Low
	ON	Low	Low	Hi	Hi	Hi	Hi
Between 20 and 69 km/h (Between 12 and 43 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	Hi	Hi	Hi	Hi	Hi	Hi
Between 70 and 105 km/h (Between 43 and 65 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	Low	Low	Low	Low	Hi	Hi
More than 106 km/h (More than 66 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	OFF	OFF	Low	OFF	Hi	Hi

SERVICE MANUAL

SUBARU IMPREZA

Technical description

- Mechanism and function

BODY SECTION

13. Sunroof

The sunroof has two operating mechanisms. One raises the rear of the slide panel for ventilation and the other fully opens the panel.

The sunroof also has the following features:

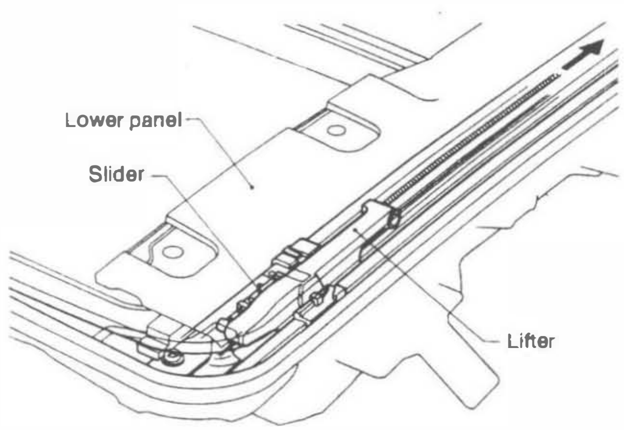
- Use of the outer slide type provides the sunroof function despite the small size of the roof.
- The reduced thickness of the roof provides extra-overhead clearance in the passenger compartment.
- Die-cast aluminum is used for roof components, thus reducing weight.
- Sheet metal components are copper-plated for rust proofing.

Operation (Operating time)	When opened:	Fully closed → tilted-up → Pause after tilt-up → Slides to rear in tilted-up mode → Fully open (Fully closed → 0.5 — 1.5 sec → Pause after tilt-up → 5.0 — 6.0 sec → Fully open)
	When closed:	Fully open → Slides to front in tilted-up mode → Pause with 150 mm (5.91 in) open → From tilt-up to tilt-down while sliding → Fully closed (Fully open → 2.5 — 3.5 sec → Pause with 150 mm (5.91 in) open → 3.0 — 4.0 sec → Fully closed)

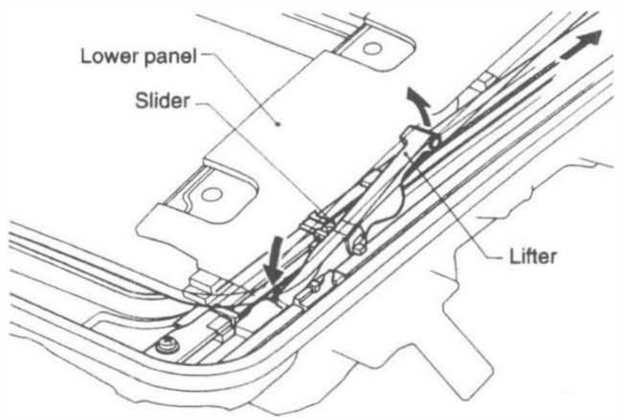
A: TILT-UP MECHANISM

1. OPERATION

- The lower panel installed with the outer panel is secured to the lifter.
- When the "OPEN" switch is pressed, the slider is pulled back by the motor.
- The slider guide pin moves along the guide hole to tilt the rear of the lifter up.
- When the "OPEN" switch is pressed again, the slider is pulled back further. Since the slider guide pin is located at the rear end of the lifter guide hole, the lifter and slider move back as a unit to open the sunroof.



G5H0065

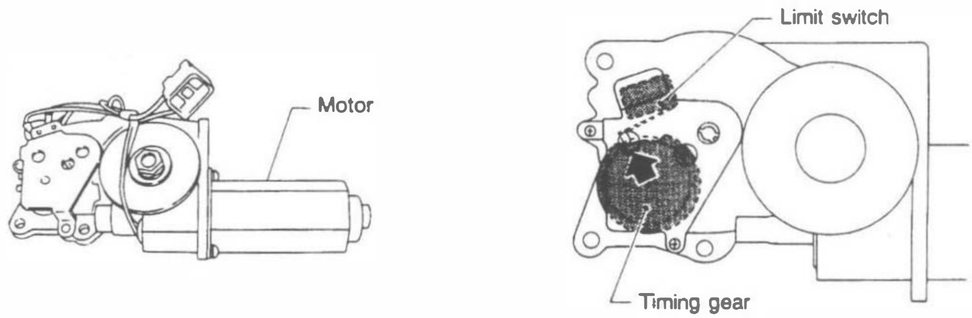


G5H0066

B: SUNROOF MOTOR

1. CONSTRUCTION

The sunroof motor consists essentially of a motor, timing gear and limit switch. The timing gear is provided with a pinion gear cam mechanism, and the limit switch turns the relay on or off according to the tilt-up position of the slide panel.

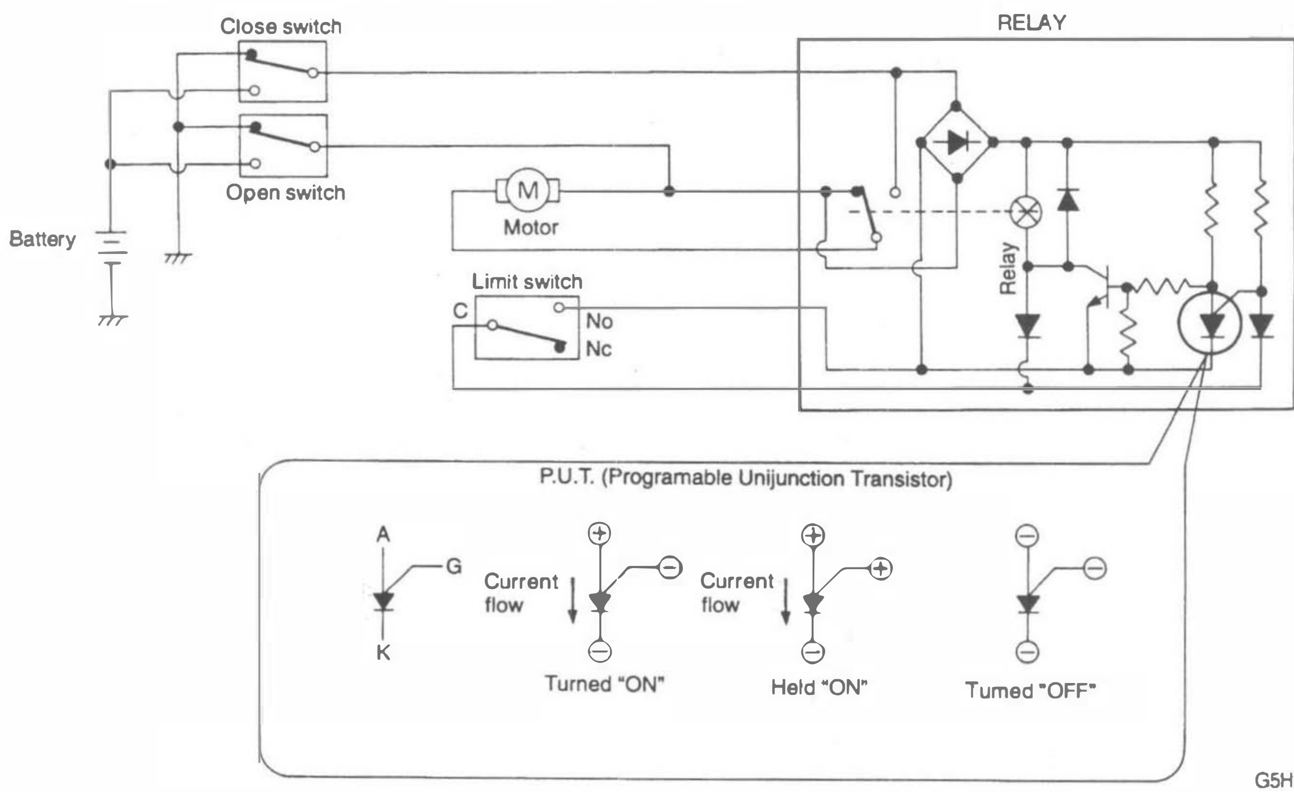


G5H0067

C: LIMIT SWITCH

1. CONSTRUCTION

This switch closes or opens according to the tilt-up position of the slide panel. It also activates when the slide panel reaches the 150 mm (5.91 in) open position.



G5H0068

D: SYSTEM OPERATION

1. SLIDE OPERATION

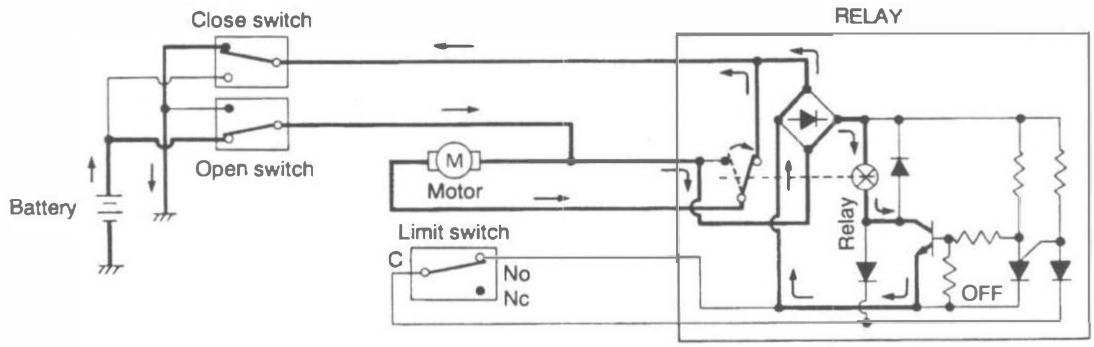
The slide panel continuously opens while the "OPEN" switch is pressed, and stops at the specified tilt-up position.

When the switch is released and pressed again, the slide panel continues to move to the fully open position.

The slide panel continuously closes while the "CLOSE" switch is pressed, and stops at approximately the 150 mm (5.91 in) open position. When the switch is released and pressed again, the slide panel continues to move to the fully closed position.

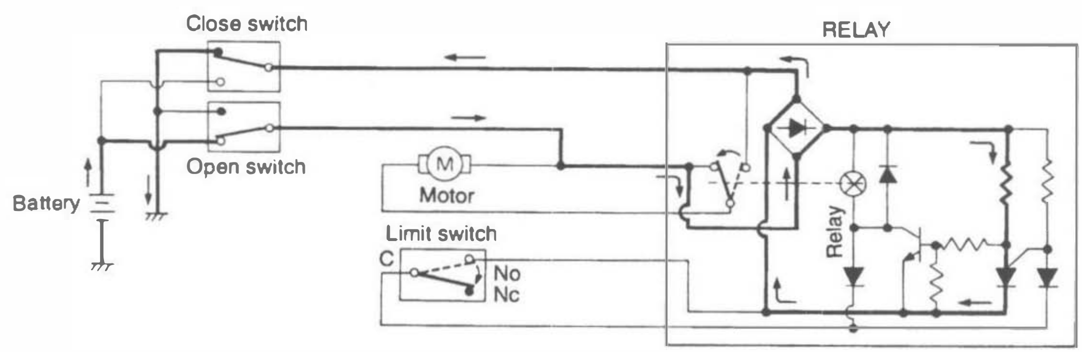
2. OPEN OPERATION

- When the "OPEN" switch is pressed, current flows to activate the transistor and relay so that the motor rotates in the direction that opens the slide panel. (The P.U.T. is held "OFF".)



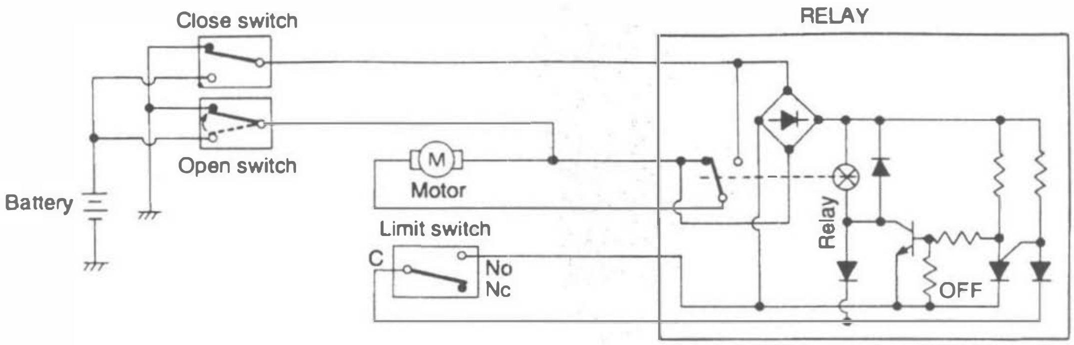
G5H0069

- The limit switch turns from "ON" to "OFF" so that the P.U.T. turns ON. This turns the transistor and relay off, and the motor will then stop.



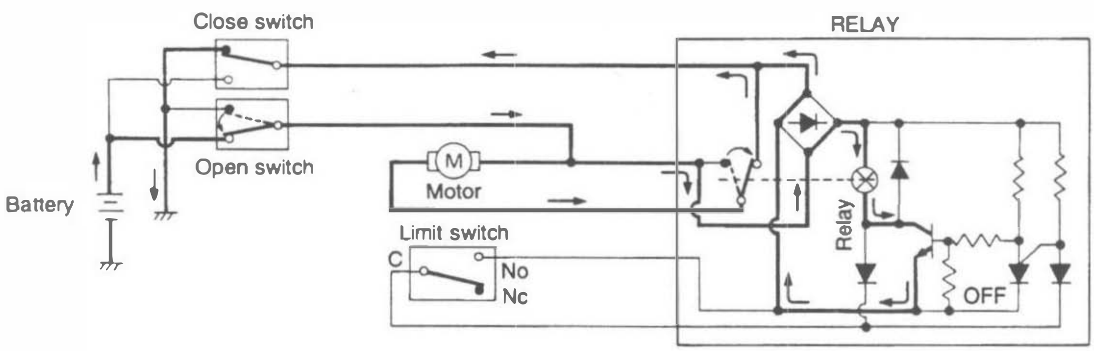
G5H0070

• When the "OPEN" switch is released, the P.U.T. turns OFF. The circuit is then held in a stand-by mode for ready operation.



G5H0071

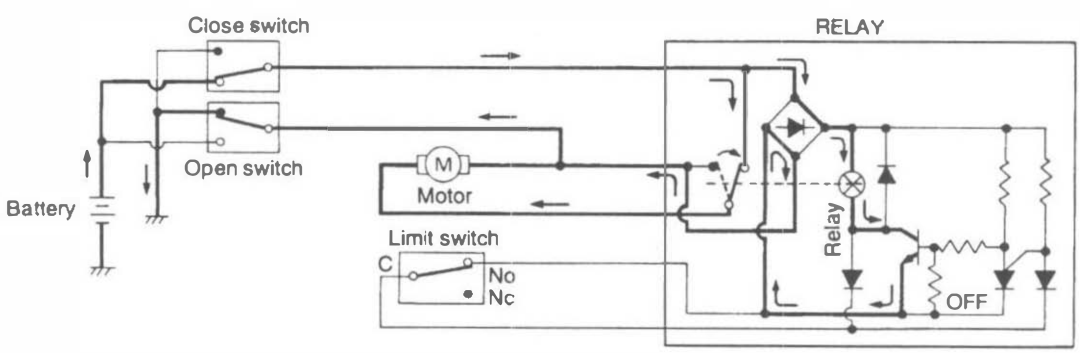
• When the "OPEN" switch is pressed again, the transistor and relay turn ON (the P.U.T. is held OFF). The motor will then rotate in the direction that opens the slide panel fully.



G5H0072

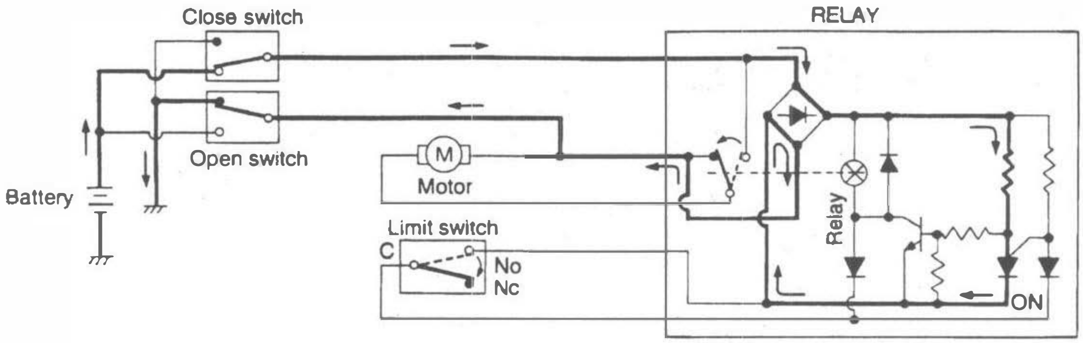
3. CLOSED OPERATION

• When the "CLOSE" switch is pressed, current flows to turn the transistor and relay ON (the P.U.T. is held OFF), the motor rotates in the direction that closes the slide panel.



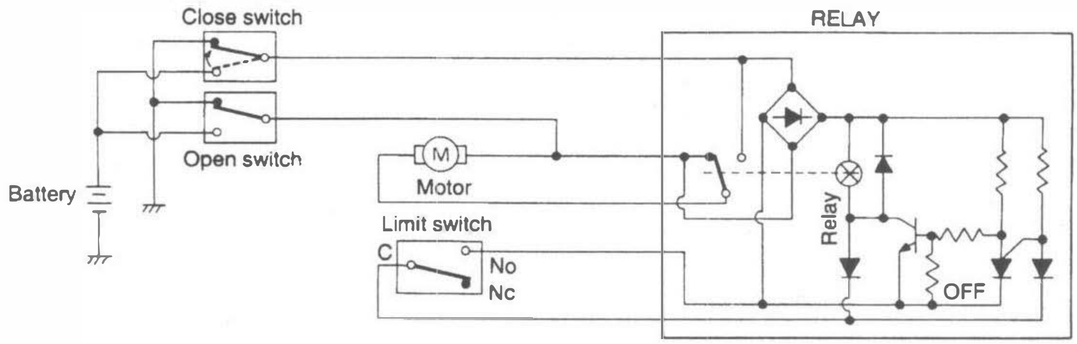
G5H0073

- The limit switch turns from ON to OFF (the P.U.T. turns ON), and the motor will stop.



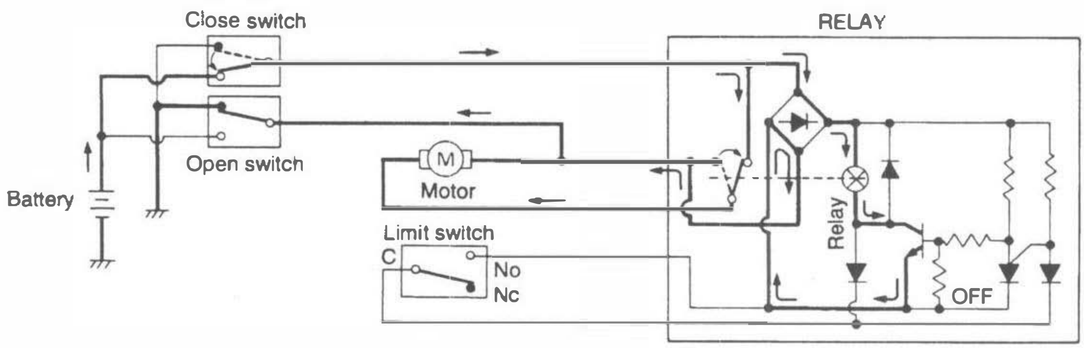
G5H0074

- When the "CLOSE" switch is released, the P.U.T. turns OFF, holding the circuit in a stand-by mode for ready operation.



G5H0075

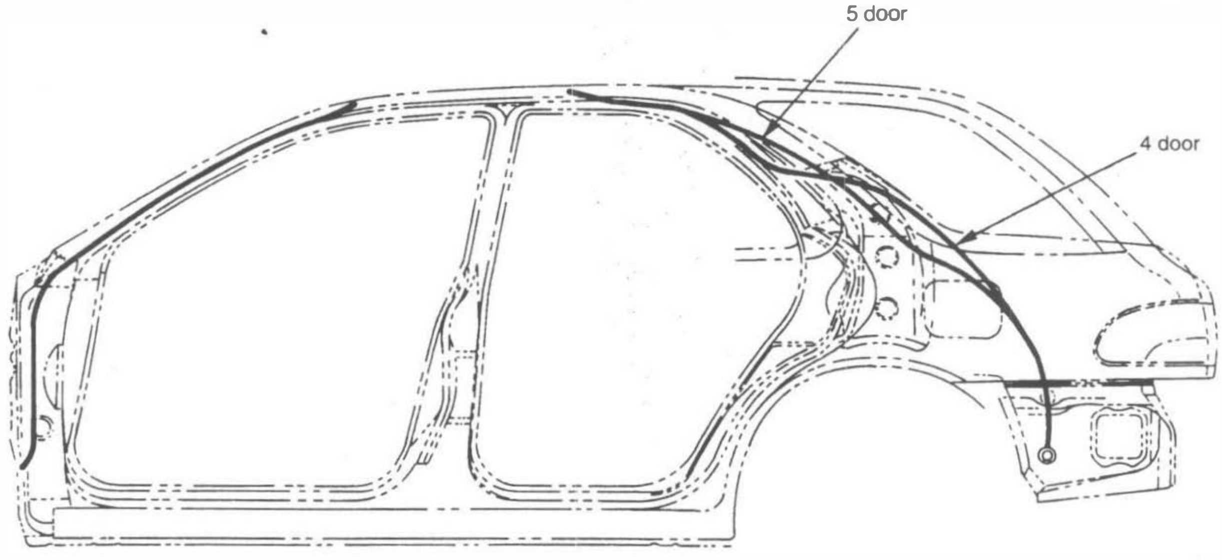
- When the "CLOSE" switch is pressed again, the transistor and relay turn ON. The motor will then rotate in the direction that closes the slide panel fully. (In this case, the slide panel does not stop at the tilt-up position.)



G5H0087

E: DRAIN TUBE LAYOUT

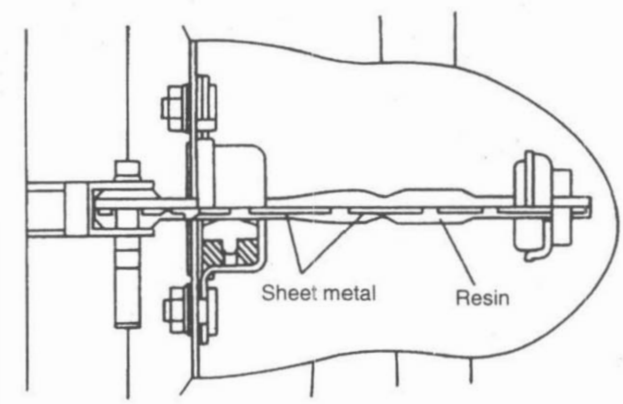
The front drain tube is routed to the inner side of the front wheel arch through the front pillar. The rear drain tube is routed to the back of the rear bumper through the side rail and rear pillar.



1. Door

A: DOOR CHECKER

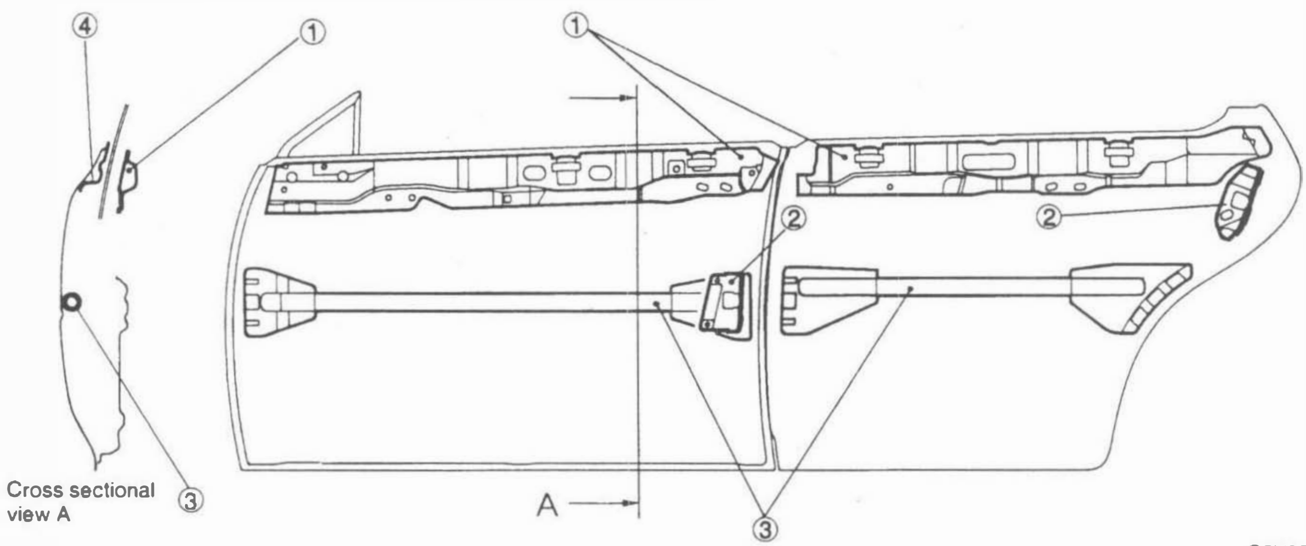
A resin molding type door checker is introduced (Front door).



B5H0471A

B: DOOR CONSTRUCTION

All front and rear doors are fitted with a side door beam, an inner upper reinforcement, an outer upper reinforcement and a reinforcement latch.

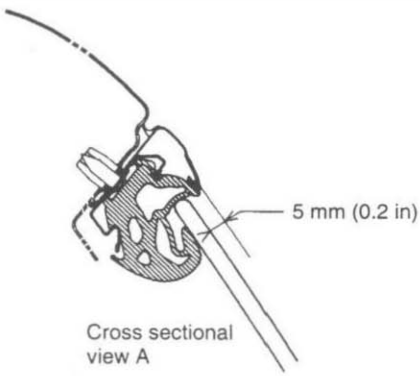


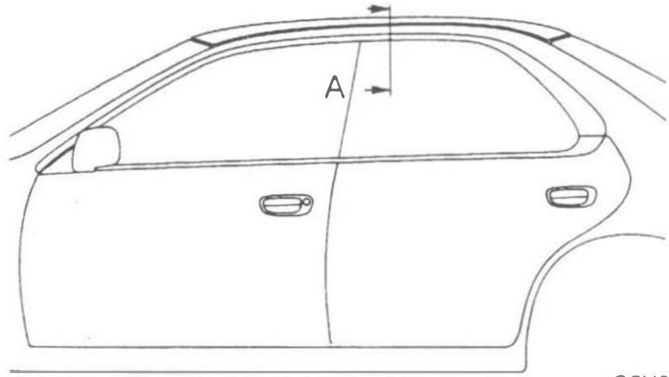
G5H0506

① Inner upper reinforcement
② Reinforcement latch
③ Side door beam
④ Outer upper reinforcement

2. Window Glass

The window glass aligns with the body paneling at surface level difference of approximately 5 mm (0.2 in).



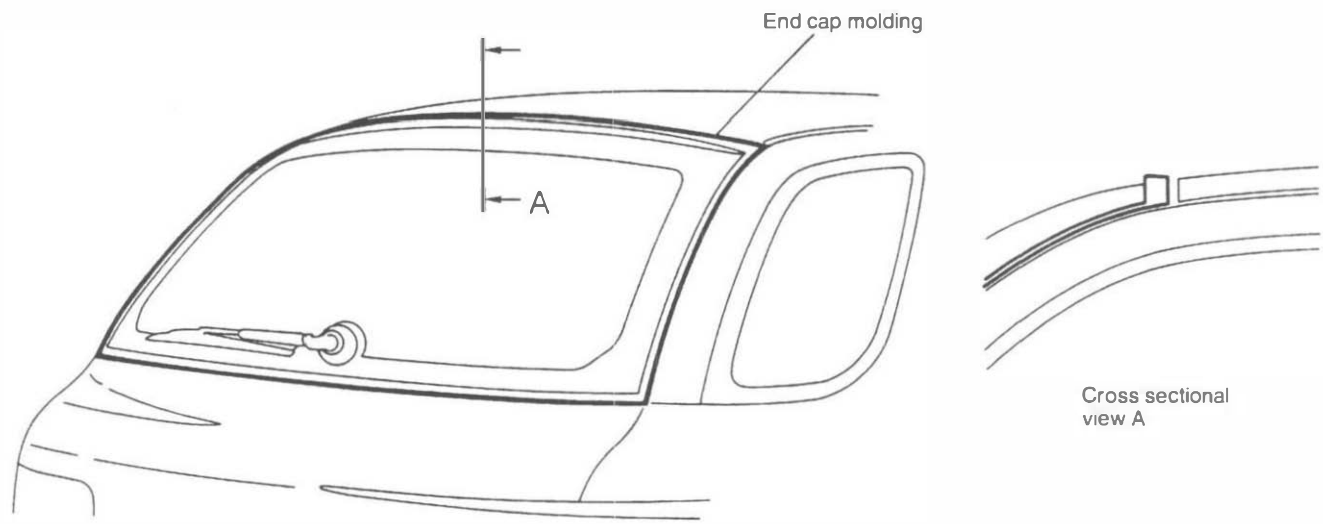


G5H0108

3. Rear Gate

The rear gate borders on the body paneling by the rear window glass.

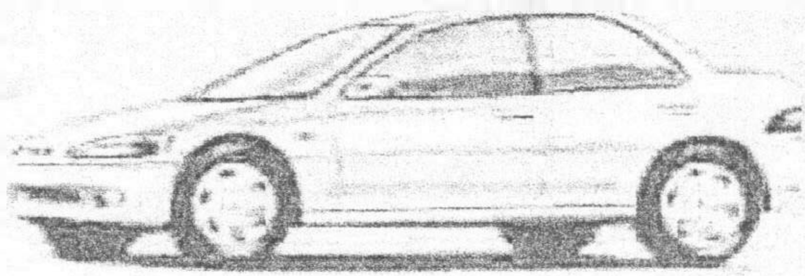
The rear window glass has an end cap molding whose top section has a spoiler-like shape.



G5H0109

SERVICE MANUAL

SUBARU IMPREZA



SERVICE MANUAL

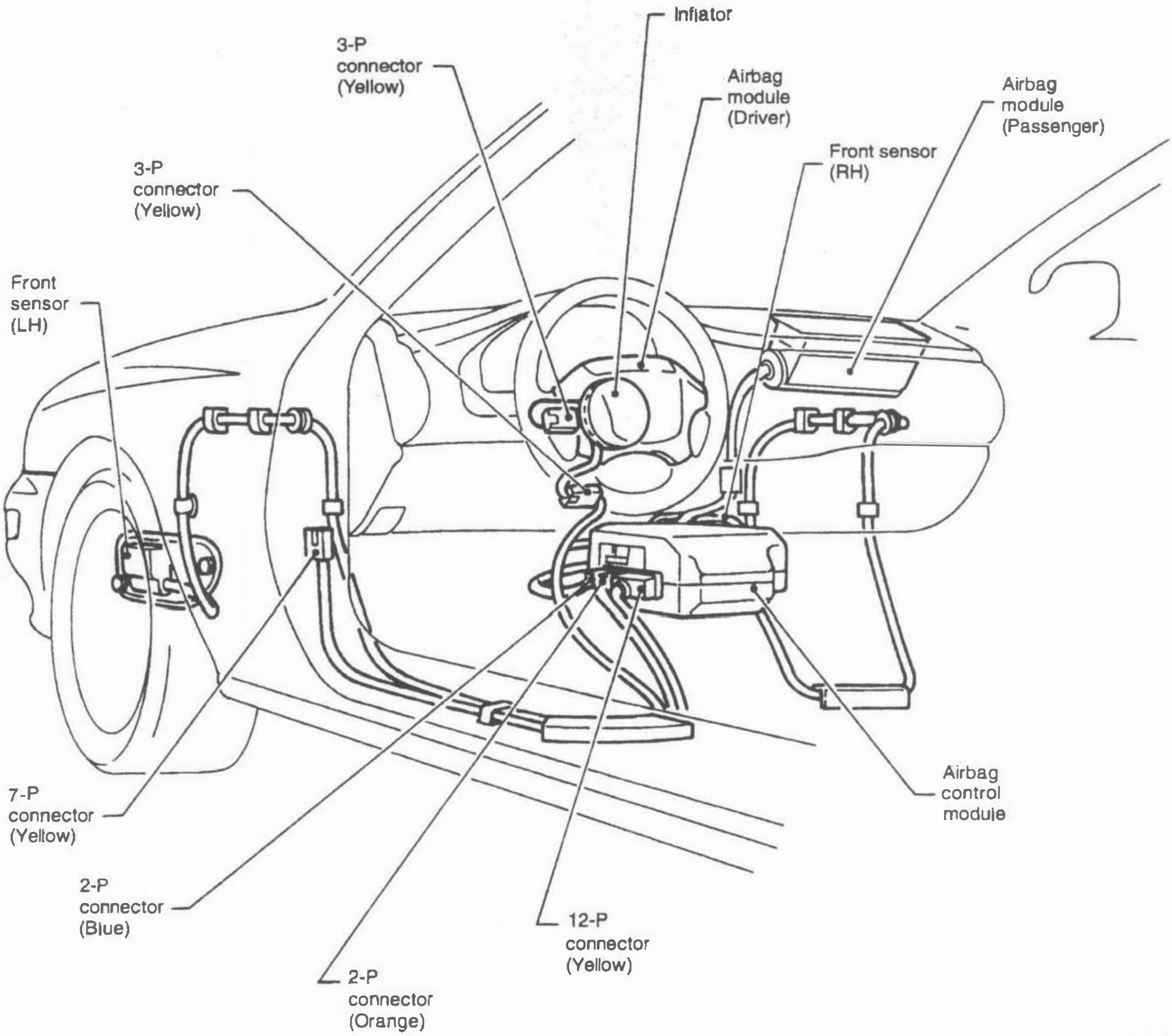
- Diagnostics section

SUPPLEMENTAL RESTRAINT SYSTEM 5-5

1. SRS Airbag System

A: INSTALLATION

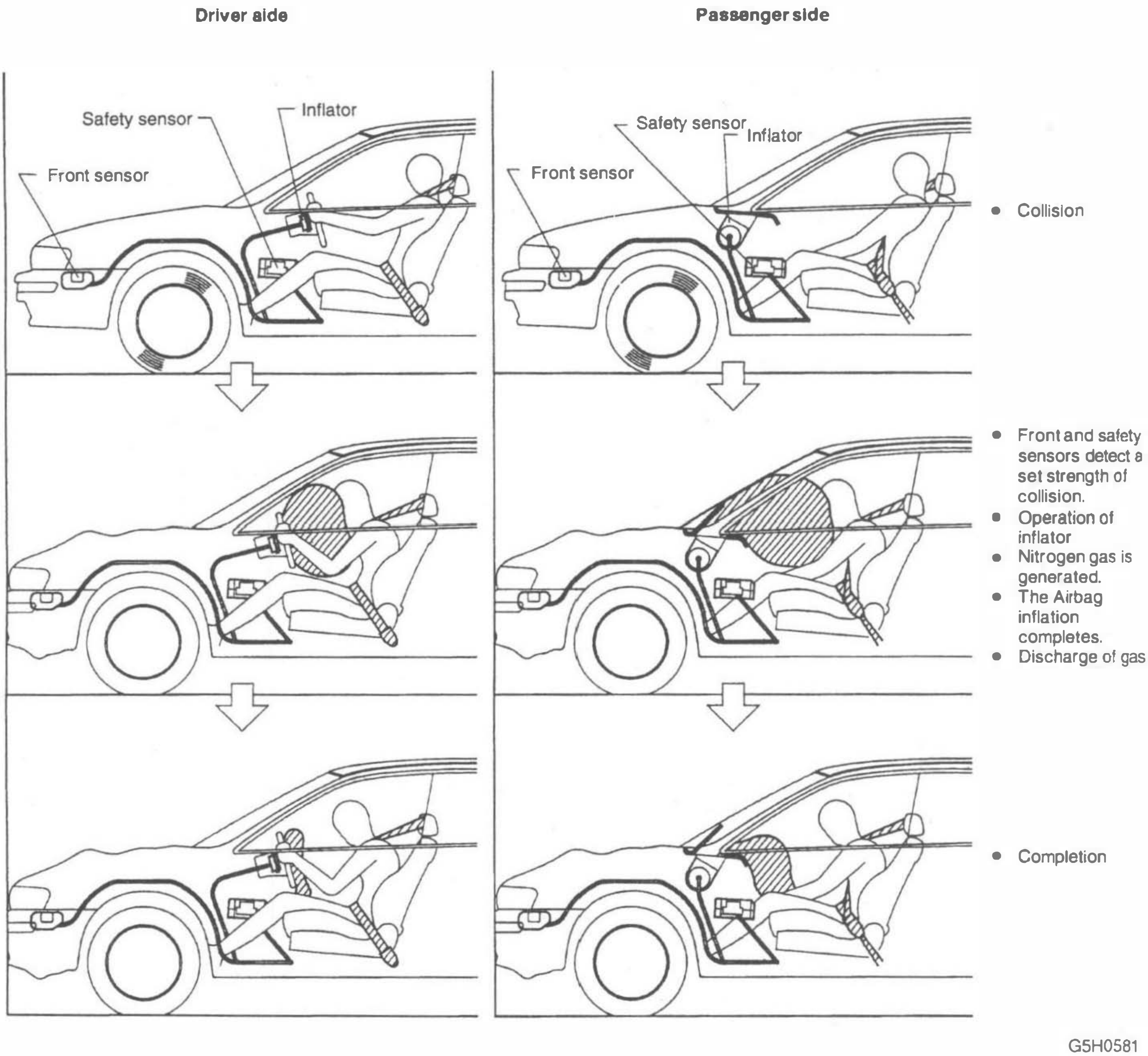
1. LHD MODEL



G5H0580

B. FUNCTION

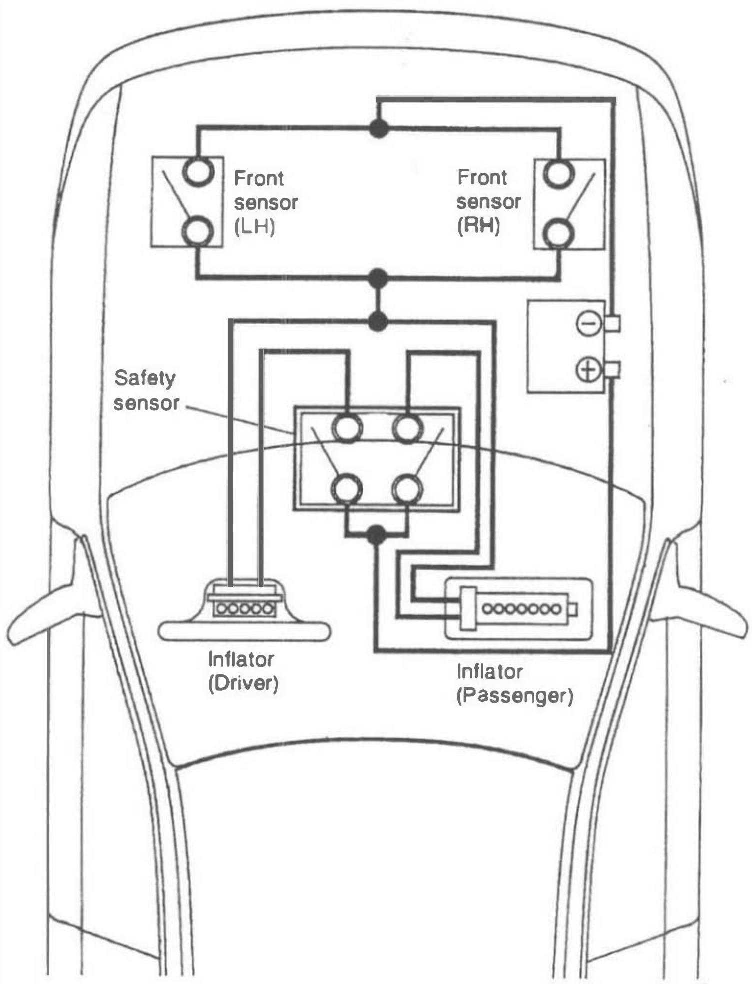
The SRS airbag is provided as an auxiliary driver and passenger sit in front seat restraint system to be used in combination with the seat belt. When an impact greater than a set level is applied to the front of the vehicle, the sensor senses it and generates an electrical pulse to inflate the bag in the airbag module, thus preventing the driver and passenger sit in front seat of upper bodies from impacting the steering wheel, instrument panel and windshield.



2. Construction

A: GENERAL

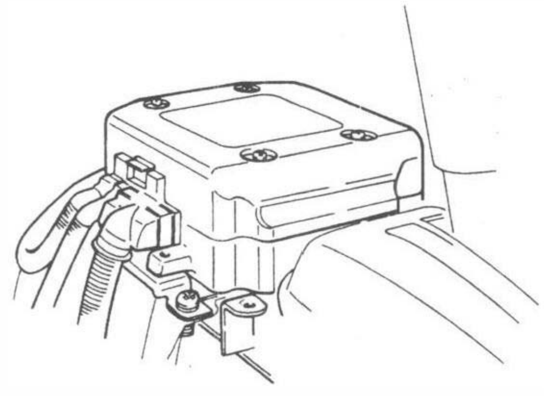
The SRS airbag consists of an airbag control module, left and right front sensors, safety sensor built into the control module, and airbag modules of driver and passenger containing an inflator and airbag. The left and right front sensors are connected in parallel respectively, and the front sensors and safety sensor are connected in series, so that the airbag will inflate if at least one front sensor and safety sensor sense an impact at the same time.



G5H0582

B: AIRBAG CONTROL MODULE

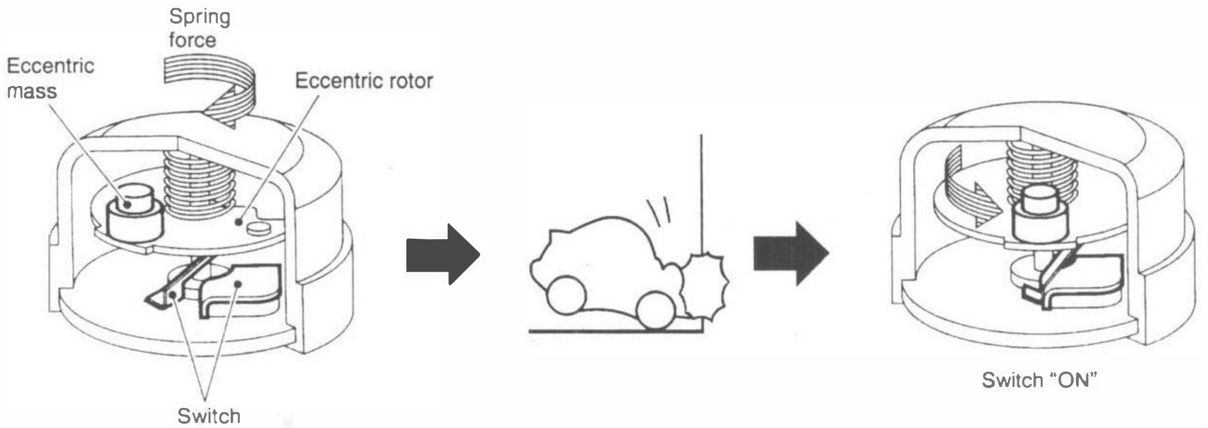
The airbag control module is installed ahead of the front floor tunnel. It detects the vehicle's deceleration by receiving electrical signals from the sensors and judges whether to fire the airbag. This control module has a built-in self-diagnosis function. If a trouble occurs inside the system, it lights up the airbag warning light in the combination meter. The trouble data is stored in the module. A back-up power supply is provided for possible damage to the battery during an accident, and a boosting circuit is built into the module in case of a battery voltage drop.



G5H0079

C: FRONT SENSOR

One front sensor is installed on both left and right sides ahead of the front wheel apron wall. If the rotary type sensor receives a frontal impact exceeding a certain set limit. The eccentric rotor rotates to turn the switch ON.



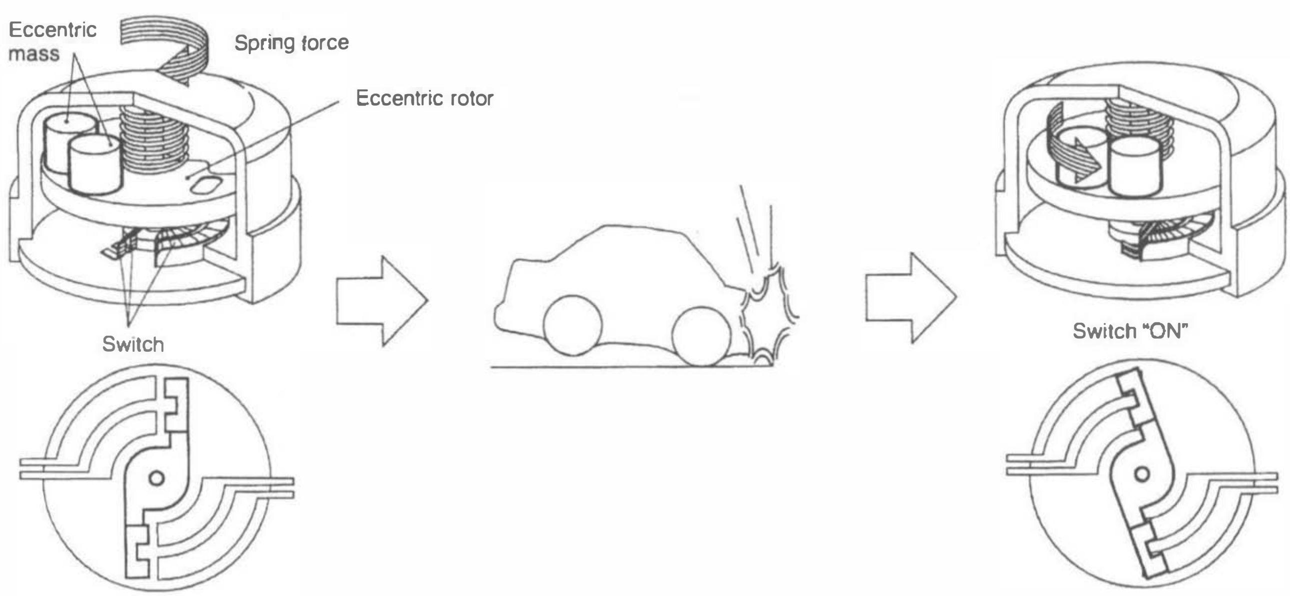
G5H0080

D: SAFETY SENSOR

1. WITH PASSENGER AIRBAG MODEL

Safety sensor is built into the airbag control module.

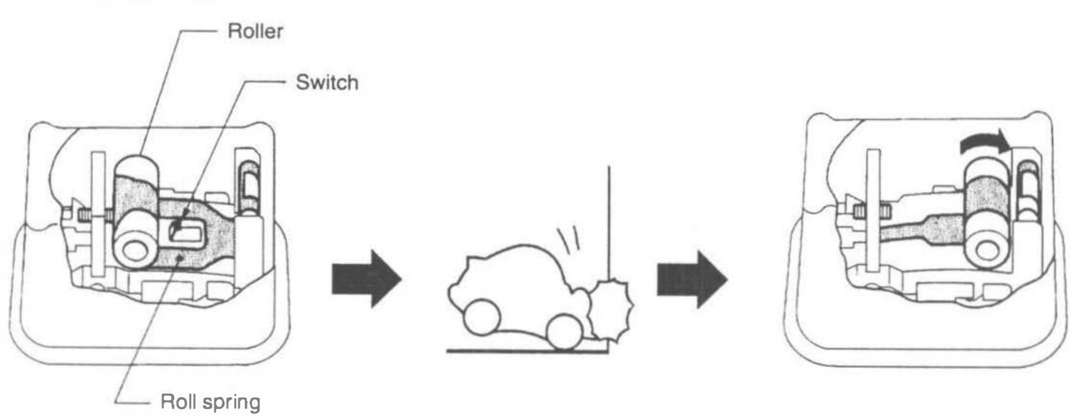
If the dual pole rotary type sensor receives a frontal impact exceeding a certain set limit. The eccentric rotor rotates to turn the switch ON.



G5H0583

2. WITHOUT PASSENGER AIRBAG MODEL

Two safety sensors are built into the airbag control module.
If the roller-might type sensor receives a frontal impact exceeding a certain set limit. The roller rotates to turn the switch ON.

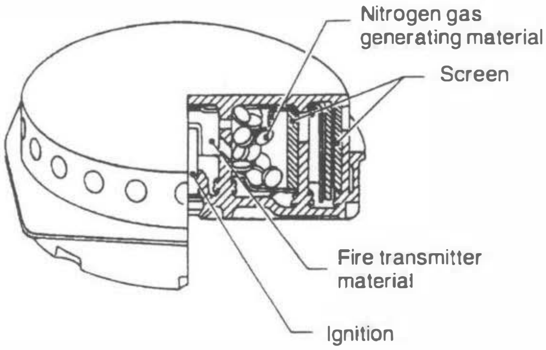


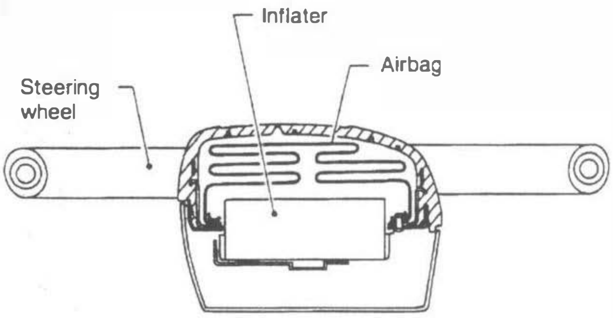
G5H0081

E: AIRBAG MODULE

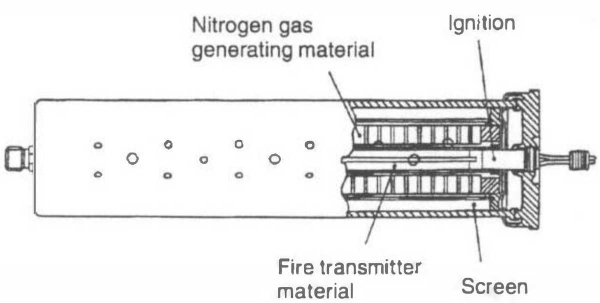
The driver's airbag module is located at the center of the steering wheel, and passenger's airbag module is located at upper side of instrument panel, and it each contains an airbag and inflater. If a collision occurs, the inflator produces a large volume of nitrogen gas inflating the nylon airbag in a very short time.

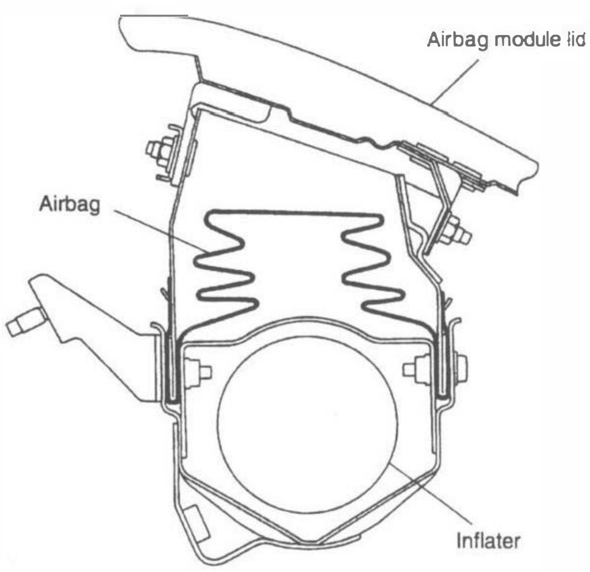
Driver side





Passenger side





G5H0585

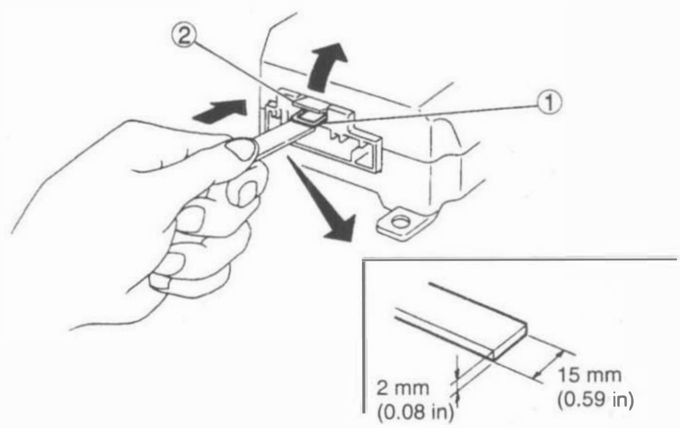
F: AIRBAG CONNECTOR

The SRS airbag adopts a connector which has a double lock mechanism and coupling error detection mechanism for enhanced reliability. If coupling is incomplete, the airbag warning light comes on in the combination meter.

1. CONNECTOR COUPLED TO AIRBAG CONTROL MODULE

To disconnect the connector, press wire ① of the control module as illustrated below until the green lever ② tilts up. This unlocks the double lock, then you can pull off the connector while pressing tile connector lock.

To couple the connector, insert the three connectors until a "click" is heard, then push in the green lever ② to apply the double lock.

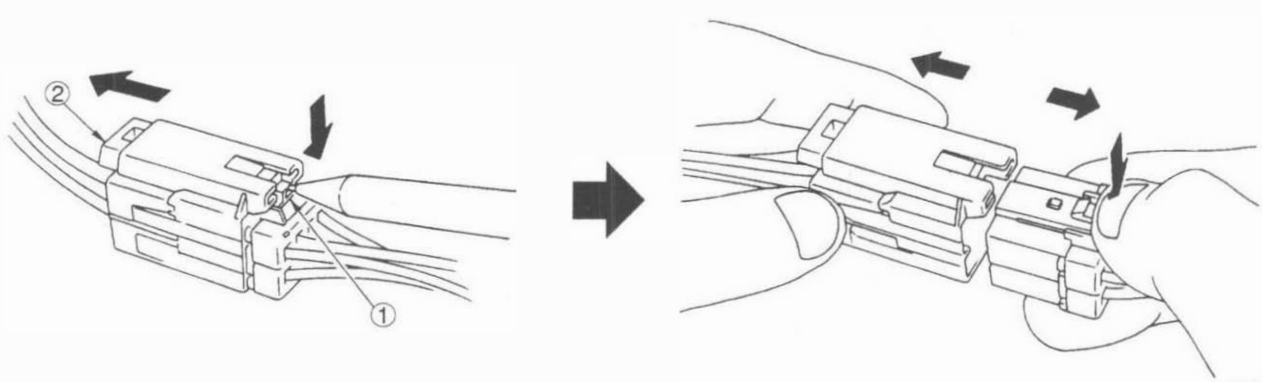


G5H0083

2. CONNECTOR BETWEEN HARNESSES

To disconnect the connector, press lever ① to pop green lever ② out, this unlocks the double lock system. Then separate the connector by pulling both sides while holding the connector sections and pressing in lever ①.

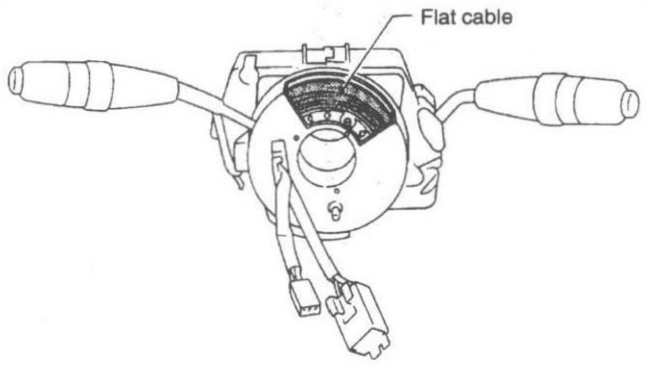
To couple the connector, insert both connectors until a "click" is heard, then push in the green lever ② until a "click" is heard; this applies the double lock.



G5H0084

G: STEERING ROLL CONNECTOR

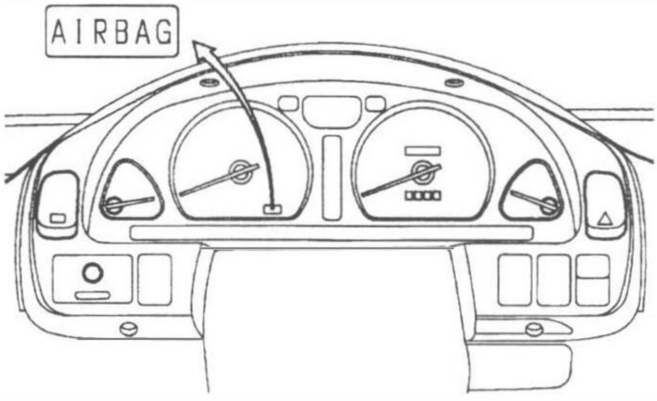
The steering roll connector is located between the steering column and steering wheel. A flat cable stored in a spiral form transmits the electrical signal from the airbag control module to the steering wheel from the body harness.



G5H0085

H: AIRBAG WARNING LIGHT

The airbag warning light is located inside the combination meter. It illuminates if a poor connection occurs, or if the airbag control module detects an abnormality, When the airbag system is normal, this light goes out about 7 seconds after turning the ignition switch ON.



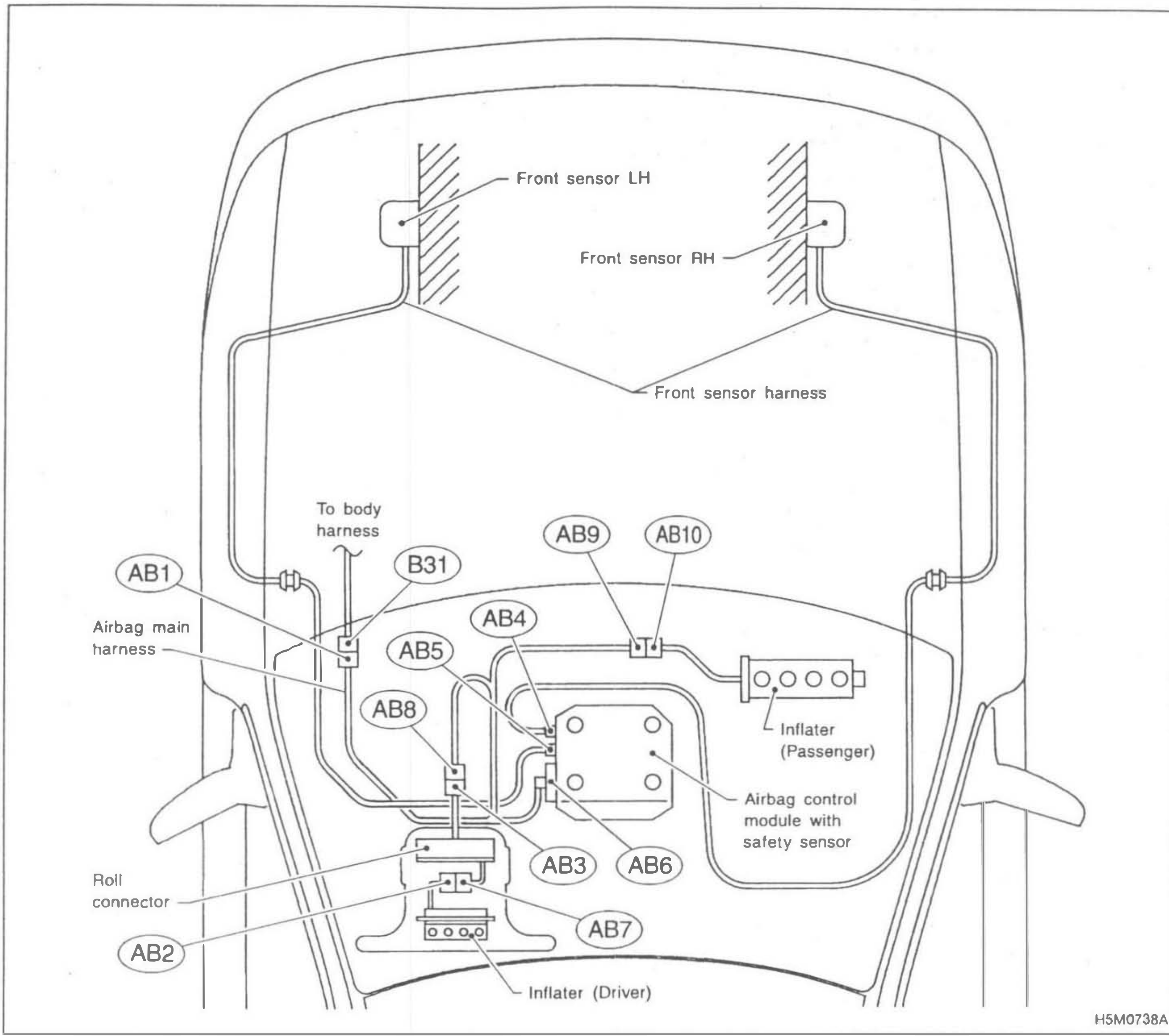
G5H0086

I: WIRE HARNESS

The wire harness of the SRS airbag is entirely covered with a yellow protective tube, and can easily be identified from harnesses of other systems.

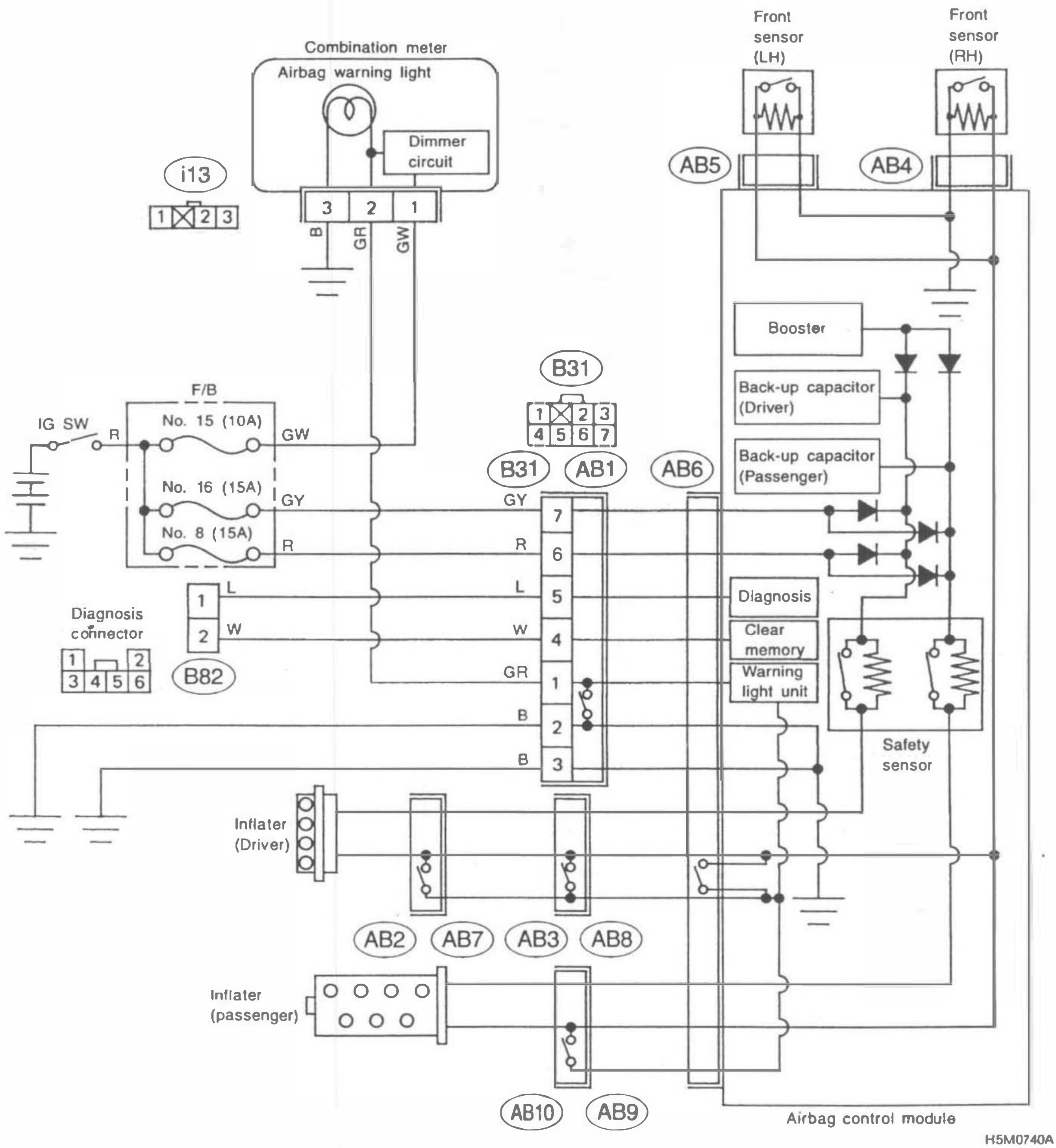
1. Electrical Components Location

A: LHD MODEL



Connector No.	(AB1)	(AB2)	(AB3)	(AB4)	(AB5)	(AB6)	(AB7)	(AB8)	(AB9)	(AB10)
Pole	7	3	3	2	2	12	3	3	3	3
Color	Yellow	Yellow	Yellow	Blue	Orange	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Male	Female	Female	Female	Female	Female	Male	Male	Male	Female

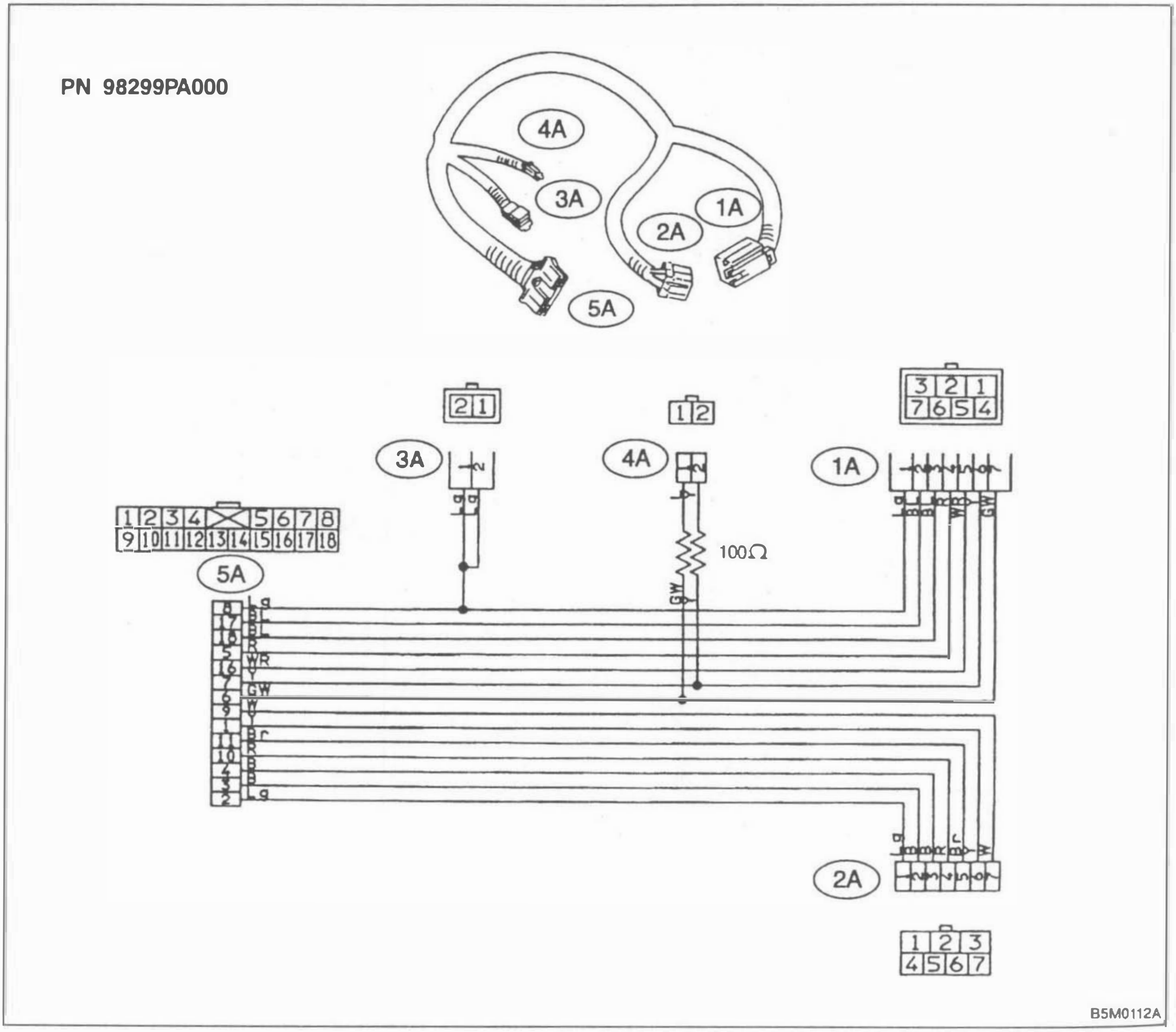
B: WITH PASSENGER'S AIRBAG MODEL



3. Tools for Diagnostics

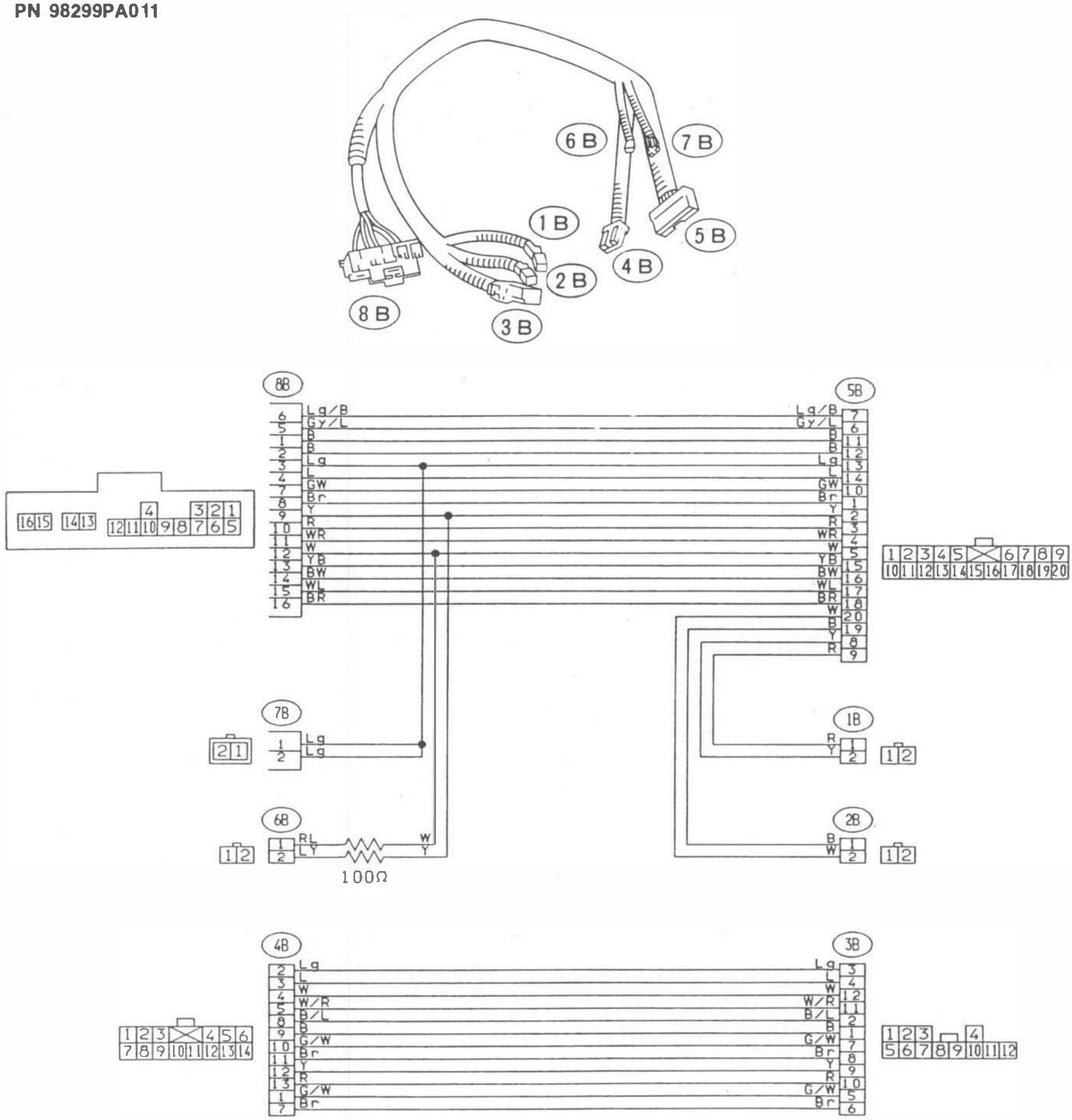
CAUTION:
Be sure to use specified test harness A, B2 or C when measuring voltage, resistance, etc. of AIRBAG system component parts.

A: TEST HARNESS A



B: TEST HARNESS B2

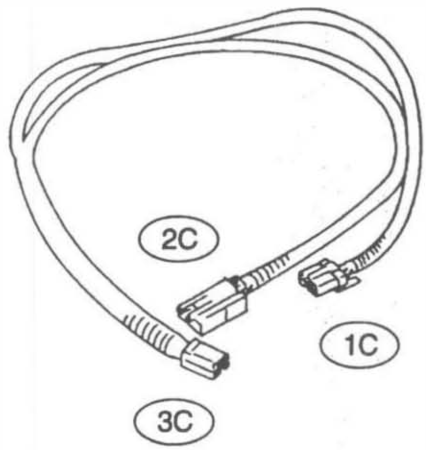
PN 98299PA011

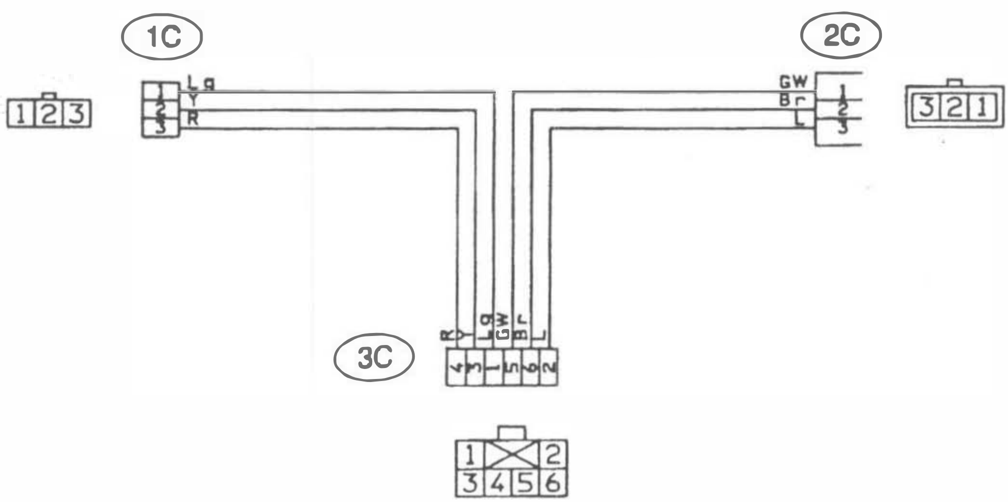


G5M0593

C: TEST HARNESS C

PN 98299PA020



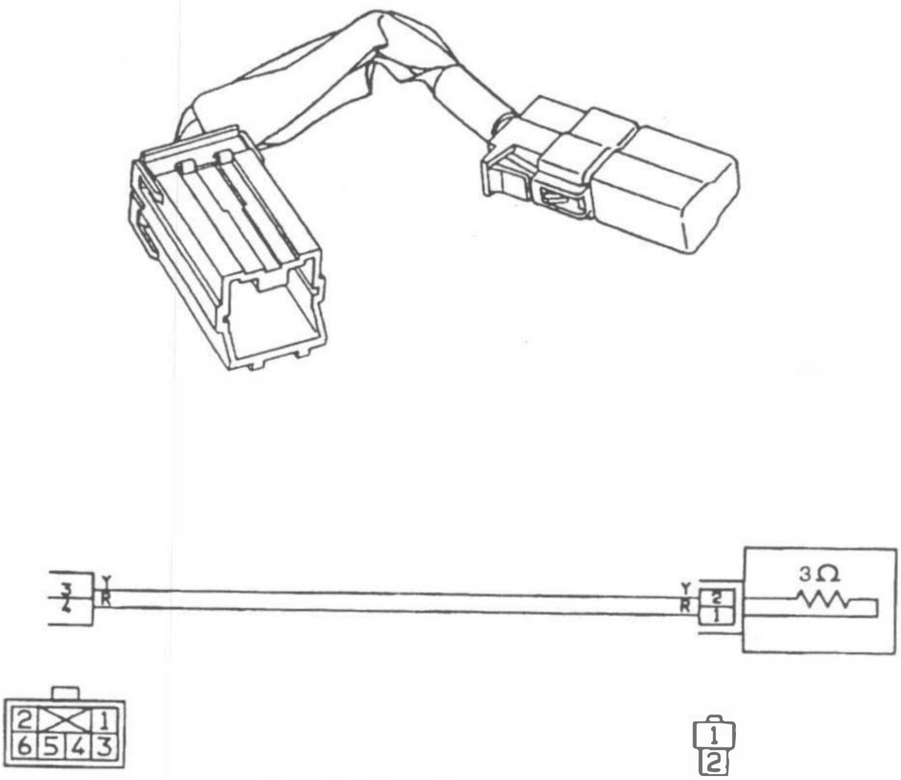


B5M0113A

D: AIRBAG RESISTOR

The airbag resistor is used during diagnostics. The airbag resistor has the same resistance as the airbag module and thus provides safety when used instead of the airbag module. It also makes it possible to finish, diagnostics in less time.

PN 98299PA040



B5M0114A

4. Diagnostics Chart for On-board Diagnostic System

A: BASIC DIAGNOSTICS PROCEDURE

4A1	**CHECK AIRBAG WARNING LIGHT ILLUMINATES.**

1) Airbag warning light comes ON.
2) Turn ignition switch to ON (engine OFF).
3) Check airbag warning light illuminates.

CHECK : ***Does airbag warning light stay ON after about 7 seconds or remain OFF, or come back ON after 30 seconds?***

YES : Repair and replace. <Ref. to 5-5 [T4D0].>
NO : Go to step **4A2**.

4A2	**CHECK TROUBLE CODE INDICATES.**

Perform ON-BOARD DIAGNOSTICS.
<Ref. to 5-5 [T4B0].>

CHECK : ***Does trouble code indicate? <Ref. to 5-5 [T5A0].>***

YES : Repair and replace. <Ref. to 5-5 [T5Q0].> Then go to step **4A3**.
NO : Repair and replace. <Ref. to 5-5 [T5R0].> Then go to step **4A3**.

4A3	**CHECK AIRBAG WARNING LIGHT ILLUMINATES.**

1) Turn ignition switch to ON (engine OFF).
2) Check airbag warning light illuminates.

CHECK : ***Does airbag warning light stay ON after about 7 seconds or come back ON after 30 seconds?***

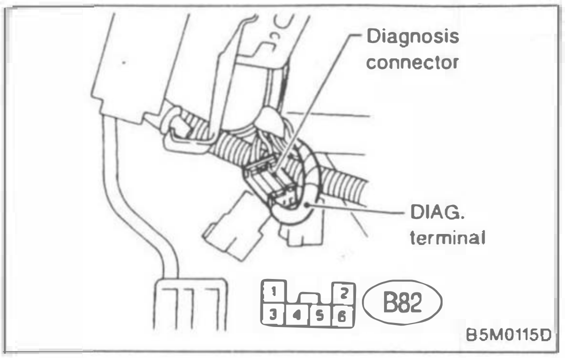
YES : Repair and replace. <Ref. to 5-5 [T4D0].>
NO : Go to step **4A4**.

4A4	**CHECK AIRBAG WARNING LIGHT ILLUMINATES.**

Check airbag warning light illuminates.

CHECK : ***Does airbag warning light come ON for about 7 seconds, then go out and stay out?***

YES : Perform clear memory. <Ref. to 5-5 [T4C0].>
NO : Go to step **4A1**.



B: ON-BOARD DIAGNOSTIC

When the airbag system is in functioning condition, the airbag warning light will remain on for about 7 seconds and go out when the ignition switch is set to ON.

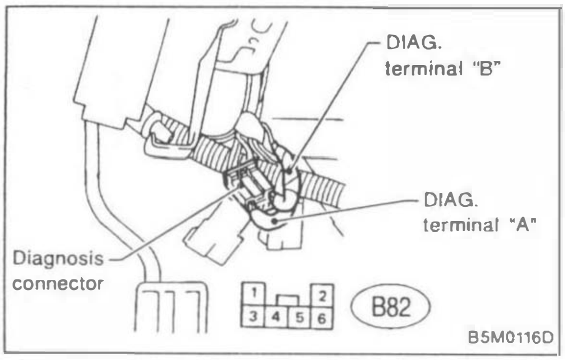
If there is any malfunction, the airbag warning light will either stay on or off continuously. In such cases, perform on-board diagnostic in accordance with the specified procedure to determine trouble codes.

1) Turn ignition switch ON (with engine OFF).

2) Connect DIAG. terminal to No. 1 terminal of diagnosis connector located below lower cover.

3) Check in accordance with the trouble code indicated by the AIRBAG warning light, and record the trouble codes.

4) Turn the ignition switch "OFF" and remove the DIAG. terminal from No.1 terminal of diagnosis connector.



C: CLEAR MEMORY

After eliminating problem as per trouble code, clear memory as follows:

1) Make sure ignition switch is ON (and engine off). Connect one DIAG. terminal "A" on diagnosis connector terminal No. 1.

While warning light is flashing, contact the other DIAG. terminal "B" on terminal No. 2 for at least three seconds.

2) After memory is cleared, normal warning light flashing rate resumes. (Warning light flashes every 0.6 seconds ON-OFF operation.) Memory cannot be cleared if any problem exists.

3) After clear memory and then DIAG. terminals "A" and "B", extract from diagnosis connector.

D: DIAGNOSTICS PROCEDURE

1. WITHOUT PASSENGER'S AIRBAG MODEL

Airbag warning light stays on after about 7 seconds.

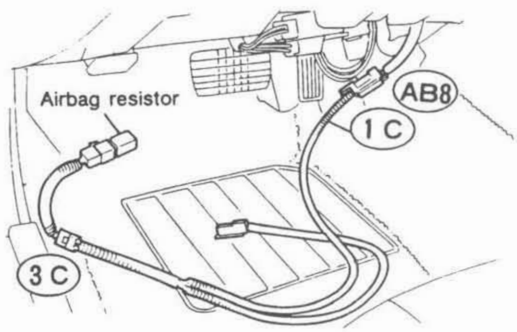
1) Perform on-board diagnostic. <Ref. to 5-5 [T4B0].>

2) Are trouble codes 2, 12, 13, or 23 indicated? <Ref. to 5-5 [T5A2].>
Trouble code is written down.

3) If "NO", proceed with diagnostics and repair according to trouble code indicated then perform step 20).

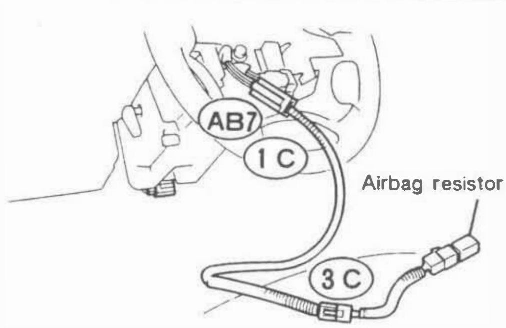
4) If "YES", proceed by turning ignition switch "OFF", disconnecting the battery, and waiting 20 seconds. If codes 12 or 13 are indicated proceed to step 6). If codes 12 or 13 are not indicated proceed to step 5).

5) Remove lower cover panel and connect test harness C connector (1C) to (AB8) <Ref. to 5-4 [W1A0].> with airbag resistor attached to test harness C connector (3C).
Turn ignition switch "ON". Does airbag warning light go "OFF" after about 7 seconds and remain off for more than 30 seconds?
See notes 1) and 2).
If "YES" proceed to step 6).
If "NO" proceed to step 3).



G5M0429

6) Remove airbag module and connect test harness C connector (1C) to (AB7). <Ref. to 5-5 [W3A1].>
Connect airbag resistor to test harness C connector (3C).



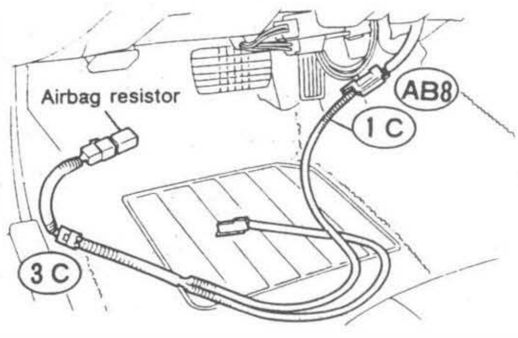
G5M0430

7) Reconnect battery cable.

8) Turn ignition switch "ON", does airbag warning light go out after about 7 seconds and remain "OFF" for more than 30 seconds? See notes 1) and 2).

9) If "YES", disconnect battery, turn ignition switch "OFF", and wait 20 seconds. Install a new airbag module <Ref. to 5-5 [W3B1].> then proceed to step 20).

10) If "NO", connect test harness C connector (1C) to (AB8) <Ref. to 5-4 [W1A0].> with airbag resistor attached to test harness C connector (3C).



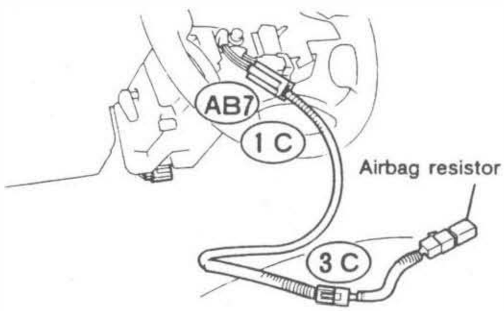
G5M0429

11) Turn ignition switch "ON". Does airbag warning light go "OFF" after about 7 seconds and remain off for more than 30 seconds? See notes 1) and 2).

12) If "YES", replace combination switch, <Ref. to 5-5 [W6A0].> and proceed to step 16).

13) If "NO", proceed with diagnostics according to trouble code indicated during on-board diagnostic.

14) After repair, reconnect test harness C connector (1C) to (AB7) <Ref. to 5-5 [W3A1].> with airbag resistor attached to (3C).



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15) Turn ignition switch "ON". Does airbag warning light go "OFF" after about 7 seconds and remain off for more than 30 seconds? See notes 1) and 2).

16) If "YES", disconnect battery. Turn ignition switch "OFF", and wait 20 seconds. Install airbag module <Ref. to 5-5 [W3B1].> and proceed to step 18).

17) If "NO", replace combination switch, <Ref. to 5-5 [W6A0].> and proceed to step 16).

18) Reconnect battery and turn ignition switch "ON". Does airbag warning light go off after about 7 seconds and remain off for more than 30 seconds? See notes 1) and 2).

19) If "NO", disconnect battery, turn ignition switch "OFF", replace a new airbag module <Ref. to 5-5 [W3A1].> and repeat step 18).

20) If "YES", perform clear memory procedure. <Ref. to 5-5 [T4C0].>

21) If memory cannot be cleared, another trouble code exists. Proceed to returning to step 1).

NOTES:

- **Always remember to secure the green double locks before turning the ignition switch "ON".**
- **In some cases the airbag warning light will go "OFF" after about 7 seconds but will turn "ON" again within 30 seconds. In this case continue diagnostics with the basic diagnostics procedures or trouble code procedures.**

2. WITH PASSENGER'S AIRBAG MODEL

Airbag warning light stays on after about 7 seconds.

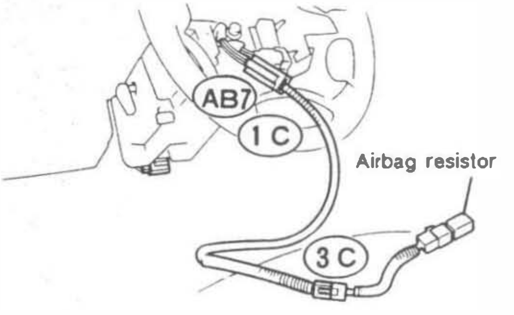
1) Perform on-board diagnostic. <Ref. to 5-5 [T4B0].>

2) Are trouble codes 2, 4, 12, 13, 22, 23, 24 or 32 indicated? <Ref. to 5-5 [T5A2].>
Record trouble codes.

3) If "NO", proceed with diagnostics and repair according to trouble code indicated then perform step 29).

4) If "YES", proceed by turning ignition switch "OFF", disconnect battery ground cable, and wait 20 seconds. If codes 12 or 13 are indicated proceed to step 5). If codes 12 or 13 are not indicated proceed to step 6).

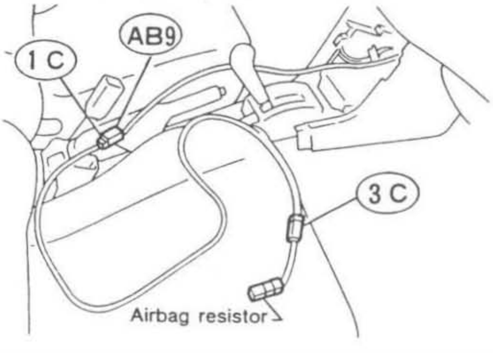
5) Remove driver side airbag module and connect test harness C connector (1C) to (AB7). <Ref. to 5-5 [W3A1].>
Connect airbag resistor to test harness C connector (3C).
Proceed to step 19).



G5M0430

6) If codes 4 or 22 are indicated, proceed to step 7). If codes 4 or 22 are not indicated proceed to step 11).

7) Turn ignition switch "OFF", disconnect battery ground cable, and wait 20 seconds. Disconnect passenger side airbag module connector (AB9) to (AB10). <Ref. to 5-5 [W3A2].> Connect test harness C connector (1C) to (AB9).
Connect airbag resistor to test harness C connector (3C).



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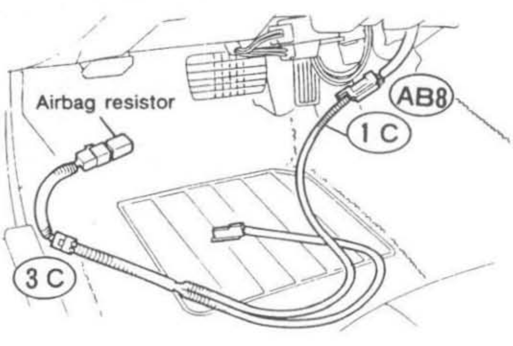
8) Reconnect battery ground cable and turn ignition switch "ON", does airbag warning light go out after about 7 seconds and remain "OFF" for more than 30 seconds? See notes 1) and 2). (Refer to end of chart.)

9) If "YES", turn ignition switch "OFF", disconnect battery ground cable, and wait 20 seconds. Install a new passenger side airbag module <Ref. to 5-5 [W3B2].> then proceed to step 29).

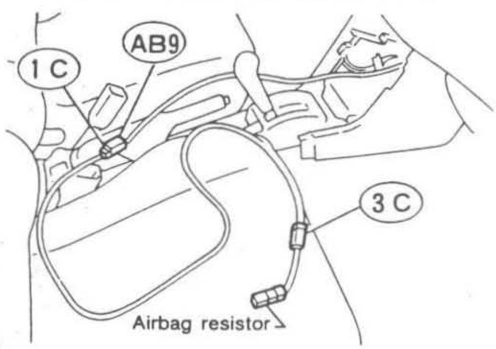
10) If "NO" proceed to step 1).

11) Remove lower cover panel and connect test harness C connector (1C) to (AB8) <Ref. to 5-4 [W1A0].> with airbag resistor attached to test harness C connector (3C).
Turn ignition switch "ON". Does airbag warning light go "OFF" after about 7 seconds and remain off for more than 30 seconds?
See notes 1) and 2). (Refer to end of chart.)
If "YES" proceed to step 5).
If "NO" proceed to step 12).



G5M0429

12) Turn ignition switch "OFF", disconnect battery ground cable, and wait 20 seconds. Connect connector (AB3) to (AB8). Disconnect passenger side airbag module connector (AB9) to (AB10). <Ref. to 5-5 [W3A2].>
Connect test harness C connector (1C) to (AB9). Connect airbag resistor to test harness C connector (3C).

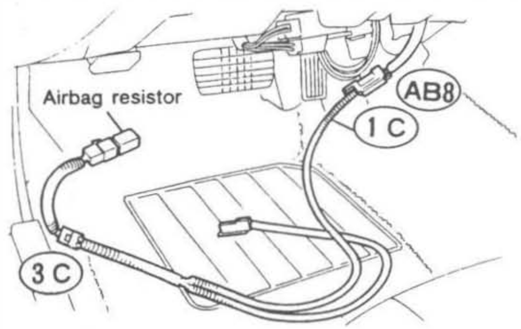


G5M0589

13) Reconnect battery ground cable and turn ignition switch "ON". Does airbag warning light go "OFF" after about 7 seconds and remain off for more than 30 seconds? See notes 1) and 2). (Refer to end of chart.)

14) If "YES", proceed to step 9).

15) If "NO", turn ignition switch "OFF", disconnect battery ground cable, and wait 20 seconds. Disconnect connector (AB3) to (AB8). Connect test harness C connector (1C) to (AB8). Connect airbag resistor to test harness C connector (3C).



G5M0429

16) Reconnect battery ground cable and turn ignition switch "ON". Does airbag warning light go "OFF" after about 7 seconds and remain off for more than 30 seconds? See notes 1) and 2). (Refer to end of chart.)

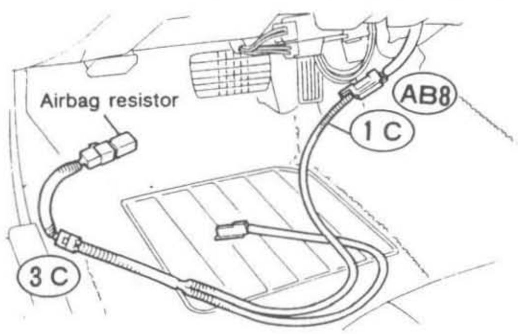
17) If "YES", turn ignition switch "OFF", disconnect battery ground cable and wait 20 seconds. Install a new passenger side airbag module <Ref. to 5-5 [W3B2].> then proceed to step 5).

18) If "NO", proceed with diagnostics according to trouble code indicated during on-board diagnostic. Proceed to step 29).

19) Reconnect battery ground cable and turn ignition switch "ON", does airbag warning light go out after about 7 seconds and remain "OFF" for more than 30 seconds? See notes 1) and 2). (Refer to end of chart.)

20) If "YES", turn ignition switch "OFF", disconnect battery ground cable and wait 20 seconds. Install driver side airbag module <Ref. to 5-5 [W3B1].> and proceed to step 29).

21) If "NO", remove lower cover panel and connect test harness C connector (1C) to (AB8) <Ref. to 5-4 [W1A0].> with airbag resistor attached to test harness C connector (3C).
Turn ignition switch "ON". Does airbag warning light go "OFF" after about 7 seconds and remain off for more than 30 seconds?
See notes 1) and 2). (Refer to end of chart.)
If "YES" proceed to step 22).
If "NO" proceed to step 23).

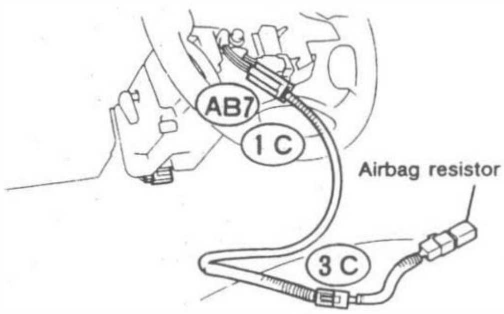


G5M0429

22) If "YES", replace combination switch, <Ref. to 5-5 [W6A0].> and proceed to step 26).

23) If "NO", proceed with diagnostics and repair according to trouble code indicated, then perform step 24).

24) Turn ignition switch "OFF", disconnect battery ground cable, and wait 20 seconds. Remove driver side airbag module and connect test harness C connector (1C) to (AB7) <Ref. to 5-5 [W3A1].> with airbag resistor attached to test harness C connector (3C).



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25) Reconnect battery ground cable and turn ignition switch "ON". Does airbag warning light go "OFF" after about 7 seconds and remain off for more than 30 seconds? See notes 1) and 2). (Refer to end of chart.) If "YES", proceed to step 26). If "NO", proceed to step 27).

26) Turn ignition switch "OFF", disconnect battery ground cable, and wait 20 seconds. Install driver side airbag module <Ref. to 5-5 [W3B1].> and proceed to step 27).

27) Replace combination switch, <Ref. to 5-5 [W6A0].> and proceed to step 26).

28) Reconnect battery and turn ignition switch "ON". Does airbag warning light go off after about 7 seconds and remain off for more than 30 seconds? See notes 1) and 2). (Refer to end of chart.) If "YES", proceed to step 29). If "NO", proceed to step 31).

29) Perform clear memory procedure. <Ref. to 5-5 [T4C0].>

30) If memory cannot be cleared, another trouble code exists. Return to step 1).

31) Turn ignition switch "OFF", disconnect battery ground cable, and wait 20 seconds. Replace driver side airbag module. <Ref. to 5-5 [W3A1].> Proceed to step 28).

NOTES:
- **Always remember to secure the green double locks before turning the ignition switch "ON".**
- **In some cases the airbag warning light will go "OFF" after about 7 seconds but will turn "ON" again within 30 seconds. In this case continue diagnostics with the basic diagnostics procedures or trouble code procedures.**

5. Diagnostics Chart with Trouble Code

A: TROUBLE CODES

1. LIST OF TROUBLE CODES

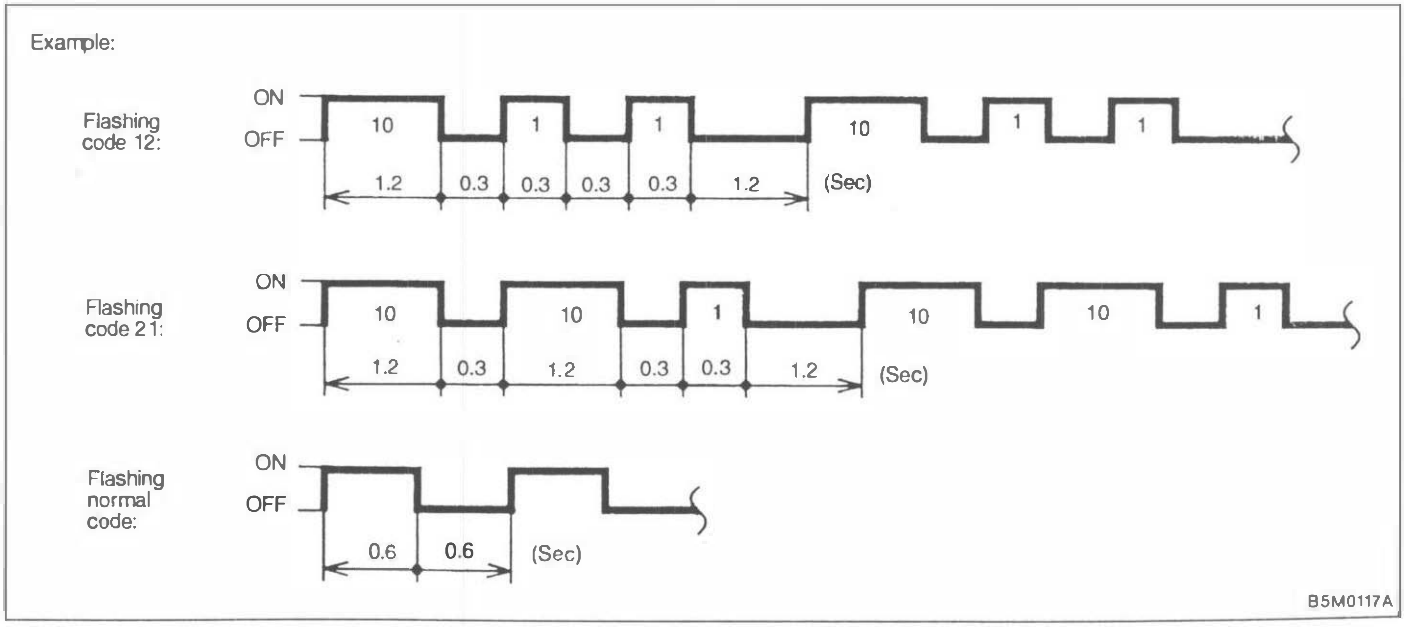
Trouble code/ Contents of troubles	Memory function	Contents of diagnosis	Index No.
02	Provided.	1) Front sensor harness is shorted. 2) Airbag main harness is shorted. 3) Airbag module harness (Dr/Ps) is shorted. 4) Roll connector is shorted. 5) Airbag control module is faulty.	<Ref. to 5-5 [T5B0].>
03	Provided.	1) Front sensor harness circuit is open. 2) Front sensor unit circuit is open.	<Ref. to 5-5 [T5C0].>
04	Provided.	1) Airbag main harness circuit is shorted. 2) Airbag module harness (Ps) circuit is shorted. 3) Airbag control module is faulty.	<Ref. to 5-5 [T5D0].>
11	Provided.	1) Airbag control module is faulty. 2) Airbag main harness circuit is open. 3) Fuse No. 8 is blown. 4) Body harness circuit is open.	<Ref. to 5-5 [T5E0].>
12	Provided.	1) Airbag main harness circuit is open. 2) Airbag module harness (Dr) circuit is open. 3) Roll connector circuit is open. 4) Airbag control module is faulty.	<Ref. to 5-5 [T5F0].>
13	Provided.	1) Airbag main harness circuit is shorted. 2) Airbag module harness (Dr) is shorted. 3) Roll connector circuit is shorted. 4) Airbag control module is faulty.	<Ref. to 5-5 [T5G0].>
14	Not provided.	1) (AB9) and (AB10) are not connected properly. 2) (AB2) and (AB7) are not connected properly. 3) (AB3) and (AB8) are not connected properly. 4) (AB4), (AB5) and (AB6) are not connected properly to airbag control module.	<Ref. to 5-5 [T5H0].>
21	Provided.	Airbag control module is faulty.	<Ref. to 5-5 [T5I0].>
22	Provided.	1) Airbag main harness circuit is open. 2) Airbag module harness (Ps) circuit is open. 3) Airbag control module is faulty.	<Ref. to 5-5 [T5J0].>
23	Provided.	1) Airbag main harness is shorted to power supply. 2) Front sensor harness is shorted to power supply. 3) Airbag module harness (Dr/Ps) is damaged. 4) Roll connector is shorted to power supply. 5) Airbag control module is faulty.	<Ref. to 5-5 [T5K0].>
24	Provided.	1) Airbag main harness circuit is open. 2) Airbag module harness (Dr) circuit is open. 3) Roll connector circuit is open. 4) Airbag control module is faulty. 5) Above diagnosis plus other faulty of airbag moduler parts.	<Ref. to 5-5 [T5L0].>
31	Not provided.	1) Airbag control module is faulty. 2) Airbag main harness circuit is open. 3) Fuse No. 16 is blown. 4) Body harness circuit is open.	<Ref. to 5-5 [T5M0].>
32	Provided.	1) Airbag main harness circuit is open. 2) Airbag module harness (Ps) circuit is open. 3) Airbag control module is faulty. 4) Above diagnosis plus other faulty of airbag moduler parts.	<Ref. to 5-5 [T5N0].>

NOTE: Dr: Driver side Ps: Passenger side

Trouble code/ Contents of troubles	Memory function	Contents of diagnosis	Index No.
Airbag warning light remains on.	Not provided.	1) Airbag warning light is faulty. 2) Airbag control module to airbag warning light harness circuit is shorted or open. 3) Grounding circuit is faulty. 4) Airbag control module is faulty. 5) (AB1) and (B31) are not connected properly.	<Ref. to 5-5 [T5O0].>
Airbag warning light remains off.	Not provided.	1) Fuse No. 15 is blown. 2) Body harness circuit is open. 3) Airbag warning light is faulty. 4) Airbag main harness is faulty. 5) Airbag control module is faulty.	<Ref. to 5-5 [T5P0].>
Warning light indicates trouble code, then normal code. (Flashing trouble code.)	Provided.	Airbag system component parts are faulty.	<Ref. to 5-5 [T5Q0].>
Warning light indicates trouble code, then normal code. (Flashing trouble code.)	Not provided.	1) Airbag connector is faulty. 2) Fuse No. 16 is blown. 3) Airbag main harness is faulty. 4) Airbag control module is faulty. 5) Body harness is faulty.	<Ref. to 5-5 [T5R0].>

2. HOW TO READ TROUBLE CODES

The AIRBAG warning light flashes a code corresponding to the faulty parts.
The long segment (1.2 sec on) indicates a "ten", and the short segment (0.3 sec on) indicates a "one".



B: TROUBLE CODE 02

DIAGNOSIS:

- Front sensor harness is shorted.
- Airbag main harness is shorted.
- Airbag module harness (Driver or passenger) is shorted.
- Roll connector is shorted.
- Airbag control module is faulty.

1. Front sensor and harness inspection — Not O.K. → Replace front sensor.

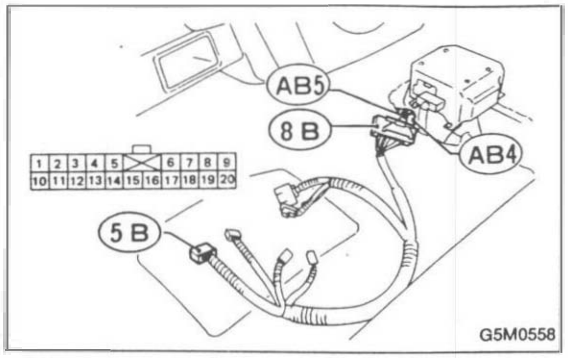
↓ O.K.

2. Airbag main harness inspection — Not O.K. → Replace airbag main harness.

↓ O.K.

Replace airbag control module.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



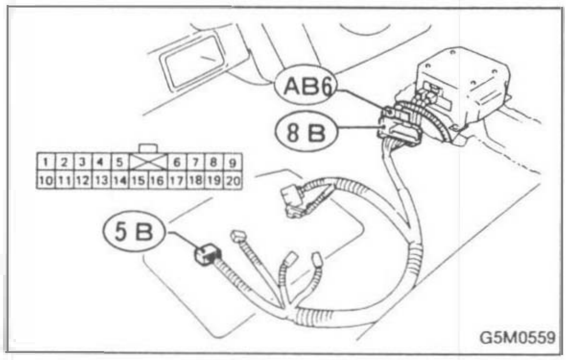
1. FRONT SENSOR AND HARNESS INSPECTION

1) Disconnect connectors (AB4) and (AB5) from airbag control module. <Ref. to 5-5 [W6A0].>
2) Connect connectors (AB4) and (AB5) to connector (8B) of test harness B2.
3) Measure resistance between connector (5B) terminals indicated.

(5B) Terminals / Specified resistance:
(RH: AB4): No. 17 — No. 18 / 1.4 — 1.6 kΩ
(LH: AB5): No. 15 — No. 16 / 1.4 — 1.6 kΩ

4) Measure resistance between each connector (5B) terminal and body.

(5B) Terminals / Specified resistance:
(RH: AB4): No. 17 — Body / 200 Ω, or more
No. 18 — Body / 200 Ω, or more
(LH: AB5): No. 15 — Body / 200 Ω, or more
No. 16 — Body / 200 Ω, or more



2. AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W6A0].>, and connect (AB6) to test harness B2 connector (8B).
2) Measure resistance between each (5B) terminal and body.

(5B) Terminals / Specified resistance:
No. 1 — Body / 200 Ω, or more
No. 14 — Body / 200 Ω, or more

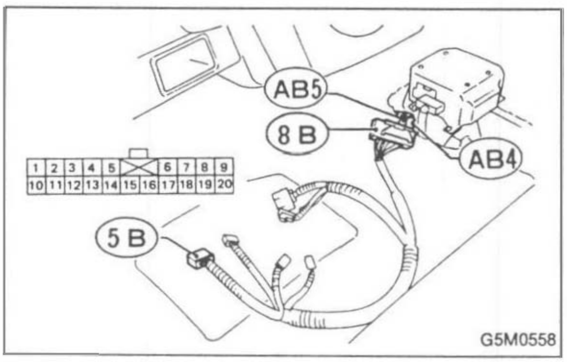
C: TROUBLE CODE 03

DIAGNOSIS:

- Front sensor harness circuit is open.
- Front sensor unit circuit is open.

1. Front sensor (LH and RH) Inspection	→ Identify faulty sensor and replace front sensor.

CAUTION:
Before performing the diagnostics on airbag system, turn Ignition switch "OFF", disconnect battery ground terminal and then wait at least 20 seconds.



1. FRONT SENSOR (LH AND RH) INSPECTION

1) Disconnect connectors (AB4) and (AB5) from airbag control module. <Ref. to 5-5 [W6A0].>
2) Connect connectors (AB4) and (AB5) to test harness B2 connector (8B).
3) Measure resistance between connector (5B) terminals.

(5B) Terminals / Specified resistance:
(RH: AB4): No. 17 — No. 18 / 1.4 — 1.6 kΩ
(LH: AB5): No. 15 — No. 16 / 1.4 — 1.6 kΩ

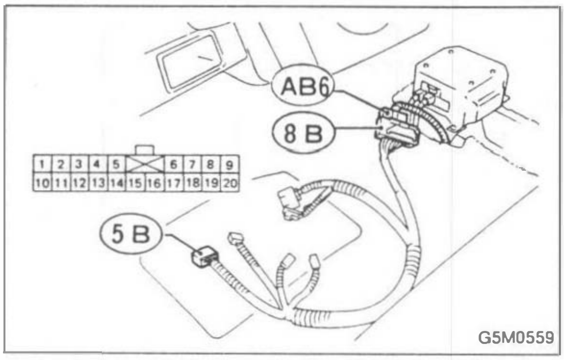
D: TROUBLE CODE 04

DIAGNOSIS:

- Airbag main harness circuit is shorted.
- Airbag module harness (Passenger) circuit is shorted.
- Airbag control module is faulty.

	Not O.K.
1. Airbag main harness inspection	Replace airbag main harness.
O.K. ↓ Replace airbag control module.	

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



G5M0559

1. AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness B2 connector (8B).
2) Measure resistance between test harness B2 connector (5B) terminals.

(5B) Terminal / Specified resistance:
No. 6 — No. 7 / 10 kΩ, or more

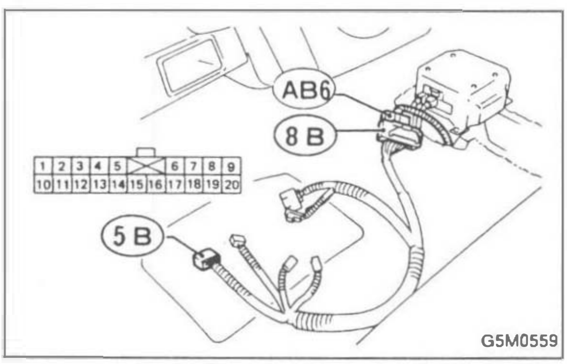
E: TROUBLE CODE 11

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 8 is blown.
- Body harness circuit is open.

Step	Result	Action
1. Airbag control module inspection	O.K.	Replace airbag control module.
	Not O.K.	Go to step 2.
2. Airbag main harness inspection	Not O.K.	Replace airbag main harness.
	O.K.	Go to step 3.
3. Fuse No. 8 inspection	Not O.K.	Replace fuse No. 8.
	O.K.	Repair body harness.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



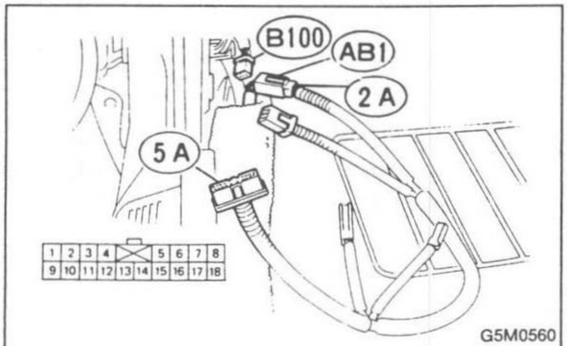
1. AIRBAG CONTROL MODULE INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W6A0].> and connect it to test harness B2 connector (8B).
2) Connect battery ground cable and turn ignition switch "ON". (engine off)
3) Measure voltage across connector (5B) terminal and body.

(5B) Terminal / Specified voltage:
No. 2 — Body / 10 V, or more

2. AIRBAG MAIN HARNESS INSPECTION

1) Go to step 2) below after performing diagnostics on airbag system as per flowchart under "1. AIR BAG CONTROL MODULE INSPECTION" previously outlined.
2) Turn ignition switch "OFF", disconnect battery ground terminal and then wait at least 20 seconds.



G5M0560

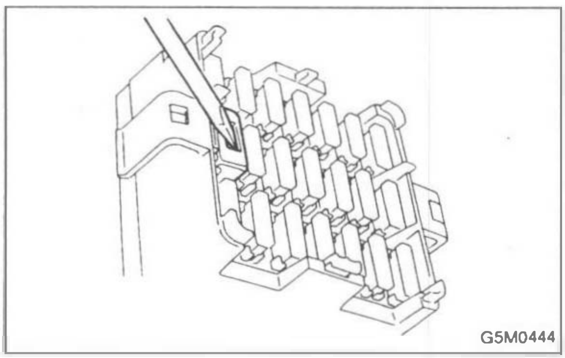
3) Disconnect bulk harness connector (B100) from connector (AB1) at front lower pillar, and connect connector (AB1) to test harness A connector (2A).
4) Measure resistance between test harness A connector (5A) terminal and test harness B connector (5B) terminal.

Connector & terminal / Specified resistance:
(5A) No. 1 — (5B) No. 2 / 10 Ω, or less

5) Measure resistance between terminals of connectors (5A) and (5B).

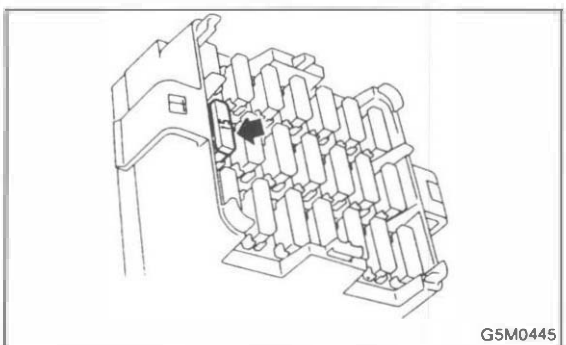
(5A) Terminal / Specified resistance:
No. 1 — Body / 10 kΩ, or more

(5B) Terminal / Specified resistance:
No. 2 — Body / 10 kΩ, or more


G5M0444

3. FUSE No. 8 INSPECTION

1) Turn ignition switch "OFF", and remove airbag. fuse protector.


G5M0445

2) Remove and visually check fuse No. 8.

F: TROUBLE CODE 12

DIAGNOSIS:

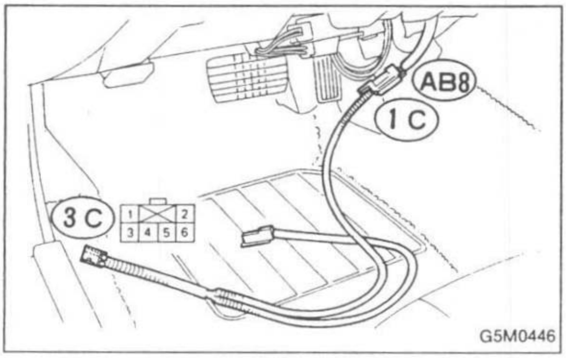
- Airbag main harness circuit is open.
- Airbag module harness (Driver) circuit is open.
- Roll connector circuit is open.
- Airbag control module is faulty.

1. Airbag main harness inspection — Not O.K. → Replace airbag main harness.

O.K. ↓

Replace airbag control module.

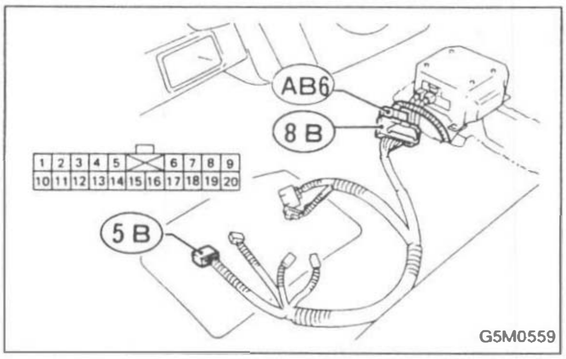
CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



G5M0446

1. AIRBAG MAIN HARNESS INSPECTION

1) Remove lower cover panel <Ref. to 5-4 [W1A0].>, and connect connector (AB8) below steering column to test harness C connector (1C).



G5M0559

2) Disconnect connector (AB6) <Ref. to 5-5 [W6A0].> from airbag control module, and connect it to test harness B2 connector (8B) terminal.

3) Measure resistance between test harness B2 connector (5B) and test harness C connector (3C) terminals.

Connector & terminal / Specified resistance:

(5B) No. 14 — (3C) No. 4 / 10 Ω, or less
(5B) No. 1 — (3C) No. 3 / 10 Ω, or less

G: TROUBLE CODE 13

DIAGNOSIS:

- Airbag main harness circuit is shorted.
- Airbag module harness (Driver) is shorted.
- Roll connector circuit is shorted.
- Airbag control module is faulty.

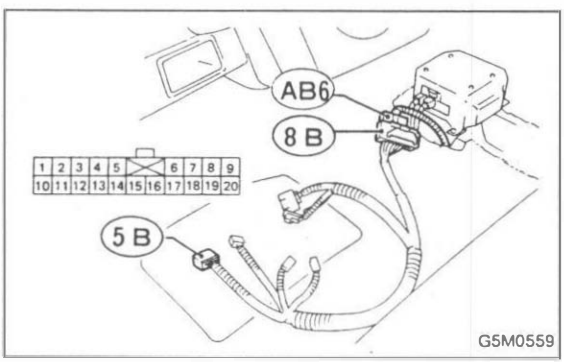
1. Airbag main harness inspection

Not O.K. → Replace airbag main harness.

O.K. ↓

Replace airbag control module.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



1. AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W6A0].>, and connect it to test harness B2 connector (8B).
2) Measure resistance between test harness B2 connector (5B) terminals.

(5B) Terminal / Specified resistance:
No. 1 — No. 14 / 10 kΩ, or more

H: TROUBLE CODE 14

DIAGNOSIS:

- (AB9) and (AB10) are not connected properly.
- (AB2) and (AB7) are not connected properly.
- (AB3) and (AB8) are not connected properly.
- (AB4), (AB5) and (AB6) are not connected properly to airbag control module.

1. Double lock inspection for connectors (AB9) and (AB10)

Not O.K. → Apply double lock.

O.K. ↓

2. Airbag control module double lock inspection at connectors (AB4) (AB5) (AB6)

Not O.K. → Apply double lock.

O.K. ↓

3. Double lock inspection for connectors (AB3) and (AB8)

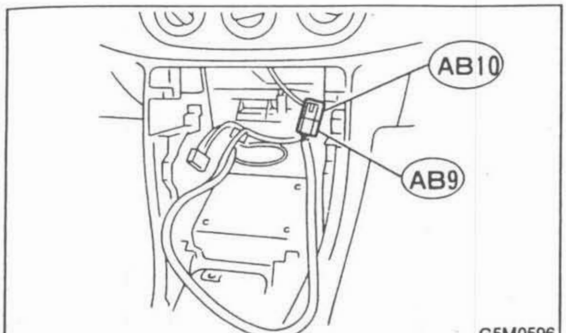
Not O.K. → Apply double lock.

O.K. ↓

4. Roll connector double lock inspection at connectors (AB2) and (AB7)

CAUTION:

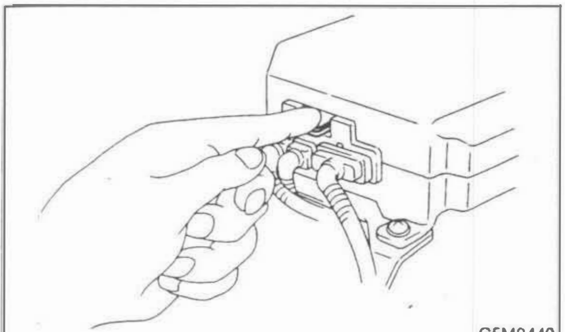
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



G5M0596

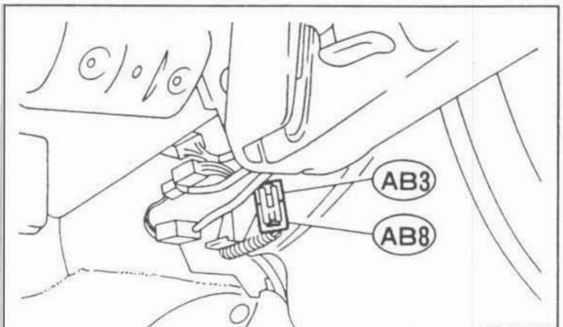
1. DOUBLE LOCK INSPECTION FOR CONNECTORS (AB9) AND (AB10)

1) Remove console cover and radio. <Ref. to 5-4 [W1A0].>
2) Check double lock of connectors (AB9) and (AB10).


G5M0449

2. AIRBAG CONTROL MODULE DOUBLE LOCK INSPECTION AT CONNECTORS (AB4) (AB5) (AB6)

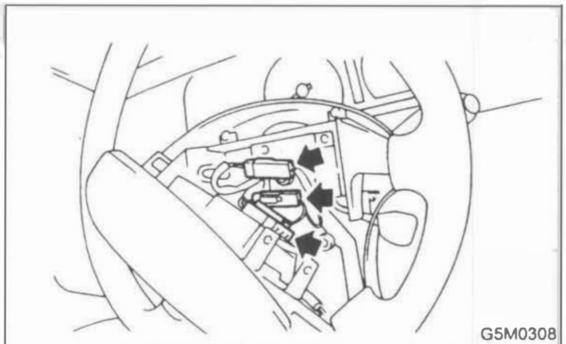
1) Check double lock of connectors (AB4) (AB5) (AB6) connected to airbag control module. <Ref. to 5-5 [W6A0].>



G5M0312

3. DOUBLE LOCK INSPECTION FOR CONNECTORS (AB3) AND (AB8)

1) Remove lower cover panel. <Ref. to 5-4 [W1A0].>
2) Check double lock of connectors (AB3) and (AB8) below steering column.


G5M0308

4. ROLL CONNECTOR DOUBLE LOCK INSPECTION AT CONNECTORS (AB2) AND (AB7)

1) Remove airbag module <Ref. to 5-5 [W3A1].>, and check double lock of connectors (AB2) and (AB7) at roll connector.

I: TROUBLE CODE 21

DIAGNOSIS:

- Airbag control module is faulty.

Replace airbag control module.

CAUTION:

Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal, and then wait at least 20 seconds. **<Ref. to 5-5 [W6A0].>**

J: TROUBLE CODE 22

DIAGNOSIS:

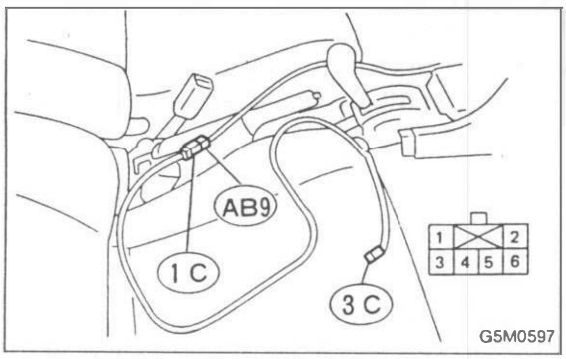
- Airbag main harness circuit is open.
- Airbag module harness (Passenger) circuit is open.
- Airbag control module is faulty.

1. Airbag main harness inspection — Not O.K. → Replace airbag main harness.

O.K. → Replace airbag control module.

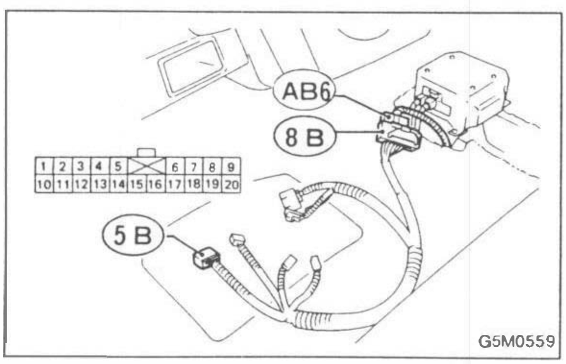
CAUTION:

Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



1. AIRBAG MAIN HARNESS INSPECTION

1) Remove console cover and radio <Ref. to 5-4 [W1A0].>, disconnect connector (AB9) and (AB10) and connect connector (AB9) to test harness C connector (1C).



2) Disconnect connector (AB6) <Ref. to 5-5 [W6A0].> from airbag control module, and connect it to test harness B2 connector (8B) terminal.
3) Measure resistance between test harness B2 connector (5B) and test harness C connector (3C) terminals.

Connector & terminal / Specified resistance:
(5B) No. 6 — (3C) No. 4 / 10 Ω, or less
(5B) No. 7 — (3C) No. 3 / 10 Ω, or less

K: TROUBLE CODE 23

DIAGNOSIS:

- Airbag main harness is shorted to power supply.
- Front sensor harness is shorted to power supply.
- Airbag module harness (Driver or passenger) is damaged.
- Roll connector is shorted to power supply.
- Airbag control module is faulty.

1. Front sensor inspection — Not O.K. → Replace front sensor.

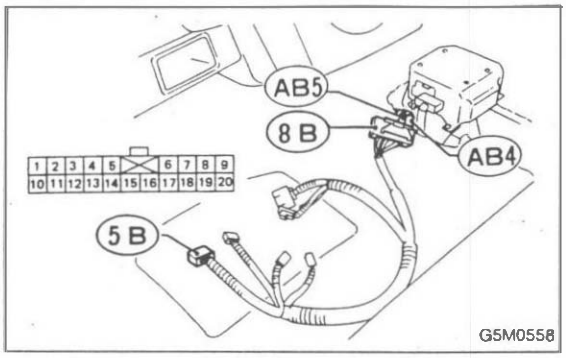
O.K. ↓

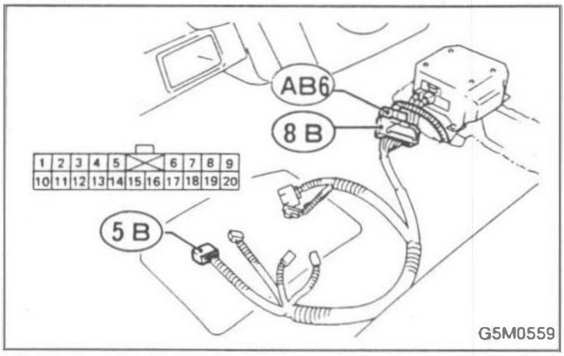
2. Airbag main harness inspection — Not O.K. → Replace airbag main harness.

O.K. ↓

Replace airbag control module.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).





1. FRONT SENSOR INSPECTION

1) Disconnect connectors (AB4) and (AB5) from airbag control module. <Ref. to 5-5 [W6A0].>
2) Connect connectors (AB4) and (AB5) to test harness B2 connector (8B).
3) Measure resistance between test harness B2 connector (5B) terminals.

(5B) Terminals / Specified resistance:
(RH: AB4): No. 17 — No. 18 / 1.4 — 1.6 kΩ
(LH: AB5): No. 15 — No. 16 / 1.4 — 1.6 kΩ

2. AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W6A0].>, and connect it to test harness B2 connector (8B).
2) Connect battery ground cable and turn ignition switch "ON" (engine off).
3) Measure voltage across each test harness B2 connector (5B) terminal and body.

(5B) Terminals / Specified voltage:
No. 1 — Body / 1 V, or less
No. 6 — Body / 1 V, or less
No. 7 — Body / 1 V, or less
No. 14 — Body / 1 V, or less

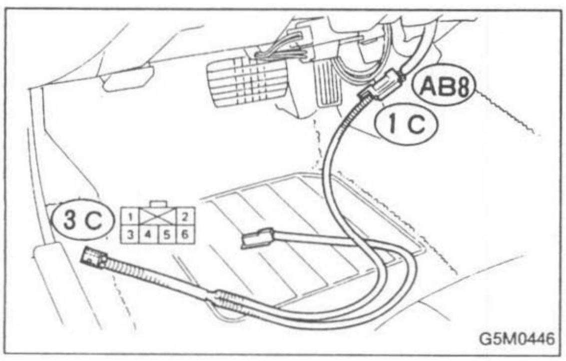
L: TROUBLE CODE 24

DIAGNOSIS:

- Airbag main harness circuit is open.
- Airbag module harness (Driver) circuit is open.
- Roll connector circuit is open.
- Airbag control module is faulty.
- Above diagnosis plus other faulty of airbag moduler parts

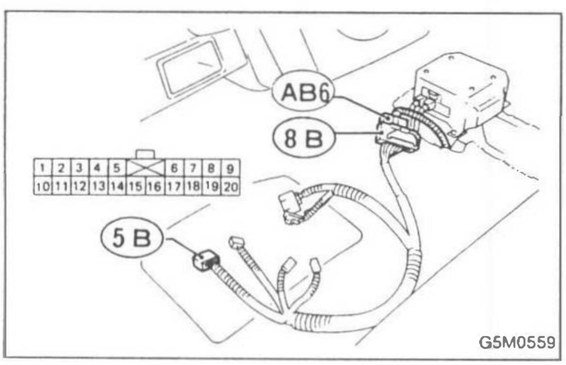
1. Airbag main harness inspection	Not O.K. →	Replace airbag main harness.
O.K. ↓		
Replace airbag control module.		

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



1. AIRBAG MAIN HARNESS INSPECTION

1) Remove lower cover panel <Ref. to 5-4 [W1A0].>, and connect connector (AB8) below steering column to test harness C connector (1C).



2) Disconnect connector (AB6) <Ref. to 5-5 [W6A0].> from airbag control module, and connect it to test harness B2 connector (8B) terminal.
3) Measure resistance between test harness B2 connector (5B) and test harness C connector (3C) terminals.

Connector & terminal / Specified resistance:
(5B) No. 14 — (3C) No. 4 / 10 Ω, or less
(5B) No. 1 — (3C) No. 3 / 10 Ω, or less

M: TROUBLE CODE 31

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 16 is blown.
- Body harness circuit is open.

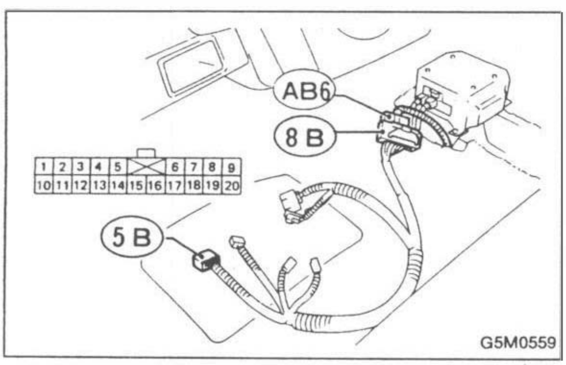
1. Airbag control module inspection — O.K. → Replace airbag control module.
Not O.K. ↓

2. Airbag main harness inspection — Not O.K. → Replace airbag main harness.
O.K. ↓

3. Fuse No. 16 inspection — Not O.K. → Replace fuse No. 16.
O.K. ↓

Repair body harness.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



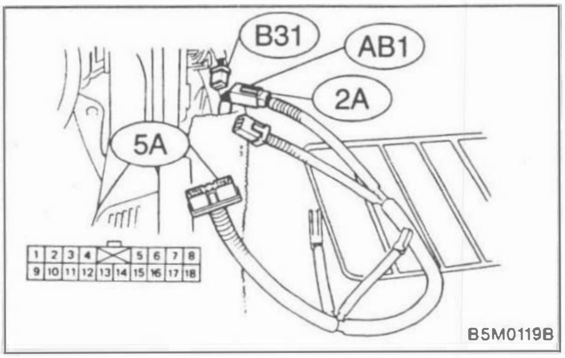
1. AIRBAG CONTROL MODULE INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W6A0].>, and connect it to test harness B2 connector (8B).
2) Connect battery ground cable and turn ignition switch "ON" (engine off).
3) Measure voltage across connector (5B) terminal and body.

(5B) Terminal / Specified voltage:
No. 5 — Body / 10 V, or more

2. AIRBAG MAIN HARNESS INSPECTION

1) Go to step 2) below after performing diagnostics on airbag system as per flowchart under "1. AIRBAG CONTROL MODULE INSPECTION" previously outlined.
2) Turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



B5M0119B

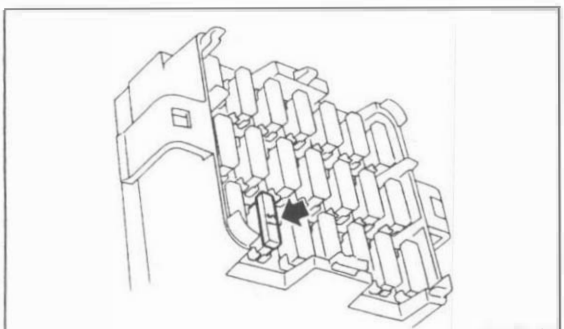
3) Disconnect connector (AB1) from bulk harness connector (B31) at front lower pillar, and connect connector (AB1) to test harness A connector (2A).
4) Measure resistance between test harness A connector (5A) and test harness B2 connector (5B) terminals.

Connector & terminal / Specified resistance:
(5A) No. 9 — (5B) No. 5 / 10 Ω, or less

5) Measure resistance between each terminal of connectors (5A) and (5B) and body.

(5A) Terminal / Specified resistance:
No. 9 — Body / 10 kΩ, or more

(5B) Terminal / Specified resistance:
No. 5 — Body / 10 kΩ, or more


G5M0453

3. FUSE No. 16 INSPECTION

Make sure ignition switch is turned "OFF", then remove and visually check fuse No. 16.

N: TROUBLE CODE 32

DIAGNOSIS:

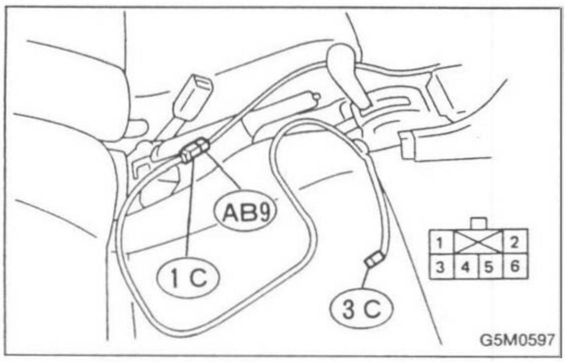
- Airbag main harness circuit is open.
- Airbag module harness (Passenger) circuit is open.
- Airbag control module is faulty.
- Above diagnosis plus other faulty of airbag moduler parts

1. Airbag main harness inspection — Not O.K. → Replace airbag main harness.

↓ O.K.

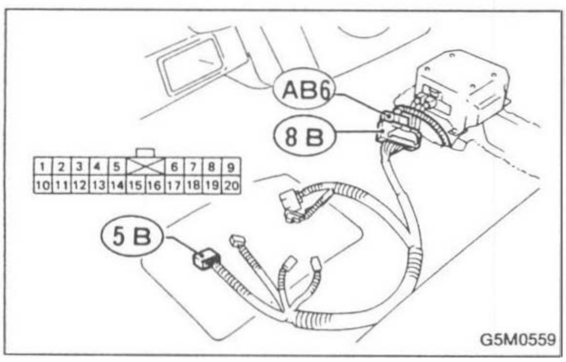
Replace airbag control module.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



1. AIRBAG MAIN HARNESS INSPECTION

1) Remove console cover and radio <Ref. to 5-4 [W1A0].>, disconnect connector (AB9) and (AB10) and connect connector (AB9) to test harness C connector (1C).



2) Disconnect connector (AB6) <Ref. to 5-5 [W6A0].> from airbag control module, and connect it to test harness B2 connector (8B) terminal.

3) Measure resistance between test harness B2 connector (5B) and test harness C connector (3C) terminals.

Connector & terminal / Specified resistance:

(5B) No. 6 — (3C) No. 4 / 10 Ω, or less
(5B) No. 7 — (3C) No. 3 / 10 Ω, or less

O: AIRBAG WARNING LIGHT REMAINS ON.

DIAGNOSIS:

- Airbag warning light is faulty.
- Airbag control module to airbag warning light harness circuit is shorted or open.
- Grounding circuit is faulty.
- Airbag control module is faulty.
- (AB1) and (B31) are not connected properly.

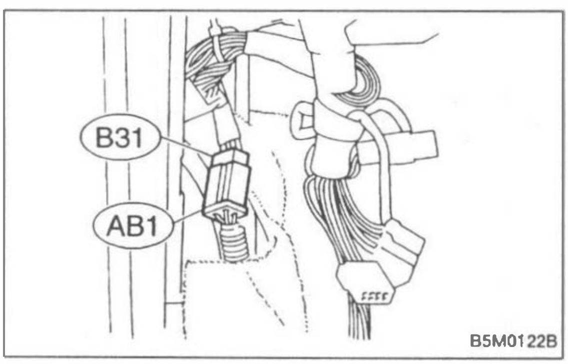
1. Double lock inspection for connectors (AB1) and (B31)
- Not O.K. → Apply double lock.
- O.K. ↓

2. Inspection of body harness, connector and airbag warning light
- Not O.K. → Repair body harness or replace airbag main harness or warning light.
- O.K. ↓

3. Grounding circuit inspection
- Not O.K. → Repair body grounding circuit or replace airbag main harness.
- O.K. ↓

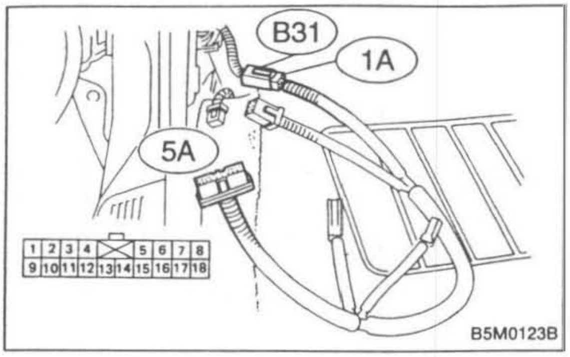
Replace airbag control module.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



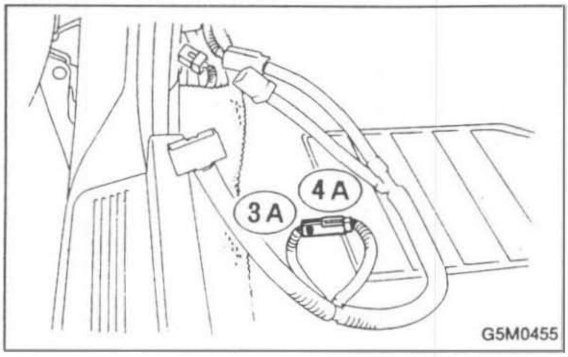
1. DOUBLE LOCK INSPECTION FOR CONNECTORS (AB1) AND (B31)

1) Remove front pillar lower trim (Driver side).
2) Check double lock of connectors (AB1) and (B31).

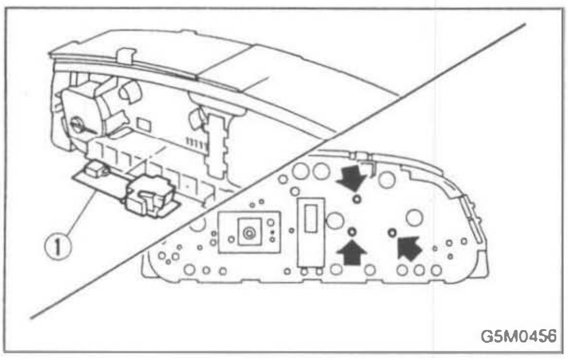


2. INSPECTION OF BODY HARNESS, CONNECTOR AND AIRBAG WARNING LIGHT

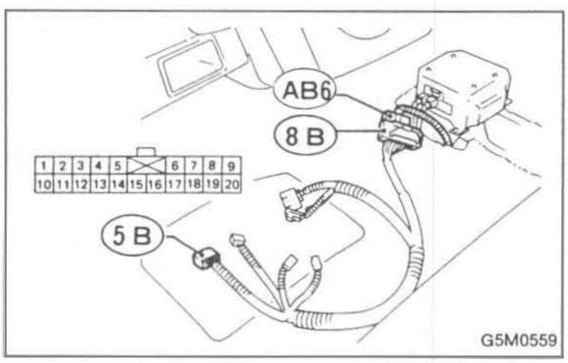
1) Turn ignition switch "OFF" and connect connector (B31) to test connector A connector (1A).



2) Connect battery ground cable and turn ignition switch "ON", (engine off) and connect connectors (3A) and (4A) to check if warning light goes out. If it does, go to step 4) below. If it remains on, check body harness and repair if necessary.

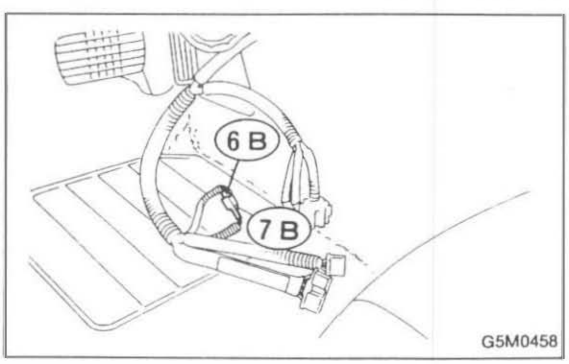


3) If body harness is satisfactory, replace airbag warning light unit ①. After problem has been eliminated, disconnect connectors (3A) and (4A).

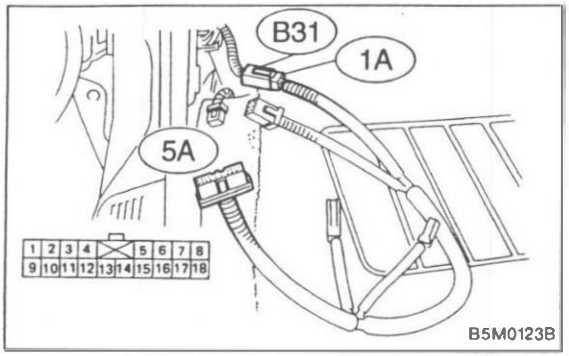


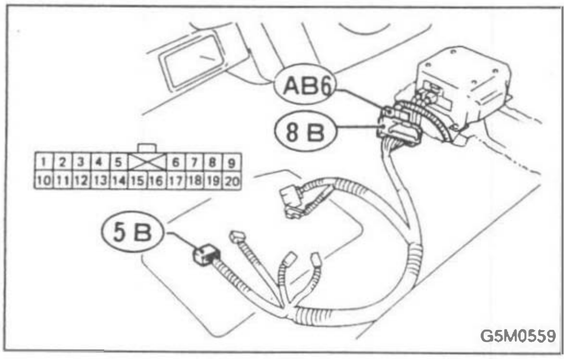
4) Turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds, and re-connect connectors (AB1) and (B31).

5) Remove instrument panel lower cover and disconnect (AB3) with (AB8), then disconnect connector (AB6) from airbag control module, <Ref. to 5-5 [W6A0].> and connect it to test harness B2 connector (8B).



6) Connect battery ground cable and turn ignition switch "ON," (engine off) and connect connectors (6B) and (7B) to check if warning light goes out. If it does, go to "3. GROUNDING CIRCUIT INSPECTION". If it remains on, replace airbag main harness. After problem has been eliminated, disconnect connectors (6B) and (7B).





3. GROUNDING CIRCUIT INSPECTION

1) Turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds. Disconnect connector (AB1) from bulk harness connector (B31), and connect connector (B31) to test harness A connector (1A). Measure resistance between connector (5A) terminal and body.

(5A) Terminal / Specified resistance:
No. 17 — Body / 10 Ω, or less
No. 18 — Body / 10 Ω, or less

If resistance is greater than 10 ohms, body grounding circuit is faulty and should be repaired. If resistance is less than 10 ohms, go to step 2) below.

2) Connect connectors (AB1) and (B31). Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W6A0].>, and connect it to test harness B2 connector (8B).

3) Measure resistance between each test harness B2 connector (5B) terminal and body.

(5B) Terminal / Specified resistance:
No. 11 — Body / 10 Ω, or less
No. 12 — Body / 10 Ω, or less

If resistance is greater than 10 ohms, replace airbag main harness.

If resistance is less than 10 ohms, replace airbag control module.

P: AIRBAG WARNING LIGHT REMAINS OFF.

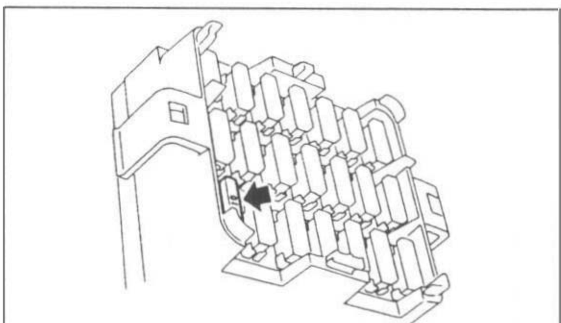
DIAGNOSIS:

- Fuse No. 15 is blown.
- Body harness circuit is open.
- Airbag warning light is faulty.
- Airbag main harness is faulty.
- Airbag control module is faulty.

Inspection	Not O.K.
1. Fuse No. 15 inspection	Replace fuse No. 15.
O.K. ↓	
2. Body harness inspection	Repair body harness.
O.K. ↓	
3. Airbag warning light unit (in combination meter) inspection	Replace airbag warning light unit.
O.K. ↓	
4. Airbag main harness inspection	Replace airbag main harness.
O.K. ↓	
Replace airbag control module.	

CAUTION:

Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal, and then wait at least 20 seconds.



G5M0460

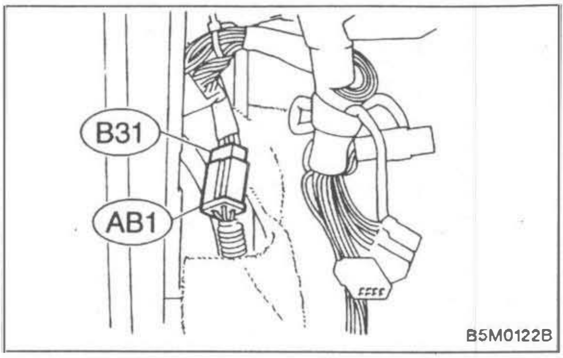
1. FUSE No. 15 INSPECTION

1) Remove and visually check fuse No. 15.

2) If fuse is blown, replace it with a new one. After connecting battery cable and turning ignition switch "ON", if it blows again, proceed to "2. BODY HARNESS INSPECTION".

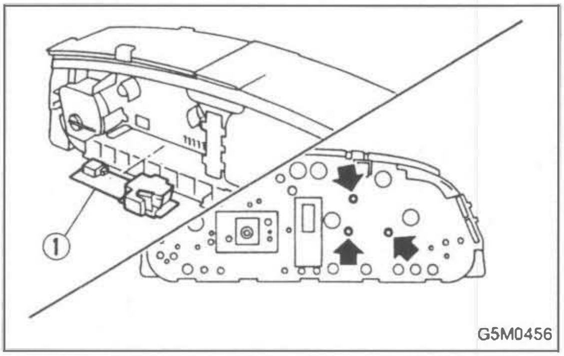
2. BODY HARNESS INSPECTION

1) Turn ignition switch "ON" (engine off) to make sure other warning lights (in combination meter) illuminate. If they do not, check body harness.

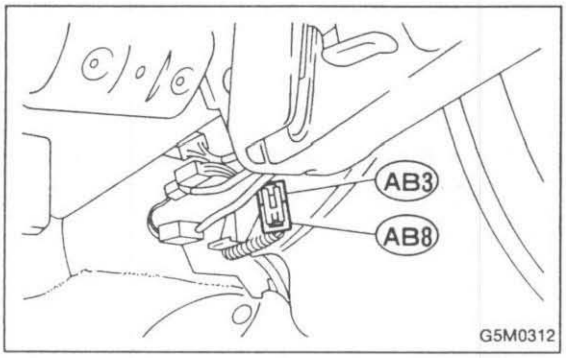


3. AIRBAG WARNING LIGHT UNIT (IN COMBINATION METER) INSPECTION

1) Turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
2) Disconnect bulk harness connector (B31) from connector (AB1).

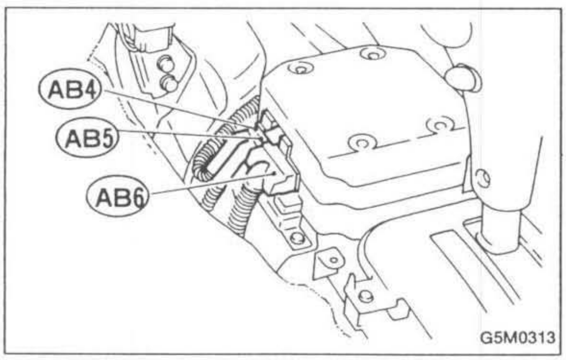


3) Connect battery ground cable and turn ignition switch "ON" (engine off) to make sure airbag warning light illuminates.
If it does not, replace airbag warning light unit ①.



4. AIRBAG MAIN HARNESS INSPECTION

1) Turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
2) Connect bulk harness connector (B31) and connector (AB1).
3) Disconnect connectors (AB3) and (AB8) below steering column.

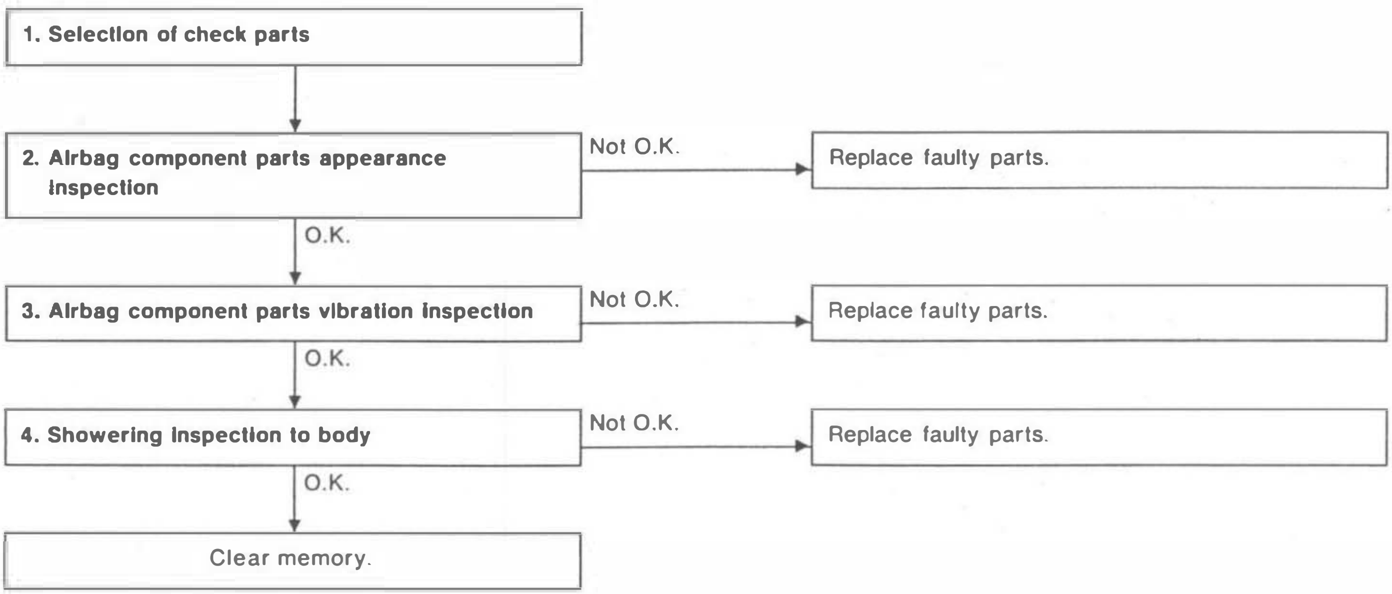


4) Disconnect connector (AB6) from airbag control module. <Ref. to 5-5 [W6A0].>
5) Connect battery ground cable and turn ignition switch "ON" to make sure airbag warning light illuminates.

Q: WARNING LIGHT INDICATES TROUBLE CODE, THEN NORMAL CODE. — FLASHING TROUBLE CODE. —

DIAGNOSIS:

- Airbag system component parts are faulty.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable, and then wait at least 20 seconds.

1. SELECTION OF CHECK PARTS

1) Conduct on-board diagnostic and call up trouble codes stored in memory. <Ref. to [T4B0].>
2) Select trouble code required to check airbag component parts from those listed in table and reproduce symptom.

Trouble codes	Check parts	Index No.
02	• Front sensor (RH, LH) • Airbag main harness • Airbag module (Driver/Passenger) • Roll connector • Airbag control module	<Ref. to 5-5 [W400].> <Ref. to 5-5 [W500].> <Ref. to 5-5 [W300].> <Ref. to 5-5 [W700].> <Ref. to 5-5 [W600].>
03	• Front sensor (RH, LH) • Airbag control module	<Ref. to 5-5 [W400].> <Ref. to 5-5 [W600].>
04	• Airbag module (Passenger) • Airbag main harness • Airbag control module	<Ref. to 5-5 [W300].> <Ref. to 5-5 [W500].> <Ref. to 5-5 [W600].>
11	• Fuse No. 8 • Airbag main harness • Airbag control module • Body harness	<Ref. to 5-5 [T5E3].> <Ref. to 5-5 [W500].> <Ref. to 5-5 [W600].> —
12	• Roll connector • Airbag module (Driver) • Airbag main harness • Airbag control module	<Ref. to 5-5 [W700].> <Ref. to 5-5 [W300].> <Ref. to 5-5 [W500].> <Ref. to 5-5 [W600].>
13	• Airbag module (Driver) • Roll connector • Airbag main harness • Airbag control module	<Ref. to 5-5 [W300].> <Ref. to 5-5 [W700].> <Ref. to 5-5 [W500].> <Ref. to 5-5 [W600].>
21	• Airbag control module	<Ref. to 5-5 [W600].>
22	• Airbag module (Passenger) • Airbag main harness • Airbag control module	<Ref. to 5-5 [W300].> <Ref. to 5-5 [W500].> <Ref. to 5-5 [W600].>
23	• Airbag main harness • Roll connector • Airbag module (Driver/Passenger) • Front sensor (RH, LH) • Airbag control module	<Ref. to 5-5 [W500].> <Ref. to 5-5 [W700].> <Ref. to 5-5 [W300].> <Ref. to 5-5 [W400].> <Ref. to 5-5 [W600].>
24	• Airbag module (Driver) • Roll connector • Airbag main harness • Airbag control module	<Ref. to 5-5 [W300].> <Ref. to 5-5 [W700].> <Ref. to 5-5 [W500].> <Ref. to 5-5 [W600].>
32	• Airbag module (Passenger) • Roll connector • Airbag main harness • Airbag control module	<Ref. to 5-5 [W300].> <Ref. to 5-5 [W700].> <Ref. to 5-5 [W500].> <Ref. to 5-5 [W600].>

2. AIRBAG COMPONENT PARTS APPEARANCE INSPECTION

1) Conduct appearance inspection on parts selected.

NOTE:

Also check connector terminals, wiring harness, case, etc. for damage.

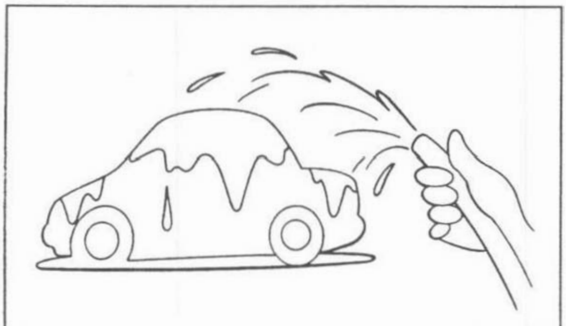
3. AIRBAG COMPONENT PARTS VIBRATION INSPECTION

1) Gently shake check parts (to determine faults.).

2) To check airbag module or roll connector, turn and tilt steering wheel.

CAUTION:

Do not shake or vibrate airbag control module and front sensor at the same time as erroneous operation may result.



G5M0461

4. SHOWERING INSPECTION TO BODY

1) Spray water on vehicle body.

CAUTION:

Do not directly spray water on airbag components.

2) Check passenger compartment for traces of leaking.

NOTE:

Also check wiring harnesses as water may leak along them and get airbag component parts wet.

R: WARNING LIGHT INDICATES TROUBLE CODE, THEN NORMAL CODE. — FLASHING NORMAL CODE. —

DIAGNOSIS:

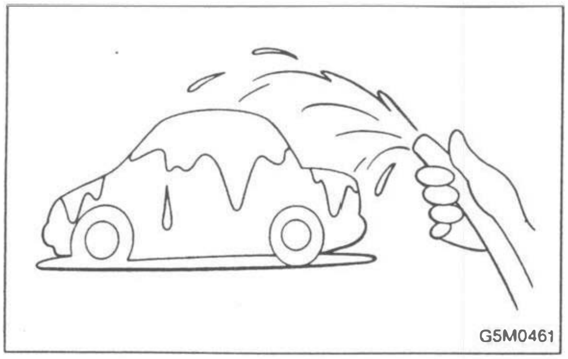
- Airbag connector is faulty.
- Fuse No. 16 is blown.
- Airbag main harness is faulty.
- Airbag control module is faulty.
- Body harness is faulty.

	Not O.K.
1. Airbag connectors appearance and vibration inspection	Replace faulty parts.
O.K. ↓	
2. Showering inspection to body	Replace faulty parts.
O.K. ↓	
3. Fuse No. 16, airbag main harness, airbag control module, body harness appearance and vibration inspection	Replace faulty parts.
O.K. ↓	
4. Showering inspection to body	Replace faulty parts.
O.K. ↓	
5. Warning light illumination check	Go to "T4D0" diagnostics procedure.
O.K. ↓	
Clear memory.	

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable, and then wait at least 20 seconds.

1. AIRBAG CONNECTORS APPEARANCE AND VIBRATION INSPECTION

1) Conduct appearance inspection on airbag connectors (AB2 through AB8). <Ref. to [T100].>
NOTE:
Check terminals, case and wiring harnesses for damage.
2) Conduct vibration inspection on airbag connectors (AB2 through AB8). <Ref. to [T100].>
NOTE:
Gently shake each airbag connector.


G5M0461

2. SHOWERING INSPECTION TO BODY

1) Spray water on vehicle body.

CAUTION:
Do not directly spray water on airbag components.

2) Check passenger compartment for traces of leaking.

NOTE:
If leaks are noted, also check wiring harnesses as water may leak along them and wet airbag connectors.

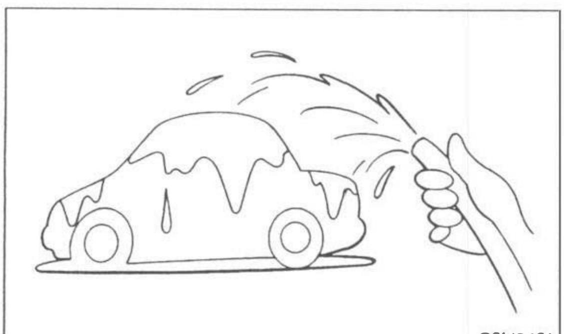
3. FUSE No. 16, AIRBAG MAIN HARNESS, AIRBAG CONTROL MODULE, BODY HARNESS APPEARANCE AND VIBRATION INSPECTION

1) Conduct appearance inspection on fuse No. 16 <Ref. to [T5M3].>, airbag main harness <Ref. to [W5A0].>, airbag control module <Ref. to [W6A0].> and body harness.

NOTE:
Also check connectors, terminals, wiring harness and case for damage.

2) Conduct vibration inspection on fuse No. 16, airbag main harness, airbag control module and body harness.

NOTE:
Gently shake each part.


G5M0461

4. SHOWERING INSPECTION TO BODY

1) Spray water on vehicle body.

CAUTION:
Do not directly spray water on each part.

2) Check passenger compartment for traces of leaking.

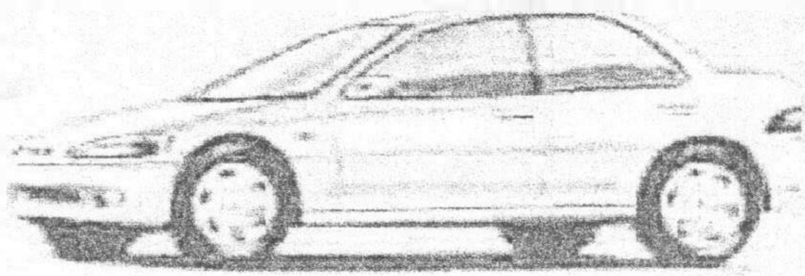
NOTE:
If leaks are noted, check wiring harnesses as water may leak along them and get parts wet.

5. WARNING LIGHT ILLUMINATION CHECK

1) Turn ignition switch "ON" (engine "OFF") and observe airbag warning light.
Airbag warning light comes "ON" for about 7 seconds then goes out and stays out.

SERVICE MANUAL

SUBARU IMPREZA



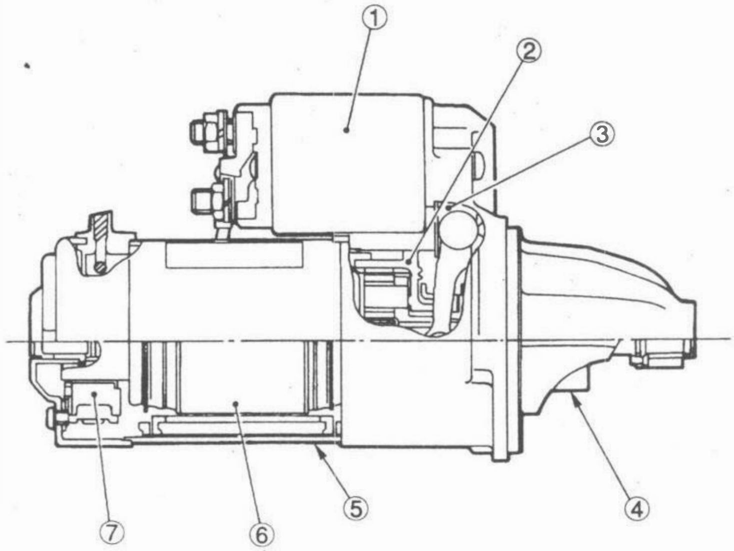
SERVICE MANUAL

- Diagnostics section

BODY ELECTRICAL SYSTEM
(IMMOBILISER SYSTEM) 6-2

1. Starter

The starter is of reduction type. Its output is 1.0 kW on the MT model and 1.4 kW on the AT model.

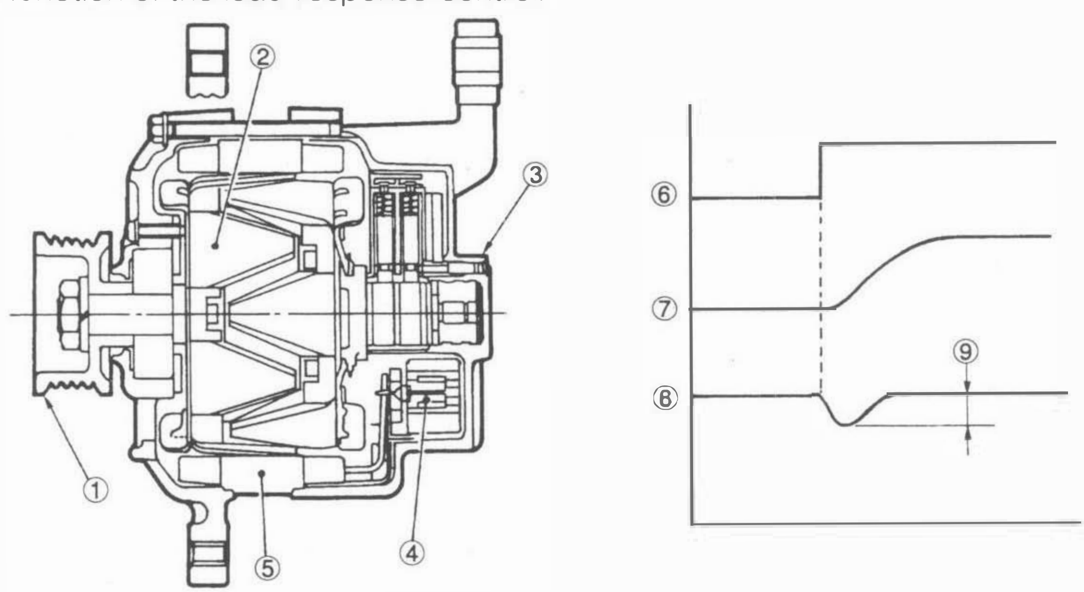


G6H0001

① Magnet switch
② Internal gear
③ Shift lever
④ Pinion
⑤ Yoke
⑥ Armature
⑦ Brush holder

2. Generator

The generator for 2000 cc non-turbo model incorporates an IC regulator which features a "load response control". The load response control circuit function to gradually increase the generator output when an additional electric load such as headlights or blower fan is applied to the engine in the idling state. This prevents a sharp drop in engine idling speed and ensures an improved comfort while the engine is idling. The generator for except 2000 cc non-turbo model does not equip the function of the load response control.

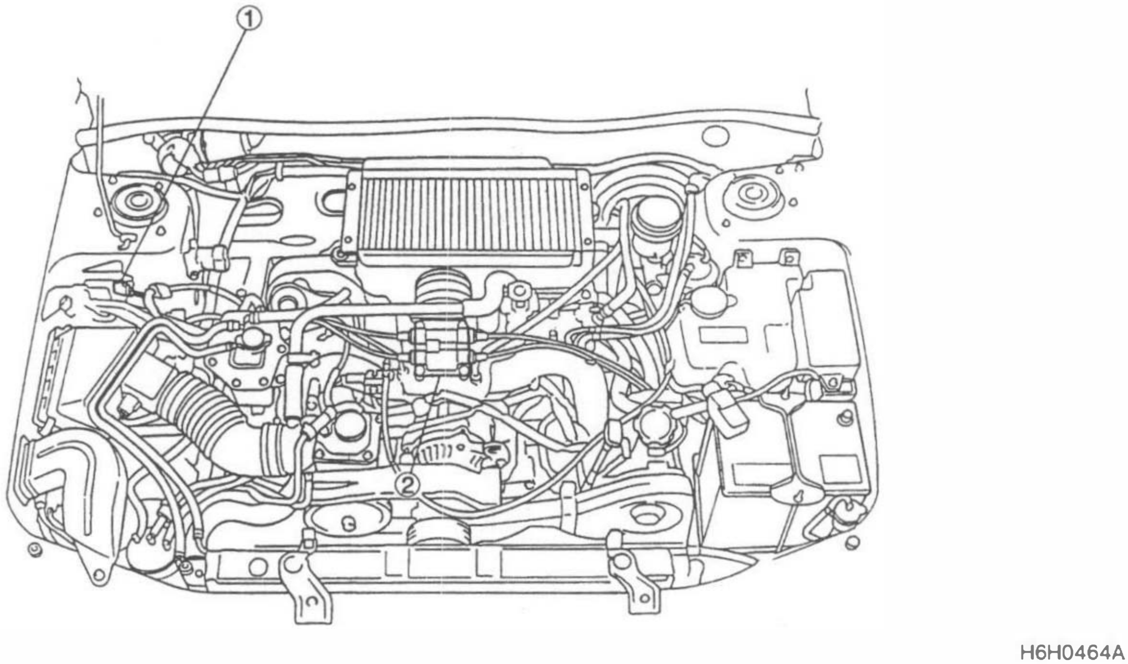


G6H0002

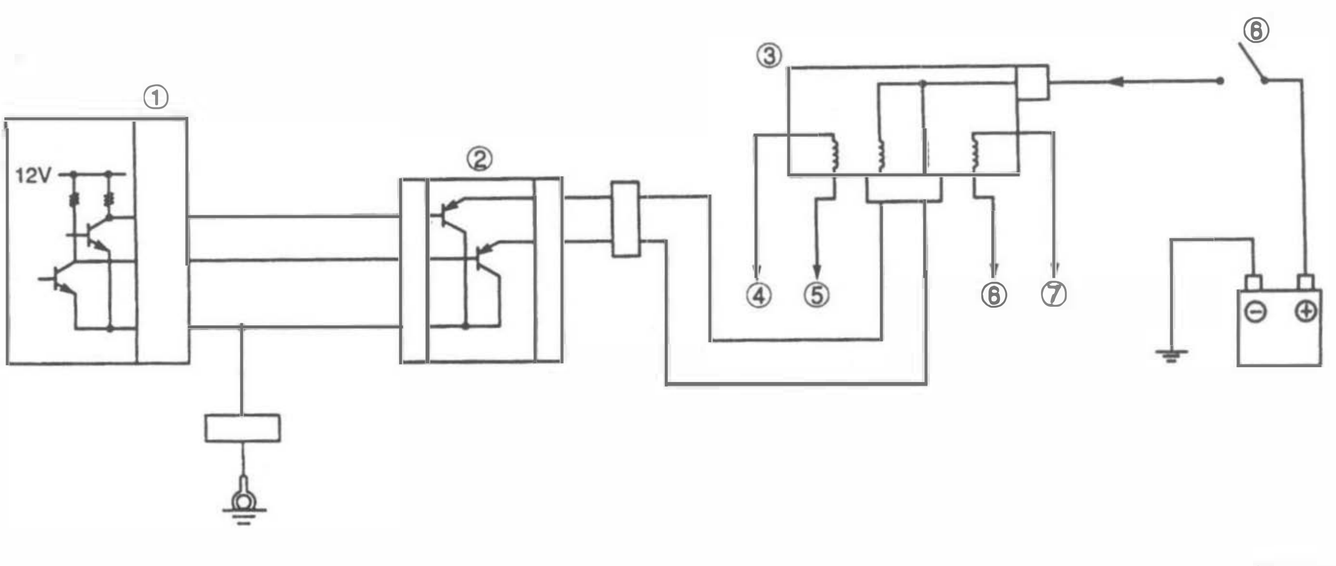
① Pulley
② Rotor
③ Rear cover
④ IC regulator
⑤ Stator coil
⑥ Electric load
⑦ Alternator output
⑥ Engine idle speed
⑨ Amplitude

C: TURBO MODEL

The ignition system is of a 2-cylinder simultaneous ignition design. In response to the signal from the ECM, the igniter supplies another signal to the ignition coil to ignite a pair of cylinders #1 and #2 or #3 and #4 simultaneously.



① Ignitior
② Ignition coil



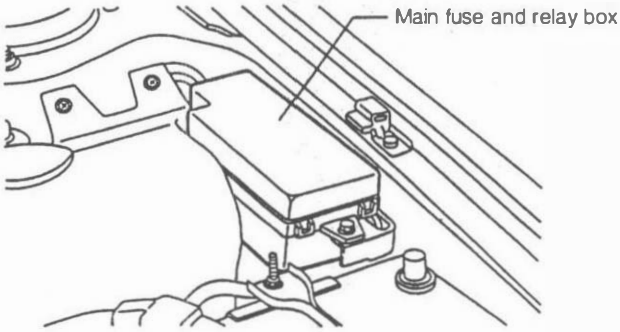
① ECM
② Ignitor
③ Ignition coil
④ Spark plug #1
⑤ Spark plug #2
⑥ Spark plug #3
⑦ Spark plug #4
⑧ Ignition switch

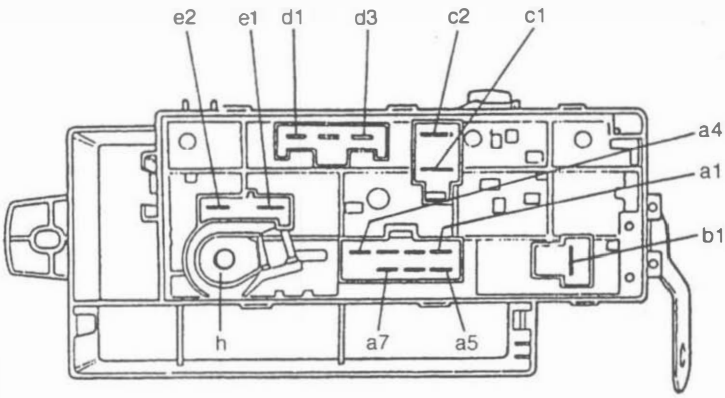
1. Fuse

A: MAIN FUSE AND RELAY BOX

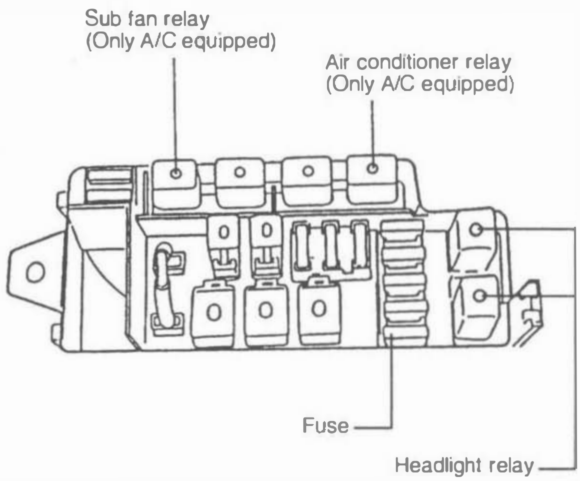
The main fuse and relay box is installed at the rear of the battery on left side of the engine compartment.

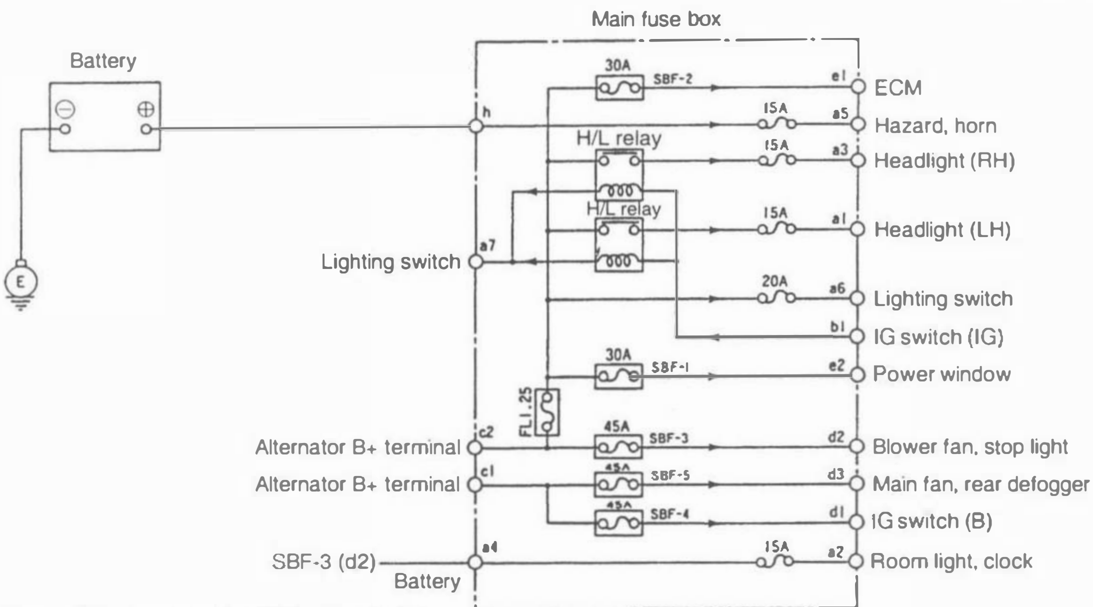
The fuses, relays and fusible links are installed in the box as described below.





Main fuse and relay box (back side)





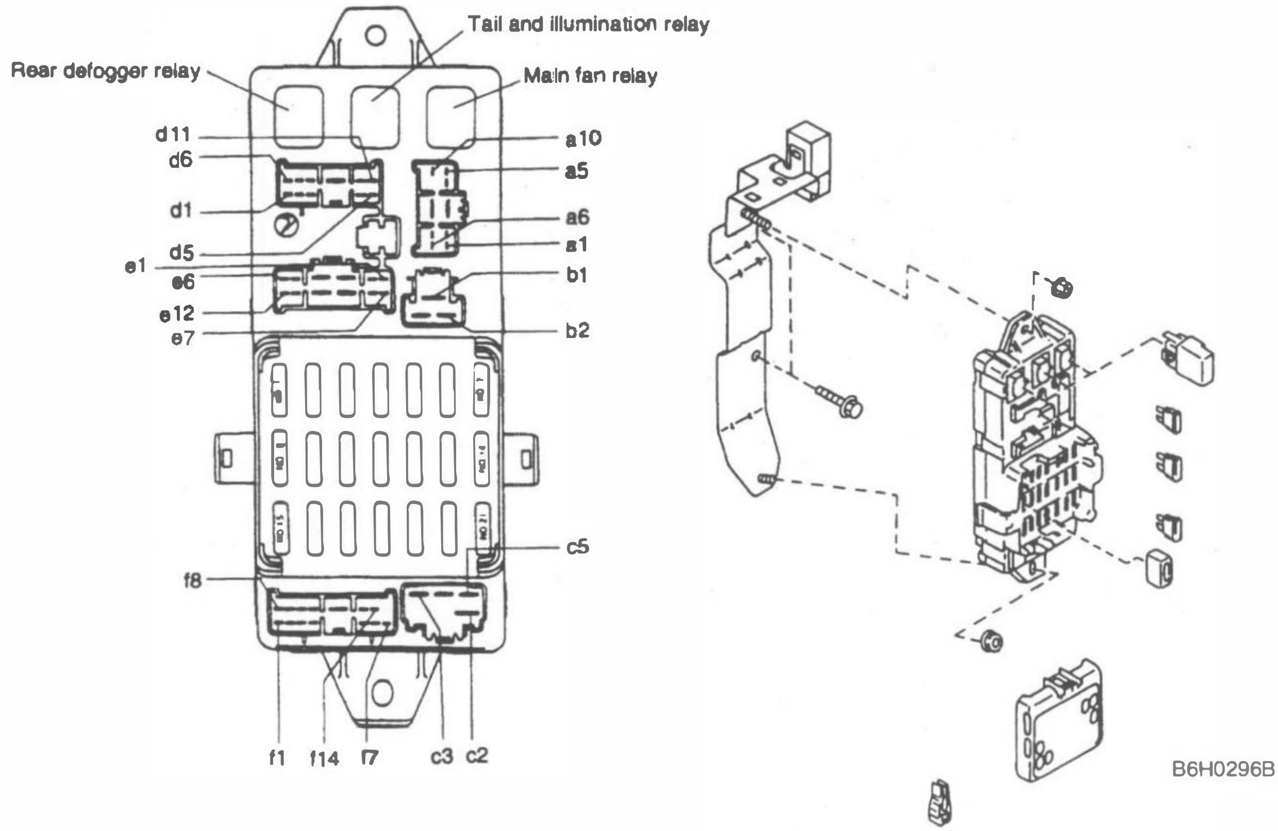
NOTE:

The distined connection points shown are for a typical case. For details, refer to the Wiring Diagram Manual.

H6H0415A

B: JOINT BOX

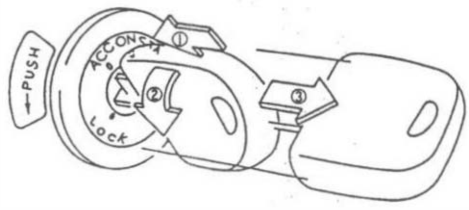
The joint box is installed under the instrument panel on driver's side.
The fuses are installed in the joint box as described below.

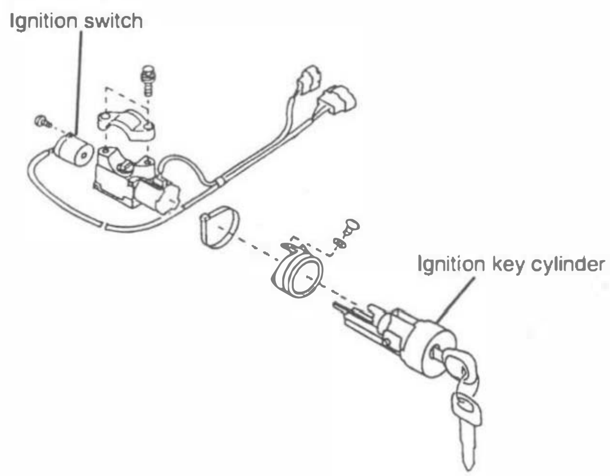


2. Ignition Switch

A: DESCRIPTION

- When turning the ignition key from "ACC" to "LOCK" position, it is necessary to push the key into the key cylinder (arrow 1.in the illustration) and then turn the key to "LOCK" position (arrow 2).
- Ignition key can be turned to "LOCK" position only when select lever is set to P position.





H6H0439A

3. Front Wiper and Washer

A: DESCRIPTION

1. FRONT WIPER

1) The front wiper is of a tandem type featuring wide wiping area. The blade is installed to the arm by means of U-hook joint to improve serviceability.

2) The front wiper operates in three modes of speed; HI, LOW and INTERMITTENT.

The operation speed can be changed by turning the wiper switch incorporated in the combination switch.

3) The intermittent unit which controls the front wiper operation interval is installed behind the combination switch.

2. FRONT WASHER SYSTEM

1) The washer system consists of a washer tank, motor and a pair of nozzles.

2) The washer tank is installed at the front of the strut mount on the left side of the engine compartment.

3) The washer motor is installed directly at the lower position of the washer tank.

4) The washer nozzles are installed on the engine hood, and each nozzle has two injection ports.

3. SPECIFICATION

Washer Tank	Capacity			4.0 liters (4.2 US qt, 3.5 Imp qt)
Wiper Motor	Standard voltage			12 V
	No-load current			3.5 A or less
	Speed [at 2.0 N·m (20 kg-cm, 17 in-lb)]		HIGH	72–80 rpm
			LOW	47–50 rpm
	Locked rotor characteristics	Torque	HIGH	21.6 N·m (220 kg-cm, 1.6 ft-lb)
			LOW	27.5 N·m (280 kg-cm, 2.0 ft-lb)
		Current		29.5 A or less
Wiper Blade	Blade length	Driver's side		525 mm (20.67 in)
		Passenger's side		450 mm (17.72 in)

4. Rear Wiper and Washer

A: DESCRIPTION

1. REAR WIPER

1) The rear wiper has 180 degree wide wiping area.
2) The wiper link is installed to the wiper motor shaft through the rear window glass.
3) The wiper blade is attached to the arm by means of U-hook joint in the same way as the front wiper blade.

2. REAR WASHER SYSTEM

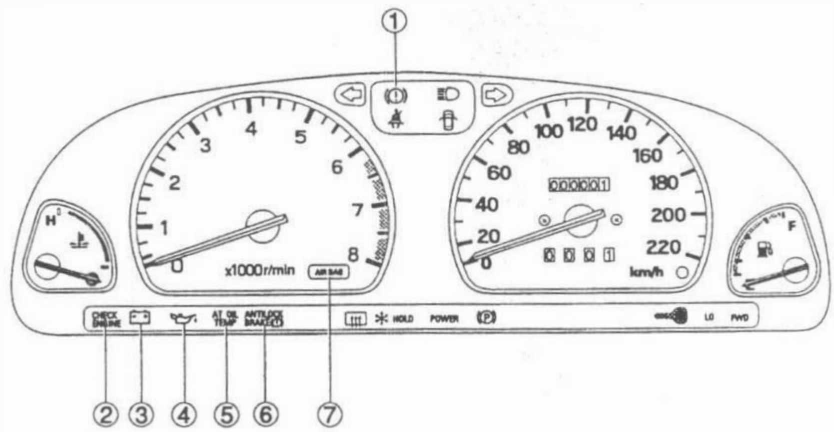
1) The washer tank of the rear washer system is shared with the front washer system.
2) The washer motor is installed at the bottom of the washer tank, adjacent to the front washer motor.
3) The washer nozzle is installed on the wiper shaft base.

3. SPECIFICATION

Wiper Motor	Standard voltage	12 V
	No-load current	1 A or less
	Speed [at 0.5 N·m (5 kg-cm, 4.3 in-lb)]	25 rpm or more
	Locked rotor current	12 A or less
Wiper Blade	Blade length	375 mm (14.76 in)

5. Combination Meter

A: WARNING AND INDICATOR LIGHT



H6H0440A

① Brake fluid level warning

This light illuminates when the fluid level in the brake reservoir tank lowers under specified level.

② CHECK ENGINE warning light

This light illuminates when trouble occurs in MFI (Multiple point Fuel Injection) system.

③ Charge indicator light

This light illuminates when trouble occurs in charging system during engine is running.

④ Oil pressure warning light

This light illuminates when the engine oil pressure decreases below 14.7 kPa (0.15 kg/cm^2, 2.1 psi).

⑤ AT oil temperature warning light

This light illuminates when the ATF temperature exceeds 150 °C (302 °F).

⑥ ABS warning light

This light illuminates when trouble occurs in electrical components of ABS (Anti-lock Brake System).

⑦ AIR BAG system warning light

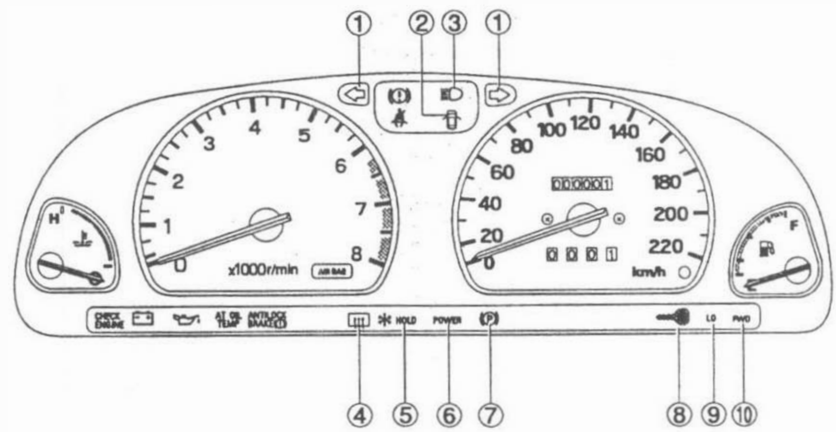
This light illuminates when trouble occurs in Airbag system.

According to ignition switch position, the warning lights will come on and/or go off under normal conditions as follows:

Warning/Indicator light	Ignition switch position			
	OFF/ACC	ON	ST	While engine is running
① Brake fluid level	OFF	ON	ON	OFF
② Malfunction indicator (CHECK ENGINE)	OFF	*1	ON	OFF
③ Charge	OFF	ON	ON	OFF
④ Oil pressure	OFF	ON	ON	OFF
⑤ AT oil temperature	OFF	ON	ON	*3
⑥ ABS	OFF	ON	ON	OFF
⑦ AIR BAG	OFF	*2	ON	OFF

*1: Light comes ON before engine starts, and stay OFF after engine has stopped.
*2: Light comes ON for about seven seconds, and go out.
*3: Light comes ON for about two seconds, and go out.

B: TELLTALE (GRAPHIC MONITOR)



H6H0440B

① Turn signal indicator light
This light blinks (and turn signal light flashes) when the turn signal switch is turned ON.

② Door open warning light
This light illuminated when one or more doors and/or rear gate are not fully closed.

③ Headlight beam indicator light
This light illuminates when the headlight is in high-beam position.

④ Rear defogger indicator light
This light illuminates when the rear defogger switch is turned ON.

⑤ HOLD indicator light
This light illuminates when the automatic transmission is in HOLD mode.

⑥ POWER indicator light
This light illuminates when the automatic transmission is in POWER mode.

⑦ Parking brake indicator light
This light illuminates when parking brake is applied.

⑧ Immobiliser indicator light
This light illuminates when the immobiliser system is operating (while when the ignition switch is turned to the "ACC" or "OFF" position).

⑨ 4WD LO indicator light
This light illuminates when dual-range select lever is in LO position.

⑩ FWD indicator light
This light illuminates when the center differential locks (with the fuse installed in the center differential locking circuit).

According to ignition switch position, the telltales will come on and/or go off under normal conditions as follows:

Telltale light		Ignition switch position			
		OFF/ACC	ON	ST	While engine is running
① Turn signal		OFF	Blink	Blink	Blink
② Door open	• Open	ON	ON	ON	ON
	• Shut	OFF	OFF	OFF	OFF
③ Headlight beam	• High beam	OFF	ON	ON	ON
	• Low beam	OFF	OFF	OFF	OFF
④ Rear defogger		OFF	ON *1	ON *1	ON *1
⑤ HOLD		OFF	*2	*2	*2
⑥ POWER		OFF	OFF	OFF	*3
⑦ Parking brake		OFF	ON	ON	ON
⑧ Immobiliser		Blink	OFF	OFF	OFF
⑨ AWD-LO	• Low range	OFF	ON	ON	ON
	• High range	OFF	OFF	OFF	OFF
⑩ FWD	• FWD	OFF	ON	ON	ON
	• AWD	OFF	OFF	OFF	OFF

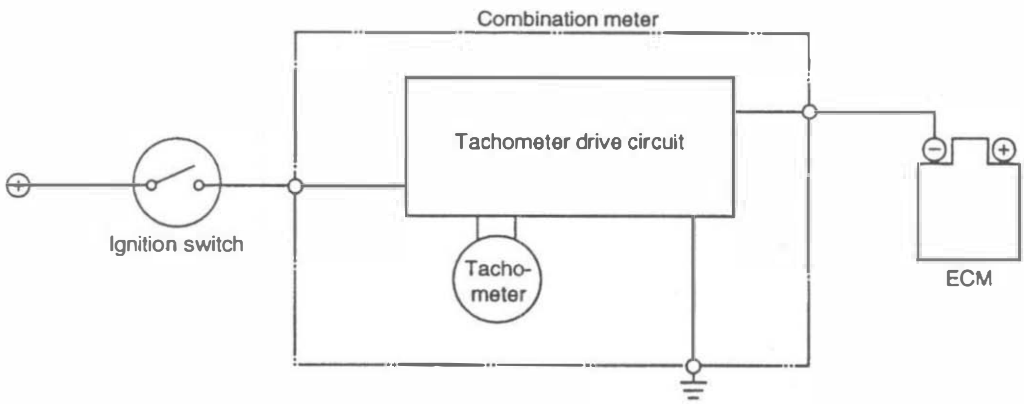
*1: When rear defogger switch turn to ON.
*2, *3: Light illuminates when the AT is in HOLD mode.

C: TACHOMETER

The tachometer drive circuit connects to engine revolution detecting circuit in engine control module.

When the engine revolution increases/decreases, the voltage of this circuit also increases/decreases, changing the magnetic force of tachometer drive coil.

Thus, the tachometer hand moves together with engine revolution change.



H6H0419

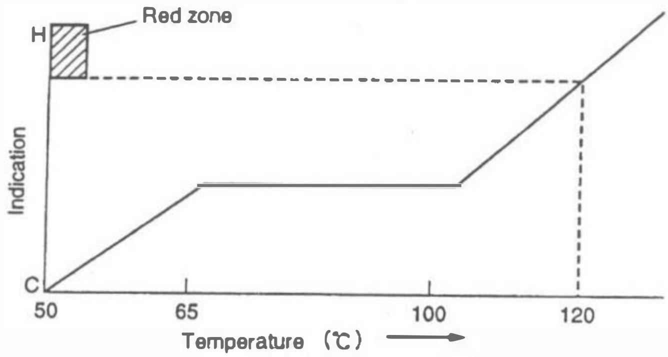
D: WATER TEMPERATURE GAUGE

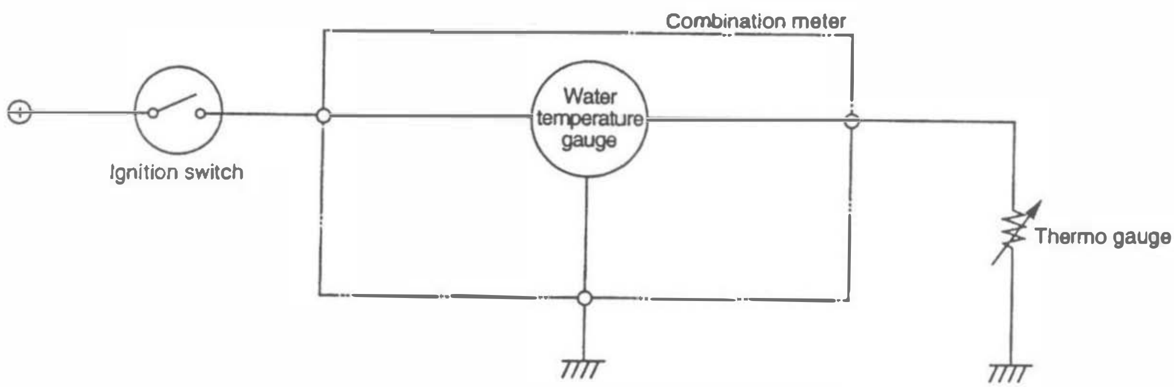
The water temperature gauge is a cross-coil type.

The water temperature signal is input from thermo gauge installed on the engine.

The resistance of thermo gauge changes according to engine coolant temperature. Therefore, the current input to water temperature gauge also changes according to engine coolant temperature. Accordingly, gauge hand moves in proportion to the change in magnetic force of coil.

When the water temperature is at approx. 70 to 100 °C (158 to 212 °F)[normal operating temperature], the meter hand is stable in the middle of indication range as shown in the graph below.





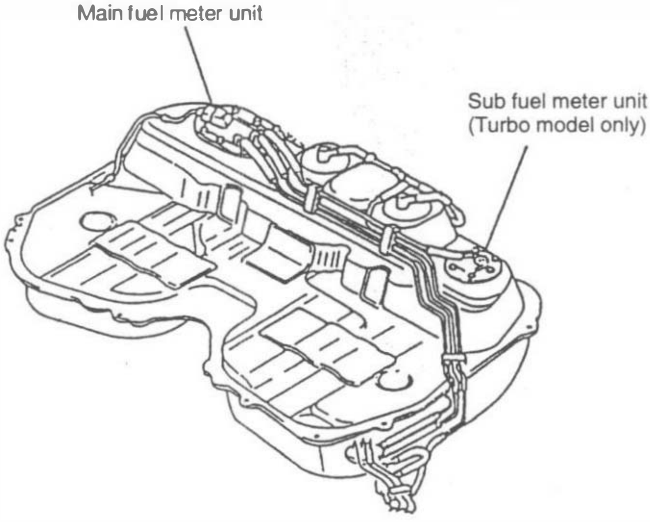
H6H0420

E: FUEL GAUGE

1. GENERAL

The fuel gauge is a resistance type and indicates the fuel level in the tank even when the ignition switch is in OFF position.

Turbo model is equipped with two fuel meter units. Two fuel meter units are installed in the fuel tank, one each at the right and left side, because the fuel tank is divided into main and sub tank area.

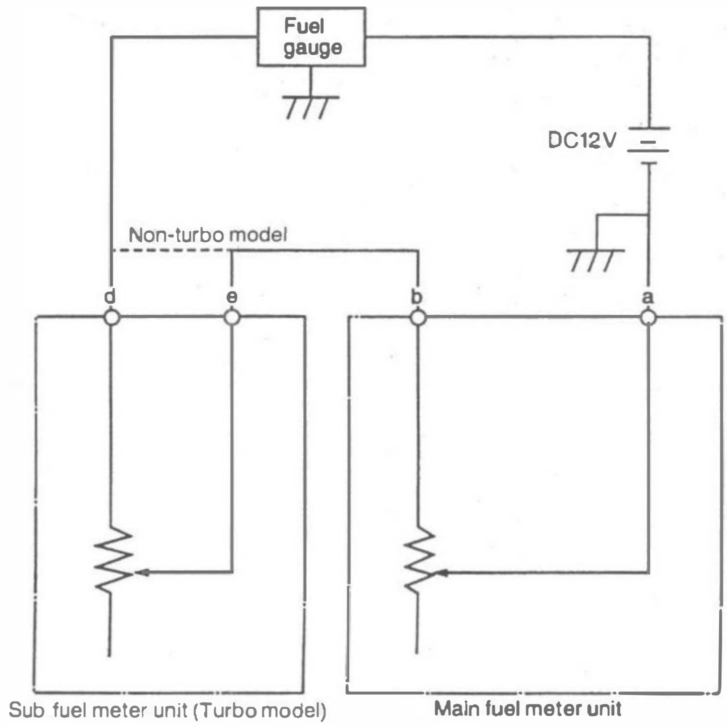


H6H0421B

2. SPECIFICATION

	Fuel amount	Resistance	
		Non-turbo model	Turbo model
Main unit	FULL	2–5 Ω	0.5–2.5 Ω
	1/2	45.5–51.5 Ω	25–29 Ω
	EMPTY	92–95 Ω	50–52 Ω
Sub unit (Turbo model)	FULL	—	0.5–2.5 Ω
	1/2	—	19.5–23.5 Ω
	EMPTY	—	42–44 Ω

3. CIRCUIT DIAGRAM



H6H0422A

6. Power Window

A: CONSTRUCTION

The power window system consists of regulator motor and switch (installed in each door), relay and circuit breaker unit.

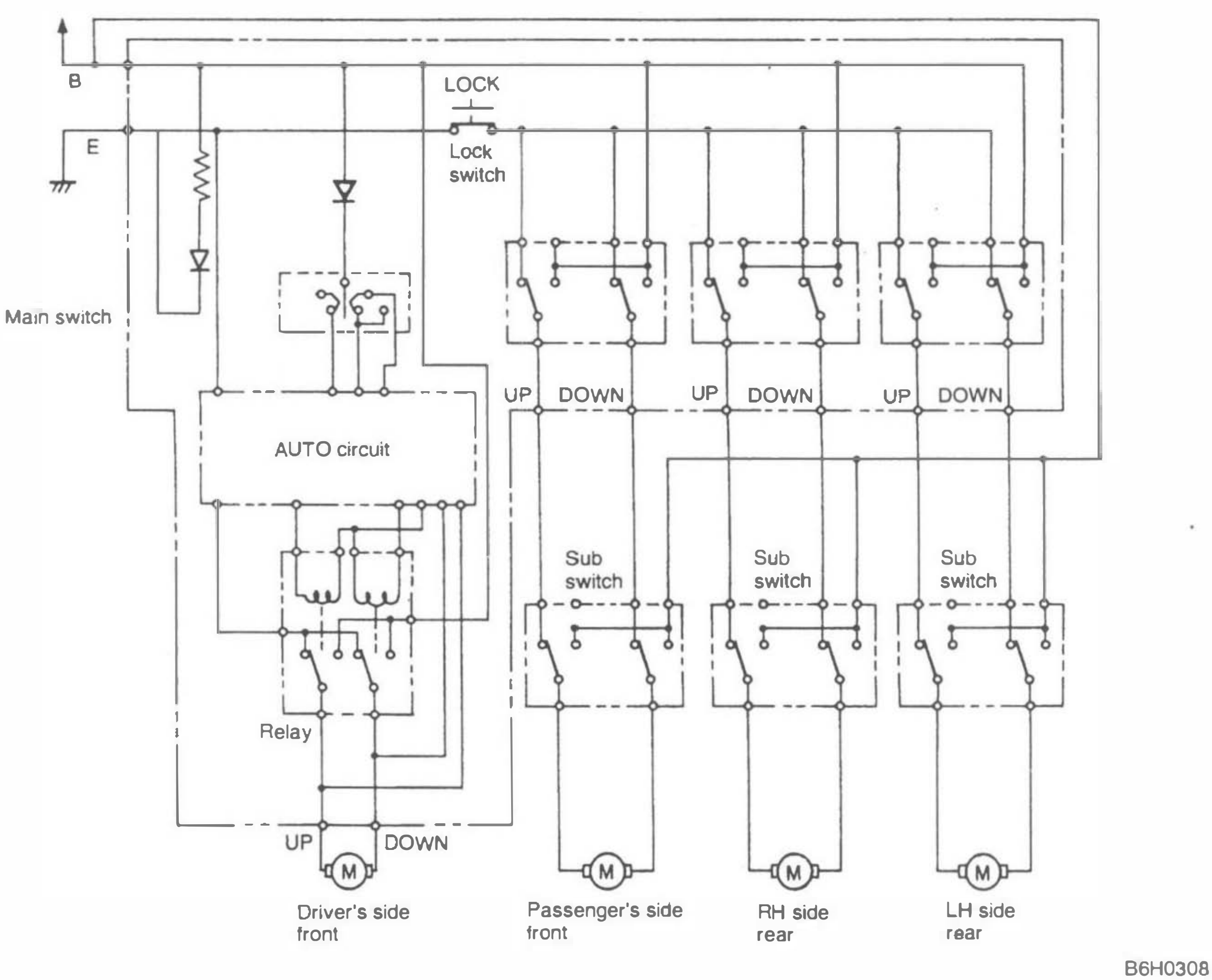
Each door window opens/closes by pushing down/pulling up the switch.

Only driver's door window switch has a 2-stage mechanism;

- When the switch is pushed down to "one click" position and held there, the window continue to lower until the switch is released.
- When the switch is pushed down fully, the window lowers to the end position automatically.

NOTE:
For the sake of safety, the power window system is designed to operate only when the ignition switch is in ON position.

B: CIRCUIT DIAGRAM



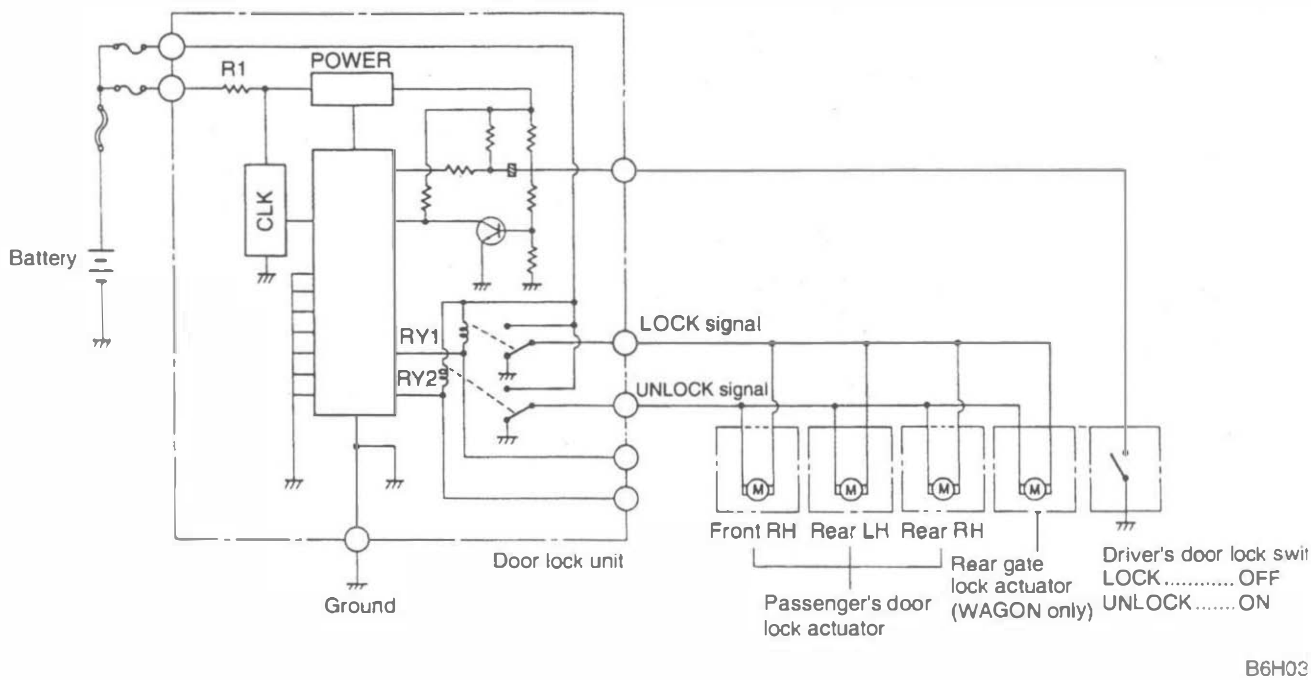
7. Power Door Lock

A: CONSTRUCTION

The power door lock system consists of driver's door lock switch, passenger's door lock actu rear door lock actuators, and rear gate lock actuator (WAGON).

When driver locks or releases the driver's door using the lock knob, the other doors and the gate (WAGON) are also locked or released automatically.

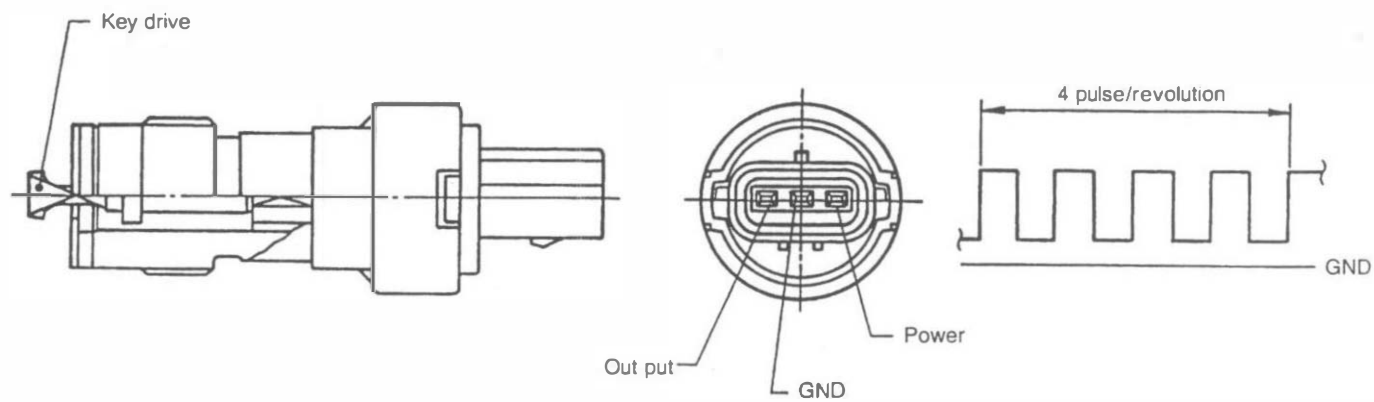
1. CIRCUIT DIAGRAM



8. Vehicle Speed Sensor 2 (Turbo model)

A: DESCRIPTION

The vehicle speed sensor 2 is a rotating type that utilizes a magnetic resistance element MRE. The MRE is a two-dimensional magnetic sensor whose resistance value varies with changes in the direction of the magnetic field. When the multi-pole ring magnet built into the sensor rotates along with the revolution of the transmission's driven gear, the direction of the magnetic field applied to the MRE cyclically changes by the same number of magnet poles, causing a cyclical change in the resistance value of the MRE. This change in the resistance value is shaped to a rectangular waveform through a built-in IC which produces it as a pulse output.

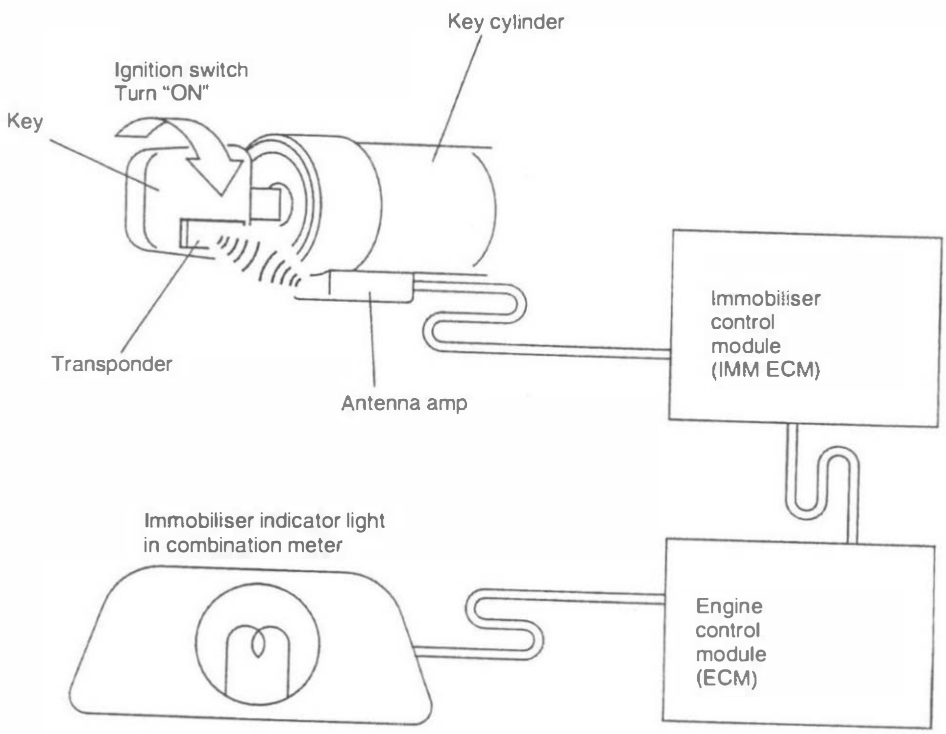


H6H0441A

9. Immobiliser System

A: CONSTRUCTION

The immobiliser system consists of the following components: an indicator light in the combination meter, an immobiliser controller module (IMM ECM), an engine control module (ECM), a transponder inside the ignition key, and an antenna amp. The antenna amp receives transmissions from the key transponder.
When the key is inserted into the key cylinder and turned to the "ON" position, the key transponder transmits a preset vehicle ID code to the antenna amp. This ID code is then verified by the immobiliser control module. If it matches the ID code registered in the immobiliser system, the system allows the engine to be started. Even if a key fits into the key cylinder and can be used to start the engine, the engine will automatically stop after a few seconds if the key's ID code is not successfully verified.
The immobiliser system is automatically armed when the ignition switch is turned to the "ACC" or "OFF" position. When the system is operating, the indicator light flashes at intervals of 0.2-second ON and 2.4-second OFF. The indicator light may sometimes flash irregularly, but this does not indicate a fault.
This indicator light flashing warns the potential thieves that this vehicle is protected by the immobiliser system.
In the event that the immobiliser system develops a fault, the "CHECK ENGINE" warning light flashes when the ignition switch is in the "ON" position.



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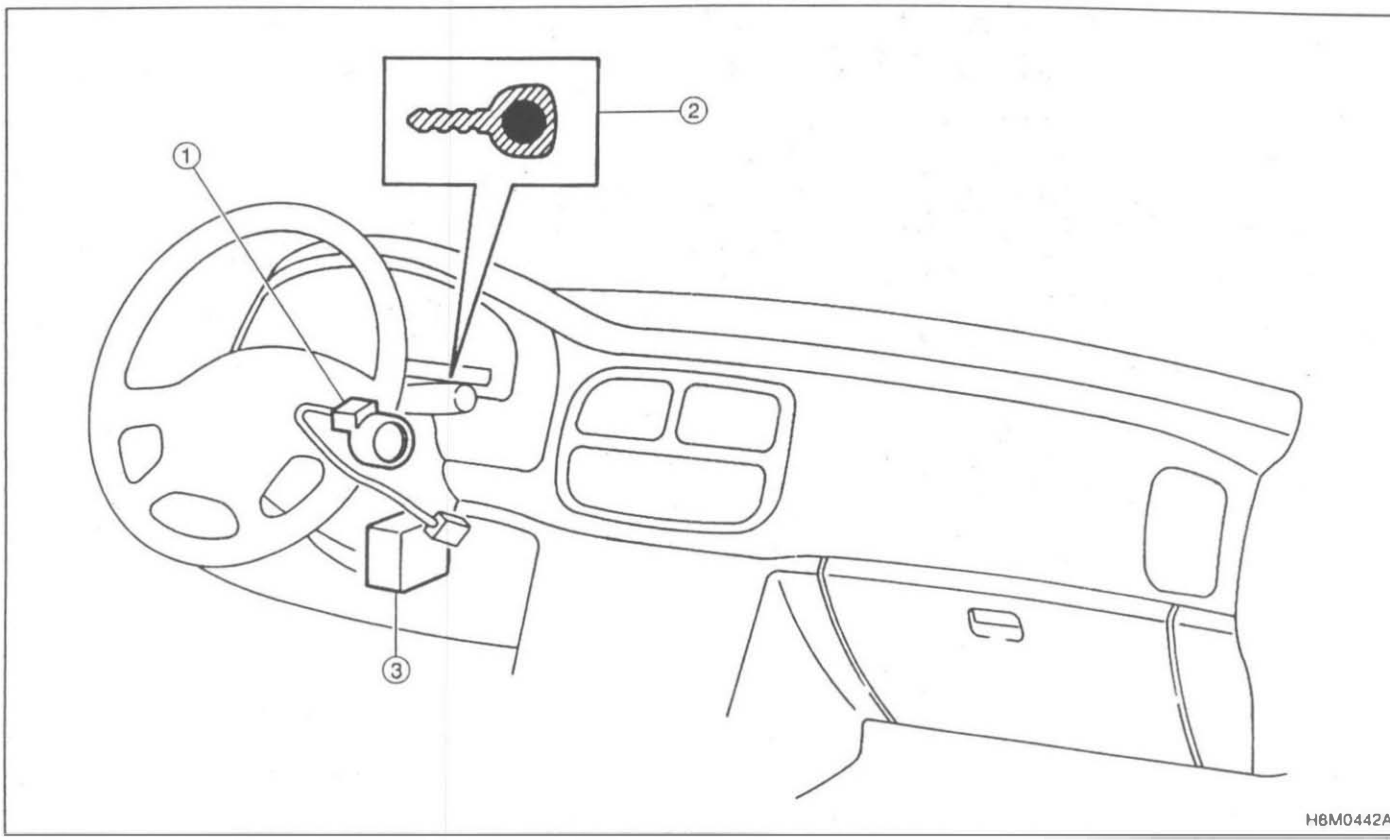
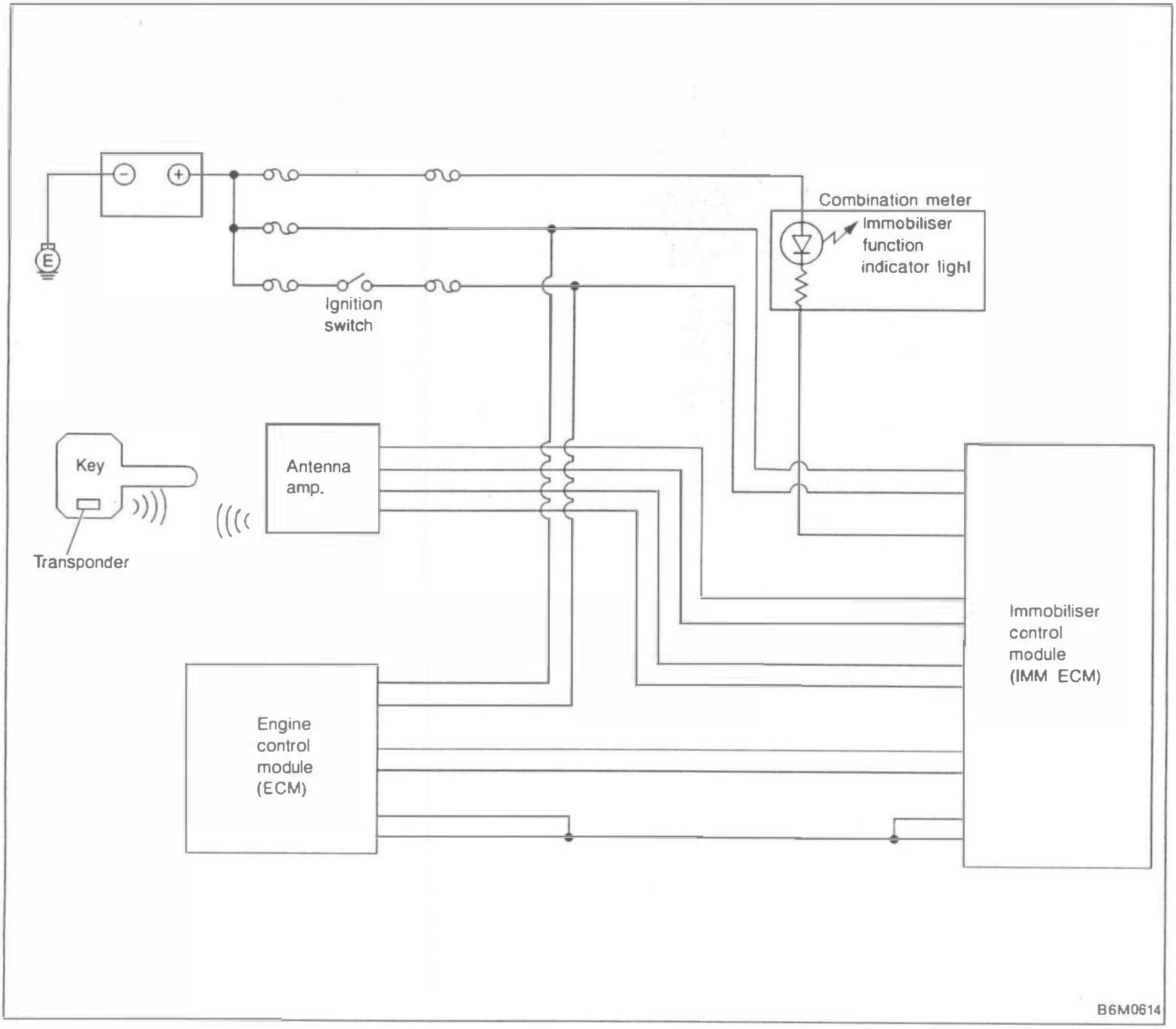
2. Electrical Components Location



① Antenna amp.
② Immobiliser indicator light (LED bulb)
③ Immobiliser control module (IMM ECM): LHD model

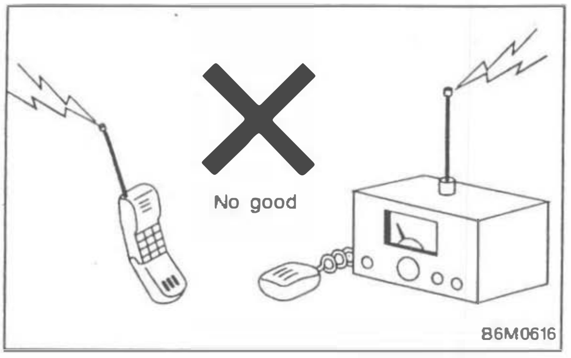
NOTE:
IMM ECM location for RHD model is symmetrically opposite.

3. Schematic

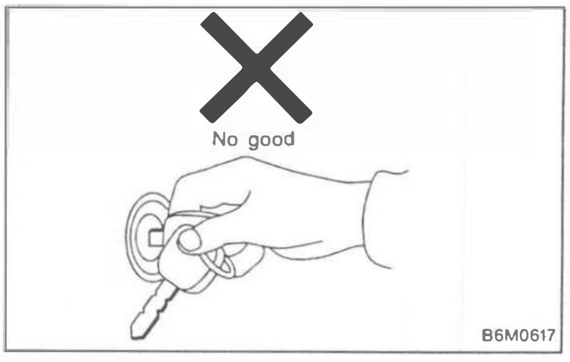

Combination meter
Immobiliser function indicator light
Ignition switch
E
Key
Transponder
Antenna amp.
Immobiliser control module (IMM ECM)
Engine control module (ECM)
B6M0614

4. Diagnostics Chart for On-board Diagnosis System

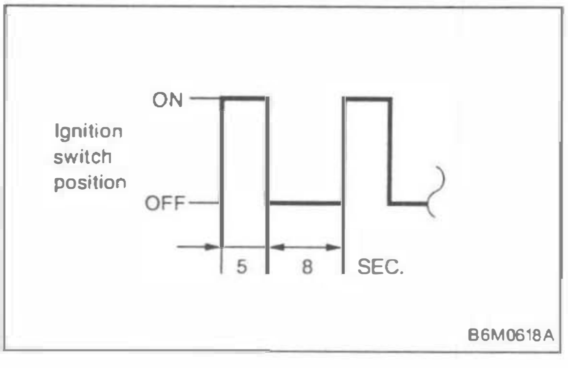
A: PRECAUTIONS



- While diagnostic items are being checked, do not operate radios, portable telephones, etc. which emit electromagnetic waves near or inside the vehicle.



- When ignition switch is being turned ON or OFF while diagnostic items are being checked, do not allow keys with different ID codes close to the ignition switch. If ignition key is in a key holder, remove it from holder before carrying out diagnoses.

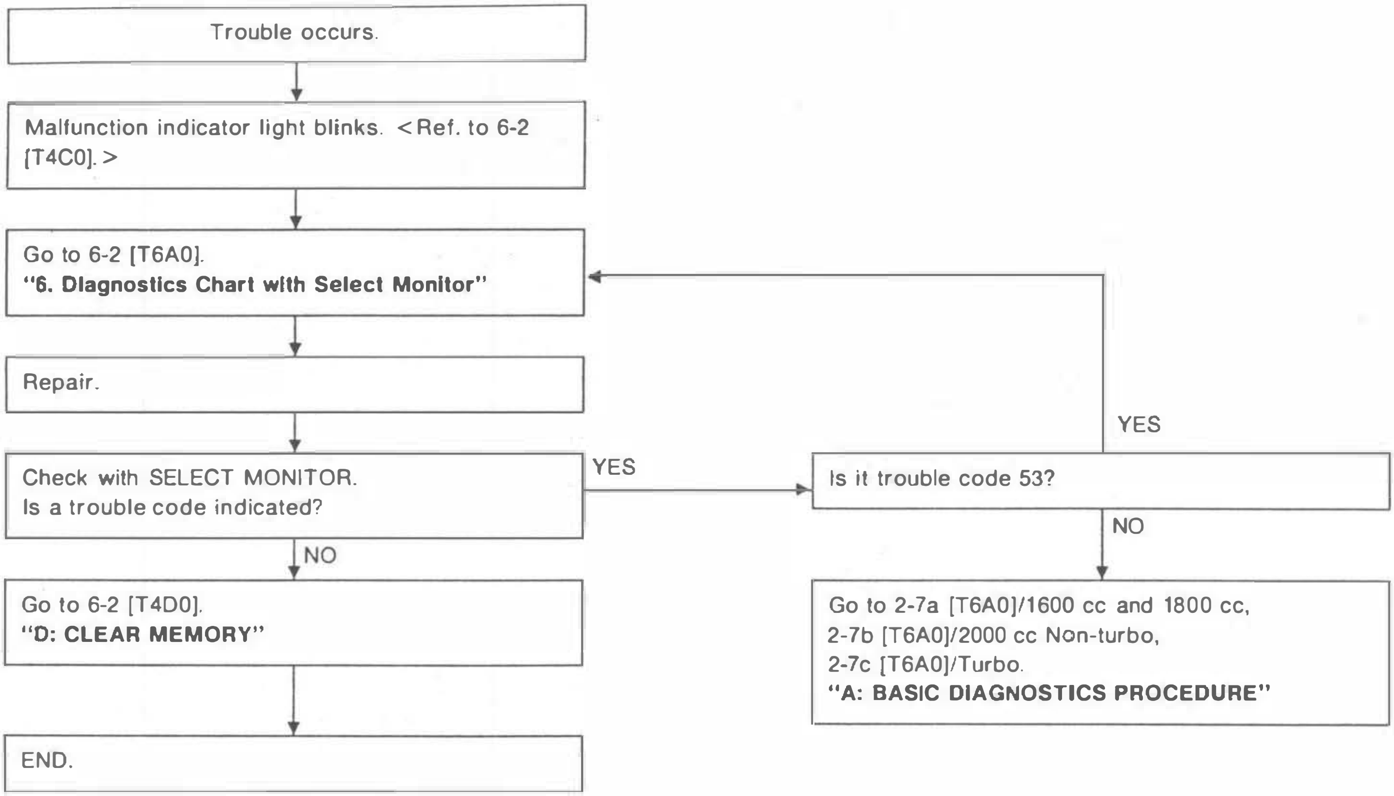


- When repeatedly turning ignition ON or OFF while diagnostic items are being checked, it should be switched in cycles of "ON" for at least 5 seconds → "OFF" for at least 8 seconds.

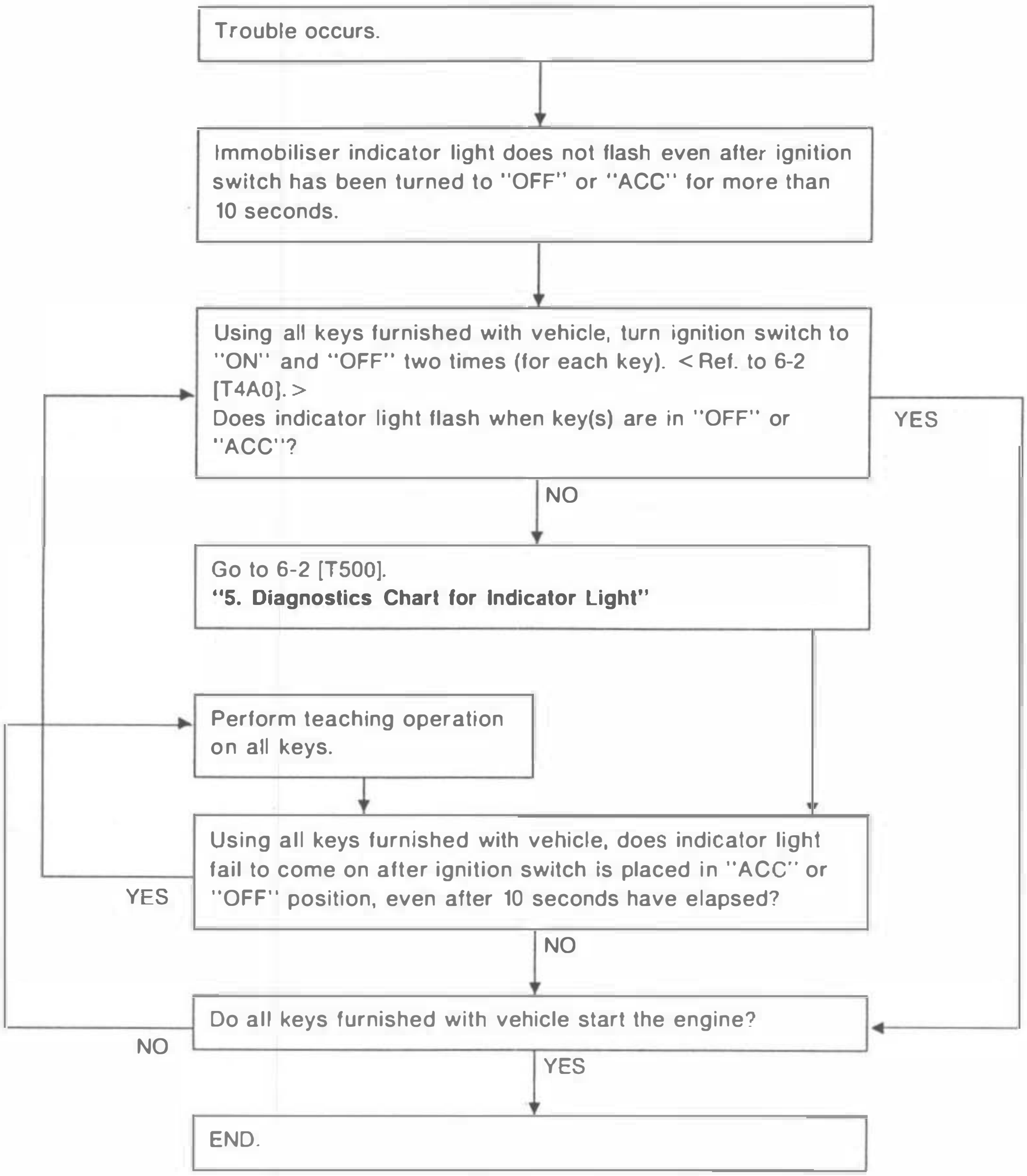
- If engine fails to start with a registered ignition key, turn the key to "ACC" or "OFF" and wait for approximately 5 seconds until immobiliser indicator light begins to flash. Start engine again.
- Before checking diagnostic items, obtain all keys for vehicle to be checked possessed by owner.

B: BASIC DIAGNOSTICS PROCEDURE

1. MALFUNCTION INDICATOR LIGHT BLINKS

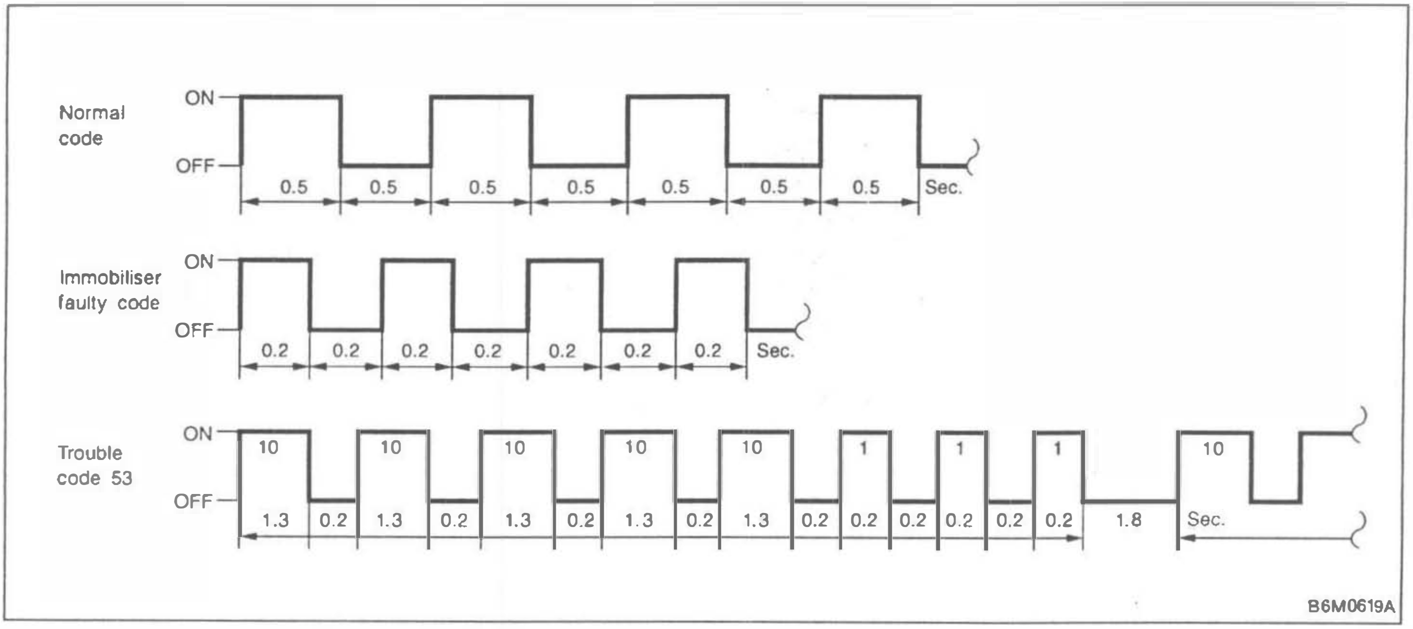


2. IMMOBILISER INDICATOR LIGHT REMAINS OFF



C: HOW TO READ TROUBLE CODE

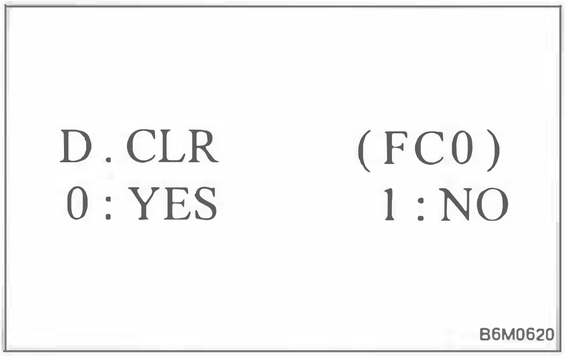
The malfunction indicator light blinks the code corresponding to the faulty parts. The long segment (1.3 seconds ON) indicates a "ten", and the short segment (0.2 seconds ON) signifies "one". Blinks at 0.5 second intervals means "normal code" and blinks at 0.2 second intervals means "Immobiliser faulty code".



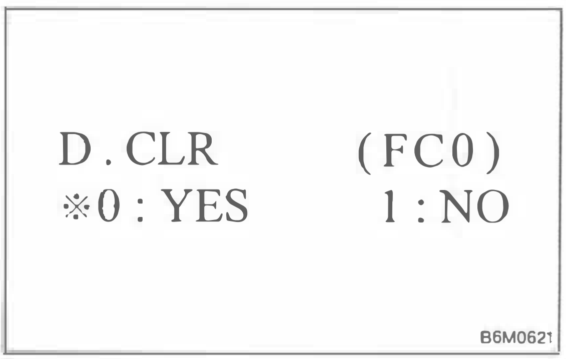
D: CLEAR MEMORY

NOTE:
Repair according to trouble code and diagnostic item. After repairs, make sure trouble code no longer appears on screen.
Using select monitor, clear memory to erase trouble code stored in ECM.

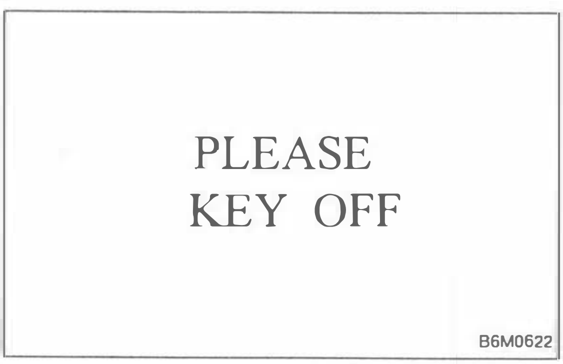
1) Connect select monitor.
2) Use function keys to key in "F" "C" "0" "ENT".



3) Screen indicates as shown.

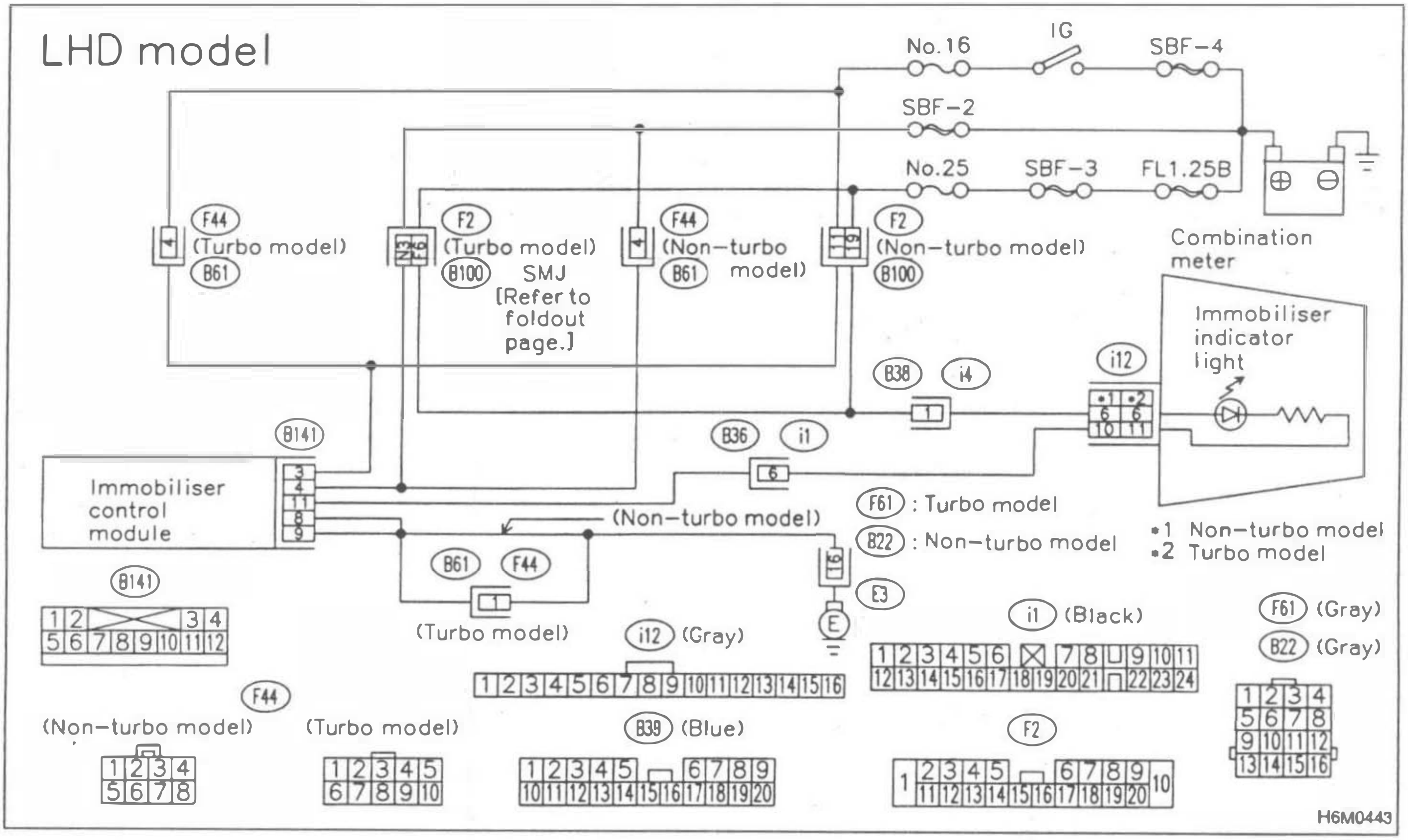


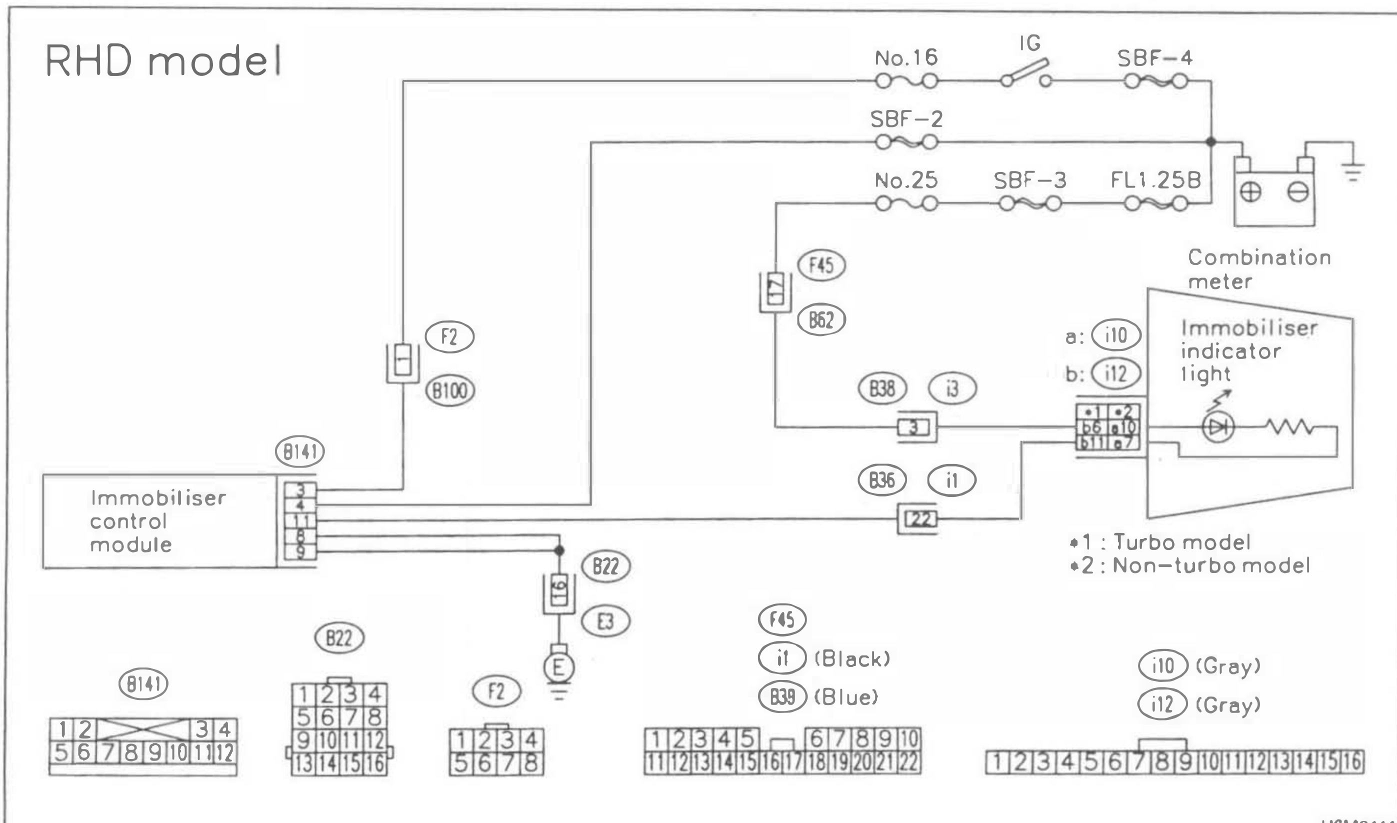
4) Key in "0" to clear memories. The indication of ※ is added to screen.

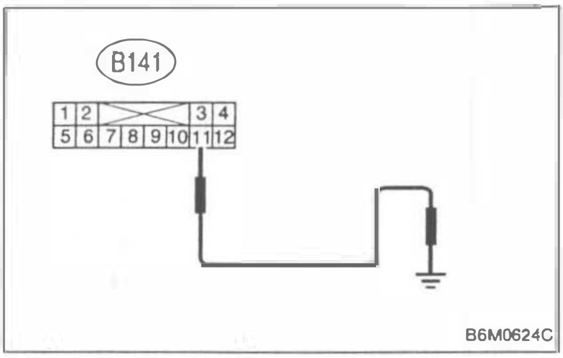


5) Key in "ENT". Screen indicates as shown.
6) Turn the key OFF.

5. Diagnostics Chart for Indicator Light







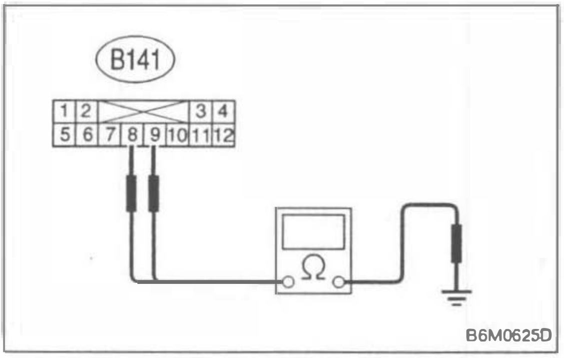
1	CHECK IMMOBILISER INDICATOR LIGHT COMES ON.

1) Turn ignition switch to OFF.
2) Disconnect connector from IMM ECM.
3) Connect between IMM ECM connector (B141) No. 11 and chassis ground.

CHECK : ***Does indicator light comes on?***

YES : Go to step **2**.

NO : Go to step **3**.



2	CHECK IMM ECM CIRCUIT.

1) Measure resistance between IMM ECM connector and chassis ground.

CHECK : ***Connector & terminal (B141) No. 8 (+) — Chassis ground (–): Is the resistance less than 10 Ω?***

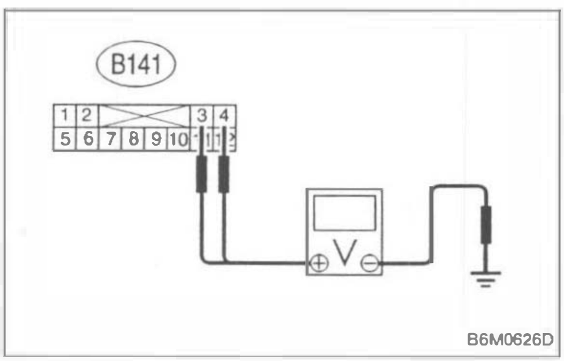
YES : Replace IMM ECM. <Ref. to 6-2 [W10A1].> Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0590GZ).

NO : Repair open circuit of IMM ECM ground circuit. Then go to next CHECK .

CHECK : ***Connector & terminal (B141) No. 9 (+) — Chassis ground (–): Is the resistance less than 10 Ω?***

YES : Replace IMM ECM. <Ref. to 6-2 [W10A1].> Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0590GZ).

NO : Repair open circuit of IMM ECM ground circuit. Then go to step 2).



2) Turn ignition switch to ON. (Engine OFF.)
3) Measure voltage between IMM ECM connector and chassis ground.

CHECK : ***Connector & terminal (B141) No. 3 (+) — Chassis ground (–): Is the voltage more than 10 V?***

YES : Replace IMM ECM. <Ref. to 6-2 [W10A1].> Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0590GZ).

NO : Repair harness between IMM ECM connector and battery voltage line. Then go to step 4).

4) Turn ignition switch to OFF.

CHECK : ***Connector & terminal***
(B141) No. 4 (+) — Chassis ground (–):
Is the voltage more than 10 V?

YES : Replace IMM ECM. <Ref. to 6-2 [W10A1].> Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0590GZ).

NO : Repair harness between IMM ECM connector and battery voltage line. Then go to next CHECK .

CHECK : ***Connector & terminal***
(B141) No. 3 (+) — Chassis ground (–):
Is the voltage 0 V?

YES : Replace IMM ECM. <Ref. to 6-2 [W10A1].> Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0590GZ).

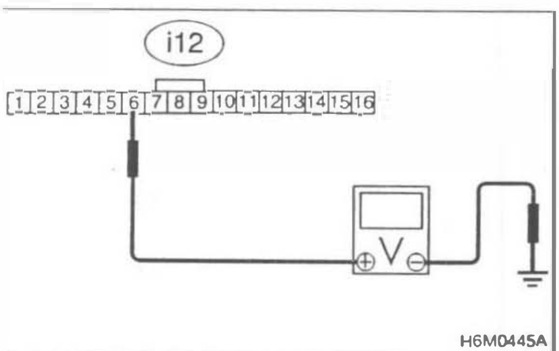
NO : Repair harness between IMM ECM connector and ignition switch "ON" line. Then go to step 5).

5) Turn ignition switch to ON. (Engine OFF.)

CHECK : ***Connector & terminal***
(B141) No. 3 (+) — Chassis ground (–):
Is the voltage more than 10 V?

YES : Replace IMM ECM. <Ref. to 6-2 [W10A1].> Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0590GZ).

NO : Repair harness between IMM ECM connector and ignition switch "ON" line.



3	CHECK COMBINATION METER CIRCUIT.

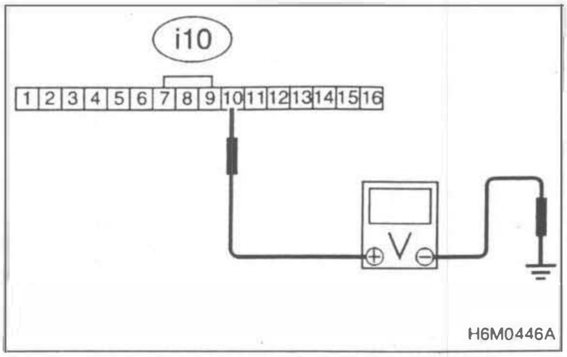
1) Remove combination meter. <Ref. to 6-2 [W8A0].> Then disconnect connector from combination meter.
2) Measure voltage between combination meter connector and chassis ground.

ALL LHD MODELS AND RHD TURBO MODEL

CHECK : ***Connector & terminal***
(i12) No. 6 (+) — Chassis ground (–):
Is the voltage more than 10 V?

YES : Go to step 3).

NO : Repair harness or connector.

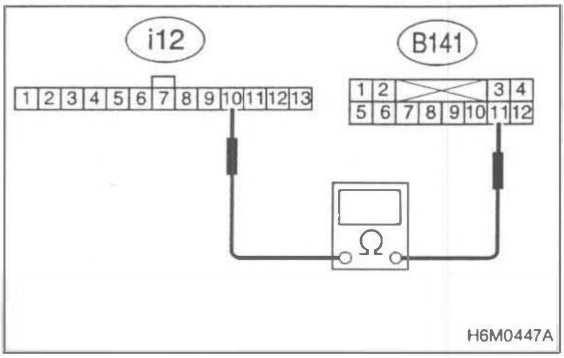


RHD NON-TURBO MODEL

CHECK : ***Connector & terminal (i10) No. 10 (+) — Chassis ground (–): Is the voltage more than 10 V?***

YES : Go to step 3).

NO : Repair harness or connector.



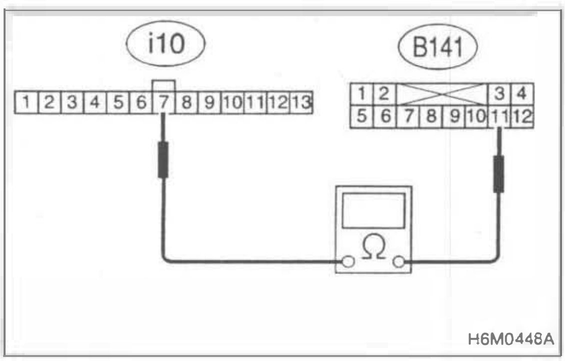
3) Measure resistance between IMM ECM connector and combination meter connector.

LHD NON-TURBO MODEL

CHECK : ***Connector & terminal (B141) No. 11 — (i12) No. 10: Is the resistance less than 10 Ω?***

YES : Go to step **4**.

NO : Repair harness or connector.

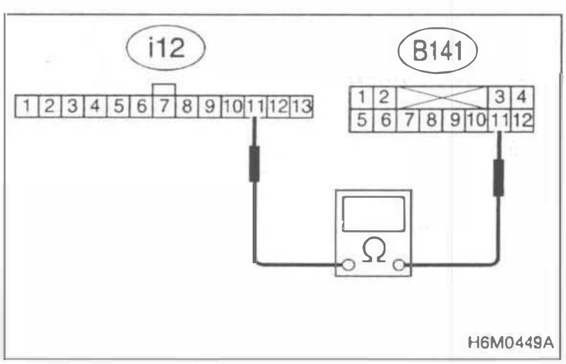


RHD NON-TURBO MODEL

CHECK : ***Connector & terminal (B141) No. 11 — (i10) No. 7: Is the resistance less than 10 Ω?***

YES : Go to step **4**.

NO : Repair harness or connector.

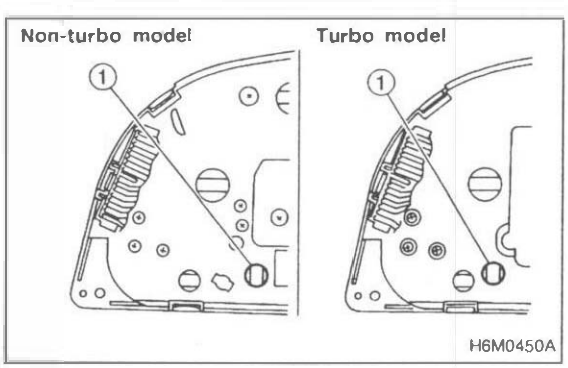


TURBO MODEL

CHECK : ***Connector & terminal (B141) No. 11 — (i12) No. 11: Is the resistance less than 10 Ω?***

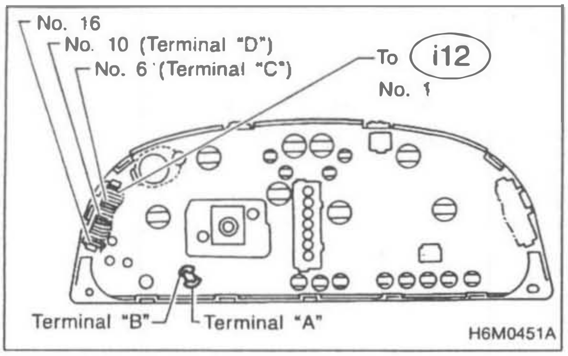
YES : Go to step **4**.

NO : Repair harness or connector.



4	**CHECK IMMOBILISER INDICATOR LIGHT CIRCUIT IN COMBINATION METER.**

1) Remove LED bulb ① from combination meter.

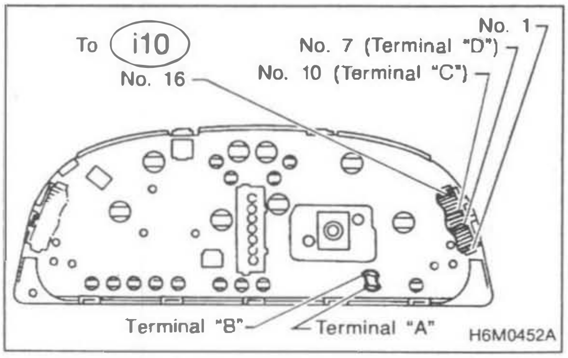


2) Measure resistance between indicator light circuit terminal.

LHD NON-TURBO MODEL

CHECK : ***Terminal***
Terminal "A" — Terminal "D":
Is the resistance 750 Ω?

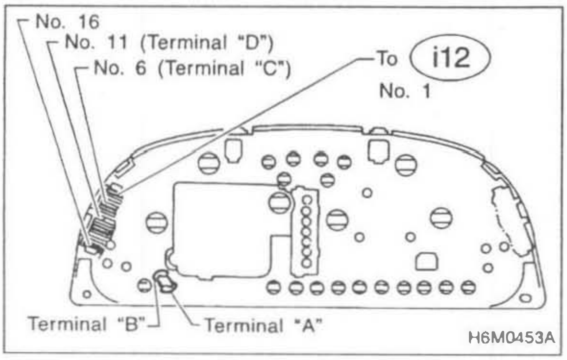
YES : Go to step 3).
NO : Replace combination meter.



RHD NON-TURBO MODEL

CHECK : ***Terminal***
Terminal "A" — Terminal "D":
Is the resistance 750 Ω?

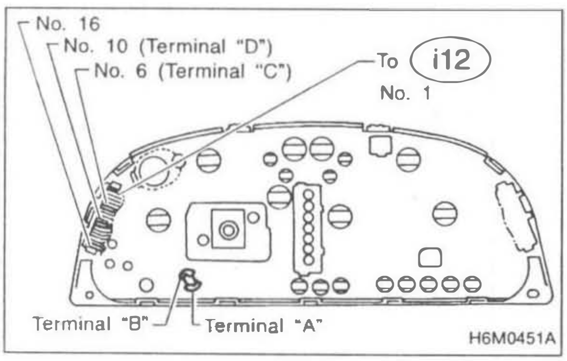
YES : Go to step 3).
NO : Replace combination meter.



TURBO MODEL

CHECK : ***Terminal***
Terminal "A" — Terminal "D" :
Is the resistance 750 Ω?

YES : Go to step 3).
NO : Replace combination meter.

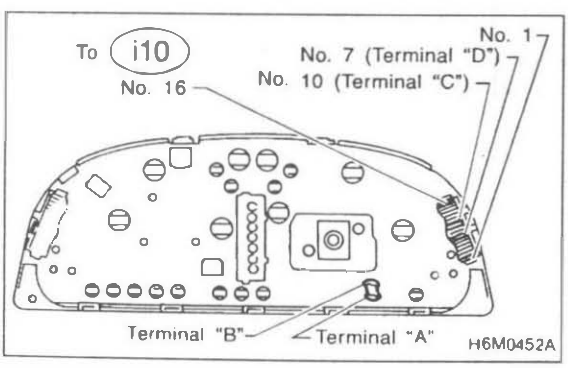


3) Measure resistance between indicator light circuit terminal.

LHD NON-TURBO MODEL

CHECK : ***Terminal***
Terminal "B" — Terminal "C":
Is the resistance less than 10 Ω?

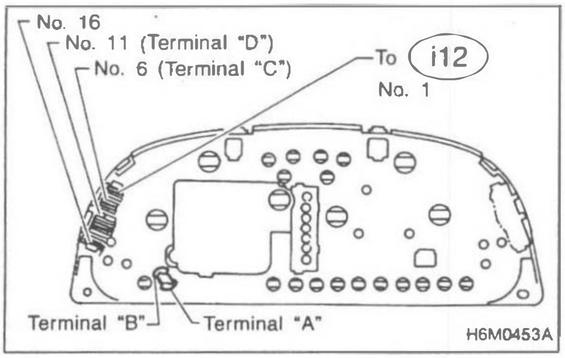
YES : Replace LED bulb.
NO : Replace combination meter.



RHD NON-TURBO MODEL

CHECK : ***Terminal***
Terminal "B" — Terminal "C" :
Is the resistance less than 10 Ω?

YES : Replace LED bulb.
NO : Replace combination meter.



TURBO MODEL

CHECK : ***Terminal***
Terminal "B" — Terminal "C" :
Is the resistance less than 10 Ω?

YES : Replace LED bulb.

NO : Replace combination meter.

6. Diagnostics Chart with Select Monitor

A: BASIC DIAGNOSTIC PROCEDURE

1. Trouble occurs.

↓

2. Malfunction indicator light blinks.

↓

3. Ignition switch turned OFF. Connect select monitor.

↓

4. Ignition switch turned ON. (Engine OFF.)

↓

5. Select monitor switch turned ON. Enter FB0 or FB1 using function switch.

↓

6. Locate diagnostic item. <Ref. to 6-2 [T6C0].>

↓

7. Repair.

↓

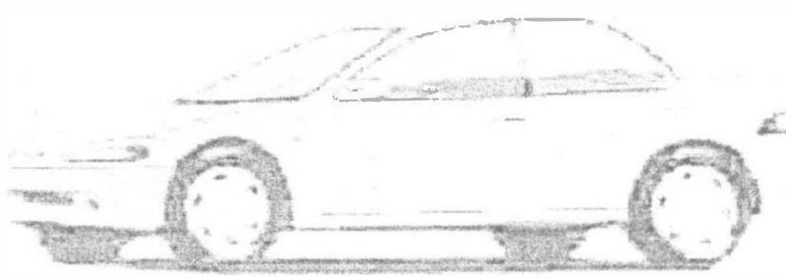
8. Clear memory. <Ref. to 6-2 [T4D0].>

↓

9. END

SERVICE MANUAL

SUBARU IMPREZA



Service manual

Wiring diagram

WIRING DIAGRAM 6-3

Page

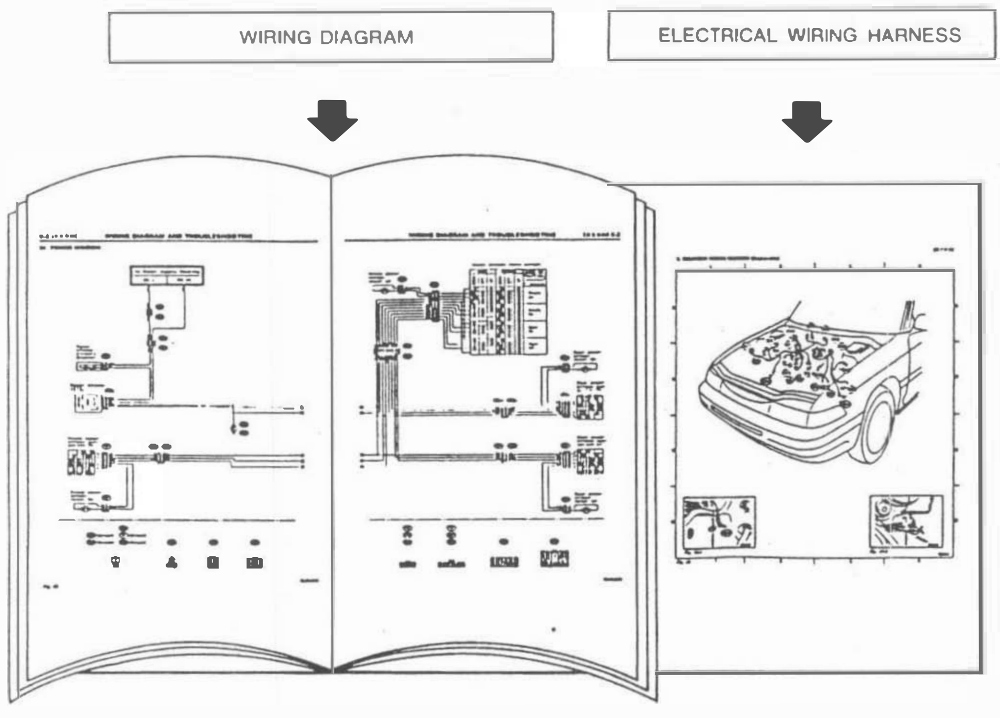
1. General Description

1. HOW TO USE THIS MANUAL

The description of the electrical system is divided into the charging system, starting system, etc.

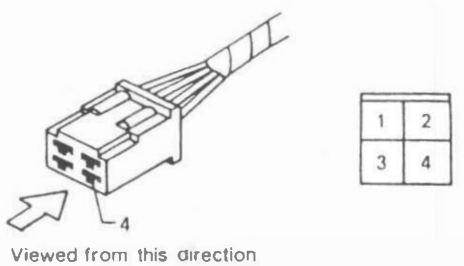
1) First, open to the necessary electrical system section and wiring diagram.

2) Next, open the foldout page of the electrical wiring diagram. By observing the electrical wiring harness' illustrations (front, instrument panel, etc.), the wiring diagram connector can be located.



G6M0192

2. WIRING DIAGRAM



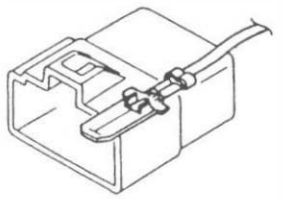
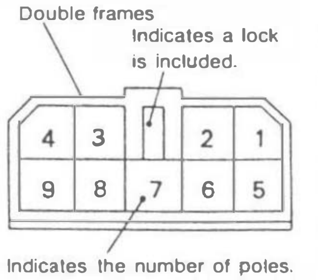
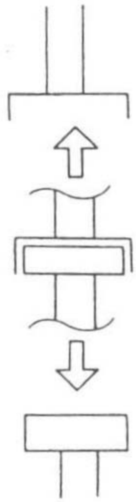
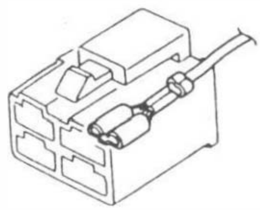
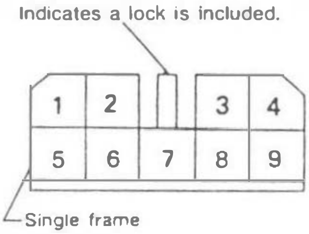
G6M0193

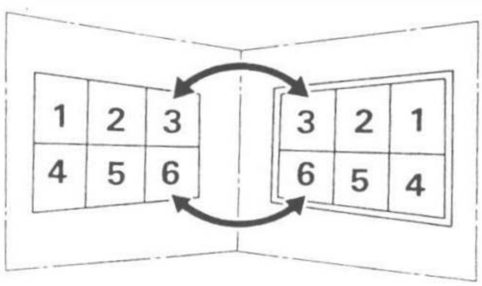
The wiring diagram of each system is illustrated so that you can understand the path through which the electric current flows from the battery.

Sketches and codes are used in the diagrams. They should read as follows:

1) Each connector and its terminal position are indicated by a sketch of the connector in a disconnected state which is viewed from the front, as shown in figure.

2) The number of poles or pins, presence of a lock, and pin number of each terminal are indicated in the sketch of each connector.
In the sketch, the highest pole number refers to the number of poles which the connector has. For example, the sketch of the connector shown in figure indicates the connector has 9 poles.

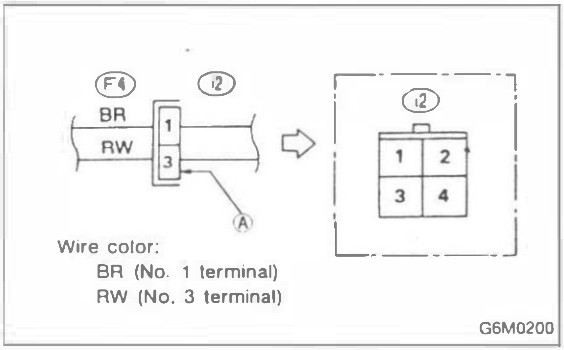
Connector used in vehicle	Connector shown in wiring diagram		
	Sketch	Symbol	Number of poles
 G6M0194	 G6M0196	 G6M0198	Numbered in order from upper right to lower left.
 G6M0195	 G6M0197		Numbered in order from upper left to lower right.



G6M0199

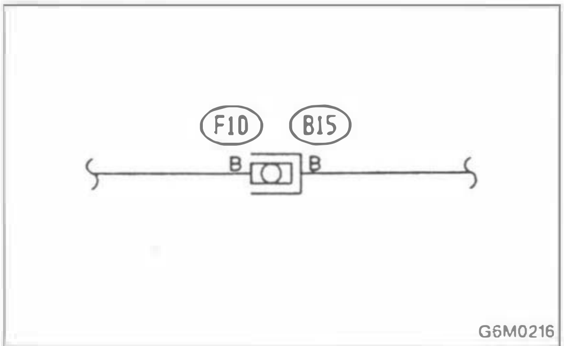
When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of the other. When these two connectors are connected as a unit, the poles which have the same number are joined.

3) Electrical wiring harness
The connectors are numbered along with the number of poles, external colors, and mating connections in the accompanying list.

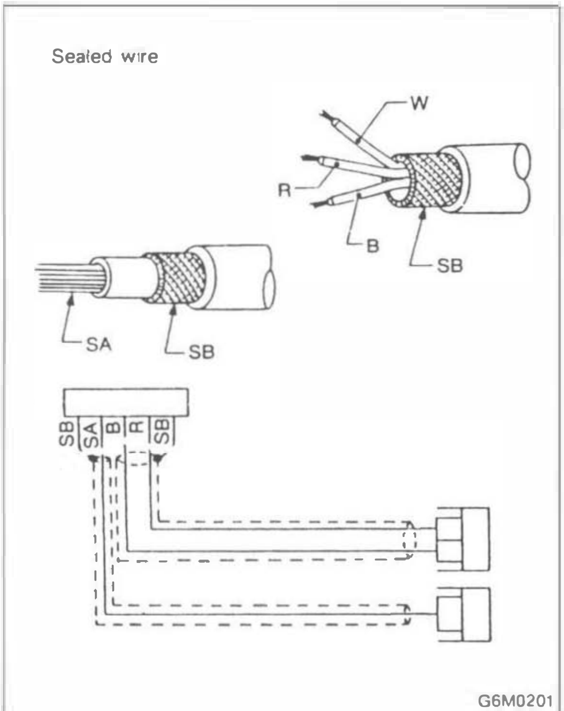


4) The sketch of each connector in the wiring diagram usually shows the "A" side of the connector. The relationship between the wire color, terminal number and connector is described in figure.

NOTE:
A wire which runs in one direction from a connector terminal sometimes may have a different color from that which runs in the other direction from that terminal.

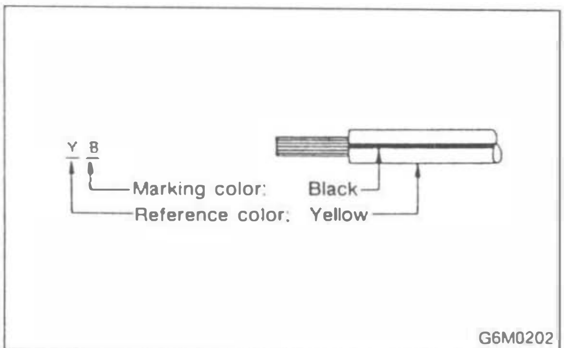


5) In wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.



6) The following color codes are used to indicate the colors of the wires used.

Color code	Color
L	Blue
B	Black
Y	Yellow
G	Green
R	Red
W	White
Br	Brown
Lg	Light green
Gr	Gray
P	Pink
Or	Orange
Lb	Light Blue
V	Violet
SA	Sealed (Inner)
SB	Sealed (Outer)



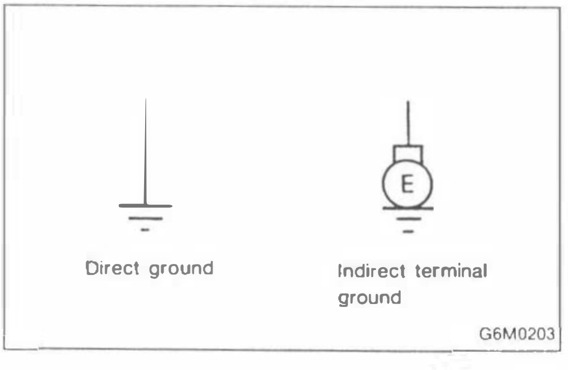
7) The wire color code, which consists of two letters (or three letters including Br or Lg), indicates the standard color (base color of the wire covering) by its first letter and the stripe marking by its second letter.

8) The table below lists the nominal sectional areas and allowable currents of the wires.

Nominal sectional area mm^2	No. of strands/ strand diameter	Outside diameter of finished wiring mm	Allowable current Amps/40°C
0.3	7/0.26	1.8	7
0.5	7/0.32	2.2 (or 2.0)	12
0.75	30/0.18	2.6 (or 2.4)	16
0.85	11/0.32	2.4 (or 2.2)	16
1.25	16/0.32	2.7 (or 2.5)	21
2	26/0.32	3.1 (or 2.9)	28
3	41/0.32	3.8 (or 3.6)	38
5	65/0.32	4.6 (or 4.4)	51
8	50/0.45	5.5	67

CAUTION:
When replacing or repairing a wire, be sure to use the same size and type of the wire which was originally used.

NOTE:
- The allowable current in the above table indicates the tolerable amperage of each wire at an ambient temperature of 40°C (104°F).
- The allowable current changes with ambient temperature. Also, it changes if a bundle of more than two wires is used.



9) Each unit is directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.
The ground points shown in the wiring diagram refer to the following:

GB Body ground

GE Engine ground

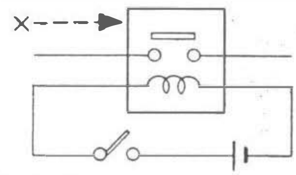
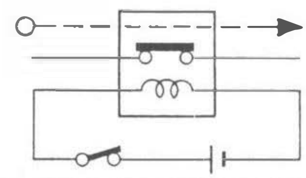
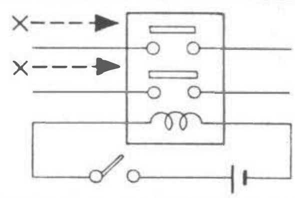
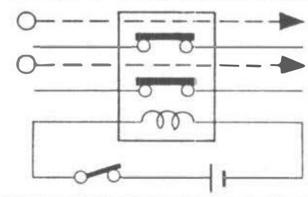
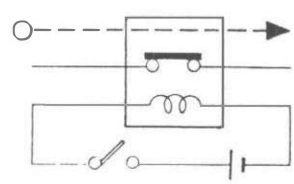
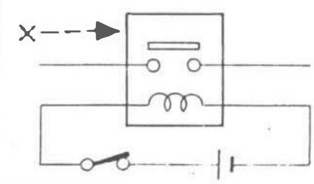
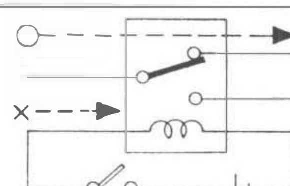
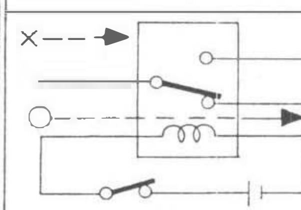
GR Radio ground

GD Rear defogger ground

GS Sunroof ground

All wiring harnesses are provided with a ground point which should be securely connected.

10) Relays are classified as normally-open or normally-closed.
The normally-closed relay has one or more contacts.
The wiring diagram shows the relay mode when the energizing circuit is OFF.

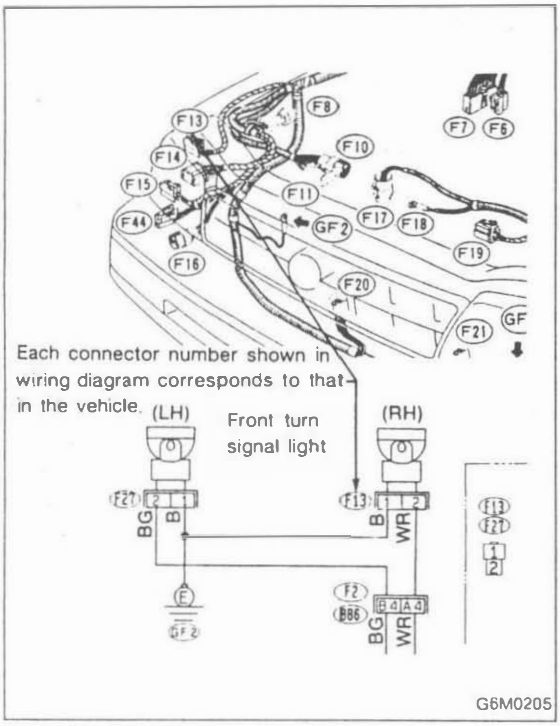
Relay type		Energizing circuit OFF	Energizing circuit ON
Normally-open type	4-pole		
	6-pole		
Normally-closed type	4-pole		
Mixed type	5-pole		

G6M0204

Key to symbols:

○ → : Current flows.

X → : Current does not flow.



11) Each connector number shown in the wiring diagram corresponds to that in the wiring harness. The location of each connector in the actual vehicle is determined by reading the first character of the connector (for example, a "F" for F8, "i" for i16, etc.) and the type of wiring harness.
The first character of each connector number refers to the area or system of the vehicle, as indicated in table below.

Symbol	Wiring harness and Cord
F	Front wiring harness
B	Bulkhead wiring harness
E	Engine wiring harness
T	Transmission cord
D	Door cord LH & RH, Rear door adapter cord LH & RH, Rear gate cord, Rear gate lock adapter cord
I	Instrument panel wiring harness
R	Rear wiring harness, Rear defogger cord, Roof cord, Fuel tank cord

2. Basic Diagnostics Procedures

The most important purpose of diagnostics is to determine which part is malfunctioning quickly, to save time and labor.

A: IDENTIFICATION OF TROUBLE SYMPTOM

Determine what the problem is based on the symptom.

B: PROBABLE CAUSE OF TROUBLE

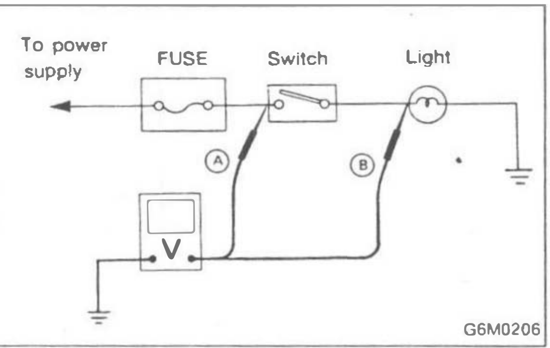
Look at the wiring diagram and check the system's circuit. Then check the switch, relay, fuse, ground, etc.

C: LOCATION AND REPAIR OF TROUBLE

1) Using the diagnostics narrow down the causes.
2) If necessary, use a voltmeter, ohmmeter, etc.
3) Before replacing certain component parts (switch, relay, etc.), check the power supply, ground, for open wiring harness, poor connectors, etc. If no problems are encountered, check the component parts.

D: CONFIRMATION OF SYSTEM OPERATION

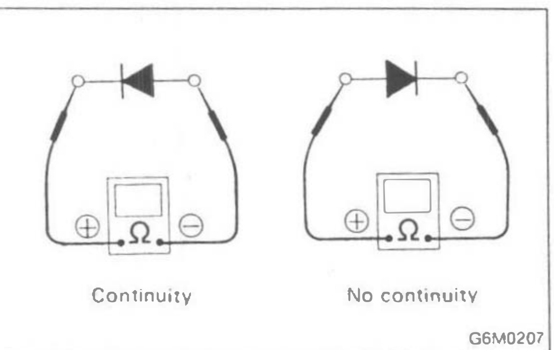
After repairing, ensure that the system operates properly.



E: INSPECTION

1. VOLTAGE MEASUREMENT

1) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal and the positive lead to the connector or component terminal.
2) Contact the positive probe of the voltmeter on connector (A).
The voltmeter will indicate a voltage.
3) Shift the positive probe to connector (B). The voltmeter will indicate no voltage.
With test set-up held as it is, turn switch ON. The voltmeter will indicate a voltage and, at the same time, the light will come on.
4) The circuit is in good order. If a problem such as a lamp failing to light occurs, use the procedures outlined above to track down the malfunction.

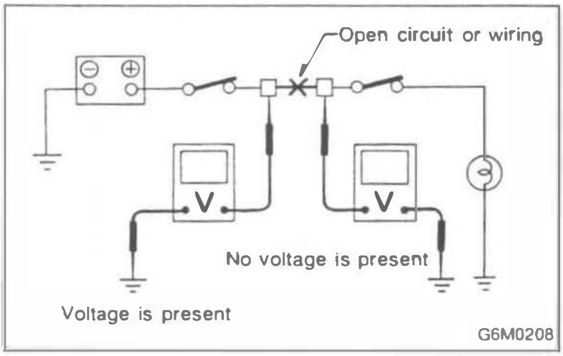


2. CIRCUIT CONTINUITY CHECKS

1) Disconnect the battery terminal or connector so there is no voltage between the check points.
Contact the two leads of an ohmmeter to each of the check points.
If the circuit has diodes, reverse the two leads and check again.
2) Use an ohmmeter to check for diode continuity.
When contacting the negative lead to the diode positive side and the positive lead to the negative side, there should be continuity.
When contacting the two leads in reverse, there should be no continuity.

3) Symbol "o—o" indicates that continuity exists between two points or terminals. For example, when a switch position is "3", continuity exists among terminals 1, 3 and 6, as shown in table below.

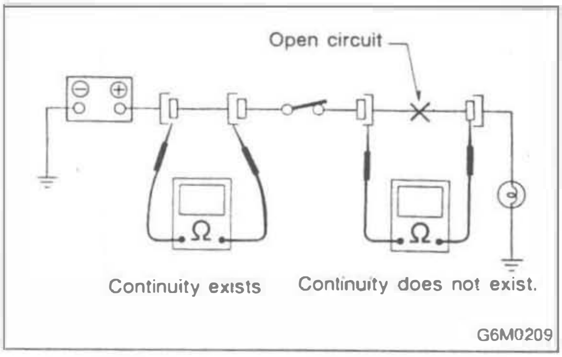
Terminal / Switch Position	1	2	3	4	5	6
OFF						
1	o				o	o
2	o			o		o
3	o		o			o
4	o	o				o



3. HOW TO DETERMINE AN OPEN CIRCUIT

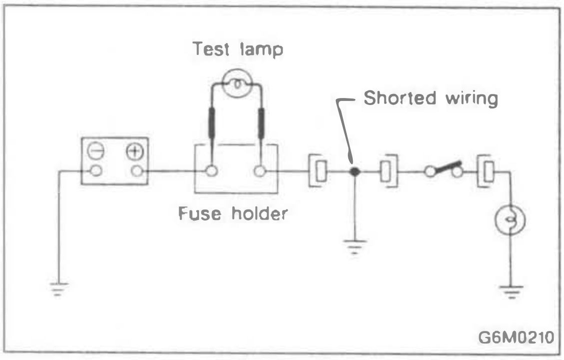
1) Voltmeter Method

An open circuit is determined by measuring the voltage between respective connectors and ground using a voltmeter, starting with the connector closest to the power supply. The power supply must be turned ON so that current flows in the circuit. If voltage is not present between a particular connector and ground, the circuit between that connector and the previous connector is open.



2) Ohmmeter method

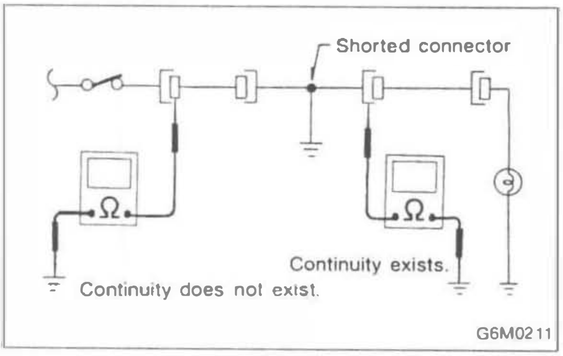
Disconnect all connectors affected, and check continuity in the wiring between adjacent connectors. When the ohmmeter indicates "infinite", the wiring is open.



4. HOW TO DETERMINE A SHORT-CIRCUIT

1) Test lamp method

Connect a test lamp (rated at approximately 3 watts) in place of the blown fuse and allow current to flow through the circuit. Disconnect one connector at a time from the circuit, starting with the one located farthest from the power supply. If the test lamp goes out when a connector is disconnected, the wiring between that connection and the next connector (farther from the power supply) is shorted.



2) Ohmmeter method

Disconnect all affected connectors, and check continuity between each connector and ground. When ohmmeter indicates continuity between a particular connector and ground, that connector is shorted.

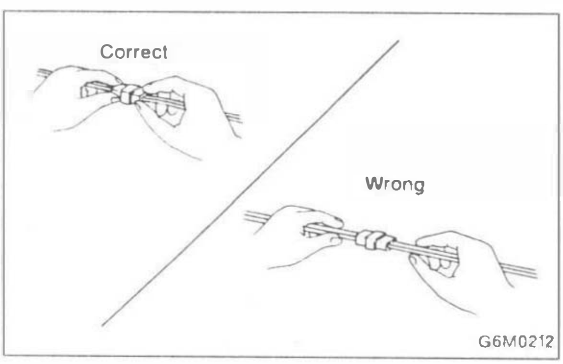
3. Working Precautions

1. PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

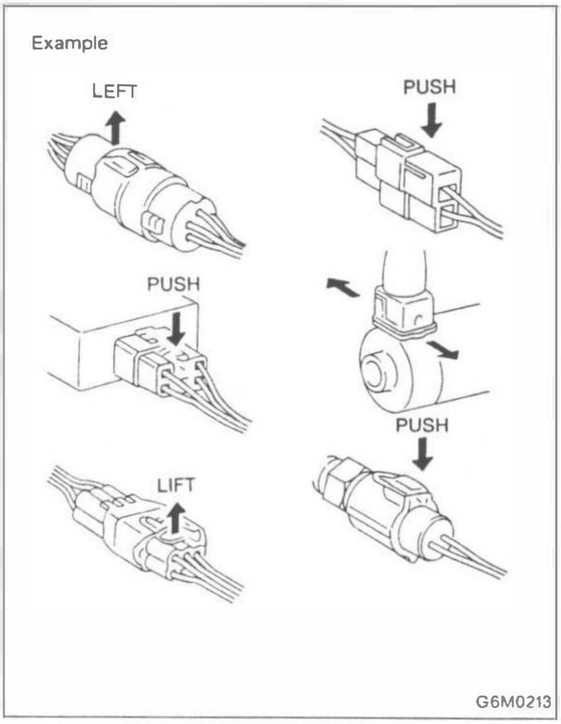
1) When working under a vehicle which is jacked-up, always be sure to use safety stands.
2) The parking brake must always be applied during working. Also, in automatic transmission vehicles, keep the select lever set to the P (Parking) range.
3) Be sure the workshop is properly ventilated when running the engine. Further, be careful not to touch the belt or fan while the engine is operating.
4) Be careful not to touch hot metal parts, especially the radiator and exhaust system immediately after the engine has been shut off.

2. PRECAUTIONS IN TROUBLE DIAGNOSIS AND REPAIR OF ELECTRIC PARTS

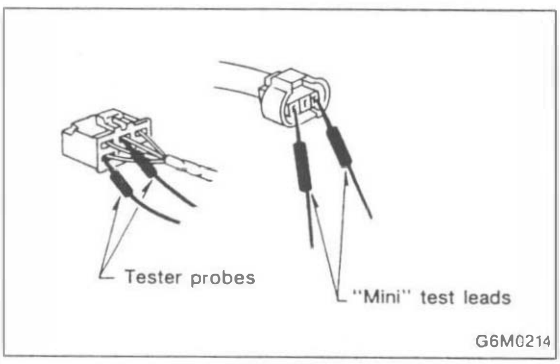
1) The battery cable must be disconnected from the battery's (–) terminal, and the ignition switch must be set to the OFF position, unless otherwise required by the diagnostics.
2) Securely fasten the wiring harness with clamps and slips so that the harness does not interfere with the body end parts or edges and bolts or screws.
3) When installing parts, be careful not to catch them on the wiring harness.



4) When disconnecting a connector, do not pull the wires, but pull while holding the connector body.



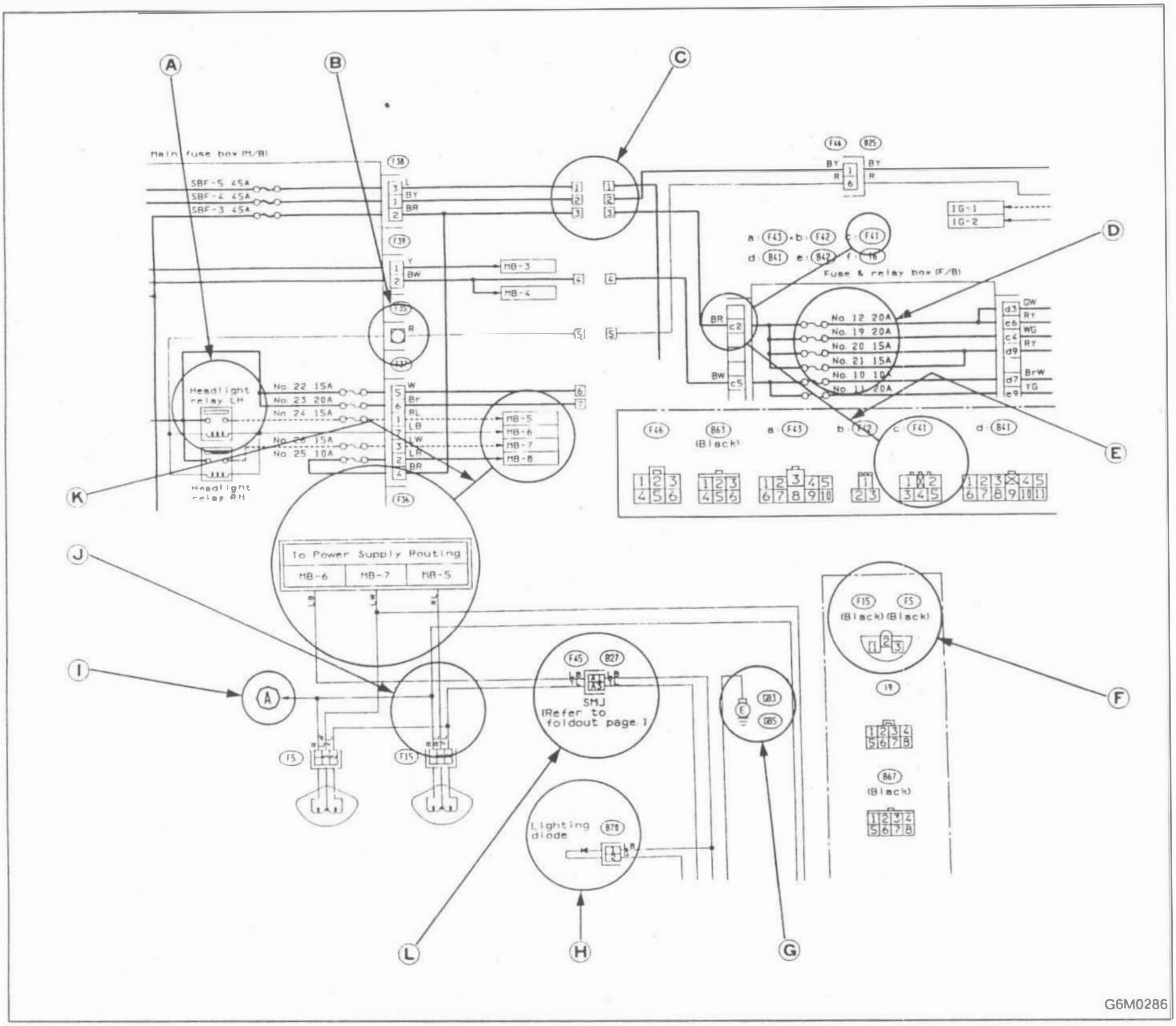
5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector.
To connect, insert the connector until it snaps and confirm that it is tightly connected.



6) When checking continuity between connector terminals, or measuring voltage across the terminal and ground, always contact tester probe(s) on terminals from the wiring connection side. If the probe is too thick to gain access to the terminal, use "mini" test leads.
To check water-proof connectors (which are not accessible from the wiring side), contact test probes on the terminal side being careful not to bend or damage the terminals.

7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts.
Handle them with care so that they are not dropped or mishandled.

4. How to Use Wiring Diagram



A: RELAY

A symbol used to indicate a relay.

B: CONNECTOR-1

The sketch of the connector indicates the one-pole types.

C: WIRING CONNECTION

Some wiring diagrams are indicated in foldouts for convenience. Wiring destinations are indicated where necessary by corresponding symbols (as when two pages are needed for clear indication).

D: FUSE No. & RATING

The "FUSE No. & RATING" corresponds with that used in the fuse box (main fuse box, fuse and joint box).

E: CONNECTOR-2

1. Each connector is indicated by a symbol.
2. Each terminal number is indicated in the corresponding wiring diagram in an abbreviated form.
3. For example, terminal number "C2" refers to No. 2 terminal of connector (C:F41) shown in the connector sketch.

F: CONNECTOR SKETCH

1. Each connector sketch clearly identifies the shape and color of a connector as well as terminal locations. Non-colored connectors are indicated in natural color.
2. When more than two types of connector number are indicated in a connector sketch, it means that the same type connectors are used.

G: GROUND

Each grounding point can be located easily by referring to the corresponding wiring harness.

H: DIODE

A symbol is used to indicate a diode.

I: WIRE TRACING ON EXTENDED WIRING DIAGRAMS

For a wiring diagram extending over at least two pages, a symbol (consisting of the same characters with arrows), as shown below, facilitates wire tracing from one page to the next.
A ↔ A, B ↔ B

J: SYMBOLS OF WIRE CONNECTION AND CROSSING

 Symbol — Refers to wires which are connected and branched at the "dot" point.

 Symbol — Refers to wires which are crossed but not connected.

K: POWER SUPPLY ROUTING

A symbol is used to indicate the power supply in each wiring diagram.
"MB-5", "MB-6", etc., which are used as power supply symbols throughout the text, correspond with those shown in the POWER SUPPLY ROUTING in the wiring diagram.
Accordingly, using the POWER SUPPLY ROUTING and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

L: SMJ

A symbol is used to indicate the terminal arrangement of the super multiple junction (SMJ). The SMJ is not shown in respective wiring diagrams but is indicated on the next page.

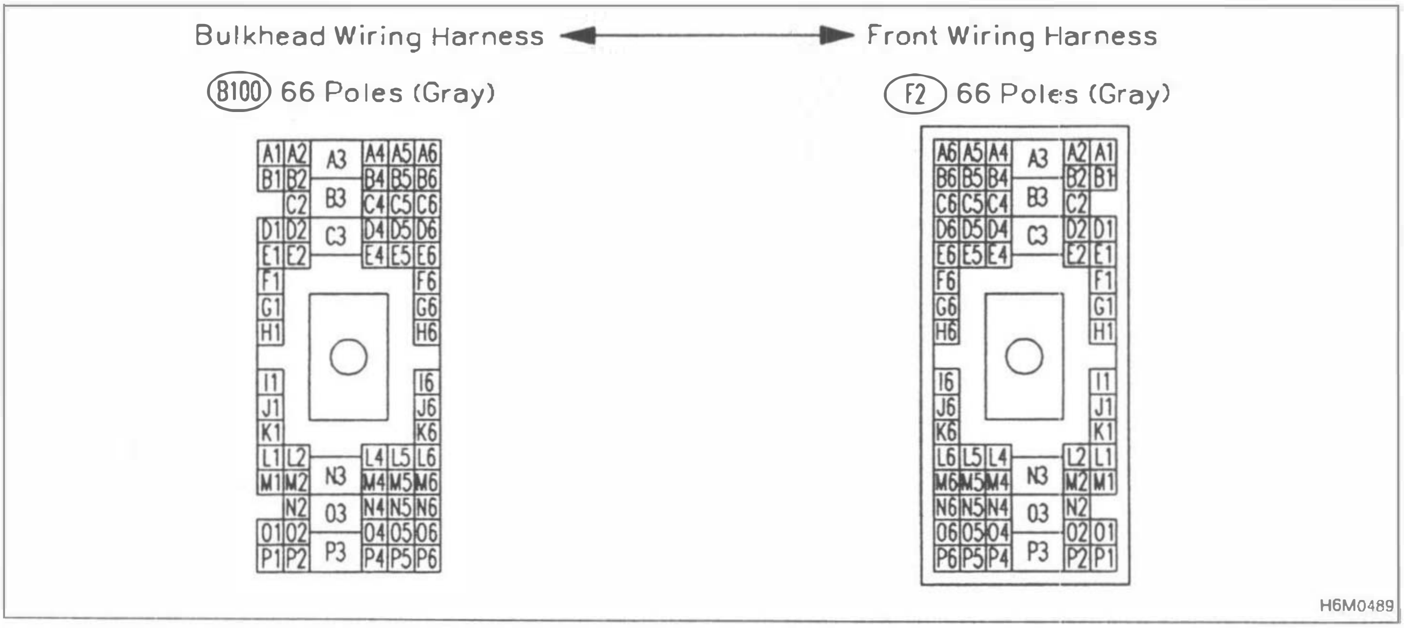
SYMBOLS AND ABBREVIATIONS

A number of symbols and abbreviations are used in each wiring diagram to easily identify parts or circuits.

5. How to Use Super Multiple Junction (SMJ)

The "SMJ" indicated in wiring diagram is shown in a simplified form.

TERMINAL ARRANGEMENT



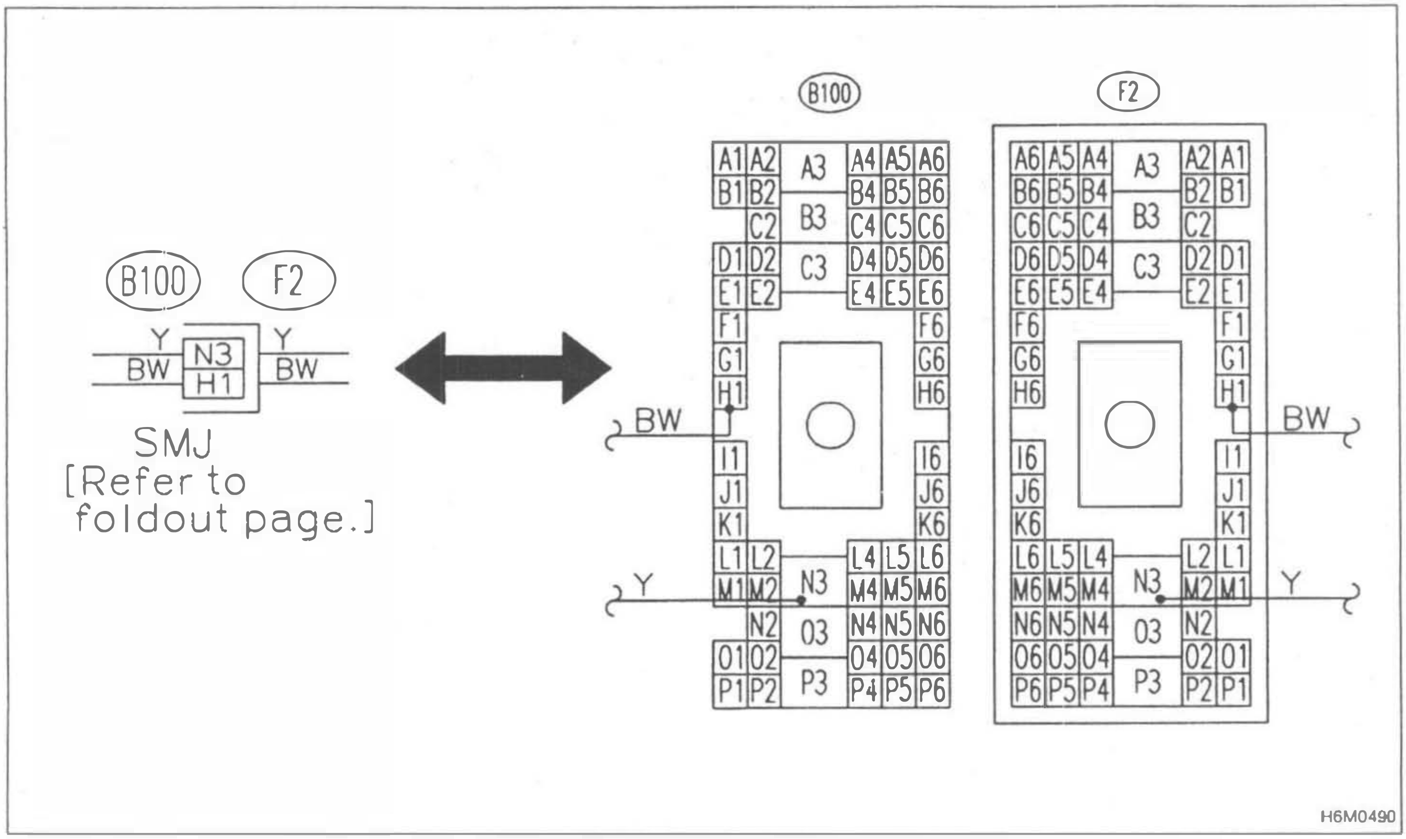
CAUTION:

- **Align the cutout portion of one connector with that of other before tightening the connecting bolt.**
- **Do not tighten the bolt excessively since this may deform the connectors.**

Tightening torque:

5.9 ± 1.5 N·m (0.6 ± 0.15 kg-m 4.4 ± 1.1 ft-lb)

EXPLANATION OF SMJ SHOWN IN THE WIRING DIAGRAM



ABBREVIATION LIST

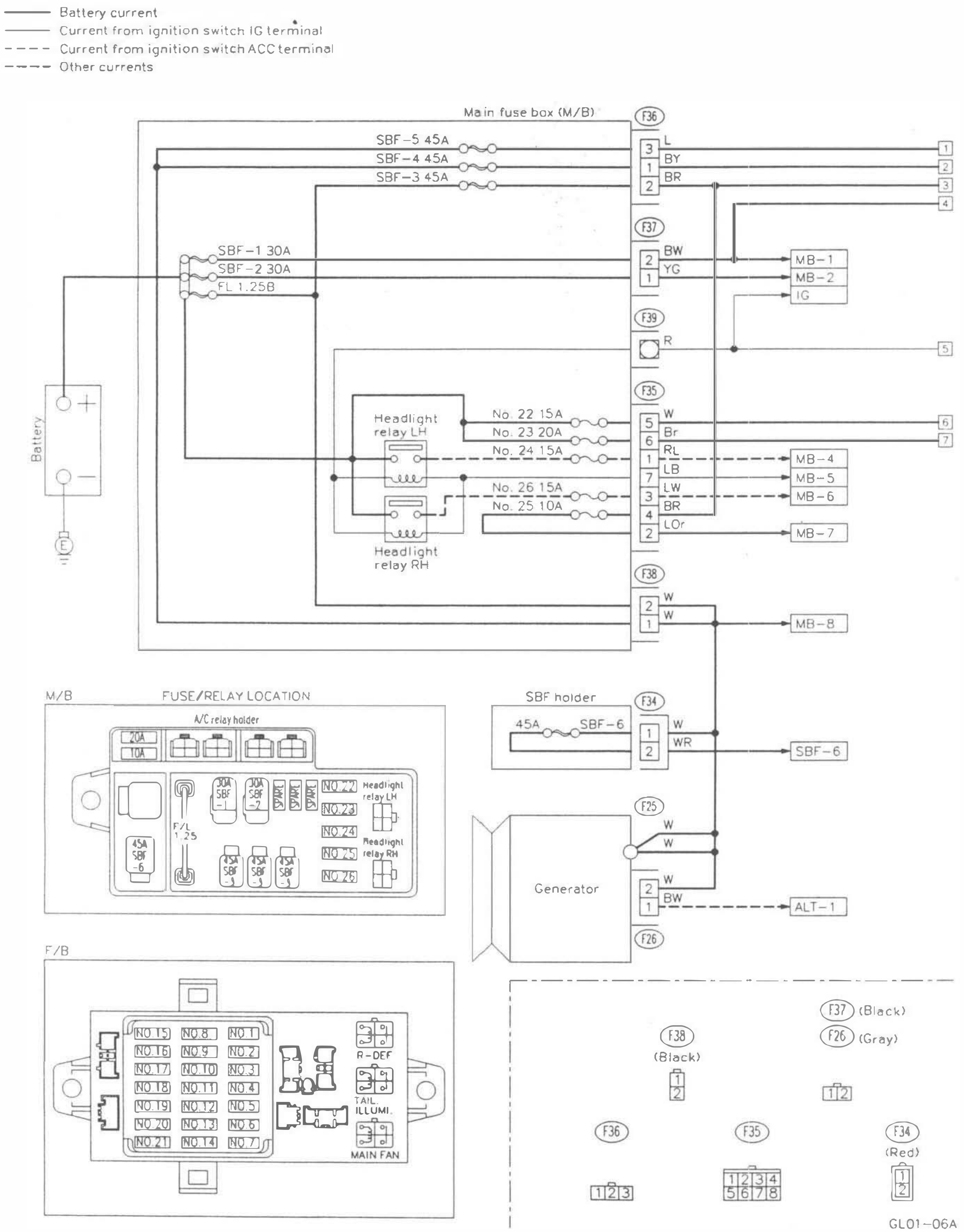
Abbr.	Full name
ABS	Antilock Brake System
ACC	Accessory
A/C	Air Conditioning
AT	Automatic Transmission
+B	Battery
DN	Down
E	Ground
F/B	Fuse & Joint Box
FL1.5	Fusible link 1.5 mm^2
IG	Ignition
Illumi.	Illumination
LH	Left Hand
Lo	Low

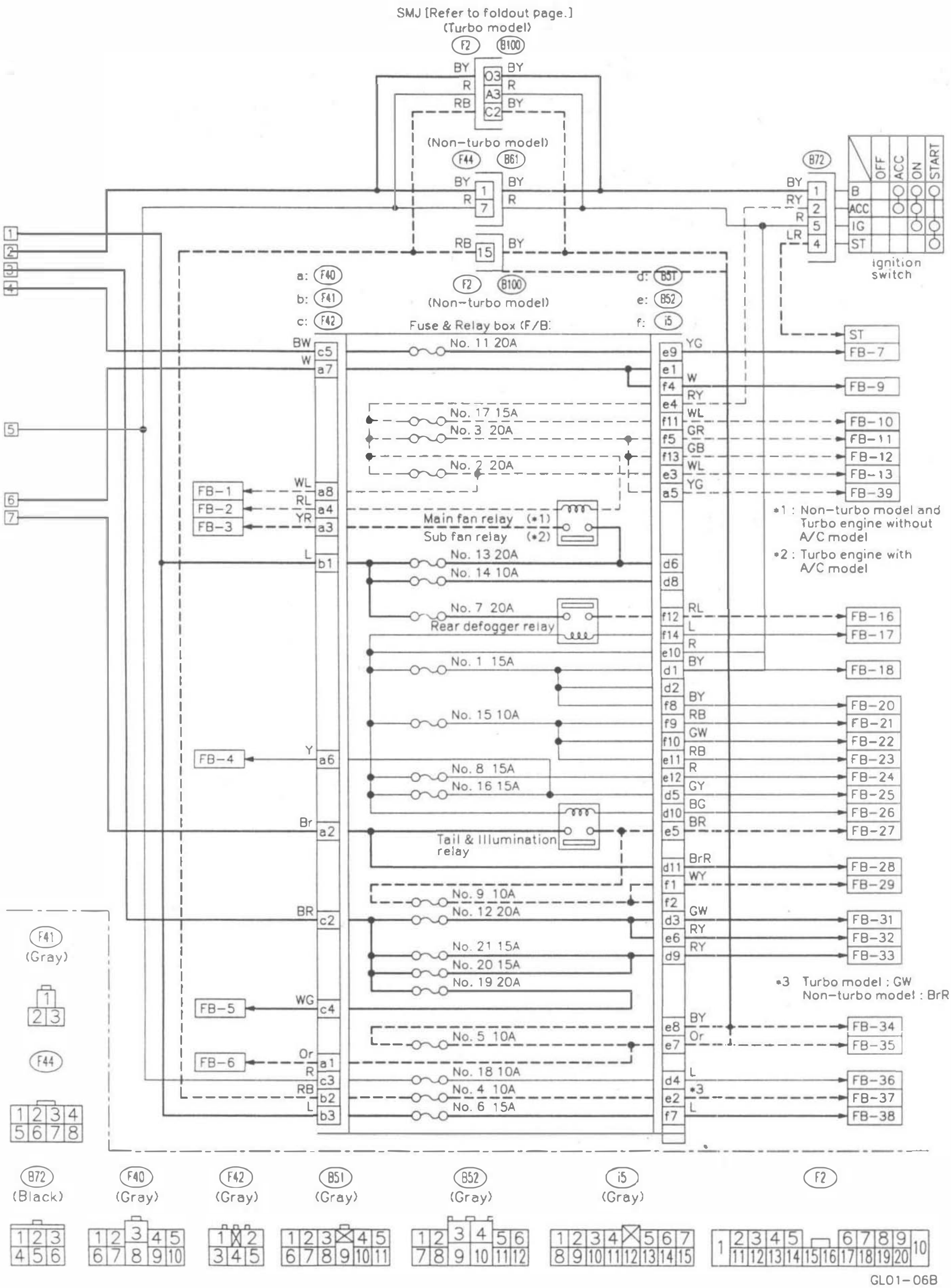
Abbr.	Full name
M	Motor
M/B	Main Fuse Box
MG	Magnet
Mi	Middle
OP	Optional Parts
PASS	Passing
RH	Right Hand
SBF	Slow Blow Fuse
ST	Starter
SW	Switch
UP	Up
WASH	Washer

6. Wiring Diagram

1. POWER SUPPLY ROUTING

● LHD model

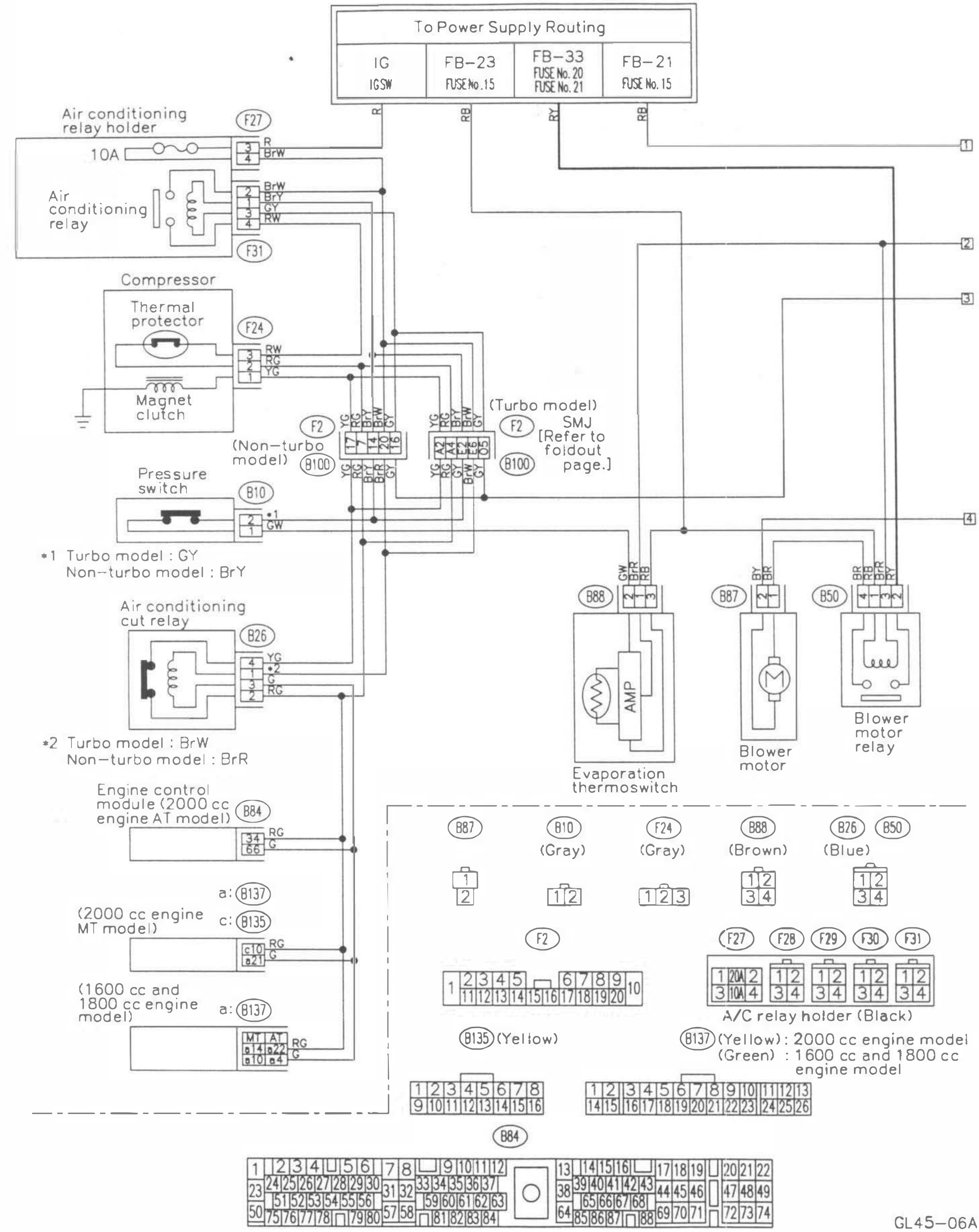




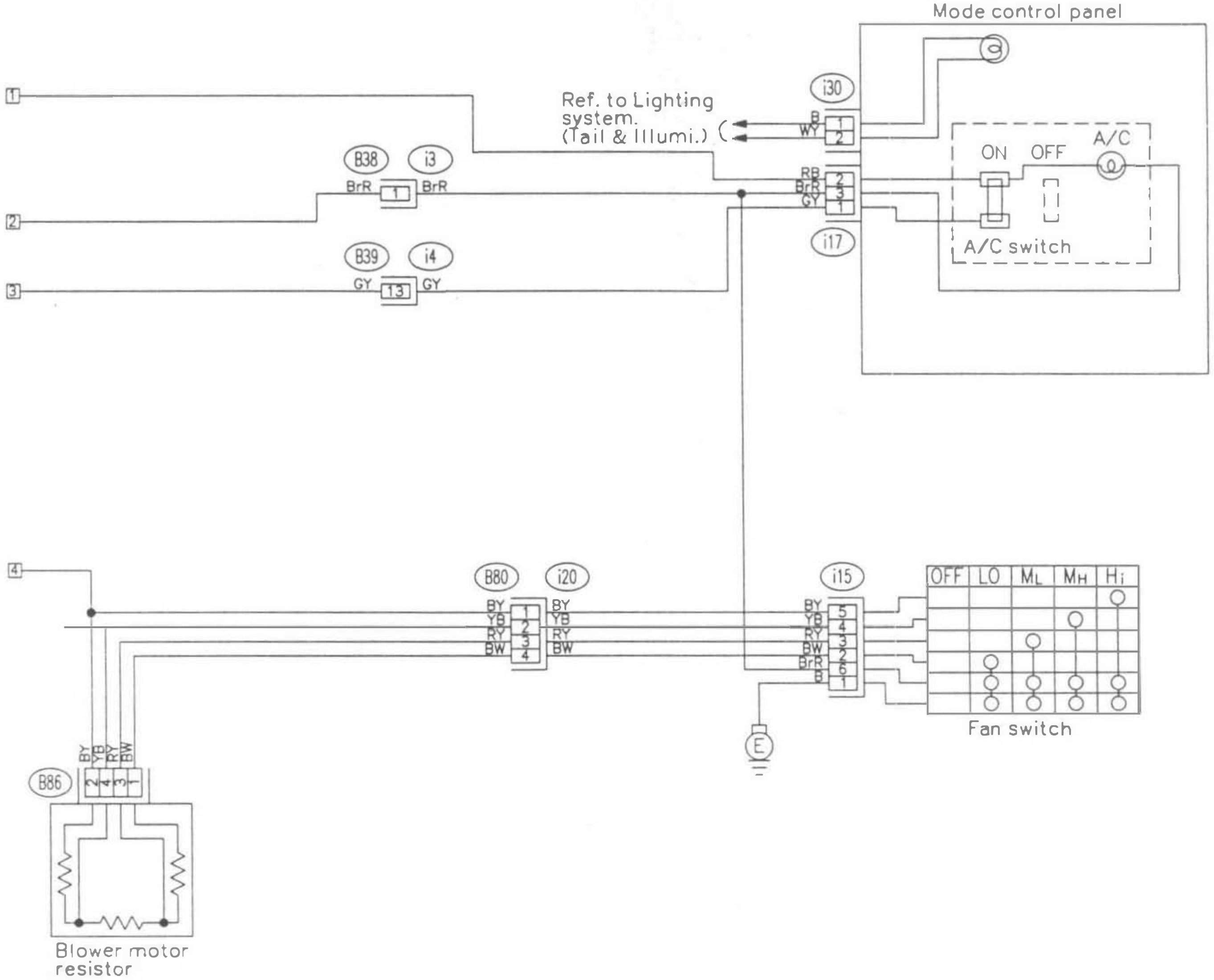
SMJ [Refer to foldout page.]
(Turbo model)
F2
B100
(Non-turbo model)
F44
B61
B72
OFF
ACC
ON
START
B
ACC
IG
ST
Ignition switch
a: F40
b: F41
c: F42
d: B51
e: B52
f: i5
Fuse & Relay box (F/B)
No. 11 20A
No. 17 15A
No. 3 20A
No. 2 20A
Main fan relay (*1)
Sub fan relay (*2)
No. 13 20A
No. 14 10A
No. 7 20A
Rear defogger relay
No. 1 15A
No. 15 10A
No. 8 15A
No. 16 15A
Tail & Illumination relay
No. 9 10A
No. 12 20A
No. 21 15A
No. 20 15A
No. 19 20A
No. 5 10A
No. 18 10A
No. 4 10A
No. 6 15A
*1 : Non-turbo model and Turbo engine without A/C model
*2 : Turbo engine with A/C model
*3 Turbo model : GW Non-turbo model : BrR
ST
FB-7
FB-9
FB-10
FB-11
FB-12
FB-13
FB-39
FB-1
FB-2
FB-3
FB-4
FB-5
FB-6
FB-16
FB-17
FB-18
FB-20
FB-21
FB-22
FB-23
FB-24
FB-25
FB-26
FB-27
FB-28
FB-29
FB-31
FB-32
FB-33
FB-34
FB-35
FB-36
FB-37
FB-38
F41 (Gray)
F44
B72 (Black)
F40 (Gray)
F42 (Gray)
B51 (Gray)
B52 (Gray)
i5 (Gray)
F2
GL01-06B

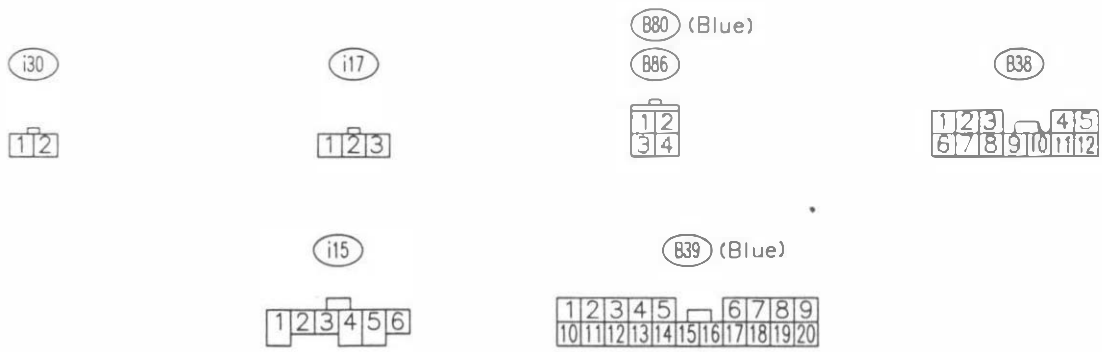
3. AIR CONDITIONING SYSTEM

- **LHD model**



GL45-06A

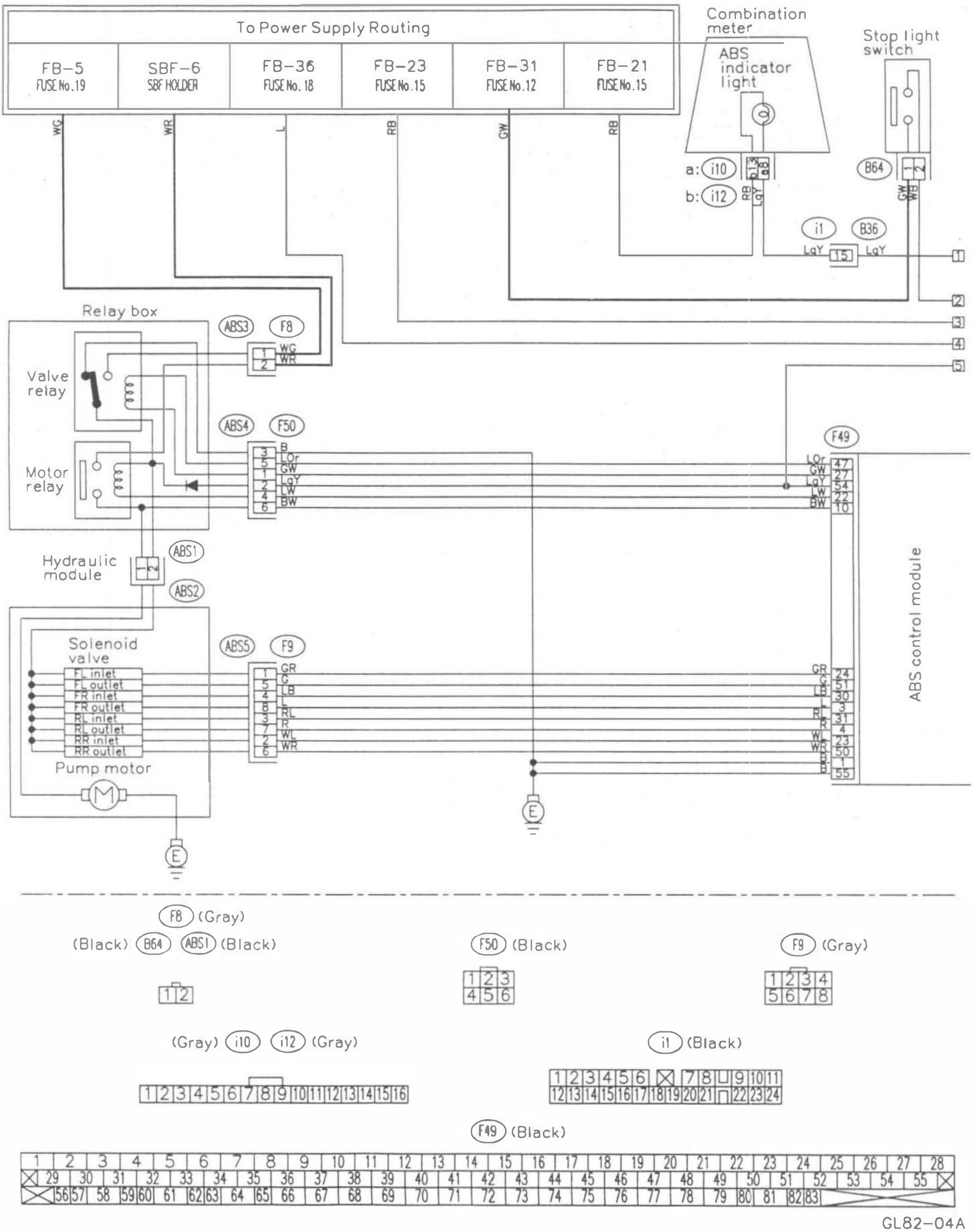

Mode control panel
Ref. to Lighting system. (Tail & Illumi.)
i30
B
WY
1
2
B38
i3
BrR
1
BrR
RB
BrR
GY
2
3
1
i17
ON
OFF
A/C
A/C switch
B39
i4
GY
13
GY
1
2
3
4
B80
i20
BY
YB
RY
BW
i15
5
4
3
2
6
1
B
E
OFF
LO
ML
MH
Hi
Fan switch
B86
Blower motor resistor

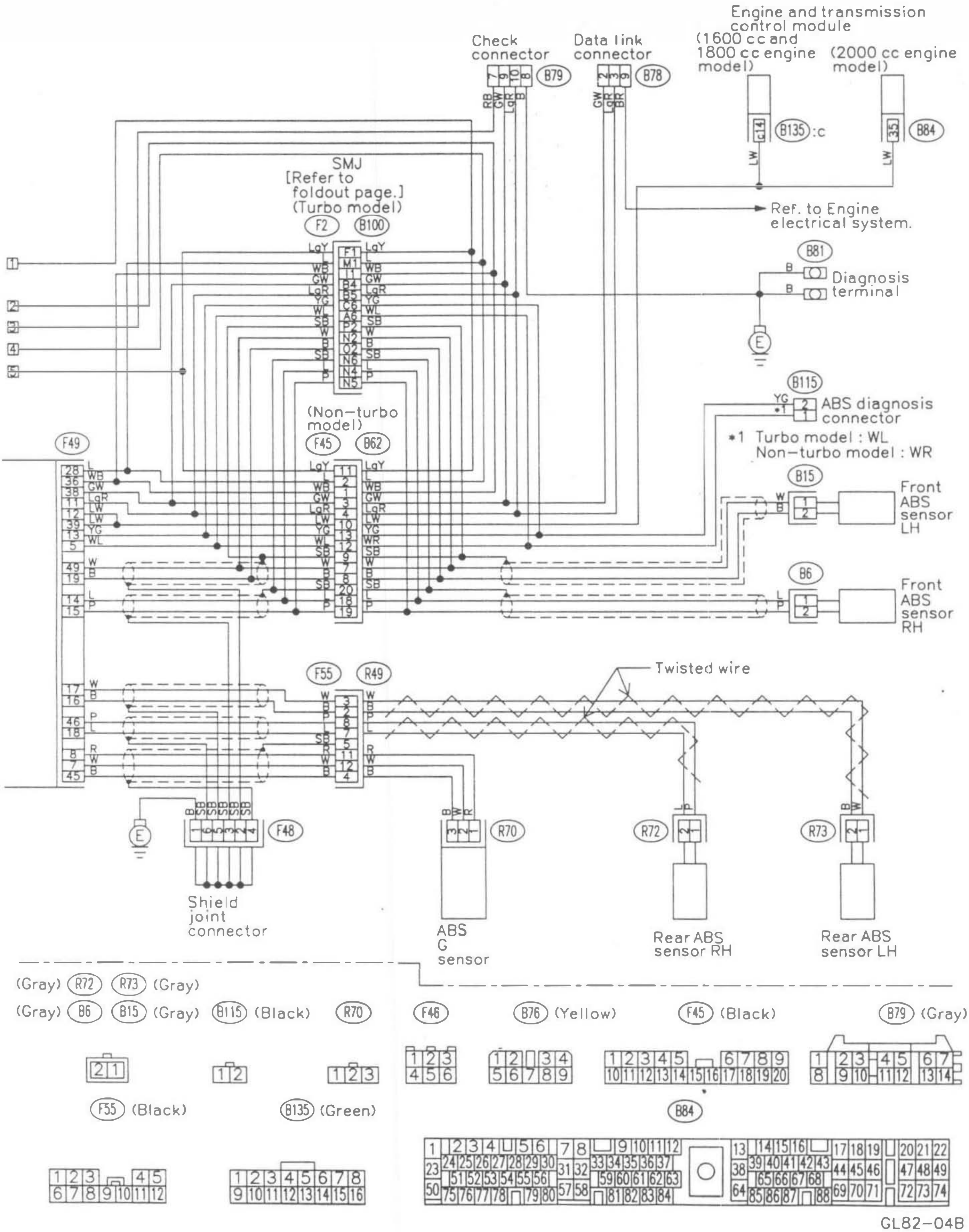

i30
i17
B80 (Blue)
B86
B38
i15
B39 (Blue)

GL45-06B

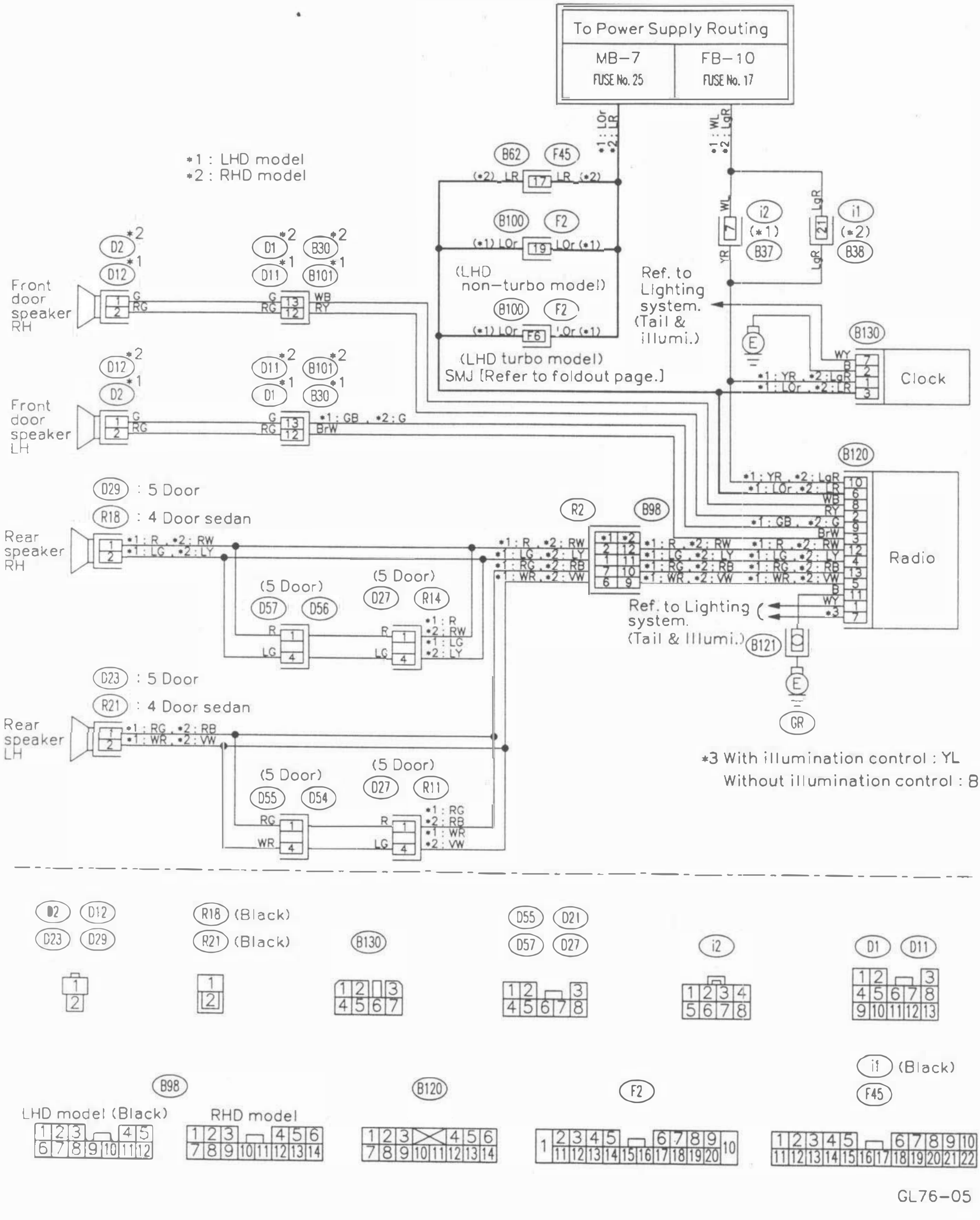
4. ANTI-LOCK BRAKE SYSTEM

- **LHD model**

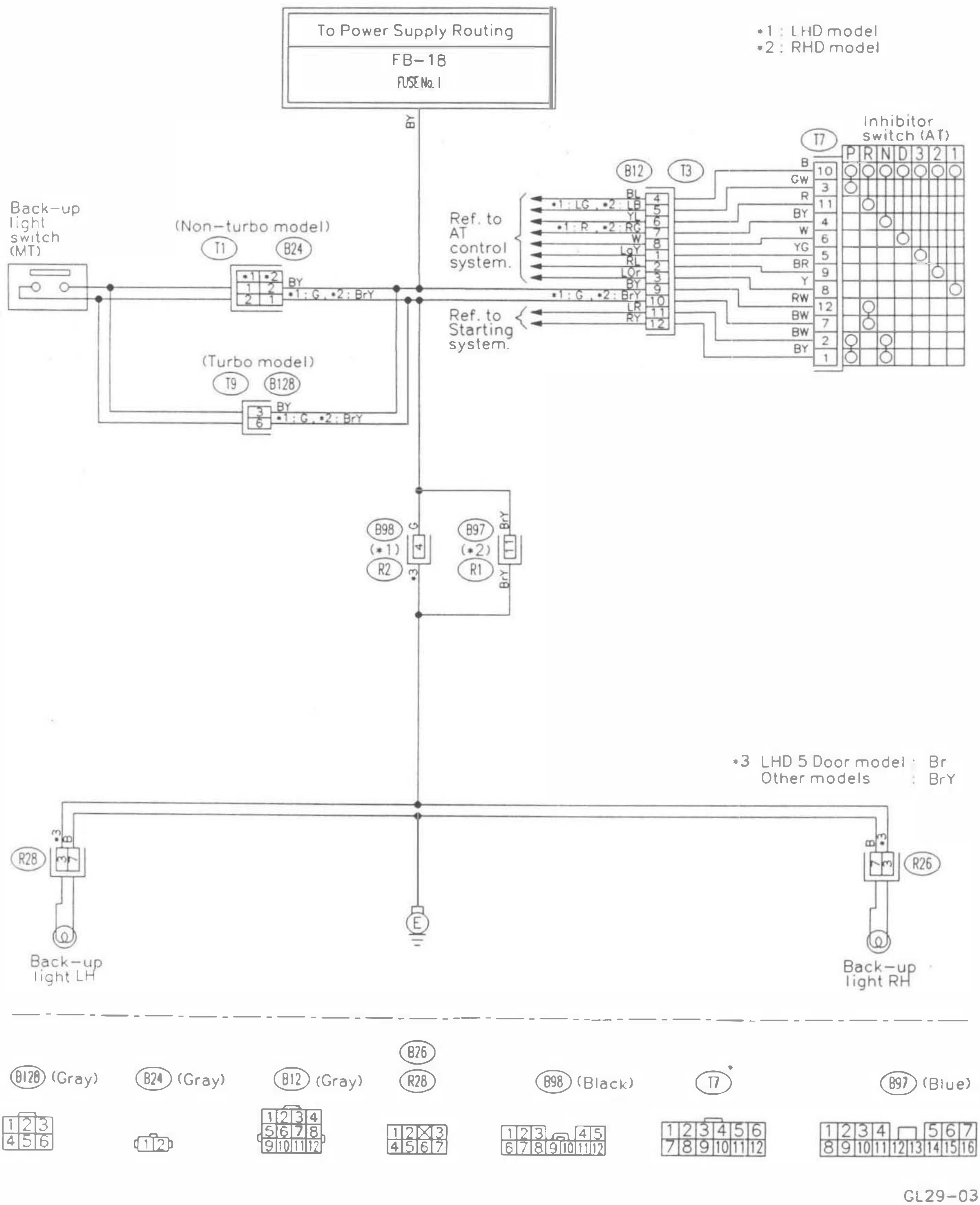



Engine and transmission control module
(1600 cc and 1800 cc engine model)
(2000 cc engine model)
Check connector
B79
Data link connector
B78
B135 :c
B84
SMJ
[Refer to foldout page.]
(Turbo model)
F2
B100
Ref. to Engine electrical system.
B81
Diagnosis terminal
B115
ABS diagnosis connector
*1 Turbo model : WL
Non-turbo model : WR
(Non-turbo model)
F45
B62
F49
B15
Front ABS sensor LH
B6
Front ABS sensor RH
Twisted wire
F55
R49
F48
R70
R72
R73
Shield joint connector
ABS G sensor
Rear ABS sensor RH
Rear ABS sensor LH
(Gray) R72
R73 (Gray)
(Gray) B6
B15 (Gray)
B115 (Black)
R70
F46
B76 (Yellow)
F45 (Black)
B79 (Gray)
F55 (Black)
B135 (Green)
B84
GL82-04B

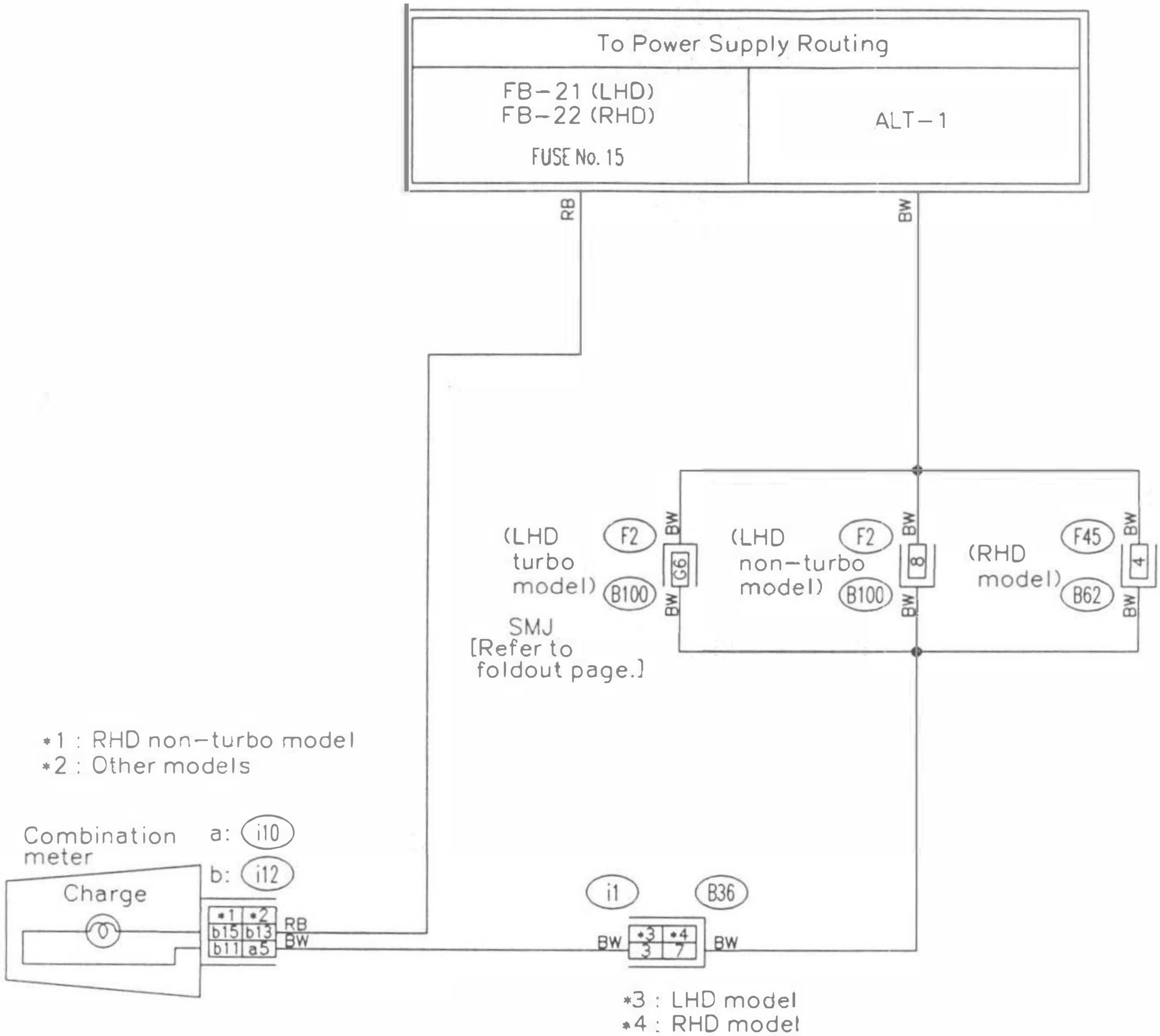
6. AUDIO & CLOCK SYSTEM

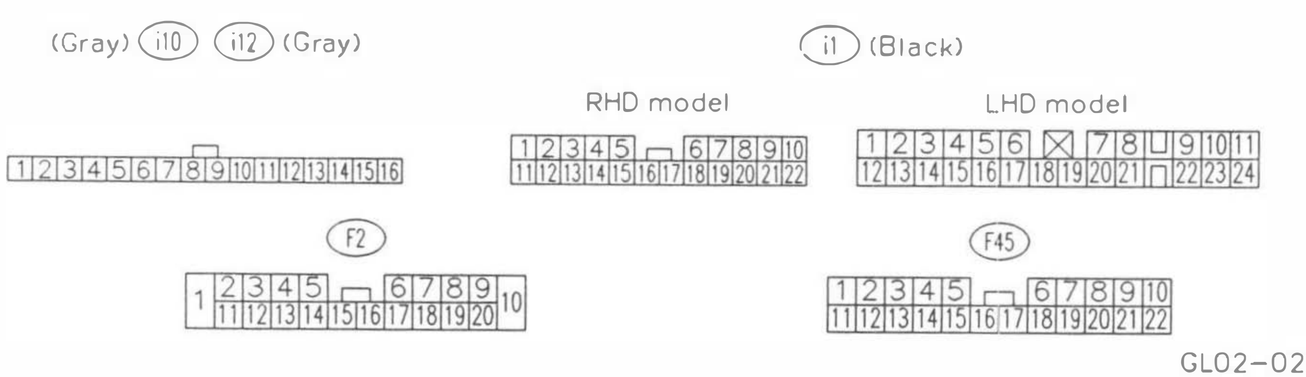


7. BACK-UP LIGHT SYSTEM



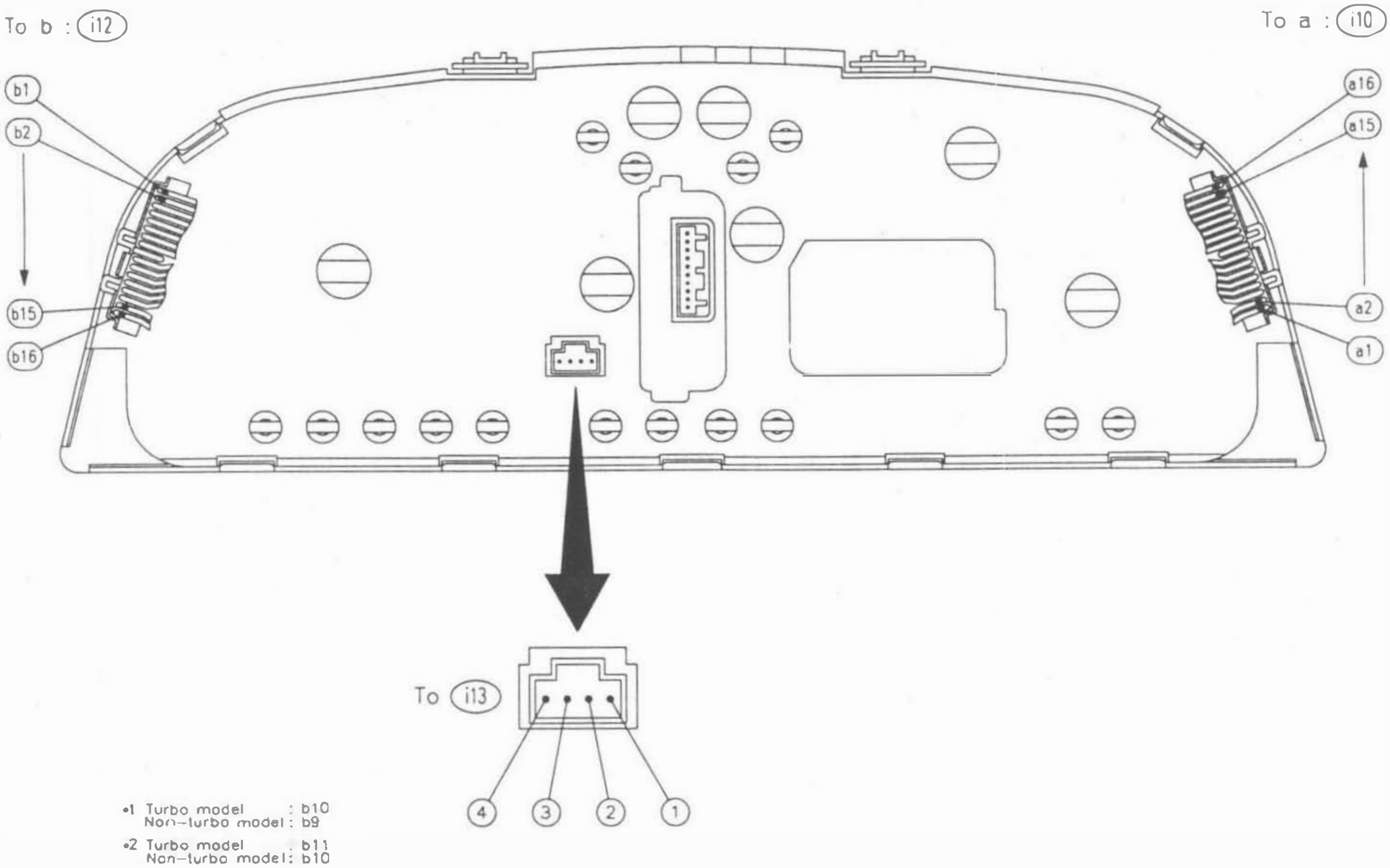
8. CHARGING SYSTEM

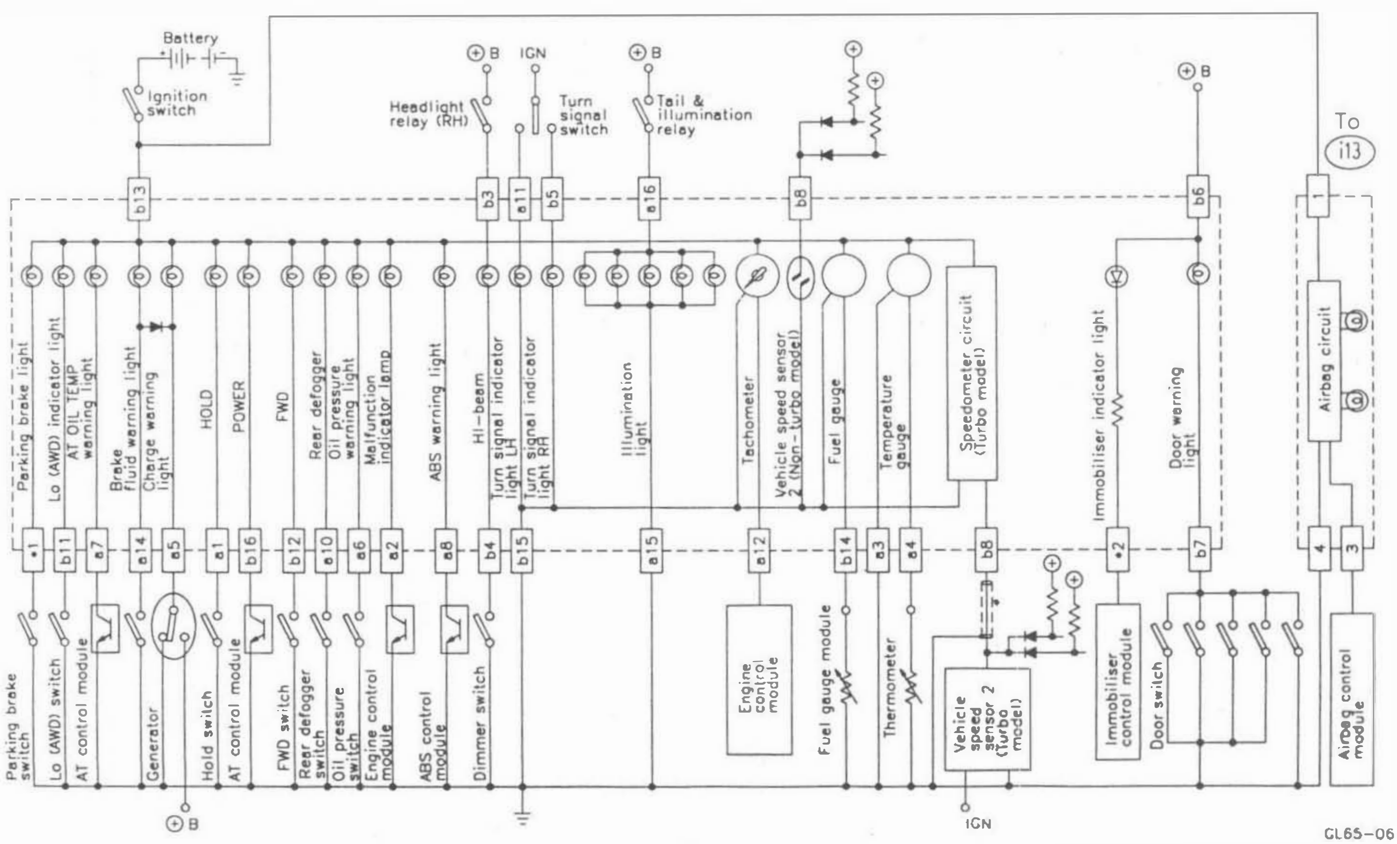




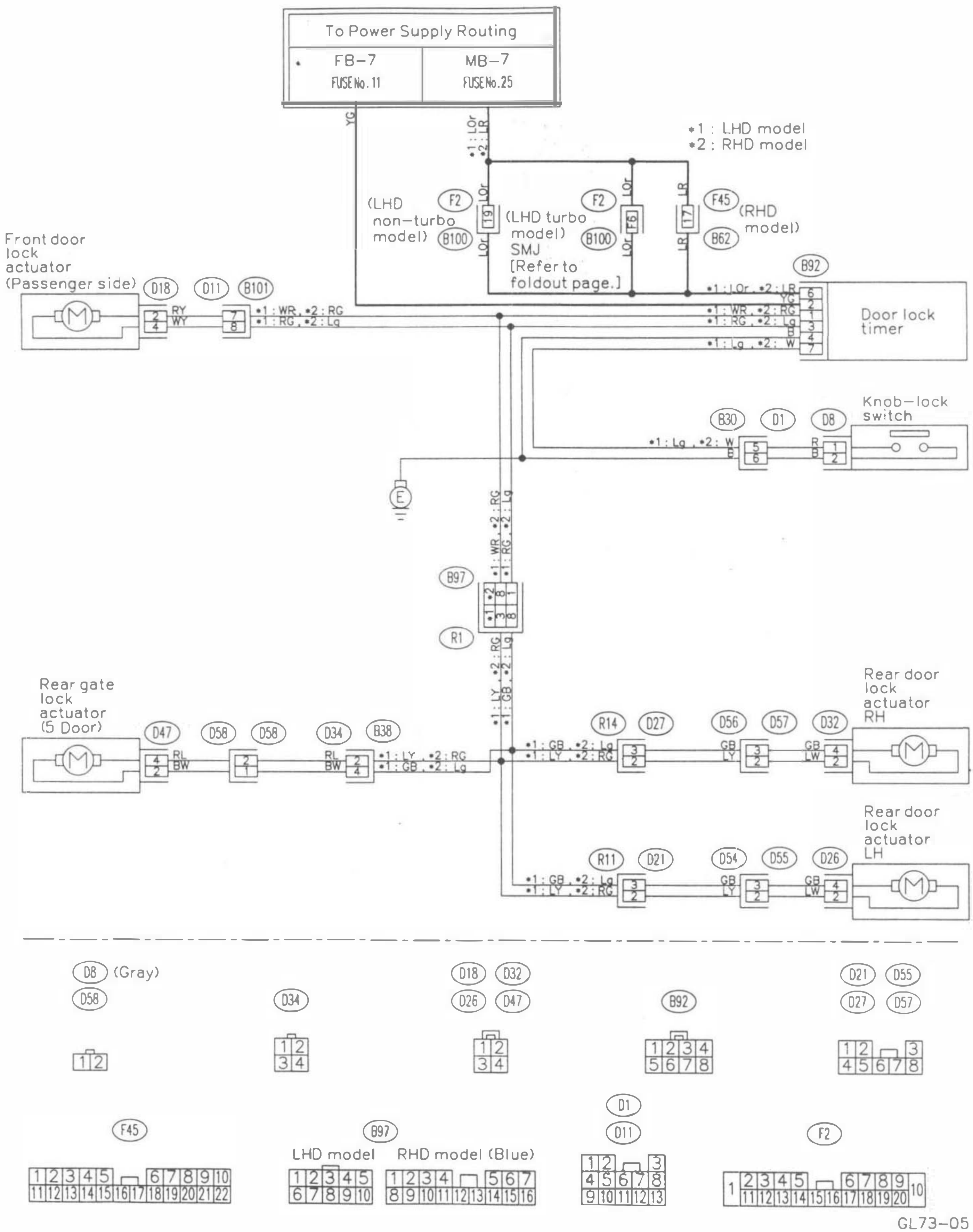
9. COMBINATION METER

- **LHD model**



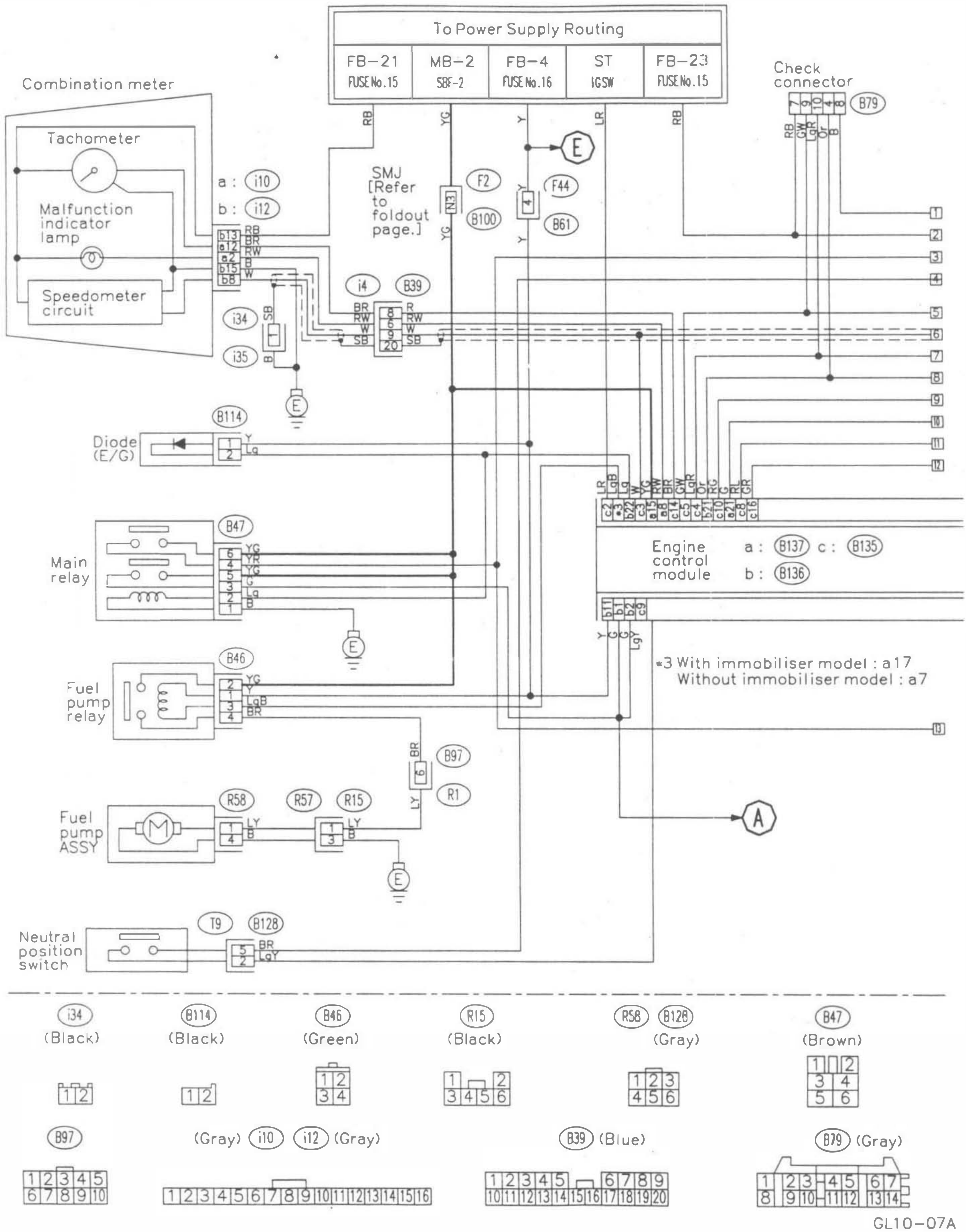


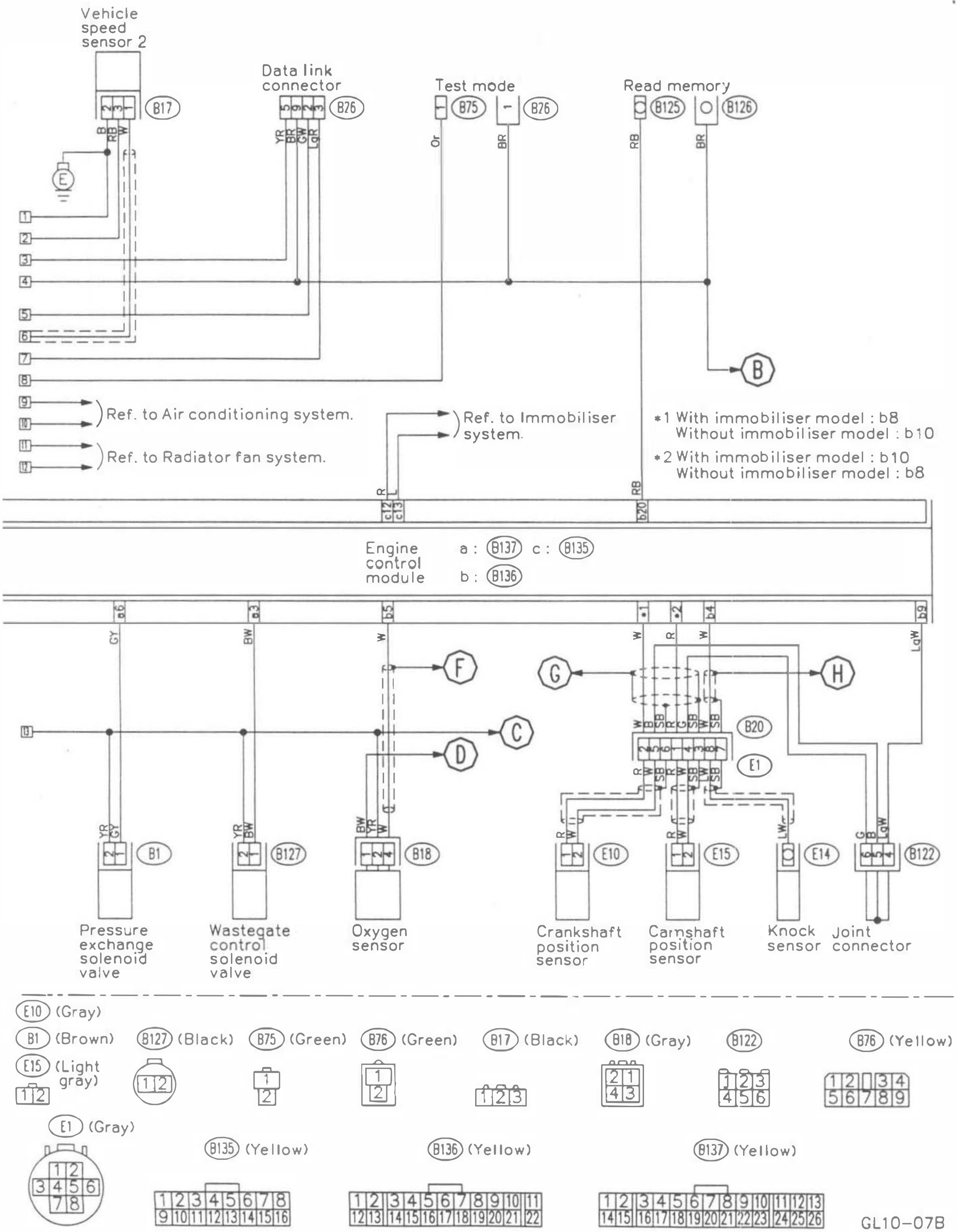
11. DOOR LOCK SYSTEM

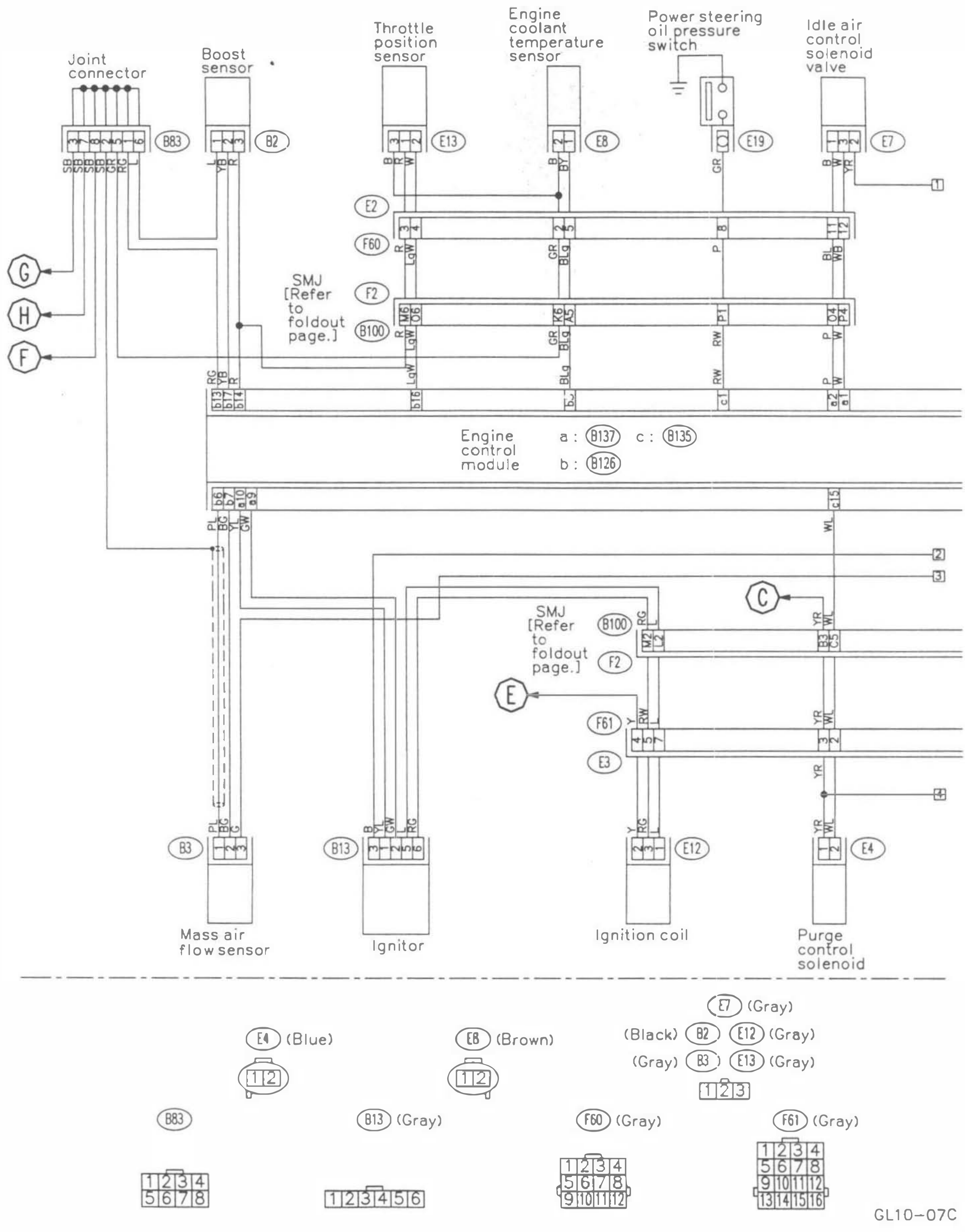


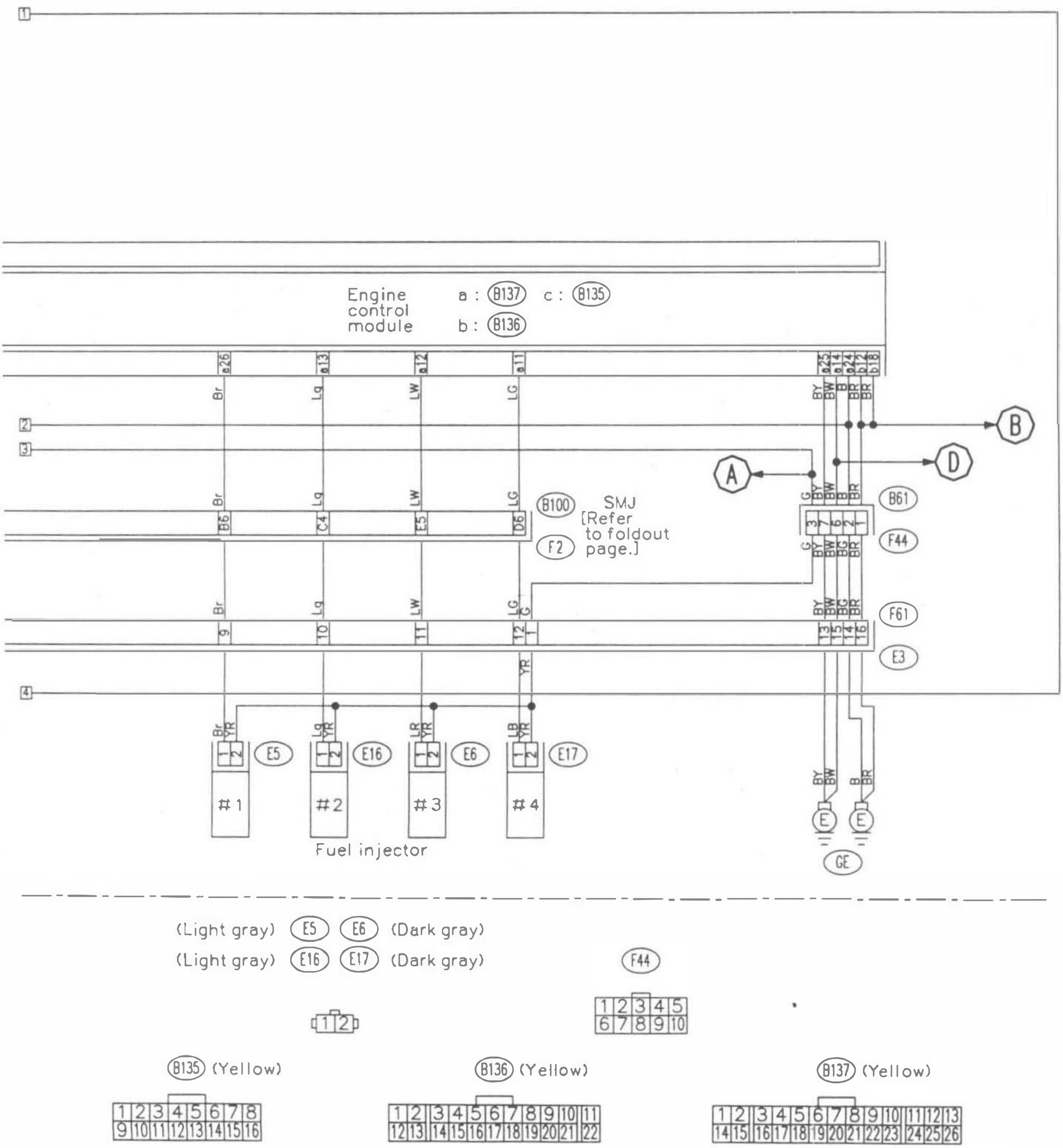
12. ENGINE ELECTRICAL SYSTEM

- **LHD turbo model**




Vehicle speed sensor 2
B17
Data link connector
B26
Test mode
B75
B26
Read memory
B125
B126
Ref. to Air conditioning system.
Ref. to Radiator fan system.
Ref. to Immobiliser system.
*1 With immobiliser model : b8
Without immobiliser model : b10
*2 With immobiliser model : b10
Without immobiliser model : b8
Engine control module
a : B137 c : B135
b : B136
B20
E1
B1
B127
B18
E10
E15
E14
B122
Pressure exchange solenoid valve
Wastegate control solenoid valve
Oxygen sensor
Crankshaft position sensor
Camshaft position sensor
Knock sensor
Joint connector
E10 (Gray)
B1 (Brown)
B127 (Black)
B75 (Green)
B76 (Green)
B17 (Black)
B18 (Gray)
B122
B76 (Yellow)
E15 (Light gray)
E1 (Gray)
B135 (Yellow)
B136 (Yellow)
B137 (Yellow)
GL10-07B

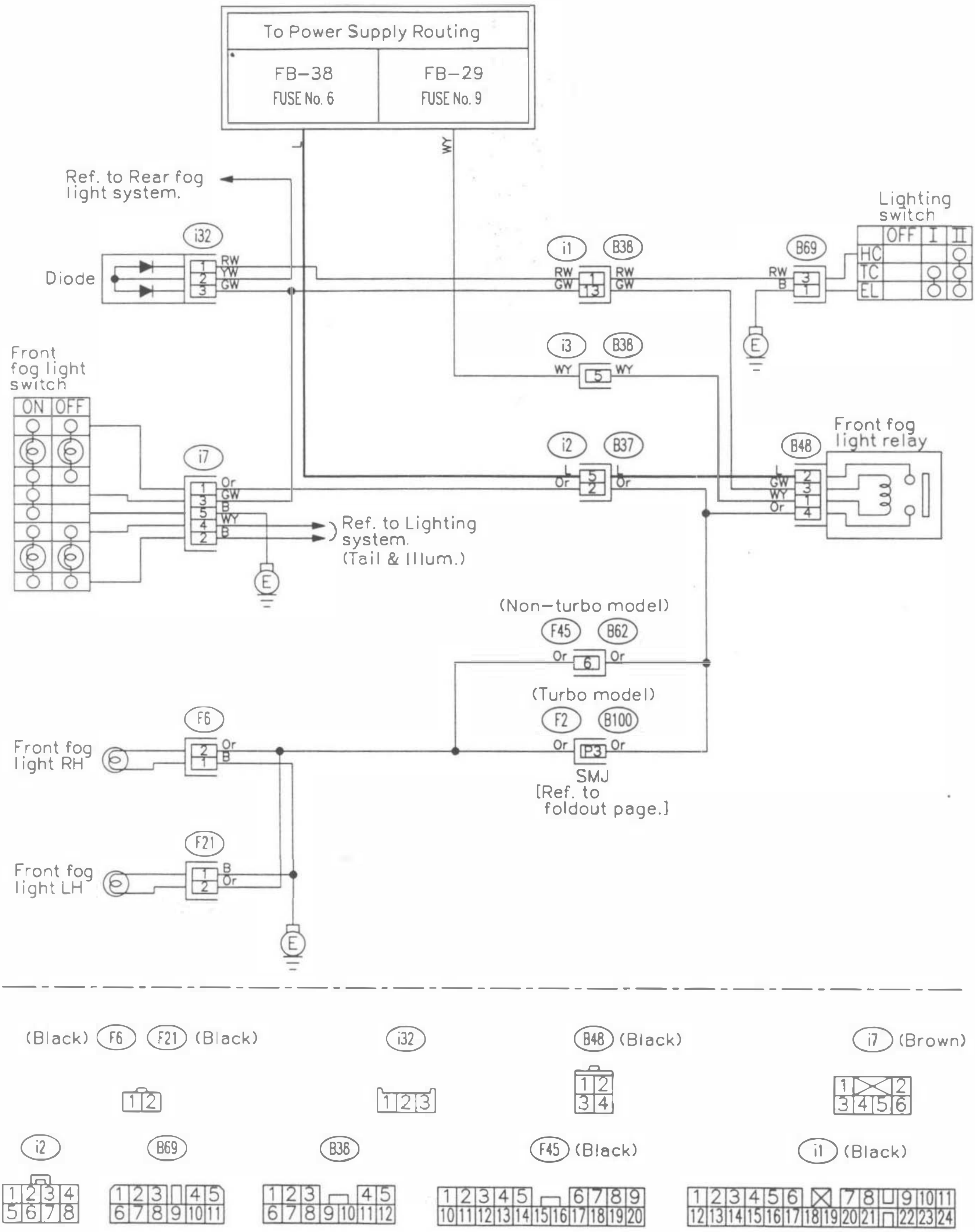

Joint connector
Boost sensor
Throttle position sensor
Engine coolant temperature sensor
Power steering oil pressure switch
Idle air control solenoid valve
SMJ [Refer to foldout page.]
Engine control module
a : B137
b : B126
c : B135
Mass air flow sensor
Ignitor
Ignition coil
Purge control solenoid
E4 (Blue)
E8 (Brown)
E7 (Gray)
(Black) B2
E12 (Gray)
(Gray) B3
E13 (Gray)
B83
B13 (Gray)
F60 (Gray)
F61 (Gray)
GL10-07C


Engine control module
a : B137 c : B135
b : B136
a26 a13 a12 a11 a25 a14 b24 b2 b18
Br Lg LW LG BY BW B BR BR
B D A
B100 SMJ [Refer to foldout page.]
F2
B6 C4 E5 D6
G BY BW B BR
B61
F44
G BY BW BG BR
F61
E3
9 10 11 12 13 15 14 16
E5 E16 E6 E17
#1 #2 #3 #4
Fuel injector
GE
(Light gray) E5 E6 (Dark gray)
(Light gray) E16 E17 (Dark gray)
F44
B135 (Yellow)
B136 (Yellow)
B137 (Yellow)

GL10-07D

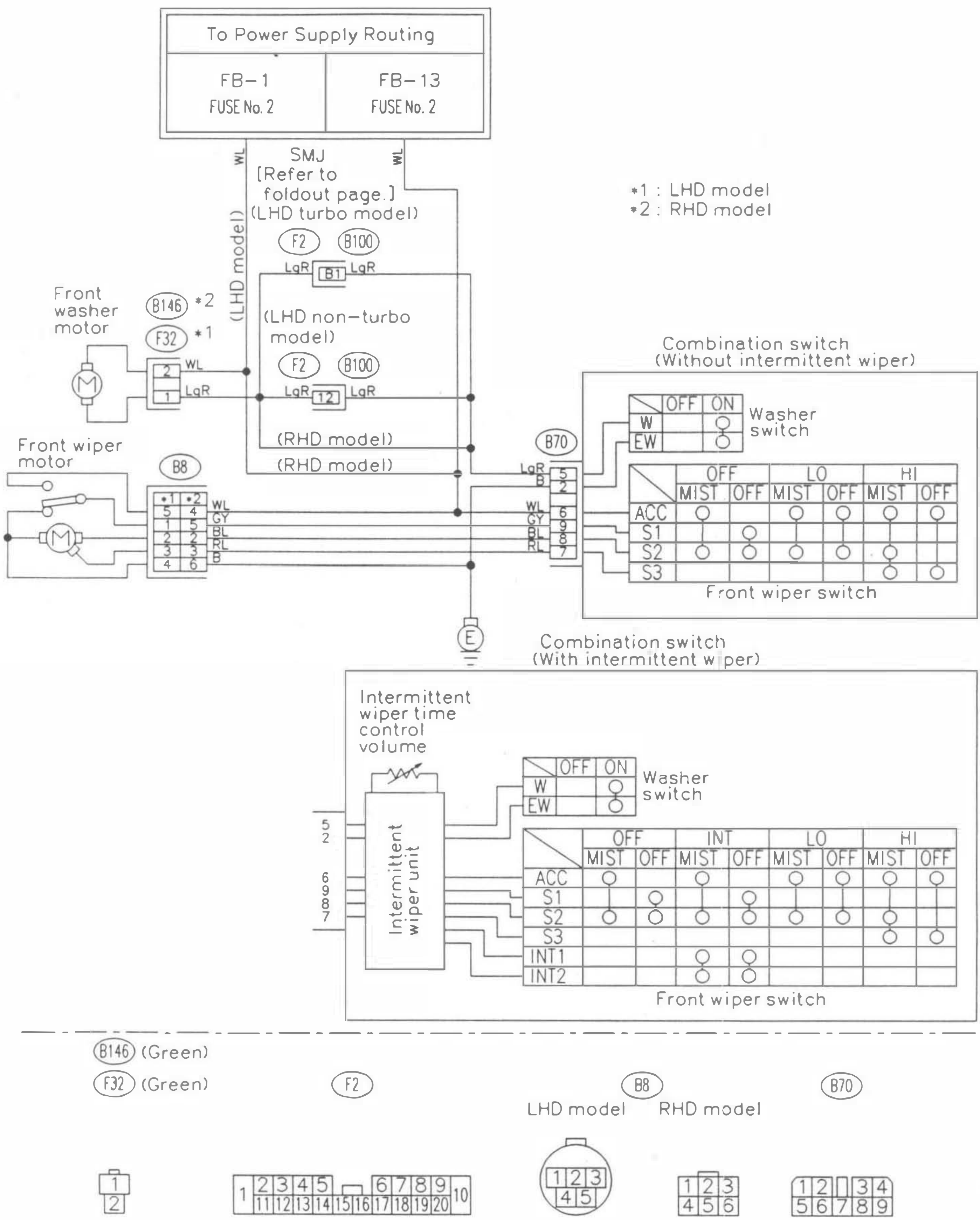
13. FRONT FOG LIGHT SYSTEM

- **LHD model**



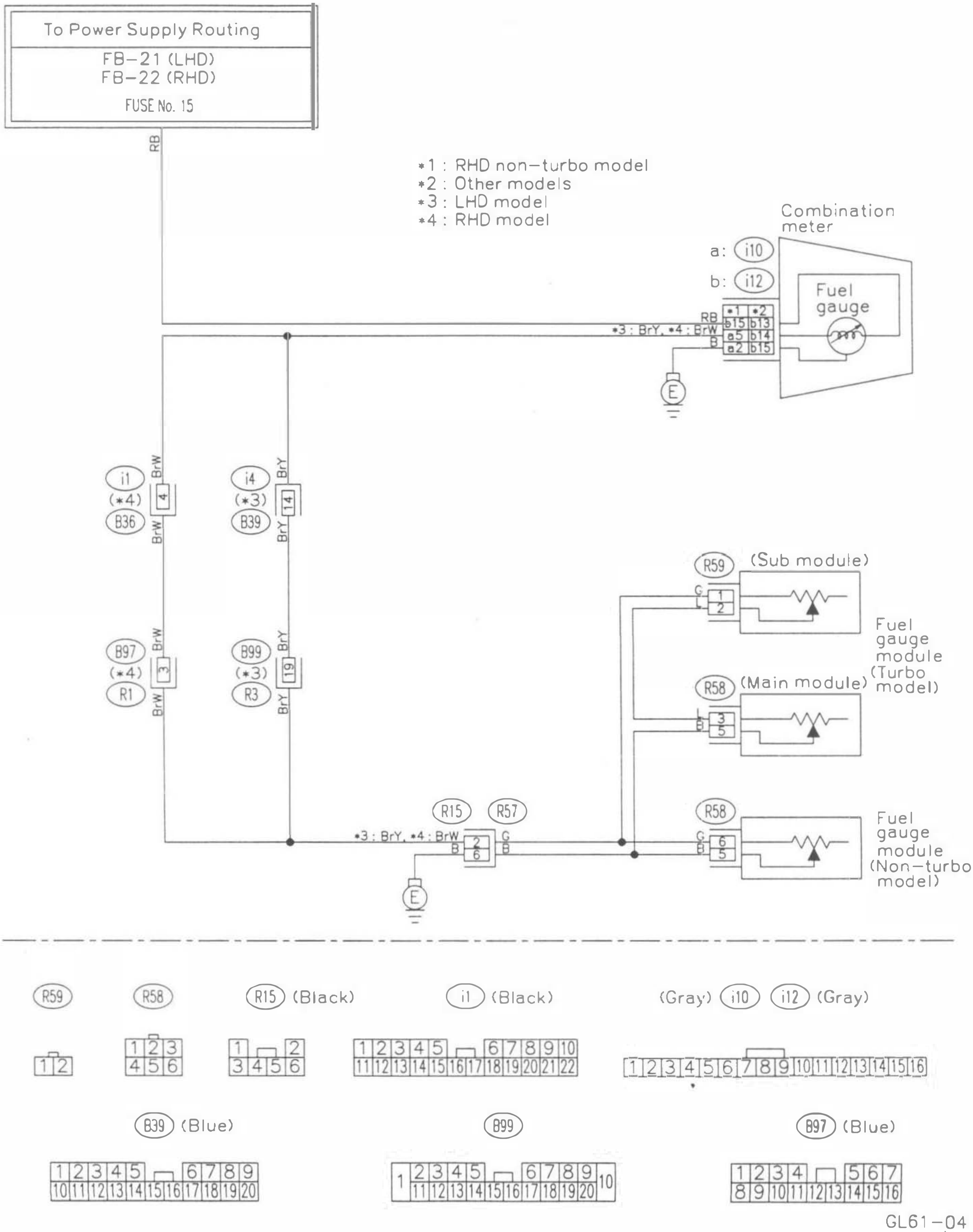
GL22-02

14. FRONT WIPER AND WASHER SYSTEM

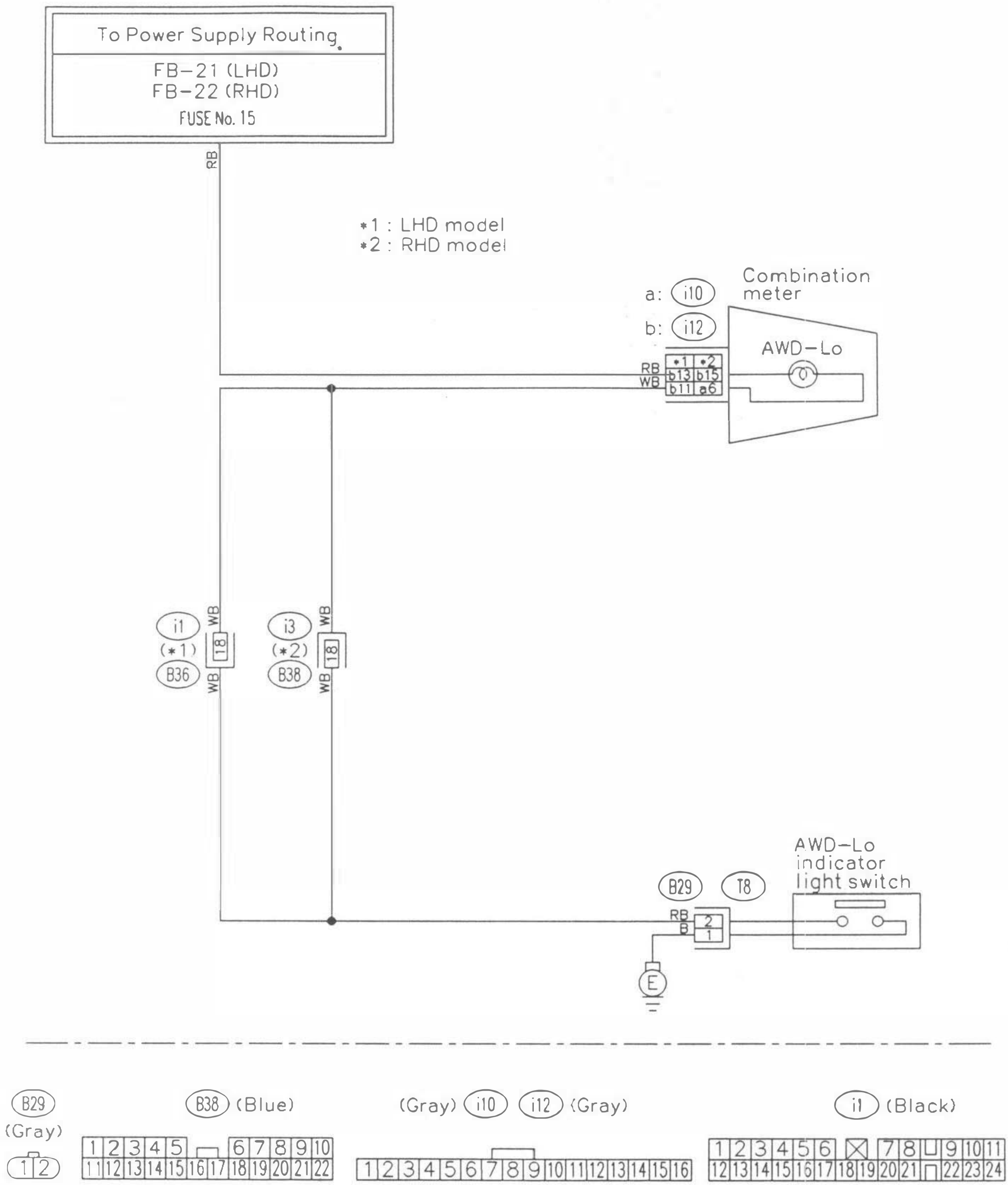


GL50-02

15. FUEL GAUGE SYSTEM

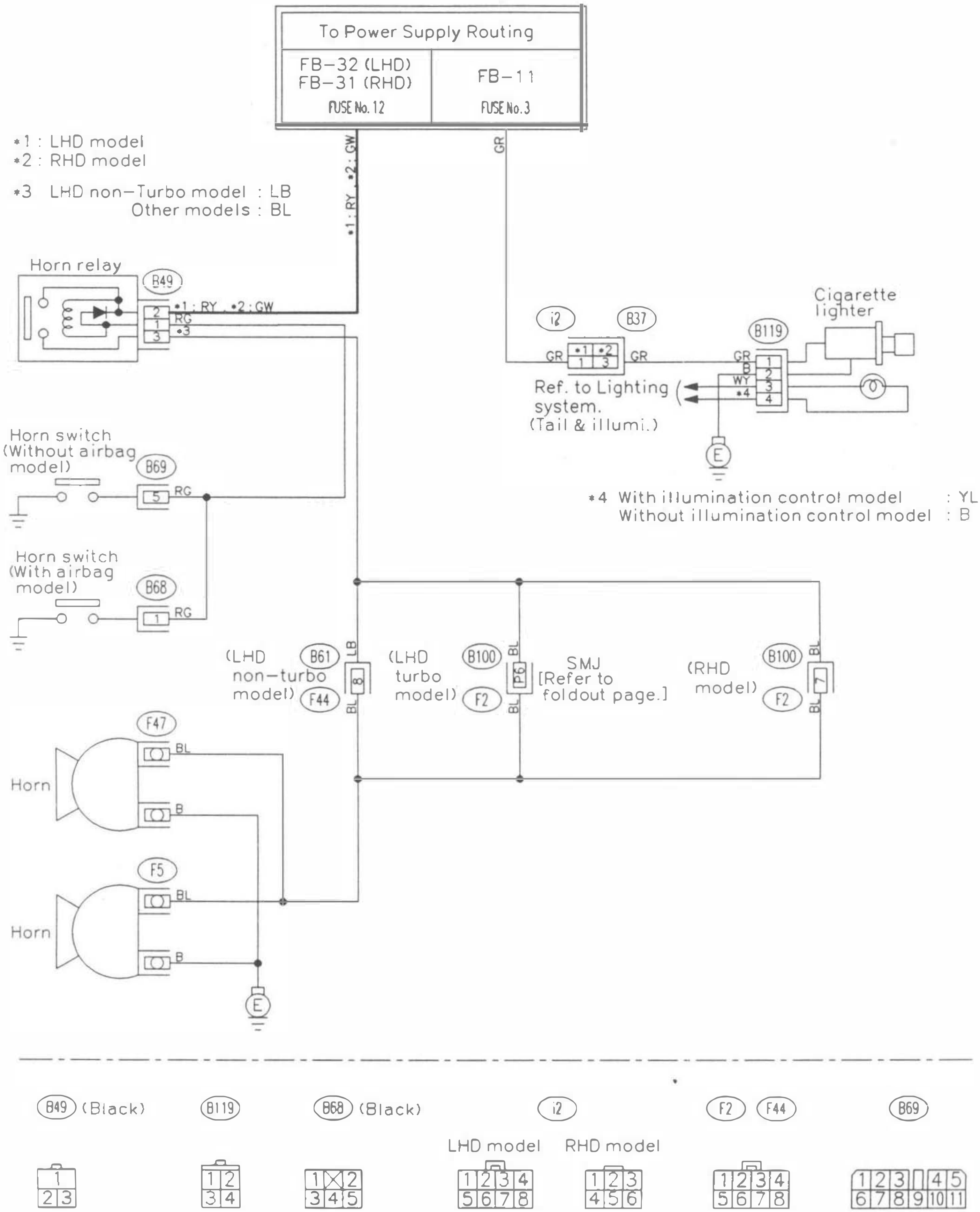


16. FULL TIME DUAL-RANGE SYSTEM



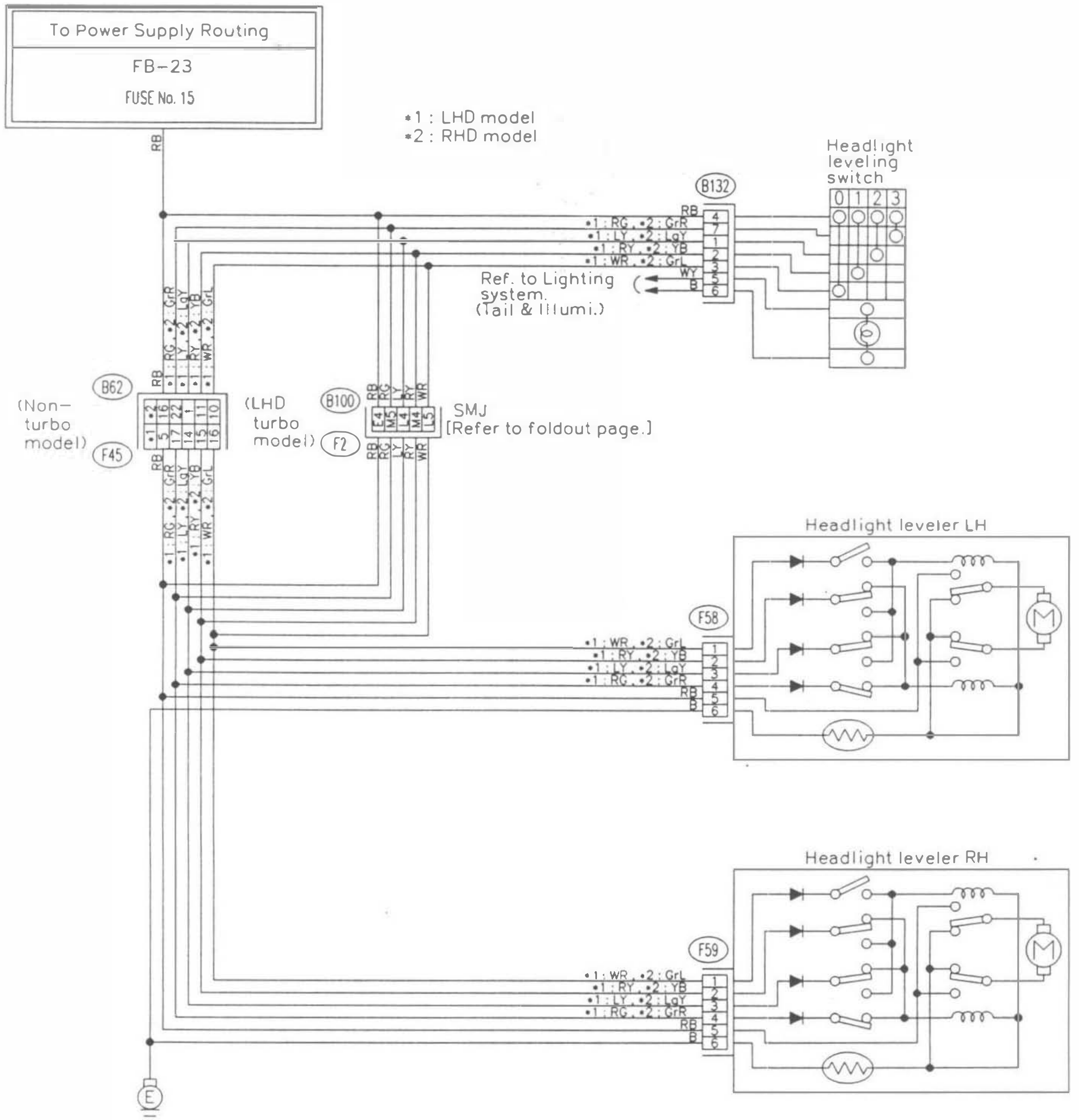
GL38−02

17. HORN AND CIGARETTE LIGHTER SYSTEM



GL74−05

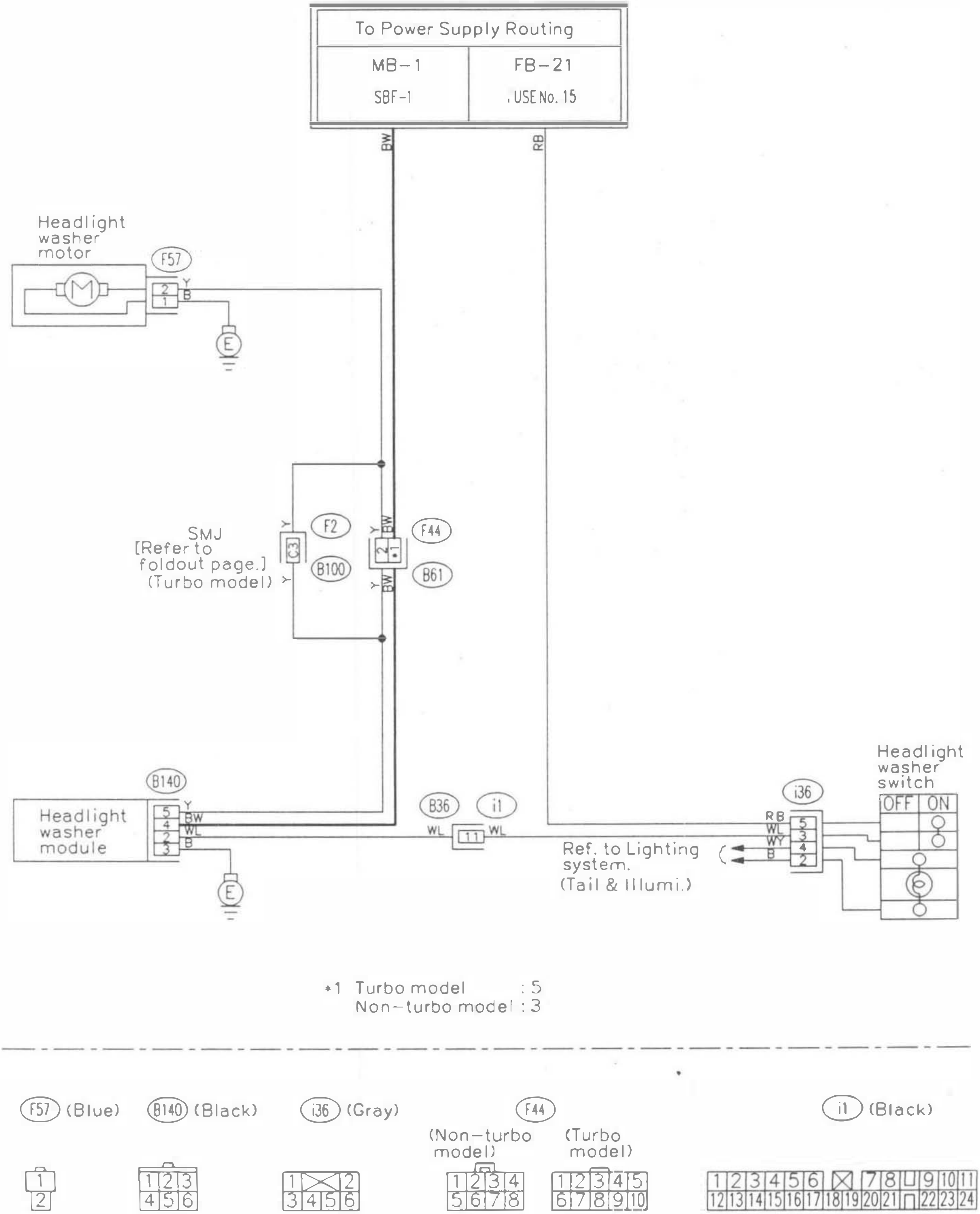
18. HEADLIGHT BEAM LEVELER SYSTEM



GL83-05

19. HEADLIGHT WASHER SYSTEM

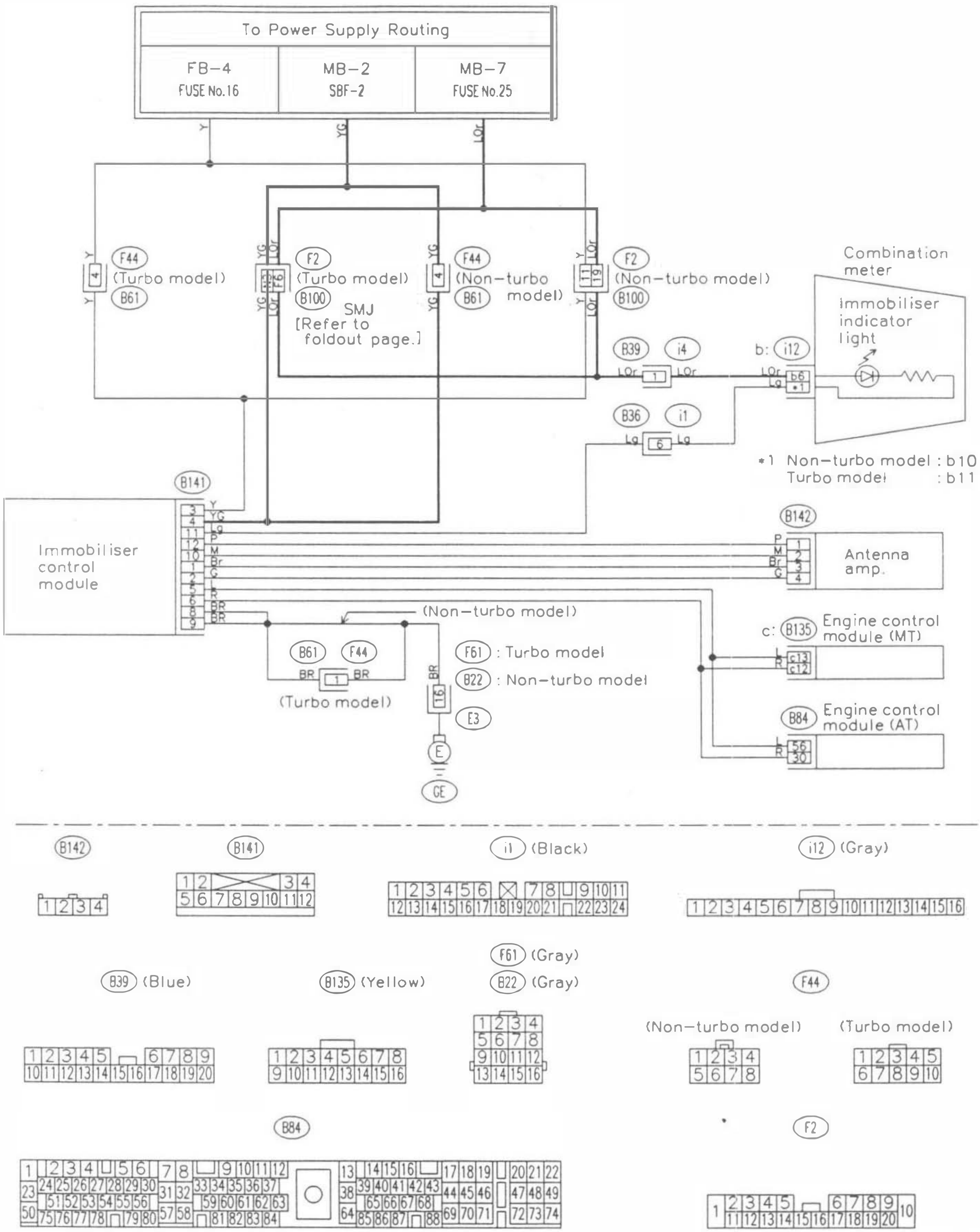
- **LHD model**



GL53-05

20. IMMOBILISER SYSTEM

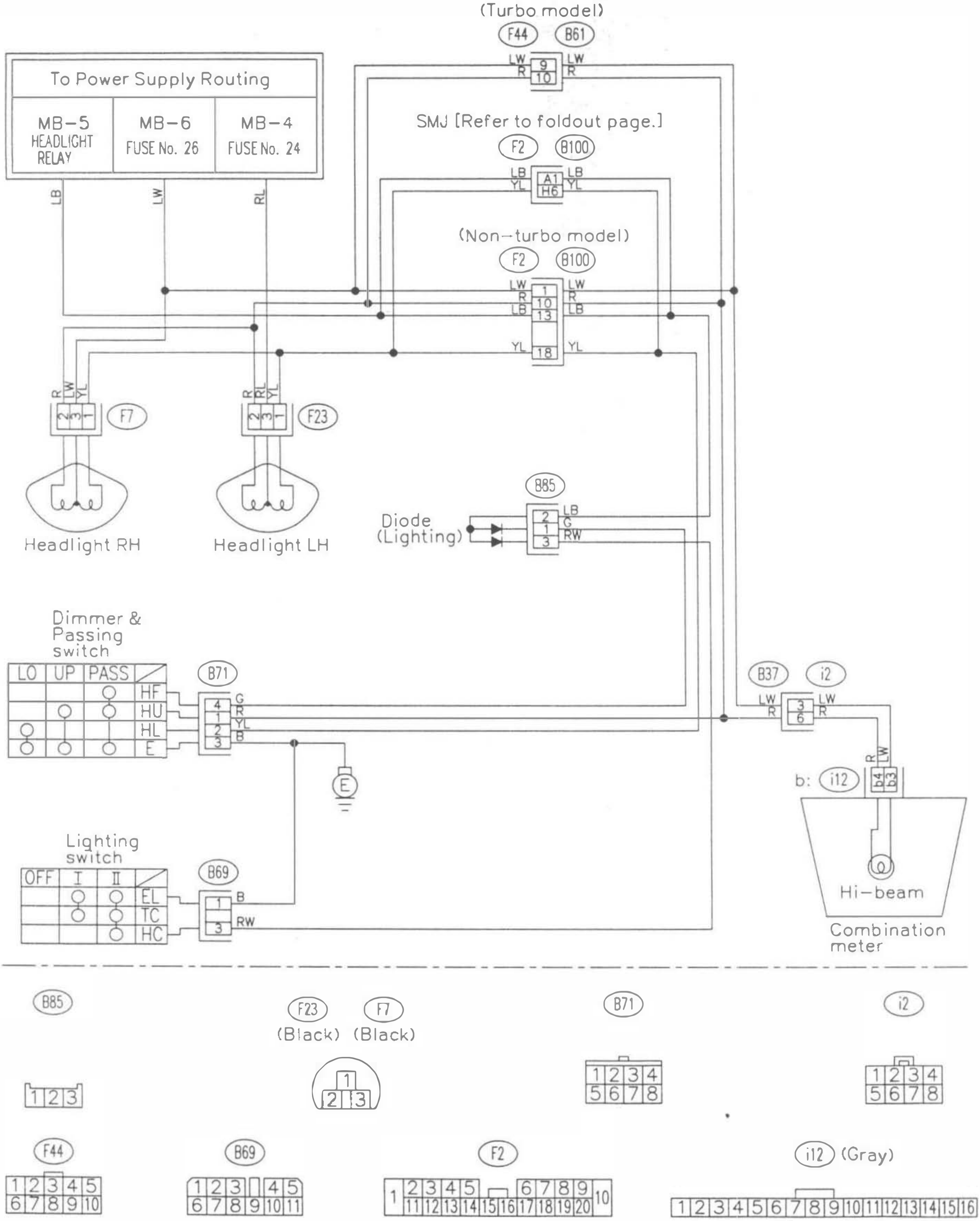
● **LHD model**



GL91-01

21. LIGHTING (HEADLIGHT) SYSTEM

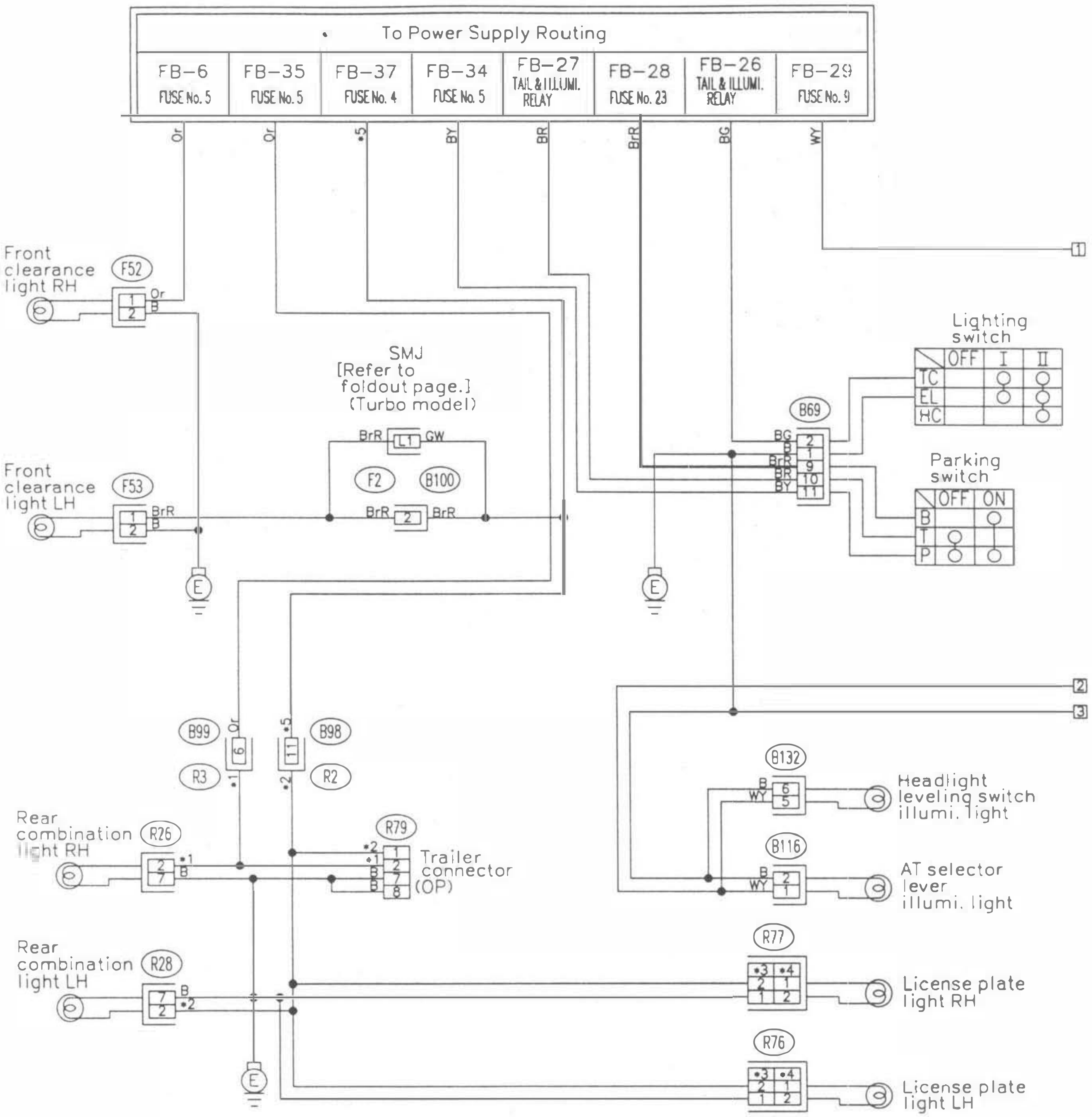
● LHD model



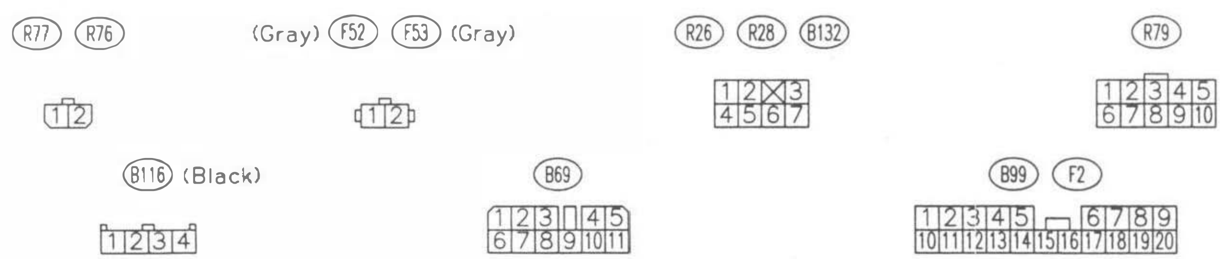
GL20-01

22. LIGHTING (TAIL LIGHT·ILLUMINATION LIGHT·ETC.) SYSTEM

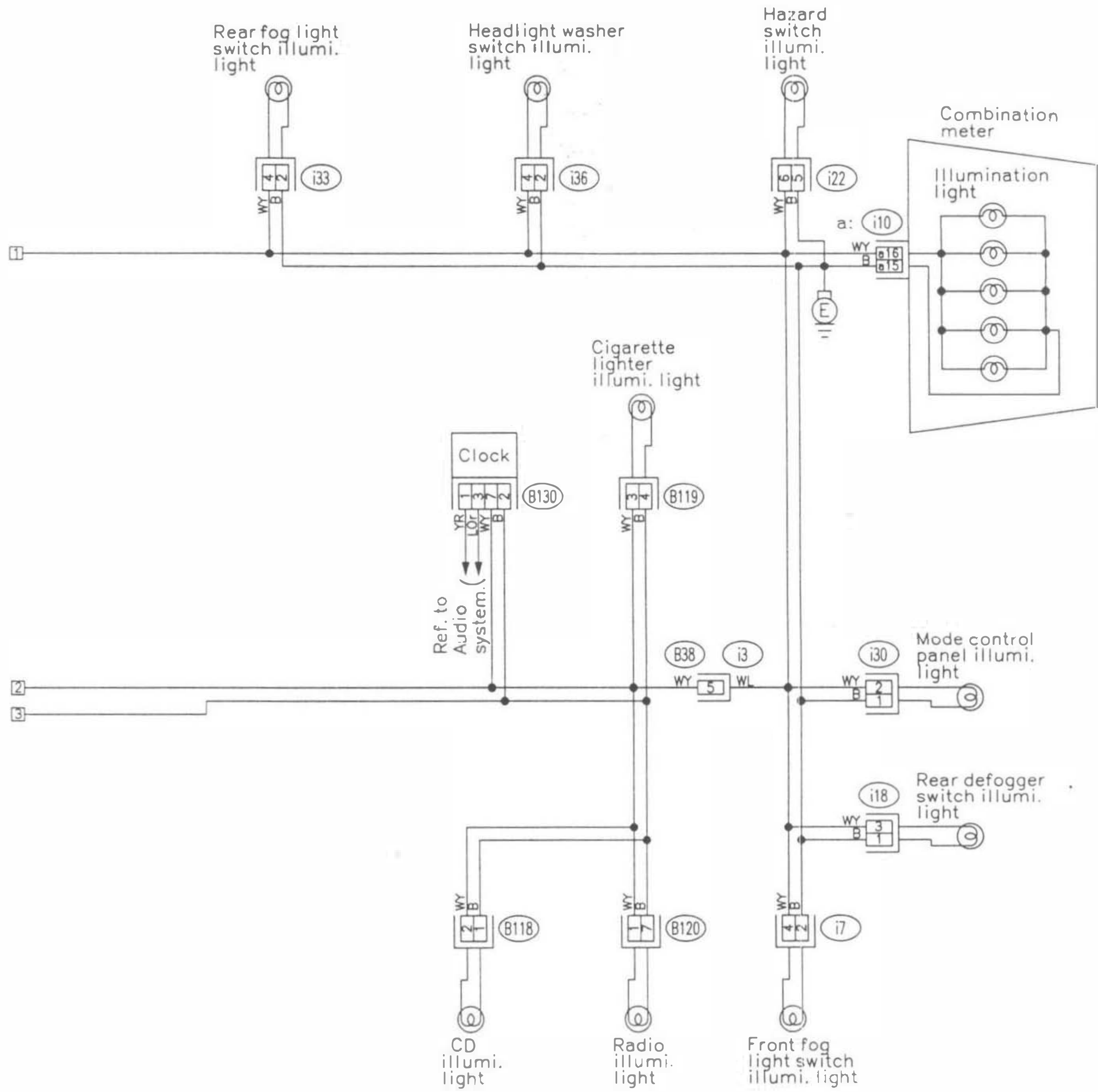
● LHD model

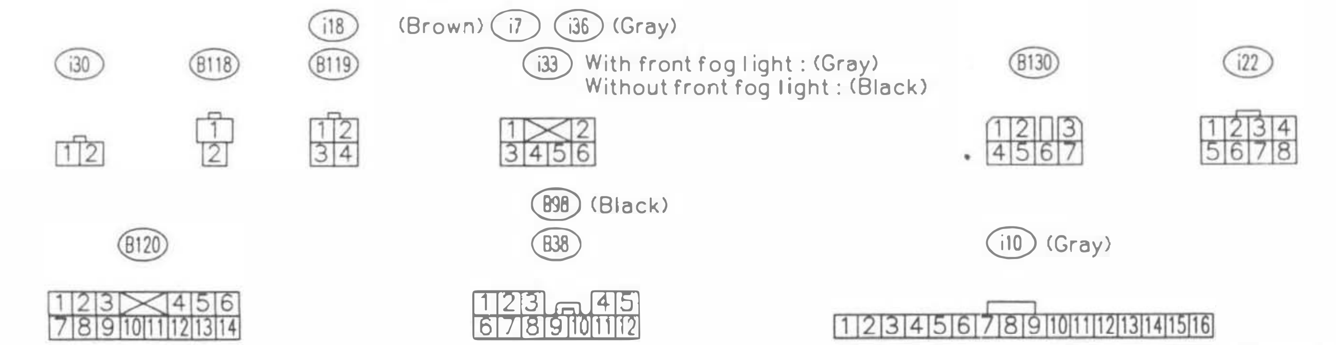


*1 4 Door sedan : Or   5 Door : RY
*2 4 Door sedan : BrR   5 Door : GW
*3 : 4Door sedan
*4 : 5 Door
*5 Turbo model : GW
Non-turbo model : BrR



GL21-05A

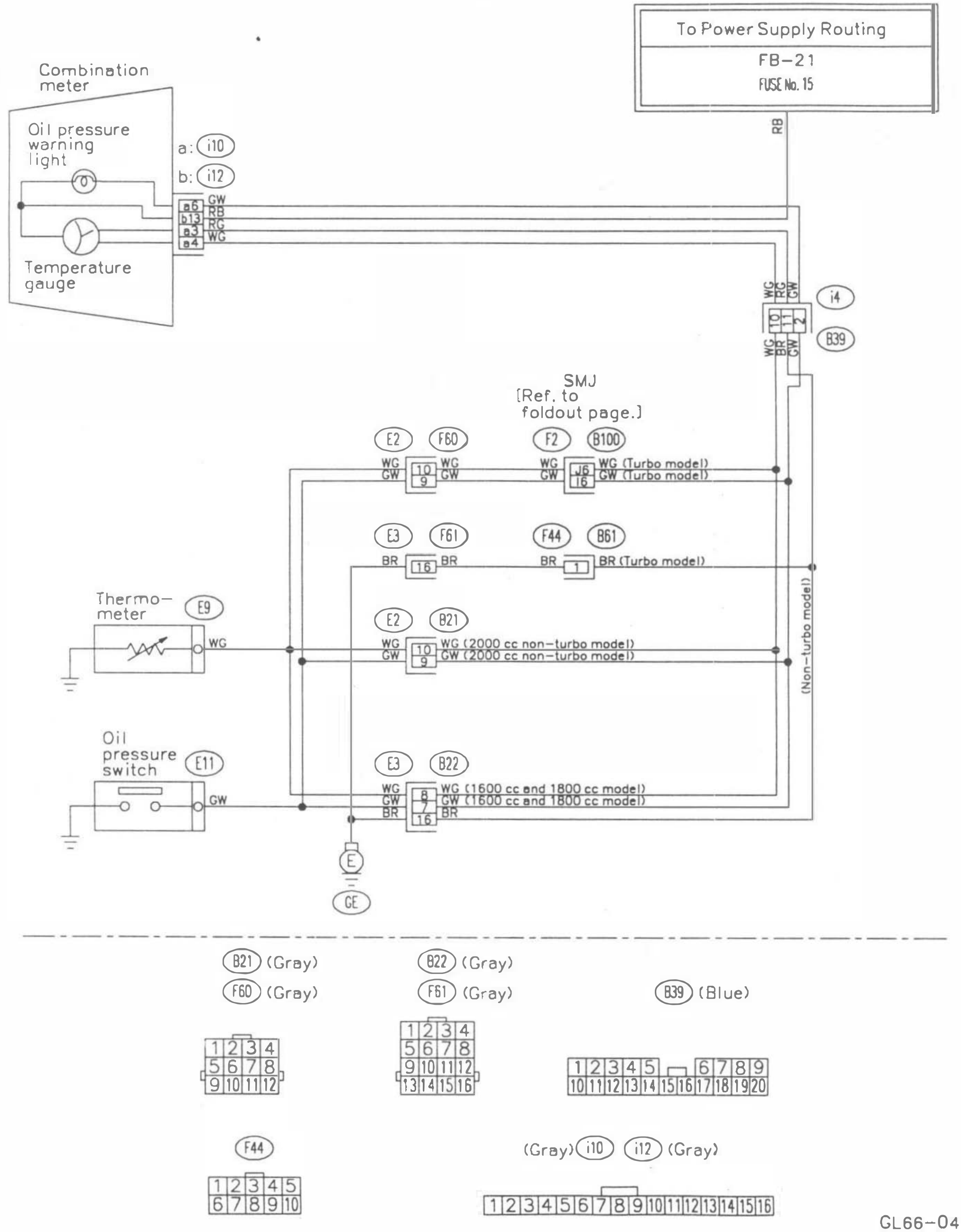

Rear fog light switch illumi. light
Headlight washer switch illumi. light
Hazard switch illumi. light
Combination meter
Illumination light
a: i10
i33
i36
i22
Cigarette lighter illumi. light
Clock
B130
B119
Ref. to Audio system.
B38
i3
i30
Mode control panel illumi. light
i18
Rear defogger switch illumi. light
B118
B120
i7
CD illumi. light
Radio illumi. light
Front fog light switch illumi. light


i18 (Brown) i7 i36 (Gray)
i30
B118
B119
i33 With front fog light : (Gray)
Without front fog light : (Black)
B130
i22
B98 (Black)
B120
B38
i10 (Gray)

GL21-05B

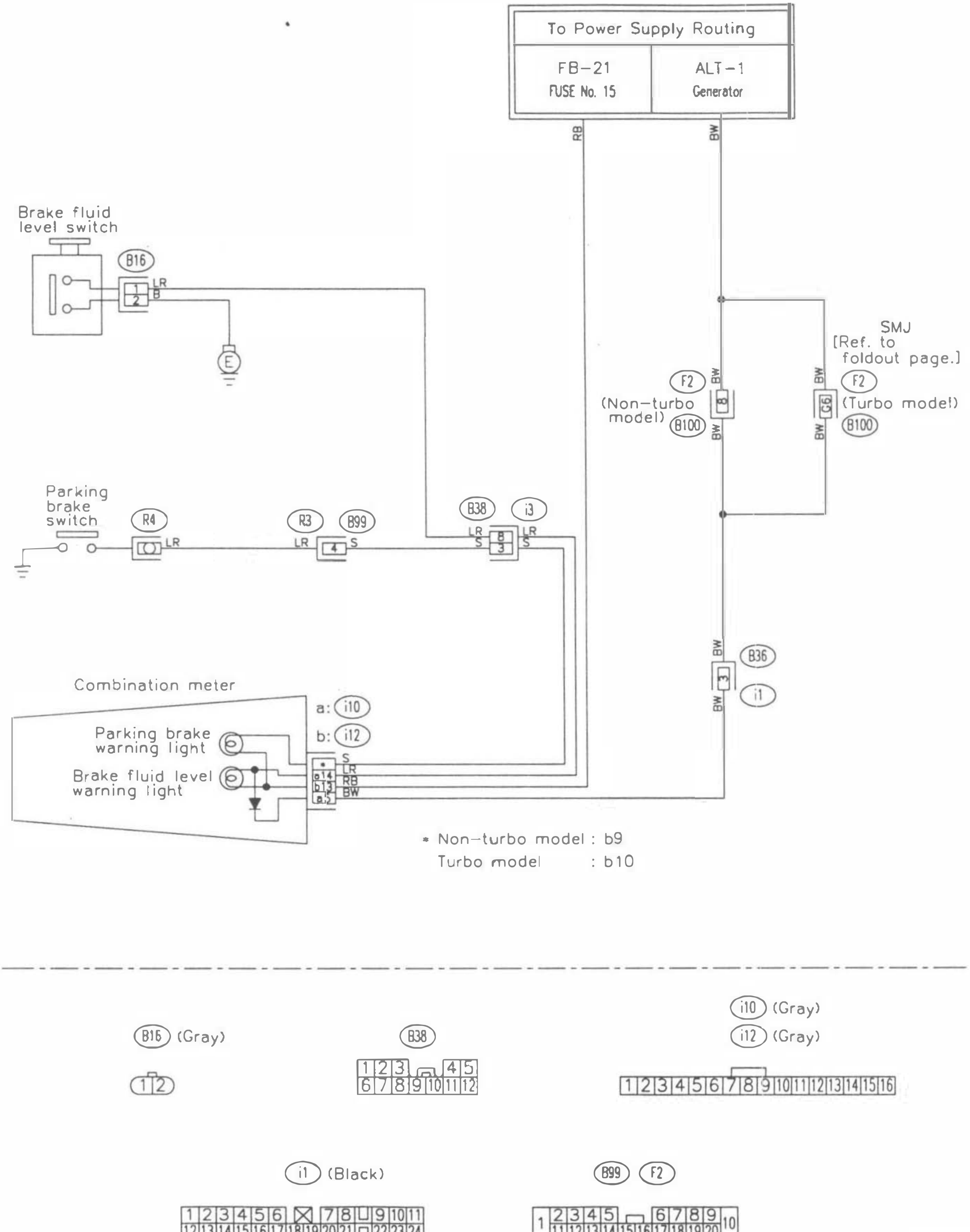
23. OIL PRESSURE AND TEMPERATURE GAUGE SYSTEM

- **LHD model**



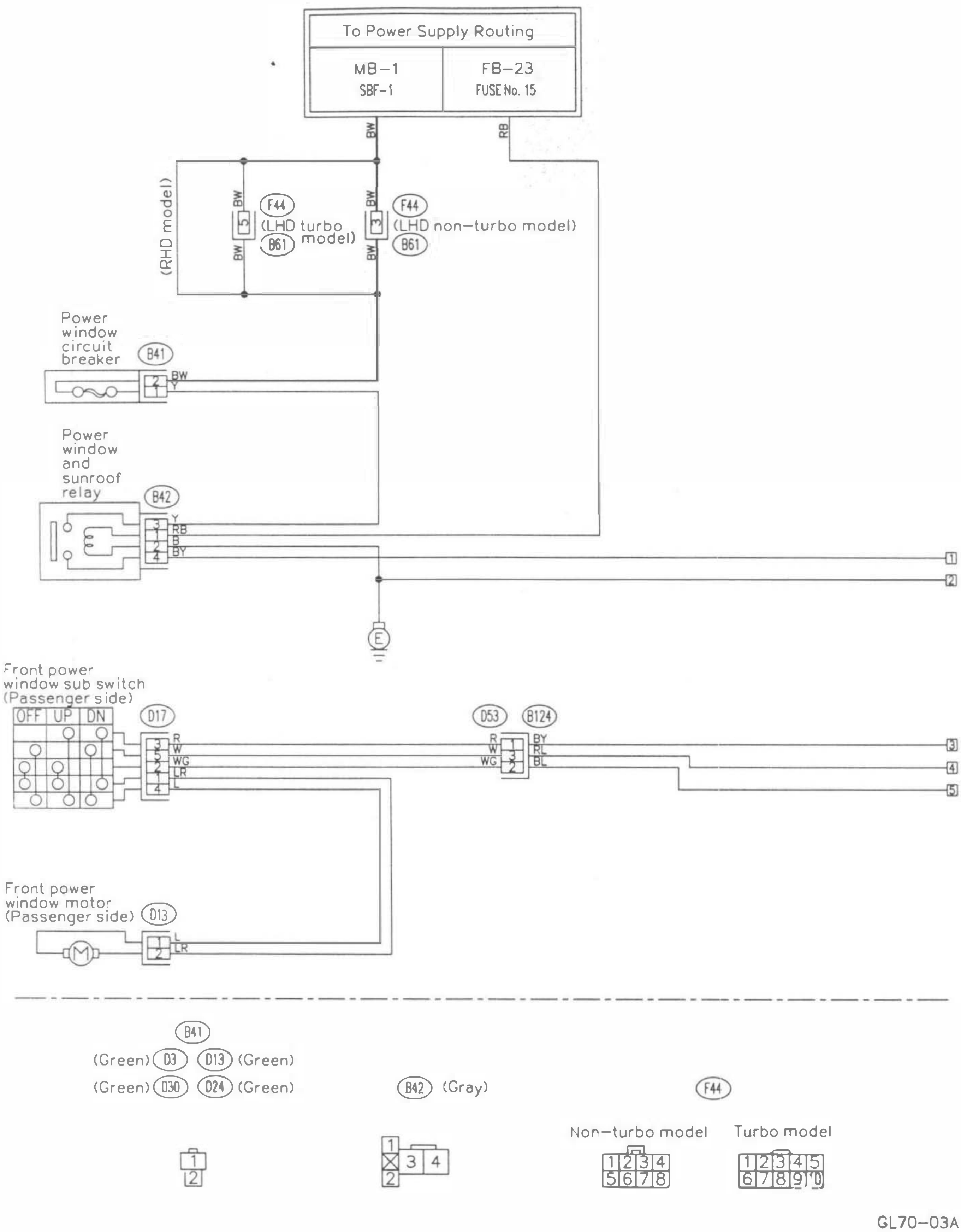
24. PARKING BRAKE AND BRAKE FLUID LEVEL WARNING SYSTEM

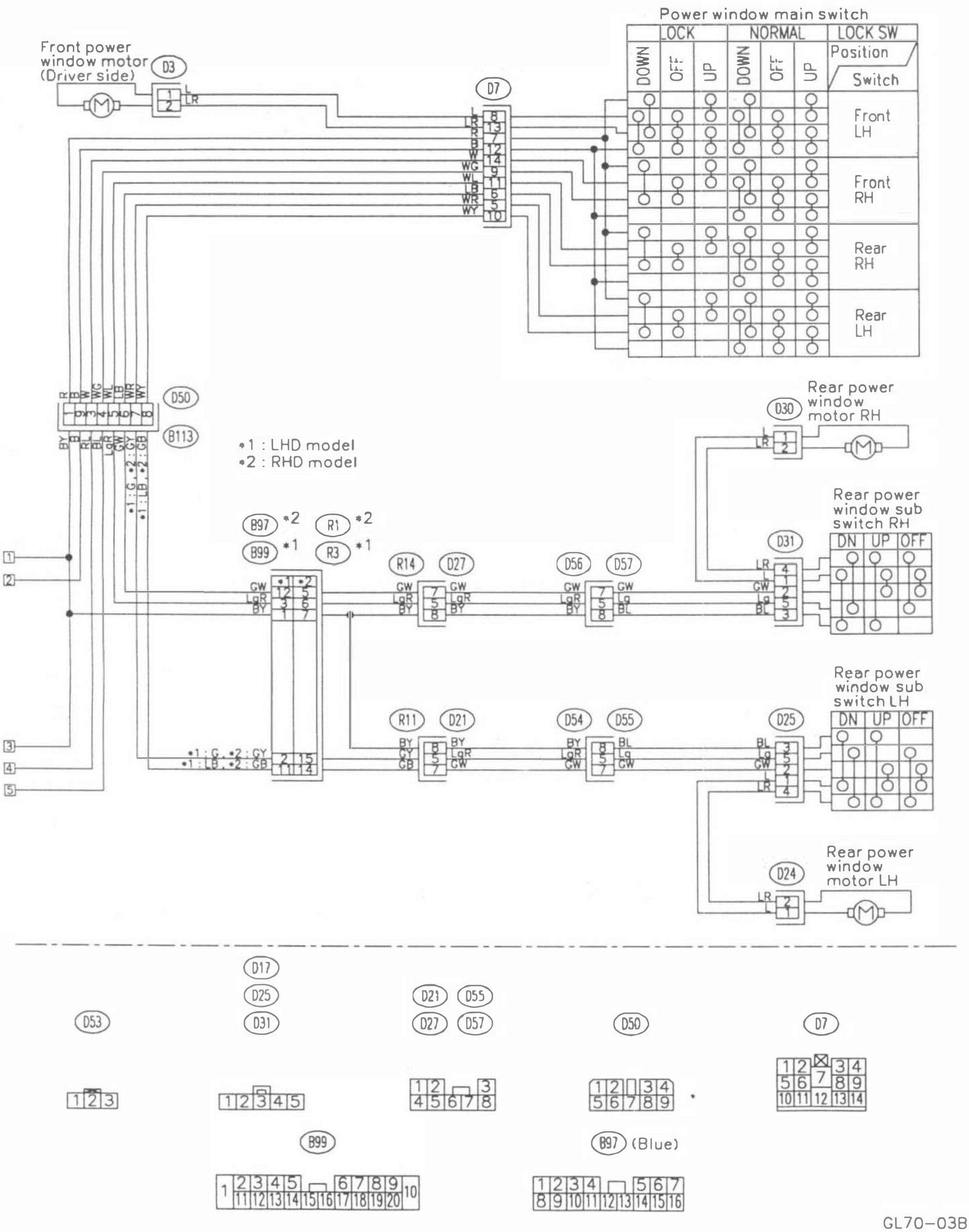
- **LHD model**



GL60-03

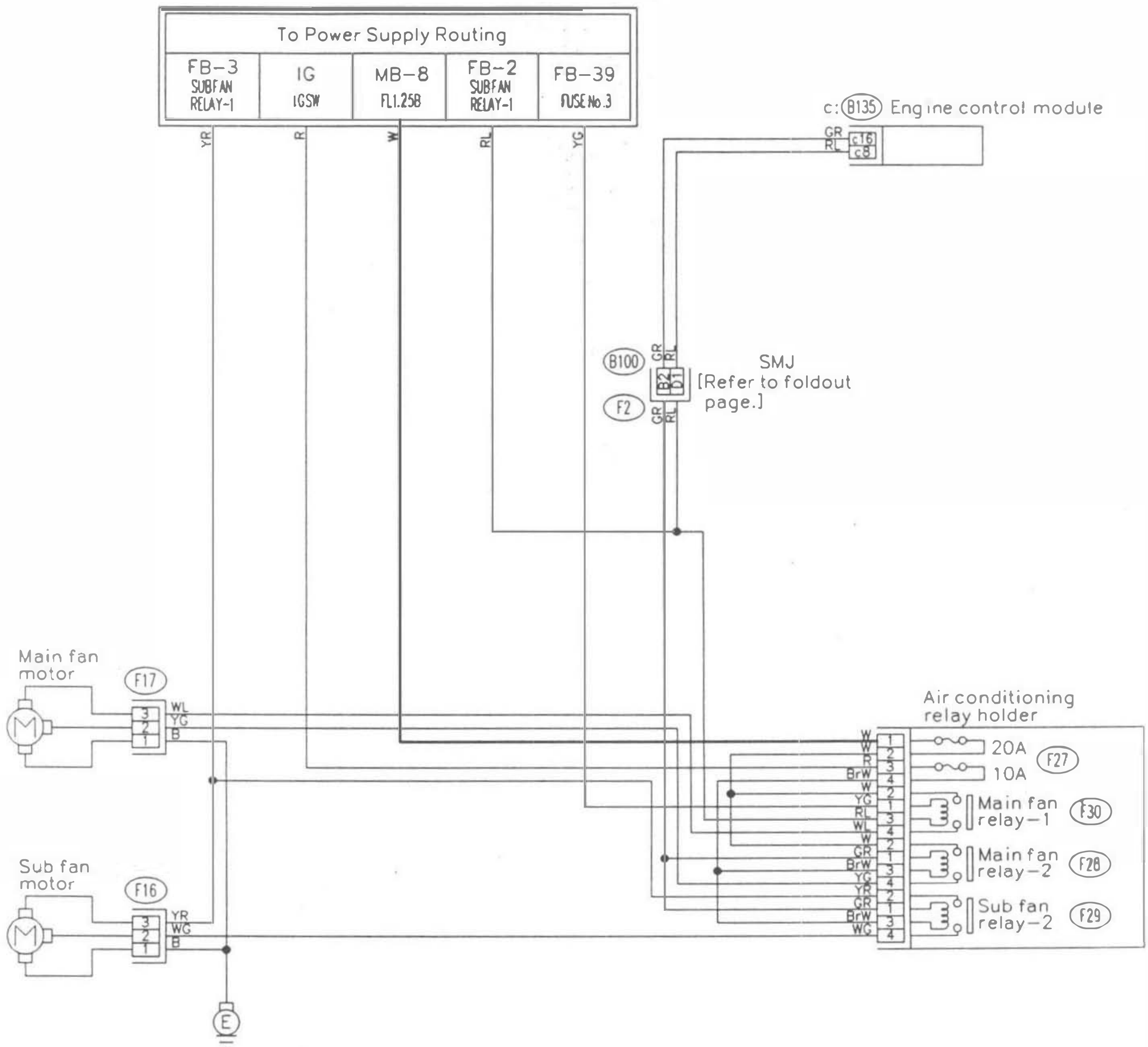
25. POWER WINDOW SYSTEM

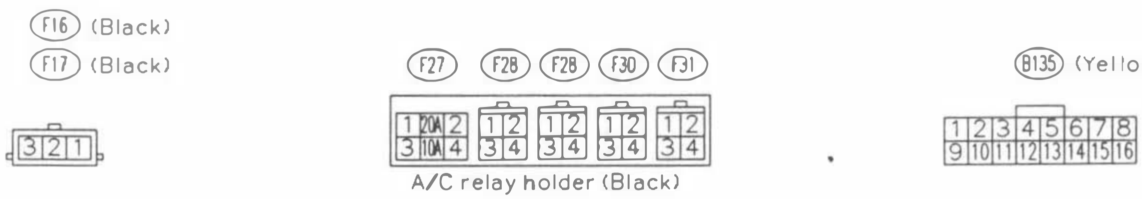



Power window main switch
LOCK
NORMAL
LOCK SW
Position
Switch
DOWN
OFF
UP
Front LH
Front RH
Rear RH
Rear LH
Front power window motor (Driver side)
Rear power window motor RH
Rear power window sub switch RH
Rear power window sub switch LH
Rear power window motor LH
DN UP OFF
*1 : LHD model
*2 : RHD model
(Blue)
GL70-03B

26. RADIATOR FAN SYSTEM

- **LHD turbo with A/C model**

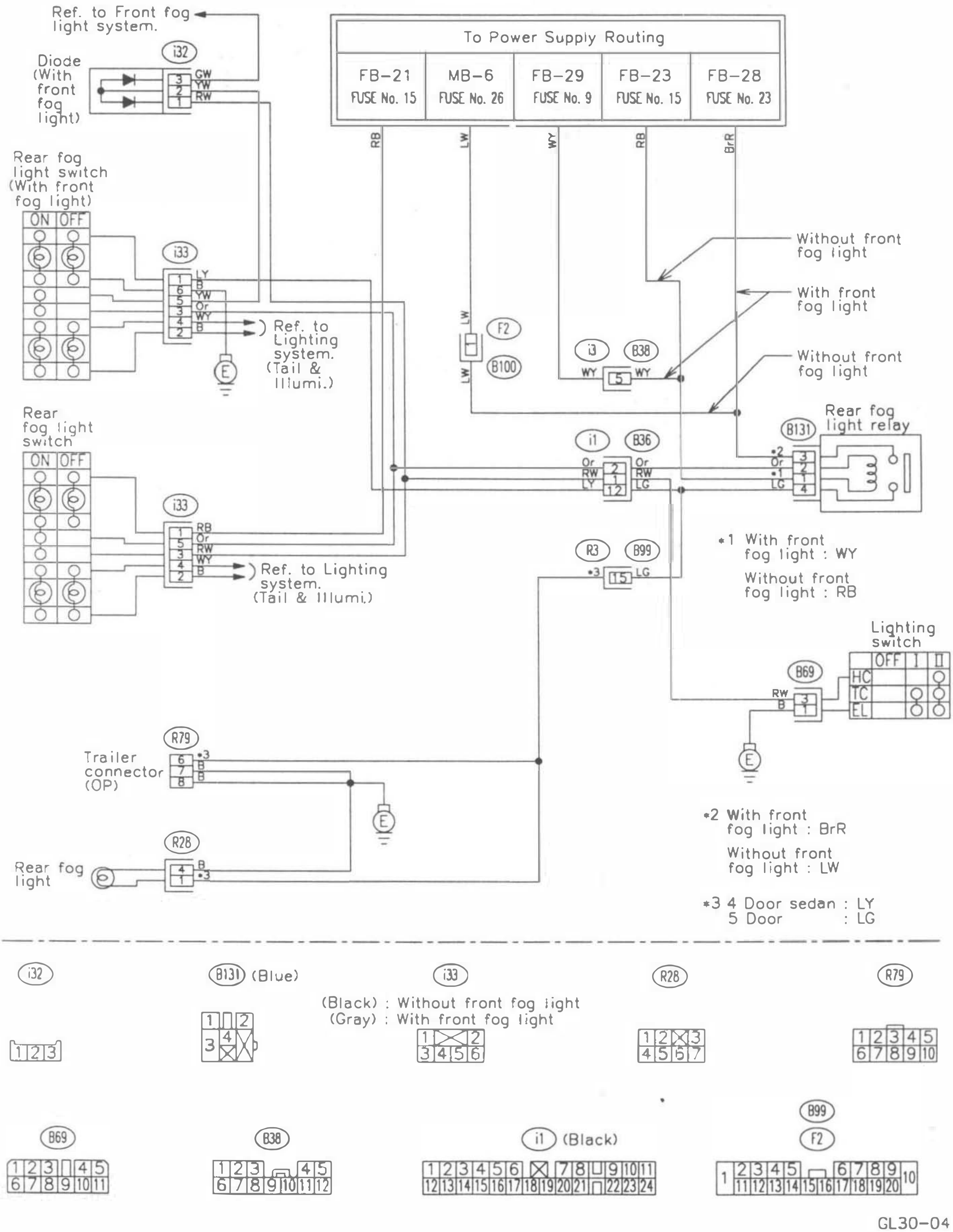




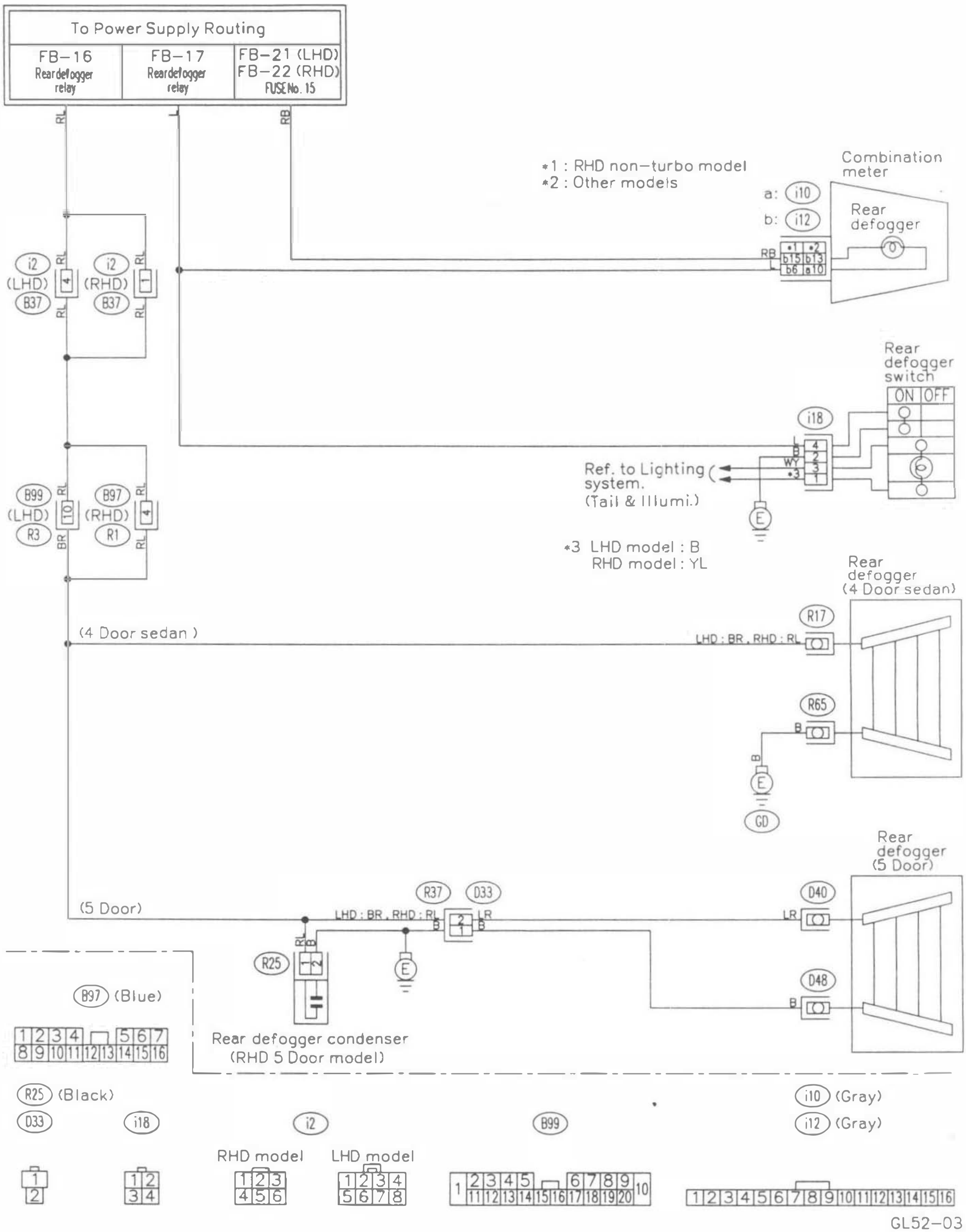
GL14-09

27. REAR FOG LIGHT SYSTEM

- **LHD model**

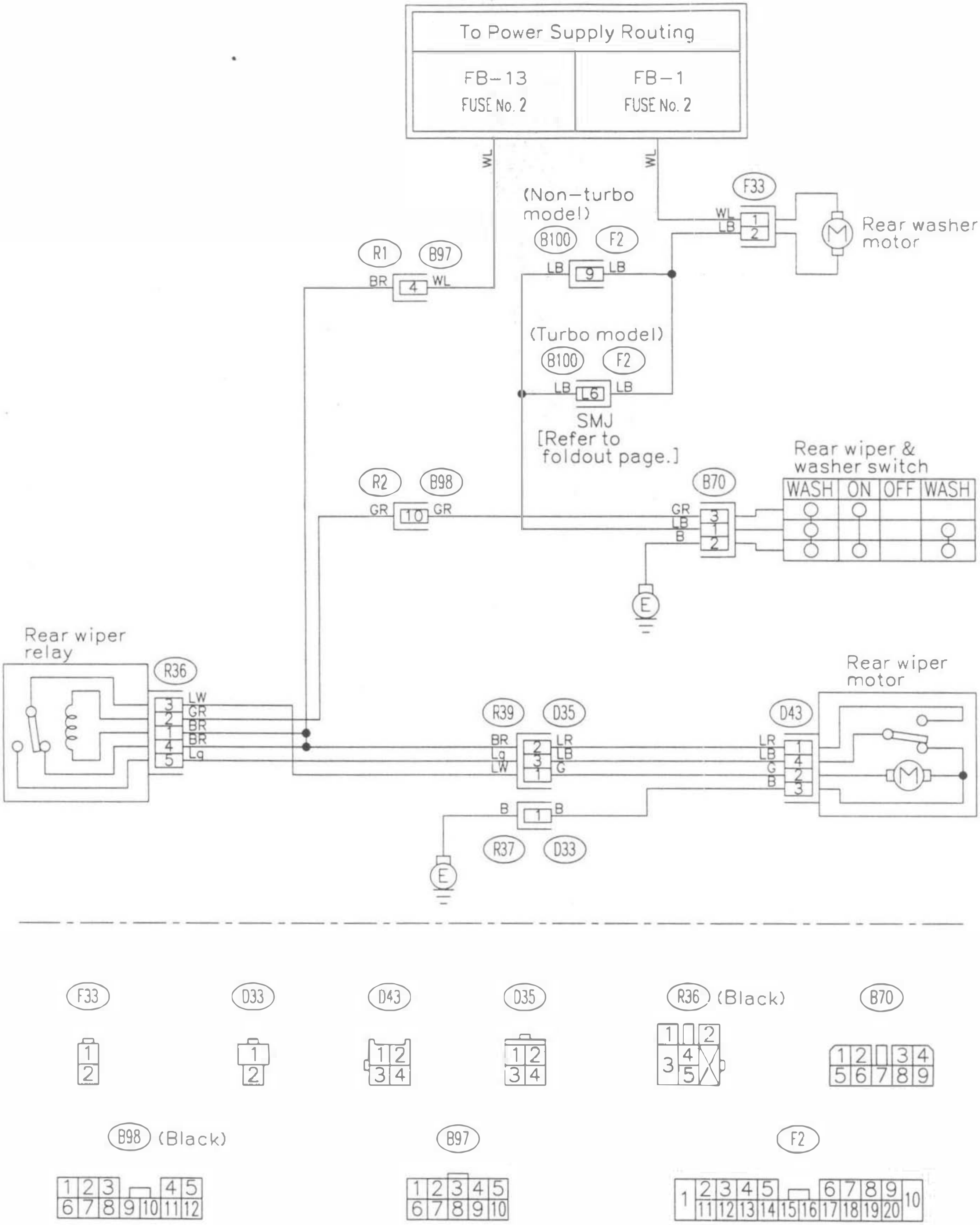


28. REAR WINDOW DEFOGGER SYSTEM



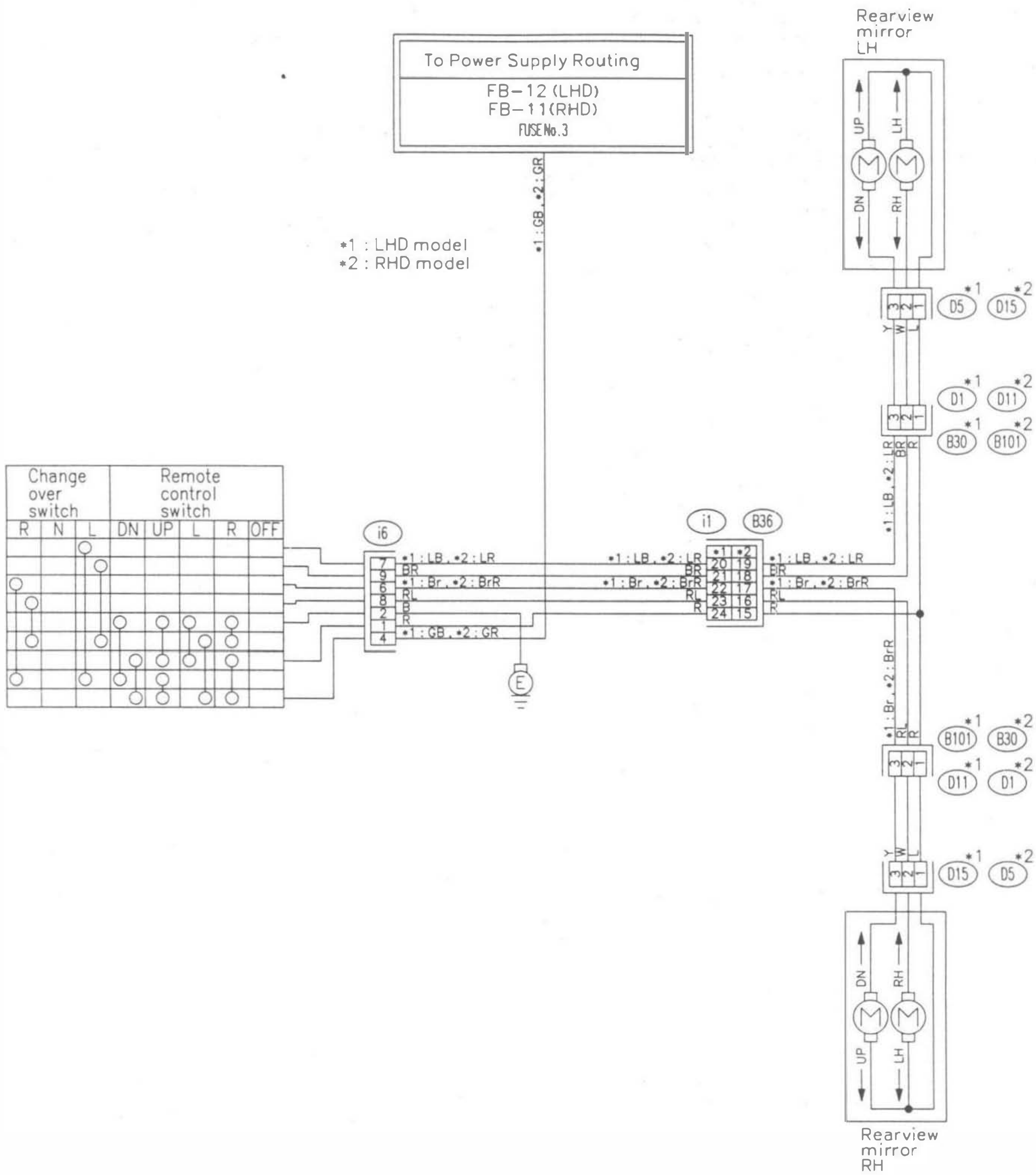
29. REAR WIPER AND WASHER SYSTEM

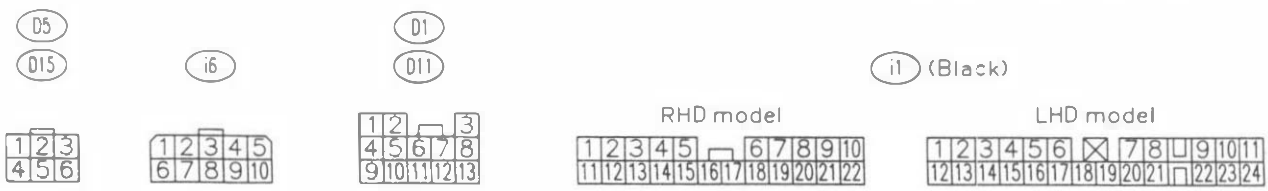
- **LHD model**



GL51-03

30. REMOTE CONTROL REARVIEW MIRROR SYSTEM

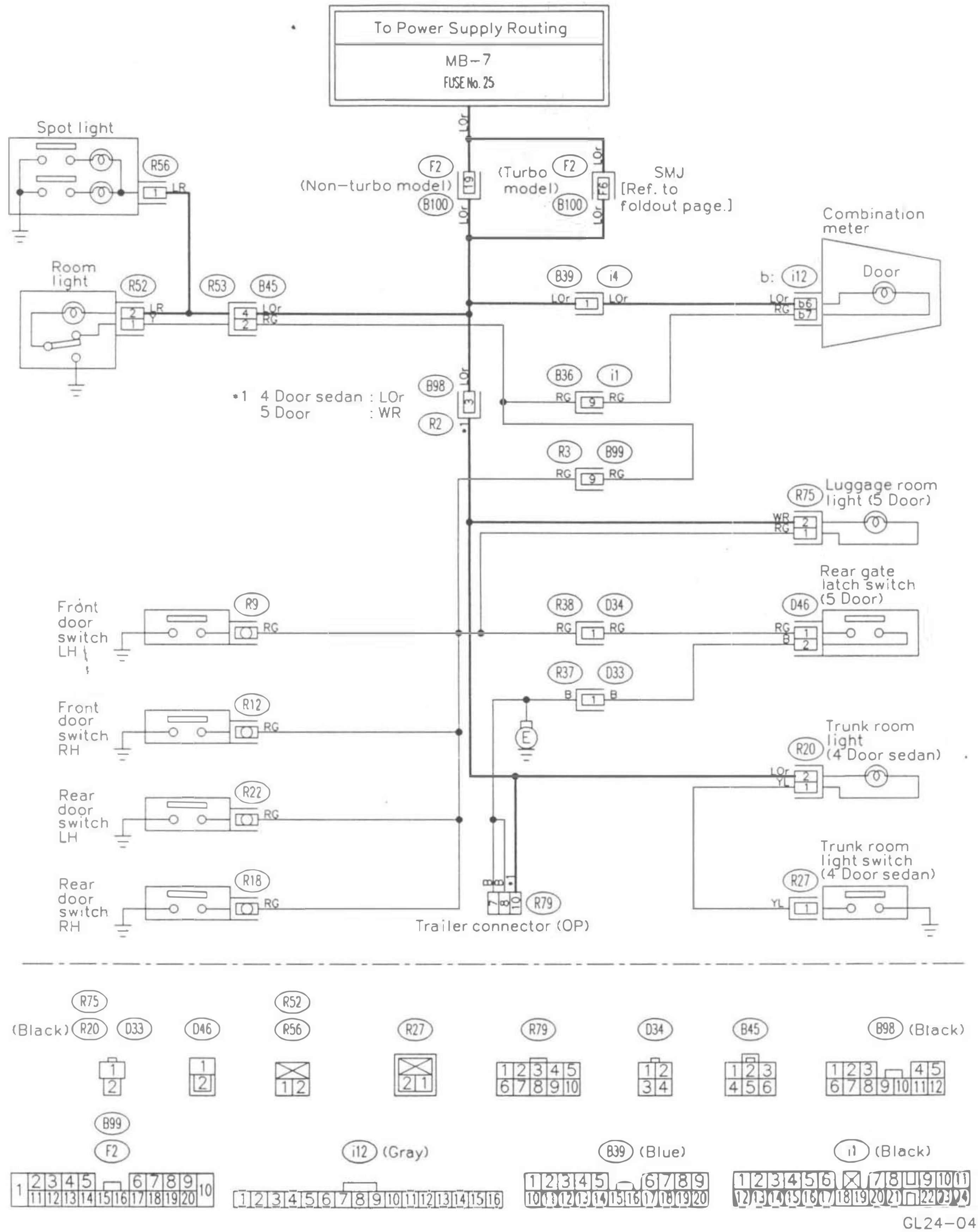




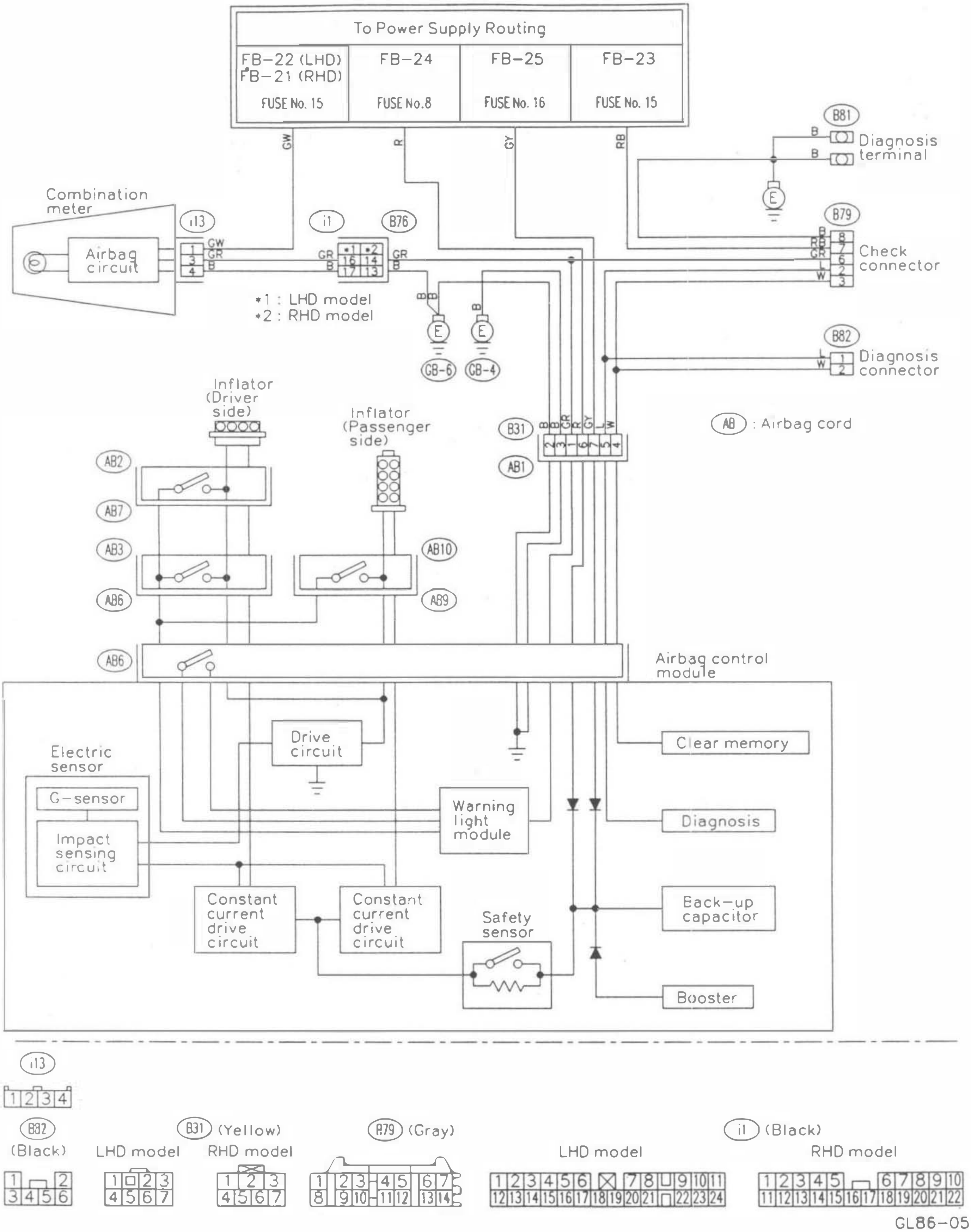
GL79-02

32. SPOT LIGHT, ROOM LIGHT, LUGGAGE AND TRUNK ROOM LIGHT SYSTEM

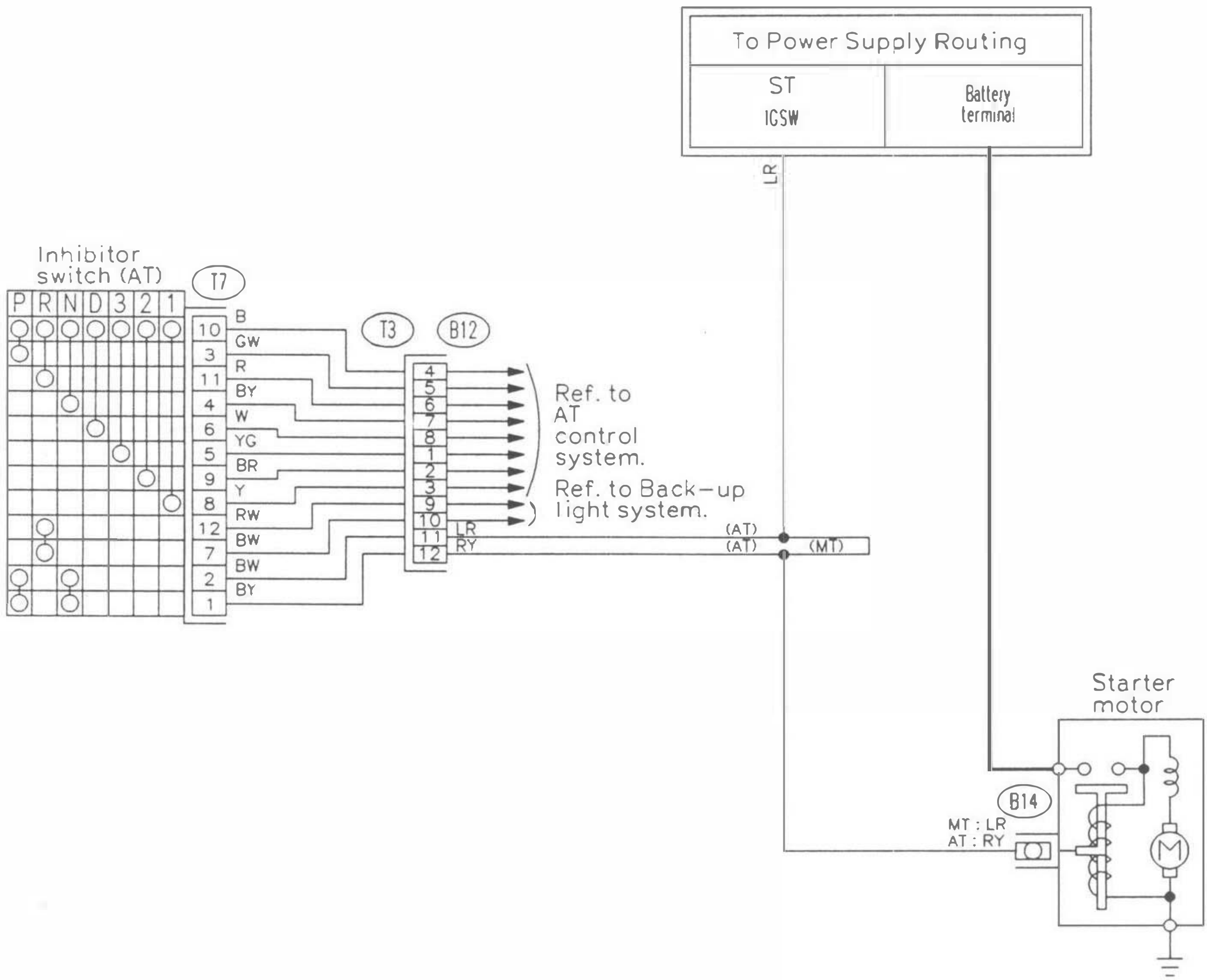
- **LHD model**



33. SRS (AIRBAG SYSTEM)

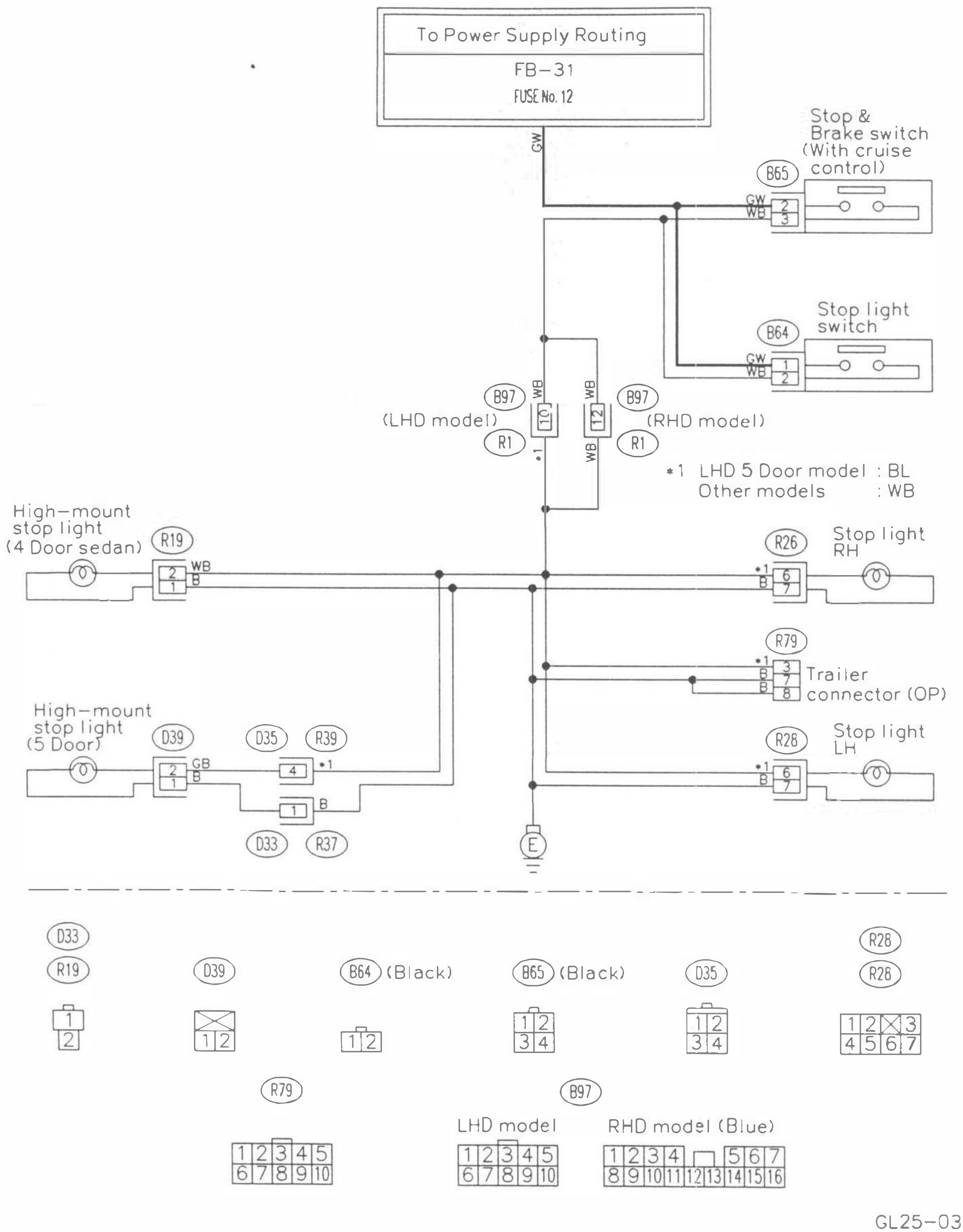


34. STARTING SYSTEM

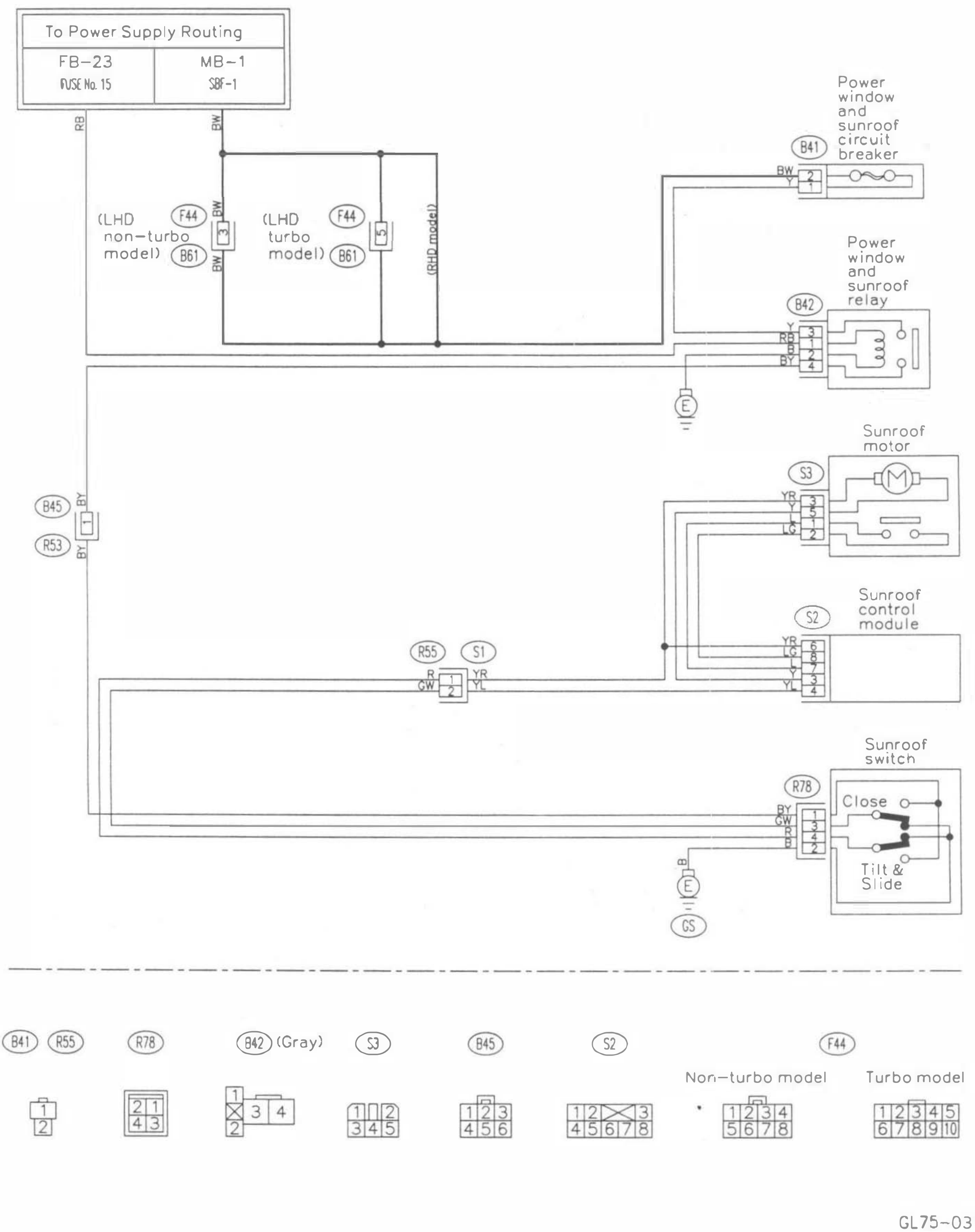


GL03-02

35. STOP LIGHT SYSTEM

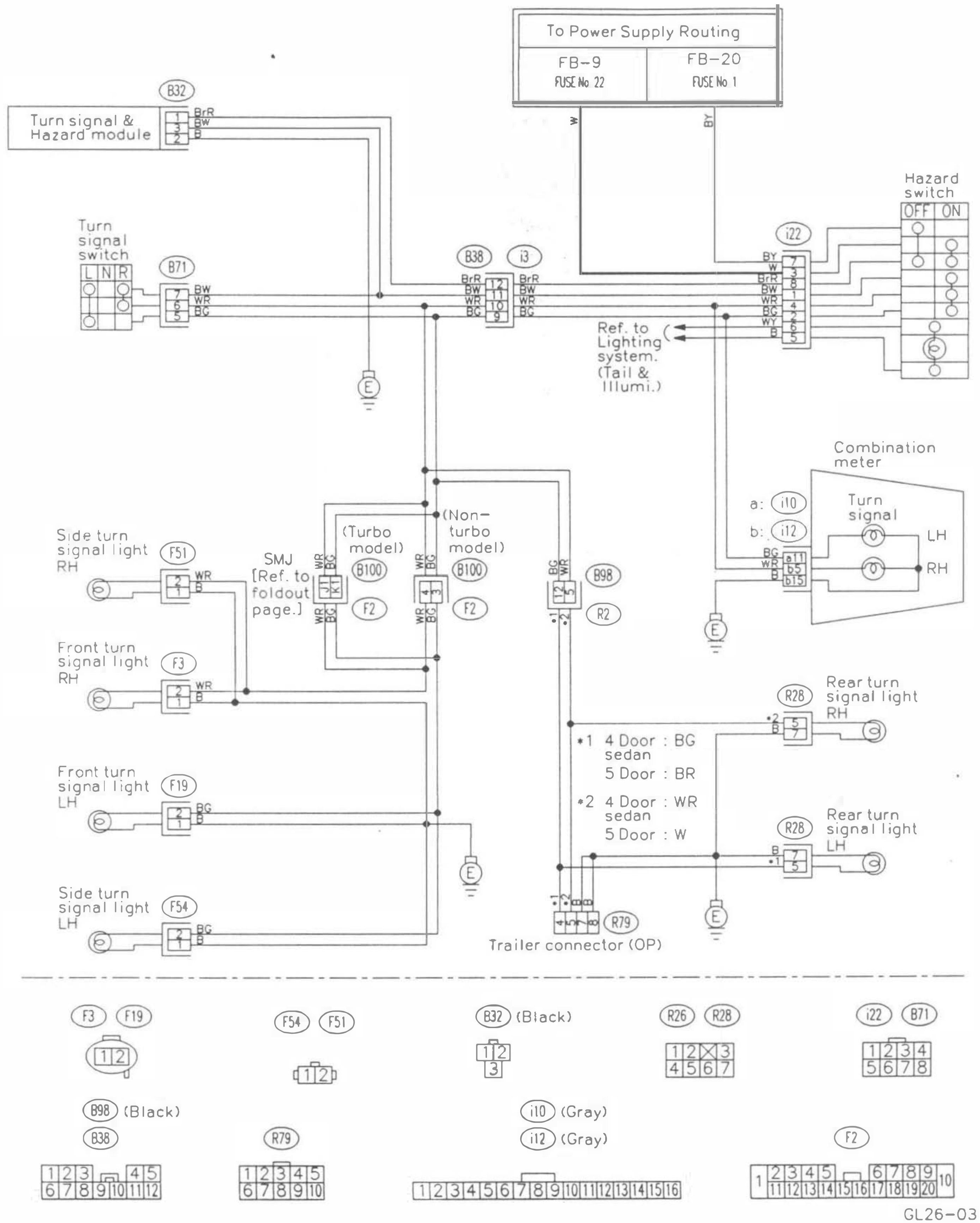


36. SUNROOF SYSTEM



37. TURN SIGNAL AND HAZARD SYSTEM

- **LHD model**

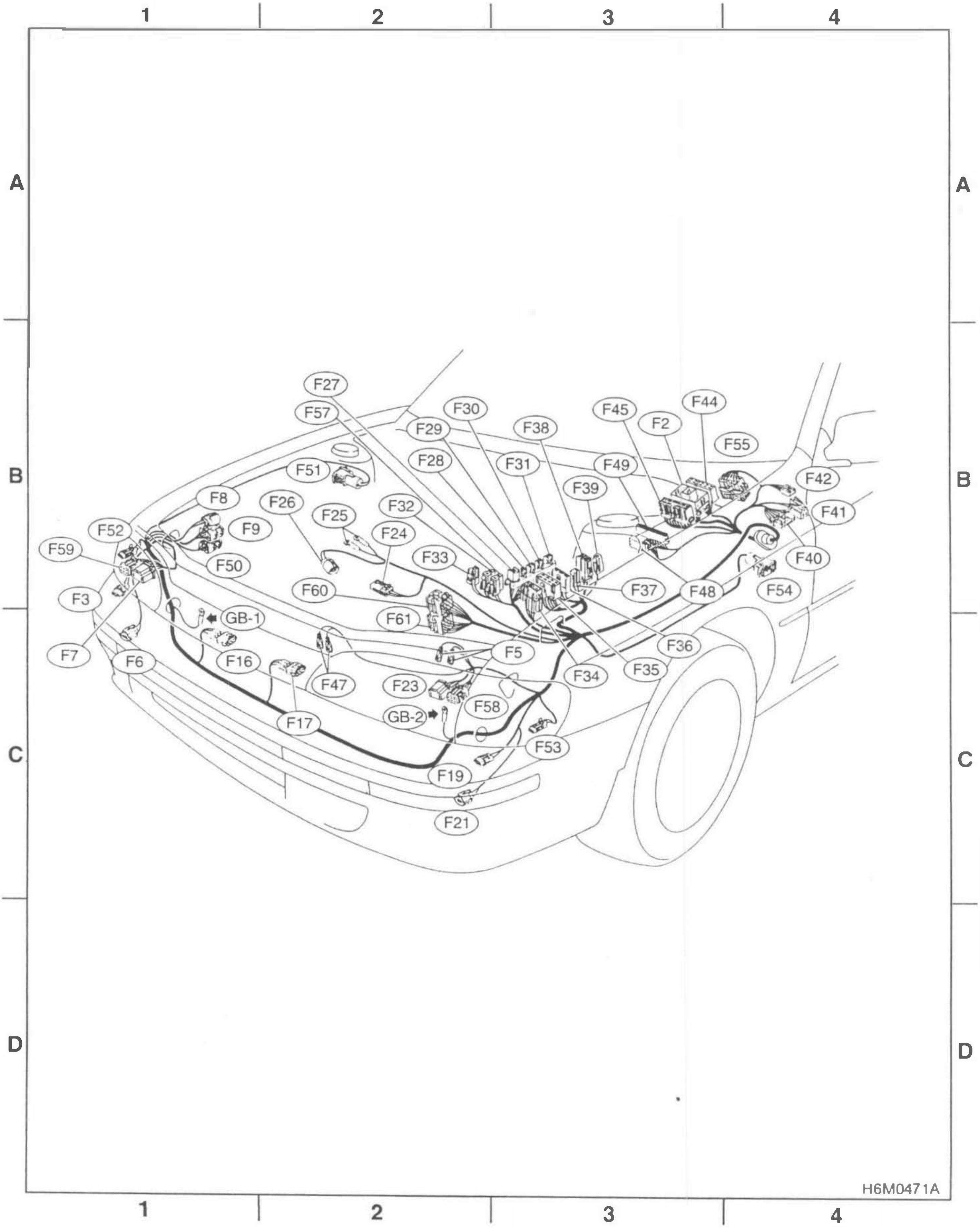


1. FRONT WIRING HARNESS AND GROUND POINT (LHD MODEL)

Connector			Connecting to	
No.	Pole	Color	No.	Name
F2	20	★	B100	Bulkhead wiring harness (Non-turbo model)
	66	Gray	B100	Bulkhead wiring harness (Turbo model) (SMJ)
F3	2	★		Front turn signal light RH
F5	1 x 2	★		Horn
F6	2	Black		Front fog light RH
F7	3	Black		Headlight RH
F8	2	Gray		Hydraulic module (ABS)
F9	8	Gray		
F16	2	Black		Sub fan motor (Non-turbo model)
	3	Black		Sub fan motor (Turbo model)
F17	2	Black		Radiator main fan motor (Non-turbo model)
	3	Black		Radiator main fan motor (Turbo model)
F19	2	★		Front turn signal light LH
F21	2	Black		Front fog light LH
F23	3	Black		Headlight LH
F24	3	Gray		A/C compressor
F25	1 x 2	★		Generator
F26	2	Gray		
F27	4	Black		A/C fuse (Relay holder)
F28	4	Black		A/C sub fan relay (Relay holder) (Non-turbo model)
				A/C main fan relay-2 (Relay holder) (Turbo model)
F29	4	Black		A/C sub fan relay-2 (Relay holder) (Turbo model)
F30	4	Black		A/C main fan relay-1 (Relay holder) (Turbo model)
F31	4	Black		A/C relay (Relay holder)
F32	2	Green		Front washer motor

Connector			Connecting to	
No.	Pole	Color	No.	Name
F33	2	★		Rear washer motor
F34	2	Red		SBF holder
F35	8	★		M/B
F36	3	★		
F37	2	Black		
F38	2	Black		
F39	1	Brown		
F40	10	Gray		F/B
F41	3	Gray		
F42	5	Gray		
F44	8	★	B61	Bulkhead wiring harness (Non-turbo model)
	10	★	B61	Bulkhead wiring harness (Turbo model)
F45	20	Black	B62	Bulkhead wiring harness (Non-turbo model)
F47	1 x 2	★		Horn
F48	6	★		Shield joint connector (ABS)
F49	83	Black		ABS control module
F50	6	Black		ABS relay box
F51	2	★		Side turn signal light RH
F52	2	Gray		Front marker light RH
F53	2	Gray		Front marker light LH
F54	2	★		Side turn signal light LH
F55	12	Black	R49	Rear wiring harness (ABS)
F57	2	Blue		Headlight washer motor
F58	6	Gray		Headlight beam leveler actuator LH
F59	6	Gray		Headlight beam leveler actuator RH
F60	12	Gray	E2	Engine wiring harness (Turbo model)
F61	16	Gray	E3	

★: Non-colored

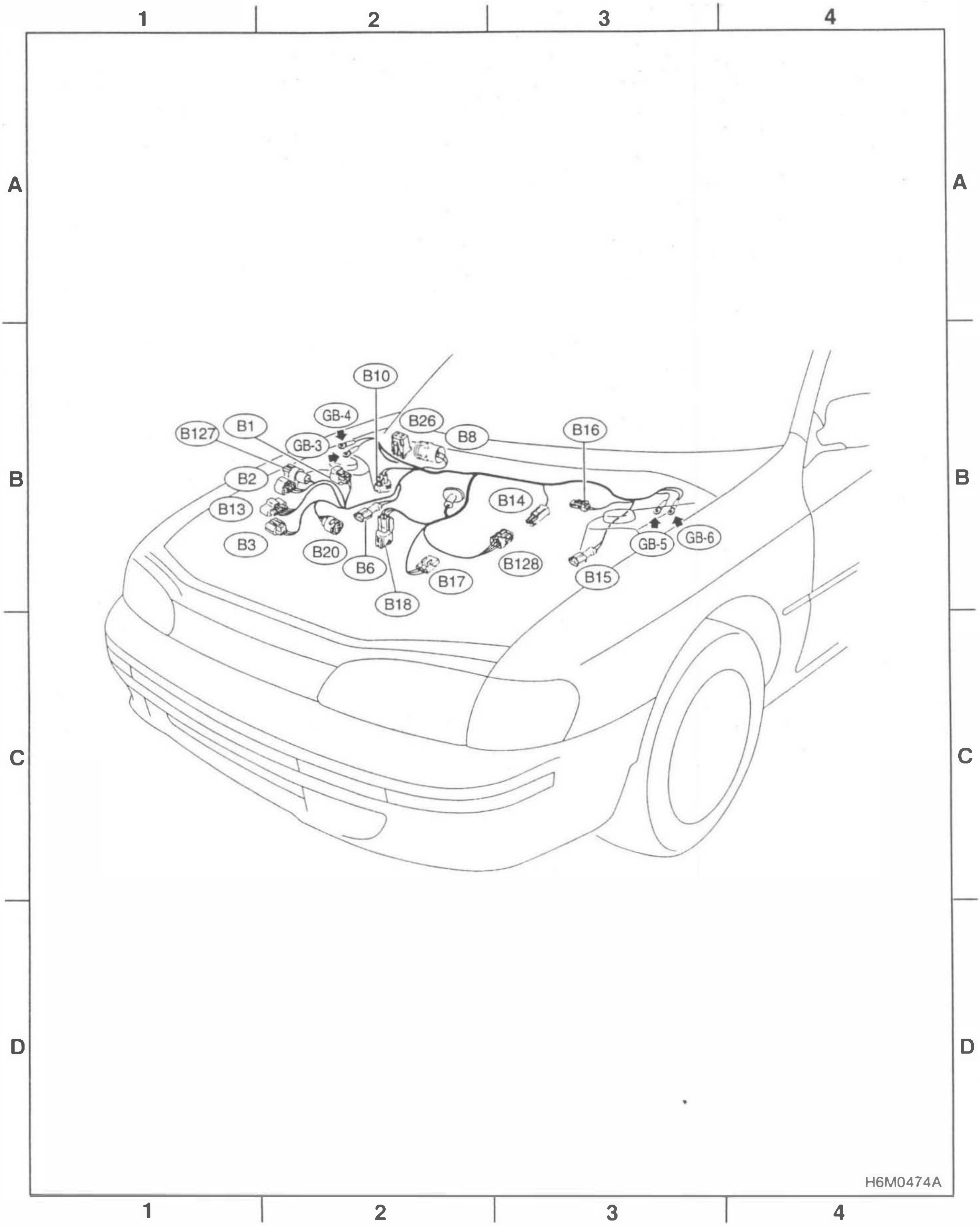

1
2
3
4
A
B
C
D
F27
F57
F30
F29
F38
F45
F2
F44
F55
F28
F31
F49
F42
F51
F39
F41
F8
F26
F32
F25
F52
F9
F24
F59
F50
F33
F40
F3
F60
F37
F48
F54
GB-1
F61
F36
F7
F5
F6
F16
F34
F35
F47
F23
F58
GB-2
F17
F53
F19
F21
H6M0471A

2. BULKHEAD WIRING HARNESS AND GROUND POINT (IN ENGINE ROOM)

● LHD turbo model

Connector			Connecting to	
No	Pole	Color	No.	Name
B1	2	Brown		Pressure exchange solenoid valve
B2	3	Black		Boost sensor
B3	3	Gray		Mass air flow sensor
B6	2	Gray		ABS front sensor RH
B8	5	★		Front wiper motor
B10	2	Gray		A/C pressure switch
B13	6	Gray		Ignitor
B14	1	Black		Starter (Magnet)
B15	2	Gray		ABS front sensor LH
B16	2	Gray		Brake fluid level switch
B17	3	Black		Vehicle speed sensor
B18	4	Gray		Oxygen sensor
B20	8	Gray	E1	Engine wiring harness
B26	4	Blue		A/C cut relay
B127	2	Black		Wastegate control solenoid valve
B128	6	Gray	T9	Transmission

★: Non-colored

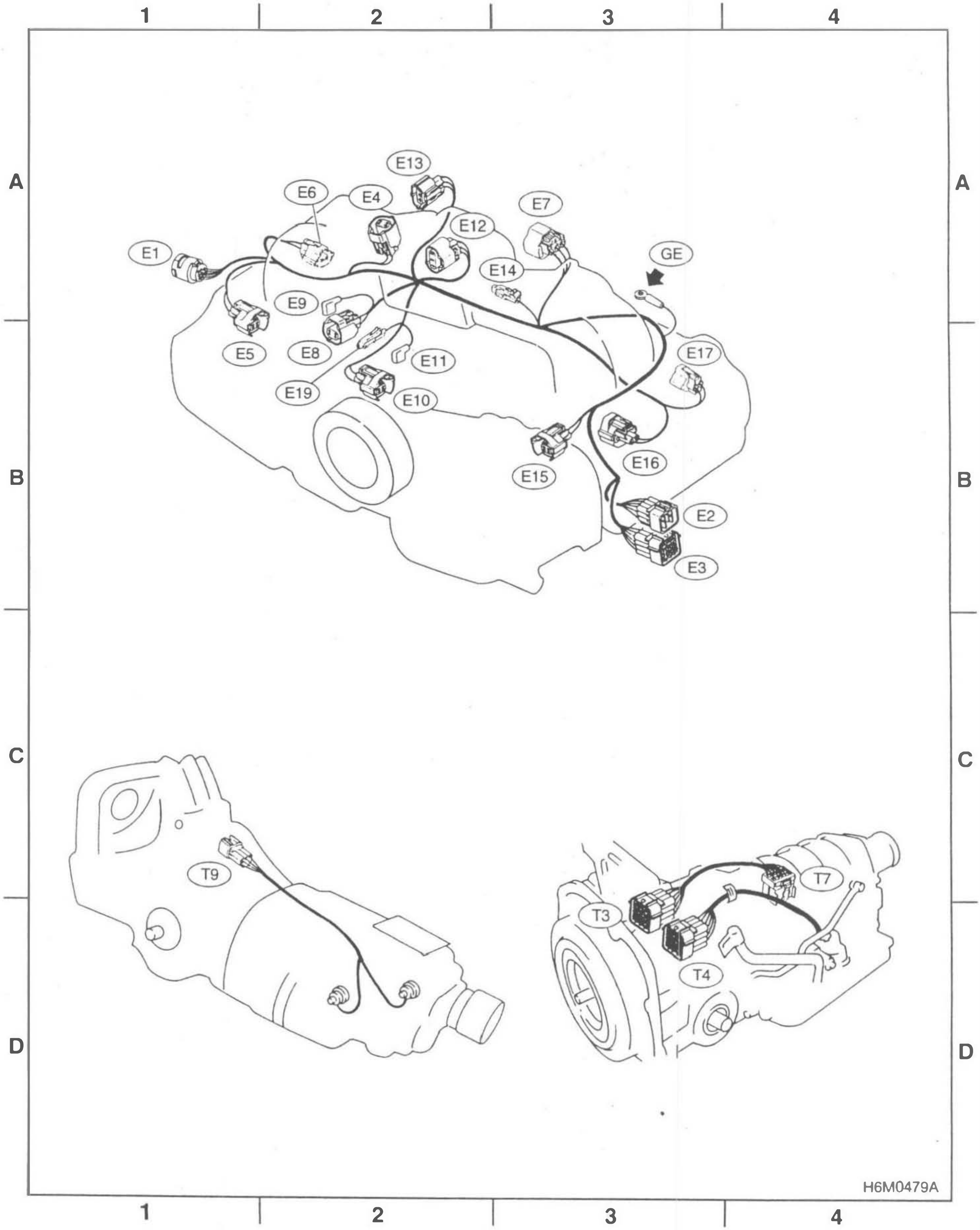

1
2
3
4
A
B
C
D
B10
GB-4
B26
B8
B16
B127
B1
GB-3
B2
B13
B14
B3
B20
B6
B17
B128
B15
GB-5
GB-6
B18
H6M0474A

. ENGINE WIRING HARNESS, TRANSMISSION CORD AND GROUND POINT (Turbo engine odel)

Connector			Connecting to	
No.	Pole	Color	No.	Name
E1	8	Gray	*B20	Bulkhead wiring harness
E2	12	Gray	F60	Front wiring harness (LHD model)
			B21	Bulkhead wiring harness (RHD model)
E3	16	Gray	F61	Front wiring harness (LHD model)
			B22	Bulkhead wiring harness (RHD model)
E4	2	Blue		Purge control solenoid valve
E5	2	Light-gray		Injector #1
E6	2	Dark-gray		Injector #3
E7	3	Gray		Idle air control solenoid
E8	2	Brown		Engine coolant temperature sensor
E9	1	★		Thermometer
E10	2	Gray		Crankshaft position sensor
E11	1	★		Oil pressure switch
E12	3	Gray		Ignition coil
E13	3	Gray		Throttle position sensor
E14	1	Gray		Knock sensor
E15	2	Light-gray		Camshaft position sensor
E16	2	Light-gray		Injector #2
E17	2	Dark-gray		Injector #4
E19	1	Gray		Power steering oil pressure switch

Connector			Connecting to	
No.	Pole	Color	No.	Name
T3	12	Gray	B12	Bulkhead wiring harness (AT)
T4	16	Gray	B11	
T7	12	★		Inhibitor switch (AT)
T9	6	Gray	B128	Bulkhead wiring harness (MT)

Non-colored


1
2
3
4
A
B
C
D
E13
E6
E4
E7
E12
E1
E14
GE
E9
E5
E8
E11
E17
E19
E10
E16
E15
E2
E3
T9
T7
T3
T4
H6M0479A

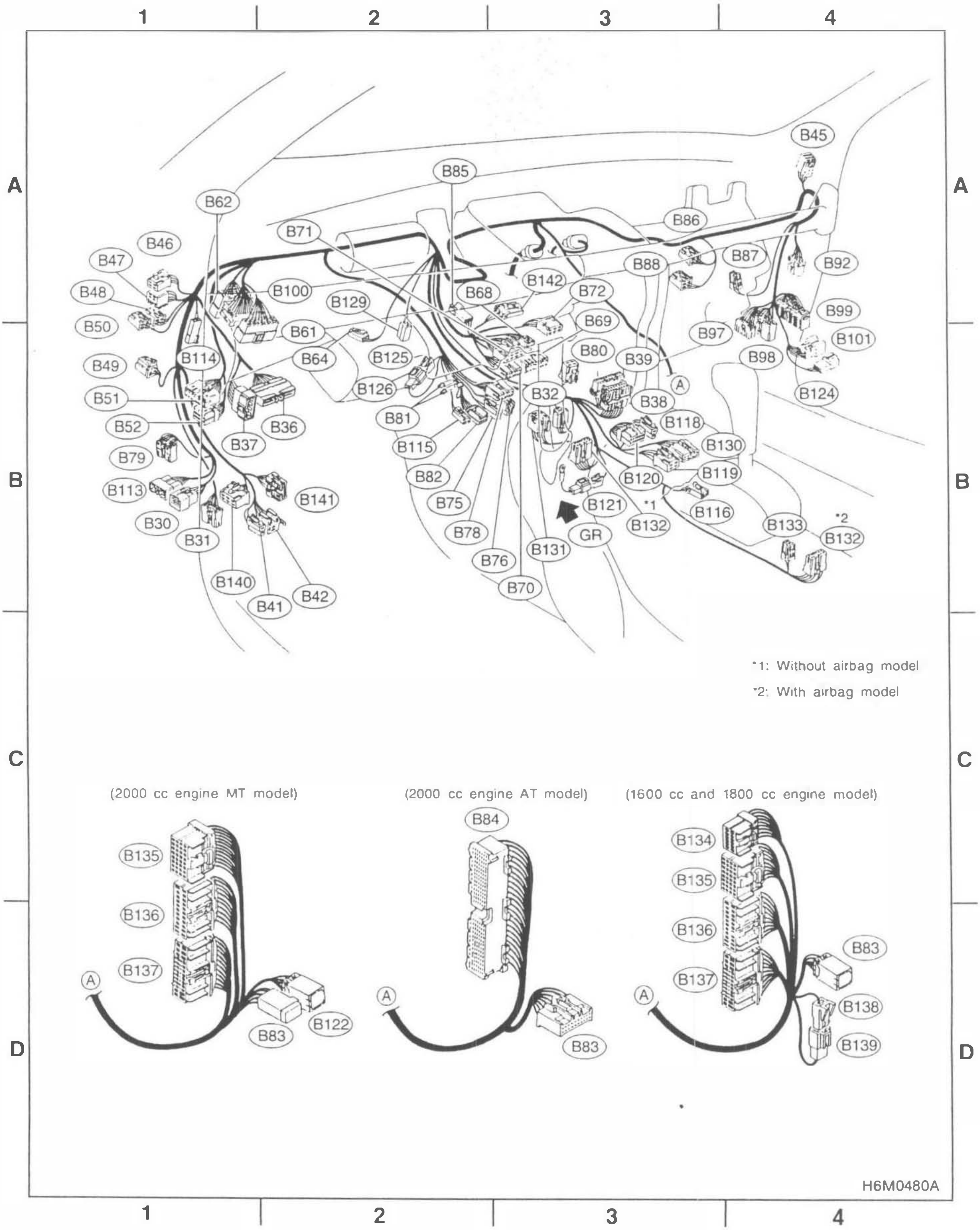
4. BULKHEAD WIRING HARNESS (IN COMPARTMENT)

● LHD model

Connector			Connecting to	
No	Pole	Color	No.	Name
B30	13	★	D1	Front door cord LH
B31	7	Yellow	AB1	SRS (Airbag) harness
B32	3	Black		Turn & hazard module
B36	24	Black	i1	Instrument panel wiring harness
B37	8	★	i2	
B38	12	★	i3	
B39	20	Blue	i4	
B41	2	★		Power window circuit breaker
B42	4	Gray		Power window and sunroof relay
B45	6	★	R53	Roof cord
B46	4	Green		Fuel pump relay
B47	6	Brown		Main relay
B48	4	Black		Front fog light relay
B49	3	Black		Horn relay
B50	4	★		Blower relay
B51	11	Gray		F/B
B52	12	Gray		
B61	8	★	F44	Front wiring harness (Non-turbo model)
	10	★	F44	Front wiring harness (Turbo model)
B62	20	Black	F45	Front wiring harness (Non-turbo model)
B64	2	Black		Stop light switch
B68	5	Black		Horn switch (With airbag)
B69	11	★		Combination switch
B70	9	★		
B71	8	★		
B72	6	Black		Ignition switch
B75	2	Green	B76	Test mode connector
B76	2	Green	B75	
B78	9	Yellow		Data link connector
B79	14	Gray		Check connector
B80	4	Blue	i20	Instrument panel wiring harness
B81	1 x 2	★		Diagnosis terminal (Ground)
B82	6	Black		Diagnosis connector
B83	6	★		Shield joint connector (1600 cc and 1800 cc engine model and 2000 cc non-turbo MT model)
	8	★		Shield joint connector (Turbo model)
	20	★		Shield joint connector (2000 cc engine AT model)
B84	88	★		Engine and transmission control module (2000 cc engine AT model)
B85	3	★		Diode (Lighting)
B86	4	★		Blower motor resistor
B87	2	★		Blower motor

Connector			Connecting to	
No.	Pole	Color	No.	Name
B88	4	Brown		Evaporator thermoswitch
B92	8	★		Door lock timer
B97	10	★	R1	Rear wiring harness
B98	12	Black	R2	
B99	20	★	R3	
B100	20	★	F2	Front wiring harness (Non-turbo model)
	66	Gray	F2	Front wiring harness (SMJ) (Turbo model)
B101	13	★	D11	Front door cord RH
B113	9	★	D50	Front door cord LH
B115	2	Black		Check connector (ABS)
B116	4	Black		Select lever illumination light and power mode switch (AT)
B118	2	★		CD player illumination light
B119	4	★		Cigarette lighter
B120	14	★		Radio
B121	1	Black		Ground (Radio)
B122	6	★		Sensor ground joint connector (2000 cc non-turbo MT model)
B124	3	★	D53	Front door cord RH
B125	1	Black	B126	Read memory connector
B126	1	Black	B125	
B129	2	Black		Kick-down switch
B130	7	★		Clock
B131	4	Blue		Rear fog light relay
B132	7	★		Headlight leveling switch
B133	2	★		Hold mode switch
B134	12	Green		Engine and transmission control module
B135	16	Green		Engine and transmission control module
	16	Yellow		Engine control module (2000 cc engine MT model)
B136	22	Green		Engine and transmission control module
	22	Yellow		Engine control module (2000 cc engine MT model)
B137	26	Green		Engine and transmission control module
	26	Yellow		Engine control module (2000 cc engine MT model)
B138	1	★	B139	Joint connector (1600 cc and 1800 cc engine AT model)
B139	1	★	B136	
B140	6	Black		Headlight washer module
B141	12	★		Immobiliser control module
B142	4	★		Antenna amp. (Immobiliser)

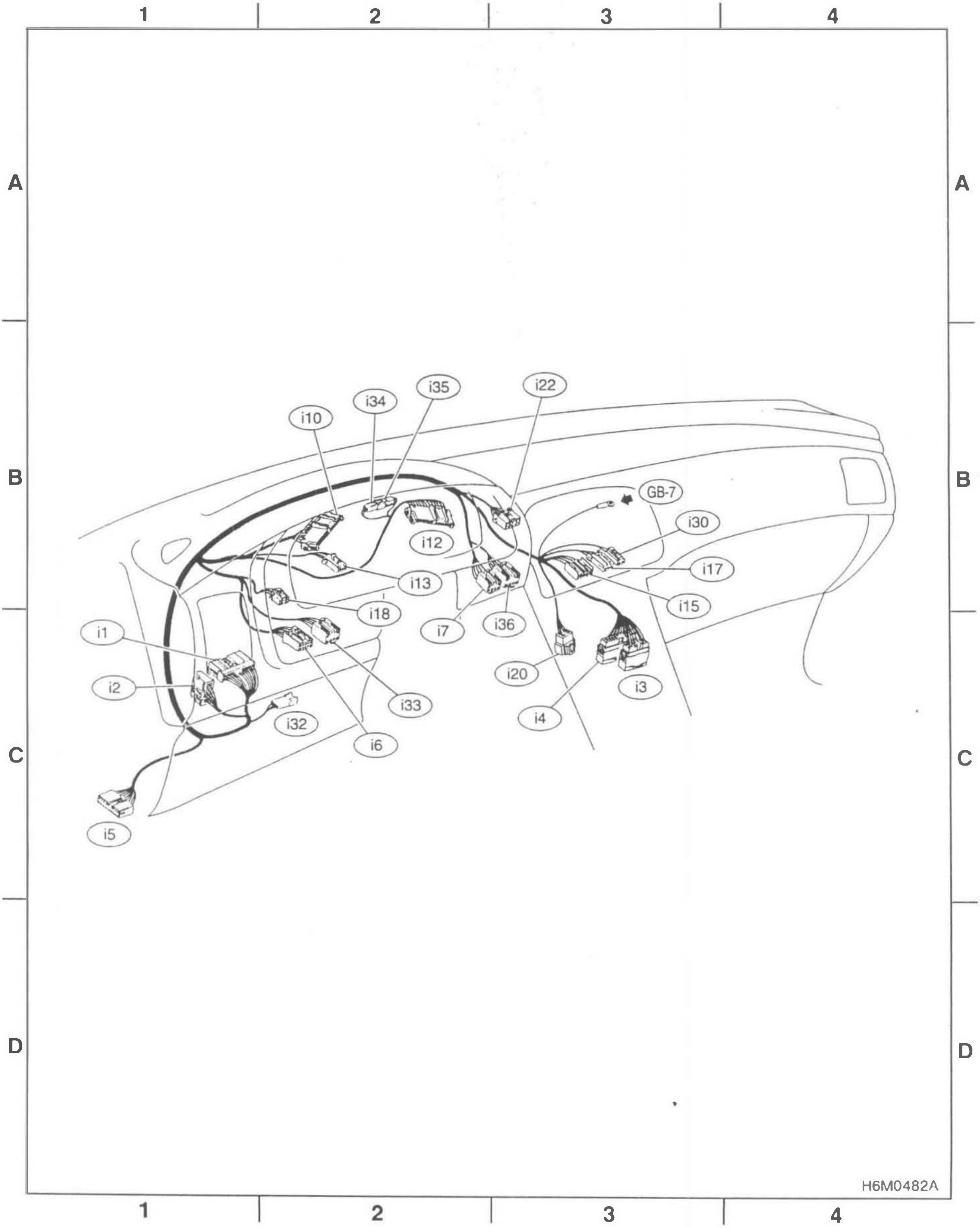
★: Non-colored


1
2
3
4
A
B
C
D
B45
B85
B62
B86
B71
B46
B47
B87
B88
B92
B48
B100
B68
B142
B72
B129
B99
B50
B61
B69
B97
B101
B49
B114
B64
B125
B80
B39
B98
A
B51
B126
B32
B38
B124
B36
B52
B37
B81
B118
B130
B79
B115
B119
B120
B82
B113
B141
B75
B121
*1
B116
B30
B132
B133
*2
B132
B31
B78
GR
B76
B131
B140
B42
B70
B41
*1: Without airbag model
*2: With airbag model
(2000 cc engine MT model)
(2000 cc engine AT model)
(1600 cc and 1800 cc engine model)
B84
B134
B135
B135
B136
B136
B83
B137
B137
A
A
A
B138
B122
B83
B83
B139
H6M0480A

5. INSTRUMENT PANEL WIRING HARNESS AND GROUND POINT (LHD MODEL)

Connector			Connecting to	
No.	Pole	Color	No.	Name
i1	24	Black	B36	Bulkhead wiring harness
i2	8	★	B37	
i3	12	★	B38	
i4	20	Blue	B39	
i5	15	Gray		F/B
i6	10	★		Remote control rearview mirror switch
i7	6	Brown		Front fog light switch
i10	16	Gray		Combination meter
i12	16	Gray		
i13	4	★		Combination meter (Airbag warning)
i15	6	★		Fan switch
i17	3	★		Mode control panel
i18	4	★		Rear defogger switch
i20	4	Blue	B80	Bulkhead wiring harness
i22	8	★		Hazard switch
i30	2	★		Mode control panel illumination light
i32	3	★		Diode (Rear fog light)
i33	6	Gray		Rear fog light switch
i34	2	Black	i35	Shield joint connector (Turbo model)
i35	2	Black	i34	
i36	6	Gray		Headlight washer switch

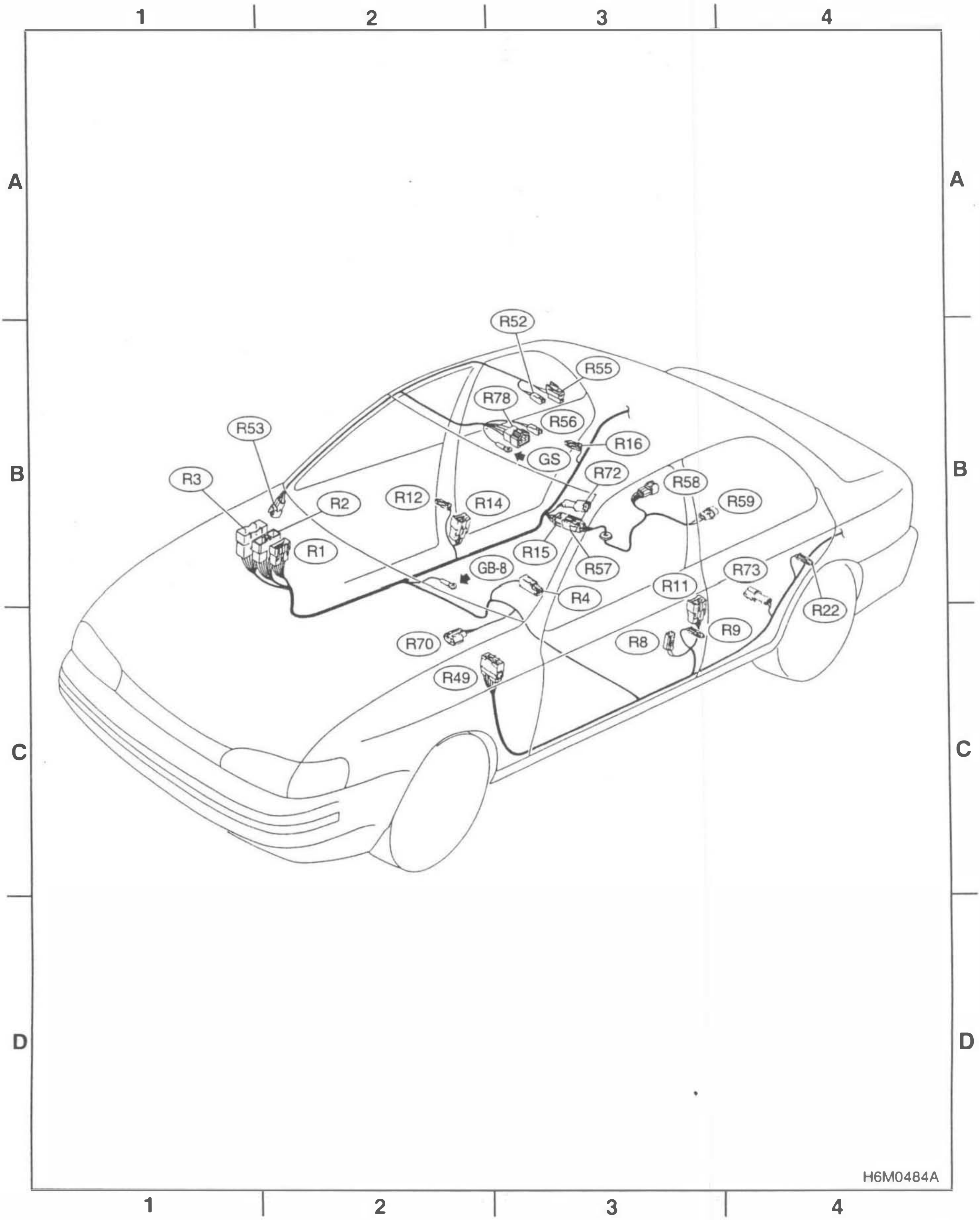
★: Non-colored


1
2
3
4
A
B
C
D
i35
i22
i34
i10
GB-7
i30
i12
i13
i17
i18
i15
i7
i36
i1
i20
i2
i33
i3
i32
i4
i6
i5
H6M0482A

6. REAR WIRING HARNESS AND GROUND POINT (LHD MODEL)

Connector			Connecting to	
No.	Pole	Color	No	Name
R1	10	★	B97	Bulkhead wiring harness
R2	12	Black	B98	
R3	20	★	B99	
R4	1	Black		Parking brake switch
R8	2	★		Seat belt switch
R9	1	Brown		Front door switch LH
R11	8	★	D21	Rear door adapter cord LH
R12	1	Brown		Front door switch RH
R14	8	★	D27	Rear door adapter cord RH
R15	6	Black	R57	Fuel tank cord
R16	1	Brown		Rear door switch RH
R22	1	Brown		Rear door switch LH
R49	12	Black	F55	Front wiring harness (With ABS model)
R52	2	★		Room light
R53	6	★	B45	Bulkhead wiring harness
R55	2	★		Sunroof control module and sunroof motor
R56	2	★		Spot light
R57	6	Black	R15	Rear wiring harness
R58	6	★		Fuel gauge module & fuel pump assembly
R59	2	★		Fuel gauge sub module
R70	3	★		ABS G sensor
R72	2	Gray		Rear ABS sensor RH
R73	2	Gray		Rear ABS sensor LH

★: Non-colored


1
2
3
4
A
B
C
D
R52
R55
R78
R56
R53
R16
GS
R3
R72
R58
R2
R12
R14
R59
R1
R15
R57
GB-8
R73
R11
R4
R22
R9
R8
R70
R49
H6M0484A