1. General Description

A: SPECIFICATION

Cooling system					Electric fan + Forced engine coolant circulation system
Total engine coolant capacity				ℓ (US qt, Imp qt)	7.6 (8.0, 6.7)
Water pump	Type				Centrifugal impeller type
	Discharge performance	Discharge rate		ℓ (US gal, Imp gal) /min.	240 (63.4, 52.8)
		Pump speed — Discharge pressure			4,956 rpm — 140 kPa (14.0 mAq)
		Engine coolant temperature			80°C (176°F)
	Impeller diameter			mm (in)	66 (2.60)
	Number of impeller blades				8
	Pump sprocket outer diameter			mm (in)	60.60 (2.39)
Thermostat	Type				Wax pellet type
	Starting temperature to open				80 — 84°C (176 — 183°F)
	Fully opens				95°C (203°F)
	Valve lift			mm (in)	9.0 (0.354) or more
	Valve bore			mm (in)	35 (1.38)
Radiator fan	Motor input	Main fan		W	200
		Sub fan		W	200
	Fan diameter / Blade	Main fan			320 mm (12.6 in)/5
		Sub fan			320 mm (12.6 in)/7
Radiator	Type				Cross flow, pressure type
	Core dimensions	Width × Height × Thickness		mm (in)	674.2 × 478.6 × 27 (26.543 × 18.842 × 1.06)
	Pressure range in which cap valve is open		Positive pressure side	Standard	73.6 — 103.0 (0.75 — 1.05, 11 — 15)
				Limit	63.6 (0.65, 9)
		kPa (kg/cm^2, psi)	Negative pressure side	Standard	–1.0 — –4.9 (–0.01 — –0.05, –0.1 — –0.7)
	Fins				Corrugated fin type
Reservoir tank	Capacity			ℓ (US qt, Imp qt)	0.45 (0.48, 0.40)

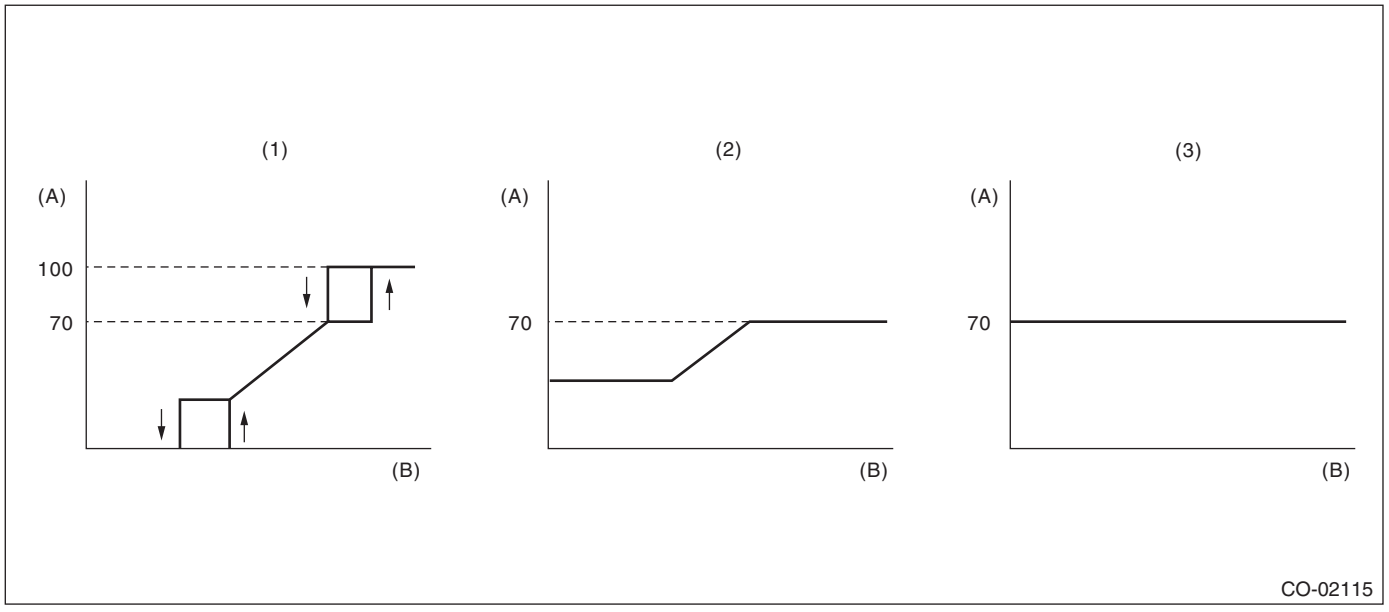
	Recommended materials	Item number	Alternative
Coolant	SUBARU SUPER COOLANT (Concentrated type)	—	—
	SUBARU SUPER COOLANT (Diluted type)	K0670Y0001	
Water for dilution	Distilled water	—	Soft water or tap water
Cooling system protective agent	Cooling system conditioner	SOA345001	—

• Outside temperature: less than 35°C (95°F)

A/C compressor load		Engine coolant temperature		
		Increase: less than 95°C (203°F) Decrease: less than 92°C (198°F)	Increase: 98 — 101°C (203 — 214°F) Decrease: 92 — 99°C (198 — 210°F)	Increase: 102°C (216°F) or more Decrease: 100°C (212°F) or more
OFF		0%	Refer to fig. (1)	100%
ON	Middle pressure switch OFF	Refer to fig. (2)		100%
	Middle pressure switch ON	Refer to fig. (3)		100%

• OUTSIDE TEMPERATURE: 35°C (95°F) OR MORE

Vehicle speed	A/C compressor load		Engine coolant temperature		
			Increase: less than 95°C (203°F) Decrease: less than 92°C (198°F)	Increase: 95 — 101°C (203 — 214°F) Decrease: 92 — 99°C (198 — 210°F)	Increase: 102°C (216°F) or more Decrease: 100°C (212°F) or more
During acceleration: 19 km/h (12 MPH) or less During deceleration: 10 km/h (6 MPH) or less	OFF		Refer to fig. (1)		100%
	ON	Middle pressure switch OFF	Refer to fig. (2)		100%
		Middle pressure switch ON	100%		
During acceleration: 20 — 69 km/h (12 — 43 MPH) During deceleration: 11 — 64 km/h (7 — 40 MPH)	OFF		Refer to fig. (1)		100%
	ON	Middle pressure switch OFF	100%		
		Middle pressure switch ON	100%		
During acceleration: 70 — 105 km/h (43 — 65 MPH) During deceleration: 65 — 103 km/h (40 — 64 MPH)	OFF		Refer to fig. (1)		100%
	ON	Middle pressure switch OFF	Refer to fig. (2)		100%
		Middle pressure switch ON	Refer to fig. (3)		100%
During acceleration: 106 km/h (66 MPH) or more During deceleration: 104 km/h (65 MPH) or more	OFF		Refer to fig. (1)		100%
	ON	Middle pressure switch OFF	Refer to fig. (2)		100%
		Middle pressure switch ON	Refer to fig. (3)		100%



(A) Fan speed (%)

(B) Water temperature

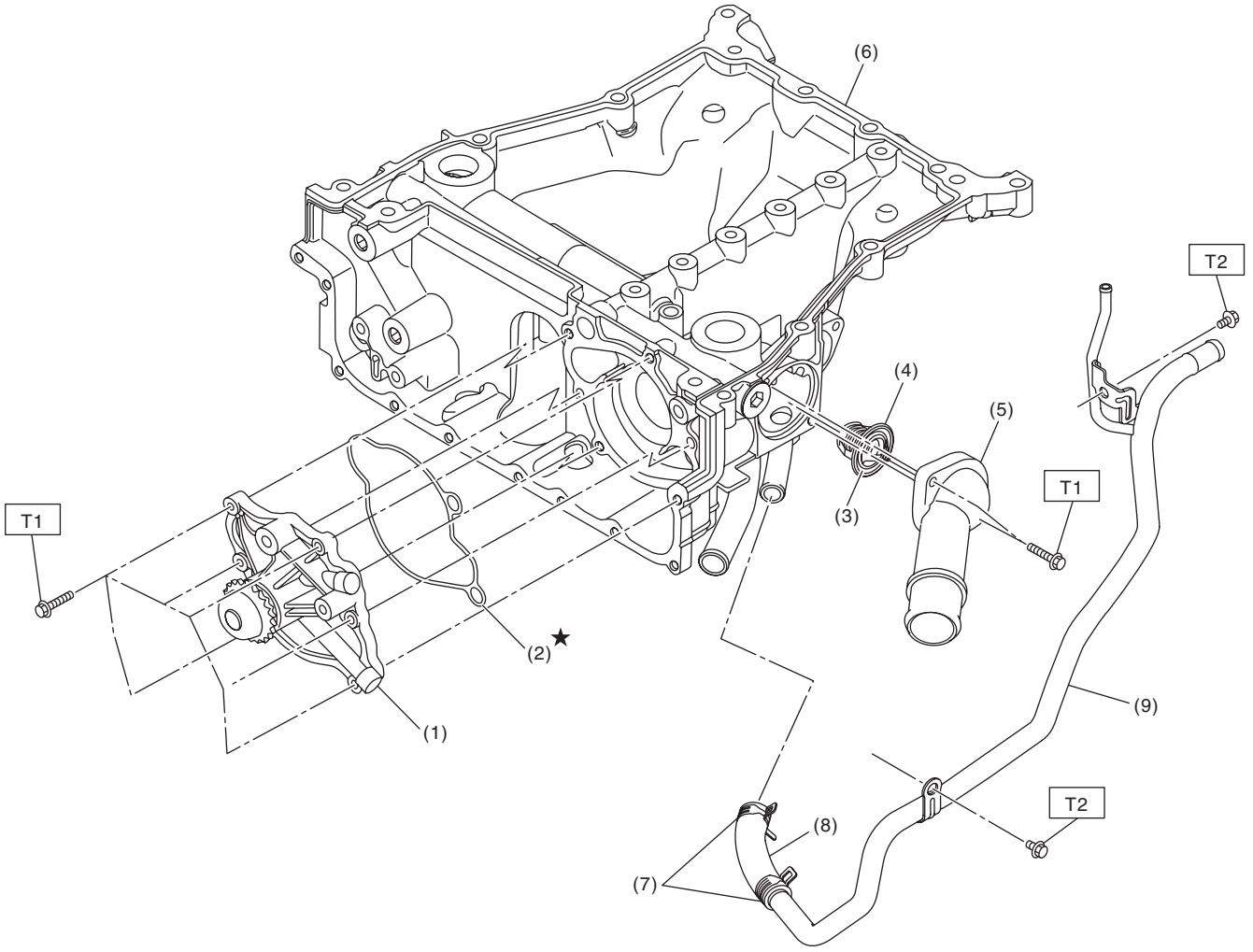
(1) A/C OFF control

(2) A/C ON control (A/C middle pressure switch OFF)

(3) A/C ON control (A/C middle pressure switch ON)

B: COMPONENT

1. WATER PUMP & WATER PIPE

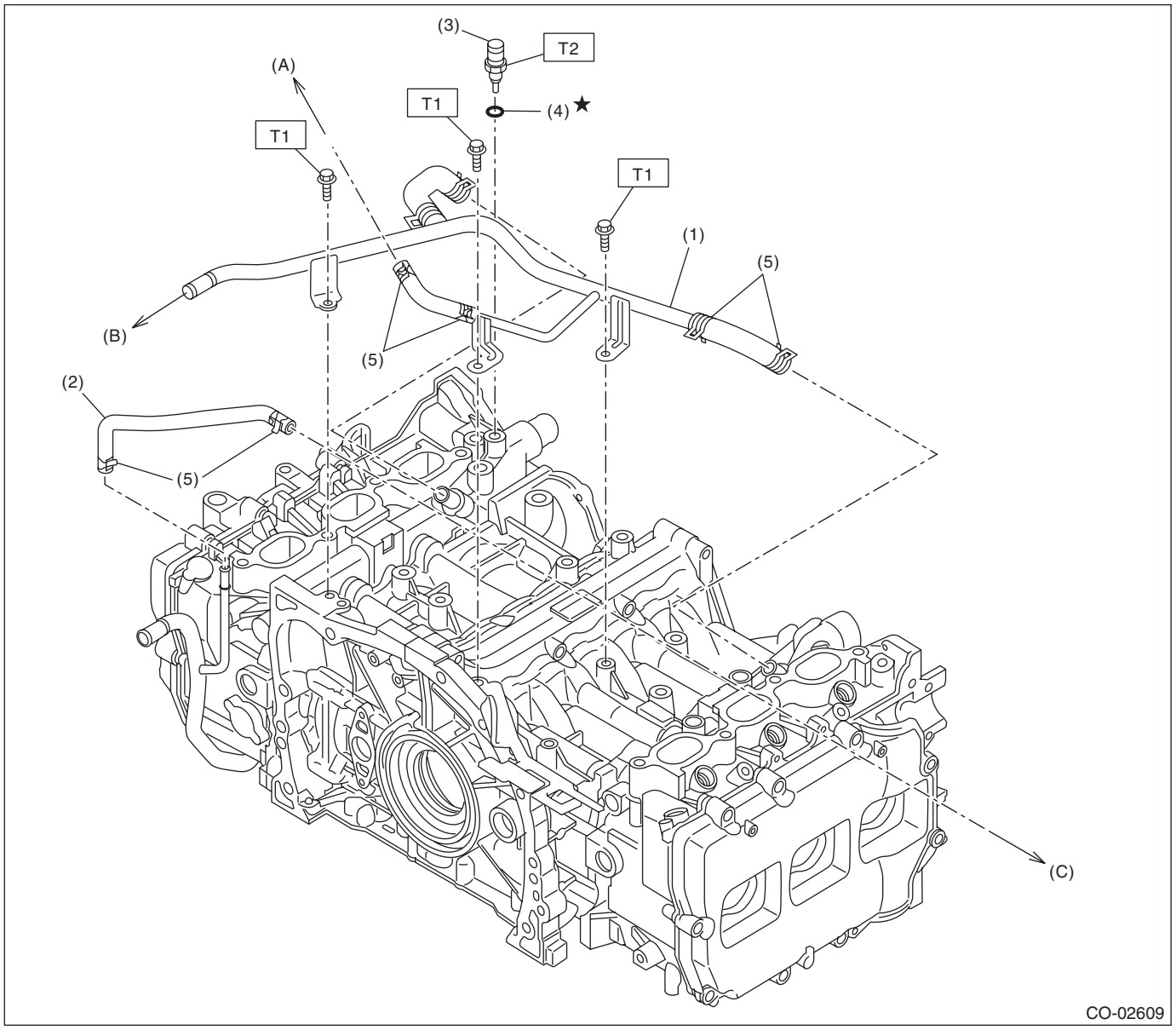


CO-02757

(1) Water pump ASSY
(2) O-ring
(3) Thermostat
(4) Gasket
(5) Thermostat cover
(6) Oil pan upper
(7) Clip
(8) Hose
(9) Water return pipe

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.7, 4.7)
T2: 16 (1.6, 11.8)

2. ENGINE COOLANT TEMPERATURE SENSOR & HEATER HOSE

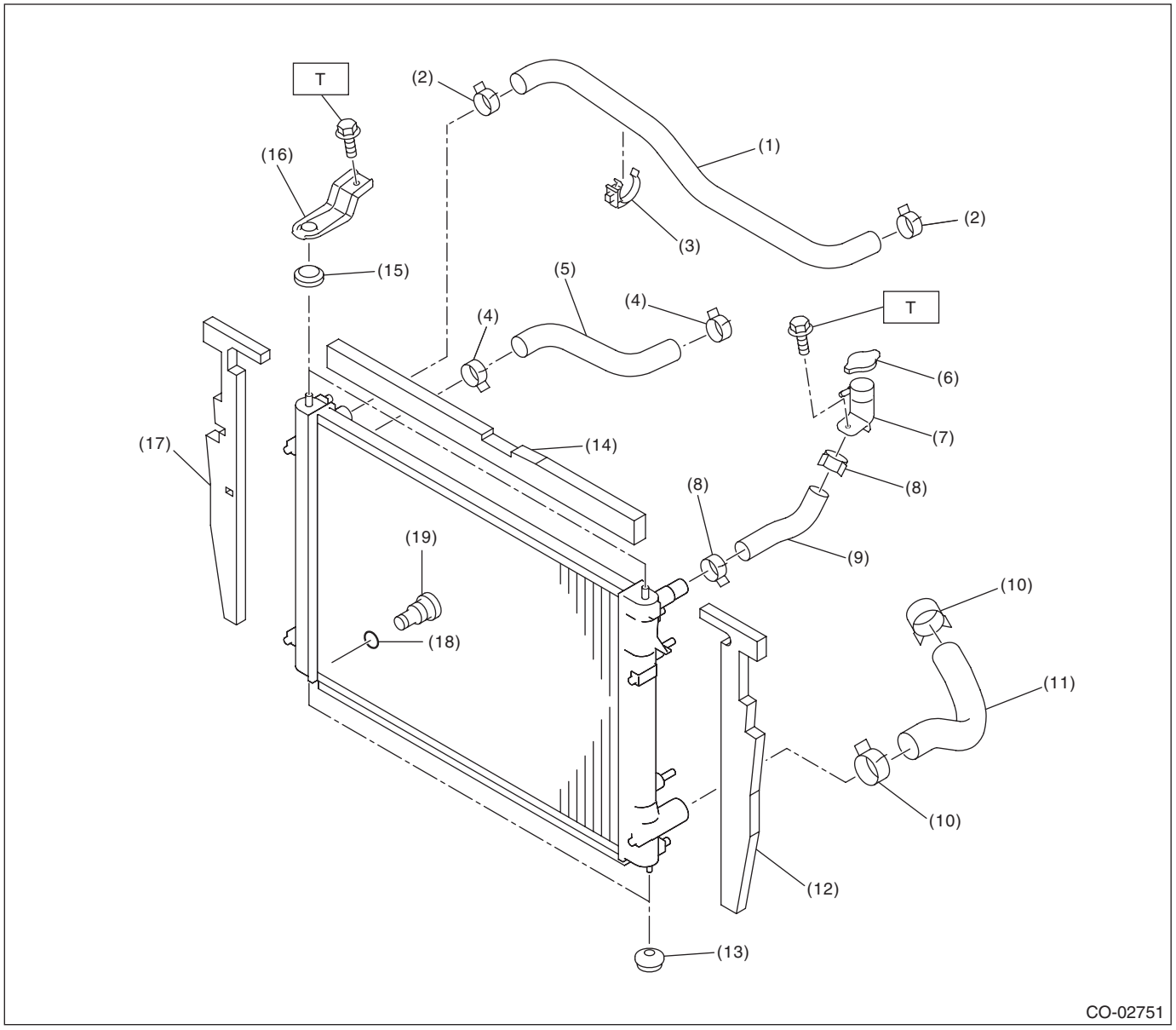


(A) To the throttle body
(B) To the heater hose on body side
(C) To the throttle body
(1) Heater pipe
(2) Preheater hose
(3) Engine coolant temperature sensor
(4) Gasket
(5) Clip

Tightening torque:N·m (kgf-m, ft-lb)
T1: 19 (1.9, 14.0)
T2: 22 (2.2, 16.2)

3. RADIATOR AND RADIATOR FAN

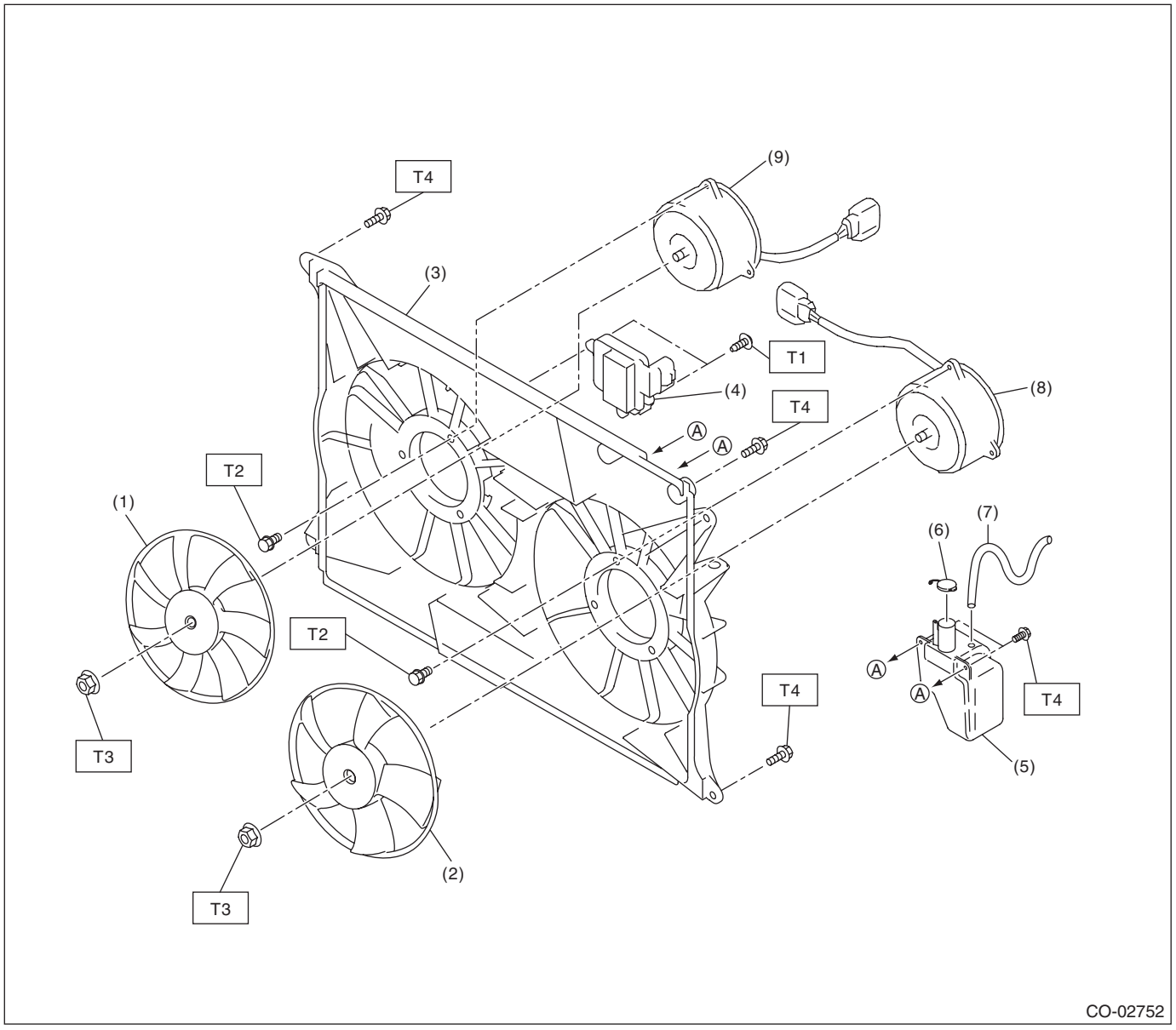
- Radiator



(1) Radiator upper hose LH
(2) Clip
(3) Clip
(4) Clip
(5) Radiator upper hose RH
(6) Radiator cap
(7) Filler neck
(8) Clip
(9) Radiator cap hose
(10) Clip
(11) Radiator lower hose
(12) Gasket
(13) Radiator lower cushion
(14) Gasket
(15) Radiator upper cushion
(16) Radiator upper bracket
(17) Gasket
(18) O-ring
(19) Drain plug

Tightening torque:N·m (kgf-m, ft-lb)
T: 12 (1.2, 8.9)

- Radiator fan



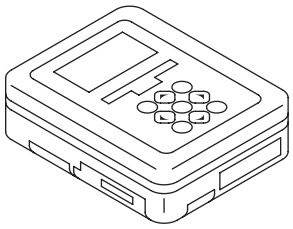
(1)	Radiator sub fan	(6)	Reservoir tank cap	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Radiator main fan	(7)	Over flow hose	***T1: 2.6 (0.3, 1.9)***
(3)	Radiator fan shroud	(8)	Radiator main fan motor	***T2: 3.8 (0.4, 2.8)***
(4)	Radiator fan control unit	(9)	Radiator sub fan motor	***T3: 6.3 (0.6, 4.6)***
(5)	Reservoir tank			***T4: 7.5 (0.8, 5.5)***

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Prepare a container and cloth to prevent scattering of engine coolant when performing work where engine coolant can be spilled. If the fuel spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing engine coolant.

D: PREPARATION TOOL

1. SPECIAL TOOL

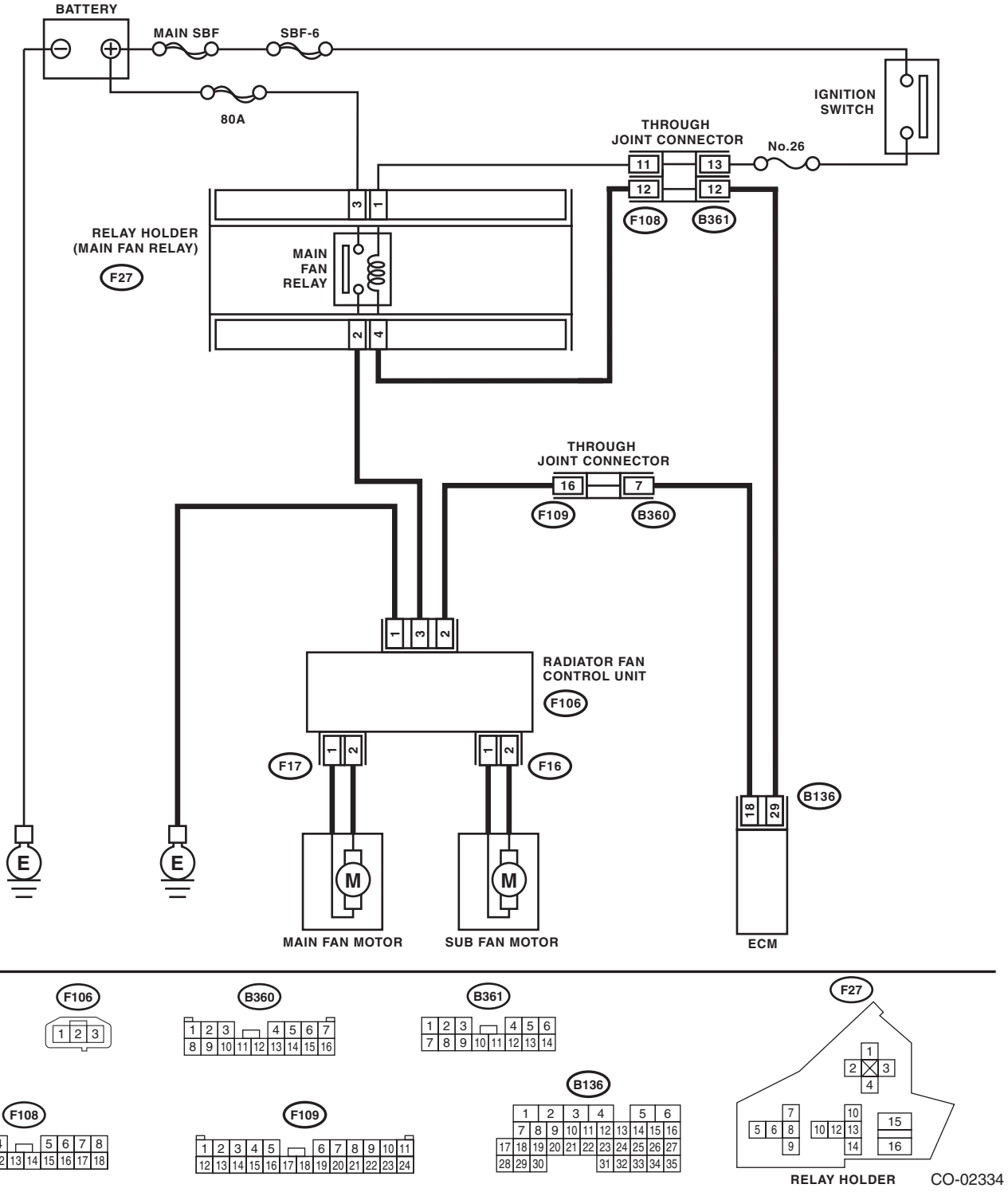
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting for electrical system.

2. GENERAL TOOL

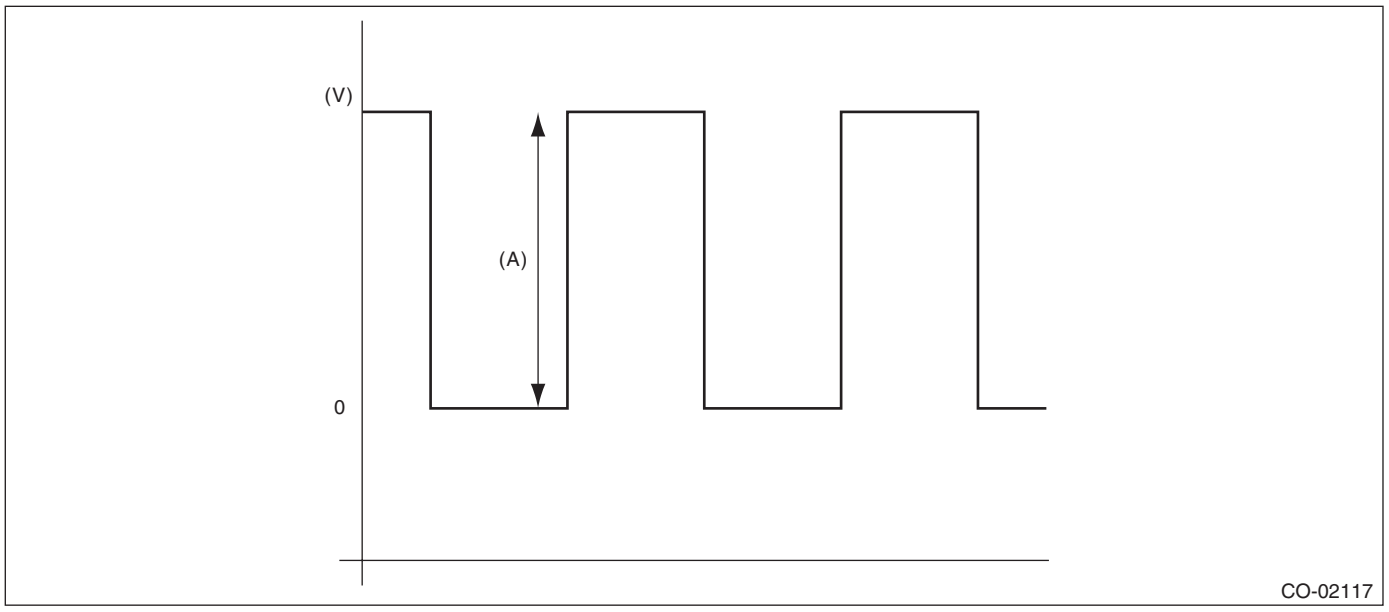
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Radiator cap tester	Used for checking radiator and radiator cap.

2. Radiator Fan System

A: WIRING DIAGRAM



B: RADIATOR FAN CONTROL OUTPUT WAVEFORM



(A) 5 V

C: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is 95°C (203°F) or more.
- A/C switch is turned OFF.
- Vehicle speed is 19 km/h (12 MPH) or less.

TROUBLE SYMPTOMS:

Radiator main fan and radiator sub fan do not rotate under the above conditions.

	Step	Check	Yes	No
1	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay from the relay holder. 3) Measure the resistance of the main fan relay switch terminal.	Is the resistance 1 MΩ or more?	Go to step **2**.	Replace the main fan relay.
2	**CHECK MAIN FAN RELAY.** 1) Connect the battery to the terminal on main fan relay coil side. 2) Measure the resistance between main fan relay switch terminals.	Is the resistance less than 1 Ω?	Go to step **3**.	Replace the main fan relay.
3	**CHECK POWER SUPPLY FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM terminal and chassis ground. ***Connector & terminal*** ***(B136) No. 29 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the power supply line.
4	**CHECK POWER SUPPLY FOR RADIATOR FAN CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ECM. 3) Disconnect the connector from radiator fan control unit. 4) Turn the ignition switch to ON. 5) Measure the voltage between radiator fan control unit terminal and chassis ground. ***Connector & terminal*** ***(F106) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **5**.	Repair the power supply line.
5	**CHECK HARNESS BETWEEN ECM AND RADIATOR FAN CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between radiator fan control unit and ECM connector. ***Connector & terminal*** ***(B136) No. 18 — (F106) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit of harness between ECM and radiator fan control unit.
6	**CHECK GROUND CIRCUIT FOR RADIATOR FAN CONTROL UNIT.** 1) Connect the connector to ECM and radiator fan control unit. 2) Measure the resistance between radiator fan control unit connector and chassis ground. ***Connector & terminal*** ***(F106) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **7**.	Repair the open circuit of harness between radiator fan control unit connector and chassis ground.

	Step	Check	Yes	No
7	**CHECK MAIN FAN MOTOR.** 1) Disconnect the connector from radiator fan control unit. 2) Connect the battery positive (+) terminal to terminal No. 1 of the main fan motor, and the ground (–) terminal to terminal No. 2.	Does the main fan motor rotate?	Go to step **8**.	Replace the main fan motor.
8	**CHECK SUB FAN MOTOR.** 1) Disconnect the connector from radiator fan control unit. 2) Connect the battery positive (+) terminal to terminal No. 1 of the sub fan motor, and the ground (–) terminal to terminal No. 2.	Does the sub fan motor rotate?	Go to step **9**.	Replace the sub fan motor.
9	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the delivery (test) mode connector. 3) Turn the ignition switch to ON. 4) Check the output waveform using oscilloscope. <Ref. to CO(H6DO)-10, RADIATOR FAN CONTROL OUTPUT WAVEFORM, Radiator Fan System.> ***Connector & terminal*** ***(B134) No. 18 (+) — Chassis ground (–):***	Is waveform being output?	Replace the radiator fan control unit. <Ref. to CO(H6DO)-33, Radiator Fan Control Unit.>	Replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>

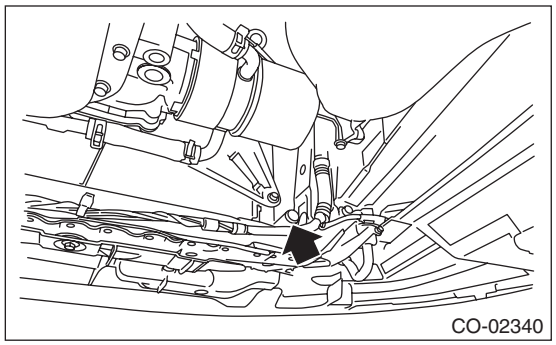
3. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift up the vehicle.
2) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
3) Remove the drain plug to drain engine coolant into container.

NOTE:
Remove the radiator cap so that engine coolant will drain faster.


CO-02340

4) Install the drain plug.
5) Install the under cover. <Ref. to EI-18, INSTALLATION, Front Under Cover.>

2. FILLING OF ENGINE COOLANT

1) Pour cooling system conditioner through the filler neck.

Cooling system protective agent:
For cooling system protective agent, refer to "SPECIFICATION". <Ref. to CO(H6DO)-2, SPECIFICATION, General Description.>

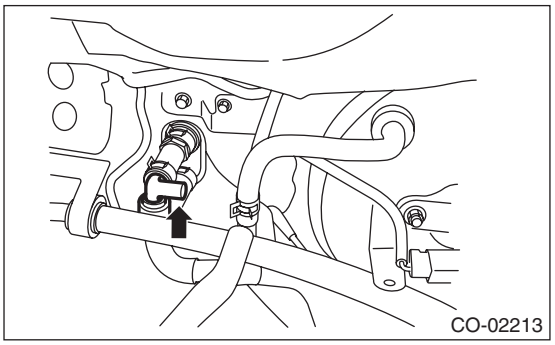
2) Pour engine coolant into the radiator up to the filler neck position.

Recommended engine coolant:
Refer to "SPECIFICATION" for recommended engine coolant. <Ref. to CO(H6DO)-2, SPECIFICATION, General Description.>

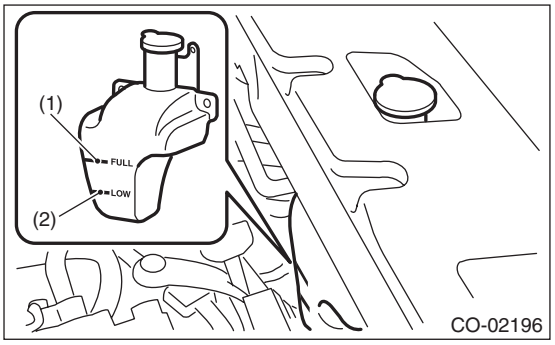
Engine coolant level:
Refer to "SPECIFICATION" for engine coolant level. <Ref. to CO(H6DO)-2, SPECIFICATION, General Description.>

Engine coolant concentration:
Refer to "ADJUSTMENT" for the recommended engine coolant concentration. <Ref. to CO(H6DO)-15, ADJUSTMENT, Engine Coolant.>

NOTE:
The SUBARU Super Coolant contains anti-freeze and anti-rust agents, and is especially made for Subaru engines with an aluminum cylinder block. Always use SUBARU Super Coolant, since other coolant may cause corrosion.
3) Open the air bleeding valve on the heater hose side.


CO-02213

4) If the engine coolant level drops, add engine coolant into radiator up to the filler neck position.
5) Close the air bleeder valve when engine coolant comes out of the air bleeder valve on the heater hose side.
6) If the engine coolant level drops, add engine coolant into radiator up to the filler neck position.
7) When engine coolant has come out from the air bleeding valve on the radiator side, close the valve.
8) Fill engine coolant into the reservoir tank up to "FULL" level.



CO-02196

(1) FULL
(2) LOW

9) Close the radiator cap and start the engine. Race 5 to 6 times at 3,000 rpm or less, then stop the engine. (Complete this operation within 40 seconds.)
10) Wait for one minute after the engine stops, and open the radiator cap. If the engine coolant level drops, add engine coolant into radiator up to the filler neck position.
11) Perform the procedures 9) and 10) again.
12) Attach the radiator cap and reservoir tank cap properly.

13) Start the engine and operate the heater at maximum hot position and the blower speed setting to “LO”.
14) Run the engine at 2,000 rpm or less until radiator fan starts and stops.

NOTE:
• Be careful with the engine coolant temperature gauge to prevent overheating.
• If the radiator hose becomes hardened with the pressure of engine coolant, air bleeding operation seems to be almost completed.

15) Stop the engine and wait until the engine coolant temperature lowers to 30°C (86°F) or less.
16) Open the radiator cap. If the engine coolant level drops, add engine coolant into the radiator up to the filler neck position and the reservoir tank to “FULL” level.
17) Attach the radiator cap and reservoir tank cap properly.
18) Set the heater setting to maximum hot position and the blower speed setting to “LO” and start the engine. Perform racing at 3,000 rpm or less. If the flowing sound is heard from the heater core, repeat the procedures from step 14).

B: ADJUSTMENT

1. PROCEDURE TO ADJUST THE CONCENTRATION OF THE SUBARU SUPER COOLANT

CAUTION:
Use the SUBARU Super Coolant with a 50 — 60% concentration in order to obtain maximum anti-freeze and anti-rust performance.

To adjust the concentration of SUBARU Super Coolant according to temperature, find the proper SUBARU Super Coolant concentration in the table, and add diluting water to the SUBARU Super Coolant (undiluted type) until it reaches the proper dilution.

Relationship of SUBARU Super Coolant concentration and freezing temperature			
SUBARU Super Coolant concentration	50%	55%	60%
Freezing temp.	–36°C (–33°F)	–41°C (–42°F)	–50°C (–58°F)

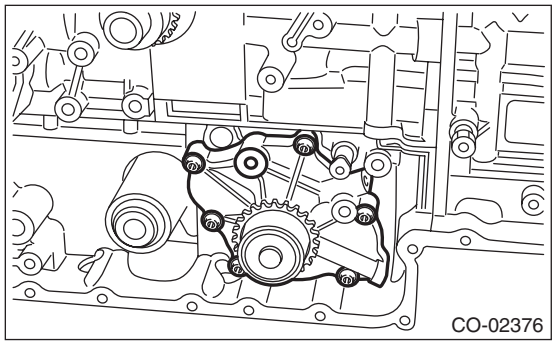
Engine coolant and diluting water:

Refer to "SPECIFICATION" for the recommended engine coolant and diluting water. <Ref. to CO(H6DO)-2, SPECIFICATION, General Description.>

4. Water Pump

A: REMOVAL

1) Remove the radiator. <Ref. to CO(H6DO)-19, REMOVAL, Radiator.>
2) Remove the V-belts. <Ref. to ME(H6DO)-46, REMOVAL, V-belt.>
3) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
4) Remove the chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Chain Cover.>
5) Remove the timing chain assembly. <Ref. to ME(H6DO)-55, REMOVAL, Timing Chain Assembly.>
6) Remove the water pump from the oil pan upper.

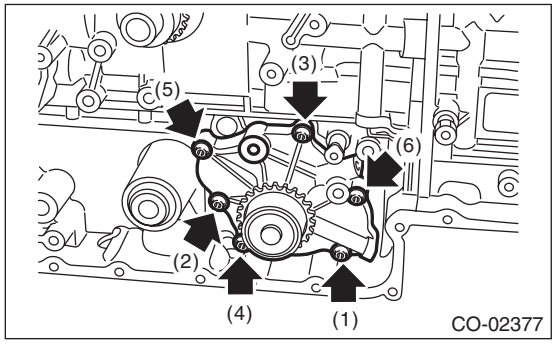


B: INSTALLATION

1) Tighten the bolts in the numerical order as shown in the figure, and install water pump to the oil pan upper.

NOTE:
Use new O-rings.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



2) Install the timing chain assembly. <Ref. to ME(H6DO)-61, INSTALLATION, Timing Chain Assembly.>
3) Install the chain cover. <Ref. to ME(H6DO)-50, INSTALLATION, Chain Cover.>
4) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>
6) Install the radiator. <Ref. to CO(H6DO)-21, INSTALLATION, Radiator.>
7) Fill engine coolant. <Ref. to CO(H6DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

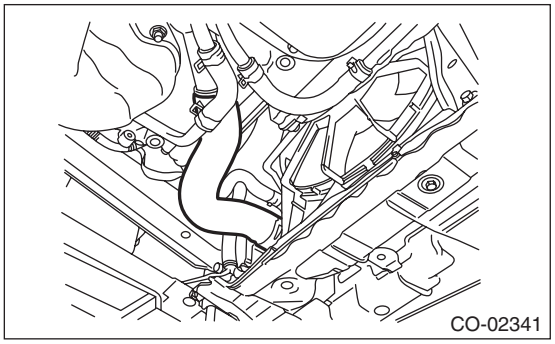
C: INSPECTION

1) Check the water pump bearing for smooth rotation.
2) Check the water pump sprocket for abnormalities.
3) Make sure the impeller is not abnormally deformed or damaged.
4) After water pump installation, check pulley shaft for engine coolant leaks or noise. If leaks or noise are noted, replace the water pump assembly.

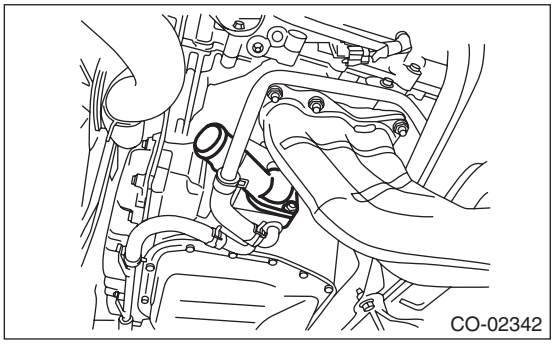
5. Thermostat

A: REMOVAL

1) Lift up the vehicle.
2) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
3) Drain engine coolant completely. <Ref. to CO(H6DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Remove the radiator lower hose from the radiator lower and the thermostat cover.



5) Remove the thermostat cover, and then remove the thermostat.



B: INSTALLATION

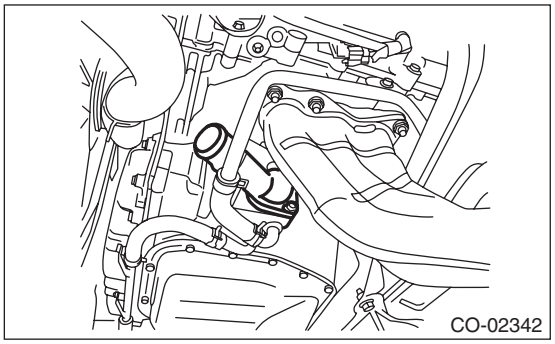
1) Install a gasket to thermostat.

NOTE:
Use a new gasket.

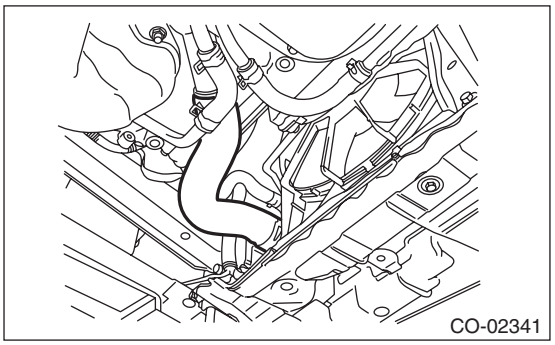
2) Install the thermostat and thermostat cover.

NOTE:
Install the parts with the jiggle pin facing the upside.

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



3) Install the radiator lower hose to the radiator lower and the thermostat cover.



4) Install the under cover. <Ref. to EI-18, INSTALLATION, Front Under Cover.>
5) Lower the vehicle.
6) Fill engine coolant. <Ref. to CO(H6DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

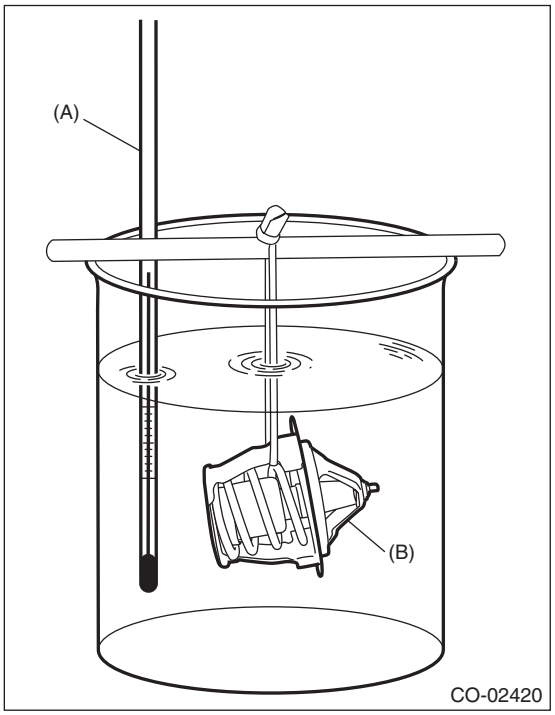
1) Check that the thermostat does not have deformation, cracks or damage.
2) Check that the thermostat valve closes completely at an ambient temperature.
3) Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and check the temperature and valve lift when the valve begins to open and when the valve is fully opened. Replace the thermostat if faulty.

NOTE:
• During the test, agitate the water for even temperature distribution.
• Leave the thermostat in the boiling water for five minutes or more before measuring the valve lift.
• Hold the thermostat with a wire or the like to avoid contacting the container.

Starting temperature to open:
80 — 84°C (176 — 183°F)

Full open temperature:
95°C (203°F)

Total valve lift:
9.0 mm (0.354 in) or more



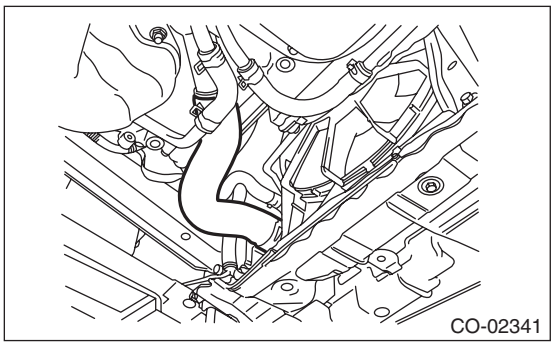
(A) Thermometer
(B) Thermostat

6. Radiator

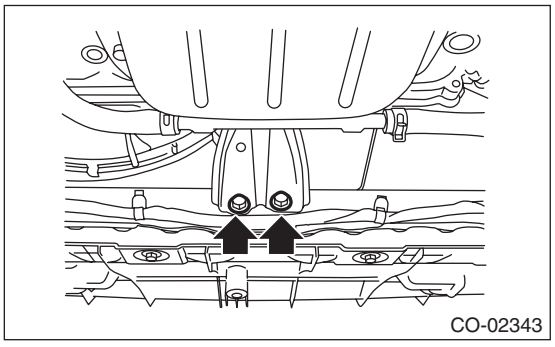
A: REMOVAL

CAUTION:
The radiator is pressurized when the engine and radiator are hot. Wait until engine and radiator cool down before working on the radiator.

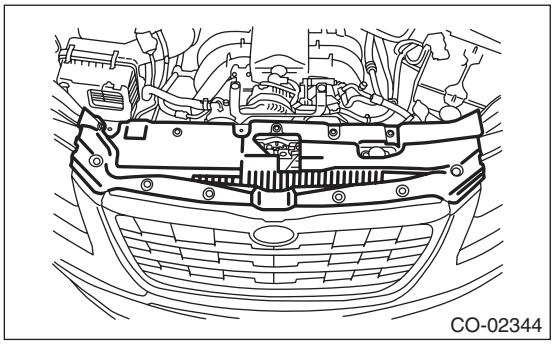
1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Lift up the vehicle.
4) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
5) Drain engine coolant completely. <Ref. to CO(H6DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Disconnect the radiator lower hose from the radiator lower.


CO-02341

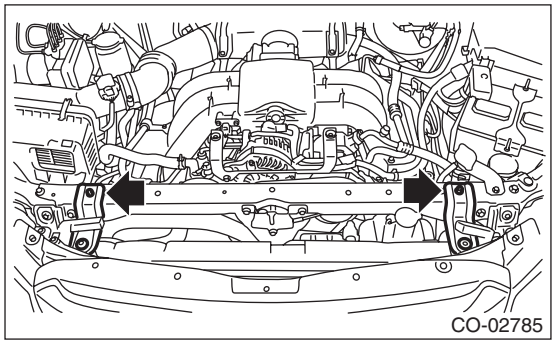
7) Remove the bolts on the underside of the radiator stay.


CO-02343

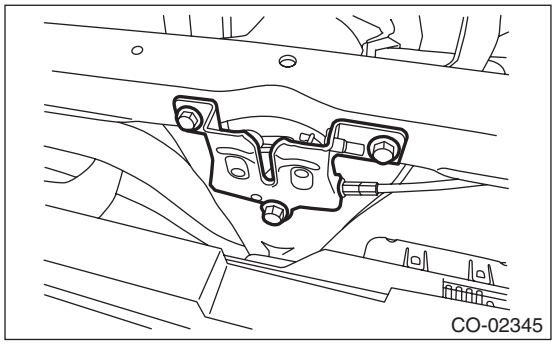
8) Lower the vehicle.
9) Remove the air intake duct. <Ref. to IN(H6DO)-9, REMOVAL, Air Intake Duct.>
10) Remove the front upper cover.


CO-02344

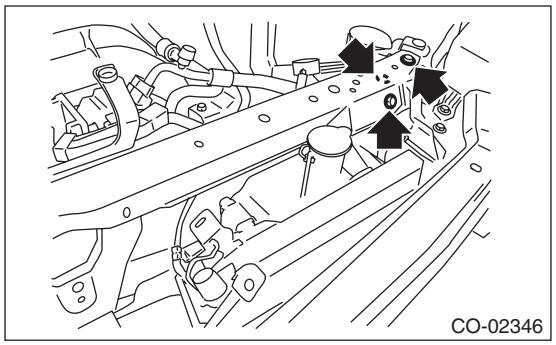
11) Remove the radiator upper brackets.


CO-02785

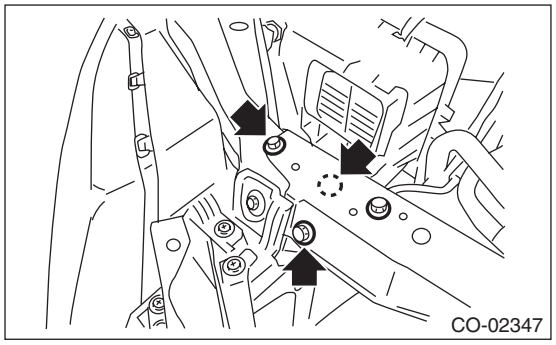
12) Remove the radiator stay.
(1) Remove the latch.


CO-02345

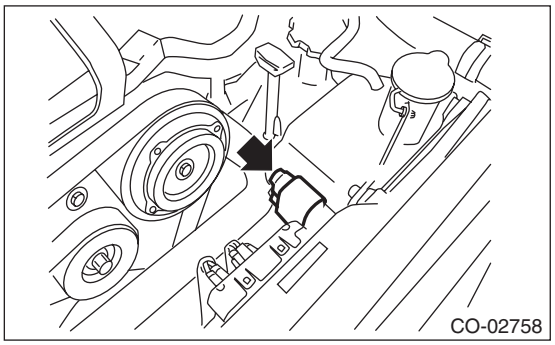
(2) Remove the radiator upper hose LH from the clip.
(3) Remove the front hood cable fixing clip from the radiator stay.
(4) Remove the bolts on the left side of the radiator stay.


CO-02346

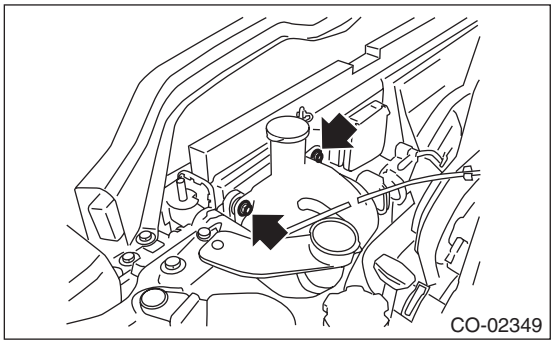
(5) Remove the bolts on the right side of the radiator stay.


CO-02347

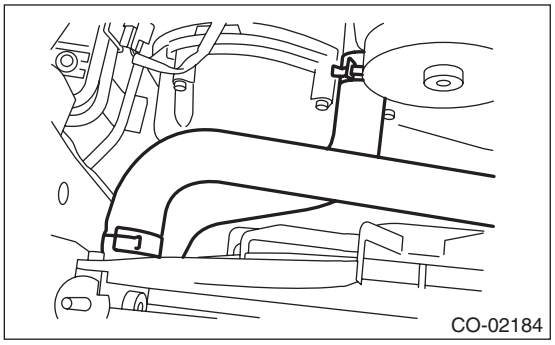
13) Disconnect the connector from radiator fan control unit.



14) Remove the reservoir tank.

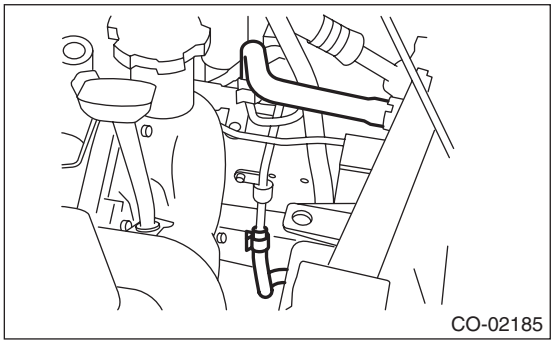


15) Disconnect the radiator upper hoses LH and RH from the radiator.



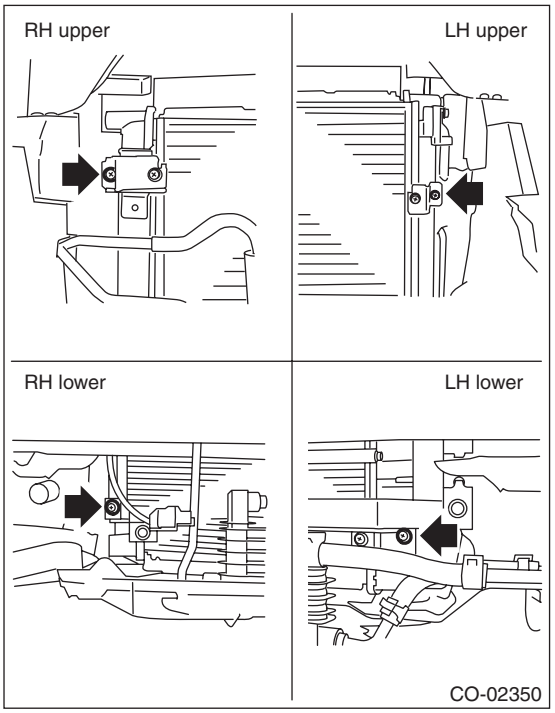
16) Disconnect the ATF cooler hose from the radiator.

NOTE:
Plug the ATF pipe to prevent ATF leaks.

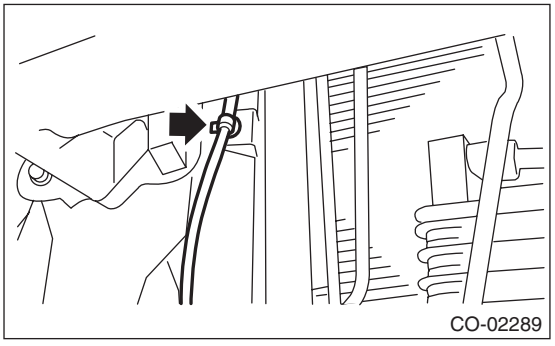


17) Remove the front bumper. <Ref. to EI-22, REMOVAL, Front Bumper.>

18) Remove the bolts which hold the radiator and condenser.



19) Remove the clip holding the ambient sensor harness.



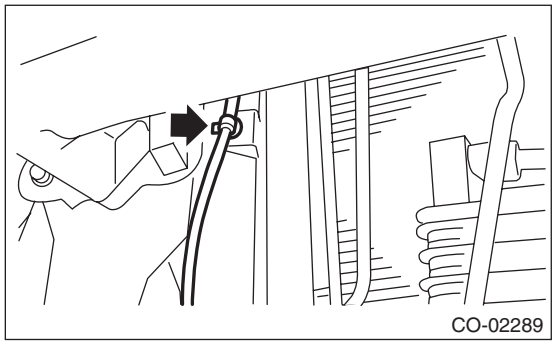
20) Lift the radiator up and away from vehicle.
21) Remove the radiator lower cushion.

B: INSTALLATION

1) Install the radiator lower cushion.
2) Install the radiator to vehicle.

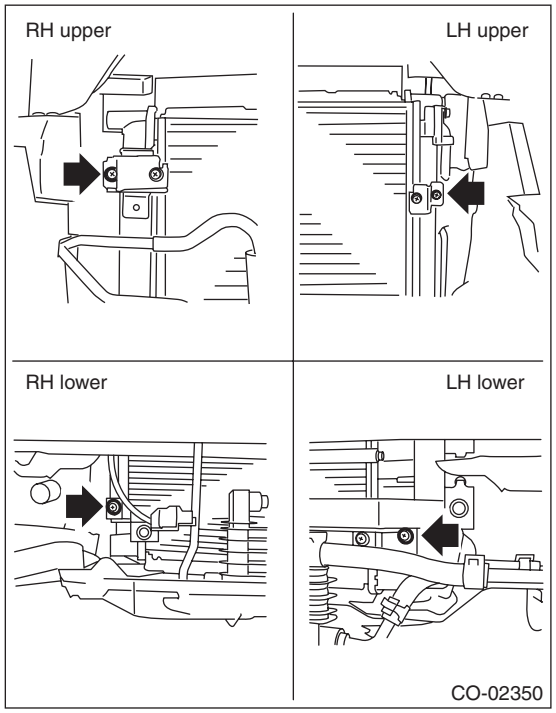
NOTE:
Insert pins on the lower side of radiator into the radiator lower cushions on vehicle side.

3) Hold the ambient sensor harness with clip.



4) Hold the radiator and condenser with bolts.

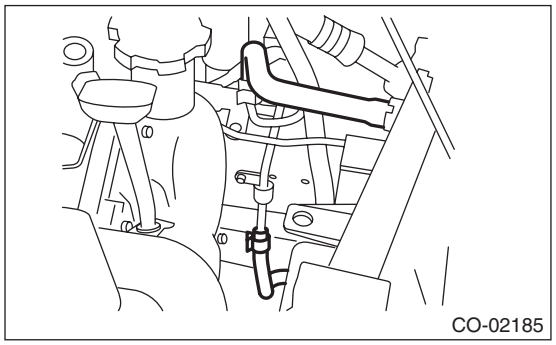
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



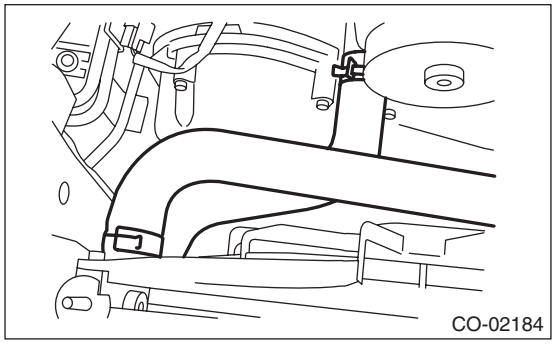
5) Install the front bumper. <Ref. to EI-23, INSTALLATION, Front Bumper.>

6) Connect the ATF cooler hoses.

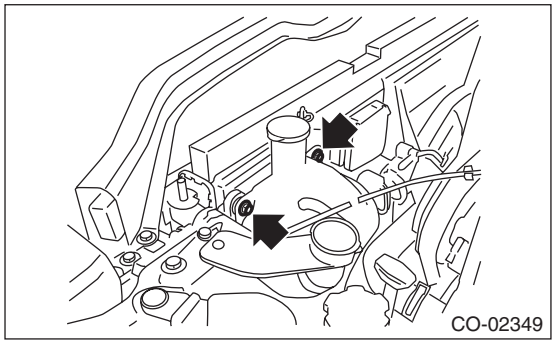
NOTE:
Use a new ATF hose.



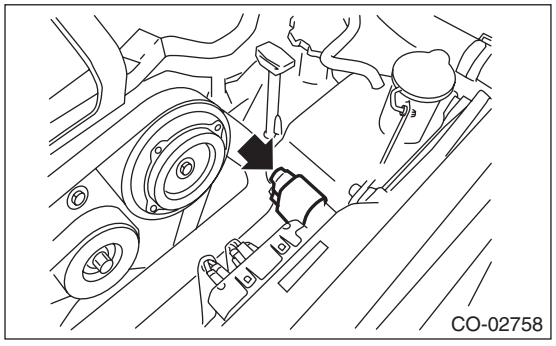
7) Connect the radiator upper hoses LH and RH.



8) Install the reservoir tank.

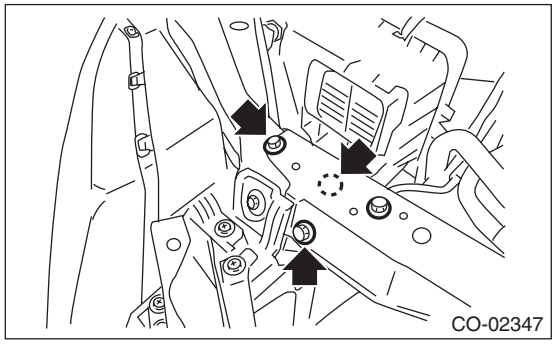


9) Connect the connector to radiator fan control unit.



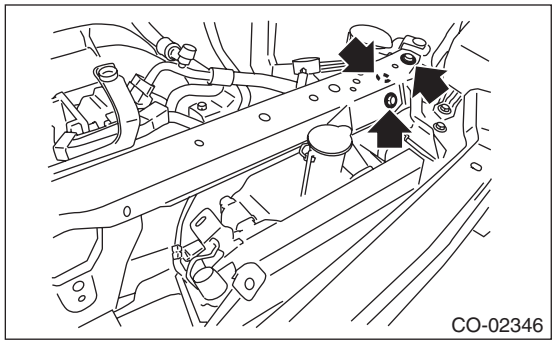
10) Install the radiator stay.
(1) Tighten the bolts on the right side of the radiator stay.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



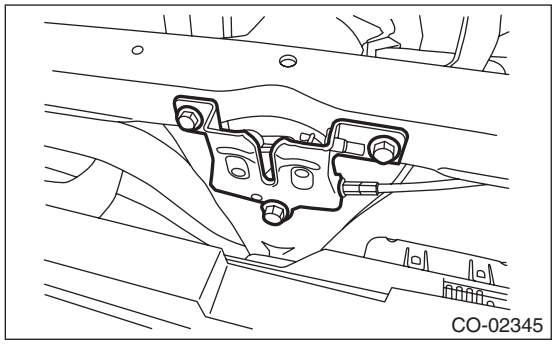
(2) Tighten the bolts on the left side of the radiator stay.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



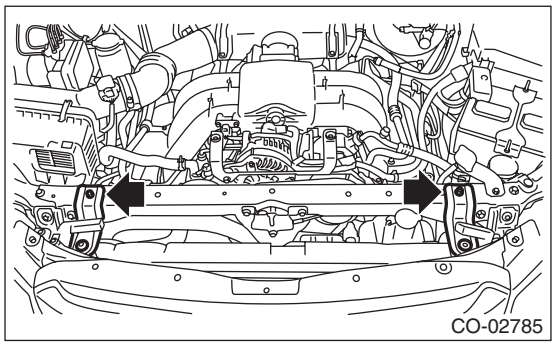
(3) Install the front hood cable fixing clip to the radiator stay.
(4) Install the radiator upper hose LH to the clip.
(5) Install the latch.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

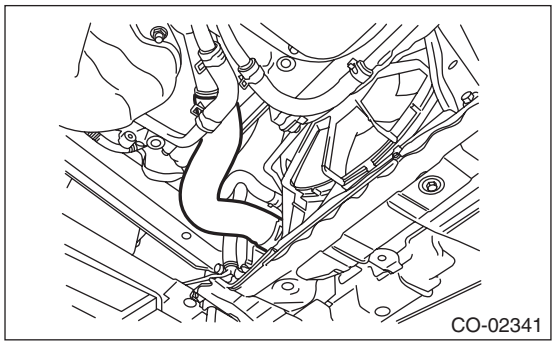


11) Install the radiator upper brackets.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)

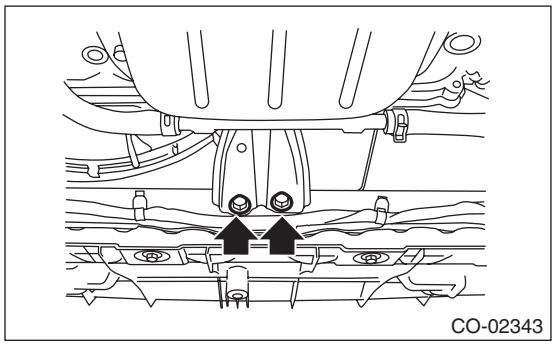


12) Lift up the vehicle.
13) Connect the radiator lower hose to the radiator lower.



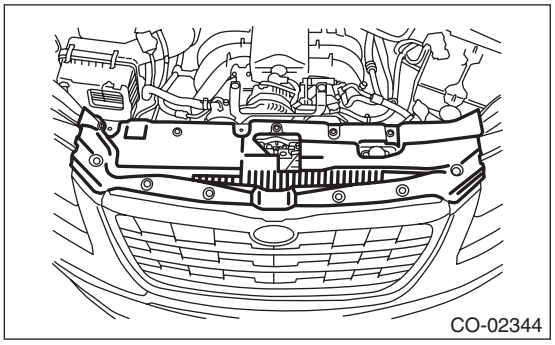
14) Tighten the bolts at the bottom of the radiator stay.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



15) Install the under cover. <Ref. to EI-18, INSTALLATION, Front Under Cover.>
16) Lower the vehicle.
17) Connect the battery ground terminal.
18) Fill engine coolant. <Ref. to CO(H6DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
19) Check the ATF level and replenish it if necessary. <Ref. to 5AT-29, INSPECTION, Automatic Transmission Fluid.>

20) Install the front upper cover.



21) Install the air intake duct. <Ref. to IN(H6DO)-9, INSTALLATION, Air Intake Duct.>
22) Install the collector cover.

C: INSPECTION

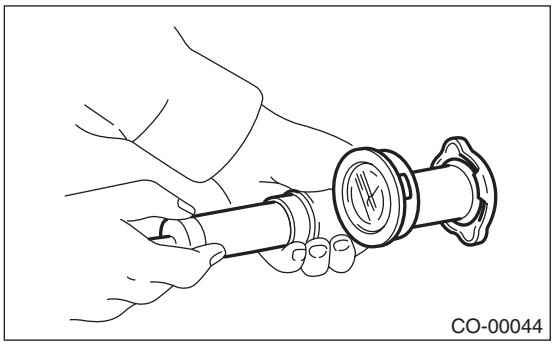
1) Check that the radiator does not have deformation, cracks or damage.
2) Check that the hose has no cracks, damage or loose part.
3) Remove the radiator cap, fill the radiator with engine coolant, and then install the radiator cap tester to the filler neck of radiator.
4) Apply a pressure of 157 kPa (1.6 kgf/cm^2, 23 psi) to the radiator, and check the following items.
- Leakage from the radiator or its vicinity
- Leakage from the hose or its connections

CAUTION:
- **Engine should be turned off.**
- **Wipe engine coolant from check points in advance.**
- **Be careful of engine coolant from spurting out when removing the radiator cap tester.**
- **Be careful not to deform the filler neck of radiator when installing and removing the radiator cap tester.**

7. Radiator Cap

A: INSPECTION

1) Check that the radiator cap does not have deformation, cracks or damage.
2) Attach the radiator cap tester to radiator cap.



3) Increase pressure until the radiator cap tester gauge needle stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 — 6 seconds. Replace the radiator cap if its valve opens at less than the service limit.

Standard:
73.6 — 103.0 kPa (0.75 — 1.05 kgf/cm^2, 11 — 15 psi)

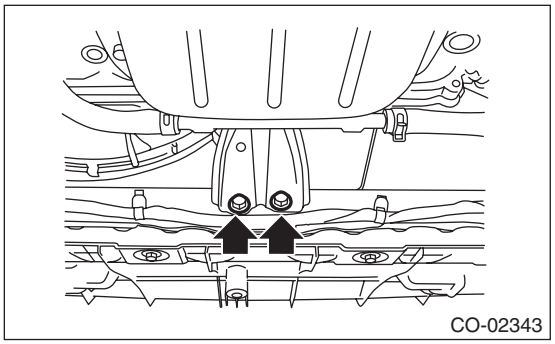
Service limit:
63.6 kPa (0.65 kgf/cm^2, 9 psi)

CAUTION:
Be sure to remove foreign matter and rust from the cap in advance. Otherwise, results of pressure test will be incorrect.

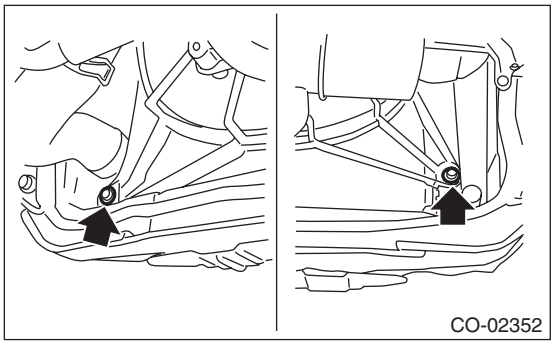
8. Radiator Main Fan and Fan Motor

A: REMOVAL

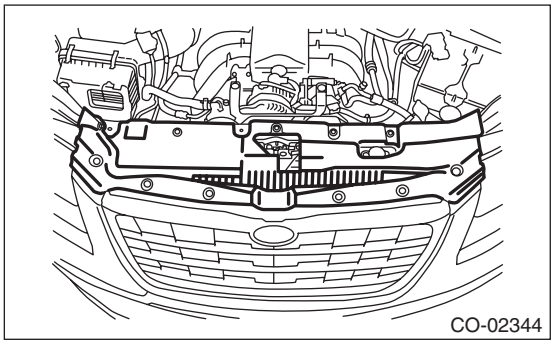
1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Lift up the vehicle.
4) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
5) Remove the bolts at the bottom of the radiator stay.


CO-02343

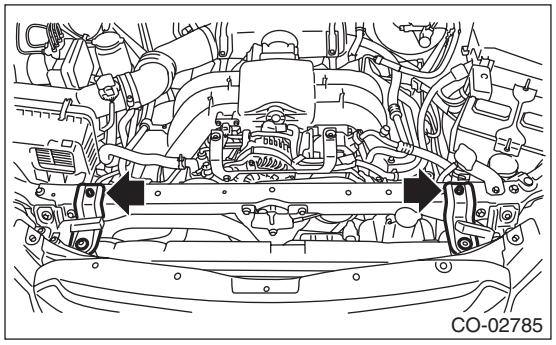
6) Remove the bolts at the bottom of the radiator fan shroud.


CO-02352

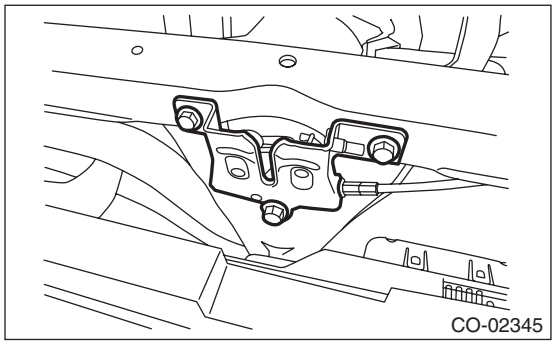
7) Lower the vehicle.
8) Remove the air intake duct. <Ref. to IN(H6DO)-9, REMOVAL, Air Intake Duct.>
9) Remove the front upper cover.


CO-02344

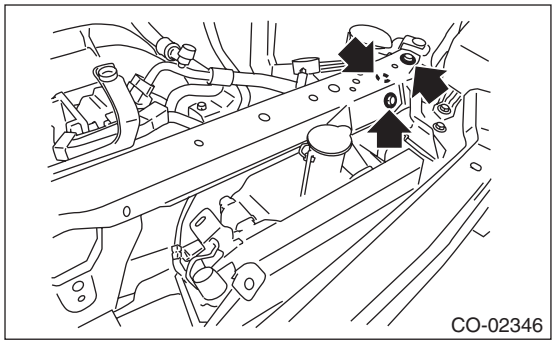
10) Remove the radiator upper brackets.


CO-02785

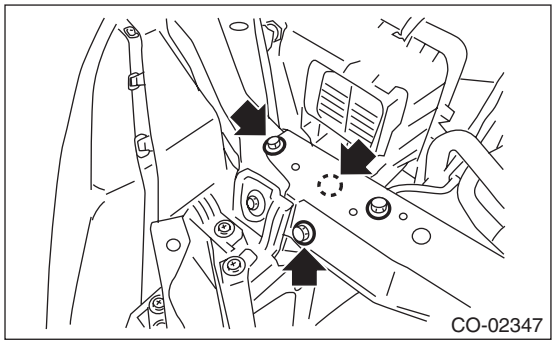
11) Remove the radiator stay.
(1) Remove the latch.


CO-02345

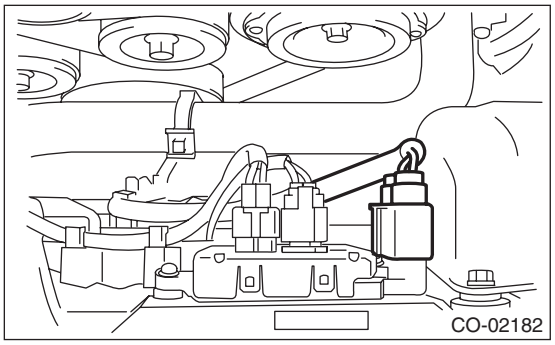
(2) Remove the radiator upper hose LH from the clip.
(3) Remove the front hood cable fixing clip from the radiator stay.
(4) Remove the bolts on the left side of the radiator stay.


CO-02346

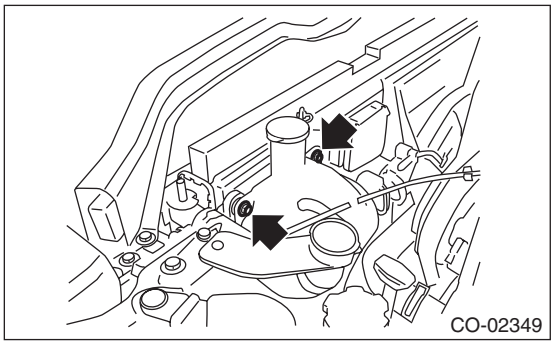
(5) Remove the bolts on the right side of the radiator stay.


CO-02347

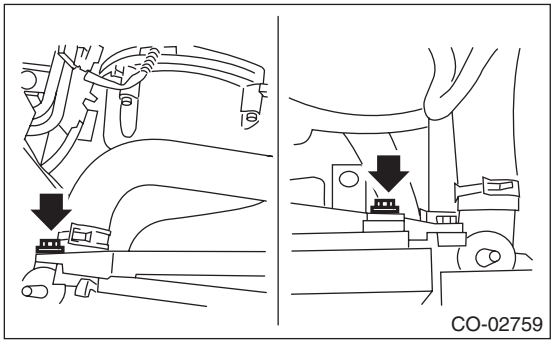
12) Disconnect the connector from radiator fan control unit.



13) Remove the reservoir tank.



14) Remove the bolts on the upper side of the radiator fan shroud.



15) Remove the radiator fan shroud.

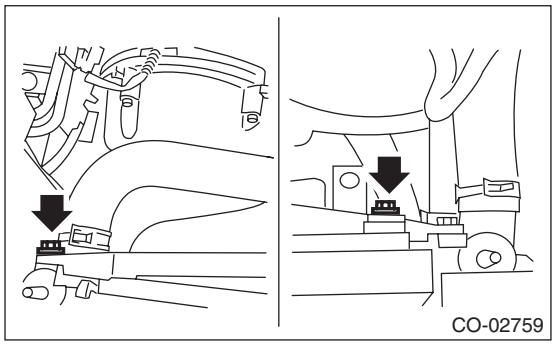
NOTE:
When pulling up the radiator fan shroud, be careful not to damage the radiator hose or ATF hose.

B: INSTALLATION

CAUTION:
Check if the radiator hose and the over flow hose or ATF hose are properly connected.

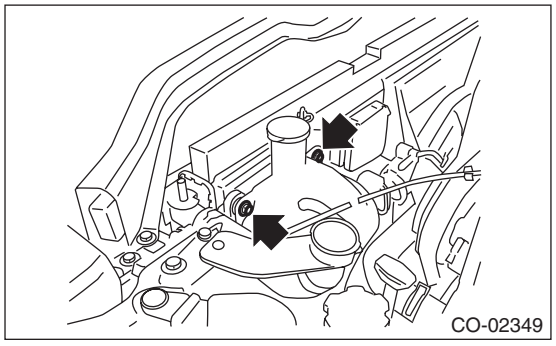
1) Tighten the bolts on the upper side of radiator fan shroud.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

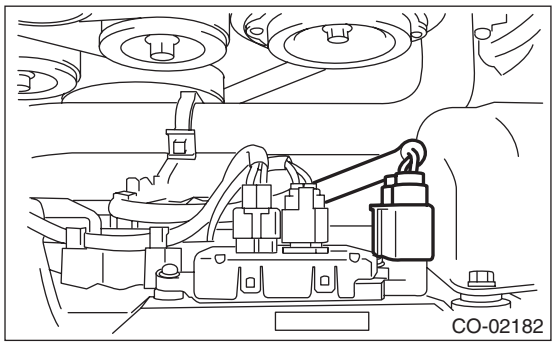


2) Install the reservoir tank.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

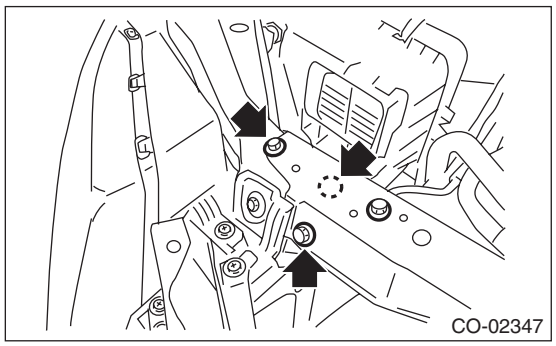


3) Connect the connector to radiator fan control unit.



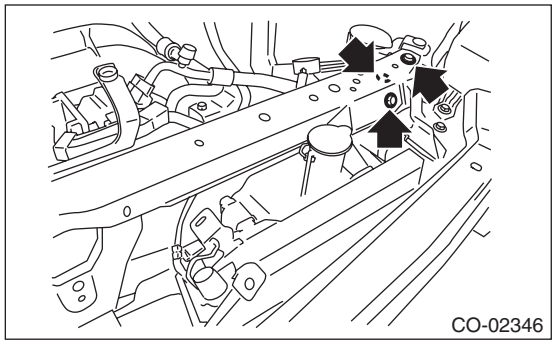
4) Install the radiator stay.
(1) Tighten the bolts on the right side of the radiator stay.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



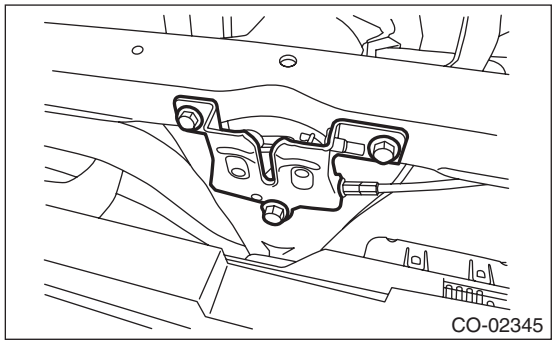
(2) Tighten the bolts on the left side of the radiator stay.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



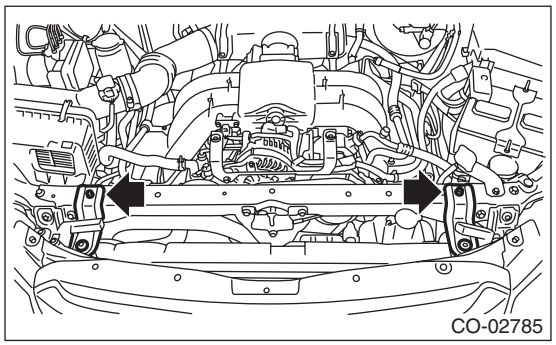
(3) Install the front hood cable fixing clip to the radiator stay.
(4) Install the radiator upper hose LH to the clip.
(5) Install the latch.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

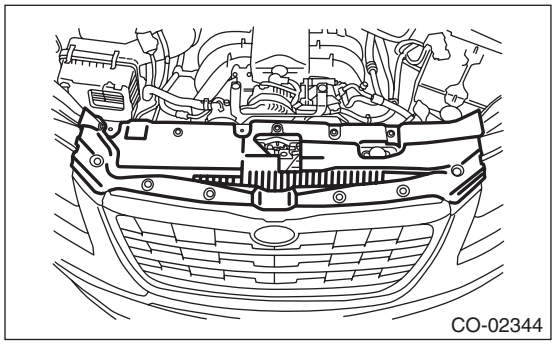


5) Install the radiator upper brackets.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)

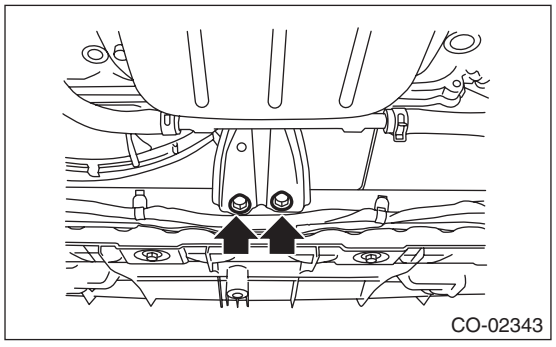


6) Install the front upper cover.



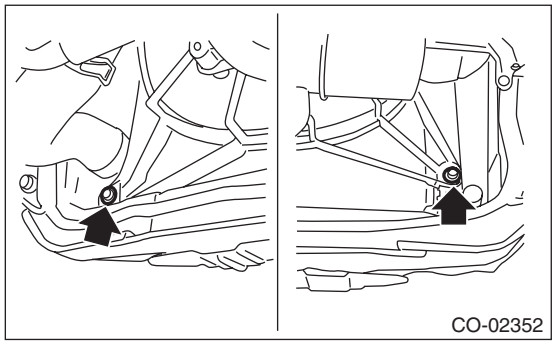
7) Install the air intake duct. <Ref. to IN(H6DO)-9, INSTALLATION, Air Intake Duct.>
8) Lift up the vehicle.
9) Tighten the bolts at the bottom of the radiator stay.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



10) Tighten the bolts at the bottom of the radiator fan shroud.

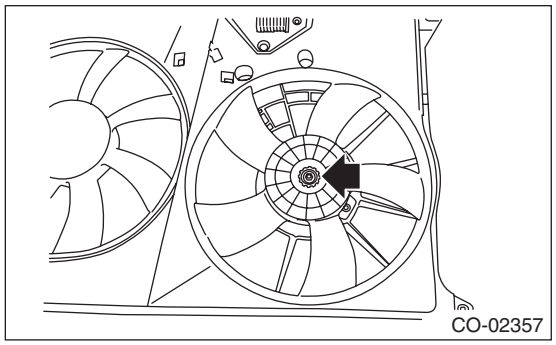
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



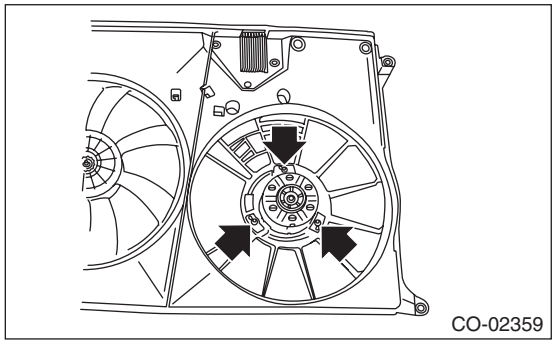
11) Install the under cover. <Ref. to EI-18, INSTALLATION, Front Under Cover.>
12) Lower the vehicle.
13) Connect the battery ground terminal.
14) Install the collector cover.

C: DISASSEMBLY

1) Remove the radiator main fan.



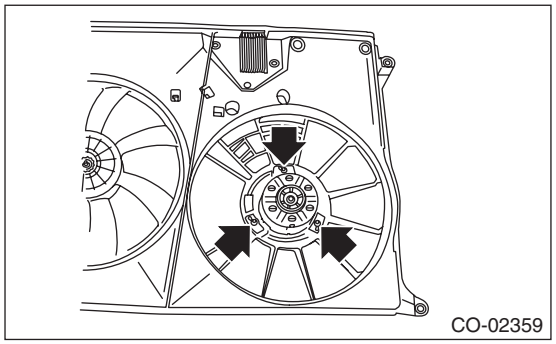
2) Remove the radiator main fan motor.



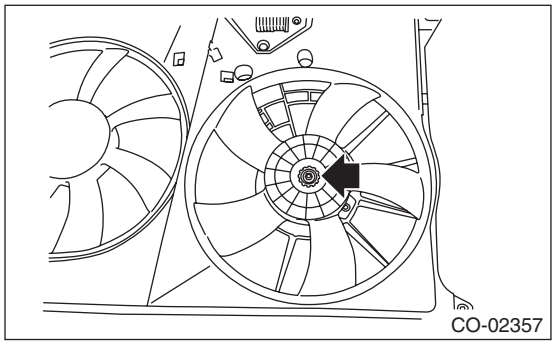
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
3.8 N·m (0.4 kgf-m, 2.8 ft-lb)



Tightening torque:
6.3 N·m (0.6 kgf-m, 4.6 ft-lb)



E: INSPECTION

Check that the radiator main fan, radiator main fan shroud and main fan motor do not have deformation, cracks or damage.

9. Radiator Sub Fan and Fan Motor

A: REMOVAL

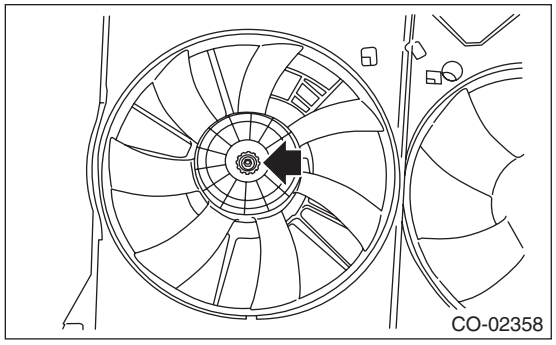
Refer to the radiator main fan and fan motor. <Ref. to CO(H6DO)-25, REMOVAL, Radiator Main Fan and Fan Motor.>

B: INSTALLATION

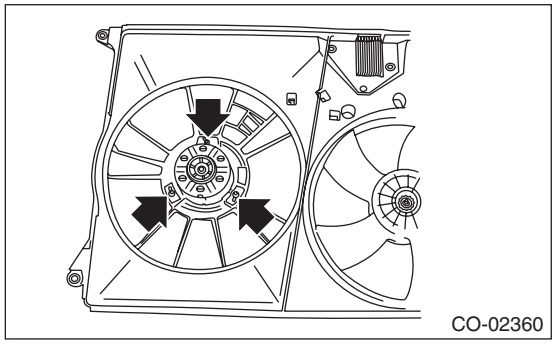
Refer to the radiator main fan and fan motor. <Ref. to CO(H6DO)-26, INSTALLATION, Radiator Main Fan and Fan Motor.>

C: DISASSEMBLY

1) Remove the radiator sub fan.



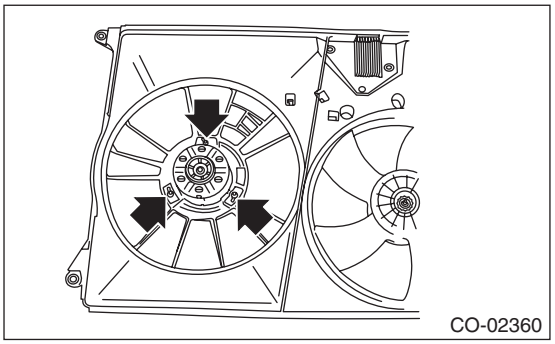
2) Remove the radiator sub fan motor.



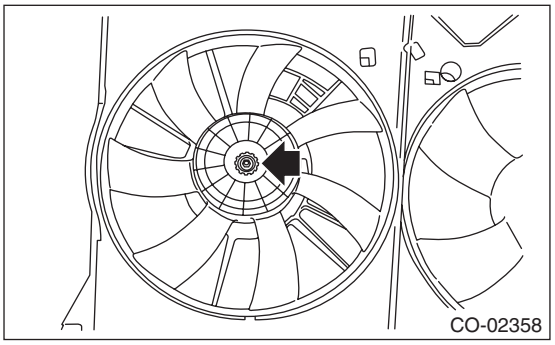
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
3.8 N·m (0.4 kgf-m, 2.8 ft-lb)



Tightening torque:
6.3 N·m (0.6 kgf-m, 4.6 ft-lb)



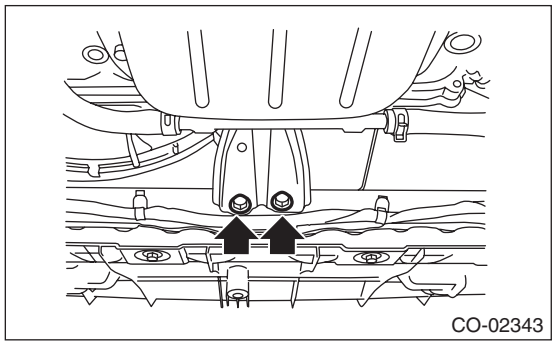
E: INSPECTION

Check that the radiator sub fan, radiator sub fan shroud and sub fan motor do not have deformation, cracks or damage.

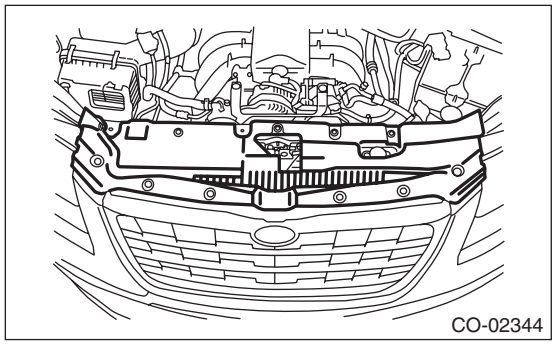
10.Reservoir Tank

A: REMOVAL

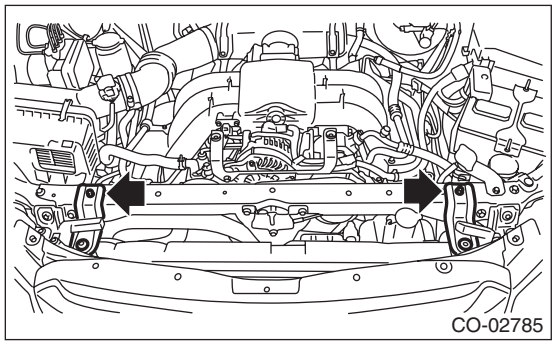
1) Remove the collector cover.
2) Lift up the vehicle.
3) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
4) Remove the bolts at the bottom of the radiator stay.


CO-02343

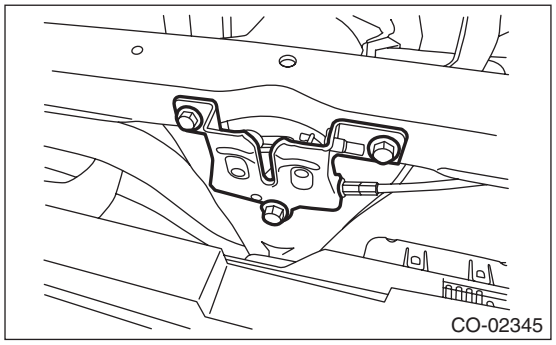
5) Lower the vehicle.
6) Remove the air intake duct. <Ref. to IN(H6DO)-9, REMOVAL, Air Intake Duct.>
7) Remove the front upper cover.


CO-02344

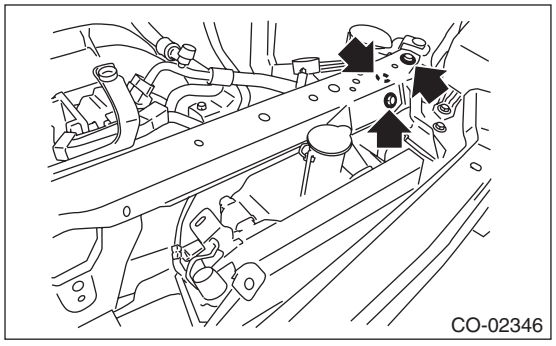
8) Remove the radiator upper brackets.


CO-02785

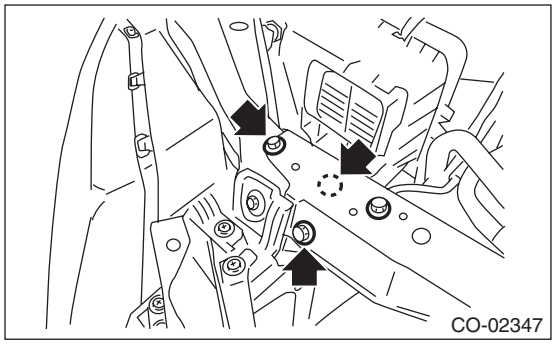
9) Remove the radiator stay.
(1) Remove the latch.


CO-02345

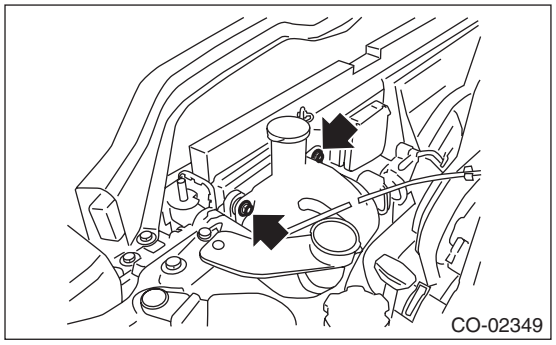
(2) Remove the radiator upper hose LH from the clip.
(3) Remove the front hood cable fixing clip from the radiator stay.
(4) Remove the bolts on the left side of the radiator stay.


CO-02346

(5) Remove the bolts on the right side of the radiator stay.


CO-02347

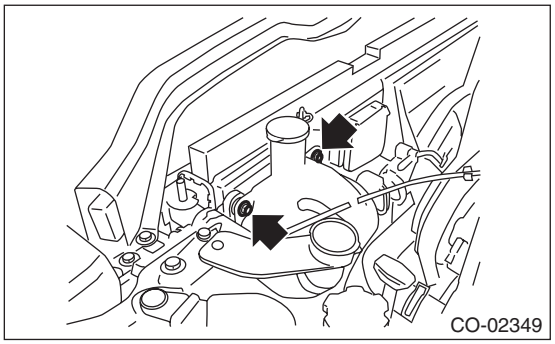
10) Remove the reservoir tank.


CO-02349

B: INSTALLATION

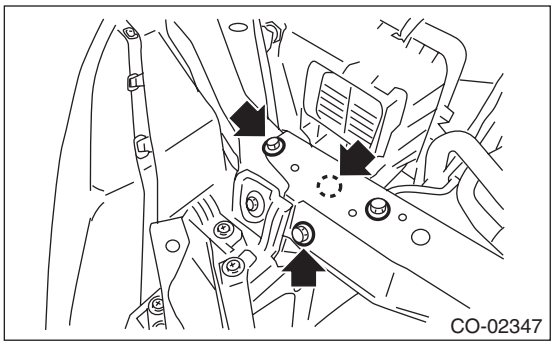
1) Install the reservoir tank.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



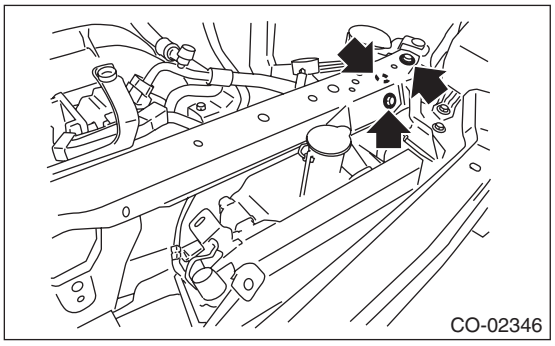
2) Install the radiator stay.
(1) Tighten the bolts on the right side of the radiator stay.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



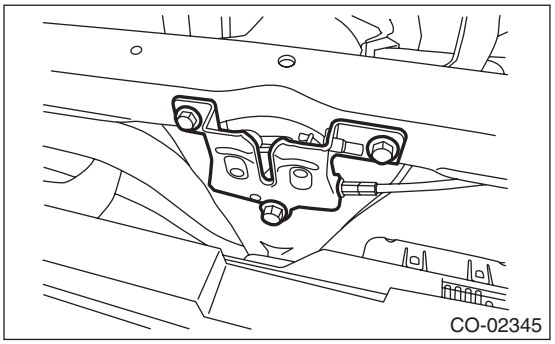
(2) Tighten the bolts on the left side of the radiator stay.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



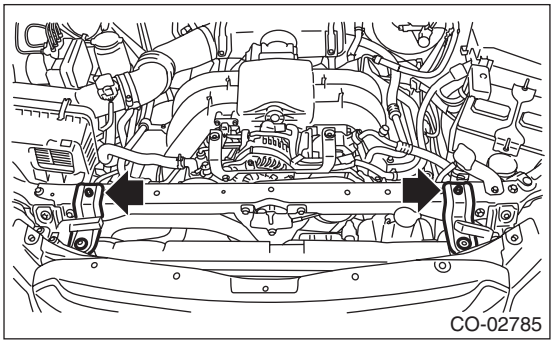
(3) Install the front hood cable fixing clip to the radiator stay.
(4) Install the radiator upper hose LH to the clip.
(5) Install the latch.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

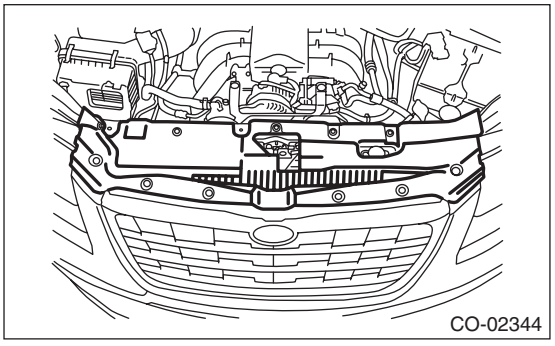


3) Install the radiator upper brackets.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)



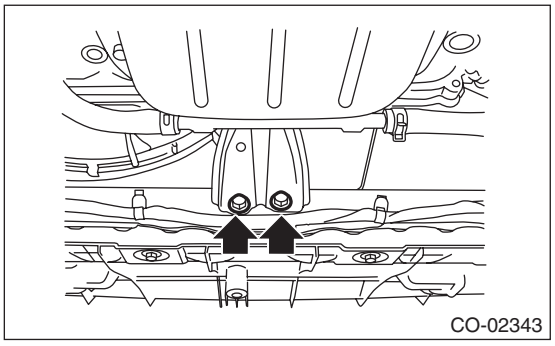
4) Install the front upper cover.



5) Install the air intake duct. <Ref. to IN(H6DO)-9, INSTALLATION, Air Intake Duct.>
6) Lift up the vehicle.

7) Tighten the bolts at the bottom of the radiator stay.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



8) Install the under cover. <Ref. to EI-18, INSTALLATION, Front Under Cover.>
9) Lower the vehicle.
10) Install the collector cover.

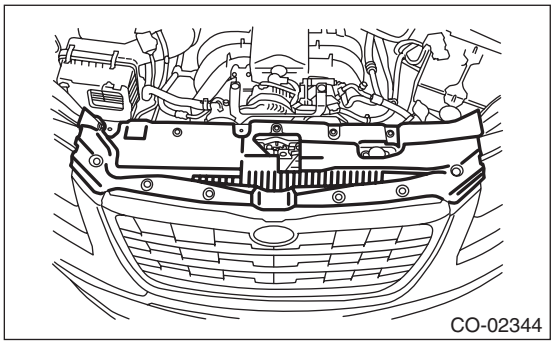
C: INSPECTION

1) Check that the reservoir tank does not have deformation, cracks or damage.
2) Check the over flow hose for cracks or damage.
3) Make sure the engine coolant level is between “FULL” and “LOW”.

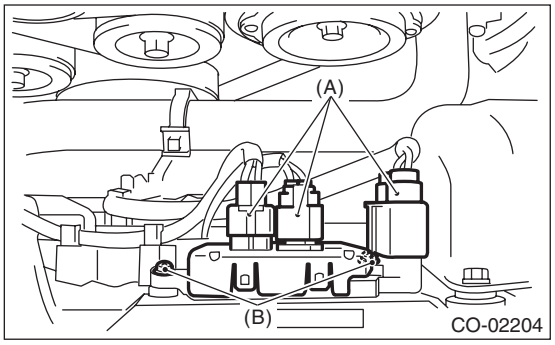
11.Radiator Fan Control Unit

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the air intake duct. <Ref. to IN(H6DO)-9, REMOVAL, Air Intake Duct.>
3) Remove the front upper cover.


CO-02344

4) Remove the radiator fan control unit.
   (1) Disconnect the connector (A) from the radiator fan control unit.
   (2) Remove the screws (B) holding the radiator fan control unit.



CO-02204

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
2.6 N·m (0.3 kgf-m, 1.9 ft-lb)

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair it if necessary.
	b. Defective thermostat	Replace.
	c. Malfunction of water pump	Replace.
	d. Clogged engine coolant passage	Clean.
	e. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(H6DO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	f. Clogged or leaking radiator	Clean, repair or replace.
	g. Improper engine oil in engine coolant	Replace the engine coolant.
	h. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H6DO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	i. Excessive back pressure in exhaust system	Clean or replace.
	j. Insufficient clearance between piston and cylinder	Adjust or replace.
	k. Dragging brake	Adjust.
	l. Defective radiator fan	Inspect the radiator fan relay, engine coolant temperature sensor or fan motor and replace them.
Over-cooling	a. Ambient temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Cylinder head and crankcase damaged or cracked	Repair or replace.
	f. Damaged or cracked thermostat cover	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective radiator fan	Replace.
	b. Defective water pump bearing	Replace water pump.
	c. Defective water pump mechanical seal	Replace water pump.

LUBRICATION

LU(H6DO)

Page

1. General Description 2
2. Oil Pressure System 8
3. Engine Oil 10
4. Oil Pan 12
5. Oil Pump 13
6. Oil Pressure Switch 15
7. Engine Oil Filter 16
8. Oil Cooler 17
9. General Diagnostic Table 18

1. General Description

A: CAUTION

• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

B: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance.
Mighty Vac	Used for inspecting the fuel tank pressure sensor.

2. Front Catalytic Converter

A: REMOVAL

The front and rear catalytic converters are integrated into the front exhaust pipe; therefore, refer to “Front Exhaust Pipe” for the removal procedure. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

The front and rear catalytic converters are integrated into front exhaust pipe as one unit; therefore, refer to “Front Exhaust Pipe” for installation procedure. <Ref. to EX(H6DO)-5, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.

3. Rear Catalytic Converter

A: REMOVAL

The front and rear catalytic converters are integrated into the front exhaust pipe; therefore, refer to “Front Exhaust Pipe” for the removal procedure. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

The front and rear catalytic converters are integrated into front exhaust pipe as one unit; therefore, refer to “Front Exhaust Pipe” for installation procedure. <Ref. to EX(H6DO)-5, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.

4. EGR Valve

A: REMOVAL

For removal procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-40, REMOVAL, EGR Valve.>

B: INSTALLATION

For installation procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-40, INSTALLATION, EGR Valve.>

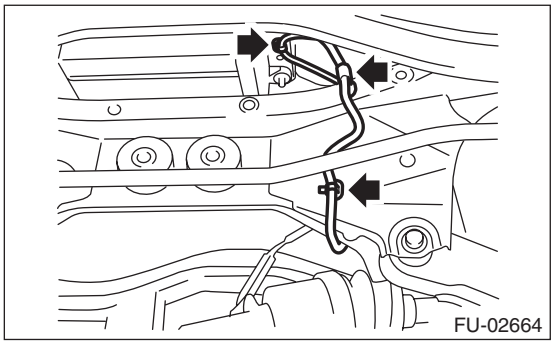
C: INSPECTION

For inspection procedures, refer to the “FU(H6DO)” section. <Ref. to FU(H6DO)-40, INSPECTION, EGR Valve.>

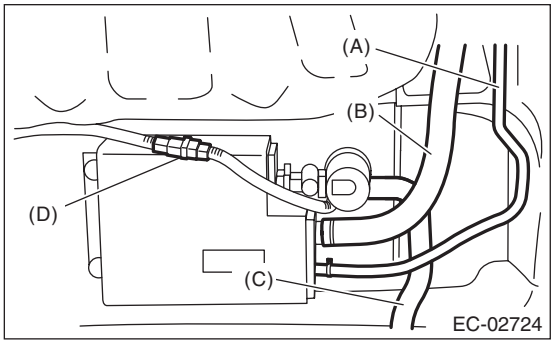
5. Canister

A: REMOVAL

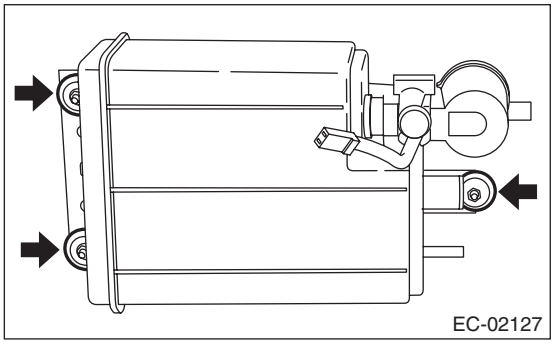
1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the clip holding the harness.



4) Remove the rear suspension assembly. <Ref. to RS-17, REMOVAL, Rear Sub Frame.>
5) Disconnect the purge hose (A), air vent hose (B), drain hose (C) and connector (D).



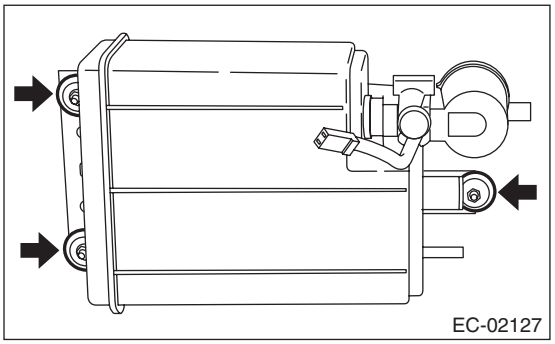
6) Remove the canister from body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



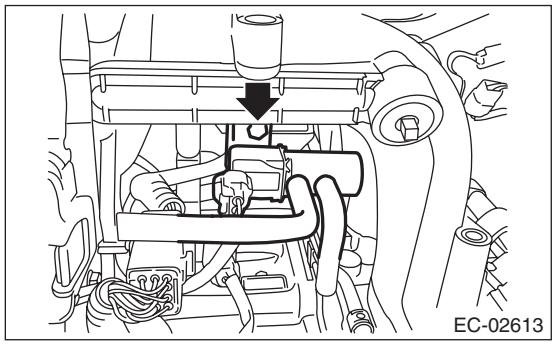
C: INSPECTION

Check that the canister has no deformation, cracks or other damages.

6. Purge Control Solenoid Valve

A: REMOVAL

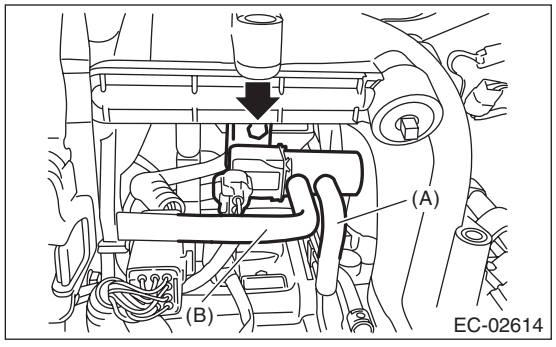
1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the air intake chamber. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector and hoses of purge control solenoid valve, and then remove the purge control solenoid valve.



B: INSTALLATION

Install in the reverse order of removal.

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

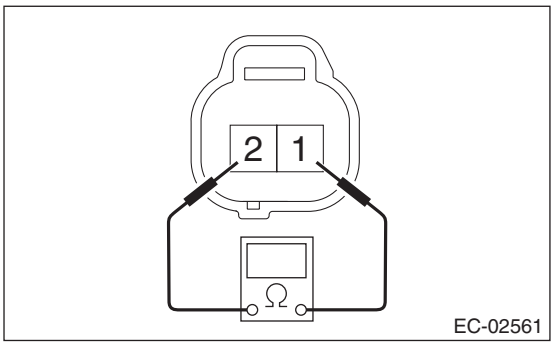


(A) To fuel pipe (evaporation line)
(B) To intake manifold

C: INSPECTION

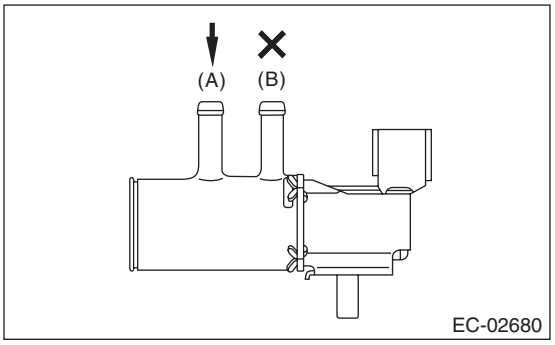
1. PURGE CONTROL SOLENOID VALVE

1) Check that the purge control solenoid valve has no deformation, cracks or other damages.
2) Measure the resistance between the purge control solenoid valve terminals.

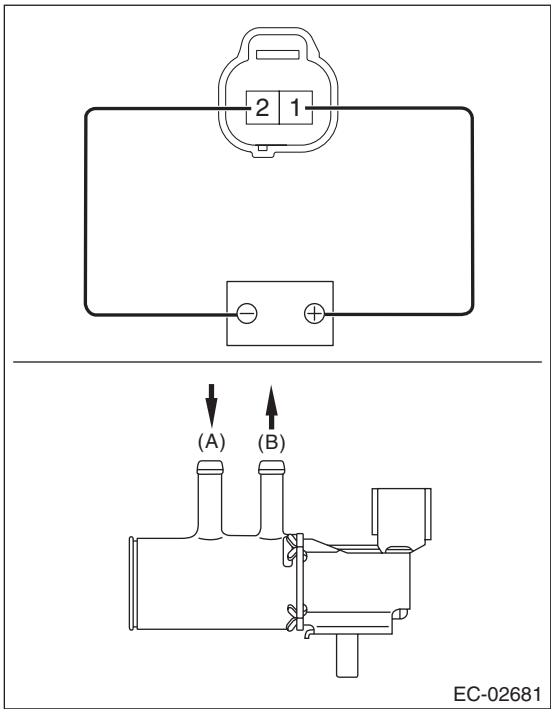


	Terminal No.	Standard
Purge control solenoid valve	1 and 2	32±3 Ω (when 20°C (68°F))

3) Check that air does not come out from (B) when air is blown into (A).



4) Connect the battery positive terminal to the terminal No. 1 and the battery negative terminal to the terminal No. 2. Check that air is discharged from (B), when supplying air to (A).



2. OTHER INSPECTIONS

Check that the evaporation hose has no cracks, damage or loose part.

7. Fuel Level Sensor

A: REMOVAL

For removal procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-68, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

For installation procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-68, INSTALLATION, Fuel Level Sensor.>

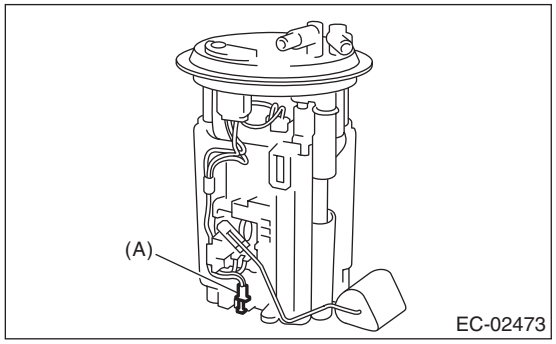
C: INSPECTION

For inspection procedures, refer to the “FU(H6DO)” section. <Ref. to FU(H6DO)-68, INSPECTION, Fuel Level Sensor.>

8. Fuel Temperature Sensor

A: REMOVAL

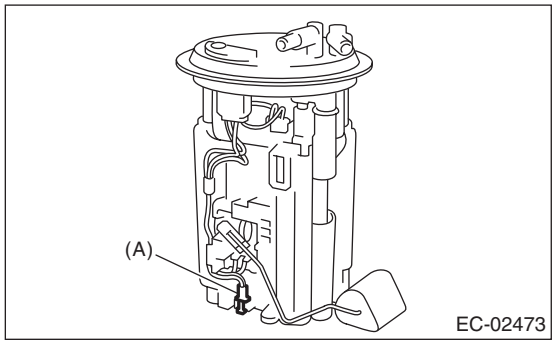
The fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, refer to “Fuel Level Sensor” for removal procedure. <Ref. to FU(H6DO)-68, REMOVAL, Fuel Level Sensor.>



(A) Fuel temperature sensor

B: INSTALLATION

The fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, refer to “Fuel Level Sensor” for installation procedure. <Ref. to FU(H6DO)-68, INSTALLATION, Fuel Level Sensor.>

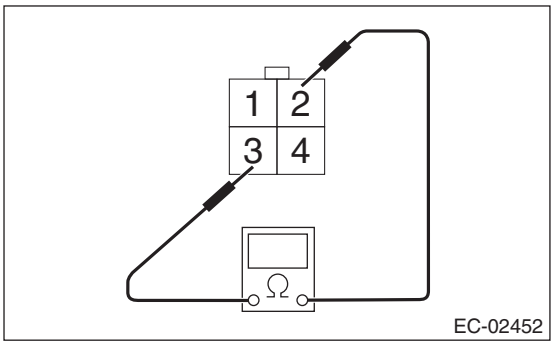


(A) Fuel temperature sensor

C: INSPECTION

1) Check that the fuel temperature sensor has no deformation, cracks or other damages.
2) Check the resistance between the fuel temperature sensor terminals.

CAUTION:
When inspecting the resistance, check the circuit tester specification and be careful not to turn on electricity 3 V or more to prevent damaging the fuel temperature sensor.



Temperature	Terminal No.	Standard
–10°C (14°F)	2 and 3	11.21±0.69 kΩ (measured current 0.10 mA)
20°C (68°F)		2.502±0.08 kΩ (measured current 0.10 mA)
50°C (122°F)		0.7176±0.034 kΩ (measured current 0.10 mA)

9. Fuel Sub Level Sensor

A: REMOVAL

For removal procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-69, REMOVAL, Fuel Sub Level Sensor.>

B: INSTALLATION

For installation procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-70, INSTALLATION, Fuel Sub Level Sensor.>

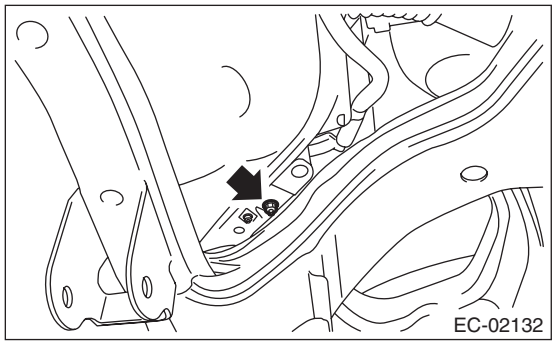
C: INSPECTION

For inspection procedures, refer to the “FU(H6DO)” section. <Ref. to FU(H6DO)-70, INSPECTION, Fuel Sub Level Sensor.>

10.Fuel Tank Pressure Sensor

A: REMOVAL

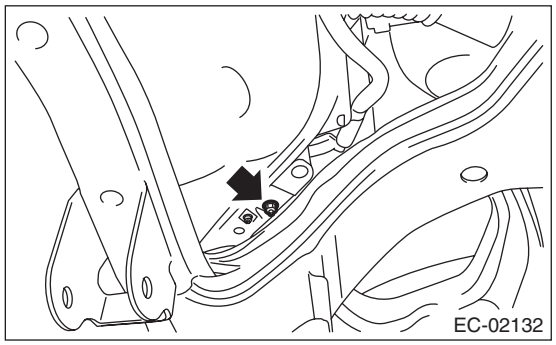
WARNING:
Place "NO OPEN FLAMES" signs near the working area.
1) Disconnect the ground cable from battery.
2) Open the fuel filler lid and remove the fuel filler cap.
3) Lift up the vehicle.
4) Disconnect the connector from the fuel tank pressure sensor.
5) Disconnect the vacuum hose from the fuel tank pressure sensor.
6) Remove the fuel tank pressure sensor along with the bracket.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.35 N·m (0.7 kgf-m, 5.4 ft-lb)

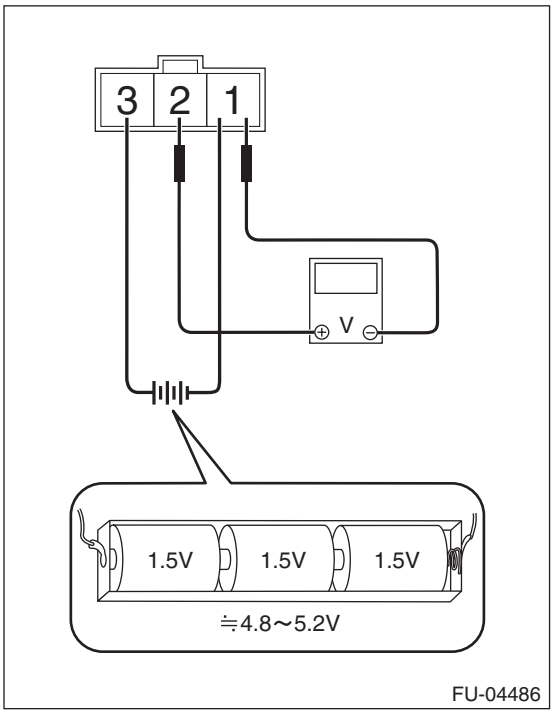


C: INSPECTION

1. FUEL TANK PRESSURE SENSOR

1) Check that the fuel tank pressure sensor has no deformation, cracks or other damages.
2) Connect dry-cell battery positive terminal to terminal No. 3 and dry-cell battery ground terminal to terminal No. 1, circuit tester positive terminal to terminal No. 2 and the circuit tester negative terminal to terminal No. 1.

NOTE:
- Use new dry-cell batteries.
- Using circuit tester, check the voltage of a single dry-cell battery is 1.6 V or more. And also check the voltage of three batteries in series is between 4.8 V and 5.2 V.

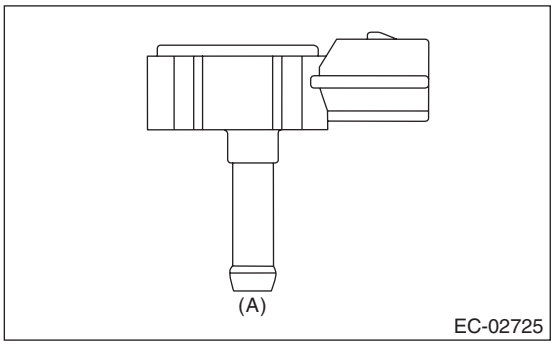


3) Check the voltage at a normal atmospheric pressure.

NOTE:
The atmospheric pressure at higher altitude is lower than normal. Therefore, the voltage is lower than the standard value.

Terminal No.	Standard
2 (+) and 1 (–)	Approx. 2.5 V (when 25°C (77°F))

4) Connect the Mighty Vac to the pressure port (A) of fuel tank pressure sensor.



5) Check the voltage when generating vacuum and positive pressure using Mighty Vac.

CAUTION:
Do not apply pressure out of the range of –10 — 20 kPa (–0.1 — 0.2 kgf/cm^2, –1.45 — 2.90 psi). Doing so may damage the fuel tank pressure sensor.

Pressure	Terminal No.	Standard
–6.67 kPa (–0.07 kgf/cm^2, –0.97 psi)	2 (+) and 1 (–)	Approx. 0.5 V (when 25°C (77°F))
6.67 kPa (0.07 kgf/cm^2, 0.97 psi)		Approx. 4.5 V (when 25°C (77°F))

2. OTHER INSPECTIONS

Check that the hose has no cracks, damage or loose part.

11.Drain Filter

A: SPECIFICATION

Canister is a non-disassembled part, so do not remove the drain filter from canister. Refer to “Canister” for removal and installation procedure. <Ref. to EC(H6DO)-6, REMOVAL, Canister.> <Ref. to EC(H6DO)-6, INSTALLATION, Canister.>

12.Drain Valve

A: REMOVAL

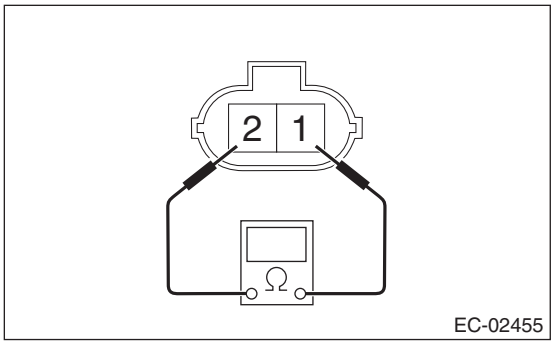
Drain valve is integrated with canister. Refer to “Canister” for removal procedures. <Ref. to EC(H6DO)-6, REMOVAL, Canister.>

B: INSTALLATION

Refer to “Canister” for installation procedures. <Ref. to EC(H6DO)-6, INSTALLATION, Canister.>

C: INSPECTION

Check the resistance between drain valve terminals.

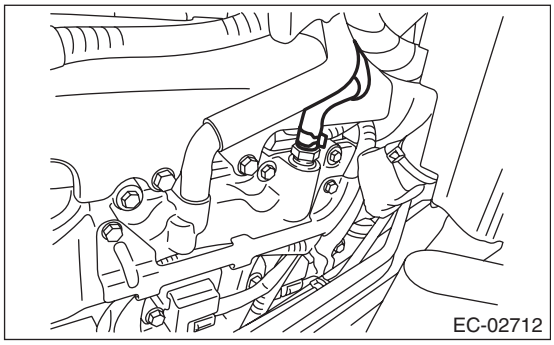


Terminal No.	Standard
1 and 2	25 — 30 Ω (when 20°C (68°F))

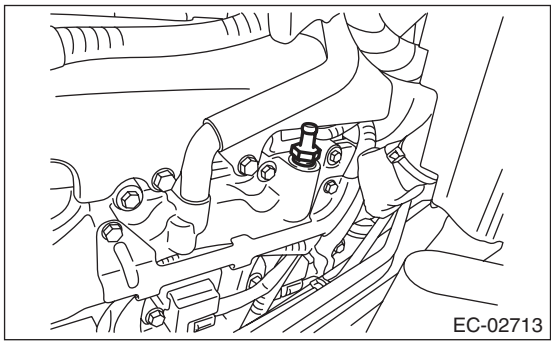
13.PCV Valve

A: REMOVAL

1) Remove the collector cover.
2) Remove the battery and battery carrier. <Ref. to SC(H6DO)-18, REMOVAL, Battery.>
3) Disconnect the PCV hose.



4) Remove the PCV valve from rocker cover.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Apply liquid gasket to the bolt threads of PCV valve.

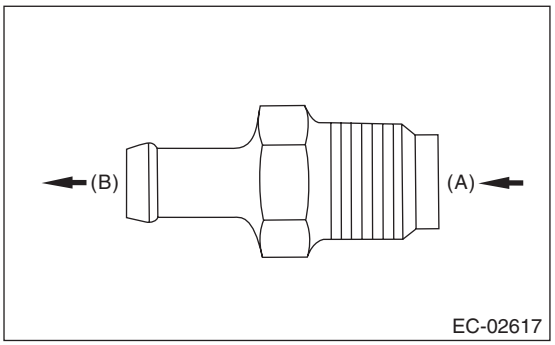
Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

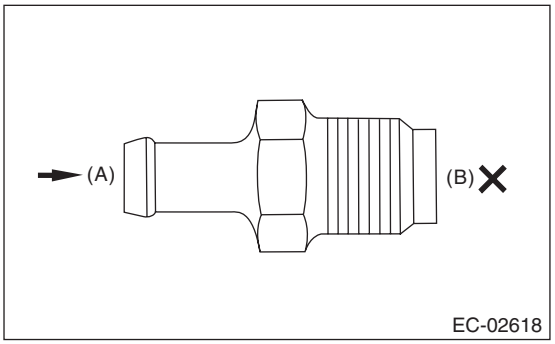
C: INSPECTION

1. PCV valve

1) Check that the PCV valve has no deformation, cracks or other damages.
2) Check that air is discharged from (B) when air is blown into (A).



3) Check that air does not come out from (B) when air is blown into (A).



2. OTHER INSPECTIONS

Check the vacuum hose for cracks, damage or looseness.

INTAKE (INDUCTION)

IN(H6DO)

Page

1. General Description 2
2. Air Cleaner Element 4
3. Air Cleaner Case 6
4. Air Intake Chamber 8
5. Air Intake Duct 9
6. Resonator Chamber 10

1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H6DO)(diag)-4, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2**.	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H6DO)(diag)-72, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.**	Does the malfunction indicator light illuminate?	Go to step **3**.	Inspection using "General Diagnostic Table". <Ref. to EN(H6DO)(diag)-353, INSPECTION, General Diagnostic Table.>
3	**CHECK COMMUNICATION STATUS.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to the data link connector. 3) Turn the ignition switch to ON, and run the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed procedures, refer to "Subaru Select Monitor". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Does Subaru select monitor or general scan tool communicate with vehicle normally?	Go to step **4**.	Inspection using "Diagnostics Procedure for Subaru Select Monitor Communication". <Ref. to EN(H6DO)(diag)-85, Diagnostic Procedure for Subaru Select Monitor Communication.>
4	**CHECK DTC.** Read DTC using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor Refer to "Read Diagnostic Trouble Code" for detailed operation procedure. <Ref. to EN(H6DO)(diag)-44, Read Diagnostic Trouble Code (DTC).> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is DTC displayed on Subaru Select Monitor or general scan tool?	Record the DTC. Repair the trouble cause. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).> Go to step **5**.	Repair the related parts. NOTE: If DTC is not shown on display although the malfunction indicator light illuminates, perform the diagnosis of malfunction indicator light circuit or combination meter. <Ref. to EN(H6DO)(diag)-62, Malfunction Indicator Light.>

	Step	Check	Yes	No
5	**CHECK FREEZE FRAME DATA.** Check the freeze frame data using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed procedures, refer to "Subaru Select Monitor". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is freeze frame data displayed on Subaru Select Monitor or general scan tool?	Record the freeze frame data. Repair the cause of fault, and go to the next step. Go to step **6**.	Go to step **6**.
6	**PERFORM DIAGNOSIS.** 1) Perform the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-57, Clear Memory Mode.> 2) Perform the Inspection Mode or Drive Cycle. <Ref. to EN(H6DO)(diag)-45, Inspection Mode.> <Ref. to EN(H6DO)(diag)-51, Drive Cycle.>	Is DTC displayed on Subaru Select Monitor or general scan tool?	Inspect using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-95, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following item when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of purchase		Fuel type	
Date of repair		Odometer reading	km
V.I.N.			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Ambient air temperature	°C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	km/h (MPH)		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON/❑ OFF	Rear defogger	❑ ON/❑ OFF
Blower	❑ ON/❑ OFF	Audio	❑ ON/❑ OFF
A/C compressor	❑ ON/❑ OFF	CD/Cassette	❑ ON/❑ OFF
Radiator fan	❑ ON/❑ OFF	Car phone	❑ ON/❑ OFF
Front wiper	❑ ON/❑ OFF	Wireless device	❑ ON/❑ OFF
Rear wiper	❑ ON/❑ OFF		

2. CHECK LIST NO. 2

Check the following item about the vehicle's state when malfunction indicator light turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators illuminate. ❑ Yes / ❑ No
❑ Low fuel warning light ❑ Charge warning light ❑ Engine coolant temperature warning light ❑ Oil pressure warning light ❑ ATF temperature warning light or SPORT indicator light ❑ Driver's control center differential indicator light ❑ ABS warning light ❑ VDC warning light ❑ Cruise indicator light ❑ SI-CRUISE warning light ❑ Immobilizer indicator light ❑ STEERING warning light ❑ Glow indicator light ❑ Sedimentor warning light ❑ Electronic parking brake warning light ❑ Others:
b) Fuel level
• Lack of fuel: ❑ Yes / ❑ No • Indicator position of fuel gauge: • Experienced running out of fuel: ❑ Yes / ❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes / ❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes / ❑ No
• What:
e) Installing of other parts except genuine parts: ❑ Yes / ❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes / ❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes / ❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes / ❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ Does not shift. ❑ Excessive shift shock

3. General Description

A: CAUTION

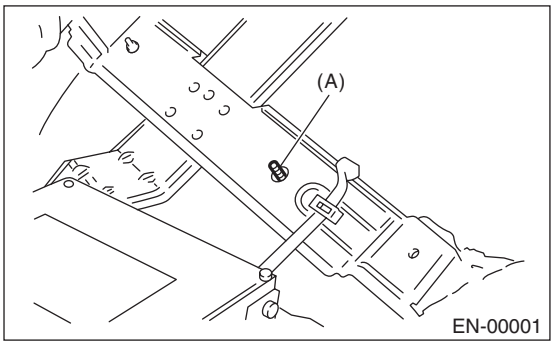
1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:
• Do not use electrical test equipment on the airbag system circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity. Doing so will damage the ECM instantly, and other parts will also be damaged.
3) Do not disconnect the battery terminals while the engine is running. A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM etc.
4) Before disconnecting the connectors of each sensor and ECM, be sure to turn the ignition switch to OFF. Perform the Clear Memory Mode after connecting the connectors. <Ref. to EN(H6DO)(diag)-57, Clear Memory Mode.>
5) When measuring the voltage or resistance of individual sensor or all electrical control modules, use a tapered pin with a diameter of less than 0.6 mm (0.024 in). Do not insert the pin 4 mm (0.16 in) or more into the part.

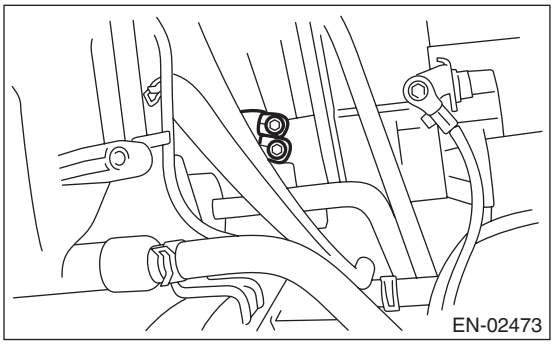
CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

NOTE:
When replacing the ECM of the models with Immobilizer, immobilizer system must be registered. To do so, all ignition keys and ID cards need to be prepared. Refer to the “PC application help for Subaru Select Monitor”.
6) Take care not to allow water to get into the connectors when servicing or washing the vehicle in rainy weather. Avoid exposure to water even if the connectors are waterproof.
7) Use ECM mounting stud bolts at the body side grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

8) Use the engine ground terminal or engine assembly as the grounding point to chassis when measuring the voltage and resistance in engine compartment.



9) All parts related to the engine control system are precision parts. Do not drop them.
10) Observe the following cautions when installing a radio in vehicle.

CAUTION:
• The antenna must be kept as far apart as possible from control module. (ECM is installed under the passenger’s side floor mat.)
• The antenna feeder must be placed as far apart as possible from the ECM and engine control system harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items mentioned above.
• Incorrect installation of the radio may affect the operation of ECM.

11) When disconnecting the fuel hose, release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

12) Warning lights may illuminate when performing driving test with jacked-up or lifted-up condition, but this is not a system malfunction. The reason for this is the speed difference between the front and rear wheels. When engine control system diagnosis is finished, perform the VDC memory clearance procedure of self-diagnosis function. <Ref. to VDC(diag)-23, Clear Memory Mode.>

B: INSPECTION

Before performing diagnostics, check the following item which might affect engine problems.

1. BATTERY

1) Measure the battery voltage and specific gravity of the electrolyte.

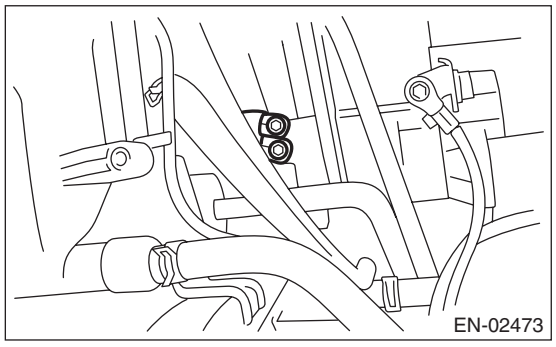
Standard voltage: 12 V

Specific gravity: 1.260 or more

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

2. ENGINE GROUND

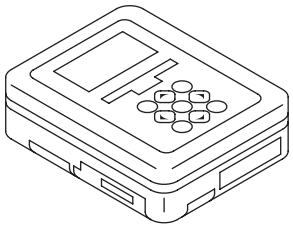
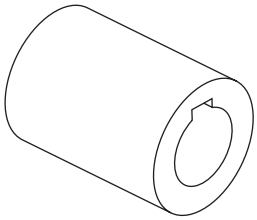
Make sure that the engine ground terminal is properly connected to the engine.



C: NOTE

• The on-board diagnostic (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure of sensors as may disable the drive, the fail-safe function is provided to ensure the minimal drivability.
• The OBD system incorporated with the vehicles within this type of engine complies with OBD-II regulations. The OBD system monitors the components and the system malfunction listed in “Engine Section” which affects on emissions.
• When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction.
• Freeze frame engine condition data are stored until the DTCs are cleared. However when such malfunctions as fuel trim fault and misfire are detected with the freeze frame engine condition data stored, they are rewritten into those related to the fuel trim fault and misfire.
• When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
• When performing diagnosis, connect the Subaru Select Monitor or general scan tool to the vehicle.

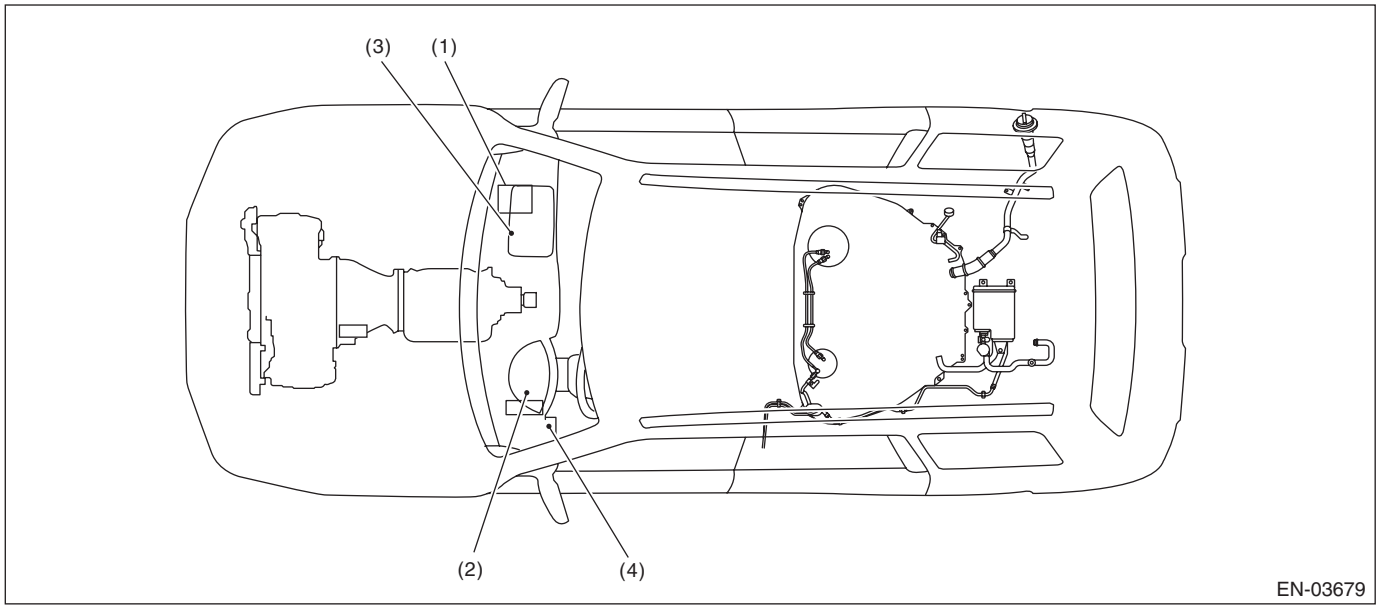
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.
 ST18252AA000	18252AA000	CRANKSHAFT SOCKET	Used for rotating crankshaft.

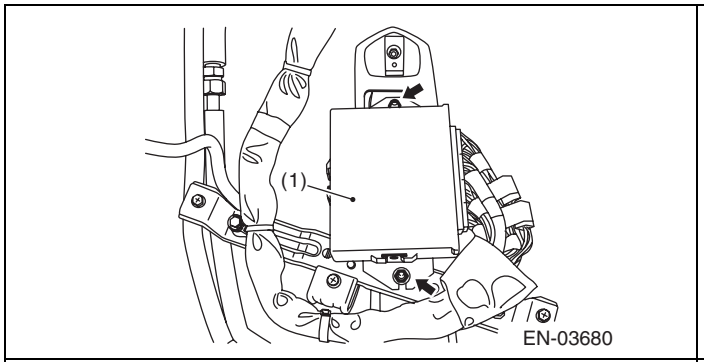
4. Electrical Component Location

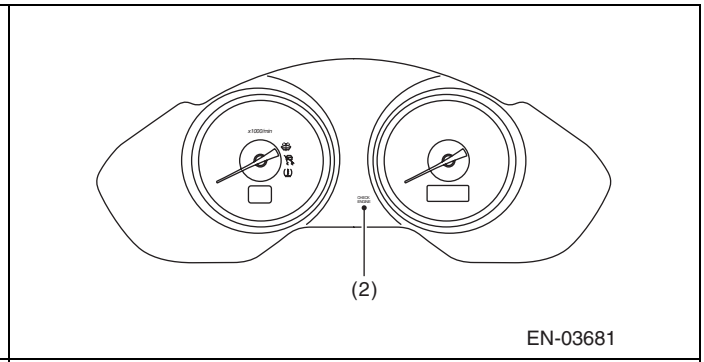
A: LOCATION

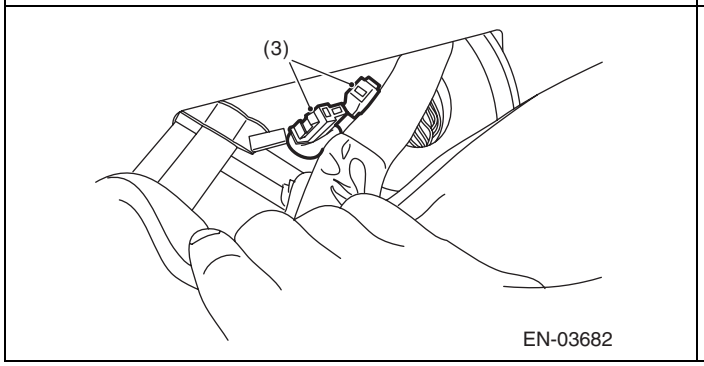
1. CONTROL MODULE

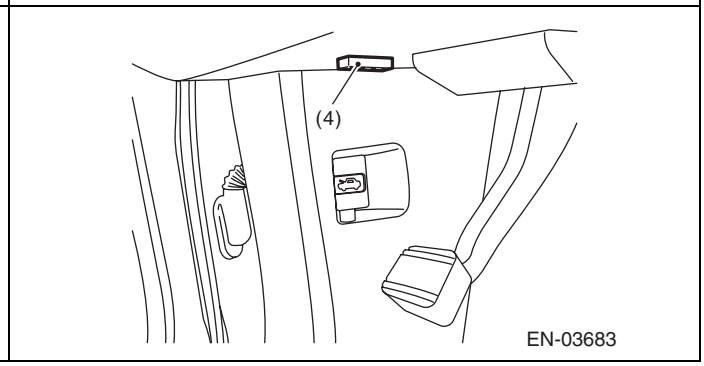


(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Delivery (test) mode connector
(4) Data link connector

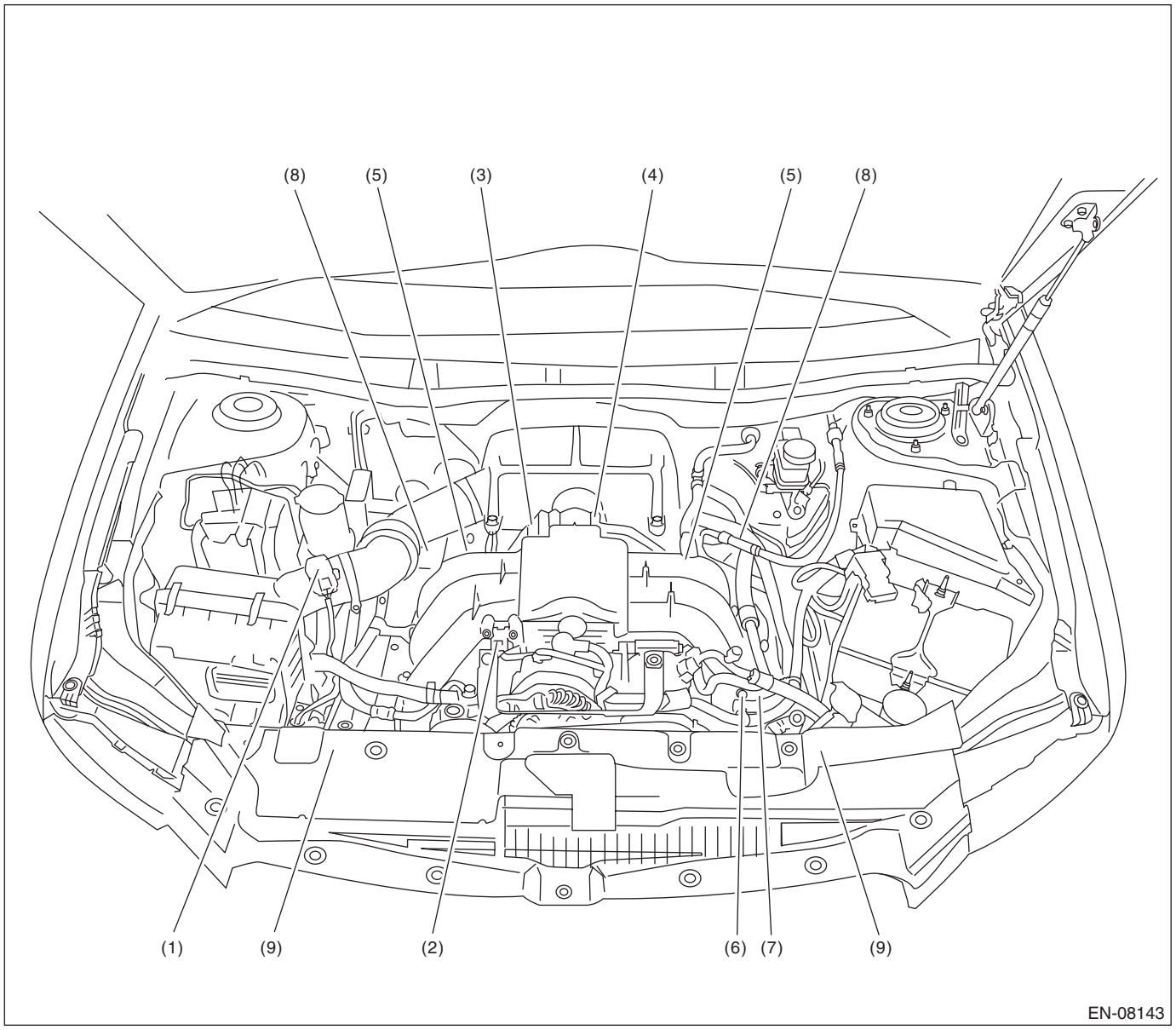




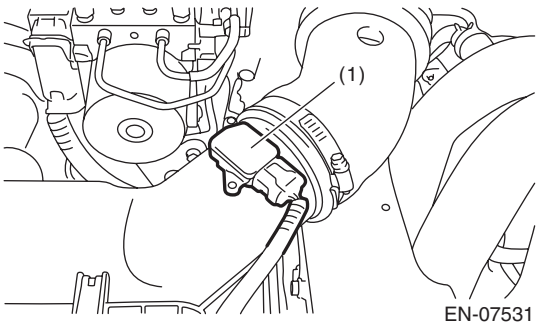


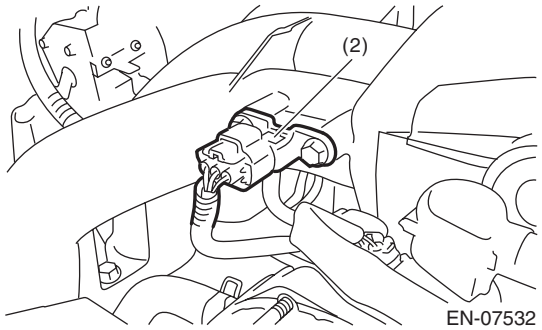


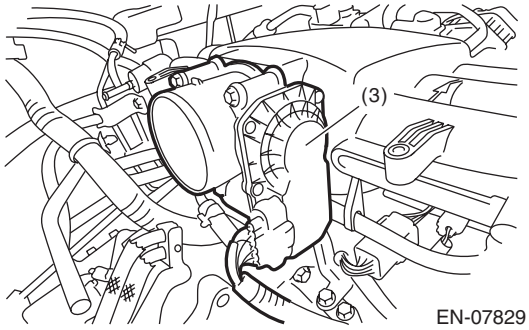
2. SENSOR

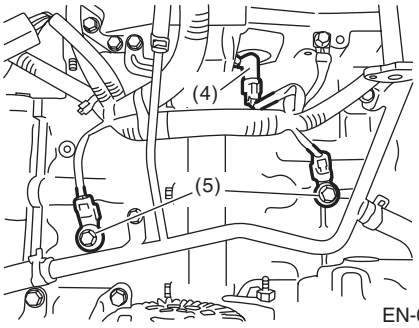


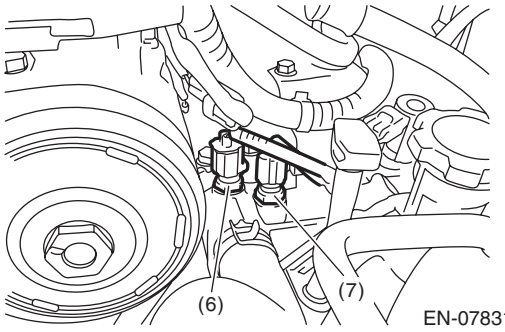
(1) Mass air flow and intake air temperature sensor
(2) Manifold absolute pressure sensor
(3) Electronic throttle control
(4) Crankshaft position sensor
(5) Knock sensor
(6) Engine coolant temperature sensor
(7) Oil temperature sensor
(8) Intake camshaft position sensor
(9) Exhaust camshaft position sensor

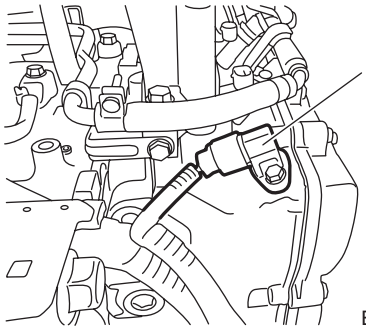

(1)
EN-07531

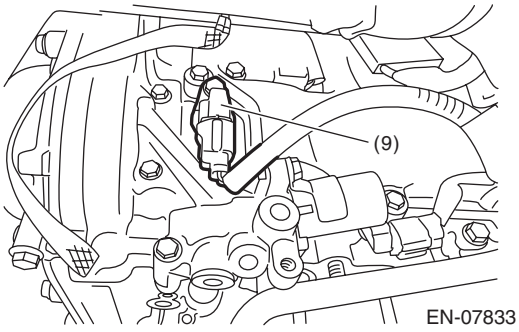

(2)
EN-07532


(3)
EN-07829

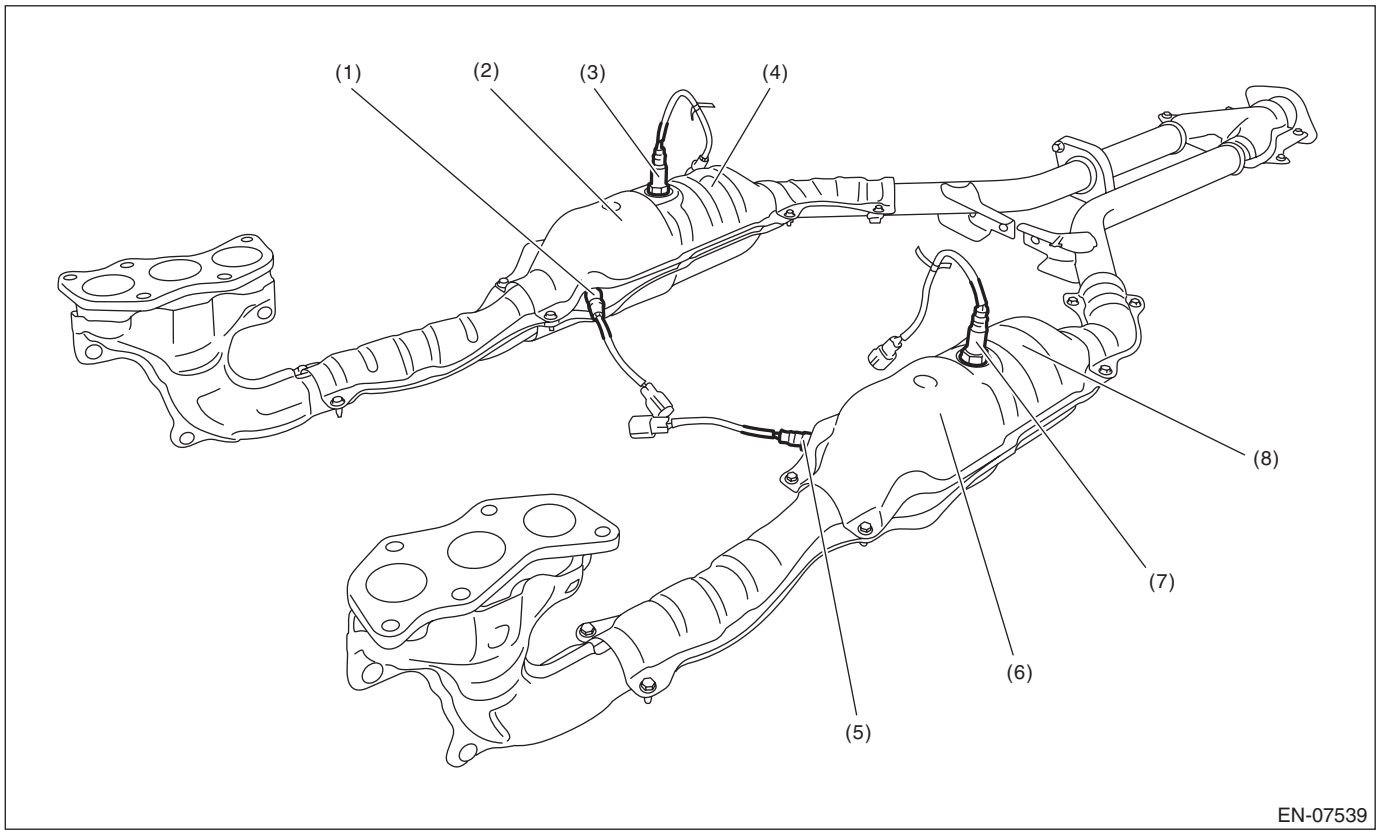

(4)
(5)
EN-07830


(6)
(7)
EN-07831

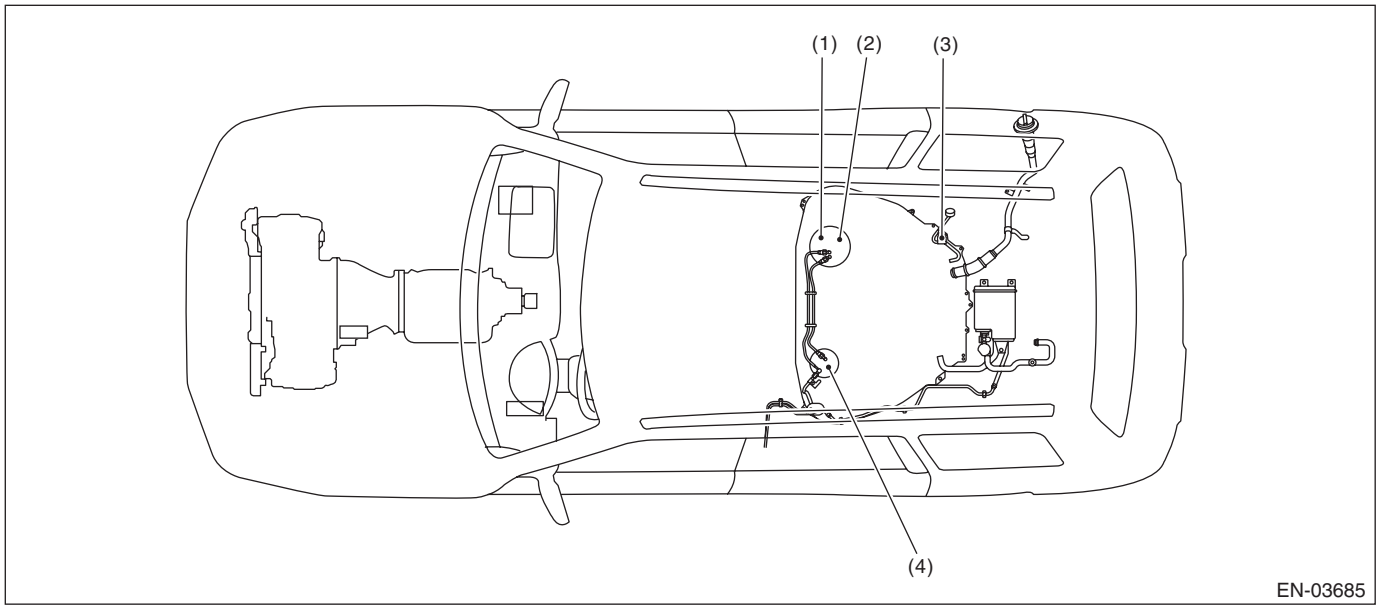

(8)
EN-07832


(9)
EN-07833

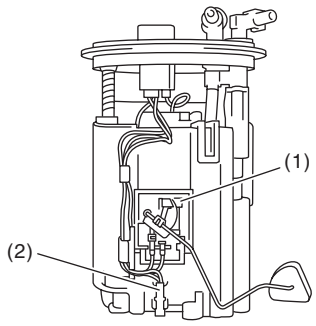
Electrical Component Location

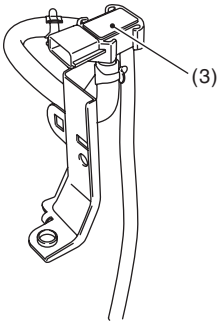


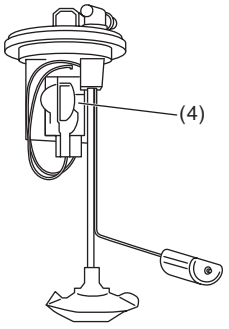
(1) Front oxygen (A/F) sensor RH
(2) Front catalytic converter RH
(3) Rear oxygen sensor RH
(4) Rear catalytic converter RH
(5) Front oxygen (A/F) sensor LH
(6) Front catalytic converter LH
(7) Rear oxygen sensor LH
(8) Rear catalytic converter LH



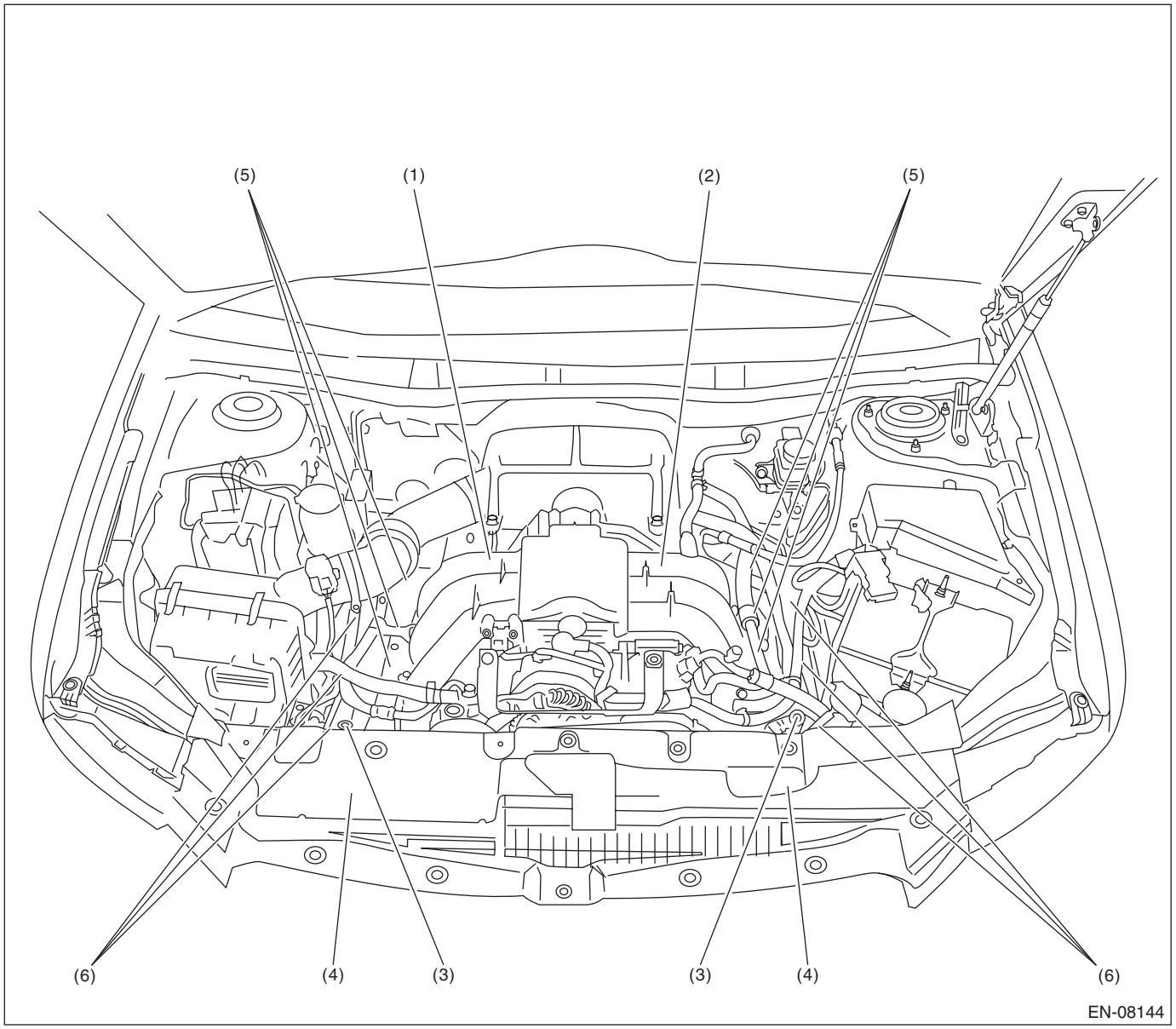
(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor



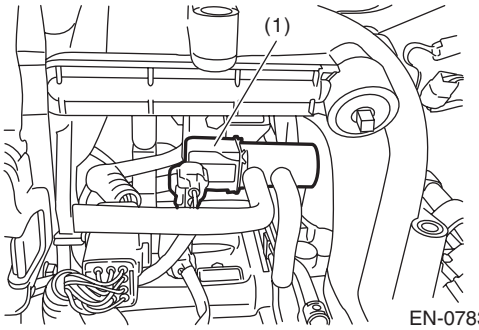




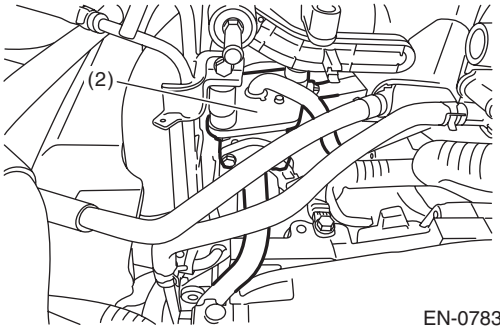
3. SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



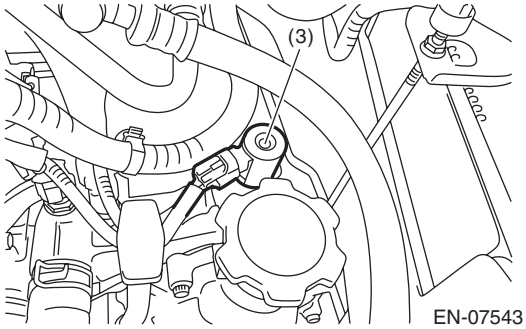
(1)	Purge control solenoid valve	(3)	Intake oil flow control solenoid valve	(5)	Fuel injector
(2)	EGR valve	(4)	Exhaust oil flow control solenoid valve	(6)	Ignition coil



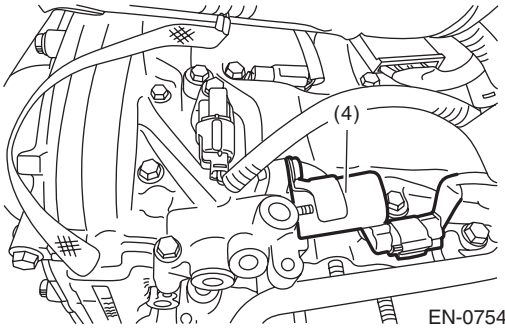
EN-07836



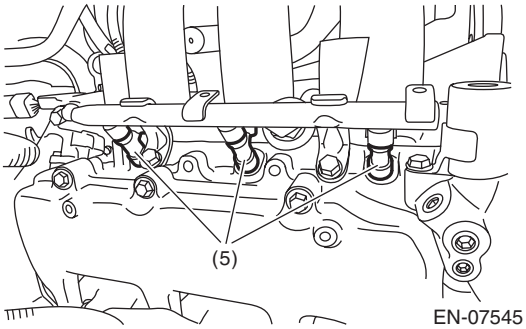
EN-07837



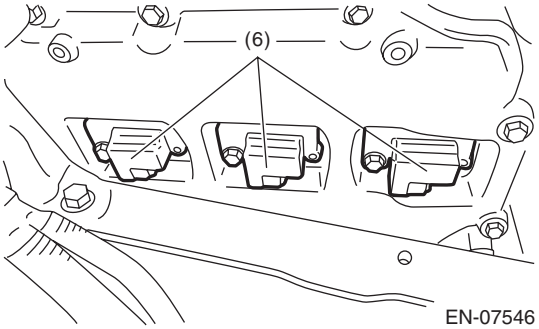
EN-07543



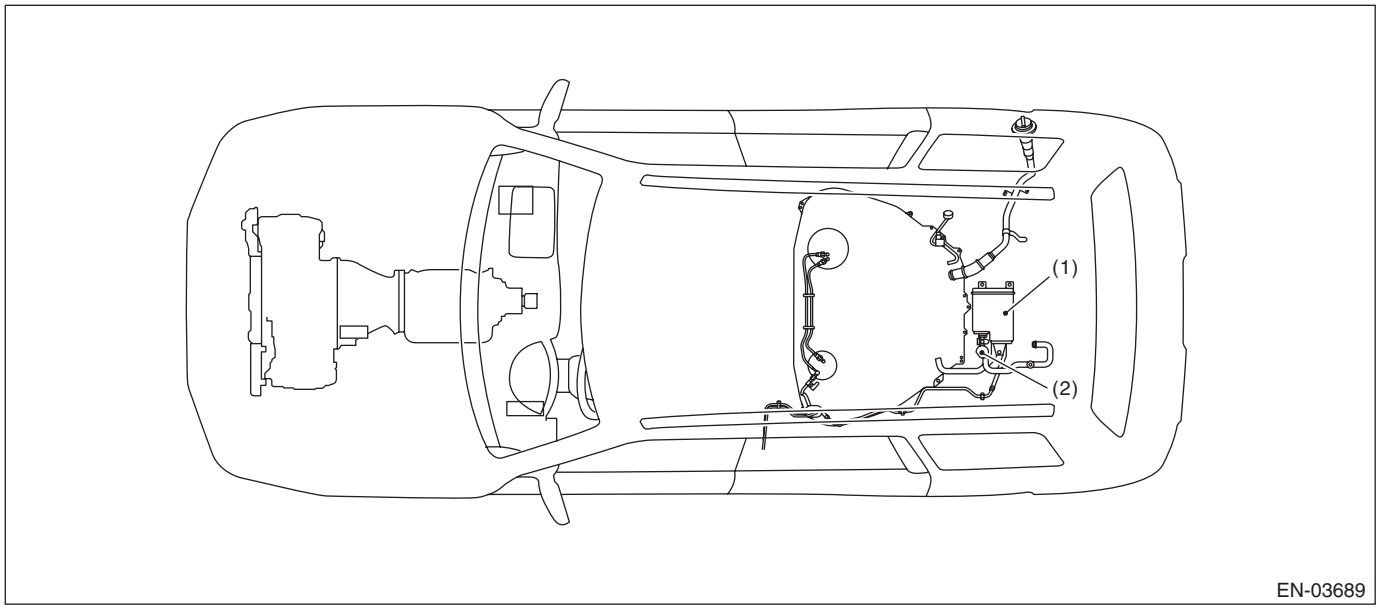
EN-07544



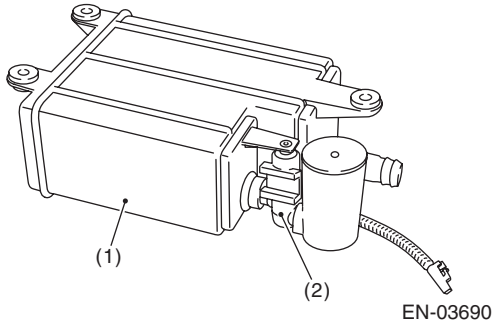
EN-07545

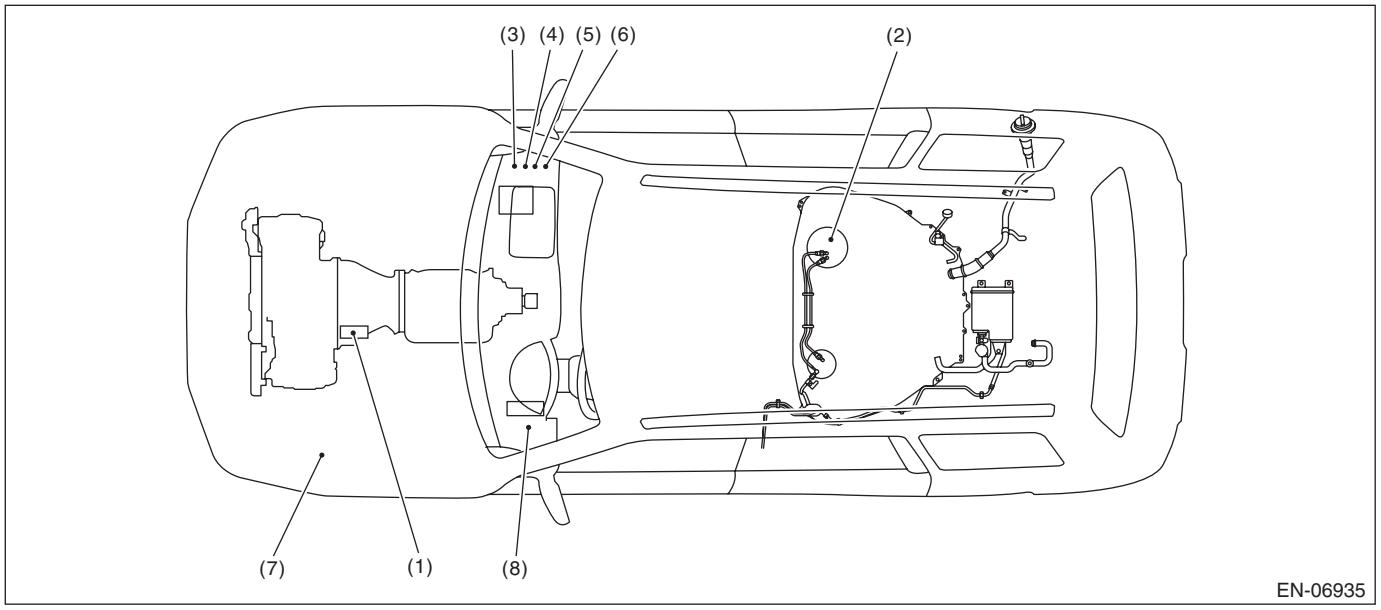


EN-07546

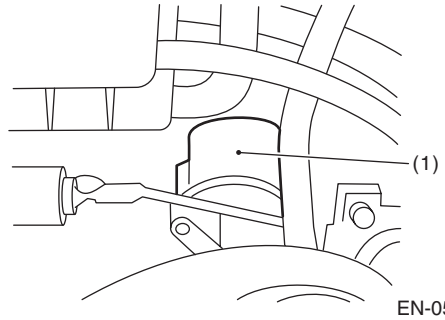


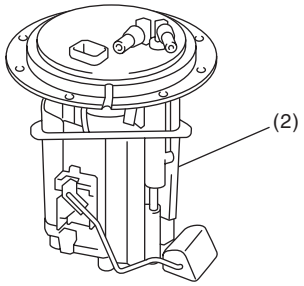
(1) Canister (2) Drain valve

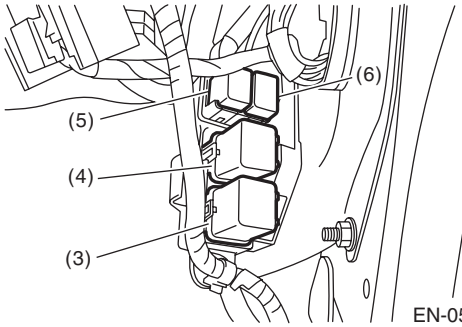


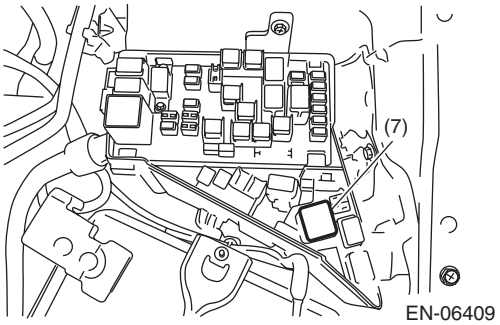


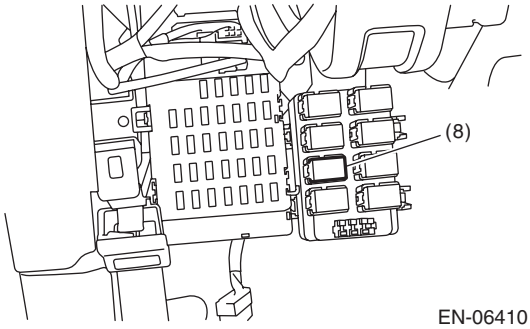
(1) Starter
(2) Fuel pump
(3) Main relay 2
(4) Main relay
(5) Electronic throttle control relay
(6) Fuel pump relay
(7) Main fan relay
(8) Starter relay





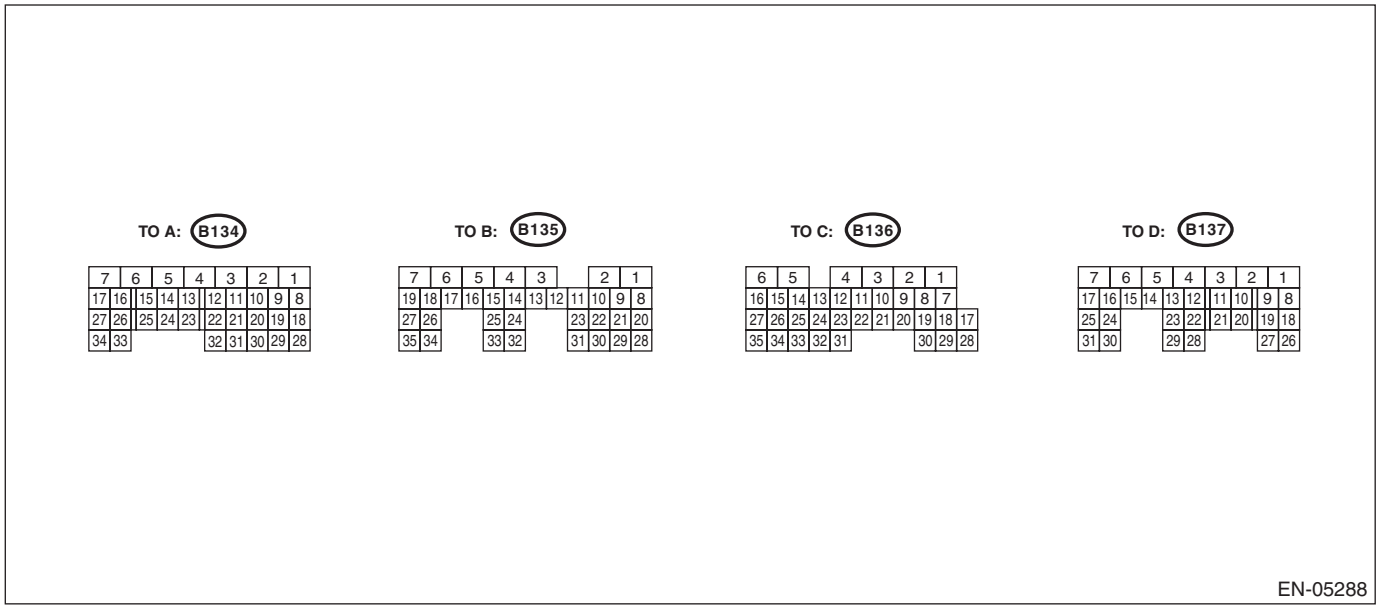






5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B137	17	0	–7 — +7	Waveform
	Signal (–)	B137	25	0	0	—
	Shield	B137	31	0	0	—
Intake camshaft position sensor (LH)		B137	16	0 or 5	0 or 5	Waveform
Intake camshaft position sensor (RH)		B137	24	0 or 5	0 or 5	Waveform
Exhaust camshaft position sensor (LH)		B137	29	0 or 5	0 or 5	Waveform
Exhaust camshaft position sensor (RH)		B137	23	0 or 5	0 or 5	Waveform
Camshaft position sensor ground		B137	30	0	0	—
Electronic throttle control	Main	B134	18	0.64 — 0.94 Fully open: Approx. 4.04	0.64 — 0.72 (After engine is warmed up.)	Fully closed: Approx. 0.6 Fully open: Approx. 4.04
	Sub	B134	28	1.51 — 1.76 Fully open: Approx. 4.232	1.51 — 1.58 (After engine is warmed up.)	Fully closed: Approx. 1.48 Fully open: Approx. 4.23
Electronic throttle control motor (+)		B134	2	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor (–)		B134	1	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor power supply		B135	7	10 — 13	12 — 14	—
Electronic throttle control motor relay		B135	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	When ignition switch is turned to ON: ON

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Accelerator pedal position sensor	Main sensor signal	B135	23	Fully closed: 1 Fully opened: 3.6	Fully closed: 1 Fully opened: 3.3	—
	Main power supply	B135	21	5	5	—
	Ground (main sensor)	B135	29	0	0	—
	Sub sensor signal	B135	31	Fully closed: 1 Fully opened: 3.7	Fully closed: 1 Fully opened: 3.3	—
	Sub power supply	B135	22	5	5	—
	Ground (sub sensor)	B135	30	0	0	—
Engine coolant temperature sensor		B137	22	1.0 — 1.4	1.0 — 1.4	After engine is warmed up.
Starter switch		B136	16	0	0	Cranking: 8 — 14
Starter relay		B135	26	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Ignition switch		B136	30	10 — 13	12 — 14	—
Neutral position switch		B136	35	ON: 0 OFF: 12±0.5		Switch is ON when select lever is in “P” range or “N” range.
Delivery (test) mode connector		B136	34	10 — 13	12 — 14	When connected: 0
Knock sensor 1		B137	2	2.4	2.4	—
Knock sensor 2		B137	4	2.4	2.4	—
Knock sensor shield		B137	8	0	0	—
Back-up power supply		B136	2	10 — 13	12 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B137	7	10 — 13	12 — 14	—
		B136	1	10 — 13	12 — 14	—
Sensor power supply		B134	19	5	5	—
Ignition control	#1	B134	21	0	12 — 14	Waveform
	#2	B134	22	0	12 — 14	Waveform
	#3	B134	31	0	12 — 14	Waveform
	#4	B134	32	0	12 — 14	Waveform
	#5	B134	25	0	12 — 14	Waveform
	#6	B134	26	0	12 — 14	Waveform
Fuel injector	#1	B134	10	10 — 13	1 — 14	Waveform
	#2	B134	11	10 — 13	1 — 14	Waveform
	#3	B134	12	10 — 13	1 — 14	Waveform
	#4	B134	13	10 — 13	1 — 14	Waveform
	#5	B134	23	10 — 13	1 — 14	Waveform
	#6	B134	24	10 — 13	1 — 14	Waveform
A/C switch		B136	29	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
A/C middle pressure switch		B136	7	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
A/C relay control		B135	35	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan control		B135	11	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—

Engine Control Module (ECM) I/O Signal

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Radiator fan control power supply		B135	12	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Self-shutoff control		B135	13	0	0	—
Malfunction indicator light		B135	33	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B135	15	—	0 — 13 or more	Waveform
Purge control solenoid valve		B137	6	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
EGR valve	Signal 1	B134	8	0 or 10 — 13	0 or 12 — 14	—
	Signal 2	B134	9	0 or 10 — 13	0 or 12 — 14	—
	Signal 3	B134	20	0 or 10 — 13	0 or 12 — 14	—
	Signal 4	B134	30	0 or 10 — 13	0 or 12 — 14	—
Manifold absolute pressure sensor		B137	20	3.5 — 4.8	1.1 — 1.9	—
Air flow sensor	Signal	B136	22	0.74	0.3 — 4.5	—
	Shield	B136	10	0	0	—
	Ground	B136	11	0	0	—
Intake air temperature sensor		B136	31	3.15 — 3.33	3.15 — 3.33	Ambient air temperature
Front oxygen (A/F) sensor LH	Signal (+)	B135	8	2.8 — 3.2	2.8 — 3.2	—
	Signal (–)	B135	20	2.4 — 2.7	2.4 — 2.7	—
	Shield	B136	9	0	0	—
Front oxygen (A/F) sensor heater LH	Signal 1	B135	2	12 — 14	—	Waveform
	Signal 2	B135	1	12 — 14	—	Waveform
Front oxygen (A/F) sensor RH	Signal (+)	B136	19	2.8 — 3.2	2.8 — 3.2	—
	Signal (–)	B136	18	2.4 — 2.7	2.4 — 2.7	—
	Shield	B136	9	0	0	—
Front oxygen (A/F) sensor heater RH	Signal 1	B136	6	12 — 14	—	Waveform
	Signal 2	B136	5	12 — 14	—	Waveform
Rear oxygen sensor LH	Signal	B135	28	0	0 — 0.9	—
	Shield	B136	9	0	0	—
Rear oxygen sensor heater LH signal		B135	5	12 — 14	—	Waveform
Rear oxygen sensor RH	Signal	B136	20	0	0 — 0.9	—
	Shield	B136	9	0	0	—
Rear oxygen sensor heater RH signal		B135	6	12 — 14	—	Waveform
Immobilizer	Communi-cation 1	B135	25	—	—	—
	Communi-cation 2	B135	24	—	—	—
Fuel pump control unit	Control	B136	33	0 or 5	0 or 5	Waveform
	Diagnostic signal	B135	10	0 or 10 — 13	12 — 14	—
Brake switch 1 (brake switch)		B136	15	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 12 — 14	—
Brake switch 2 (stop light switch)		B136	3	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 12 — 14 When brake pedal is released: 0	—

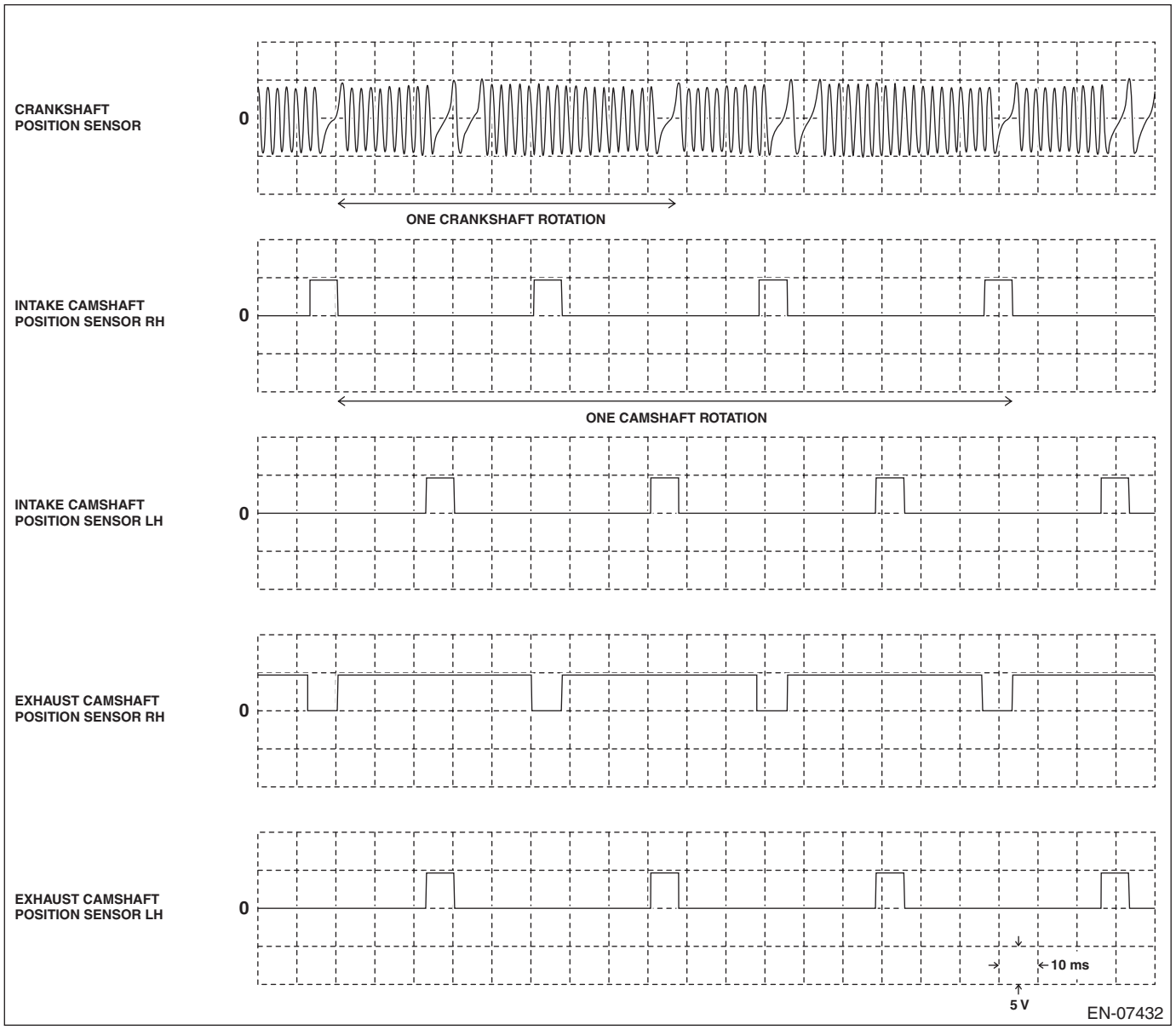
Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Cruise control command switch		B136	12	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating vehicle distance setting: 1.5 — 2.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating vehicle distance setting: 1.5 — 2.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	—
Cruise control main switch		B136	13	ON: 0 OFF: 5	ON: 0 OFF: 5	—
Intake oil flow control solenoid valve LH	Signal (+)	B134	17	0	0.6	—
	Signal (–)	B134	16	0	0	—
Intake oil flow control solenoid valve RH	Signal (+)	B134	34	0	0.6	—
	Signal (–)	B134	27	0	0	—
Exhaust oil flow control solenoid valve LH	Signal (+)	B134	5	0	1.9	—
	Signal (–)	B134	14	0	0	—
Exhaust oil flow control solenoid valve RH	Signal (+)	B134	7	0	1.9	—
	Signal (–)	B134	15	0	0	—
Oil temperature sensor signal		B137	21	1.0 — 1.4	1.0 — 1.4	After engine is warmed up.
Power steering oil pressure switch		B137	28	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
SSM communication		B135	14	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—
Ground	Sensor	B134	29	0	0	—
		B135	30	0	0	—
	Engine 1	B134	6	0	0	—
	Engine 2	B134	4	0	0	—
	Engine 3	B134	3	0	0	—
	Engine 4	B137	1	0	0	—
	Engine 5	B137	3	0	0	—
	Engine 6	B137	5	0	0	—
	Body	B136	4	0	0	—
CAN communication	(Hi)	B136	17	Pulse signal		—
	(Lo)	B136	28	Pulse signal		—
Fuel tank pressure sensor		B136	21	2.3 — 2.7	2.3 — 2.7	Value after detaching and attaching the fuel filler cap
Drain valve		B135	4	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Fuel temperature sensor		B136	23	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (77°F)
Brake vacuum sensor		B137	9	1 — 3.8	1 — 3.8	—

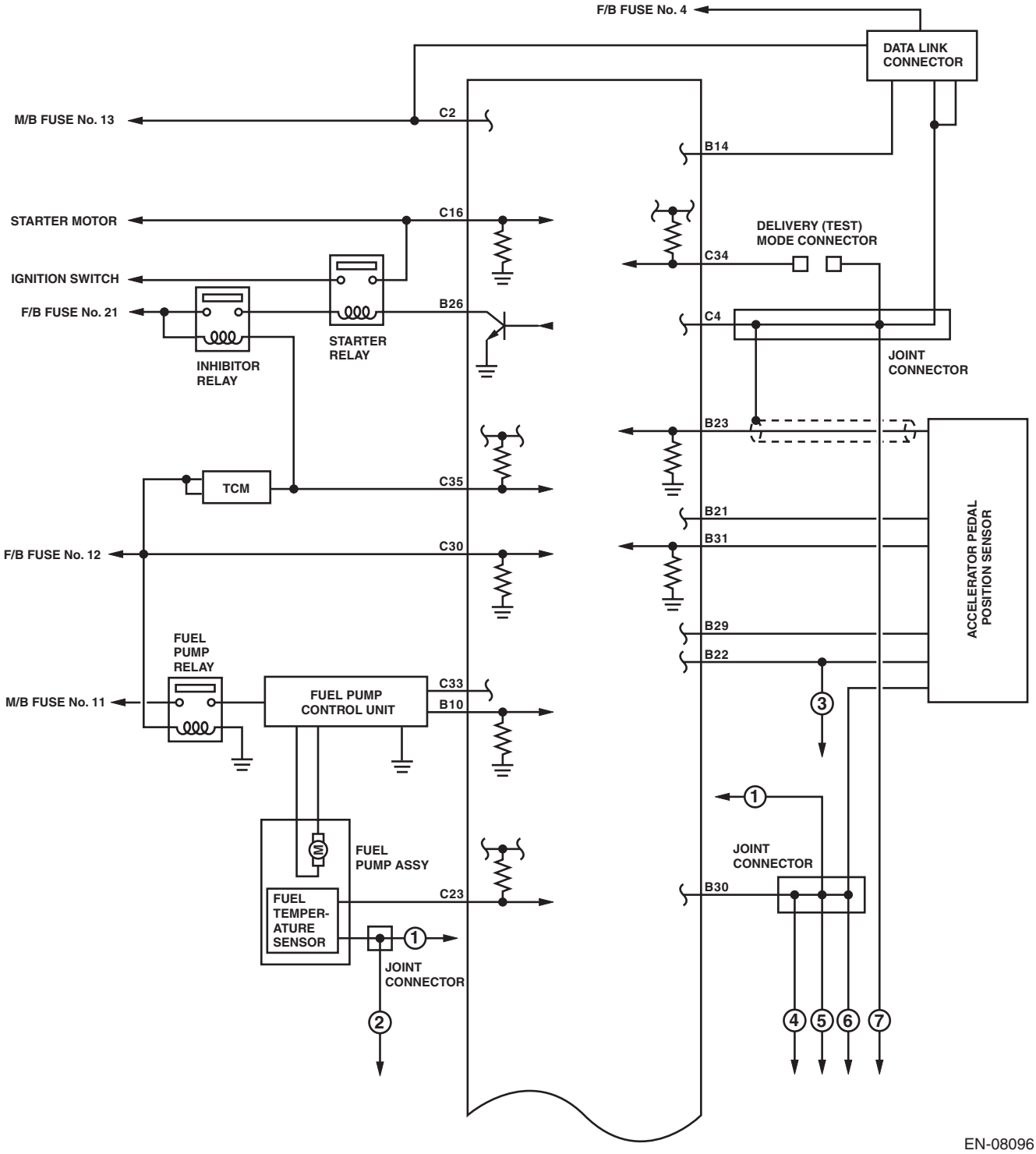
Contents	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (engine OFF)	Engine ON (idling)	
Brake vacuum pump	B136	8	0 (When pump is OFF)	0 (When pump is OFF)	—
			10 — 13 (When pump is ON)	12 — 14 (When pump is ON)	
Brake vacuum pump relay	B135	27	10 — 13 (When pump is OFF)	12 — 14 (When pump is OFF)	—
			0 (When pump is ON)	0 (When pump is ON)	

Input/output name:
- Crankshaft position sensor
- Intake camshaft position sensor RH
- Intake camshaft position sensor LH
- Exhaust camshaft position sensor RH
- Exhaust camshaft position sensor LH

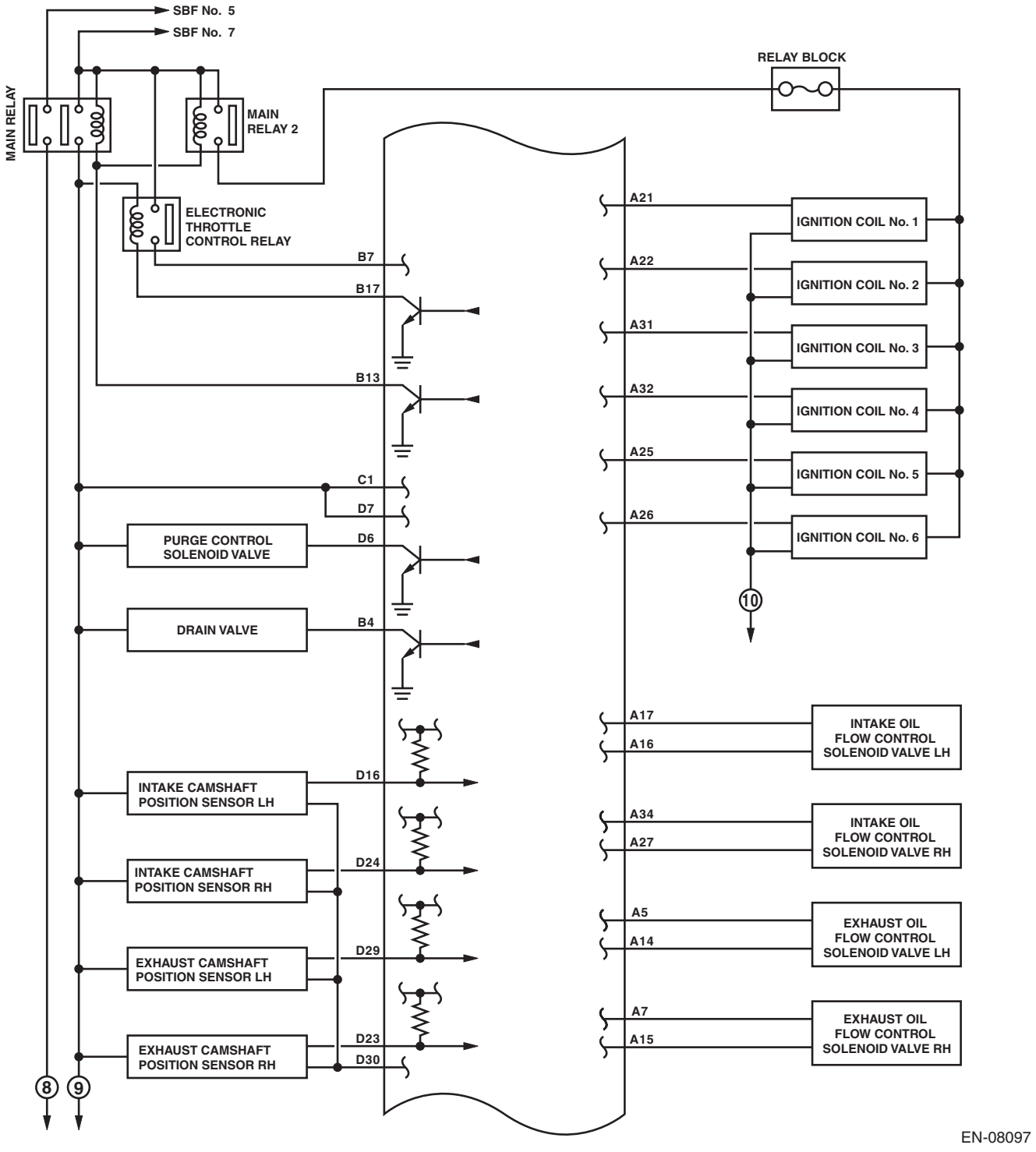
Measuring condition:
- After warming-up

- At idling

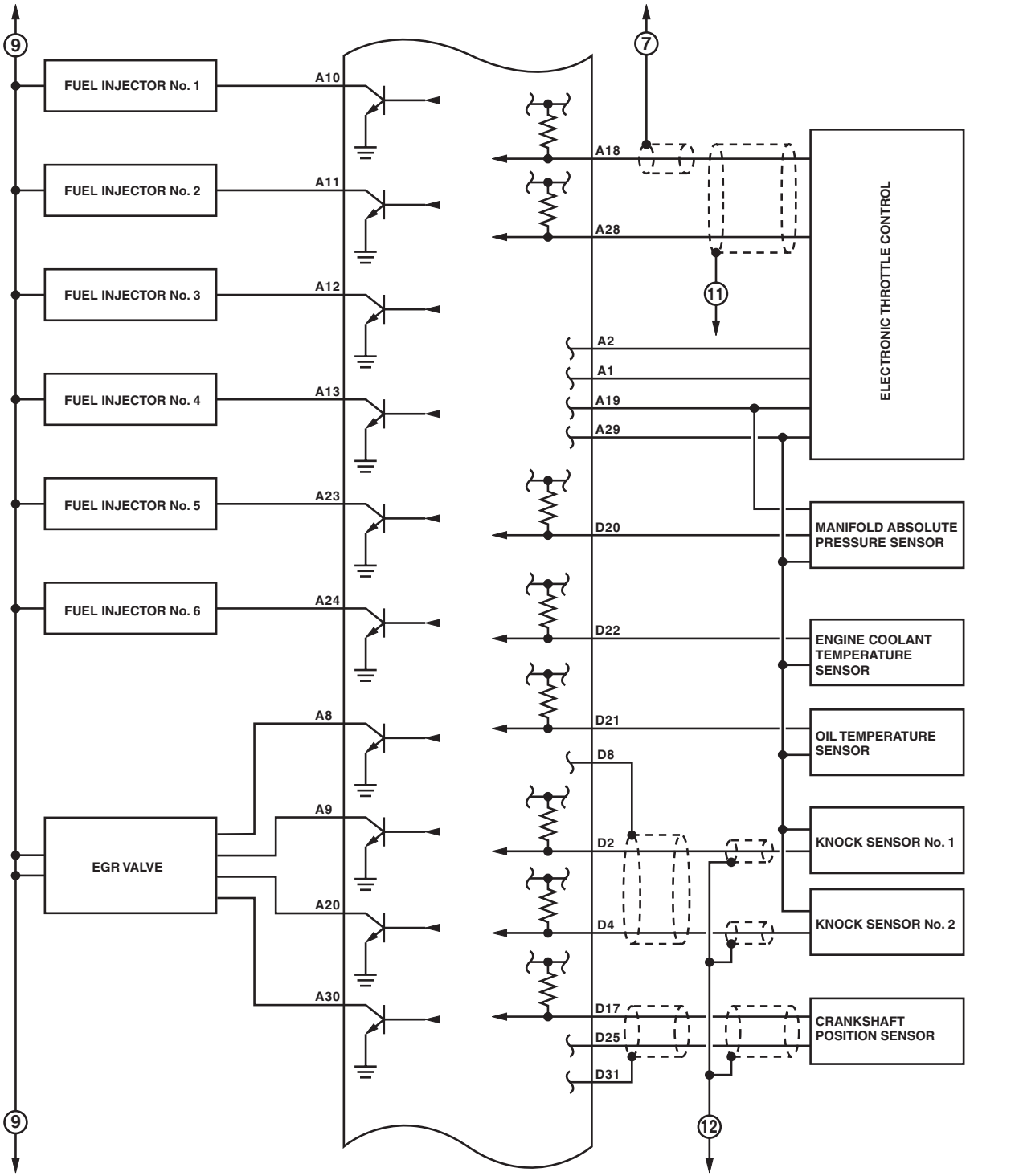

CRANKSHAFT POSITION SENSOR
0
ONE CRANKSHAFT ROTATION
INTAKE CAMSHAFT POSITION SENSOR RH
0
ONE CAMSHAFT ROTATION
INTAKE CAMSHAFT POSITION SENSOR LH
0
EXHAUST CAMSHAFT POSITION SENSOR RH
0
EXHAUST CAMSHAFT POSITION SENSOR LH
0
10 ms
5 V
EN-07432


F/B FUSE No. 4
DATA LINK CONNECTOR
M/B FUSE No. 13
C2
B14
STARTER MOTOR
C16
DELIVERY (TEST) MODE CONNECTOR
C34
IGNITION SWITCH
F/B FUSE No. 21
B26
C4
STARTER RELAY
INHIBITOR RELAY
JOINT CONNECTOR
B23
TCM
C35
B21
B31
F/B FUSE No. 12
C30
ACCELERATOR PEDAL POSITION SENSOR
B29
B22
FUEL PUMP RELAY
M/B FUSE No. 11
FUEL PUMP CONTROL UNIT
C33
B10
3
1
FUEL PUMP ASSY
JOINT CONNECTOR
B30
FUEL TEMPER-ATURE SENSOR
C23
1
JOINT CONNECTOR
2
4
5
6
7

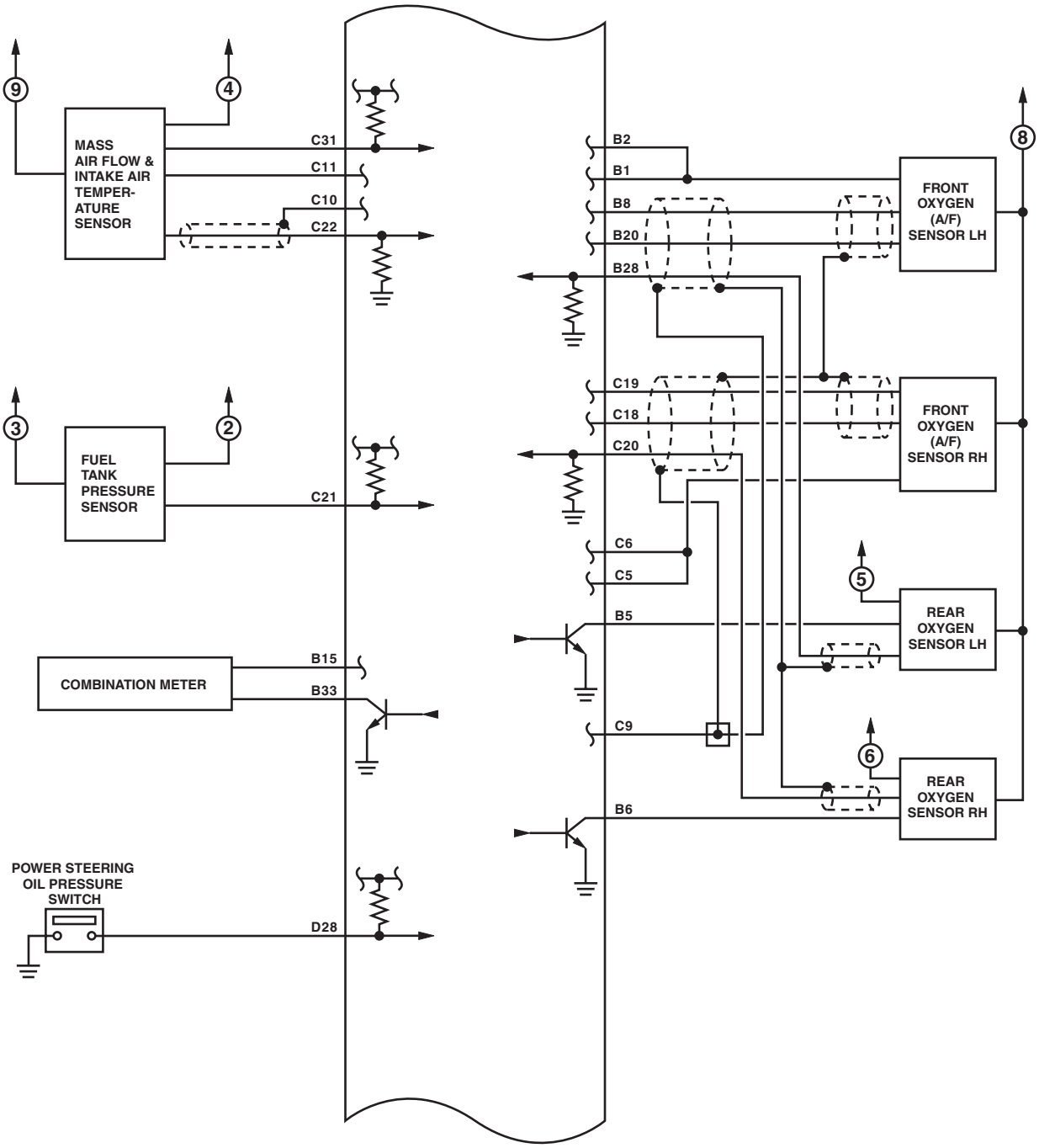
EN-08096


SBF No. 5
SBF No. 7
RELAY BLOCK
MAIN RELAY
MAIN RELAY 2
ELECTRONIC THROTTLE CONTROL RELAY
B7
B17
B13
C1
D7
PURGE CONTROL SOLENOID VALVE
D6
DRAIN VALVE
B4
INTAKE CAMSHAFT POSITION SENSOR LH
D16
INTAKE CAMSHAFT POSITION SENSOR RH
D24
EXHAUST CAMSHAFT POSITION SENSOR LH
D29
EXHAUST CAMSHAFT POSITION SENSOR RH
D23
D30
8
9
A21
A22
A31
A32
A25
A26
IGNITION COIL No. 1
IGNITION COIL No. 2
IGNITION COIL No. 3
IGNITION COIL No. 4
IGNITION COIL No. 5
IGNITION COIL No. 6
10
A17
A16
INTAKE OIL FLOW CONTROL SOLENOID VALVE LH
A34
A27
INTAKE OIL FLOW CONTROL SOLENOID VALVE RH
A5
A14
EXHAUST OIL FLOW CONTROL SOLENOID VALVE LH
A7
A15
EXHAUST OIL FLOW CONTROL SOLENOID VALVE RH

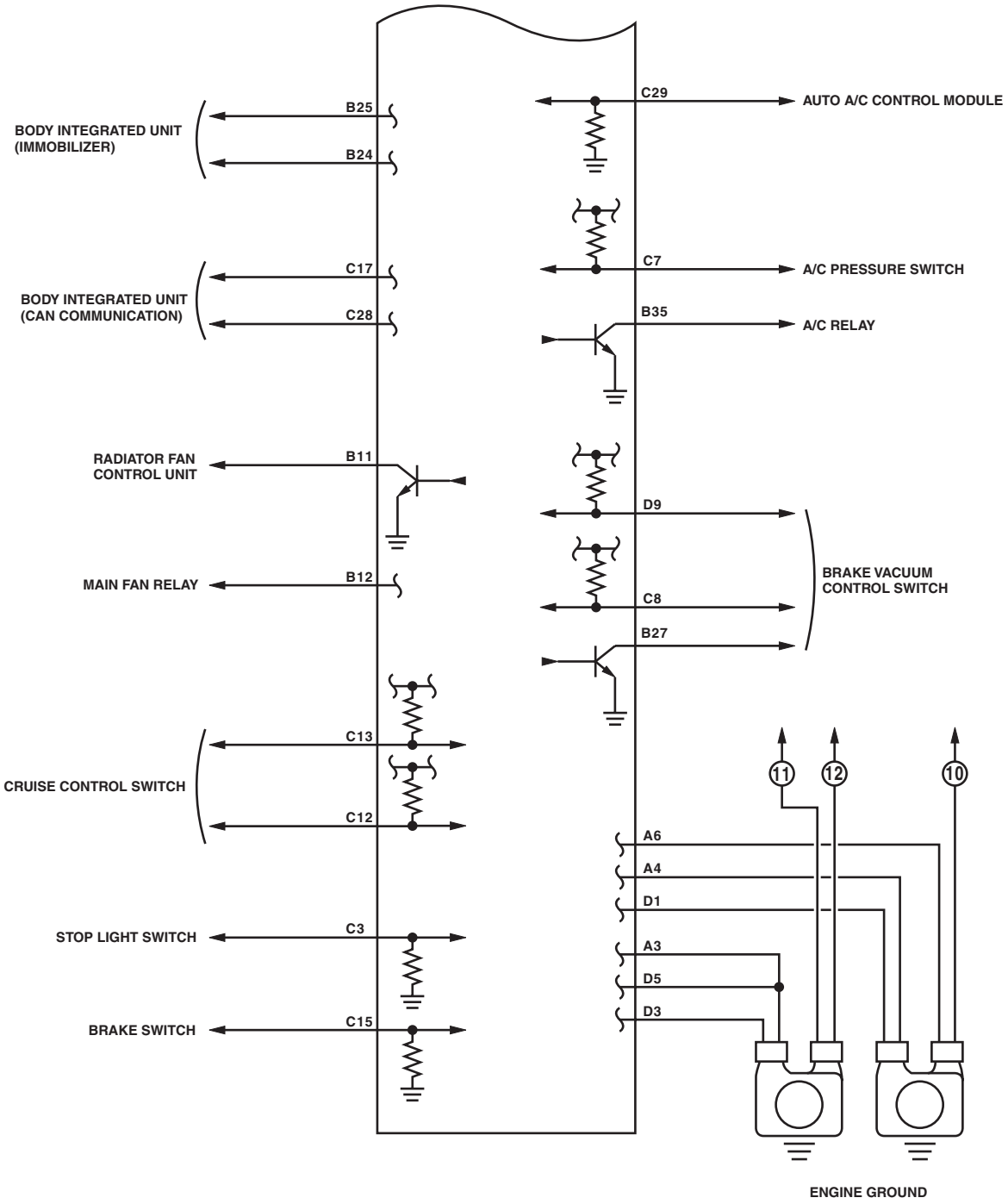
EN-08097


9
FUEL INJECTOR No. 1
FUEL INJECTOR No. 2
FUEL INJECTOR No. 3
FUEL INJECTOR No. 4
FUEL INJECTOR No. 5
FUEL INJECTOR No. 6
EGR VALVE
9
A10
A11
A12
A13
A23
A24
A8
A9
A20
A30
7
A18
A28
11
A2
A1
A19
A29
D20
D22
D21
D8
D2
D4
D17
D25
D31
12
ELECTRONIC THROTTLE CONTROL
MANIFOLD ABSOLUTE PRESSURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
OIL TEMPERATURE SENSOR
KNOCK SENSOR No. 1
KNOCK SENSOR No. 2
CRANKSHAFT POSITION SENSOR

EN-08098


9
4
MASS AIR FLOW & INTAKE AIR TEMPER-ATURE SENSOR
C31
C11
C10
C22
3
2
FUEL TANK PRESSURE SENSOR
C21
COMBINATION METER
B15
B33
POWER STEERING OIL PRESSURE SWITCH
D28
B2
B1
B8
B20
B28
C19
C18
C20
C6
C5
B5
C9
B6
8
FRONT OXYGEN (A/F) SENSOR LH
FRONT OXYGEN (A/F) SENSOR RH
5
REAR OXYGEN SENSOR LH
6
REAR OXYGEN SENSOR RH

EN-08099


BODY INTEGRATED UNIT (IMMOBILIZER)
B25
B24
BODY INTEGRATED UNIT (CAN COMMUNICATION)
C17
C28
RADIATOR FAN CONTROL UNIT
B11
MAIN FAN RELAY
B12
CRUISE CONTROL SWITCH
C13
C12
STOP LIGHT SWITCH
C3
BRAKE SWITCH
C15
C29
AUTO A/C CONTROL MODULE
C7
A/C PRESSURE SWITCH
B35
A/C RELAY
D9
BRAKE VACUUM CONTROL SWITCH
C8
B27
11
12
10
A6
A4
D1
A3
D5
D3
ENGINE GROUND

EN-08100

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specifications
Engine load	17.9 — 38.8(%): Idling
	16.6 — 33.7(%): 2,500 rpm racing

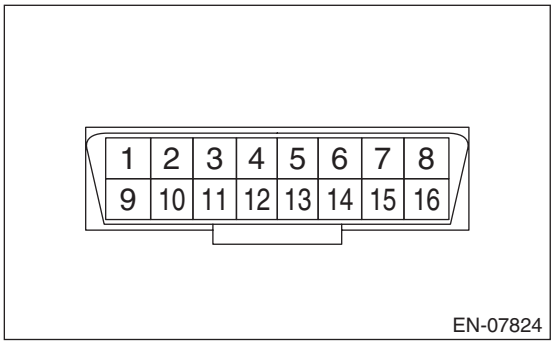
Measuring condition:
- After engine is warmed up.
- Place the select lever in “P” range or “N” range.
- Turn the A/C to OFF.
- Turn all the accessory switches to OFF.

7. Data Link Connector

A: NOTE

This connector is used for Subaru Select Monitor.

CAUTION:
Do not connect any scan tools other than Subaru Select Monitor or general scan tool because the circuit for Subaru Select Monitor may be damaged.



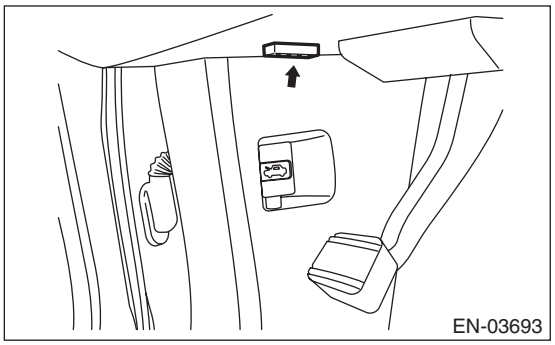
Terminal No.	Content	Terminal No.	Content
1	Blank	9	Blank
2	Blank	10	Blank
3	Blank	11	Blank
4	Ground	12	Blank
5	Ground	13	Blank
6	CAN communication (Hi)	14	CAN communication (Lo)
7	Subaru Select Monitor signal	15	Blank
8	Blank	16	Power supply

8. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

1) Prepare a scan tool (general scan tool) required by SAE J1978.
2) Connect the general scan tool to data link connector located in the lower portion of the instrument panel (on the driver's side).



3) Using the general scan tool, call up each data. General scan tool functions consist of:
   (1) MODE $01: Current powertrain diagnostic data
   (2) MODE $02: Powertrain freeze frame data
   (3) MODE $03: Emission-related powertrain DTC
   (4) MODE $04: Clear/Reset emission-related diagnostic information
   (5) MODE $06: Request on-board monitoring test results for intermittently monitored systems
   (6) MODE $07: Request on-board monitoring test results for continuously monitored systems
   (7) MODE $09: Request vehicle information

   Read out the data according to repair procedures. (For detailed operation procedure, refer to the general scan tool operation manual.)

NOTE:
For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refer to data denoting the current operating condition of analog input/output, digital input/output or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
$01	Number of emission-related powertrain DTC and malfunction indicator light status	—
$03	Fuel system control status	—
$04	Calculated engine load value	%
$05	Engine coolant temperature	°C
$06	Short term fuel trim (Bank 1)	%
$07	Long term fuel trim (Bank 1)	%
$08	Short term fuel trim (Bank 2)	%
$09	Long term fuel trim (Bank 2)	%
$0B	Intake manifold absolute pressure	kPa
$0C	Engine speed	rpm
$0D	Vehicle speed	MPH
$0E	Ignition timing advance	°
$0F	Intake air temperature	°C
$10	Intake air amount	g/s
$11	Throttle valve opening angle	%
$13	Air fuel ratio sensor	—
$15	Oxygen sensor output voltage (Bank 1 Sensor 2)	V
$15	Oxygen sensor correction (Bank 1 Sensor 2)	%
$19	Oxygen sensor output voltage (Bank 2 Sensor 2)	V
$19	Oxygen sensor correction (Bank 2 Sensor 2)	%
$1C	On-board diagnostic system	—
$1F	Elapsed time after starting the engine	sec
$21	Travel distance after the malfunction indicator light illuminates	miles
$24	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (Bank 1)	– and V
$28	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (Bank 2)	– and V
$2C	Target EGR	%
$2D	EGR deviation	%
$2E	Evaporative purge	%
$2F	Fuel level	%
$30	Number of warm ups after DTC clear	—
$31	Travel distance after DTC clear	miles
$32	Fuel tank pressure	Pa
$33	Barometric pressure	kPa
$34	A/F sensor lambda value (Bank 1 Sensor 1)	—
$34	A/F sensor current value (Bank 1 Sensor 1)	mA
$38	A/F sensor lambda value (Bank 2 Sensor 1)	—
$38	A/F sensor current value (Bank 2 Sensor 1)	mA
$3C	Catalyst temperature #1	°C
$3D	Catalyst temperature #2	°C
$41	Diagnostic monitor of each drive cycle	—
$42	ECM power voltage	V
$43	Absolute load	%
$44	A/F target lambda	—
$45	Relative throttle opening angle	%
$46	Ambient temperature	°C
$47	Absolute throttle opening angle 2	%

PID	Data	Unit of measure
$49	Absolute accelerator opening angle 1	%
$4A	Absolute accelerator opening angle 2	%
$4C	Target throttle opening angle	%
$4D	Engine operating time while malfunction indicator light lit	min
$4E	Elapsed time after DTC clear	min
$51	Fuel used	—
$5A	Relative accelerator opening angle	%
$65	Neutral status	—

NOTE:
Refer to general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refer to data denoting the operating condition when trouble is detected by on-board diagnosis system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
$02	DTC that caused the freeze frame data storage required by CARB	—
$03	Fuel system control status	—
$04	Calculated engine load value	%
$05	Engine coolant temperature	°C
$06	Short term fuel trim (Bank 1)	%
$07	Long term fuel trim (Bank 1)	%
$08	Short term fuel trim (Bank 2)	%
$09	Long term fuel trim (Bank 2)	%
$0B	Intake manifold absolute pressure	kPa
$0C	Engine speed	rpm
$0D	Vehicle speed	MPH
$0E	Ignition timing advance	°
$0F	Intake air temperature	°C
$10	Intake air amount	g/s
$11	Throttle valve opening angle	%
$13	Air fuel ratio sensor	—
$15	Oxygen sensor output voltage (Bank 1 Sensor 2)	V
$15	Oxygen sensor correction (Bank 1 Sensor 2)	%
$19	Oxygen sensor output voltage (Bank 2 Sensor 2)	V
$19	Oxygen sensor correction (Bank 2 Sensor 2)	%
$1C	On-board diagnostic system	—
$1F	Elapsed time after starting the engine	sec
$2C	Target EGR	%
$2D	EGR deviation	%
$2E	Evaporative purge	%
$2F	Fuel level	%
$32	Fuel tank pressure	Pa
$33	Barometric pressure	kPa
$42	ECM power voltage	V
$43	Absolute load	%
$44	A/F target lambda	—
$45	Relative throttle opening angle	%
$46	Ambient temperature	°C
$47	Absolute throttle opening angle 2	%
$49	Absolute accelerator opening angle 1	%

PID	Data	Unit of measure
$4A	Absolute accelerator opening angle 2	%
$4C	Target throttle opening angle	%
$65	Neutral status	—

NOTE:
Refer to general scan tool manufacturer's operation manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DTC)

Refer to "List of Diagnostic Trouble Code (DTC)" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refer to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:
Refer to general scan tool manufacturer's instruction manual to clear the emission-related diagnostic information (MODE $04).

6. MODE $06

Refer to test value of troubleshooting and data of test limit indicated on the support data bit sequence table. A list of the support data is shown in the following table.

OBDMID	TID	SID	Diagnostic item
$01	$81	$0A	A/F sensor continuity failure (Bank 1 Sensor 1)
	$82	$8D	
	$83	$14	
	$84	$1E	A/F sensor range failure (Bank 1 Sensor 1)
	$85	$1E	
	$86	$20	A/F sensor response failure (Bank 1 Sensor 1)
$02	$87	$0B	Oxygen sensor circuit failure (Bank 1 Sensor 2)
	$88	$0B	
	$07	$0B	Oxygen sensor drop failure (Bank 1 Sensor 2)
	$08	$0B	
	$A5	$0B	
	$05	$10	Oxygen sensor response failure (Bank 1 Sensor 2)
	$06	$10	
$05	$81	$0A	A/F sensor continuity failure (Bank 2 Sensor 1)
	$82	$8D	
	$83	$14	
	$84	$1E	A/F sensor range failure (Bank 2 Sensor 1)
	$85	$1E	
	$86	$20	A/F sensor response failure (Bank 2 Sensor 1)
$06	$87	$0B	Oxygen sensor circuit failure (Bank 2 Sensor 2)
	$88	$0B	
	$07	$0B	Oxygen sensor drop failure (Bank 2 Sensor 2)
	$08	$0B	
	$A5	$0B	
	$05	$10	Oxygen sensor response failure (Bank 2 Sensor 2)
	$06	$10	
$21	$89	$20	Catalyst deterioration diagnosis (Bank 1)
$31	$8A	$FD	EGR system diagnosis

OBDMID	TID	SID	Diagnostic item
$35	$8B	$9D	VVT monitor (Bank 1)
	$8C	$9D	
	$8D	$9D	
	$8E	$9D	
$36	$8B	$9D	VVT monitor (Bank 2)
	$8C	$9D	
	$8D	$9D	
	$8E	$9D	
$39	$93	$FE	Evaporative emission control system (Cap off)
$3B	$94	$FE	Evaporative emission control system (0.04 inch leak)
	$95	$FE	
$3C	$96	$FE	Evaporative emission control system (0.02 inch leak)
	$97	$FE	
$3D	$98	$FE	Evaporative emission control system (Purge flow)
$41	$99	$24	A/F sensor heater failure (Bank 1 Sensor 1)
	$9A	$24	
	$9B	$14	A/F sensor heater characteristics failure (Bank 1 Sensor 1)
$42	$9C	$24	Oxygen sensor heater failure (Bank 1 Sensor 2)
	$9D	$24	
$45	$99	$24	A/F sensor heater failure (Bank 2 Sensor 1)
	$9A	$24	
	$9B	$14	A/F sensor heater characteristics failure (Bank 2 Sensor 1)
$46	$9C	$24	Oxygen sensor heater failure (Bank 2 Sensor 2)
	$9D	$24	
$A1	$0B	$24	Misfire monitoring (All cylinders)
	$0C	$24	
$A2	$0B	$24	Misfire monitoring (#1 cylinder)
	$0C	$24	
$A3	$0B	$24	Misfire monitoring (#2 cylinder)
	$0C	$24	
$A4	$0B	$24	Misfire monitoring (#3 cylinder)
	$0C	$24	
$A5	$0B	$24	Misfire monitoring (#4 cylinder)
	$0C	$24	
$A6	$0B	$24	Misfire monitoring (#5 cylinder)
	$0C	$24	
$A7	$0B	$24	Misfire monitoring (#6 cylinder)
	$0C	$24	

7. MODE $07

Refer to the data of DTC (pending code) for troubleshooting result about emission in the first time.

8. MODE $09

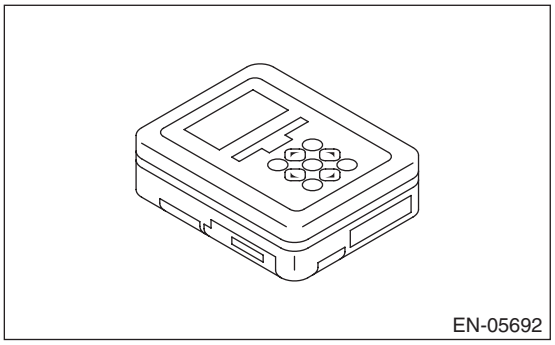
Refer to the data of vehicle specification (V.I.N., calibration ID, diagnosis frequency, etc.).

9. Subaru Select Monitor

A: OPERATION

1. HOW TO USE THE SUBARU SELECT MONITOR

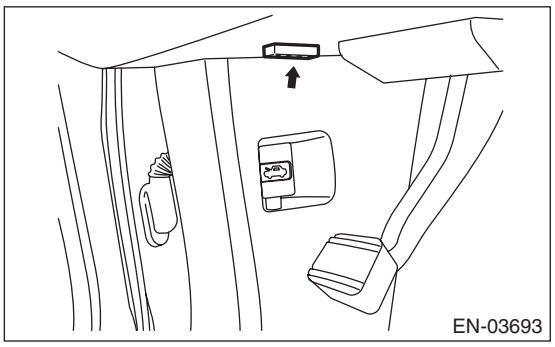
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-8, PREPARATION TOOL, General Description.>



2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
4) Connect the diagnosis cable to SDI.
5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool.



6) Start the PC.
7) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
8) Call up DTC and data, then record them.

NOTE:
For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

2. READ CURRENT DATA FOR ENGINE (NORMAL MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {Current Data Display & Save}.
5) On «Current Data Display & Save» display, select {Normal sampling}.
6) Using the scroll key, scroll the display screen up or down until the desired data is shown.

NOTE:
- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- A list of the support data is shown in the following table.

Content	Display	Unit of measure	Note (at idling)
Engine load	Engine Load	%	2.4%
Engine coolant temperature signal	Coolant Temp.	°C or °F	≥ 85°C or 185°F (after warm-up)
A/F correction #1	A/F Correction #1	%	–10% — +10%
A/F learning #1	A/F Learning #1	%	–10% — +10%
A/F correction #2	A/F Correction #2	%	–10% — +10%
A/F learning #2	A/F Learning #2	%	–10% — +10%
Intake manifold absolute pressure	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	210 mmHg, 28 kPa, 8.3 inHg or 4.1 psig
Engine speed signal	Engine Speed	rpm	600 — 800 rpm (after warm-up)
Meter vehicle speed signal	Vehicle Speed	km/h or MPH	0 km/h or 0 MPH
Ignition timing signal	Ignition Timing	deg	13 — 15 deg
Intake air temperature signal	Intake Air Temp.	°C or °F	(Ambient air temperature)
Intake air amount	Mass Air Flow	g/s or lb/m	2.5 g/s — 5.0 g/s or 0.31 lb/m — 0.71 lb/m
Throttle opening angle signal	Throttle Opening Angle	%	2%
Front oxygen sensor voltage value 1	Front O2 Sensor #1	V	0.900 V
Front oxygen sensor voltage value 2	Front O2 Sensor #2	V	0.900 V
Battery voltage	Battery Voltage	V	12 — 13 V
Mass air flow voltage	Air Flow Sensor Voltage	V	1.2 — 1.3 V
Injection 1 pulse width	Fuel Injection #1 Pulse	ms	2.5 ms — 3.5 ms
Injection 2 pulse width	Fuel Injection #2 Pulse	ms	2.5 ms — 3.5 ms
Atmospheric pressure signal	Atmosphere Pressure	mmHg, kPa, inHg or psig	(Atmospheric pressure)
Intake manifold relative pressure	Mani. Relative Pressure	mmHg, kPa, inHg or psig	(Air intake absolute pressure — Atmospheric pressure)
Learned ignition timing	Learned Ignition Timing	deg	+0.0 deg
Acceleration opening angle signal	Accel. Opening Angle	%	0%
Fuel temperature signal	Fuel Temp.	°C or °F	+28°C or +82°F
Radiator fan output	Radiator Fan Control	%	0% (Water temperature 90°C (194°F) when air conditioner is OFF)
Purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%	18%
Number of EGR steps	No. of EGR steps	STEP	0 STEP
Fuel pump duty ratio	Fuel Pump Duty	%	33%
AVCS advance angle amount RH	VVT Adv. Ang. Amount R	deg	0 deg — +1 deg
AVCS advance angle amount LH	VVT Adv. Ang. Amount L	deg	0 deg — +1 deg
Oil flow control solenoid valve duty ratio RH	OCV Duty R	%	9.4%
Oil flow control solenoid valve duty ratio LH	OCV Duty L	%	9.4%
Oil flow control solenoid valve current RH	OCV Current R	mA	64 mA

Content	Display	Unit of measure	Note (at idling)
Oil flow control solenoid valve current LH	OCV Current L	mA	64 mA
Front oxygen (A/F) sensor current value 1	A/F Sensor #1 Current	mA	0.0 mA
Front oxygen (A/F) sensor current value 2	A/F Sensor #2 Current	mA	0.0 mA
Front oxygen (A/F) sensor resistance value 1	A/F Sensor #1 Resistance	Ω	31 Ω
Front oxygen (A/F) sensor resistance value 2	A/F Sensor #2 Resistance	Ω	31 Ω
Front oxygen (A/F) sensor output lambda 1	A/F Sensor #1	—	1.01
Front oxygen (A/F) sensor output lambda 2	A/F Sensor #2	—	1.01
A/F correction #3	A/F Correction #3	%	0% — 1%
A/F learning #3	A/F Learning #3	%	0.0%
Throttle motor duty	Throttle Motor Duty	%	–20% — +20%
Throttle motor voltage	Throttle Motor Voltage	V	(Battery voltage)
Sub throttle sensor voltage	Sub-Throttle Sensor	V	1.4 V — 1.5 V
Main throttle sensor voltage	Main-Throttle Sensor	V	0.62 V — 0.70 V
Sub accelerator sensor voltage	Sub-Accelerator Sensor	V	1.0 V — 1.2 V
Main acceleration sensor voltage	Main-Accelerator Sensor	V	0.9 V — 1.1 V
Memory vehicle speed	Memorized Cruise Speed	km/h or MPH	0 km/h or 0 MPH
A/F correction #4	A/F Correction #4	%	–1% — 1%
A/F learning #4	A/F Learning #4	%	0.0%
Fuel level sensor resistance	Fuel level resistance	Ω	4 — 96 Ω
Engine oil temperature	Oil Temperature	°C or °F	≥ 85°C or 185°F (after warm-up)
Exhaust AVCS retard angle amount RH	Exh. VVT Retard Ang. R	deg	0 deg — +1 deg
Exhaust AVCS retard angle amount LH	Exh. VVT Retard Ang. L	deg	0 deg — +1 deg
Exhaust oil flow control solenoid valve duty ratio RH	Exh. OCV Duty R	%	9.4%
Exhaust oil flow control solenoid valve duty ratio LH	Exh. OCV Duty L	%	9.4%
Exhaust oil flow control solenoid valve current RH	Exh. OCV Current R	mA	64 mA
Exhaust oil flow control solenoid valve current LH	Exh. OCV Current L	mA	64 mA
#1 cylinder roughness monitor	Roughness Monitor #1	—	0
#2 cylinder roughness monitor	Roughness Monitor #2	—	0
#3 cylinder roughness monitor	Roughness Monitor #3	—	0
#4 cylinder roughness monitor	Roughness Monitor #4	—	0
#5 cylinder roughness monitor	Roughness Monitor #5	—	0
#6 cylinder roughness monitor	Roughness Monitor #6	—	0
Knock sensor correction	Knocking Correction	deg	0 deg
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig	7.5 mmHg, 1 kPa, 0.3 inHg or 0.14 psi
AT/MT identification	AT Vehicle ID Signal	—	AT vehicle
D-check require Flag	D-check Require Flag	—	OFF
Delivery (test) mode terminal	Delivery Mode Connector (Test Mode Connector)	—	OFF
Neutral position switch signal	Neutral Position Switch	—	ON
Idle switch signal	Idle Switch Signal	—	ON
Ignition switch signal	Ignition Switch	—	ON
Power steering switch signal	P/S Switch	—	OFF (when OFF)
Air conditioning switch signal	A/C Switch	—	OFF (when OFF)
Starter switch signal	Starter Switch	—	OFF
Front oxygen monitor 1	Front O2 #1 Rich Signal	—	Rich, Lean
Front oxygen monitor 2	Front O2 #2 Rich Signal	—	Rich, Lean
Knocking signal	Knocking Signal	—	OFF

Content	Display	Unit of measure	Note (at idling)
Crankshaft position sensor signal	Crankshaft Position Sig.	—	ON
Camshaft position sensor signal	Camshaft Position Sig.	—	ON
Rear defogger switch signal	Rear Defogger SW	—	OFF (when OFF)
Blower fan switch signal	Blower Fan SW	—	OFF (when OFF)
Light switch signal	Light Switch	—	OFF (when OFF)
A/C middle pressure switch signal	A/C Mid Pressure Switch	—	OFF (when A/C OFF)
A/C compressor relay signal	A/C Compressor Signal	—	OFF (when A/C OFF)
Drain valve signal	Vent. Solenoid Valve	—	OFF (when OFF)
AT coordinate retard angle demand signal	Retard Signal from AT	—	OFF
AT coordinate fuel cut demand signal	Fuel Cut signal from AT	—	OFF
Vehicle dynamics control (VDC) torque down prohibition output	Ban of Torque Down	—	ON
Vehicle dynamics control (VDC) torque down demand	Request Torque Down VDC	—	OFF
AT coordinate permission signal	Torque permission signal	—	ON
Electronic throttle control motor relay signal	ETC Motor Relay	—	ON
Stop light switch signal	Stop Light Switch	—	OFF (when brake is OFF)
SET/COAST switch signal	SET/COAST Switch	—	OFF (when levers are not operated)
RESUME/ACCEL switch signal	RESUME/ACCEL Switch	—	OFF (when levers are not operated)
Brake switch signal	Brake Switch	—	OFF (when brake is OFF)
Main switch signal	Main Switch	—	OFF (when levers are not operated)
Cruise control cancel switch signal	CC Cancel SW	—	OFF (when levers are not operated)
Malfunction indicator light on flag	MIL On Flag	—	Light OFF

3. READ CURRENT DATA FOR ENGINE (OBD MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {OBD System}.
5) On «OBD Menu» display, select {Current Data Display & Save}.
6) On «Current Data Display & Save» display, select {All data display}.
7) Using the scroll key, scroll the display screen up or down until the desired data is shown.

NOTE:
- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- A list of the support data is shown in the following table.

Content	Display	Note (at idling)	Unit of measure
Number of diagnosis code	Number of Diag. Code:	0	—
Condition of malfunction indicator light	MI(MIL)	OFF	—
Monitoring test of misfire	Misfire monitoring (Supp)	YES	—
Monitoring test of misfire	Misfire monitoring (Rdy)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Supp)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Rdy)	YES	—
Monitoring test of comprehensive component	Component monitoring (Supp)	YES	—
Monitoring test of comprehensive component	Component monitoring (Rdy)	YES	—
Test of catalyst	Catalyst Diagnosis (Supp)	YES	—
Test of catalyst	Catalyst Diagnosis (Rdy)	NO	—

Content	Display	Note (at idling)	Unit of measure
Test of heating-type catalyst	Heated catalyst (Supp)	NO	—
Test of heating-type catalyst	Heated catalyst (Rdy)	N/A	—
Test of evaporative emission purge control system	Evaporative purge system (Supp)	YES	—
Test of evaporative emission purge control system	Evaporative purge system (Rdy)	NO	—
Secondary air system test	Secondary air system (Supp)	NO	—
Secondary air system test	Secondary air system (Rdy)	N/A	—
Test of air conditioning system refrigerant	A/C system refrigerant (Supp)	NO	—
Test of air conditioning system refrigerant	A/C system refrigerant (Rdy)	N/A	—
Test of oxygen sensor	Oxygen sensor (Supp)	YES	—
Test of oxygen sensor	Oxygen sensor (Rdy)	NO	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Supp)	YES	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Rdy)	NO	—
Test of EGR system	EGR system (Supp)	YES	—
Test of EGR system	EGR system (Rdy)	NO	—
Air fuel ratio control system for bank 1	Fuel system for Bank 1	Cl_normal	—
Air fuel ratio control system for bank 2	Fuel system for Bank 2	Cl_normal	—
Engine load data	Calculated load value	21.0	%
Engine coolant temperature signal	Coolant Temp.	91	°C
Short term fuel trim by front oxygen (A/F) sensor (Bank 1)	Short term fuel trim B1	17.2	%
Long term fuel trim by front oxygen (A/F) sensor (Bank 1)	Long term fuel trim B1	5.5	%
Short term fuel trim by front oxygen (A/F) sensor (Bank 2)	Short term fuel trim B2	17.2	%
Long term fuel trim by front oxygen (A/F) sensor (Bank 2)	Long term fuel trim B2	5.5	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	233	mmHg
Engine speed signal	Engine Speed	700	rpm
Vehicle speed signal	Vehicle Speed	0	km/h
#1 Cylinder ignition timing	Ignition timing adv. #1	16.5	°
Intake air temperature signal	Intake Air Temp.	54	°C
Intake air amount	Mass Air Flow	2.8	g/s
Throttle position signal	Throttle Opening Angle	13	%
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor #12	0.1 — 0.7	V
A/F correction (Bank 1 Sensor 2)	Short term fuel trim #12	0.0	%
Oxygen sensor (Bank 2 Sensor 2)	Oxygen sensor #22	0.1 — 0.7	V
A/F correction (Bank 2 Sensor 2)	Short term fuel trim #22	0.0	%
On-board diagnostic system	OBD System	OBD/OBD2	—
Front oxygen (A/F) sensor (Bank 1 Sensor 1)	Oxygen sensor #11	Supported	—
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor #12	Supported	—
Front oxygen (A/F) sensor (Bank 2 Sensor 1)	Oxygen sensor #21	Supported	—
Oxygen sensor (Bank 2 Sensor 2)	Oxygen sensor #22	Supported	—
Elapsed time after engine start	Time Since Engine Start	—	sec
Travel distance after the malfunction indicator light illuminates	Lighted MI lamp history	—	km
A/F lambda signal (Bank 1 Sensor 1)	A/F Sensor #11	1.001	—
A/F sensor output signal (Bank 1 Sensor 1)	A/F Sensor #11	2.805	V
A/F lambda signal (Bank 2 Sensor 1)	A/F Sensor #21	1.001	—
A/F sensor output signal (Bank 2 Sensor 1)	A/F Sensor #21	2.805	V
Target EGR	Commanded EGR	0	%
EGR deviation	EGR Error	0.0	%

Content	Display	Note (at idling)	Unit of measure
Evaporative purge	Commanded Evap Purge	0	%
Fuel level signal	Fuel Level	—	%
Number of warm ups after DTC clear	Number of warm-ups	—	—
Travel distance after DTC clear	Meter since DTC cleared	—	km
Fuel tank pressure signal	Fuel Tank Pressure	8.8	mmHg
Atmospheric pressure signal	Atmosphere Pressure	Atmospheric pressure	mmHg
A/F lambda signal (Bank 1 Sensor 1)	A/F Sensor #11	0.999	—
A/F sensor current (Bank 1 Sensor 1)	A/F Sensor #11	0.02	mA
A/F lambda signal (Bank 2 Sensor 1)	A/F Sensor #21	0.999	—
A/F sensor current (Bank 2 Sensor 1)	A/F Sensor #21	0.02	mA
Catalyst temperature #1	Catalyst Temperature #11	—	°C
Catalyst temperature #2	Catalyst Temperature #21	—	°C
Monitoring test of misfire	Misfire monitoring (Enable)	YES	—
Monitoring test of misfire	Misfire monitoring (Comp)	NO	—
Monitoring test of fuel system	Fuel system monitoring (Enable)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Comp)	NO	—
Monitoring test of comprehensive component	Component monitoring (Enable)	YES	—
Monitoring test of comprehensive component	Component monitoring (Comp)	NO	—
Test of catalyst	Catalyst Diagnosis (Enable)	YES	—
Test of catalyst	Catalyst Diagnosis (Comp)	NO	—
Test of heating-type catalyst	Heated catalyst (Enable)	N/A	—
Test of heating-type catalyst	Heated catalyst (Comp)	N/A	—
Test of evaporative emission purge control system	Evaporative purge system (Enable)	YES	—
Test of evaporative emission purge control system	Evaporative purge system (Comp)	NO	—
Secondary air system test	Secondary air system (Enable)	N/A	—
Secondary air system test	Secondary air system (Comp)	N/A	—
Test of air conditioning system refrigerant	A/C system refrigerant (Enable)	N/A	—
Test of air conditioning system refrigerant	A/C system refrigerant (Comp)	N/A	—
Test of oxygen sensor	Oxygen sensor (Enable)	YES	—
Test of oxygen sensor	Oxygen sensor (Comp)	NO	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Enable)	YES	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Comp)	NO	—
Test of EGR system	EGR system (Enable)	YES	—
Test of EGR system	EGR system (Comp)	NO	—
ECM power supply voltage	Control module voltage	13.789	V
Absolute load	Absolute Load Value	22	%
A/F target lambda	Target Equivalence Ratio	0.976	—
Relative throttle opening angle	Relative Throttle Pos.	2	%
Ambient temperature	Ambient Temperature	Ambient air temperature	°C
Absolute throttle opening angle 2	Absolute Throttle Pos.#2	32	%
Absolute accelerator opening angle 1	Accelerator Pedal Pos.#1	13	%
Absolute accelerator opening angle 2	Accelerator Pedal Pos.#2	13	%
Target throttle opening angle	Target Throt. Act. Cont.	0	%

Content	Display	Note (at idling)	Unit of measure
Engine operating time while malfunction indicator light lit	Time while MIL lighted	—	min
Elapsed time after DTC clear	Time since DTC cleared	—	min
Type of fuel	Type of fuel	GAS	—
Relative acceleration opening angle	Relative Accelera. Pos.	0	%
Neutral condition	AT drive status	NEUT	—

4. READ FREEZE FRAME DATA FOR ENGINE (OBD MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {OBD System}.
5) On «OBD Menu» display, select {Freeze Frame Data Display}.

NOTE:
- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
DTC of freeze frame data	Freeze frame data	—
Air fuel ratio control system for bank 1	Fuel system for Bank 1	—
Air fuel ratio control system for bank 2	Fuel system for Bank 2	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor (Bank 1)	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor (Bank 1)	Long term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor (Bank 2)	Short term fuel trim B2	%
Long term fuel trim by front oxygen (A/F) sensor (Bank 2)	Long term fuel trim B2	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing adv. #1	Ignition timing adv. #1	°
Intake air temperature	Intake Air Temp.	°C or °F
Amount of intake air	Mass Air Flow	g/s
Throttle valve angle	Throttle Opening Angle	%
Oxygen sensor #12	Oxygen sensor #12	V
A/F correction value #12	Short term fuel trim #12	%
Oxygen sensor #22	Oxygen sensor #22	V
A/F correction value #22	Short term fuel trim #22	%
On-board diagnostic system	OBD System	—
Oxygen sensor #11	Oxygen sensor #11	—
Oxygen sensor #12	Oxygen sensor #12	—
Oxygen sensor #21	Oxygen sensor #21	—
Oxygen sensor #22	Oxygen sensor #22	—
Elapsed time after engine start	Time Since Engine Start	sec
Target EGR	Commanded EGR	%
EGR deviation	EGR Error	%
Evaporative purge	Commanded Evap Purge	%
Fuel level signal	Fuel Level	%
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig
Atmospheric pressure	Atmosphere Pressure	mmHg, kPa, inHg or psig
ECM power supply voltage	Control module voltage	V

Contents	Display	Unit of measure
Absolute load	Absolute Load Value	%
A/F target lambda	Target Equivalence Ratio	—
Relative throttle opening angle	Relative Throttle Pos.	%
Ambient temperature	Ambient Temperature	°C or °F
Absolute throttle opening angle 2	Absolute Throttle Pos.#2	%
Absolute accelerator opening angle 1	Accelerator Pedal Pos.#1	%
Absolute accelerator opening angle 2	Accelerator Pedal Pos.#2	%
Target throttle opening angle	Target Throt. Act. Cont.	%
Neutral condition	AT drive status	—

5. V.I.N. REGISTRATION

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {Entry VIN}.
5) Perform the procedures shown on the display screen.

10.Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu», select {Each System Check}.
2) On the «System Selection Menu», select {Engine Control System}.
3) Click the [OK] key after the information regarding engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select {Diagnostic Code(s) Display}.
5) On the «Diagnostic Trouble Code» screen, select {Temporary Diagnostic Code(s)} or {Memorized Diagnostic Code(s)}.

NOTE:
• For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu», select {Each System Check}.
2) On the «System Selection Menu», select {Engine Control System}.
3) Click the [OK] key after the information regarding engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System}.
5) On the «OBD Menu» display screen, select the {Diagnostic Code(s) Display}.
6) Make sure DTC is shown on the screen.

NOTE:
• For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>

3. GENERAL SCAN TOOL

Refer to the data denoting emission-related powertrain DTC.
For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to the general scan tool manufacturer’s operation manual to access powertrain DTC (MODE $03).

11.Inspection Mode

A: PROCEDURE

Perform the diagnosis shown in the following DTC table.
When performing the diagnosis not listed in “List of Diagnostic Trouble Code (DTC)”, refer to the item on the drive cycle. <Ref. to EN(H6DO)(diag)-51, Drive Cycle.>

DTC	Item	Condition
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	—
P0014	Exhaust AVCS System 1 (Range/Performance)	—
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	—
P0017	Crank and Cam Timing B System Failure (Bank 1)	—
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	—
P0019	Crank and Cam Timing B System Failure (Bank 2)	—
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	—
P0024	Exhaust AVCS System 2 (Range/Performance)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)	—
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)	—
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)	—
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Sensor 1 Circuit Low	—
P0113	Intake Air Temperature Sensor 1 Circuit High	—
P0117	Engine Coolant Temperature Circuit Low	—
P0118	Engine Coolant Temperature Circuit High	—
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low	—
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High	—
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	—
P0151	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)	—
P0152	O2 Sensor Circuit High Voltage (Bank 2 Sensor 1)	—
P0157	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)	—
P0158	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)	—
P0160	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2)	—
P0182	Fuel Temperature Sensor “A” Circuit Low Input	—
P0183	Fuel Temperature Sensor “A” Circuit High Input	—
P0197	Engine Oil Temperature Sensor Low	—
P0198	Engine Oil Temperature Sensor High	—
P0222	Throttle/Pedal Position Sensor/Switch “B” Circuit Low	—
P0223	Throttle/Pedal Position Sensor/Switch “B” Circuit High	—
P0230	Fuel Pump Primary Circuit	—
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	—

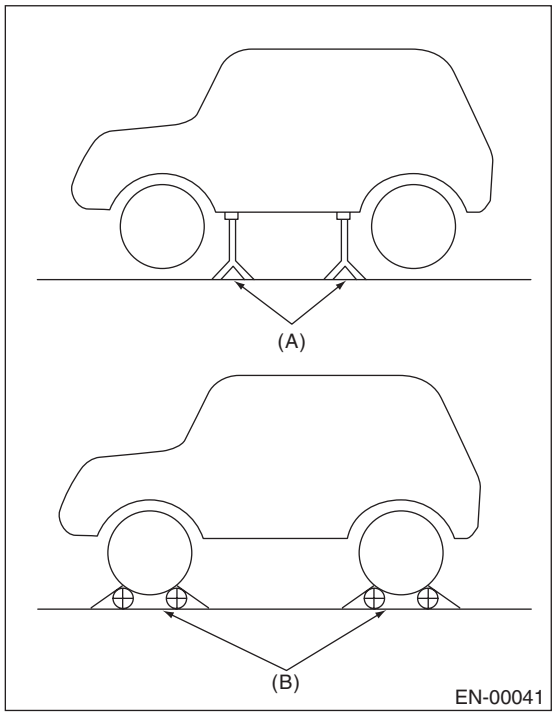
DTC	Item	Condition
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	—
P0332	Knock Sensor 2 Circuit Low (Bank 2)	—
P0333	Knock Sensor 2 Circuit High (Bank 2)	—
P0335	Crankshaft Position Sensor “A” Circuit	—
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	—
P0365	Camshaft Position Sensor “B” Circuit (Bank 1)	—
P0390	Camshaft Position Sensor “B” Circuit (Bank 2)	—
P0447	Evaporative Emission Control System Vent Control Circuit Open	—
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	—
P0452	Evaporative Emission Control System Pressure Sensor Low Input	—
P0453	Evaporative Emission Control System Pressure Sensor High Input	—
P0458	Evaporative Emission System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor “A” Circuit Low	—
P0463	Fuel Level Sensor “A” Circuit High	—
P0500	Vehicle Speed Sensor “A”	—
P0512	Starter Request Circuit	—
P0513	Incorrect Immobilizer Key	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Throttle Control System Circuit Range/Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
P0700	Transmission Control System (MIL Request)	—
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	—
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	—
P1154	O2 Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1)	—
P1155	O2 Sensor Circuit Range/Performance (High) (Bank 2 Sensor 1)	—
P1160	Return Spring Failure	—
P1518	Starter Switch Circuit Low Input	—
P1560	Back-Up Voltage Circuit Malfunction	—
P1570	Antenna	—
P1571	Reference Code Incompatibility	—
P1572	IMM Circuit Failure	—
P1574	Key Communication Failure	—
P1576	EGI Control Module EEPROM	—
P1577	IMM Control Module EEPROM	—
P1578	Meter Failure	—
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	—
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	—
P2090	Exhaust Camshaft Position Actuator Control Circuit Low (Bank 1)	—
P2091	Exhaust Camshaft Position Actuator Control Circuit High (Bank 1)	—
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	—
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	—
P2094	Exhaust Camshaft Position Actuator Control Circuit Low (Bank 2)	—
P2095	Exhaust Camshaft Position Actuator Control Circuit High (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
P2103	Throttle Actuator Control Motor Circuit High	—
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance	—

DTC	Item	Condition
P2122	Throttle/Pedal Position Sensor/Switch “D” Circuit Low Input	—
P2123	Throttle/Pedal Position Sensor/Switch “D” Circuit High Input	—
P2127	Throttle/Pedal Position Sensor/Switch “E” Circuit Low Input	—
P2128	Throttle/Pedal Position Sensor/Switch “E” Circuit High Input	—
P2135	Throttle/Pedal Position Sensor/Switch “A”/“B” Voltage Correlation	—
P2138	Throttle/Pedal Position Sensor/Switch “D”/“E” Voltage Correlation	—
P2227	Atmospheric Pressure Sensor Range/Performance	—
P2228	Barometric Pressure Circuit Low	—
P2229	Barometric Pressure Circuit High	—
U0073	CAN Failure, Bus “OFF” Detection	—
U0101	CAN (TCM) Data not Loaded	—
U0122	CAN (VDC) Data not Loaded	—
U0140	CAN (BCU) Data not Loaded	—
U0402	CAN (TCM) Data Abnormal	—
U0416	CAN (VDC) Data Abnormal	—
U0422	CAN (BCU) Data Abnormal	—

1. PREPARATION FOR THE INSPECTION MODE

1) Check that the battery voltage is 12 V or more and fuel remains approx. half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) Lift up the vehicle using a garage jack and place it on rigid racks, or drive the vehicle onto free rollers.

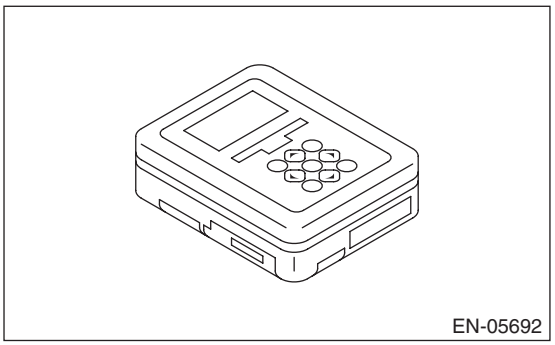
WARNING:
• Before lifting up the vehicle, ensure parking brake is applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Before rotating the wheels, make sure that there is no one in front of the vehicle. Besides while the wheels are rotating, make sure that no one approaches the vehicle front side.
• Make sure that there is nothing around the wheels. For AWD model, pay special attention to all four wheels.
• While servicing, do not depress or release the clutch pedal or accelerator pedal quickly regardless of the engine speed. Quick operation may cause the vehicle to drop off the free roller.
• To prevent the vehicle from slipping due to vibration, do not place anything between rigid rack and the vehicle.



(A) Rigid rack
(B) Free roller

2. SUBARU SELECT MONITOR

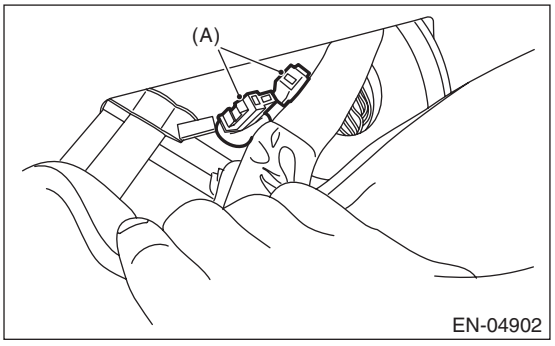
1) Check that no DTC remains after clearing memory. <Ref. to EN(H6DO)(diag)-57, Clear Memory Mode.>
2) Warm up the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-8, PREPARATION TOOL, General Description.>



4) Prepare PC with Subaru Select Monitor installed.
5) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

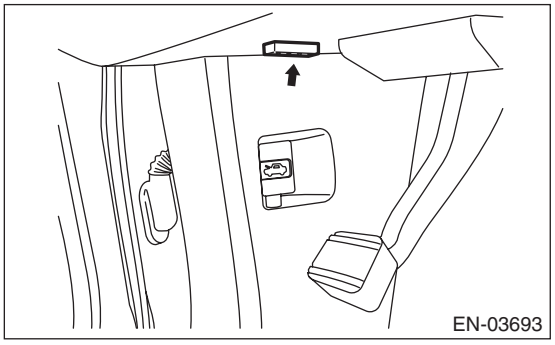
NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

6) Connect the diagnosis cable to SDI.
7) Connect the delivery (test) mode connector (A) located under the glove box.



8) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

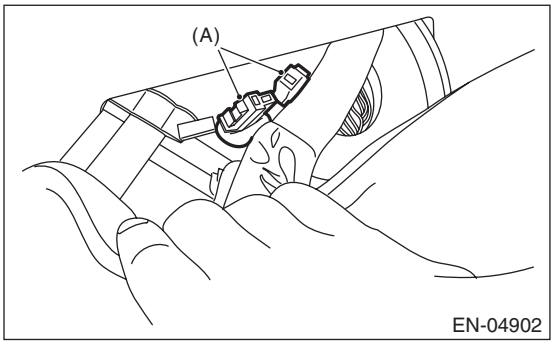


9) Start the PC.
10) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
11) On «Main Menu» display, select {Each System Check}.
12) On «System Selection Menu» display, select {Engine Control System}.
13) Click the [OK] button after the information of engine type has been displayed.
14) On «Engine Diagnosis» display, select {Dealer Check Mode Procedure}.
15) When the «Perform Inspection (Dealer Check) Mode?» is shown on the screen, click the [Next] button.
16) Perform subsequent procedures as instructed on the display screen.
• If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:
• For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".
• For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may illuminate the ABS warning light, but this does not indicate a malfunction. When engine control system diagnosis is finished, perform the VDC memory clearance procedure of self-diagnosis function. <Ref. to VDC(diag)-23, Clear Memory Mode.>

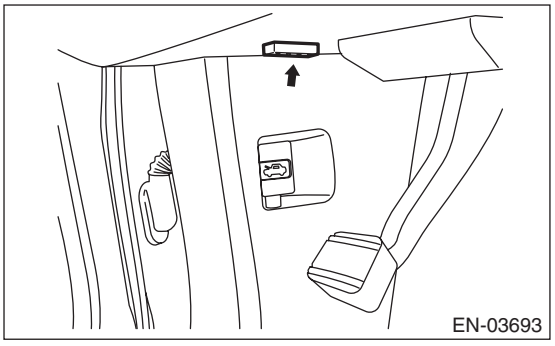
3. GENERAL SCAN TOOL

1) Check that no DTC remains after clearing memory. <Ref. to EN(H6DO)(diag)-57, Clear Memory Mode.>
2) Warm up the engine.
3) Connect the delivery (test) mode connector (A) located under the glove box.



4) Connect the general scan tool to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.



5) Start the engine.

NOTE:
Ensure the selector lever is placed in "P" range before starting.
6) Turn the neutral position switch to ON using select lever.
7) Depress the brake pedal to turn the brake switch ON.
8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
9) Shift the select lever in the "D" range and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• For AWD model, release the parking brake.

• The speed difference between front and rear wheels may illuminate the ABS warning light, but this does not indicate a malfunction. When engine control system diagnosis is finished, perform the VDC memory clearance procedure of self-diagnosis function. <Ref. to VDC(diag)-23, Clear Memory Mode.>

10) Using the general scan tool, check for DTC and record the result(s).

NOTE:
• For detailed operation procedures, refer to the general scan tool operation manual.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”.
<Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: PROCEDURE

It is necessary to perform the drive cycle listed below if DTC is not found in the Inspection Mode. It is possible to complete diagnosis of the DTC by performing the indicated drive cycle. After the repair for the DTC, perform a necessary drive cycle and make sure the function recovers and the DTC is recorded.

1. PREPARATION FOR DRIVE CYCLE

1) Check that the battery voltage is 12 V or more and fuel remains approx. half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) After performing the diagnostics and Clear Memory Mode, check that no DTC remains. <Ref. to EN(H6DO)(diag)-57, Clear Memory Mode.>
3) Check the delivery (test) mode connector is disconnected.

NOTE:
• Perform the drive cycle after warming up the engine except when the engine coolant temperature at engine start is specified.
• Perform the drive cycle twice if the DTC in the list is marked with *. After completing the first drive cycle, stop the engine and perform second diagnosis in same condition.

2. DRIVE CYCLE A

DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature at engine start is less than 20°C (68°F).
*P0126	Insufficient Engine Coolant Temperature for Stable Operation	—
*P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	—
*P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0141	O2 Sensor Heater Circuit (Bank 1 Sensor 2)	—
*P0153	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	—
*P0161	O2 Sensor Heater Circuit (Bank 2 Sensor 2)	—
*P0171	System Too Lean (Bank 1)	Complete diagnosis with drive cycle B or C as well.
*P0172	System Too Rich (Bank 1)	Complete diagnosis with drive cycle B or C as well.
*P0174	System Too Lean (Bank 2)	Complete diagnosis with drive cycle B or C as well.
*P0175	System Too Rich (Bank 2)	Complete diagnosis with drive cycle B or C as well.
*P0196	Engine Oil Temperature Sensor Circuit Range/Performance	—
*P0301	Cylinder 1 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0302	Cylinder 2 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0303	Cylinder 3 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0304	Cylinder 4 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0305	Cylinder 5 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0306	Cylinder 6 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (Small Leak)	Engine coolant temperature at engine start is less than 25°C (77°F).
*P0451	Evaporative Emission Control System Pressure Sensor	—

DTC	Item	Condition
*P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	Engine coolant temperature at engine start is less than 25°C (77°F).
*P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	Engine coolant temperature at engine start is less than 25°C (77°F).
*P0464	Fuel Level Sensor Circuit Intermittent	—
P1443	Vent Control Solenoid Valve Function Problem	—
*P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	Complete diagnosis with drive cycle B or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	Complete diagnosis with drive cycle B or C as well.
*P2098	Post Catalyst Fuel Trim System Too Lean (Bank 2)	Complete diagnosis with drive cycle B or C as well.
*P2099	Post Catalyst Fuel Trim System Too Rich (Bank 2)	Complete diagnosis with drive cycle B or C as well.

Diagnostic procedure:
1) Drive for 20 minutes at a constant speed of 80 km/h (50 MPH).
2) Stop the vehicle and idle for one minute.

3. DRIVE CYCLE B

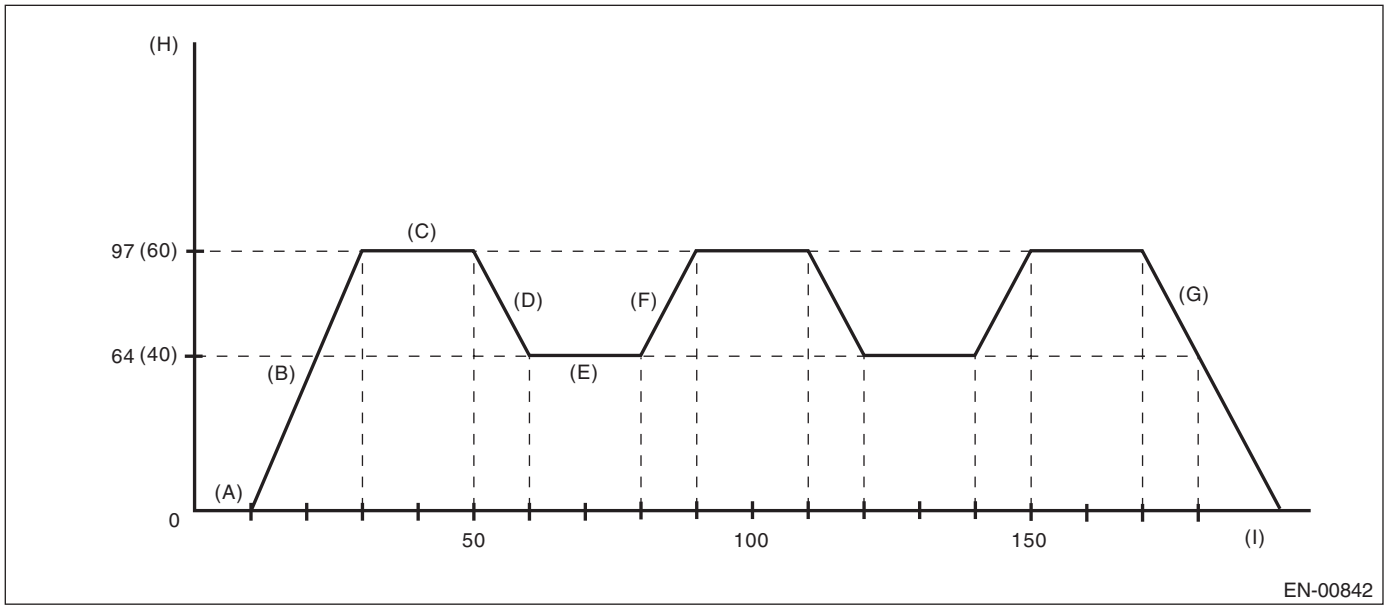
DTC	Item	Condition
*P0171	System Too Lean (Bank 1)	Complete diagnosis with drive cycle A or C as well.
*P0172	System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or C as well.
*P0174	System Too Lean (Bank 2)	Complete diagnosis with drive cycle A or C as well.
*P0175	System Too Rich (Bank 2)	Complete diagnosis with drive cycle A or C as well.
*P0301	Cylinder 1 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0302	Cylinder 2 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0303	Cylinder 3 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0304	Cylinder 4 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0305	Cylinder 5 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0306	Cylinder 6 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0459	Evaporative Emission System Purge Control Valve Circuit High	—
*P0506	Idle Air Control System RPM Lower Than Expected	—
*P0507	Idle Air Control System RPM Higher Than Expected	—
*P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	Complete diagnosis with drive cycle A or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or C as well.
*P2098	Post Catalyst Fuel Trim System Too Lean (Bank 2)	Complete diagnosis with drive cycle A or C as well.
*P2099	Post Catalyst Fuel Trim System Too Rich (Bank 2)	Complete diagnosis with drive cycle A or C as well.

Diagnostic procedure:
1) Drive at 10 km/h (6 MPH) or more.
2) Stop the vehicle and idle for ten minutes.

4. DRIVE CYCLE C

DTC	Item	Condition
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
*P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	—
*P0068	MAP/MAF - Throttle Position Correlation	—
*P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
*P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
P0154	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	—
*P0159	O2 Sensor Circuit Slow Response (Bank 2 Sensor 2)	—
*P0171	System Too Lean (Bank 1)	Complete diagnosis with drive cycle A or B as well.
*P0172	System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or B as well.
*P0174	System Too Lean (Bank 2)	Complete diagnosis with drive cycle A or B as well.
*P0175	System Too Rich (Bank 2)	Complete diagnosis with drive cycle A or B as well.
*P0301	Cylinder 1 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0302	Cylinder 2 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0303	Cylinder 3 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0304	Cylinder 4 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0305	Cylinder 5 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0306	Cylinder 6 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0400	Exhaust Gas Recirculation Flow	—
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	—
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	—
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	—
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	—
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	—
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	—
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	—
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	—
*P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	Complete diagnosis with drive cycle A or B as well.
*P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or B as well.
*P2098	Post Catalyst Fuel Trim System Too Lean (Bank 2)	Complete diagnosis with drive cycle A or B as well.
*P2099	Post Catalyst Fuel Trim System Too Rich (Bank 2)	Complete diagnosis with drive cycle A or B as well.

Diagnostic procedure:
Drive according to the drive pattern described below.



(A)	Idle the engine for 10 seconds or more.	(D)	Decelerate with fully closed throttle to 64 km/h (40 MPH).	(G)	Stop the vehicle with throttle fully closed.
(B)	Accelerate to 97 km/h (60 MPH) within 20 seconds.	(E)	Drive the vehicle at 64 km/h (40 MPH) for 20 seconds.	(H)	Vehicle speed km/h (MPH)
(C)	Drive the vehicle at 97 km/h (60 MPH) for 20 seconds.	(F)	Accelerate to 97 km/h (60 MPH) within 10 seconds.	(I)	Sec.

5. DRIVE CYCLE D

DTC	Item	Condition
*P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	—

NOTE:
In drive cycle D, one drive cycle will be established when both the drift diagnosis and stuck diagnosis have completed.
Diagnostic procedure:

DRIFT DIAGNOSIS

1) Make sure of the items below before starting the engine.
- Engine coolant temperature is less than 30°C (86°F).
- Remaining fuel is 10 ℓ (2.6 US gal, 2.2 Imp gal) or more.
- Battery voltage is 10.9 V or more.

2) Idle the engine until engine coolant temperature is at least 10°C (18°F) higher than it was when engine started.
3) After the engine has reached the state of procedure 2), idle the engine for another 5 minutes or more.

STUCK DIAGNOSIS

1) Make sure that the battery voltage is 10.9 V or more.
2) Perform the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-57, Clear Memory Mode.>
3) Drive for approximately 50 ℓ (13.2 US gal, 11 Imp gal) of fuel.

NOTE:
- It is acceptable to drive the vehicle intermittently.
- Do not disconnect the battery terminals during stuck diagnosis. (Data will be cleared by disconnecting the battery terminals.)

6. DRIVE CYCLE E

DTC	Item	Condition
*P0461	Fuel Level Sensor “A” Circuit Range/Performance	—

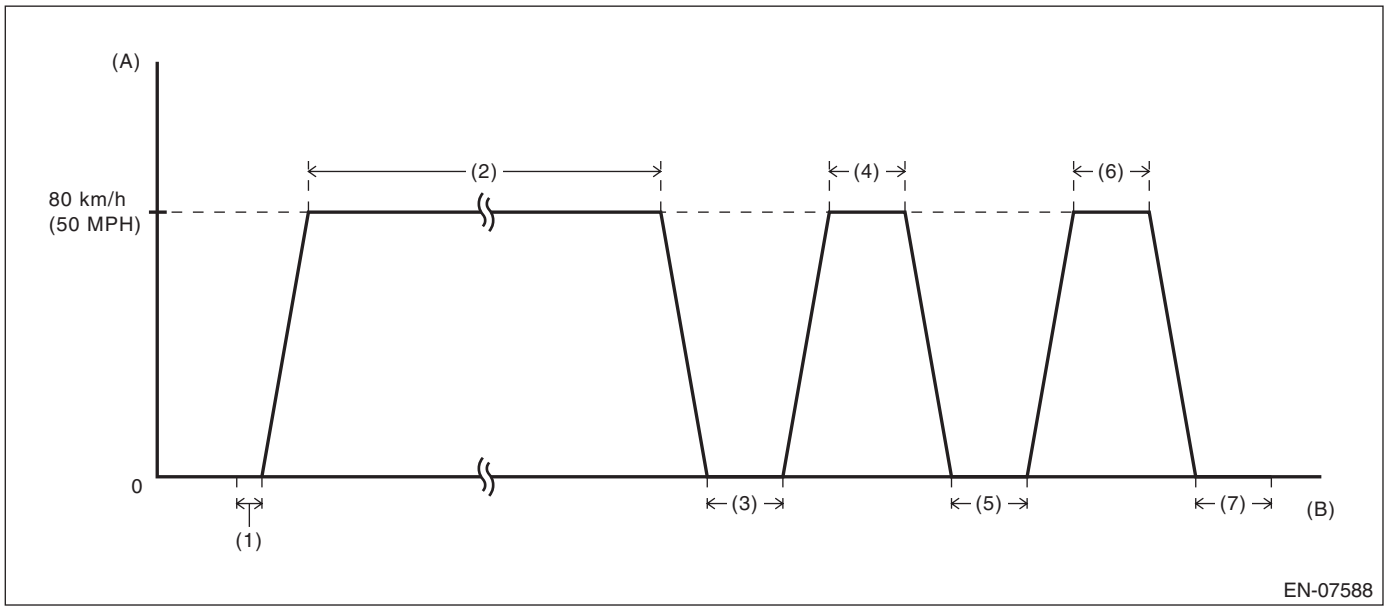
Diagnostic procedure:
1) Make sure that the battery voltage is 10.9 V or more.
2) Perform the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-57, Clear Memory Mode.>
3) Drive for approximately 30 ℓ (7.9 US gal, 6.6 Imp gal) of fuel.

NOTE:
• It is acceptable to drive the vehicle intermittently.
• Do not disconnect the battery terminals while diagnosing. (Data will be cleared by disconnecting the battery terminals.)

7. DRIVE CYCLE F

DTC	Item	Condition
*P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	—

Diagnostic procedure:
1) Make sure that the engine coolant temperature is less than 30°C (86°F).
2) Drive according to the drive pattern described below.



(A) Vehicle speed
(B) Elapsed time
(1) Idle the engine for 10 seconds after engine start.
(2) Drive for 8 minutes at a constant speed of 80 km/h (50 MPH).
(3) Stop the vehicle and idle for 30 seconds.
(4) Drive for 30 seconds at a constant speed of 80 km/h (50 MPH).
(5) Stop the vehicle and idle for 30 seconds.
(6) Drive for 30 seconds at a constant speed of 80 km/h (50 MPH).
(7) Stop the vehicle and idle for 30 seconds.

NOTE:
• There is no given transition time between idling and cruising.
• Driving at constant speed only on a downhill causes smaller engine load and may result in failure to obtain a right diagnostic result.
• When the engine stops while performing drive cycle F, perform it again from the state of procedure 1).

8. DRIVE CYCLE H

DTC	Item	Condition
*P1602	Control Module Programming Error	—

Diagnostic procedure:
1) Perform the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-57, Clear Memory Mode.>
2) With the ignition switch ON (engine OFF), read the engine coolant temperature, intake air temperature and fuel temperature. <Ref. to EN(H6DO)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>
3) If the values from step 2) satisfy the following two conditions, idle the engine for one minute.

Condition:
| Engine coolant temperature — Intake air temperature | ≤ 5°C (41°F)
| Engine coolant temperature — Fuel temperature | ≤ 2°C (36°F)

NOTE:
- If the conditions are not satisfied, turn the ignition switch to OFF and wait until the parameters are satisfied.
- Hold the select lever in “P” range or “N” range at idling.

13.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu», select {Each System Check}.
2) On the «System Selection Menu», select {Engine Control System}.
3) Select [OK] after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select {Clear Memory}.
5) When the “Clear Memory?” is shown on the screen, click the [Yes] button.
6) When “Done” and “Turn ignition switch to OFF” are shown on the display screen, turn the ignition switch to OFF.

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance. Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.
• For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu», select {Each System Check}.
2) On the «System Selection Menu», select {Engine Control System}.
3) Select [OK] after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System}.
5) On the «OBD Menu» display screen, select the {Clear Diagnostic Code}.
6) When the “Clear Diagnostic Code?” is shown on the screen, click the [Yes] button.
7) When “Done” and “Turn ignition switch to OFF” are shown on the display screen, turn the ignition switch to OFF.

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance. Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.
• For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

3. GENERAL SCAN TOOL

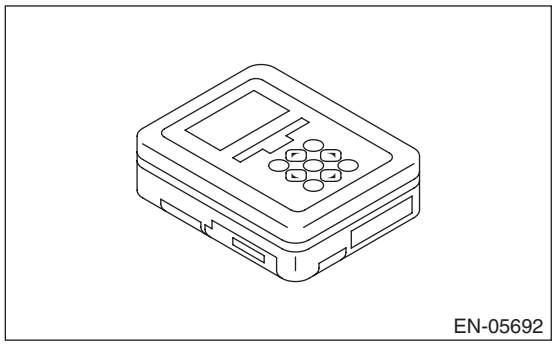
For procedures clearing memory using the general scan tool, refer to the general scan tool operation manual.

NOTE:
Initial diagnosis of electronic throttle control is performed after memory clearance. For this reason, start the engine after 10 seconds or more have elapsed since the ignition switch was turned to ON.

14.Compulsory Valve Operation Check Mode

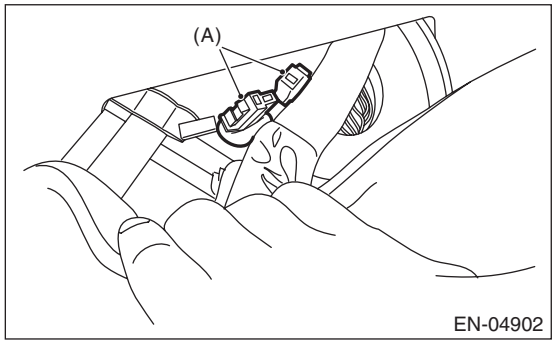
A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-8, PREPARATION TOOL, General Description.>


EN-05692

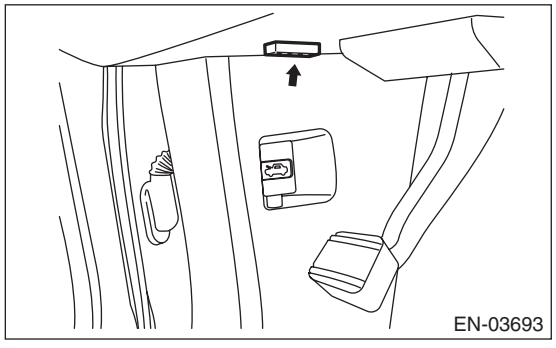
2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
4) Connect the diagnosis cable to SDI.
5) Connect the delivery (test) mode connector (A) located under the glove box.



EN-04902

6) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).


EN-03693

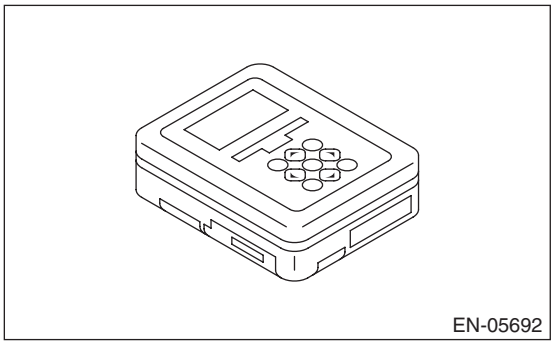
CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.
7) Start the PC.
8) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
9) On «Main Menu» display, select {Each System Check}.
10) On «System Selection Menu» display, select {Engine Control System}.
11) Click the [OK] button after the information of engine type has been displayed.
12) On «Engine Diagnosis» display, select {System Operation Check Mode}.
13) On «System Operation Check Mode» display, select {Actuator ON/OFF Operation}.
14) Select the actuator to be forcibly driven on the «Actuator ON/OFF Operation» display screen and click the [Next] button.
15) Clicking the [Finished] button completes the compulsory drive mode of actuator. The display will then return to the «Actuator ON/OFF Operation» screen.

NOTE:
For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

15. System Operation Check Mode

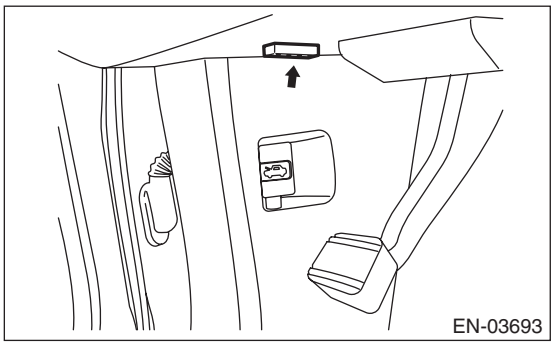
A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-8, PREPARATION TOOL, General Description.>


EN-05692

2) Prepare PC with Subaru Select Monitor installed.
3) Connect the SDI (Subaru Diagnostic Interface) to the PC USB port (exclusively for Subaru Select Monitor) using a USB cable.

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
4) Connect the diagnosis cable to SDI.
5) Connect the SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).


EN-03693

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.
6) Start up the PC.
7) Turn the ignition switch to ON (engine OFF), and run the "Application for Subaru Select Monitor".
8) On the «Main Menu», select {Each System Check}.
9) On the «System Selection Menu», select {Engine Control System}.
10) Click the [OK] key after the information regarding engine type has been displayed.
11) Select {System Operation Check Mode} on the «Engine Diagnosis» display screen.
12) The following items are displayed on the monitor.

Display
Actuator ON/OFF Operation
Immobilizer System
Fuel Pump Control
Fixed Idle Ignition Timing
Idle Speed Control
Injector Control
EGR Valve Control

1. FUEL PUMP CONTROL (OFF OPERATION)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Fuel Pump Control}.
2) On «Fuel Pump Control» display, select {OFF Drive}.
3) On «Start the Engine» display, start the engine and click the [OK] button.
4) On «OFF Drive» display, click the [Execution] button and execute the OFF drive.
5) Click the [Cancel] button to stop the OFF drive.
6) Click the [F12 Exit] button to end the OFF drive. The screen will return to the «Fuel Pump Control» screen.

NOTE:
For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

2. FUEL PUMP CONTROL (ON/OFF OPERATION)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Fuel Pump Control}.
2) On «Fuel Pump Control» display, select {ON/OFF Dr.}.
3) On «Turn Ignition Switch ON with Engine OFF» display, turn the ignition switch to ON and click the [OK] button.
4) On «ON/OFF Dr.» display, click the [Execution] button and execute the ON/OFF drive.
5) Click the [Cancel] button to stop the ON/OFF drive.

6) Click the [F12 Exit] button to end the ON/OFF drive. The screen will return to the «Fuel Pump Control» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

3. IDLING IGNITION TIMING FIXED

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Fixed Idle Ignition Timing}.
2) On «Start the Engine» display, start the engine and click the [OK] button.
3) On «Fixed Idle Ignition Timing» display, click the [Execution] button and execute the idling ignition timing fixed.
4) Click the [Cancel] button to stop the idling ignition timing fixed.
5) Click the [F12 Exit] button to end the idle ignition timing fixed. The screen will return to the «System Operation Check Mode» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

4. IDLE SPEED CONTROL

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Idle Speed Control}.
2) On «Start the Engine» display, start the engine and click the [OK] button.
3) In the «Idle Speed Control» display, click the [△] button or the [▽] button to change the setting values, then click the [OK] button.
Setting is possible in a range between 500 rpm — 2,000 rpm, in increments of 50 rpm. However, the engine speed that can actually be controlled will vary depending on the vehicle.
4) Click the [Cancel] button to stop the idle speed control.
5) Click the [F12 Exit] button to end the idle speed control. The screen will return to the «System Operation Check Mode» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

5. INJECTOR CONTROL (INJECTION STOP MODE)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Injector Control}.
2) On «Injector Control» display, select {Injection Stop Mode}.
3) On «Injection Stop Mode» display, select the fuel injector to be stopped.
4) On «Start the Engine» display, start the engine and click the [OK] button.
5) On «Fuel Injector #» display, click the [Execution] button and execute the injection stop mode.
6) Click the [Cancel] button to stop the injection stop mode.
7) Click the [F12 Exit] button to return the «Injection Stop Mode» display screen.
8) On «Injection Stop Mode» display, click the [Return] button to end the «Injection Stop Mode». The screen will return to the «Injector Control» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

6. INJECTOR CONTROL (INJECTION QUANTITY CONTROL)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Injector Control}.
2) On «Injector Control» display, select {Injection Quantity Control}.
3) On «Start the Engine» display, start the engine and click the [OK] button.
4) In the «Injection Quantity Control» display, click the [△] button or the [▽] button to change the setting values, then click the [OK] button.
Setting is possible in a range between 0 — 20%, in increments of 1%.
5) Click the [Cancel] button to stop the injection quantity control.
6) Click the [F12 Exit] button to end the injection quantity control. The screen will return to the «Injector Control» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

7. EGR VALVE CONTROL

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>

1) On «System Operation Check Mode» display, select {EGR Valve Control}.
2) On «Start the Engine» display, start the engine and click the [OK] button.
3) In the «EGR Valve Control» display, click the [△] button or the [▽] button to change the setting values, then click the [OK] button.
Setting is possible in increments of 1 STEP. However, the STEP number that can actually be controlled will vary depending on the vehicle.
4) Click the [Cancel] button to stop the EGR valve control.
5) Click the [F12 Exit] button to end the EGR valve control. The screen will return to the «System Operation Check Mode» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

16.Malfunction Indicator Light

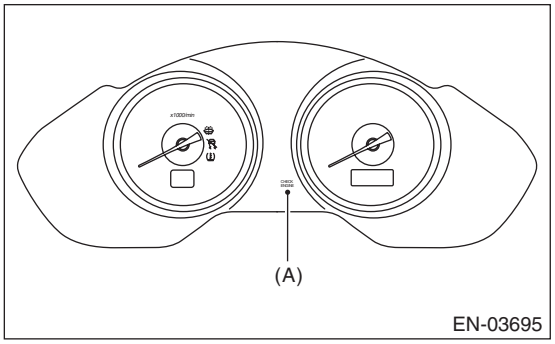
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H6DO)(diag)-63, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Malfunction indicator light does not come on. <Ref. to EN(H6DO)(diag)-65, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Malfunction indicator light does not go off. <Ref. to EN(H6DO)(diag)-67, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>
↓
4. Malfunction indicator light does not blink. <Ref. to EN(H6DO)(diag)-68, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK, Malfunction Indicator Light.>
↓
5. Malfunction indicator light remains blinking. <Ref. to EN(H6DO)(diag)-70, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING, Malfunction Indicator Light.>

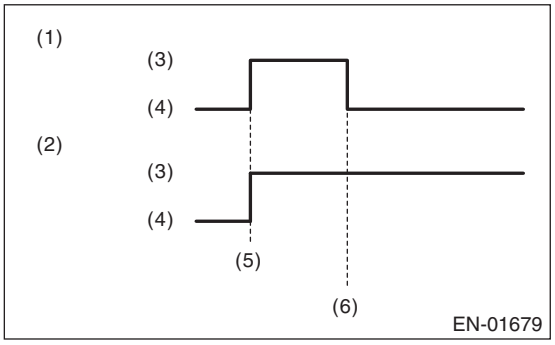
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light (A) in the combination meter illuminates.

NOTE:
If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H6DO)(diag)-65, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>

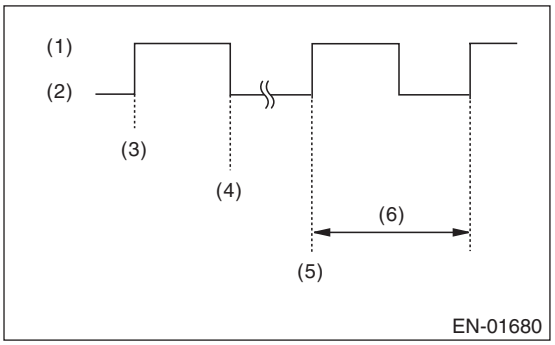


2) After starting the engine, the malfunction indicator light goes out. If it does not go off, any of the engine and emission control system has malfunction.



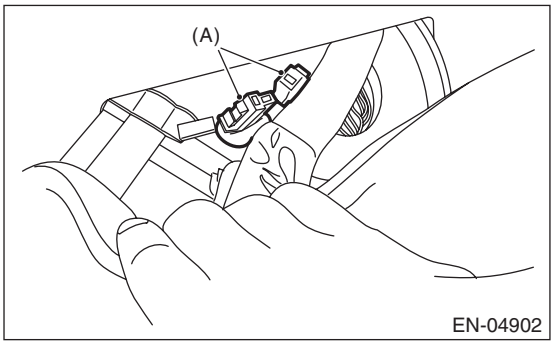
(1) No faulty
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

3) If the diagnostic system detects a misfire which could damage the catalyst, the malfunction indicator light will blink at a cycle of 1 Hz.



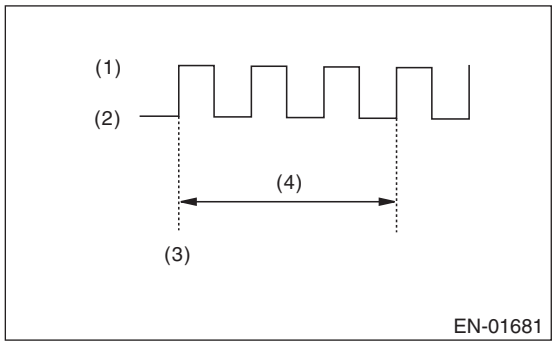
(1) ON
(2) OFF
(3) Ignition switch ON
(4) Engine start
(5) Misfire start
(6) 1 second

4) Turn the ignition switch to OFF and connect the delivery (test) mode connector (A) located under the glove box.



(1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light illuminates.
(2) After the engine starts, malfunction indicator light blinks in a cycle of 0.5 Hz. (During diagnosis)

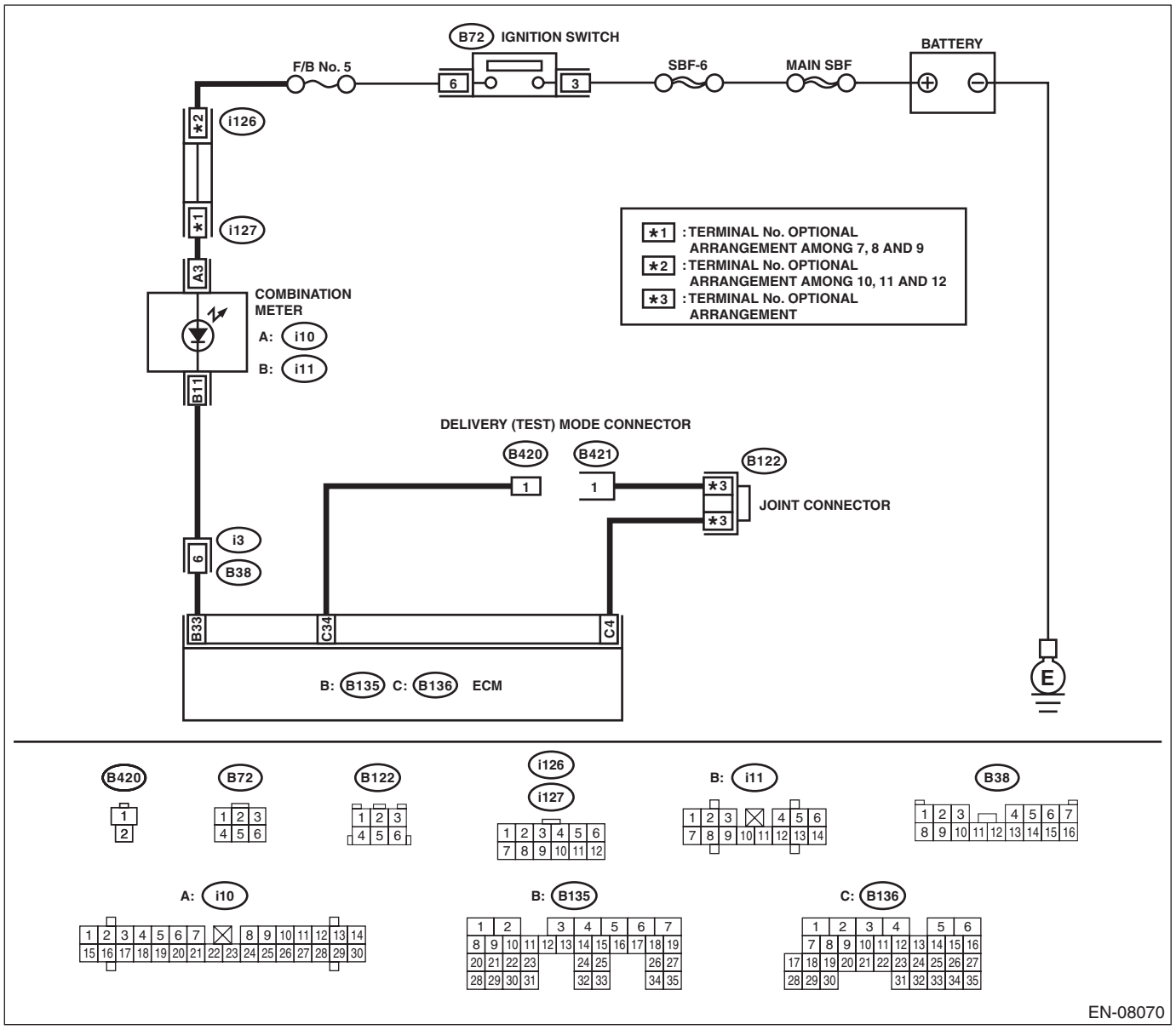
(3) Malfunction indicator light blinks at a cycle of 3 Hz after diagnosis if there is no trouble. Malfunction indicator light illuminates if faulty.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 seconds

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON

DIAGNOSIS:
The malfunction indicator light circuit is open or shorted.
TROUBLE SYMPTOM:
When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not illuminate.
WIRING DIAGRAM:

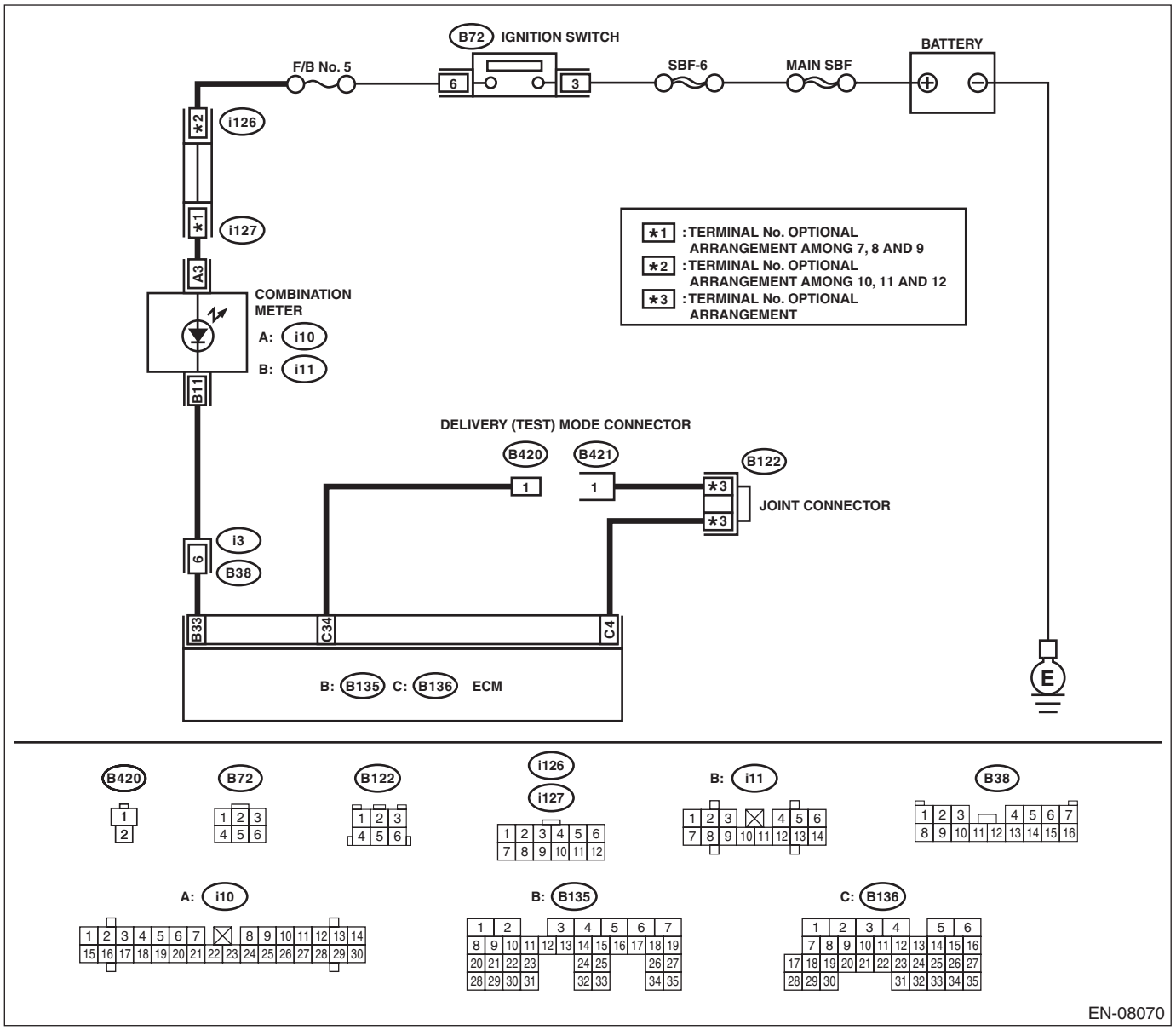


Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 33 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **5**.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-11, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM connector and combination meter connector. ***Connector & terminal*** ***(B135) No. 33 — (i11) No. 11:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and combination meter connector • Poor contact of coupling connector
3	**CHECK FOR POOR CONTACT.** Check for poor contact of combination meter connector.	Is there poor contact of combination meter connector?	Repair the poor contact of combination meter connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the meter case assembly of combination meter. <Ref. to IDI-11, Combination Meter.>	Check the following item and repair if necessary. NOTE: • Blown-out of fuse (F/B No. 5) • Open circuit or short circuit to ground in harness of power supply circuit
5	**CHECK FOR POOR CONTACT.** Check for poor connection by shaking or pulling ECM connector and harness.	Does the malfunction indicator light illuminate?	Repair the poor contact of ECM connector.	Go to step **6**.
6	**CHECK ECM CONNECTOR.** Check the connection of ECM connector.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>	Repair the connection of ECM connector.

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF

DIAGNOSIS:
The malfunction indicator light circuit is shorted.
TROUBLE SYMPTOM:
Although malfunction indicator light comes on when the engine runs, DTC is not shown on the Subaru Select Monitor display.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the ground short circuit of harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK

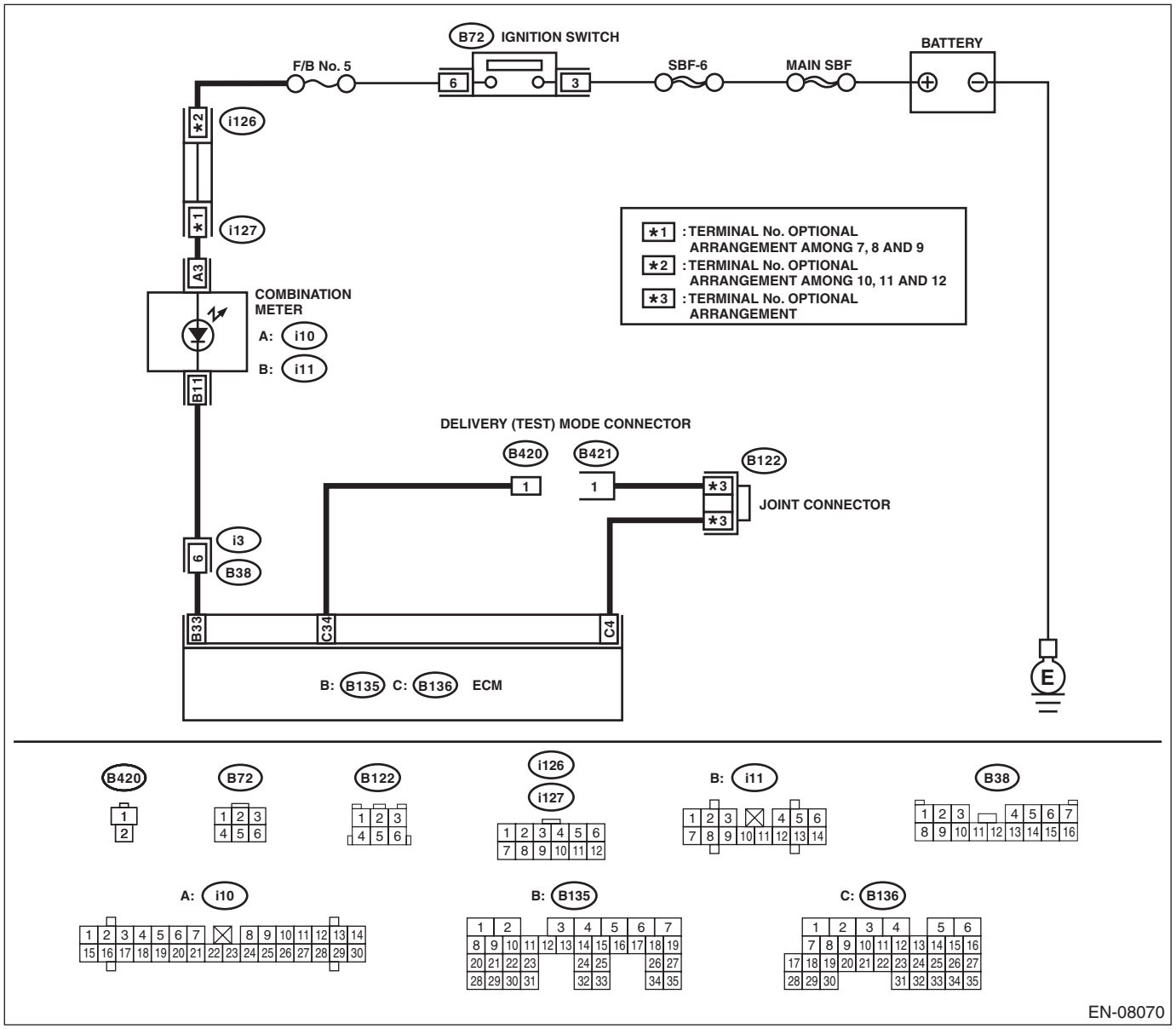
DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- The delivery (test) mode connector circuit is open.

TROUBLE SYMPTOM:

Malfunction indicator light does not blink during Inspection Mode.

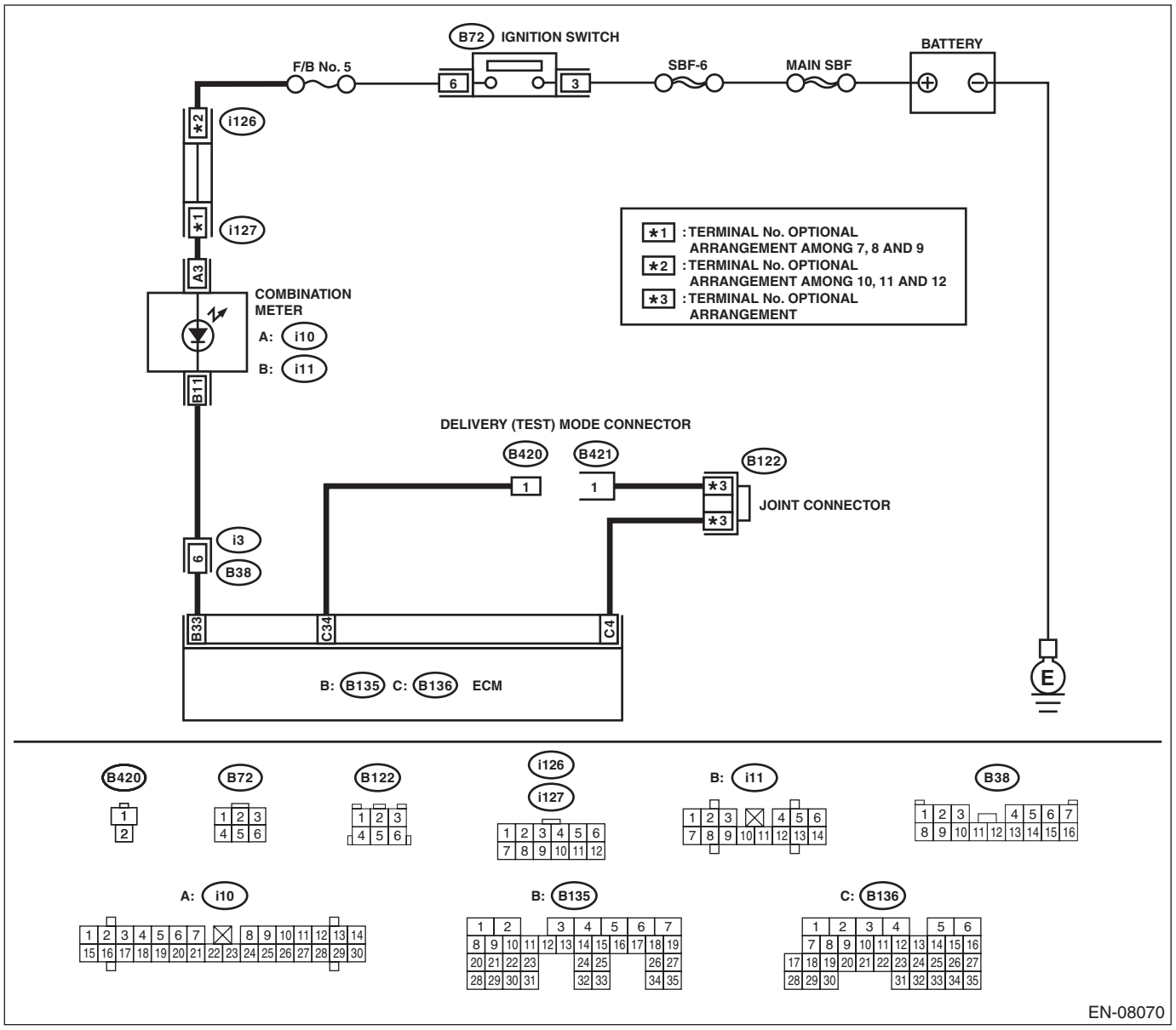
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Check the delivery (test) mode connector is disconnected. 3) Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light illuminate?	Go to step **2**.	Repair the malfunction indicator light circuit. <Ref. to EN(H6DO)(diag)-65, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the ground short circuit of harness between combination meter and ECM connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND DELIVERY (TEST) MODE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Connect the delivery (test) mode connector of the main fuse box. 3) Measure the resistance of harness between ECM connectors. ***Connector & terminal*** ***(B136) No. 4 — (B136) No. 34:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and delivery (test) mode connector • Poor contact of joint connector
4	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING

DIAGNOSIS:
The delivery (test) mode connector circuit is shorted.
TROUBLE SYMPTOM:
Malfunction indicator light blinks while the delivery (test) mode connector is not connected.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DELIVERY (TEST) MODE CONNECTOR.** 1) Check the delivery (test) mode connector is disconnected. 2) Turn the ignition switch to ON.	Does the malfunction indicator light blink?	Go to step **2**.	System is normal. NOTE: Malfunction indicator light blinks when delivery (test) mode connector is connected.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND CHASSIS GROUND TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 34 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit to ground in harness between ECM and delivery (test) mode connector.	Replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>

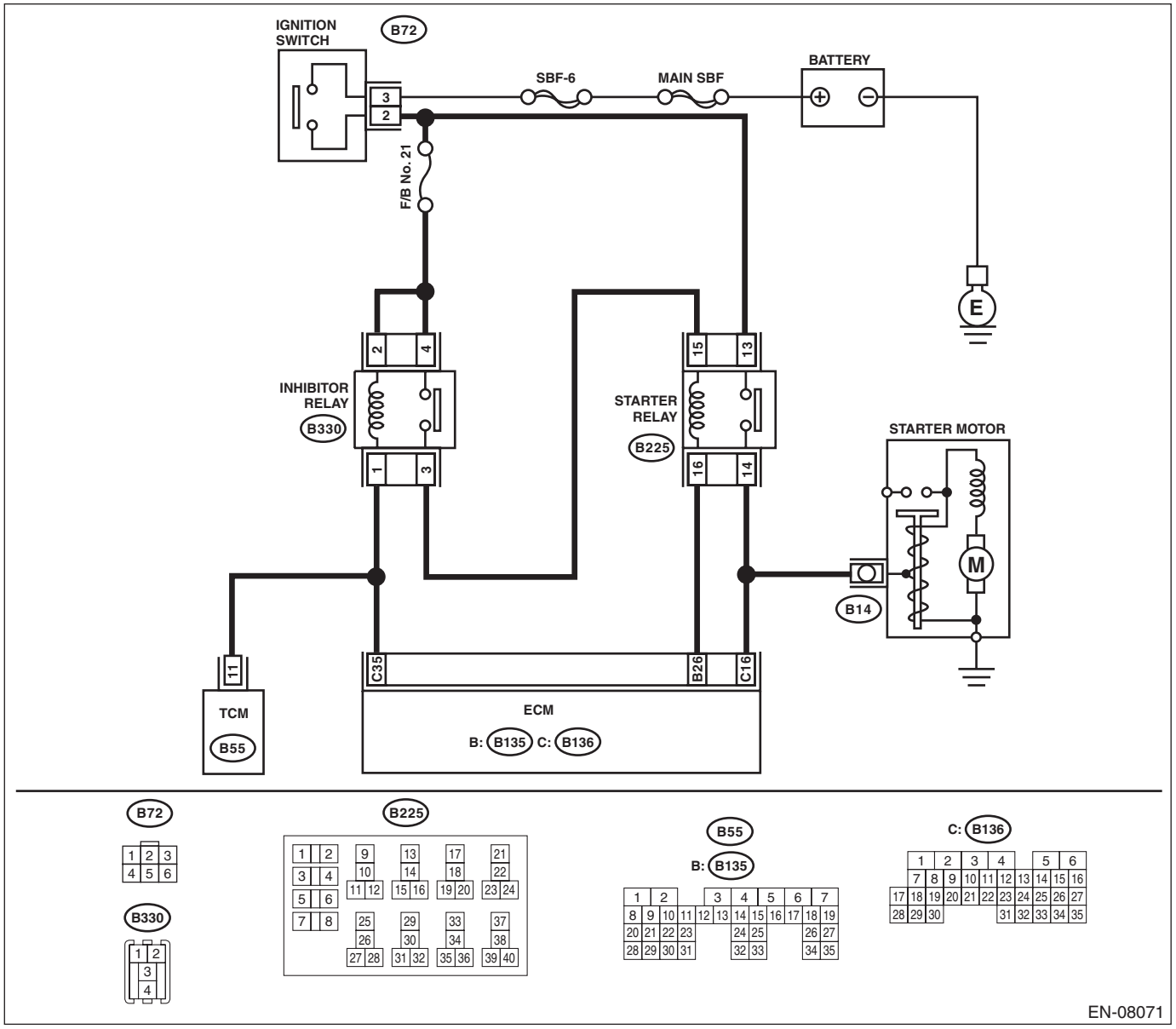
17.Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Check of the fuel amount
↓
2. Inspection of starter motor circuit. <Ref. to EN(H6DO)(diag)-73, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H6DO)(diag)-77, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(H6DO)(diag)-79, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H6DO)(diag)-82, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H6DO)(diag)-83, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK BATTERY.** Check the battery voltage.	Is the voltage 12 V or more?	Go to step **2**.	Charge or replace the battery.
2	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **3**.	Go to step **4**.

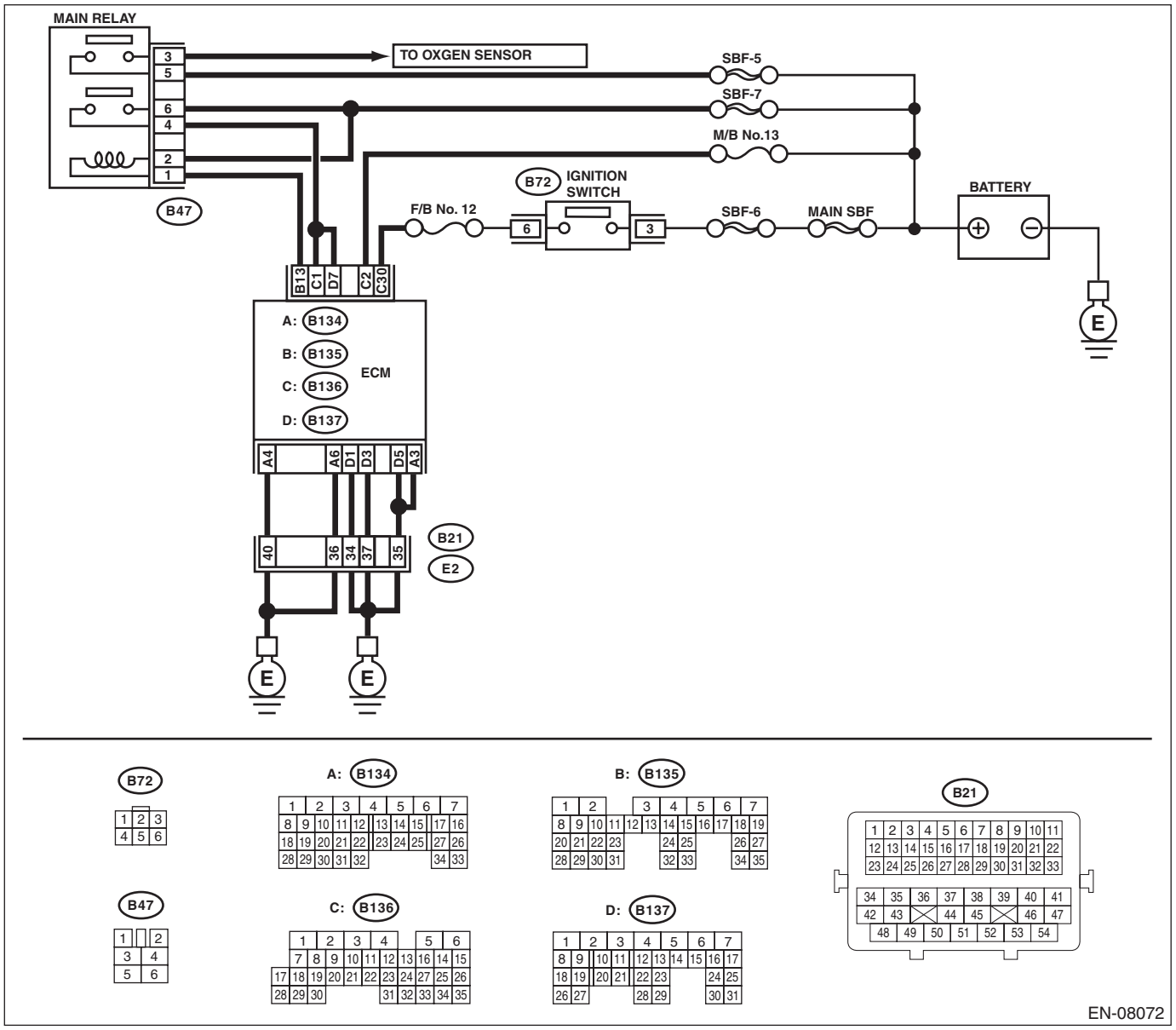
	Step	Check	Yes	No
3	**CHECK DTC.**	Is DTC displayed? <Ref. to EN(H6DO)(diag)-44, OPERATION, Read Diagnostic Trouble Code (DTC).>	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	The circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
4	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Place the select lever in "P" range or "N" range. 4) Turn the ignition switch to START. 5) Measure the voltage between the starter motor connector and the engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Check the starter motor. <Ref. to SC(H6DO)-6, Starter.>	Go to step **5**.
5	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Place the select lever in "P" range or "N" range. 2) Turn the ignition switch to START. 3) Measure the voltage between starter relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 14 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the open circuit of the harness between starter relay connector and starter motor.	Go to step **6**.
6	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition switch. 3) Measure the voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **7**.	Repair the power supply circuit.
7	**CHECK IGNITION SWITCH.** Measure the resistance between ignition switch terminals after turning the ignition switch to START position. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **8**.	Replace the ignition switch. <Ref. to SL-42, REPLACEMENT, Ignition Key Lock.>

	Step	Check	Yes	No
8	**CHECK INPUT VOLTAGE OF STARTER RELAY.** 1) Remove the starter relay. 2) Connect the connector to ignition switch. 3) Turn the ignition switch to START. 4) Measure the voltage between starter relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **9**.	Repair the open circuit of harness between starter relay connector and ignition switch connector.
9	**CHECK STARTER RELAY.** 1) Connect the battery to starter relay terminals No. 15 and No. 16. 2) Measure the resistance between starter relay terminals. ***Terminals*** ***No. 13 — No. 14:***	Is the resistance less than 1 Ω?	Go to step **10**.	Replace the starter relay.
10	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and starter relay connector. ***Connector & terminal*** ***(B135) No. 26 — (B225) No. 16:*** ***(B136) No. 16 — (B225) No. 14:***	Is the resistance less than 1 Ω?	Go to step **11**.	Repair the open circuit of harness between ECM and starter relay connector.
11	**CHECK INPUT VOLTAGE OF STARTER RELAY.** 1) Connect the connector to ECM. 2) Place the select lever in “P” range or “N” range. 3) Turn the ignition switch to START. 4) Measure the voltage between starter relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 15 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **12**.	Go to step **13**.
12	**CHECK HARNESS BETWEEN ECM AND INHIBITOR RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the inhibitor relay connector. 3) Measure the resistance of harness between ECM and inhibitor relay connector. ***Connector & terminal*** ***(B136) No. 35 — (B330) No. 1:***	Is the resistance less than 1 Ω?	Check the ECM power supply and ground line. <Ref. to EN(H6DO)(diag)-77, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>	Repair the open circuit of harness between ECM and inhibitor relay connector.
13	**CHECK INPUT VOLTAGE OF INHIBITOR RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the inhibitor relay connector. 3) Turn the ignition switch to START. 4) Measure the voltage between inhibitor relay connector and chassis ground. ***Connector & terminal*** ***(B330) No. 2 (+) — Chassis ground (–):*** ***(B330) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **14**.	Check the following item and repair if necessary. • Blown-out of fuse (F/B No. 21) • Open or ground short circuit of harness between ignition switch connector and inhibitor relay connector

	Step	Check	Yes	No
14	**CHECK INHIBITOR RELAY.** 1) Connect the battery to inhibitor relay terminals No. 1 and No. 2. 2) Measure the resistance between inhibitor relay terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **15**.	Replace the inhibitor relay.
15	**CHECK HARNESS BETWEEN INHIBITOR RELAY CONNECTOR AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between inhibitor relay connector and starter relay connector. ***Connector & terminal*** ***(B330) No. 3 — (B225) No. 15:***	Is the resistance less than 1 Ω?	Repair the open circuit of harness between TCM and inhibitor relay connector.	Repair the open circuit of harness between inhibitor relay connector and starter relay connector.

C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

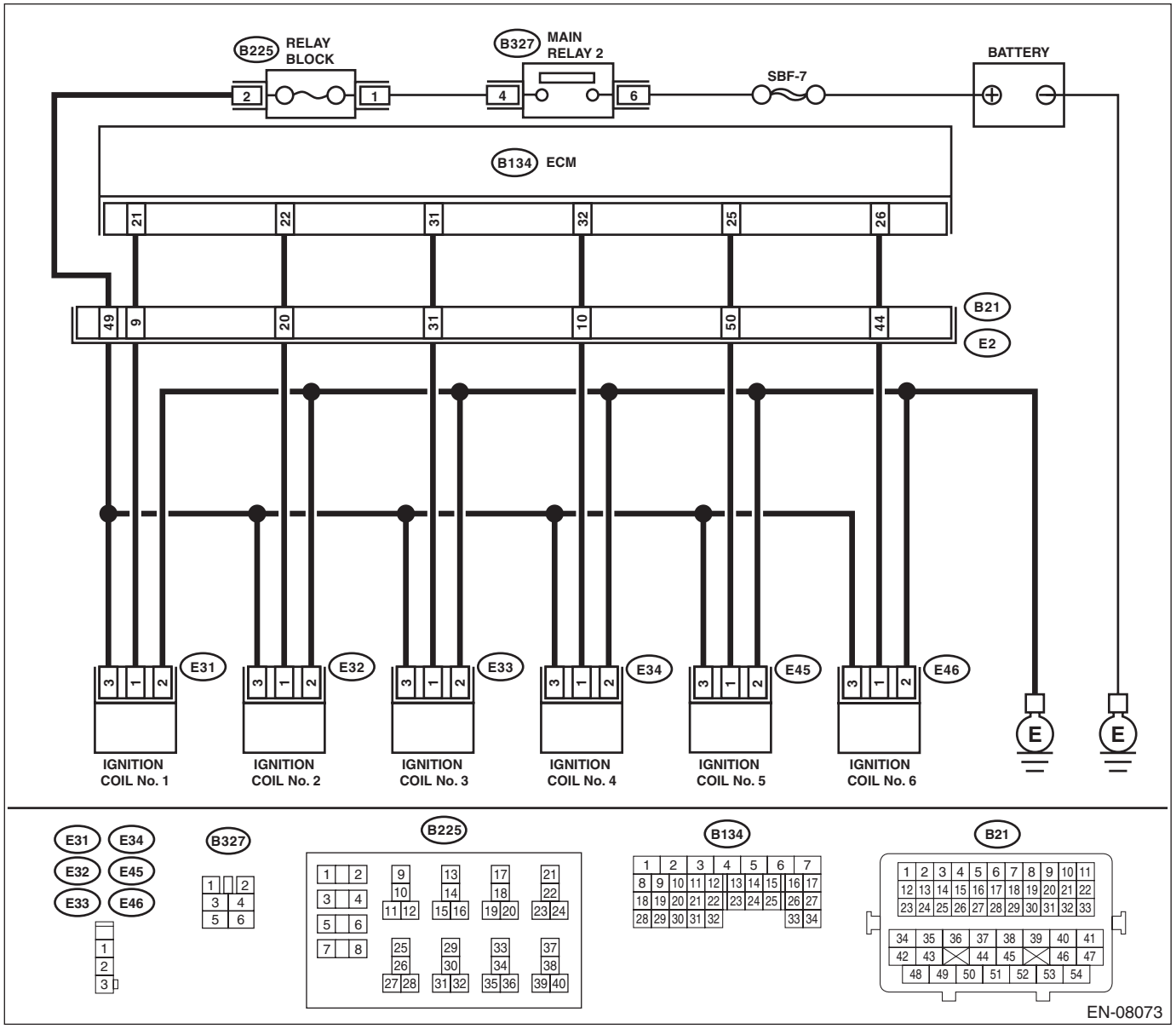


Step		Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the main relay. <Ref. to FU(H6DO)-52, Main Relay.>

	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM connector and engine ground terminal. • Poor contact of coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 2 (+) — Chassis ground (–):*** ***(B136) No. 30 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the open or ground short circuit of harness of power supply circuit.
4	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (–):*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **5**.	Repair the open or ground short circuit of harness of power supply circuit.
5	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Install the main relay. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Repair the open circuit of harness between ECM connector and main relay connector.
6	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Check ignition control system. <Ref. to EN(H6DO)(diag)-79, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM connector and fuel injector connector • Poor contact of main relay connector • Poor contact of ECM connector

D: IGNITION CONTROL SYSTEM

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



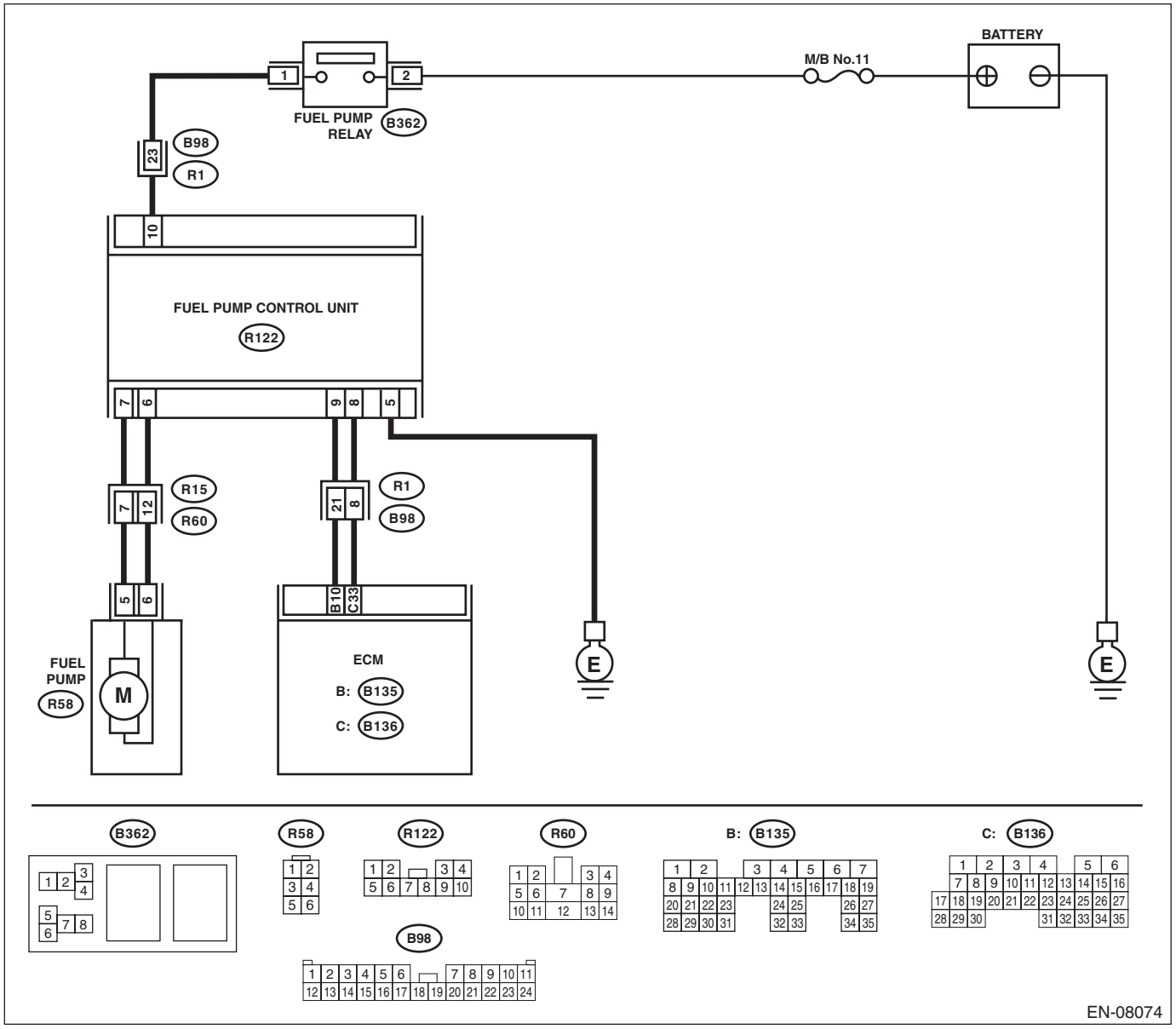
Step		Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H6DO)-5, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H6DO)-6, INSPECTION, Spark Plug.>	Is the spark plug condition normal?	Go to step **2**.	Replace the spark plug. <Ref. to IG(H6DO)-5, Spark Plug.>

	Step	Check	Yes	No
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Contact the spark plug thread portion to engine. 4) While opening the throttle valve fully, start the engine to check if spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H6DO)(diag)-82, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3**.
3	**CHECK IGNITION COIL POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil. 3) Turn the ignition switch to ON. 4) Measure the voltage between ignition coil connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (–):*** ***(E32) No. 3 (+) — Engine ground (–):*** ***(E33) No. 3 (+) — Engine ground (–):*** ***(E34) No. 3 (+) — Engine ground (–):*** ***(E45) No. 3 (+) — Engine ground (–):*** ***(E46) No. 3 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit or short circuit to ground in harness of power supply circuit • Blown out of fuse (SBF-7) • Poor contact of coupling connector
4	**CHECK HARNESS OF IGNITION COIL GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ignition coil connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:*** ***(E45) No. 2 — Engine ground:*** ***(E46) No. 2 — Engine ground***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair the open circuit in harness between ignition coil connector and engine grounding terminal.
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and ignition coil connector. ***Connector & terminal*** ***(B134) No. 21 — (E31) No. 1:*** ***(B134) No. 22 — (E32) No. 1:*** ***(B134) No. 31 — (E33) No. 1:*** ***(B134) No. 32 — (E34) No. 1:*** ***(B134) No. 25 — (E45) No. 1:*** ***(B134) No. 26 — (E46) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM connector and the ignition coil connector • Poor contact of coupling connector
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal:*** ***(B134) No. 21 — Chassis ground:*** ***(B134) No. 22 — Chassis ground:*** ***(B134) No. 31 — Chassis ground:*** ***(B134) No. 32 — Chassis ground:*** ***(B134) No. 25 — Chassis ground:*** ***(B134) No. 26 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the ground short circuit of harness between ECM connector and ignition coil connector.

	Step	Check	Yes	No
7	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Replace the ignition coil. <Ref. to IG(H6DO)-8, Ignition Coil.>

E: FUEL PUMP CIRCUIT

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



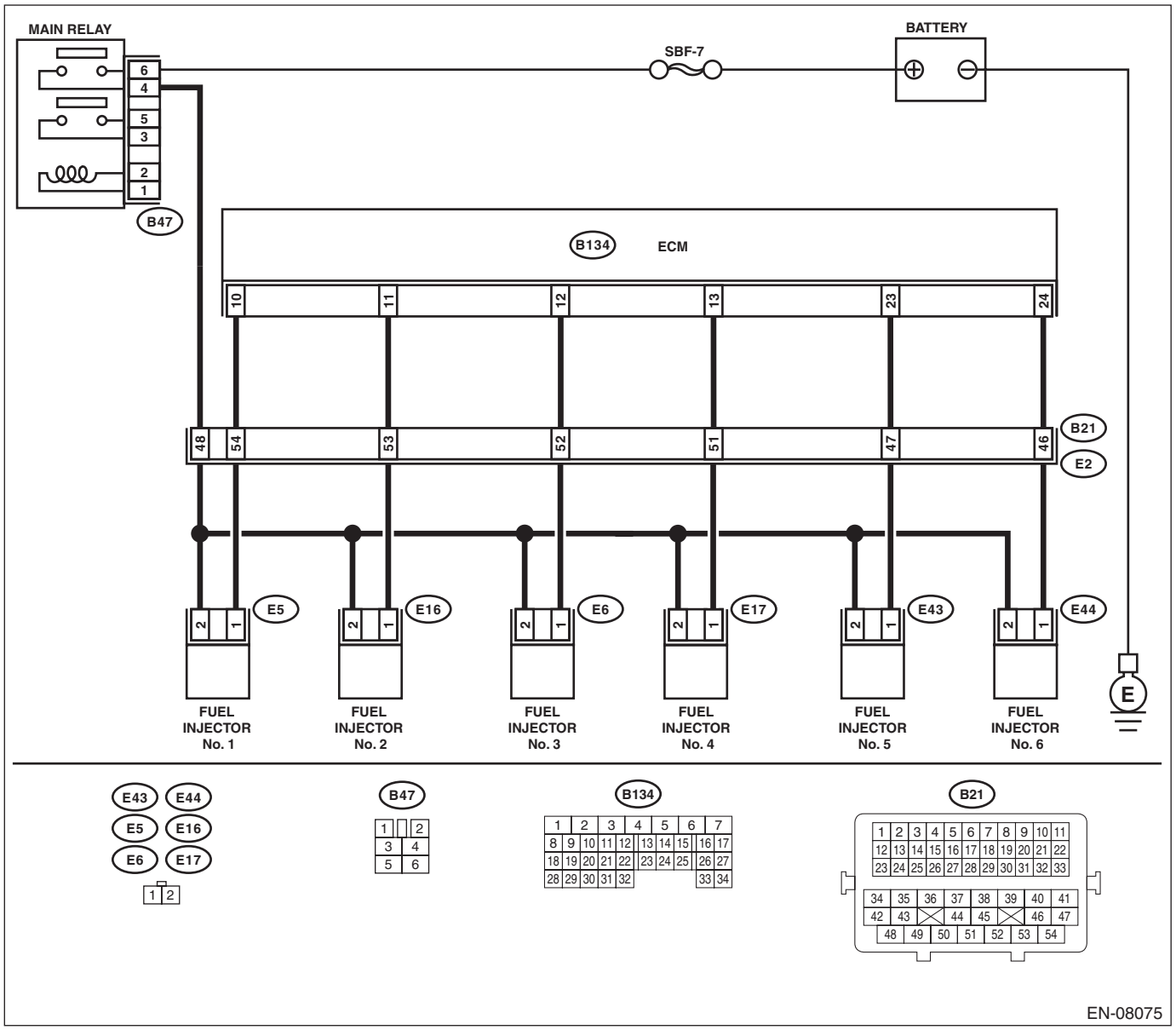
EN-08074

	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump operates for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can be executed using the Subaru Select Monitor. For detailed procedures, refer to "System Operation Check". <Ref. to EN(H6DO)(diag)-59, System Operation Check Mode.>	Does the fuel pump emit operating sound?	Check the fuel injector circuit. <Ref. to EN(H6DO)(diag)-83, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(H6DO)(diag)-44, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.**

WIRING DIAGRAM:



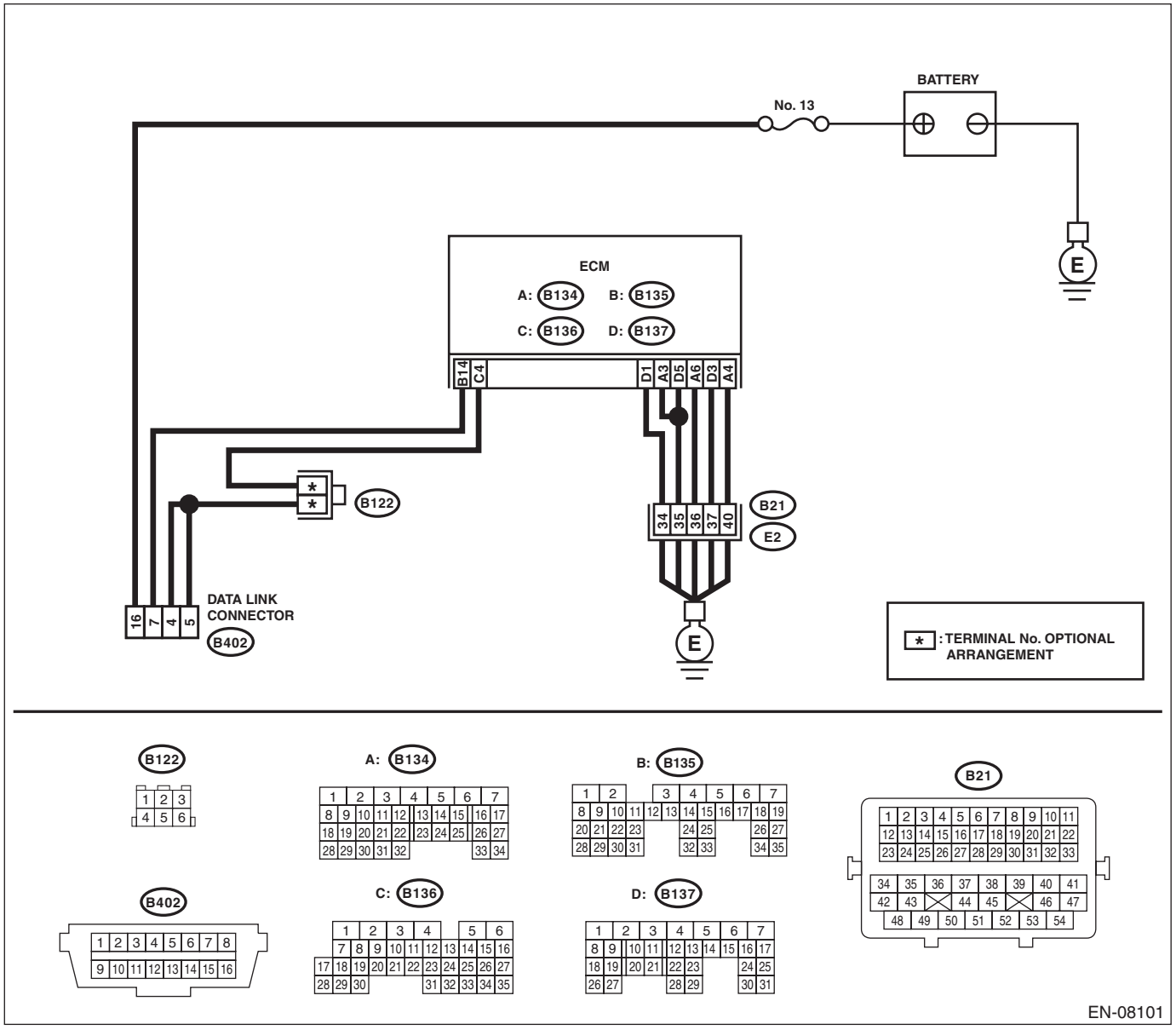
Step		Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check each fuel injector emits operating sound. Use a sound scope or listen by attaching a screwdriver to the injector for this check.	Does the fuel pump emit operating sound?	Check the fuel pressure. <Ref. to ME(H6DO)-32, INSPECTION, Fuel Pressure.>	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel injector connector and the engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):*** ***#5 (E43) No. 2 (+) — Engine ground (–):*** ***#6 (E44) No. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and fuel injector connector • Poor contact of main relay connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B134) No. 10 — (E5) No. 1:*** ***#2 (B134) No. 11 — (E16) No. 1:*** ***#3 (B134) No. 12 — (E6) No. 1:*** ***#4 (B134) No. 13 — (E17) No. 1:*** ***#5 (B134) No. 23 — (E43) No. 1:*** ***#6 (B134) No. 24 — (E44) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***#1 (B134) No. 10 — Chassis ground:*** ***#2 (B134) No. 11 — Chassis ground:*** ***#3 (B134) No. 12 — Chassis ground:*** ***#4 (B134) No. 13 — Chassis ground:*** ***#5 (B134) No. 23 — Chassis ground:*** ***#6 (B134) No. 24 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6**.	Replace the faulty fuel injector. <Ref. to FU(H6DO)-41, Fuel Injector.>
6	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H6DO)(diag)-353, INSPECTION, General Diagnostic Table.>

18. Diagnostic Procedure for Subaru Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:
Open or short circuit in data link connector
TROUBLE SYMPTOM:
Subaru Select Monitor communication failure
WIRING DIAGRAM:



EN-08101

Step		Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT.** Connect the SDI (Subaru Diagnosis Interface) or general scan tool to data link connector.	Does SDI or general scan tool turn ON?	Go to step **4**.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY CIRCUIT.** Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B402) No. 16 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair the power supply circuit. NOTE: In this case, repair the following item: • Open or ground short circuit of harness between battery and data link connector • Blown out of fuse (M/B No. 13)
3	**CHECK HARNESS BETWEEN DATA LINK CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between data link connector and chassis ground. ***Connector & terminal*** ***(B402) No. 4 — Chassis ground:*** ***(B402) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of data link connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and data link connector • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND DATA LINK CONNECTOR.** 1) Disconnect the connector from ECM, TCM, VDC CM, airbag CM and body integrated unit. **CAUTION:** **When disconnecting the connector from airbag control module, always follow the precautions on AB section. <Ref. to AB-4, CAUTION, General Description.>** 2) Measure the resistance of harness between ECM and data link connector. ***Connector & terminal*** ***(B135) No. 14 — (B402) No. 7:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit of harness between ECM and data link connector.
5	**CHECK HARNESS BETWEEN ECM AND DATA LINK CONNECTOR.** Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B407) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact of the ECM or data link connector.	Repair the ground short circuit of harness between ECM and data link connector.

19.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Note
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	<Ref. to EN(H6DO)(diag)-95, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0014	Exhaust AVCS System 1 (Range/Performance)	<Ref. to EN(H6DO)(diag)-96, DTC P0014 EXHAUST AVCS SYSTEM 1 (RANGE/PERFORMANCE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	<Ref. to EN(H6DO)(diag)-97, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0017	Crank and Cam Timing B System Failure (Bank 1)	<Ref. to EN(H6DO)(diag)-98, DTC P0017 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to EN(H6DO)(diag)-99, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0019	Crank and Cam Timing B System Failure (Bank 2)	<Ref. to EN(H6DO)(diag)-100, DTC P0019 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(H6DO)(diag)-101, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0024	Exhaust AVCS System 2 (Range/Performance)	<Ref. to EN(H6DO)(diag)-102, DTC P0024 EXHAUST AVCS SYSTEM 2 (RANGE/PERFORMANCE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-103, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-105, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-107, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-109, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-111, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-113, DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-115, DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-117, DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-119, DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-121, DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to EN(H6DO)(diag)-123, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-124, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H6DO)(diag)-125, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H6DO)(diag)-127, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H6DO)(diag)-129, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H6DO)(diag)-131, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-133, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to EN(H6DO)(diag)-134, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to EN(H6DO)(diag)-136, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to EN(H6DO)(diag)-138, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High	<Ref. to EN(H6DO)(diag)-140, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low	<Ref. to EN(H6DO)(diag)-142, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High	<Ref. to EN(H6DO)(diag)-144, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(H6DO)(diag)-146, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0126	Insufficient Engine Coolant Temperature for Stable Operation	<Ref. to EN(H6DO)(diag)-147, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(H6DO)(diag)-149, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-150, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-152, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-154, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-155, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-157, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-159, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-161, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-163, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0141	O2 Sensor Heater Circuit (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-165, DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0151	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-166, DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0152	O2 Sensor Circuit High Voltage (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-168, DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0153	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-170, DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0154	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-171, DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0157	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-173, DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0158	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-175, DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0159	O2 Sensor Circuit Slow Response (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-177, DTC P0159 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0160	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-179, DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK2 SENSOR2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0161	O2 Sensor Heater Circuit (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-181, DTC P0161 O2 SENSOR HEATER CIRCUIT (BANK2 SENSOR2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H6DO)(diag)-181, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System Too Rich (Bank 1)	<Ref. to EN(H6DO)(diag)-181, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0174	System Too Lean (Bank 2)	<Ref. to EN(H6DO)(diag)-181, DTC P0174 SYSTEM TOO LEAN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0175	System Too Rich (Bank 2)	<Ref. to EN(H6DO)(diag)-182, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-184, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to EN(H6DO)(diag)-185, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to EN(H6DO)(diag)-187, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0196	Engine Oil Temperature Sensor Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-189, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0197	Engine Oil Temperature Sensor Low	<Ref. to EN(H6DO)(diag)-190, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0198	Engine Oil Temperature Sensor High	<Ref. to EN(H6DO)(diag)-192, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/Switch “B” Circuit Low	<Ref. to EN(H6DO)(diag)-194, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/Switch “B” Circuit High	<Ref. to EN(H6DO)(diag)-196, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H6DO)(diag)-198, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H6DO)(diag)-200, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H6DO)(diag)-200, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H6DO)(diag)-200, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H6DO)(diag)-200, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0305	Cylinder 5 Misfire Detected	<Ref. to EN(H6DO)(diag)-200, DTC P0305 CYLINDER 5 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0306	Cylinder 6 Misfire Detected	<Ref. to EN(H6DO)(diag)-201, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)(diag)-207, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)(diag)-209, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0332	Knock Sensor 2 Circuit Low (Bank 2)	<Ref. to EN(H6DO)(diag)-211, DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0333	Knock Sensor 2 Circuit High (Bank 2)	<Ref. to EN(H6DO)(diag)-213, DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H6DO)(diag)-215, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-217, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)(diag)-218, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	<Ref. to EN(H6DO)(diag)-220, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0365	Camshaft Position Sensor “B” Circuit (Bank 1)	<Ref. to EN(H6DO)(diag)-222, DTC P0365 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0390	Camshaft Position Sensor “B” Circuit (Bank 2)	<Ref. to EN(H6DO)(diag)-224, DTC P0390 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust Gas Recirculation Flow	<Ref. to EN(H6DO)(diag)-226, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H6DO)(diag)-228, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to EN(H6DO)(diag)-232, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to EN(H6DO)(diag)-234, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to EN(H6DO)(diag)-236, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission Control System Pressure Sensor	<Ref. to EN(H6DO)(diag)-238, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to EN(H6DO)(diag)-239, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to EN(H6DO)(diag)-241, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to EN(H6DO)(diag)-243, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to EN(H6DO)(diag)-245, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to EN(H6DO)(diag)-247, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to EN(H6DO)(diag)-249, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor “A” Circuit Range/ Performance	<Ref. to EN(H6DO)(diag)-251, DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor “A” Circuit Low	<Ref. to EN(H6DO)(diag)-251, DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor “A” Circuit High	<Ref. to EN(H6DO)(diag)-251, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H6DO)(diag)-252, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle Speed Sensor “A”	<Ref. to EN(H6DO)(diag)-252, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to EN(H6DO)(diag)-253, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Air Control System RPM Higher Than Expected	<Ref. to EN(H6DO)(diag)-254, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H6DO)(diag)-255, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-15, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H6DO)(diag)-257, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to EN(H6DO)(diag)-257, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Throttle Control System Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-258, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(H6DO)(diag)-259, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H6DO)(diag)-259, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(H6DO)(diag)-260, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(H6DO)(diag)-262, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1154	O2 Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-264, DTC P1154 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1155	O2 Sensor Circuit Range/Performance (High) (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-266, DTC P1155 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H6DO)(diag)-267, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(H6DO)(diag)-268, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to EN(H6DO)(diag)-269, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to EN(H6DO)(diag)-269, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to EN(H6DO)(diag)-269, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to EN(H6DO)(diag)-269, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to EN(H6DO)(diag)-269, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to EN(H6DO)(diag)-269, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to EN(H6DO)(diag)-270, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to EN(H6DO)(diag)-273, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H6DO)(diag)-276, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(H6DO)(diag)-278, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM(diag)-16, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-18, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM(diag)-19, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM(diag)-21, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-21, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-22, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1578	Meter Failure	<Ref. to IM(diag)-23, DTC P1578 METER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1602	Control Module Programming Error	<Ref. to EN(H6DO)(diag)-280, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to EN(H6DO)(diag)-289, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to EN(H6DO)(diag)-291, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2090	Exhaust Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to EN(H6DO)(diag)-293, DTC P2090 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2091	Exhaust Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to EN(H6DO)(diag)-295, DTC P2091 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to EN(H6DO)(diag)-297, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H6DO)(diag)-299, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2094	Exhaust Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to EN(H6DO)(diag)-301, DTC P2094 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2095	Exhaust Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H6DO)(diag)-303, DTC P2095 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	<Ref. to EN(H6DO)(diag)-305, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	<Ref. to EN(H6DO)(diag)-311, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2098	Post Catalyst Fuel Trim System Too Lean (Bank 2)	<Ref. to EN(H6DO)(diag)-317, DTC P2098 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2099	Post Catalyst Fuel Trim System Too Rich (Bank 2)	<Ref. to EN(H6DO)(diag)-323, DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-329, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(H6DO)(diag)-334, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to EN(H6DO)(diag)-336, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance	<Ref. to EN(H6DO)(diag)-337, DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2122	Throttle/Pedal Position Sensor/Switch “D” Circuit Low Input	<Ref. to EN(H6DO)(diag)-338, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2123	Throttle/Pedal Position Sensor/Switch “D” Circuit High Input	<Ref. to EN(H6DO)(diag)-340, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2127	Throttle/Pedal Position Sensor/Switch “E” Circuit Low Input	<Ref. to EN(H6DO)(diag)-342, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2128	Throttle/Pedal Position Sensor/Switch “E” Circuit High Input	<Ref. to EN(H6DO)(diag)-344, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2135	Throttle/Pedal Position Sensor/Switch “A”/“B” Voltage Correlation	<Ref. to EN(H6DO)(diag)-346, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2138	Throttle/Pedal Position Sensor/Switch “D”/“E” Voltage Correlation	<Ref. to EN(H6DO)(diag)-349, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2227	Atmospheric Pressure Sensor Range/Performance	<Ref. to EN(H6DO)(diag)-351, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2228	Barometric Pressure Circuit Low	<Ref. to EN(H6DO)(diag)-351, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2229	Barometric Pressure Circuit High	<Ref. to EN(H6DO)(diag)-352, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0073	CAN Failure, Bus “OFF” Detection	<Ref. to EN(H6DO)(diag)-352, DTC U0073 CAN FAILURE, BUS ‘OFF’ DETECTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0101	CAN (TCM) Data not Loaded	<Ref. to EN(H6DO)(diag)-352, DTC U0101 CAN (TCU) DATA NOT LOADED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0122	CAN (VDC) Data not Loaded	<Ref. to EN(H6DO)(diag)-352, DTC U0122 CAN (VDC) DATA NOT LOADED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0140	CAN (BCU) Data not Loaded	<Ref. to EN(H6DO)(diag)-352, DTC U0140 CAN (BCU) DATA NOT LOADED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0402	CAN (TCM) Data Abnormal	<Ref. to EN(H6DO)(diag)-352, DTC U0402 CAN (TCU) DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0416	CAN (VDC) Data Abnormal	<Ref. to EN(H6DO)(diag)-352, DTC U0416 CAN (VDC) DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0422	CAN (BCU) Data Abnormal	<Ref. to EN(H6DO)(diag)-352, DTC U0422 CAN (BCU) DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

20.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Check the AVCS system operating angle using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approximately 0°?	Go to step **2**.	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)
2	**CHECK CURRENT DATA.** 1) Drive with acceleration and deceleration at 80 km/h (50 MPH) or less. NOTE: Drive to an extent that the duty output of oil flow control solenoid valve increases. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-16, Engine Oil Filter.>

B: DTC P0014 EXHAUST AVCS SYSTEM 1 (RANGE/PERFORMANCE)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-12, DTC P0014 EXHAUST AVCS SYSTEM 1 (RANGE/PERFORMANCE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Check the exhaust AVCS system operating angle using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the exhaust AVCS system operating angle approx. 0°?	Go to step **2**.	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Exhaust camshaft (dirt, damage of camshaft)
2	**CHECK CURRENT DATA.** 1) Drive with acceleration and deceleration at 80 km/h (50 MPH) or less. NOTE: Drive to an extent that the duty output of oil flow control solenoid valve increases. 2) Measure the exhaust AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the exhaust AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Exhaust camshaft (dirt, damage of camshaft)	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-16, Engine Oil Filter.>

C: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-14, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°, and oil flow control solenoid valve duty output approx. 10%?	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-16, Engine Oil Filter.>	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft) • Timing chain (matching of timing mark)

D: DTC P0017 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-16, DTC P0017 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the exhaust AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the exhaust AVCS system operating angle approx. 0°, and oil flow control solenoid valve duty output approx. 10%?	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-16, Engine Oil Filter.>	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Exhaust camshaft (dirt, damage of camshaft) • Timing chain (matching of timing mark)

E: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-18, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°, and oil flow control solenoid valve duty output approx. 10%?	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-16, Engine Oil Filter.>	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft) • Timing chain (matching of timing mark)

F: DTC P0019 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-18, DTC P0019 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the exhaust AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the exhaust AVCS system operating angle approx. 0°, and oil flow control solenoid valve duty output approx. 10%?	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-16, Engine Oil Filter.>	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Exhaust camshaft (dirt, damage of camshaft) • Timing chain (matching of timing mark)

G: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-18, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Check the AVCS system operating angle using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approximately 0°?	Go to step **2**.	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)
2	**CHECK CURRENT DATA.** 1) Drive with acceleration and deceleration at 80 km/h (50 MPH) or less. NOTE: Drive to an extent that the duty output of oil flow control solenoid valve increases. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-16, Engine Oil Filter.>

H: DTC P0024 EXHAUST AVCS SYSTEM 2 (RANGE/PERFORMANCE)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-18, DTC P0024 EXHAUST AVCS SYSTEM 2 (RANGE/PERFORMANCE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Check the exhaust AVCS system operating angle using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the exhaust AVCS system operating angle approx. 0°?	Go to step **2**.	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Exhaust camshaft (dirt, damage of camshaft)
2	**CHECK CURRENT DATA.** 1) Drive with acceleration and deceleration at 80 km/h (50 MPH) or less. NOTE: Drive to an extent that the duty output of oil flow control solenoid valve increases. 2) Measure the exhaust AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the exhaust AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Exhaust camshaft (dirt, damage of camshaft)	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-16, Engine Oil Filter.>

I: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

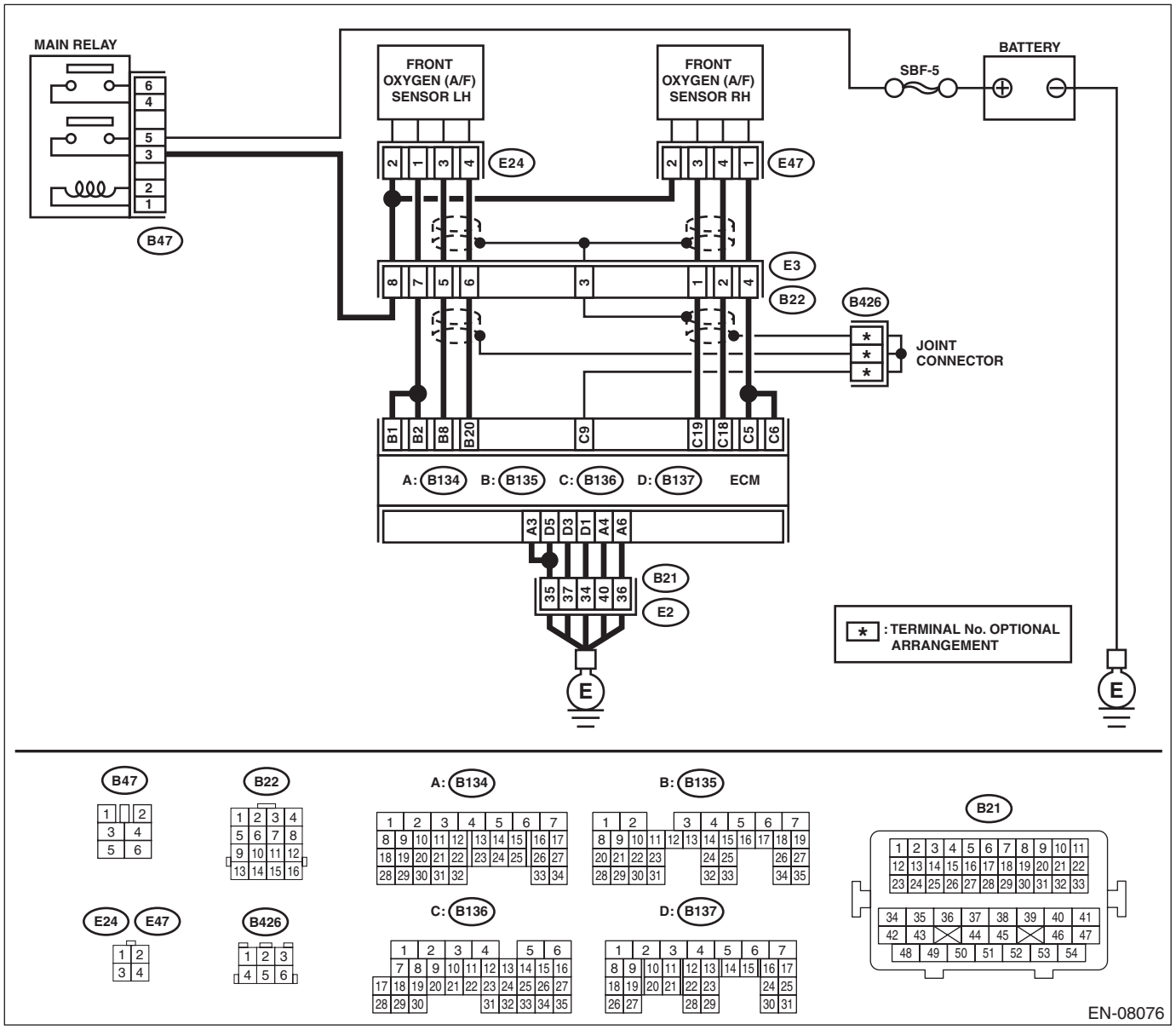
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-19, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start and warm up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 5 — (E47) No. 1:*** ***(B136) No. 6 — (E47) No. 1:*** ***(B136) No. 19 — (E47) No. 3:*** ***(B136) No. 18 — (E47) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
2	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 2 — 3 Ω?	Go to step **3**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>
3	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact of ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

J: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

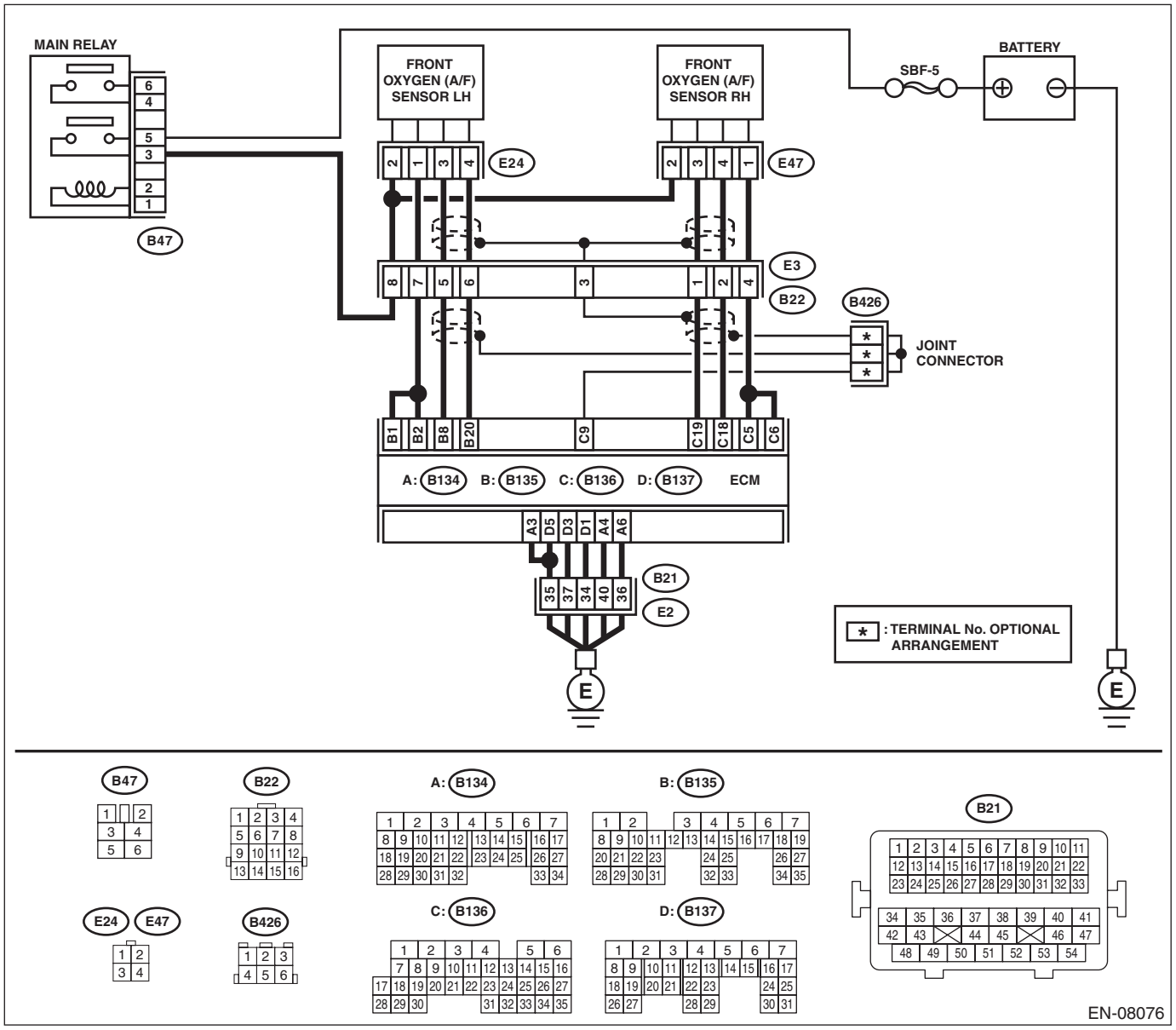
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-21, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(E47) No. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and front oxygen (A/F) sensor connector • Poor contact of main relay connector • Poor contact of coupling connector • Defective main relay
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 5 — (E47) No. 1:*** ***(B136) No. 6 — (E47) No. 1:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
3	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 2 — 3 Ω?	Repair the poor contact of ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

K: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

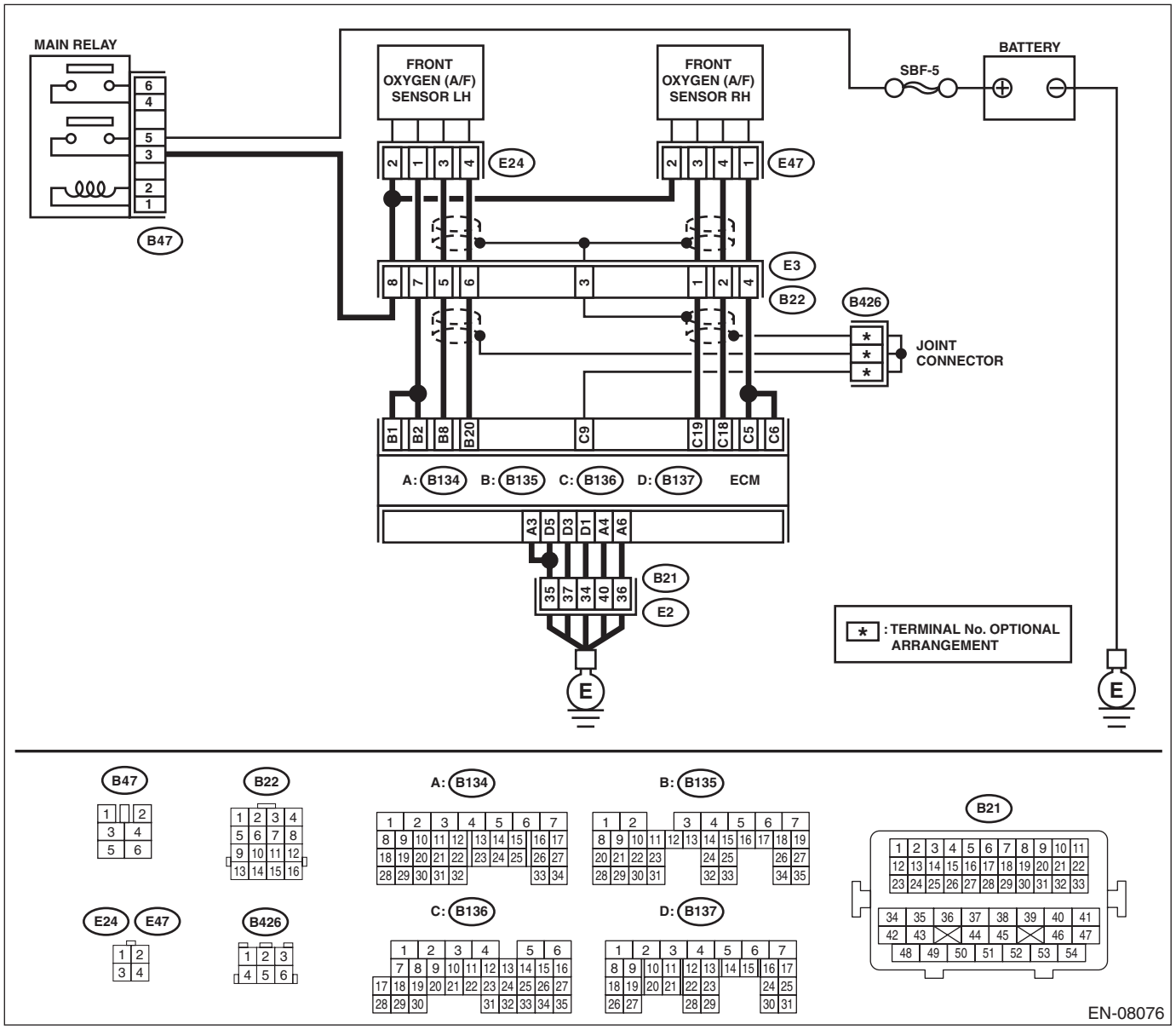
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-23, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 5 (+) — Chassis ground (–):*** ***(B136) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector.	Go to step **2**.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connectors from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

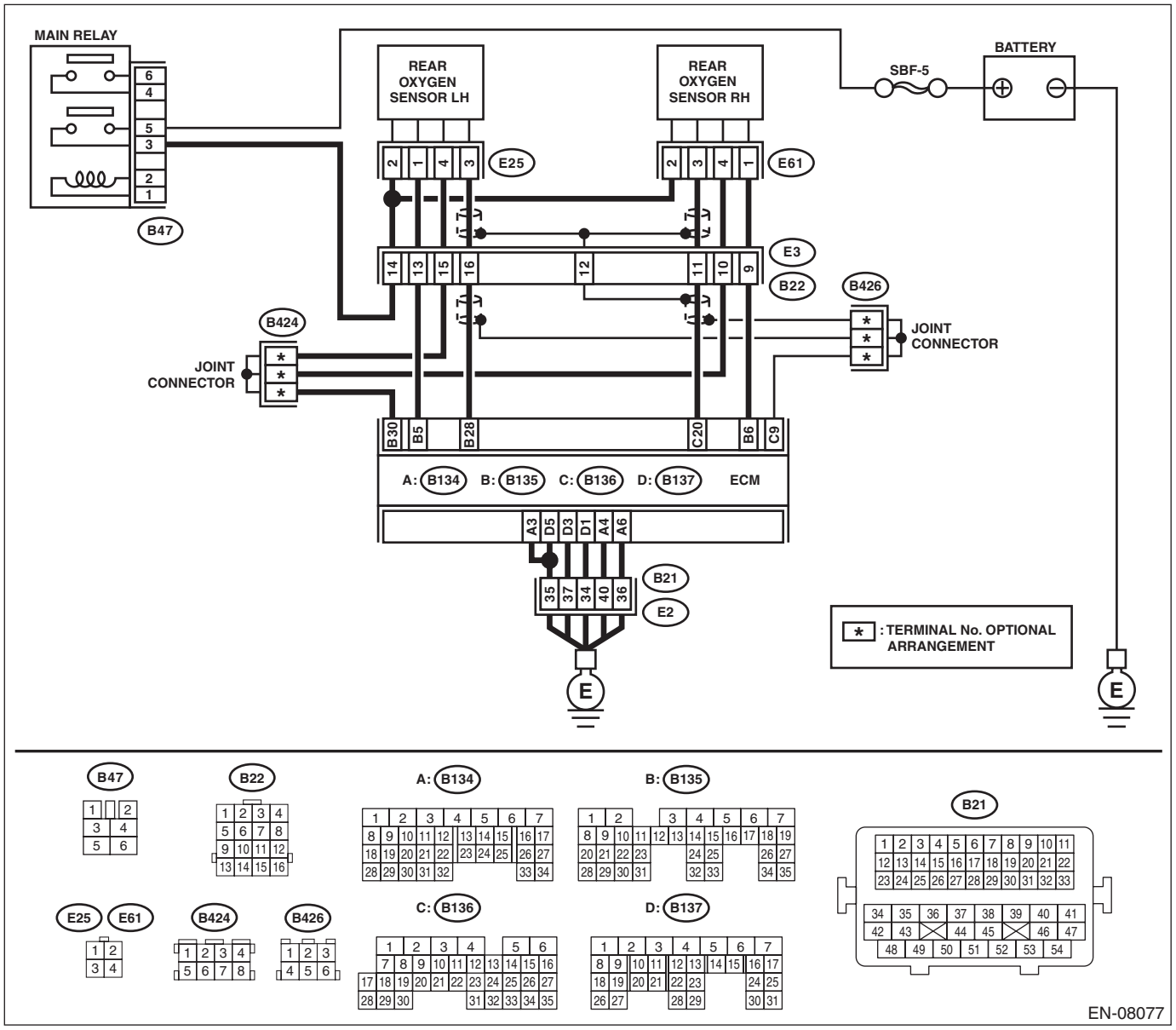
L: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-25, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground. ***Connector & terminal*** ***(E61) No. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and rear oxygen sensor connector • Poor contact of main relay connector • Poor contact of coupling connector • Defective main relay
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 6 — (E61) No. 1:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
3	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector
4	**CHECK REAR OXYGEN SENSOR.** Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 5 — 7 Ω?	Repair the poor contact of ECM connector.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>

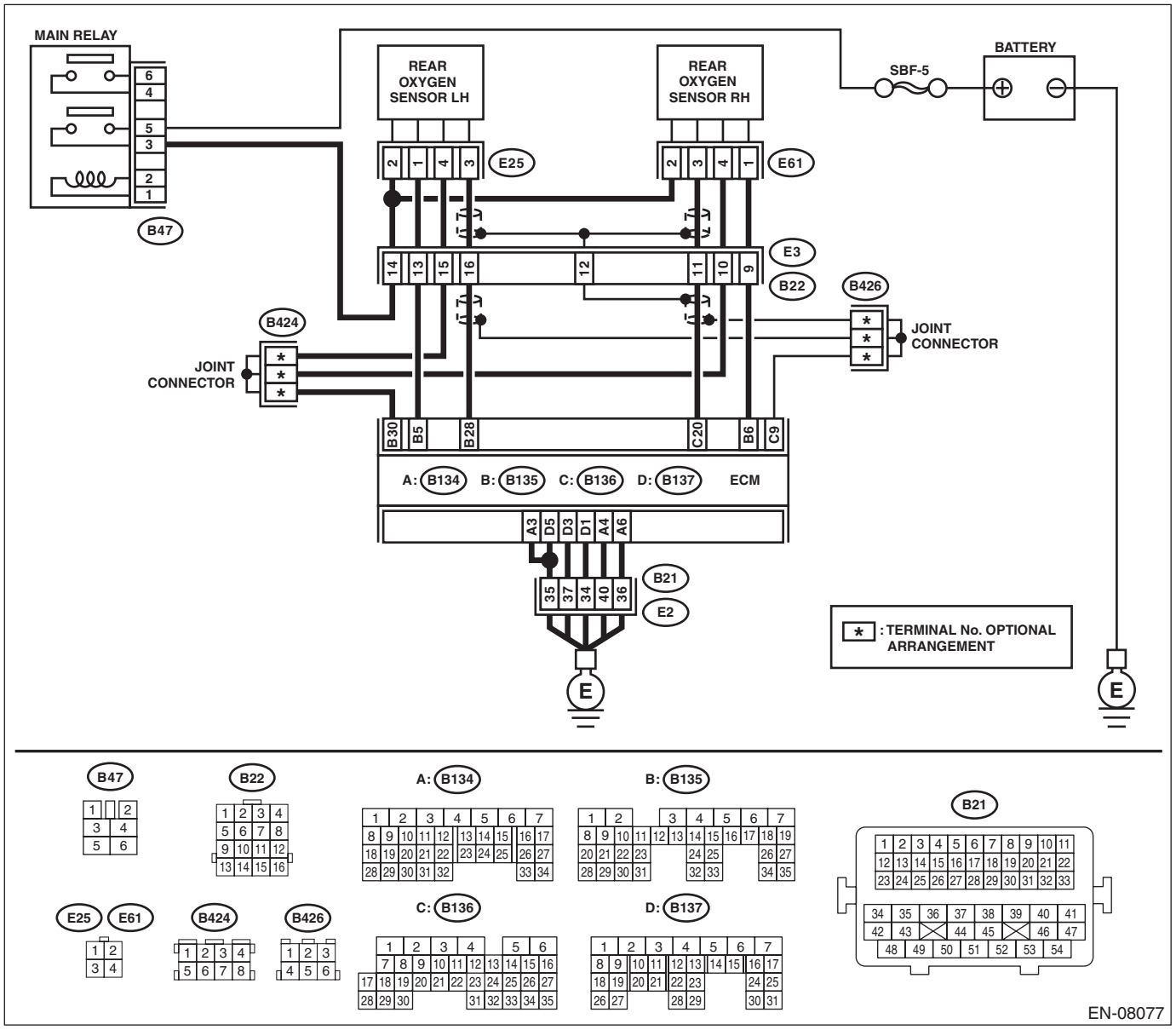
M: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-27, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and rear oxygen sensor connector.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connectors from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

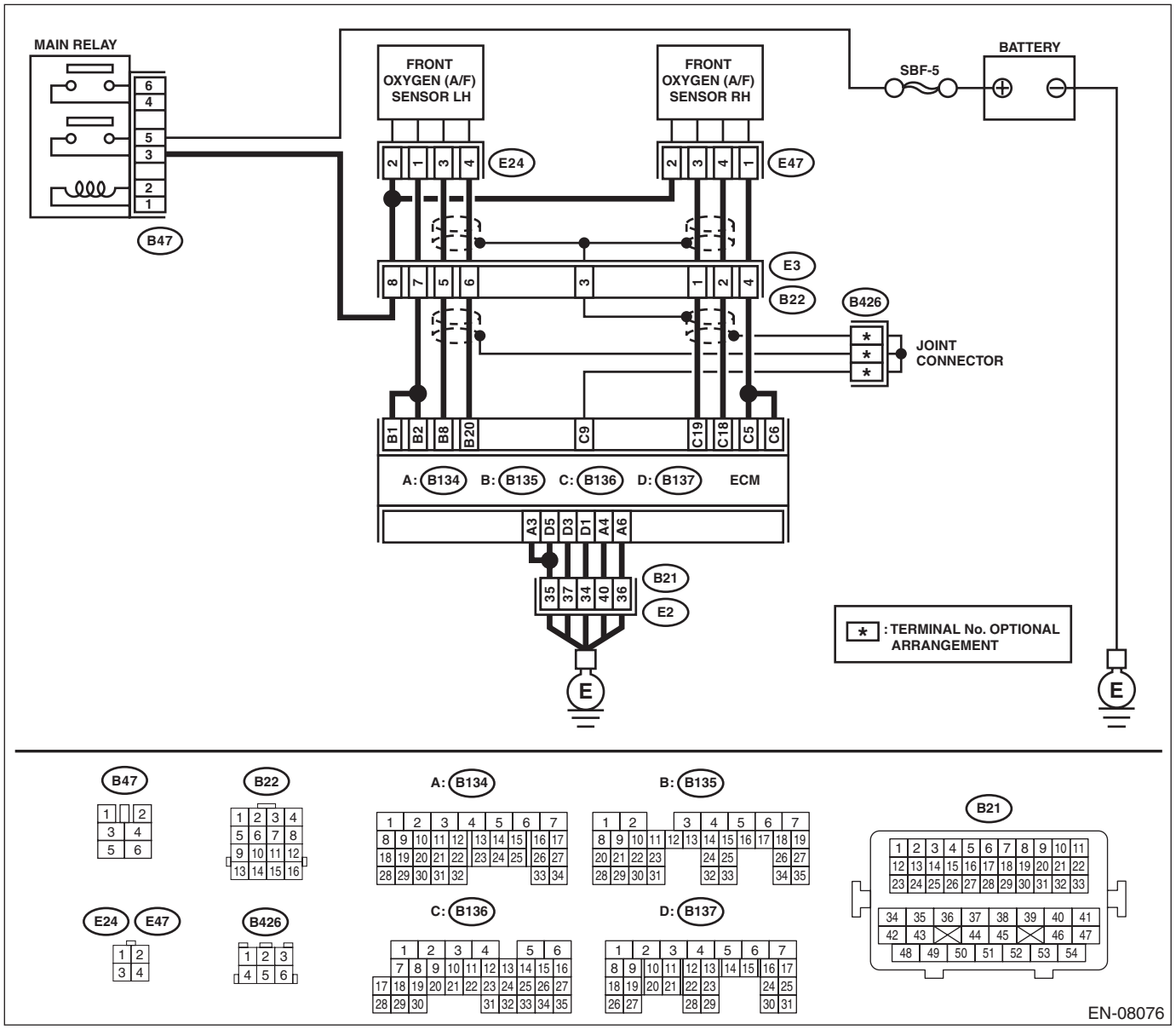
N: DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-28, DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start and warm up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 1 — (E24) No. 1:*** ***(B135) No. 2 — (E24) No. 1:*** ***(B135) No. 8 — (E24) No. 3:*** ***(B135) No. 20 — (E24) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
2	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 2 — 3 Ω?	Go to step **3**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>
3	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact of ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

O: DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

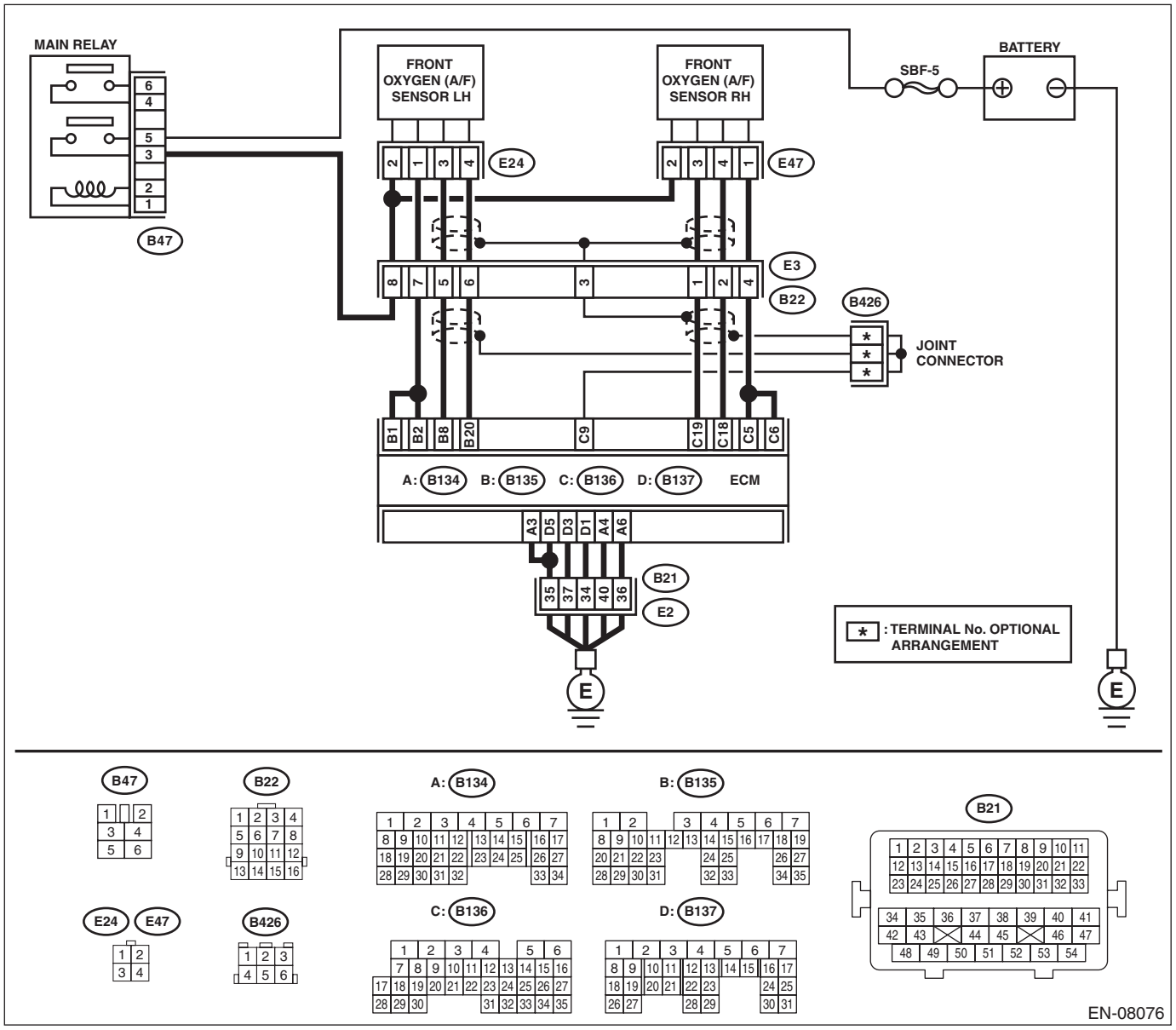
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-28, DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(E24) No. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and front oxygen (A/F) sensor connector • Poor contact of main relay connector • Poor contact of coupling connector • Defective main relay
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 1 — (E24) No. 1:*** ***(B135) No. 2 — (E24) No. 1:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
3	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 2 — 3 Ω?	Repair the poor contact of ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

P: DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

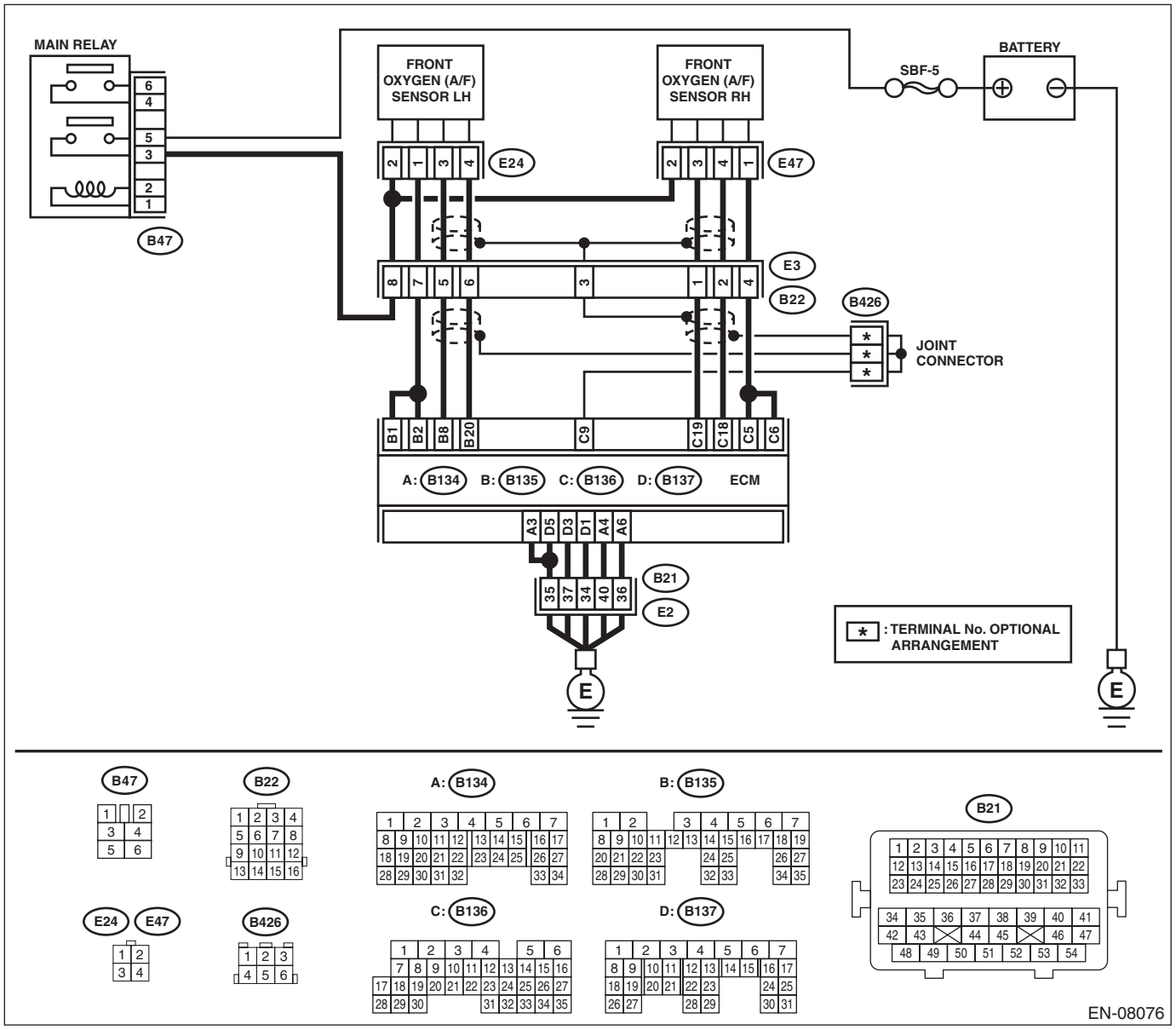
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-28, DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 1 (+) — Chassis ground (–):*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector.	Go to step **2**.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connectors from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

Q: DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2)

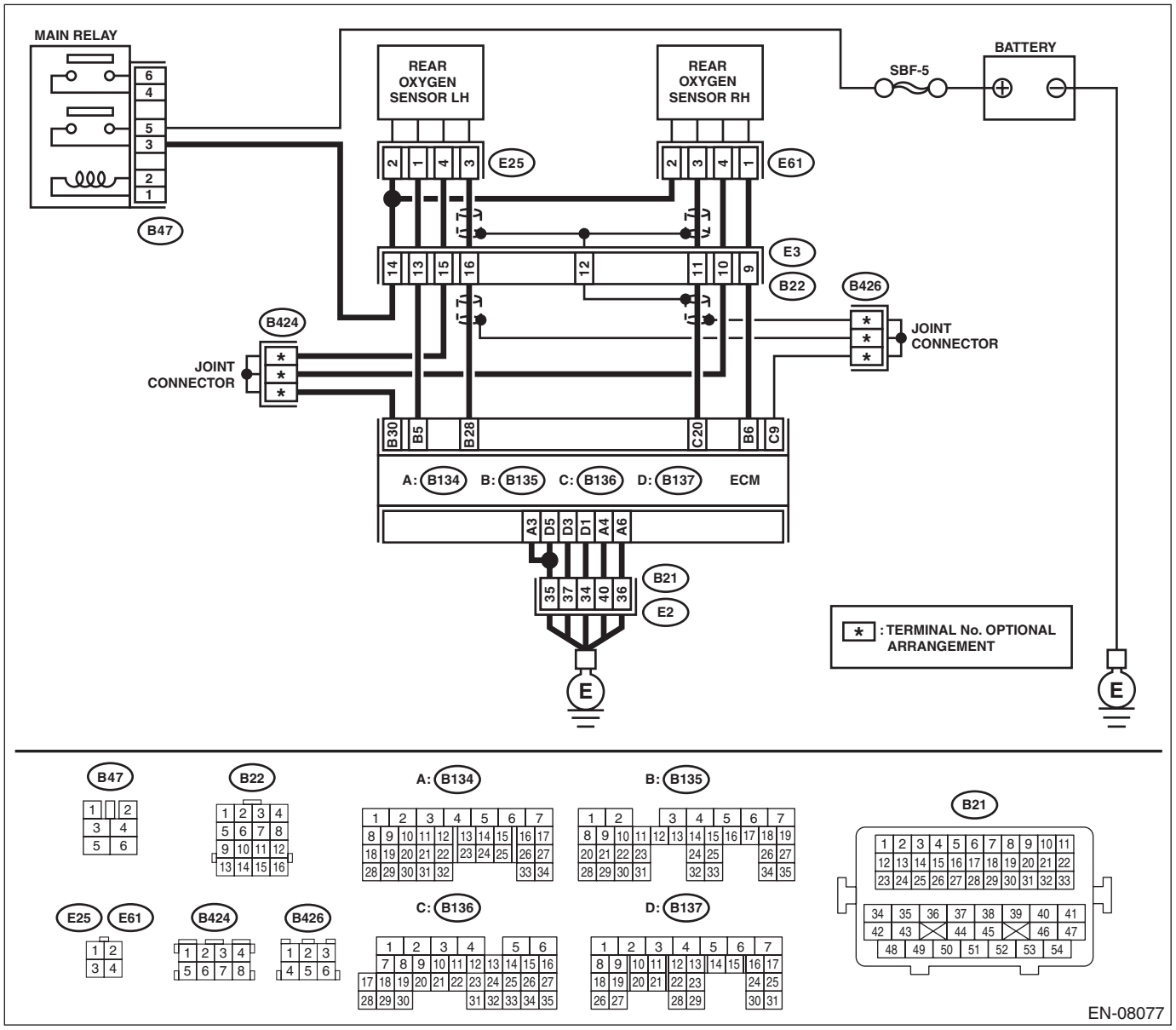
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-28, DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground. ***Connector & terminal*** ***(E25) No. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and rear oxygen sensor connector • Poor contact of main relay connector • Poor contact of coupling connector • Defective main relay
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 5 — (E25) No. 1:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
3	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector
4	**CHECK REAR OXYGEN SENSOR.** Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 5 — 7 Ω?	Repair the poor contact of ECM connector.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>

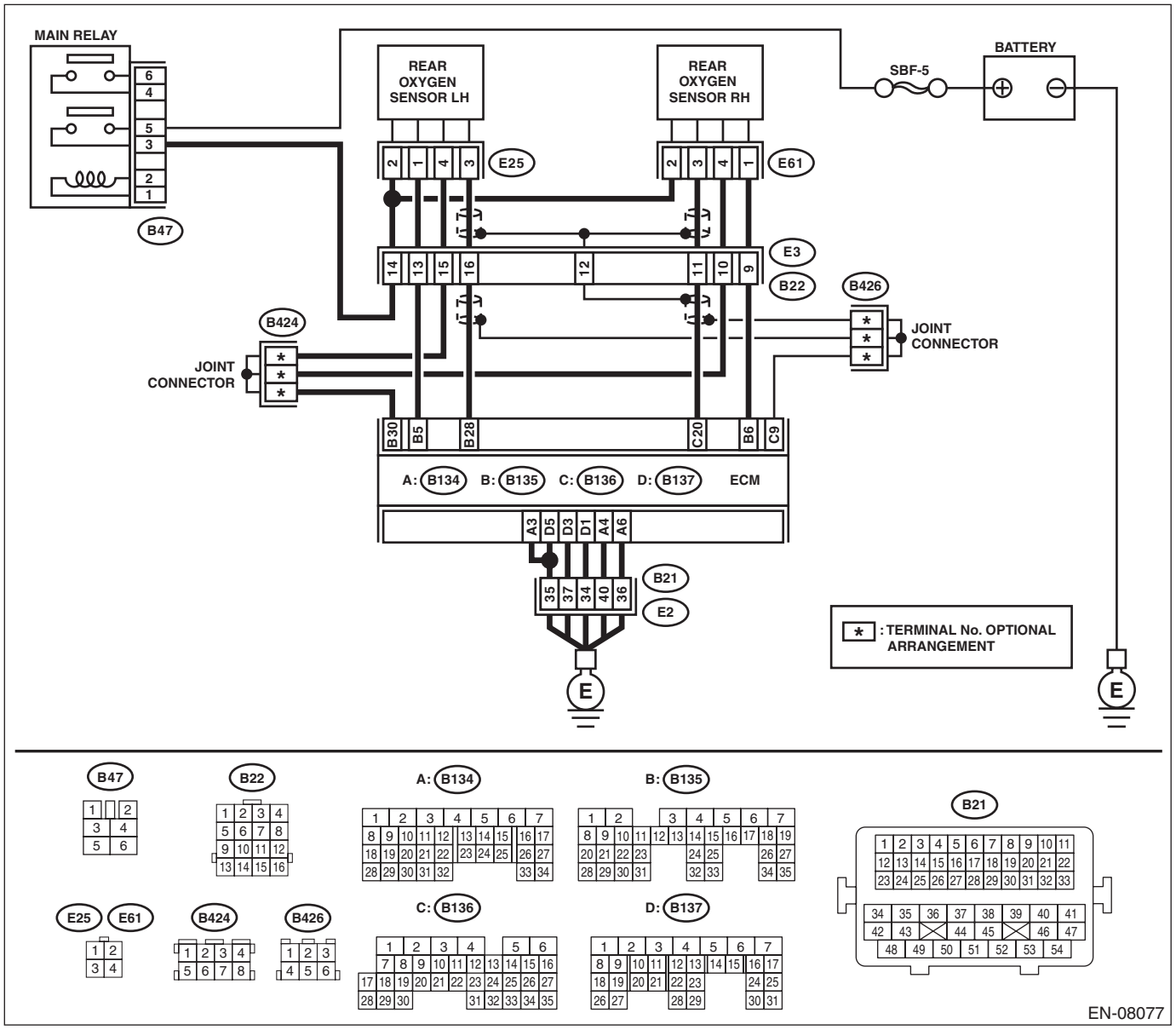
R: DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-28, DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and rear oxygen sensor connector.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connectors from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

S: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-29, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **2**.
2	**CHECK MANIFOLD ABSOLUTE PRESSURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in “P” range or “N” range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.	Is the measured value 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) when the ignition is turned ON, and 20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg) during idling?	Go to step **3**.	Replace the manifold absolute pressure sensor. <Ref. to FU(H6DO)-37, Manifold Absolute Pressure Sensor.>
3	**CHECK THROTTLE OPENING ANGLE.** Read the data of throttle position signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.	Is the measured value less than 5% when throttle is fully closed?	Go to step **4**.	Replace the electronic throttle control. <Ref. to FU(H6DO)-19, Throttle Body.>
4	**CHECK THROTTLE OPENING ANGLE.**	Is the measured value 85% or more when throttle is fully open?	Replace the manifold absolute pressure sensor. <Ref. to FU(H6DO)-37, Manifold Absolute Pressure Sensor.>	Replace the electronic throttle control. <Ref. to FU(H6DO)-19, Throttle Body.>

T: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-31, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>

U: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

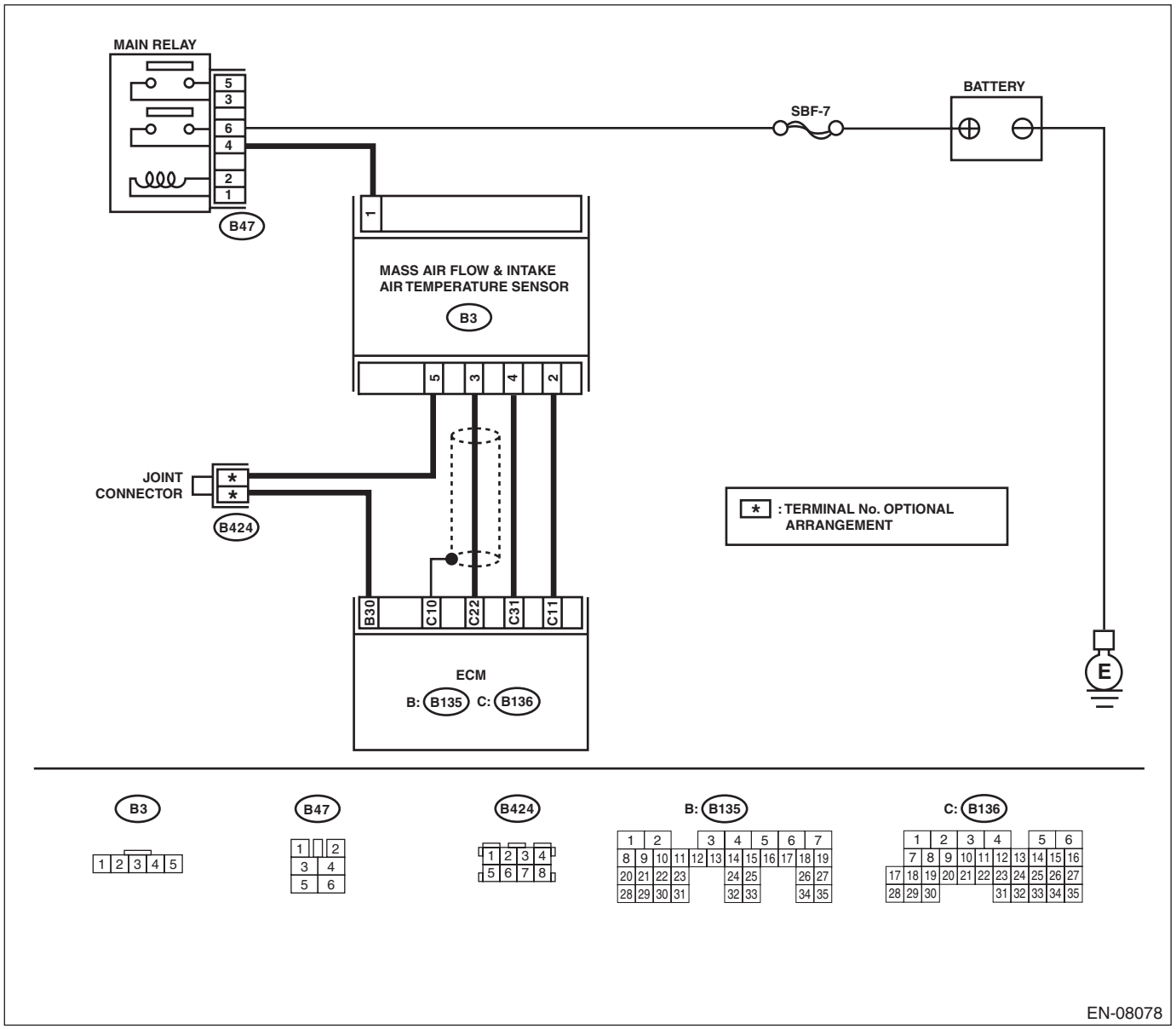
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-33, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of air flow sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK POWER SUPPLY OF MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and mass air flow and intake air temperature sensor connector • Poor contact of main relay connector
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connector. ***Connector & terminal*** ***(B136) No. 22 — (B3) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit in harness between ECM and the mass air flow and intake air temperature sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 22 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between ECM and mass air flow and intake air temperature sensor connector.
5	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and mass air flow and intake air temperature sensor connector.	Is there poor contact of ECM or mass air flow and intake air temperature sensor connector?	Repair the poor contact of ECM or mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>

V: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

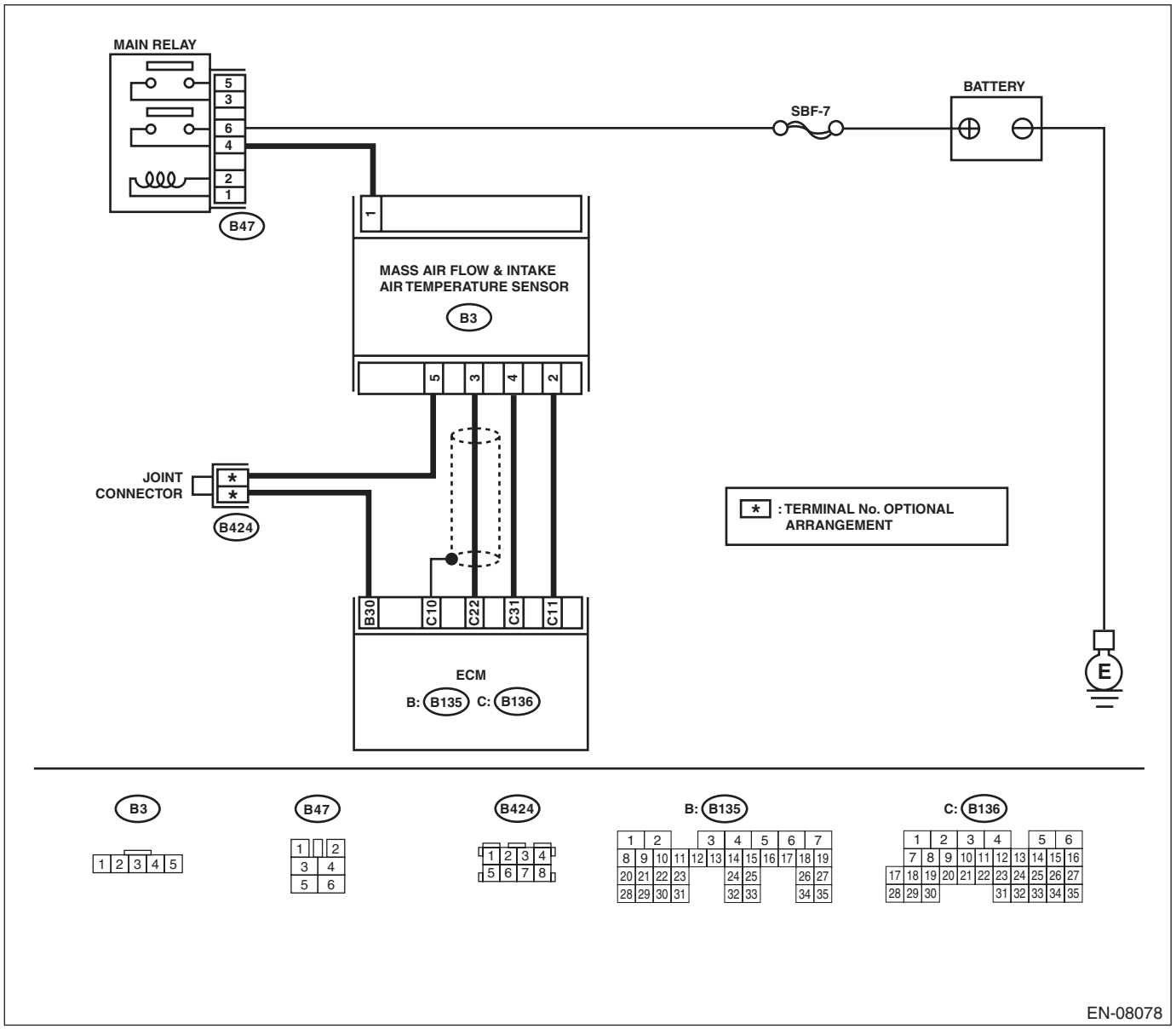
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-34, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of air flow sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the mass air flow and intake air temperature sensor. 3) Start the engine. 4) Read the data of air flow sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Repair the short circuit of harness to power supply between ECM and mass air flow and intake air temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and mass air flow and intake air temperature sensor connector • Poor contact of ECM connector
4	**CHECK FOR POOR CONTACT.** Check for poor contact of mass air flow and intake air temperature sensor connector.	Is there poor contact of mass air flow and intake air temperature sensor connector?	Repair the poor contact of mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>

W: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

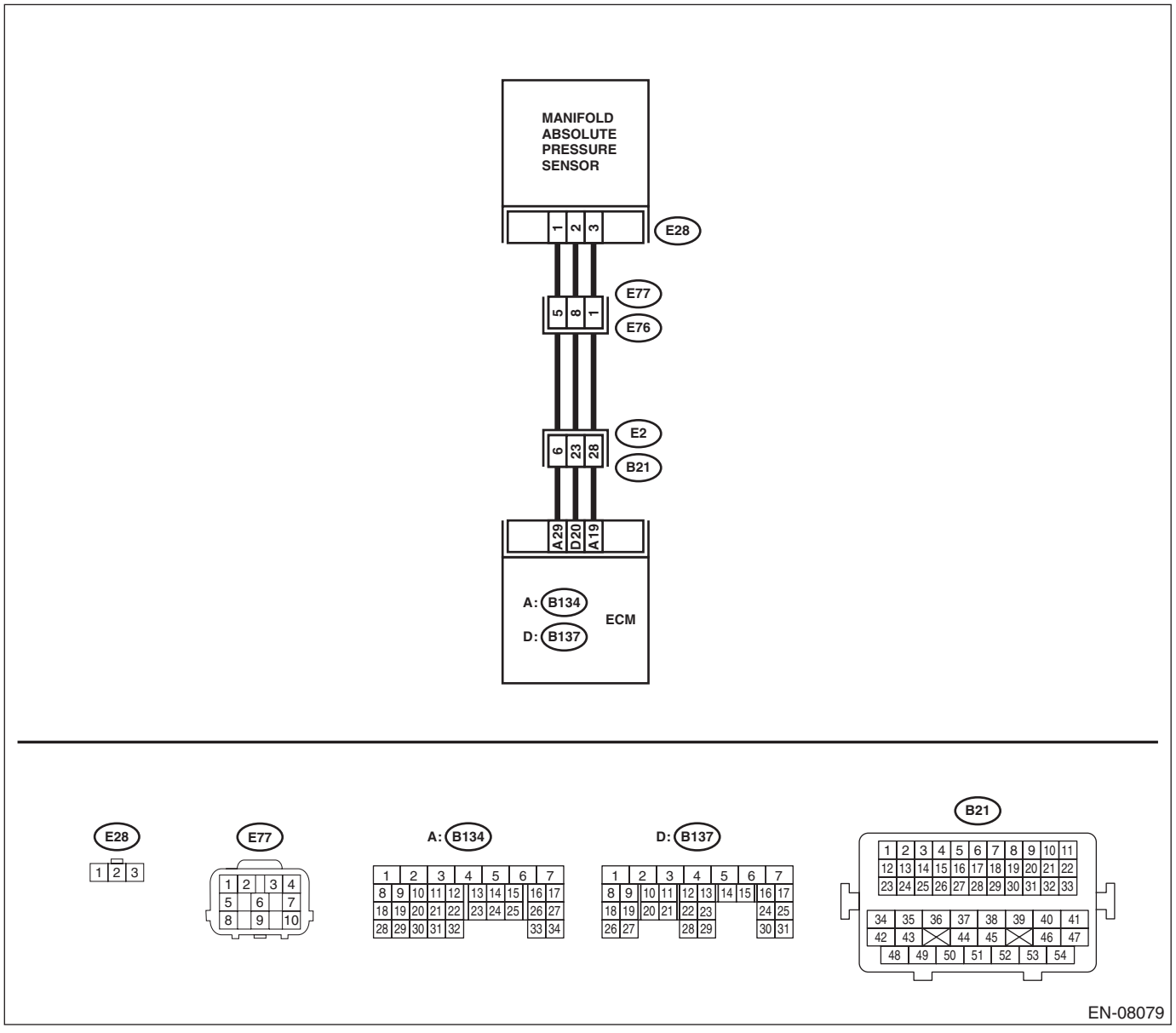
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-35, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-08079

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than 13.3 kPa (100 mmHg, 3.94 inHg) ?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK POWER SUPPLY OF MANIFOLD ABSOLUTE PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E28) No. 3 (+) — Engine ground (–):***	Is the voltage 4.5 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B137) No. 20 — (E28) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 20 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair ground short circuit of harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and manifold absolute pressure sensor connector.	Is there poor contact of ECM or manifold absolute pressure sensor connector?	Repair the poor contact of ECM or manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H6DO)-37, Manifold Absolute Pressure Sensor.>

X: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

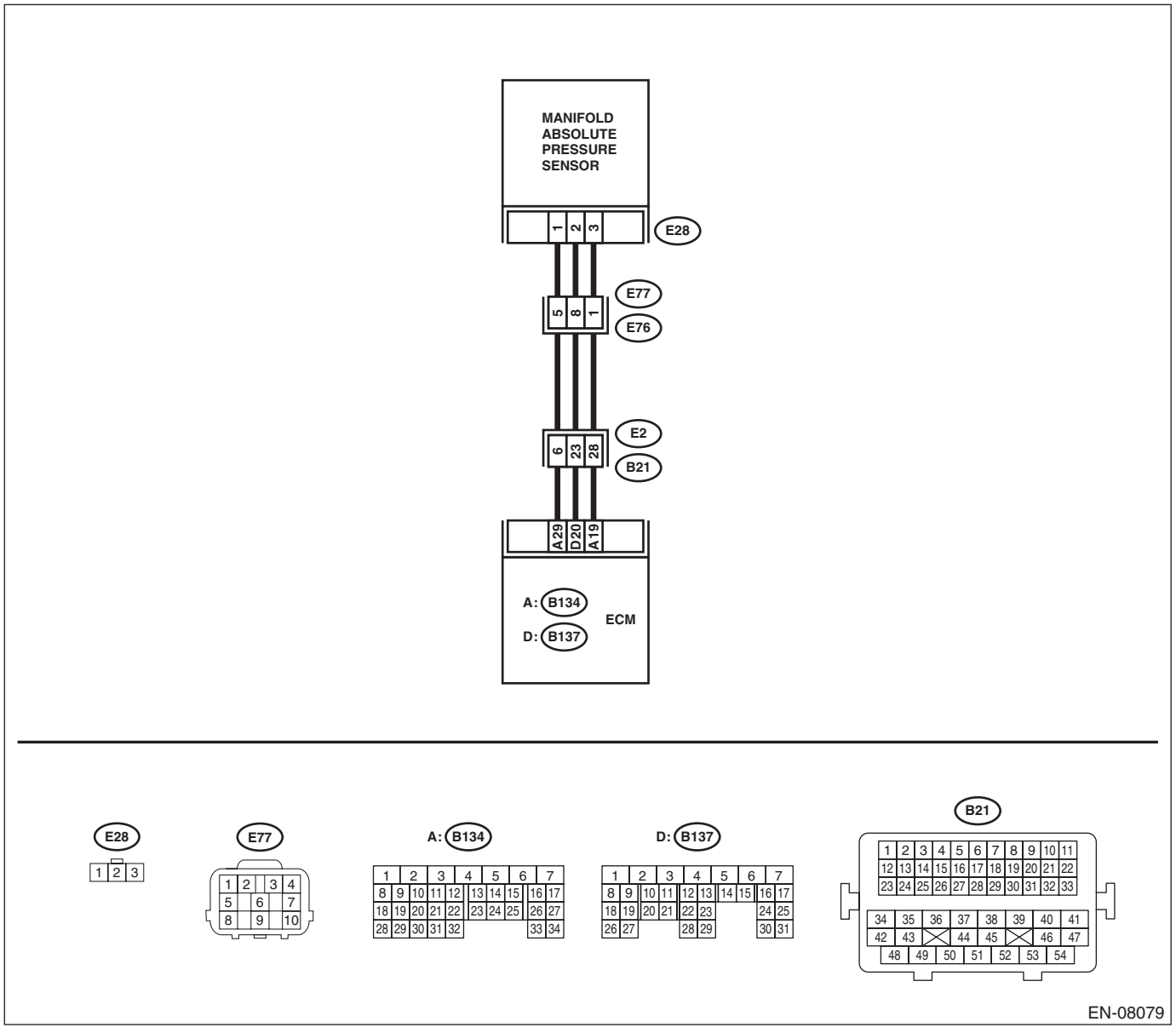
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-36, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-08079

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 119.5 kPa (896.5 mmHg, 35.29 inHg) or more?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Start the engine. 4) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 119.5 kPa (896.5 mmHg, 35.29 inHg) or more?	Repair the short circuit to power in harness between ECM and manifold absolute pressure sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E28) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact of ECM connector • Poor contact of coupling connector
4	**CHECK FOR POOR CONTACT.** Check for poor contact of manifold absolute pressure sensor connector.	Is there poor contact of manifold absolute pressure sensor connector?	Repair the poor contact of manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H6DO)-37, Manifold Absolute Pressure Sensor.>

Y: DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-37, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT TEMPERATURE.** 1) Start the engine and warm up completely. 2) Measure the engine coolant temperature using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>	Check for DTC P0125. <Ref. to EN(H6DO)(diag)-146, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Z: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-39, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

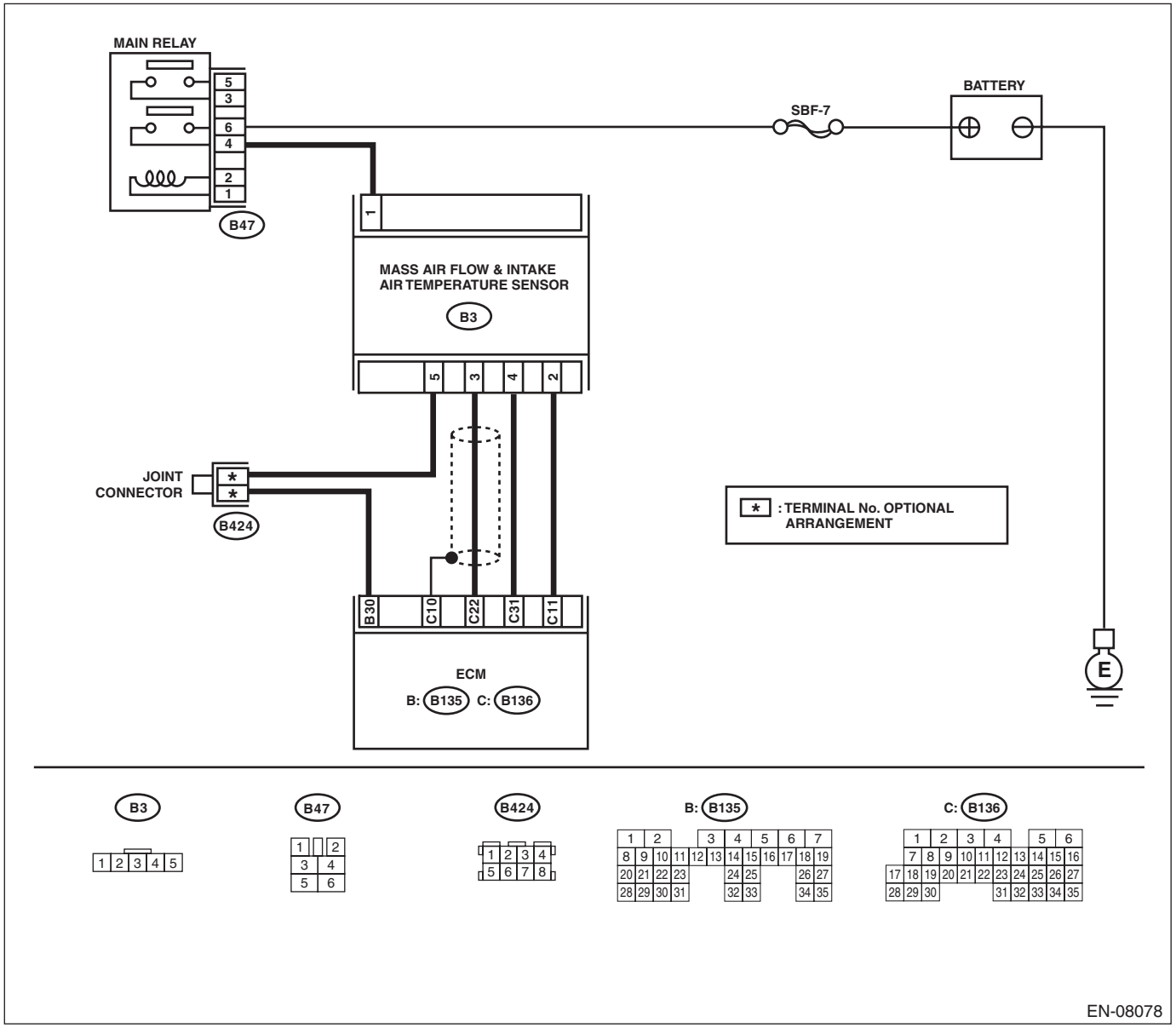
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the intake air temperature 120°C (248°F) or more?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and the mass air flow and intake air temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the short circuit to ground in harness between ECM and mass air flow and intake air temperature sensor connector.

AA:DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

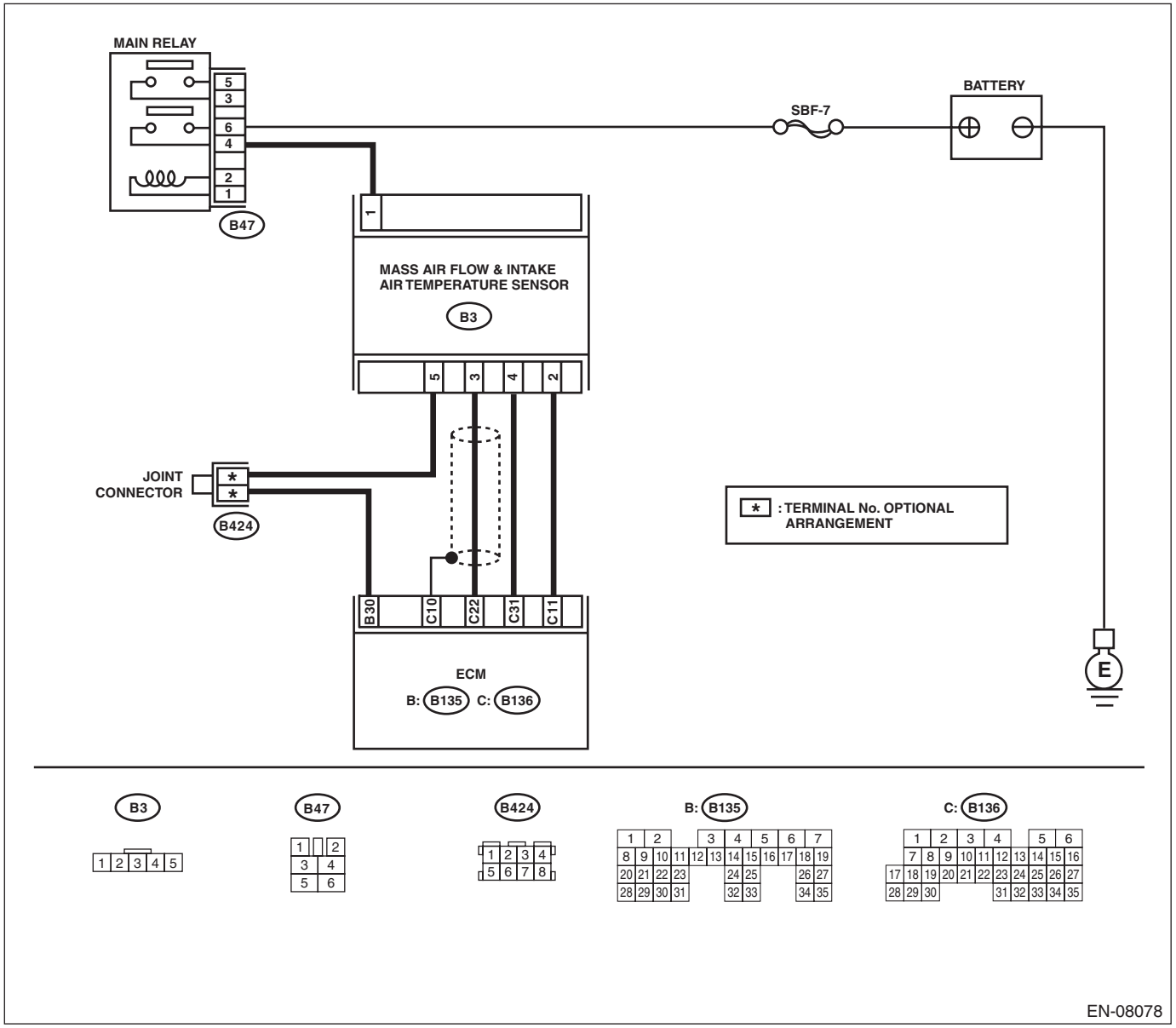
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-40, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the intake air temperature less than –40°C (–40°F) ?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and mass air flow and intake air temperature sensor connector.	Is there poor contact of ECM or mass air flow and intake air temperature sensor connector?	Repair the poor contact of ECM or mass air flow and intake air temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and the mass air flow and intake air temperature sensor. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connector. ***Connector & terminal*** ***(B136) No. 31 — (B3) No. 4:*** ***(B135) No. 30 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and mass air flow and intake air temperature sensor connector • Poor contact of joint connector
4	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Disconnect the connectors from the mass air flow and intake air temperature sensor. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit of harness to power supply between ECM and mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>

AB:DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

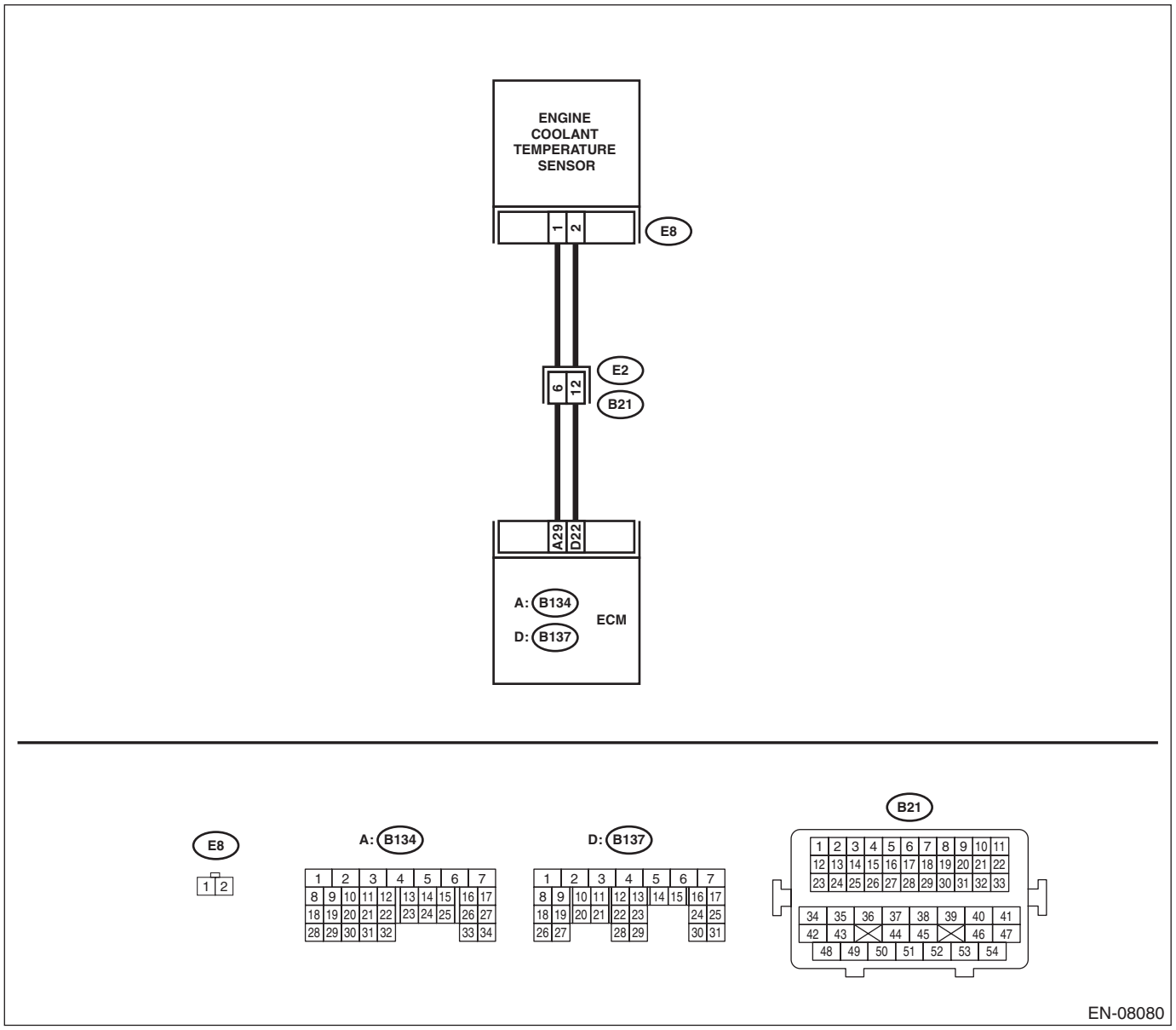
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-41, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 150°C (302°F) or higher?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and engine coolant temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>	Repair short circuit in harness to ground between ECM and engine coolant temperature sensor connector.

AC:DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

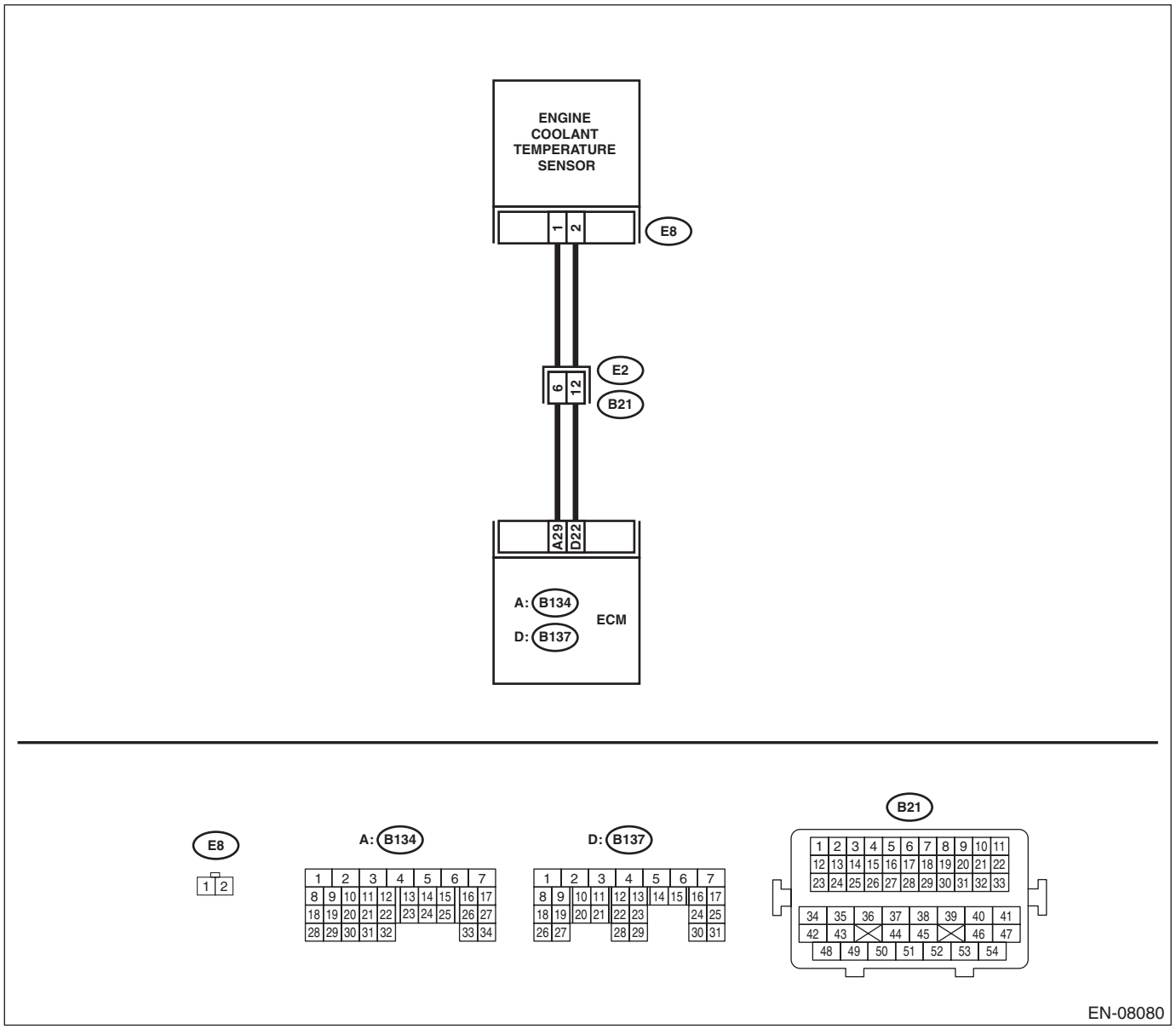
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-42, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature less than –40°C (–40°F) ?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and engine coolant temperature sensor connector.	Is there poor contact of ECM or engine coolant temperature sensor connector?	Repair the poor contact of ECM or engine coolant temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and engine coolant temperature sensor. 3) Measure the resistance of harness between ECM and engine coolant temperature sensor connector. ***Connector & terminal*** ***(B134) No. 29 — (E8) No. 1:*** ***(B137) No. 22 — (E8) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and engine coolant temperature sensor connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>

AD:DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-43, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

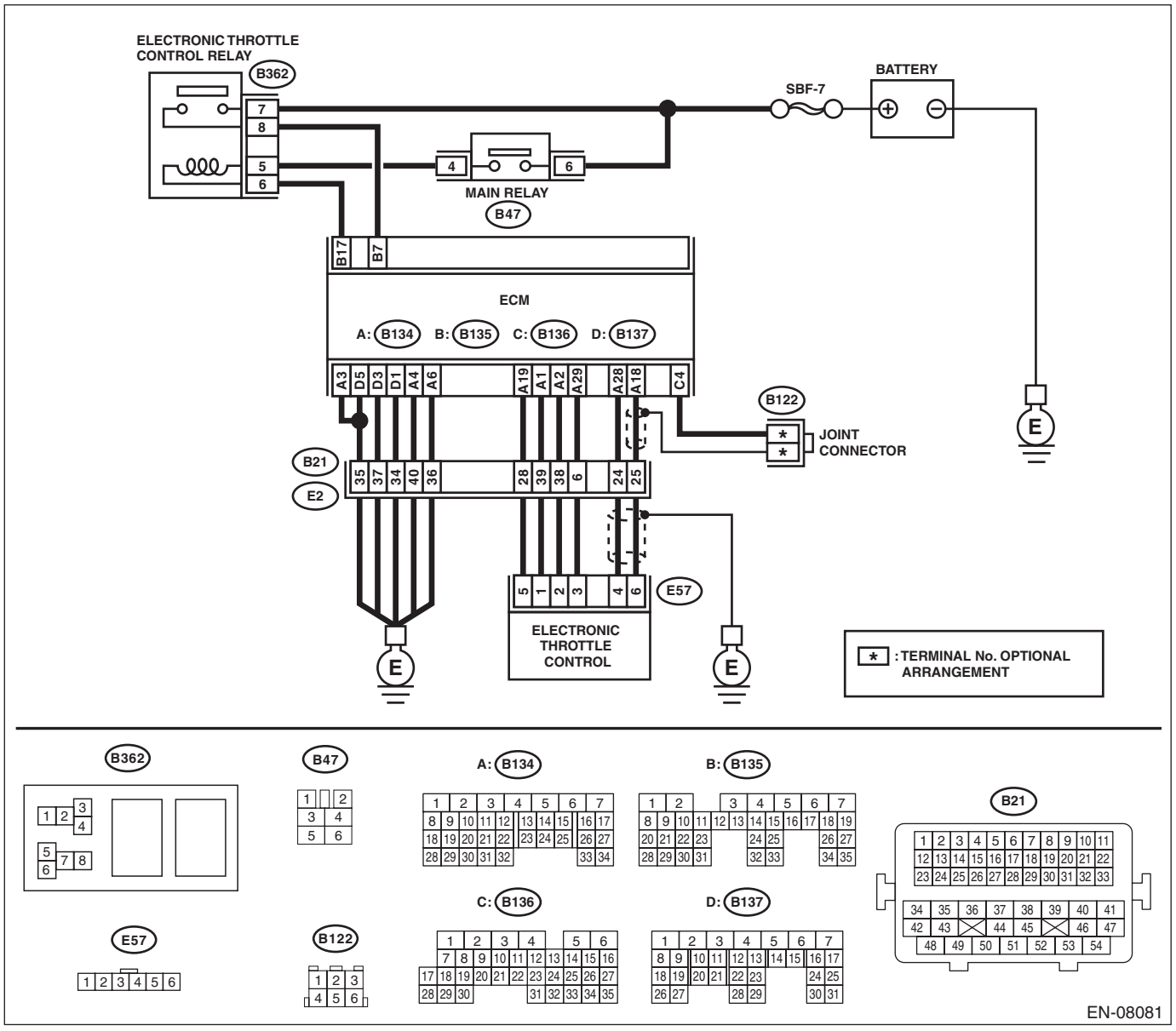
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:***	Is the resistance 1 MΩ or more?	Replace the electronic throttle control. <Ref. to FU(H6DO)-19, Throttle Body.>	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>

AE:DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-44, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

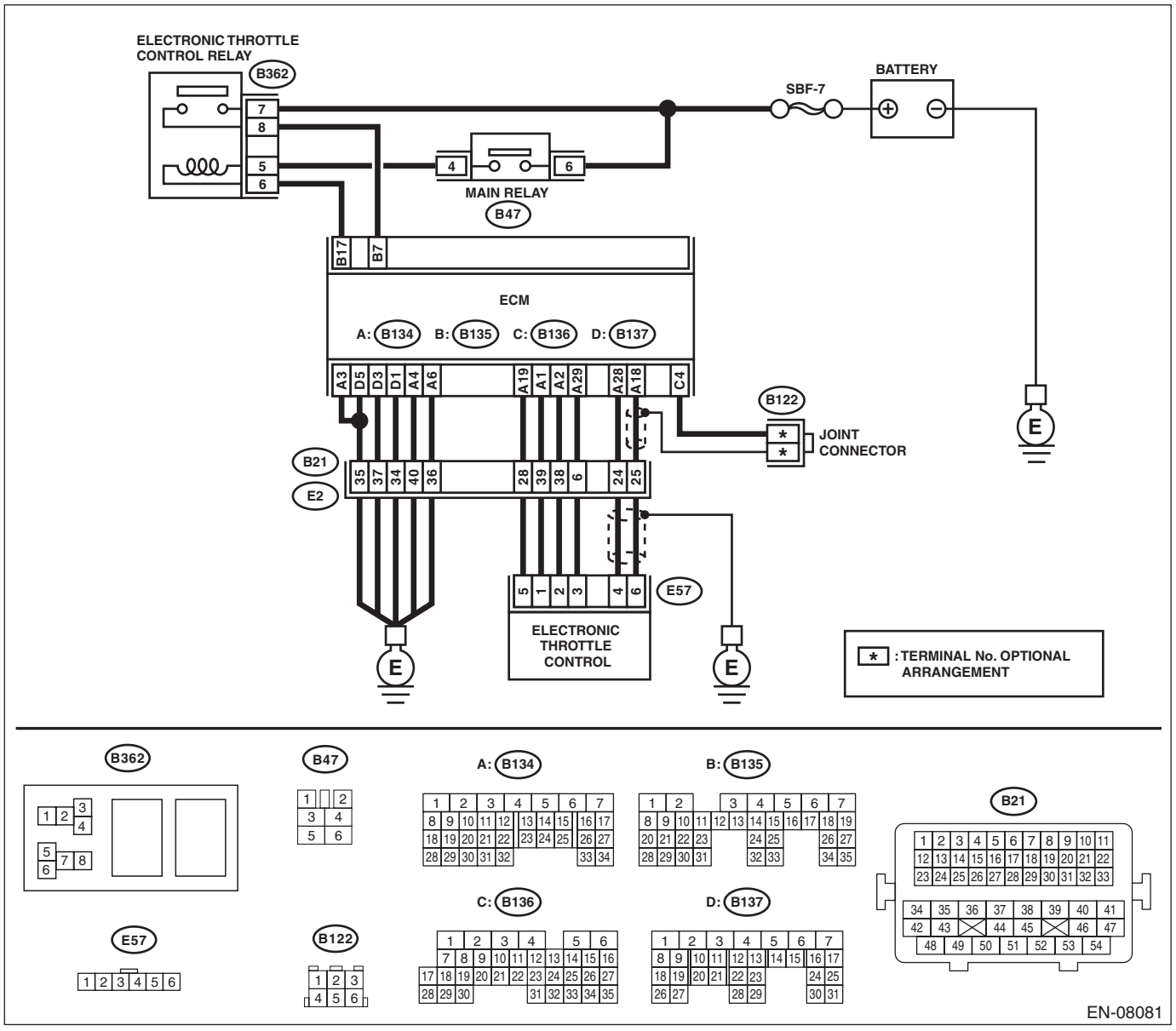
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 18 — (E57) No. 6:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:***	Is the resistance 1 MΩ or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-19, Throttle Body.>	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

AF:DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-45, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Engine does not return to idle.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK TIRE SIZE.**	Is the tire size as specified and the same size as three other wheels?	Go to step **2**.	Replace the tire.
2	**CHECK ENGINE COOLANT.** Check the following items: • Amount of engine coolant • Engine coolant freeze • Contamination of engine coolant	Is the engine coolant normal?	Go to step **3**.	Fill or replace the engine coolant. <Ref. to CO(H6DO)-13, Engine Coolant.>
3	**CHECK THERMOSTAT.**	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H6DO)-17, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>

AG:DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-47, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

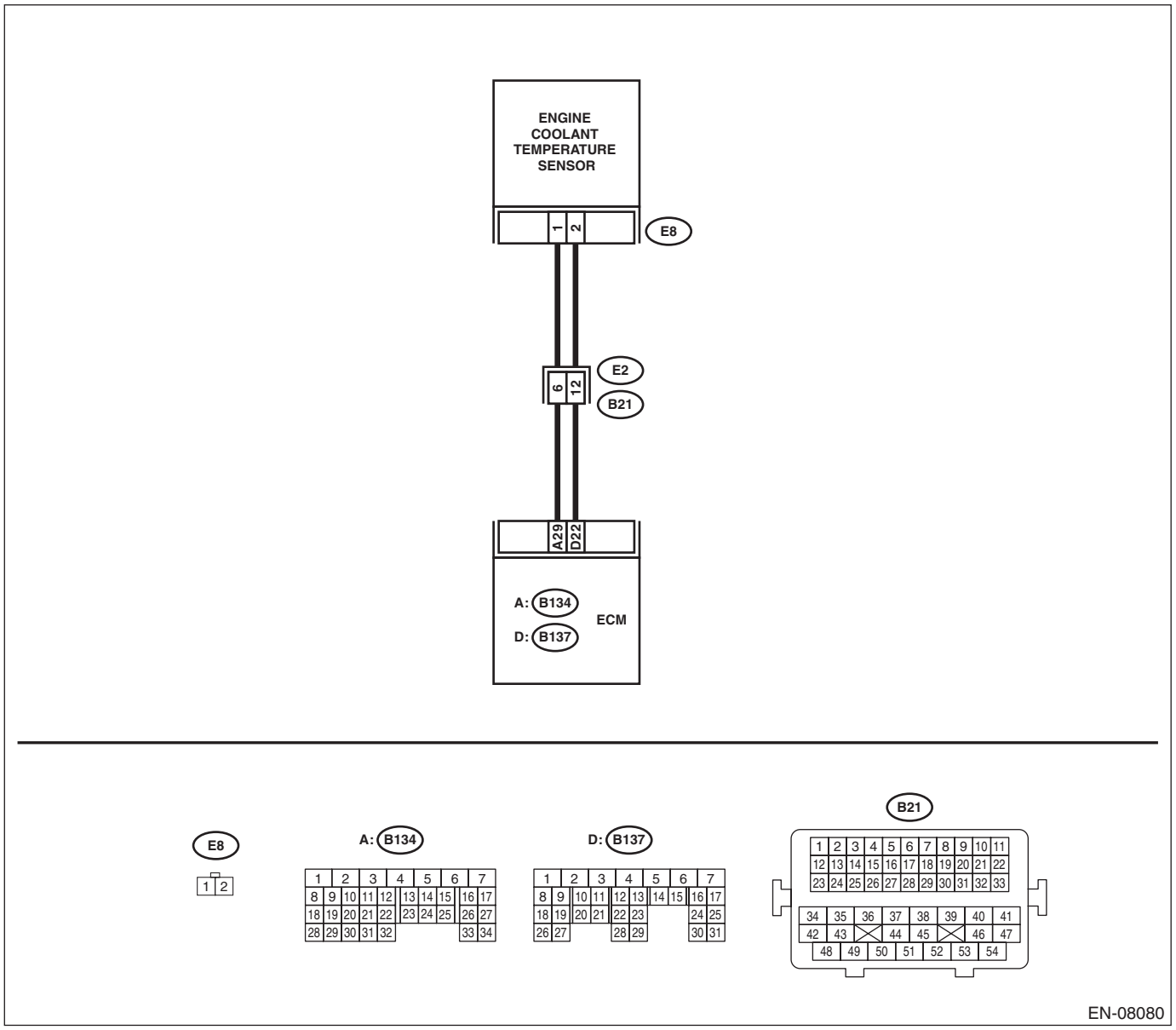
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** Measure the resistance between engine coolant temperature sensor terminals when the engine coolant is cold and after warmed up. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance of engine coolant temperature sensor different between when engine coolant is cold and after warmed up?	Repair the poor contact of ECM connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>

AH:DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-49, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT.**	Is the engine coolant amount normal?	Go to step **2**.	Refill the engine coolant. <Ref. to CO(H6DO)-13, Engine Coolant.>
2	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check the radiator fan operation.	Does the radiator fan continuously rotate for 3 minutes or more during idling?	Repair radiator fan circuit. <Ref. to CO(H6DO)-25, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H6DO)-29, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO(H6DO)-17, Thermostat.>

AI: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

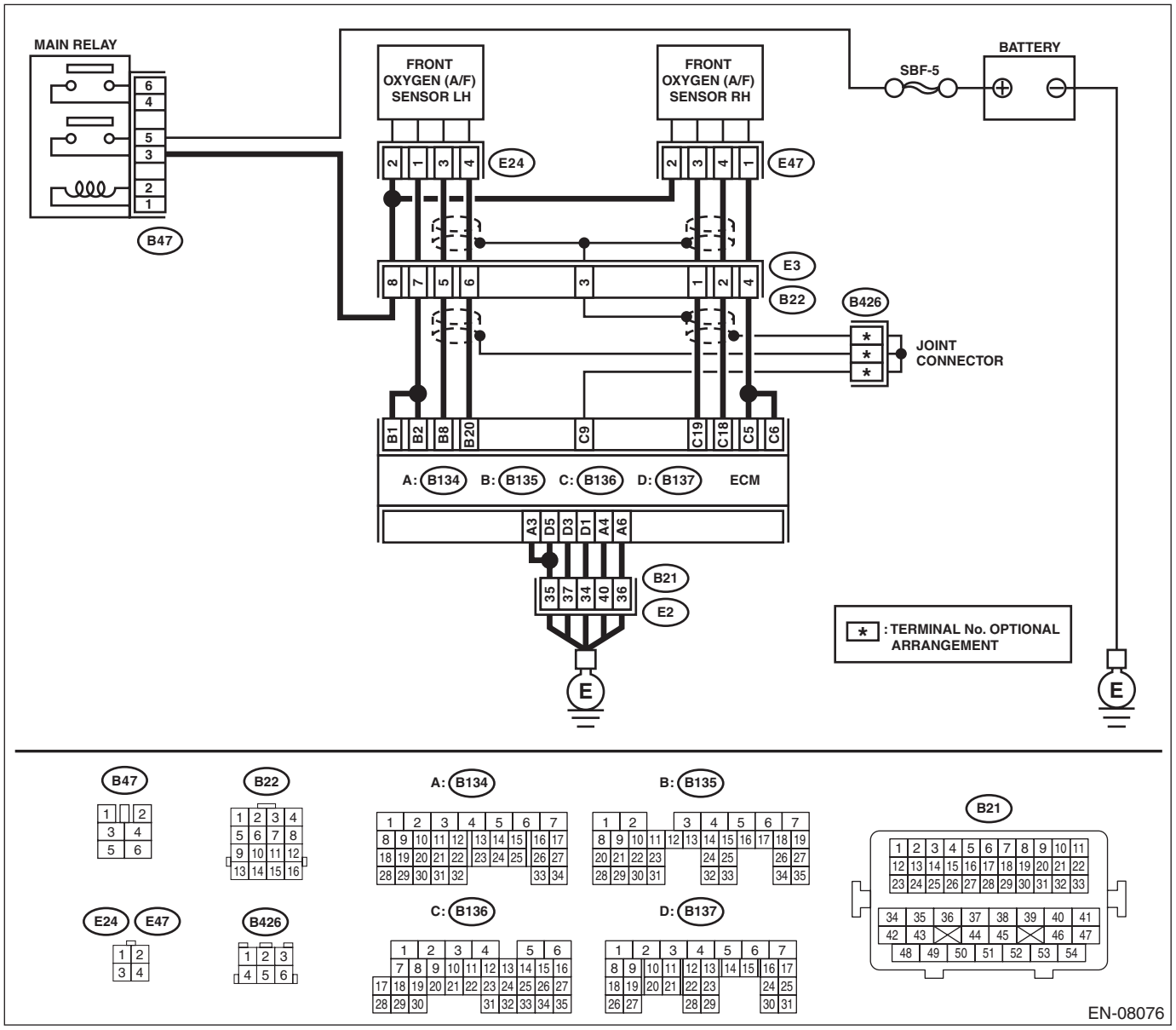
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-51, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 19 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK FOR POOR CONTACT.** Check for poor contact of the front oxygen (A/F) sensor connector.	Is there poor contact of front oxygen (A/F) sensor connector?	Repair the poor contact of front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

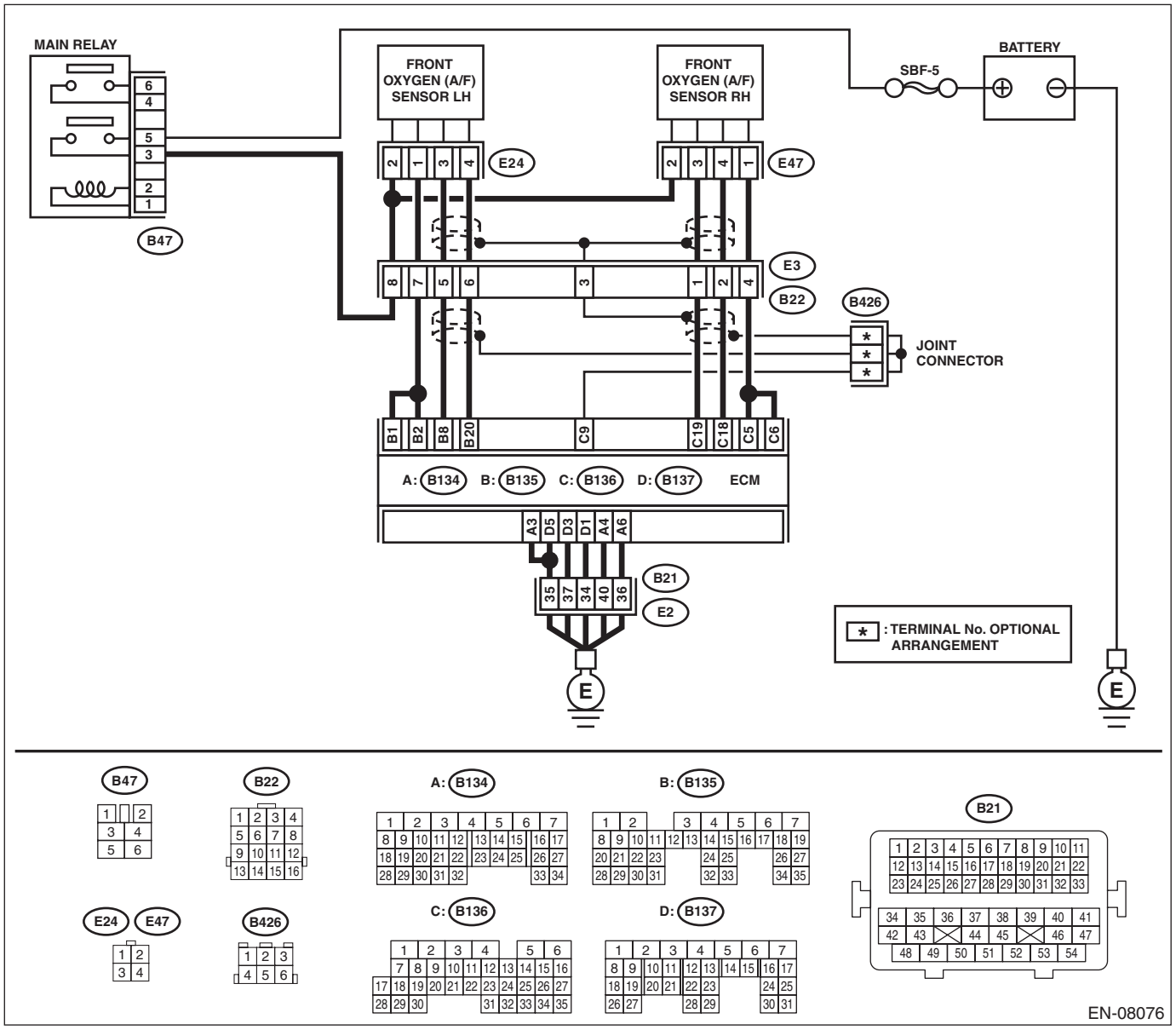
AJ:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-53, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (–):*** ***(B136) No. 19 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

AK:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-55, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there any fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

AL:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

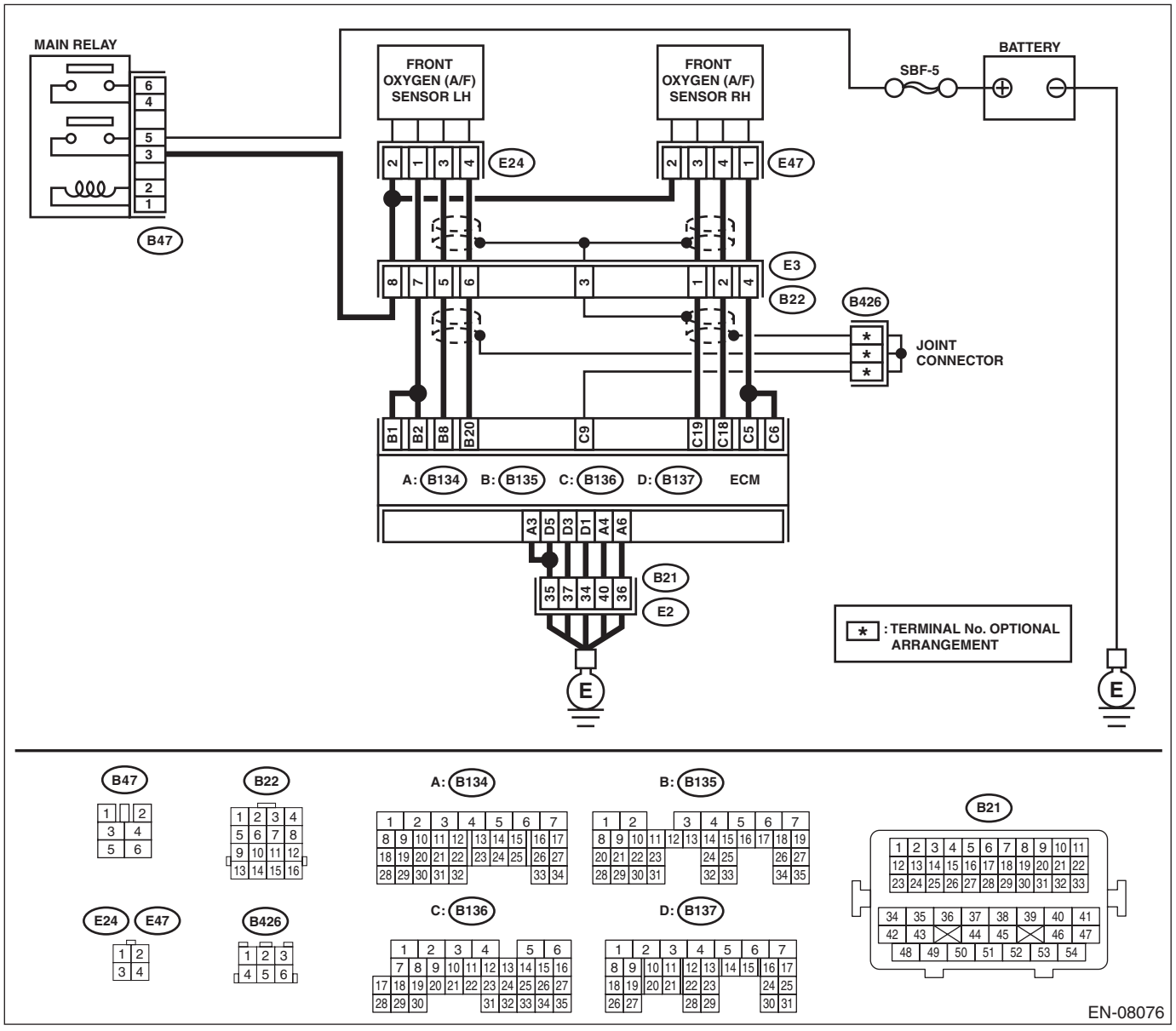
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-58, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 19 — (E47) No. 3:*** ***(B136) No. 18 — (E47) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact of ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

AM:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

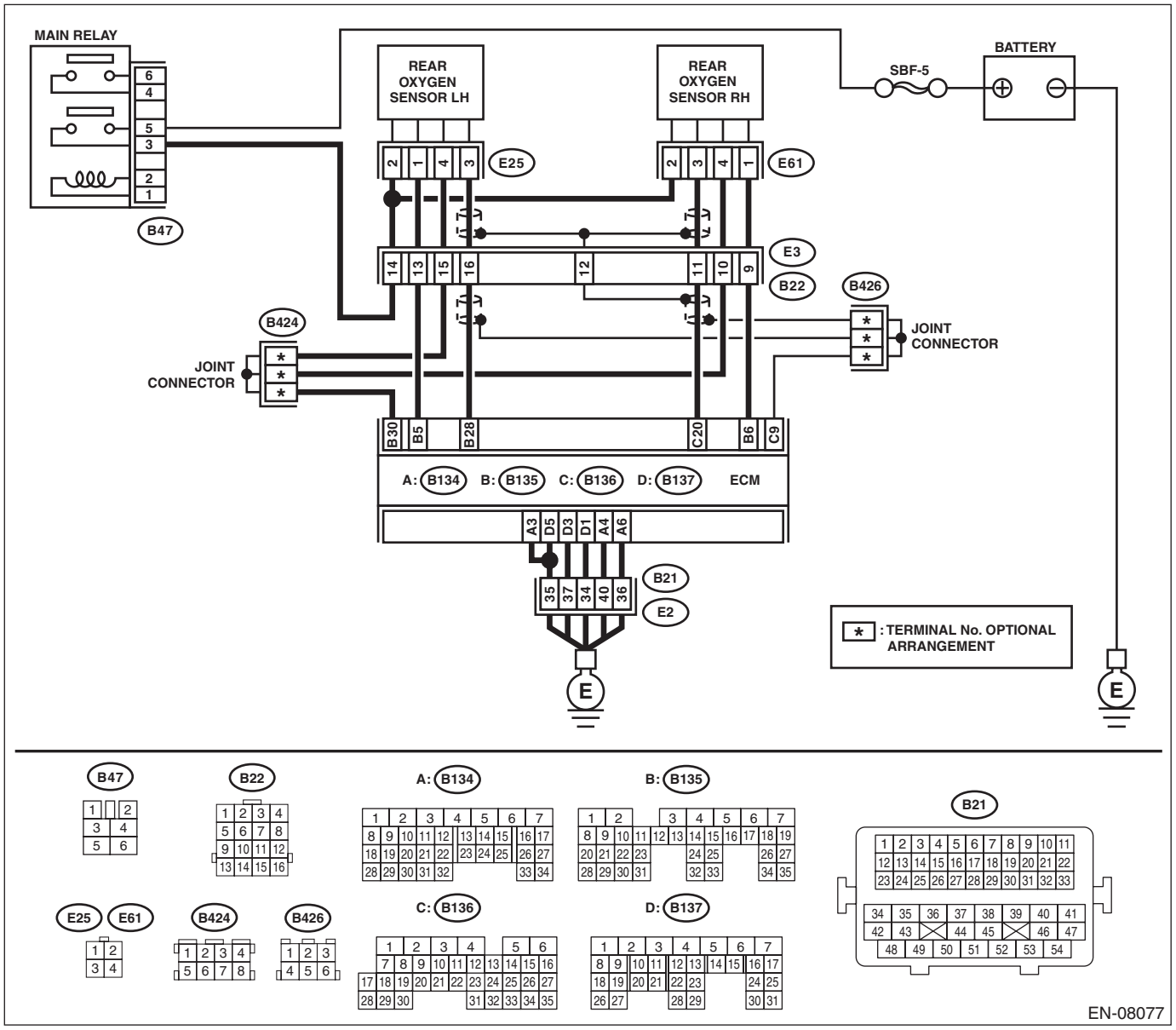
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-60, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **5**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B136) No. 20 — (E61) No. 3:*** ***(B135) No. 30 — (E61) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E61) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>

AN:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

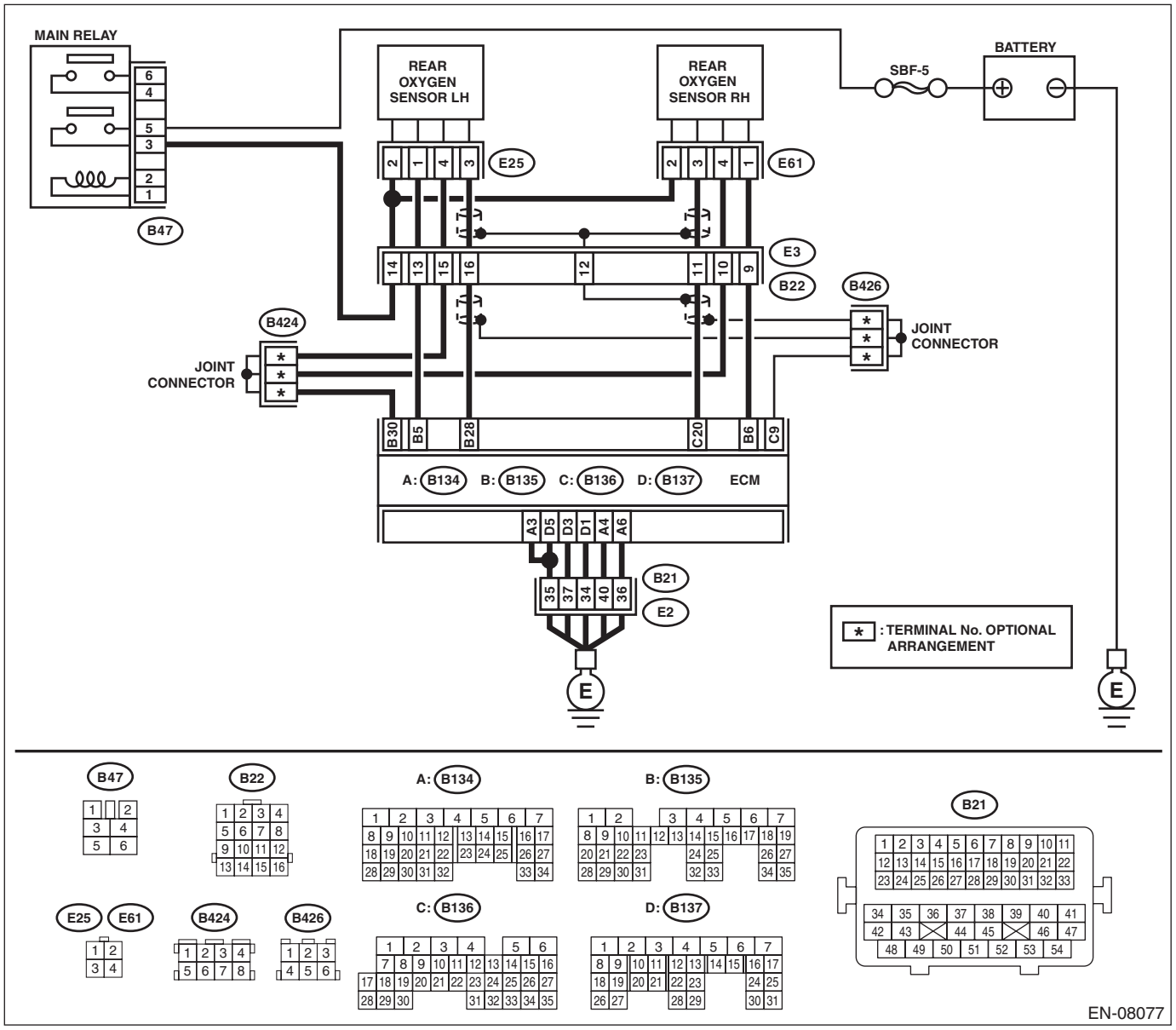
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-62, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **5**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B136) No. 20 — (E61) No. 3:*** ***(B135) No. 30 — (E61) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E61) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>

AO:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

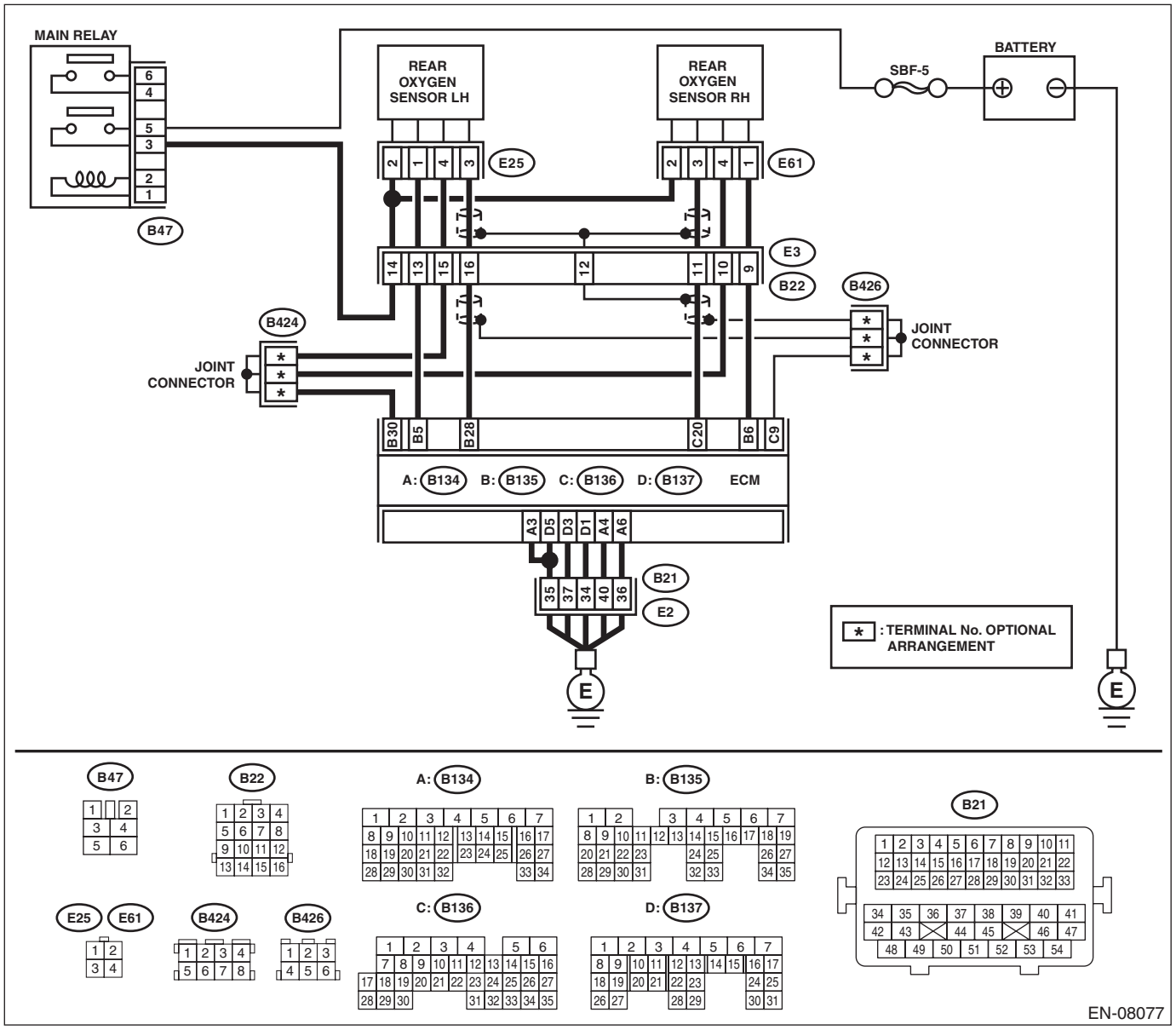
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-63, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B136) No. 20 — (E61) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** Measure the resistance between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E61) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and rear oxygen sensor connector.
3	**CHECK REAR OXYGEN SENSOR.** Measure the resistance between rear oxygen sensor terminals. ***Terminals*** ***No. 3 — No. 4***	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.

AP:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2)

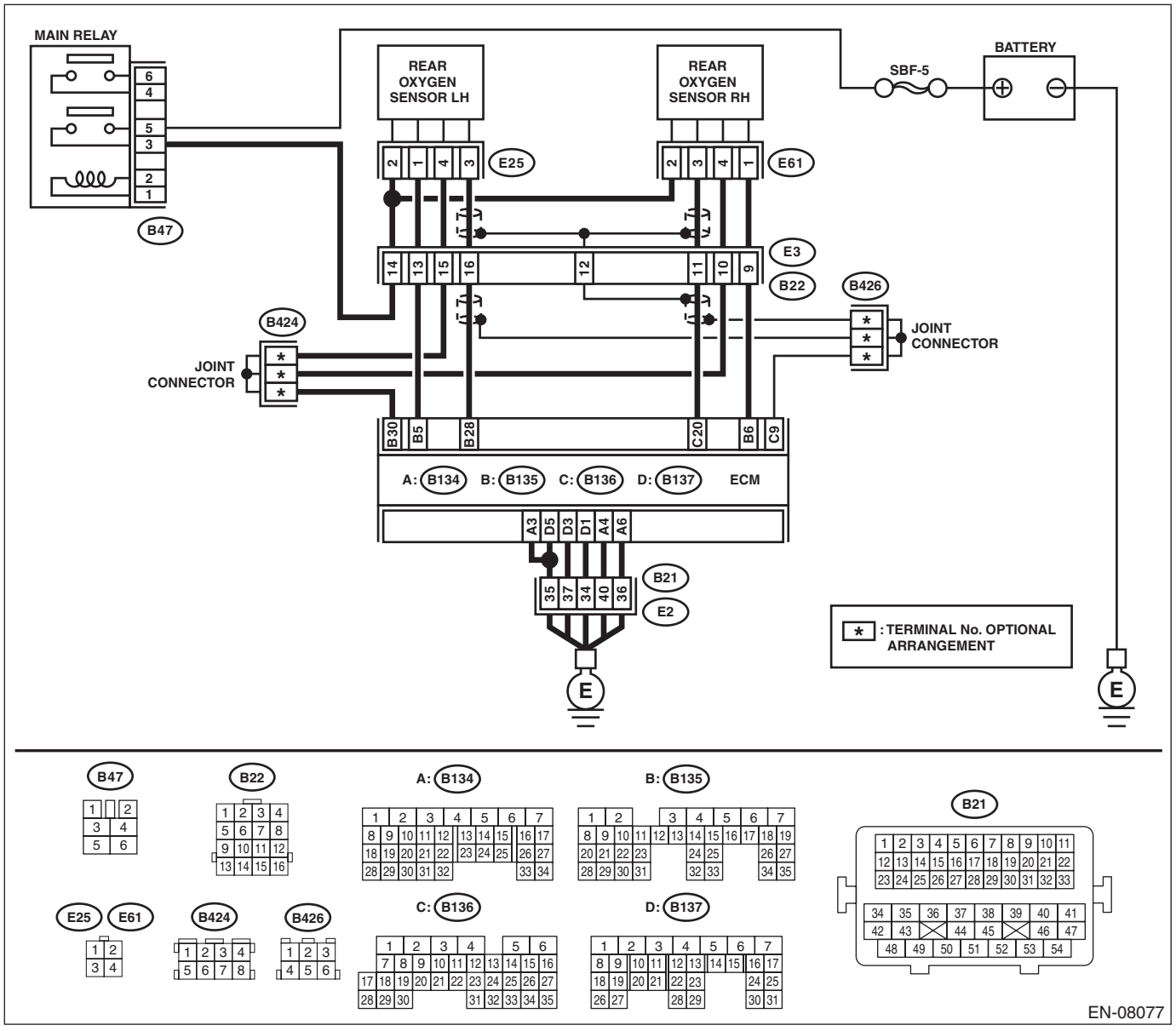
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-71, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **6**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **6**.	Go to step **3**.
3	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B136) No. 20 — (E61) No. 3:*** ***(B135) No. 30 — (E61) No. 4:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E61) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>

AQ:DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2)

NOTE:
Refer to DTC P0037 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-109, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

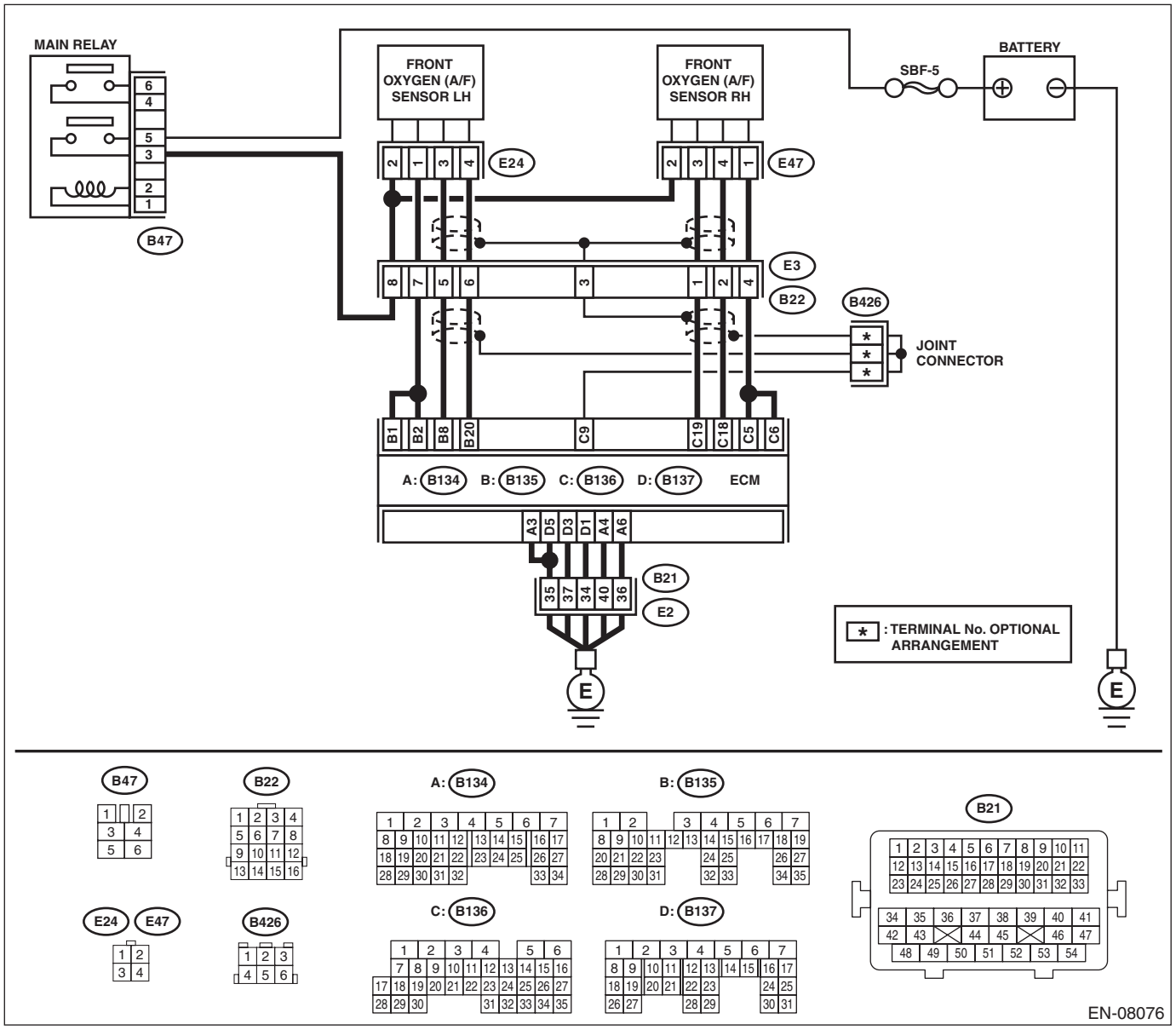
AR:DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-74, DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 — Chassis ground:*** ***(B135) No. 20 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK FOR POOR CONTACT.** Check for poor contact of the front oxygen (A/F) sensor connector.	Is there poor contact of front oxygen (A/F) sensor connector?	Repair the poor contact of front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

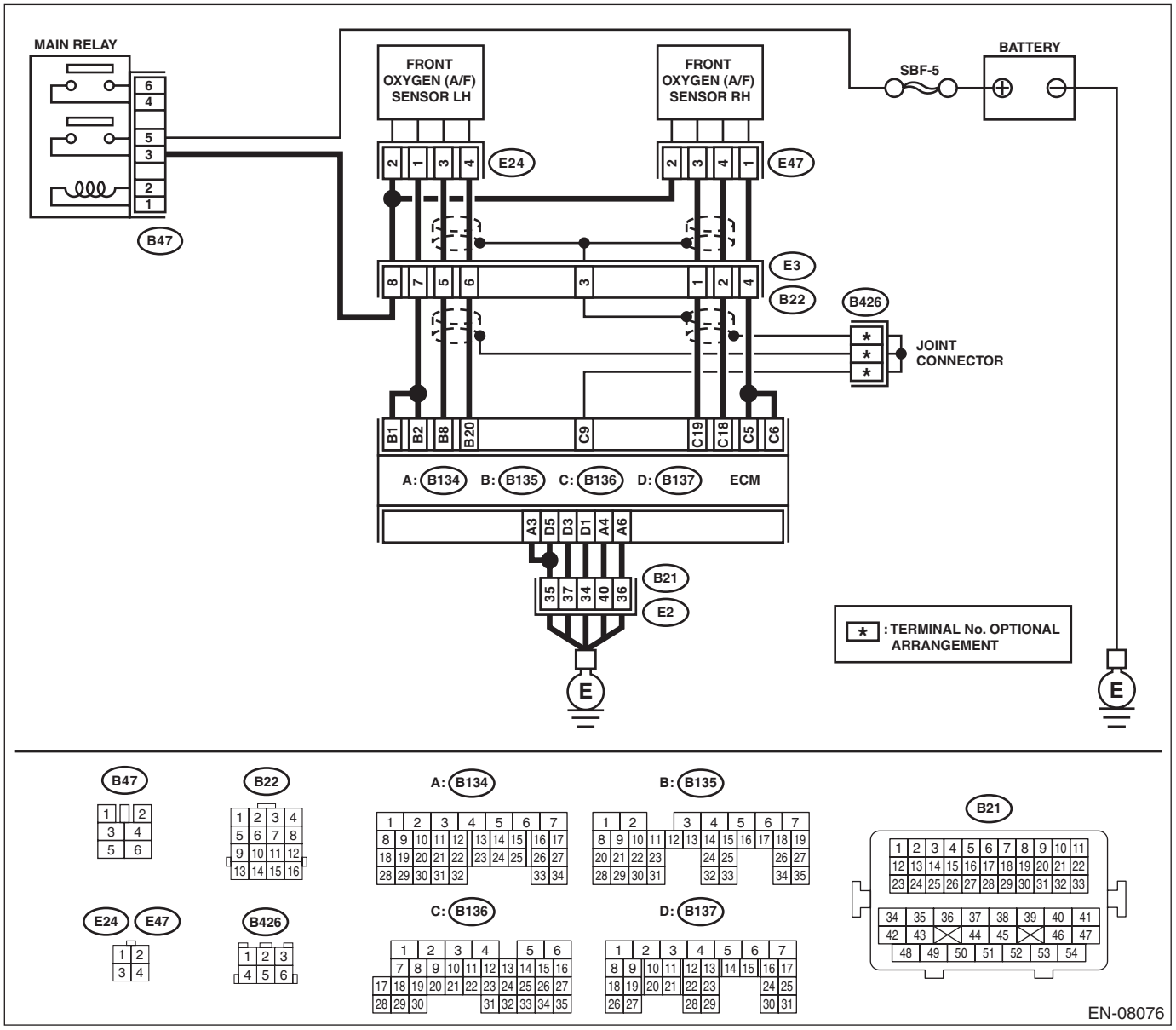
AS:DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-74, DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

AT:DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-74, DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there any fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

AU:DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1)

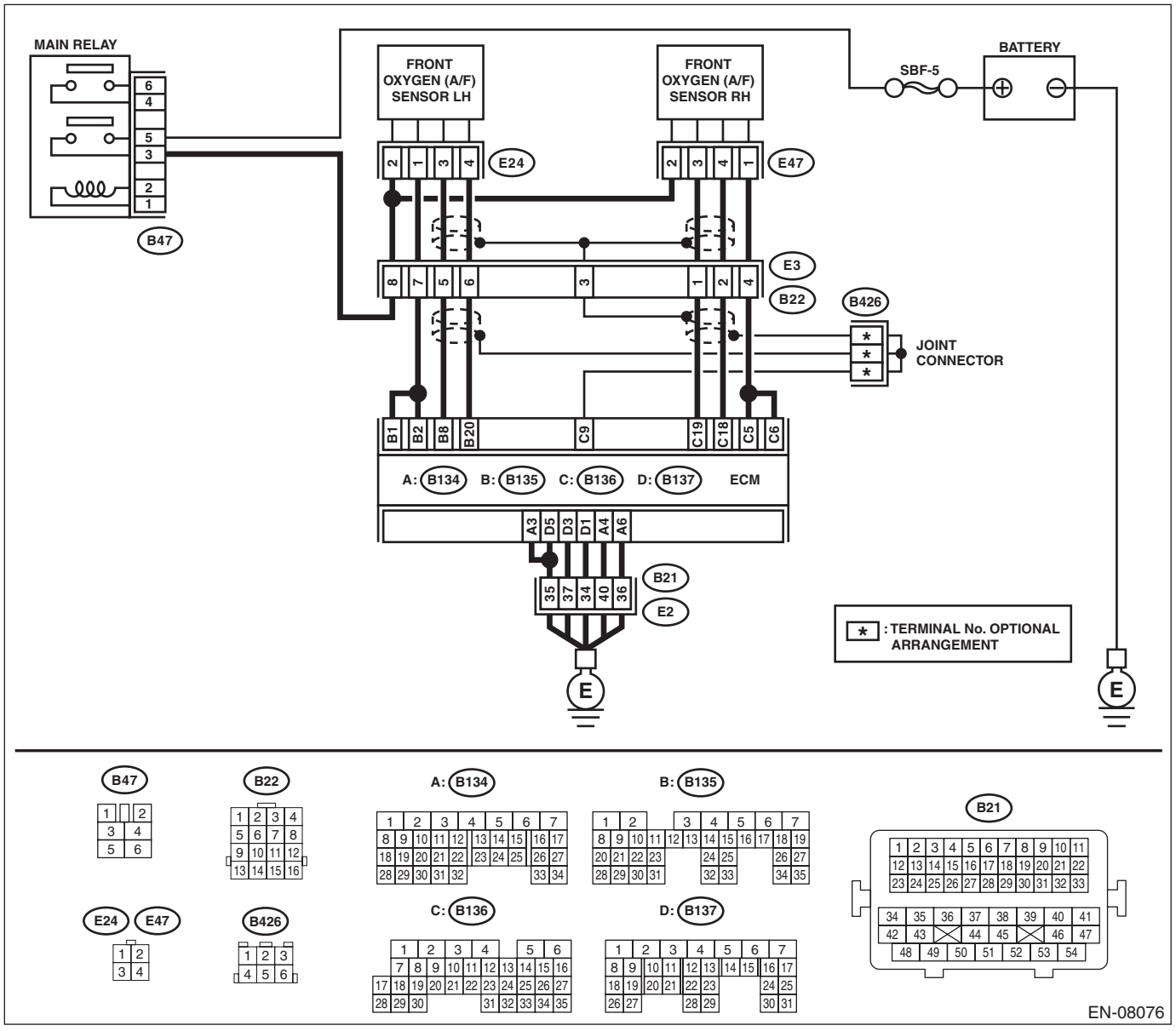
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-75, DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 8 — (E24) No. 3:*** ***(B135) No. 20 — (E24) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact of ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

AV:DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2)

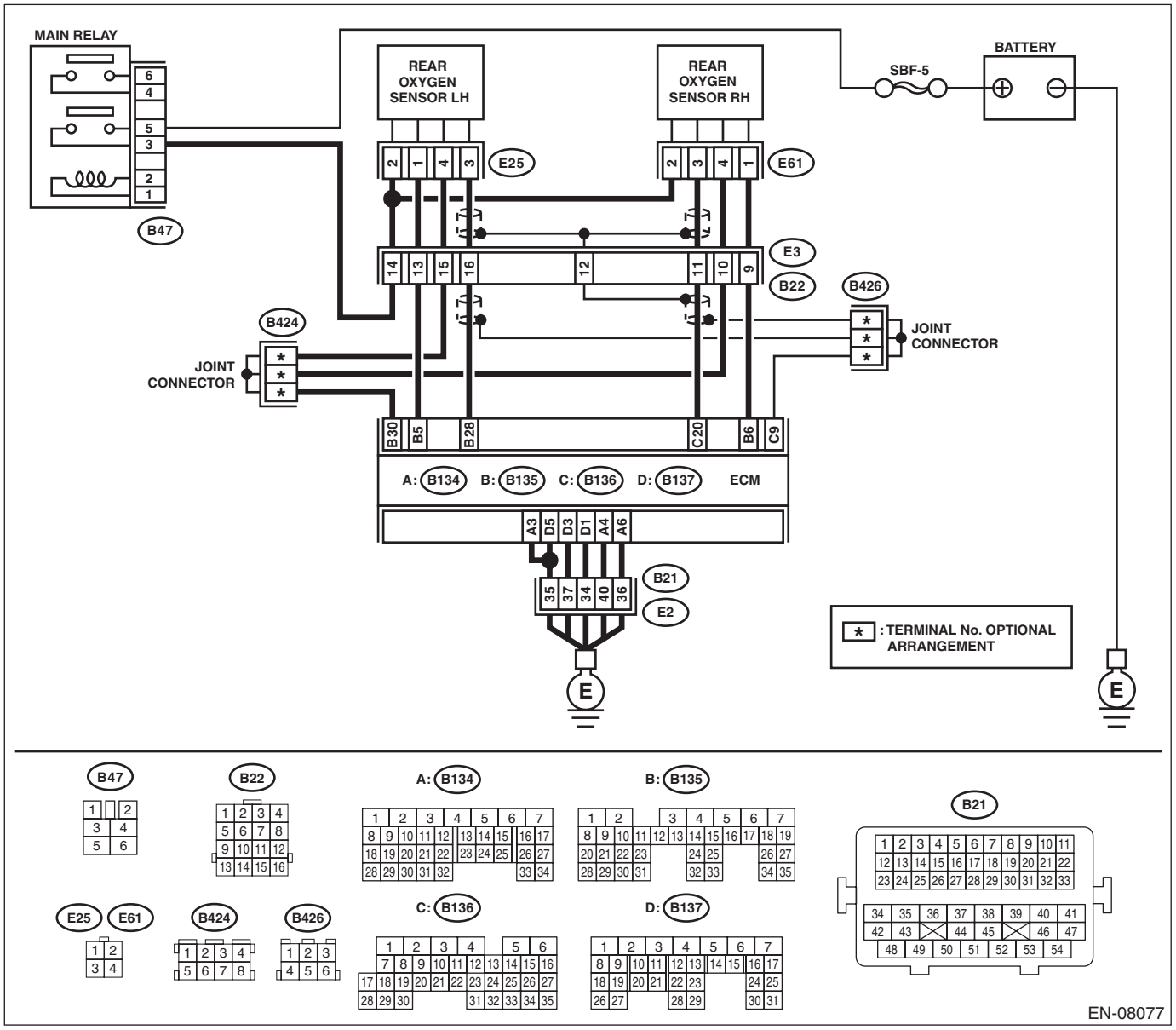
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-75, DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **5**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 28 — (E25) No. 3:*** ***(B135) No. 30 — (E25) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E25) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>

AW:DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2)

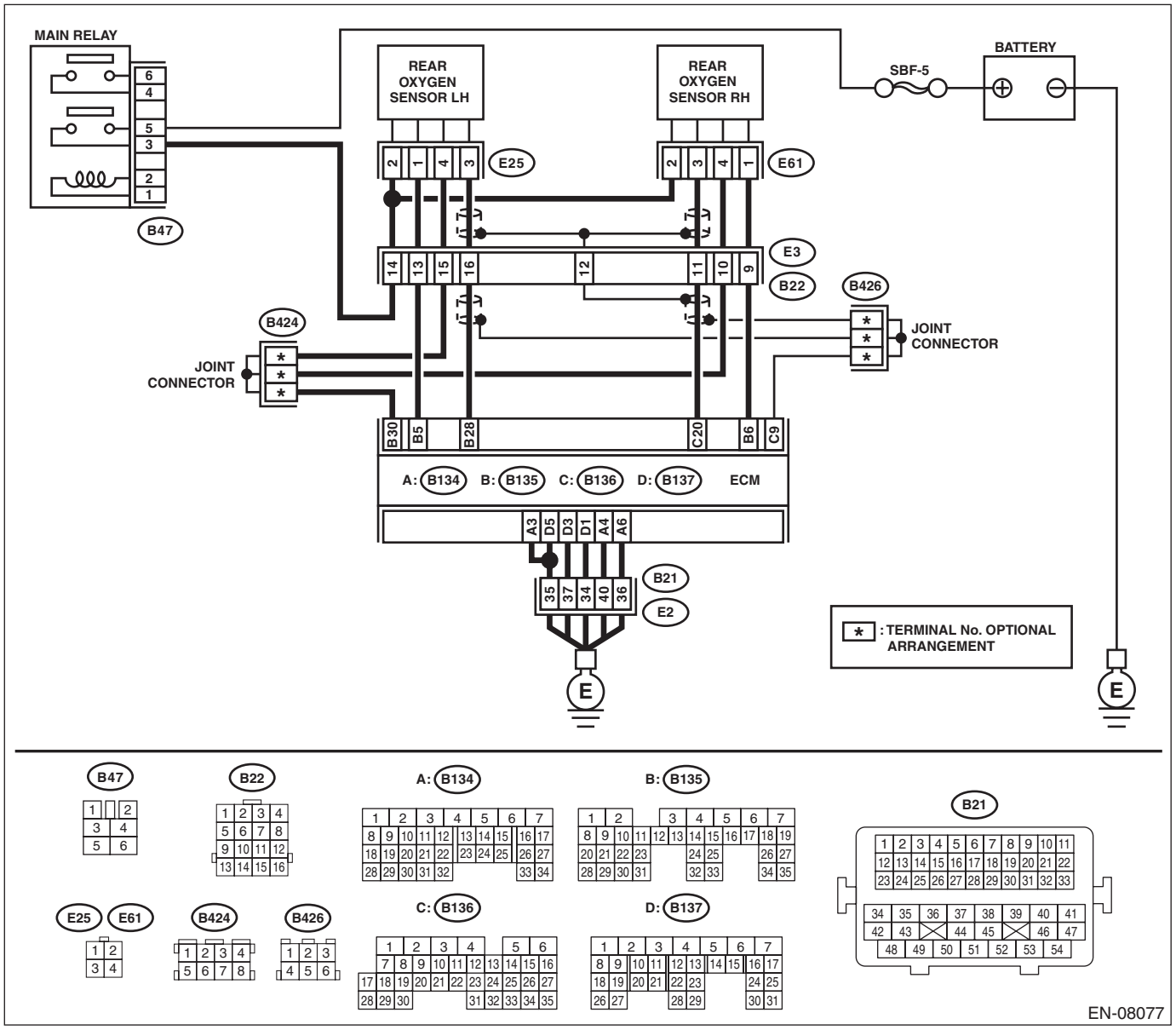
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-75, DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **5**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 28 — (E25) No. 3:*** ***(B135) No. 30 — (E25) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E25) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>

AX:DTC P0159 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2)

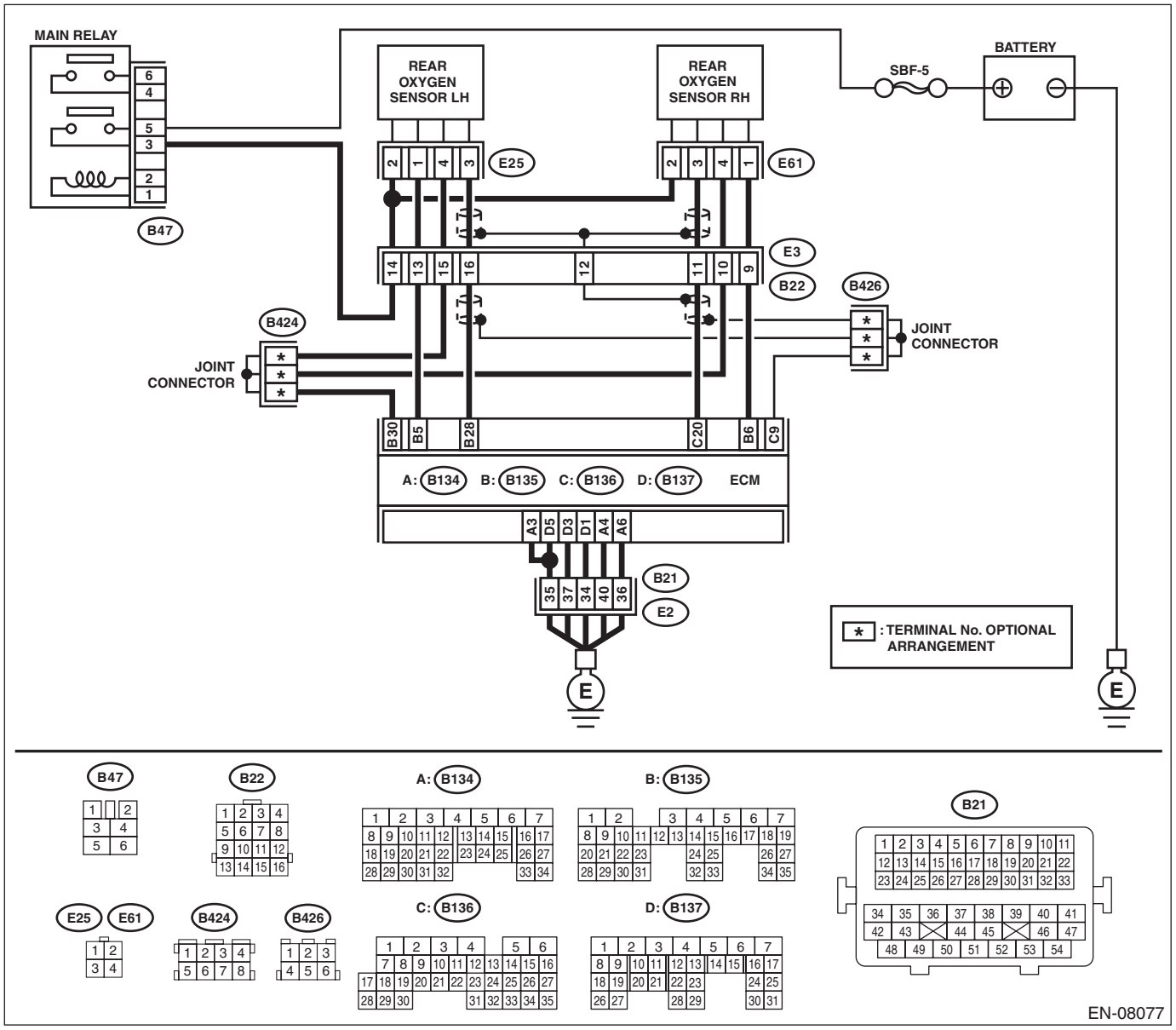
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-75, DTC P0159 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 28 — (E25) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** Measure the resistance between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E25) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and rear oxygen sensor connector.
3	**CHECK REAR OXYGEN SENSOR.** Measure the resistance between rear oxygen sensor terminals. ***Terminals*** ***No. 3 — No. 4***	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.

AY:DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK2 SENSOR2)

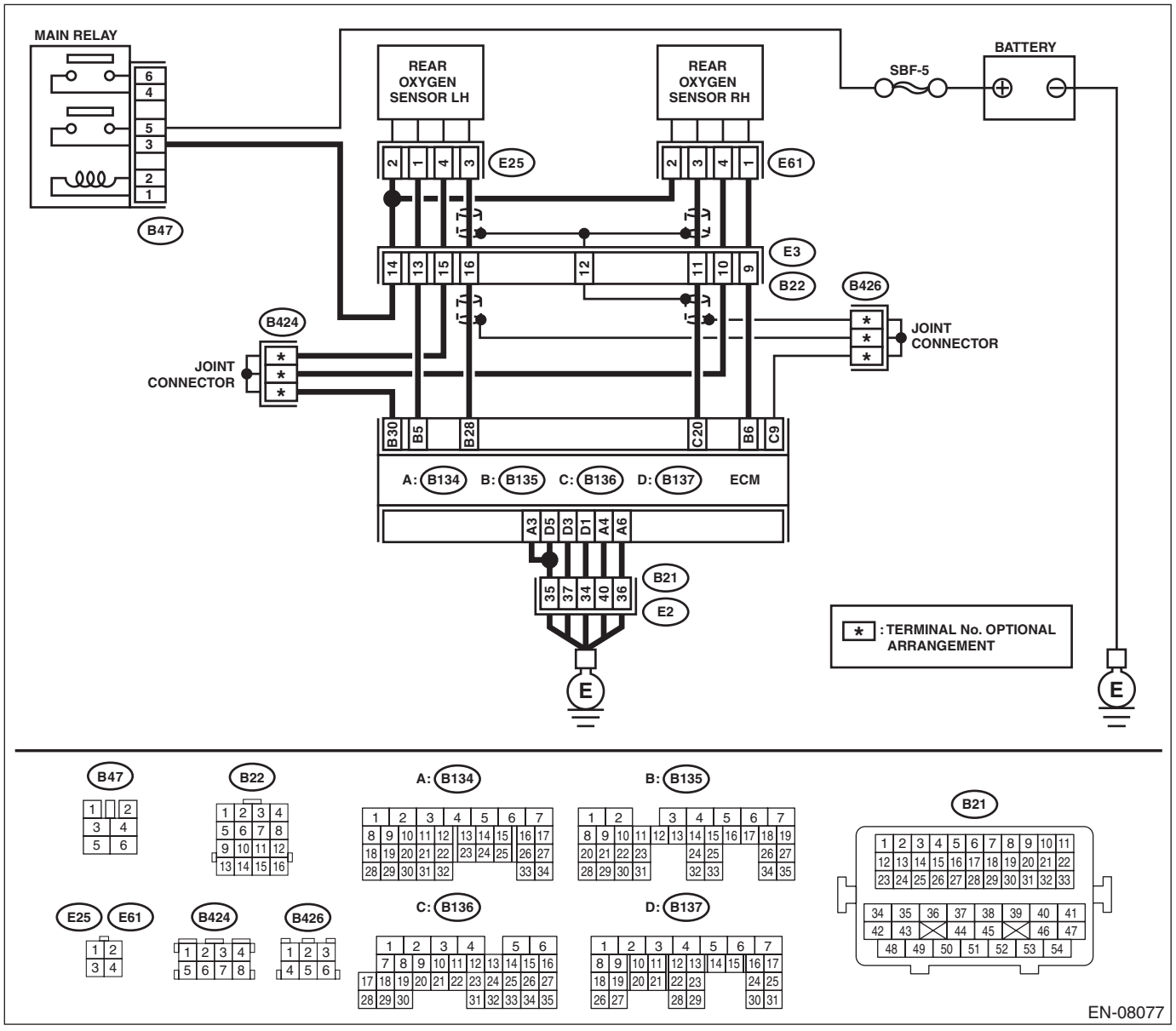
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-75, DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK2 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **6**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **6**.	Go to step **3**.
3	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 28 — (E25) No. 3:*** ***(B135) No. 30 — (E25) No. 4:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E25) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>

AZ:DTC P0161 O2 SENSOR HEATER CIRCUIT (BANK2 SENSOR2)

NOTE:
Refer to DTC P0057 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-119, DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BA:DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:
Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-182, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BB:DTC P0172 SYSTEM TOO RICH (BANK 1)

NOTE:
Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-182, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BC:DTC P0174 SYSTEM TOO LEAN (BANK 2)

NOTE:
Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-182, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BD:DTC P0175 SYSTEM TOO RICH (BANK 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-78, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **3**.
3	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** Measure the fuel pressure. <Ref. to ME(H6DO)-32, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 333 — 343 kPa (3.4 — 3.5 kgf/cm^2, 48.4 — 49.8 psi)?	Go to step **4**.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
4	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **5**.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
5	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR SIGNAL.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **6**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Repair the poor contact of ECM connector.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>

BE:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-79, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Replace the fuel temperature sensor. <Ref. to EC(H6DO)-10, Fuel Temperature Sensor.>

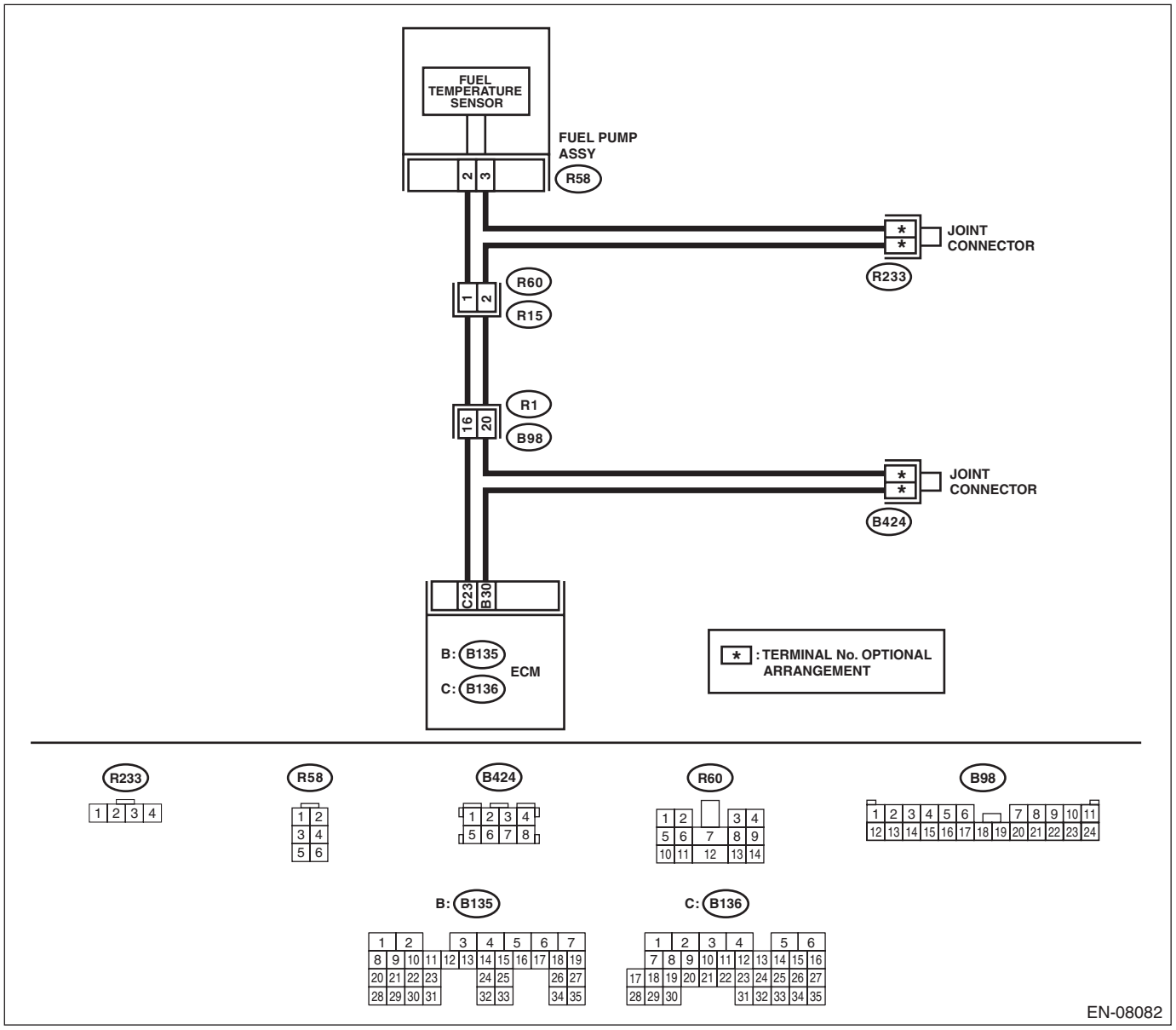
BF:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-82, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.>	Is the temperature 120°C (248°F) or higher?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and fuel temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 23 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the fuel temperature sensor. <Ref. to EC(H6DO)-10, Fuel Temperature Sensor.>	Repair the ground short circuit of harness between ECM and fuel pump.

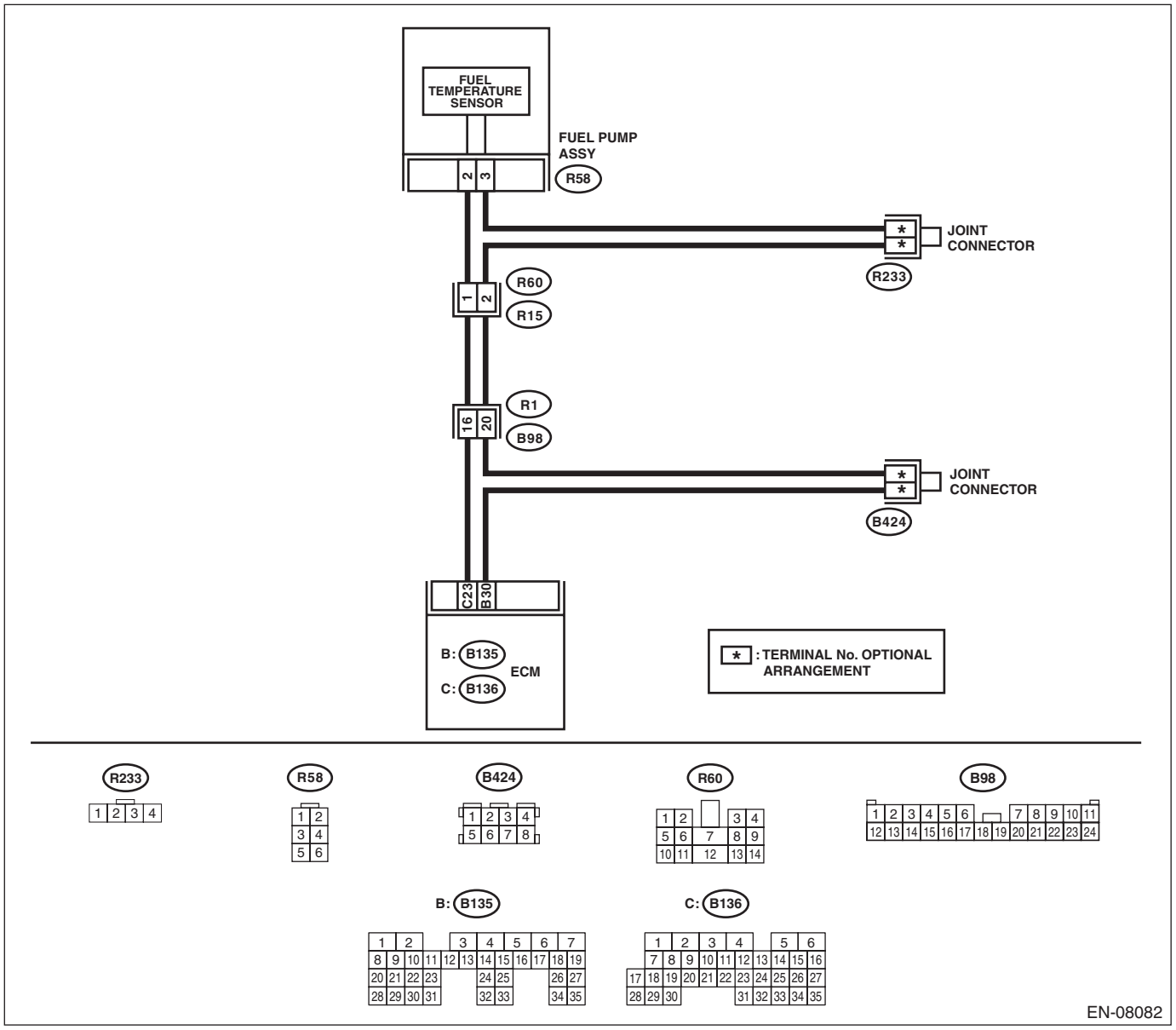
BG:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-83, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.>	Is the temperature less than –40°C (–40°F)?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK FOR POOR CONTACT.** Repair any poor contact between the ECM and fuel temperature sensor connectors.	Is there poor contact of the ECM or fuel temperature sensor connectors?	Repair any poor contact between the ECM and fuel temperature sensor connectors.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and fuel temperature sensor. 3) Measure the resistance of the harness between the ECM and fuel temperature sensor connector. ***Connector & terminal*** ***(B136) No. 23 — (R58) No. 2:*** ***(B135) No. 30 — (R58) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel temperature sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 23 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and fuel temperature sensor connector.	Replace the fuel temperature sensor. <Ref. to EC(H6DO)-10, Fuel Temperature Sensor.>

BH:DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-84, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Replace the oil temperature sensor. <Ref. to FU(H6DO)-46, Oil Temperature Sensor.>

BI: DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

DTC DETECTING CONDITION:

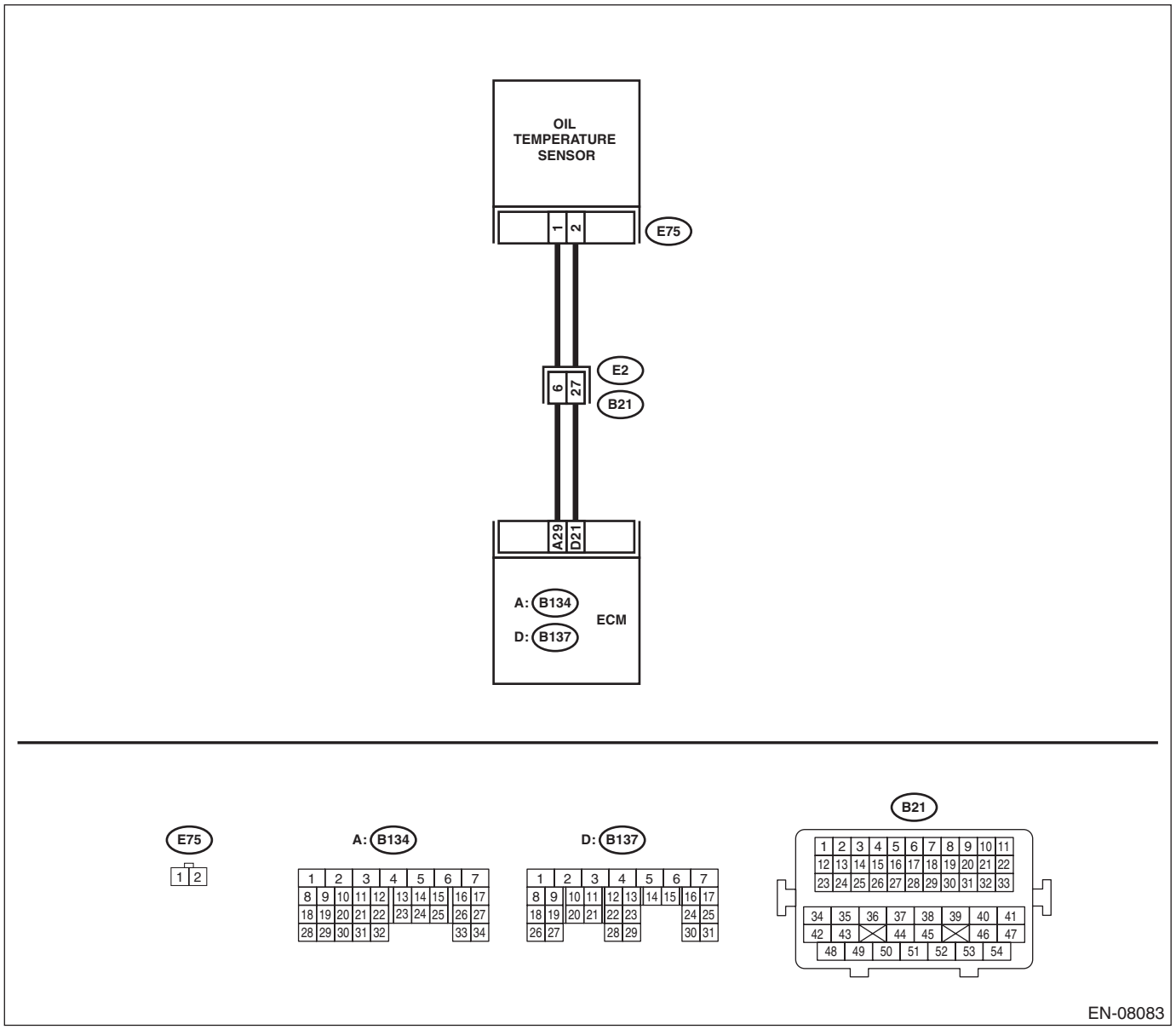
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-86, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of the oil temperature sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the oil temperature 215°C (419°F) or more?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND OIL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 21 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the oil temperature sensor. <Ref. to FU(H6DO)-46, Oil Temperature Sensor.>	Repair the short circuit to ground in harness between ECM and oil temperature sensor connector.

BJ:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

DTC DETECTING CONDITION:

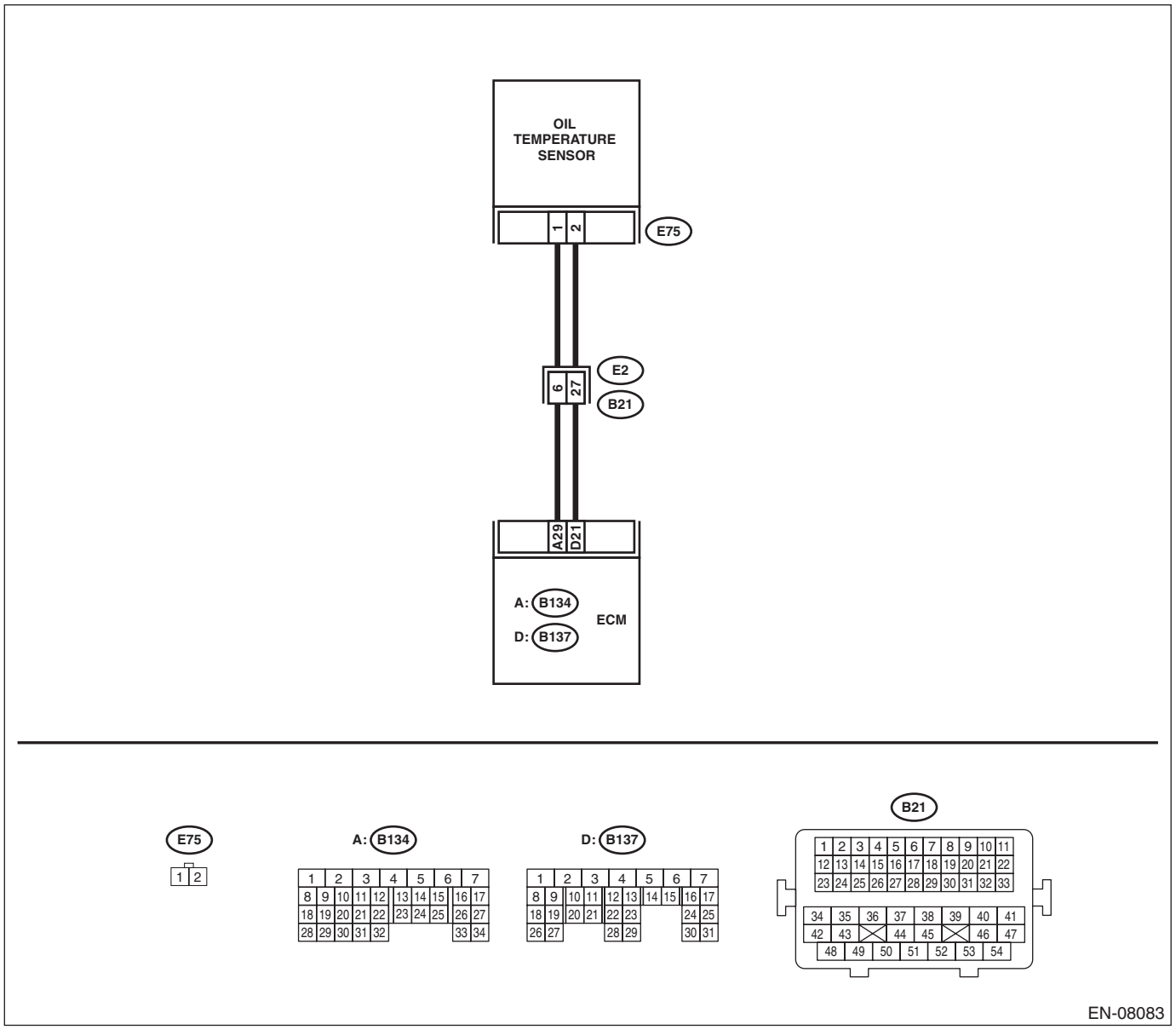
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-87, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of the oil temperature sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the oil temperature less than –40°C (–40°F)?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and oil temperature sensor connector.	Is there poor contact of ECM or oil temperature sensor connector?	Repair the poor contact of ECM or the oil temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND OIL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil temperature sensor. 3) Measure the resistance of the harness between ECM and oil temperature sensor connector. ***Connector & terminal*** ***(B134) No. 29 — (E75) No. 1:*** ***(B137) No. 21 — (E75) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil temperature sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND OIL TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 21 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power supply in harness between ECM and oil temperature sensor connector.	Replace the oil temperature sensor. <Ref. to FU(H6DO)-46, Oil Temperature Sensor.>

BK:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-88, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

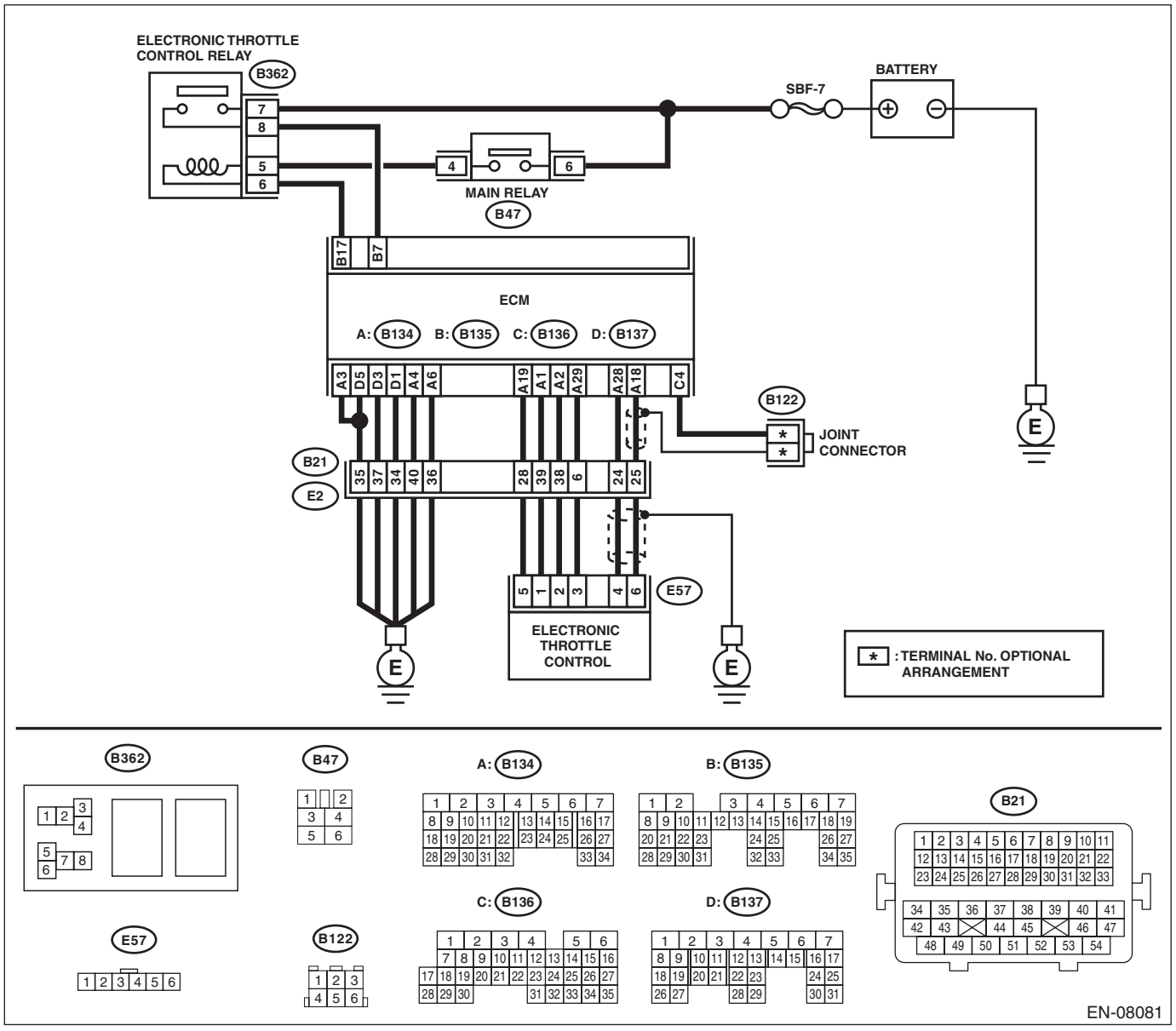
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:***	Is the resistance 1 MΩ or more?	Replace the electronic throttle control. <Ref. to FU(H6DO)-19, Throttle Body.>	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>

BL:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-89, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

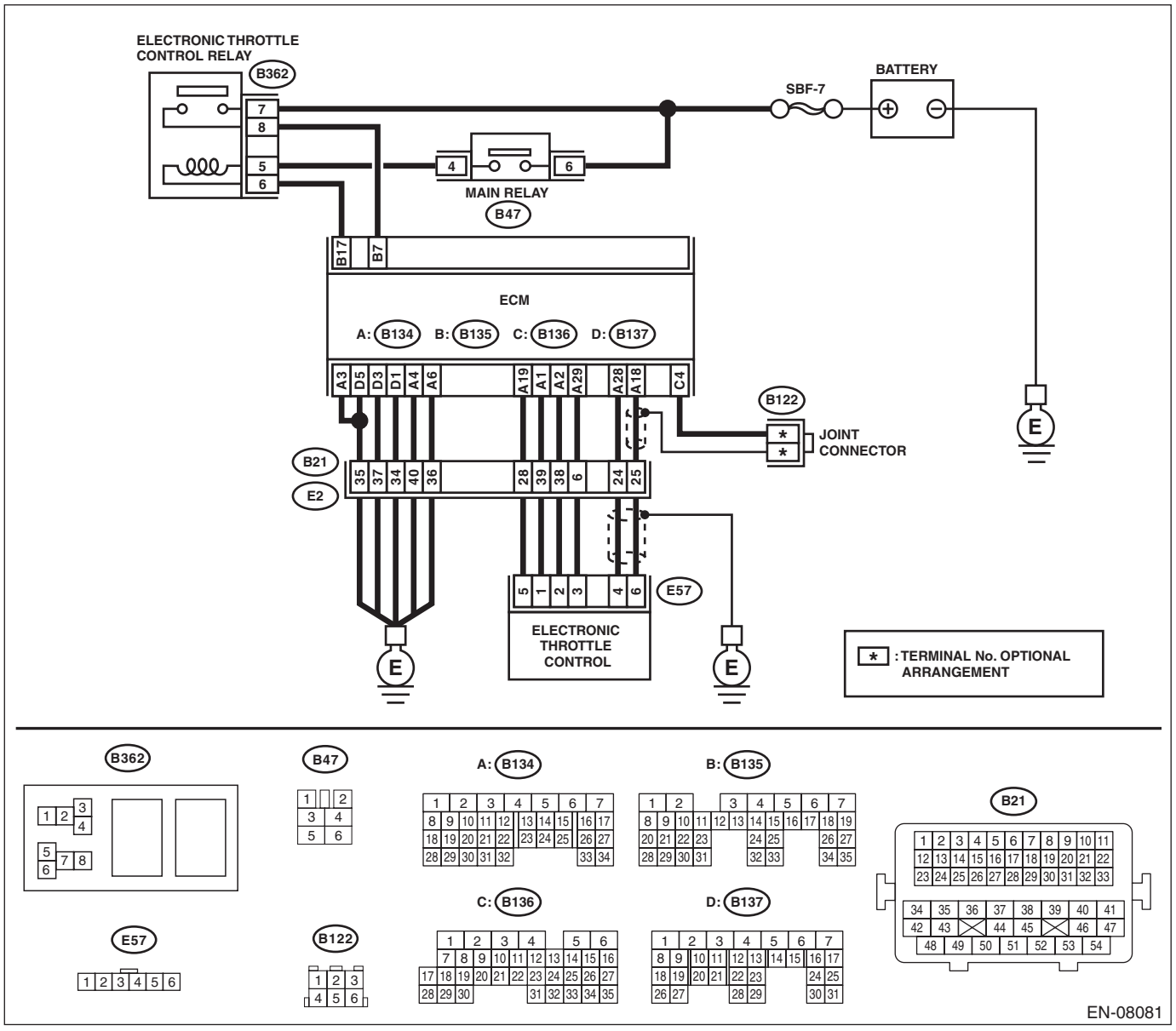
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



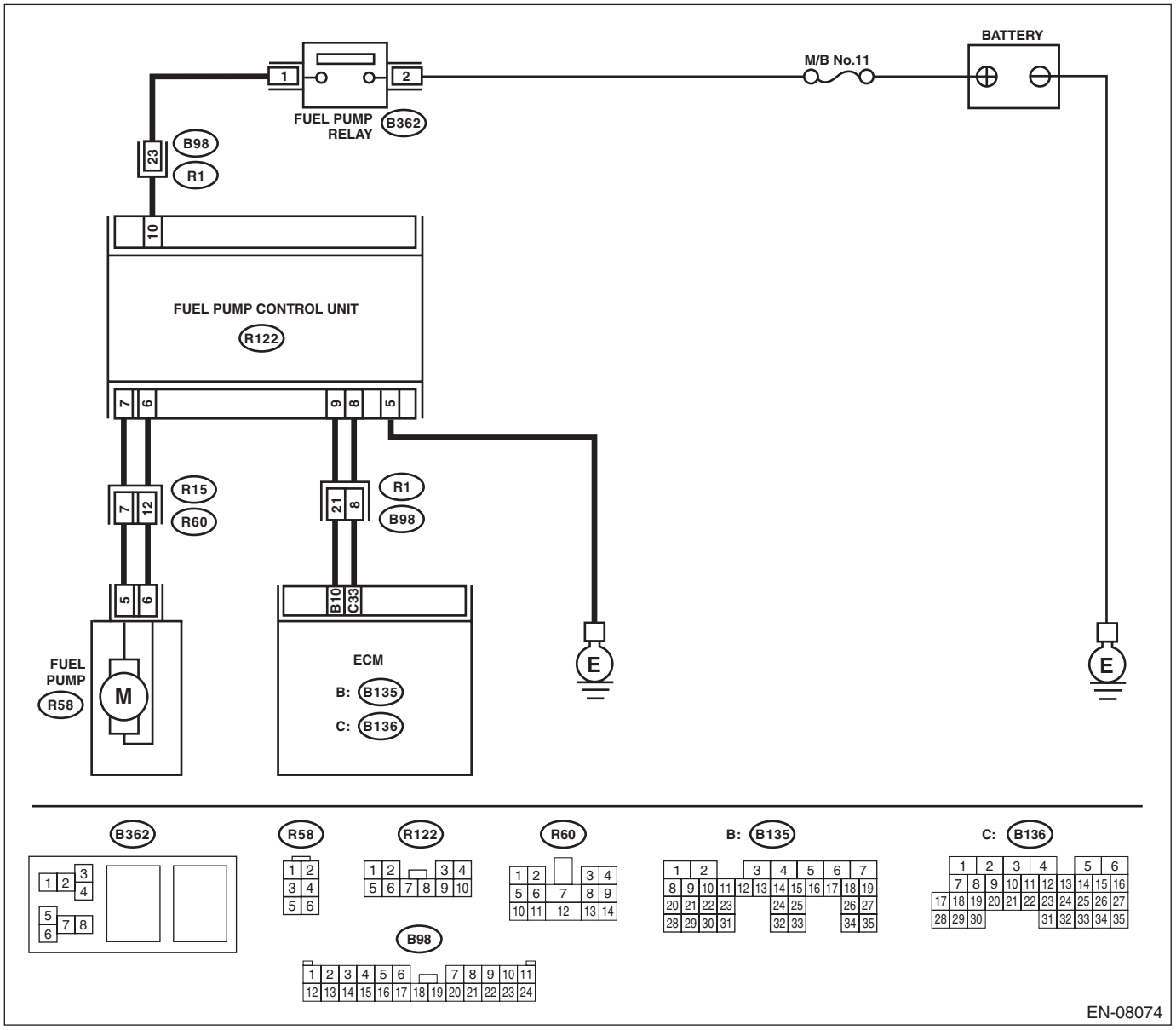
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 28 — (E57) No. 4:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-19, Throttle Body.>	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

BM:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-90, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply circuit. NOTE: In this case, repair the following item: • Open circuit or short circuit to ground in harness between fuel pump relay connector and fuel pump control unit connector • Poor contact of fuel pump relay connector • Poor contact of coupling connector
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the open circuit in harness between fuel pump control unit connector and chassis ground.
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** 1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump control unit and fuel pump connector. ***Connector & terminal*** ***(R122) No. 7 — (R58) No. 5:*** ***(R122) No. 6 — (R58) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between fuel pump control unit connector and fuel pump connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** Measure the resistance between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between fuel pump control unit connector and fuel pump connector.
5	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONTROL UNIT.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of the harness between the ECM and fuel pump control unit. ***Connector & terminal*** ***(B136) No. 33 — (R122) No. 8:*** ***(B135) No. 10 — (R122) No. 9:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel pump control unit connector • Poor contact of coupling connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONTROL UNIT.** Measure the resistance between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 8 — Chassis ground:*** ***(R122) No. 9 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the short circuit to ground in harness between ECM and fuel pump control unit connector.
7	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and fuel pump control unit connector.	Is there poor contact of ECM or fuel pump control unit connector?	Repair the poor contact of ECM or fuel pump control unit connector.	Go to step **8**.
8	**CHECK EXPERIENCE OF RUNNING OUT OF FUEL.**	Has the vehicle experienced running out of fuel?	Finish the diagnosis. NOTE: DTC may be recorded as a result of fuel pump idling while running out of fuel.	Replace the fuel pump control unit. <Ref. to FU(H6DO)-58, Fuel Pump Control Unit.>

BN:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-201, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BO:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-201, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BP:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-201, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BQ:DTC P0304 CYLINDER 4 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-201, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BR:DTC P0305 CYLINDER 5 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-201, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BS:DTC P0306 CYLINDER 6 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-97, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

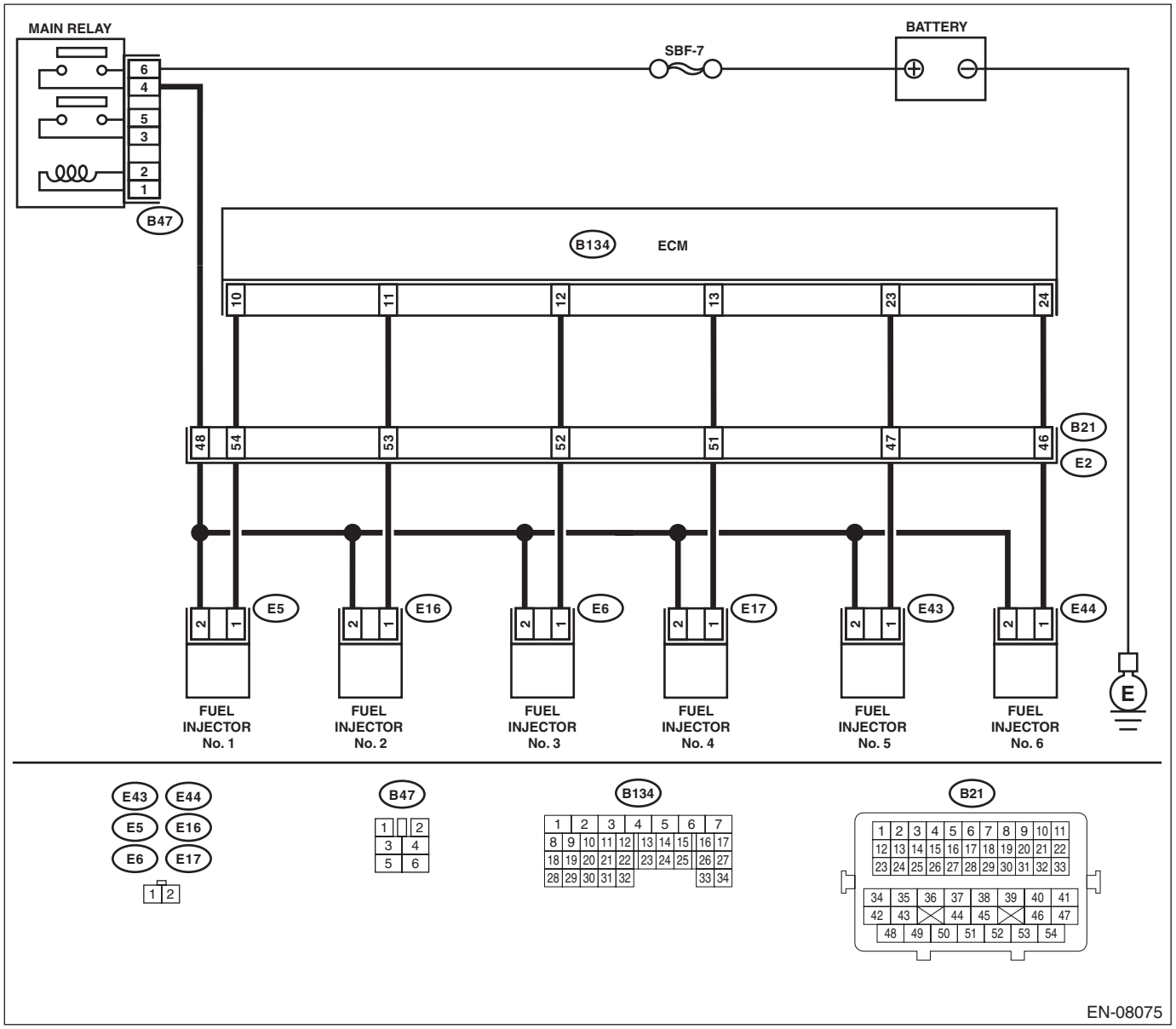
TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling
- Rough driving

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):*** ***#5 (B134) No. 23 (+) — Chassis ground (–):*** ***#6 (B134) No. 24 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between fuel injector connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:*** ***#5 (E43) No. 1 — Engine ground:*** ***#6 (E44) No. 1 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and fuel injector connector.
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** Measure the resistance of harness between ECM and fuel injector connector on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 — (E5) No. 1:*** ***#2 (B134) No. 11 — (E16) No. 1:*** ***#3 (B134) No. 12 — (E6) No. 1:*** ***#4 (B134) No. 13 — (E17) No. 1:*** ***#5 (B134) No. 23 — (E43) No. 1:*** ***#6 (B134) No. 24 — (E44) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact of coupling connector
4	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **5**.	Replace the faulty fuel injector. <Ref. to FU(H6DO)-41, Fuel Injector.>
5	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector connector of faulty cylinders and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):*** ***#5 (E43) No. 2 (+) — Engine ground (–):*** ***#6 (E44) No. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between the main relay and fuel injector connector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):*** ***#5 (B134) No. 23 (+) — Chassis ground (–):*** ***#6 (B134) No. 24 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and fuel injector connector.	Go to step **7**.
7	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Replace the faulty fuel injector. <Ref. to FU(H6DO)-41, Fuel Injector.>	Go to step **8**.
8	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step **9**.
9	**CHECK CRANK PLATE.**	Is the crank sprocket rusted or the teeth of crank plate broken?	Replace the crank plate. <Ref. to ME(H6DO)-97, Cylinder Block.>	Go to step **10**.
10	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn the crankshaft using ST, and align the alignment mark on crank sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET	Is the timing chain dislocated from its proper position?	Correct the installation condition of timing chain. <Ref. to ME(H6DO)-54, Timing Chain Assembly.>	Go to step **11**.
11	**CHECK FUEL LEVEL.**	Is the fuel meter indication lower than the “Lower” level?	Refill the fuel so that the fuel meter indication is higher than the “Lower” level, and proceed to the next step. Go to step **13**.	Go to step **12**.
12	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using the Subaru Select Monitor or general scan tool. <Ref. to EN(H6DO)(diag)-57, Clear Memory Mode.> 2) Start the engine, and drive the vehicle 10 minutes or more.	Does the malfunction indicator light illuminate or blink?	Go to step **14**.	Go to step **13**.

Step		Check	Yes	No
13	**CHECK CAUSE OF MISFIRE.**	Was the cause of misfire identified when the engine is running?	Finish diagnostics operation, if the engine has no abnormality.	Repair the poor contact of connector. NOTE: In this case, repair the following item: • Poor contact of ignition coil connector • Poor contact of fuel injector connector on faulty cylinders • Poor contact of ECM connector • Poor contact of coupling connector
14	**CHECK AIR INTAKE SYSTEM.**	Is there any fault in air intake system?	Repair the air intake system. NOTE: Check the following items. • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **15**.
15	**CHECK MISFIRE SYMPTOM.** 1) Turn the ignition switch to ON. 2) Read the DTC. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Does the Subaru Select Monitor or general scan tool indicate only one DTC?	Go to step **21**.	Go to step **16**.
16	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Are DTCs P0301 and P0302 displayed?	Go to step **22**.	Go to step **17**.
17	**CHECK DTC ON DISPLAY.**	Are DTCs P0303 and P0304 displayed?	Go to step **23**.	Go to step **18**.
18	**CHECK DTC ON DISPLAY.**	Is DTC P0305 and P0306 displayed?	Go to step **24**.	Go to step **19**.
19	**CHECK DTC ON DISPLAY.**	Is DTC P0301, P0303 and P0305 displayed?	Go to step **25**.	Go to step **20**.
20	**CHECK DTC ON DISPLAY.**	Is DTC P0302, P0304 and P0306 displayed?	Go to step **26**.	Go to step **27**.

Step		Check	Yes	No
21	**ONLY ONE CYLINDER.**	Is there any fault in the cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio	Check DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>
22	**GROUP OF #1 AND #2 CYLINDERS.**	Are there any faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plug • Fuel injector • Ignition coil • Compression ratio • If any fault is not found, check the "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side. <Ref. to EN(H6DO)(diag)-79, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Check DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>
23	**GROUP OF #3 AND #4 CYLINDERS.**	Are there any faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plug • Fuel injector • Ignition coil • Compression ratio • If any fault is not found, check the "IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(H6DO)(diag)-79, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Check DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
24	GROUP OF #5 AND #6 CYLINDERS.	Are there any faults in #5 and #6 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plug • Fuel injector • Ignition coil • Compression ratio • If any fault is not found, check the "IGNITION CONTROL SYSTEM" of #5 and #6 cylinders side. <Ref. to EN(H6DO)(diag)-79, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Check DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>
25	GROUP OF #1, #3 AND #5 CYLINDERS.	Is there any fault in #1, #3 and #5 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio • Skipping timing chain teeth	Check DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>
26	GROUP OF #2, #4 AND #6 CYLINDERS.	Is there any fault in #2, #4 and #6 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio • Skipping timing chain teeth	Check DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>
27	CYLINDER AT RANDOM.	Is the engine idle rough?	Check DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio

BT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-98, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

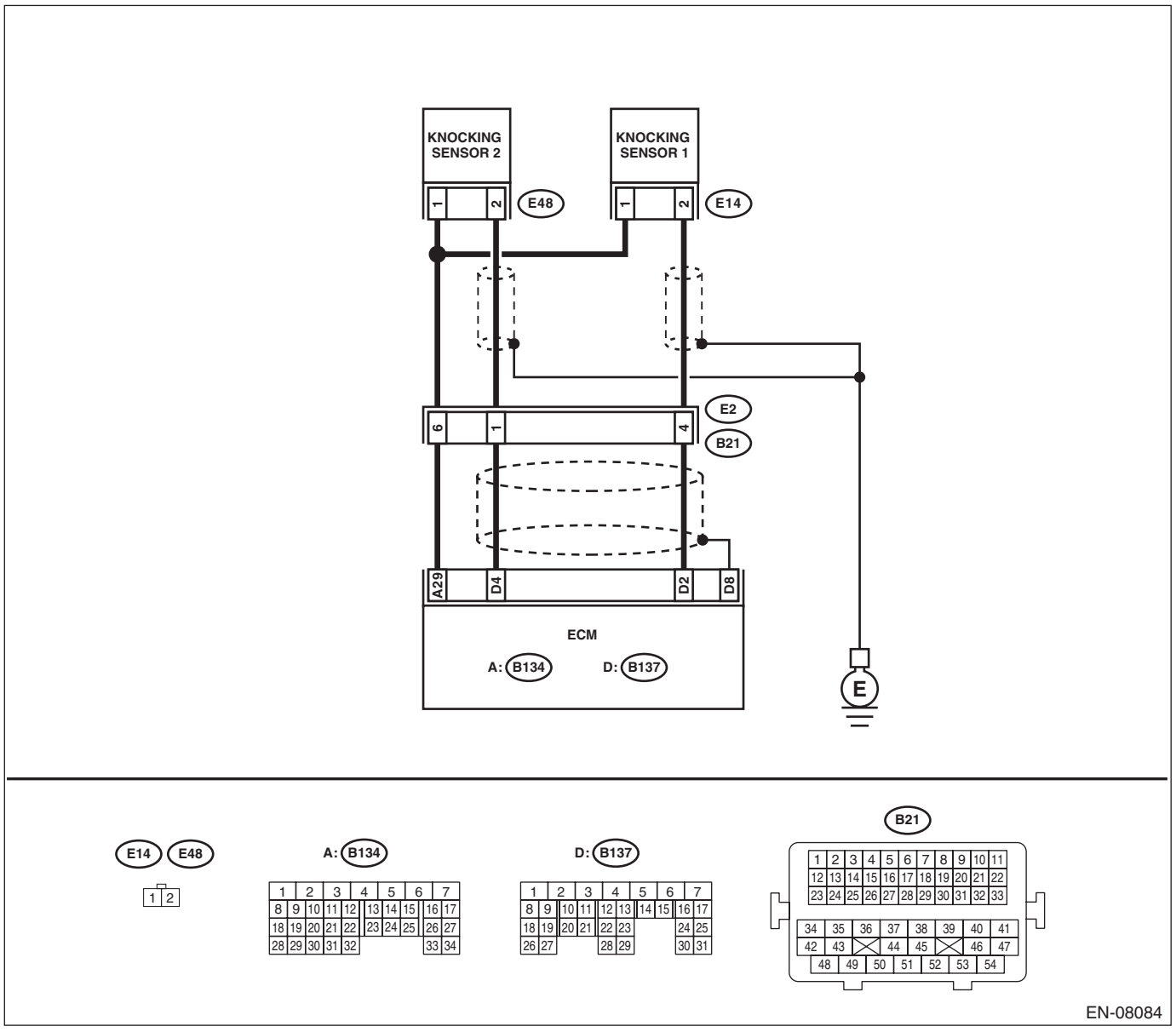
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B137) No. 2 — (B134) No. 29:***	Is the resistance 600 kΩ or more?	Go to step **2**.	Repair the poor contact of ECM connector.
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 600 kΩ or more?	Replace the knock sensor. <Ref. to FU(H6DO)-35, Knock Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and knock sensor connector • Poor contact of knock sensor connector • Poor contact of coupling connector

BU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-100, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

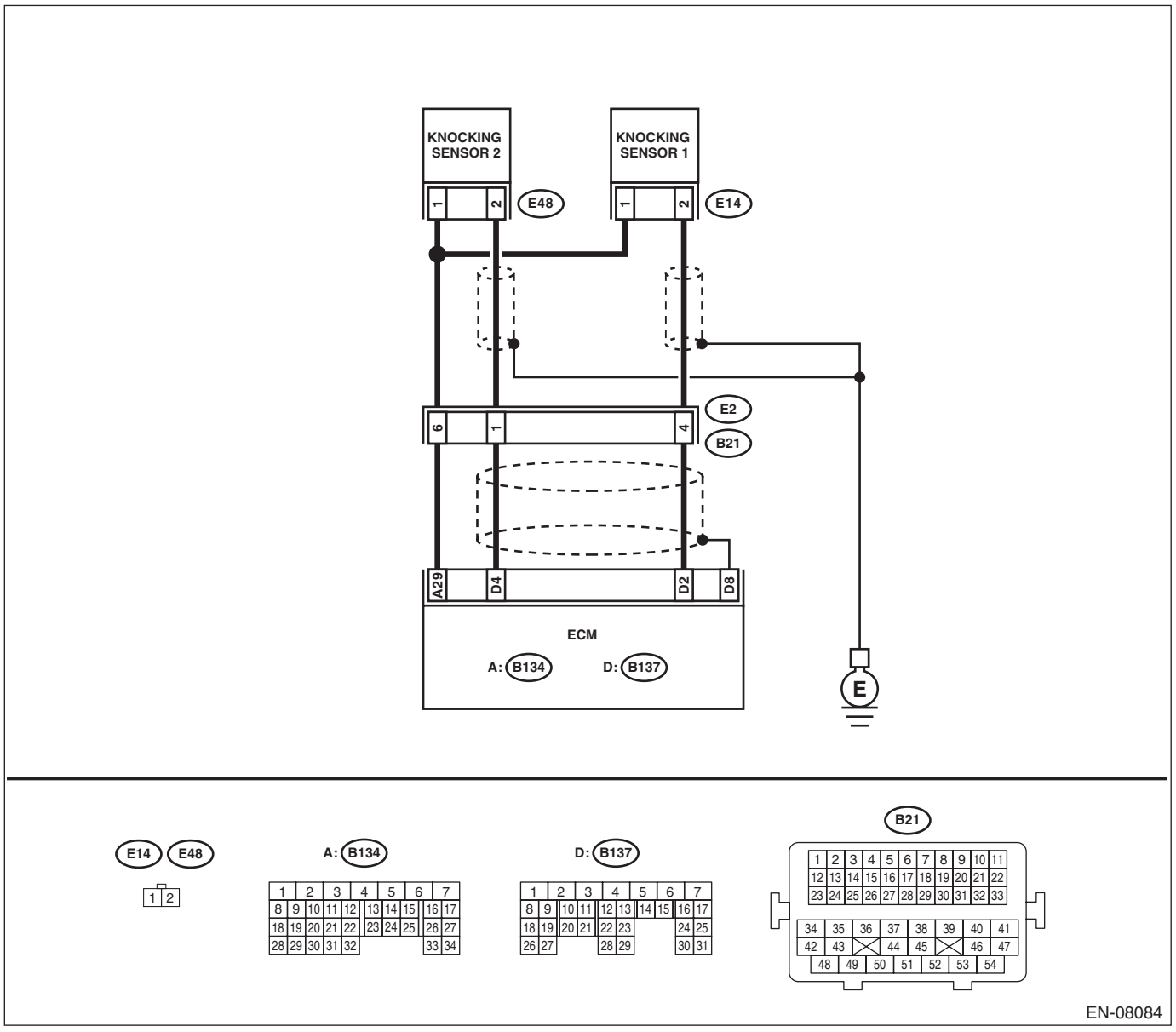
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B137) No. 2 — (B134) No. 29:***	Is the resistance less than 500 kΩ?	Go to step **2**.	Go to step **3**.
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connectors. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 500 kΩ?	Replace the knock sensor. <Ref. to FU(H6DO)-35, Knock Sensor.>	Repair the short circuit to ground in harness between ECM and knock sensor connector. NOTE: The harness between both connectors are shielded. Remove the shield and repair the short circuit of harness.
3	**CHECK INPUT SIGNAL OF ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 2 (+) — Chassis ground (–):***	Is the voltage 2 V or more?	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.	Repair the poor contact of ECM connector.

BV:DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-101, DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

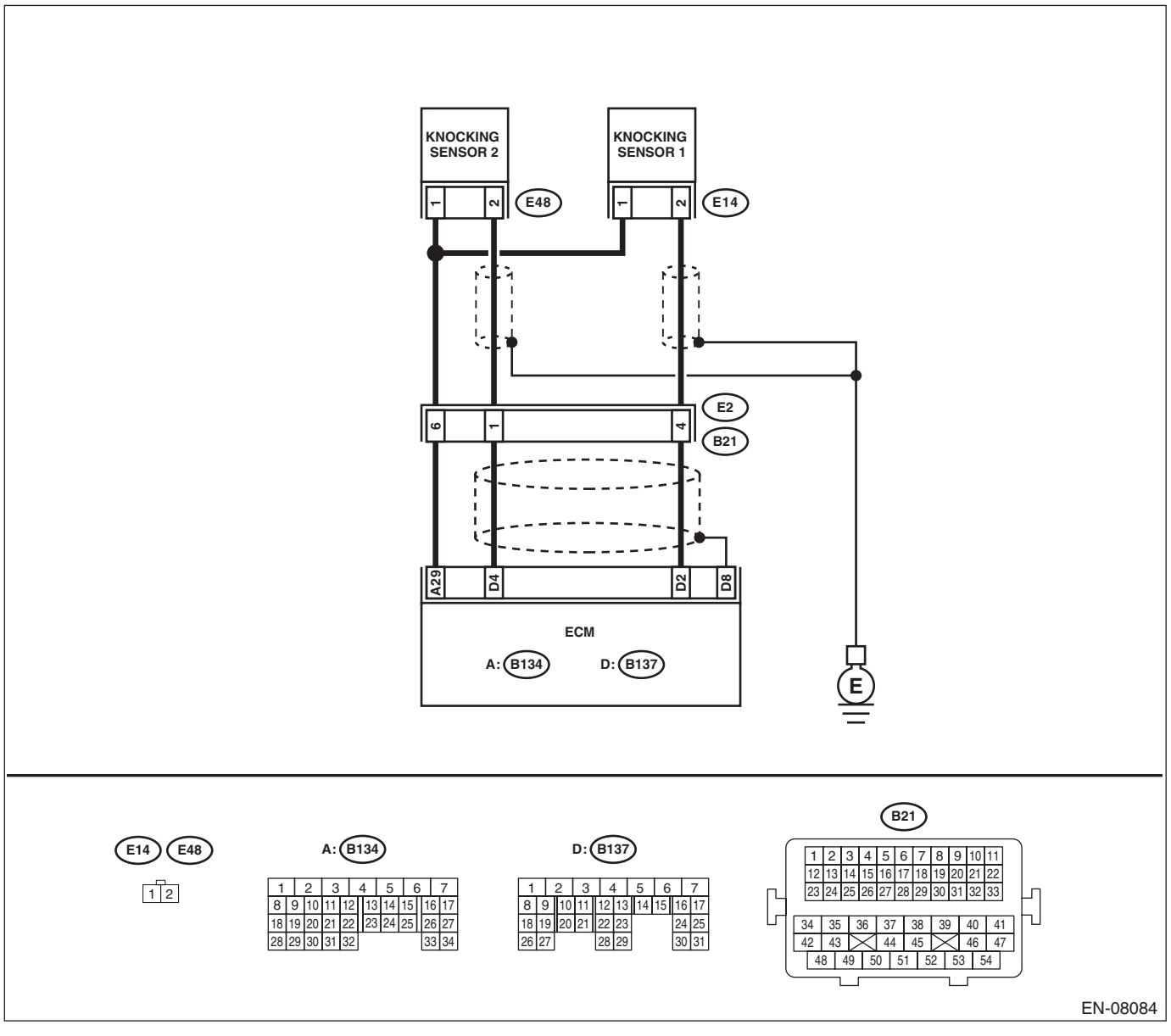
TROUBLE SYMPTOM:

- Driving performance problem
- Knocking is occurred.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B137) No. 4 — (B134) No. 29:***	Is the resistance 600 kΩ or more?	Go to step **2**.	Repair the poor contact of ECM connector.
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 600 kΩ or more?	Replace the knock sensor. <Ref. to FU(H6DO)-35, Knock Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and knock sensor connector • Poor contact of knock sensor connector • Poor contact of coupling connector

BW:DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-101, DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

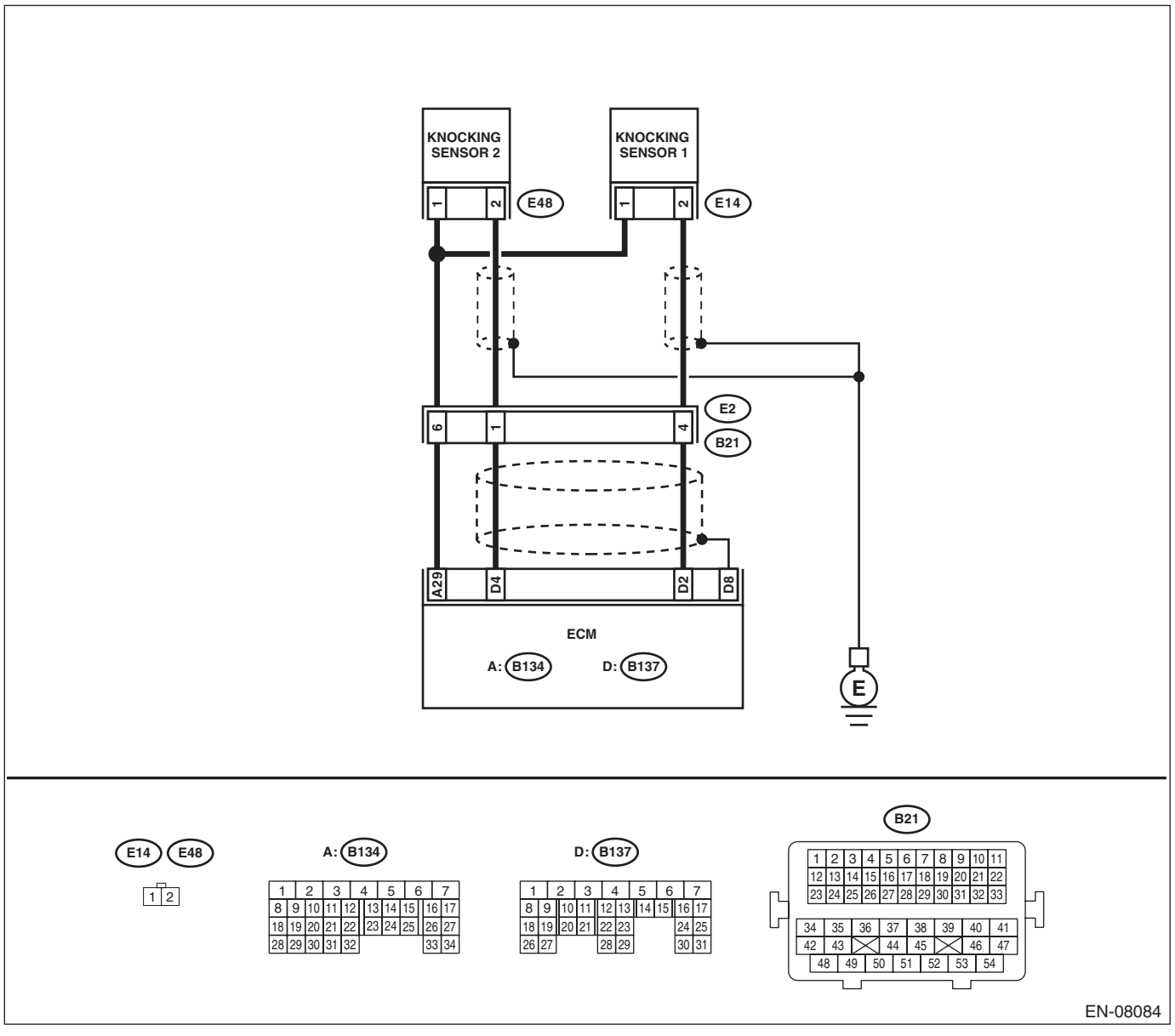
TROUBLE SYMPTOM:

- Driving performance problem
- Knocking occurs.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B137) No. 4 — (B134) No. 29:***	Is the resistance less than 500 kΩ?	Go to step **2**.	Go to step **3**.
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connectors. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 500 kΩ?	Replace the knock sensor. <Ref. to FU(H6DO)-35, Knock Sensor.>	Repair the short circuit to ground in harness between ECM and knock sensor connector. NOTE: The harness between both connectors are shielded. Remove the shield and repair the short circuit of harness.
3	**CHECK INPUT SIGNAL OF ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):***	Is the voltage 2 V or more?	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.	Repair the poor contact of ECM connector.

BX:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-102, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

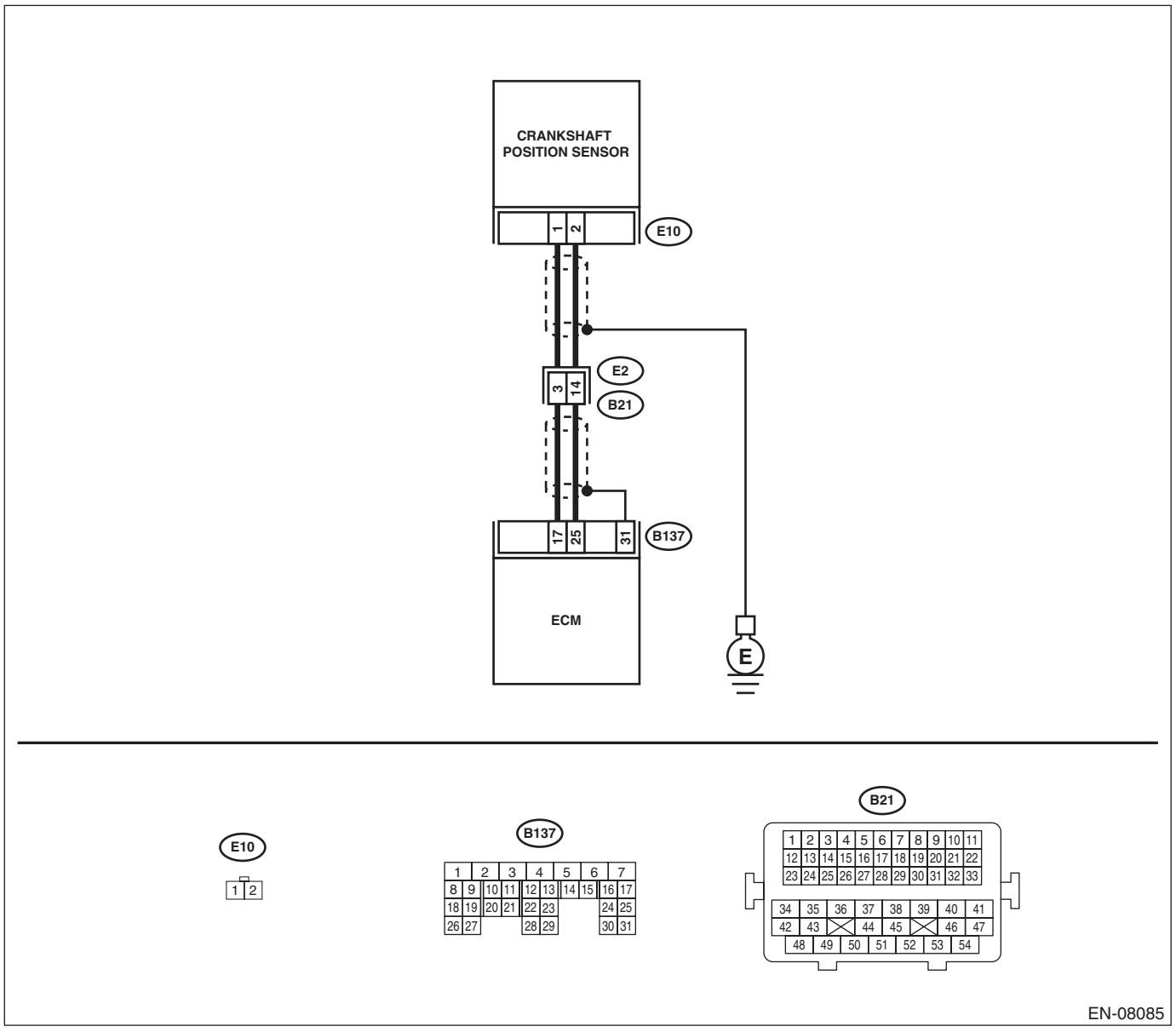
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **2**.	Tighten the crankshaft position sensor installation bolt securely.
2	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the crankshaft position sensor. 3) Measure the resistance between terminals of crankshaft position sensor connector. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 1 and 4 kΩ?	Go to step **3**.	Replace the crankshaft position sensor. <Ref. to FU(H6DO)-30, Crankshaft Position Sensor.>
3	**CHECK HARNESS BETWEEN ECM AND CRANKSHAFT POSITION SENSOR CONNECTOR.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and crankshaft position sensor connector. ***Connector & terminal*** ***(B137) No. 17 — (E10) No. 1:*** ***(B137) No. 25 — (E10) No. 2:***	Is the resistance less than 1 Ω?	Repair the poor contact of ECM and crankshaft position sensor connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and crankshaft position sensor connector • Poor contact of coupling connector

BY:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-104, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **2**.	Tighten the crankshaft position sensor installation bolt securely.
2	**CHECK CRANKSHAFT PLATE.**	Is there crack or damage in the crankshaft plate teeth?	Replace the crankshaft plate.	Go to step **3**.
3	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET	Is the timing chain dislocated from its proper position?	Correct the installation condition of timing chain. <Ref. to ME(H6DO)-54, Timing Chain Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(H6DO)-30, Crankshaft Position Sensor.>

BZ:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

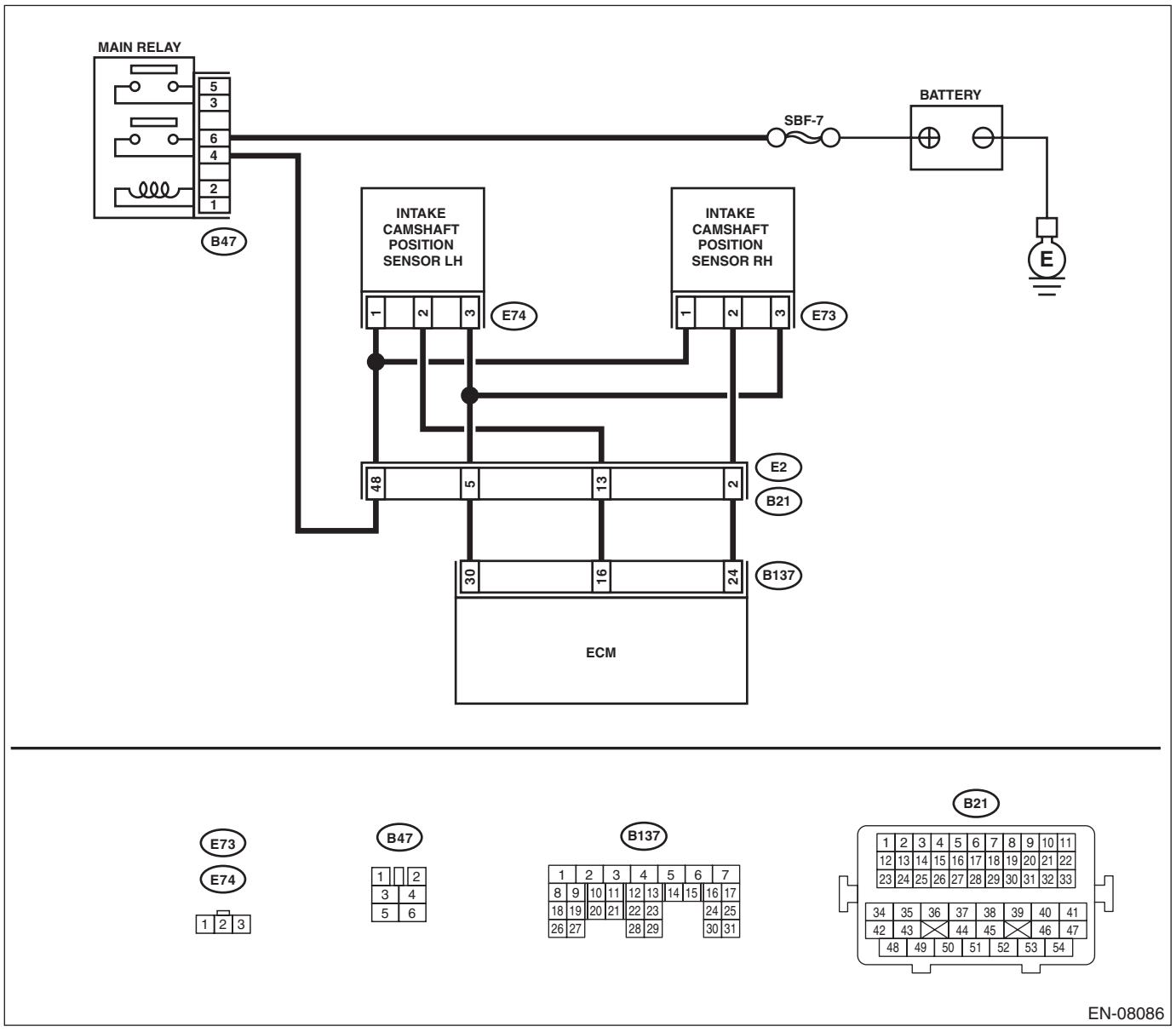
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-106, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E73) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit or short circuit to ground in harness between main relay connector and camshaft position sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B137) No. 24 — (E73) No. 2:*** ***(B137) No. 30 — (E73) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and camshaft position sensor connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E73) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair short circuit to ground in harness between ECM and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E73) No. 2 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and camshaft position sensor connector.	Go to step **5**.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6**.	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check the waveform of the camshaft position sensor. <Ref. to EN(H6DO)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-32, Camshaft Position Sensor.>	Repair the following item. • Poor contact of ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

CA:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-107, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

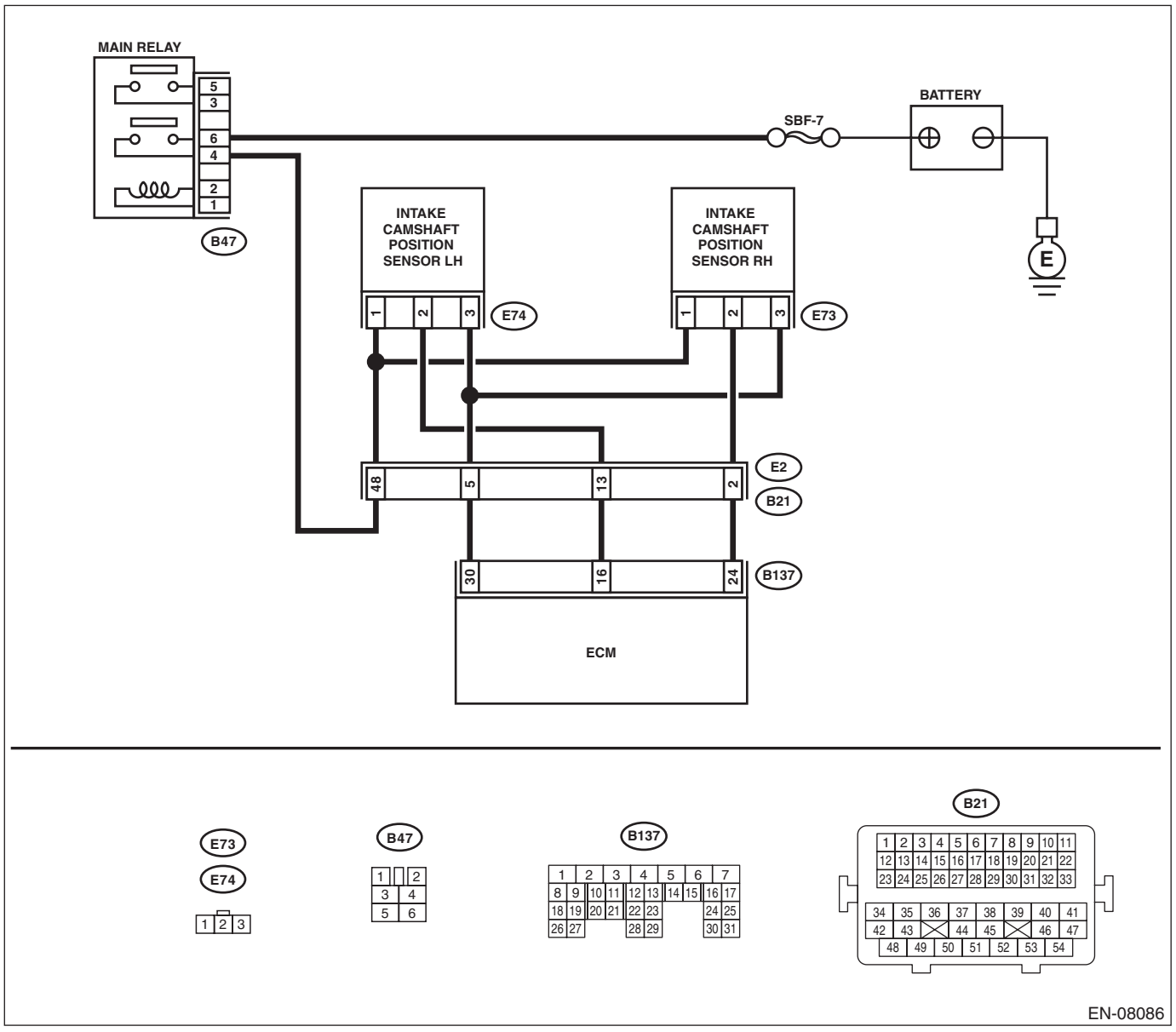
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E74) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit or short circuit to ground in harness between main relay connector and camshaft position sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B137) No. 16 — (E74) No. 2:*** ***(B137) No. 30 — (E74) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and camshaft position sensor connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E74) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair short circuit to ground in harness between ECM and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E74) No. 2 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and camshaft position sensor connector.	Go to step **5**.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6**.	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check the waveform of the camshaft position sensor. <Ref. to EN(H6DO)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-32, Camshaft Position Sensor.>	Repair the following item. • Poor contact of ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

CB:DTC P0365 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-108, DTC P0365 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

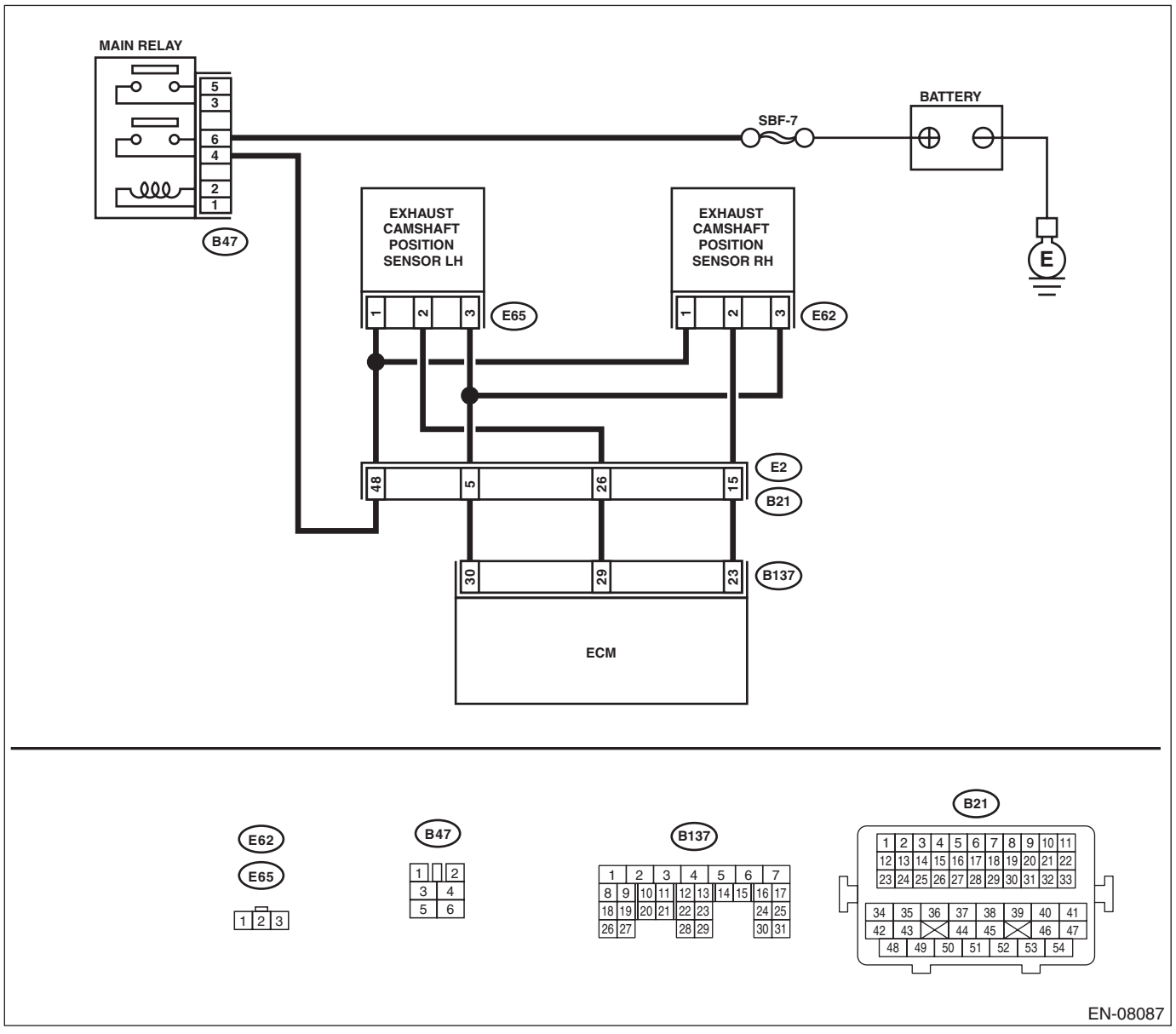
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E62) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit or short circuit to ground in harness between main relay connector and camshaft position sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B137) No. 23 — (E62) No. 2:*** ***(B137) No. 30 — (E62) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and camshaft position sensor connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E62) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair short circuit to ground in harness between ECM and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E62) No. 2 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and camshaft position sensor connector.	Go to step **5**.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6**.	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check the waveform of the camshaft position sensor. <Ref. to EN(H6DO)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-32, Camshaft Position Sensor.>	Repair the following item. • Poor contact of ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

CC:DTC P0390 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-109, DTC P0390 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

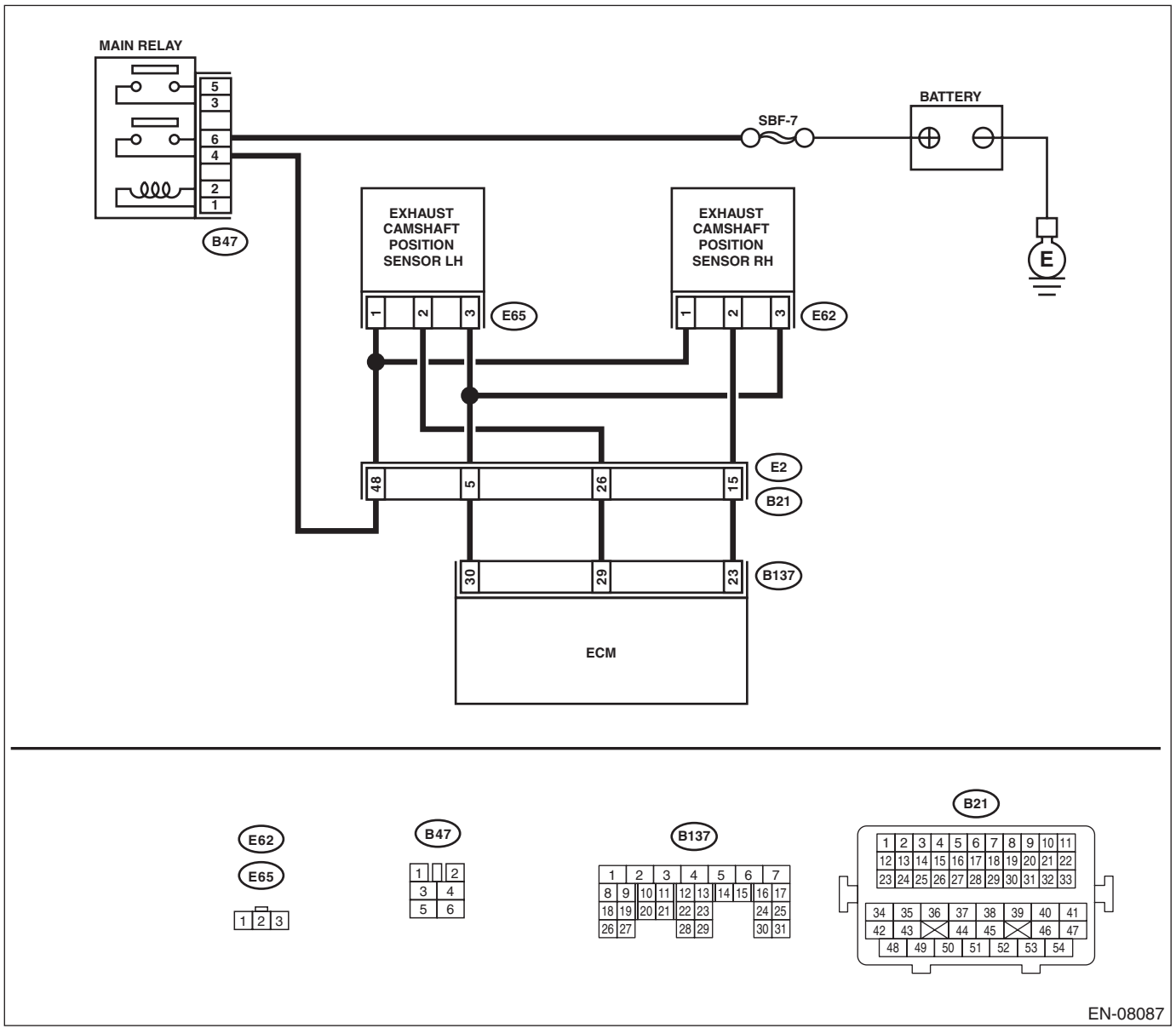
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E65) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit or short circuit to ground in harness between main relay connector and camshaft position sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B137) No. 29 — (E65) No. 2:*** ***(B137) No. 30 — (E65) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and camshaft position sensor connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E65) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair short circuit to ground in harness between ECM and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E65) No. 2 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and camshaft position sensor connector.	Go to step **5**.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6**.	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check the waveform of the camshaft position sensor. <Ref. to EN(H6DO)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-32, Camshaft Position Sensor.>	Repair the following item. • Poor contact of ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

CD:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-110, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

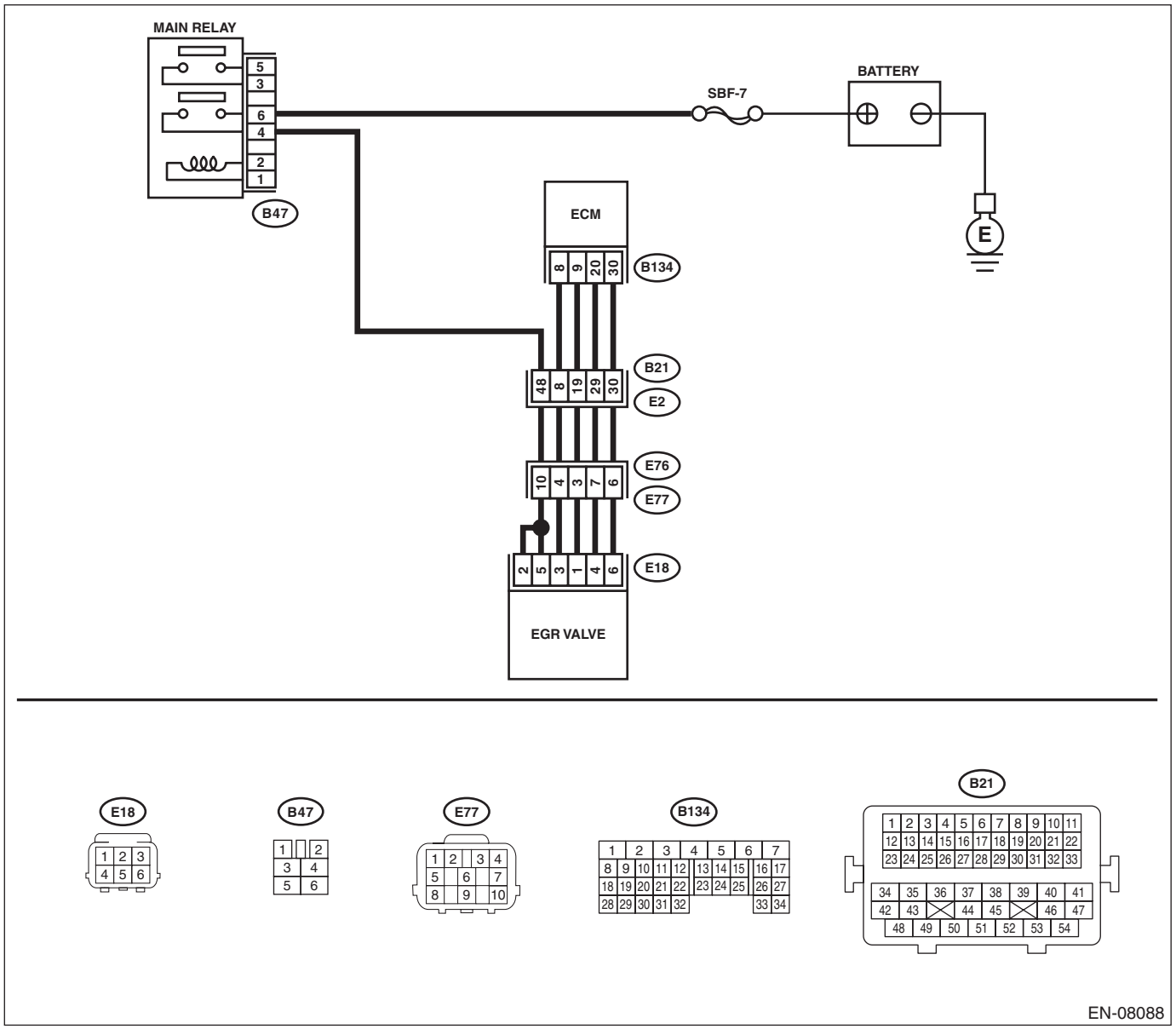
TROUBLE SYMPTOM:

- Movement performance problem when engine is low speed.
- Improper idling
- Movement performance problem

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 53.3 kPa (400 mmHg, 15.75 inHg) or more?	Make sure that the EGR valve, manifold absolute pressure sensor and throttle body are installed securely.	Go to step **2**.
2	**CHECK EGR VALVE.** Remove the EGR valve.	Are there any holes, clogged lines or foreign matters in the EGR system?	Repair the EGR system.	Replace the EGR valve. <Ref. to FU(H6DO)-40, EGR Valve.>

CE:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-113, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

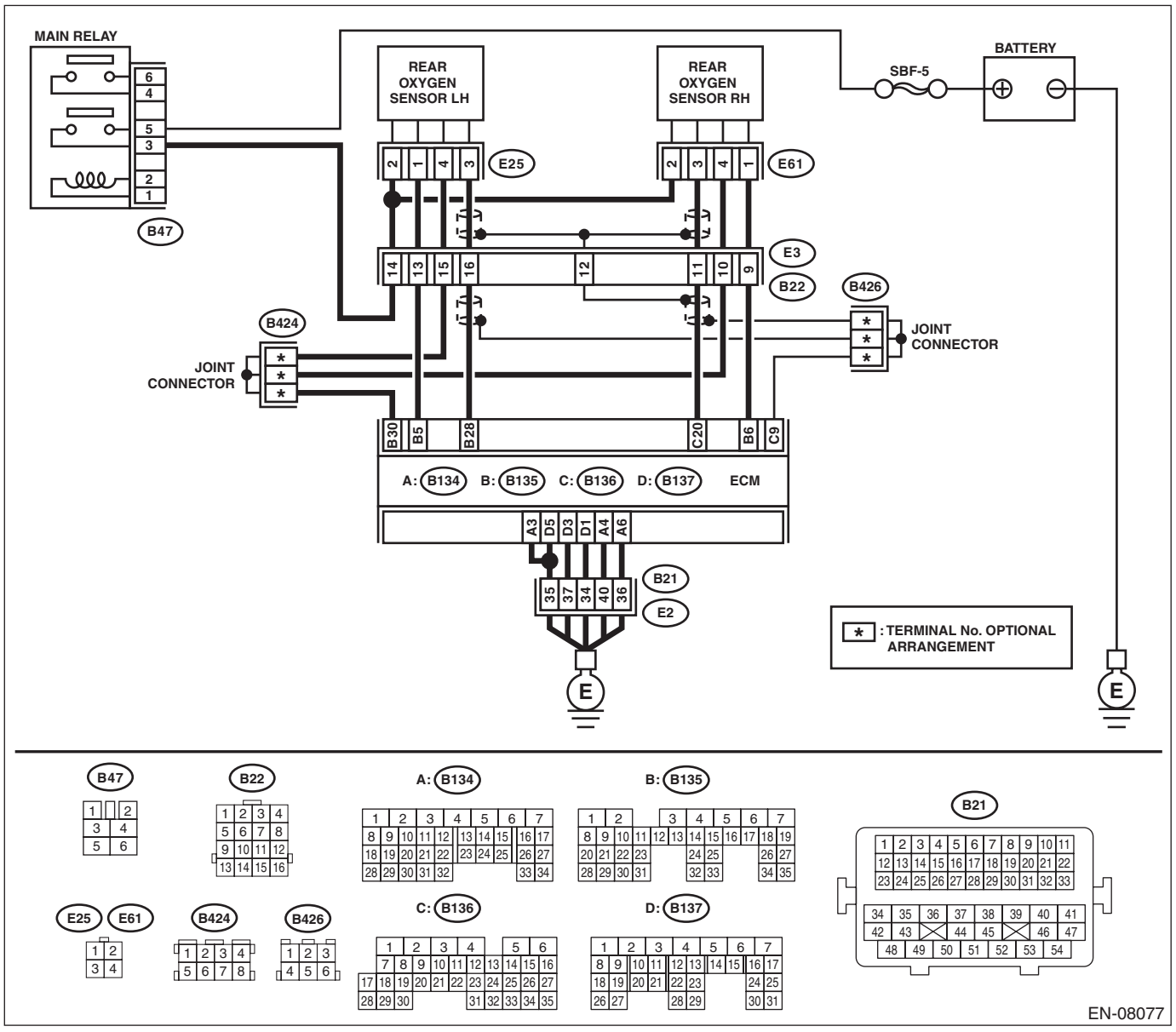
TROUBLE SYMPTOM:

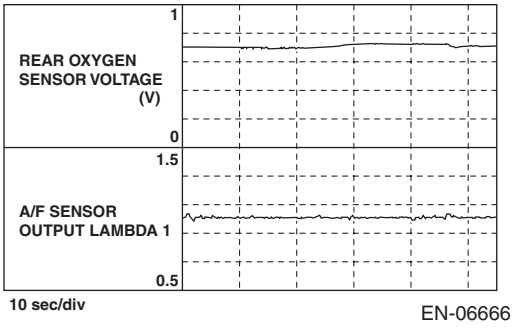
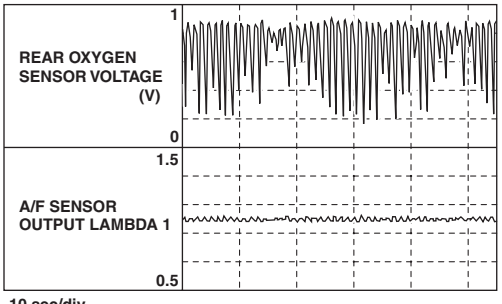
- Engine stalls.
- Idle mixture is out of specifications.

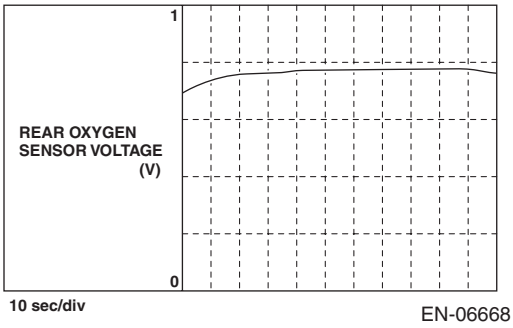
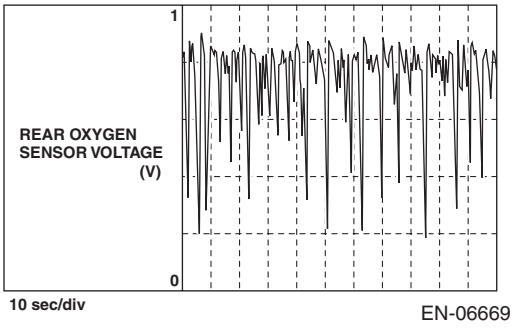
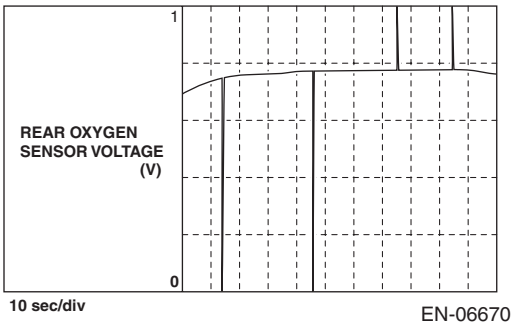
CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter • Loose or improperly attached front oxygen (A/F) sensor or rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H6DO)-2, General Description.>	Go to step **2**.
2	**CHECK WAVEFORM DATA ON THE SUBARU SELECT MONITOR (WHILE DRIVING).** 1) Drive at a constant speed between 80 — 112 km/h (50 — 70 MPH). 2) After 5 minutes have elapsed in the condition of step 1), use the Subaru Select Monitor while still driving to read the waveform data. • At normal condition  EN-06666 • At abnormal condition (numerous inversion)  EN-06667	Is a normal waveform displayed?	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK WAVEFORM DATA ON THE SUBARU SELECT MONITOR (WHILE IDLING).** 1) Run the engine at idle. 2) In the condition of step 1), use the Subaru Select Monitor to read the waveform data. • At normal condition  EN-06668 • At abnormal condition 1 (numerous inversion)  EN-06669 • At abnormal condition 2 (noise input)  EN-06670	Is a normal waveform displayed?	Go to step **4**.	• The waveform is displayed at abnormal condition 1: Go to step **4**. • The waveform is displayed at abnormal condition 2: Go to step **5**.
4	**CHECK CATALYTIC CONVERTER.**	Is the catalytic converter damaged?	Replace the catalytic converter. <Ref. to EC(H6DO)-3, Front Catalytic Converter.>	Go to step **5**.
5	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **6**.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B136) No. 20 — (E61) No. 3:*** ***(B135) No. 30 — (E61) No. 4:*** ***(B135) No. 28 — (E25) No. 3:*** ***(B135) No. 30 — (E25) No. 4:***	Is the resistance less than 1 Ω?	Go to step **7**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
7	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E61) No. 3 (+) — Chassis ground (–):*** ***(E25) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Go to step **8**.	Repair the harness and connector. NOTE: Repair the following locations. • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
8	**CHECK REAR OXYGEN SENSOR SHIELD.** 1) Turn the ignition switch to OFF. 2) Expose the rear oxygen sensor connector body side harness sensor shield. 3) Measure the resistance between sensor shield and chassis ground.	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Repair the open circuit of rear oxygen sensor harness.

CF:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION<Ref. to GD(H6DO)-115, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode<Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode<Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain has caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap genuine?	Go to step **3**.	Replace with a genuine fuel filler cap.
3	**CHECK FUEL FILLER PIPE GASKET.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H6DO)-64, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Install the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: The drain valve can be operated using Subaru Select Monitor. For procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-58, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H6DO)-15, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-58, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **6**.	Replace the purge control solenoid valve. <Ref. to EC(H6DO)-7, Purge Control Solenoid Valve.>
6	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Remove the delivery (test) mode connector.	Is there any hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H6DO)-75, Fuel Delivery and Evaporation Lines.>	Go to step **7**.

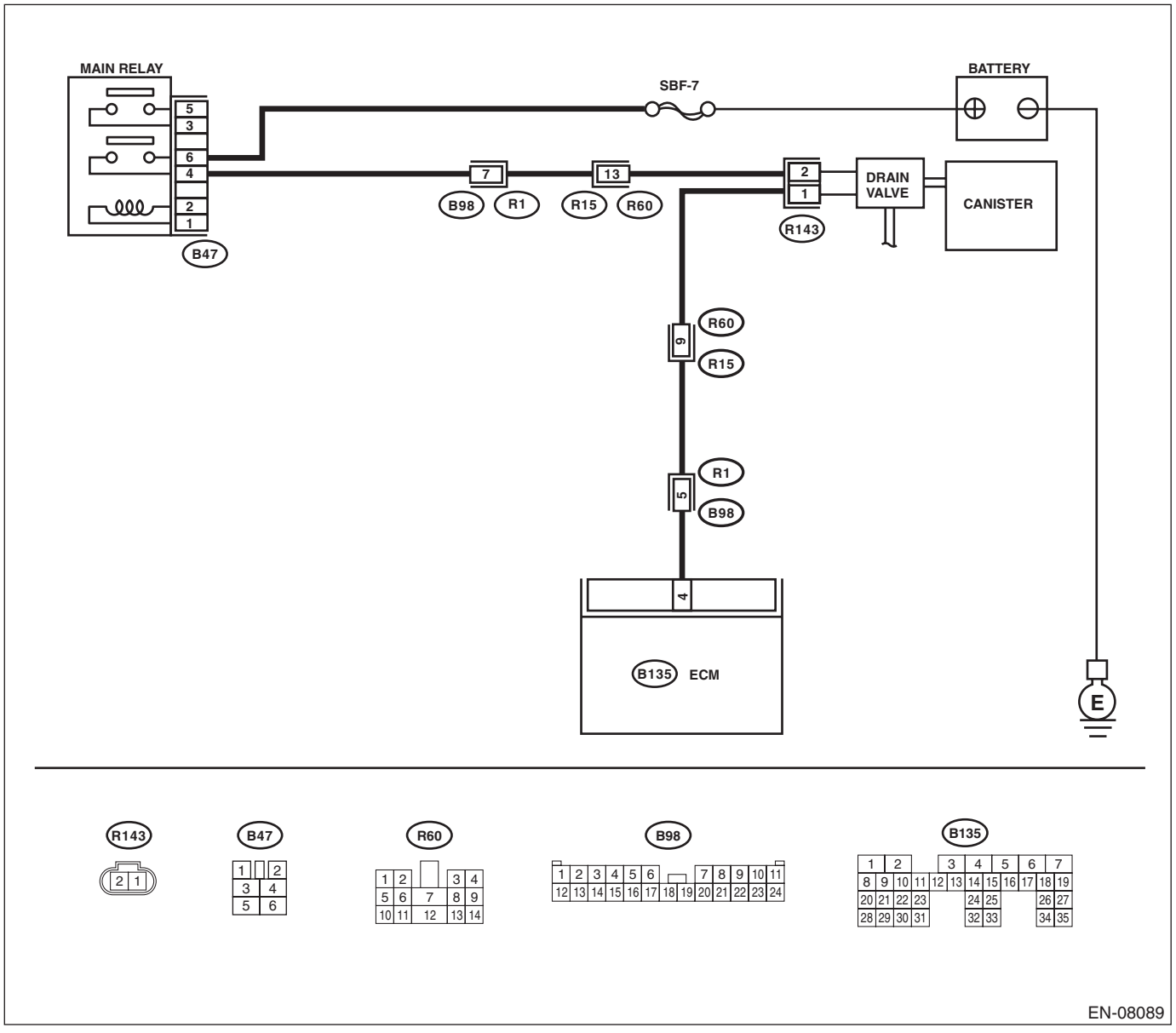
Step		Check	Yes	No
7	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H6DO)-6, Canister.>	Go to step **8**.
8	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H6DO)-61, Fuel Tank.>	Is the fuel tank damaged or is there any hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H6DO)-61, Fuel Tank.>	Go to step **9**.
9	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Is there any hole of more than 1.0 mm (0.04 in) dia., crack, clogging, or disconnection, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of ECM connector.

CG:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-128, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



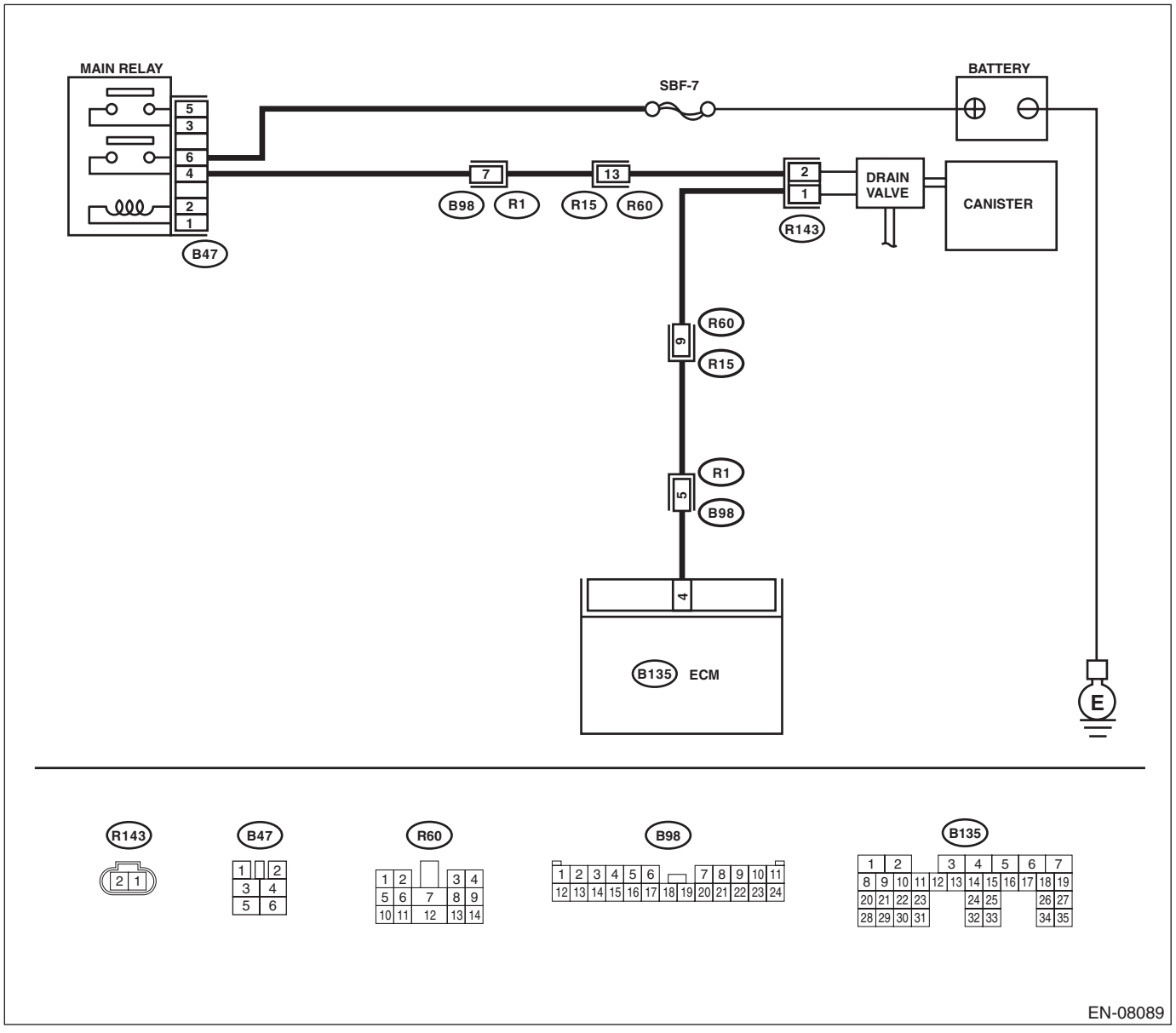
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Go to step **3**.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary open or short circuit of harness or temporary poor contact of connector may be the cause.
3	**CHECK POWER SUPPLY TO DRAIN VALVE.** Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R143) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND DRAIN VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and drain valve. 3) Measure the resistance between the drain valve connector and chassis ground. ***Connector & terminal*** ***(R143) No. 1 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and drain valve connector.
5	**CHECK HARNESS BETWEEN ECM AND DRAIN VALVE CONNECTOR.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B135) No. 4 — (R143) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and drain valve connector • Poor contact of coupling connector
6	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Repair the poor contact of drain valve connector.	Replace the drain valve. <Ref. to EC(H6DO)-15, Drain Valve.>

CH:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-130, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND DRAIN VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and drain valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and drain valve connector.	Go to step **2**.
2	**CHECK DRAIN VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the drain valve. <Ref. to EC(H6DO)-15, Drain Valve.>	Repair the poor contact of ECM connector.

CI: DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-132, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK PRESSURE VACUUM LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there any fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(H6DO)-12, Fuel Tank Pressure Sensor.>

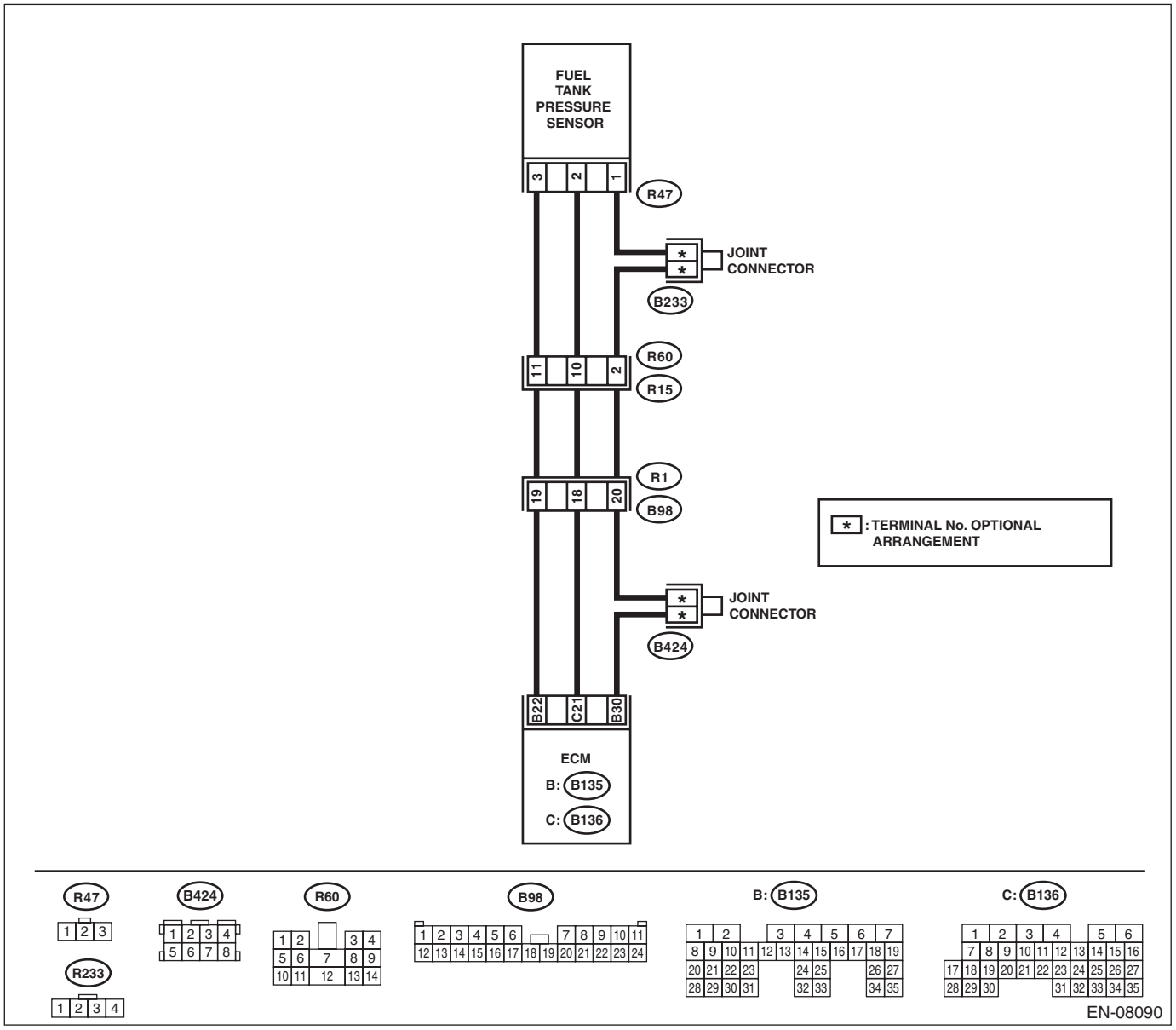
CJ:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-134, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of fuel tank pressure sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than –7.45 kPa (–55.85 mmHg, –2.2003 inHg) ?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK FUEL TANK PRESSURE SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the fuel tank pressure sensor connector and chassis ground. ***Connector & terminal*** ***(R47) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel tank pressure sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between the ECM and fuel tank pressure sensor connector. ***Connector & terminal*** ***(B136) No. 21 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel tank pressure sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and fuel tank pressure sensor connector.
5	**CHECK FOR POOR CONTACT.** Check for poor contact between the ECM and fuel tank pressure sensor connector.	Is there poor contact of the ECM or fuel tank pressure sensor connector?	Repair the poor contact of the ECM or fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H6DO)-12, Fuel Tank Pressure Sensor.>

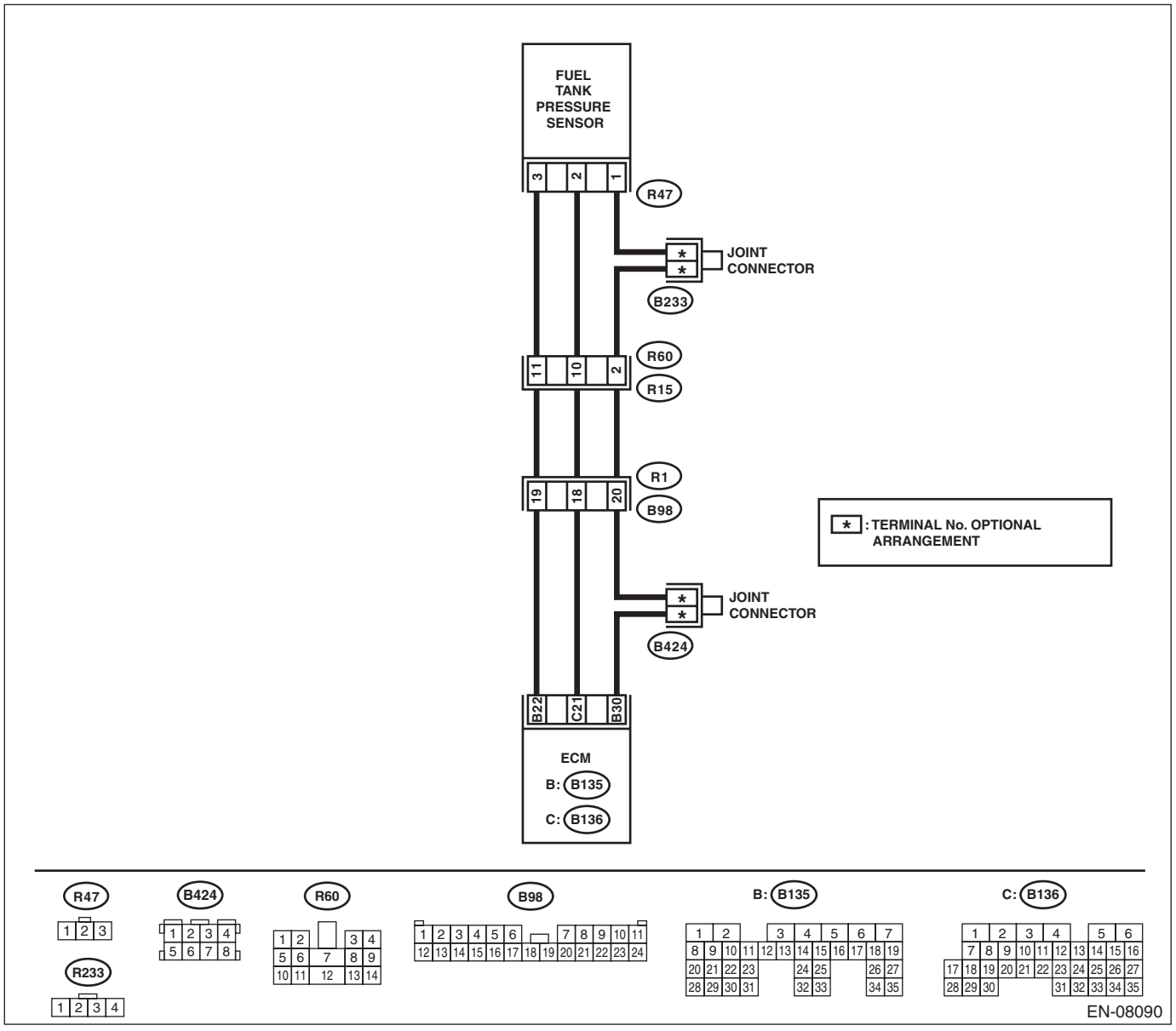
CK:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-136, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of fuel tank pressure sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 7.98 kPa (59.85 mmHg, 2.357 inHg) or more?	Go to step **2**.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 7.98 kPa (59.85 mmHg, 2.357 inHg) or more?	Repair the short circuit to power in the harness between ECM and fuel tank pressure sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. ***Connector & terminal*** ***(R47) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel tank pressure sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
4	**CHECK FOR POOR CONTACT.** Check for poor contact of the fuel tank pressure sensor connector.	Is there poor contact of fuel tank pressure sensor connector?	Repair the poor contact of fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H6DO)-12, Fuel Tank Pressure Sensor.>

CL:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION<Ref. to GD(H6DO)-137, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode<Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode<Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain has caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap genuine?	Go to step **3**.	Replace with a genuine fuel filler cap.
3	**CHECK FUEL FILLER PIPE GASKET.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H6DO)-64, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: Drain valve can be operated using the Subaru Select Monitor. For procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-58, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H6DO)-15, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-58, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **6**.	Replace the purge control solenoid valve. <Ref. to EC(H6DO)-7, Purge Control Solenoid Valve.>
6	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the delivery (test) mode connector.	Is there any hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H6DO)-75, Fuel Delivery and Evaporation Lines.>	Go to step **7**.

Step		Check	Yes	No
7	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H6DO)-6, Canister.>	Go to step **8**.
8	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H6DO)-61, Fuel Tank.>	Is the fuel tank damaged or is there any hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H6DO)-61, Fuel Tank.>	Go to step **9**.
9	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Is there any hole of more than 0.5 mm (0.020 in) dia., crack, clogging, or disconnection, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of ECM connector.

CM:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION<Ref. to GD(H6DO)-137, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Fuel odor
- Fuel filler cap loose or lost

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode<Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode<Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain has caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap genuine?	Go to step **3**.	Replace with a genuine fuel filler cap.
3	**CHECK FUEL FILLER PIPE GASKET.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H6DO)-64, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: Drain valve can be operated using the Subaru Select Monitor. For procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-58, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H6DO)-15, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-58, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **6**.	Replace the purge control solenoid valve. <Ref. to EC(H6DO)-7, Purge Control Solenoid Valve.>
6	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the delivery (test) mode connector.	Is there any disconnection, damage or clogging on the evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H6DO)-75, Fuel Delivery and Evaporation Lines.>	Go to step **7**.

Step		Check	Yes	No
7	**CHECK CANISTER.**	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H6DO)-6, Canister.>	Go to step **8**.
8	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H6DO)-61, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H6DO)-61, Fuel Tank.>	Go to step **9**.
9	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes, cracks, clogging, or disconnection, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of ECM connector.

CN:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-138, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

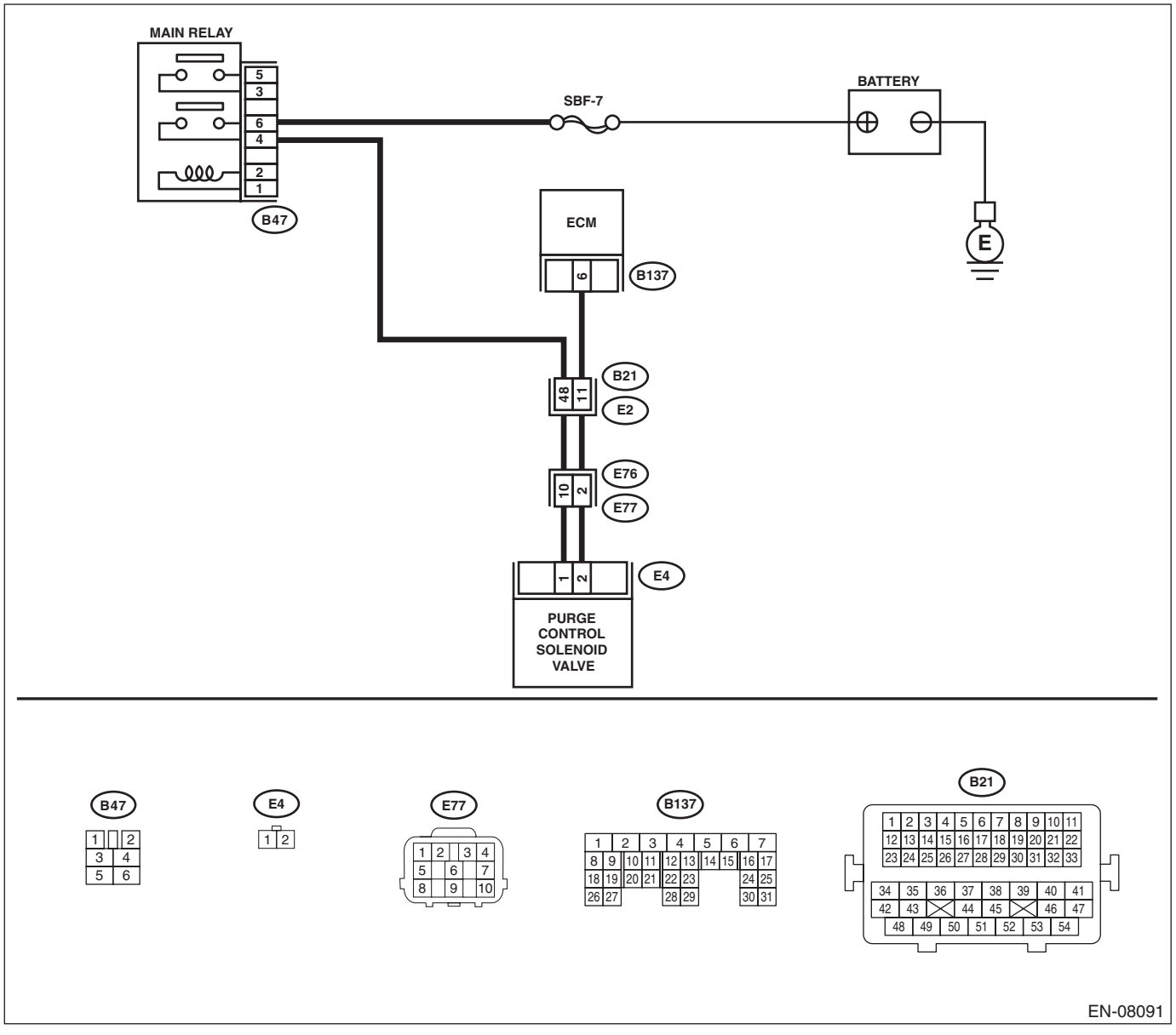
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Go to step **3**.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary open or short circuit of harness or temporary poor contact of connector may be the cause.
3	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve. 3) Measure the resistance between the purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and purge control solenoid valve connector.
5	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve. ***Connector & terminal*** ***(B137) No. 6 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact of coupling connector
6	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Repair the poor contact of purge control solenoid valve connector.	Replace the purge control solenoid valve. <Ref. to EC(H6DO)-7, Purge Control Solenoid Valve.>

CO:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-140, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

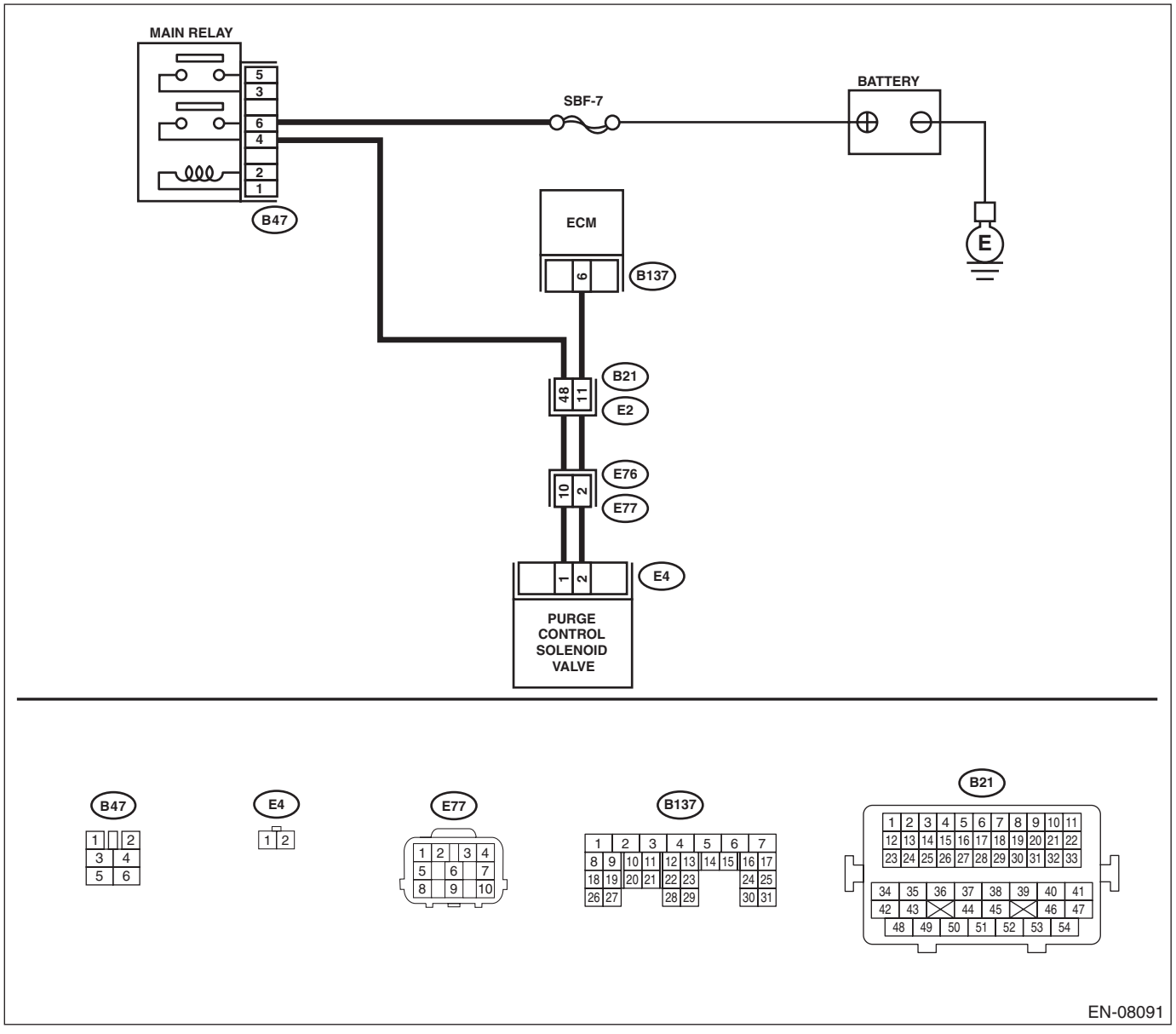
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and purge control solenoid valve connector.	Go to step **2**.
2	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve. <Ref. to EC(H6DO)-7, Purge Control Solenoid Valve.>	Repair the poor contact of ECM connector.

CP:DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-142, DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Replace the fuel level sensor and fuel sub level sensor. <Ref. to FU(H6DO)-68, Fuel Level Sensor.> <Ref. to FU(H6DO)-69, Fuel Sub Level Sensor.>

CQ:DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW

NOTE:
For the diagnostic procedure, refer to DTC P0463. <Ref. to EN(H6DO)(diag)-251, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CR:DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-146, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is DTC P0462 or P0463 displayed on the Subaru Select Monitor?	Check the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.

CS:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-148, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is DTC P0464 displayed on the display?	Check the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.

CT:DTC P0500 VEHICLE SPEED SENSOR “A”

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-151, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK DTC OF VDC.** Check DTC of VDC.	Is DTC of VDC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact of ECM connector.

CU:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-152, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start the engine.
- Engine does not start.
- Improper idling
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK AIR CLEANER ELEMENT.** 1) Turn the ignition switch to OFF. 2) Check the air cleaner element.	Is there excessive clogging on air cleaner element?	Replace the air cleaner element. <Ref. to IN(H6DO)-4, Air Cleaner Element.>	Go to step **3**.
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Remove the electronic throttle control. 2) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101. <Ref. to EN(H6DO)(diag)-329, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CV:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-153, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Engine keeps running at higher speed than specified idle speed.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.** 1) Start and idle the engine. 2) Check the following items. • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnection of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step **3**.
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101. <Ref. to EN(H6DO)(diag)-329, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CW:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-154, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

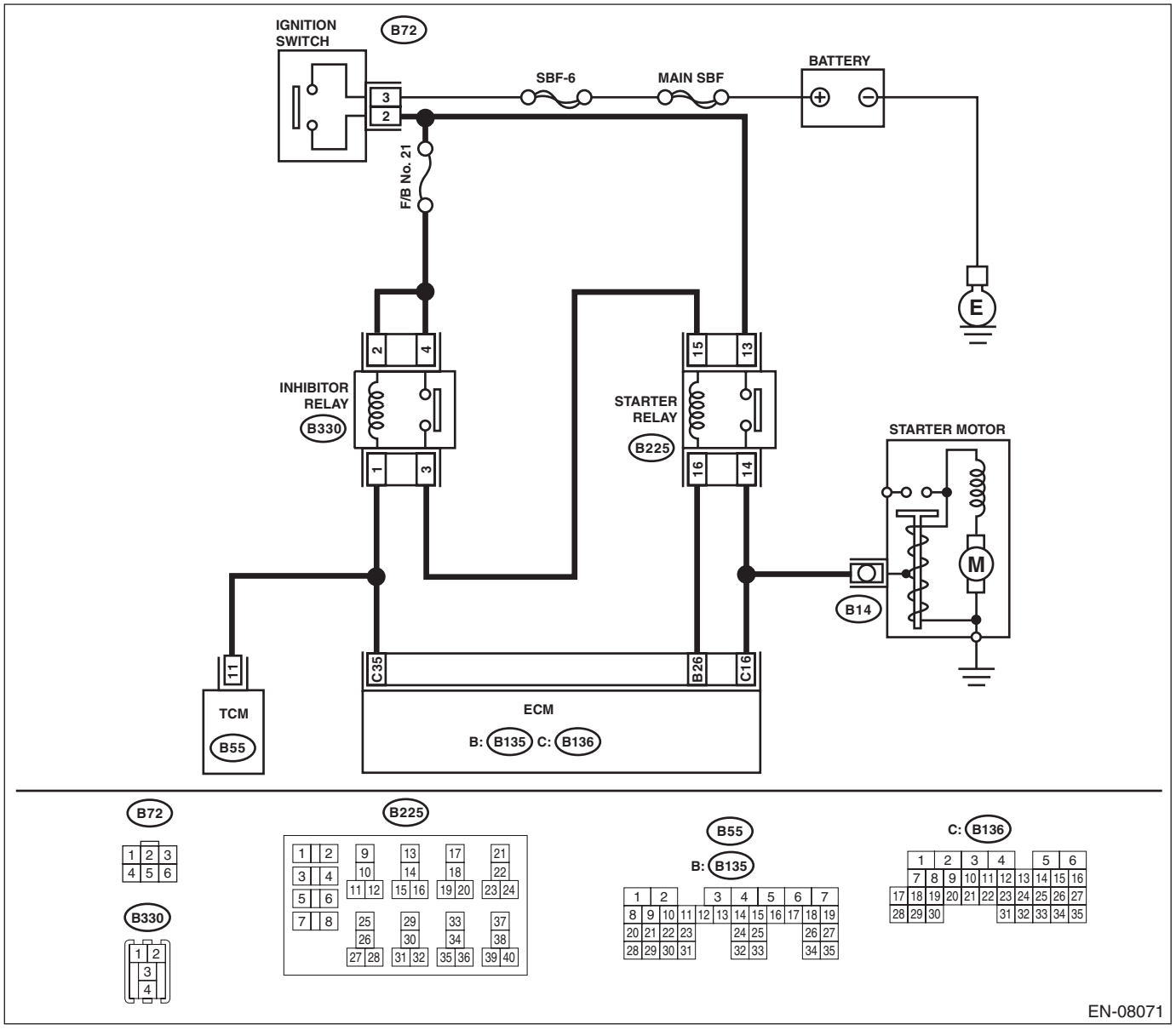
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power supply in harness between ECM and starter relay connector.	Repair the poor contact of ECM connector.

CX:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-156, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Even if DTC is detected, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.

CY:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H6DO)(diag)-258, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CZ:DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-158, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

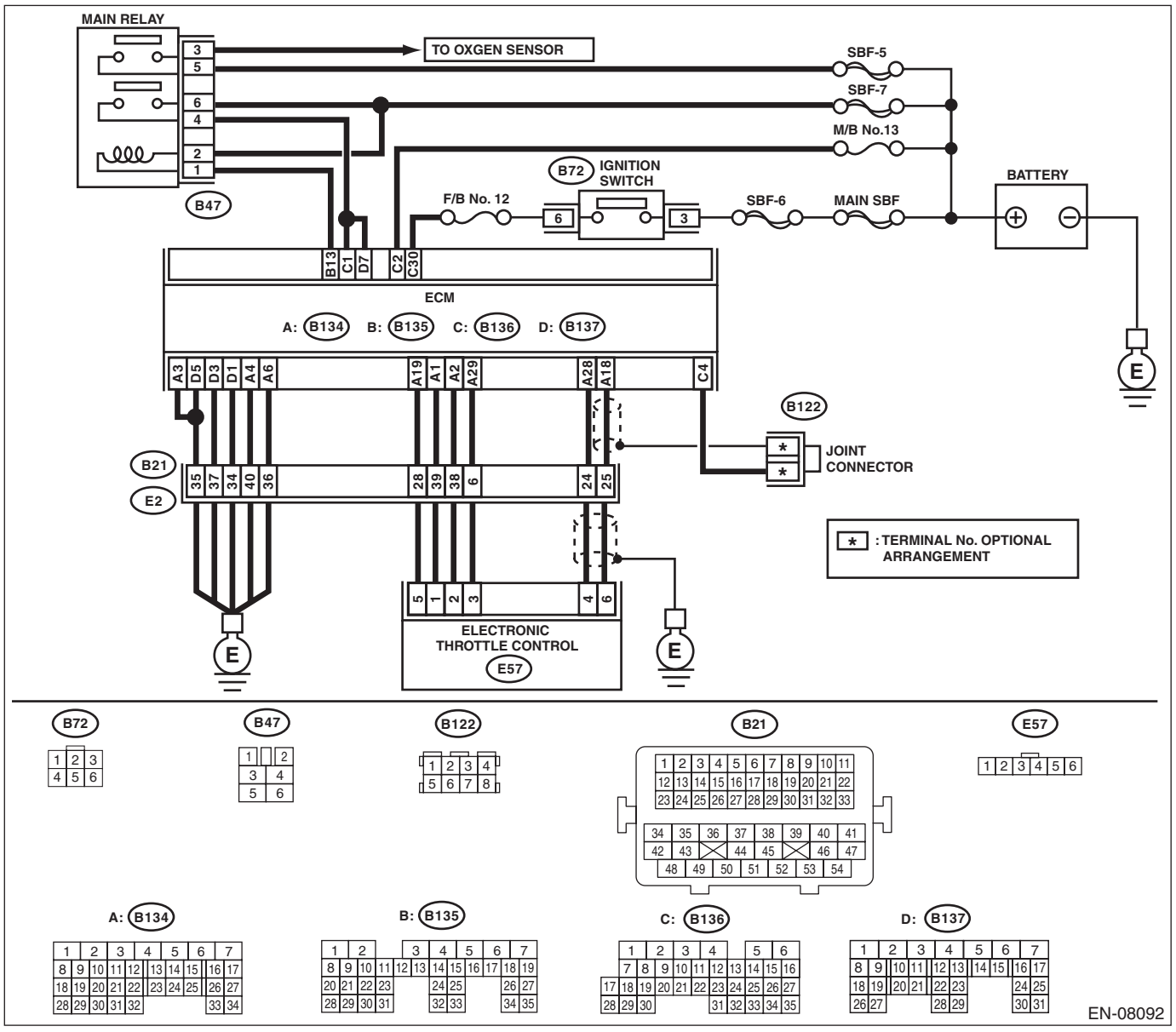
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **2**.	Repair the open or ground short circuit of power supply circuit.
2	**CHECK INPUT VOLTAGE OF ECM.** 1) Start the engine. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — Chassis ground (–):***	Is the voltage 13 — 15 V?	Go to step **3**.	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 19 — (E57) No. 5:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
4	**CHECK ECM GROUND HARNESS.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):*** ***(B134) No. 4 (+) — Chassis ground (–):*** ***(B134) No. 6 (+) — Chassis ground (–):*** ***(B137) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 3 (+) — Chassis ground (–):*** ***(B137) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in ground circuit • Further tightening of the engine ground terminal • Poor contact of coupling connector

DA:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-329, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DB:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 5AT(diag)-2, Basic Diagnostic Procedure.>

DC:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

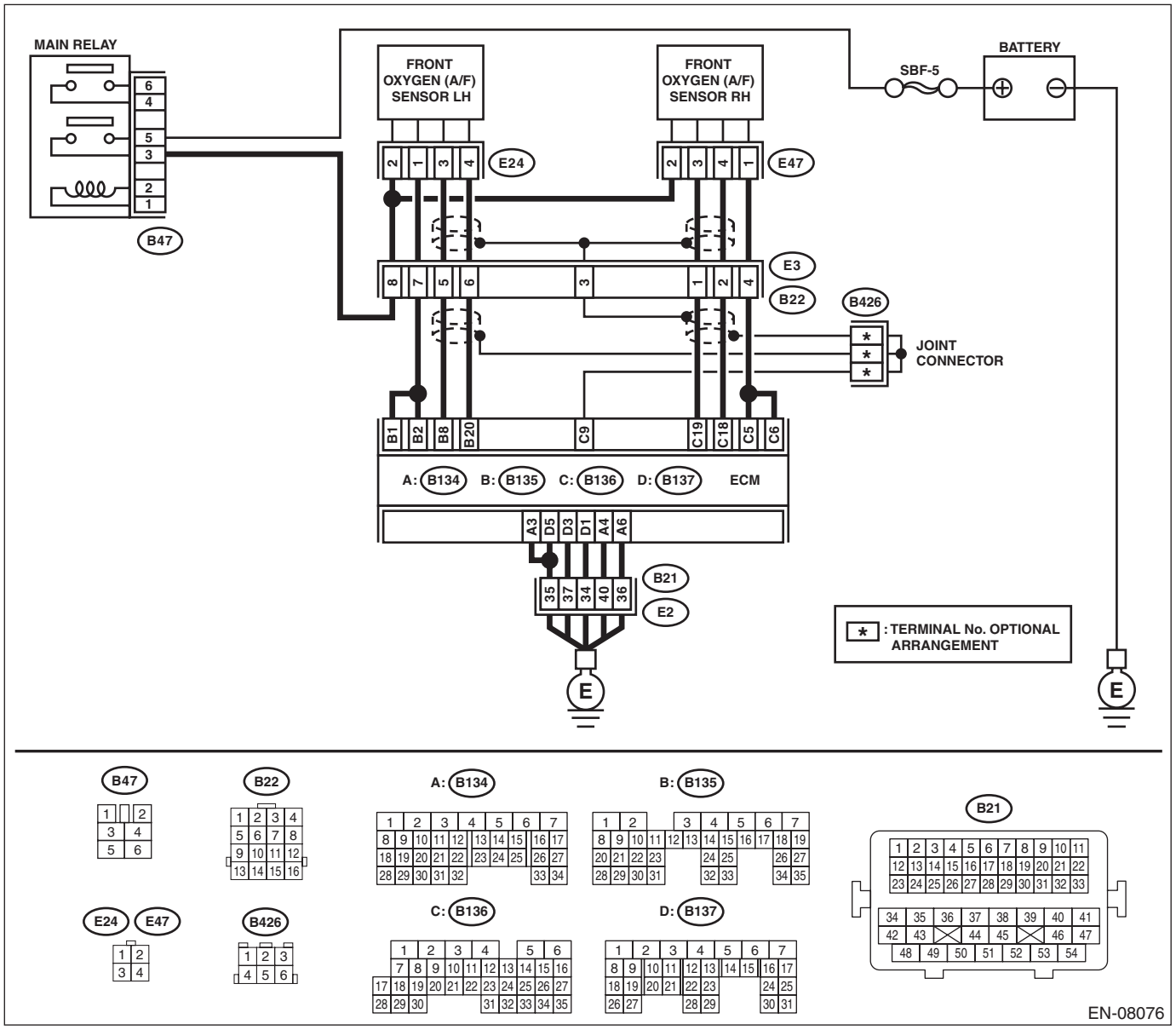
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-163, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 19 — (E47) No. 3:*** ***(B136) No. 18 — (E47) No. 4:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
3	**CHECK FOR POOR CONTACT.** Check for poor contact of the front oxygen (A/F) sensor connector.	Is there poor contact of front oxygen (A/F) sensor connector?	Repair the poor contact of front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

DD:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

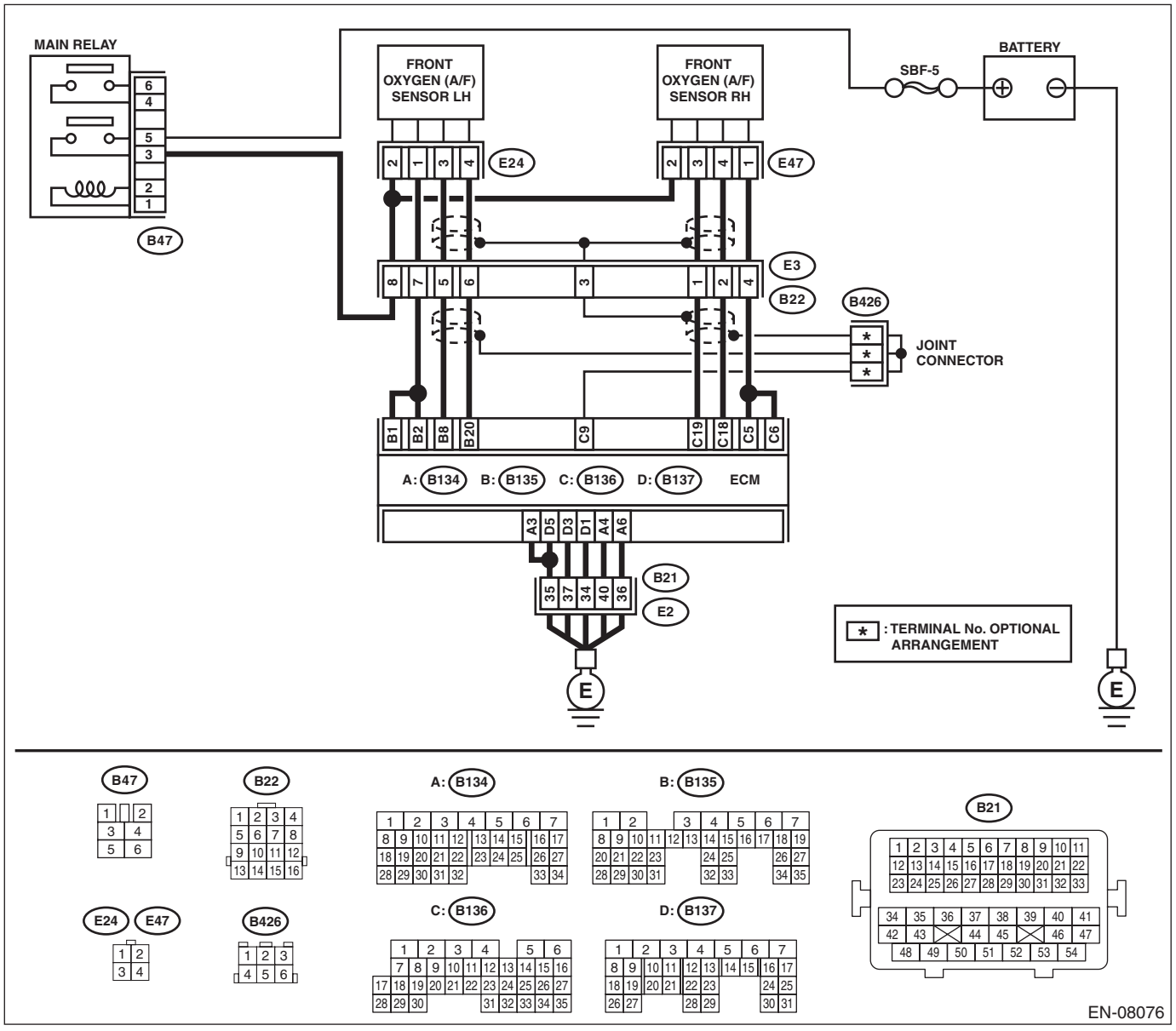
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-165, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **5**.	Go to step **4**.
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **5**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 (+) — Chassis ground (–):*** ***(B136) No. 18 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.

DE:DTC P1154 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1)

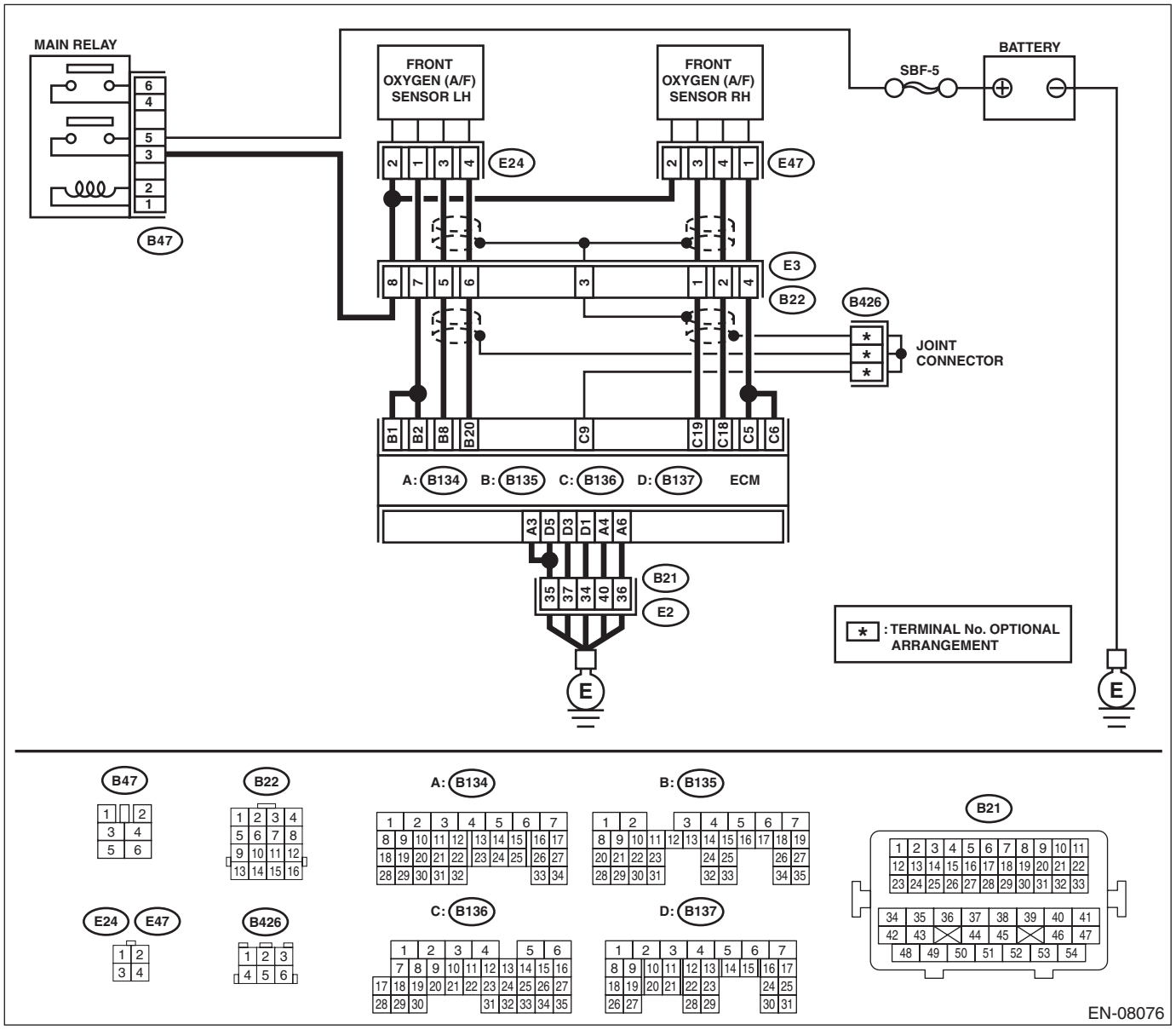
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-167, DTC P1154 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 8 — (E24) No. 3:*** ***(B135) No. 20 — (E24) No. 4:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
3	**CHECK FOR POOR CONTACT.** Check for poor contact of the front oxygen (A/F) sensor connector.	Is there poor contact of front oxygen (A/F) sensor connector?	Repair the poor contact of front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>

DF:DTC P1155 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1)

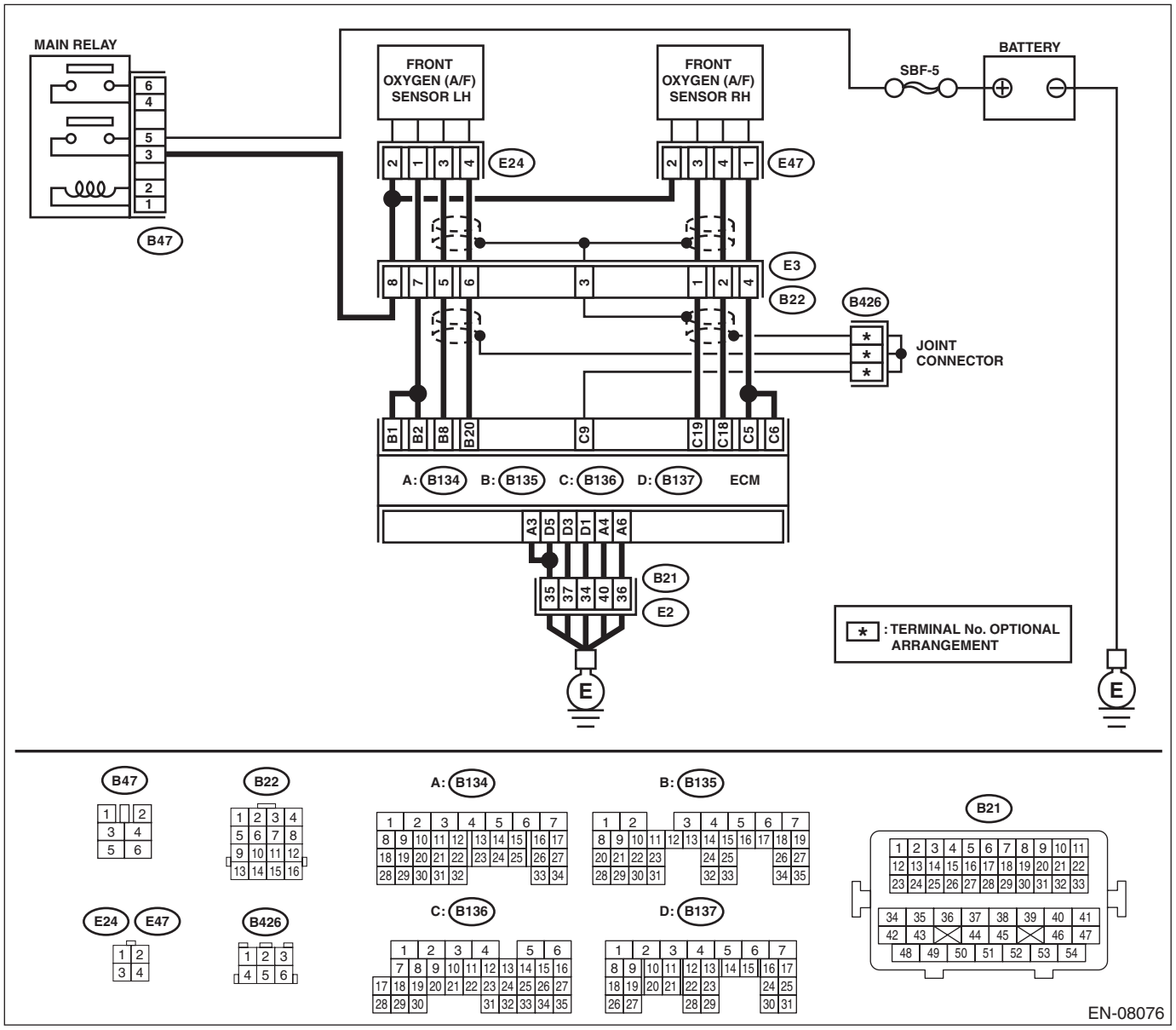
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-167, DTC P1155 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 — Chassis ground:*** ***(B135) No. 20 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **5**.	Go to step **4**.
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **5**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.

DG:DTC P1160 RETURN SPRING FAILURE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-329, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DH:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-170, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK DRAIN HOSE.** Check the drain hose for clogging.	Is there clogging in the drain hose?	Replace the drain hose.	Go to step **3**.
3	**CHECK DRAIN VALVE OPERATION.** 1) Turn the ignition switch to OFF. 2) Install the delivery (test) mode connector. 3) Turn the ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve can be operated using the Subaru Select Monitor. For procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-58, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Repair the poor contact of ECM connector.	Replace the drain valve. <Ref. to EC(H6DO)-15, Drain Valve.>

DI: DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H6DO)(diag)-270, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DJ:DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H6DO)(diag)-273, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DK:DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H6DO)(diag)-270, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DL:DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H6DO)(diag)-273, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DM:DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H6DO)(diag)-270, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DN:DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H6DO)(diag)-273, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DO:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-172, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-176, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-176, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-176, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

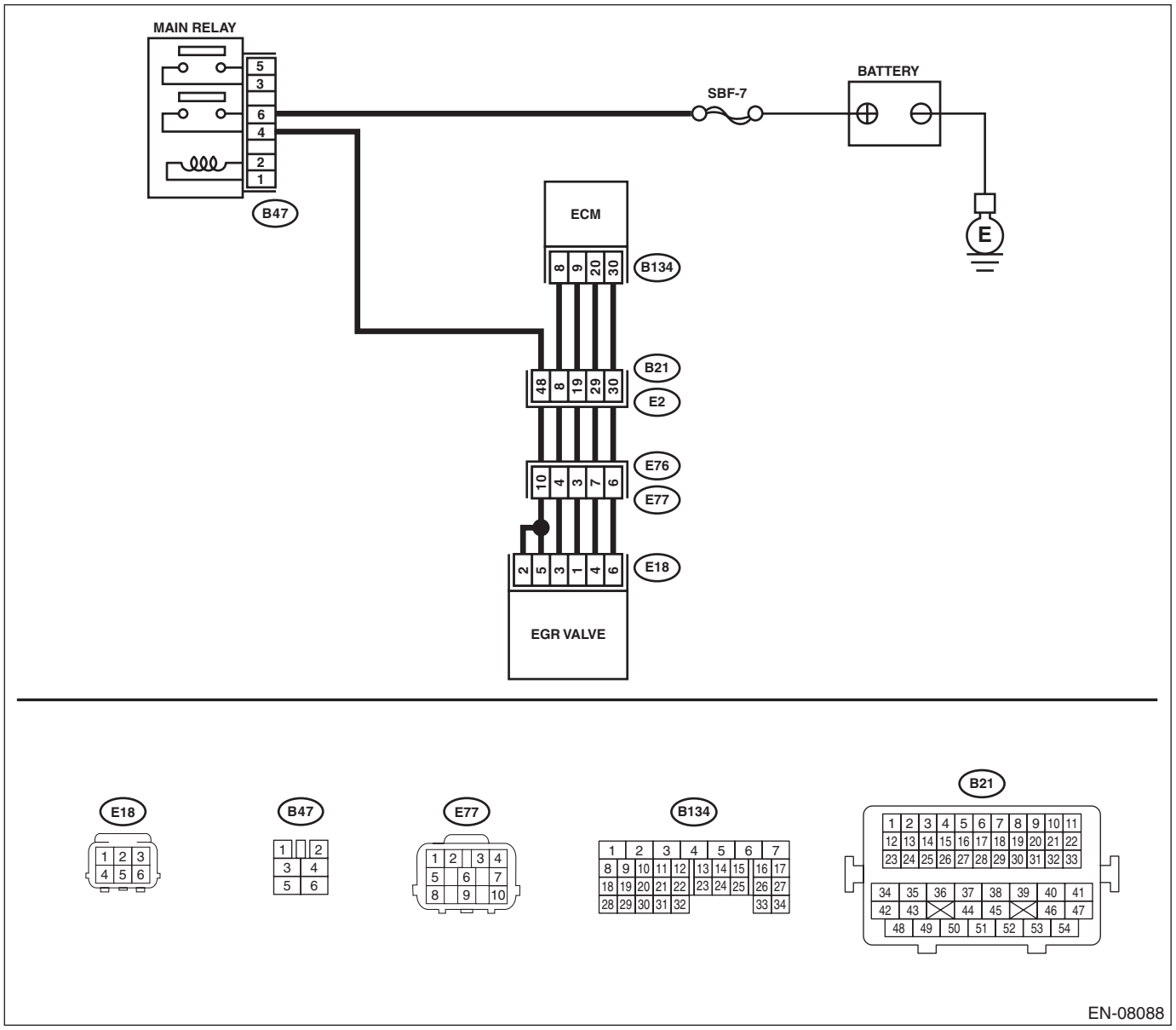
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine breathing

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POWER SUPPLY TO EGR VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from EGR valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between EGR valve connector and engine ground. ***Connector & terminal*** ***(E18) No. 2 (+) — Engine ground (–):*** ***(E18) No. 5 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between EGR valve connector and main relay connector • Poor contact of coupling connector

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND EGR VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and EGR valve connector. ***Connector & terminal*** ***DTC P1492; (B134) No. 8 — (E18) No. 3:*** ***DTC P1494; (B134) No. 9 — (E18) No. 1:*** ***DTC P1496; (B134) No. 20 — (E18) No. 4:*** ***DTC P1498; (B134) No. 30 — (E18) No. 6:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and EGR valve connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND EGR VALVE CONNECTOR.** 1) Disconnect the connectors from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***DTC P1492; (B134) No. 8 — Chassis ground:*** ***DTC P1494; (B134) No. 9 — Chassis ground:*** ***DTC P1496; (B134) No. 20 — Chassis ground:*** ***DTC P1498; (B134) No. 30 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the ground short in harness between ECM and EGR valve connector.
4	**CHECK FOR POOR CONTACT.** Check poor contact of ECM and EGR valve connectors.	Is there poor contact of ECM or EGR valve connector?	Repair the poor contact of ECM or EGR valve connector.	Replace the EGR valve. <Ref. to FU(H6DO)-40, EGR Valve.>

DP:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-174, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-176, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-176, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-176, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

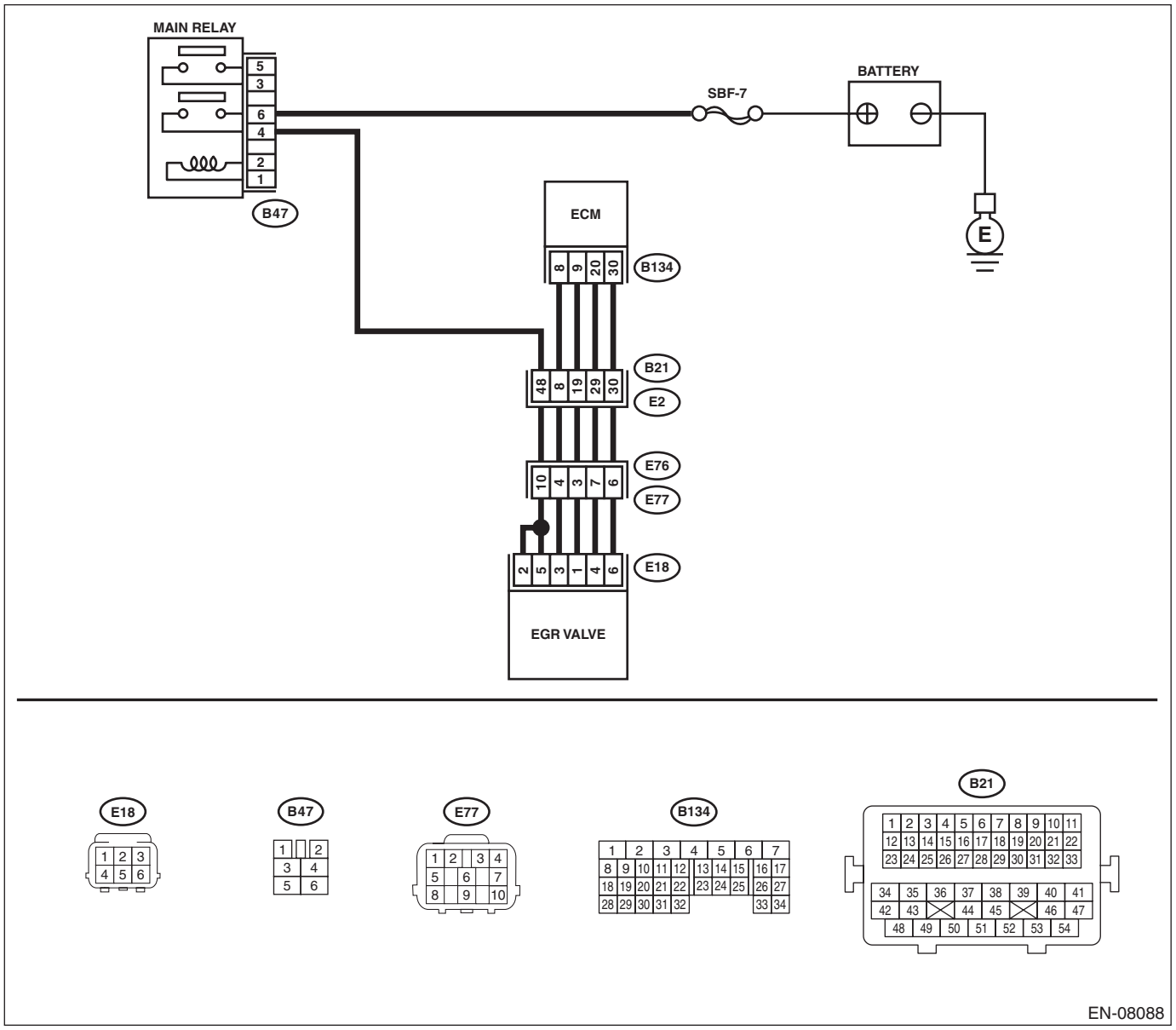
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine breathing

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND EGR VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and EGR valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***DTC P1493; (B134) No. 8 (+) — Chassis ground (–):*** ***DTC P1495; (B134) No. 9 (+) — Chassis ground (–):*** ***DTC P1497; (B134) No. 20 (+) — Chassis ground (–):*** ***DTC P1499; (B134) No. 30 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power supply in harness between ECM and EGR valve connector.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK EGR VALVE.** Measure the resistance between EGR valve terminals. ***Terminals*** ***DTC P1493; No. 2 — No. 3:*** ***DTC P1493; No. 5 — No. 3:*** ***DTC P1495; No. 2 — No. 1:*** ***DTC P1495; No. 5 — No. 1:*** ***DTC P1497; No. 2 — No. 4:*** ***DTC P1497; No. 5 — No. 4:*** ***DTC P1499; No. 2 — No. 6:*** ***DTC P1499; No. 5 — No. 6:***	Is the resistance 20 Ω or more?	Repair the poor contact of ECM connector.	Replace the EGR valve. <Ref. to FU(H6DO)-40, EGR Valve.>

DQ:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-177, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

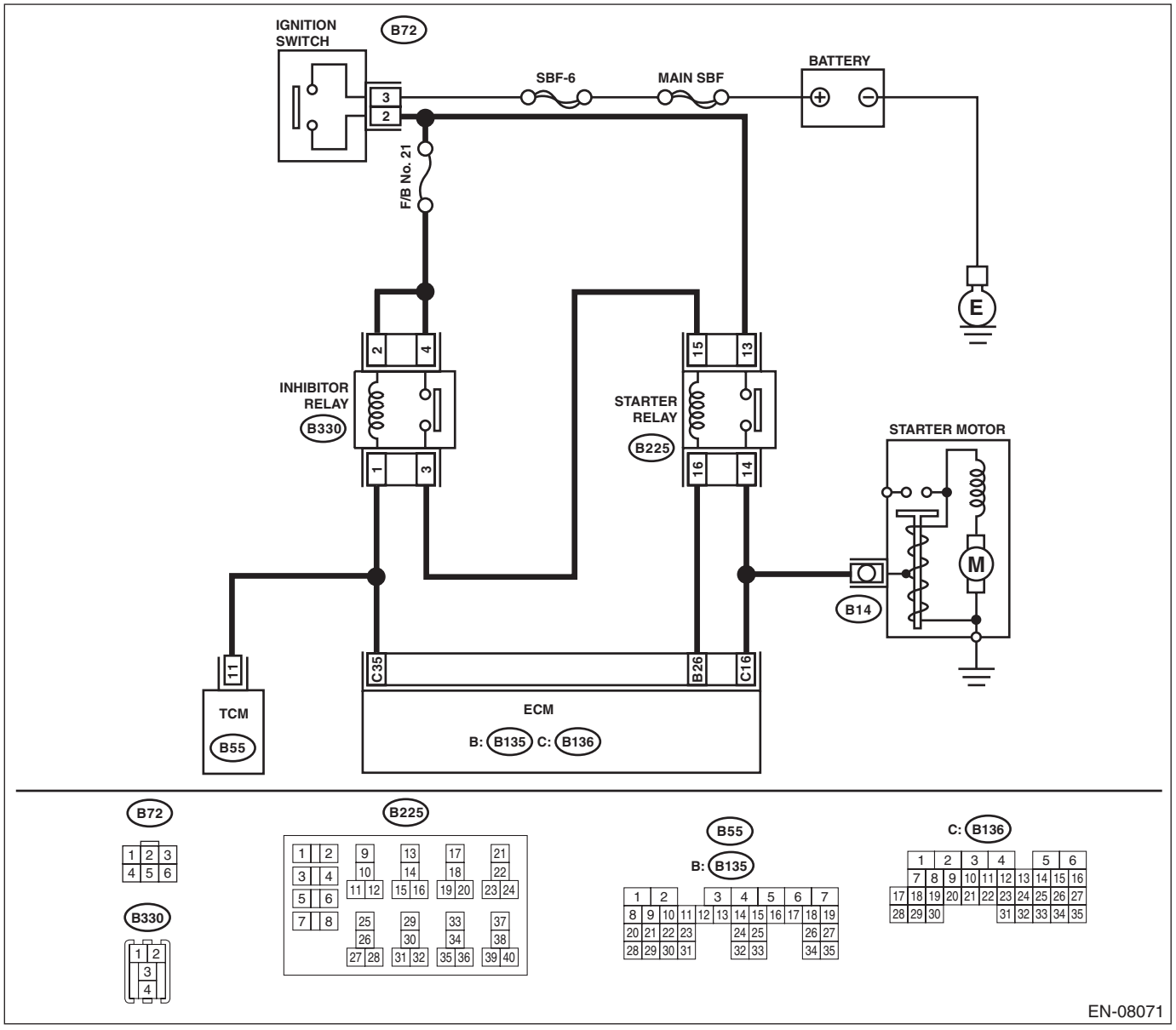
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the starter relay. 3) Disconnect the connectors from ECM and starter motor. 4) Measure the resistance of harness between ECM and starter relay connector. ***Connector & terminal*** ***(B136) No. 16 — (B225) No. 14:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness between ECM and starter relay connector.
3	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact of ECM connector.	Repair the short circuit to ground in harness between ECM and starter relay connector.

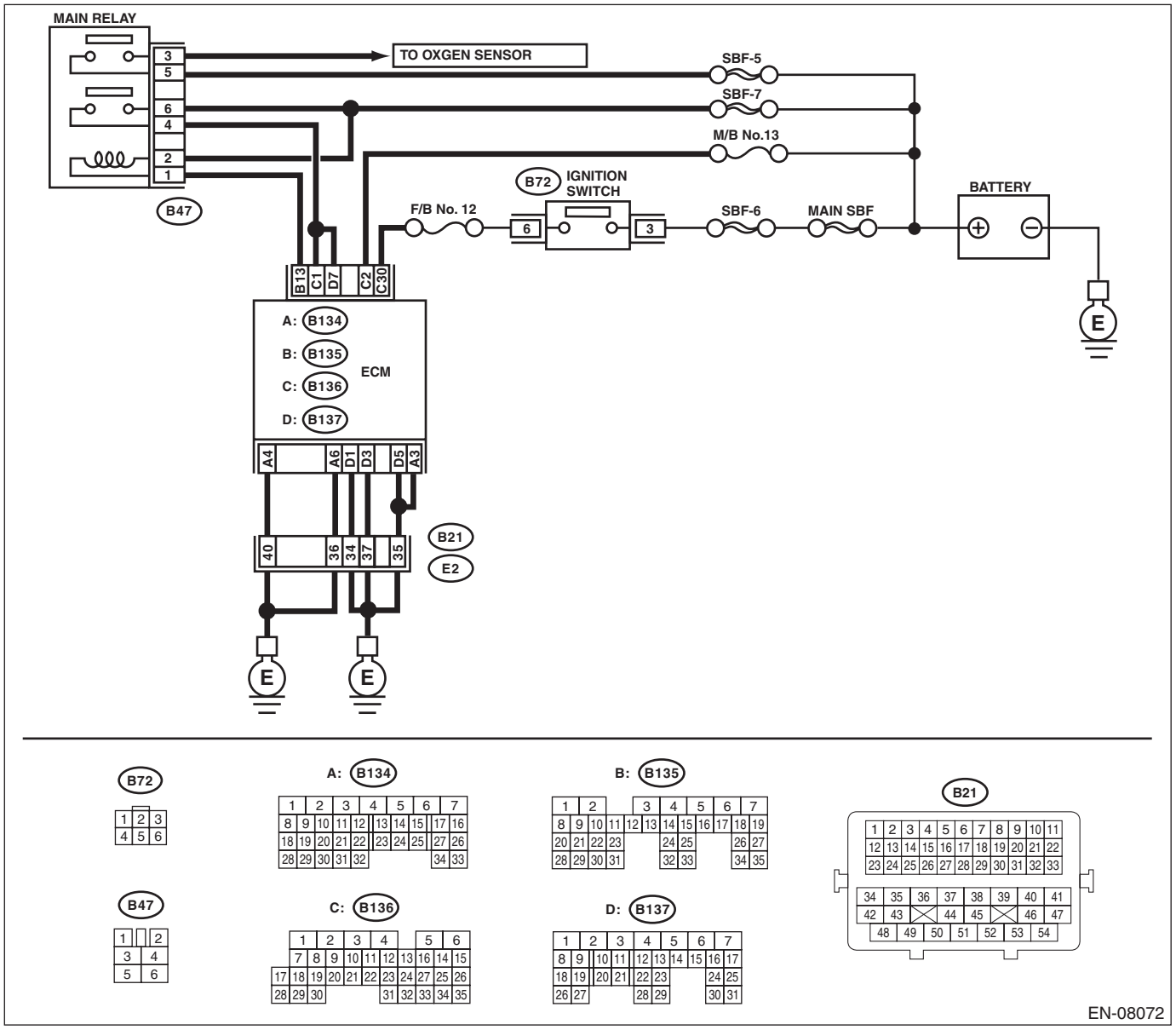
DR:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-178, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of ECM connector.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connectors from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and battery terminal.
3	**CHECK M/B FUSE NO. 13.**	Is the fuse blown out?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and battery • Poor contact of ECM connector • Poor contact of battery terminal

DS:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-180, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

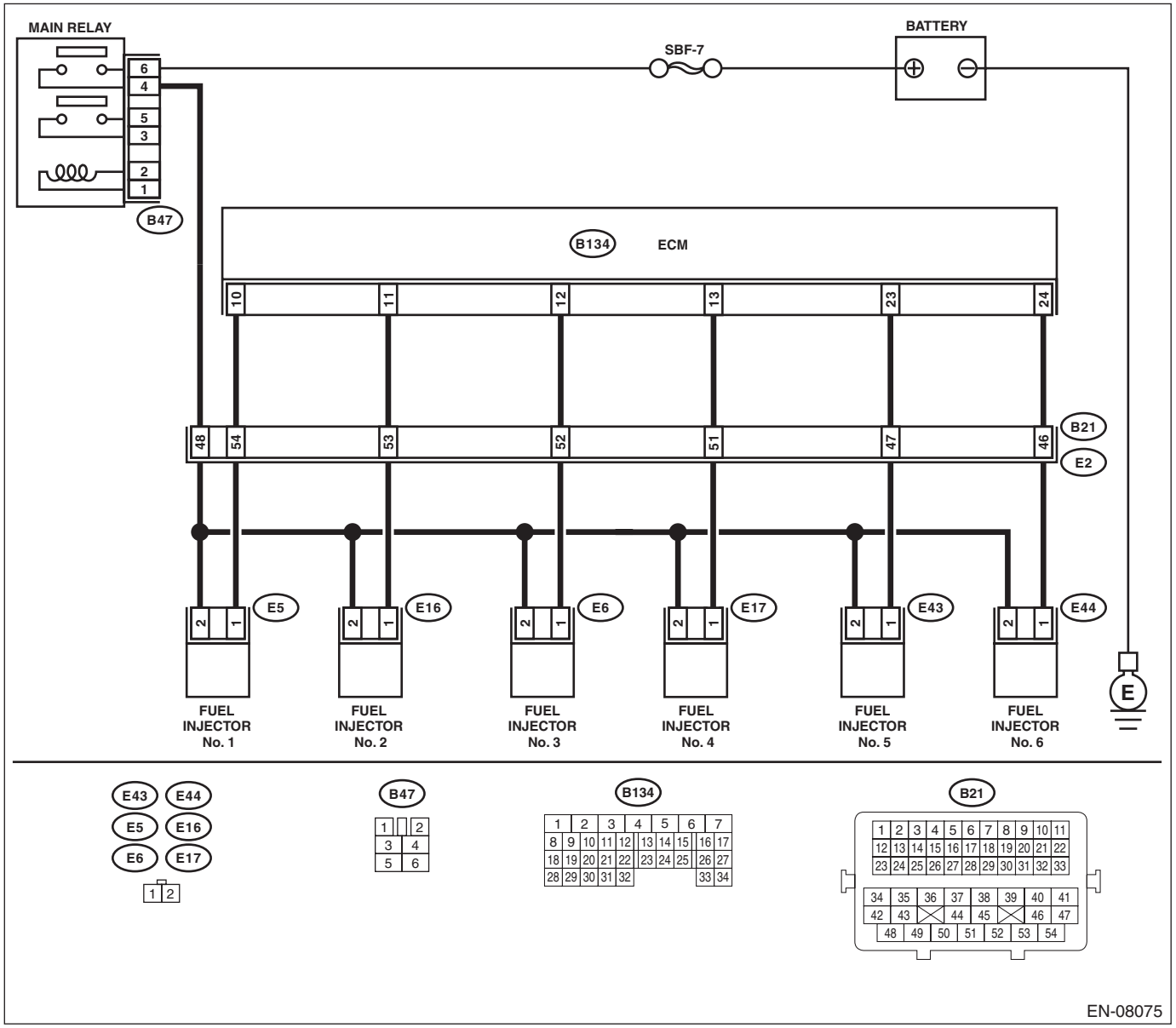
TROUBLE SYMPTOM:

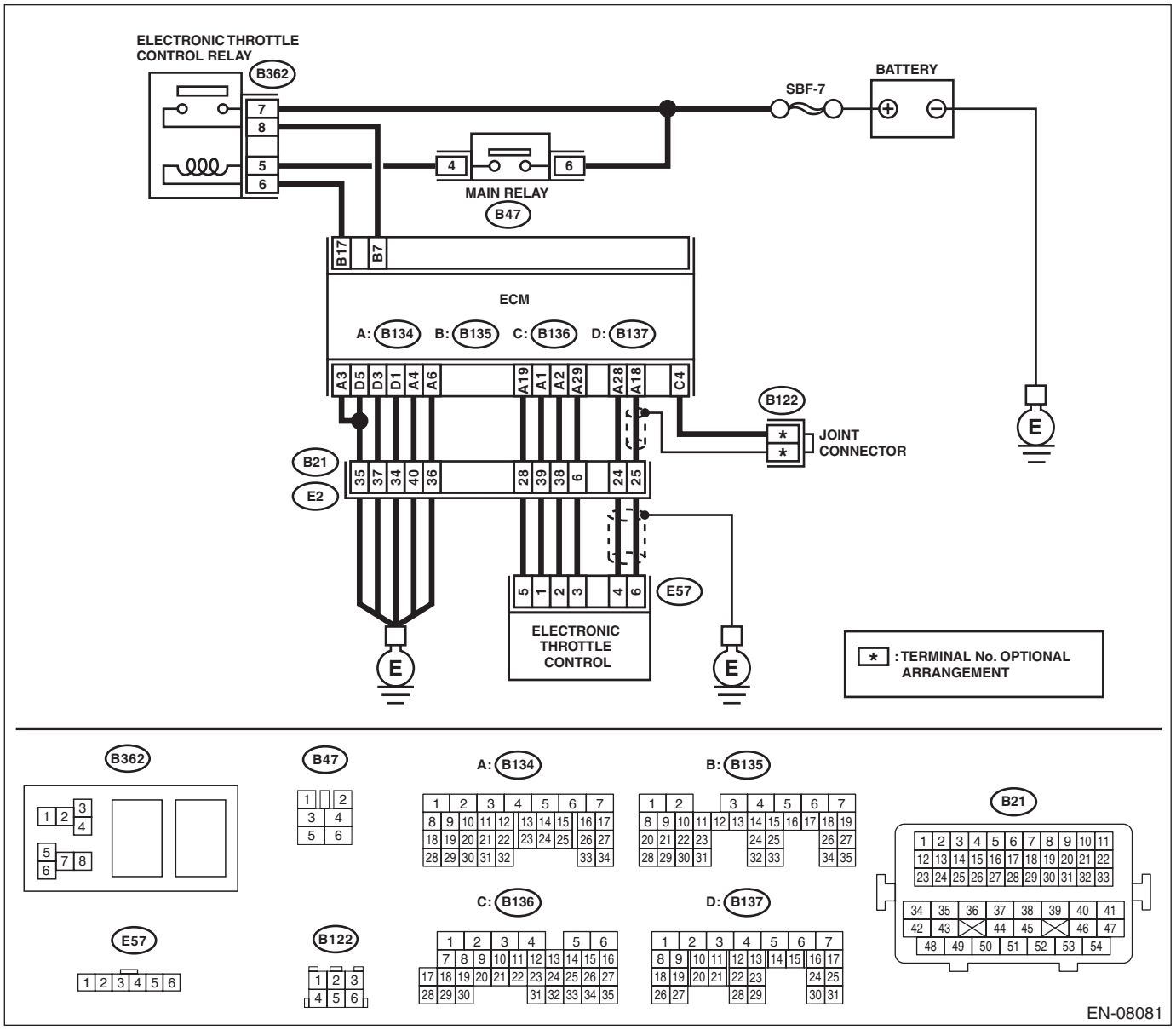
- Engine keeps running at higher speed than specified idle speed.
- Engine keeps running at a lower speed than the specified idle speed.
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ENGINE OIL.**	Is there a proper amount of engine oil?	Go to step **3**.	Replace engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
3	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **4**.

	Step	Check	Yes	No
4	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **5**.
5	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** Measure the fuel pressure. <Ref. to ME(H6DO)-32, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 333 — 363 kPa (3.4 — 3.7 kgf/cm^2, 48 — 53 psi)?	Go to step **6**.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
6	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **7**.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **8**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
8	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **9**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>
9	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):*** ***#5 (B134) No. 23 (+) — Chassis ground (–):*** ***#6 (B134) No. 24 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **14**.	Go to step **10**.
10	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between fuel injector connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:*** ***#5 (E43) No. 1 — Engine ground:*** ***#6 (E44) No. 1 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **11**.	Repair the ground short circuit of harness between ECM and fuel injector.
11	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** Measure the resistance of harness between ECM and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 — (E5) No. 1:*** ***#2 (B134) No. 11 — (E16) No. 1:*** ***#3 (B134) No. 12 — (E6) No. 1:*** ***#4 (B134) No. 13 — (E17) No. 1:*** ***#5 (B134) No. 23 — (E43) No. 1:*** ***#6 (B134) No. 24 — (E44) No. 1:***	Is the resistance less than 1 Ω?	Go to step **12**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact of coupling connector

	Step	Check	Yes	No
12	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **13**.	Replace the faulty fuel injector. <Ref. to FU(H6DO)-41, Fuel Injector.>
13	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):*** ***#5 (E43) No. 2 (+) — Engine ground (–):*** ***#6 (E44) No. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between the main relay and fuel injector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector
14	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):*** ***#5 (B134) No. 23 (+) — Chassis ground (–):*** ***#6 (B134) No. 24 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between the ECM and fuel injector.	Go to step **15**.
15	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Replace the faulty fuel injector. <Ref. to FU(H6DO)-41, Fuel Injector.>	Go to step **16**.
16	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step **17**.
17	**CHECK CRANK PLATE.**	Is the crank sprocket rusted or the teeth of crank plate broken?	Replace the crank plate. <Ref. to ME(H6DO)-97, Cylinder Block.>	Go to step **18**.
18	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn the crankshaft using ST, and align the alignment mark on crank sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET	Is the timing chain dislocated from its proper position?	Correct the installation condition of timing chain. <Ref. to ME(H6DO)-54, Timing Chain Assembly.>	Go to step **19**.

	Step	Check	Yes	No
19	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 5 and No. 6 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **20**.	Replace the electronic throttle control relay. <Ref. to EN(H6DO)(diag)-9, Electrical Component Location.>
20	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **21**.	Repair the open or ground short circuit of power supply circuit.
21	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control relay.	Go to step **22**.
22	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 — Chassis ground:*** ***(B362) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **23**.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
23	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 17 — (B362) No. 6:*** ***(B135) No. 7 — (B362) No. 8:***	Is the resistance less than 1 Ω?	Go to step **24**.	Repair the open circuit of harness between ECM and electronic throttle control relay.
24	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **25**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
25	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **26**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>
26	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 18 — (E57) No. 6:*** ***(B134) No. 28 — (E57) No. 4:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **27**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
27	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **28**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
28	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **29**.
29	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Go to step **30**.	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
30	**CHECK SENSOR OUTPUT.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **31**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-19, Throttle Body.>
31	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **32**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-19, Throttle Body.>
32	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 1 — (E57) No. 1:*** ***(B134) No. 2 — (E57) No. 2:***	Is the resistance less than 1 Ω?	Go to step **33**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control • Poor contact of coupling connector
33	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 (+) — Engine ground (–):*** ***(E57) No. 1 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control.	Go to step **34**.
34	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 — Engine ground:*** ***(E57) No. 1 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **35**.	Repair the short circuit to ground in harness between ECM and electronic throttle control.
35	**CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.** Measure the resistance between electronic throttle control connectors. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance 1 MΩ or more?	Go to step **36**.	Repair the short circuit of harness between ECM and electronic throttle control.

	Step	Check	Yes	No
36	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **37**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector
37	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 50 Ω or less?	Go to step **38**.	Replace the electronic throttle control. <Ref. to FU(H6DO)-19, Throttle Body.>
38	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Standard value: 3 mm (0.12 in) from fully closed position	Repair the poor contact of ECM connector.	Replace the electronic throttle control. <Ref. to FU(H6DO)-19, Throttle Body.>

DT:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-182, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

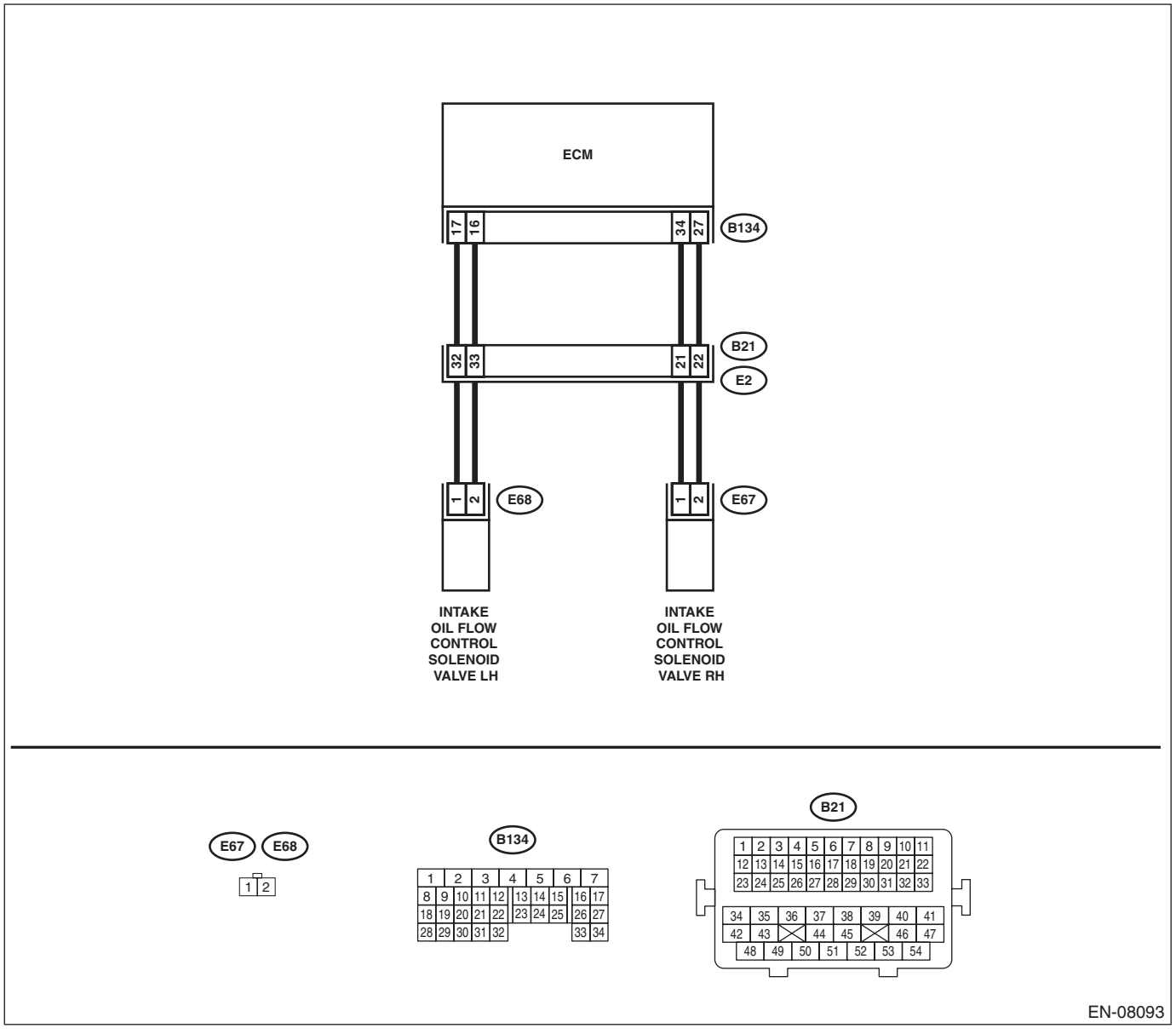
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve RH. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve RH connector. ***Connector & terminal*** ***(B134) No. 34 — (E67) No. 1:*** ***(B134) No. 27 — (E67) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil flow control solenoid valve RH connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 34 — Chassis ground:*** ***(B134) No. 27 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and oil flow control solenoid valve RH connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve RH connector RH.	Replace the oil flow control solenoid valve RH. <Ref. to FU(H6DO)-44, Oil Flow Control Solenoid Valve.>

DU:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-183, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

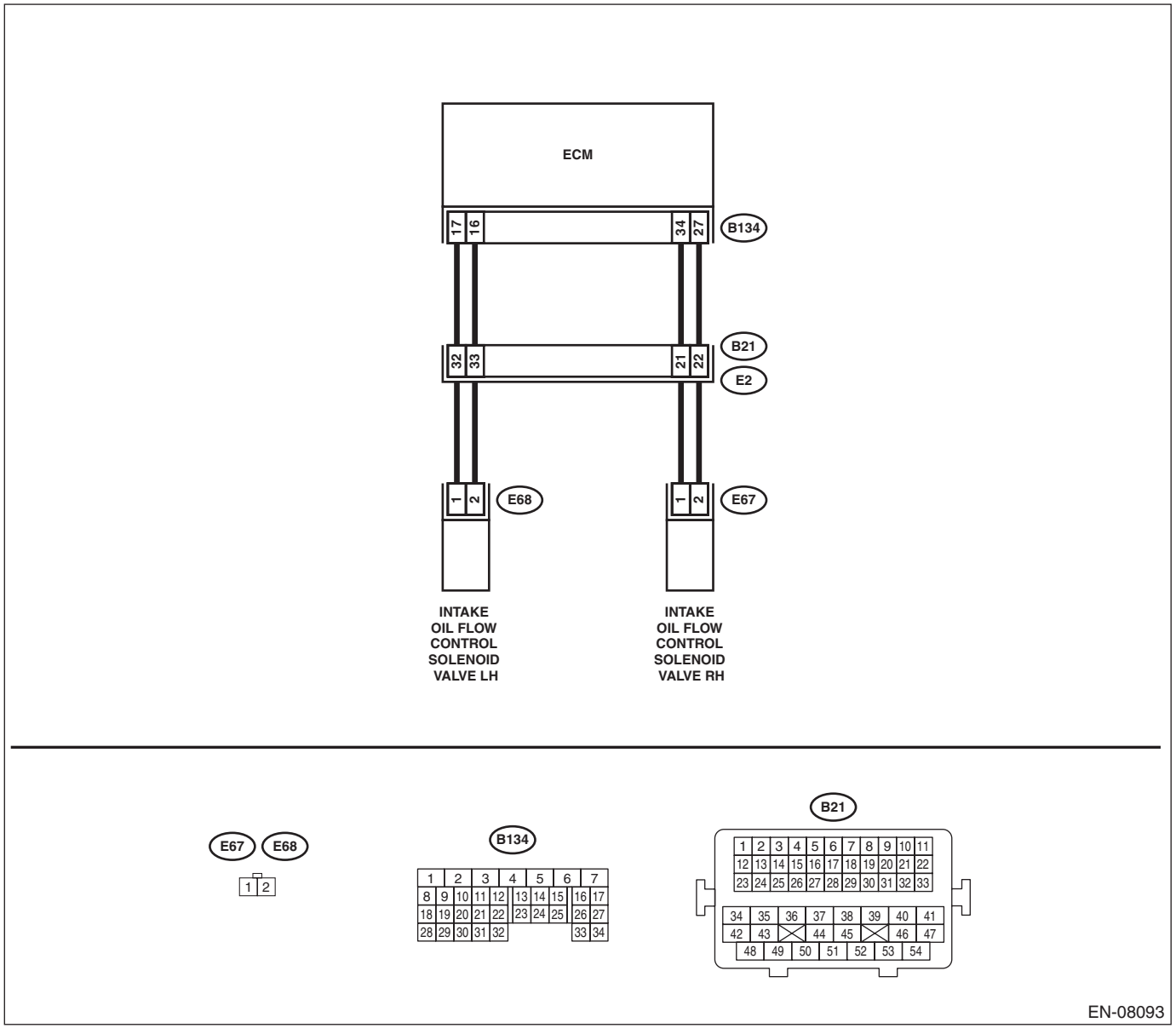
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve RH. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 34 (+) — Chassis ground (–):*** ***(B134) No. 27 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power supply in harness between ECM and oil flow control solenoid valve RH connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** Measure the resistance of harness between ECM and oil flow control solenoid valve RH connector. ***Connector & terminal*** ***(B134) No. 34 — (E67) No. 1:*** ***(B134) No. 27 — (E67) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil flow control solenoid valve RH connector • Poor contact of coupling connector
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve RH connector RH.	Replace the oil flow control solenoid valve RH. <Ref. to FU(H6DO)-44, Oil Flow Control Solenoid Valve.>

DV:DTC P2090 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-184, DTC P2090 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

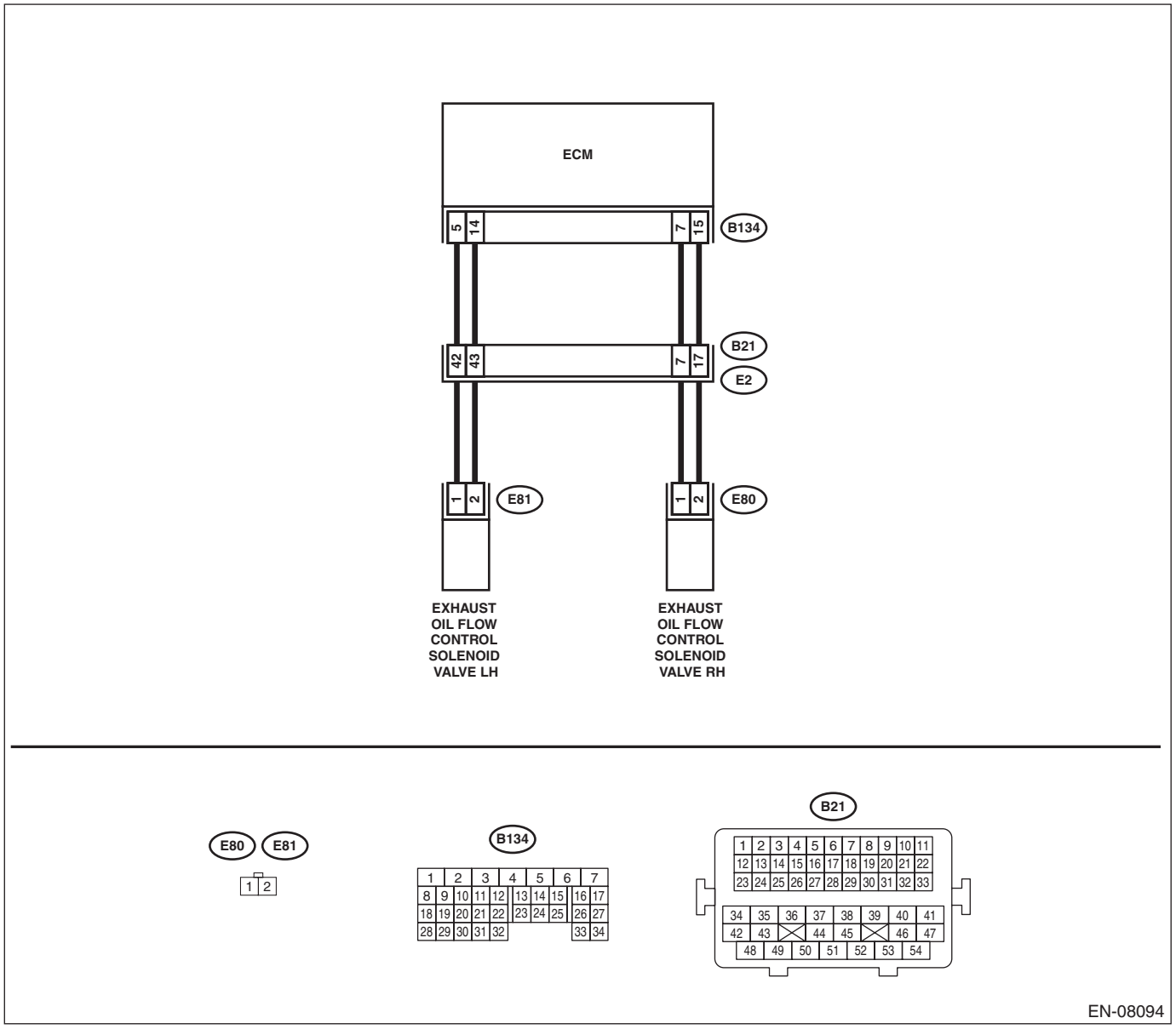
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve RH. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve RH connector. ***Connector & terminal*** ***(B134) No. 7 — (E80) No. 1:*** ***(B134) No. 15 — (E80) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil flow control solenoid valve RH connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 15 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and oil flow control solenoid valve RH connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve RH connector RH.	Replace the oil flow control solenoid valve RH. <Ref. to FU(H6DO)-44, Oil Flow Control Solenoid Valve.>

DW:DTC P2091 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-185, DTC P2091 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

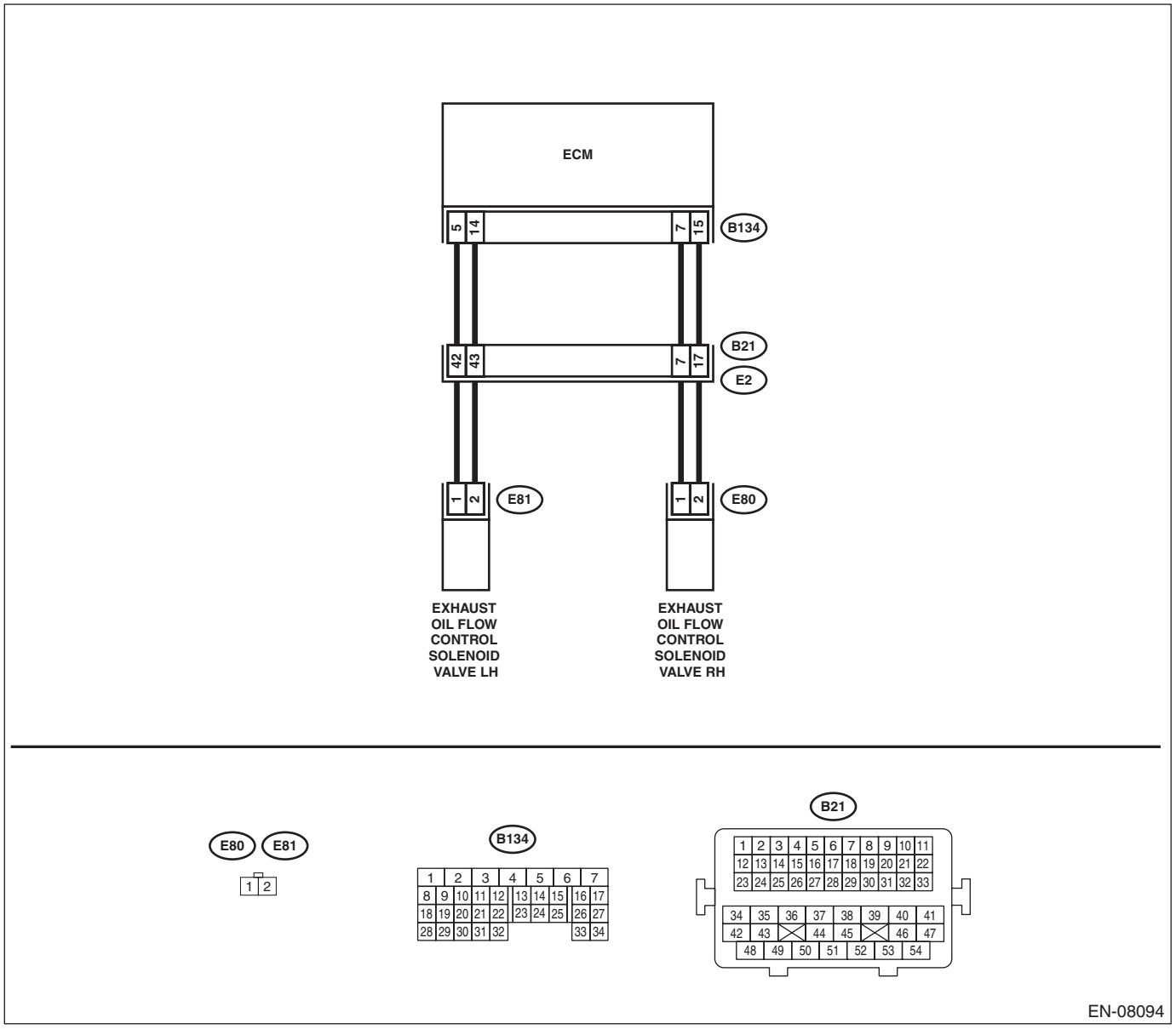
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve RH. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 (+) — Chassis ground (–):*** ***(B134) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power supply in harness between ECM and oil flow control solenoid valve RH connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** Measure the resistance of harness between ECM and oil flow control solenoid valve RH connector. ***Connector & terminal*** ***(B134) No. 7 — (E80) No. 1:*** ***(B134) No. 15 — (E80) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil flow control solenoid valve RH connector • Poor contact of coupling connector
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve RH connector RH.	Replace the oil flow control solenoid valve RH. <Ref. to FU(H6DO)-44, Oil Flow Control Solenoid Valve.>

DX:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-186, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

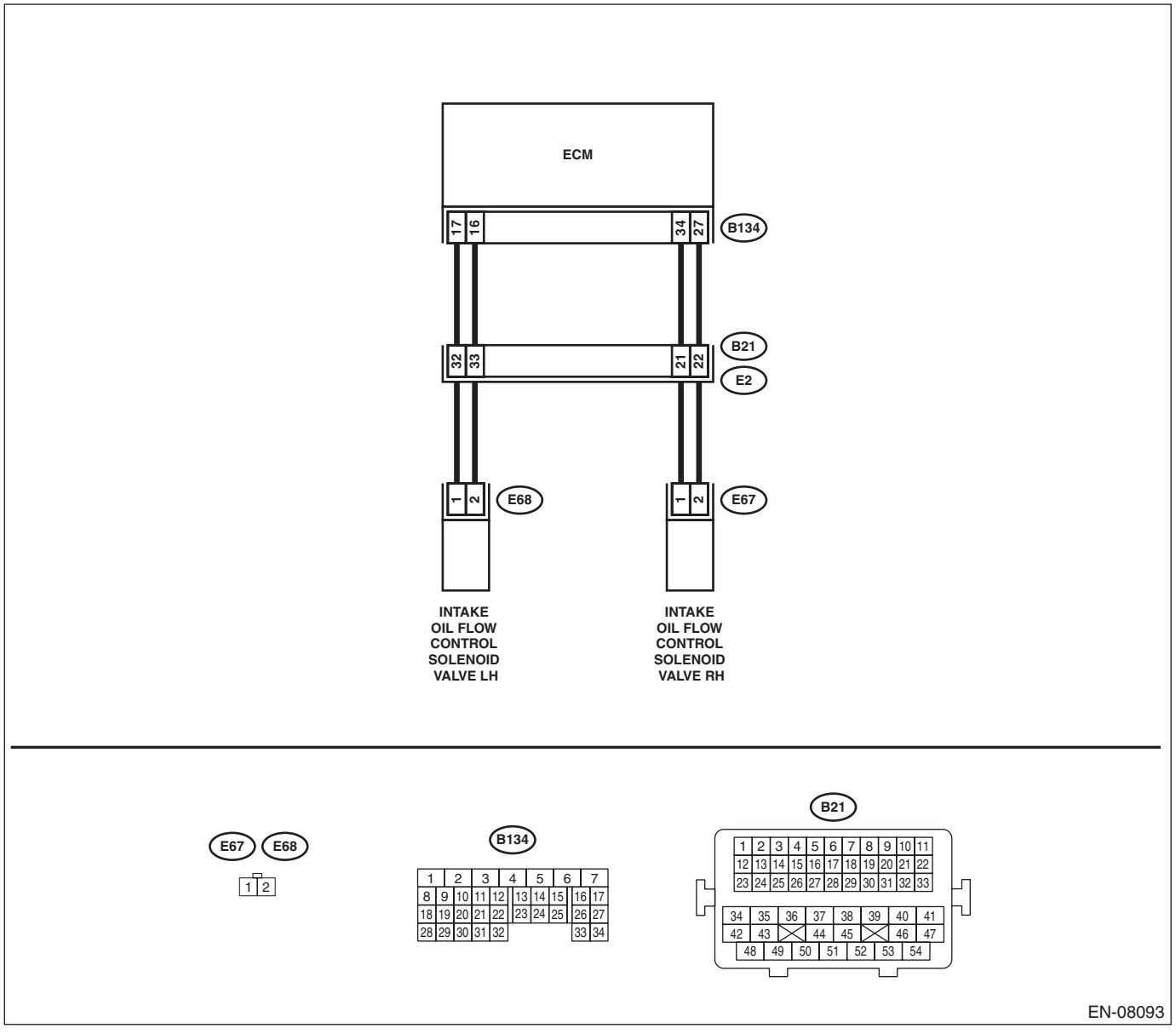
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve LH. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve LH connector. ***Connector & terminal*** ***(B134) No. 17 — (E68) No. 1:*** ***(B134) No. 16 — (E68) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil flow control solenoid valve RH connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 17 — Chassis ground:*** ***(B134) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and oil flow control solenoid valve LH connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve LH connector.	Replace the oil flow control solenoid valve LH. <Ref. to FU(H6DO)-44, Oil Flow Control Solenoid Valve.>

DY:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-186, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

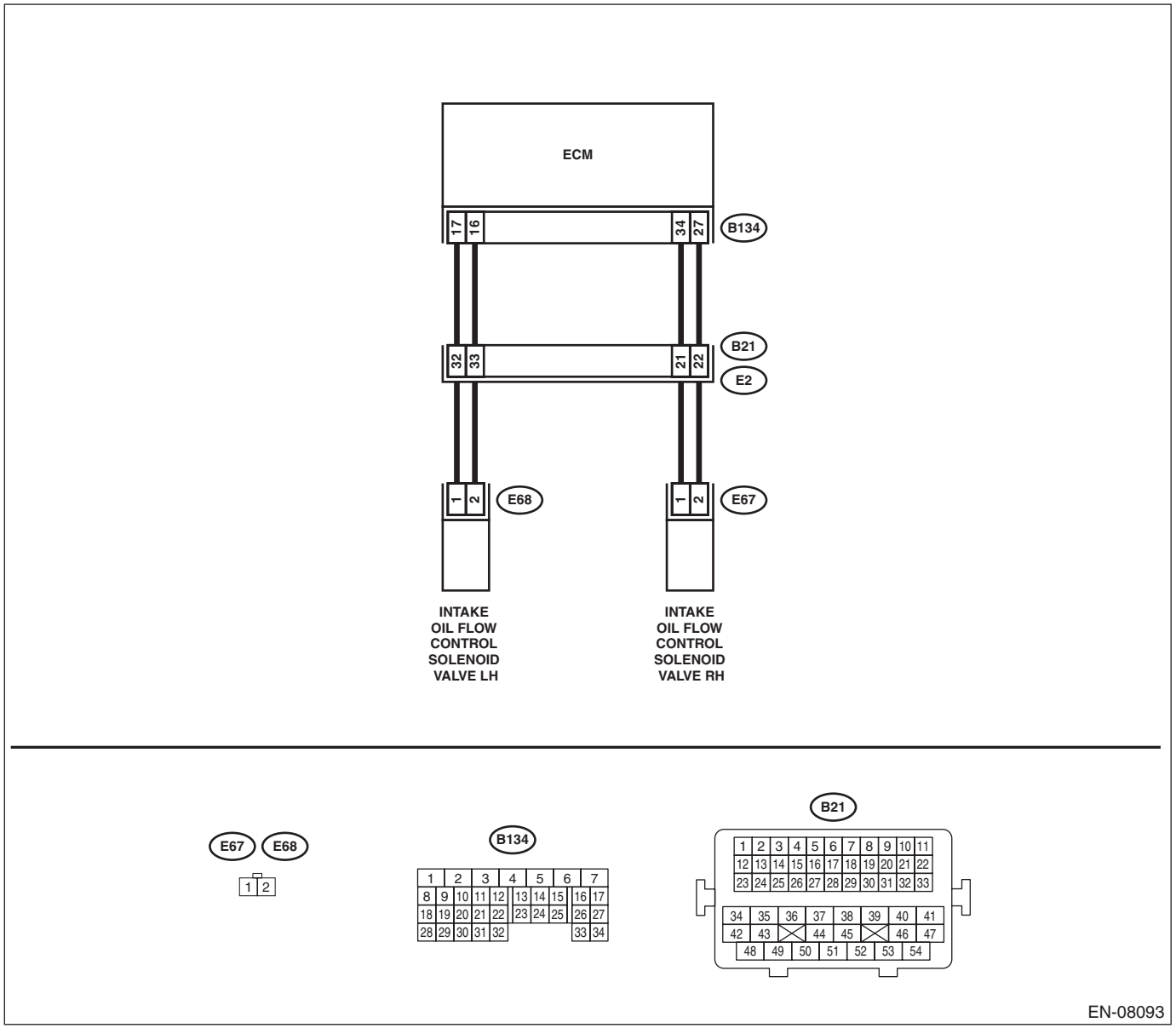
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve LH. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 17 (+) — Chassis ground (–):*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power supply in harness between ECM and oil flow control solenoid valve LH connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** Measure the resistance of harness between ECM and oil flow control solenoid valve LH connector. ***Connector & terminal*** ***(B134) No. 17 — (E68) No. 1:*** ***(B134) No. 16 — (E68) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil flow control solenoid valve RH connector • Poor contact of coupling connector
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve LH connector.	Replace the oil flow control solenoid valve LH. <Ref. to FU(H6DO)-44, Oil Flow Control Solenoid Valve.>

DZ:DTC P2094 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-186, DTC P2094 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

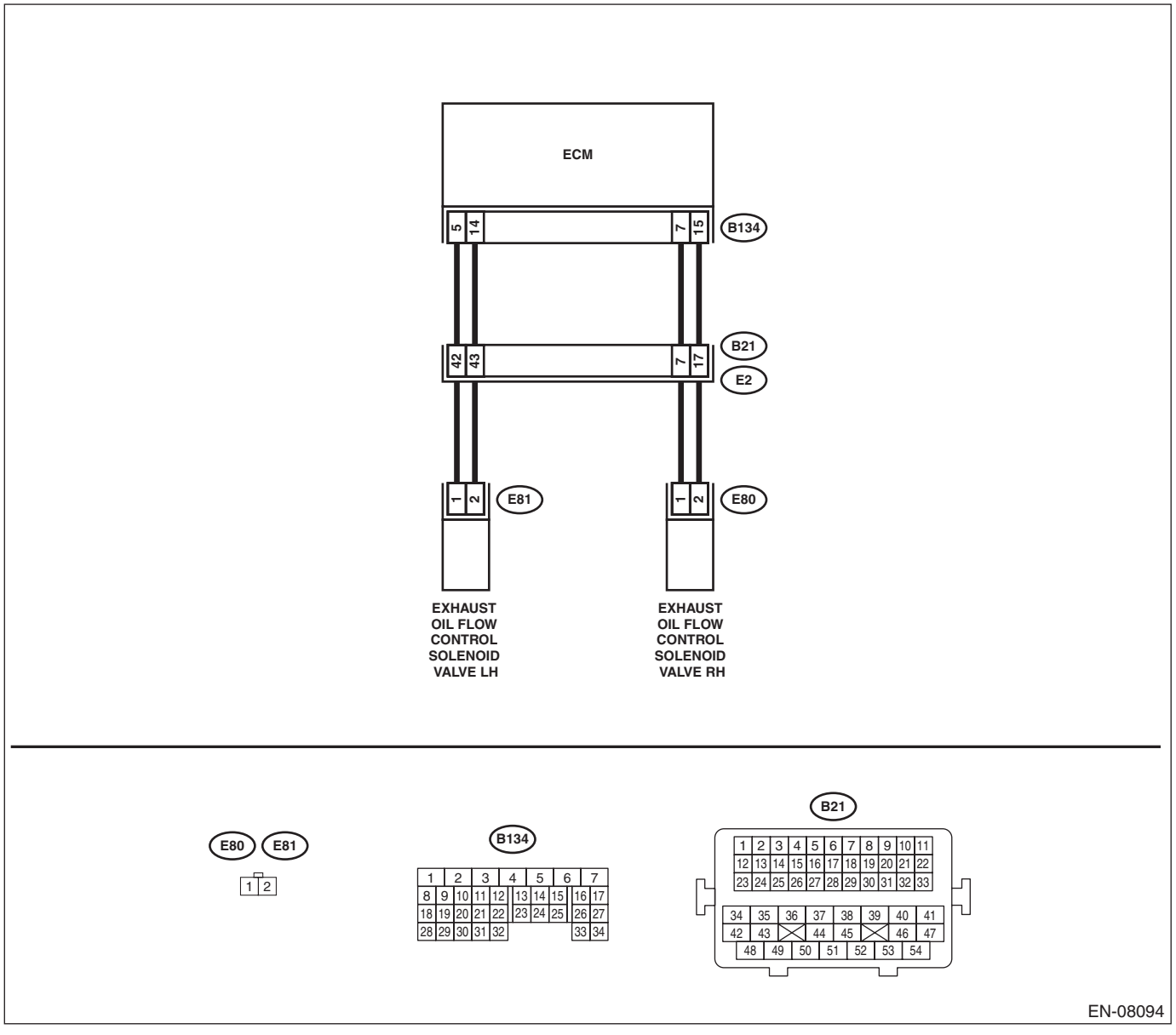
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve LH. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve LH connector. ***Connector & terminal*** ***(B134) No. 5 — (E81) No. 1:*** ***(B134) No. 14 — (E81) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil flow control solenoid valve RH connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:*** ***(B134) No. 14 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and oil flow control solenoid valve LH connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve LH connector.	Replace the oil flow control solenoid valve LH. <Ref. to FU(H6DO)-44, Oil Flow Control Solenoid Valve.>

EA:DTC P2095 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-186, DTC P2095 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

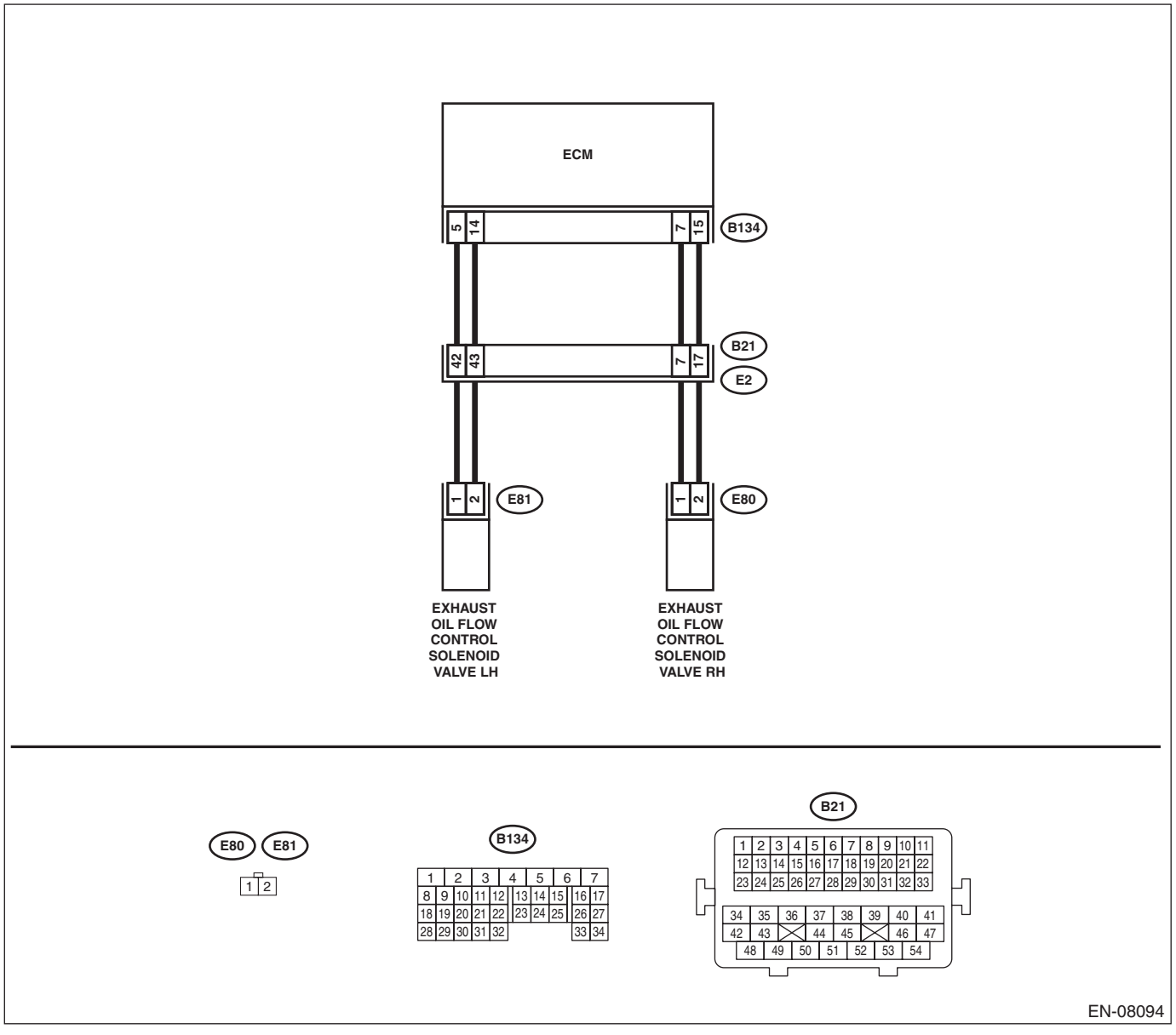
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve LH. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 (+) — Chassis ground (–):*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power supply in harness between ECM and oil flow control solenoid valve LH connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** Measure the resistance of harness between ECM and oil flow control solenoid valve LH connector. ***Connector & terminal*** ***(B134) No. 5 — (E81) No. 1:*** ***(B134) No. 14 — (E81) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil flow control solenoid valve RH connector • Poor contact of coupling connector
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve LH connector.	Replace the oil flow control solenoid valve LH. <Ref. to FU(H6DO)-44, Oil Flow Control Solenoid Valve.>

EB:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1)

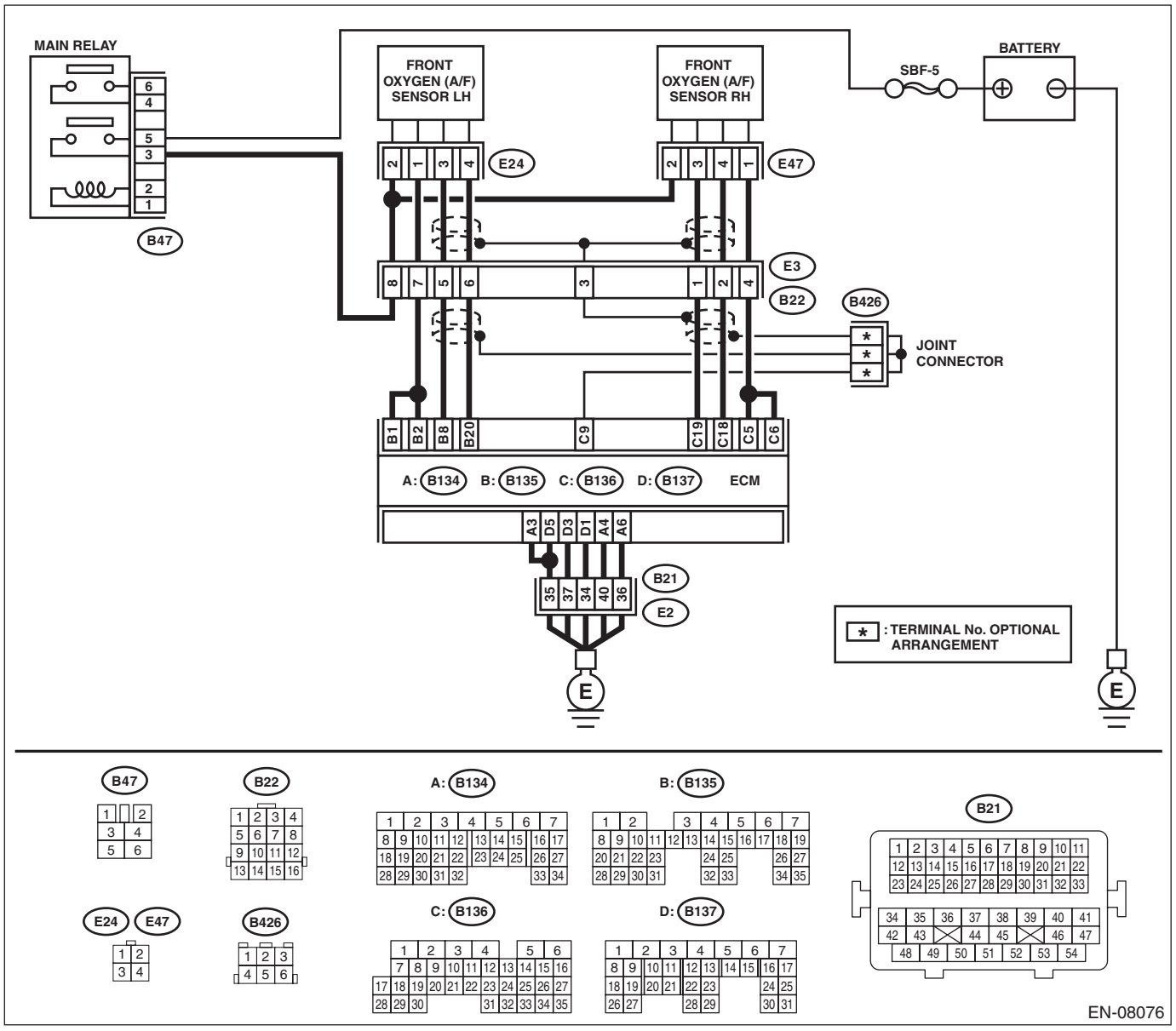
DTC DETECTING CONDITION:

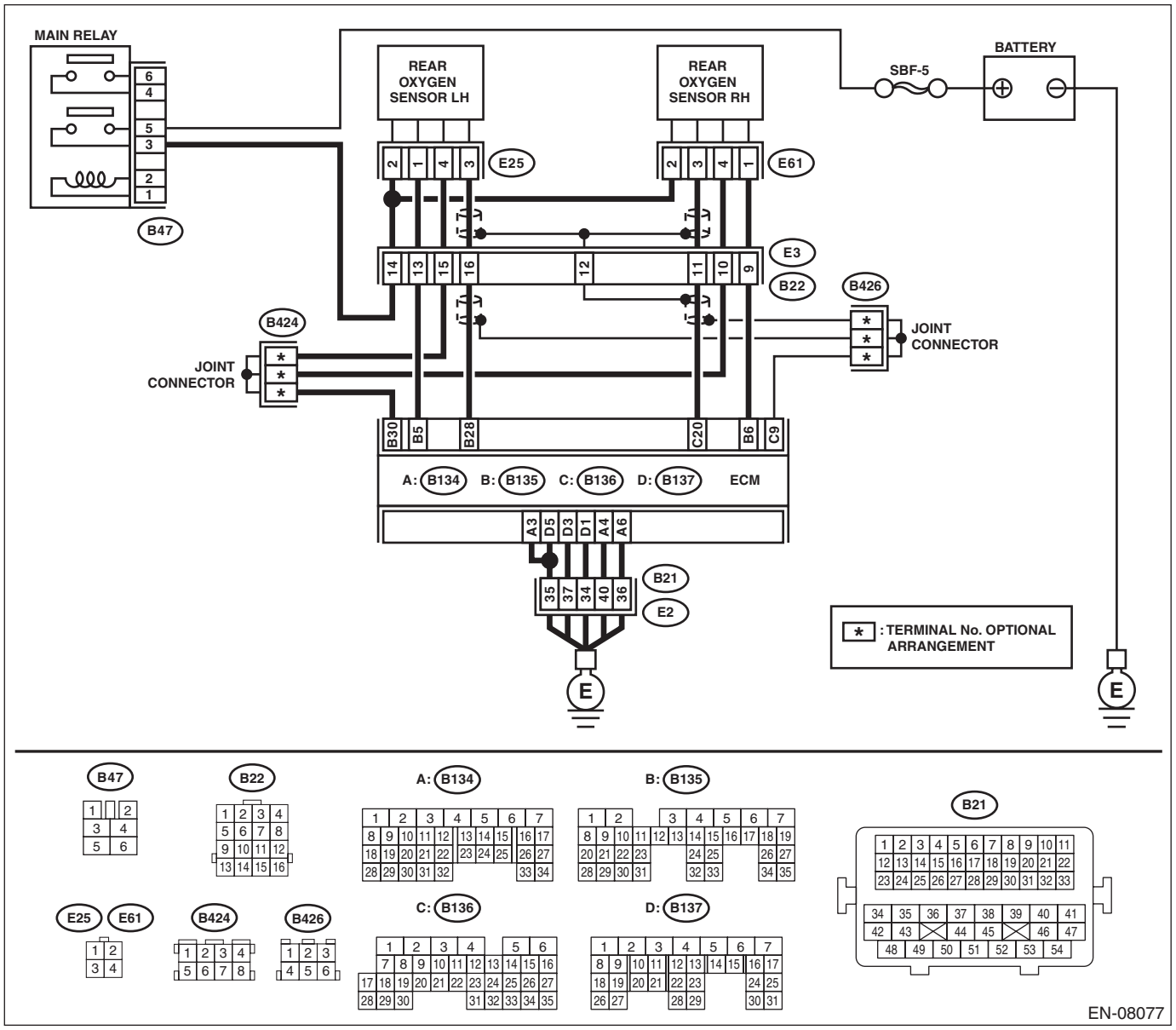
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-187, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 19 — (E47) No. 3:*** ***(B136) No. 18 — (E47) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E47) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **7**.	Go to step **6**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E47) No. 4 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **7**.	Go to step **8**.
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E47) No. 3 (+) — Chassis ground (–):*** ***(E47) No. 4 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10**.

	Step	Check	Yes	No
10	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure. <Ref. to ME(H6DO)-32, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 333 — 343 kPa (3.4 — 3.5 kgf/cm^2, 48.4 — 49.8 psi)?	Go to step **11**.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
11	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **12**.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **13**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **14**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **15**.	Go to step **16**.
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **17**.	Go to step **16**.
16	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **18**.

	Step	Check	Yes	No
17	**CHECK FRONT OXYGEN (A/F) SENSOR USING REAR OXYGEN SENSOR SIGNAL.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is a voltage of 250 mV or less maintained for 5 minutes or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>	Go to step **18**.
18	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B136) No. 20 — (E61) No. 3:*** ***(B135) No. 30 — (E61) No. 4:***	Is the resistance less than 1 Ω?	Go to step **19**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
19	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E61) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector

EC:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1)

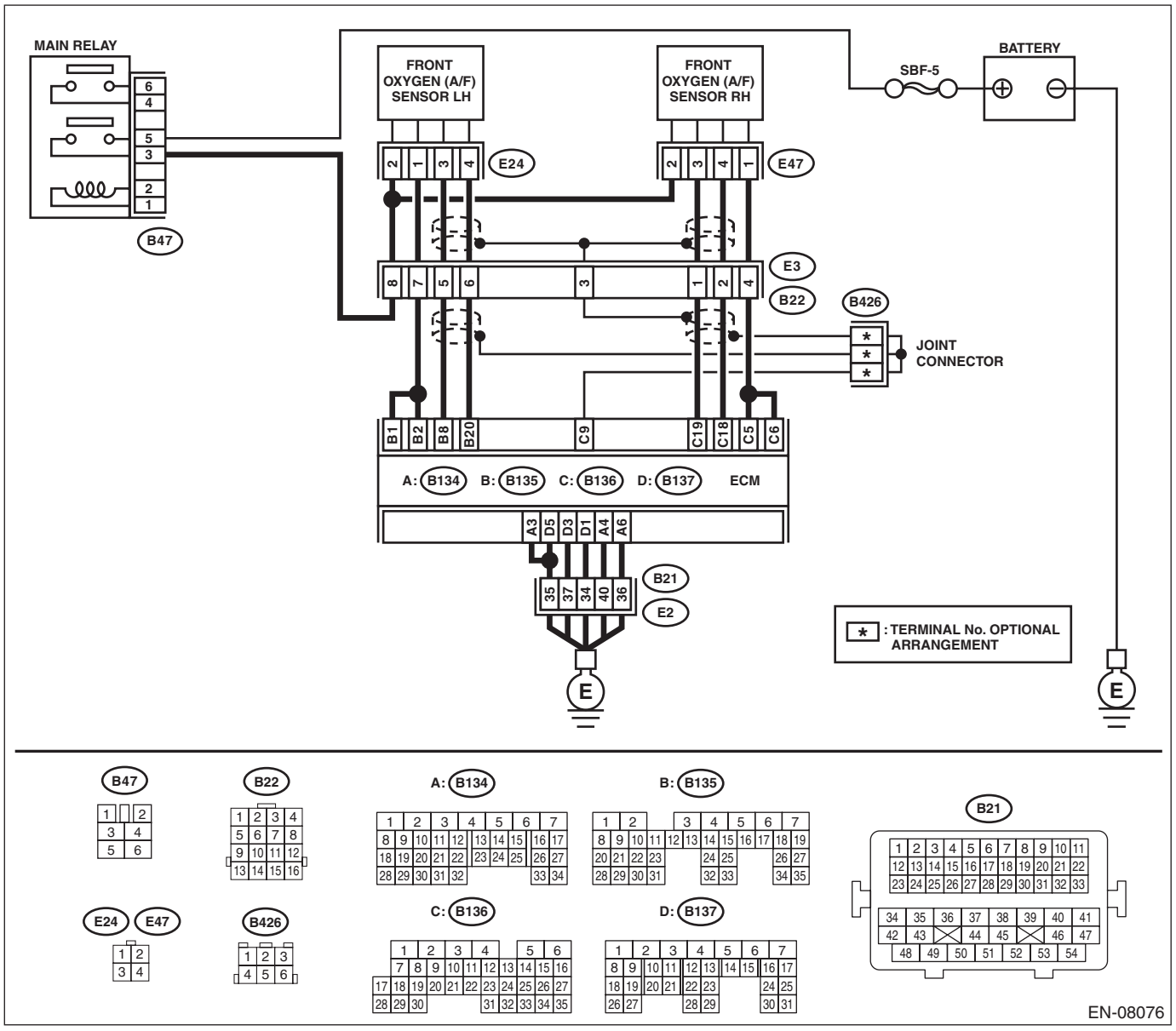
DTC DETECTING CONDITION:

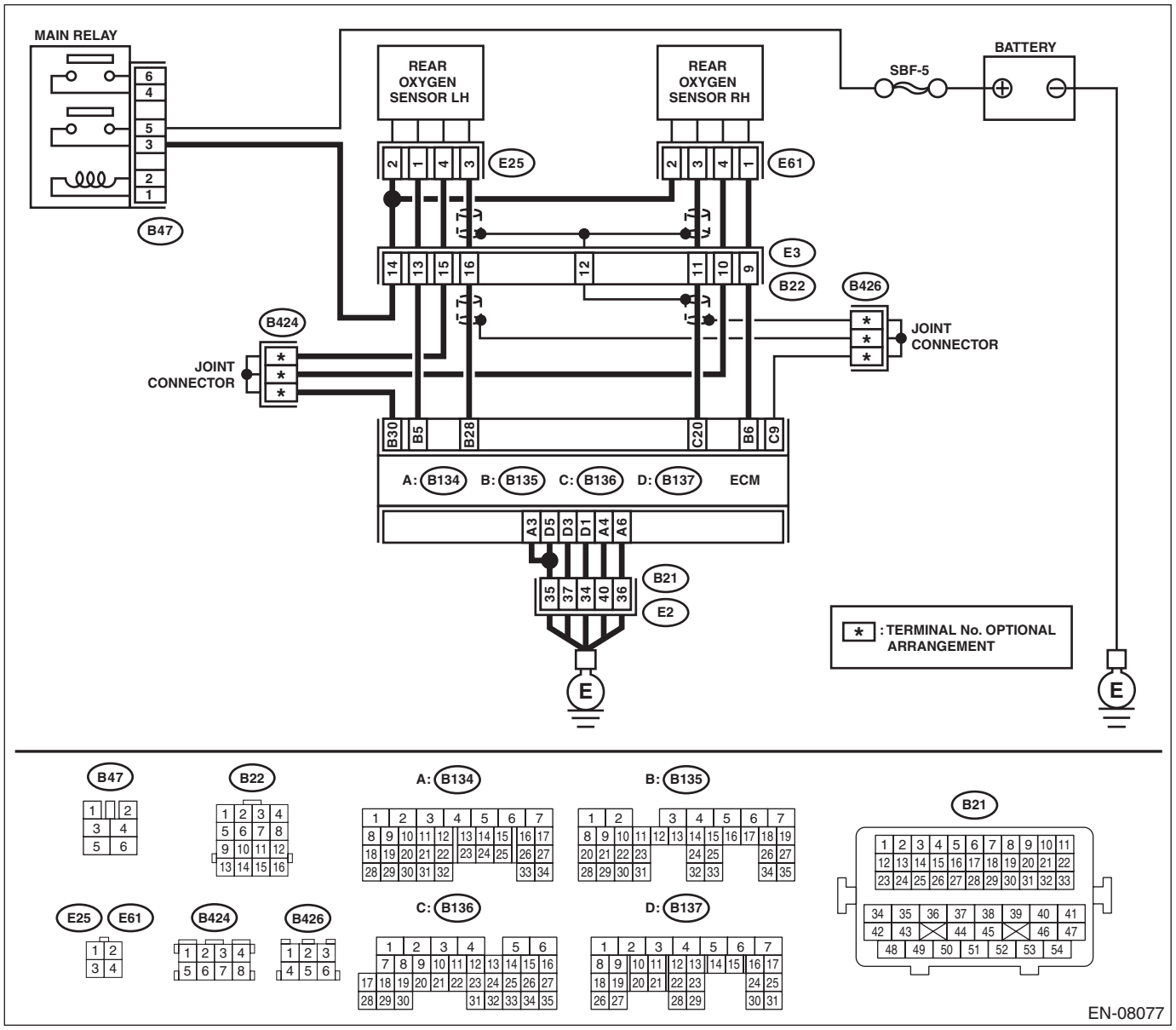
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-189, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 19 — (E47) No. 3:*** ***(B136) No. 18 — (E47) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E47) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **7**.	Go to step **6**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E47) No. 4 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **7**.	Go to step **8**.
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E47) No. 3 (+) — Chassis ground (–):*** ***(E47) No. 4 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10**.

	Step	Check	Yes	No
10	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure. <Ref. to ME(H6DO)-32, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 333 — 343 kPa (3.4 — 3.5 kgf/cm^2, 48.4 — 49.8 psi)?	Go to step **11**.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
11	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **12**.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **13**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **14**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **15**.	Go to step **16**.
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **17**.	Go to step **16**.
16	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **18**.

	Step	Check	Yes	No
17	**CHECK FRONT OXYGEN (A/F) SENSOR USING REAR OXYGEN SENSOR SIGNAL.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is a voltage of 0.8 V or more maintained for 5 minutes or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>	Go to step **18**.
18	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B136) No. 20 — (E61) No. 3:*** ***(B135) No. 30 — (E61) No. 4:***	Is the resistance less than 1 Ω?	Go to step **19**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
19	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E61) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector

ED:DTC P2098 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2

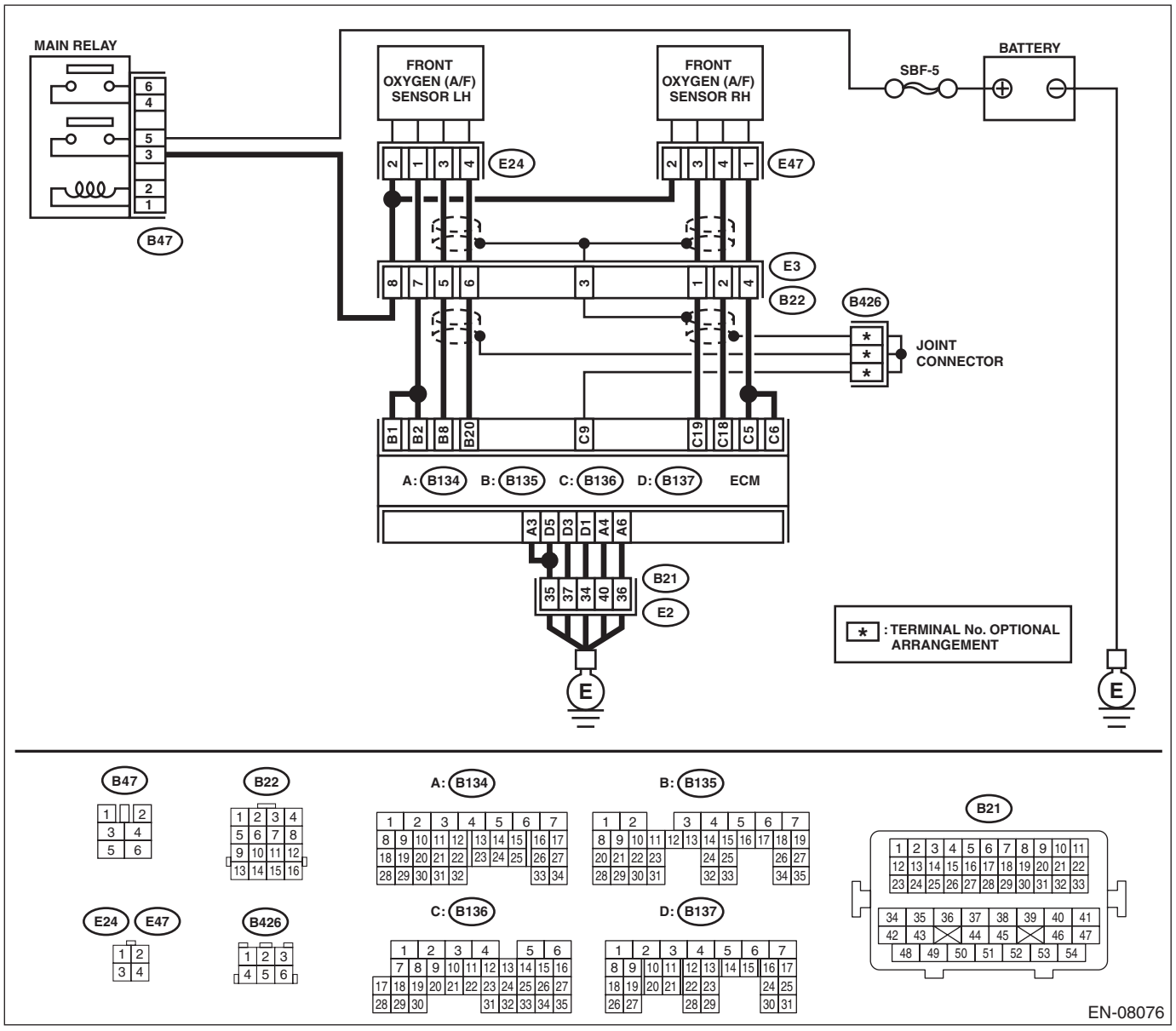
DTC DETECTING CONDITION:

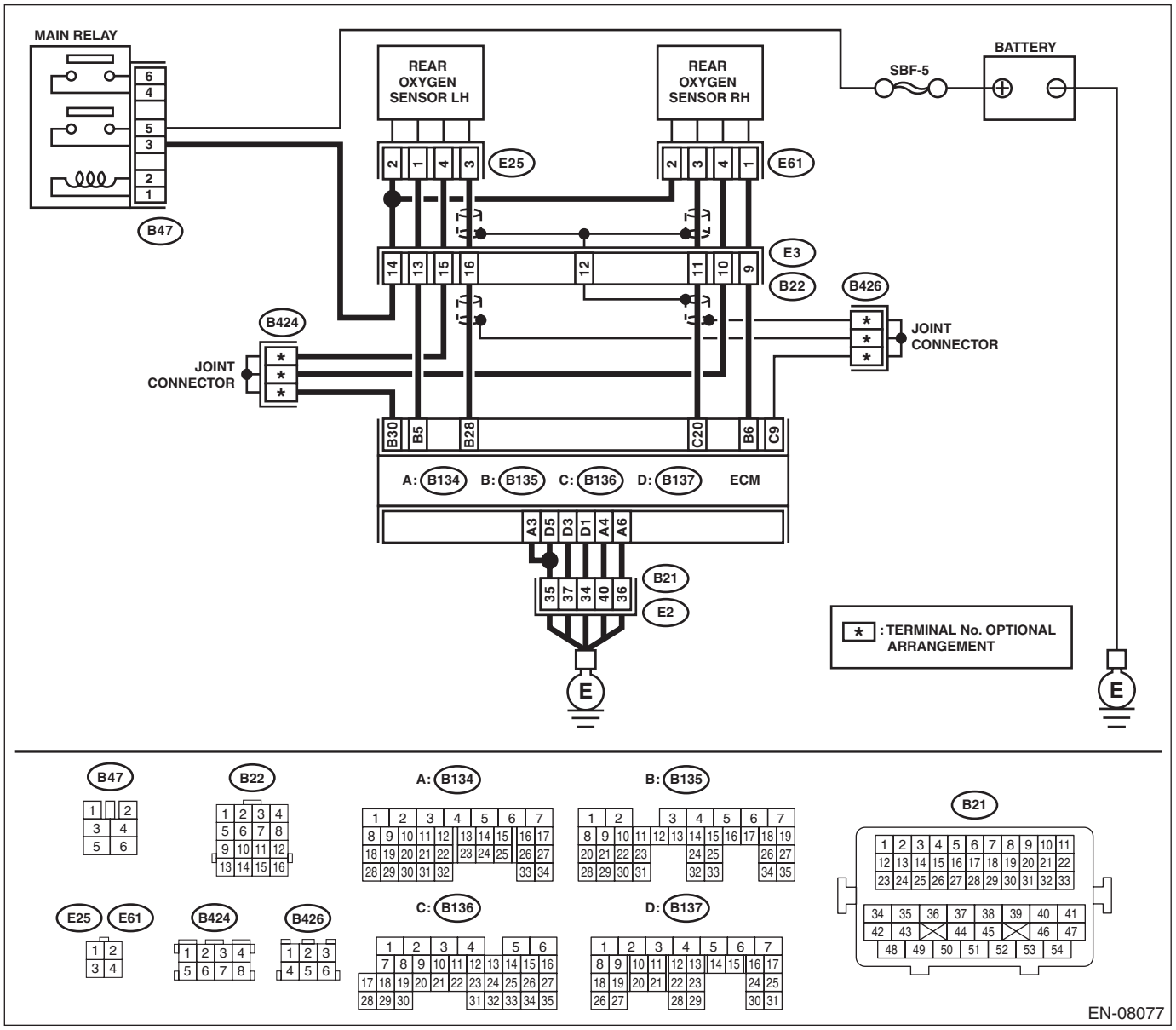
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-190, DTC P2098 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 8 — (E24) No. 3:*** ***(B135) No. 20 — (E24) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 — Chassis ground:*** ***(B135) No. 20 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E24) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **7**.	Go to step **6**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E24) No. 4 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **7**.	Go to step **8**.
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E24) No. 3 (+) — Chassis ground (–):*** ***(E24) No. 4 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10**.

	Step	Check	Yes	No
10	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure. <Ref. to ME(H6DO)-32, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 333 — 343 kPa (3.4 — 3.5 kgf/cm^2, 48.4 — 49.8 psi)?	Go to step **11**.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
11	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **12**.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **13**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **14**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **15**.	Go to step **16**.
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **17**.	Go to step **16**.
16	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **18**.

	Step	Check	Yes	No
17	**CHECK FRONT OXYGEN (A/F) SENSOR USING REAR OXYGEN SENSOR SIGNAL.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is a voltage of 250 mV or less maintained for 5 minutes or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>	Go to step **18**.
18	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 28 — (E25) No. 3:*** ***(B135) No. 30 — (E25) No. 4:***	Is the resistance less than 1 Ω?	Go to step **19**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
19	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E25) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector

EE:DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2

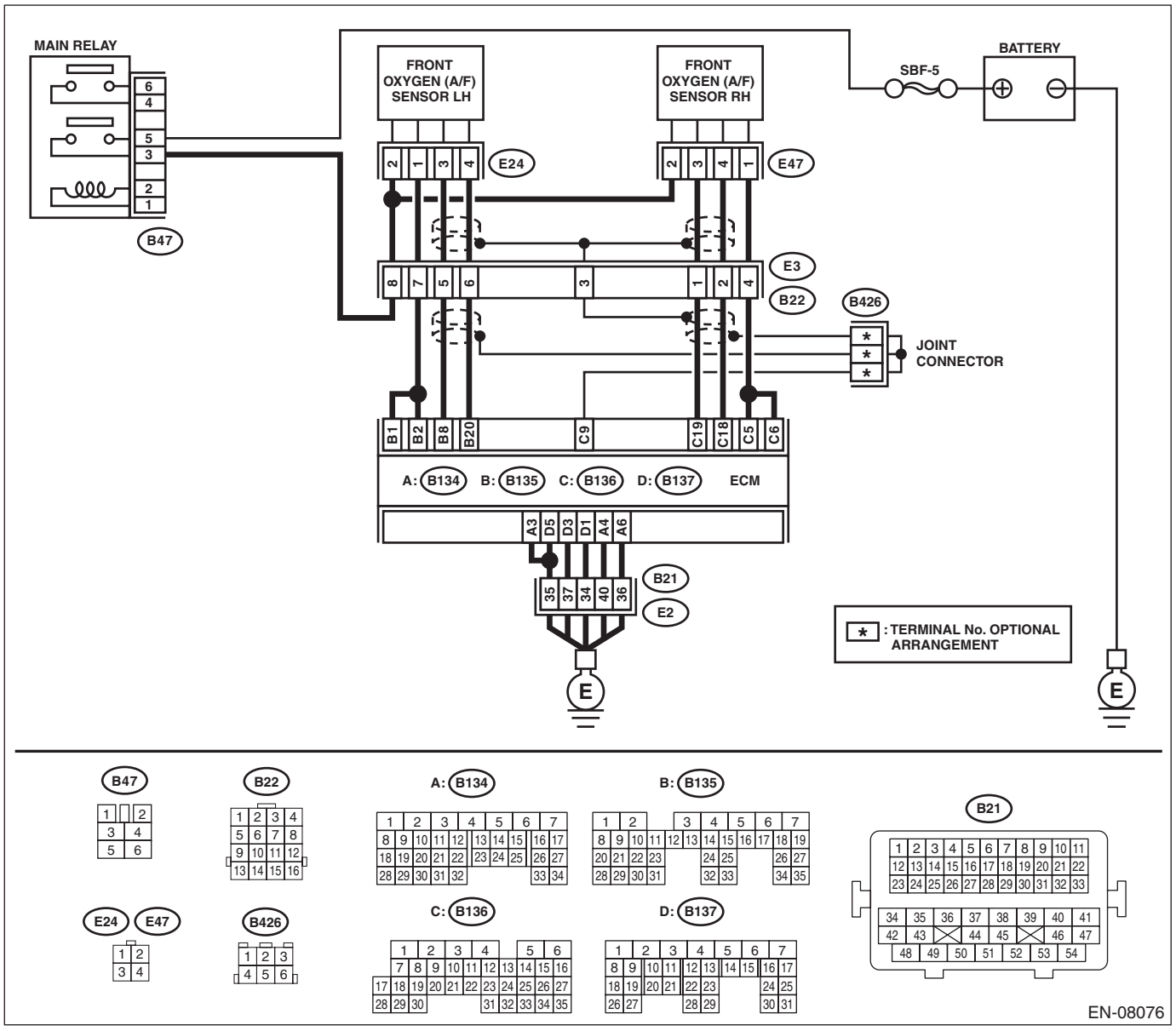
DTC DETECTING CONDITION:

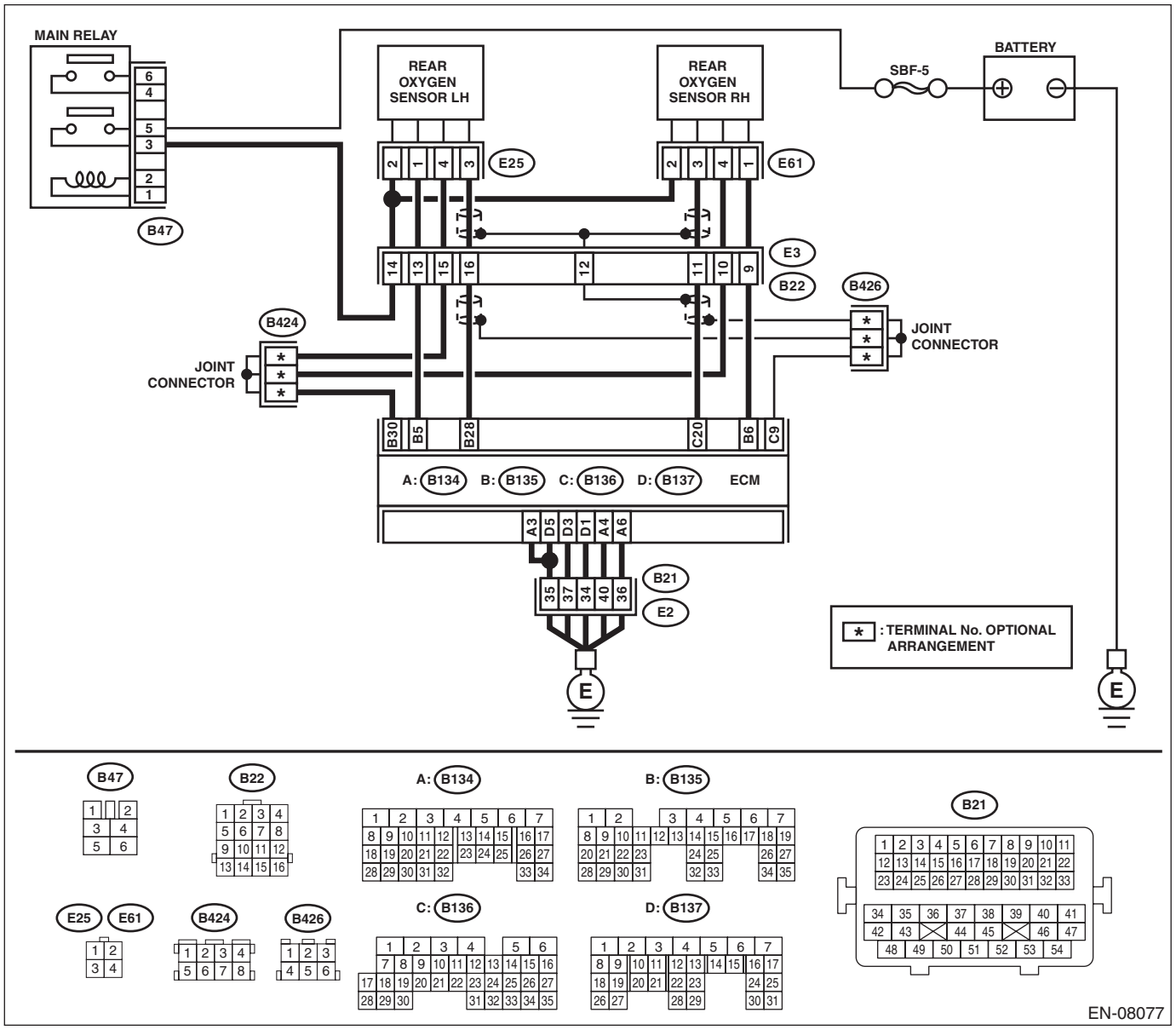
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-190, DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 8 — (E24) No. 3:*** ***(B135) No. 20 — (E24) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 — Chassis ground:*** ***(B135) No. 20 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E24) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **7**.	Go to step **6**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E24) No. 4 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **7**.	Go to step **8**.
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E24) No. 3 (+) — Chassis ground (–):*** ***(E24) No. 4 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10**.

	Step	Check	Yes	No
10	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure. <Ref. to ME(H6DO)-32, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 333 — 343 kPa (3.4 — 3.5 kgf/cm^2, 48.4 — 49.8 psi)?	Go to step **11**.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
11	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **12**.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **13**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of the mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **14**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-39, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **15**.	Go to step **16**.
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **17**.	Go to step **16**.
16	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **18**.

	Step	Check	Yes	No
17	**CHECK FRONT OXYGEN (A/F) SENSOR USING REAR OXYGEN SENSOR SIGNAL.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is a voltage of 0.8 V or more maintained for 5 minutes or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-47, Front Oxygen (A/F) Sensor.>	Go to step **18**.
18	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 28 — (E25) No. 3:*** ***(B135) No. 30 — (E25) No. 4:***	Is the resistance less than 1 Ω?	Go to step **19**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
19	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E25) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-49, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector

EF:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-191, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

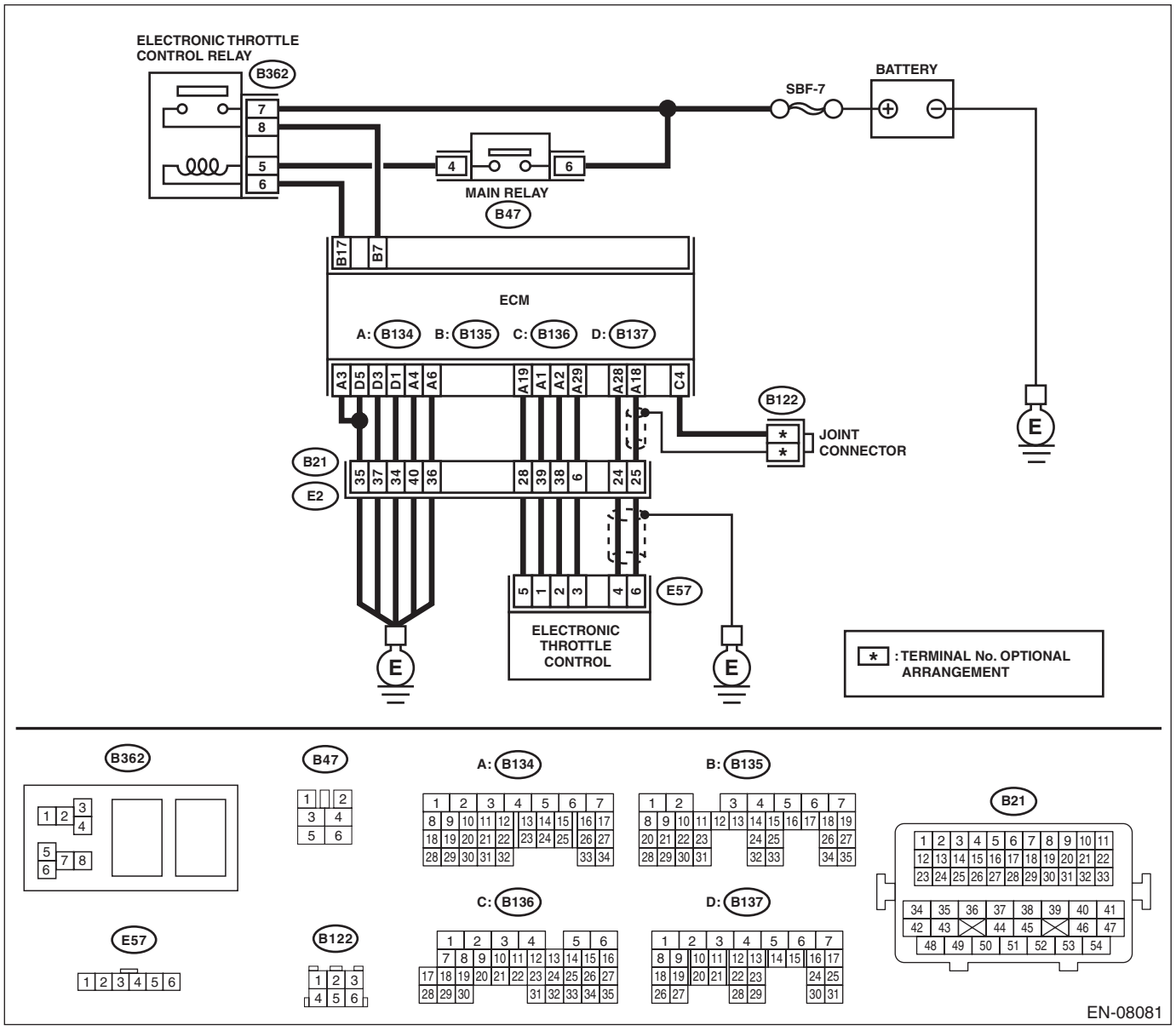
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 5 and No. 6 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to EN(H6DO)(diag)-9, Electrical Component Location.>
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control relay.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 8 — Chassis ground:*** ***(B362) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 7 — (B362) No. 8:*** ***(B135) No. 17 — (B362) No. 6:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit of harness between ECM and electronic throttle control relay.
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
7	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>
8	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 18 — (E57) No. 6:*** ***(B134) No. 28 — (E57) No. 4:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
9	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **10**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
10	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **11**.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Go to step **12**.	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
12	**CHECK SENSOR OUTPUT.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **13**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-19, Throttle Body.>
13	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-36, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **14**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-19, Throttle Body.>
14	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 1 — (E57) No. 1:*** ***(B134) No. 2 — (E57) No. 2:***	Is the resistance less than 1 Ω?	Go to step **15**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control • Poor contact of coupling connector
15	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 (+) — Engine ground (–):*** ***(E57) No. 1 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control.	Go to step **16**.
16	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 — Engine ground:*** ***(E57) No. 1 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **17**.	Repair the short circuit to ground in harness between ECM and electronic throttle control.
17	**CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.** Measure the resistance between electronic throttle control connectors. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance 1 MΩ or more?	Go to step **18**.	Repair the short circuit of harness between ECM and electronic throttle control.

	Step	Check	Yes	No
18	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **19**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector
19	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 50 Ω or less?	Go to step **20**.	Replace the electronic throttle control. <Ref. to FU(H6DO)-19, Throttle Body.>
20	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Standard value: 3 mm (0.12 in) from fully closed position	Repair the poor contact of ECM connector.	Replace the electronic throttle control. <Ref. to FU(H6DO)-19, Throttle Body.>

EG:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

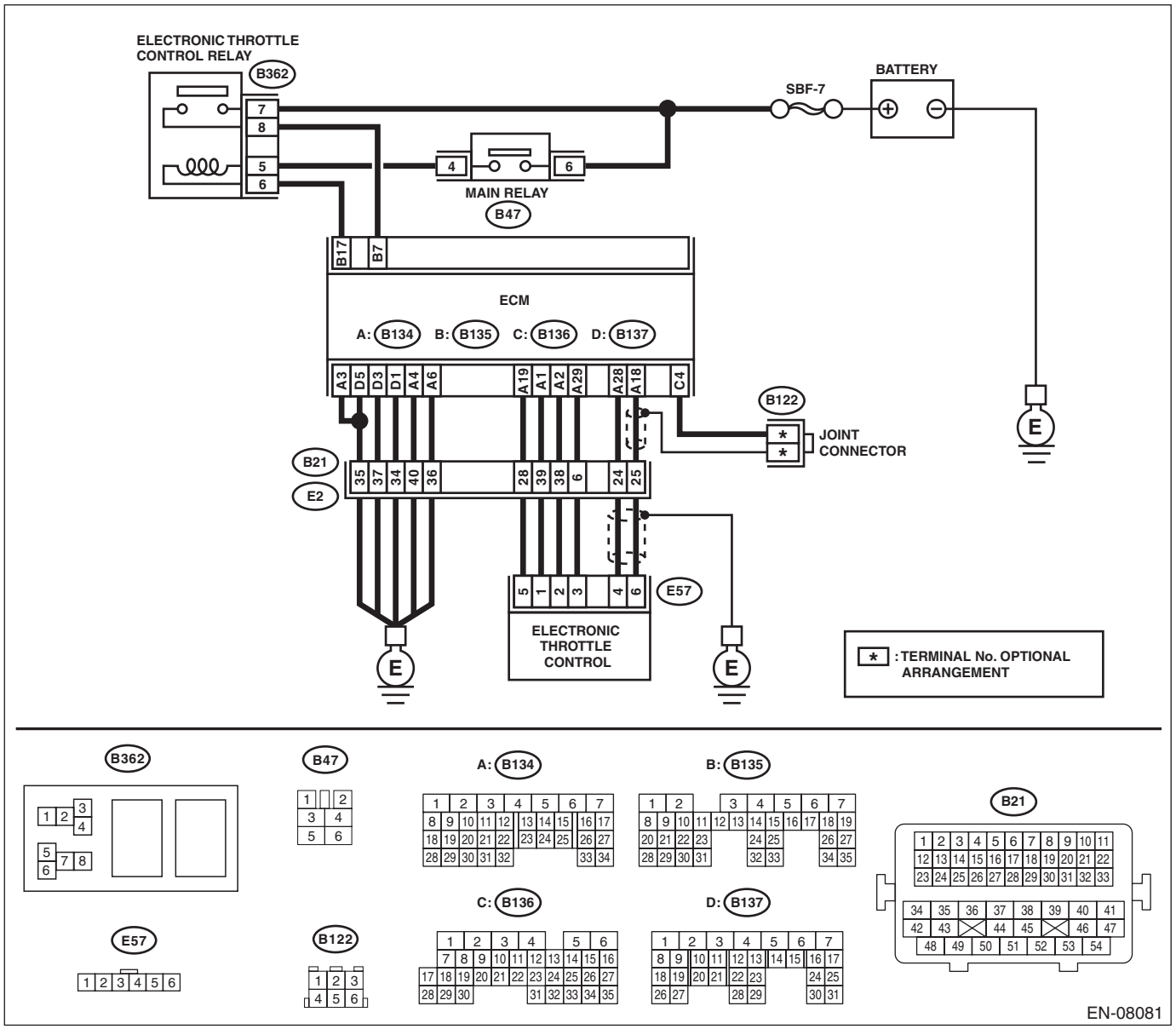
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-193, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 5 and No. 6 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to EN(H6DO)(diag)-9, Electrical Component Location.>
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control relay.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 — Chassis ground:*** ***(B362) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 7 — (B362) No. 8:*** ***(B135) No. 17 — (B362) No. 6:***	Is the resistance less than 1 Ω?	Repair the poor contact of ECM connector.	Repair the open circuit of harness between ECM and electronic throttle control relay.

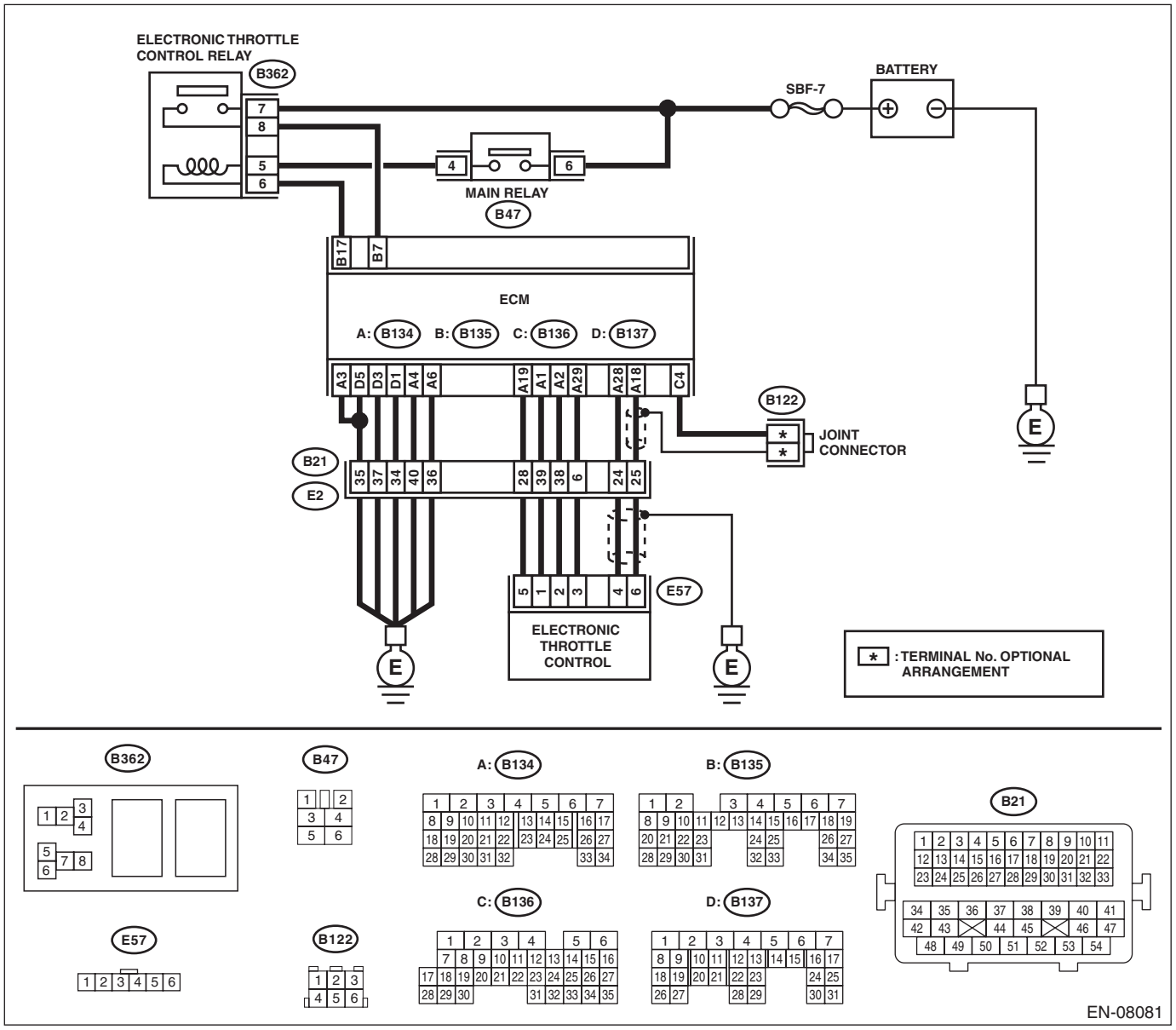
EH:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-195, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to EN(H6DO)(diag)-9, Electrical Component Location.>
2	**CHECK SHORT CIRCUIT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 8 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control relay.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 17 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact of ECM connector.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.

EI: DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-329, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EJ: DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-199, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

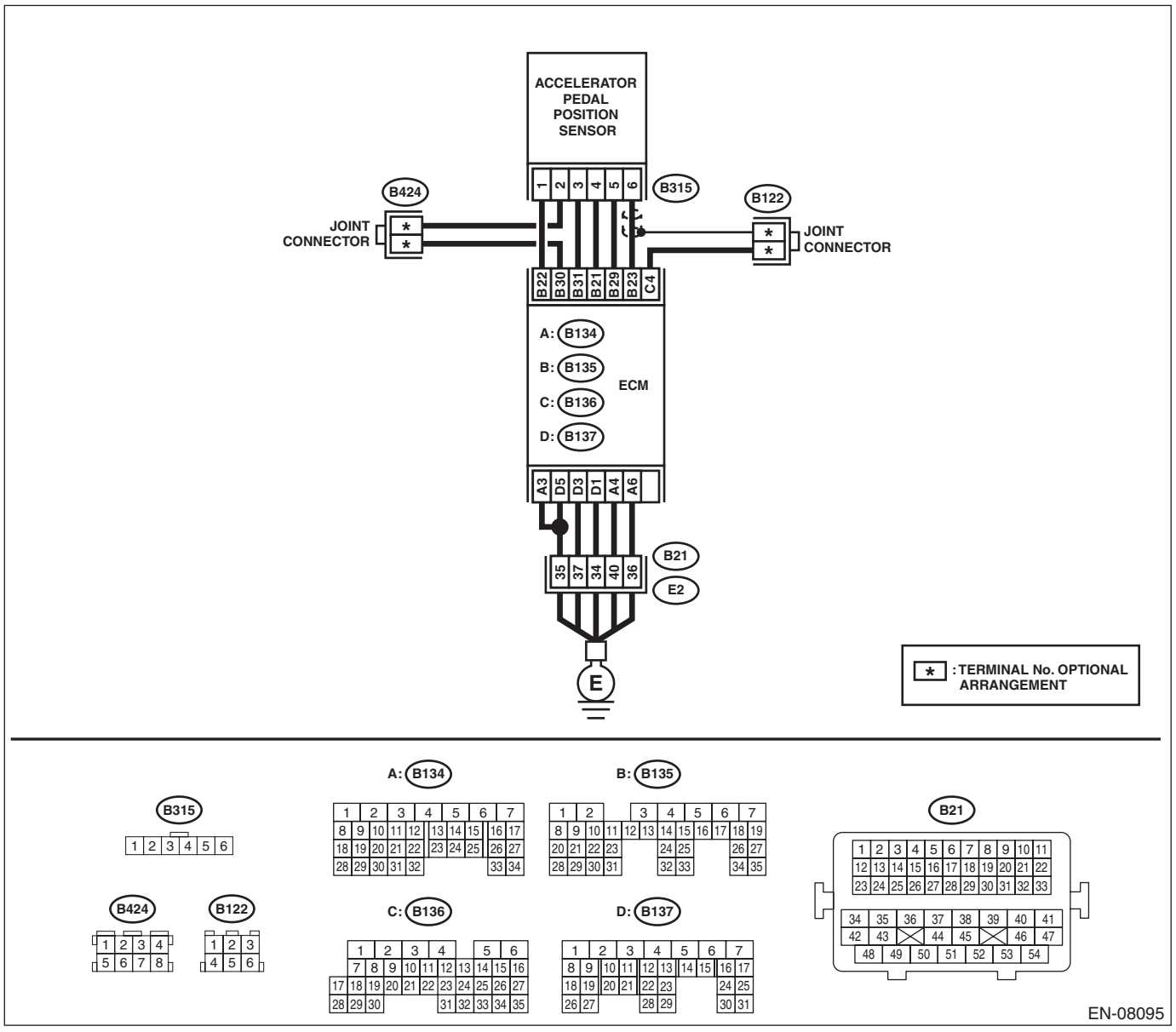
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 21 — Chassis ground:*** ***(B135) No. 23 — Chassis ground:*** ***(B135) No. 23 — (B136) No. 4:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H6DO)-4, Accelerator Pedal.>	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>

EK:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-201, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

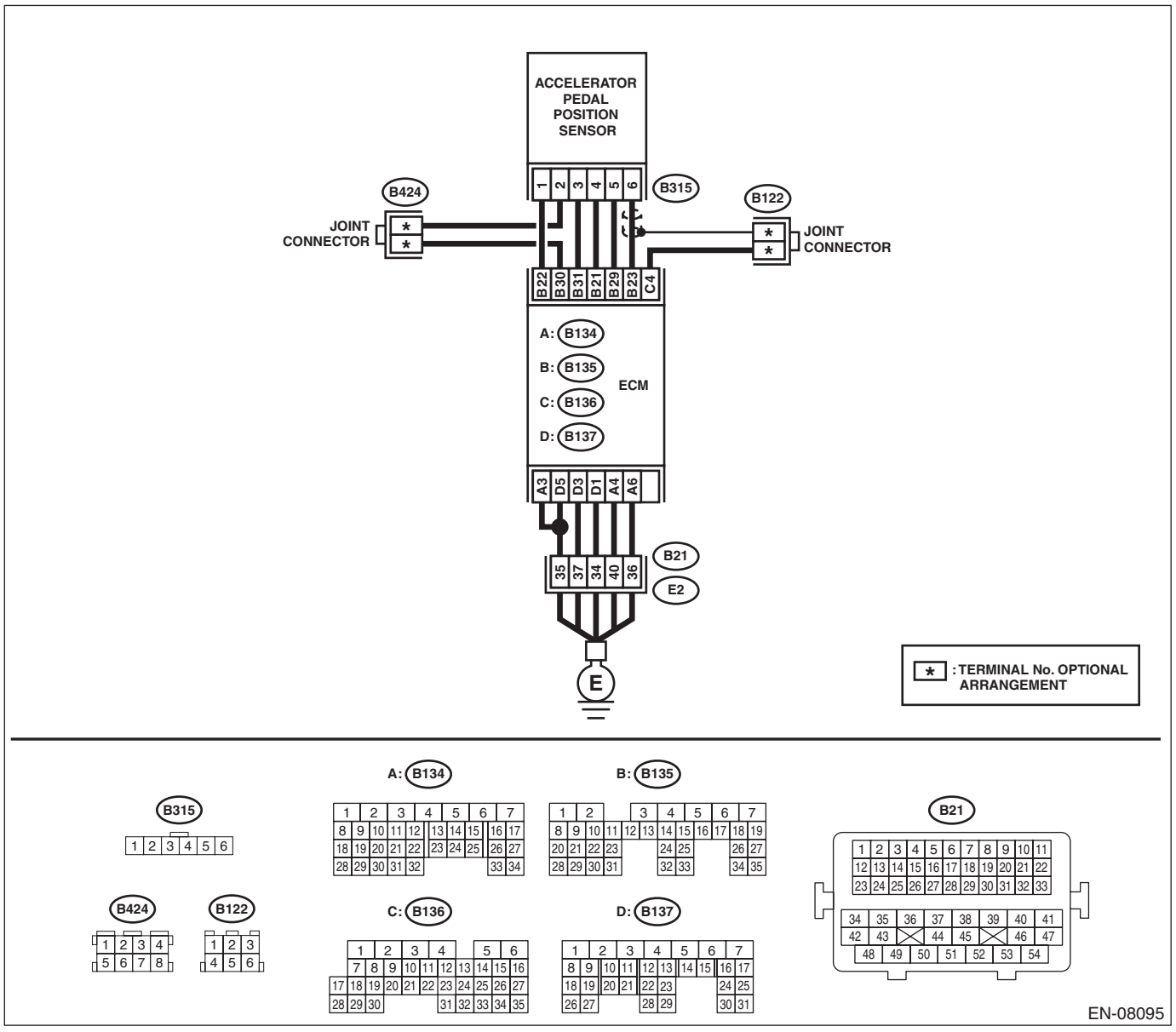
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance of harness between ECM and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 23 — (B315) No. 6:*** ***(B135) No. 29 — (B315) No. 5:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit in harness between ECM and accelerator pedal position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B135) No. 21 — (B135) No. 23:***	Is the resistance 1 MΩ or more?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal if defective. <Ref. to SP(H6DO)-4, Accelerator Pedal.>	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.

EL:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-203, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

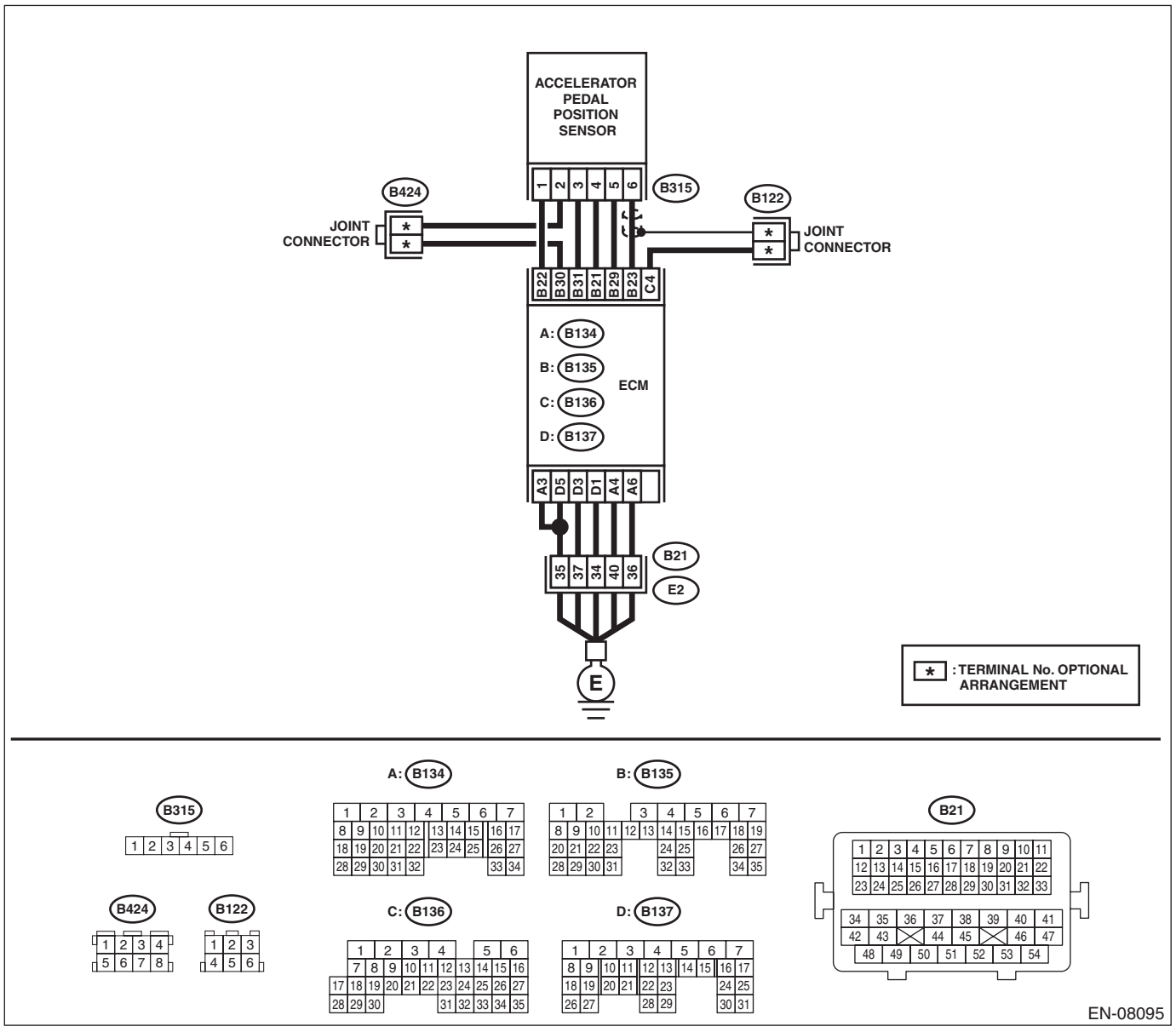
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 22 — Chassis ground:*** ***(B135) No. 31 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H6DO)-4, Accelerator Pedal.>	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>

EM:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-205, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

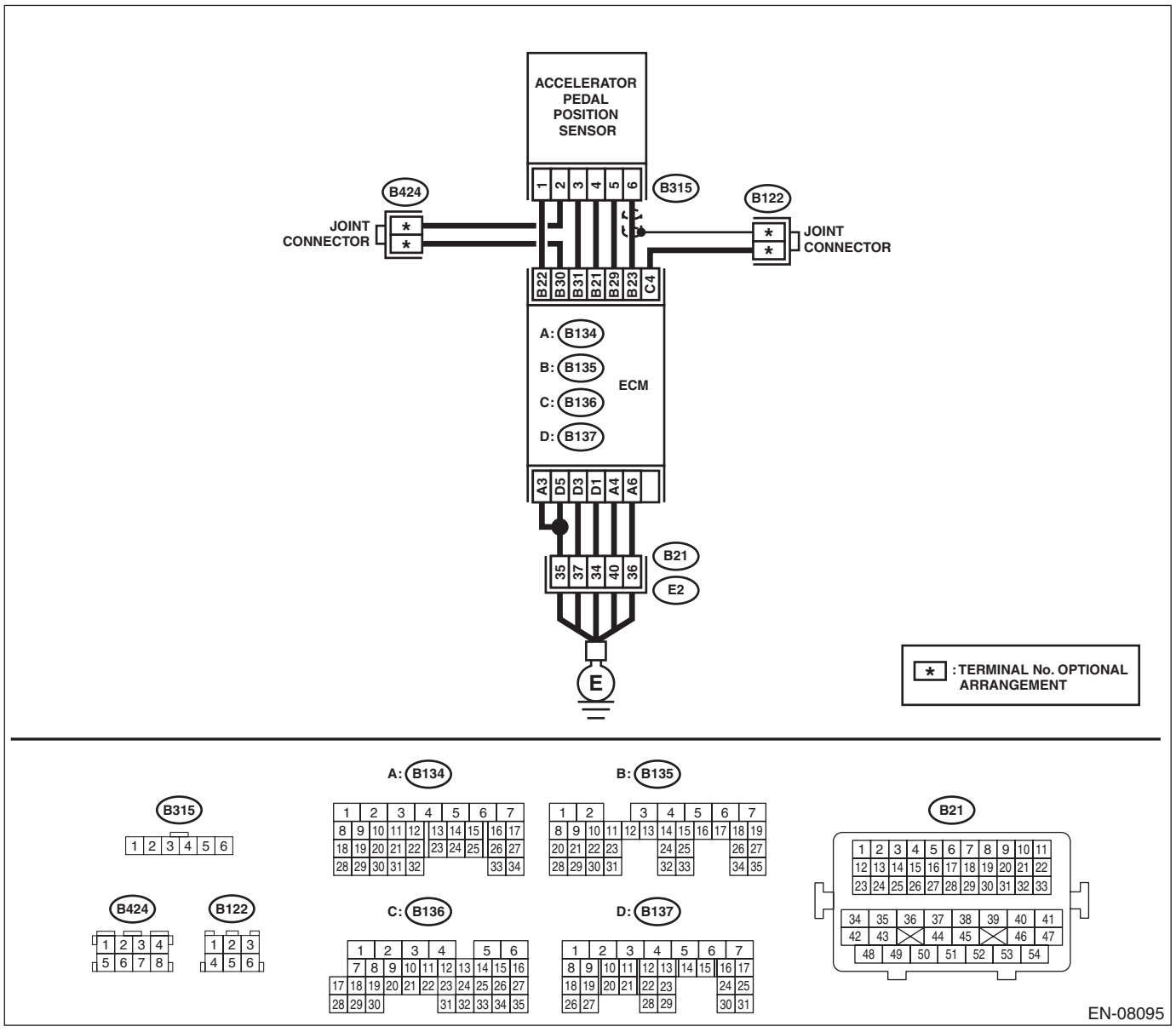
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance of harness between ECM and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 31 — (B315) No. 3:*** ***(B135) No. 30 — (B315) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit in harness between ECM and accelerator pedal position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 2 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B135) No. 22 — (B135) No. 31:***	Is the resistance 1 MΩ or more?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal if defective. <Ref. to SP(H6DO)-4, Accelerator Pedal.>	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.

EN:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-207, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

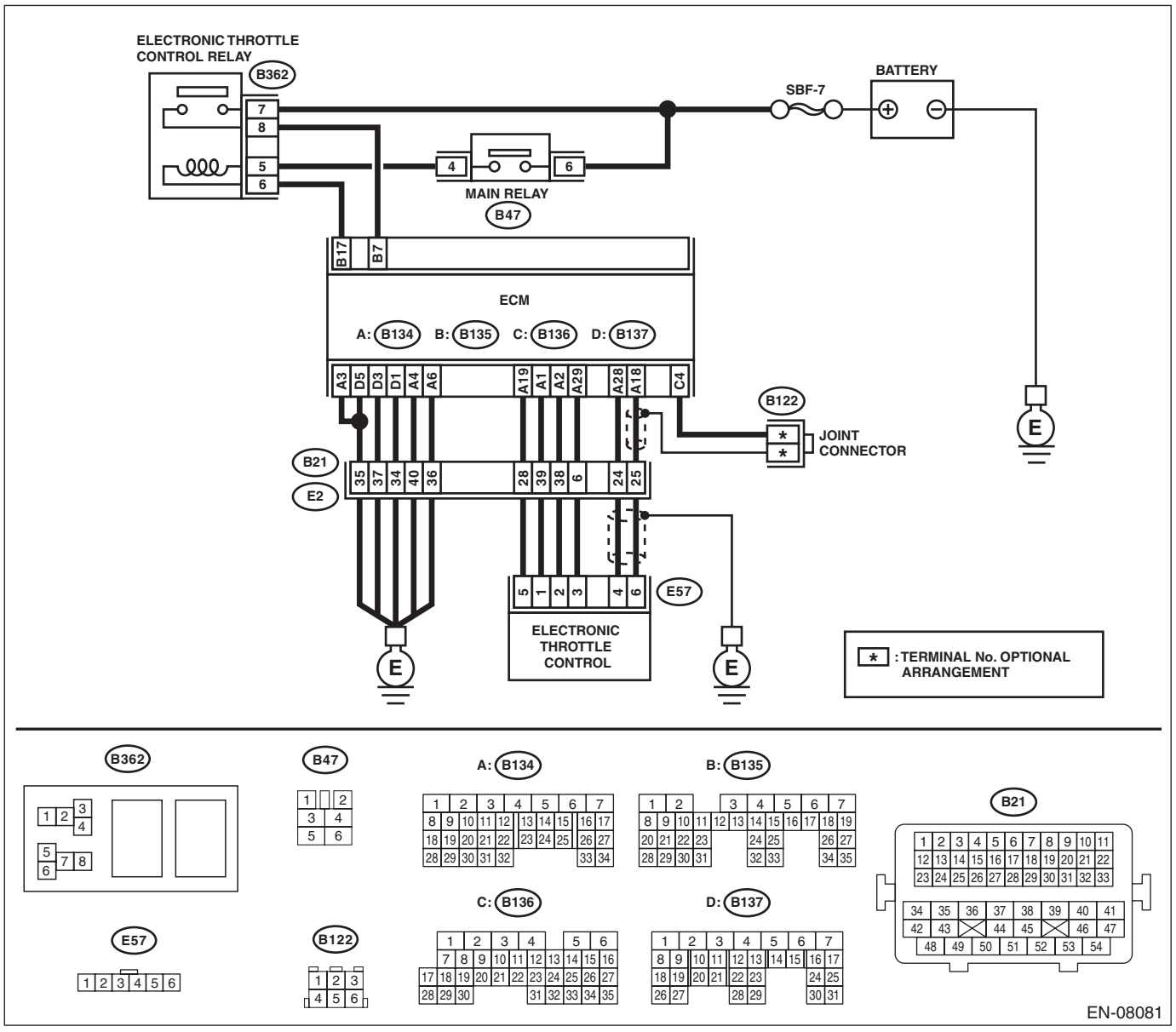
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 18 — (E57) No. 6:*** ***(B134) No. 28 — (E57) No. 4:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **6**.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-19, Throttle Body.>	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

EO:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-209, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

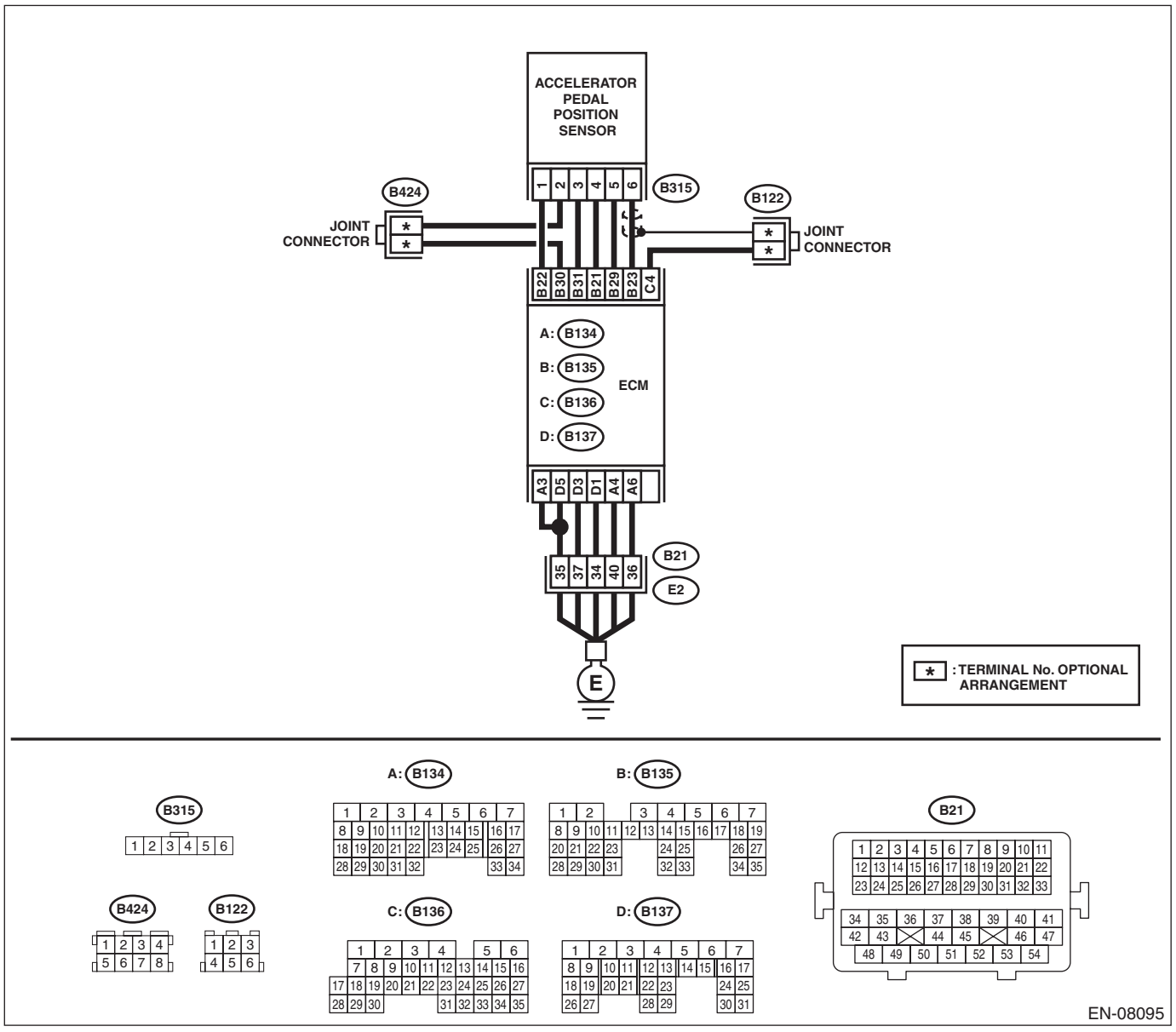
CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***Main accelerator pedal position sensor signal*** ***(B135) No. 23 (+) — Chassis ground (–):*** ***Accelerator pedal position sensor signal*** ***(B135) No. 31 (+) — Chassis ground (–):***	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelerator pedal position sensor signal 0 V?	Go to step **3**.	Go to step **2**.
2	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 (+) — Chassis ground (–):*** ***(B315) No. 3 (+) — Chassis ground (–):***	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelerator pedal position sensor signal 0 V?	Replace the accelerator pedal. <Ref. to SP(H6DO)-4, Accelerator Pedal.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and accelerator pedal position sensor connector • Short circuit to ground in harness between ECM and accelerator pedal position sensor connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** Measure the resistance of harness between the accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 — Chassis ground:*** ***(B315) No. 2 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and accelerator pedal position sensor connector • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector

EP:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-211, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).> NOTE: The barometric pressure sensor is built into the ECM.

EQ:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-212, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).> NOTE: The barometric pressure sensor is built into the ECM.

ER:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-213, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-87, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H6DO)-51, Engine Control Module (ECM).> NOTE: The barometric pressure sensor is built into the ECM.

ES:DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

ET:DTC U0101 CAN (TCU) DATA NOT LOADED

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

EU:DTC U0122 CAN (VDC) DATA NOT LOADED

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

EV:DTC U0140 CAN (BCU) DATA NOT LOADED

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

EW:DTC U0402 CAN (TCU) DATA ABNORMAL

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

EX:DTC U0416 CAN (VDC) DATA ABNORMAL

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

EY:DTC U0422 CAN (BCU) DATA ABNORMAL

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

21.General Diagnostic Table

A: INSPECTION

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H6DO)-125, Engine Trouble in General.>

Symptoms	Problem parts
1. Engine stalls during idling.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Ignition parts (*1) 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4) 8) Electronic throttle control
2. Rough idling	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Ignition parts (*1) 5) Air intake system (*5) 6) Fuel injection parts (*4) 7) Electronic throttle control 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay 12) EGR valve
3. Engine does not return to idle.	1) Engine coolant temperature sensor 2) Electronic throttle control 3) Manifold absolute pressure sensor 4) Mass air flow and intake air temperature sensor 5) Accelerator pedal position sensor 6) Oil temperature sensor 7) EGR valve
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Electronic throttle control 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) EGR valve 10) Engine torque control signal circuit 11) Ignition parts (*1) 12) Accelerator pedal position sensor 13) Oil temperature sensor
5. Engine stalls, hesitates, or sputters at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Electronic throttle control 9) Fuel pump and fuel pump relay 10) EGR valve

Symptoms	Problem parts
6. Surging	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Electronic throttle control 8) Fuel pump and fuel pump relay 9) EGR valve
7. Spark knock	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay 7) EGR valve
8. After burning in exhaust system	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check the fuel injector and fuel pressure regulator.
*5: Inspect for air leak in air intake system.

GENERAL DESCRIPTION

GD(H6DO)

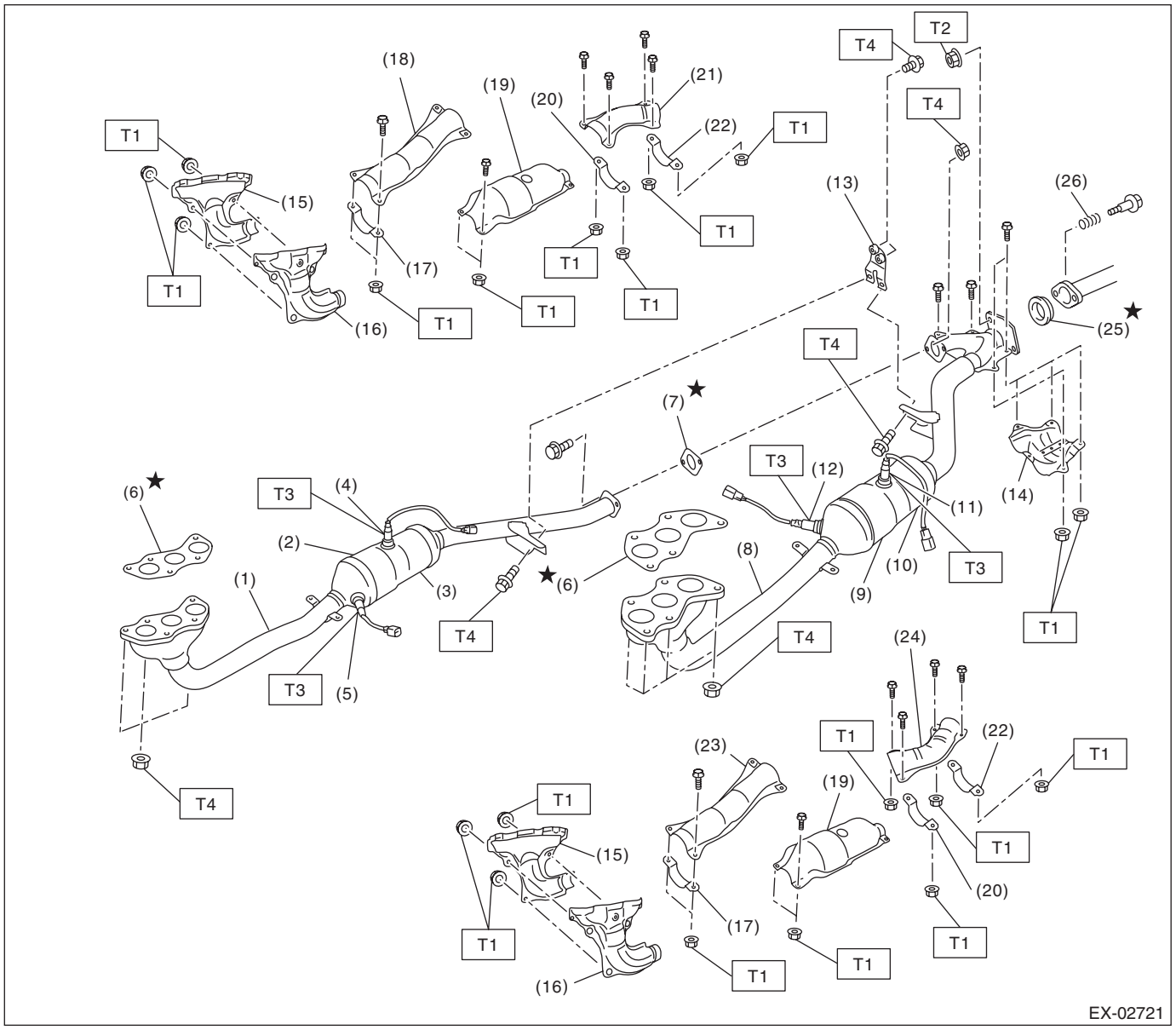
Page

1. List of Diagnostic Trouble Code (DTC) 2
2. Diagnostic Trouble Code (DTC) Detecting Criteria 10

1. General Description

A: COMPONENT

1. Front exhaust pipe

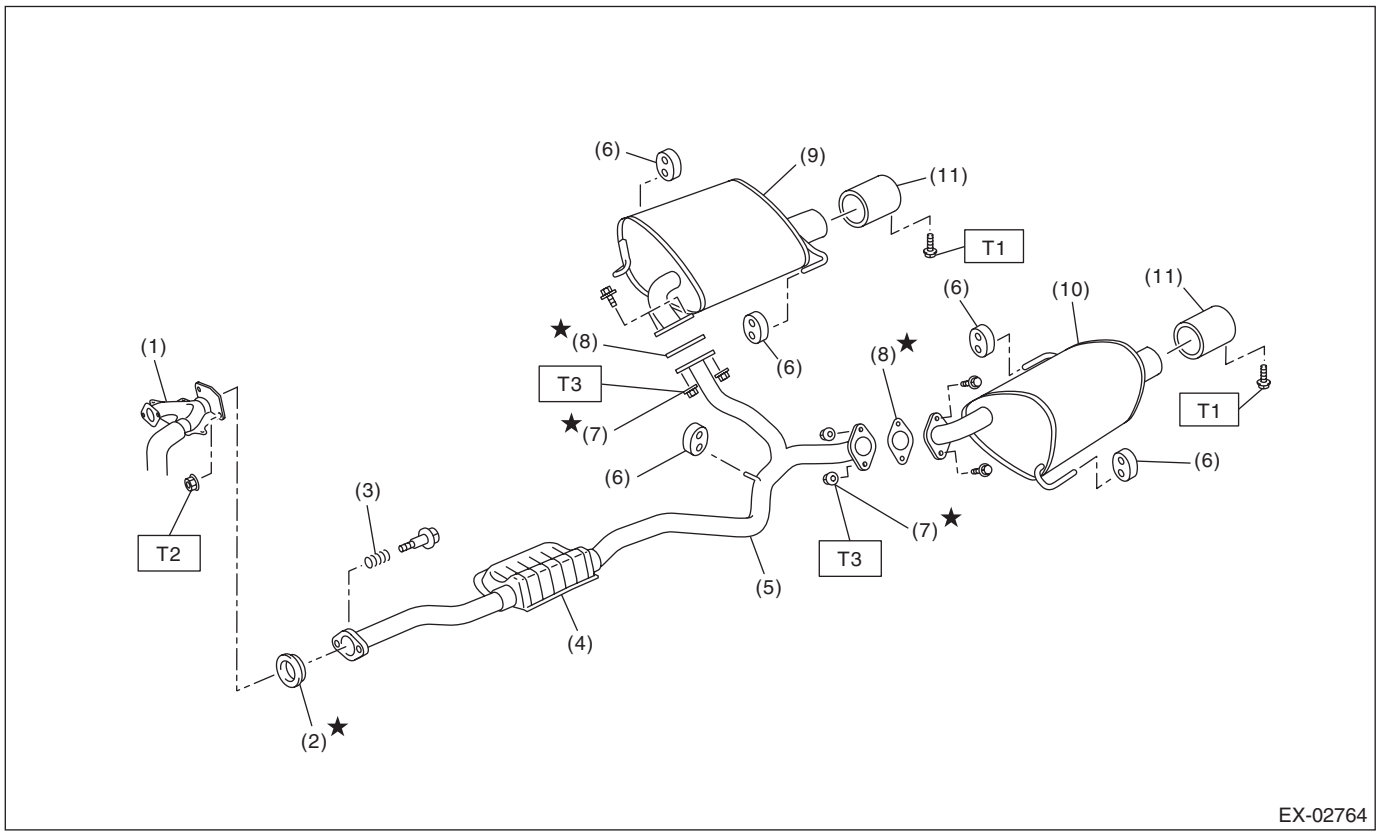


(1)	Front exhaust pipe (RH)	(13)	Bracket	(23)	Front exhaust pipe upper cover (LH) (front)
(2)	Front catalytic converter (RH)	(14)	Protector	(24)	Front exhaust pipe upper cover (LH) (rear)
(3)	Rear catalytic converter (RH)	(15)	Front exhaust pipe cover (RH)	(25)	Gasket
(4)	Rear oxygen sensor (RH)	(16)	Front exhaust pipe cover (LH)	(26)	Spring
(5)	Front oxygen sensor (RH)	(17)	Clamp		
(6)	Gasket	(18)	Front exhaust pipe upper cover (RH) (front)		
(7)	Gasket				
(8)	Front exhaust pipe (LH)	(19)	Catalytic converter upper cover		
(9)	Front catalytic converter (LH)	(20)	Clamp		
(10)	Rear catalytic converter (LH)	(21)	Front exhaust pipe upper cover (RH) (rear)		
(11)	Rear oxygen sensor (LH)				
(12)	Front oxygen sensor (LH)	(22)	Clamp		

Tightening torque:N·m (kgf-m, ft-lb)

T1: 13 (1.3, 9.6)
T2: 18 (1.8, 13.3)
T3: 21 (2.1, 15.5)
T4: 30 (3.1, 22.1)

2. Rear exhaust pipe and muffler



(1)	Front exhaust pipe (LH)	(7)	Self-locking nut
(2)	Gasket	(8)	Gasket
(3)	Spring	(9)	Muffler (RH)
(4)	Chamber	(10)	Muffler (LH)
(5)	Rear exhaust pipe	(11)	Muffler cutter
(6)	Cushion rubber		

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.8, 5.5)
T2: 18 (1.8, 13.3)
T3: 48 (4.9, 35.4)

B: CAUTION

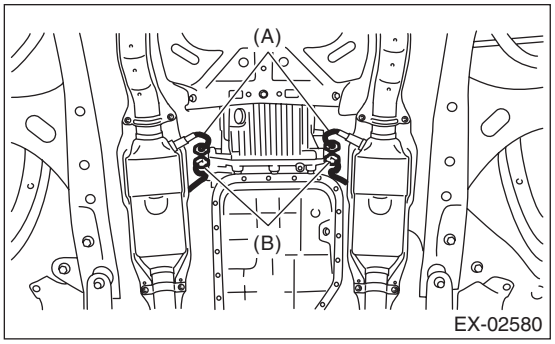
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
- If any fat adheres to the exhaust pipe, wipe it off. Otherwise a fire may happen.

2. Front Exhaust Pipe

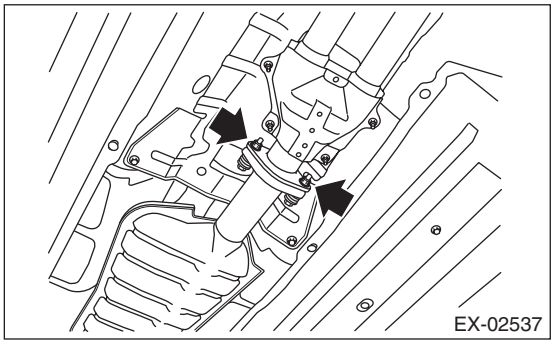
A: REMOVAL

CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
4) Disconnect the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B).

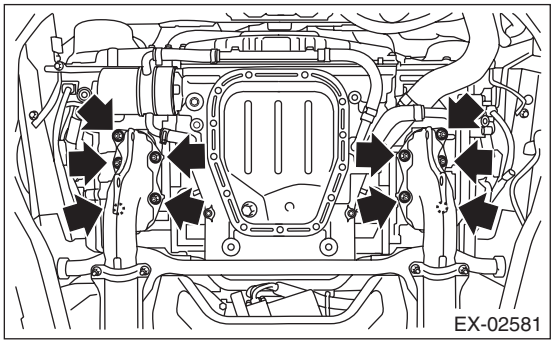


5) Remove the rear exhaust pipe from the front exhaust pipe assembly.

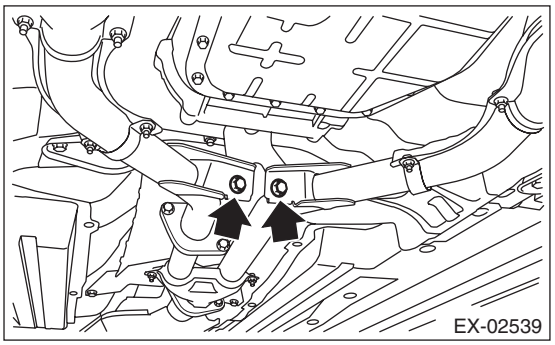


6) Remove the nuts which hold front exhaust pipe assembly onto cylinder heads.

CAUTION:
Be careful not to drop the front exhaust pipe assembly.



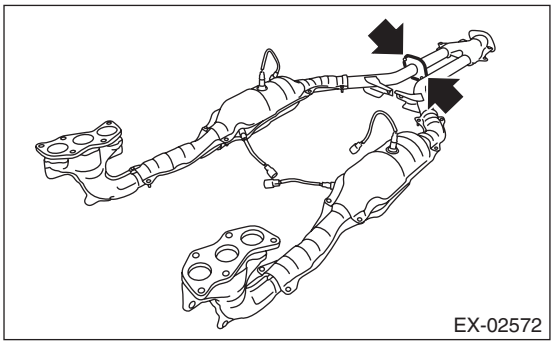
7) Remove the bolt which holds front exhaust pipe assembly to hanger bracket.



8) Remove the front exhaust pipe assembly.

CAUTION:
- **Be careful not to let the front exhaust pipe assembly fall off when removing, since it is very heavy.**
- **After removing the front exhaust pipe assembly, do not apply excessive pulling force on the rear exhaust pipe.**

9) Separate the front exhaust pipe (RH) from the front exhaust pipe (LH).



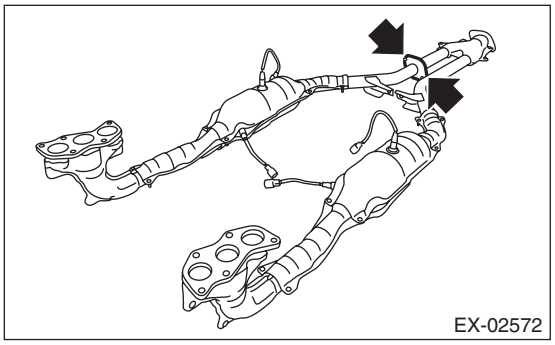
10) Remove the front oxygen (A/F) sensor and rear oxygen sensor. <Ref. to FU(H6DO)-47, REMOVAL, Front Oxygen (A/F) Sensor.> <Ref. to FU(H6DO)-49, REMOVAL, Rear Oxygen Sensor.>

B: INSTALLATION

1) Install the front oxygen (A/F) sensor and rear oxygen sensor. <Ref. to FU(H6DO)-47, INSTALLATION, Front Oxygen (A/F) Sensor.> <Ref. to FU(H6DO)-49, INSTALLATION, Rear Oxygen Sensor.>
2) Install the front exhaust pipe (RH) to the front exhaust pipe (LH).

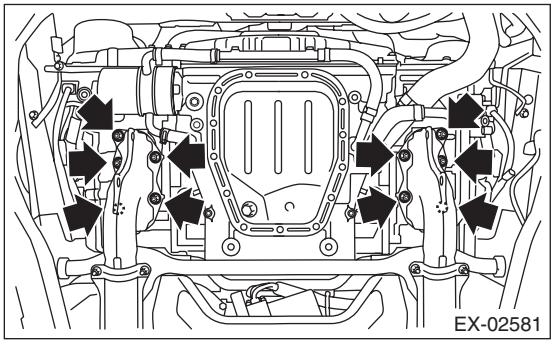
NOTE:
Use a new gasket.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)


EX-02572

3) Install the front exhaust pipe assembly.

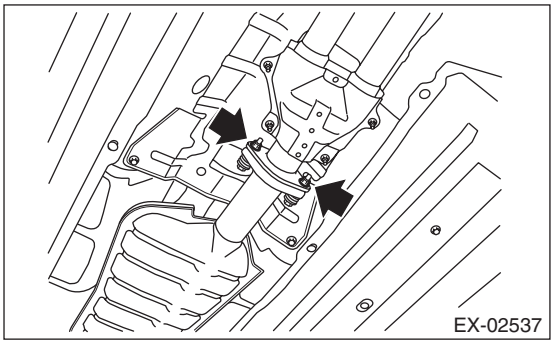
NOTE:
Use a new gasket.
4) Temporarily tighten the nuts which hold front exhaust pipe assembly to cylinder heads.


EX-02581

5) Install the front exhaust pipe assembly to the rear exhaust pipe.

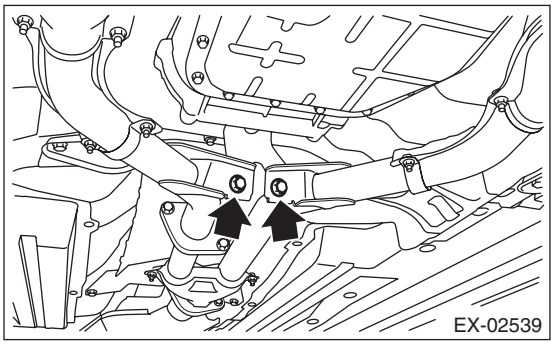
NOTE:
Use a new gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)


EX-02537

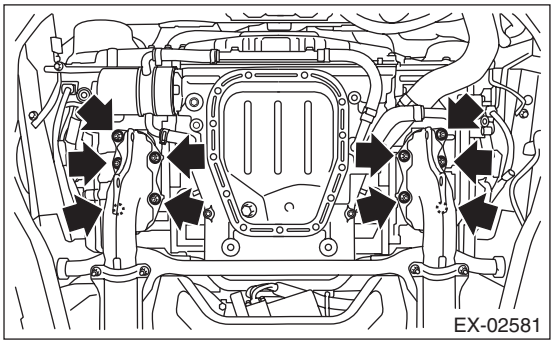
6) Tighten the bolts which hold front exhaust pipe assembly to hanger bracket.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

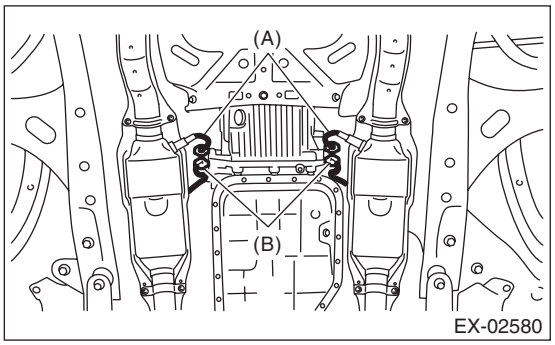

EX-02539

7) Tighten the nuts which the hold front exhaust pipe assembly to cylinder heads.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)


EX-02581

8) Connect the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B).



9) Install the under cover. <Ref. to EI-18, INSTALLATION, Front Under Cover.>
10) Lower the vehicle.
11) Connect the battery ground terminal.

C: INSPECTION

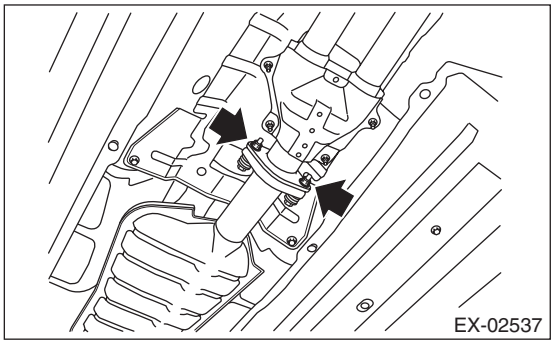
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.

3. Rear Exhaust Pipe

A: REMOVAL

CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

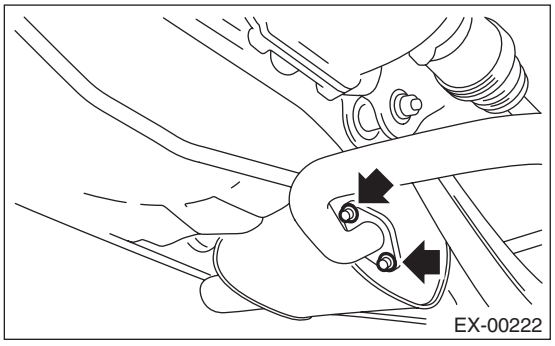
1) Lift up the vehicle.
2) Remove the rear exhaust pipe from the front exhaust pipe assembly.



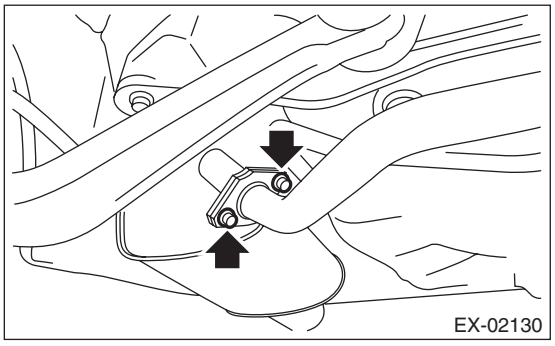
3) Remove the rear exhaust pipe from the muffler.

CAUTION:
Be careful not to drop the rear exhaust pipe.

- LH side

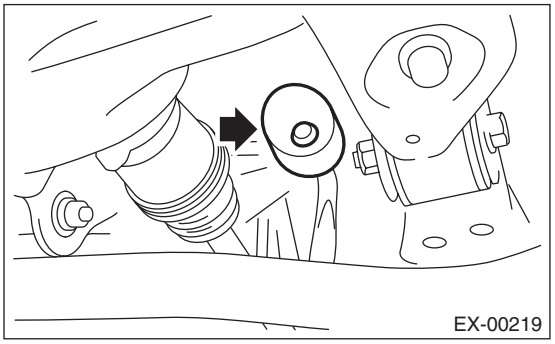


- RH side



4) Apply a coat of spray type lubricant to the mating area of cushion rubber.
5) Remove the rear exhaust pipe from the cushion rubber.

CAUTION:
Be careful not to let the muffler contact the rear bumper.

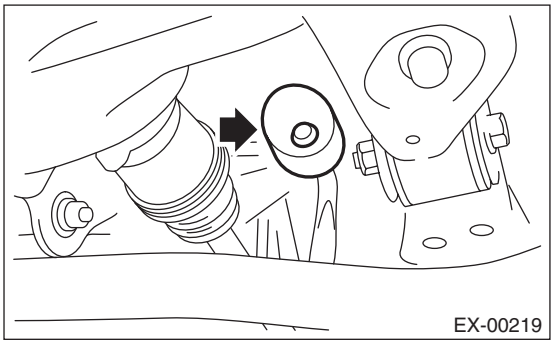


6) Remove the rear exhaust pipe.

B: INSTALLATION

1) Apply a coat of spray type lubricant to the mating area of cushion rubber.
2) Install the rear exhaust pipe to cushion rubber.

NOTE:
After assembling, degrease the lubricant which was applied to the cushion rubber while removing/installing.

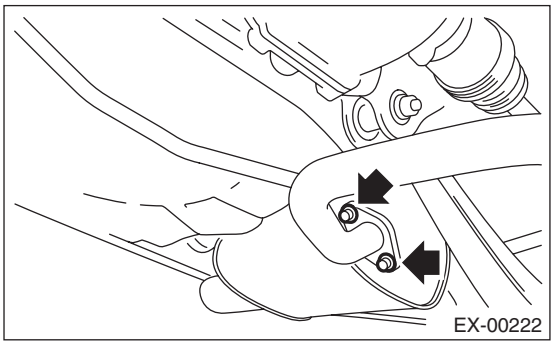


3) Install the rear exhaust pipe to the muffler.

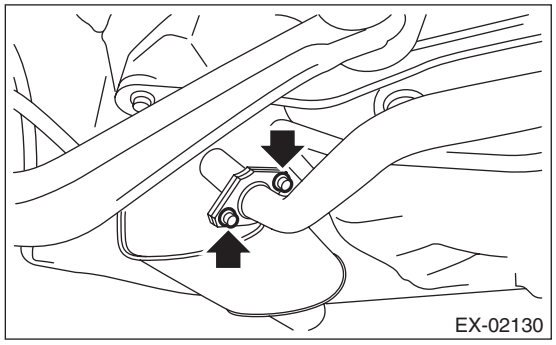
NOTE:
Use a new gasket and self-locking nut.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

- LH side



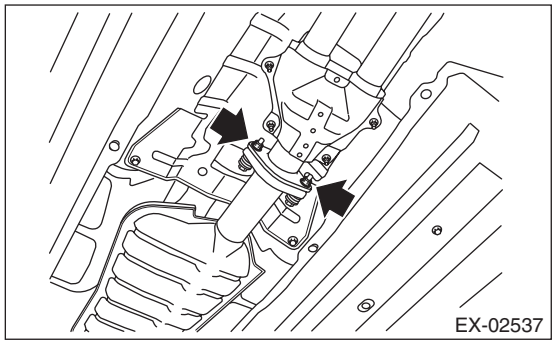
- RH side



4) Install the rear exhaust pipe to the front exhaust pipe assembly.

NOTE:
Use a new gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



5) Lower the vehicle.

C: INSPECTION

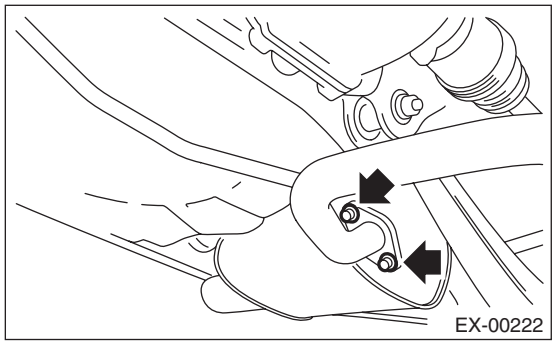
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.
3) Check the cushion rubber for wear or crack.

4. Muffler

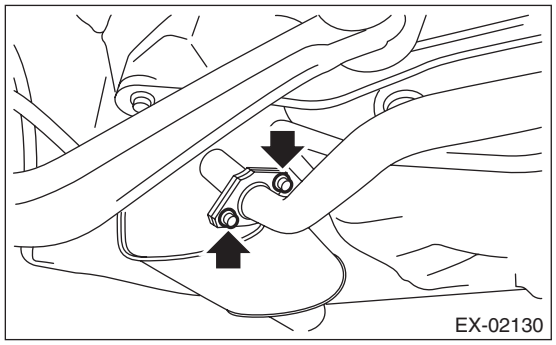
A: REMOVAL

CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

1) Lift up the vehicle.
2) Remove the muffler from rear exhaust pipe.
- LH side



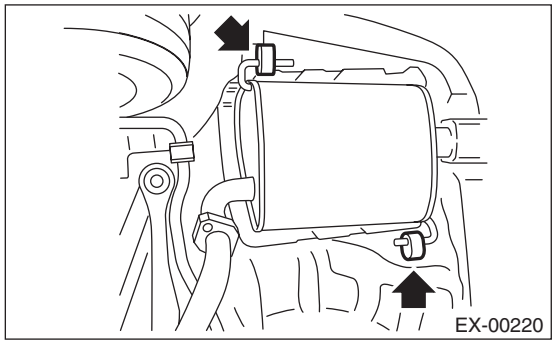
- RH side



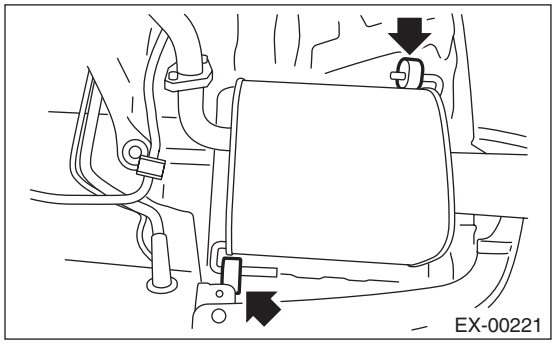
3) Apply a coat of spray type lubricant to the mating area of cushion rubber.
4) Remove the muffler from the cushion rubber.

CAUTION:
Be careful not to drop the muffler during removal.

- LH side



- RH side



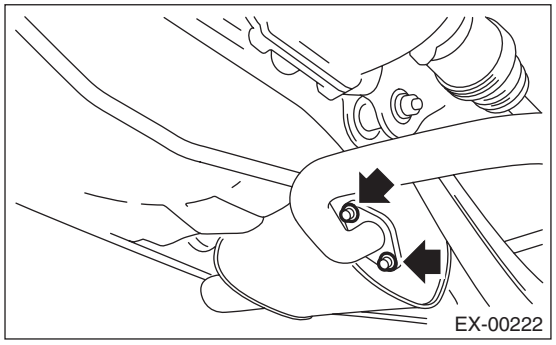
B: INSTALLATION

Install in the reverse order of removal.

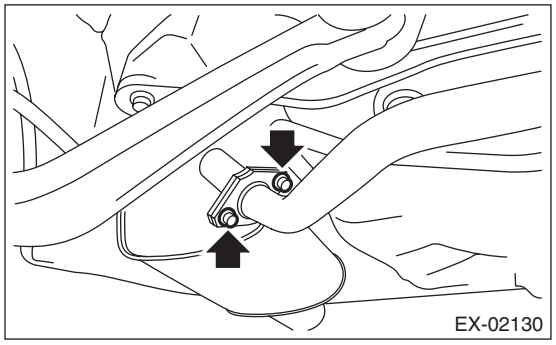
NOTE:
- Use a new gasket and self-locking nut.
- After assembling, degrease the lubricant which was applied to the cushion rubber while removing/installing.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

- LH side



- RH side



C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.
3) Check the cushion rubber for wear or crack.

COOLING

CO(H6DO)

Page

1. General Description 2
2. Radiator Fan System 9
3. Engine Coolant 13
4. Water Pump 16
5. Thermostat 17
6. Radiator 19
7. Radiator Cap 24
8. Radiator Main Fan and Fan Motor 25
9. Radiator Sub Fan and Fan Motor 29
10. Reservoir Tank 30
11. Radiator Fan Control Unit 33
12. Engine Cooling System Trouble in General 34

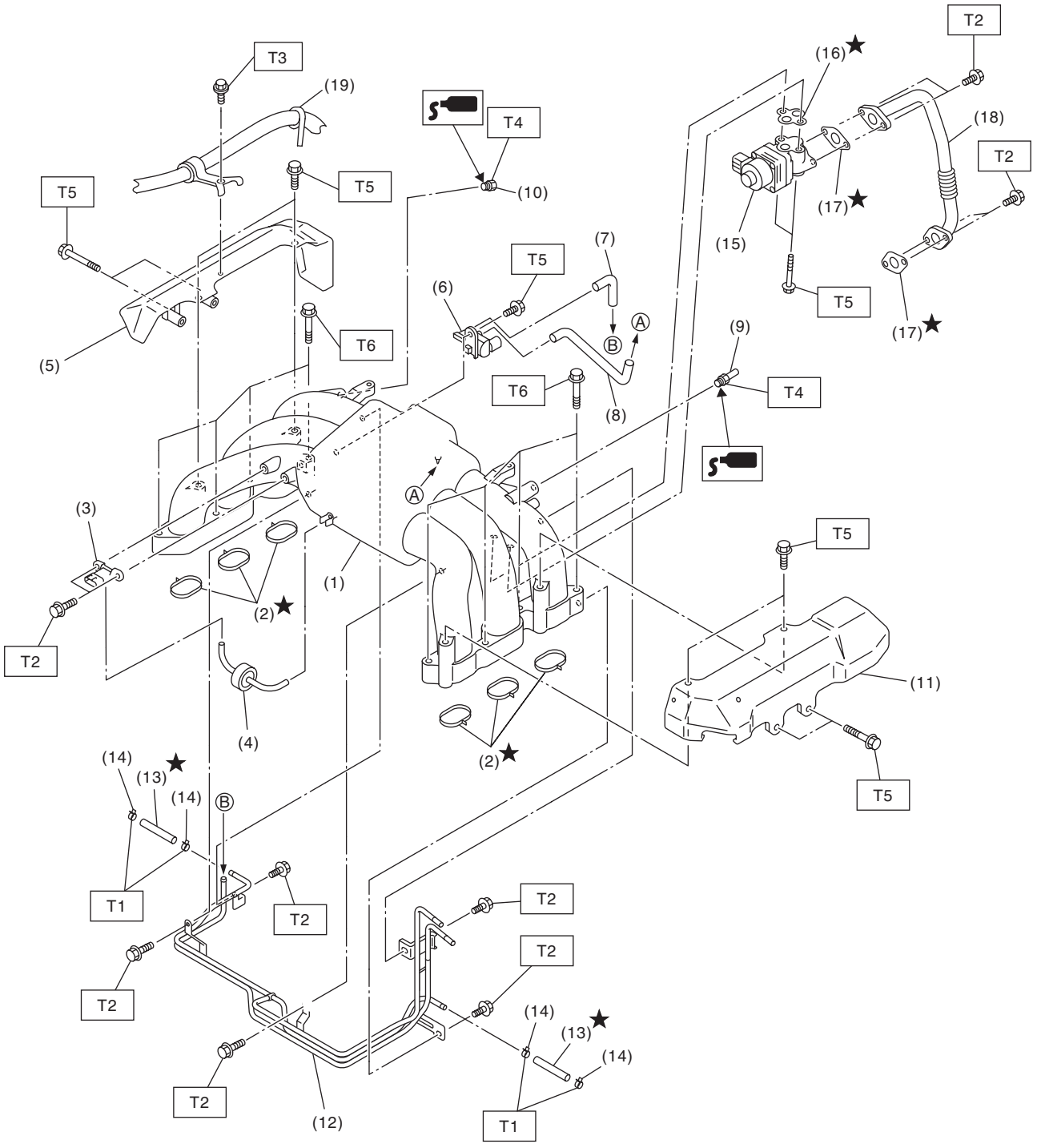
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Rear floor under
Fuel pump	Type	Impeller
	Shutoff discharge pressure	550 — 850 kPa (5.61 — 8.67 kg/cm^2, 79.8 — 123.3 psi)
	Discharge rate	155 ℓ (41 US gal, 34.1 Imp gal)/h or more [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		In-tank type

B: COMPONENT

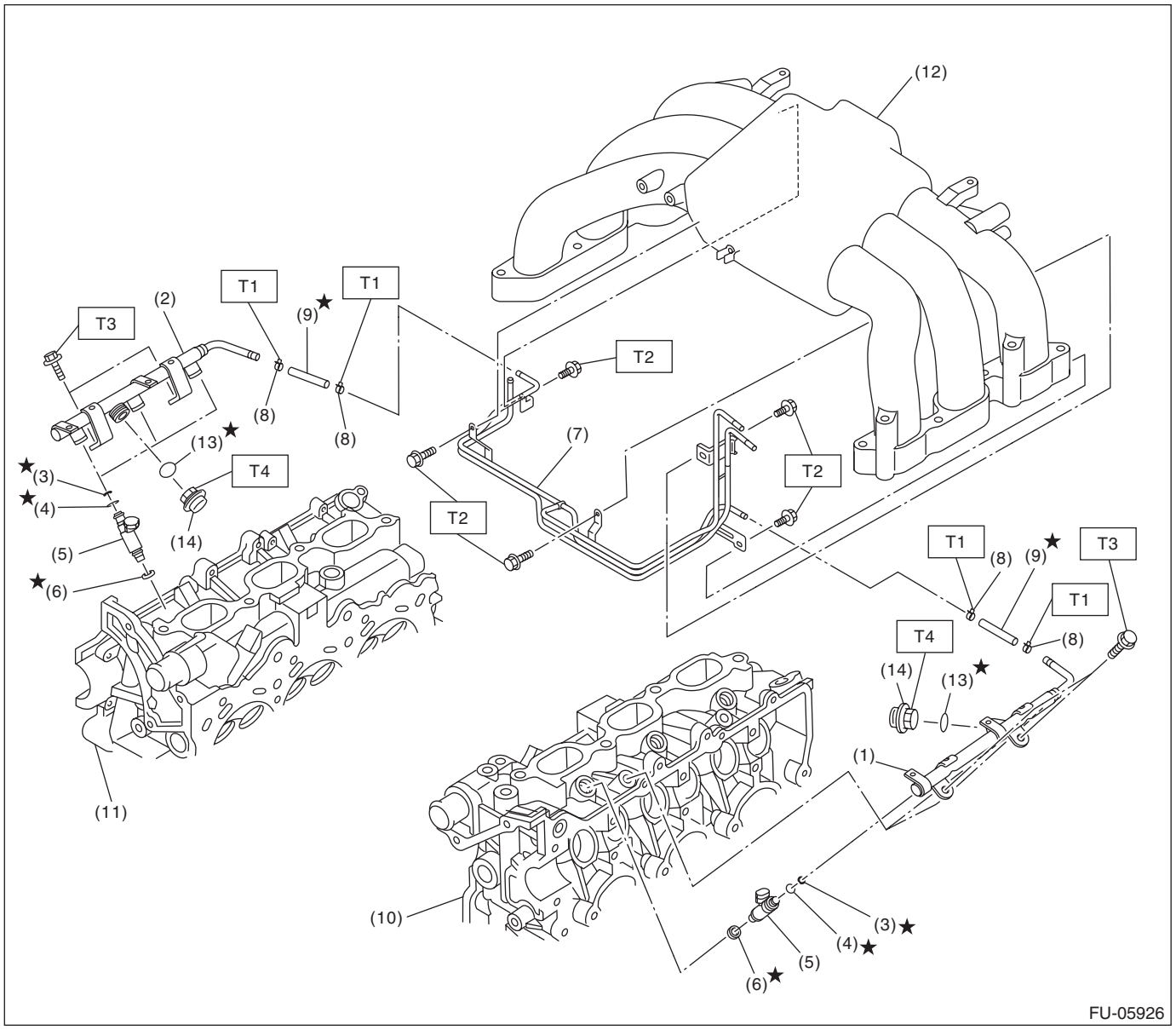
1. INTAKE MANIFOLD



(1) Intake manifold
(2) O-ring
(3) Manifold absolute pressure sensor
(4) Filter
(5) Fuel pipe protector RH
(6) Purge control solenoid valve
(7) Hose
(8) Hose
(9) Nipple
(10) Plug
(11) Fuel pipe protector LH
(12) Fuel pipe ASSY
(13) Fuel hose
(14) Clamp
(15) EGR valve
(16) Gasket
(17) Gasket
(18) EGR pipe
(19) Feed hose

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.25 (0.1, 0.9)
T2: 6.4 (0.7, 4.7)
T3: 13 (1.3, 9.6)
T4: 17 (1.7, 12.5)
T5: 19 (1.9, 14.0)
T6: 25 (2.5, 18.4)

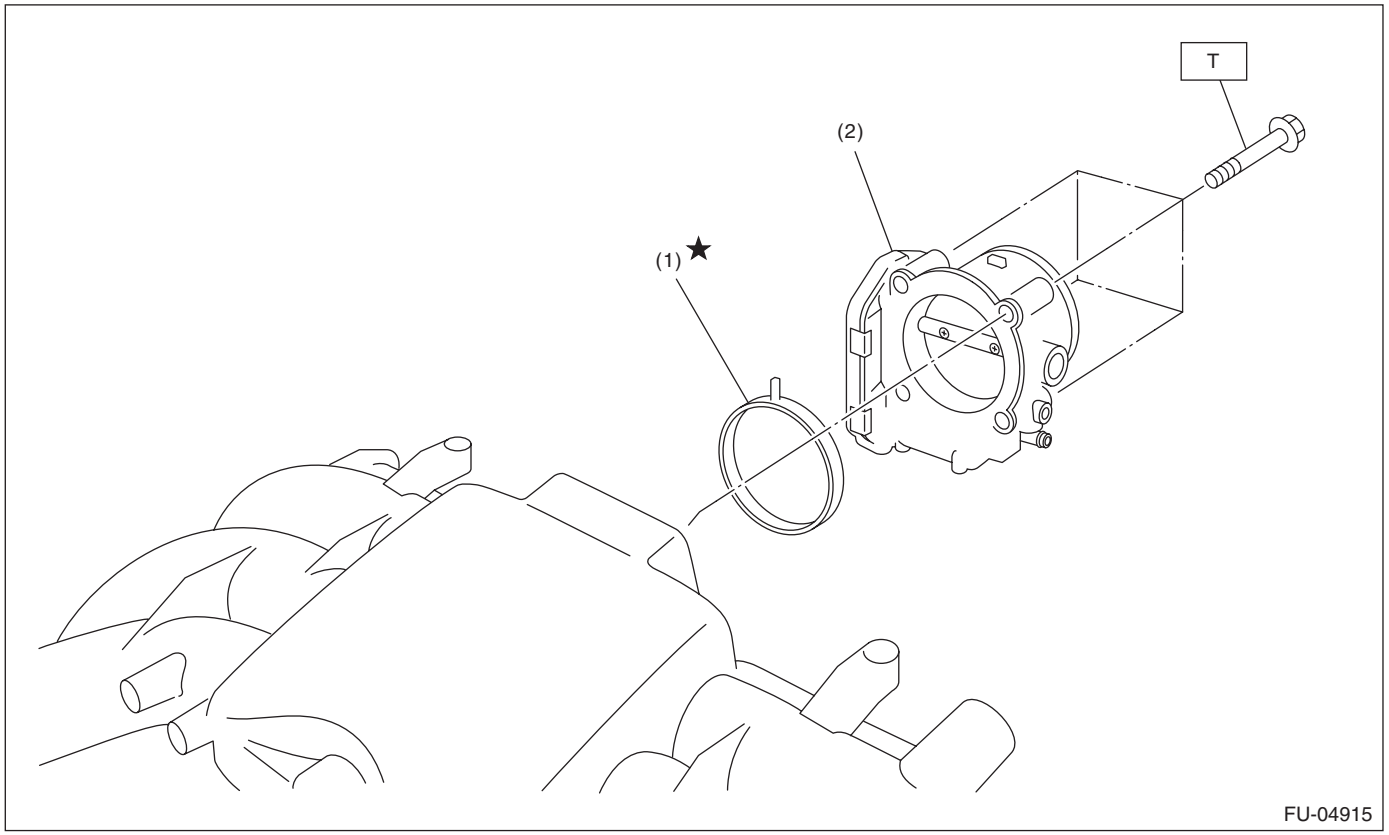
2. FUEL INJECTOR



(1)	Fuel injector pipe LH	(8)	Clamp
(2)	Fuel injector pipe RH	(9)	Fuel hose
(3)	O-ring	(10)	Cylinder head LH
(4)	Injection rubber	(11)	Cylinder head RH
(5)	Fuel injector	(12)	Intake manifold
(6)	Seal ring	(13)	Gasket
(7)	Fuel pipe ASSY	(14)	Pulsation damper

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.25 (0.1, 0.9)
T2: 6.4 (0.7, 4.7)
T3: 19 (1.9, 14.0)
T4: 21.6 (2.2, 15.9)

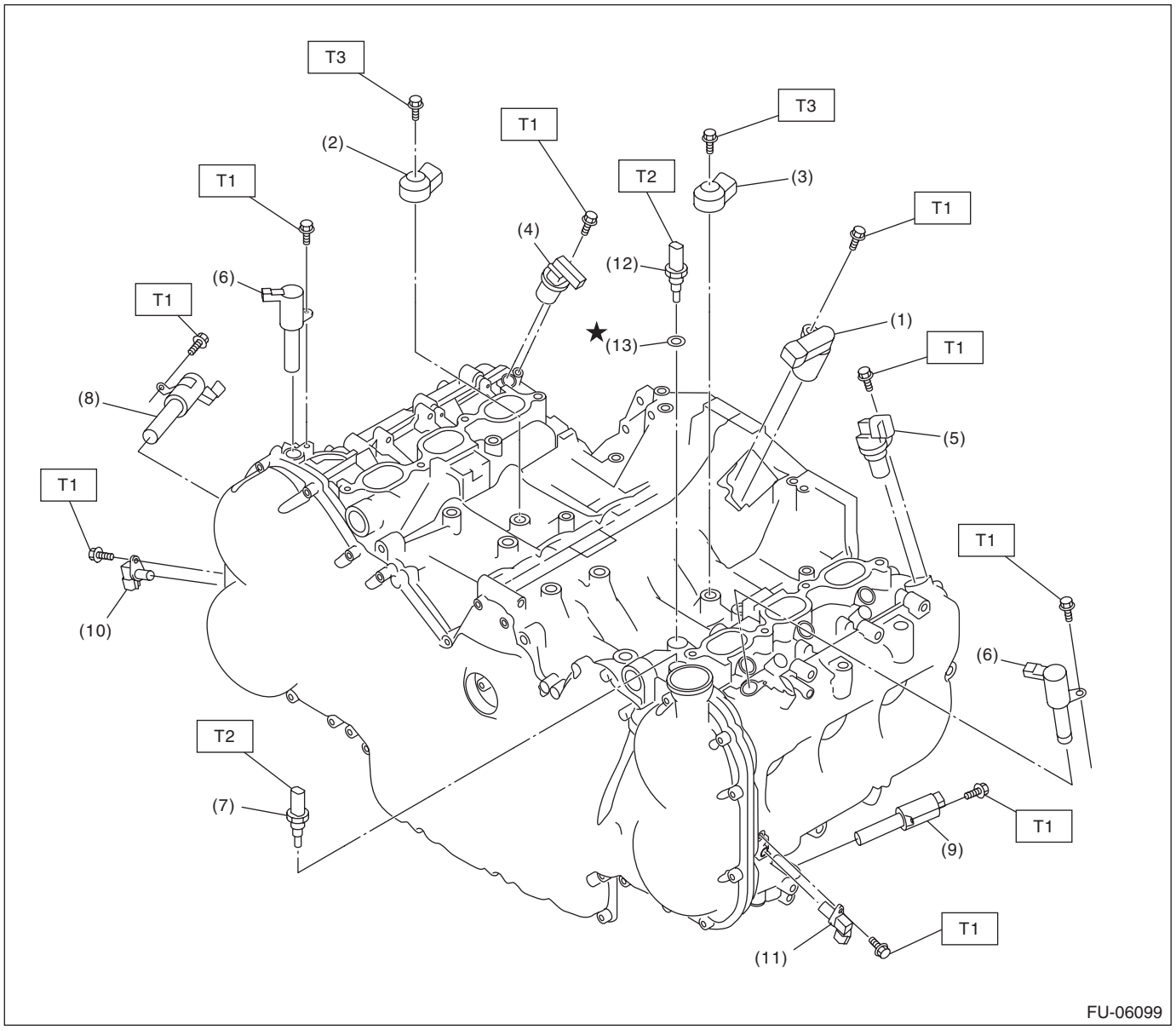
3. AIR INTAKE SYSTEM



(1) O-ring
(2) Throttle body

Tightening torque:N·m (kgf-m, ft-lb)
T: 8 (0.8, 5.9)

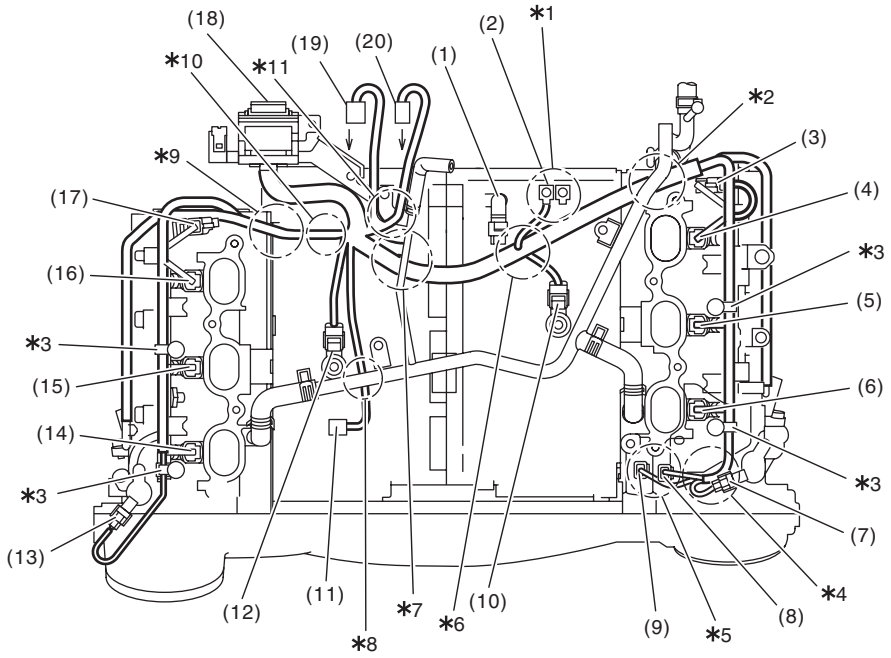
4. SENSOR



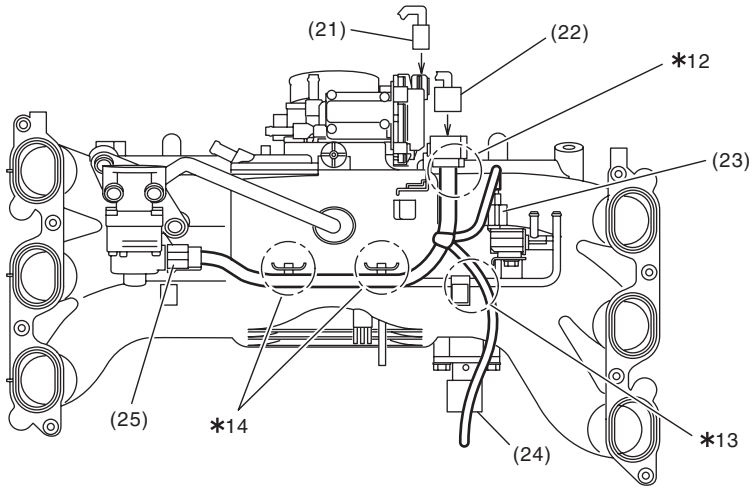
(1)	Crankshaft position sensor	(7)	Oil temperature sensor	(13)	Gasket
(2)	Knock sensor RH	(8)	Exhaust oil flow control solenoid valve RH		
(3)	Knock sensor LH	(9)	Exhaust oil flow control solenoid valve LH	***Tightening torque:N·m (kgf-m, ft-lb)***	
(4)	Intake camshaft position sensor RH	(10)	Exhaust camshaft position sensor RH	***T1:***	***6.4 (0.7, 4.7)***
(5)	Intake camshaft position sensor LH	(11)	Exhaust camshaft position sensor LH	***T2:***	***22 (2.2, 16.2)***
(6)	Intake oil flow control solenoid valve	(12)	Engine coolant temperature sensor	***T3:***	***25 (2.5, 18.4)***

5. ENGINE HARNESS

Engine harness assembly diagram 1



(A)



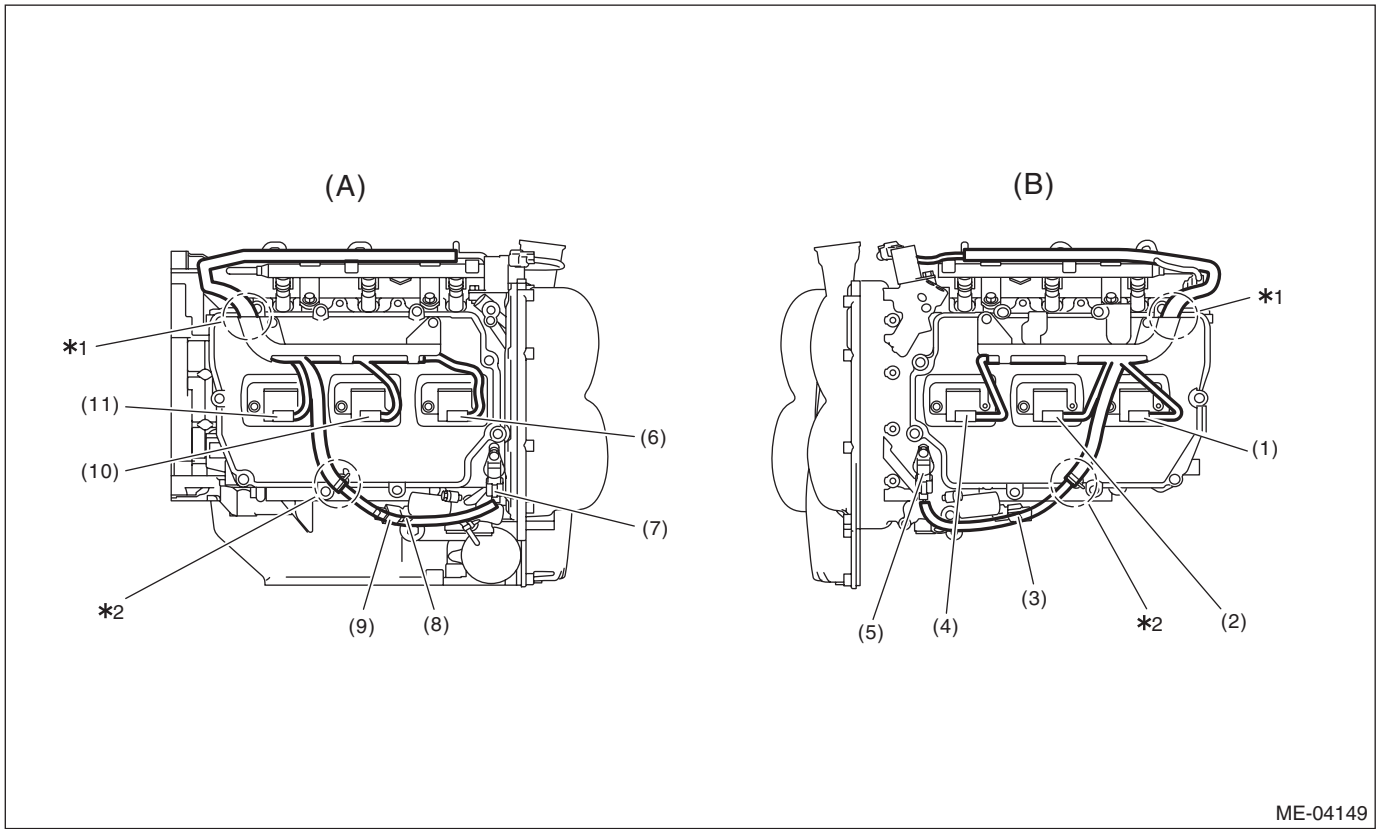
(B)

ME-04534

(A)	Cylinder block upper face	(B)	Intake manifold back surface		
(1)	Crankshaft position sensor connector	(10)	Knock sensor LH connector	(19)	Upper/lower connection connector (To intake manifold)
(2)	Engine ground	(11)	Power steering switch connector	(20)	Electronic throttle control connector (To intake manifold)
(3)	Intake camshaft position sensor LH connector	(12)	Knock sensor RH connector	(21)	Electronic throttle control connector (From upper part of the cylinder block)
(4)	#6 injector connector	(13)	Intake oil flow control solenoid valve RH connector	(22)	Upper/lower connection connector (From upper part of the cylinder block)
(5)	#4 injector connector	(14)	#1 injector connector	(23)	Purge control solenoid valve connector
(6)	#2 injector connector	(15)	#3 injector connector	(24)	Manifold absolute pressure sensor connector
(7)	Intake oil flow control solenoid valve LH connector	(16)	#5 injector connector	(25)	EGR valve connector
(8)	Oil temperature sensor connector	(17)	Intake camshaft position sensor RH connector		
(9)	Engine coolant temperature sensor connector	(18)	Engine harness docking connector		

*1: Install so that engine ground terminals face the rear side of vehicle.
*2: Route under the heater pipe.
*3: Attach the engine harness fixing clip to the fuel pipe stay.
*4: Route from the cutout portion on the fuel pipe protector LH.
*5: Be careful not to mix up the connectors of oil temperature sensor and engine coolant temperature sensor.
*6: Route between crankshaft position sensor and knock sensor LH.
*7: Route under the heater pipe.
*8: Route under the heater pipe.
*9: Route under the fuel pipe.
*10: Attach the engine harness fixing clip to the fixing boss on the cylinder block.
*11: Route over the heater pipe stay.
*12: Securely install the engine harness fixing stay.
*13: Route outside the fuel pipe.
*14: Attach the engine harness fixing clip to the fixing stay on the intake manifold.

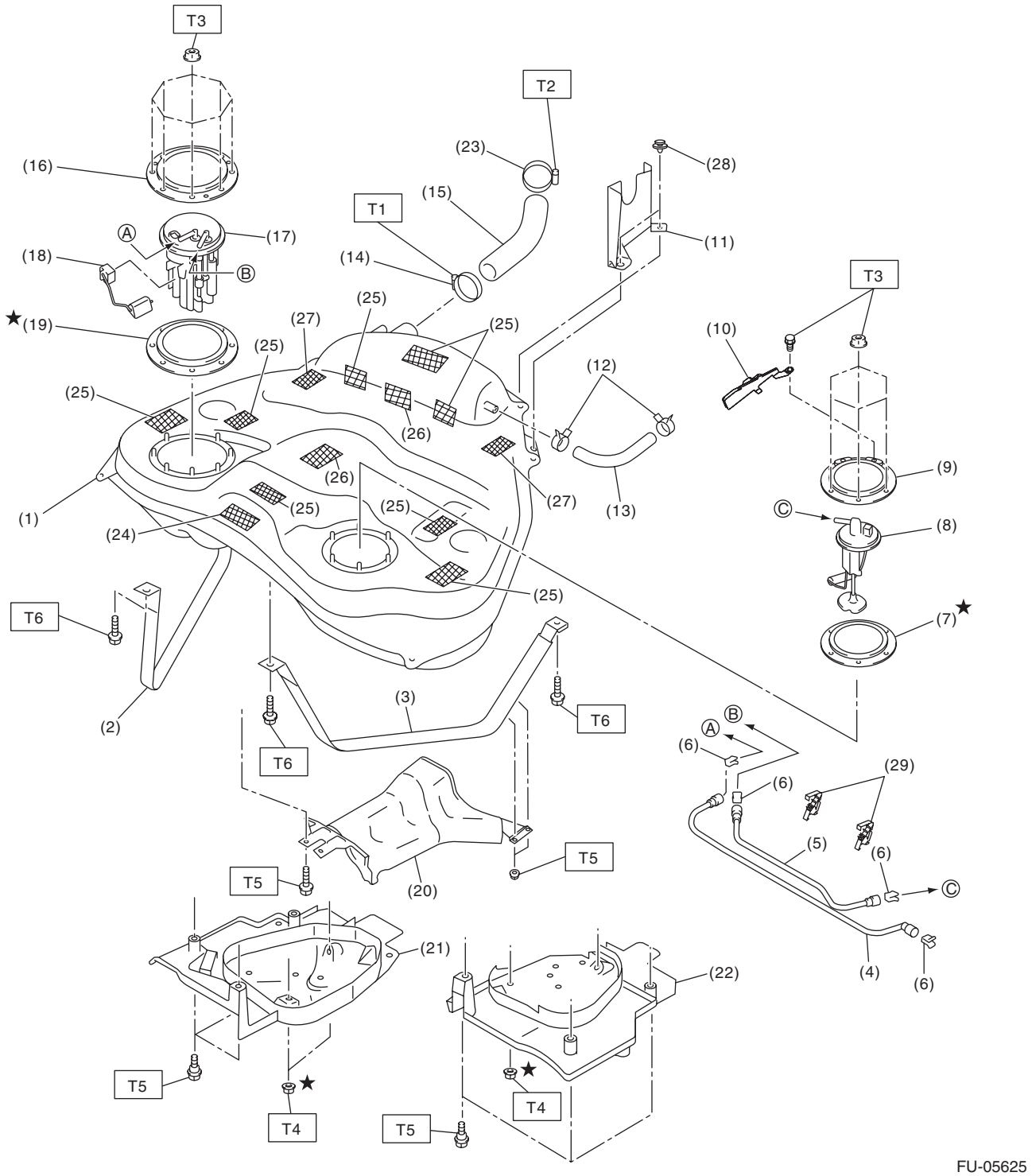
Engine harness assembly diagram 2



(A)	Right side of the engine	(B)	Left side of the engine		
(1)	#6 ignition coil connector	(5)	Exhaust camshaft position sensor LH connector	(9)	Exhaust oil flow control valve solenoid RH connector
(2)	#4 ignition coil connector	(6)	#1 injector connector	(10)	#3 ignition coil connector
(3)	Exhaust oil flow control valve solenoid LH connector	(7)	Exhaust camshaft position sensor RH connector	(11)	#5 ignition coil connector
(4)	#2 ignition coil connector	(8)	Oil pressure switch connector		

*1: Align the engine harness stay end with the end of engine harness identification tape.
*2: Attach the engine harness fixing clip to the fixing boss on the rocker cover.

6. FUEL TANK

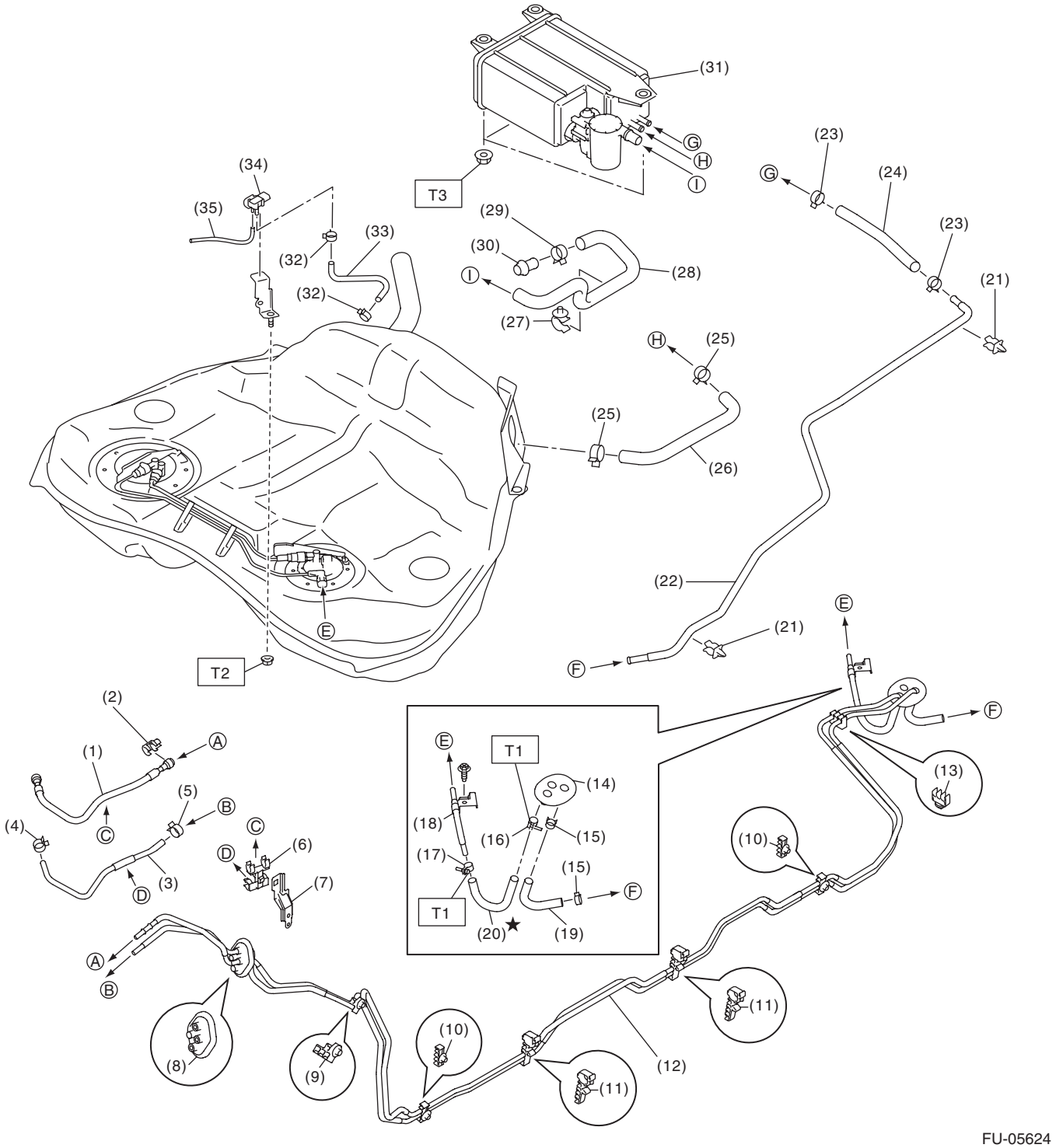


FU-05625

(1) Fuel tank
(2) Fuel tank band RH
(3) Fuel tank band LH
(4) Fuel delivery tube
(5) Fuel sub delivery tube
(6) Retainer
(7) Fuel sub level sensor gasket
(8) Fuel sub level sensor
(9) Fuel sub level sensor upper plate
(10) Fuel sub level sensor protector
(11) Fuel tank protector
(12) Clip
(13) Air vent hose
(14) Clamp
(15) Fuel filler hose
(16) Fuel pump upper plate
(17) Fuel pump ASSY
(18) Fuel level sensor
(19) Fuel level sensor gasket
(20) Heat shield cover
(21) Fuel tank protector RH
(22) Fuel tank protector LH
(23) Clamp
(24) Cushion
(25) Cushion
(26) Cushion
(27) Cushion
(28) Clip
(29) Fuel tube clamp

Tightening torque:N·m (kgf-m, ft-lb)
T1: 2 (0.2, 1.5)
T2: 2.5 (0.3, 1.8)
T3: 4.4 (0.4, 3.2)
T4: 9 (0.9, 6.6)
T5: 18 (1.8, 13.3)
T6: 33 (3.4, 24.3)

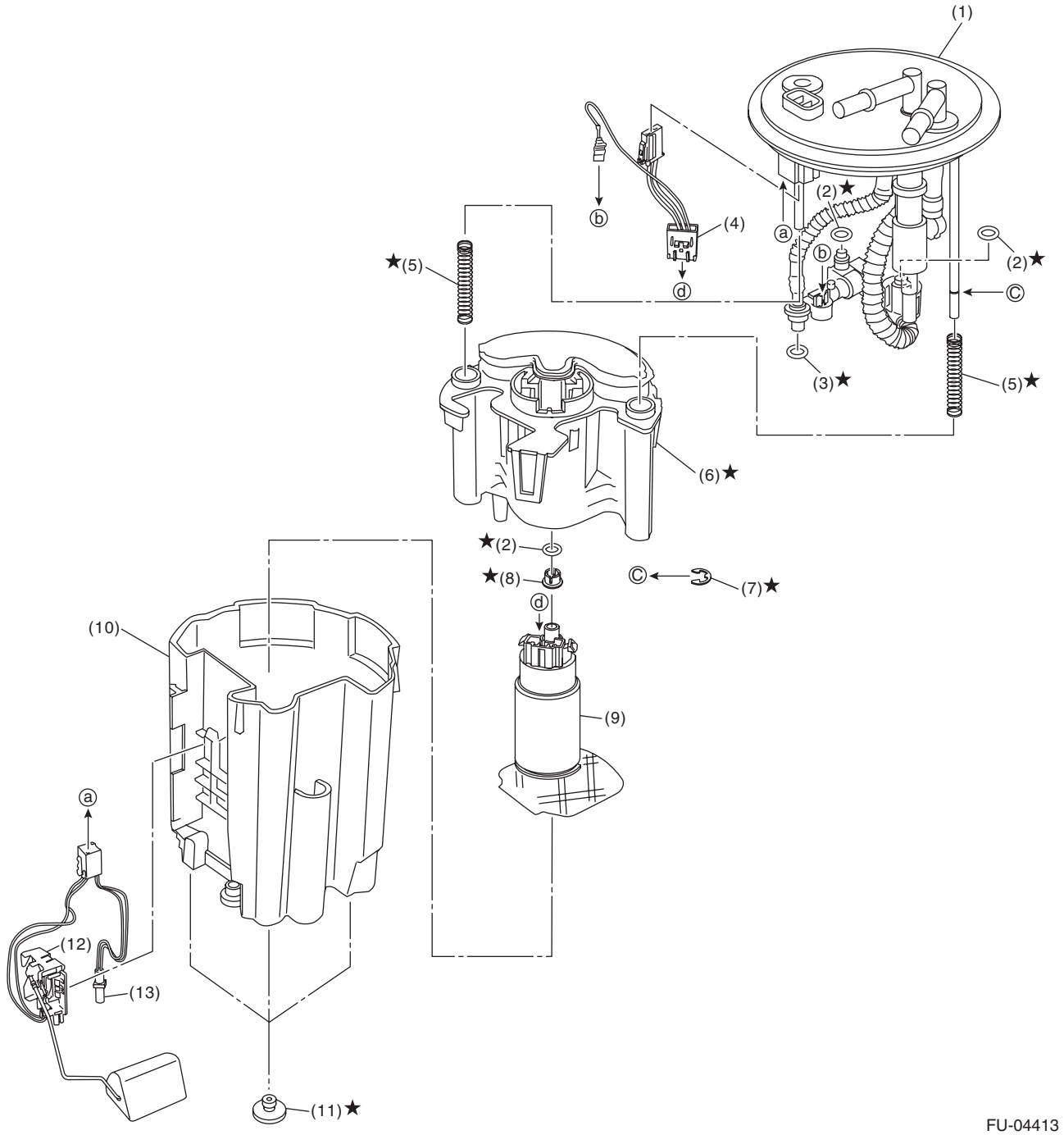
7. FUEL LINE


(31)
T3
(34)
(35)
(33)
(32)
(32)
(29)
(30)
(28)
(27)
(23)
(24)
(23)
(21)
(25)
(25)
(26)
(22)
(21)
T2
(2)
(1)
(5)
(4)
(3)
(6)
(7)
T1
(14)
(18)
(16)
(15)
(17)
(15)
T1
(20)
(19)
(13)
(10)
(8)
(9)
(10)
(11)
(12)
(11)
FU-05624

(1) Fuel delivery hose A
(2) Connect check cover
(3) Evaporation hose A
(4) Clip
(5) Clip
(6) Hose clamp
(7) Clamp bracket
(8) Grommet
(9) Clamp
(10) Clamp
(11) Clamp
(12) Fuel pipe ASSY
(13) Clamp
(14) Grommet
(15) Clip
(16) Clamp
(17) Clamp
(18) Fuel delivery pipe
(19) Evaporation hose B
(20) Fuel delivery hose B
(21) Clamp
(22) Purge pipe
(23) Clip
(24) Purge hose
(25) Clip
(26) Air vent hose
(27) Clip
(28) Drain hose
(29) Clip
(30) Drain connector
(31) Canister
(32) Clip
(33) Pressure hose
(34) Fuel tank pressure sensor
(35) Vacuum hose

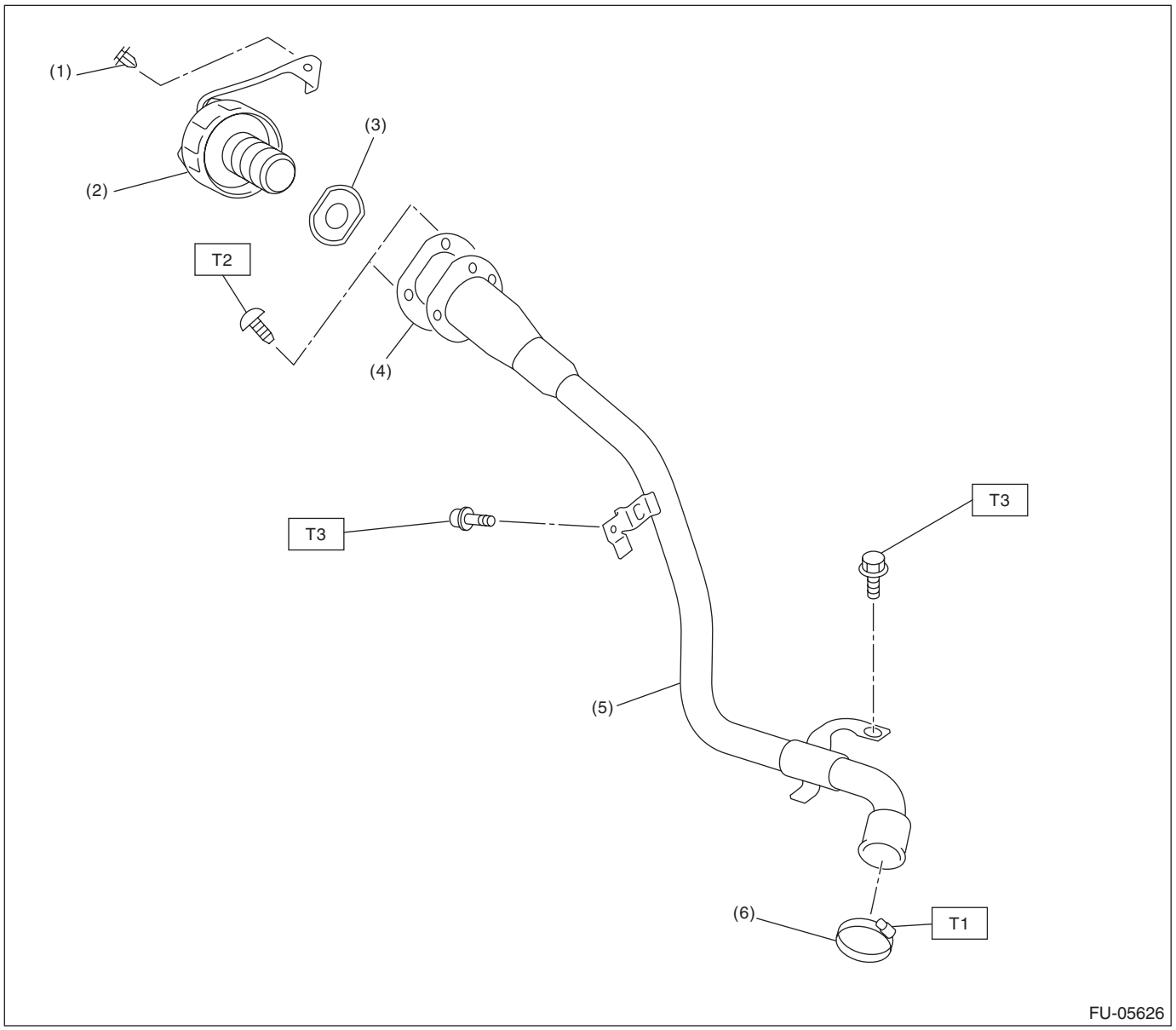
Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.25 (0.1, 0.9)
T2: 7.35 (0.7, 5.4)
T3: 8 (0.8, 5.9)

8. FUEL PUMP



(1)	Sub tank bracket ASSY	(6)	Fuel filter	(11)	Cushion
(2)	O-ring	(7)	Clip	(12)	Fuel level sensor
(3)	O-ring	(8)	Spacer	(13)	Fuel temperature sensor
(4)	Fuel pump harness	(9)	Pump ASSY		
(5)	Spring	(10)	Sub tank		

9. FUEL FILLER PIPE



(1) Clip
(2) Fuel filler cap
(3) Ring
(4) Gasket
(5) Fuel filler pipe
(6) Clamp

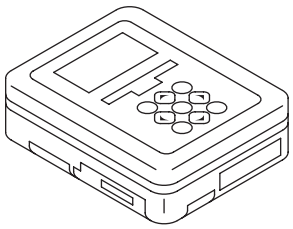
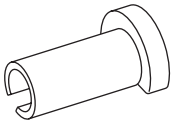
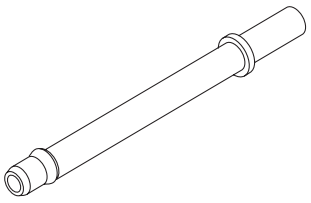
Tightening torque:N·m (kgf-m, ft-lb)
T1: 2.5 (0.3, 1.8)
T2: 4.5 (0.5, 3.3)
T3: 7.8 (0.8 5.5)

C: CAUTION

• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
• Place “NO OPEN FLAMES” signs near the working area.
• Prepare a container and cloth to prevent scattering of fuels when performing work where fuels can be spilled. If the fuel spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
• Follow all government and local regulations concerning disposal of refuse when disposing fuel.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for draining fuel and each inspection.
 ST42099AE000	42099AE000	QUICK CONNECTOR RELEASE	Used for removing the quick connector.
 ST18471AA000	18471AA000	FUEL PIPE ADAPTER	Used for draining fuel.

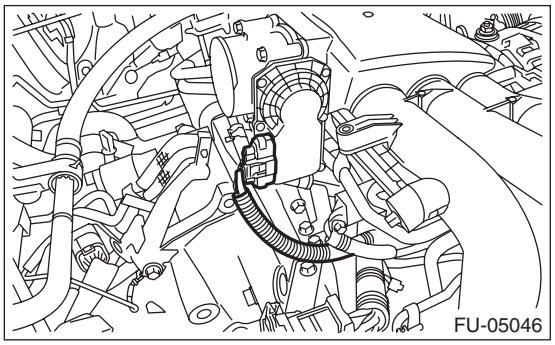
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Oscilloscope	Used for inspecting the waveform of each sensor.

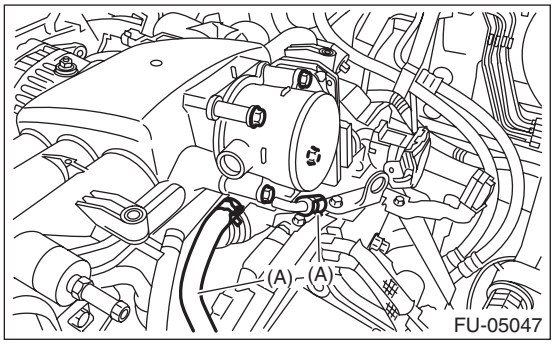
2. Throttle Body

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the air intake chamber. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector from the throttle body.



5) Disconnect the engine coolant hoses (A) from throttle body.
6) Remove the bolts which secure the throttle body to the intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

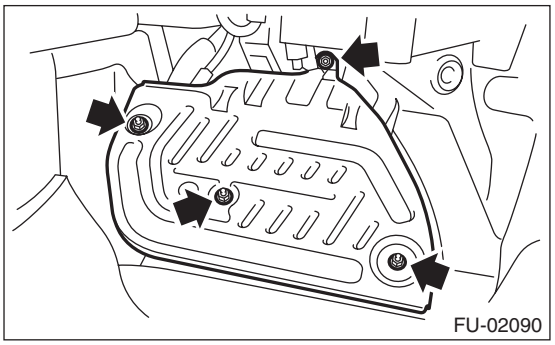
NOTE:
Use new O-rings.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

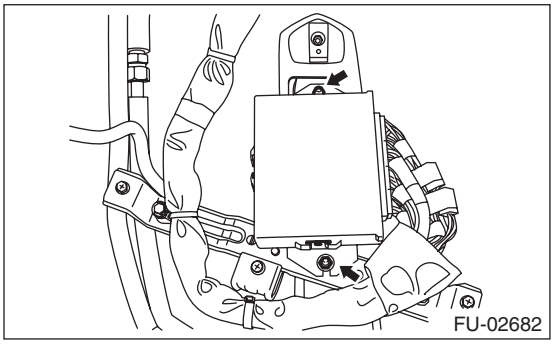
C: INSPECTION

1. THROTTLE SENSOR (METHOD WITH CIRCUIT TESTER)

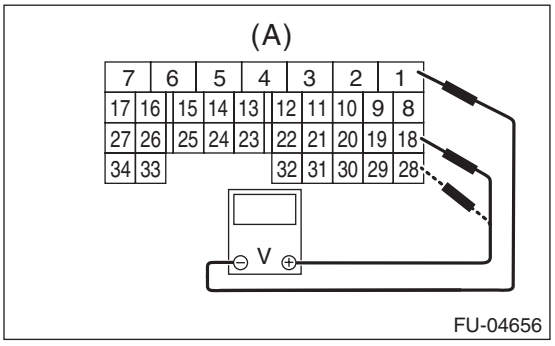
1) Disconnect the ground cable from battery.
2) Remove the front pillar lower trim and console side panel lower RH of passenger's side.
3) Detach the floor mat of passenger's seat.
4) Remove the protect cover.



5) Remove the ECM from vehicle.



6) Turn the ignition switch to ON. (engine OFF)
7) Measure the voltage between ECM connector terminals.



(A) To ECM connector

Throttle sensor	Accelerator pedal	Terminal No.	Standard
Main	Not depressed (Full closed)	18 (+) and 1 (–)	Approx. 0.6 V
	Depressed (Full opened)		Approx. 4.04 V
Sub	Not depressed (Full closed)	28 (+) and 1 (–)	Approx. 1.48 V
	Depressed (Full opened)		Approx. 4.23 V

8) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

2. THROTTLE SENSOR (METHOD WITH SUBARU SELECT MONITOR)

1) Turn the ignition switch to ON. (engine OFF)
2) Read the throttle opening angle signal and voltage of throttle sensor using Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

Throttle sensor	Throttle opening angle signal	Standard
Main	0.0%	Approx. 0.6 V
	100.0%	Approx. 4.04 V
Sub	0.0%	Approx. 1.48 V
	100.0%	Approx. 4.23 V

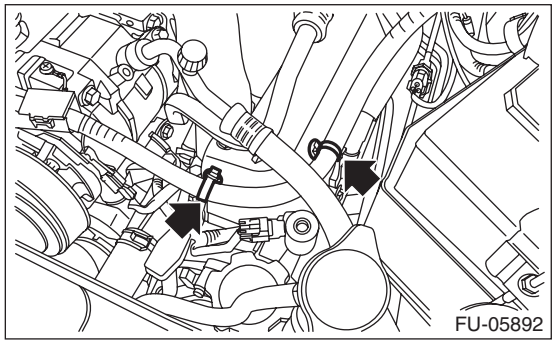
3. OTHER INSPECTIONS

1) Check that the throttle body has no deformation, cracks or other damages.
2) Check that the engine coolant hose has no cracks, damage or loose part.

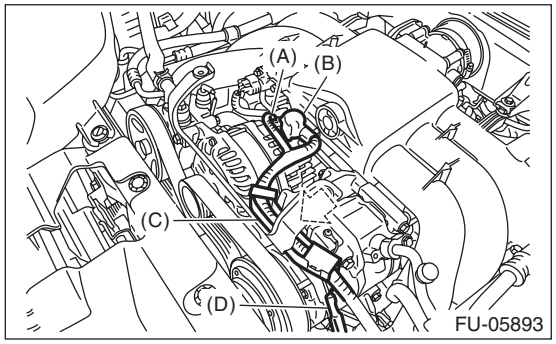
3. Intake Manifold

A: REMOVAL

1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Remove the battery and battery carrier. <Ref. to SC(H6DO)-18, REMOVAL, Battery.>
4) Open the fuel filler lid and remove the fuel filler cap.
5) Remove the air cleaner case, intake boot and air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Cleaner Case.> <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Chamber.>
6) Disconnect the following connector.
(1) Remove the securing clips from the two locations on the fuel pipe protector LH.


FU-05892

(2) Generator connector
(3) Generator terminal B
(4) Remove the harness cover from collector cover bracket.
(5) Magnet clutch connector

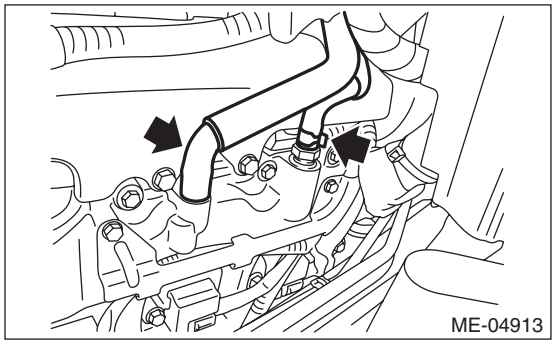


FU-05893

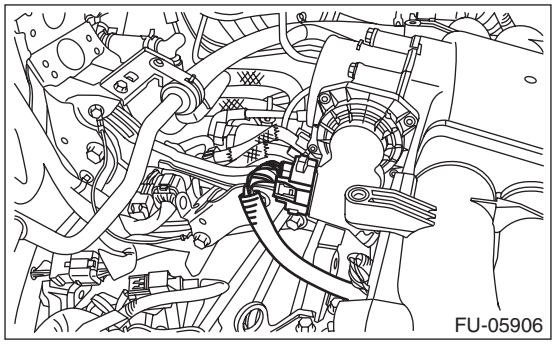
(A) Generator connector
(B) Terminal B
(C) Remove the harness cover from collector cover bracket.
(D) Magnet clutch connector

(6) Slide the harness and connector to the battery side.

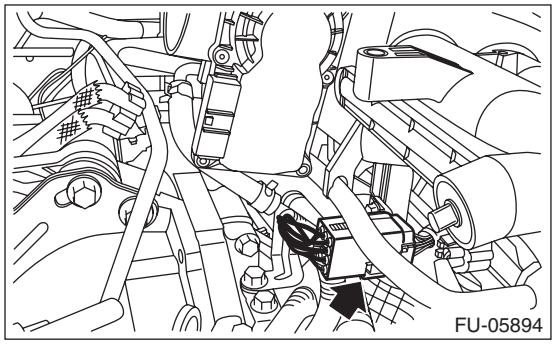
7) Disconnect the PCV hose and blow-by hose.


ME-04913

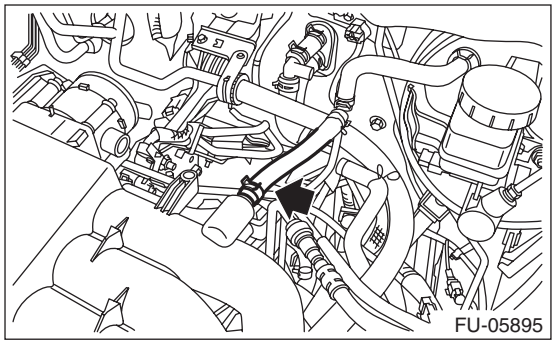
8) Disconnect the connector from the throttle body.


FU-05906

9) Disconnect the engine harness connector.

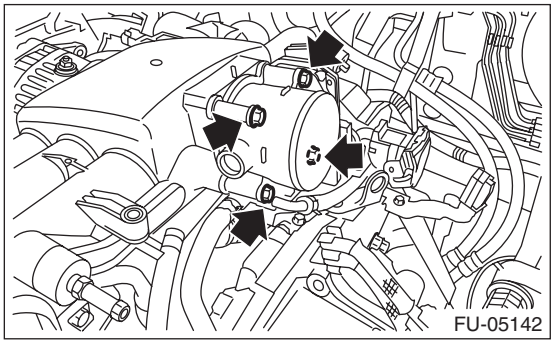

FU-05894

10) Disconnect the brake booster vacuum hose.


FU-05895

11) Remove the throttle body from the intake manifold.

NOTE:
Do not disconnect the inlet and outlet hoses of engine coolant.

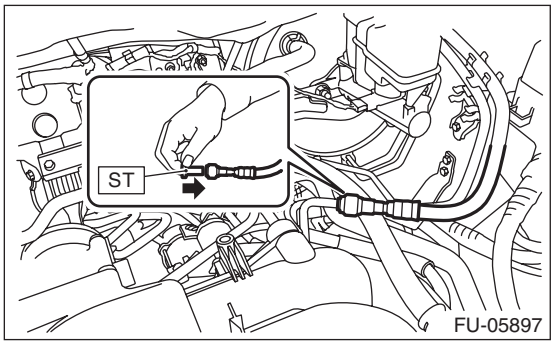


12) Disconnect the fuel delivery hose and evaporation hose.

CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**

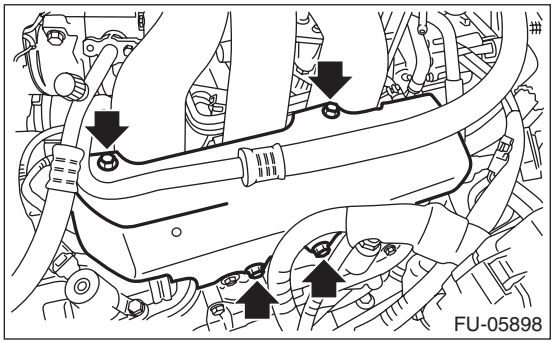
(1) Disconnect the quick connector of the fuel delivery hose by pushing the ST in the direction of the arrow.

ST 42099AE000 QUICK CONNECTOR RELEASE



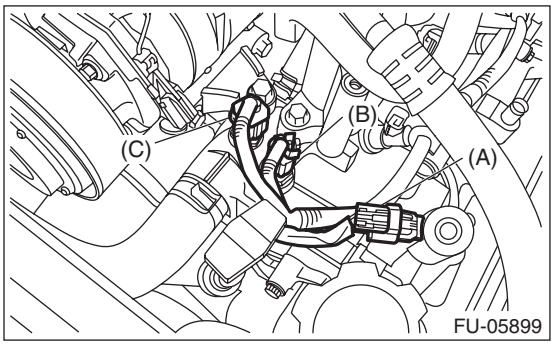
(2) Remove the clip and disconnect the evaporation hose.

13) Remove the fuel pipe protector LH.



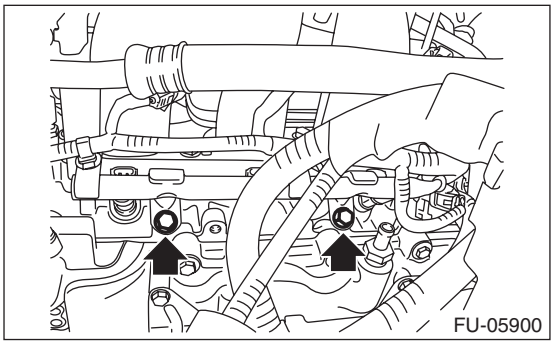
14) Disconnect #2, #4, and #6 fuel injector connectors.

15) Disconnect the connectors of the oil temperature sensor, engine coolant temperature sensor and intake oil flow control solenoid valve LH.

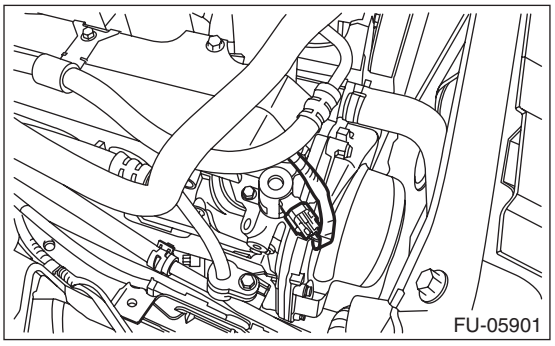


(A) Intake oil flow control solenoid valve LH
(B) Oil temperature sensor
(C) Engine coolant temperature sensor

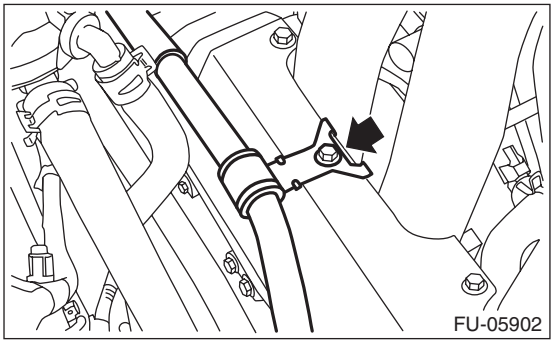
16) Remove the bolts which hold fuel injector pipe LH to cylinder head.



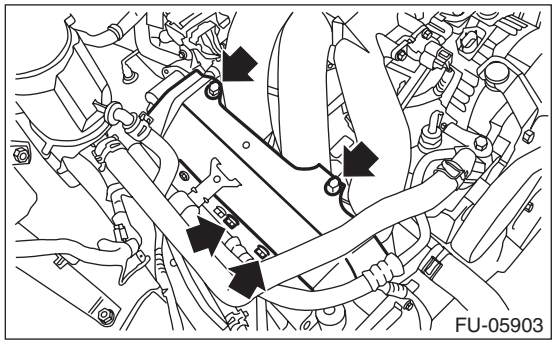
17) Disconnect the connectors of the intake oil flow control solenoid valve RH.



18) Remove the feed hose from fuel pipe protector RH.

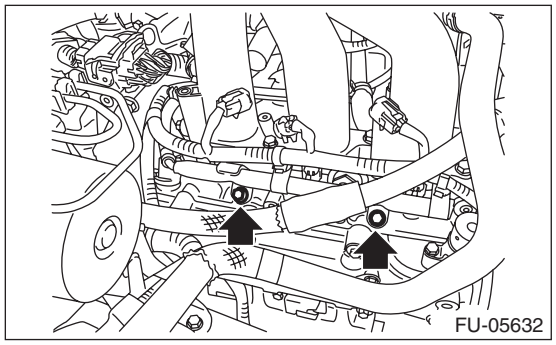


19) Remove the fuel pipe protector RH.



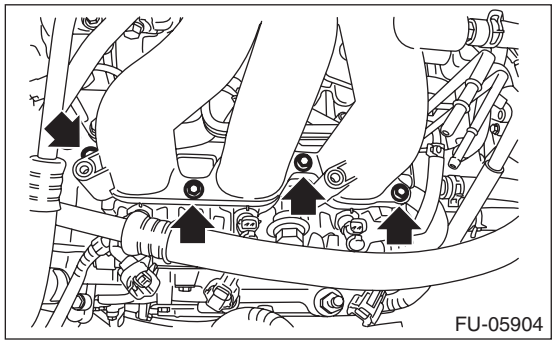
20) Disconnect #1, #3, and #5 fuel injector connectors.

21) Remove the bolts which hold the fuel injector pipe RH to the cylinder head.

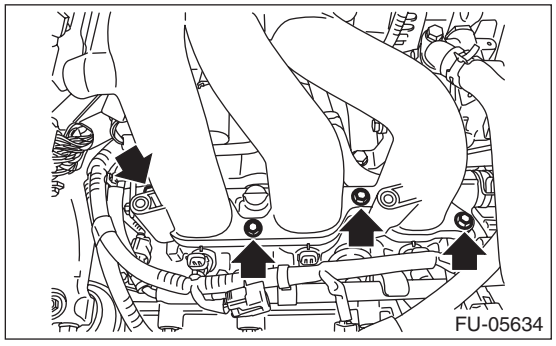


22) Remove the bolts which hold the intake manifold to the cylinder head.

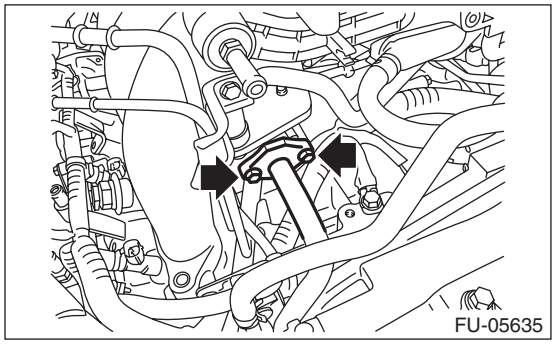
- LH side



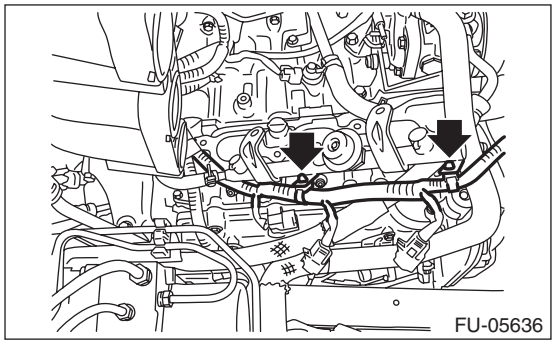
- RH side



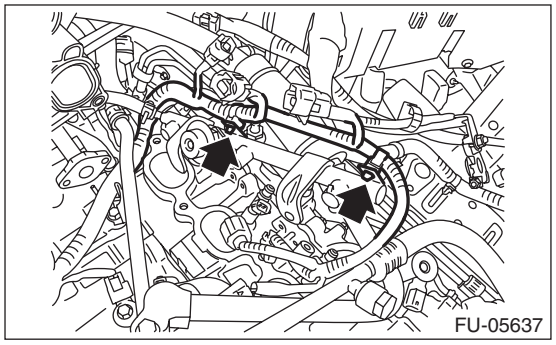
23) Remove the EGR pipe securing bolt.



24) Remove the engine harness from the fuel injector pipe RH.



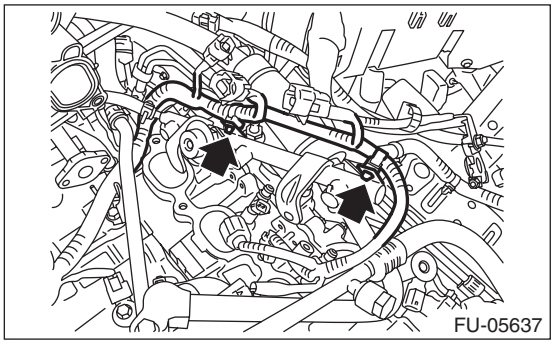
25) Remove the engine harness from the fuel injector pipe LH.



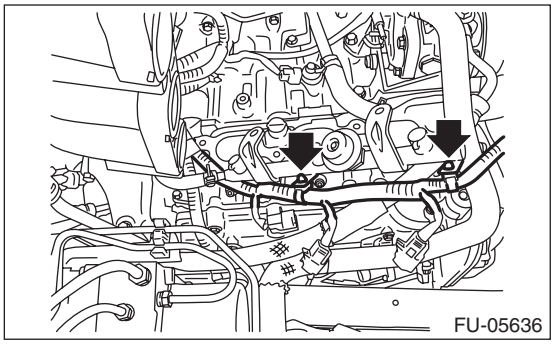
26) Remove the intake manifold.

B: INSTALLATION

1) Install the engine harness to fuel injector pipe LH.



2) Install the engine harness to fuel injector pipe RH.

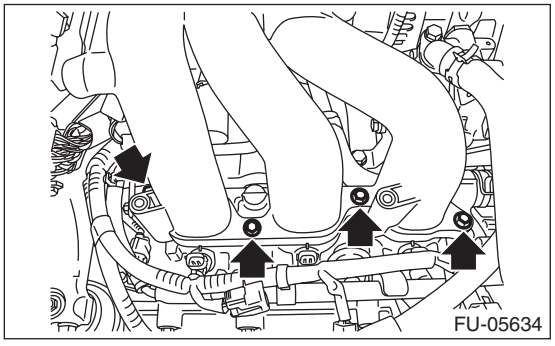


3) Install the intake manifold onto cylinder heads.

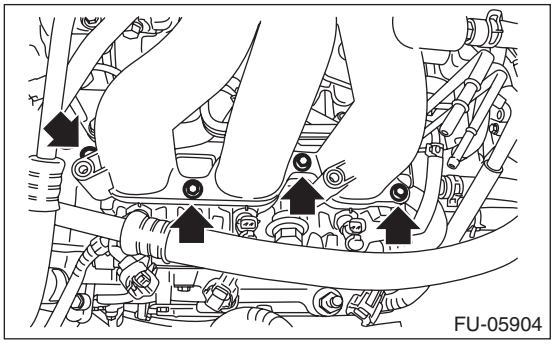
NOTE:
Use new O-rings.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

- RH side



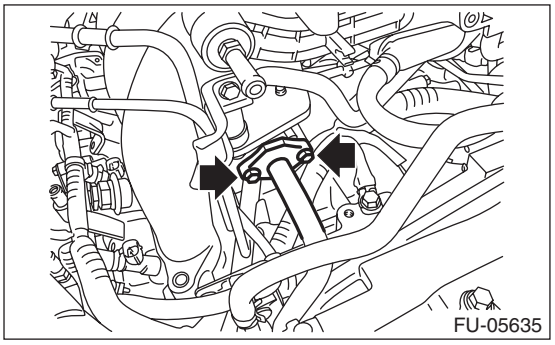
- LH side



4) Install the EGR pipe securing bolt.

NOTE:
Use a new gasket.

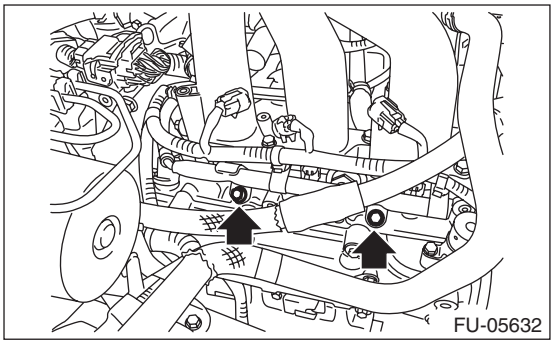
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



5) Install the bolts which hold fuel injector pipe RH to cylinder head.

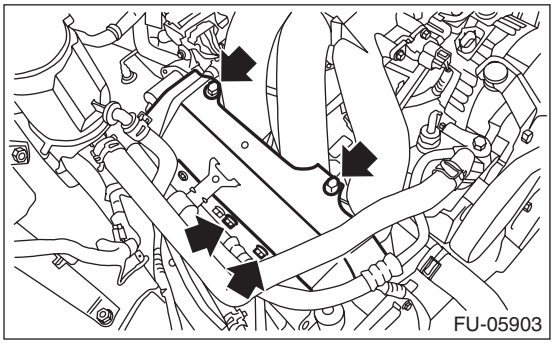
NOTE:
Use new O-rings, injection rubbers, and seal rings.

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



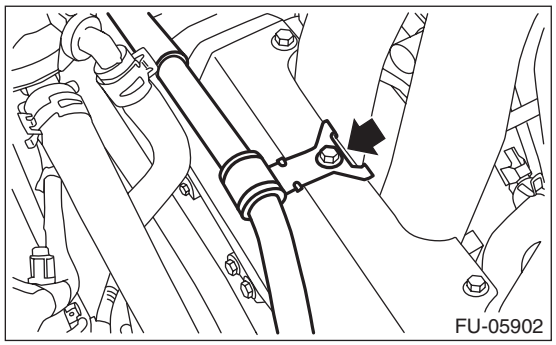
6) Connect #1, #3, and #5 fuel injector connectors.
7) Install the fuel pipe protector RH.

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

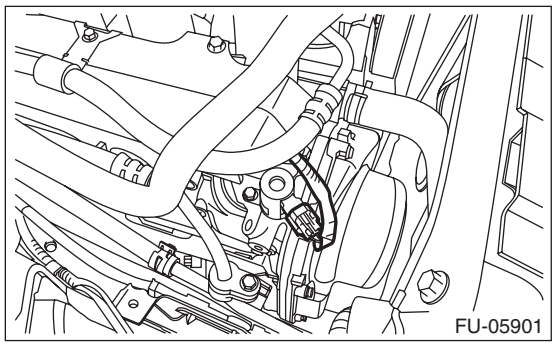


8) Install the feed hose to fuel pipe protector RH.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



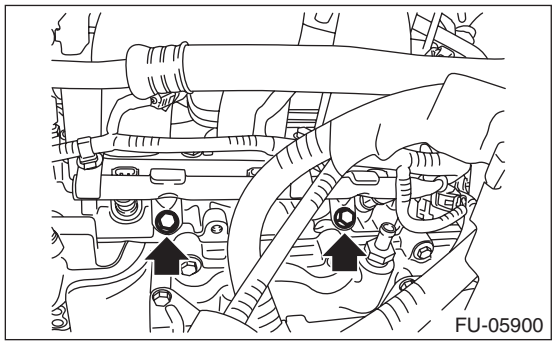
9) Connect the connectors of the intake oil flow control solenoid valve RH.



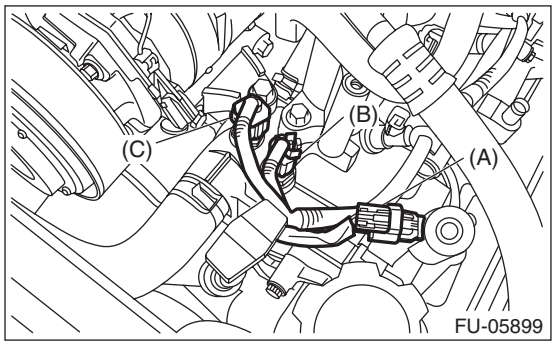
10) Install the bolts which hold fuel injector pipe LH to cylinder head.

NOTE:
Use new O-rings, injection rubbers, and seal rings.

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



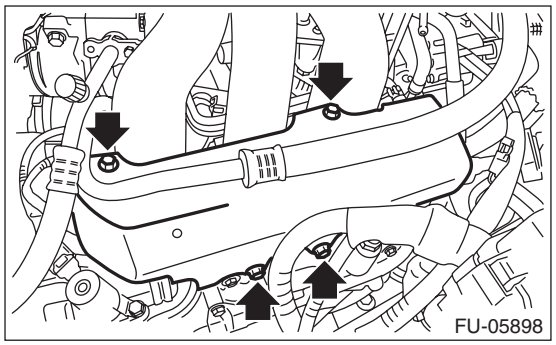
11) Connect the connectors of the oil temperature sensor, engine coolant temperature sensor and intake oil flow control solenoid valve LH.



(A) Intake oil flow control solenoid valve LH
(B) Oil temperature sensor
(C) Engine coolant temperature sensor

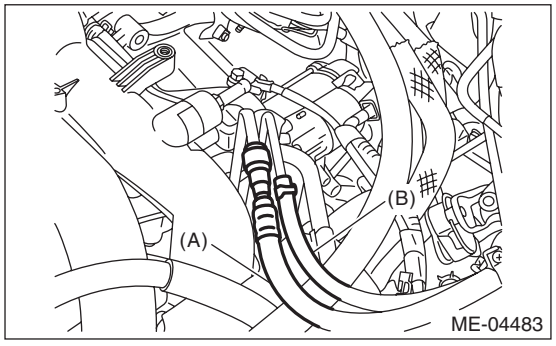
12) Connect #2, #4, and #6 fuel injector connectors.
13) Install the fuel pipe protector LH.

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



14) Connect the fuel delivery hose (A) and evaporation hose (B).

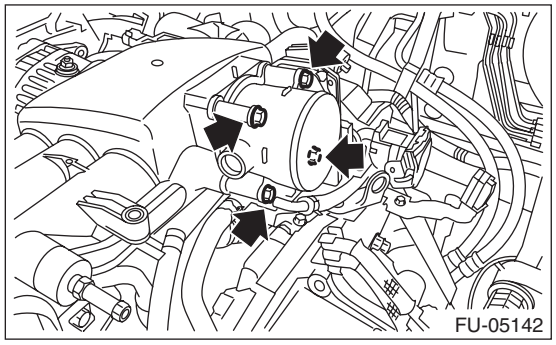
NOTE:
If fuel hoses or clamps are damaged, replace them with new parts.



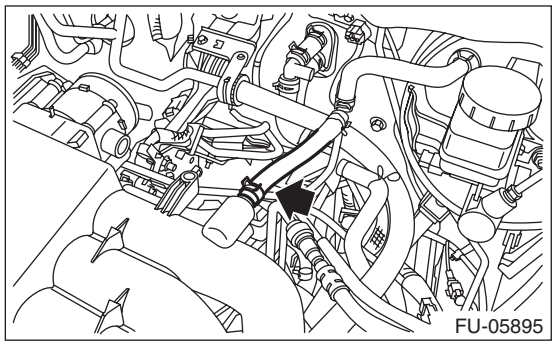
15) Install the throttle body to the intake manifold.

NOTE:
Use new O-rings.

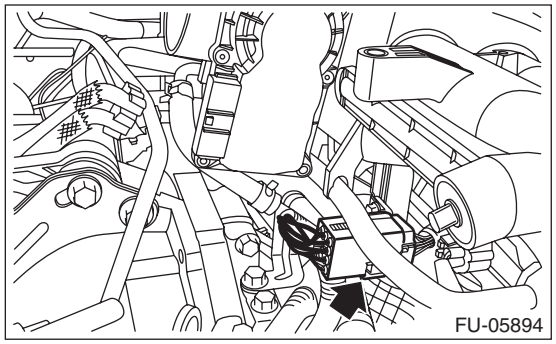
Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



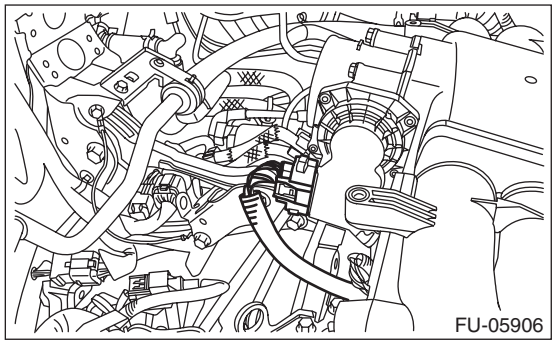
16) Connect the brake booster vacuum hose.



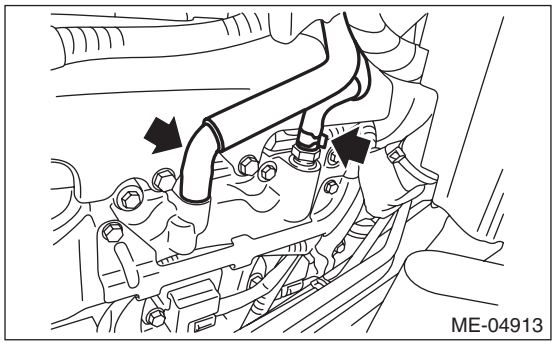
17) Connect the engine harness connector.



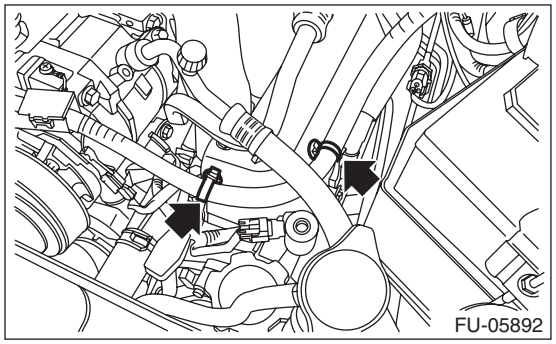
18) Connect the connector to the throttle body.



19) Connect the PCV hose and blow-by hose.



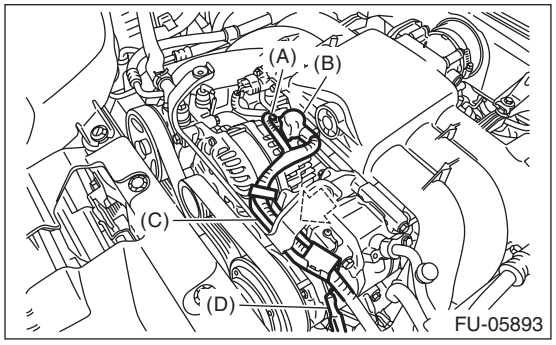
20) Connect the following connectors.
(1) Install the securing clips to the two locations on the fuel pipe protector LH.



(2) Generator connector
(3) Generator terminal B

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

(4) Install the harness cover to the collector cover bracket.
(5) Magnet clutch connector

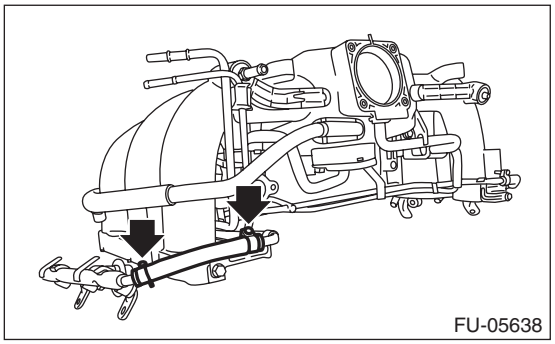


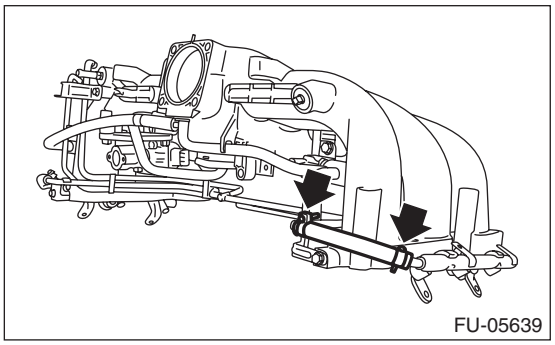
(A) Generator connector
(B) Terminal B
(C) Install the harness cover to the collector cover bracket.
(D) Magnet clutch connector

21) Install the air cleaner case, intake boot and air intake chamber. <Ref. to IN(H6DO)-7, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H6DO)-8, INSTALLATION, Air Intake Chamber.>
22) Install the battery and battery carrier. <Ref. to SC(H6DO)-18, INSTALLATION, Battery.>
23) Install the collector cover.

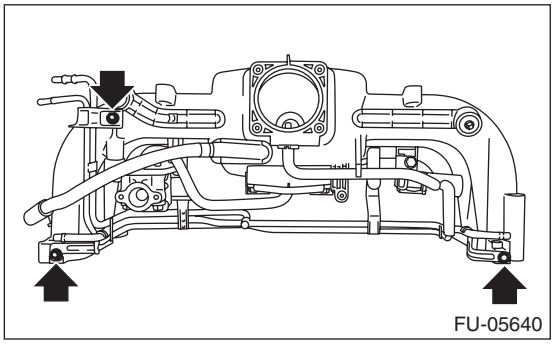
C: DISASSEMBLY

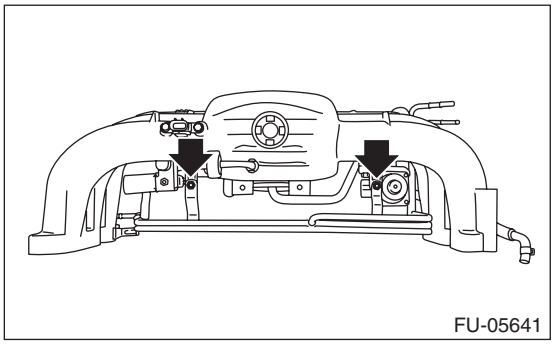
1) Remove the engine harness from intake manifold. <Ref. to FU(H6DO)-8, ENGINE HARNESS, COMPONENT, General Description.>
2) Remove the fuel injector pipe and the fuel hose.


FU-05638


FU-05639

3) Remove the fuel pipe assembly.


FU-05640


FU-05641

4) Remove the EGR valve. <Ref. to FU(H6DO)-40, REMOVAL, EGR Valve.>
5) Remove the manifold absolute pressure sensor. <Ref. to FU(H6DO)-37, REMOVAL, Manifold Absolute Pressure Sensor.>
6) Remove the purge control solenoid valve. <Ref. to EC(H6DO)-7, REMOVAL, Purge Control Solenoid Valve.>

D: ASSEMBLY

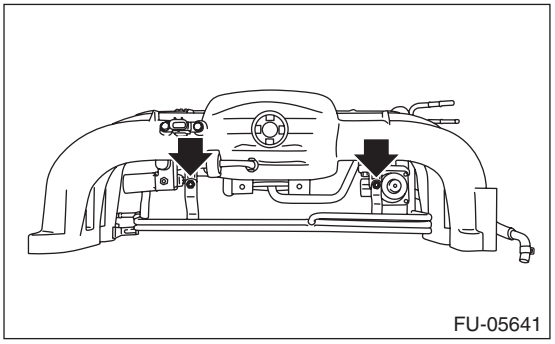
NOTE:
When assembling the nipple, apply liquid gasket.

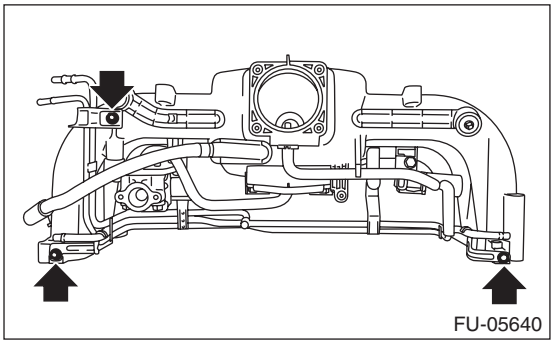
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
17 N·m (1.7 kgf-m, 12.5 ft-lb)

1) Install the purge control solenoid valve. <Ref. to EC(H6DO)-7, INSTALLATION, Purge Control Solenoid Valve.>
2) Install the manifold absolute pressure sensor. <Ref. to FU(H6DO)-37, INSTALLATION, Manifold Absolute Pressure Sensor.>
3) Install the EGR valve. <Ref. to FU(H6DO)-40, INSTALLATION, EGR Valve.>
4) Install the fuel pipe assembly.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

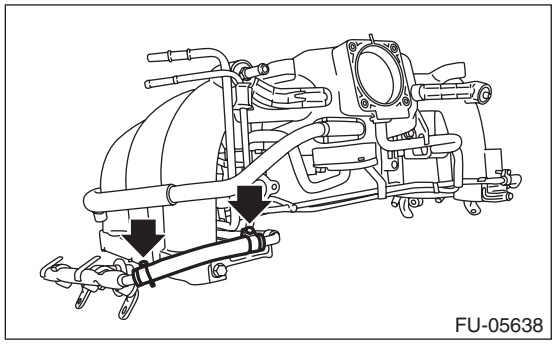

FU-05641

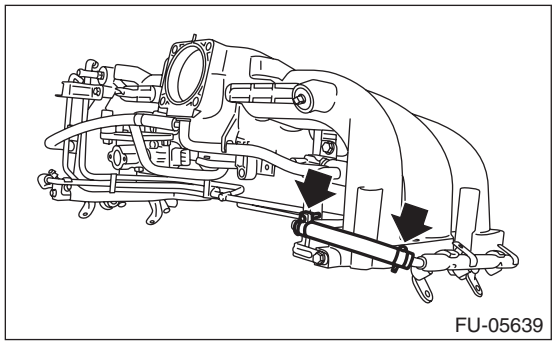

FU-05640

5) Install the fuel injector pipe and the fuel hose.

NOTE:
Use a new fuel hose.

Tightening torque:
1.25 N·m (0.1 kgf-m, 0.9 ft-lb)


FU-05638


FU-05639

6) Install the engine harness to the intake manifold. <Ref. to FU(H6DO)-8, ENGINE HARNESS, COMPONENT, General Description.>

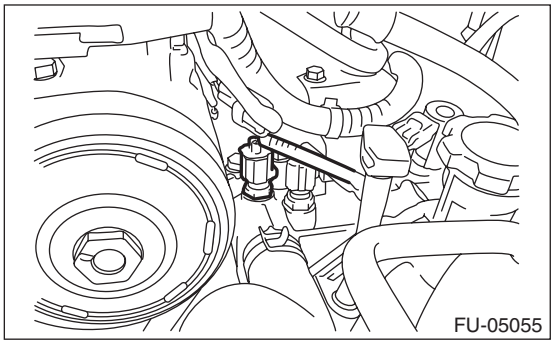
E: INSPECTION

1) Check that the intake manifold and fuel pipe have no deformation, cracks and other damages.
2) Check that the hose has no cracks, damage or loose part.

4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Drain engine coolant. <Ref. to CO(H6DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Disconnect the connectors from the engine coolant temperature sensor.



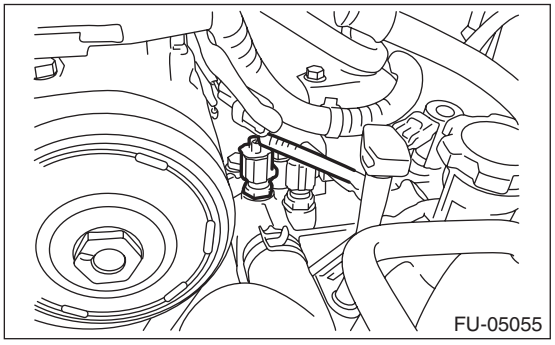
5) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.

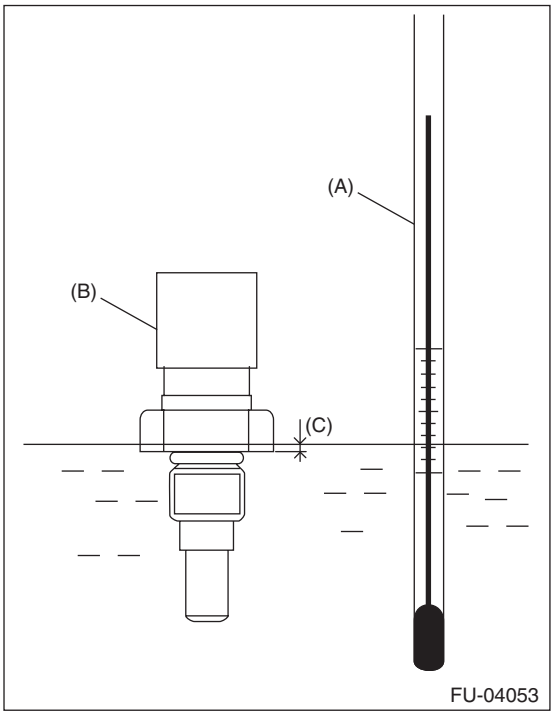
Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)



C: INSPECTION

1) Check that the engine coolant temperature sensor has no deformation, cracks or other damages.
2) Immerse the engine coolant temperature sensor and a thermometer in water.

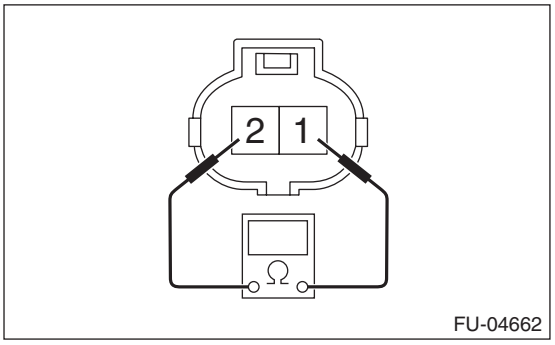
CAUTION:
Take care not to allow water to get into the engine coolant temperature sensor connector. Completely remove any water inside.



(A) Thermometer
(B) Engine coolant temperature sensor
(C) Hexagonal part height: To approx. $^1/_3$

3) Raise water temperature gradually, measure the resistance between the engine coolant temperature sensor terminals when the temperature is 20°C (68°F) and 80°C (176°F).

NOTE:
Agitate the water for even temperature distribution.



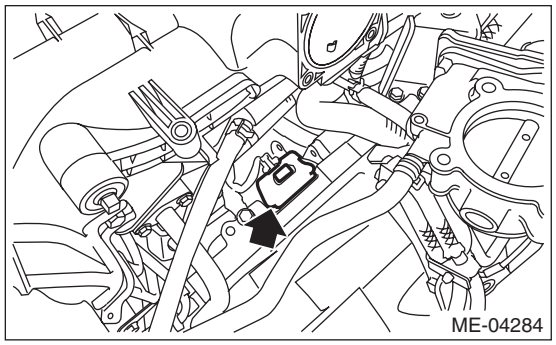
Water temperature	Terminal No.	Standard
20°C (68°F)	1 and 2	2.45±0.2 kΩ
80°C (176°F)		0.318±0.013 kΩ

5. Crankshaft Position Sensor

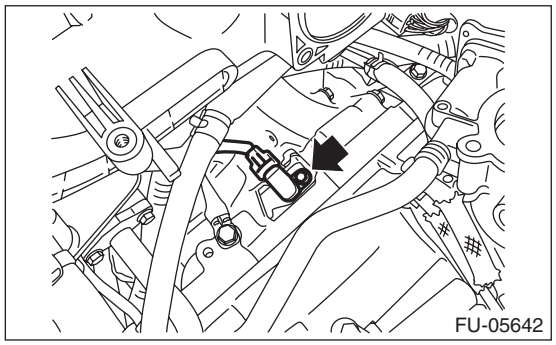
A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the air intake chamber. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Chamber.>
4) Remove the throttle body from the intake manifold.

NOTE:
Do not disconnect the inlet and outlet hoses of engine coolant.
5) Remove the service hole plug.


ME-04284

6) Remove the crankshaft position sensor.

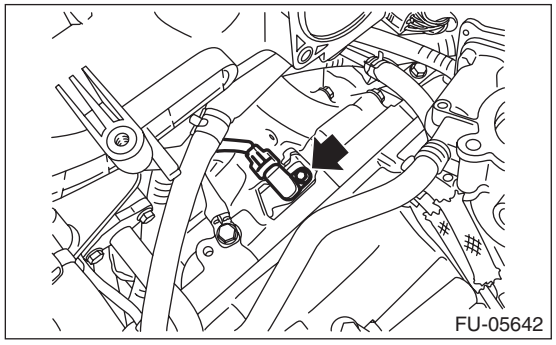

FU-05642

7) Disconnect the connector from the crankshaft position sensor.

B: INSTALLATION

Install in the reverse order of removal.

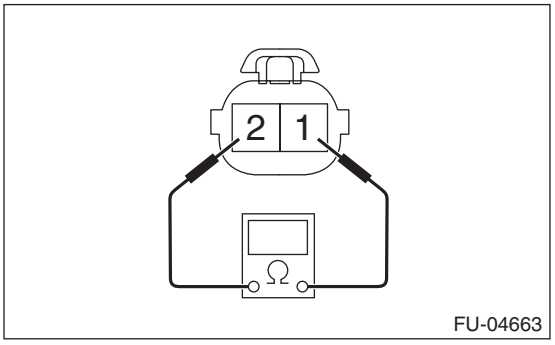
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)


FU-05642

C: INSPECTION

1. CRANKSHAFT POSITION SENSOR (METHOD WITH CIRCUIT TESTER)

Measure the resistance between crankshaft position sensor terminals.

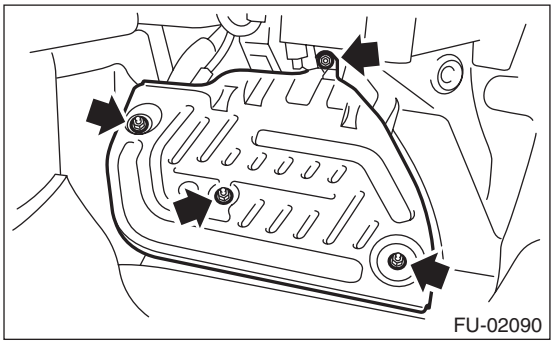


FU-04663

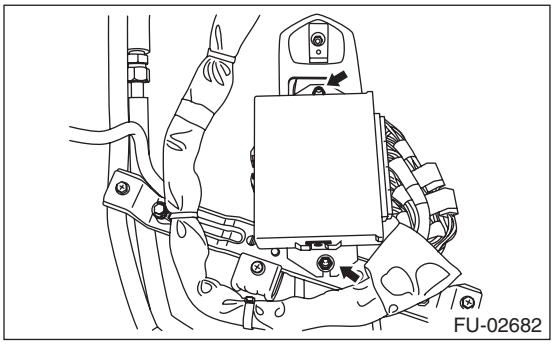
Terminal No.	Standard
1 and 2	1.86±0.186 kΩ

2. CRANKSHAFT POSITION SENSOR (METHOD WITH OSCILLOSCOPE)

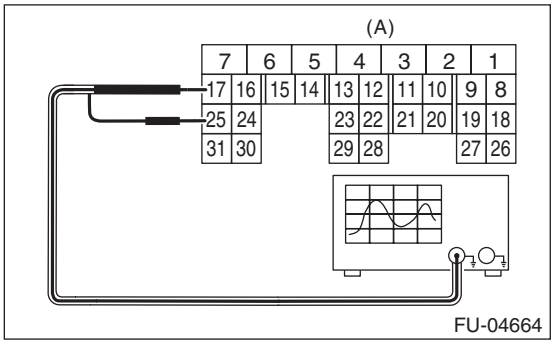
1) Prepare an oscilloscope.
2) Disconnect the ground cable from battery.
3) Remove the front pillar lower trim and console side panel lower RH of passenger's side.
4) Detach the floor mat of passenger's seat.
5) Remove the protect cover.


FU-02090

6) Remove the ECM from vehicle.


FU-02682

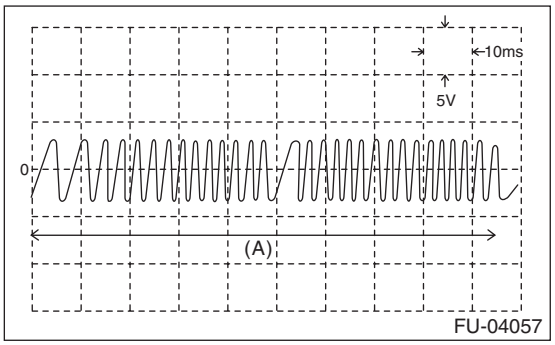
7) Connect the probe to ECM connector.



(A) To ECM connector

Terminal No.	Probe
17	+
25	–

8) Start the engine and let it idle.
9) Check the pattern is the same as the waveform and voltage shown below.



(A) One crankshaft rotation

10) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

3. OTHER INSPECTIONS

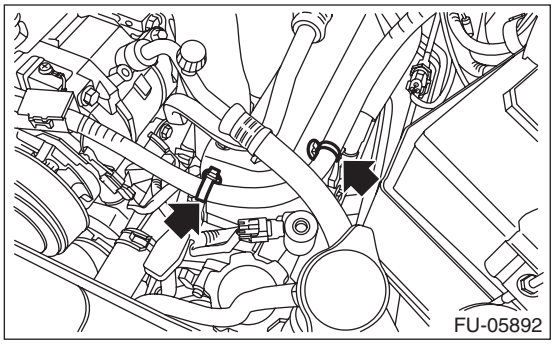
Check that the crankshaft position sensor has no deformation, cracks or other damages.

6. Camshaft Position Sensor

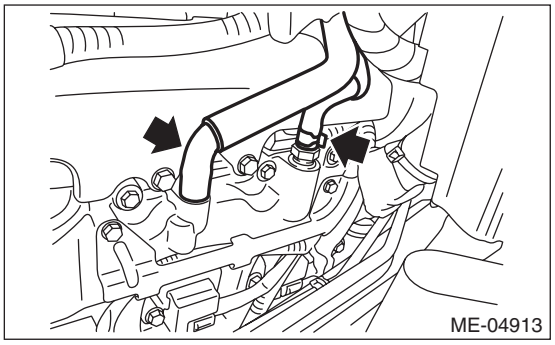
A: REMOVAL

1. INTAKE SIDE

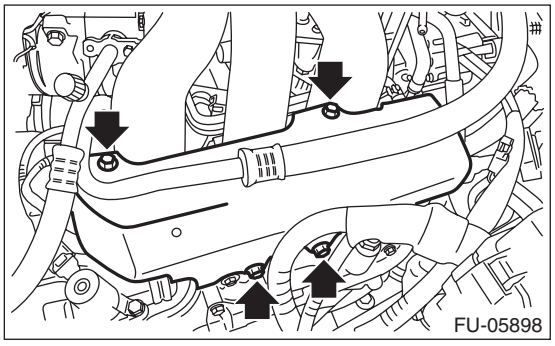
1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Remove the battery and battery carrier. <Ref. to SC(H6DO)-18, REMOVAL, Battery.>
4) Open the fuel filler lid and remove the fuel filler cap.
5) Remove the securing clips from the two locations on the fuel pipe protector LH.



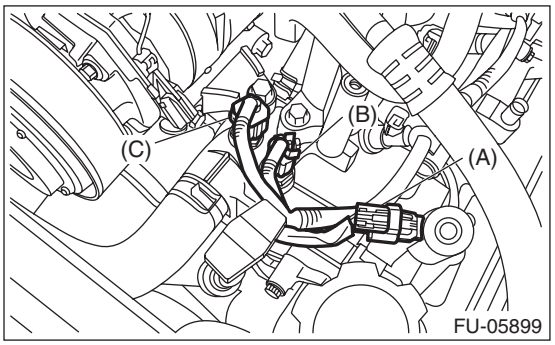
6) Disconnect the PCV hose and blow-by hose.



7) Remove the fuel pipe protector LH.

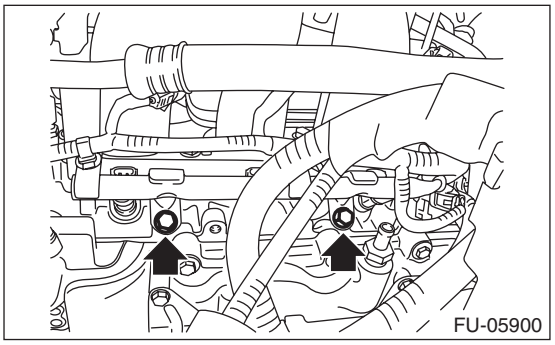


8) Disconnect the connectors of the oil temperature sensor, engine coolant temperature sensor and intake oil flow control solenoid valve LH.

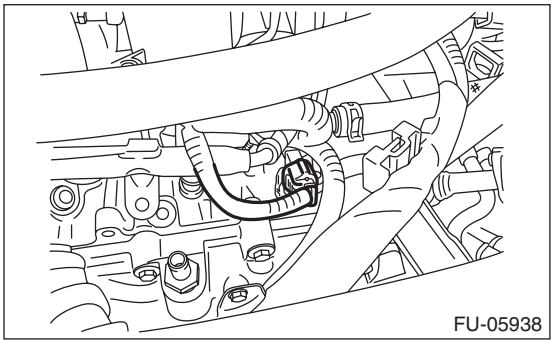


(A) Intake oil flow control solenoid valve LH
(B) Oil temperature sensor
(C) Engine coolant temperature sensor

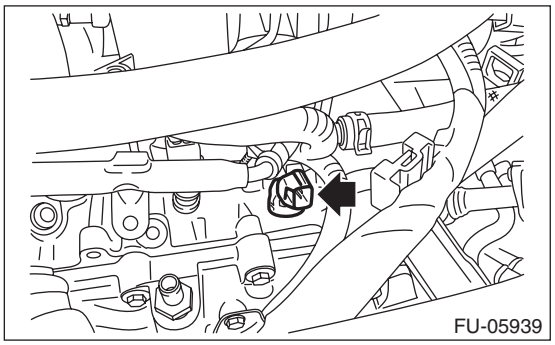
9) Remove the bolts which hold fuel injector pipe LH to cylinder head.



10) Slightly raise the fuel injector pipe LH.
11) Disconnect the connector from intake camshaft position sensor LH.



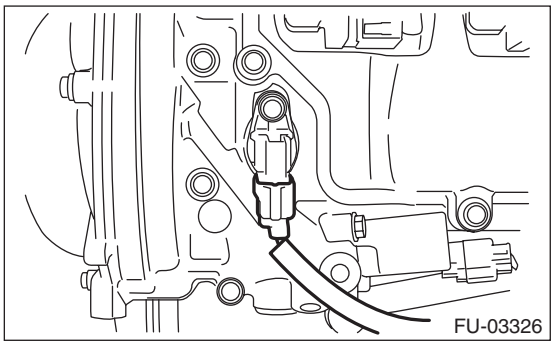
12) Remove the intake camshaft position sensor LH.



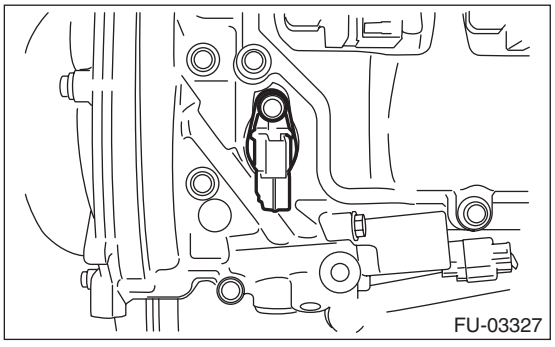
13) Remove the intake camshaft position sensor RH in the same procedure as LH side.

2. EXHAUST SIDE

1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
4) Disconnect the connector from exhaust camshaft position sensor LH.



5) Remove the exhaust camshaft position sensor LH.



6) Remove the exhaust camshaft position sensor RH in the same procedure as LH side.

B: INSTALLATION

1. INTAKE SIDE

Install in the reverse order of removal.

Tightening torque:
Intake camshaft position sensor
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)
Fuel pipe protector
19 N·m (1.9 kgf-m, 14.0 ft-lb)

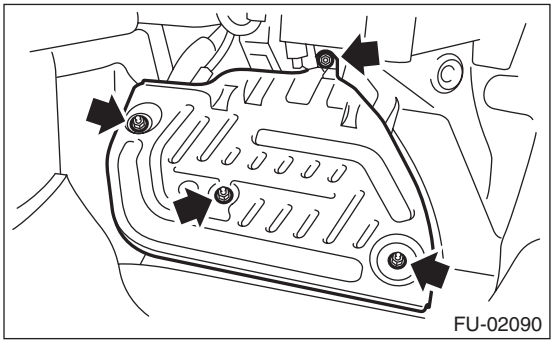
2. EXHAUST SIDE

Tightening torque:
Exhaust camshaft position sensor
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

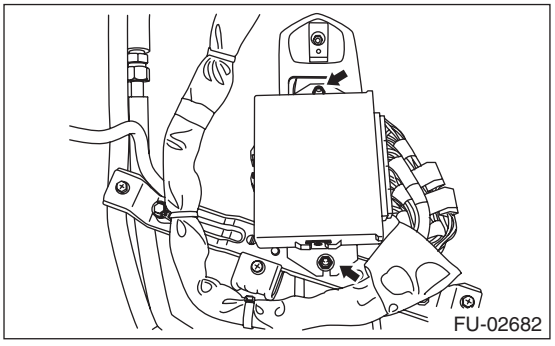
C: INSPECTION

1. CAMSHAFT POSITION SENSOR (METHOD WITH OSCILLOSCOPE)

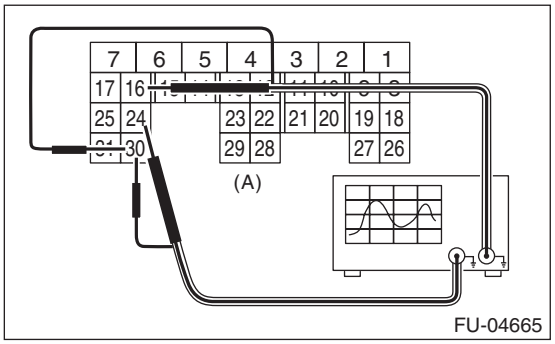
1) Prepare an oscilloscope.
2) Disconnect the ground cable from battery.
3) Remove the front pillar lower trim and console side panel lower RH of passenger's side.
4) Detach the floor mat of passenger's seat.
5) Remove the protect cover.



6) Remove the ECM from vehicle.



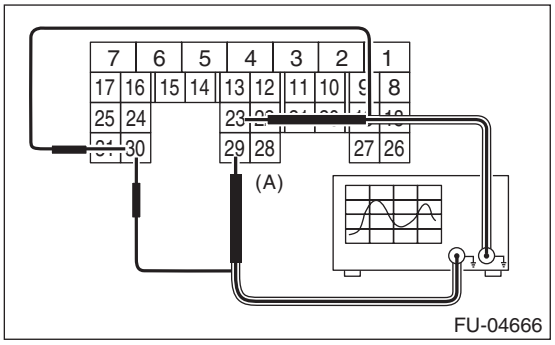
7) Connect the probe to ECM connector.
- Intake camshaft position sensor



(A) To ECM connector

Camshaft position sensor	Terminal No.	Probe
RH	24	+
LH	16	+
RH and LH	30	–

- Exhaust camshaft position sensor

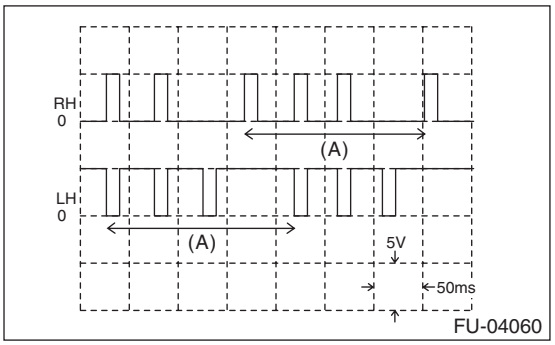


(A) To ECM connector

Camshaft position sensor	Terminal No.	Probe
RH	23	+
LH	29	+
RH and LH	30	–

8) Start the engine and let it idle.

9) Check the pattern is the same as the waveform and voltage shown below.



(A) One camshaft rotation

10) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

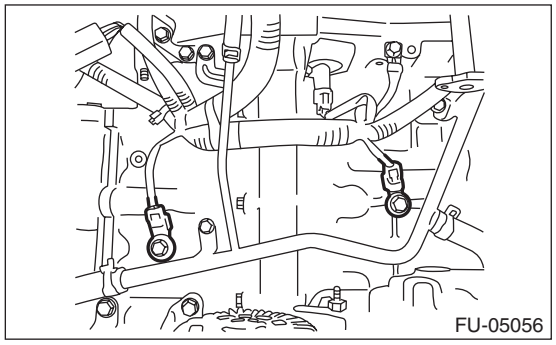
2. OTHER INSPECTIONS

Check that the camshaft position sensor has no deformation, cracks or other damages.

7. Knock Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the intake manifold. <Ref. to FU(H6DO)-21, REMOVAL, Intake Manifold.>
4) Disconnect the knock sensor connector.
5) Remove the knock sensor from cylinder block.

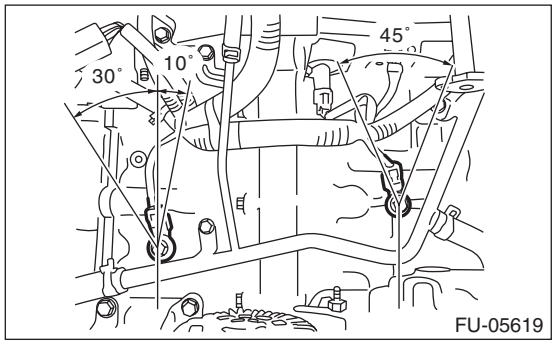


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

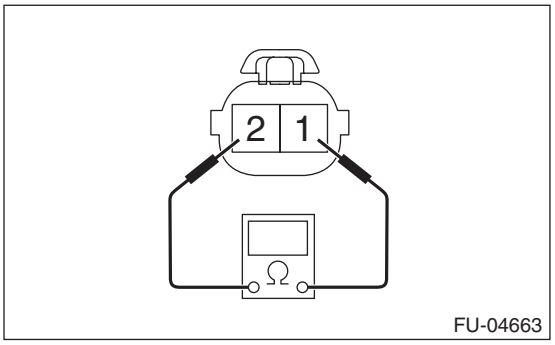
NOTE:
For the knock sensor installation angle, refer to the figure below.



2) Connect the knock sensor connector.
3) Install the intake manifold. <Ref. to FU(H6DO)-24, INSTALLATION, Intake Manifold.>
4) Connect the battery ground terminal.
5) Install the collector cover.

C: INSPECTION

1) Check that the knock sensor has no deformation, cracks or other damages.
2) Measure the resistance between knock sensor terminals.



Terminal No.	Standard
1 and 2	560±28 kΩ

8. Throttle Position Sensor

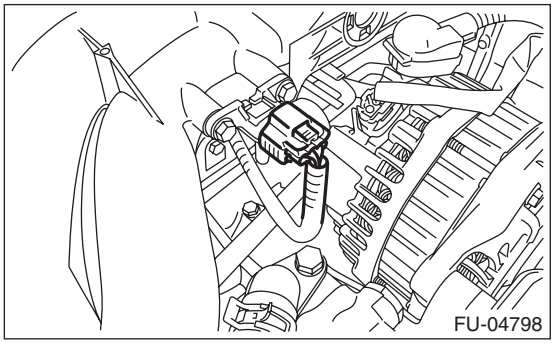
A: SPECIFICATION

Throttle body is a non-disassembled part, so do not remove the throttle position sensor from throttle body.
Refer to “Throttle Body” for removal and installation procedure. <Ref. to FU(H6DO)-19, REMOVAL, Throttle Body.> <Ref. to FU(H6DO)-19, INSTALLATION, Throttle Body.>

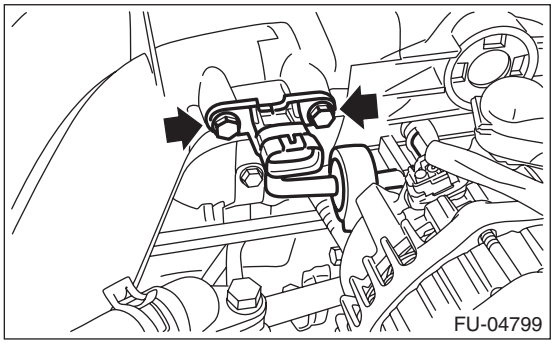
9. Manifold Absolute Pressure Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Disconnect the manifold pressure sensor connector.



4) Remove the manifold pressure sensor and the filter and hose from intake manifold.



B: INSTALLATION

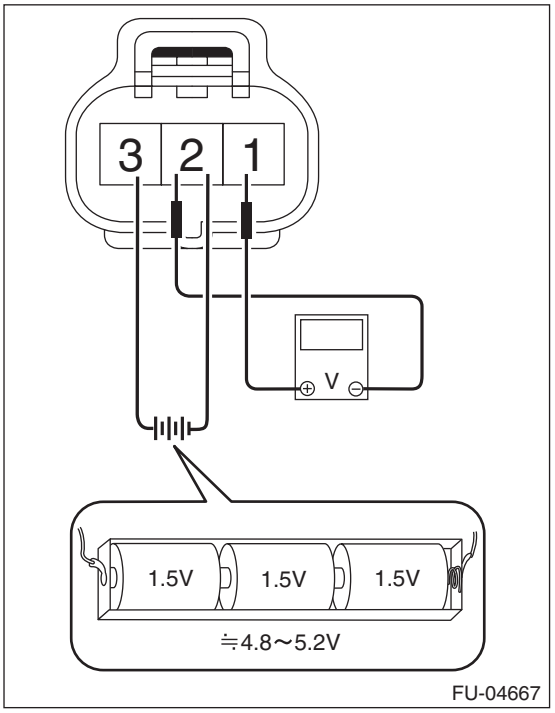
Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

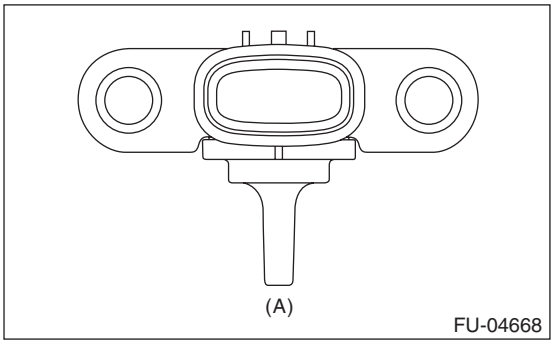
C: INSPECTION

1) Check that the manifold absolute pressure sensor has no deformation, cracks or other damages.
2) Connect dry-cell battery positive terminal to terminal No. 3 and dry-cell battery ground terminal to terminal No. 2, circuit tester ground terminal to terminal No. 2 and the circuit tester positive terminal to terminal No. 1.

NOTE:
- Use new dry-cell batteries.
- Using circuit tester, check the voltage of a single dry-cell battery is 1.6 V or more. And also check the voltage of three batteries in series is between 4.8 V and 5.2 V.



3) Connect the Mighty Vac to the pressure port (A) of manifold absolute pressure sensor.



4) Check the voltage when generating vacuum and positive pressure using Mighty Vac.

CAUTION:
Do not apply vacuum of less than –88 kPa (–0.9 kgf/cm^2, –12.8 psi). Doing so may damage the manifold absolute pressure sensor.

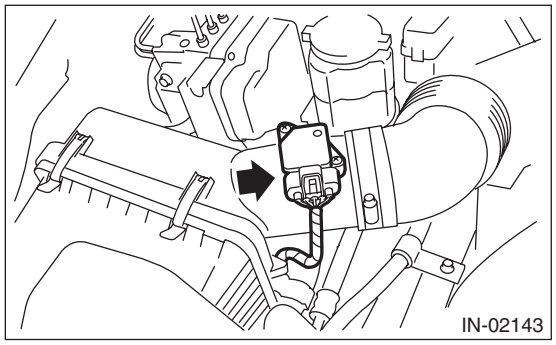
NOTE:
When vacuum occurs at the pressure port of manifold absolute pressure sensor, the voltage will drop from the value as in step 3). When positive pressure occurs, on the other hand, the voltage will rise.

Pressure	Terminal No.	Standard
–88 kPa (–0.9 kgf/cm^2, –12.8 psi)	2 (+) and 1 (–)	Approx. 1 V (when 25°C (77°F))
–35 kPa (–0.4 kgf/cm^2, –5.1 psi)		Approx. 2.6 V (when 25°C (77°F))
19 kPa (–0.2 kgf/cm^2, 2.8 psi)		Approx. 4.2 V (when 25°C (77°F))

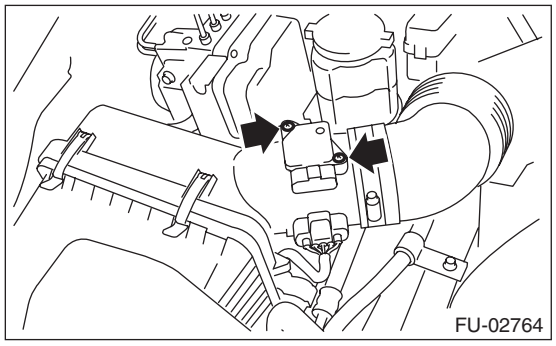
10.Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Disconnect the connector from mass air flow and intake air temperature sensor.



3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

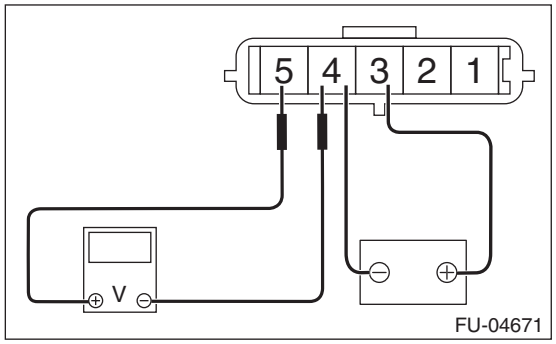
Install in the reverse order of removal.

Tightening torque:
1 N·m (0.1 kgf-m, 0.7 ft-lb)

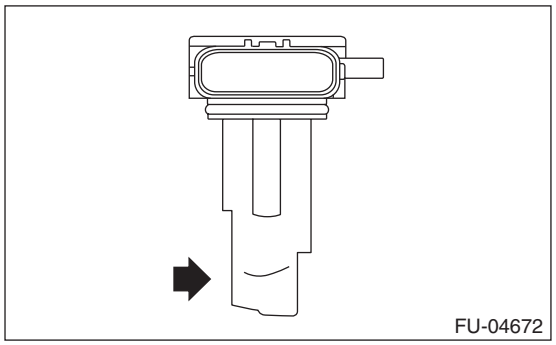
C: INSPECTION

1. CHECK THE MASS AIR FLOW SENSOR UNIT

1) Connect the battery positive terminal to terminal No. 3 and the battery ground terminal to terminal No. 4, the circuit tester positive terminal to terminal No. 5 and the circuit tester ground terminal to terminal No. 4.

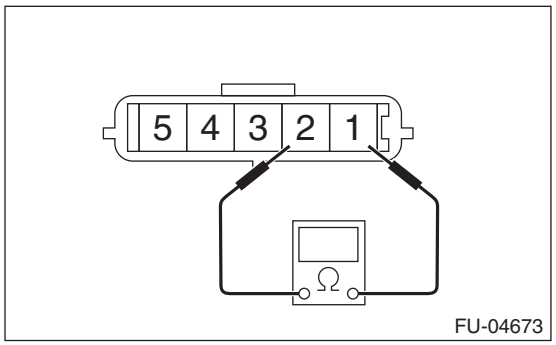


2) Check the voltage changes when air is blown to the mass air flow sensor unit in arrow direction.



2. CHECK THE INTAKE AIR TEMPERATURE SENSOR UNIT

Measure the resistance between intake air temperature sensor terminals.



Temperature	Terminal No.	Standard
–20°C (–4°F)	1 and 2	16.0±2.4 kΩ
20°C (68°F)		2.45±0.24 kΩ
60°C (140°F)		0.58±0.087 kΩ

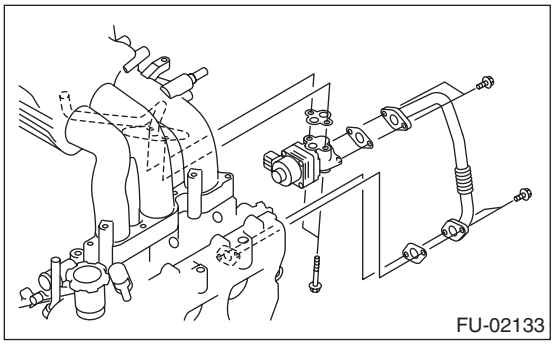
3. OTHER INSPECTIONS

1) Check that the mass air flow and intake air temperature sensor has no deformation, cracks or other damages.
2) Check that the mass air flow and intake air temperature sensor has no dirt.

11.EGR Valve

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the air intake chamber. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Chamber.>
4) Remove the starter. <Ref. to SC(H6DO)-6, REMOVAL, Starter.>
5) Remove the EGR pipe from EGR valve and cylinder head.
6) Remove the EGR valve from intake manifold.


FU-02133

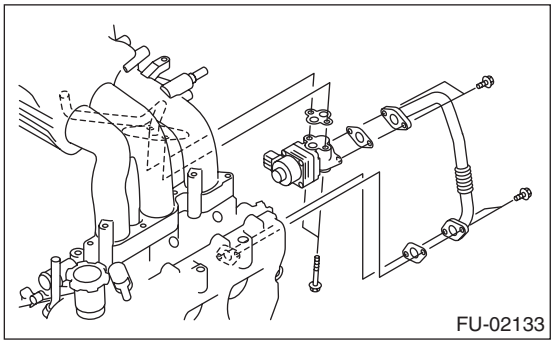
7) Disconnect the connector from EGR valve.

B: INSTALLATION

Install in the reverse order of removal.

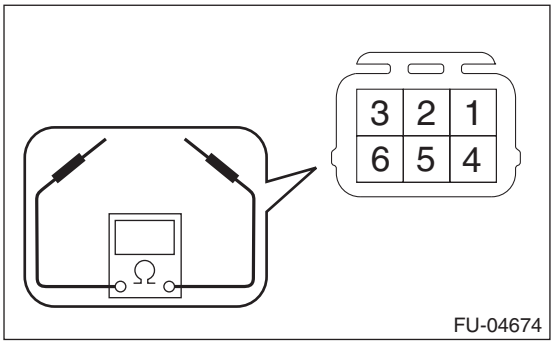
NOTE:
Use a new gasket.

Tightening torque:
EGR valve
19 N·m (1.9 kgf-m, 14.0 ft-lb)
EGR pipe
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)


FU-02133

C: INSPECTION

1) Check that the EGR valve has no deformation, cracks or other damages.
2) Measure the resistance between EGR valve terminals.



FU-04674

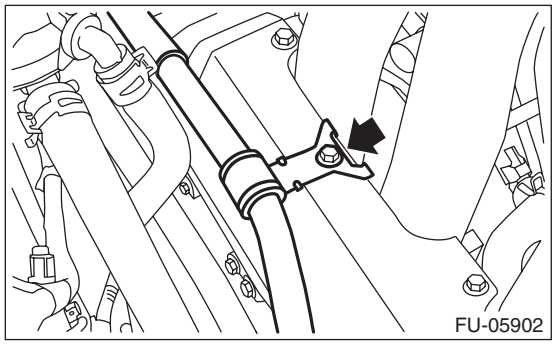
Terminal No.	Standard
2 and 1	22±2 Ω
2 and 3	22±2 Ω
5 and 4	22±2 Ω
5 and 6	22±2 Ω

12.Fuel Injector

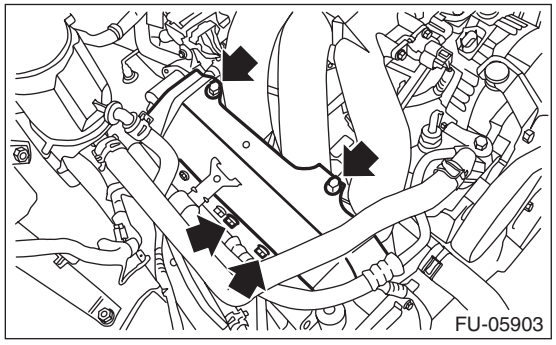
A: REMOVAL

1. RH SIDE

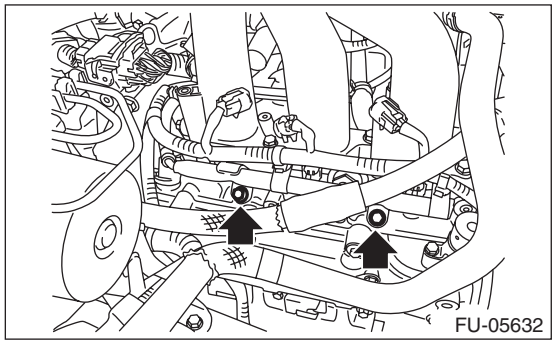
1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.
4) Open the fuel filler lid and remove the fuel filler cap.
5) Remove the air cleaner case, intake boot and air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Cleaner Case.> <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Chamber.>
6) Remove the feed hose from fuel pipe protector RH.


FU-05902

7) Remove the fuel pipe protector RH.


FU-05903

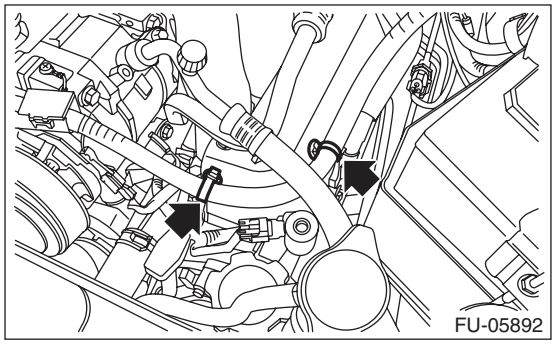
8) Disconnect the connector from fuel injector.
9) Remove the bolt which holds fuel injector pipe onto cylinder head.


FU-05632

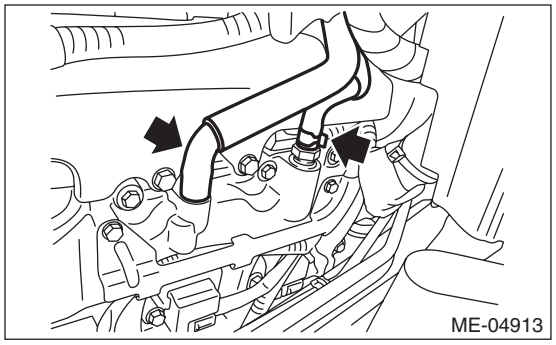
10) Remove the fuel injector while lifting up the fuel injector pipe.

2. LH SIDE

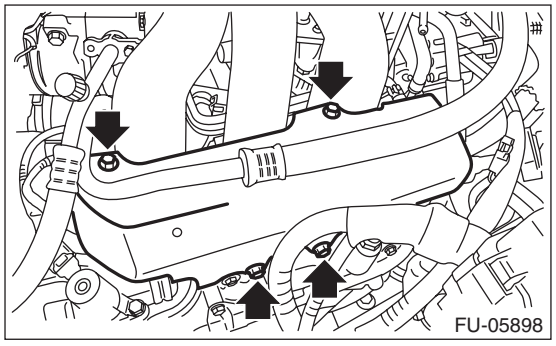
1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Remove the battery and battery carrier. <Ref. to SC(H6DO)-18, REMOVAL, Battery.>
4) Open the fuel filler lid and remove the fuel filler cap.
5) Remove the securing clips from the two locations on the fuel pipe protector LH.


FU-05892

6) Disconnect the PCV hose and blow-by hose.

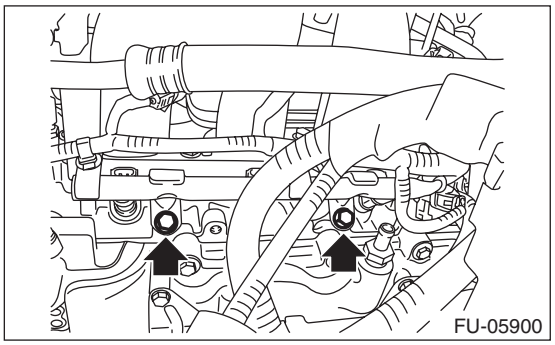

ME-04913

7) Remove the fuel pipe protector LH.


FU-05898

8) Disconnect the connector from fuel injector.

9) Remove the bolt which holds fuel injector pipe onto cylinder head.



10) Remove the fuel injector while lifting up the fuel injector pipe.

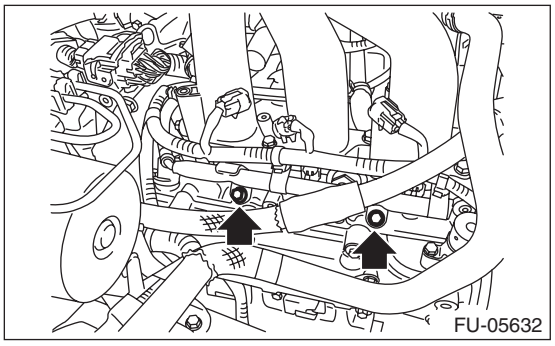
B: INSTALLATION

1. RH SIDE

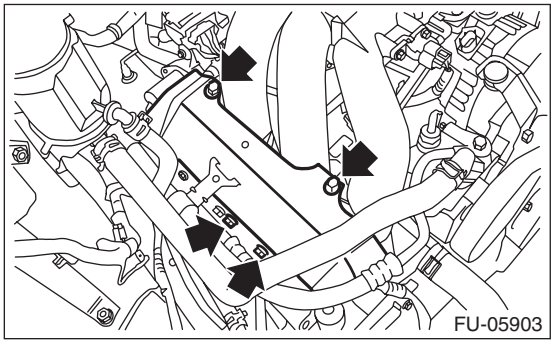
Install in the reverse order of removal.

NOTE:
Use new O-rings, injection rubbers, and seal rings.

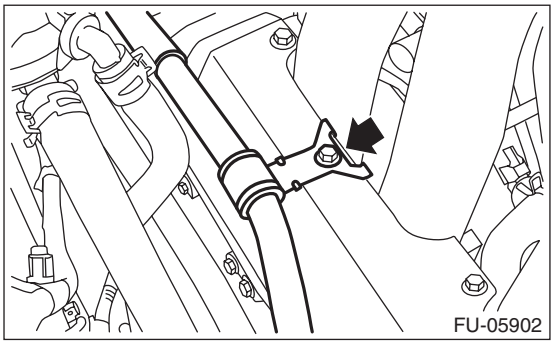
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



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



Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

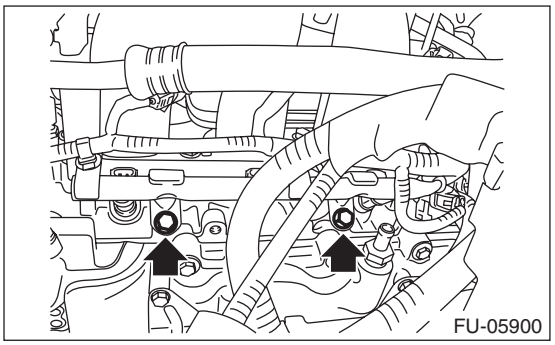


2. LH SIDE

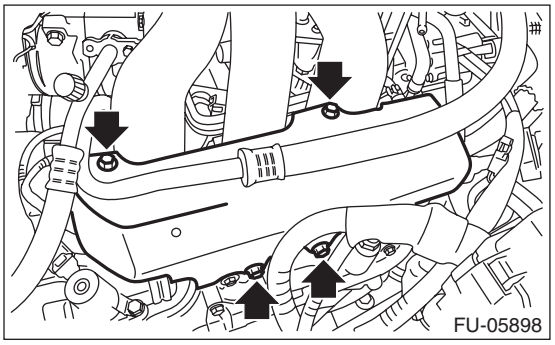
Install in the reverse order of removal.

NOTE:
Use new O-rings, injection rubbers, and seal rings.

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

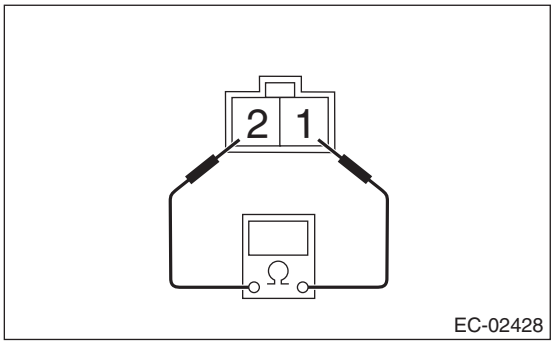


Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



C: INSPECTION

1) Check that the fuel injector has no deformation, cracks or other damages.
2) Measure the resistance between fuel injector terminals.



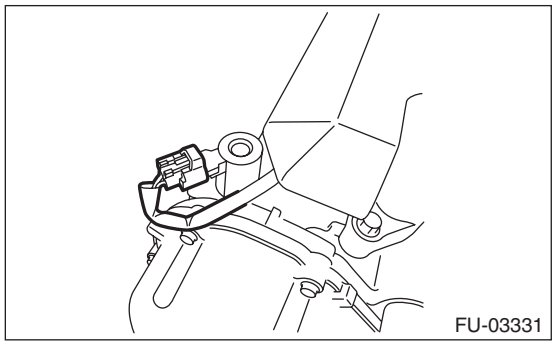
Terminal No.	Standard
1 and 2	Approx. 12.0 Ω (when 20°C (68°F))

13. Oil Flow Control Solenoid Valve

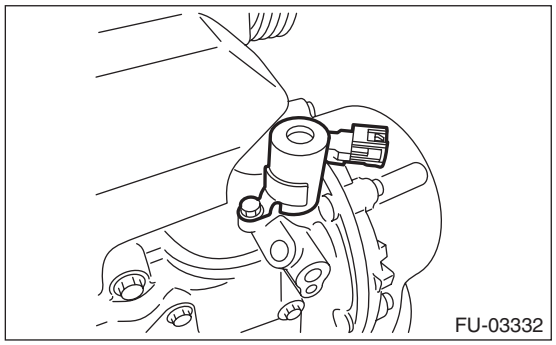
A: REMOVAL

1. INTAKE SIDE

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Disconnect the connector from the intake oil flow control solenoid valve RH.



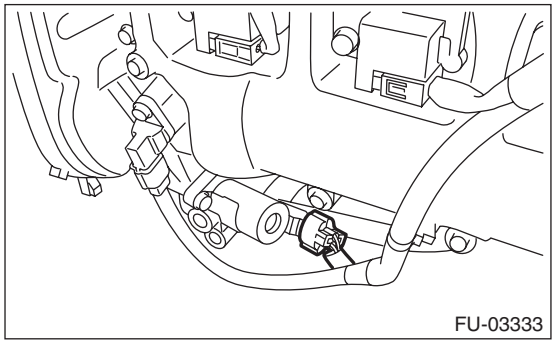
4) Remove the intake oil flow control solenoid valve RH.



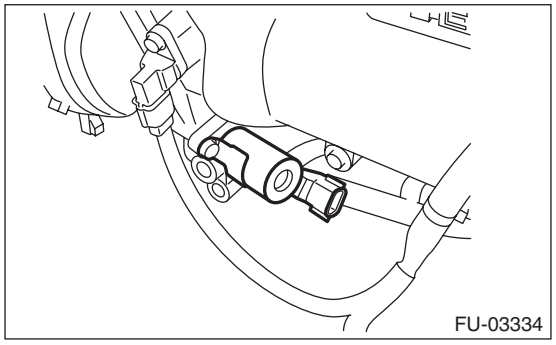
5) Remove the intake oil flow control solenoid valve LH in the same procedure as RH.

2. EXHAUST SIDE

1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
4) Disconnect the connector from the exhaust oil flow control solenoid valve LH.



5) Remove the exhaust oil flow control solenoid valve LH.



6) Remove the exhaust oil flow control solenoid valve RH in the same procedure as LH.

B: INSTALLATION

1. INTAKE SIDE

Install in the reverse order of removal.

Tightening torque:
Intake oil flow control solenoid valve
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

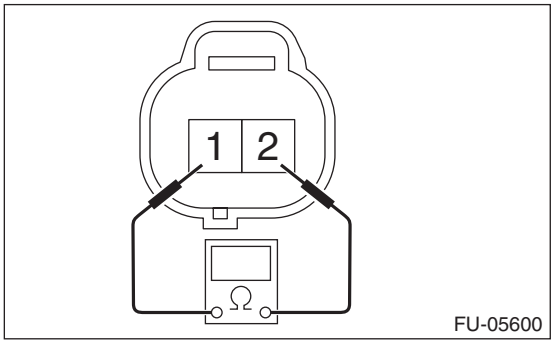
2. EXHAUST SIDE

Tightening torque:
Exhaust oil flow control solenoid valve
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

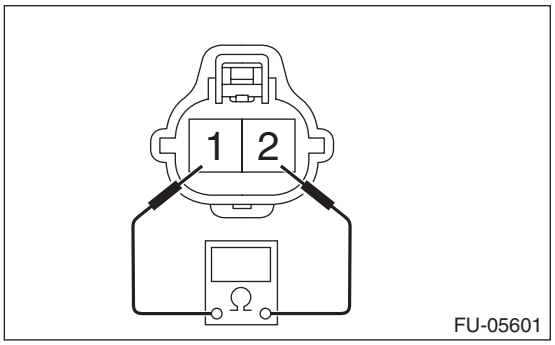
C: INSPECTION

1) Check that the oil flow control solenoid valve has no deformation, cracks or other damages.
2) Measure the resistance between the oil flow control solenoid valve terminals.

- Intake oil flow control solenoid valve



- Exhaust oil flow control solenoid valve

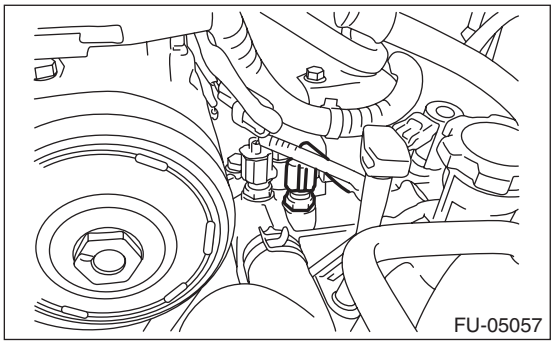


Terminal No.	Standard
1 and 2	7.4±0.5 Ω (when 20°C (68°F))

14.Oil Temperature Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Disconnect the connector from oil temperature sensor.



4) Remove the oil temperature sensor.

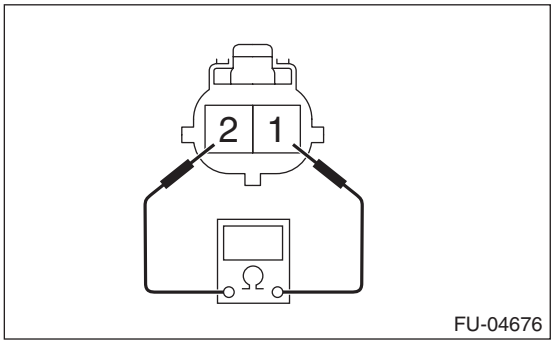
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)

C: INSPECTION

1) Check that the oil temperature sensor has no deformation, cracks or other damages.
2) Check the resistance between the oil temperature sensor terminals.

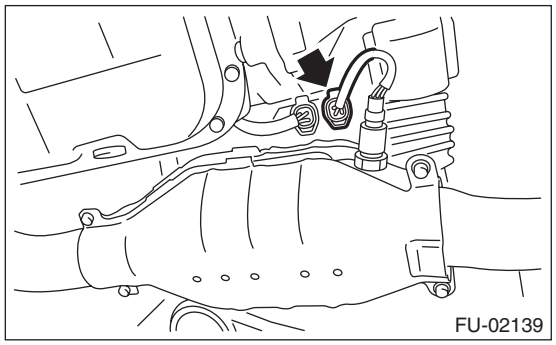


Terminal No.	Standard
1 and 2	2.45±0.2 Ω (when 20°C (68°F))

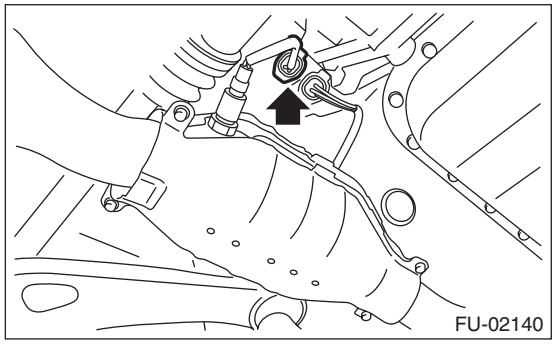
15.Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Disconnect the connector of front oxygen (A/F) sensor.
• LH side



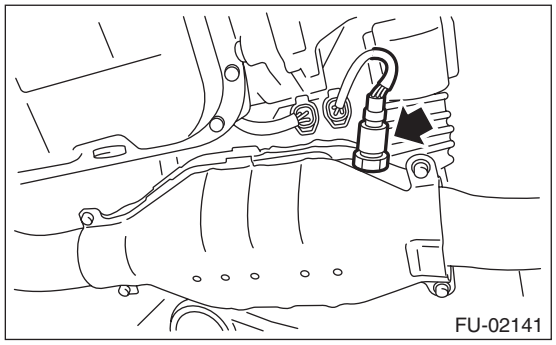
• RH side



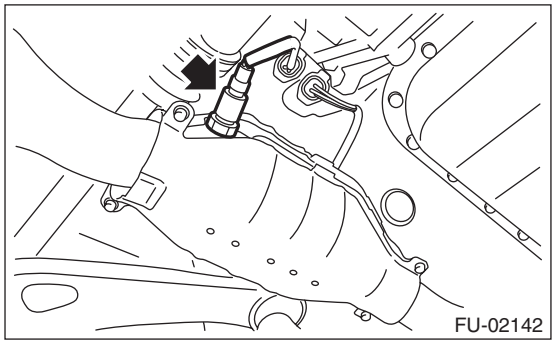
4) Apply spray-type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
5) Remove the front oxygen (A/F) sensor.

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

• LH side



• RH side



B: INSTALLATION

CAUTION:
If the lubricant adheres to the exhaust pipe, wipe it off with cloth to avoid emitting smoke or causing a fire.

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

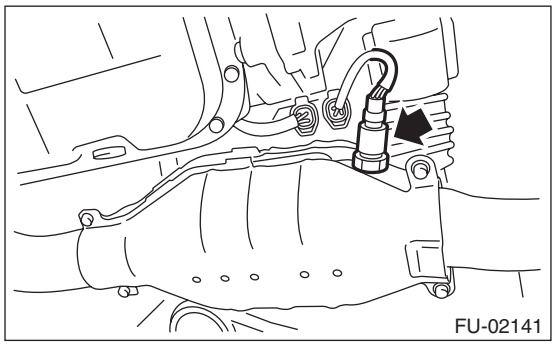
CAUTION:
Never apply anti-seize compound to the protector of front oxygen (A/F) sensor.

Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30 or equivalent

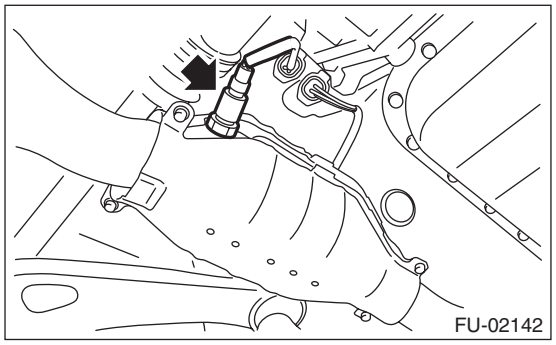
2) Install the front oxygen (A/F) sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)

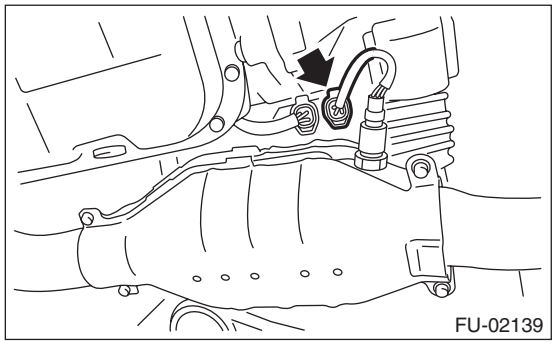
• LH side



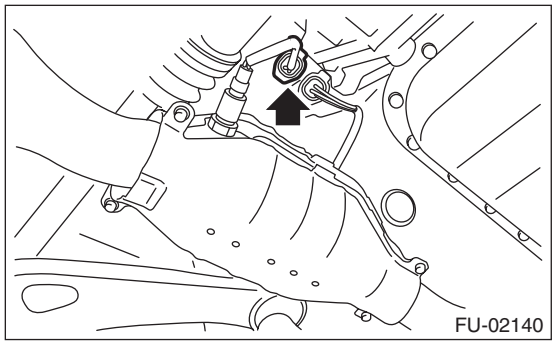
• RH side



3) Connect the connector of front oxygen (A/F) sensor.
- LH side



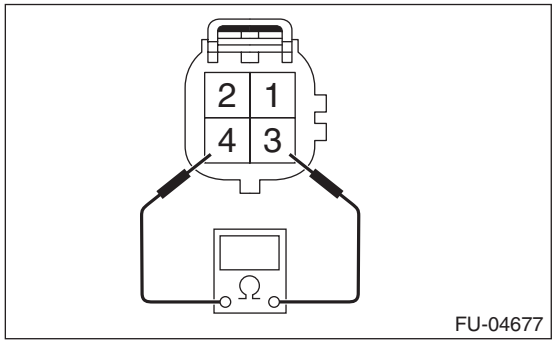
- RH side



4) Lower the vehicle.
5) Connect the ground cable to battery.

C: INSPECTION

1) Check that the front oxygen (A/F) sensor has no deformation, cracks or other damages.
2) Measure the resistance between front oxygen (A/F) sensor terminals.



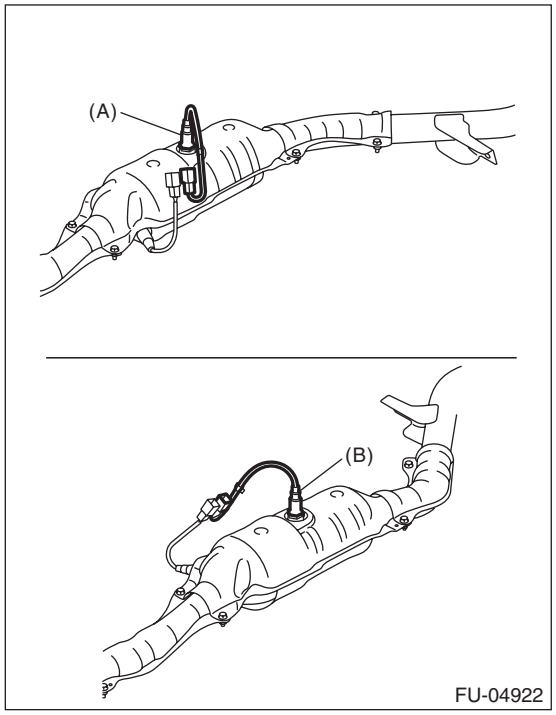
Terminal No.	Standard
3 and 4	2.4±0.24 Ω (when 20°C (68°F))

16.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the front exhaust pipe. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>
4) Apply spray-type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
5) Remove the rear oxygen sensor.

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



(A) Rear oxygen sensor RH
(B) Rear oxygen sensor LH

B: INSTALLATION

CAUTION:
If lubricant is spilt over the exhaust pipe, wipe it off with cloth to avoid emission of smoke or causing a fire.

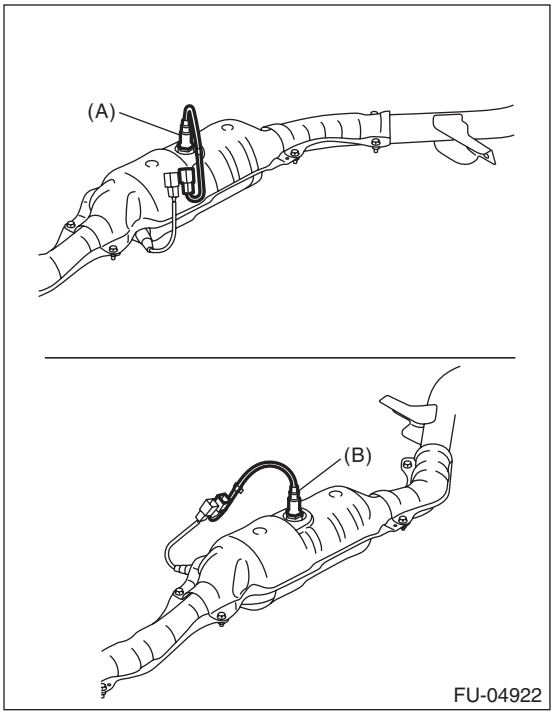
1) Before installing rear oxygen sensor, apply the anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

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

Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30 or equivalent

2) Install the rear oxygen sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)

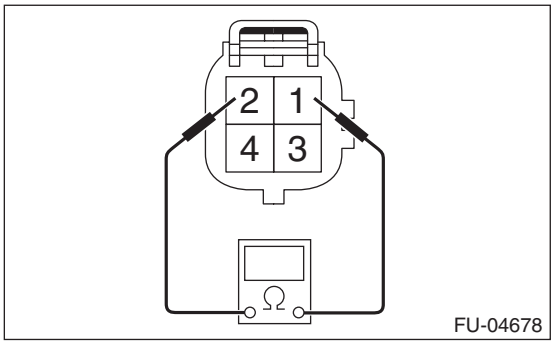


(A) Rear oxygen sensor RH
(B) Rear oxygen sensor LH

3) Install the front exhaust pipe. <Ref. to EX(H6DO)-5, INSTALLATION, Front Exhaust Pipe.>
4) Lower the vehicle.
5) Connect the battery ground terminal.

C: INSPECTION

1) Check the rear oxygen (A/F) sensor for deformation, cracks or other damages.
2) Check the resistance between rear oxygen (A/F) sensor terminals.

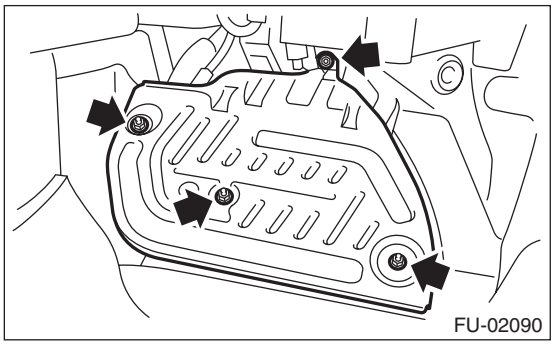


Terminal No.	Standard
1 and 2	$5.6^{+0.8}_{-0.6}$ Ω (when 20°C (68°F))

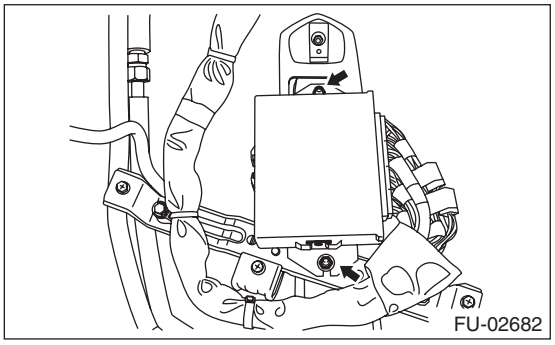
17.Engine Control Module (ECM)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front pillar lower trim and console side panel lower RH of passenger's side.
3) Detach the floor mat of passenger's seat.
4) Remove the protect cover.



5) Remove the ECM from vehicle.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
• When the ECM of model with immobilizer has been replaced, be sure to perform the registration of immobilizer system. (Refer to "PC application help for Subaru Select Monitor".)
• If replacing ECM or the bracket, replace both parts with new parts at a time.
• After installing the bracket to ECM, do not separate the bracket.
• If the bracket has been installed to ECM in the wrong direction, replace both parts to new parts.

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

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

C: INSPECTION

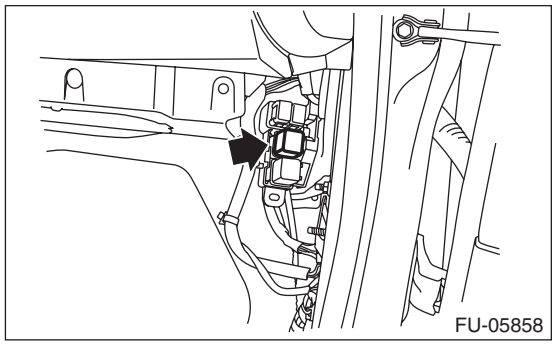
Check that the ECM has no deformation, cracks or other damages.

18.Main Relay

A: REMOVAL

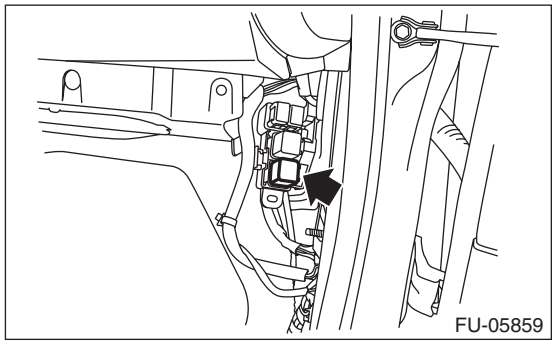
1. Main relay

1) Disconnect the ground cable from battery.
2) Remove the passenger's front door scuff plate. <Ref. to EI-44, FRONT DOOR SCUFF PLATE, REMOVAL, Side Trim.>
3) Remove the front pillar lower trim. <Ref. to EI-44, FRONT PILLAR LOWER TRIM, REMOVAL, Side Trim.>
4) Remove the main relay from the relay holder.



2. Main relay 2

1) Disconnect the ground cable from battery.
2) Remove the passenger's front door scuff plate. <Ref. to EI-44, FRONT DOOR SCUFF PLATE, REMOVAL, Side Trim.>
3) Remove the front pillar lower trim. <Ref. to EI-44, FRONT PILLAR LOWER TRIM, REMOVAL, Side Trim.>
4) Remove main relay 2 from the relay holder.

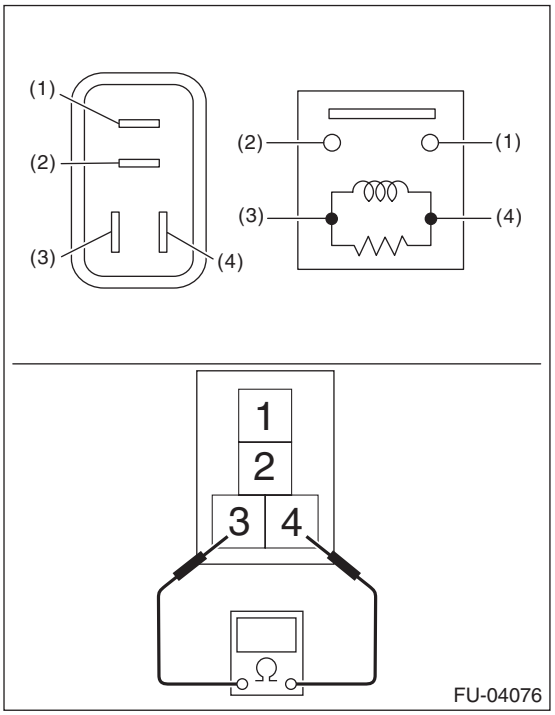


B: INSTALLATION

Install in the reverse order of removal.

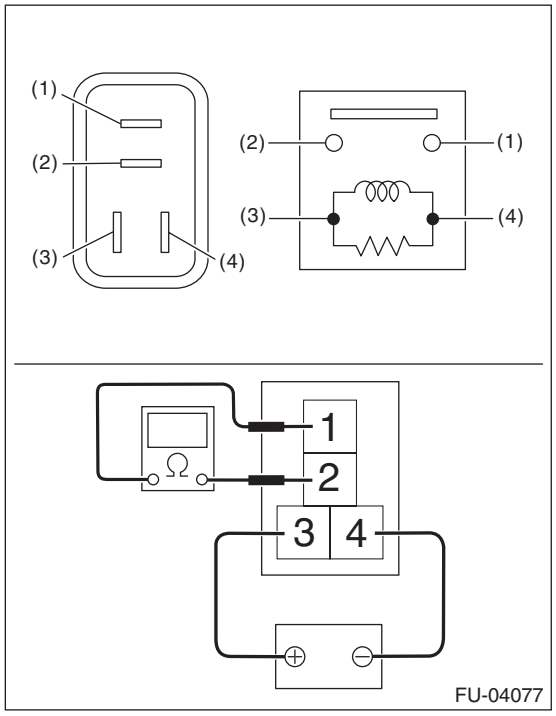
C: INSPECTION

1) Check that the main relay has no deformation, cracks or other damages.
2) Measure the resistance between main relay terminals.



Terminal No.	Standard
1 and 2	1 MΩ or more
3 and 4	130.4 — 230.8 Ω (when 20°C (68°F))

3) Connect battery positive terminal to terminal No. 3 and battery ground terminal to terminal No. 4, and measure the resistance between the main relay terminals.

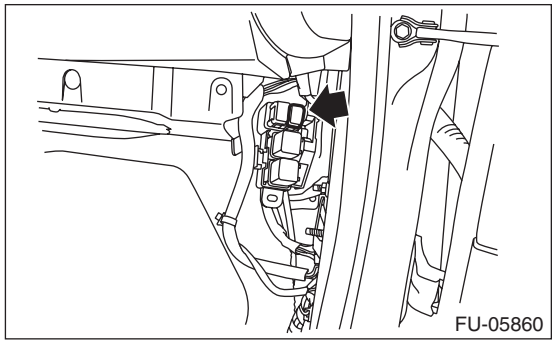


Terminal No.	Standard
1 and 2	Less than 1 Ω

19.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the passenger's front door scuff plate. <Ref. to EI-44, FRONT DOOR SCUFF PLATE, REMOVAL, Side Trim.>
3) Remove the front pillar lower trim. <Ref. to EI-44, FRONT PILLAR LOWER TRIM, REMOVAL, Side Trim.>
4) Remove the fuel pump relay from the relay holder.

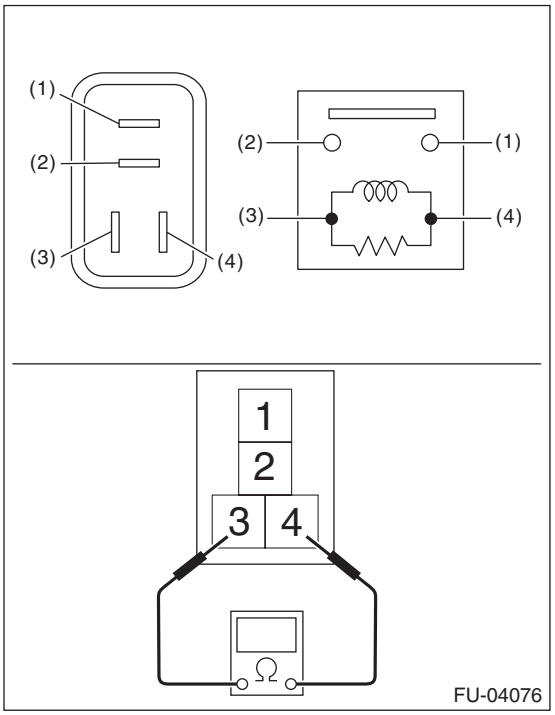


B: INSTALLATION

Install in the reverse order of removal.

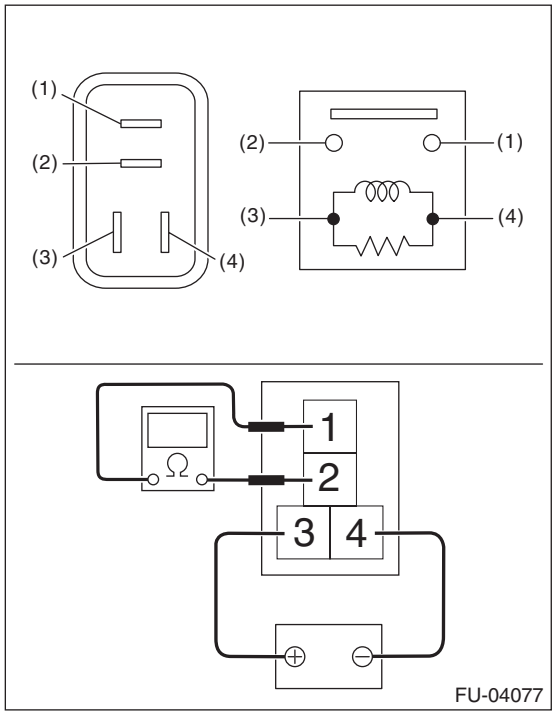
C: INSPECTION

1) Check that the fuel pump relay has no deformation, cracks or other damages.
2) Measure the resistance between fuel pump relay terminals.



Terminal No.	Standard
1 and 2	1 MΩ or more
3 and 4	93.8 — 136.4 Ω (when 20°C (68°F))

3) Connect battery positive terminal to terminal No. 3 and battery ground terminal to terminal No. 4, and measure the resistance between the fuel pump relay terminals.

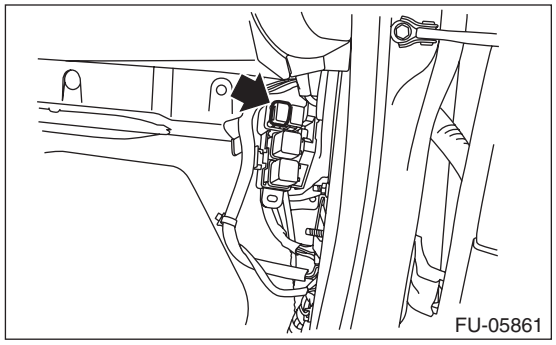


Terminal No.	Standard
1 and 2	Less than 1 Ω

20. Electronic Throttle Control Relay

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the passenger's front door scuff plate. <Ref. to EI-44, FRONT DOOR SCUFF PLATE, REMOVAL, Side Trim.>
3) Remove the front pillar lower trim. <Ref. to EI-44, FRONT PILLAR LOWER TRIM, REMOVAL, Side Trim.>
4) Remove the electronic throttle control relay from the relay holder.

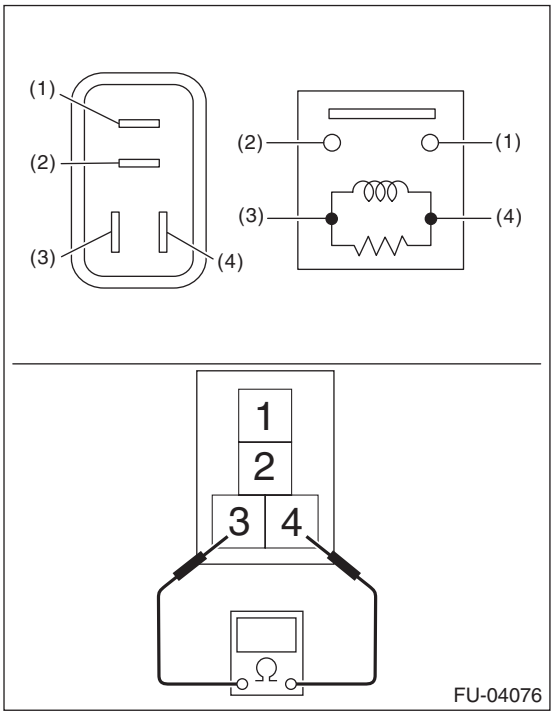


B: INSTALLATION

Install in the reverse order of removal.

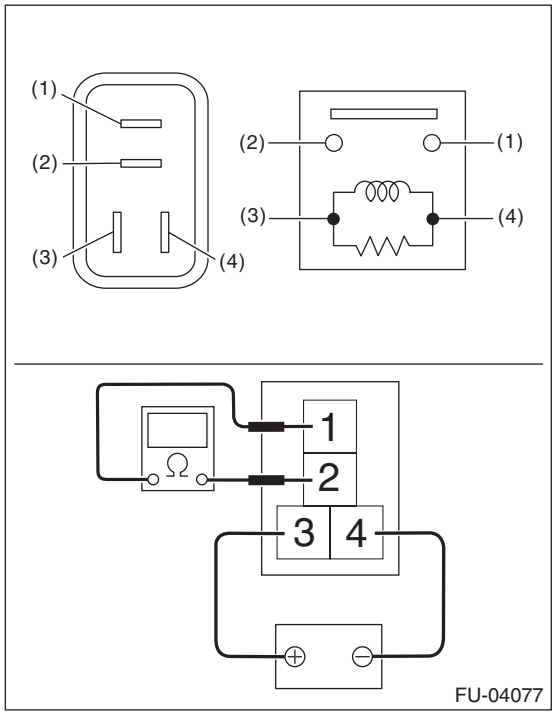
C: INSPECTION

1) Check that the electronic throttle control relay has no deformation, cracks or other damages.
2) Measure the resistance between electronic throttle control relay terminals.



Terminal No.	Standard
1 and 2	1 MΩ or more
3 and 4	93.8 — 136.4 Ω (when 20°C (68°F))

3) Connect battery positive terminal to terminal No. 3 and battery ground terminal to terminal No. 4, and measure the resistance between the electronic throttle control relay terminals.

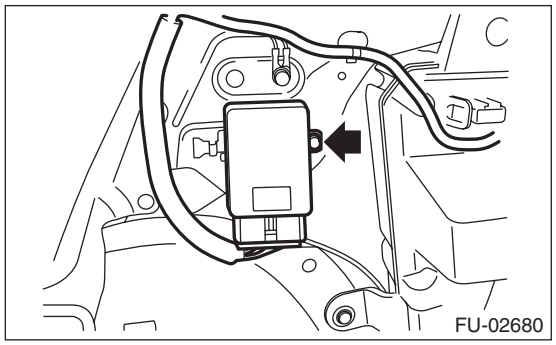


Terminal No.	Standard
1 and 2	Less than 1 Ω

21.Fuel Pump Control Unit

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear quarter trim (right side). <Ref. to EI-46, REMOVAL, Rear Quarter Trim.>
3) Disconnect the connector from fuel pump control unit.
4) Remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

C: INSPECTION

Check that the fuel pump control unit has no deformation, cracks or other damages.

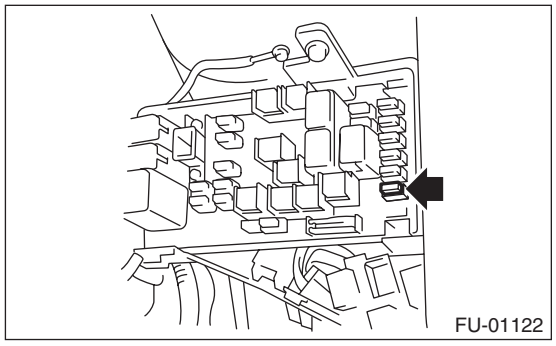
22.Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.
1) Remove the fuse of fuel pump from main fuse box.



2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn the ignition switch to OFF.
5) Install the fuse of fuel pump to the main fuse box.

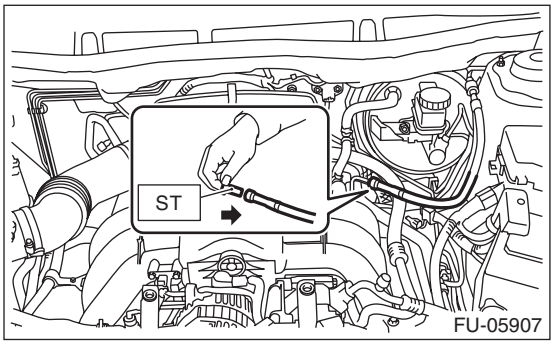
2. DRAINING FUEL (WITH SUBARU SELECT MONITOR)

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

NOTE:
• If the fuel pump cannot be driven, refer to the procedures for draining from the fuel filler hose. <Ref. to FU(H6DO)-59, DRAINING FUEL (THROUGH THE FUEL FILLER HOSE), PROCEDURE, Fuel.>
• Be careful not to let the battery run-out.
1) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the collector cover.
3) Disconnect the fuel delivery hose by pushing the ST in the direction of the arrow.
ST 42099AE000 QUICK CONNECTOR RELEASE

CAUTION:
• Be careful not to spill fuel.
• Catch the fuel from hoses using a container or cloth.



4) Connect ST to the fuel delivery hose.
ST 18471AA000 FUEL PIPE ADAPTER
5) Connect the gasoline proof hose to ST and put the end of the hose in the container.
6) Drive the fuel pump and drain the fuel using Subaru Select Monitor. (Refer to "PC application help for Subaru Select Monitor".)

CAUTION:
Be careful not to spill fuel.
7) Install the related parts in the reverse order after draining the fuel.

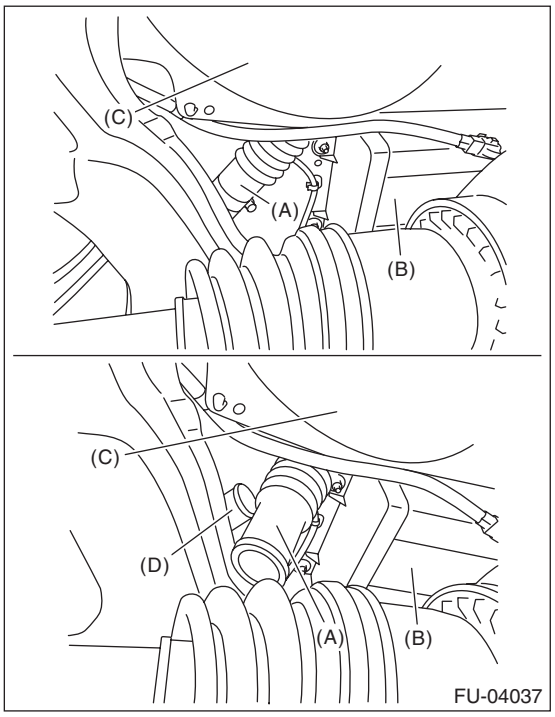
3. DRAINING FUEL (THROUGH THE FUEL FILLER HOSE)

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
• Be careful not to spill fuel.
• Fuel may remain in the fuel filler pipe. Draining the fuel from the fuel filler pipe through the fill opening using the gasoline proof pump and the gasoline proof hose (ø10 or less) before the operation.
1) Lift up the vehicle.
2) Remove the rear exhaust pipe and muffler. <Ref. to EX(H6DO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
3) Open the fuel filler lid and remove the fuel filler cap.
4) Drain the fuel from the fuel filler pipe through the filler opening using the gasoline proof pump and the gasoline proof hose (ø10 or less).

5) Disconnect the fuel filler hoses from the fuel filler pipe.

CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**



(A) Fuel filler hose
(B) Canister
(C) Fuel tank
(D) Fuel filler pipe

6) Set the container under the vehicle and insert the gasoline proof hose (ø10 or less) into the fuel filler hose to drain the fuel.

CAUTION:
Be careful not to spill fuel.

7) Install the related parts in the reverse order after draining the fuel.

Tightening torque:
2.5 N·m (0.3 kgf-m, 1.8 ft-lb)

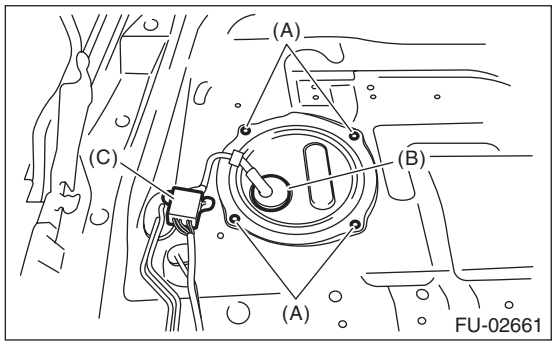
23.Fuel Tank

A: REMOVAL

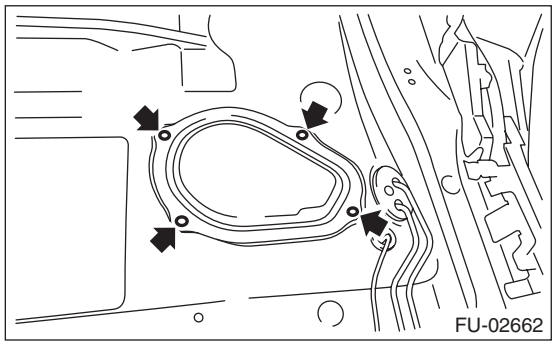
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

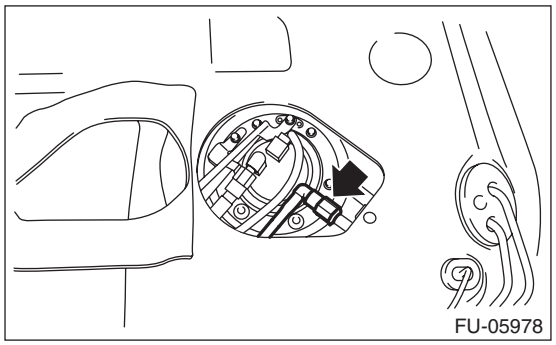
1) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H6DO)-59, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.
4) Remove the second row seats. <Ref. to SE-13, REMOVAL, Second Seat.>
5) Remove the service hole cover of fuel pump.
   (1) Disconnect the connector (C).
   (2) Remove the bolt (A).
   (3) Push the grommet (B) down and remove service hole cover.



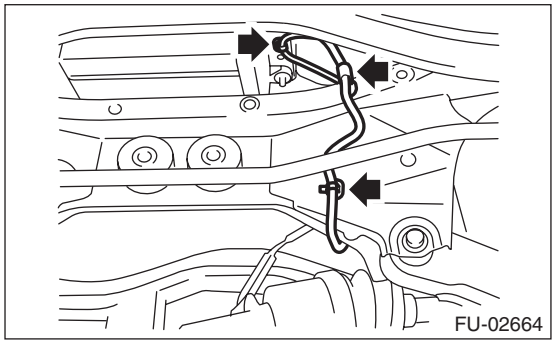
6) Remove the service hole cover of fuel sub level sensor.



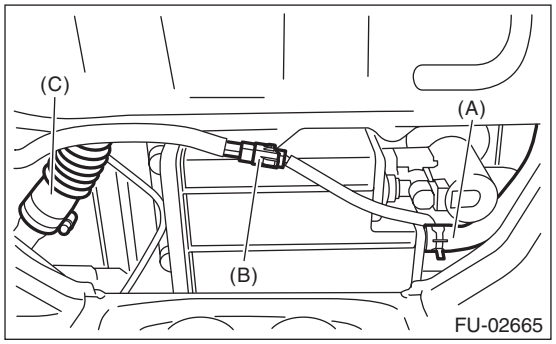
7) Disconnect the quick connector on the fuel delivery tube. <Ref. to FU(H6DO)-75, REMOVAL, Fuel Delivery and Evaporation Lines.>



8) Remove the rear wheels.
9) Lift up the vehicle.
10) Remove the clip holding the harness.



11) Remove the rear suspension assembly. <Ref. to RS-17, REMOVAL, Rear Sub Frame.>
12) Disconnect purge hose (A), connector (B) and fuel filler hose (C).

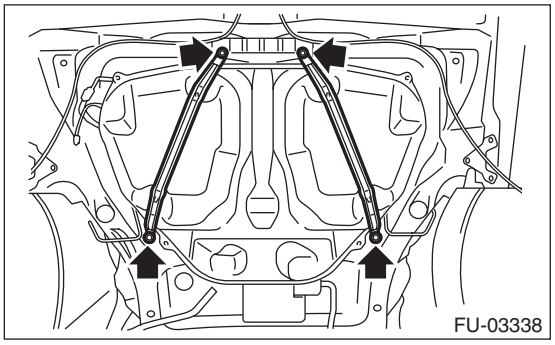


13) Remove the fuel tank from the vehicle.

WARNING:
- **A helper is required to perform this work.**
- **Fuel may remain in the fuel tank. This will cause the left and right sides to be unbalanced. Be careful not to drop the fuel tank when removing.**

   (1) Support the fuel tank with the transmission jack.
   (2) Remove the fuel tank band that holds the fuel tank.

(3) Remove the fuel tank from the vehicle.



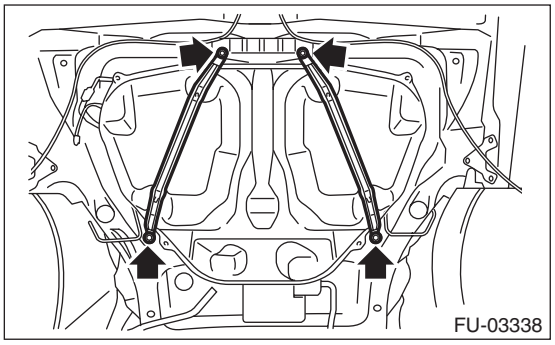
B: INSTALLATION

1) Install the fuel tank to the vehicle.

WARNING:
A helper is required to perform this work.

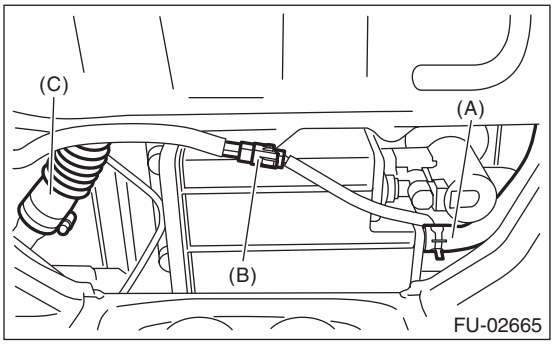
(1) Lift the fuel tank with the transmission jack.
(2) Mount the fuel tank to the vehicle with a jack.
(3) Install the fuel tank band that holds the fuel tank.

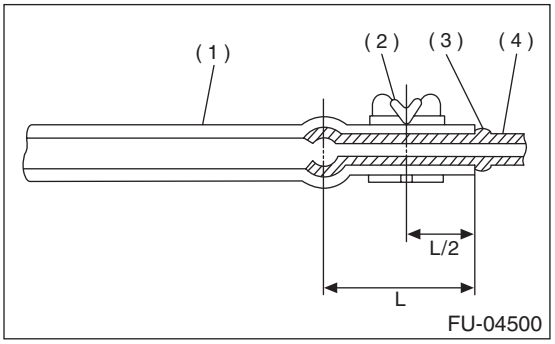
Tightening torque:
33 N·m (3.4 kgf-m,24.3 ft-lb)



2) Connect purge hose (A), connector (B) and fuel filler hose (C).

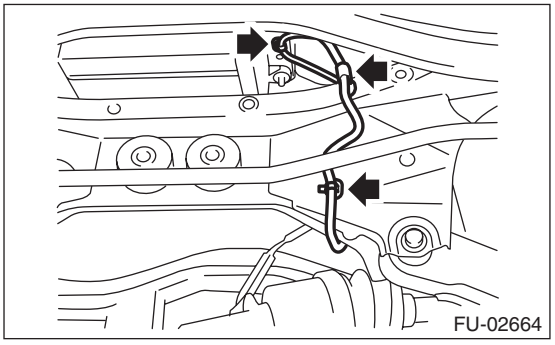
Tightening torque:
2.5 N·m (0.3 kgf-m, 1.8 ft-lb)





(1) Hose
(2) Clamp or clip
(3) Spool
(4) Pipe

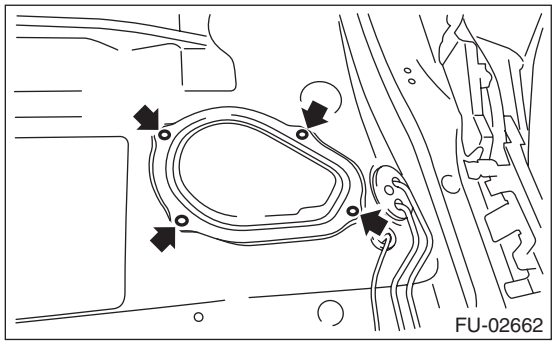
3) Install the rear suspension assembly. <Ref. to RS-17, INSTALLATION, Rear Sub Frame.>
4) Install the clip that holds the harness.



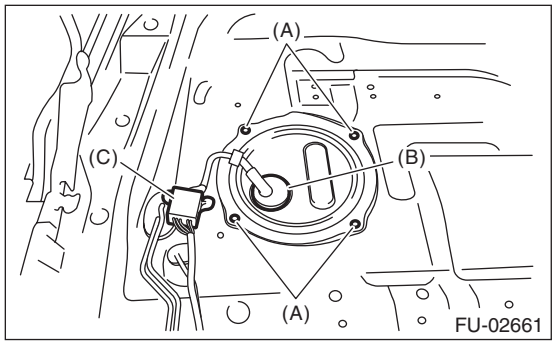
5) Lower the vehicle.
6) Install the rear wheels.

Tightening torque:
Chromed plated wheel
150 N·m (15.3 kgf-m, 110.6 ft-lb)
Other than above
120 N·m (12.2 kgf-m, 88.5 ft-lb)

7) Connect the quick connector of the fuel delivery tube. <Ref. to FU(H6DO)-77, INSTALLATION, Fuel Delivery and Evaporation Lines.>
8) Install the service hole cover of fuel sub level sensor.



9) Install the service hole cover of fuel pump.
(1) Push on the grommet (B) to install it to the service hole cover.
(2) Tighten the bolt (A).
(3) Connect the connector (C).



10) Install the second seat. <Ref. to SE-13, INSTALLATION, Second Seat.>
11) Connect the battery ground terminal.
12) Inspect the wheel alignment and adjust if necessary.

C: INSPECTION

1) Check that the fuel tank does not have holes, cracks or is damaged in any other way.
2) Make sure that the fuel pipe and fuel hose are not cracked and that the connections are tight.

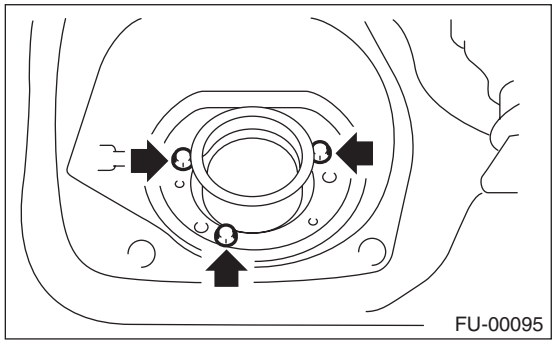
24.Fuel Filler Pipe

A: REMOVAL

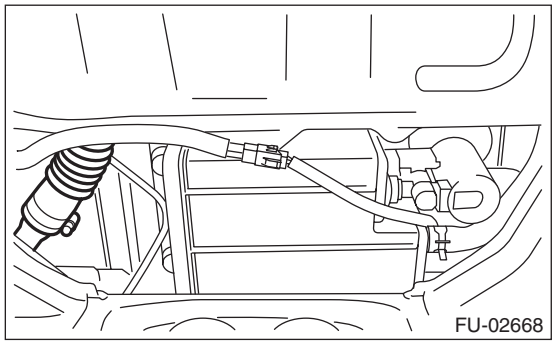
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

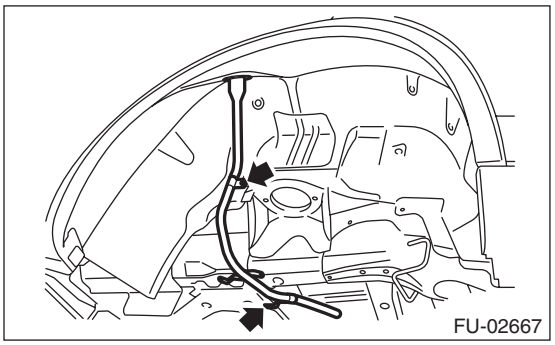
1) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H6DO)-59, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.
4) Open the fuel filler lid and remove the fuel filler cap.
5) Remove the bolt which secures the gasket.


FU-00095

6) Remove the rear wheel RH.
7) Lift up the vehicle.
8) Remove the mud guard. <Ref. to EI-20, REMOVAL, Mud Guard.>
9) Remove the rear suspension assembly. <Ref. to RS-17, REMOVAL, Rear Sub Frame.>
10) Disconnect the fuel filler hose.


FU-02668

11) Remove the bolts which hold the fuel filler pipe on the body.


FU-02667

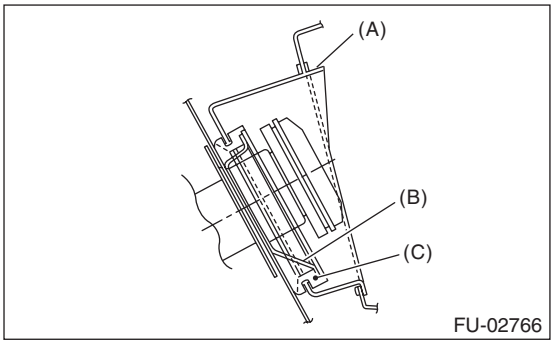
12) Remove the fuel filler pipe to the underside of the vehicle.

B: INSTALLATION

1) Open the fuel filler lid.
2) Set the fuel saucer (A) with gasket (C), and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the bolts.

NOTE:
If the edges of gasket are folded toward inside, straighten it with a flat tip screwdriver.

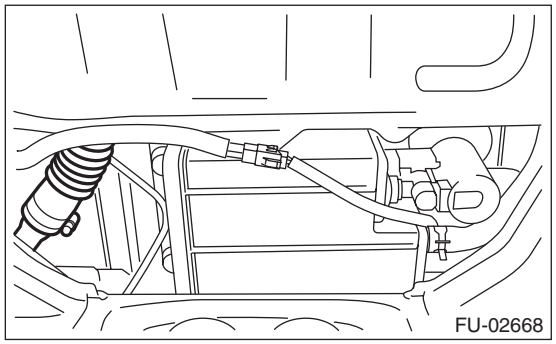
Tightening torque:
4.5 N·m (0.5 kgf-m, 3.3 ft-lb)

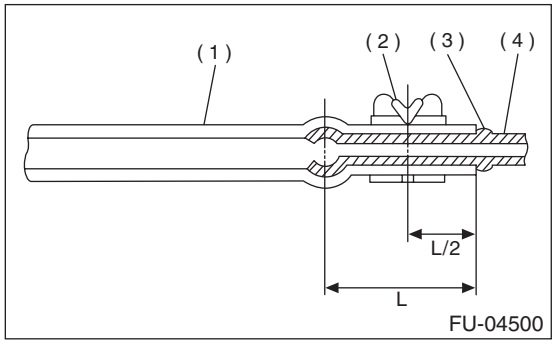


FU-02766

4) Correctly insert the fuel filler hose to specified position, and then tighten the clamp.

Tightening torque:
2.5 N·m (0.3 kgf-m, 1.8 ft-lb)

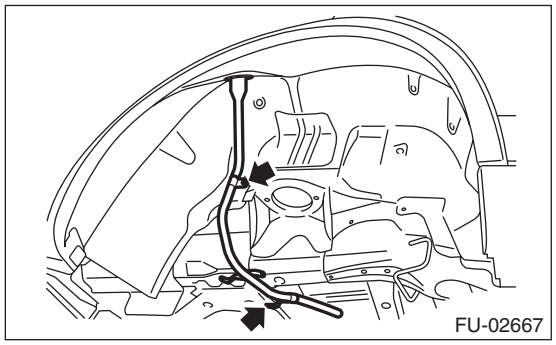




(1) Hose
(2) Clamp or clip
(3) Spool
(4) Pipe

5) Tighten the bolts which hold the fuel filler pipe on the body.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



6) Install the rear suspension assembly. <Ref. to RS-17, INSTALLATION, Rear Sub Frame.>
7) Install the mud guard. <Ref. to EI-20, INSTALLATION, Mud Guard.>
8) Lower the vehicle.
9) Install the rear wheel RH.

Tightening torque:
Chromed plated wheel
150 N·m (15.3 kgf-m, 110.6 ft-lb)
Other than above
120 N·m (12.2 kgf-m, 88.5 ft-lb)

10) Connect the battery ground terminal.
11) Inspect the wheel alignment and adjust if necessary.

C: INSPECTION

Check that the fuel filler pipe does not have deformation, cracks or other damages.

25.Fuel Pump

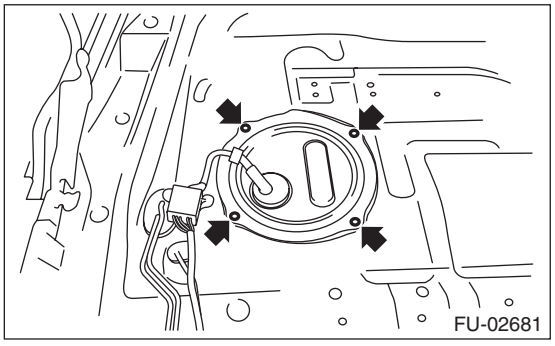
A: REMOVAL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

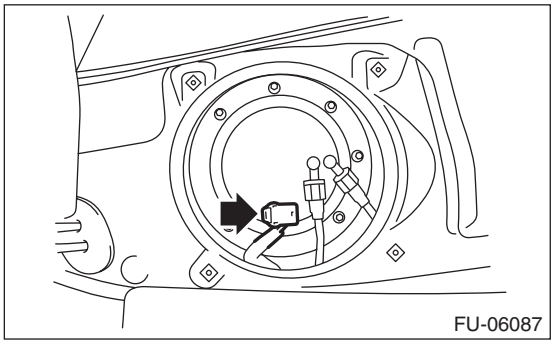
CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**

NOTE:
Fuel pump assembly consists of fuel pump, fuel filter and fuel level sensor.

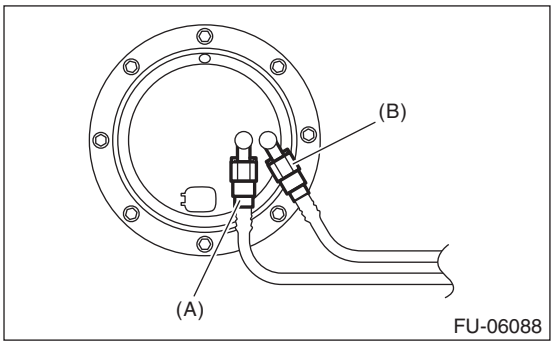
1) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H6DO)-59, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.
4) Remove the second row seats. <Ref. to SE-13, REMOVAL, Second Seat.>
5) Remove the service hole cover.


FU-02681

6) Disconnect the connector from fuel pump.


FU-06087

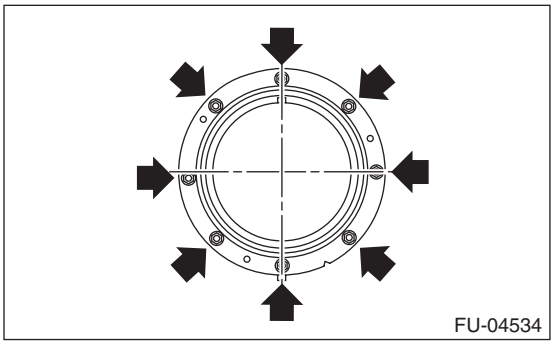
7) Disconnect the quick connectors of fuel delivery tube and fuel sub delivery tube. <Ref. to FU(H6DO)-75, REMOVAL, Fuel Delivery and Evaporation Lines.>



FU-06088

(A) Fuel delivery tube
(B) Fuel sub delivery tube

8) Remove the nuts securing the fuel pump upper plate to the fuel tank and remove the fuel pump upper plate.


FU-04534

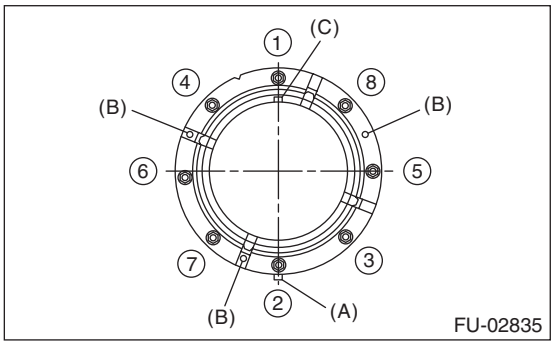
9) Remove the fuel pump assembly from the fuel tank.

B: INSTALLATION

Install in the reverse order of removal while being careful of the following.
• Make sure the sealing portion is free from fuel or foreign matter before installation.
• Install with the protrusion (A) of gasket aimed at the front side of the vehicle.
• Insert the protrusion (B) of gasket into the upper plate. (3 places)
• Align the protrusion (C) of fuel pump assembly with the cutout on the upper plate.
• Tighten the nuts to the specified torque in the order as shown in the figure.

NOTE:
Use a new gasket.

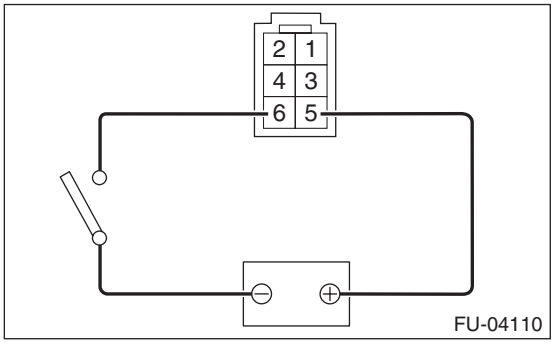
Tightening torque:
4.4 N·m (0.4 kgf-m, 3.2 ft-lb)



C: INSPECTION

1) Check that the fuel pump has no deformation, cracks or other damages.
2) Connect the battery positive terminal to terminal No. 5 and the battery ground terminal to terminal No. 6, and inspect the fuel pump operation.

WARNING:
• Wipe off fuel completely.
• Keep the battery as far apart from fuel pump as possible.
• Do not run the fuel pump for a long time under non-load condition.



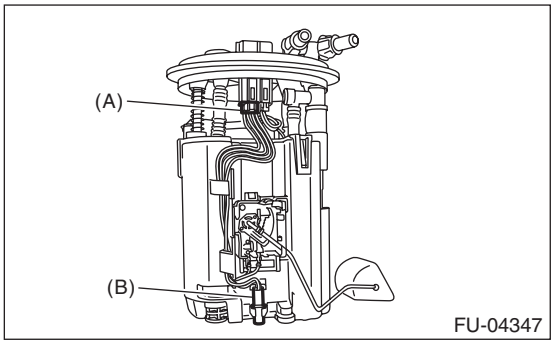
26.Fuel Level Sensor

A: REMOVAL

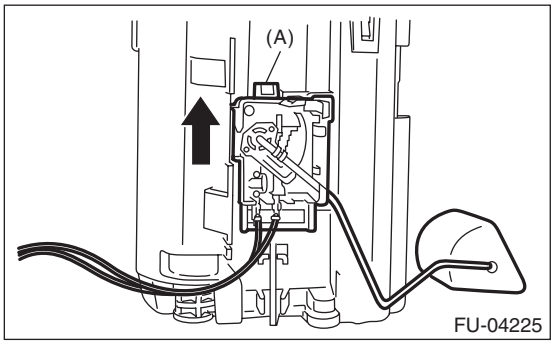
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**

NOTE:
The fuel level sensor is built in fuel pump assembly.
1) Remove the fuel pump assembly. <Ref. to FU(H6DO)-66, REMOVAL, Fuel Pump.>
2) Disconnect the fuel level sensor connector (A) from the sub tank bracket assembly.
3) Remove the fuel temperature sensor (B) from sub tank.



4) Slide the fuel level sensor in the direction of the arrow and remove the fuel level sensor by pressing the claw (A) of the fuel level sensor.



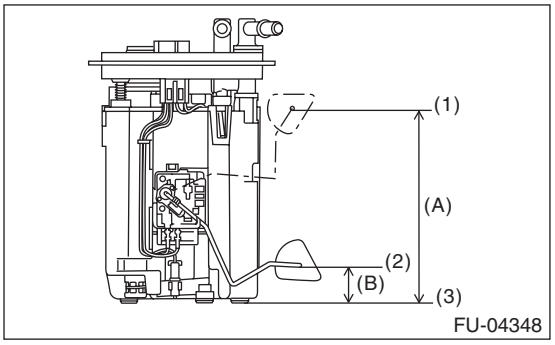
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Check that the fuel level sensor has no damage.
2) Measure the fuel level sensor float position.

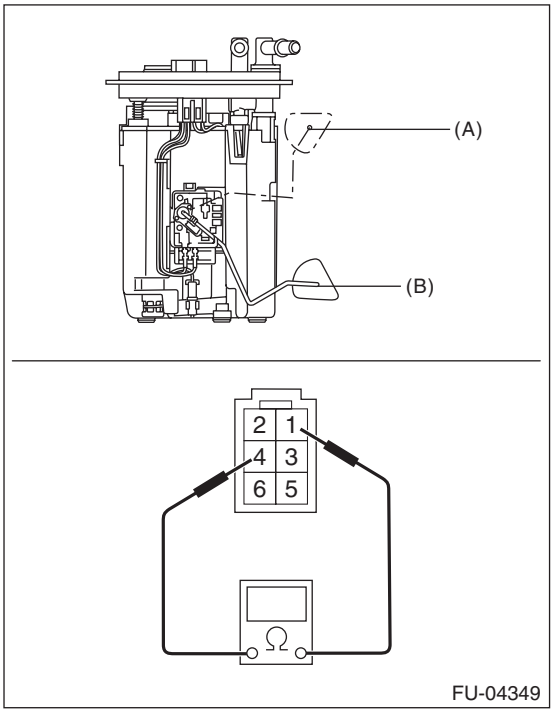
NOTE:
When inspecting the fuel level sensor, perform the work with the sensor installed to the fuel pump.



(1) FULL
(2) EMPTY
(3) Fuel tank seating surface

Float position	Standard
FULL to Fuel tank seating surface (A)	135 ±4 mm (5.315±0.157 in)
EMPTY to Fuel tank seating surface (B)	23.7 ±4 mm (0.933±0.157 in)

3) Measure the resistance between fuel level sensor terminals.



Float position	Terminal No.	Standard
FULL (A)	1 and 4	2.0±1.0 Ω
EMPTY (B)		31.9±1.0 Ω

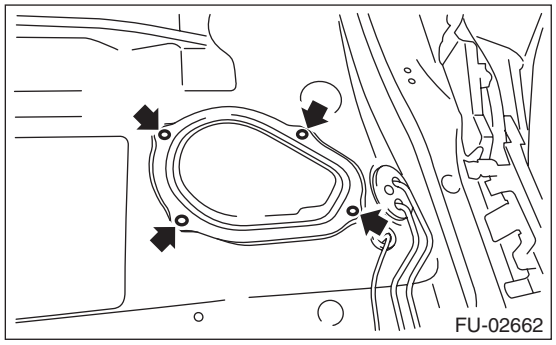
27.Fuel Sub Level Sensor

A: REMOVAL

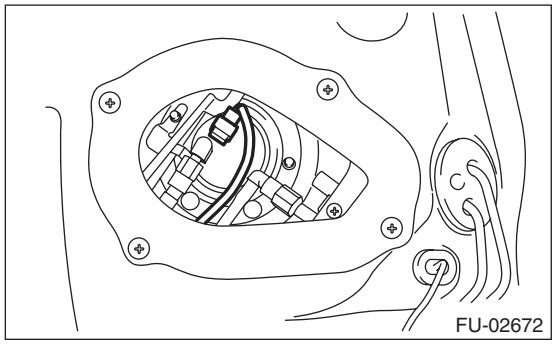
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**

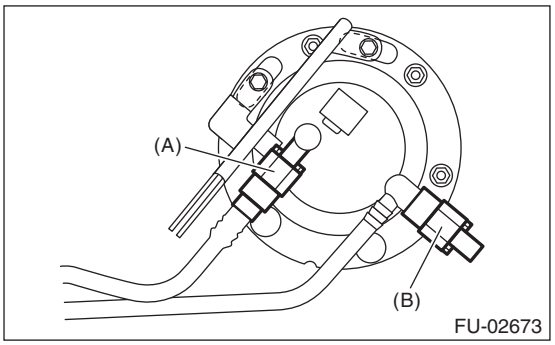
1) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H6DO)-59, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.
4) Remove the second row seats. <Ref. to SE-13, REMOVAL, Second Seat.>
5) Remove the service hole cover.


FU-02662

6) Disconnect the connector from the fuel sub level sensor.


FU-02672

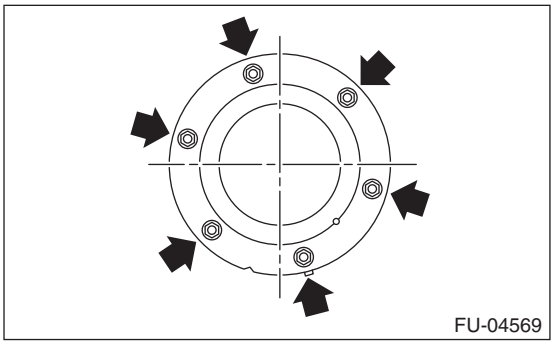
7) Disconnect the quick connectors of fuel delivery tube and fuel sub delivery tube. <Ref. to FU(H6DO)-75, REMOVAL, Fuel Delivery and Evaporation Lines.>



FU-02673

(A) Fuel sub delivery tube
(B) Fuel delivery tube

8) Remove the nuts securing the fuel sub level sensor upper plate to the fuel tank and remove the fuel sub level sensor upper plate.


FU-04569

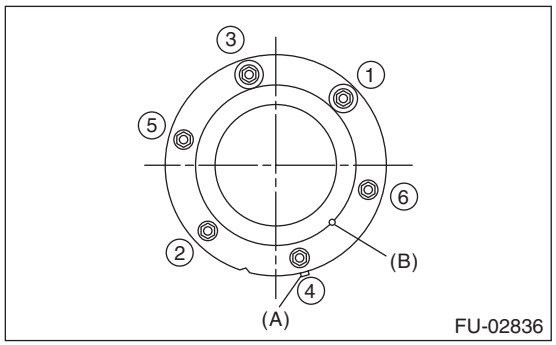
9) Remove the fuel sub level sensor.

B: INSTALLATION

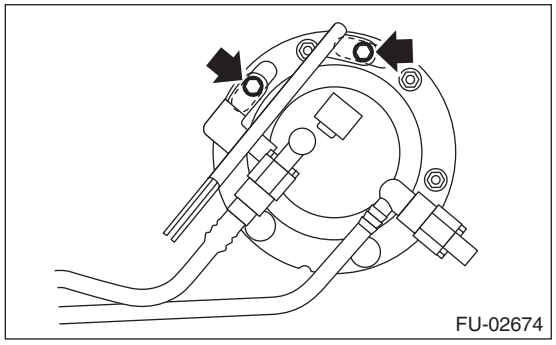
Install in the reverse order of removal while being careful of the following.
- Make sure the sealing portion is free from fuel or foreign matter before installation.
- Align protrusion (A) of the gasket to the position shown in the following figure.
- Align protrusion of the fuel sub level sensor to the cutout in the fuel sub level sensor upper plate.
- Tighten the nuts and bolts to the specified torque in the order as shown in the figure.

NOTE:
Use a new gasket.

Tightening torque:
4.4 N·m (0.4 kgf-m, 3.2 ft-lb)

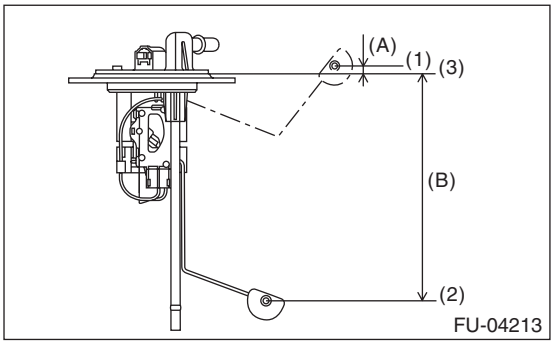


FU-02836


FU-02674

C: INSPECTION

1) Check that the fuel sub level sensor has no damage.
2) Measure the fuel sub level sensor float position.

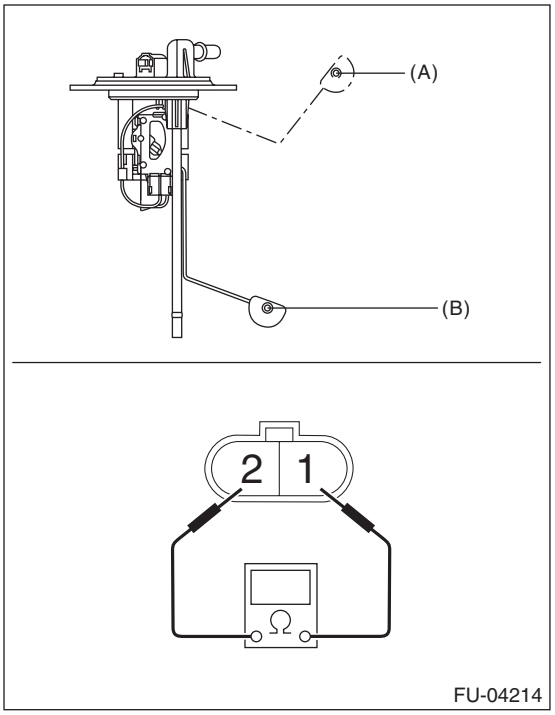


FU-04213

(1) FULL
(2) EMPTY
(3) Datum points

Float position	Standard
FULL to Datum point (A)	5.3±3.5 mm (0.209±0.138 in)
EMPTY to Datum point (B)	160.6±3.5 mm (6.323±0.138 in)

3) Measure the resistance between fuel sub level sensor terminals.



FU-04214

Float position	Terminal No.	Standard
FULL (A)	1 and 2	2.0±1.0 Ω
EMPTY (B)		62.1±1.0 Ω

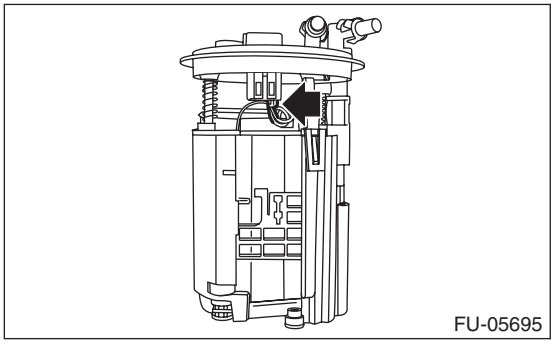
28.Fuel Filter

A: REMOVAL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**
- **Be careful not to drop or apply any impact to the fuel pump during work. This may deteriorate its performance.**

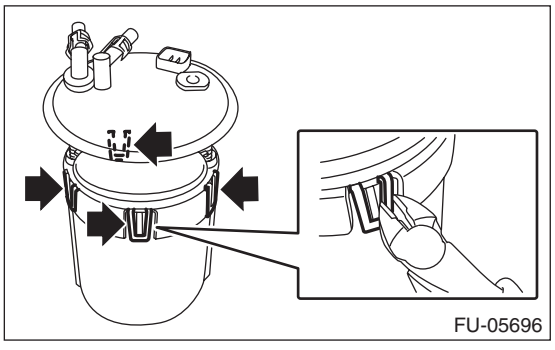
NOTE:
The fuel filter is built in fuel pump assembly.
1) Remove the fuel pump assembly. <Ref. to FU(H6DO)-66, REMOVAL, Fuel Pump.>
2) Remove the fuel level sensor and fuel temperature sensor. <Ref. to FU(H6DO)-68, REMOVAL, Fuel Level Sensor.>
3) Disconnect the pump assembly connector from sub tank bracket assembly.


FU-05695

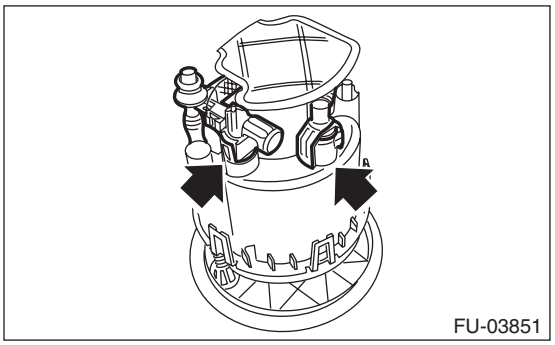
4) Cut off the tab holders connecting the sub tank bracket assembly and the sub tank in four locations, and separate the two.

CAUTION:
Be careful not to damage the sub tank.

NOTE:
If the O-ring is remaining on the sub tank, remove.

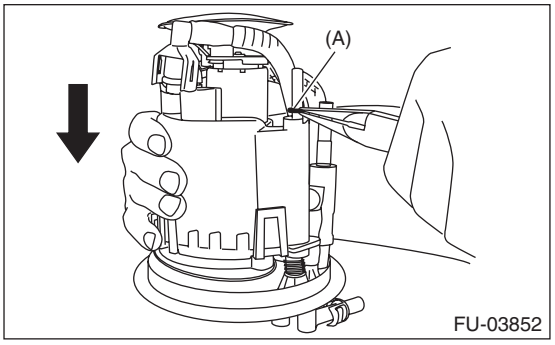

FU-05696

5) Disconnect two connectors of fuel delivery pipe from fuel filter assembly.


FU-03851

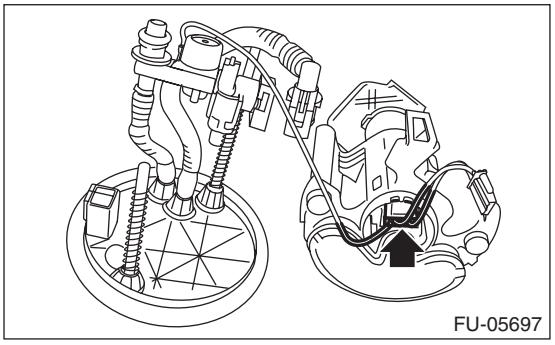
6) Push to compress the fuel filter assembly in the direction of the arrow, remove clip (A), and separate the sub tank bracket assembly and the fuel filter assembly.

CAUTION:
When separating the sub tank bracket assembly and the fuel filter assembly, be careful not to damage the ground wire.



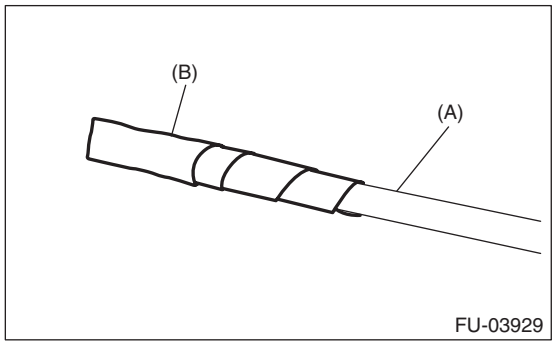
FU-03852

7) Disconnect the connector from the pump assembly.


FU-05697

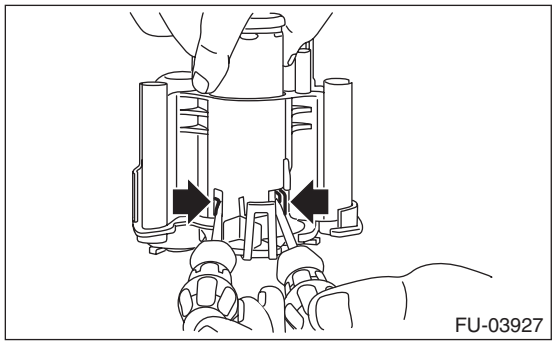
8) Lift the two tab holders connecting the pump assembly to the fuel filter using a flat tip screwdriver [with a shaft diameter of approx. 3 mm (0.12 in)], etc., and separate the fuel filter and pump assembly.

CAUTION:
• To prevent damaging the tabs of the pump assembly, wrap the tip of flat tip screwdriver (A), etc. with tape (B).



• Be careful not to drop or apply any impact to the pump assembly.

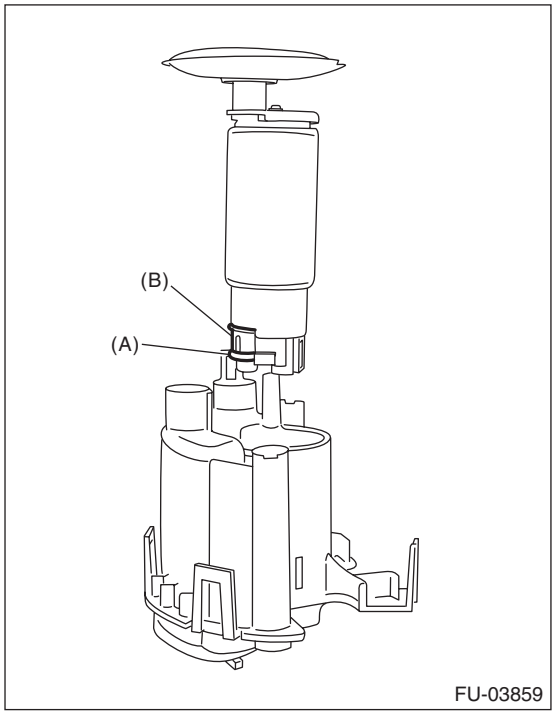
NOTE:
If the spacer and O-ring is remaining on the pump assembly, remove these.



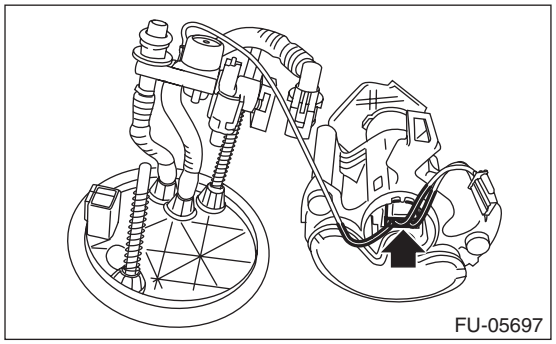
B: INSTALLATION

1) Assemble O-ring (A) and spacer (B) to the pump assembly and attach the pump assembly to the fuel filter.

NOTE:
- Use new O-rings [8 mm (0.31 in) inner diameter].
- Use a new spacer.
- Apply gasoline to the O-ring.
- Insert the pump assembly until a “pop” is heard.

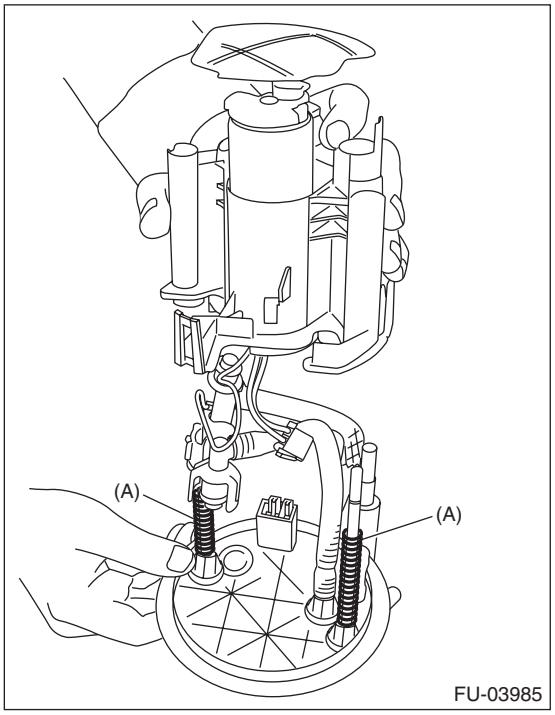


2) Connect the connector to the pump assembly.



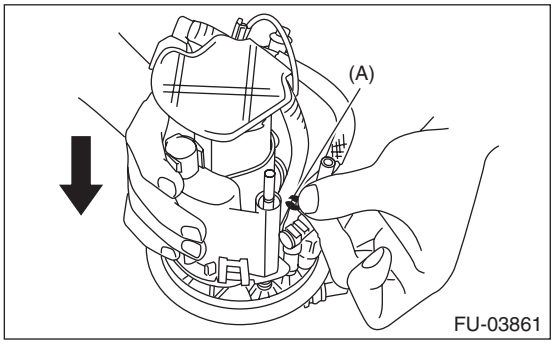
3) Attach spring (A) to the metal rod of the sub tank bracket assembly, and assemble the fuel filter assembly.

NOTE:
Use a new spring.



4) Push the fuel filter assembly in the direction of the arrow to compress, and attach clip (A).

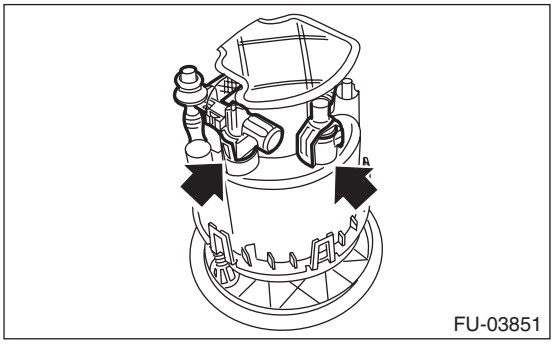
NOTE:
Use a new clip.



5) Connect the fuel piping connector to the fuel filter assembly.

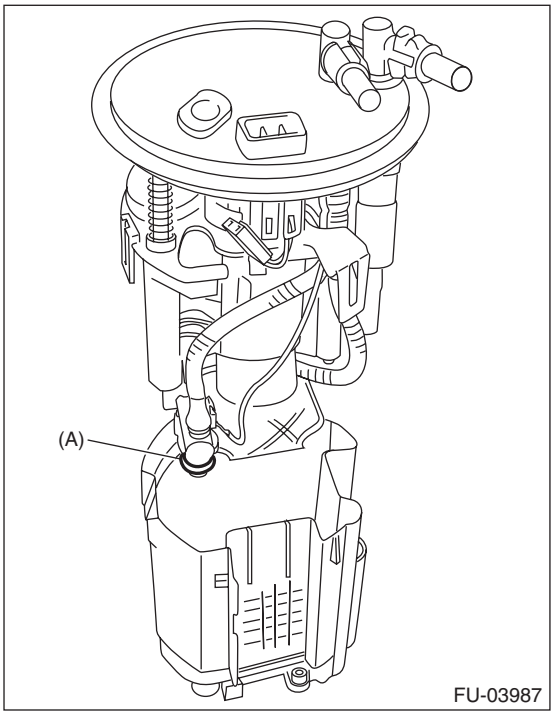
NOTE:
- Use new O-rings.
- Apply gasoline to the O-ring.
- The O-rings of the black and white connectors are identified by a difference in diameter. Be careful not to confuse the two during assembly.

O-ring inner diameter:
Black connector O-ring [Approx. 7 mm (0.28 in)]
White connector O-ring [Approx. 8 mm (0.31 in)]

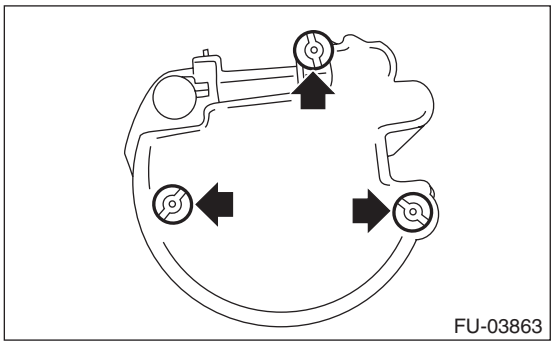


6) Attach the O-ring (A) to the fuel filter assembly, and attach the sub tank to the sub tank bracket assembly.

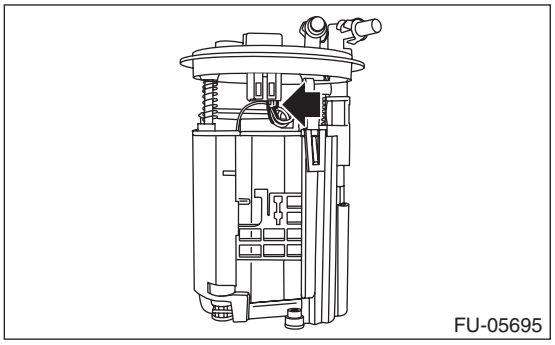
NOTE:
- Use new O-rings [8 mm (0.31 in) inner diameter].
- Apply gasoline to the O-ring.
- Insert the pump assembly until a “pop” is heard.



7) Replace the cushion on the rear face of the sub tank with a new cushion.



8) Connect the pump assembly connector to the sub tank bracket assembly.

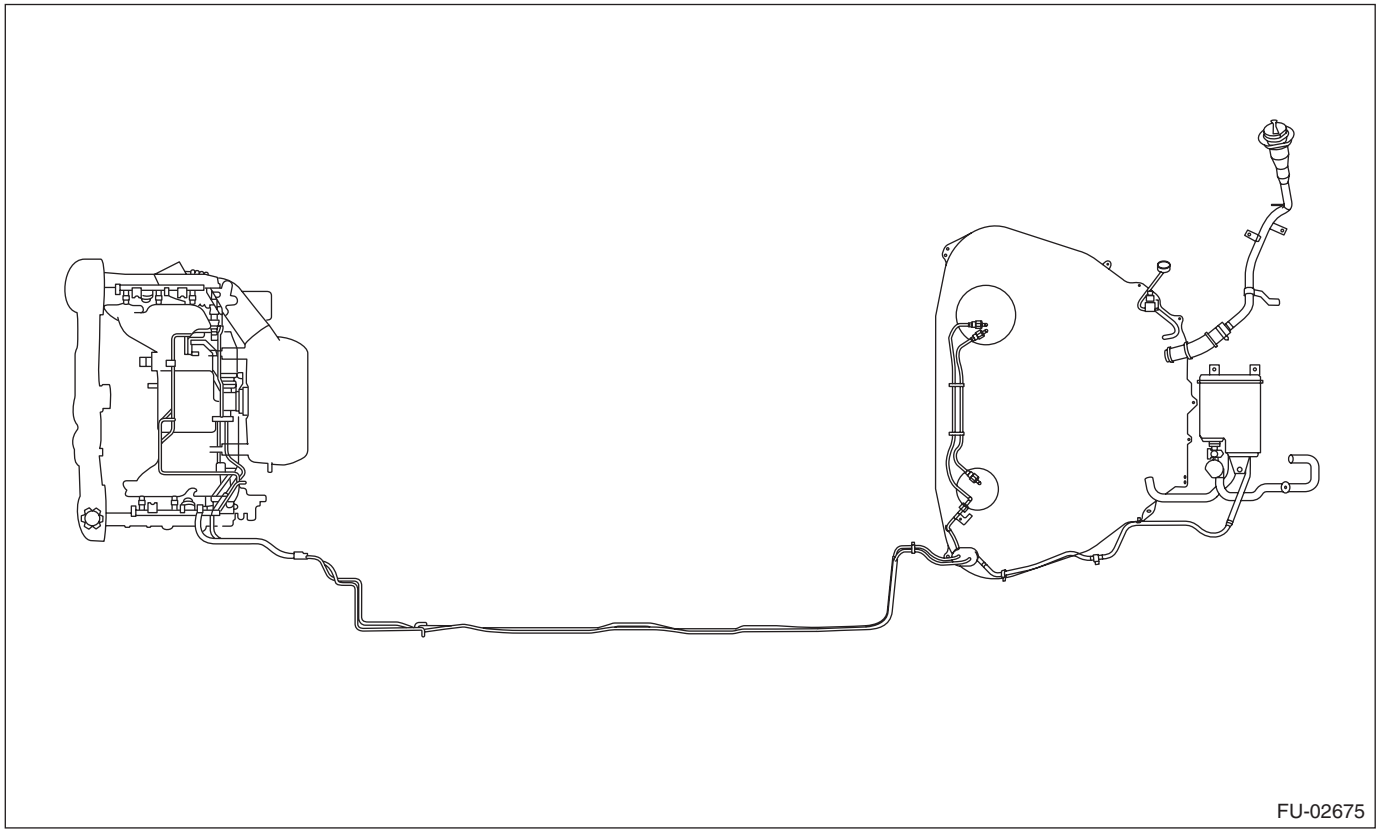


9) Install the fuel level sensor and fuel temperature sensor. <Ref. to FU(H6DO)-68, INSTALLATION, Fuel Level Sensor.>

10) Install the fuel pump assembly. <Ref. to FU(H6DO)-67, INSTALLATION, Fuel Pump.>

29.Fuel Delivery and Evaporation Lines

A: REMOVAL



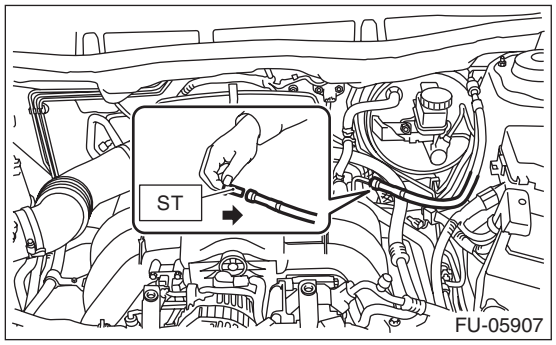
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.
1) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Remove the floor mat. <Ref. to EI-48, REMOVAL, Floor Mat.>
4) Disconnect the fuel delivery pipe and hose and the evaporation pipe and hose.
5) In the engine compartment, disconnect the fuel delivery hoses and evaporation hose.

CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**

(1) Disconnect the quick connector of the fuel delivery line by pushing the ST in the direction of the arrow.

ST 42099AE000 QUICK CONNECTOR RELEASE



(2) Remove the clip and disconnect the evaporation hose.

6) Remove the fuel tank. <Ref. to FU(H6DO)-61, REMOVAL, Fuel Tank.>
7) Disconnect the quick connector, and remove the fuel delivery tube and fuel sub delivery tube from the fuel tank.

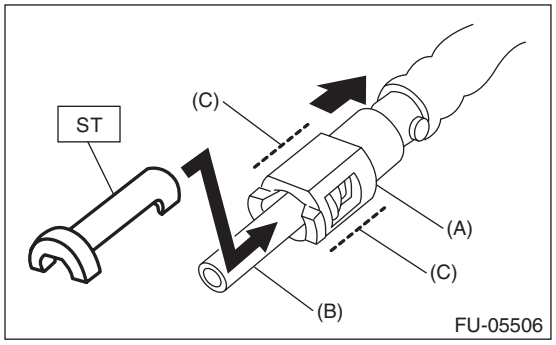
- When using ST

1. Attach ST to the pipe and push ST in the direction of arrow mark to disconnect the quick connector.

ST 42099AE000 QUICK CONNECTOR RELEASE

CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**
- **To disconnect the connector, hold (C) shown in the figure and pull in axial direction.**
- **If the connector and pipe are sticking to each other, push and pull the connector with ST pushed, and then pull the connector after it starts moving freely.**
- **When disconnecting the connector, do not bend or twist the tube forcibly. If the tube is bent, replace with a new part.**

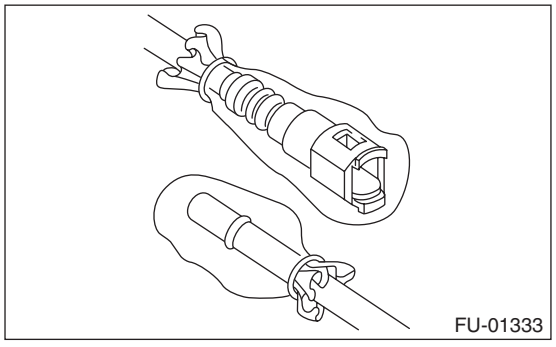
NOTE:
Clean the pipe and quick connector, if they are covered with dust.



(A) Quick connector
(B) Pipe
(C) Connector holding position

2. To prevent from damaging or entering foreign matter, wrap the pipes and quick connectors with plastic bag etc.

CAUTION:
When reusing the retainer, do not disconnect the retainer from the connector.



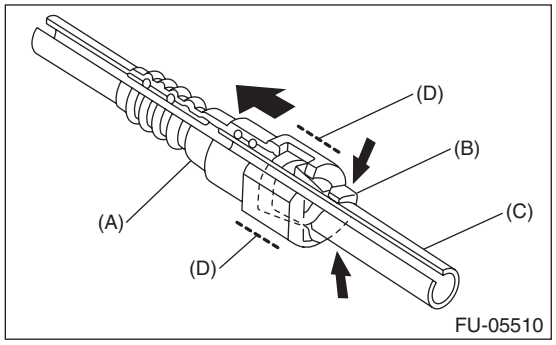
- When not using ST

1. Push the retainer in the direction of the arrow, disconnect the quick connector from pipe.

CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**
- **To disconnect the connector, hold (D) shown in the figure and pull in axial direction.**

• If the connector and pipe are sticking to each other, push and pull the connector with the retainer pushed in the direction of the arrow, and then pull the connector after it starts moving freely.
• When disconnecting the connector, do not bend or twist the tube forcibly. If the tube is bent, replace with a new part.

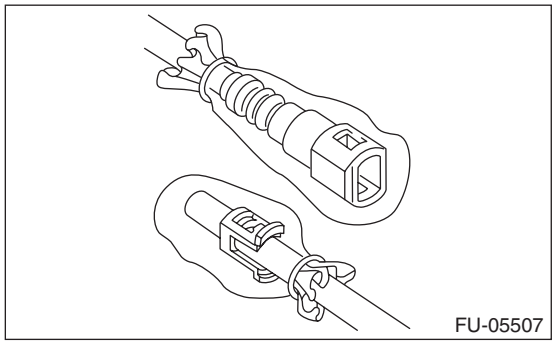
NOTE:
Clean the pipe and quick connector, if they are covered with dust.



(A) Quick connector
(B) Retainer
(C) Pipe
(D) Connector holding position

2. To prevent from damaging or entering foreign matter, wrap the pipes and quick connectors with plastic bag etc.

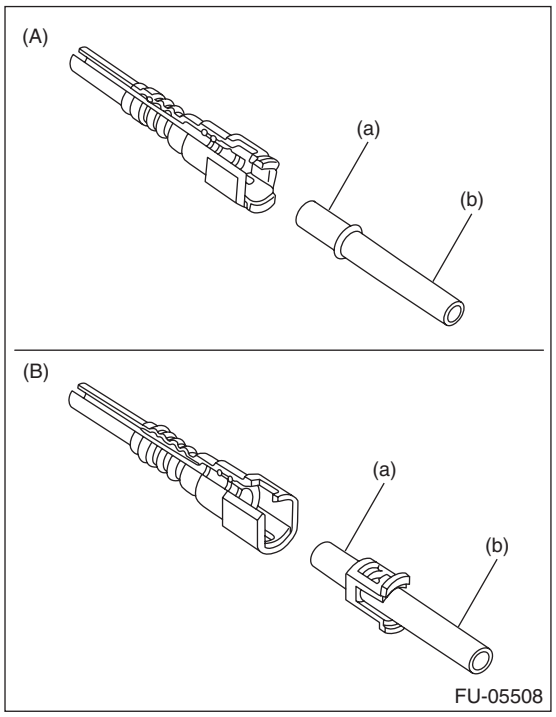
CAUTION:
When reusing the retainer, do not disconnect the retainer from the pipe.



B: INSTALLATION

1. CONNECTING THE FUEL LINE QUICK CONNECTOR

CAUTION:
• Make sure there are no damage or dust on connections. If necessary, clean seal surface of pipe.

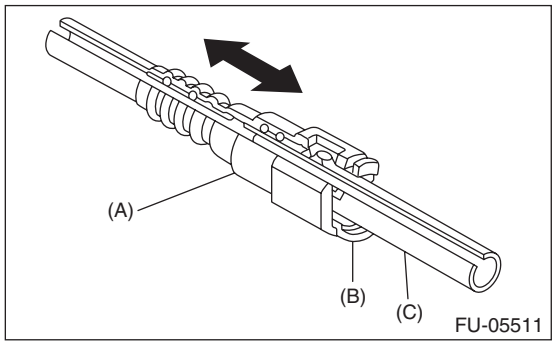


(A) When removed using the ST
(B) When removed without using the ST
(a) Seal surface
(b) Pipe

• When reusing the retainer, make sure that neither scratches nor deformation exist on the retainer. If it is faulty, use a new part.

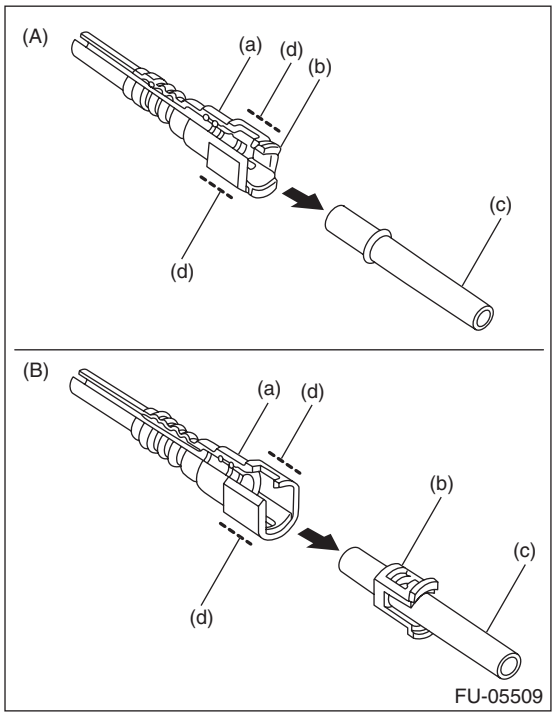
1) Connect the quick connector to pipe.

CAUTION:
• Make sure that the quick connector is securely connected.



(A) Quick connector
(B) Retainer
(C) Pipe

• Make sure the two retainer pawls are engaged in their mating positions in the quick connector.
• Be sure to inspect tubes and their connections for any leakage of fuel.
• To connect the connector, hold (d) shown in the figure and push in axial direction.
• When connecting the connector, do not bend or twist the tube forcibly. If the tube is bent, replace with a new part.



(A) When removed using the ST
(B) When removed without using the ST
(a) Quick connector
(b) Retainer
(c) Pipe
(d) Connector holding position

2. CONNECTING THE FUEL DELIVERY HOSE AND FUEL HOSE

Connect the fuel delivery hose or fuel hose as shown in the figure.

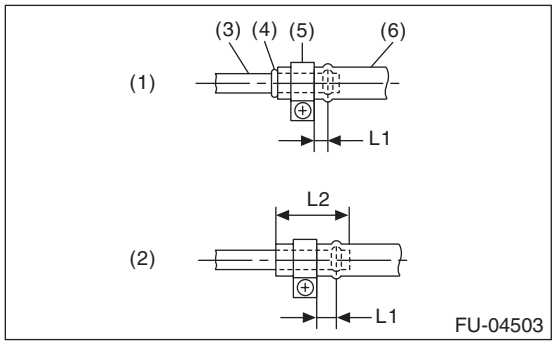
CAUTION:
• If the connection portion has a spool or stopper, do not allow the end of the hose to bend or ride over by inserting the hose too deep.
• Be sure to inspect hoses and their connections for any leakage of fuel.

NOTE:
Use new fuel delivery hose and fuel hose.

Tightening torque:
1.25 N·m (0.1 kgf-m, 0.9 ft-lb)

L1: 2.5±1.5 mm (0.098±0.059 in)

L2: 22.5±2.5 mm (0.886±0.098 in)

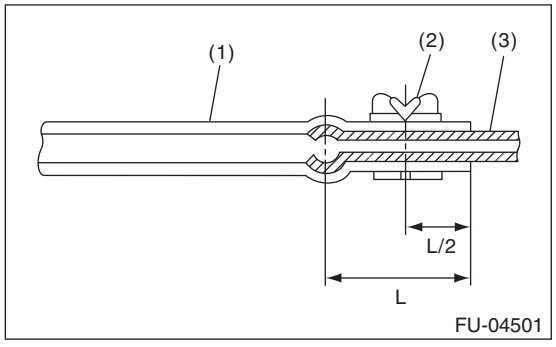


(1) When there is a spool or bump
(2) When there is no spool or bump
(3) Pipe
(4) Spool or bump
(5) Clamp
(6) Hose

3. EVAPORATION HOSE CONNECTION

Connect the evaporation hose to the pipe with an overlap of 15 to 20 mm (0.59 to 0.79 in).

L = 17.5±2.5 mm (0.689±0.098 in)



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

C: INSPECTION

1) Check that the fuel pipe has no deformation, cracks or other damages.
2) Check that the hose and tube have no cracks, damage or loose part.

30.Fuel System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Insufficient fuel supply to injector	a. Fuel pump does not operate.	
	❍ Defective terminal contact	Inspect contact, especially ground, and tighten it securely.
	❍ Trouble in electromagnetic or electronic circuit parts	Replace the faulty parts.
	b. Decline of fuel pump function	Replace the fuel pump.
	c. Clogged fuel filter	Replace the fuel filter. Clean or replace the fuel tank if necessary.
	d. Clogged or bent fuel line pipe, hose or tube	Clean, correct or replace the fuel line pipe, hose or tube.
	e. Air is mixed in fuel system.	Check the fuel line connections, correct or replace the defective part.
	f. Damaged diaphragm of pressure regulator	Replace the pressure regulator.
Leakage or blow out of fuel	a. Loose connections of fuel line pipe, hose or tube	Check the fuel line connections, correct or replace the defective part.
	b. Cracked fuel line pipe, hose or tube	Replace the fuel line pipe, hose or tube.
	c. Cracked fuel tank or defective welding part	Replace the fuel tank.
	d. Clogged or bent fuel line pipe, hose or tube	Clean, correct or replace the fuel line pipe, hose or tube.
Gasoline smell inside of compartment	a. Loose connections of fuel line pipe, hose or tube	Check the fuel line connections, correct or replace the defective part.
	b. Improper installation of rubber saucer	Correct or replace the rubber saucer.
	c. Defective canister	Replace the canister.
Defective fuel gauge	a. Defective operation of fuel level sensor	Replace the fuel level sensor.
	b. Defective operation of combination meter	Replace the combination meter.
Noise	a. Large operation noise or vibration of fuel pump	Replace the fuel pump.

NOTE:
• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent the problem.
• In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop to 0°C (32°F) or less throughout the winter season, use a water removing agent in the fuel system to prevent freezing fuel system and accumulating water.
• When water is accumulated in fuel filter, fill the water removing agent in the fuel tank.
• Before using water removing agent, follow the cautions noted on the bottle.

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

EC(H6DO)

		Page
1.	General Description	2
2.	Front Catalytic Converter	3
3.	Rear Catalytic Converter	4
4.	EGR Valve	5
5.	Canister	6
6.	Purge Control Solenoid Valve	7
7.	Fuel Level Sensor	9
8.	Fuel Temperature Sensor	10
9.	Fuel Sub Level Sensor	11
10.	Fuel Tank Pressure Sensor	12
11.	Drain Filter	14
12.	Drain Valve	15
13.	PCV Valve	16

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	<Ref. to GD(H6DO)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0014	Exhaust AVCS System 1 (Range/Performance)	<Ref. to GD(H6DO)-12, DTC P0014 EXHAUST AVCS SYSTEM 1 (RANGE/PERFORMANCE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	<Ref. to GD(H6DO)-14, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0017	Crank and Cam Timing B System Failure (Bank 1)	<Ref. to GD(H6DO)-16, DTC P0017 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to GD(H6DO)-18, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0019	Crank and Cam Timing B System Failure (Bank 2)	<Ref. to GD(H6DO)-18, DTC P0019 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H6DO)-18, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0024	Exhaust AVCS System 2 (Range/Performance)	<Ref. to GD(H6DO)-18, DTC P0024 EXHAUST AVCS SYSTEM 2 (RANGE/PERFORMANCE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-19, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-21, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-23, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-25, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-27, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-28, DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-28, DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-28, DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-28, DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-28, DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to GD(H6DO)-29, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H6DO)-31, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(H6DO)-33, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(H6DO)-34, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H6DO)-35, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H6DO)-36, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	<Ref. to GD(H6DO)-37, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to GD(H6DO)-39, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to GD(H6DO)-40, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to GD(H6DO)-41, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(H6DO)-42, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low	<Ref. to GD(H6DO)-43, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High	<Ref. to GD(H6DO)-44, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(H6DO)-45, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0126	Insufficient Engine Coolant Temperature for Stable Operation	<Ref. to GD(H6DO)-47, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H6DO)-49, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-51, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-53, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-55, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-58, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-60, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-62, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-63, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-71, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0141	O2 Sensor Heater Circuit (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-73, DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0151	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-74, DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0152	O2 Sensor Circuit High Voltage (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-74, DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0153	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-74, DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0154	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-75, DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0157	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-75, DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0158	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-75, DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0159	O2 Sensor Circuit Slow Response (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-75, DTC P0159 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0160	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-75, DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK2 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0161	O2 Sensor Heater Circuit (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-75, DTC P0161 O2 SENSOR HEATER CIRCUIT (BANK2 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H6DO)-76, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H6DO)-77, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0174	System Too Lean (Bank 2)	<Ref. to GD(H6DO)-78, DTC P0174 SYSTEM TOO LEAN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0175	System Too Rich (Bank 2)	<Ref. to GD(H6DO)-78, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to GD(H6DO)-79, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to GD(H6DO)-82, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to GD(H6DO)-83, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0196	Engine Oil Temperature Sensor Circuit Range/Performance	<Ref. to GD(H6DO)-84, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0197	Engine Oil Temperature Sensor Low	<Ref. to GD(H6DO)-86, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0198	Engine Oil Temperature Sensor High	<Ref. to GD(H6DO)-87, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low	<Ref. to GD(H6DO)-88, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High	<Ref. to GD(H6DO)-89, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H6DO)-90, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H6DO)-92, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H6DO)-97, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H6DO)-97, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H6DO)-97, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0305	Cylinder 5 Misfire Detected	<Ref. to GD(H6DO)-97, DTC P0305 CYLINDER 5 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0306	Cylinder 6 Misfire Detected	<Ref. to GD(H6DO)-97, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to GD(H6DO)-98, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to GD(H6DO)-100, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0332	Knock Sensor 2 Circuit Low (Bank 2)	<Ref. to GD(H6DO)-101, DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0333	Knock Sensor 2 Circuit High (Bank 2)	<Ref. to GD(H6DO)-101, DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to GD(H6DO)-102, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to GD(H6DO)-104, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H6DO)-106, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	<Ref. to GD(H6DO)-107, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0365	Camshaft Position Sensor “B” Circuit (Bank 1)	<Ref. to GD(H6DO)-108, DTC P0365 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0390	Camshaft Position Sensor “B” Circuit (Bank 2)	<Ref. to GD(H6DO)-109, DTC P0390 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0400	Exhaust Gas Recirculation Flow	<Ref. to GD(H6DO)-110, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H6DO)-113, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H6DO)-115, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H6DO)-128, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H6DO)-130, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor	<Ref. to GD(H6DO)-132, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H6DO)-134, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H6DO)-136, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to GD(H6DO)-137, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to GD(H6DO)-137, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to GD(H6DO)-138, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to GD(H6DO)-140, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor “A” Circuit Range/Performance	<Ref. to GD(H6DO)-142, DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor “A” Circuit Low	<Ref. to GD(H6DO)-144, DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor “A” Circuit High	<Ref. to GD(H6DO)-146, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H6DO)-148, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0500	Vehicle Speed Sensor “A”	<Ref. to GD(H6DO)-151, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to GD(H6DO)-152, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Air Control System RPM Higher Than Expected	<Ref. to GD(H6DO)-153, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H6DO)-154, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(H6DO)-155, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H6DO)-156, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to GD(H6DO)-157, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Throttle Control System Circuit Range/Performance	<Ref. to GD(H6DO)-158, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H6DO)-160, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	Transmission Control System (MIL Request)	<Ref. to GD(H6DO)-162, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(H6DO)-163, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(H6DO)-165, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P1154	O2 Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-167, DTC P1154 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1155	O2 Sensor Circuit Range/Performance (High) (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-167, DTC P1155 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H6DO)-168, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H6DO)-170, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to GD(H6DO)-172, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to GD(H6DO)-174, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to GD(H6DO)-176, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to GD(H6DO)-176, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to GD(H6DO)-176, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to GD(H6DO)-176, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to GD(H6DO)-176, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to GD(H6DO)-176, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H6DO)-177, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H6DO)-178, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(H6DO)-179, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(H6DO)-179, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(H6DO)-179, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(H6DO)-179, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(H6DO)-179, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(H6DO)-179, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1578	Meter Failure	<Ref. to GD(H6DO)-179, DTC P1578 METER FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1602	Control Module Programming Error	<Ref. to GD(H6DO)-180, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to GD(H6DO)-182, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to GD(H6DO)-183, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2090	Exhaust Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to GD(H6DO)-184, DTC P2090 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2091	Exhaust Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to GD(H6DO)-185, DTC P2091 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to GD(H6DO)-186, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to GD(H6DO)-186, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2094	Exhaust Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to GD(H6DO)-186, DTC P2094 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2095	Exhaust Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to GD(H6DO)-186, DTC P2095 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	<Ref. to GD(H6DO)-187, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	<Ref. to GD(H6DO)-189, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2098	Post Catalyst Fuel Trim System Too Lean (Bank 2)	<Ref. to GD(H6DO)-190, DTC P2098 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2099	Post Catalyst Fuel Trim System Too Rich (Bank 2)	<Ref. to GD(H6DO)-190, DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(H6DO)-191, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(H6DO)-193, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H6DO)-195, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance	<Ref. to GD(H6DO)-197, DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to GD(H6DO)-199, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2123	Throttle/Pedal Position Sensor/ Switch “D” Circuit High Input	<Ref. to GD(H6DO)-201, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2127	Throttle/Pedal Position Sensor/ Switch “E” Circuit Low Input	<Ref. to GD(H6DO)-203, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to GD(H6DO)-205, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Correlation	<Ref. to GD(H6DO)-207, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Correlation	<Ref. to GD(H6DO)-209, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2227	Atmospheric Pressure Sensor Range/Performance	<Ref. to GD(H6DO)-211, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2228	Barometric Pressure Circuit Low	<Ref. to GD(H6DO)-212, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2229	Barometric Pressure Circuit High	<Ref. to GD(H6DO)-213, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0073	CAN Failure, Bus “OFF” Detection	<Ref. to GD(H6DO)-214, DTC U0073 CAN FAILURE, BUS ‘OFF’ DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0101	CAN (TCU) Data not Loaded	<Ref. to GD(H6DO)-215, DTC U0101 CAN (TCU) DATA NOT LOADED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0122	CAN (VDC) Data not Loaded	<Ref. to GD(H6DO)-215, DTC U0122 CAN (VDC) DATA NOT LOADED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0140	CAN (BCU) Data not Loaded	<Ref. to GD(H6DO)-215, DTC U0140 CAN (BCU) DATA NOT LOADED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0402	CAN (TCU) Data Abnormal	<Ref. to GD(H6DO)-215, DTC U0402 CAN (TCU) DATA ABNORMAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0416	CAN (VDC) Data Abnormal	<Ref. to GD(H6DO)-215, DTC U0416 CAN (VDC) DATA ABNORMAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0422	CAN (BCU) Data Abnormal	<Ref. to GD(H6DO)-215, DTC U0422 CAN (BCU) DATA ABNORMAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

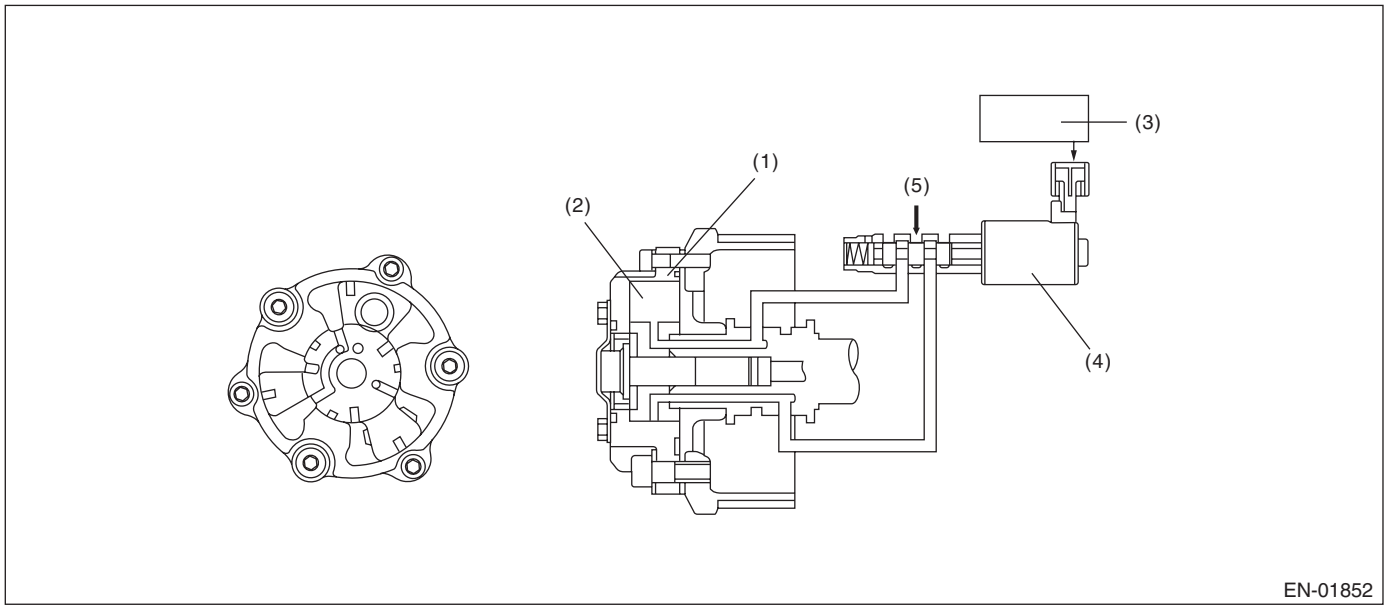
2. Diagnostic Trouble Code (DTC) Detecting Criteria

A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.
Judge as NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.

2. COMPONENT DESCRIPTION



(1) AVCS timing controller
(2) Vane
(3) Engine control module (ECM)
(4) Oil flow control solenoid valve
(5) Oil pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time of establishing all secondary parameter conditions	≥ 5000 ms
Battery voltage	≥ 10.9 V
Engine speed	≥ 1500 rpm
Engine coolant temperature	≥ 50 °C (122 °F)
AVCS control	Operation
Target timing advance change amount (per 64 ms)	< 1.07 °CA

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after warming up when the engine speed increases and AVCS operates.

5. DIAGNOSTIC METHOD

1) When the conditions during which the differences of AVCS target timing advance amount and AVCS actual timing advance amount is large continues for certain amount of time.
2) When the differences of target timing advance amount and actual timing advance amount is calculated during AVCS control, and the difference per predetermined time is the specified value or larger.

- **Abnormality Judgment**

Judge as NG when the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Σ(Target position – Actual position)	> 7000 °CA(Bank 1) > 7000 °CA(Bank 2)
or	
Σ(Target position – Actual position)	< –12000 °CA(Bank 1) < –12000 °CA(Bank 2)

Time Needed for Diagnosis: 60000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Σ(Target position – Actual position)	≤ 7000 °CA(Bank 1) ≤ 7000 °CA(Bank 2) and ≥ –12000 °CA(Bank 1) ≥ –12000 °CA(Bank 2)

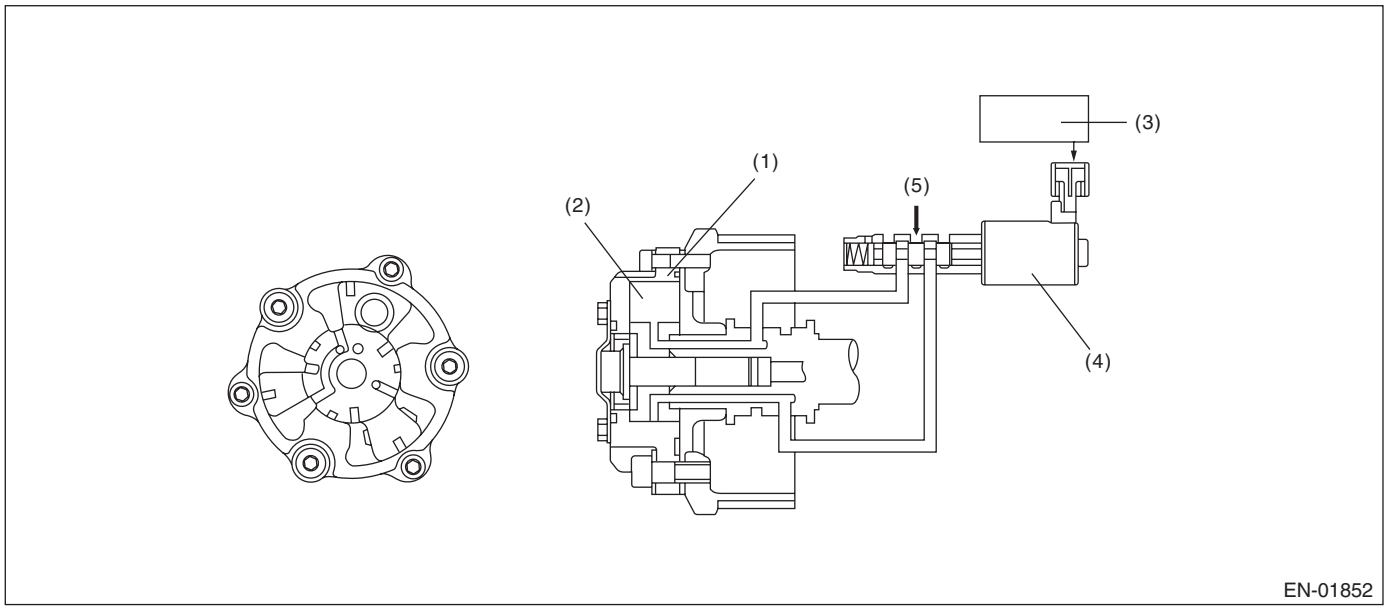
Time Needed for Diagnosis: 60000 ms

B: DTC P0014 EXHAUST AVCS SYSTEM 1 (RANGE/PERFORMANCE)

1. OUTLINE OF DIAGNOSIS

Detect the exhaust AVCS system malfunction.
Judge as NG when the amount of exhaust AVCS actual timing advance does not approach to the amount of exhaust AVCS target timing advance.

2. COMPONENT DESCRIPTION



(1) Exhaust AVCS timing controller
(2) Vane
(3) Engine control module (ECM)
(4) Oil flow control solenoid valve
(5) Oil pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time of establishing all secondary parameter conditions	≥ 5000 ms
Battery voltage	≥ 10.9 V
Engine speed	≥ 1500 rpm
Engine coolant temperature	≥ 50 °C (122 °F)
Exhaust AVCS control	Operation
Target timing advance change amount (per 64 ms)	< 1.07 °CA

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after warming up when the engine speed increases and exhaust AVCS operates.

5. DIAGNOSTIC METHOD

1) When the conditions during which the differences of exhaust AVCS target timing advance amount and exhaust AVCS actual timing advance amount is large continues for certain amount of time.
2) When the differences of target timing advance amount and actual timing advance amount is calculated during exhaust AVCS control, and the difference per predetermined time is the specified value or larger.

- **Abnormality Judgment**

Judge as NG when the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Σ(Target position – Actual position)	> 8000 °CA (Bank 1) > 8000 °CA (Bank 2)
or	
Σ(Target position – Actual position)	< –4000 °CA (Bank 1) < –4000 °CA (Bank 2)

Time Needed for Diagnosis:
50000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Σ(Target position – Actual position)	≤ 8000 °CA (Bank 1) ≤ 8000 °CA (Bank 2) and ≥ –4000 °CA (Bank 1) ≥ –4000 °CA (Bank 2)

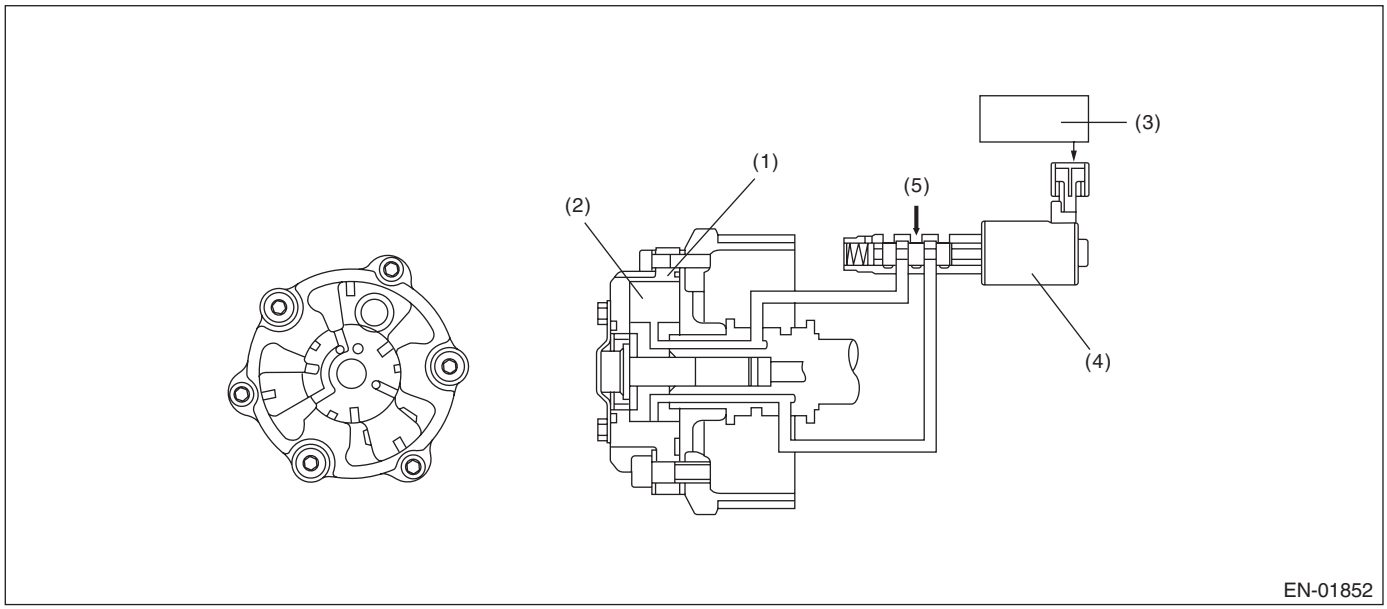
Time Needed for Diagnosis: 50000 ms

C: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1)

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.
Judge as NG when standard timing advance amount is far from learning angle.

2. COMPONENT DESCRIPTION



(1) AVCS timing controller
(2) Vane
(3) Engine control module (ECM)
(4) Oil flow control solenoid valve
(5) Oil pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	≥ 600 rpm and < 900 rpm
Engine coolant temperature	≥ 75 °C (167 °F)
AVCS control	Not in operation
Target timing advance	0°CA

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after warming up and while AVCS is not operating.

5. DIAGNOSTIC METHOD

Judge as NG when the absolute value of the difference between cam signal input position and learning value is out of specification.

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
|Crankshaft position when camshaft position sensor signal is input – Learning value|	> 13 °CA

Time Needed for Diagnosis: 5000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

NOTE:
Initial standard learning value is the value of crank angle initially input at the production plant. And then it will be updated every time normal judgment has been completed. Learning value will not be updated if NG judgment occurs because timing belt or chain derails suddenly in process or because wrong assembly occurs during servicing.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
|Crankshaft position when camshaft position sensor signal is input – Learning value|	≤ 13 °CA

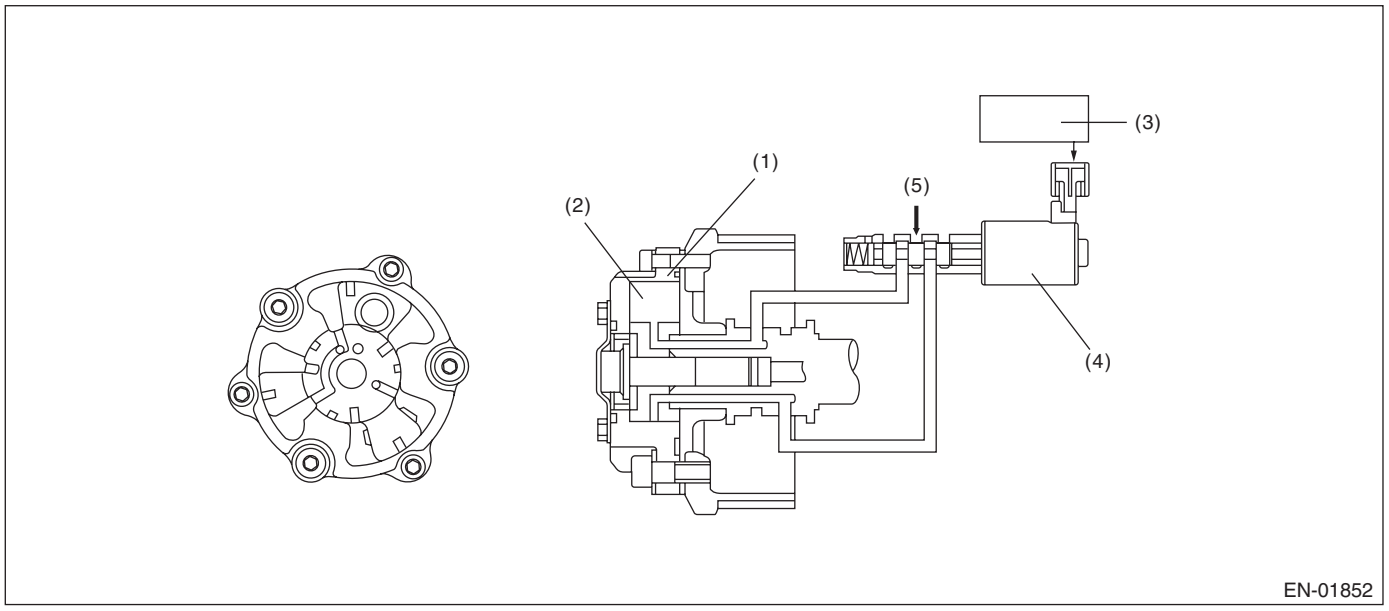
Time Needed for Diagnosis: Less than 1 second

D: DTC P0017 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the exhaust AVCS system malfunction.
Judge as NG when standard timing advance amount is far from learning angle.

2. COMPONENT DESCRIPTION



(1) Exhaust AVCS timing controller
(2) Vane
(3) Engine control module (ECM)
(4) Oil flow control solenoid valve
(5) Oil pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	≥ 600 rpm and < 900 rpm
Engine coolant temperature	≥ 75 °C (167 °F)
Exhaust AVCS control	Not in operation
Target timing advance	0°CA

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after warming up and while exhaust AVCS is not operating.

5. DIAGNOSTIC METHOD

Judge as NG when the absolute value of the difference between cam signal input position and learning value is out of specification.

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
|Crankshaft position when camshaft position sensor signal is input – Learning value|	> 13 °CA

Time Needed for Diagnosis: 5000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

NOTE:
Initial standard learning value is the value of crank angle initially input at the production plant. And then it will be updated every time normal judgment has been completed. Learning value will not be updated if NG judgment occurs because timing belt or chain derails suddenly in process or because wrong assembly occurs during servicing.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
|Crankshaft position when camshaft position sensor signal is input – Learning value|	≤ 13 °CA

Time Needed for Diagnosis: Less than 1 second

E: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0016. <Ref. to GD(H6DO)-14, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

F: DTC P0019 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0017. <Ref. to GD(H6DO)-16, DTC P0017 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

G: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0011. <Ref. to GD(H6DO)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

H: DTC P0024 EXHAUST AVCS SYSTEM 2 (RANGE/PERFORMANCE)

1. OUTLINE OF DIAGNOSIS

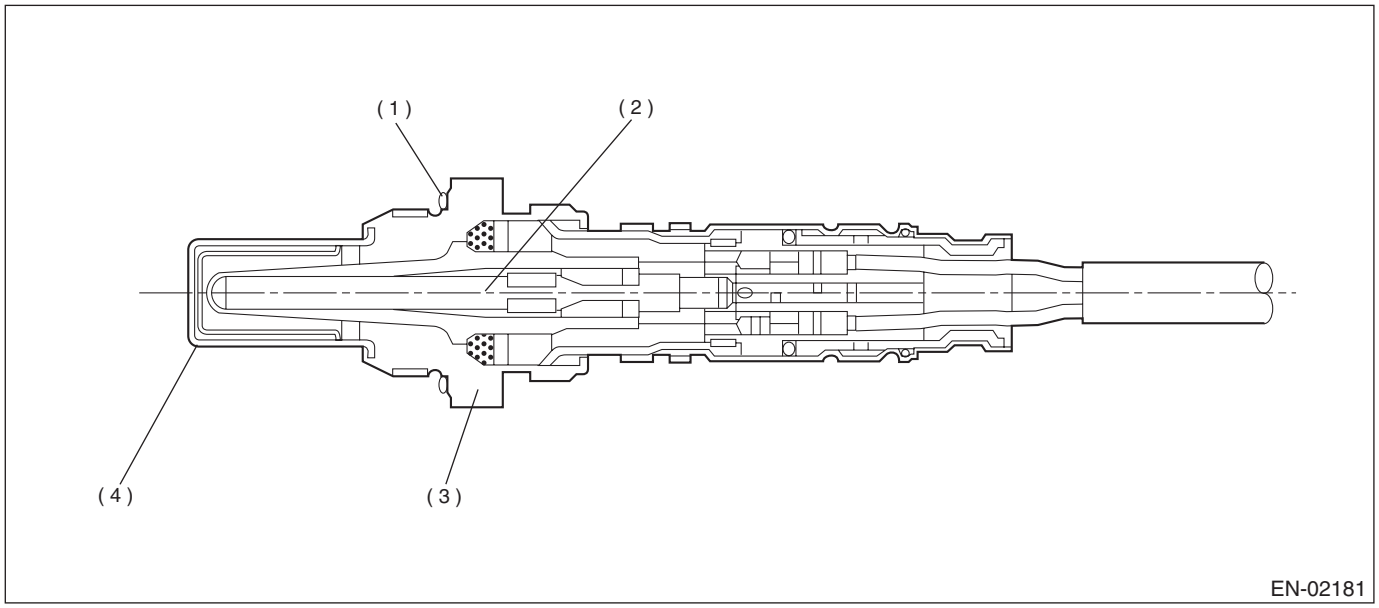
NOTE:
For the detection standard, refer to DTC P0014. <Ref. to GD(H6DO)-12, DTC P0014 EXHAUST AVCS SYSTEM 1 (RANGE/PERFORMANCE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

I: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect functional errors of the front oxygen (A/F) sensor heater.
Judge as NG when it is determined that the front oxygen (A/F) sensor impedance is large when looking at engine status such as deceleration fuel cut.

2. COMPONENT DESCRIPTION



(1) Gasket
(2) Ceramic heater
(3) Sensor housing
(4) Protection tube

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Condition established time	≥ 30000 ms
Battery voltage	≥ 10.9 V
Heater current	Permitted
Control duty ≥ 35 %	Experienced
After fuel cut	≥ 20000 ms

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 30000 ms seconds or more have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	> 50 Ω

Time Needed for Diagnosis: 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	≤ 50 Ω

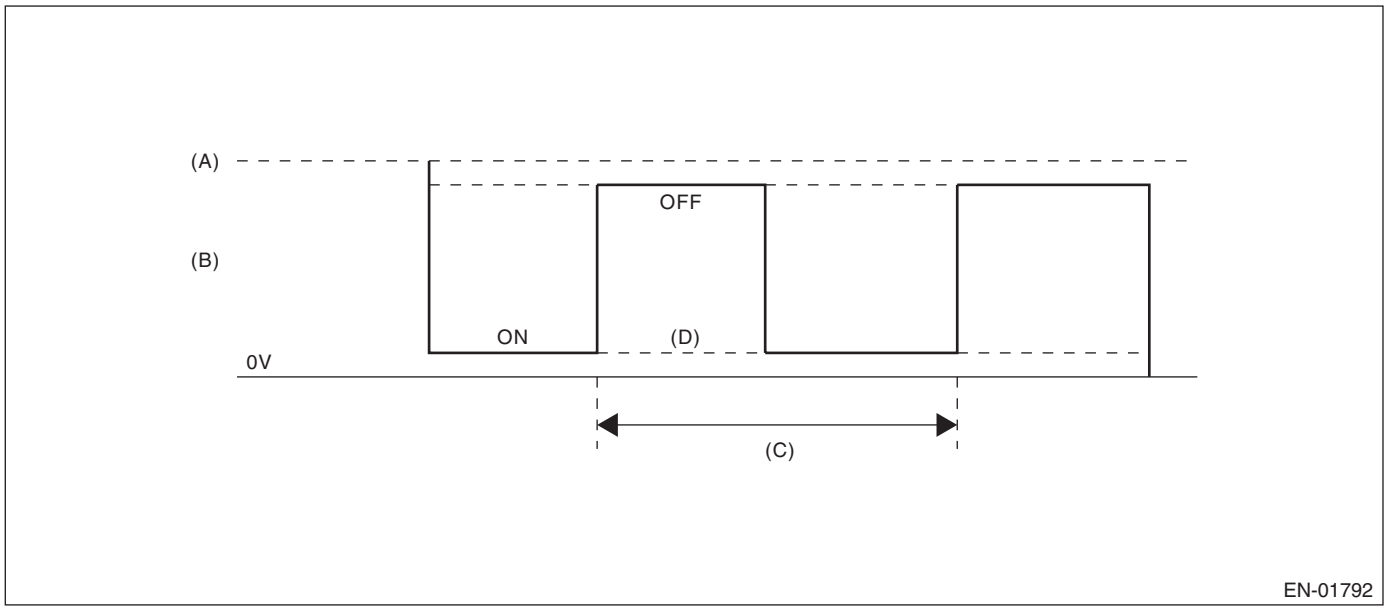
Time Needed for Diagnosis: 10000 ms

J: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect front oxygen (A/F) sensor heater open or short circuit.
The front oxygen (A/F) sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.
Judge as NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 ms
(D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	< 87.5 %

Time Needed for Diagnosis:4 ms × 250 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

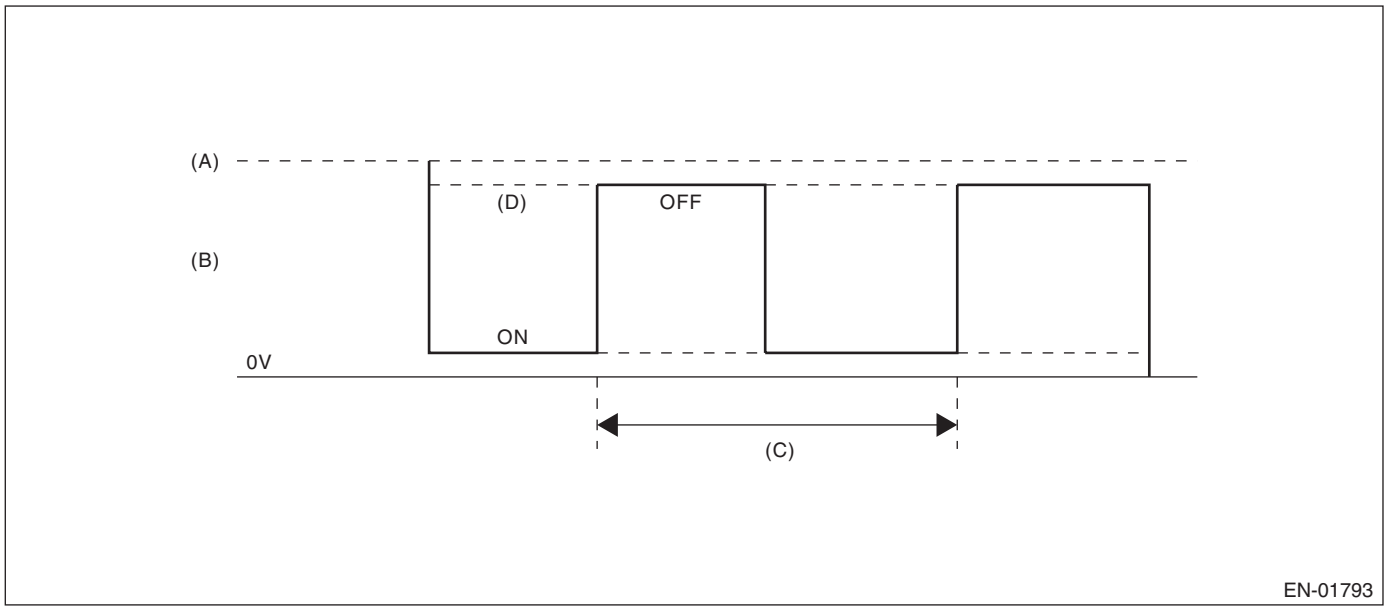
Time Needed for Diagnosis: Less than 1 second

K: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect front oxygen (A/F) sensor heater open or short circuit.
The front oxygen (A/F) sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.
Judge as NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 ms
(D) High error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	≥ 12.5 %

Time Needed for Diagnosis:4 ms × 250 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

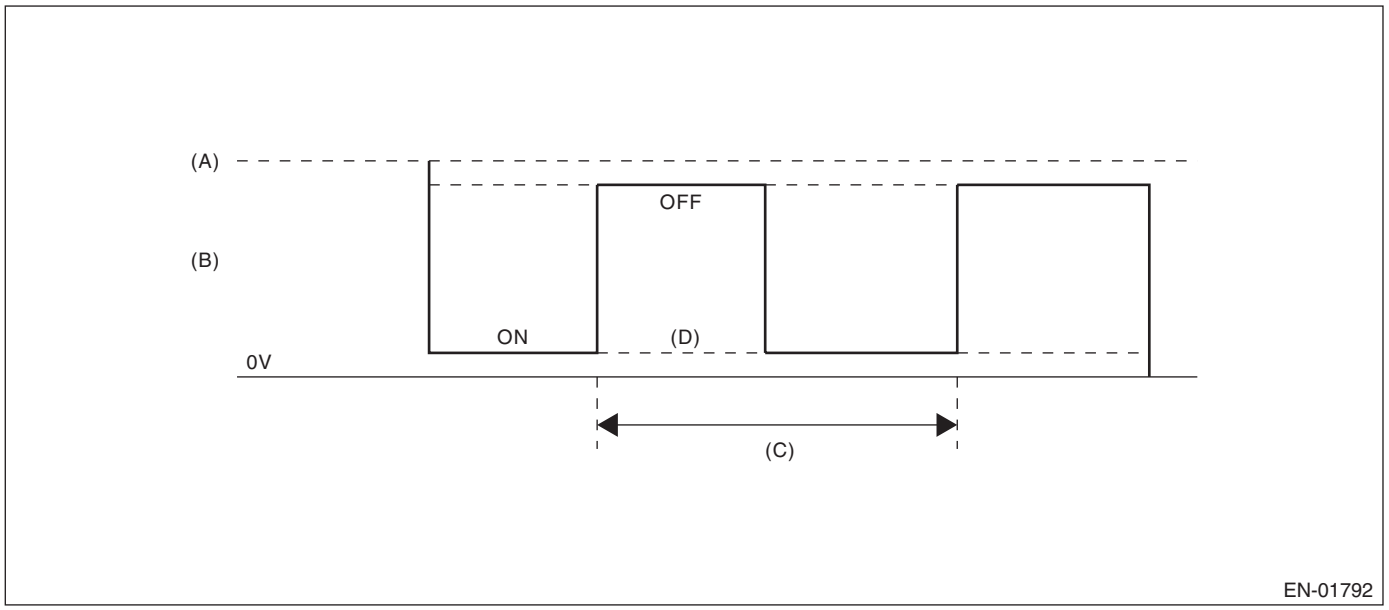
Time Needed for Diagnosis: Less than 1 second

L: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.
The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.
Judge as NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Output voltage of the rear oxygen sensor heater
(C) 256 ms (cycles)
(D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Engine speed	< 4500 rpm

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis continuously when engine is low speed.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75 %

Time Needed for Diagnosis:8 ms × 320 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

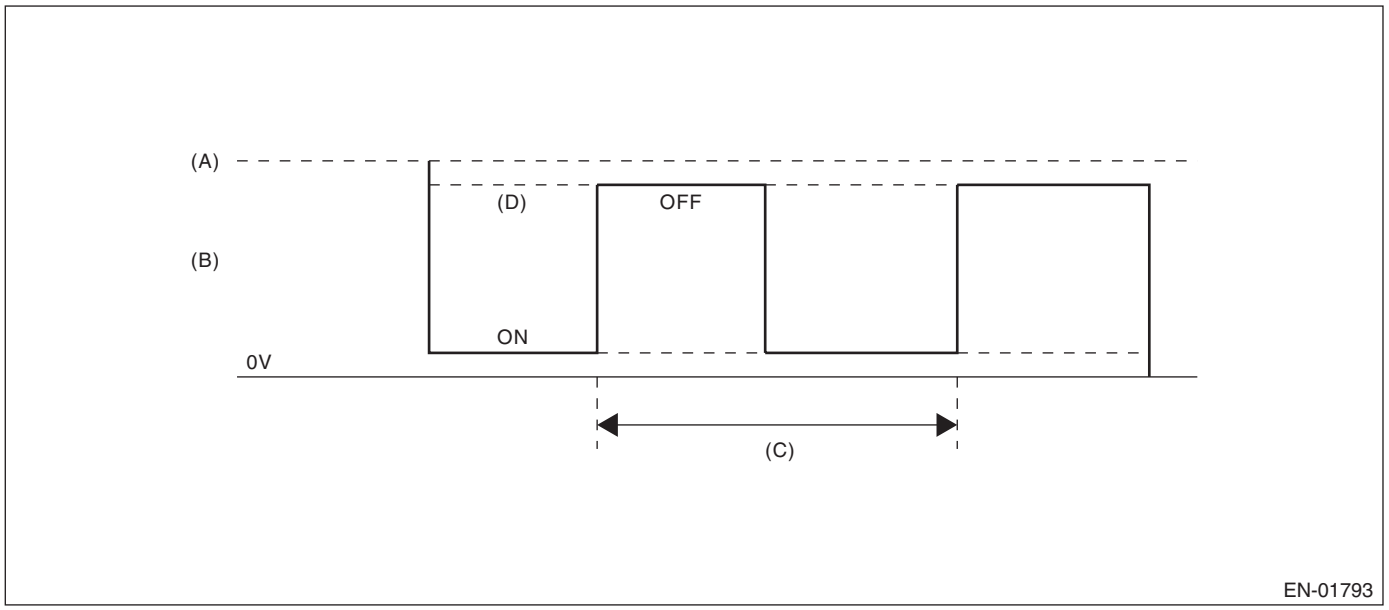
Time Needed for Diagnosis: Less than 1 second

M: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.
The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.
Judge as NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Output voltage of the rear oxygen sensor heater
(C) 256 ms (cycles)
(D) High error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Engine speed	< 4500 rpm

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis continuously when engine is low speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 15 %

Time Needed for Diagnosis:8 ms × 1250 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

Time Needed for Diagnosis: Less than 1 second

N: DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0030. <Ref. to GD(H6DO)-19, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

O: DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0031. <Ref. to GD(H6DO)-21, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

P: DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0032. <Ref. to GD(H6DO)-23, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Q: DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0037. <Ref. to GD(H6DO)-25, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

R: DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

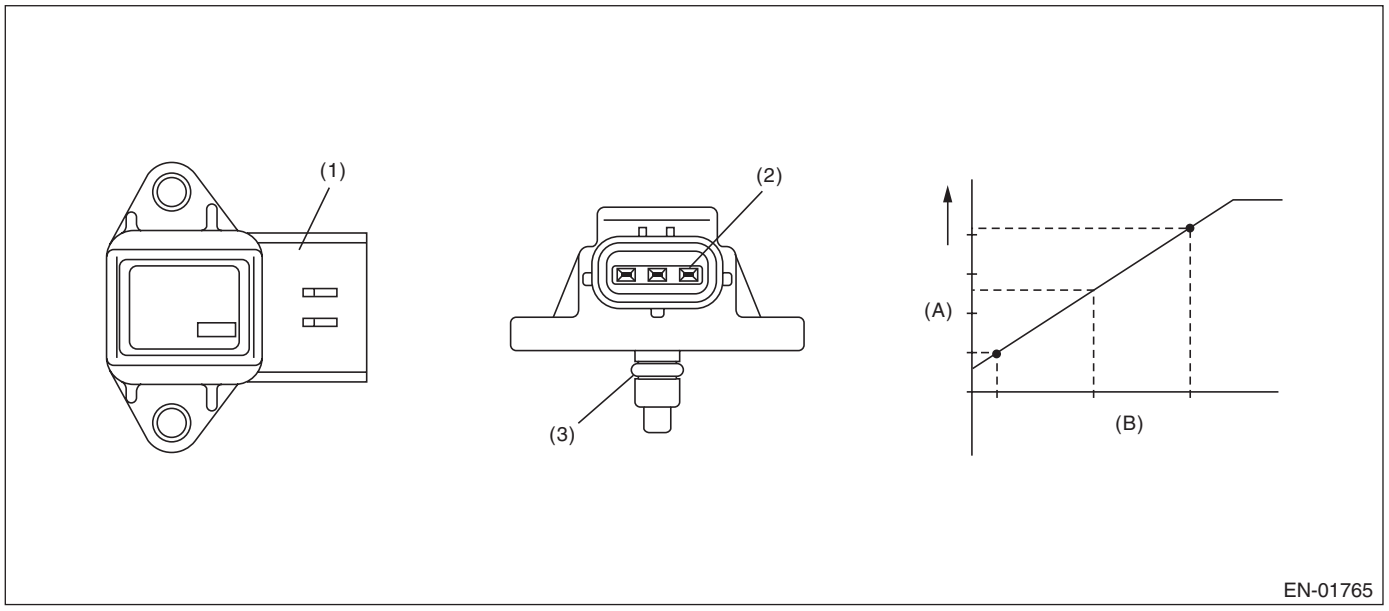
NOTE:
For the detection standard, refer to DTC P0038. <Ref. to GD(H6DO)-27, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

S: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

1. OUTLINE OF DIAGNOSIS

Detect problems in the intake manifold pressure sensor output properties.
Judge as NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Absolute pressure
(1) Connector
(2) Terminals
(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75 °C (167 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when Low side or High side becomes NG.
If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Engine speed	< 2700 rpm
Throttle position	≥ 15 °
Output voltage	< 1.99 V
Engine load	> 1 g/rev (0.04 oz/rev)
High	
Engine speed	500 rpm — 850 rpm
Throttle position	< 3.5 °
Output voltage	≥ 2.78 V
Engine load	< 0.6 g/rev (0.02 oz/rev)

Time Needed for Diagnosis:
Low side: 3000 ms
High side: 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when both Low side and High side become OK.
If the duration of time while the following conditions are met is longer than the time indicated, judge as OK.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Engine speed	< 2700 rpm
Throttle position	≥ 15 °
Output voltage	≥ 1.99 V
Engine load	> 1 g/rev (0.04 oz/rev)
High	
Engine speed	500 rpm — 850 rpm
Throttle position	< 3.5 °
Output voltage	< 2.78 V
Engine load	< 0.6 g/rev (0.02 oz/rev)

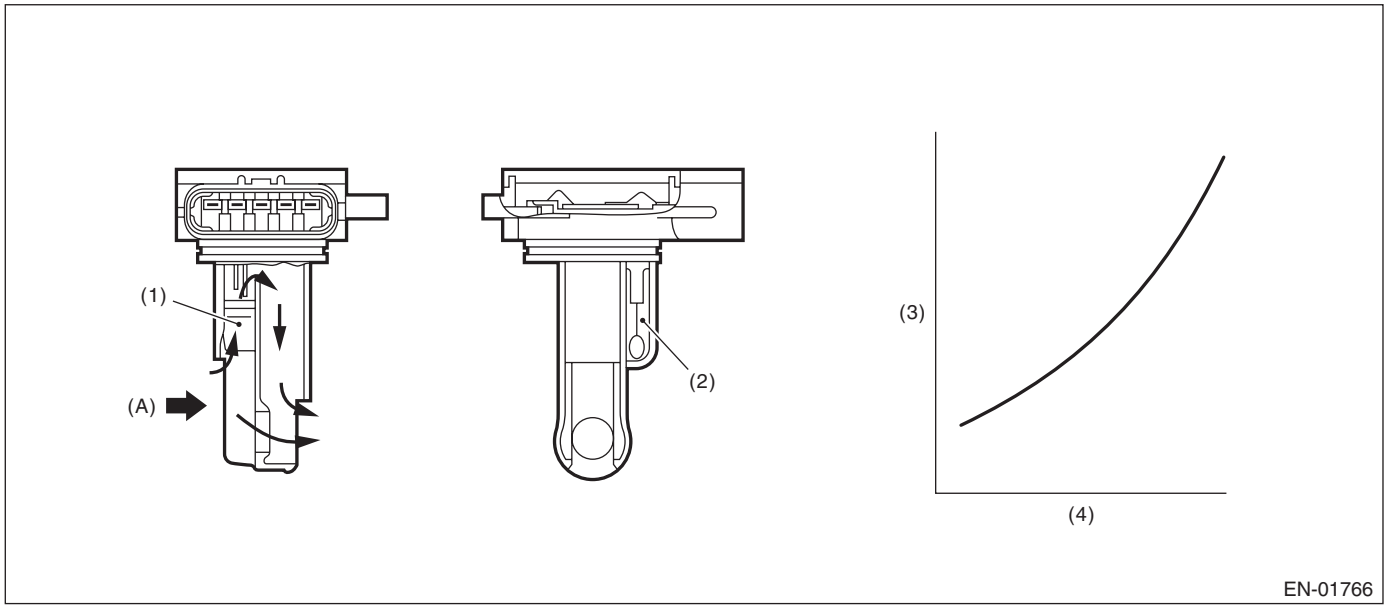
Time Needed for Diagnosis:
Low side: Less than 1 s
High side: Less than 1 s

T: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output properties.
Judge as a low side NG when the air flow voltage indicates a small value regardless of running in a state where the air flow voltage increases. Judge as a high side NG when the air flow voltage indicates a large value regardless of running in a state where the air flow voltage decreases. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 200 °C (392 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when Low side or High side becomes NG.
If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Output voltage	< 1.74 V
Engine speed	≥ 2000 rpm
Throttle opening angle	≥ 15 °
Intake manifold pressure	≥ 73.3 kPa (550 mmHg, 21.7 inHg)
High (1)	
Output voltage	≥ 1.83 V
Engine speed	500 rpm — 850 rpm
Throttle opening angle	< 3.5 °
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)
High (2)	
Output voltage	≥ 1.73 V
Engine speed	500 rpm — 850 rpm
Throttle opening angle	< 3.5 °
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)
Fuel system diagnosis	Rich side malfunction

Time Needed for Diagnosis:
Low: 5000 ms
High: 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when both Low side and High side become OK.
Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Output voltage	≥ 1.74 V
Engine speed	≥ 2000 rpm
Throttle opening angle	≥ 15 °
Intake manifold pressure	≥ 73.3 kPa (550 mmHg, 21.7 inHg)
High	
Output voltage	< 1.83 V
Engine speed	500 rpm — 850 rpm
Throttle opening angle	< 3.5 °
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)
Fuel system diagnosis	Rich side normal

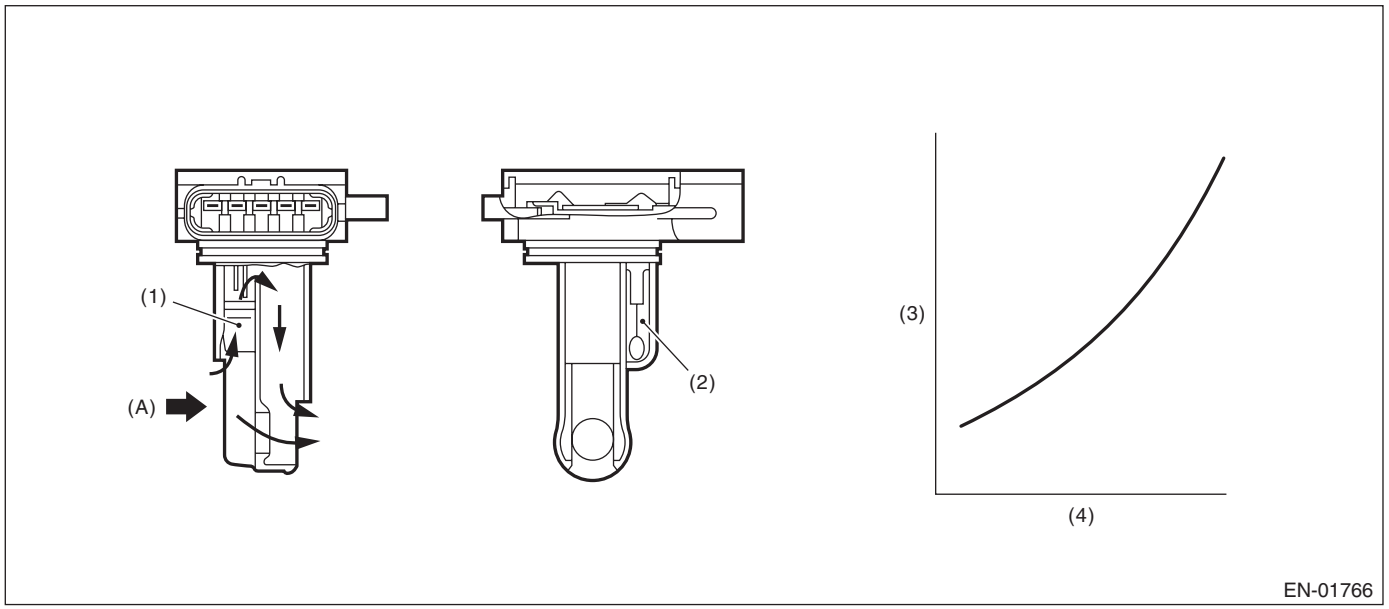
Time Needed for Diagnosis:
Low: Less than 1 s
High: Less than 1 s

U: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.2 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	> 0.2 V

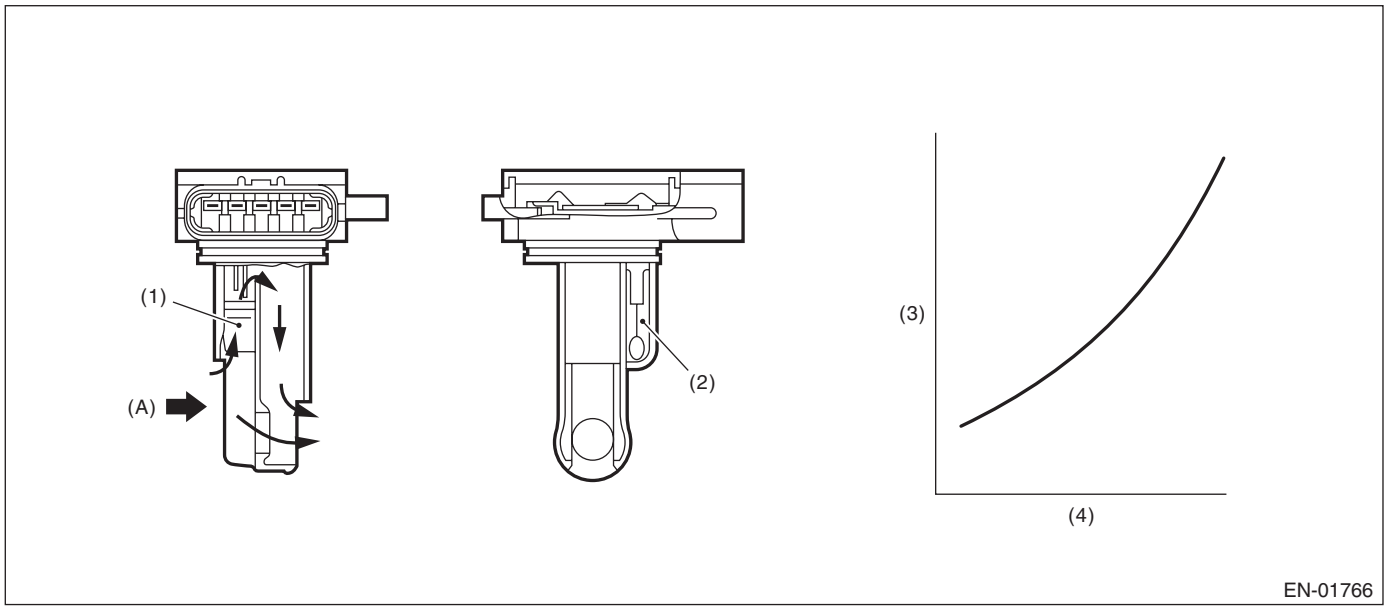
Time Needed for Diagnosis: Less than 1 second

V: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.98 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.98 V

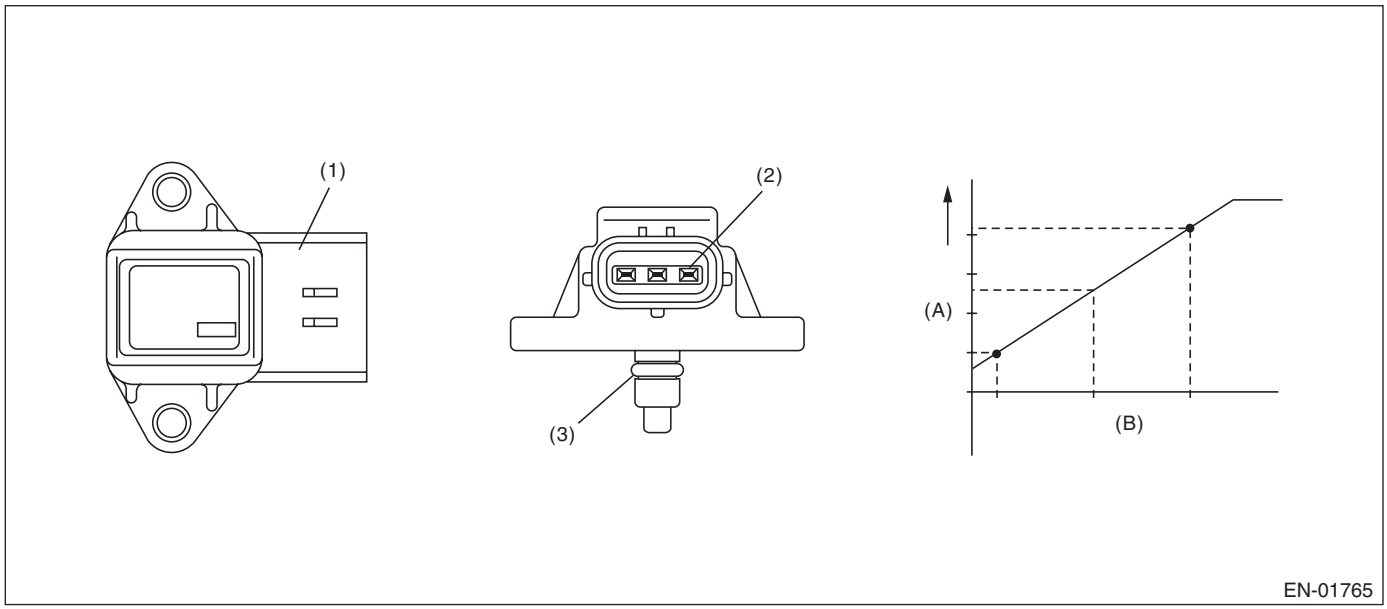
Time Needed for Diagnosis: Less than 1 second

W: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Absolute pressure
(1) Connector
(2) Terminals
(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.573 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	> 0.573 V

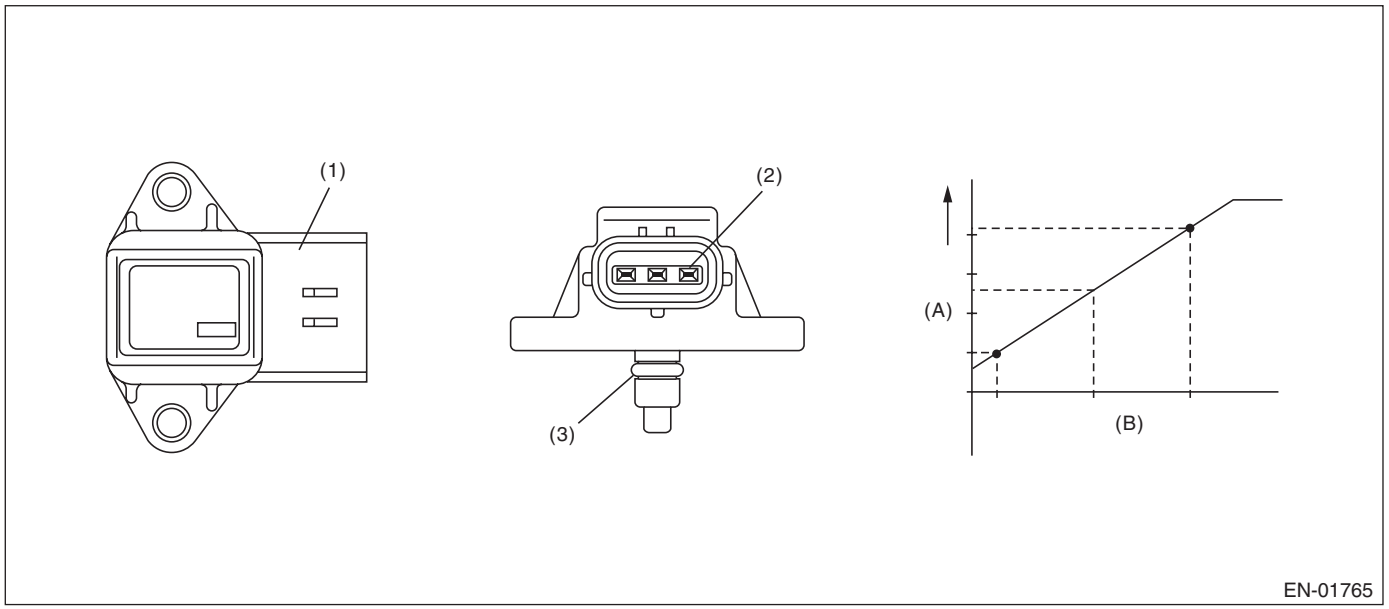
Time Needed for Diagnosis: Less than 1 second

X: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Absolute pressure
(1) Connector
(2) Terminals
(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.388 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.388 V

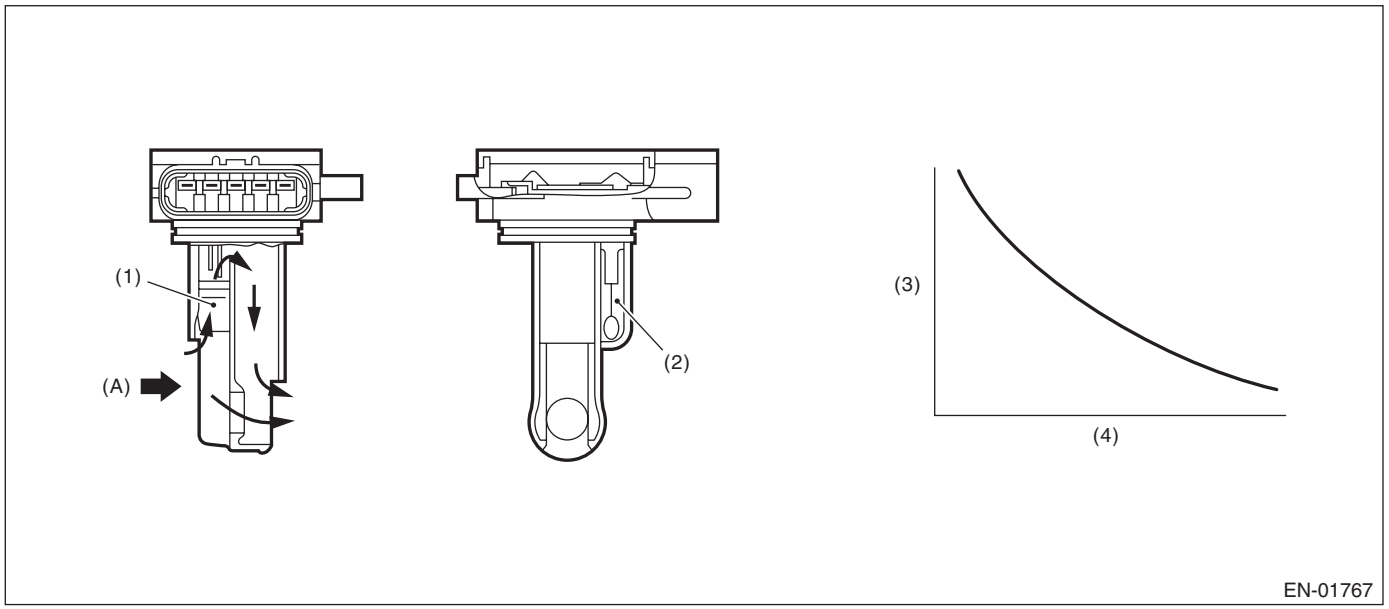
Time Needed for Diagnosis: Less than 1 second

Y: DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property.
Judge as NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature at engine starting	< 35 °C (95 °F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 2 km/h (1.2 MPH	≥ 15 s
Engine coolant temperature	≥ 75 °C (167 °F)
Intake air amount sum value	≥ Value of Map 1
Number of experiences under conditions below	≥ 3 time(s)
• Continuous time when vehicle speed is less than 4 km/h (2.5 MPH)	≥ Value from Map 2
• Continuous time when vehicle speed is 40 km/h (24.9 MPH) or more and	≥ 15 s
Establishing time of 1, 2	≥ 15 s
1. Intake air amount	≥ 10 g/s (0.35 oz/s)
2. Vehicle speed	≥ 4 km/h (2.5 MPH)

Map 1

Engine coolant temperature °C (°F)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)
Intake air amount sum value (g (oz)/s)	50000 (1763.5)	7400 (261)	6600 (232.78)	5800 (204.57)	5000 (176.35)

Map 2

Engine coolant temperature °C (°F)	–30 (–22)	0 (32)	10 (50)	20 (68)
Continuous time (s) when vehicle speed is less than 4 km/h (2.5 MPH)	250	40	32	24

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is met after warming up from a cold condition.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 0.02 V(Equivalent to approximately 0.5°C (0.9°F) near 25°C)

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 0.02 V

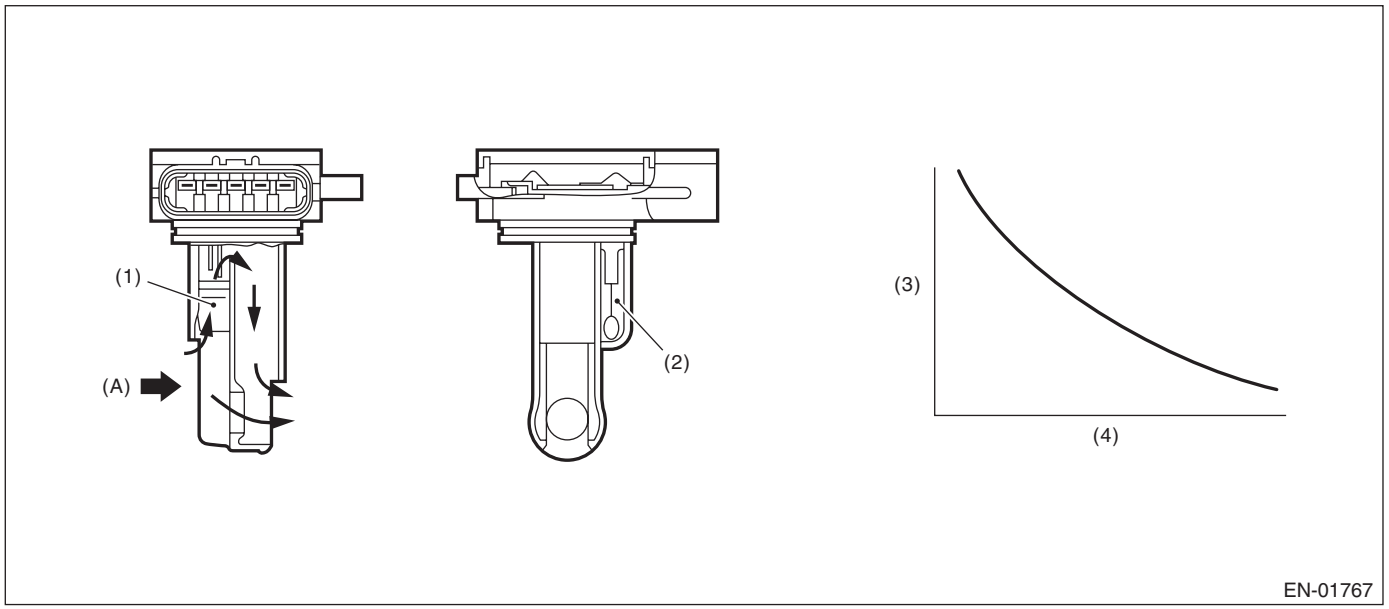
Time Needed for Diagnosis: Less than 1 second

Z: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.231 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.231 V

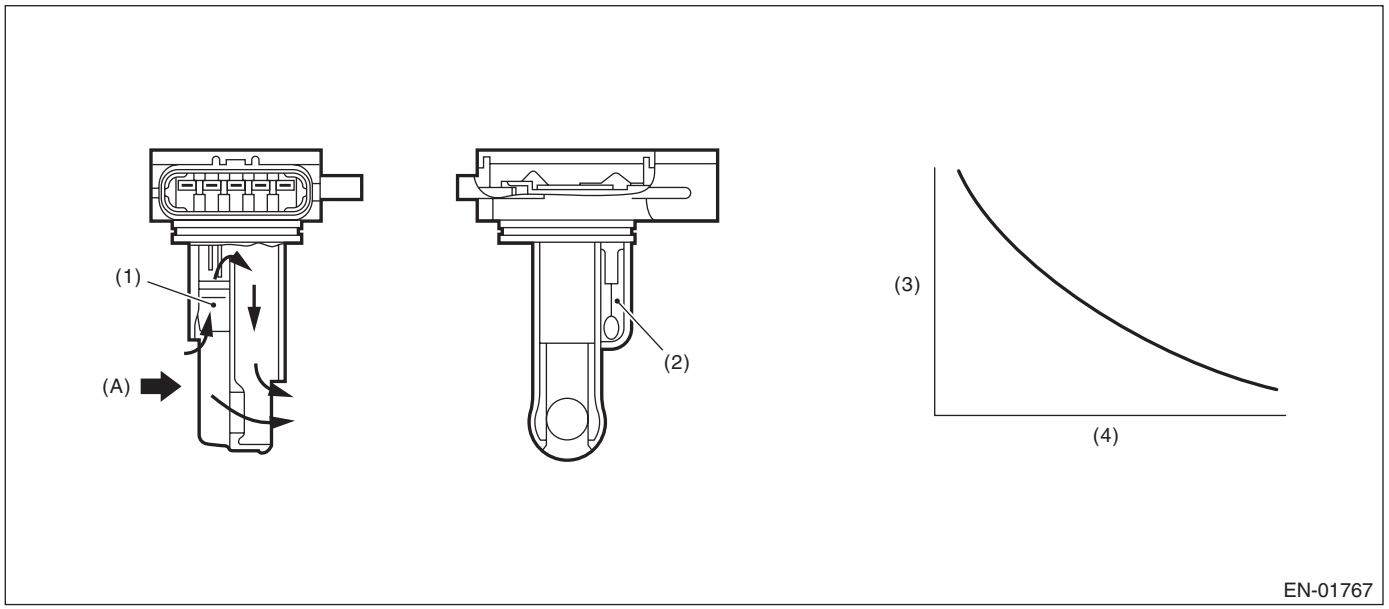
Time Needed for Diagnosis: Less than 1 second

AA:DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.716 V

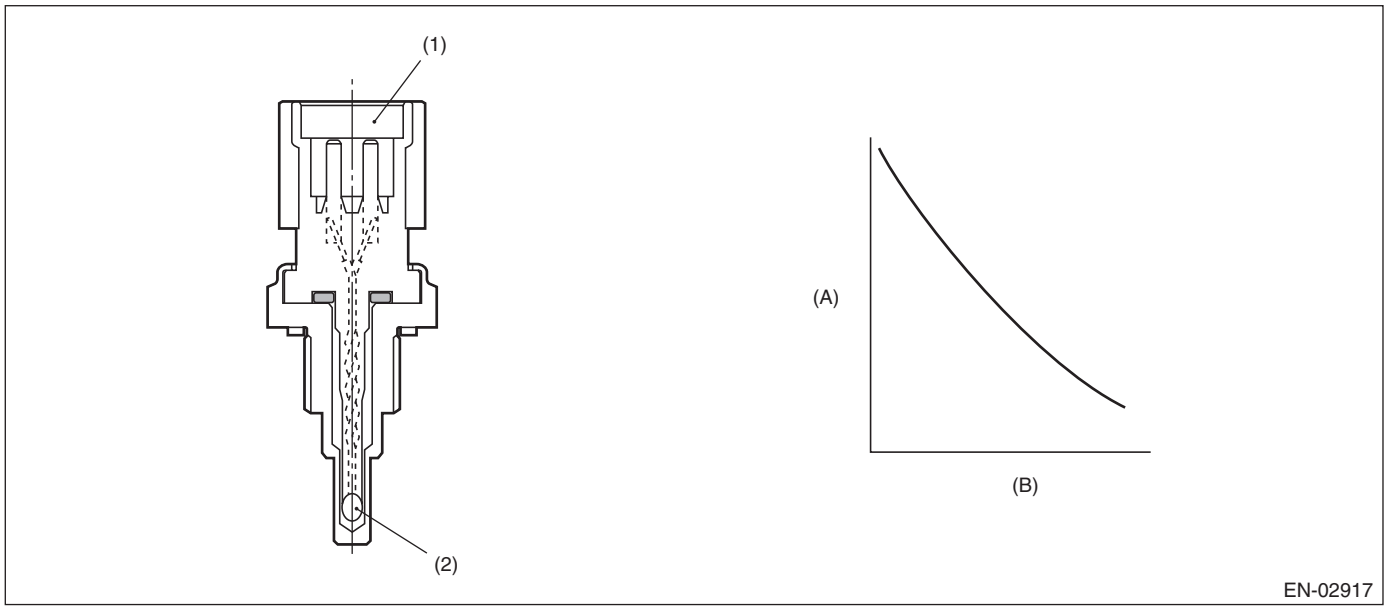
Time Needed for Diagnosis: Less than 1 second

AB:DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.265 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.265 V

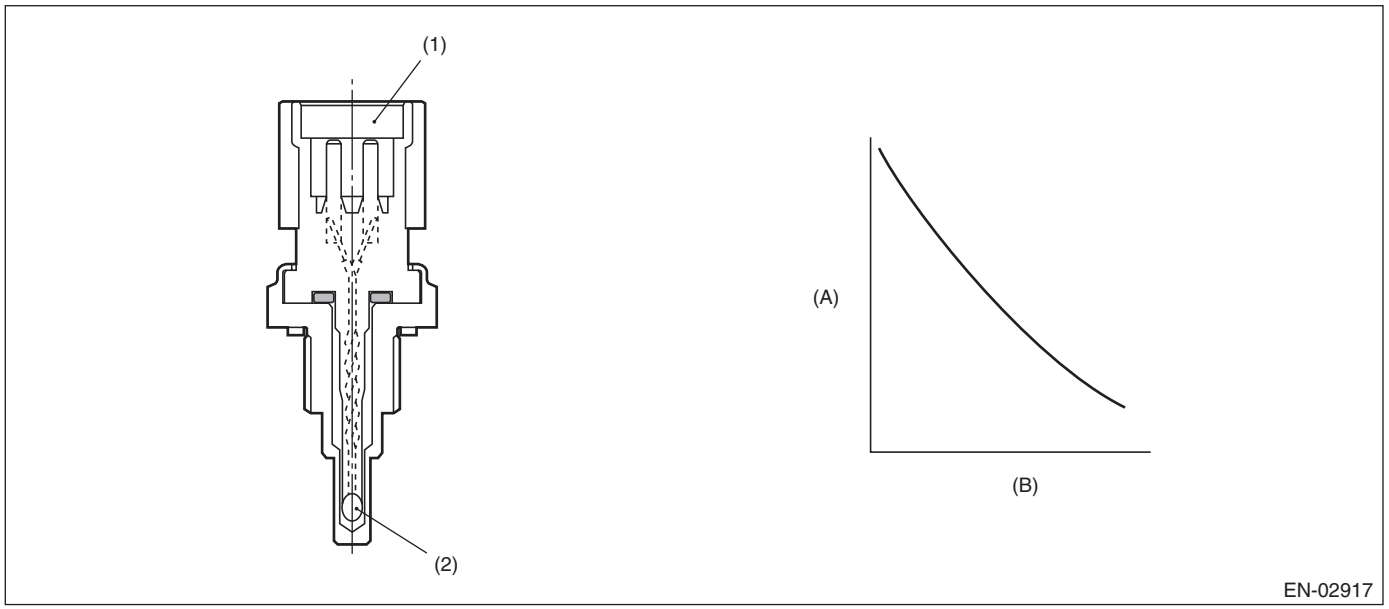
Time Needed for Diagnosis: Less than 1 second

AC:DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.716 V

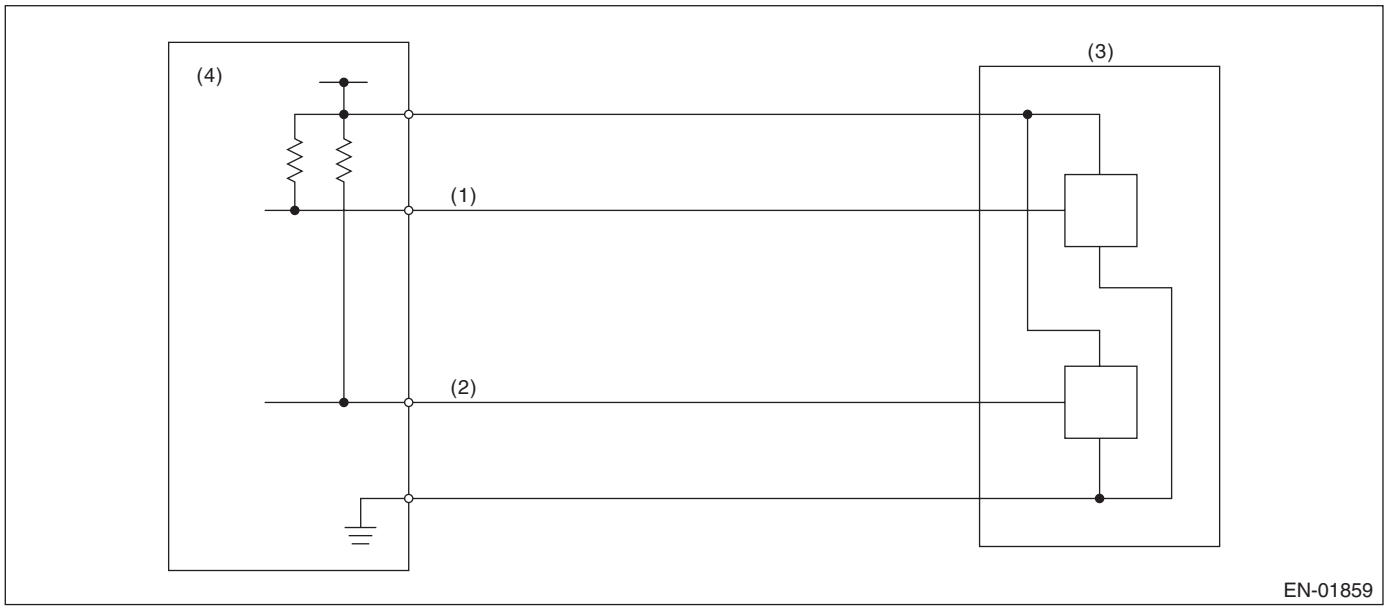
Time Needed for Diagnosis: Less than 1 second

AD:DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.217 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.217 V

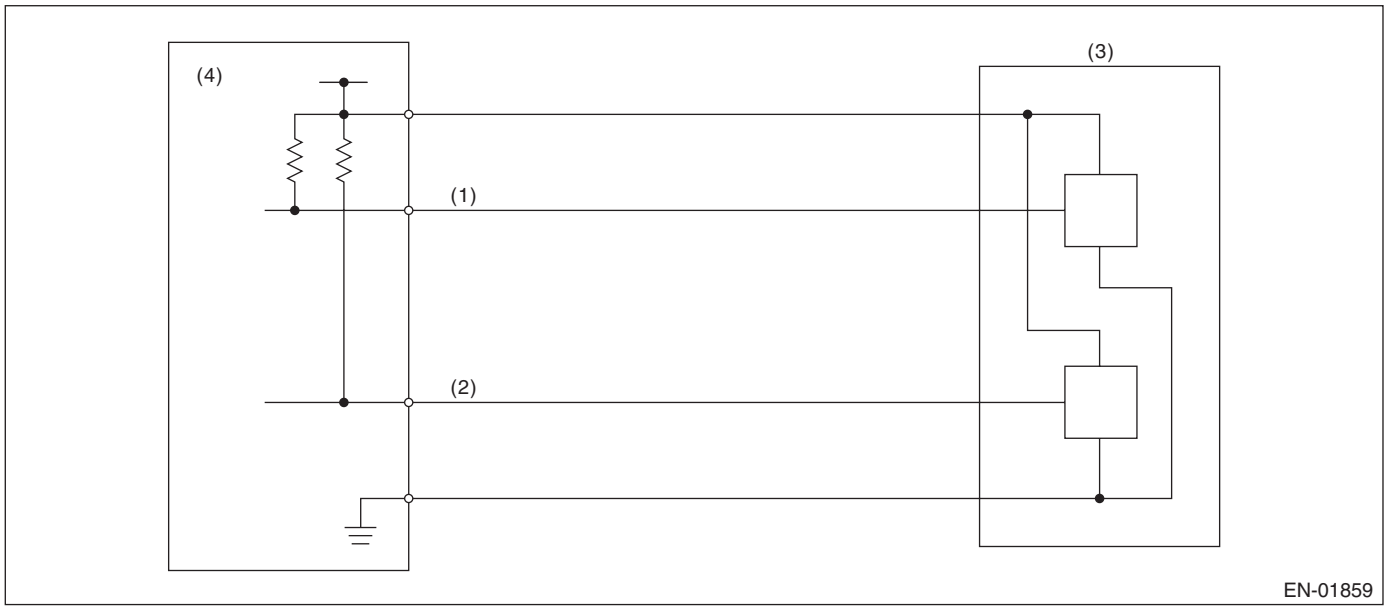
Time Needed for Diagnosis: 24 ms

AE:DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.858 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.858 V

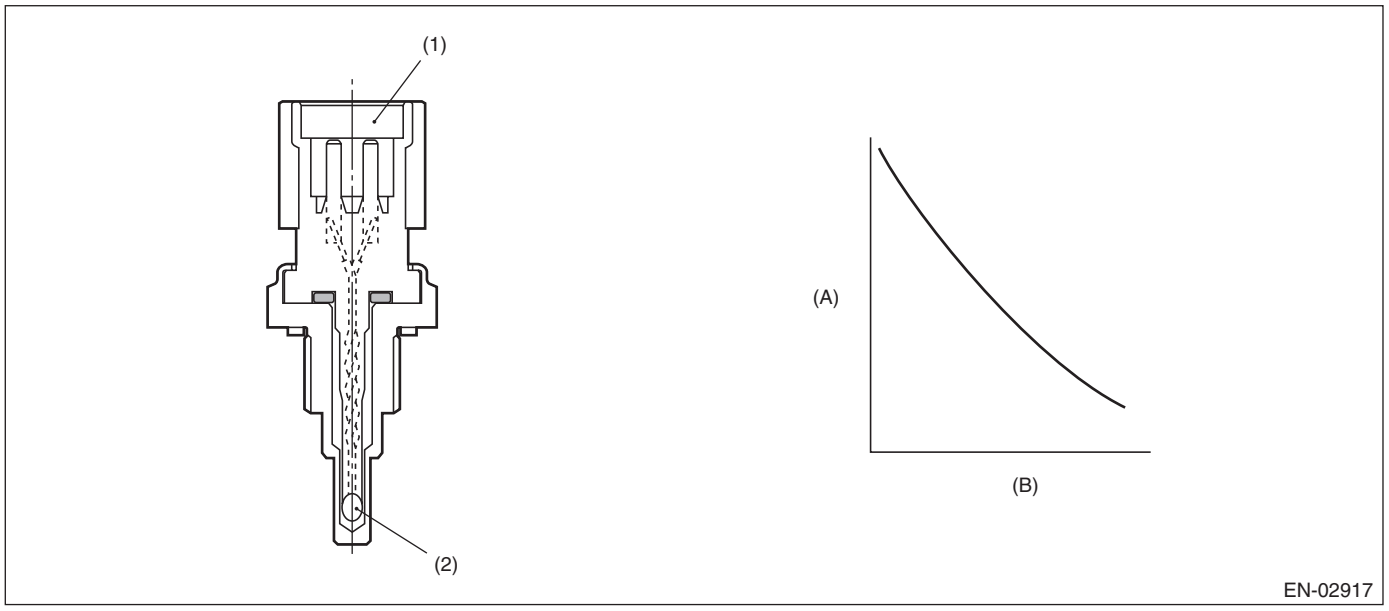
Time Needed for Diagnosis: 24 ms

AF:DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property.
Judge as NG when the engine coolant temperature does not rise in driving conditions where it should.

2. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ Value from Map
Battery voltage	≥ 10.9 V

Map

Engine coolant temperature °C (°F)	–40 (–40)	–30 (–22)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Engine speed rpm	500	500	500	500	500	500	500	500

Engine coolant temperature °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Engine speed rpm	500	500	500	500	500	500	500	500

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine start.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20 °C (68 °F)
Timer for diagnosis after engine start	≥ Judgment value of timer after engine start

Timer for diagnosis after engine start
a. Timer stop at fuel cut
b. During the driving conditions except a) above, timer counts up as follows.
64 ms + TWCNT ms (when at 64 ms)
TWCNT is defined as follows,
TWCNT = 0 at idle switch ON,
TWCNT show on the following table at idle switch OFF.

		Vehicle speed km/h (MPH)							
		0 (0)	8 (5)	16 (9.9)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
Temperature °C (°F)	–20 (–4)	0 ms	37.136 ms	74.272 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
	–10 (14)	0 ms	27.391 ms	54.782 ms	82.173 ms	99.65 ms	117.13 ms	135.96 ms	154.8 ms
	0 (32)	0 ms	17.646 ms	35.292 ms	52.938 ms	72.64 ms	92.341 ms	108.34 ms	124.33 ms
	10 (50)	0 ms	7.9012 ms	15.802 ms	23.704 ms	45 ms	45 ms	50 ms	50 ms
	20 (68)	0 ms	7.9012 ms	15.802 ms	23.704 ms	45 ms	45 ms	50 ms	50 ms

Judgment value of timer after engine starting
$t = 429523 \text{ ms} - 28605 \text{ ms} \times Ti$
Ti : The lowest coolant temperature after engine start
Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20 °C (68 °F)

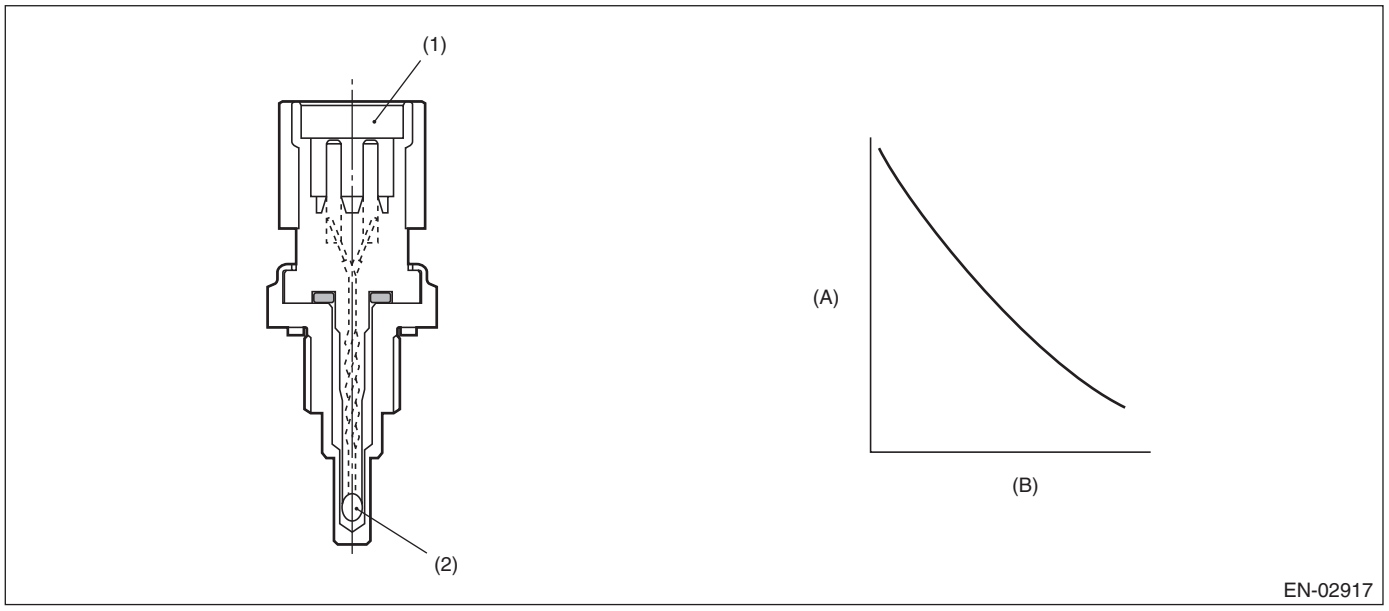
Time Needed for Diagnosis: Less than 1 second

AG:DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of the engine coolant temperature sensor characteristics.
Memorize the engine coolant temperature and fuel temperature at the last engine stop, and use them to judge as NG when the engine coolant temperature does not decrease when it should.

2. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Refueling from the last engine stop till the current engine start	None
Fuel level	≥ 15 ℓ (3.96 US gal, 3.3 Imp gal)
Engine coolant temperature at the last engine stop	≥ 75 °C (167 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	< 2.5 °C (36.5 °F)
Fuel temperature at the last engine stop — fuel temperature	≥ 5 °C (41 °F)
Intake air temperature — fuel temperature	< 2.5 °C (36.5 °F)
Fuel temperature	< 35 °C (95 °F)

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	≥ 2.5 °C (36.5 °F)

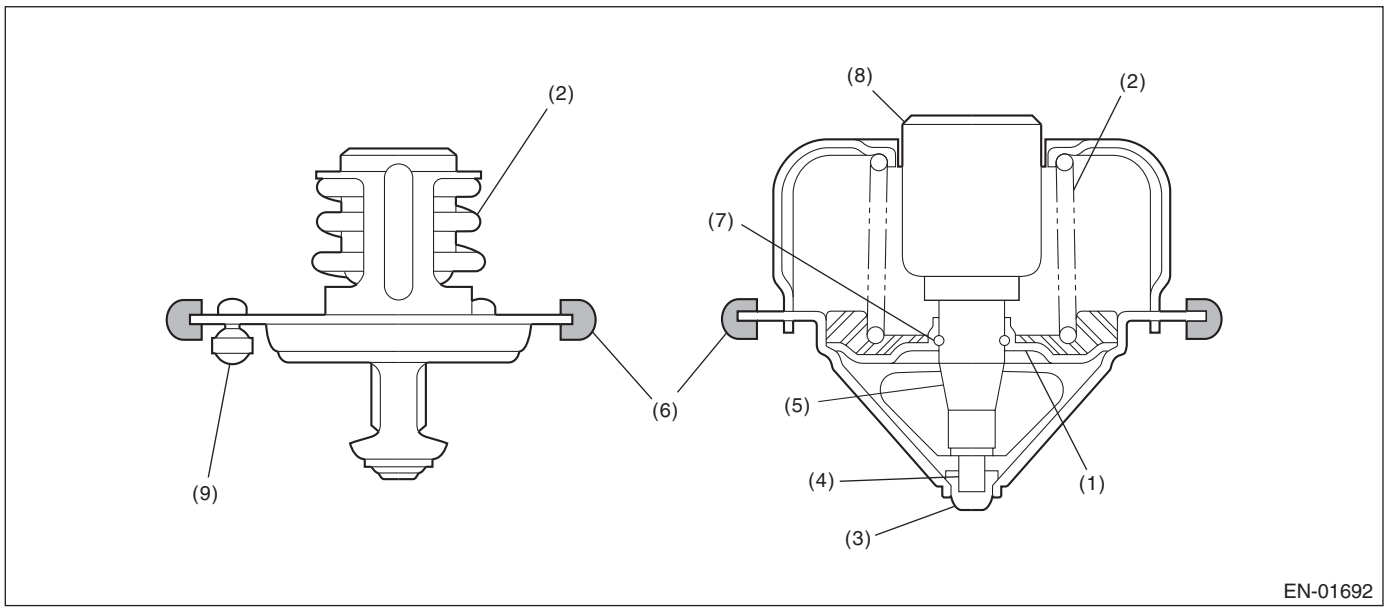
Time Needed for Diagnosis: Less than 1 second

AH:DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the thermostat function.
Judge as NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge as OK when the engine coolant temperature becomes to 75°C (167°F), and the difference is small, before judging NG.

2. COMPONENT DESCRIPTION



(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber seal
(7) Stop ring
(8) Wax element
(9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimate ambient temperature	≥ –7 °C (19.4 °F)
Thermostat malfunction diagnosis	Incomplete
Engine coolant temperature at engine starting	< 55 °C (131 °F)
Estimated coolant temperature	≥ 75 °C (167 °F)
Engine coolant temperature	≤ 75 °C (167 °F)
(Estimated – Measured) Engine coolant temperature	> 20 °C (68 °F)
Vehicle speed	≥ 20 km/h (12.4 MPH)

Time Needed for Diagnosis:64 ms × 3 time(s) × 120 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimate ambient temperature	≥ –7 °C (19.4 °F)
Thermostat malfunction diagnosis	Incomplete
Engine coolant temperature at engine starting	< 55 °C (131 °F)
Engine coolant temperature	≥ 75 °C (167 °F)
(Estimated – Measured) Engine coolant temperature	≤ 20 °C (68 °F)

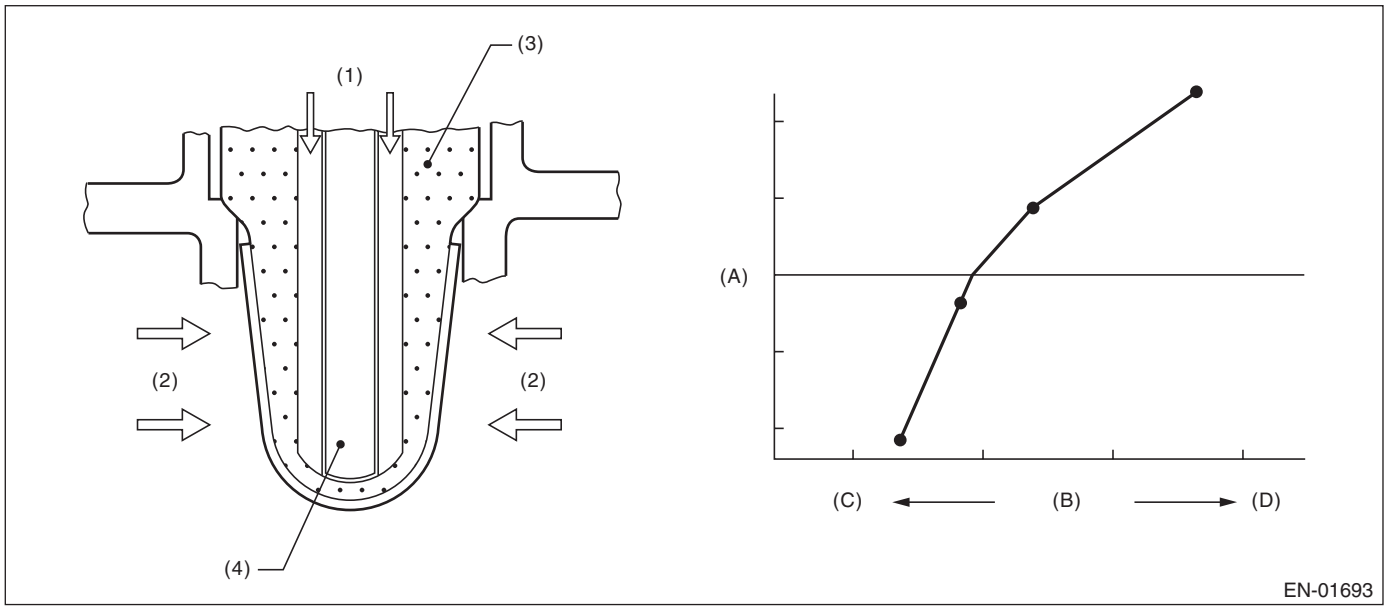
Time Needed for Diagnosis: Less than 1 second

AI: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge as NG, when the element voltage is out of the specified range.

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage (+)	< 1.128 V
or	
Input voltage (–)	< 0.23 V
or	
|Input voltage (+) – Input voltage (–)|	< 0.644 V

Time Needed for Diagnosis:
Input voltage (+): 1000 ms
Input voltage (–): 1000 ms
|Input voltage (+) – Input voltage (–)|: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage (+)	≥ 1.128 V
Input voltage (–)	≥ 0.23 V
|Input voltage (+) – Input voltage (–)|	≥ 0.644 V

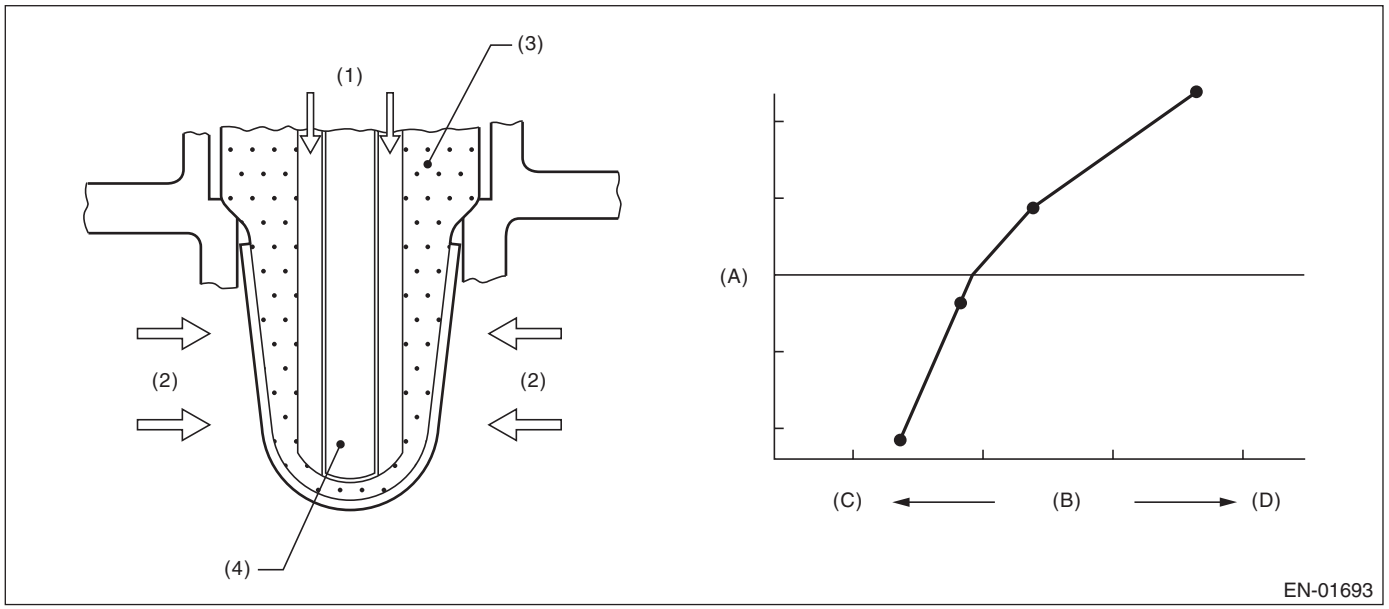
Time Needed for Diagnosis: Less than 1 second

AJ:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge as NG, when the element voltage is out of the specified range.

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage (+)	> 3.589 V
or	
Input voltage (–)	> 3.541 V

Time Needed for Diagnosis:
Input voltage (+): 1000 ms
Input voltage (–): 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

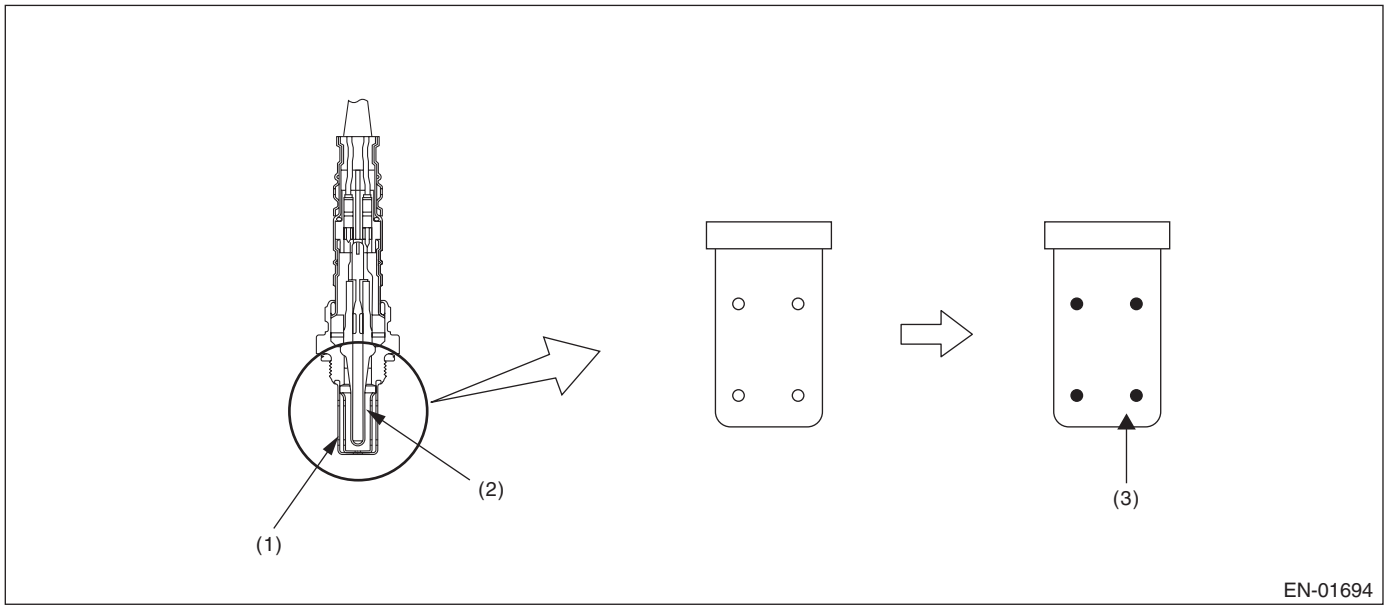
Malfunction Criteria	Threshold Value
Input voltage (+)	≤ 3.589 V
Input voltage (–)	≤ 3.541 V

Time Needed for Diagnosis: Less than 1 second

AK:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

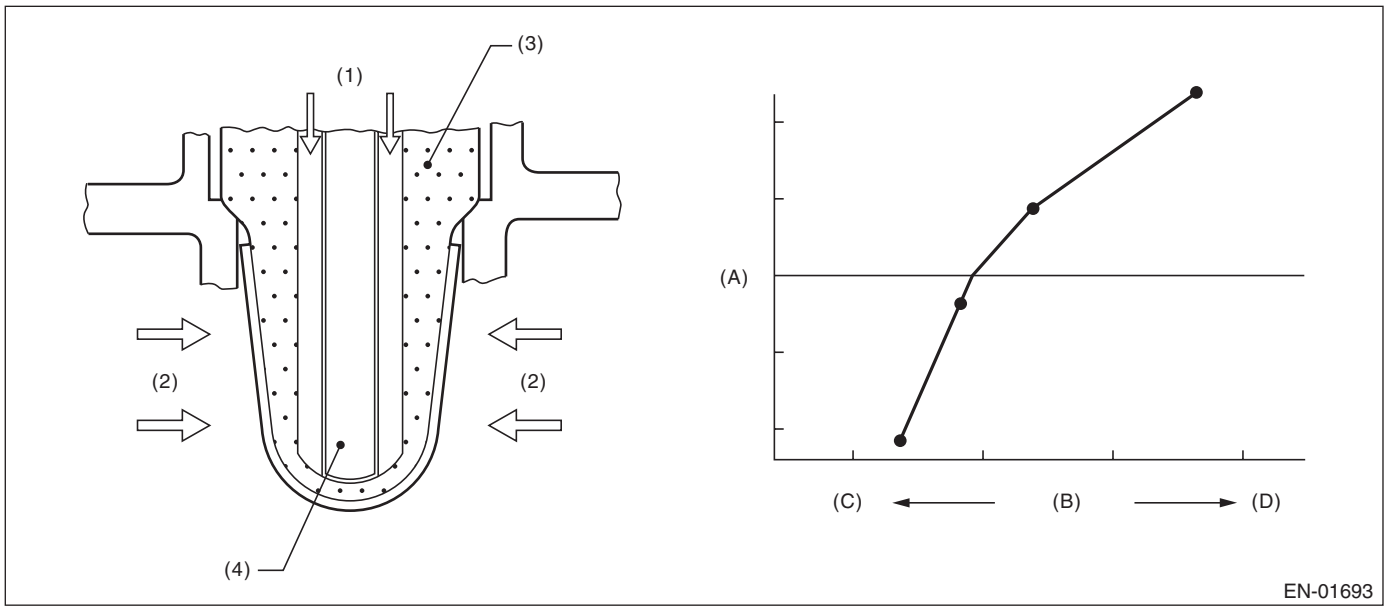
1. OUTLINE OF DIAGNOSIS

Detect the slow response of front oxygen (A/F) sensor.
Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed.
When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the sensor cover holes are clogged, the rich to lean judgment in the ECM is delayed when the actual change from rich to lean occurs.
Judge as NG when the actual movement in comparison to the ECM control amount is slow.



(1) Cover (2) Zirconia (3) Clogging

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 1024 ms
Battery voltage	≥ 10.9 V
Barometric pressure	> 75 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	0 Ω — 50 Ω
Elapsed time after starting the engine	≥ 120000 ms
Engine coolant temperature	≥ 75 °C (167 °F)
Engine speed	1000 rpm — 2500 rpm
Vehicle speed	10 km/h — 120 km/h (6.2 MPH — 74.6 MPH)
Amount of intake air	10 g/s — 40 g/s (0.35 oz/s — 1.41 oz/s)
Engine load	< 0.02 g/rev (0 oz/rev)
Learning value of EVAP conc. during purge	< 0.2
Total time of operating canister purge	≥ 19.9 s

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 km/h — 120 km/h (6.2 MPH — 74.6 MPH) 120000 ms or more after starting the engine.

5. DIAGNOSTIC METHOD

Calculate faf difference every 32ms × 4 , and the λ value difference. Calculate the diagnosis value after calculating 820 time(s).

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n–1) + |d2faf (n)| td2lmd (N) = td2lmd (n–1) + |d2lmd (n)| add up to 32 ms × 4 × 820 time(s). d2faf (n) = (faf (n) – faf (n–1)) – (faf (n–1) – faf (n–2)) d2lmd (n) = (lmd (n) – lmd (n–1)) – (lmd (n–1) – lmd (n–2)) faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	> 0.2

Time Needed for Diagnosis:32 ms × 4 × 820 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n–1) + |d2faf (n)| td2lmd (N) = td2lmd (n–1) + |d2lmd (n)| add up to 32 ms × 4 × 820 time(s). d2faf (n) = (faf (n) – faf (n–1)) – (faf (n–1) – faf (n–2)) d2lmd (n) = (lmd (n) – lmd (n–1)) – (lmd (n–1) – lmd (n–2)) faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≤ 0.2

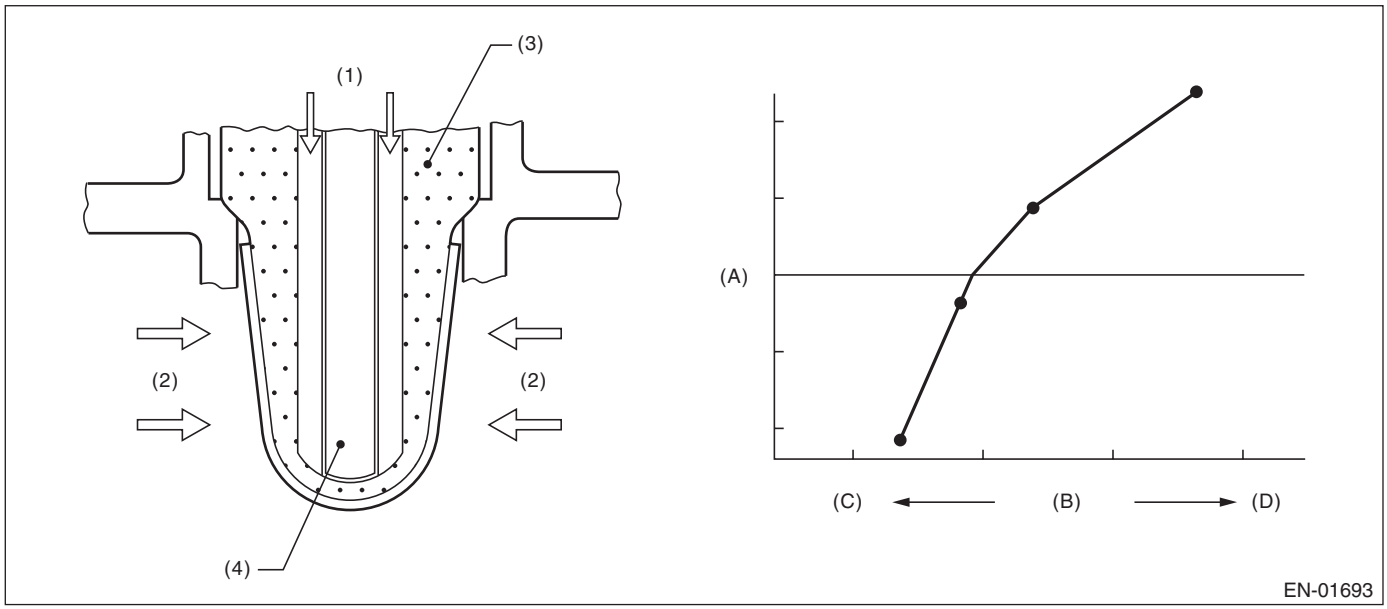
Time Needed for Diagnosis:32 ms × 4 × 820 time(s)

AL:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect open circuits of the sensor.
Judge as NG when the impedance of the element is large.

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Time of heater control duty at 70 % or more	≥ 30000 ms
Front oxygen (A/F) sensor impedance.	> 500 Ω

Time Needed for Diagnosis: 5000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Front oxygen (A/F) sensor impedance.	≤ 500 Ω

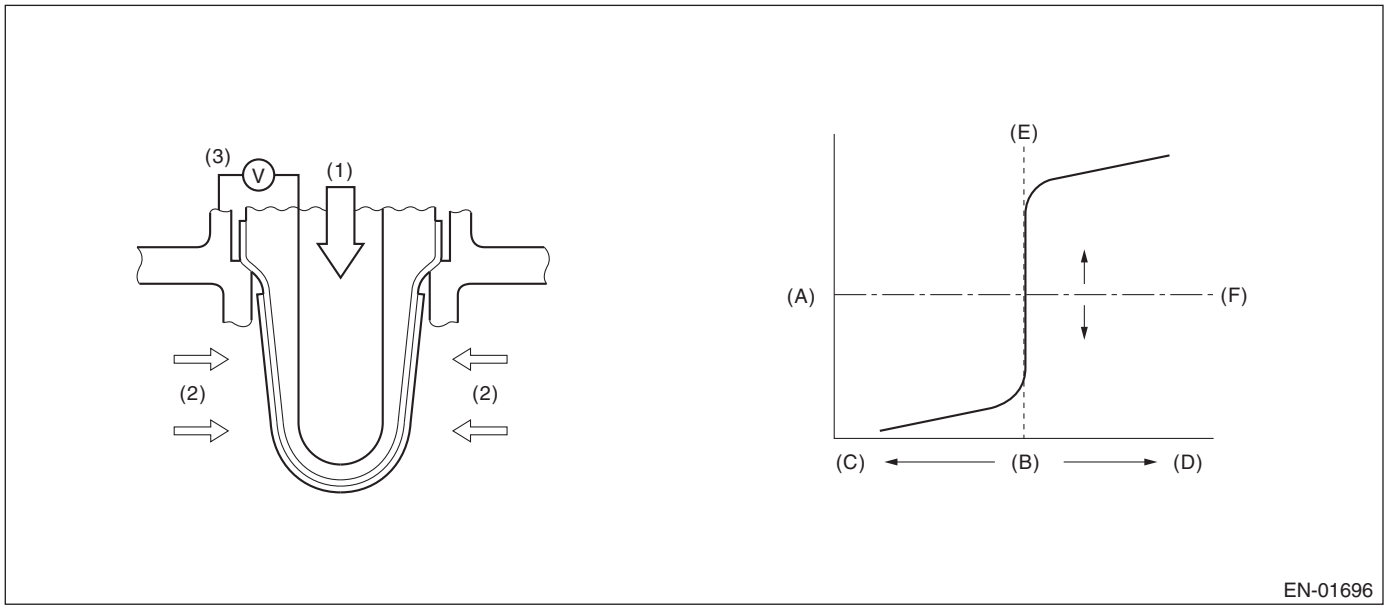
Time Needed for Diagnosis: Less than 1 second

AM:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect continuity NG of the oxygen sensor. If the oxygen sensor voltage reading is not within the probable range considering the operating conditions, judge as NG.

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force

3. ENABLE CONDITION

Used for abnormality judgment

Secondary Parameters	Enable Conditions
High	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 75 °C (167 °F)
Low (1)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 75 °C (167 °F)
Amount of intake air	≥ 10 g/s (0.35 oz/s)
Low (2)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 75 °C (167 °F)
Amount of intake air	< 10 g/s (0.35 oz/s)
Current continuation time of the rear oxygen sensor heater	≥ 25000 ms
Low (3)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 75 °C (167 °F)
Amount of intake air	< 10 g/s (0.35 oz/s)
Current continuation time of the rear oxygen sensor heater	≥ 25000 ms
Fuel cut	Experienced

Used for normality judgment

Secondary Parameters	Enable Conditions
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 75 °C (167 °F)

4. GENERAL DRIVING CYCLE

After starting the engine, continuously perform the diagnosis with the same engine condition.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High		P0138
Sensor output voltage	> 1.2 V	P0158
Low		P0137
Sensor output voltage	< 0.03 V	P0157

Time Needed for Diagnosis

High: 2500 ms
Low (1): 20000 ms
Low (2): 40000 ms
Low (3): Value from Map

Map

Fuel Cut Time (second)	0	2000	10000
Time needed for diagnosis (second)	40000	40000	60000

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High		P0138
Sensor output voltage	≤ 1.2 V	P0158
Low		P0137
Sensor output voltage	≥ 0.03 V	P0157

Time Needed for Diagnosis

High: Less than 1 second
Low (1): Less than 1 second
Low (2): Less than 1 second
Low (3): Less than 1 second

AN:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0137. <Ref. to GD(H6DO)-60, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AO:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

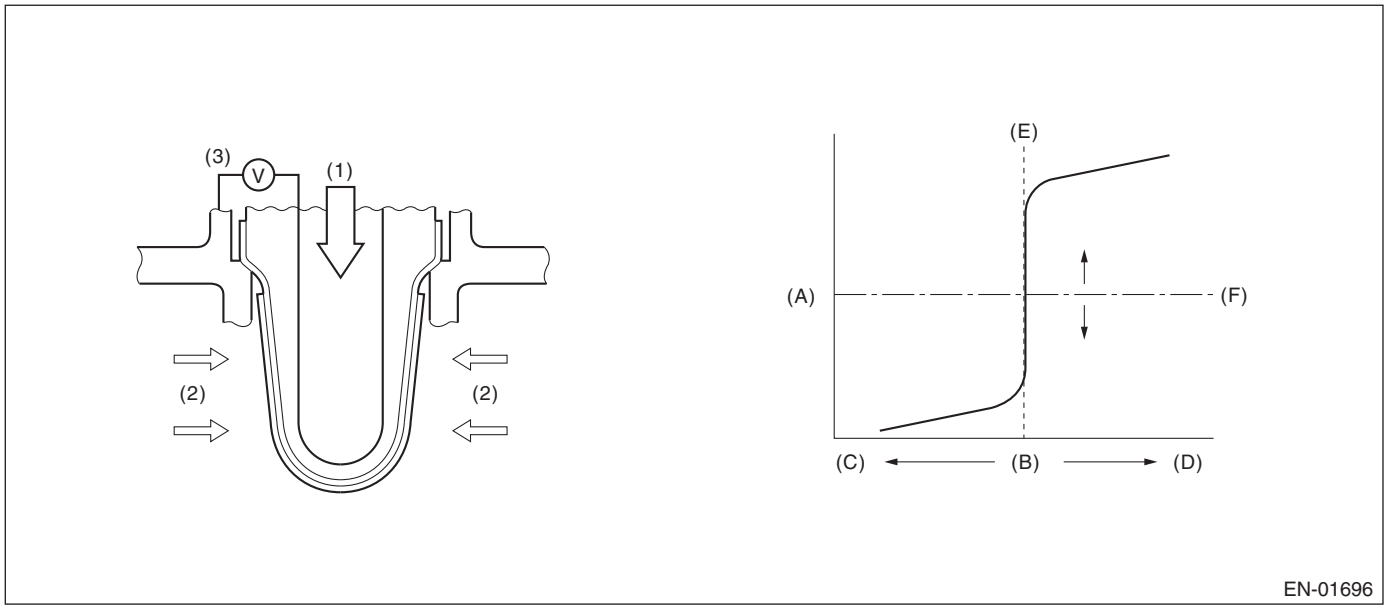
1. OUTLINE OF DIAGNOSIS

Detect the slow response of the oxygen sensor.
Judge as NG if either the rich to lean response diagnosis or lean to rich response diagnosis is NG, and judge as OK if both are OK.
[Rich → lean diagnosis response]
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to rich to lean. If the measured response time is larger than the threshold value, it is NG. If it is smaller, it is OK. Response time calculation is categorized in two by voltage difference.
   - Response time in small voltage difference: Intermediate
   - Response time in large voltage difference: Wide
2. Judge as NG when the oxygen sensor voltage is large (rich) even after deceleration fuel cut has occurred.
[Lean → rich diagnosis response]
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to lean to rich. If the measured response time is larger than the threshold value, it is NG.
2. Judge as NG when the oxygen sensor voltage remains small when recovering from a deceleration fuel cut.

Diagnostic method

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes to rich to lean. And Judge as NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(B)	Air fuel ratio	(C)	Rich
(D)	Lean	(E)	Theoretical air fuel ratio	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION

Rich → lean diagnosis response

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
A/F main feedback control condition	Completed
Deceleration fuel cut time of 5000 ms or more (intermediate) Deceleration fuel cut time of 5000 ms or more (wide)	Experienced
After fuel cut	≥ 2000 ms (Intermediate) ≥ 2000 ms (Wide)
Estimated temperature of the rear oxygen sensor element	≥ 400 °C (752 °F) (Intermediate) ≥ 500 °C (932 °F) (Wide)
Number of deceleration fuel cut	≥ 1 time(s)

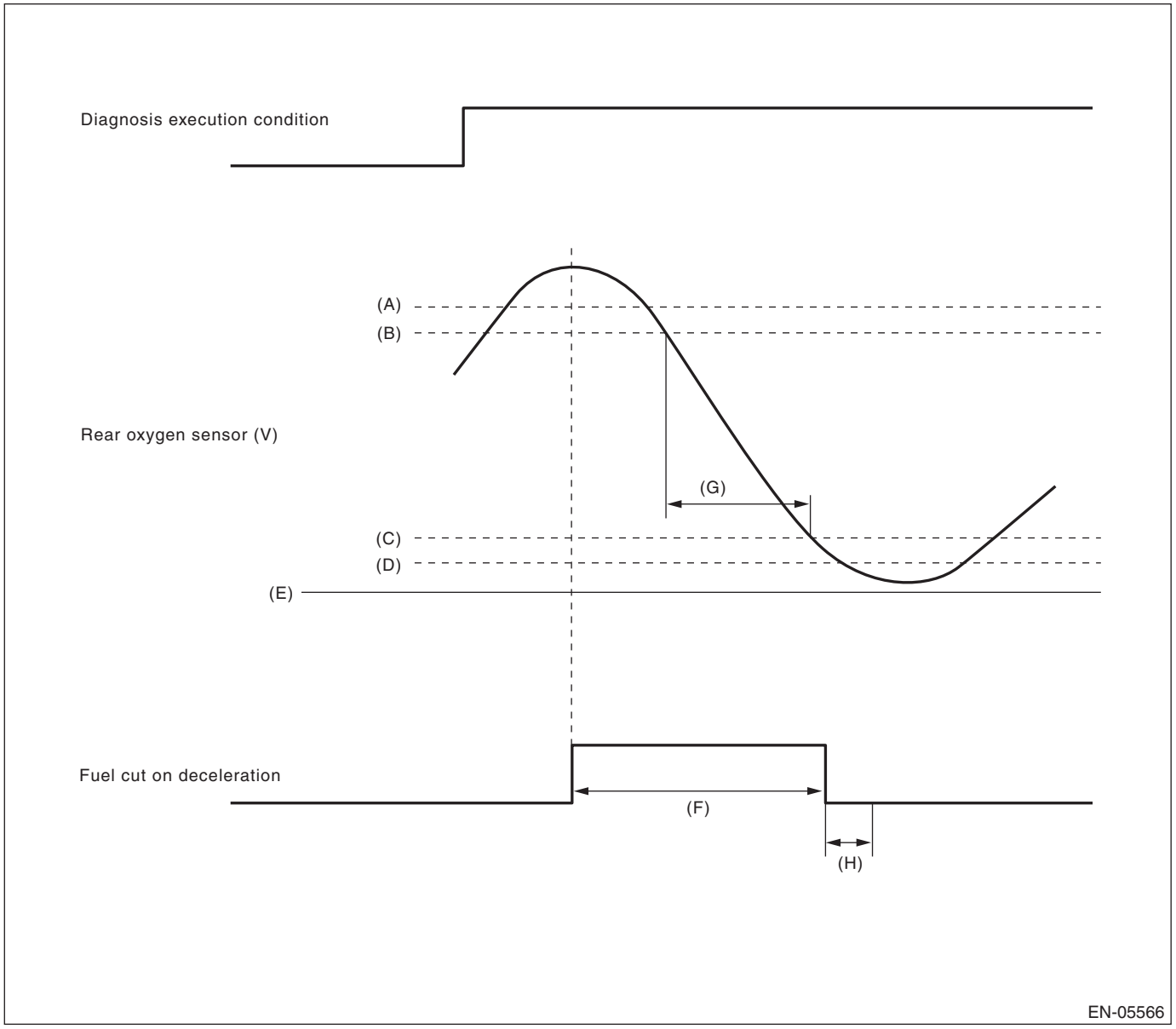
4. GENERAL DRIVING CYCLE

Perform diagnosis once during deceleration fuel cut from a constant and high speed driving, when rear oxygen sensor is warmed up sufficiently. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

5. DIAGNOSTIC METHOD

- Intermediate

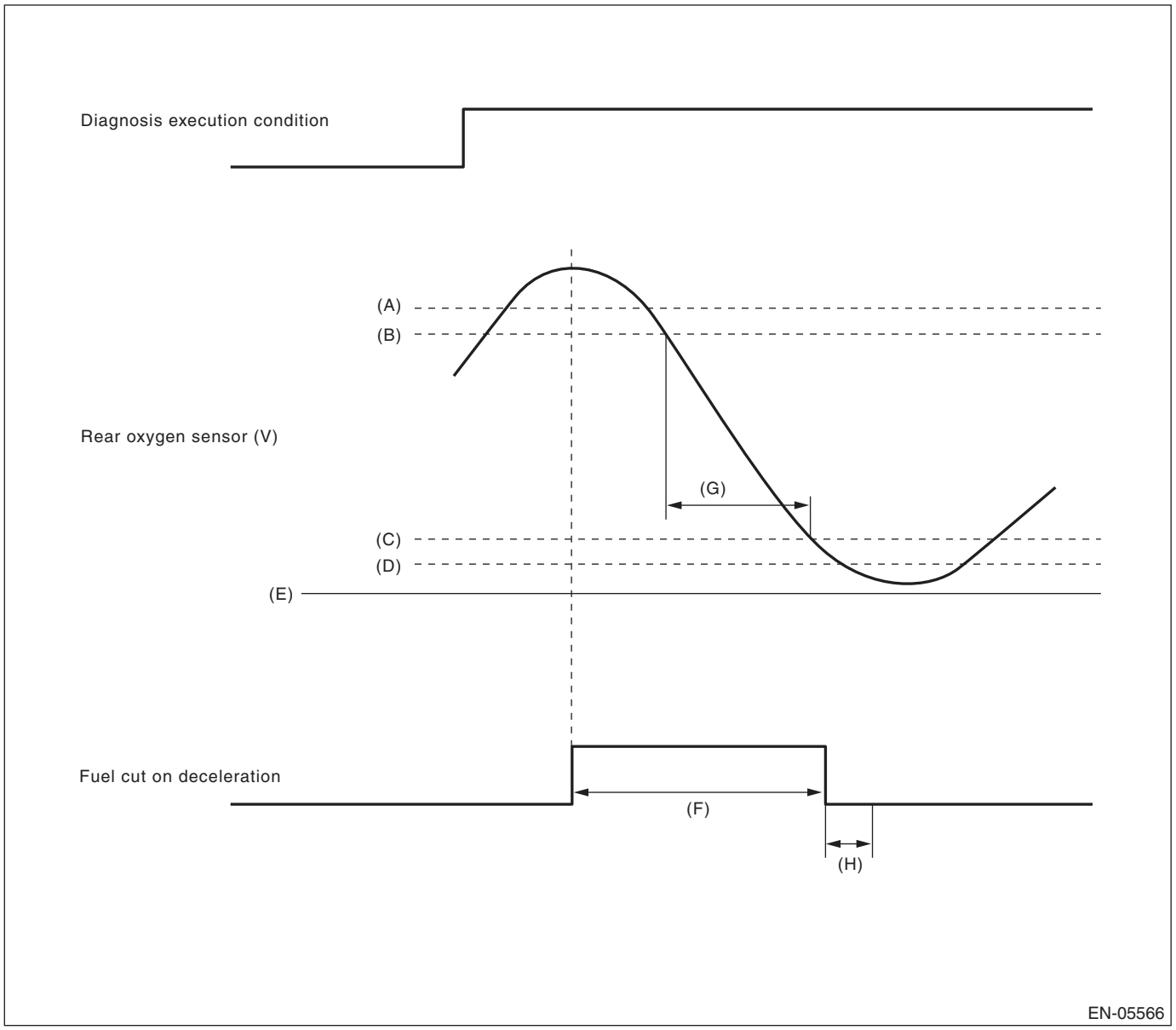
When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.15 V (lean), calculate the minimum response time for output change between 0.5 V and 0.2 V for the judgment criteria.



(A) 0.55 V
(B) 0.5 V
(C) 0.2 V
(D) 0.15 V
(E) 0 V
(F) More than 5000 ms
(G) Measure the response time.
(H) Execute the malfunction judgment in 2000 ms from the recovery of fuel cut on deceleration.

- Wide

When the oxygen sensor output voltage changes from 0.65 V (rich) to 0.05 V (lean), calculate the minimum response time for output change between 0.6 V and 0.1 V for the judgment criteria.



(A) 0.65 V
(B) 0.6 V
(C) 0.1 V
(D) 0.05 V
(E) 0 V
(F) More than 5000 ms
(G) Measure the response time.
(H) Execute the malfunction judgment in 2000 ms from the recovery of fuel cut on deceleration.

• Abnormality Judgment

1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnosis value) > Threshold value → Abnormal

NOTE:
Perform NG judgment only during fuel cut, when exhaust gas apparently changes from rich → lean. Even without deceleration fuel cut, judge as OK if the value is below the threshold.
2) Judge as NG when the oxygen sensor voltage at a deceleration fuel cut is large.
Judge as NG when oxygen sensor voltage is large even after a long period of deceleration fuel cut has completed.

Judgment value (intermediate)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O_2 output) to lean (0.2 V) when voltage reduces from 0.55 V to 0.15 V	> 491 ms
or	
Longest time over 0.55 V	≥ 2000 ms

Judgment value (Wide)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.6 V O_2 output) to lean (0.1 V) when voltage decreases from 0.65 V to 0.05 V	> Value from Map
or	
Longest time over 0.65 V	≥ 2000 ms

Map

Estimated temperature of rear oxygen sensor element when fuel cut starts °C (°F)	0 (32)	450 (842)	500 (932)	1000 (1832)
Longest time in rich status after fuel cut (ms)	3000	3000	2000	2000

Time Needed for Diagnosis: 1 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

1) Regardless of a deceleration fuel cut, if the response time (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.
Response time (diagnosis value) ≤ Threshold value → Normal
2) Do not judge as a normal condition.
Judge as OK and clear the NG if the following conditions are established.

Judgment value (intermediate)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O_2 output) to lean (0.2 V) when voltage reduces from 0.55 V to 0.15 V	≤ 491 ms

Judgment value (Wide)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.6 V O_2 output) to lean (0.1 V) when voltage decreases from 0.65 V to 0.05 V	≤ 2000 ms

Time Needed for Diagnosis: 1 time(s)

6. ENABLE CONDITION

Lean → rich response diagnosis

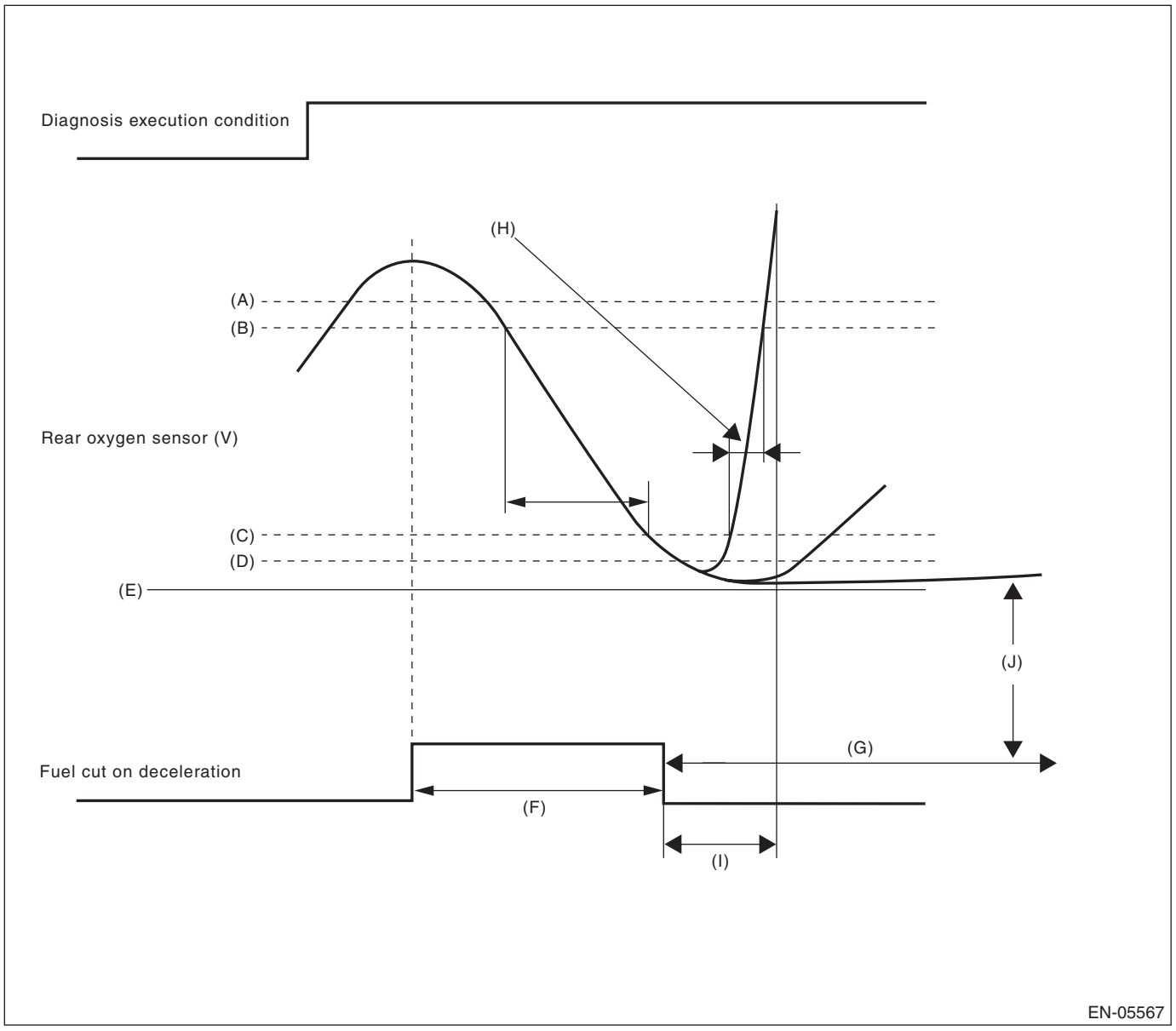
Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
A/F main feedback control condition	Completed
Deceleration fuel cut time is 5000 ms or more.	Experienced
After fuel cut	≥ 2000 ms
Number of deceleration fuel cut	≥ 1 time(s)

7. GENERAL DRIVING CYCLE

Perform diagnosis once during deceleration fuel cut from a constant and high speed driving, when rear oxygen sensor is warmed up sufficiently. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

8. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the minimum response time for output change between 0.3 V and 0.5 V for the judgment criteria.



(A) 0.55 V
(B) 0.5 V
(C) 0.3 V
(D) 0.25 V
(E) 0 V
(F) More than 5 seconds
(G) More than 120000 ms
(H) Measure the response time (diagnostic value).
(I) Execute the malfunction judgment in 4000 ms from the recovery of fuel cut on deceleration.
(J) Judge NG when the voltage of rear oxygen sensor is 0.25 V or less for 120000 ms or more after recovery of fuel cut on deceleration.

• Abnormality Judgment

1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnosis value) > Threshold value → Abnormal
2) If the oxygen sensor voltage is small after recovering from a deceleration fuel cut, and remains small, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (0.3 V O_2 output) to rich (0.5 V) when voltage changes from 0.25 V to 0.55 V	> 4000 ms
or	
Longest time under 0.25 V	≥ 120000 ms

Time Needed for Diagnosis: 1 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

1) Regardless of a deceleration fuel cut, if the response time (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.
Response time (diagnosis value) ≤ Threshold value → Normal
2) Do not judge as a normal condition.
Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (0.3 V O_2 output) to rich (0.5 V) when voltage changes from 0.25 V to 0.55 V	≤ 4000 ms

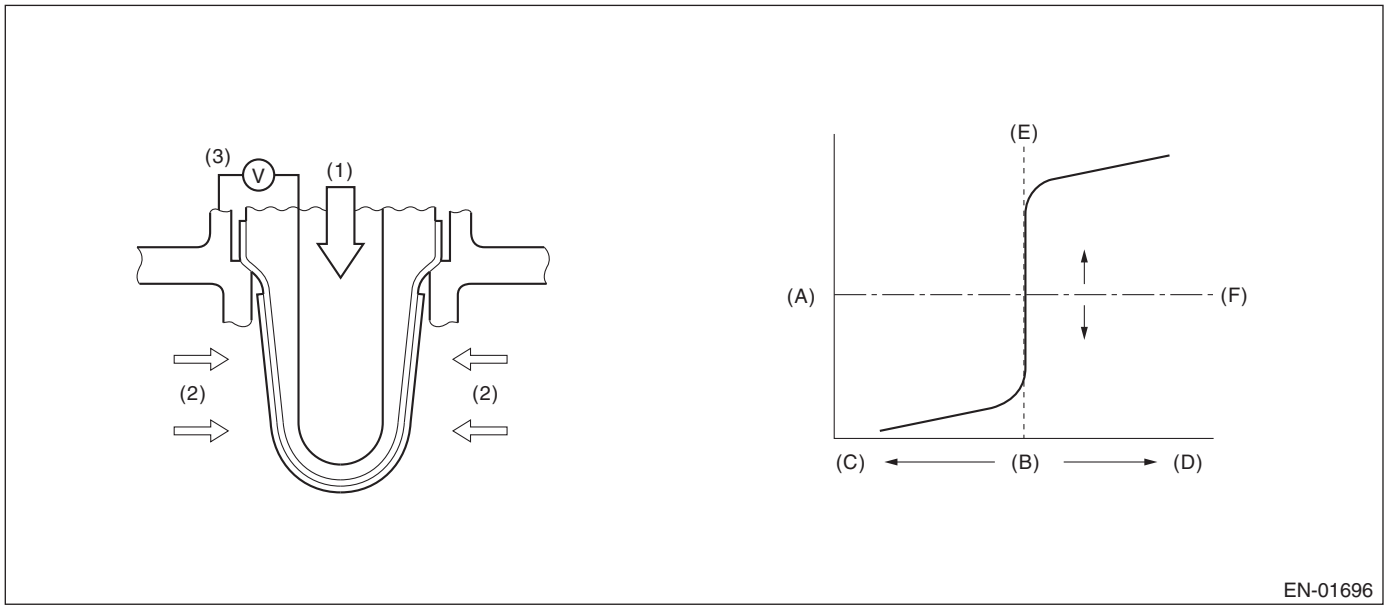
Time Needed for Diagnosis: 1 time(s)

AP:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2)

1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor open or short circuit. Judge as NG when the rear oxygen sensor voltage can be determined to be abnormal considering conditions such as intake air amount, engine coolant temperature, main feedback control and deceleration fuel cut.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(C)	Rich	(E)	Theoretical air fuel ratio
(B)	Air fuel ratio	(D)	Lean	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control at the rear oxygen sensor	In operation
Target output voltage of rear oxygen sensor	≥ 0.55 V + 0.05 V
Amount of intake air	≥ 10 g/s (0.35 oz/s)
Engine coolant temperature	≥ 75 °C (167 °F)
Misfire detection every 200 rotations	< 7 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Deceleration fuel cut of 5000 ms or more.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Minimum output voltage	> 0.15 V
or	
Maximum output voltage	< 0.55 V

Time Needed for Diagnosis: 200000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Diagnosis of the rear oxygen sensor voltage low side	Incomplete
Minimum output voltage	≤ 0.15 V
Maximum output voltage	≥ 0.55 V

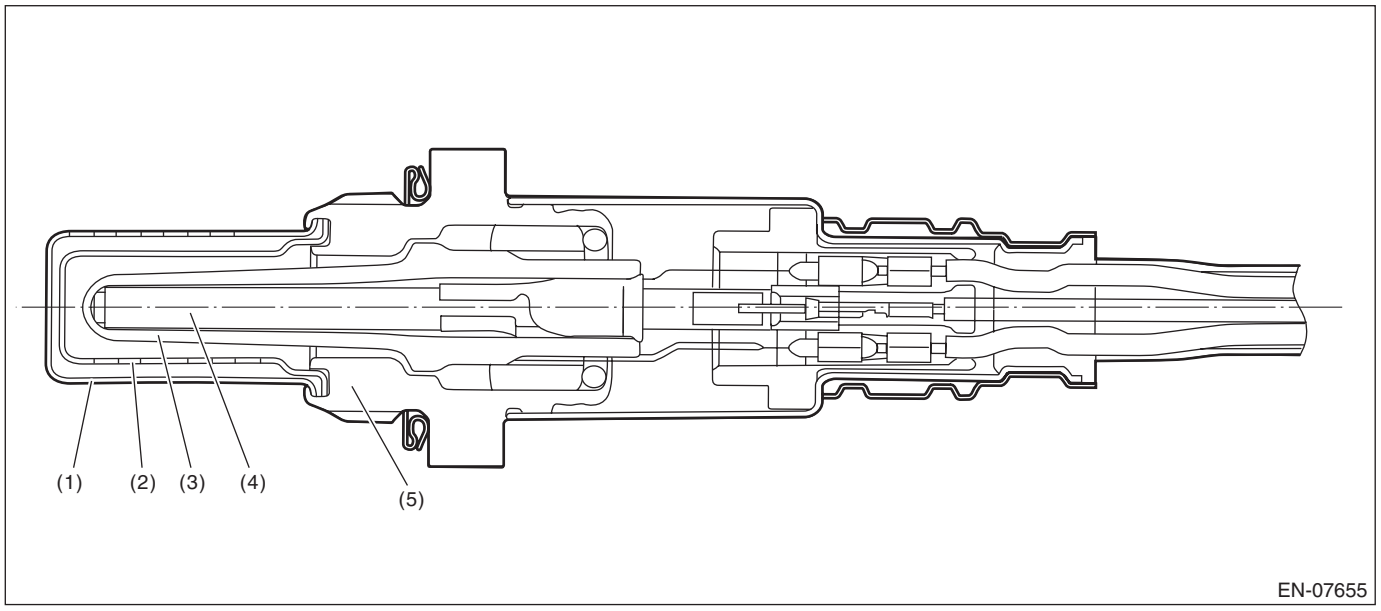
Time Needed for Diagnosis: Less than 1 second

AQ:DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2)

1. OUTLINE OF DIAGNOSIS

Detect malfunction of the rear oxygen sensor heater.
Judge as NG if it is determined that the rear oxygen sensor impedance is large by observing the engine conditions.

2. COMPONENT DESCRIPTION



(1) Element cover (outer)
(2) Element cover (inner)
(3) Sensor element
(4) Ceramic heater
(5) Sensor housing

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 0 ms
Engine coolant temperature	≥ 75 °C (167 °F)
A/F sensor element impedance	≤ 50 Ω
A/F sensor heater control duty	≤ 75 %
Rear oxygen sensor heater control duty	< 100 %

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 0 ms seconds or more have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output terminal for heater characteristics failure detection	Low

Time Needed for Diagnosis:4 ms × 2500 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output terminal for heater characteristics failure detection	High

Time Needed for Diagnosis:4 ms × 2500 time(s)

AR:DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0131. <Ref. to GD(H6DO)-51, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AS:DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0132. <Ref. to GD(H6DO)-53, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AT:DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0133. <Ref. to GD(H6DO)-55, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AU:DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0134. <Ref. to GD(H6DO)-58, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV:DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0137. <Ref. to GD(H6DO)-60, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AW:DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0137. <Ref. to GD(H6DO)-60, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AX:DTC P0159 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0139. <Ref. to GD(H6DO)-63, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AY:DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK2 SENSOR2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0140. <Ref. to GD(H6DO)-71, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AZ:DTC P0161 O2 SENSOR HEATER CIRCUIT (BANK2 SENSOR2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0141. <Ref. to GD(H6DO)-73, DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BA:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

Diagnostic method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 75 °C (167 °F)
Engine load change	< 0.02 g/rev (0 oz/rev)
Engine load	≥ Value of Map 1

Map1

Engine speed (rpm)	Idling	700	1000	1500	2000	2500	3000	3500	4000	4500	5000
Measured value (g (oz)/rev)	na	0.357 (0.01)	0.25 (0.01)	0.25 (0.01)	0.317 (0.01)	0.326 (0.01)	0.337 (0.01)	0.397 (0.01)	0.439 (0.02)	0.454 (0.02)	0.454 (0.02)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition meeting the malfunction criteria below continues for 10 s × 5 time(s) or more, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ Value from Map 2
In this case: sglmd = measured lambda	
tglmda = target lambda	
faf = main feedback compensation coefficient (every 64 milliseconds)	
flaf = main feedback learning compensation coefficient	

Map 2

Amount of air (g (oz)/s)	0 (0)	3.2 (0.11)	6.4 (0.23)	9.6 (0.34)	12.8 (0.45)	16 (0.56)	19.2 (0.68)
fsobdL1 (%)	1.4	1.4	1.332	1.265	1.265	1.265	1.265

Time Needed for Diagnosis: 10 s × 5 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	< 1.2

Time Needed for Diagnosis: 10 s

BB:DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

Diagnostic method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 75 °C (167 °F)
Engine load change	≤ 0.02 g/rev (0 oz/rev)
Learning value of EVAP conc.	< 0.1
Cumulative time of canister purge after engine start	≥ 20 s
Continuous period after canister purge starting	≥ 29884 ms
Engine load	≥ Value of Map 1

Map1

Engine speed (rpm)	idling	700	1000	1500	2000	2500	3000	3500	4000	4500	5000
Measured value (g (oz)/rev)	na	0.357 (0.01)	0.25 (0.01)	0.25 (0.01)	0.317 (0.01)	0.326 (0.01)	0.337 (0.01)	0.397 (0.01)	0.439 (0.02)	0.454 (0.02)	0.454 (0.02)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition meeting the malfunction criteria below continues for 10 s × 5 time(s) or more, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf In this case: sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient (every 64 milliseconds) flaf = main feedback learning compensation coefficient	< Value of Map 2

Map 2

Amount of air (g (oz)/s)	0 (0)	3.2 (0.11)	6.4 (0.23)	9.6 (0.34)	12.8 (0.45)	16 (0.56)	19.2 (0.68)
fsobdL1 (%)	0.6	0.6	0.688	0.715	0.725	0.735	0.735

Time Needed for Diagnosis: 10 s × 5 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK if the status that the criteria below are met continues for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ 0.8

Time Needed for Diagnosis: 10 s

BC:DTC P0174 SYSTEM TOO LEAN (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0171. <Ref. to GD(H6DO)-76, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BD:DTC P0175 SYSTEM TOO RICH (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0172. <Ref. to GD(H6DO)-77, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BE:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect faults in the fuel temperature sensor output properties.
Diagnosis is performed in two methods (drift diagnosis and stuck diagnosis). If either is NG, judge as NG. If both are OK, Judge as OK and clear the NG.

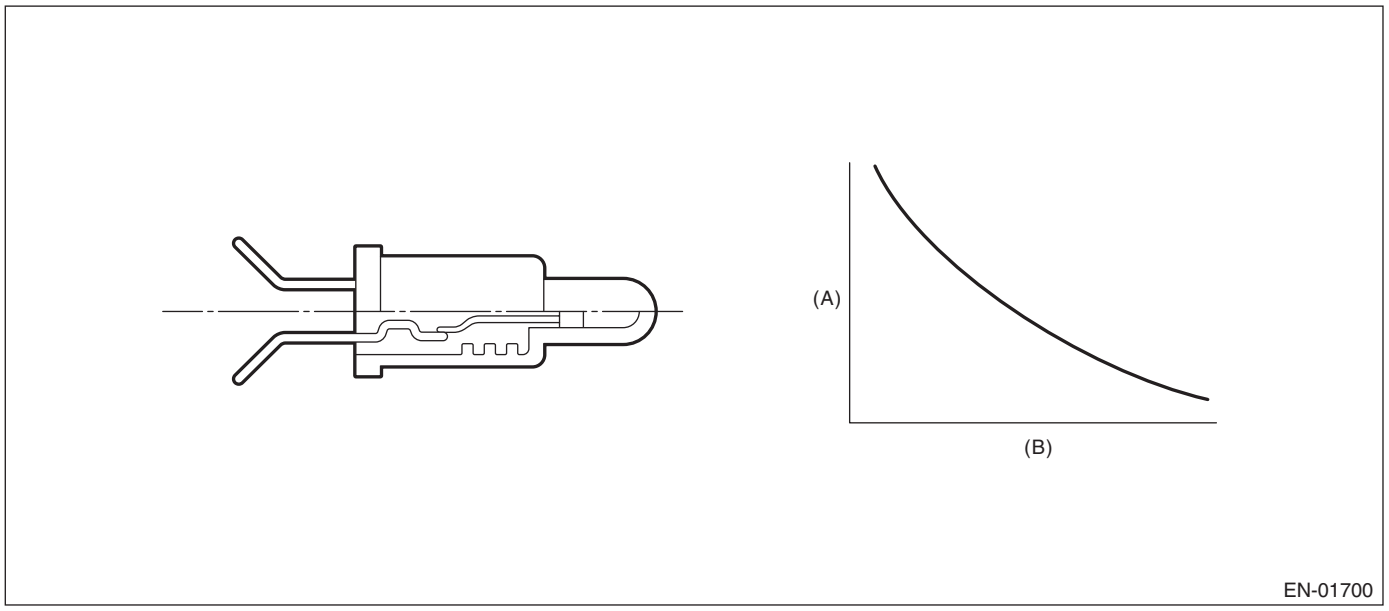
Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and judged as NG.

Stuck Diagnosis

As the engine warms up (cumulative amount of intake air after starting is large), if the fuel temperature which should rise does not, determine as being stuck and NG.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Drift Diagnosis

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	≥ 20 s
Engine coolant temperature – Engine coolant temperature at engine start	> 10 °C (50 °F)
Fuel temperature – Engine coolant temperature	≥ 10 °C (50 °F)
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 120 s
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	≥ 20 s
Engine coolant temperature – Engine coolant temperature at engine start	> 10 °C (50 °F)
Fuel temperature – Engine coolant temperature	< 10 °C (50 °F)
Battery voltage	≥ 10.9 V
Engine coolant temperature	< 75 °C (167 °F)

Time Needed for Diagnosis: Less than 1 second

6. ENABLE CONDITION

Stuck Diagnosis

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 20000 ms
Battery voltage	≥ 10.9 V

7. GENERAL DRIVING CYCLE

Always perform diagnosis after 20 seconds have passed since the engine started.

8. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 551043 g (19435.29 oz)
Fuel temperature difference between Max. and Min.	< 2 °C (35.6 °F)

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel temperature difference between Max. and Min.	≥ 2 °C (35.6 °F)

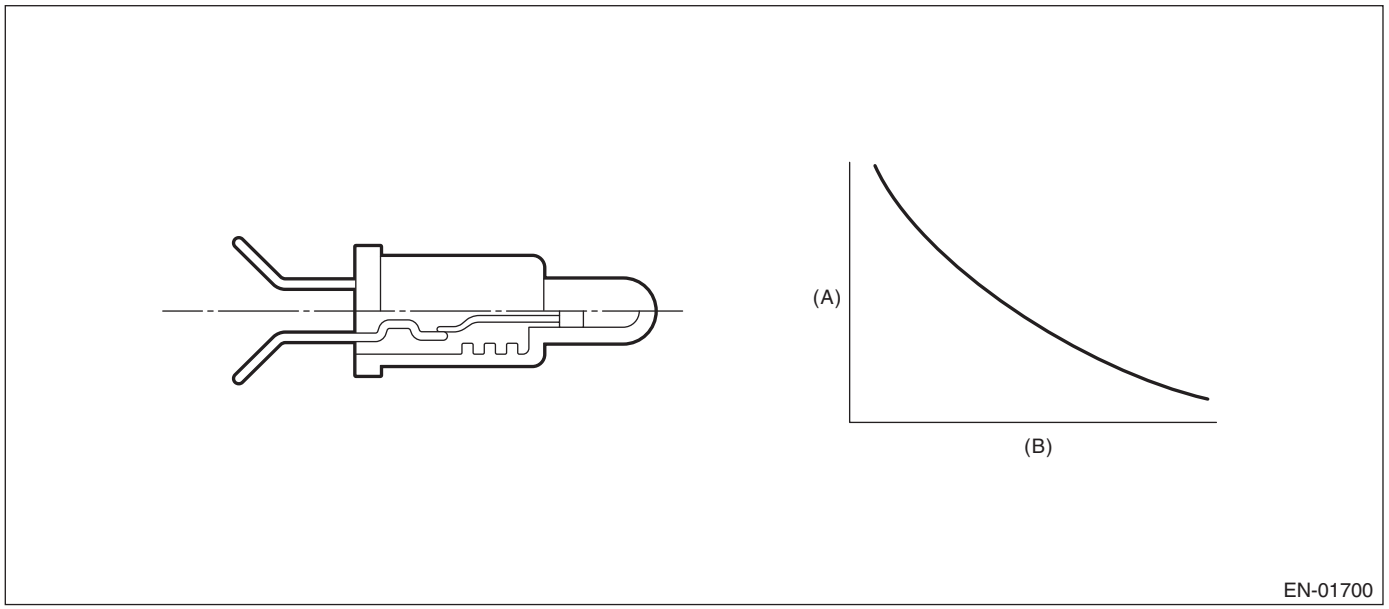
Time Needed for Diagnosis: Less than 1 second

BF:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.344 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.344 V
Battery voltage	≥ 10.9 V

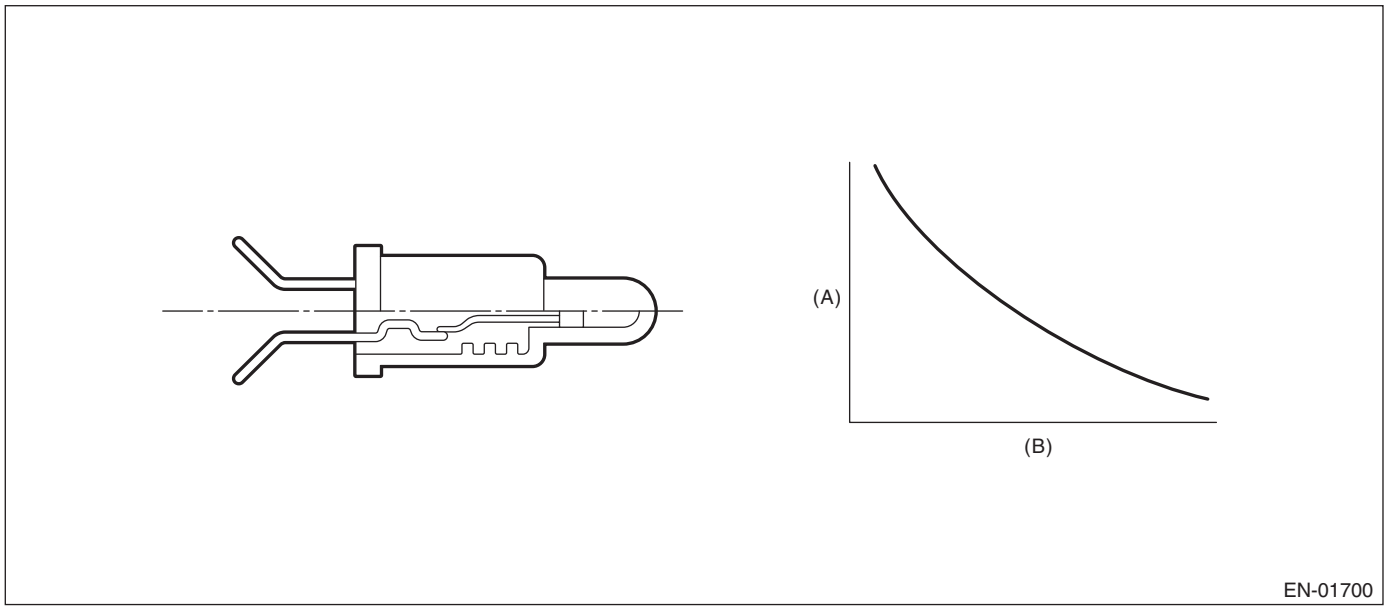
Time Needed for Diagnosis: Less than 1 second

BG:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.881 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.881 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: Less than 1 second

BH:DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect for abnormal values in the oil temperature sensor output properties.
Judge as NG when the oil temperature does not rise even though the engine is running under a condition where it should rise.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	≥ Value from Map

Map

Engine coolant temperature °C (°F)	–40 (–40)	–30 (–22)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Engine speed rpm	500	500	500	500	500	500	500	500

Engine coolant temperature °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Engine speed rpm	500	500	500	500	500	500	500	500

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Engine oil temperature	< 15 °C (59 °F)
After engine start oil temperature sensor characteristic diagnosis timer.	≥ Judgment value for after engine start oil temperature sensor characteristic diagnosis timer

After engine start oil temperature sensor characteristic diagnosis timer (timer for diagnosis).

a. Timer stop at fuel cut
b. During the driving conditions except a) above, timer counts up as follows.
64 ms + TOILCNT ms (when at 64 ms)
Where, TOILCNT is determined as follows,
TOILCNT = 0 at idle switch ON
For TOILCNT at Idle switch off, refer to the following table.

		Vehicle speed km/h (MPH)							
		0 (0)	8 (5)	16 (9.9)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
Temperature °C (°F)	–40 (–40)	0 ms	32 ms	76 ms	130 ms	149 ms	171 ms	176 ms	181 ms
	–30 (–22)	67 ms	93 ms	121 ms	157 ms	170 ms	184 ms	193 ms	203 ms
	–20 (–4)	98 ms	123 ms	148 ms	184 ms	193 ms	204 ms	214 ms	226 ms
	–10 (14)	145 ms	166 ms	187 ms	208 ms	223 ms	239 ms	242 ms	245 ms
	0 (32)	161 ms	187 ms	212 ms	243 ms	252 ms	262 ms	266 ms	270 ms

After engine start oil temperature characteristic diagnosis timer judgment value (t).
$t = 2400000\ ms - 60000\ ms \times Ti\ (t \geq 2400000)$
Ti = The lowest coolant temperature after starting the engine.
Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Engine oil temperature	≥ 15 °C (59 °F)

Time Needed for Diagnosis: Less than 1 second

BI: DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the oil temperature sensor.
Judge as NG when outside of the judgment value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.188 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.188 V

Time Needed for Diagnosis: Less than 1 second

BJ:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the oil temperature sensor.
Judge as NG when outside of the judgment value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.694 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.694 V

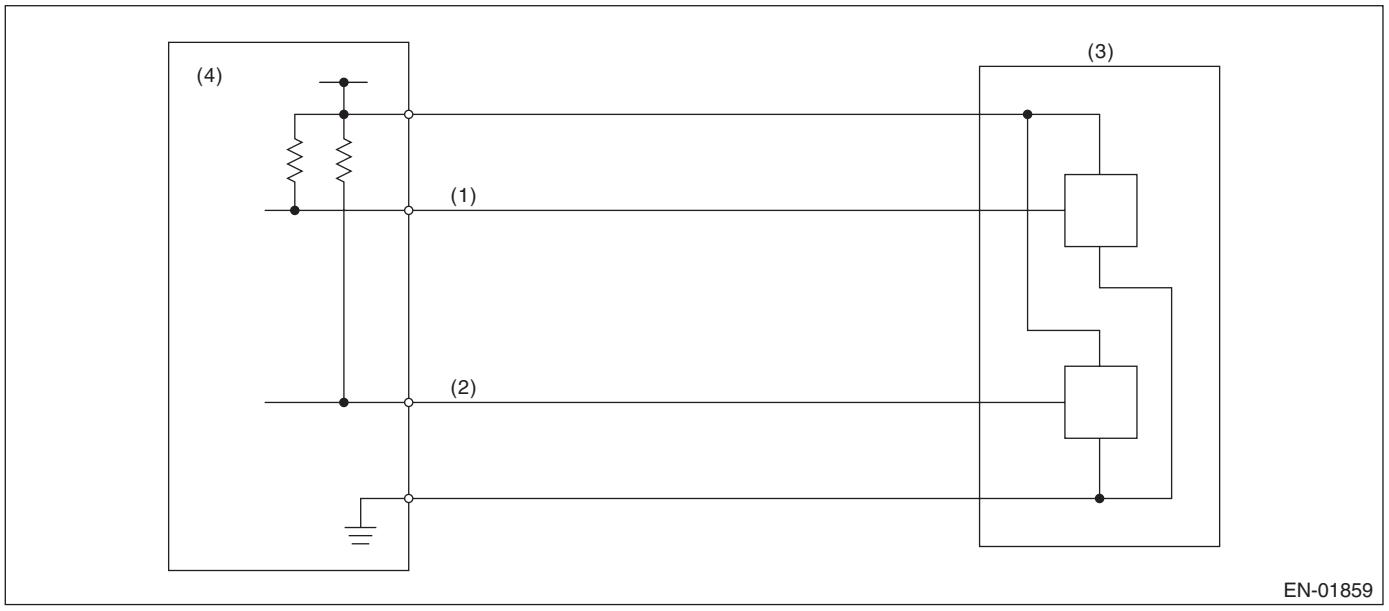
Time Needed for Diagnosis: Less than 1 second

BK:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≤ 0.926 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	> 0.926 V

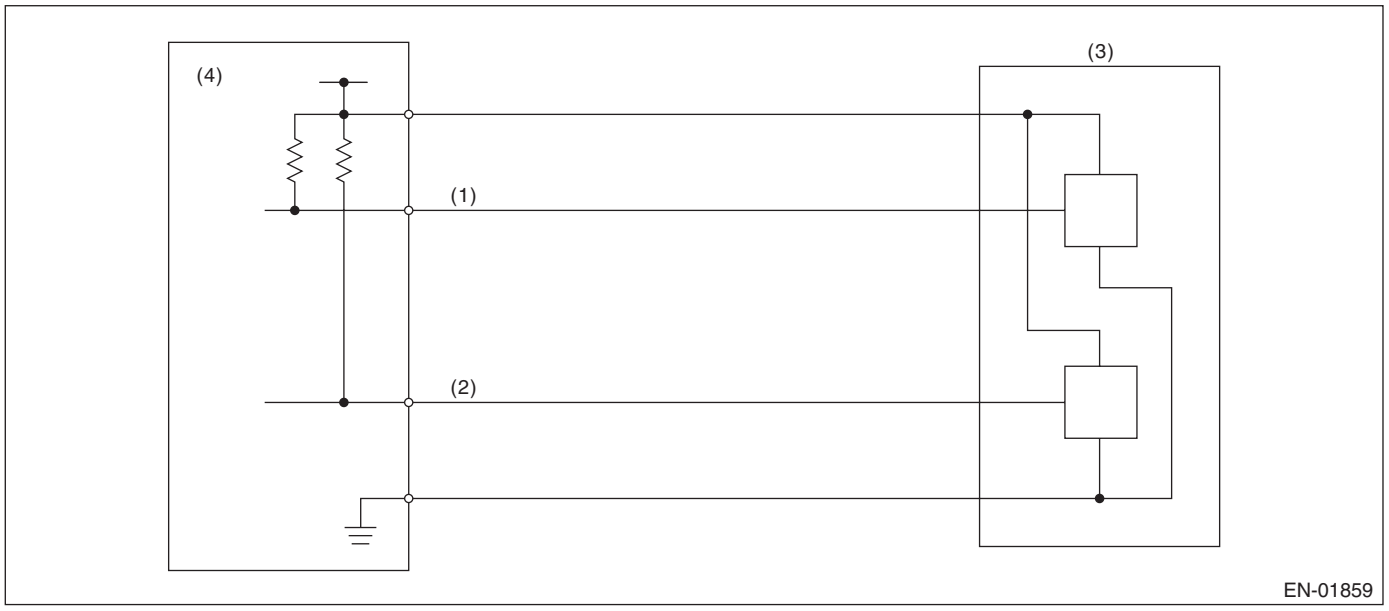
Time Needed for Diagnosis: 24 ms

BL:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 4.858 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	< 4.858 V

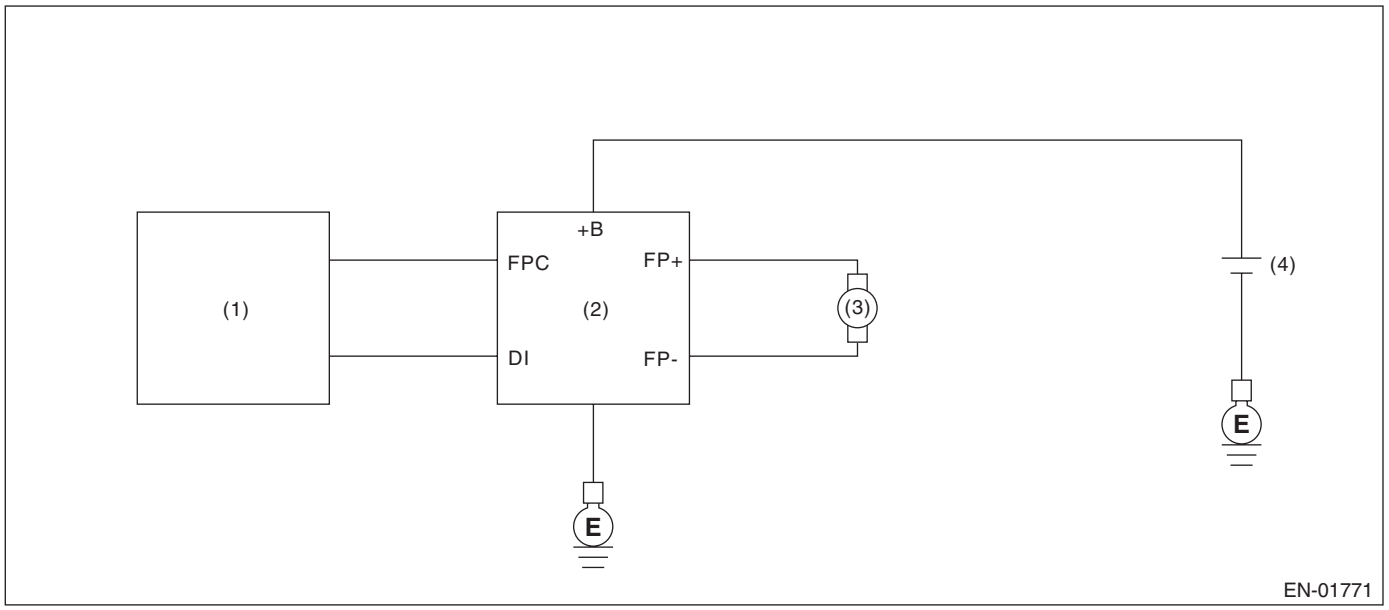
Time Needed for Diagnosis: 24 ms

BM:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit.
Judge as NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit.
Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel pump control unit
(3) Fuel pump
(4) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Elapsed time after starting the engine	≥ 180000 ms
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Elapsed time after starting the engine	≥ 180000 ms
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)

Time Needed for Diagnosis: Less than 1 second

BN:DTC P0301 CYLINDER 1 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

Detect the presence of misfire occurrence. (Revolution fluctuation method)
Monitoring Misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has two patterns below. :

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.
1) Intermittent misfire: FTP 1.5 times misfire

- 120° Interval Difference Method
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or more)

2) Misfire every time: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	≥ 1024 ms
Intake manifold pressure change at 120° CA	< Value of Map 1
Throttle position change during 16 milliseconds	< 20 °
Fuel shut-off function	Not in operation
Fuel level	≥ 10.5 ℓ (2.77 US gal, 2.31 Imp gal)
Vehicle dynamic control or AT torque control	Not in operation
Evaporative system leak check	Not in operation
Engine speed	400 rpm — 6500 rpm
Intake manifold pressure	≥ Value from Map 2
Battery voltage	≥ 8 V
Fuel parameter determination	Not extremely low volatility
Elapsed time after starting the engine	≥ 0 ms
Engine speed change during 32 milliseconds	< 500 rpm

Map 1

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
kPa (mmHg, inHg)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)	20 (150, 5.9)

Map 2

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
kPa (mmHg, inHg)	30.3 (227.6 , 9)	28 (209.9 , 8.3)	25.9 (194.0 , 7.6)	27.7 (207.8 , 8.2)	25.4 (190.2 , 7.5)	27 (202.9 , 8)	29 (217.9 , 8.6)	28.3 (212.5 , 8.4)	28.7 (215.3 , 8.5)	30.6 (229.3 , 9)	32.4 (243.3 , 9.6)	34.3 (257.3 , 10.1)	36.4 (273.3 , 10.8)	36.4 (273.3 , 10.8)

3. GENERAL DRIVING CYCLE

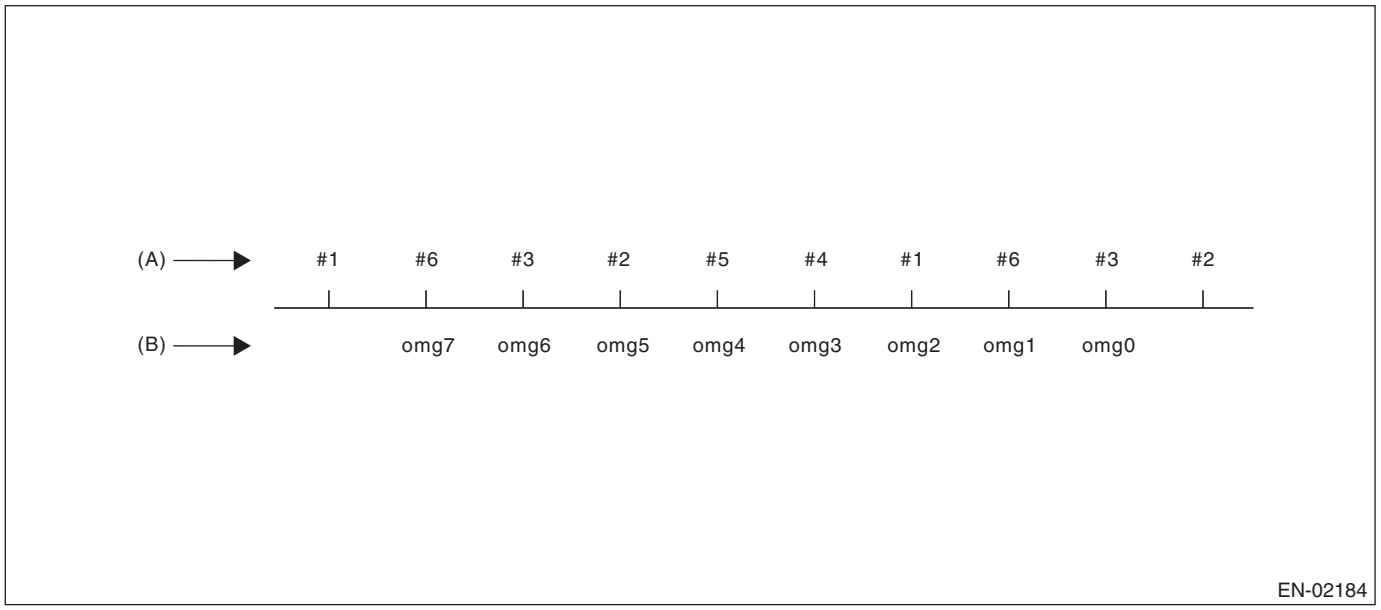
- If conditions are met, it is possible to detect the misfires from idling to high engine speed. However, to avoid excessive load or harm to the engine, perform diagnosis at idle.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

When a misfire occurs, the engine speed will decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether a misfire is occurring or not comparing the calculated result with judgment value. Counting the number of misfires. If the misfire ratio is higher during 1000 revs. or 200 revs., Judge corresponding cylinders as NG.

Diagnostic value calculation (Calculate from angle speed) →	Misfire detection every single ignition (Compare diagnostic value with judgment value) →	NG judgment (Misfire occurrence judgment required by the law) (Compare number of misfire with judgment)
	• 120° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method	• FTP 1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

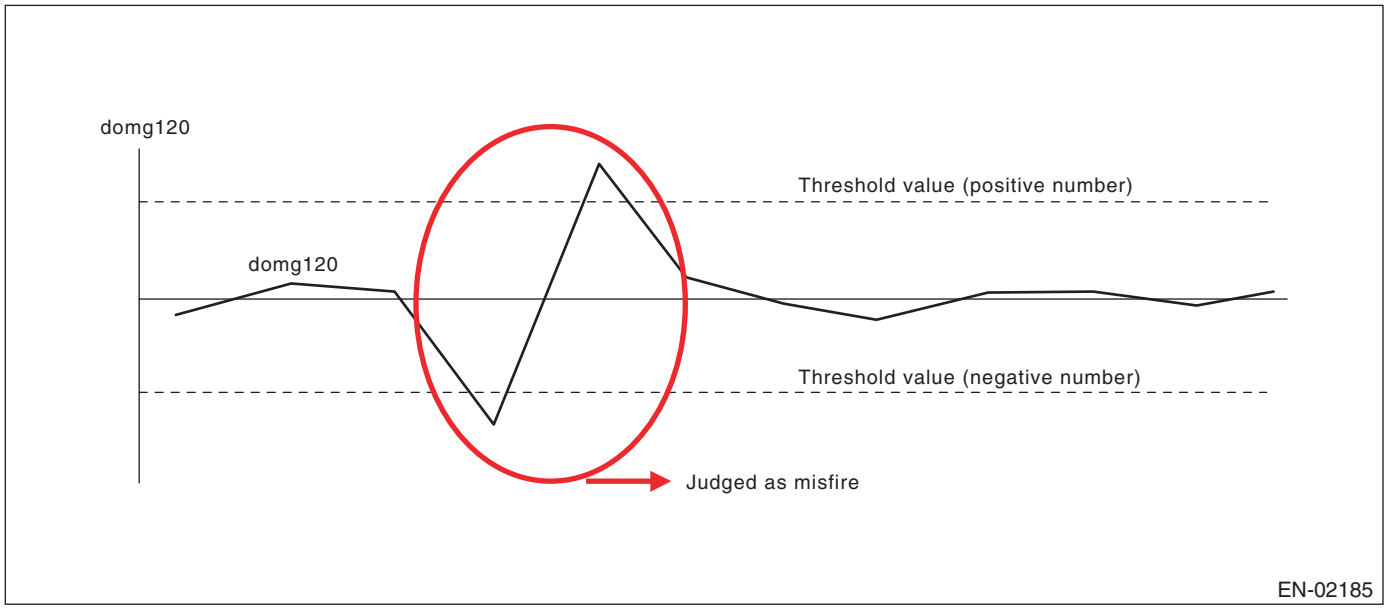
As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.



(A) Ignition order (B) Crankshaft position speed

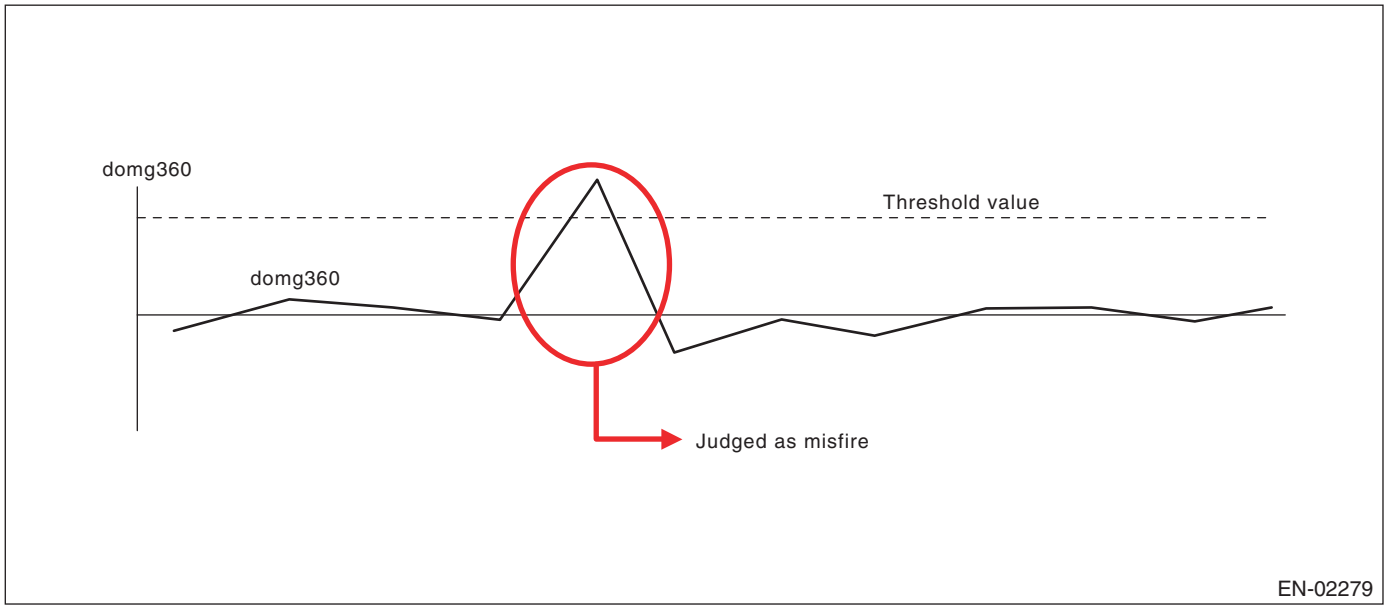
120° Interval Difference Method

Diagnostic value	domg 120 = (omg 1 – omg 0) – (omg 7 – omg 1)/6
Judge as a misfire in the following cases. • domg 120 > judgment value of positive side • domg 121 ≤ judgment value of negative side (Judgment value before 120° CA)	



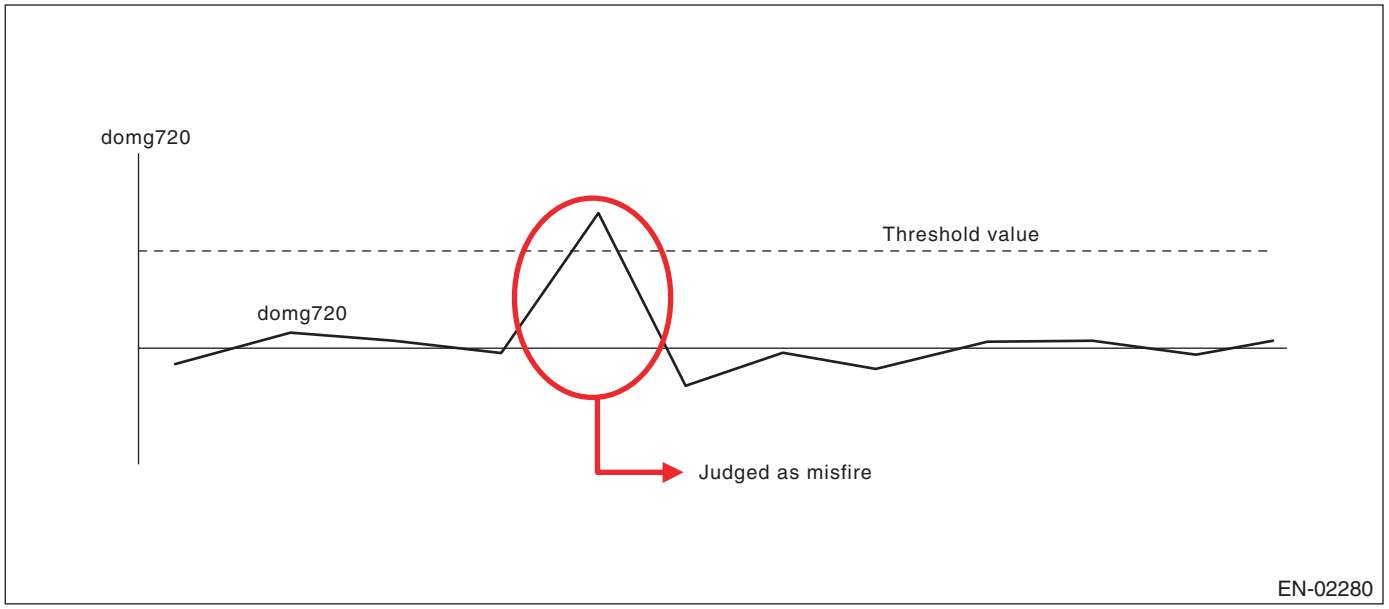
360° Interval Difference Method

Diagnostic value	domg 360 = (omg 1 – omg 0) – (omg 4 – omg 3)
Misfire judgment	domg 360 > Judgment value → Judge as misfire



720° Interval Difference Method

Diagnostic value	domg 720 = (omg 1 – omg 0) – (omg 7 – omg 6)
Misfire judgment	domg 720 > Judgment value → Judge as misfire



- **FTP 1.5 times misfire (Misfire occurrence level which influences exhaust gas)**
- **Abnormality Judgment**

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	≥ 50 × 100/3000% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
FTP emission judgment value	< 50 × 100/3000% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.

- **Catalyst damage misfire (Misfire occurrence level damaging catalyst)**
- **Abnormality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	≥ Value of Map 3

Map 3

		Intake air (g(oz)/rev)									
		0.2 (0.01)	0.4 (0.01)	0.6 (0.02)	0.8 (0.03)	1 (0.04)	1.2 (0.04)	1.4 (0.05)	1.6 (0.06)	1.8 (0.06)	2 (0.07)
Engine speed (rpm)	700	90	90	88	76	68	68	68	68	68	68
	1000	90	90	88	76	68	68	68	68	68	68
	1500	89	88	80	64	56	56	56	56	56	56
	2000	88	84	64	40	36	35	35	35	35	35
	2500	88	80	56	36	30	30	30	30	30	30
	3000	64	56	30	30	30	30	30	30	30	30
	3500	50	40	30	30	30	30	30	30	30	30
	4000	40	38	30	30	30	30	30	30	30	30
	4500	50	30	30	30	30	30	30	30	30	30
	5000	40	30	30	30	30	30	30	30	30	30
	5500	40	30	30	30	30	30	30	30	30	30
	6000	36	36	30	30	30	30	30	30	30	30
	6500	32	32	30	30	30	30	30	30	30	30
	7000	32	32	30	30	30	30	30	30	30	30

Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	< Value of Map 2

Time Needed for Diagnosis: 200 engine revs.

BO:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-92, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BP:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-92, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BQ:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-92, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BR:DTC P0305 CYLINDER 5 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-92, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BS:DTC P0306 CYLINDER 6 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

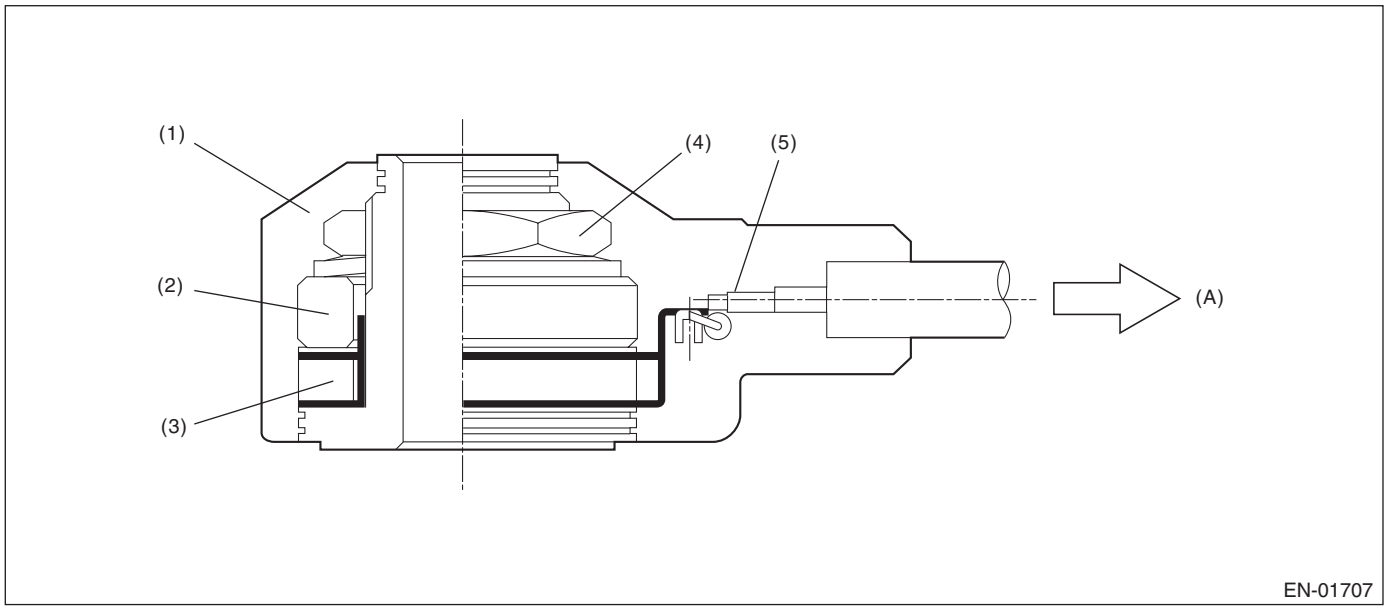
NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-92, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) To knock sensor harness

(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.243 V

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.243 V

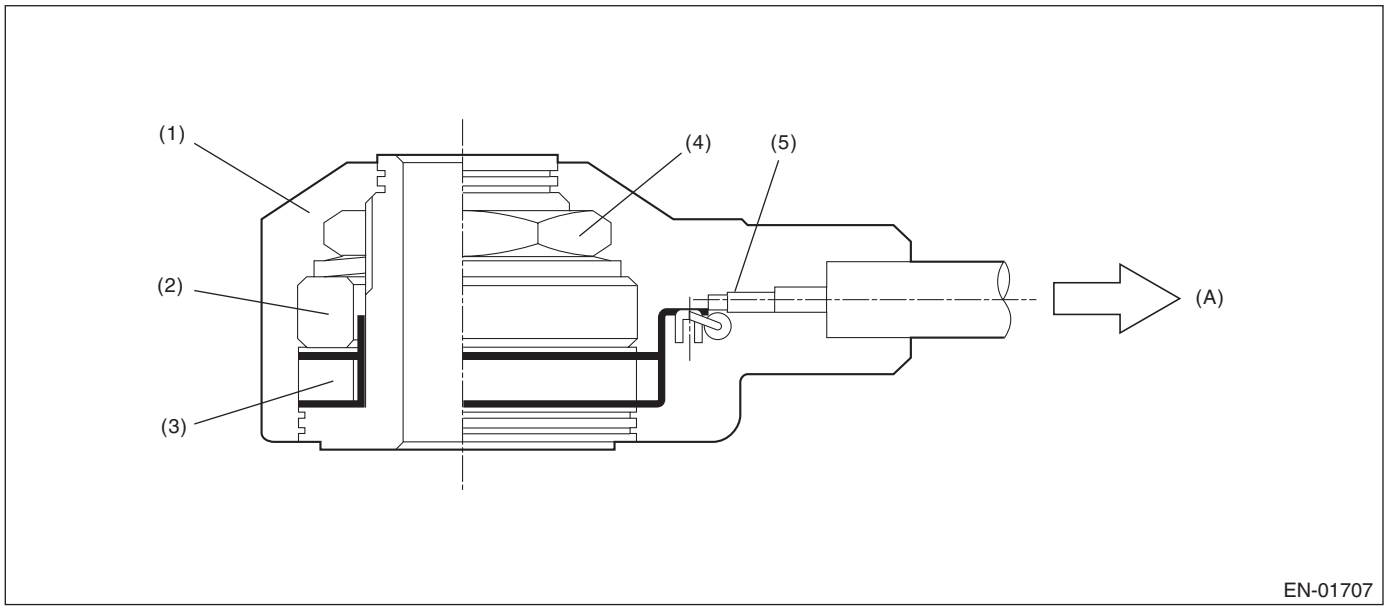
Time Needed for Diagnosis: Less than 1 second

BU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) To knock sensor harness

(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.709 V

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.709 V

Time Needed for Diagnosis: Less than 1 second

BV:DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0327. <Ref. to GD(H6DO)-98, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BW:DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

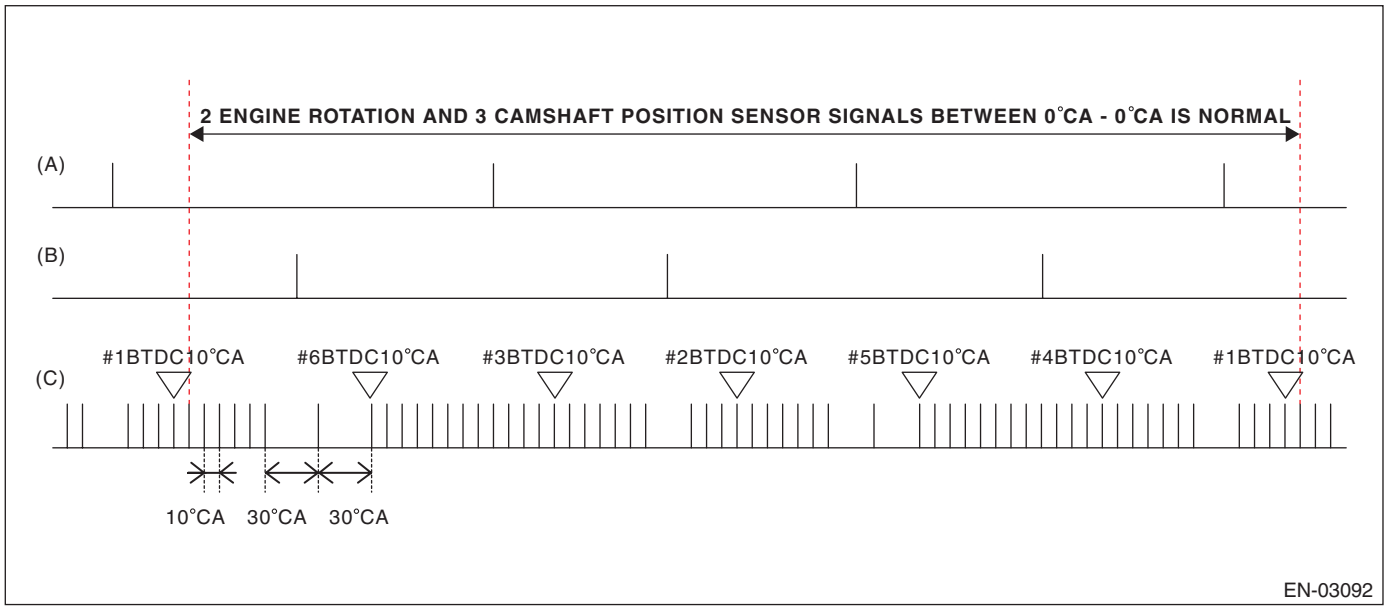
NOTE:
For the detection standard, refer to DTC P0328. <Ref. to GD(H6DO)-100, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BX:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

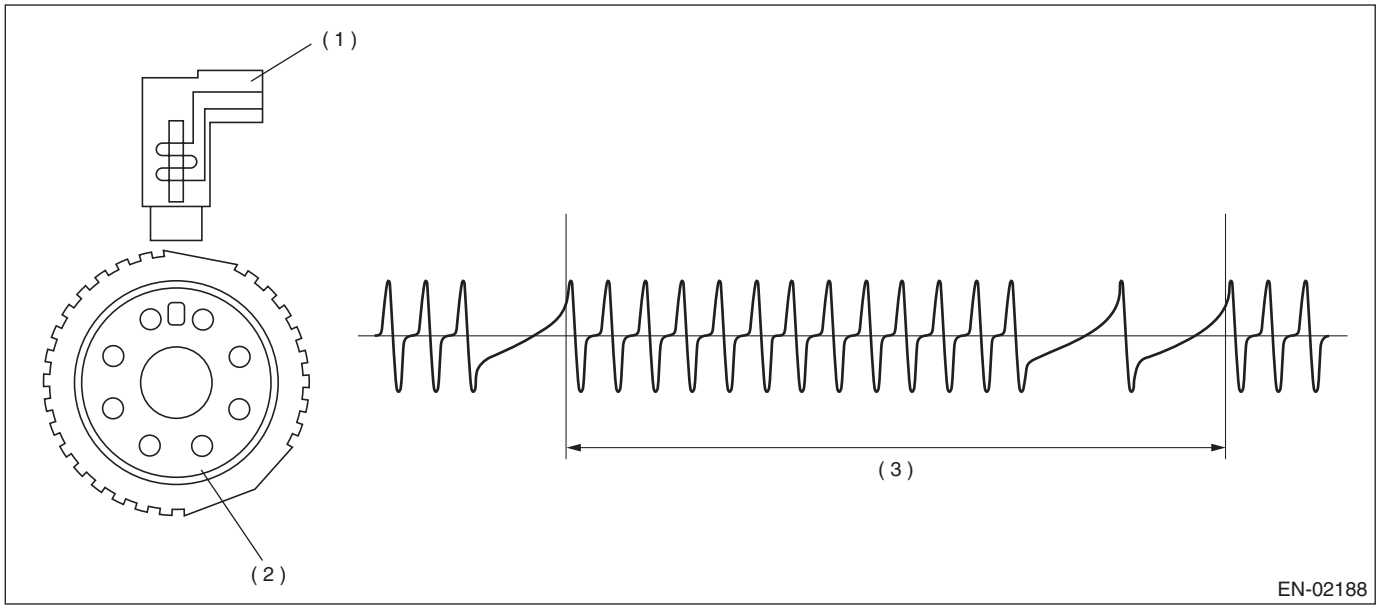
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the crankshaft position sensor.
Judge as NG when the crank signal is not input even though the starter was rotated.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH) (B) Camshaft signal (LH) (C) Crankshaft signal



(1) Crankshaft position sensor (2) Crank sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

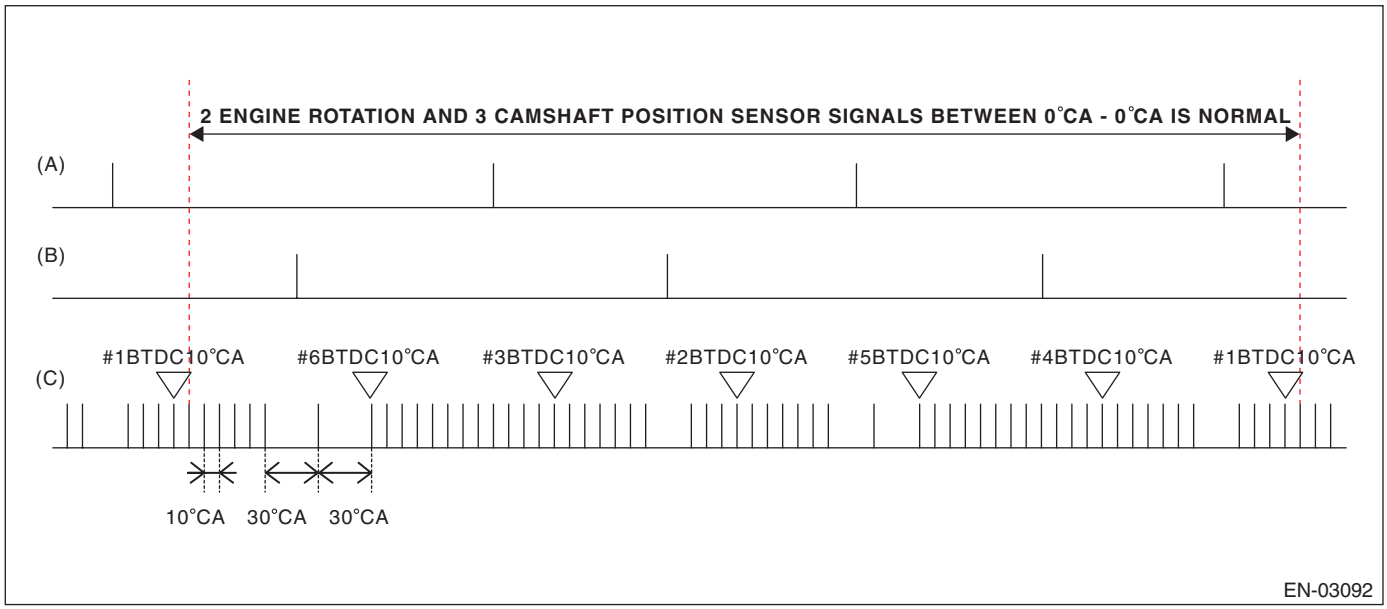
Time Needed for Diagnosis: Less than 1 second

BY:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

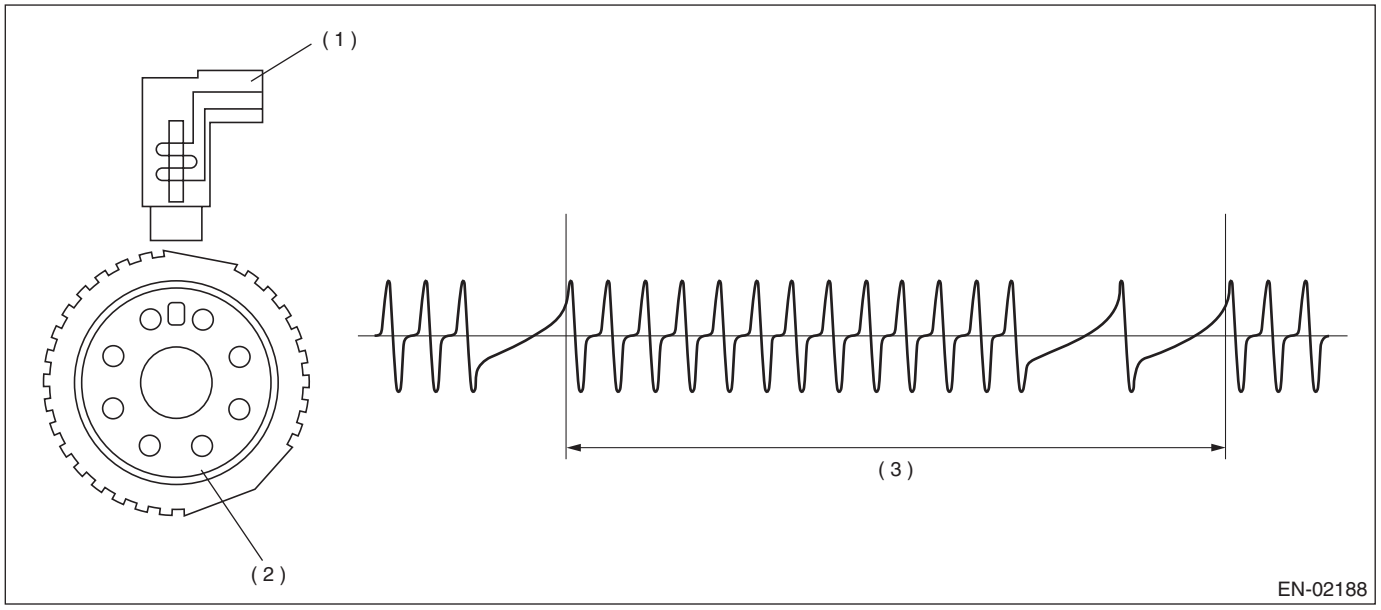
1. OUTLINE OF DIAGNOSIS

Detect for faults in crankshaft position sensor output properties.
Judge as NG when there is a problem in the number of crankshaft signals for every revolution.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH) (B) Camshaft signal (LH) (C) Crankshaft signal



(1) Crankshaft position sensor (2) Crank sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Engine speed	< 3000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs. engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev.	= 30

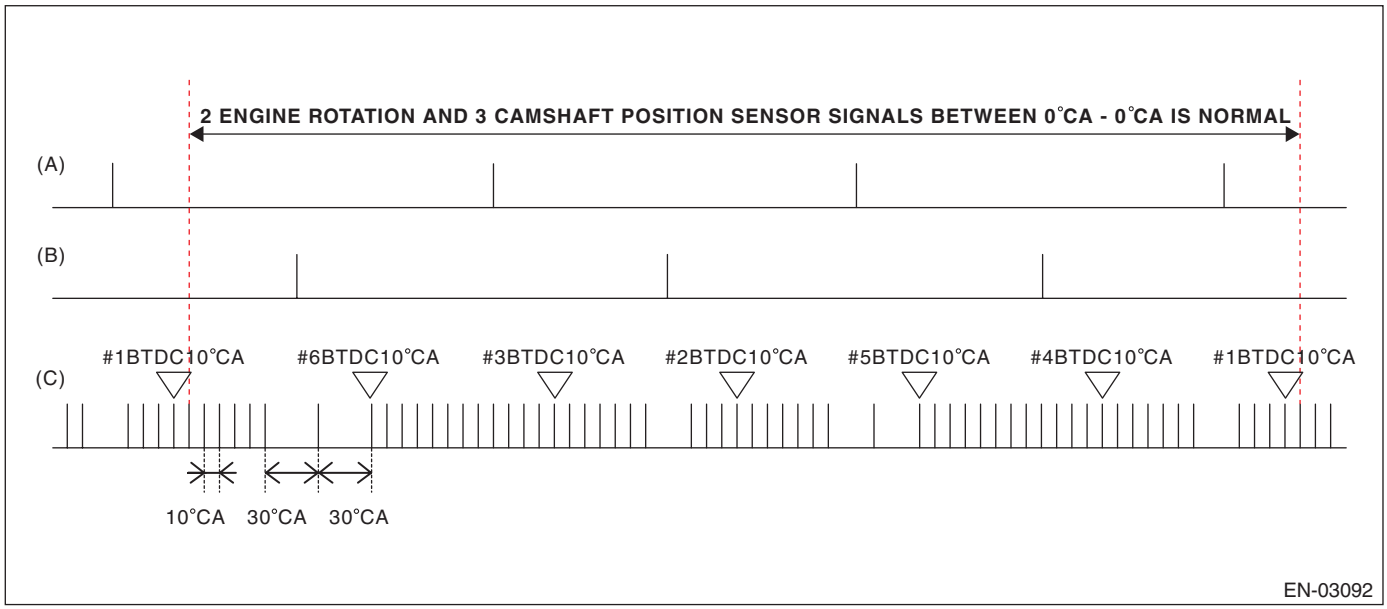
Time Needed for Diagnosis: Less than 1 second

BZ:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

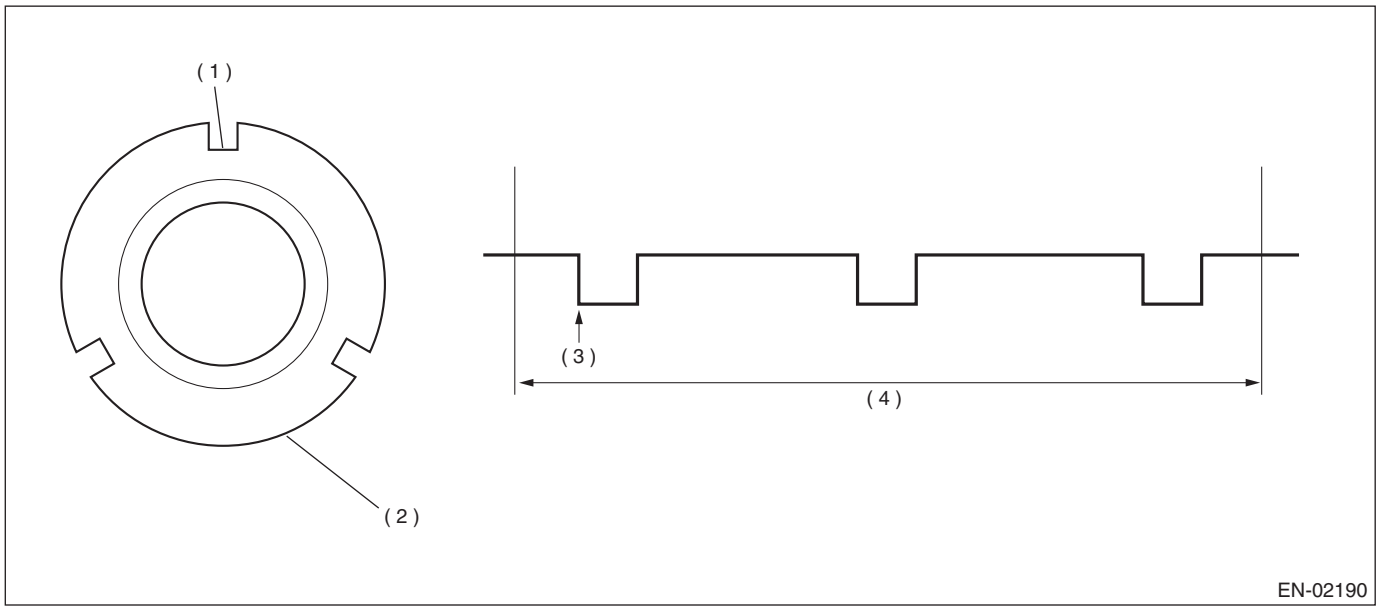
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the camshaft position sensor.
Judge as NG when the number of camshaft signals remains abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)
(B) Camshaft signal (LH)
(C) Crankshaft signal



(1) Throttle
(2) Camshaft plate
(3) Detecting point
(4) Camshaft one revolution (engine two revolutions)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment 1

Judge as NG when the condition where the number of camshaft position sensor signals are less than 3 times during 2 engine speed. continues.

Judgment Value

Malfunction Criteria	Threshold Value
Amount of camshaft sensor signal during 2 revs.	< 3 time(s)

Time Needed for Diagnosis: Engine two revolutions × 4 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment 1

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	≥ 3 time(s)

Time Needed for Diagnosis: Two engine revs.

• Abnormality Judgment 2

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Starter	ON
Camshaft position sensor signal	No input

Time Needed for Diagnosis: 3000 ms

• Normality Judgment 2

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	Input exists

Time Needed for Diagnosis: Less than 1 second

CA:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

1. OUTLINE OF DIAGNOSIS

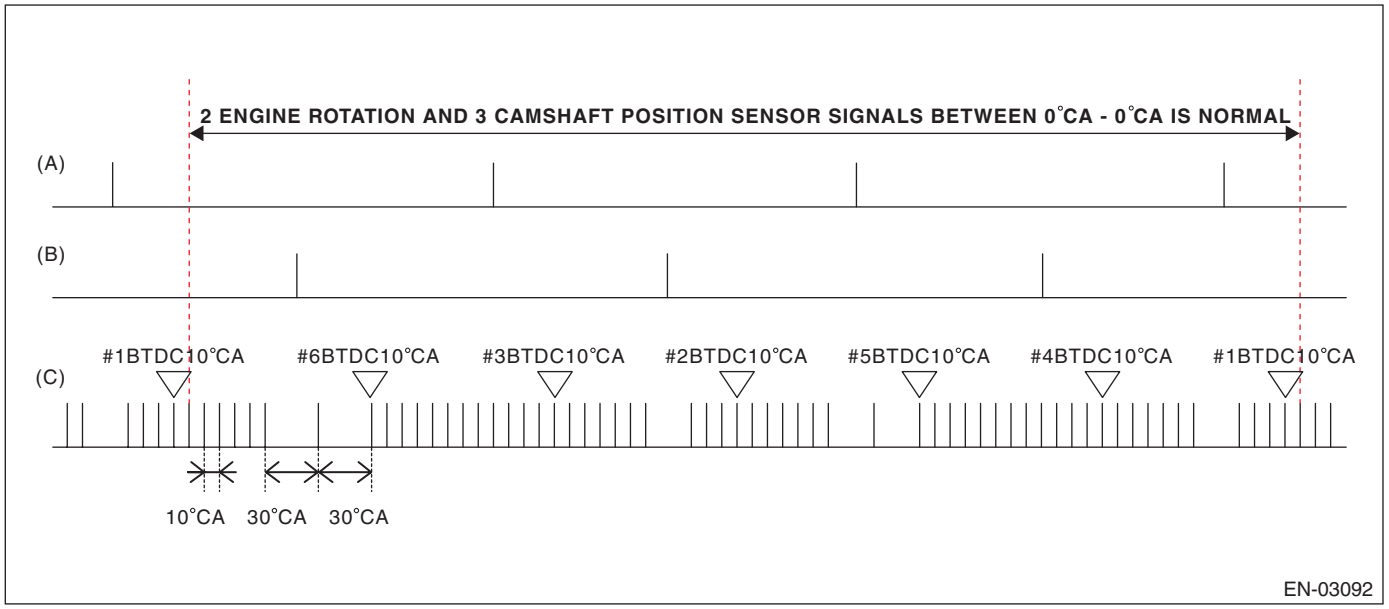
NOTE:
For the detection standard, refer to DTC P0340. <Ref. to GD(H6DO)-106, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CB:DTC P0365 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1)

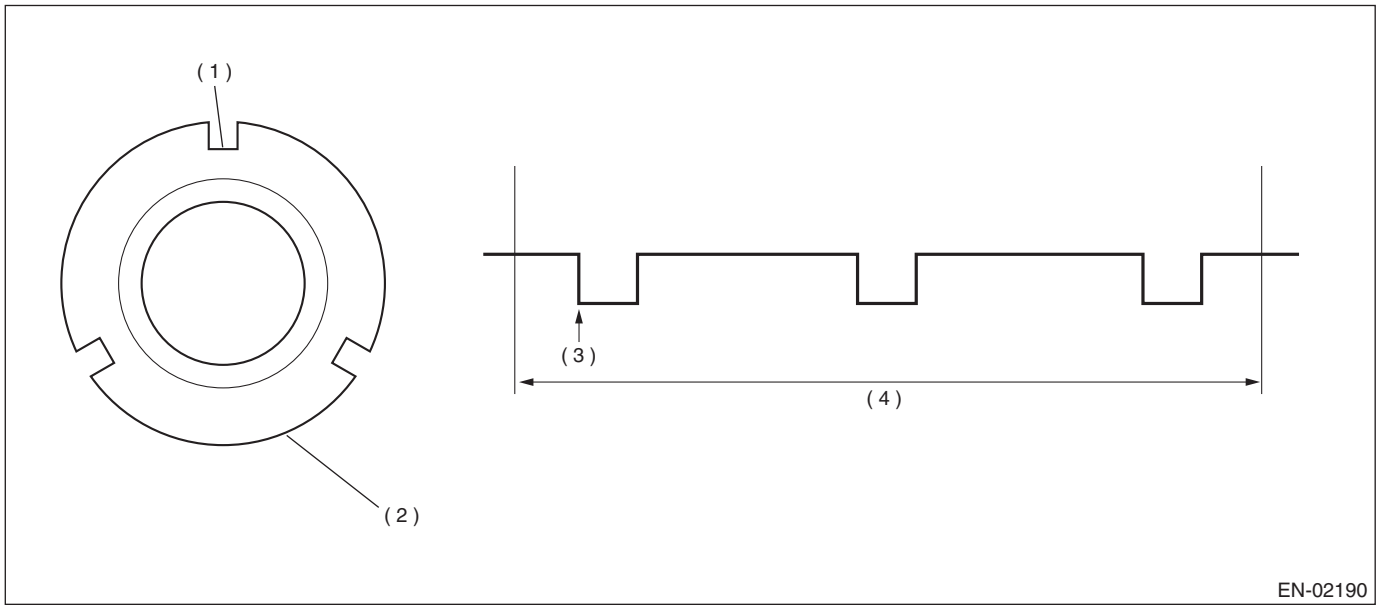
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the camshaft position sensor.
Judge as NG when the number of camshaft signals remains abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)
(B) Camshaft signal (LH)
(C) Crankshaft signal



(1) Throttle
(2) Camshaft plate
(3) Detecting point
(4) Camshaft one revolution (two engine revolutions)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the condition where the number of camshaft position sensor signals are less than 3 time(s) during 2 engine revs. continues.

Judgment Value

Malfunction Criteria	Threshold Value
Amount of camshaft sensor signal during 2 revs.	< 3 time(s)

Time Needed for Diagnosis: Two engine revolutions × 50
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	≥ 3 time(s)

Time Needed for Diagnosis: Two engine revolutions

CC:DTC P0390 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2)

1. OUTLINE OF DIAGNOSIS

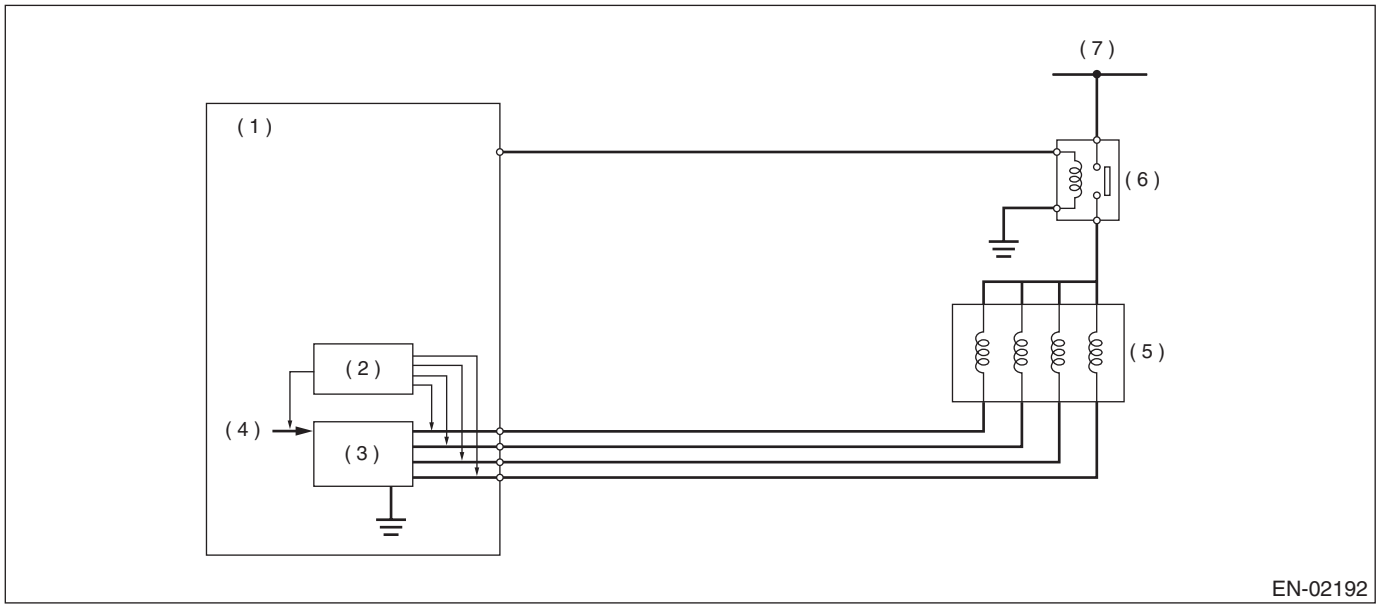
NOTE:
For the detection standard, refer to DTC P0365. <Ref. to GD(H6DO)-108, DTC P0365 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CD:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

1. OUTLINE OF DIAGNOSIS

Detect EGR system malfunction.
Intake manifold pressure (negative pressure) is constant because the throttle valve is fully closed during deceleration fuel cut. At this time, when the EGR valve is opened/closed, the intake manifold pressure will change. EGR System OK/NG is judged by the range of this change.

2. COMPONENT DESCRIPTION



(1) ECM
(2) Detecting circuit
(3) Switching circuit
(4) CPU
(5) EGR valve
(6) Main relay
(7) Battery power supply

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 40 s
Engine coolant temperature	≥ 75 °C(167 °F)
Engine speed	1200 rpm — 3250 rpm
Intake manifold pressure (absolute pressure)	< 46.7 kPa (350 mmHg, 13.8 inHg)
Ambient air temperature	≥ 5 °C(41 °F)
Throttle position	< 0.25 °
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Vehicle speed	≥53 km/h (32.9 MPH)
Fuel shut-off function	In operation
Neutral switch	OFF
After neutral switch ON/OFF change	≥ Value from Map
No load change (A/C, power steering, lighting, rear defogger, heater fan and radiator fan)	≥ 5000 ms

Map

Engine coolant temperature °C (°F)	–40 (–40)	–30 (–22)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
After neutral switch change msec	0	0	0	0	0	0	0	0

Engine coolant temperature °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
After neutral switch change msec	0	0	0	0	0	0	0	0

4. GENERAL DRIVING CYCLE

During deceleration fuel cut from 53 km/h (approx. 33 MPH) or more, perform diagnosis once.
Be careful of vehicle speed and engine speed. (Diagnosis will not be completed if the vehicle speed and engine speed conditions become out of specification due to deceleration.)

5. DIAGNOSTIC METHOD

Measure the pressure values when the enable conditions are established, and perform diagnosis by calculating those results.
1. Label the intake manifold pressure value as PMOF1, which is observed when enable conditions are established, and set the EGR target step to 50 steps (nearly full open).
2. Label the intake manifold pressure value as PMON, which is observed after one second has passed since EGR target step was set to 50 steps (when the enable conditions were established), and set the EGR target step to 0.
3. Label the intake manifold pressure as PMOF2, which is observed after one second has passed since EGR target step was set to 0 (after two seconds have passed since the enable conditions were established).

- **Abnormality Judgment**

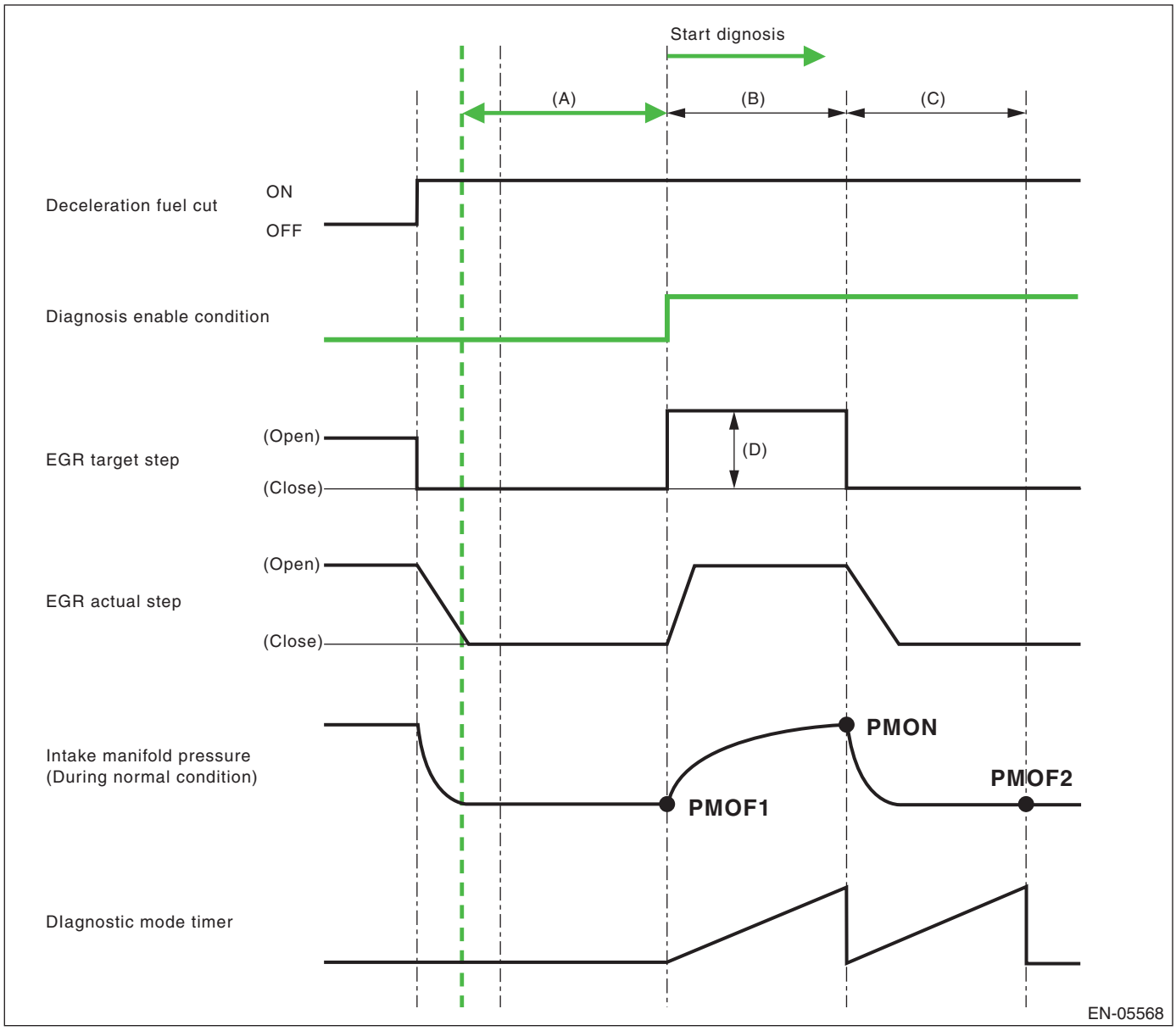
Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
PMON – (PMOF1 + PMOF2)/2	< 1.6 kPa (11.8 mmHg, 0.5 inHg)

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.



(A) 2000 ms
(B) 1500 ms
(C) 1500 ms
(D) 50 step(s)

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
PMON – (PMOF1 + PMOF2)/2	≥ 1.6 kPa (11.8 mmHg, 0.5 inHg)

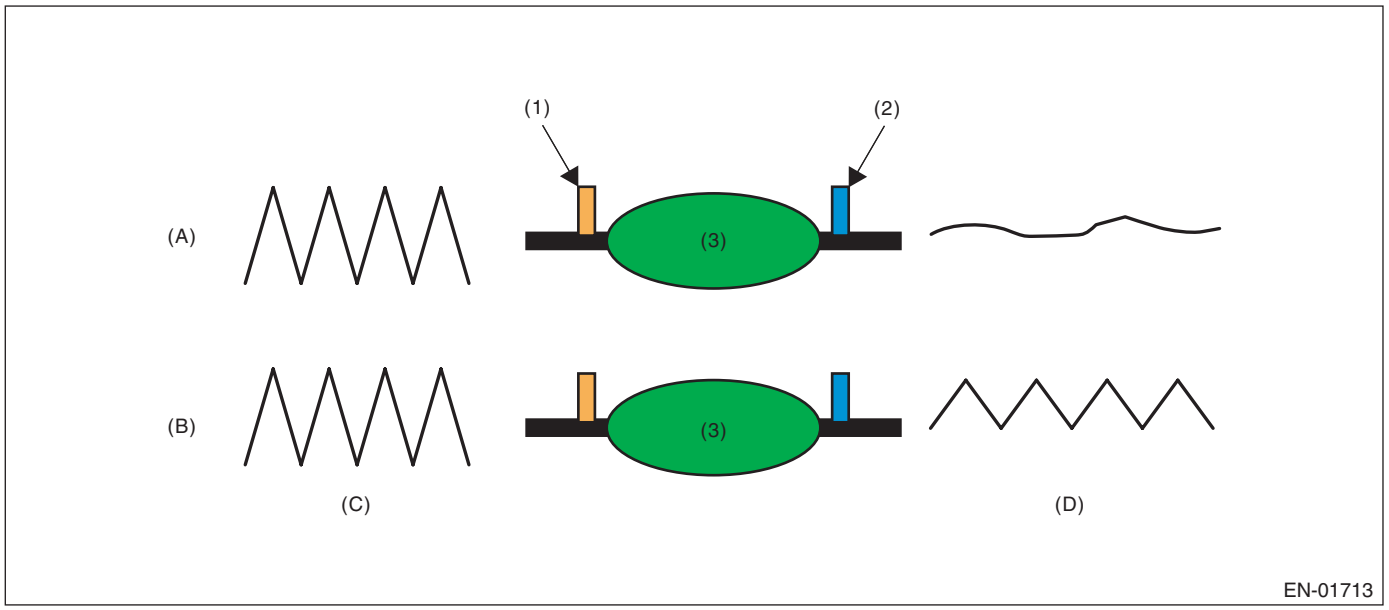
Time Needed for Diagnosis: 1 time

CE:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of the catalyst function.
Though the front oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened.
For this reason, the catalyst diagnosis is carried out by monitoring the front oxygen sensor output and comparing it with the front oxygen (A/F) sensor output.

2. COMPONENT DESCRIPTION



(A) Normal
(B) Deterioration
(C) Output waveform from the front oxygen (A/F) sensor
(D) Output waveform from the rear oxygen Sensor
(1) Front oxygen (A/F) sensor
(2) Front oxygen sensor
(3) Catalytic converter

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 75 °C (167 °F)
Estimated catalyst temperature	≥ 580 °C (1076 °F)
Misfire detection every 200 rotations	< 7 time(s)
Learning value of evaporation gas density	< 0.2
Sub feedback	In operation
Evaporative system diagnosis	Not in operation
Time of difference (< 0.10) between actual lambda and target lambda	≥ 1000 ms
Vehicle speed	> 60 km/h (37.3 MPH)
Amount of intake air	≥ 10 g/s (0.35 oz/s) and < 70 g/s (2.47 oz/s)
Engine load change every 0.5 engine revs.	< 0.02 g/rev (0 oz/rev)
Rear oxygen output change from 660 mV or less to 660 mV or more	Experienced after fuel cut
Elapsed time after starting the engine	≥ 220 s
Purge execution calculated time	≥ 5 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at a constant 60 km/h (37.3 MPH) or higher.

5. DIAGNOSTIC METHOD

After establishing the execution conditions, calculate the front oxygen (A/F) sensor lambda deviation cumulative value per 32 milliseconds × 4 (Σ |(sglmd$_n$ – sglmd$_{n-1}$)|) and rear oxygen sensor output voltage deviation cumulative value (Σ |(ro2sad$_n$ – ro2sad$_{n-1}$)|), and when the front oxygen (A/F) sensor lambda deviation cumulative value (Σ |(sglmd$_n$ – sglmd$_{n-1}$)|) becomes the predetermined value or more, calculate the diagnostic value.

• Abnormality Judgment

If the duration of time while the following conditions are met is within the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Σ |(ro2sad$_n$ – ro2sad$_{n-1}$)| / Σ |(sglmd$_n$ – sglmd$_{n-1}$)|	> 25

Time Needed for Diagnosis: 30 — 55 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is within the predetermined time.

Judgment Value

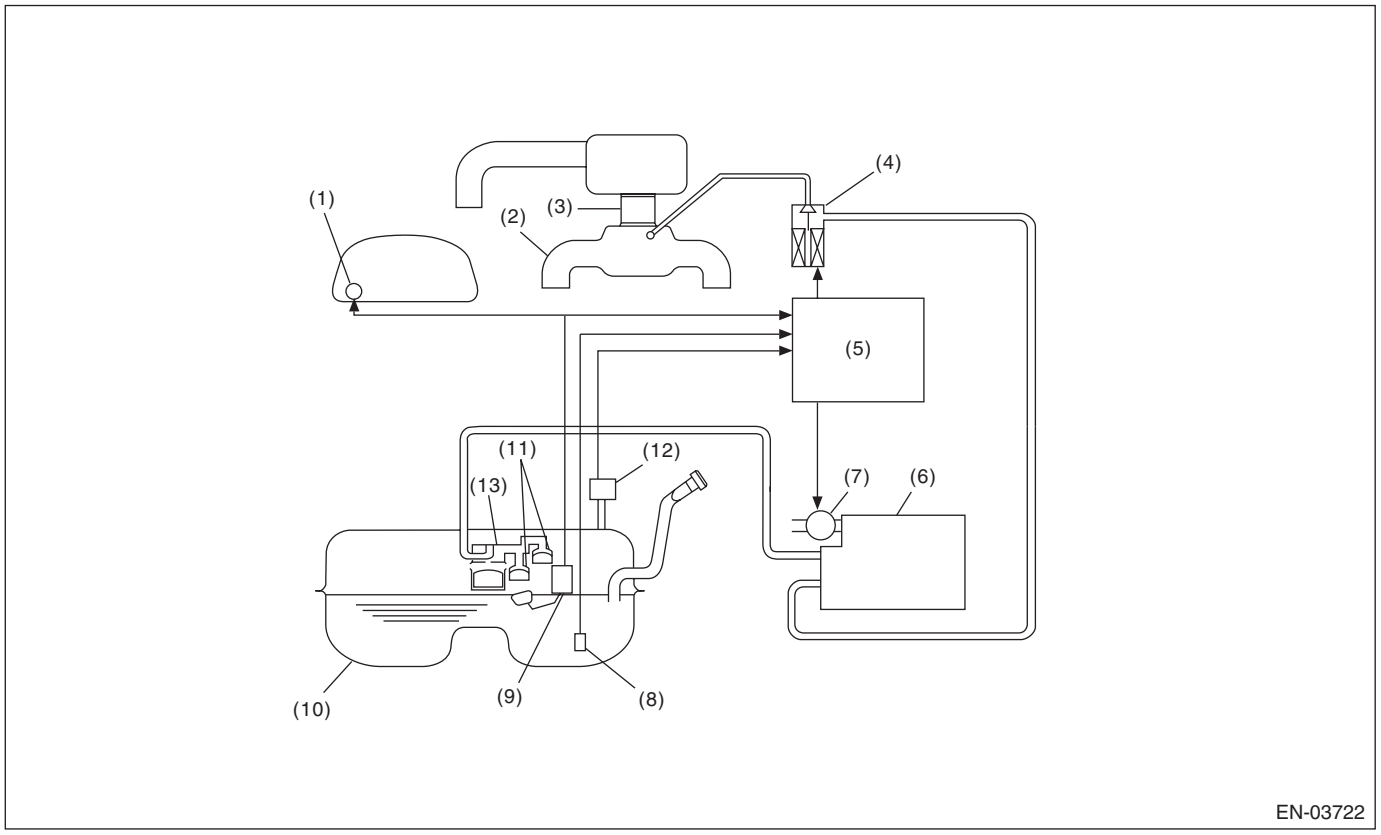
Malfunction Criteria	Threshold Value
Σ |(ro2sad$_n$ – ro2sad$_{n-1}$)| / Σ |(sglmd$_n$ – sglmd$_{n-1}$)|	≤ 25

Time Needed for Diagnosis: 30 — 55 seconds

CF:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

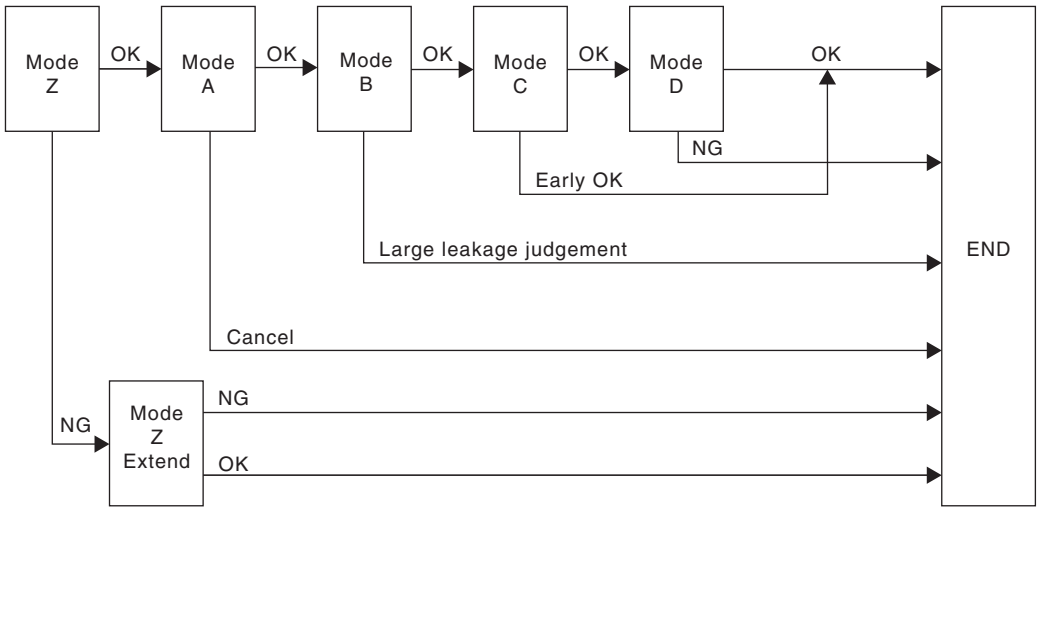
Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.



(1) Fuel gauge
(2) Intake manifold
(3) Throttle body
(4) Purge control solenoid valve
(5) Engine control module (ECM)
(6) Canister
(7) Drain valve
(8) Fuel temperature sensor
(9) Fuel level sensor
(10) Fuel tank
(11) Fuel cut valve
(12) Fuel tank pressure sensor
(13) Vent valve

In this system diagnosis, check for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor. When in 0.04 inch diagnosis, perform in the order of mode Z → mode A → mode B → mode C and mode D; When in 0.02 inch diagnosis, perform in the order of mode A → mode B → mode C → mode D and mode E.

0.04-inch Diagnosis

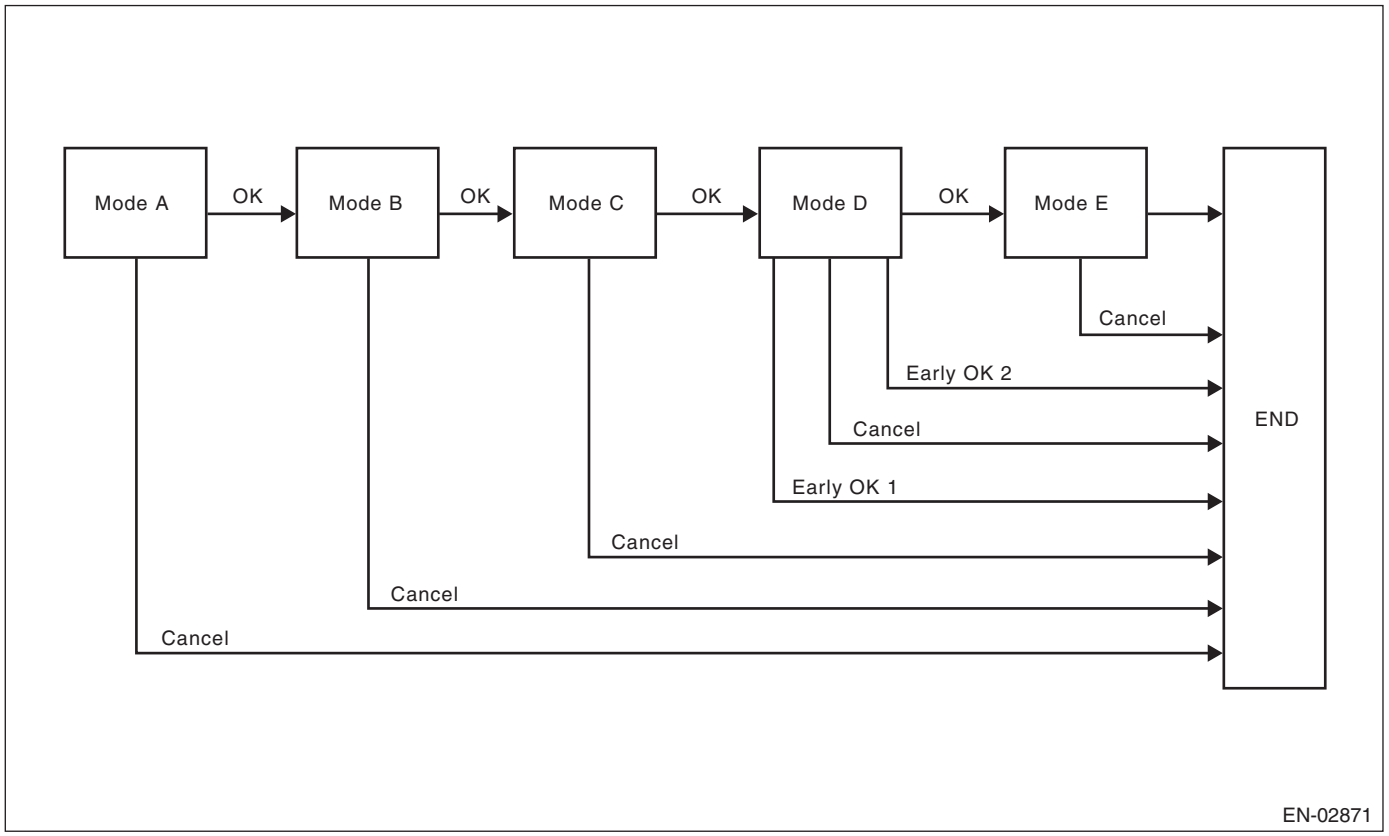


Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve opening failure diagnosis)	Perform purge control solenoid valve opening failure diagnosis from the size of tank pressure variation from diagnosis start.	5000 ms + 3000 ms — 5000 ms + 3000 ms + 13000 ms
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10000 ms
Mode B (Sealed negative pressure, large leakage judgment)	Decrease the pressure in the tank to the target value by introducing the intake manifold pressure to the fuel tank. If the tank pressure cannot be reduced, it is diagnosed as large leak.	0 — 10000 ms + 25000 ms
Mode C (Pressure increase check, advanced OK judgment)	Wait until the tank pressure returns to the target (start level of P2 calculation). If the tank pressure does not become the value, make advanced OK judgment.	0 — 14230 ms
Mode D (Negative pressure variation measurement, evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 found in Mode A. Perform the evaporation diagnosis using the diagnostic value.	0 ms + 10000 ms

Mode Table for Evaporative Emission Control System Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Roughly the same as barometric pressure (Same as 0 kPa (0 mmHg, 0 inHg))	Purge control solenoid valve is judged to be open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.	—	None
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leak	P0457
Mode C	Reaches target pressure	—	None
Mode D	Pressure change is small.	EVAP system large leak determination. [1.0 mm (0.04 in)]	P0442

0.02-inch Diagnosis



Mode	Mode Description	Diagnosis Period
Mode A (0 point compensation)	When the pressure in the tank is not near 0 mmHg, wait until it returns to 0 point (near 0 mmHg).	0 — Value of Map 1
Mode B (Negative pressure introduced)	Decrease the pressure in the tank to the target value by introducing the intake manifold pressure to the fuel tank.	0 — Value of Map 2
Mode C (Negative pressure maintained)	Wait until the tank pressure returns to the target (start level of P2 calculation).	Value of Map 3
Mode D (Negative pressure change calculated)	Calculate the time it takes for the tank pressure to change to the Mode E shifting pressure. If the tank pressure does not change to the Mode E shifting pressure, make advanced OK judgment.	0 — 0 ms + Value of Map 4
Mode E (Evaporation generated amount calculation)	Calculate the amount of evaporation (P1).	0 — 0 ms + Value of Map 4 + Value of Map 5

Map 1

Fuel level (ℓ , US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Time Needed for Diagnosis (ms)	6400	6400	6530	6660	7020	7380	7380

Map 2

Fuel level (ℓ , US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Time Needed for Diagnosis (ms)	19600	19600	19600	19600	21050	22500	22500

Map 3

Fuel level (ℓ , US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2	70, 18.49, 15.4
Time Needed for Diagnosis (ms)	18819	18819	18819	18819	18819	18819	18819	18819

Map 4

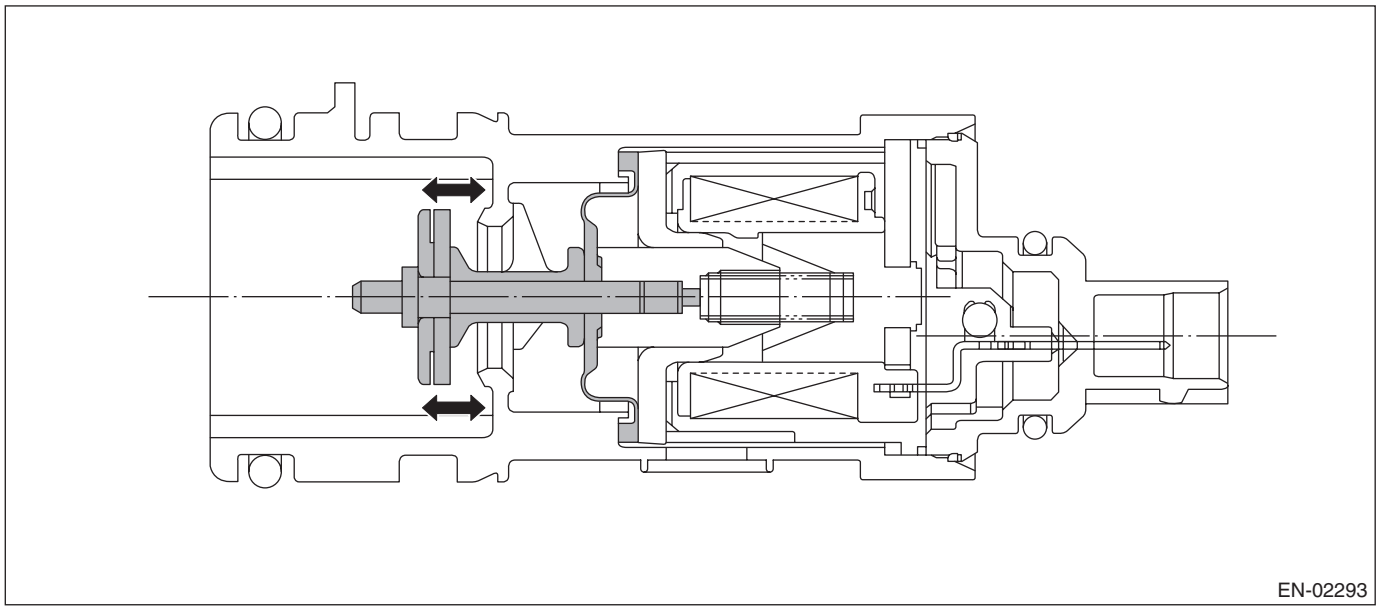
Fuel level (ℓ , US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2	70, 18.49, 15.4
Time Needed for Diagnosis (ms)	200000	200000	200000	200000	200000	200000	200000	200000

Map 5

Fuel level (ℓ , US gal, Imp gal)	10	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Time Needed for Diagnosis (ms)	80000	70000	60000	60000	60000	60000

2. COMPONENT DESCRIPTION

Drain valve controls the ambient air to be introduced to the canister.



3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	≥ 120000 ms
Learning value of evaporation gas density	< 0.08
Engine speed	1050 rpm — 7000 rpm
Fuel tank pressure	≥ –4 kPa (–30 mmHg, –1.2 inHg)
Intake manifold relative vacuum (relative pressure)	≥ –26.7 kPa (–200 mmHg, –7.9 inHg)
Duration time of fuel level 10.5 ℓ (2.77 US gal, 2.31 Imp gal) — 59.5 ℓ (15.72 US gal, 13.09 Imp gal)	≥ 5000 ms
Closed air/fuel ratio control	In operation
Fuel temperature	–10 °C (14 °F) — 45 °C (113 °F)
Intake air temperature	≥ –10 °C (14 °F)
Pressure change every 1 second	< 1.7 mmHg (Mode A) < 1.7 mmHg (Mode D)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 1.7 mmHg (Mode A) < 1.7 mmHg (Mode D)
Fuel level change every 128 milliseconds	< Value of Map 6
Air fuel ratio	0.76 — 1.25
Elapsed time after starting the engine	≥ 851 s
or	
Elapsed time after starting the engine	≥ 335 s and Vehicle speed 72 km/h (44.7 MPH) or more

Map 6

Fuel level (ℓ , US gal, Imp gal)	10, 2.64, 2.2	20, 5.28, 4.4	25, 6.61, 5.5	30, 7.93, 6.6	43, 11.36, 9.46	45, 11.89, 9.9	50, 13.21, 11	60, 15.85, 13.2
Change (ℓ , US gal, Imp gal)	4, 1.06, 0.88	5, 1.32, 1.1	6.5, 1.72, 1.43	4, 1.06, 0.88	5, 1.32, 1.1	5, 1.32, 1.1	6, 1.59, 1.32	8, 2.11, 1.76

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
At starting a diagnosis	
Evap. diagnosis	Incomplete
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Time since last incomplete 0.02-inch leakage diagnosis	
When cancelling in mode A	> 120000 ms
When cancelling in other than mode A	> 600000 ms
Total time of canister purge operation	≥ 120000 ms
Elapsed time after starting the engine	≥ 120 s
Fuel temperature	–10 °C (14 °F) — 55 °C (131 °F)
Duration time of fuel level 10.5 ℓ (2.77 US gal, 2.31 Imp gal) — 59.5 ℓ (15.72 US gal, 13.09 Imp gal)	≥ 120000 ms
Intake manifold relative vacuum (relative pressure)	≥ –8 kPa (–60 mmHg, –2.4 inHg)
Fuel tank pressure	–0.7 kPa (–5 mmHg, –0.2 inHg) — 0.4 kPa (2.9 mmHg, 0.1 inHg)
Closed air/fuel ratio control	In operation
Engine speed	1050 rpm — 7000 rpm
Vehicle speed	50 km/h (31.1 MPH) — 510 km/h (316.9 MPH) continues for 125000 ms
During diagnosis	
Change of fuel level	≤ Value of Map 7
Pressure change every 1 second	< 0 kPa (0.3 mmHg, 0 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 0.1 kPa (0.564 mmHg, 0 inHg) (Mode D)
| Tank pressure change every 1 second |	≤ 0.1 kPa (0.425 mmHg, 0 inHg)
Barometric pressure change	–0.5 kPa (–3.6 mmHg, –0.1 inHg) — 0.3 kPa (2.4 mmHg, 0.1 inHg) (Mode D) –0.3 kPa (–2.4 mmHg, –0.1 inHg) — 0.3 kPa (2.4 mmHg, 0.1 inHg) (Mode E)

Map 7

Fuel level (ℓ , US gal, Imp gal)	10, 2.64, 2.2	20, 5.28, 4.4	25, 6.61, 5.5	30, 7.93, 6.6	43, 11.36, 9.46	45, 11.89, 9.9	50, 13.21, 11	60, 15.85, 13.2
Change (ℓ , US gal, Imp gal)	4, 1.06, 0.88	5, 1.32, 1.1	6.5, 1.72, 1.43	4, 1.06, 0.88	5, 1.32, 1.1	5, 1.32, 1.1	6, 1.59, 1.32	8, 2.11, 1.76

4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis

- Perform the diagnosis only once in 335 seconds or more after starting the engine, at a constant speed of 72 km/h (45 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

0.02-inch Diagnosis

- Perform the diagnosis 125 seconds or more at a constant engine speed of 50 km/h (31 MPH) or higher to judge as NG or OK.
- If judgment cannot be made, repeat the diagnosis.
- Pay attention to the fuel level.

5. DIAGNOSTIC METHOD

Purge control solenoid valve stuck open fault diagnosis

DTC
P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, the purge control solenoid valve must operate normally. Therefore, mode Z is used to diagnose the purge control solenoid valve stuck open condition. Note that if a purge control solenoid valve stuck open fault is detected, the EVAP system leakage diagnosis is cancelled.

Diagnostic method

Purge control solenoid valve functional diagnosis is performed by monitoring the tank pressure in mode Z.

- **Abnormality Judgment**

If OK judgment cannot be made, extend Mode Z, and Judge as NG when the following conditions are established after predetermined amount of time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
evptez – evptezha	> 0.6 kPa (4.5 mmHg, 0.2 inHg)	P0457
evptezini	≤ 0.4 kPa (2.9 mmHg, 0.1 inHg)	
Time with no fuel sloshing equal to or over the value of Map 6	≥ 40000 ms	

Time Needed for Diagnosis: 5000 ms + 3000 ms + 13000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

When judgment for purge control solenoid valve stuck open NG is made, end the evaporative diagnosis.

Cancel the evaporative diagnosis when the OK/NG judgment for purge control solenoid valve stuck open cannot be made in Mode Z.

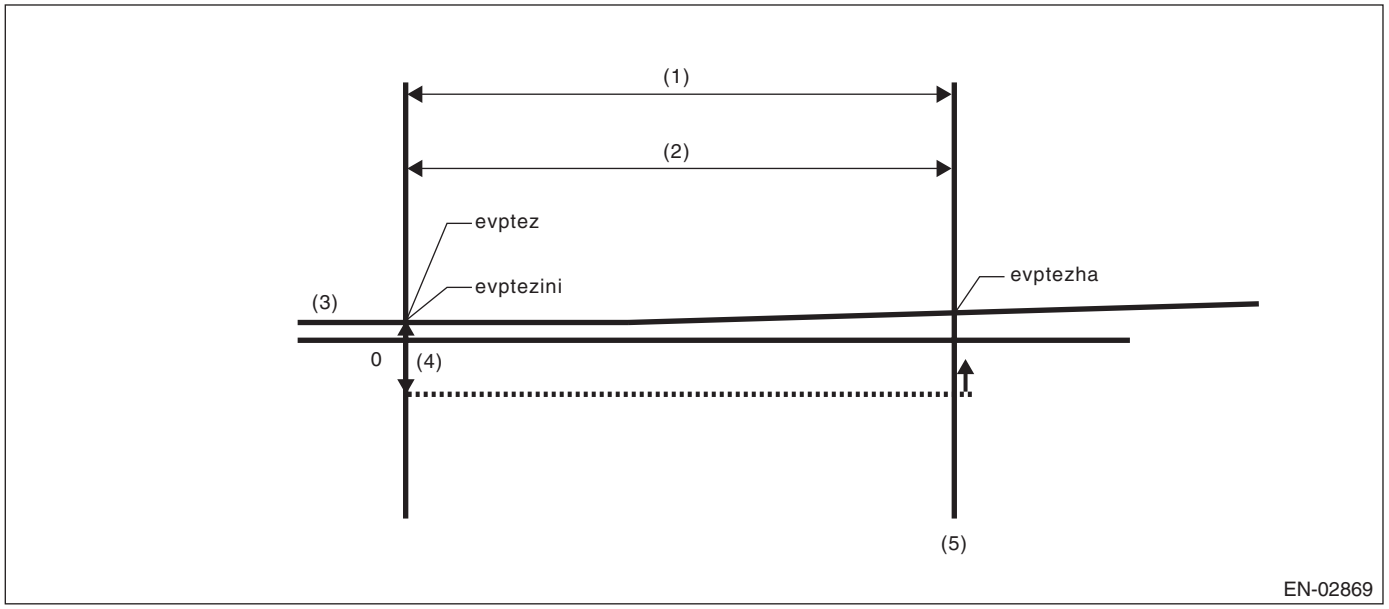
- **Normality Judgment**

Judge as OK and change to Mode A when the following conditions are established after 3000 ms has passed since Mode Z started.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
evptez – evptezha	≤ 0.4 kPa (3 mmHg, 0.1 inHg)	P0457

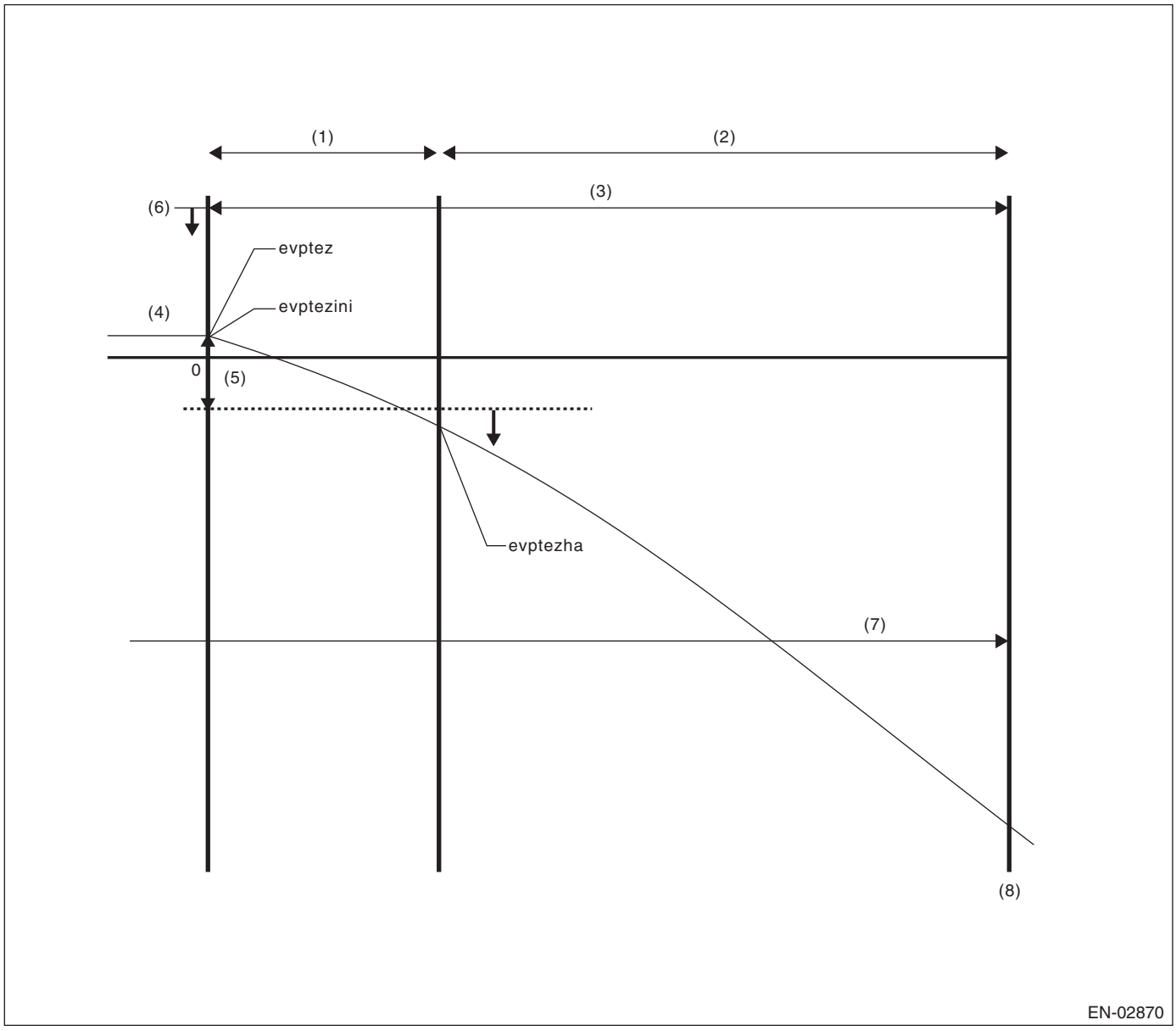
Normal



(1) Mode Z
(2) 3000 ms
(3) Fuel tank pressure
(4) 0.4 kPa (3 mmHg, 0.1 inHg)
(5) OK judgment

evptez – evptezha ≤ 0.4 kPa (3 mmHg, 0.1 inHg) Normal when above is established
Time Needed for Diagnosis: 5000 ms + 3000 ms

Purge control solenoid valve Open Fixation



(1) Mode Z
(2) Extended mode Z
(3) 5000 ms + 3000 ms + 13000 ms
(4) Fuel tank pressure
(5) 0.6 kPa (4.5 mmHg, 0.2 inHg)
(6) 0.4 kPa (2.9 mmHg, 0.1 inHg)
(7) 40000 ms no fuel sloshing
(8) NG judgment

- evptezini ≤ 0.4 kPa (2.9 mmHg, 0.1 inHg)
- evptez – evptezha > 0.6 kPa (4.5 mmHg, 0.2 inHg)
- No fuel sloshing equal to or over the value of Map 6 for 40000 ms or more

Judge as abnormal when all are established.

Leak Diagnosis

DTC
P0442 Evaporative Emission Control System Leak Detected (Small Leak)
P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

- The diagnostic consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to barometric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (Estimated evaporation gas amount)
Calculate the tank pressure change amount (P1) when using mode A. After calculating P1, switch to mode B.
Mode B: (Negative pressure sealed)
Introduce negative pressure in the intake manifold to the tank.
Approx. 0 → –1.4 kPa (0 → –10.5 mmHg, 0 → –0.4 inHg)
When the pressure above (desired negative pressure) is reached, enters Mode C.
In this case, if the tank pressure does not reach the target negative pressure, judge that there is a large leakage in the system and terminate the evaporative emission control system diagnosis.
Abnormality Judgment
Judge as NG (large leakage) when the following conditions are established.
Judgment Value

Malfunction Criteria	Threshold Value	DTC
Time to reach target negative pressure	≥ 10000 ms + 25000 ms	P0457
or		
Mode B time	≥ 10000 ms	
(Min. pressure value in tank when in mode B) – (Tank pressure when mode B started)	> –0.5 kPa (–4 mmHg, –0.2 inHg)	

Time Needed for Diagnosis: 5000 ms + 3000 ms + 10000 ms + 10000 ms + 25000 ms
Mode C: (Check pressure rise)
Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)
Change to Mode D when the tank pressure returns to the start level of P2 calculation.
Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

Tank pressure when starting calculation of P2	Time for advanced OK judgment
–1.3 kPa (–9.75 mmHg, –0.4 inHg)	14230 ms

Time Needed for Diagnosis: 5000 ms + 3000 ms + 10000 ms + 10000 ms + 25000 ms + 14230 ms
Mode D: (Measure amount of negative pressure change)
Monitor the tank pressure change amount when using mode D. In this case, the tank pressure increases, (nears barometric pressure) because evaporation occurs. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.
After calculating P2, perform a small leak diagnosis according to the items below.
When Mode D is ended
Assign tank variations measured in Mode A and Mode D, P1 and P2, to the formula below, judge small leaks in the system. If the measured judgment value exceeds the threshold value, it is judged to be a malfunction.

Abnormality Judgment
Judge as NG when the following conditions are established within the predetermined time. Judge as OK and clear the NG if the following conditions are not established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 – × P1 P2: Tank pressure that changes every 10000 ms in mode D P1: Tank pressure that changes every 10000 ms in mode A	> Value of Map 8	P0442

*1.5 –: Evaporation amount compensation value when below negative pressure (Amount of evaporation occurrence increases as a vacuum condition increases.)

Map 8 Malfunction criteria limit for evaporation diagnosis

Fuel temperature vs. Fuel level	15 °C (59 °F)	25 °C (77 °F)	35 °C (95 °F)	45 °C (113 °F)
10.5 ℓ (2.77 US gal, 2.31 Imp gal)	0.3 kPa (2.1 mmHg, 0.1 inHg)	0.3 kPa (2.1 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.4 mmHg, 0.1 inHg)
27 ℓ (7.13 US gal, 5.94 Imp gal)	0.3 kPa (2.32 mmHg, 0.1 inHg)	0.3 kPa (2.5 mmHg, 0.1 inHg)	0.4 kPa (2.725 mmHg, 0.1 inHg)	0.4 kPa (2.875 mmHg, 0.1 inHg)
43 ℓ (11.36 US gal, 9.46 Imp gal)	0.4 kPa (2.876115385 mmHg, 0.1 inHg)	0.4 kPa (2.968181818 mmHg, 0.1 inHg)	0.4 kPa (3.229545455 mmHg, 0.1 inHg)	0.5 kPa (3.429545455 mmHg, 0.1 inHg)
59.5 ℓ (15.72 US gal, 13.09 Imp gal)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.5 kPa (3.7 mmHg, 0.1 inHg)

Time Needed for Diagnosis: 5000 ms + 3000 ms + 10000 ms + 10000 ms + 25000 ms + 14230 ms + 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Leak Diagnosis

DTC
P0456 Evaporative Emission Control System Leak Detected (very small leak)
- The diagnostic consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to barometric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (0 point compensation)
When the pressure in the tank is not near 0 mmHg, wait until it returns to 0 point (near 0 mmHg). Shift to mode B when returned to the 0 point. Cancel the diagnosis when 0 point does not return in the specified time.
Mode B: (Negative pressure introduced)
Introduce negative pressure in the intake manifold to the tank.
Approx. 0 → –2 kPa (0 → –15 mmHg, 0 → –0.6 inHg)
When the pressure above (desired negative pressure) is reached, enters Mode C.
When the tank internal pressure does not reach the target negative pressure, the diagnosis is cancelled.
Mode C: (Negative pressure maintained)
Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)
Change to Mode D either when the tank pressure returns to the start level of P2 calculation, or when the predetermined amount of time has passed.
Mode D: (Calculate the amount of negative pressure change)
Monitor the tank pressure in mode D, calculate the pressure change in the tank (P2), and measure the time (evpdset) for the tank pressure to change to the Mode E shifting pressure. When the Mode E shifting pressure is reached, Mode E is entered. If it does not change to the Mode E shifting pressure after the predetermined amount of time has passed, make advanced OK judgment or cancel the diagnosis according to the value of P2.

Normality Judgment
Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Advanced OK judgment 1	
Mode D time	≥ 0 ms + 20000 ms
Tank internal pressure	≤ Value of Map 9
Advanced OK judgment 2	
Mode D time	≥ 0 ms + Value of Map 10
P2	≤ Value of Map 11

Map 9

Fuel level (ℓ , US gal, Imp gal)	0, 0, 0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Tank pressure (kPa, mmHg, inHgl)	–1.9, –13.9, –0.5	–1.9, –13.9, –0.5	–1.8, –13.8, –0.5	–1.8, –13.7, –0.5	–1.8, –13.6, –0.5	–1.8, –13.5, –0.5	–1.8, –13.5, –0.5

Map 10

Fuel level (ℓ , US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2	70, 18.49, 15.4
Time Needed for Diagnosis (ms)	200000	200000	200000	200000	200000	200000	200000	200000

Map 11

Fuel level (ℓ , US gal, Imp gal)	0, 0, 0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Tank pressure (kPa, mmHg, inHgl)	0.9, 7, 0.3	0.9, 7, 0.3	0.9, 7.05, 0.3	0.9, 7.1, 0.3	1.1, 8.2, 0.3	1.3, 9.6, 0.4	1.3, 9.6, 0.4

Mode E: (Evaporation occurrence amount calculation)
Calculate the change of tank pressure with the time evpdset (P1) to judge as NG/OK according to the value of P1. (ambiguous determination acceptable).

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
P1	< Value of Map 12

Map 12 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs. Fuel level	0 ms	30000 ms	50000 ms	100000 ms	160000 ms	200000 ms
16 ℓ (4.23 US gal, 3.52 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
38 ℓ (10.04 US gal, 8.36 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.3 kPa (2 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0 kPa (0 mmHg, 0 inHg)

Time Needed for Diagnosis: Value of Map 1 + Value of Map 2 + Value of Map 3 + 0 ms + Value of Map 4 + 0 ms + Value of Map 4 + Value of Map 5
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
P1	> Value of Map 13

Map 13 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs. Fuel level	0 ms	30000 ms	50000 ms	100000 ms	160000 ms	200000 ms
16 ℓ (4.23 US gal, 3.52 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)
38 ℓ (10.04 US gal, 8.36 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.4 kPa (3 mmHg, 0.1 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.2 kPa (1.5 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)

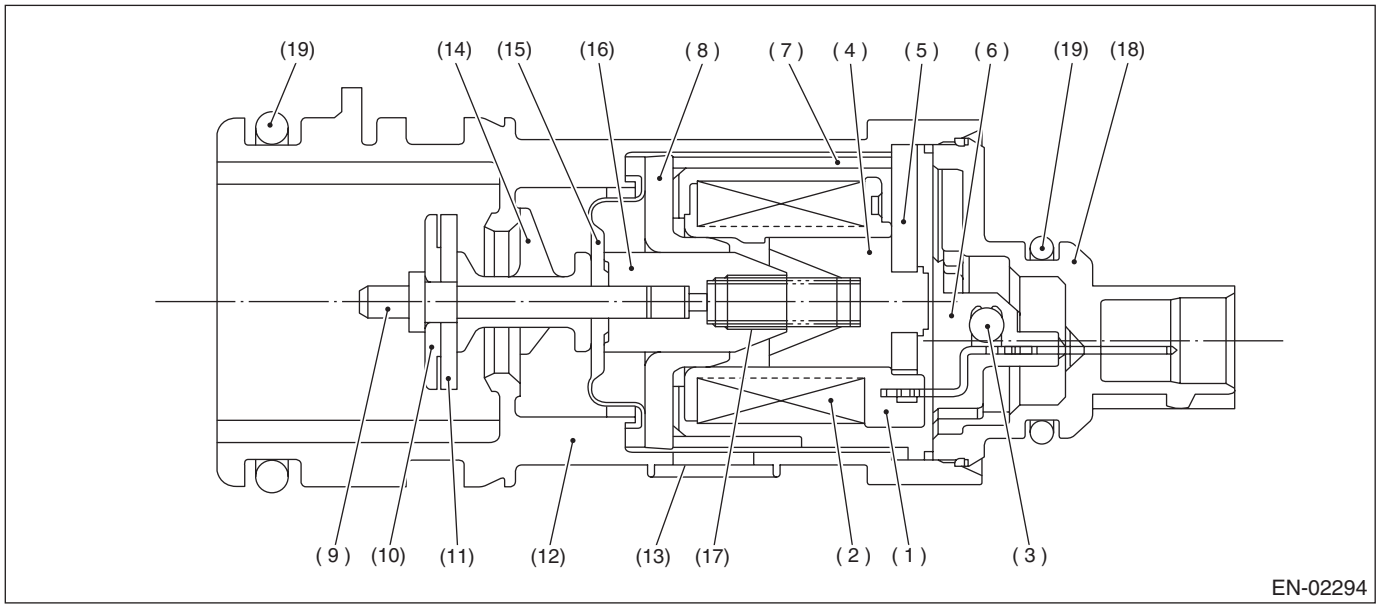
Time Needed for Diagnosis: Value of Map 1 + Value of Map 2 + Value of Map 3 + 0 ms + Value of Map 4 + 0 ms + Value of Map 4 + Value of Map 5

CG:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.
Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs OFF signal	High

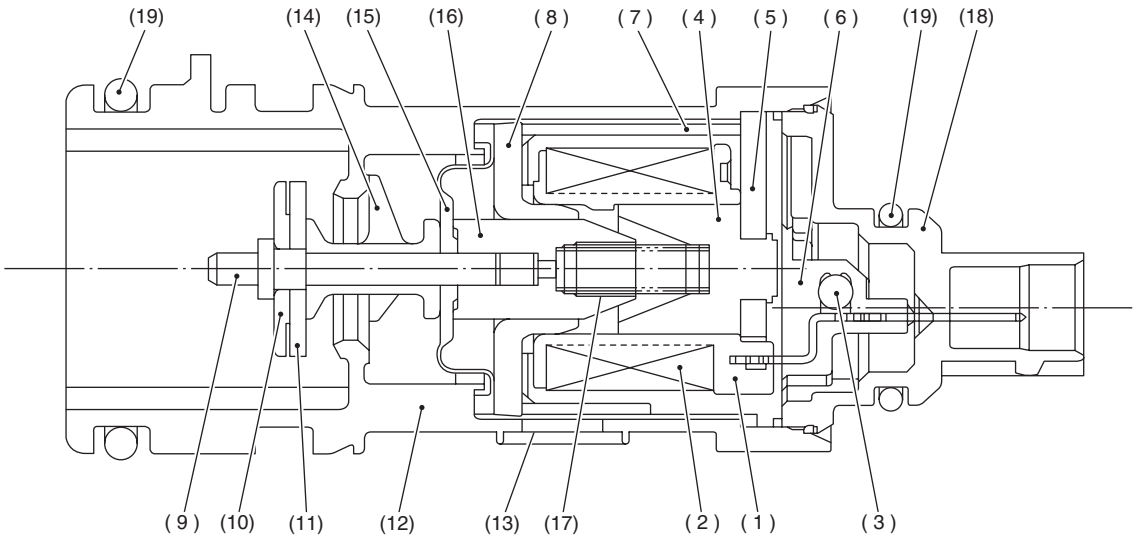
Time Needed for Diagnosis: Less than 1 second

CH:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.
Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs ON signal	Low

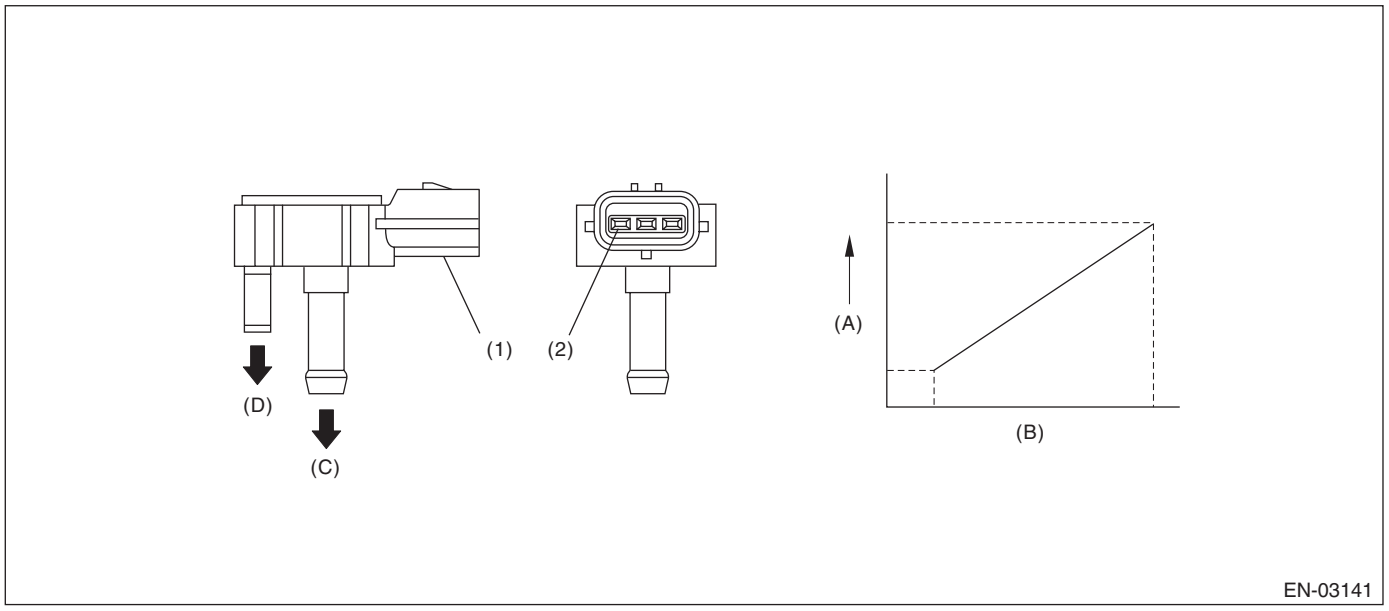
Time Needed for Diagnosis: Less than 1 second

CI: DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.
Judge as NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmosphere
(1) Connector
(2) Terminals

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 60 s
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Fuel temperature	< 35 °C (95 °F)
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously after 60 s have passed since the engine started.
- Pay attention to the fuel level and temperature.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of 10000 ms or more with purge ON	Experienced
Continuous time of 10000 ms or more with purge OFF	Experienced
Number of times that the difference between the Max. fuel level every 60 s and Min. fuel level every 60 s is 2 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable condition established)	≥ 16 time(s)
Maximum – Minimum tank pressure (with enable condition completed)	< 0 kPa (0.375 mmHg, 0 inHg)
Maximum – Minimum fuel temperature (with enable condition completed)	≥ 7 °C (44.6 °F)

If the difference between the Max. fuel level every 60 s and Min. fuel level every 60 s is less than 2 ℓ (0.53 US gal, 0.44 Imp gal), extend 60 s and make judgment with the Max. and Min. values for the fuel level in 60 s × 2. 60 s If a difference does not appear, extend the time 60 s × 3, 60 s × 4, 60 s × 5 and continue the judgment. If the difference between the Max. fuel level every 60 s and Min. fuel level every 60 s is 2 ℓ (0.53 US gal, 0.44 Imp gal) or more, the diagnosis counter counts up.

Time Needed for Diagnosis: 60 s × 16 time(s) or more

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum - minimum tank pressure	≥ 0 kPa (0.375 mmHg, 0 inHg)

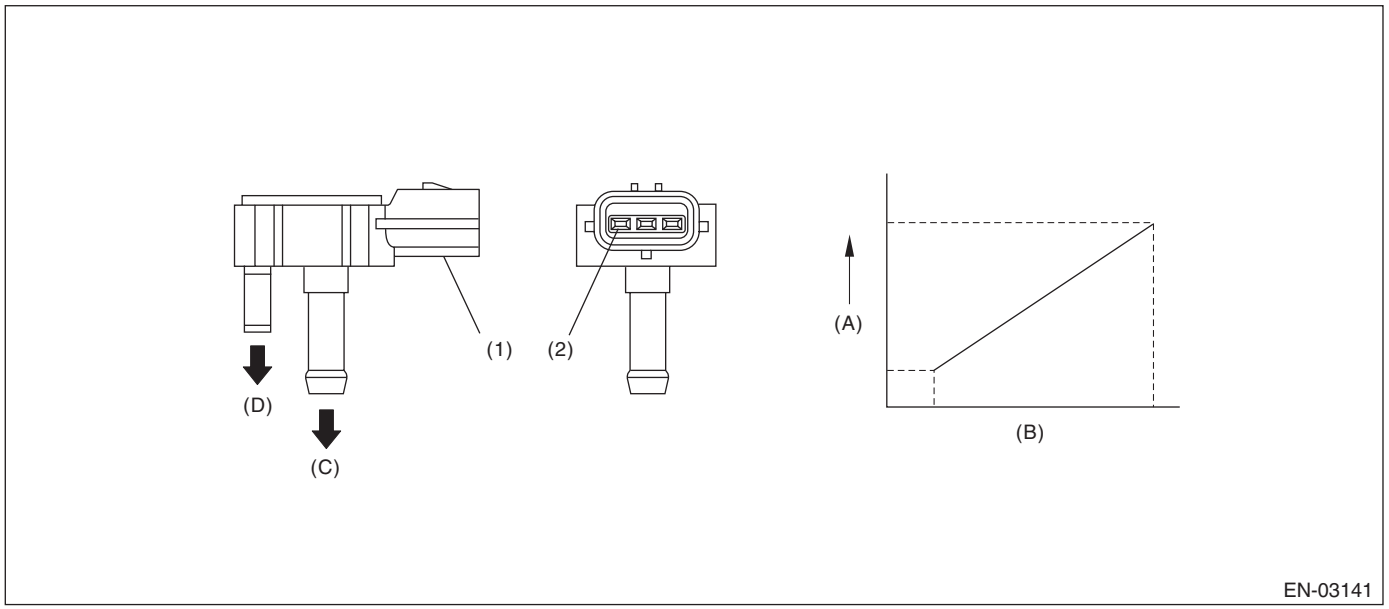
Time Needed for Diagnosis: Less than 1 second

CJ:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmosphere
(1) Connector
(2) Terminals

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< –7.4 kPa (–55.6 mmHg, –2.2 inHg)
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 15000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ –7.4 kPa (–55.6 mmHg, –2.2 inHg)
Battery voltage	≥ 10.9 V

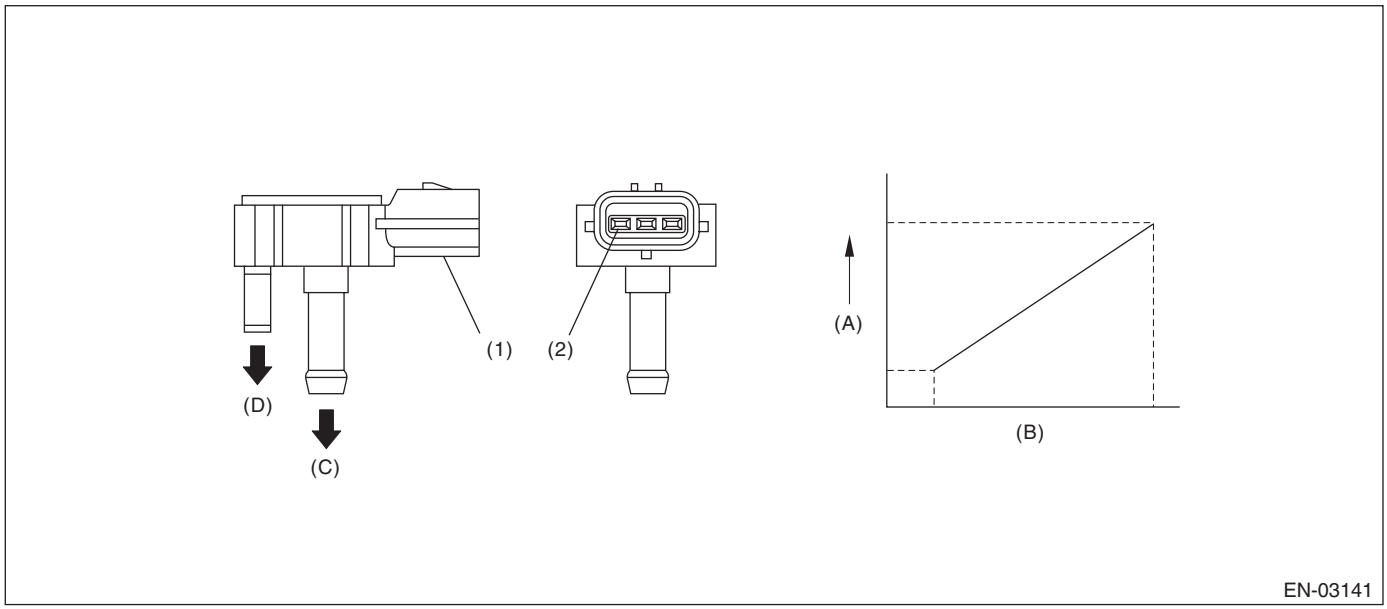
Time Needed for Diagnosis: Less than 1 second

CK:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmosphere
(1) Connector
(2) Terminals

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 5000 ms
Vehicle speed	≥ 2 km/h (1.2 MPH)
All conditions of EVAP canister purge	Completed
Learning value of evaporation gas concentration (left and right)	< 0.08
Main feedback compensation coefficient (left and right)	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging enable conditions are met without idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.9 kPa (59.6 mmHg, 2.3 inHg)
Fuel temperature	< 35 °C (95 °F)
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 7.9 kPa (59.6 mmHg, 2.3 inHg)

Time Needed for Diagnosis: Less than 1 second

CL:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0442. <Ref. to GD(H6DO)-115, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CM:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

1. OUTLINE OF DIAGNOSIS

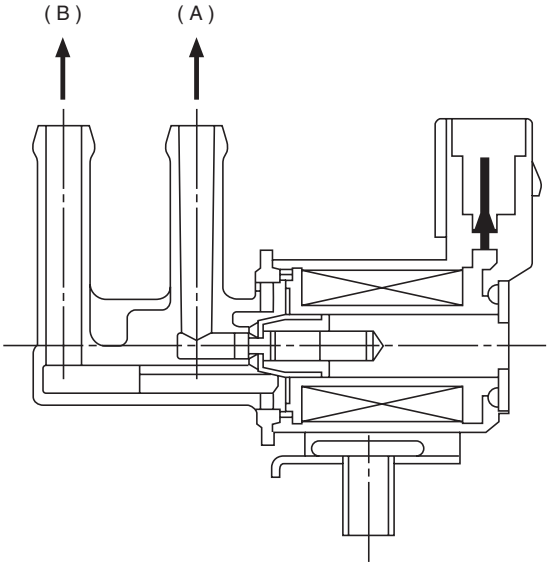
NOTE:
For the detection standard, refer to DTC P0442. <Ref. to GD(H6DO)-115, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CN:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.
Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-02197

(A) To canister (B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of “ON”	< 0.75
Terminal output voltage	Low

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

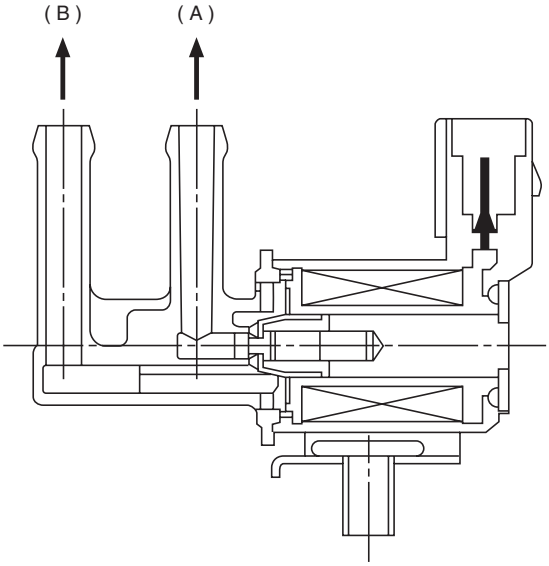
Time Needed for Diagnosis: Less than 1 second

CO:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.
Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-02197

(A) To canister (B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of "ON"	≥ 0.25
Terminal output voltage	High

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

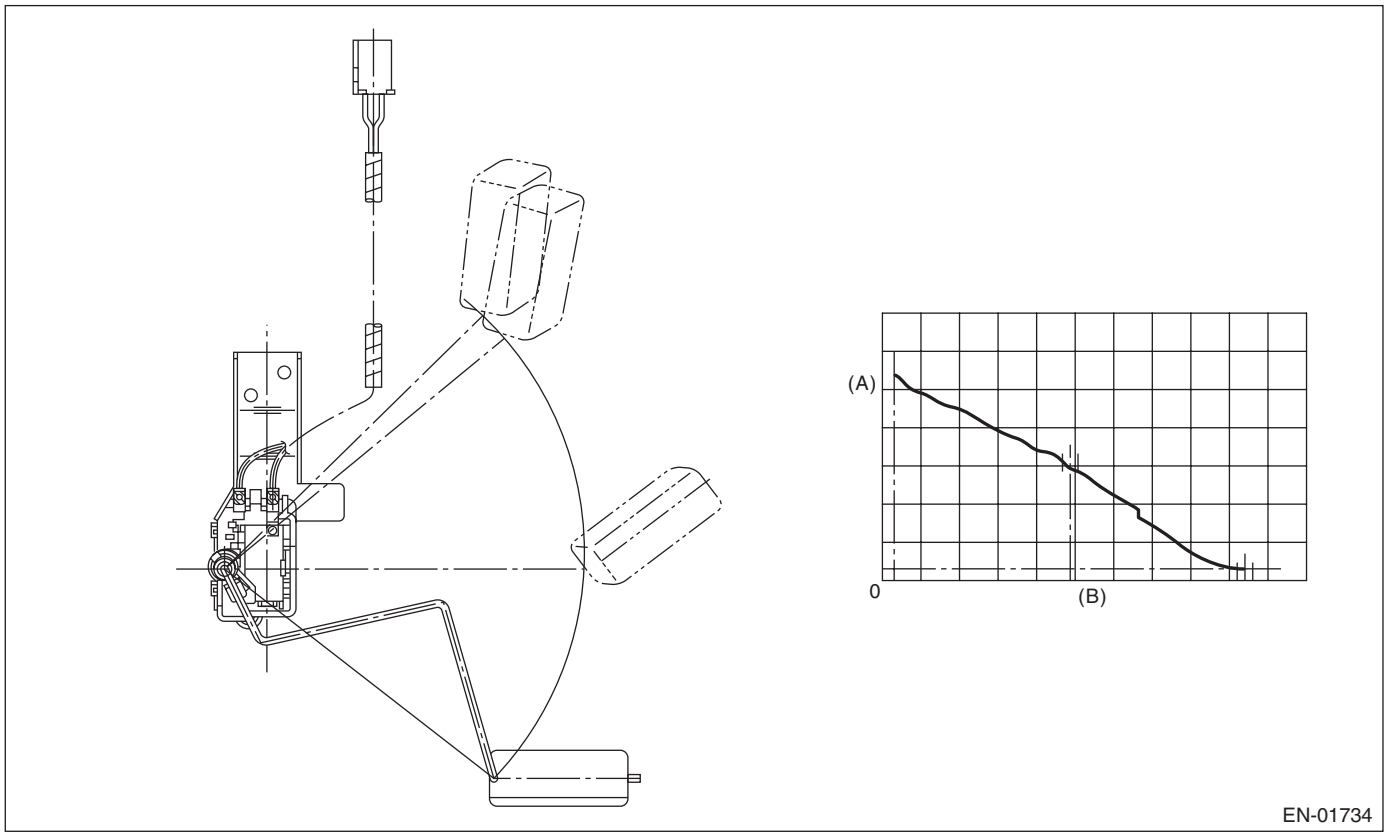
Time Needed for Diagnosis: Less than 1 second

CP:DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the fuel level sensor output property.
If the fuel level does not vary in a particular driving condition / engine condition where it should, judge as NG.

2. COMPONENT DESCRIPTION



(A) Fuel level (B) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 330957 g (11672.85 oz)
Max. – min. values of fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 7000 rpm
Elapsed time after starting the engine	≥ 5000 ms

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 330957 g (11672.85 oz)
Max. – min. values of fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 7000 rpm
Elapsed time after starting the engine	≥ 5000 ms

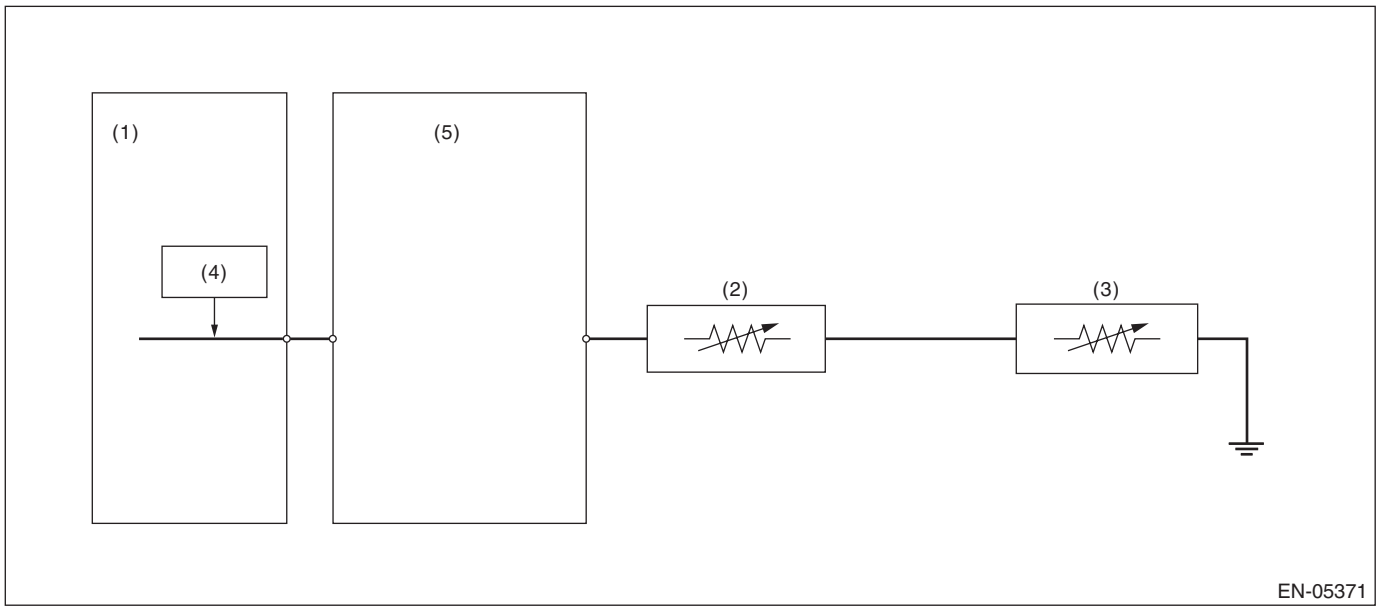
Time Needed for Diagnosis: Less than 1 second

CQ:DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit
(5) Body integrated unit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	< 0.173 V

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	≥ 0.173 V

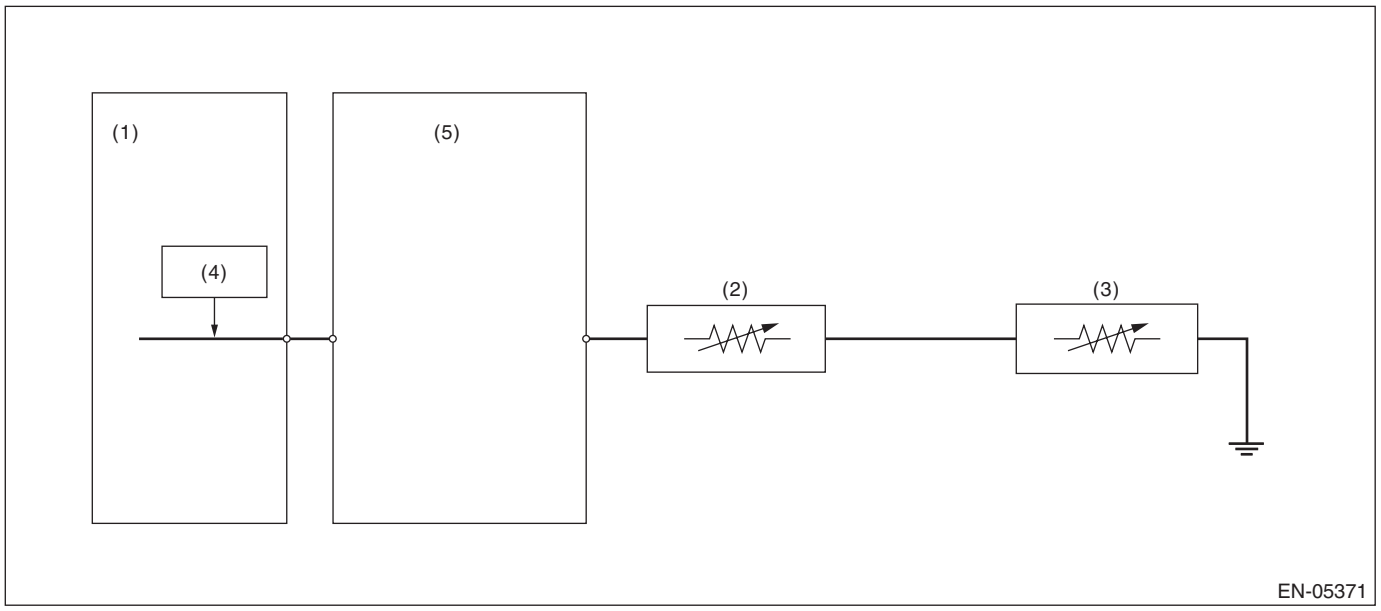
Time Needed for Diagnosis: Less than 1 second

CR:DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit
(5) Body integrated unit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	≥ 7.212 V

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	< 7.212 V

Time Needed for Diagnosis: Less than 1 second

CS:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

1. OUTLINE OF DIAGNOSIS

Detect the unstable output faults from the fuel level sensor caused by noise. Judge as NG when the Max. value and cumulative value of output voltage variation of the fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

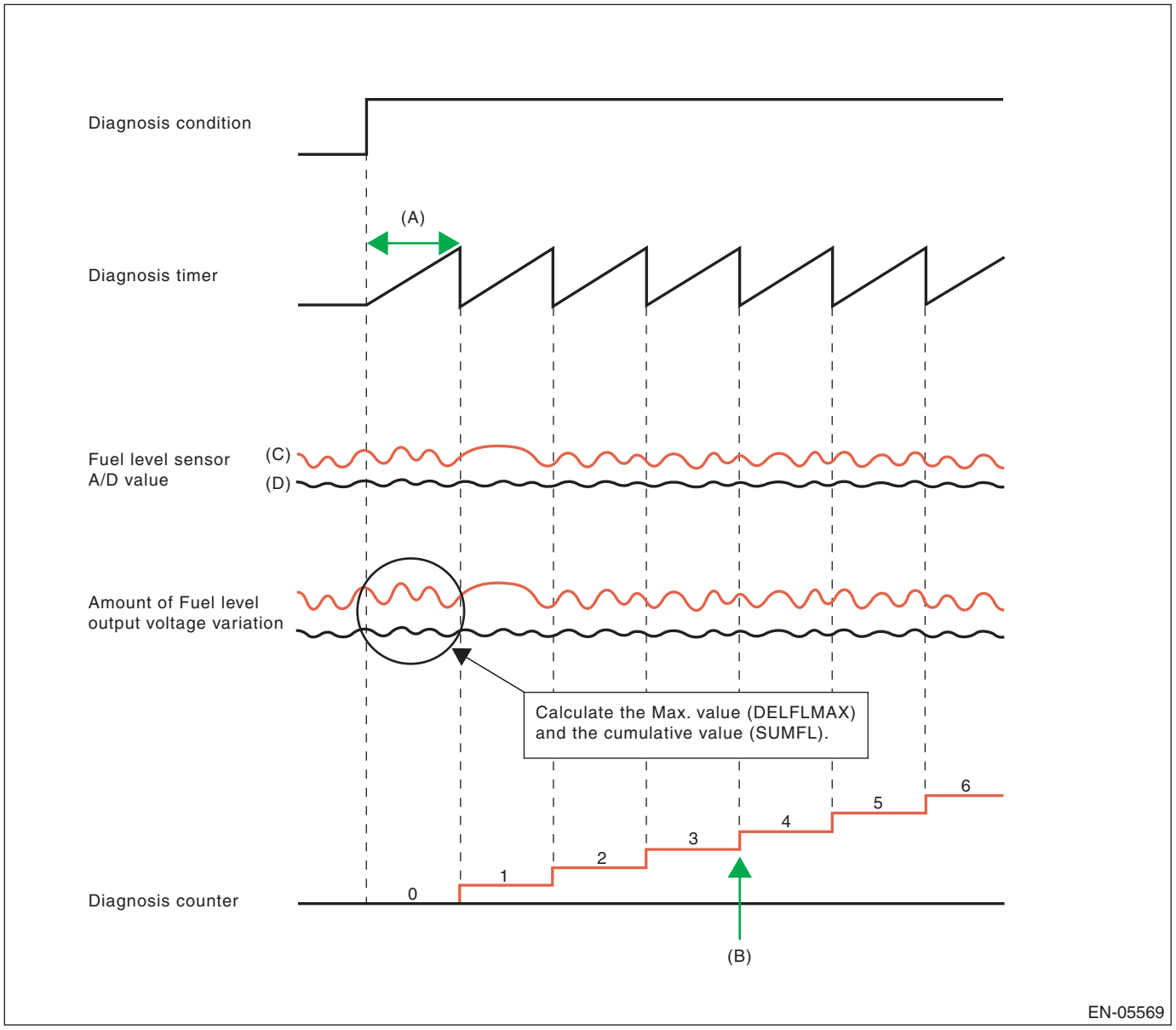
Malfunction Criteria	Threshold Value
Engine speed	≥ 500 rpm
Elapsed time after starting the engine	≥ 1 second
Battery voltage	≥ 10.9 V
Idle switch	ON
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal) and < 54.4 ℓ (14.37 US gal, 11.97 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	≥ 10000 ms

3. GENERAL DRIVING CYCLE

- Always perform the diagnosis continuously at idle speed.
- Pay attention to the fuel level.

4. DIAGNOSTIC METHOD

Calculate the Max. value (DELFLMAX) and cumulative value (SUMFL) of output voltage variation of fuel level sensor during 12.2 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, the diagnosis counter counts up. Judge as NG if the counter indicated 4 time(s).



(A) 12288 ms
(B) NG at 4 time(s) counts
(C) Malfunction
(D) Normal

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows,	≥ 4 time(s)
DELFLMAX	≥ Value from Map
or	
SUMFL	≥ 25.92 V
At this time, DELFLMAX: Maximum difference of sensor output for 12288 ms SUMFL: Integrated value of the sensor output deviation for12288 ms	

Map

Fuel level (ℓ , US gal, Imp gal)	0, 0, 0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Measured voltage (V)	0.27	0.27	0.426	0.582	0.738	0.894	0.894

The diagnosis counter does not count up when the following conditions are completed within 12288 ms.

Maximum value – minimum value of change of tank pressure during 12288 ms	≥ 0 kPa (0.375031 mmHg, 0 inHg)
Maximum value – minimum value of battery voltage during 12288 ms	≥ 1.2 V

Time Needed for Diagnosis: 12288 ms × 4 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX	< Value from Map
SUMFL	< 25.92 V
At this time, DELFLMAX: Maximum difference of sensor output for 12288 ms SUMFL: Integrated value of the sensor output deviation for12288 ms	

Time Needed for Diagnosis: 12288 ms

CT:DTC P0500 VEHICLE SPEED SENSOR “A”

1. OUTLINE OF DIAGNOSIS

Judge as NG when outside of the judgment value.
Judge as NG when the received data from ABSCM&H/U is abnormal vehicle speed, and the vehicle speed data is impossible.

2. COMPONENT DESCRIPTION

Vehicle speed signals are taken in to the ABS control module and hydraulic control unit, and normal/erroneous data of the ABS wheel speed sensor is received by CAN communication from the ABS control module and hydraulic control unit.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 2000 ms

4. GENERAL DRIVING CYCLE

Always perform diagnosis more than 2000 ms after starting the engine.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Front ABS wheel speed sensor status	Malfunction
Either of the following is established	
Front left wheel speed	≥ 300 km/h (186.4 MPH)
Front right wheel speed	≥ 300 km/h (186.4 MPH)

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Front left wheel speed	> 0 km/h (0 MPH) and < 300 km/h (186.4 MPH)
Front right wheel speed	> 0 km/h (0 MPH) and < 300 km/h (186.4 MPH)

Time Needed for Diagnosis: 2500 ms

CU:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75 °C (167 °F)
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	≥ 10.49 s
Feedback of ISC	In operation
Lambda value (left and right)	≥ 0.9 and < 1.1
After switching air conditioner to ON/OFF	≥ 5.1 s
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5.1 s
Elapsed time after switching neutral position switch to ON/OFF	> 5.1 s
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling after warming up engine.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed — Targeted engine speed	< –100 rpm
Feedback value for ISC	Max.

Time Needed for Diagnosis: 10 s × 3 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed — Targeted engine speed	≥ –100 rpm

Time Needed for Diagnosis: 10 s

CV:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75 °C (167 °F)
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	≥ 10.49 s
Feedback of ISC	In operation
Lambda value (left and right)	≥ 0.9 and < 1.1
After switching air conditioner to ON/OFF	≥ 5.1 s
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5.1 s
Elapsed time after switching neutral position switch to ON/OFF	> 5.1 s
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling after warming up engine.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	≥ 200 rpm
Feedback value for ISC	Min.

Time Needed for Diagnosis: 10 s × 3 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	< 200 rpm

Time Needed for Diagnosis: 10 s

CW:DTC P0512 STARTER REQUEST CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge as ON NG when the starter SW signal remains ON.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Engine condition	After engine starting
Starter OFF signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 180000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Starter OFF signal	Detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: Less than 1 second

CX:DTC P0513 INCORRECT IMMOBILIZER KEY

1. OUTLINE OF DIAGNOSIS

DTC	Item	Outline of diagnosis
P0513	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of unregistered key in body integrated unit)
P1570	Antenna	Faulty antenna
P1571	Reference Code Incompatibility	Reference code incompatibility between body integrated unit and ECM
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between body integrated unit and ECM
P1574	Key Communication Failure	Failure of body integrated unit to verify key (transponder) ID code or transponder failure
P1576	EGI Control Module EEPROM	ECM malfunctioning
P1577	IMM Control Module EEPROM	Body integrated unit malfunctioning
P1578	Meter Failure	Reference code incompatibility between body integrated unit and combination meter

2. ENABLE CONDITION

When starting the engine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis only after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the conditions for the outline of the diagnosis of the top are established.

CY:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of microcomputer (RAM).
If RAM is abnormal, judge as NG, and when it is normal, judge as OK.
If it is possible to write data to the whole area of RAM in the initial routine, and is possible to read the same data, it is judged as OK, and if not, NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Diagnosis with the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis as soon as the ignition switch is turned to ON.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Write the specified value into the RAM.	The written value cannot be read.

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Write the specified value into the RAM.	The written value can be read.

Time Needed for Diagnosis: Less than 1 second

CZ:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

1. OUTLINE OF DIAGNOSIS

Judge as NG when SUM value of ROM is outside the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard

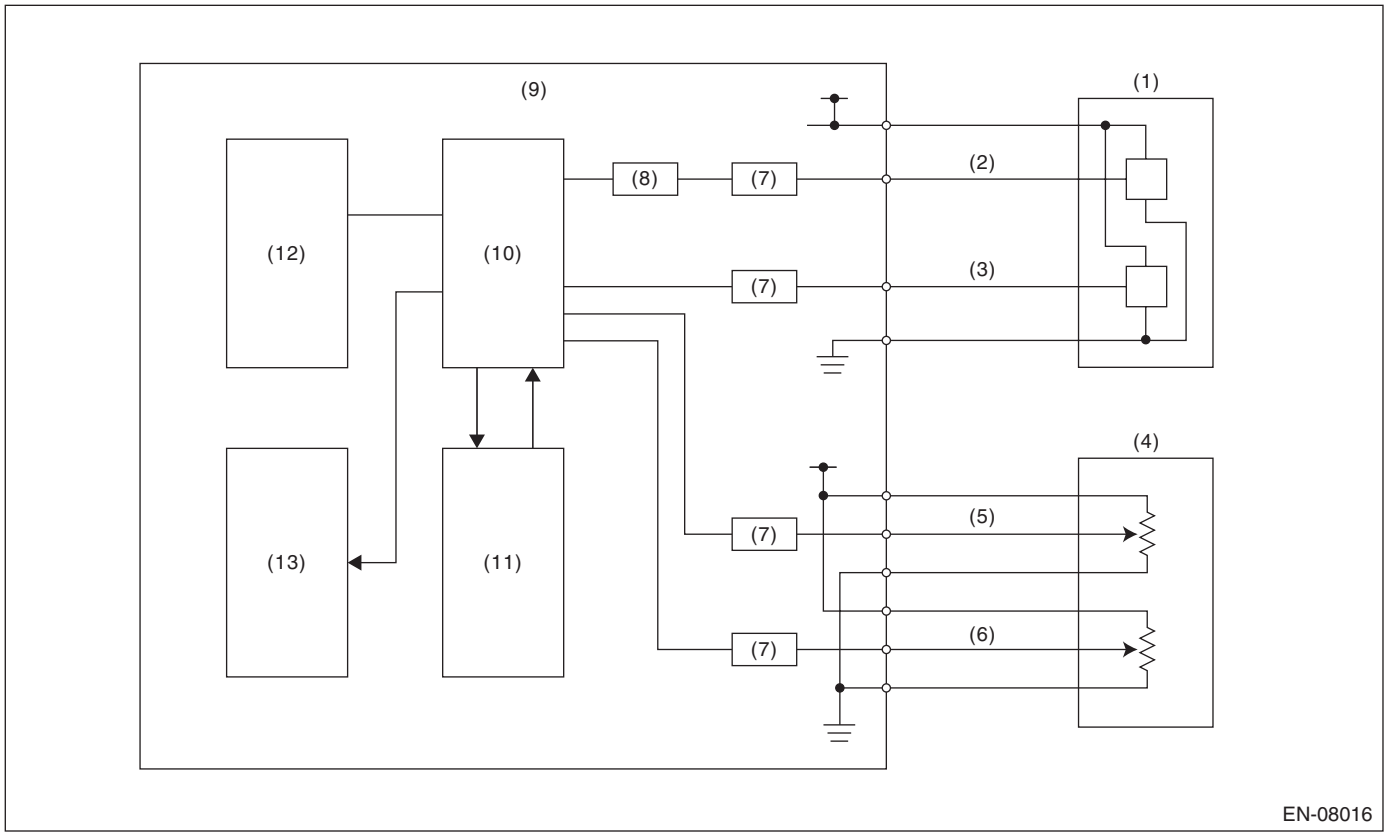
Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

DA:DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when any one of the followings is established.
(1) If the monitoring IC operation is abnormal (monitoring IC malfunction).
(2) If the input amplifier circuit of throttle position sensor 1 is abnormal (quadruple amplification problem).
(3) If the CPU operation is abnormal (instruction/flow check).
(4) If the A/D converter operation is abnormal (ADC malfunction).
(5) If the EEPROM operation is abnormal (iEEPROM malfunction).
(6) If the output IC operation is abnormal (output driver malfunction).

2. COMPONENT DESCRIPTION



(1) Throttle position sensor
(2) Throttle position sensor 1
(3) Throttle position sensor 2
(4) Accelerator pedal position sensor
(5) Accelerator pedal position sensor 1
(6) Accelerator pedal position sensor 2
(7) I/F circuit
(8) Amplifier circuit
(9) Engine control module (ECM)
(10) CPU
(11) Monitoring IC
(12) EEPROM
(13) Output IC

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Battery voltage	≥ 6 V
(2) Ignition switch	ON
(2) Battery voltage	≥ 6 V
(3) Ignition switch	ON
(3) ETC control	Permission
(4) Ignition switch	ON
(4) Battery voltage	≥ 6 V
(5) Starter switch	OFF
(5) Battery voltage	> 6 V
(6) Ignition switch	ON
(6) Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Monitoring IC operation	The result and expected value match.
(2) | Throttle position sensor 1 opening angle – (Throttle position sensor 1 opening angle after passing amplifier/4) |	< 3 °
(3) Main CPU calculation result	The result and expected value match.
(4) | standard voltage – read voltage value |	< 0.078125 V
(5) EEPROM writing	Writing completed
(6) Communication between output ICs	Possible to communicate

Time Needed for Diagnosis:

(1): 200 ms
(2): 24 ms
(3): 192 ms
(4): 200 ms
(5): 48 ms
(6): 2500 ms

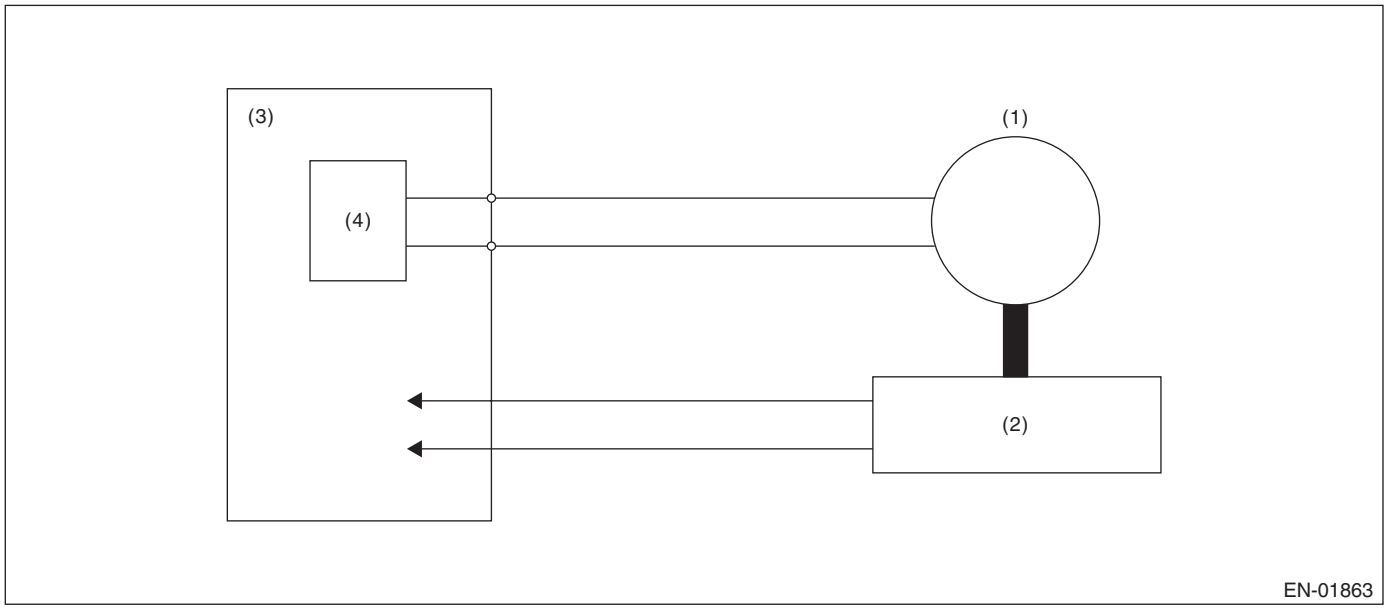
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

DB:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Judge as NG when the target opening angle and actual opening angle is mismatched or the current to motor is the specified duty or more for specified time continuously.

2. COMPONENT DESCRIPTION



(1) Motor
(2) Throttle position sensor
(3) Engine control module (ECM)
(4) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electronic throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

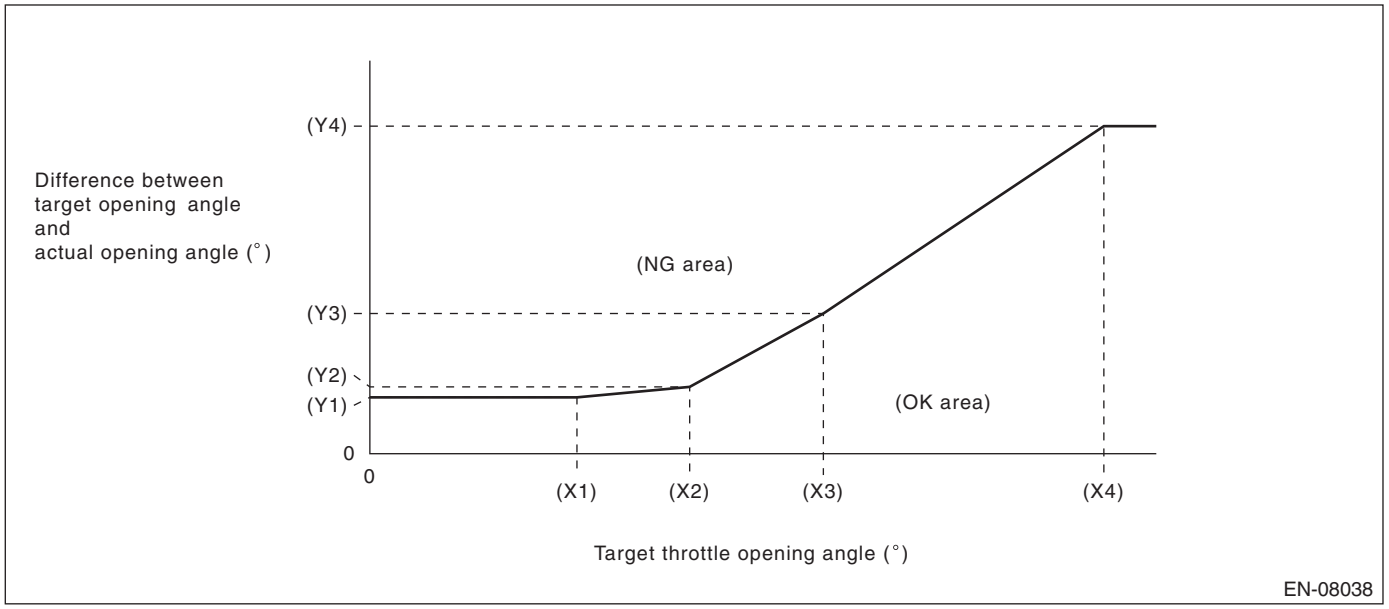
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	Within OK range of **Details of Judgment value**
Output duty to drive circuit	< 95 %

Time Needed for Diagnosis:

- Difference between target opening angle and actual opening angle:
  - NG judgment: See **Details of Judgment time**
  - OK judgment: 2000 ms
- Output duty to drive circuit: 2000 ms

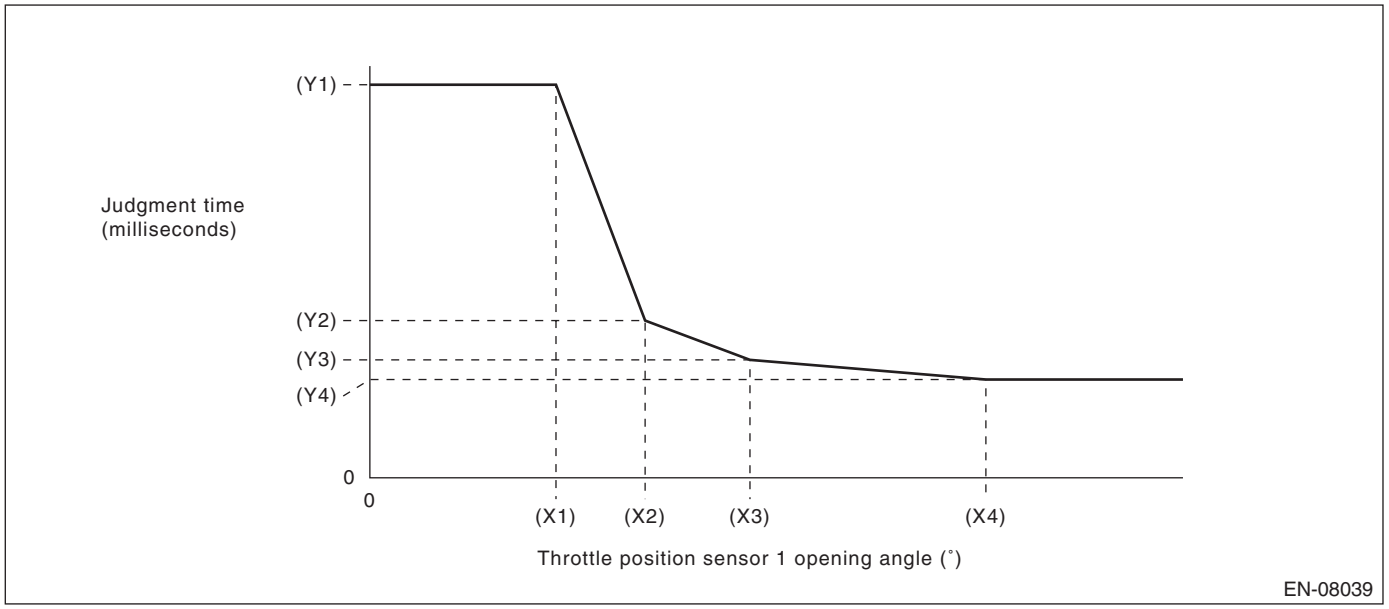
Details of Judgment Value



(X1) 7.9 °
(X2) 12.2 °
(X3) 17.3 °
(X4) 28 °

(Y1) 4.3 °
(Y2) 5.1 °
(Y3) 10.7 °
(Y4) 25 °

Details of Judgment time



(X1) 7.1 °
(X2) 10.5 °
(X3) 14.5 °
(X4) 23.5 °

(Y1) 1000 ms
(Y2) 400 ms
(Y3) 300 ms
(Y4) 250 ms

NOTE:
Judgment time when actual opening angle ≤ target opening angle is always 1000 milliseconds.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

DC:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

1. OUTLINE OF DIAGNOSIS

Judge as NG when there is CAN communication with the TCM and there is a MIL lighting request.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
MIL lighting request from TCM	Yes

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
MIL lighting request from TCM	None

Time Needed for Diagnosis: Less than 1 second

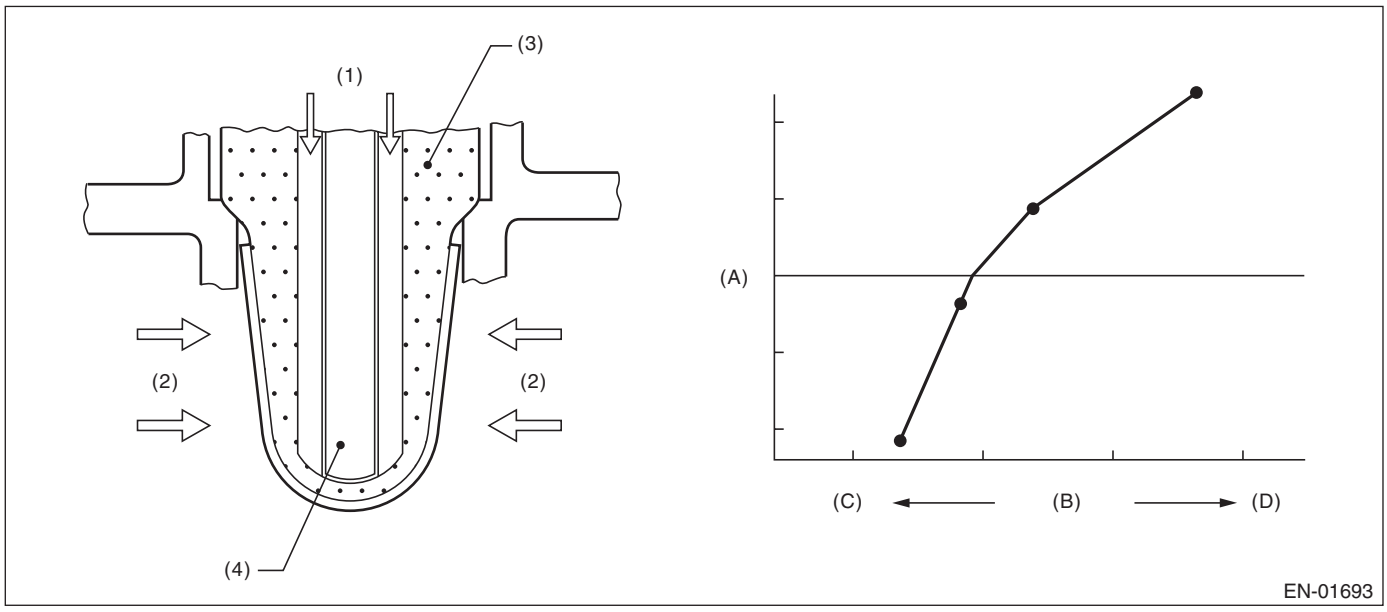
DD:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains low.
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 4096 ms
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V — 0.1 V
or	
Rear oxygen sensor sub feedback compensation coefficient	On Min.
or	
Rear oxygen sensor sub feedback compensation coefficient	On Max.
Elapsed time after starting the engine	≥ 60000 ms
Engine coolant temperature	≥ 75 °C (167 °F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 8 g/s (0.28 oz/s)
Load change at 120°CA	< 0.02 g/rev (0 oz/rev)
Front oxygen (A/F) sensor impedance	0 Ω — 50 Ω
Learning value of evaporation gas density	< 0.2
Total time of operating canister purge	≥ 19.9 s
Targeted lambda value load compensation coefficient	–0.05 — 0.050

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12.4 MPH) or more after 60000 ms have passed since the engine started.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	< 0.85

Time Needed for Diagnosis: 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	≥ 0.85

Time Needed for Diagnosis: Less than 1 second

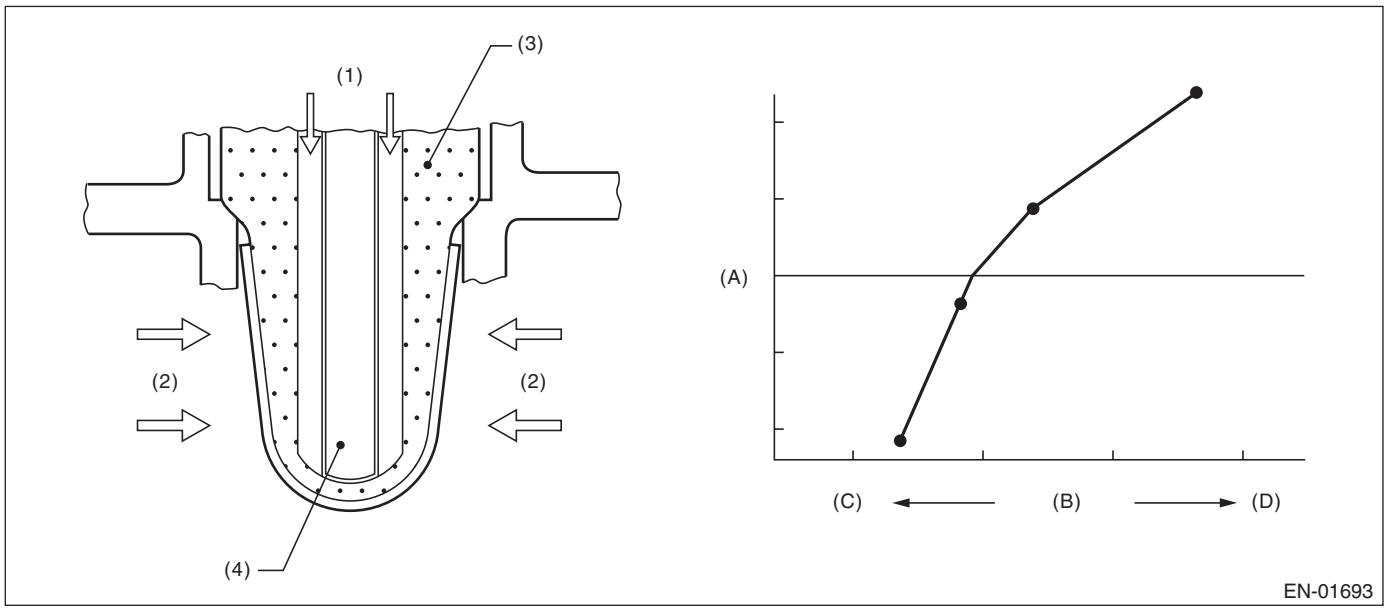
DE:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains high.
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 4096 ms
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V — 0.1 V
or	
Rear oxygen sensor sub feedback compensation coefficient	On Min.
or	
Rear oxygen sensor sub feedback compensation coefficient	On Max.
Elapsed time after starting the engine	≥ 60000 ms
Engine coolant temperature	≥ 75 °C (167 °F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 8 g/s (0.28 oz/s)
Load change at 120°CA	< 0.02 g/rev (0 oz/rev)
Front oxygen (A/F) sensor impedance	0 Ω — 50 Ω
Learning value of evaporation gas density	< 0.2
Total time of operating canister purge	≥ 19.9 s
Targeted lambda value load compensation coefficient	–0.05 — 0.050

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12.4 MPH) or more after 60000 ms have passed since the engine started.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	> 1.15

Time Needed for Diagnosis: 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	≤ 1.15

Time Needed for Diagnosis: Less than 1 second

DF:DTC P1154 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1152. <Ref. to GD(H6DO)-163, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DG:DTC P1155 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

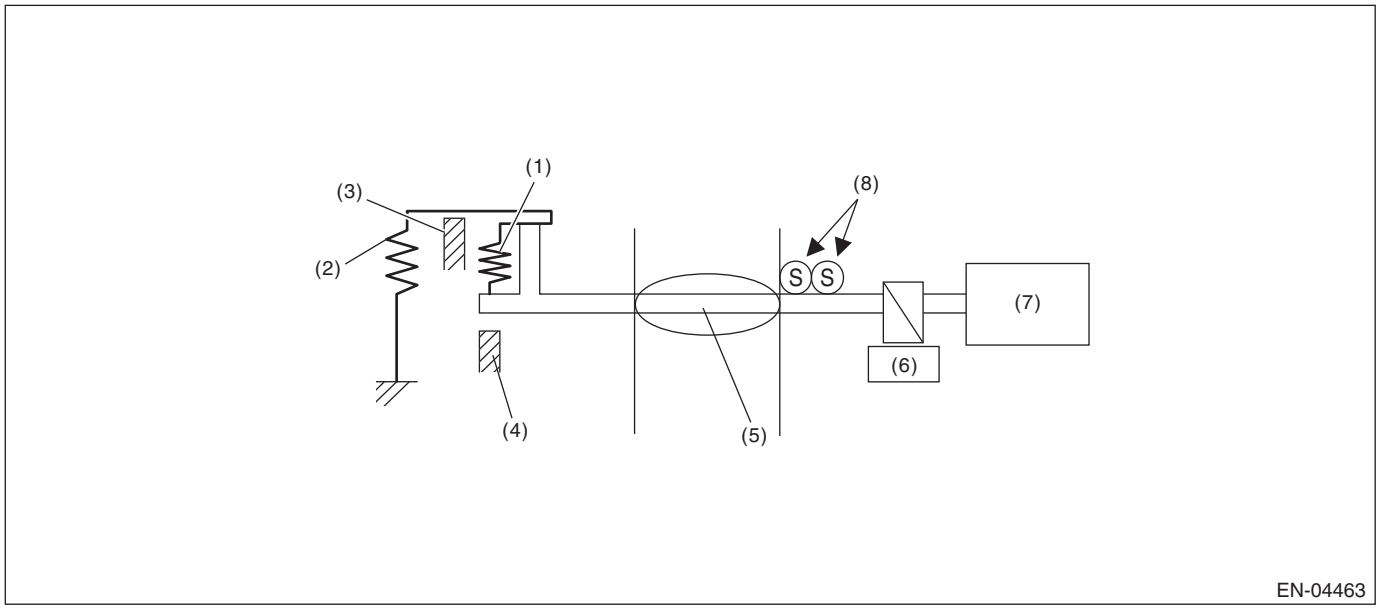
NOTE:
For the detection standard, refer to DTC P1153. <Ref. to GD(H6DO)-165, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DH:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the valve is opened more than the default opening angle, but does not move to the close direction with the motor power stopped.

2. COMPONENT DESCRIPTION



(1) Opener spring
(2) Return spring
(3) Intermediate stopper
(4) Full closed stopper
(5) Throttle valve
(6) Gear
(7) DC motor
(8) Main and sub throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 6 V
Throttle position sensor	Normal

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	< 2 °

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	≥ 2 °

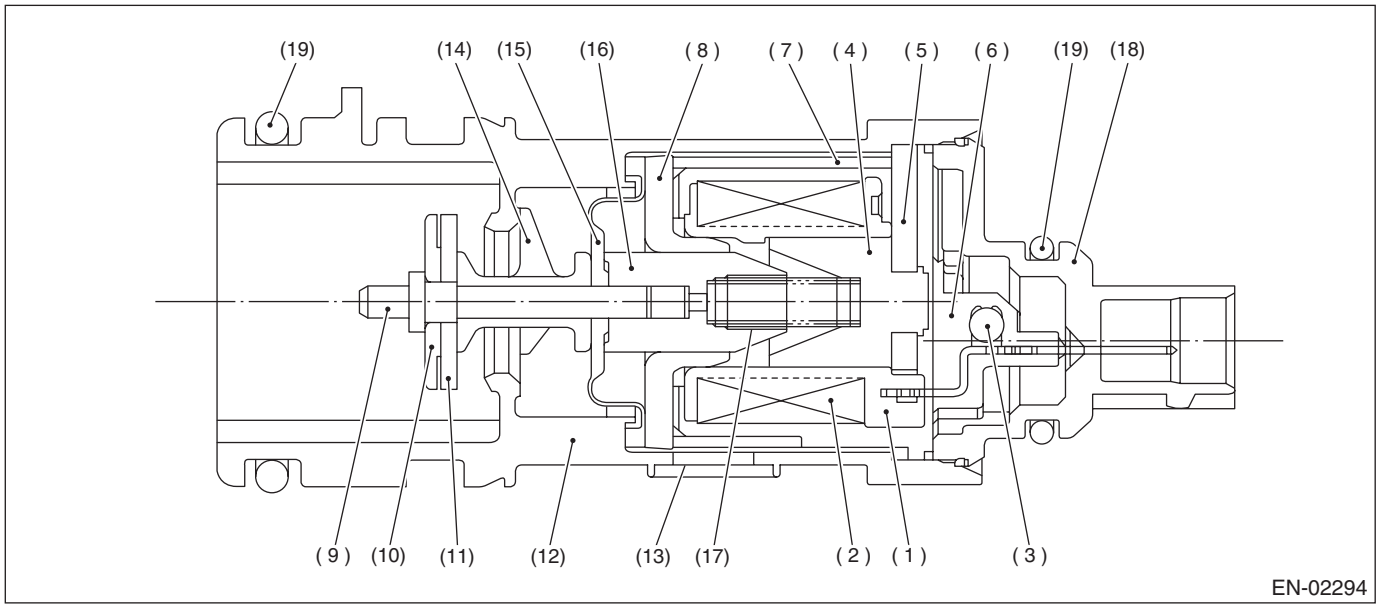
Time Needed for Diagnosis: 3400 ms

DI: DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the abnormal function (stuck closed) of the drain valve.
Judge as NG when fuel tank pressure is low.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Drain valve	Open
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Tank pressure when starter is OFF → ON	–0.5 kPa (–4 mmHg, –0.2 inHg) and 0.4 kPa (2.9 mmHg, 0.1 inHg)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≤ –4 kPa (–30 mmHg, –1.2 inHg)

Time Needed for Diagnosis: 3000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	> –4 kPa (–30 mmHg, –1.2 inHg)
Cumulative time when all the malfunction criteria below are met.	≥ 30000 ms
Purge control solenoid valve duty	Not = 0
Fuel temperature	–10 °C (14 °F) — 70 °C (158 °F)
Intake manifold relative pressure	≥ –26.7 kPa (–200 mmHg, –7.9 inHg)

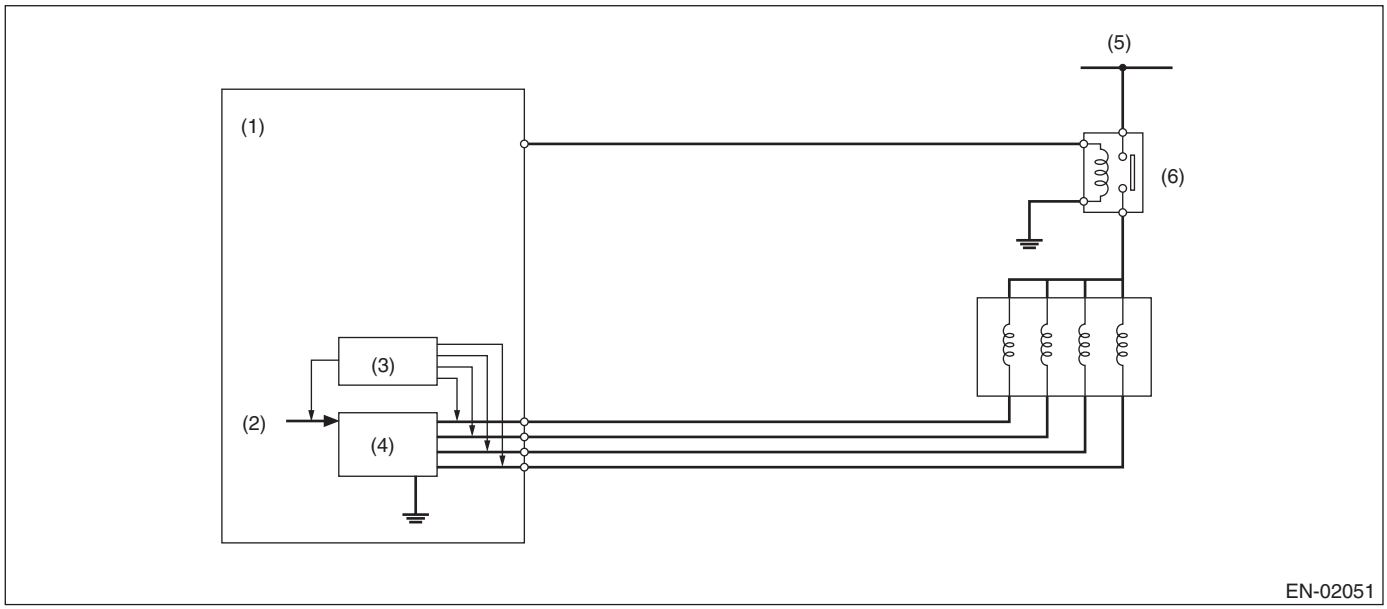
Time Needed for Diagnosis: Less than 1 second

DJ:DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

- Detects open or short circuit of EGR.
- Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Computer unit (CPU)
(3) Detecting circuit
(4) Switch circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 1 second
EGR valve target position	> 0 step
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously during EGR operation.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal or Terminal voltage level when EGR operates	Low level Low level

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level
Terminal voltage level when EGR operates	High level

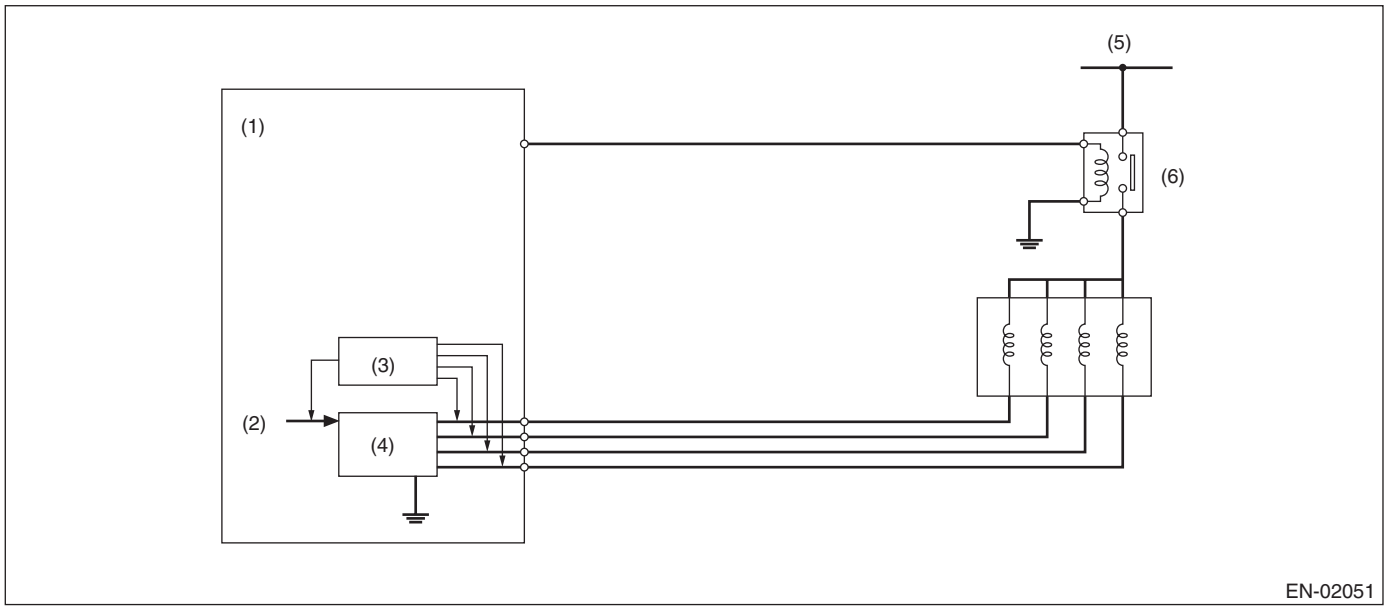
Time Needed for Diagnosis: 256 ms

DK:DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

- Detects open or short circuit of EGR.
- Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Computer unit (CPU)
(3) Detecting circuit
(4) Switch circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 1 second
EGR valve target position	> 0 step
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level
or	
Terminal voltage level when EGR operates	High level

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level
Terminal voltage level when EGR operates	Low level

Time Needed for Diagnosis: 256 ms

DL:DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1492. <Ref. to GD(H6DO)-172, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DM:DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1493. <Ref. to GD(H6DO)-174, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DN:DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1492. <Ref. to GD(H6DO)-172, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DO:DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1493. <Ref. to GD(H6DO)-174, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DP:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1492. <Ref. to GD(H6DO)-172, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DQ:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1493. <Ref. to GD(H6DO)-174, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DR:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
If the status becomes post engine start although the starter has not been turned to ON, judge as OFF NG.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as OFF NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.6 MPH)
Starter ON signal	Not detected
Engine condition	Change from pre-start to post-start
Battery voltage	≥ 8 V

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OFF OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	No diagnosis experience
Battery voltage	≥ 8 V

Time Needed for Diagnosis: Less than 1 second

DS:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of back-up power supply circuit.
Judge as NG when the backup power voltage is low.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	Low
Battery voltage	≥ 10.9 V
Engine condition	After engine starting

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Engine condition	After engine starting

Time Needed for Diagnosis: Less than 1 second

DT:DTC P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-155, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DU:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-155, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DV:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-155, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DW:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-155, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DX:DTC P1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-155, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DY:DTC P1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-155, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DZ:DTC P1578 METER FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-155, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EA:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the catalyst advanced idling retard angle control.
Judge as NG when ECM is not controlling the angle properly during catalyst advanced idling retard angle control.
Judge as NG if there is exhaust gas temperature diagnosis, idle speed diagnosis and final ignition timing diagnosis, and if any one of them is NG.

- Exhaust gas temperature diagnosis

Judge as NG when the estimated exhausted gas temperature in 14 seconds after the cold start is below the specified value.

- Idle speed diagnosis

Judge as NG when actual engine speed is not close to target engine speed after terminating the retard angle control.

- Final ignition timing diagnosis

Judge as NG when actual retard amount is under the specified value at cold start.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Battery voltage	≥ 10.9 V
Cold start diagnosis	Incomplete
Vehicle speed	< 2 km/h (1.2 MPH)
Misfire in 200 engine revs.	< 5
Elapsed time after starting the engine	= 14 s

3. GENERAL DRIVING CYCLE

Perform the diagnosis at cold start.

4. DIAGNOSTIC METHOD

- **Exhaust gas temperature diagnosis**

Abnormality Judgment
Calculate the estimated exhaust gas temperature when the diagnostic enable condition is established. Judge as NG when the following conditions are established after engine starting within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	< Value from Map

Map

Coolant temperature after starting the engine	–30 °C (–22 °F)	–20 °C (–4 °F)	–10 °C (14 °F)	0 °C (32 °F)	10 °C (50 °F)	20 °C (68 °F)	30 °C (86 °F)	40 °C (104 °F)	50 °C (122 °F)	60 °C (140 °F)
Estimated exhaust gas temperature	200 °C (392 °F)	200 °C (392 °F)	200 °C (392 °F)	225 °C (437 °F)	225 °C (437 °F)	220 °C (428 °F)	210 °C (410 °F)	200 °C (392 °F)	190 °C (374 °F)	190 °C (374 °F)

Time Needed for Diagnosis: 14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment
Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	≥ Value from Map

Time Needed for Diagnosis: Less than 1 second

- **Idle speed diagnosis**

Abnormality Judgment
Judge as NG when the following conditions are established after the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of (Target engine speed – Actual engine speed > –200 rpm)	≥ 6000 ms
Continuous time of (actual retard amount > 20 °CA)	≥ 0 ms

Time Needed for Diagnosis: 14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Normality Judgment
Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of (Target engine speed – Actual engine speed > –200 rpm)	< 6000 ms
Continuous time of (actual retard amount > 20 °CA)	< 0 ms

Time Needed for Diagnosis: Less than 1 second

- **Final ignition timing diagnosis**

Abnormality Judgment
Judge as NG when the following conditions are established with diagnosis enable conditions successful.

Judgment Value

Malfunction Criteria	Threshold Value
Duration time of (Standard ignition timing – Actual ignition timing ≤ 0 °CA)	> 5000 ms

Time Needed for Diagnosis: 5000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Normality Judgment
Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Duration time of (Standard ignition timing – Actual ignition timing > 0 °CA)	> 5000 ms

Time Needed for Diagnosis: 5000 ms

EB:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control solenoid valve.
Judge as NG when the current is small even though the duty signal is large.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Oil flow control solenoid valve control duty	≥ 99.61 %
Oil control solenoid valve control present current	< 0.306 A

Time Needed for Diagnosis: 2000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Target current value of the oil flow control solenoid valve	≥ 0.14 A
|Target current value of the oil flow control solenoid valve – oil flow control solenoid valve control current value|	< 0.08 A

Time Needed for Diagnosis: 2000 ms

EC:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control solenoid valve.
Judge as NG when the current is large even though the duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Oil flow control solenoid valve control duty	< 0.39 %
Oil control solenoid valve control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
|Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value|	< 0.08 A

Time Needed for Diagnosis: 2000 ms

ED:DTC P2090 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open circuit of the oil flow control solenoid valve.
Judge as open NG when the current is small even though the duty signal is large.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Oil flow control solenoid valve control duty	≥ 99.61 %
Oil control solenoid valve control present current	< 0.306 A

Time Needed for Diagnosis: 2000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Target current value of the oil flow control solenoid valve	≥ 0.14 A
|Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value|	< 0.08 A

Time Needed for Diagnosis: 2000 ms

EE:DTC P2091 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect short circuit of oil flow control solenoid valve.
Judge as short NG when the current is large even though the duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Oil flow control solenoid valve control duty	< 0.39 %
Oil control solenoid valve control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
|Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value|	< 0.08 A

Time Needed for Diagnosis: 2000 ms

EF:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P2088. <Ref. to GD(H6DO)-182, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EG:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P2089. <Ref. to GD(H6DO)-183, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EH:DTC P2094 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P2090. <Ref. to GD(H6DO)-184, DTC P2090 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EI: DTC P2095 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

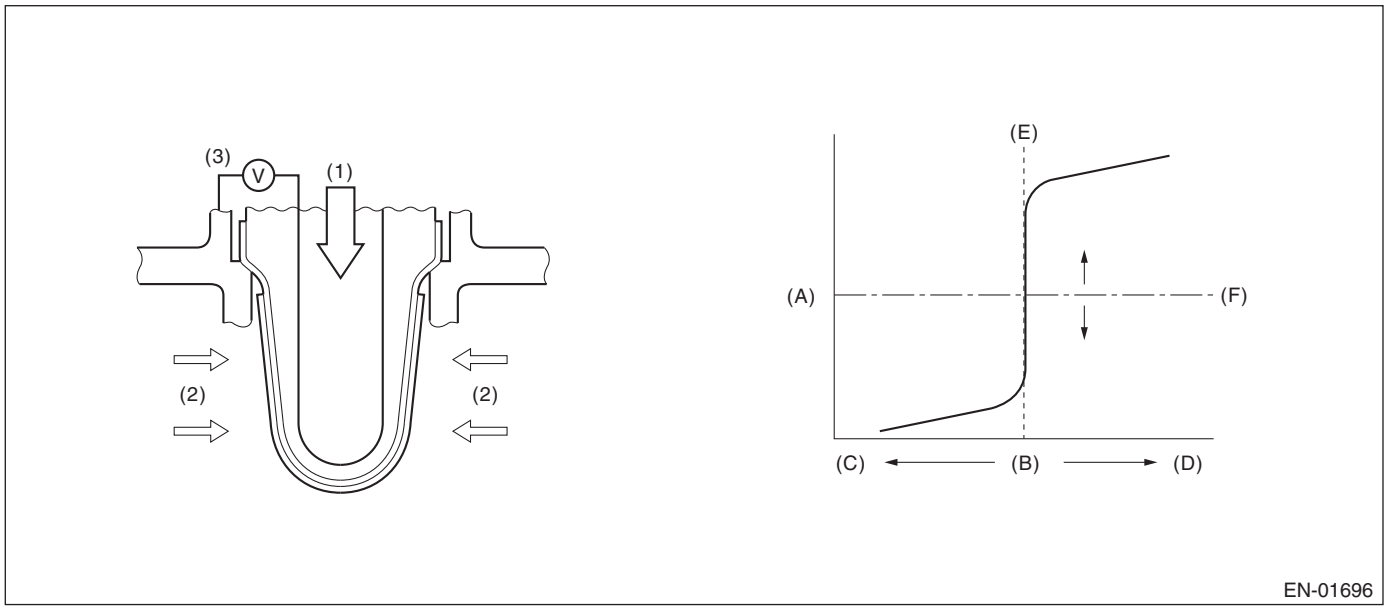
NOTE:
For the detection standard, refer to DTC P2091. <Ref. to GD(H6DO)-185, DTC P2091 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EJ:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value.
Control the sub feedback learning and judge as NG when the learning value is in the lean zone.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(C)	Rich	(E)	Theoretical air fuel ratio
(B)	Air fuel ratio	(D)	Lean	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Conditions for carrying out the sub feedback learning	Completed
Continuous time when all conditions are established.	≥ 1 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the vehicle is idling or running at a constant speed of 80 km/h (50 MPH) or more.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	< –0.035

Time Needed for Diagnosis: 5 s × 1 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ –0.035 + 0

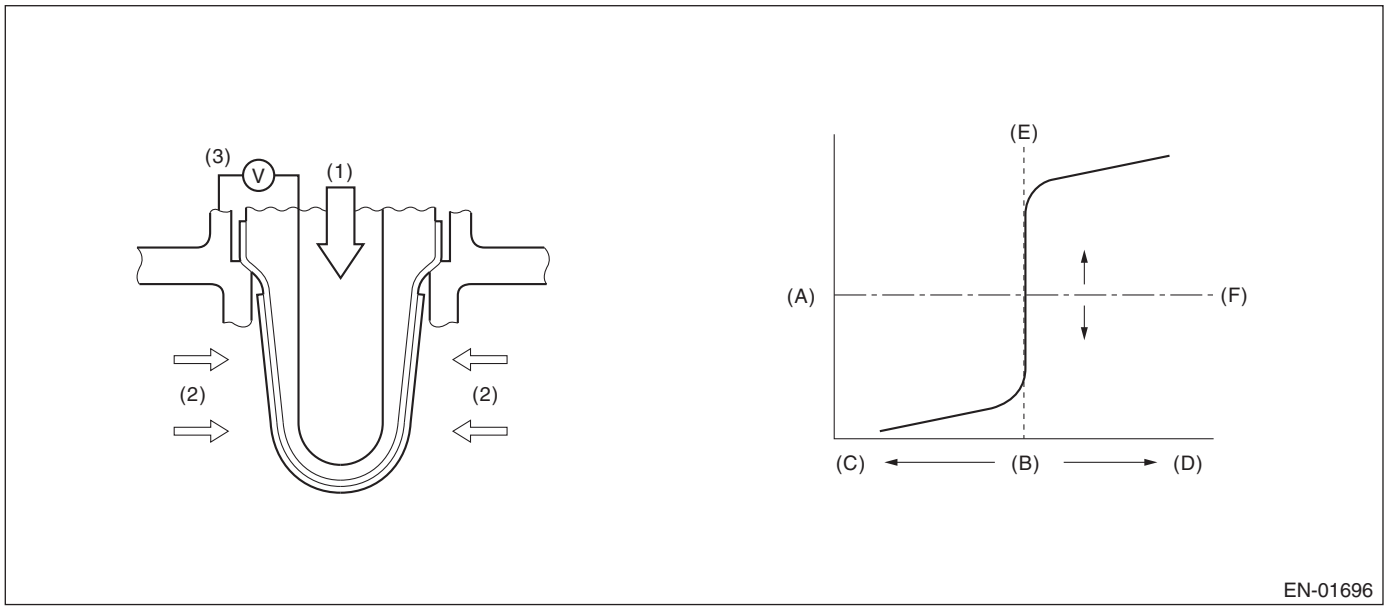
Time Needed for Diagnosis: 5 s

EK:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value.
Sub feedback learning is being performed. When the learning value goes to the rich side, judge as NG.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(C)	Rich	(E)	Theoretical air fuel ratio
(B)	Air fuel ratio	(D)	Lean	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Conditions for carrying out the sub feedback learning	Completed
Continuous time when all conditions are established.	≥ 1 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the vehicle is idling or running at a constant speed of 80 km/h (50 MPH) or more.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ 0.031

Time Needed for Diagnosis: 5 s × 1 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	< 0.031 + 0

Time Needed for Diagnosis: 5 s

EL:DTC P2098 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P2096. <Ref. to GD(H6DO)-187, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EM:DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2

1. OUTLINE OF DIAGNOSIS

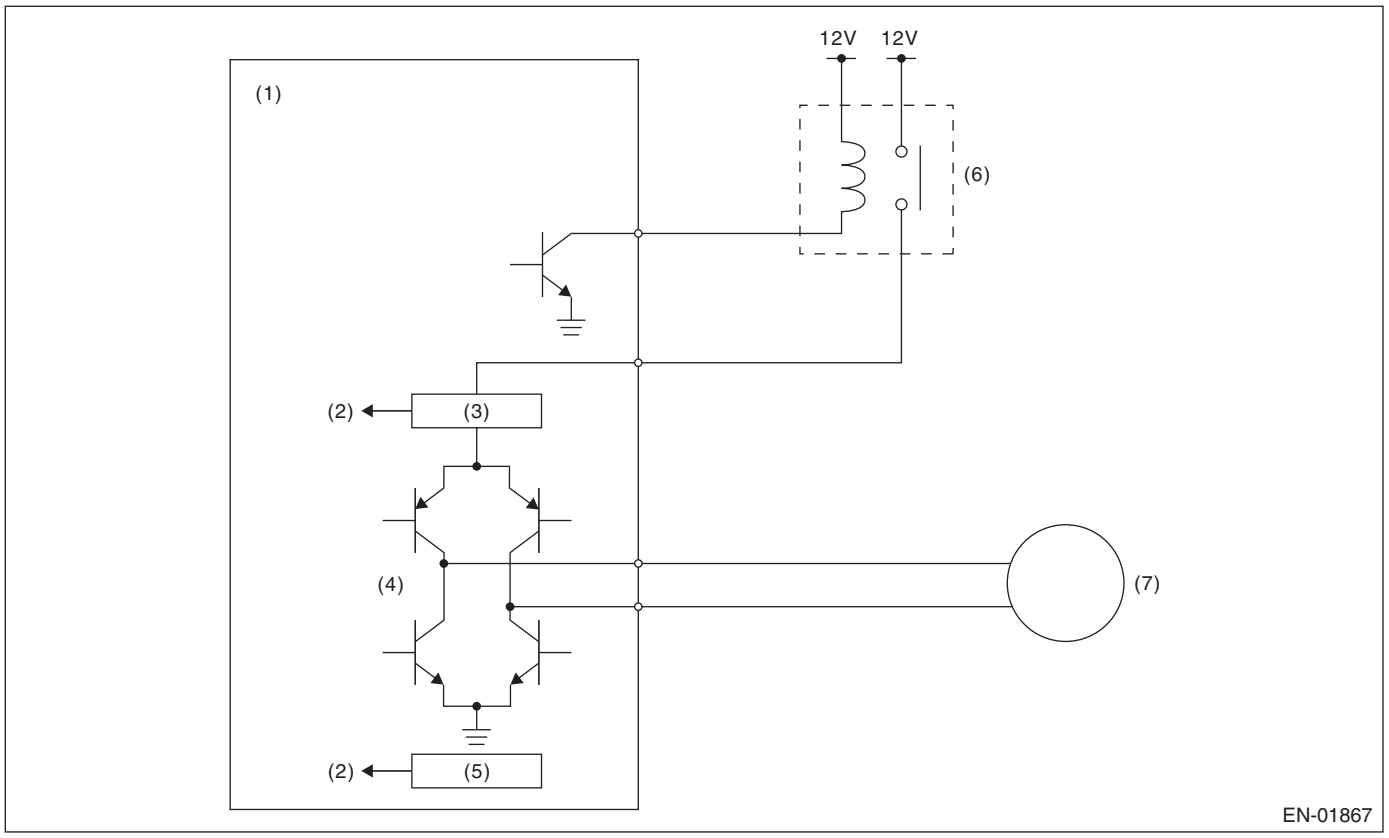
NOTE:
For the detection standard, refer to DTC P2097. <Ref. to GD(H6DO)-189, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EN:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the motor current becomes large or drive circuit is heated.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Overcurrent detection circuit
(4) Drive circuit
(5) Temperature detection circuit
(6) Electronic throttle control relay
(7) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	> 8 A
or	
Drive circuit inner temperature	> 175°C (347°F)

Time Needed for Diagnosis: 512 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	≤ 8 A
Drive circuit inner temperature	≤ 175°C (347°F)

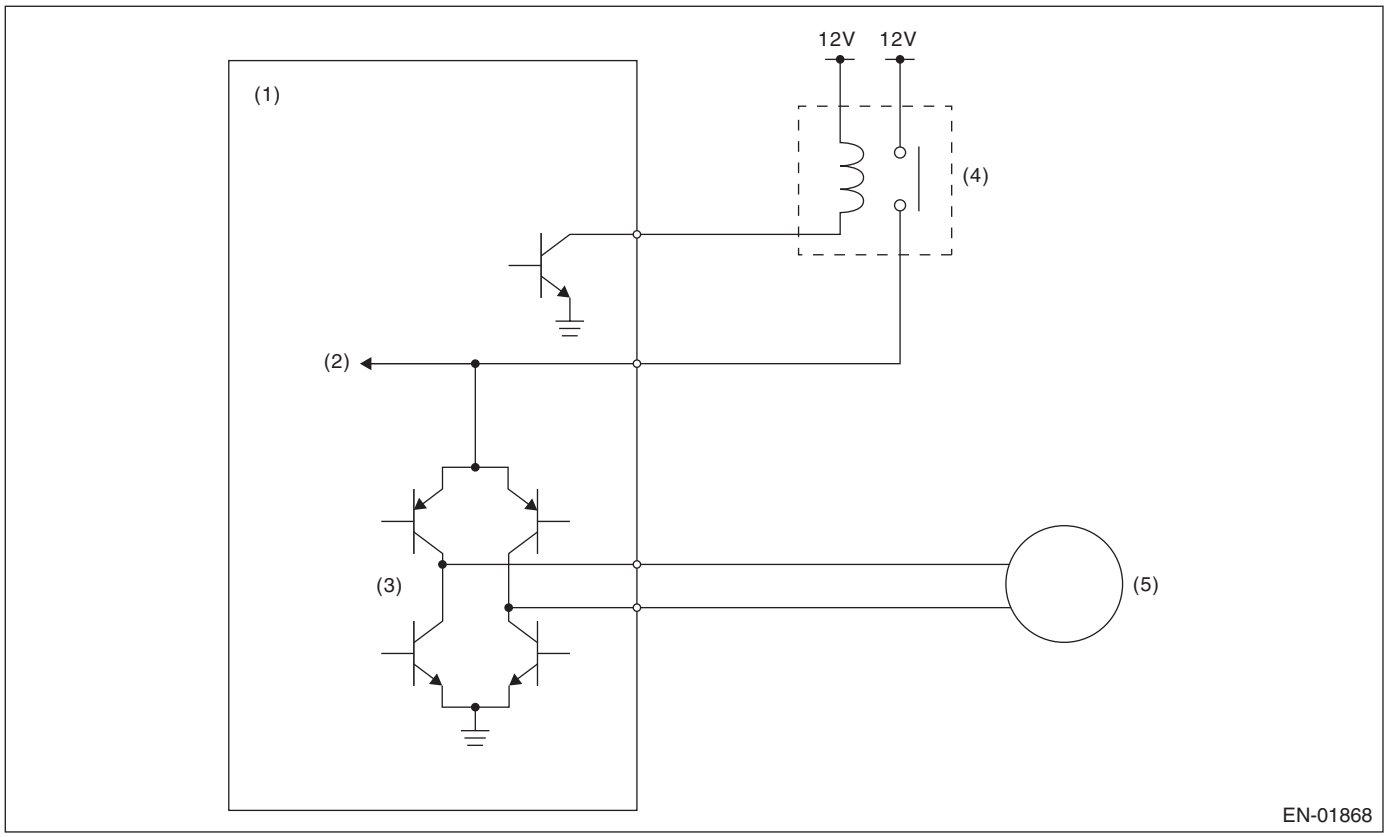
Time Needed for Diagnosis: 2000 ms

EO:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is not supplied even when ECM sets the electronic throttle control relay to ON.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic throttle control relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 11 V
Electronic throttle control relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis: 352 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	> 5 V

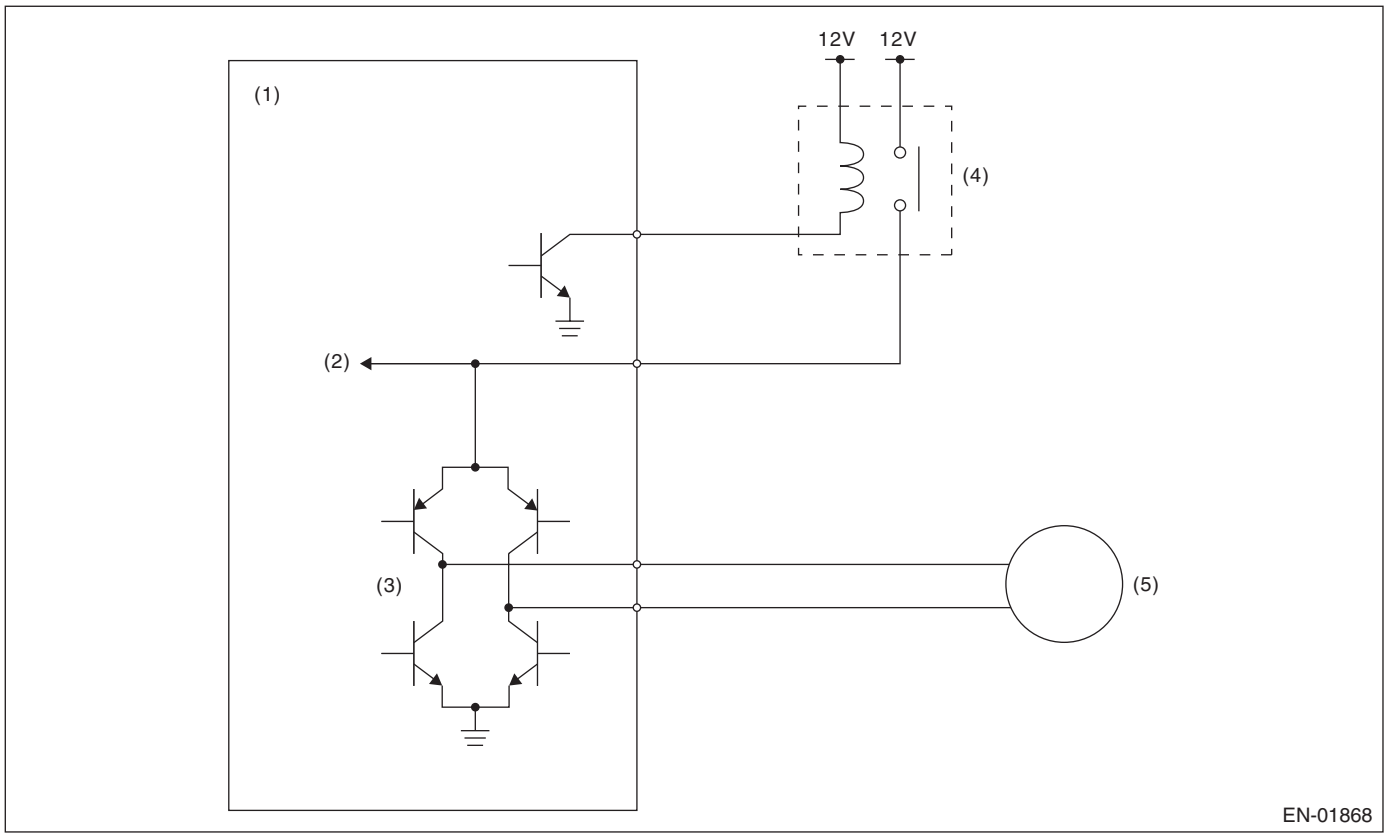
Time Needed for Diagnosis: 2000 ms

EP:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is supplied even when ECM sets the electronic throttle control relay to OFF.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic throttle control relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 6 V
Electronic throttle control relay output	OFF

4. GENERAL DRIVING CYCLE

- When ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≥ 5 V

Time Needed for Diagnosis: 600 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	< 5 V

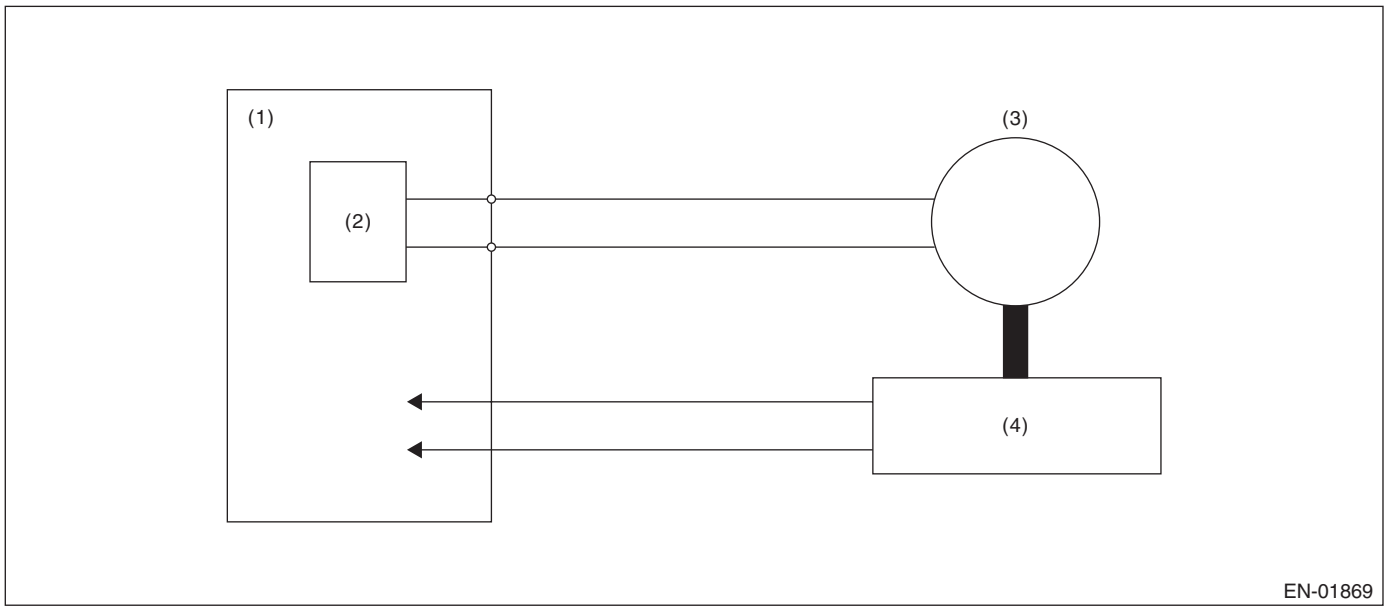
Time Needed for Diagnosis: 400 ms

EQ:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when full close point learning cannot conducted or abnormal value is detected.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Drive circuit
(3) Motor
(4) Throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (only after clear memory)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at full closed point learning.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor opening angle at full close point learning	< 10.384 ° or > 19.616 °
or	
Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	< 0.887 °

Time Needed for Diagnosis: 8 ms — 80 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor opening angle at full close point learning	≥ 10.384 ° and ≤ 19.616 °
Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	≥ 0.887 °

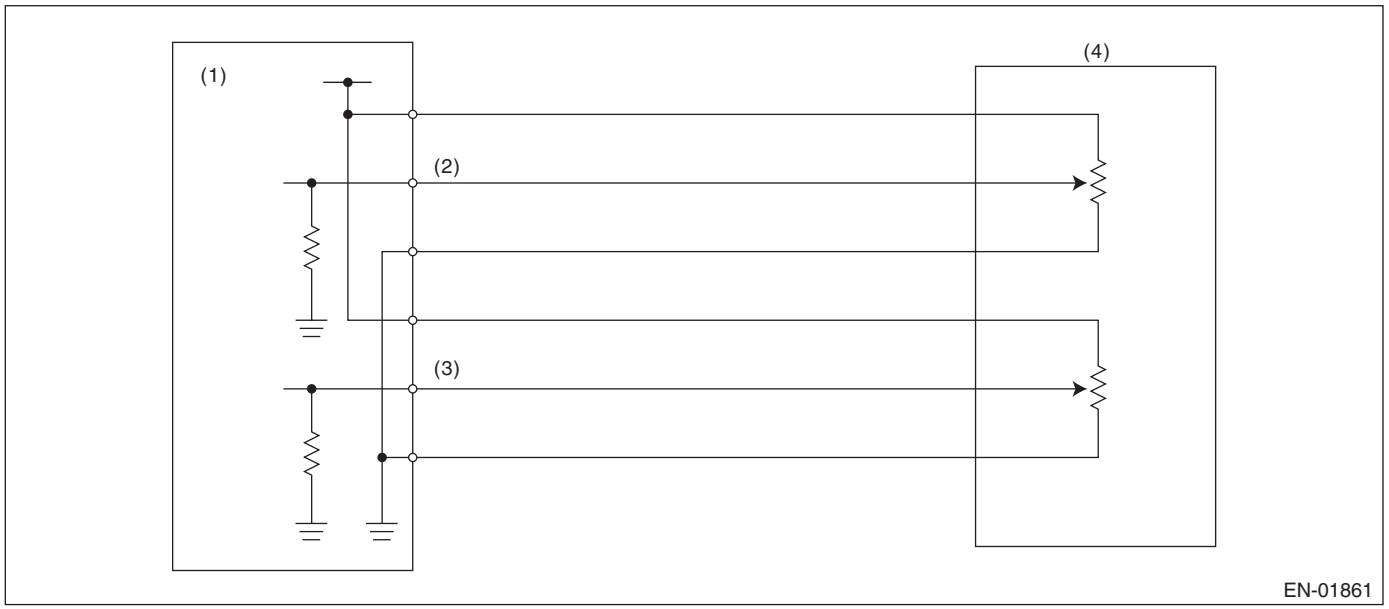
Time Needed for Diagnosis: 8 ms

ER:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal
(3) Accelerator pedal position sensor 2 signal
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 0.217 V

Time Needed for Diagnosis: 100 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.217 V

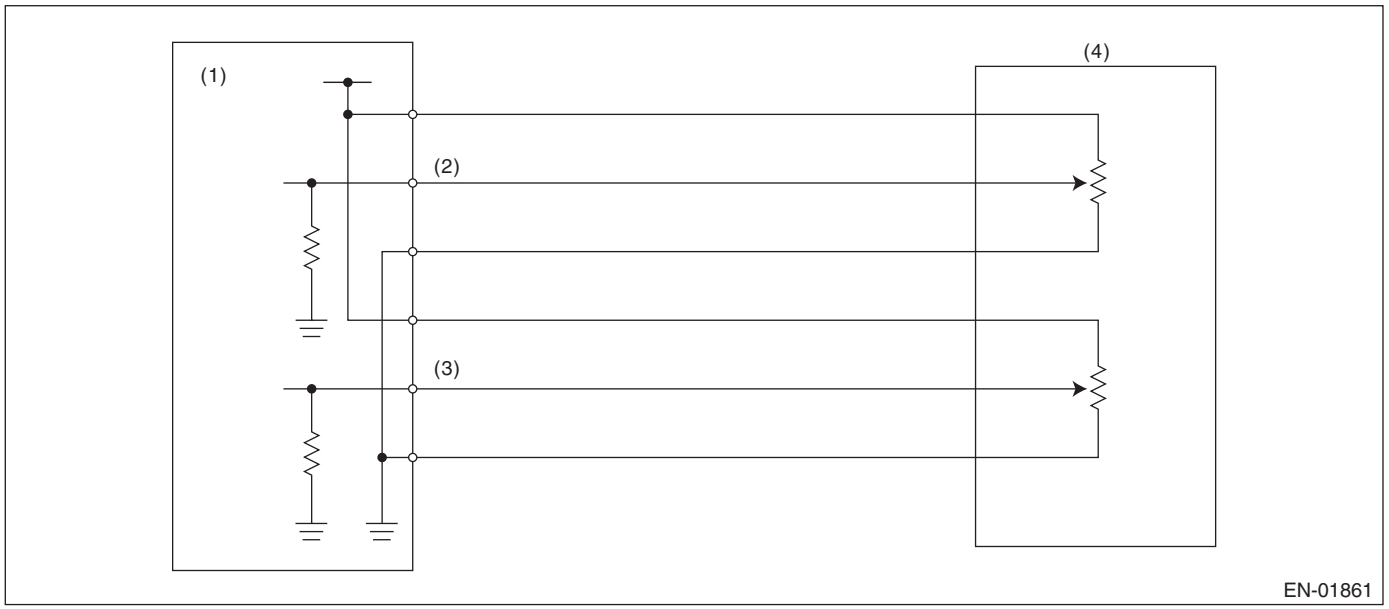
Time Needed for Diagnosis: 100 ms

ES:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal
(3) Accelerator pedal position sensor 2 signal
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.783 V

Time Needed for Diagnosis: 32 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.783 V

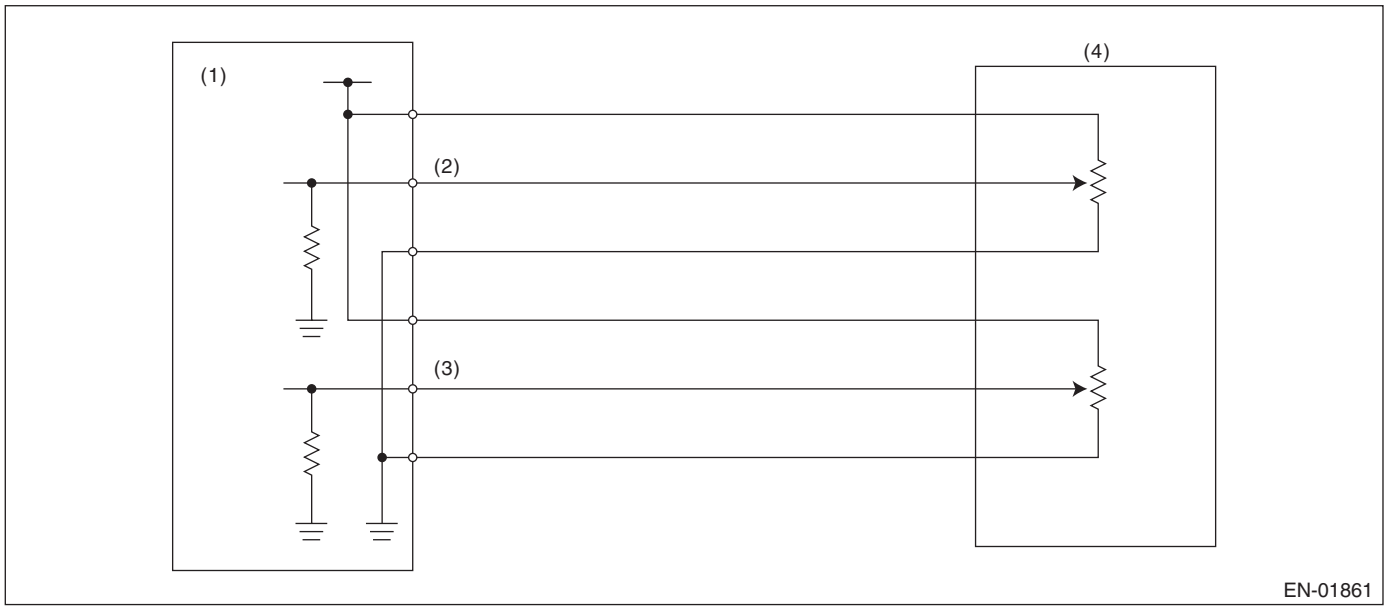
Time Needed for Diagnosis: 32 ms

ET:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal
(3) Accelerator pedal position sensor 2 signal
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	< 0.217 V

Time Needed for Diagnosis: 100 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 0.217 V

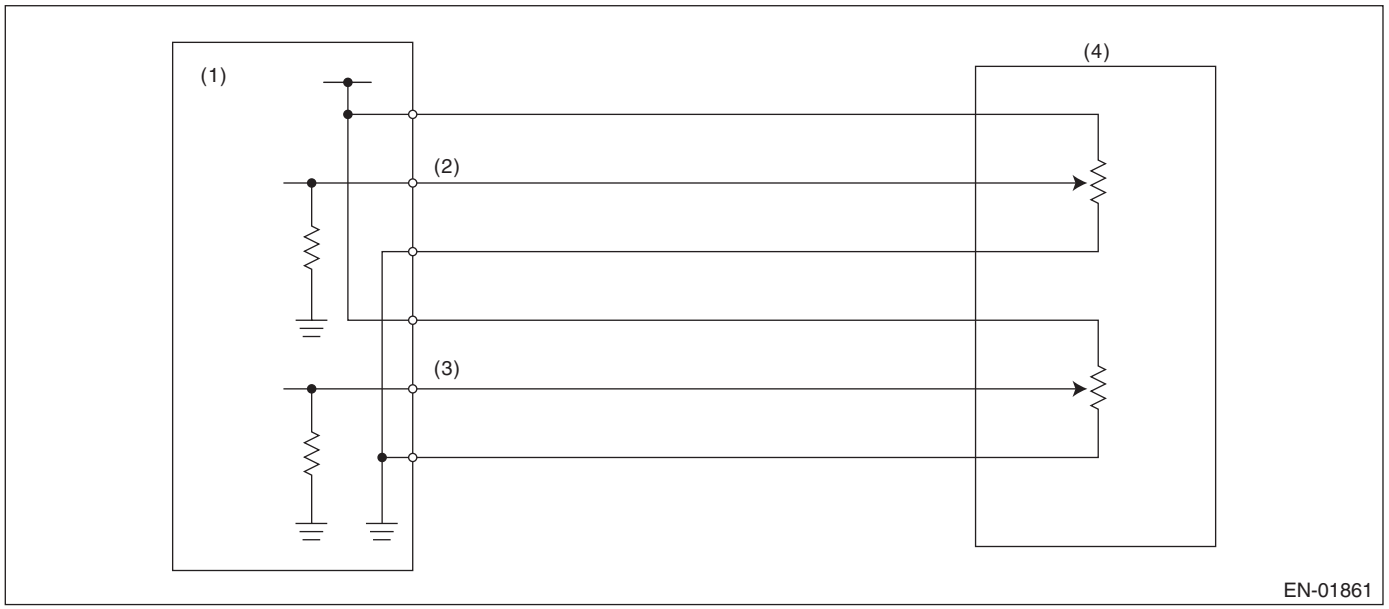
Time Needed for Diagnosis: 100 ms

EU:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal
(3) Accelerator pedal position sensor 2 signal
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 4.783 V

Time Needed for Diagnosis: 100 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	< 4.783 V

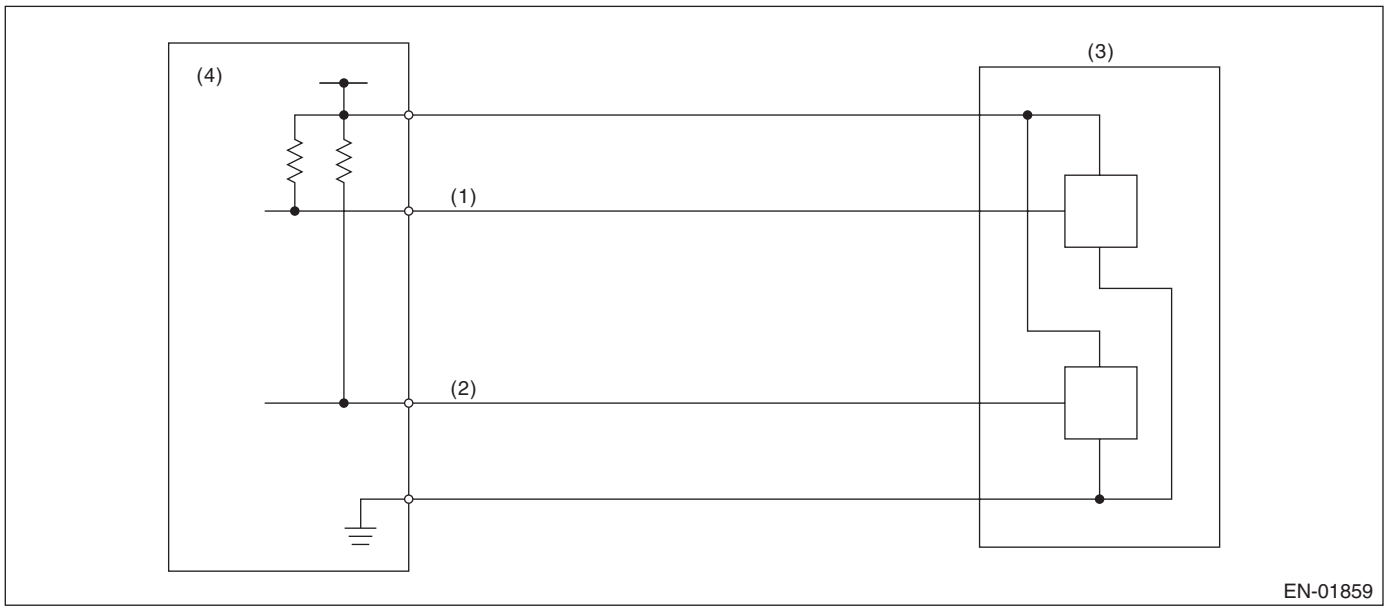
Time Needed for Diagnosis: 100 ms

EV:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

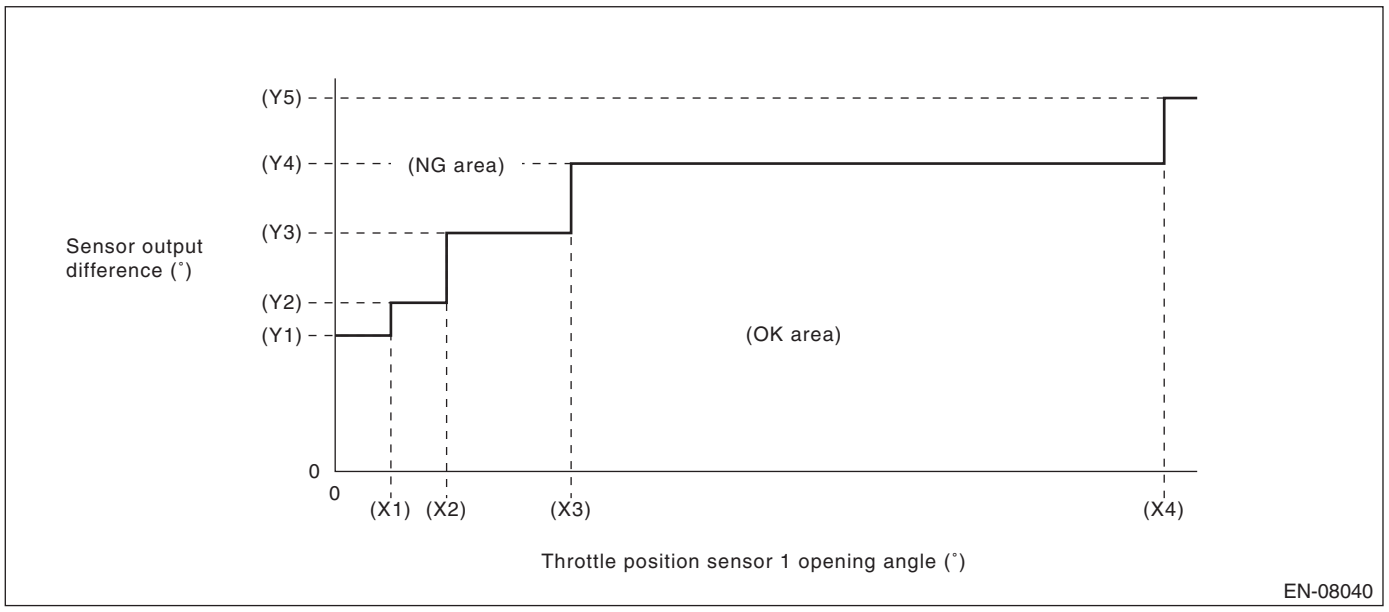
- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within NG range of **Details of Judgment value**

Details of Judgment Value



(X1) 2.125 °
(X2) 4.25 °
(X3) 9 °
(X4) 31.625 °

(Y1) 4.15 °
(Y2) 5.15 °
(Y3) 7.28 °
(Y4) 9.4 °
(Y5) 11.4 °

Time Needed for Diagnosis: 212 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within OK range of **Details of Judgment value**

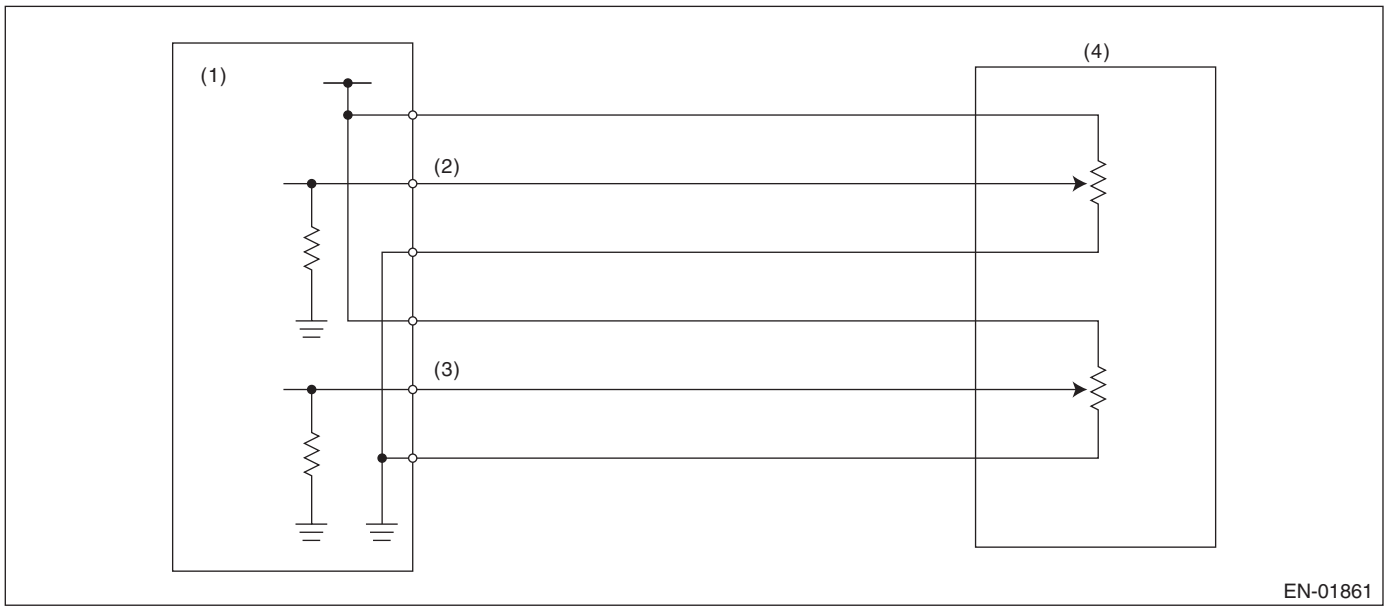
Time Needed for Diagnosis: 24 ms

EW:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal
(3) Accelerator pedal position sensor 2 signal
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

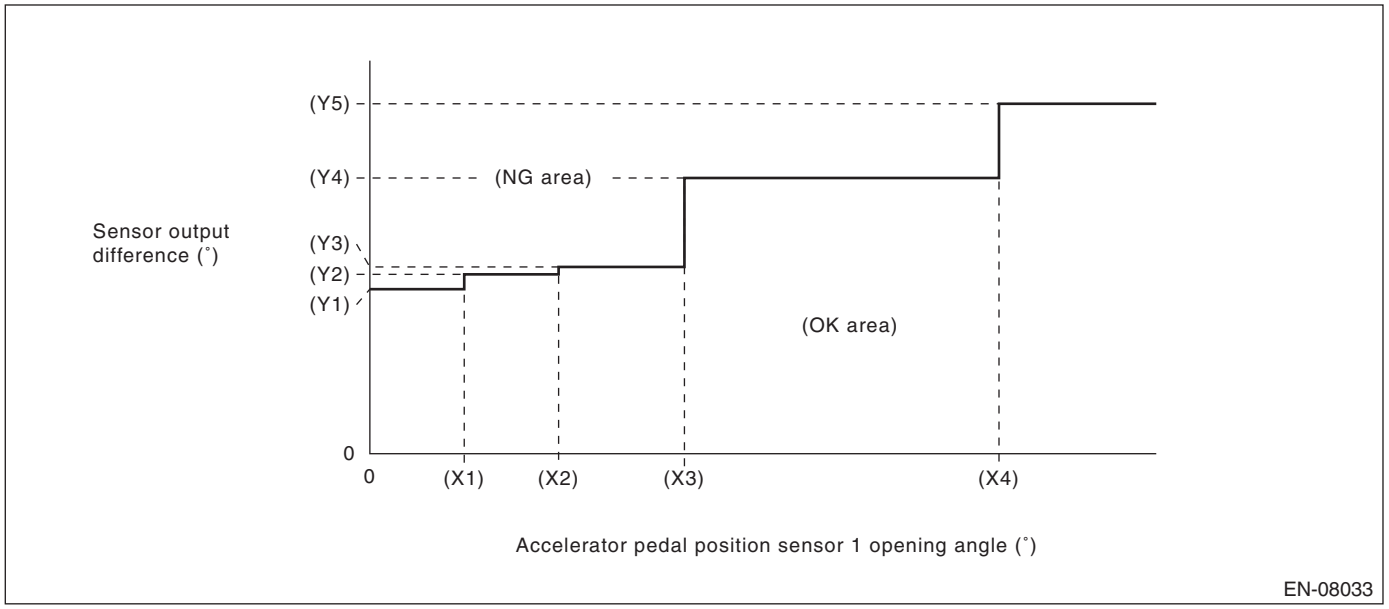
- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within NG range of **Details of Judgment value**

Details of Judgment Value



(X1) 0.6 °
(X2) 1.2 °
(X3) 2 °
(X4) 4 °

(Y1) 1.465 °
(Y2) 1.597 °
(Y3) 1.663 °
(Y4) 2.455 °
(Y5) 3.116 °

Time Needed for Diagnosis: 116 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within OK range of **Details of Judgment value**

Time Needed for Diagnosis: 116 ms

EX:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of barometric pressure sensor output property.
Judge as NG when the barometric pressure sensor output is largely different from the intake manifold pressure at engine start.

2. COMPONENT DESCRIPTION

The barometric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 300 rpm
Vehicle speed	< 1 km/h (0.6 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at ignition switch ON.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
|Barometric pressure – Intake manifold pressure|	≥ 26.7 kPa (200 mmHg, 7.9 inHg)
|Intake manifold pressure at engine start – Intake manifold pressure|	< 1.3 kPa (9.99 mmHg, 0.4 inHg)

Time Needed for Diagnosis: 328 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
|Barometric pressure – Intake manifold pressure|	< 26.7 kPa (200 mmHg, 7.9 inHg)

Time Needed for Diagnosis: 262 ms

EY:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the barometric pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION

The barometric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 1.707 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 1.707 V

Time Needed for Diagnosis: Less than 1 second

EZ:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the barometric pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION

The barometric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.234 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.234 V

Time Needed for Diagnosis: Less than 1 second

FA:DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.
When CAN communications is not possible, and CAN communications with TCM, VDC CM and body integrated unit is not possible, judge as NG if data from the TCM, VDC CM and body integrated unit are not normal.

2. COMPONENT DESCRIPTION

ECM, TCM, VDC CM and body integrated unit are connected by high speed CAN.

(Common Specifications)
CAN Protocol 2.0 B (Active)
Frame Format: 11 Bit ID Frame (Standard Frame)

(High speed CAN)
Conforms to ISO11898
Communication Speed: 500 kbps

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Starter switch	OFF
Engine	run
bus off flag or error warning flag	set (error)
or	
ID received from control module connected to driving system CAN	None during 500 milliseconds
or	
Data updated from control module connected to driving system CAN	None during 2000 milliseconds

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Starter switch	OFF
Engine	run
bus off flag or error warning flag	clear (No error)
ID received from control module connected to driving system CAN	Yes
Data updated from control module connected to driving system CAN	Yes

Time Needed for Diagnosis: 1000 ms

FB:DTC U0101 CAN (TCU) DATA NOT LOADED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H6DO)-214, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

FC:DTC U0122 CAN (VDC) DATA NOT LOADED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H6DO)-214, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

FD:DTC U0140 CAN (BCU) DATA NOT LOADED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H6DO)-214, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

FE:DTC U0402 CAN (TCU) DATA ABNORMAL

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H6DO)-214, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

FF:DTC U0416 CAN (VDC) DATA ABNORMAL

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H6DO)-214, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

FG:DTC U0422 CAN (BCU) DATA ABNORMAL

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H6DO)-214, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TRANSMISSION SECTION

CONTROL SYSTEMS	CS
AUTOMATIC TRANSMISSION	5AT
AUTOMATIC TRANSMISSION (DIAGNOSTICS)	5AT(diag)

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUJI HEAVY INDUSTRIES LTD. G3160BE3

CONTROL SYSTEMS

CS

Page

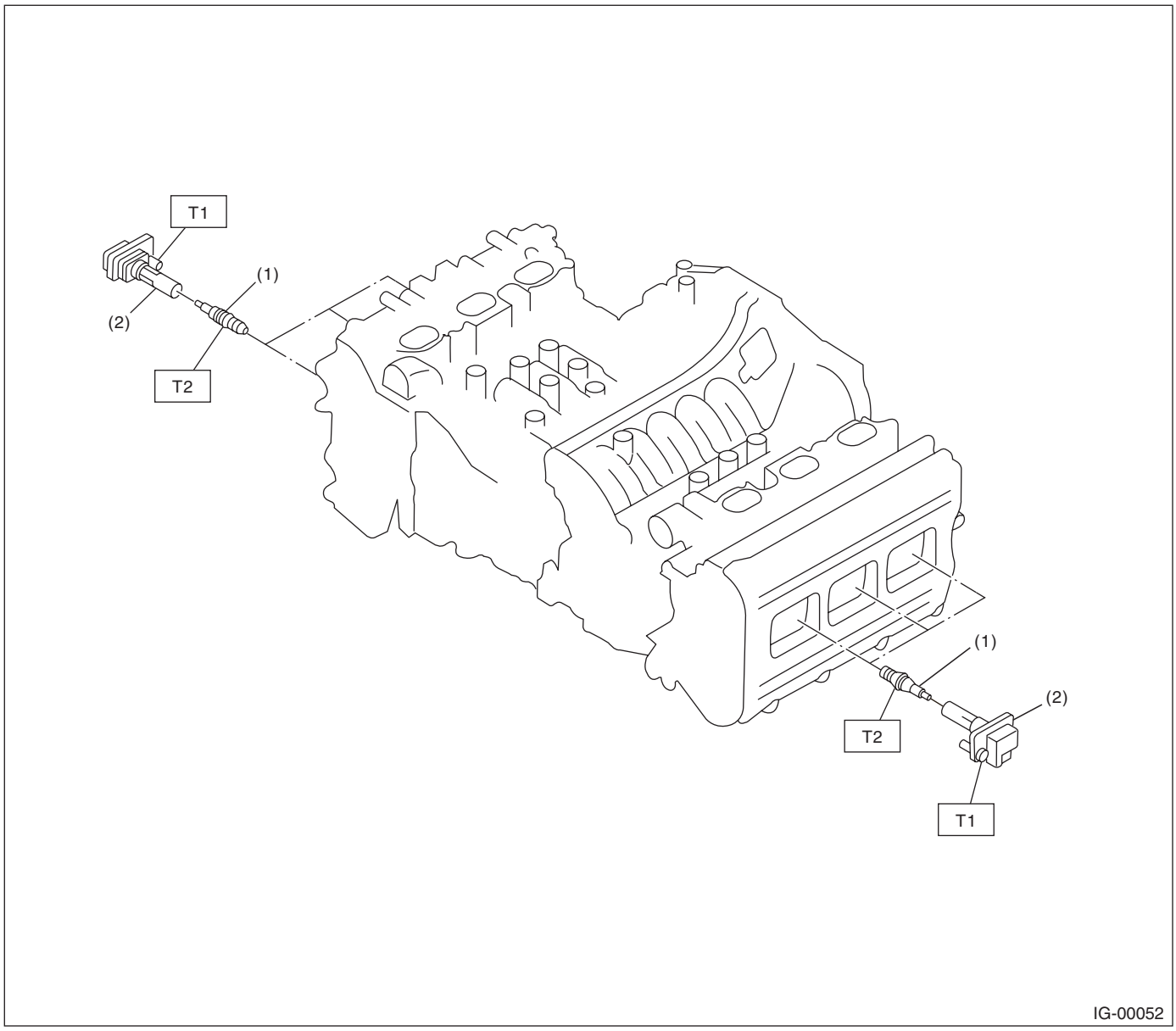
1. General Description 2
2. AT Shift Lock Control System 5
3. Select Lever 19
4. Select Cable 26
5. AT Shift Lock Solenoid and “P” Range Switch 29
6. Body Integrated Unit 32
7. General Diagnostic Table 33

1. General Description

A: SPECIFICATION

Item			Specifications
Ignition coil	Type		FK0368
	Ignition system		Independent ignition coil
	Manufacturer		Diamond Electric
Spark plug	Manufacturer and type		NGK: SILFR6C11
	Thread size (diameter, pitch, length) mm		14?1.25?26.5
	Spark plug gap mm (in)	Standard	1.0 — 1.1 (0.039 — 0.043)
	Electrode		Iridium

B: COMPONENT



(1) Spark plug
(2) Ignition coil

Tightening torque:N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.8)
T2: 21 (2.1, 15.5)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

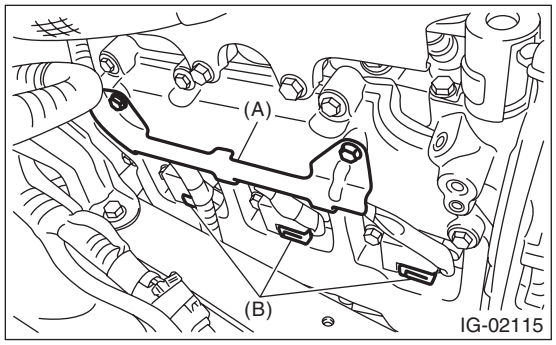
2. Spark Plug

A: REMOVAL

Spark plug:
<Ref. to IG(H6DO)-2, SPECIFICATION, General Description.>

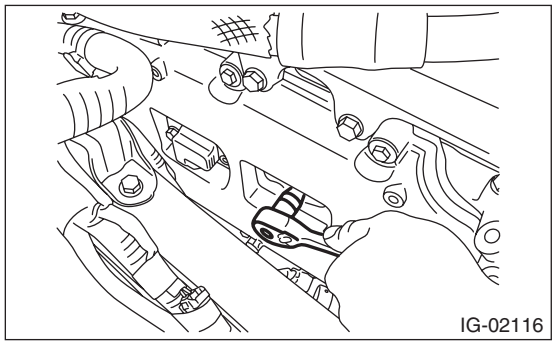
1. RH SIDE

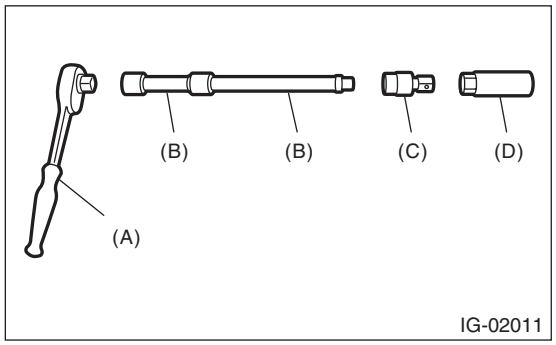
1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the air cleaner case. <Ref. to IN(H6DO)-6, REMOVAL, Air Cleaner Case.>
4) Remove the engine harness stay (A).
5) Disconnect the connector (B) from ignition coil.



6) Remove the ignition coil.

NOTE:
Turn the #5 ignition coil to remove it.
7) Remove the spark plug with a spark plug socket.

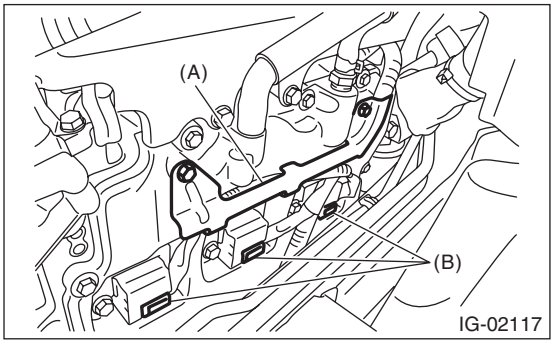




(A) Ratchet handle
(B) Extension bar
(C) Universal joint
(D) Spark plug socket

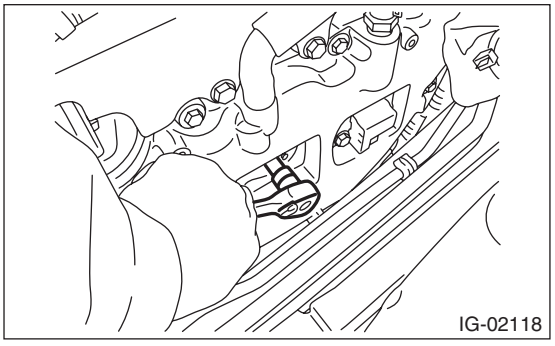
2. LH SIDE

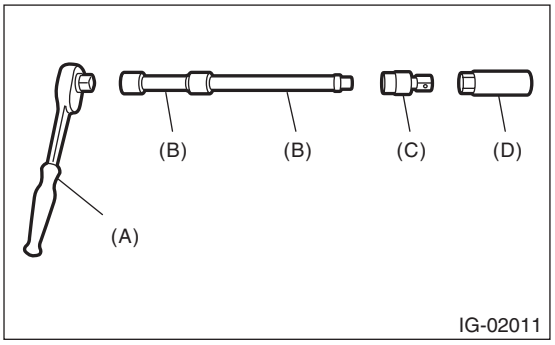
1) Remove the collector cover.
2) Remove the battery and battery carrier. <Ref. to SC(H6DO)-18, REMOVAL, Battery.>
3) Remove the engine harness stay (A).
4) Disconnect the connector (B) from ignition coil.



5) Remove the ignition coil.

NOTE:
Turn the #6 ignition coil to remove it.
6) Remove the spark plug with a spark plug socket.





(A) Ratchet handle
(B) Extension bar
(C) Universal joint
(D) Spark plug socket

B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque:
Spark plug
21 N·m (2.1 kgf-m, 15.5 ft-lb)
Ignition coil
16 N·m (1.6 kgf-m, 11.8 ft-lb)
Engine harness stay
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

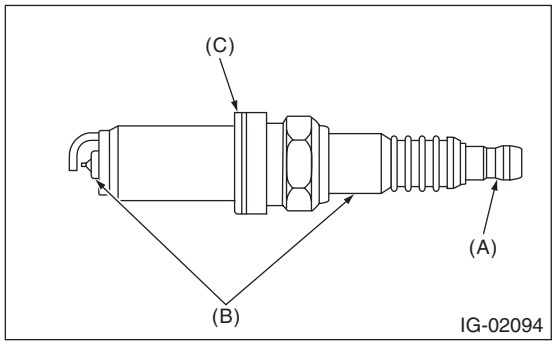
2. LH SIDE

Install in the reverse order of removal.

Tightening torque:
Spark plug
21 N·m (2.1 kgf-m, 15.5 ft-lb)
Ignition coil
16 N·m (1.6 kgf-m, 11.8 ft-lb)
Engine harness stay
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

C: INSPECTION

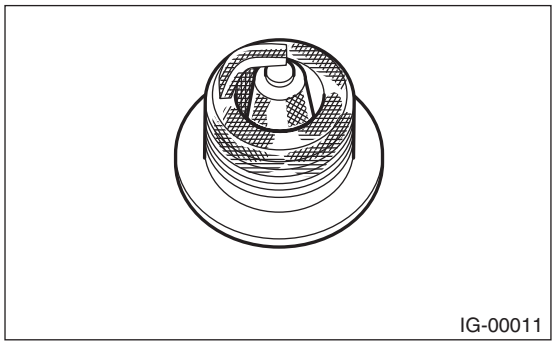
1) Check the spark plug for abnormalities. If defective, replace the spark plug.



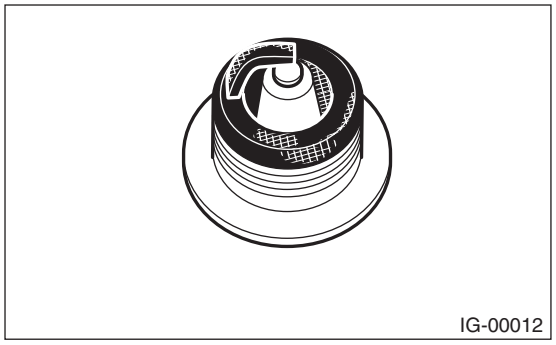
(A) Terminal damage
(B) Crack or damage in insulator
(C) Damaged gasket

2) Check the spark plug electrode and condition of the insulator. If abnormal, check and repair the cause and replace the spark plug.

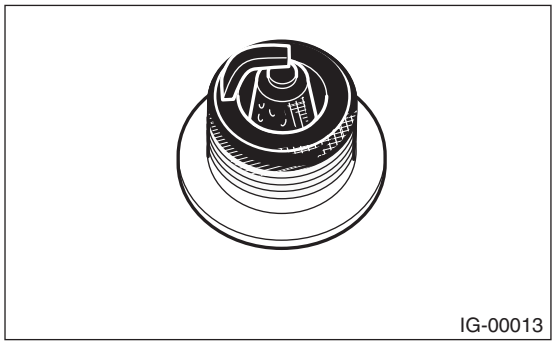
(1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



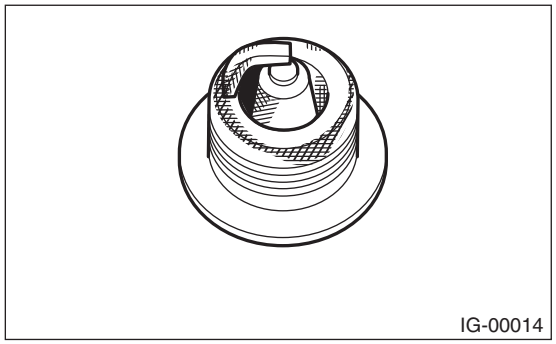
(2) Carbon fouled:
Dry fluffy carbon deposits on the insulator and electrode are mostly caused by slow-speed driving in town, weak ignition, too rich fuel mixture, etc.



(3) Oil fouled:
Wet black deposits show oil entrance into combustion chamber through worn piston rings or increased clearance between valve guides and valve stems.



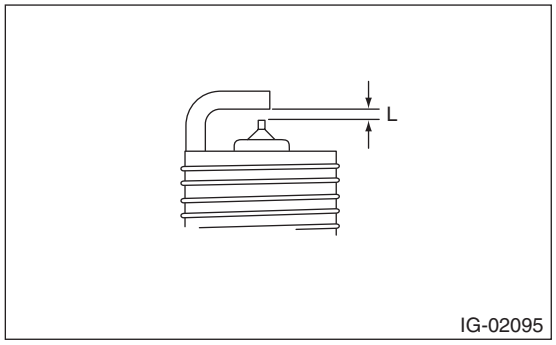
(4) Overheating:
A white or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating, wrong selection of fuel, or loose spark plugs.


IG-00014

3) Using a nylon brush, etc., clean and remove the carbon or oxide deposits from the spark plug. If deposits are too stubborn, replace the spark plugs. After cleaning the spark plugs, check the spark plug gap “L” using a gap gauge. If it is not within the standard, replace the spark plug.

NOTE:
- Never use a plug cleaner.
- Do not use a metal brush as it may damage the electrode area.

Spark plug gap L:
Standard
1.0 — 1.1 mm (0.039 — 0.043 in)



IG-02095

3. Ignition Coil

A: REMOVAL

Direct ignition type has been adopted. Refer to “Spark Plug” for removal procedure. <Ref. to IG(H6DO)-5, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

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

C: INSPECTION

For inspection procedure, refer to “Diagnostics for Engine Starting Failure”. <Ref. to EN(H6DO)(diag)-79, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

STARTING/CHARGING SYSTEMS

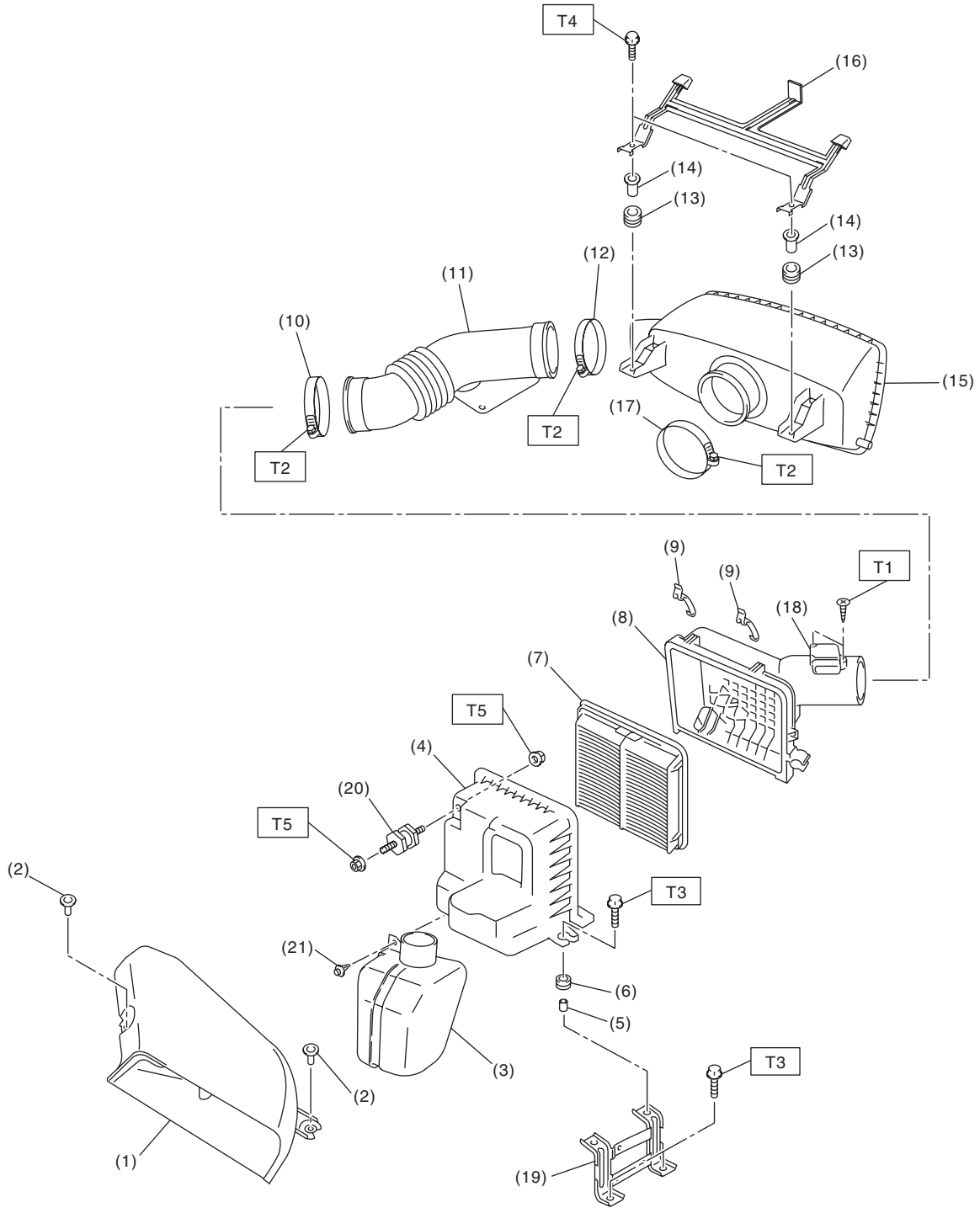
SC(H6DO)

Page

1. General Description 2
2. Starter 6
3. Generator 12
4. Battery 18

1. General Description

A: COMPONENT



IN-02919

(1) Air intake duct
(2) Clip
(3) Resonator chamber
(4) Air cleaner case (Front)
(5) Spacer
(6) Cushion
(7) Air cleaner element
(8) Air cleaner case (Rear)
(9) Clip
(10) Clamp
(11) Intake boot
(12) Clamp
(13) Cushion
(14) Spacer
(15) Air intake chamber
(16) Collector cover bracket
(17) Clamp
(18) Mass air flow and intake air temperature sensor
(19) Air cleaner bracket
(20) Cushion
(21) Clip

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1 (0.1, 0.7)
T2: 3 (0.3, 2.2)
T3: 6 (0.6, 4.4)
T4: 6.5 (0.7, 4.8)
T5: 7.5 (0.8, 5.5)

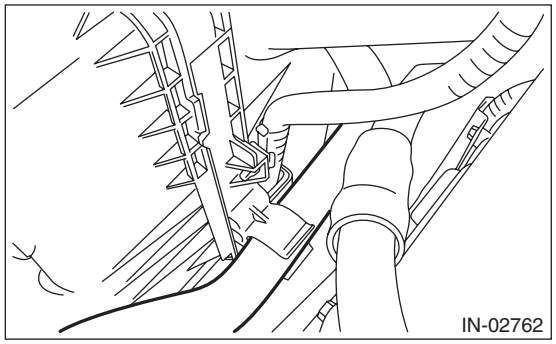
B: CAUTION

• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

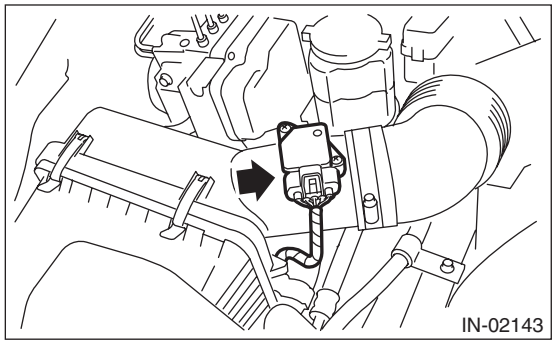
2. Air Cleaner Element

A: REMOVAL

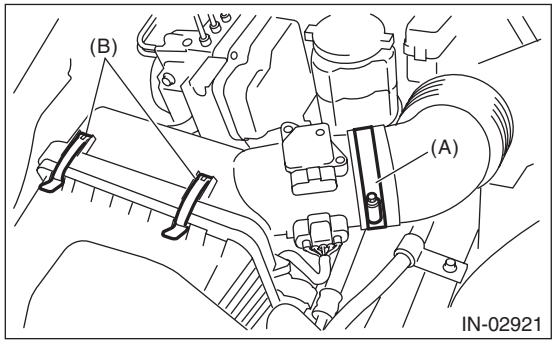
1) Disconnect the ground cable from battery.
2) Disconnect the power steering oil pressure hose (suction hose) from the clip on the side of air cleaner case (rear).



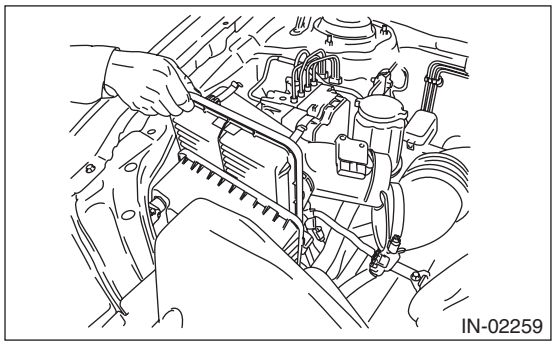
3) Disconnect the connectors from the mass air flow and intake air temperature sensor.



4) Loosen the clamp (A) which connects the air cleaner case (rear) to intake duct.
5) Remove the clips (B) securing the upper side of the air cleaner case.



6) Pull the air cleaner case (rear) backward of the vehicle, and remove the air cleaner element.

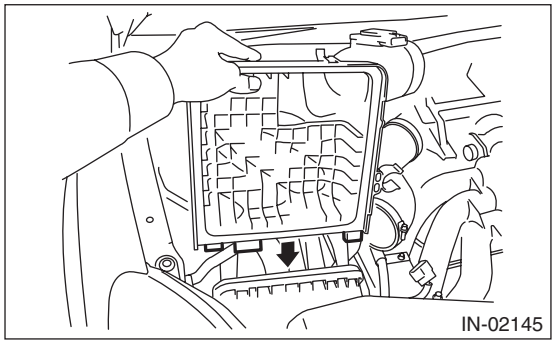


B: INSTALLATION

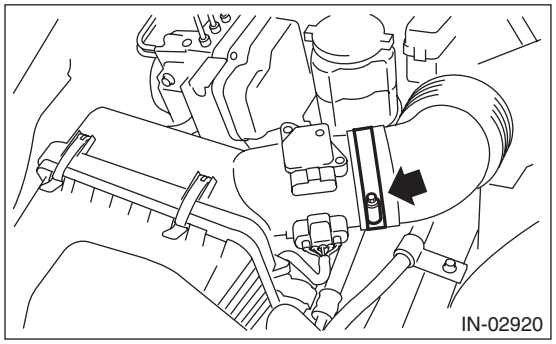
Install in the reverse order of removal.

CAUTION:
Be sure to use SUBARU genuine air cleaner element depending on the engine type when replacing the air cleaner elements. Using other air cleaner element may affect the engine performance.

NOTE:
• Check that there are no foreign objects in the air cleaner case.
• When installing the air cleaner case (rear), align the protrusion of the air cleaner case (rear) to the hole on the air cleaner case (front) to install.



Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



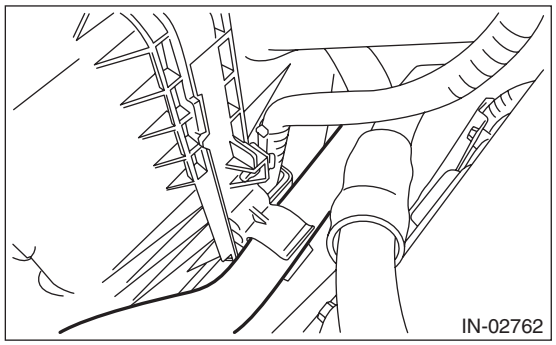
C: INSPECTION

1) Check that the air cleaner element has no deformation, cracks or other damages.
2) Check if the air cleaner element is extremely dirty.

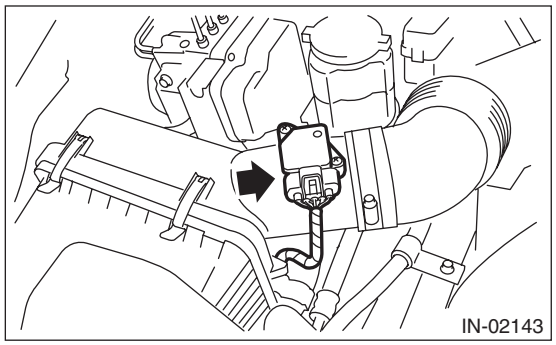
3. Air Cleaner Case

A: REMOVAL

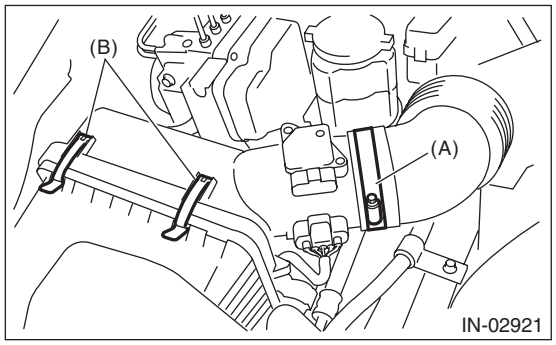
1) Disconnect the ground cable from battery.
2) Disconnect the power steering oil pressure hose (suction hose) from the clip on the side of air cleaner case (rear).



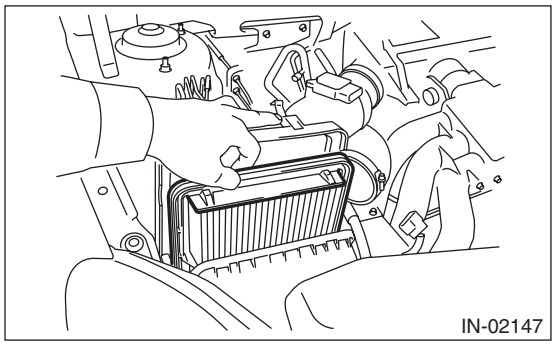
3) Disconnect the connectors from the mass air flow and intake air temperature sensor.



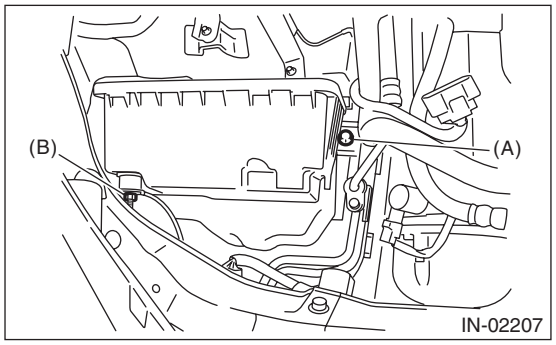
4) Loosen the clamp (A) which connects the air cleaner case (rear) to intake duct.
5) Remove the clips (B) securing the upper side of the air cleaner case.



6) Remove the air cleaner case (rear) and air cleaner element.



7) Remove the air intake duct. <Ref. to IN(H6DO)-9, REMOVAL, Air Intake Duct.>
8) Remove the bolts (A) and nut (B) which secure the air cleaner case to body.

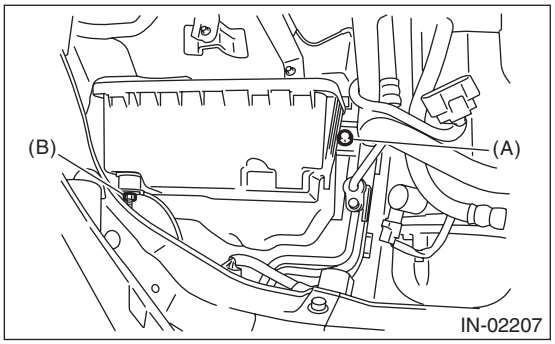


9) Remove the air cleaner case (front).

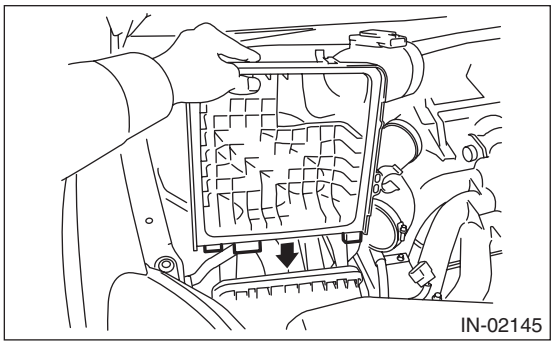
B: INSTALLATION

Install in the reverse order of removal.

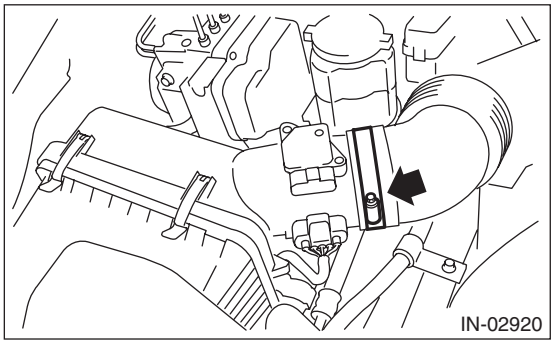
Tightening torque:
Bolt (A):
6 N·m (0.6 kgf-m, 4.4 ft-lb)
Nut (B):
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



NOTE:
When installing the air cleaner case (rear), align the protrusion of the air cleaner case (rear) to the hole on the air cleaner case (front) to install.



Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



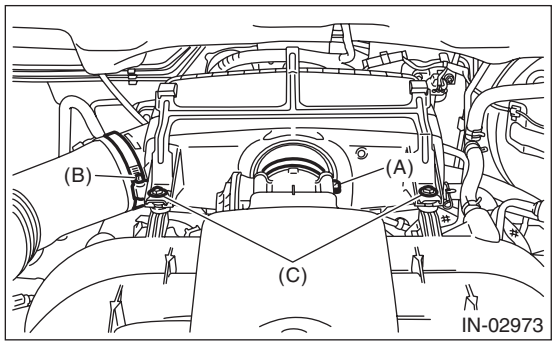
C: INSPECTION

1) Check that the air cleaner case has no deformation, cracks or other damages.
2) Check the intake boot for cracks, damage or looseness.

4. Air Intake Chamber

A: REMOVAL

1) Remove the collector cover.
2) Loosen the clamp (A) which connects air intake chamber to throttle body.
3) Loosen the clamp (B) which connects intake boot to air intake chamber.
4) Remove the bolt (C) which secures air intake chamber and collector cover bracket to the stay.

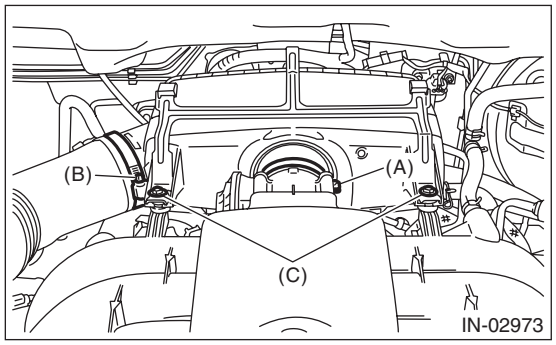


5) Disconnect the blow-by hoses, and then remove air intake chamber.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Clamp (A), (B)
3 N·m (0.3 kgf-m, 2.2 ft-lb)
Bolt (C)
6.5 N·m (0.7 kgf-m, 4.8 ft-lb)



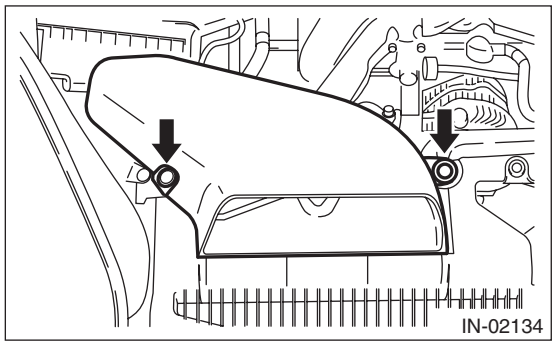
C: INSPECTION

1) Check the intake boot for deformation, cracks or other damages.
2) Check that no foreign matter is mixed in air intake chamber.

5. Air Intake Duct

A: REMOVAL

1) Remove the clip holding the air intake duct.
2) Remove the air intake duct.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Check that the air intake duct has no deformation, cracks or other damages.
2) Check that no foreign matter is mixed in air intake duct.

6. Resonator Chamber

A: REMOVAL

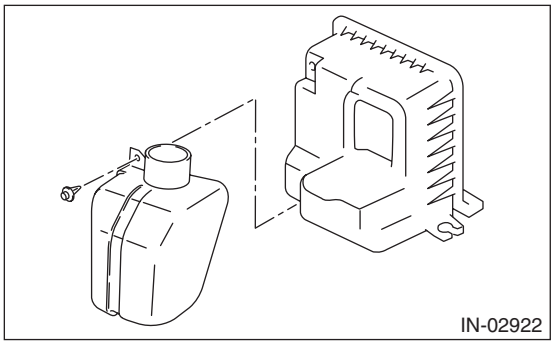
The resonator chamber and air cleaner case are integrated into one unit; therefore, refer to “Air Cleaner Case” for the removal procedure. <Ref. to IN(H6DO)-6, REMOVAL, Air Cleaner Case.>

B: INSTALLATION

The resonator chamber and air cleaner case are integrated into one unit; therefore, refer to “Air Cleaner Case” for installation procedure. <Ref. to IN(H6DO)-7, INSTALLATION, Air Cleaner Case.>

C: DISASSEMBLY

1) Remove the clip which connects the resonator chamber and the air cleaner case (front).



2) Separate the resonator chamber and the air cleaner case (front).

D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

Check that the resonator chamber has no deformation, cracks or other damages.

MECHANICAL

ME(H6DO)

		Page
1.	General Description	2
2.	Compression	27
3.	Idle Speed	28
4.	Ignition Timing	29
5.	Intake Manifold Vacuum	30
6.	Engine Oil Pressure	31
7.	Fuel Pressure	32
8.	Valve Clearance	33
9.	Engine Assembly	36
10.	Engine Mounting	44
11.	Preparation for Overhaul	45
12.	V-belt	46
13.	Crank Pulley	47
14.	Chain Cover	48
15.	Timing Chain Assembly	54
16.	Cam Sprocket	74
17.	Crank Sprocket	75
18.	Camshaft	76
19.	Cylinder Head	83
20.	Cylinder Block	97
21.	Oil Flow Control Solenoid Valve	120
22.	Intake and Exhaust Valve	121
23.	Piston	122
24.	Connecting Rod	123
25.	Crankshaft	124
26.	Engine Trouble in General	125
27.	Engine Noise	131

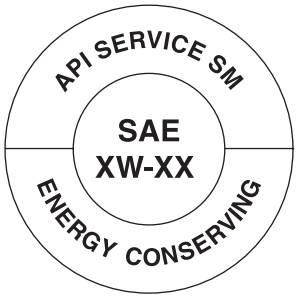
1. General Description

A: SPECIFICATION

Lubrication method					Forced lubrication
Oil pump	Pump type				Trochoid type
	Number of teeth	Inner rotor			7
		Outer rotor			8
	Outer rotor diameter × thickness			mm (in)	76 × 30.2 (2.99 × 1.19)
	Performance (Oil temperature 80°C (176°F))	600 rpm	Discharge pressure	kPa (kgf/cm^2, psi)	98 (1.0, 14)
			Discharge rate	ℓ (US qt, Imp qt)/min.	5.0 (5.3, 4.4) or more
		6,000 rpm	Discharge pressure	kPa (kgf/cm^2, psi)	392 (4.0, 57)
			Discharge rate	ℓ (US qt, Imp qt)/min.	82.8 (87.5, 72.9) or more
Oil filter	Filter type				Full-flow filter type
	Filtration area			cm^2 (sq in)	1,300 (201.5)
	By-pass valve opening pressure			kPa (kgf/cm^2, psi)	160 (1.63, 23.2)
	Outer diameter × width			mm (in)	80 × 75 (3.15 × 2.95)
	Installation screw specifications				M 20 × 1.5
Oil pressure switch	Type				Immersed contact point type
	Operating voltage — power consumption				12 V — 3.4 W or less
	Warning light operating pressure			kPa (kgf/cm^2, psi)	14.7 (0.15, 2.1)
	Proof pressure			kPa (kgf/cm^2, psi)	980 (10.0, 142) or more
Engine oil	Total capacity (at overhaul)			ℓ (US qt, Imp qt)	7.8 (8.2, 6.9)
	When replacing engine oil and oil filter			ℓ (US qt, Imp qt)	6.5 (6.9, 5.7)
	When replacing engine oil only			ℓ (US qt, Imp qt)	6.3 (6.7, 5.5)

Recommended oil:

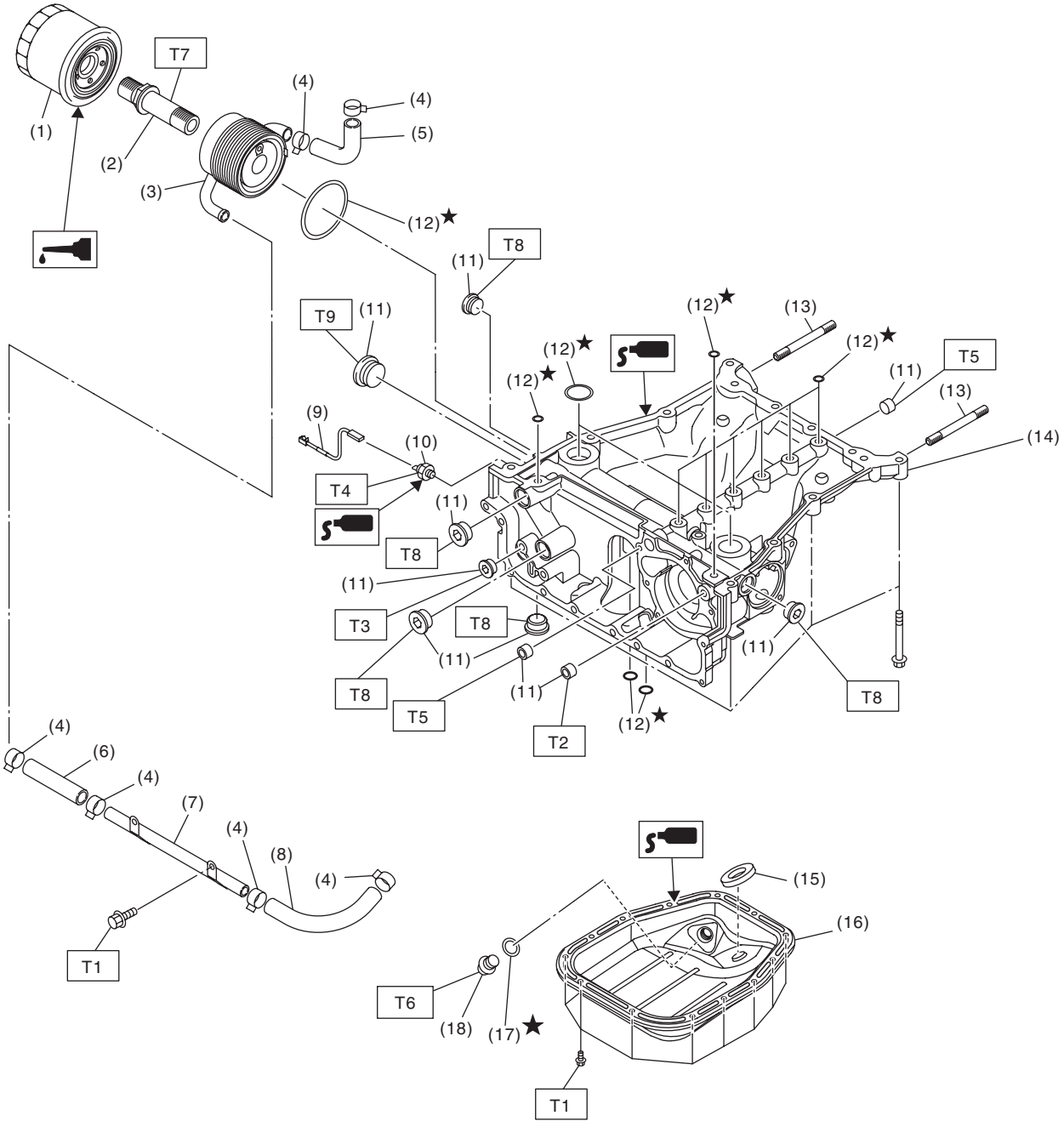
CAUTION:
It is acceptable to fill an engine with oil of another brand when replacing the oil, but make sure to use following oil specified by Subaru.

Engine oil standard		SAE viscosity No.
 RM-00076 For API standard, oil with SM "Energy Conserving" or SN "Resource Conserving" logo.	or	 RM-00002 Those with the ILSAC standard GF-4 or GF-5 "starburst mark" displayed on top of the container.	5W-30 (synthetic oil)

NOTE:
The proper viscosity oil helps the engine maintain its ideal temperature, and cranking speed increased by reducing viscosity friction in hot condition.

B: COMPONENT

1. OIL PAN UPPER, OIL COOLER, OIL FILTER

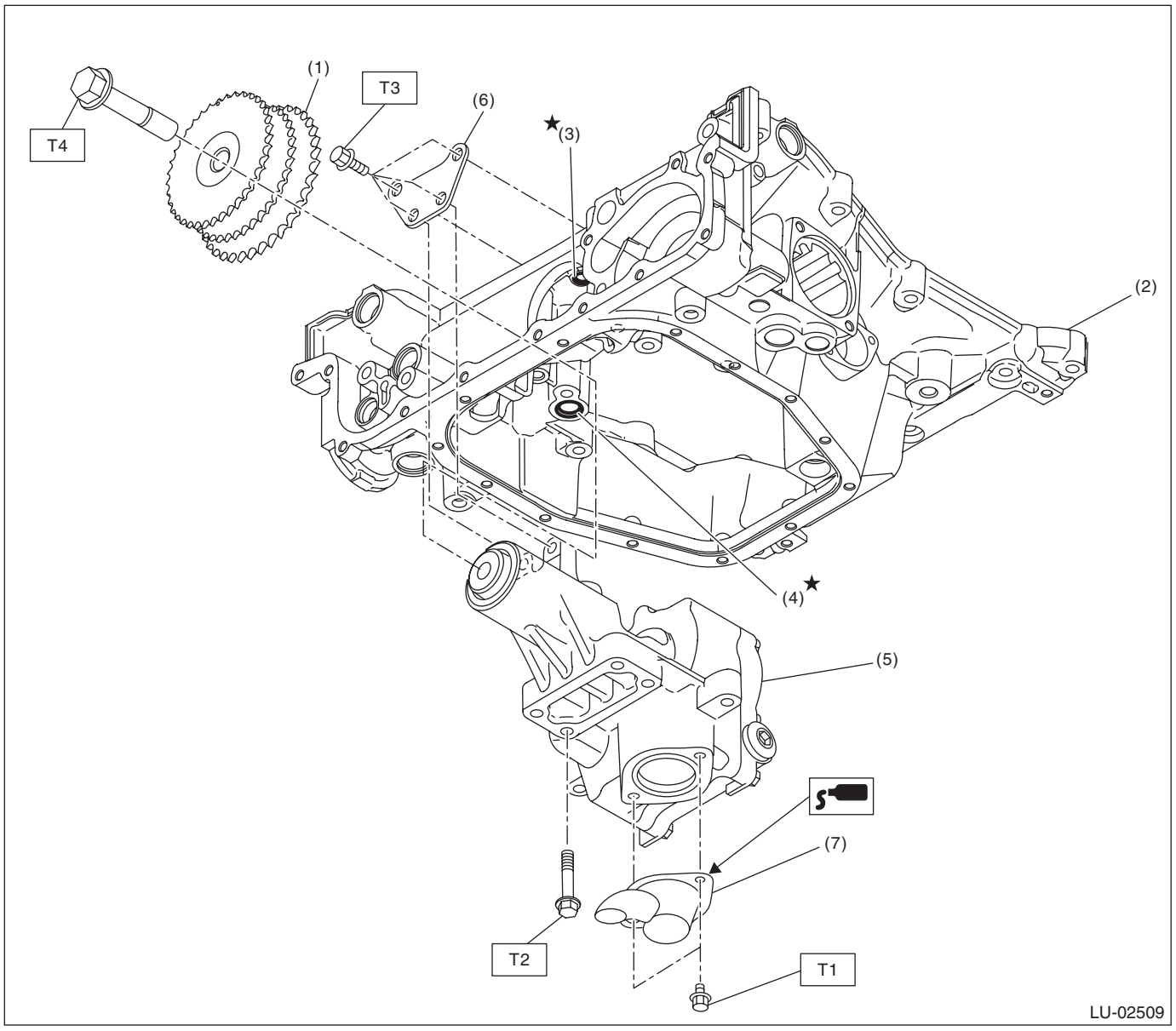


LU-02689

(1)	Oil filter	(10)	Oil pressure switch
(2)	Oil cooler connector	(11)	Plug
(3)	Oil cooler	(12)	O-ring
(4)	Clip	(13)	Stud bolt
(5)	Water hose	(14)	Oil pan upper
(6)	Water hose	(15)	Oil pan magnet
(7)	Engine oil cooler water pipe	(16)	Oil pan lower
(8)	Water hose	(17)	Gasket
(9)	Oil pressure switch harness	(18)	Drain plug

Tightening torque:N·m (kgf-m, ft-lb)	
T1:	***6.4 (0.7, 4.7)***
T2:	***17 (1.7, 12.5)***
T3:	***23 (2.3, 17.0)***
T4:	***25 (2.5, 18.4)***
T5:	***34 (3.5, 25.1)***
T6:	***44 (4.5, 32.5)***
T7:	***54 (5.5, 39.8)***
T8:	***60 (6.1, 44.3)***
T9:	***90 (9.2, 66.4)***

2. OIL PUMP



(1) Idler sprocket
(2) Oil pan upper
(3) O-ring
(4) O-ring
(5) Oil pump
(6) Stiffener
(7) Strainer

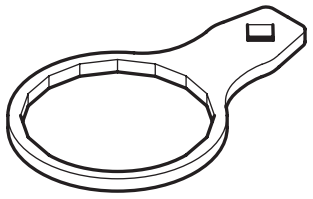
Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.7, 4.7)
T2: 13 (1.3, 9.6)
T3: 24 (2.4, 17.7)
T4: 120 (12.2, 88.5)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Before applying liquid gasket, completely remove the old liquid gasket and degrease it.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.
- If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.
- Prepare a container and cloth to prevent scattering of oil when performing work where engine coolant can be spilled. If the fuel spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing oil.

D: PREPARATION TOOL

1. SPECIAL TOOL

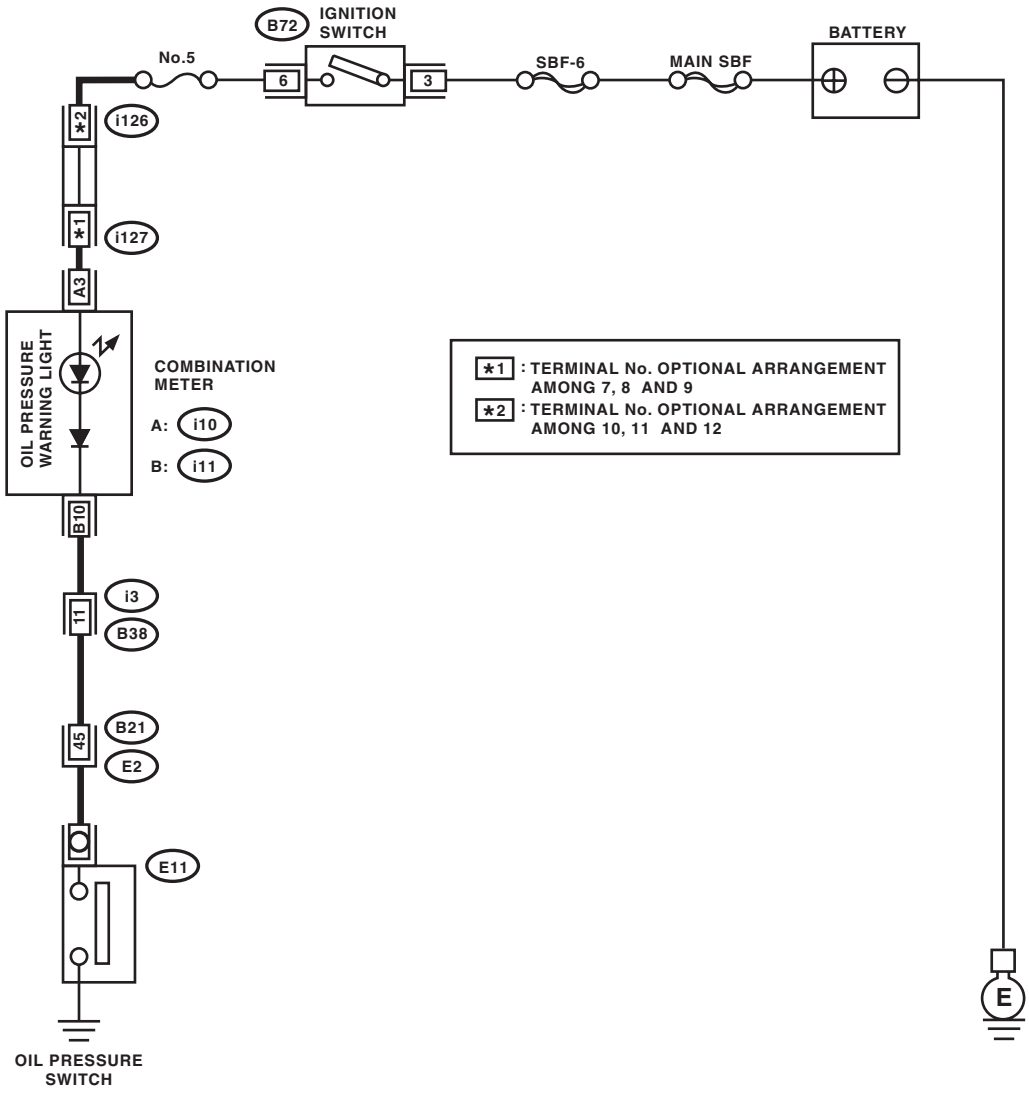
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA020	18332AA020	OIL FILTER WRENCH	Used for removing and installing oil filter.

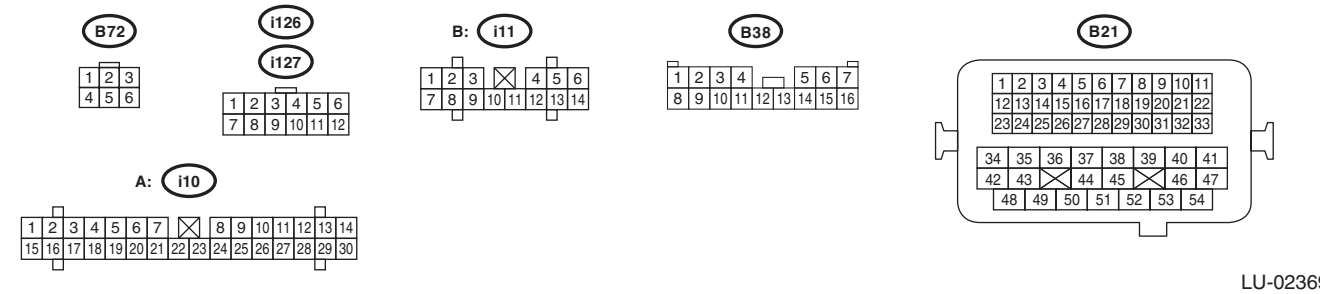
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Oil Pressure System

A: WIRING DIAGRAM





LU-02369

B: INSPECTION

Step		Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (Engine OFF) 2) Check the warning light of combination meter.	Does the warning light illuminate?	Go to step **2**.	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil pressure switch. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between oil pressure switch connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the oil pressure switch.	Go to step **3**.
3	**CHECK COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. ***Terminals*** ***(i10) No. 3 — (i11) No. 10:***	Is the resistance less than 10 Ω?	Repair the harness and connector. NOTE: In this case, repair the following items. • Open circuit of harness between combination meter and oil pressure switch • Poor contact in combination meter connector • Poor contact in oil pressure switch connector • Poor contact of coupling connector	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>

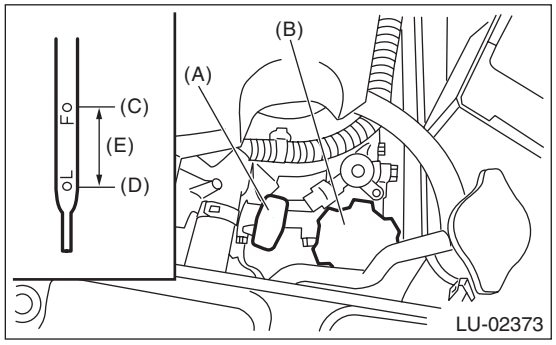
3. Engine Oil

A: INSPECTION

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe away the oil.
3) Reinsert the oil level gauge all the way. Be sure that the oil level gauge is correctly inserted and properly orientated.
4) Pull out the oil level gauge again, and check the oil level. If the engine oil level is below “L” line, make sure that there is no oil leakage from the engine, then add oil to raise the level up to the “F” line.
5) Start the engine to circulate the oil in engine room.
6) After turning off the engine, wait a few minutes for the oil to return to the oil pan before checking the level.

NOTE:
• Just after driving or while the engine is warm, engine oil level may be exceeding the “F” line. This is caused by thermal expansion of engine oil.
• To prevent overfilling of engine oil, do not add oil above “F” line when the engine is cold.
• As the oil level gauge is used for daily inspection, standard of “F” line and “L” line of the oil level gauge is set for the condition that engine is cold.



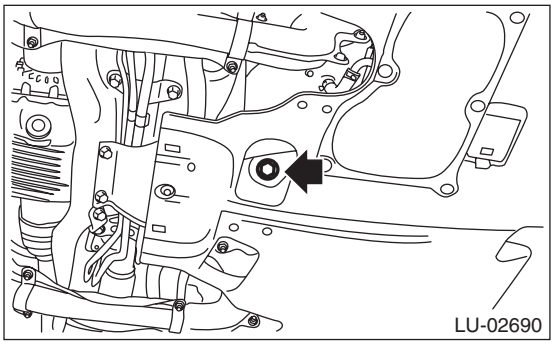
(A) Oil level gauge
(B) Engine oil filler cap
(C) “F” line
(D) “L” line
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1) Open the engine oil filler cap for quick draining of engine oil.
2) Lift up the vehicle.
3) Drain engine oil by loosening the engine oil drain plug.

NOTE:
Prepare the container for draining of engine oil.



4) Tighten the engine oil drain plug after draining engine oil.

NOTE:
Use a new drain plug gasket.

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

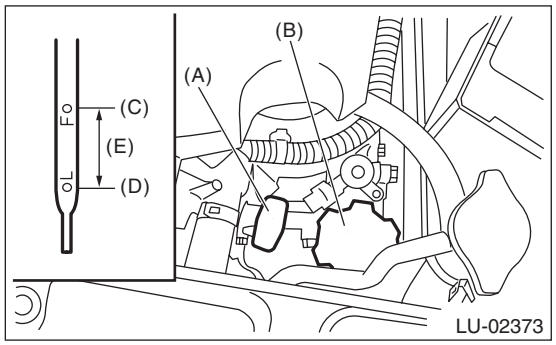
5) Lower the vehicle.
6) Using engine oil of proper quality and viscosity, fill engine oil through the oil filler duct to the “F” line on level gauge. Make sure that the vehicle is parked on a level surface when checking oil level.

Recommended oil:
<Ref. to LU(H6DO)-2, SPECIFICATION, General Description.>

Engine oil capacity:
<Ref. to LU(H6DO)-2, SPECIFICATION, General Description.>

7) Close the engine oil filler cap.
8) Start the engine to circulate the oil in engine room.

9) After the engine stops, recheck the oil level. If necessary, add engine oil up to the “F” line on level gauge.



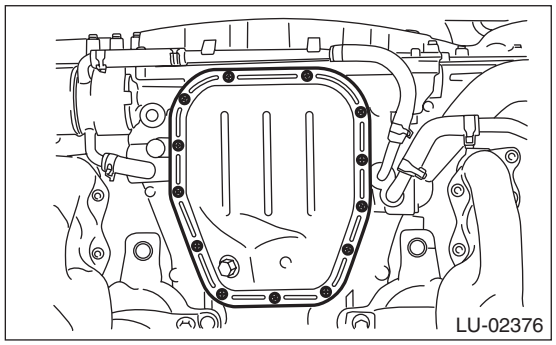
(A) Oil level gauge
(B) Engine oil filler cap
(C) “F” line
(D) “L” line
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

4. Oil Pan

A: REMOVAL

NOTE:
Before removing the oil pan upper, remove the engine from vehicle. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.> <Ref. to ME(H6DO)-97, REMOVAL, Cylinder Block.>
1) Lift up the vehicle.
2) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
3) Drain the engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
4) Insert an oil pan cutter blade into the gap between oil pan upper and oil pan lower, and remove the oil pan.

CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.
5) Remove the oil pan lower.



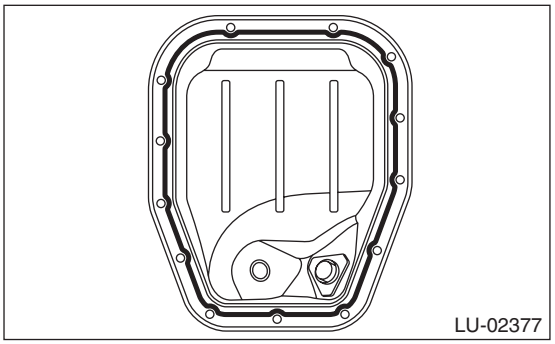
B: INSTALLATION

1) Apply liquid gasket to the mating surfaces of oil pan, and install the oil pan lower.

NOTE:
Install within 5 min. after applying liquid gasket.

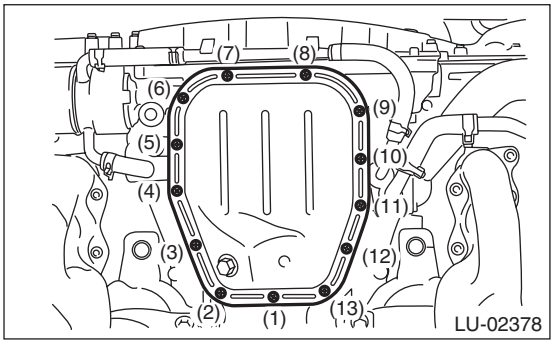
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Liquid gasket applying diameter:
5.0±1.0 mm (0.197±0.039 in)



2) Tighten the oil pan lower installing bolts in the numerical order as shown in the figure.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



3) Install the under cover. <Ref. to EI-18, INSTALLATION, Front Under Cover.>
4) Lower the vehicle.
5) Refill the engine oil. <Ref. to LU(H6DO)-10, INSPECTION, Engine Oil.>
6) Check the engine oil level. <Ref. to LU(H6DO)-10, INSPECTION, Engine Oil.>

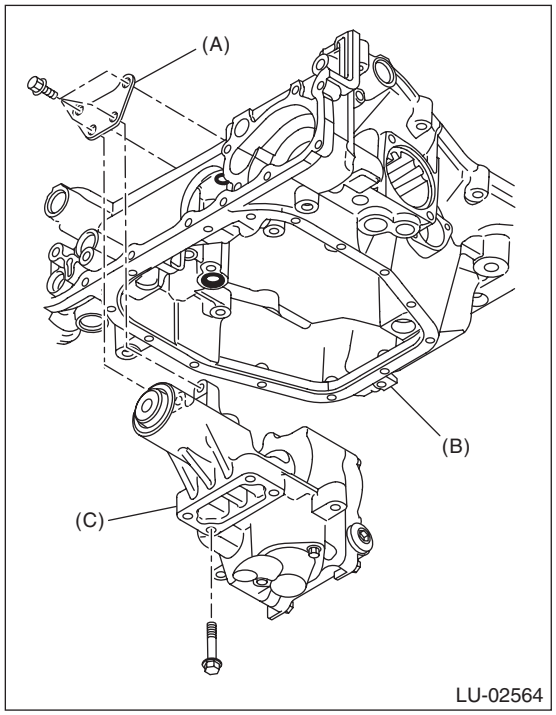
C: INSPECTION

Check that the oil pan upper and oil pan lower have no deformation, cracks or other damages.

5. Oil Pump

A: REMOVAL

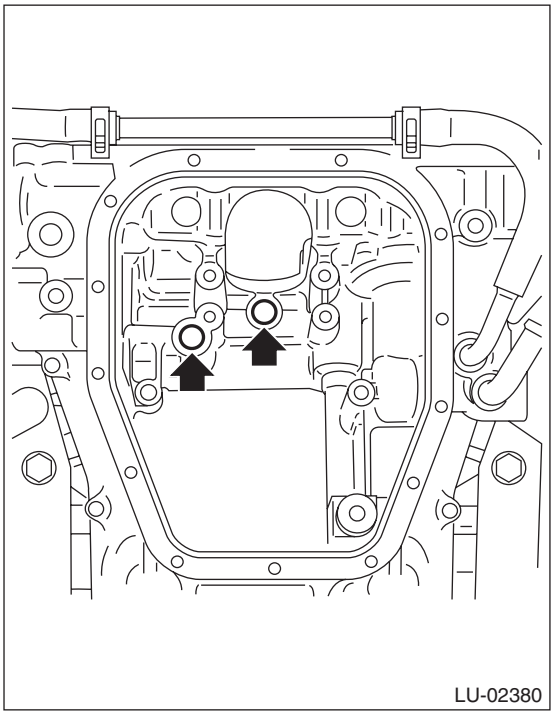
1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Lift up the vehicle.
4) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
5) Drain the engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
6) Drain engine coolant. <Ref. to CO(H6DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Lower the vehicle.
8) Remove the radiator. <Ref. to CO(H6DO)-19, REMOVAL, Radiator.>
9) Remove the V-belts. <Ref. to ME(H6DO)-46, REMOVAL, V-belt.>
10) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
11) Remove the chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Chain Cover.>
12) Remove the timing chain. <Ref. to ME(H6DO)-55, REMOVAL, Timing Chain Assembly.>
13) Remove the oil pan lower. <Ref. to LU(H6DO)-12, REMOVAL, Oil Pan.>
14) Remove the stiffener and the oil pump.



(A) Stiffener
(B) Oil pan upper
(C) Oil pump

15) Remove the strainer from the oil pump.

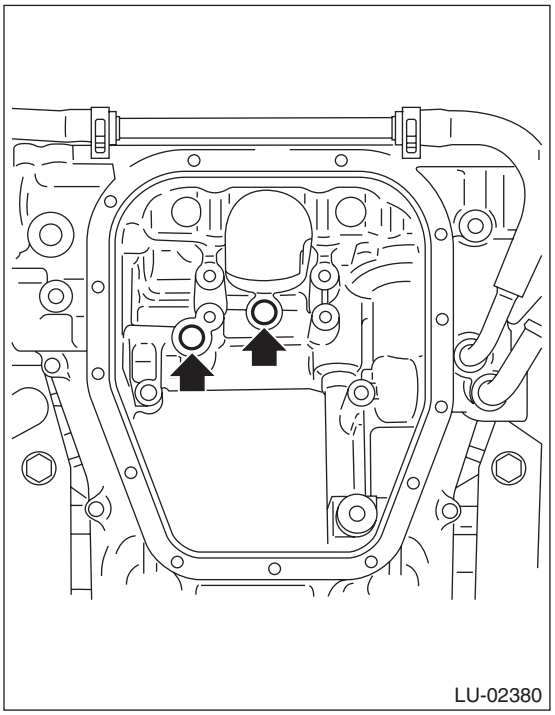
16) Remove the O-ring from oil pan upper.



B: INSTALLATION

1) Apply engine oil to the O-ring and attach it to the oil pan upper.

NOTE:
Use new O-rings.

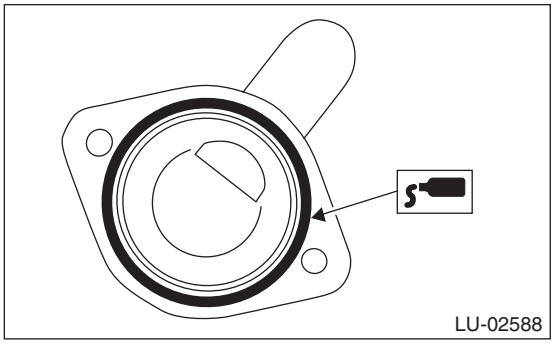


2) Apply liquid gasket to the mating surfaces of strainer.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Liquid gasket applying diameter:
2.0±1.0 mm (0.079±0.039 in)

NOTE:
- Install within 5 min. after applying liquid gasket.
- After installing the strainer, remove any liquid gasket that is squeezed out.

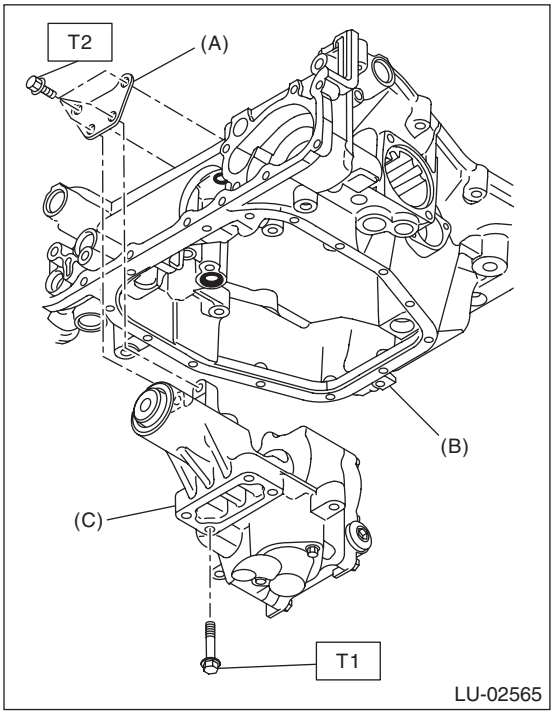


3) Install the strainer to the oil pump.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

4) Install the stiffener and the oil pump.

Tightening torque:
T1: 13 N·m (1.3 kgf-m, 9.6 ft-lb)
T2: 24 N·m (2.4 kgf-m, 17.7 ft-lb)



(A) Stiffener
(B) Oil pan upper
(C) Oil pump

5) Install the oil pan lower. <Ref. to LU(H6DO)-12, INSTALLATION, Oil Pan.>
6) Install the timing chain. <Ref. to ME(H6DO)-61, INSTALLATION, Timing Chain Assembly.>
7) Install the chain cover. <Ref. to ME(H6DO)-50, INSTALLATION, Chain Cover.>
8) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
9) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>
10) Install the radiator. <Ref. to CO(H6DO)-21, INSTALLATION, Radiator.>
11) Lift up the vehicle.
12) Install the under cover. <Ref. to EI-18, INSTALLATION, Front Under Cover.>
13) Lower the vehicle.
14) Fill the ATF. <Ref. to CO(H6DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
15) Refill the engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
16) Check the engine oil level. <Ref. to LU(H6DO)-10, INSPECTION, Engine Oil.>

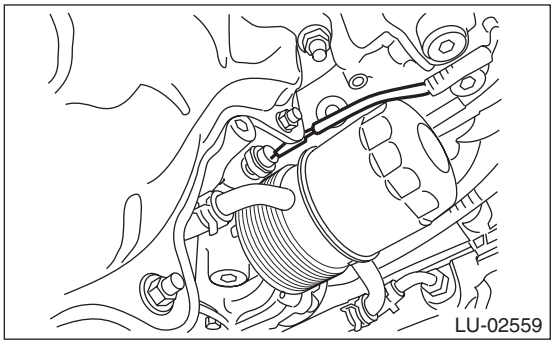
C: INSPECTION

1) Visually check the oil pump for breakage.
2) Visually check the strainer portion for clogging.

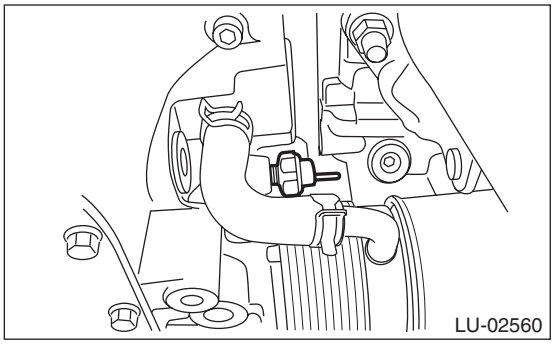
6. Oil Pressure Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
4) Drain the engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
5) Disconnect the terminal from oil pressure switch.



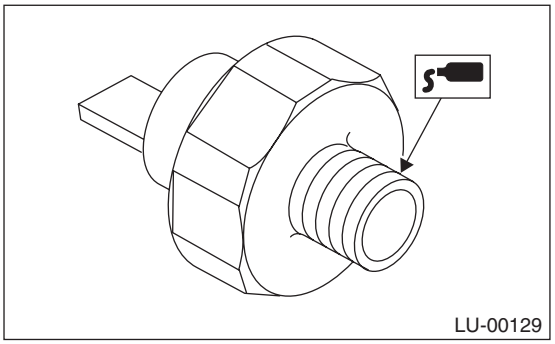
6) Remove the oil pressure switch.



B: INSTALLATION

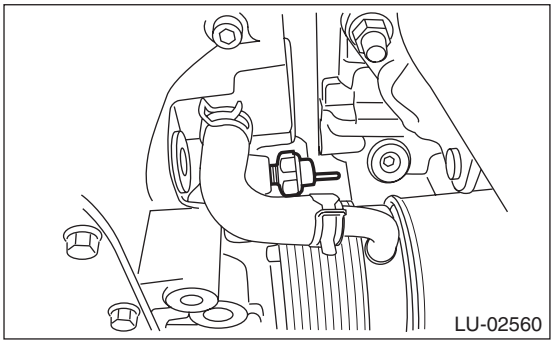
1) Apply liquid gasket to the oil pressure switch threads.

Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

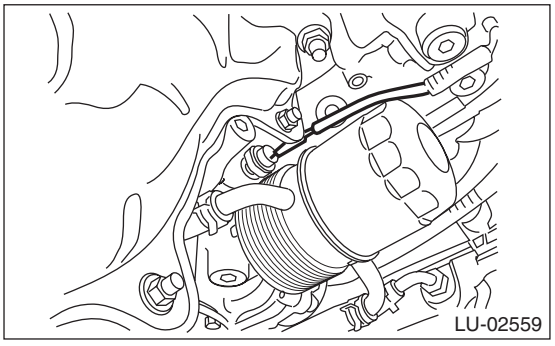


2) Install the oil pressure switch.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



3) Connect the terminal of the oil pressure switch.



4) Install the under cover. <Ref. to EI-18, INSTALLATION, Front Under Cover.>
5) Refill the engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
6) Check the engine oil level. <Ref. to LU(H6DO)-10, INSPECTION, Engine Oil.>

C: INSPECTION

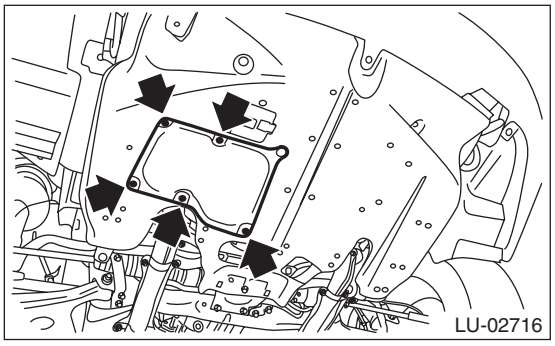
1) Check that the oil pressure switch does not have deformation, cracks or damage.
2) Check the oil pressure switch installation portion for oil leakage and oil seepage.

7. Engine Oil Filter

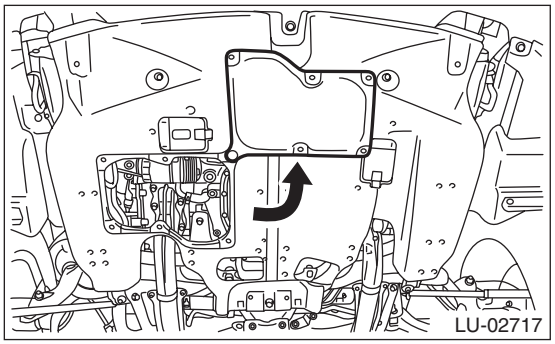
A: REMOVAL

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

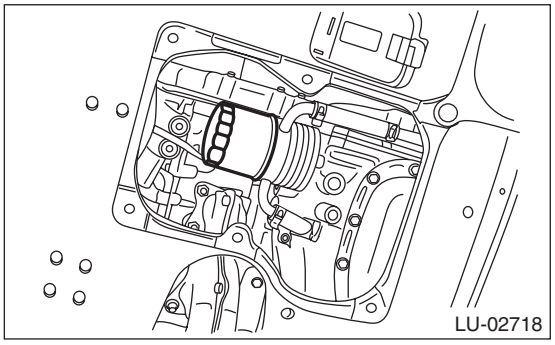
1) Lift up the vehicle.
2) Drain the engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
3) Remove the service hole cover clip.



4) Rotate the service hole cover in the arrow direction.



5) Remove the oil filter using ST.
ST 18332AA020 OIL FILTER WRENCH



B: INSTALLATION

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

1) Clean the oil filter installation surface of the oil cooler.
2) Obtain a new oil filter and apply a thin coat of engine oil to the seal rubber.
3) Install the oil filter turning it by hand, being careful not to damage the seal rubber.
4) Tighten more (approx. 3/4 turn) after the seal rubber contacts the oil cooler. When using a torque wrench, tighten to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
5) Install the service hole cover.
6) Lower the vehicle.
7) Refill the engine oil. <Ref. to LU(H6DO)-10, INSPECTION, Engine Oil.>
8) Check the engine oil level. <Ref. to LU(H6DO)-10, INSPECTION, Engine Oil.>

C: INSPECTION

1) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

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

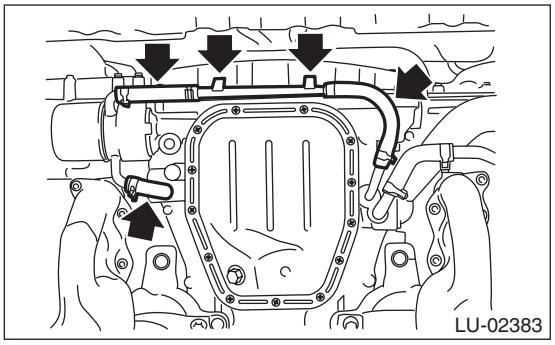
2) Check the engine oil level. <Ref. to LU(H6DO)-10, INSPECTION, Engine Oil.>

8. Oil Cooler

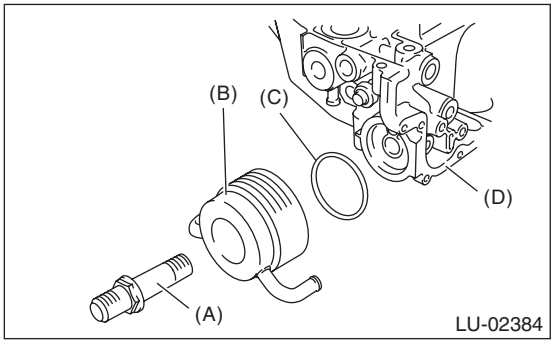
A: REMOVAL

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1) Lift up the vehicle.
2) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
3) Drain engine coolant. <Ref. to CO(H6DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Drain the engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
5) Remove the bolts which hold the engine oil cooler water pipe to chain cover and disconnect the water hose from oil cooler.



6) Remove the oil filter using the ST. <Ref. to LU(H6DO)-16, REMOVAL, Engine Oil Filter.>
7) Remove the oil cooler connector and remove the oil cooler.



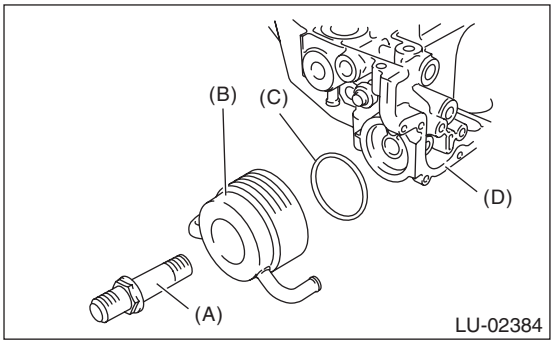
(A) Oil cooler connector
(B) Oil cooler
(C) O-ring
(D) Oil pan upper

B: INSTALLATION

1) Tighten the oil cooler connector to install the oil cooler to the oil pan upper.

Tightening torque:
54 N·m (5.5 kgf-m, 39.8 ft-lb)

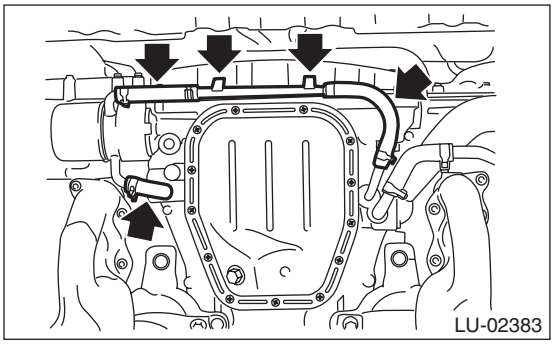
NOTE:
Use new O-rings.



(A) Oil cooler connector
(B) Oil cooler
(C) O-ring
(D) Oil pan upper

2) Install the oil filter. <Ref. to LU(H6DO)-16, INSTALLATION, Engine Oil Filter.>
3) Attach the bolts which hold the engine oil cooler water pipe to chain cover and connect the water hose to oil cooler.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



4) Lower the vehicle.
5) Refill the engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
6) Fill the ATF. <Ref. to CO(H6DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Check the engine oil level. <Ref. to LU(H6DO)-10, INSPECTION, Engine Oil.>

C: INSPECTION

1) Check that coolant passages are not clogged using an compressed air.
2) Check that the oil pan upper and O-ring installing surface of oil filter are not damaged.

9. General Diagnostic Table

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause	Corrective action
Warning light remains ON.	a. Oil pressure switch failure	
	❍ Cracked diaphragm or oil leakage within switch	Replace.
	❍ Broken spring or seized contacts	Replace.
	b. Low oil pressure	
	❍ Clogging of oil filter	Replace.
	❍ Malfunction of oil by-pass valve in oil filter	Replace.
	❍ Malfunction of oil relief valve in oil pump	Replace.
	❍ Clogged oil passage	Clean.
	❍ Excessive tip clearance and side clearance of oil pump rotor	Replace.
	❍ Clogged oil strainer or broken pipe	Clean or replace.
	c. No oil pressure	
	❍ Insufficient engine oil (degradation, etc.)	Replace.
	❍ Broken pipe of oil strainer	Replace.
	❍ Stuck oil pump rotor	Replace.
Warning light does not illuminate.	a. Malfunction of combination meter	Replace.
	b. Poor contact of switch contact points	Replace.
	c. Disconnection of wiring	Repair.
Warning light flickers momentarily.	a. Defective terminal contact	Repair.
	b. Defective wiring harness	Repair.
	c. Oil pressure switch failure	
	❍ Cracked diaphragm or oil leakage within switch	Replace.
	❍ Broken spring or seized contacts	Replace.
	d. Low oil pressure	
	❍ Clogging of oil filter	Replace.
	❍ Malfunction of oil by-pass valve in oil filter	Replace.
	❍ Malfunction of oil relief valve in oil pump	Replace.
	❍ Clogged oil passage	Clean.
	❍ Excessive tip clearance and side clearance of oil pump rotor	Replace.
	❍ Clogged oil strainer or broken pipe	Clean or replace.

SPEED CONTROL SYSTEMS

SP(H6DO)

Page

1. General Description 2
2. Accelerator Pedal 4

1. General Description

A: SPECIFICATION

Engine	Model			3.6 L
	Cylinder arrangement			Horizontally opposed, liquid cooled, 6-cylinder, 4-stroke gasoline engine
	Valve system mechanism			Chain driven, double overhead camshaft, 4-valve/cylinder
	Bore × Stroke mm (in)			92 × 91 (3.622 × 3.583)
	Displacement cm^3 (cu in)			3,630 (221.5)
	Compression ratio			10.5
	Compression (350 rpm and fully open throttle) kPa (kgf/cm^2, psi)		Standard	1,275 — 1,471 (13.0 — 15.0, 185 — 213)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Open	Max. retard	ATDC 10°
			Min. advance	BTDC 40°
		Close	Max. retard	ABDC 74°
			Min. advance	ABDC 24°
	Exhaust valve timing	Open	Max. retard	BBDC 4°
			Min. advance	BBDC 44°
		Close	Max. retard	ATDC 44°
			Min. advance	ATDC 4°
	Valve clearance mm (in)	Intake		$0.20^{+0.04}_{-0.06}$ ($0.0079^{+0.0016}_{-0.0024}$)
		Exhaust		0.35±0.05 (0.0138±0.0020)
	Idle speed [“P” or “N” range] rpm	No load	Standard	700±100
		A/C ON	Standard	805±100
	Ignition order			$1 \rightarrow 6 \rightarrow 3 \rightarrow 2 \rightarrow 5 \rightarrow 4$
	Ignition timing BTDC/rpm		Standard	15°±8°/700

NOTE:
OS: Oversize
US: Undersize

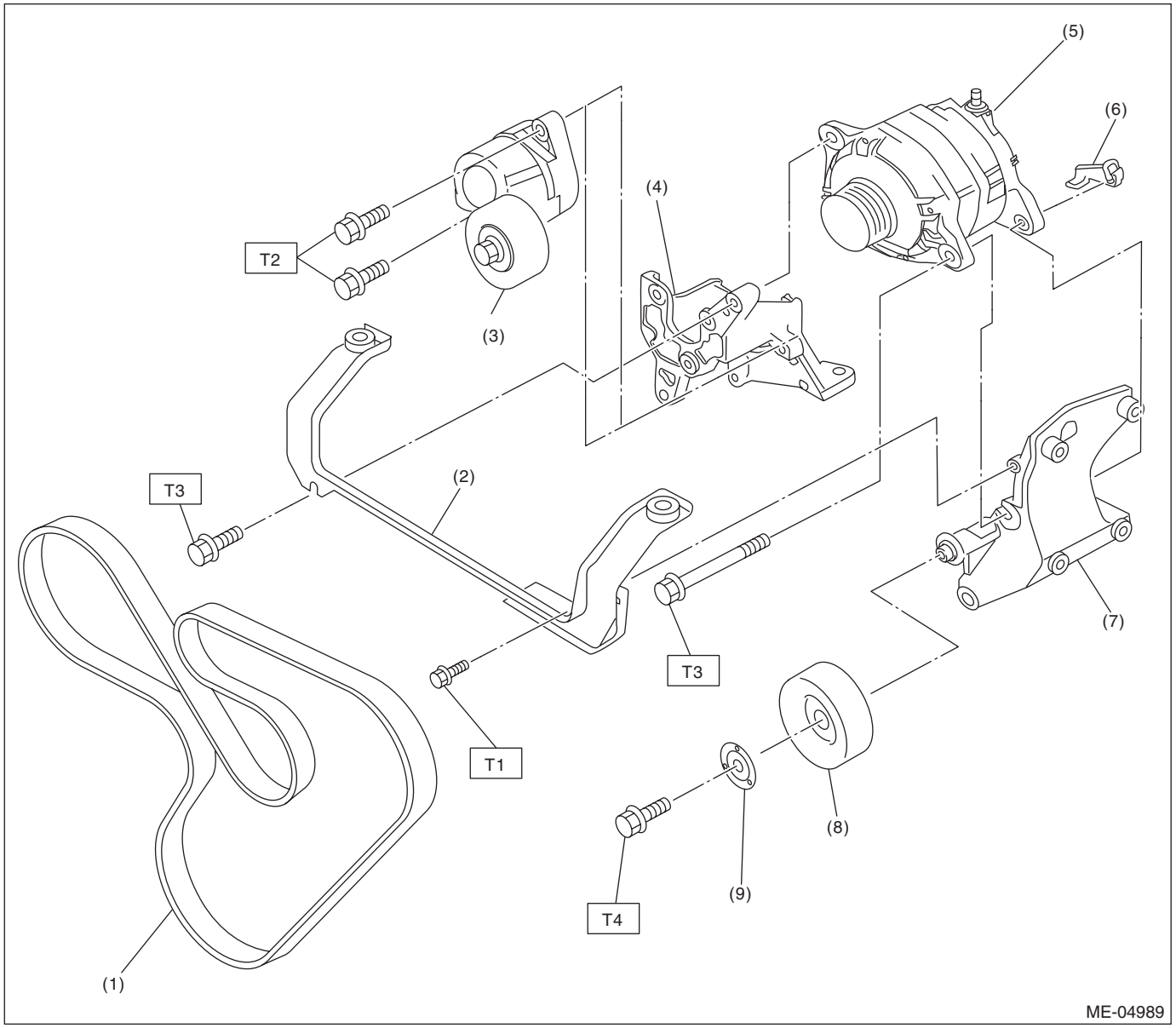
Camshaft	Bending limit			mm (in)	0.020 (0.00079)
	Cam lobe height mm (in)	Intake		Standard	45.90 — 46.00 (1.8071 — 1.8110)
		Exhaust		Standard	44.65 — 44.75 (1.7579 — 1.7618)
	Cam base circle diameter mm (in)	Intake		Standard	36.00 (1.4173)
		Exhaust		Standard	36.00 (1.4173)
	Journal O.D. mm (in)	Front		Standard	37.946 — 37.963 (1.4939 — 1.4946)
		Except for front		Standard	25.946 — 25.963 (1.0215 — 1.0222)
	Oil clearance		mm (in)	Standard	0.037 — 0.072 (0.0015 — 0.0028)
	Thrust clearance mm (in)	Intake		Standard	0.075 — 0.135 (0.0030 — 0.0053)
		Exhaust		Standard	0.075 — 0.135 (0.0030 — 0.0053)
Cylinder head	Warping limit (Mating surface with cylinder block)			mm (in)	0.020 (0.0008)
	Standard height			mm (in)	124±0.05 (4.88±0.0020)
Valve seat	Seating angle between valve and valve seat				90°
	Contacting width between valve and valve seat mm (in)	Intake		Standard	1.0 (0.039)
		Exhaust		Standard	1.5 (0.059)
Valve guide	Clearance between the valve guide and valve stem mm (in)	Intake		Standard	0.030 — 0.057 (0.0012 — 0.0022)
		Exhaust		Standard	0.040 — 0.067 (0.0016 — 0.0026)
	Inside diameter			mm (in)	5.500 — 5.512 (0.2165 — 0.2170)
	Valve stem outer diameters mm (in)		Intake		5.455 — 5.470 (0.2148 — 0.2154)
			Exhaust		5.445 — 5.460 (0.2144 — 0.2150)
	Valve guide protrusion amount	Intake		mm (in)	8.6 — 9.0 (0.3386 — 0.3543)
		Exhaust		mm (in)	10.7 — 11.1 (0.4213 — 0.4370)
Valve	Head edge thickness mm (in)	Intake		Standard	1.0 (0.039)
		Exhaust		Standard	1.2 (0.047)
	Overall length mm (in)		Intake		103.5 (4.075)
			Exhaust		103.2 (4.063)
Valve spring	Free length mm (in)	Intake			49.06 (1.9315)
		Exhaust			49.06 (1.9315)
	Tension/spring height N (kgf, lb)/mm (in)			Set	182 — 210 (18.6 — 21.4, 40.9 — 47.2) /31.0 (1.220)
				Lift	316 — 350 (32.2 — 35.7, 71.0 — 78.7) /21.0 (0.827)
	Squareness				2.5°, 2.1 mm (0.083 in)
Valve lifter	Outer diameter		mm (in)	Standard	32.959 — 32.975 (1.2976 — 1.2982)
	Inner diameter of valve lifter hole		mm (in)	Standard	32.994 — 33.016 (1.2990 — 1.2998)
	Clearance between the valve lifter and valve lifter hole		mm (in)	Standard	0.019 — 0.057 (0.0007 — 0.0022)
Cylinder block	Warping limit (Mating surface with cylinder head)			mm (in)	0.020 (0.0008)
	Standard height			mm (in)	202 (7.95)
	Cylindricality		mm (in)	Standard	0.030 (0.0012)
	Out-of-roundness		mm (in)	Standard	0.010 (0.0004)
	Clearance between cylinder and piston at 20°C (68°F)		mm (in)	Standard	–0.010 — 0.010 (–0.0004 — 0.0004)
	Cylinder inner diameter boring limit (diameter)			mm (in)	92.515 (3.6717)

Piston	Piston grade point mm (in)			37.3 (1.4685)
	Outer diameter mm (in)	Standard	A	92.005 — 92.015 (3.6222 — 3.6226)
			B	91.995 — 92.005 (3.6218 — 3.6222)
		0.25 (0.0098) OS		92.245 — 92.265 (3.6317 — 3.6325)
		0.50 (0.0197) OS		92.495 — 92.515 (3.6415 — 3.6423)
	Inner diameter of piston pin hole mm (in)		Standard	22.000 — 22.006 (0.8661 — 0.8664)
Piston pin	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
	Outer diameter mm (in)		Standard	21.994 — 22.000 (0.8659 — 0.8661)
	Clearance between piston and piston pin mm (in)		Standard	0.004 — 0.008 (0.0002 — 0.0003)
Piston ring	Piston ring gap mm (in)	Top ring	Standard	0.20 — 0.25 (0.0079 — 0.0098)
		Second ring	Standard	0.40 — 0.50 (0.0157 — 0.0197)
		Oil ring	Standard	0.20 — 0.50 (0.0079 — 0.0197)
	Clearance between piston ring and piston ring groove mm (in)	Top ring	Standard	0.040 — 0.080 (0.0016 — 0.0031)
		Second ring	Standard	0.030 — 0.070 (0.0012 — 0.0028)
		Oil ring	Standard	0.065 — 0.165 (0.0026 — 0.0065)
Connecting rod and connecting rod bearing	Bend or twist per 100 mm (3.94 in) in length mm (in)		Limit	0.10 (0.0039 in)
	Thrust clearance mm (in)		Standard	0.070 — 0.330 (0.0028 — 0.0130)
	Oil clearance mm (in)		Standard	0.016 — 0.043 (0.0006 — 0.0017)
	Bearing size (Thickness at center) mm (in)	Standard		1.489 — 1.505 (0.0586 — 0.0593)
		0.03 (0.0012) US		1.507 — 1.515 (0.0593 — 0.0596)
		0.05 (0.0020) US		1.517 — 1.525 (0.0597 — 0.0600)
		0.25 (0.0098) US		1.617 — 1.625 (0.0637 — 0.0640)
Bushing of small end	Clearance between piston pin and bushing mm (in)		Standard	0 — 0.022 (0 — 0.0009)

Crankshaft and crankshaft bearing	Bending limit			mm (in)	0.035 (0.0014)
	Crank pin	Out-of-roundness	mm (in)	Standard	0.005 (0.0002)
		Cylindricality	mm (in)	Standard	0.006 (0.0002)
		Grinding limit		mm (in)	51.734 (2.0368)
	Crank journal	Out-of-roundness	mm (in)	Standard	0.005 (0.0002)
		Cylindricality	mm (in)	Standard	0.006 (0.0002)
		Grinding limit		mm (in)	63.742 (2.5095)
	Crank pin outer diameter mm (in)			Standard	51.976 — 52.000 (2.0463 — 2.0472)
				0.03 (0.0012) US	51.954 — 51.970 (2.0454 — 2.0461)
				0.05 (0.0020) US	51.934 — 51.950 (2.0446 — 2.0453)
				0.25 (0.0098) US	51.734 — 51.750 (2.0368 — 2.0374)
	Crank journal outer diameter mm (in)		#1, #3, #5, #7	Standard	63.992 — 64.016 (2.5194 — 2.5203)
				0.03 (0.0012) US	63.962 — 63.978 (2.5182 — 2.5188)
				0.05 (0.0020) US	63.942 — 63.958 (2.5174 — 2.5180)
				0.25 (0.0098) US	63.742 — 63.758 (2.5095 — 2.5102)
			#2, #4, #6	Standard	63.992 — 64.016 (2.5194 — 2.5203)
				0.03 (0.0012) US	63.962 — 63.978 (2.5182 — 2.5188)
				0.05 (0.0020) US	63.942 — 63.958 (2.5174 — 2.5180)
				0.25 (0.0098) US	63.742 — 63.758 (2.5095 — 2.5102)
	Bearing size (Thickness at center) mm (in)		#1, #3, #5	Standard	1.996 — 2.013 (0.0786 — 0.0793)
				0.03 (0.0012) US	2.011 — 2.014 (0.0792 — 0.0793)
				0.05 (0.0020) US	2.021 — 2.024 (0.0796 — 0.0797)
				0.25 (0.0098) US	2.121 — 2.124 (0.0835 — 0.0836)
			#2, #4, #6	Standard	1.996 — 2.013 (0.0786 — 0.0793)
				0.03 (0.0012) US	2.015 — 2.018 (0.0793 — 0.0794)
				0.05 (0.0020) US	2.025 — 2.028 (0.0797 — 0.0798)
				0.25 (0.0098) US	2.125 — 2.128 (0.0837 — 0.0838)
			#7	Standard	1.992 — 2.009 (0.0784 — 0.0791)
				0.03 (0.0012) US	2.011 — 2.014 (0.0792 — 0.0793)
				0.05 (0.0020) US	2.021 — 2.024 (0.0796 — 0.0797)
				0.25 (0.0098) US	2.121 — 2.124 (0.0835 — 0.0836)
	Thrust clearance mm (in)			Standard	0.030 — 0.115 (0.0012 — 0.0045)
	Oil clearance mm (in)			Standard	0.010 — 0.030 (0.0004 — 0.0012)

B: COMPONENT

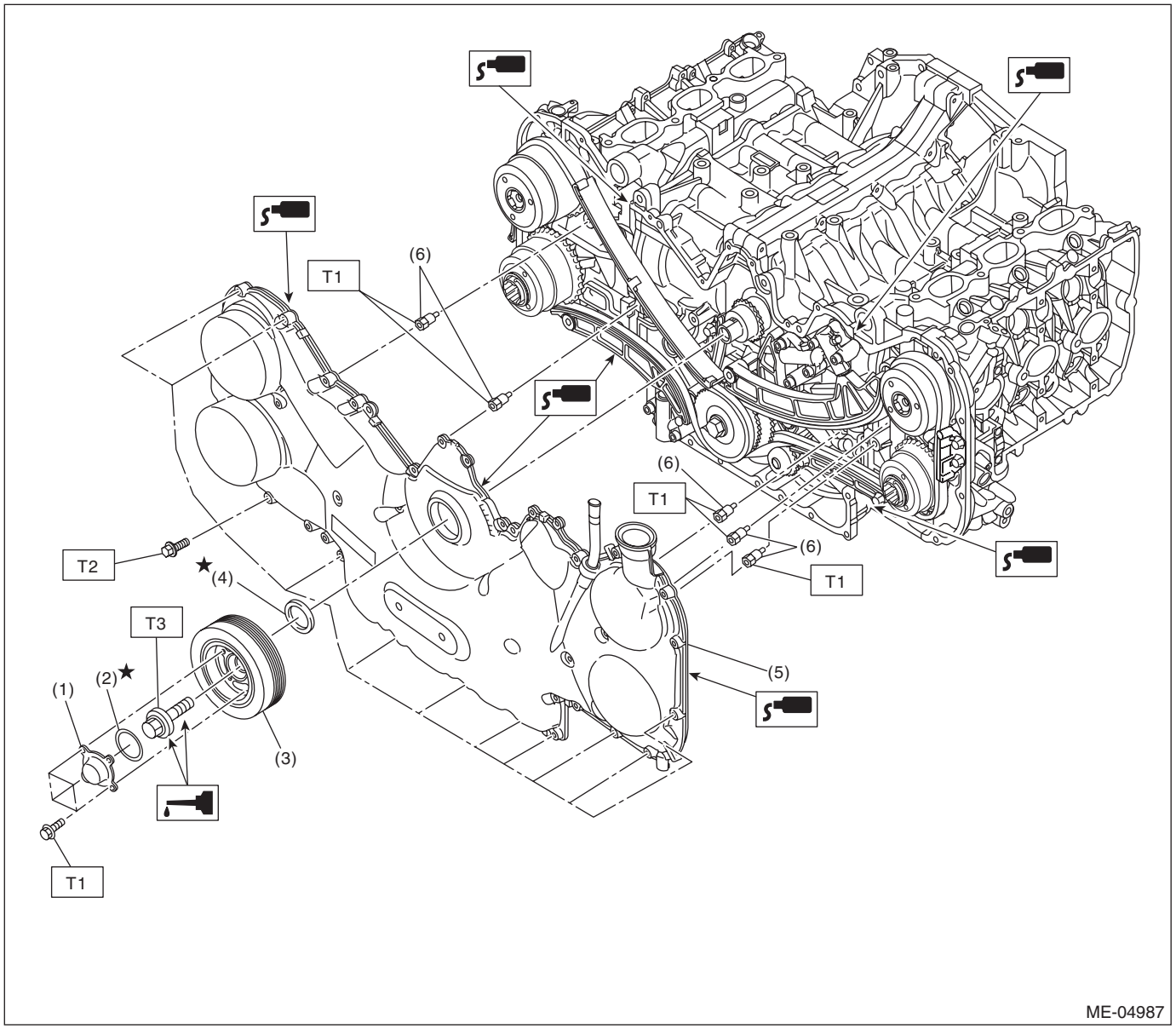
1. V-BELT



(1)	V-belt	(6)	Generator plate
(2)	Collector cover bracket	(7)	A/C compressor stay
(3)	Belt tension adjuster ASSY	(8)	Idler pulley
(4)	Power steering pump bracket	(9)	Idler pulley cover
(5)	Generator		

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.7, 4.7)
T2: 20 (2.0, 14.8)
T3: 25 (2.5, 18.4)
T4: 33 (3.4, 24.3)

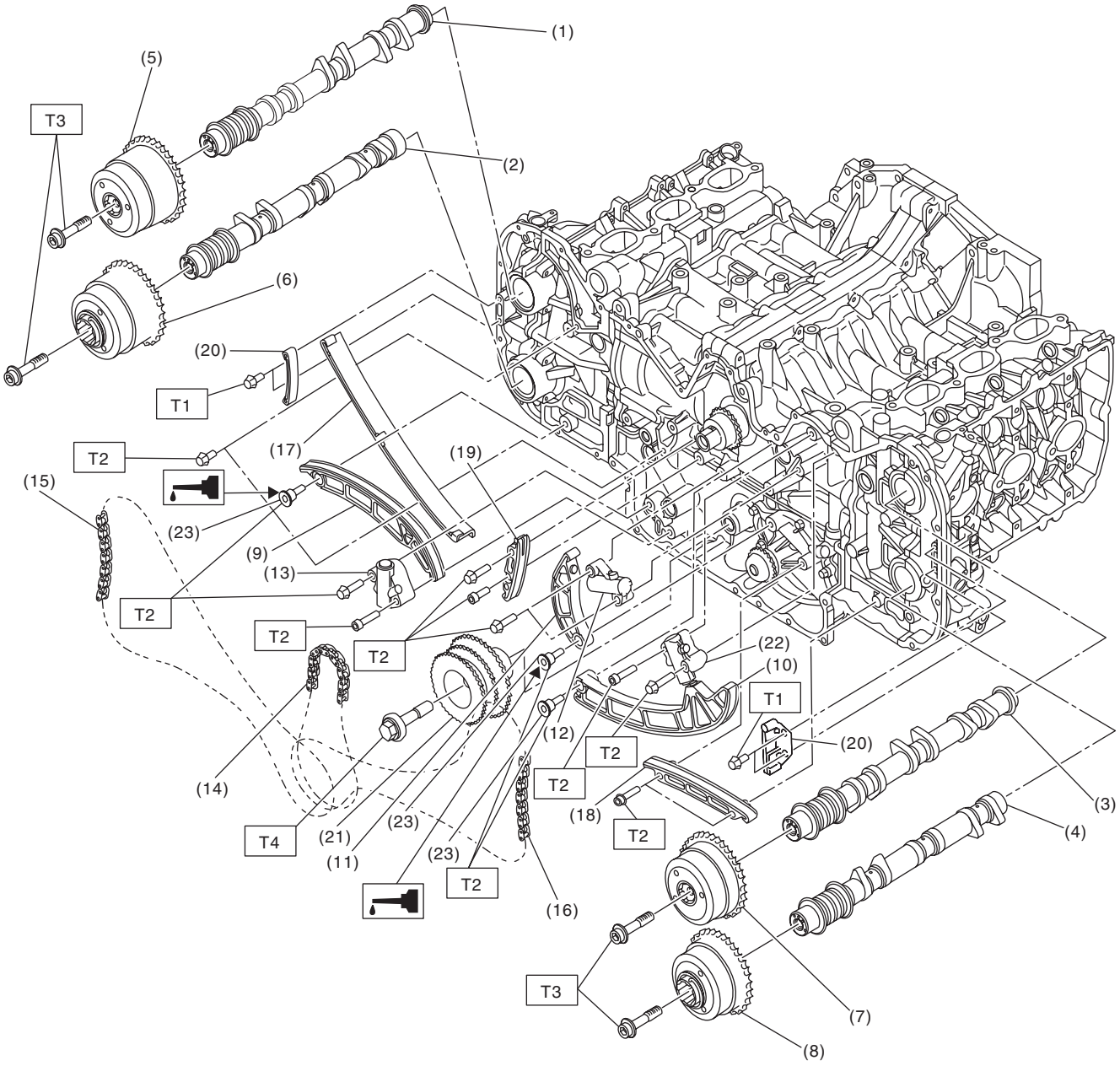
2. TIMING CHAIN COVER



(1)	Crank pulley cover	(4)	Oil seal
(2)	O-ring	(5)	Chain cover
(3)	Crank pulley	(6)	Bolt

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.7, 4.7)
T2: 10 (1.0, 7.4)
T3: 195 (19.9, 143.8)

3. TIMING CHAIN



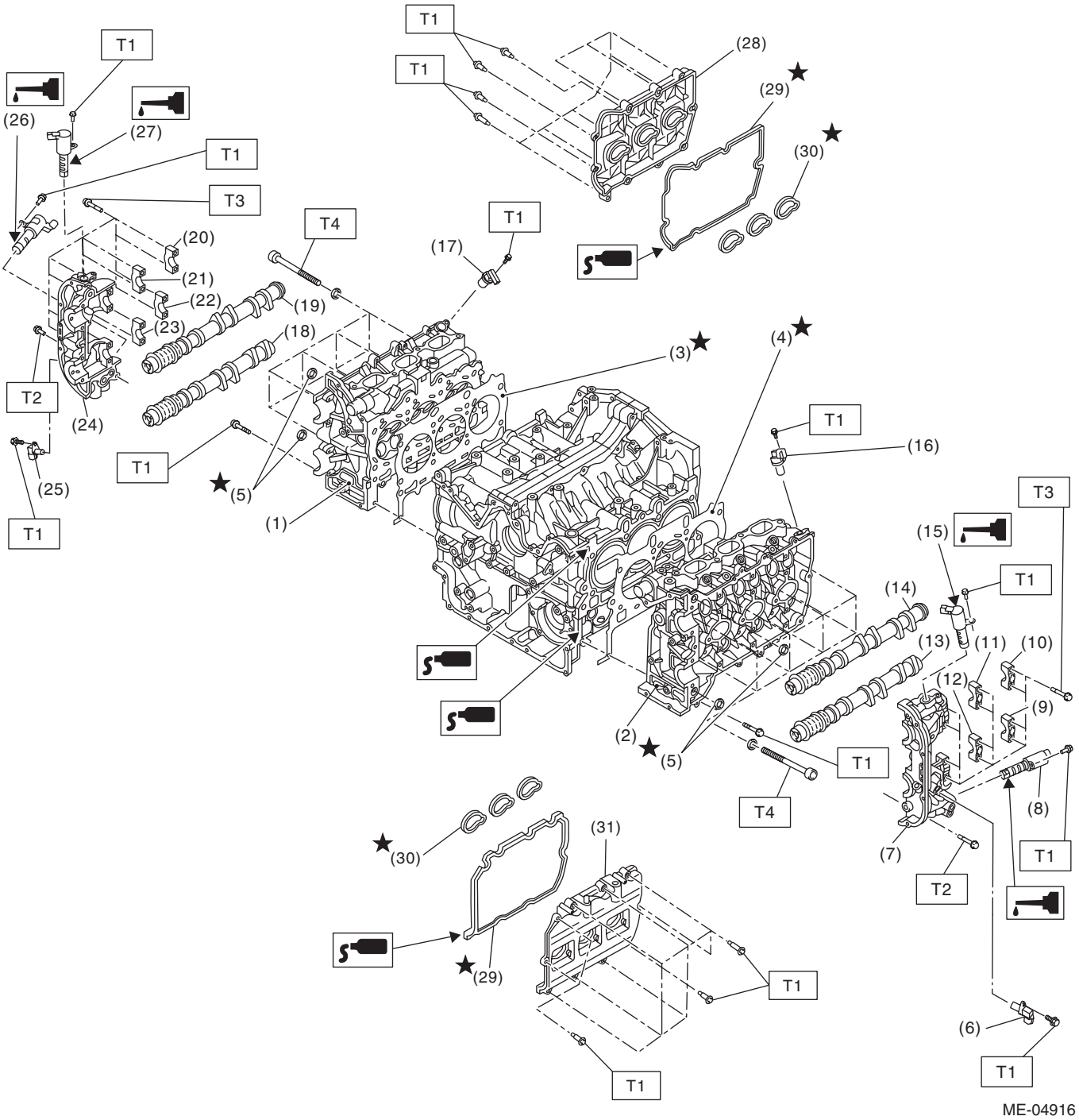
ME-04428

(1) Intake camshaft (RH)
(2) Exhaust camshaft (RH)
(3) Intake camshaft (LH)
(4) Exhaust camshaft (LH)
(5) Intake cam sprocket (RH)
(6) Exhaust cam sprocket (RH)
(7) Intake cam sprocket (LH)
(8) Exhaust cam sprocket (LH)
(9) Chain tensioner lever (RH)
(10) Chain tensioner lever (LH)
(11) Chain tensioner lever (Main)
(12) Chain tensioner (Main)
(13) Chain tensioner (RH)
(14) Timing chain (Main)
(15) Timing chain (RH)
(16) Timing chain (LH)
(17) Chain guide (RH)
(18) Chain guide (LH)
(19) Chain guide (Main)
(20) Chain guide (Between cams)
(21) Idler sprocket
(22) Chain tensioner (LH)
(23) Chain tensioner lever shaft

Tightening torque:N·m (kgf-m, ft-lb)

T1: 6.4 (0.7, 4.7)
T2: 16 (1.6, 11.8)
T3: <Ref. to ME(H6DO)-74, Cam Sprocket.>
T4: 120 (12.2, 88.5)

4. CYLINDER HEAD AND CAMSHAFT

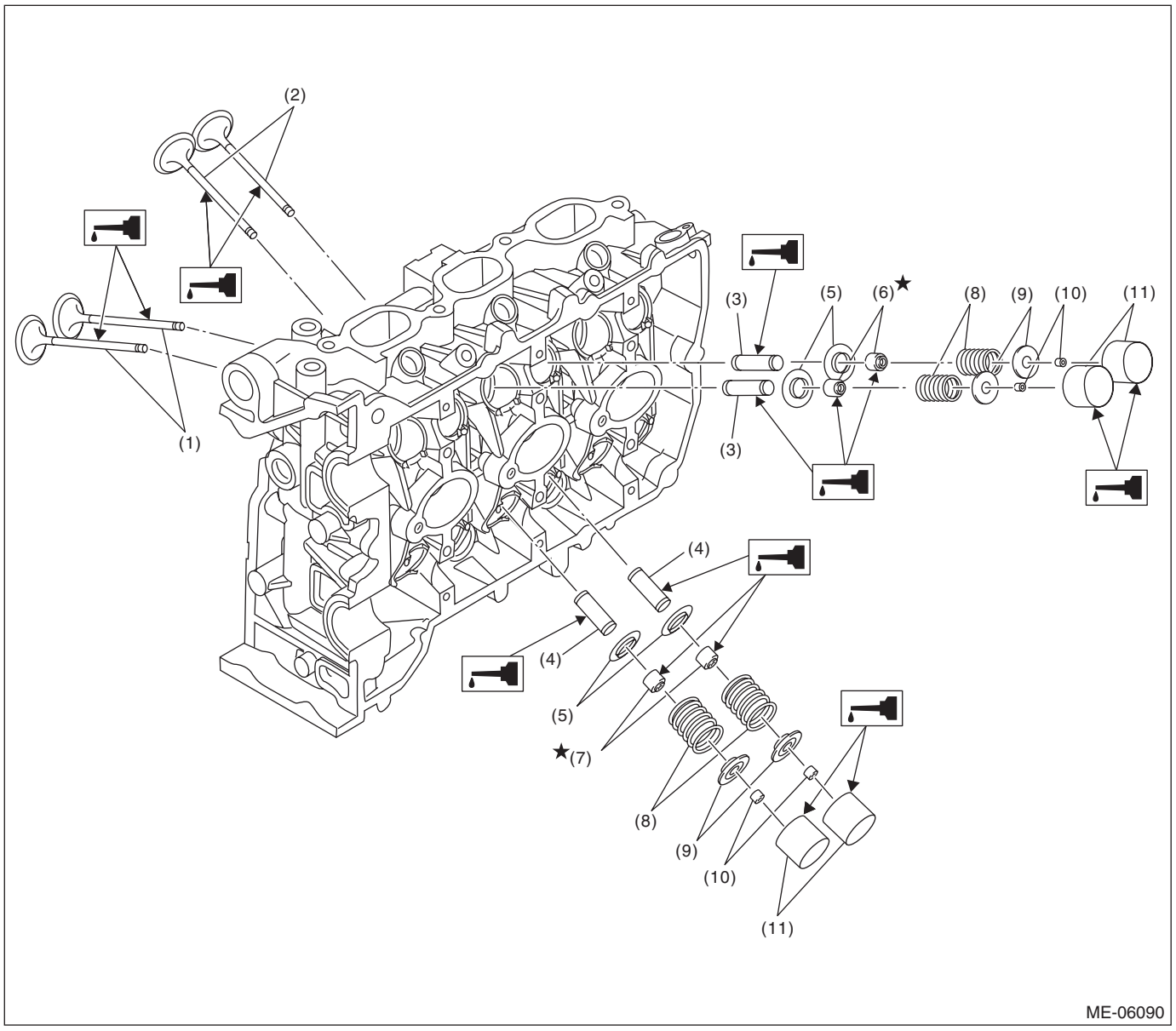


(1) Cylinder head (RH)
(2) Cylinder head (LH)
(3) Cylinder head gasket (RH)
(4) Cylinder head gasket (LH)
(5) O-ring
(6) Exhaust camshaft position sensor (LH)
(7) Front camshaft cap (LH)
(8) Exhaust oil flow control solenoid valve (LH)
(9) Exhaust camshaft cap (Rear LH)
(10) Intake camshaft cap (Rear LH)
(11) Intake camshaft cap (Center LH)
(12) Exhaust camshaft cap (Center LH)
(13) Exhaust camshaft (LH)
(14) Intake camshaft (LH)
(15) Intake oil flow control solenoid valve (LH)
(16) Intake camshaft position sensor (LH)
(17) Intake camshaft position sensor (RH)
(18) Exhaust camshaft (RH)
(19) Intake camshaft (RH)
(20) Intake camshaft cap (Rear RH)
(21) Intake camshaft cap (Center RH)
(22) Exhaust camshaft cap (Rear RH)
(23) Exhaust camshaft cap (Center RH)
(24) Front camshaft cap (RH)
(25) Exhaust camshaft position sensor (RH)
(26) Exhaust oil flow control solenoid valve (RH)
(27) Intake oil flow control solenoid valve (RH)
(28) Rocker cover (RH)
(29) Gasket
(30) Gasket
(31) Rocker cover (LH)

Tightening torque:N·m (kgf-m, ft-lb)

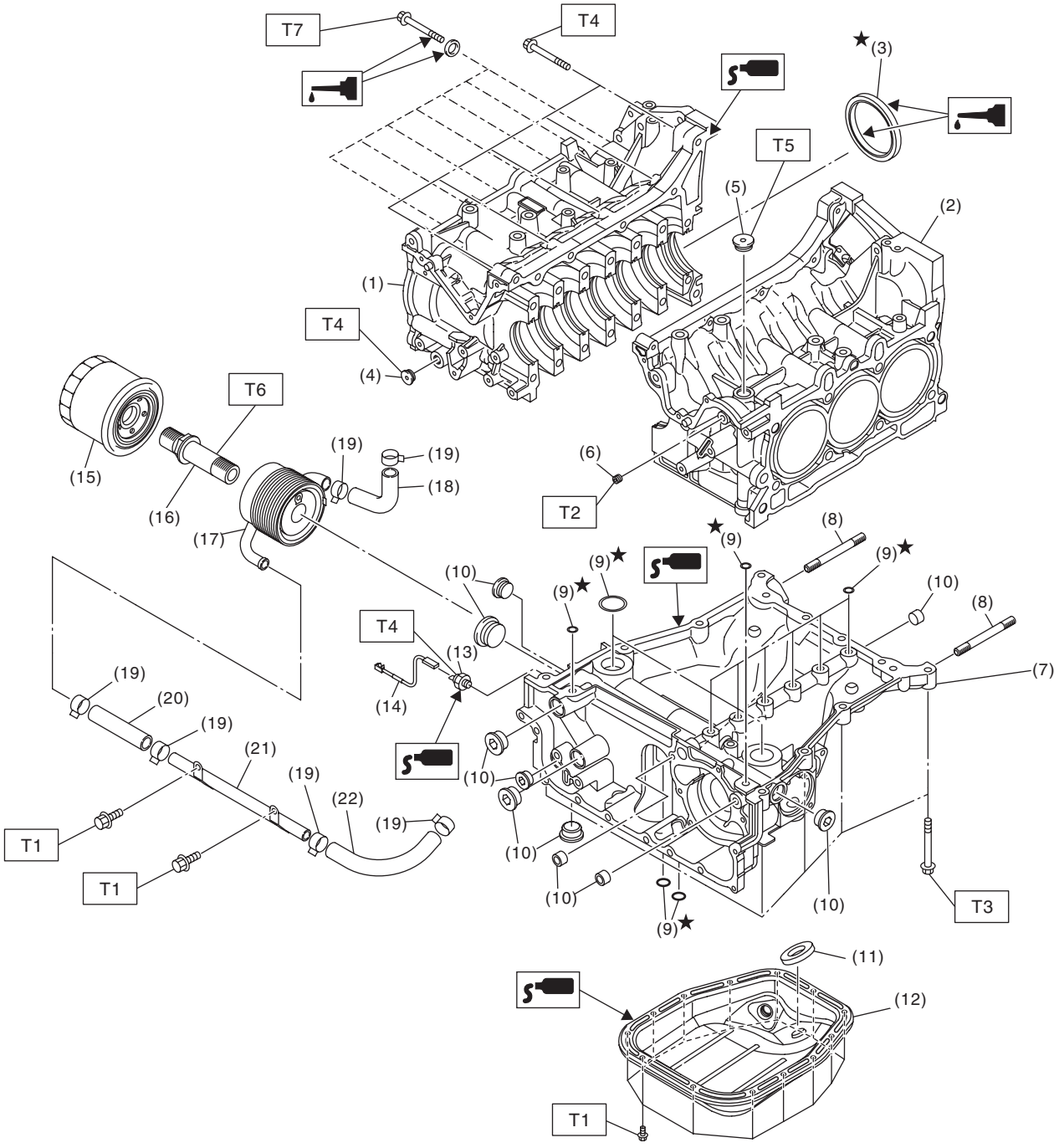
T1: 6.4 (0.7, 4.7)
T2: 9.75 (1.0, 7.2)
T3: 16 (1.6, 11.8)
T4: <Ref. to ME(H6DO)-83, Cylinder Head.>

5. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Intake valve
(2) Exhaust valve
(3) Valve guide (Intake)
(4) Valve guide (Exhaust)
(5) Valve spring seat
(6) Stem seal (Intake)
(7) Stem seal (Exhaust)
(8) Valve spring
(9) Valve spring retainer
(10) Valve collet
(11) Valve lifter

6. CYLINDER BLOCK



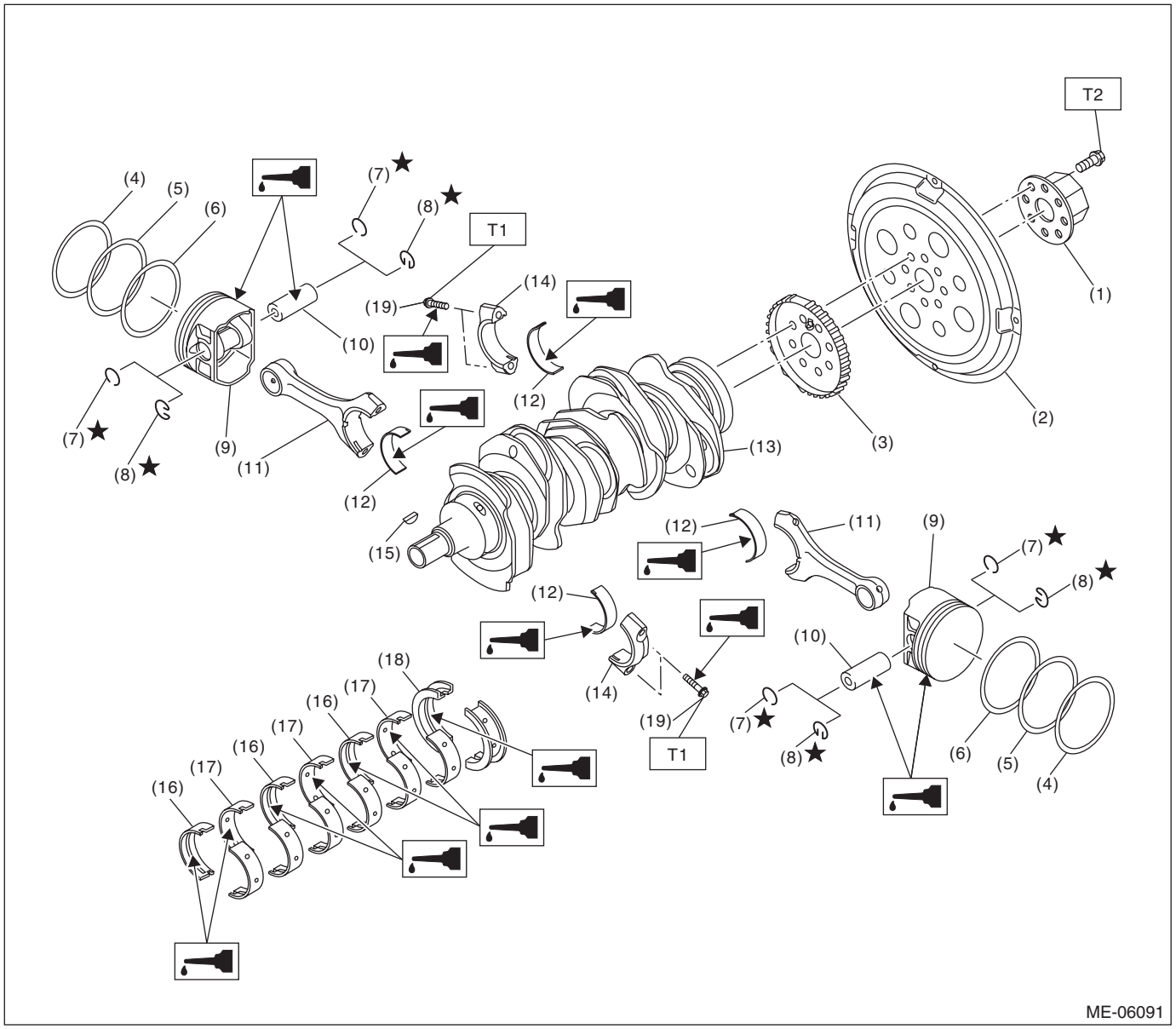
ME-04988

(1) Cylinder block (RH)
(2) Cylinder block (LH)
(3) Oil seal
(4) Plug
(5) Plug
(6) Orifice
(7) Oil pan upper
(8) Stud bolt
(9) O-ring
(10) Plug
(11) Magnet
(12) Oil pan lower
(13) Oil pressure switch
(14) Oil pressure switch harness
(15) Oil filter
(16) Oil cooler connector
(17) Oil cooler
(18) Hose
(19) Clamp
(20) Hose
(21) Oil cooler pipe
(22) Hose

Tightening torque:N·m (kgf-m, ft-lb)

T1: 6.4 (0.7, 4.7)
T2: 17 (1.7, 12.5)
T3: 18 (1.8, 13.3)
T4: 25 (2.5, 18.4)
T5: 37 (3.8, 27.3)
T6: 54 (5.5, 39.8)
T7: <Ref. to ME(H6DO)-97, Cylinder Block.>

7. CRANKSHAFT AND PISTON



(1)	Reinforcement	(9)	Piston	(17)	Crankshaft bearing #2, #4, #6
(2)	Drive plate	(10)	Piston pin	(18)	Crankshaft bearing #7
(3)	Crankshaft sensor plate	(11)	Connecting rod	(19)	Connecting rod cap bolt
(4)	Top ring	(12)	Connecting rod bearing		
(5)	Second ring	(13)	Crankshaft		
(6)	Oil ring	(14)	Connecting rod cap		
(7)	Circlip	(15)	Woodruff key		
(8)	Snap ring	(16)	Crankshaft bearing #1, #3, #5		

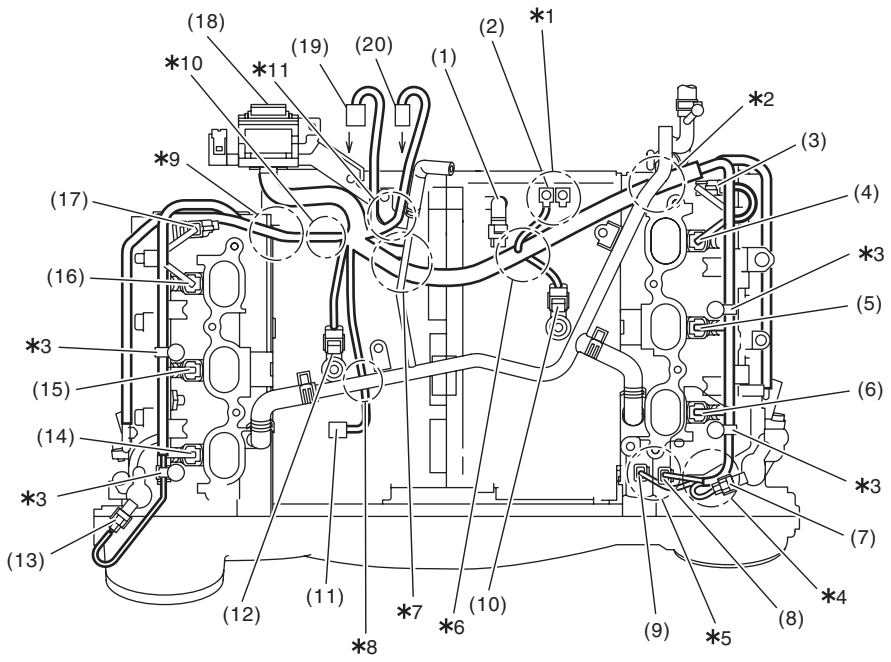
Tightening torque:N·m (kgf-m, ft-lb)

T1: 60 (6.1, 44.3)

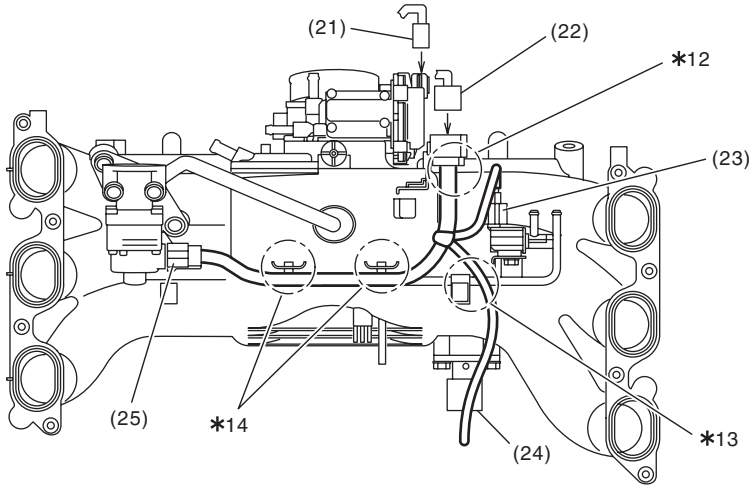
T2: <Ref. to 5AT-62, INSTALLATION, Drive Plate.>

8. ENGINE HARNESS

Engine harness assembly diagram 1



(A)



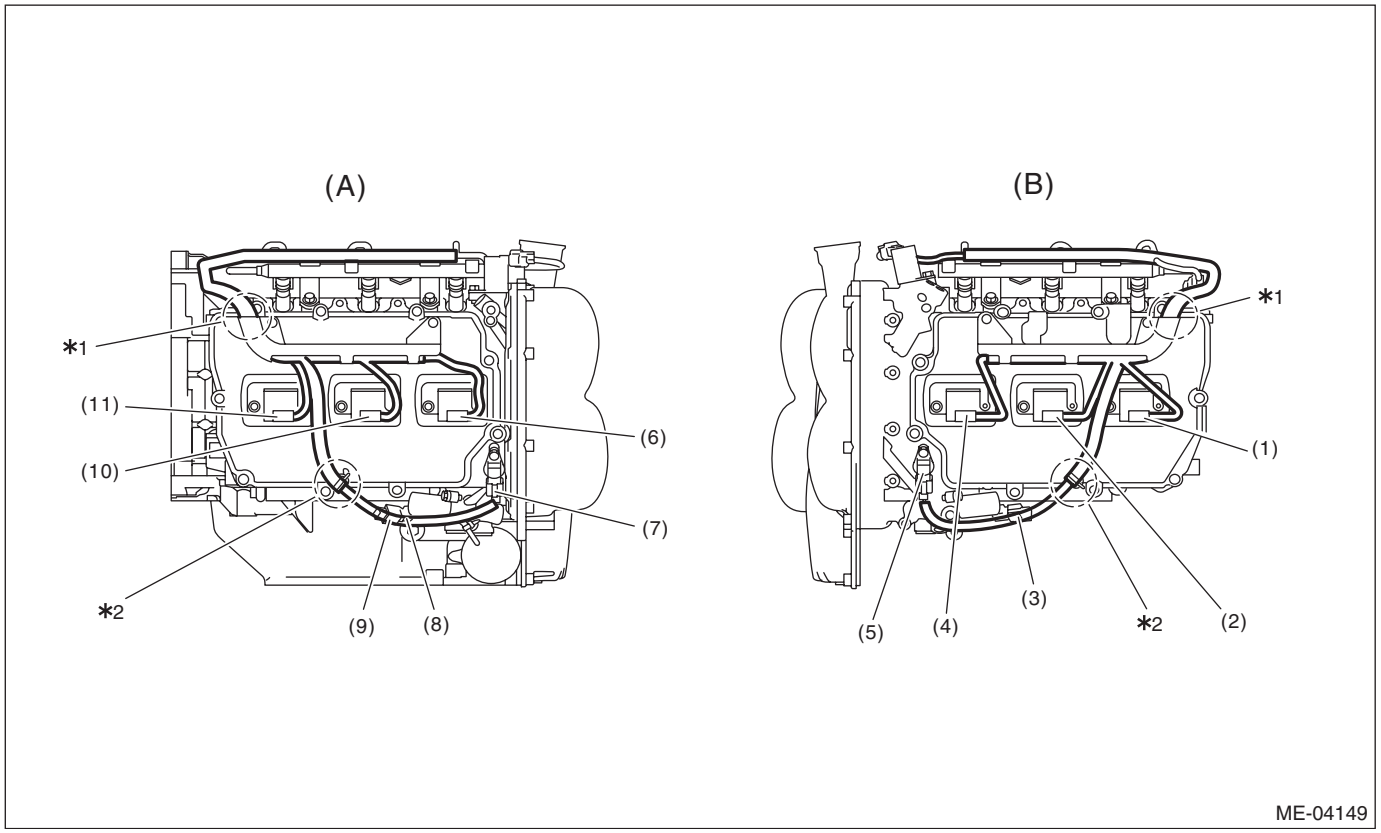
(B)

ME-04534

(A)	Cylinder block upper face	(B)	Intake manifold back surface		
(1)	Crankshaft position sensor connector	(10)	Knock sensor LH connector	(19)	Upper/lower connection connector (To intake manifold)
(2)	Engine ground	(11)	Power steering switch connector	(20)	Electronic throttle control connector (To intake manifold)
(3)	Intake camshaft position sensor LH connector	(12)	Knock sensor RH connector	(21)	Electronic throttle control connector (From upper part of the cylinder block)
(4)	#6 injector connector	(13)	Intake oil flow control solenoid valve RH connector	(22)	Upper/lower connection connector (From upper part of the cylinder block)
(5)	#4 injector connector	(14)	#1 injector connector	(23)	Purge control solenoid valve connector
(6)	#2 injector connector	(15)	#3 injector connector	(24)	Manifold absolute pressure sensor connector
(7)	Intake oil flow control solenoid valve LH connector	(16)	#5 injector connector	(25)	EGR valve connector
(8)	Oil temperature sensor connector	(17)	Intake camshaft position sensor RH connector		
(9)	Engine coolant temperature sensor connector	(18)	Engine harness docking connector		

*1: Install so that engine ground terminals face the rear side of vehicle.
*2: Route under the heater pipe.
*3: Attach the engine harness fixing clip to the fuel pipe stay.
*4: Route from the cutout portion on the fuel pipe protector LH.
*5: Be careful not to mix up the connectors of oil temperature sensor and engine coolant temperature sensor.
*6: Route between crankshaft position sensor and knock sensor LH.
*7: Route under the heater pipe.
*8: Route under the heater pipe.
*9: Route under the fuel pipe.
*10: Attach the engine harness fixing clip to the fixing boss on the cylinder block.
*11: Route over the heater pipe stay.
*12: Securely install the engine harness fixing stay.
*13: Route outside the fuel pipe.
*14: Attach the engine harness fixing clip to the fixing stay on the intake manifold.

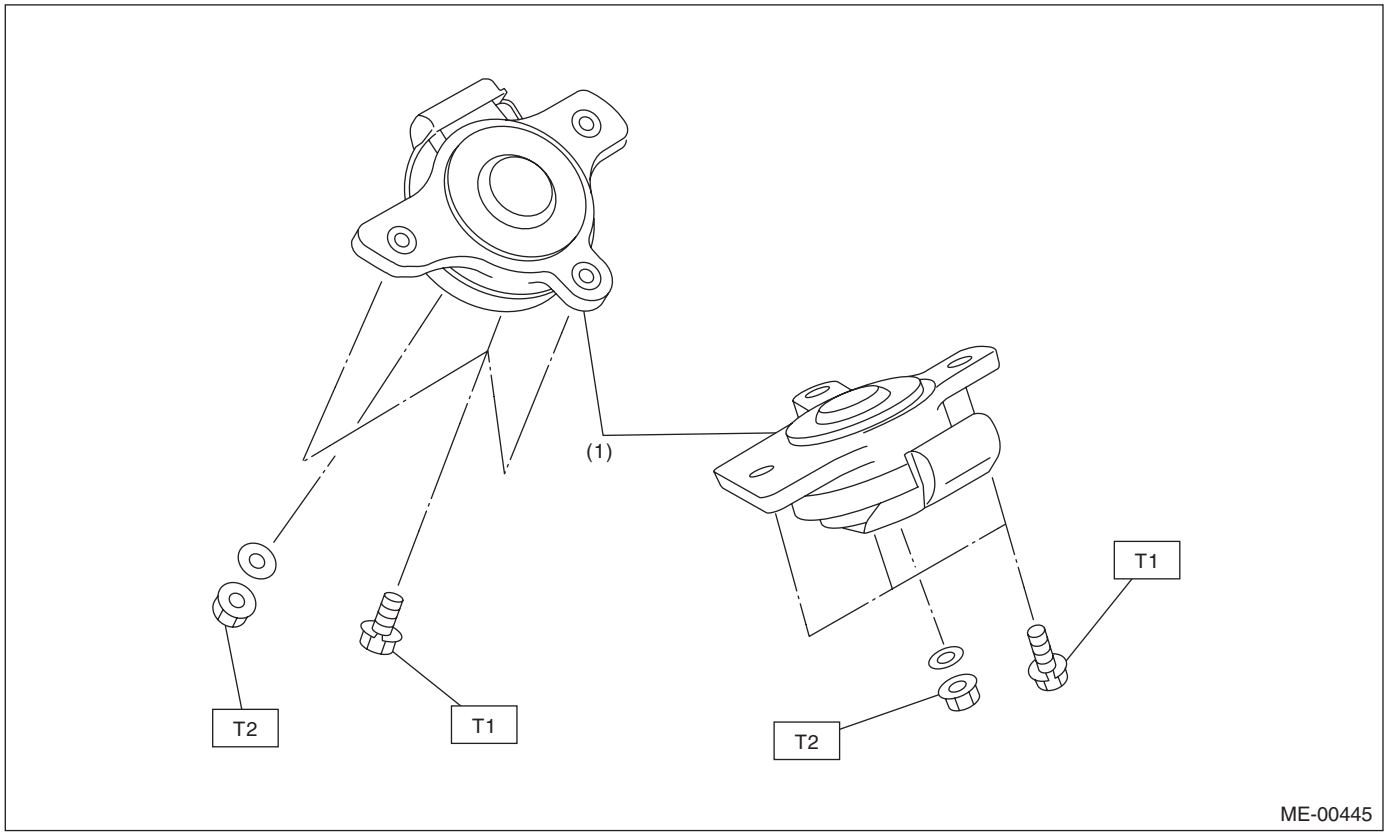
Engine harness assembly diagram 2



(A)	Right side of the engine	(B)	Left side of the engine		
(1)	#6 ignition coil connector	(5)	Exhaust camshaft position sensor LH connector	(9)	Exhaust oil flow control valve solenoid RH connector
(2)	#4 ignition coil connector	(6)	#1 injector connector	(10)	#3 ignition coil connector
(3)	Exhaust oil flow control valve solenoid LH connector	(7)	Exhaust camshaft position sensor RH connector	(11)	#5 ignition coil connector
(4)	#2 ignition coil connector	(8)	Oil pressure switch connector		

*1: Align the engine harness stay end with the end of engine harness identification tape.
*2: Attach the engine harness fixing clip to the fixing boss on the rocker cover.

9. ENGINE MOUNTING



(1) Front cushion rubber

Tightening torque:N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 75 (7.6, 55.3)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
- All parts should be thoroughly cleaned, paying special attention to engine oil passages, pistons and bearings.
- Before applying liquid gasket, completely remove the old liquid gasket and degrease it.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- All removed parts, if to be reused, should be reinstalled in the original positions and directions.
- Bolts, nuts and washers should be replaced with new parts as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools, or not to stain seats and windows with coolant or oil. Place a cover over fender, as required, for protection.
- Prior to starting work, prepare the following:

Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.

- Lift up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOL

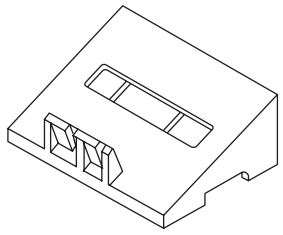
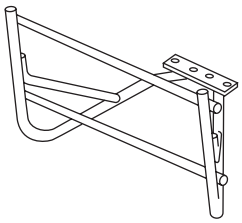
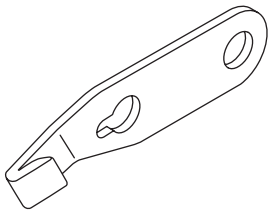
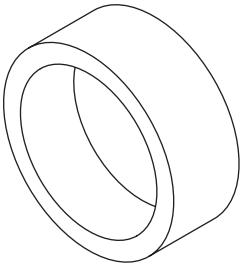
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18250AA010	18250AA010	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve spring.
 ST18232AA000	18232AA000	ENGINE STAND	Used for disassembling and assembling engine.
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of drive plate when removing/tightening crank pulley bolt.
 ST-398744300	398744300	PISTON GUIDE	Used for installing piston in cylinder.

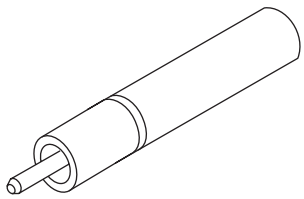
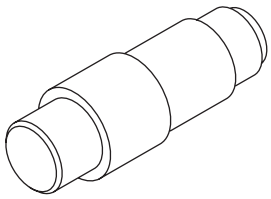
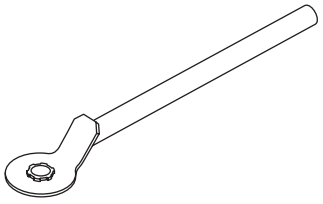
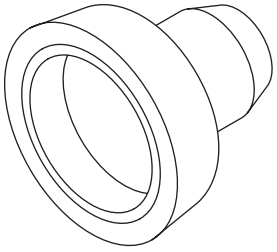
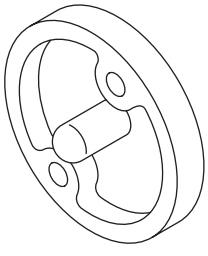
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18261AA010	18261AA010	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST18350AA000	18350AA000	CONNECTING ROD BUSHING REMOVER AND INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used together with CRANKSHAFT OIL SEAL GUIDE (499597100).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used together with CRANKSHAFT OIL SEAL INSTALLER (499587200).

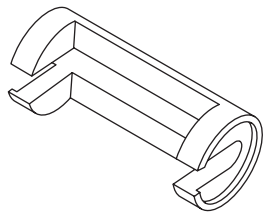
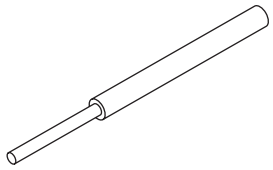
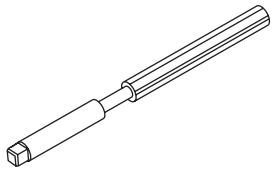
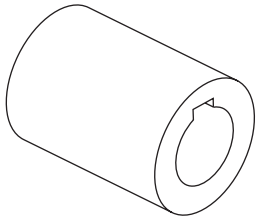
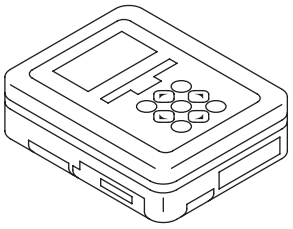
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST-499765700	499765700	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499765900	499765900	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST18252AA000	18252AA000	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

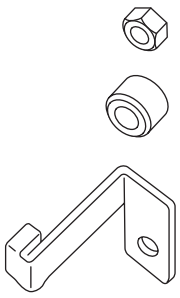
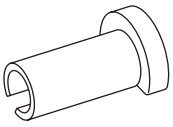
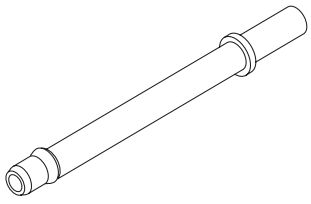
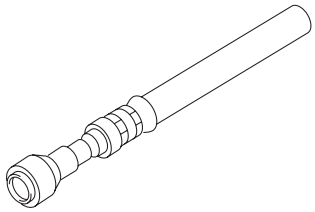
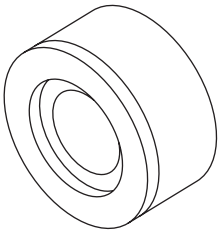
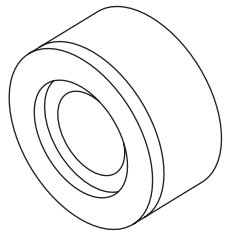
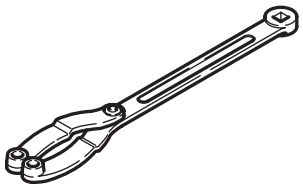
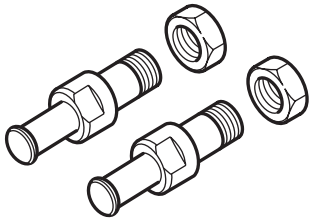
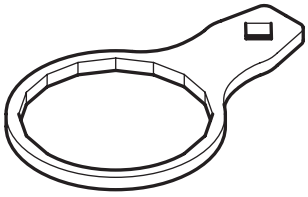
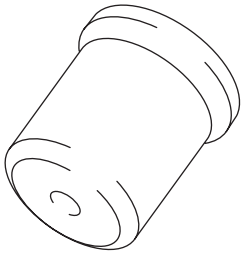
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST42099AE000	42099AE000	QUICK CONNECTOR RELEASE	Used for disconnecting quick connector of the engine compartment.
 ST18471AA000	18471AA000	FUEL PIPE ADAPTER	Used for measuring fuel pressure.
 ST42075AG690	42075AG690	FUEL HOSE	• Used for measuring fuel pressure. • This is the SUBARU genuine part.
 ST18251AA050	18251AA050	VALVE GUIDE ADJUSTER	Used for installing valve guides on intake side.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18251AA060	18251AA060	VALVE GUIDE ADJUSTER	Used for installing valve guides on exhaust side.
 ST18355AA000	18355AA000	PULLEY WRENCH	• Used for stopping rotation of crank pulley when removing and installing crank pulley bolt. • Used for stopping rotation of idler sprocket when removing and installing idler sprocket bolt.
 ST18334AA000	18334AA000	PULLEY WRENCH PIN SET	• Used for stopping rotation of crank pulley when removing and installing crank pulley bolt. • Used for stopping rotation of idler sprocket when removing and installing idler sprocket bolt.
 ST18332AA020	18332AA020	OIL FILTER WRENCH	Used for removing and installing oil filter.
 ST-499585700	499585700	OIL SEAL GUIDE	Used for installing the chain cover oil seal.

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.
Vacuum gauge	Used for measuring intake manifold vacuum.
Oil pressure gauge	Used for measuring engine oil pressure.
Fuel pressure gauge	Used for measuring fuel pressure.
TORX® socket (E12)	Used for removing and installing connecting rod cap.

2. Compression

A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) Remove the collector cover.
2) After warming-up the engine, turn the ignition switch to OFF.
3) Make sure that the battery is fully charged.
4) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
5) Remove all spark plugs. <Ref. to IG(H6DO)-5, REMOVAL, Spark Plug.>
6) Fully open the throttle valve.
7) Check the starter motor for satisfactory performance and operation.
8) Secure the compression gauge tightly against the spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw should be less than 18 mm (0.71 in) long.

9) Crank the engine by the starter motor, and read the maximum value on the gauge when the needle of gauge is steady.

NOTE:
• Perform at least two measurements per cylinder, and make sure that the values are correct.
• If the compression pressure is out of standard, check or adjust the pistons, valves and cylinders.

Compression (350 rpm and fully open throttle):
Standard
1,275 — 1,471 kPa (13.0 — 15.0 kgf/cm^2, 185 — 213 psi)
Limit
1,128 kPa (11.5 kgf/cm^2, 164 psi)
Difference between cylinders
49 kPa (0.5 kgf/cm^2, 7 psi) or less

10) After inspection, install the related parts in the reverse order of removal.

3. Idle Speed

A: INSPECTION

1) Before checking the idle speed, check the following item:
   (1) Check the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and hoses are connected properly.
   (2) Check the malfunction indicator light does not illuminate.
2) Warm up the engine.
3) Read the engine idle speed using Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

NOTE:
• Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted.
• If idle speed is out of standard, refer to the General Diagnosis Table under “Engine Control System”. <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>

(1) Check the idle speed when no-loaded. (Headlight, heater fan, rear defroster, radiator fan, A/C and etc. are OFF)

Idle speed (No load and gears in “P” or “N” range):
Standard
700±100 rpm

(2) Check the idle speed when loaded. (Turn the A/C switch to “ON” and operate the compressor for at least one minute before measurement.)

Idle speed (A/C ON and gear in “P” or “N” range):
Standard
805±100 rpm

4. Ignition Timing

A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself at measurement.

1. METHOD WITH SUBARU SELECT MONITOR

1) Before checking the ignition timing, check the following item:
   (1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.
   (2) Check the malfunction indicator light does not illuminate.
2) Warm up the engine.
3) Read the ignition timing using Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

NOTE:
If ignition timing is out of standard, check the ignition control system. Refer to “Engine Control System”. <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>

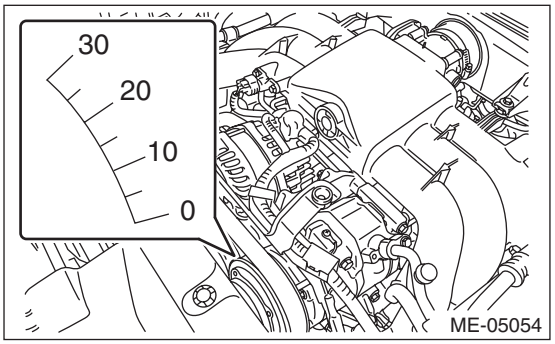
Ignition timing [BTDC/rpm]:
Standard
15°±8°/700

2. METHOD WITH TIMING LIGHT

1) Before checking the ignition timing, check the following item:
   (1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.
   (2) Check the malfunction indicator light does not illuminate.
2) Warm up the engine.
3) Stop the engine, and turn the ignition switch to OFF.
4) Remove the collector cover.
5) Disconnect the ground cable from battery.
6) Remove the air intake duct. <Ref. to IN(H6DO)-9, REMOVAL, Air Intake Duct.>
7) Disconnect the connector from mass air flow and intake air temperature sensor.
8) Remove the air cleaner case and element.
9) Connect the timing light to the power wire of #1 ignition coil.
10) Install the connectors of air cleaner case, element, and the mass air flow and intake air temperature sensor.
11) Connect the battery ground terminal.
12) Start the engine, turn the timing light to the crank pulley, and check the ignition timing through the chain cover gauge.

NOTE:
If ignition timing is out of standard, check the ignition control system. Refer to “Engine Control System”. <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>

Ignition timing [BTDC/rpm]:
Standard
15°±8°/700

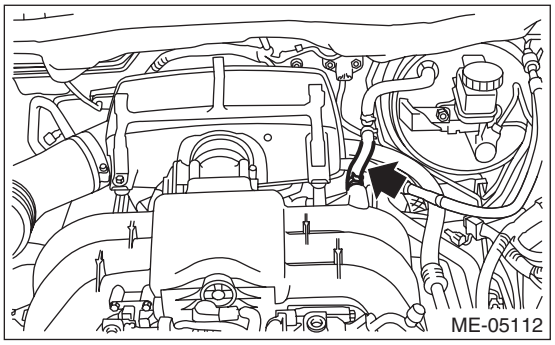


13) After inspection, install the related parts in the reverse order of removal.

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm up the engine.
2) Remove the collector cover.
3) Disconnect the brake booster vacuum hose from the intake manifold, and install the vacuum gauge.



4) Keep the engine at idle speed and read the vacuum gauge indication.

NOTE:
Condition of engine inside can be diagnosed by observing the behavior of the vacuum gauge needle as described in table below.

Intake manifold vacuum (at idling, A/C OFF):
Standard
Less than –60.0 kPa (–450 mmHg, –17.72 inHg)

Diagnosis of engine condition by measurement of intake manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than standard value. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket, disconnection or damage of vacuum hose
2. Needle intermittently drops to position lower than standard value.	Leakage around cylinder
3. Needle drops suddenly and intermittently from standard value.	Sticky valve
4. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
5. Needle vibrates above and below standard value in narrow range.	Defective ignition system

6. Engine Oil Pressure

A: INSPECTION

1) Disconnect the ground cable from battery.
2) Remove the oil pressure switch from the oil pan upper. <Ref. to LU(H6DO)-15, REMOVAL, Oil Pressure Switch.>
3) Connect the oil pressure gauge hose to the oil pan upper.
4) Connect the battery ground terminal.
5) Start the engine, and measure the oil pressure.

NOTE:
• If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H6DO)-18, General Diagnostic Table.>
• If the oil pressure warning light is ON and oil pressure is within specification, check the oil pressure switch. <Ref. to LU(H6DO)-8, Oil Pressure System.>

Oil pressure (at oil temperature of 80°C (176°F)):
Standard
100 kPa (1.0 kgf/cm^2, 15 psi) or more (at 700 rpm)
500 kPa (5.1 kgf/cm^2, 73 psi) or more (at 5,000 rpm)

6) After inspection, install the related parts in the reverse order of removal.

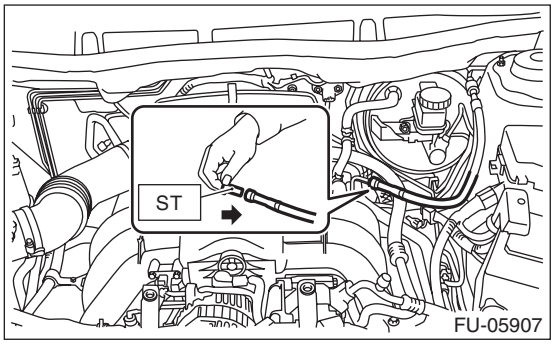
7. Fuel Pressure

A: INSPECTION

CAUTION:
• Before removing the fuel pressure gauge, release the fuel pressure.
• Be careful not to spill fuel.
• Catch the fuel from hoses using a container or cloth.

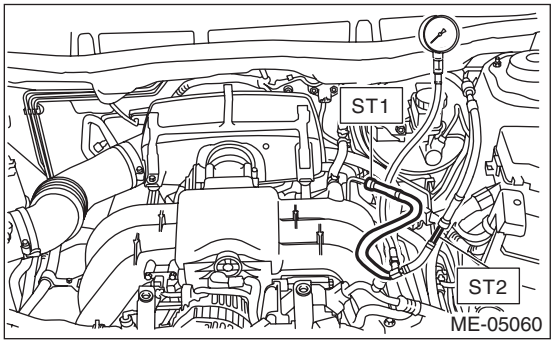
1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler lid and remove the fuel filler cap.
4) Disconnect the fuel delivery hose and connect the fuel pressure gauge.
   (1) Disconnect the fuel delivery hose using the ST.

ST 42099AE000 QUICK CONNECTOR RELEASE



   (2) Connect the fuel pressure gauge with ST1 and ST2.

NOTE:
ST1 is a SUBARU genuine part.
ST1 42075AG690 FUEL HOSE
ST2 18471AA000 FUEL PIPE ADAPTER



5) Start the engine.
6) Measure the fuel pressure after warming up the engine.

NOTE:
• The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.
• Check or replace the fuel pump and fuel delivery line if the fuel pressure is out of the standard.

Fuel pressure:
Standard
340 — 400 kPa (3.5 — 4.1 kgf/cm^2, 49.3 — 58 psi)

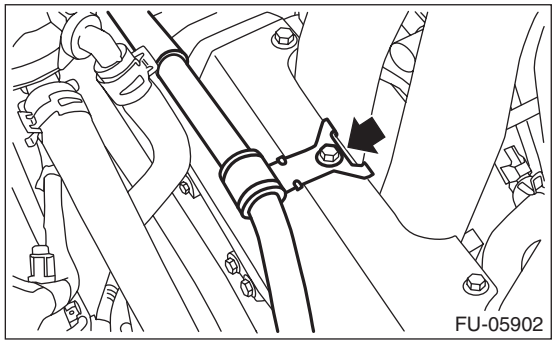
8. Valve Clearance

A: INSPECTION

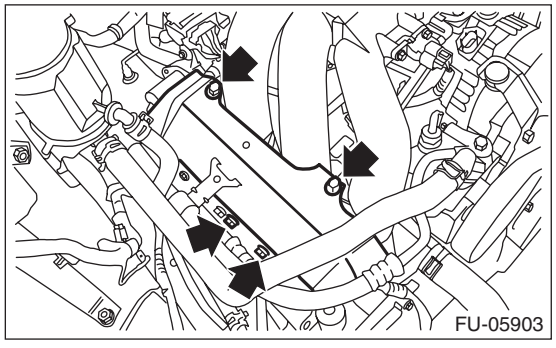
CAUTION:
If engine oil is spilt onto the exhaust pipe, wipe it off with cloth to avoid emission of smoke or causing a fire.

NOTE:
Inspection and adjustment of valve clearance should be performed while engine is cold.

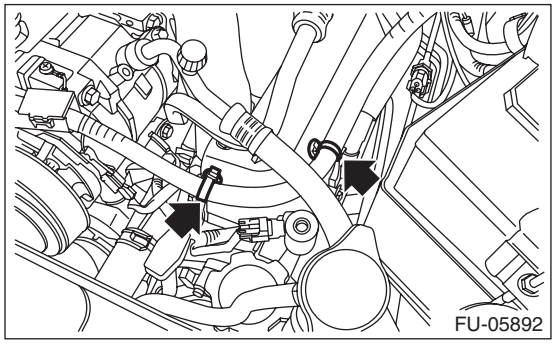
1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Lift up the vehicle.
4) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
5) Lower the vehicle.
6) When inspecting #1, #3 and #5 cylinders
   (1) Remove the air cleaner case, intake boot, and air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Cleaner Case.> <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Chamber.>
   (2) Remove the feed hose from fuel pipe protector RH.



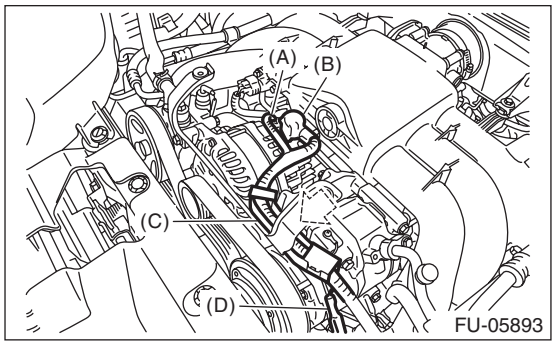
   (3) Remove the fuel pipe protector (RH).



   (4) Disconnect the connector of oil pressure switch.
   (5) Remove the ignition coil. <Ref. to IG(H6DO)-8, REMOVAL, Ignition Coil.>
   (6) Remove the rocker cover (RH). <Ref. to ME(H6DO)-76, REMOVAL, Camshaft.>
7) When inspecting #2, #4 and #6 cylinders
   (1) Remove the battery and battery carrier. <Ref. to SC(H6DO)-18, REMOVAL, Battery.>
   (2) Remove two fixing clips on the fuel pipe protector (LH).

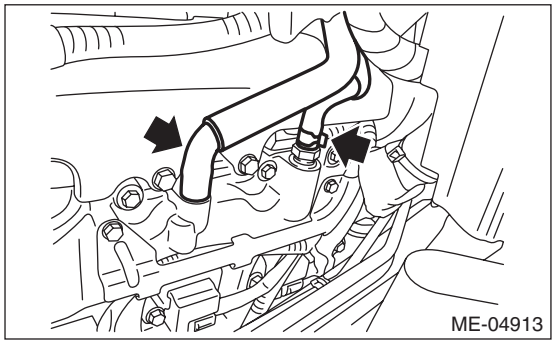


   (3) Generator connector
   (4) Generator terminal B
   (5) Remove the harness cover from collector cover bracket.
   (6) Magnet clutch connector

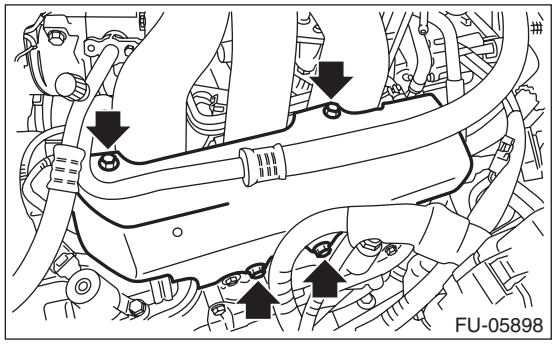


   (A) Generator connector
   (B) Terminal B
   (C) Remove the harness cover from collector cover bracket.
   (D) Magnet clutch connector

   (7) Slide the harness and connector to the battery side.
   (8) Disconnect the PCV hose and blow-by hose from the rocker cover (LH).

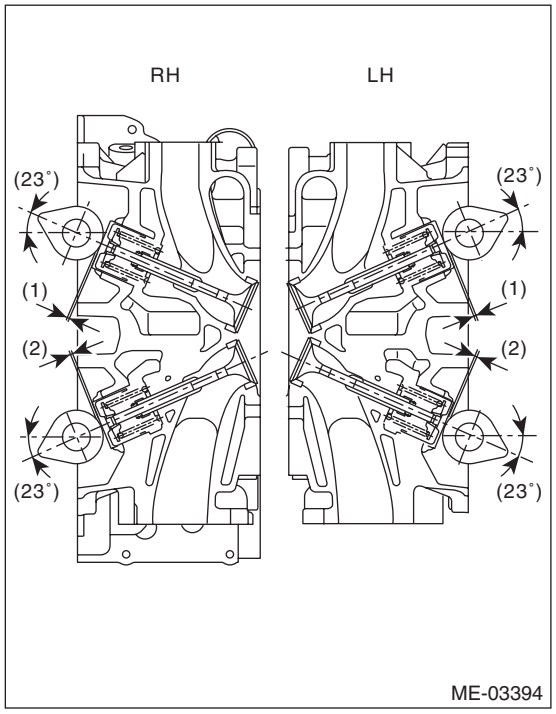


(9) Remove the fuel pipe protector (LH).



(10) Remove the ignition coil. <Ref. to IG(H6DO)-8, REMOVAL, Ignition Coil.>
(11) Remove the rocker cover (LH). <Ref. to ME(H6DO)-76, REMOVAL, Camshaft.>

8) Turn the crankshaft clockwise until the camshaft is set to position shown in the figure.

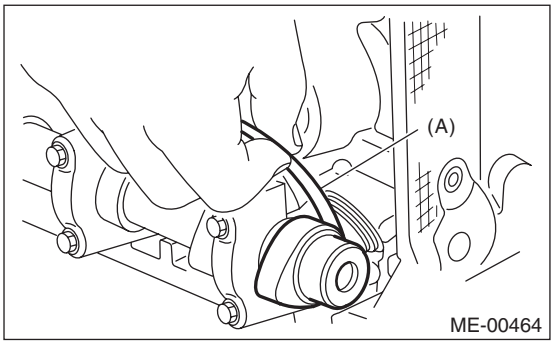


(1) Valve clearance (Intake side)
(2) Valve clearance (Exhaust side)

9) Measure the clearance of intake valve and exhaust valve using thickness gauge (A).

NOTE:
• Measure it within the range of ±30° from specified position shown in the figure.
• Insert a thickness gauge in a direction as horizontal as possible with respect to the valve lifter.
• If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.

Valve clearance (inspection value):
Intake
$0.20^{+0.04}_{-0.06}$ mm ($0.0079^{+0.0016}_{-0.0024}$ in)
Exhaust
0.35±0.05 mm (0.0138±0.0020 in)



10) If necessary, adjust the valve clearance. <Ref. to ME(H6DO)-34, ADJUSTMENT, Valve Clearance.>
11) Further turn the crank pulley clockwise and then measure the valve clearances again.
12) After inspection, install the related parts in the reverse order of removal. <Ref. to ME(H6DO)-77, INSTALLATION, Camshaft.>

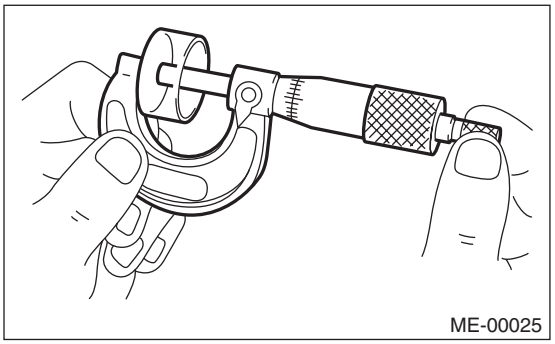
B: ADJUSTMENT

1. INTAKE SIDE

1) Remove the engine from vehicle. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.>
2) Measure all the valve clearances. <Ref. to ME(H6DO)-33, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after measurement.

3) Remove the timing chain assembly. <Ref. to ME(H6DO)-55, REMOVAL, Timing Chain Assembly.>
4) Remove the cam sprocket. <Ref. to ME(H6DO)-74, REMOVAL, Cam Sprocket.>
5) Remove the camshaft. <Ref. to ME(H6DO)-76, REMOVAL, Camshaft.>
6) Remove the valve lifter.
7) Measure the thickness of valve lifter using micrometer.



8) Select a valve lifter of suitable thickness using the measured valve clearance and valve lifter thickness, and install it.

NOTE:
Use a new valve lifter.

Unit: mm (in)
S = (V + T) – 0.20 (0.0079)
S: Valve lifter thickness required V: Measured valve clearance T: Valve lifter thickness to be used

9) Install the camshaft. <Ref. to ME(H6DO)-77, INSTALLATION, Camshaft.>
10) Install the cam sprocket. <Ref. to ME(H6DO)-74, INSTALLATION, Cam Sprocket.>
11) Install the timing chain assembly. <Ref. to ME(H6DO)-61, INSTALLATION, Timing Chain Assembly.>
12) Measure all valve clearance again at this time. If the valve clearance is not appropriate, repeat from the first step.

Valve clearance (adjustment value):
$0.20^{+0.04}_{-0.06}$ mm ($0.0079^{+0.0016}_{-0.0024}$ in)

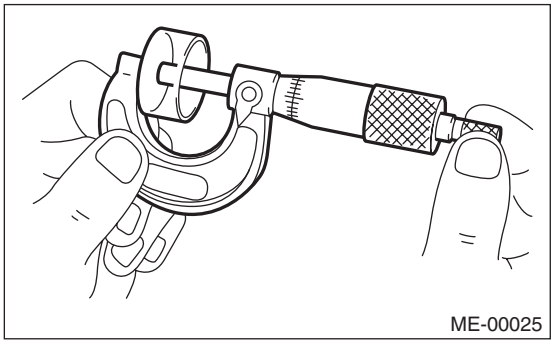
13) After adjustment, install the related parts in the reverse order of removal.

NOTE:
Use a new rocker cover gasket.

2. EXHAUST SIDE

1) Remove the engine from vehicle. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.>
2) Measure all the valve clearances. <Ref. to ME(H6DO)-33, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after measurement.
3) Remove the camshaft. <Ref. to ME(H6DO)-76, REMOVAL, Camshaft.>
4) Remove the valve lifter.
5) Measure the thickness of valve lifter using micrometer.



6) Select a valve lifter of suitable thickness using the measured valve clearance and valve lifter thickness, and install it.

NOTE:
Use a new valve lifter.

Unit: mm (in)
S = (V + T) – 0.35 (0.0138)
S: Valve lifter thickness required V: Measured valve clearance T: Valve lifter thickness to be used

7) Install the camshaft. <Ref. to ME(H6DO)-77, INSTALLATION, Camshaft.>
8) Install the cam sprocket. <Ref. to ME(H6DO)-74, INSTALLATION, Cam Sprocket.>
9) Install the timing chain assembly. <Ref. to ME(H6DO)-61, INSTALLATION, Timing Chain Assembly.>
10) Measure all valve clearance again at this time. If the valve clearance is not appropriate, repeat from the first step.

Valve clearance (adjustment value):
0.35 ± 0.05 mm (0.0138 ± 0.0020 in)

11) After adjustment, install the related parts in the reverse order of removal.

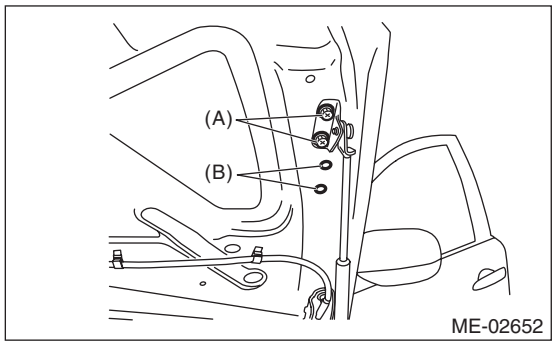
NOTE:
Use a new rocker cover gasket.

9. Engine Assembly

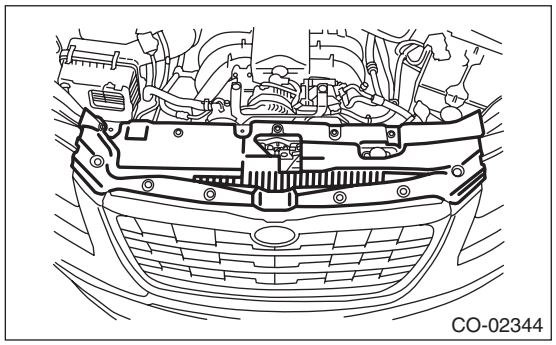
A: REMOVAL

1) Change the bolt mounting position from (A) to (B), then completely open the front hood.

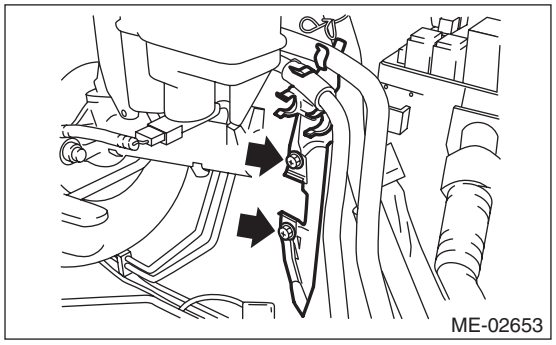
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



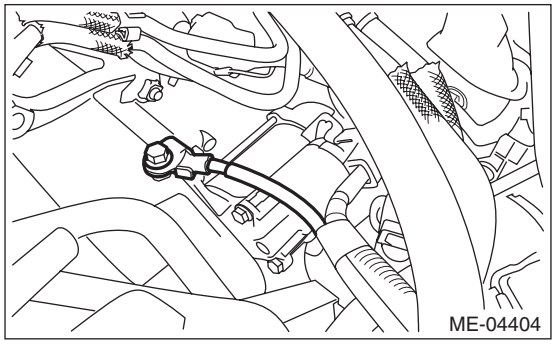
2) Remove the collector cover.
3) Collect the refrigerant from A/C system. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
4) Release the fuel pressure. <Ref. to FU(H6DO)-59, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
5) Remove the battery from vehicle. <Ref. to SC(H6DO)-18, REMOVAL, Battery.>
6) Remove the air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H6DO)-9, REMOVAL, Air Intake Duct.> <Ref. to IN(H6DO)-6, REMOVAL, Air Cleaner Case.> <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Chamber.>
7) Remove the front upper cover.



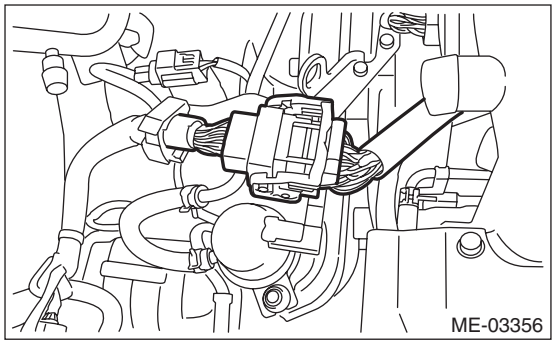
8) Remove the front bumper. <Ref. to EI-22, FRONT BUMPER FACE, REMOVAL, Front Bumper.>
9) Remove the radiator main fan & fan motor and radiator sub fan & fan motor. <Ref. to CO(H6DO)-25, REMOVAL, Radiator Main Fan and Fan Motor.> <Ref. to CO(H6DO)-29, REMOVAL, Radiator Sub Fan and Fan Motor.>
10) Remove the radiator. <Ref. to CO(H6DO)-19, REMOVAL, Radiator.>
11) Remove the fuel hose bracket.



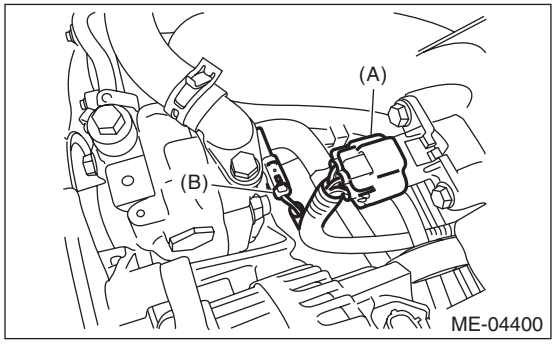
12) Remove the V-belts. <Ref. to ME(H6DO)-46, REMOVAL, V-belt.>
13) Disconnect the A/C pressure hoses from A/C compressor. <Ref. to AC-38, REMOVAL, Hose and Pipe.>
14) Remove the engine ground.



15) Disconnect the following connector.
(1) Engine harness connectors

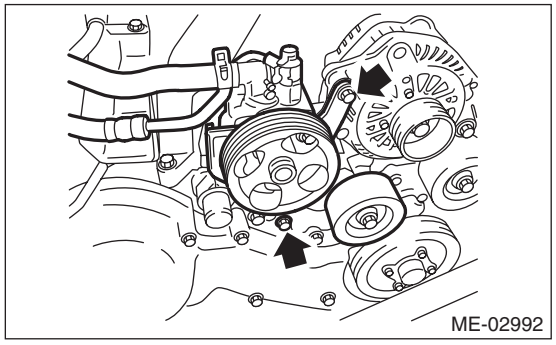


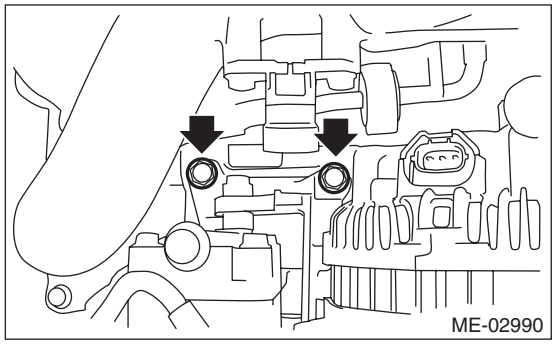
(2) Generator connector, terminal B and magnet clutch connector
(3) Manifold absolute pressure sensor connector (A) and power steering pump connector (B)



16) Remove the power steering pump together with the bracket.

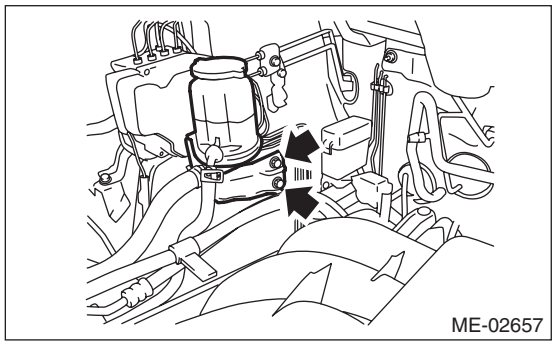
NOTE:
Do not disconnect the hose and pipe from the power steering pump body.


ME-02992

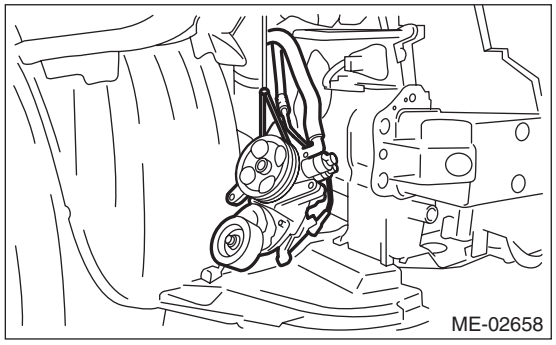

ME-02990

17) Remove the power reserve tank together with the bracket.

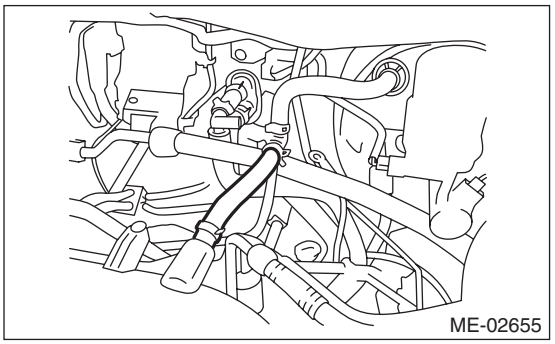
NOTE:
Do not disconnect the hose from the reservoir tank body.


ME-02657

18) Suspend the power steering pump using wire, etc.


ME-02658

19) Disconnect the following hoses.
(1) Brake booster vacuum hose


ME-02655

(2) Heater inlet and outlet hoses

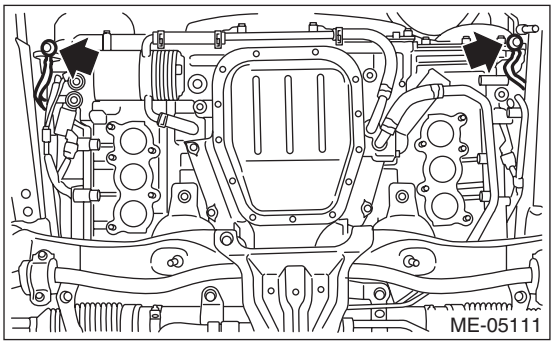
20) Remove the bolts which hold the vacuum pump bracket to the engine. <Ref. to BR-9, BRAKE VACUUM PUMP, COMPONENT, General Description.>

21) Lift up the vehicle.

22) Remove the front exhaust pipe. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>

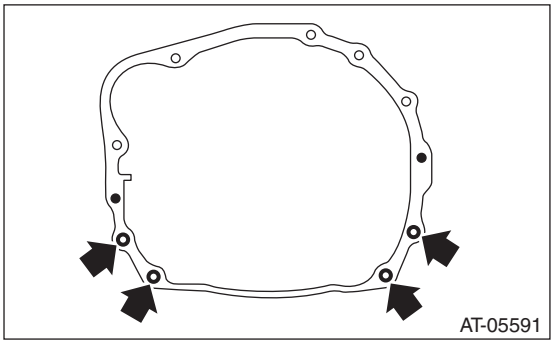
NOTE:
Be careful not to let the front exhaust pipe interfere with water pipes on engine side.

23) Remove the ground cable from the underside of chain cover.

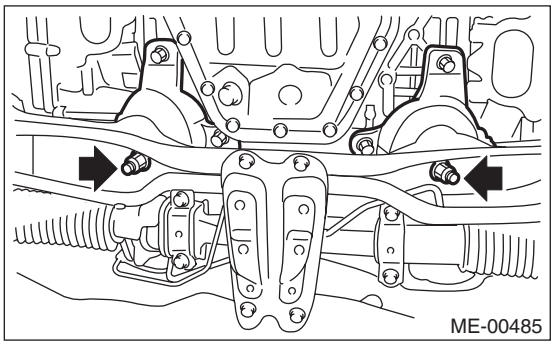

ME-05111

24) Remove the bolts which hold the vacuum pump bracket to the transmission, then remove the vacuum pump together with the bracket. <Ref. to BR-9, BRAKE VACUUM PUMP, COMPONENT, General Description.>

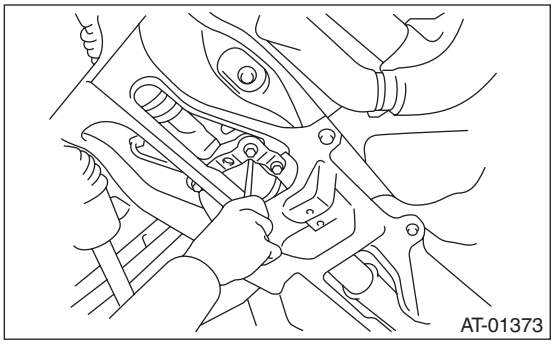
25) Remove the bolts and nuts which hold lower side of transmission to engine.

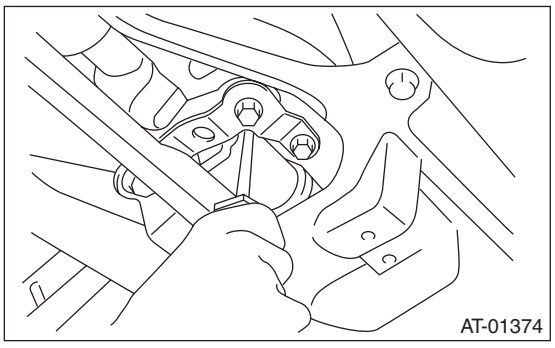

AT-05591

26) Remove the nuts which install front cushion rubber onto front crossmember.



27) Remove the two clutch housing cover securing bolts.





28) Lower the vehicle.

29) Remove the throttle body from the intake manifold.

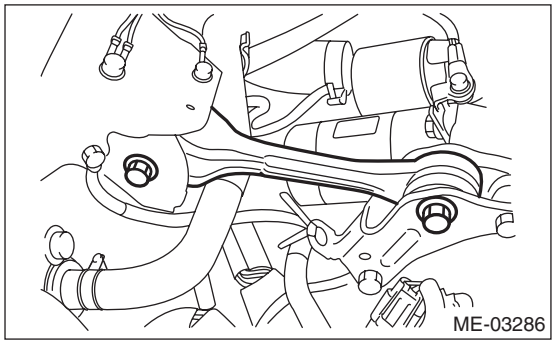
NOTE:
Do not disconnect the inlet and outlet hoses of engine coolant.

30) Separate the torque converter clutch from drive plate.

(1) Remove the service hole plug.

(2) Rotate the clank pulley to align the drive plate to the service hole, and remove four bolts.

31) Remove the pitching stopper.



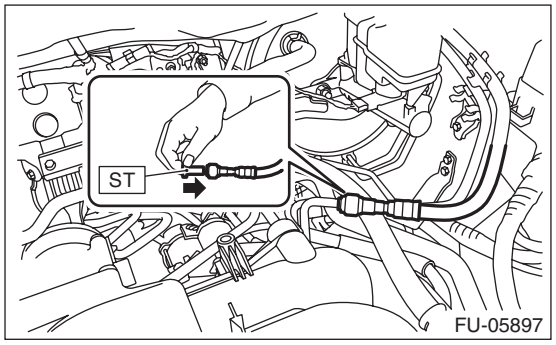
32) Disconnect the fuel delivery hose and evaporation hose.

CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**

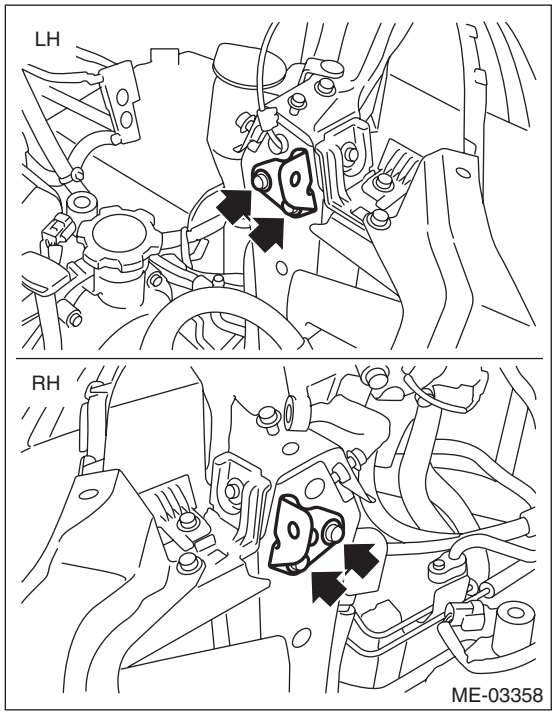
(1) Disconnect the connector of fuel pipe by pushing the ST in the direction of arrow.

ST 42099AE000 QUICK CONNECTOR RELEASE

(2) Remove the clamp and disconnect the evaporation hose.

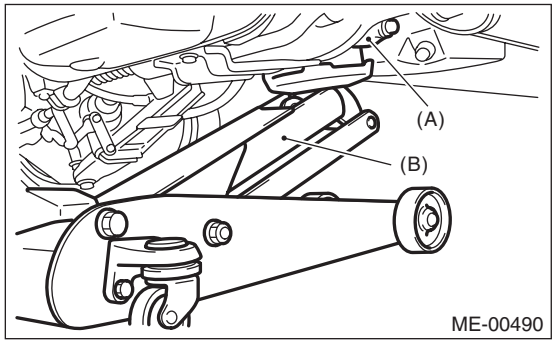


33) Remove the radiator center bracket.



34) Support the engine with a lifting device and wire ropes.
35) Support the transmission with a garage jack.

CAUTION:
Be sure to perform this procedure to prevent the transmission from lowering by its own weight.

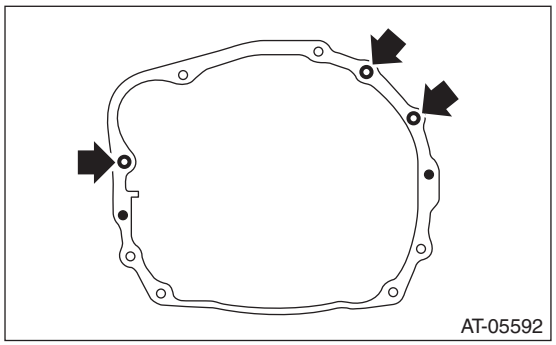


(A) Transmission
(B) Garage jack

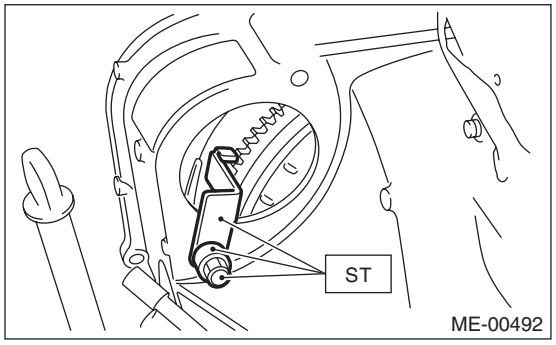
36) Separate the engine and transmission.

CAUTION:
Before removing the engine away from transmission, check to be sure no work has been overlooked.

(1) Remove the starter. <Ref. to SC(H6DO)-6, REMOVAL, Starter.>
(2) Remove the bolts which hold upper side of transmission to engine.

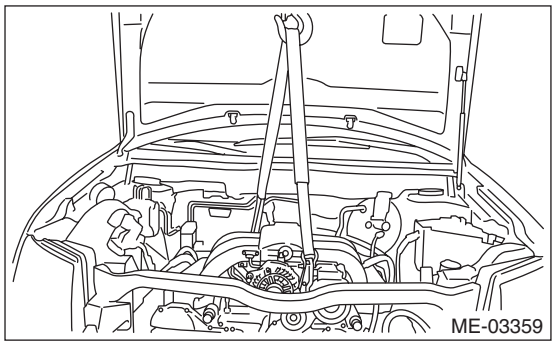


37) Attach the ST to converter case.
ST 498277200 STOPPER SET



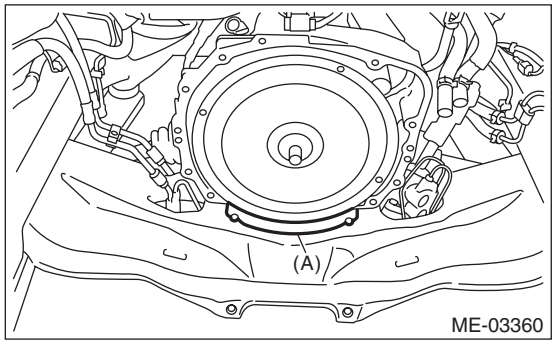
38) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until main shaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



39) Remove the engine mounting.

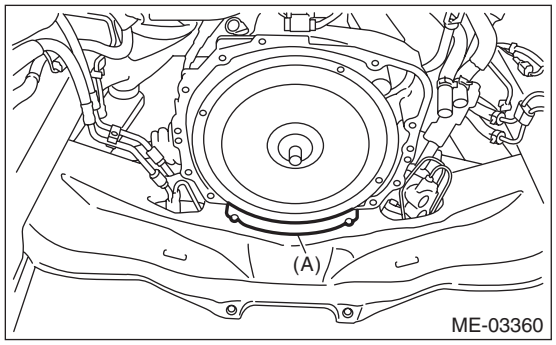
40) Remove the clutch housing cover from vehicle.



(A) Clutch housing cover

B: INSTALLATION

1) Set the clutch housing cover to the vehicle.



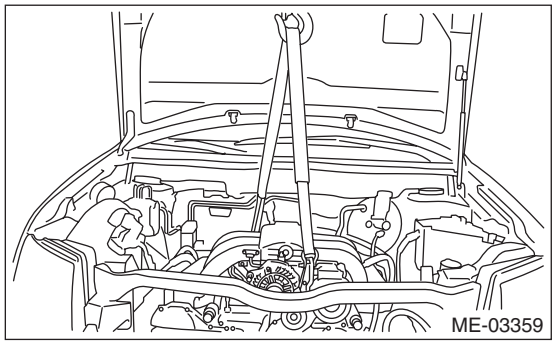
(A) Clutch housing cover

2) Install the engine mount.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

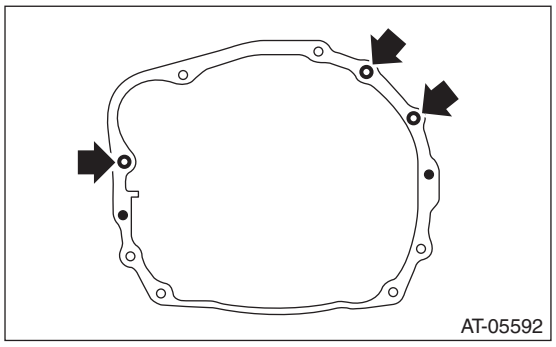
3) Position the engine in engine compartment and align it with transmission.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



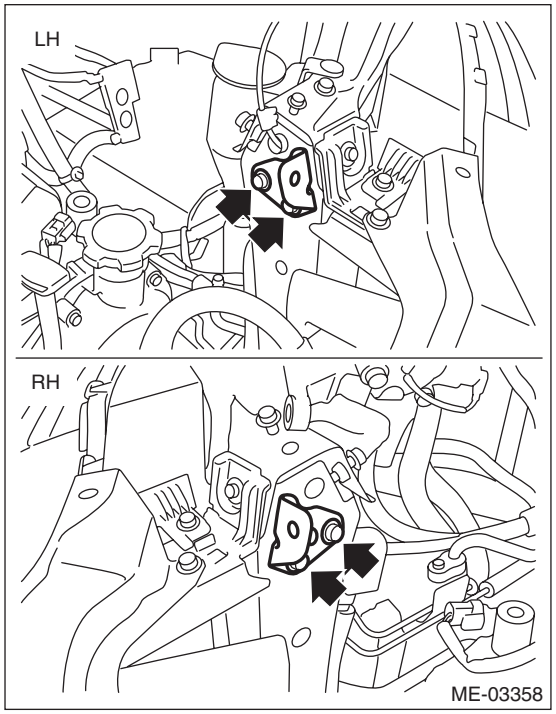
4) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



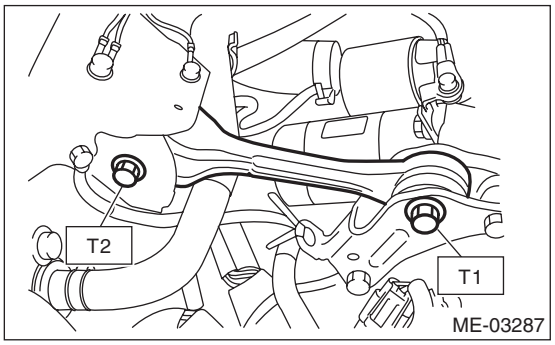
5) Remove the lifting device and wire ropes.
6) Remove the garage jack.
7) Install the radiator center bracket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



8) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



9) Remove the ST from converter case.

NOTE:
Be careful not to drop the ST into the converter case when removing the ST.

10) Install the starter. <Ref. to SC(H6DO)-6, INSTALLATION, Starter.>

11) Connect the torque converter clutch to the drive plate.

(1) Rotate the clank pulley to align the drive plate to the service hole, and tighten four bolts.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

(2) Install the service hole plug.

12) Install the throttle body to intake manifold.

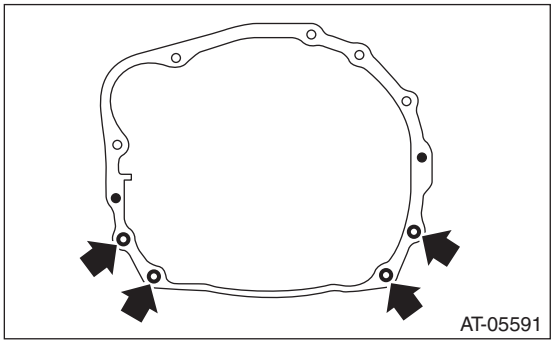
NOTE:
Use a new gasket.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

13) Lift up the vehicle.

14) Tighten the bolts and nuts which hold lower side of the transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



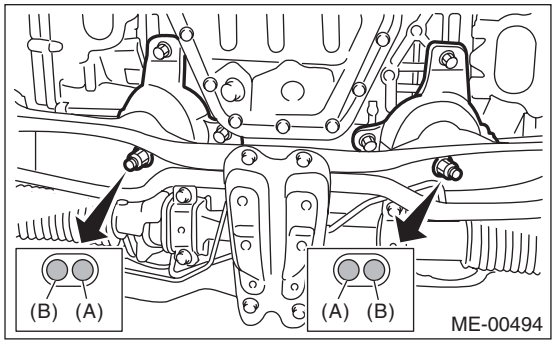
15) Tighten the bolts which holds the vacuum pump bracket to the transmission. <Ref. to BR-9, BRAKE VACUUM PUMP, COMPONENT, General Description.>

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

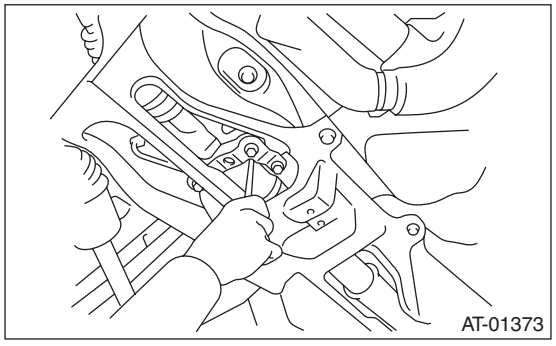
16) Tighten the nuts which install the front cushion rubber onto crossmember.

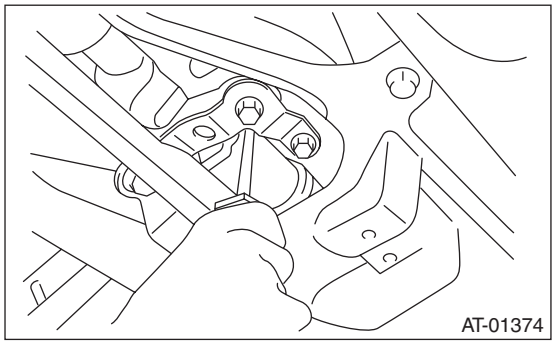
NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.

Tightening torque:
75 N·m (7.6 kgf-m, 55.3 ft-lb)



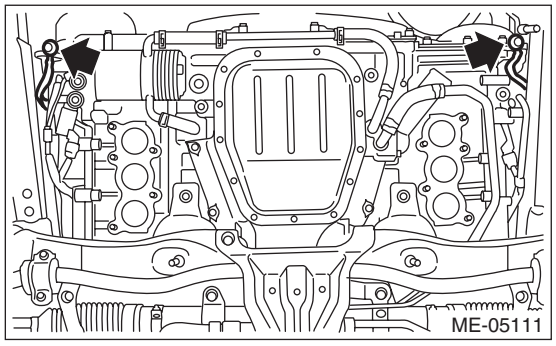
17) Install the clutch housing cover securing bolts.





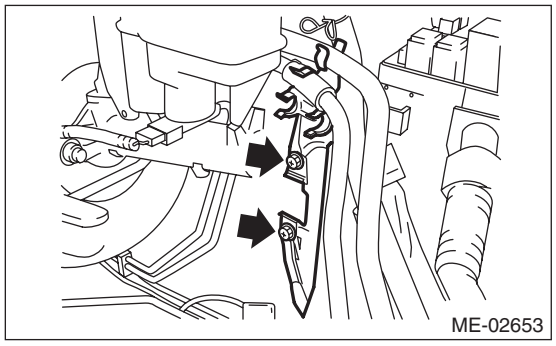
18) Install the ground cable to the underside of chain cover.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



19) Install the front exhaust pipe. <Ref. to EX(H6DO)-5, INSTALLATION, Front Exhaust Pipe.>
20) Lower the vehicle.
21) Install the fuel hose bracket.

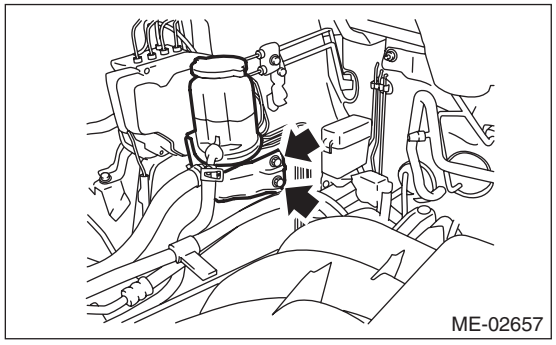
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



22) Tighten the bolts which holds the vacuum pump bracket to the engine. <Ref. to BR-9, BRAKE VACUUM PUMP, COMPONENT, General Description.>

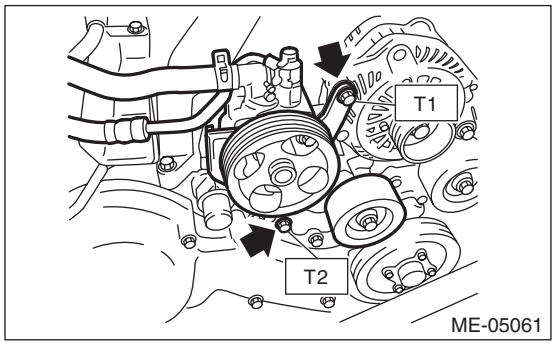
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)
23) Install the reservoir tank.

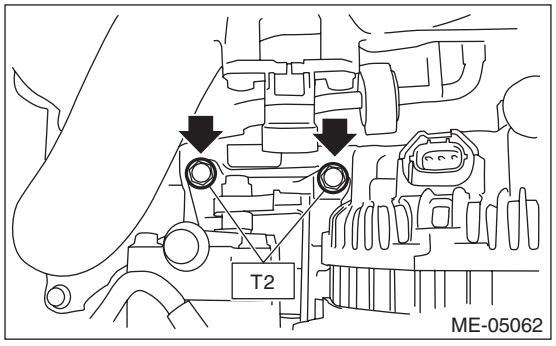
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)



24) Install the power steering pump.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.4 ft-lb)
T2: 33 N·m (3.4 kgf-m, 24.3 ft-lb)

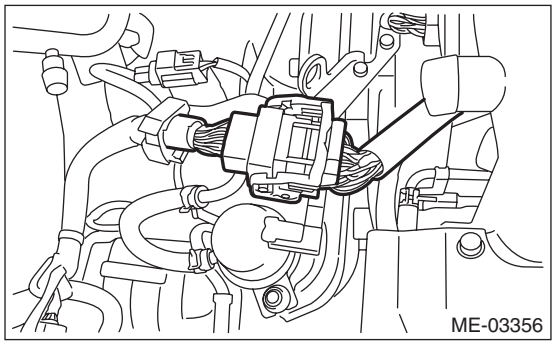




25) Connect the following hoses.
(1) Fuel delivery hose and evaporation hose

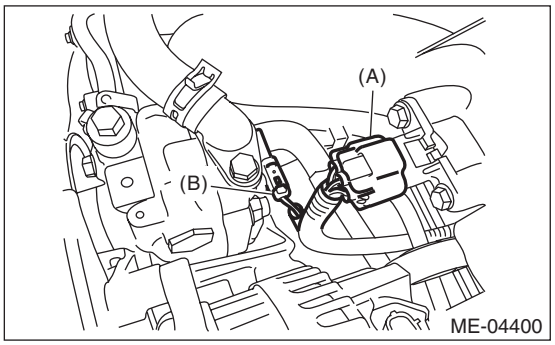
NOTE:
If fuel hoses or clamps are damaged, replace them with new parts.

(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
26) Connect the following connectors.
(1) Engine harness connectors



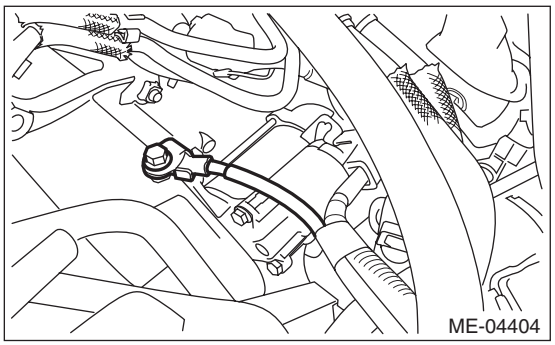
(2) Generator connector, terminal B and magnet clutch connector

(3) Manifold absolute pressure sensor connector (A) and power steering pump connector (B)

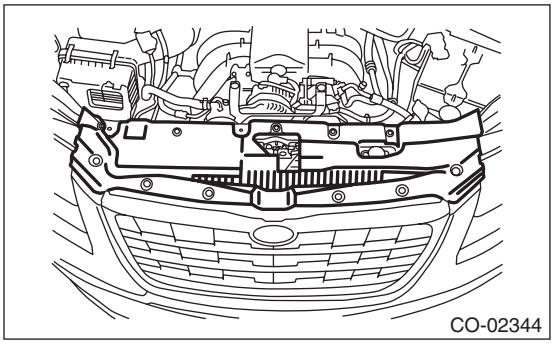


27) Install the engine ground.

Tightening torque:
14 N·m (1.4 kgf-m, 10.3 ft-lb)

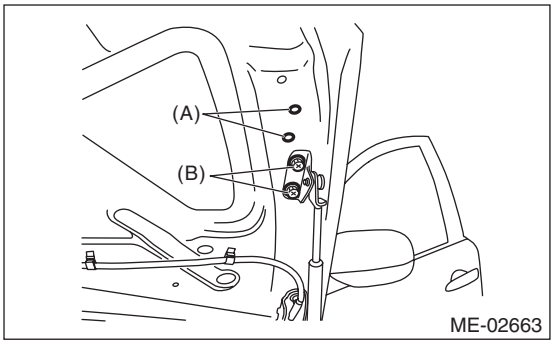


28) Install the A/C pressure hoses. <Ref. to AC-40, INSTALLATION, Hose and Pipe.>
29) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>
30) Install the radiator to vehicle. <Ref. to CO(H6DO)-21, INSTALLATION, Radiator.>
31) Install the radiator main fan & fan motor and radiator sub fan & fan motor. <Ref. to CO(H6DO)-26, INSTALLATION, Radiator Main Fan and Fan Motor.> <Ref. to CO(H6DO)-29, INSTALLATION, Radiator Sub Fan and Fan Motor.>
32) Install the front bumper. <Ref. to EI-23, FRONT BUMPER FACE, INSTALLATION, Front Bumper.>
33) Install the battery to the vehicle. <Ref. to SC(H6DO)-18, INSTALLATION, Battery.>
34) Fill engine coolant. <Ref. to CO(H6DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
35) Check the ATF level and replenish it if necessary. <Ref. to 5AT-29, INSPECTION, Automatic Transmission Fluid.>
36) Charge the A/C system with refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>
37) Install the front upper cover.



38) Install the air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H6DO)-9, INSTALLATION, Air Intake Duct.> <Ref. to IN(H6DO)-7, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H6DO)-8, INSTALLATION, Air Intake Chamber.>
39) Install the collector cover.
40) Change the bolt mounting position from (B) to (A), then close the front hood.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



41) Lower the vehicle from lift.

C: INSPECTION

1) Check that the pipes, hoses, connectors and clips are securely connected.
2) Check the engine coolant is at specified level.
3) Check that the ATF is at specified level.
4) Start the engine, and then check exhaust gas and engine coolant. And check for fuel leakage, noise, vibrations, etc.

10.Engine Mounting

A: REMOVAL

1) Remove the engine from vehicle. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

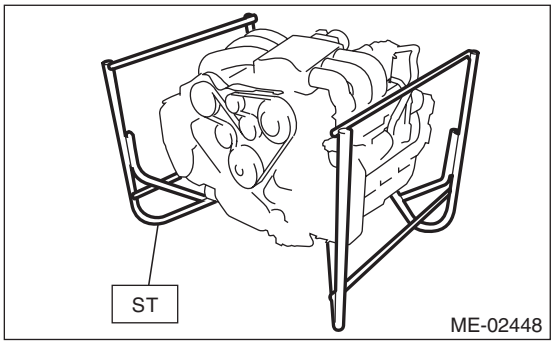
C: INSPECTION

Make sure that no crack or other damages do not exist.

11.Preparation for Overhaul

A: REMOVAL

1) Remove the engine from vehicle. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.>
2) Set the engine on ST.
ST 18232AA000 ENGINE STAND

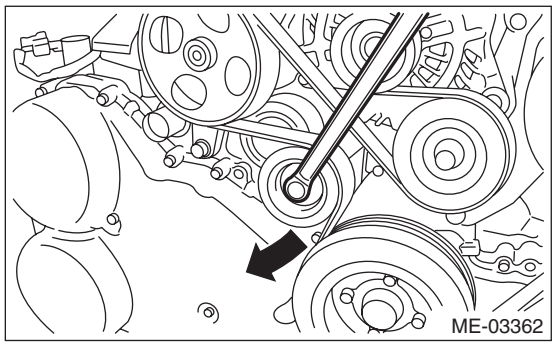


3) Before servicing overhaul, remove the sensor, pipe and hose that installed to engine.
(1) Remove the intake manifold. <Ref. to FU(H6DO)-21, REMOVAL, Intake Manifold.>
(2) Remove the generator. <Ref. to SC(H6DO)-12, REMOVAL, Generator.>
(3) Remove the A/C compressor. <Ref. to AC-33, REMOVAL, Compressor.>
(4) Disconnect the water pipe and hose.
(5) Disconnect the engine harness.
(6) Remove the spark plug. <Ref. to IG(H6DO)-5, REMOVAL, Spark Plug.>
(7) Remove the camshaft position sensor. <Ref. to FU(H6DO)-32, REMOVAL, Camshaft Position Sensor.>
(8) Remove the crankshaft position sensor. <Ref. to FU(H6DO)-30, REMOVAL, Crankshaft Position Sensor.>
(9) Remove the knock sensor. <Ref. to FU(H6DO)-35, REMOVAL, Knock Sensor.>
(10) Remove the engine coolant temperature sensor. <Ref. to FU(H6DO)-29, REMOVAL, Engine Coolant Temperature Sensor.>
(11) Remove the oil temperature sensor. <Ref. to FU(H6DO)-46, REMOVAL, Oil Temperature Sensor.>
(12) Remove the oil flow control solenoid valve. <Ref. to FU(H6DO)-44, REMOVAL, Oil Flow Control Solenoid Valve.>
(13) Remove the oil pressure switch. <Ref. to LU(H6DO)-15, REMOVAL, Oil Pressure Switch.>
(14) Remove the oil filter. <Ref. to LU(H6DO)-16, REMOVAL, Engine Oil Filter.>
(15) Remove the oil cooler. <Ref. to LU(H6DO)-17, REMOVAL, Oil Cooler.>

12.V-belt

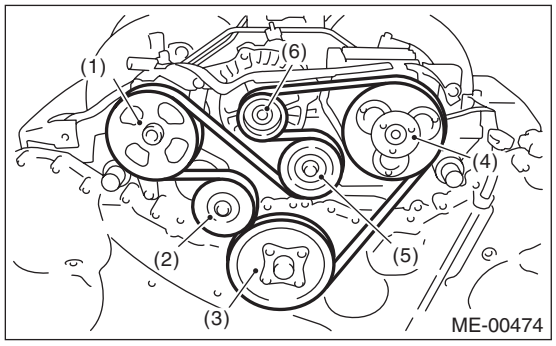
A: REMOVAL

1) Remove the collector cover.
2) Install the tool to belt tension adjuster assembly installation bolt.
3) Rotate the tool clockwise and loosen the V-belt to remove.



B: INSTALLATION

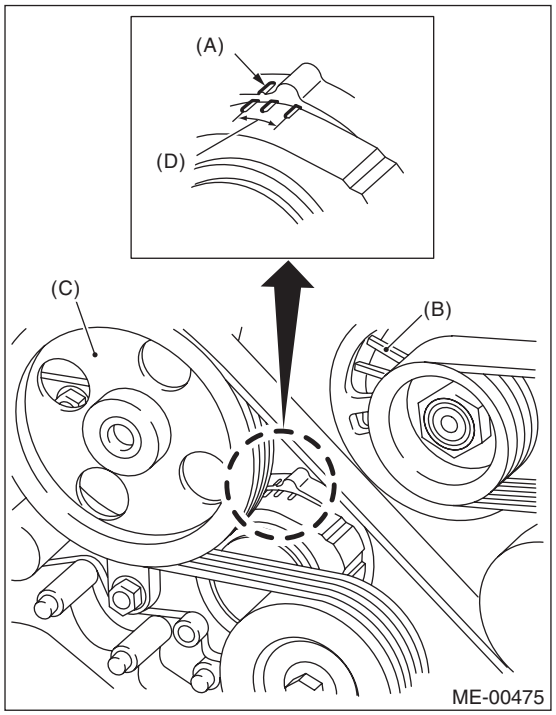
Install in the reverse order of removal.



(1) Power steering oil pump pulley
(2) Belt tension adjuster ASSY
(3) Crank pulley
(4) A/C compressor pulley
(5) Belt idler
(6) Generator

C: INSPECTION

1) Replace the V-belt, if cracks, fraying or wear is found.
2) Make sure that the V-belt automatic belt tension indicator (A) is within the range (D).

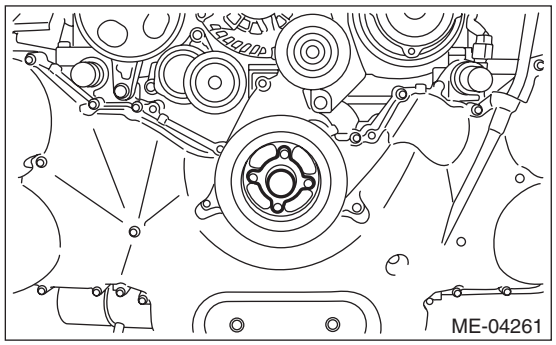


(A) Indicator
(B) Generator
(C) Power steering oil pump pulley
(D) Service limit

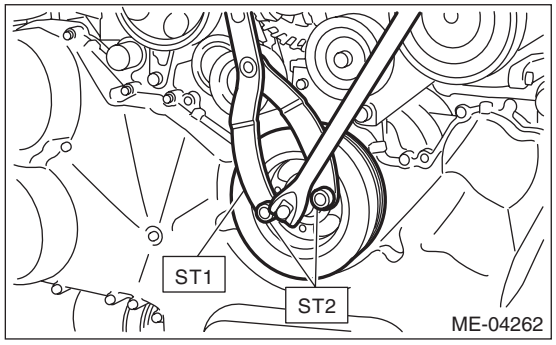
13.Crank Pulley

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H6DO)-46, REMOVAL, V-belt.>
2) Remove the crank pulley cover.



3) Use the ST to lock the crank pulley, and remove the crank pulley bolt.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET

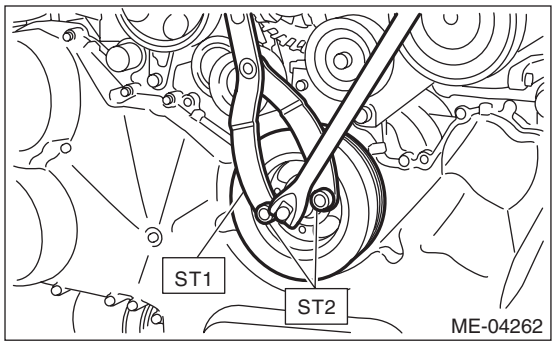


4) Remove the crank pulley.

B: INSTALLATION

1) Clean the crankshaft thread using compressed air.
2) Install the crank pulley.
3) Apply engine oil to the crank pulley bolt seat and thread.
4) Use the ST to lock the crank pulley, and tighten the crank pulley bolt.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET

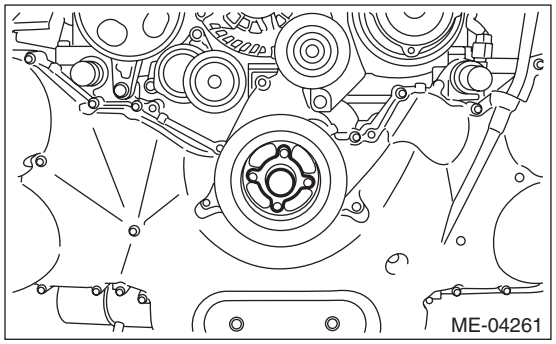
Tightening torque:
195 N·m (19.9 kgf-m, 143.8 ft-lb)



5) Install the O-ring, and install the crank pulley cover.

NOTE:
Use new O-rings.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



6) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>

C: INSPECTION

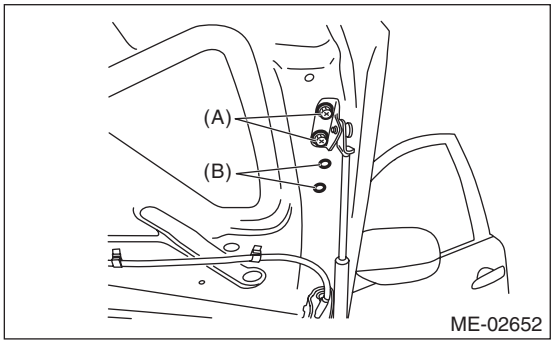
1) Check for oil leaks in the crank pulley cover.
2) Check the crank pulley for looseness.

14.Chain Cover

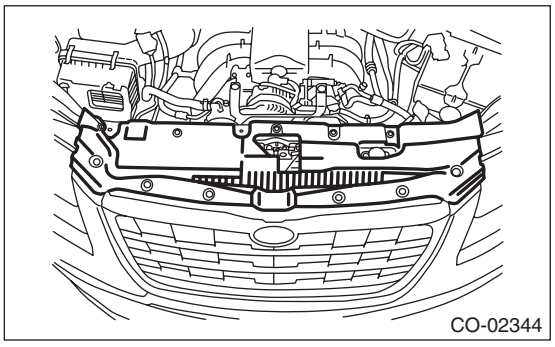
A: REMOVAL

1) Lift up the vehicle.
2) Remove the under cover. <Ref. to EI-18, REMOVAL, Front Under Cover.>
3) Drain the engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
4) Drain engine coolant. <Ref. to CO(H6DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Lower the vehicle.
6) Change the bolt mounting position from (A) to (B), then completely open the front hood.

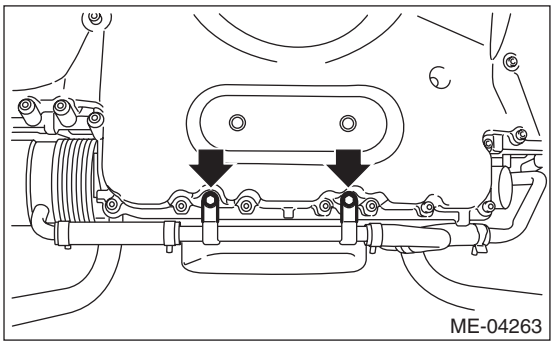
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



7) Remove the air intake duct. <Ref. to IN(H6DO)-9, REMOVAL, Air Intake Duct.>
8) Remove the V-belts. <Ref. to ME(H6DO)-46, REMOVAL, V-belt.>
9) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
10) Remove the front upper cover.

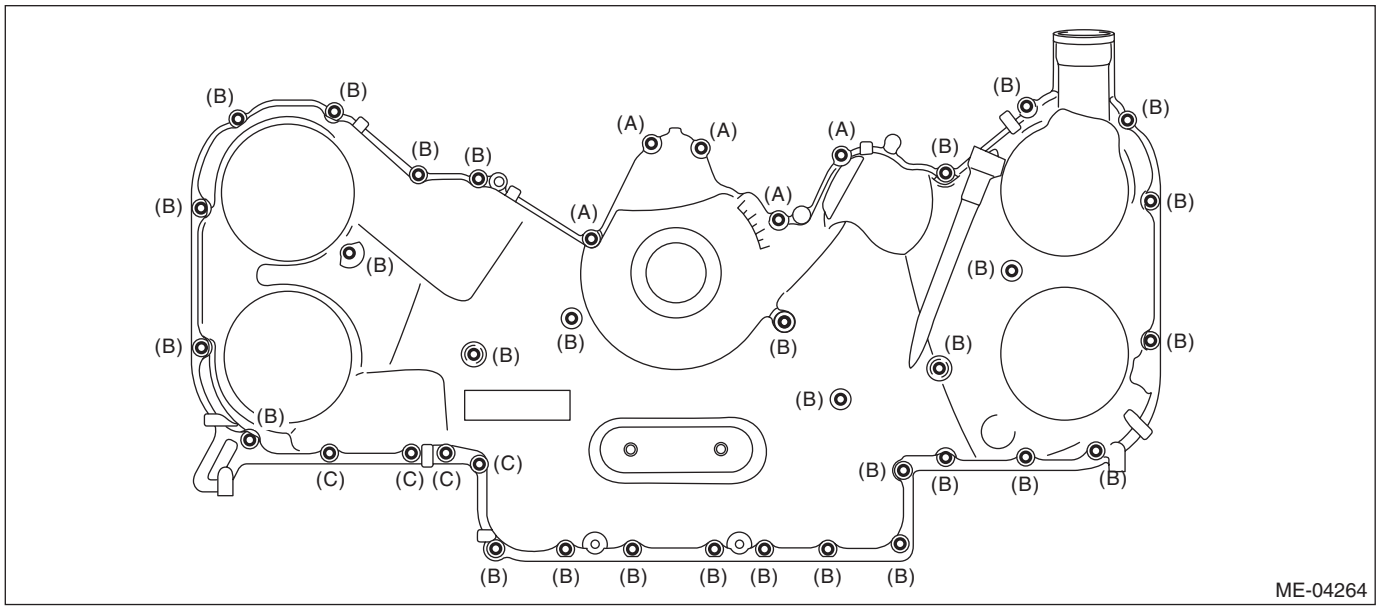


11) Remove the reservoir tank. <Ref. to CO(H6DO)-30, REMOVAL, Reservoir Tank.>
12) Remove the radiator main fan & fan motor and radiator sub fan & fan motor. <Ref. to CO(H6DO)-25, REMOVAL, Radiator Main Fan and Fan Motor.>
13) Remove the radiator. <Ref. to CO(H6DO)-19, REMOVAL, Radiator.>
14) Remove the oil cooler pipe from the chain cover.



15) Remove the chain cover.

NOTE:
Chain cover installation bolt has three different sizes. To prevent the confusion in installation, keep these bolts on container individually.

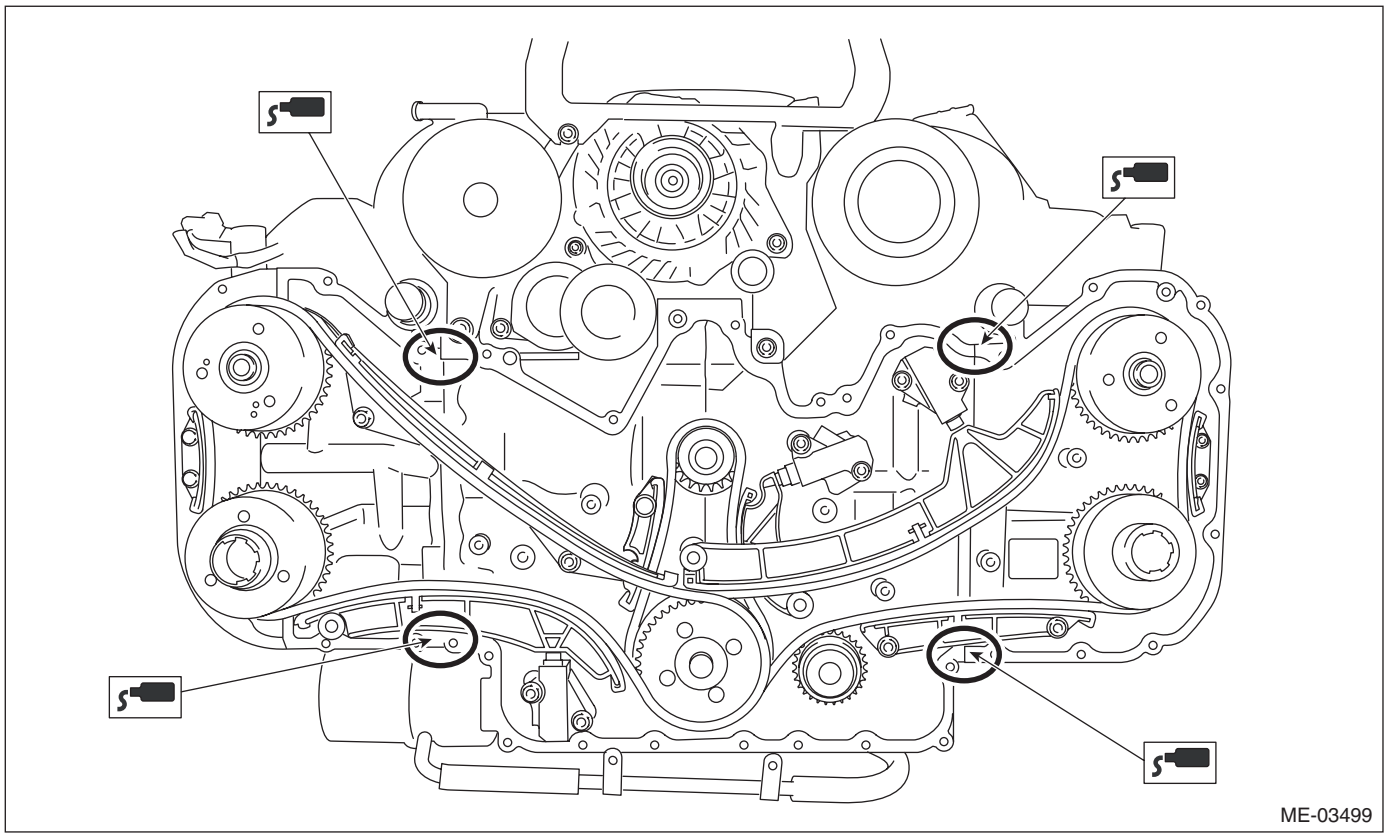


(A) M6 × 21 (B) M6 × 30 (C) M6 × 53

B: INSTALLATION

1) Apply liquid gasket to the mating surfaces of the cylinder block, cylinder head and oil pan upper as shown in the figure.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

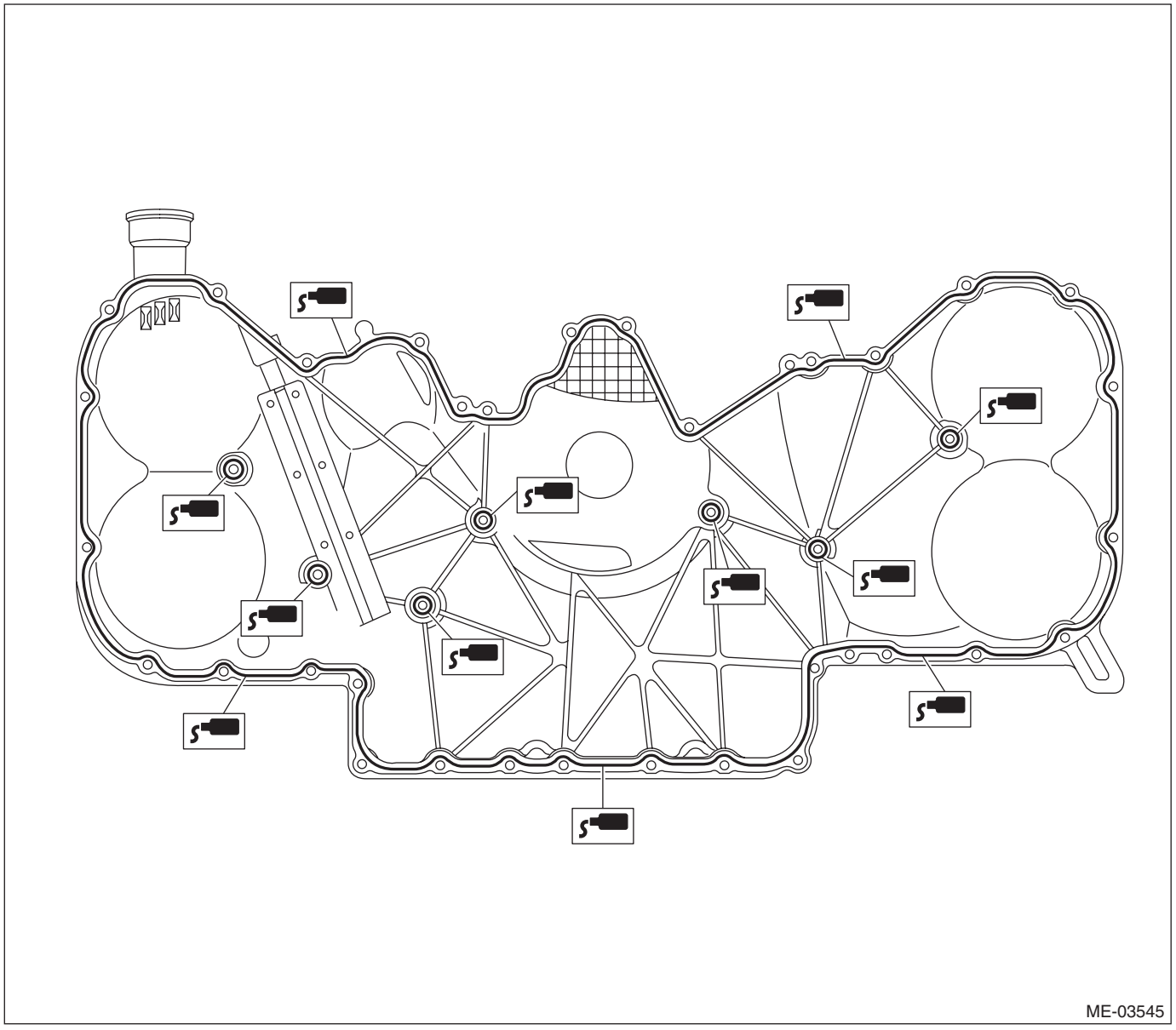


2) Apply liquid gasket to the mating surface of the chain cover.

NOTE:
Install within 5 min. after applying liquid gasket.

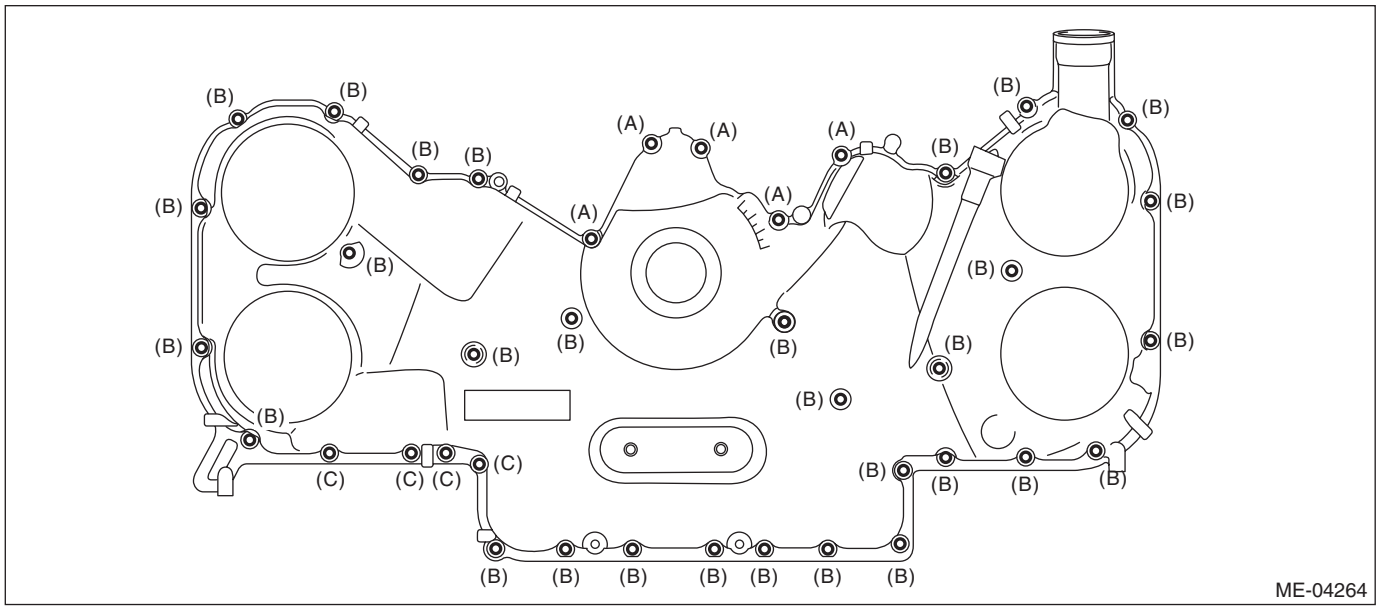
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Liquid gasket applying diameter:
3.5±0.5 mm (0.138±0.020 in)



3) Install the chain cover and temporarily tighten the bolts.

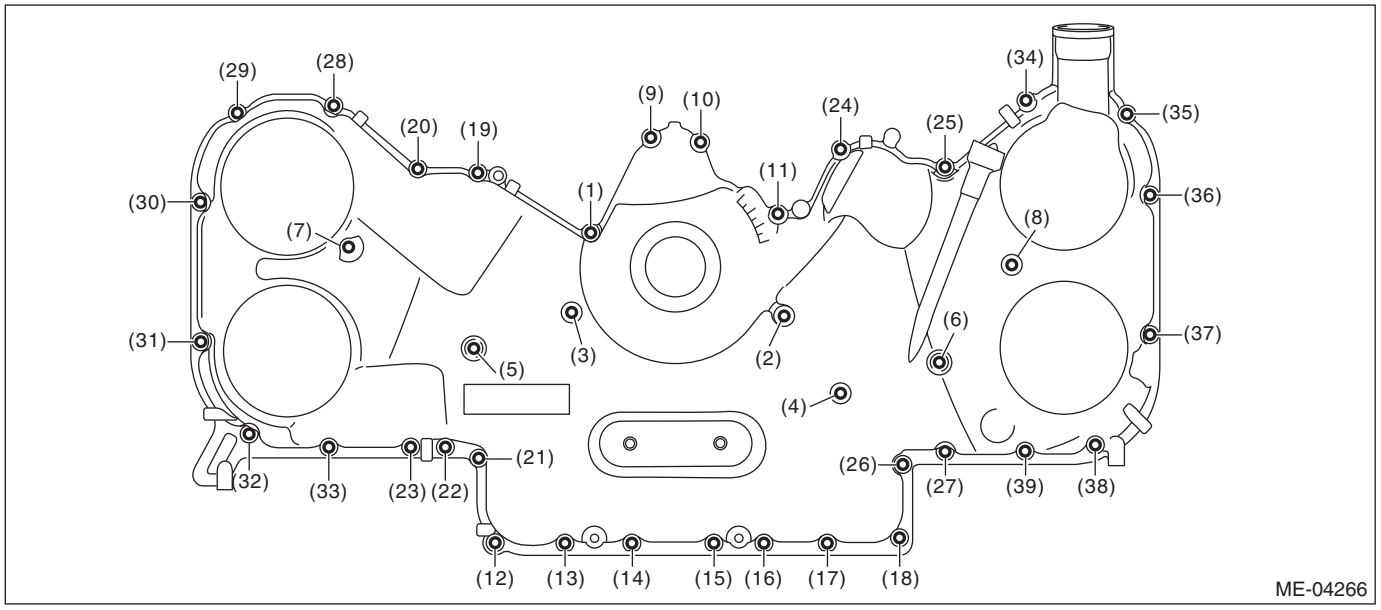
CAUTION:
Do not install the bolts in wrong place.



(A) M6 × 21 (B) M6 × 30 (C) M6 × 53

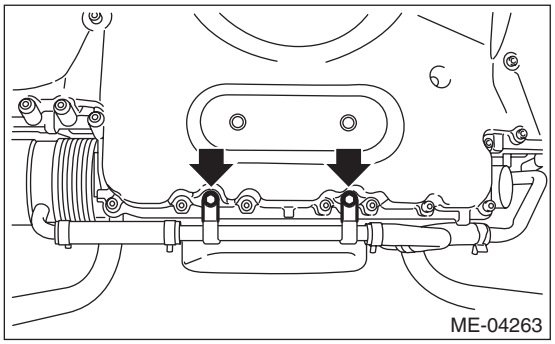
4) Tighten the bolts in the numerical order as shown in the figure.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)

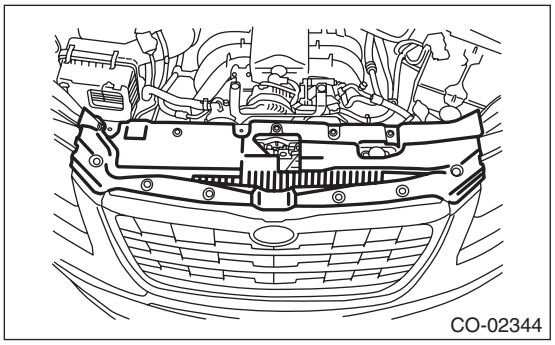


5) Install the oil cooler pipe to the chain cover.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

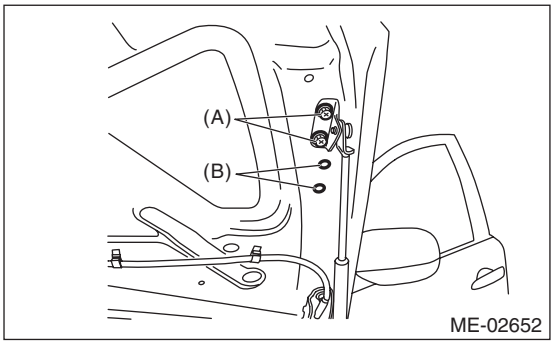


6) Install the radiator. <Ref. to CO(H6DO)-21, INSTALLATION, Radiator.>
7) Install the radiator main & fan motor and radiator sub fan & fan motor. <Ref. to CO(H6DO)-26, INSTALLATION, Radiator Main Fan and Fan Motor.>
8) Install the reservoir tank. <Ref. to CO(H6DO)-30, REMOVAL, Reservoir Tank.>
9) Install the front upper cover.



10) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
11) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>
12) Install the air intake duct. <Ref. to IN(H6DO)-9, INSTALLATION, Air Intake Duct.>
13) Fill engine coolant. <Ref. to CO(H6DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
14) Fill engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
15) Make sure there is no oil leaks in the chain cover mating surface.
16) Install the under cover. <Ref. to EI-18, INSTALLATION, Front Under Cover.>
17) Install the collector cover.
18) Change the bolt mounting position from (B) to (A), and completely close the front hood.

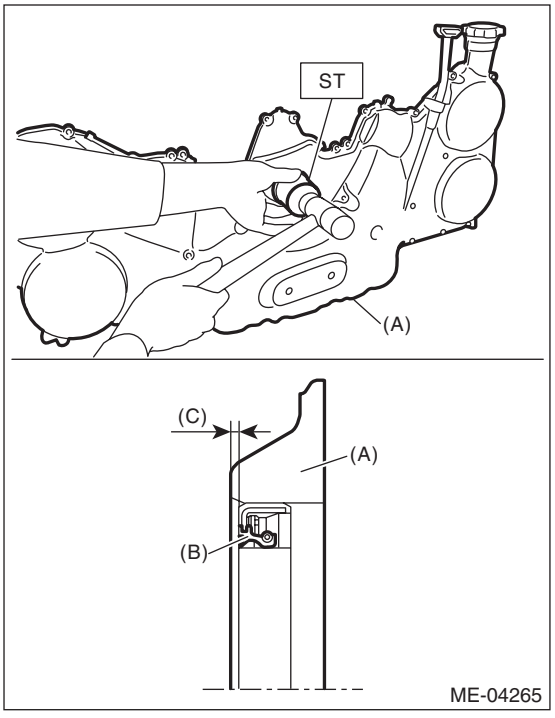
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



C: INSPECTION

1) Check the chain cover surface for scratches or dents.
2) Check for oil leakage on the chain cover mating surface and installation part of crank pulley.
If there is an oil leak from the oil seal, perform replacement with a new oil seal.
ST 499585700 OIL SEAL GUIDE

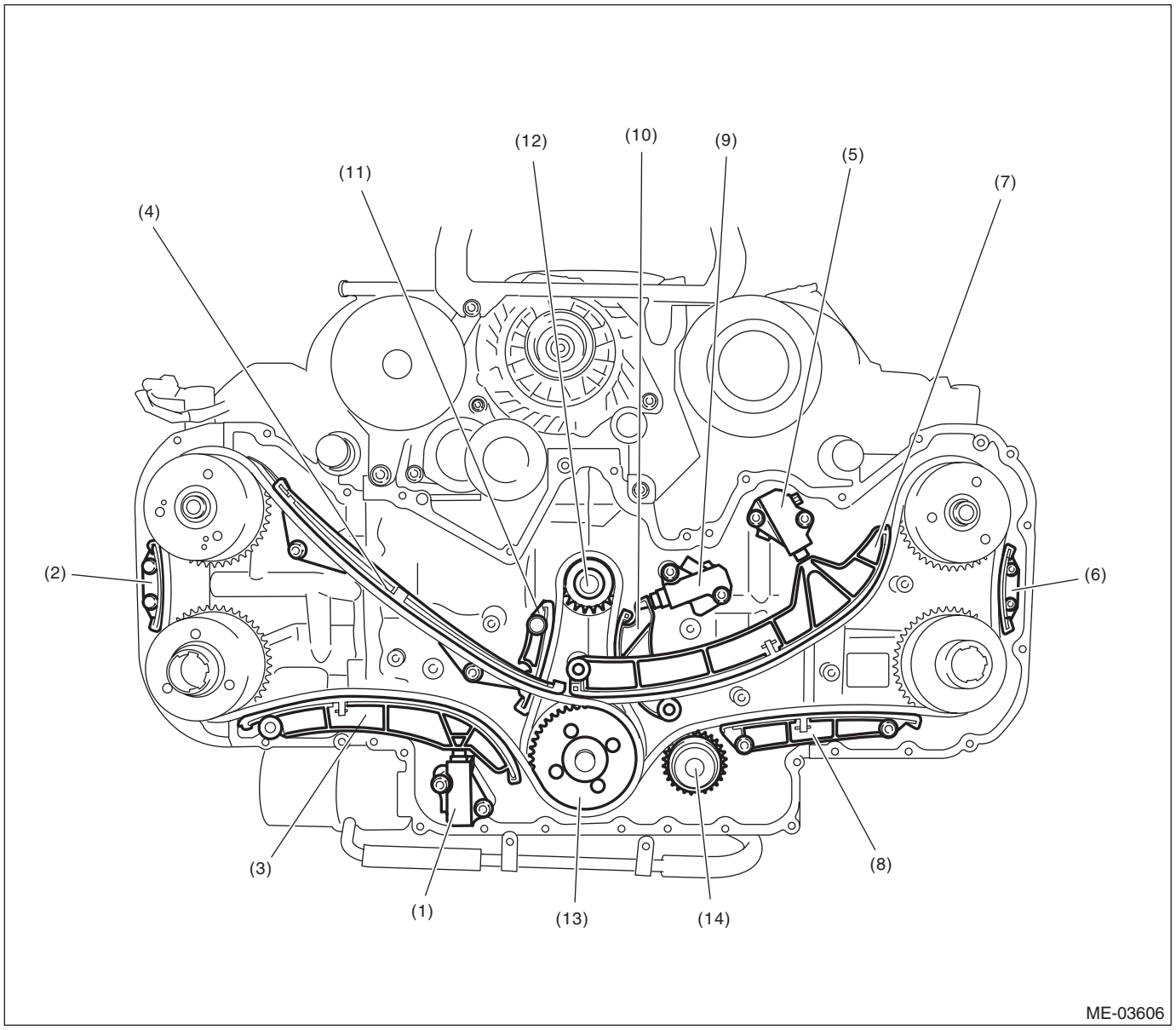
Oil seal press-fit position:
Chain cover end face — Position of –1 mm (–0.039 in) from the chain cover end face



(A) Chain cover
(B) Oil seal
(C) Oil seal press-fit position (Chain cover end face — Position of –1 mm (–0.039 in) from the chain cover end face)

15.Timing Chain Assembly

A: LOCATION

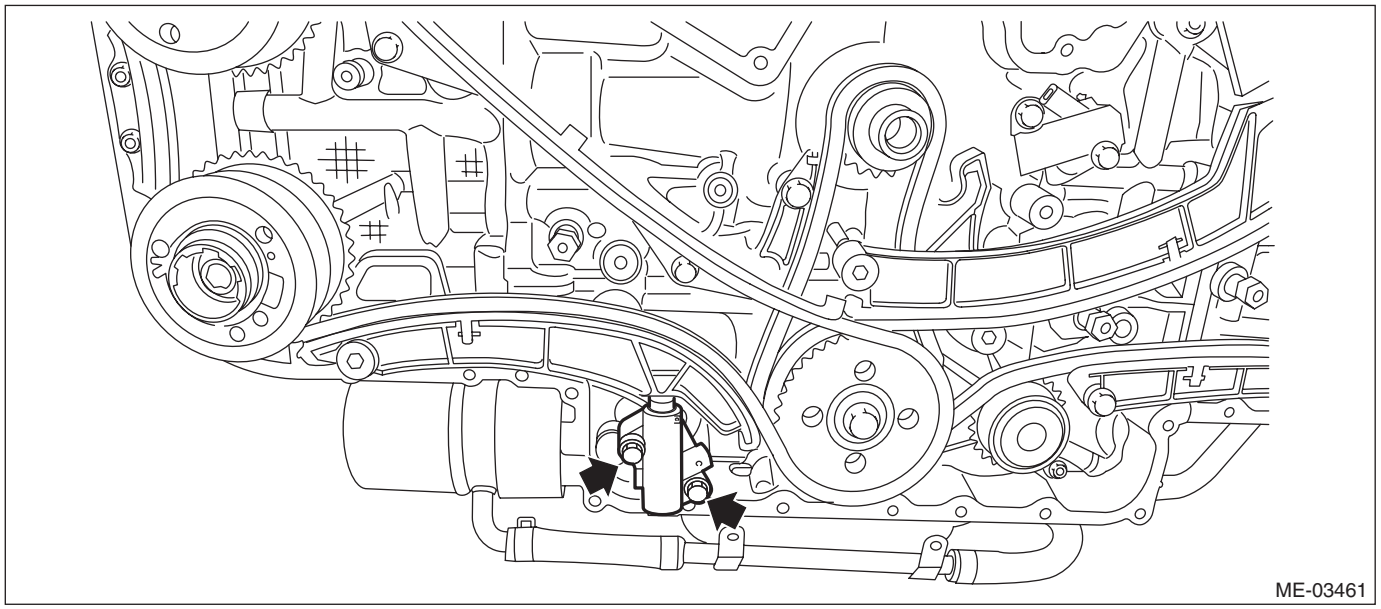


(1) Chain tensioner (RH)
(2) Chain guide (RH: between cams)
(3) Chain tensioner lever (RH)
(4) Chain guide (RH)
(5) Chain tensioner (LH)
(6) Chain guide (LH: between cams)
(7) Chain tensioner lever (LH)
(8) Chain guide (LH)
(9) Chain tensioner (Main)
(10) Chain tensioner lever (Main)
(11) Chain guide (Main)
(12) Crank sprocket
(13) Idler sprocket
(14) Water pump sprocket

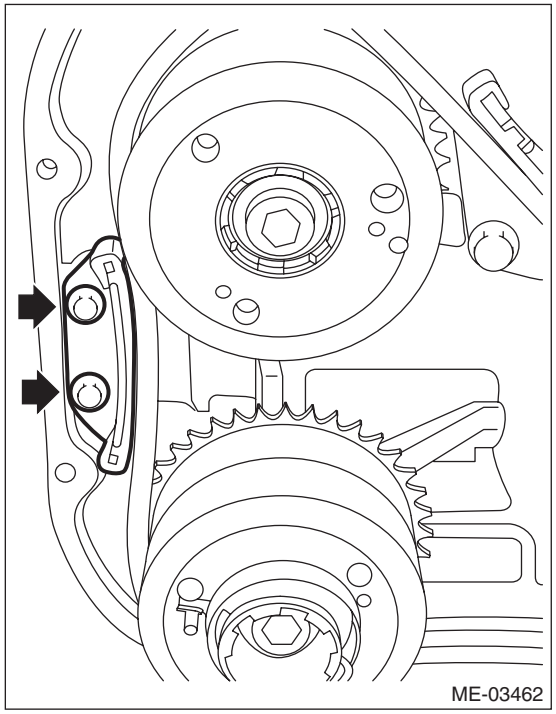
B: REMOVAL

NOTE:
To avoid mixing the timing chain component parts, separate each part after their removal.
1) Drain the engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
2) Remove the radiator. <Ref. to CO(H6DO)-19, REMOVAL, Radiator.>
3) Remove the V-belts. <Ref. to ME(H6DO)-46, REMOVAL, V-belt.>
4) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
5) Remove the chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Chain Cover.>
6) Remove the chain tensioner (RH).

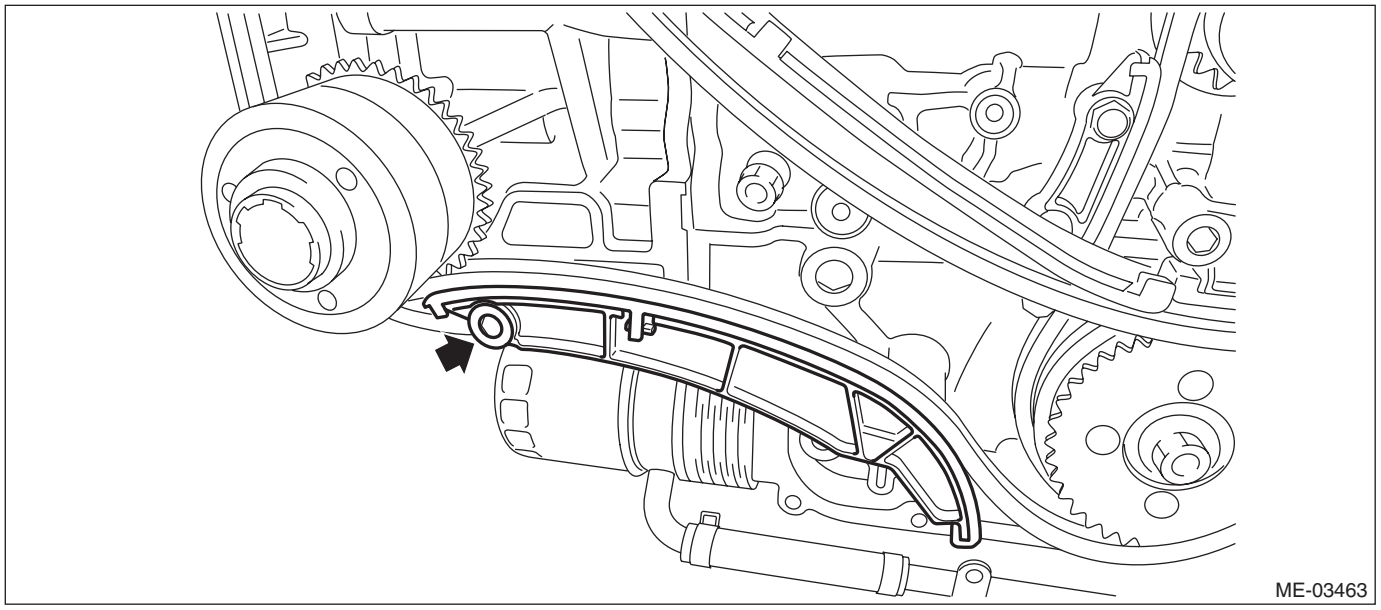
NOTE:
During removal of chain tensioner (RH) from chain tensioner lever (RH), press the plunger by hand to prevent it from popping out.


ME-03461

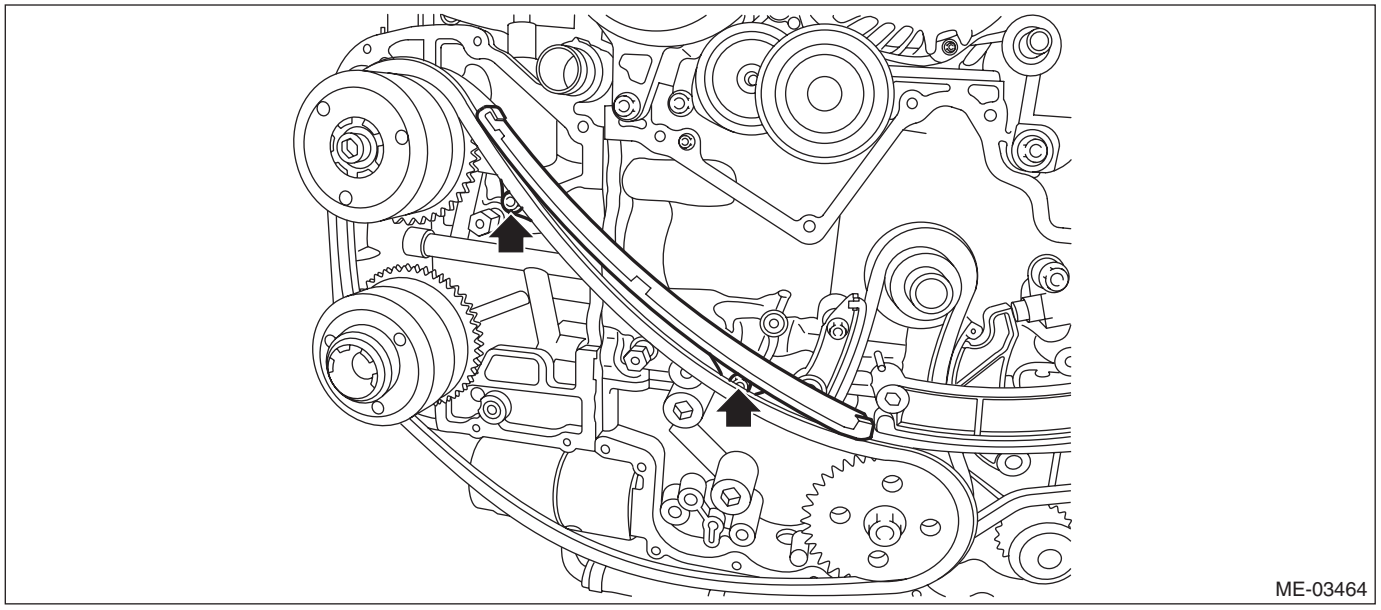
7) Remove the chain guide (RH: between cams).


ME-03462

8) Remove the chain tensioner lever (RH).



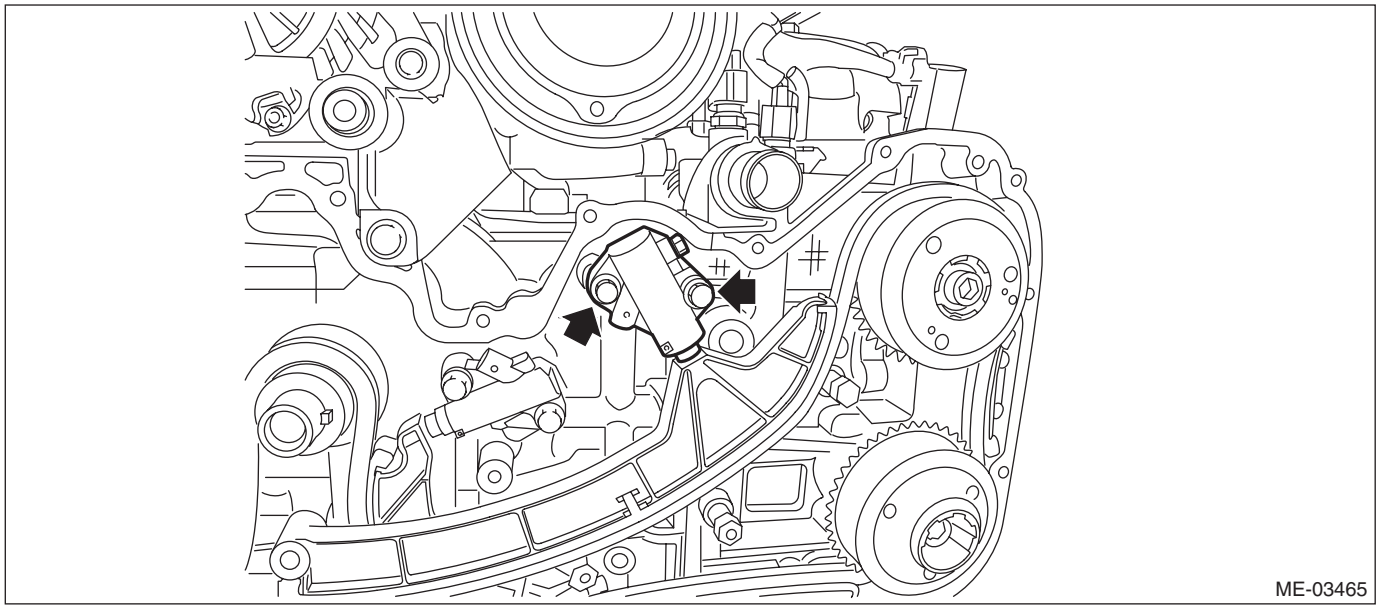
9) Remove the chain guide (RH).



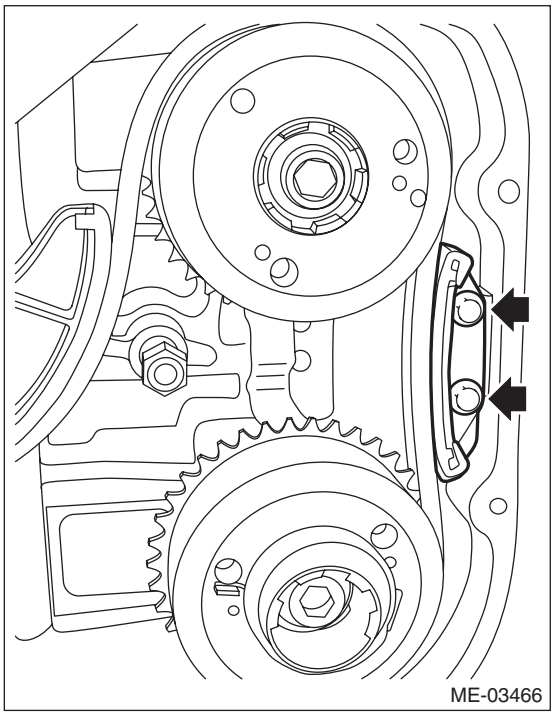
10) Remove the timing chain (RH).

11) Remove the chain tensioner (LH).

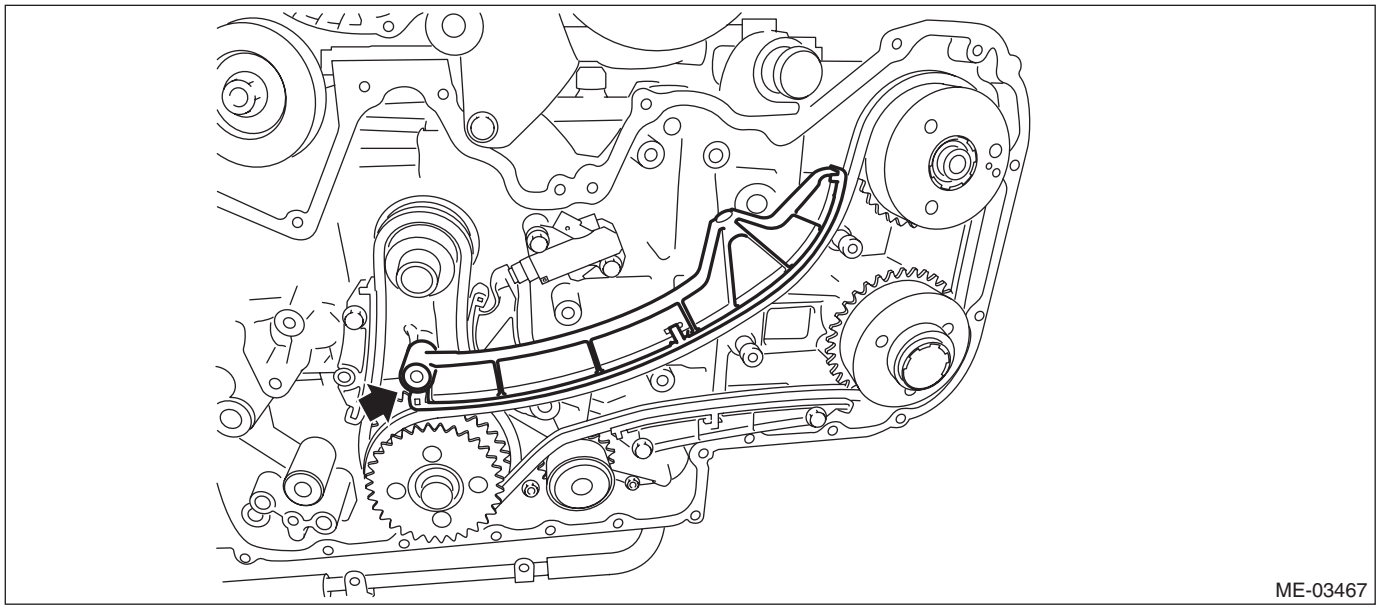
NOTE:
During removal of chain tensioner (LH) from chain tensioner lever (LH), press the plunger by hand to prevent it from popping out.



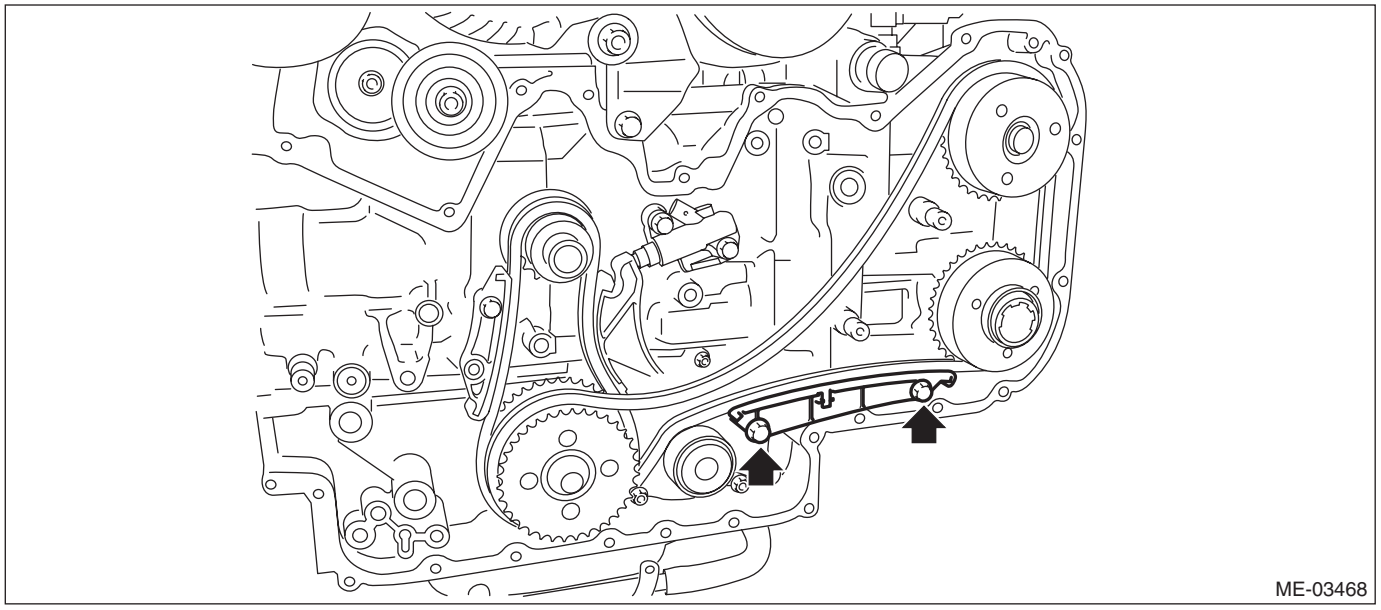
12) Remove the chain guide (LH: between cams).



13) Remove the chain tensioner lever (LH).



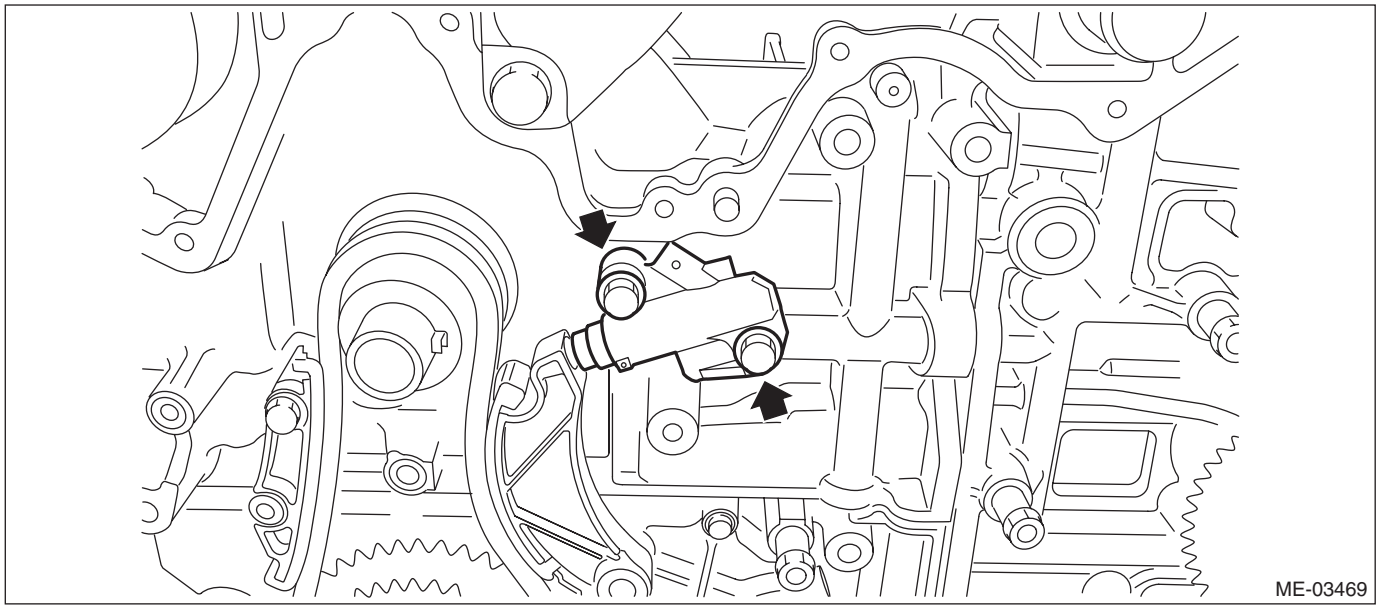
14) Remove the chain guide (LH).



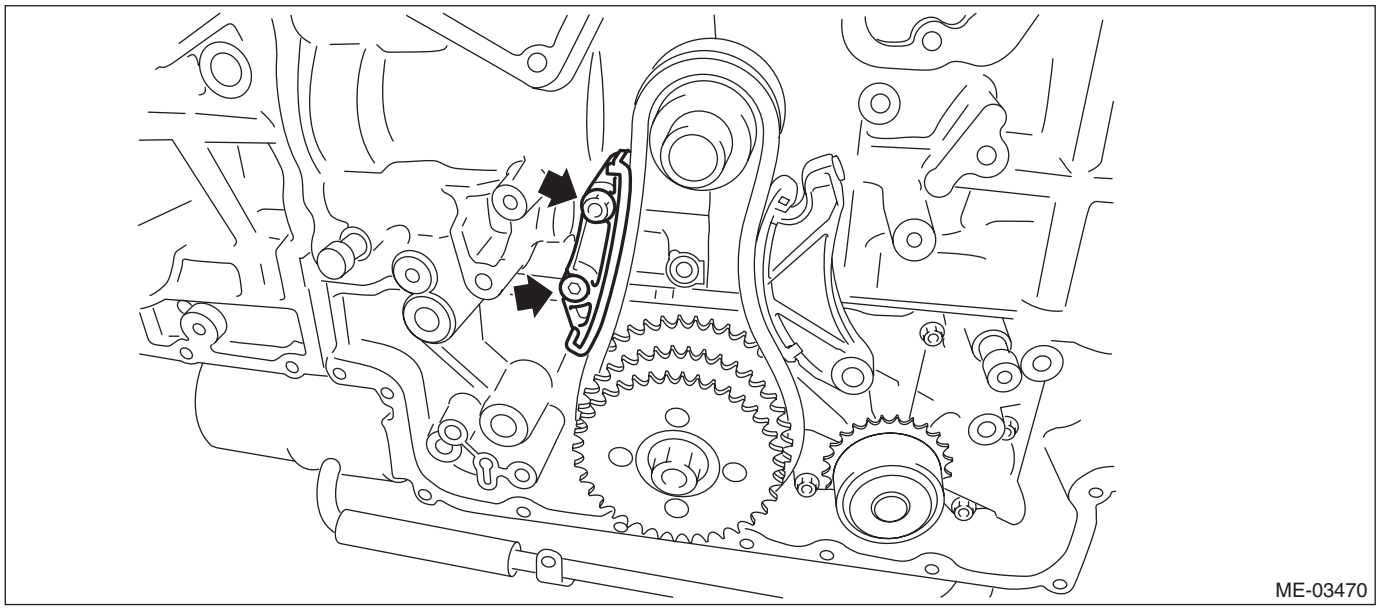
15) Remove the timing chain (LH).

16) Remove the chain tensioner (main).

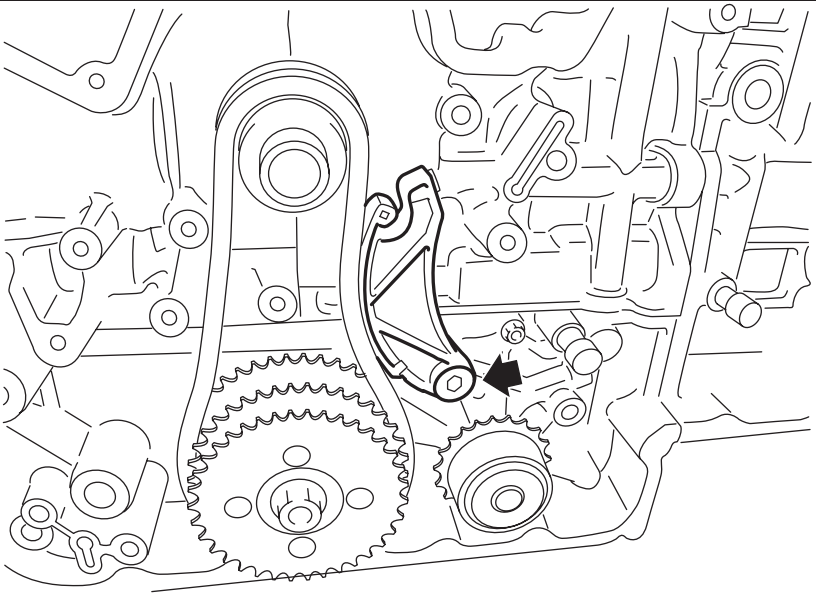
NOTE:
During removal of chain tensioner (Main) from chain tensioner lever (Main), press the plunger by hand to prevent it from popping out.



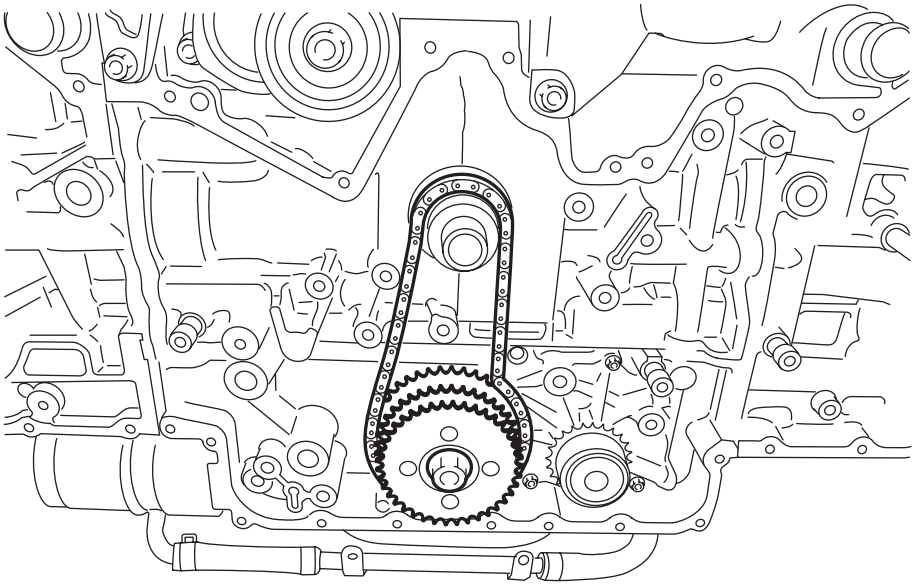
17) Remove the chain guide (main).



18) Remove the chain tensioner lever (main).



19) Remove the idler sprocket, and then remove the idler sprocket and timing chain (main).
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET

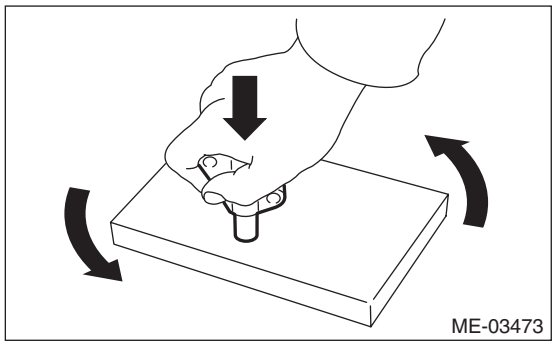


C: INSTALLATION

NOTE:
- Be careful that the foreign matter is not into or onto assembled component during installation.
- Apply engine oil to all component parts of the timing chain.

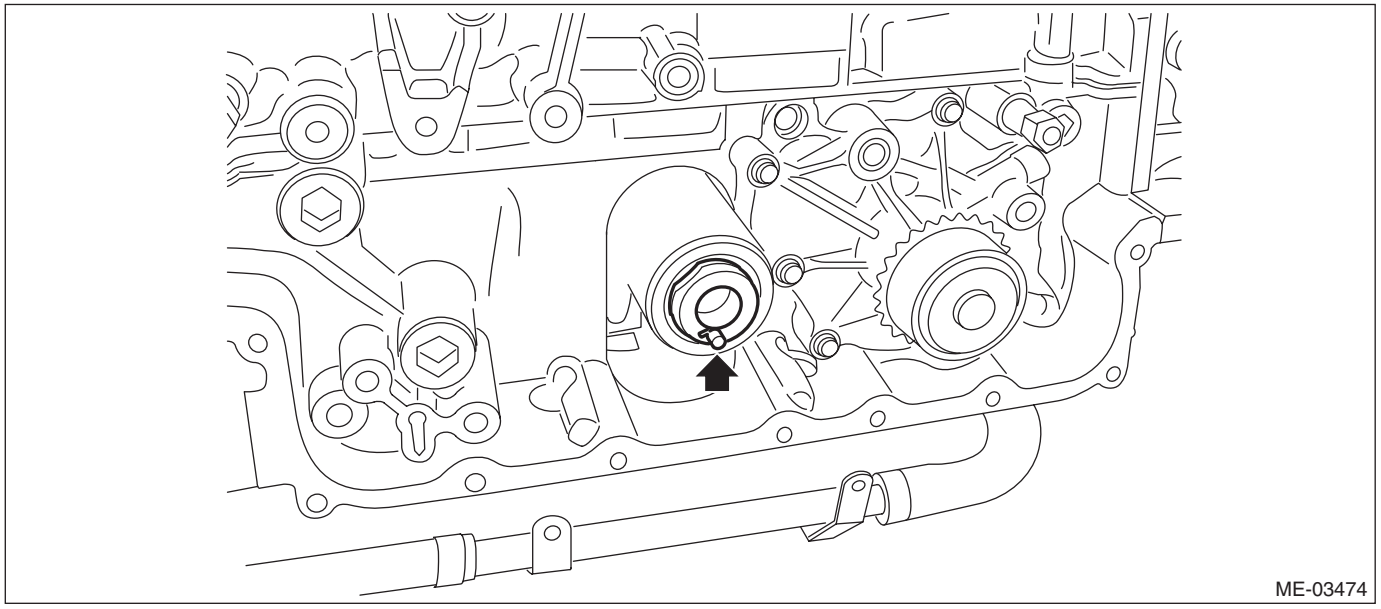
1) Prepare to attach the chain tensioner.
   (1) Insert the screw, spring pin and plunger into the tensioner body.
   (2) As shown in the figure, turn the rubber mat counterclockwise while holding the chain tensioner from above by hand.

NOTE:
Degrease the contact surface between the plunger head and rubber mat, so that they do not slip.

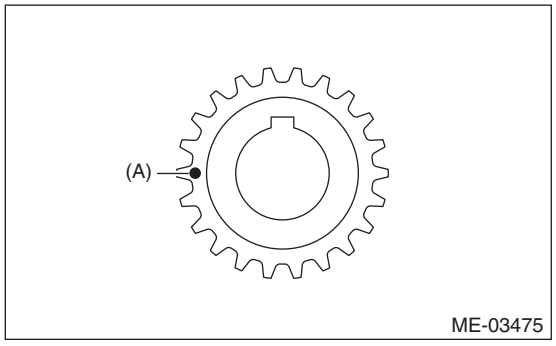

ME-03473

   (3) Insert the stopper pin into the hole on the chain tensioner body.

2) Align the position of oil pump shaft knock pin to six o'clock position as shown in the figure.


ME-03474

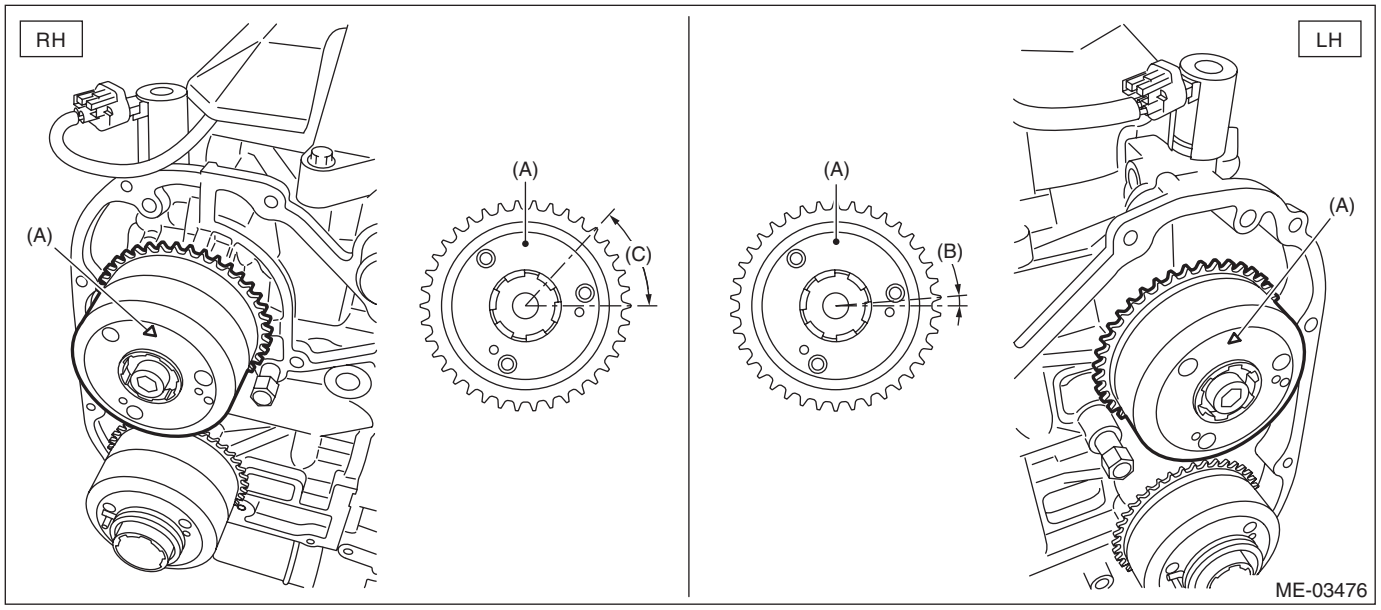
3) Using ST, align the "Top mark" on crank sprocket to nine o'clock position as shown in the figure.



ME-03475

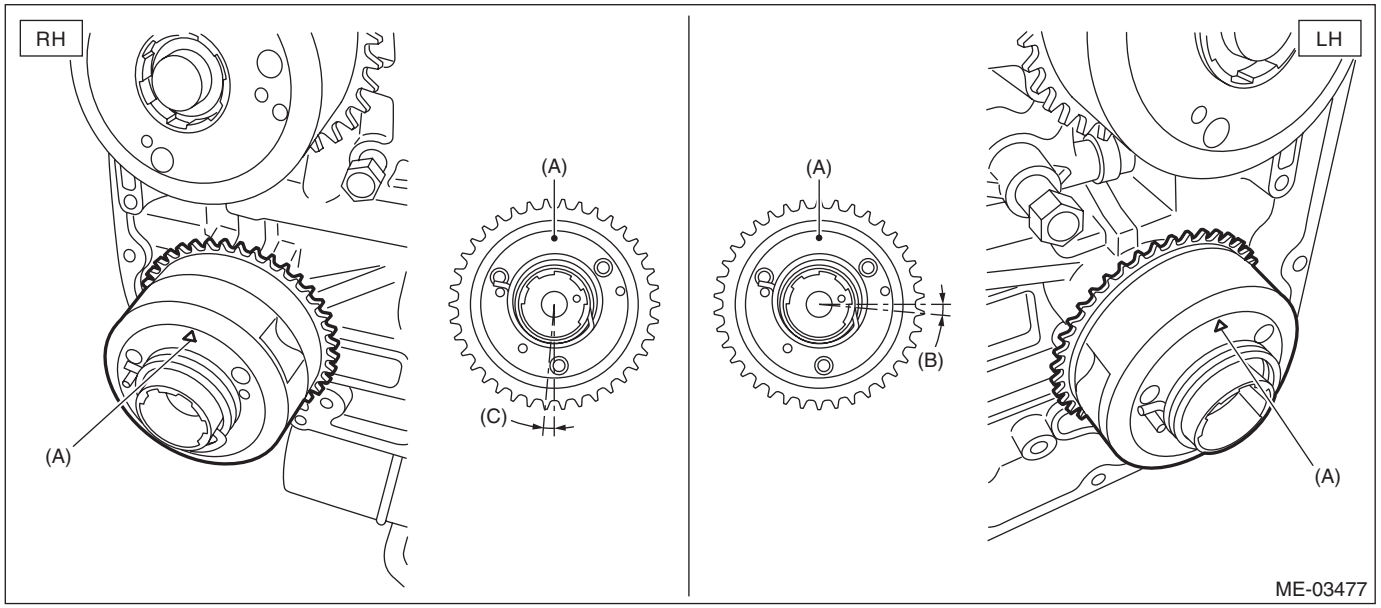
(A) Top mark

4) Align the intake cam sprocket to twelve o'clock position as shown in the figure.



(A) Align the marking (top mark) to twelve o'clock position.
(B) 6°
(C) 47°

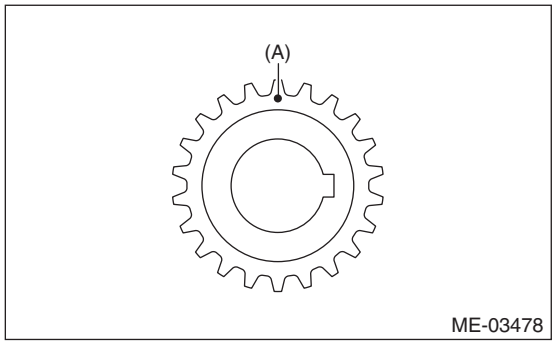
5) Align the exhaust cam sprocket to twelve o'clock position as shown in the figure.



(A) Align the marking (top mark) to twelve o'clock position.
(B) 5.5°
(C) 3.5°

6) Using ST, align the “Top mark” on crank sprocket to twelve o’clock position as shown in the figure.

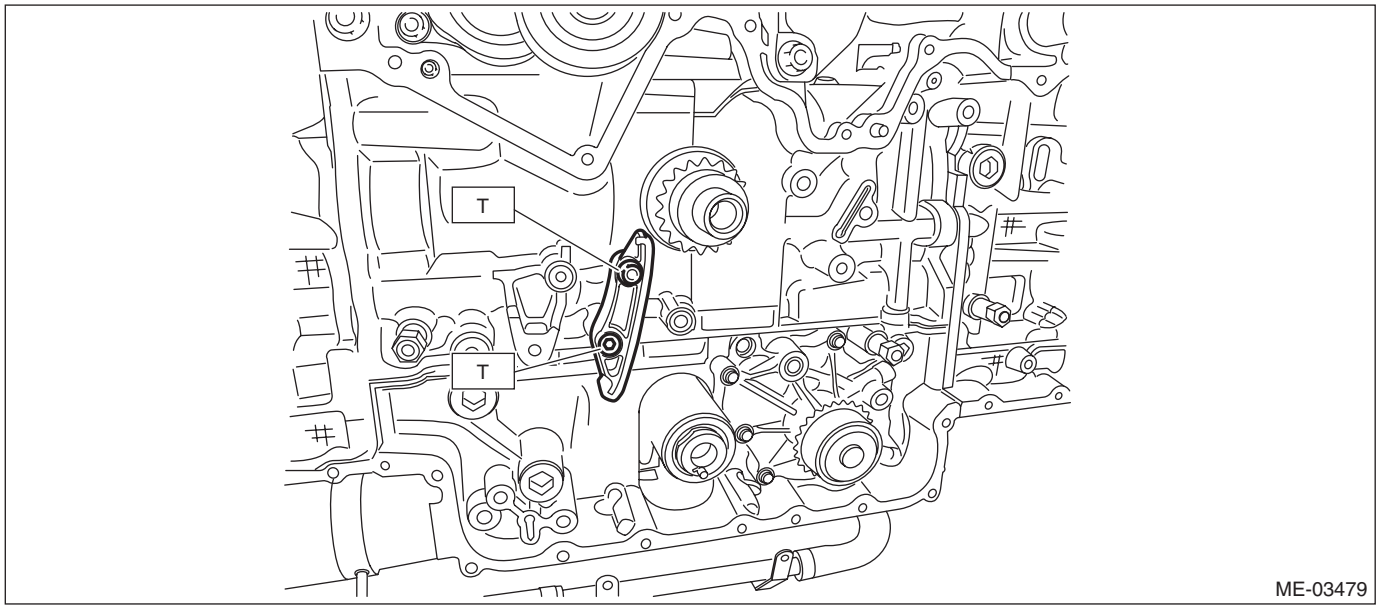
NOTE:
- The #1 piston is positioned at TDC.
- Do not rotate the crankshaft and cam sprocket before completing timing chain installation.
- Crank sprocket key is located at three o’clock position.



(A) Top mark

7) Install the chain guide (main).

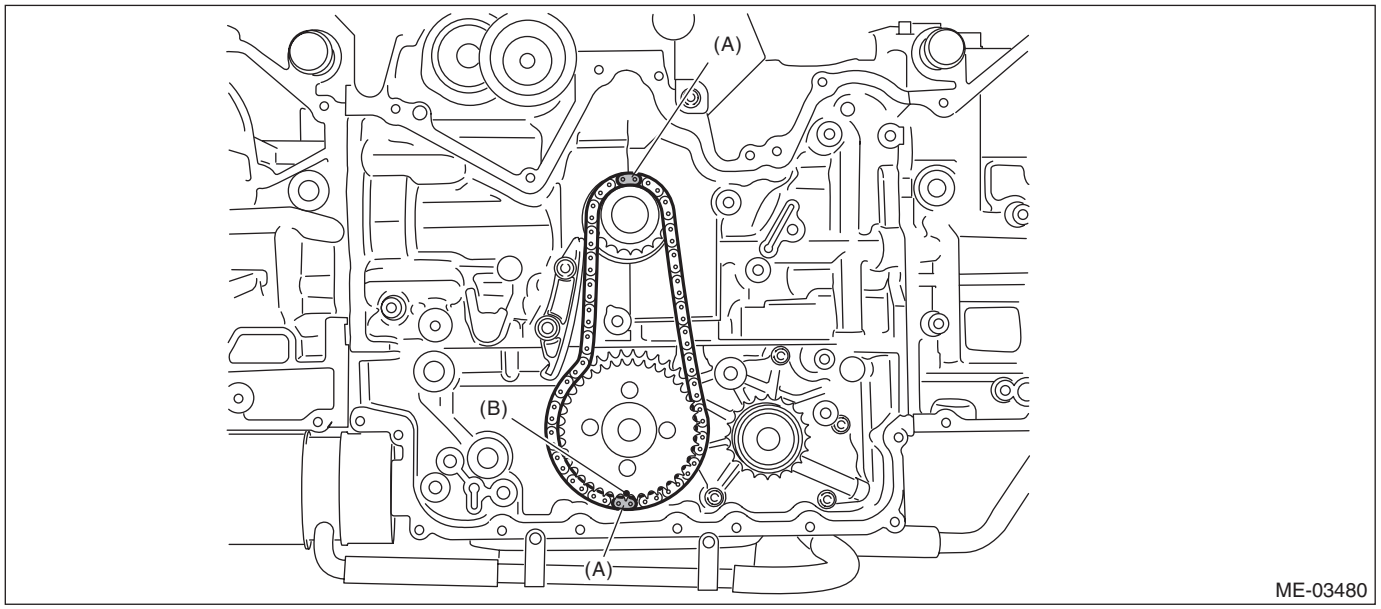
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



8) Install the idler sprocket and timing chain (main).
(1) Match the timing chain mark (gold) to the timing mark position of the idler sprocket.
(2) Align the idler sprocket timing mark at six o'clock position, and install the idler sprocket and timing chain.
(3) Make sure that the timing chain mark (gold) is located at twelve o'clock position on the crank sprocket.
(4) Install the idler sprocket bolt.

ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET

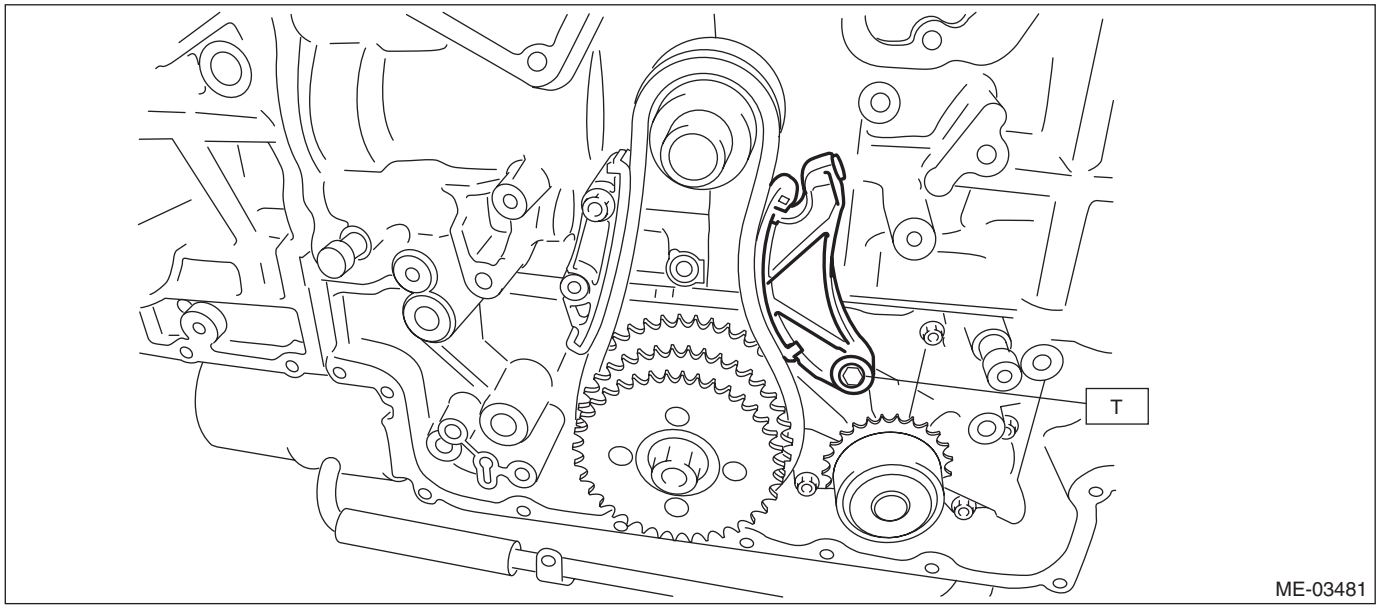
Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)



(A) Gold (B) Timing mark

9) Install the chain tensioner lever (main).

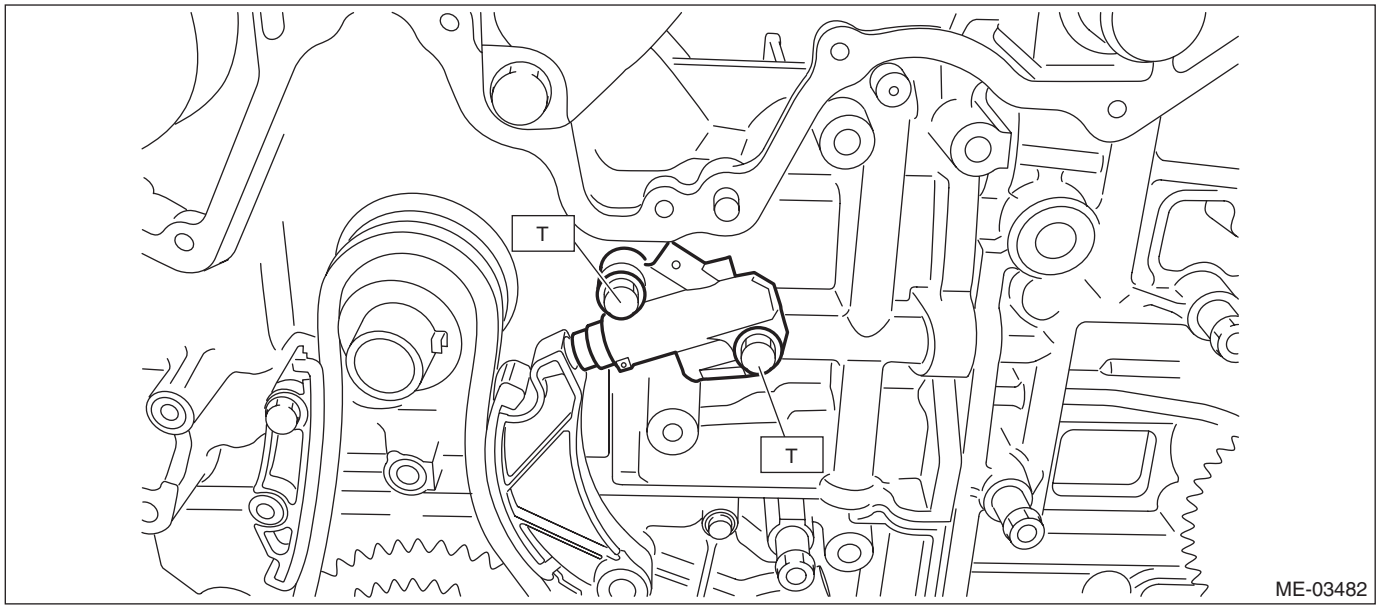
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



10) Install the chain tensioner (main) and pull out the stopper pin.

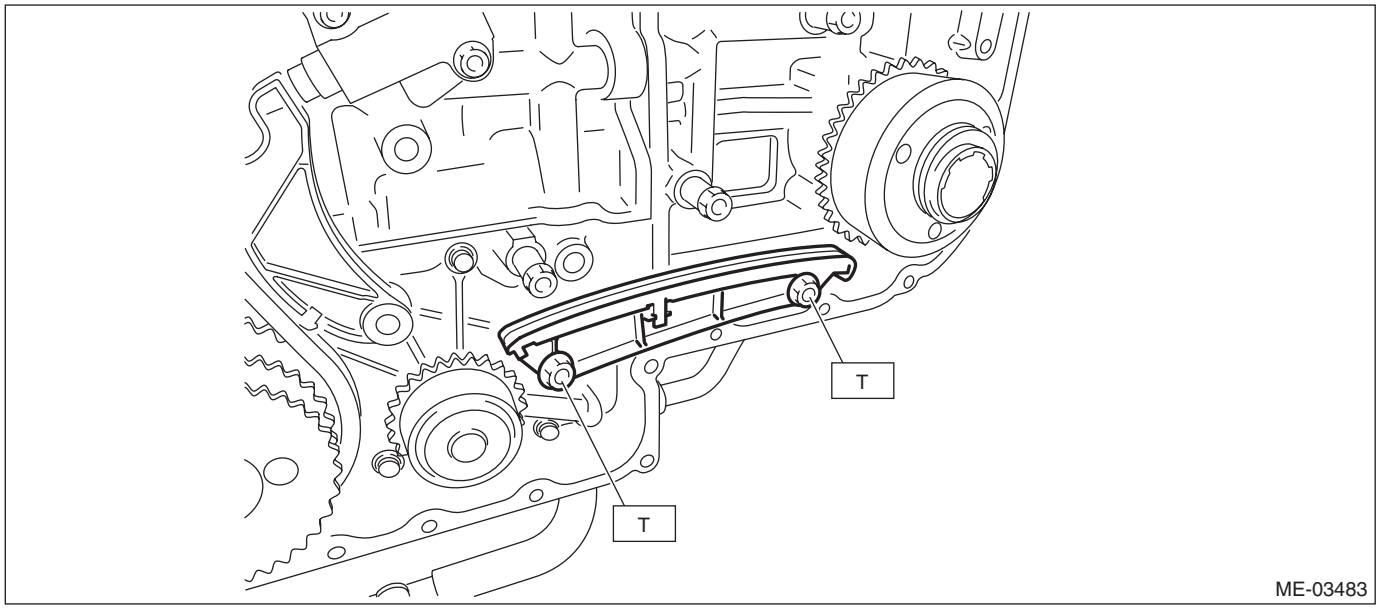
NOTE:
The timing chain (main) line will be complete.

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



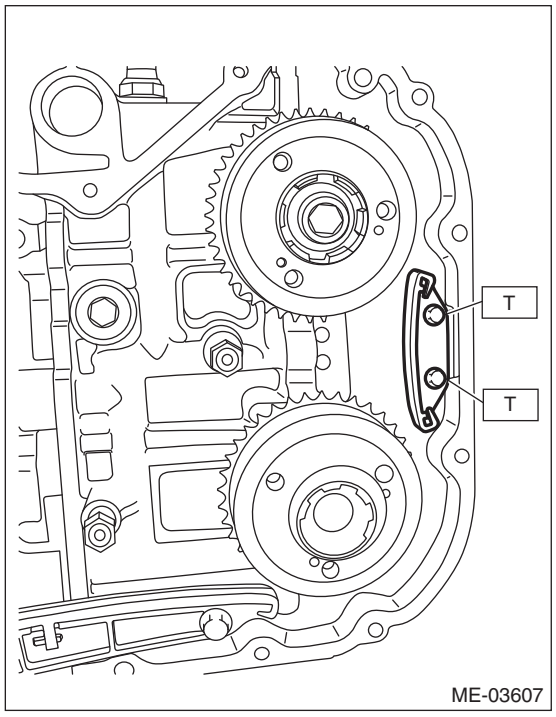
11) Install the chain guide (LH).

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

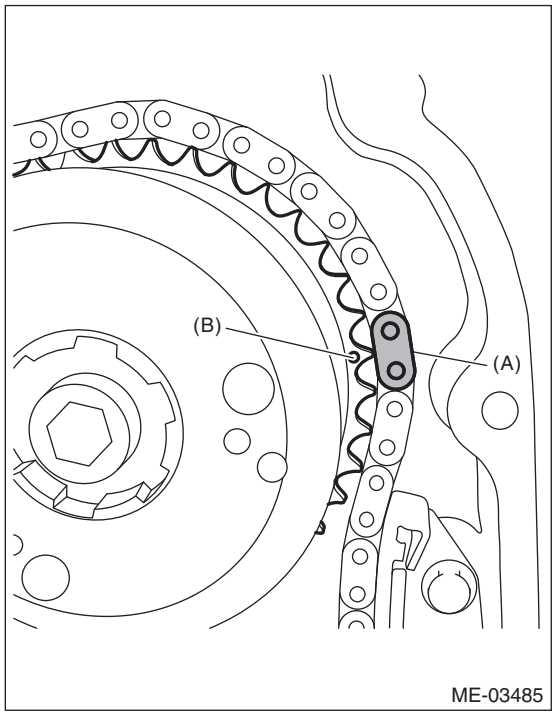


12) Install the chain guide (LH: between cams).

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

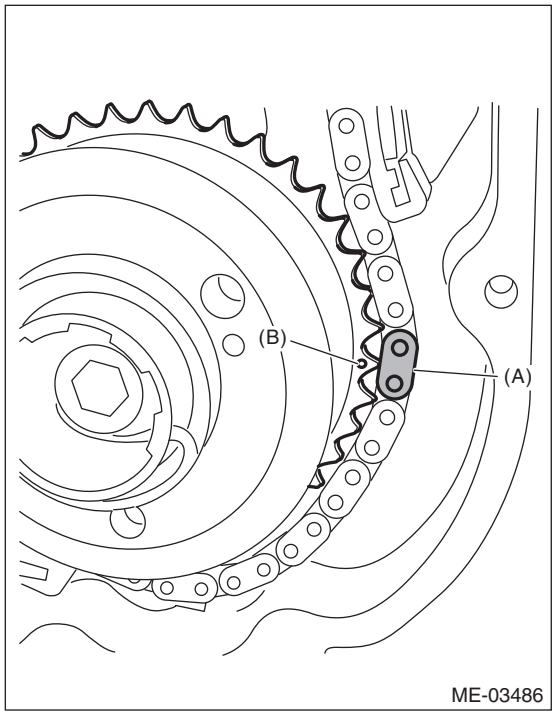


13) Install timing chain (LH).
(1) Match the timing mark of intake cam sprocket (LH) to the timing chain mark (blue).



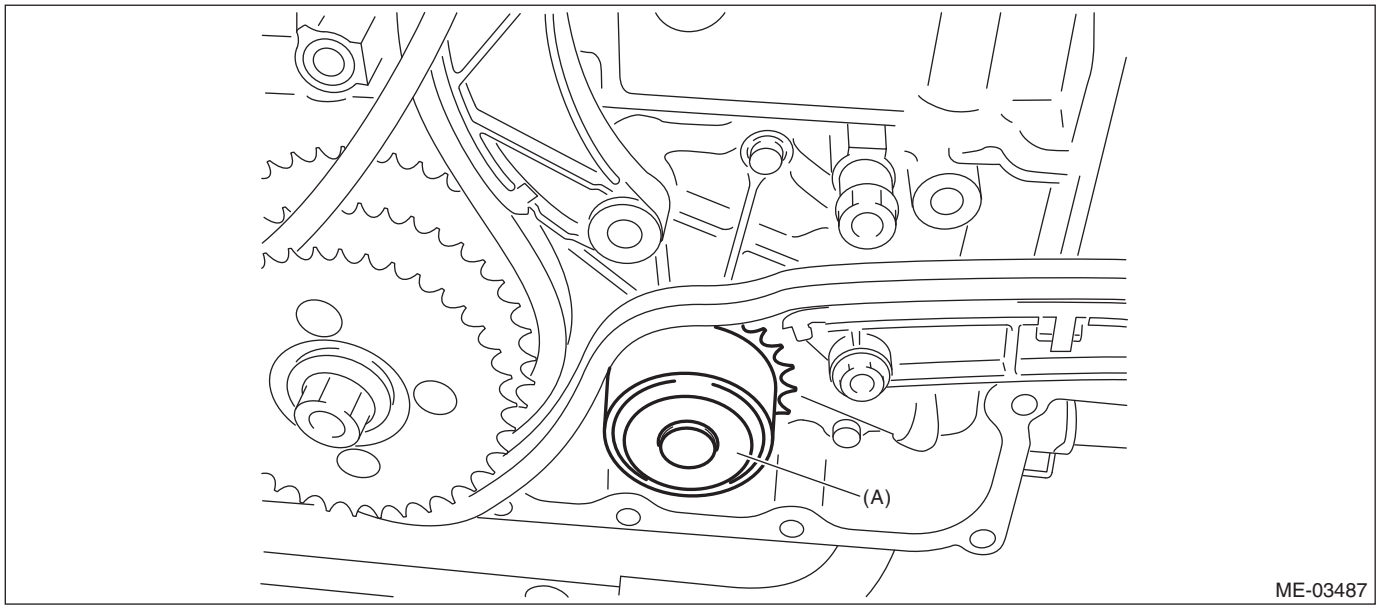
(A) Blue
(B) Timing mark

(2) Match the timing mark of exhaust cam sprocket (LH) to the timing chain mark (blue).



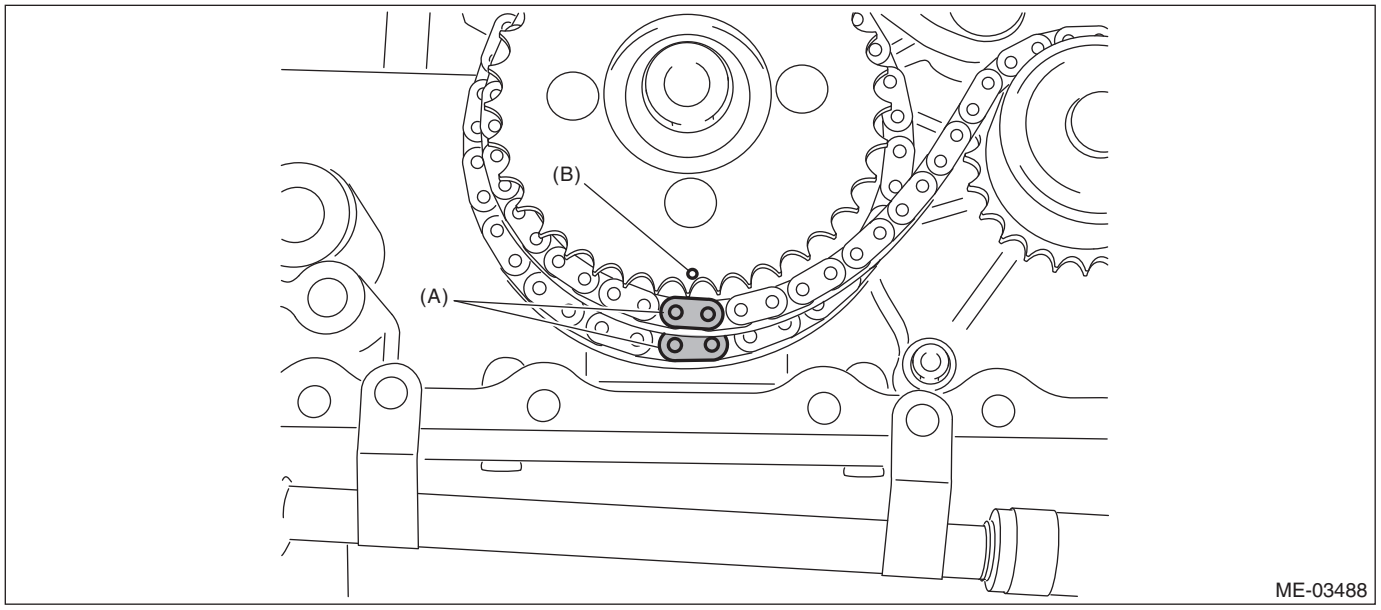
(A) Blue
(B) Timing mark

(3) Install the timing chain to the water pump sprocket.



(A) Water pump sprocket

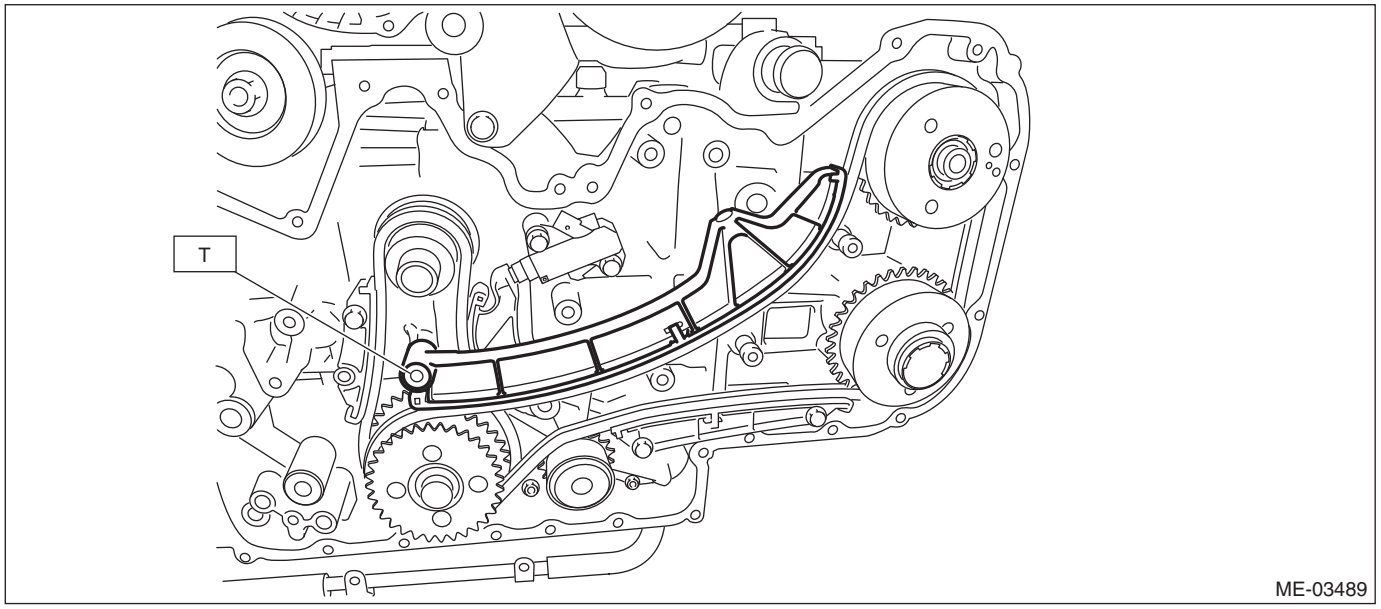
(4) Match the timing mark of idler sprocket to the timing chain mark (gold).



(A) Gold (B) Timing mark

14) Install the chain tensioner lever (LH).

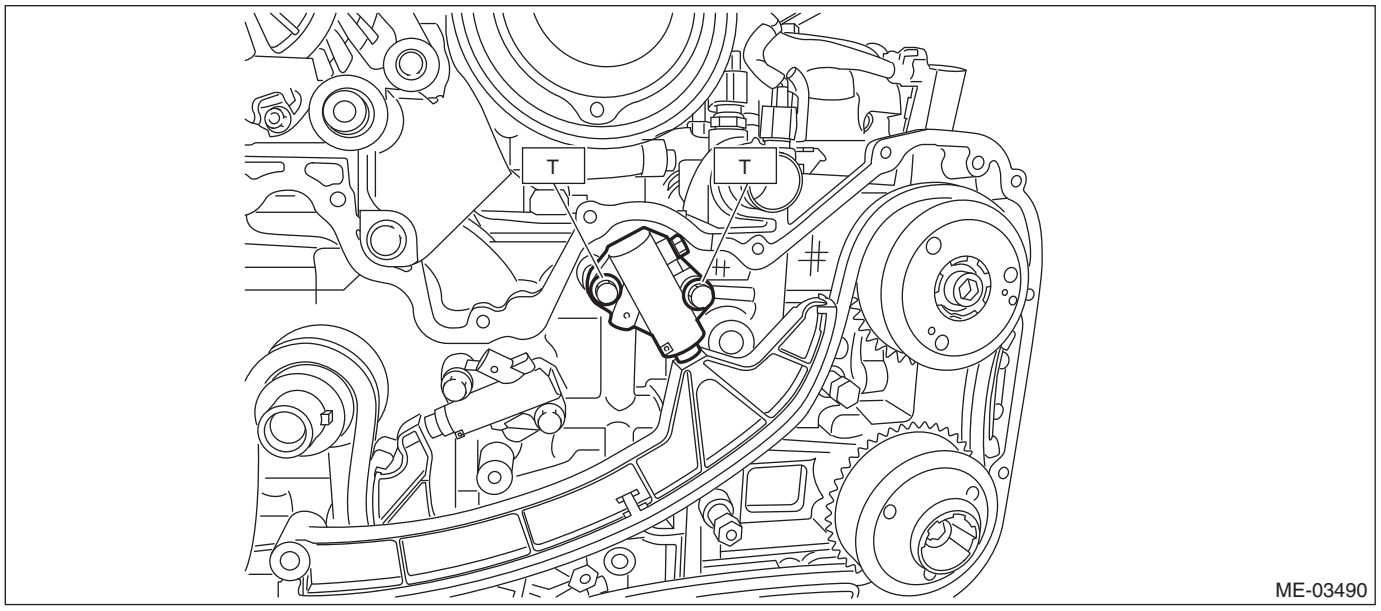
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



15) Install the chain tensioner (LH) and pull out the stopper pin.

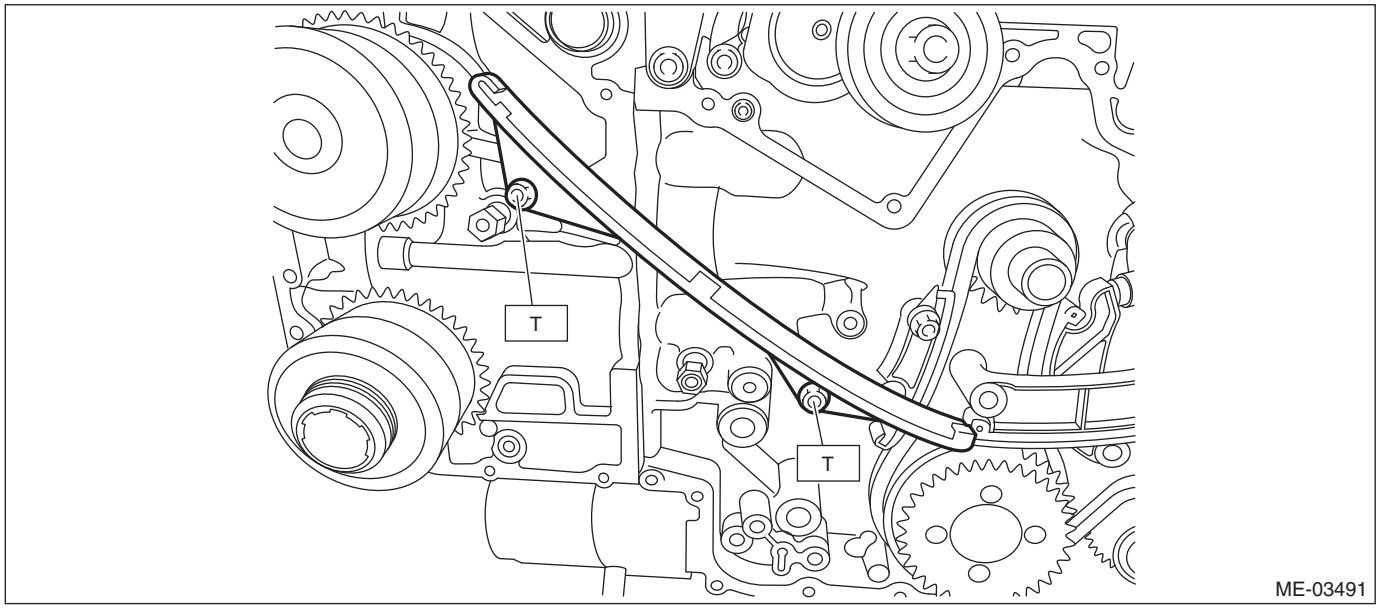
NOTE:
- Make sure that there is a bolt attached on the side face of the chain tensioner housing.
- The timing chain (LH) line will be complete.

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



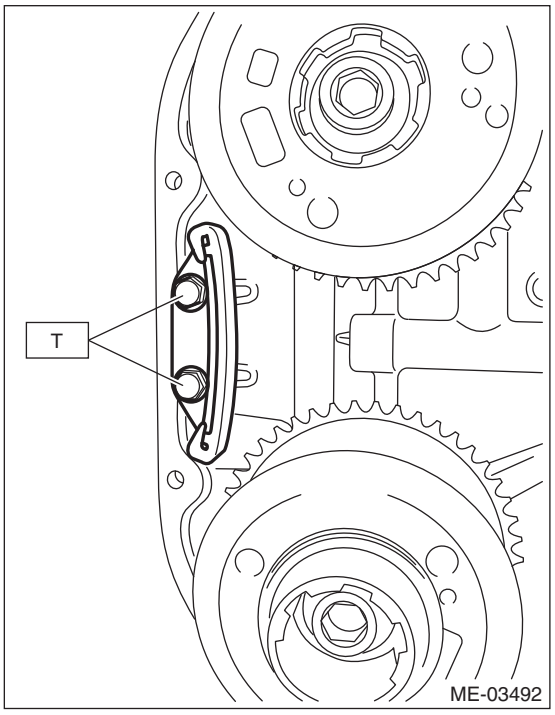
16) Install the chain guide (RH).

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

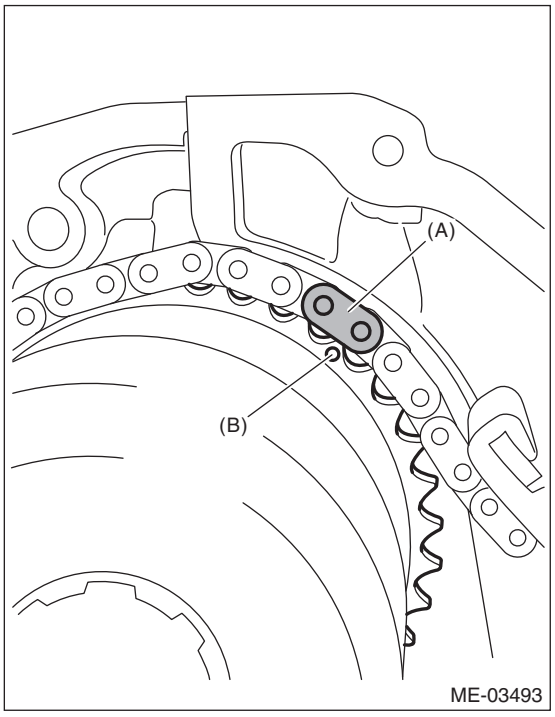


17) Install the chain guide (RH: between cams).

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

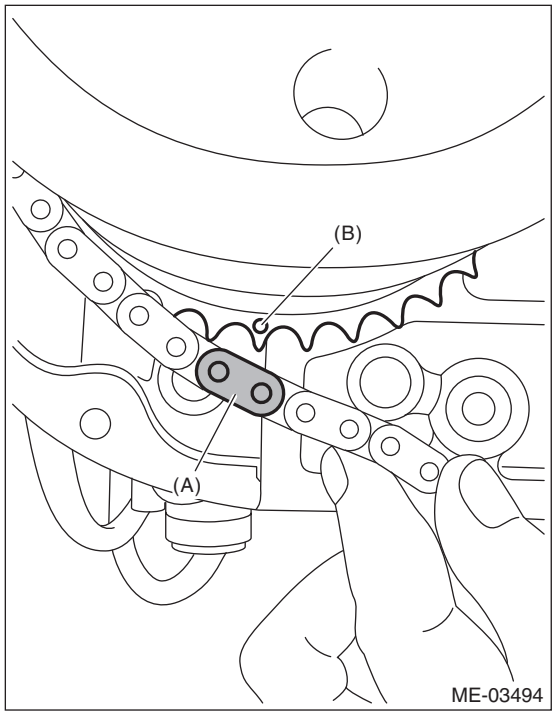


18) Install timing chain (RH).
(1) Match the timing mark of intake cam sprocket (RH) to the timing chain mark (blue).



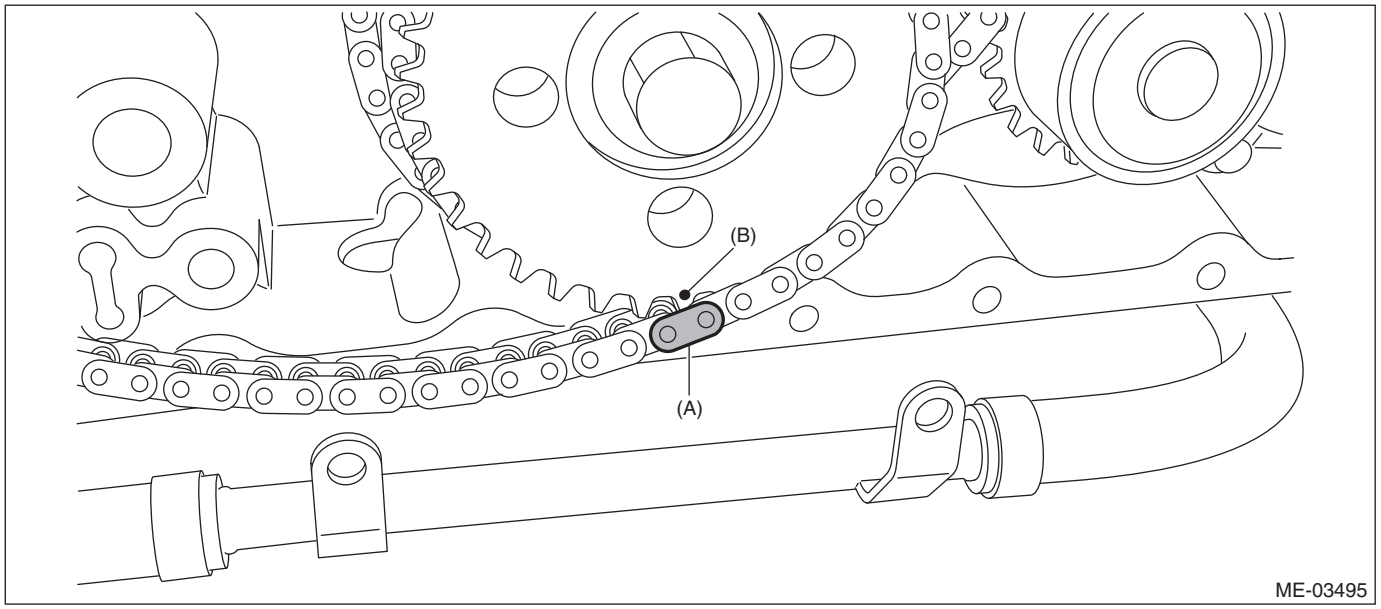
(A) Blue
(B) Timing mark

(2) Match the timing mark of exhaust cam sprocket (RH) to the timing chain mark (blue).



(A) Blue
(B) Timing mark

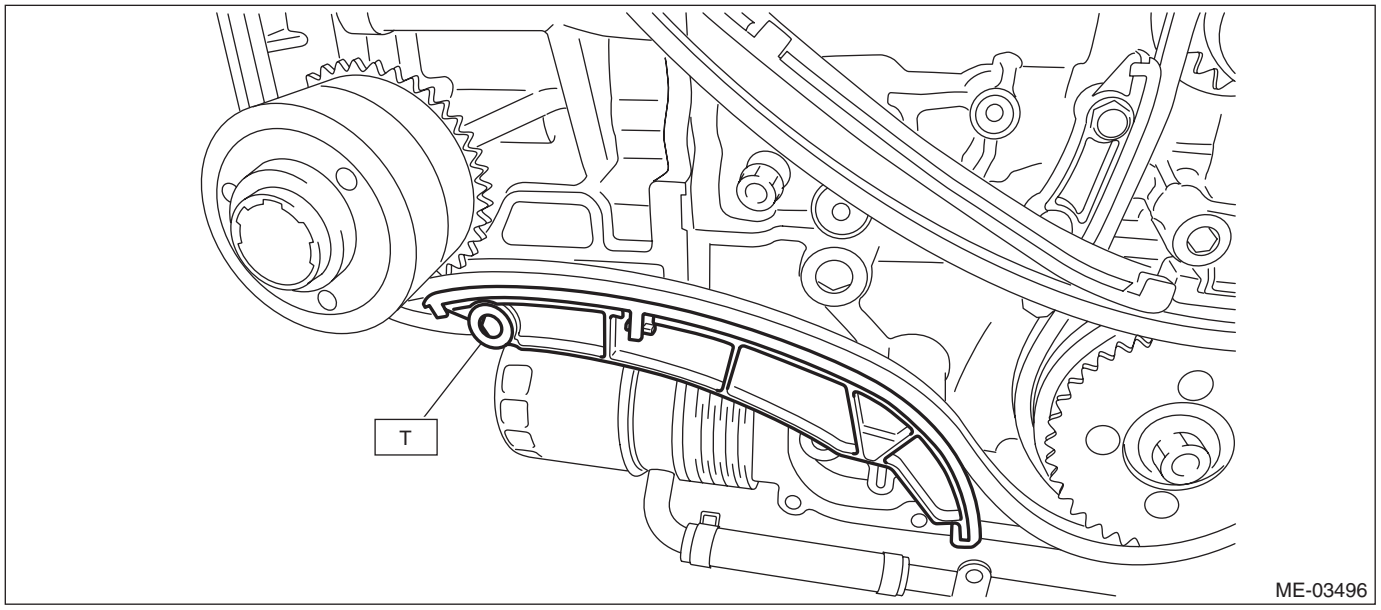
(3) Match the timing mark of idler sprocket to the timing chain mark (gold).



(A) Gold
(B) Timing mark

19) Install the chain tensioner lever (RH).

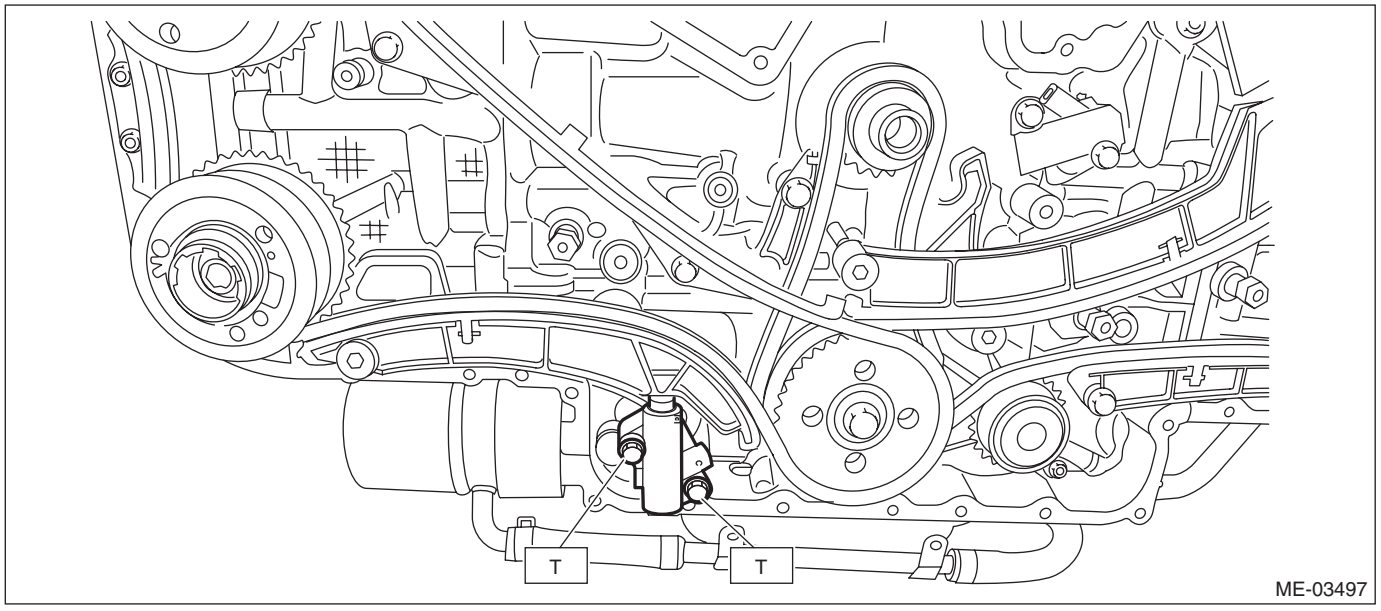
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



20) Install the chain tensioner (RH) and pull out the stopper pin.

NOTE:
The timing chain (RH) line will be complete.

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



21) After installation, perform the following confirmations.

CAUTION:
Always make sure to perform this confirmation.

(1) Make sure that the timing mark of idler sprocket is aligned to three timing chain marks (gold).
(2) Make sure that the twelve o'clock position on the crank sprocket is aligned to the timing chain (main) mark (gold).
(3) Make sure that the LH side cam sprocket timing mark is aligned to the timing chain mark (blue).
(4) Make sure that the RH side cam sprocket timing mark is aligned to the timing chain mark (blue).
(5) Make sure that all bolts are tightened at the specified torque.

22) Using the ST, turn the crankshaft in the direction of engine rotation, and make sure that there are no abnormal conditions.

CAUTION:
Always make sure to perform this confirmation.

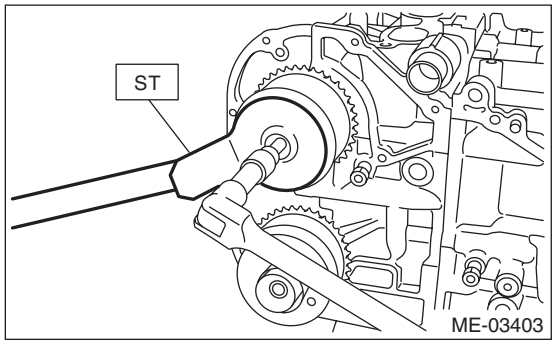
23) Install the chain cover. <Ref. to ME(H6DO)-50, INSTALLATION, Chain Cover.>
24) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
25) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>
26) Fill engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
27) Make sure there is no oil leaks in the chain cover mating surface.
28) Install the radiator. <Ref. to CO(H6DO)-21, INSTALLATION, Radiator.>

16.Cam Sprocket

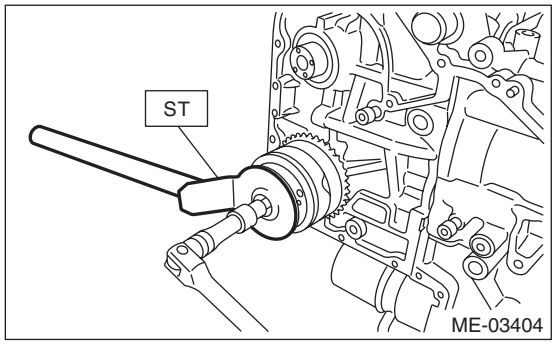
A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H6DO)-46, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
3) Remove the chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-55, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. To lock the camshaft, use the ST.
ST 499977500 CAM SPROCKET WRENCH

- IN side



- EX side



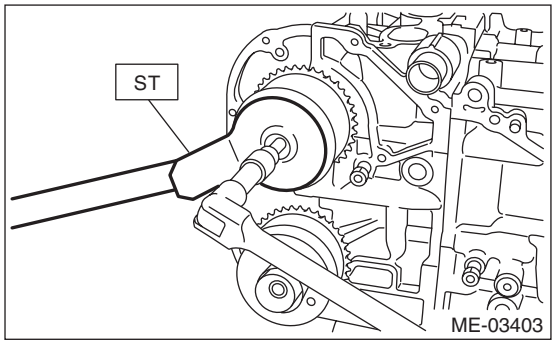
B: INSTALLATION

1) Install the cam sprocket. To lock the camshaft, use the ST.

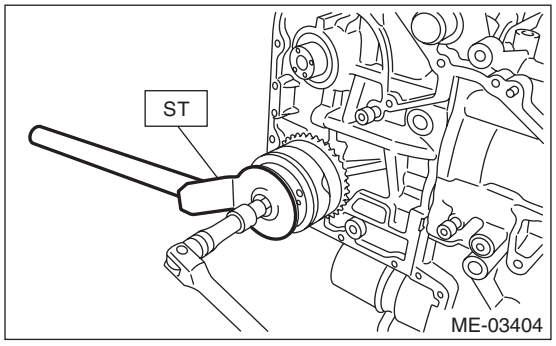
Tightening torque:
29.5 N·m (3.0 kgf-m, 21.8 ft-lb)
2) Further tighten the bolt.

Tightening angle:
45°±5°
ST 499977500 CAM SPROCKET WRENCH

- IN side



- EX side



3) Install the timing chain assembly. <Ref. to ME(H6DO)-61, INSTALLATION, Timing Chain Assembly.>
4) Install the chain cover. <Ref. to ME(H6DO)-50, INSTALLATION, Chain Cover.>
5) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
6) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>

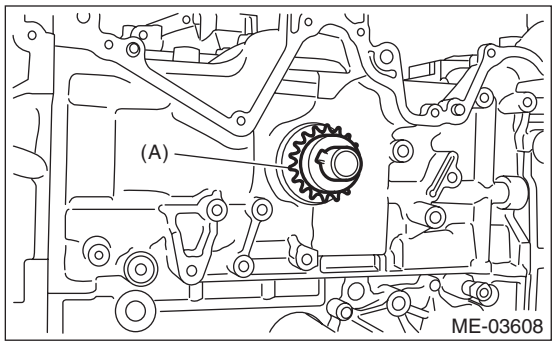
C: INSPECTION

1) Check the cam sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between cam sprocket and key.

17.Crank Sprocket

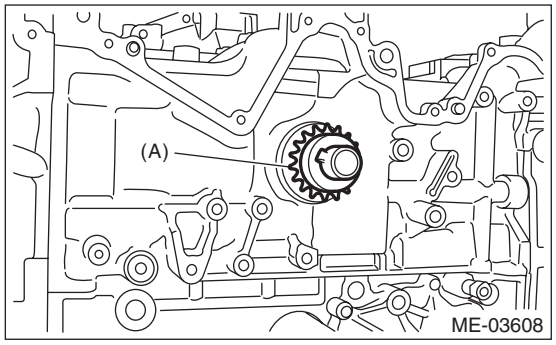
A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H6DO)-46, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
3) Remove the chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-55, REMOVAL, Timing Chain Assembly.>
5) Remove the crank sprocket (A).



B: INSTALLATION

1) Install the crank sprocket (A).



2) Install the timing chain assembly. <Ref. to ME(H6DO)-61, INSTALLATION, Timing Chain Assembly.>
3) Install the chain cover. <Ref. to ME(H6DO)-50, INSTALLATION, Chain Cover.>
4) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>

C: INSPECTION

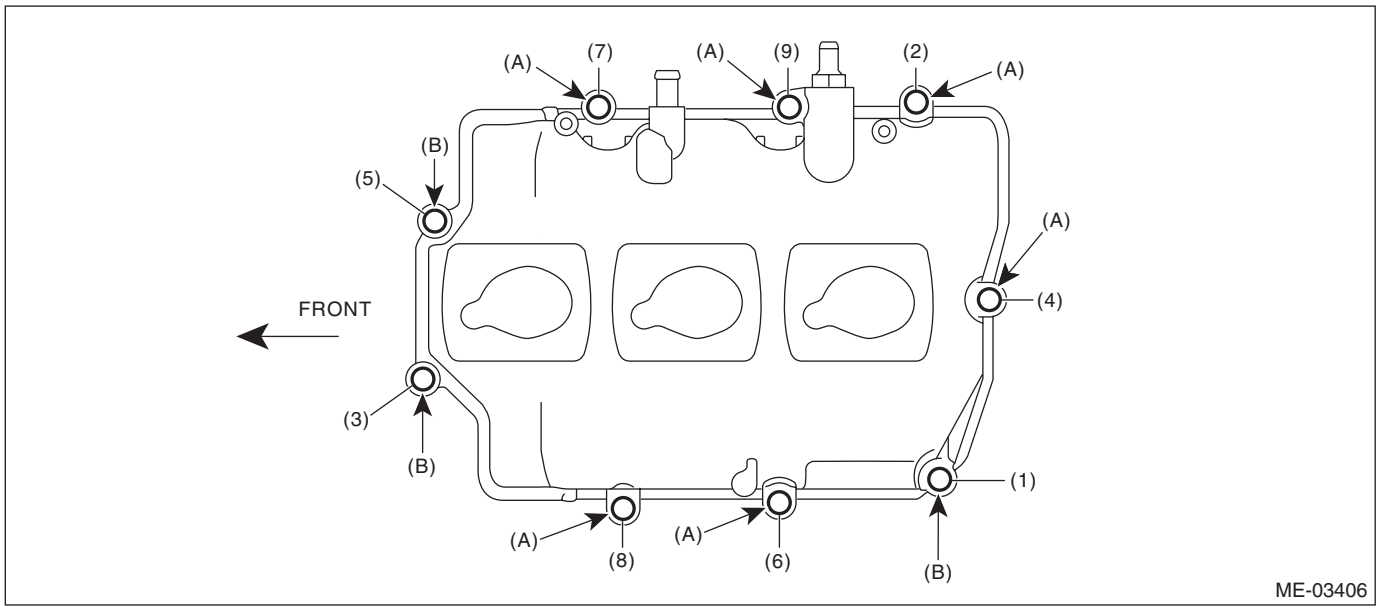
1) Check the crank sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between crank sprocket and key.

18.Camshaft

A: REMOVAL

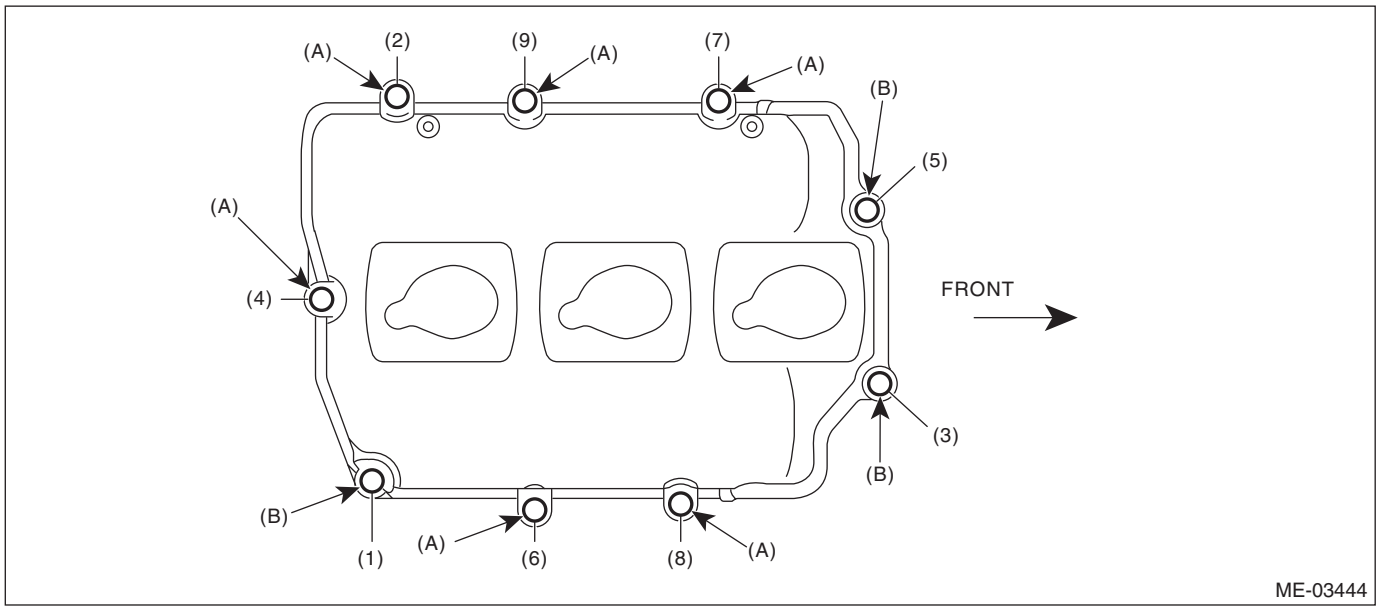
1) Remove the engine from vehicle. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
3) Remove the chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-55, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. <Ref. to ME(H6DO)-74, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H6DO)-75, REMOVAL, Crank Sprocket.>
7) Remove the exhaust oil flow control solenoid valve. <Ref. to FU(H6DO)-44, REMOVAL, Oil Flow Control Solenoid Valve.>
8) Remove the camshaft position sensor. <Ref. to FU(H6DO)-32, REMOVAL, Camshaft Position Sensor.>
9) Loosen the rocker cover bolts in the order indicated in the figure, and remove the rocker cover.

- LH side



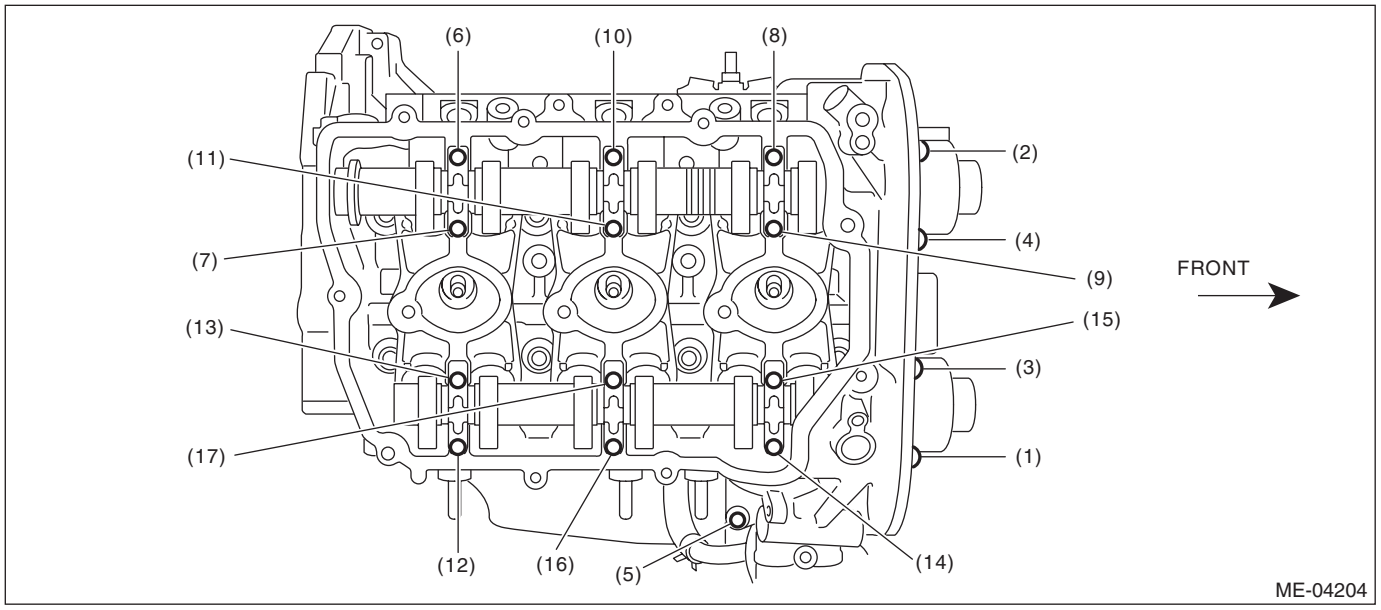
(A) M6 × 37 (B) M6 × 23

- RH side



(A) M6 × 37 (B) M6 × 23

10) Loosen the camshaft cap bolts equally, a little at a time in numerical sequence as shown in the figure.



11) Remove the camshaft caps and camshaft (RH).

NOTE:
Arrange camshaft caps in order so that they can be installed in their original positions.
12) Similarly, remove the camshafts (LH) and related parts.

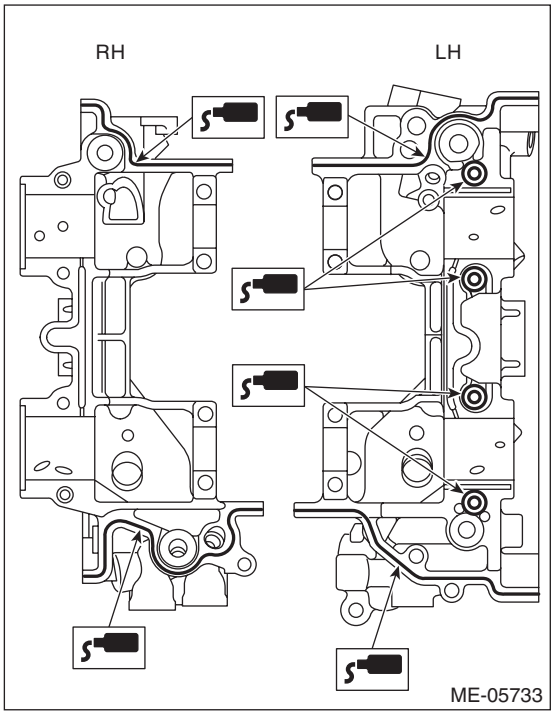
B: INSTALLATION

1) Apply engine oil to camshaft journals, and install the camshaft.
2) Install the camshaft cap.
   (1) Apply liquid gasket sparingly to back side of the front camshaft cap as shown in the figure.

NOTE:
- Install within 5 min. after applying liquid gasket.
- Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to come out and flow toward cam journal, resulting in engine seizure.

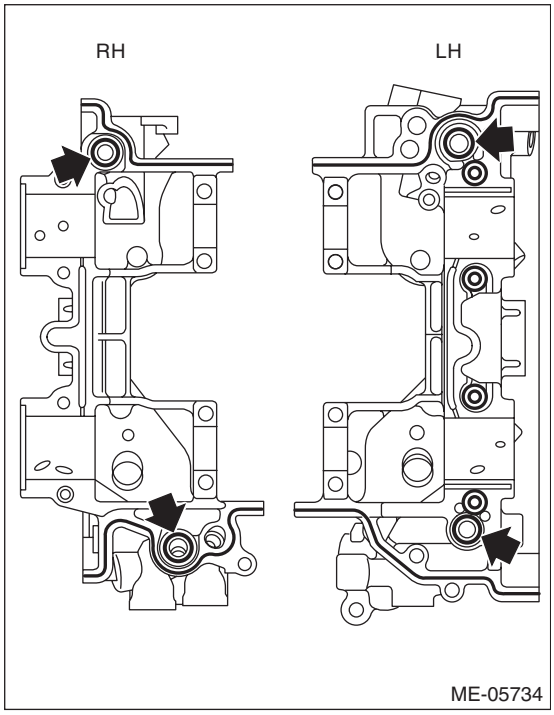
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Liquid gasket applying diameter:
2.0±0.5 mm (0.079±0.020 in)



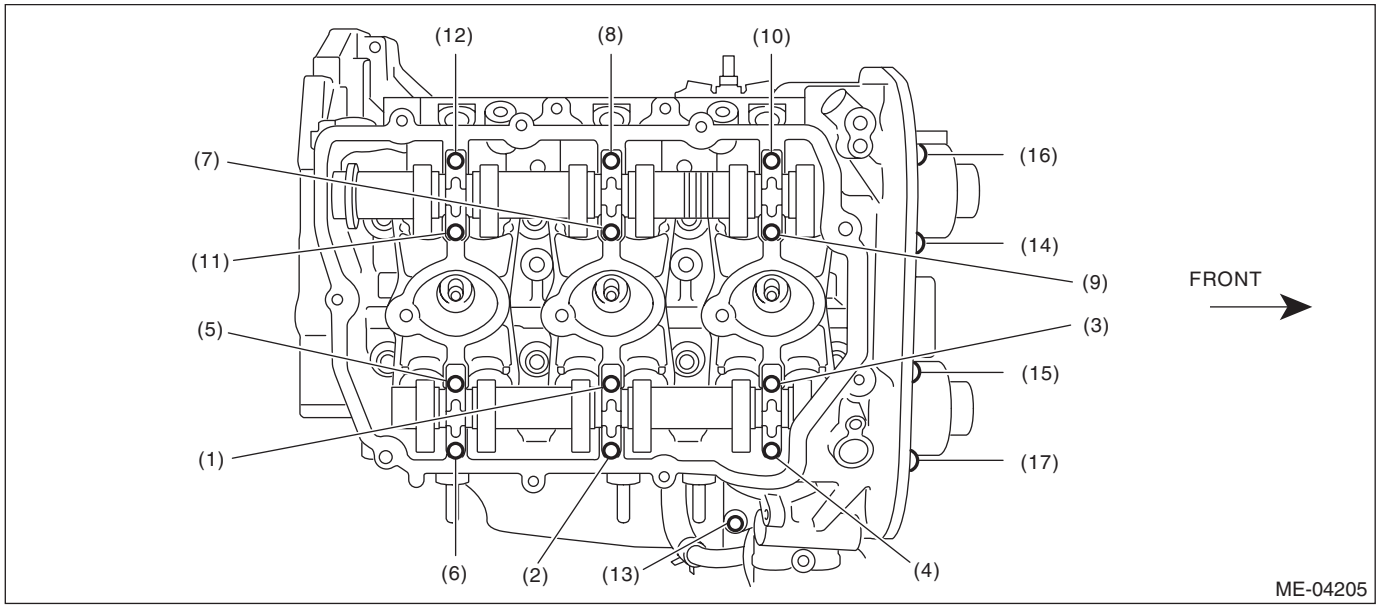
(2) Install O-rings to the front camshaft cap.

NOTE:
Use new O-rings.



(3) Apply a thin coat of engine oil to the cap journal surface, and install the camshaft cap to the camshaft.
(4) Gradually tighten the camshaft cap in at least two stages in the numerical order shown in the figure, then tighten to specified torque.

Tightening torque:
(1) — (12): 16 N·m (1.6 kgf-m, 11.8 ft-lb)
(13) — (17): 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



(5) After tightening the camshaft cap, ensure the camshaft rotates only slightly while holding it at base circle.

3) Install the rocker cover.
(1) Install the rocker cover gasket to the rocker cover.

NOTE:
Use a new rocker cover gasket.

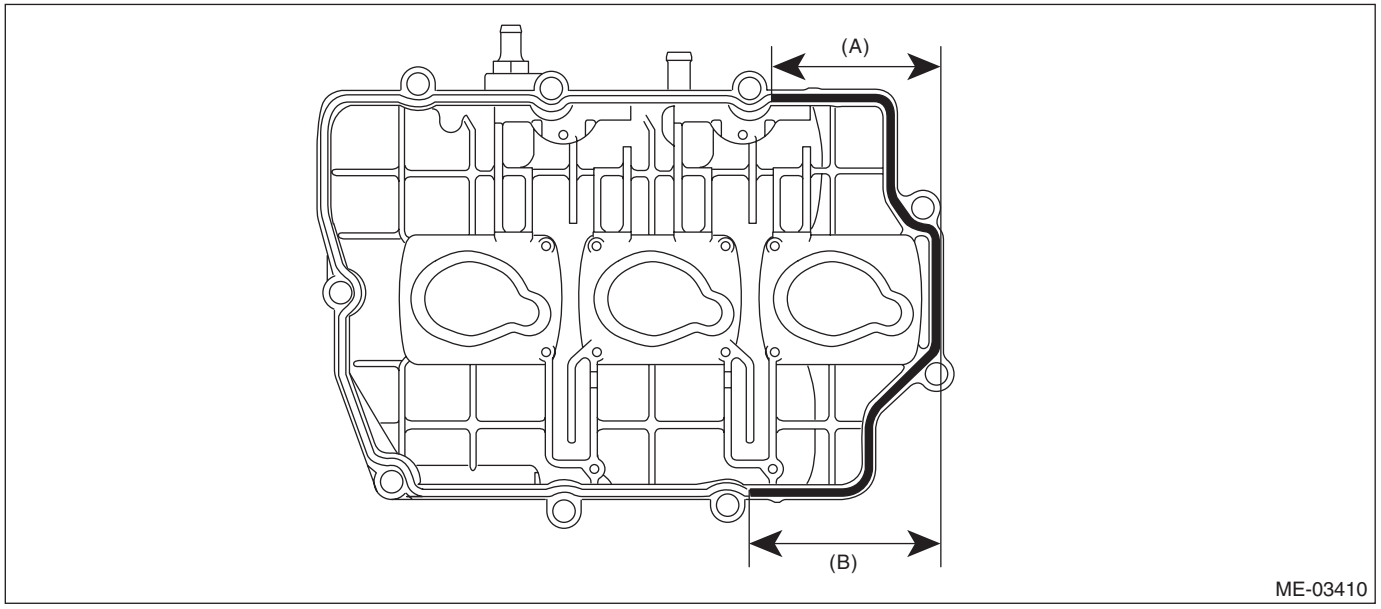
(2) Apply liquid gasket sparingly to the mating surface of cylinder head and rocker cover as shown in the figure.

NOTE:
- Install within 5 min. after applying liquid gasket.
- Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to come out and flow toward cam journal, resulting in engine seizure.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

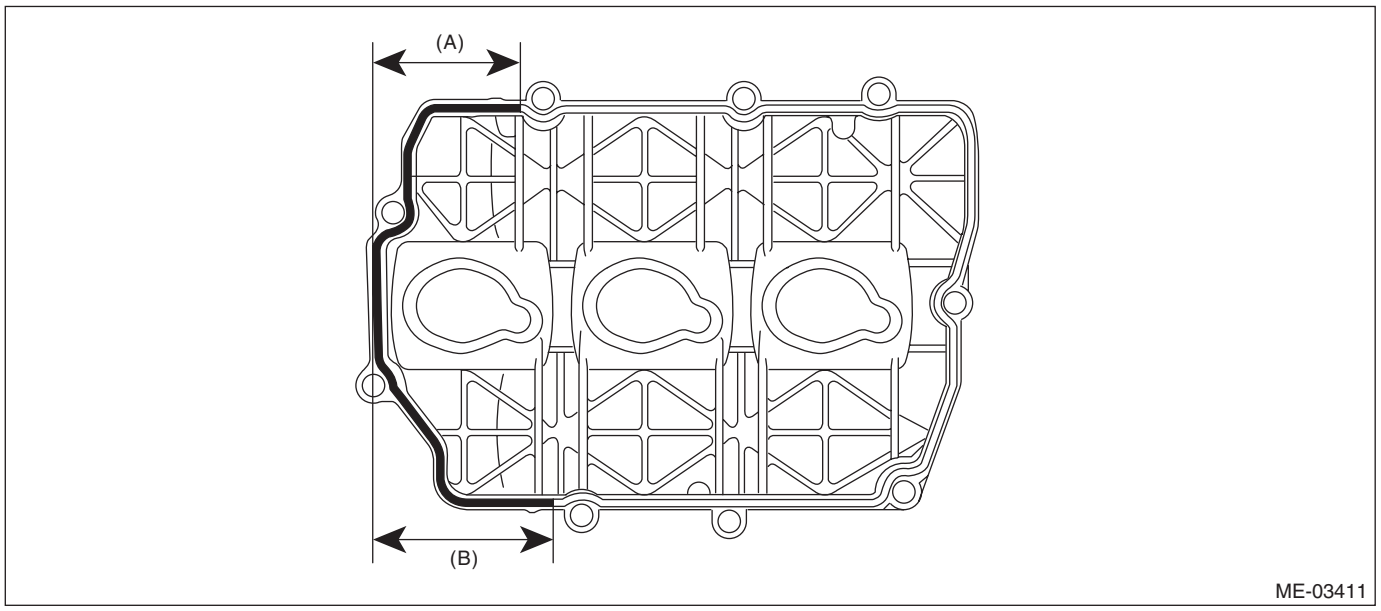
Liquid gasket applying diameter:
3.5±0.5 mm (0.138±0.020 in)

- LH side



(A) 90 mm (3.543 in) or more (B) 105 mm (4.134 in) or more

- RH side

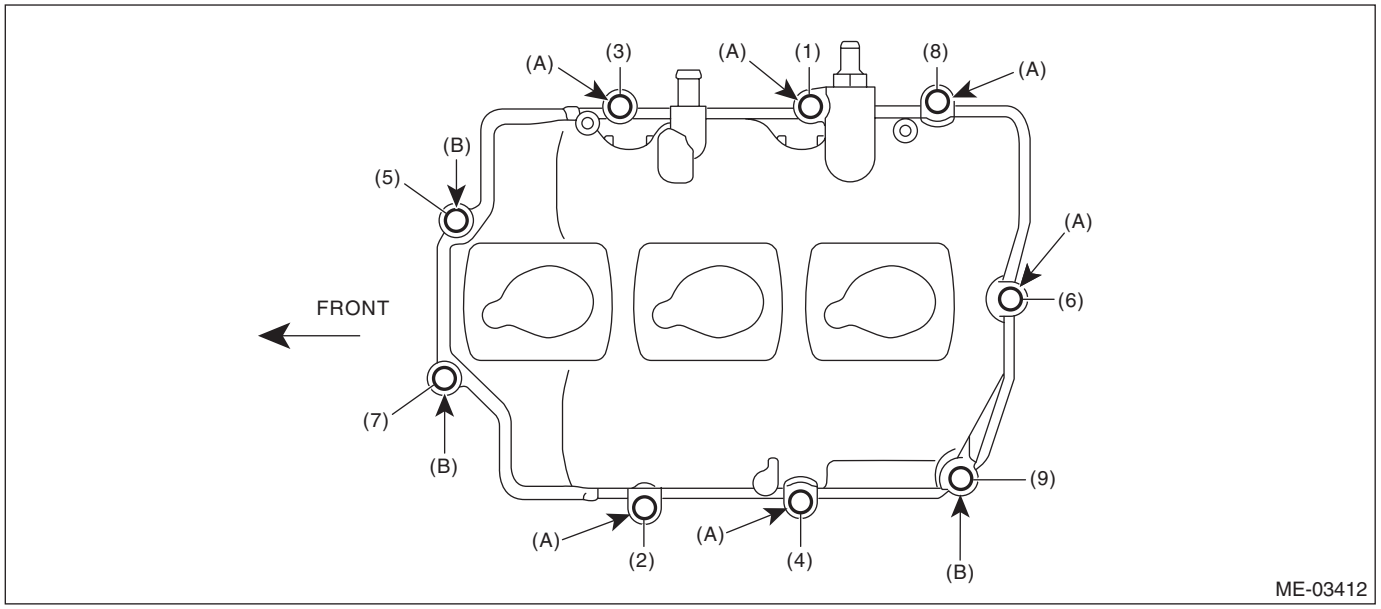


(A) 80 mm (3.150 in) or more (B) 100 mm (3.937 in) or more

(3) Tighten the rocker cover bolts in the numerical order as shown in the figure.

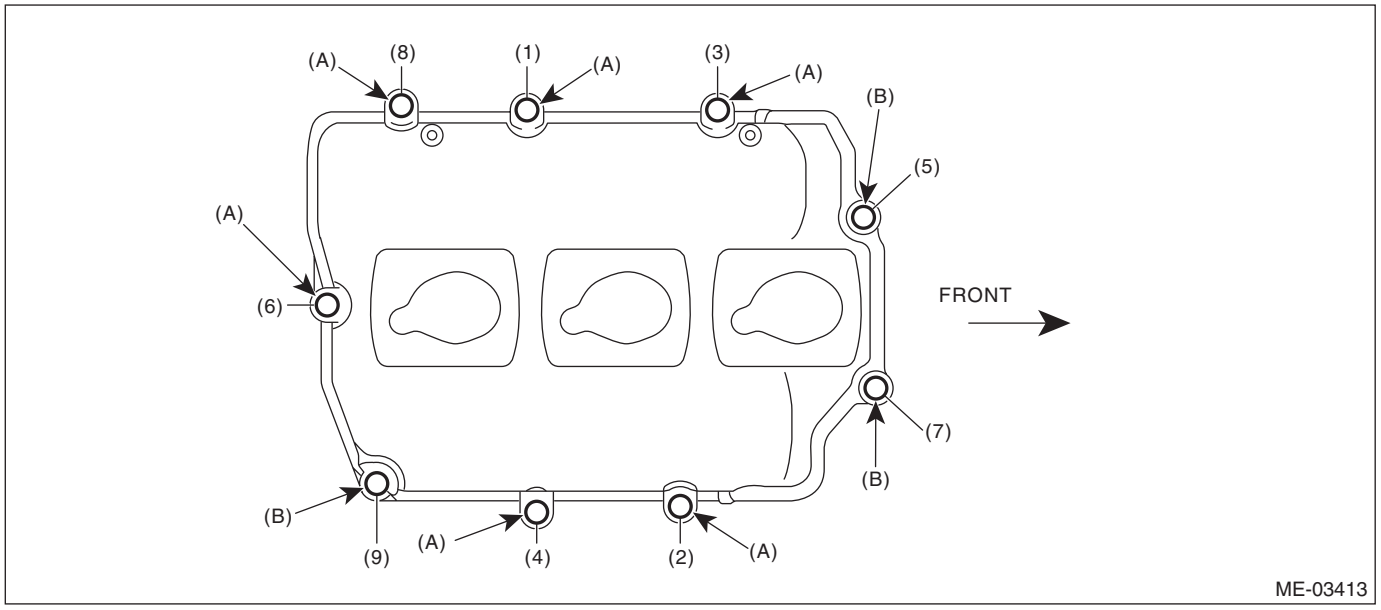
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

- LH side



(A) M6 × 37 (B) M6 × 23

- RH side



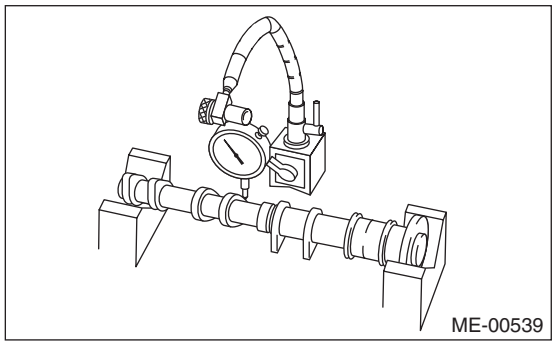
(A) M6 × 37 (B) M6 × 23

4) Install the crank sprocket. <Ref. to ME(H6DO)-75, INSTALLATION, Crank Sprocket.>
5) Install the cam sprocket. <Ref. to ME(H6DO)-74, INSTALLATION, Cam Sprocket.>
6) Install the timing chain assembly. <Ref. to ME(H6DO)-61, INSTALLATION, Timing Chain Assembly.>
7) Install the chain cover. <Ref. to ME(H6DO)-50, INSTALLATION, Chain Cover.>
8) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
9) Install the engine to the vehicle. <Ref. to ME(H6DO)-40, INSTALLATION, Engine Assembly.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Camshaft bend limit:
0.020 mm (0.00079 in)



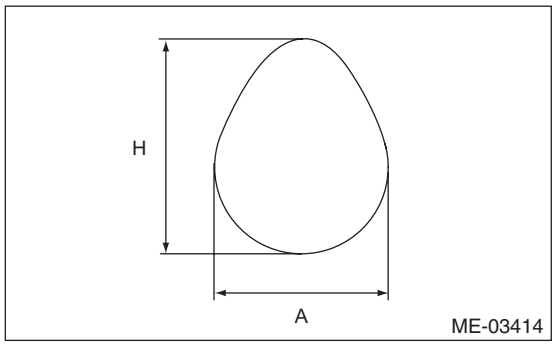
2) Check the journal for damage and wear. Replace if faulty.
3) Check the cutout portion used for camshaft sensor for damage. Replace if faulty.
4) Check the cam face condition; remove the minor faults by grinding with oil stone. Replace if there is uneven wear or others.
5) Measure the cam lobe height “H” and cam base circle diameter “A”. If it exceeds the standard or offset wear occurs, replace it.

Cam lobe height H:

Standard
Intake
45.90 — 46.00 mm (1.8071 — 1.8110 in)
Exhaust
44.65 — 44.75 mm (1.7579 — 1.7618 in)

Cam base circle diameter A:

Standard
Intake
36.00 mm (1.4173 in)
Exhaust
36.00 mm (1.4137 in)

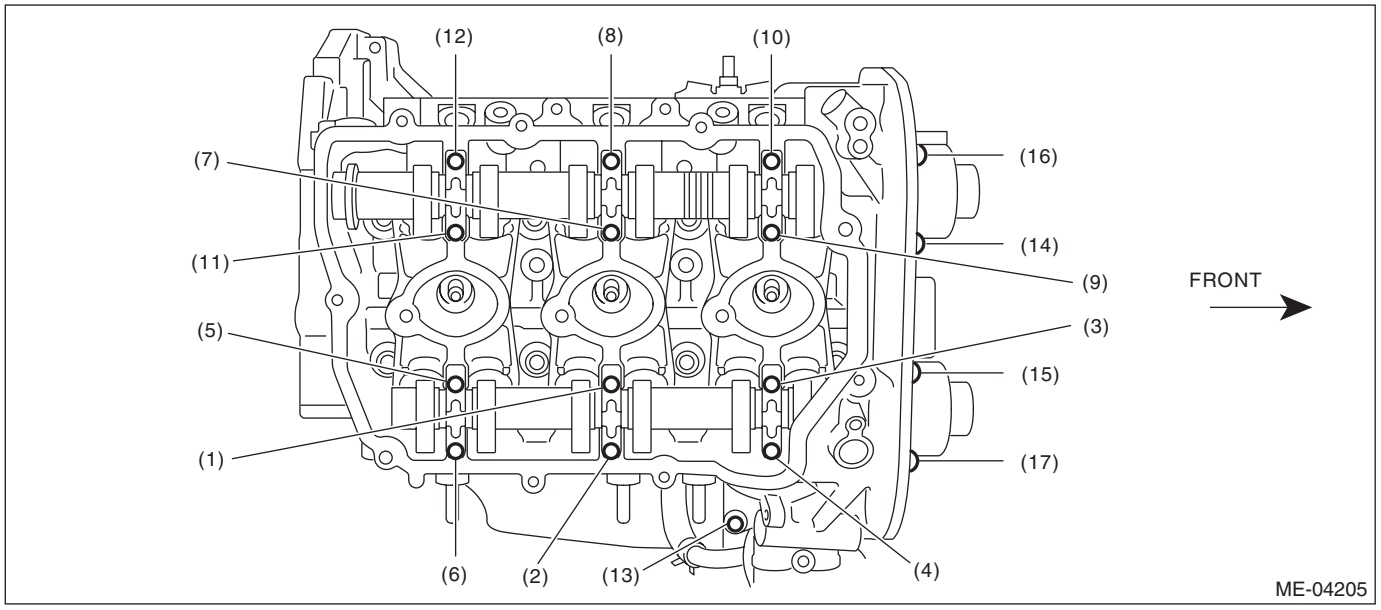


6) Measure the outside diameter of camshaft journal. If the journal diameter is not within specification, check the oil clearance.

	Camshaft journal	
	Front	Except for front
Standard mm (in)	37.946 — 37.963 (1.4939 — 1.4946)	25.946 — 25.963 (1.0215 — 1.0222)

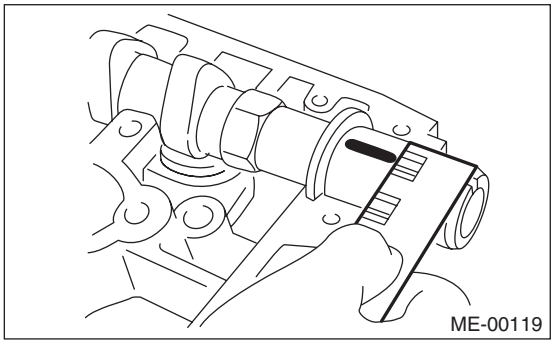
7) Measure the oil clearance of camshaft journal.
(1) Clean the camshaft cap and cylinder head camshaft journal.
(2) Place the camshaft on cylinder head. (Without installing the valve lifter)
(3) Place a plastigauge across each camshaft journals.
(4) Gradually tighten the camshaft cap in at least two stages in the numerical order shown in the figure, then tighten to specified torque. Do not turn the camshaft.

Tightening torque:
(1) — (12): 16 N·m (1.6 kgf-m, 11.8 ft-lb)
(13) — (17): 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



(5) Remove the camshaft cap.
(6) Measure the widest point of the plastigauge on each journal. If oil clearance exceeds the standard, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Camshaft oil clearance:
Standard
0.037 — 0.072 mm (0.0015 — 0.0028 in)



(7) Completely remove the plastigauge.

8) Measure the thrust clearance with setting the dial gauge at end surface of camshaft. If the thrust clearance is not within the standard or there is offset wear, replace the camshaft caps and cylinder head as a set. If necessary replace the camshaft.

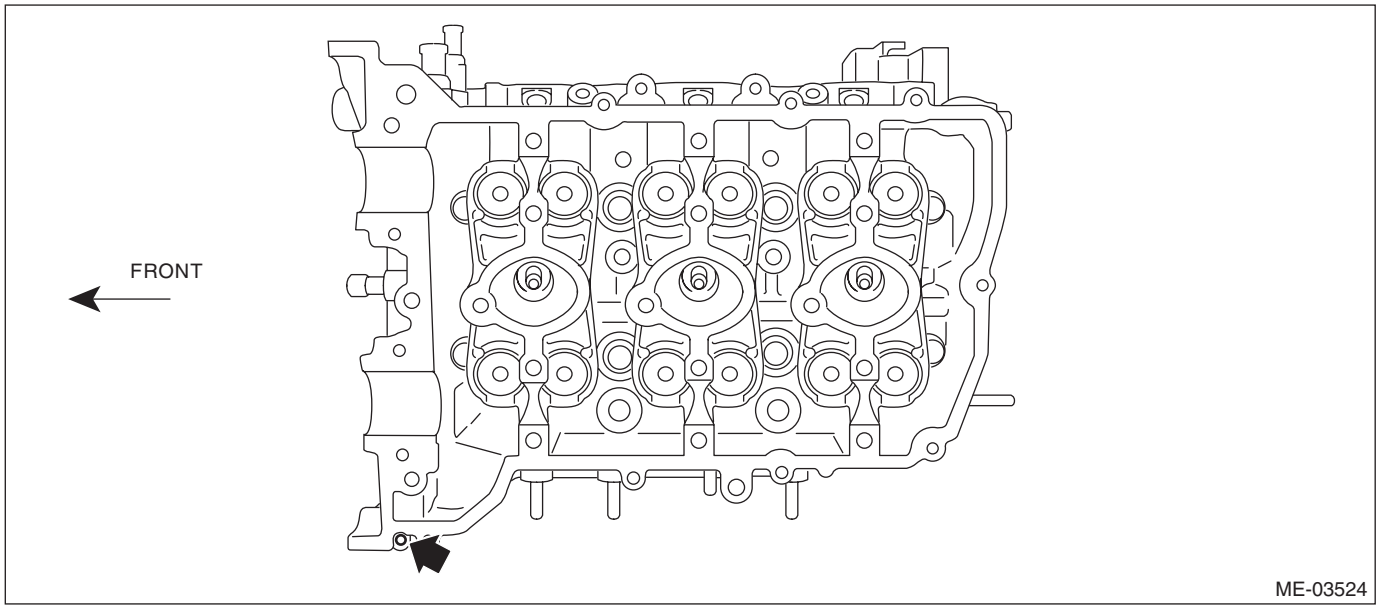
Camshaft thrust clearance:

Standard
Intake
0.075 — 0.135 mm (0.0030 — 0.0053 in)
Exhaust
0.075 — 0.135 mm (0.0030 — 0.0053 in)

19.Cylinder Head

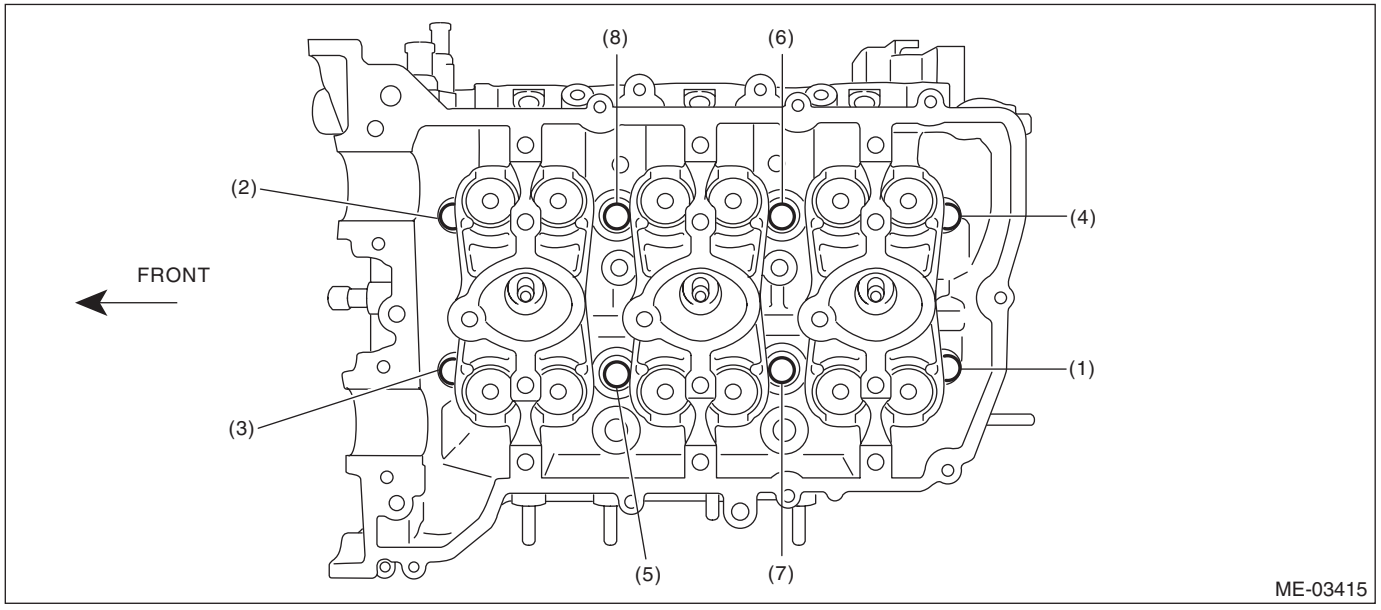
A: REMOVAL

1) Remove the engine from vehicle. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
3) Remove the chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-55, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. <Ref. to ME(H6DO)-74, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H6DO)-75, REMOVAL, Crank Sprocket.>
7) Remove the camshaft. <Ref. to ME(H6DO)-76, REMOVAL, Camshaft.>
8) Remove the seal bolt shown in the figure.



9) Remove the cylinder head bolts in the numerical order as shown in the figure.

NOTE:
Leave bolts (2) and (4) engaged by three or four threads to prevent the cylinder head from falling.



10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.
11) Remove the bolts (2) and (4) to remove cylinder head.

12) Remove the cylinder head gasket.

CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.
13) Similarly, remove the cylinder head (RH).

B: INSTALLATION

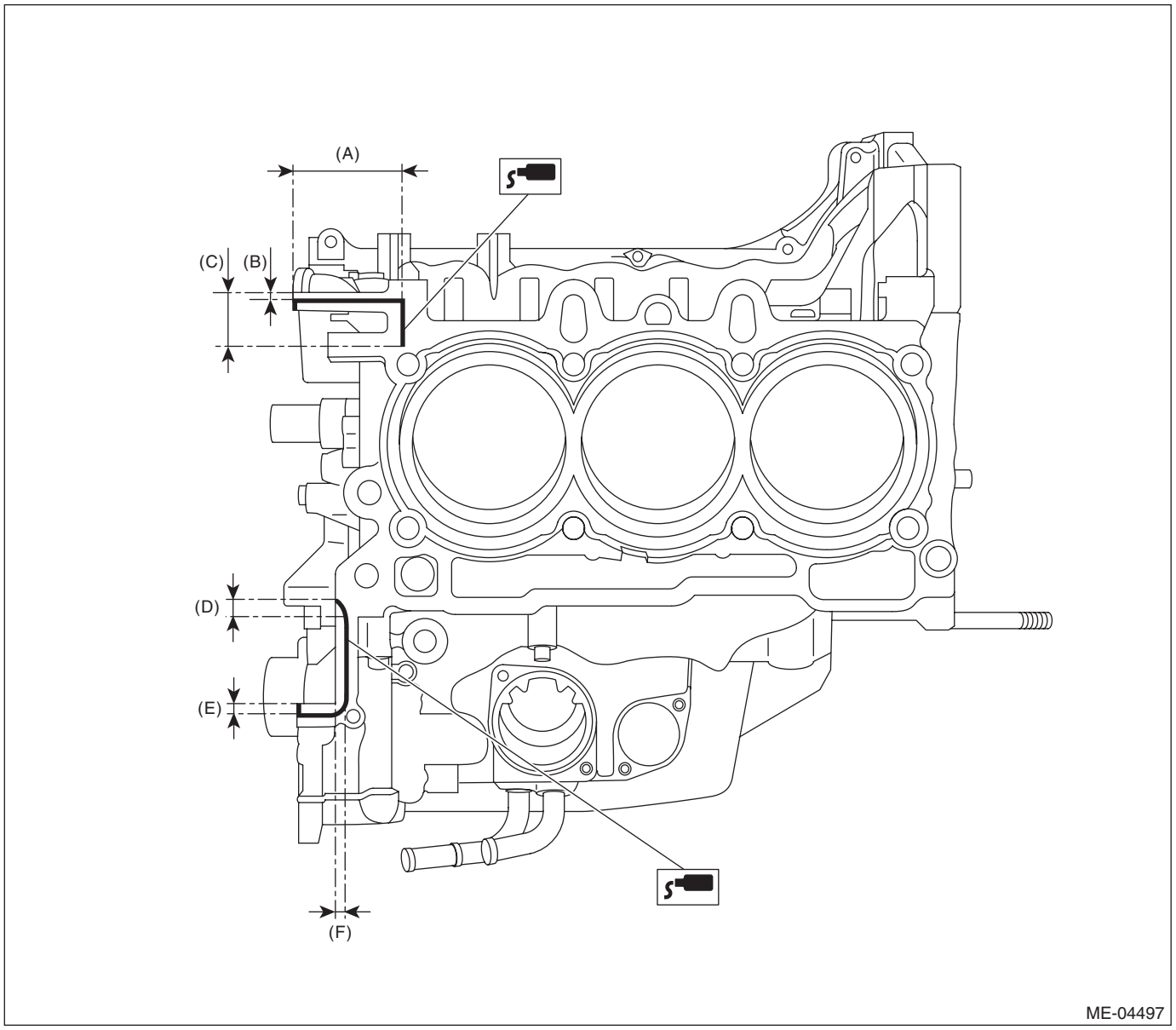
1) Apply liquid gasket to the mating surface of cylinder block shown in the figure.

NOTE:
- Install within 5 min. after applying liquid gasket.
- Do not apply liquid gasket excessively. If too much is applied, remove any liquid gasket that is squeezed out.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

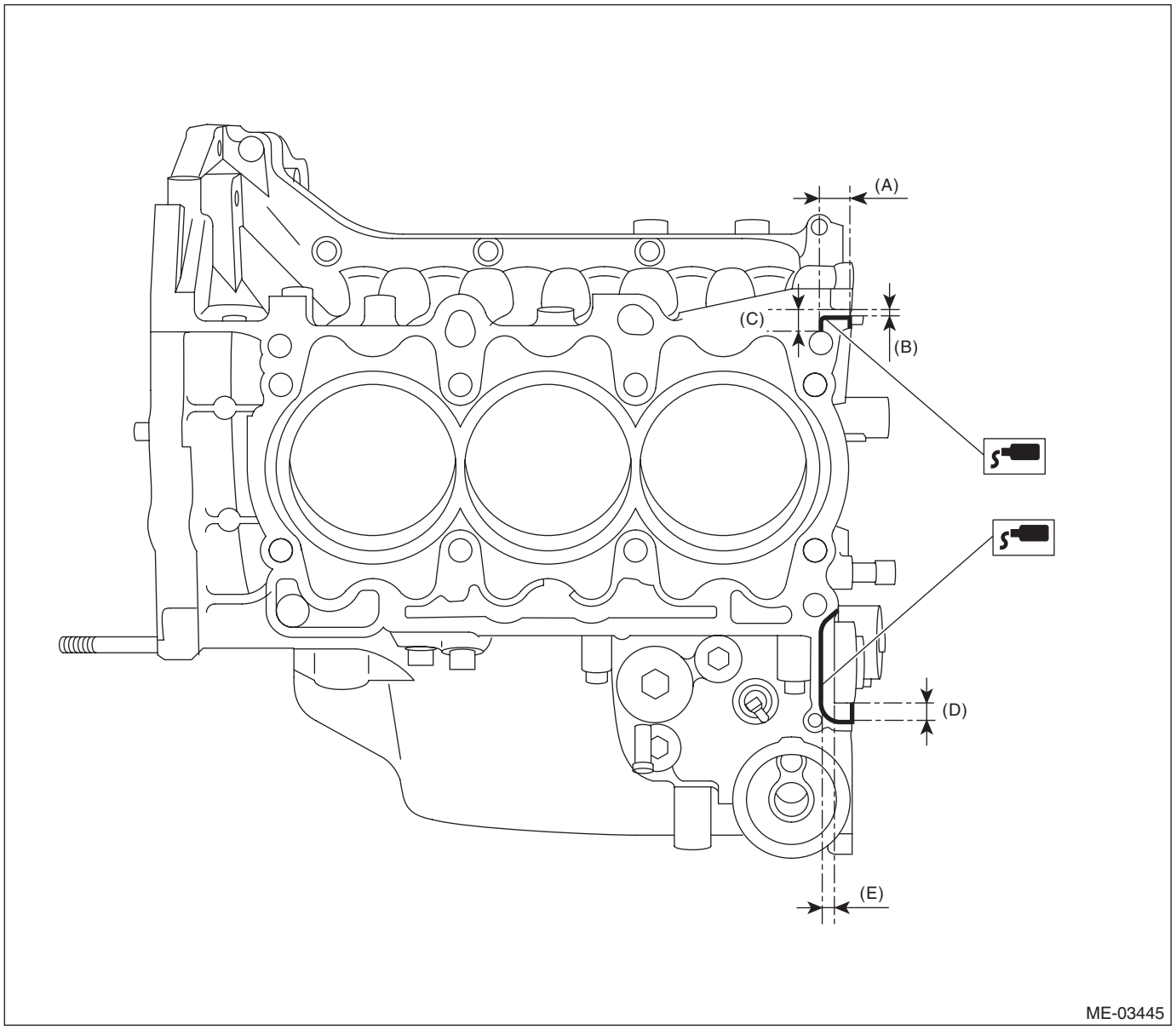
Liquid gasket applying diameter:
3.5±1.0 mm (0.138±0.039 in)

- LH side



(A)	59 mm (2.323 in)	(C)	20 mm (0.787 in)	(E)	4 mm (0.157 in)
(B)	2 mm (0.079 in)	(D)	7 mm (0.276 in)	(F)	4 mm (0.157 in)

- RH side



(A) 17 mm (0.669 in)
(B) 2 mm (0.079 in)
(C) 9 mm (0.354 in)
(D) 4 mm (0.157 in)
(E) 4 mm (0.157 in)

2) Install the cylinder head gaskets LH and RH onto the cylinder block.

NOTE:
Use a new cylinder head gasket.

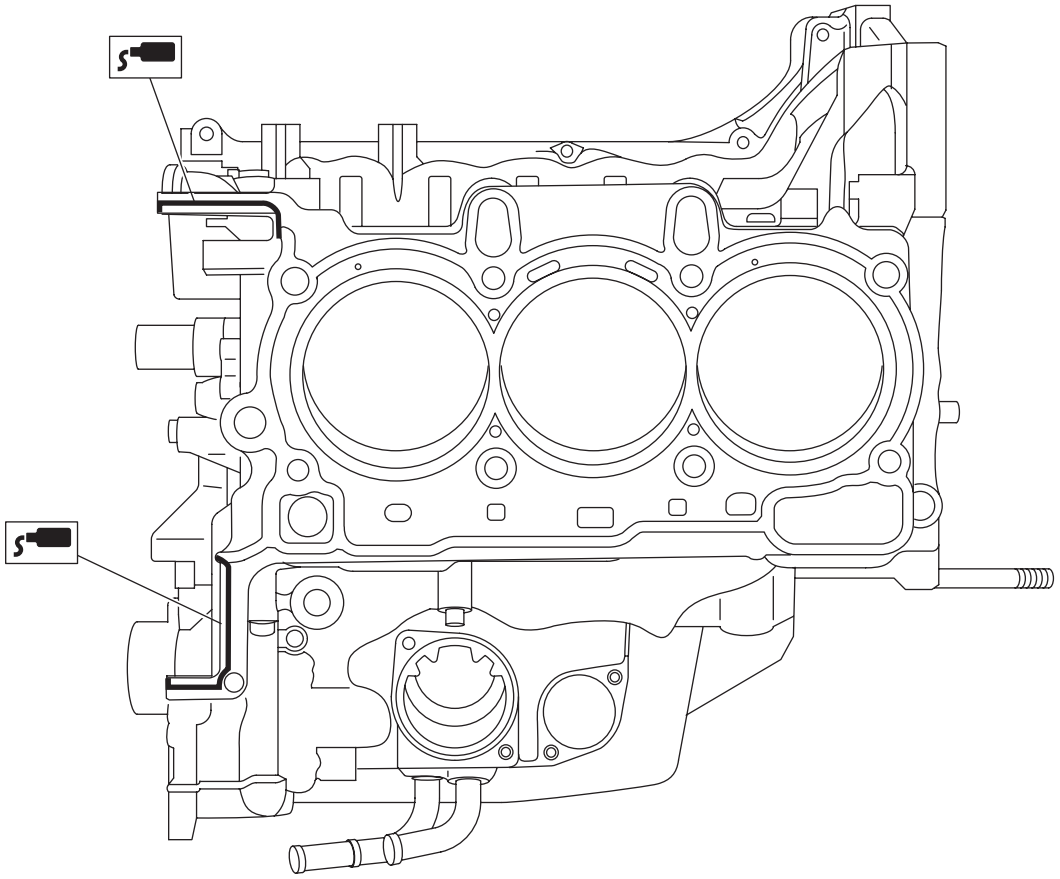
3) Apply liquid gasket to the mating surface of cylinder head gasket shown in the figure.

NOTE:
- Install within 5 min. after applying liquid gasket.
- Do not apply liquid gasket excessively. If too much is applied, remove any liquid gasket that is squeezed out.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

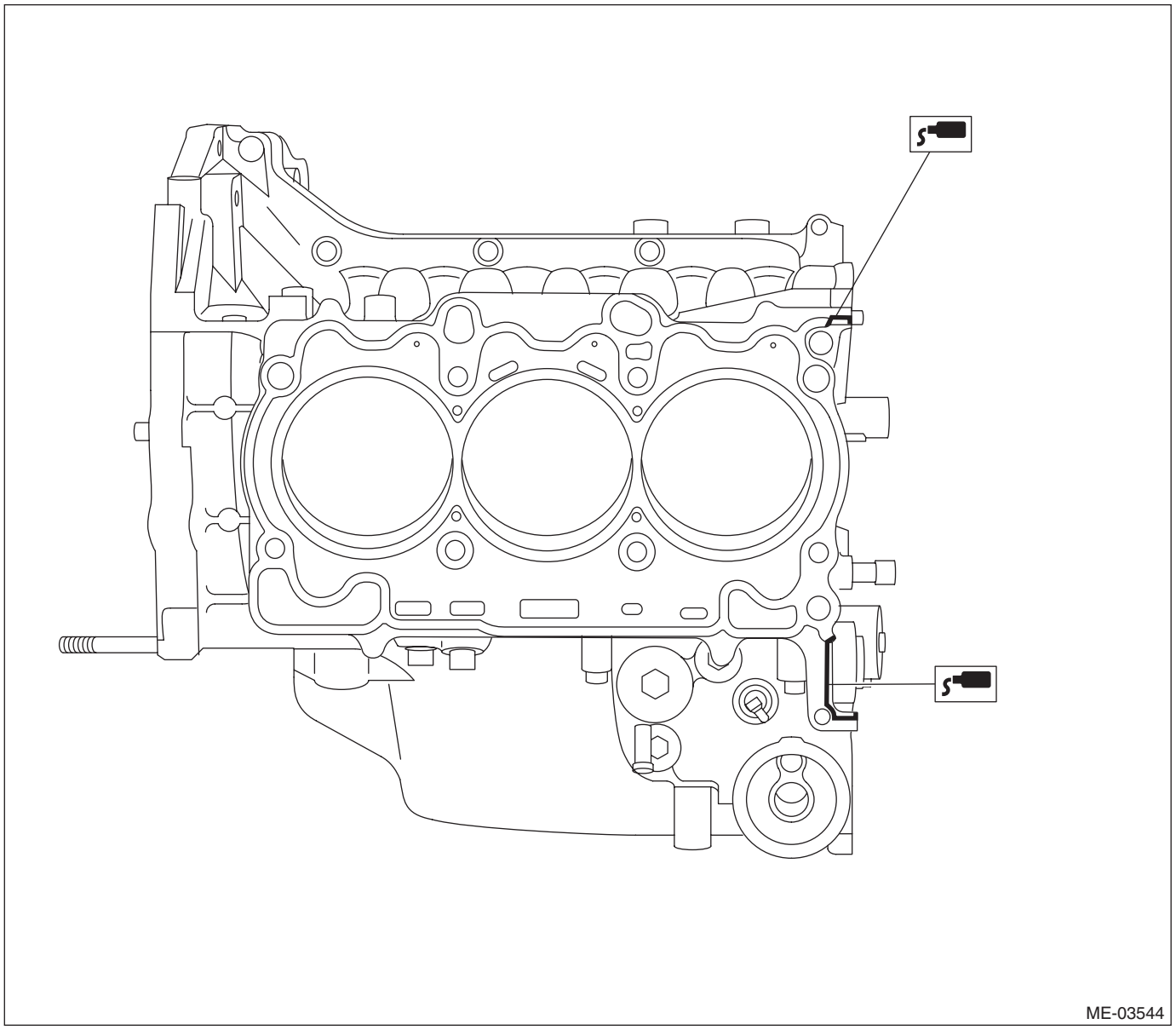
Liquid gasket applying diameter:
3.5±1.0 mm (0.138±0.039 in)

- LH side



ME-04498

- RH side

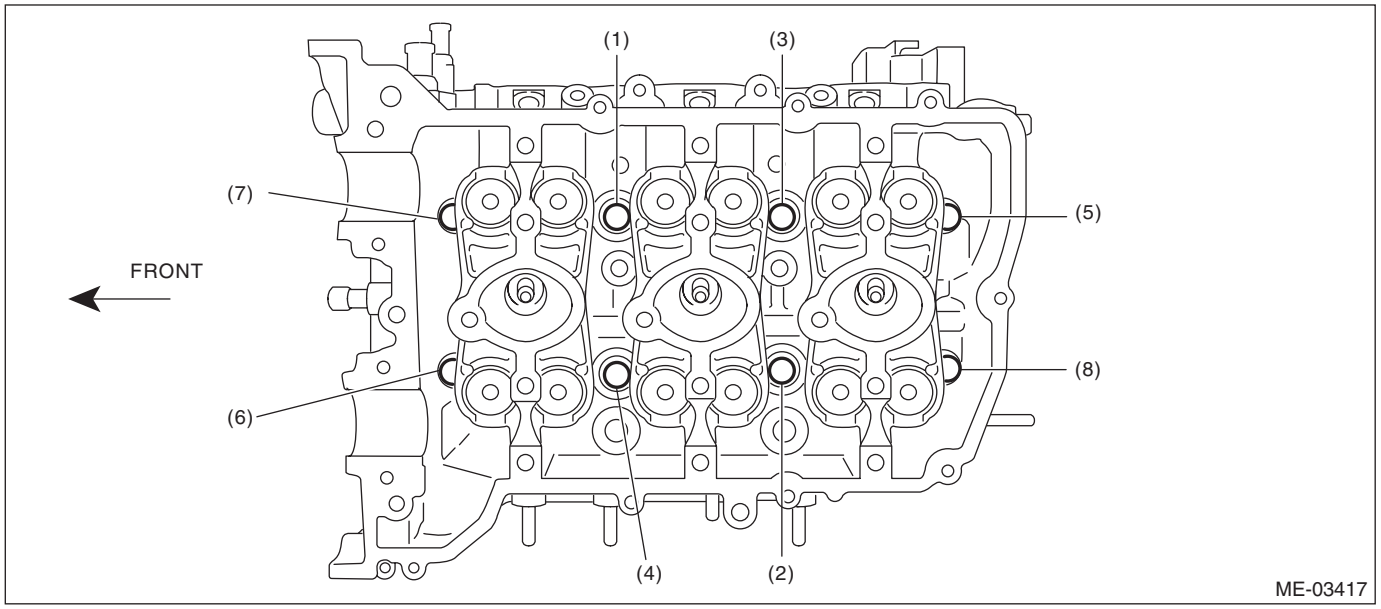


4) Attach the cylinder head to the cylinder block.

CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.

5) Tighten the cylinder head bolts.
(1) Apply a thin coat of engine oil to washers and cylinder head bolt threads.
(2) Mount the cylinder head onto the cylinder block, then tighten the bolts with a torque of 20 N·m (2.0 kgf-m, 14.8 ft-lb) in the order indicated in the figure.
(3) Tighten the bolts with a torque of 50 N·m (5.1 kgf-m, 36.9 ft-lb) in the order indicated in the figure.
(4) Loosen all the bolts by 180° in the reverse order of installing, and loosen them further by 180°.
(5) Tighten the bolts with torque of 20 N·m (2.0 kgf-m, 14.8 ft-lb) in numerical sequence as shown in the figure.
(6) Tighten the bolts (1) — (4) in the order indicated with a torque of 48 N·m (4.9 kgf-m, 35.4 ft-lb).
(7) Tighten the bolts (5) — (8) in the order indicated with a torque of 44 N·m (4.5 kgf-m, 32.5 ft-lb).
(8) Tighten all bolts 90° in the numerical order as shown in the figure.

(9) Tighten the bolt (1) — (4) by 45° in the numerical order.

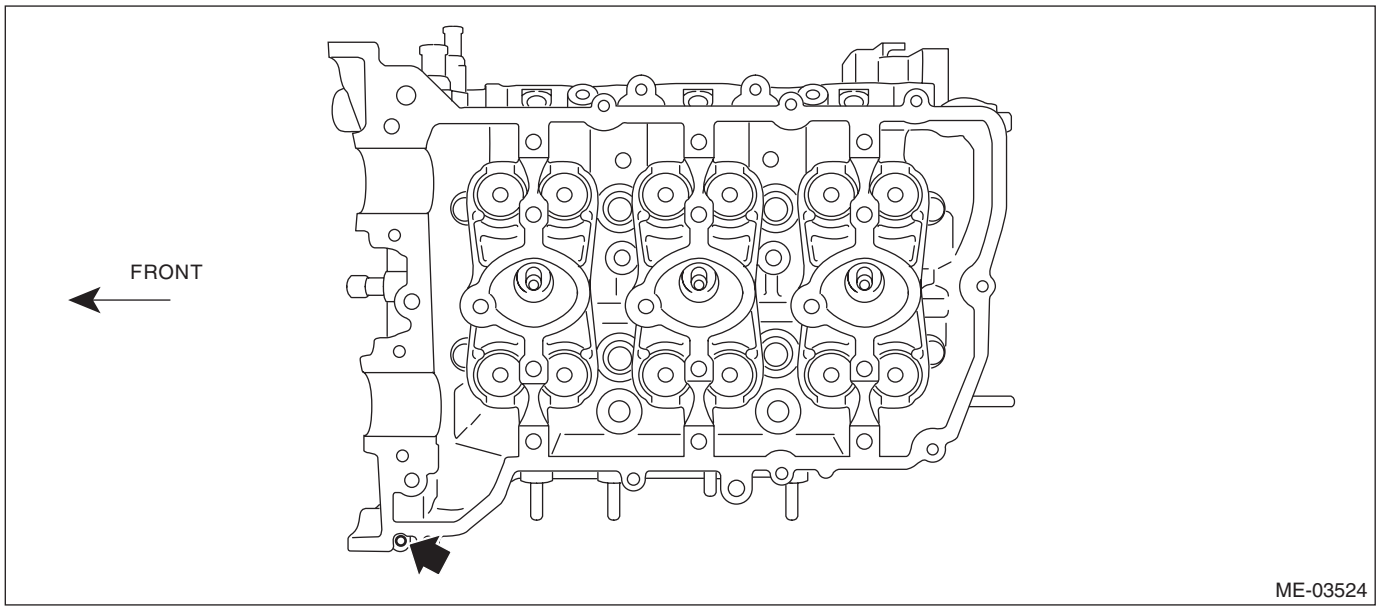


6) Install the seal bolt shown in the figure.

NOTE:
Before installing seal bolts, apply a sealing material to bolt threads.

Seal material:
THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

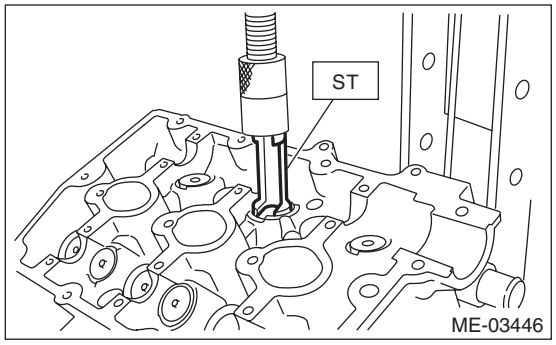


7) Install the camshaft. <Ref. to ME(H6DO)-77, INSTALLATION, Camshaft.>
8) Install the crank sprocket. <Ref. to ME(H6DO)-75, INSTALLATION, Crank Sprocket.>
9) Install the cam sprocket. <Ref. to ME(H6DO)-74, INSTALLATION, Cam Sprocket.>
10) Install the timing chain assembly. <Ref. to ME(H6DO)-61, INSTALLATION, Timing Chain Assembly.>
11) Install the chain cover. <Ref. to ME(H6DO)-50, INSTALLATION, Chain Cover.>
12) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
13) Install the engine to the vehicle. <Ref. to ME(H6DO)-40, INSTALLATION, Engine Assembly.>

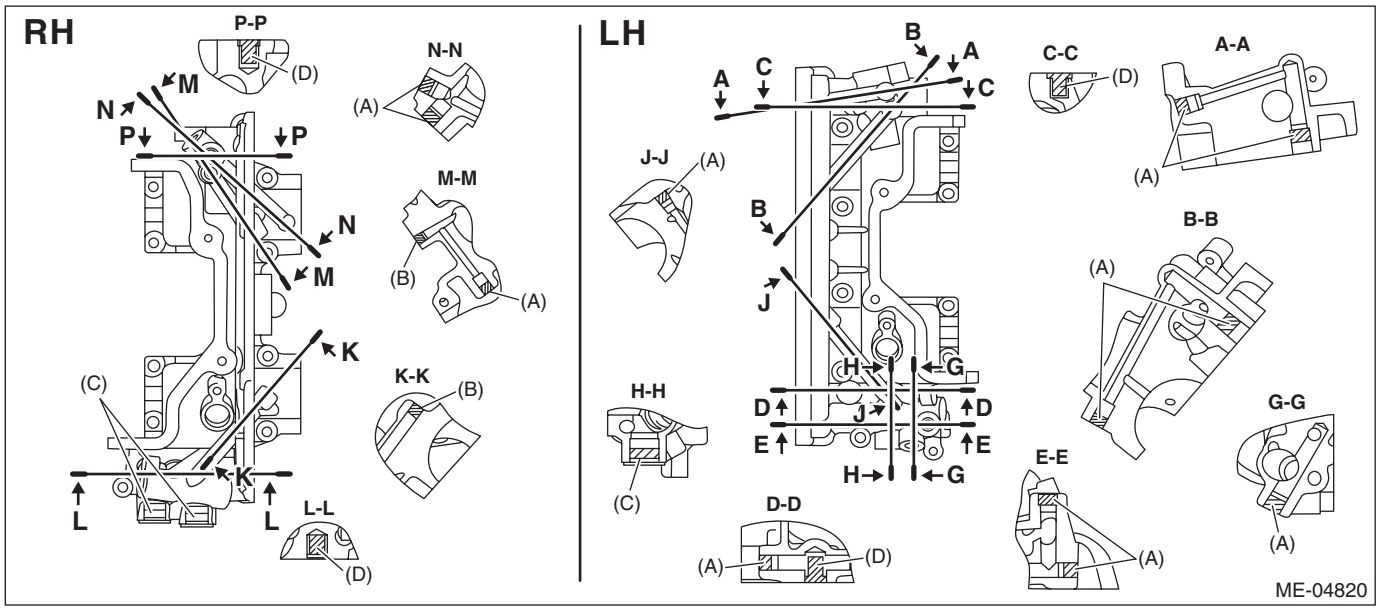
C: DISASSEMBLY

1) Set the cylinder head on ST.
ST 18250AA010 CYLINDER HEAD TABLE
2) Remove the valve lifter.
3) Compress the valve spring using ST, and remove the valve spring retainer key, each valve and valve spring.
ST 499718000 VALVE SPRING REMOVER

NOTE:
- Mark each valve to prevent confusion.
- Pay careful attention not to damage the lips of intake valve oil seals and exhaust valve oil seals.
- Keep all the removed parts in order for re-installing in their original positions.
- For removal and installation procedures of the valve guide, intake valve oil seal and exhaust valve oil seal, refer to “INSPECTION”. <Ref. to ME(H6DO)-93, VALVE GUIDE, INSPECTION, Cylinder Head.> <Ref. to ME(H6DO)-95, INTAKE AND EXHAUST VALVE OIL SEAL, INSPECTION, Cylinder Head.>



4) Remove the plug and filter from the front camshaft cap as necessary.



(A) Plug (PT 1/8)
(B) Plug (PT 1/16)
(C) Plug (M16 × 1.5)
(D) Filter

D: ASSEMBLY

1) Install the valve spring and valve.
(1) Set the cylinder head on ST.

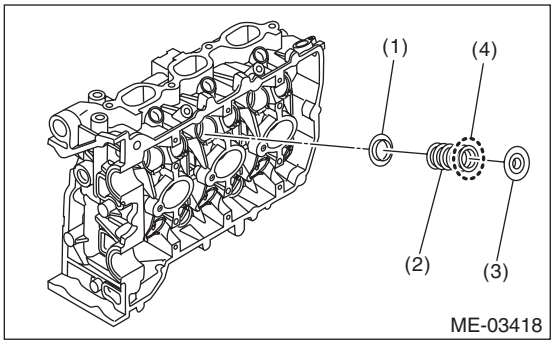
ST 18250AA010 CYLINDER HEAD TABLE

(2) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

(3) Install the valve spring and retainer.

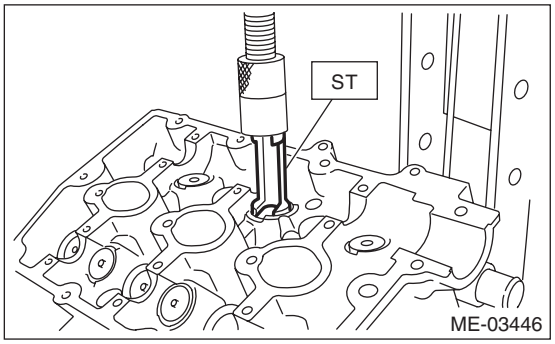
NOTE:
• Be sure to install the valve spring with its close-coiled end facing the seat on cylinder head.
• Install the valve spring with the painted side facing to retainer.



(1) Seat
(2) Valve spring
(3) Retainer
(4) Painted face

(4) Set the ST on valve spring.

ST 499718000 VALVE SPRING REMOVER

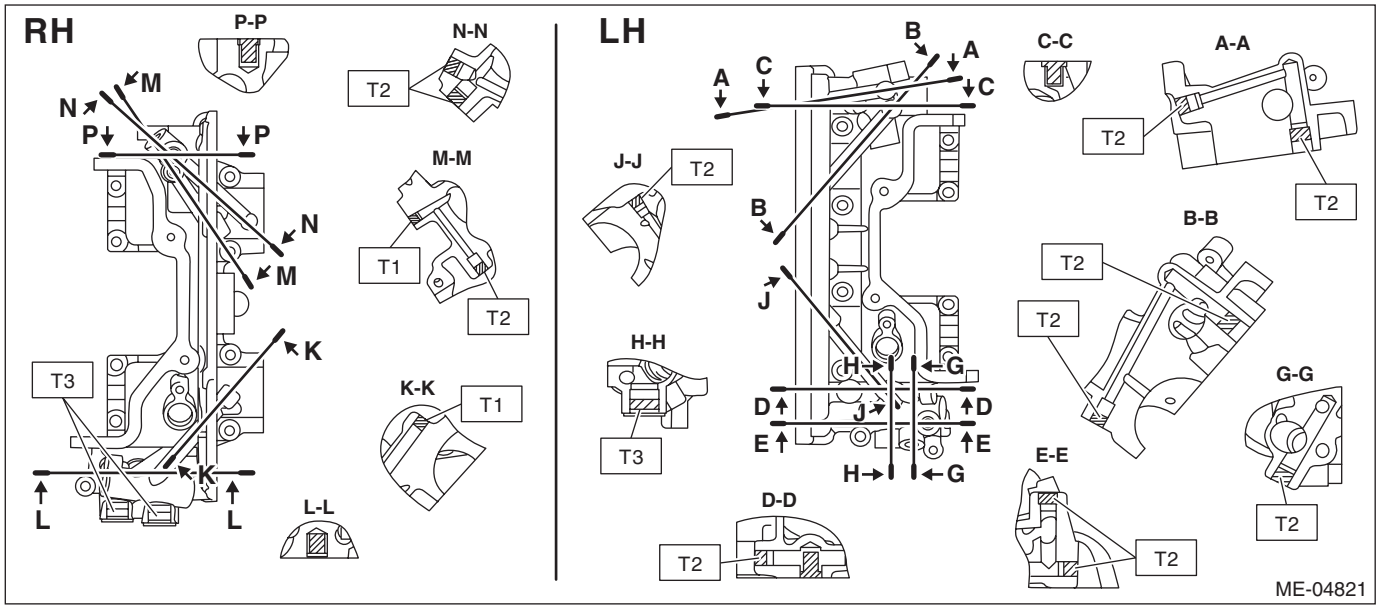


(5) Compress the valve spring and fit the valve spring retainer key.
(6) After installing, tap the valve spring retainers lightly with a wooden hammer for better seating.

2) Apply oil to the surface of valve lifter.
3) Install the valve lifter.

4) Install the plug and filter to the front camshaft cap as necessary.

Tightening torque:
T1: 9 N·m (0.9 kgf-m, 6.6 ft-lb)
T2: 17 N·m (1.7 kgf-m, 12.5 ft-lb)
T3: 23 N·m (2.3 kgf-m, 17.0 ft-lb)



E: INSPECTION

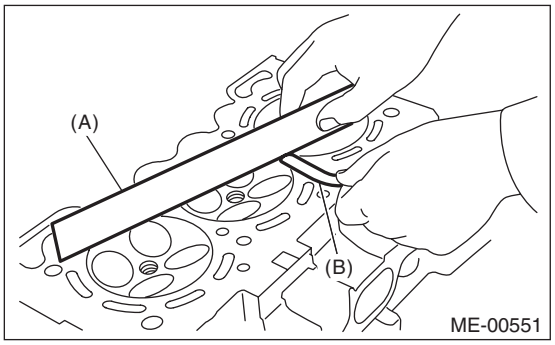
1. CYLINDER HEAD

1) Make sure that there are no cracks or other damages. Perform visual check, and use liquid penetrant tester on the important sections. Check that there are no marks of gas leaking or water leaking on gasket installing surface.
2) Set the cylinder head on ST.
ST 18250AA010 CYLINDER HEAD TABLE
3) Check for warpage at mating surface between the cylinder block and cylinder head using a straight edge (A) and thickness gauge (B). If the warpage exceeds limit, replace the cylinder head.

Warping limit:
0.020 mm (0.0008 in)

Standard height of cylinder head:
124±0.05 mm (4.88±0.0020 in)

NOTE:
Uneven torque for the cylinder head bolts can cause warpage. When reinstalling, pay special attention to the torque so as to tighten evenly.

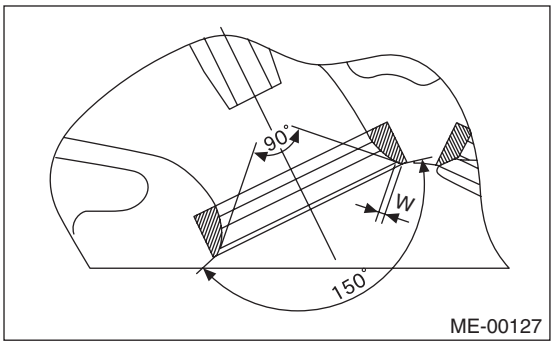


2. VALVE SEAT

Inspect the intake and exhaust valve seats, and correct the contact surfaces with a valve seat cutter if they are defective or when valve guides are replaced.

Contacting width of valve seat W:

Standard
Intake
1.0 mm (0.039 in)
Exhaust
1.5 mm (0.059 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and valve stem. The clearance can be checked by measuring respectively the outer diameter of valve stem with a micrometer and the inner diameter of valve guide with a caliper gauge.

Clearance between the valve guide and valve stem:

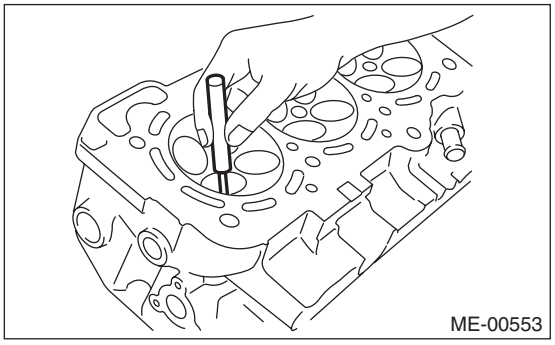
Standard
Intake
0.030 — 0.057 mm (0.0012 — 0.0022 in)
Exhaust
0.040 — 0.067 mm (0.0016 — 0.0026 in)
2) If the clearance between valve guide and valve stem exceeds the standard, replace the valve guide or valve itself, whichever shows the greater amount of wear or damage. See the following procedure for valve guide replacement.

Valve guide inner diameter:
5.500 — 5.512 mm (0.2165 — 0.2170 in)

Valve stem outer diameters:
Intake
5.455 — 5.470 mm (0.2148 — 0.2154 in)
Exhaust
5.445 — 5.460 mm (0.2144 — 0.2150 in)
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.

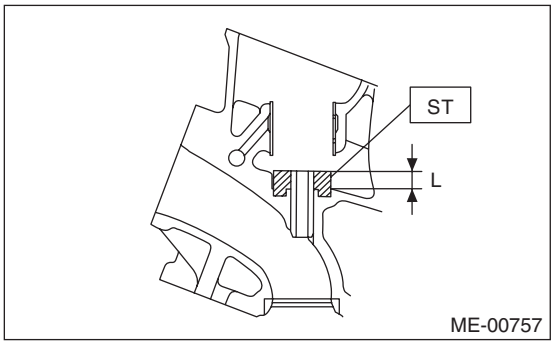
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 18250AA010 CYLINDER HEAD TABLE
ST2 499765700 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place the ST as shown in the figure.

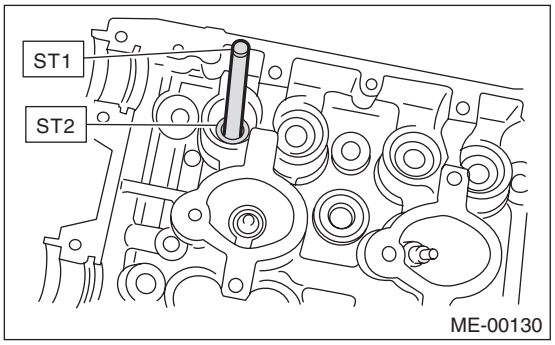
ST 18251AA050 VALVE GUIDE ADJUSTER (INTAKE SIDE)
ST 18251AA060 VALVE GUIDE ADJUSTER (EXHAUST SIDE)



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inner surface of valve guide holes in cylinder head.

(5) Put a new valve guide, coated with sufficient oil, in the cylinder head, and insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499765700 VALVE GUIDE REMOVER
ST2 18251AA050 VALVE GUIDE ADJUSTER (INTAKE SIDE)
ST2 18251AA060 VALVE GUIDE ADJUSTER (EXHAUST SIDE)



(6) Check the valve guide protrusion amount "L".

Valve guide protrusion amount L:
Intake
8.6 — 9.0 mm (0.3386 — 0.3543 in)
Exhaust
10.7 — 11.1 mm (0.4213 — 0.4370 in)

(7) Ream the inside of valve guide using ST. Put the ST in valve guide, and rotate the ST slowly clockwise while pushing it lightly. Bring the ST back while rotating it clockwise.

ST 499765900 VALVE GUIDE REAMER

NOTE:
- Apply engine oil to the ST when reaming.
- If the inner surface of valve guide is damaged, the edge of ST should be slightly ground with oil stone.
- If the inner surface of valve guide becomes lustrous and the ST does not chip, use a new ST or remedy the ST.

(8) After reaming, clean the valve guide to remove chips.

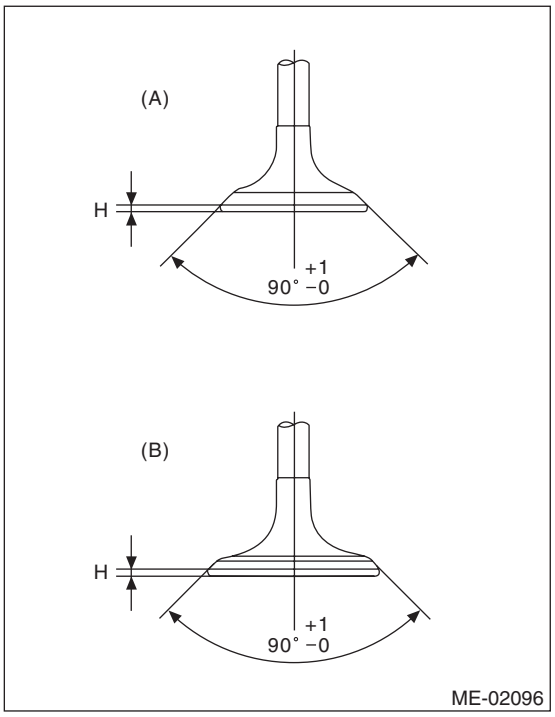
(9) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Check the flange and stem of the valve, and replace the valve with new one if damaged, worn, or deformed, “H” exceeds the standard, or if there is uneven wear.

Head edge thickness H:

Standard
Intake (A)
1.0 mm (0.039 in)
Exhaust (B)
1.2 mm (0.047 in)



2) Put a small amount of grinding compound on the valve seat surface, and lap the valve and valve seat surface. Install a new valve oil seal after lapping.

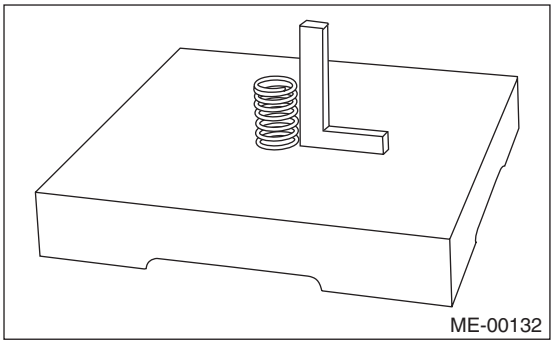
NOTE:
It is possible to differentiate between the intake valve and the exhaust valve by their overall length.

Valve overall length:
Intake
103.5 mm (4.075 in)
Exhaust
103.2 mm (4.063 in)

5. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within the standard value presented in the table.
2) To measure the squareness of the valve spring, stand the valve spring on a surface plate and measure its deflection at the top of the spring using a try square.

Free length	mm (in)	49.06 (1.9315)
Tension/spring height N (kgf, lb)/mm (in)	Set	182 — 210 (18.6 — 21.4, 40.9 — 47.2) /31.0 (1.220 in)
	Lift	316 — 350 (32.2 — 35.7, 71.0 — 78.7) /21.0 (0.827 in)
Squareness		2.5°, 2.1 mm (0.083 in) or less



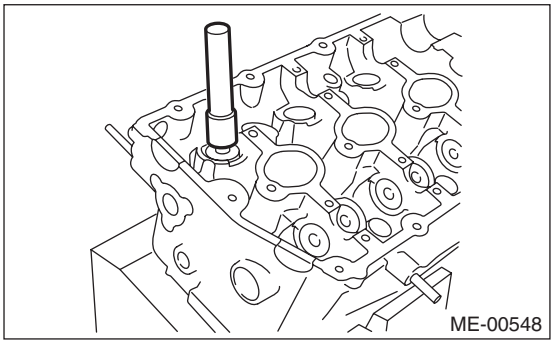
6. INTAKE AND EXHAUST VALVE OIL SEAL

1) For the following, replace the oil seal with a new part.
- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of valve and valve seat.
- When replacing the valve guide.

2) Set the cylinder head on ST1.
3) Using the ST2, press in the oil seal.

ST1 18250AA010 CYLINDER HEAD TABLE
ST2 18261AA010 VALVE OIL SEAL GUIDE

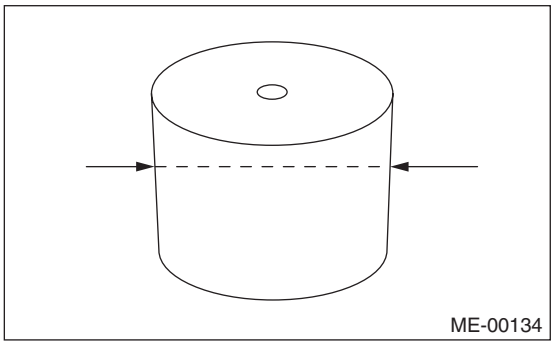
NOTE:
- Apply engine oil to oil seal before press-fitting.
- When press-fitting the oil seal, do not use a hammer to strike in.



7. VALVE LIFTER

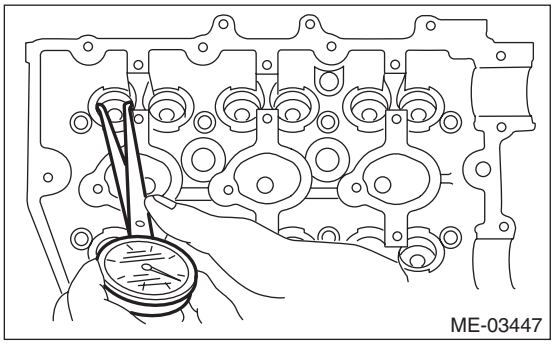
1) Check the valve lifter visually.
2) Measure the outer diameter of valve lifter.

Outer diameter of valve lifter:
32.959 — 32.975 mm (1.2976 — 1.2982 in)



3) Measure the inner diameter of valve lifter hole of cylinder head.

Inner diameter of valve lifter hole:
32.994 — 33.016 mm (1.2990 — 1.2998 in)



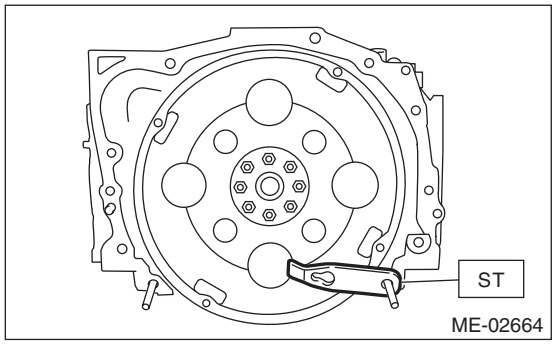
4) Check the clearance between valve lifter and valve lifter hole. The clearance can be checked by measuring the outer diameter of valve lifter and the inner diameter of valve lifter hole. If it exceeds the standard or offset wear occurs, replace the cylinder head.

Clearance between the valve lifter and valve lifter hole:
Standard
0.019 — 0.057 mm (0.0007 — 0.0022 in)

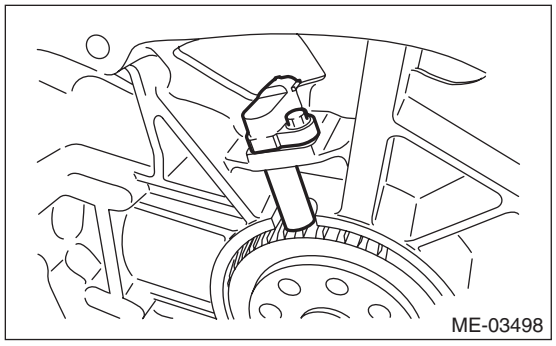
20.Cylinder Block

A: REMOVAL

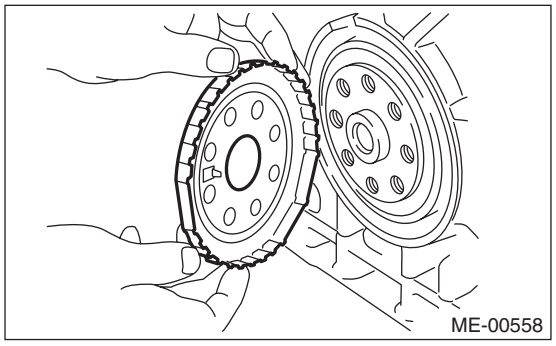
NOTE:
Before conducting this procedure, drain the engine oil completely.
1) Remove the engine from vehicle. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
3) Remove the chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-55, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. <Ref. to ME(H6DO)-74, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H6DO)-75, REMOVAL, Crank Sprocket.>
7) Remove the camshaft. <Ref. to ME(H6DO)-76, REMOVAL, Camshaft.>
8) Remove the cylinder head. <Ref. to ME(H6DO)-83, REMOVAL, Cylinder Head.>
9) Use the ST to lock the crankshaft, and remove the drive plate.
ST 498497100 CRANKSHAFT STOPPER



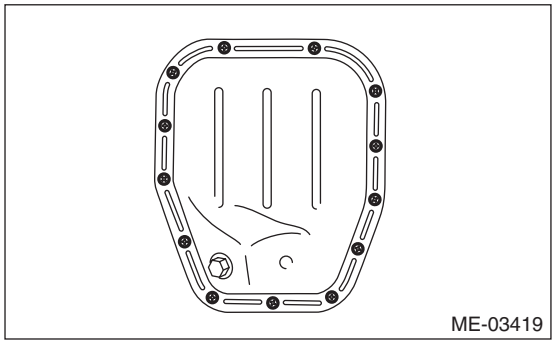
10) Remove the crankshaft position sensor.



11) Remove the crankshaft position sensor plate.

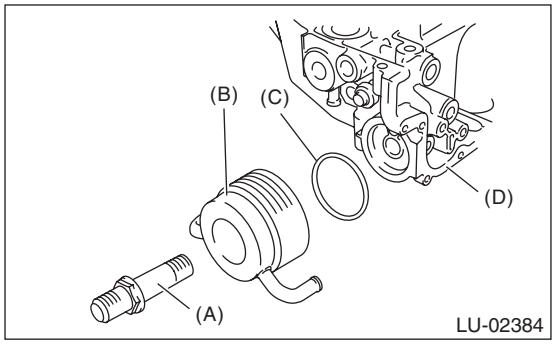


12) Rotate the engine to set oil pan upper.
13) Remove the bolts which secure oil pan lower to oil pan upper.



14) Insert an oil pan cutter blade into the gap between oil pan upper and oil pan lower, and remove the oil pan lower.

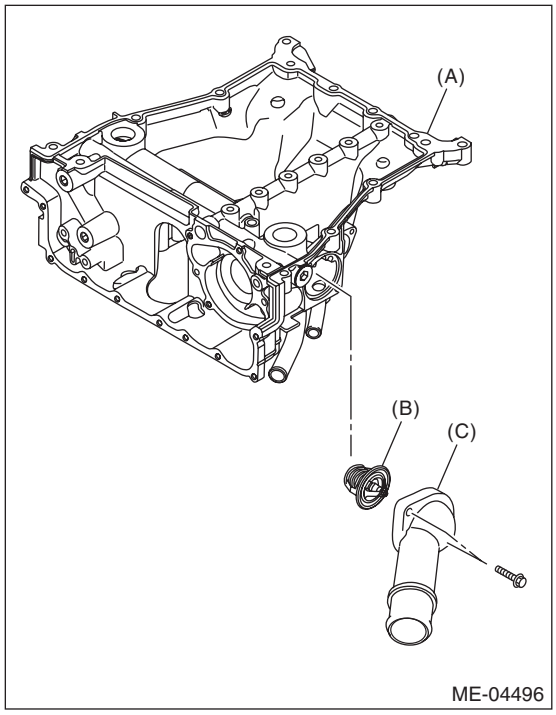
CAUTION:
Do not use a screwdriver or similar tools in place of oil pan cutter.
15) Remove the oil cooler connector and remove the oil cooler.



(A) Oil cooler connector
(B) Oil cooler
(C) O-ring
(D) Oil pan upper

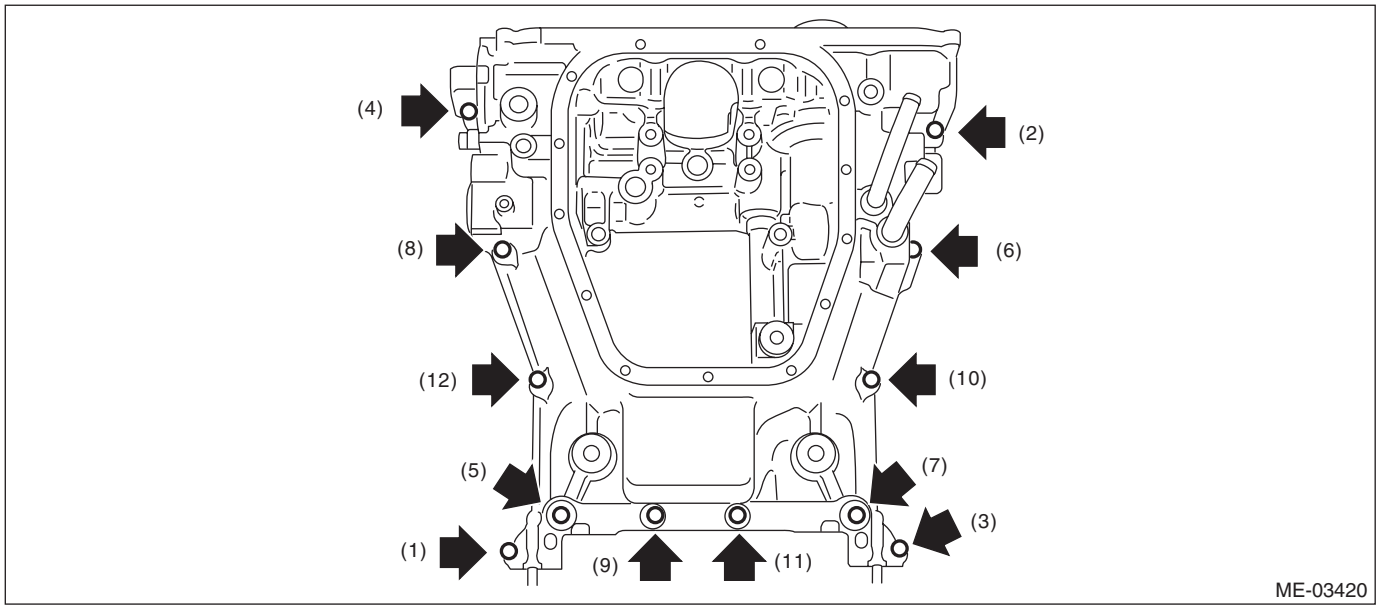
16) Remove the oil pump. <Ref. to LU(H6DO)-13, REMOVAL, Oil Pump.>

17) Remove the thermostat cover, and then remove the thermostat.

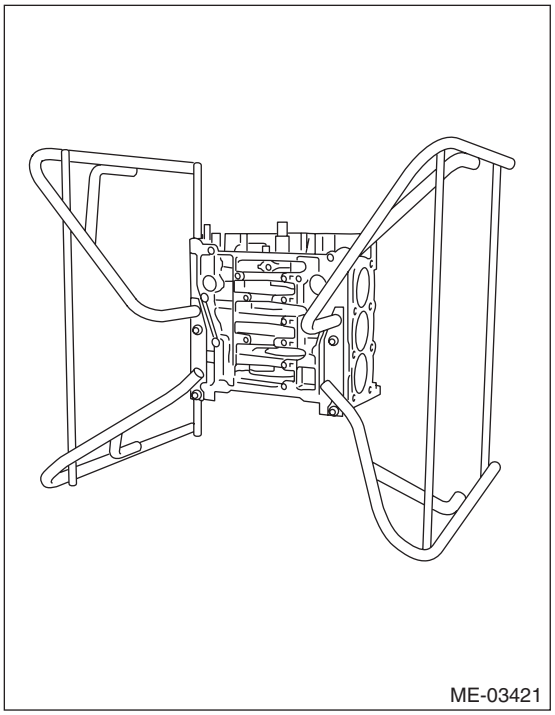


(A) Oil pan upper
(B) Thermostat
(C) Thermostat cover

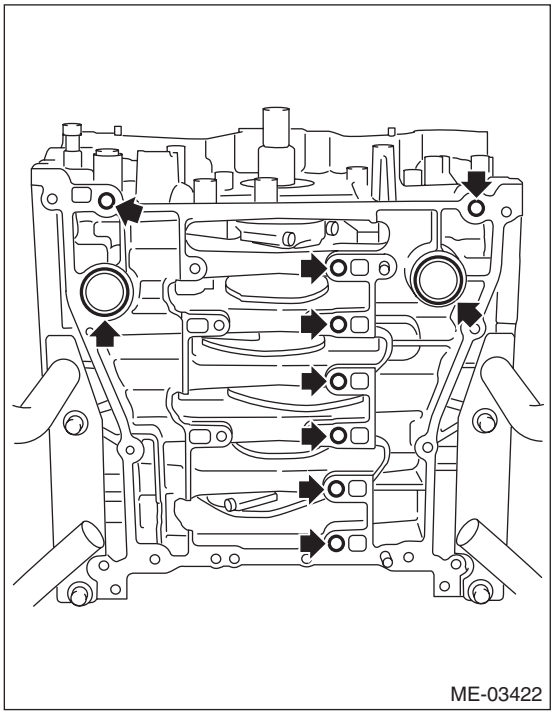
18) Remove the oil pump cover.



19) Face the front of the engine up, standing the engine on one end.


ME-03421

20) Remove ten O-rings from the underside of the cylinder block.


ME-03422

21) Mark the direction of front and the number of connecting rod caps.

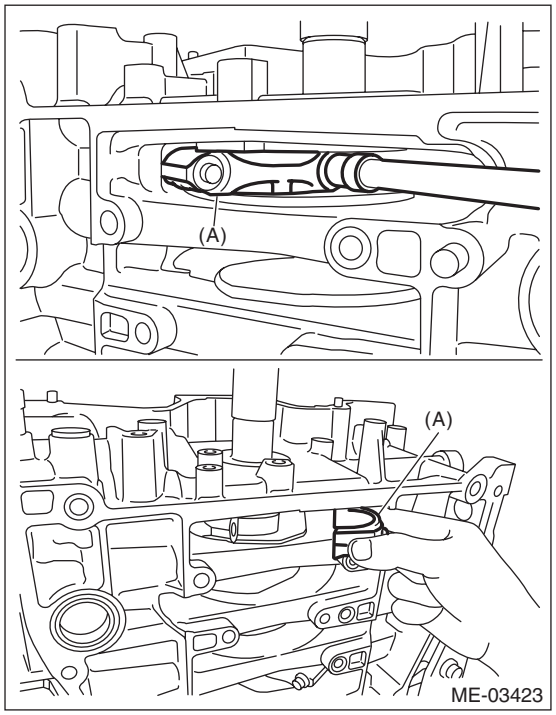
22) Remove the #1 and #4 connecting rod caps and pistons from the cylinder block.

NOTE:
• Use 3/8 inch (9.5 sq.) for the extension and TORX® socket (E12).
• After removing the two connecting rod connection bolts, turning the crankshaft (ST) counterclockwise will remove the connecting rod cap.
• Mark each connecting rod cap and piston with connecting rod cap number and piston number.
• The removal of all connecting rod caps and pistons are performed in three separate steps. First, remove the #1 and #4 connecting rod caps and pistons are simultaneously, then the #2 and #5 connecting rod caps and pistons simultaneously, and then the #3 and #6 connecting rod caps and pistons simultaneously.

(1) Using the ST, turn the crankshaft and set the #1 piston at the mid point between TDC and BDC.

ST 18252AA000 CRANKSHAFT SOCKET

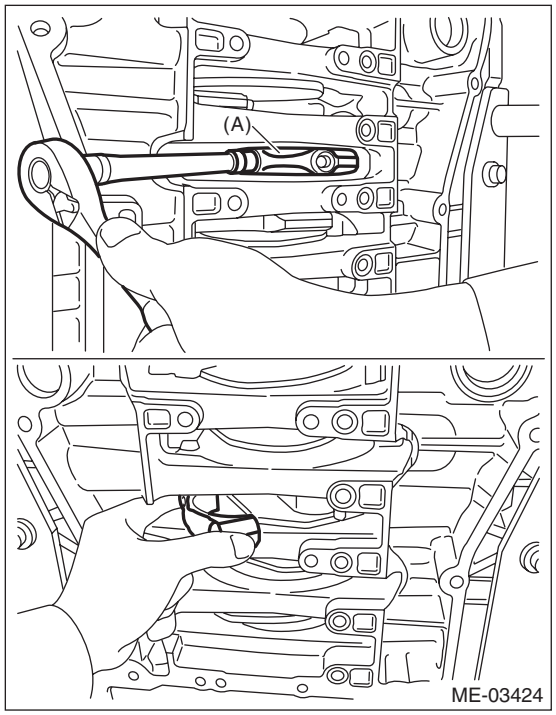
(2) Remove the two #1 connecting rod cap connection bolts, and remove the connecting rod cap.



ME-03423

(A) #1 connecting rod cap

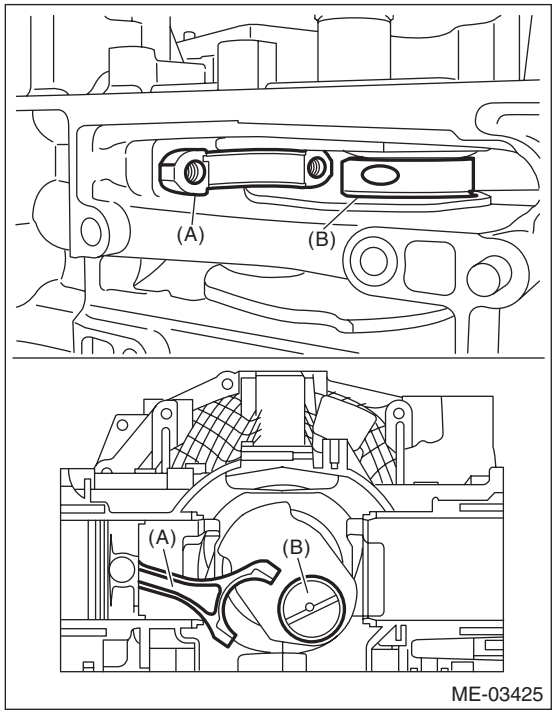
(3) Remove the two #4 connecting rod cap connection bolts, and remove the connecting rod cap.



(A) #4 connecting rod cap

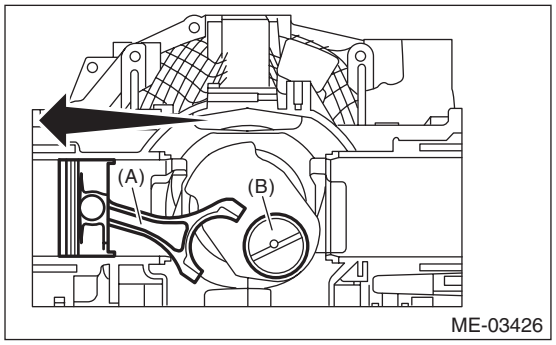
(4) Using the ST, turn the crankshaft and separate the positions of the crank pin and the large end of the #1 connecting rod.

ST 18252AA000 CRANKSHAFT SOCKET



(A) #1 connecting rod
(B) Crank pin

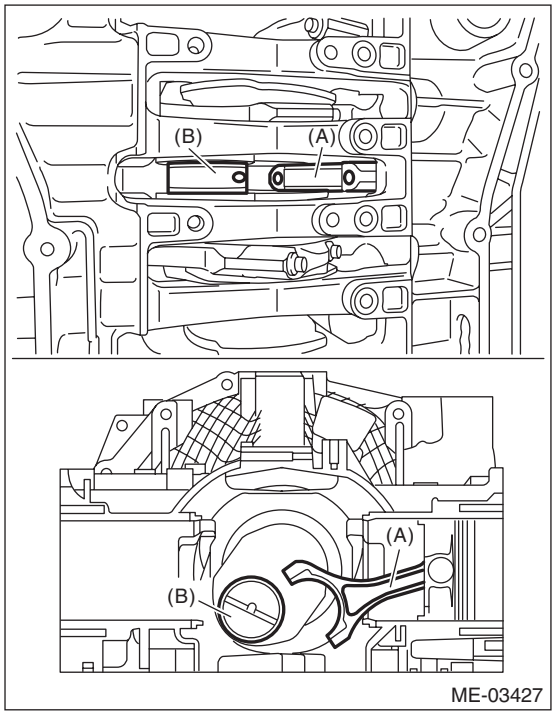
(5) Push the #1 connecting rod in the direction of the arrow, and remove the #1 piston and connecting rod from the cylinder block.



(A) #1 connecting rod
(B) Crank pin

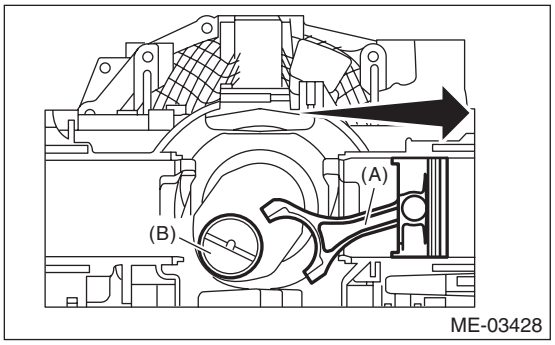
(6) Using the ST, turn the crankshaft and separate the positions of the crank pin and the large end of the #4 connecting rod.

ST 18252AA000 CRANKSHAFT SOCKET



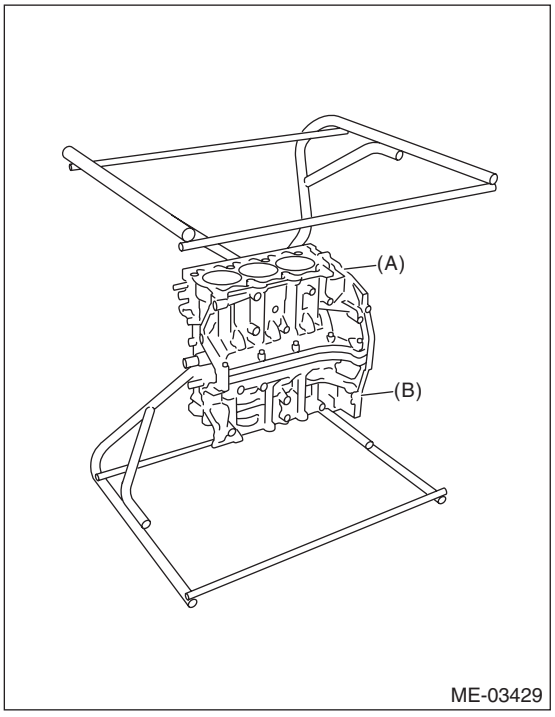
(A) #4 connecting rod
(B) Crank pin

(7) Push the #4 connecting rod in the direction of the arrow, and remove the #4 piston and connecting rod from the cylinder block.



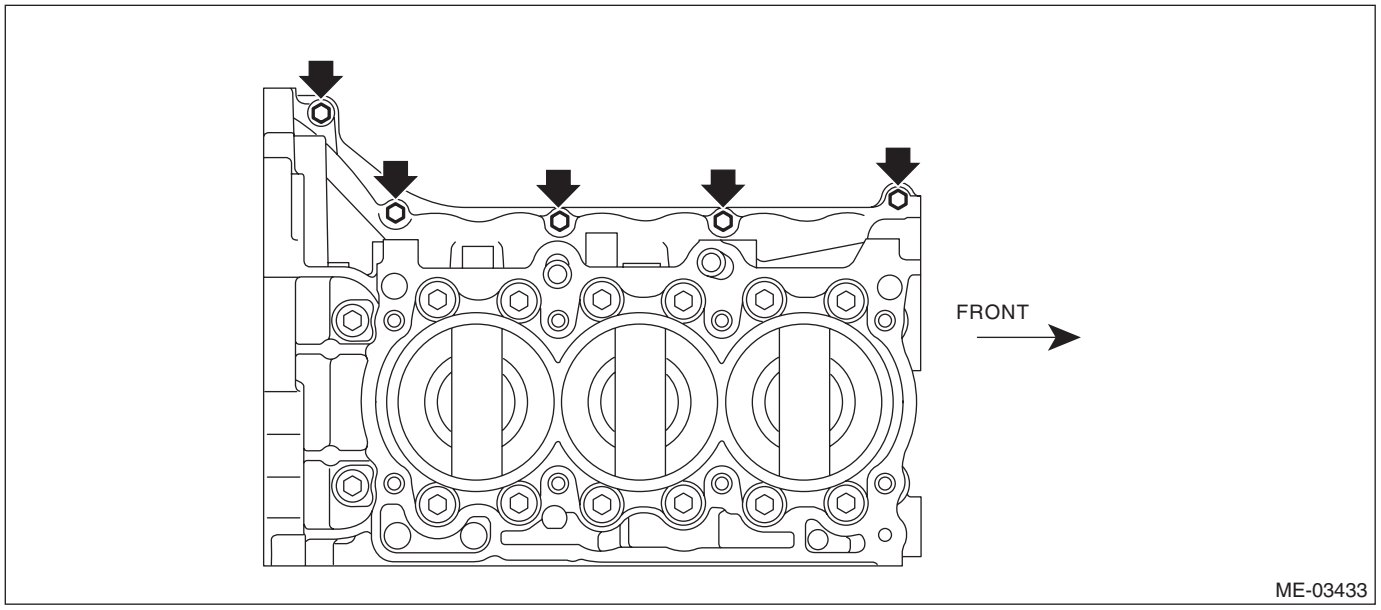
(A) #4 connecting rod
(B) Crank pin

23) Remove the #2 and #5 connecting rods and pistons from the cylinder block in the same manner.
ST 18252AA000 CRANKSHAFT SOCKET
24) Remove the #3 and #6 connecting rods and pistons from the cylinder block in the same manner.
ST 18252AA000 CRANKSHAFT SOCKET
25) Face the cylinder block (RH) up.



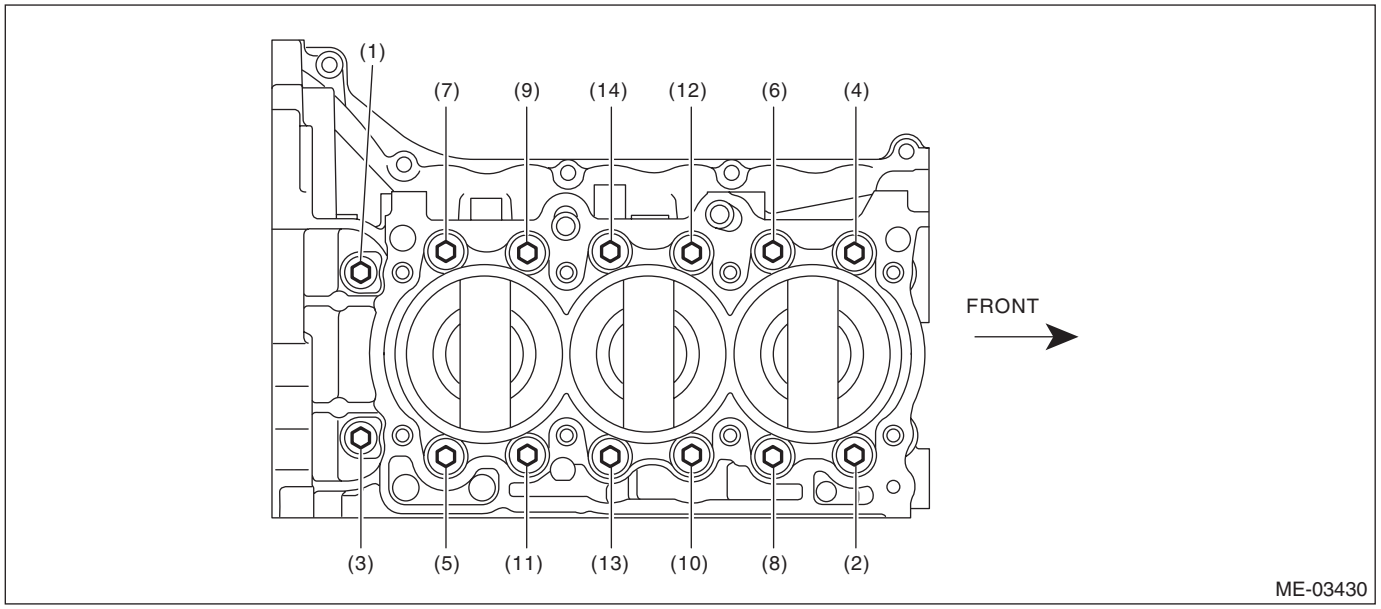
(A) Cylinder block (RH)
(B) Cylinder block (LH)

26) Remove the upper bolt.



27) Loosen the cylinder block bolts in the order indicated in the figure, and separate cylinder block (RH) and (LH).

NOTE:
Confirm that the crankshaft is remaining in the cylinder block (LH).
If the cylinder block (RH) is lifted carelessly when separating, the crankshaft may stick to cylinder block (RH), then fall off.



28) Remove the rear oil seal.
29) Remove the crankshaft from cylinder block (LH).
30) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:
- Do not confuse the combination of crankshaft bearings.
- Press the bearing at the end opposite to locking lip.

B: INSTALLATION

1) After setting the cylinder block to ST, install the crankshaft bearing.
ST 18232AA000 ENGINE STAND

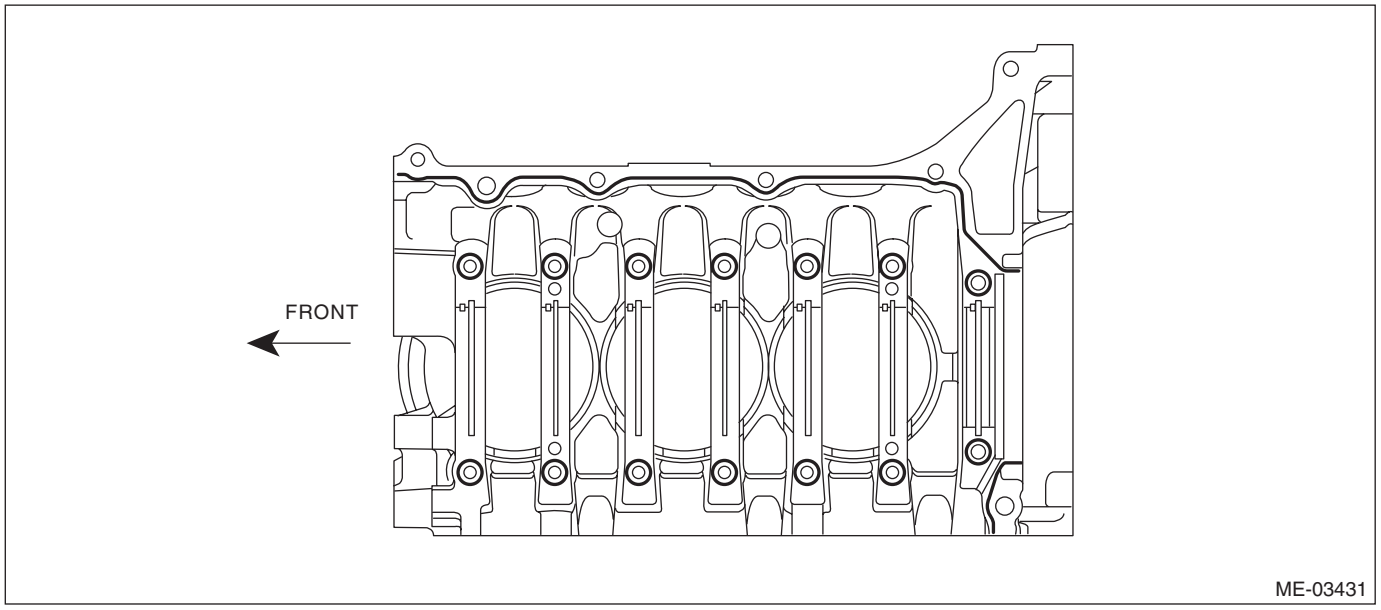
NOTE:
Apply a coat of engine oil to the bearing and crankshaft journal.
2) Mount the crankshaft in cylinder block (LH).
3) Apply liquid gasket to the mating surfaces of cylinder block (RH).

CAUTION:
Do not allow liquid gasket to run over into oil passages, bearing grooves, etc.

NOTE:
Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

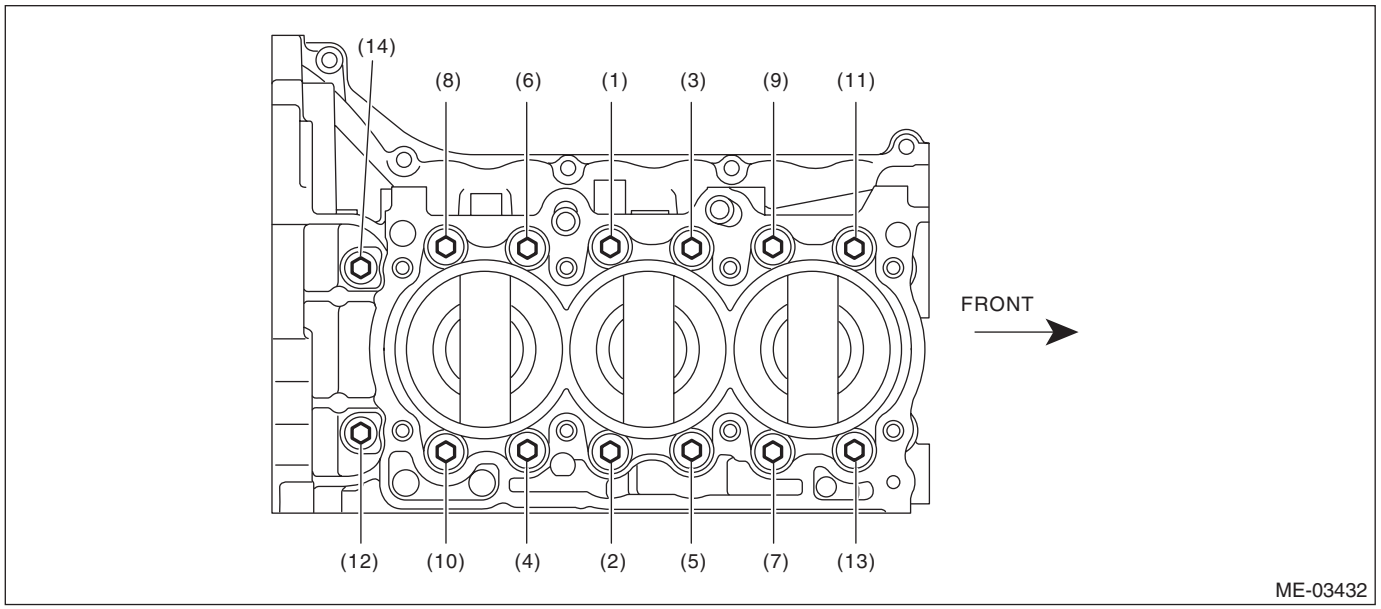
Liquid gasket applying diameter:
1.0±0.2 mm (0.039±0.008 in)



4) Attach cylinder block (RH) to cylinder block (LH).
5) Apply a coat of engine oil to the washer and bolt thread.

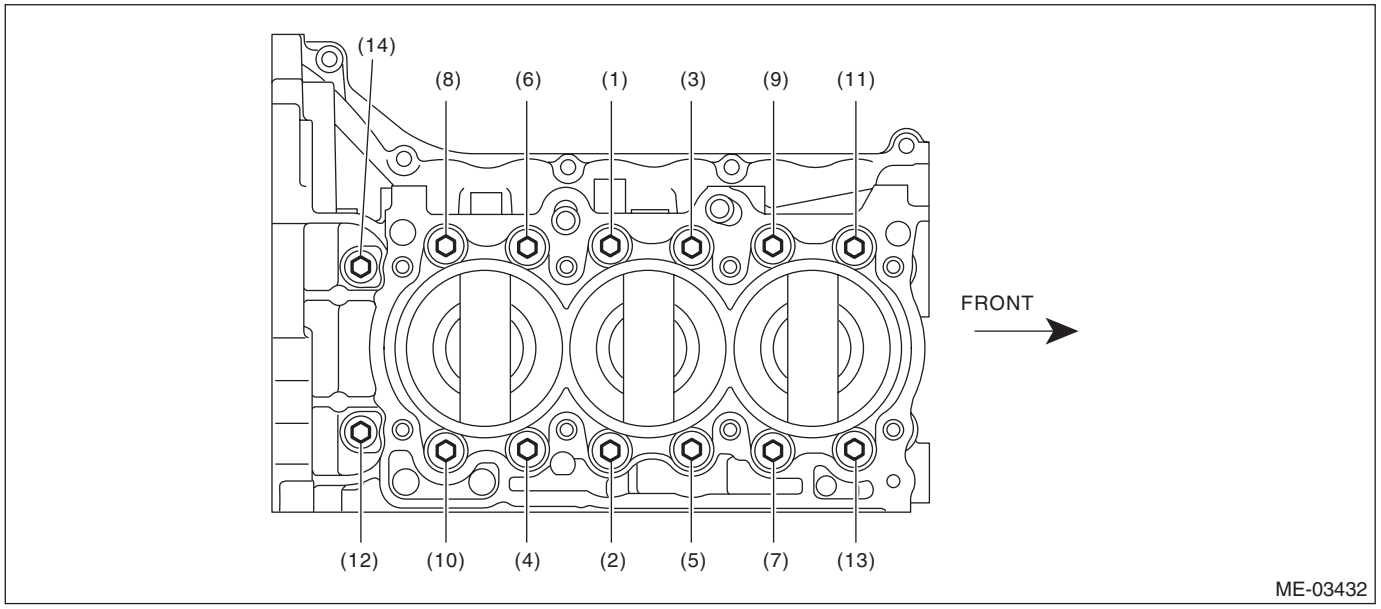
6) Tighten all bolts in the numerical order as shown in the figure.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)

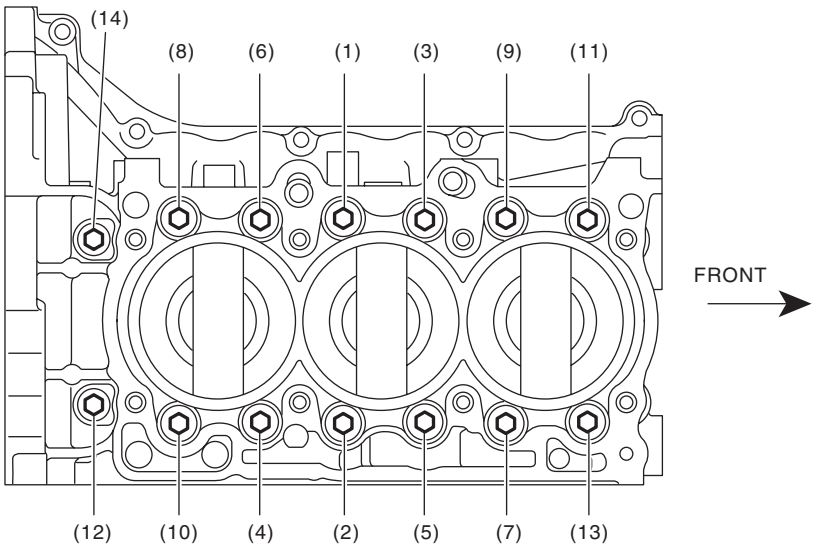


7) Retighten all bolts in the numerical order as shown in the figure.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



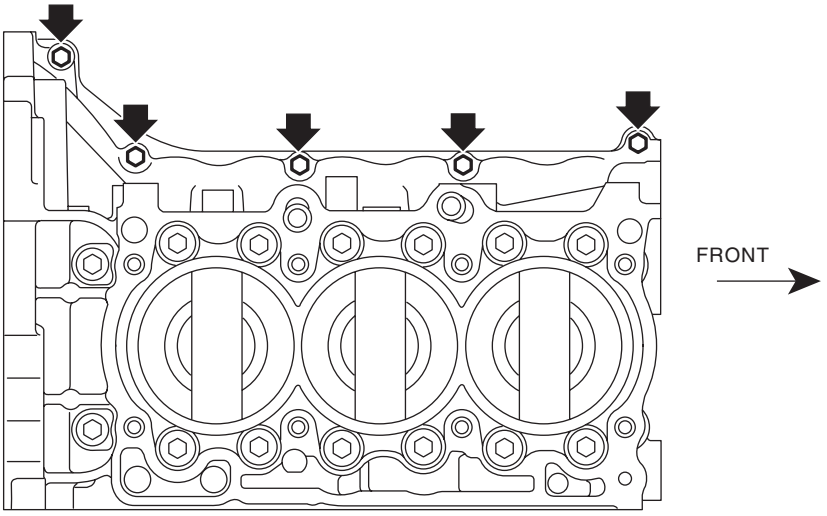
8) Tighten all bolts by 90° in numerical order as shown in the figure.



9) Install the upper bolt to cylinder block.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

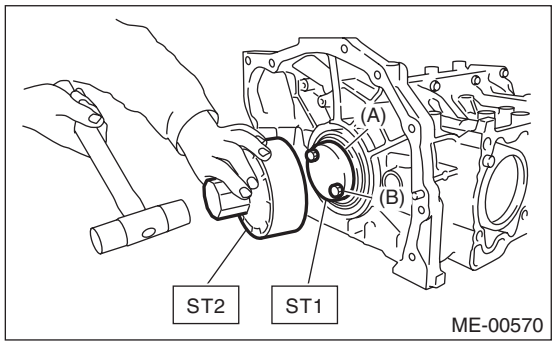
NOTE:
Remove any liquid gasket squeezed out onto the seal surface between the chain cover and oil pan upper, after tightening the cylinder block connecting bolts.



10) Apply a coat of engine oil to the oil seal inner periphery and outer periphery, and install the rear oil seal using ST1 and ST2.

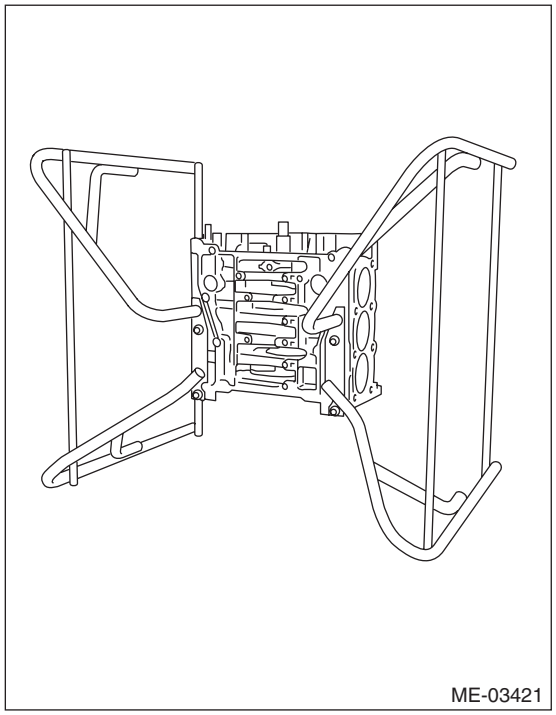
NOTE:
Use a new rear oil seal.

ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER

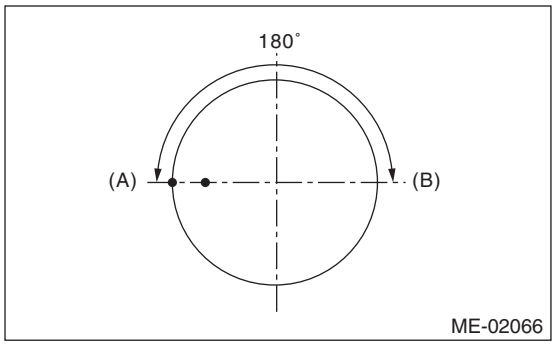


(A) Rear oil seal
(B) Drive plate installation bolt

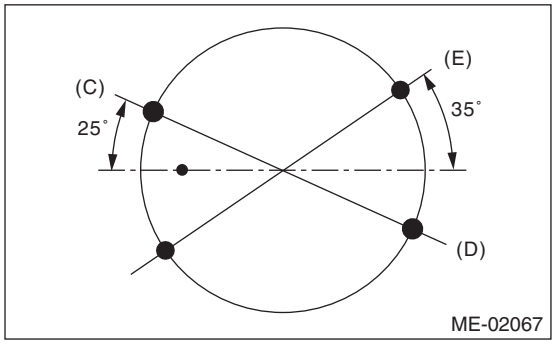
11) Face the front of the engine up, standing the engine on one end.



12) Attach the piston ring and oil ring to the piston.
(1) Position the top ring gap at (A) in the figure.
(2) Position the second ring gap at (B).

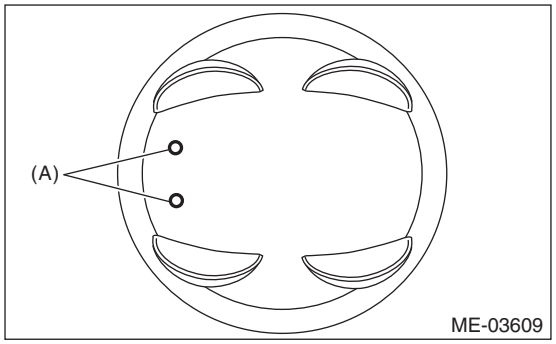


(3) Position the upper rail gap at (C) in the figure.
(4) Position the expander gap at (D) in the figure.
(5) Position the lower rail gap at (E) in the figure.



CAUTION:
• Make sure ring gaps do not face the same direction.
• Make sure ring gaps are not within the piston skirt area.
• Assemble so that the stamp mark N faces towards the top of the piston.

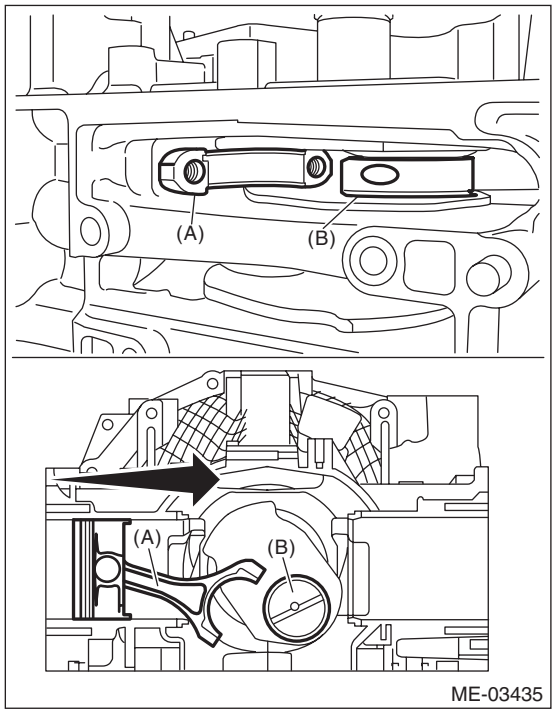
13) Install the #1 piston and connecting rod to the cylinder block.
(1) Apply engine oil to the outer circumference of the piston and in the cylinder block.
(2) Face the front mark of piston (A) towards the front of the engine, and set the piston to the ST.



(3) Using ST, press-fit the piston into cylinder block.

NOTE:
When inserting the piston into the cylinder block, perform according to the items listed below.
• Insert while lightly tapping the top of the piston with the handle of a plastic hammer.
• Insert while making sure that the large end of the connecting rod does not scratch the cylinder liner.
• Insert while continually making sure that the large end of the connecting rod does not touch the crankshaft.

ST 398744300 PISTON GUIDE



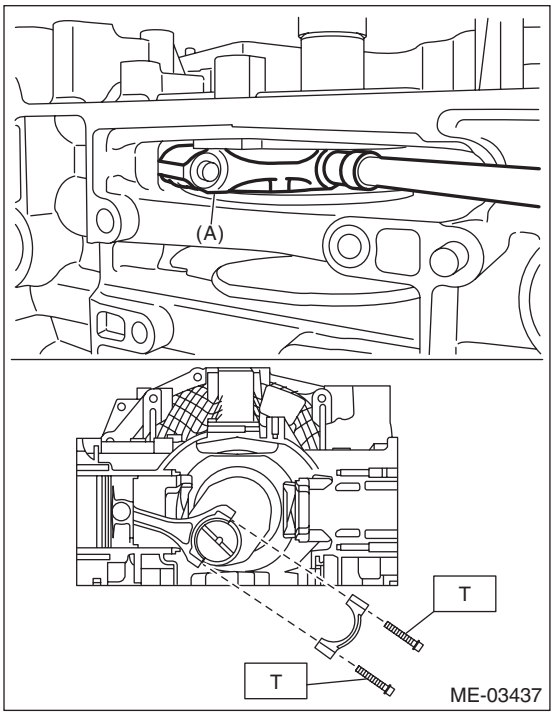
(A) #1 connecting rod
(B) Crank pin

(4) Using the ST, turn the crankshaft and match the positions of the crank pin and the large end of the connecting rod.

ST 18252AA000 CRANKSHAFT SOCKET

(5) Install the connecting rod cap.

Tightening torque:
60 N·m (6.1 kgf-m, 44.3 ft-lb)

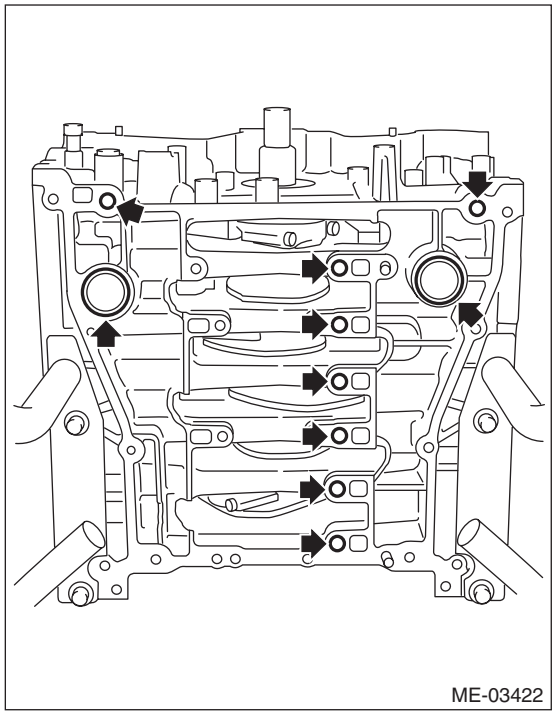


(A) #1 connecting rod

14) In the same procedures as for the #1 piston, install the piston and connecting rods to the cylinder block, in the order of #2, #3, #4, #5 and #6.

15) Install the O-ring to the underside of the cylinder block.

NOTE:
Use new O-rings.

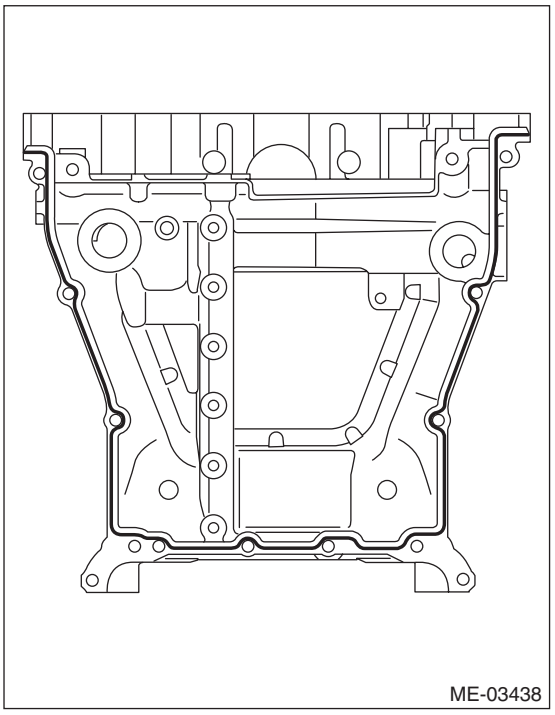


16) Apply liquid gasket to the mating surface of oil pan upper.

NOTE:
Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

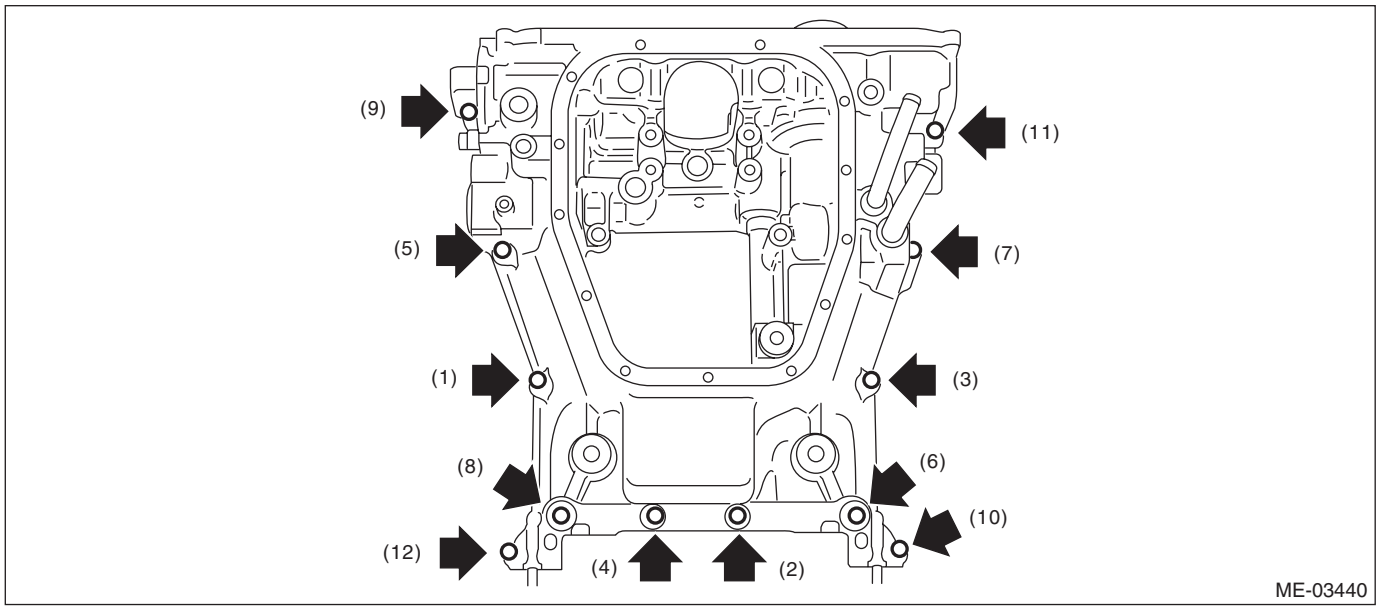
Liquid gasket applying diameter:
5.0±1.0 mm (0.20±0.04 in)



17) Temporarily tighten the oil pan upper.

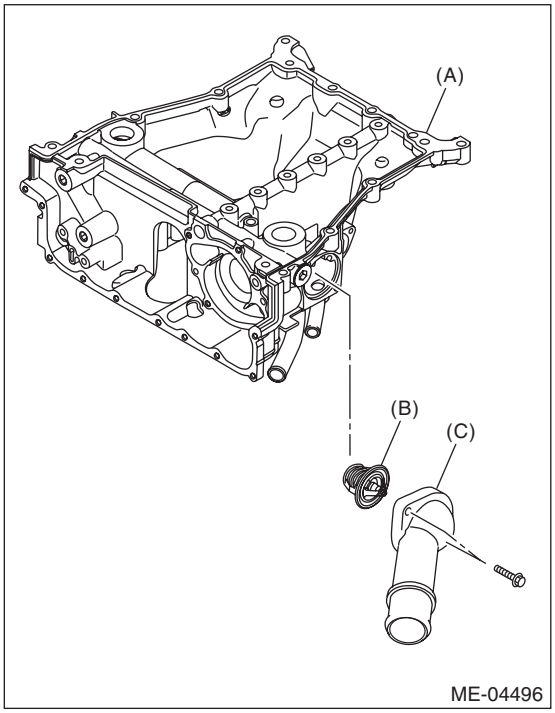
18) Tighten the oil pan upper installing bolts in the numerical order as shown in the figure.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



19) Install the thermostat and thermostat cover.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

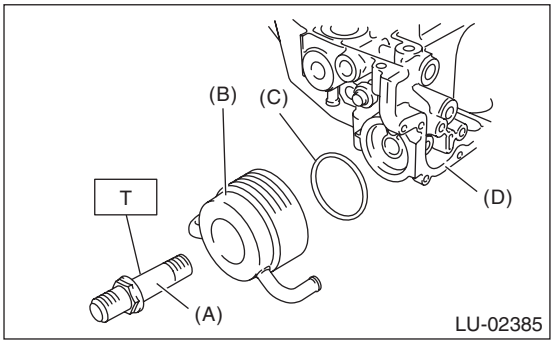


(A) Oil pan upper
(B) Thermostat
(C) Thermostat cover

20) Install the oil pump. <Ref. to LU(H6DO)-13, INSTALLATION, Oil Pump.>
21) Tighten the oil cooler connector to install the oil cooler to the oil pan upper.

Tightening torque:
54 N·m (5.5 kgf-m, 39.8 ft-lb)

NOTE:
Use new O-rings.



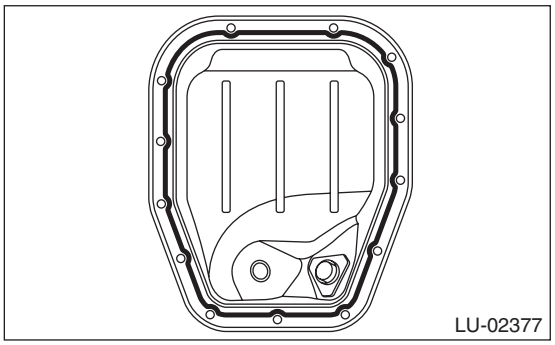
(A) Oil cooler connector
(B) Oil cooler
(C) O-ring
(D) Oil pan upper

22) Apply liquid gasket to the matching surface of oil pan lower.

NOTE:
Install within 5 min. after applying liquid gasket.

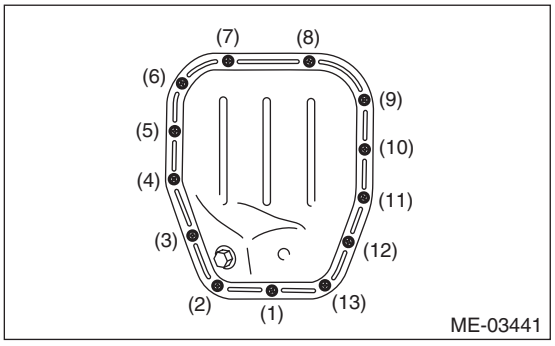
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Liquid gasket applying diameter:
5.0±1.0 mm (0.20±0.04 in)

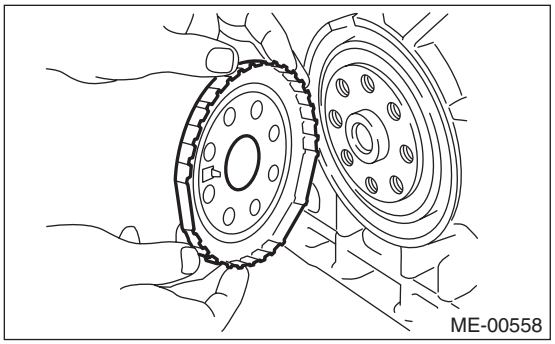


23) Tighten the oil pan lower installing bolts in the numerical order as shown in the figure.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

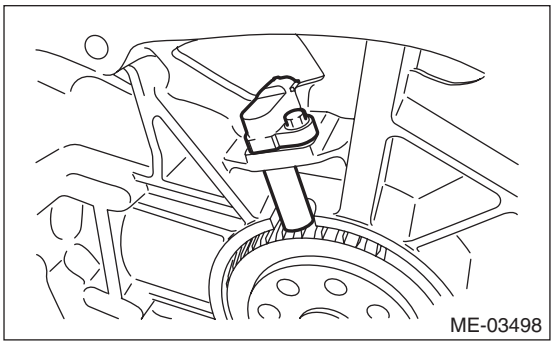


24) Install the crankshaft position sensor plate.



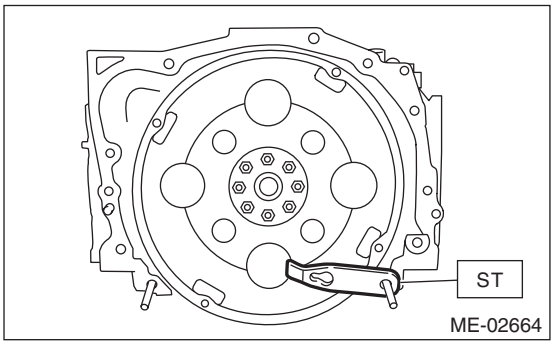
25) Install the crankshaft position sensor.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



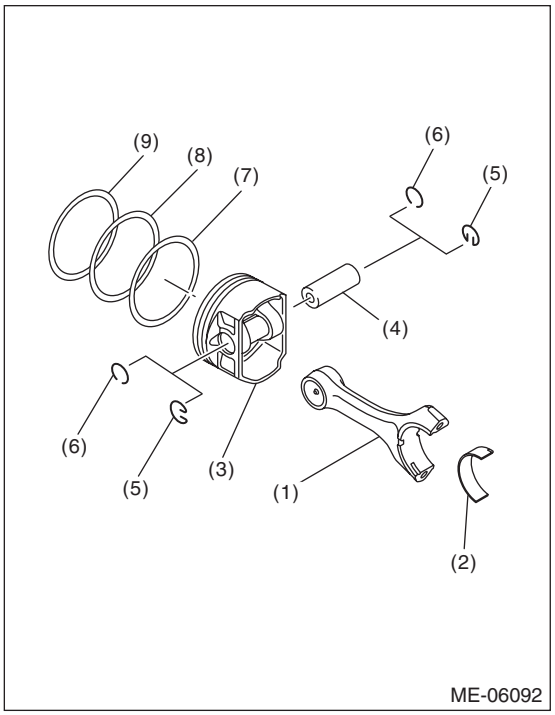
26) Using the ST, install the drive plate.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
90 N·m (9.2 kgf-m, 66.4 ft-lb)



27) Install the cylinder head. <Ref. to ME(H6DO)-84, INSTALLATION, Cylinder Head.>
28) Install the camshaft. <Ref. to ME(H6DO)-77, INSTALLATION, Camshaft.>
29) Install the crank sprocket. <Ref. to ME(H6DO)-75, INSTALLATION, Crank Sprocket.>
30) Install the cam sprocket. <Ref. to ME(H6DO)-74, INSTALLATION, Cam Sprocket.>
31) Install the timing chain assembly. <Ref. to ME(H6DO)-61, INSTALLATION, Timing Chain Assembly.>
32) Install the chain cover. <Ref. to ME(H6DO)-50, INSTALLATION, Chain Cover.>
33) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
34) Install the engine to the vehicle. <Ref. to ME(H6DO)-40, INSTALLATION, Engine Assembly.>

C: DISASSEMBLY



(1) Connecting rod
(2) Connecting rod bearing
(3) Piston
(4) Piston pin
(5) Snap ring
(6) Circlip
(7) Oil ring
(8) Second ring
(9) Top ring

NOTE:
To prevent confusion of various parts, mark each part.
1) Remove the connecting rod bearing.
2) Remove the piston rings using piston ring expander.
3) Remove the oil ring by hand.

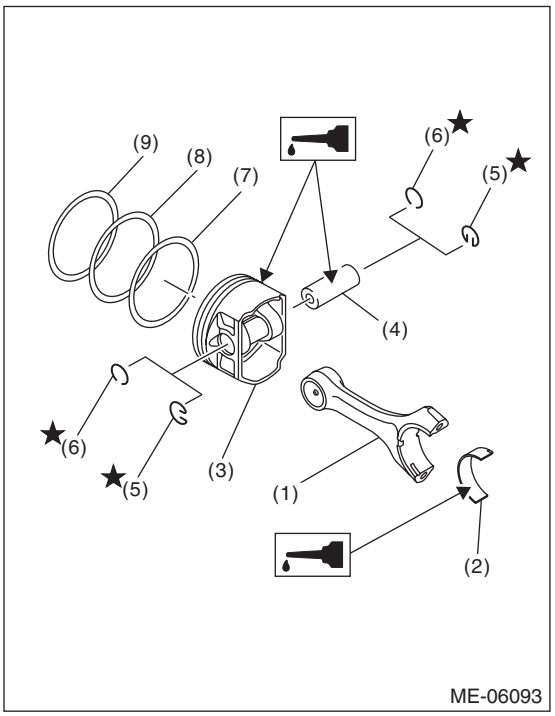
NOTE:
Arrange the removed piston rings in proper order, to prevent confusion.
4) Remove the snap ring on one end from the piston using a snap ring pliers. (Snap ring type)
5) Remove the circlip on one end from the piston using a flat tip screwdriver. (Circlip type)

NOTE:
Be careful not to damage the piston, by wrapping the tip of flat tip screwdriver with tape.
6) Remove the piston pin from the piston.
7) Separate the piston and connecting rod.

NOTE:
Mark the direction of front side to each connecting rod.
8) Remove the snap ring on other end from the piston using a snap ring pliers. (Snap ring type)
9) Remove the circlip on other end from the piston using a flat tip screwdriver. (Circlip type)

NOTE:
Be careful not to damage the piston, by wrapping the tip of flat tip screwdriver with tape.
10) Remove the plug and orifice from the cylinder block as necessary. <Ref. to ME(H6DO)-13, CYLINDER BLOCK, COMPONENT, General Description.>

D: ASSEMBLY

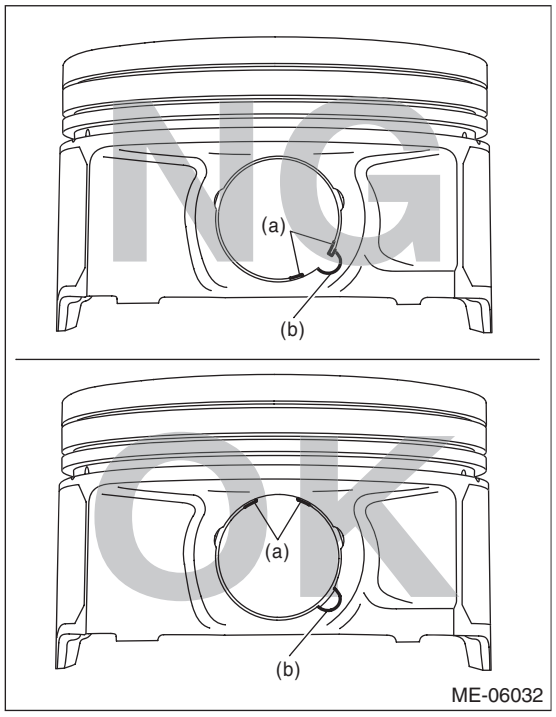


(1) Connecting rod
(2) Connecting rod bearing
(3) Piston
(4) Piston pin
(5) Snap ring
(6) Circlip
(7) Oil ring
(8) Second ring
(9) Top ring

1) Apply engine oil to the surface of the connecting rod bearing. Attach the connecting rod bearing to the connecting rod.

2) Install the circlip on one end of the piston using a flat tip screwdriver. (Circlip type)

NOTE:
- Be careful not to damage the piston, by wrapping the tip of flat tip screwdriver with tape.
- Make sure the circlip is firmly inserted into the circlip groove.
- After installing the circlip, rotate the circlip so that its end part (a) and the cutout portion of circlip groove (b) do not match.

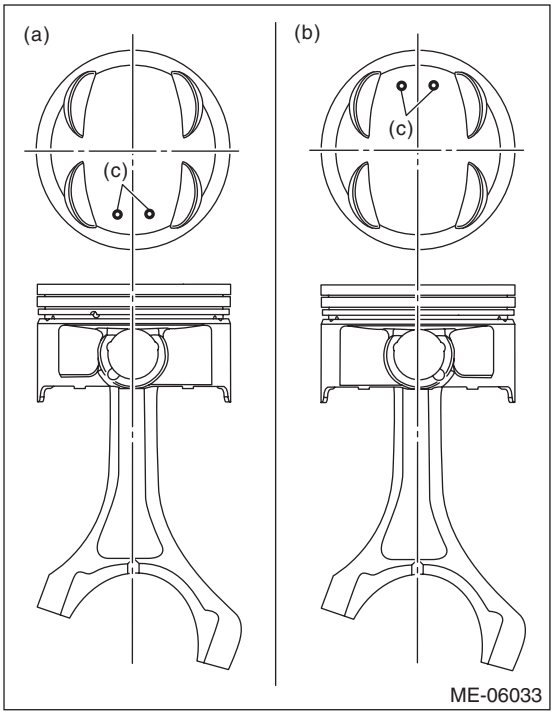


3) Install the snap ring on one end of the piston using a snap ring pliers. (Snap ring type)

NOTE:
Make sure the snap ring is firmly inserted into the snap ring groove.

4) Set the piston to the connecting rod.

NOTE:
Align the front mark of piston and the connecting rod direction correctly as shown in the figure.

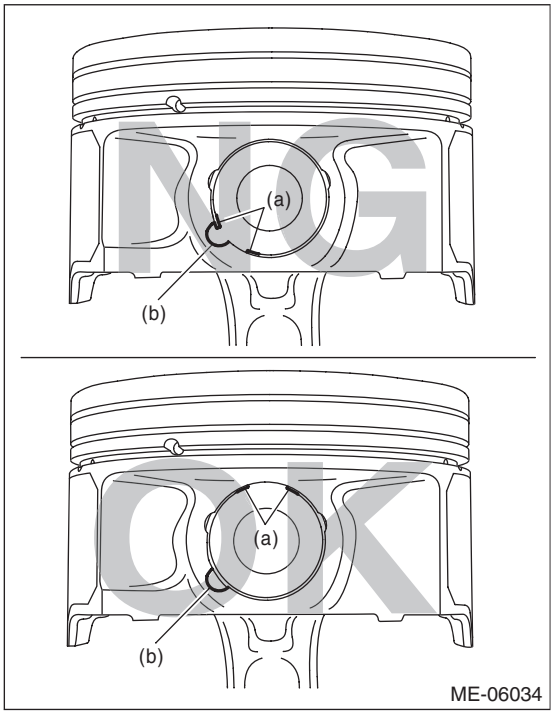


(a) RH side (#1, #3 and #5)
(b) LH side (#2, #4 and #6)
(c) Front mark

5) Apply engine oil to the piston pin, and attach the piston pin.

6) Install the circlip on the piston using a flat tip screwdriver. (Circlip type)

NOTE:
• Be careful not to damage the piston and piston pin, by wrapping the tip of flat tip screwdriver with tape.
• Make sure the circlip is firmly inserted into the circlip groove.
• After installing the circlip, rotate the circlip so that its end part (a) and the cutout portion of circlip groove (b) do not match.



7) Install the snap ring on the piston using a snap ring pliers. (Snap ring type)

NOTE:
Make sure the snap ring is firmly inserted into the snap ring groove.
8) Install the oil ring upper rail, expander and lower rail by hand.
9) Install the second ring and top ring using piston ring expander.
10) Install the plug and orifice to the cylinder block as necessary. <Ref. to ME(H6DO)-13, CYLINDER BLOCK, COMPONENT, General Description.>

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks or damage. Use liquid penetrant tester on the important sections for checking. Check that there are no marks of gas leaking or water leaking on gasket installing surface.
2) Check the oil passages for clogging.
3) Inspect the cylinder block surface that mates with cylinder head for warping by using a straight edge If the warpage exceeds limit, replace the cylinder block.

Warping limit:
0.020 mm (0.0008 in)

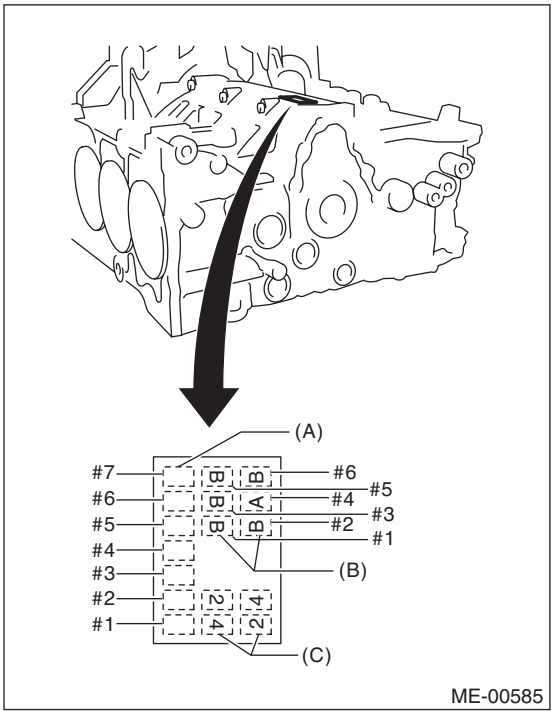
Standard height of cylinder block:
202 mm (7.95 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the front upper face of the cylinder block.

NOTE:
• Measurement should be performed at a temperature of 20°C (68°F).
• Standard sized pistons are classified into two grades, “A” and “B”. These grades should be used as guide lines in selecting a standard piston.

Standard diameter:
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)
B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)



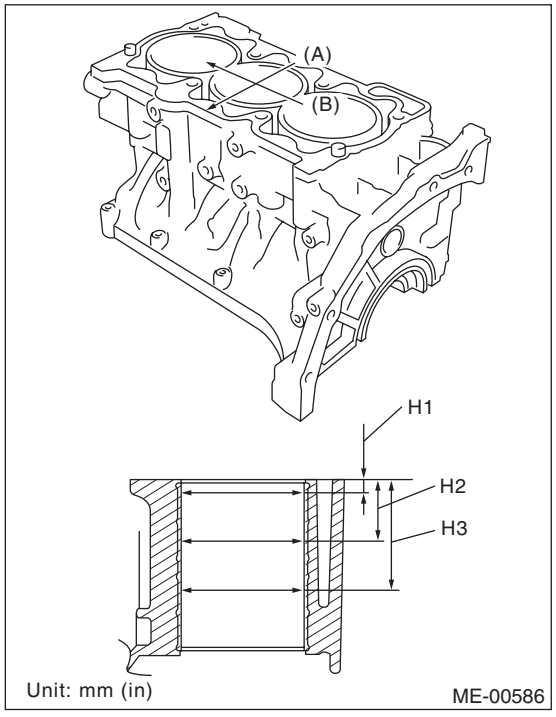
(A) Main journal size mark
(B) Cylinder bore size mark
(C) Cylinder block (RH) – (LH) combination mark

2) Measure inner diameter of each cylinder.
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights as shown in the figure, using a cylinder bore gauge.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cylindricality:
Standard
0.030 mm (0.0012 in)

Out-of-roundness:
Standard
0.010 mm (0.0004 in)



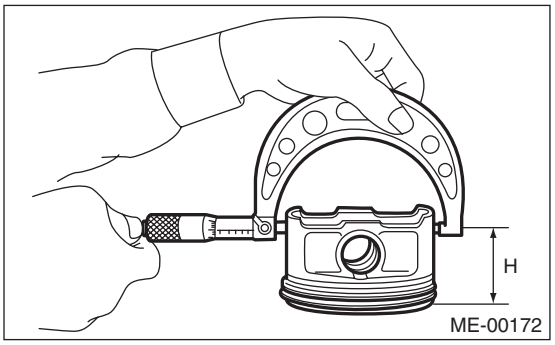
(A) Thrust direction
(B) Piston pin direction
H1: 10 mm (0.39 in)
H2: 45 mm (1.77 in)
H3: 80 mm (3.15 in)

3) When the piston is to be replaced due to general or cylinder wear, select a suitable sized piston by measuring the piston clearance.
4) Measure outer diameter of each piston.
Measure the outer diameter of each piston at the height as shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
37.3 mm (1.4685 in)

Piston outer diameter:
Standard
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)
B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)
0.25 mm (0.0098 in) oversize
92.245 — 92.265 mm (3.6317 — 3.6325 in)
0.50 mm (0.0197 in) oversize
92.495 — 92.515 mm (3.6415 — 3.6423 in)



5) Calculate the clearance between cylinder and piston.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Clearance between cylinder and piston at 20°C (68°F):
Standard
–0.010 — 0.010 mm (–0.0004 — 0.0004 in)

6) Boring and honing
(1) If any of the measured value of cylindricality, out-of-roundness or cylinder-to-piston clearance is out of standard or if there is any damage on the cylinder wall, rebore it to replace with an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and replaced with oversize pistons.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the cylinder block.

NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, when measuring the cylinder diameter, wait until it has cooled to room temperature.

Cylinder inner diameter boring limit (diameter):
To 92.515 mm (3.6717 in)

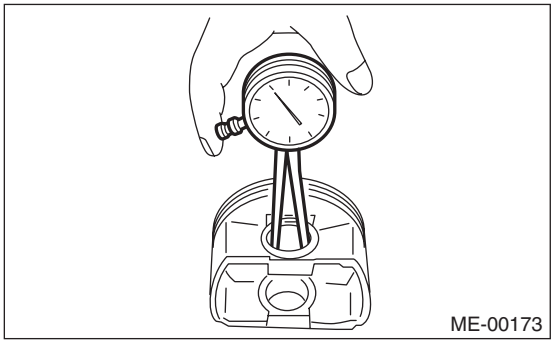
3. PISTON AND PISTON PIN

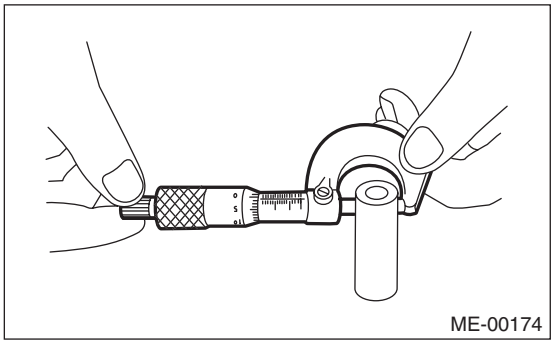
1) Check the piston and piston pin for damage, cracks or wear. Replace if faulty.
2) Check the piston ring groove for wear or damage. Replace if faulty.
3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if faulty.

Clearance between piston pin hole and piston pin:

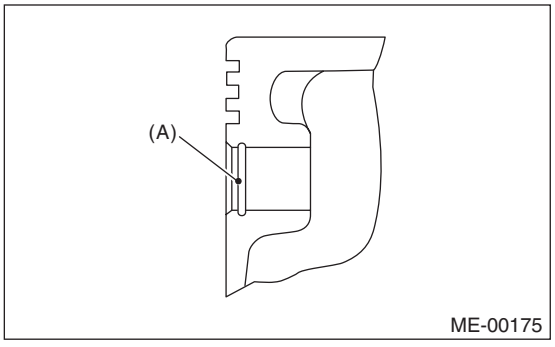
Standard

0.004 — 0.008 mm (0.0002 — 0.0003 in)





4) Check the snap ring installation groove (A) on the piston for burr. If necessary, remove burr from the groove so that the piston pin can lightly move.

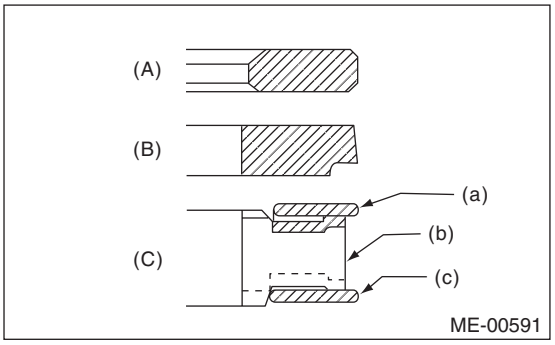


5) Check the piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new part of the same size as piston.

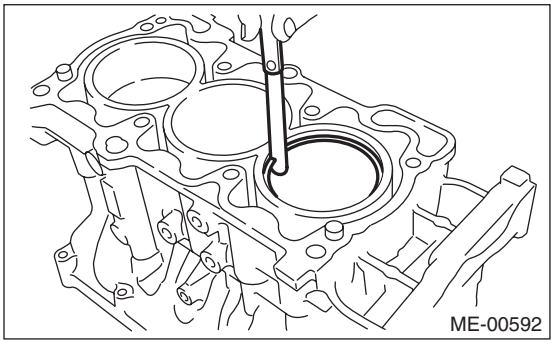
NOTE:
• The top ring and second ring have the mark to determine the direction for installing. When installing the ring to piston, face marks to the top side.
• Oil ring consists of the upper rail, expander and lower rail. When installing to the piston, be careful of the direction of each rail.



(A) Top ring
(B) Second ring
(C) Oil ring
(a) Upper rail
(b) Expander
(c) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

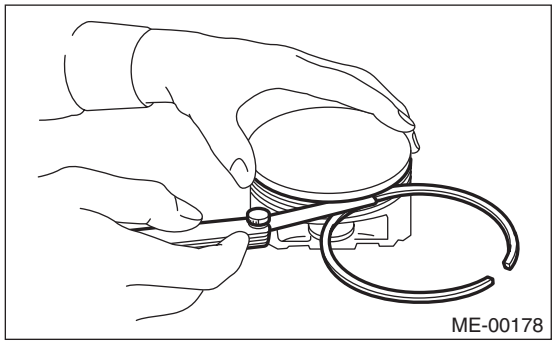
		Standard mm (in)
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)
	Second ring	0.40 — 0.50 (0.0157 — 0.0197)
	Oil ring	0.20 — 0.50 (0.0079 — 0.0197)



3) Fit the piston ring straight into the piston ring groove, then measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

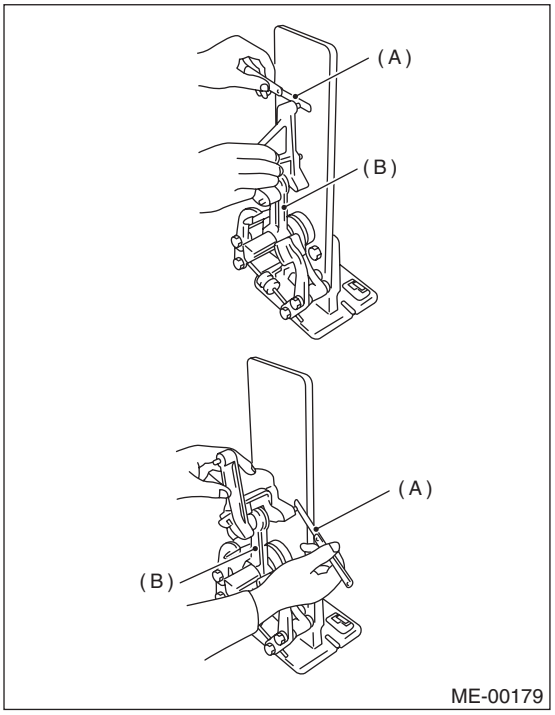
		Standard mm (in)
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)
Clearance between oil ring and oil ring groove		0.065 — 0.165 (0.0026 — 0.0065)


ME-00178

5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)

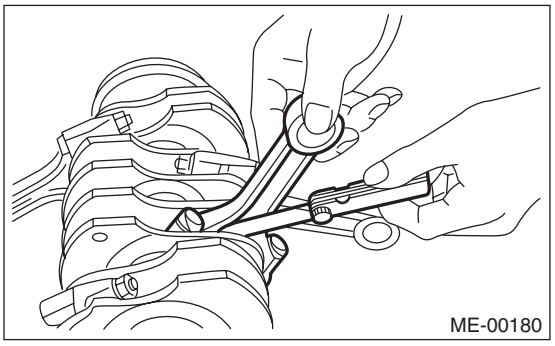


ME-00179

(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod with bearings attached to the crankshaft, and using a thickness gauge, measure the thrust clearance. If the thrust clearance exceeds the standard or uneven wear is found, replace the connecting rod.

Connecting rod thrust clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)


ME-00180

4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

5) Measure the oil clearance on each connecting rod bearing using plastigauge. If any oil clearance is not within the standard, replace the defective bearing with a new part of standard size or undersize as necessary.

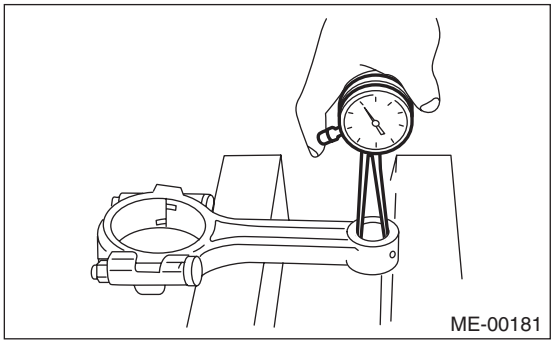
Connecting rod oil clearance:
Standard
0.016 — 0.043 mm (0.0006 — 0.0017 in)

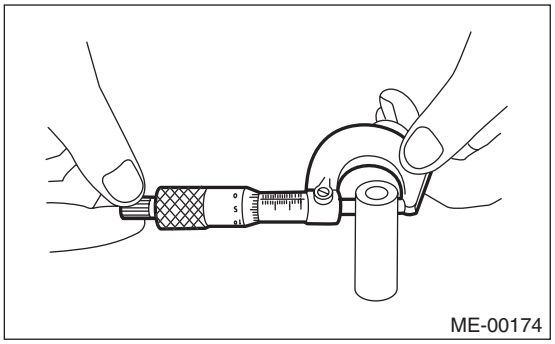
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.489 — 1.505 (0.0586 — 0.0593)	51.976 — 52.000 (2.0463 — 2.0472)
0.03 (0.0012) Undersize	1.507 — 1.515 (0.0593 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) Undersize	1.517 — 1.525 (0.0597 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) Undersize	1.617 — 1.625 (0.0637 — 0.0640)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace with a new part if worn or damaged.
7) Measure the piston pin clearance at connecting rod small end. If the measured value is not within the standard, replace it with a new part.

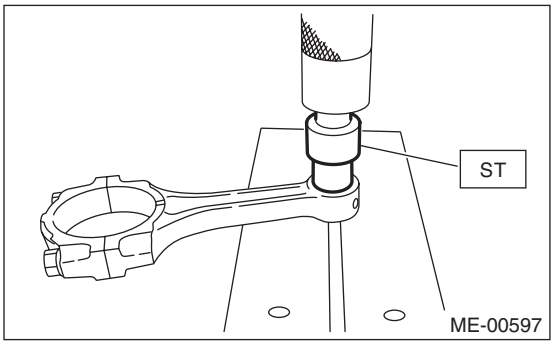
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)


ME-00181


ME-00174

8) The replacement procedure for the connecting rod small end bushing is as follows.
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with the ST after applying oil on the periphery of new bushing.

ST 18350AA000 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00597

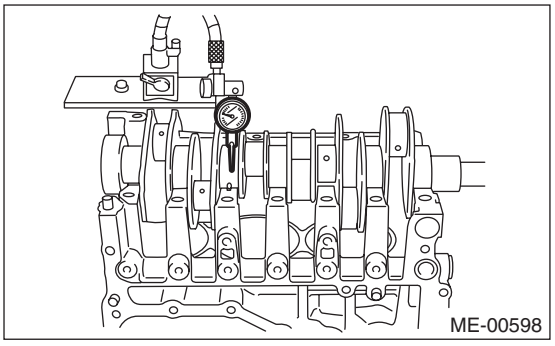
(3) Make two 3 mm (0.12 in) holes in the pressed bushing to match the pre-manufactured holes on the connecting rod, then ream the inside of the bushing.
(4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely, and check it for cracks using liquid penetrant tester. If defective, replace the crankshaft.
2) Check the crankshaft for bend, and repair or replace if needed. If it exceeds the limit, correct or replace it.

NOTE:
If a suitable V-block is not available, using the #1 and #7 crankshaft bearings on cylinder block, position the crankshaft on cylinder block. Then, measure the crankshaft bend using a dial gauge.

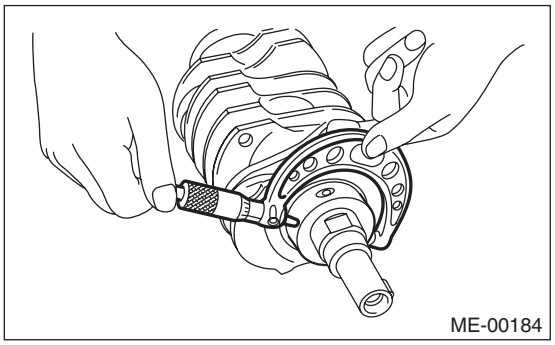
Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00598

3) Inspect the crank journal and crank pin for wear. If they are not within the standard, replace the bearing with a suitable (undersize) one, and replace or grind to correct the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

Crank pin:
Out-of-roundness
Standard
0.005 mm (0.0002 in)
Cylindricality
Standard
0.006 mm (0.0002 in)
Grinding limit (dia.)
To 51.734 mm (2.0368 in)

Crank journal:
Out-of-roundness
Standard
0.005 mm (0.0002 in)
Cylindricality
Standard
0.006 mm (0.0002 in)
Grinding limit (dia.)
To 63.742 mm (2.5095 in)

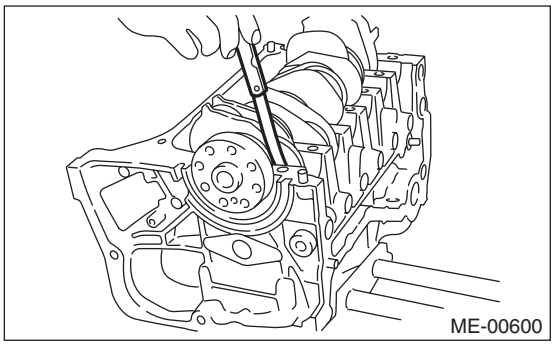


Unit: mm (in)

		Crank journal diameter			Crank pin outer diameter
		#1, #3, #5	#7	#2, #4, #6	
Standard	Journal O.D.	63.992 — 64.016 (2.5194 — 2.5203)			51.976 — 52.000 (2.0463 — 2.0472)
	Bearing size (Thickness at center)	1.996 — 2.013 (0.0786 — 0.0793)	1.992 — 2.009 (0.0784 — 0.0791)	1.996 — 2.013 (0.0786 — 0.0793)	1.489 — 1.505 (0.0586 — 0.0593)
0.03 (0.0012) Undersize	Journal O.D.	63.962 — 63.978 (2.5182 — 2.5188)			51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.011 — 2.014 (0.0792 — 0.0793)	2.011 — 2.014 (0.0792 — 0.0793)	2.015 — 2.018 (0.0793 — 0.0794)	1.507 — 1.515 (0.0593 — 0.0596)
0.05 (0.0020) Undersize	Journal O.D.	63.942 — 63.958 (2.5174 — 2.5180)			51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.021 — 2.024 (0.0796 — 0.0797)	2.021 — 2.024 (0.0796 — 0.0797)	2.025 — 2.028 (0.0797 — 0.0798)	1.517 — 1.525 (0.0597 — 0.0600)
0.25 (0.0098) Undersize	Journal O.D.	63.742 — 63.758 (2.5095 — 2.5102)			51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.121 — 2.124 (0.0835 — 0.0836)	2.121 — 2.124 (0.0835 — 0.0836)	2.125 — 2.128 (0.0837 — 0.0838)	1.617 — 1.625 (0.0637 — 0.0640)

4) Use a thickness gauge to measure the thrust clearance of crankshaft at center bearing. If clearance exceeds the standard, replace the bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting and wear.
6) Measure the oil clearance on each crankshaft bearing using plastigauge. If the measured value is out of standard, replace the defective bearing with an undersize one, and replace or grind to correct the crankshaft as necessary.

Crankshaft oil clearance:
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)

21.Oil Flow Control Solenoid Valve

A: REMOVAL

The oil flow control solenoid valve is listed in the FU section. <Ref. to FU(H6DO)-44, REMOVAL, Oil Flow Control Solenoid Valve.>

B: INSTALLATION

The oil flow control solenoid valve is listed in the FU section. <Ref. to FU(H6DO)-44, INSTALLATION, Oil Flow Control Solenoid Valve.>

22.Intake and Exhaust Valve

A: SPECIFICATION

Refer to “Cylinder Head” for removal and installation procedures of intake and exhaust valves. <Ref. to ME(H6DO)-83, REMOVAL, Cylinder Head.> <Ref. to ME(H6DO)-84, INSTALLATION, Cylinder Head.>

23.Piston

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of pistons. <Ref. to ME(H6DO)-97, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-103, INSTALLATION, Cylinder Block.>

24.Connecting Rod

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of connecting rod. <Ref. to ME(H6DO)-97, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-103, INSTALLATION, Cylinder Block.>

25.Crankshaft

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of crankshaft. <Ref. to ME(H6DO)-97, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-103, INSTALLATION, Cylinder Block.>

26.Engine Trouble in General

A: INSPECTION

NOTE:
The “RANK” shown in the chart shows the possibilities of the cause of trouble in order from “Very often” to “Rarely”.
A — Very often
B — Sometimes
C — Rarely

Symptoms	Problem parts etc.	Possible cause	RANK
1. Engine does not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch	C
		Defective starter	B
	Battery	Improper connection of terminal	A
		Run-down battery	A
		Defective charging system	B
	Friction	Seizure of crankshaft and connecting rod bearing	C
		Seized camshaft	C
		Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system<Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Clogged fuel line	C
		Lack of fuel or insufficient fuel	B
	Timing chain	Trouble	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

Symptoms	Problem parts etc.	Possible cause	RANK
3) Initial combustion occurs.	Engine control system<Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of fuel or insufficient fuel	B
	Timing chain	Trouble	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
4) Engine stalls after initial combustion.	Engine control system<Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of fuel or insufficient fuel	B
	Timing chain	Trouble	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

Symptoms	Problem parts etc.	Possible cause	RANK
2. Rough idle and engine stall	Engine control system<Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of fuel or insufficient fuel	B
	Timing chain	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Over-heating	C
	Others	Evaporative emission control system malfunction	A
		Stuck or damaged throttle valve	B

Symptoms	Problem parts etc.	Possible cause	RANK
3. Low output, hesitation and poor acceleration	Engine control system<Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of fuel or insufficient fuel	C
	Timing chain	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Over-heating	C
		Over-cooling	C
	Others	Evaporative emission control system malfunction	A

Symptoms	Problem parts etc.	Possible cause	RANK
4. Surging	Engine control system<Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of fuel or insufficient fuel	C
	Timing chain	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Cooling system	Over-heating	B
	Others	Evaporative emission control system malfunction	C
5. Engine does not return to idle.	Engine control system<Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
6. Dieseling (Run-on)	Engine control system<Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Over-heating	B
	Others	Evaporative emission control system malfunction	B
7. After burning in exhaust system	Engine control system<Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Timing chain	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over-cooling	C
	Others	Evaporative emission control system malfunction	C

Symptoms	Problem parts etc.	Possible cause	RANK
8. Knocking	Engine control system<Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Timing chain	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Over-heating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter O-ring	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan fitting bolts or defective oil pan	B
10. Excessive fuel consumption	Engine control system<Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Timing chain	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over-cooling	C

27.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn camshaft • Broken valve spring • Trouble of valve lifter
Heavy and dull clank	Oil pressure is low.	• Worn camshaft main bearing • Worn connecting rod bearing (large end)
	Oil pressure is normal.	Damaged engine mounting
High-pitched clank	Sound is noticeable when accelerating with an overload condition.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong heat range of spark plug • Gasoline of improper octane number
Clank when engine speed is between 1,000 and 2,000 rpms.	Noise is reduced when fuel injector connector of noisy cylinder is disconnected. *	• Worn crankshaft main bearing • Worn connecting rod bearing (large end)
Knocking sound when engine is operating under idling speed and engine is warm	Noise is reduced when fuel injector connector of noisy cylinder is disconnected. *	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. *	• Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in cylinder head
Squeaky sound	—	Insufficient generator lubrication
Rubbing sound	—	Poor contact of generator brush and rotor
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• V-belt • Defective water pump shaft
Hissing sound	—	• Insufficient compression • Air leakage in air intake system, hose, connection or manifold
Timing chain noise	—	• Loose timing chain • Timing chain contacting with adjacent part
Valve lifter noise	—	Incorrect valve clearance

* When disconnecting the fuel injector connector, the malfunction indicator light illuminates and DTC is stored in ECM memory. Therefore, perform the Clear Memory Mode<Ref. to EN(H6DO)(diag)-57, OPERATION, Clear Memory Mode.> and Inspection Mode<Ref. to EN(H6DO)(diag)-45, PROCEDURE, Inspection Mode.>after connecting the fuel injector connector.

EXHAUST

EX(H6DO)

Page

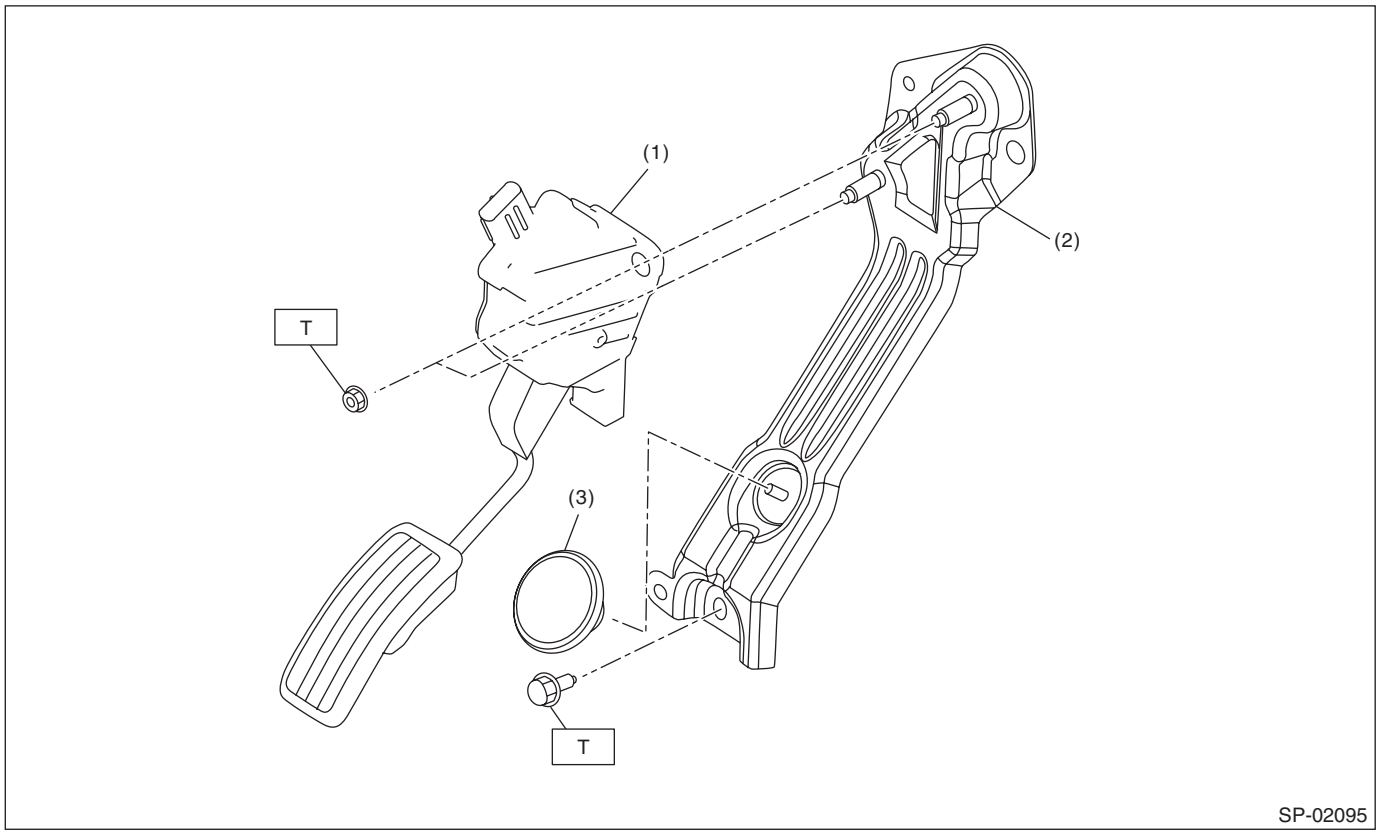
1. General Description 2
2. Front Exhaust Pipe 4
3. Rear Exhaust Pipe 7
4. Muffler 9

1. General Description

A: SPECIFICATION

Accelerator pedal	Stroke	At pedal pad	49 — 58 mm (1.93 — 2.28 in)

B: COMPONENT



(1) Accelerator pedal ASSY
(2) Accelerator pedal bracket
(3) Accelerator stopper

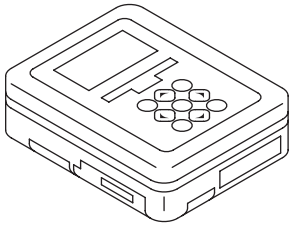
Tightening torque:N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.3)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal or installation.
- Keep the parts in order and protect them from dust and dirt.
- Before removal or installation, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for inspecting the accelerator pedal.

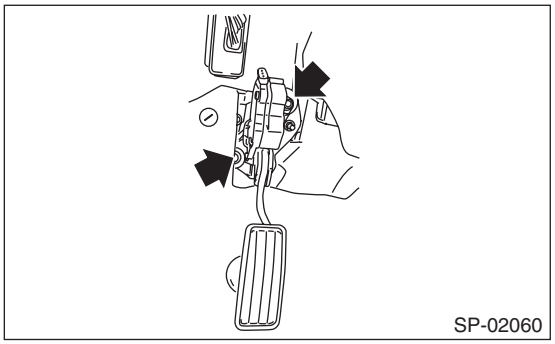
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring voltage.

2. Accelerator Pedal

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the connector.
3) Remove the nut securing accelerator pedal assembly, and remove the accelerator pedal assembly.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

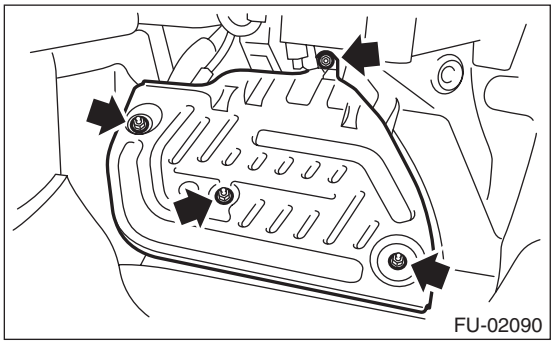
C: DISASSEMBLY

NOTE:
The accelerator pedal cannot be disassembled.

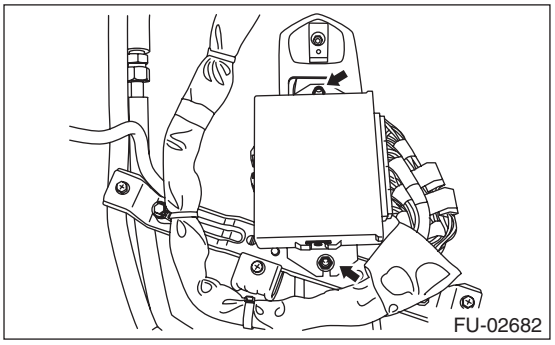
D: INSPECTION

1. CHECK ACCELERATOR PEDAL SENSOR AREA (METHOD WITH CIRCUIT TESTER)

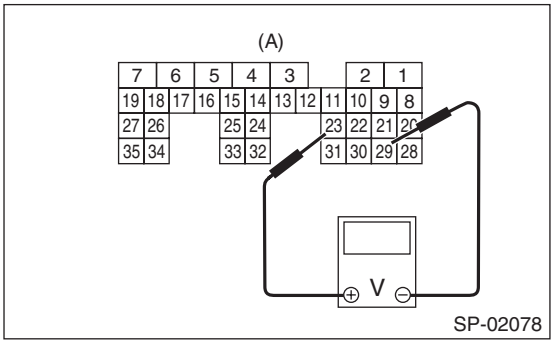
1) Remove the front pillar lower trim and console side panel lower RH of passenger's side.
2) Detach the floor mat of passenger's seat.
3) Remove the protect cover.



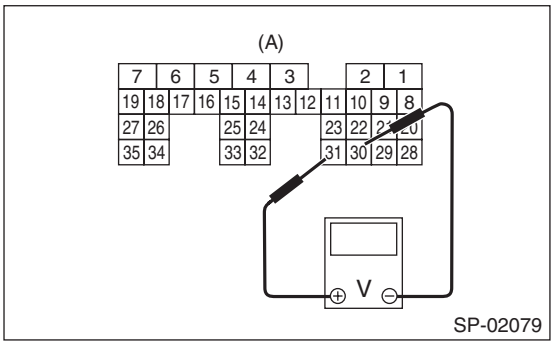
4) Remove the ECM from vehicle.



5) Turn the ignition switch to ON. (engine OFF)
6) Measure the voltage between ECM connector terminals.
Main sensor side



Sub sensor side



(A) To ECM connector

Accelerator pedal sensor	Accelerator pedal	Terminal No.	Standard
Main	Not depressed (Full closed)	23 (+) and 29 (–)	1 V
	Depressed (Full opened)		3.5 V
Sub	Not depressed (Full closed)	31 (+) and 30 (–)	1 V
	Depressed (Full opened)		3.5 V

7) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

2. CHECK ACCELERATOR PEDAL SENSOR AREA (METHOD WITH SUBARU SELECT MONITOR)

1) Turn the ignition switch to ON. (engine OFF)
2) Read the accelerator pedal opening angle signal and voltage of accelerator pedal sensor using Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

Accelerator pedal sensor	Accelerator pedal opening angle signal	Standard
Main	0.0%	1 V
	100.0%	3.5 V
Sub	0.0%	1 V
	100.0%	3.5 V

3. OTHER INSPECTIONS

1) Check that the accelerator pedal does not have deformation, cracks or damage.
2) Check for smooth operation when the accelerator pedal is depressed.
3) Check if the accelerator pedal returns to its original position smoothly when the pedal is released.

IGNITION

IG(H6DO)

Page

1. General Description 2
2. Spark Plug 5
3. Ignition Coil 8

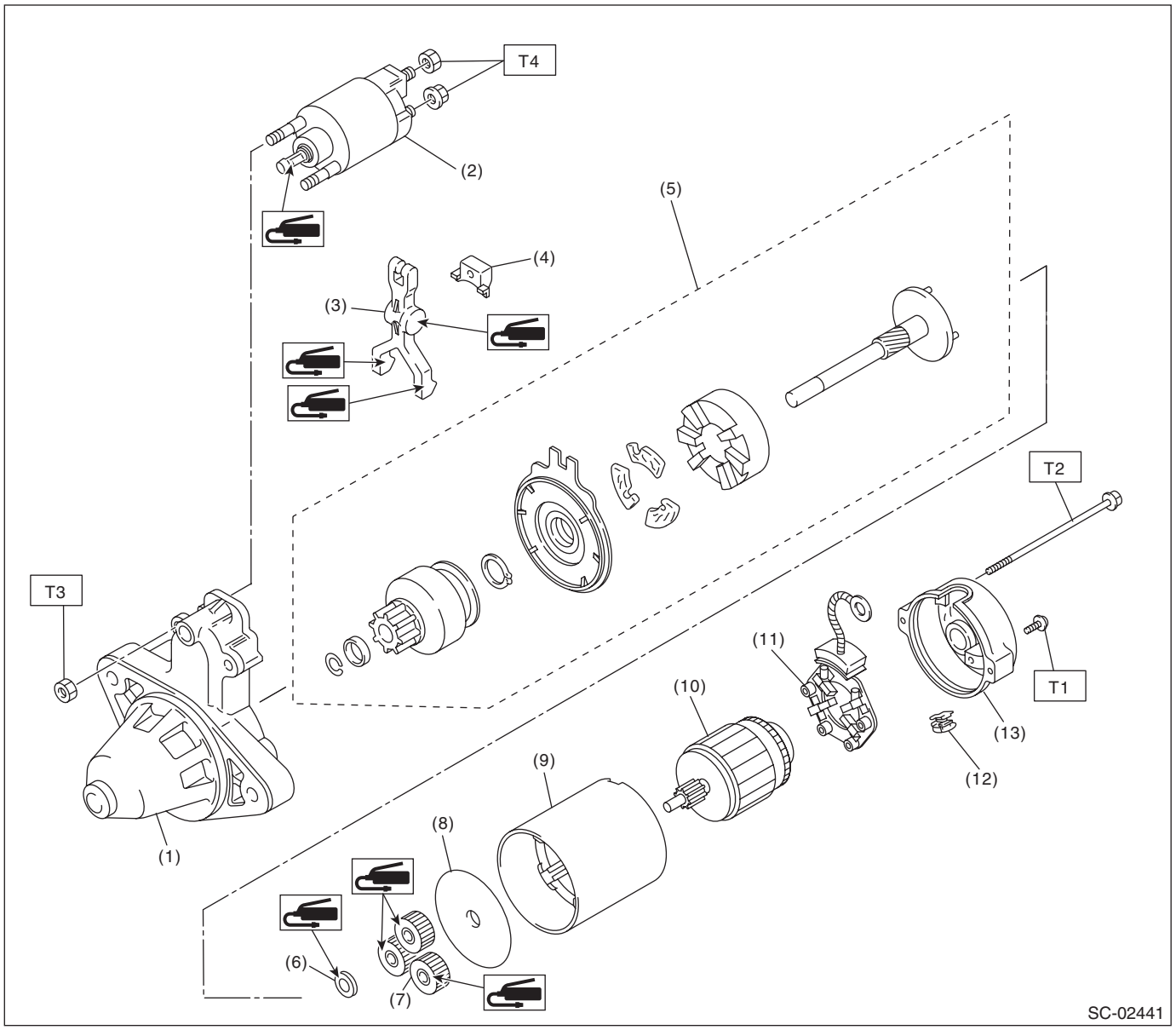
1. General Description

A: SPECIFICATION

Item			Specifications
Vehicle model			AT
Starter	Type		Reduction type
	Model		428000-5250
	Manufacturer		DENSO
	Voltage and output		12 V — 1.6 kW
	Direction of rotation		Counterclockwise (when observed from pinion)
	Number of pinion teeth		9
	No-load characteristics	Voltage	11 V
		Current	90 A or less
		Rotating speed	1,550 rpm or more
	Load characteristics	Voltage	8 V
		Current	370 A
		Torque	12.8 N·m (1.3 kgf-m, 9.4 ft-lb) or more
		Rotating speed	800 rpm or more
	Lock characteristics	Voltage	3 V
		Current	750 A or less
		Torque	19.0 N·m (1.9 kgf-m, 14.0 ft-lb) or more
Generator	Type		Rotating-field three-phase type, voltage regulator built-in type, with load response control system
	Model		A3TJ3591
	Manufacturer		Mitsubishi Electric
	Voltage and output		12 V — 130 A
	Polarity on ground side		Negative
	Direction of rotation		Clockwise (when observed from pulley side)
	Armature connection		3-phase △ type
	Output current		1,500 rpm — 55 A or more 2,500 rpm — 108 A or more 5,000 rpm — 127 A or more
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]
	Rotor slip ring outer diameter	Standard	22.7 mm (0.894 in)
		Limit	22.1 mm (0.870 in)
	Brush length	Standard	22.5 mm (0.886 in)
		Limit	5.0 mm (0.197 in)
Battery	Type and capacity		12 V — 52 AH (75D 23L)

B: COMPONENT

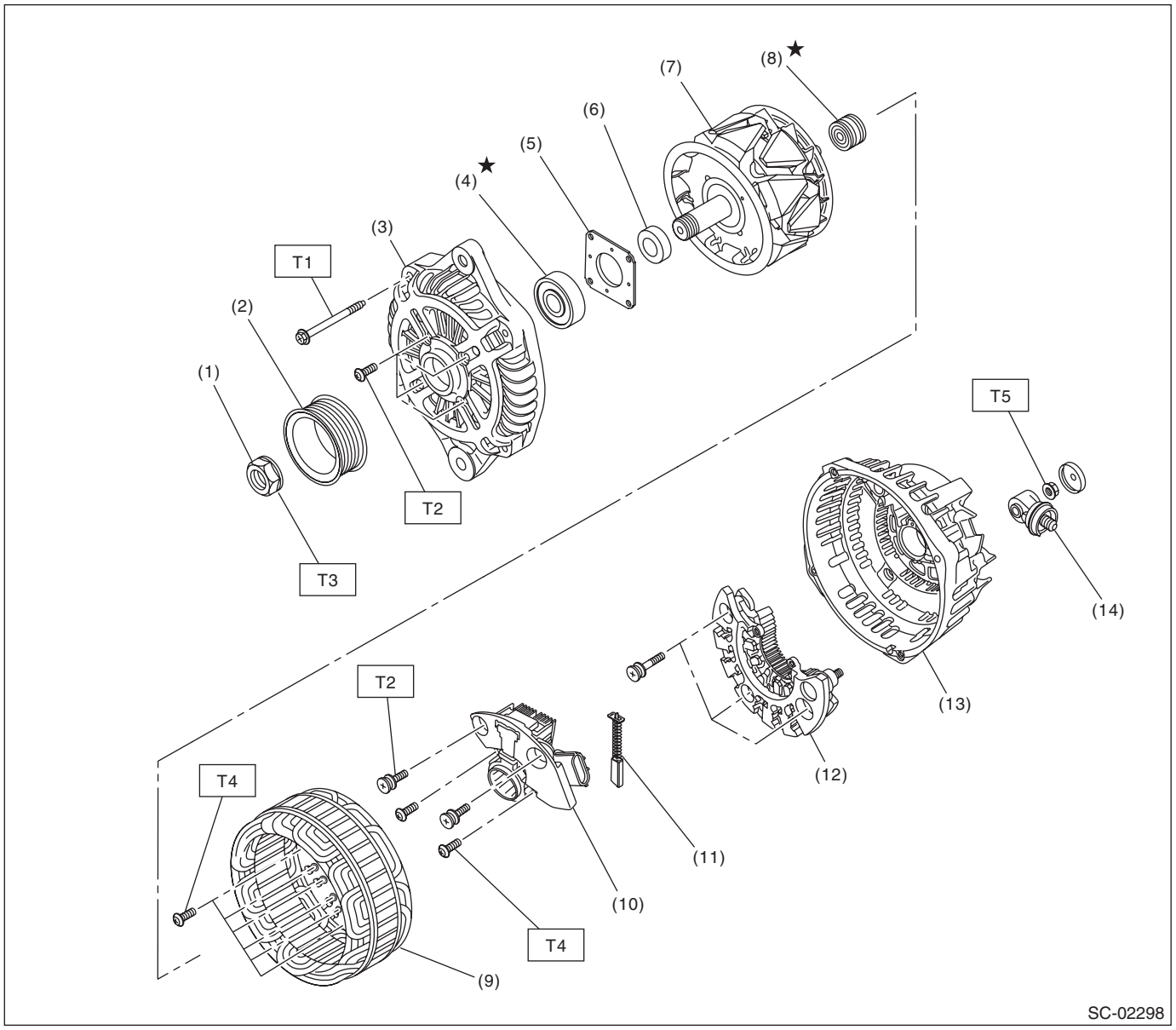
1. STARTER



(1) Starter housing
(2) Magnet switch ASSY
(3) Shift lever
(4) Starter seal
(5) Overrunning clutch ASSY
(6) Washer
(7) Planetary gear
(8) Starter plate
(9) Yoke
(10) Armature
(11) Brush holder ASSY
(12) Drain duct
(13) Starter cover

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.4 (0.1, 1.0)
T2: 6 (0.6, 4.4)
T3: 7.5 (0.8, 5.5)
T4: 10 (1.0, 7.4)

2. GENERATOR



(1)	Pulley nut	(8)	Bearing
(2)	Pulley	(9)	Stator coil
(3)	Front cover	(10)	IC regulator
(4)	Ball bearing	(11)	Brush
(5)	Bearing retainer	(12)	Rectifier
(6)	Spacer	(13)	Rear cover
(7)	Rotor	(14)	Terminal B

Tightening torque:N·m (kgf-m, ft-lb)
T1: 4.4 (0.4, 3.2)
T2: 3.9 (0.4, 2.9)
T3: 117.5 (12.0, 86.7)
T4: 2 (0.2, 1.5)
T5: 8.9 (0.9, 6.6)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

D: PREPARATION TOOL

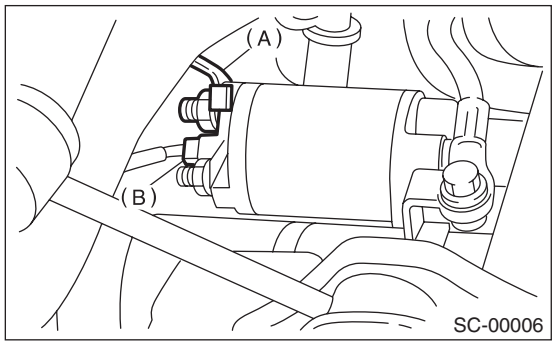
1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.

2. Starter

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the air intake chamber. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector (B) and terminal (A) from starter.



5) Remove the starter from transmission.

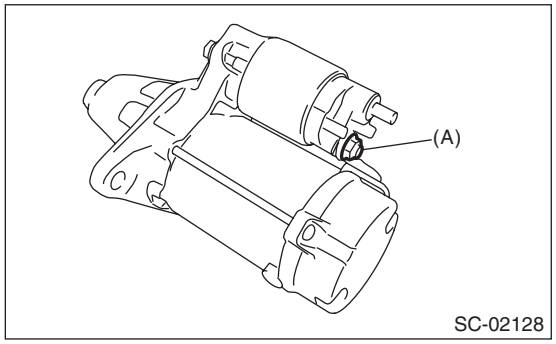
B: INSTALLATION

Install in the reverse order of removal.

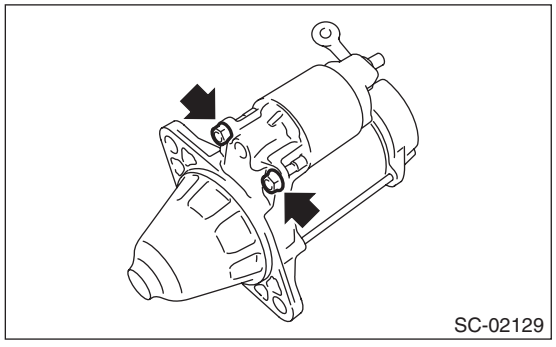
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

C: DISASSEMBLY

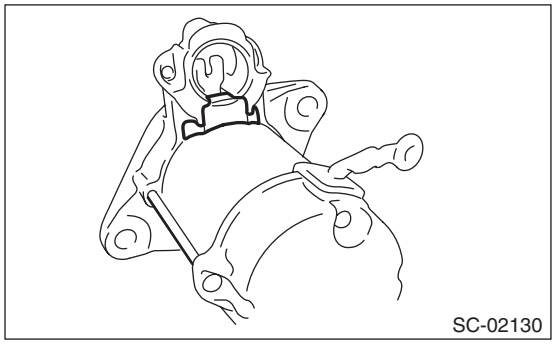
1) Remove the nut which holds terminal M (A) of the magnet switch assembly, then disconnect the harness from the terminal.



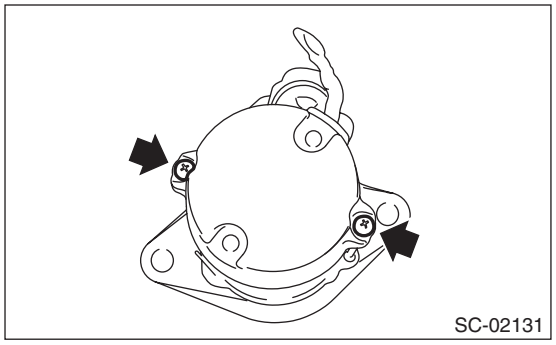
2) Remove the nuts fastening the magnet switch assembly to the starter housing, then remove the magnet switch assembly.

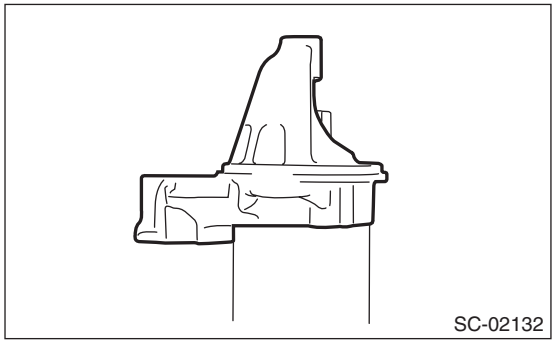


3) Remove the starter seal.

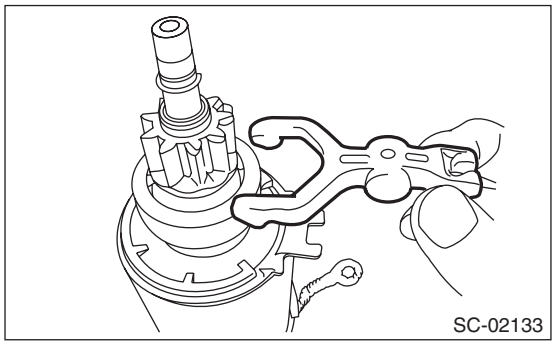


4) Remove the through bolts on both sides, and remove the starter housing.

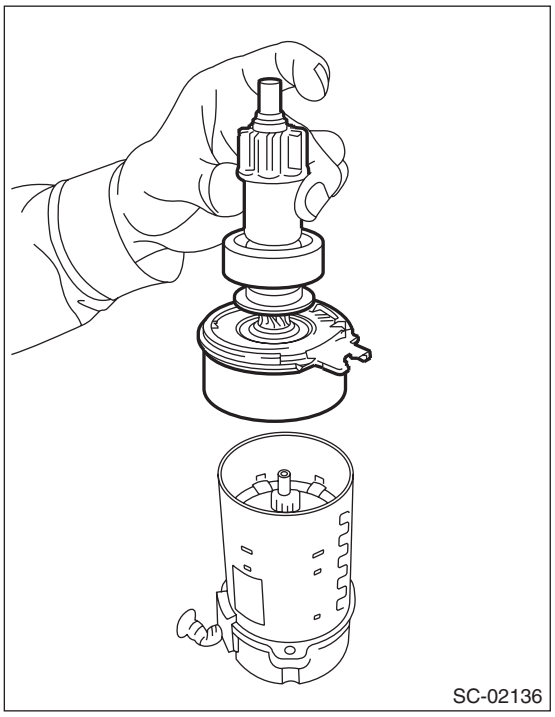




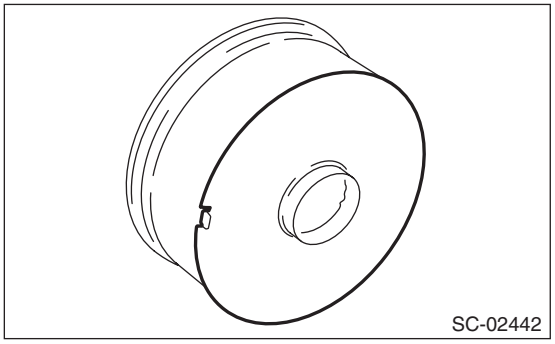
5) Remove the shift lever.



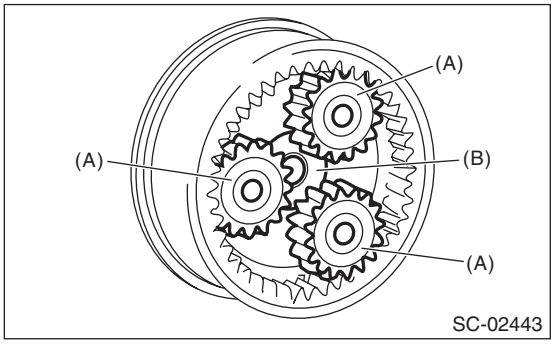
6) Remove the overrunning clutch assembly from the yoke.


SC-02136

7) Remove the starter plate.


SC-02442

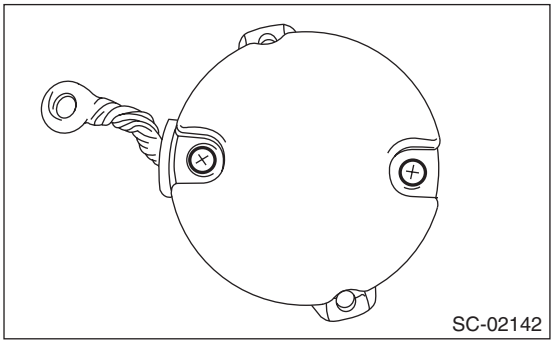
8) Remove the planetary gear (A) and washer (B) from internal gear.

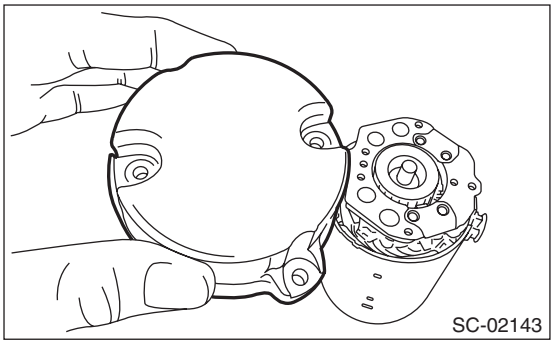


SC-02443

9) Remove the screws, and remove the starter cover from the brush holder assembly.

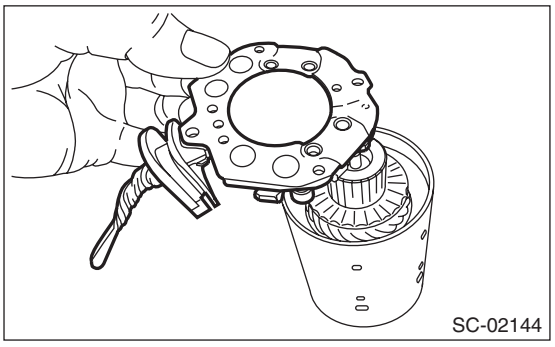
NOTE:
Separate the starter cover by pressing the brush holder assembly using the screws so that the assembly stays onto the armature side.


SC-02142

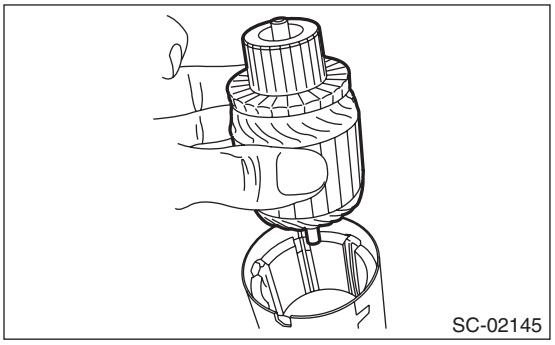

SC-02143

10) Remove the brush holder assembly from the armature by hand.

NOTE:
Spread the brush with your fingers, being careful not to damage the brush.

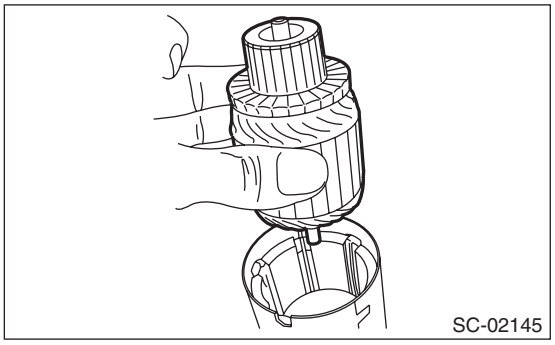

SC-02144

11) Remove the armature from the yoke.


SC-02145

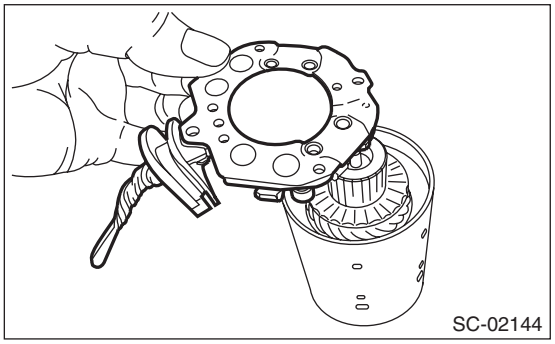
D: ASSEMBLY

1) Install the armature to the yoke.

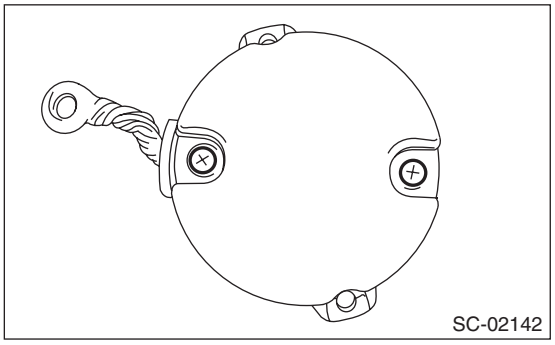


2) Install the brush holder assembly to the armature.

NOTE:
Spread the brush with your fingers, being careful not to damage the brush.



3) Install the starter cover, and secure it to the brush holder assembly with the screws.



4) Assemble the planetary gear (A) and washer (B) to the internal gear.

(1) Apply grease to the planetary gear installation position.

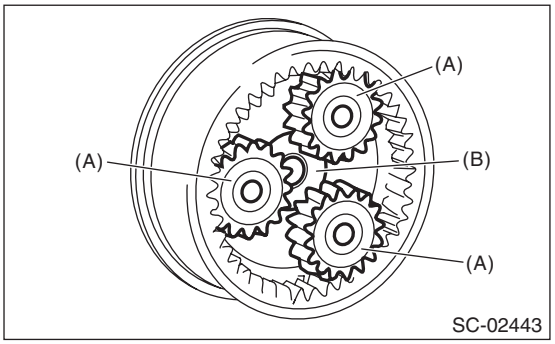
Grease:
DENSO HL50

(2) Install the planetary gear to the pin.

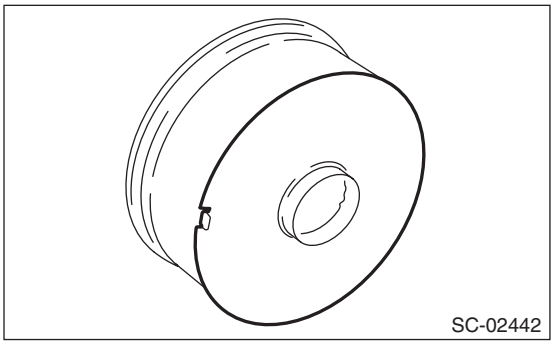
(3) Apply grease to the planetary gear, internal gear, washer, and upper part of the pin.

NOTE:
- Apply grease so that it contacts each gear.
- Be careful not to allow dirt to get in.

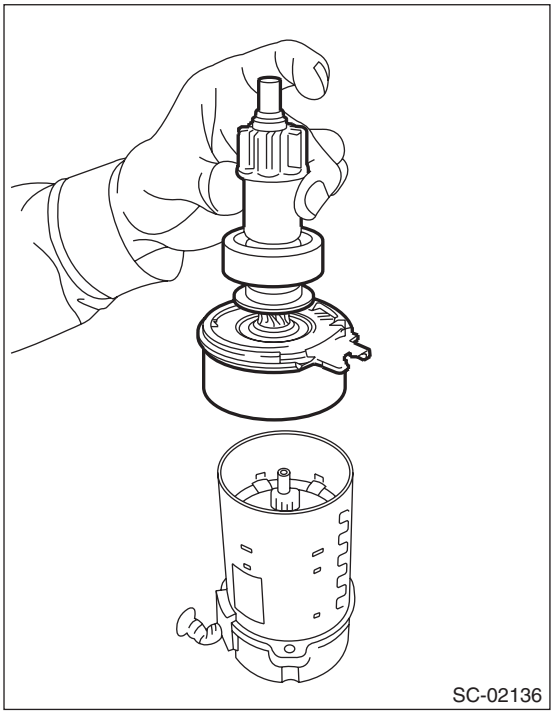
Grease:
DENSO HL50



(4) Install the starter plate.



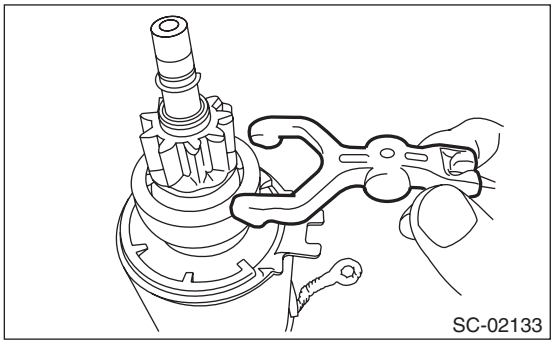
5) Assemble the overrunning clutch assembly to the yoke.



6) Install the shift lever.

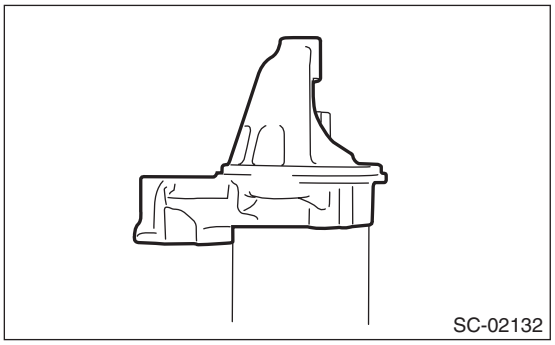
NOTE:
Apply grease to the contact portion of the shift lever.

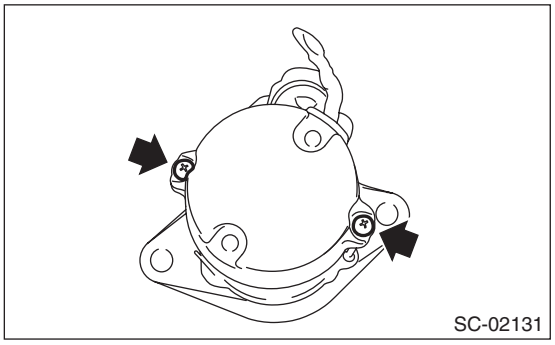
Grease:
DENSO HL50


SC-02133

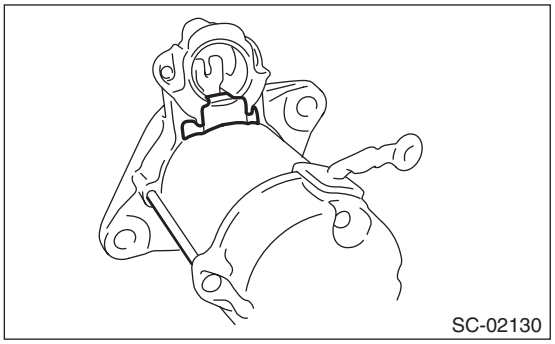
7) Install the starter housing, and tighten through bolts on both sides.

Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)


SC-02132


SC-02131

8) Install the starter seal.

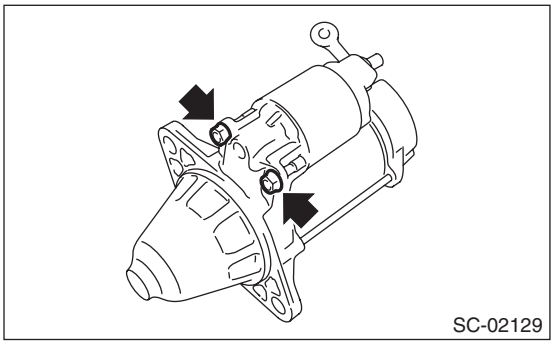

SC-02130

9) Install the magnet switch assembly to the starter housing, and tighten the nuts.

NOTE:
Apply grease to the shift lever installation position.

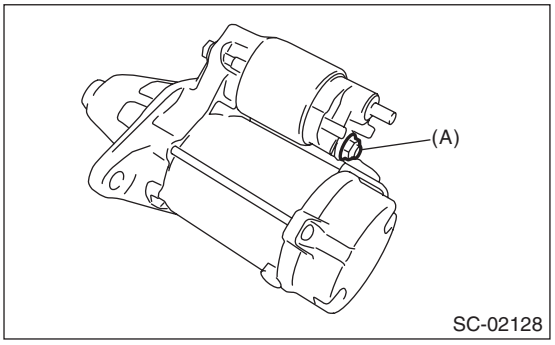
Grease:
DENSO HL50

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)


SC-02129

10) Install the harness to the terminal M (A) of the magnet switch assembly, and tighten the nut.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



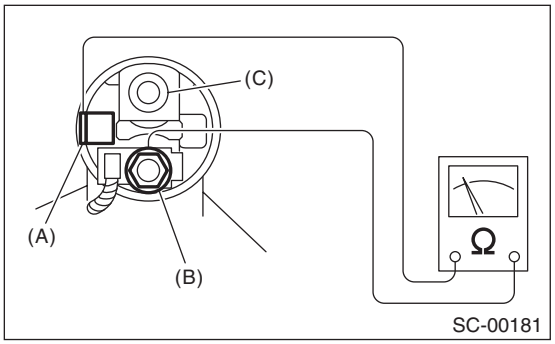
SC-02128

E: INSPECTION

1. SWITCH ASSEMBLY

Using a circuit tester (set to “ohm”), check that there is continuity between terminals S and M, and between terminal S and ground.
Also check to be sure there is no continuity between terminal M and B.

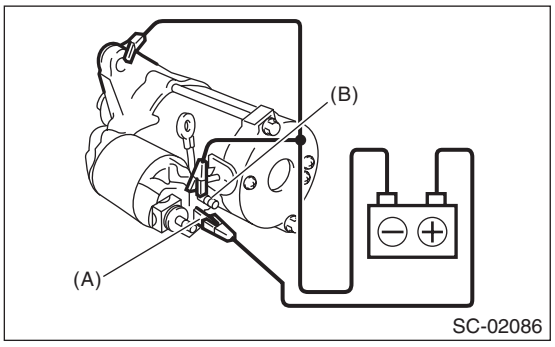
Terminal/Resistance:
S — M/1 Ω or less
S — Ground/1 Ω or less
M — B/1 MΩ or more



(A) Terminal S
(B) Terminal M
(C) Terminal B

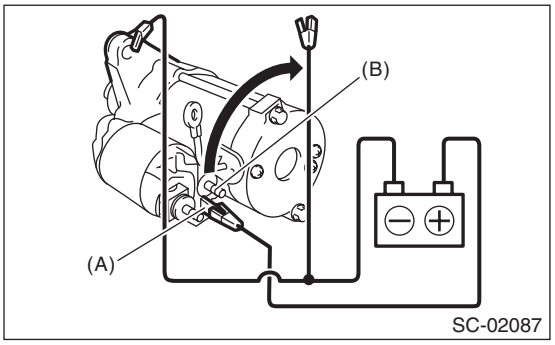
2. SWITCH ASSEMBLY OPERATION

NOTE:
Perform each test in a short period of time (3 — 5 sec).
1) Suction test
Check that the pinion gear comes flying out when the harness is disconnected from terminal M and connected as shown in the figure.



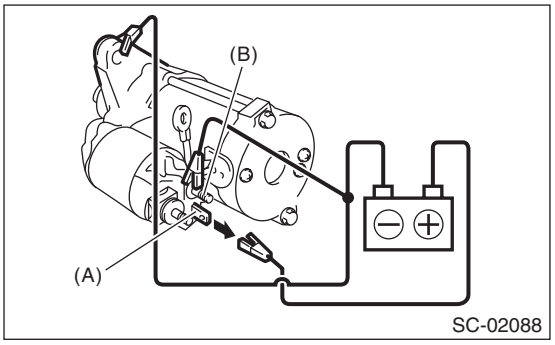
(A) Terminal S
(B) Terminal M

2) Holding test
Check that the pinion gear remains flying out after the cable is disconnected from terminal M.



(A) Terminal S
(B) Terminal M

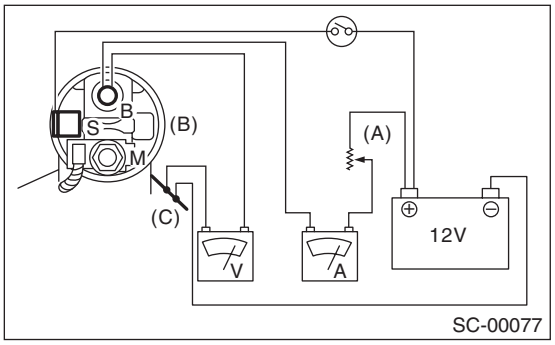
3) Returning test
With terminal S connected to the positive terminal, and terminal M and starter body connected to the battery ground terminal to suction the main contact point, check that the pinion gear returns to its original position when terminal S is disconnected.



(A) Terminal S
(B) Terminal M

3. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.
Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.
For these performance tests, use the circuit shown in figure.



(A) Variable resistance
(B) Magnetic switch
(C) Starter body

1) No-load test
Adjust the variable resistance with the switch on until the voltage is 11 V, and read the value displayed on the ammeter to measure rotating speed. Compare these values with the standard.

No-load test (standard):

Voltage/Current
Max. 11 V/90 A or less

Rotating speed
1,550 rpm or more

2) Load test
Apply the specified braking torque to starter. The condition is normal if the current draw and rotating speed are within standard.

Load test (standard):

Voltage/Load
8 V/12.8 N·m (1.3 kgf-m, 9.4 ft-lb)

Current/Rotating speed
370 A/800 rpm or more

3) Lock test
With the starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to standard voltage.

Lock test (standard):

Voltage/Current
3 V/750 A or less

Torque
19.0 N·m (1.9 kgf-m, 14.0 ft-lb)

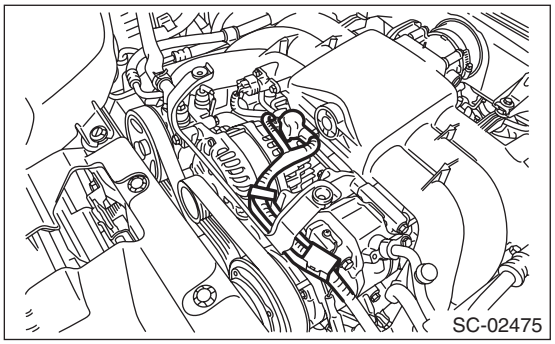
4. OTHER INSPECTIONS

Check that the starter does not have deformation, cracks and any other damage.

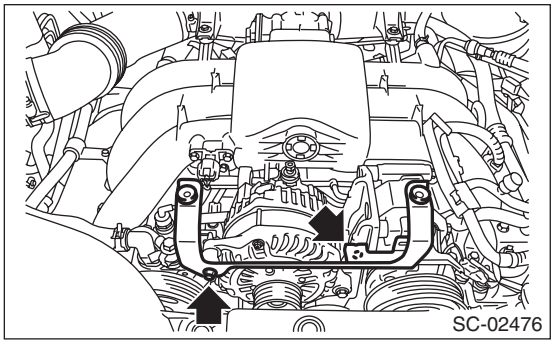
3. Generator

A: REMOVAL

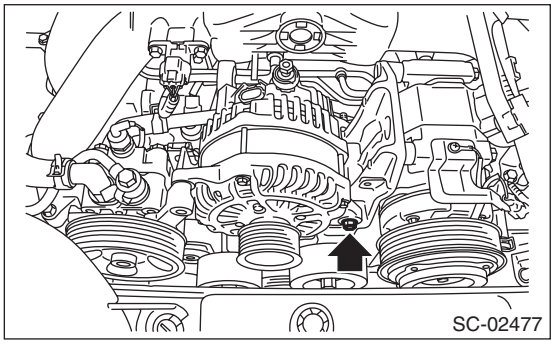
1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Disconnect the connector and terminal B from the generator, and remove the harness cover from the collector cover bracket.



4) Remove the V-belts. <Ref. to ME(H6DO)-46, REMOVAL, V-belt.>
5) Remove the collector cover bracket.



6) Remove the generator.

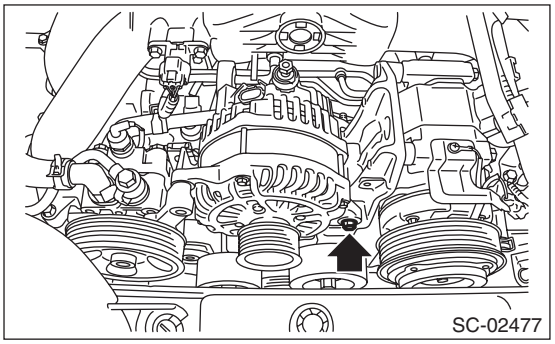


B: INSTALLATION

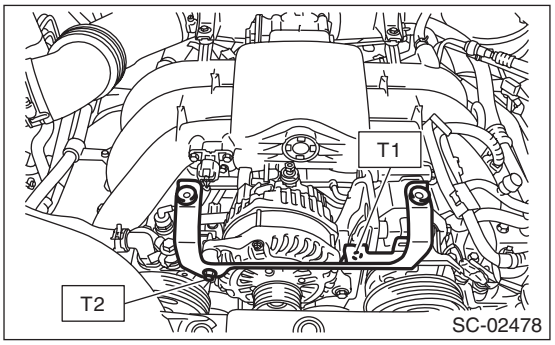
Install in the reverse order of removal.

CAUTION:
Check and adjust the V-belt tension. <Ref. to ME(H6DO)-46, INSPECTION, V-belt.>

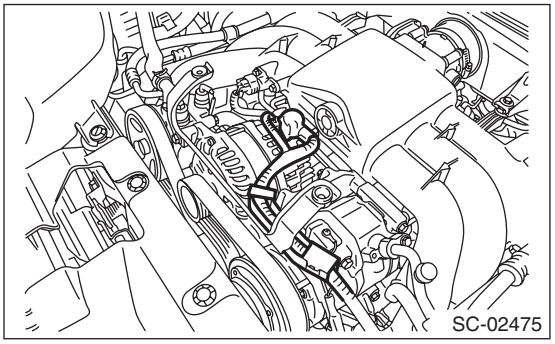
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



Tightening torque:
T1: 6.4 N·m (0.7 kgf-m, 4.7 ft-lb)
T2: 25 N·m (2.5 kgf-m, 18.4 ft-lb)

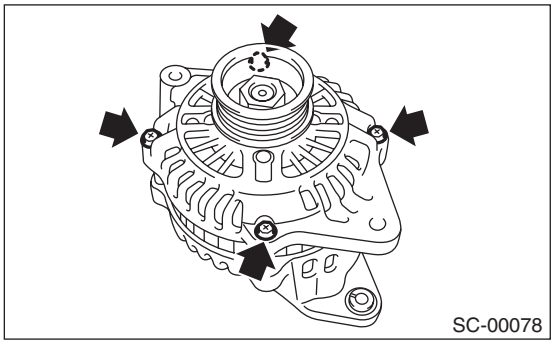


Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)

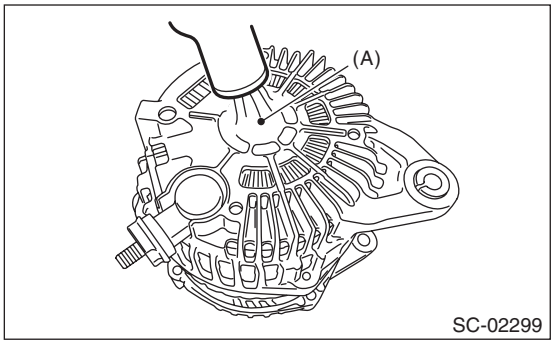


C: DISASSEMBLY

1) Remove the four through bolts.

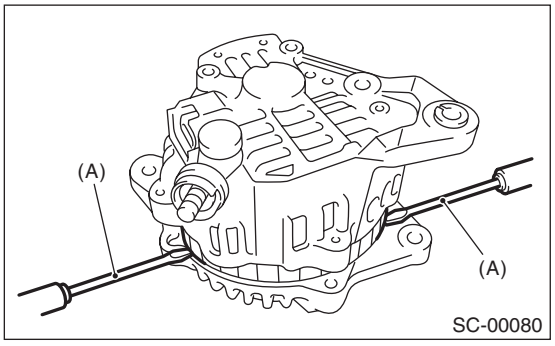

SC-00078

2) Use a drier to heat the rear cover (A) portion to 50 — 60°C (122 — 140°F).



SC-02299

3) Insert the end of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.

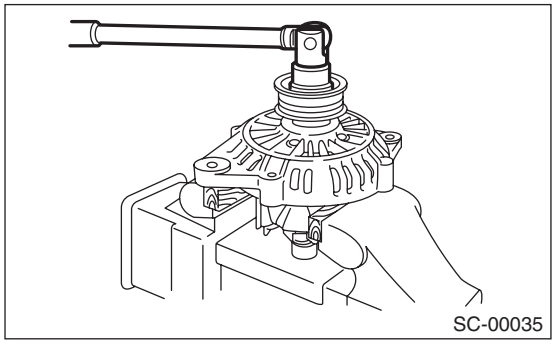


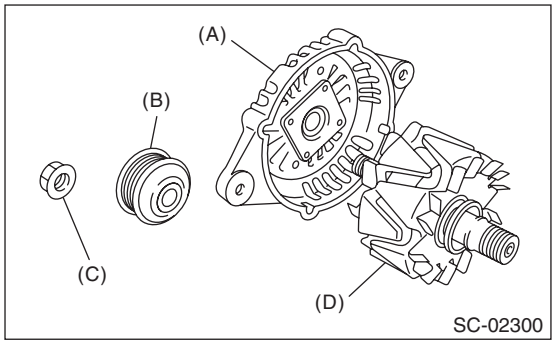
SC-00080

(A) Screwdriver

4) Using a vise, support the rotor and remove the pulley nut, then remove the rotor from the front cover.

CAUTION:
When holding the rotor with a vise, place aluminum plates or wooden pieces on the vise jaws to prevent rotor from damage.


SC-00035

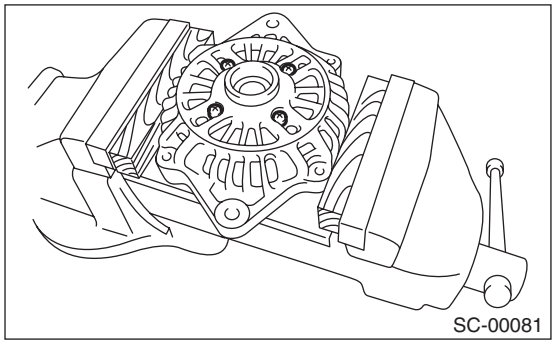


SC-02300

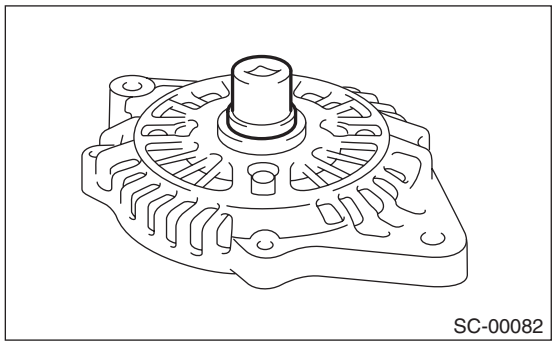
(A) Front cover
(B) Pulley
(C) Pulley nut
(D) Rotor

5) Use the following procedures to remove the ball bearings.

(1) Remove the bolt, and then detach the bearing retainer.

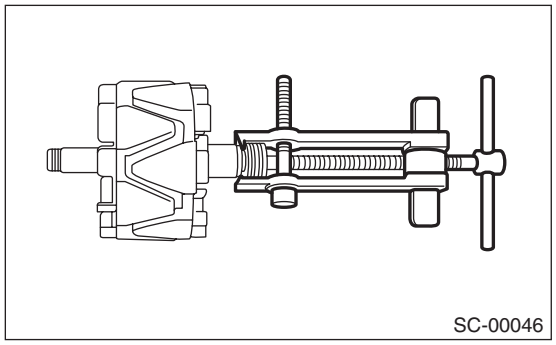

SC-00081

(2) Firmly attach an appropriate tool (such as a correct size socket wrench) to the bearing inner race.

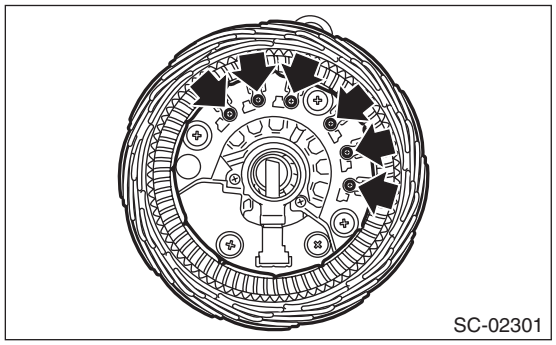

SC-00082

(3) Use the press to push the ball bearings out from the front cover.

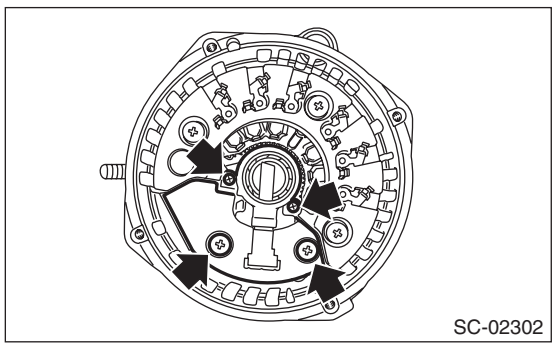
6) Using the bearing puller, remove the bearings from the rotor.


SC-00046

7) Remove six bolts between the rectifier and stator coil, then remove the stator coil.

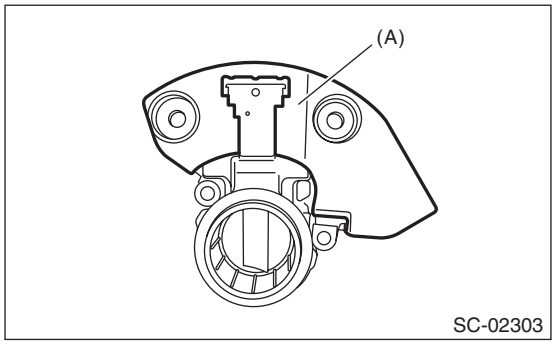

SC-02301

8) Remove four screws which secure the IC regulator to the rear cover, then remove the IC regulator.


SC-02302

9) Use the following procedures to remove the brush.

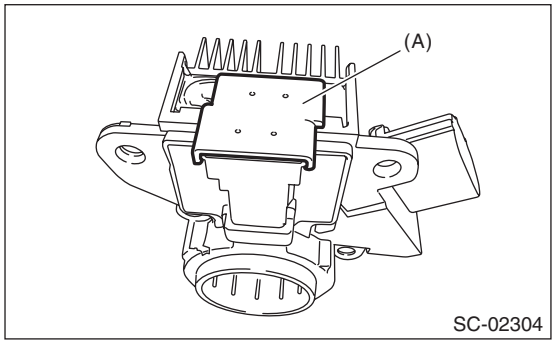
(1) Remove the cover A.



SC-02303

(A) Cover A

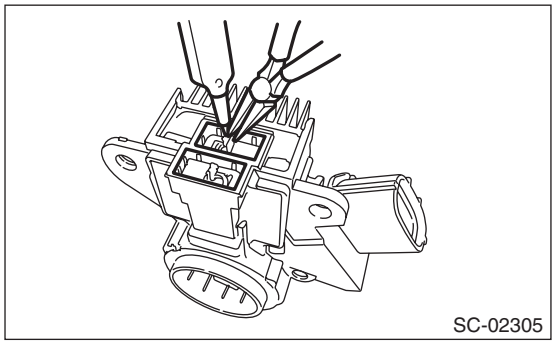
(2) Remove the cover B.



SC-02304

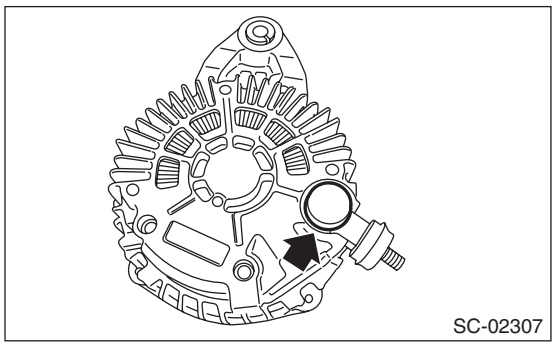
(A) Cover B

(3) Disconnect the connection and remove the brush.

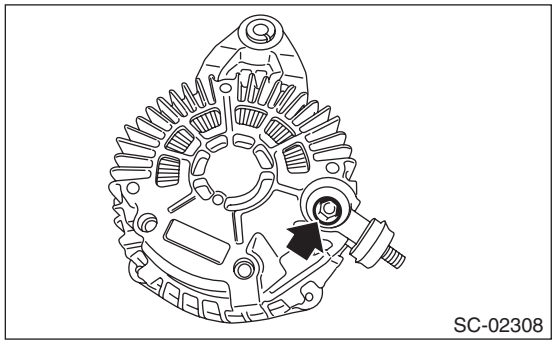

SC-02305

10) Remove the rectifier as follows.

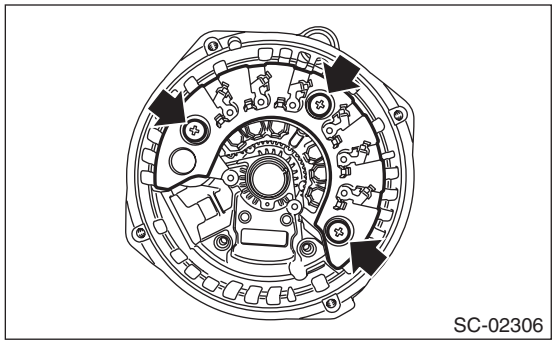
(1) Remove the cover on terminal B.


SC-02307

(2) Remove the nut on terminal B.



(3) Remove the bolts which secure the rectifier, and remove the rectifier.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:

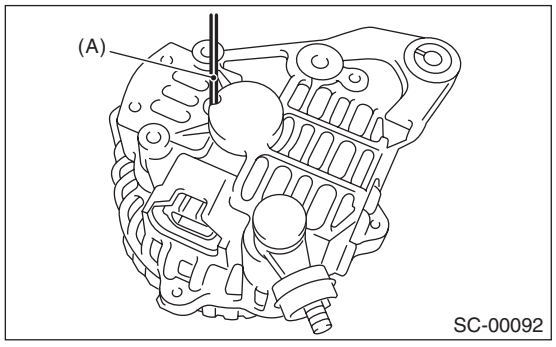
• Refer to component for tightening torque of each part. <Ref. to SC(H6DO)-4, GENERATOR, COMPONENT, General Description.>

• After assembling, manually turn the pulley to check that the rotor rotates smoothly.

1) Push of the brush

Before assembling the front and rear parts, press the brush down into the brush holder, then fix the brush in that position by inserting a [1 mm (0.08 in) dia., 40 — 50 mm (1.6 — 2.0 in) long] wire through the hole as shown in the figure.

CAUTION:
After re-assembling, remove the wire.



(A) Wire

2) Install the ball bearings.

(1) Set the ball bearings in the front cover, then securely install an appropriate tool (such as a socket wrench of proper size) to the bearing outer race.

(2) Using a press to press the ball bearings into the specified location.

(3) Install the bearing retainer.

3) Install the bearings.

CAUTION:
Do not apply grease to the bearings. If there is any oil on the bearing box, remove it completely.

(1) Use a press to install the bearings to the rotor shaft.

(2) Heat the bearing box in rear cover at 50 to 60°C (122 to 140°F), and then press the bearing into rear cover.

E: INSPECTION

1. DIODE

CAUTION:
There is the possibility of damaging the diodes if a mega-tester (used to measure high voltages) or a similar measuring instrument is used. Never use a mega tester or equivalent for this test.

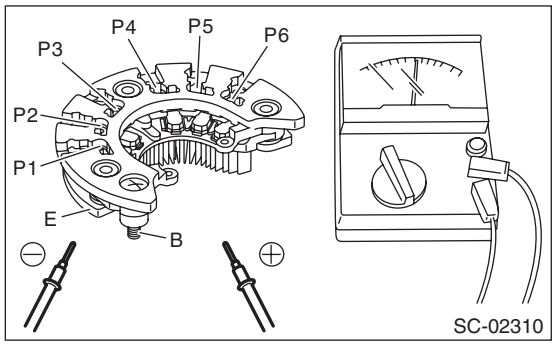
1) Check for continuity between the diode lead and terminal E or B. If continuity is not as shown in the table, replace the rectifier.

• At analog type tester

Tester lead		Continuity
–lead	+lead	
E	P1, P2, P3, P4, P5, P6	Yes
B		No
P1, P2, P3, P4, P5, P6	E	No
	B	Yes

- At digital type tester

Tester lead		Continuity
–lead	+lead	
E	P1, P2, P3, P4, P5, P6	No
B		Yes
P1, P2, P3, P4, P5, P6	E	Yes
	B	No



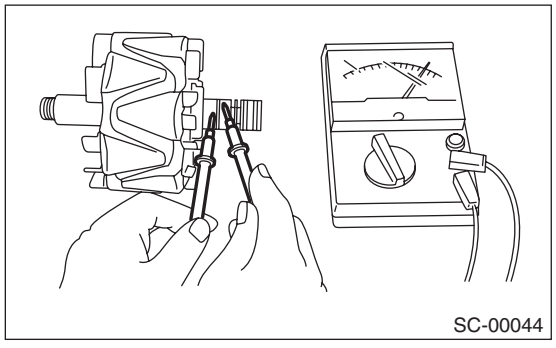
2. ROTOR

1) Inspect the slip rings for contamination or any roughness on the sliding surface. Repair the slip ring surface using a lathe or sand paper.
2) Measure the slip ring outer diameter. Replace the rotor if the slip ring is worn.

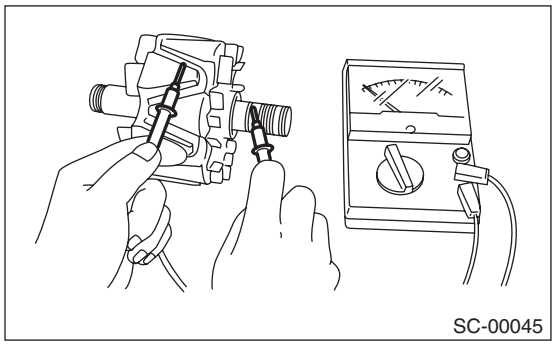
Slip ring outer diameter:
Standard
22.7 mm (0.894 in)
Limit
22.1 mm (0.870 in)

3) Using a circuit tester, check the resistance between slip rings. If resistance exceeds the standard, replace the rotor.

Standard:
Approx. 2.0 — 2.3 Ω



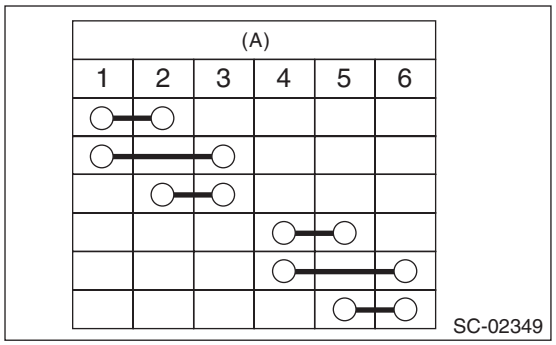
4) Check the continuity between slip ring and rotor core or shaft. If there is continuity, replace the rotor because the rotor coil is grounded.



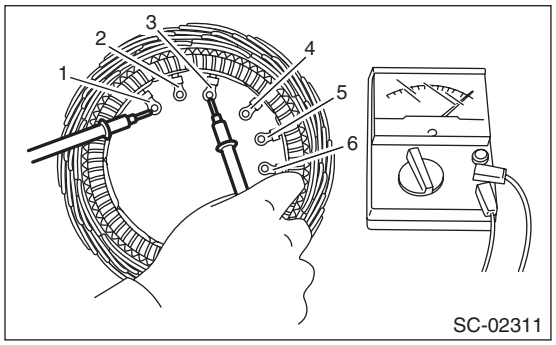
5) Check the bearings. If there is any noise, or the rotor does not rotate smoothly, replace the bearings.

3. STATOR COIL

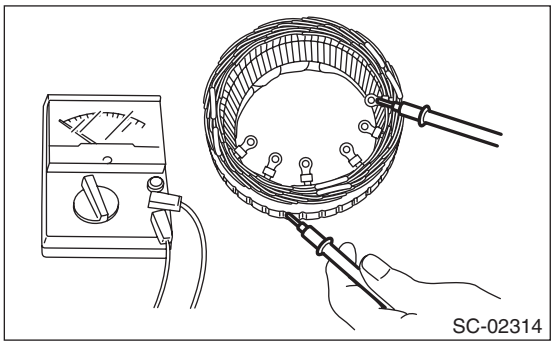
1) Inspect the continuity between the stator coil terminals. If continuity is not as shown in the table, replace the stator coil.



(A) Terminals



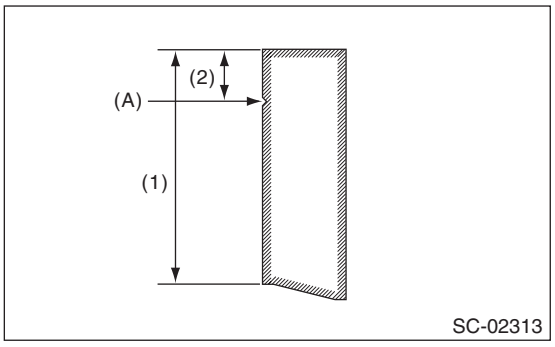
2) Inspect the continuity between the stator coil stator core and lead wire terminals. If there is continuity, replace the stator coil because the stator coil is grounded.


SC-02314

4. BRUSH

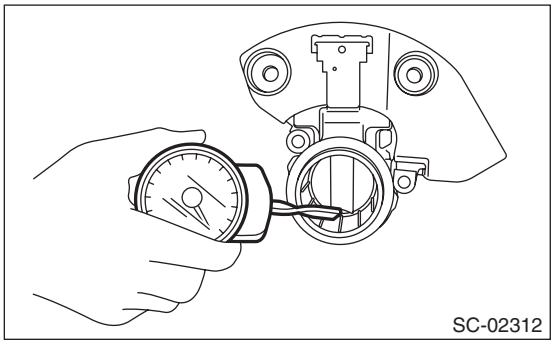
1) Measure the length of each brush. Replace the brush if wear exceeds service limits. There is a service limit mark (A) on each brush.

Brush length:
Standard (1)
22.5 mm (0.886 in)
Limit (2)
5.0 mm (0.197 in)



SC-02313

2) Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of brush spring. If the pressure is 1.7 N (173 gf, 6.11 ozf) or less, replace the brush spring. 4.1 — 5.3 N (418 — 540 gf, 14.75 — 19.06 ozf) pressure is required on the new spring.


SC-02312

5. Ball bearing

Check the ball bearings. Replace the ball bearings if there is resistance in the rotation, or if there is any abnormal noise.

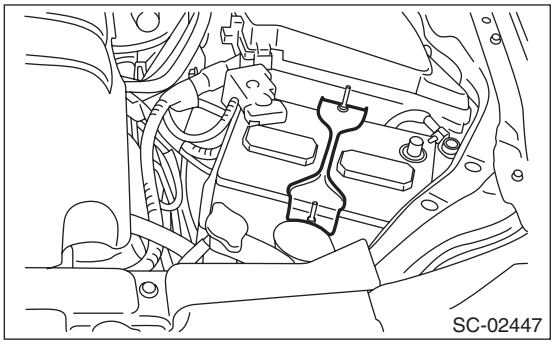
6. OTHER INSPECTIONS

Check that the generator does not have deformation, cracks and any other damage.

4. Battery

A: REMOVAL

1) After disconnecting the battery ground terminal, remove the terminal cover, then disconnect the positive terminal.
2) Remove the flange nut from battery rod and remove battery holder.



3) Remove the battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
3.5 N·m (0.4 kgf-m, 2.6 ft-lb)

NOTE:
• Clean the battery cable terminals and apply grease to retard the formation of corrosion.
• Connect the positive (+) terminal, and then connect the negative (–) terminal of the battery.
• After the battery is installed, initial diagnosis of the electronic throttle control is performed. Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.

C: INSPECTION

WARNING:
• Electrolyte is corrosive acid and has toxicity; be careful of handling the fluid.
• Do not let electrolyte contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.
• Do not let electrolyte contact with painted surfaces.
• Batteries produce explosive gases; be careful of handling.
• Keep open flames away from batteries.
• In case an explosion does occur, wear safety glasses when working near any battery. Never lean over a battery.
• Ventilate when using or charging batteries in enclosed space.
• Before starting work, remove rings, watches and other metallic belongings.
• When in contact with a metallic portion of the vehicle, never allow metallic tools held in the other hand to come into contact with the battery positive terminal or any hardware attached to the terminal.

1. EXTERNAL PARTS

Check the battery case, top cover, vent plugs, and terminal posts for dirt or cracks. If necessary, clean with water and wipe with a dry cloth. Apply a thin coat of grease on the terminal posts to prevent corrosion.

2. ELECTROLYTE LEVEL

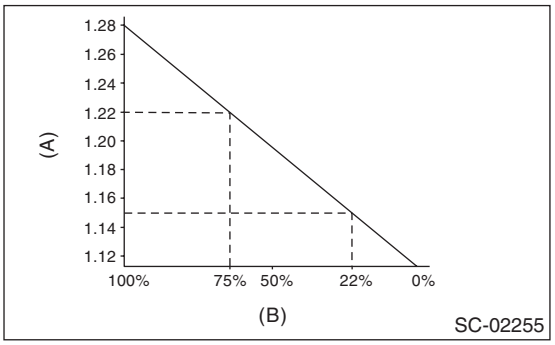
Check the electrolyte level in each cell. If the level is below MIN level, bring the level to MAX level by pouring distilled water into the battery cell. Do not fill beyond MAX level.

3. SPECIFIC GRAVITY OF ELECTROLYTE

1) Measure specific gravity of electrolyte using a hydrometer and a thermometer. Specific gravity varies with temperature of electrolyte, so it must be corrected for 20°C (68°F) using the following calculation:

$S_{20} = St + 0.0007 \times (t - 20)$
S_{20}: Specific gravity corrected at electrolyte temperature of 20°C (68°F)
St: Measured specific gravity
t: Measured temperature (°C)
Determine whether or not battery must be charged, according to the corrected specific gravity.
Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]

2) Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between specific gravity and state of charge is as shown in the figure.



(A) Specific gravity [20°C (68°F)]
(B) State of charge

D: MEASUREMENT

WARNING:
Do not bring an open flame close to the battery while working.

CAUTION:
• Prior to charging, corroded terminals should be cleaned with a brush and common caustic soda solution.
• Be careful since battery electrolyte overflows while charging the battery.
• Observe instructions when handling the battery charger.
• Before charging the battery on the vehicle, disconnect the battery ground terminal to prevent damage of generator diodes or other electrical units.

1. JUDGEMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte should be held within the specific range from 1.250 to 1.290 for more than one hour.
2) Voltage per battery cell should be held at a specific value in a range from 2.5 to 2.8 V for more than one hour.

2. CHECK CONDITION OF CHARGE WITH HYDROMETER

Hydrometer indicator	State of charge	Corrective action
Green	65% or more	Load test
Dark	65% or less	Charge battery
Clear	Low electrolyte	Replace the battery.* (If cranking is difficult)
* Check electrical system before replacement.		

3. NORMAL CHARGING

Charge the battery at the current value specified by manufacturer or at approximately 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

CAUTION:
• Observe the items in "3. NORMAL CHARGING".
• Never use 10 A or more when charging the battery because it will shorten the battery life.

Quick charging is a method that the battery is charged in a short period of time with a relatively large current by using a quick charger. Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, quick charging must be carried out within a current range that will not raise the electrolyte temperature to 40°C (104°F) or more. Also the quick charging is a temporary mean to bring battery voltage up to some level, and battery should be charged slowly with low current as a rule.

ENGINE (DIAGNOSTICS)

EN(H6DO)(diag)

		Page
1.	Basic Diagnostic Procedure	2
2.	Check List for Interview	4
3.	General Description	6
4.	Electrical Component Location	9
5.	Engine Control Module (ECM) I/O Signal	18
6.	Engine Condition Data	29
7.	Data Link Connector	30
8.	General Scan Tool	31
9.	Subaru Select Monitor	36
10.	Read Diagnostic Trouble Code (DTC)	44
11.	Inspection Mode	45
12.	Drive Cycle	51
13.	Clear Memory Mode	57
14.	Compulsory Valve Operation Check Mode	58
15.	System Operation Check Mode	59
16.	Malfunction Indicator Light	62
17.	Diagnostics for Engine Starting Failure	72
18.	Diagnostic Procedure for Subaru Select Monitor Communication	85
19.	List of Diagnostic Trouble Code (DTC)	87
20.	Diagnostic Procedure with Diagnostic Trouble Code (DTC)	95
21.	General Diagnostic Table	353