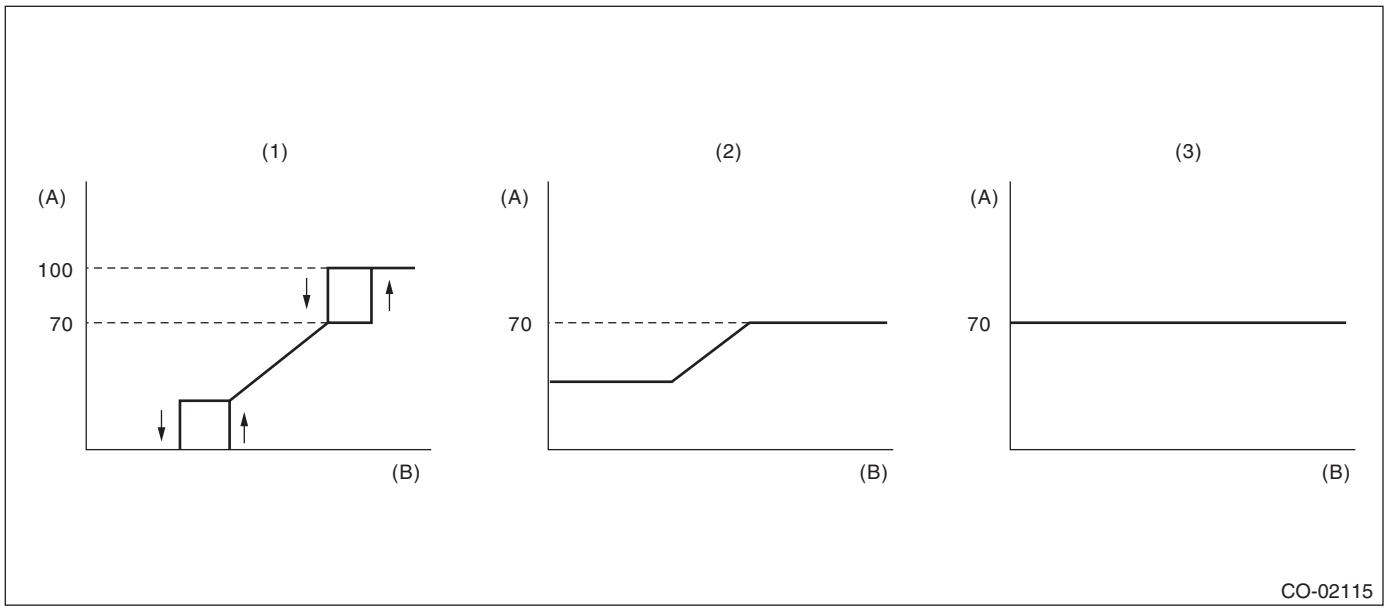
• OUTSIDE TEMPERATURE: LESS THAN 35°C (95°F)

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%	See the figure (1)	100%
ON	Middle pressure switch OFF	See the figure (2)		100%
	Middle pressure switch ON	See the figure (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		See the figure (1)		100%
	ON	Middle pressure switch OFF	See the figure (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		See the figure (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		See the figure (1)		100%
	ON	Middle pressure switch OFF	See the figure (2)		100%
		Middle pressure switch ON	See the figure (3)		100%
During acceleration: 106 km/h (66 MPH) or more During deceleration: 104 km/h (65 MPH) or more	OFF		See the figure (1)		100%
	ON	Middle pressure switch OFF	See the figure (2)		100%
		Middle pressure switch ON	See the figure (3)		100%



(A) Fan speed (%)

(B) Coolant temperature

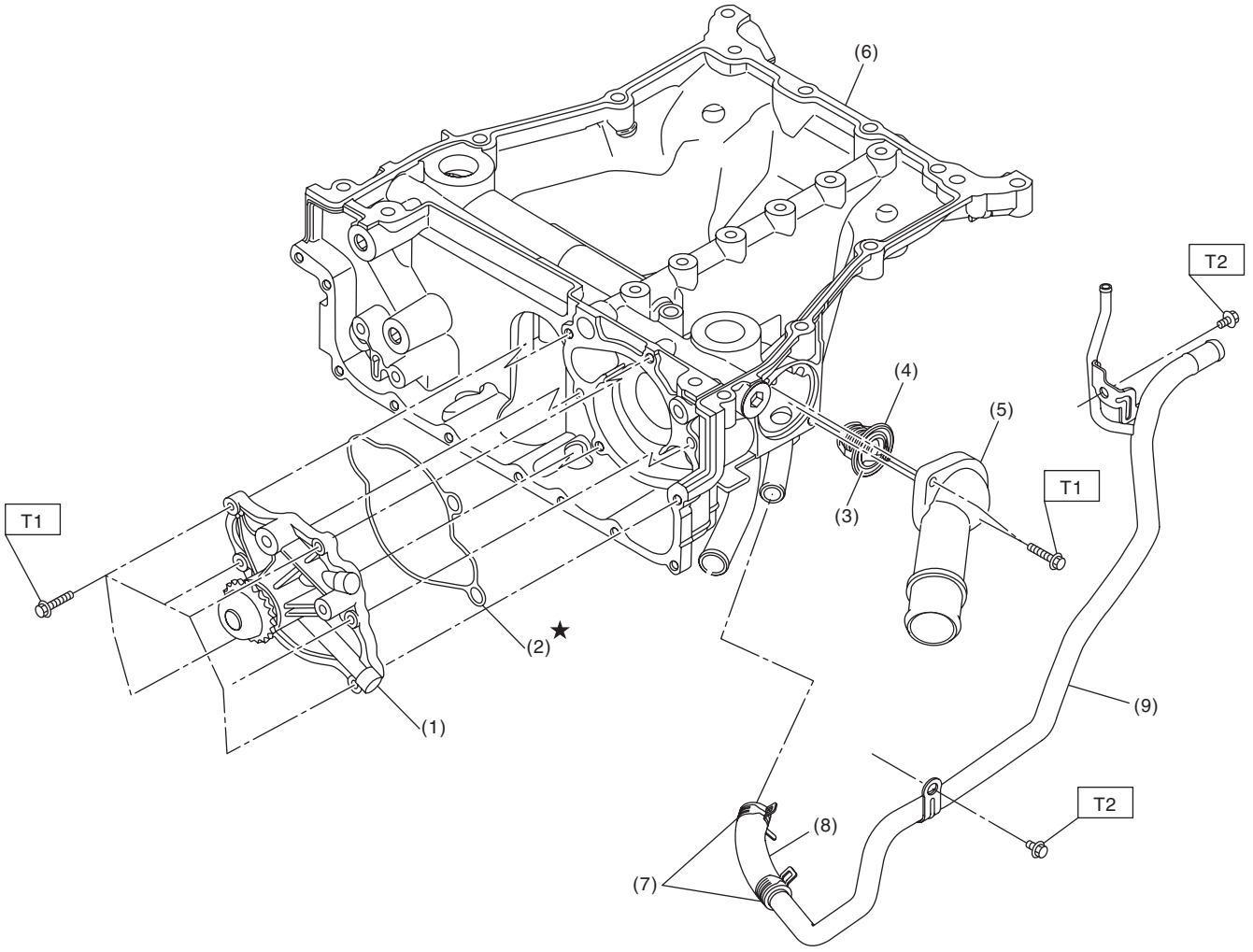
(1) A/C OFF control

(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

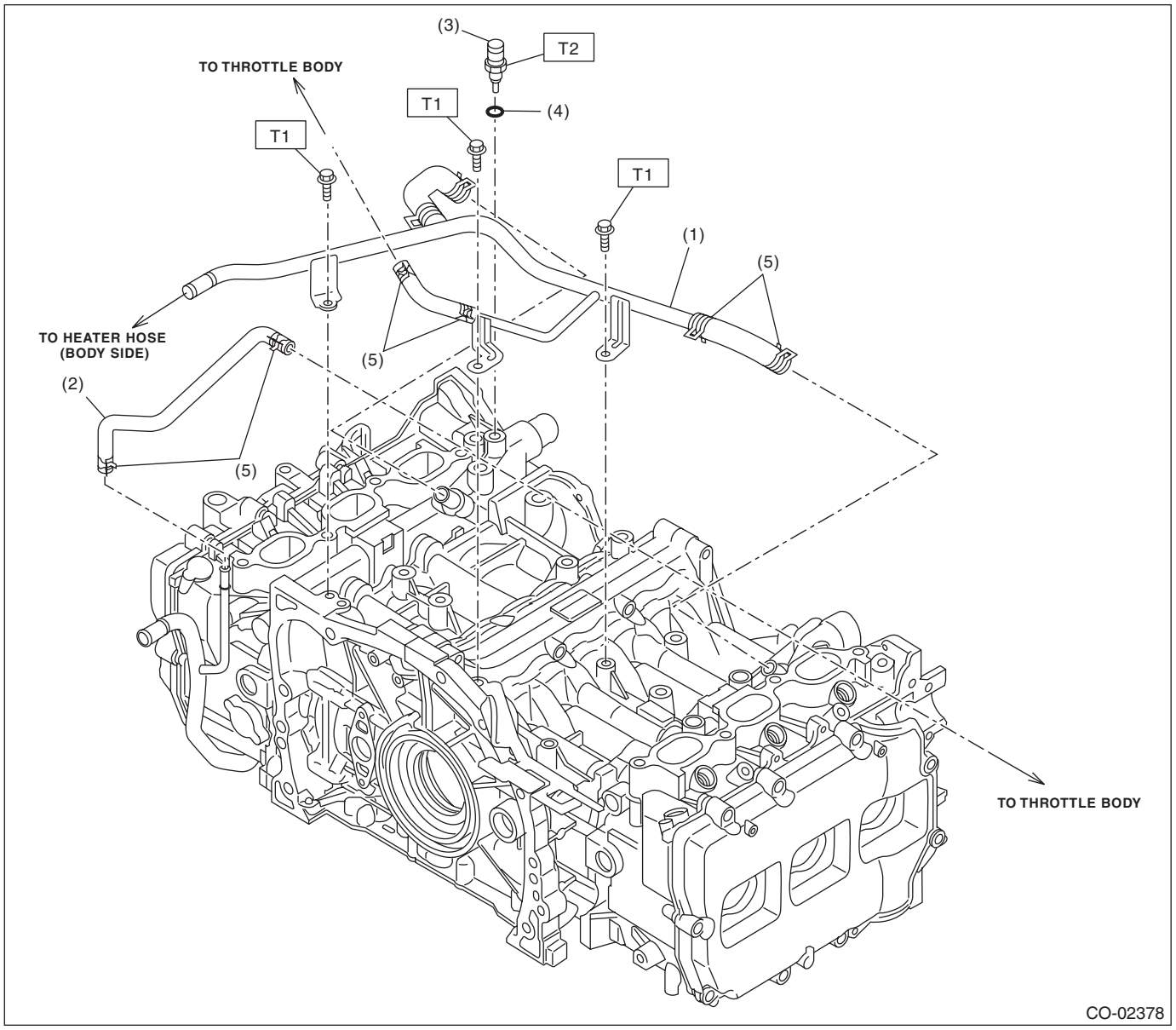


CO-02339

(1) Water pump ASSY
(2) O-ring
(3) Thermostat
(4) Gasket
(5) Thermostat cover
(6) Oil pan upper
(7) Clamp
(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)

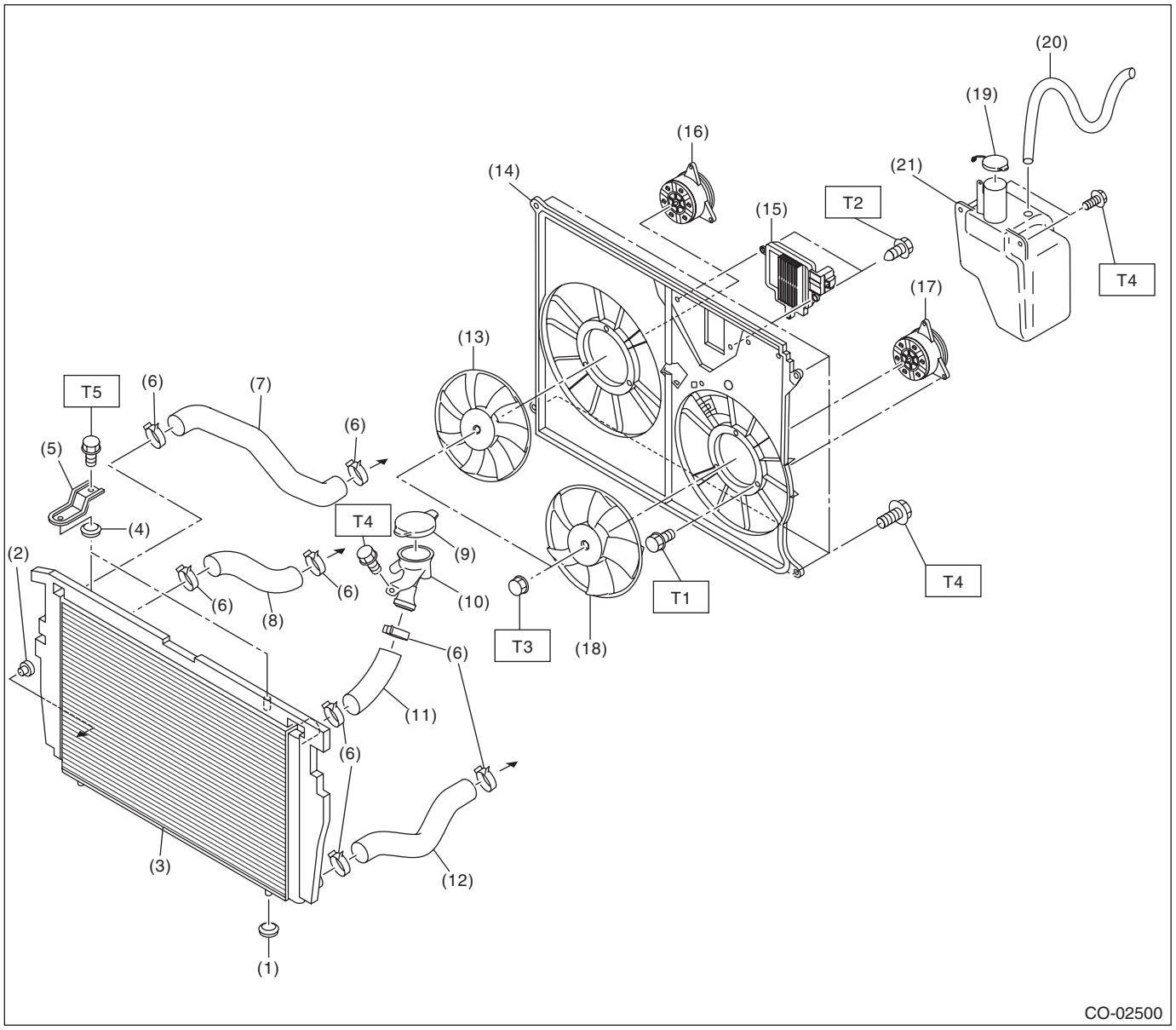
2. ENGINE COOLANT TEMPERATURE SENSOR & HEATER HOSE



(1)	Heater hose pipe	(4)	Gasket
(2)	Preheater hose	(5)	Clamp
(3)	Engine coolant temperature sensor		

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



(1) Radiator lower cushion
(2) Engine coolant drain cock
(3) Radiator
(4) Radiator upper cushion
(5) Radiator upper bracket
(6) Clamp
(7) Radiator hose A
(8) Radiator hose B
(9) Radiator cap
(10) Radiator hose bracket
(11) Radiator hose C
(12) Radiator hose D
(13) Radiator sub fan
(14) Radiator fan shroud
(15) Radiator fan control unit
(16) Radiator sub fan motor
(17) Radiator main fan motor
(18) Radiator main fan
(19) Engine coolant reservoir tank cap
(20) Over flow hose
(21) Engine coolant reservoir tank

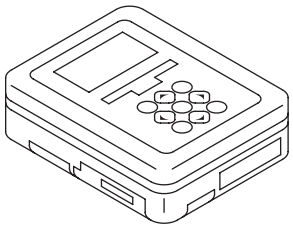
Tightening torque:N·m (kgf-m, ft-lb)
T1: 3.8 (0.4, 2.8)
T2: 2.6 (0.3, 1.9)
T3: 6.3 (0.6, 4.6)
T4: 7.5 (0.8, 5.5)
T5: 12 (1.2, 8.9)

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

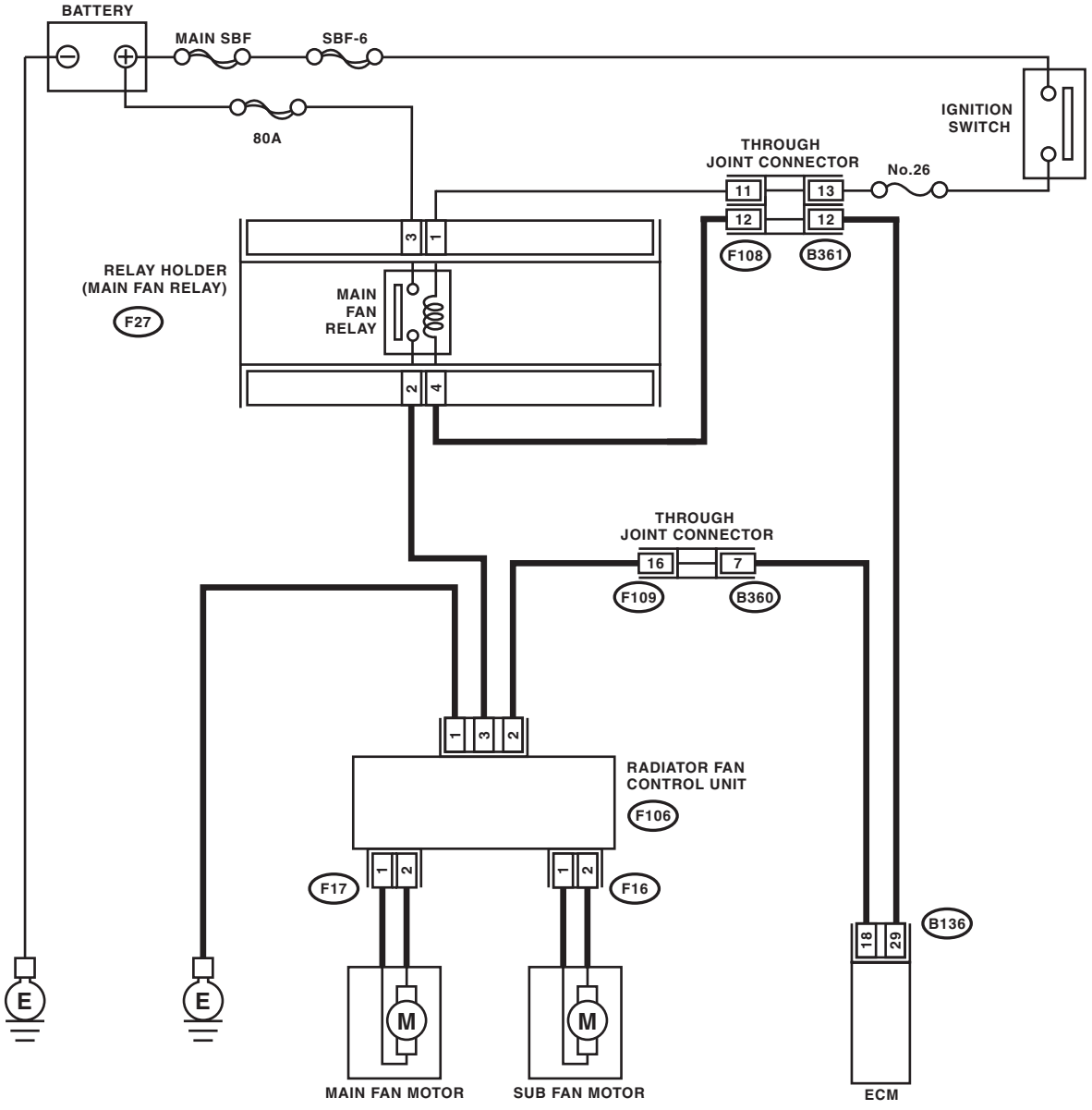
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting for electrical system.

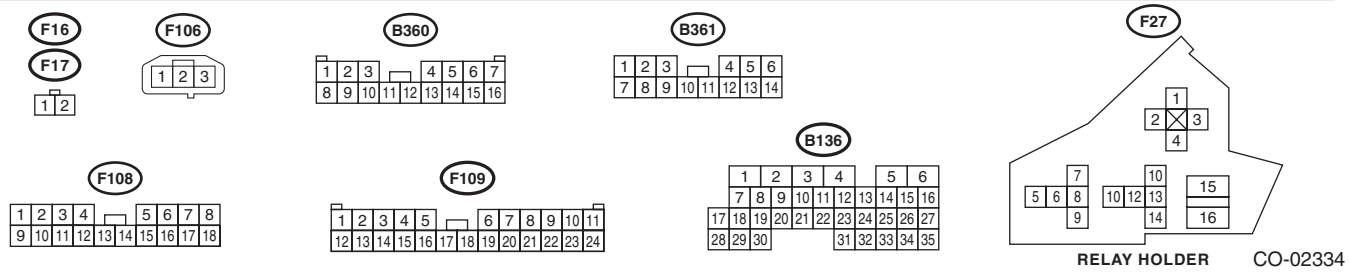
2. GENERAL TOOL

TOOL NAME	REMARKS
Radiator cap tester	Used for measuring pressure.

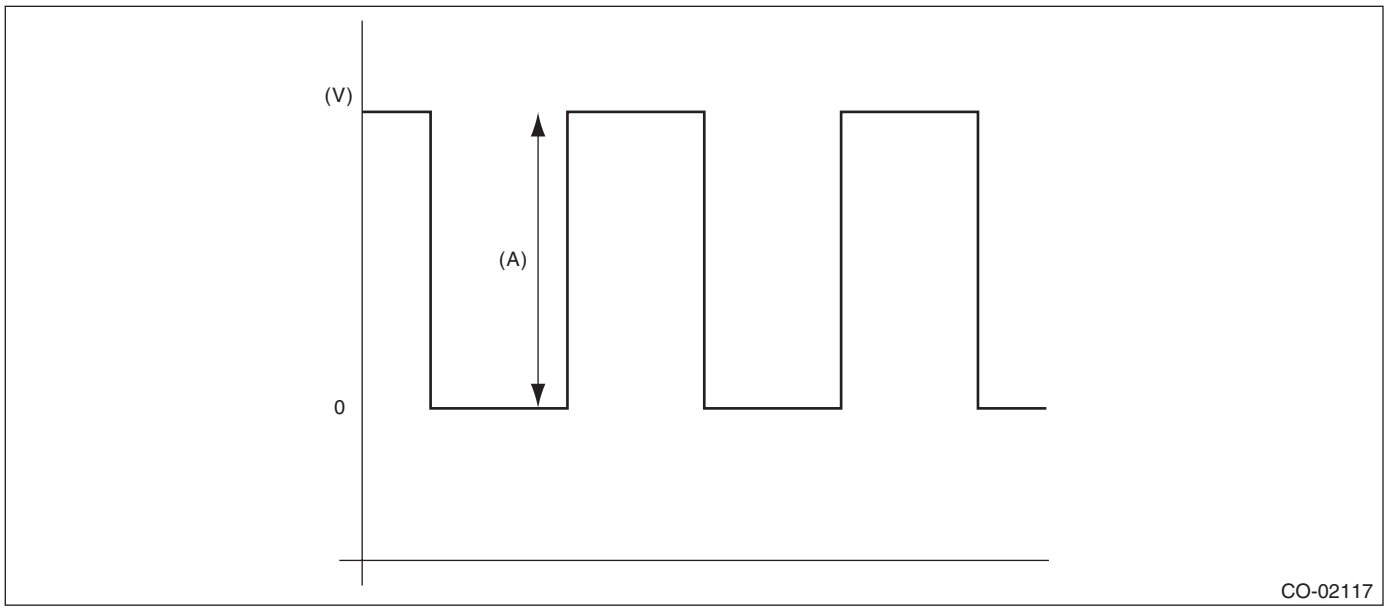
2. Radiator Fan System

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 OFF
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOMS:

Radiator main fan and 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 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 main fan relay coil terminal. 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 connectors 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.

	Step	Check	Yes	No
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 connectors 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 in harness between the ECM and radiator fan control unit.
6	**CHECK RADIATOR FAN CONTROL UNIT AND GROUND CIRCUIT.** 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 in harness between radiator fan control unit connector and chassis ground.
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 OF 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)-31, Radiator Fan Control Unit.>	Replace the ECM. <Ref. to FU(H6DO)-38, Engine Control Module (ECM).>

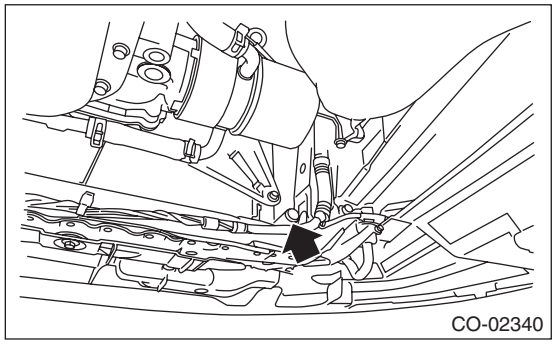
3. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Remove the under cover.
4) Remove the drain plug to drain engine coolant into container.

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


CO-02340

5) Install the drain plug.
6) Install the 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.

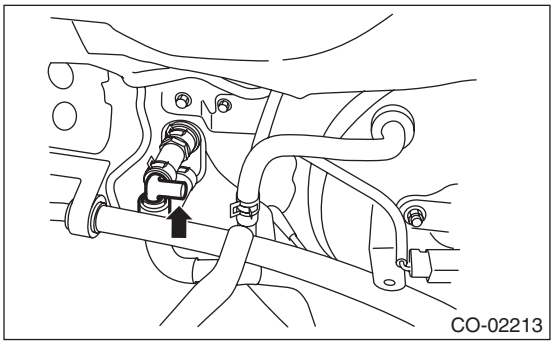
Recommended engine coolant:
Refer to "SPECIFICATION" for the recommended engine coolant. <Ref. to CO(H6DO)-2, SPECIFICATION, General Description.>

Coolant level:
For the details of coolant level, refer to "SPECIFICATION". <Ref. to CO(H6DO)-2, SPECIFICATION, General Description.>

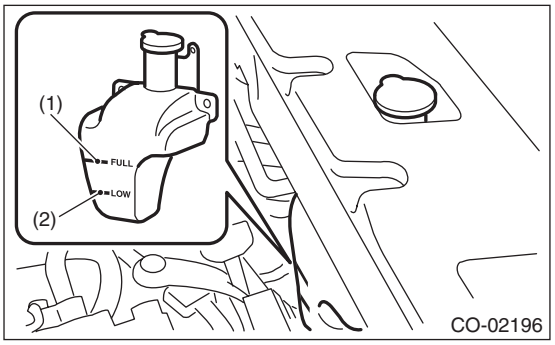
Concentration of coolant:
Refer to "ADJUSTMENT" for the concentration of the coolant. <Ref. to CO(H6DO)-13, ADJUSTMENT, Engine Coolant.>

NOTE:
The SUBARU Super Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has 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) When engine coolant has come out from the air bleeding valve on the heater hose side, close the valve.
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, 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 harden 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 radiator up to the filler neck position and reservoir tank to the “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 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.

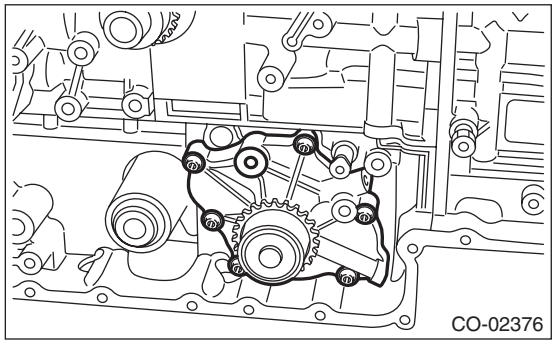
Relationship of SUBARU Super Coolant concentration and freezing temperature			
SUBARU Super Coolant concentration	50%	55%	60%
Freezing temp.	–36°C (–33°F)	–41°C (–42°F)	–50°C (–58°F)

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)-17, 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)-54, REMOVAL, Timing Chain Assembly.>
6) Remove the water pump.

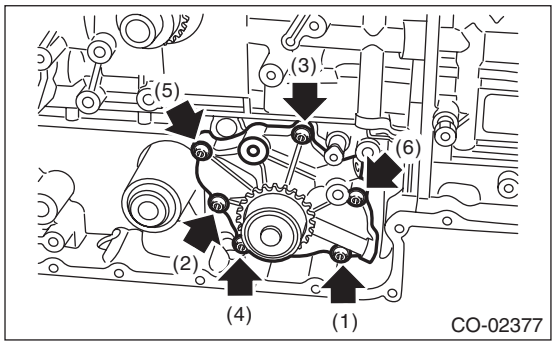


B: INSTALLATION

1) Install the water pump to oil pan upper.

NOTE:
• Tighten the bolts in the numerical order as shown in the figure.
• 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)-60, INSTALLATION, Timing Chain Assembly.>
3) Install the chain cover. <Ref. to ME(H6DO)-49, 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)-19, INSTALLATION, Radiator.>
7) Fill engine coolant. <Ref. to CO(H6DO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

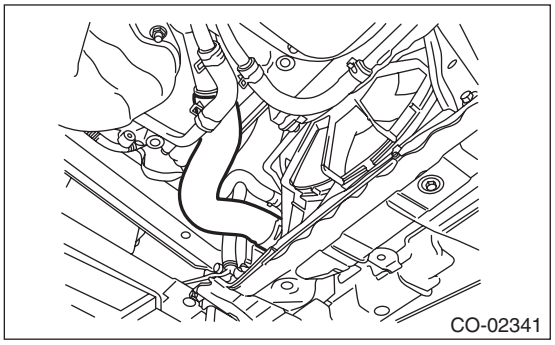
C: INSPECTION

1) Check the water pump bearing for smooth rotation.
2) Check the water pump sprocket for abnormalities.

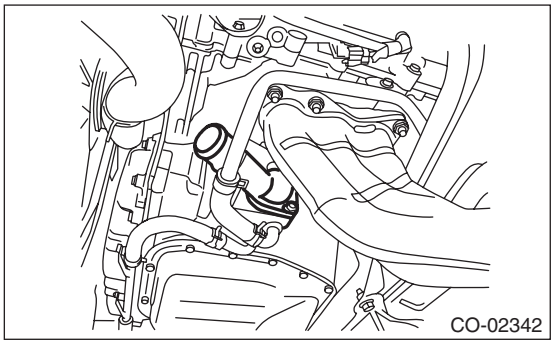
5. Thermostat

A: REMOVAL

1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Remove the under cover.
4) Drain engine coolant completely. <Ref. to CO(H6DO)-12, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Disconnect the radiator outlet hose from thermostat cover.



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



B: INSTALLATION

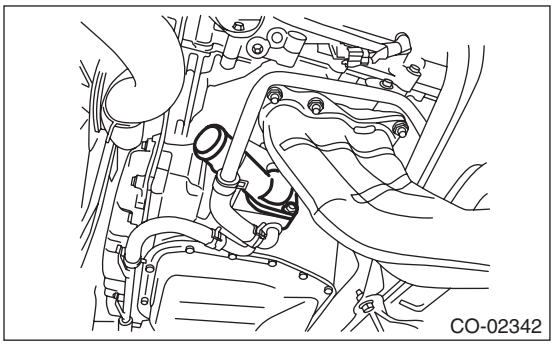
1) Install the gasket on thermostat.

NOTE:
Use a new gasket.

2) Install the thermostat and thermostat cover.

NOTE:
Install the jiggle pin facing upward.

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



3) Connect the radiator outlet hose to thermostat cover.
4) Install the under cover.
5) Lower the vehicle lift.
6) Fill engine coolant. <Ref. to CO(H6DO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if any malfunction is detected by the following test.

- Inspection method

Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measured value should meet the specification.

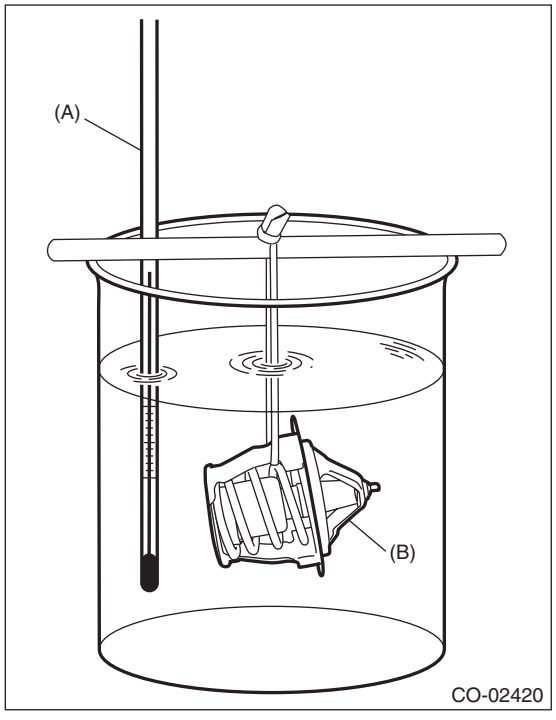
Starting temperature to open:
80 — 84°C (176 — 183°F)

Full open temperature:
95°C (203°F)

NOTE:

- 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 with container bottom.

Valve lift:
9.0 mm (0.354 in) or more



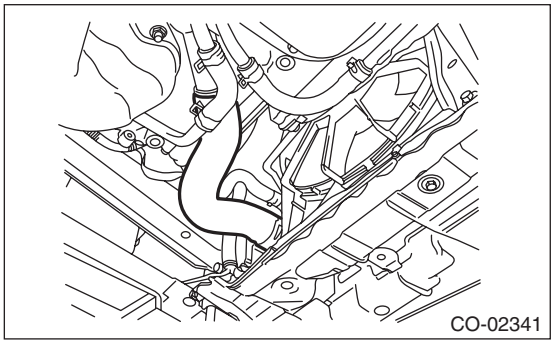
(A) Thermometer
(B) Thermostat

6. Radiator

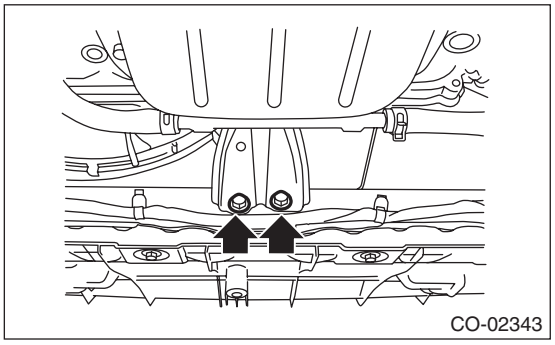
A: REMOVAL

WARNING:
The radiator is pressurized. Wait until engine cools down before working on the radiator.

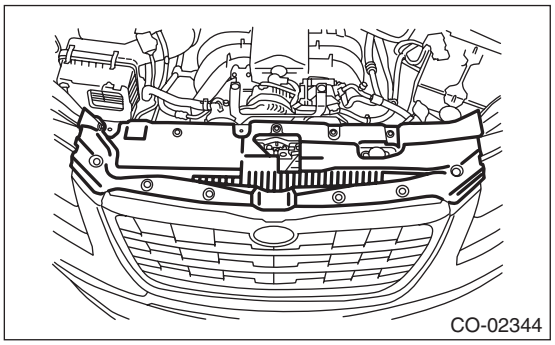
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.
4) Lift up the vehicle.
5) Remove the under cover.
6) Drain engine coolant completely. <Ref. to CO(H6DO)-12, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Disconnect the radiator outlet hose from radiator.


CO-02341

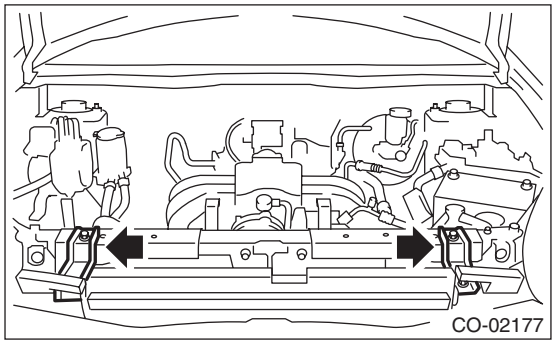
8) Remove the bolts on the underside of the radiator stay.


CO-02343

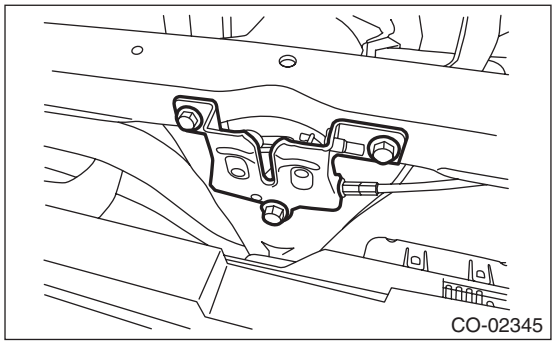
9) Lower the vehicle lift.
10) Remove the air intake duct. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.>
11) Remove the front upper cover.


CO-02344

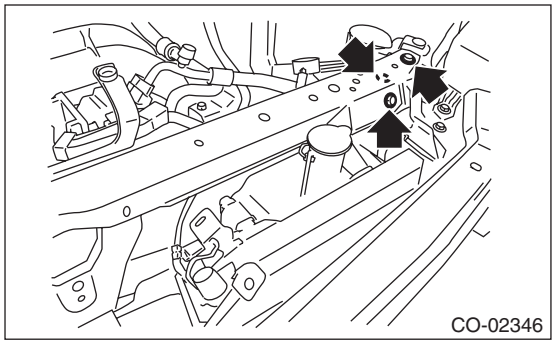
12) Remove the radiator upper brackets.


CO-02177

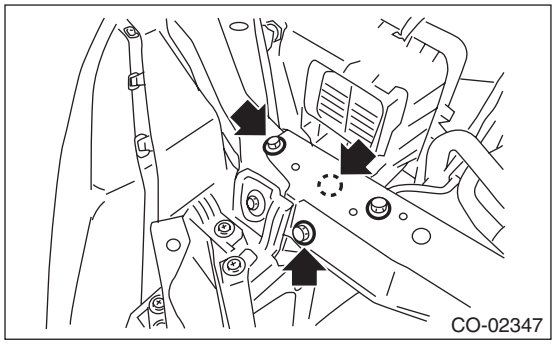
13) Remove the radiator stay.
(1) Remove the latch.


CO-02345

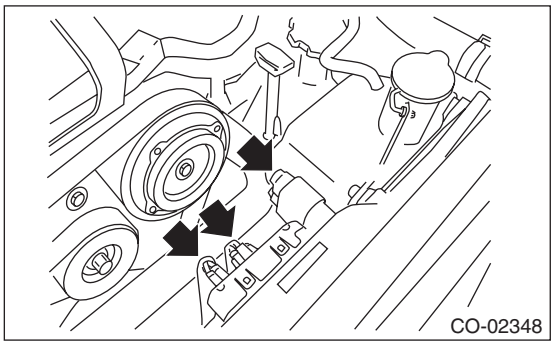
(2) Remove the radiator hose bracket.
(3) Remove the clip holding the harness.
(4) Remove the bolts on the left side of the radiator stay.


CO-02346

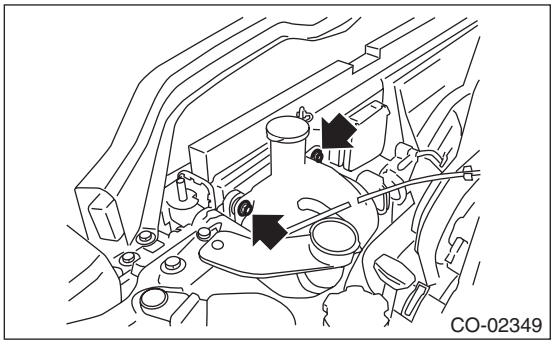
(5) Remove the bolts on the right side of the radiator stay.


CO-02347

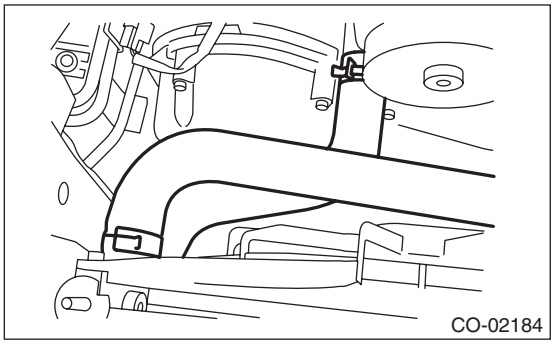
14) Disconnect the connector from radiator fan control unit.



15) Remove the reservoir tank.

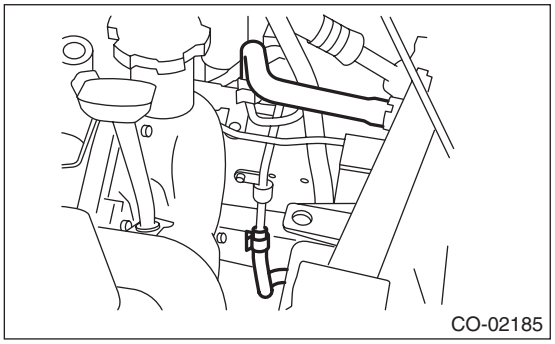


16) Disconnect the radiator hose from radiator.



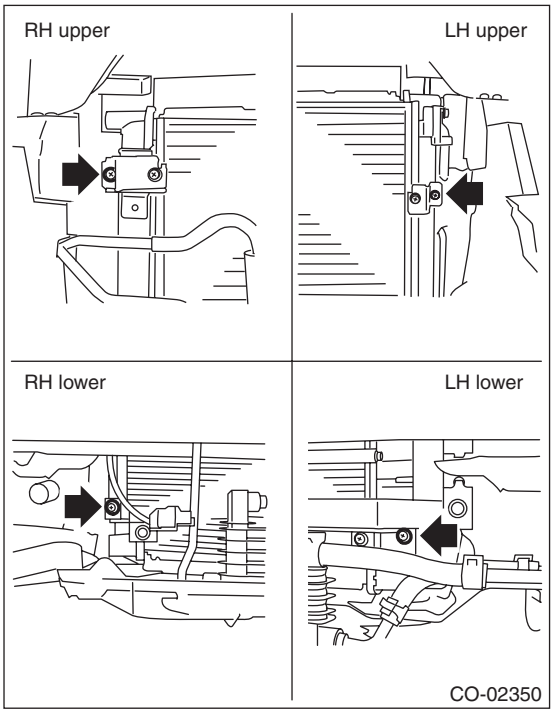
17) Disconnect the ATF cooler hose from the radiator.

NOTE:
Plug the ATF pipe to prevent ATF leaks.

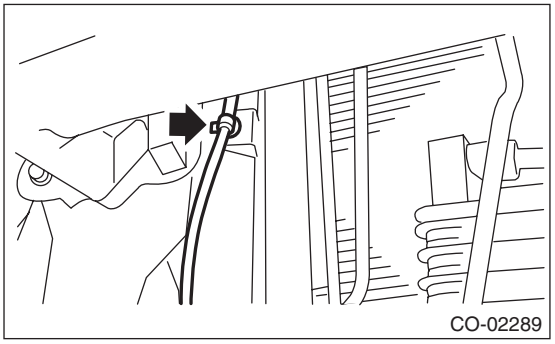


18) Remove the front bumper. <Ref. to EI-22, REMOVAL, Front Bumper.>

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



20) Remove the clip holding the ambient sensor harness.



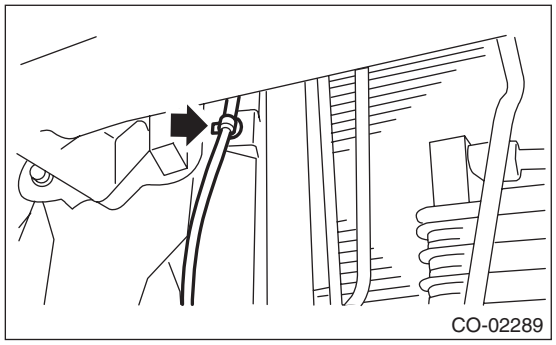
21) Lift the radiator up and away from vehicle.
22) Remove the radiator lower cushion.

B: INSTALLATION

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

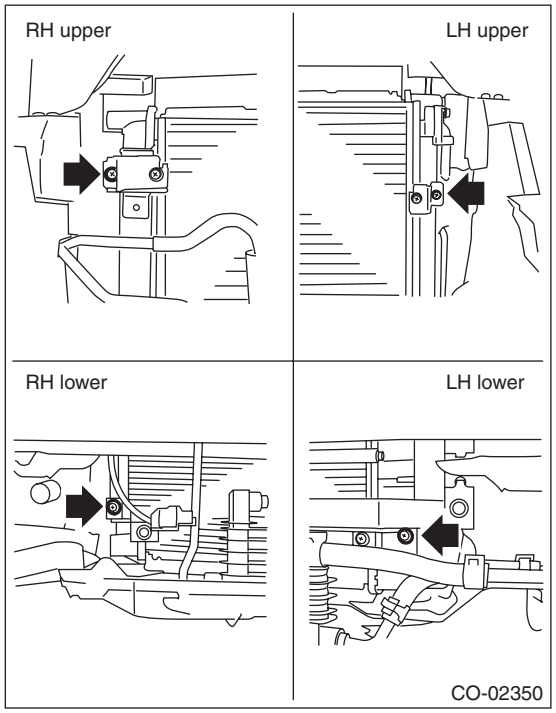
NOTE:
Insert the pins on the lower side of radiator into the radiator lower cushions on the vehicle side.

3) Hold the harness of the ambient sensor with a clip.



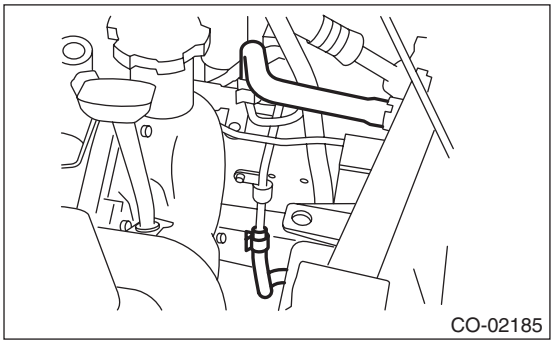
4) Hold the radiator and condenser with bolts.

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

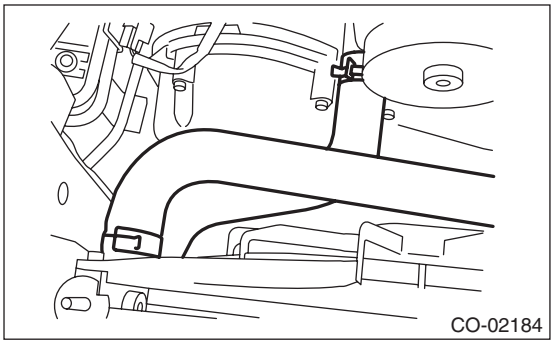


5) Install the front bumper. <Ref. to EI-23, INSTALLATION, Front Bumper.>

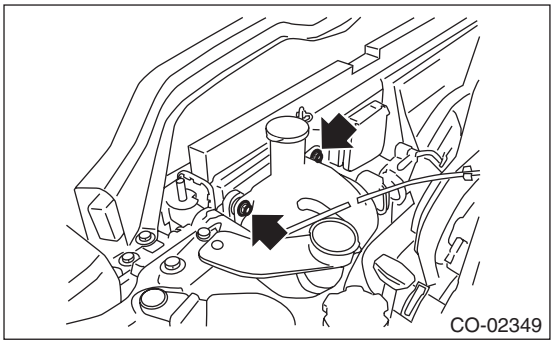
6) Connect the ATF cooler hoses.



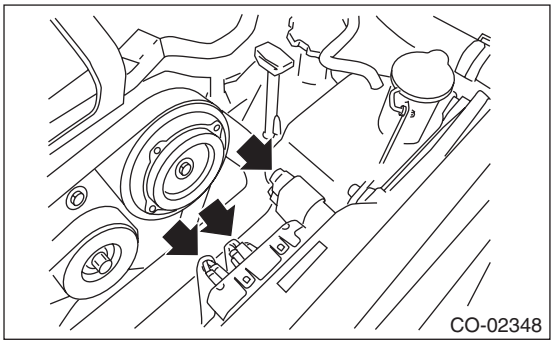
7) Connect the radiator hose.



8) Install the reservoir tank.

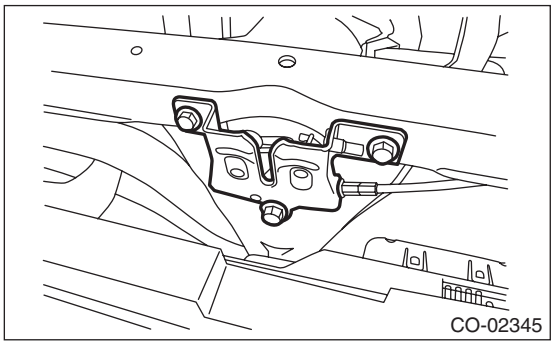


9) Connect the connector to radiator fan control unit.



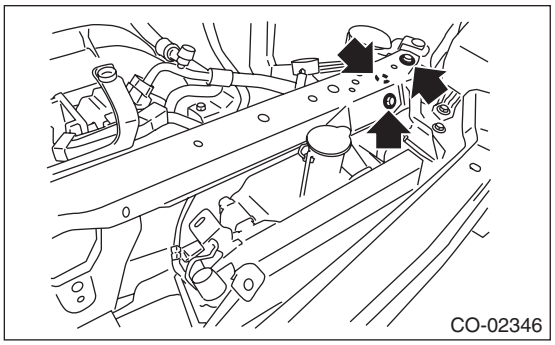
10) Install the radiator stay.
(1) Install the latch.

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


CO-02345

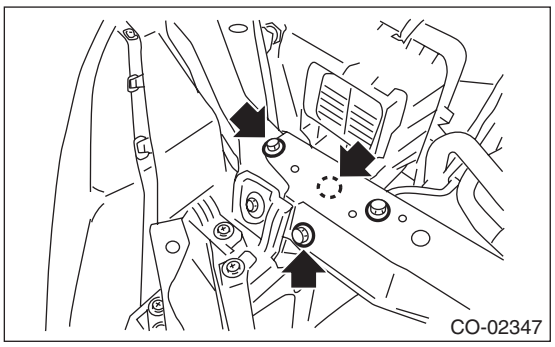
(2) Install the radiator hose bracket.
(3) Hold the harness to the radiator stay with a clip.
(4) Tighten the bolts on the left side of the radiator stay.

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


CO-02346

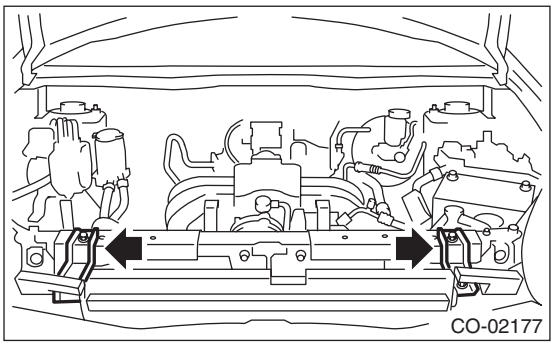
(5) Tighten the bolts on the right side of the radiator stay.

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

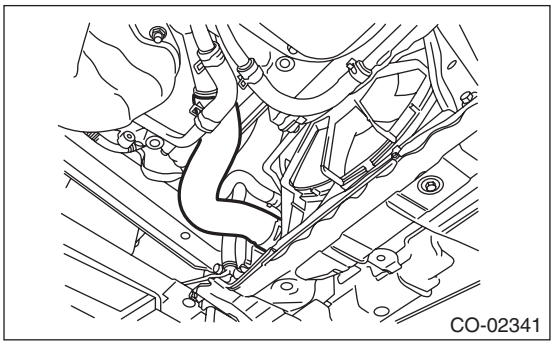

CO-02347

11) Install the radiator upper brackets.

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

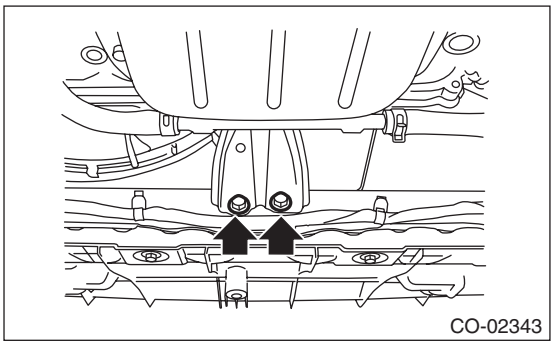

CO-02177

12) Lift up the vehicle.
13) Connect the radiator outlet hose.


CO-02341

14) Tighten the bolts on the lower side of the radiator stay.

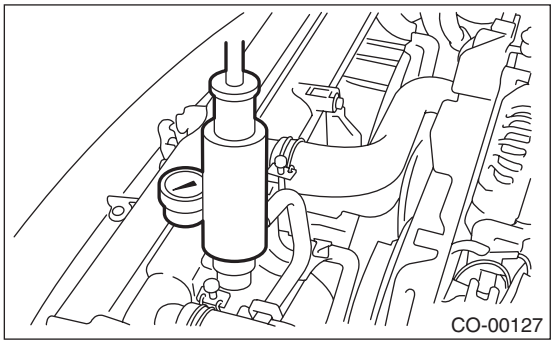
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)


CO-02343

15) Install the under cover.
16) Lower the vehicle lift.
17) Connect the ground cable to battery.
18) Fill engine coolant. <Ref. to CO(H6DO)-12, 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)-8, INSTALLATION, Air Intake Duct.>
22) Install the collector cover.

C: INSPECTION

1) Remove the radiator cap, fill the radiator with engine coolant, and then install the tester to the installation position of cap.



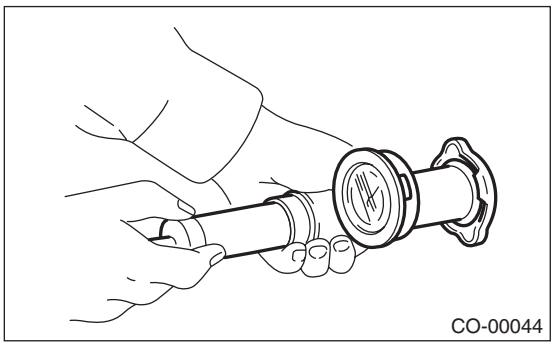
2) Apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) to the radiator and check the following points:
- Leakage from the radiator or its vicinity
- Leakage from the hose or its connections

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

7. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase pressure until the tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five — six seconds. If its valve opens below the limit, replace the cap.

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

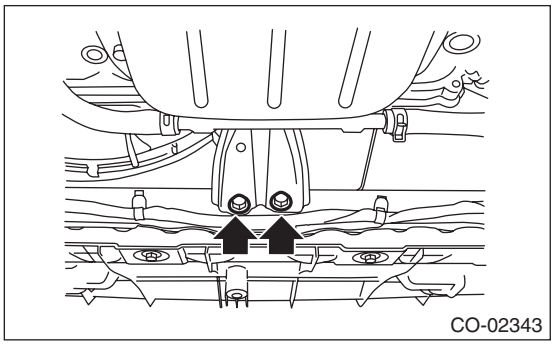
Service limit:
63.6 kPa (0.65 kg/cm^2, 9 psi)

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

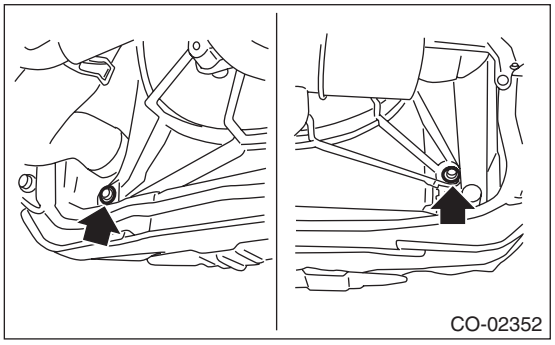
8. Radiator Main Fan and Fan Motor

A: REMOVAL

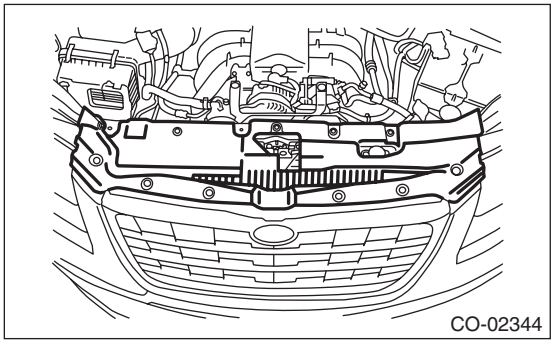
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.
4) Lift up the vehicle.
5) Remove the under cover.
6) Remove the bolts on the underside of the radiator stay.


CO-02343

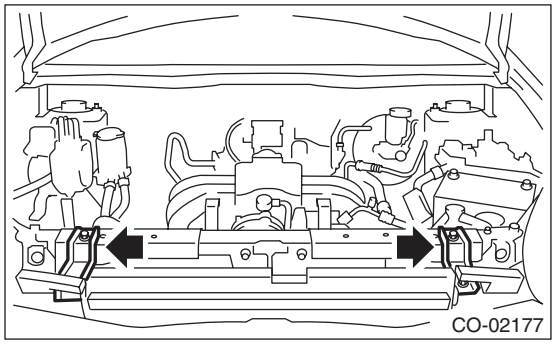
7) Remove the bolts on the underside of the radiator fan shroud.


CO-02352

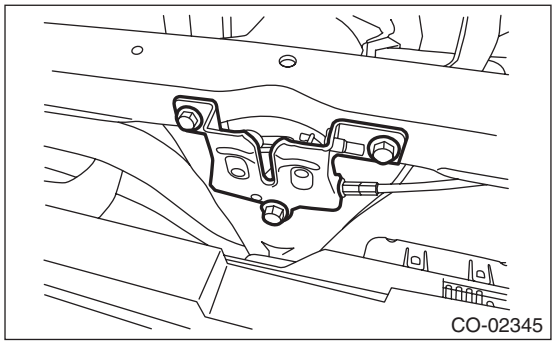
8) Lower the vehicle lift.
9) Remove the air intake duct. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.>
10) Remove the front upper cover.


CO-02344

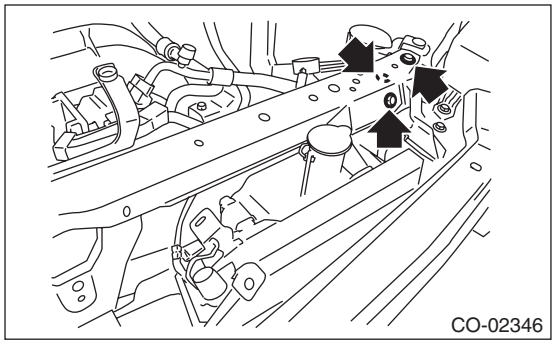
11) Remove the radiator upper brackets.


CO-02177

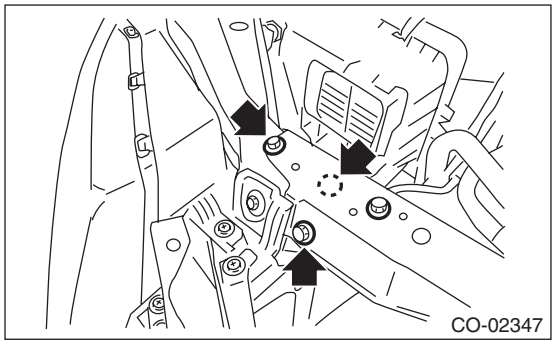
12) Remove the radiator stay.
(1) Remove the latch.


CO-02345

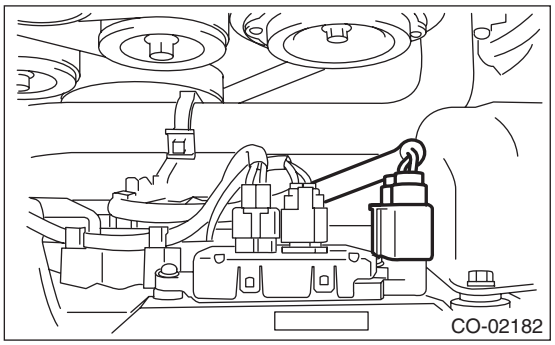
(2) Remove the radiator hose bracket.
(3) Remove the clip holding the harness.
(4) Remove the bolts on the left side of the radiator stay.


CO-02346

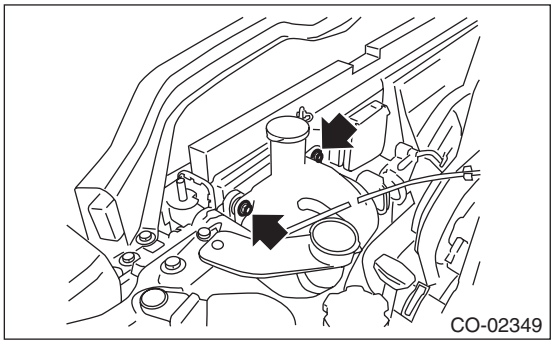
(5) Remove the bolts on the right side of the radiator stay.


CO-02347

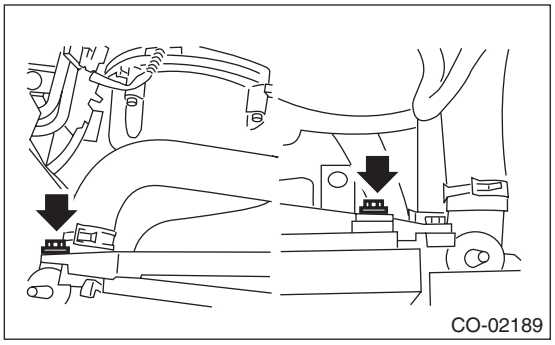
13) Disconnect the connector from radiator fan control unit.



14) Remove the reservoir tank.



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



16) Remove the radiator fan shroud.

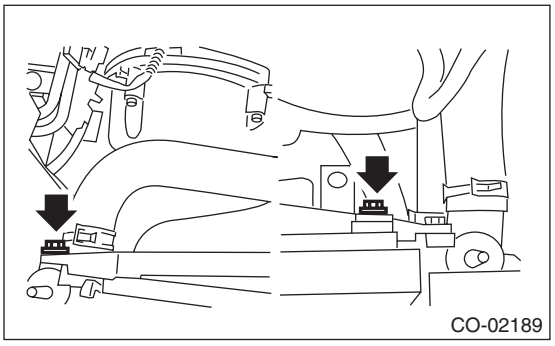
NOTE:
When pulling the radiator fan shroud up, be careful not to hit and damage the radiator and ATF hoses.

B: INSTALLATION

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

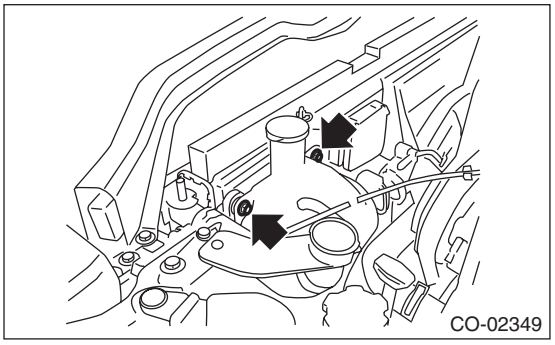
1) Tighten the bolts on the top side of the radiator fan shroud.

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

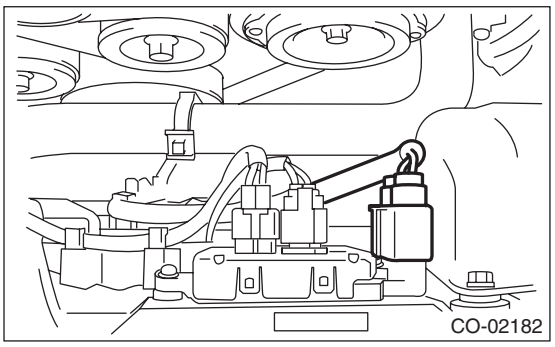


2) Install the reservoir tank.

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

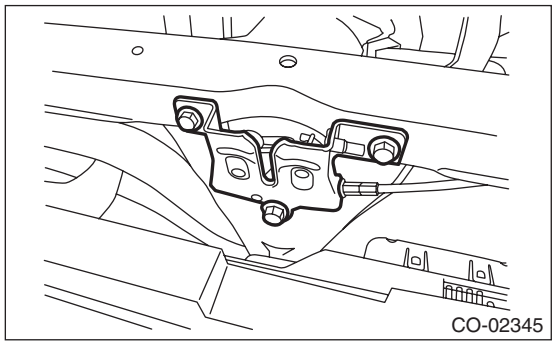


3) Connect the connector to radiator fan control unit.



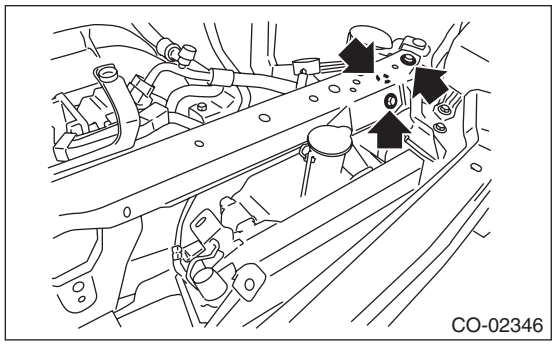
4) Install the radiator stay.
(1) Install the latch.

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



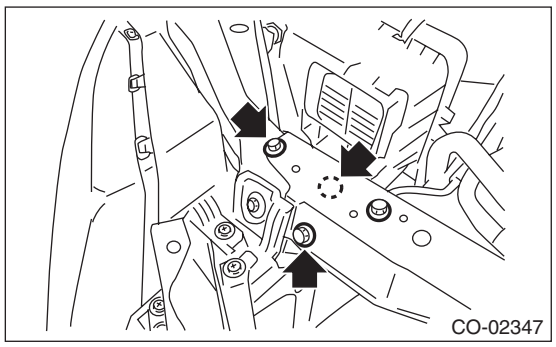
(2) Connect the radiator hose brackets.
(3) Hold the harness to the radiator stay with a clip.
(4) Tighten the bolts on the left side of the radiator stay.

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



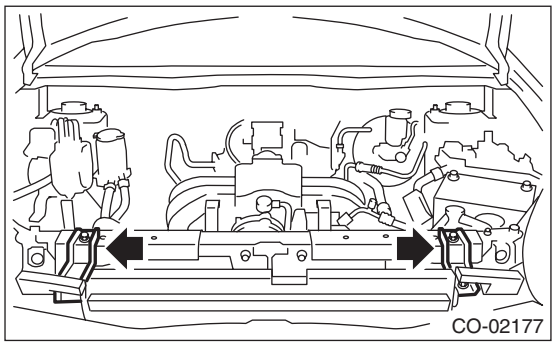
(5) Tighten the bolts on the right side of the radiator stay.

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

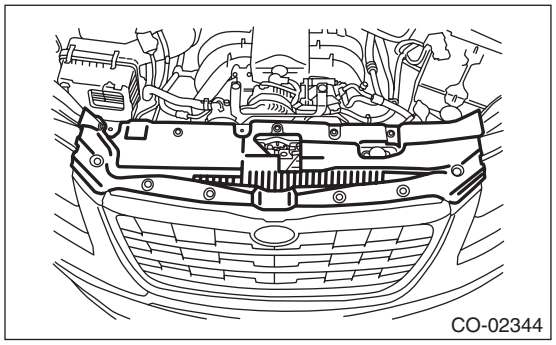


5) Install the radiator upper brackets.

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

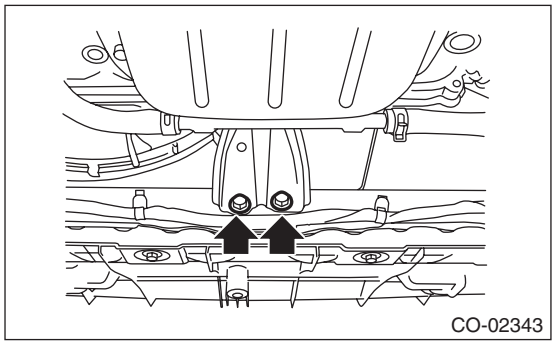


6) Install the front upper cover.



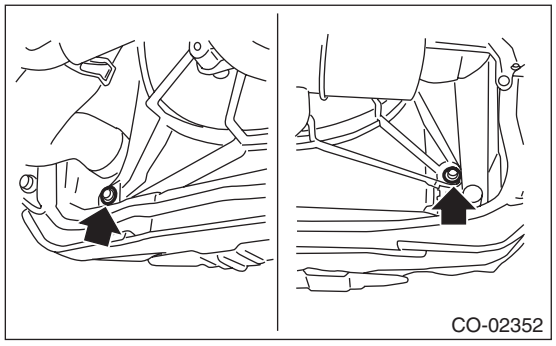
7) Install the air intake duct. <Ref. to IN(H6DO)-8, INSTALLATION, Air Intake Duct.>
8) Lift up the vehicle.
9) Tighten the bolts on the lower side of the radiator stay.

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



10) Tighten the bolts on the lower side of the radiator fan shroud.

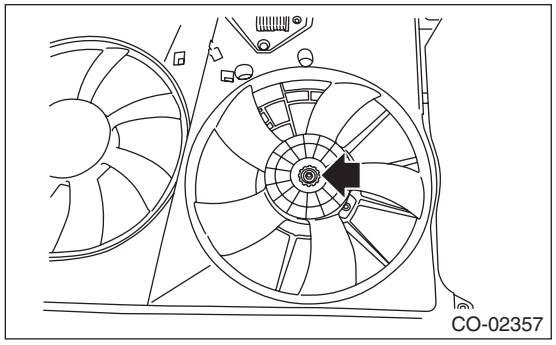
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



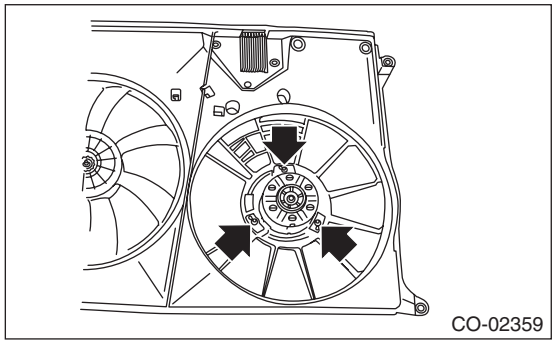
11) Install the under cover.
12) Lower the vehicle lift.
13) Connect the ground cable to battery.
14) Install the collector cover.

C: DISASSEMBLY

1) Remove the radiator main fan.



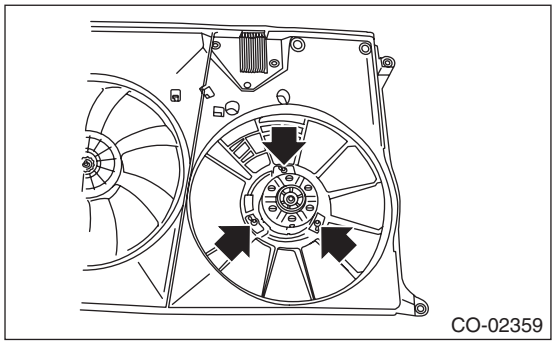
2) Remove the radiator main fan motor.



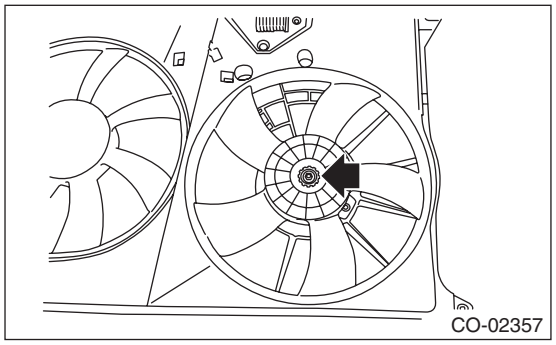
D: ASSEMBLY

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)



9. Radiator Sub Fan and Fan Motor

A: REMOVAL

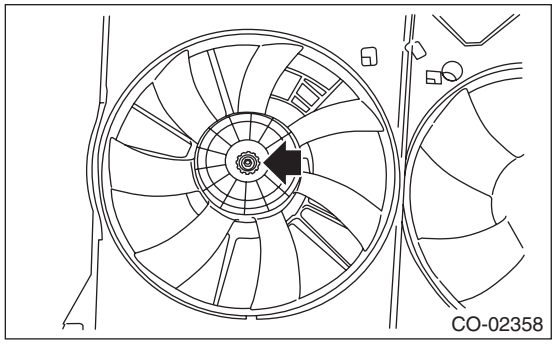
Refer to the radiator main fan and fan motor. <Ref. to CO(H6DO)-23, REMOVAL, Radiator Main Fan and Fan Motor.>

B: INSTALLATION

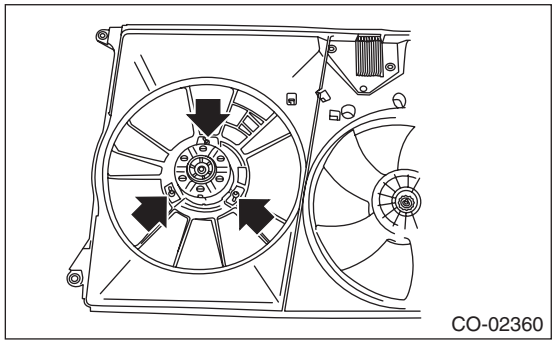
Refer to the radiator main fan and fan motor. <Ref. to CO(H6DO)-24, INSTALLATION, Radiator Main Fan and Fan Motor.>

C: DISASSEMBLY

1) Remove the radiator sub fan.



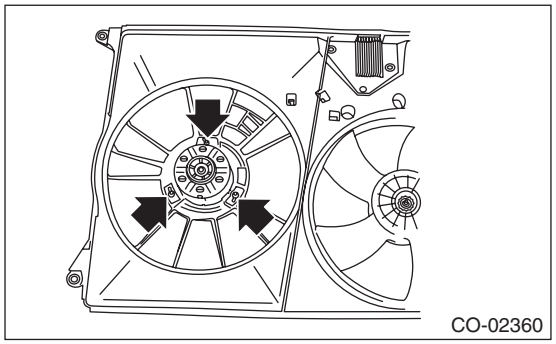
2) Remove the radiator sub fan motor.



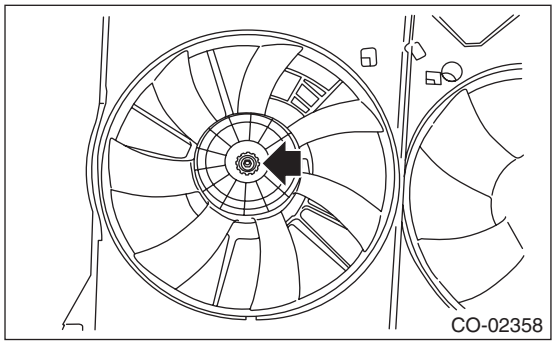
D: ASSEMBLY

Assemble in the reverse order of disassembly.

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



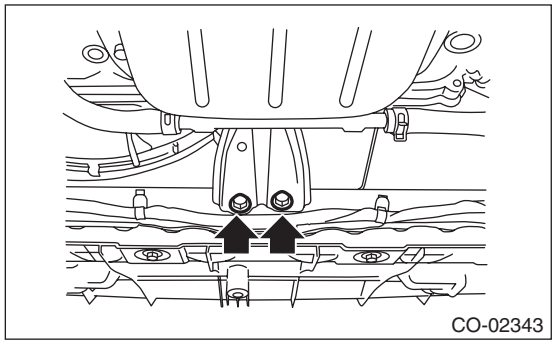
Tightening torque:
6.3 N·m (0.6 kgf-m, 4.6 ft-lb)



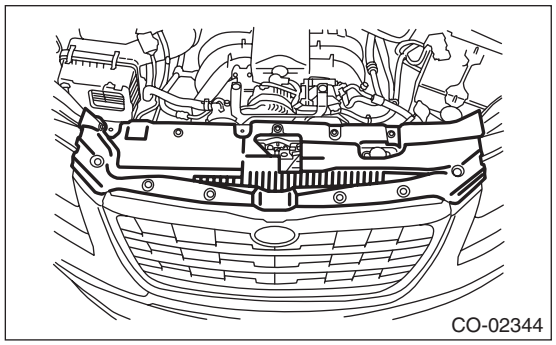
10.Reservoir Tank

A: REMOVAL

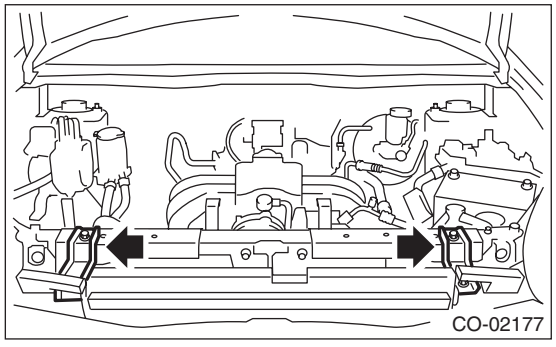
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Lift up the vehicle.
4) Remove the under cover.
5) Remove the bolts on the underside of the radiator stay.


CO-02343

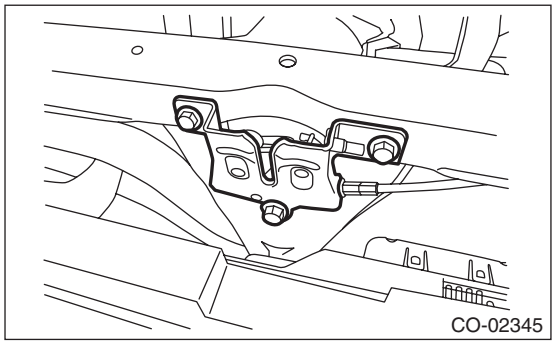
6) Lower the vehicle lift.
7) Remove the air intake duct. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.>
8) Remove the front upper cover.


CO-02344

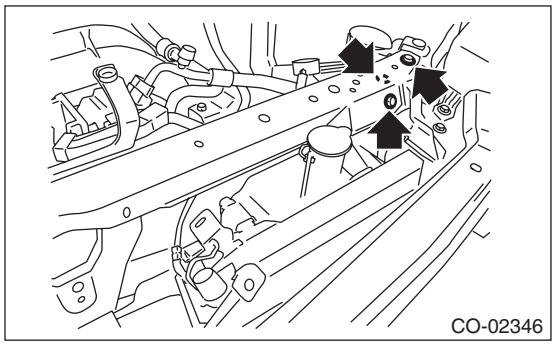
9) Remove the radiator upper brackets.


CO-02177

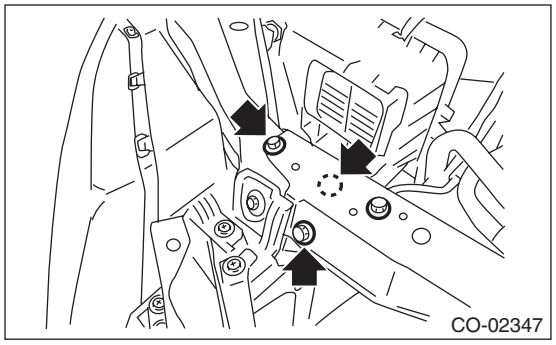
10) Remove the radiator stay.
(1) Remove the latch.


CO-02345

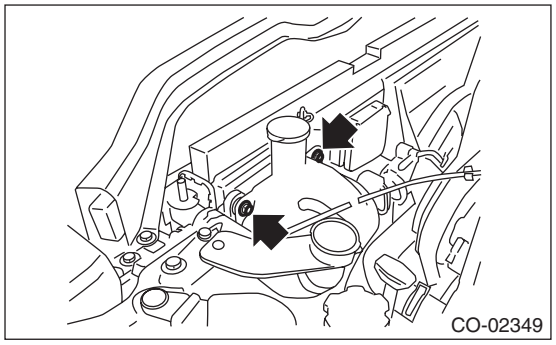
(2) Remove the radiator hose bracket.
(3) Remove the clip holding the harness.
(4) Remove the bolts on the left side of the radiator stay.


CO-02346

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


CO-02347

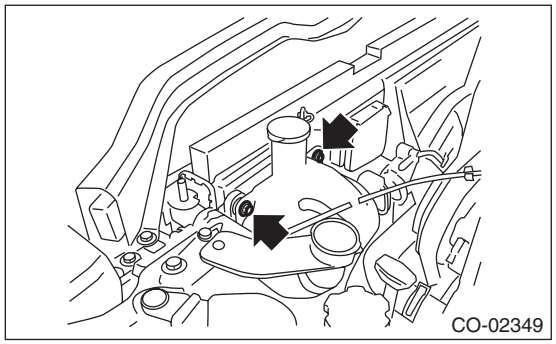
11) Remove the reservoir tank.


CO-02349

B: INSTALLATION

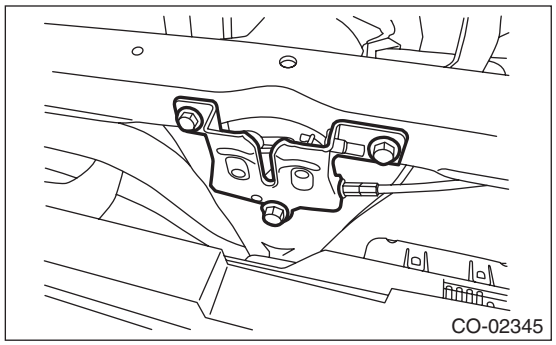
1) Install the reservoir tank.

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



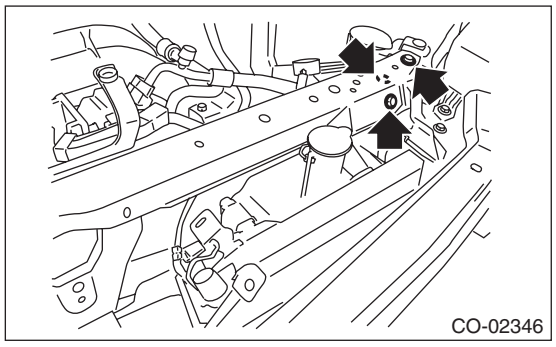
2) Install the radiator stay.
(1) Install the latch.

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



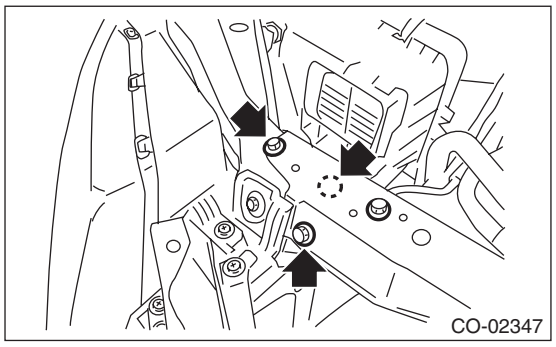
(2) Install the radiator hose bracket.
(3) Hold the harness to the radiator stay with a clip.
(4) Tighten the bolts on the left side of the radiator stay.

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



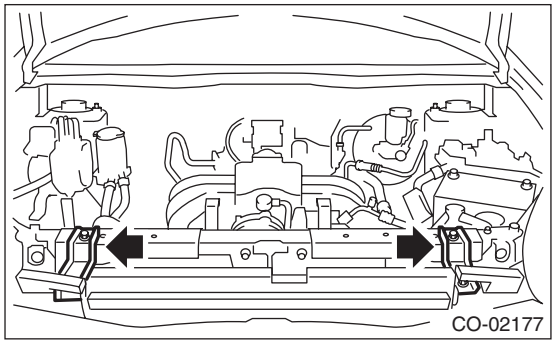
(5) Tighten the bolts on the right side of the radiator stay.

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

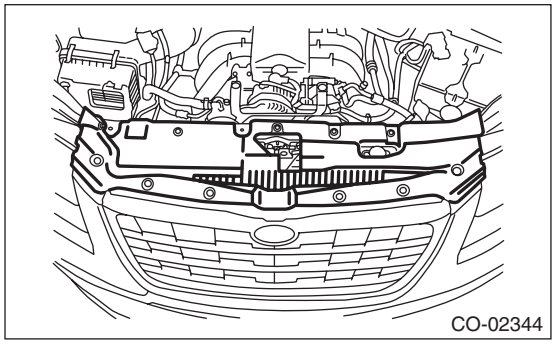


3) Install the radiator upper brackets.

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



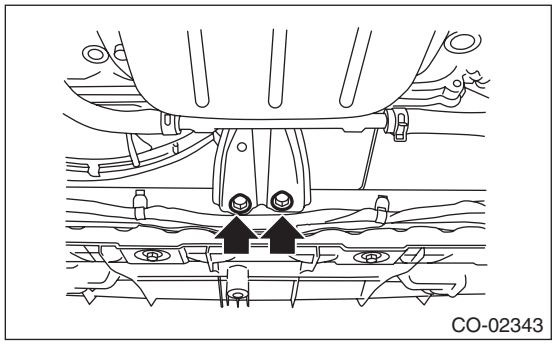
4) Install the front upper cover.



5) Install the air intake duct. <Ref. to IN(H6DO)-8, INSTALLATION, Air Intake Duct.>
6) Lift up the vehicle.

7) Tighten the bolts on the lower side of the radiator stay.

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



8) Install the under cover.
9) Lower the vehicle lift.
10) Install the collector cover.

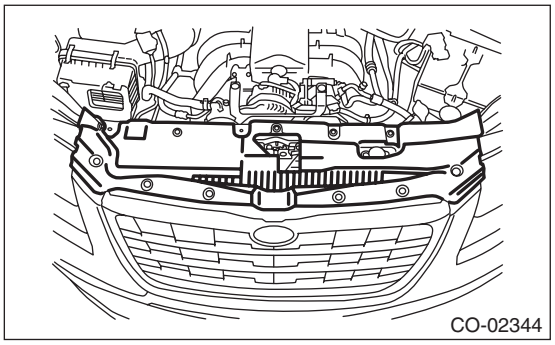
C: INSPECTION

Make sure the engine coolant level is between “FULL” and “LOW”.

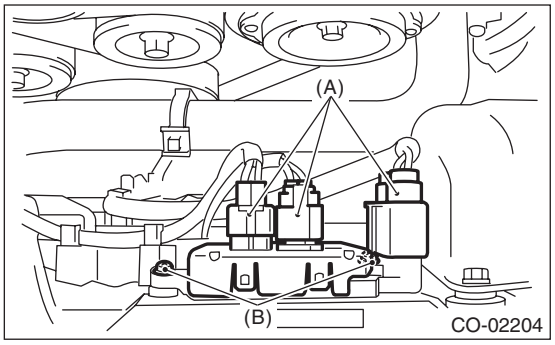
11.Radiator Fan Control Unit

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the air intake duct. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.>
3) Remove the front upper cover.


CO-02344

4) Remove the radiator fan control unit.
   (1) Disconnect the connector from radiator fan control unit.
   (2) Remove the screw which secures the radiator fan control unit.



CO-02204

(A) Connector
(B) Screw

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. Malfunction of 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. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat cover	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Strange 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	7
3.	Engine Oil	9
4.	Oil Pan	10
5.	Oil Pump	11
6.	Oil Pump Relief Valve	13
7.	Oil Pressure Switch	14
8.	Engine Oil Filter	15
9.	Oil Cooler	16
10.	General Diagnostic Table	17

1. General Description

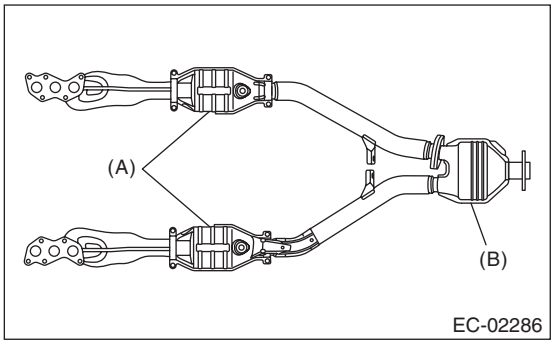
A: CAUTION

• 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.

2. Front Catalytic Converter

A: REMOVAL

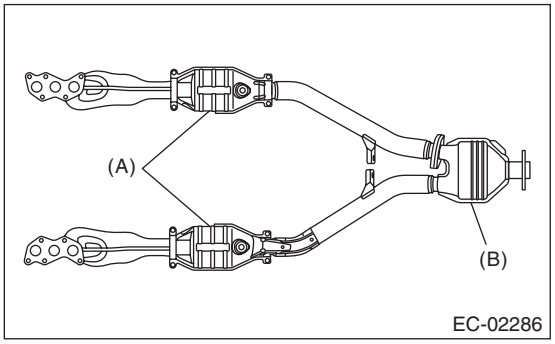
The front and rear catalytic converters are integrated into the front exhaust pipe; therefore, refer to “Front Exhaust Pipe” for removal procedures. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>



(A) Front catalytic converter
(B) Rear catalytic converter

B: INSTALLATION

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



(A) Front catalytic converter
(B) Rear catalytic converter

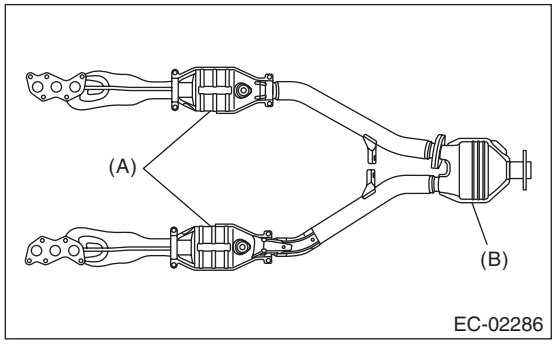
C: INSPECTION

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

3. Rear Catalytic Converter

A: REMOVAL

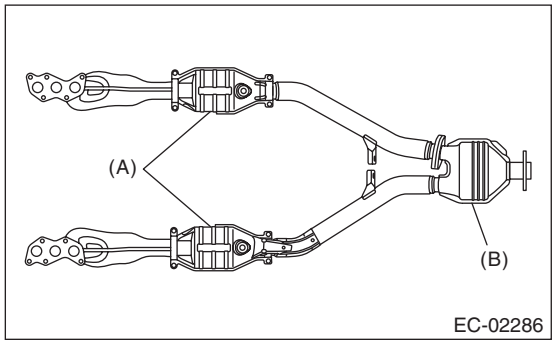
The front and rear catalytic converters are integrated into the front exhaust pipe; therefore, refer to “Front Exhaust Pipe” for removal procedures. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>



(A) Front catalytic converter
(B) Rear catalytic converter

B: INSTALLATION

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



(A) Front catalytic converter
(B) Rear catalytic converter

C: INSPECTION

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

4. EGR Valve

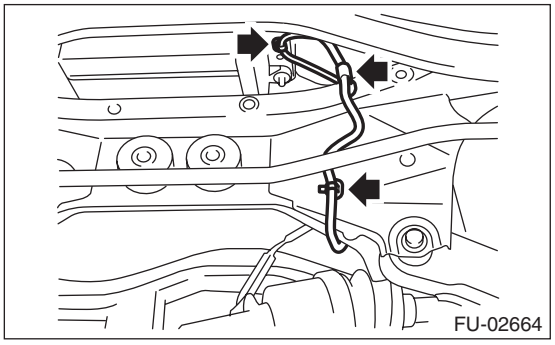
A: SPECIFICATION

Refer to “EGR valve” for the removal and installation procedure. <Ref. to FU(H6DO)-29, EGR Valve.>

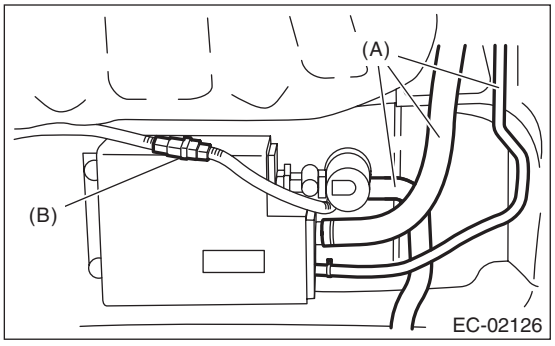
5. Canister

A: REMOVAL

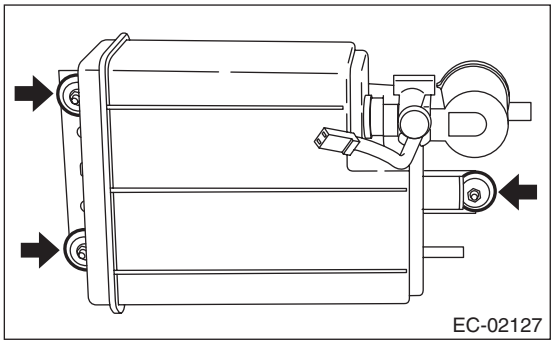
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Lift up the vehicle.
4) Remove the clip holding the harness.



5) Remove the rear suspension assembly. <Ref. to RS-18, REMOVAL, Rear Sub Frame.>
6) Disconnect the evaporation hose (A) and connector (B).



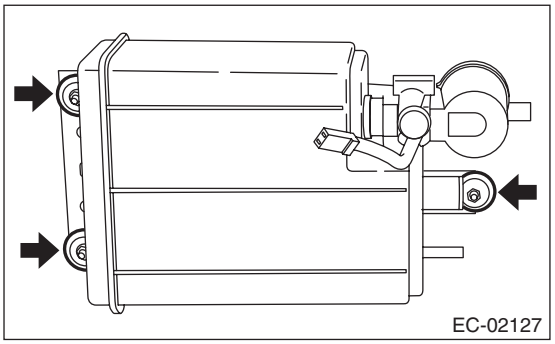
7) Remove the canister from body.



B: INSTALLATION

Install in the reverse order of removal.

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



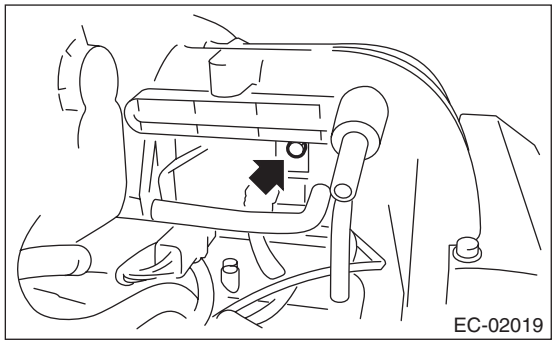
C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

6. Purge Control Solenoid Valve

A: REMOVAL

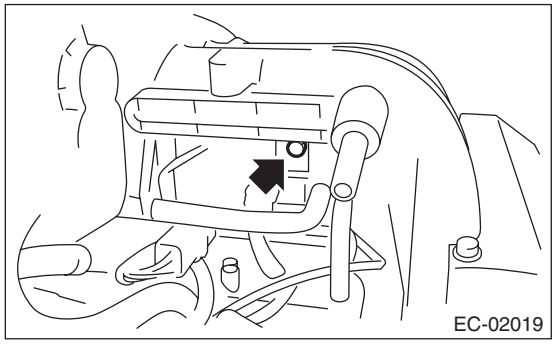
1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector and hoses of purge control solenoid valve, and then remove the purge control solenoid valve.



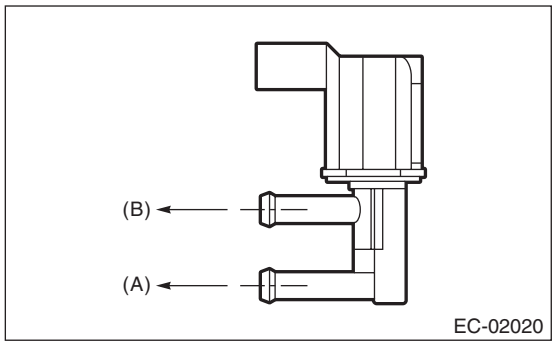
B: INSTALLATION

Install in the reverse order of removal.

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



NOTE:
Connect the evaporation hose as shown in the figure.



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

C: INSPECTION

Make sure the hoses are not cracked or loose.

7. Fuel Level Sensor

A: REMOVAL

For removal procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-52, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

For installation procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-52, INSTALLATION, Fuel Level Sensor.>

8. Fuel Temperature Sensor

A: REMOVAL

The fuel temperature sensor is integrated into fuel level sensor as one unit; therefore, refer to “Fuel Level Sensor” for removal procedure. <Ref. to FU(H6DO)-52, REMOVAL, Fuel Level 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)-52, INSTALLATION, Fuel Level Sensor.>

9. Fuel Sub Level Sensor

A: REMOVAL

For removal procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-53, REMOVAL, Fuel Sub Level Sensor.>

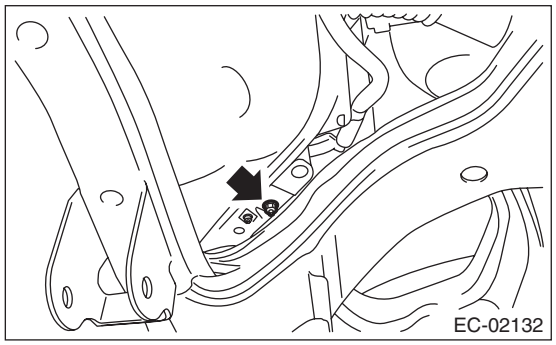
B: INSTALLATION

For installation procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-53, INSTALLATION, Fuel Sub Level Sensor.>

10.Fuel Tank Pressure Sensor

A: REMOVAL

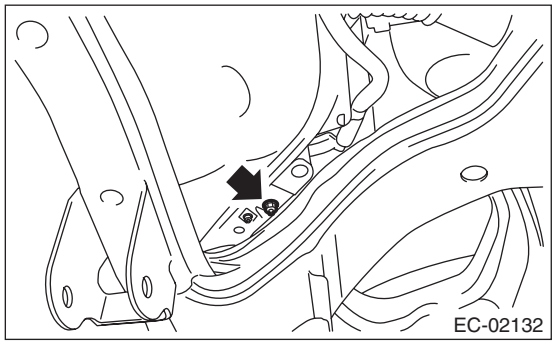
WARNING:
Place "NO OPEN FLAMES" signs near the working area.
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Open the fuel filler lid, and remove the fuel filler cap.
4) Lift up the vehicle.
5) Disconnect the connector from the fuel tank pressure sensor.
6) Disconnect the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



B: INSTALLATION

Install in the reverse order of removal.

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



C: INSPECTION

Make sure the hoses are not cracked or loose.

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

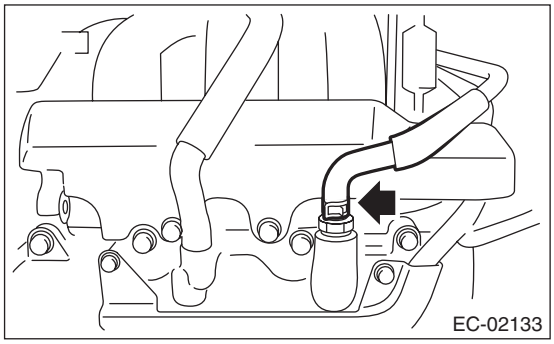
A: SPECIFICATION

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

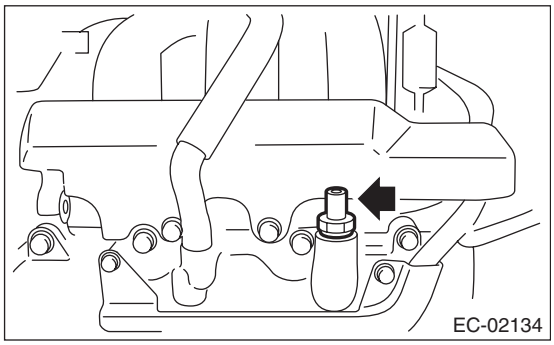
13.PCV Valve

A: REMOVAL

1) Disconnect the PCV hose.



2) 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 1141 (Part No. 004403006) or equivalent

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

INTAKE (INDUCTION)

IN(H6DO)

Page

1. General Description 2
2. Air Cleaner Element 4
3. Air Cleaner Case 5
4. Air Intake Chamber 7
5. Air Intake Duct 8
6. Resonator Chamber 9

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)-3, 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)-68, 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)-362, INSPECTION, General Diagnostic Table.>
3	**CHECK THE 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)-34, 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)-81, 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)-43, Read Diagnostic Trouble Code (DTC).> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Record the DTC. Repair the trouble cause. <Ref. to EN(H6DO)(diag)-83, 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)-59, Malfunction Indicator Light.>
5	**PERFORM DIAGNOSIS.** 1) Perform the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-54, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to EN(H6DO)(diag)-44, Inspection Mode.>	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Inspect using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-91, 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 illuminates.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes / ❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ Coolant temperature indicator light ❑ Oil pressure warning light ❑ ATF temperature indicator light or SPORT indicator light ❑ Driver's control center differential indicator light ❑ ABS warning light ❑ VDC warning light ❑ Cruise indicator light ❑ SI-CRUISE indicator light ❑ Immobilizer indicator light ❑ STEERING indicator light ❑ Glow indicator ❑ Sedimentor indicator ❑ Others:
b) Fuel level
• Lack of gasoline: ❑ 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 parts other than 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 the electrical test equipment on 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. Failure to do so will damage the ECM instantly, and the fuel injector 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)-54, Clear Memory Mode.>

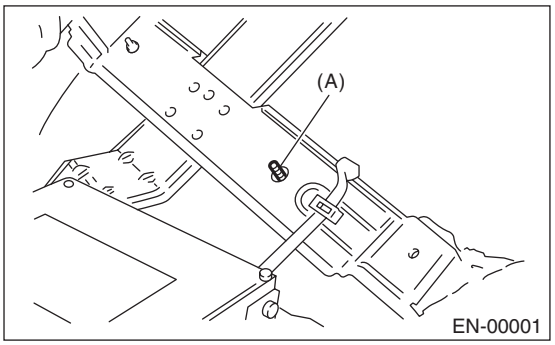
5) When measuring the voltage or resistance of individual sensor or all electrical control modules, use a tapered pin with a diameter of less than 0.6 mm (0.024 in). Do not insert the pin 4 mm (0.16 in) or more into the part.

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 “IMMOBILIZER TEACHING OPERATION MANUAL”.

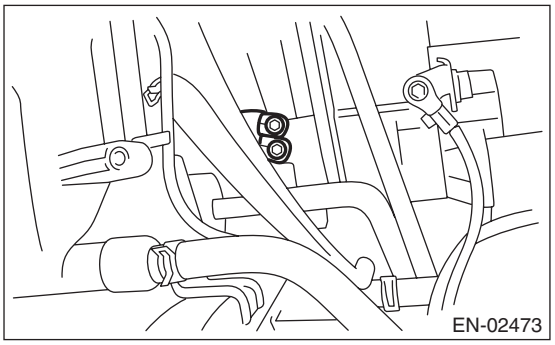
6) Take care not to allow water to get into the connector when servicing the vehicle in rainy weather or when washing the vehicle. Avoid exposure to water even if the connectors are waterproof.

7) Use ECM mounting stud bolts at the grounding point to chassis when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

8) Use the engine ground terminal or engine assembly for 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 MFI 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)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
12) Warning light 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. After diagnosis of engine control system, perform the ABS memory clear procedure of self-diagnosis function.

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.

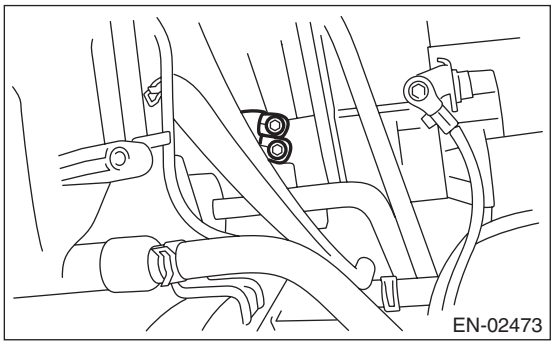
Standard voltage: 12 V

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

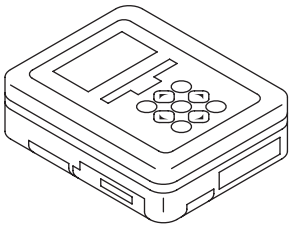
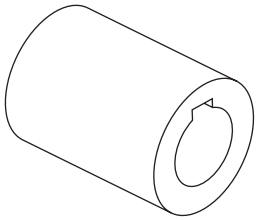
Check if the engine ground terminal is properly connected to engine.



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 or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• 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 troubleshooting the vehicle which complies with OBD-II regulations, connect the Subaru Select Monitor or general scan tool to the vehicle.

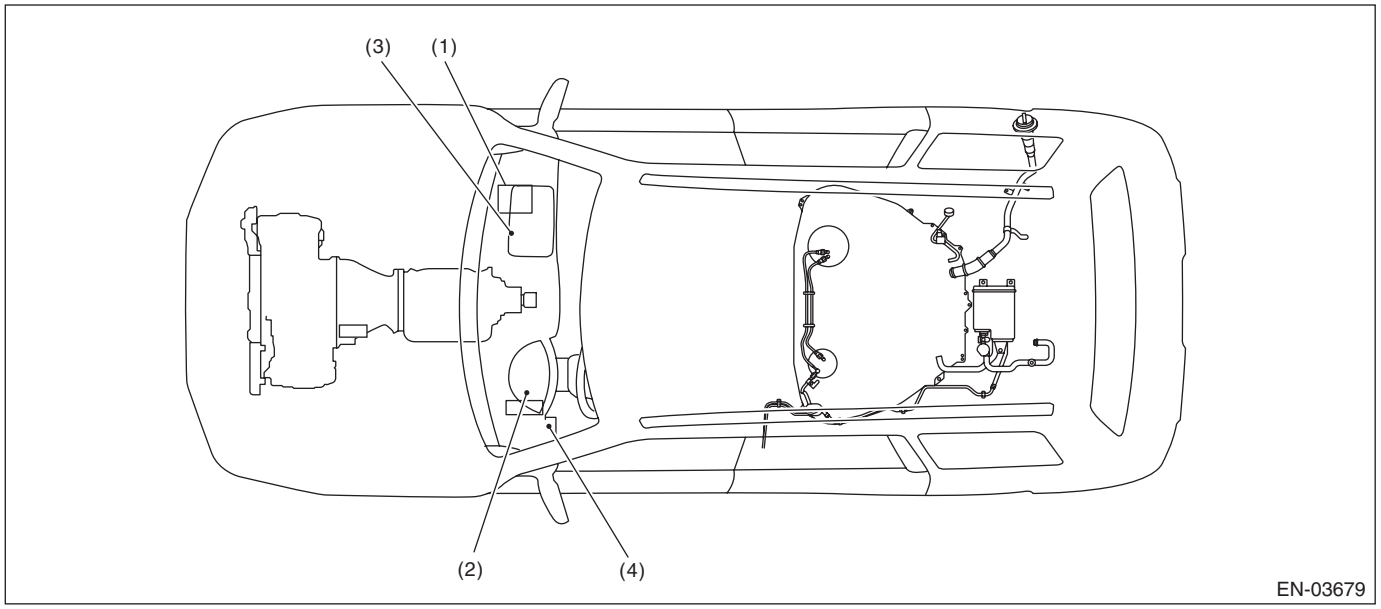
D: PREPARATION TOOL

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.

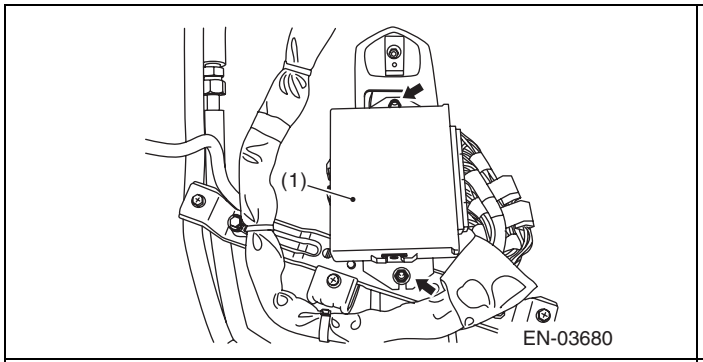
4. Electrical Component Location

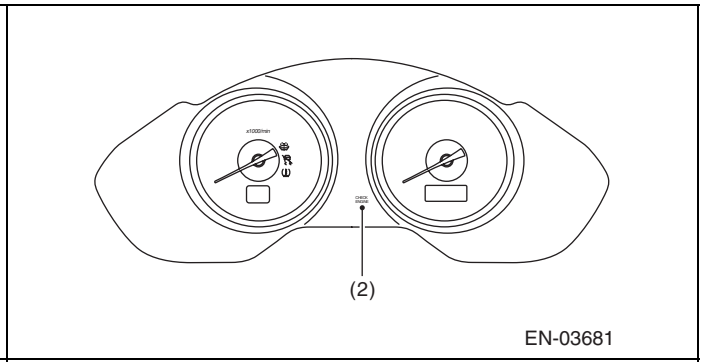
A: LOCATION

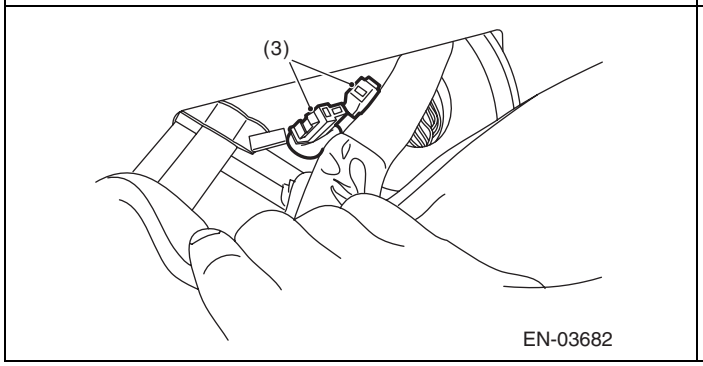
1. CONTROL MODULE

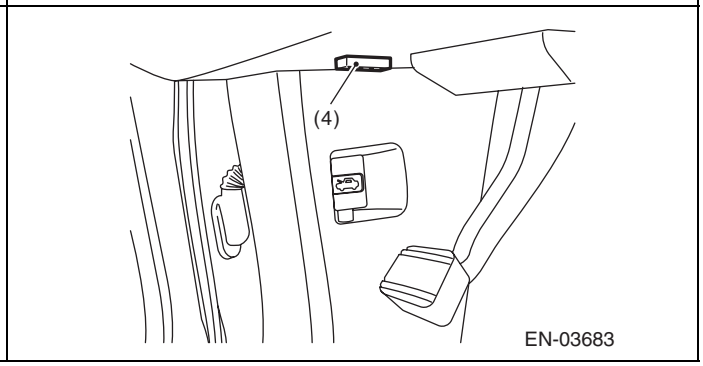


(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Delivery (test) mode connector
(4) Data link connector

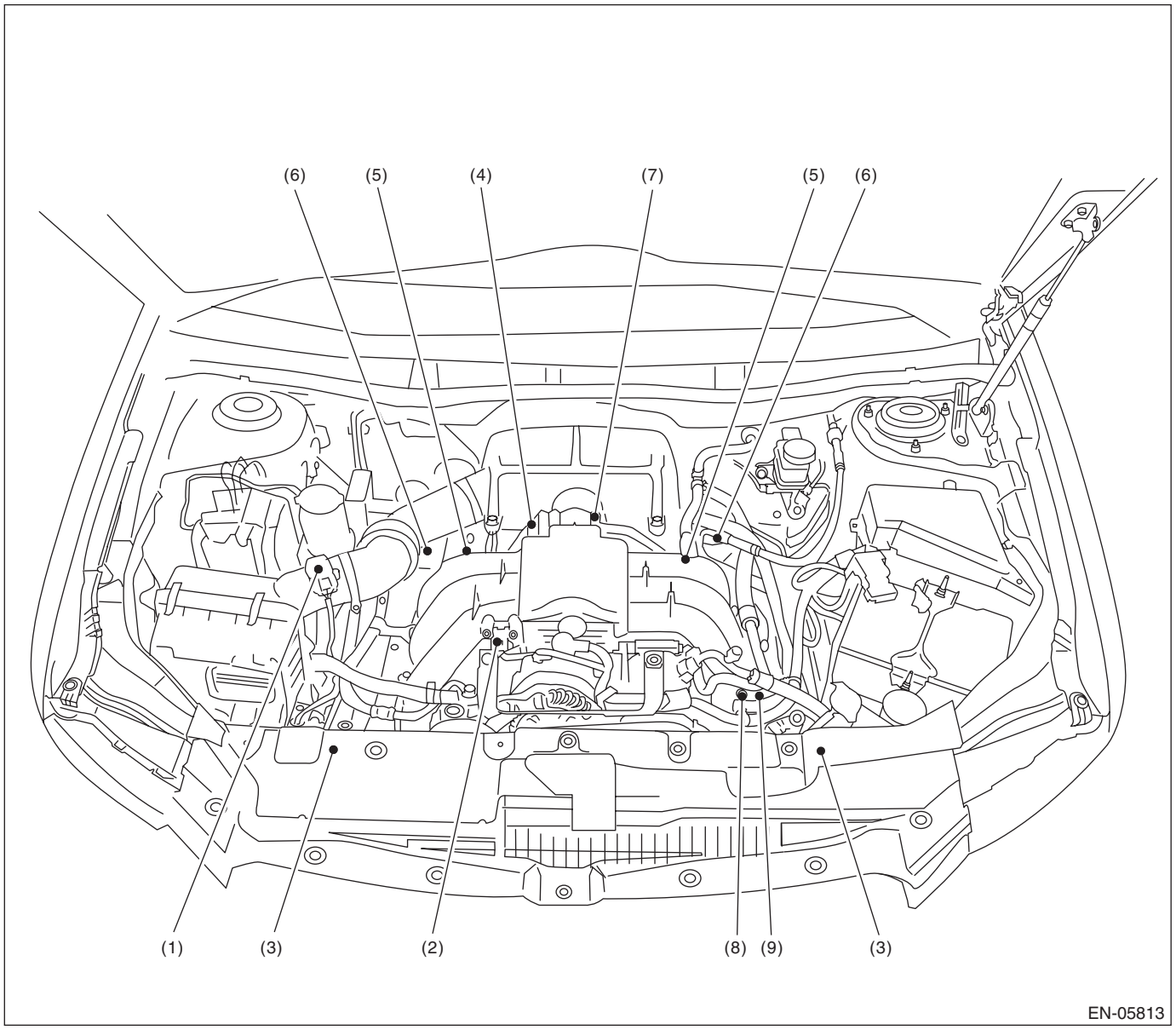




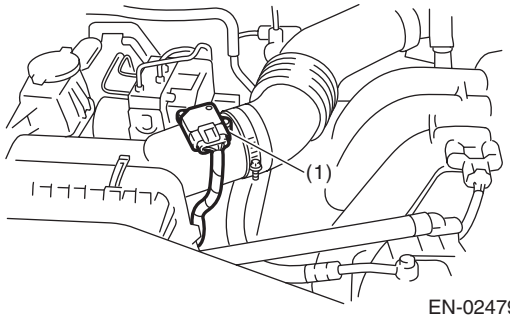




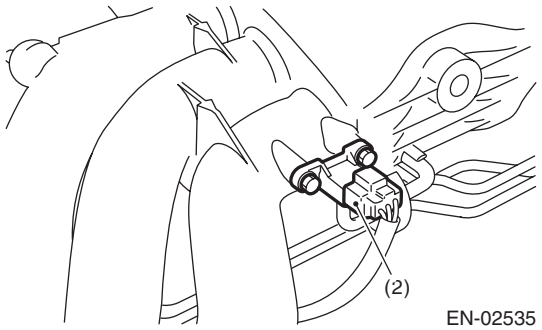
2. SENSOR



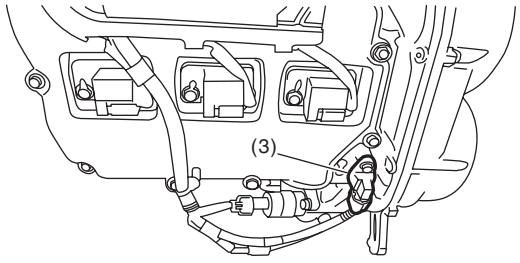
(1) Mass air flow and intake air temperature sensor
(2) Manifold absolute pressure sensor
(3) Exhaust camshaft position sensor
(4) Electronic throttle control
(5) Knock sensor
(6) Intake camshaft position sensor
(7) Crankshaft position sensor
(8) Engine coolant temperature sensor
(9) Oil temperature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



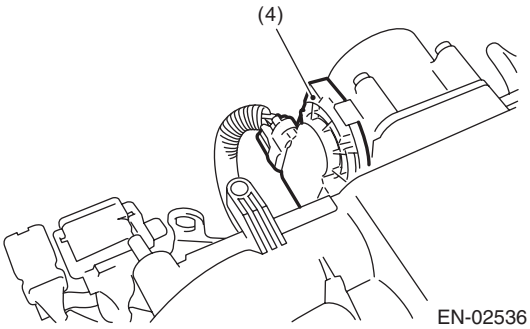
EN-02479



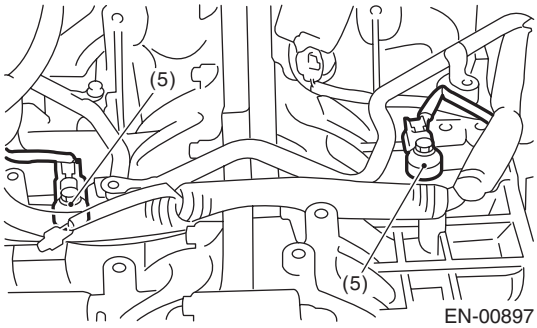
EN-02535



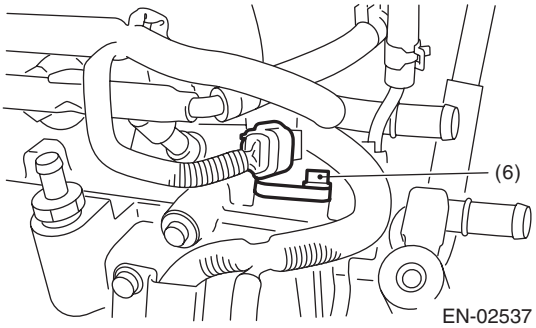
EN-05814



EN-02536



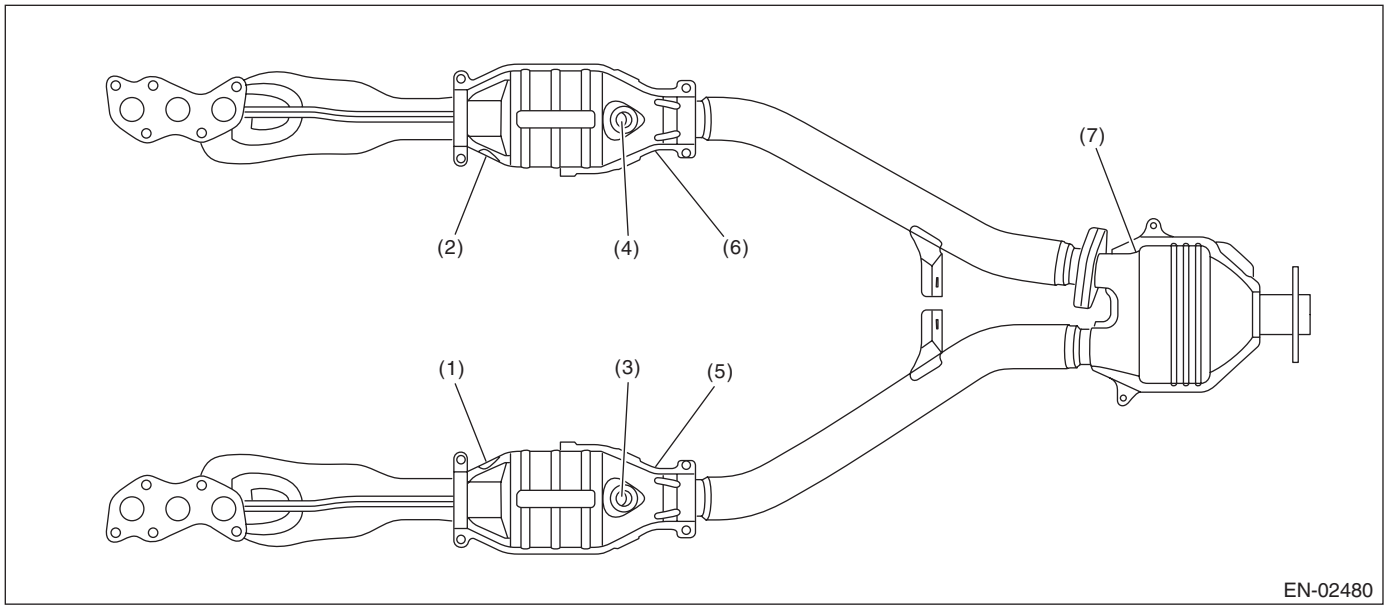
EN-00897



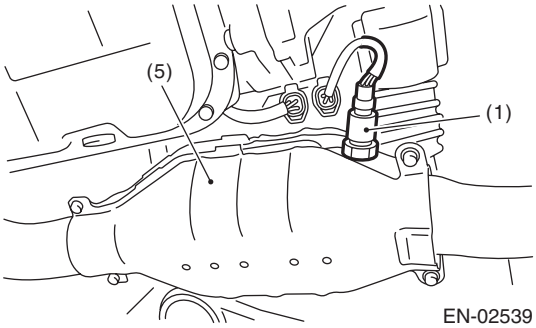
EN-02537

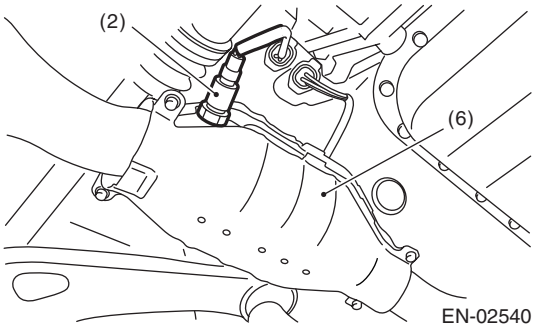
EN-00899

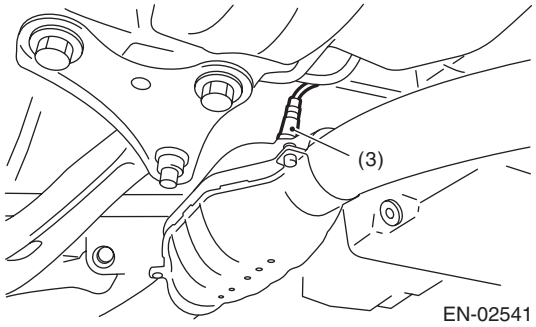
EN-05817

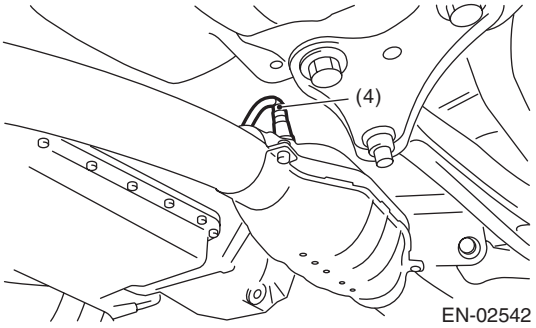


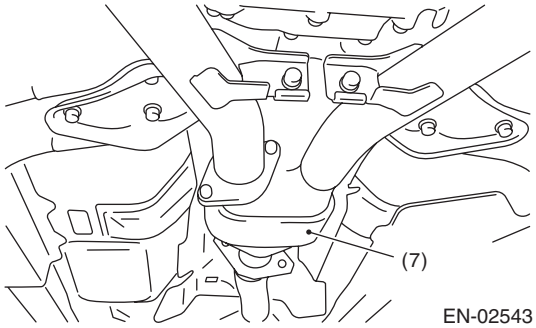
(1) Front oxygen (A/F) sensor LH
(2) Front oxygen (A/F) sensor RH
(3) Rear oxygen sensor LH
(4) Rear oxygen sensor RH
(5) Front catalytic converter LH
(6) Front catalytic converter RH
(7) Rear catalytic converter



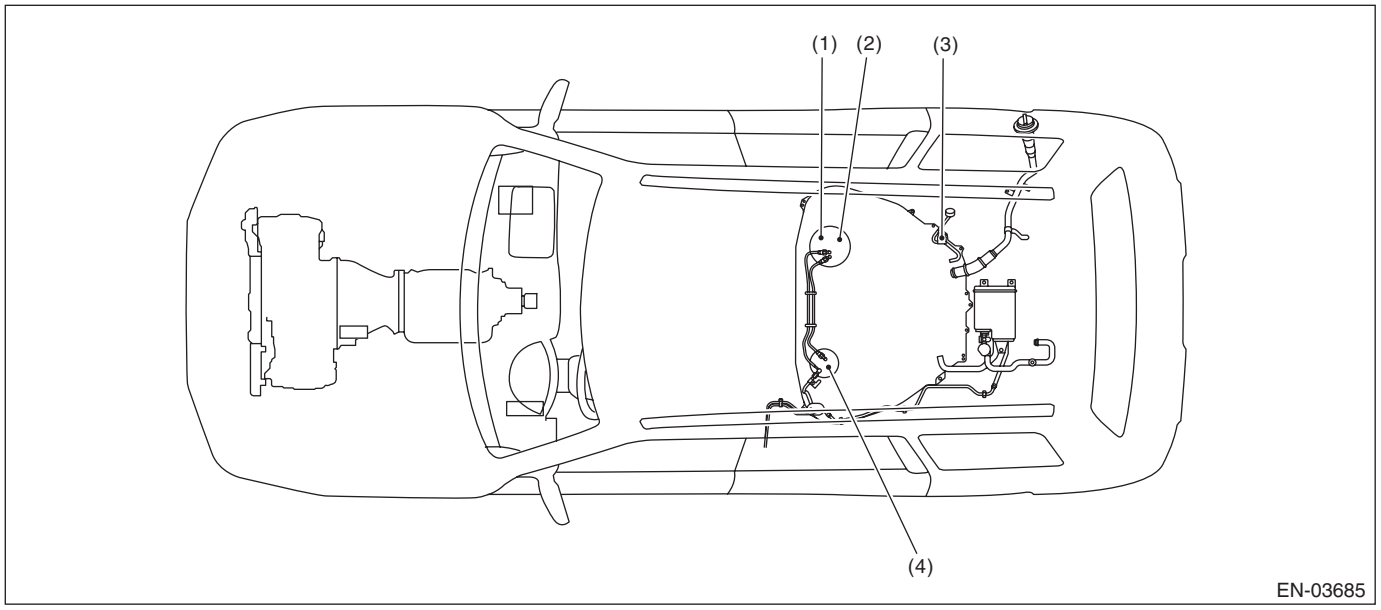




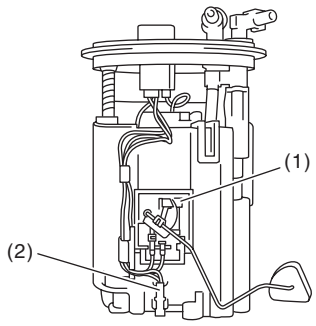


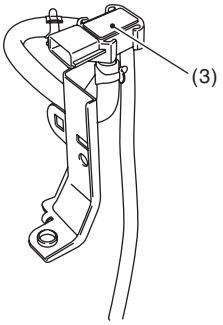


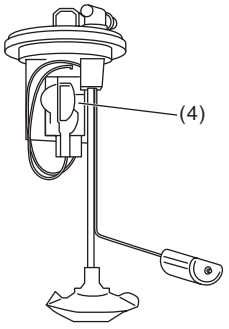
Electrical Component Location



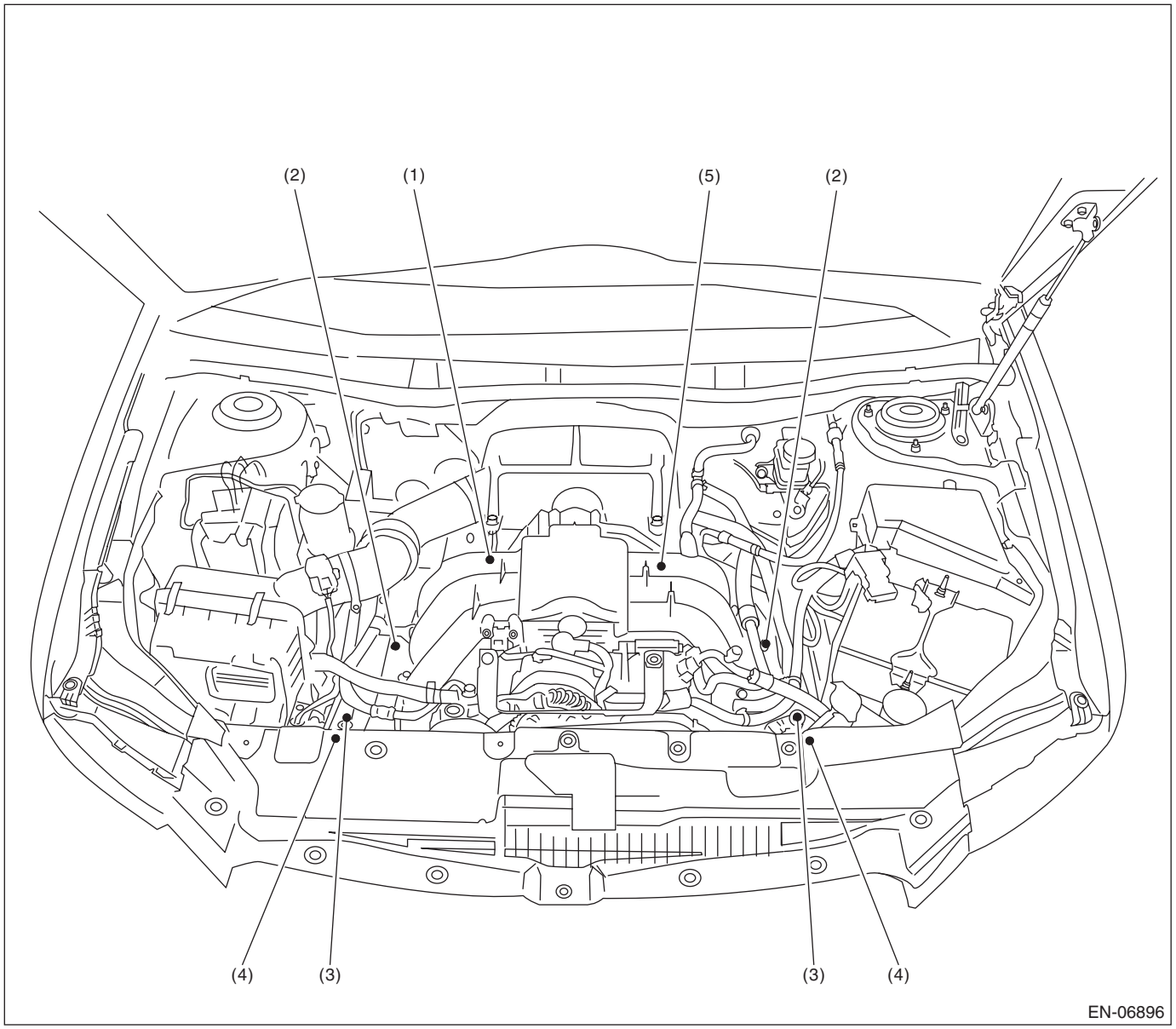
(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor



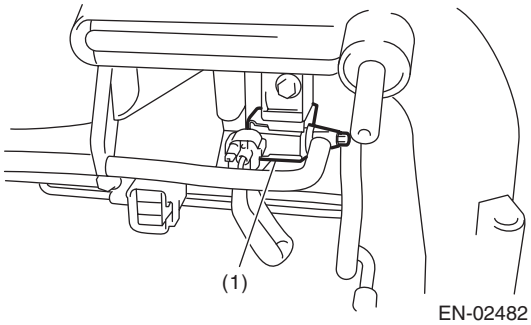




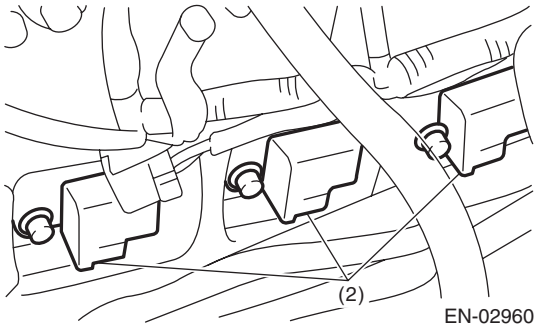
3. SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



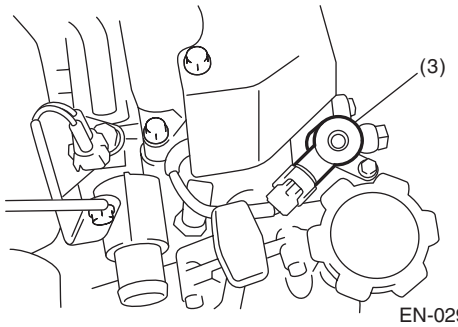
(1) Purge control solenoid valve
(2) Ignition coil
(3) Intake oil flow control solenoid valve
(4) Exhaust oil flow control solenoid valve
(5) EGR valve



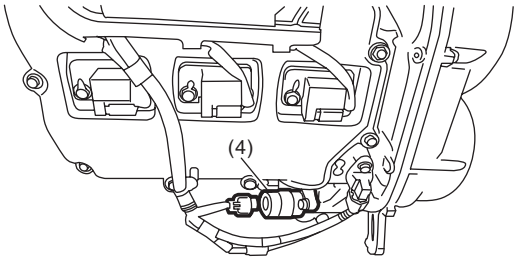
EN-02482



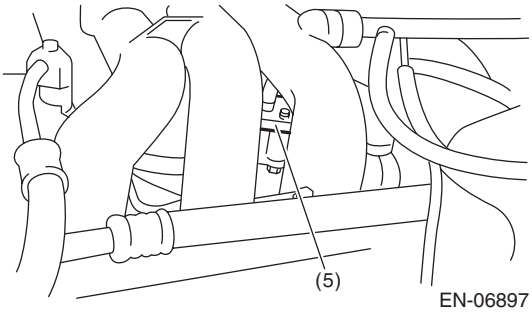
EN-02960



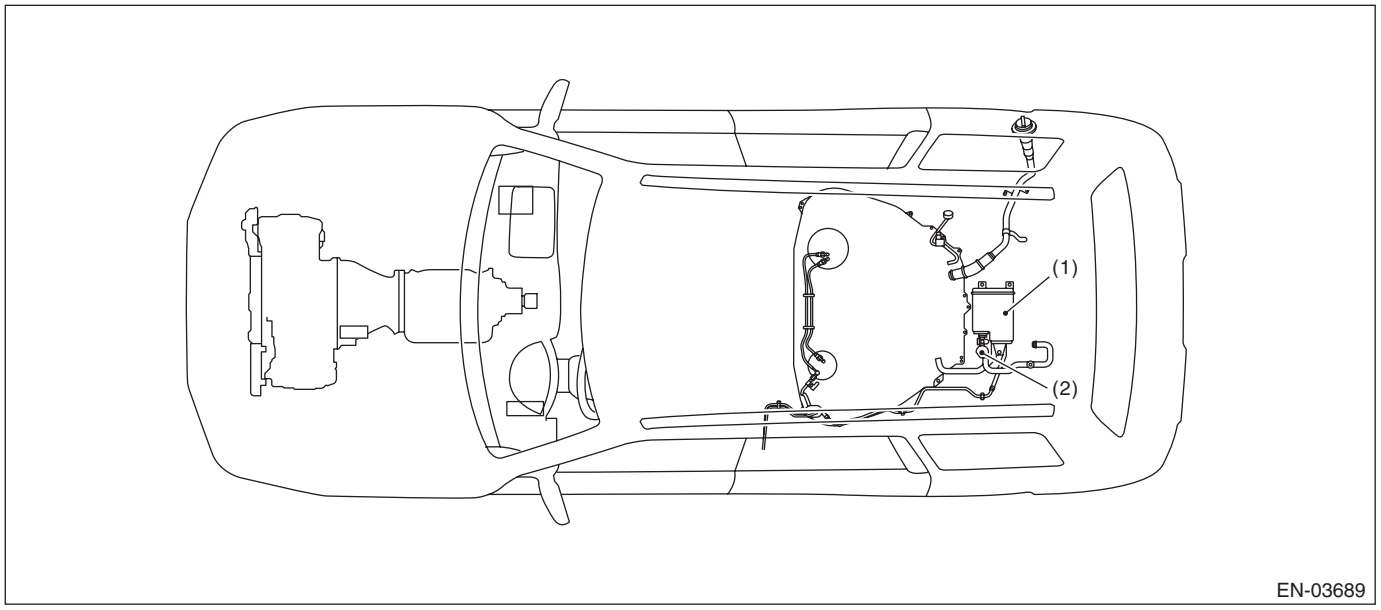
EN-02961



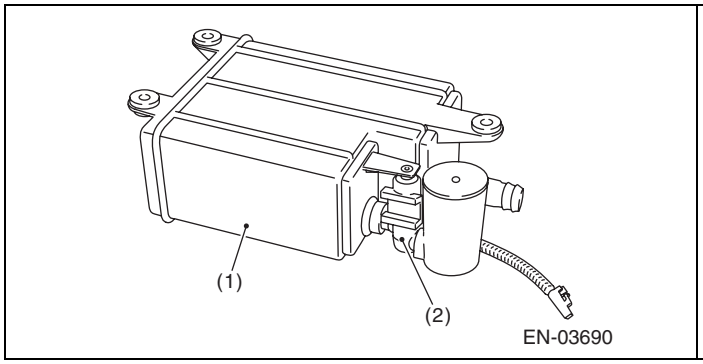
EN-05816



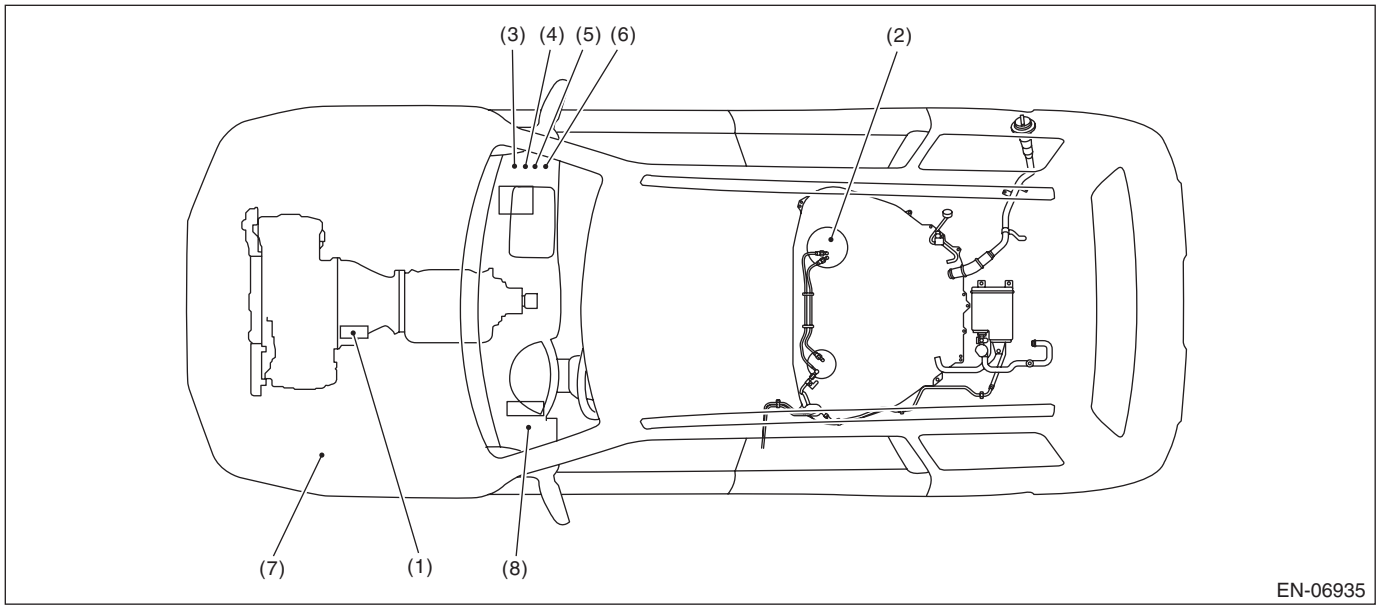
EN-06897



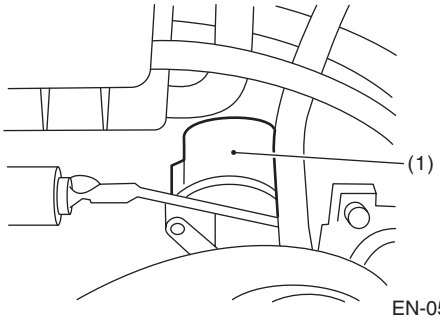
(1) Canister (2) Drain valve

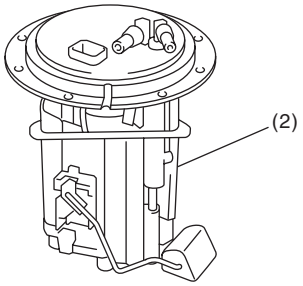


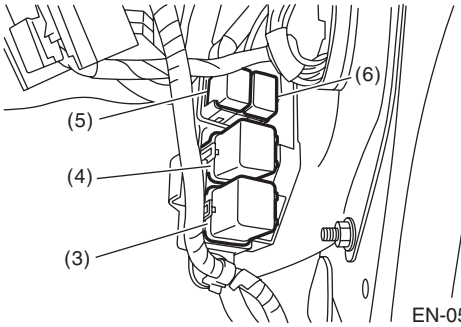
Electrical Component Location

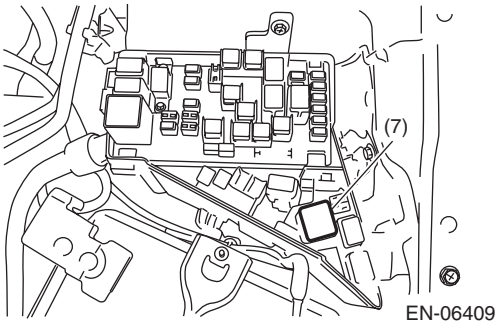


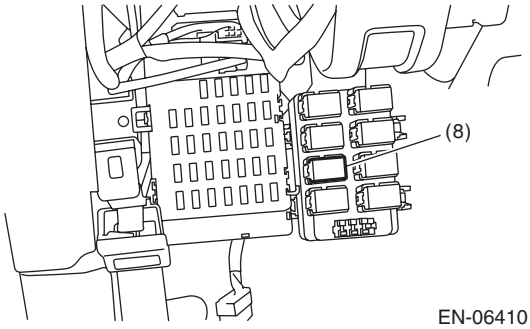
(1) Starter
(2) Fuel pump
(3) Main relay 2
(4) Main relay
(5) Electronic throttle control relay
(6) Fuel pump relay
(7) Main fan relay
(8) Starter relay





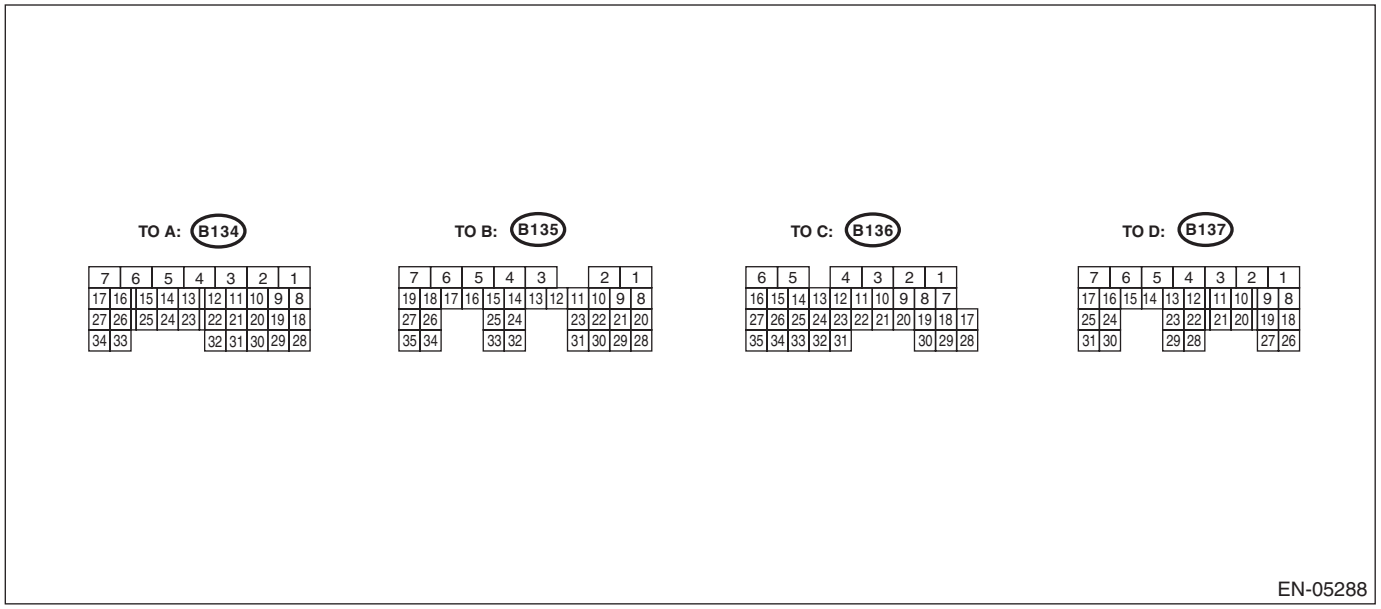






5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B134	13	0	–7 — +7	Waveform
	Signal (–)	B134	14	0	0	—
	Shield	B134	24	0	0	—
Intake camshaft position sensor (LH)		B134	21	0 or 5	0 or 5	Waveform
Intake camshaft position sensor (RH)		B134	11	0 or 5	0 or 5	Waveform
Exhaust camshaft position sensor (LH)		B134	31	0	–7 — +7	Waveform
Exhaust camshaft position sensor (RH)		B134	12	0	–7 — +7	Waveform
GND (Camshaft position sensor)		B134	22	0	0	—
Electronic throttle control	Main	B134	18	0.64 — 0.94 Fully opened: 4.01	0.64 — 0.72 (After engine is warmed up.)	Fully closed: 0.6 Fully opened: 4.01
	Sub	B134	28	1.51 — 1.76 Fully opened: 4.23	1.51 — 1.58 (After engine is warmed up.)	Fully closed: 1.48 Fully opened: 4.23
Electronic throttle control motor (+)		B137	5	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor (–)		B137	4	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor power supply		B136	1	10 — 13	12 — 14	—
Electronic throttle control motor relay		B136	21	0	0	—

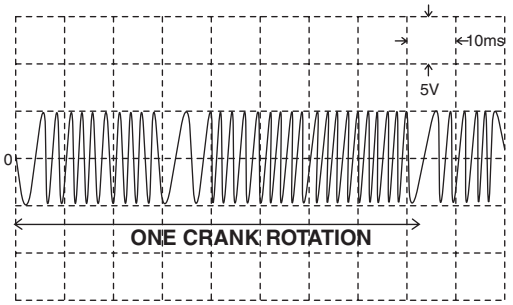
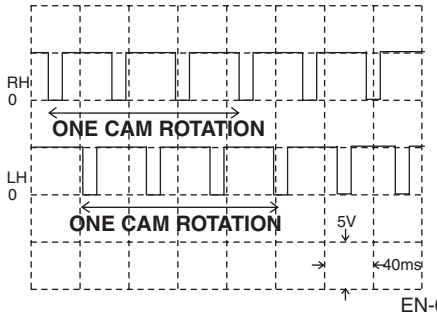
Engine Control Module (ECM) I/O Signal

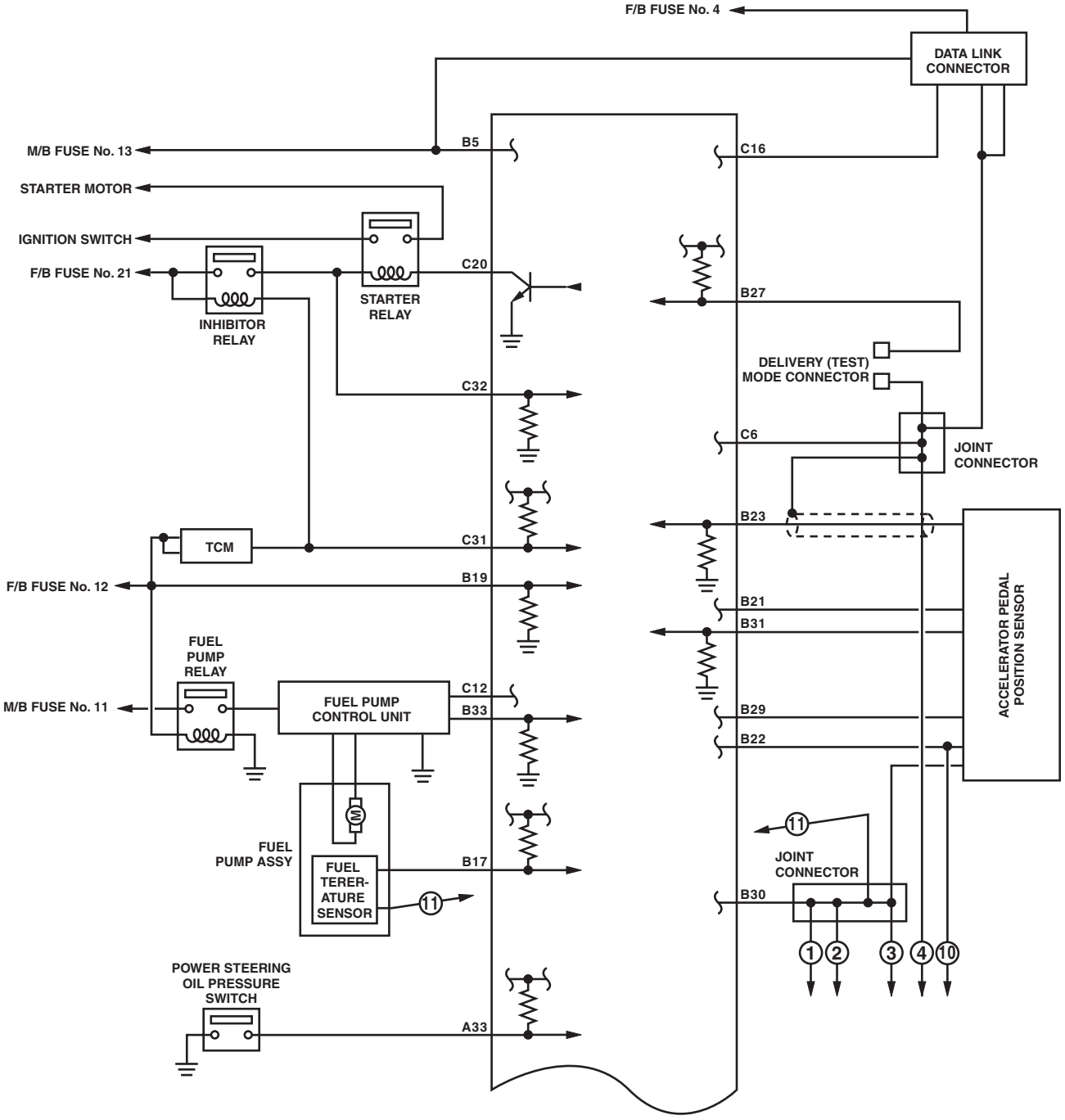
Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Accelerator pedal position sensor	Main sensor signal	B135	23	Fully closed: 0.7 Fully opened: 3.5	Fully closed: 0.7 Fully opened: 3.5	—
	Main power supply	B135	21	5	5	—
	GND (main sensor)	B135	29	0	0	—
	Sub sensor signal	B135	31	Fully closed: 0.7 Fully opened: 3.5	Fully closed: 0.7 Fully opened: 3.5	—
	Sub power supply	B135	22	5	5	—
	GND (sub sensor)	B135	30	0	0	—
Engine coolant temperature sensor		B134	34	1.0 — 1.4	1.0 — 1.4	After engine is warmed up.
Starter switch		B136	32	0	0	Cranking: 8 — 14
Starter relay		B136	20	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
A/C switch		B136	24	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
A/C middle pressure switch		B136	33	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Ignition switch		B135	19	10 — 13	13 — 14	—
Neutral position switch		B136	31	ON: 0 OFF: 12±0.5		Switch is ON when select lever is shifted into “P” range or “N” range.
Delivery (test) mode connector		B135	27	10 — 13	12 — 14	When connected: 0
Knock sensor 1	Signal	B134	15	2.4	2.4	—
	Shield	B134	25	0	0	—
Knock sensor 2	Signal	B134	16	2.4	2.4	—
	Shield	B134	25	0	0	—
Back-up power supply		B135	5	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B134	7	10 — 13	13 — 14	—
		B135	2	10 — 13	13 — 14	—
Sensor power supply (engine side)		B134	19	5	5	—
Sensor ground (engine side)		B134	29	0	0	—
Sensor power supply (body side)		B135	22	5	5	—
Sensor ground (body side)		B135	30	0	0	—
Ignition control	#1	B137	18	0	1 — 14	Waveform
	#2	B137	19	0	1 — 14	Waveform
	#3	B137	20	0	1 — 14	Waveform
	#4	B137	21	0	1 — 14	Waveform
	#5	B137	22	0	1 — 14	Waveform
	#6	B137	23	0	1 — 14	Waveform

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Fuel injector	#1	B137	8	10 — 13	1 — 14	Waveform
	#2	B137	9	10 — 13	1 — 14	Waveform
	#3	B137	10	10 — 13	1 — 14	Waveform
	#4	B137	11	10 — 13	1 — 14	Waveform
	#5	B137	12	10 — 13	1 — 14	Waveform
	#6	B137	13	10 — 13	1 — 14	Waveform
A/C relay control		B136	9	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan control		B136	18	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan control power supply		B136	29	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Self-shutoff control		B136	23	0	0	—
Malfunction indicator light		B136	11	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B136	22	—	0 — 13 or more	Waveform
Purge control solenoid valve		B137	29	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Power steering switch		B134	33	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Manifold absolute pressure sensor		B134	6	3.5 — 4.8	1.1 — 1.9	—
Air flow sensor	Signal	B135	26	0.74	0.3 — 4.5	—
	Shield	B135	35	0	0	—
	GND	B135	34	0	0	—
Intake air temperature sensor		B135	18	3.15 — 3.33	3.15 — 3.33	Intake air temperature: 25°C (77°F)
Front oxygen (A/F) sensor RH	Signal (+)	B135	9	2.8 — 3.2	2.8 — 3.2	—
	Signal (–)	B135	8	2.4 — 2.7	2.4 — 2.7	—
	Shield	B135	1	0	0	—
Front oxygen (A/F) sensor heater RH	Signal 1	B136	3	12 — 14	—	Waveform
	Signal 2	B136	2	12 — 14	—	Waveform
Front oxygen (A/F) sensor LH	Signal (+)	B135	11	2.8 — 3.2	2.8 — 3.2	—
	Signal (–)	B135	10	2.4 — 2.7	2.4 — 2.7	—
	Shield	B135	1	0	0	—
Front oxygen (A/F) sensor heater LH	Signal 1	B135	7	12 — 14	—	Waveform
	Signal 2	B135	6	12 — 14	—	Waveform
Rear oxygen sensor RH	Signal	B135	4	0	0 — 0.9	—
	Shield	B135	1	0	0	—
Rear oxygen sensor heater RH signal		B136	4	12 — 14	—	Waveform
Rear oxygen sensor LH	Signal	B135	15	0	0 — 0.9	—
	Shield	B135	1	0	0	—
Rear oxygen sensor heater LH signal		B136	5	12 — 14	—	Waveform
Immobilizer communication 1		B136	26	10	10	—
Immobilizer communication 2		B136	34	10	10	—

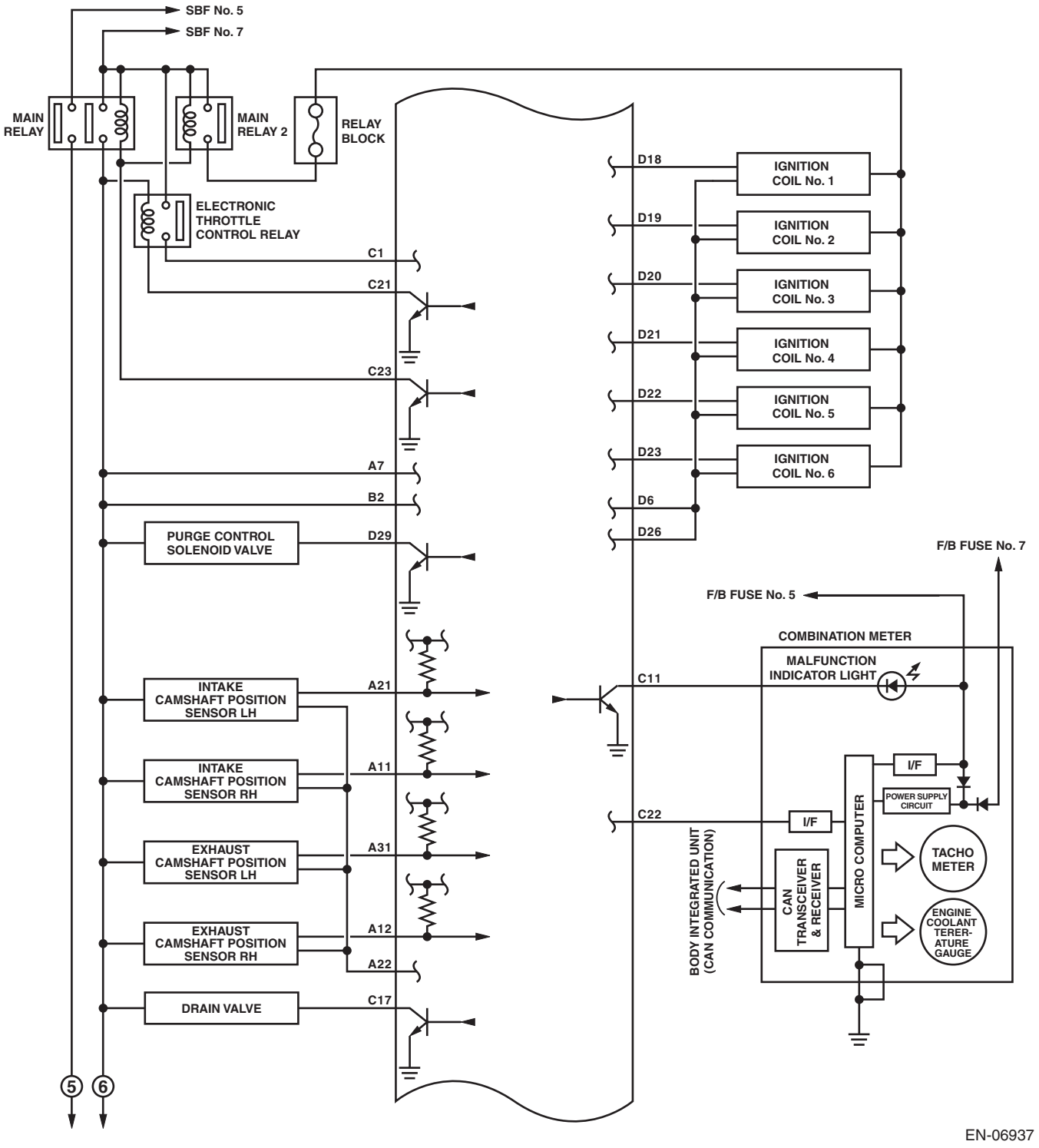
Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Fuel pump control unit	Diagnosis signal	B135	33	10 — 13	13 — 14	—
	Control	B136	12	0	0 or 5	—
Brake switch 1		B135	20	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 13 — 14	—
Brake switch 2		B135	28	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 13 — 14 When brake pedal is released: 0	—
Cruise control command switch		B135	24	When not operating: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	When not operating: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	—
Cruise control main switch		B135	12	ON: 0 OFF: 5	ON: 0 OFF: 5	—
Intake oil flow control solenoid valve RH	Signal (+)	B137	17	0	0.6	—
	Signal (–)	B137	16	0	0	—
Intake oil flow control solenoid valve LH	Signal (+)	B137	15	0	0.6	—
	Signal (–)	B137	14	0	0	—
Exhaust oil flow control solenoid valve RH	Signal (+)	B137	25	0	0.6	—
	Signal (–)	B137	24	0	0	—
Exhaust oil flow control solenoid valve LH	Signal (+)	B137	31	0	0.6	—
	Signal (–)	B137	30	0	0	—
Oil temperature sensor signal		B134	23	1.0 — 1.4	1.0 — 1.4	After engine is warmed up.
EGR valve	Signal 1	B134	8	10 — 13	12 — 14	—
	Signal 2	B134	9	10 — 13	12 — 14	—
	Signal 3	B134	10	10 — 13	12 — 14	—
	Signal 4	B134	20	10 — 13	12 — 14	—
Brake vacuum sensor		B134	27	1 — 3.8	1 — 3.8	—
Brake vacuum pump		B135	25	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		B136	8	10 — 13 (When pump is OFF)	12 — 14 (When pump is OFF)	—
				0 (When pump is ON)	0 (When pump is ON)	
SSM communication line		B136	16	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—
Fuel tank pressure sensor		B135	32	2.3	2.7	—

Description	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (engine OFF)	Engine ON (idling)	
Drain valve	B136	17	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Fuel temperature sensor	B135	17	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (77°F)
CAN communication (+)	B136	27	2.0 or more ←→ 4.5 or less	2.0 or more ←→ 4.5 or less	—
CAN communication (–)	B136	35	0.5 or more ←→ 3.0 or less	0.5 or more ←→ 3.0 or less	—
Ground (Ignition system 1)	B137	26	0	0	—
Ground (Ignition system 2)	B137	6	0	0	—
Ground (engine 1)	B134	5	0	0	—
Ground (engine 2)	B137	7	0	0	—
Ground (engine 3)	B137	2	0	0	—
Ground (engine 4)	B137	1	0	0	—
Ground (engine 5)	B137	3	0	0	—
Ground (engine 6)	B134	3	0	0	—
Ground (body)	B136	6	0	0	—

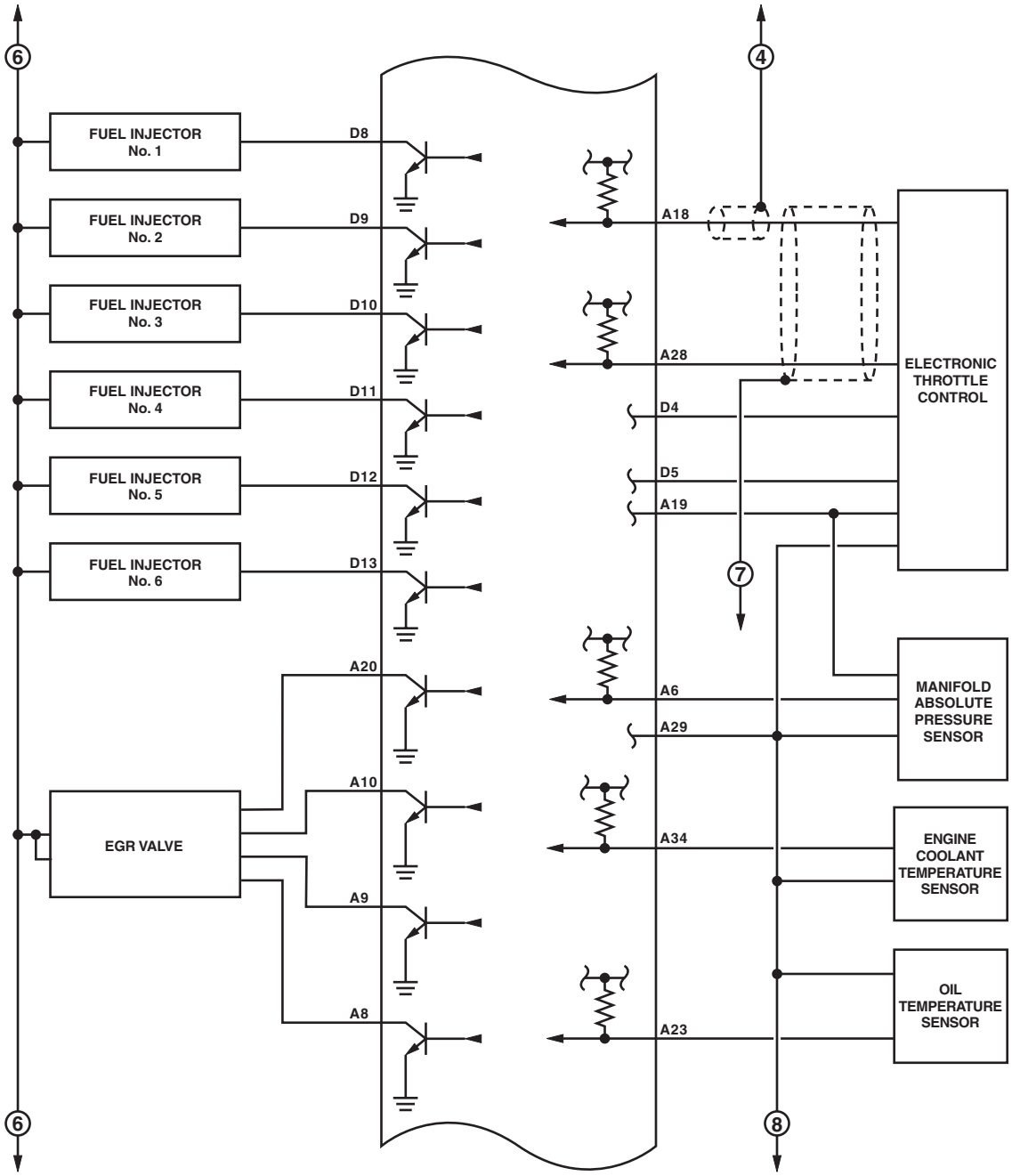
Input/output name	Measuring condition	Waveform
1. Crankshaft position sensor	At idling	 EN-05357
2. Camshaft position sensor	At idling	 EN-05358


F/B FUSE No. 4
DATA LINK CONNECTOR
M/B FUSE No. 13
B5
C16
STARTER MOTOR
IGNITION SWITCH
F/B FUSE No. 21
C20
B27
INHIBITOR RELAY
STARTER RELAY
DELIVERY (TEST) MODE CONNECTOR
C32
C6
JOINT CONNECTOR
B23
TCM
C31
F/B FUSE No. 12
B19
B21
B31
FUEL PUMP RELAY
M/B FUSE No. 11
FUEL PUMP CONTROL UNIT
C12
B33
B29
B22
ACCELERATOR PEDAL POSITION SENSOR
FUEL PUMP ASSY
FUEL TERER-ATURE SENSOR
B17
11
JOINT CONNECTOR
B30
1 2 3 4 10
POWER STEERING OIL PRESSURE SWITCH
A33

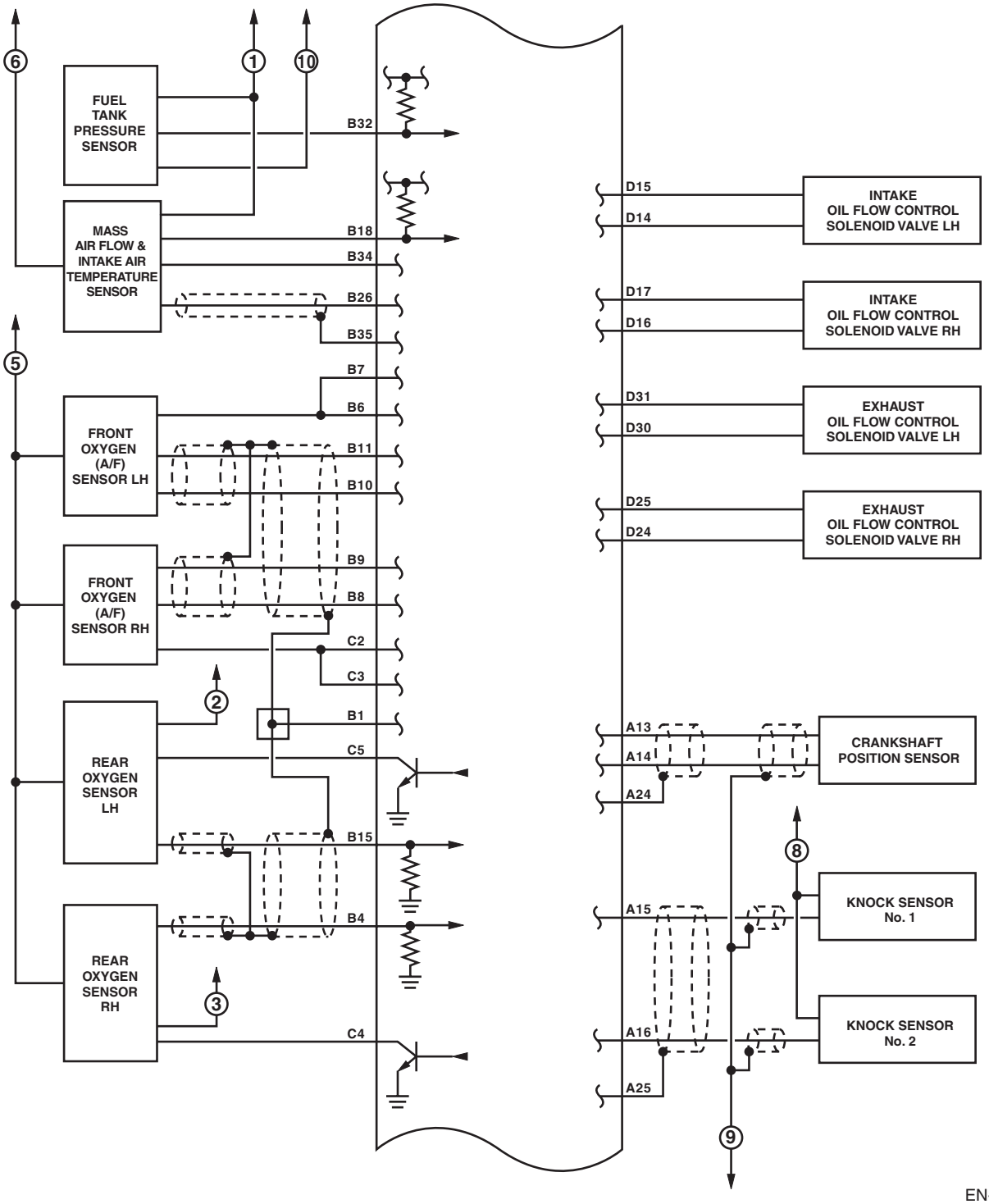
EN-06936


SBF No. 5
SBF No. 7
MAIN RELAY
MAIN RELAY 2
RELAY BLOCK
ELECTRONIC THROTTLE CONTROL RELAY
C1
C21
C23
A7
B2
PURGE CONTROL SOLENOID VALVE
D29
INTAKE CAMSHAFT POSITION SENSOR LH
A21
INTAKE CAMSHAFT POSITION SENSOR RH
A11
EXHAUST CAMSHAFT POSITION SENSOR LH
A31
EXHAUST CAMSHAFT POSITION SENSOR RH
A12
A22
DRAIN VALVE
C17
5
6
D18
D19
D20
D21
D22
D23
D6
D26
IGNITION COIL No. 1
IGNITION COIL No. 2
IGNITION COIL No. 3
IGNITION COIL No. 4
IGNITION COIL No. 5
IGNITION COIL No. 6
F/B FUSE No. 7
F/B FUSE No. 5
COMBINATION METER
MALFUNCTION INDICATOR LIGHT
C11
C22
I/F
POWER SUPPLY CIRCUIT
I/F
MICRO COMPUTER
TACHO METER
ENGINE COOLANT TERER-ATURE GAUGE
CAN TRANSCEIVER & RECEIVER
BODY INTEGRATED UNIT (CAN COMMUNICATION)

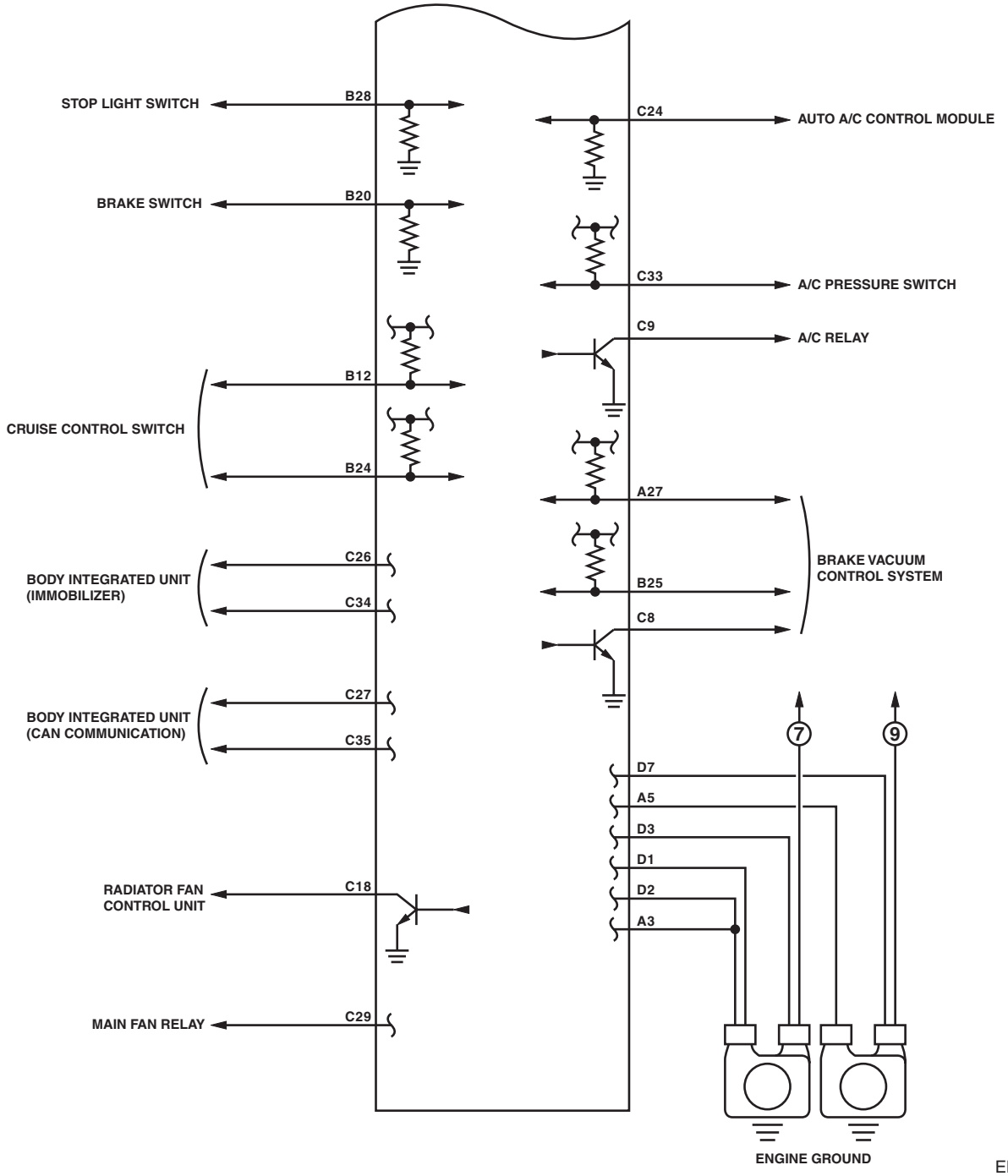
EN-06937


6
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
D8
D9
D10
D11
D12
D13
A20
A10
A9
A8
6
4
A18
A28
D4
D5
A19
7
A6
A29
A34
A23
8
ELECTRONIC THROTTLE CONTROL
MANIFOLD ABSOLUTE PRESSURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
OIL TEMPERATURE SENSOR

EN-06938


6
1
10
FUEL TANK PRESSURE SENSOR
B32
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR
B18
B34
B26
B35
5
B7
B6
FRONT OXYGEN (A/F) SENSOR LH
B11
B10
FRONT OXYGEN (A/F) SENSOR RH
B9
B8
C2
C3
2
B1
REAR OXYGEN SENSOR LH
C5
B15
B4
REAR OXYGEN SENSOR RH
3
C4
D15
D14
INTAKE OIL FLOW CONTROL SOLENOID VALVE LH
D17
D16
INTAKE OIL FLOW CONTROL SOLENOID VALVE RH
D31
D30
EXHAUST OIL FLOW CONTROL SOLENOID VALVE LH
D25
D24
EXHAUST OIL FLOW CONTROL SOLENOID VALVE RH
A13
A14
A24
CRANKSHAFT POSITION SENSOR
8
A15
KNOCK SENSOR No. 1
A16
A25
KNOCK SENSOR No. 2
9

EN-06939


STOP LIGHT SWITCH
B28
BRAKE SWITCH
B20
CRUISE CONTROL SWITCH
B12
B24
BODY INTEGRATED UNIT (IMMOBILIZER)
C26
C34
BODY INTEGRATED UNIT (CAN COMMUNICATION)
C27
C35
RADIATOR FAN CONTROL UNIT
C18
MAIN FAN RELAY
C29
C24
AUTO A/C CONTROL MODULE
C33
A/C PRESSURE SWITCH
C9
A/C RELAY
A27
B25
C8
BRAKE VACUUM CONTROL SYSTEM
7
9
D7
A5
D3
D1
D2
A3
ENGINE GROUND
EN-06940

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Contents	Specification
Engine load	17.9 — 38.8(%): Idling
	15.2 — 30.8(%): 2,500 rpm racing

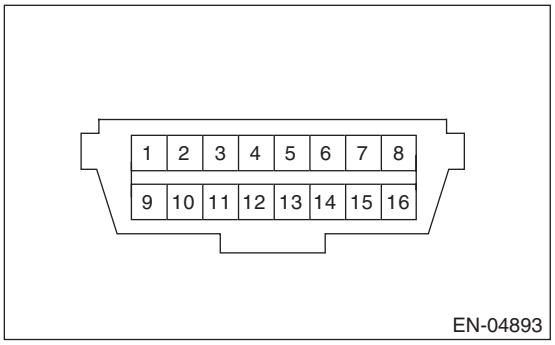
Measuring condition:
- After engine is warmed up.
- Select lever is in “P” range or “N” range.
- Turn the A/C off.
- Turn all the accessory switches to OFF.

7. Data Link Connector

A: NOTE

This connector is used for Subaru Select Monitor.

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



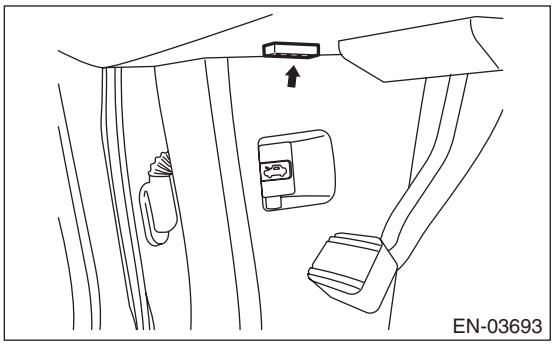
Terminal No.	Contents	Terminal No.	Contents
1	Blank	9	Blank
2	Blank	10	Blank
3	Blank	11	Blank
4	Ground	12	Blank
5	Ground	13	Blank
6	CAN communication line (+)	14	CAN communication line (–)
7	Subaru Select Monitor signal	15	Blank
8	Blank	16	Power supply

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) Open the cover and connect the general scan tool to the data link connector located in the lower area of instrument panel (on the driver's side).



3) Using the general scan tool, call up DTC and freeze frame 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 intermittently 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)-83, 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	Air flow rate of manifold absolute pressure sensor	g/s
$11	Throttle valve opening angle	%
$13	Check whether oxygen sensor is installed.	—
$15	Oxygen sensor output voltage (Bank 1 Sensor 2)	V
$15	Oxygen sensor compensation (Bank 1 Sensor 2)	%
$19	Oxygen sensor output voltage (Bank 2 Sensor 2)	V
$19	Oxygen sensor compensation (Bank 2 Sensor 2)	%
$1C	On-board diagnostic system	—
$1F	Elapsed time after starting the engine	sec
$21	Elapsed time after MIL illuminating	miles
$24	A/F value and A/F sensor output voltage	— and V
$28	A/F value and A/F sensor output voltage	— 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	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 (Bank 1)	°C
$3D	Catalyst temperature (Bank 2)	°C
$41	Diagnosis monitoring per drive cycle	—
$42	ECM power supply 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	%
$4A	Absolute accelerator opening angle 2	%

PID	Data	Unit of measure
$4C	Target throttle opening angle	%
$4D	Engine operation time during MIL on	min
$4E	Elapsed time after DTC clear	min
$51	Fuel used	—
$5A	Relative acceleration opening angle	%

NOTE:
Refer to general scan tool manufacturer's operation 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 sensed by the 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	Air flow rate of manifold absolute pressure sensor	g/s
$11	Throttle valve opening angle	%
$13	Check whether oxygen sensor is installed	—
$15	Oxygen sensor output voltage (Bank 1 Sensor 2)	V
$15	Oxygen sensor compensation (Bank 1 Sensor 2)	%
$19	Oxygen sensor output voltage (Bank 2 Sensor 2)	V
$19	Oxygen sensor compensation (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	Tank pressure	Pa
$33	Barometric pressure	kPa
$42	ECM power supply 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	%
$4A	Absolute accelerator opening angle 2	%
$4C	Target throttle opening angle	%

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)-83, 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 operation manual to clear 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	Test value & Test specification
$01	$81	$0A	A/F sensor conduction abnormal (Bank 1 Sensor 1)
	$82	$8D	A/F sensor conduction abnormal (Bank 1 Sensor 1)
	$83	$14	A/F sensor conduction abnormal (Bank 1 Sensor 1)
	$84	$1E	A/F sensor range abnormal (Bank 1 Sensor 1)
	$85	$1E	A/F sensor range abnormal (Bank 1 Sensor 1)
	$84	$1E	A/F sensor range abnormal (Bank 1 Sensor 1)
	$86	$20	A/F sensor response abnormal (Bank 1 Sensor 1)
$02	$87	$0B	Oxygen sensor circuit abnormal (Bank 1 Sensor 2)
	$88	$0B	Oxygen sensor circuit abnormal (Bank 1 Sensor 2)
	$07	$0B	Oxygen sensor drop abnormal (Bank 1 Sensor 2)
	$08	$0B	Oxygen sensor drop abnormal (Bank 1 Sensor 2)
	$A5	$0B	Oxygen sensor drop abnormal (Bank 1 Sensor 2)
	$05	$10	Oxygen sensor response abnormal (Bank 1 Sensor 2)
	$06	$10	Oxygen sensor response abnormal (Bank 1 Sensor 2)
$05	$81	$0A	A/F sensor conduction abnormal (Bank 2 Sensor 1)
	$82	$8D	A/F sensor conduction abnormal (Bank 2 Sensor 1)
	$83	$14	A/F sensor conduction abnormal (Bank 2 Sensor 1)
	$84	$1E	A/F sensor range abnormal (Bank 2 Sensor 1)
	$85	$1E	A/F sensor range abnormal (Bank 2 Sensor 1)
	$84	$1E	A/F sensor range abnormal (Bank 2 Sensor 1)
	$86	$20	A/F sensor response abnormal (Bank 2 Sensor 1)
$06	$87	$0B	Oxygen sensor circuit abnormal (Bank 2 Sensor 2)
	$88	$0B	Oxygen sensor circuit abnormal (Bank 2 Sensor 2)
	$07	$0B	Oxygen sensor drop abnormal (Bank 2 Sensor 2)
	$08	$0B	Oxygen sensor drop abnormal (Bank 2 Sensor 2)
	$A5	$0B	Oxygen sensor drop abnormal (Bank 2 Sensor 2)
	$05	$10	Oxygen sensor response abnormal (Bank 2 Sensor 2)
	$06	$10	Oxygen sensor response abnormal (Bank 2 Sensor 2)
$21	$89	$20	Catalyst degradation diagnosis (Bank 1)
$31	$8A	$FD	EGR system diagnosis
$39	$93	$FE	Evaporative emission control system leak detected (Fuel filler cap off)
$3B	$94	$FE	Evaporative emission control system 0.04 inch leak
	$95	$FE	Evaporative emission control system 0.04 inch leak
$3C	$96	$FE	Evaporative emission control system 0.02 inch leak
	$97	$FE	Evaporative emission control system 0.02 inch leak
$3D	$98	$FE	Evaporative emission control system (Purge flow)

OBDMID	TID	SID	Test value & Test specification
$41	$99	$24	A/F sensor heater abnormal (Bank 1 Sensor 1)
	$9A	$24	A/F sensor heater abnormal (Bank 1 Sensor 1)
	$9B	$14	A/F sensor characteristics abnormal (Bank 1 Sensor 1)
$42	$9C	$24	Oxygen sensor heater abnormal (Bank 1 Sensor 2)
	$9D	$24	Oxygen sensor heater abnormal (Bank 1 Sensor 2)
$45	$99	$24	A/F sensor heater abnormal (Bank 2 Sensor 1)
	$9A	$24	A/F sensor heater abnormal (Bank 2 Sensor 1)
	$9B	$14	A/F sensor characteristics abnormal (Bank 2 Sensor 1)
$46	$9C	$24	Oxygen sensor heater abnormal (Bank 2 Sensor 2)
	$9D	$24	Oxygen sensor heater abnormal (Bank 2 Sensor 2)
$A1	$0B	$24	Misfire monitoring (All cylinders)
	$0C	$24	Misfire monitoring (All cylinders)
$A2	$0B	$24	Misfire monitoring (#1 cylinder)
	$0C	$24	Misfire monitoring (#1 cylinder)
$A3	$0B	$24	Misfire monitoring (#2 cylinder)
	$0C	$24	Misfire monitoring (#2 cylinder)
$A4	$0B	$24	Misfire monitoring (#3 cylinder)
	$0C	$24	Misfire monitoring (#3 cylinder)
$A5	$0B	$24	Misfire monitoring (#4 cylinder)
	$0C	$24	Misfire monitoring (#4 cylinder)
$A6	$1B	$24	Misfire monitoring (#5 cylinder)
	$1C	$24	Misfire monitoring (#5 cylinder)
$A7	$1B	$24	Misfire monitoring (#6 cylinder)
	$1C	$24	Misfire monitoring (#6 cylinder)

7. MODE $07

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

8. MODE $09

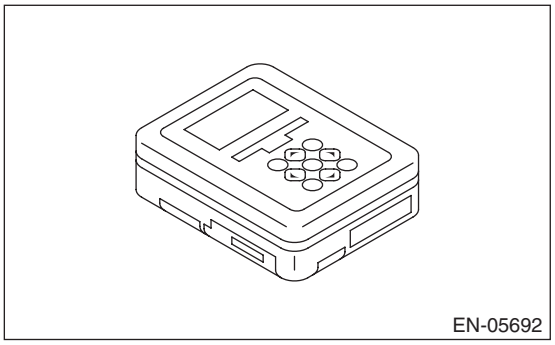
Refer to the data of vehicle specification (V.I.N., calibration ID, diagnosis frequency, etc.).

9. Subaru Select Monitor

A: OPERATION

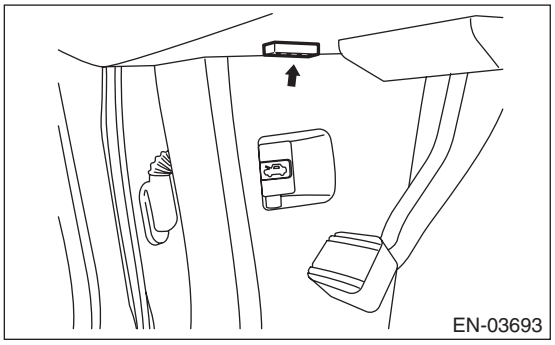
1. HOW TO USE THE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-7, 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 the data link connector located in the lower portion of the instrument panel (on the driver's side).


EN-03693

CAUTION:
Do not connect any scan tools other than Subaru Select Monitor or general scan tool.
6) Start up 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 procedure, refer to the "PC application help for Subaru Select Monitor".

2. READ CURRENT DATA FOR ENGINE (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 the {Current Data Display & Save}.
5) On the «Current Data Display & Save» display screen, select the {Normal sampling}.
6) Using the scroll key, scroll the display screen up or down until the desired data is shown.

• A list of the support data is shown in the following table.

Contents	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 engine is warmed 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 engine is warmed 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	(Intake manifold absolute pressure — atmosphere pressure)
Ignition timing learning value	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	Fuel Pump Duty	%	33%
Variable valve timing advance angle amount R	VVT Adv. Ang. Amount R	deg	+0 deg — +1 deg
Variable valve timing advance angle amount L	VVT Adv. Ang. Amount L	deg	+0 deg — +1 deg
Oil flow control solenoid valve duty R	OCV Duty R	%	9.4%
Oil flow control solenoid valve duty L	OCV Duty L	%	9.4%
Oil flow control solenoid valve current R	OCV Current R	mA	64 mA
Oil flow control solenoid valve current L	OCV Current L	mA	64 mA

Contents	Display	Unit of measure	Note (at idling)
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 power supply 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 accelerator 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 engine is warmed up.)
Exhaust variable valve timing retard angle amount R	Exh. VVT Retard Ang. R	deg	+0 deg — +1 deg
Exhaust variable valve timing retard angle amount L	Exh. VVT Retard Ang. L	deg	+0 deg — +1 deg
Exhaust oil flow control solenoid valve duty R	Exh. OCV Duty R	%	9.4%
Exhaust oil flow control solenoid valve duty L	Exh. OCV Duty L	%	9.4%
Exhaust oil flow control solenoid valve current R	Exh. OCV Current R	mA	64 mA
Exhaust oil flow control solenoid valve current L	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	—	ON
Delivery (test) mode terminal	Test Mode Signal	—	OFF
System operation check mode	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	—	ON, OFF
Front oxygen monitor 2	Front O2 #2 Rich Signal	—	ON, OFF
Knocking signal	Knocking Signal	—	OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	—	ON

Contents	Display	Unit of measure	Note (at idling)
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 air conditioner is OFF)
A/C compressor relay signal	A/C Compressor Signal	—	OFF (when air conditioner is 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
Torque control 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)
Body integrated unit data reception	Body Int. Unit Data	—	ON
Body integrated unit counter update	Body Int. Unit Count	—	ON
Cruise control cancel switch signal	CC Cancel SW	—	OFF (when levers are not operated)
Malfunction indicator light flag	MIL On Flag	—	OFF

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

3. READ CURRENT DATA FOR ENGINE (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 {Current Data Display & Save}.
6) On the «Current Data Display & Save» display screen, select the {All Data Display}.
7) Using the scroll key, scroll the display screen up or down until the desired data is shown.

• A list of the support data is shown in the following table.

Contents	Display	Referential value (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	—
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	%

Contents	Display	Referential value (at idling)	Unit of measure
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	Support	—
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor #12	Support	—
Front oxygen (A/F) sensor (bank 2 sensor 1)	Oxygen sensor #21	Support	—
Oxygen sensor (Bank 2 Sensor 2)	Oxygen sensor #22	Support	—
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	%
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	Barometric 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	—

Contents	Display	Referential value (at idling)	Unit of measure
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)	NO	—
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	%
Engine operating time while malfunction indicator light lit	Time while MIL lighted	—	min
Elapsed time after DTC clear	Time since DTC cleared	—	min
Fuel used	Type of fuel	GAS	—
Relative acceleration opening angle	Relative Accelera. Pos.	0	%

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

4. READ FREEZE FRAME DATA FOR ENGINE (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 {Freeze Frame Data Display}.

- A list of the support data is shown in the following table.

Description	Display	Unit of measure
DTC of freeze frame data	Freeze frame data	DTC
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	OBD/OBD2
Oxygen sensor #11	Oxygen sensor #11	Support
Oxygen sensor #12	Oxygen sensor #12	Support
Oxygen sensor #21	Oxygen sensor #21	Support
Oxygen sensor #22	Oxygen sensor #22	Support
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
Barometric pressure	Atmosphere Pressure	mmHg, kPa, inHg or psig
ECM power supply voltage	Control module voltage	V
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.	%

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

5. V.I.N. REGISTRATION

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 {Entry VIN}.
5) Perform the procedures shown on the display screen.

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

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)-83, 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)-83, 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)-83, 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

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)-49, 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)	—
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	—

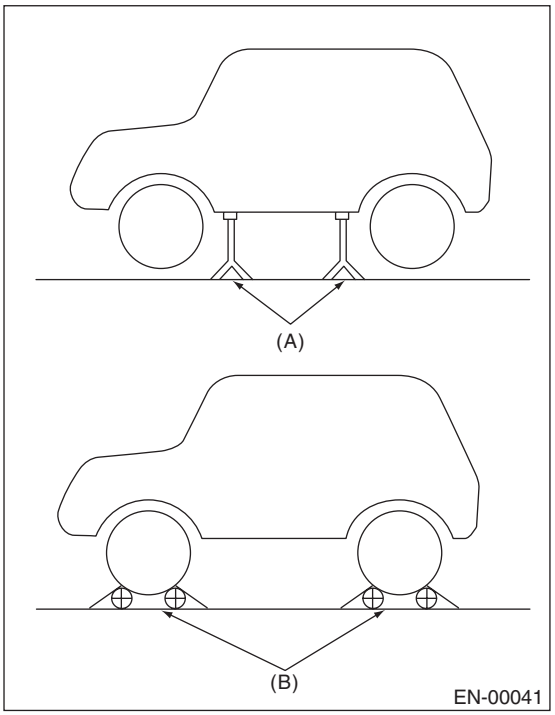
DTC	Item	Condition
P0332	Knock Sensor 2 Circuit Low (Bank 2)	—
P0333	Knock Sensor 2 Circuit High (Bank 2)	—
P0335	Crankshaft Position Sensor “A” Circuit	—
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—
P0345	Camshaft 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	—
P0600	Serial Communication Link	—
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	—
P1560	Back-Up Voltage Circuit Malfunction	—
P1570	Antenna	—
P1571	Reference Code Incompatibility	—
P1572	IMM Circuit Failure (Except Antenna Circuit)	—
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	—
P2122	Throttle/Pedal Position Sensor/Switch “D” Circuit Low Input	—

DTC	Item	Condition
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	Barometric Pressure Circuit Range/Performance	—
P2228	Barometric Pressure Circuit Low	—
P2229	Barometric Pressure Circuit High	—

1. PREPARATION FOR THE INSPECTION MODE

1) Check battery voltage is more than 12 V and fuel remains 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.

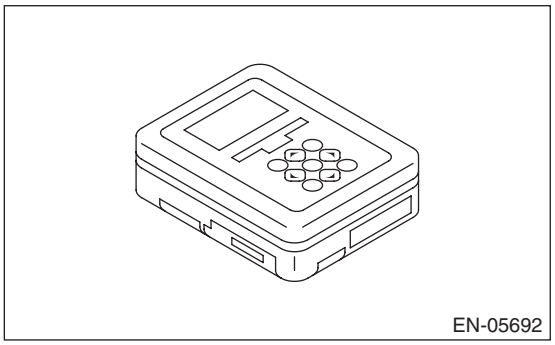
WARNING:
• Before lifting up the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Before rotating the wheels, make sure that there is no one in 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

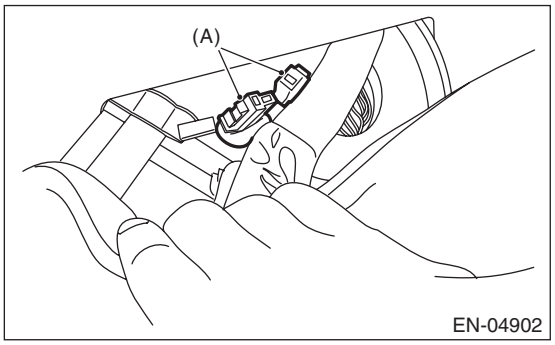
2. SUBARU SELECT MONITOR

1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)(diag)-54, Clear Memory Mode.>
2) Warm up the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-7, PREPARATION TOOL, General Description.>


EN-05692

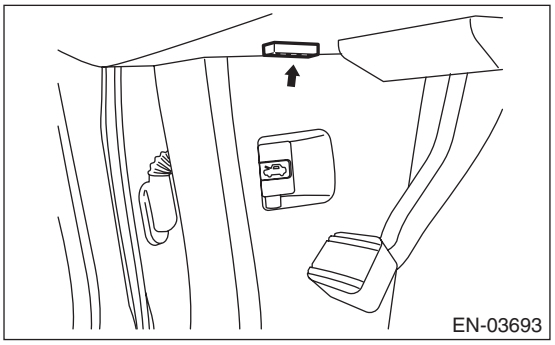
4) Prepare PC with Subaru Select Monitor installed.
5) Connect the SDI (Subaru Diagnostic Interface) to the PC USB port (exclusively for Subaru Select Monitor) using a USB cable.

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



EN-04902

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

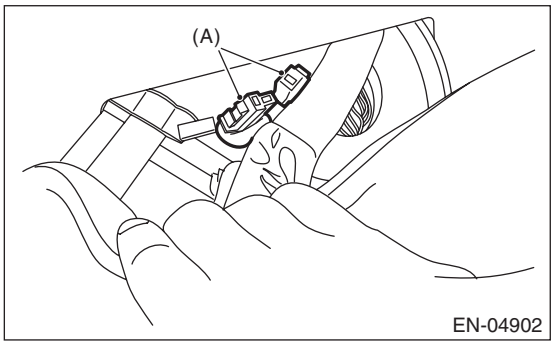

EN-03693

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.
9) Start up the PC.
10) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
11) On the «Main Menu», select {Each System Check}.
12) On the «System Selection Menu», select {Engine Control System}.
13) Click the [OK] button after the information regarding engine type has been displayed.
14) On the «Engine Diagnosis» display screen, select the {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 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)-83, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis function.

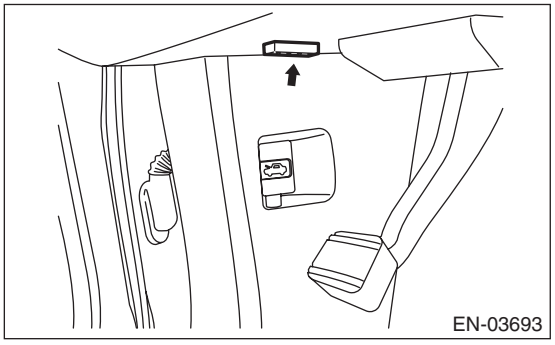
3. GENERAL SCAN TOOL

1) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)(diag)-54, Clear Memory Mode.>
2) Warm up the engine.
3) Connect the delivery (test) mode connector (A) located under the glove box.



4) Connect the Subaru Select Monitor to the data link connector at the lower portion of instrument panel (on the driver's side).

CAUTION:
Do not connect any scan tools other than Subaru Select Monitor or 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 light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.
10) Using the general scan tool, check 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)-83, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: PROCEDURE

For the troubleshooting, there are driving patterns described below. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the repair of the following trouble items, be sure to drive the vehicle with the specified drive patterns to check whether the function is resumed correctly.

1. PREPARATION FOR DRIVE CYCLE

1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)(diag)-54, Clear Memory Mode.>
3) Disconnect the delivery (test) mode connector.

NOTE:
• Except for the water temperature specified items at starting, be sure to carry out the diagnosis after the engine is warmed up.
• Perform the diagnosis twice if the DTC marked with *. After completing the first diagnosis, stop the engine and perform second diagnosis in same condition.

2. DRIVE CYCLE A — DRIVE THE VEHICLE WITH 80 KM/H (50 MPH) FOR 20 MINUTES, AND IDLE THE ENGINE FOR A MINUTE

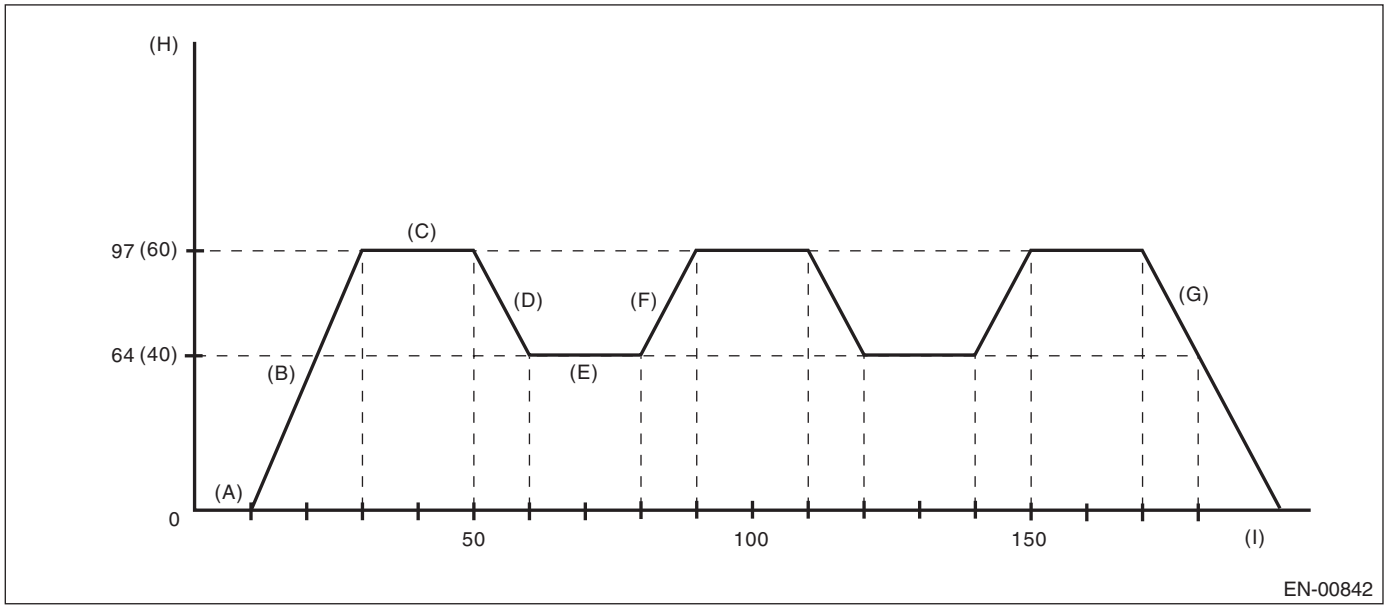
DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature at engine start is less than 20°C (68°F).
*P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	—
*P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0153	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	—
*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	—
*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.

3. DRIVE CYCLE B — 10 MINUTES IDLING

NOTE:
Drive the vehicle at 10 km/h (6 MPH) or faster before diagnosis.

DTC	Item	Condition
*P0126	Insufficient Engine Coolant Temperature for Stable Operation	—
*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.

4. DRIVE CYCLE C — DRIVE THE VEHICLE WITH FOLLOWING DRIVE PATTERNS



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

DTC	Item	Condition
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
*P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	—
*P0068	Manifold Pressure Sensor Range/Performance	—
*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	EGR System Malfunction	—
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.

5. DRIVE CYCLE D

DRIFT DIAGNOSIS

1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
2) Make sure that fuel remains 9.6 ℓ (2.5 US gal, 2.1 Imp gal) or more and the battery voltage is 10.9 V or more.
3) Start the engine, and check that the engine coolant temperature increases by 10°C (18°F) or more, and reaches 75°C (167°F) or more, when the engine is warmed up.
4) After the engine has reached the state of procedure 3), idle the engine for 120 seconds 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)-54, 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 while diagnosing. (Data will be cleared by disconnecting the battery terminals.)

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

6. DRIVE CYCLE E

1) Make sure that the battery voltage is 10.9 V or more.
2) Perform the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-54, 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.)

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

7. DRIVE CYCLE F

1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
2) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F).
3) Idle the engine for more than 10 minutes in the condition of step 2.

NOTE:
Do not disconnect the battery terminals while diagnosing. (Data will be cleared by disconnecting the battery terminals.)

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

8. DRIVE CYCLE H

1) Perform the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-54, Clear Memory Mode.>
2) With the ignition switch ON, read the engine coolant temperature, intake air temperature and fuel temperature. <Ref. to EN(H6DO)(diag)-35, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>
3) If the values from step 2) satisfy the following two conditions, start the engine.

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.
- Start AT vehicles in the P range, and MT vehicles in the N position.
- Idle the engine for 1 minute under the conditions in step 2).

Do not disconnect the battery terminals while diagnosing. (Data will be cleared by disconnecting the battery terminals.)

DTC	Item	Condition
*P1602	Control Module Programming Error	—

13.Clear Memory Mode

A: OPERATION

NOTE:
When Clear Memory Mode is performed in OBD mode on the Subaru Select Monitor, only DTCs are cleared.

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 {Clearing 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

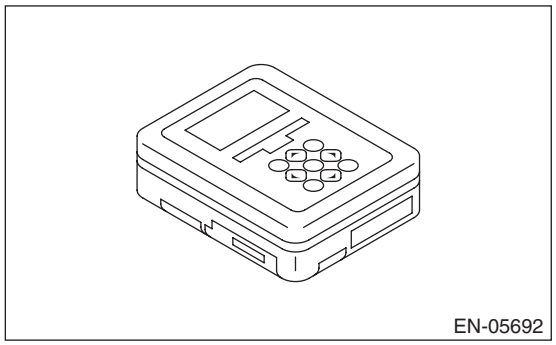
For procedures clearing memory using the general scan tool, refer to the general scan tool operation manual.

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

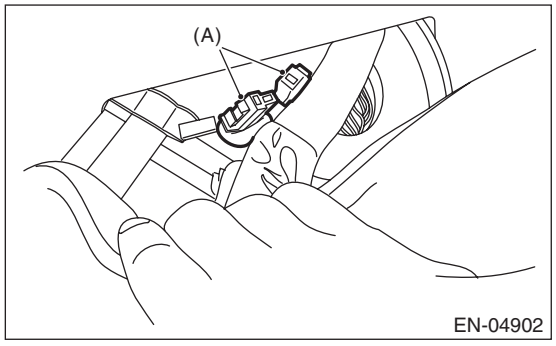
A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-7, PREPARATION TOOL, General Description.>


EN-05692

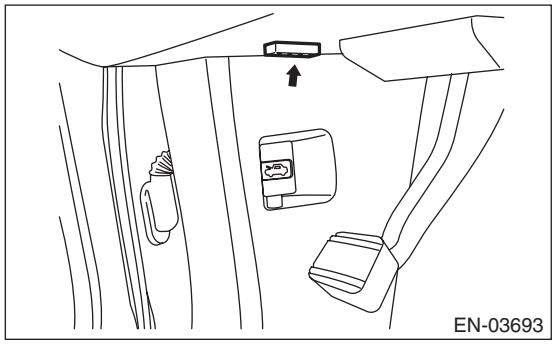
2) Prepare PC with Subaru Select Monitor installed.
3) Connect the SDI (Subaru Diagnostic Interface) to the PC USB port (exclusively for Subaru Select Monitor) using a USB cable.

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 delivery (test) mode connector (A) located under the glove box.



EN-04902

6) 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.

7) Start up the PC.
8) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
9) On the «Main Menu», select {Each System Check}.
10) On the «System Selection Menu», select {Engine Control System}.
11) Click the [OK] key after the information regarding engine type has been displayed.
12) Select {System Operation Check Mode} on the «Engine Diagnosis» display screen.
13) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation}.
14) Select the desired actuator on the «Actuator ON/OFF Operation» display screen and click the [Next] button.
15) Clicking the [Quit] button completes the compulsory valve operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

• A list of the support data is shown in the following table.

Description	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory drain valve operation check	Vent. Solenoid Valve

NOTE:
• The following parts will be displayed but not functional.

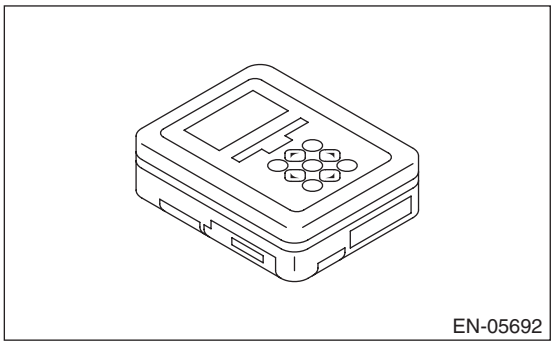
Display
EGR Solenoid Valve
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol.1
Pressure Switching Sol.2
Turbocharger Wastegate Solenoid
AAI Solenoid Valve
EXH. Bypass Control Permit Flag
PCV Solenoid Valve
Tank Sensor Cntl Valve
Secondary Air Combi Valve 1

• For detailed operation procedure, refer to the "PC application help for Subaru Select Monitor".

15. System Operation Check Mode

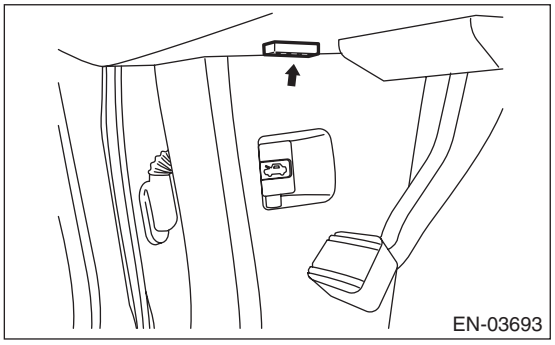
A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-7, 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 operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>
1) On the «System Operation Check Mode» display, select the {Fuel Pump Control}.
2) On the «Fuel Pump Control» display screen, select the {OFF Operation}.
3) On the «Start the Engine» display screen, start the engine and click the [OK] button.
4) On the «OFF drive» display screen, click the [Execution] button and execute 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 procedure, refer to the "PC application help for Subaru Select Monitor".

2. FUEL PUMP CONTROL (ON/OFF OPERATION)

CAUTION:
After executing the operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>
1) On the «System Operation Check Mode» display, select the {Fuel Pump Control}.
2) On the «Fuel Pump Control» display screen, select the {ON/OFF Dr.}.
3) On the «Turn Ignition Switch ON with Engine Stalled» display screen, turn the ignition switch to ON and click the [OK] button.
4) On the «ON/OFF dr.» display screen, click the [Execution] button and execute 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 procedure, refer to the “PC application help for Subaru Select Monitor”.

3. IDLING IGNITION TIMING FIXED

CAUTION:
After executing the operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>
1) On the «System Operation Check Mode» display screen, select the {Fixed Idle Ignition Timing}.
2) On the «Start the Engine» display screen, start the engine and click the [OK] button.
3) On the «Fixed Idle Ignition Timing» display screen, click the [Execution] button and execute idling ignition timing fixed.
4) Click the [Cancel] button to stop the idle ignition timing fixed.
5) Click the [F12 Exit] button to end the idle ignition timing fixed. The display will then return to the «System Operation Check Mode» screen.

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

4. IDLE SPEED CONTROL

CAUTION:
After executing the operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>
1) On the «System Operation Check Mode» display screen, select the {Idle Speed Control}.
2) On the «Start the Engine» display screen, start the engine and click the [OK] button.
3) In the «Idle Engine Speed Control» screen, 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 display will then return to the «System Operation Check Mode» screen.

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

5. INJECTOR CONTROL (INJECTION STOP MODE)

CAUTION:
After executing the operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>
1) On the «System Operation Check Mode» display, select the {Injector Control}.
2) On the «Injector Control» display screen, select the {Injection Stop Mode}.
3) On the «Injection Stop Mode», display screen, select a fuel injector to be stopped.
4) On the «Start the Engine» display screen, start the engine and click the [OK] button.
5) On the «Fuel Injector #» display screen, click the [Execution] button and execute 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 the «Injection Stop Mode» display screen, click the [Return] button to end the «Injection Stop Mode». The screen will return to the «Injector Control» screen.

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

6. INJECTOR CONTROL (INJECTION QUANTITY CONTROL)

CAUTION:
After executing the operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>
1) On the «System Operation Check Mode» display, select the {Injector Control}.
2) On the «Injector Control» display screen, select the {Injection Quantity Control}.
3) On the «Start the Engine» display screen, start the engine and click the [OK] button.
4) In the «Injection Quantity Control» screen, 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 procedure, refer to the “PC application help for Subaru Select Monitor”.

7. EGR VALVE CONTROL

CAUTION:
After executing the operation check mode, execute the Clear Memory Mode. <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>

1) On the «System Operation Check Mode» display, select the {EGR Valve Control}.
2) On the «Start the Engine» display screen, start the engine and click the [OK] button.
3) In the «EGR Valve Control» screen, 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 display will then return to the «System Operation Check Mode» screen.

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

16.Malfunction Indicator Light

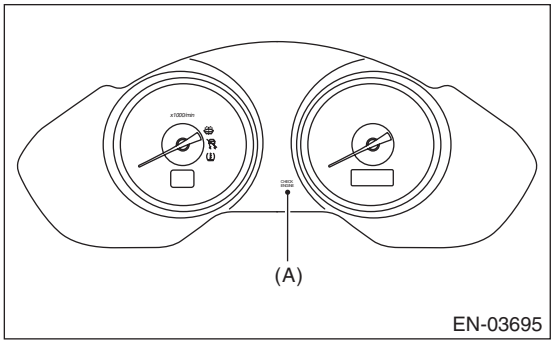
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H6DO)(diag)-60, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Malfunction indicator light does not come on. <Ref. to EN(H6DO)(diag)-61, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Malfunction indicator light does not go off. <Ref. to EN(H6DO)(diag)-63, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>
↓
4. Malfunction indicator light does not blink. <Ref. to EN(H6DO)(diag)-64, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK, Malfunction Indicator Light.>
↓
5. Malfunction indicator light remains blinking. <Ref. to EN(H6DO)(diag)-66, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING, Malfunction Indicator Light.>

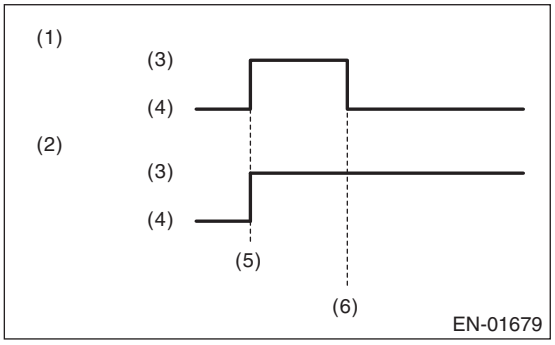
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

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)-61, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>

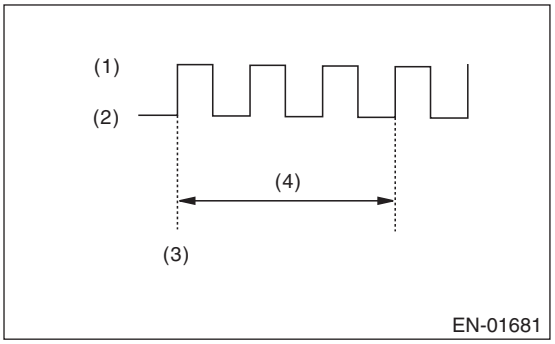


2) After starting the engine, the malfunction indicator light goes out. If it does not go off, either the engine or emission control system has malfunction.



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

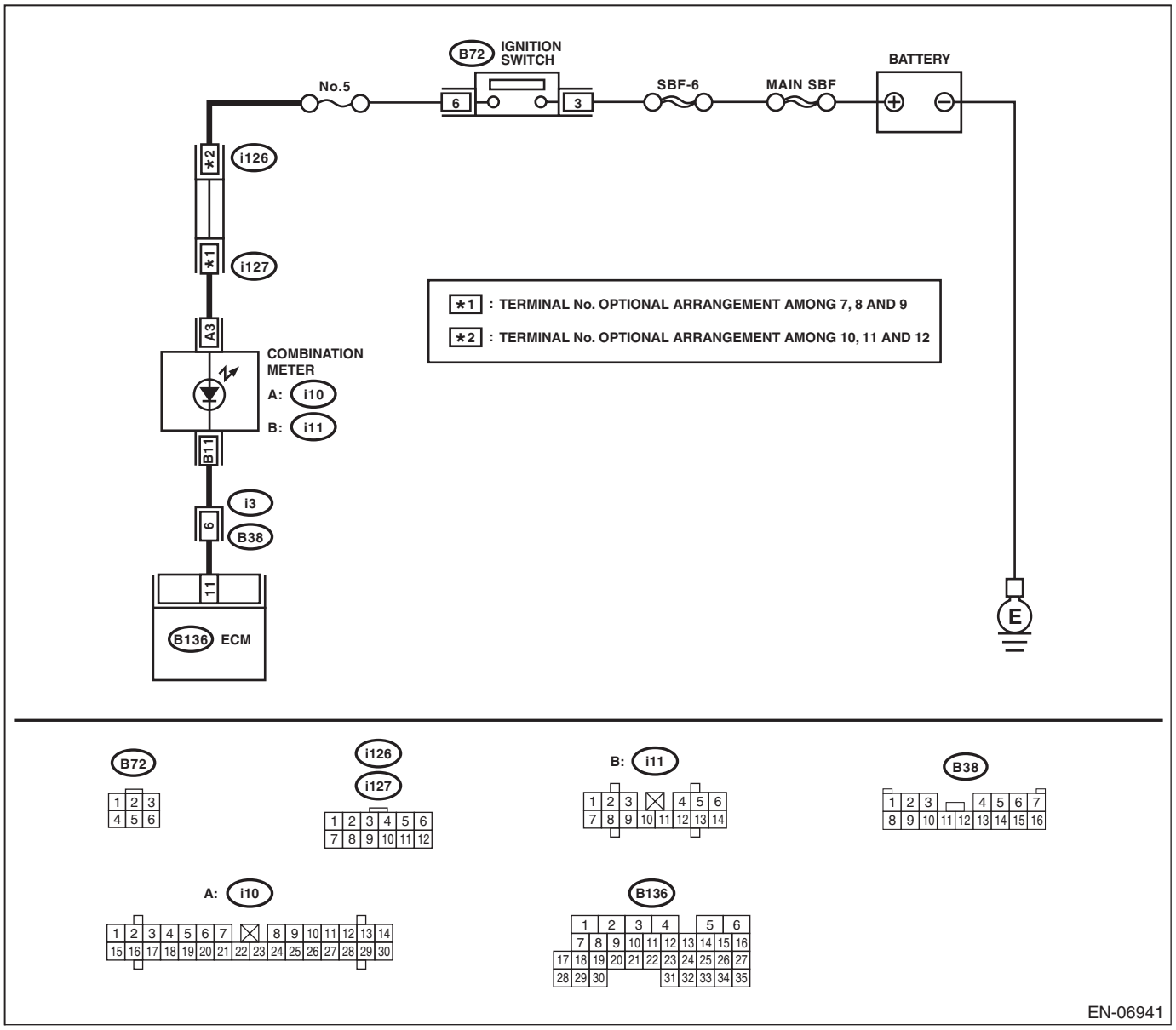
3) Turn the ignition switch to OFF and connect the delivery (test) mode connector.
(1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light illuminates.
(2) After the engine starts, malfunction indicator light blinks in a cycle of 0.5 Hz. (During diagnosis)
(3) Malfunction 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 second

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:



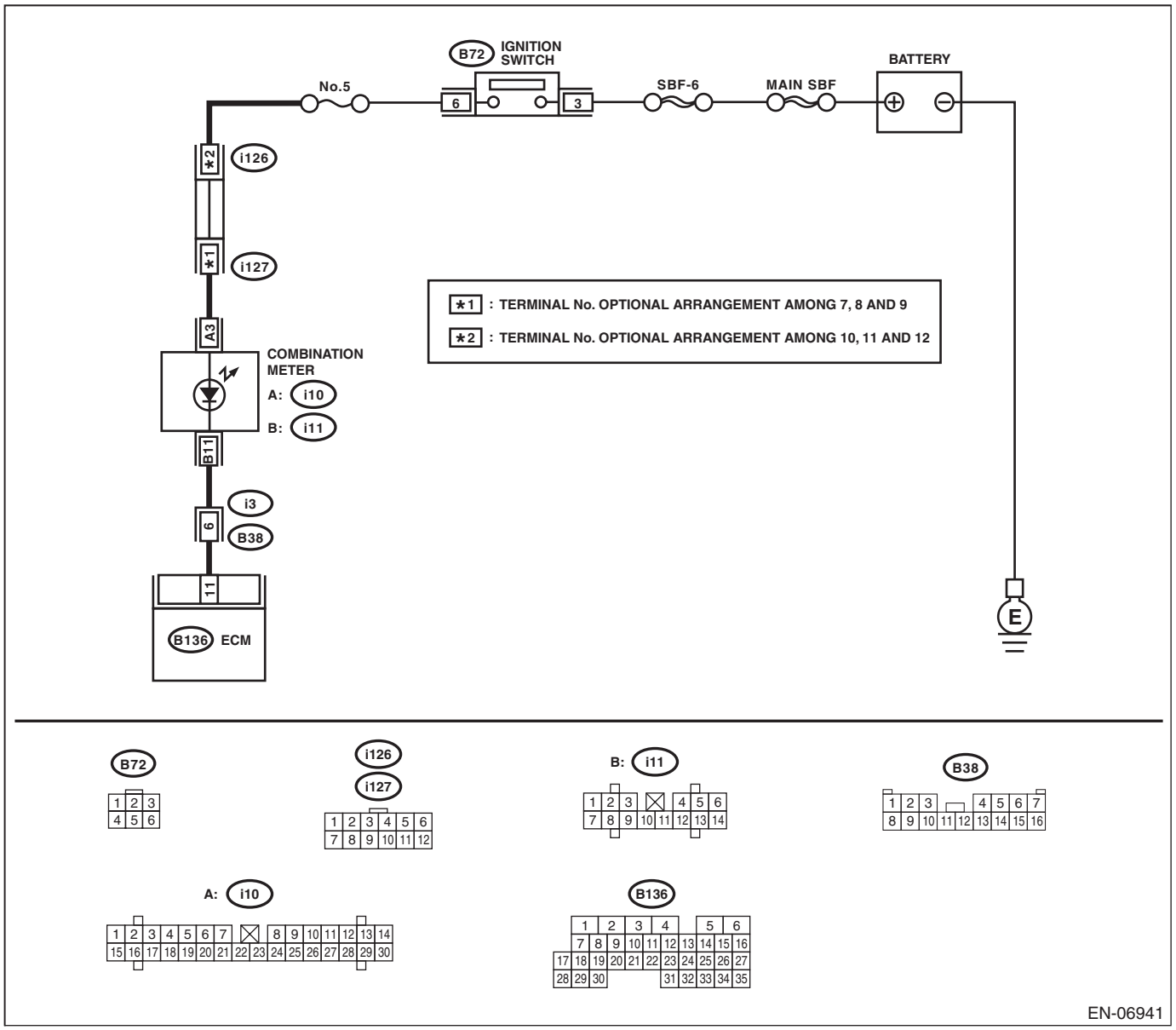
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **5**.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-12, Combination Meter.> 3) Disconnect the connector from the ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B136) No. 11 — (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 of harness between ECM and combination meter connector • Poor contact of coupling connector
3	**CHECK POOR CONTACT.** Check for poor contact of combination meter connector.	Is there poor contact in combination meter connector?	Repair the poor contact of combination meter connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH.** 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 combination meter board. <Ref. to IDI-12, Combination Meter.>	Check the following item and repair if necessary. NOTE: • Blown out of fuse (No. 5) • Open or short circuit of harness between fuse (No. 5) and battery terminal • Poor contact in ignition switch connector
5	**CHECK POOR CONTACT.** Check for poor connection by shaking or pulling ECM 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)-38, 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 ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the short circuit of harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H6DO)-38, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK

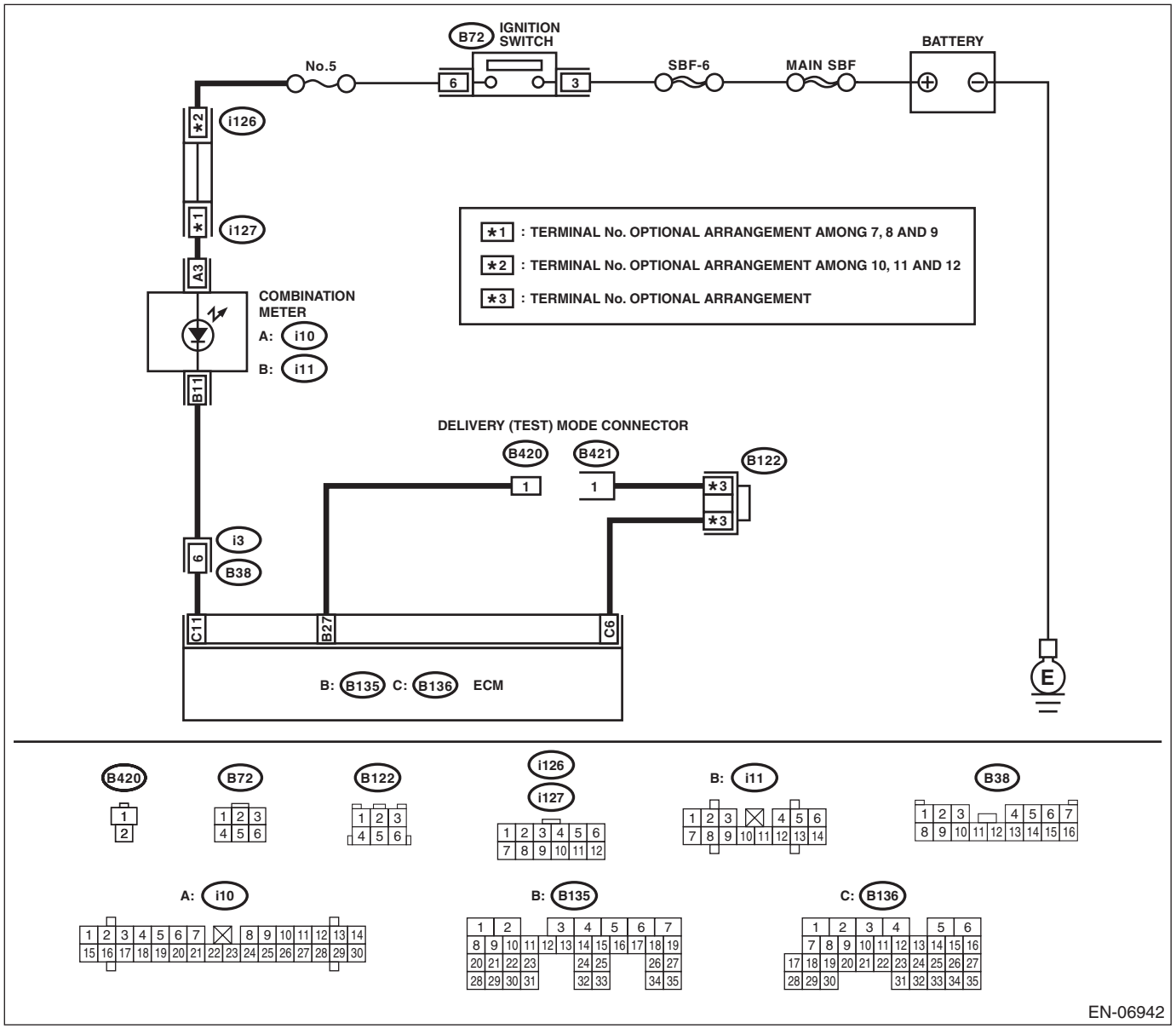
DIAGNOSIS:

- 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.

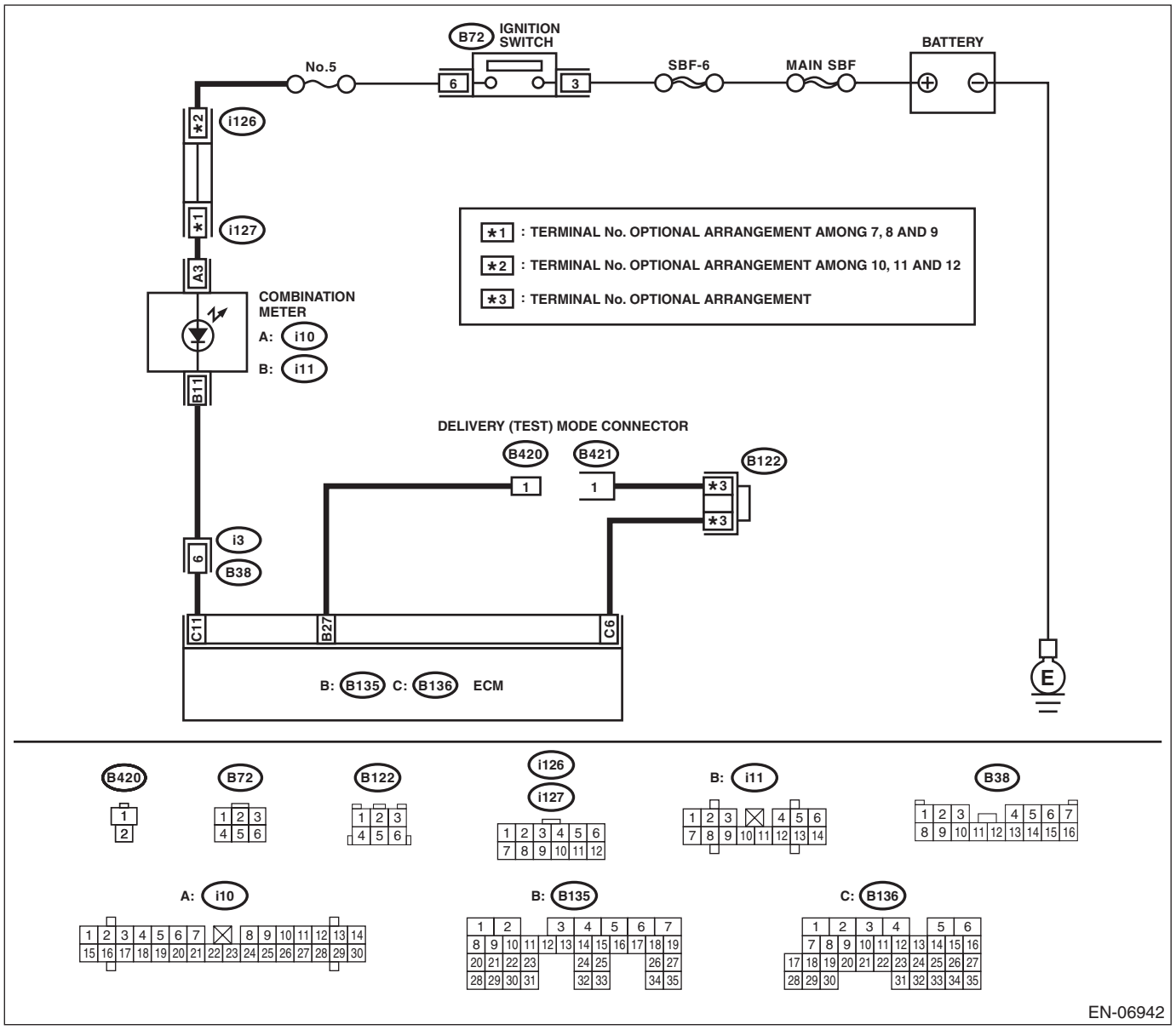
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the delivery (test) mode connector. 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)-61, 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 connectors from the ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the 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) Disconnect connectors from the ECM. 3) Measure the resistance of harness between ECM and delivery (test) mode connector. ***Connector & terminal*** ***(B420) No. 1 — (B135) No. 27:*** ***(B421) No. 1 — (B136) 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 of harness between ECM and delivery (test) mode connector • Poor contact in joint connector
4	**CHECK POOR CONTACT.** Check for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H6DO)-38, 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 when delivery (test) mode connector is not connected.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DELIVERY (TEST) MODE CONNECTOR.** 1) Disconnect the delivery (test) mode connector. 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.
2	**CHECK HARNESS BETWEEN ECM AND CHASSIS GROUND TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 27 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit of harness between ECM and delivery (test) mode connector.	Replace the ECM. <Ref. to FU(H6DO)-38, Engine Control Module (ECM).>

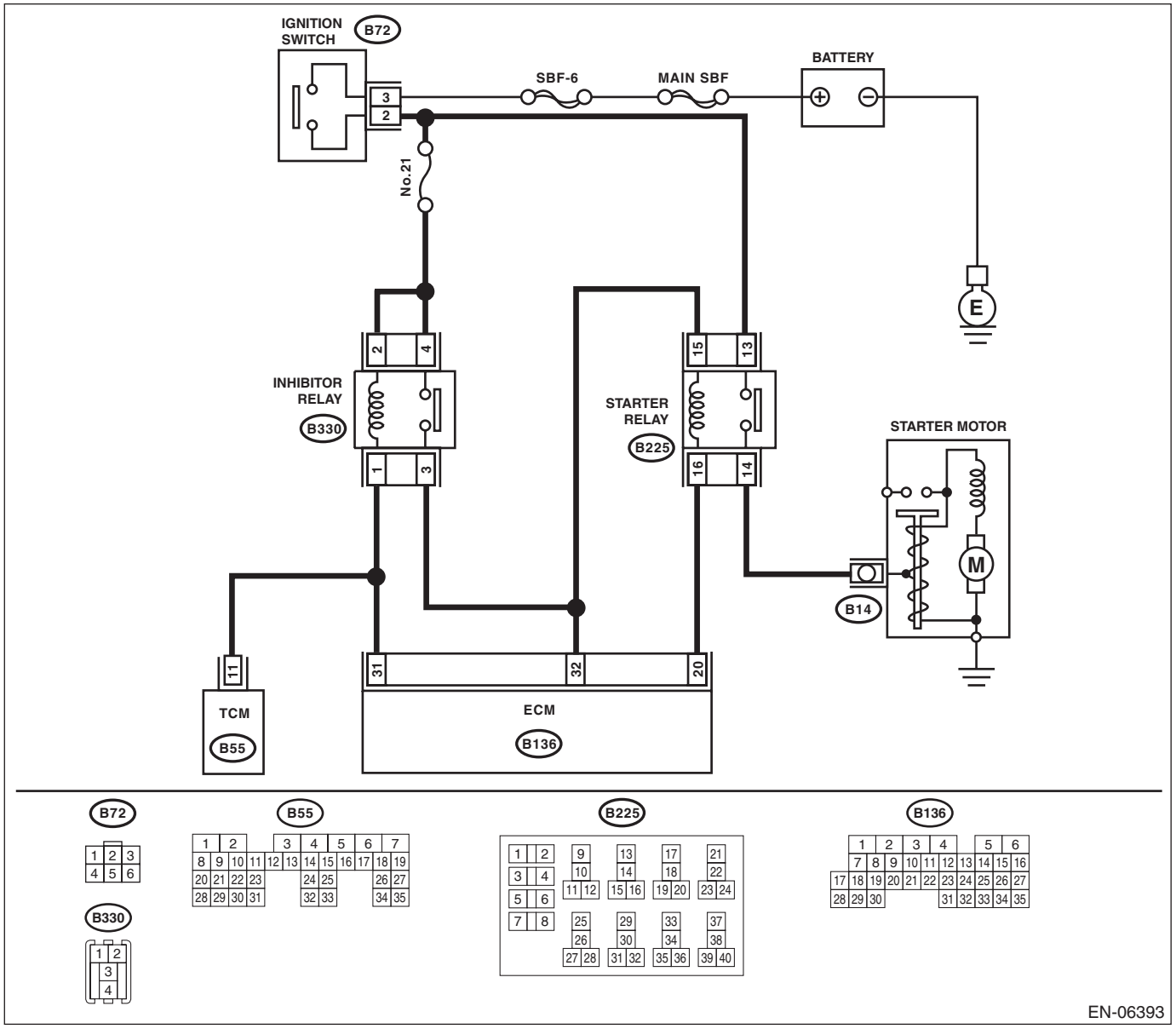
17.Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Check of the fuel amount
↓
2. Inspection of starter motor circuit. <Ref. to EN(H6DO)(diag)-69, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H6DO)(diag)-73, 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)-75, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H6DO)(diag)-78, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H6DO)(diag)-79, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



Diagnostics for Engine Starting Failure

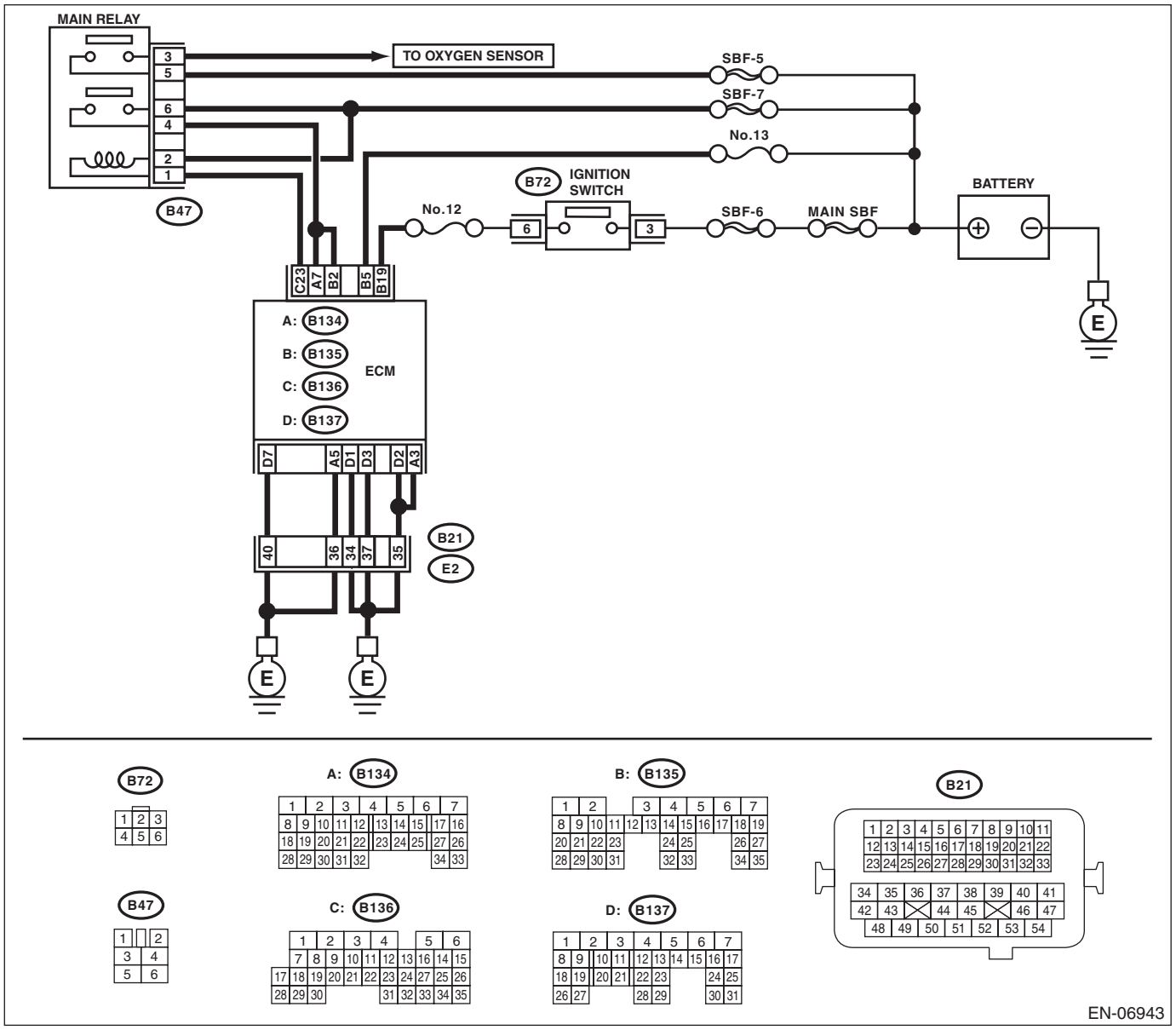
	Step	Check	Yes	No
1	**CHECK BATTERY.** Check the battery voltage.	Is the voltage 12 V or more?	Go to step **2**.	Charge or replace the battery.
2	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **3**.	Go to step **4**.
3	**CHECK DTC.**	Is DTC displayed? <Ref. to EN(H6DO)(diag)-43, OPERATION, Read Diagnostic Trouble Code (DTC).>	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-83, 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 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**.	Check the following item and repair if necessary. • Blown out of fuse • Open or ground short circuit of harness between ignition switch connector and battery
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-44, 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. <Ref. to EN(H6DO)(diag)-8, Electrical Component Location.>
10	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance of harness between ECM and starter relay connector. ***Connector & terminal*** ***(B136) No. 20 — (B225) No. 16:***	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. 31 — (B330) No. 1:*** ***(B136) No. 32 — (B330) No. 3:***	Is the resistance less than 1 Ω?	Check the ECM power supply and ground line. <Ref. to EN(H6DO)(diag)-73, 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 • 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

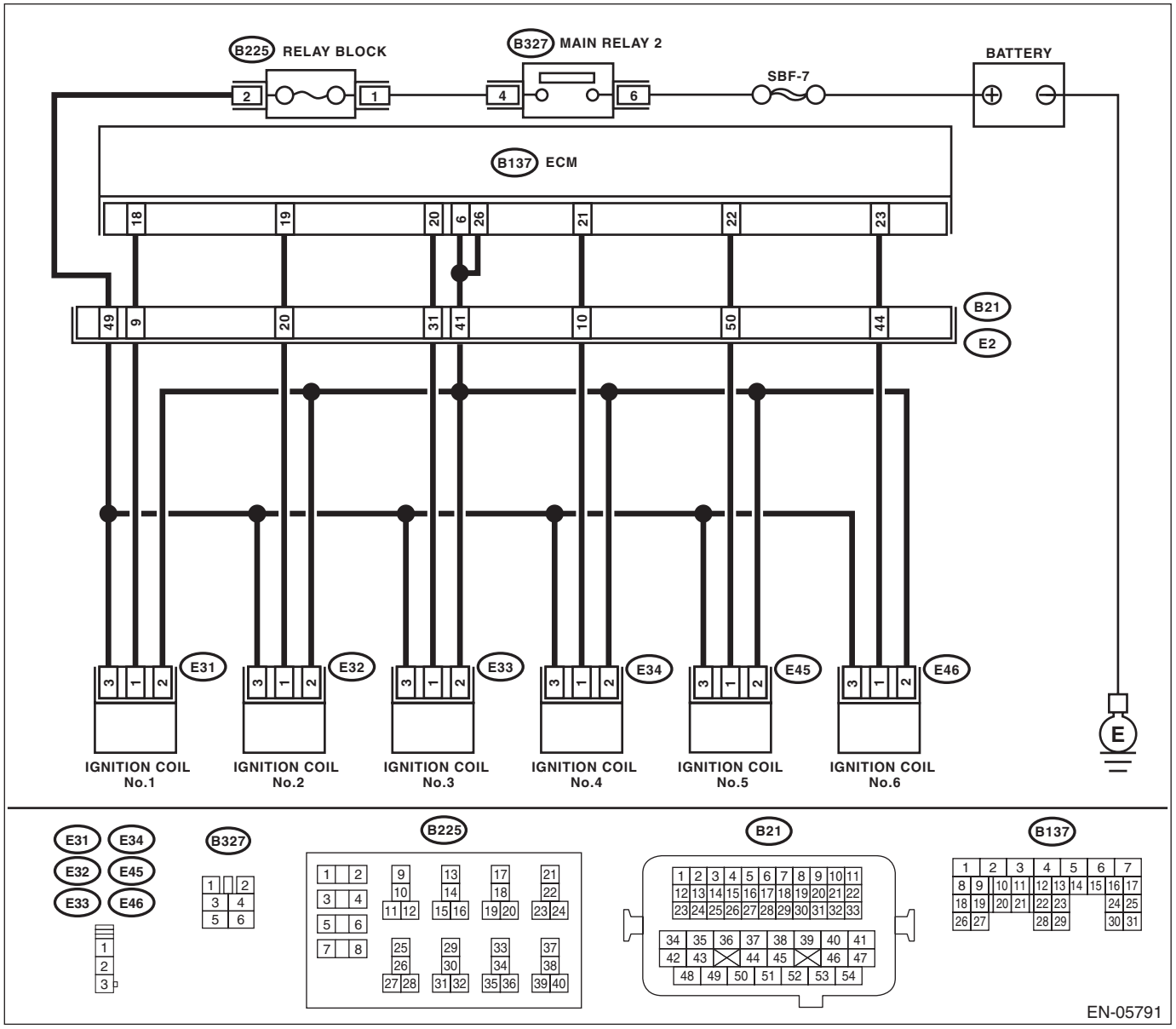


Diagnostics for Engine Starting Failure

	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 EN(H6DO)(diag)-8, Electrical Component Location.>
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect connectors from the ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the open circuit of harness between ECM and engine ground terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (–):*** ***(B135) No. 19 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the open or ground short circuit 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 power supply circuit.
5	**CHECK HARNESS BETWEEN ECM AND STARTER CUT RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and fuel pump relay connector. ***Connector & terminal*** ***(B136) No. 23 — (B47) No. 1:***	Is the resistance less than 1 Ω?	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 ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 (+) — Chassis ground (–):*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Check ignition control system. <Ref. to EN(H6DO)(diag)-75, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit of harness between ECM and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



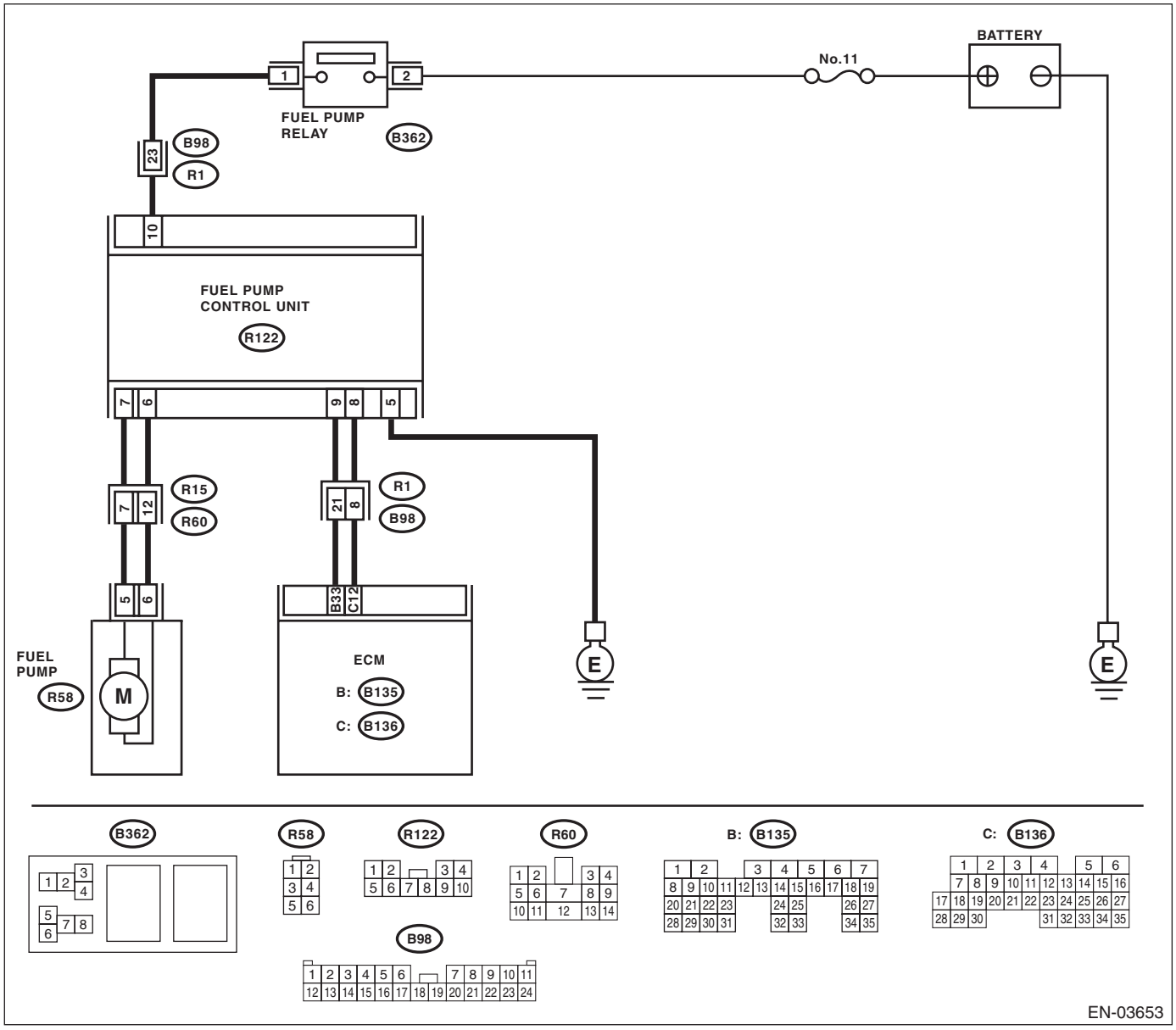
Diagnostics for Engine Starting Failure

	Step	Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H6DO)-5, INSPECTION, Spark Plug.>	Is the spark plug condition normal?	Go to step **2**.	Replace the spark plug. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H6DO)-43, PROCEDURE, Fuel.> 3) Contact the spark plug's thread portion to the engine. 4) While opening the throttle valve fully, crank 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)-78, 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 or short circuit to ground of power supply circuit • Blown out of fuse • 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 harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ignition coil connector and ECM connector • Open circuit in harness between ECM and engine ground terminal • Poor contact of coupling connector
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** 1) Disconnect connectors from the ECM. 2) Measure the resistance of harness between ECM and ignition coil connector. ***Connector & terminal*** ***(B137) No. 18 — (E31) No. 1:*** ***(B137) No. 19 — (E32) No. 1:*** ***(B137) No. 20 — (E33) No. 1:*** ***(B137) No. 21 — (E34) No. 1:*** ***(B137) No. 22 — (E45) No. 1:*** ***(B137) No. 23 — (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 and ignition coil connector • Poor contact of coupling connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal:*** ***(B137) No. 18 — Chassis ground:*** ***(B137) No. 19 — Chassis ground:*** ***(B137) No. 20 — Chassis ground:*** ***(B137) No. 21 — Chassis ground:*** ***(B137) No. 22 — Chassis ground:*** ***(B137) No. 23 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the ground short circuit of harness between ECM and ignition coil connector.
7	**CHECK POOR CONTACT.** Check for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ignition coil. <Ref. to IG(H6DO)-4, Spark Plug.>

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

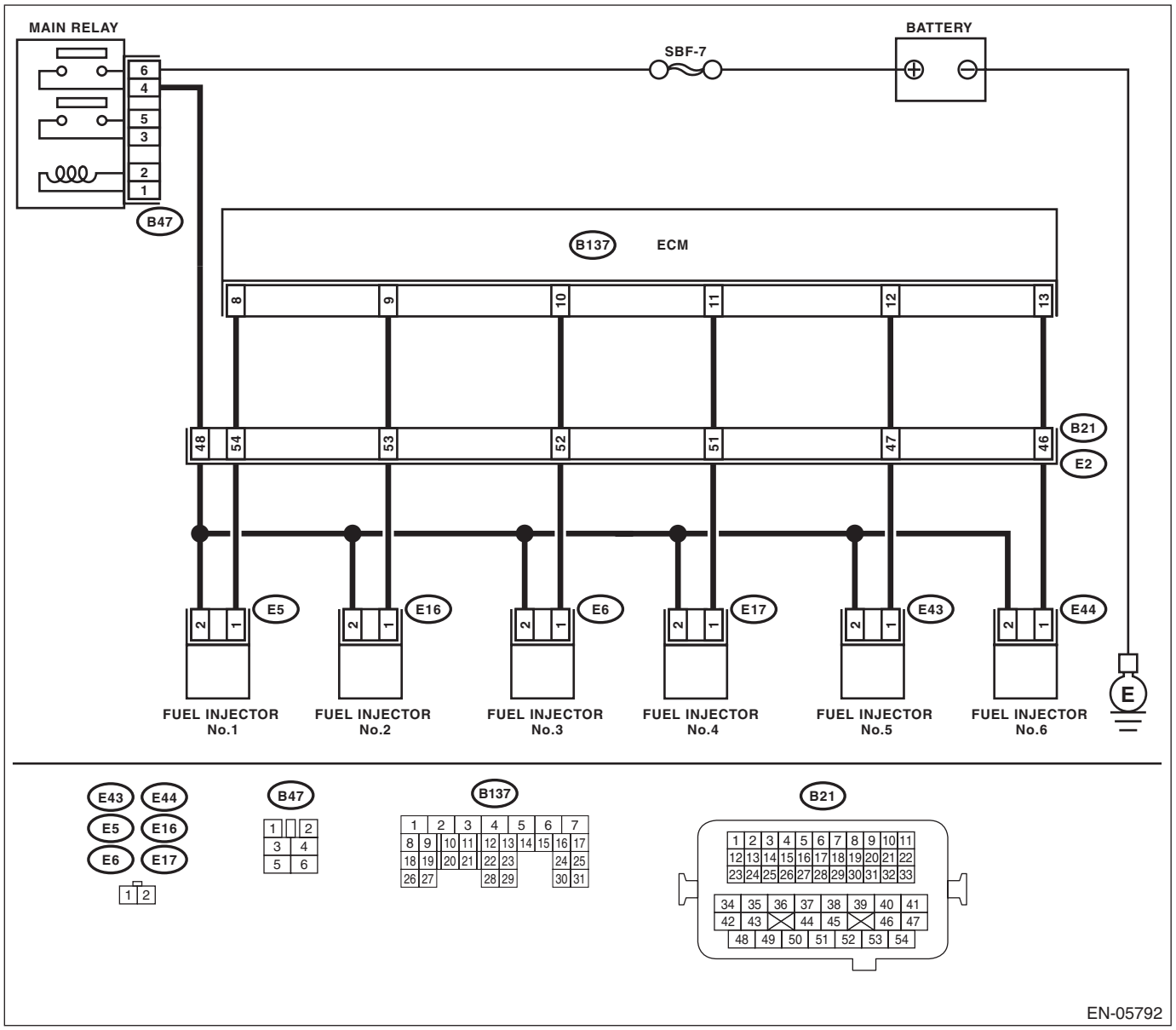


Step		Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump operates for two seconds when turning the ignition switch to ON. NOTE: The fuel pump can be operated using the Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the fuel pump emit operating sound?	Check the fuel injector circuit. <Ref. to EN(H6DO)(diag)-79, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(H6DO)(diag)-43, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.**

WIRING DIAGRAM:

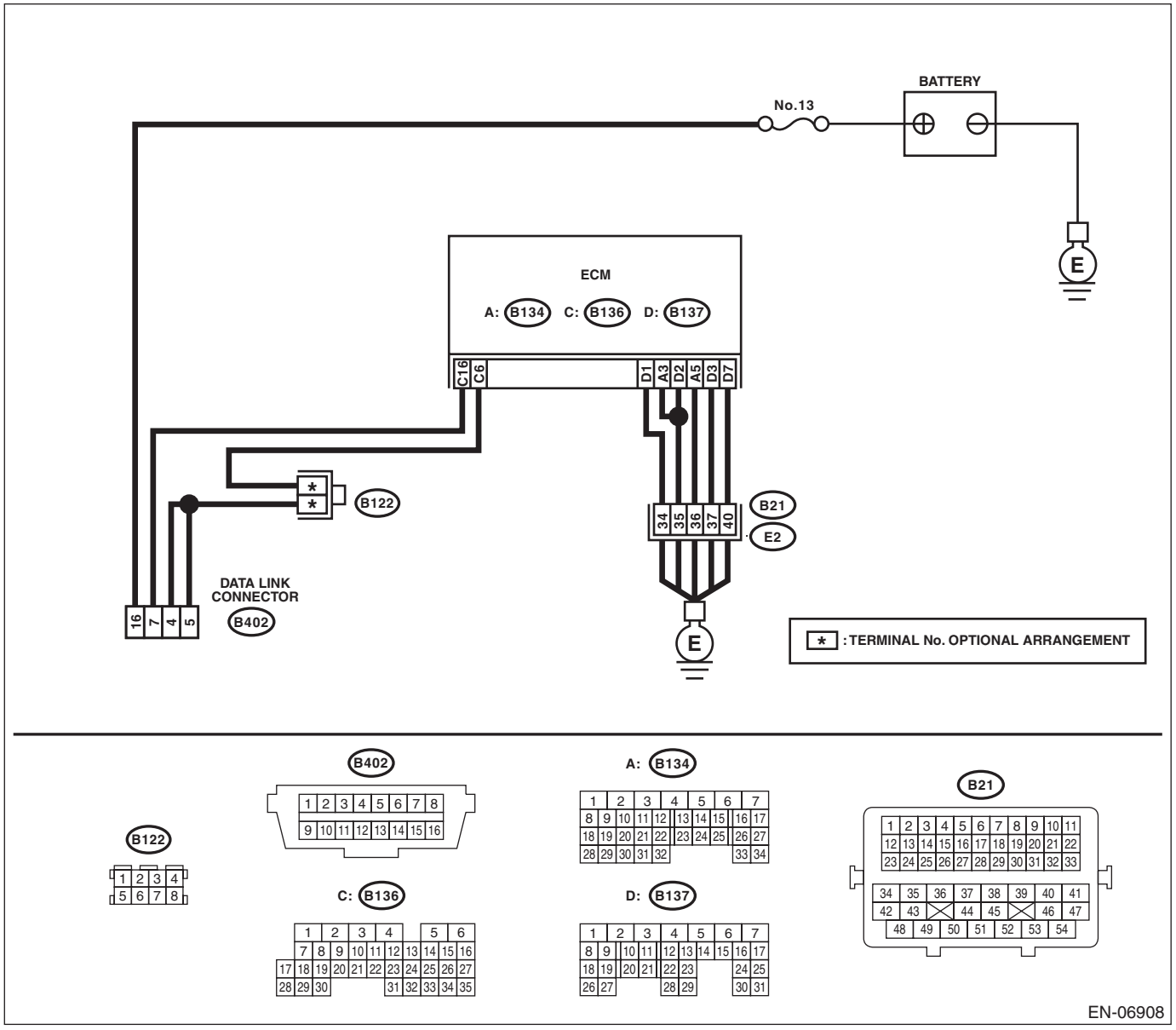


	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check each fuel injector emits operating sound. To perform this check, use a sound scope, or listen by placing a screwdriver against the injector and the other end to your ear.	Does the fuel pump emit operating sound?	Check the fuel pressure. <Ref. to ME(H6DO)-30, INSPECTION, Fuel Pressure.>	Go to step **2**.
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 connectors from the ECM. 3) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B137) No. 8 — (E5) No. 1:*** ***#2 (B137) No. 9 — (E16) No. 1:*** ***#3 (B137) No. 10 — (E6) No. 1:*** ***#4 (B137) No. 11 — (E17) No. 1:*** ***#5 (B137) No. 12 — (E43) No. 1:*** ***#6 (B137) No. 13 — (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 of harness between ECM and fuel injector connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B137) No. 8 — Chassis ground:*** ***#2 (B137) No. 9 — Chassis ground:*** ***#3 (B137) No. 10 — Chassis ground:*** ***#4 (B137) No. 11 — Chassis ground:*** ***#5 (B137) No. 12 — Chassis ground:*** ***#6 (B137) No. 13 — 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.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 5 — 20 Ω?	Go to step **6**.	Replace the faulty fuel injector. <Ref. to FU(H6DO)-30, Fuel Injector.>
6	**CHECK POOR CONTACT.** Check for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Inspection using “General Diagnostic Table” <Ref. to EN(H6DO)(diag)-362, 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:



	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**.
2	**CHECK POWER SUPPLY CIRCUIT.** Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) 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*** ***(B40) No. 4 — Chassis ground:*** ***(B40) 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 in ECM connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND DATA LINK CONNECTOR.** 1) Disconnect the connector from ECM, TCM, VDC CU, 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*** ***(B136) No. 16 — (B40) No. 7:***	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 of harness between ECM and data link connector • Poor contact of coupling connector
5	**CHECK HARNESS BETWEEN ECM AND DATA LINK CONNECTOR.** Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact in 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	Reference
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	<Ref. to EN(H6DO)(diag)-91, 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)-92, DTC P0014 EXHAUST AVCS SYSTEM 1 (RANGE/PERFORMANCE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	<Ref. to EN(H6DO)(diag)-93, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0017	Crank and Cam Timing B System Failure (Bank 1)	<Ref. to EN(H6DO)(diag)-94, DTC P0017 CRANK AND CAM TIMING B SYSTEM FAILURE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	<Ref. to EN(H6DO)(diag)-95, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0019	Crank and Cam Timing B System Failure (Bank 2)	<Ref. to EN(H6DO)(diag)-96, 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)-97, 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)-98, 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)-99, 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)-101, 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)-103, 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)-105, 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)-107, 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)-109, 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)-111, 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)-113, 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)-115, DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Reference
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-117, DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	MAP/MAF — Throttle Position Correlation	<Ref. to EN(H6DO)(diag)-119, 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)-121, 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)-123, 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)-125, 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)-127, 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)-129, 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)-131, 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)-133, 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)-135, 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)-137, 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)-139, 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)-141, 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)-147, 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)-148, 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)-150, 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)-151, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-153, 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)-155, 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)-157, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-159, 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)-161, 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)-163, 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)-165, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0151	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-168, 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)-170, 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)-172, 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)-174, 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)-176, 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)-178, 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)-180, 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)-182, DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H6DO)(diag)-184, 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)-184, 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)-184, 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)-185, 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)-187, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Reference
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to EN(H6DO)(diag)-189, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to EN(H6DO)(diag)-191, 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)-193, 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)-195, 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)-197, 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)-199, 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)-202, 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)-205, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H6DO)(diag)-207, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H6DO)(diag)-207, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H6DO)(diag)-207, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H6DO)(diag)-207, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0305	Cylinder 5 Misfire Detected	<Ref. to EN(H6DO)(diag)-207, DTC P0305 CYLINDER 5 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0306	Cylinder 6 Misfire Detected	<Ref. to EN(H6DO)(diag)-208, 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)-214, 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)-216, 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)-218, 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)-220, 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)-222, 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)-224, 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)-226, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	<Ref. to EN(H6DO)(diag)-228, 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)-230, 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)-232, 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)-234, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency below Threshold (Bank 1)	<Ref. to EN(H6DO)(diag)-236, 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)-241, 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)-243, 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)-245, 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)-247, 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)-249, 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)-251, 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)-253, 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)-255, 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)-257, 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)-259, 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)-261, 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)-261, 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)-261, 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)-262, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle Speed Sensor “A”	<Ref. to EN(H6DO)(diag)-262, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to EN(H6DO)(diag)-263, 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)-266, 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)-269, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-16, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial CAN Communication Link	<Ref. to EN(H6DO)(diag)-270, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H6DO)(diag)-271, 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)-272, 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)-273, 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)-274, 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)-274, 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)-275, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(H6DO)(diag)-278, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1154	O2 Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-281, 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)-284, 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)-286, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(H6DO)(diag)-287, 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)-289, 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)-289, 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)-289, 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)-289, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to EN(H6DO)(diag)-289, 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)-289, 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)-290, 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)-293, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(H6DO)(diag)-295, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM(diag)-17, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-19, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM(diag)-20, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM(diag)-22, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-23, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-23, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1578	Meter Failure	<Ref. to IM(diag)-24, DTC P1578 METER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1602	Control Module Programming Error	<Ref. to EN(H6DO)(diag)-297, 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)-307, 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)-309, 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)-311, 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)-313, 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)-315, 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)-317, 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)-319, DTC P2094 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P2095	Exhaust Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H6DO)(diag)-321, 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)-322, 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)-323, 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)-328, 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)-329, DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-335, 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)-341, 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)-344, 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)-345, 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)-346, 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)-348, 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)-350, 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)-352, 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)-354, 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)-358, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2227	Barometric Pressure Circuit Range/ Performance	<Ref. to EN(H6DO)(diag)-360, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2228	Barometric Pressure Circuit Low	<Ref. to EN(H6DO)(diag)-360, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2229	Barometric Pressure Circuit High	<Ref. to EN(H6DO)(diag)-361, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, 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:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-9, 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 using the 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)-34, 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°?	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) • 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 procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-34, 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 (clogged or dirty oil passages, spring settings) • 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, then replace the oil filter and engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-15, 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)-11, 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)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-34, 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)-34, 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)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-15, Engine Oil Filter.>

C: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-13, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (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)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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, then replace the oil filter and engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-15, 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) • 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)-15, 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)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-34, 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)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-15, 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 (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-17, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (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)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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, then replace the oil filter and engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-15, 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) • 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)-17, 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)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-34, 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)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-15, 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:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-17, 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 using the 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)-34, 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°?	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) • 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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 (clogged or dirty oil passages, spring settings) • 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, then replace the oil filter and engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-15, 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)-17, 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)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-34, 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)-34, 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)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-15, Engine Oil Filter.>

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

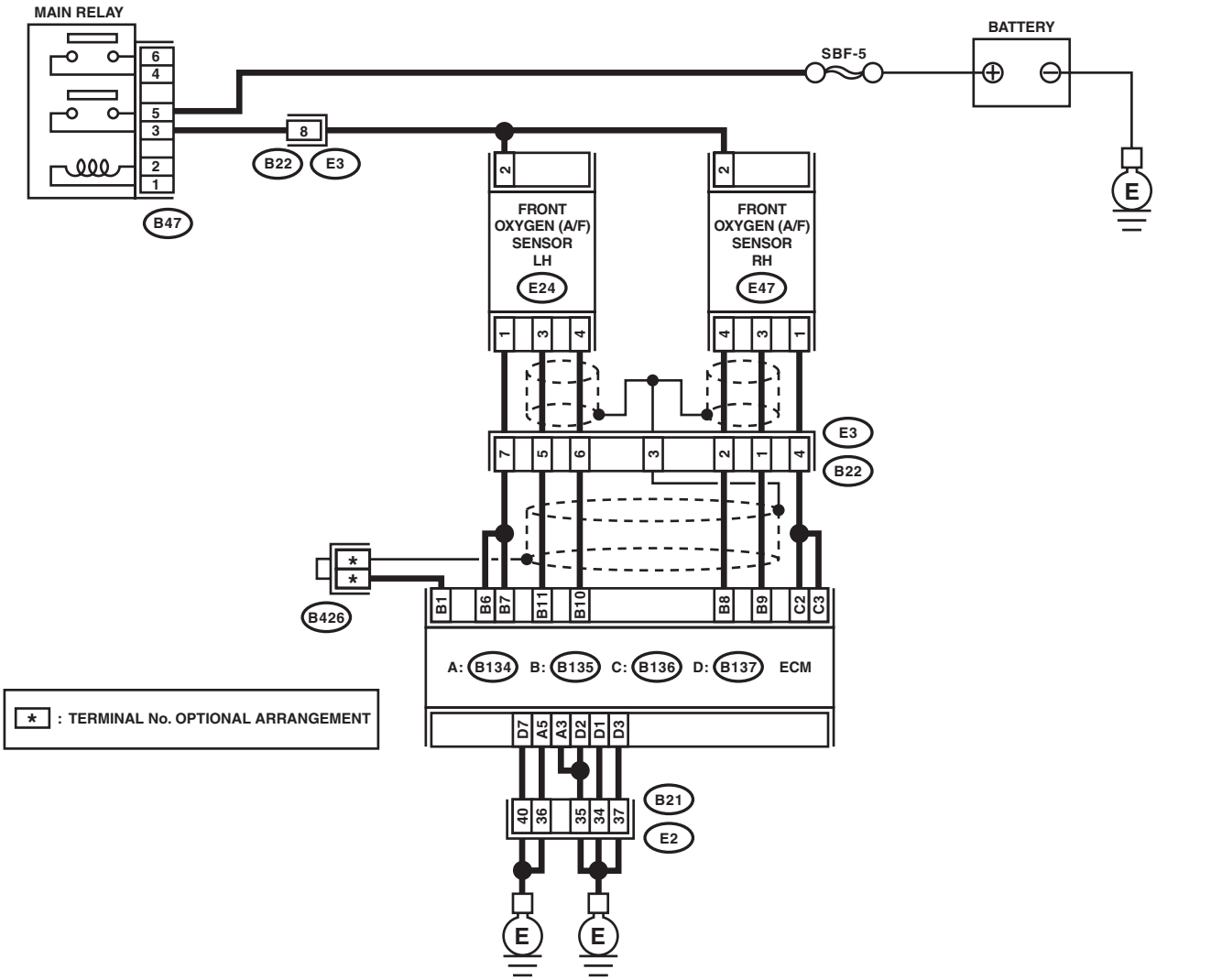
DTC DETECTING CONDITION:

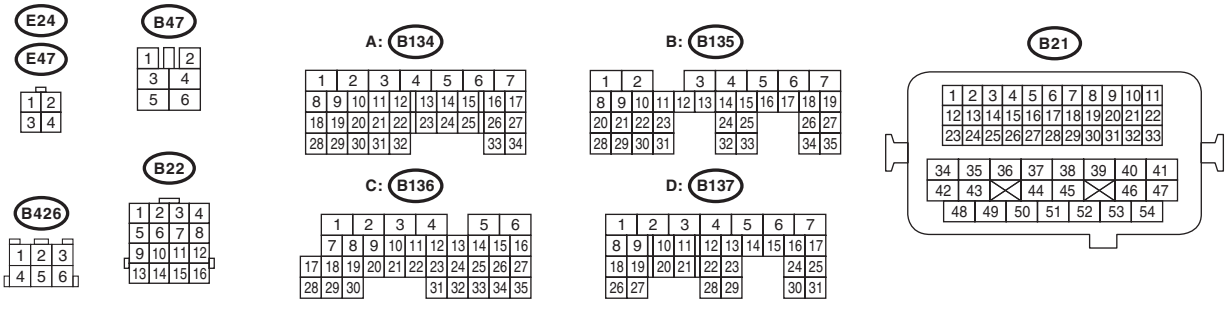
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-18, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06944

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start and warm up 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. 2 — (E47) No. 1:*** ***(B136) No. 3 — (E47) No. 1:***	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 HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 9 — (E47) No. 3:*** ***(B135) No. 8 — (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 FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance less than 5 Ω?	Go to step **4**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>
4	**CHECK POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

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

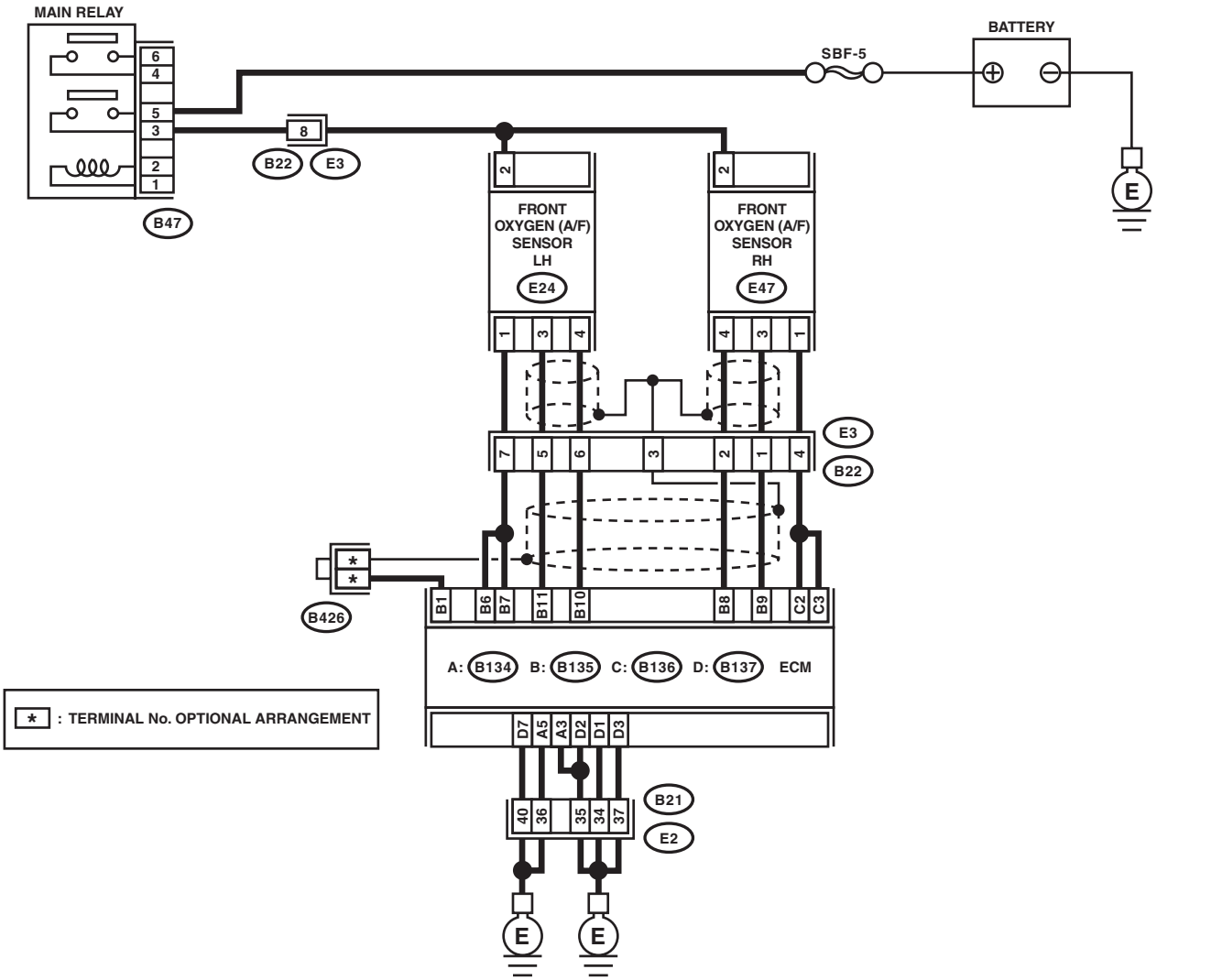
DTC DETECTING CONDITION:

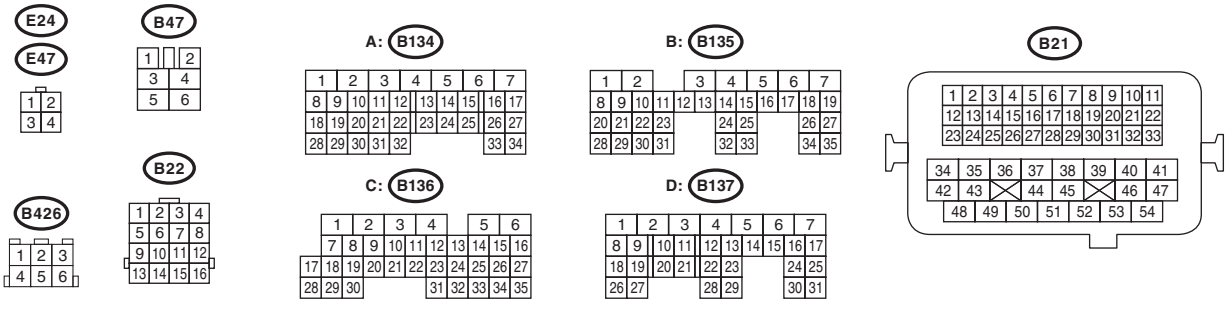
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-20, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06944

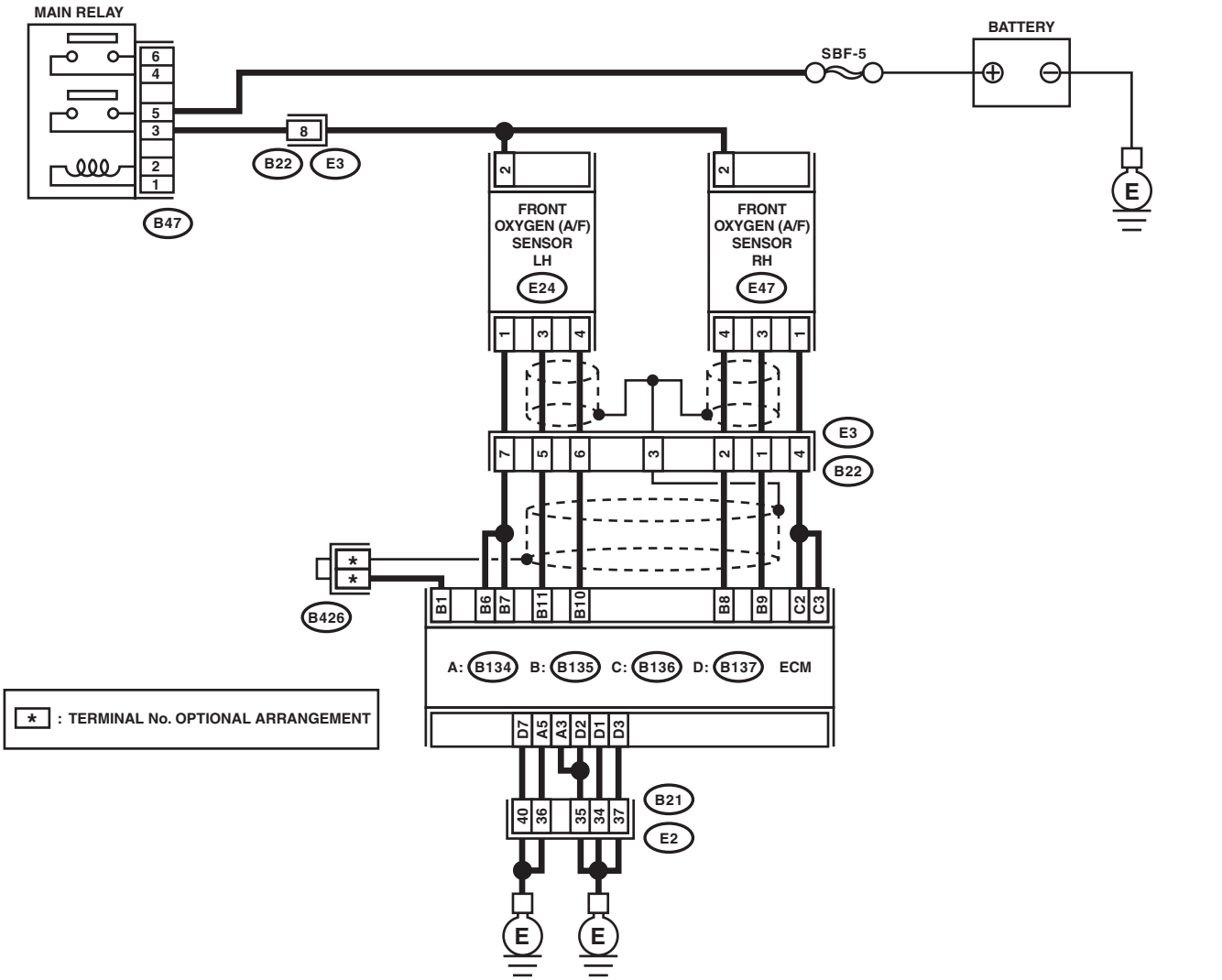
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & 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 • Malfunction of main relay
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 2 — (E47) No. 1:*** ***(B136) No. 3 — (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. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — 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 between 2 — 3 Ω?	Repair the poor contact of ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

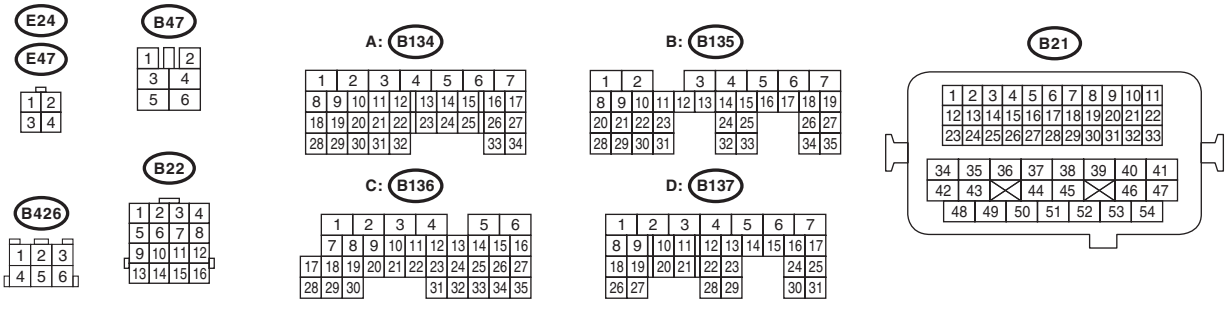
K: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-22, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06944

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 2 (+) — Chassis ground (–):*** ***(B136) No. 3 (+) — 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 connectors from the ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — 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)

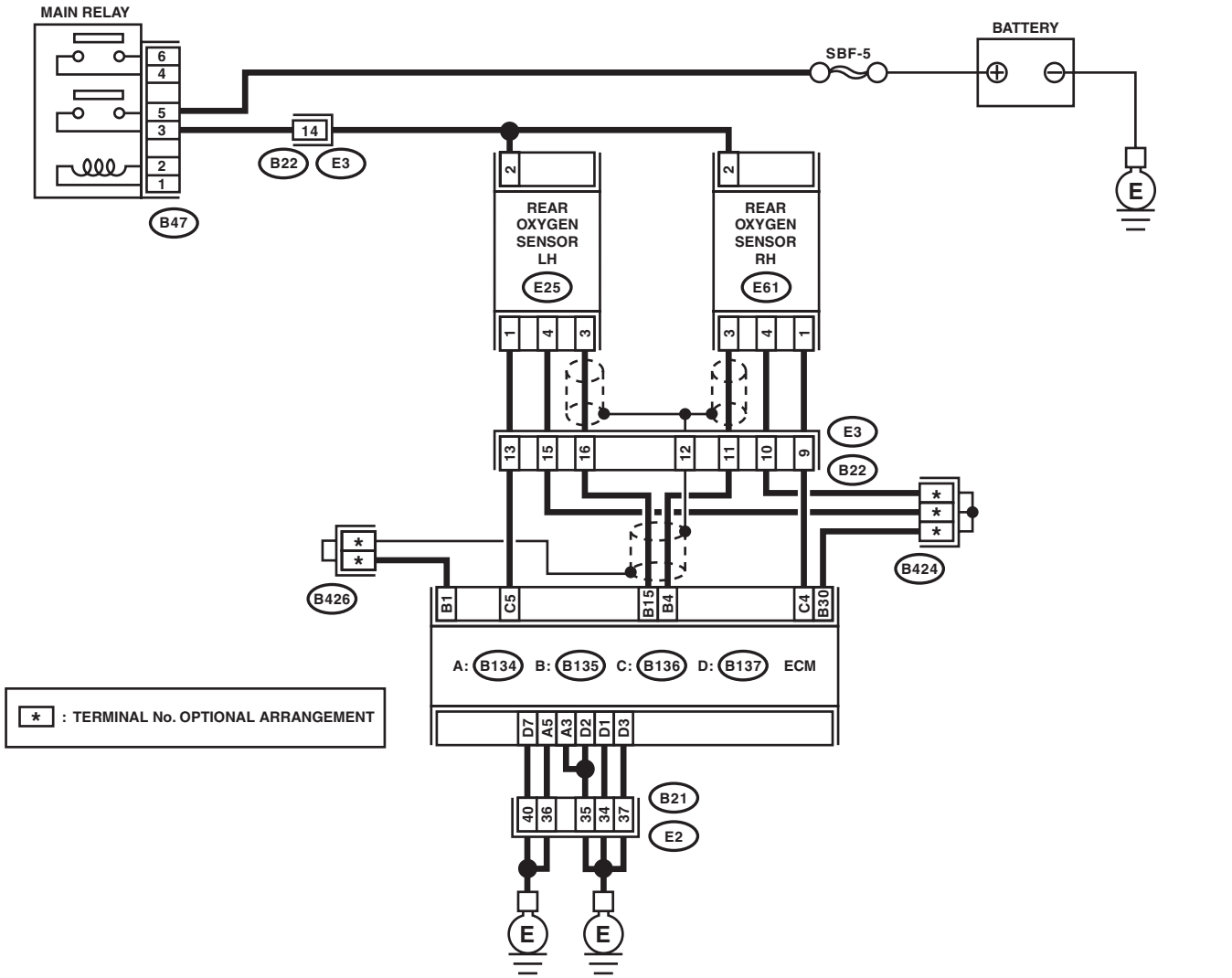
DTC DETECTING CONDITION:

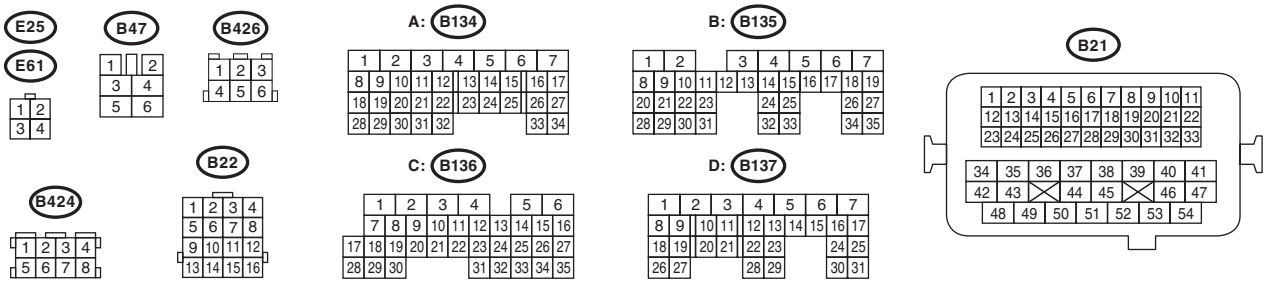
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-24, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06945

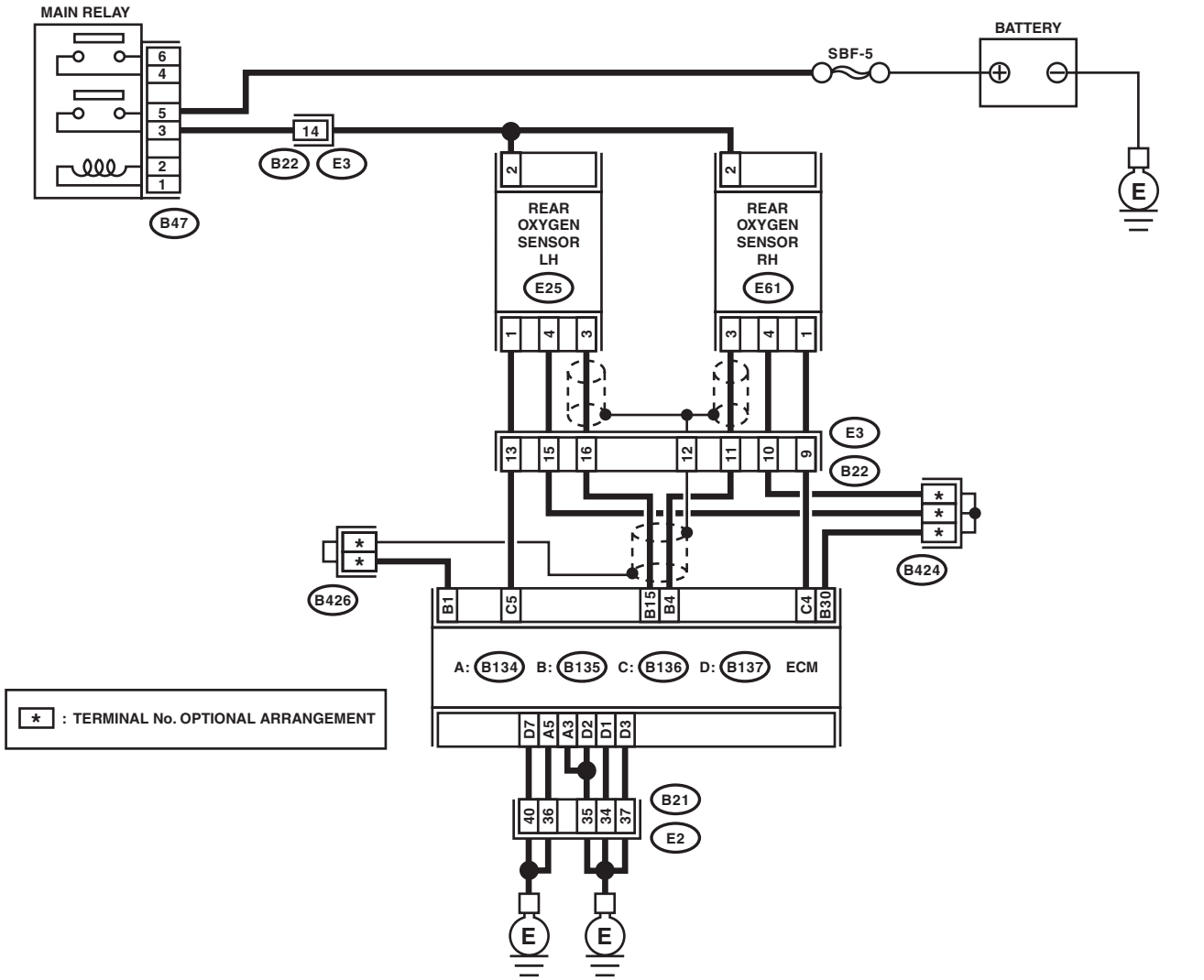
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground. ***Connector & terminal*** ***(E61) 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 • Malfunction of main relay
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B136) No. 4 — (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. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — 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 between 5 — 7 Ω?	Repair the poor contact of ECM connector.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-36, Rear Oxygen Sensor.>

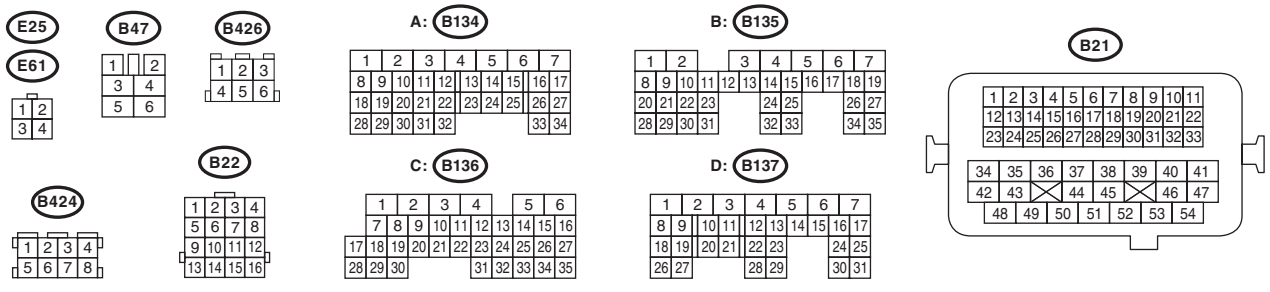
M: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-26, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06945

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — 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**.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect connectors from the ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — 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)

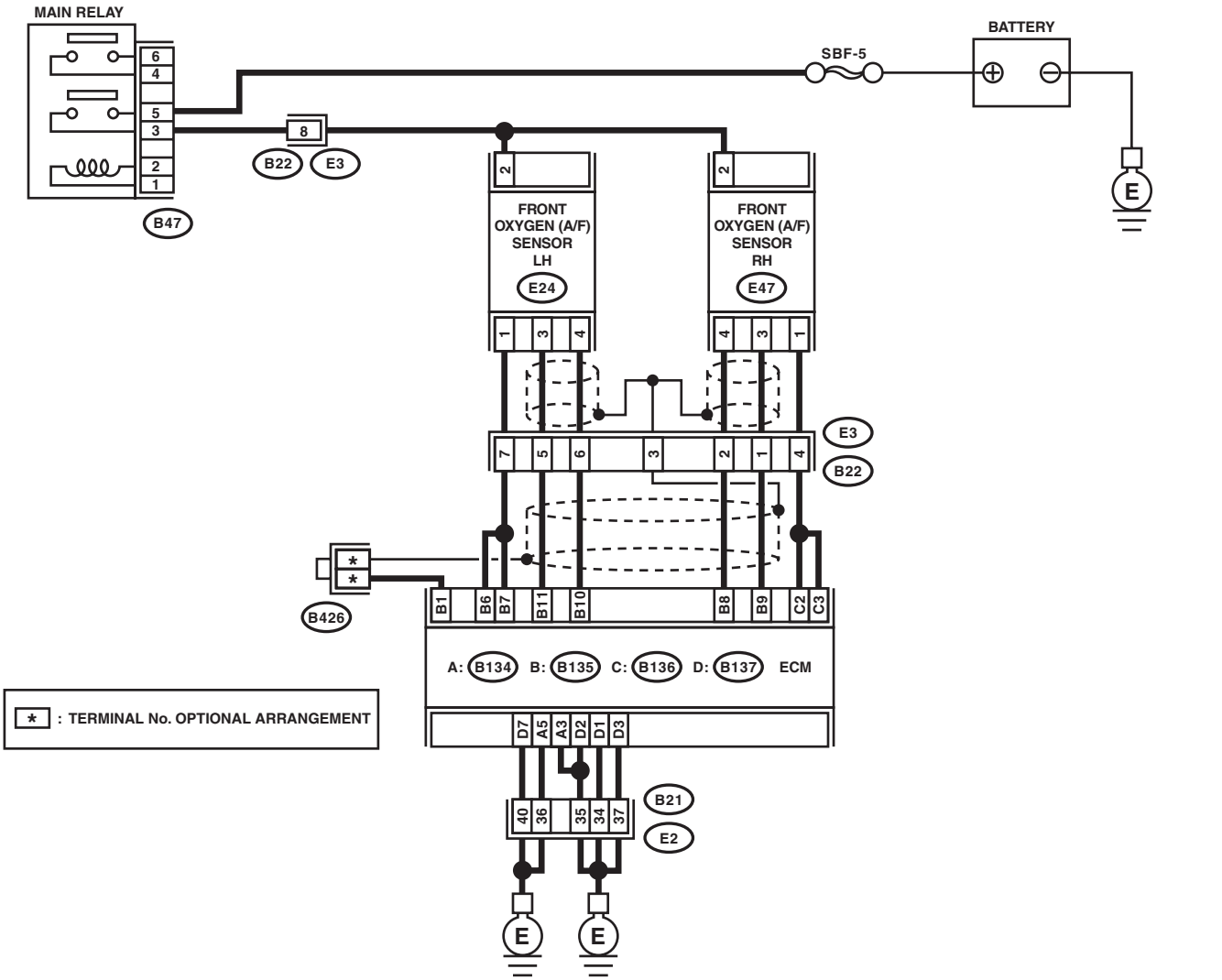
DTC DETECTING CONDITION:

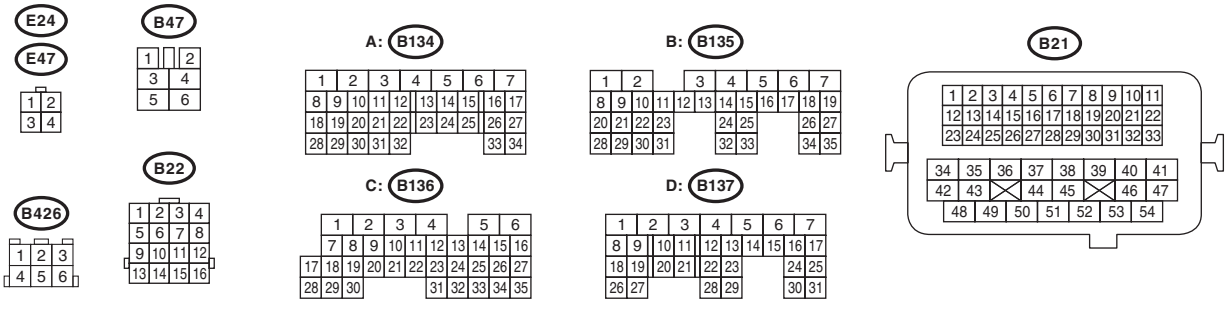
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-28, DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06944

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start and warm up 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. 6 — (E24) No. 1:*** ***(B135) No. 7 — (E24) No. 1:***	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 HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 11 — (E24) No. 3:*** ***(B135) No. 10 — (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 FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance less than 5 Ω?	Go to step **4**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>
4	**CHECK POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

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

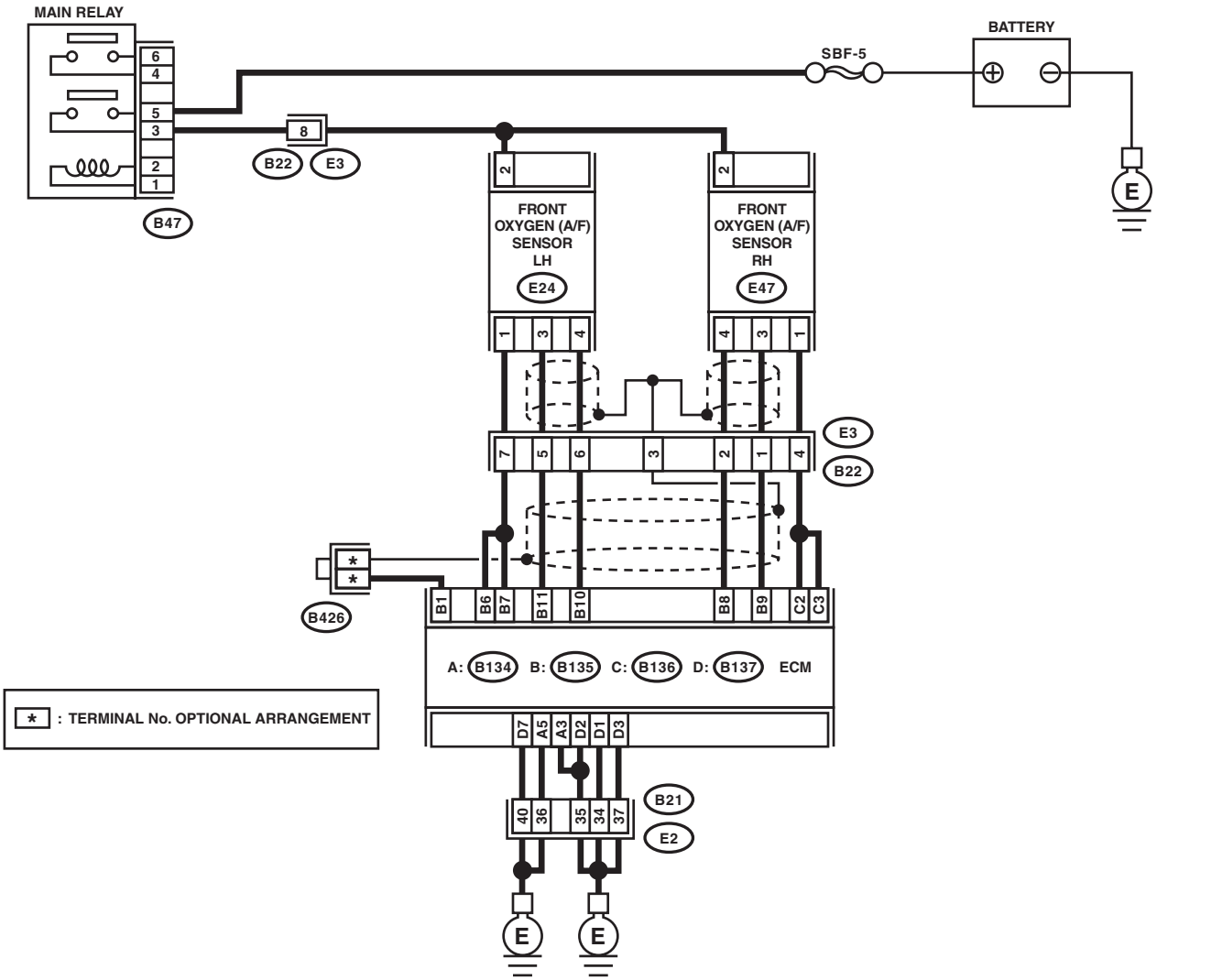
DTC DETECTING CONDITION:

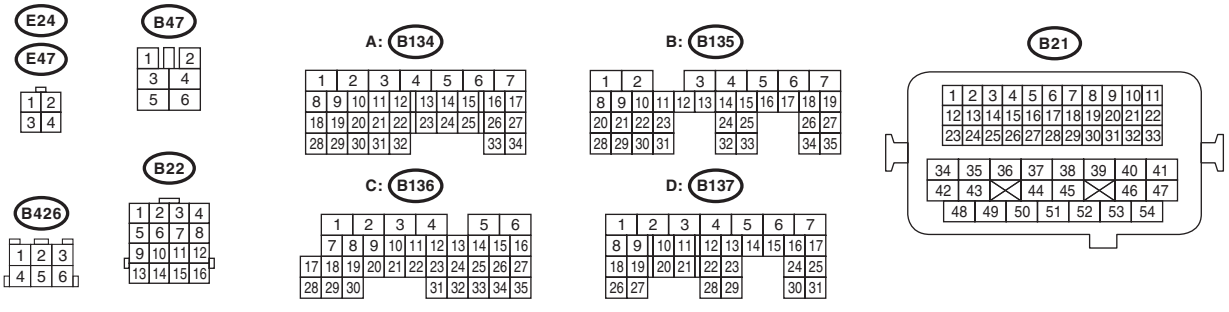
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-28, DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06944

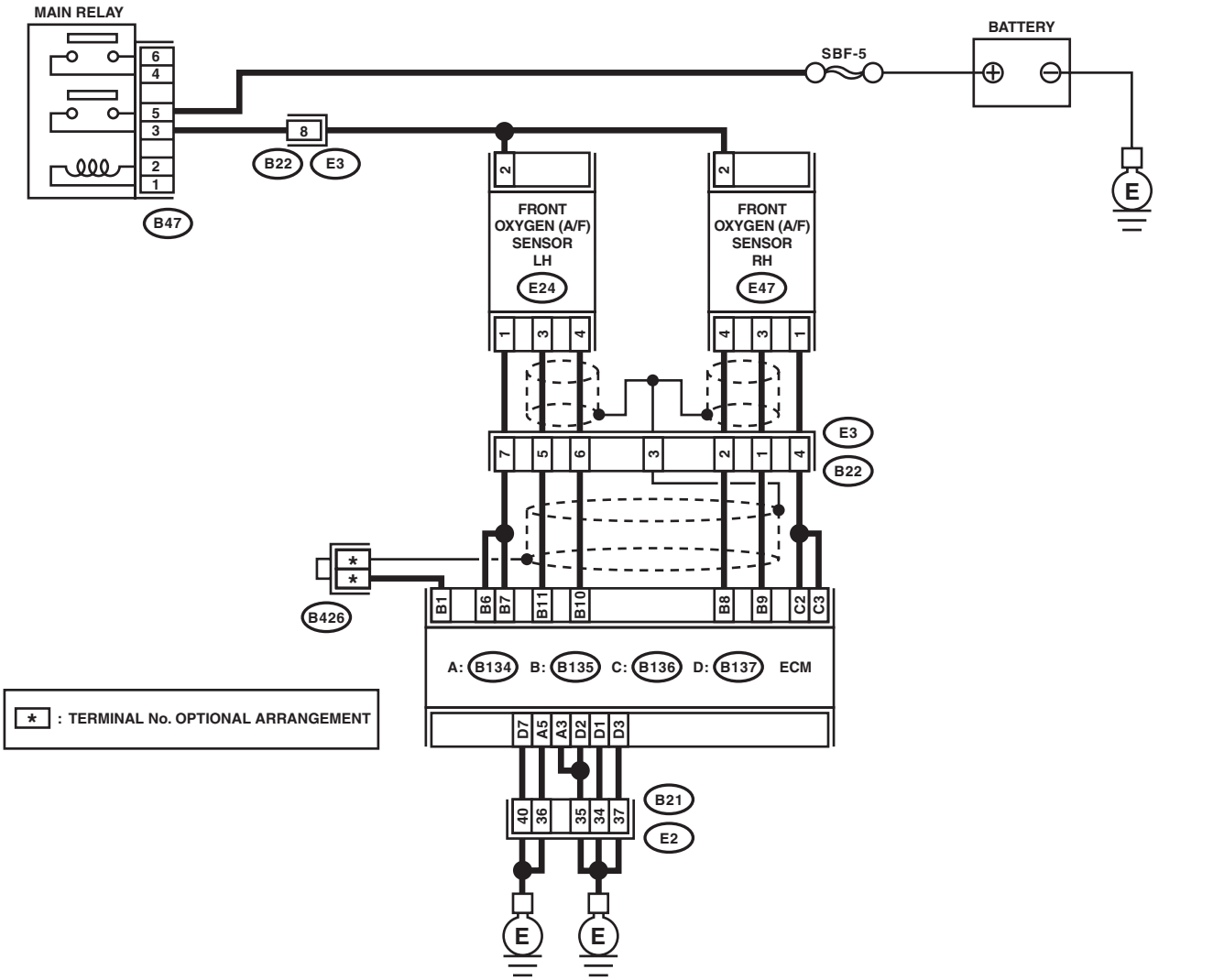
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & 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 • Malfunction of main relay
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 6 — (E24) No. 1:*** ***(B135) No. 7 — (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. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — 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 between 2 — 3 Ω?	Repair the poor contact of ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

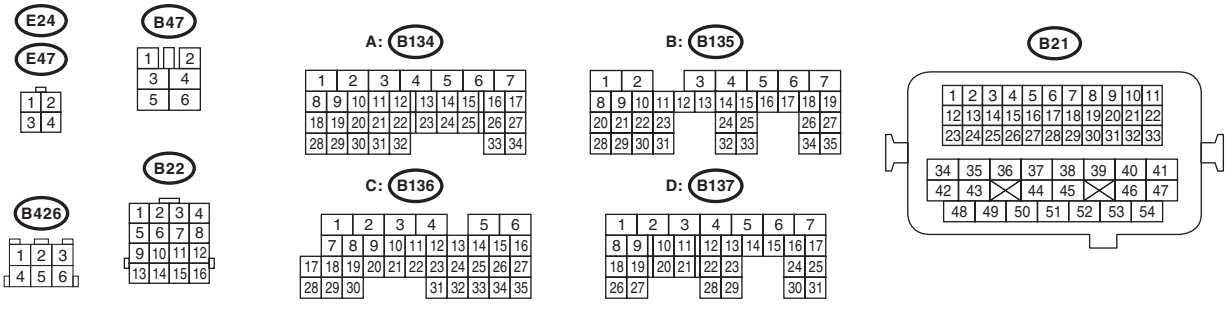
P: DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06944

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 6 (+) — Chassis ground (–):*** ***(B135) No. 7 (+) — 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 connectors from the ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — 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)

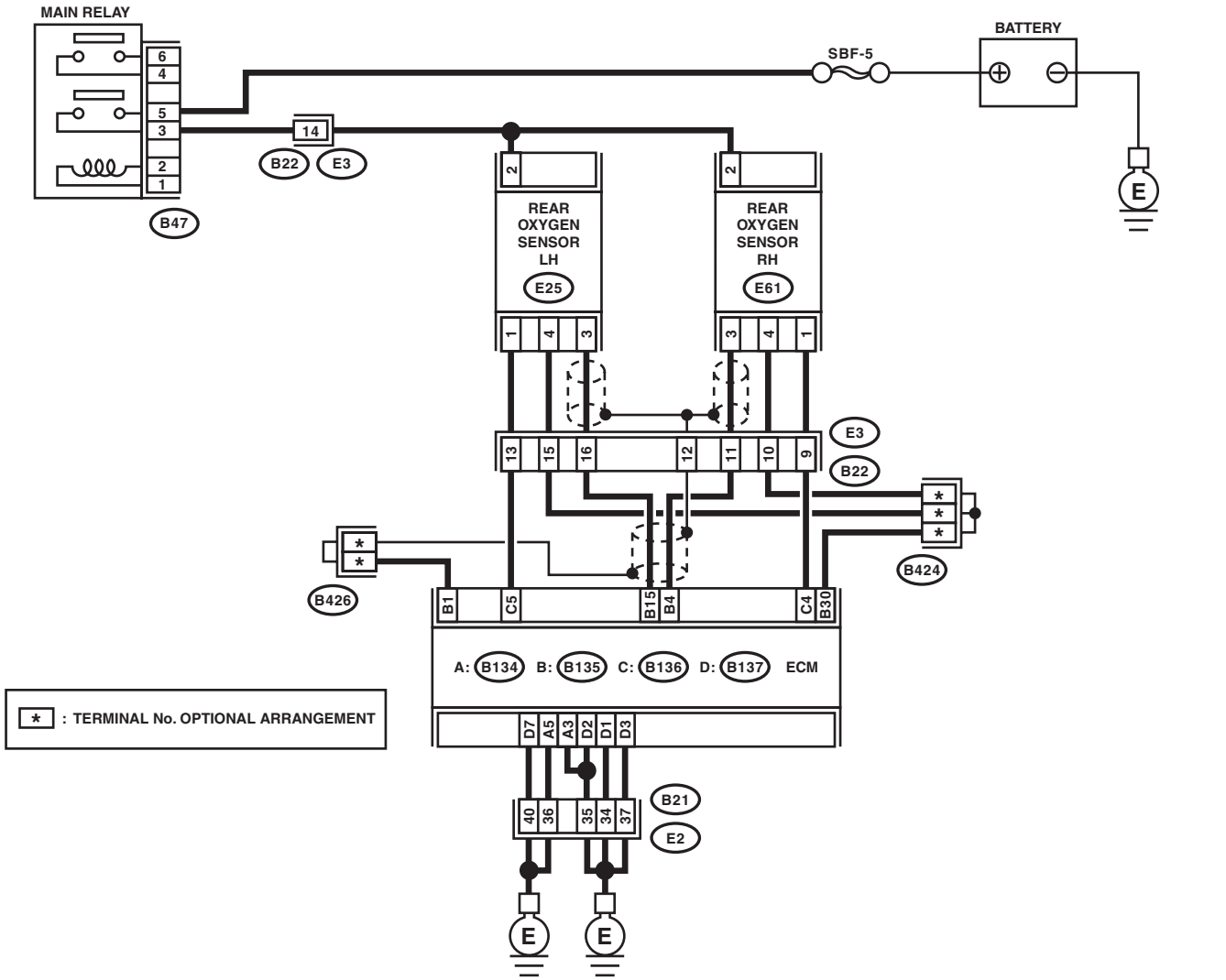
DTC DETECTING CONDITION:

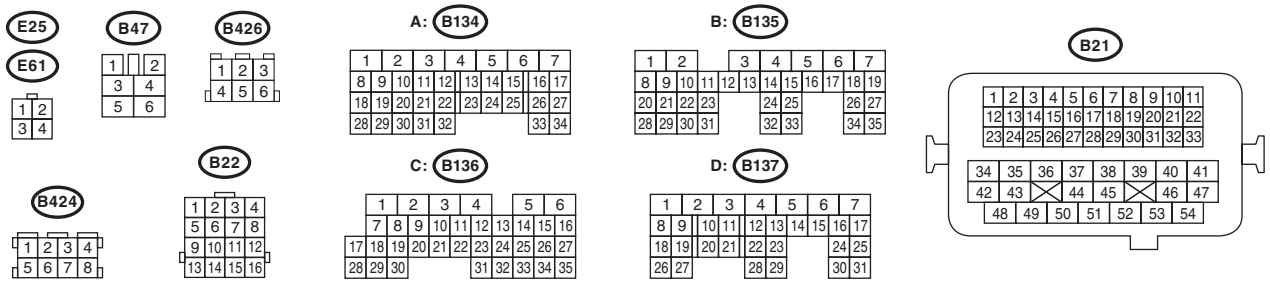
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-28, DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06945

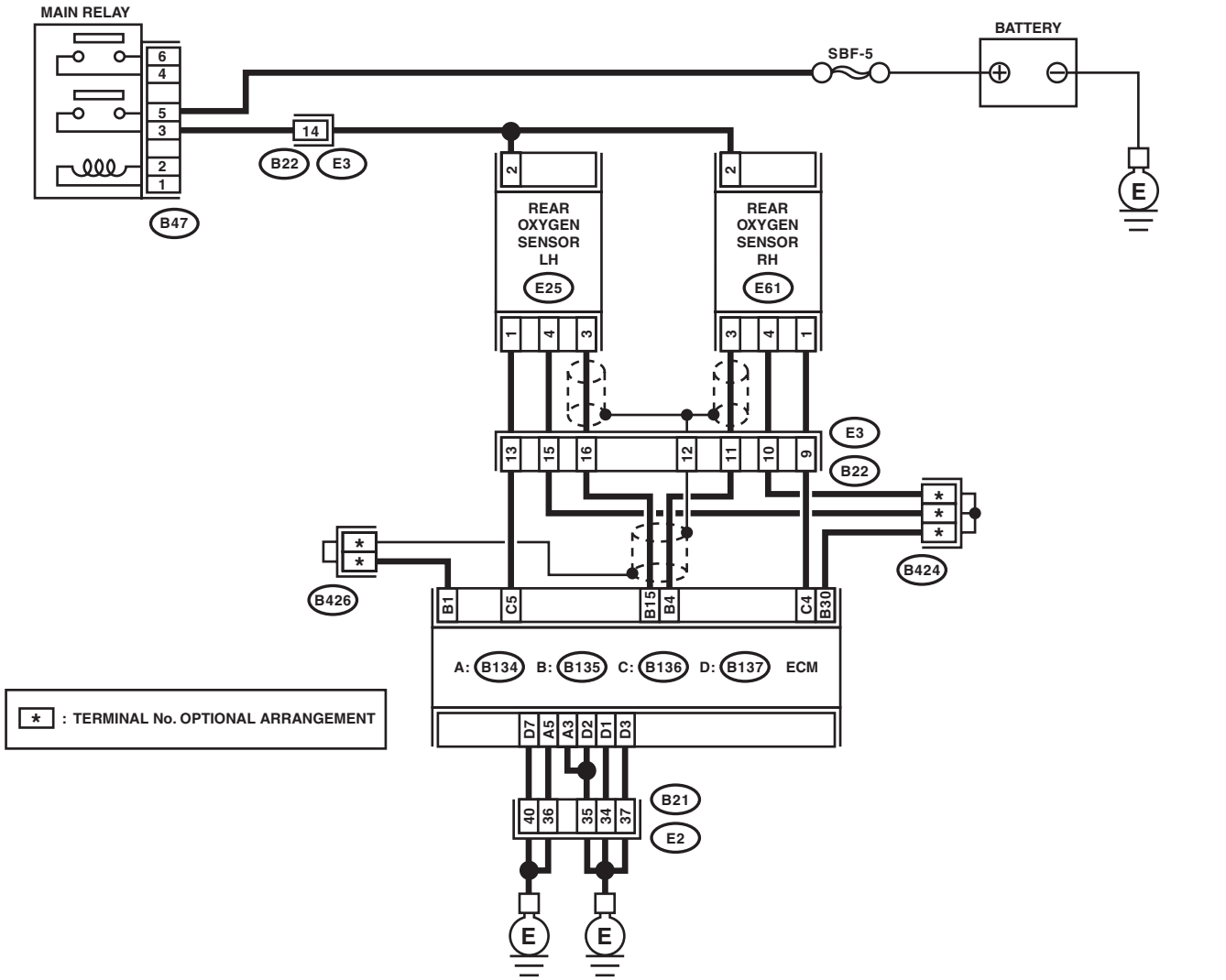
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground. ***Connector & terminal*** ***(E25) 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 • Malfunction of main relay
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between the ECM and oxygen sensor connector. ***Connector & terminal*** ***(B136) 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. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — 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 between 5 — 7 Ω?	Repair the poor contact of ECM connector.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-36, Rear Oxygen Sensor.>

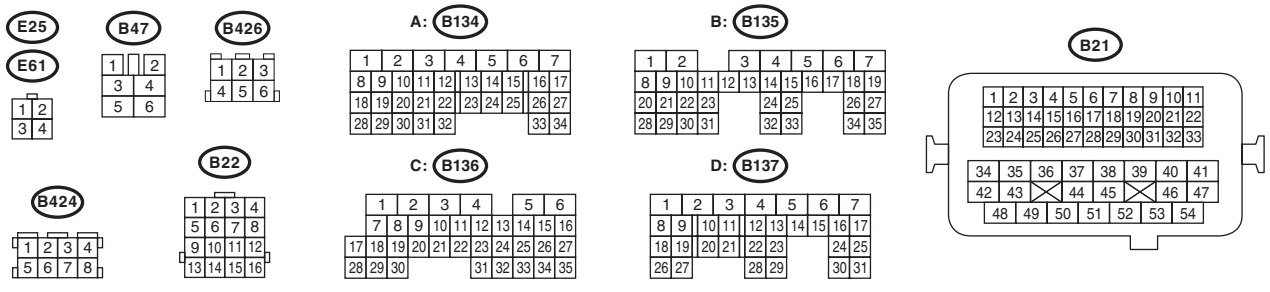
R: DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06945

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) 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**.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect connectors from the ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — 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

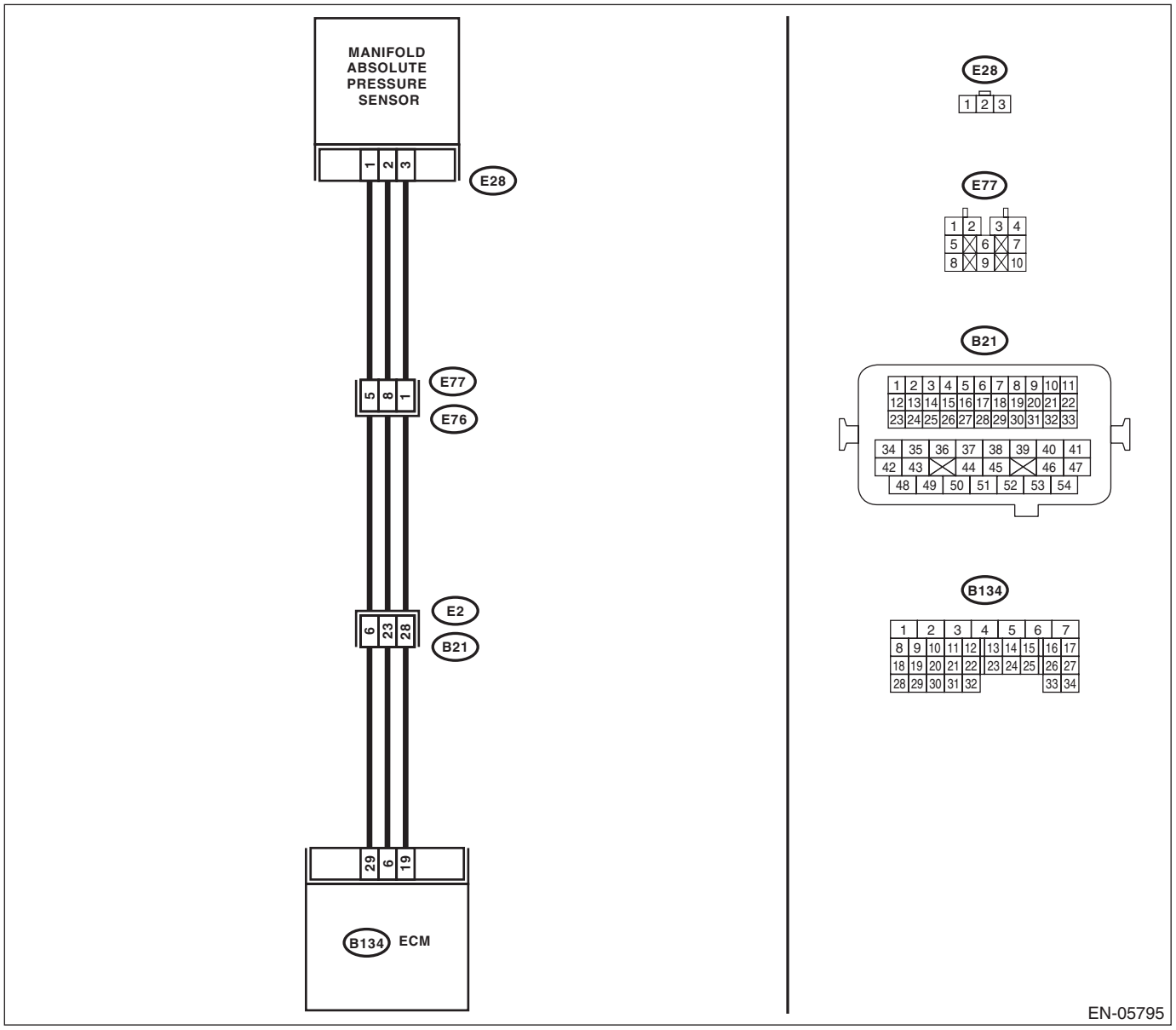
S: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

DTC DETECTING CONDITION:

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

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-27, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-15, 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)-27, Manifold Absolute Pressure Sensor.>	Replace the electronic throttle control. <Ref. to FU(H6DO)-15, Throttle Body.>

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

DTC DETECTING CONDITION:

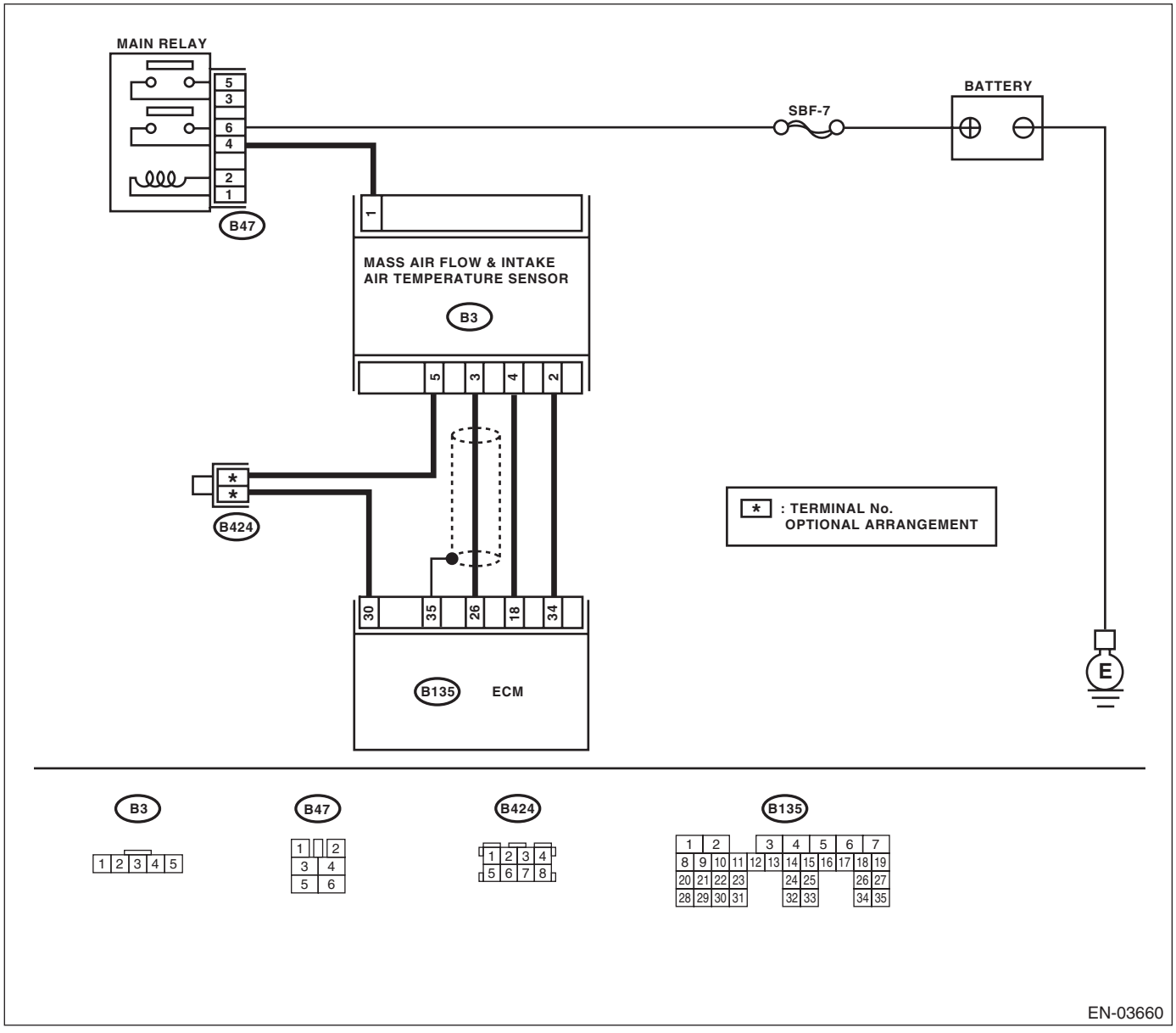
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-31, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-83, List of Diagnostic Trouble Code (DTC).>	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-28, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

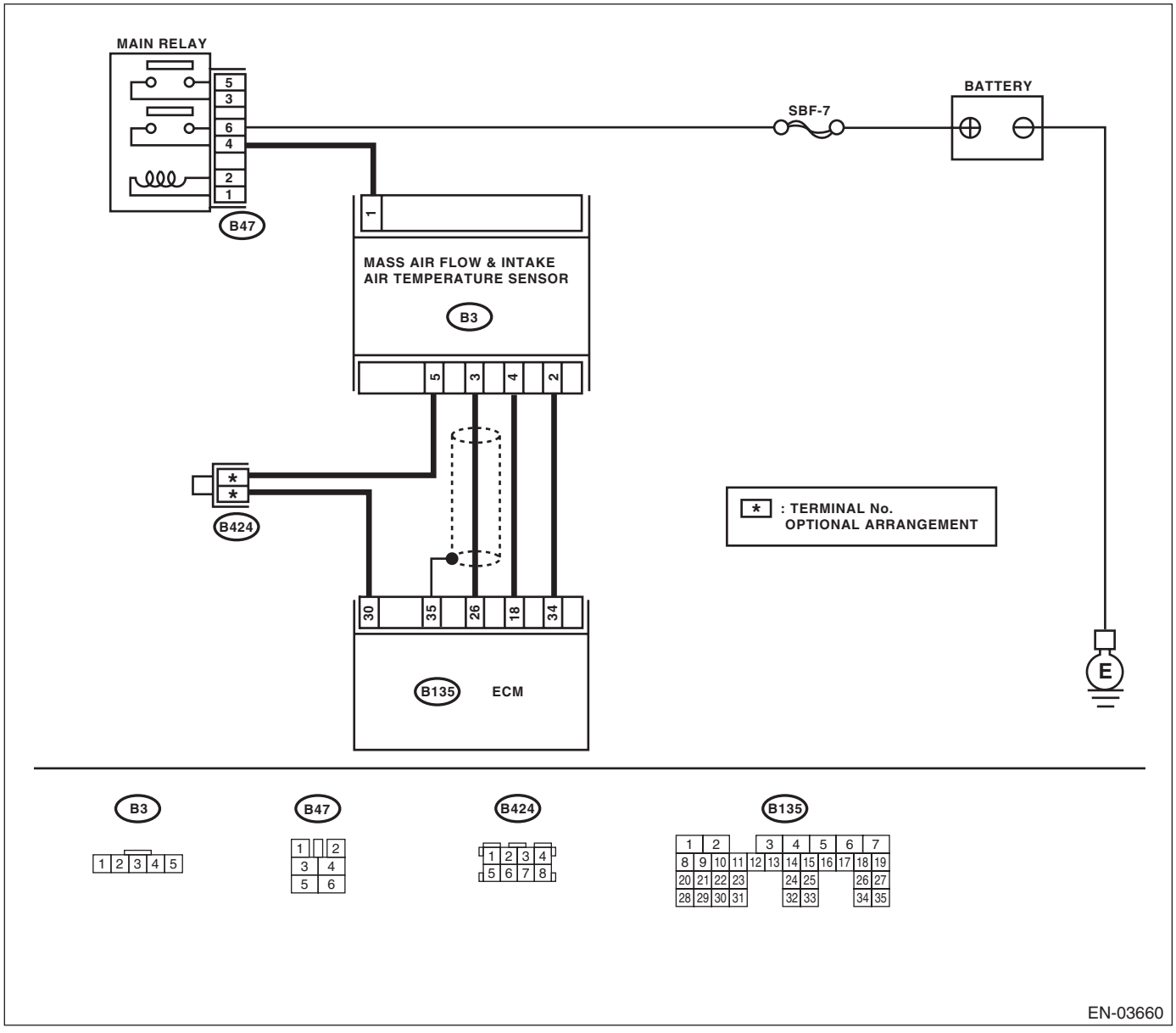
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-33, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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**.	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 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 connector 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 connectors from the ECM. 3) Measure the resistance of harness between ECM and mass air flow and intake air temperature sensor connectors. ***Connector & terminal*** ***(B135) No. 26 — (B3) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between ECM and 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*** ***(B135) No. 26 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between the ECM and the mass air flow and intake air temperature sensor connectors.
5	**CHECK POOR CONTACT.** Check for any poor contact in the ECM or the mass air flow or intake air temperature sensor connector.	Is there poor contact in the ECM or the mass air flow and intake air temperature sensor connector?	Repair the poor contact in the ECM or the mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-28, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

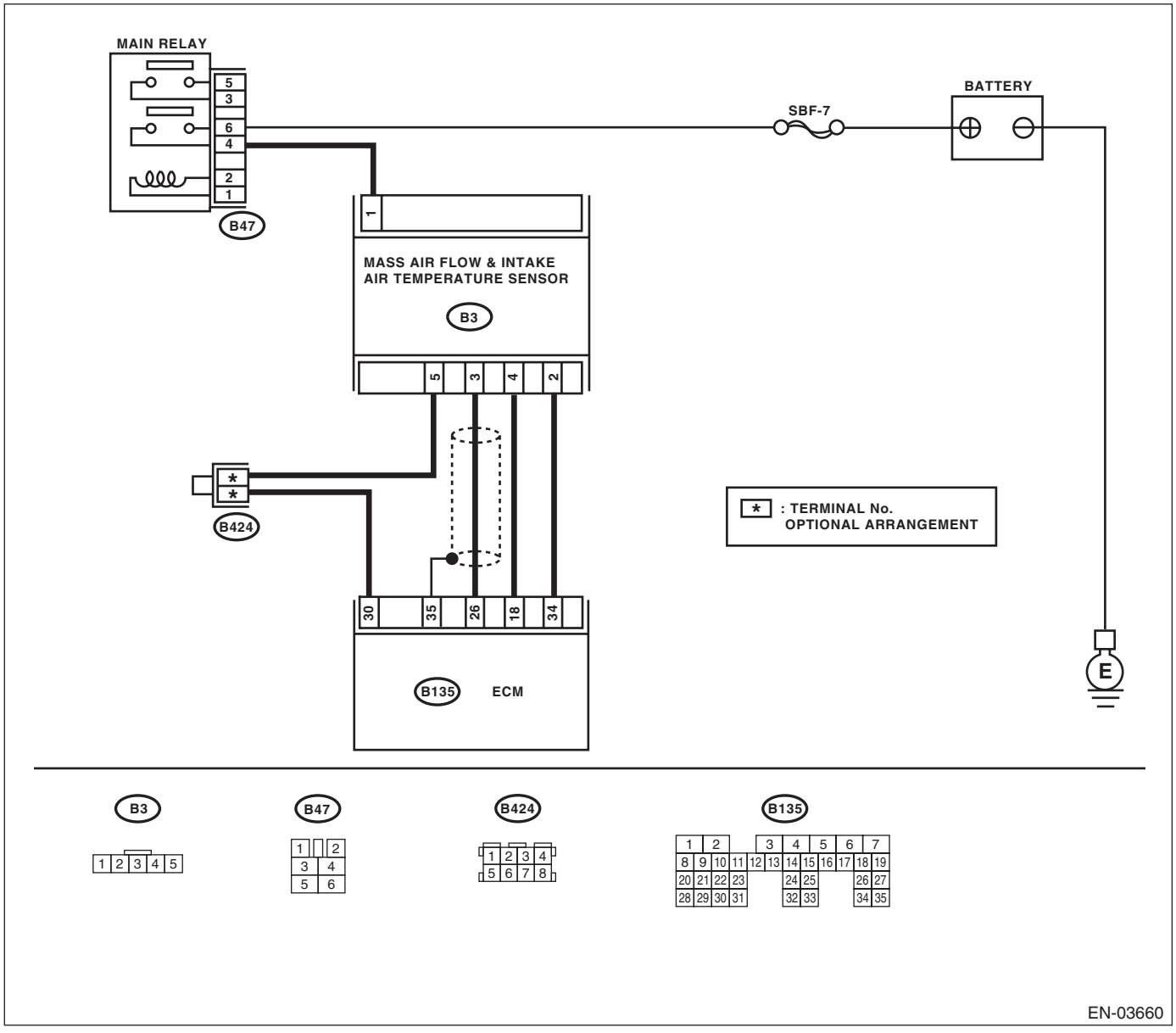
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-34, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



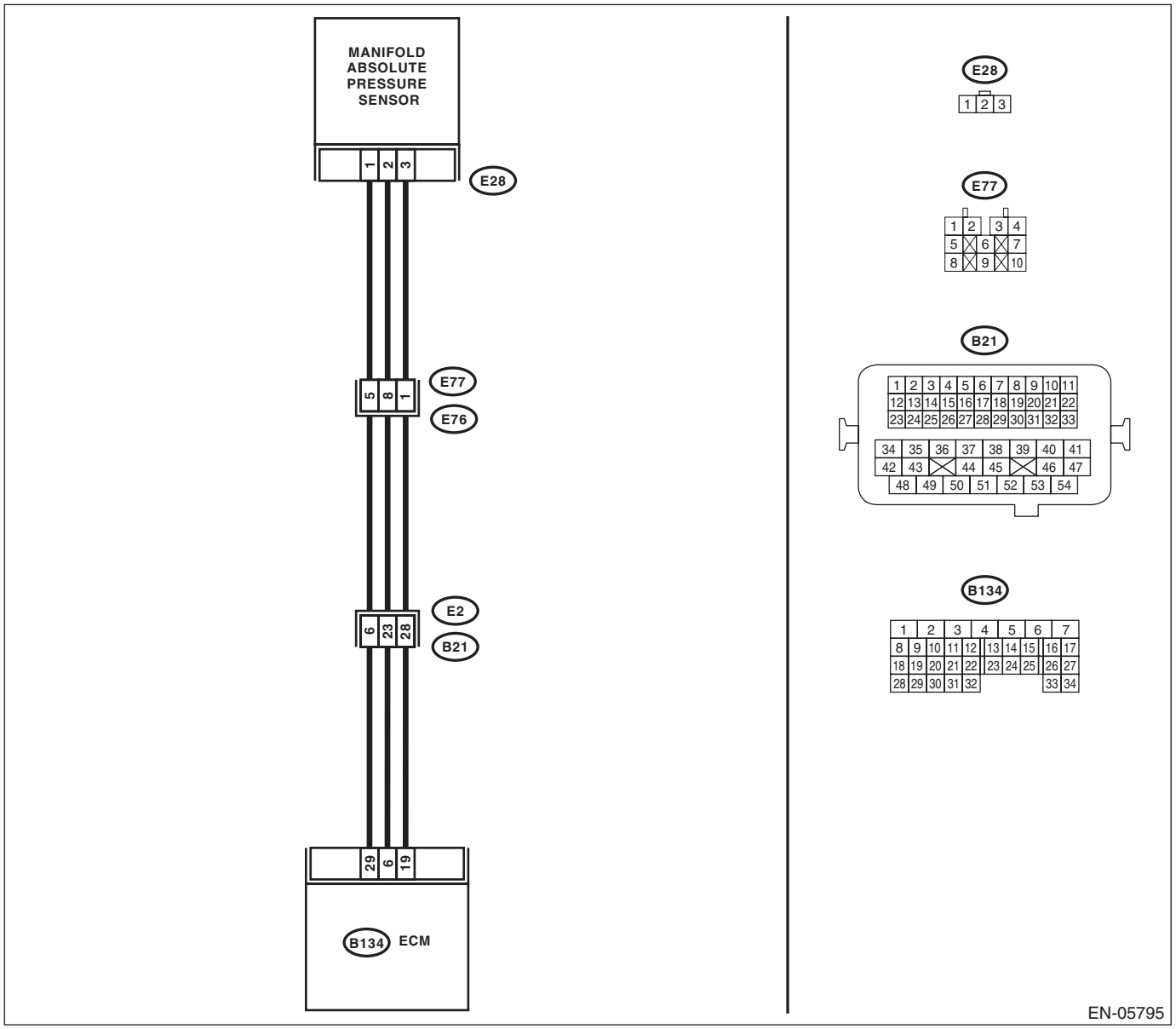
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of air flow sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select 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**.	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 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 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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 to power in the harness between the ECM and the 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: • pen circuit of harness between ECM and the mass air flow and intake air temperature sensor connector. • Poor contact in ECM connector
4	**CHECK POOR CONTACT.** Check for any poor contact in the mass air flow and intake air temperature sensor connector.	Is there poor contact in the mass air flow and intake air temperature sensor connector?	Repair any poor contact of the mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-28, 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



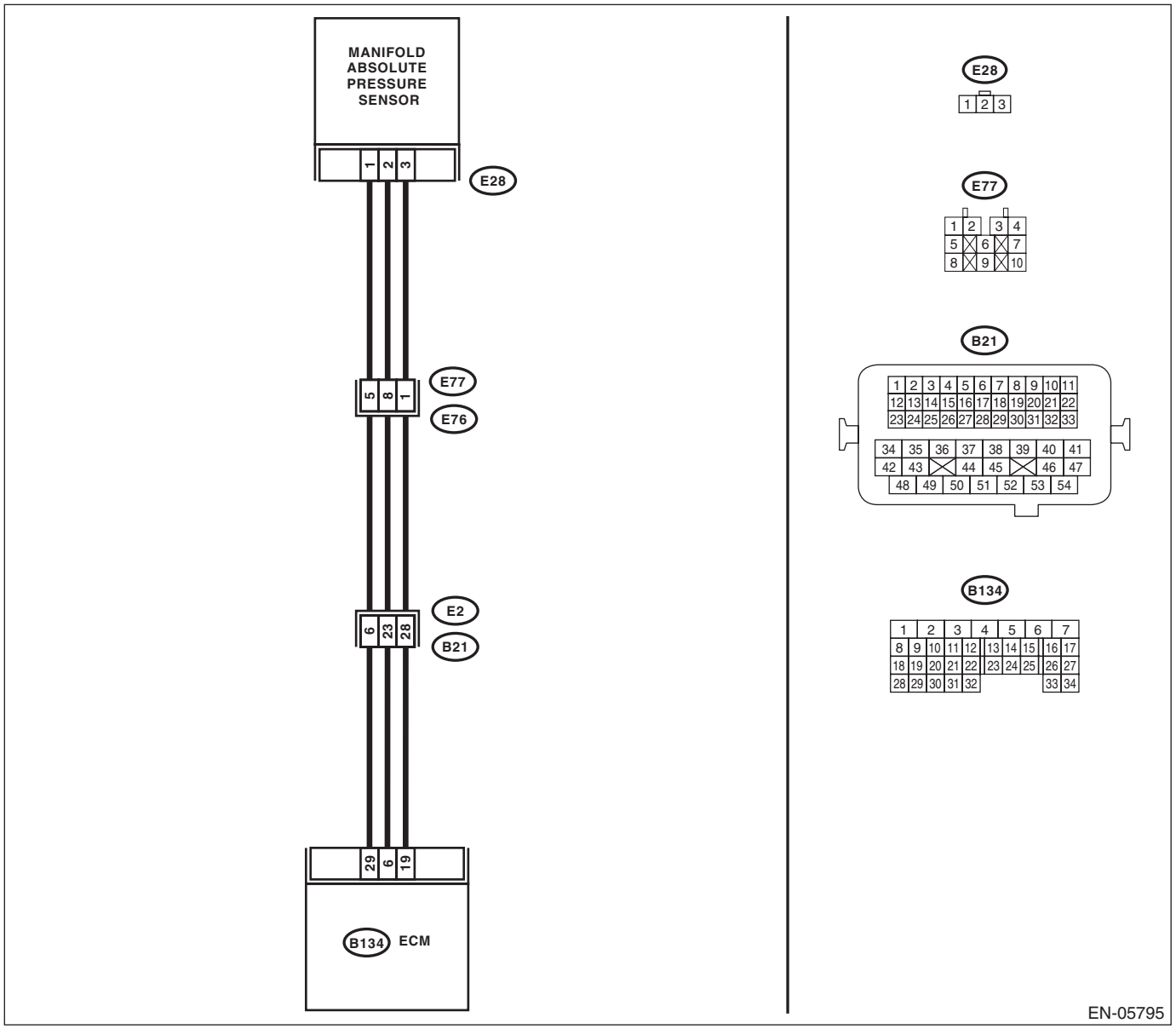
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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**.	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 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 in 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 connectors from the ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B134) No. 6 — (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*** ***(B134) No. 6 — 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 POOR CONTACT.** Check for poor contact in ECM and manifold absolute pressure sensor connector.	Is there poor contact in ECM or manifold absolute pressure sensor connector?	Repair the poor contact in ECM or manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H6DO)-27, 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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**.	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 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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 in ECM connector • Poor contact of coupling connector
4	**CHECK POOR CONTACT.** Check for poor contact in manifold absolute pressure sensor connector.	Is there poor contact in 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)-27, Manifold Absolute Pressure Sensor.>

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

DTC DETECTING CONDITION:

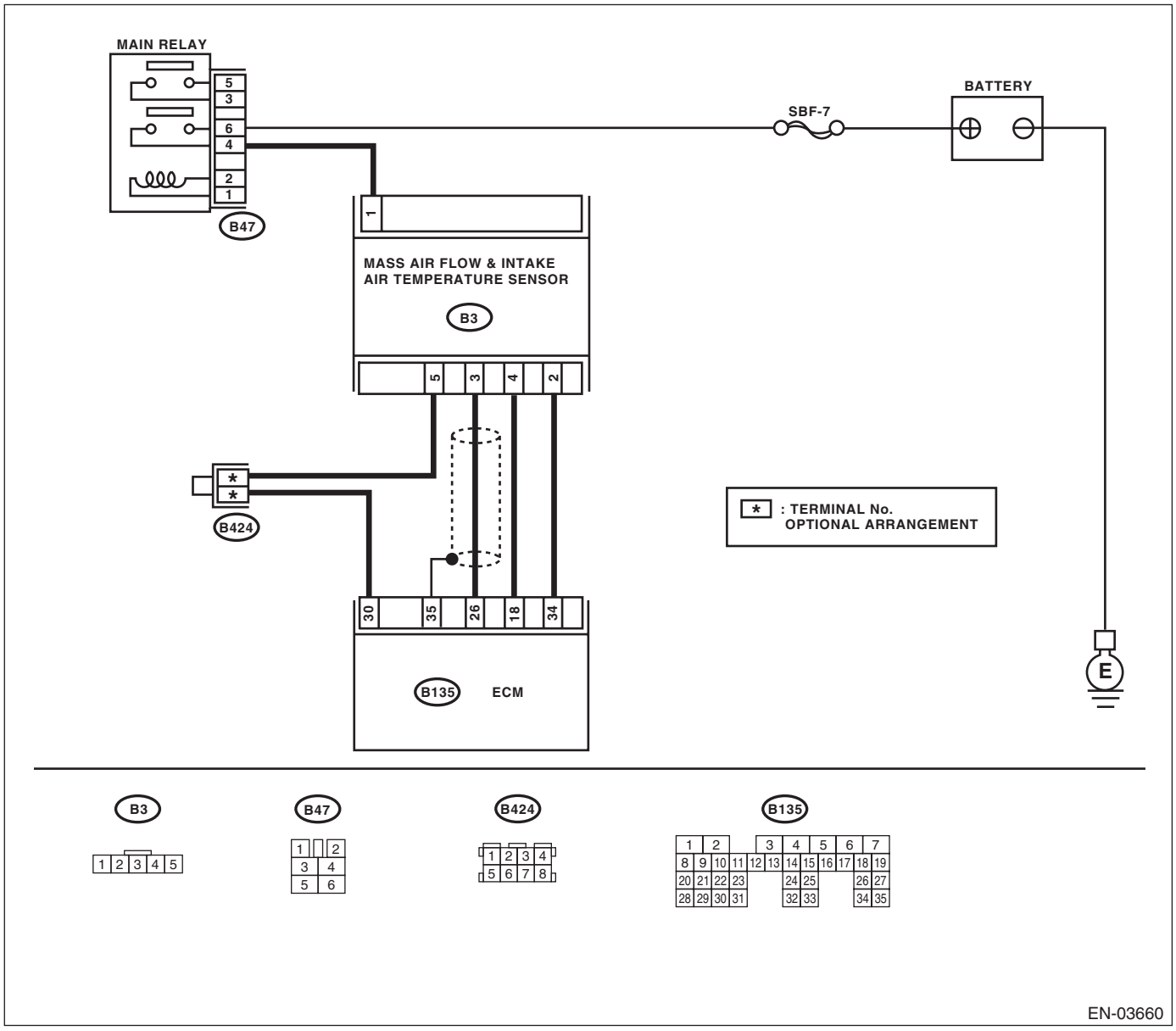
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-37, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-28, Mass Air Flow and Intake Air Temperature Sensor.>	Check DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-83, List of 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.>

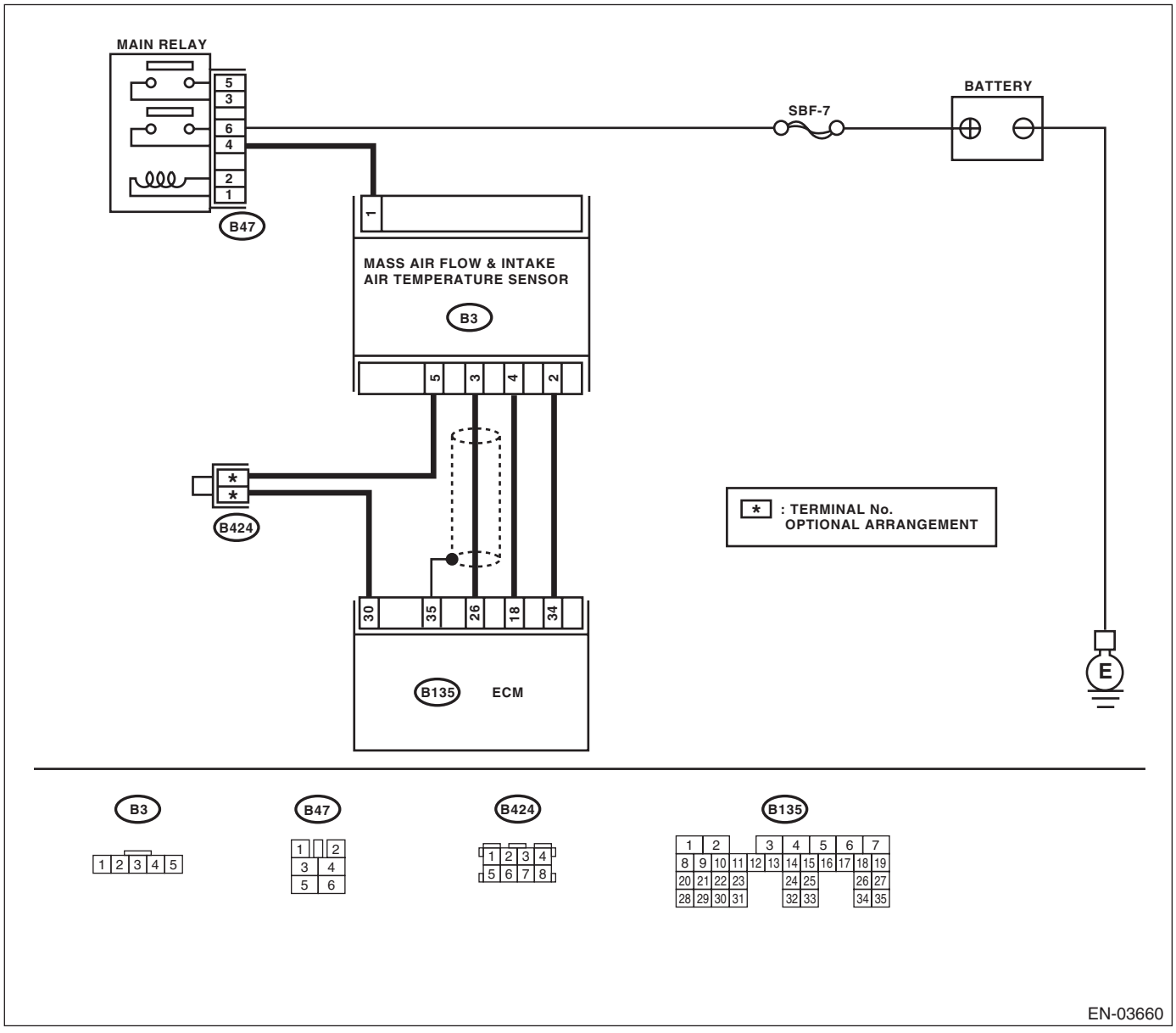
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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 higher?	Go to step **2**.	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 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 mass air flow and intake air temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 18 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-28, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit of harness between the ECM and the mass air flow and intake air temperature sensor.

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.>

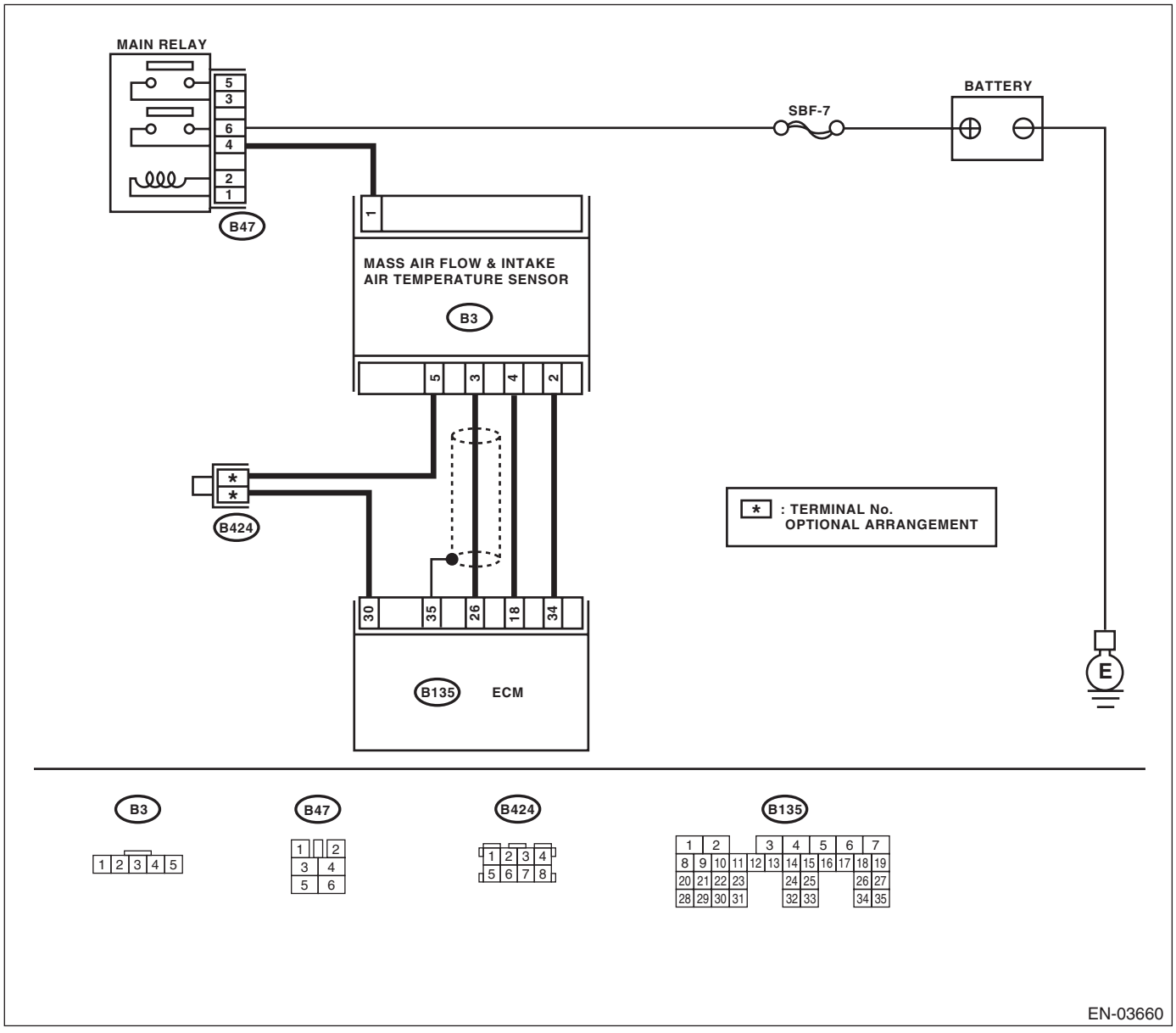
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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**.	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 may be the cause.
2	**CHECK POOR CONTACT.** Check for poor contact in the ECM or the mass air flow and intake air temperature sensor connector.	Is there poor contact in the ECM or the mass air flow and intake air temperature sensor connector?	Repair the poor contact in the ECM or the 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 mass air flow and intake air temperature sensor. 3) Measure the resistance of harness between ECM and mass air flow and intake air temperature sensor connectors. ***Connector & terminal*** ***(B135) No. 18 — (B3) No. 4:*** ***(B135) No. 30 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between ECM and mass air flow and intake air temperature sensor 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) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 18 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and the mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-28, Mass Air Flow and Intake Air Temperature Sensor.>

AB:DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

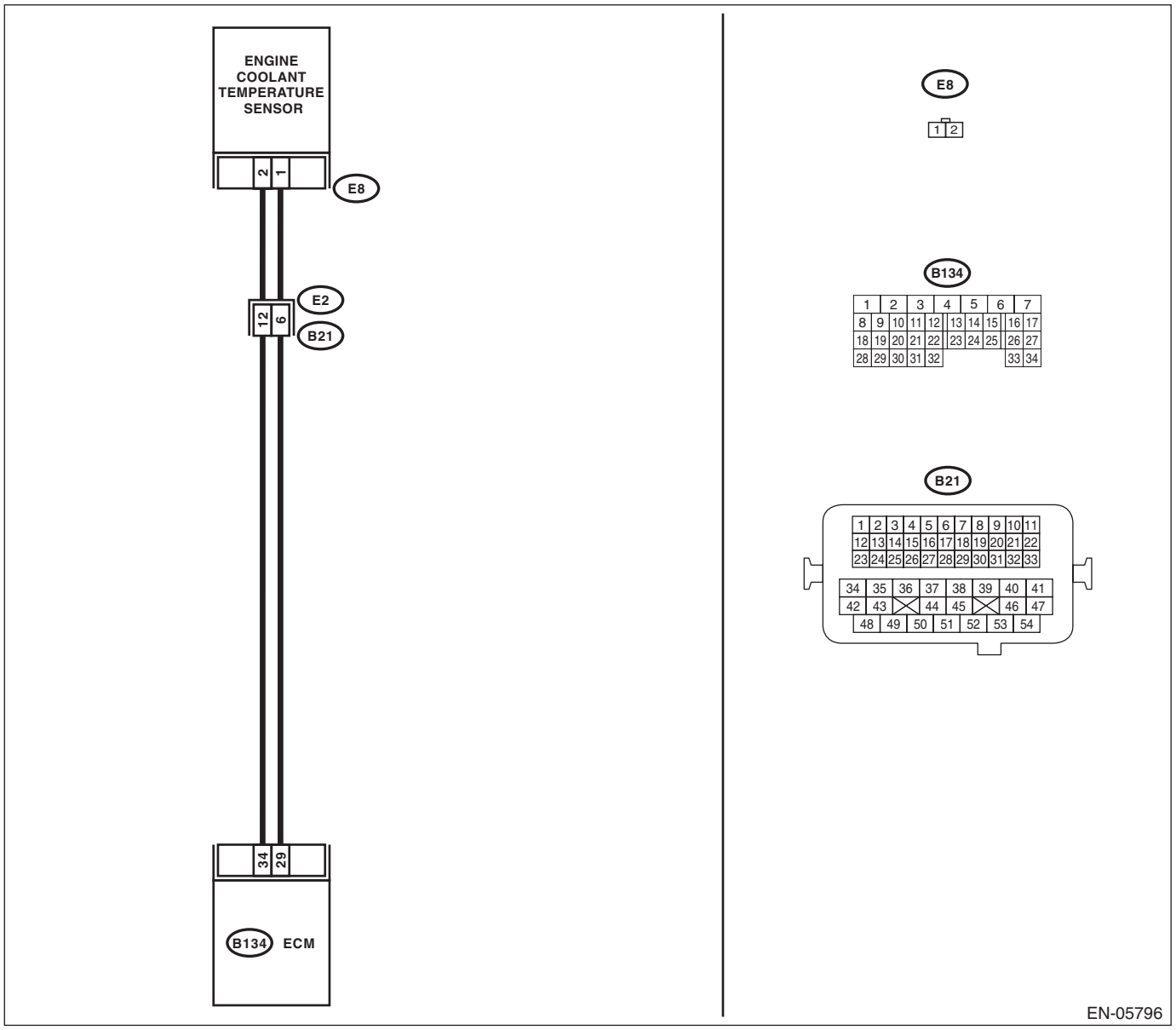
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-41, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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**.	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 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*** ***(B134) No. 34 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-22, Engine Coolant Temperature Sensor.>	Repair the short circuit to ground in harness between ECM and engine coolant temperature sensor.

AC:DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

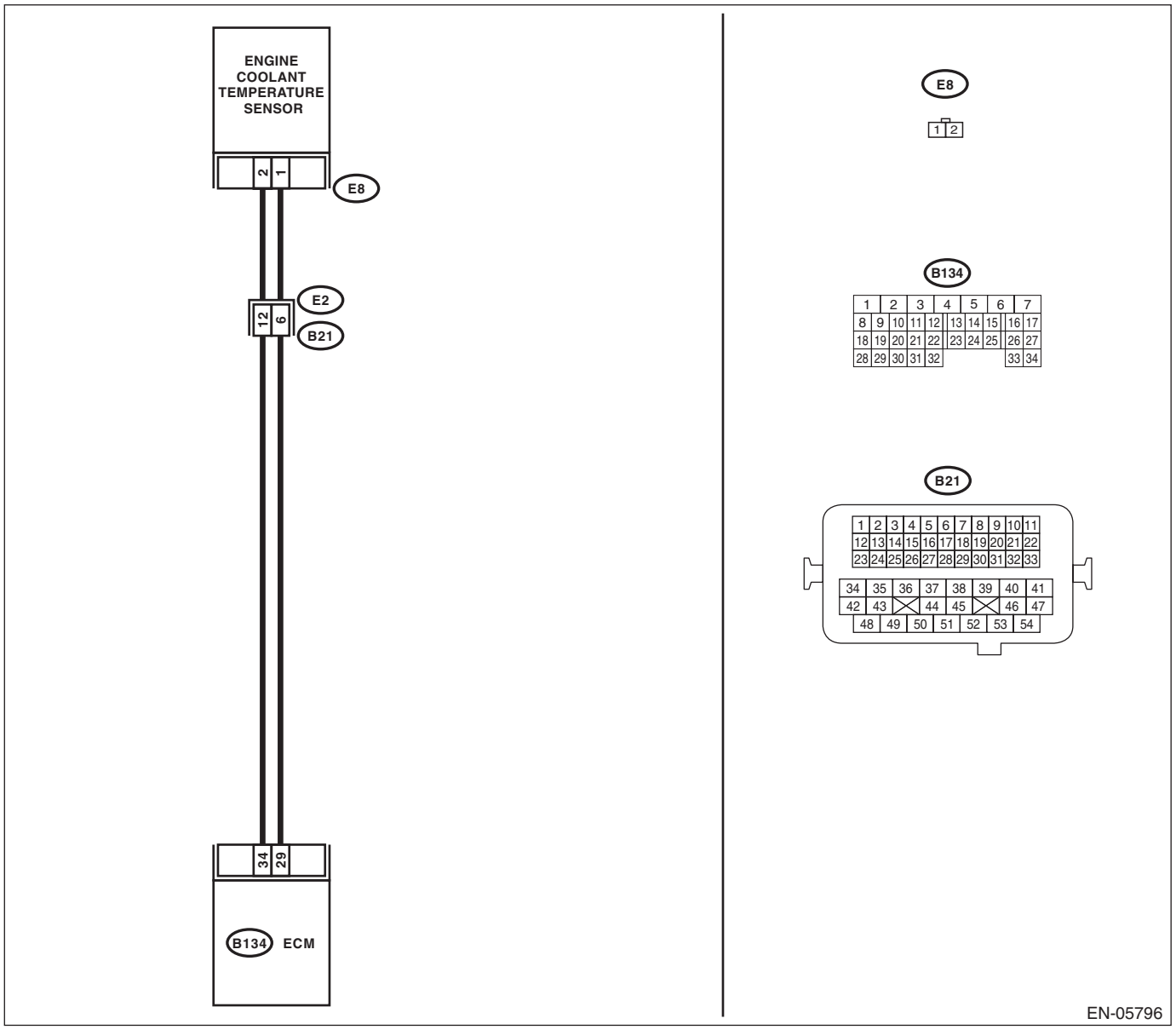
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-42, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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**.	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 may be the cause.
2	**CHECK POOR CONTACT.** Check for poor contact in ECM and engine coolant temperature sensor connector.	Is there poor contact in ECM or engine coolant temperature sensor connector?	Repair the poor contact in 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. 34 — (E8) No. 2:*** ***(B134) No. 29 — (E8) 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 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*** ***(B134) No. 34 (+) — 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)-22, 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.>

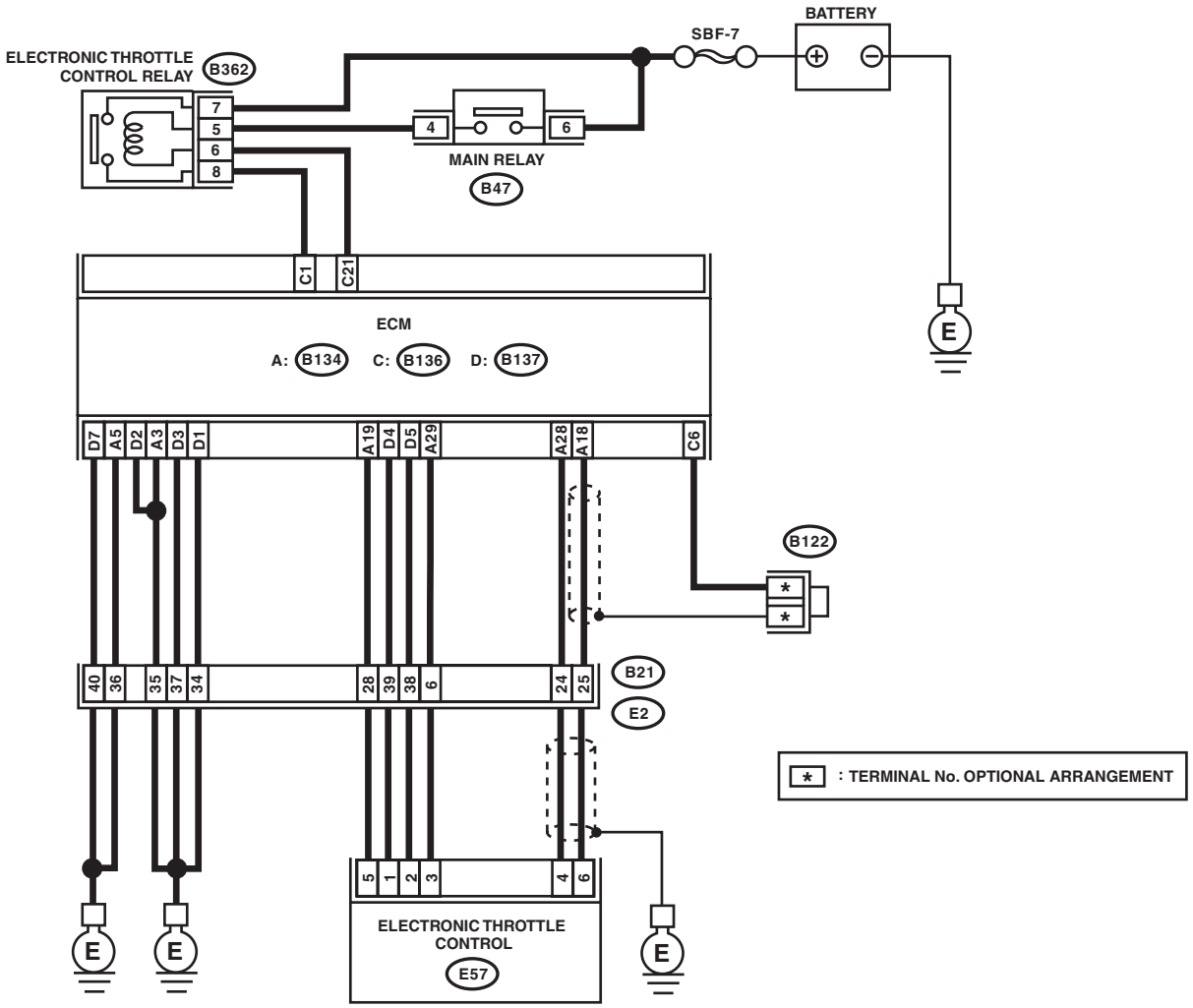
TROUBLE SYMPTOM:

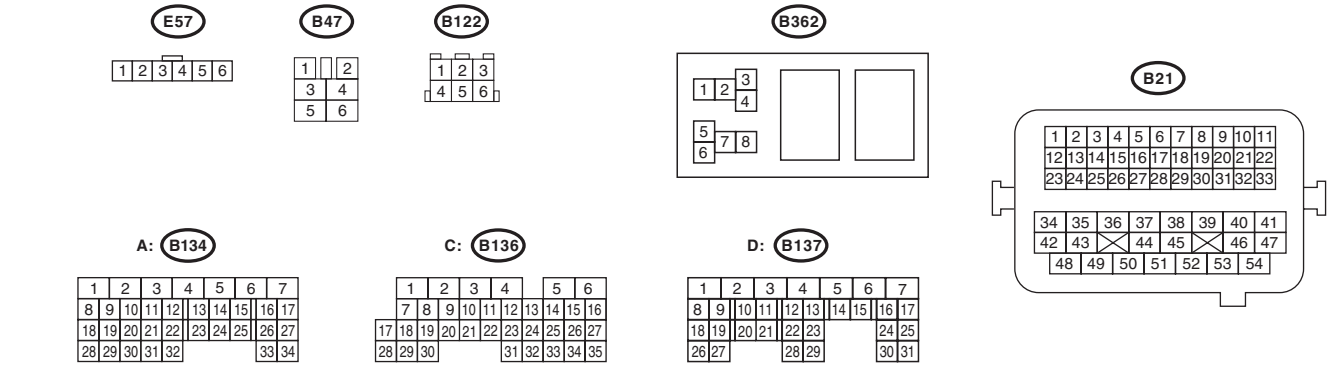
- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06946

	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. 6:***	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 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)-15, 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)-38, 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.>

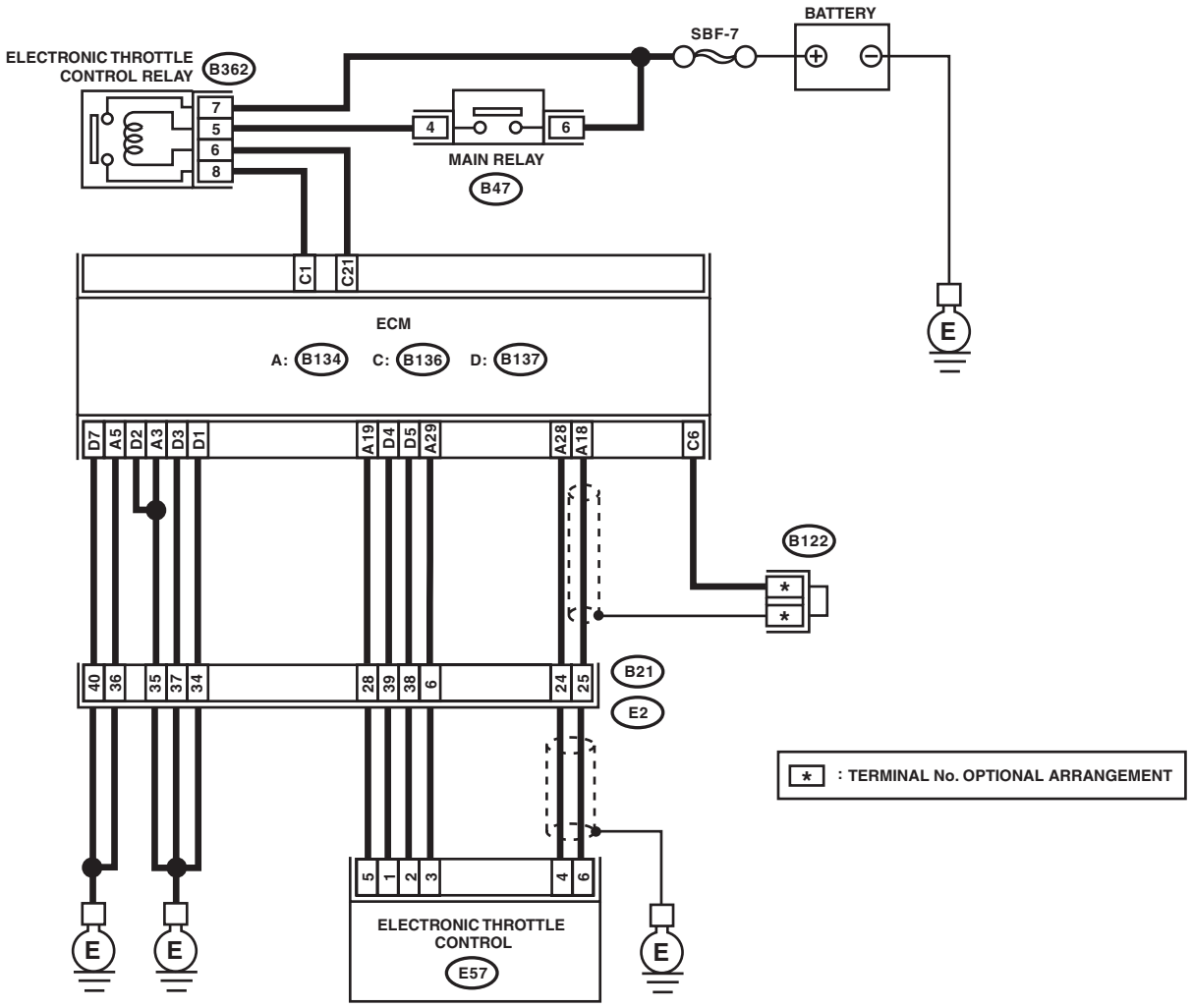
TROUBLE SYMPTOM:

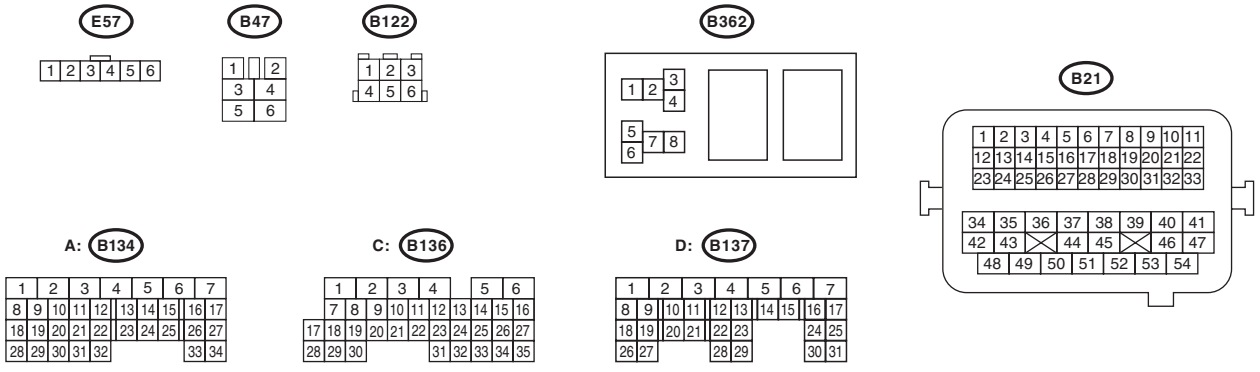
- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06946

	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 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 in 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 4.85 V or more?	Repair the short circuit to power in the 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 connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:***	Is the resistance 1 MΩ or more?	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-15, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-12, REPLACEMENT, Engine Coolant.>
3	**CHECK THERMOSTAT.**	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H6DO)-15, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-22, Engine Coolant Temperature Sensor.>

AG:DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

DTC DETECTING CONDITION:

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

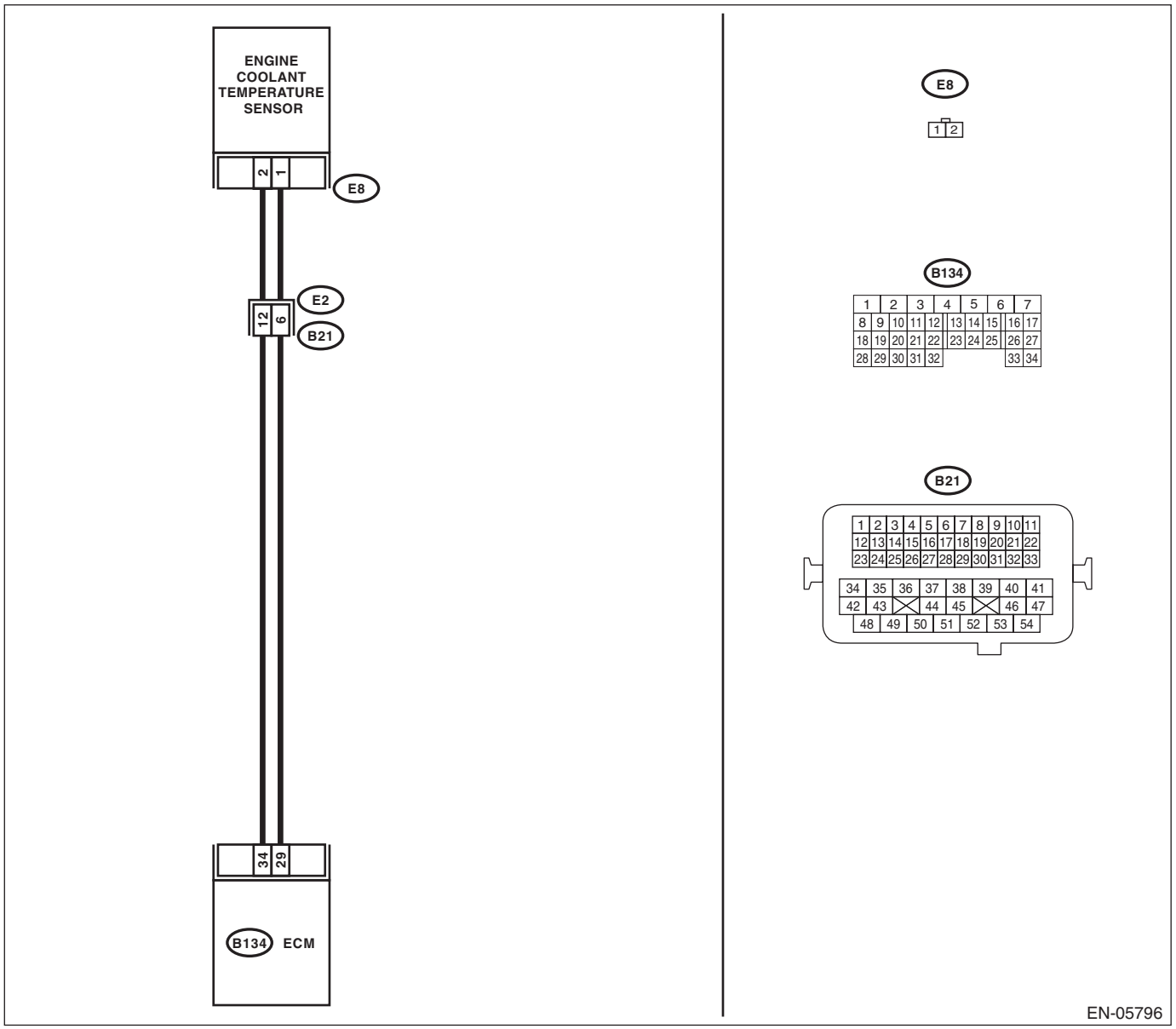
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-22, Engine Coolant Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

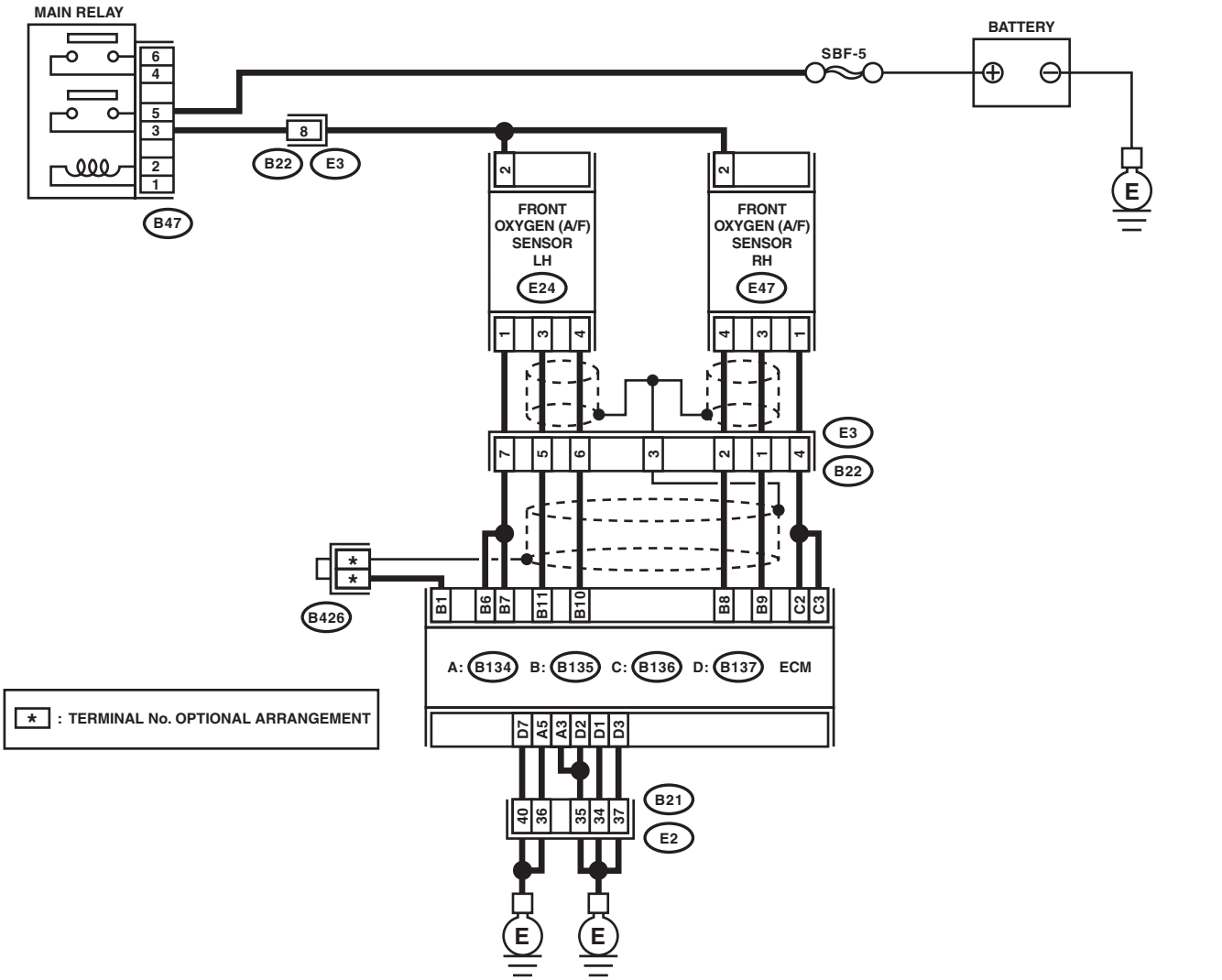
	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT.**	Are the coolant level and mixture ratio of engine coolant to anti-freeze solution correct?	Go to step **2**.	Replace the engine coolant. <Ref. to CO(H6DO)-12, REPLACEMENT, Engine Coolant.>
2	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check the radiator fan operation.	Does the radiator fan continuously rotate for 3 minutes or more during idling?	Repair radiator fan circuit. <Ref. to CO(H6DO)-23, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H6DO)-27, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO(H6DO)-15, Thermostat.>

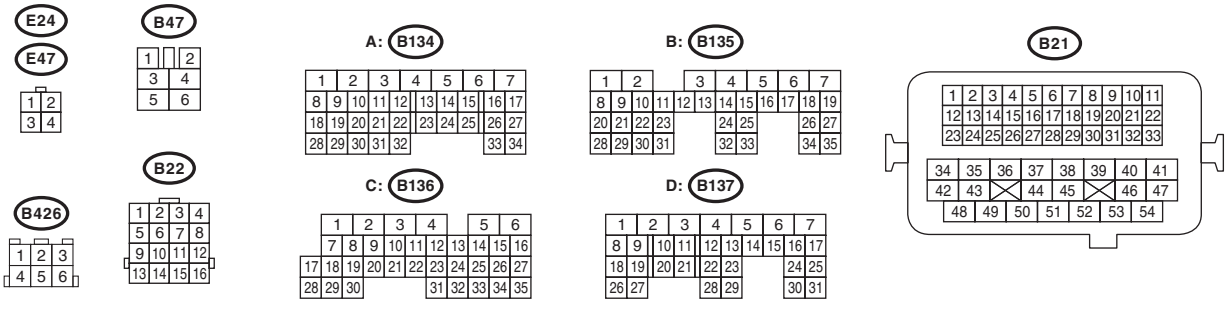
AI: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06944

	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**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — Chassis ground:*** ***(B135) No. 8 — 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 POOR CONTACT.** Check for poor contact in the front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact of the front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

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

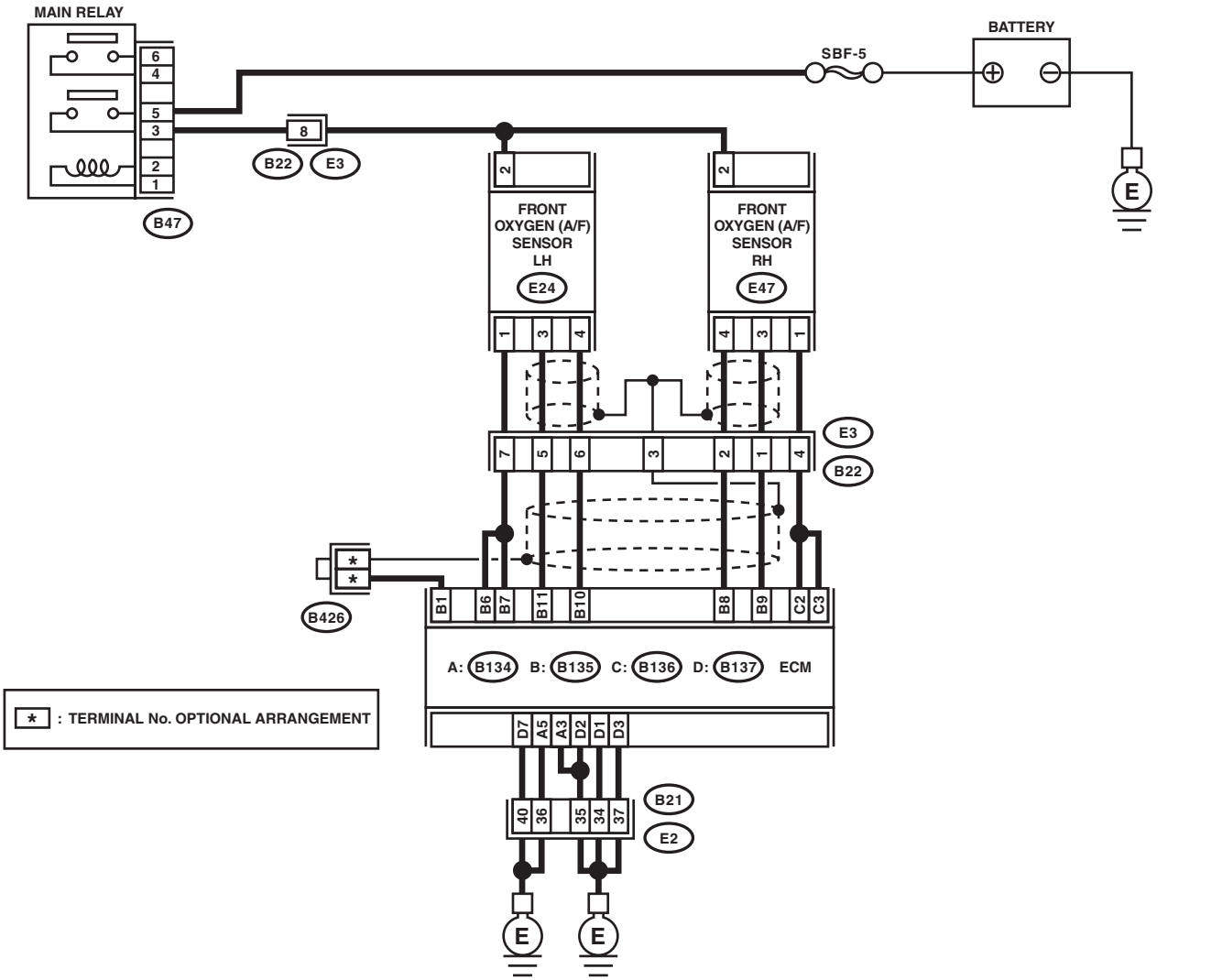
DTC DETECTING CONDITION:

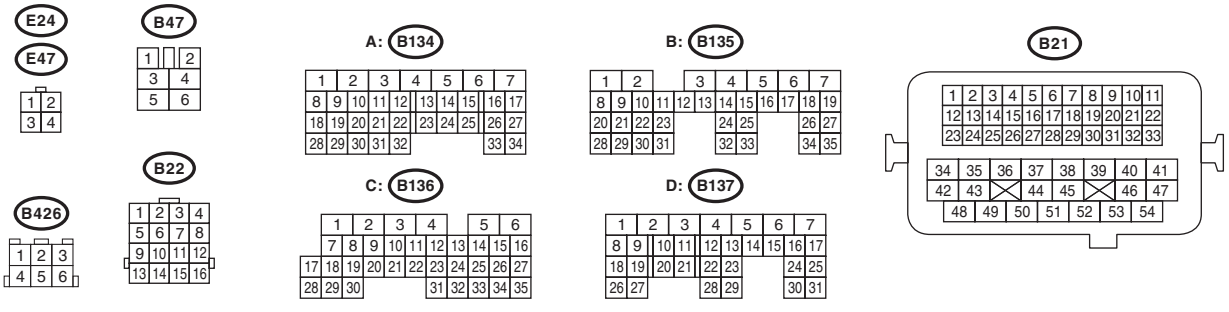
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-53, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06944

	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**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector 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. 9 (+) — Chassis ground (–):*** ***(B135) No. 8 (+) — 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)-34, Front Oxygen (A/F) Sensor.>

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

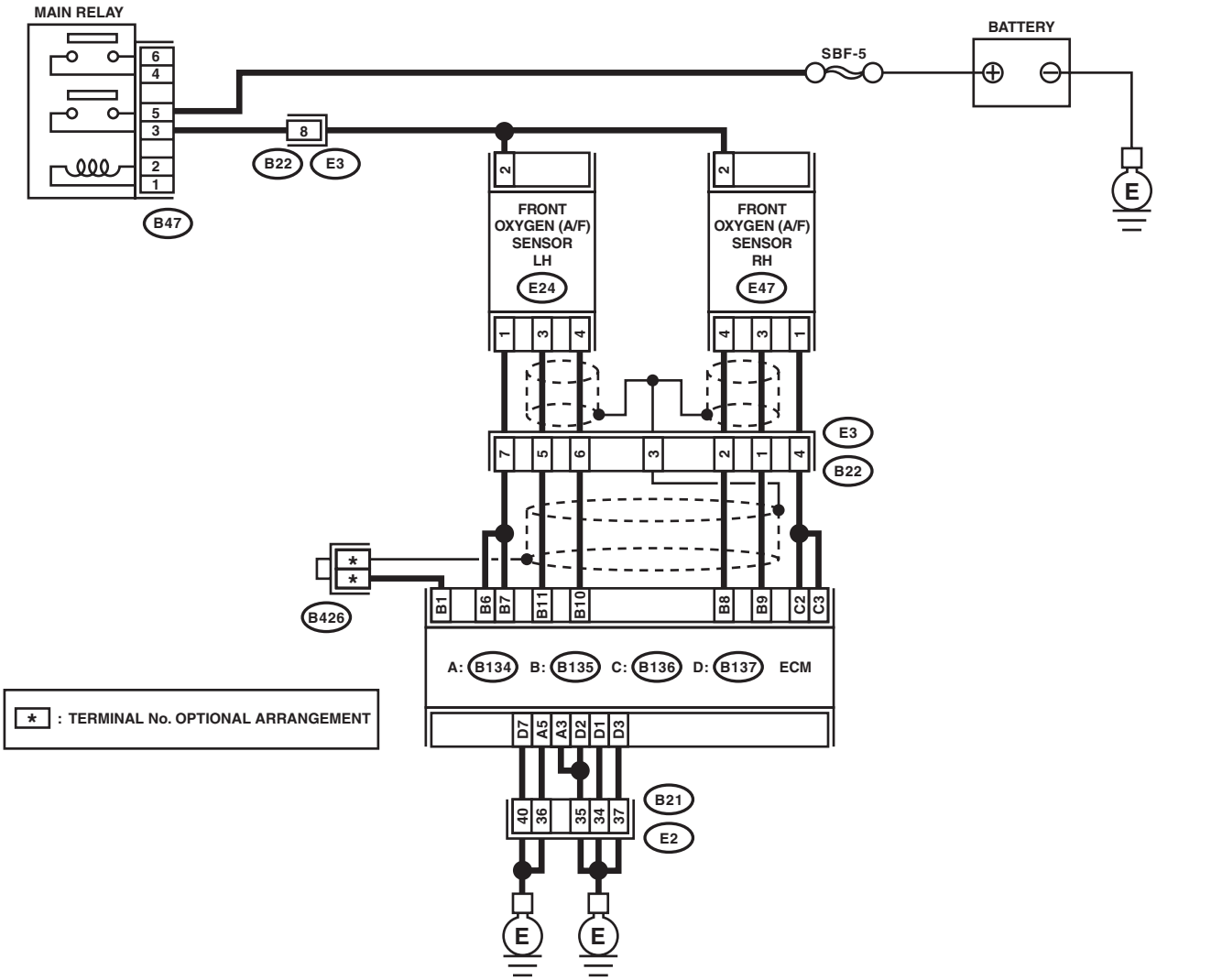
DTC DETECTING CONDITION:

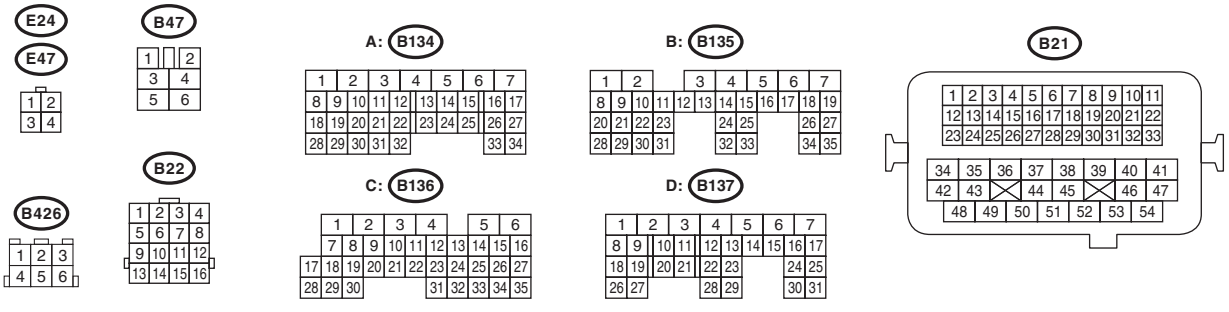
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-55, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06944

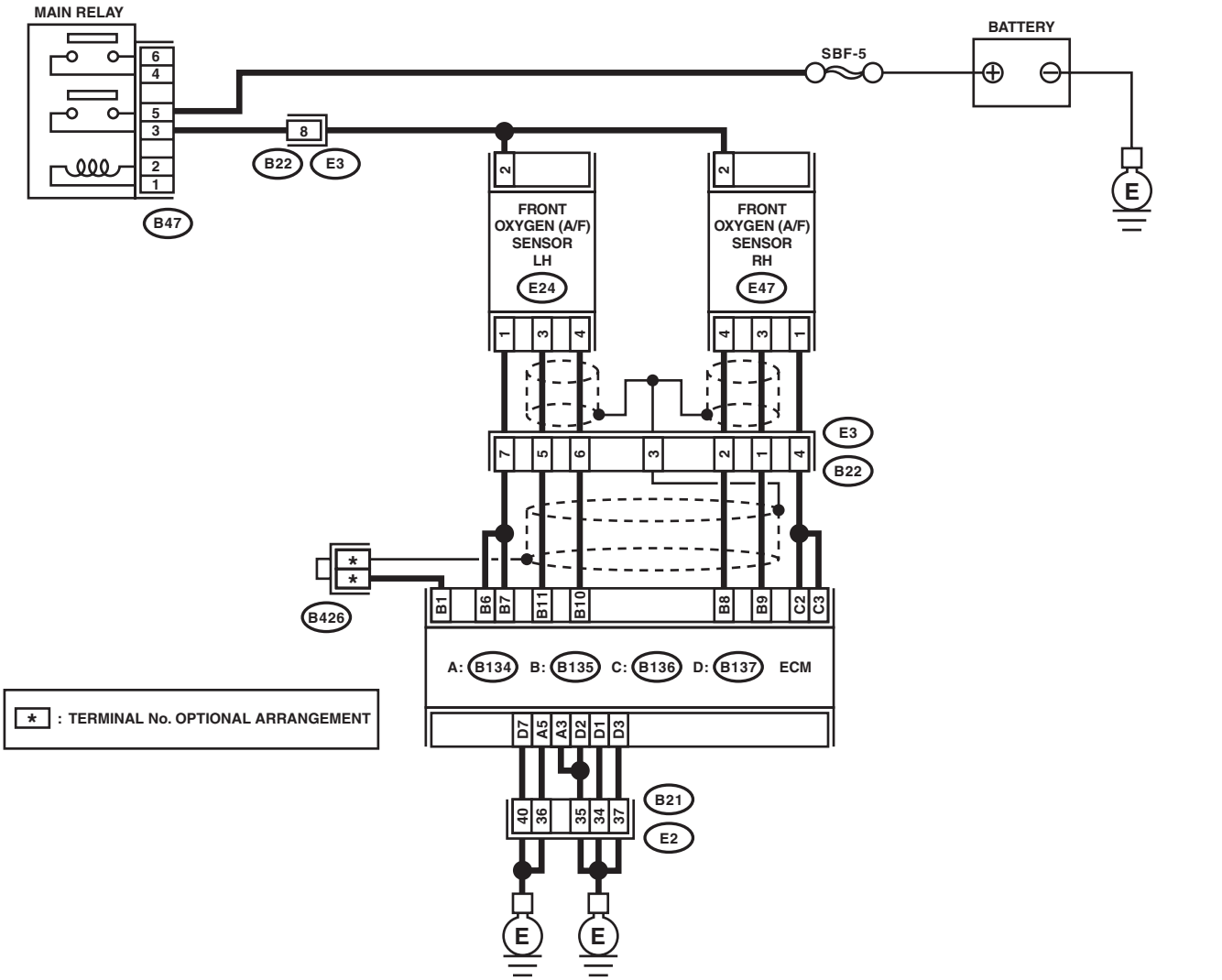
Step		Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there any fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

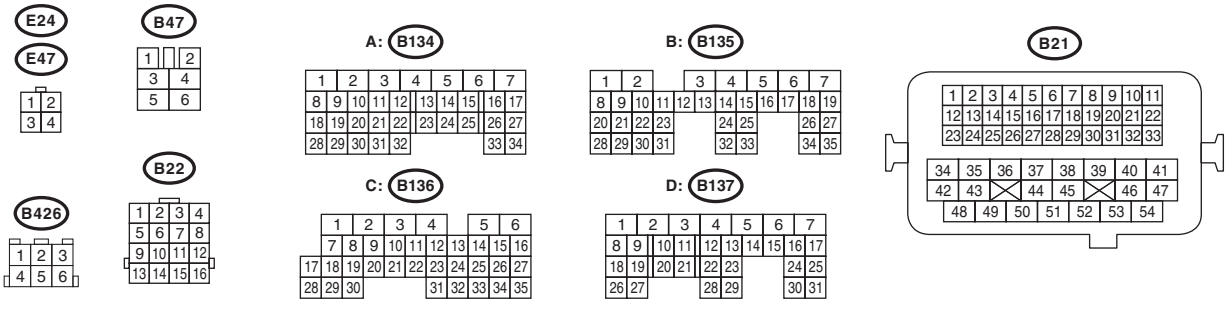
AL:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06944

	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 connector 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. 9 — (E47) No. 3:*** ***(B135) No. 8 — (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 POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

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

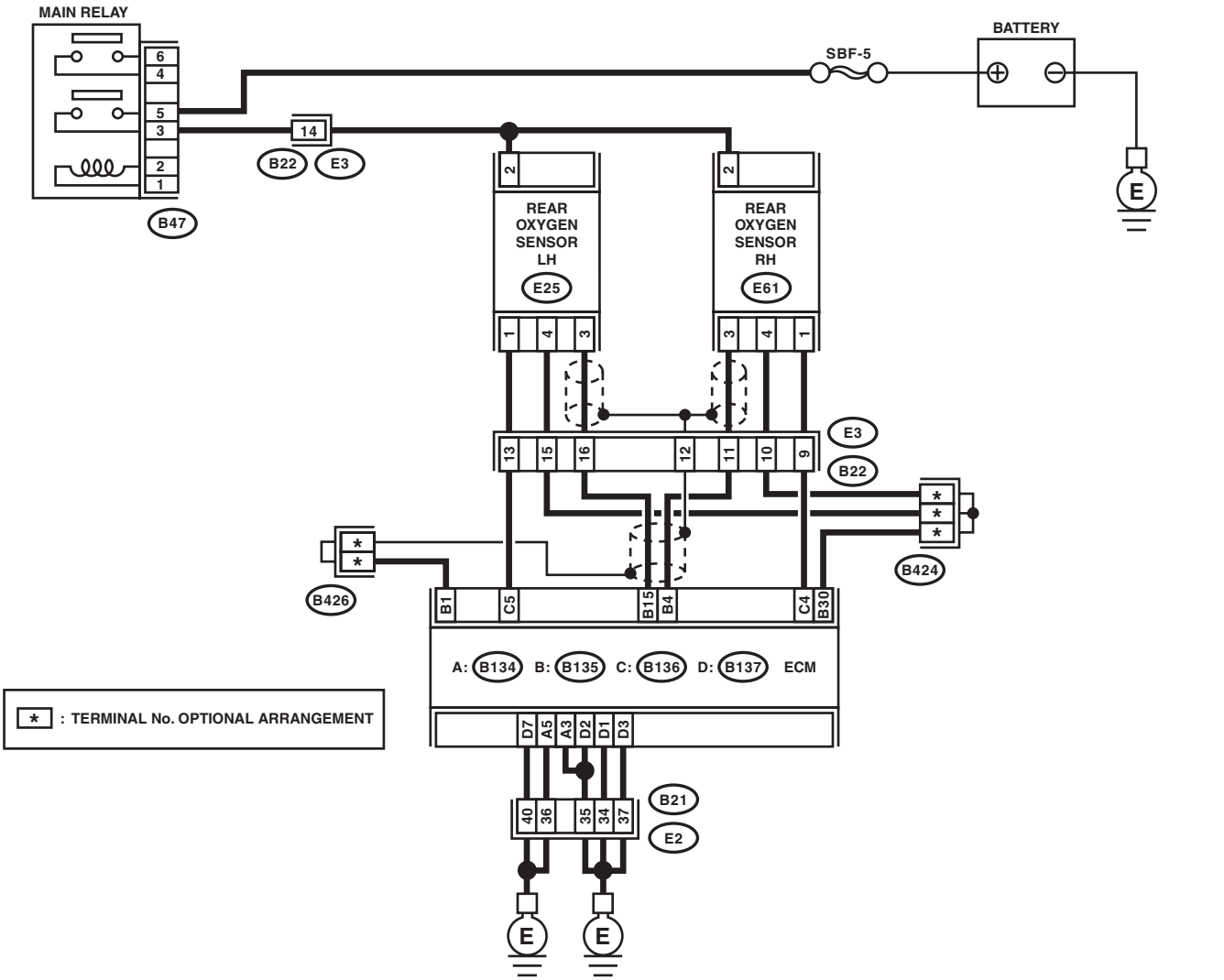
DTC DETECTING CONDITION:

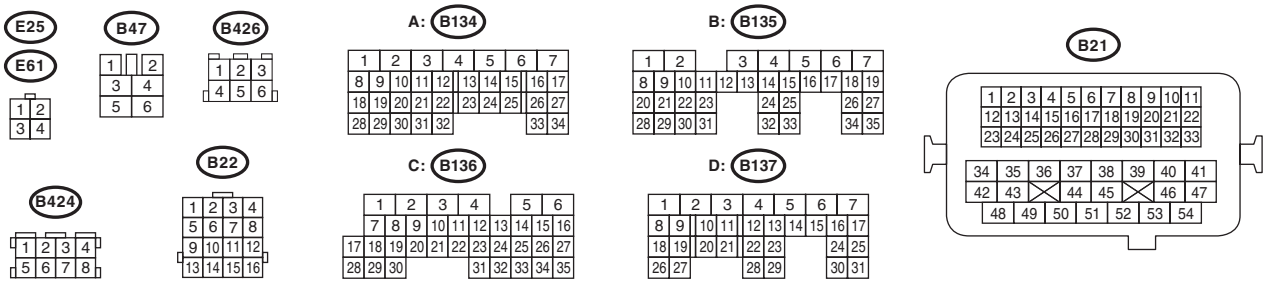
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-60, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06945

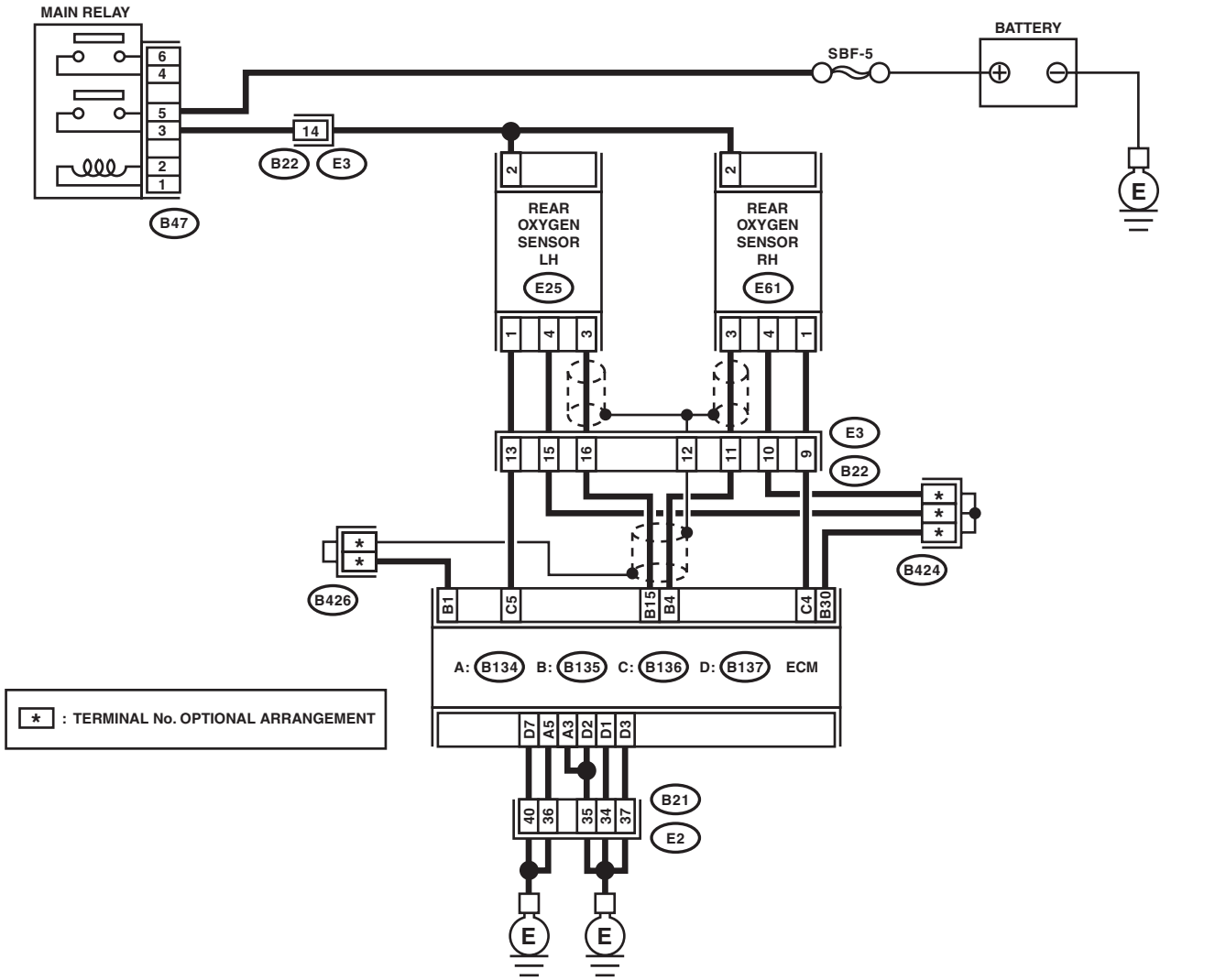
	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is above 75°C (167°F), and keep the engine speed at 3,000 rpm. (for up to 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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. 4 — (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.** 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 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)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper attachment of exhaust system parts • Damage (crack, hole etc.) of parts • Looseness and improper attachment of parts 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)-36, Rear Oxygen Sensor.>

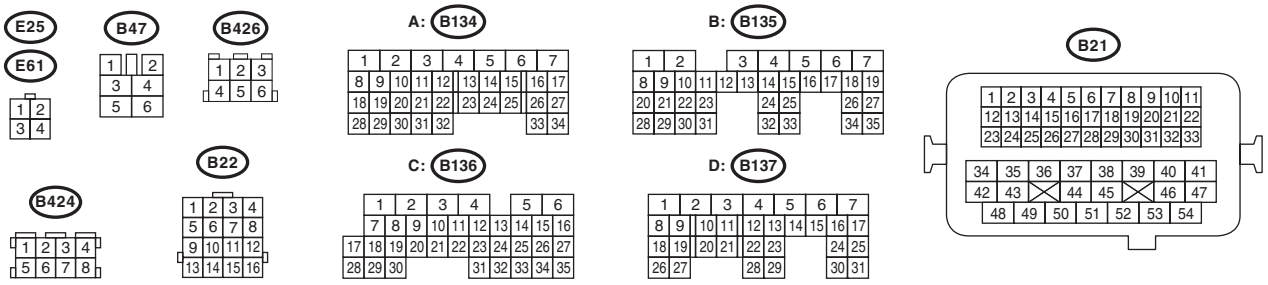
AN:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06945

	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is above 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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. 4 — (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.** 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 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)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper attachment of exhaust system parts • Damage (crack, hole etc.) of parts • Looseness and improper attachment of parts 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)-36, Rear Oxygen Sensor.>

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

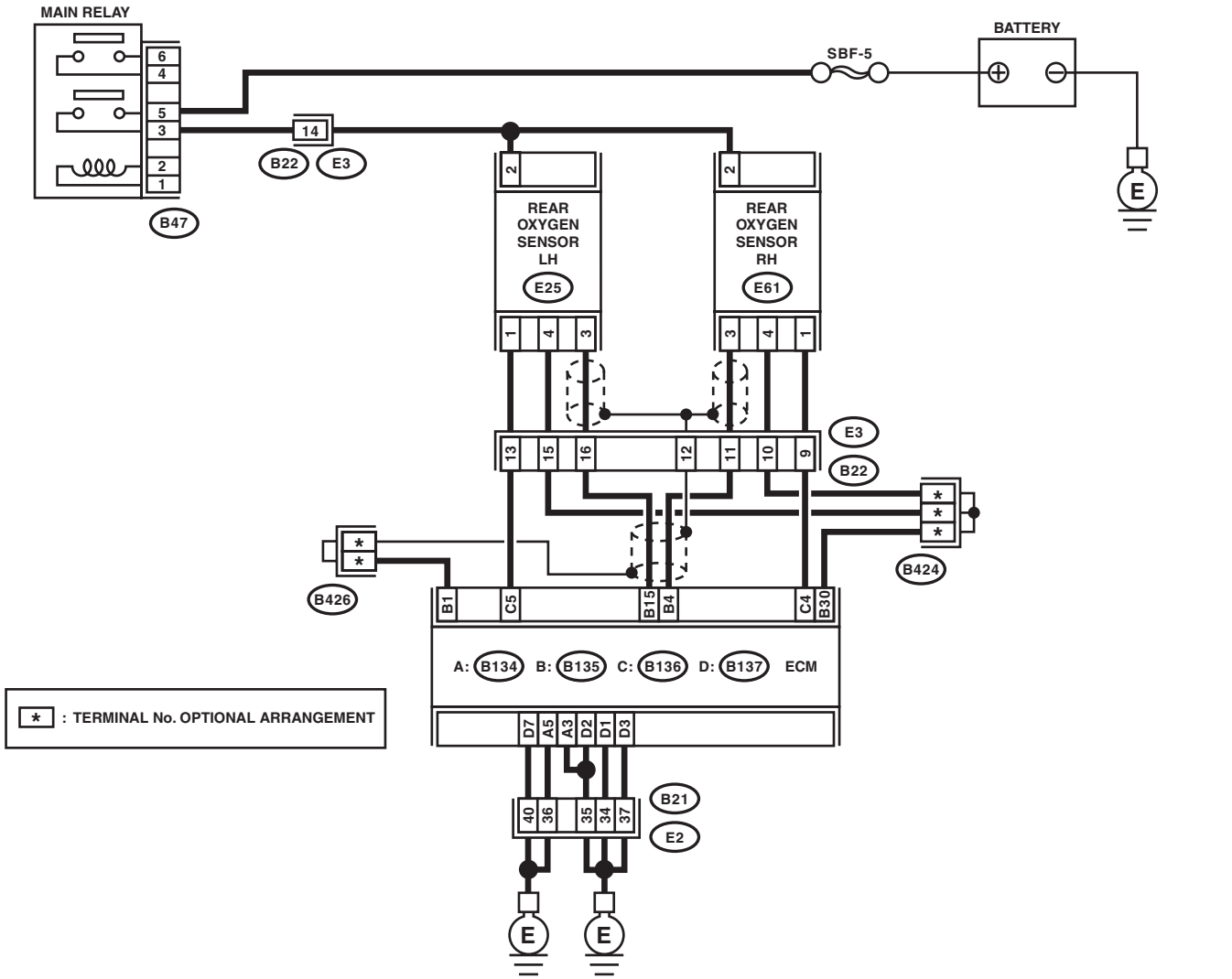
DTC DETECTING CONDITION:

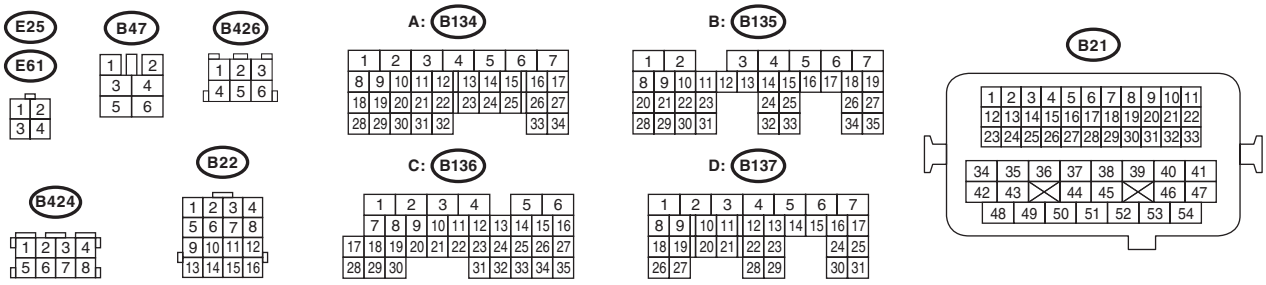
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-63, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06945

	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. 4 — (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)-36, Rear Oxygen Sensor.>	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 may be the cause.

AP:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

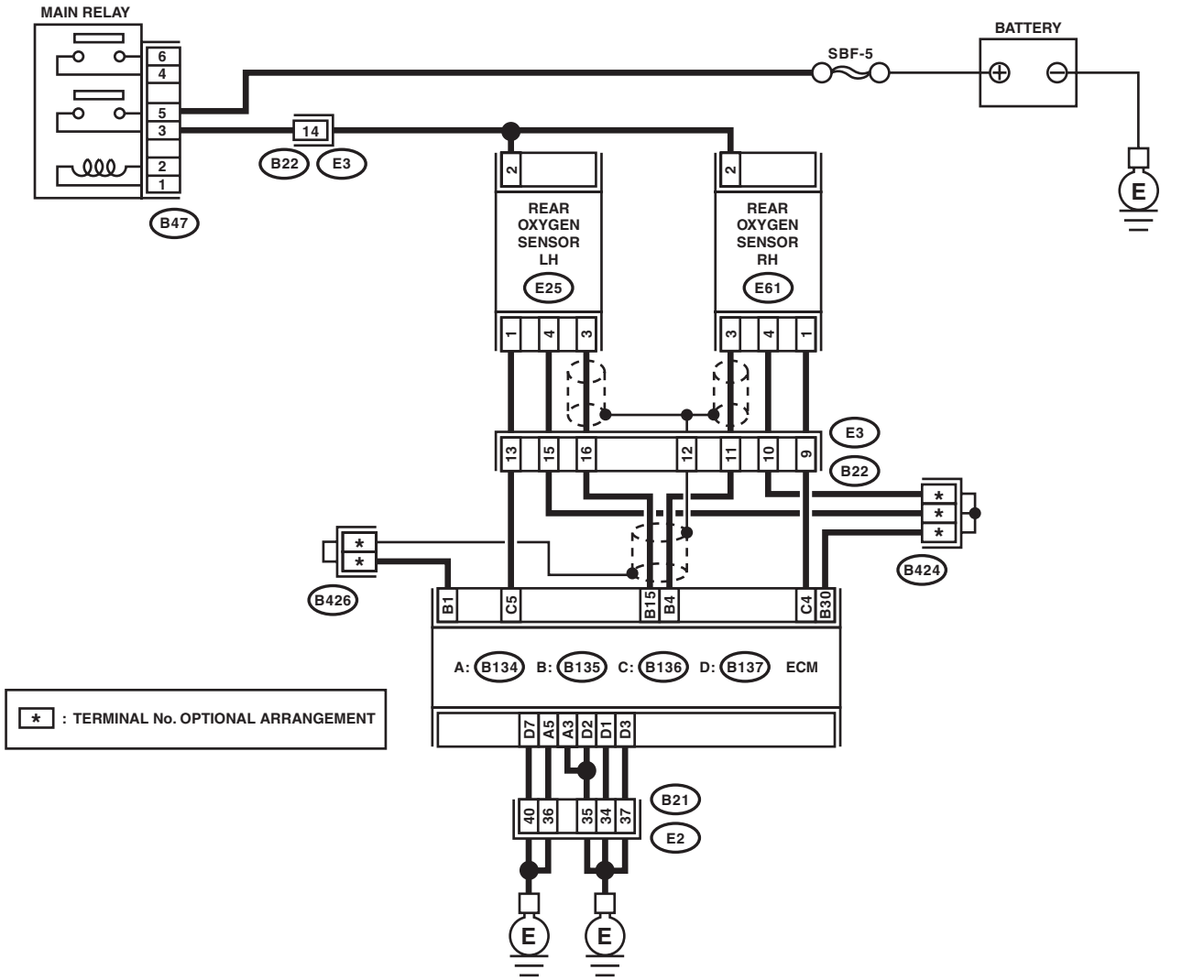
DTC DETECTING CONDITION:

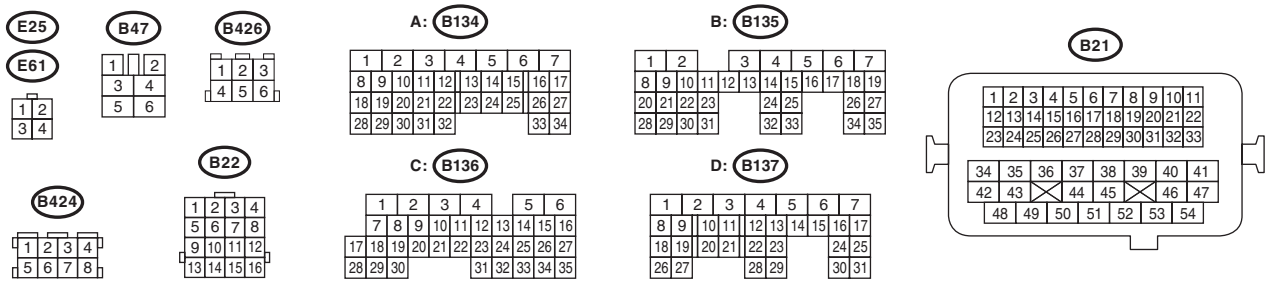
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-69, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06945

	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is above 75°C (167°F), and keep the engine speed at 3,000 rpm. (for up to 2 minutes) 2) Read the data of rear oxygen sensor signal 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)-34, 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 above 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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. 4 — (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

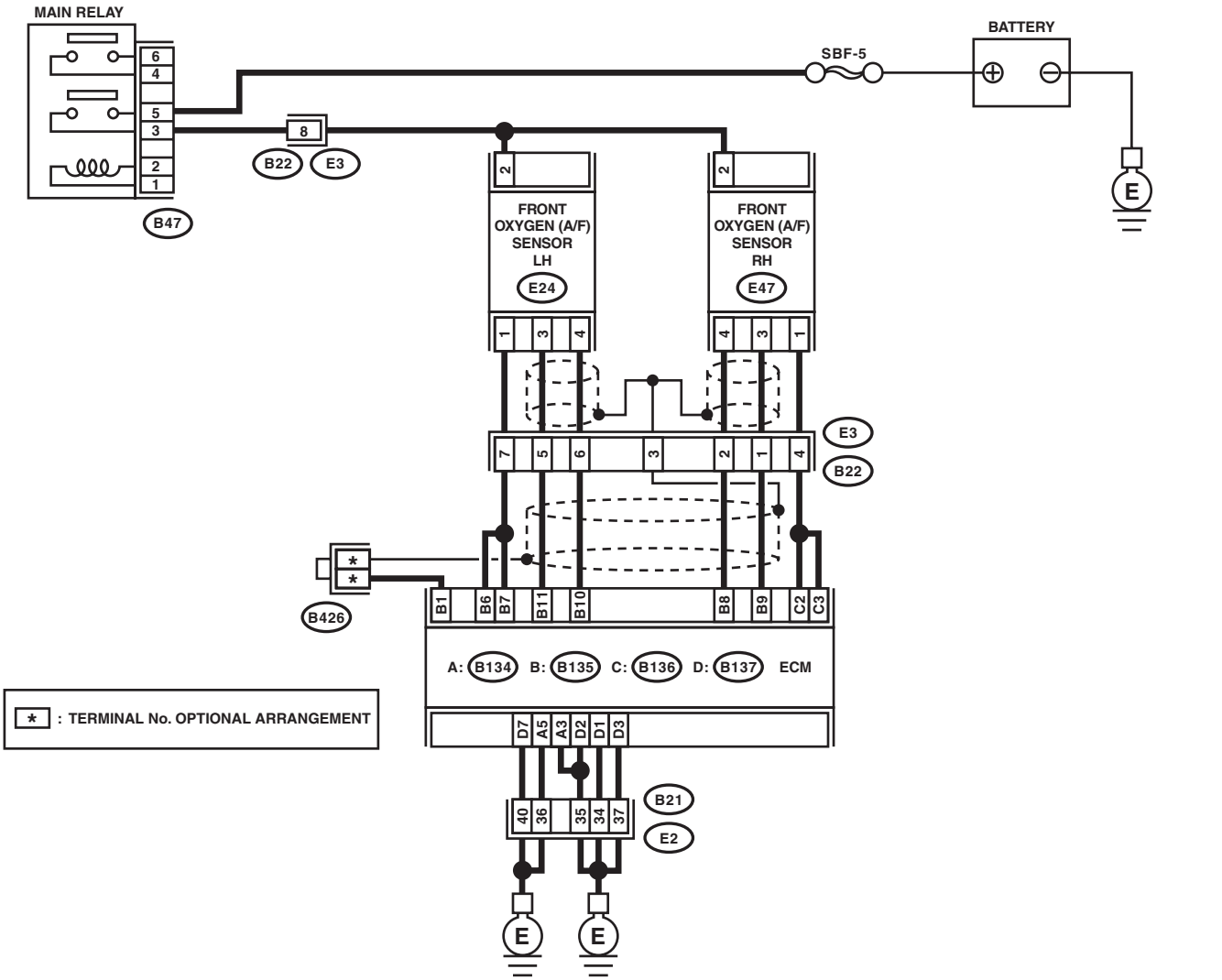
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E61) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper attachment of exhaust system parts • Damage (crack, hole etc.) of parts • Looseness and improper attachment of parts 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)-36, Rear Oxygen Sensor.>

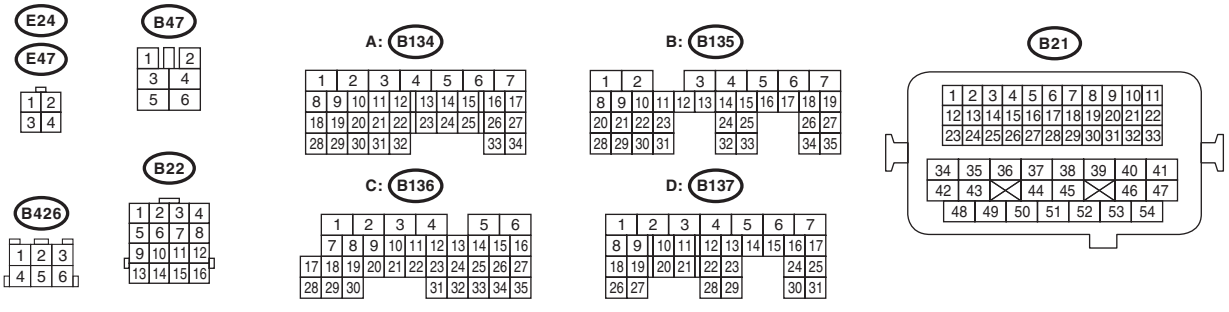
AQ:DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-71, DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06944

	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**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 11 — Chassis ground:*** ***(B135) No. 10 — 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 POOR CONTACT.** Check for poor contact in the front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact of the front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

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

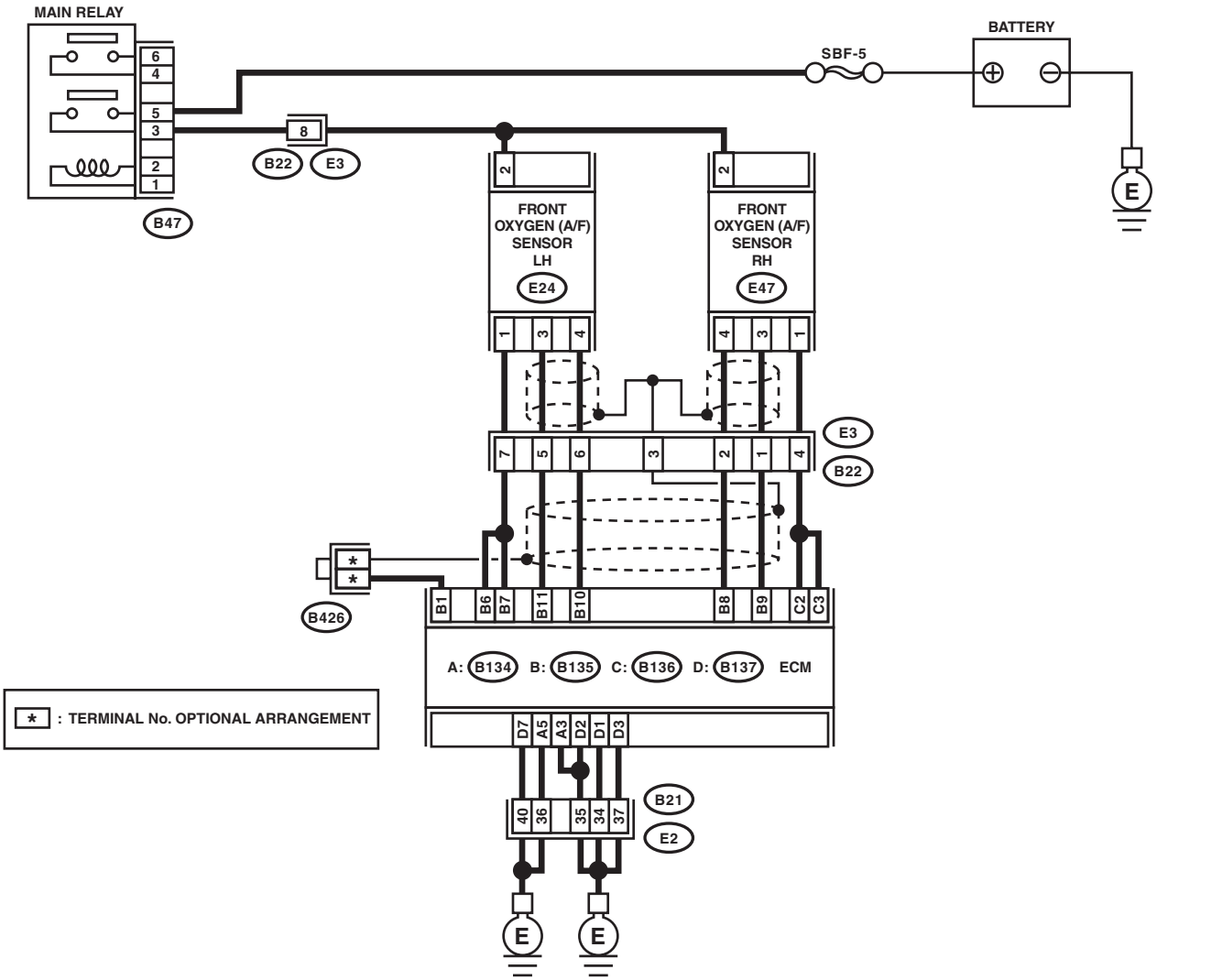
DTC DETECTING CONDITION:

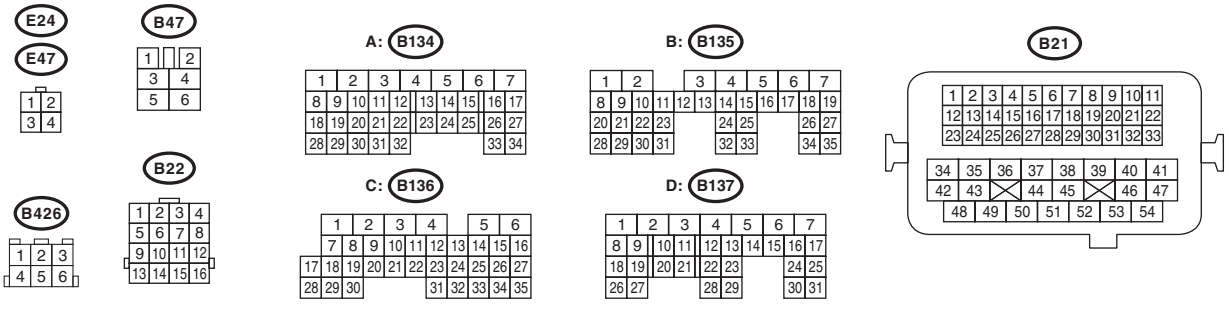
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-71, DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06944

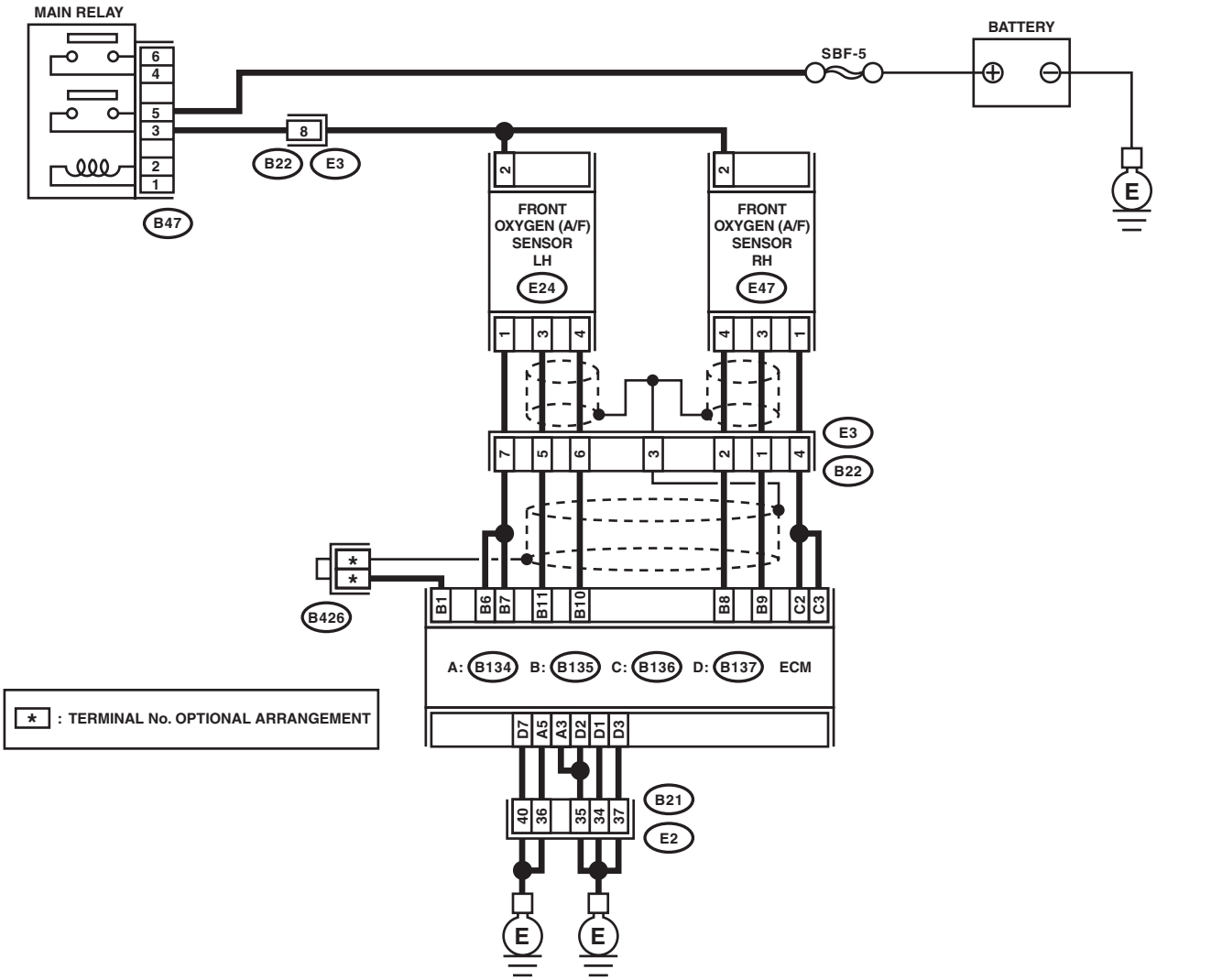
	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector 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. 11 (+) — Chassis ground (–):*** ***(B135) No. 10 (+) — 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)-34, Front Oxygen (A/F) Sensor.>

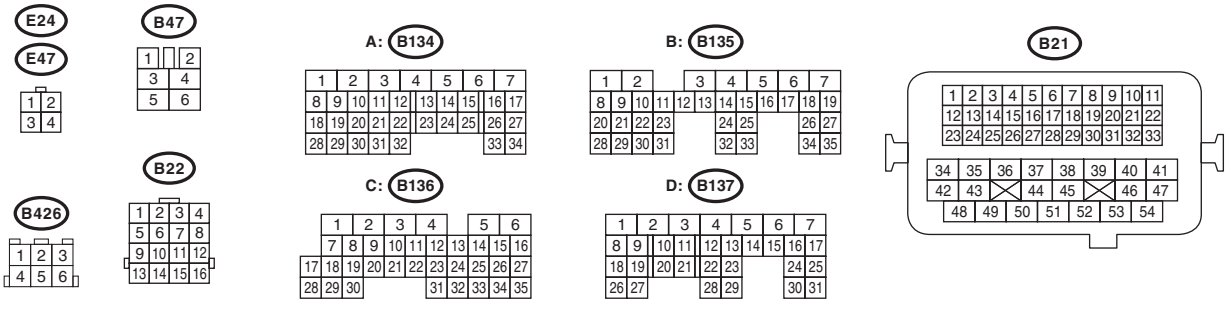
AS:DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-71, DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06944

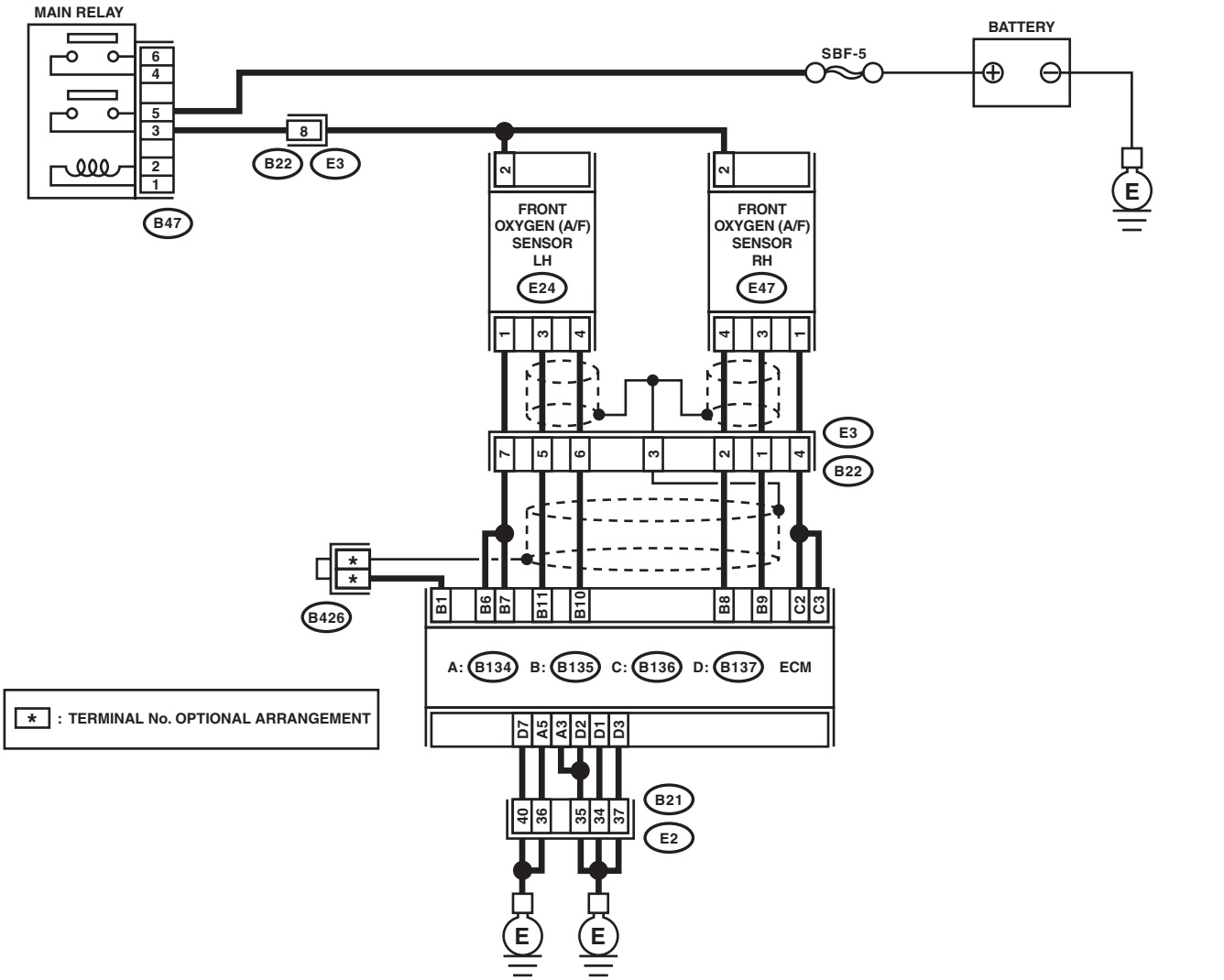
	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there any fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

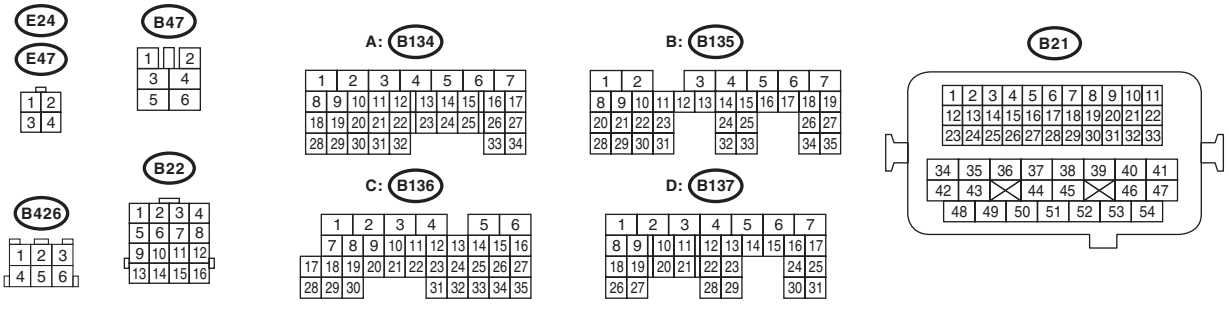
AT:DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-71, DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06944

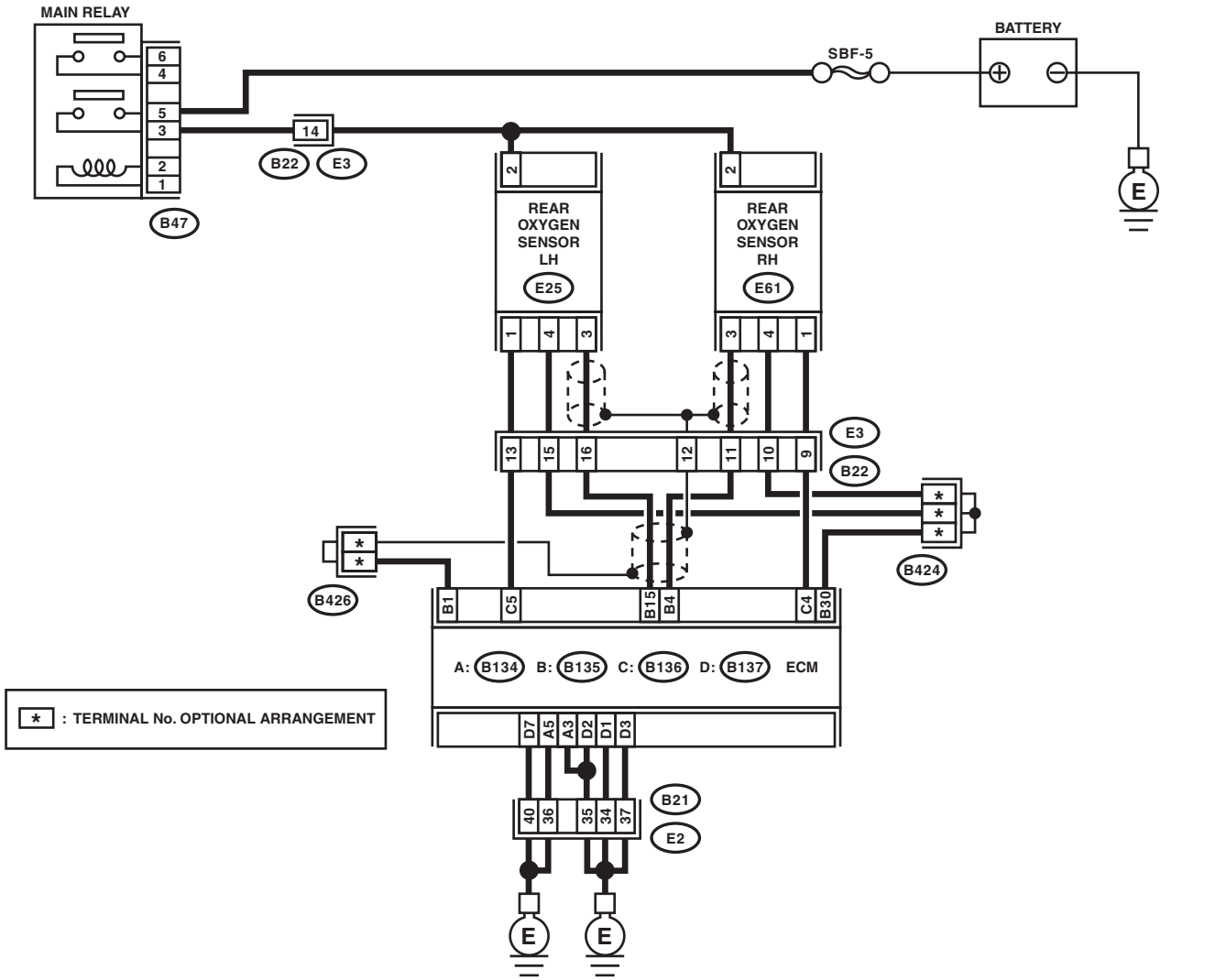
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 11 — (E24) No. 3:*** ***(B135) No. 10 — (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 POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

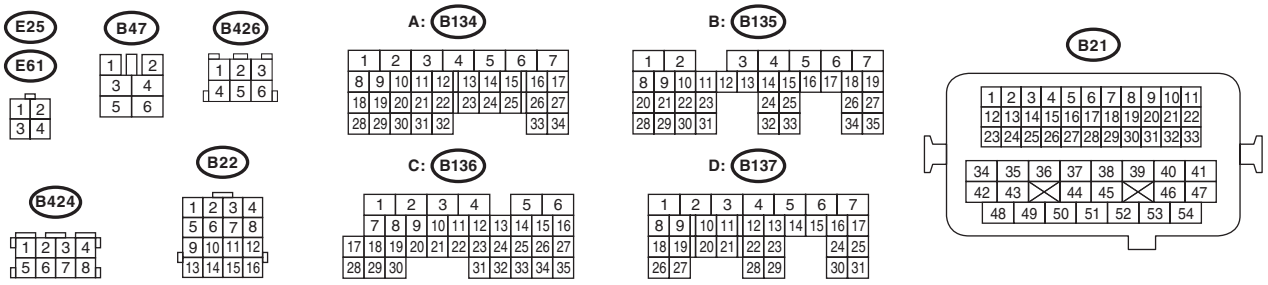
AU:DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-71, DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06945

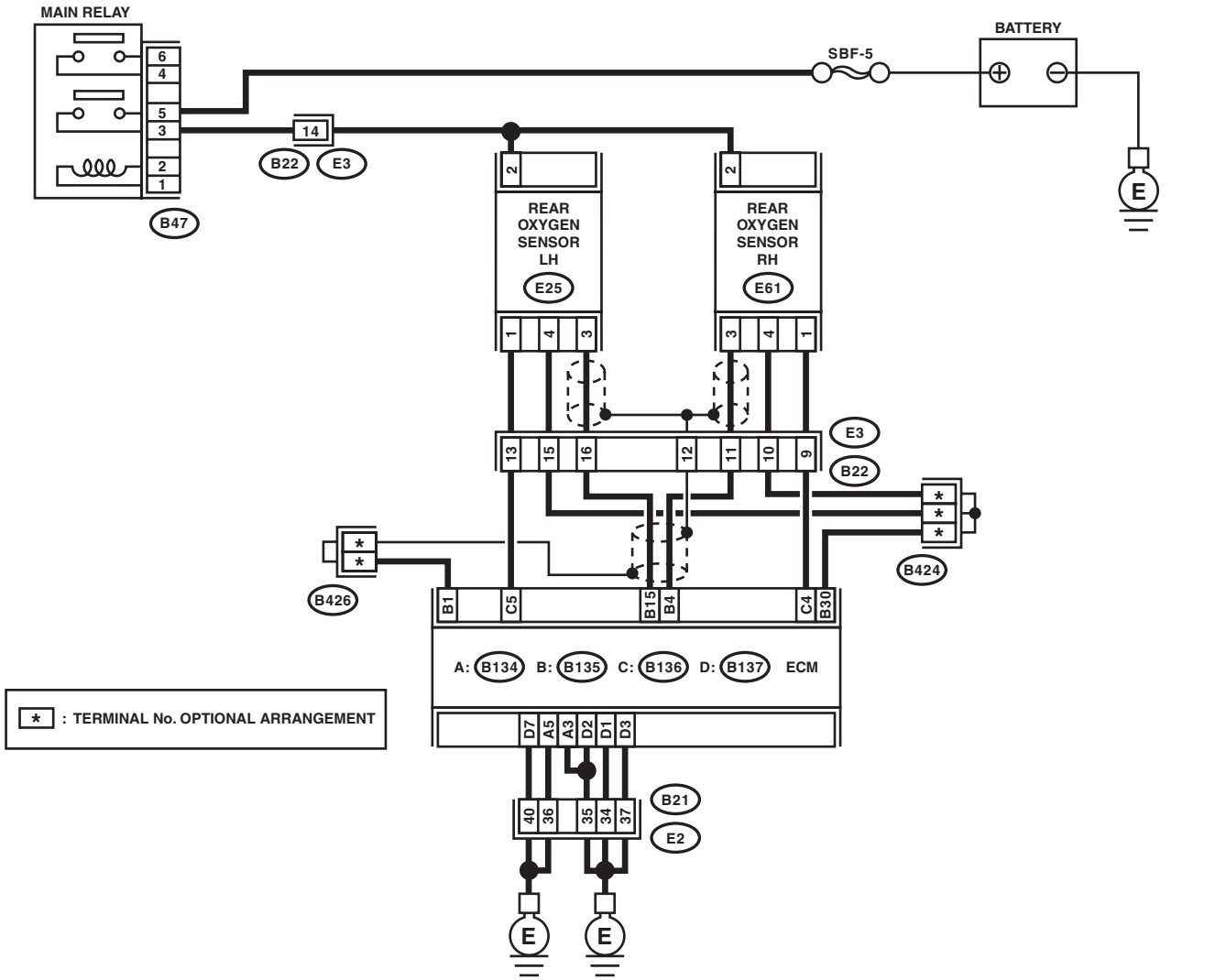
	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is above 75°C (167°F), and keep the engine speed at 3,000 rpm. (for up to 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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. 15 — (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.** 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 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)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper attachment of exhaust system parts • Damage (crack, hole etc.) of parts • Looseness and improper attachment of parts 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)-36, Rear Oxygen Sensor.>

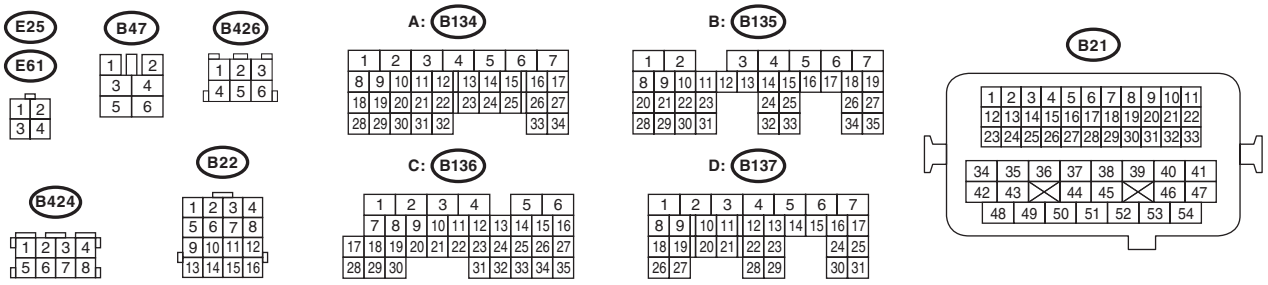
AV:DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-71, DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06945

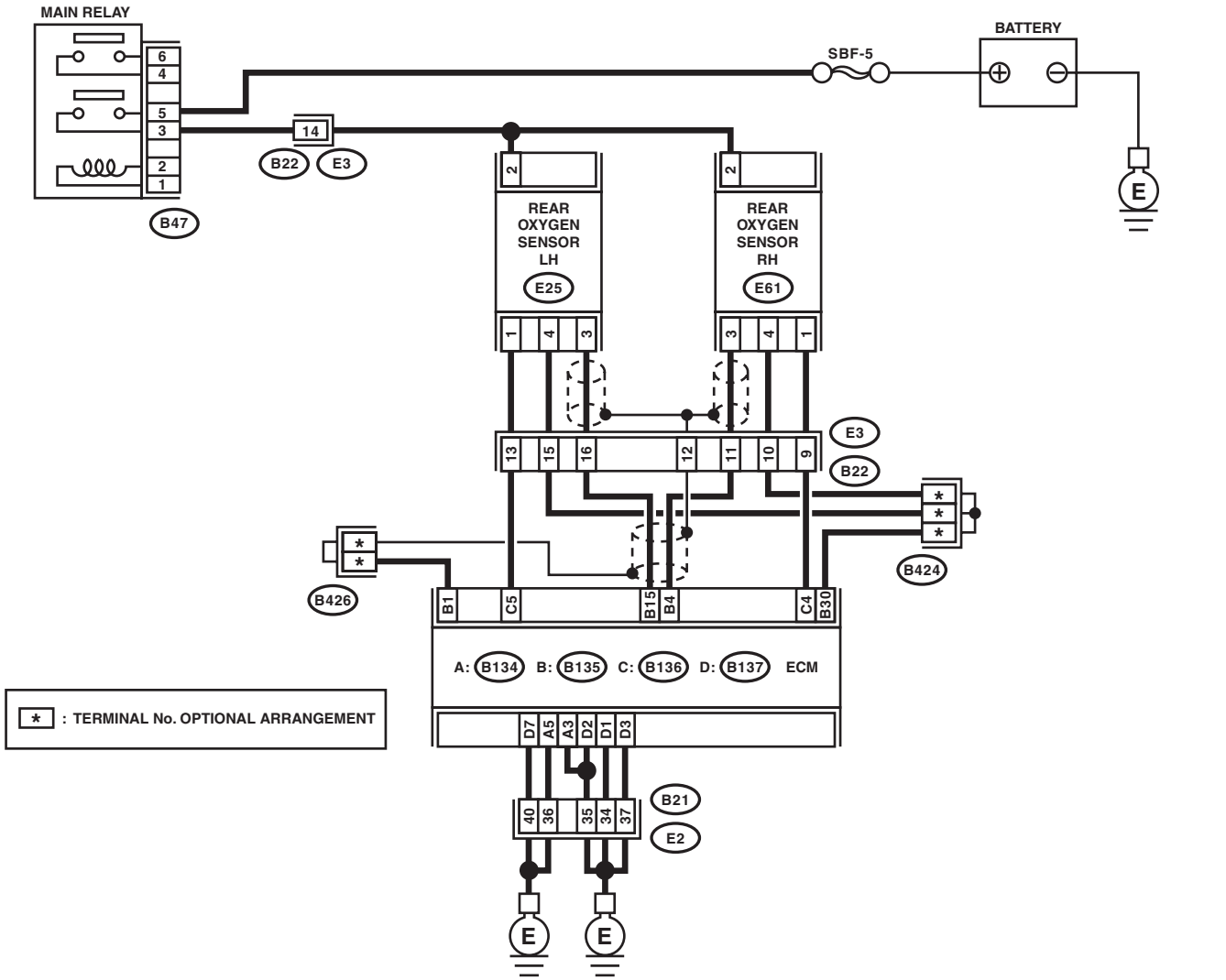
	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is above 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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. 15 — (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.** 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 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)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper attachment of exhaust system parts • Damage (crack, hole etc.) of parts • Looseness and improper attachment of parts 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)-36, Rear Oxygen Sensor.>

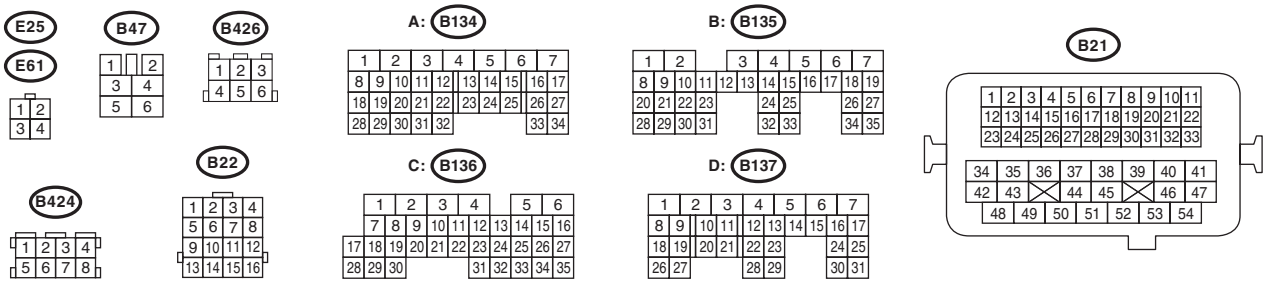
AW:DTC P0159 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-71, DTC P0159 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06945

	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. 15 — (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*** ***(B25) 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)-36, Rear Oxygen Sensor.>	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 may be the cause.

AX:DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 2)

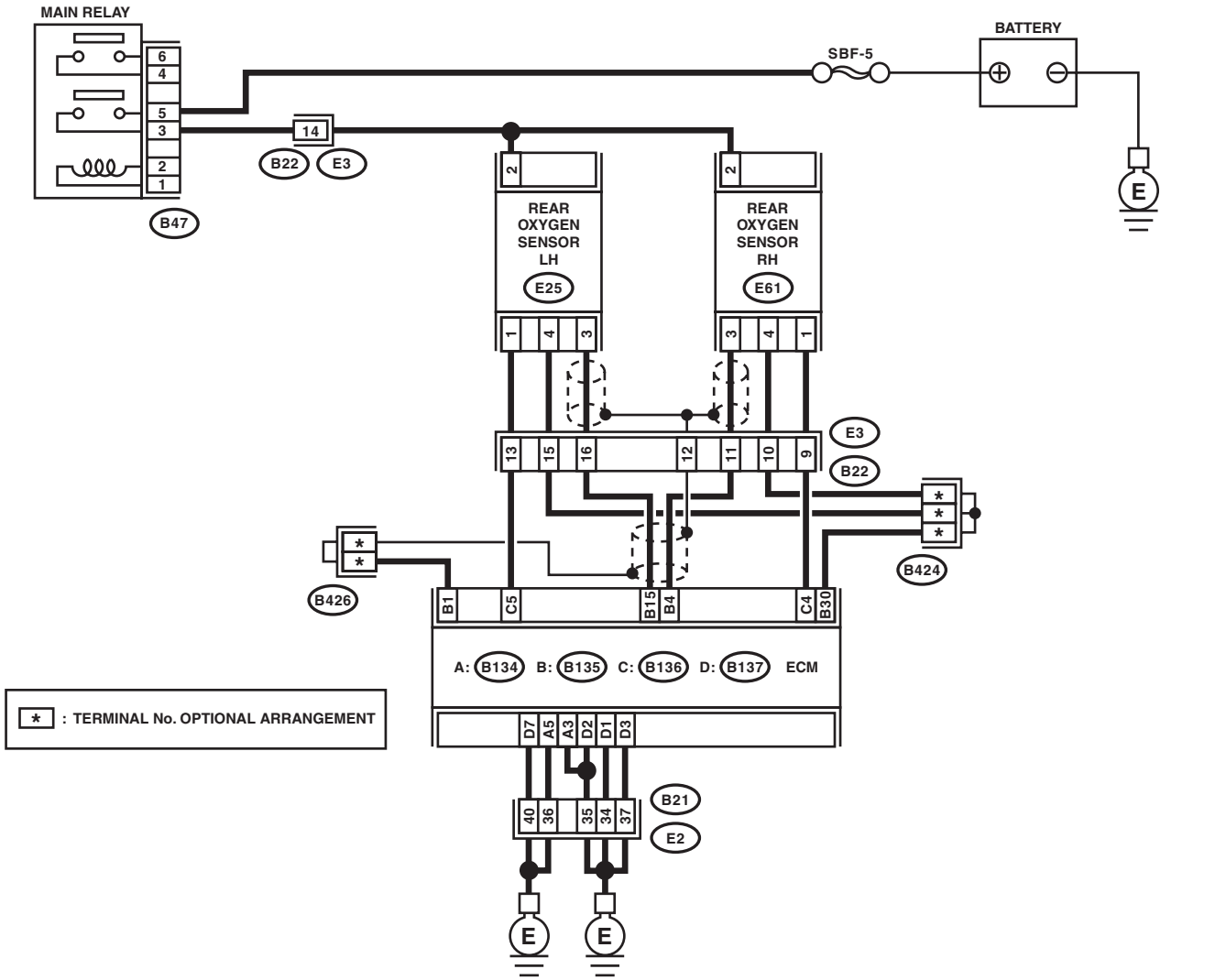
DTC DETECTING CONDITION:

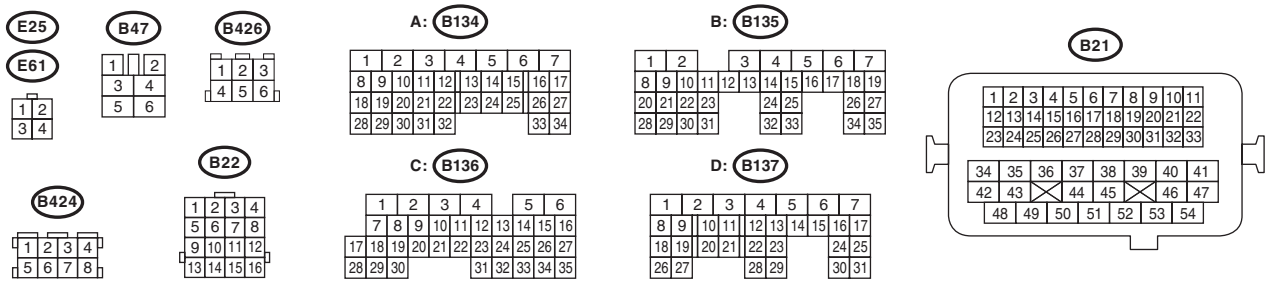
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-71, DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06945

	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is above 75°C (167°F), and keep the engine speed at 3,000 rpm. (for up to 2 minutes) 2) Read the data of rear oxygen sensor signal 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)-34, 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 above 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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. 15 — (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.** 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 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)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper attachment of exhaust system parts • Damage (crack, hole etc.) of parts • Looseness and improper attachment of parts 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)-36, Rear Oxygen Sensor.>

AY:DTC P0171 SYSTEM TOO LEAN (BANK 1)

Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-185, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AZ:DTC P0172 SYSTEM TOO RICH (BANK 1)

NOTE:
Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-185, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BA:DTC P0174 SYSTEM TOO LEAN (BANK 2)

NOTE:
Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-185, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BB:DTC P0175 SYSTEM TOO RICH (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-74, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-30, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 338 — 348 kPa (3.4 — 3.5 kgf/cm^2, 49 — 50.5 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-22, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-28, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-28, Mass Air Flow and Intake Air Temperature Sensor.>

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

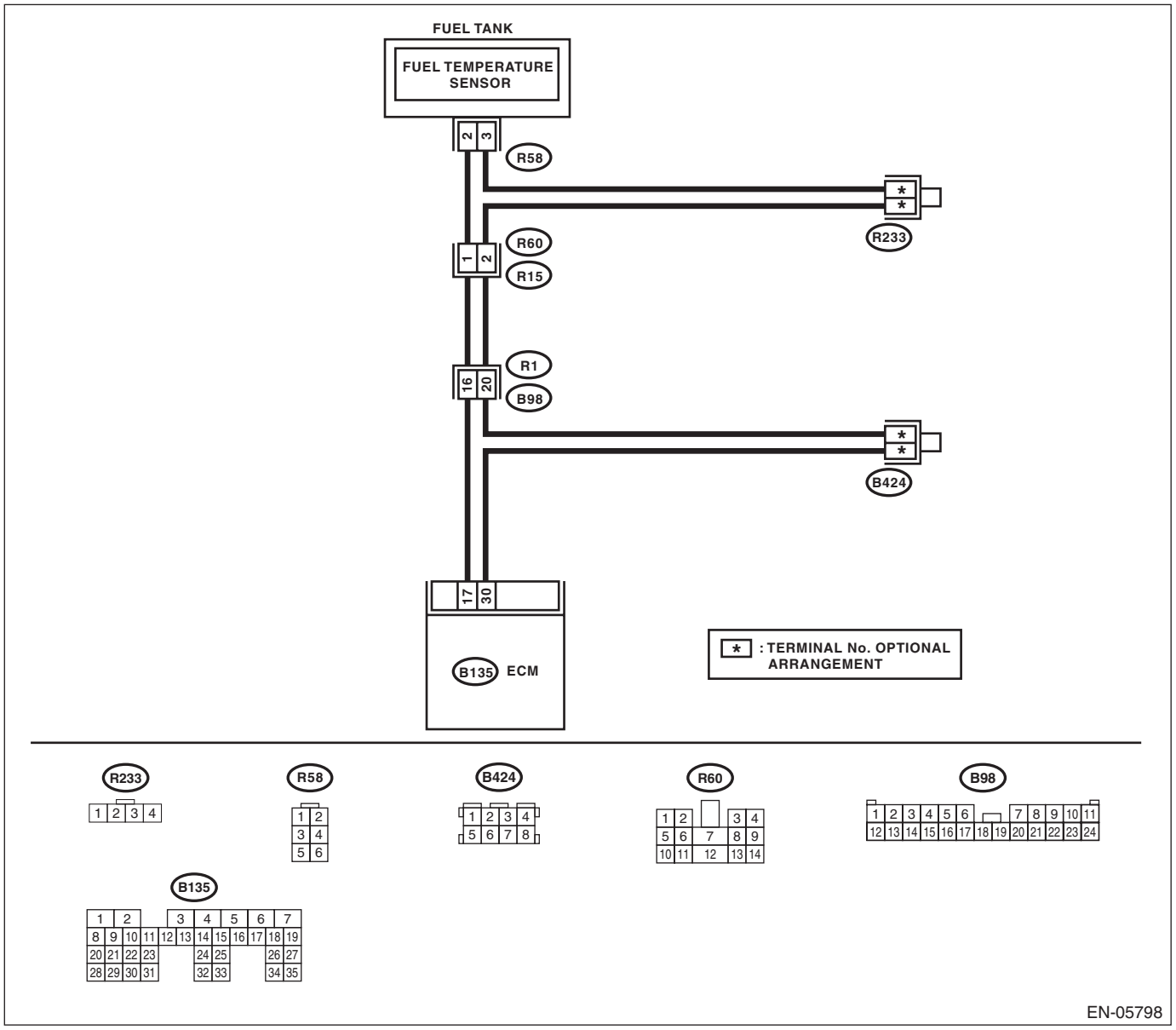
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-75, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-83, List of Diagnostic Trouble Code (DTC).>	Replace the fuel temperature sensor. <Ref. to EC(H6DO)-9, Fuel Temperature Sensor.>

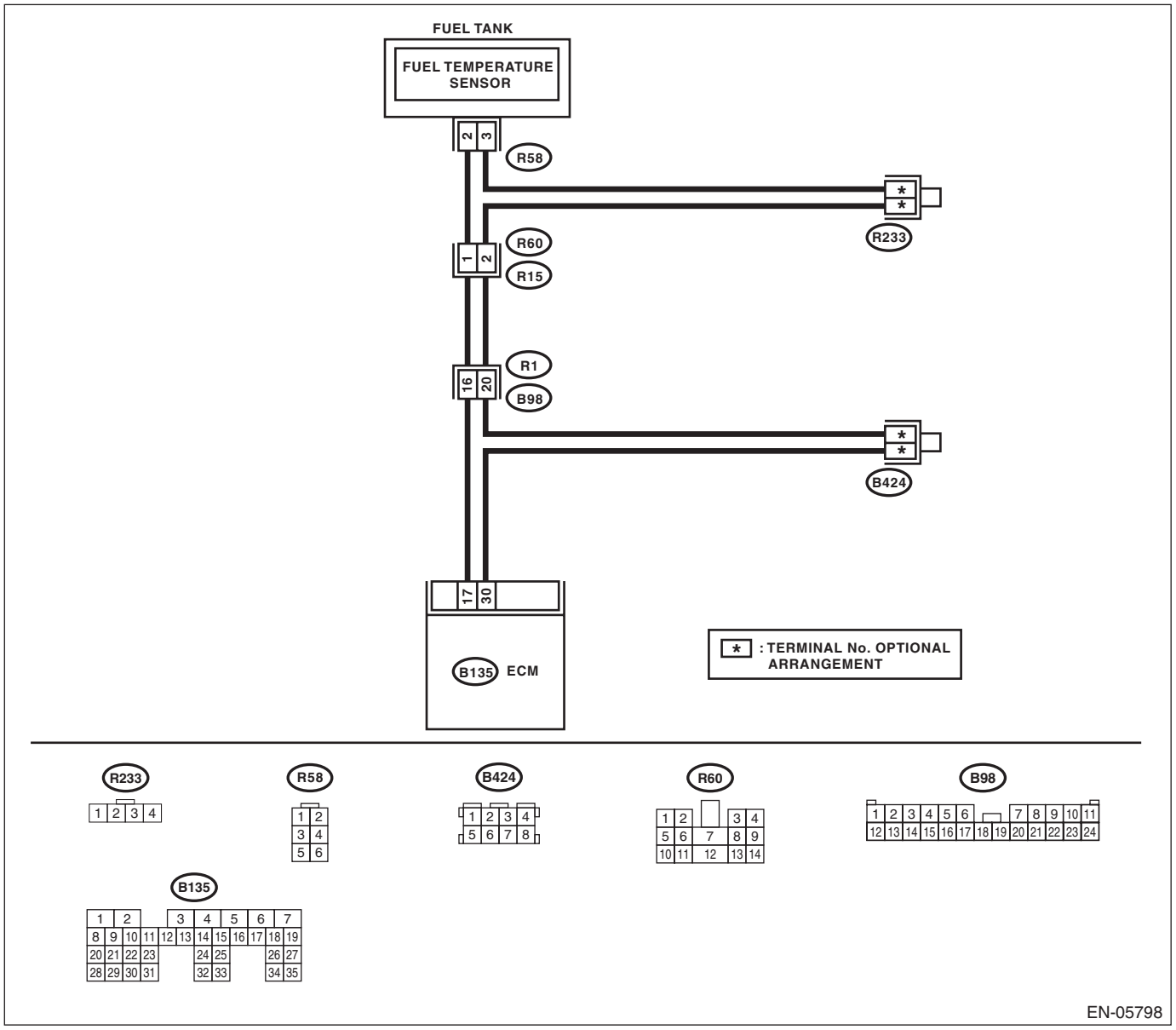
BD:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-78, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.>	Is the temperature 120°C (248°F) or higher?	Go to step **2**.	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 may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and fuel temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 17 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the fuel temperature sensor. <Ref. to EC(H6DO)-9, Fuel Temperature Sensor.>	Repair the ground short circuit of harness between ECM and fuel pump.

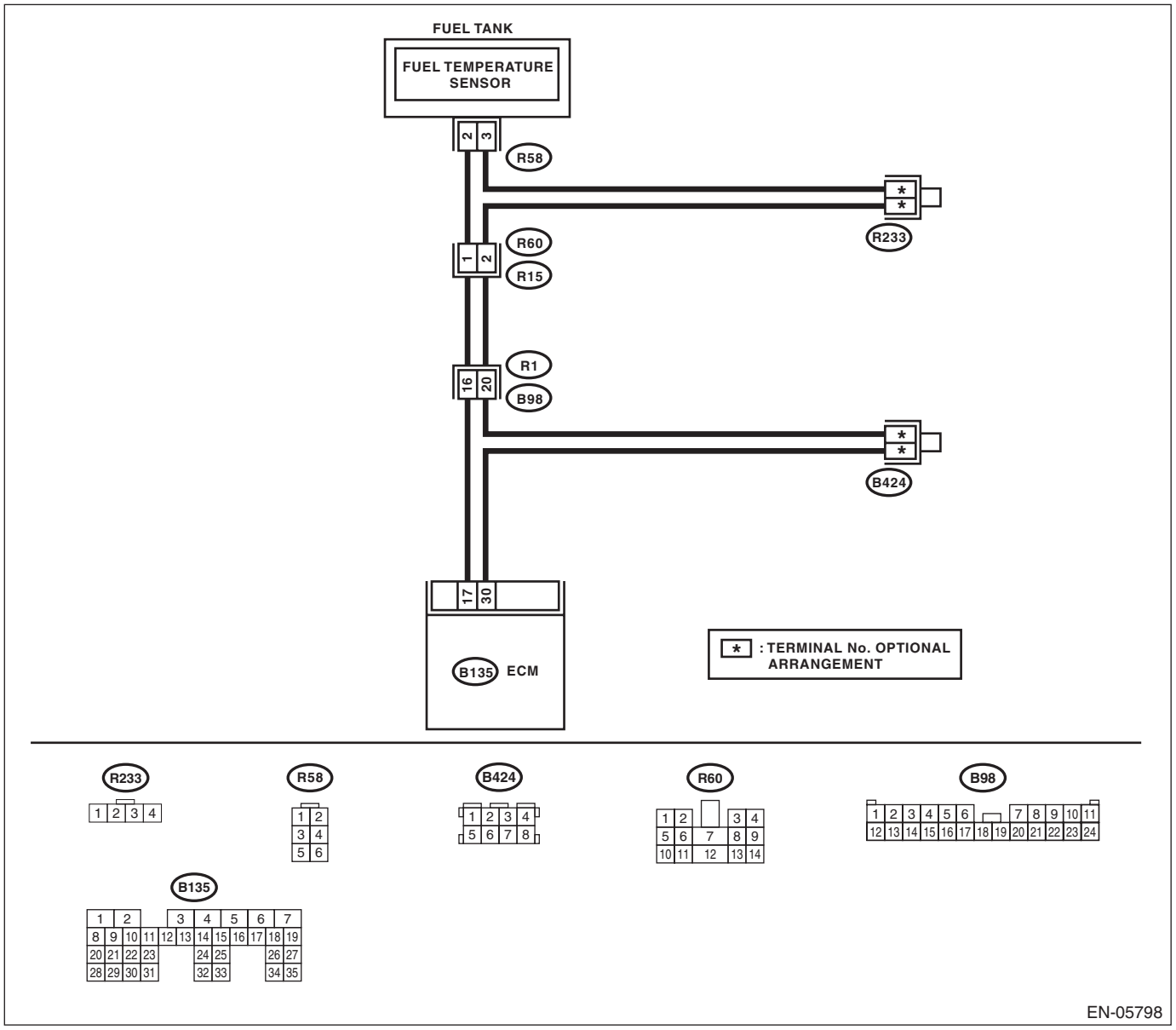
BE:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-79, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.>	Is the temperature less than –40°C (–40°F)?	Go to step **2**.	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 may be the cause.
2	**CHECK POOR CONTACT.** Repair any poor contact between the ECM and fuel temperature sensor connectors.	Is there poor contact in 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 connector from ECM and fuel temperature sensor. 3) Measure the resistance of the harness between the ECM and fuel temperature sensor connector. ***Connector & terminal*** ***(B135) No. 17 — (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*** ***(B135) No. 17 (+) — 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)-9, Fuel Temperature Sensor.>

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

DTC DETECTING CONDITION:

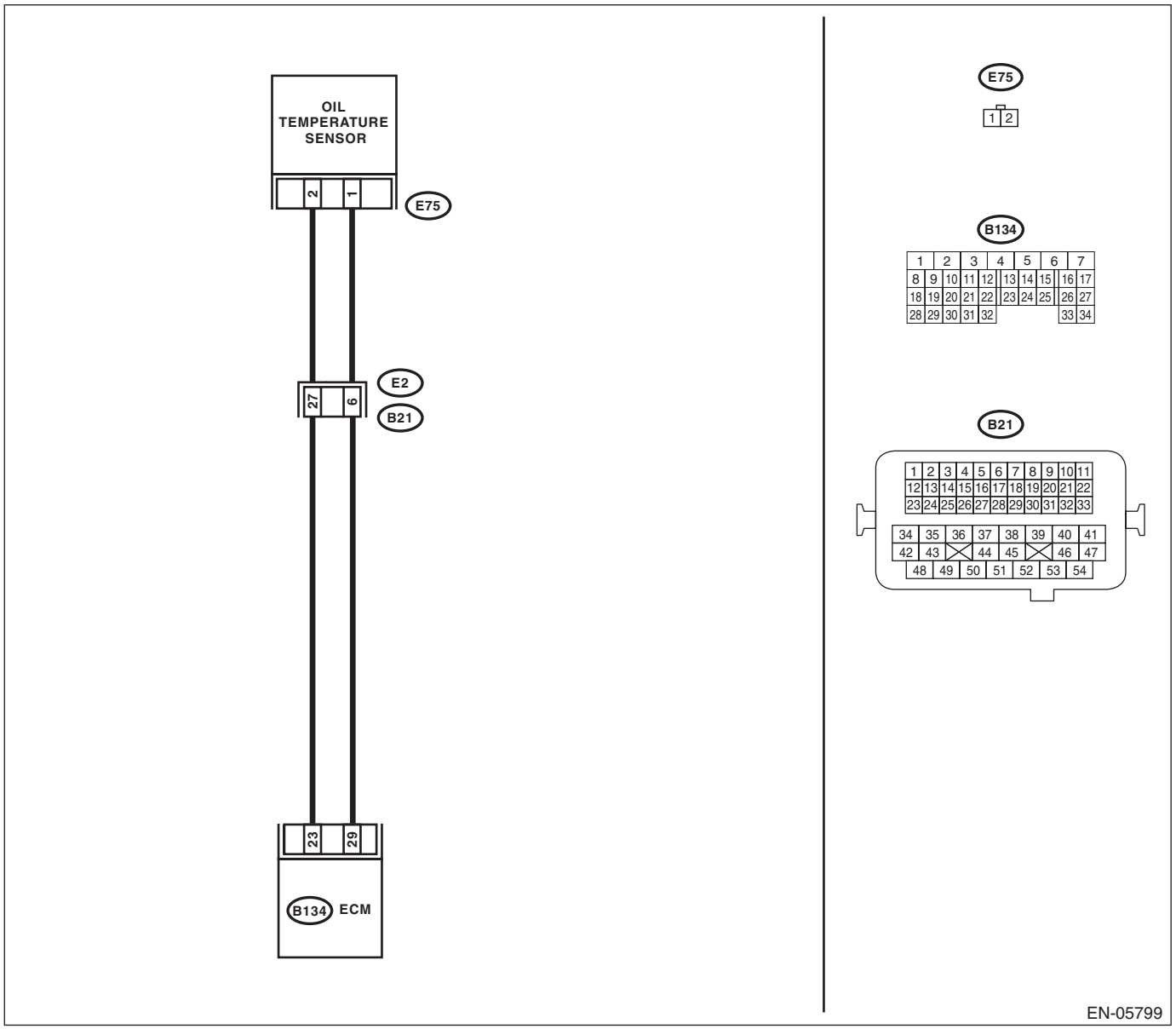
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-80, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-83, List of Diagnostic Trouble Code (DTC).>	Replace the oil temperature sensor. <Ref. to FU(H6DO)-33, Oil Temperature Sensor.>

BG:DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

DTC DETECTING CONDITION:

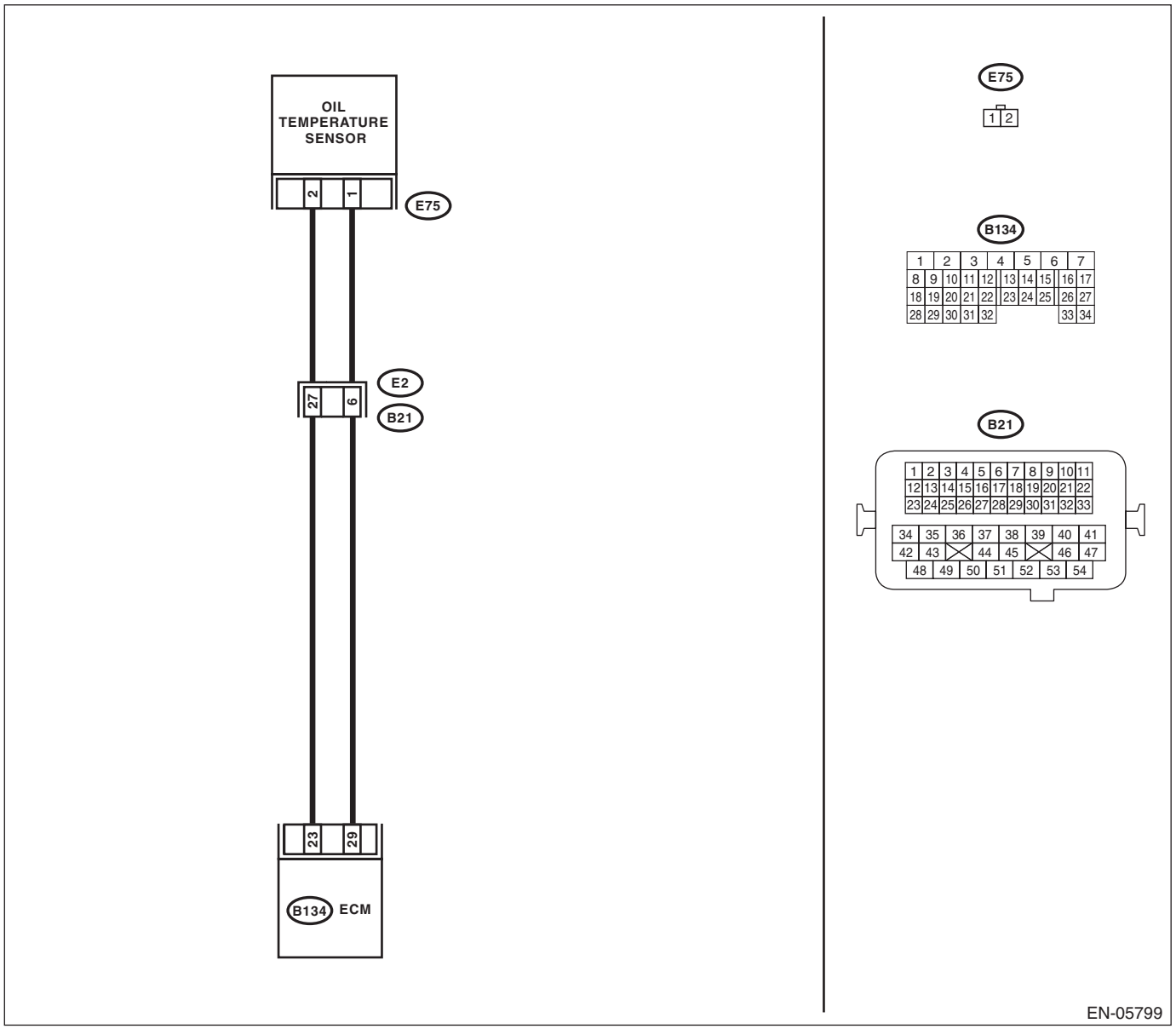
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-82, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of oil temperature sensor signal 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)-34, 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**.	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 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*** ***(B134) No. 23 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the oil temperature sensor. <Ref. to FU(H6DO)-33, Oil Temperature Sensor.>	Repair the short circuit to ground in harness between ECM and oil temperature sensor.

BH:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

DTC DETECTING CONDITION:

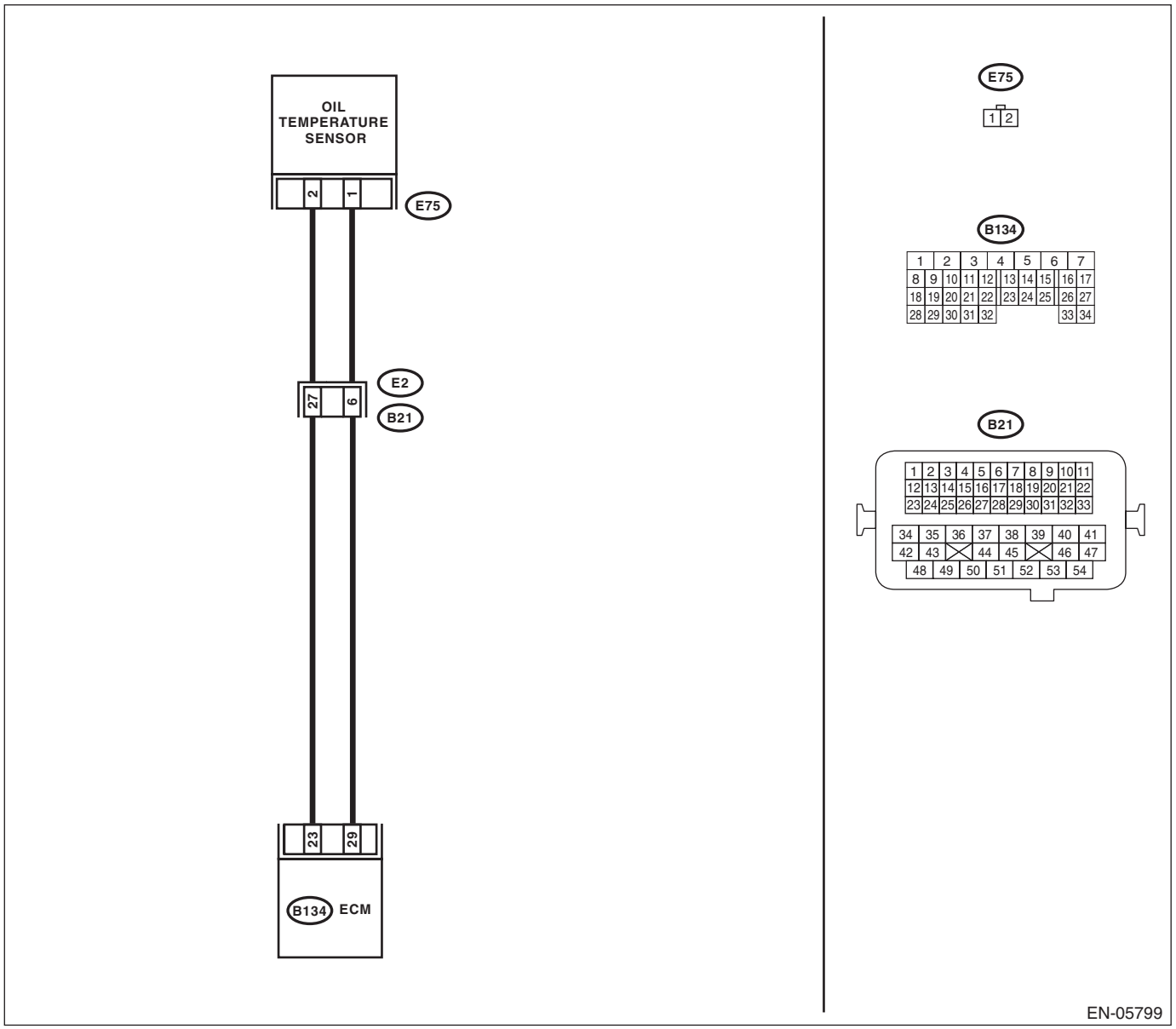
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-83, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of oil temperature sensor signal 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)-34, 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**.	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 may be the cause.
2	**CHECK POOR CONTACT.** Check for poor contact of ECM and oil temperature sensor connector.	Is there poor contact in ECM or oil temperature sensor connector?	Repair the poor contact in ECM or 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 harness between ECM and oil temperature sensor connector. ***Connector & terminal*** ***(B134) No. 23 — (E75) No. 2:*** ***(B134) No. 29 — (E75) 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 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*** ***(B134) No. 23 (+) — 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)-33, Oil Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-84, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

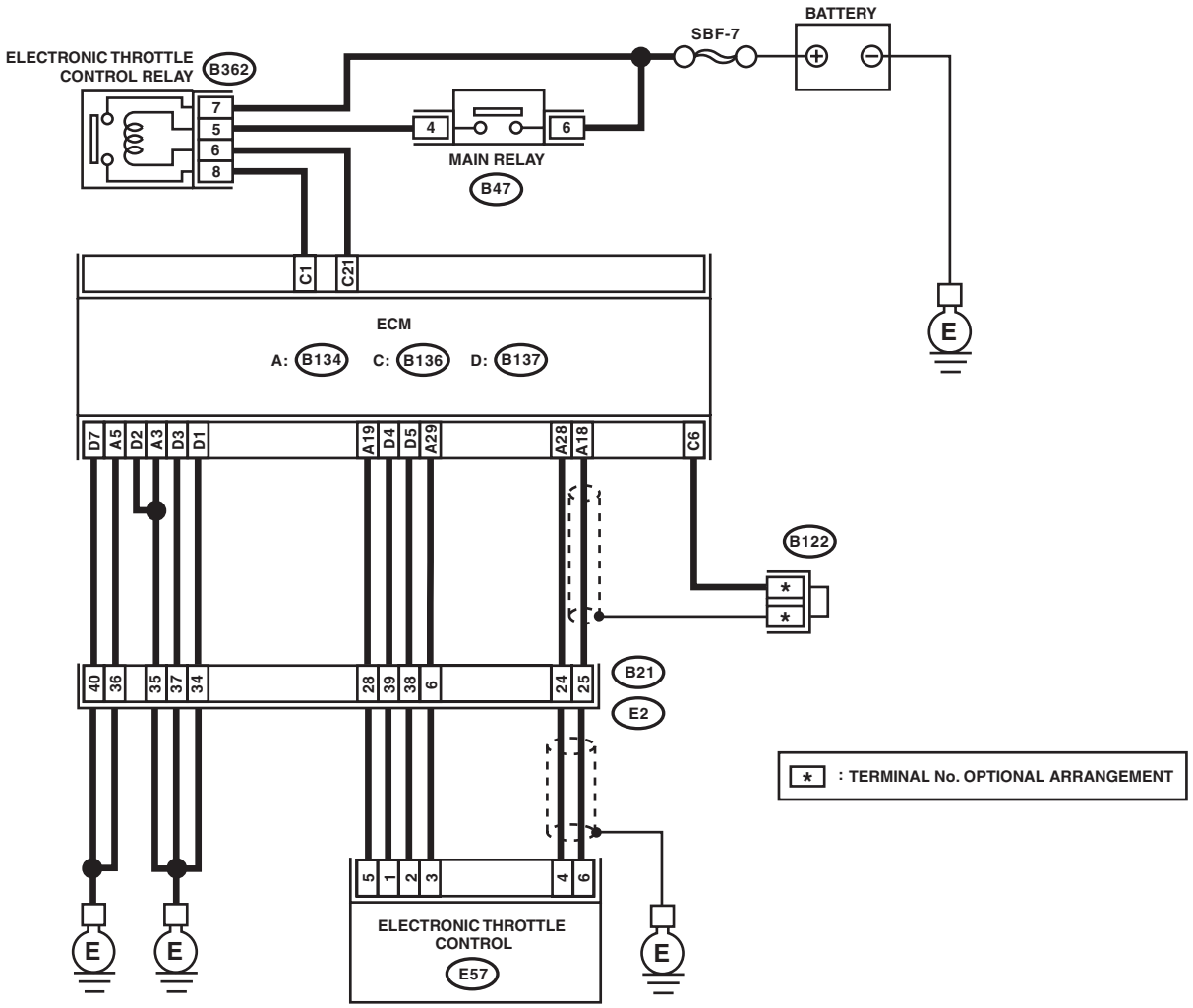
TROUBLE SYMPTOM:

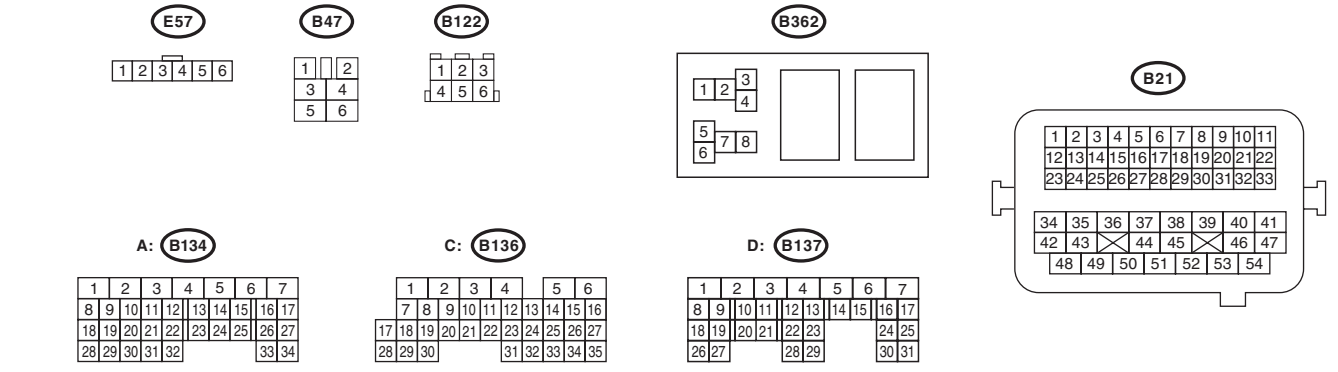
- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06946

	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 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)-15, 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)-38, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

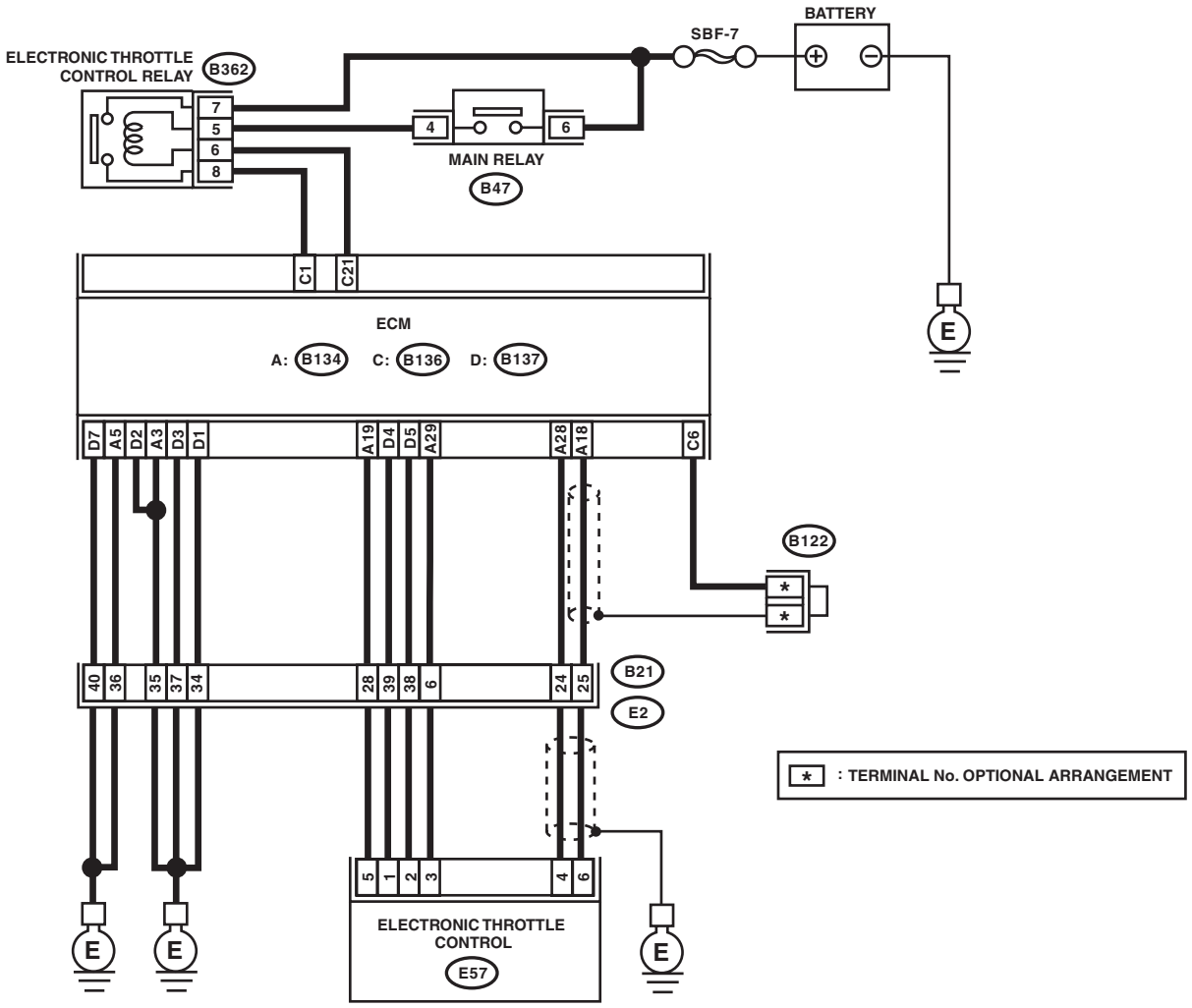
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-85, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

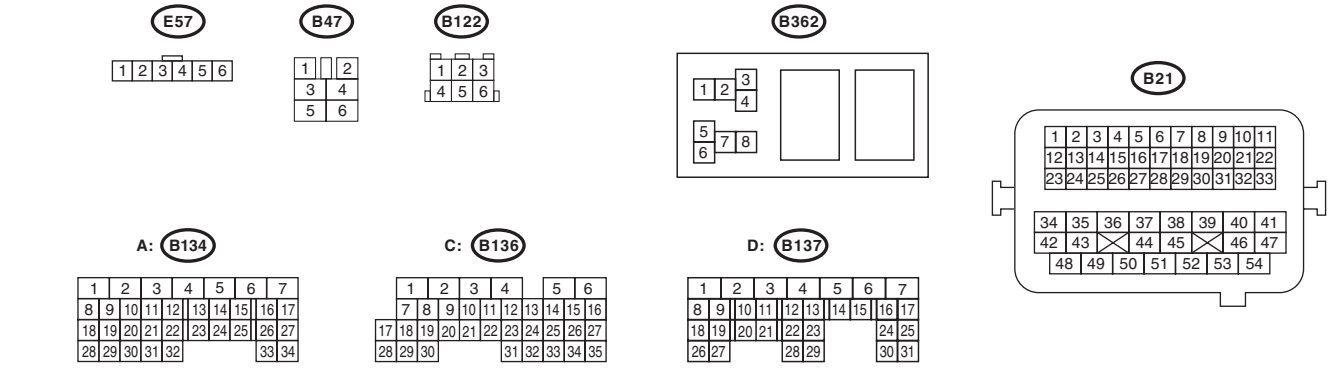
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06946

	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 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 in 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 4.85 V or more?	Repair the short circuit to power in the 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 connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-15, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

BK:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

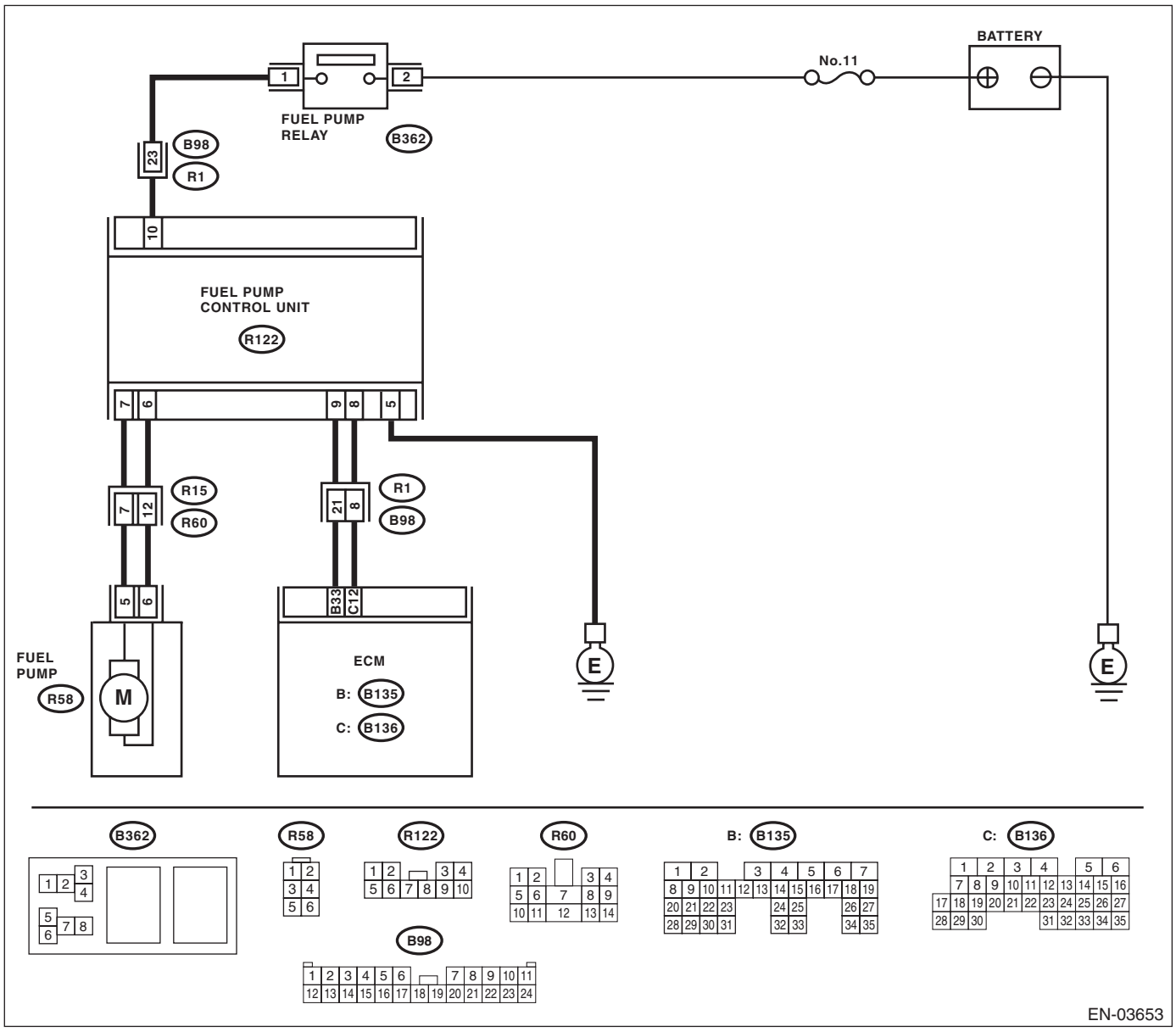
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-86, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 connector 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 control unit connector • Poor contact of fuel pump relay 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 connector and chassis ground. ***Connector & terminal*** ***(R122) 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 between fuel pump control unit connector and chassis ground • Poor contact of fuel pump control unit connector
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 connector 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 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 connector 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.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONTROL UNIT.** 1) Disconnect connectors from the ECM. 2) Measure the resistance of harness between ECM and fuel pump control unit connector. ***Connector & terminal*** ***(B135) No. 33 — (R122) No. 9:*** ***(B136) No. 12 — (R122) No. 8:***	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 between ECM and fuel pump control unit connector • Poor contact of coupling connector
6	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONTROL UNIT.** Measure the resistance between fuel pump control unit connector and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — 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 POOR CONTACT.** Check for poor contact of ECM and fuel pump control unit connector.	Is there poor contact of ECM and fuel pump control unit connector?	Repair the poor contact of ECM and 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)-42, Fuel Pump Control Unit.>

BL:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-208, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BM:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-208, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BN:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-208, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BO:DTC P0304 CYLINDER 4 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-208, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BP:DTC P0305 CYLINDER 5 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-208, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BQ:DTC P0306 CYLINDER 6 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-93, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

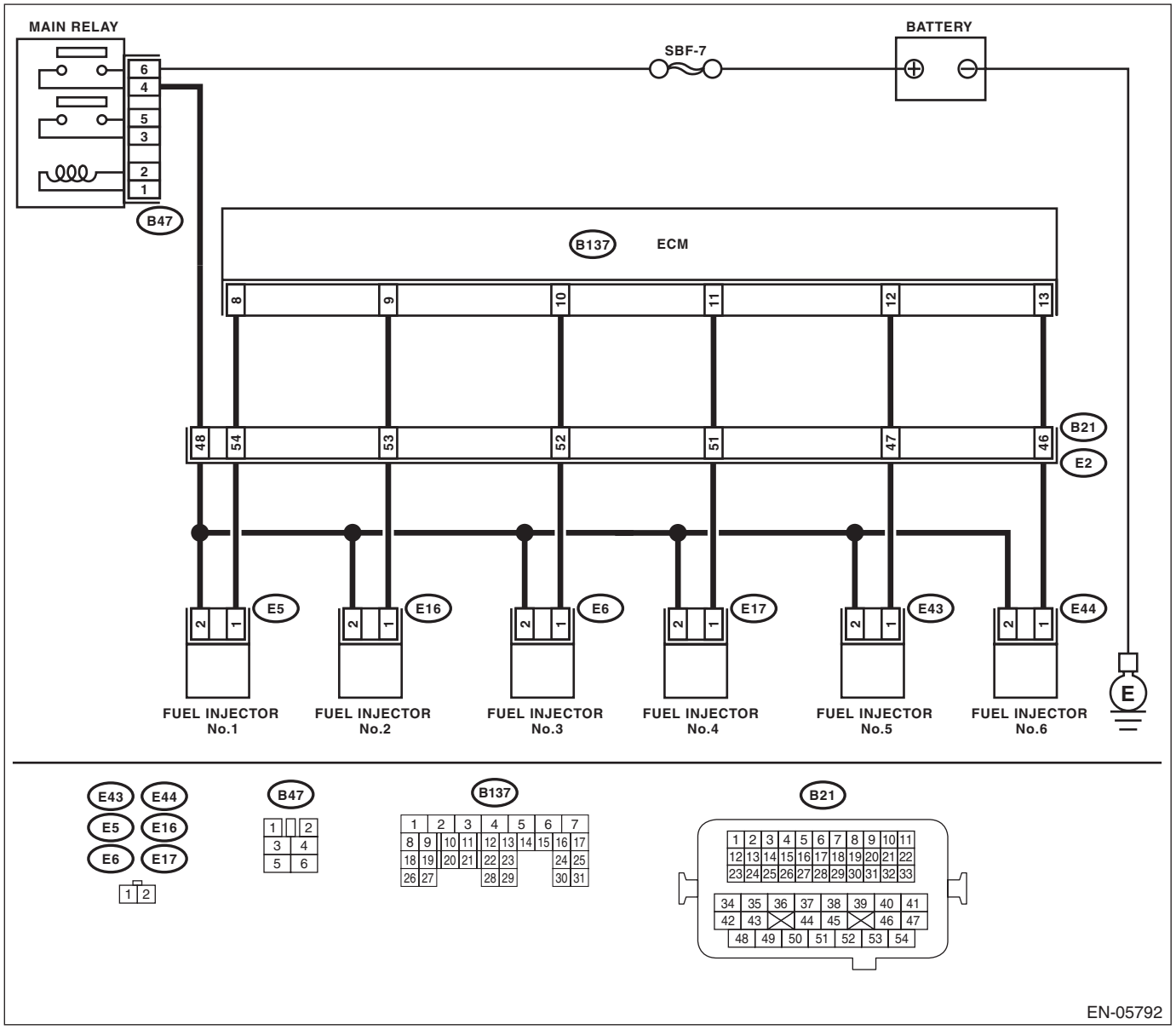
TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling
- Rough driving

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 (B137) No. 8 (+) — Chassis ground (–):*** ***#2 (B137) No. 9 (+) — Chassis ground (–):*** ***#3 (B137) No. 10 (+) — Chassis ground (–):*** ***#4 (B137) No. 11 (+) — Chassis ground (–):*** ***#5 (B137) No. 12 (+) — Chassis ground (–):*** ***#6 (B137) No. 13 (+) — 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 ground short circuit of harness between ECM and fuel injector.
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 (B137) No. 8 — (E5) No. 1:*** ***#2 (B137) No. 9 — (E16) No. 1:*** ***#3 (B137) No. 10 — (E6) No. 1:*** ***#4 (B137) No. 11 — (E17) No. 1:*** ***#5 (B137) No. 12 — (E43) No. 1:*** ***#6 (B137) No. 13 — (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 of 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 between 5 — 20 Ω?	Go to step **5**.	Replace the faulty fuel injector. <Ref. to FU(H6DO)-30, Fuel Injector.>
5	**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

	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 (B137) No. 8 (+) — Chassis ground (–):*** ***#2 (B137) No. 9 (+) — Chassis ground (–):*** ***#3 (B137) No. 10 (+) — Chassis ground (–):*** ***#4 (B137) No. 11 (+) — Chassis ground (–):*** ***#5 (B137) No. 12 (+) — Chassis ground (–):*** ***#6 (B137) No. 13 (+) — 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 **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 less than 1 Ω?	Replace the faulty fuel injector. <Ref. to FU(H6DO)-30, 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)-93, 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)-53, 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 fuel meter indication is higher than the “Lower” level. After replenishing fuel, Go to step **13**.	Go to step **12**.
12	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using Subaru Select Monitor or general scan tool. <Ref. to EN(H6DO)(diag)-54, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	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.**	Has the cause of misfire been detected while running the engine?	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 in fuel injector connector on faulty cylinders • Poor contact in 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is only one DTC displayed on the Subaru Select Monitor or general scan tool?	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.**	Are DTC P0305 and P0306 displayed?	Go to step **24**.	Go to step **19**.
19	**CHECK DTC ON DISPLAY.**	Are DTC P0301, P0303 and P0305 displayed?	Go to step **25**.	Go to step **20**.
20	**CHECK DTC ON DISPLAY.**	Are 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)-83, 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)-75, 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)-83, 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)-75, 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)-83, 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)-75, 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)-83, 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)-83, 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)-83, 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)-83, List of Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio

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

DTC DETECTING CONDITION:

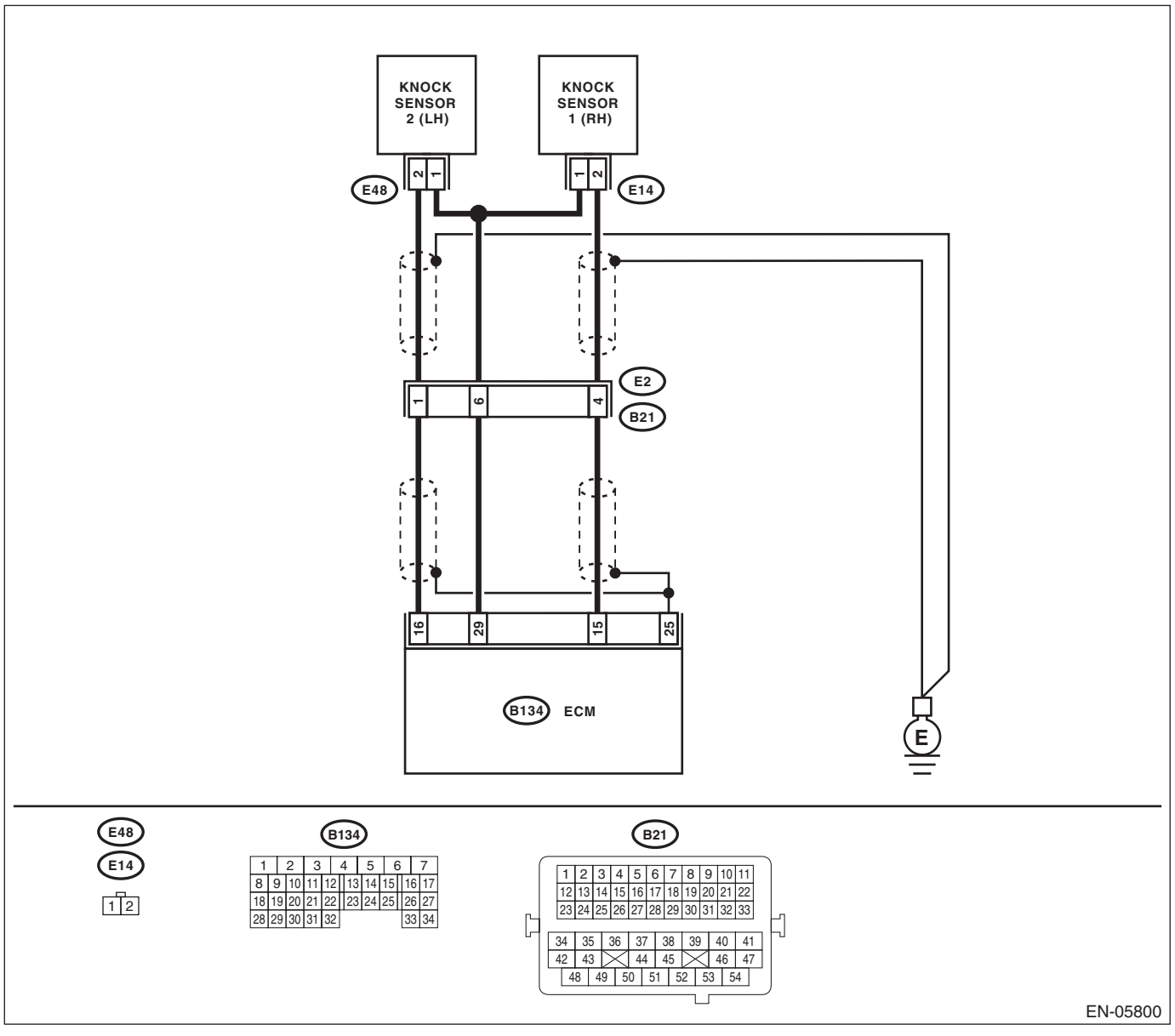
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-94, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 15 — (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)-25, Knock Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and knock sensor • Poor contact of the knock sensor connector • Poor contact of coupling connector

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

DTC DETECTING CONDITION:

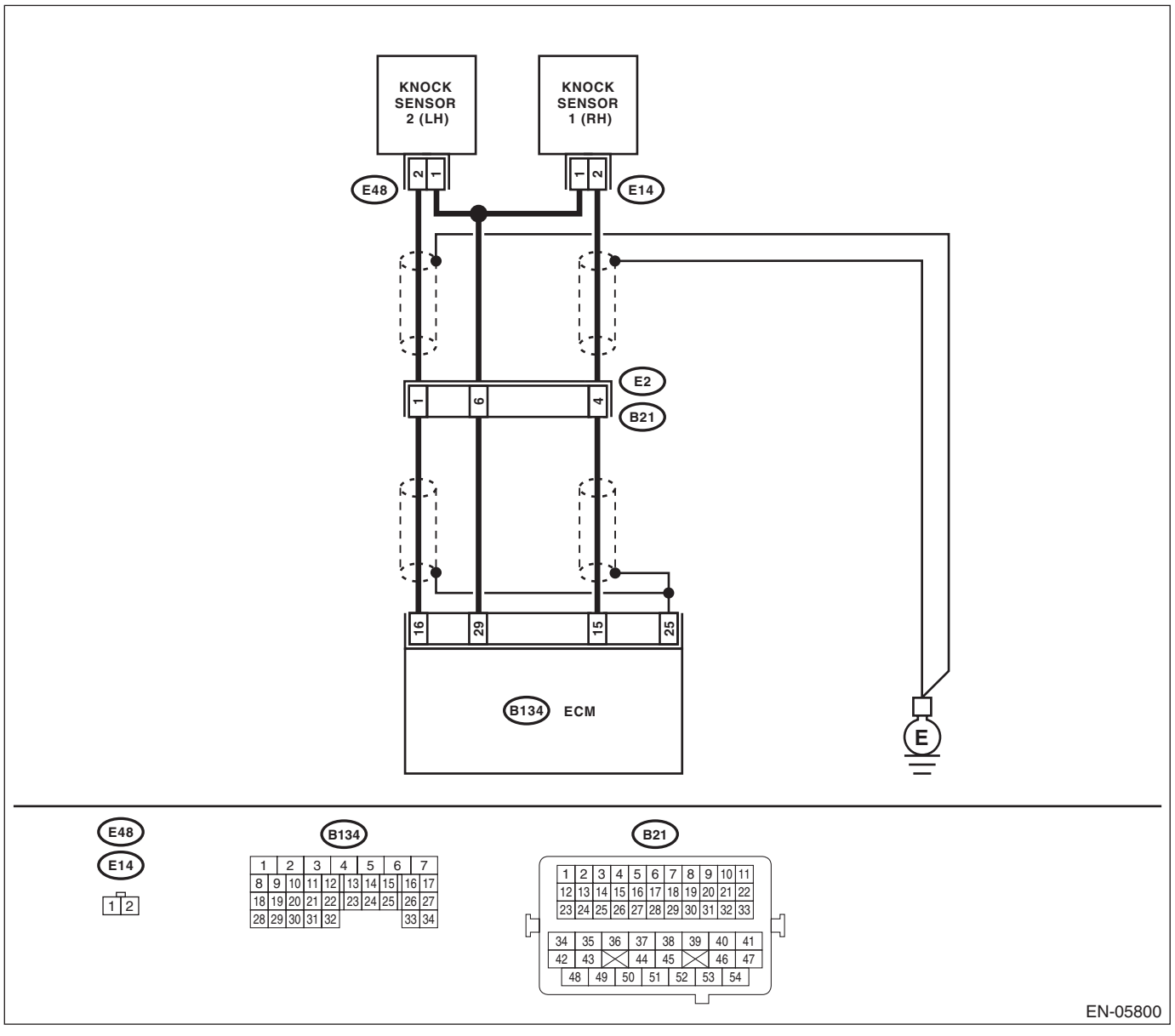
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-96, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 15 — (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)-25, 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 ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 15 (+) — Chassis ground (–):***	Is the voltage 2 V or more?	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 may be the cause.	Repair the poor contact of ECM connector.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-97, DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

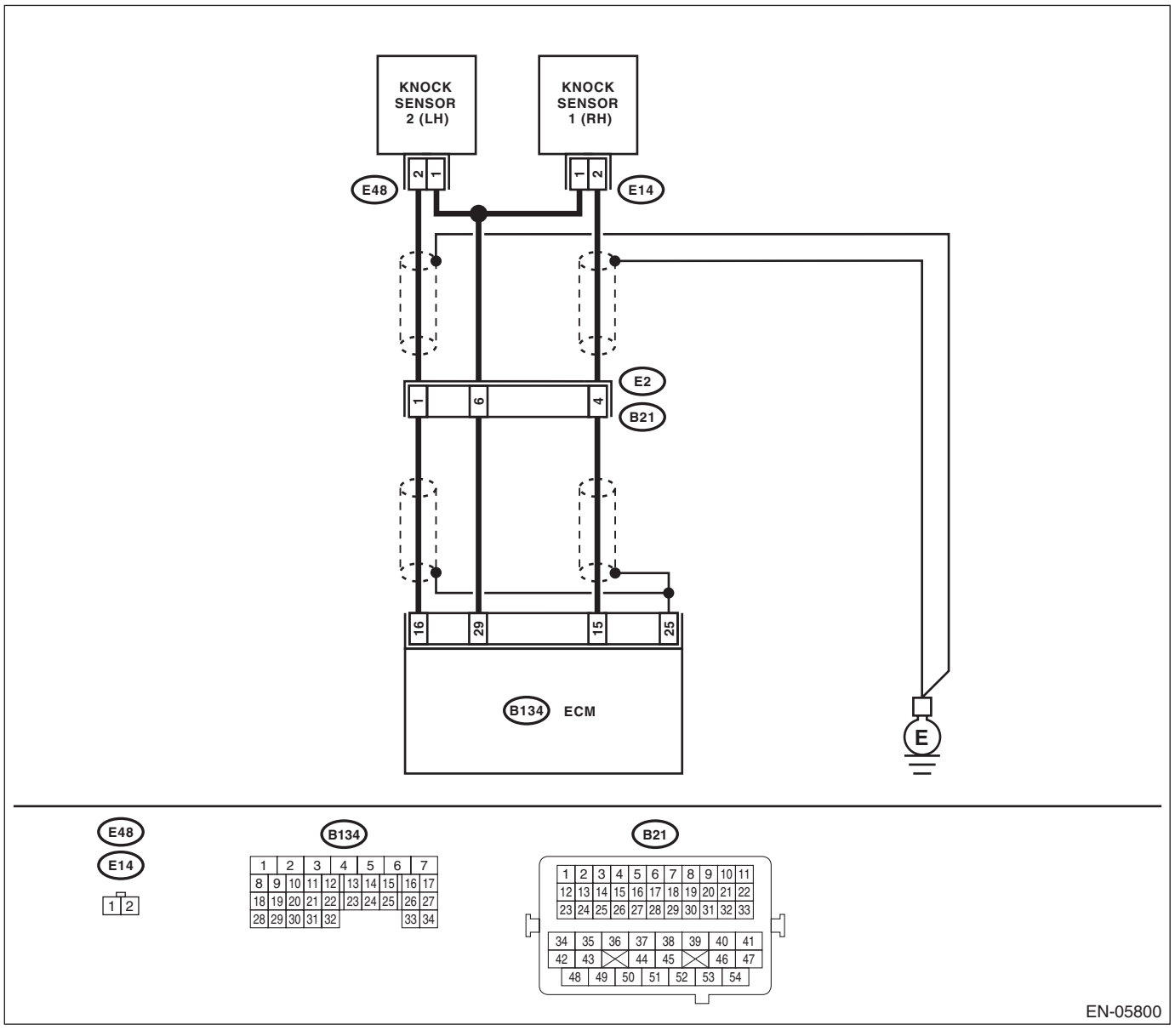
TROUBLE SYMPTOM:

- Driving performance problem
- Knocking is occurred.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 16 — (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)-25, Knock Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and knock sensor • Poor contact of the knock sensor connector • Poor contact of coupling connector

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

DTC DETECTING CONDITION:

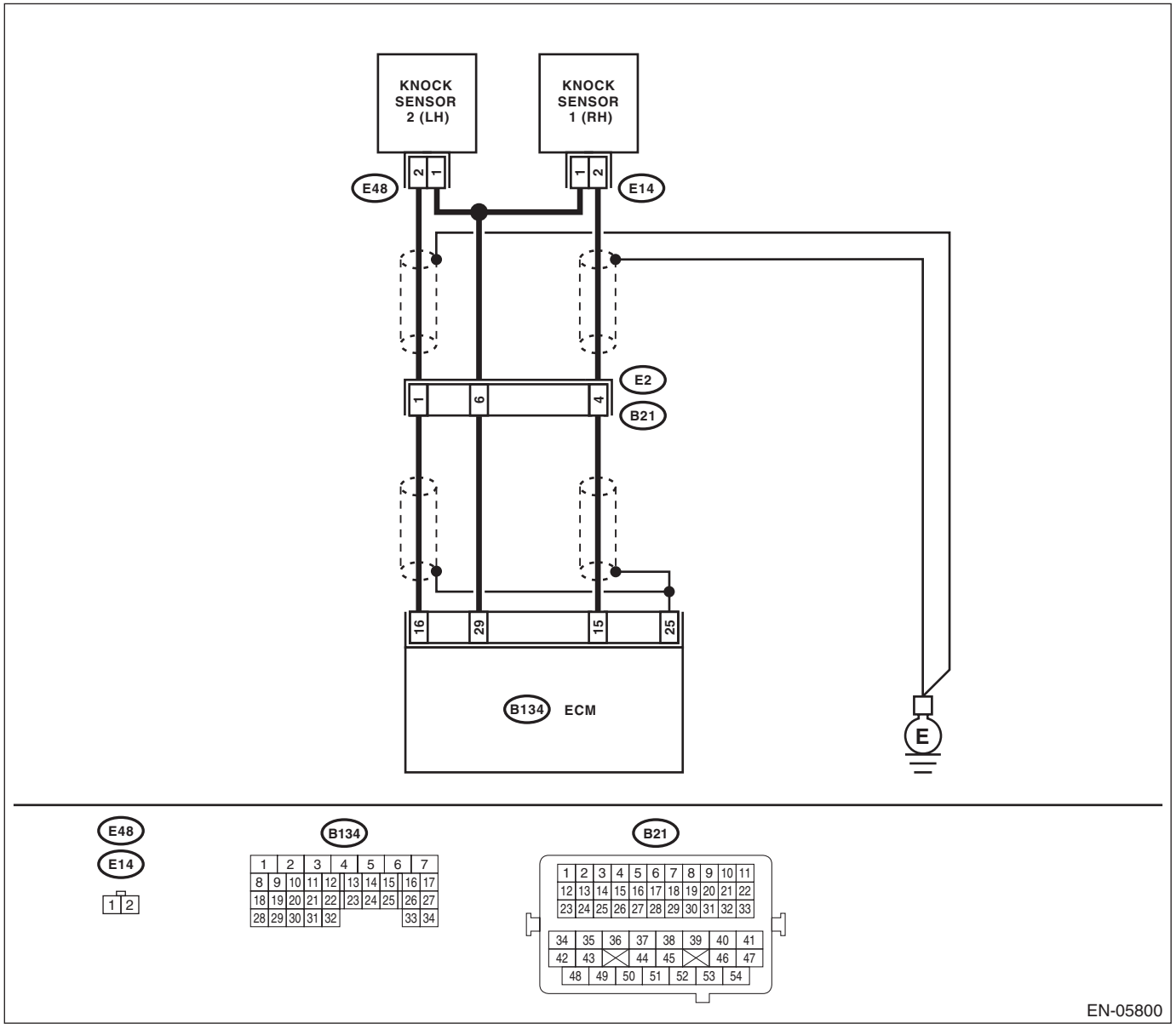
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-97, DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Driving performance problem
- Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 16 — (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)-25, 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 ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the voltage 2 V or more?	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 may be the cause.	Repair the poor contact of ECM connector.

BV:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

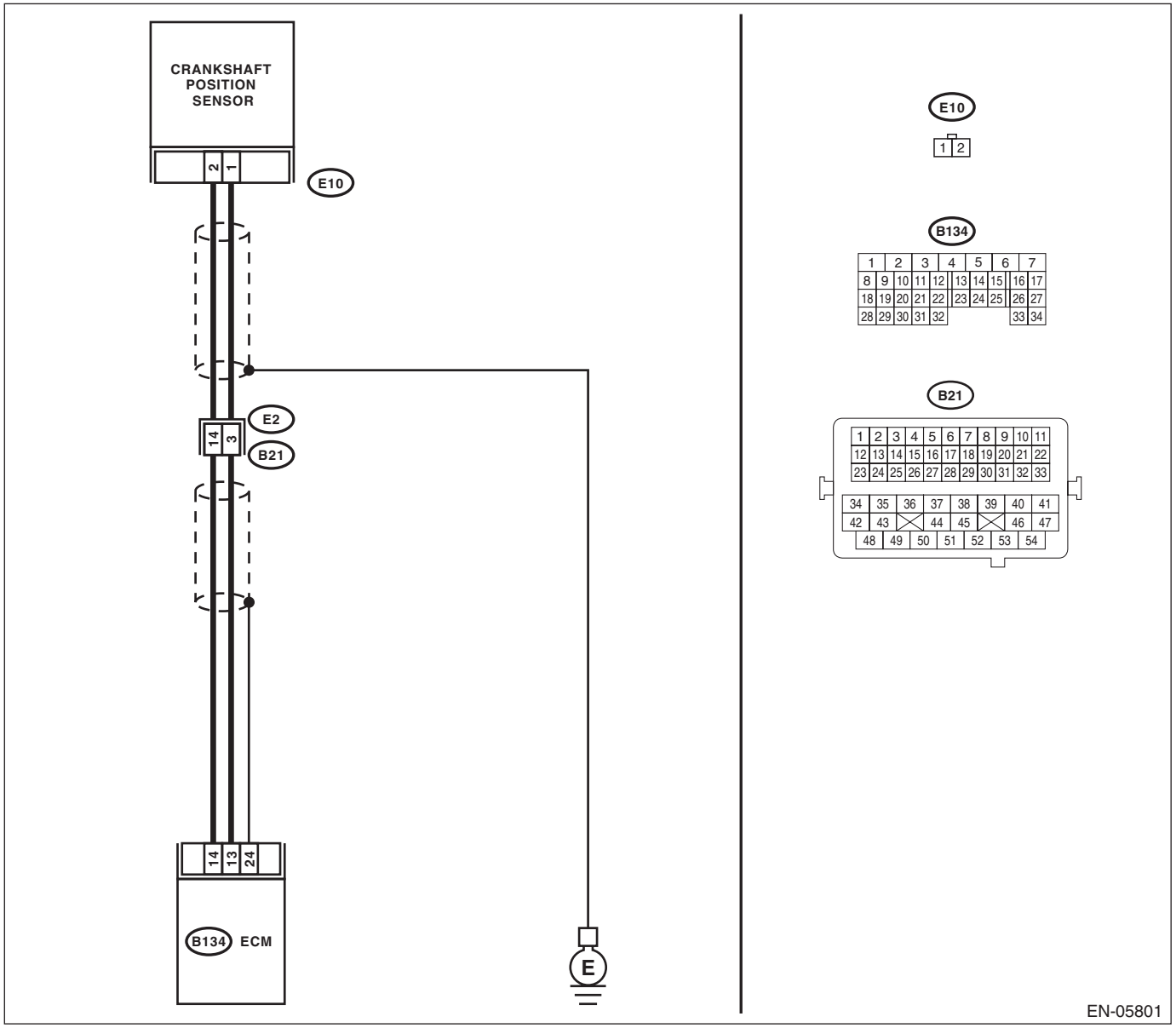
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-98, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 connector terminals of crankshaft position sensor. ***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)-23, Crankshaft Position Sensor.>
3	**CHECK HARNESS BETWEEN ECM AND CRANK SHAFT POSITION SENSOR.** 1) Disconnect connectors from the ECM. 2) Measure the resistance of harness between ECM and crankshaft position sensor connector. ***Connector & terminal*** ***(B134) No. 13 — (E10) No. 1:*** ***(B134) No. 14 — (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

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-100, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

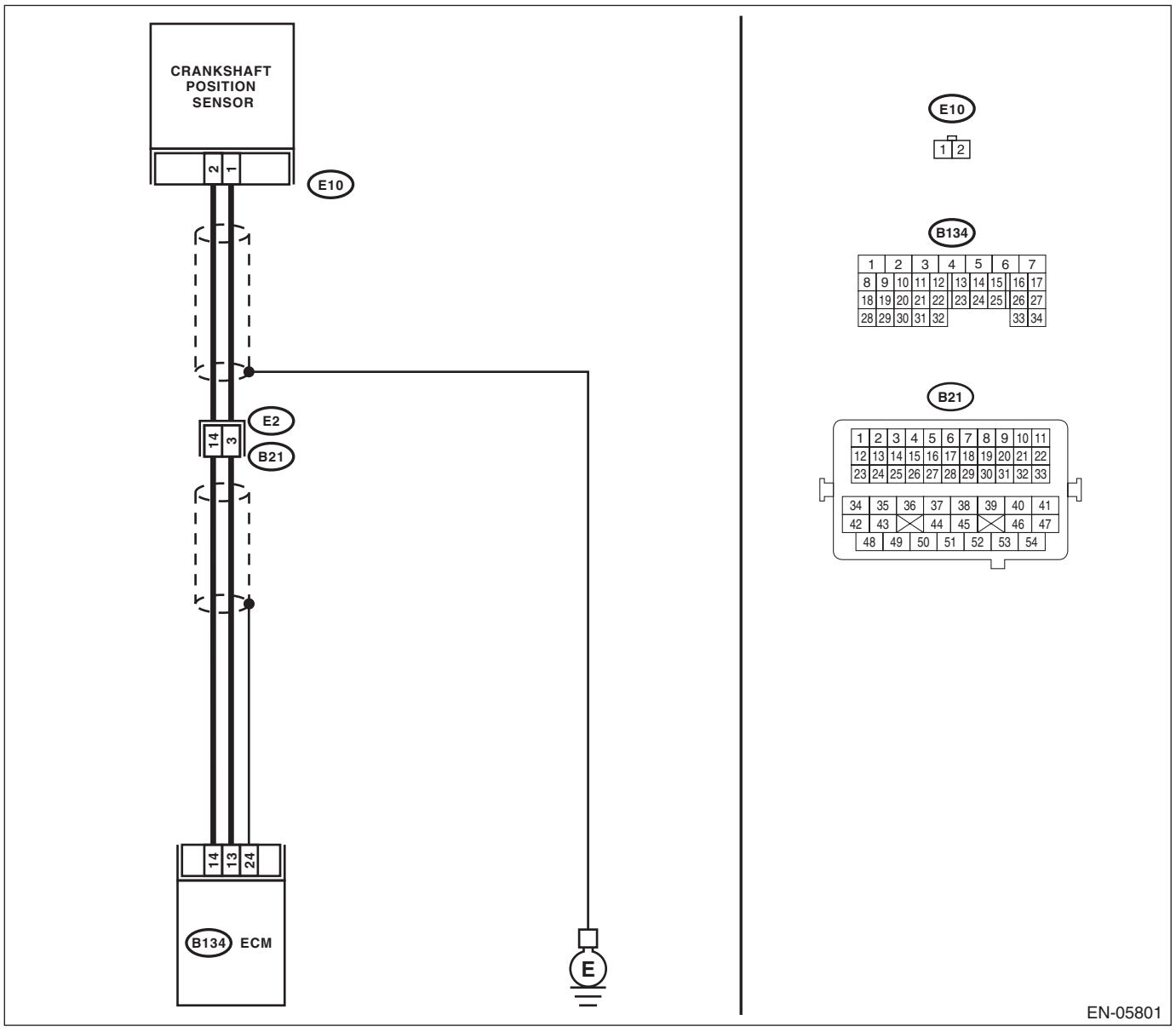
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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.**	Are the crankshaft plate teeth cracked or damaged?	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.	Is the timing chain dislocated from its proper position?	Correct the installation condition of timing chain. <Ref. to ME(H6DO)-53, Timing Chain Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(H6DO)-23, Crankshaft Position Sensor.>

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

DTC DETECTING CONDITION:

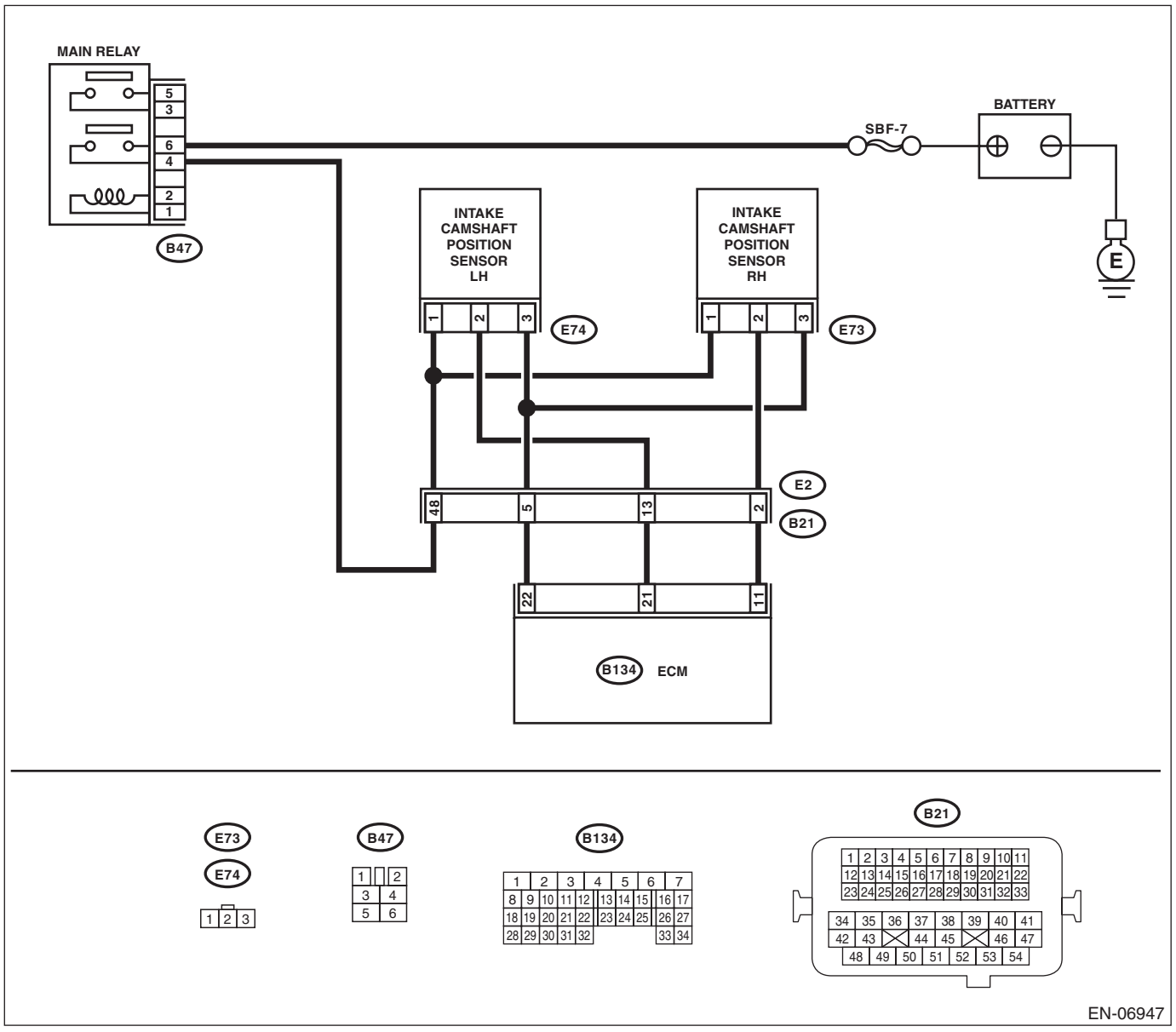
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-102, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 the 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 open or ground short circuit in harness between main relay connector and camshaft position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between the ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B134) No. 11 — (E73) No. 2:*** ***(B134) No. 22 — (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 the 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)-17, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-24, Camshaft Position Sensor.>	Repair the following item. • Poor contact in ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-103, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

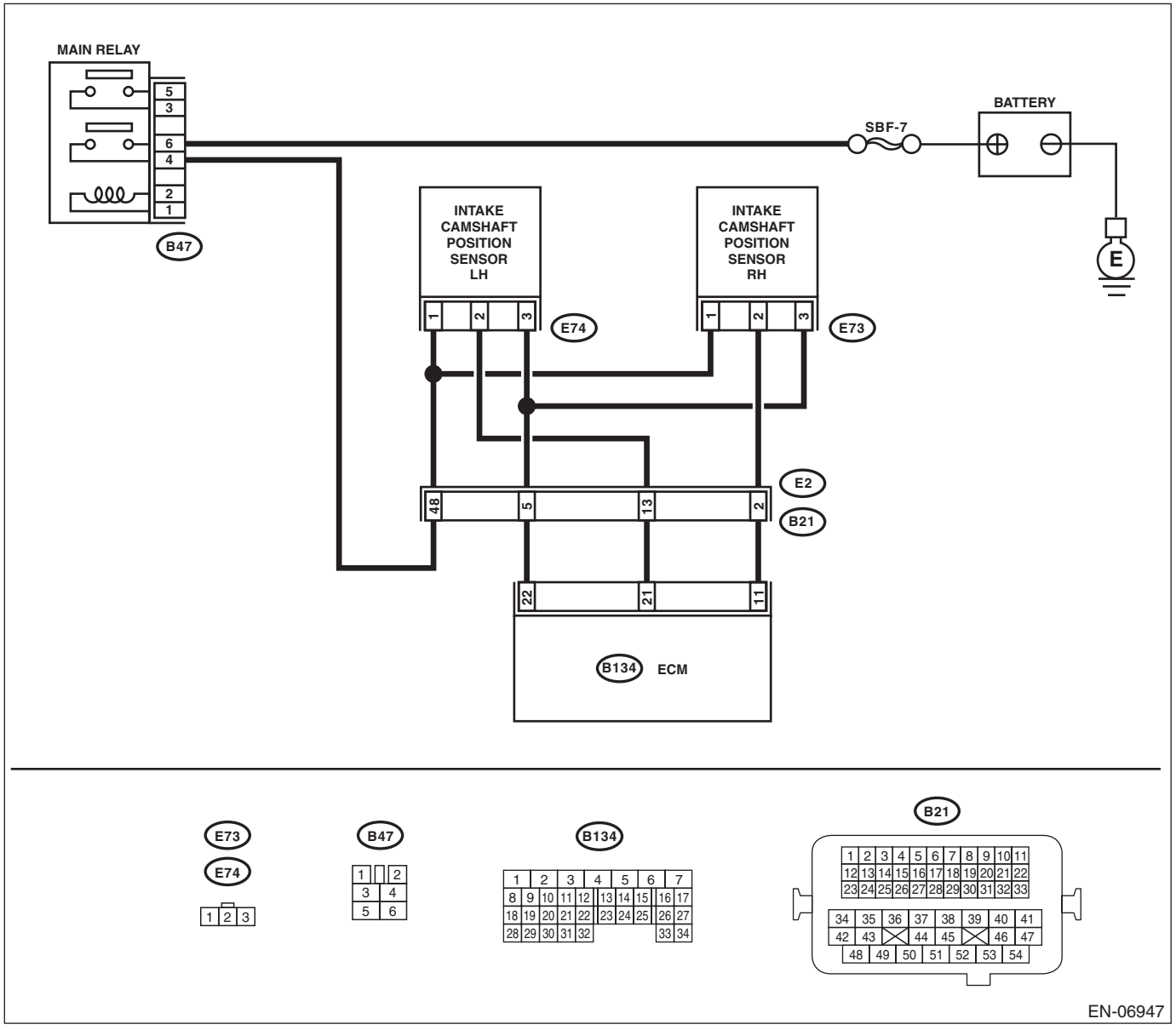
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



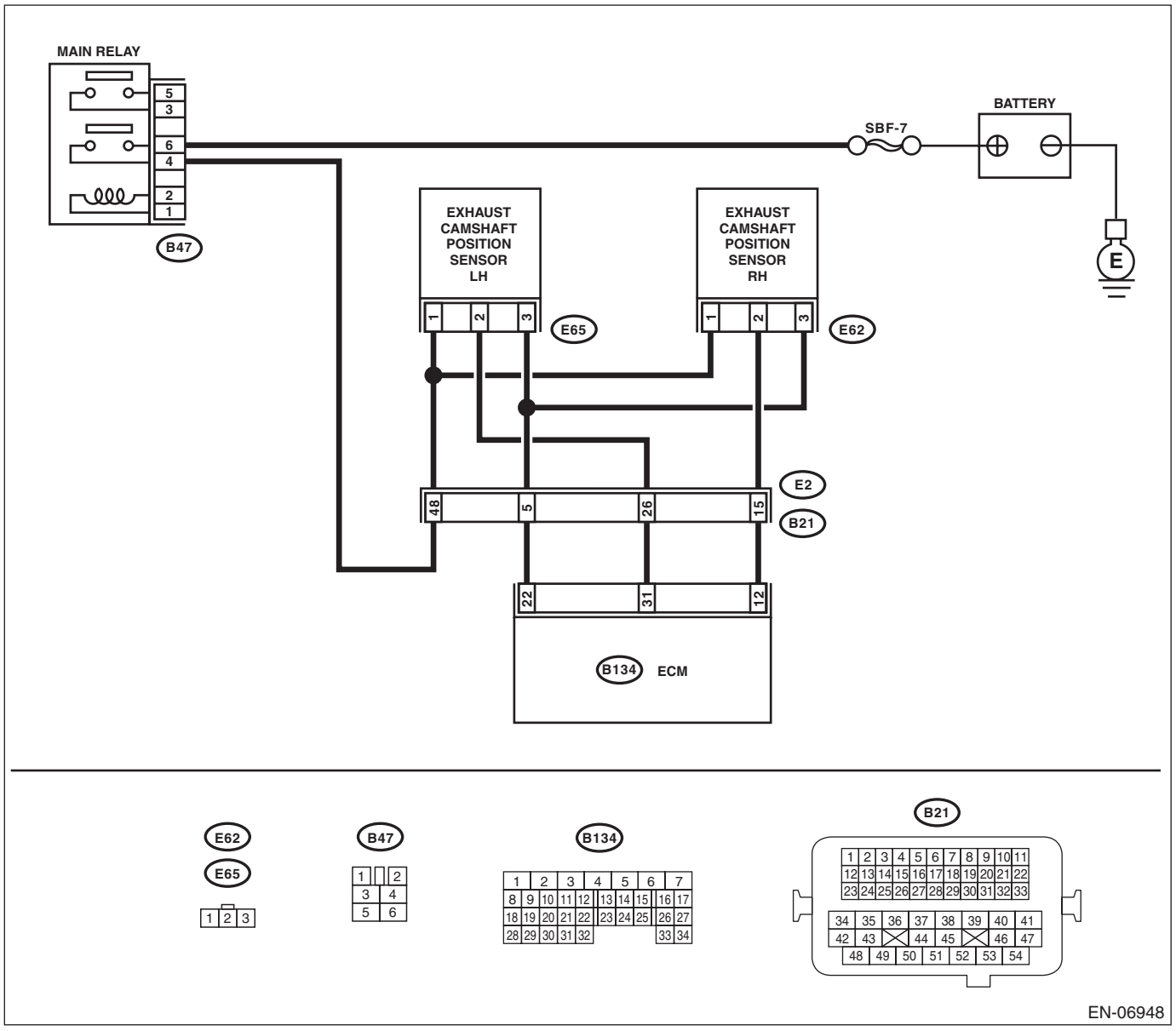
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the camshaft position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E74) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the open or ground short circuit in harness between main relay connector and camshaft position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between the ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B134) No. 21 — (E74) No. 2:*** ***(B134) No. 22 — (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 the 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)-17, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-24, Camshaft Position Sensor.>	Repair the following item. • Poor contact in ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

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

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



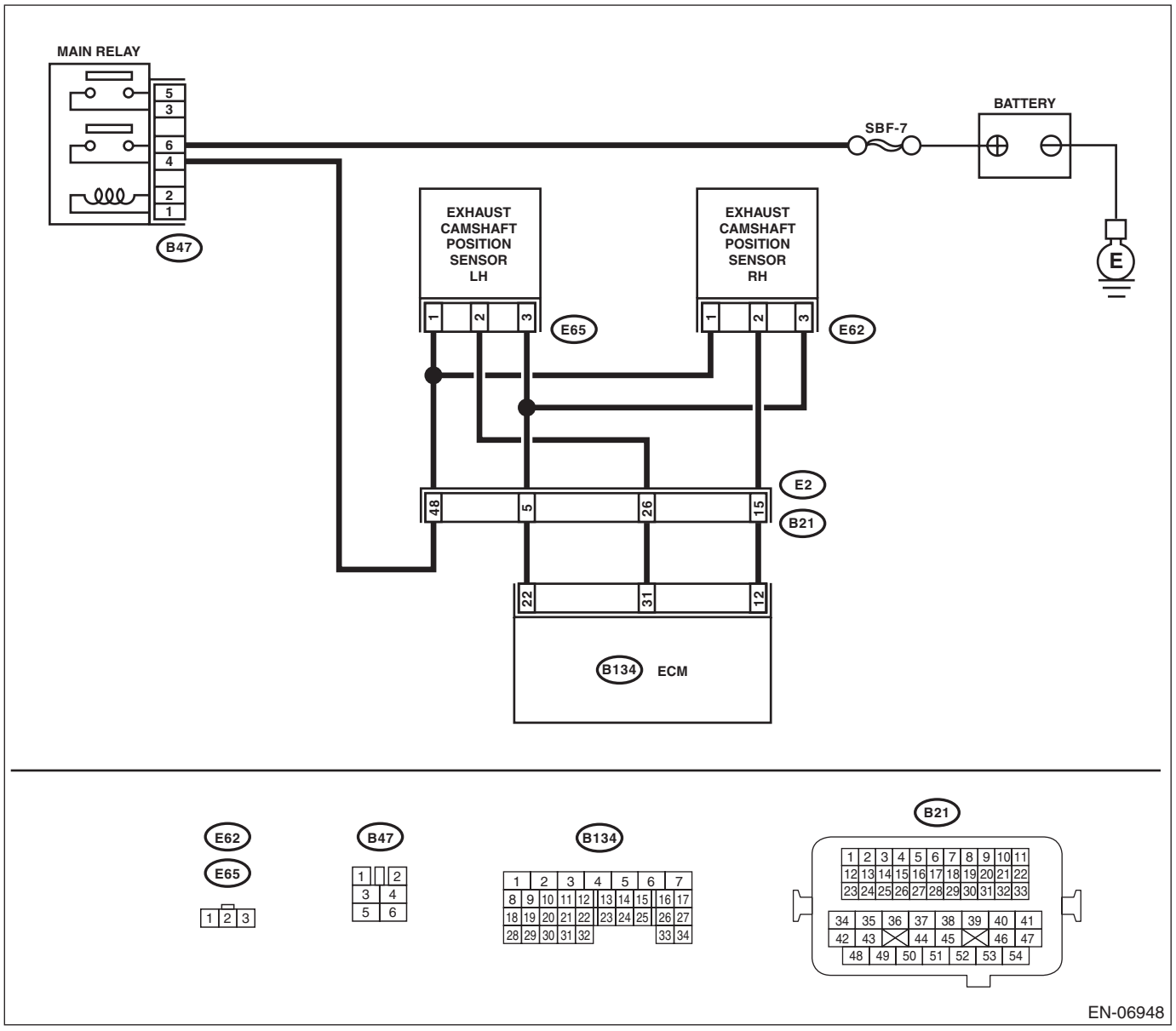
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the camshaft position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E62) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the open or ground short circuit in harness between main relay connector and camshaft position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between the ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B134) No. 12 — (E62) No. 2:*** ***(B134) No. 22 — (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 the 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)-17, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-24, Camshaft Position Sensor.>	Repair the following item. • Poor contact in ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

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

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 the 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 open or ground short circuit in harness between main relay connector and camshaft position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between the ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B134) No. 31 — (E65) No. 2:*** ***(B134) No. 22 — (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 the 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)-17, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-24, Camshaft Position Sensor.>	Repair the following item. • Poor contact in ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

CB:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

DTC DETECTING CONDITION:

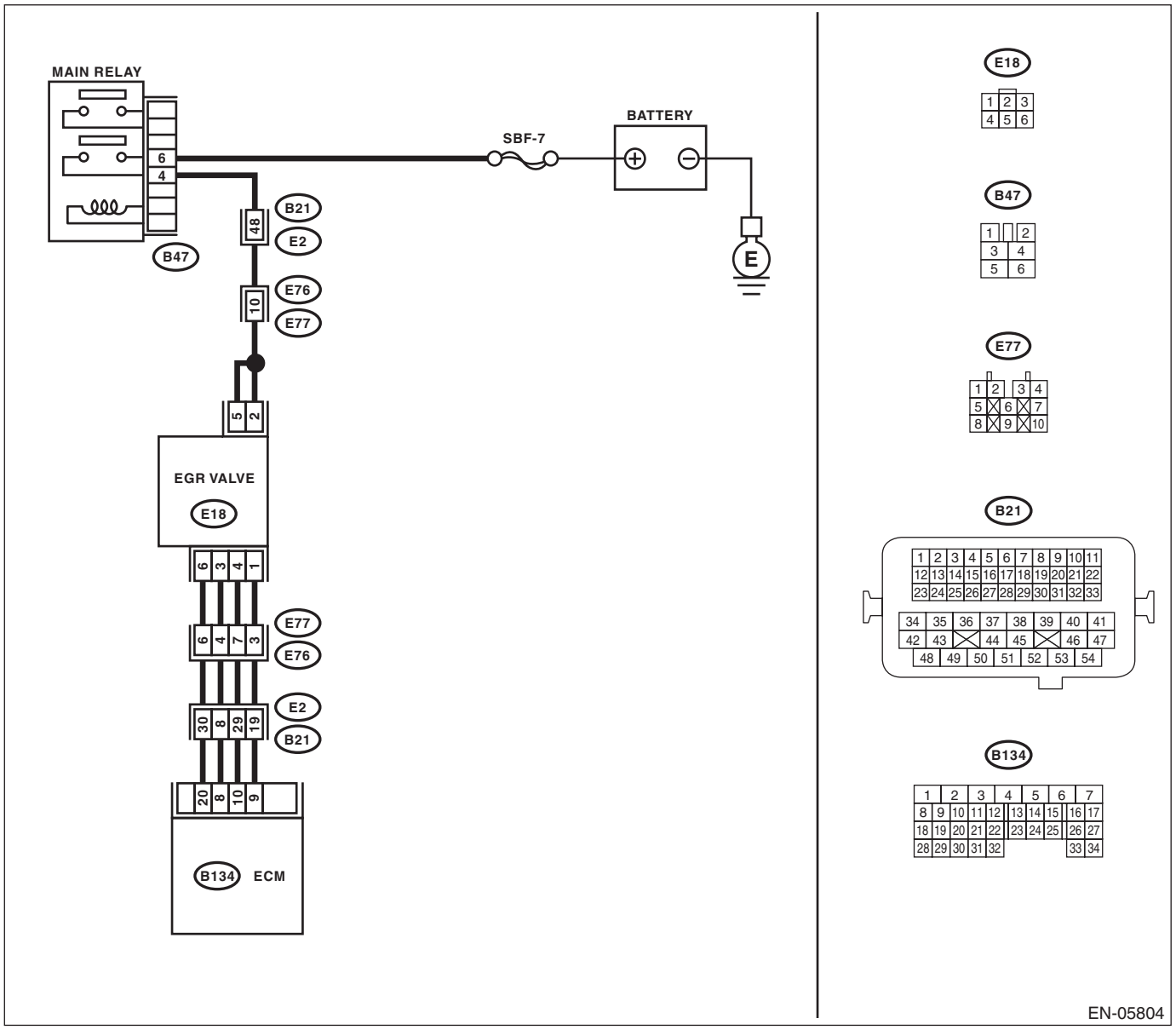
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-106, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

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

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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 holes, plugged piping or foreign objects caught in the EGR system?	Repair the EGR system.	Replace the EGR valve. <Ref. to FU(H6DO)-29, EGR Valve.>

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

DTC DETECTING CONDITION:

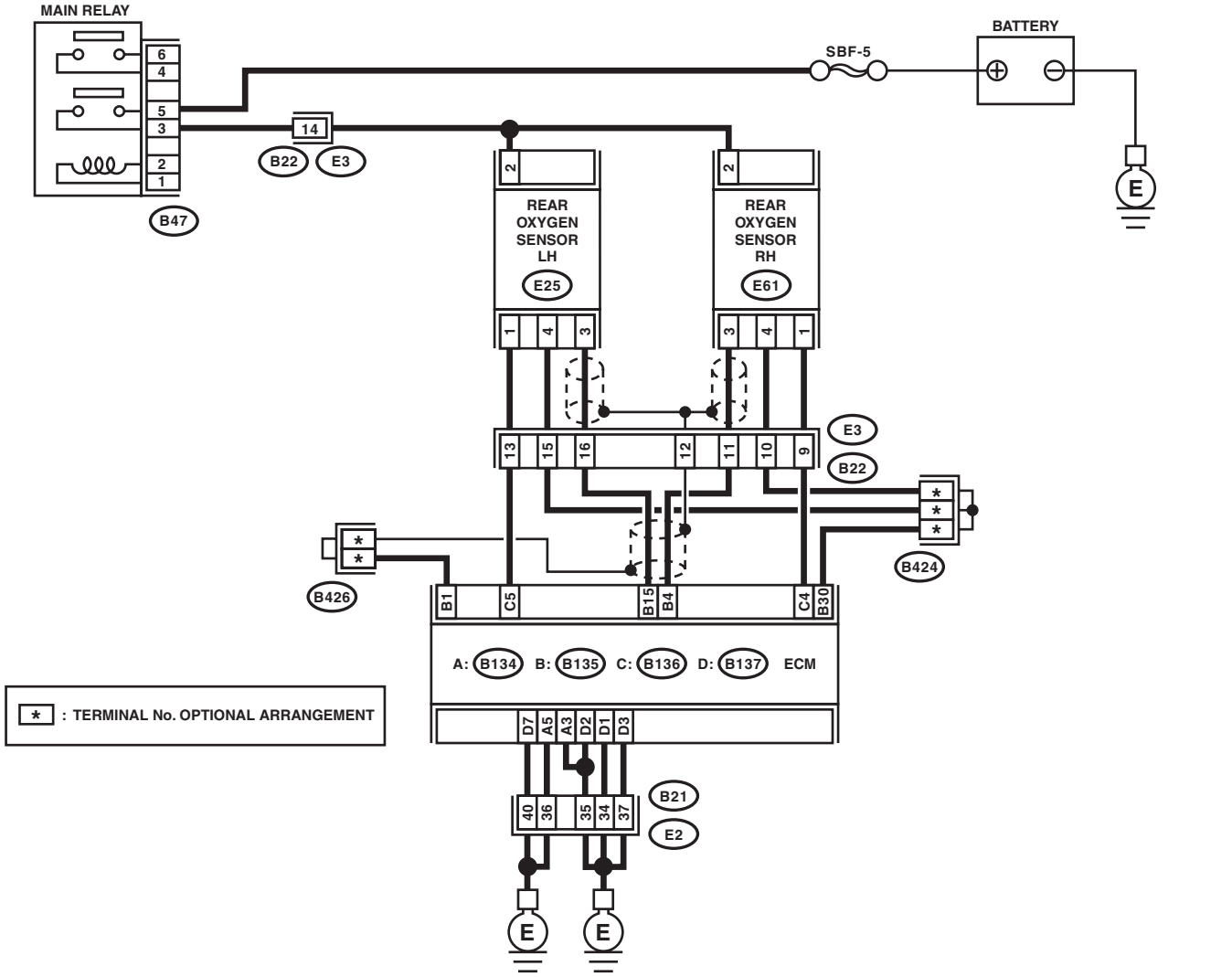
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-109, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

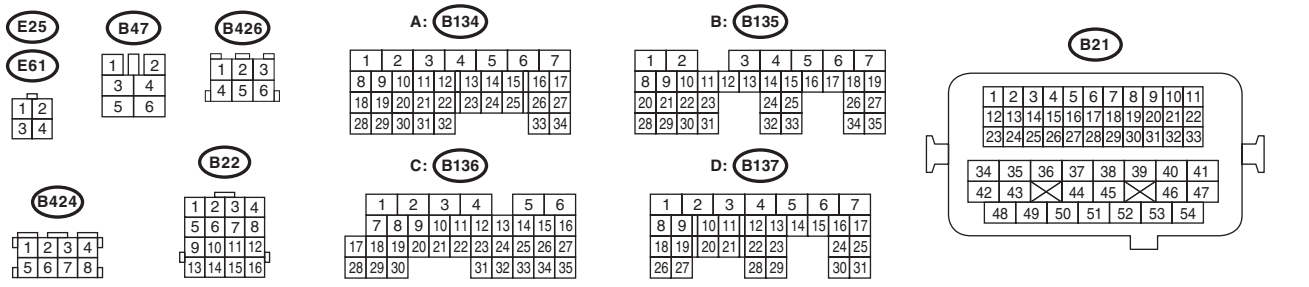
TROUBLE SYMPTOM:

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

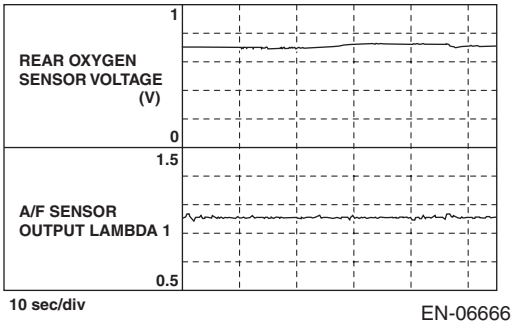
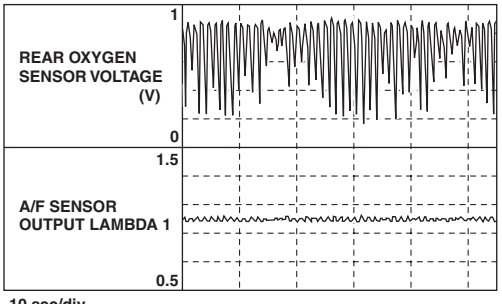
CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

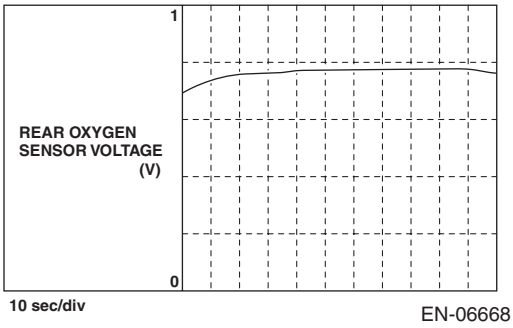
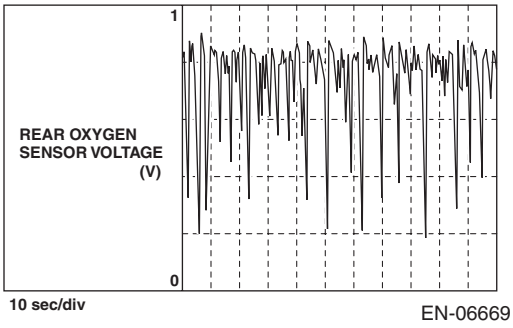
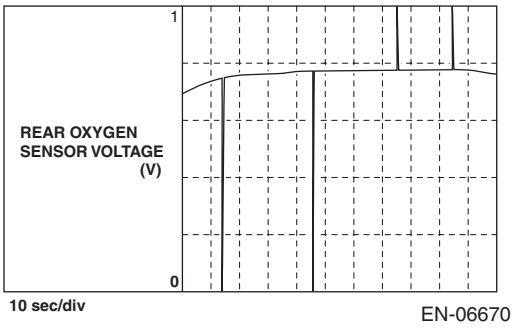
WIRING DIAGRAM:





EN-06945

	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 • Looseness and improper attachment of 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 normal waveform pattern displayed?	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 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 normal waveform pattern 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*** ***(B135) No. 4 — (E61) No. 3:*** ***(B135) No. 30 — (E61) No. 4:*** ***(B135) No. 15 — (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) Turn the ignition switch to ON. 2) Measure the resistance 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 of harness between the ECM and rear oxygen sensor • Poor contact in ECM and rear oxygen sensor • Poor contact in ECM 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 the sensor shield and chassis ground.	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-36, Rear Oxygen Sensor.>	Repair the open circuit in the rear oxygen sensor harness.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-111, 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-48, 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: The drain valve can be operated using Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H6DO)-13, 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 the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-55, 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.>

	Step	Check	Yes	No
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 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H6DO)-58, Fuel Delivery & Evaporation Lines.>	Go to step **7**.
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)-45, 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)-45, 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 disconnections, 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.

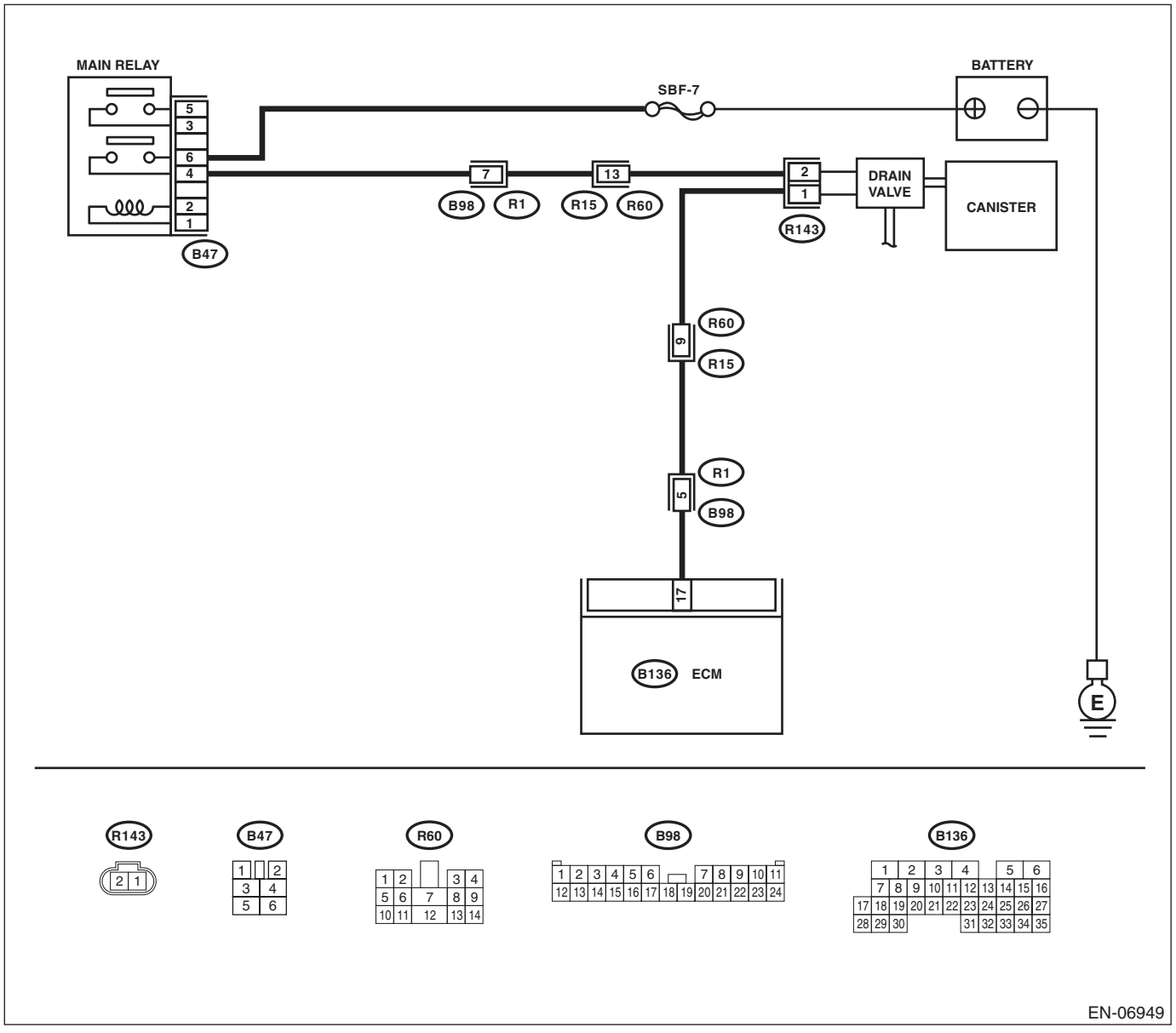
CE:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-127, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



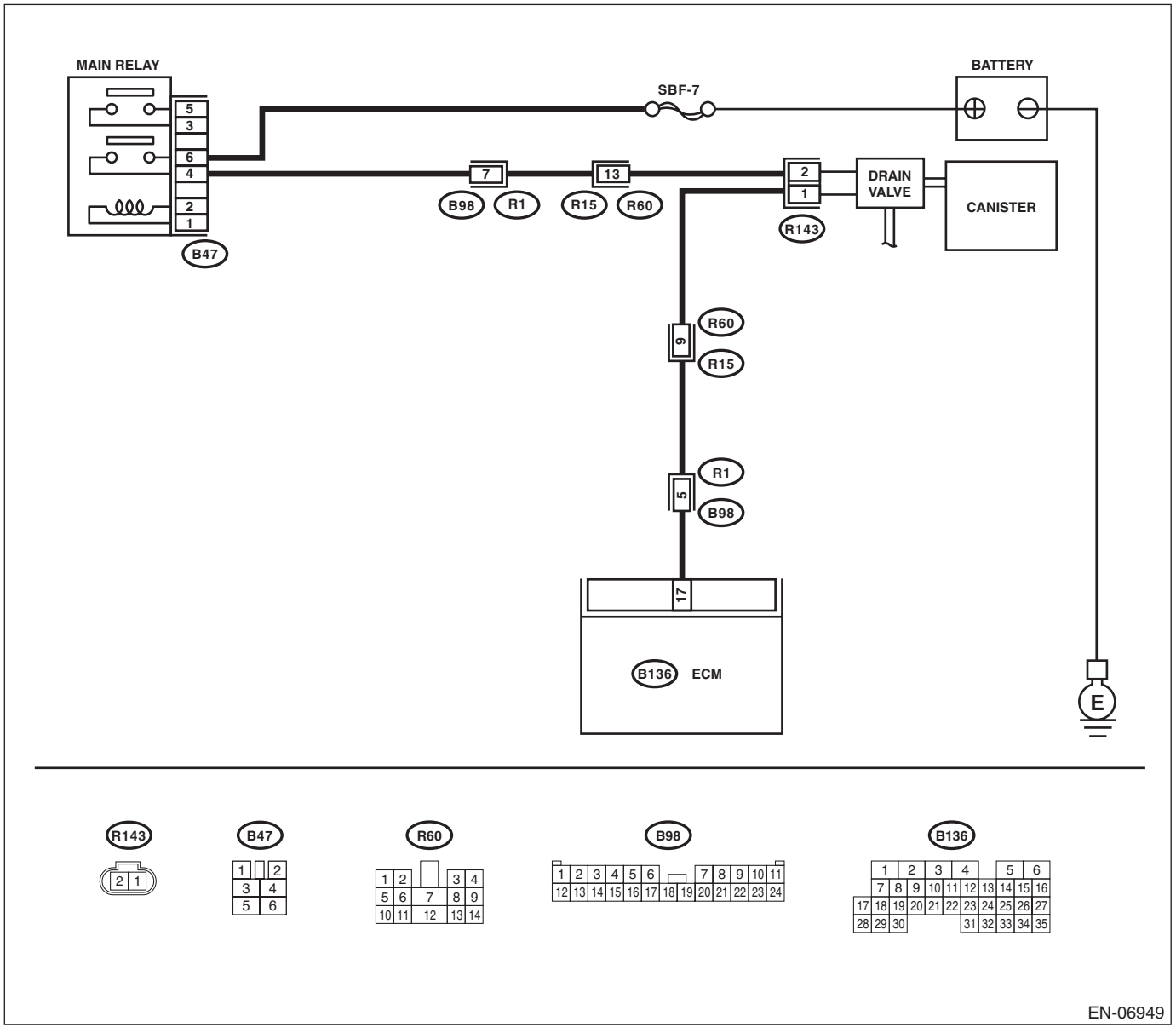
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of ECM connector.	Go to step **2**.
2	**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) 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 **3**.	Repair the ground short circuit of harness between ECM and drain valve connector.
3	**CHECK HARNESS BETWEEN ECM AND DRAIN VALVE.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B136) No. 17 — (R143) 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 drain valve connector • Poor contact of coupling connector
4	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 — 100 Ω?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H6DO)-13, Drain Valve.>
5	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R143) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair poor contact of the drain valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and drain valve • Poor contact of coupling connector • Poor contact of main relay connector

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-129, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to the power supply in the harness between the 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)-13, Drain Valve.>	Repair the poor contact of ECM connector.

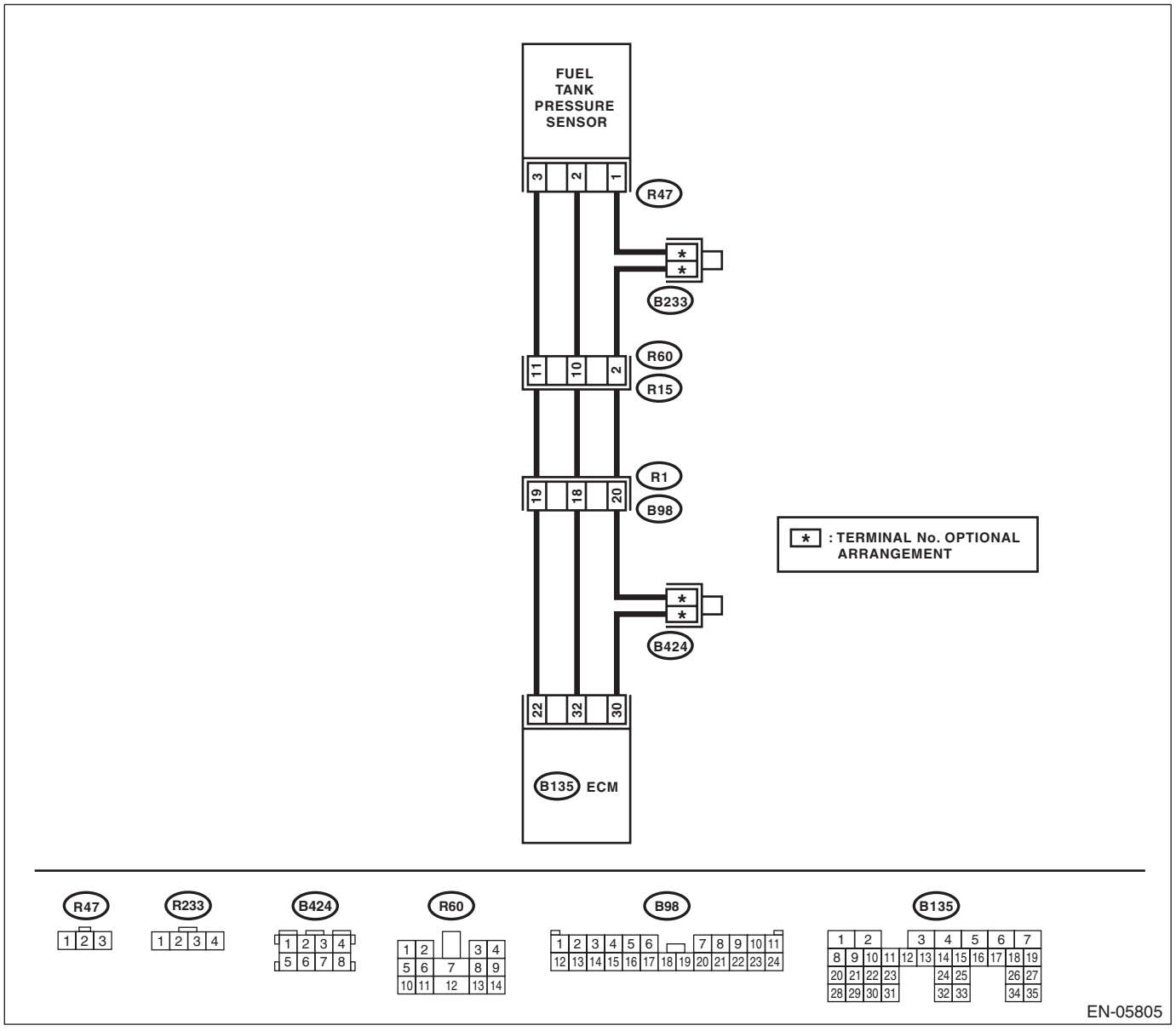
CG:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-131, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 the 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)-11, Fuel Tank Pressure Sensor.>

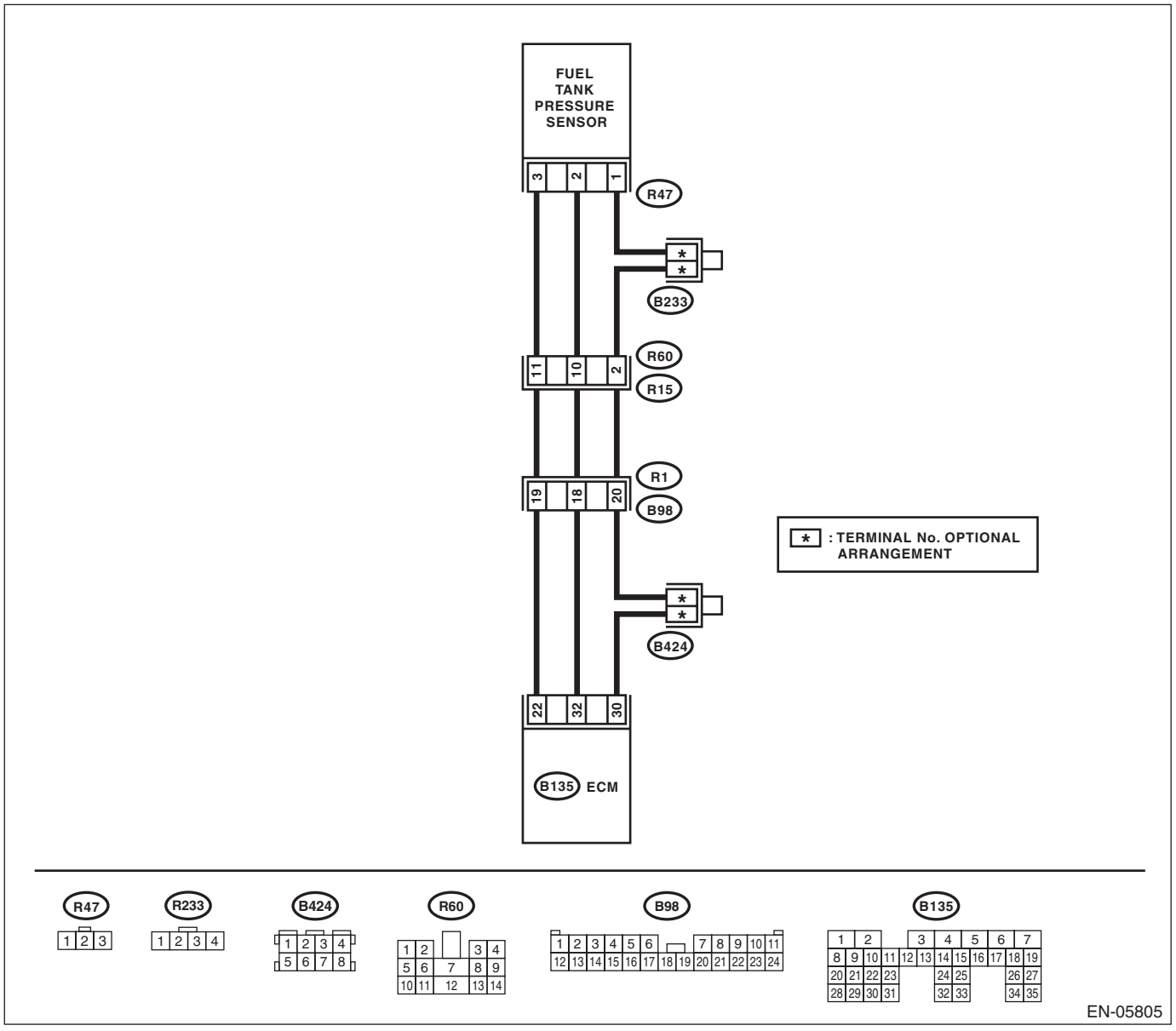
CH:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-133, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than –7.41 kPa (–55.6 mmHg, –2.189 inHg)?	Go to step **2**.	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 may be the cause.
2	**CHECK FUEL TANK PRESSURE SENSOR POWER SOURCE.** 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 in 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 connectors from the ECM. 3) Measure the resistance of harness between the ECM and fuel tank pressure sensor connector. ***Connector & terminal*** ***(B135) No. 32 — (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*** ***(B135) No. 32 — 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 POOR CONTACT.** Check for poor contact between the ECM and fuel tank pressure sensor connector.	Is there poor contact in the ECM or fuel tank pressure sensor connector?	Repair the poor contact in the ECM or fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H6DO)-11, Fuel Tank Pressure Sensor.>

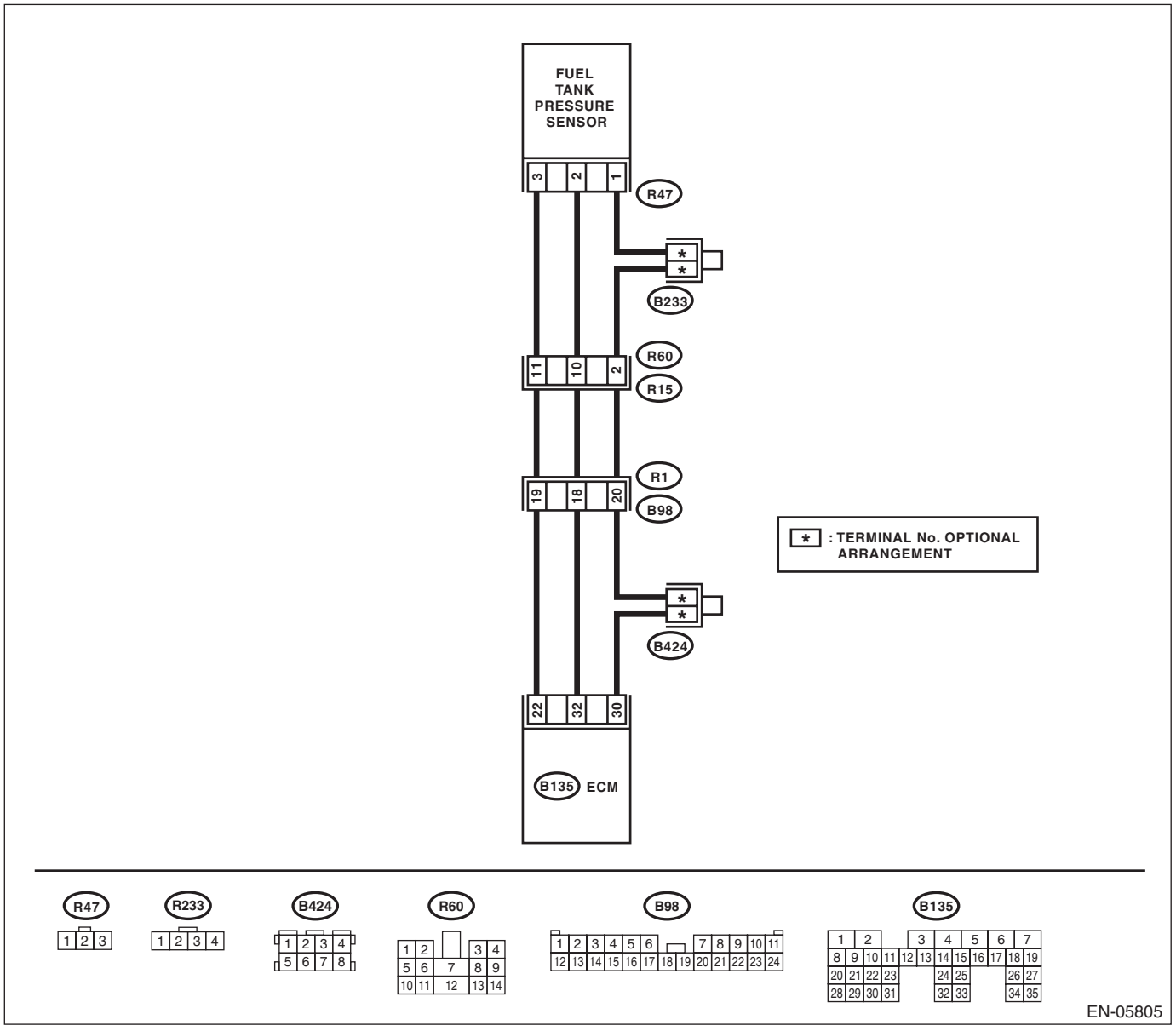
CI: DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-135, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 7.95 kPa (59.6 mmHg, 2.347 inHg) or more?	Go to step **2**.	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 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 7.95 kPa (59.6 mmHg, 2.347 inHg) or more?	Repair the short circuit to power supply in the harness between the 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 in ECM connector • Poor contact of coupling connector
4	**CHECK POOR CONTACT.** Check for poor contact of the fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair the poor contact in the fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H6DO)-11, Fuel Tank Pressure Sensor.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-136, 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-48, 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 operation can be executed using the Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H6DO)-13, 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 the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-55, 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.>

	Step	Check	Yes	No
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)-58, Fuel Delivery & Evaporation Lines.>	Go to step **7**.
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)-45, 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)-45, 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 disconnections, 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.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-136, 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-48, 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 operation can be executed using the Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H6DO)-13, 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 the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-55, 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.>

	Step	Check	Yes	No
6	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the delivery (test) mode connector.	Are there any disconnected, broken or clogged evaporation lines?	Repair or replace the evaporation line. <Ref. to FU(H6DO)-58, Fuel Delivery & Evaporation Lines.>	Go to step **7**.
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)-45, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H6DO)-45, Fuel Tank.>	Go to step **9**.
9	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes, cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of ECM connector.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-137, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

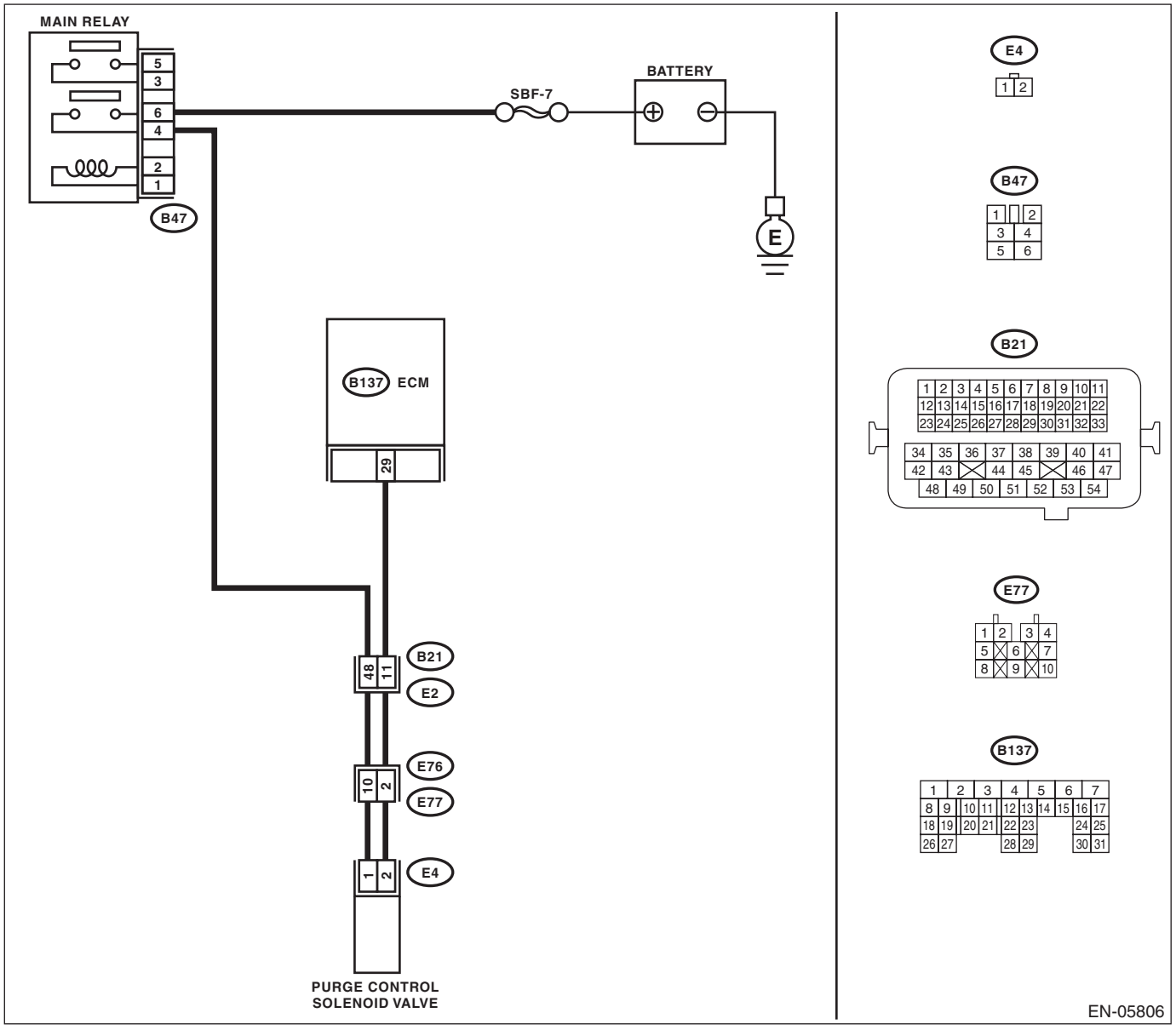
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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. 29 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of ECM connector.	Go to step **2**.
2	**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) 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 **3**.	Repair the ground short circuit of harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and purge control solenoid valve. ***Connector & terminal*** ***(B137) No. 29 — (E4) 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 purge control solenoid valve connector • Poor contact of coupling connector
4	**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 between 10 — 100 Ω?	Go to step **5**.	Replace the purge control solenoid valve. <Ref. to EC(H6DO)-7, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) 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?	Repair the poor contact of purge control solenoid valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and purge control solenoid valve • Poor contact of coupling connector • Poor contact of main relay connector

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-139, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

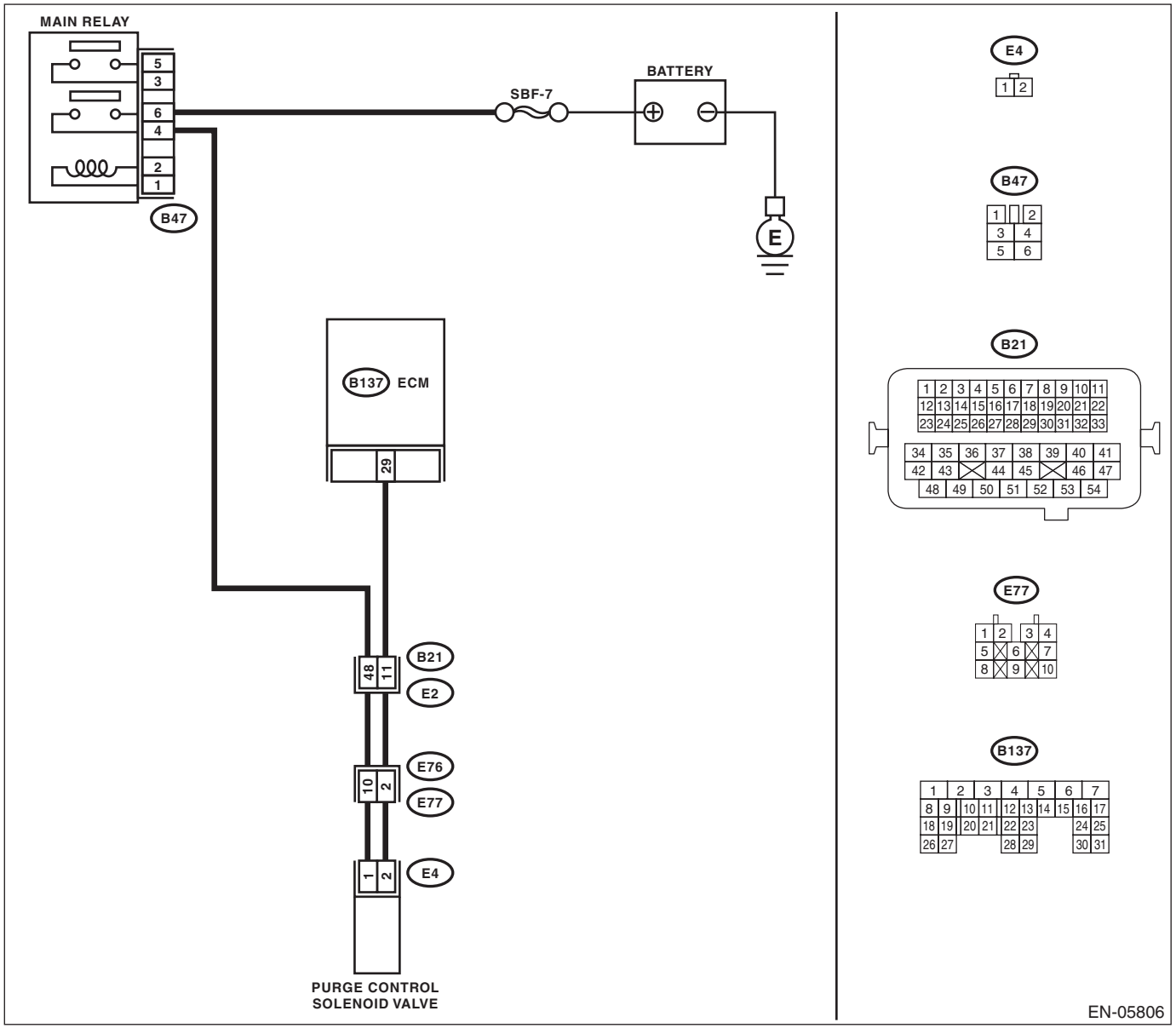
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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. 29 (+) — 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.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-141, DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-83, List of Diagnostic Trouble Code (DTC).>	Replace the fuel level sensor and fuel sub level sensor. <Ref. to FU(H6DO)-52, Fuel Level Sensor.> <Ref. to FU(H6DO)-53, Fuel Sub Level Sensor.>

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

NOTE:
For the diagnostic procedure, refer to DTC P0463. <Ref. to EN(H6DO)(diag)-261, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-145, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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-9, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>	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 may be the cause.

CQ:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-147, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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-9, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>	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 may be the cause.

CR:DTC P0500 VEHICLE SPEED SENSOR “A”

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-150, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-36, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact of ECM connector.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-151, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

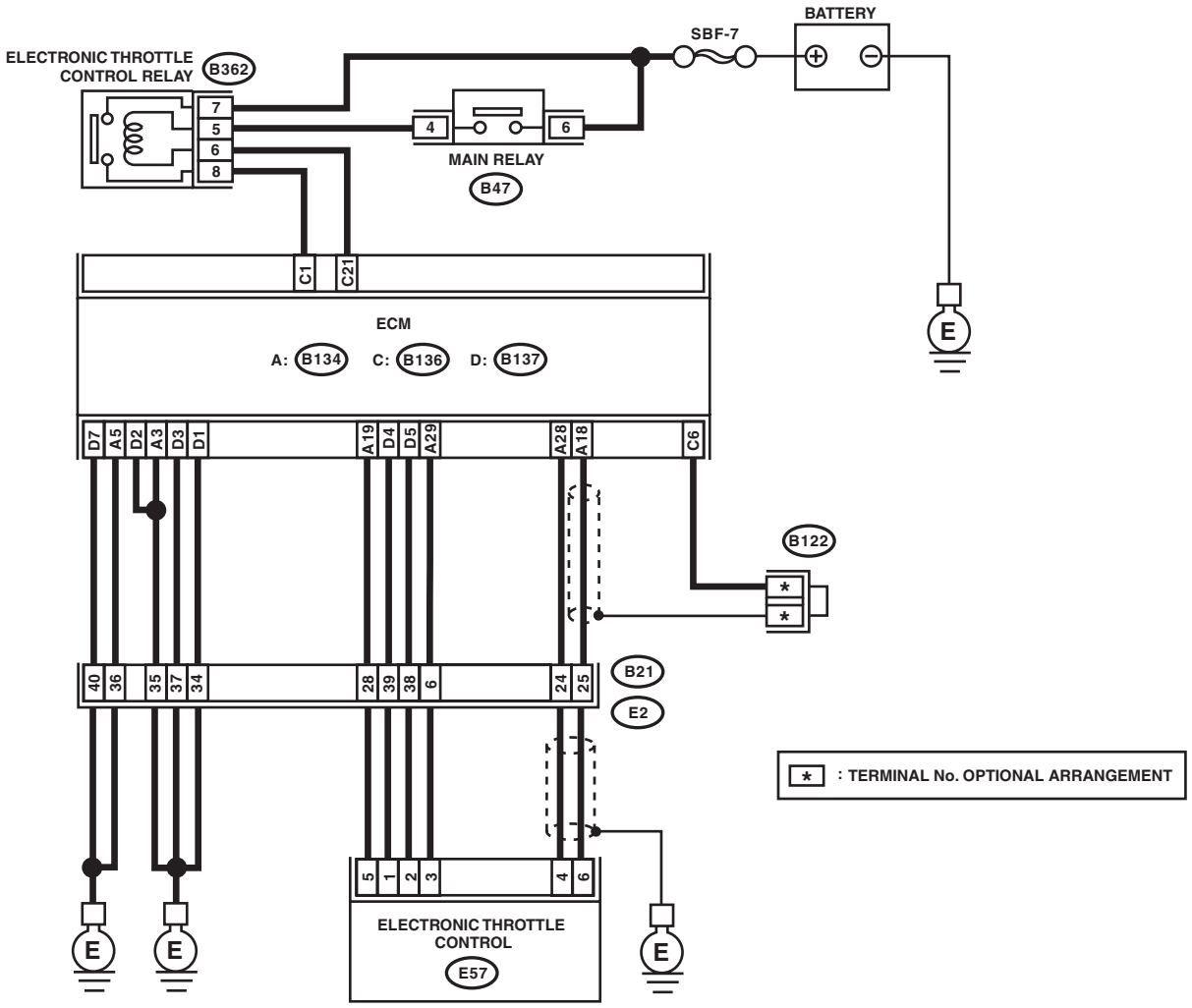
TROUBLE SYMPTOM:

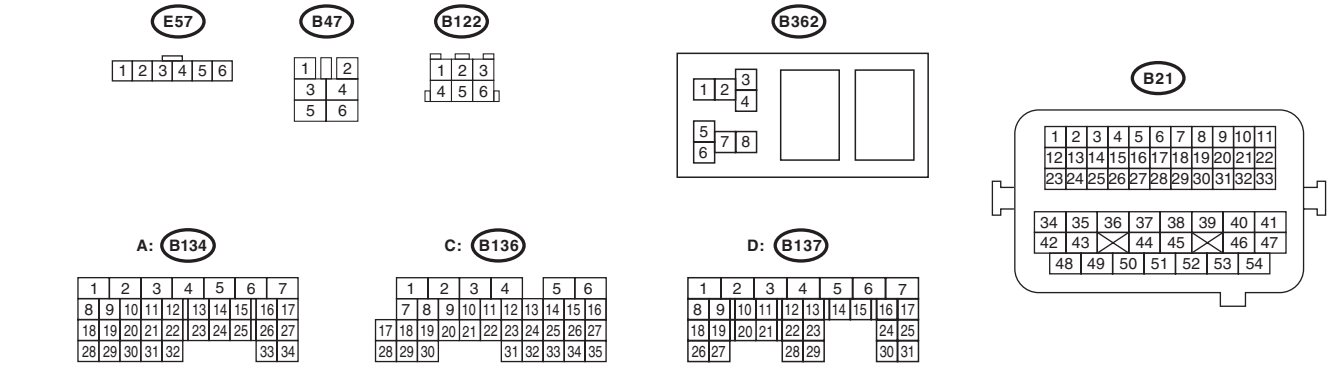
- Hard to start the engine.
- Engine does not start.
- Improper idling
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06946

	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)-83, 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 the air cleaner element excessively clogged?	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)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CT:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-152, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

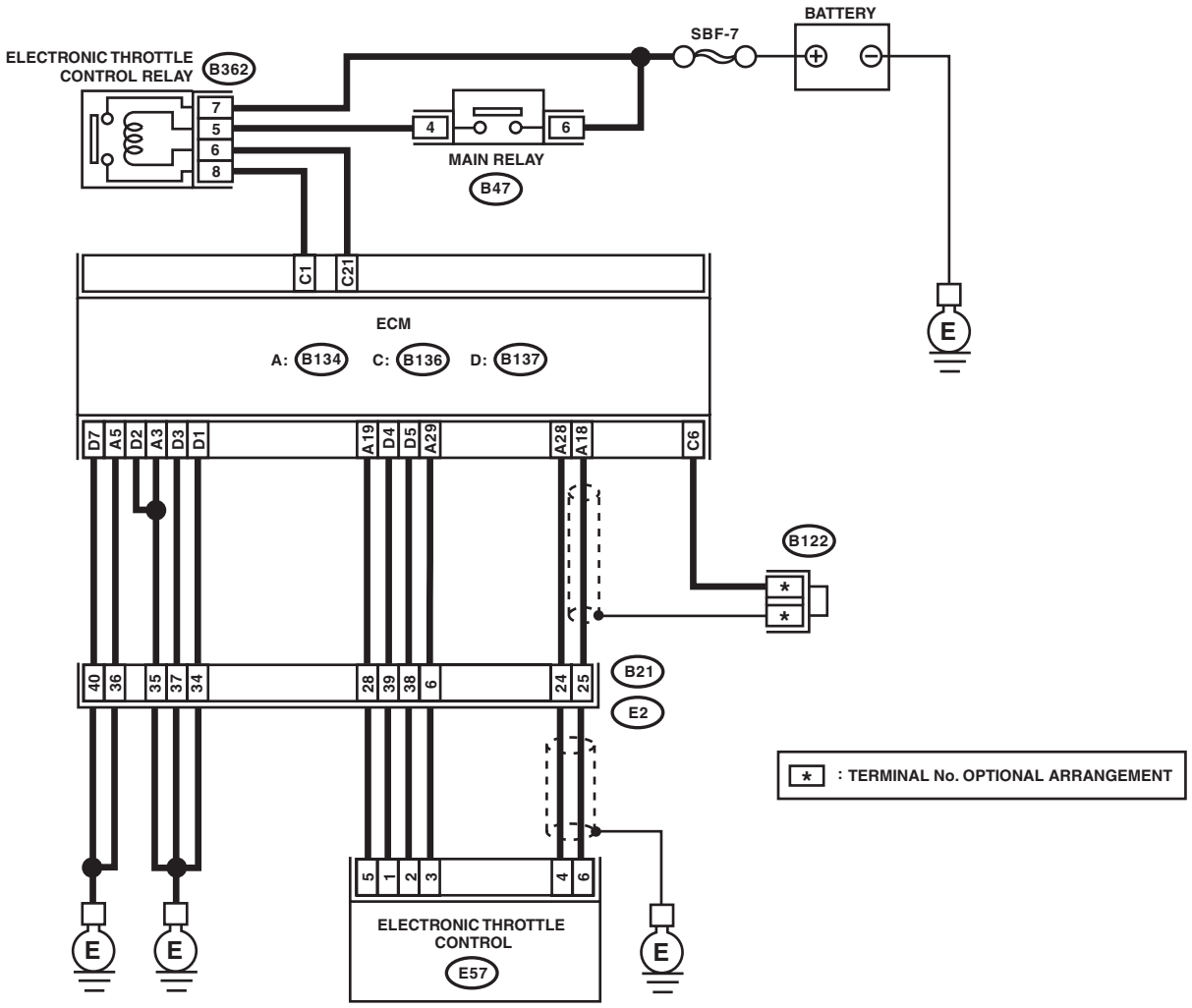
TROUBLE SYMPTOM:

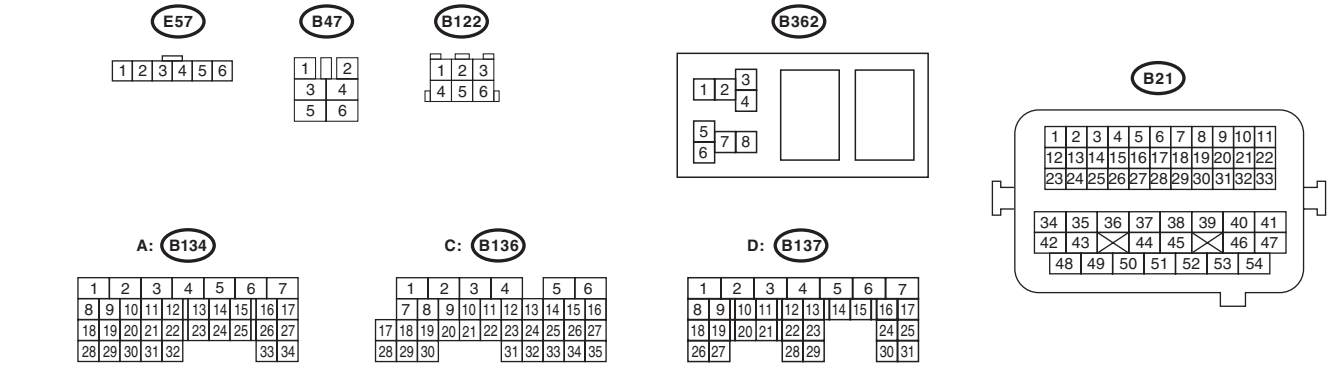
Engine keeps running at higher speed than specified idle speed.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06946

	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)-83, 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)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CU:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-153, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

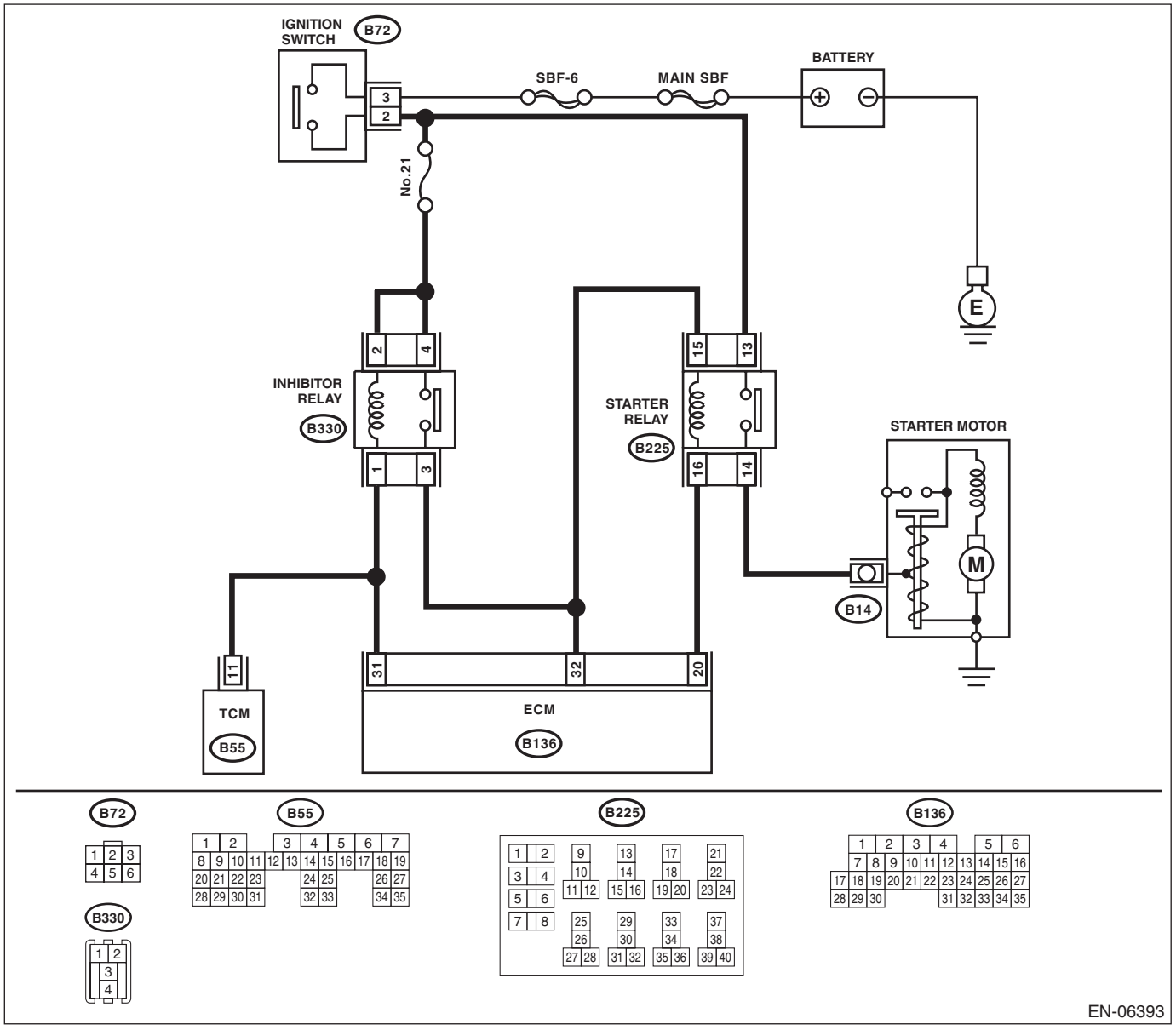
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-83, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND IGNITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 32 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between the ECM and ignition switch.	Repair the poor contact of ECM connector.

CV:DTC P0600 SERIAL COMMUNICATION LINK

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

CW:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-157, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

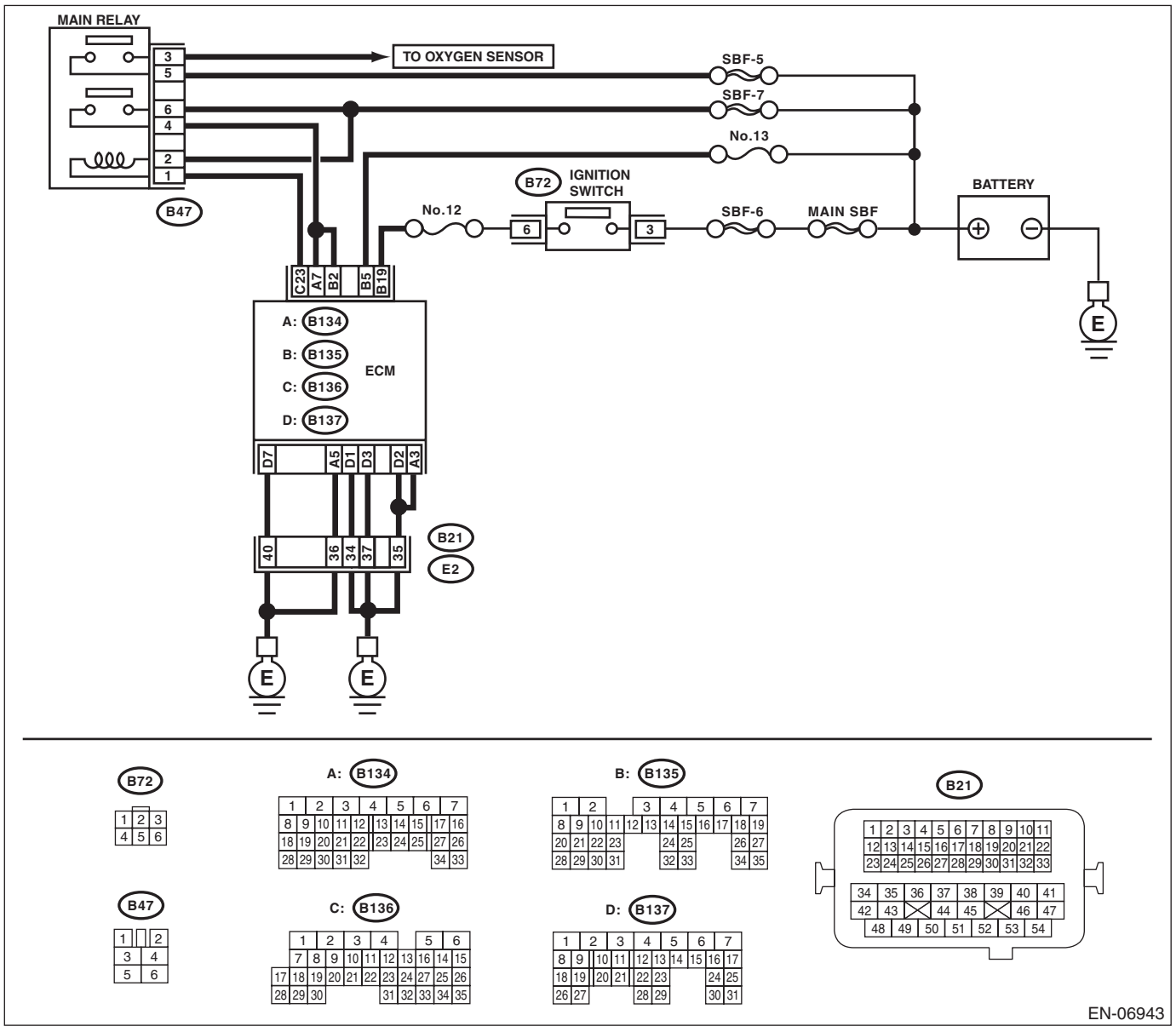
TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-83, List of Diagnostic Trouble Code (DTC).>	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 may be the cause.

CX:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H6DO)(diag)-273, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CY:DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-159, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

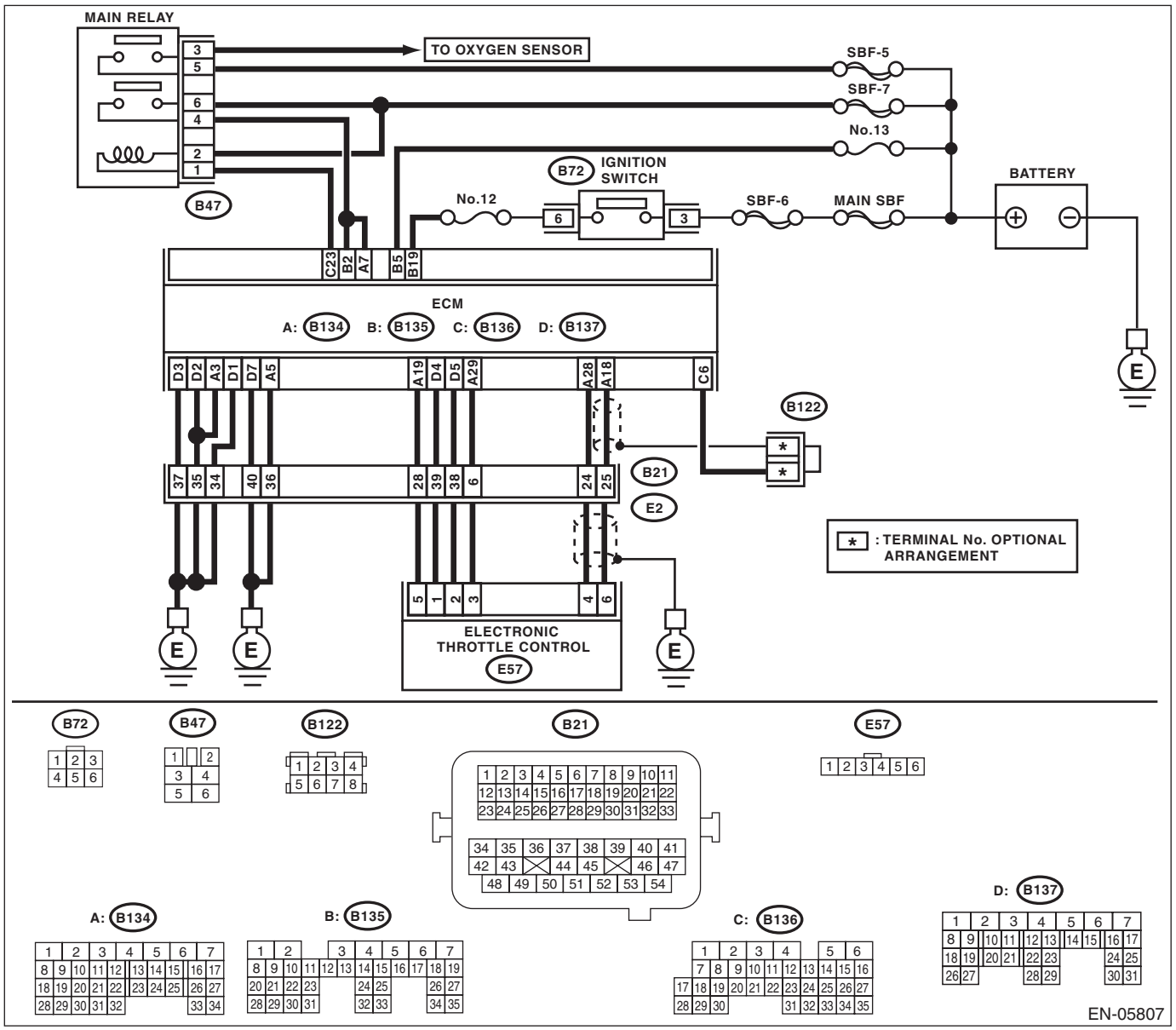
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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*** ***(B134) No. 7 (+) — Chassis ground (–):*** ***(B135) No. 2 (+) — 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*** ***(B134) No. 7 (+) — Chassis ground (–):*** ***(B135) No. 2 (+) — 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. 5 (+) — Chassis ground (–):*** ***(B137) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 2 (+) — Chassis ground (–):*** ***(B137) No. 3 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair the poor contact of ECM connector.	Repair the following item. • Open circuit of ground circuit • Retightening of engine ground terminals • Poor contact of coupling connector

CZ:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DA:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 5AT(diag)-2, Basic Diagnostic Procedure.>

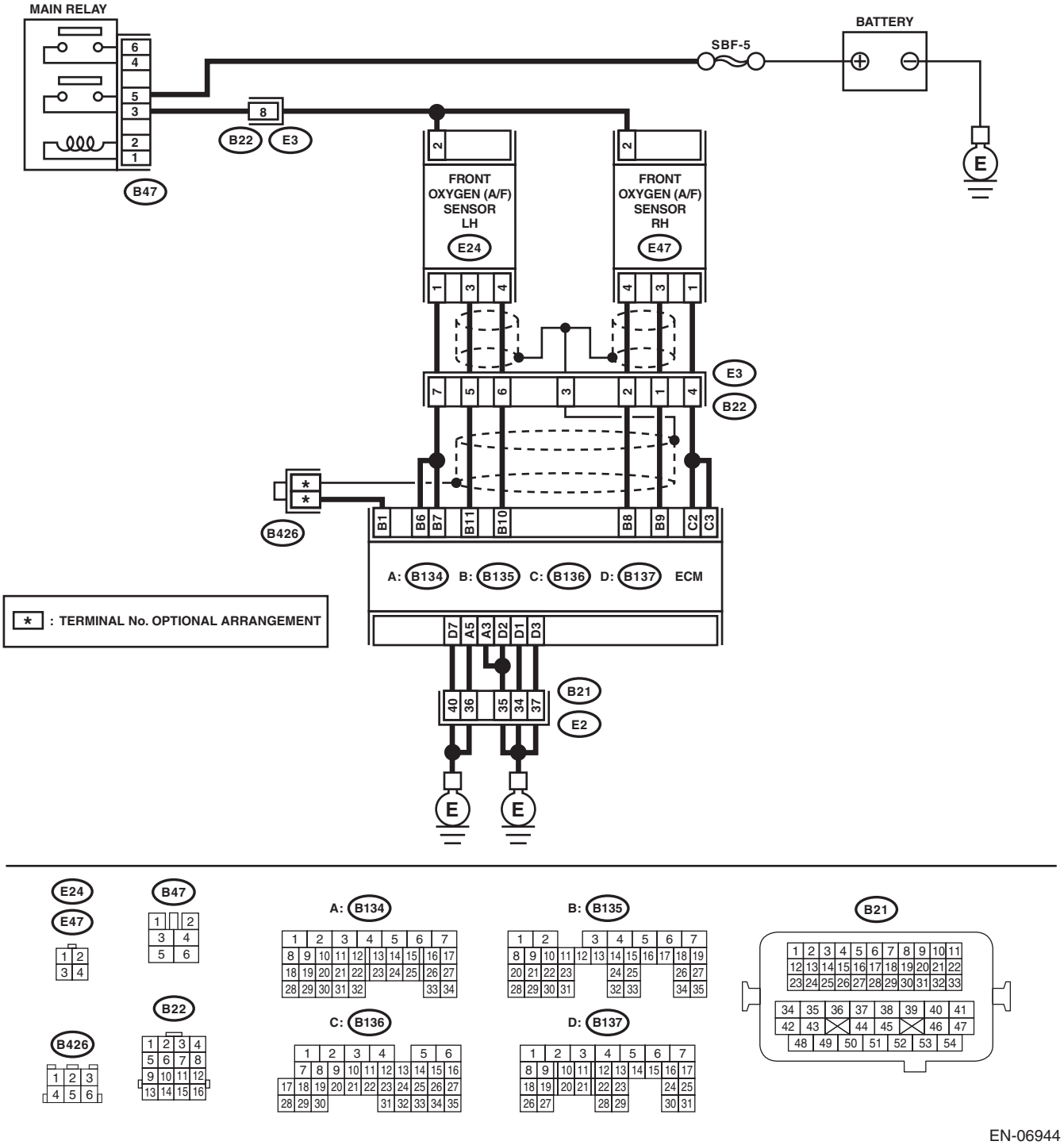
DB:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-164, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-06944

	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**.
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. 9 — (E47) No. 3:*** ***(B135) No. 8 — (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 POOR CONTACT.** Check for poor contact in the front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact of the front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

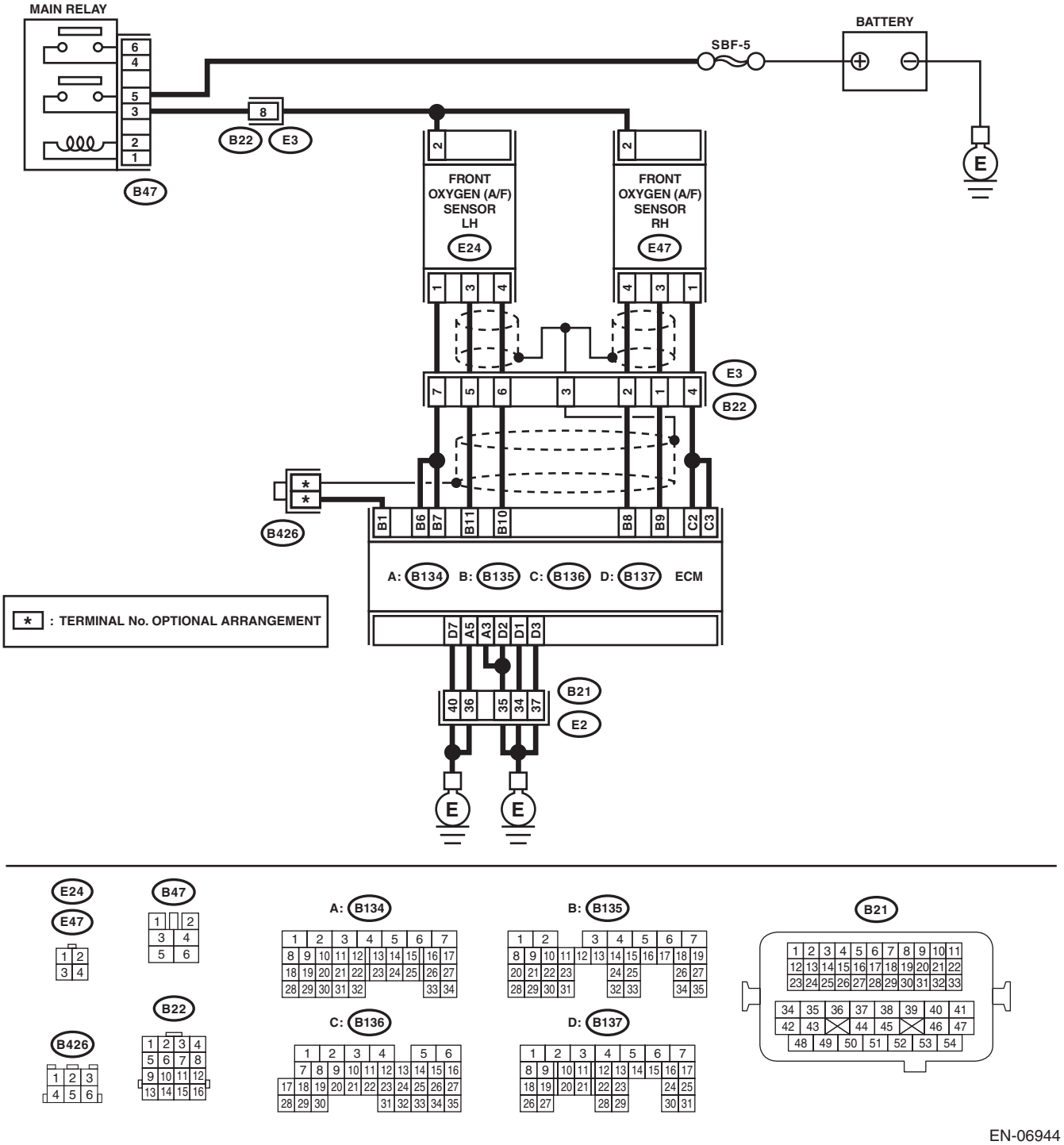
DC:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-166, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-06944

	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**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — Chassis ground:*** ***(B135) No. 8 — 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 ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — 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. 8 (+) — 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)-34, Front Oxygen (A/F) Sensor.>
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** ***(B135) No. 8 (+) — 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)-38, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.

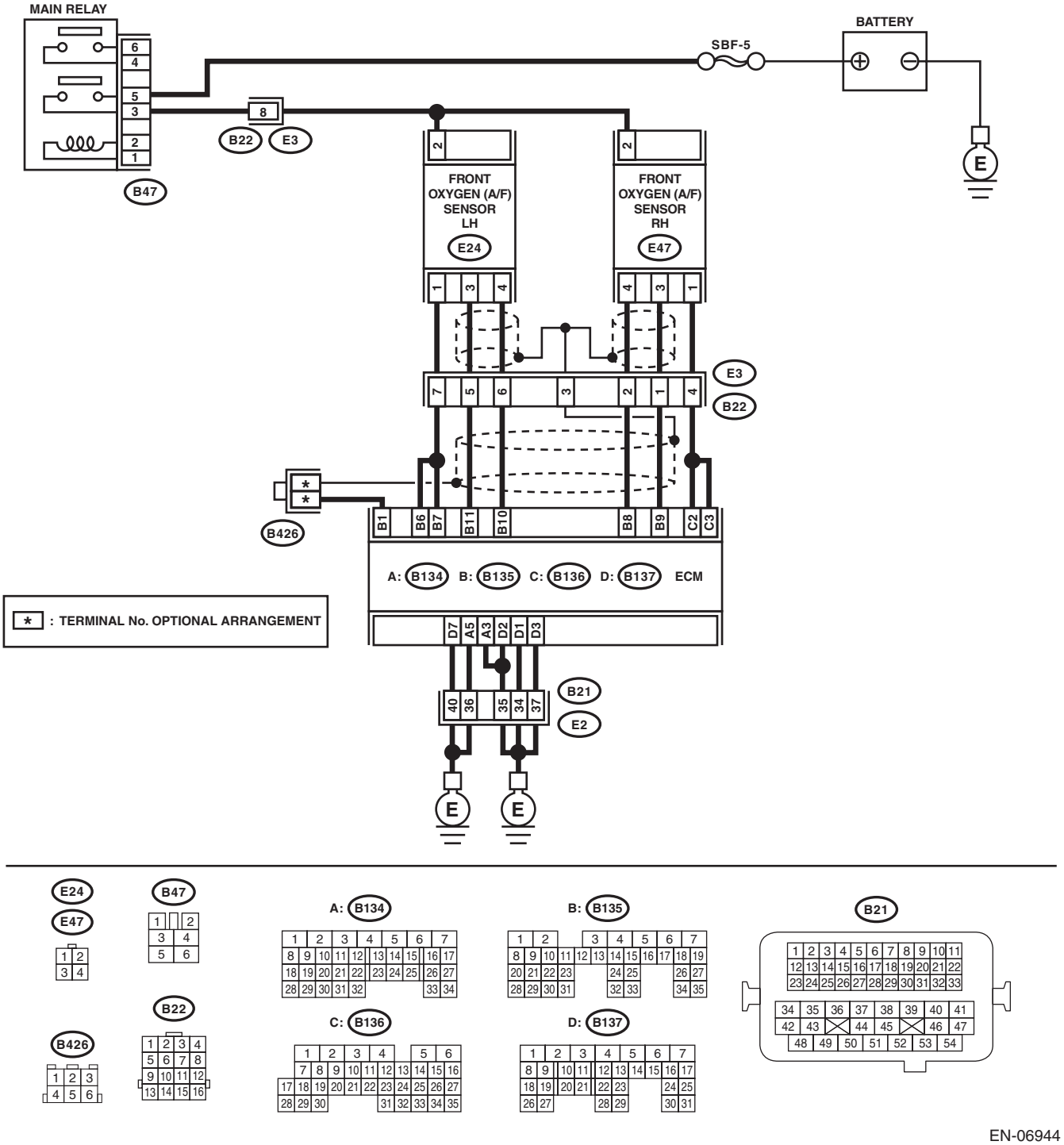
DD:DTC P1154 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-168, DTC P1154 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-06944

	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**.
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. 11 — (E24) No. 3:*** ***(B135) No. 10 — (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 POOR CONTACT.** Check for poor contact in the front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact of the front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-34, Front Oxygen (A/F) Sensor.>

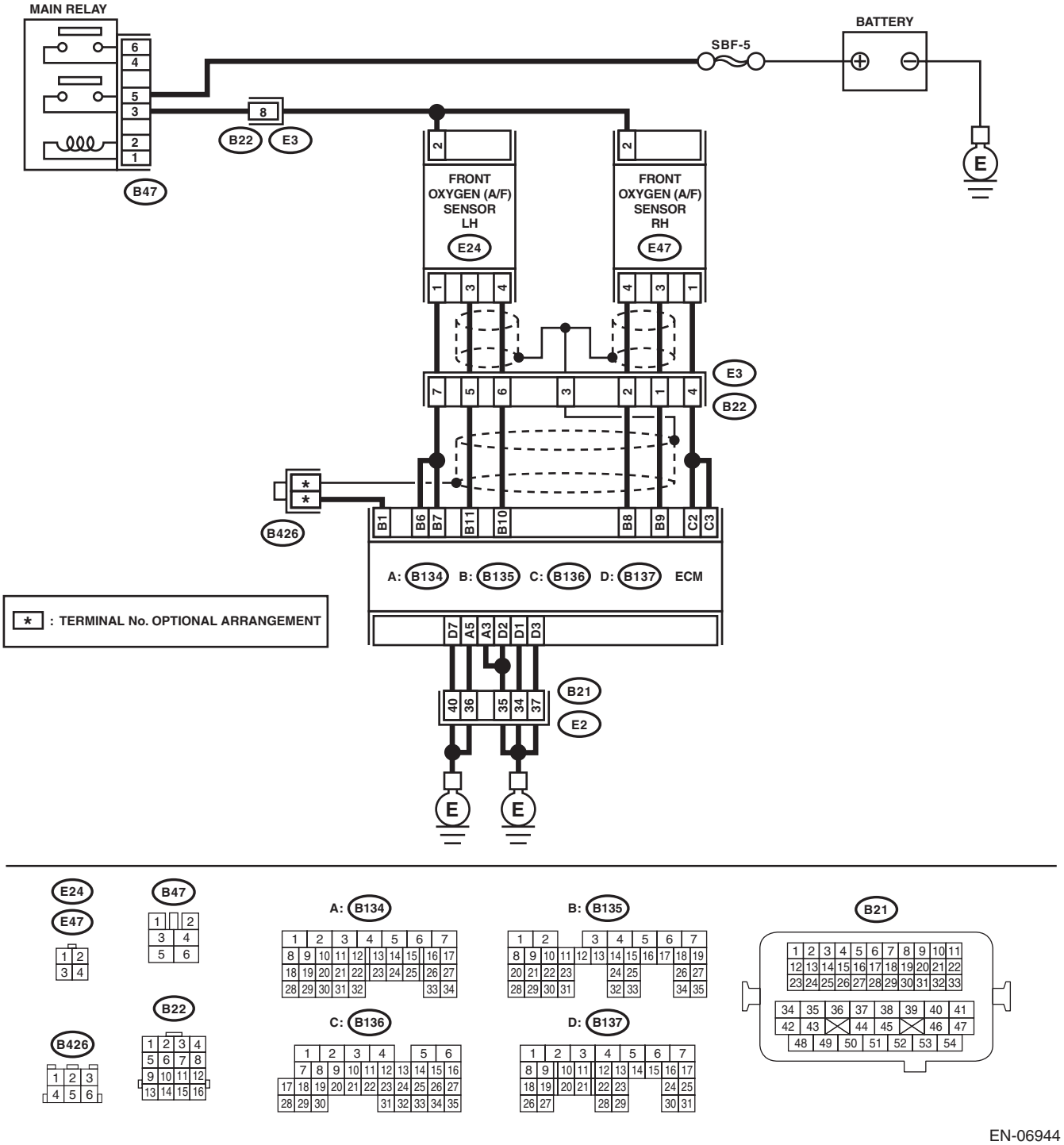
DE:DTC P1155 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-168, DTC P1155 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-06944

	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**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 11 — Chassis ground:*** ***(B135) No. 10 — 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 ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 11 (+) — 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. 10 (+) — 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)-34, Front Oxygen (A/F) Sensor.>
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 11 (+) — Chassis ground (–):*** ***(B135) No. 10 (+) — 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)-38, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.

DF:DTC P1160 RETURN SPRING FAILURE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DG:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-171, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

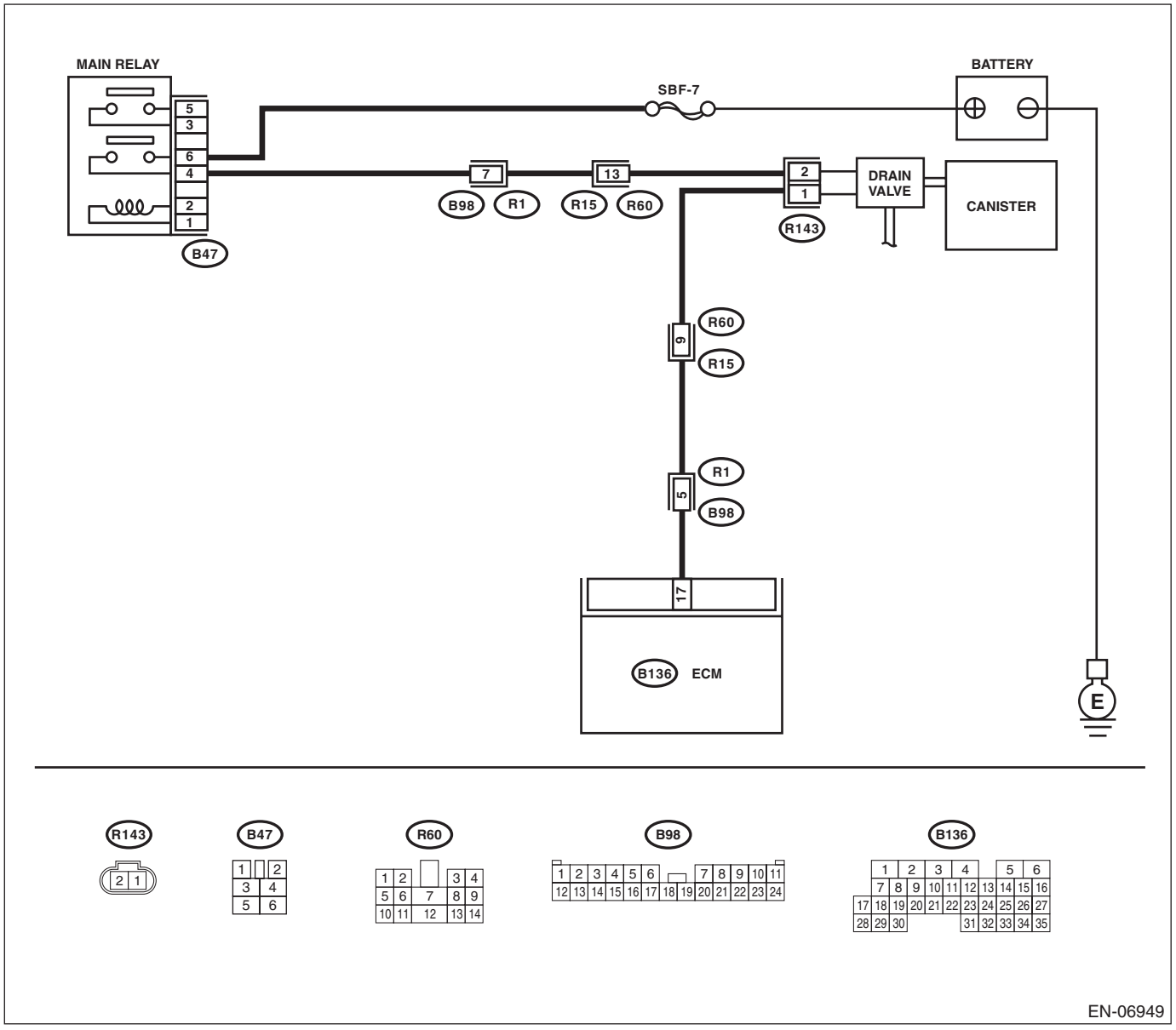
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-83, 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) Connect the delivery (test) mode connector. 3) Turn the ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can be executed using the Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-55, 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)-13, Drain Valve.>

DH: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)-290, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DI: 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)-293, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DJ: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)-290, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DK: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)-293, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DL: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)-290, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DM: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)-293, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DN:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-173, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-177, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-177, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-177, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

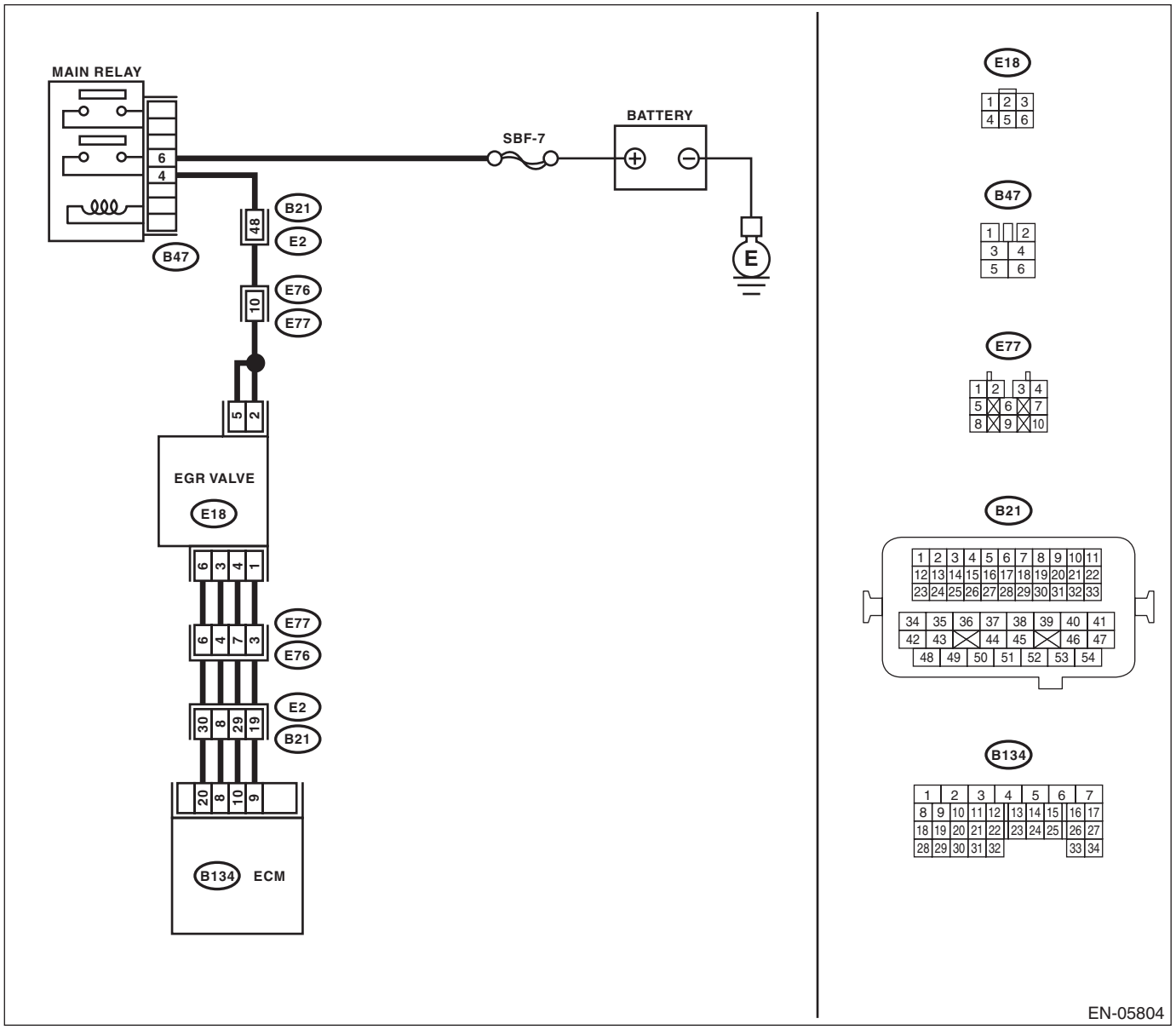
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 and main relay connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND EGR VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM. 3) Measure the resistance 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. 10 — (E18) No. 4:*** ***DTC P1498; (B134) No. 20 — (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 connectors from the 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. 10 — Chassis ground:*** ***DTC P1498; (B134) No. 20 — 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 POOR CONTACT.** Check poor contact in ECM and EGR valve connector.	Is there poor contact in ECM or EGR valve connector?	Repair the poor contact in ECM or EGR valve connector.	Replace the EGR valve. <Ref. to FU(H6DO)-29, EGR Valve.>

DO:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-175, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-177, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-177, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H6DO)-177, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

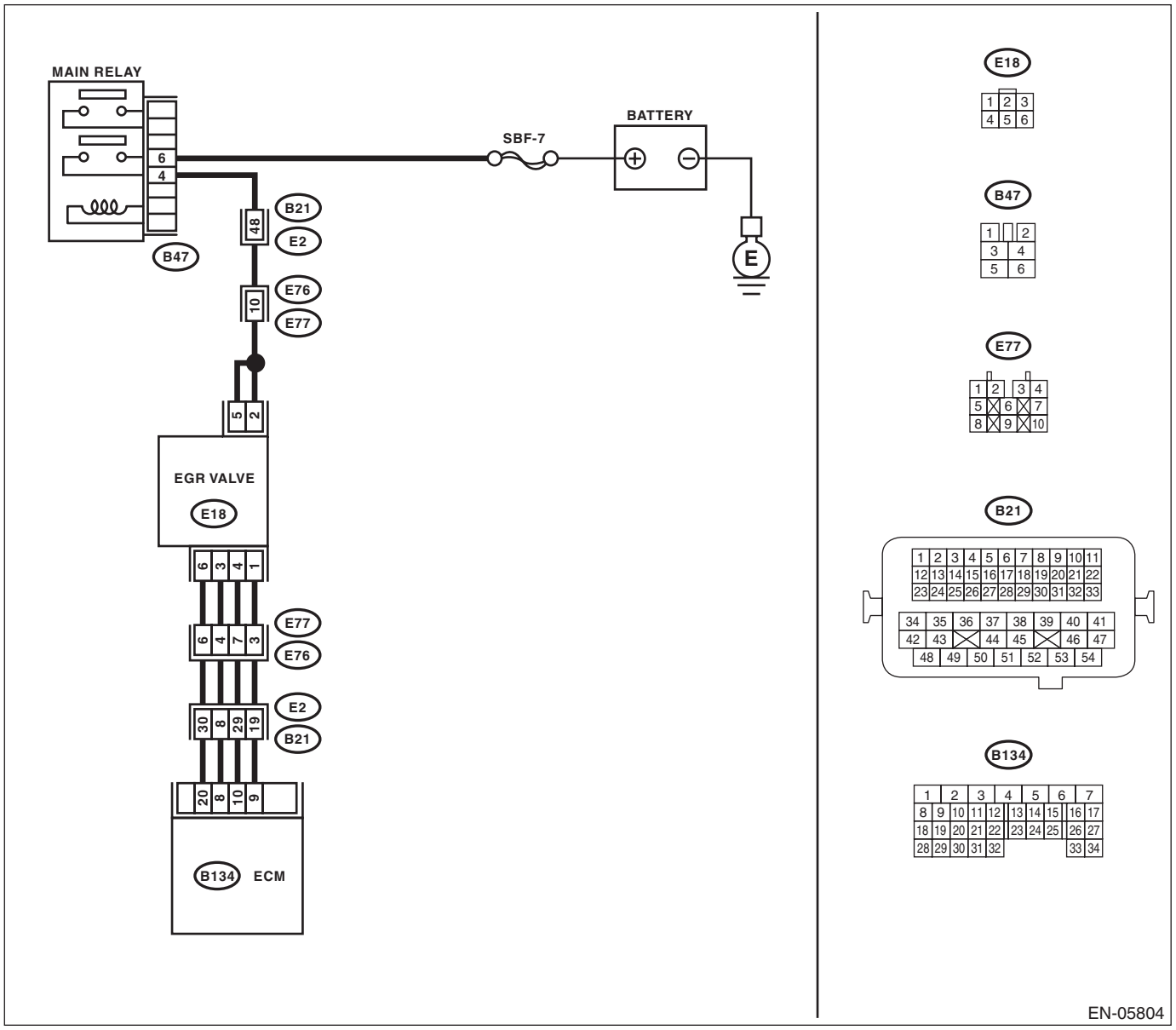
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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 connector from 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. 10 (+) — Chassis ground (–):*** ***DTC P1499; (B134) No. 20 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the power supply short circuit of harness between ECM and EGR valve connector.	Repair the poor contact of ECM connector.

DP:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

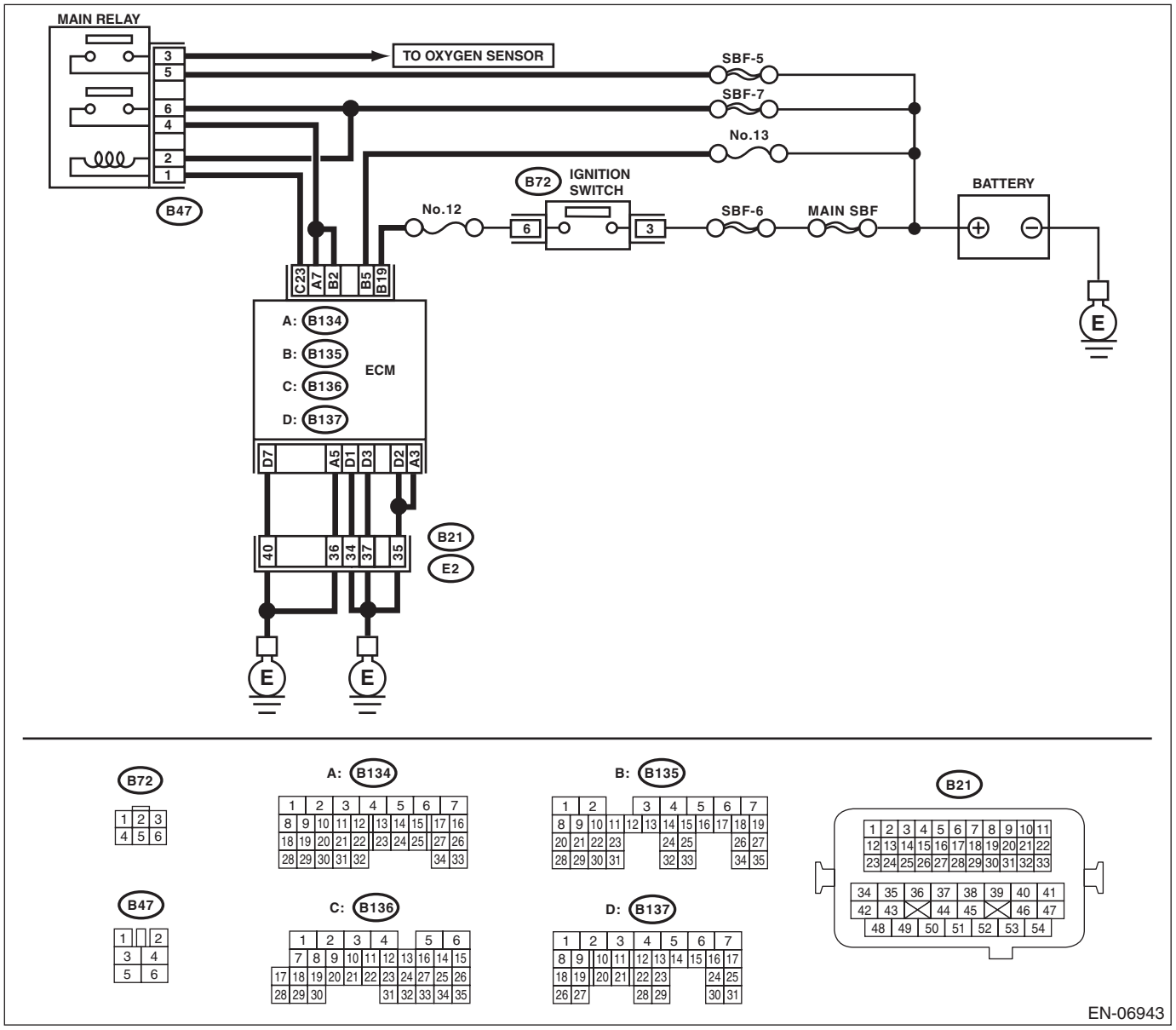
DTC DETECTING CONDITION:

- 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 repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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*** ***(B135) No. 5 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect connectors from the ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 5 — 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 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 in ECM connector • Poor contact of battery terminal

DQ:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-180, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

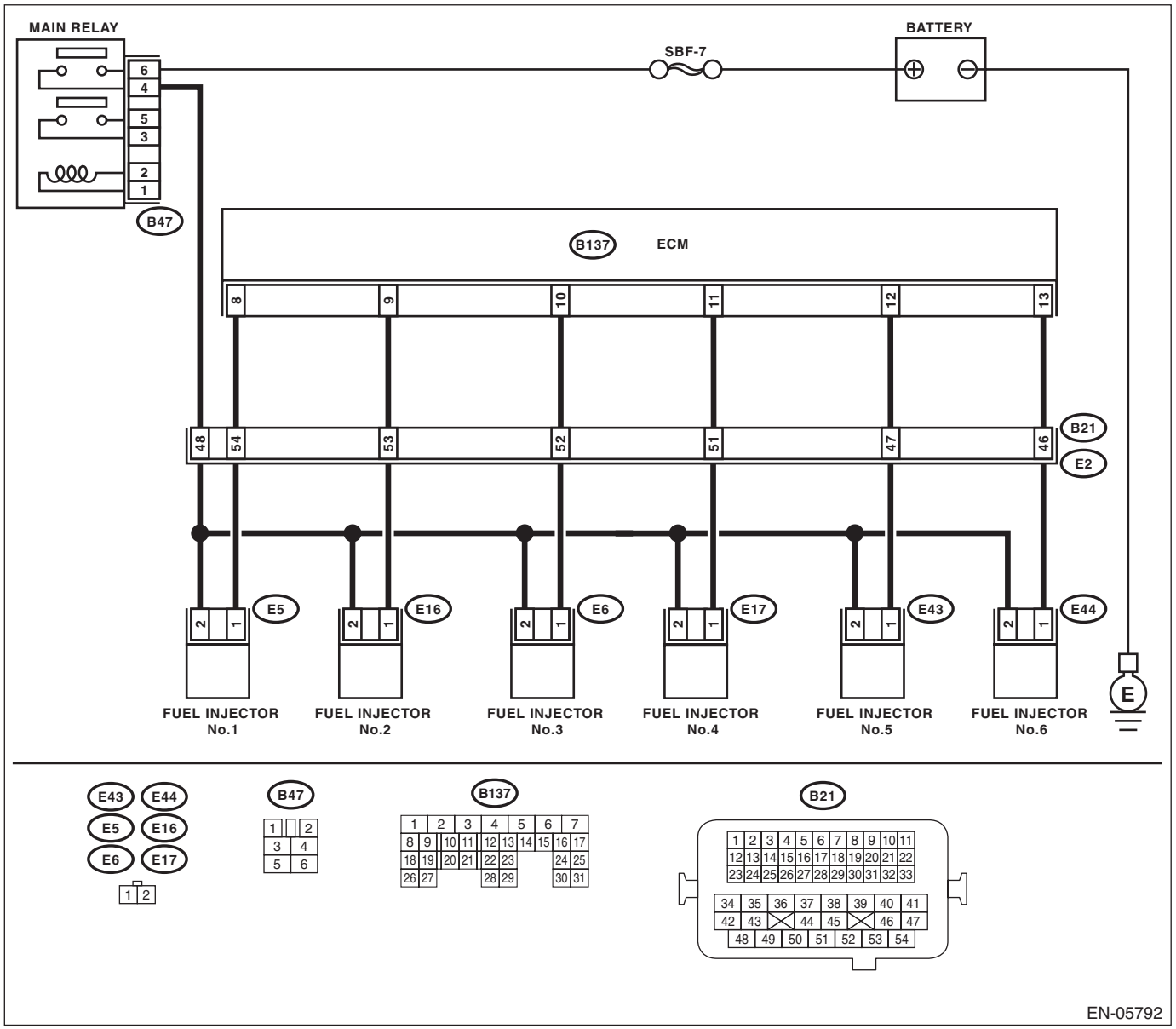
TROUBLE SYMPTOM:

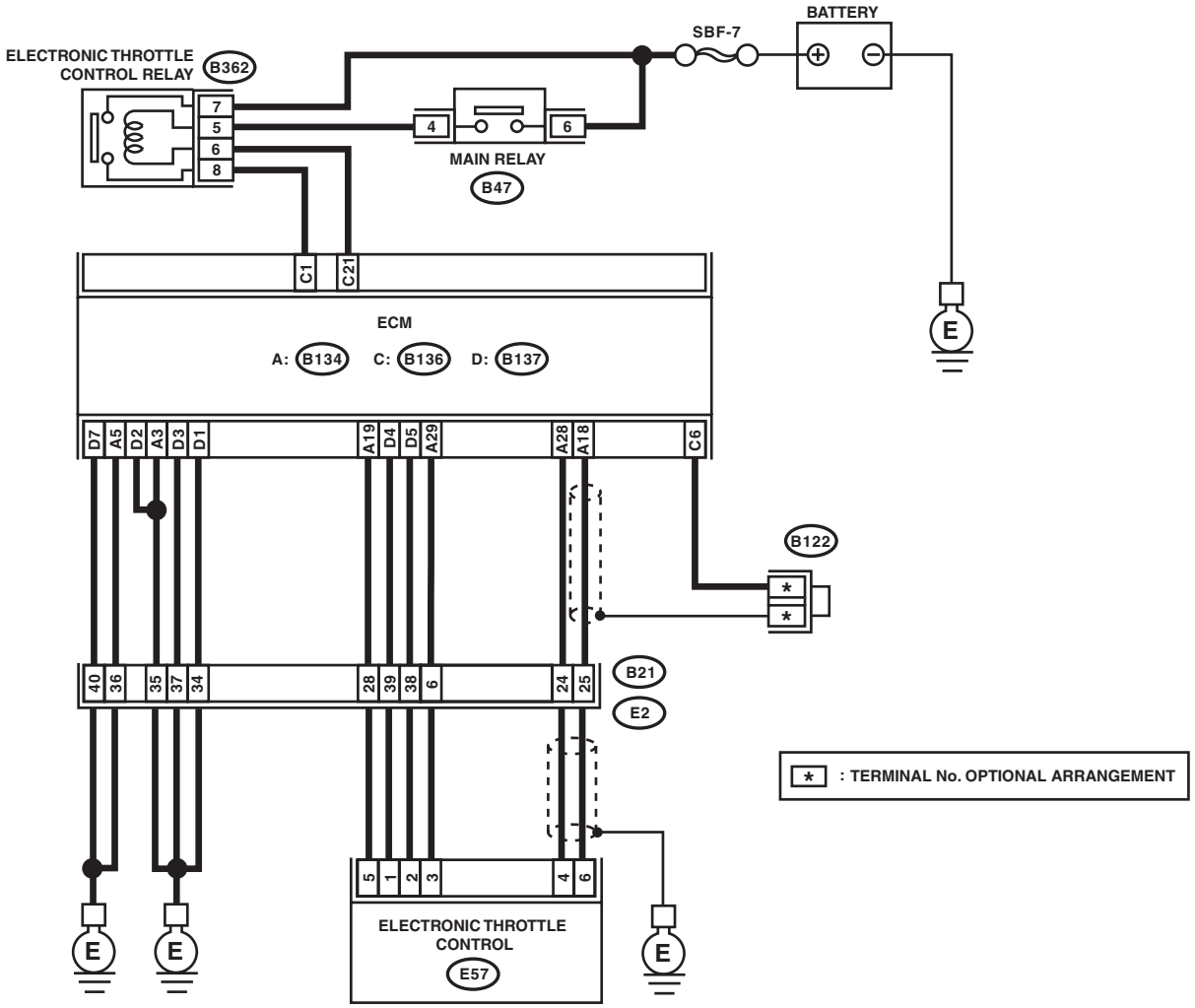
- Engine keeps running at higher speed than specified idle speed.
- Engine keeps running at a lower speed than the specified idle speed.
- Engine stalls.

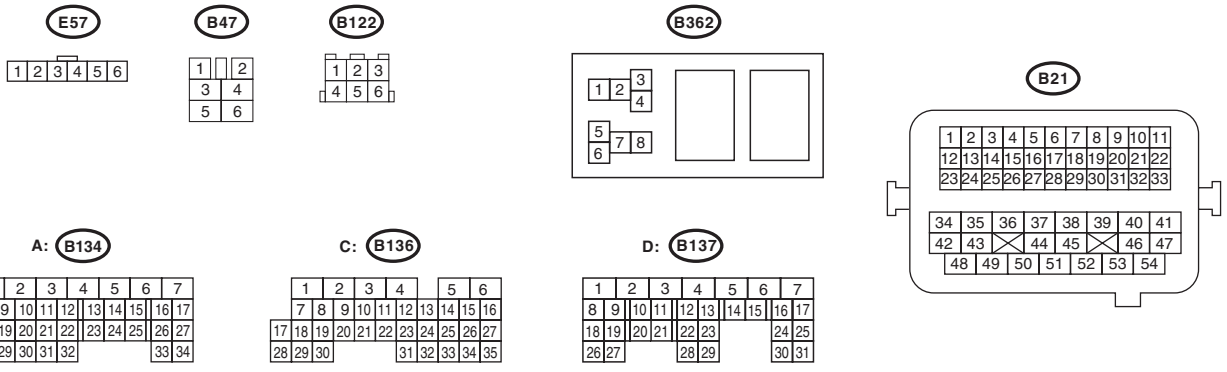
CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:




BATTERY
SBF-7
ELECTRONIC THROTTLE CONTROL RELAY
B362
7
5
6
8
4
6
MAIN RELAY
B47
C1
C21
ECM
A: B134
C: B136
D: B137
D7
A5
D2
A3
D3
D1
A19
D4
D5
A29
A28
A18
C6
B122
40
36
35
37
34
28
39
38
6
24
25
B21
E2
E
: TERMINAL No. OPTIONAL ARRANGEMENT
5
1
2
3
4
6
ELECTRONIC THROTTLE CONTROL
E57


E57
B47
B122
B362
B21
A: B134
C: B136
D: B137

EN-06946

	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)-83, 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)-9, REPLACEMENT, Engine Oil.>
3	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **4**.
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)-30, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 338 — 348 kPa (3.4 — 3.5 kgf/cm^2, 49 — 50.5 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-22, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-28, Mass Air Flow and Intake Air Temperature Sensor.>
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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-28, 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 (B137) No. 8 (+) — Chassis ground (–):*** ***#2 (B137) No. 9 (+) — Chassis ground (–):*** ***#3 (B137) No. 10 (+) — Chassis ground (–):*** ***#4 (B137) No. 11 (+) — Chassis ground (–):*** ***#5 (B137) No. 12 (+) — Chassis ground (–):*** ***#6 (B137) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **14**.	Go to step **10**.

	Step	Check	Yes	No
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 (B137) No. 8 — (E5) No. 1:*** ***#2 (B137) No. 9 — (E16) No. 1:*** ***#3 (B137) No. 10 — (E6) No. 1:*** ***#4 (B137) No. 11 — (E17) No. 1:*** ***#5 (B137) No. 12 — (E43) No. 1:*** ***#6 (B137) No. 13 — (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 of harness between ECM and fuel injector connector • Poor contact of coupling connector
12	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 5 — 20 Ω?	Go to step **13**.	Replace the faulty fuel injector. <Ref. to FU(H6DO)-30, 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

	Step	Check	Yes	No
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 (B137) No. 8 (+) — Chassis ground (–):*** ***#2 (B137) No. 9 (+) — Chassis ground (–):*** ***#3 (B137) No. 10 (+) — Chassis ground (–):*** ***#4 (B137) No. 11 (+) — Chassis ground (–):*** ***#5 (B137) No. 12 (+) — Chassis ground (–):*** ***#6 (B137) No. 13 (+) — 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 less than 1 Ω?	Replace the faulty fuel injector. <Ref. to FU(H6DO)-30, 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)-93, 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)-53, Timing Chain Assembly.>	Go to step **19**.
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.
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.

	Step	Check	Yes	No
21	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Disconnect connectors from the 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*** ***(B136) No. 21 — (B362) No. 6:*** ***(B136) No. 1 — (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. 6:*** ***(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.
25	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the 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)-38, Engine Control Module (ECM).>

	Step	Check	Yes	No
26	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect connectors from the 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 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 in 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 4.85 V or more?	Repair the short circuit to power in the 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 connectors from the 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 the harness between ECM and electronic throttle control connector.
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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **31**.	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-15, Throttle Body.>

	Step	Check	Yes	No
31	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **32**.	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-15, 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*** ***(B137) No. 5 — (E57) No. 2:*** ***(B137) No. 4 — (E57) No. 1:***	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 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 connectors from the 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 the electronic throttle control connector terminals. ***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.
36	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **37**.	Repair the open circuit in harness between ECM and engine ground.

	Step	Check	Yes	No
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)-15, 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)-15, Throttle Body.>

DR: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.>

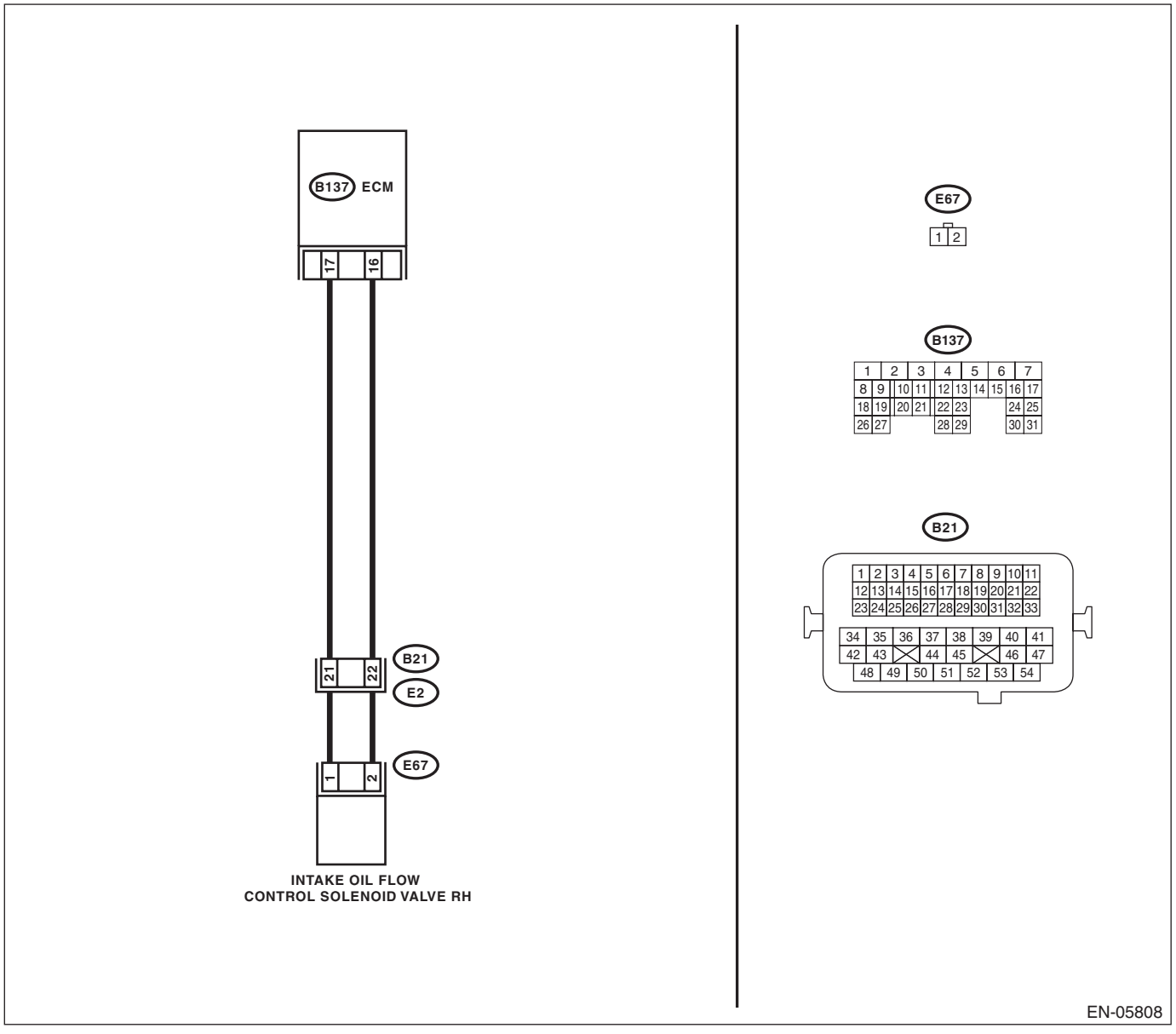
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B137) No. 17 — (E67) No. 1:*** ***(B137) No. 16 — (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 of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 17 — Chassis ground:*** ***(B137) 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 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 between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-116, Oil Flow Control Solenoid Valve.>

DS: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.>

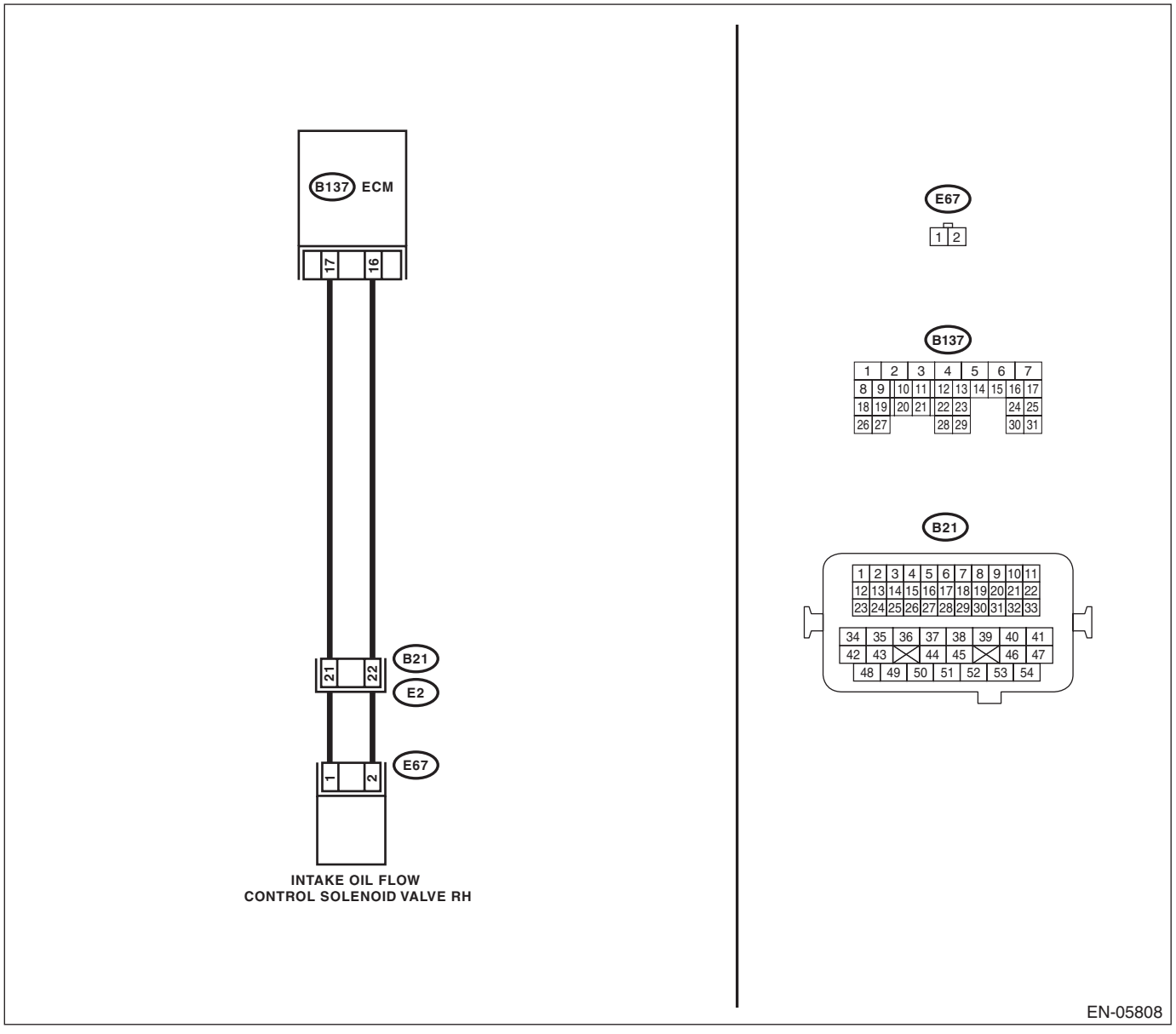
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 17 (+) — Chassis ground (–):*** ***(B137) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power in harness between ECM and oil flow control solenoid valve connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and oil flow control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 17 — (E67) No. 1:*** ***(B137) No. 16 — (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 of the harness between the ECM and oil flow control solenoid valve 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 between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-116, Oil Flow Control Solenoid Valve.>

DT: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.>

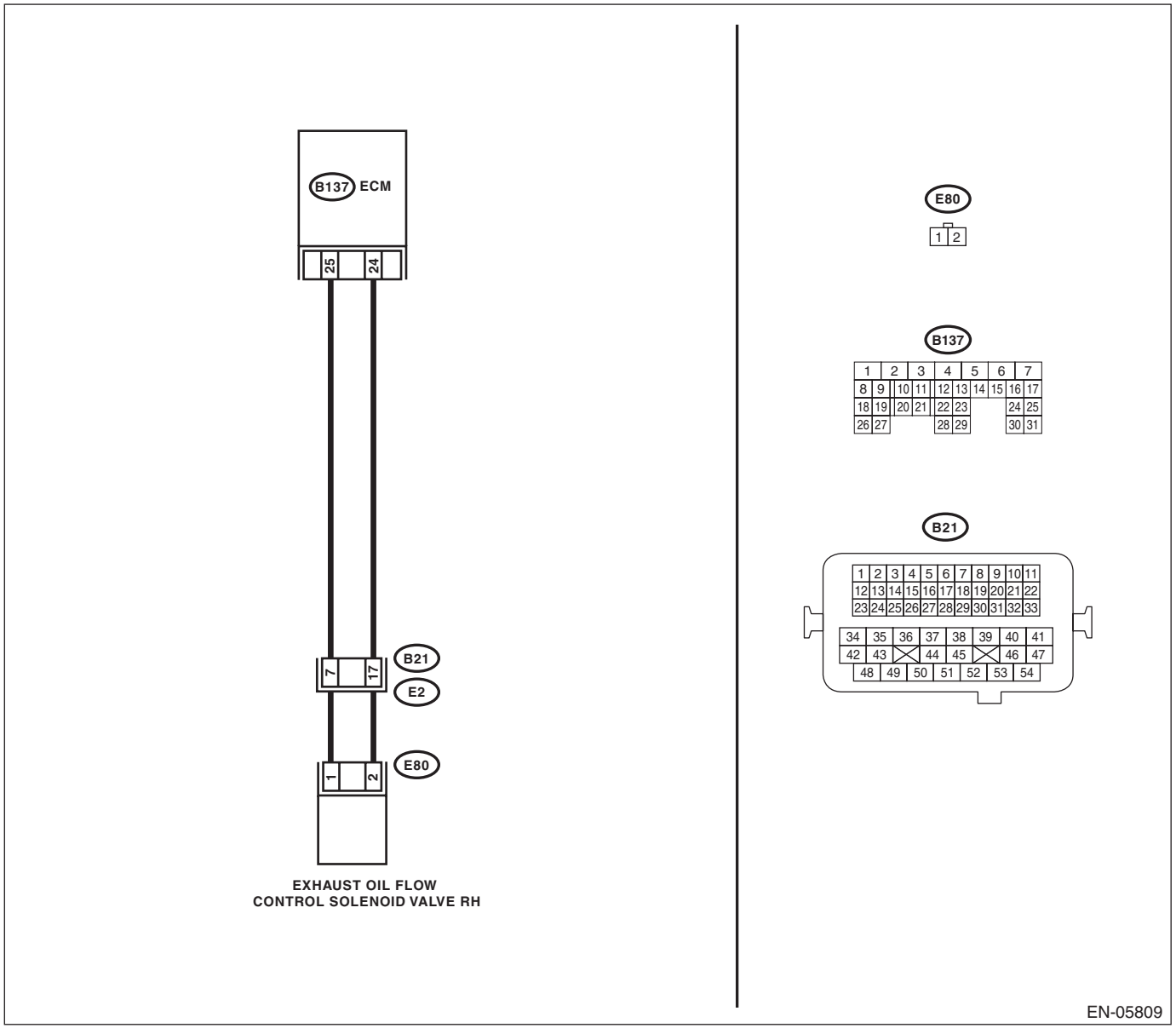
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B137) No. 25 — (E80) No. 1:*** ***(B137) No. 24 — (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 of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 25 — Chassis ground:*** ***(B137) No. 24 — 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 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 between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-116, Oil Flow Control Solenoid Valve.>

DU: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.>

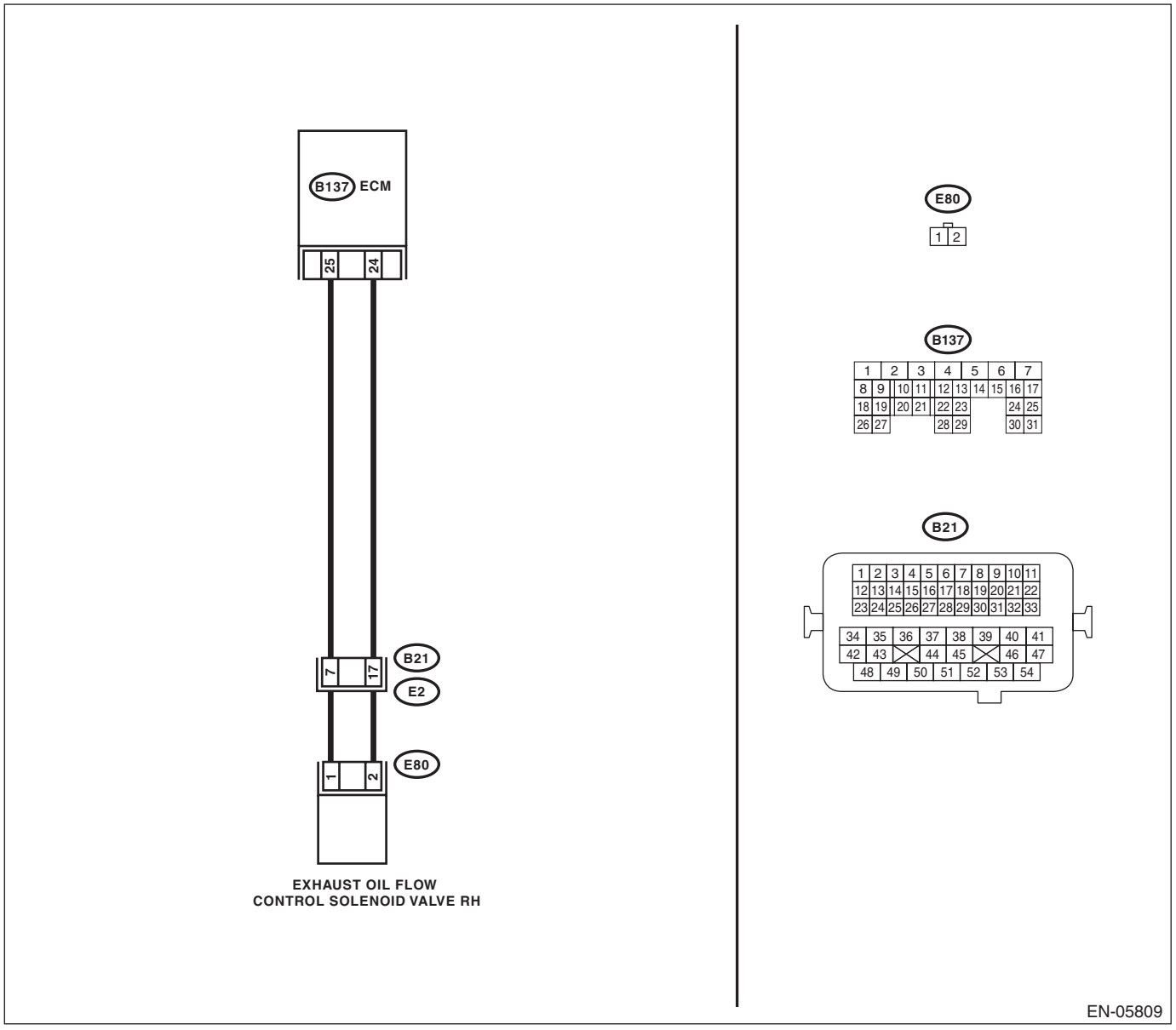
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 25 (+) — Chassis ground (–):*** ***(B137) No. 24 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power in harness between ECM and oil flow control solenoid valve connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and oil flow control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 25 — (E80) No. 1:*** ***(B137) No. 24 — (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 of the harness between the ECM and oil flow control solenoid valve 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 between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-116, Oil Flow Control Solenoid Valve.>

DV: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.>

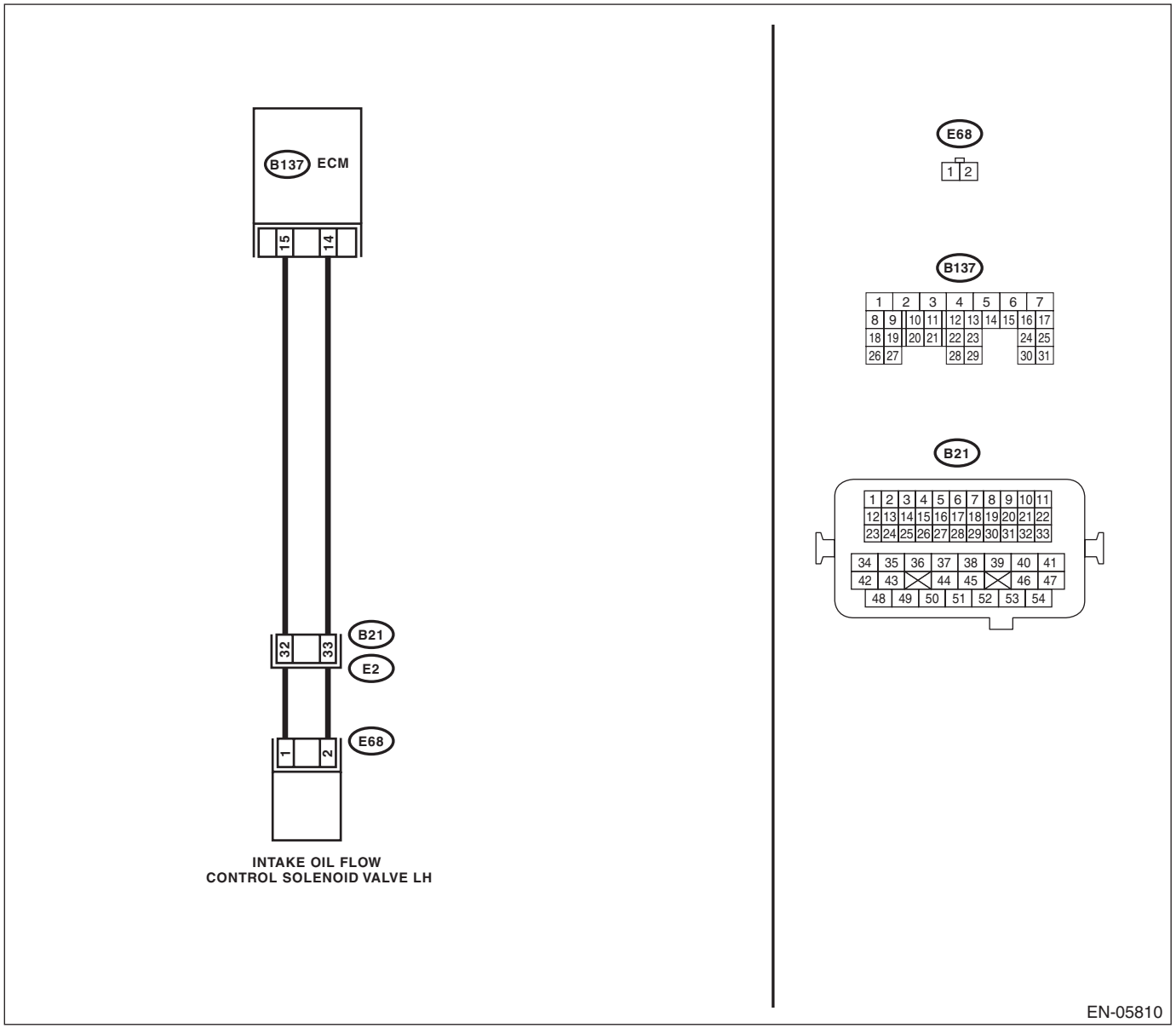
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B137) No. 15 — (E68) No. 1:*** ***(B137) No. 14 — (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 of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 15 — Chassis ground:*** ***(B137) 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 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 between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-116, Oil Flow Control Solenoid Valve.>

DW: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.>

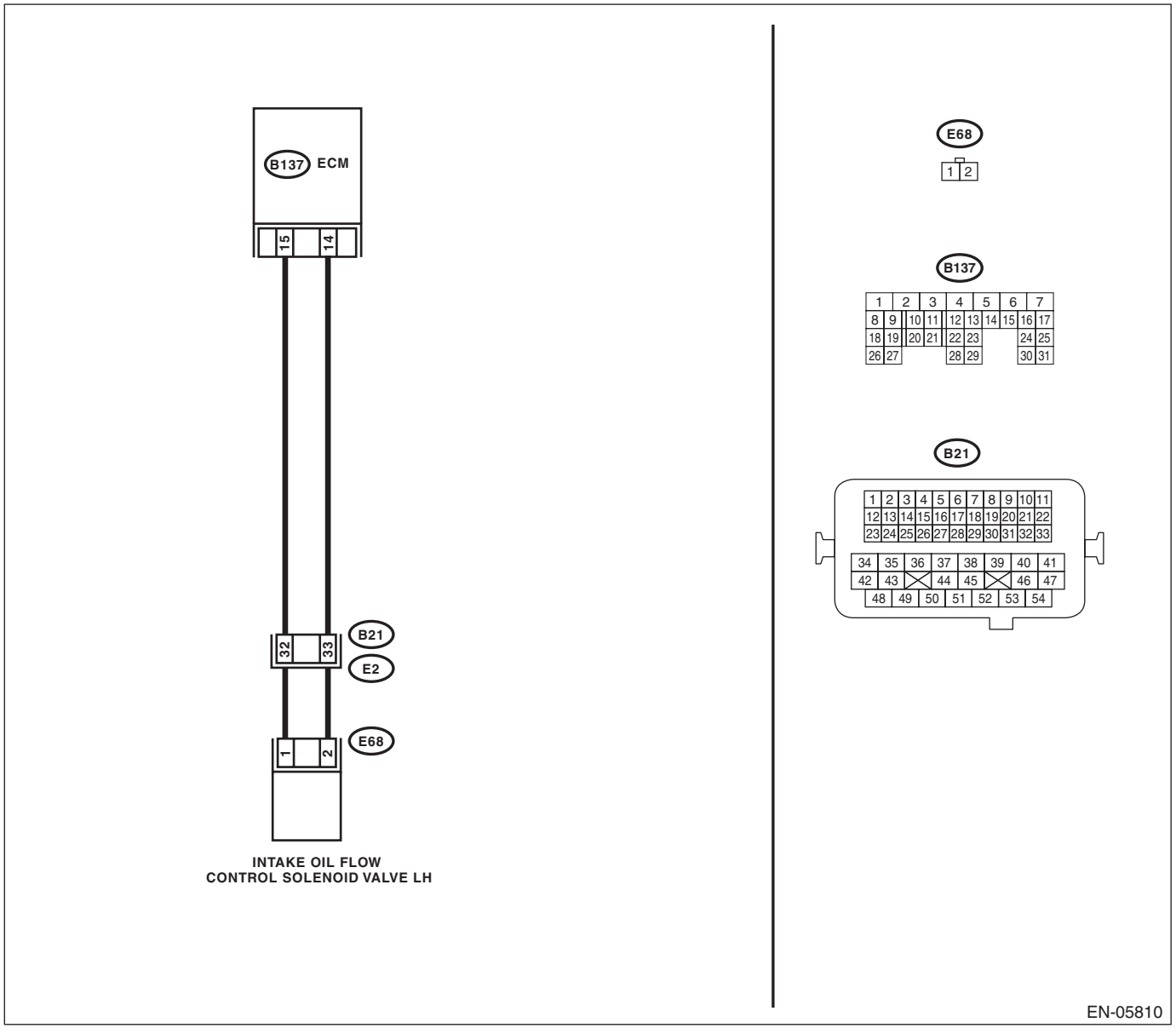
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 15 (+) — Chassis ground (–):*** ***(B137) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power in harness between ECM and oil flow control solenoid valve connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and oil flow control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 15 — (E68) No. 1:*** ***(B137) No. 14 — (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 of the harness between the ECM and oil flow control solenoid valve 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 between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-116, Oil Flow Control Solenoid Valve.>

DX: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.>

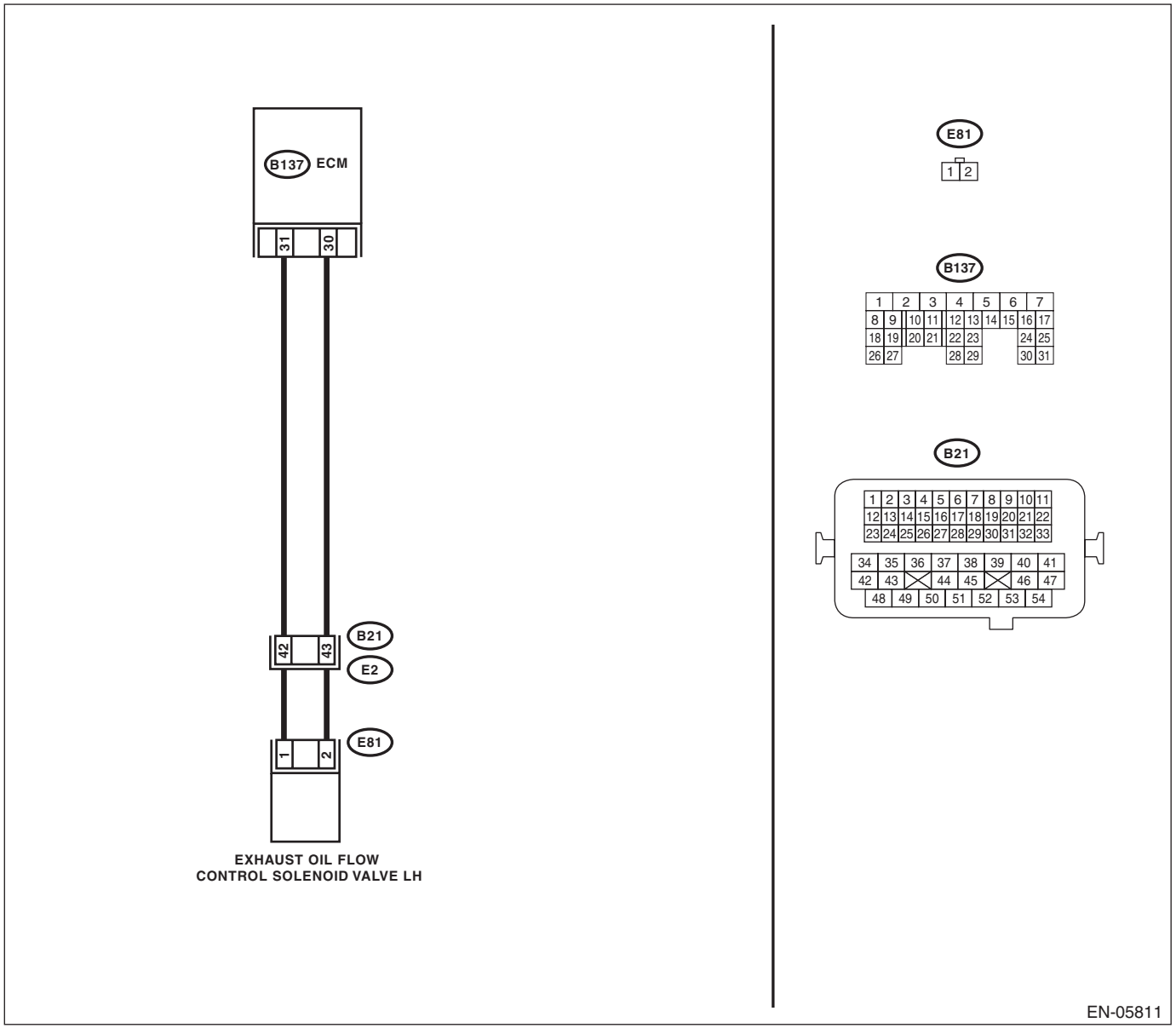
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B137) No. 31 — (E81) No. 1:*** ***(B137) No. 30 — (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 of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 31 — Chassis ground:*** ***(B137) No. 30 — 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 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 between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-116, Oil Flow Control Solenoid Valve.>

DY: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.>

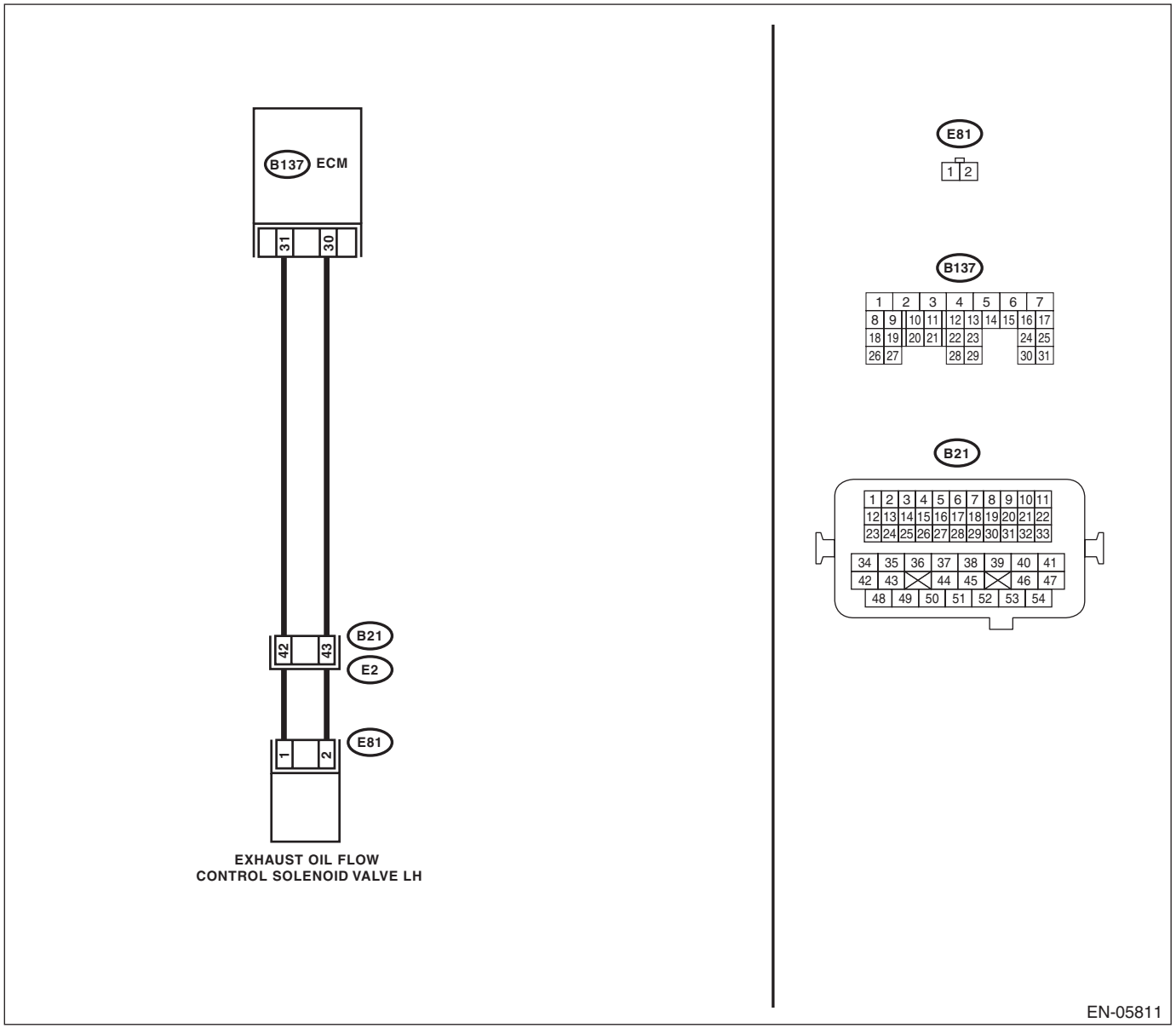
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 31 (+) — Chassis ground (–):*** ***(B137) No. 30 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power in harness between ECM and oil flow control solenoid valve connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and oil flow control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 31 — (E81) No. 1:*** ***(B137) No. 30 — (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 of the harness between the ECM and oil flow control solenoid valve 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 between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-116, Oil Flow Control Solenoid Valve.>

DZ:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1)

Refer to DTC P2097 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-323, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EA:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1)

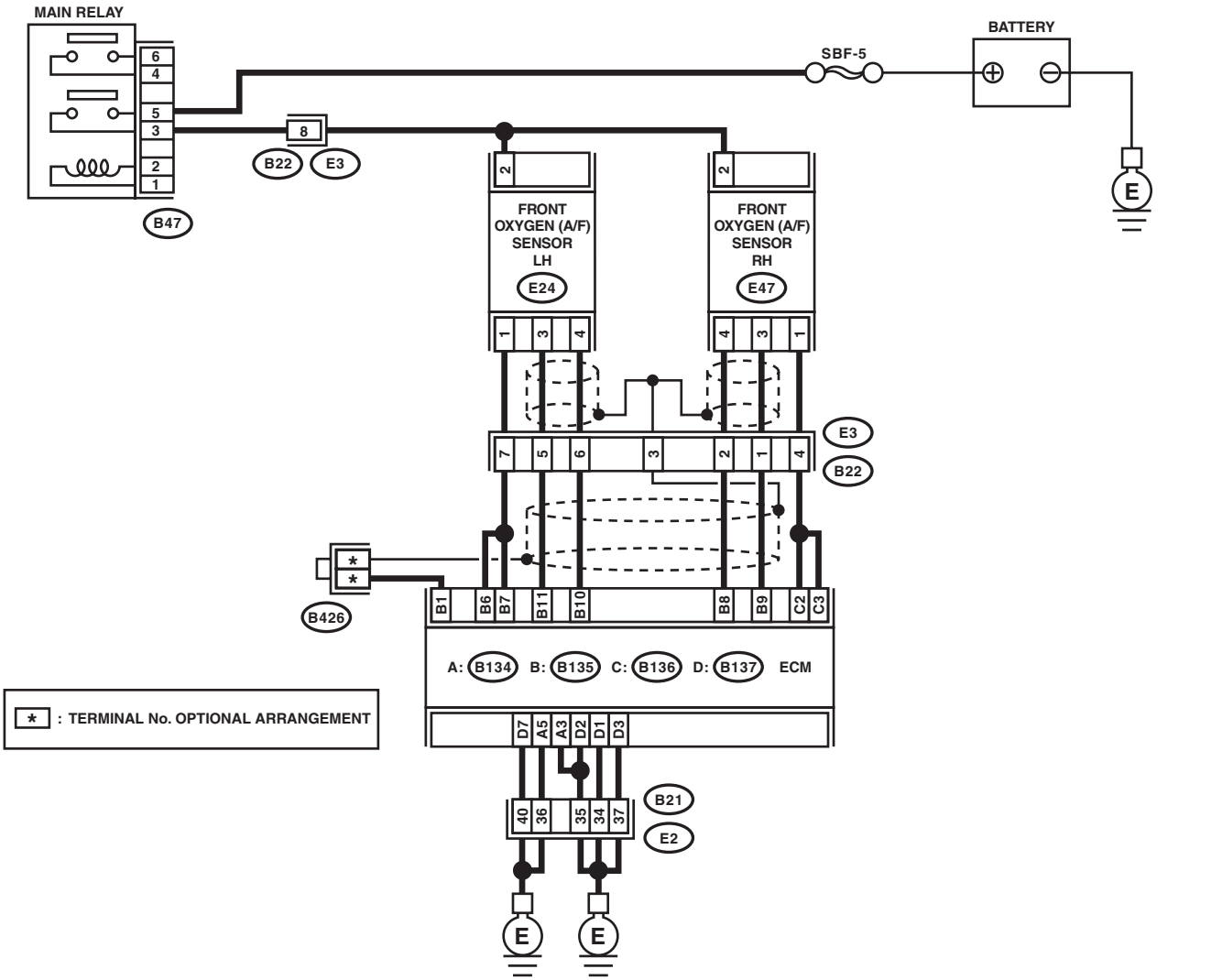
DTC DETECTING CONDITION:

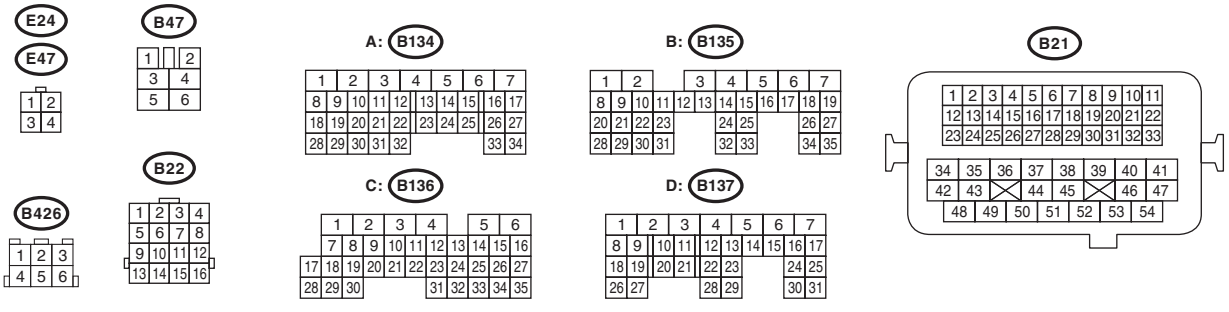
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-189, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

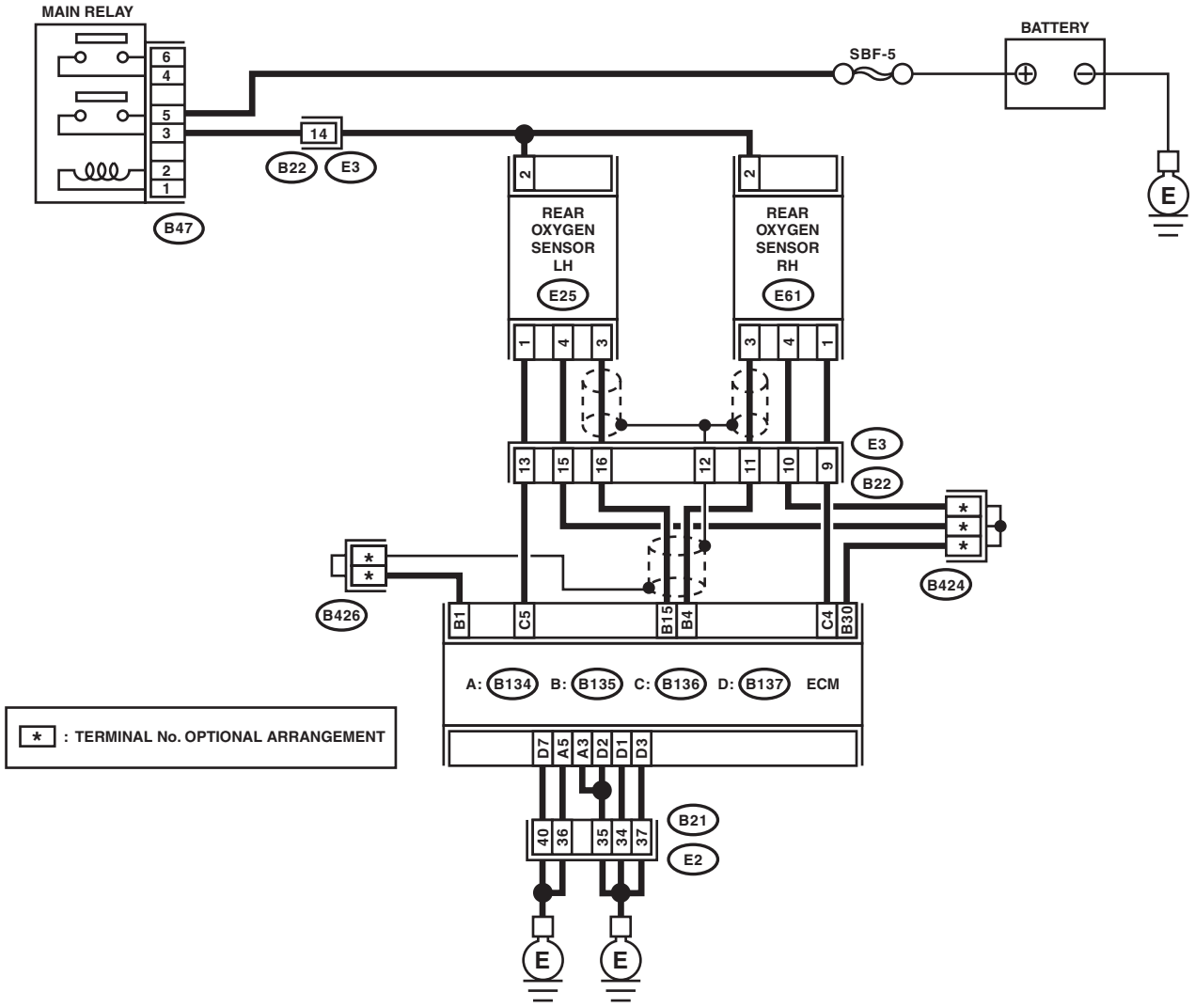
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06944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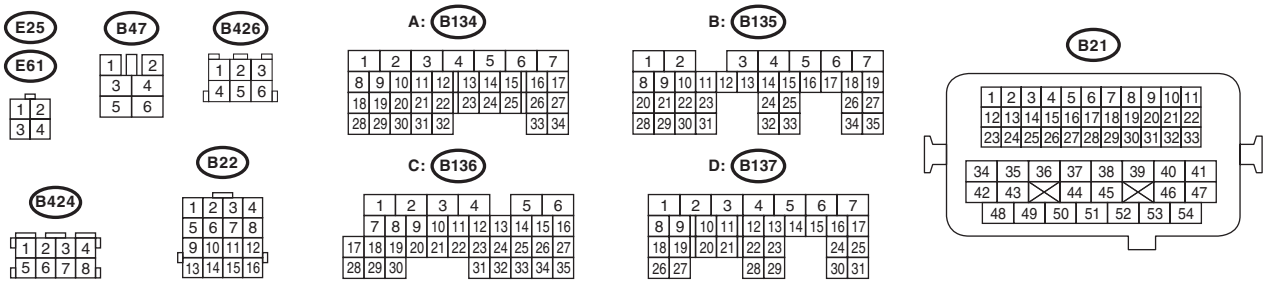
SBF-5
B47
B22
E3
REAR OXYGEN SENSOR LH
E25
REAR OXYGEN SENSOR RH
E61
E
B426
B424
B1
C5
B15
B4
C4
B30
A: B134 B: B135 C: B136 D: B137 ECM
* : TERMINAL No. OPTIONAL ARRANGEMENT
B21
E2


E25
E61
B47
B426
A: B134
B: B135
B21
B424
B22
C: B136
D: B137

EN-06945

	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)-83, 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**.
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. 9 — (E47) No. 3:*** ***(B135) No. 8 — (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*** ***(B135) No. 9 — Chassis ground:*** ***(B135) 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 front oxygen (A/F) sensor connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the 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)-38, 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**.

	Step	Check	Yes	No
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**.
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)-30, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 338 — 348 kPa (3.4 — 3.5 kgf/cm^2, 49 — 50.5 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-22, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-28, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-28, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is above 75°C (167°F), and keep the engine speed at 3,000 rpm. (for up to 2 minutes) 2) Read the data of rear oxygen sensor signal 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)-34, 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 above 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or more?	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 AND REAR OXYGEN SENSOR DATA.** 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-34, 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. 4 — (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 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)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact in ECM connector • Poor contact of coupling connector

EB:DTC P2098 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2

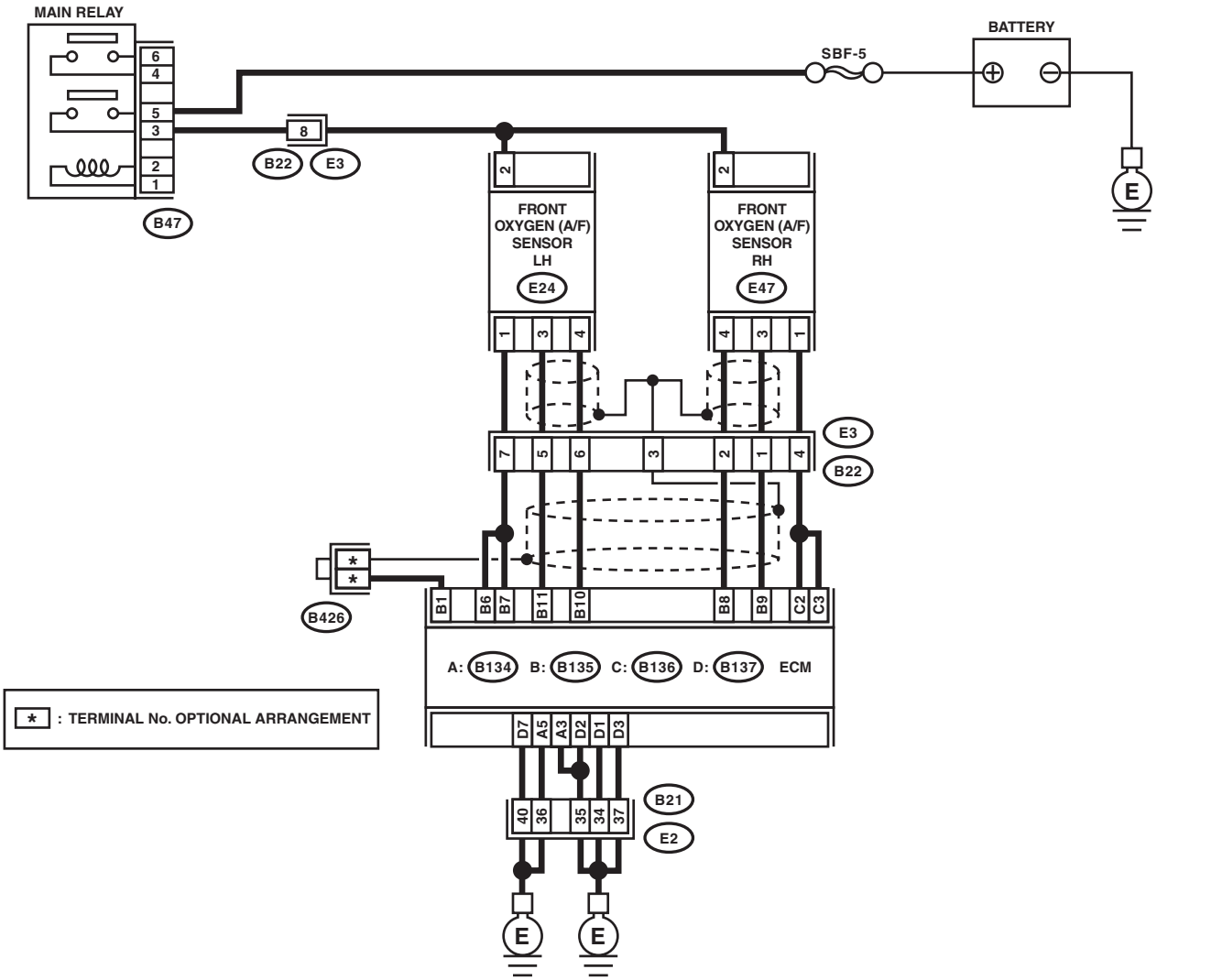
Refer to DTC P2099 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-329, DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

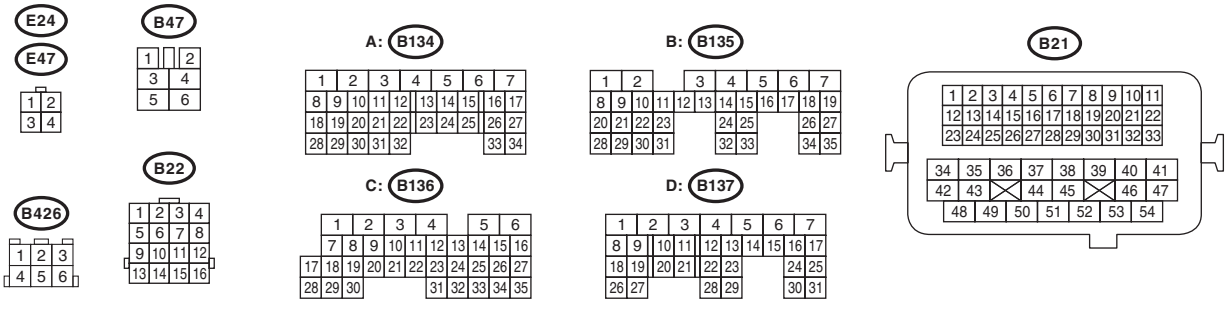
EC:DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2

DTC DETECTING CONDITION:

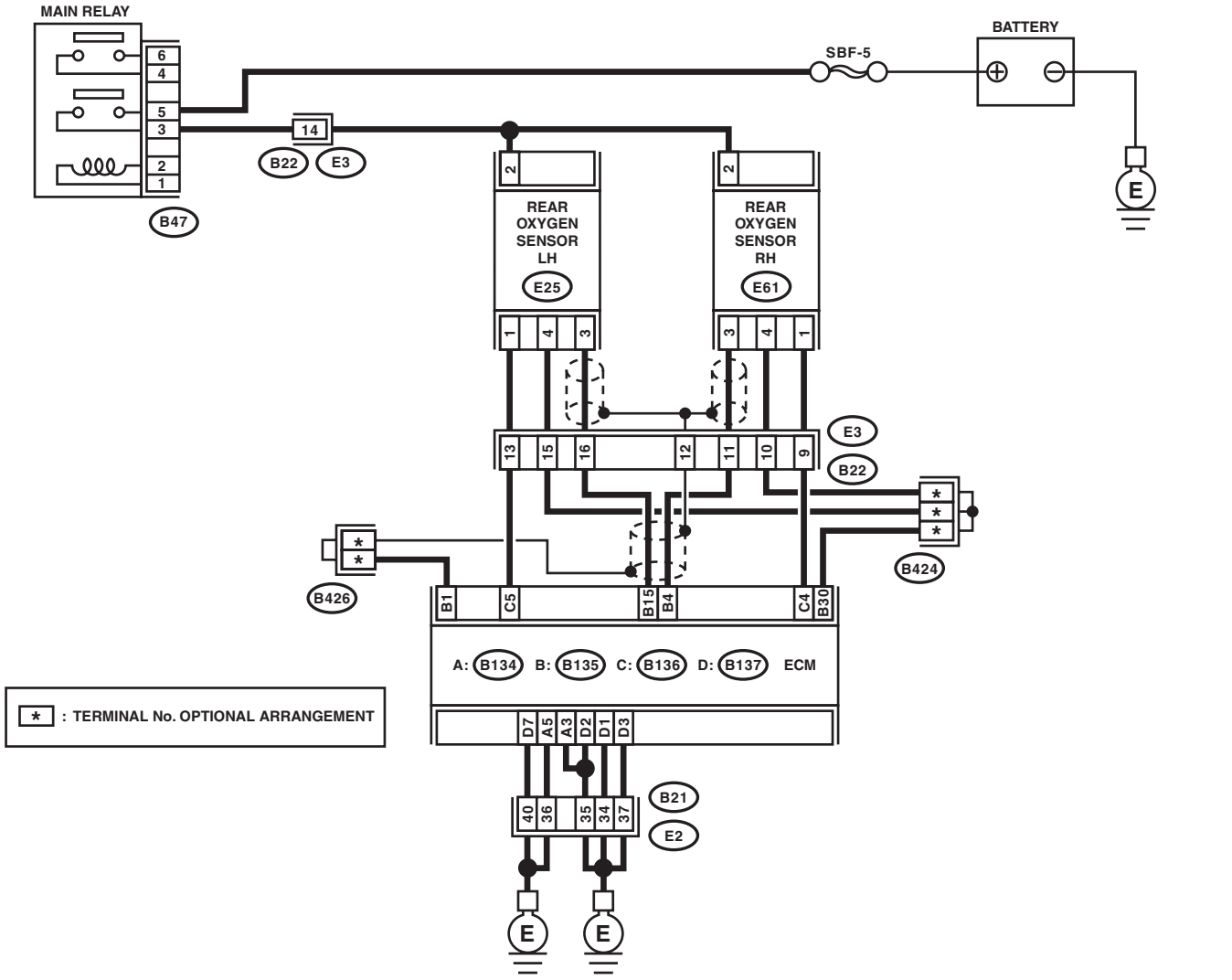
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-190, DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:





EN-06944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BATTERY
SBF-5
B47
B22
E3
REAR OXYGEN SENSOR LH
E25
REAR OXYGEN SENSOR RH
E61
E
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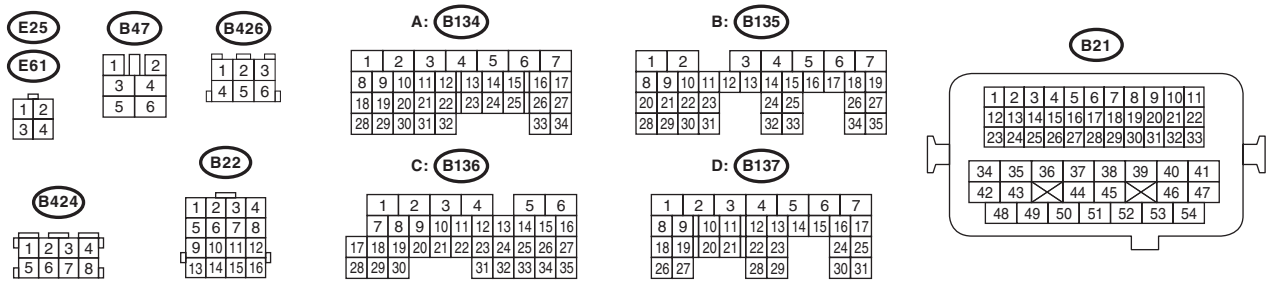
B424
B21
E2
A: B134 B: B135 C: B136 D: B137 ECM
* : TERMINAL No. OPTIONAL ARRANGEMENT


E25
E61
B47
B426
A: B134
B: B135
B21
B22
C: B136
D: B137
B424

EN-06945

	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)-83, 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**.
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. 11 — (E24) No. 3:*** ***(B135) No. 10 — (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. 11 — Chassis ground:*** ***(B135) No. 10 — 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 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)-38, 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**.

	Step	Check	Yes	No
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**.
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)-30, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 338 — 348 kPa (3.4 — 3.5 kgf/cm^2, 49 — 50.5 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-22, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-28, 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-28, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is above 75°C (167°F), and keep the engine speed at 3,000 rpm. (for up to 2 minutes) 2) Read the data of rear oxygen sensor signal 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)-34, 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 above 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or more?	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 AND REAR OXYGEN SENSOR DATA.** 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, 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)-34, 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. 15 — (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 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)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact in ECM connector • Poor contact of coupling connector

ED: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.>

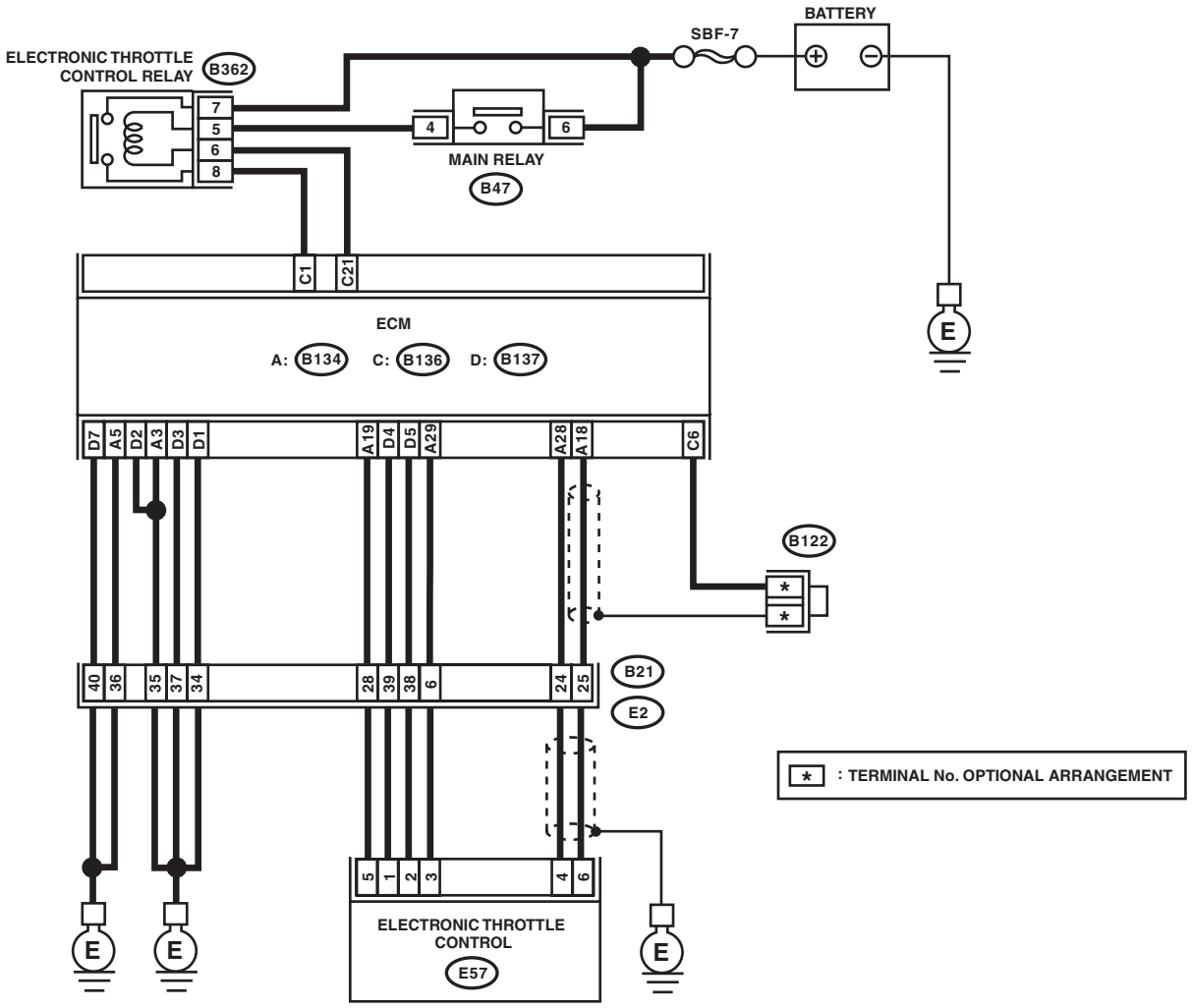
TROUBLE SYMPTOM:

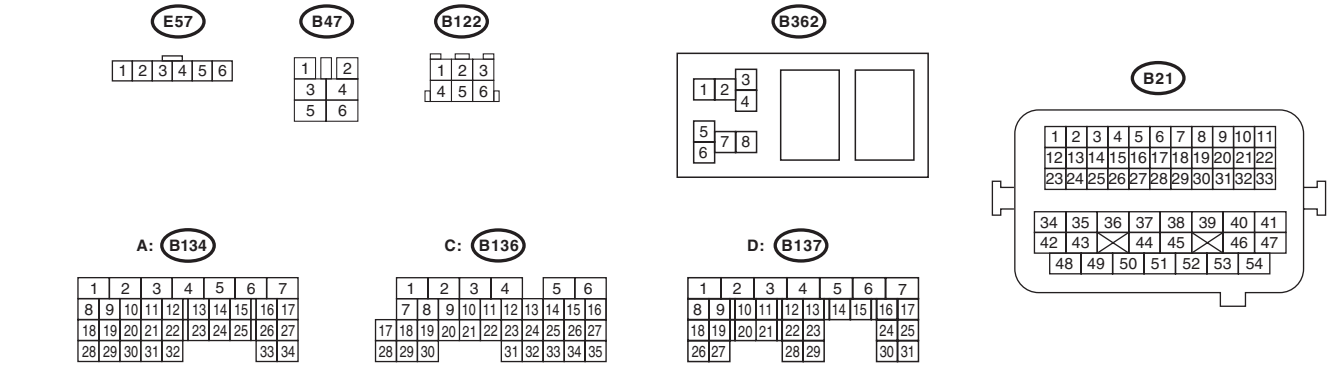
- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06946

	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.
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 connectors from the 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*** ***(B136) No. 21 — (B362) No. 6:*** ***(B136) No. 1 — (B362) No. 8:***	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. 6:*** ***(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 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)-38, Engine Control Module (ECM).>
8	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect connectors from the 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 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 in 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 4.85 V or more?	Repair the short circuit to power in the 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 connectors from the 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 the 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **13**.	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-15, Throttle Body.>
13	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-34, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **14**.	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-15, 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*** ***(B137) No. 5 — (E57) No. 2:*** ***(B137) No. 4 — (E57) No. 1:***	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 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 connectors from the 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 the electronic throttle control connector terminals. ***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. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **19**.	Repair the open circuit in harness between ECM and engine ground.
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)-15, 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)-15, Throttle Body.>

EE:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

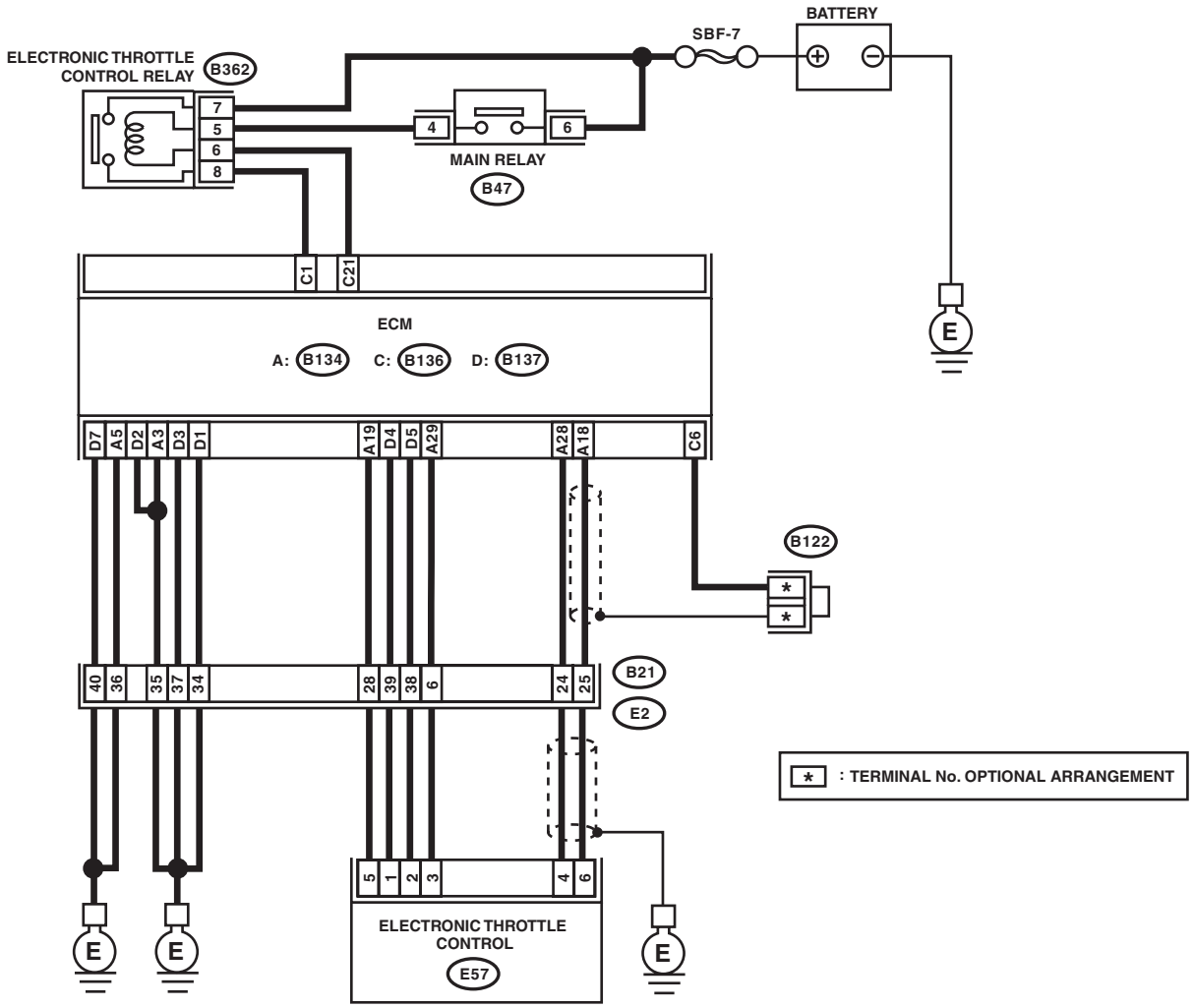
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-192, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

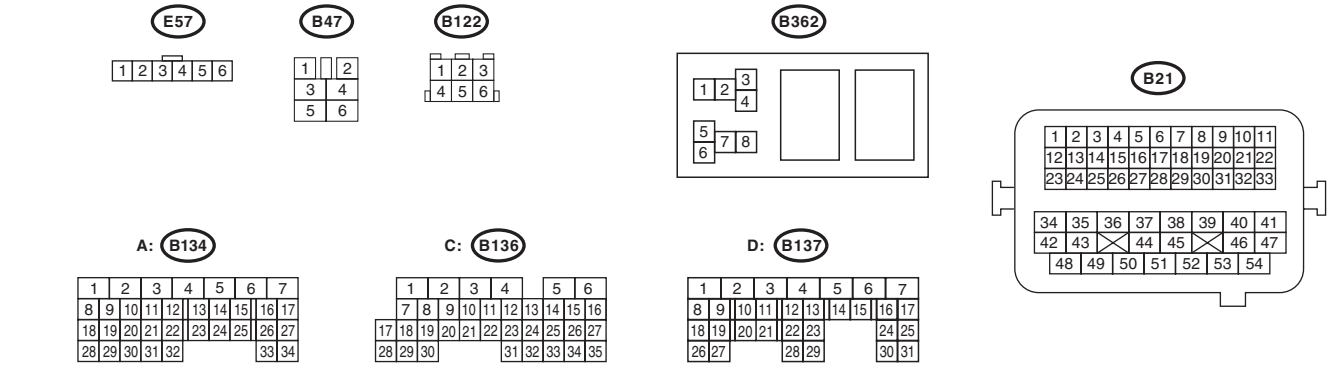
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06946

	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.
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 connectors from the 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*** ***(B136) No. 21 — (B362) No. 6:*** ***(B136) No. 1 — (B362) No. 8:***	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.

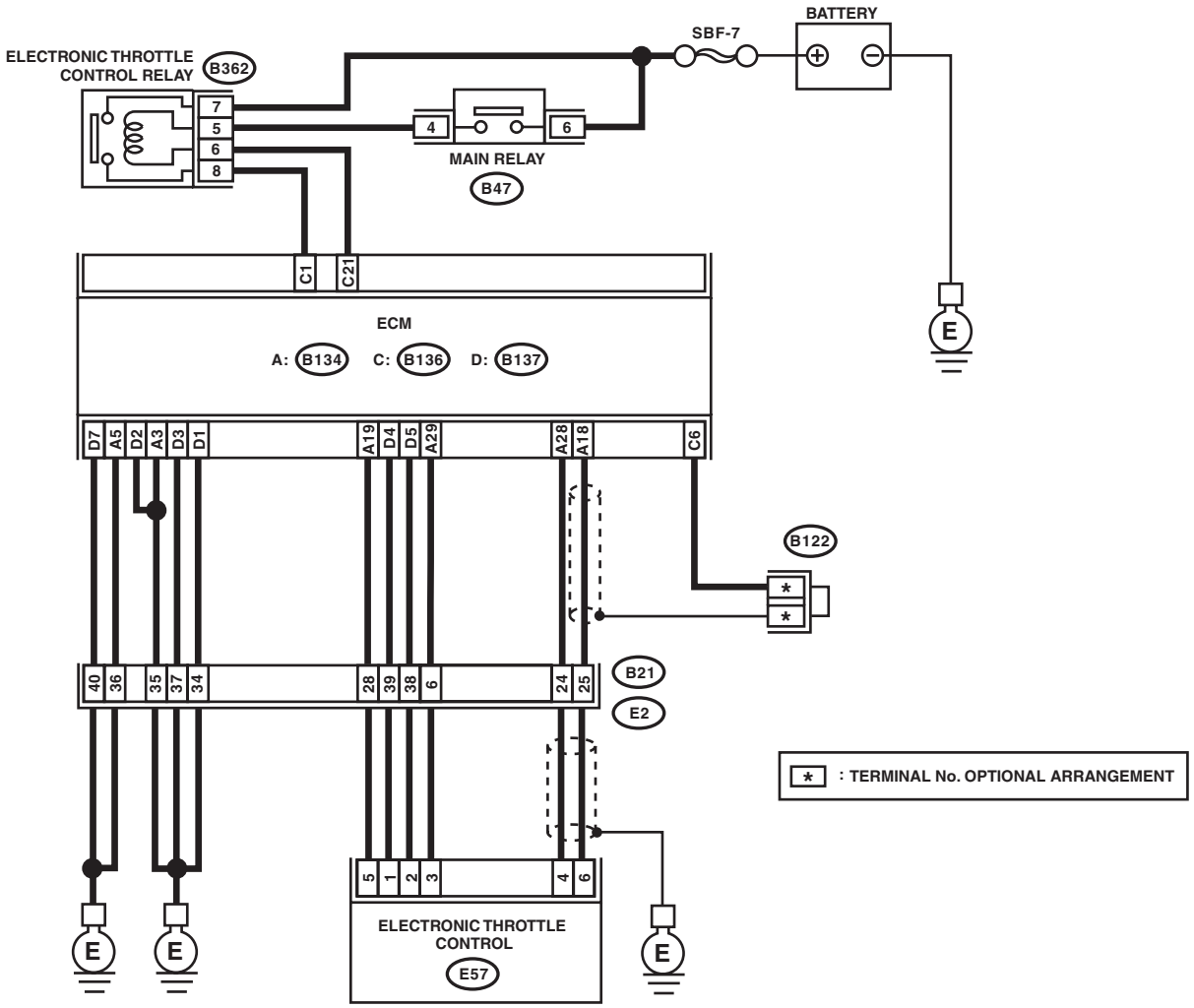
EF:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

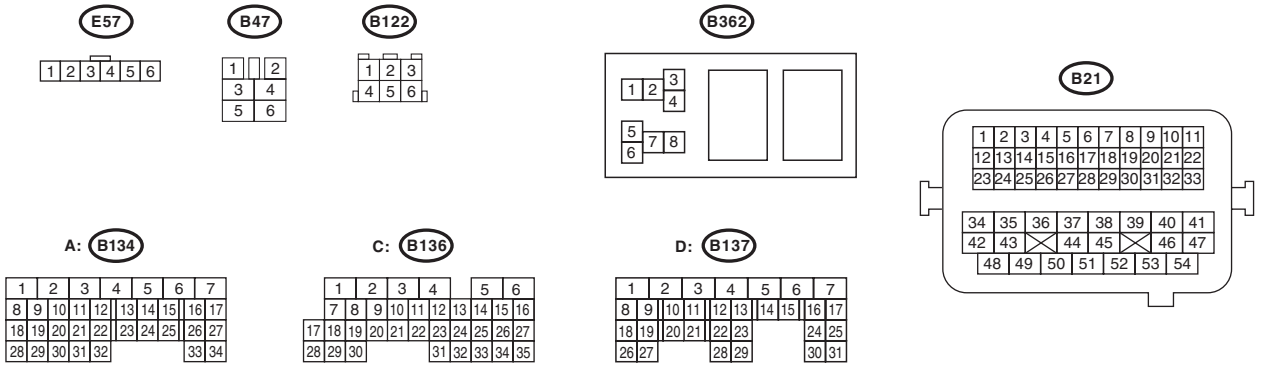
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-193, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06946

	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.
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 connectors from the ECM. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — 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.

EG:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EH:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

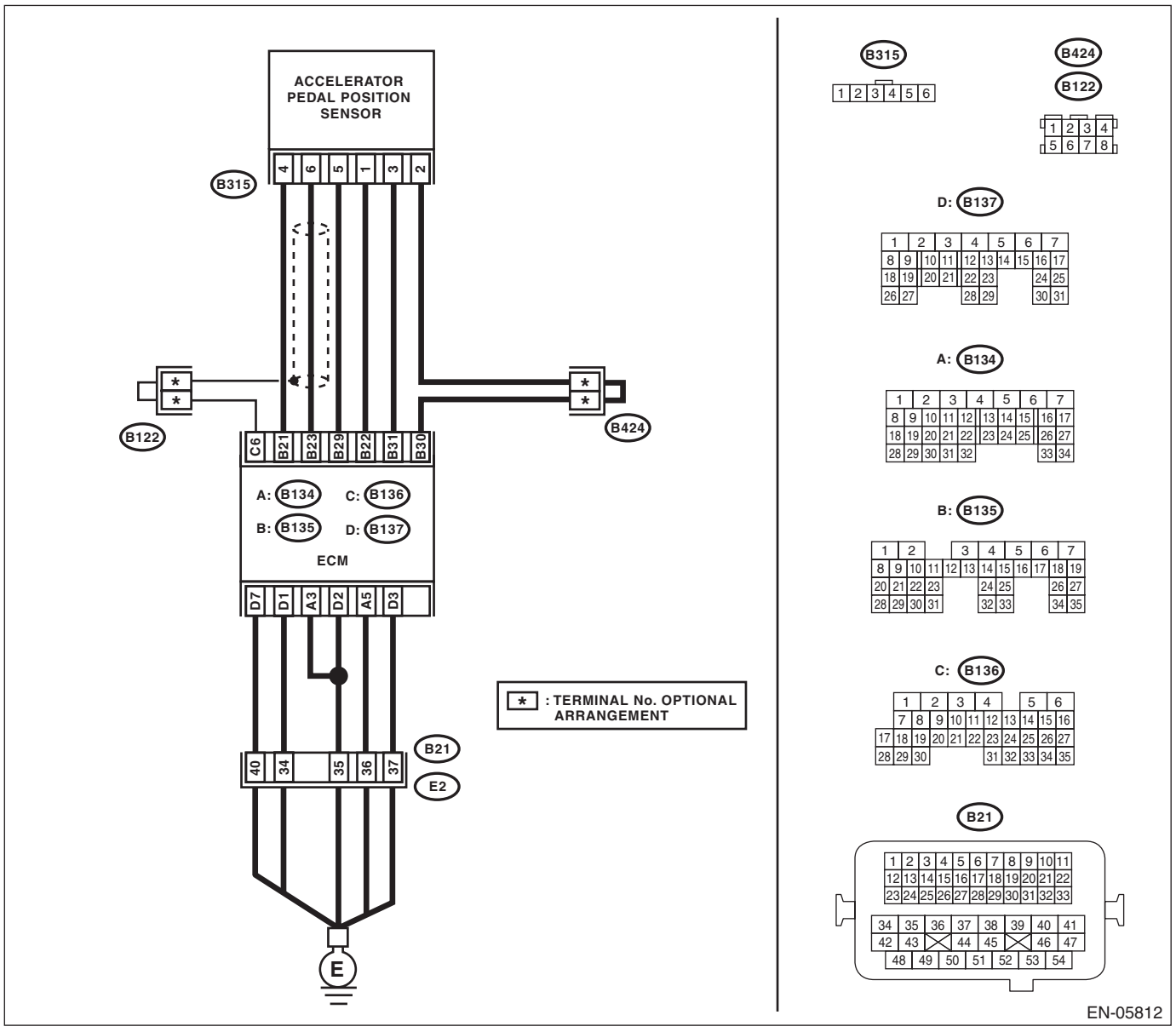
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-195, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector 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. 6:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the ground short circuit of harness between ECM and accelerator pedal position sensor connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the 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)-3, Accelerator Pedal.>	Repair the ground short circuit of harness between ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H6DO)-38, Engine Control Module (ECM).>

EI: DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-197, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

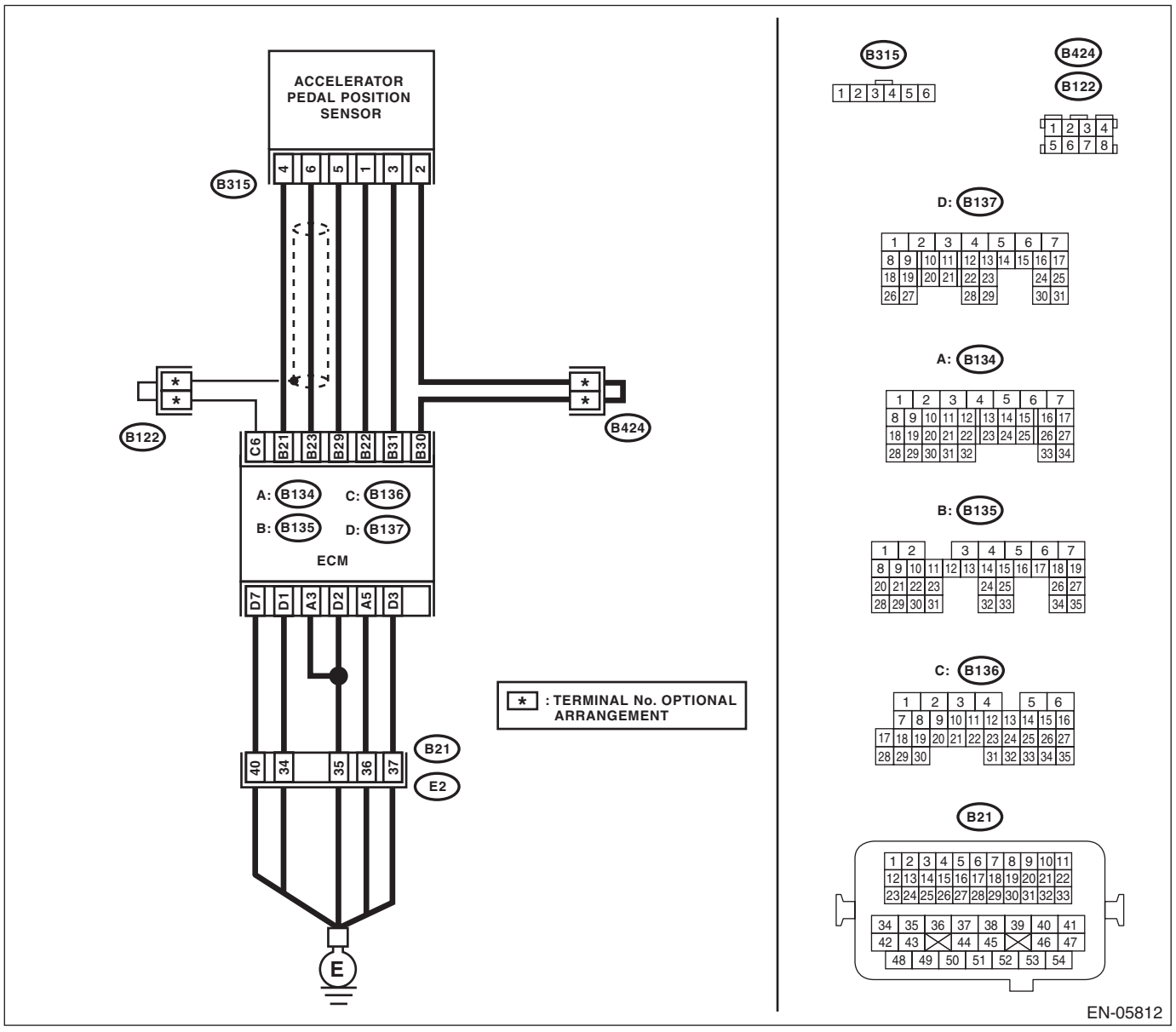
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector 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.** 1) Connect the 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 in ECM connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 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 4.85 V or more?	Repair the short circuit of harness to power supply between ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the 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)-3, Accelerator Pedal.>	Repair the short circuit of harness to power supply between ECM and accelerator pedal position sensor connector.

EJ: DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-199, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

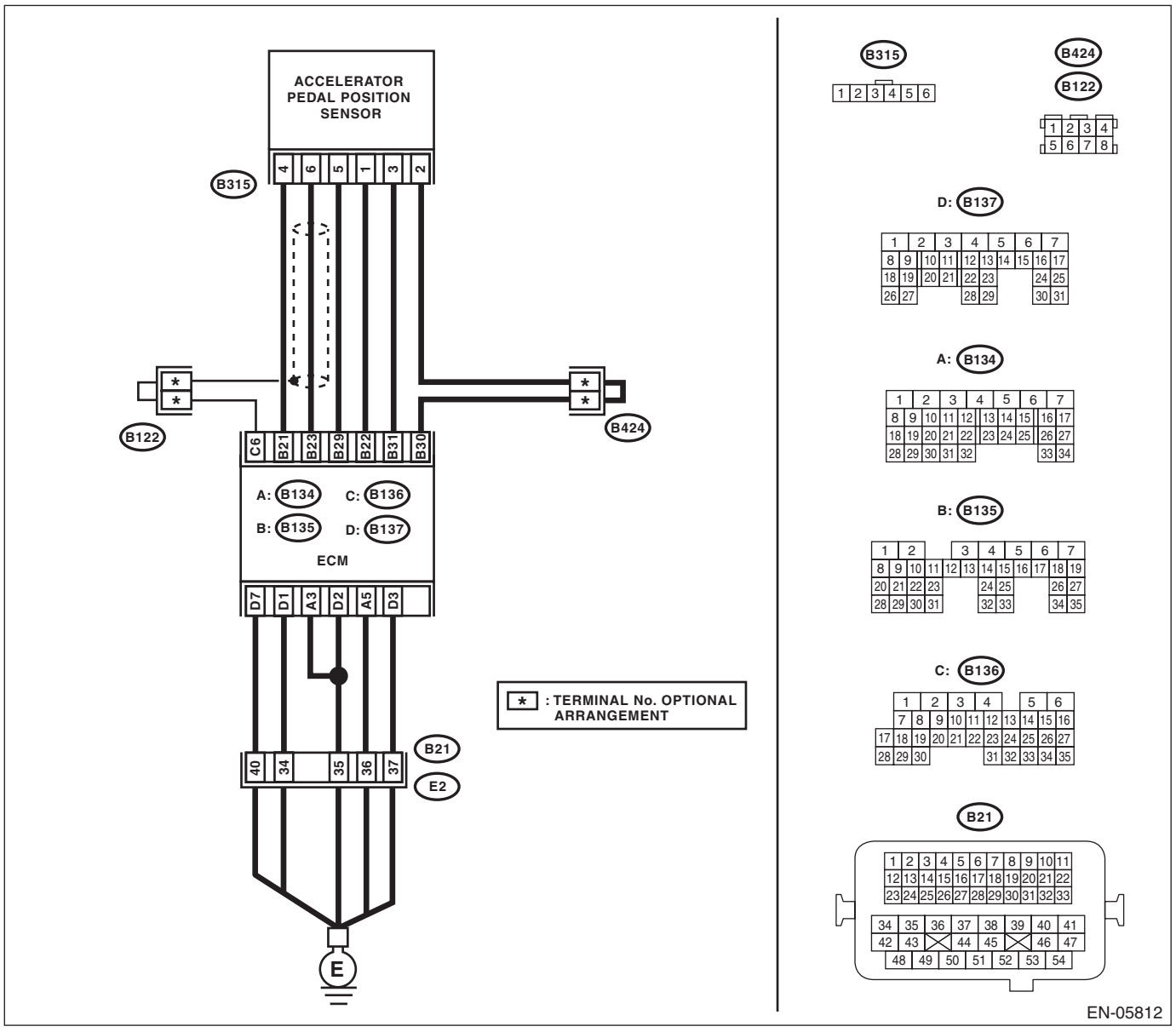
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector 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 ground short circuit of harness between ECM and accelerator pedal position sensor connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the 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)-3, Accelerator Pedal.>	Repair the ground short circuit of harness between ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H6DO)-38, Engine Control Module (ECM).>

EK:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-201, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

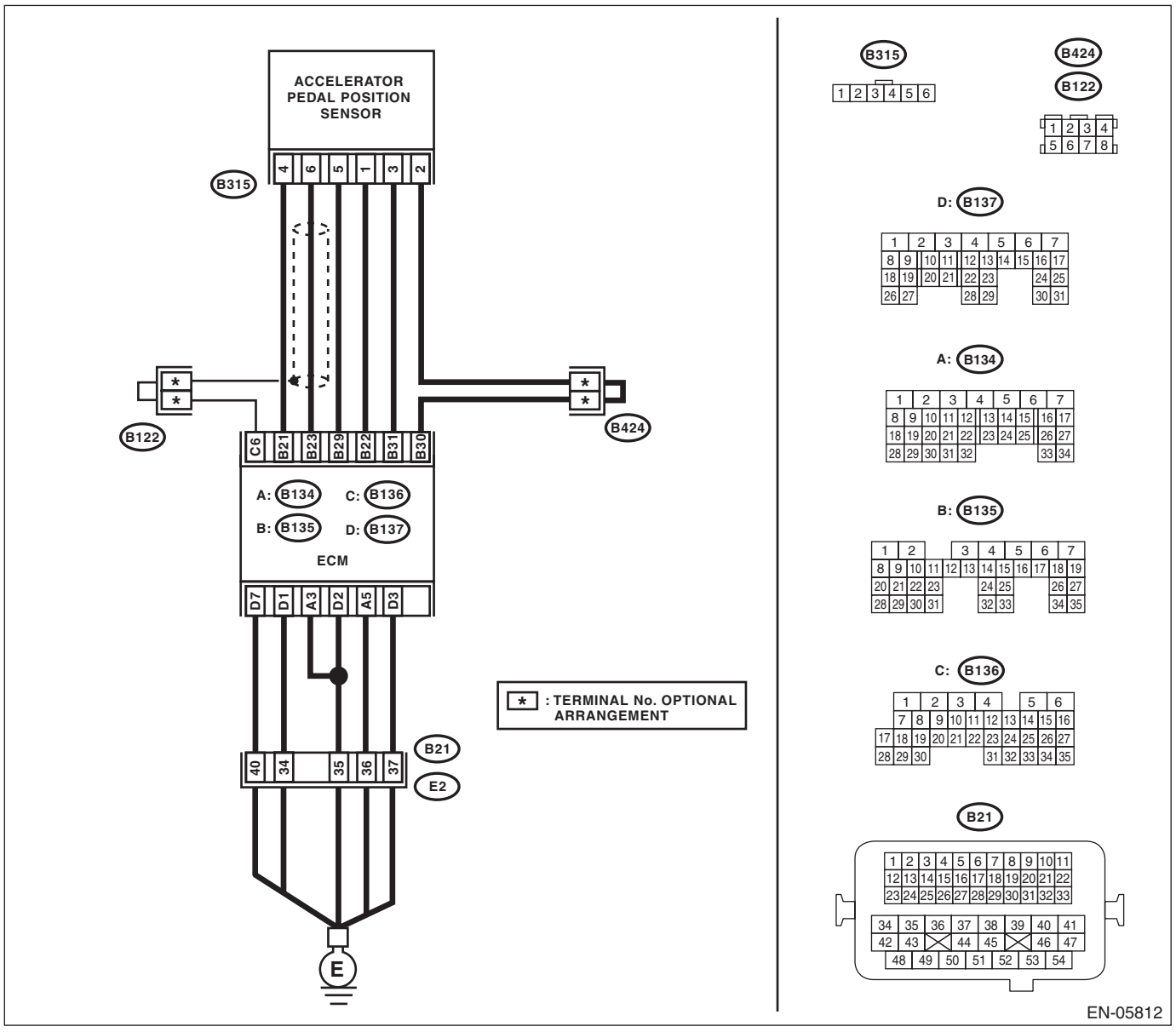
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector 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.** 1) Connect the 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 1 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 in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 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 4.85 V or more?	Repair the short circuit of harness to power supply between ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the 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)-3, Accelerator Pedal.>	Repair the short circuit of harness to power supply between ECM and accelerator pedal position sensor connector.

EL: DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-203, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

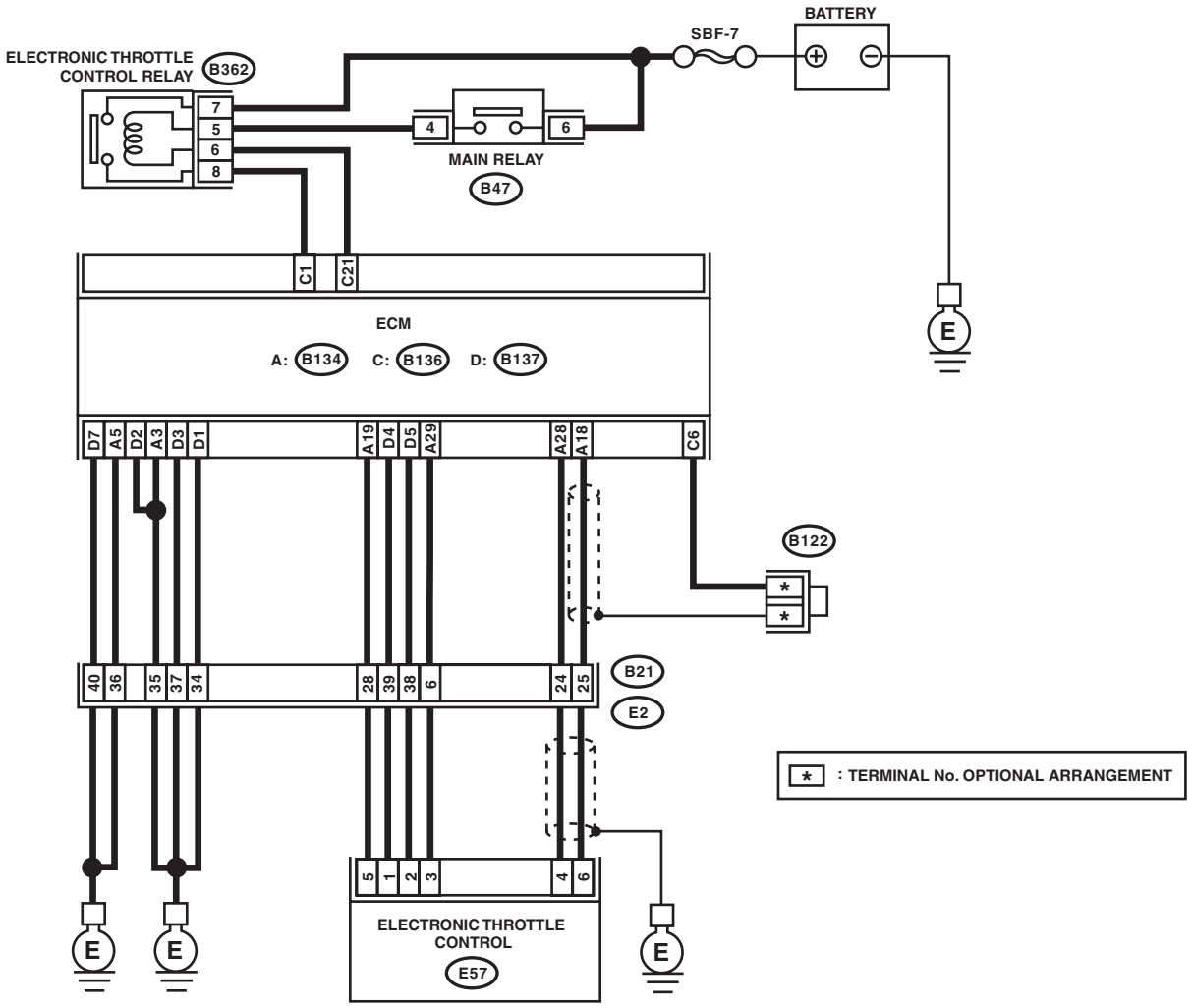
TROUBLE SYMPTOM:

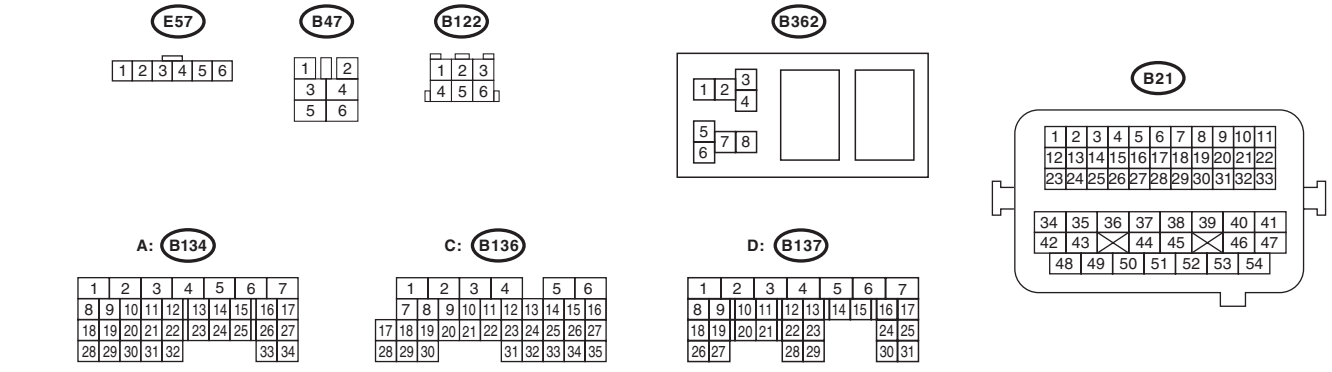
- Improper idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-06946

	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. 6:*** ***(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 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)-38, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect connectors from the 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 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 in 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 4.85 V or more?	Repair the short circuit to power in the 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 connectors from the 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 poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H6DO)-15, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

EM:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-205, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

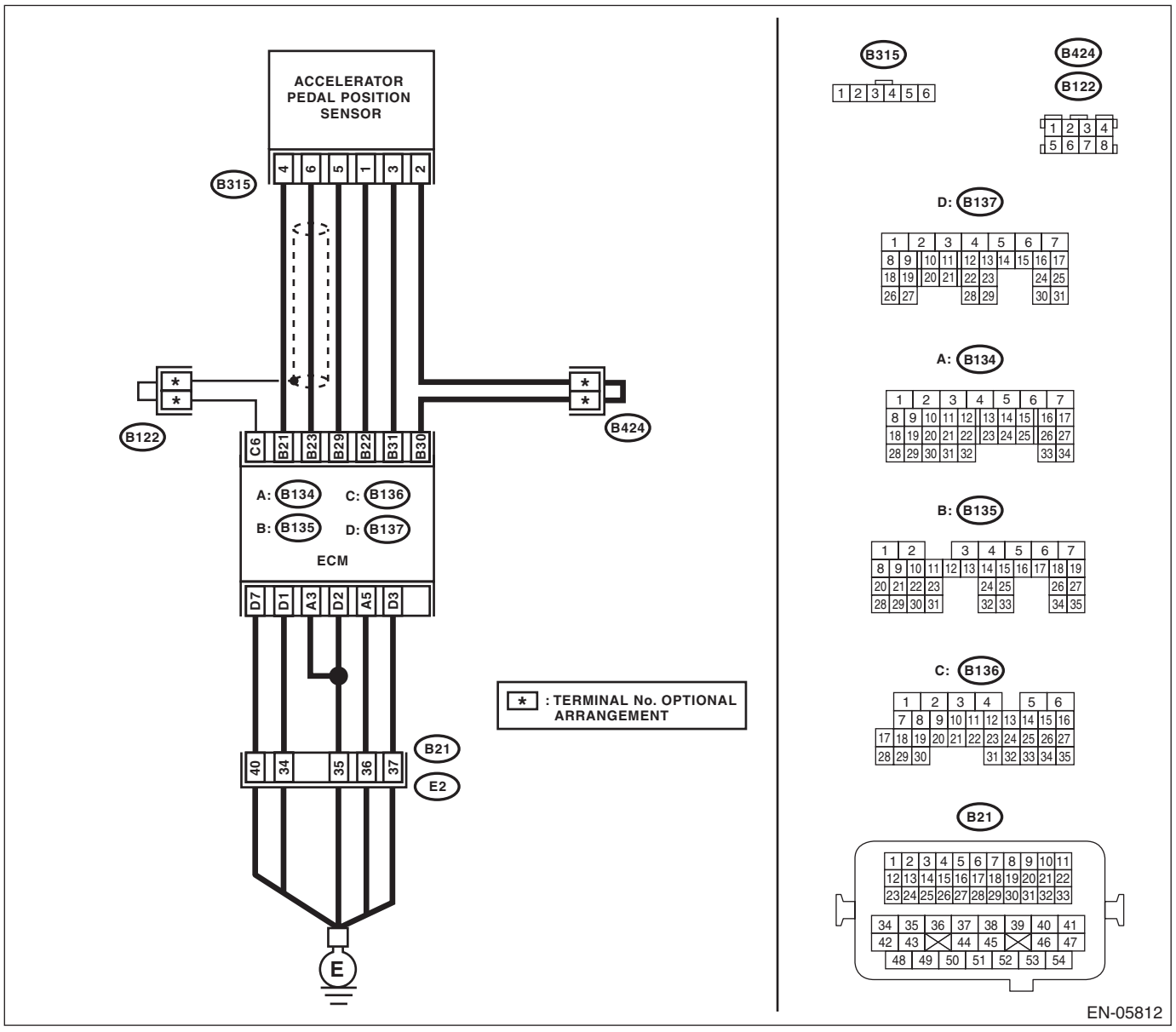
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.>.

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 (–):*** ***Sub 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.** 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)-3, Accelerator Pedal.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and accelerator pedal position sensor connector. • Short circuit to ground in harness between ECM and accelerator pedal position sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** Check 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 of harness between the ECM and accelerator pedal position sensor connector. • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector

EN:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-207, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-83, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H6DO)-38, Engine Control Module (ECM).> NOTE: The atmospheric pressure sensor is built into the ECM.

EO:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-208, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-83, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H6DO)-38, Engine Control Module (ECM).> NOTE: The atmospheric pressure sensor is built into the ECM.

EP:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-209, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H6DO)(diag)-44, 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)-83, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H6DO)-38, Engine Control Module (ECM).> NOTE: The atmospheric pressure sensor is built into the ECM.

21.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H6DO)-121, 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)
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
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
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) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1) 12) Accelerator pedal position sensor 13) Oil temperature sensor
5. Engine stalls, engine sags or hesitates 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

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
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
8. After-burn 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 air leak in air intake system.

GENERAL DESCRIPTION

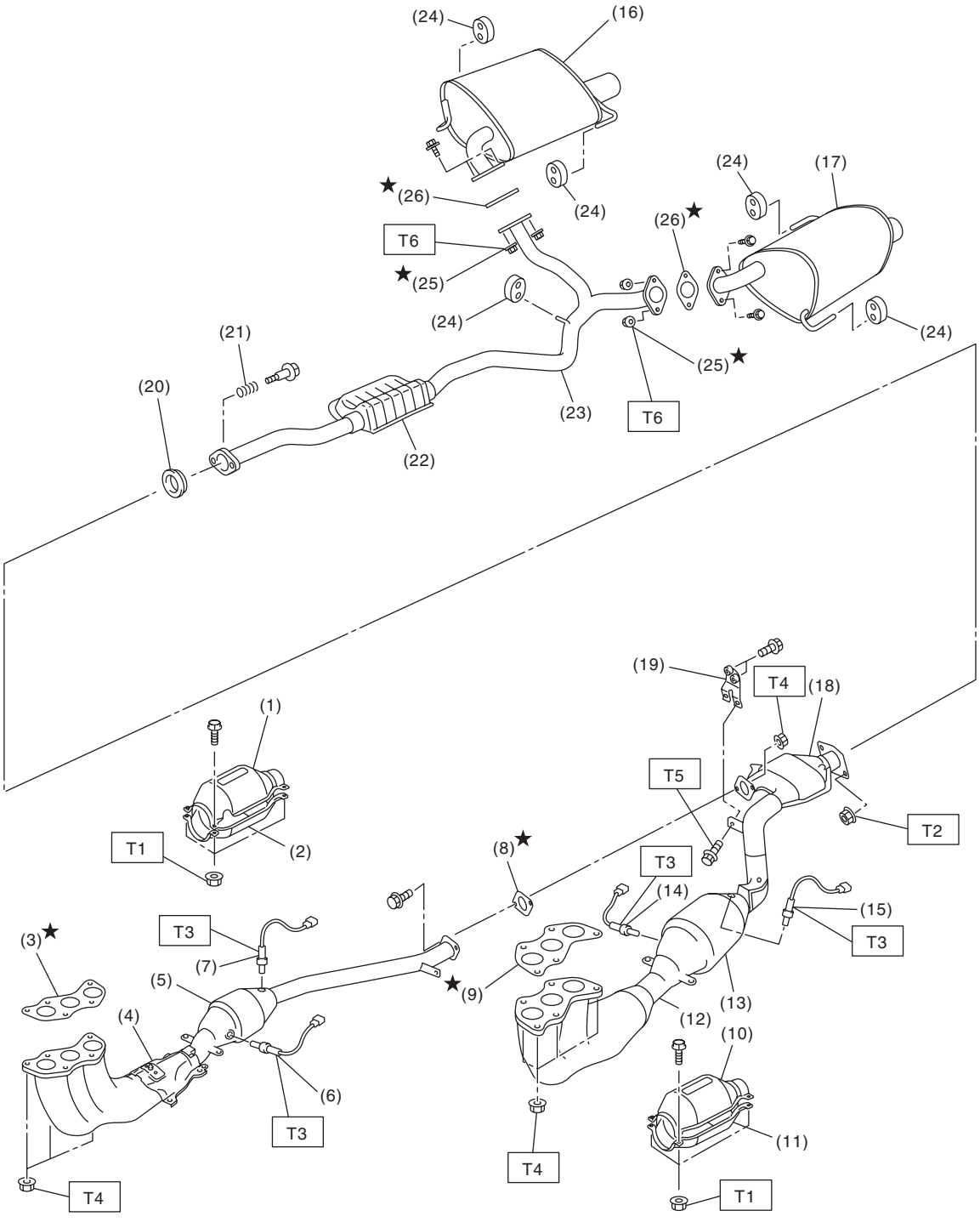
GD(H6DO)

Page

1. List of Diagnostic Trouble Code (DTC) 2
2. Diagnostic Trouble Code (DTC) Detecting Criteria 9

1. General Description

A: COMPONENT



EX-02375

(1) Front catalytic converter upper cover (RH)
(2) Front catalytic converter lower cover (RH)
(3) Gasket
(4) Front exhaust pipe (RH)
(5) Front catalytic converter (RH)
(6) Front oxygen (A/F) sensor (RH)
(7) Rear oxygen sensor (RH)
(8) Gasket
(9) Gasket
(10) Front catalytic converter upper cover (LH)
(11) Front catalytic converter lower cover (LH)
(12) Front exhaust pipe (LH)
(13) Front catalytic converter (LH)
(14) Front oxygen (A/F) sensor (LH)
(15) Rear oxygen sensor (LH)
(16) Muffler (RH)
(17) Muffler (LH)
(18) Rear catalytic converter
(19) Bracket
(20) Gasket
(21) Spring
(22) Chamber
(23) Rear exhaust pipe
(24) Cushion rubber
(25) Self-locking nut
(26) Gasket

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)*
T5:	*35 (3.6, 25.8)*
T6:	*48 (4.9, 35.4)*

B: CAUTION

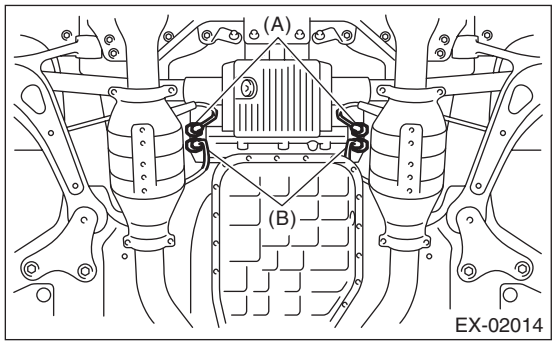
• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, 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

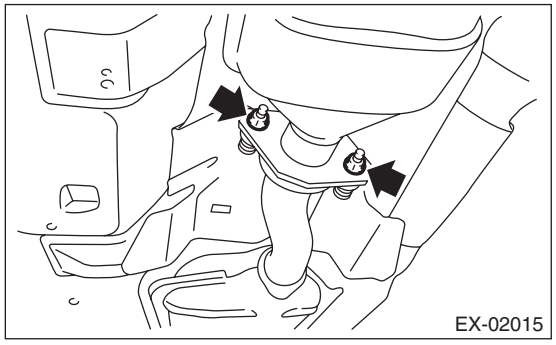
A: REMOVAL

CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Lift up the vehicle.
4) Remove the under cover.
5) Remove the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B).

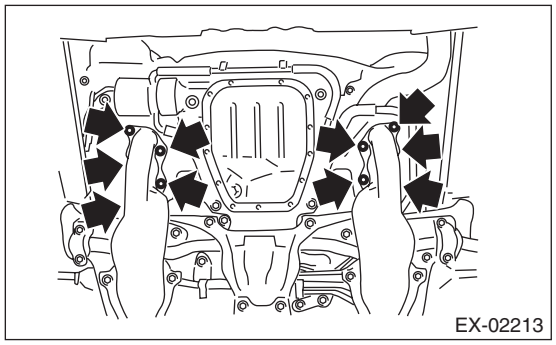


6) Separate the front exhaust pipe from rear exhaust pipe.

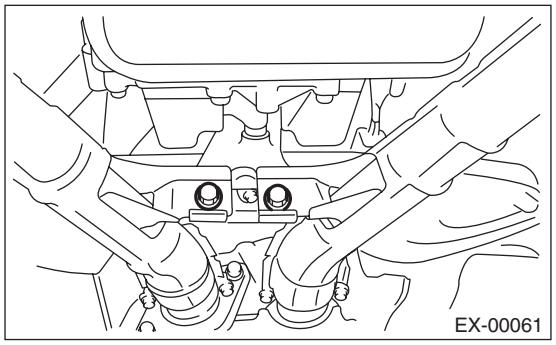


7) Remove the nuts which hold front exhaust pipe onto cylinder heads.

CAUTION:
Be careful not to let the front exhaust pipe assembly fall off.



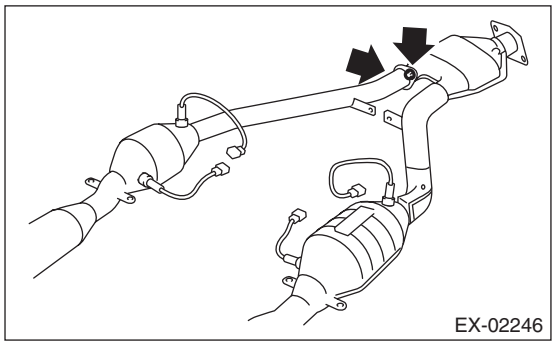
8) Remove the bolts which hold front exhaust pipe assembly to hanger bracket.



9) Remove the front exhaust pipe assembly from vehicle.

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.**

10) Separate the front exhaust pipe (RH) from front exhaust pipe assembly.



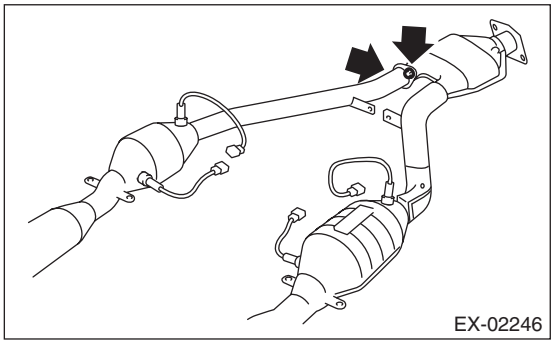
11) Remove the front oxygen (A/F) sensor and rear oxygen sensor. <Ref. to FU(H6DO)-34, REMOVAL, Front Oxygen (A/F) Sensor.> <Ref. to FU(H6DO)-36, REMOVAL, Rear Oxygen Sensor.>

B: INSTALLATION

1) Install the front oxygen (A/F) sensor and rear oxygen sensor. <Ref. to FU(H6DO)-35, INSTALLATION, Front Oxygen (A/F) Sensor.> <Ref. to FU(H6DO)-37, INSTALLATION, Rear Oxygen Sensor.>
2) Install the front exhaust pipe (RH) to front exhaust pipe (LH).

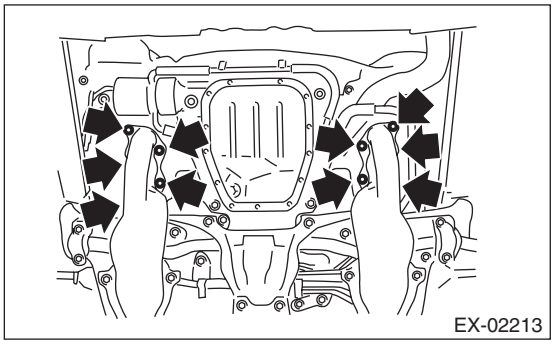
NOTE:
Use a new gasket.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

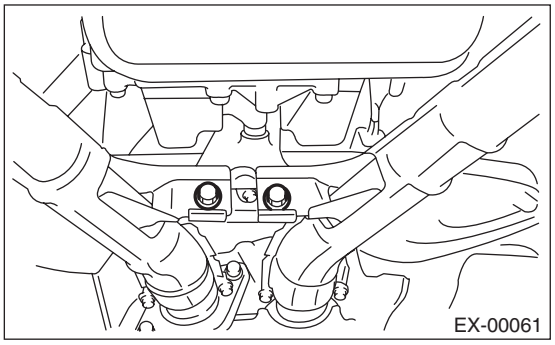

EX-02246

3) Install the front exhaust pipe assembly to vehicle.
4) Temporarily tighten the nuts to cylinder head which hold front exhaust pipe.

NOTE:
Use a new gasket.


EX-02213

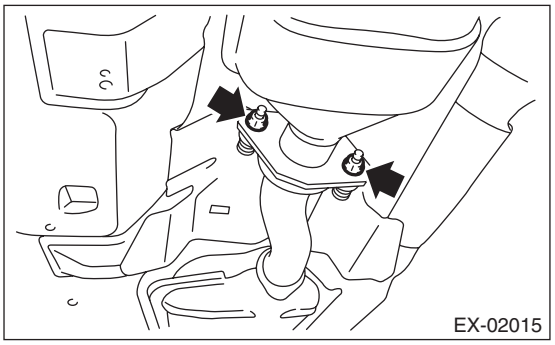
5) Temporarily tighten the bolts which hold front exhaust pipe assembly to hanger bracket.


EX-00061

6) Tighten the bolts which install front exhaust pipe to rear exhaust pipe.

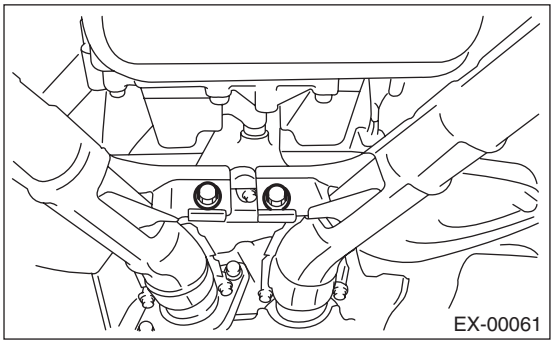
NOTE:
Use a new gasket.

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


EX-02015

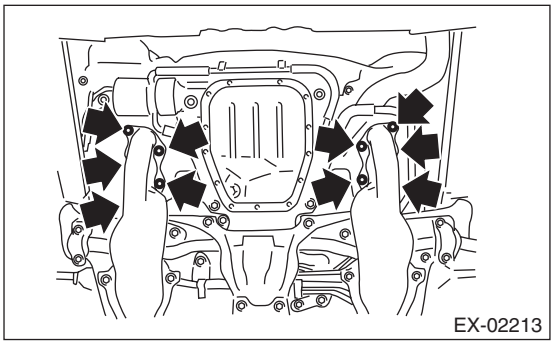
7) Tighten the bolts which hold front exhaust pipe assembly to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)


EX-00061

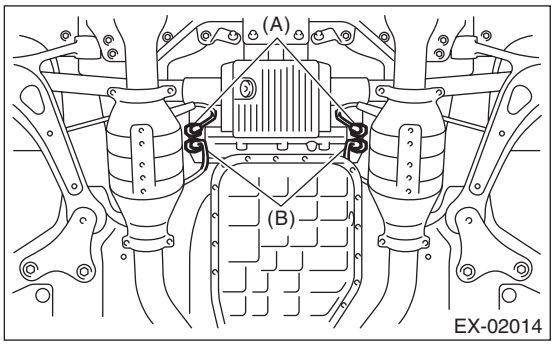
8) Install the nuts to cylinder head which hold front exhaust pipe.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)


EX-02213

9) Install the under cover.

10) Connect the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B).



11) Lower the vehicle.
12) Connect the ground cable to battery.

C: INSPECTION

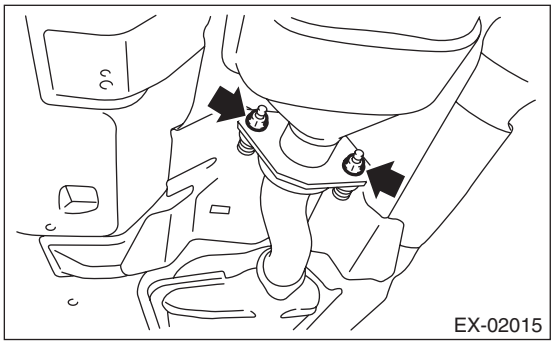
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.

3. Rear Exhaust Pipe

A: REMOVAL

CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

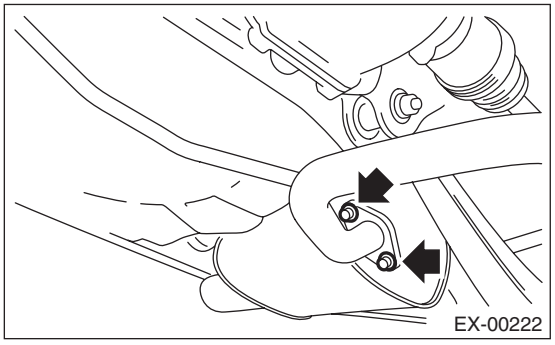
1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Separate the rear exhaust pipe from front exhaust pipe.



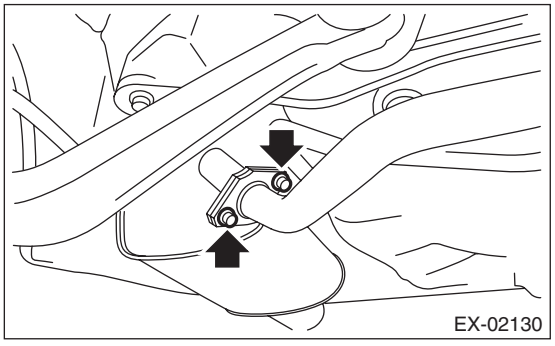
4) Separate the rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down the rear exhaust pipe.

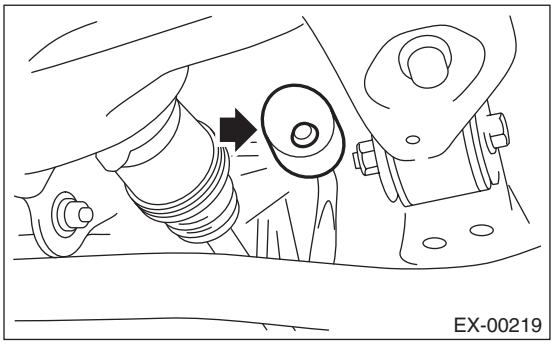
- LH side



- RH side



5) Apply a coat of spray type lubricant to the mating area of cushion rubber.
6) Remove the rear exhaust pipe bracket from cushion rubber.

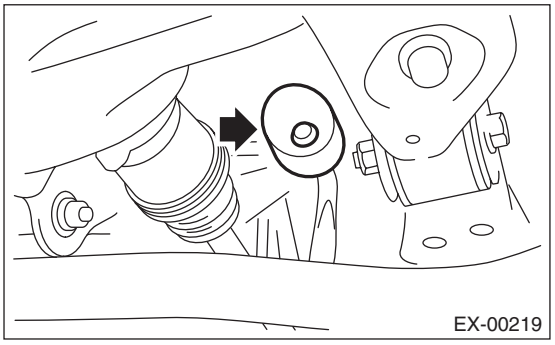


7) Remove the rear exhaust pipe.

B: INSTALLATION

1) Apply a coat of spray type lubricant to the mating area of cushion rubber.
2) Install the rear exhaust pipe bracket to cushion rubber.

NOTE:
After assembling, degrease the lubricant which was applied to the cushion rubber while removing/installing.

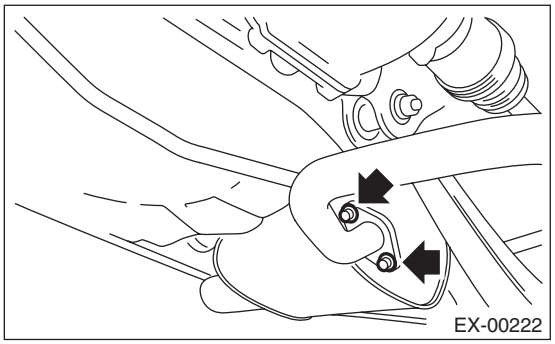


3) Install the rear exhaust pipe to muffler.

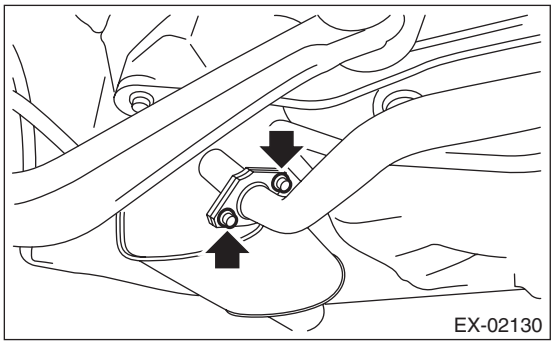
NOTE:
Use a new gasket and self-locking nut.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

- LH side



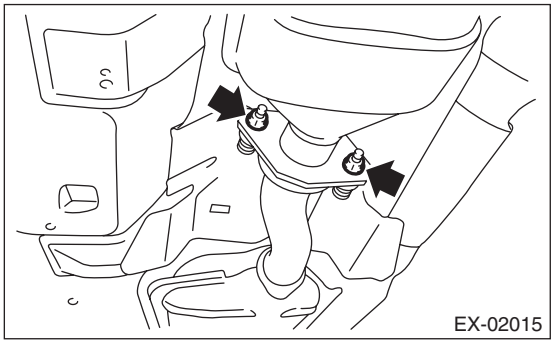
- RH side



4) Install the rear exhaust pipe to center exhaust pipe.

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.

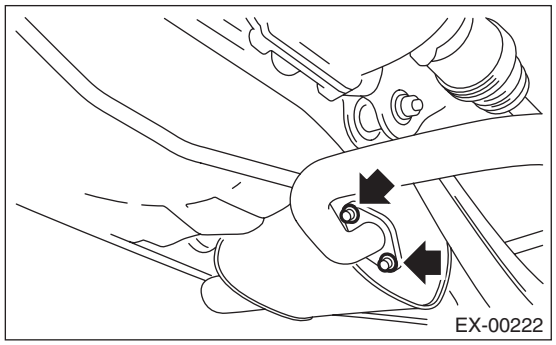
4. Muffler

A: REMOVAL

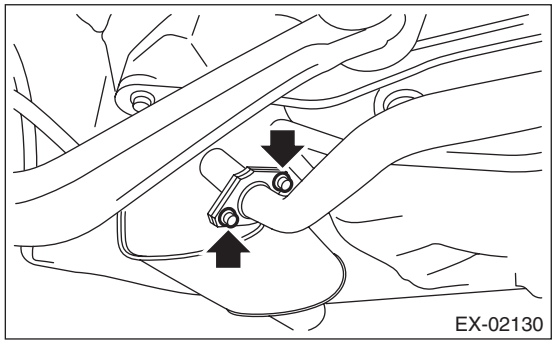
CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Separate the muffler from rear exhaust pipe.

- LH side



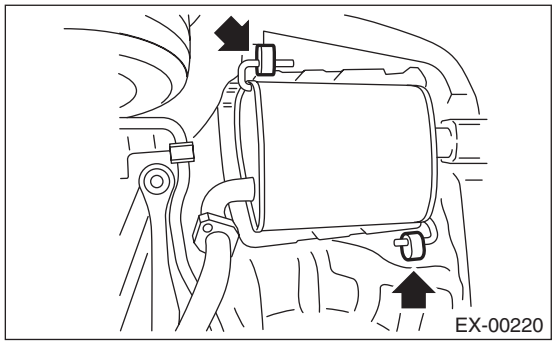
- RH side



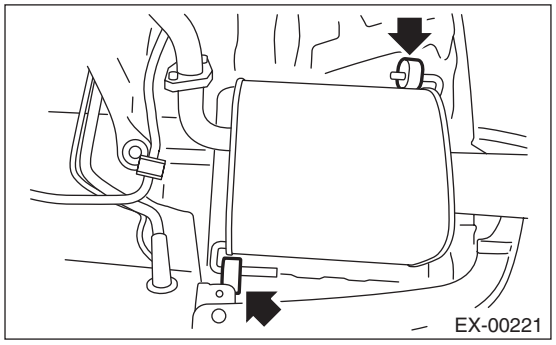
4) Apply a coat of spray type lubricant to the mating area of cushion rubber.
5) Remove the front and rear cushion rubber, and then remove the muffler.

CAUTION:
Be careful not to drop the muffler during removal.

- LH side



- RH side



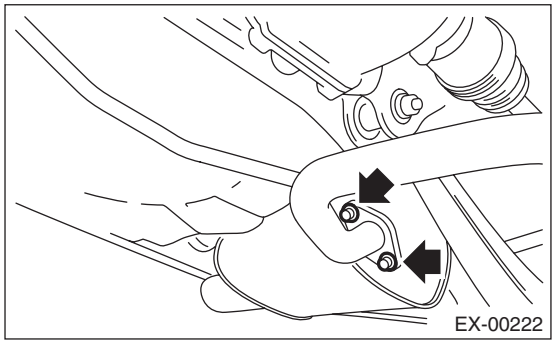
B: INSTALLATION

Install in the reverse order of removal.

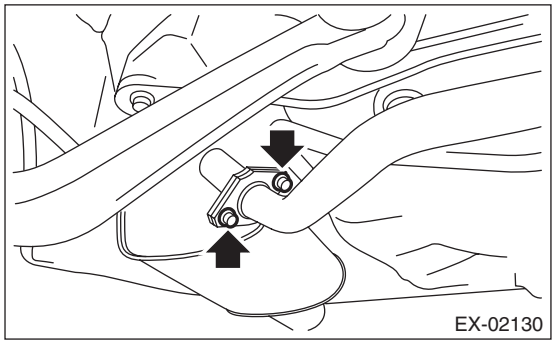
NOTE:
- Use a new gasket and self-locking nut.
- After assembling, degrease the lubricant which was applied to the cushion rubber while removing/installing.

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	12
4.	Water Pump	14
5.	Thermostat	15
6.	Radiator	17
7.	Radiator Cap	22
8.	Radiator Main Fan and Fan Motor	23
9.	Radiator Sub Fan and Fan Motor	27
10.	Reservoir Tank	28
11.	Radiator Fan Control Unit	31
12.	Engine Cooling System Trouble in General	32

1. General Description

A: SPECIFICATION

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			Approx. 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	4,960 rpm — 140 kPa (14 mAq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter mm (in)		66 (2.60)
	Number of impeller vanes		8
	Number of pump sprocket teeth		23
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 kPa (kg/cm^2, psi)		Above: 88.3±14.7 (0.9±0.15, 13±2) Below: The atmospheric pressure or less
	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)	K0670Y0000	
Water for dilution	Distilled water	—	Soft water or tap water
Cooling system protective agent	Cooling system conditioner	SOA345001	—

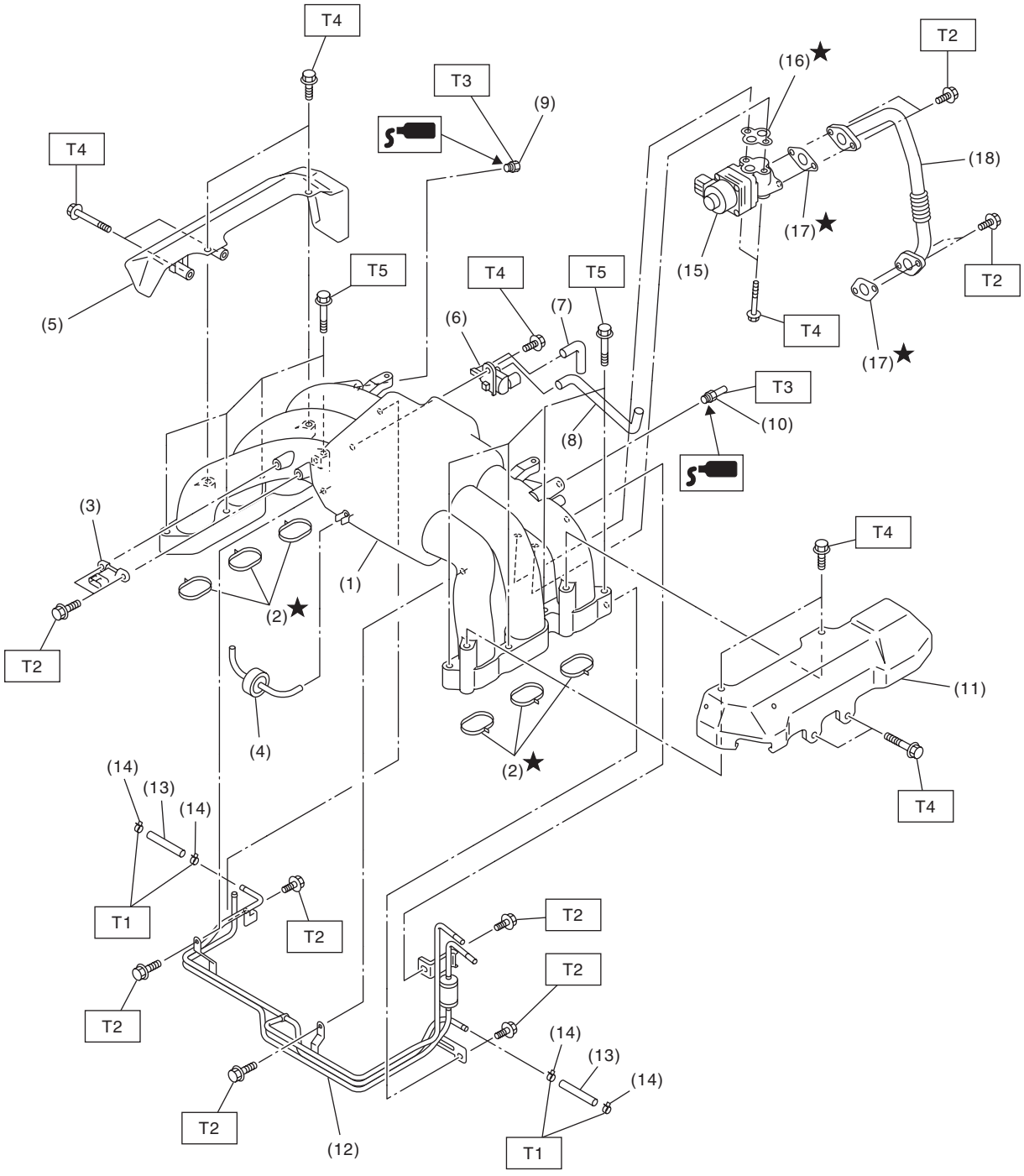
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Install locations	Rear floor bottom
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

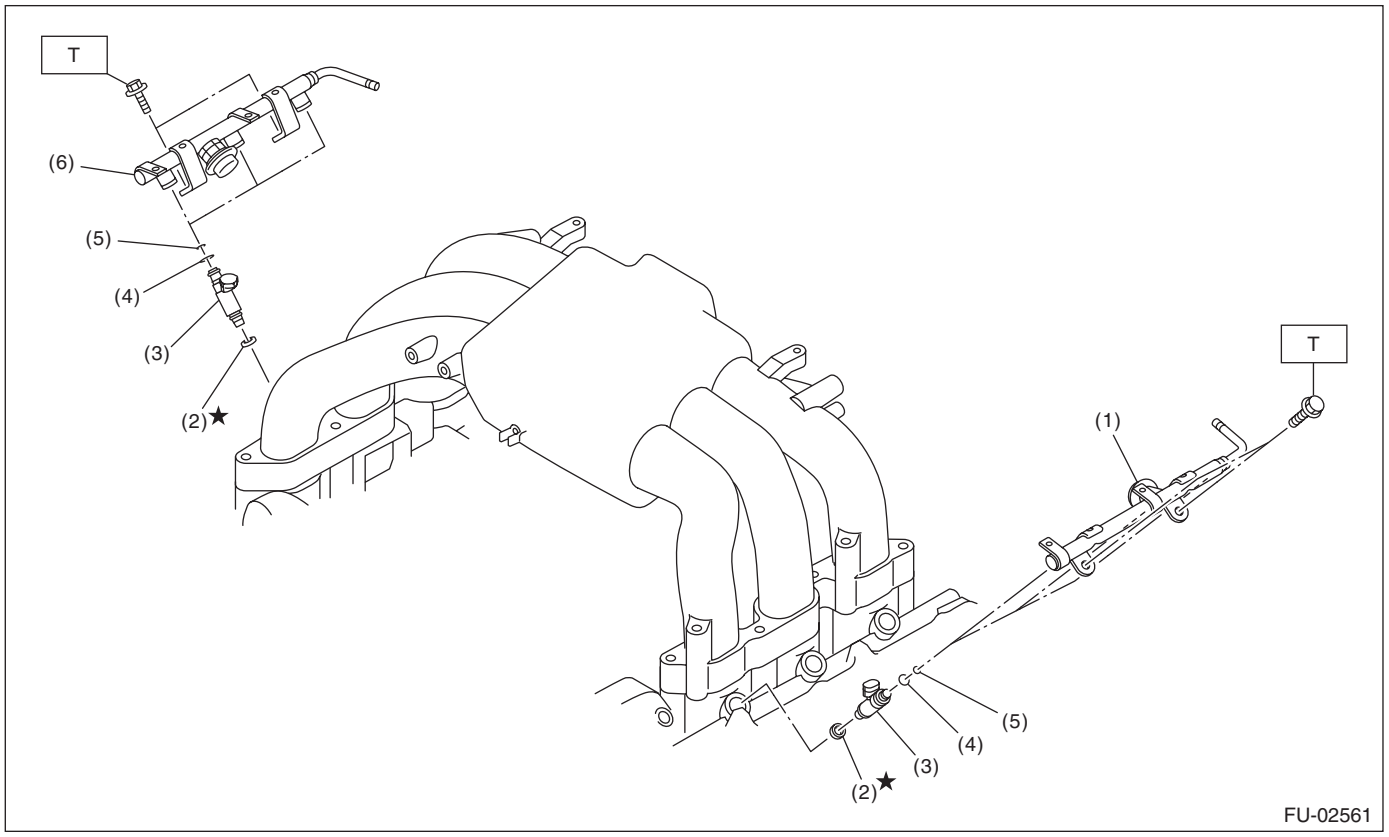


FU-04034

(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) Plug
(10) Nipple
(11) Fuel pipe protector LH
(12) Fuel pipe ASSY
(13) Hose
(14) Clamp
(15) EGR valve
(16) Gasket
(17) Gasket
(18) EGR pipe

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.25 (0.1, 0.9)
T2: 6.4 (0.7, 4.7)
T3: 17 (1.7, 12.5)
T4: 19 (1.9, 14.0)
T5: 25 (2.5, 18.4)

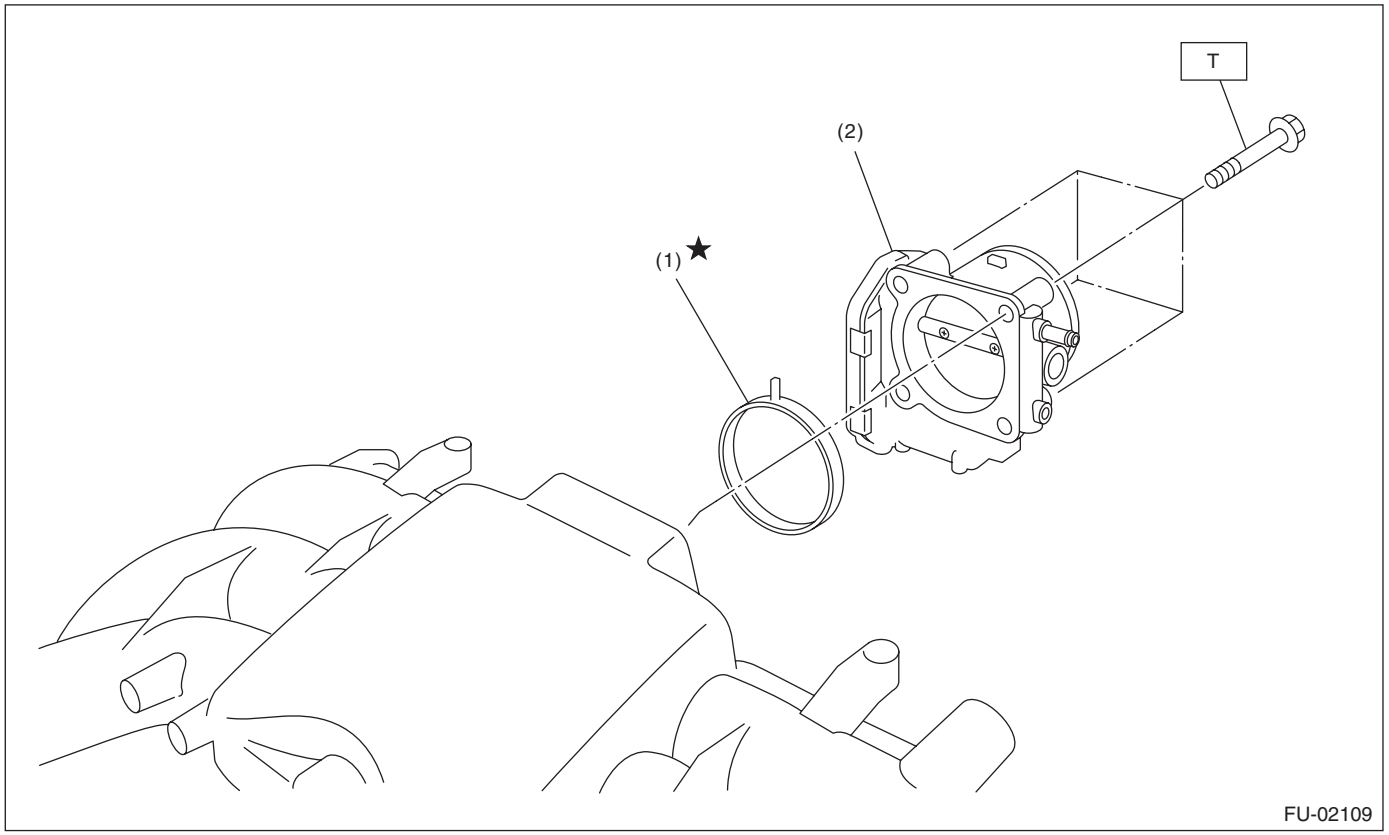
2. FUEL INJECTOR



(1) Fuel injector pipe LH
(2) Insulator
(3) Fuel injector
(4) Injection rubber
(5) O-ring
(6) Fuel injector pipe RH

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

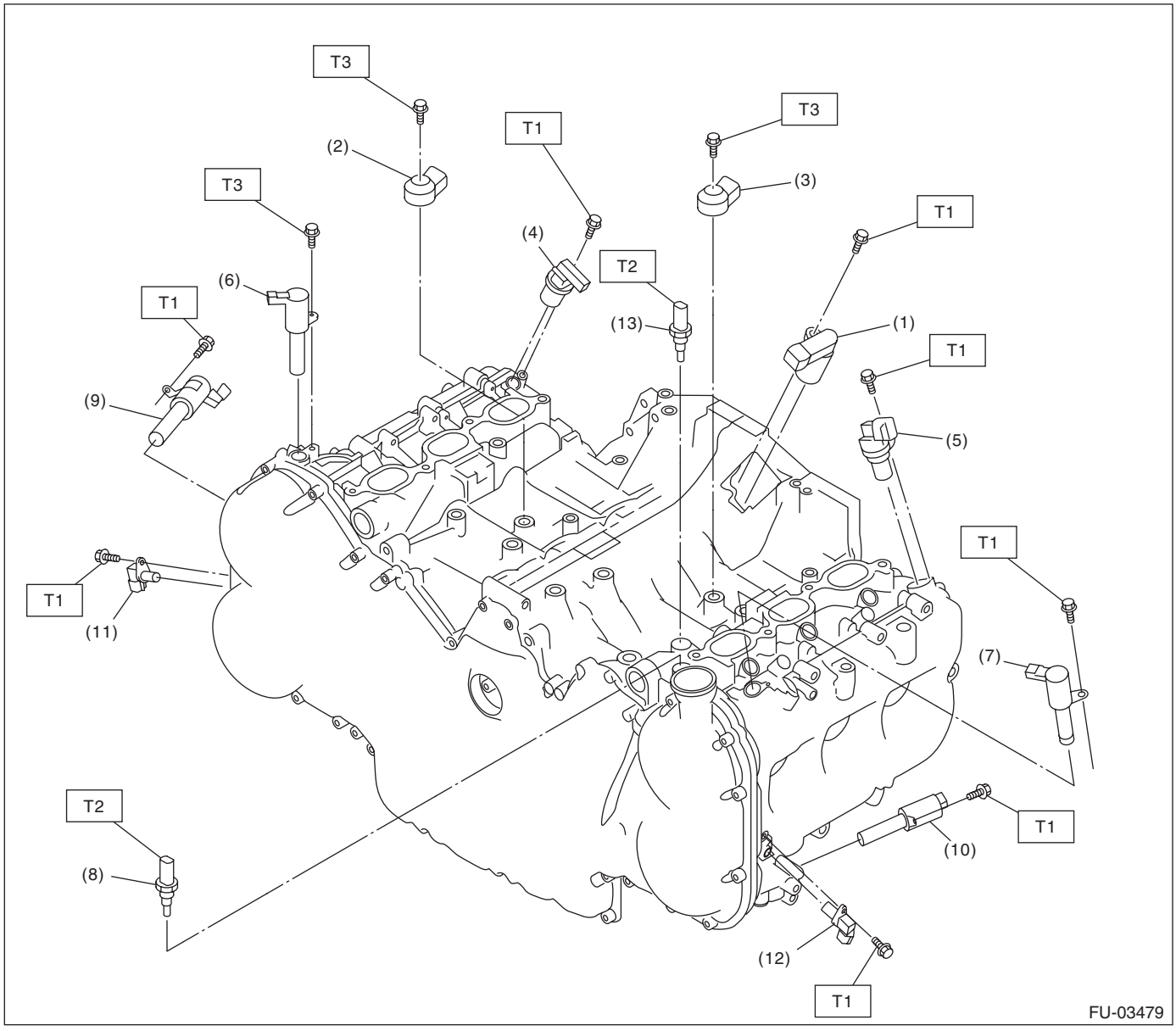
3. AIR INTAKE SYSTEM



(1) O-ring
(2) Throttle body

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

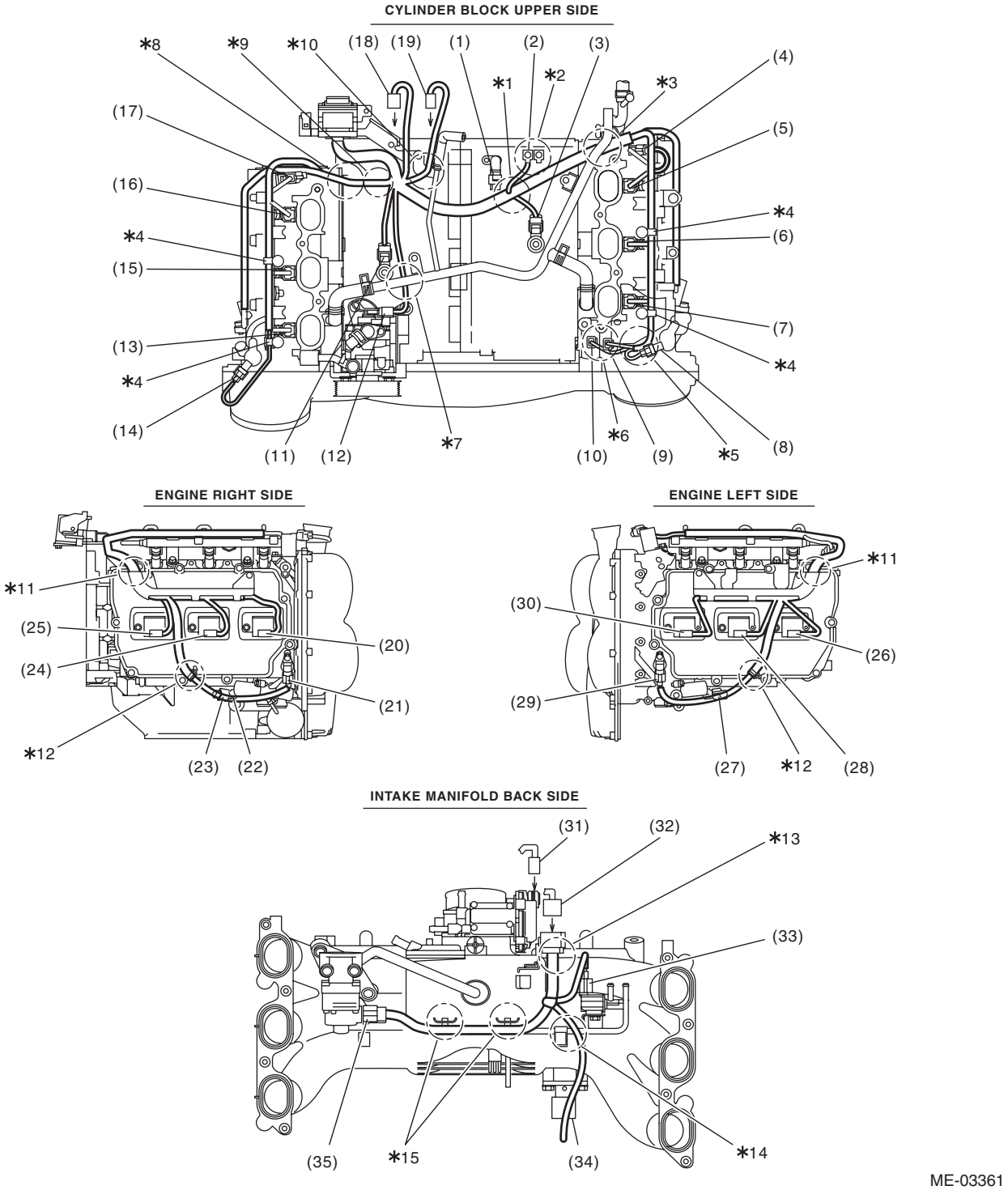
4. SENSOR



(1) Crankshaft position sensor
(2) Knock sensor RH
(3) Knock sensor LH
(4) Intake camshaft position sensor RH
(5) Intake camshaft position sensor LH
(6) Intake oil flow control solenoid valve RH
(7) Intake oil flow control solenoid valve LH
(8) Oil temperature sensor
(9) Exhaust oil flow control solenoid valve RH
(10) Exhaust oil flow control solenoid valve LH
(11) Exhaust camshaft position sensor RH
(12) Exhaust camshaft position sensor LH
(13) Engine coolant temperature sensor

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.7, 4.7)
T2: 22 (2.2, 16.2)
T3: 25 (2.5, 18.4)

5. ENGINE HARNESS

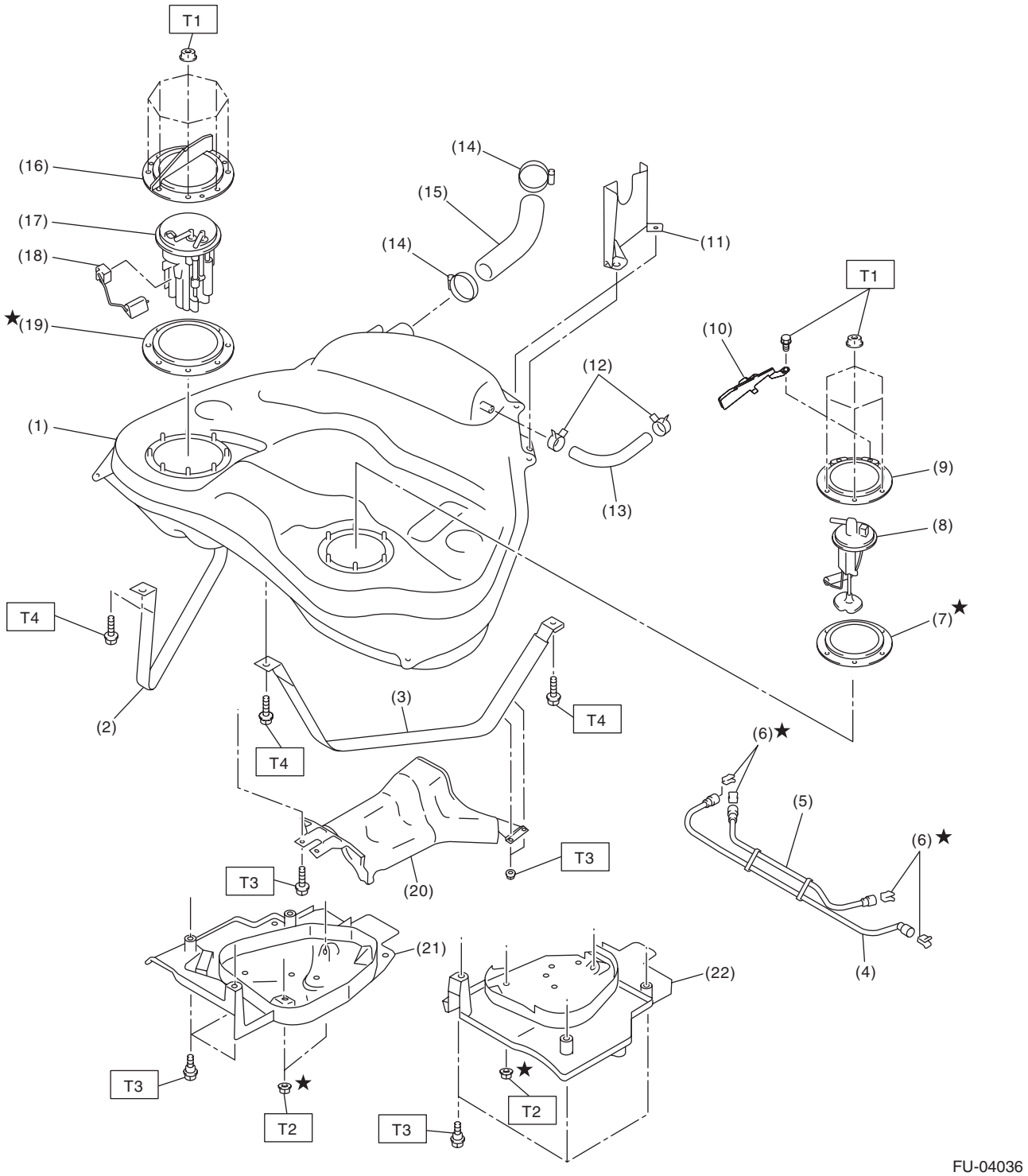


ME-03361

(1) Crankshaft position sensor connector
(2) Engine ground
(3) Knock sensor LH connector
(4) Intake camshaft position sensor LH connector
(5) #6 injector connector
(6) #4 injector connector
(7) #2 injector connector
(8) Intake oil flow control solenoid valve LH connector
(9) Oil temperature sensor connector
(10) Engine coolant temperature sensor connector
(11) Knock sensor RH connector
(12) Power steering switch connector
(13) #1 injector connector
(14) Intake oil flow control solenoid valve RH connector
(15) #3 injector connector
(16) #5 injector connector
(17) Intake camshaft position sensor RH connector
(18) Upper and lower connector (to intake manifold)
(19) Electronic throttle control connector (to intake manifold)
(20) #1 ignition coil connector
(21) Exhaust camshaft position sensor RH
(22) Oil pressure switch connector
(23) Exhaust oil flow control solenoid valve RH connector
(24) #3 ignition coil connector
(25) #5 ignition coil connector
(26) #6 ignition coil connector
(27) Exhaust oil flow control solenoid valve LH connector
(28) #4 ignition coil connector
(29) Exhaust camshaft position sensor LH connector
(30) #2 ignition coil connector
(31) Electronic throttle control connector (From cylinder block upper part)
(32) upper and lower connector (From cylinder block upper part)
(33) Purge control solenoid valve connector
(34) Manifold absolute pressure sensor connector
(35) EGR valve connector

*1: Route the harness between the crankshaft position sensor and the knock sensor LH.
*2: Install the engine ground terminal so that it faces the rear of the vehicle.
*3: Route the harness under the heater hose pipe.
*4: Install the engine harness fixing clip to the fuel pipe stay.
*5: Route the harness from the cutout portion of the fuel pipe protector LH.
*6: Do not confuse the oil temperature sensor connector and the engine coolant temperature sensor connector.
*7: Route the harness under the heater hose pipe.
*8: Route the harness under the fuel pipe.
*9: Install the engine harness fixing clip to the fixing boss of the cylinder block.
*10: Route the harness over the heater hose pipe stay.
*11: Align the edges of the engine harness stay and the engine harness identification tape.
*12: Install the engine harness fixing clip to the fixing boss of the rocker cover.
*13: Install the engine harness fixing stay securely.
*14: Route the harness outside the fuel pipe.
*15: Install the engine harness fixing clip to the fixing stay of the intake manifold.

6. FUEL TANK

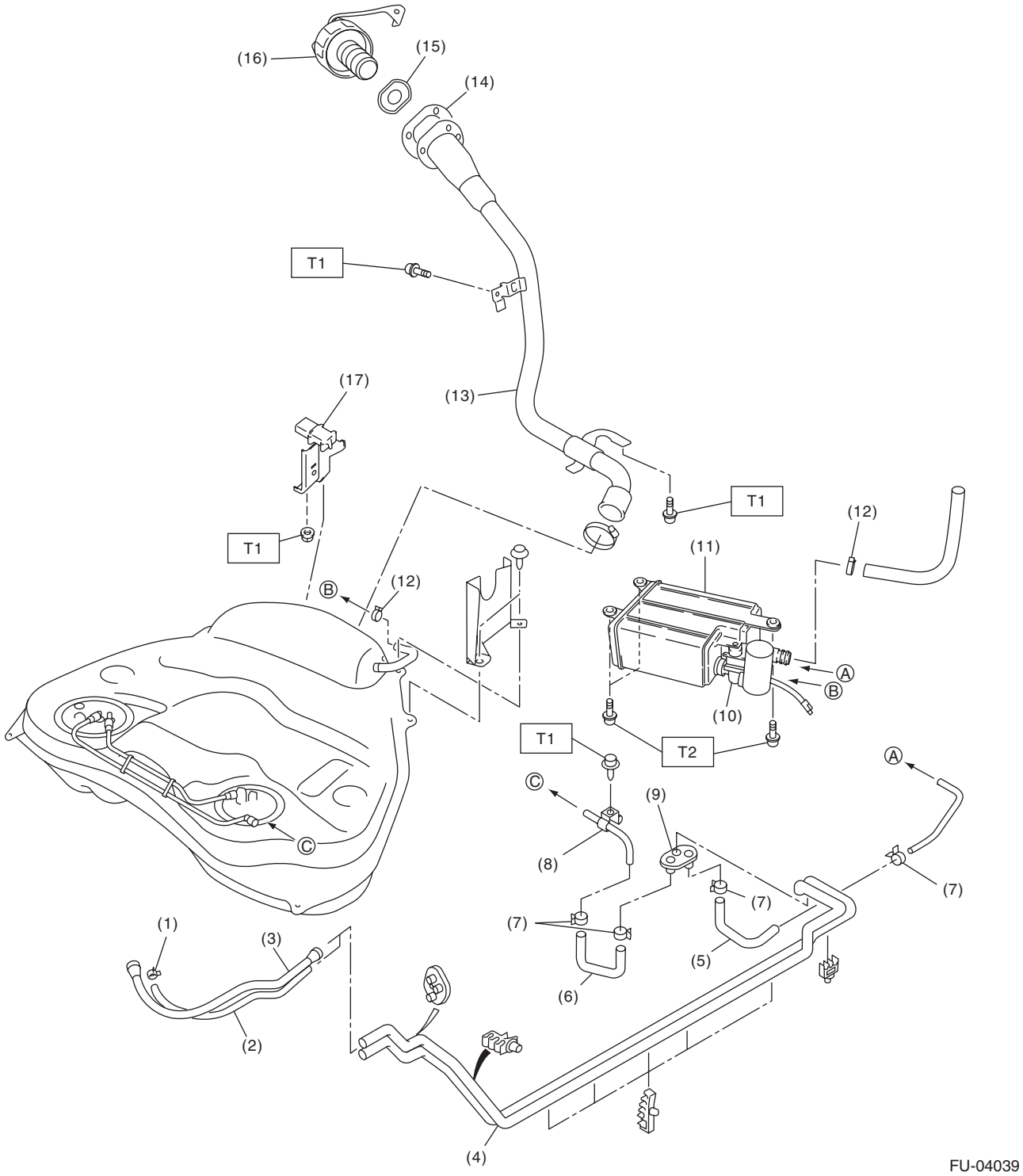


FU-04036

(1) Fuel tank
(2) Fuel tank band RH
(3) Fuel tank band LH
(4) Delivery tube
(5) Jet pump tube
(6) Retainer
(7) Fuel sub level sensor gasket
(8) Fuel sub level sensor
(9) Fuel sub level sensor upper plate
(10) Bracket
(11) Fuel tank protector LH (Rear)
(12) Clip
(13) Evaporation hose
(14) Clamp
(15) Fuel filler hose
(16) Fuel pump upper plate
(17) Fuel pump ASSY
(18) Fuel level sensor
(19) Fuel pump gasket
(20) Heat shield cover
(21) Fuel tank protector RH (Front)
(22) Fuel tank protector LH (Front)

Tightening torque:N·m (kgf-m, ft-lb)	
T1:	***4.4 (0.4, 3.2)***
T2:	***9 (0.9, 6.6)***
T3:	***18 (1.8, 13.3)***
T4:	***33 (3.4, 24.3)***

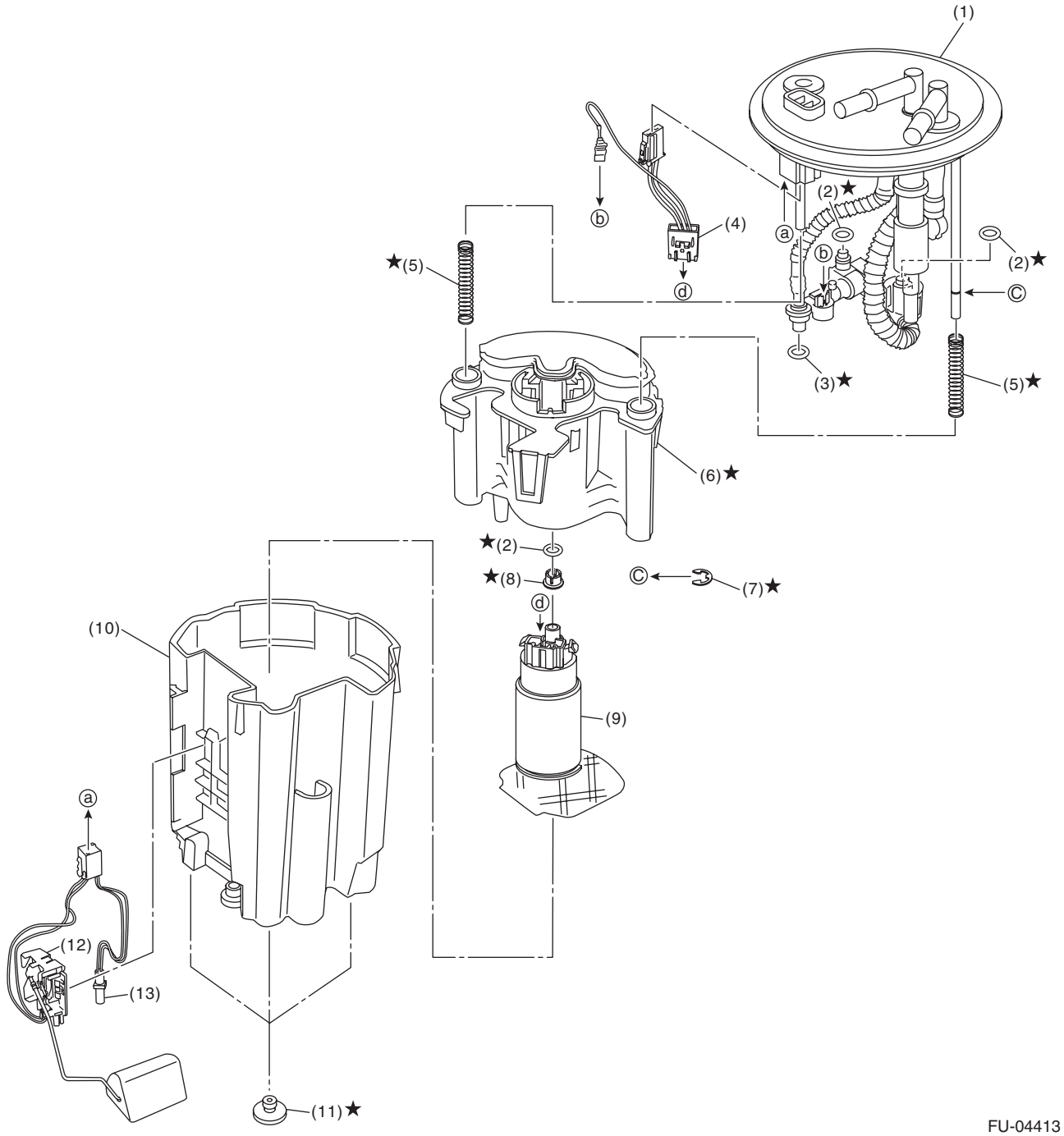
7. FUEL LINE



(1) Clamp
(2) Evaporation hose A
(3) Fuel delivery hose A
(4) Fuel pipe ASSY
(5) Evaporation hose B
(6) Fuel delivery hose B
(7) Clamp
(8) Fuel pipe ASSY
(9) Grommet
(10) Drain valve
(11) Canister
(12) Clamp
(13) Fuel filler pipe
(14) Gasket
(15) Ring
(16) Fuel filler cap
(17) Fuel tank pressure sensor

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.35 (0.7, 5.4)
T2: 8 (0.8, 5.9)

8. FUEL PUMP

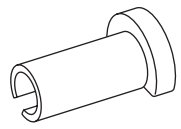
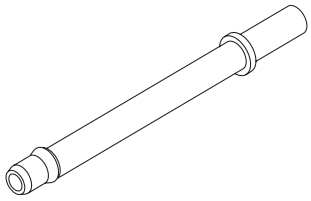
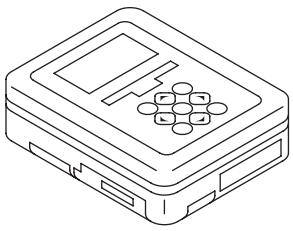


(1) Sub tank bracket ASSY
(2) O-ring
(3) O-ring
(4) Fuel pump harness
(5) Spring
(6) Fuel filter
(7) Clip
(8) Spacer
(9) Pump ASSY
(10) Sub tank
(11) Cushion
(12) Fuel level sensor
(13) Fuel temperature sensor

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.

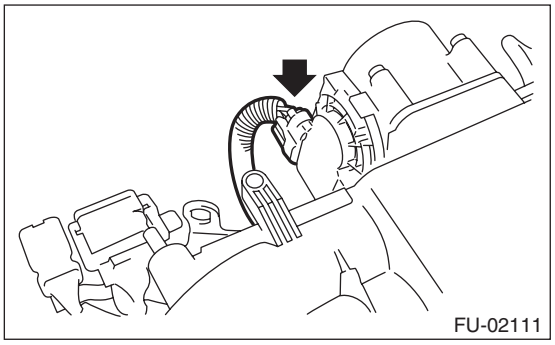
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST42099AE000	42099AE000	QUICK CONNECTOR RELEASE	Used for disconnecting quick connector of the engine compartment.
 ST18471AA000	18471AA000	FUEL PIPE ADAPTER	Used for draining fuel.
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting for electrical system and draining fuel.

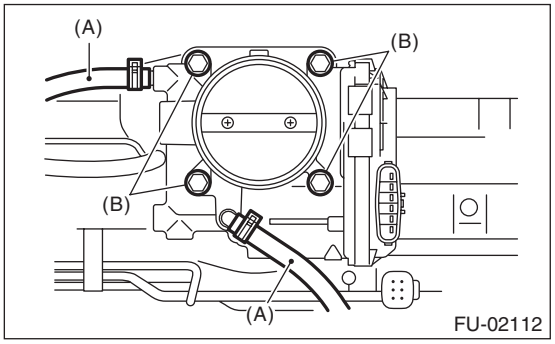
2. Throttle Body

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector from throttle body.



5) Disconnect the engine coolant hoses (A) from the throttle body.
6) Remove the bolts (B) which secure throttle body to intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

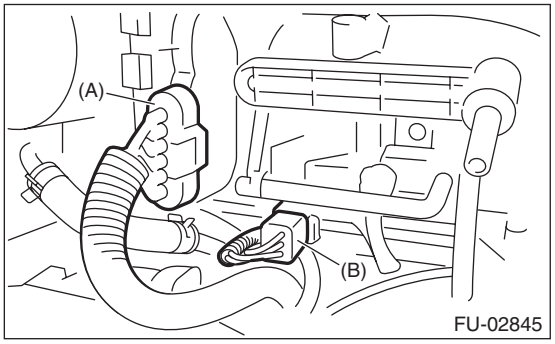
NOTE:
Use new O-rings.

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

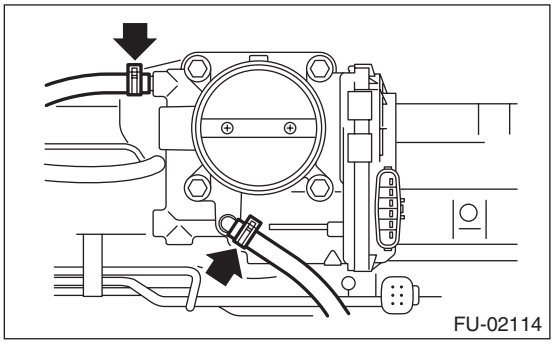
3. Intake Manifold

A: REMOVAL

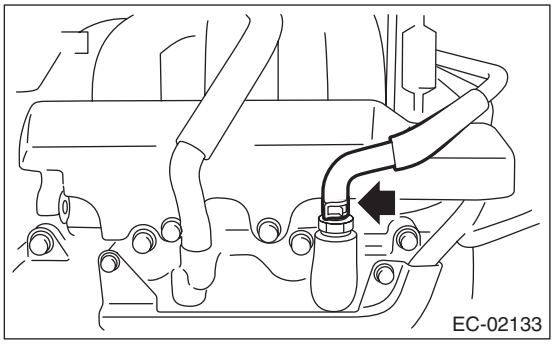
1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.
4) Open the fuel filler lid, and remove the fuel filler cap.
5) Remove the air cleaner case and air intake chamber. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
6) Remove the generator. <Ref. to SC(H6DO)-14, REMOVAL, Generator.>
7) Disconnect the connector (A) from the throttle body.
8) Disconnect the engine harness connector (B).



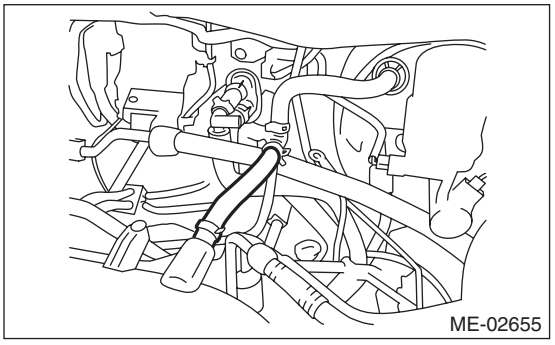
9) Disconnect the engine coolant hoses from the throttle body.



10) Disconnect the PCV hose.



11) Disconnect the brake booster hose.

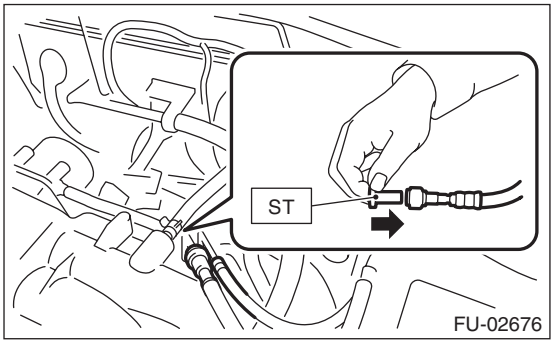


12) Disconnect the fuel hoses from the fuel pipe.
(1) Disconnect the connector of fuel pipe by pushing the ST in the direction of arrow.

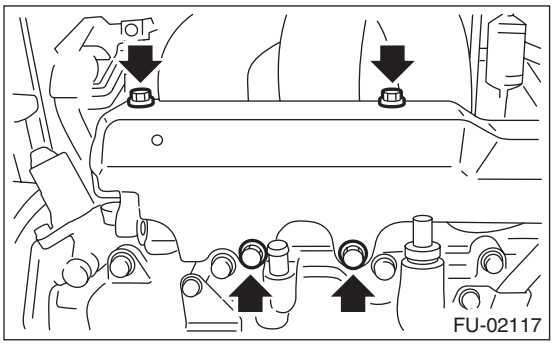
ST 42099AE000 QUICK CONNECTOR RELEASE

(2) Remove the clip, and disconnect the evaporation hose from the pipe.

CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**

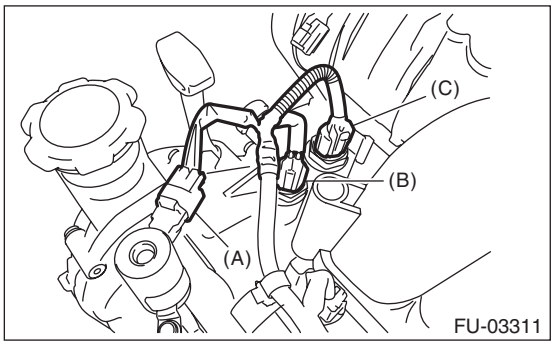


13) Remove the fuel pipe protector LH.



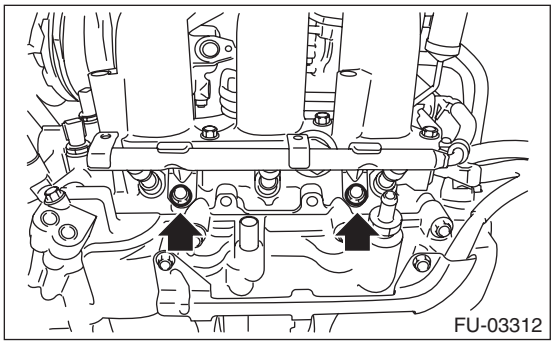
14) Remove the engine harness from the fuel injector pipe LH.

15) Disconnect the connectors of the oil temperature sensor, engine coolant temperature sensor, intake oil flow control solenoid valve LH.

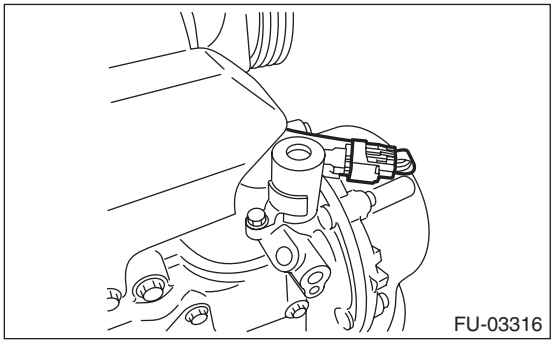


(A) Intake oil flow control solenoid valve LH
(B) Oil temperature sensor
(C) Engine coolant temperature sensor

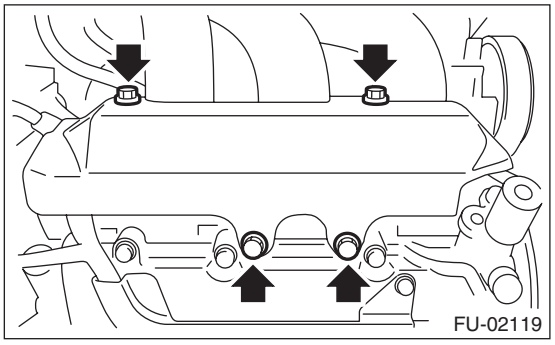
16) Remove the bolts which hold fuel injector pipe LH to cylinder head.



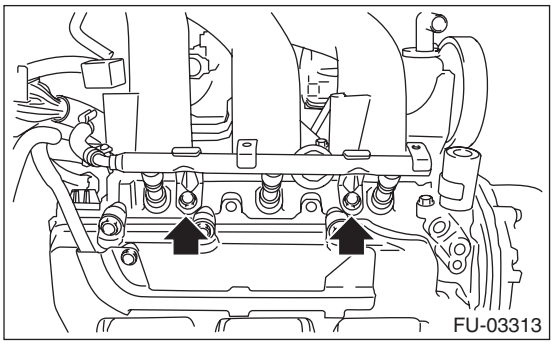
17) Disconnect the connector of intake oil flow control solenoid valve RH.



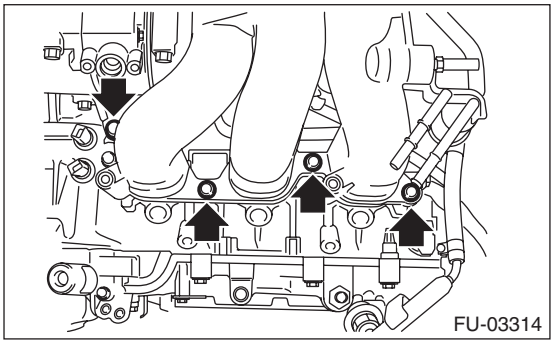
18) Remove the fuel pipe protector RH.



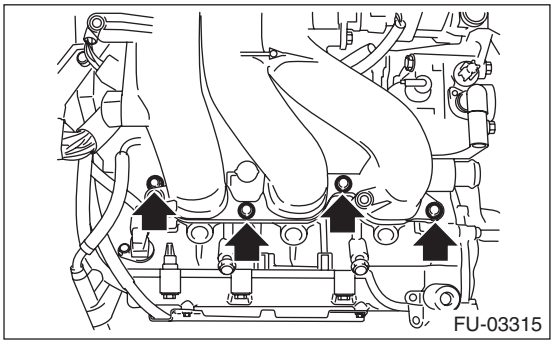
19) Remove the engine harness from the fuel injector pipe RH.
20) Remove the bolts which hold the fuel injector pipe RH to the cylinder head.



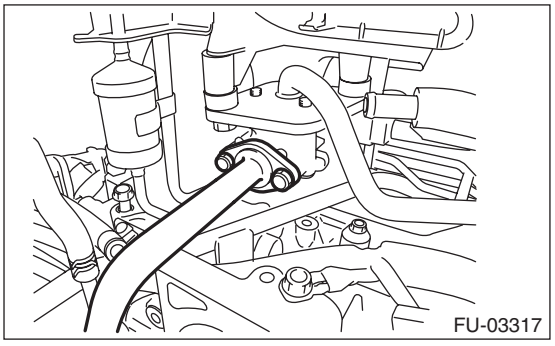
21) Remove the bolts which hold the intake manifold to the cylinder head.
• LH side



• RH side



22) Remove the EGR pipe fixing bolt.



23) Remove the intake manifold.

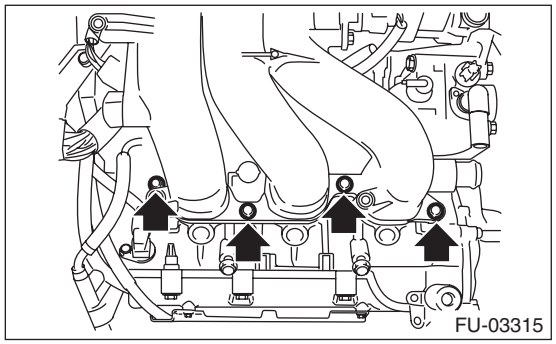
B: INSTALLATION

1) Install the intake manifold onto cylinder heads.

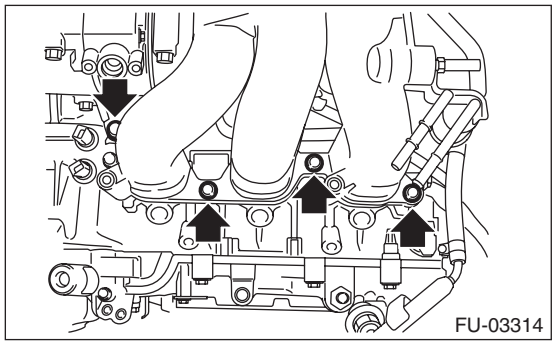
NOTE:
Use new O-rings.

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

- RH side



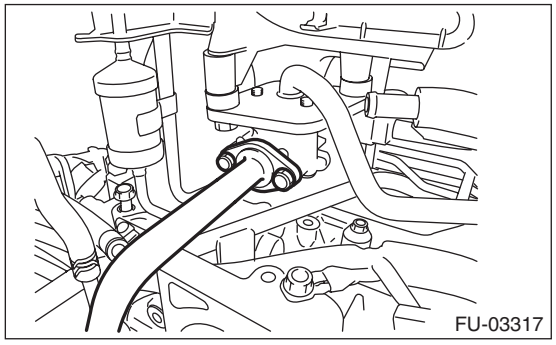
- LH side



2) Install the EGR pipe fixing bolt.

NOTE:
Use a new gasket.

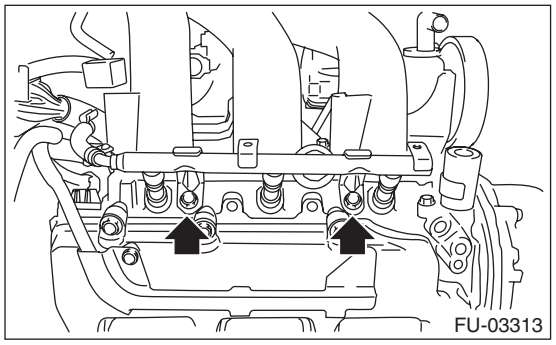
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



3) Install the bolts which hold fuel injector pipe RH to cylinder head.

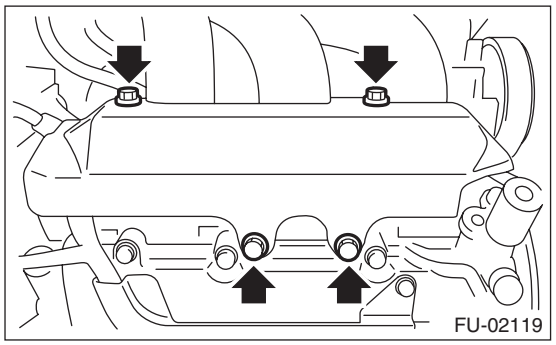
NOTE:
Use new O-rings.

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

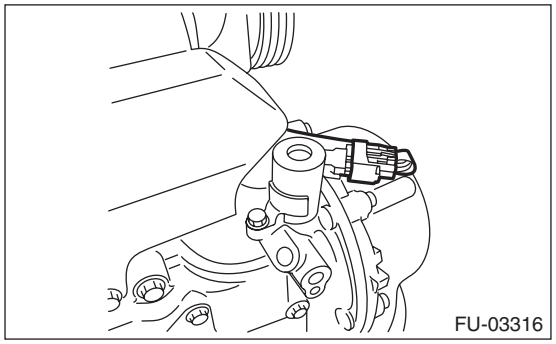


4) Install the engine harness to fuel injector pipe RH.
5) Install the fuel pipe protector RH.

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



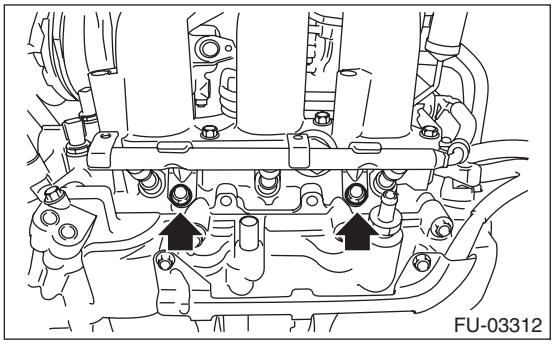
6) Connect the connector of intake oil flow control solenoid valve RH.



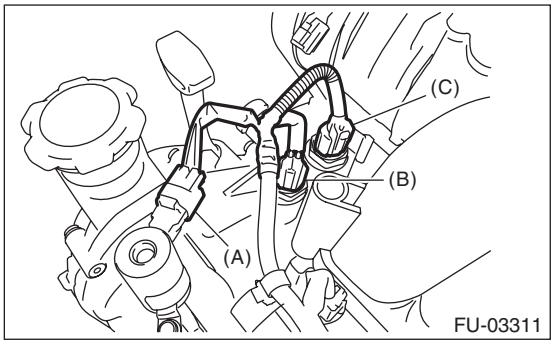
7) Install the bolts which hold fuel injector pipe LH to cylinder head.

NOTE:
Use new O-rings.

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



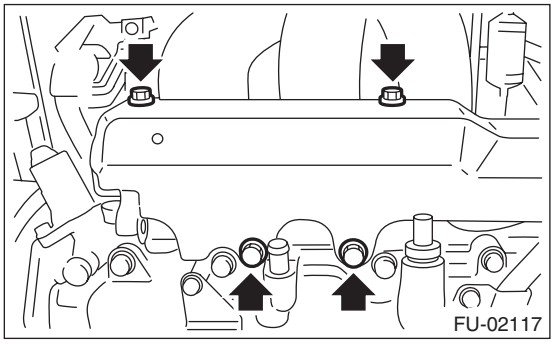
8) Connect the connectors of the oil temperature sensor, engine coolant temperature sensor, intake oil flow control solenoid valve LH.



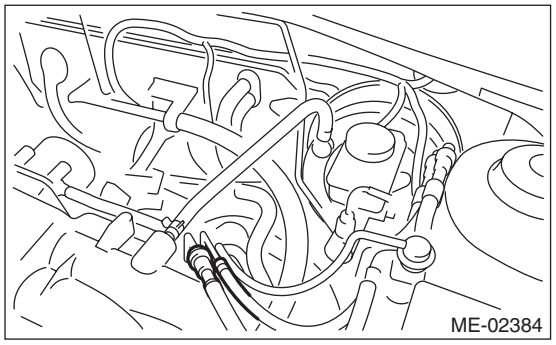
(A) Intake oil flow control solenoid valve LH
(B) Oil temperature sensor
(C) Engine coolant temperature sensor

9) Install the engine harness to fuel injector pipe LH.
10) Install the fuel pipe protector LH.

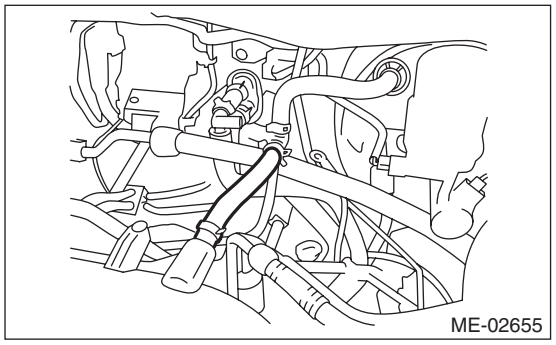
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



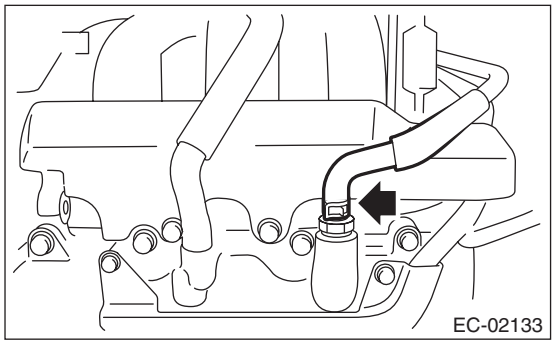
11) Connect the fuel hoses to fuel pipe.



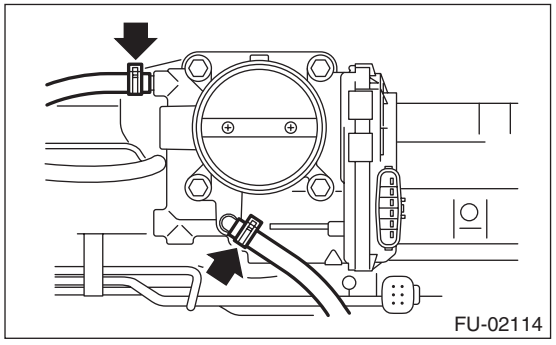
12) Connect the brake booster hose.



13) Connect the PCV hose.

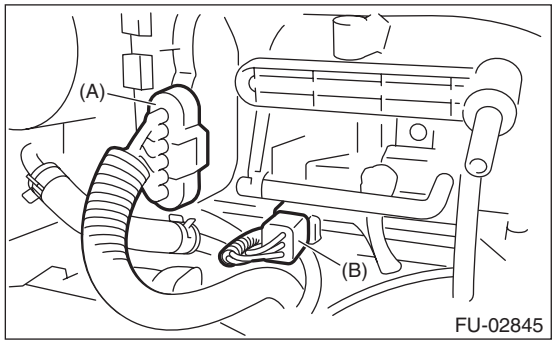


14) Connect the engine coolant hoses to throttle body.



15) Connect the connector (A) to throttle body.

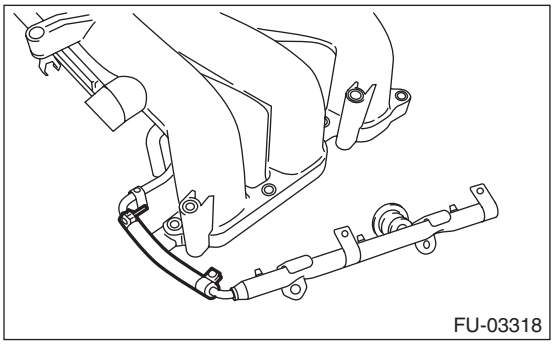
16) Connect the engine harness connector (B).



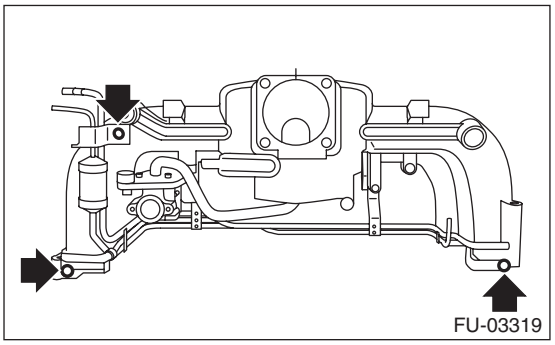
17) Install the generator. <Ref. to SC(H6DO)-14, INSTALLATION, Generator.>
18) Install the air cleaner case and air intake chamber. <Ref. to IN(H6DO)-6, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Chamber.>
19) Install the fuse of fuel pump to the main fuse box.
20) Connect the ground cable to battery.
21) Install the collector cover.

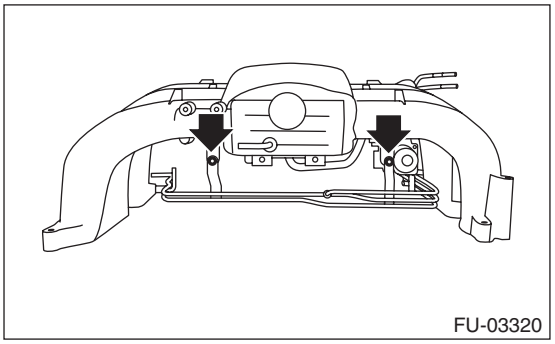
C: DISASSEMBLY

1) Remove the engine harness from intake manifold. <Ref. to FU(H6DO)-7, ENGINE HARNESS, COMPONENT, General Description.>
2) Remove the throttle body. <Ref. to FU(H6DO)-15, REMOVAL, Throttle Body.>
3) Remove the manifold absolute pressure sensor. <Ref. to FU(H6DO)-27, REMOVAL, Manifold Absolute Pressure Sensor.>
4) Remove the purge control solenoid valve. <Ref. to EC(H6DO)-7, REMOVAL, Purge Control Solenoid Valve.>
5) Loosen the clamp which holds fuel injector pipe to the fuel hose, and then disconnect the pipe from fuel hose.



6) Remove the bolts which install fuel pipes on intake manifold.





7) Remove the EGR valve. <Ref. to FU(H6DO)-29, REMOVAL, EGR Valve.>

D: ASSEMBLY

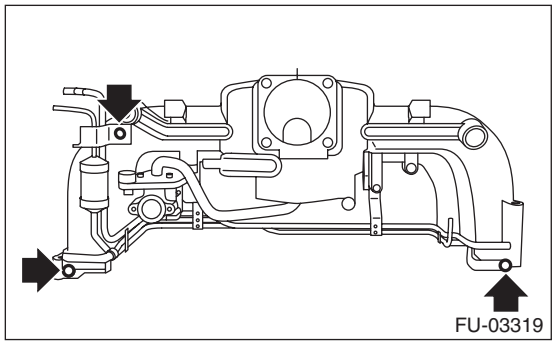
NOTE:
When assembling the nipple, apply liquid gasket.

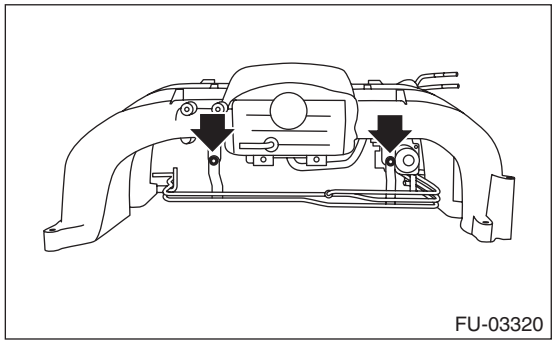
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
17 N·m (1.7 kgf-m, 12.5 ft-lb)

1) Install the EGR valve. <Ref. to FU(H6DO)-29, INSTALLATION, EGR Valve.>
2) Tighten the bolts which install fuel pipes on intake manifold.

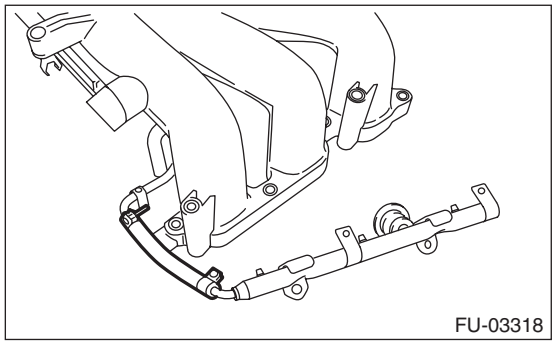
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)


FU-03319


FU-03320

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

Tightening torque:
1.25 N·m (0.1 kgf-m, 0.9 ft-lb)


FU-03318

4) Install the purge control solenoid valve. <Ref. to EC(H6DO)-7, INSTALLATION, Purge Control Solenoid Valve.>
5) Install the manifold absolute pressure sensor. <Ref. to FU(H6DO)-27, INSTALLATION, Manifold Absolute Pressure Sensor.>
6) Install the throttle body to the intake manifold. <Ref. to FU(H6DO)-15, INSTALLATION, Throttle Body.>
7) Install the engine harness to the intake manifold. <Ref. to FU(H6DO)-7, ENGINE HARNESS, COMPONENT, General Description.>

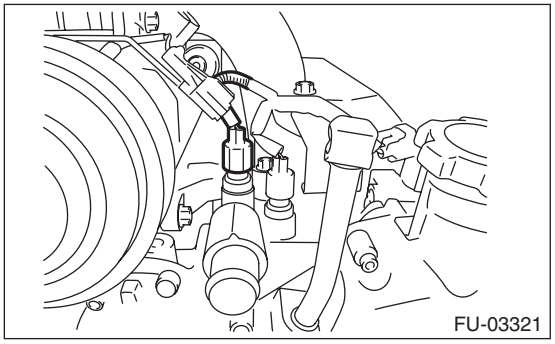
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not damaged and the connections are tightened firmly.

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)-12, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Disconnect the connectors from the engine coolant temperature sensor.

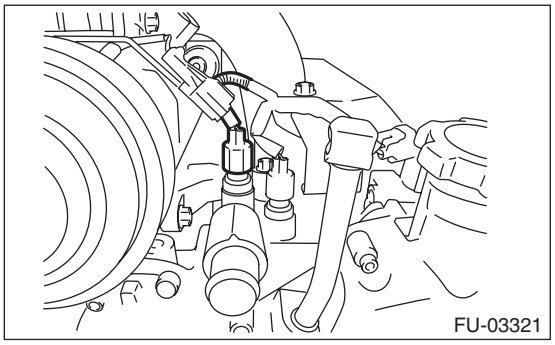


5) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

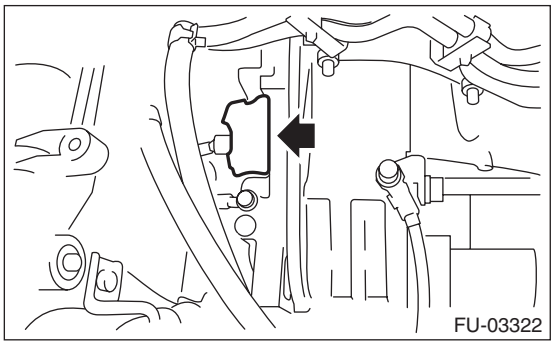
Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)



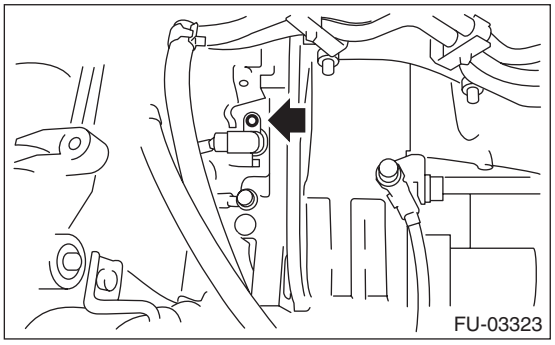
5. Crankshaft Position Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
4) Remove the service hole cover.



5) Remove the crankshaft position sensor.

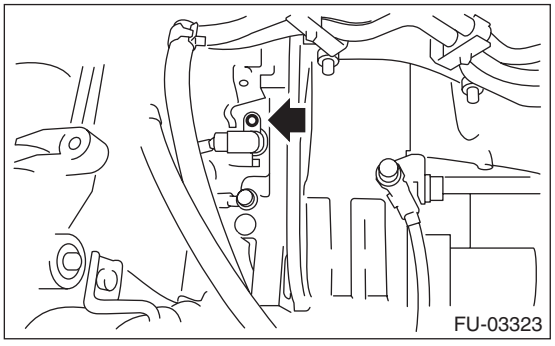


6) Disconnect the connector from crankshaft position sensor.

B: INSTALLATION

Install in the reverse order of removal.

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

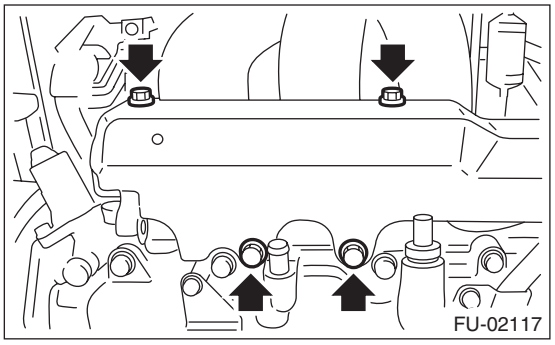


6. Camshaft Position Sensor

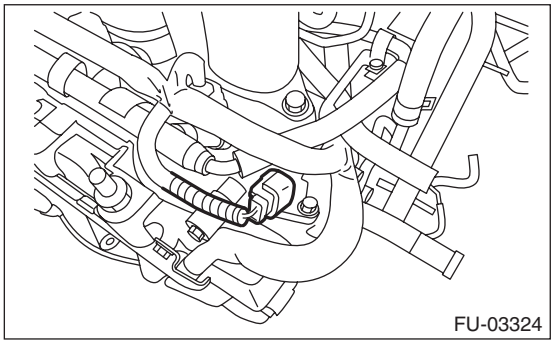
A: REMOVAL

1. INTAKE SIDE

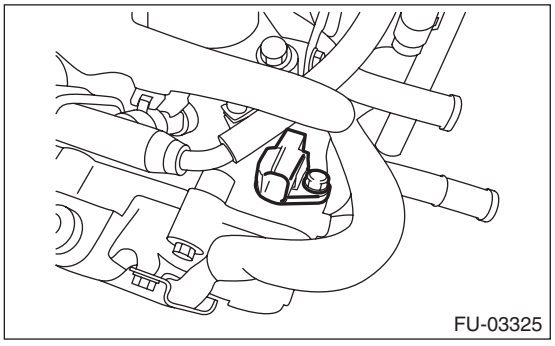
1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the generator harness from the fuel protector LH.
4) Remove the fuel protector LH.



5) Disconnect the connector from intake camshaft position sensor LH.



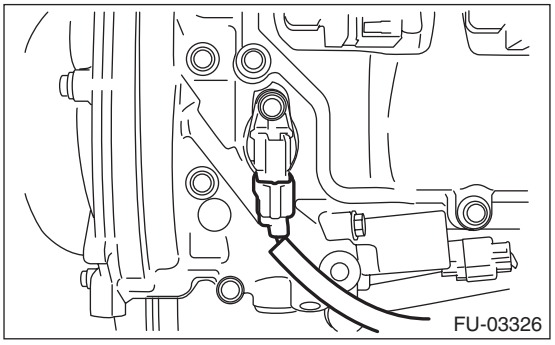
6) Remove the intake camshaft position sensor LH.



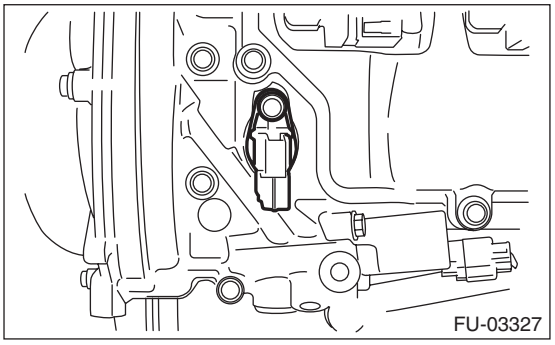
7) Remove the intake camshaft position sensor RH in the same procedure as LH.

2. EXHAUST SIDE

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

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)

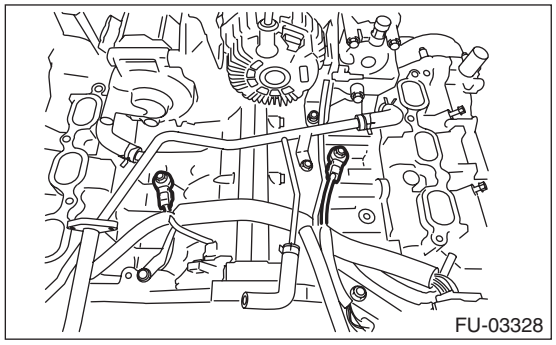
2. EXHAUST SIDE

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

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)-16, REMOVAL, Intake Manifold.>
4) Disconnect the knock sensor connector.
5) Remove the knock sensor from cylinder block.

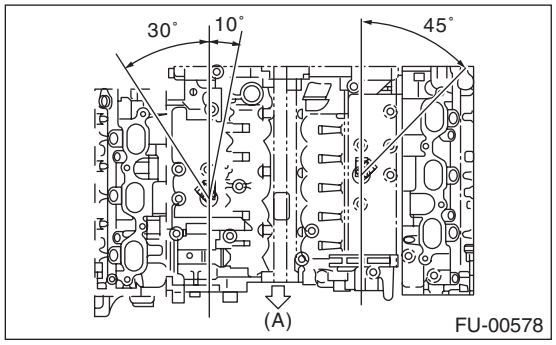


B: INSTALLATION

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.



(A) Front side of vehicle

2) Connect the knock sensor connector.
3) Install the intake manifold. <Ref. to FU(H6DO)-18, INSTALLATION, Intake Manifold.>
4) Connect the ground cable to battery.
5) Install the collector cover.

8. Throttle Position Sensor

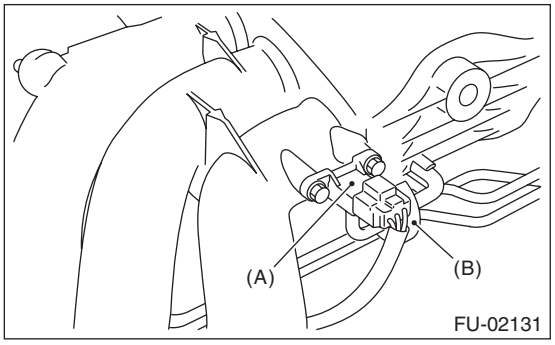
A: SPECIFICATION

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)-15, REMOVAL, Throttle Body.> <Ref. to FU(H6DO)-15, INSTALLATION, Throttle Body.>

9. Manifold Absolute Pressure Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from the battery.
3) Disconnect the connector from the manifold absolute pressure sensor (A), and remove the filter assembly (B) from the intake manifold.



4) Remove the manifold absolute pressure sensor from intake manifold.

B: INSTALLATION

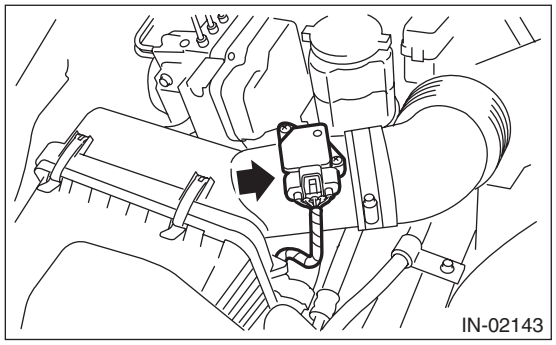
Install in the reverse order of removal.

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

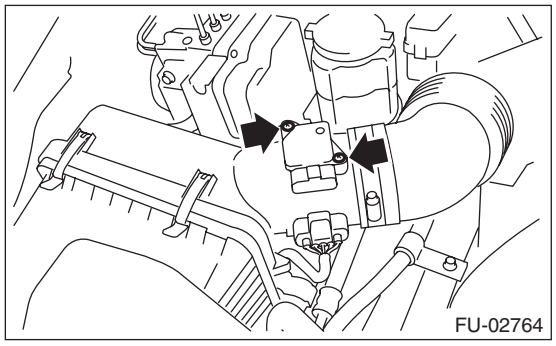
10.Mass Air Flow and Intake Air Temperature Sensor

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

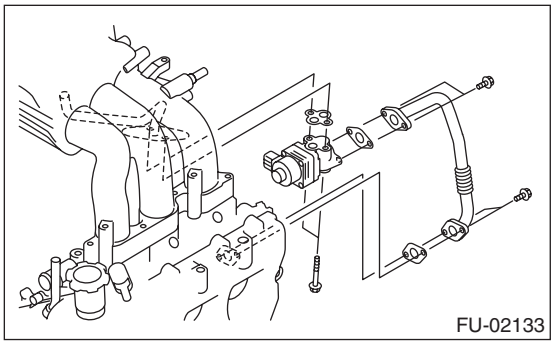
Install in the reverse order of removal.

Tightening torque:
1 N·m (0.1 kgf-m, 0.7 ft-lb)

11.EGR Valve

A: REMOVAL

1) Remove the collector cover and engine side cover.
2) Disconnect the ground cable from battery.
3) Remove the air intake chamber. <Ref. to IN(H6DO)-7, 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.



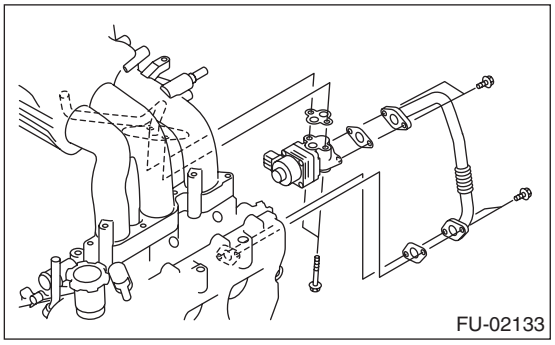
7) Disconnect connector from EGR valve.

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)

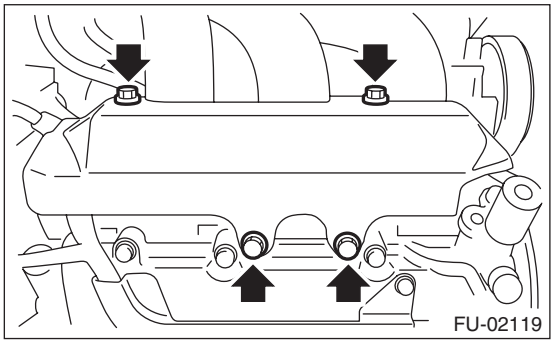


12.Fuel Injector

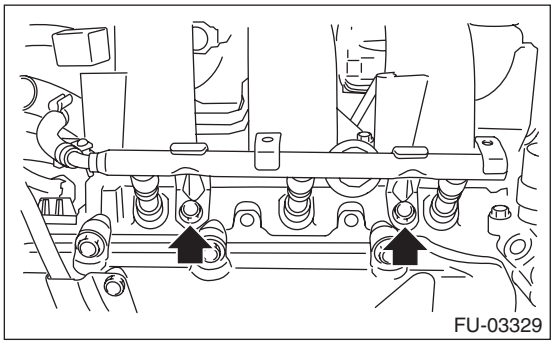
A: REMOVAL

1. RH SIDE

1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-43, 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. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.>
6) Remove the fuel pipe protector RH.



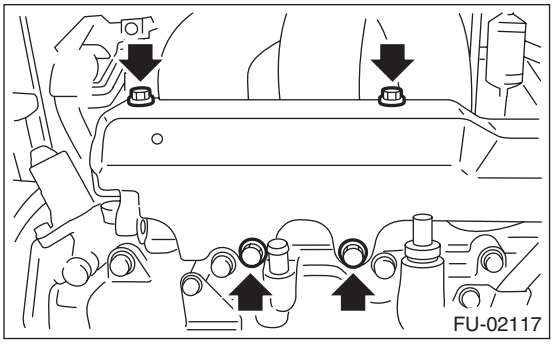
7) Disconnect the connector from fuel injector.
8) Remove the engine harness from the fuel injector pipe RH.
9) Remove the bolt which holds fuel injector pipe onto cylinder head.



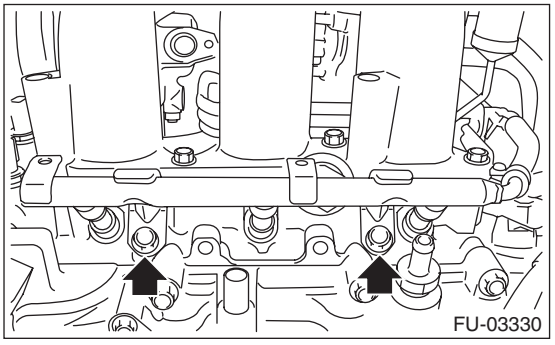
10) Remove the fuel injector while lifting up the fuel injector pipe.

2. LH SIDE

1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Remove the battery.
4) Open the fuel filler lid, and remove the fuel filler cap.
5) Remove the generator harness from the fuel pipe protector LH.
6) Remove the fuel pipe protector LH.



7) Disconnect the connector from fuel injector.
8) Remove the engine harness from the fuel injector pipe LH.
9) Remove the bolt which holds fuel injector pipe onto cylinder head.



10) Remove the fuel injector while lifting up the fuel injector pipe.

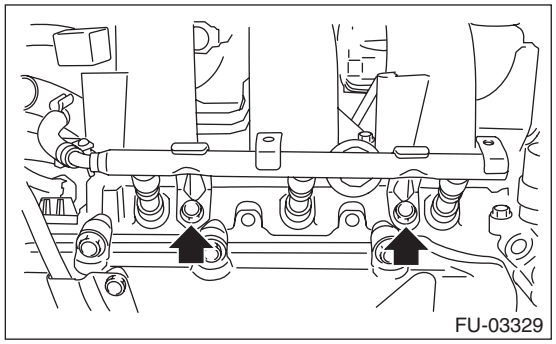
B: INSTALLATION

1. RH SIDE

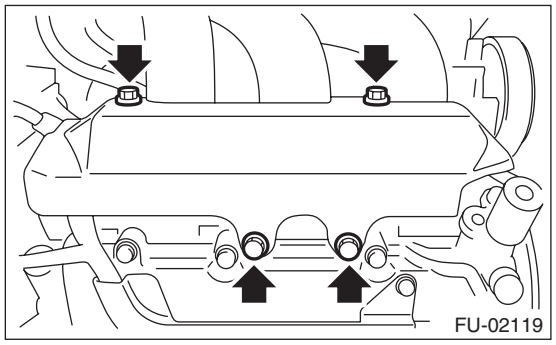
Install in the reverse order of removal.

NOTE:
Use new O-rings.

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)

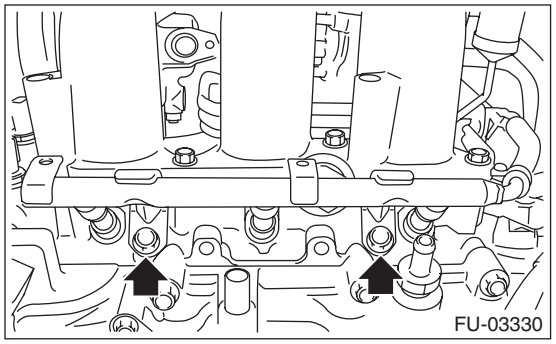


2. LH SIDE

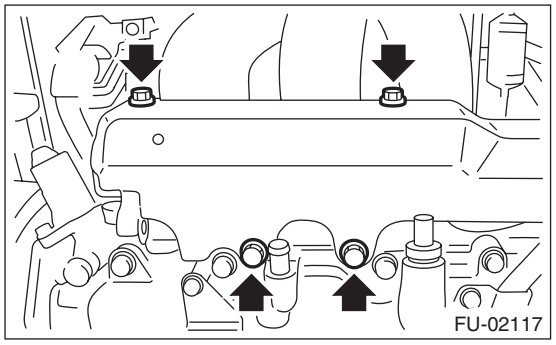
Install in the reverse order of removal.

NOTE:
Use new O-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)

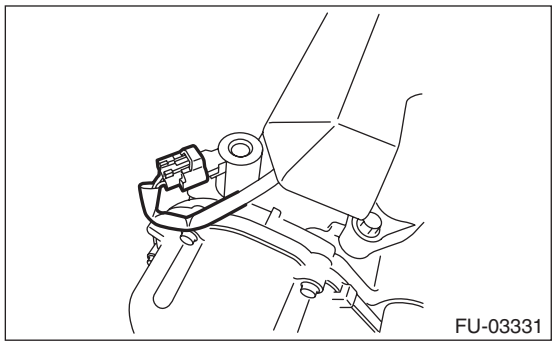


13. Oil Flow Control Solenoid Valve

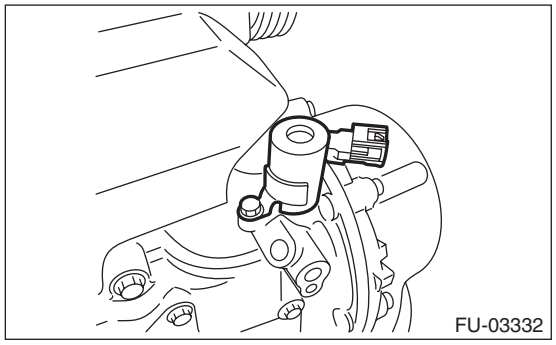
A: REMOVAL

1. INTAKE SIDE

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the generator harness from the fuel protector RH.
4) Disconnect the connector from intake oil flow control solenoid valve RH.



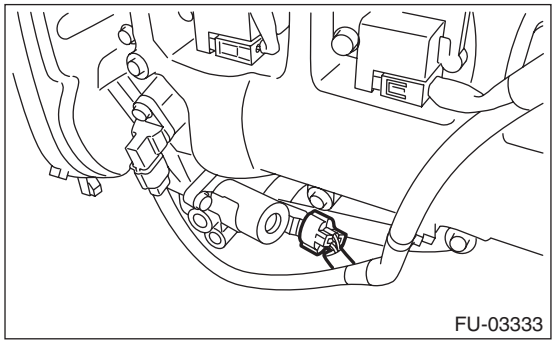
5) Remove the intake oil flow control solenoid valve RH.



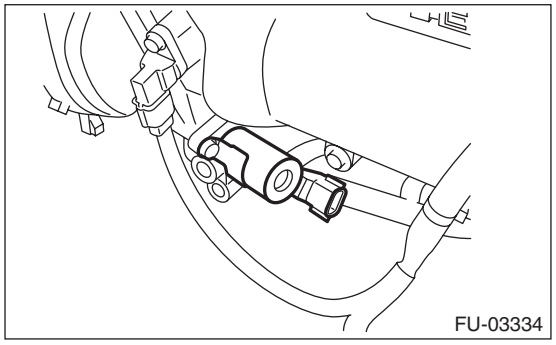
6) Remove the intake oil flow control solenoid valve LH in the same procedure as RH.

2. EXHAUST SIDE

1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the under cover.
4) Disconnect the connector from 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)

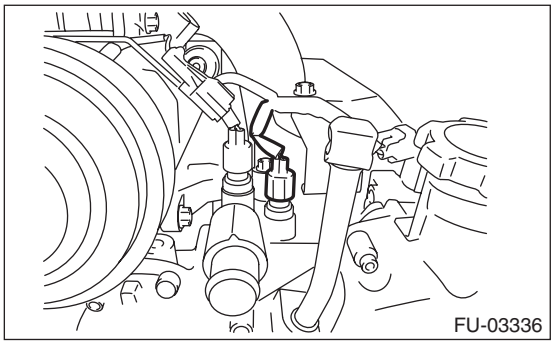
2. EXHAUST SIDE

Tightening torque:
Exhaust oil flow control solenoid valve
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

14.Oil Temperature Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Disconnect the connector from the oil temperature sensor.



4) Remove the oil temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

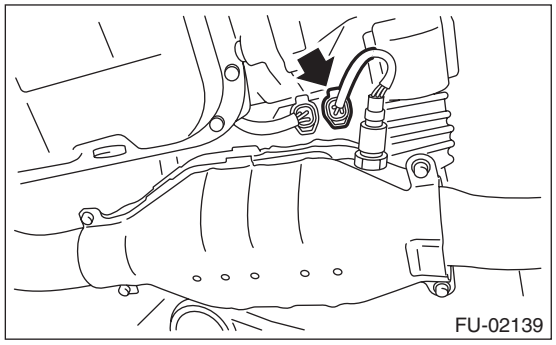
Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)

15.Front Oxygen (A/F) Sensor

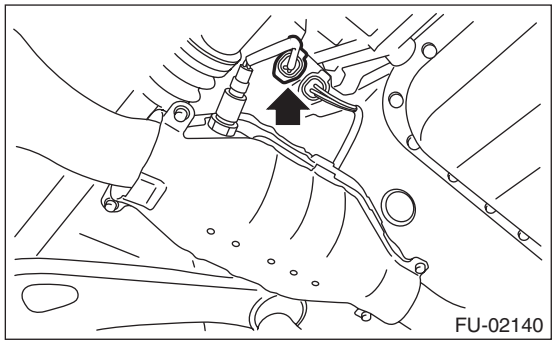
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.
3) Lift up the vehicle.
4) Disconnect the connector of front oxygen (A/F) sensor.

- LH side



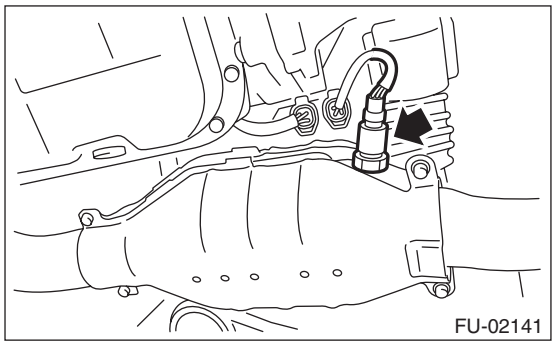
- RH side



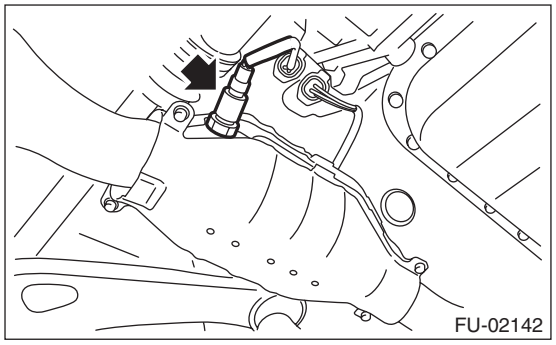
5) Apply spray-type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
6) Remove the front oxygen (A/F) sensor.

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.

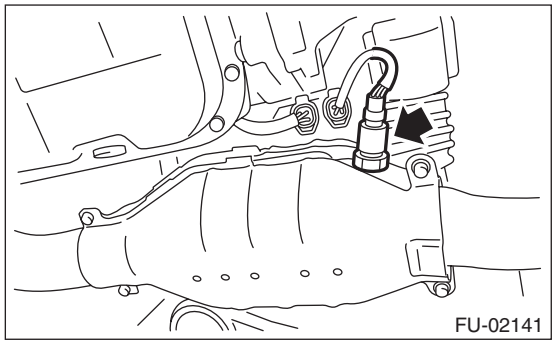
CAUTION:
Never apply anti-seize compound to the protector of front oxygen (A/F) sensor.

Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30 or equivalent

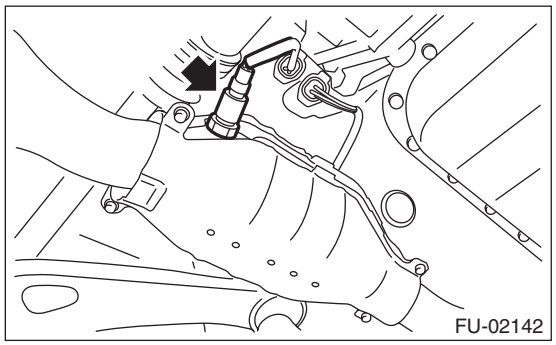
2) Install the front oxygen (A/F) sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)

- LH side

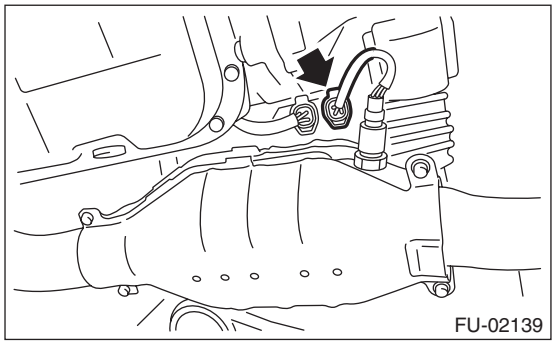


- RH side

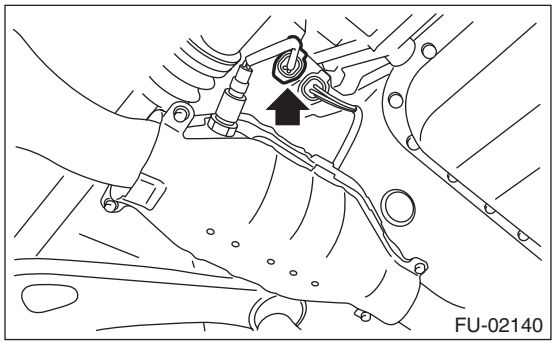


3) Connect the connector of front oxygen (A/F) sensor.

- LH side



- RH side

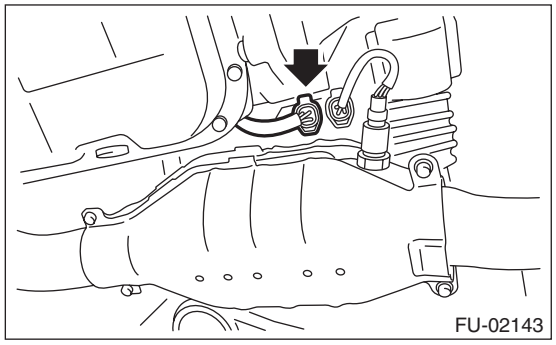


4) Lower the vehicle.
5) Connect the ground cable to battery.

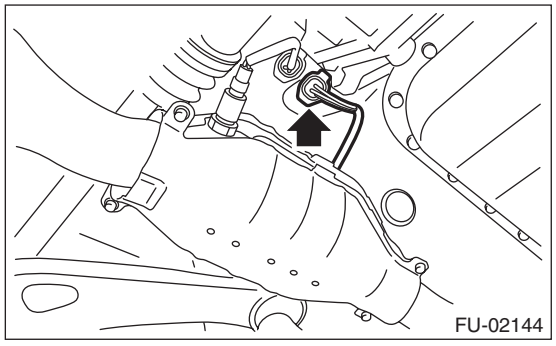
16.Rear Oxygen Sensor

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.
3) Lift up the vehicle.
4) Disconnect the connector from rear oxygen sensor.
- LH side

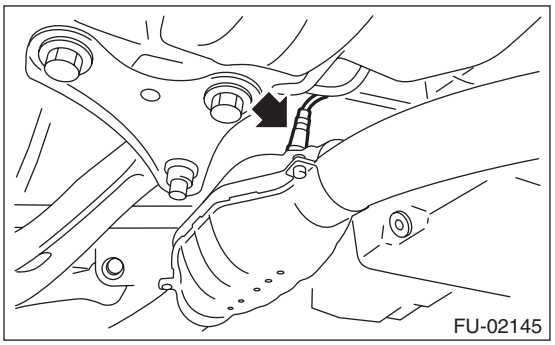


- RH side

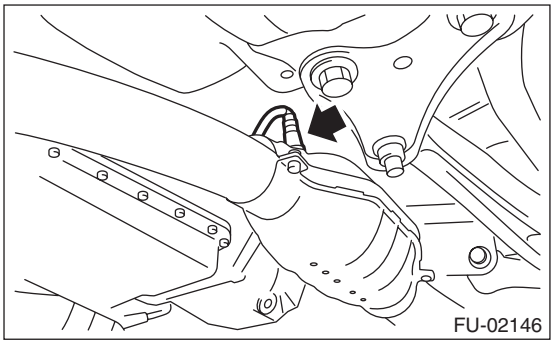


5) Remove the clip holding the harness.
6) Apply spray-type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
7) Remove the rear oxygen sensor.

CAUTION:
When removing the rear oxygen 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 rear oxygen sensor, apply the anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

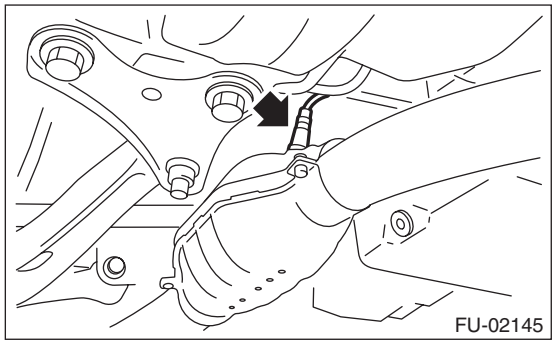
CAUTION:
Never apply anti-seize compound to the protector of rear oxygen sensor.

Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30 or equivalent

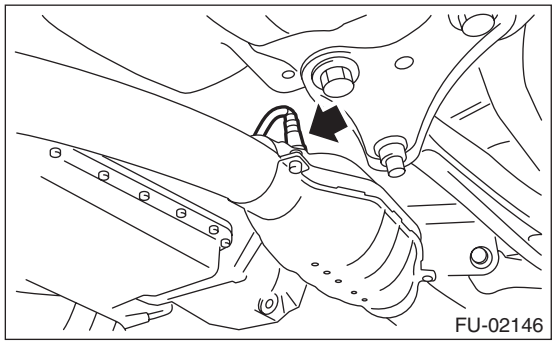
2) Install the rear oxygen sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)

- LH side



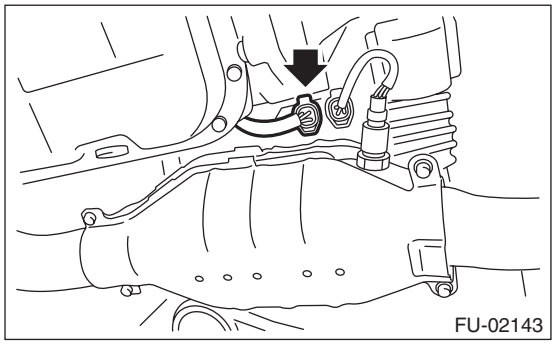
- RH side



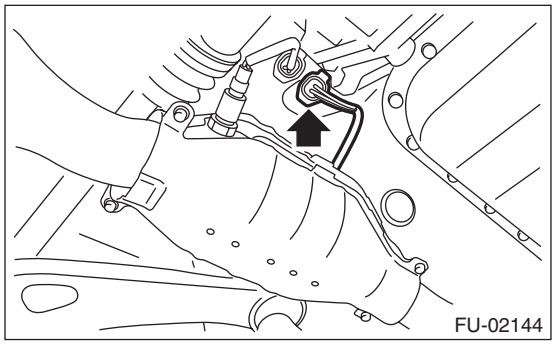
3) Hold the harness with clip.

4) Connect the connector to rear oxygen sensor.

- LH side



- RH side

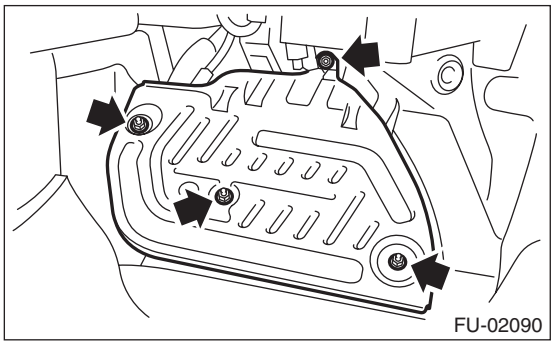


5) Lower the vehicle.
6) Connect the ground cable to battery.

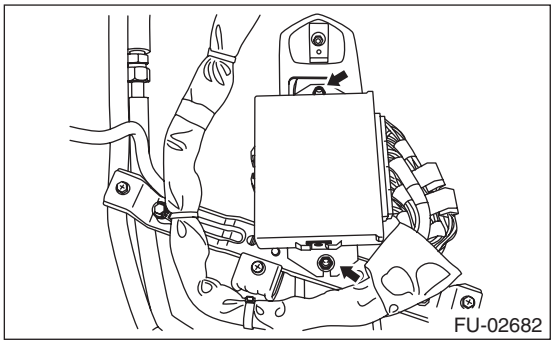
17.Engine Control Module (ECM)

A: REMOVAL

1) Disconnect the ground cable from the 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.


FU-02090

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


FU-02682

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
When the ECM on a model with immobilizer has been replaced, be sure to perform registration of the immobilizer. (Refer to "PC application help for Subaru Select Monitor".)

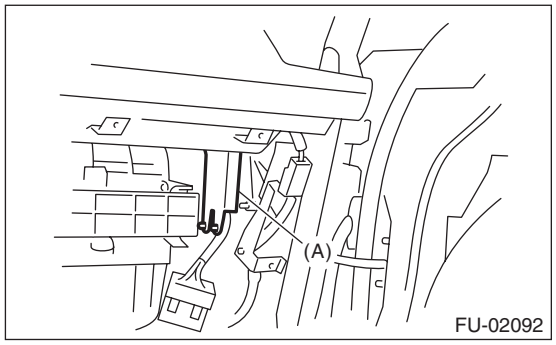
NOTE:
When replacing the ECM, be careful not to use ECM with incorrect specification to avoid any damage on the fuel injection system.

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

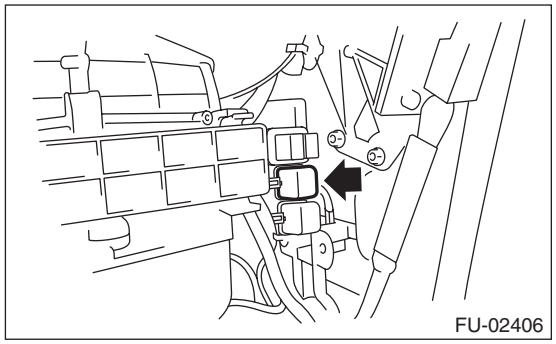
18.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-38, REMOVAL, Glove Box.>
3) Remove the harness cover (A).



4) Remove the main relay.



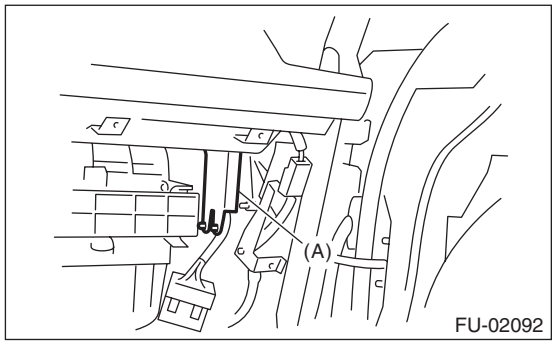
B: INSTALLATION

Install in the reverse order of removal.

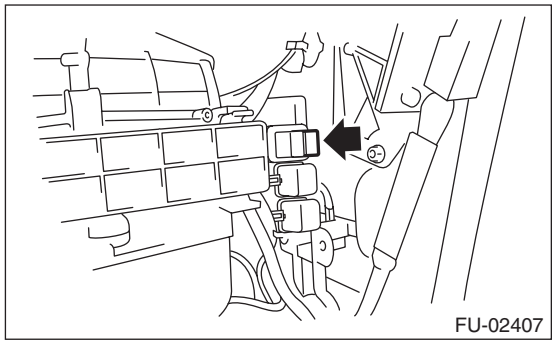
19.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-38, REMOVAL, Glove Box.>
3) Remove the harness cover (A).



4) Remove the fuel pump relay.



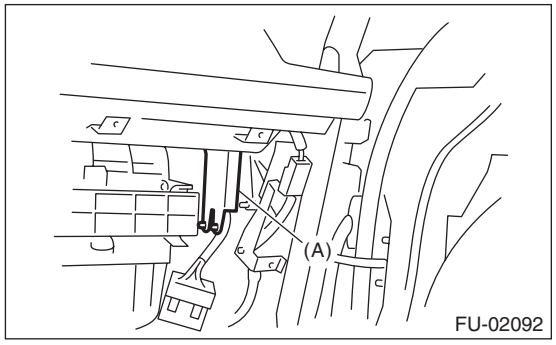
B: INSTALLATION

Install in the reverse order of removal.

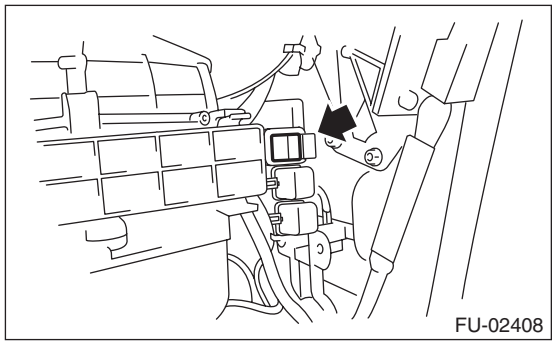
20. Electronic Throttle Control Relay

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-38, REMOVAL, Glove Box.>
3) Remove the harness cover (A).



4) Remove the electronic throttle control relay.



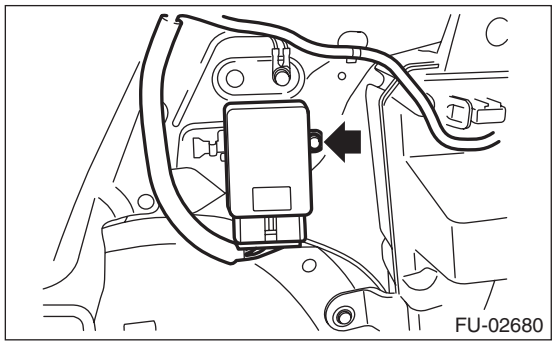
B: INSTALLATION

Install in the reverse order of removal.

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)

22.Fuel

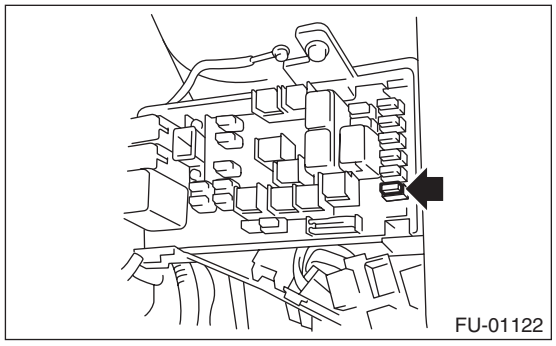
A: PROCEDURE

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

2. DRAINING FUEL (WITH SUBARU SELECT MONITOR)

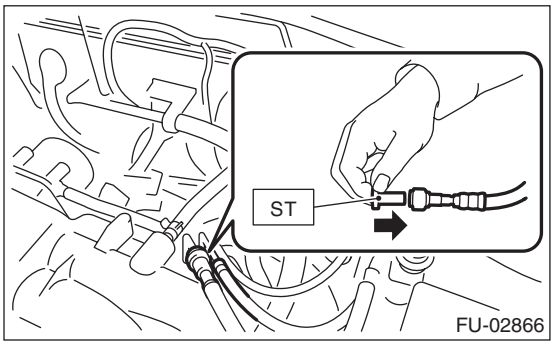
WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
Be careful not to spill fuel.

NOTE:
• If the fuel pump cannot be actuated, refer to DRAINING FUEL (THROUGH THE FUEL FILLER HOSE). <Ref. to FU(H6DO)-44, 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)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the fuel delivery hose.
ST 42099AE000 QUICK CONNECTOR RELEASE

CAUTION:
• Be careful not to spill fuel.
• Catch the fuel from hoses using a container or cloth.



3) Connect ST to the fuel delivery hose.
ST 18471AA000 FUEL PIPE ADAPTER
4) Connect the gasoline proof hose to ST and put the end of the hose in the container.
5) Actuate the fuel pump and drain the fuel using Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-56, FUEL PUMP CONTROL (ON/OFF OPERATION), OPERATION, System Operation Check Mode.>

CAUTION:
Be careful not to spill fuel.

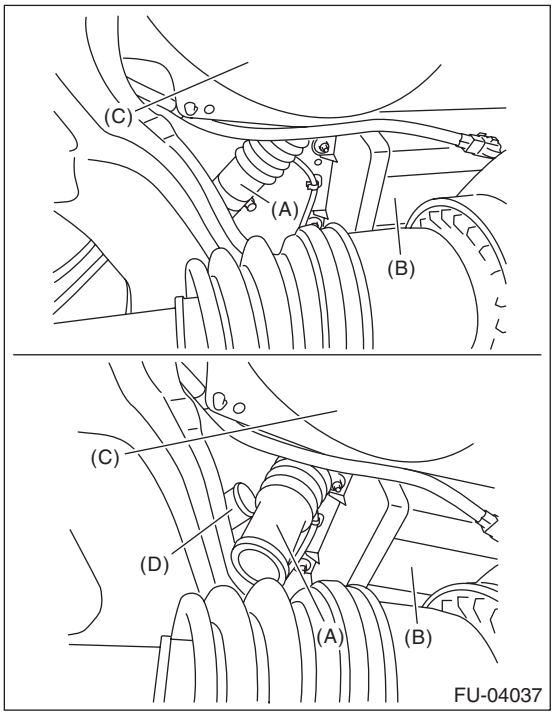
3. DRAINING FUEL (THROUGH THE FUEL FILLER HOSE)

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) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Remove the rear exhaust pipe and muffler. <Ref. to EX(H6DO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
4) Open the fuel filler lid, and remove the fuel filler cap.
5) Drain 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.
6) Disconnect the fuel filler hose 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

7) Set a container under the vehicle and insert the gasoline proof hose (ø10 or less) through the fuel filler hose to drain fuel.

CAUTION:
Be careful not to spill fuel.

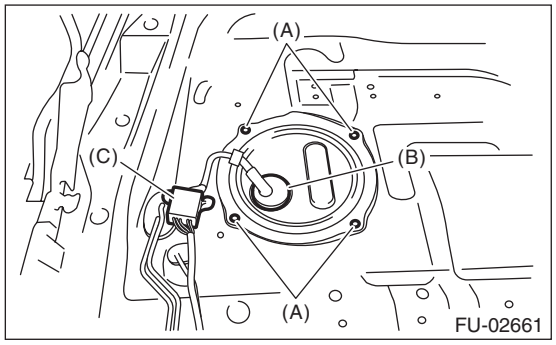
23.Fuel Tank

A: REMOVAL

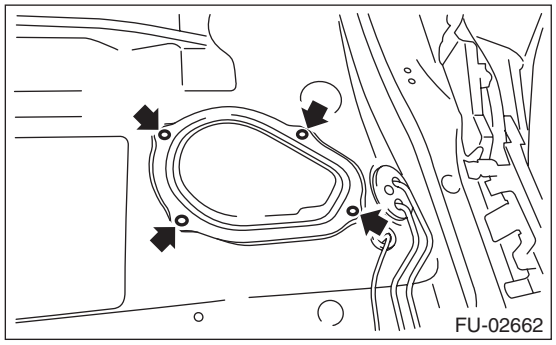
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

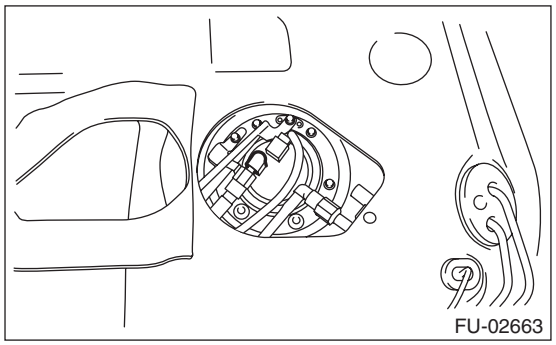
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H6DO)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.
4) Drain fuel. <Ref. to FU(H6DO)-43, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
5) Remove the second row seats. <Ref. to SE-13, REMOVAL, Second Seat.>
6) 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.



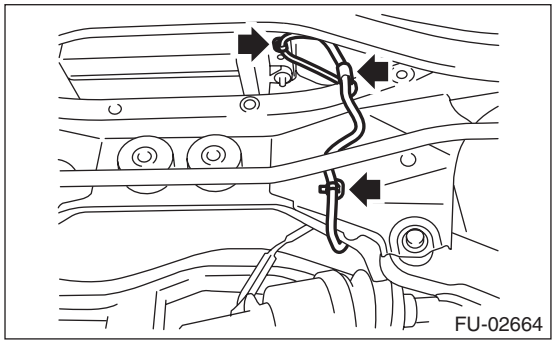
7) Remove the service hole cover of fuel sub level sensor.



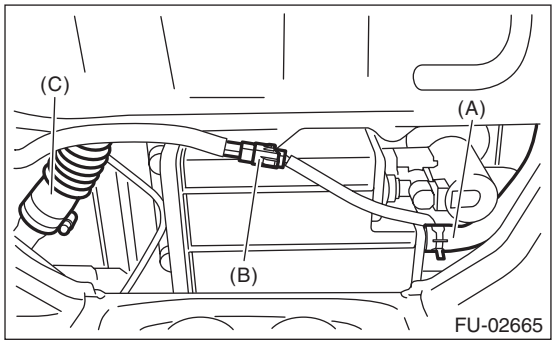
8) Disconnect the quick connector on the fuel delivery hose. <Ref. to FU(H6DO)-58, REMOVAL, Fuel Delivery & Evaporation Lines.>



9) Remove the rear wheels.
10) Lift up the vehicle.
11) Remove the clip holding the harness.



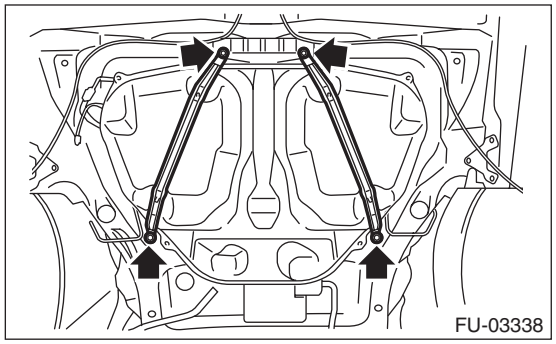
12) Remove the rear suspension assembly. <Ref. to RS-18, REMOVAL, Rear Sub Frame.>
13) Disconnect evaporation hose (A), connector (B) and fuel filler hose (C).



14) Remove the fuel tank from the vehicle.

WARNING:
- **A helper is required to perform this work.**
- **The 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.



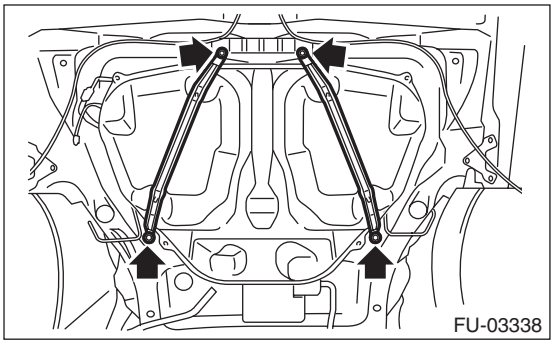
B: INSTALLATION

1) Install the fuel tank to the vehicle.

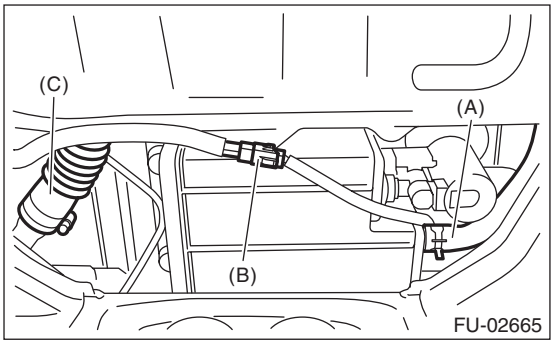
WARNING:
A helper is required to perform this work.

(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.

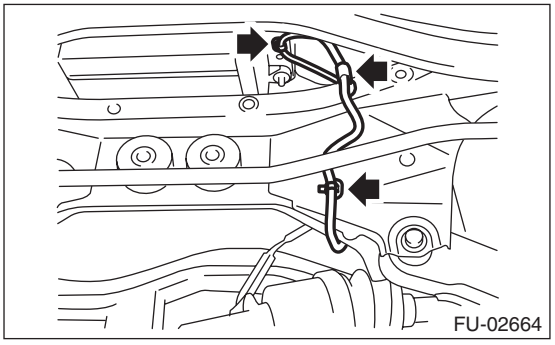
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)



2) Connect evaporation hose (A), connector (B) and fuel filler hose (C).



3) Install the rear suspension assembly. <Ref. to RS-18, INSTALLATION, Rear Sub Frame.>
4) Install the clip that holds the harness.

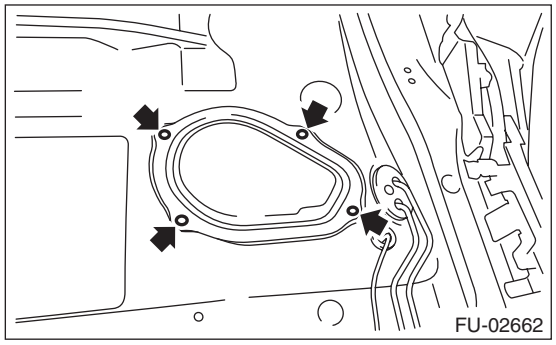


5) Lower the vehicle.

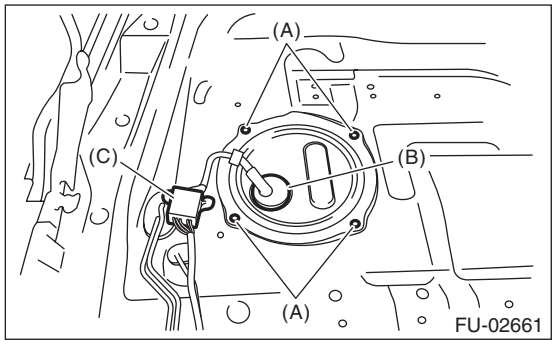
6) Install the rear wheels.

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 hose. <Ref. to FU(H6DO)-59, INSTALLATION, Fuel Delivery & 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) Install the fuse of fuel pump to the main fuse box.
12) Connect the ground cable to battery.

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.

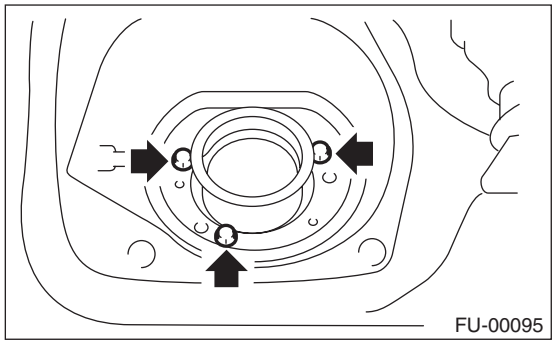
24.Fuel Filler Pipe

A: REMOVAL

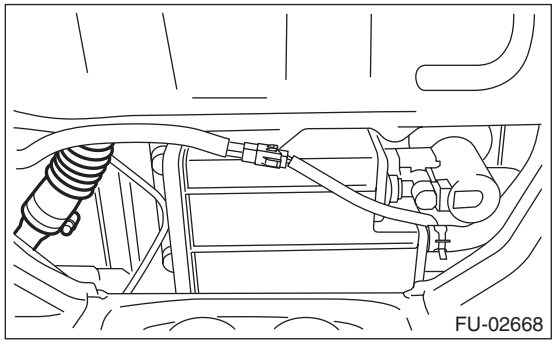
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

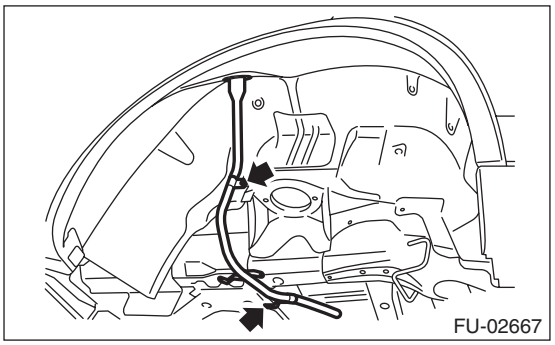
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H6DO)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Drain fuel. <Ref. to FU(H6DO)-43, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
4) Disconnect the ground cable from battery.
5) Open the fuel filler lid, and remove the fuel filler cap.
6) Remove the bolt which secures the gasket.


FU-00095

7) Remove the rear wheel RH.
8) Lift up the vehicle.
9) Remove the mud guard. <Ref. to EI-20, REMOVAL, Mud Guard.>
10) Remove the rear suspension assembly. <Ref. to RS-18, REMOVAL, Rear Sub Frame.>
11) Disconnect the fuel filler hose.


FU-02668

12) Remove the bolts which hold fuel filler pipe bracket on the body.

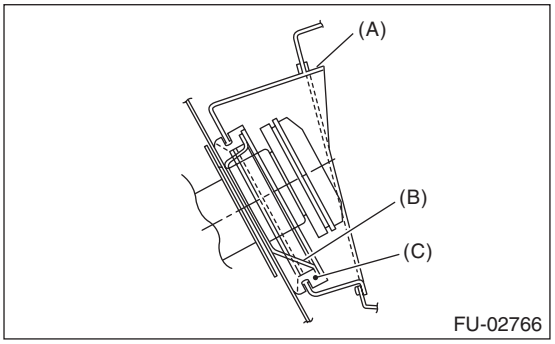

FU-02667

13) Remove the fuel filler pipe to the underside of the vehicle.

B: INSTALLATION

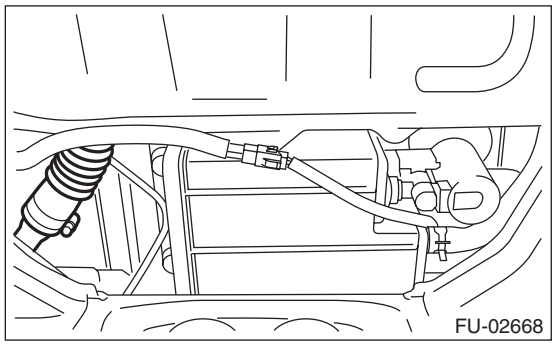
1) Open the fuel filler lid.
2) Set the fuel saucer (A) with rubber seal (C), and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the nuts.

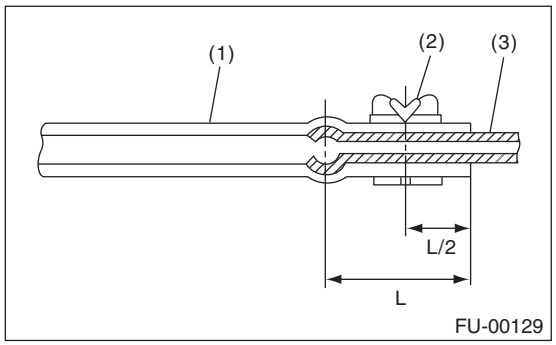
NOTE:
If the edges of rubber gasket are folded toward inside, straighten it with a flat tip screwdriver.



FU-02766

4) Correctly insert the fuel filler hose to specified position, and then tighten the clamp.


FU-02668

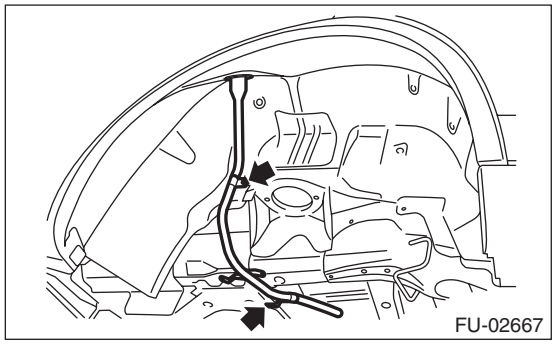


FU-00129

(1) Hose
(2) Clamp
(3) Pipe

5) Tighten the bolts which hold fuel filler pipe bracket on the body.

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


FU-02667

6) Install the rear suspension assembly. <Ref. to RS-18, 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 ground cable to battery.

25.Fuel Pump

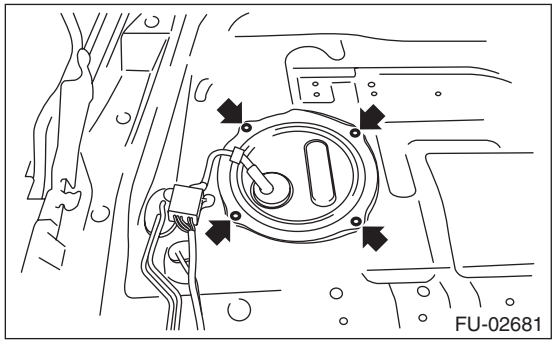
A: REMOVAL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

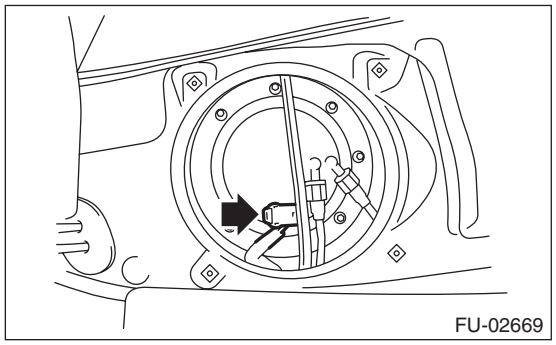
CAUTION:
- **Be careful not to spill fuel.**
- **When the fuel gauge pointer is at two third or more, the fuel may spill out. Be sure to drain the fuel before the operation.**

NOTE:
Fuel pump assembly consists of fuel pump, fuel filter and fuel level sensor.

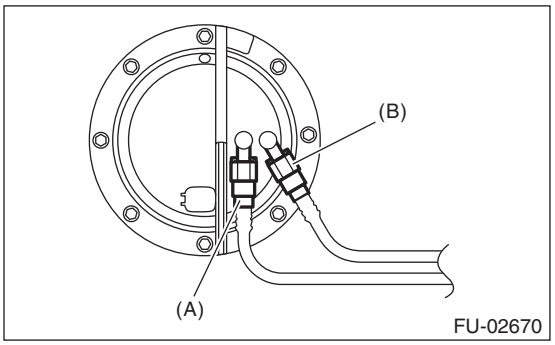
1) Release the fuel pressure. <Ref. to FU(H6DO)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H6DO)-43, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Remove the second row seats. <Ref. to SE-13, REMOVAL, Second Seat.>
4) Remove the service hole cover.


FU-02681

5) Disconnect the connector from fuel pump.


FU-02669

6) Disconnect the quick connector, and then disconnect the fuel delivery hose and jet pump hose. <Ref. to FU(H6DO)-58, REMOVAL, Fuel Delivery & Evaporation Lines.>
7) Remove the nuts which install fuel pump assembly onto fuel tank.



FU-02670

(A) Delivery hose
(B) Jet pump hose

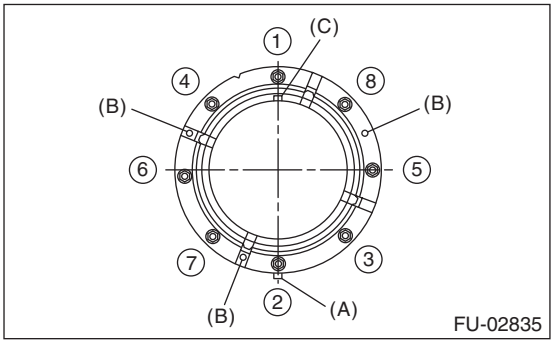
8) Remove the fuel pump assembly from the fuel tank.

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 to the upper plate. (3 places)
- Align the protrusion (C) of fuel pump assembly with the cutout portion of the upper plate.
- Tighten the nuts to the specified torque in the order as shown in the figure.

NOTE:
Use a new gasket and retainer.

Tightening torque:
4.4 N·m (0.4 kgf-m, 3.2 ft-lb)

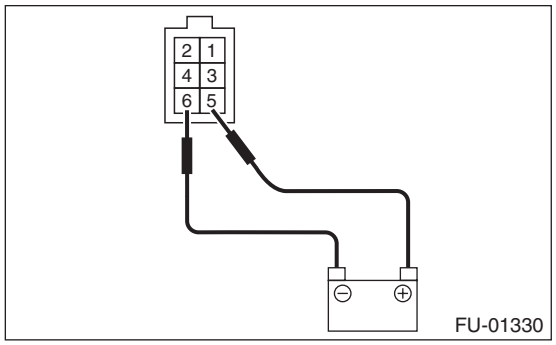


FU-02835

C: INSPECTION

Connect the lead harness to the connector terminal of fuel pump, and apply the battery power supply to check whether the pump operates.

CAUTION:
- **Wipe off fuel completely.**
- **Keep the battery as far apart from fuel pump as possible.**
- **Be sure to perform the ON/OFF operation on the battery side.**
- **Do not run the fuel pump for a long time under non-load condition.**



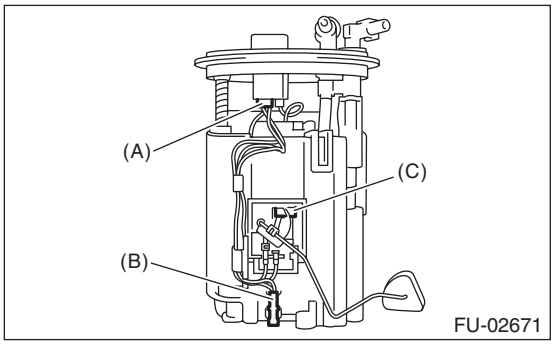
26.Fuel Level Sensor

A: REMOVAL

WARNING:
Place “NO OPEN FLAMES” signs near the working area.

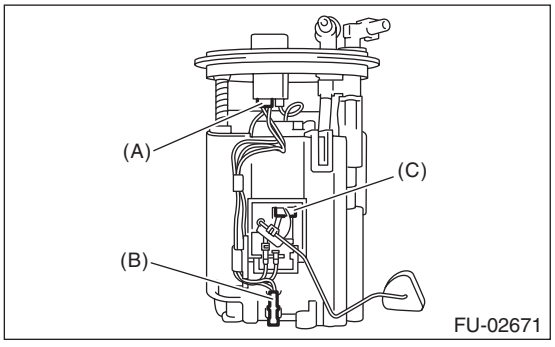
CAUTION:
- **Be careful not to spill fuel.**
- **When the fuel gauge pointer is at two third or more, the fuel may spill out. Be sure to drain the fuel before the operation.**

NOTE:
The fuel level sensor is built in fuel pump assembly.
1) Remove the fuel pump assembly. <Ref. to FU(H6DO)-50, REMOVAL, Fuel Pump.>
2) Disconnect the connector (A) from fuel pump bracket.
3) Remove the fuel temperature sensor (B).
4) Remove the fuel level sensor (C).



B: INSTALLATION

1) Attach the fuel level sensor (C).
2) Install the fuel temperature sensor (B).
3) Connect the connector (A) to fuel pump bracket.



4) Install the fuel pump assembly. <Ref. to FU(H6DO)-50, INSTALLATION, Fuel Pump.>

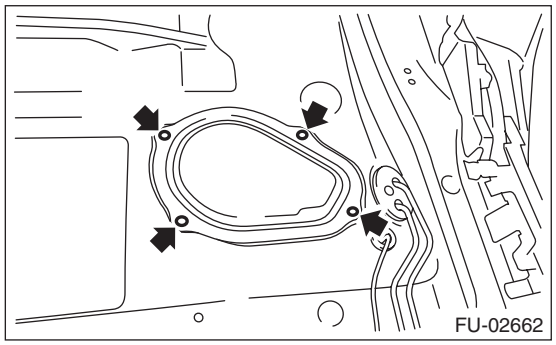
27.Fuel Sub Level Sensor

A: REMOVAL

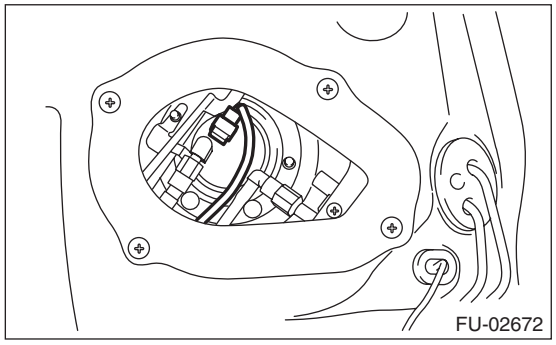
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **When the fuel gauge pointer is at two third or more, the fuel may spill out. Be sure to drain the fuel before the operation.**

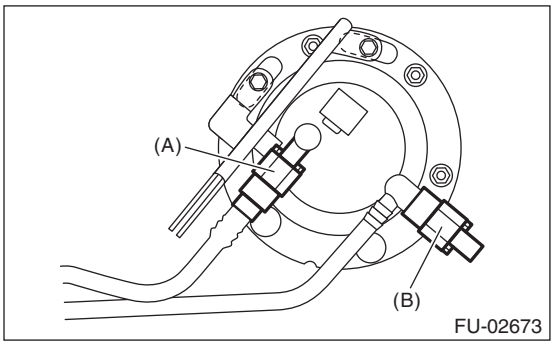
1) Release the fuel pressure. <Ref. to FU(H6DO)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H6DO)-43, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Remove the second row seats. <Ref. to SE-13, REMOVAL, Second Seat.>
4) Remove the service hole cover.


FU-02662

5) Disconnect the connector from the fuel sub level sensor.


FU-02672

6) Disconnect the quick connector, and then disconnect the fuel delivery hose and jet pump hose. <Ref. to FU(H6DO)-58, REMOVAL, Fuel Delivery & Evaporation Lines.>
7) Remove the nuts and bolts which install fuel sub level sensor on fuel tank.



FU-02673

(A) Jet pump hose
(B) Delivery hose

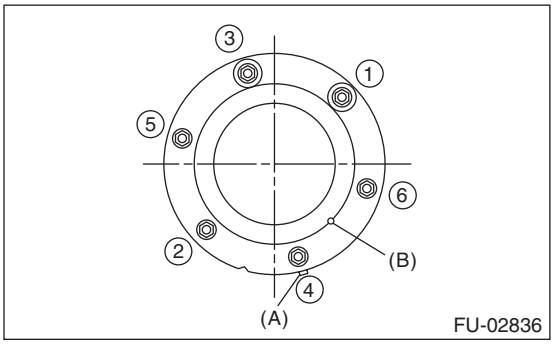
8) Remove the fuel sub level sensor.

B: INSTALLATION

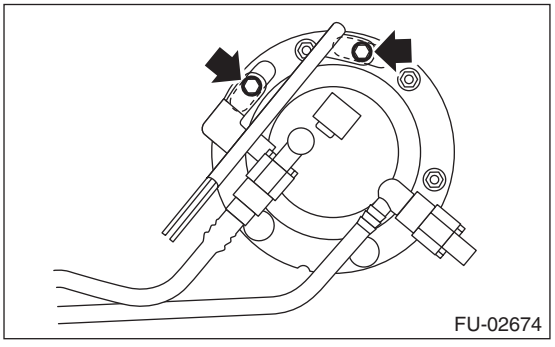
Install in the reverse order of removal by adhering to the following procedures.
- Make sure the sealing portion is free from fuel or foreign matter before installation.
- Align the protrusion (A) of gasket to the position shown in the following figure.
- Align the protrusion (B) of fuel sub level sensor with the cutout portion of 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 and a retainer.

Tightening torque:
4.4 N·m (0.4 kgf-m, 3.2 ft-lb)



FU-02836


FU-02674

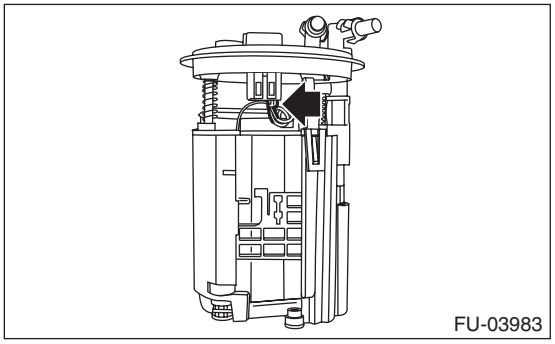
28.Fuel Filter

A: REMOVAL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **When the fuel gauge pointer is at two third or more, the fuel may spill out. Be sure to drain the fuel before the operation.**
- **Be careful not to drop or impact during the operation to prevent the fuel pump performance deterioration.**

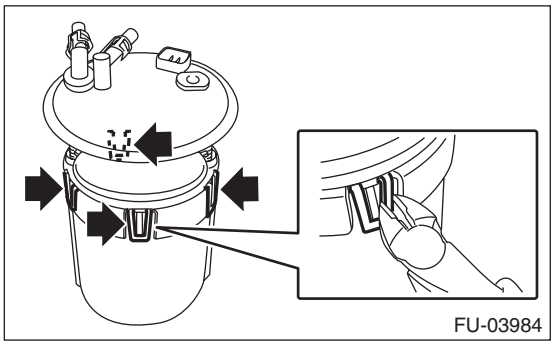
NOTE:
The fuel filter is built in fuel pump assembly.
1) Remove the fuel pump assembly. <Ref. to FU(H6DO)-50, REMOVAL, Fuel Pump.>
2) Remove the fuel level sensor and fuel temperature sensor. <Ref. to FU(H6DO)-52, REMOVAL, Fuel Level Sensor.>
3) Disconnect the pump assembly connector from sub tank bracket assembly.


FU-03983

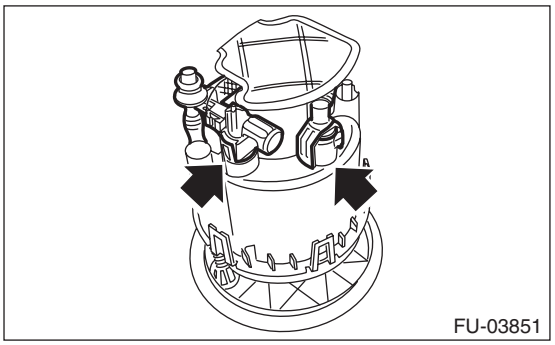
4) Cut the four claw holding portions where the sub tank bracket assembly and sub tank are combined using a nipper to separate the sub tank bracket assembly and sub tank.

CAUTION:
Be careful not to damage the sub tank.

NOTE:
If O-ring remains on the sub tank, remove it.

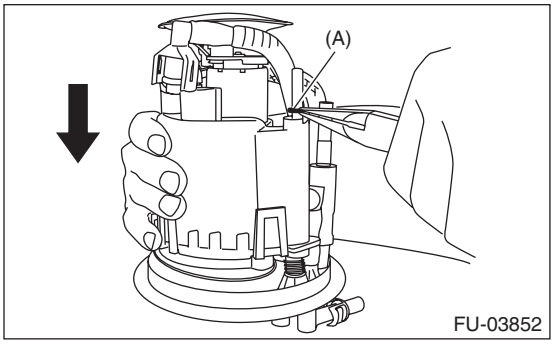

FU-03984

5) Disconnect two connectors of fuel delivery pipe from fuel filter assembly.


FU-03851

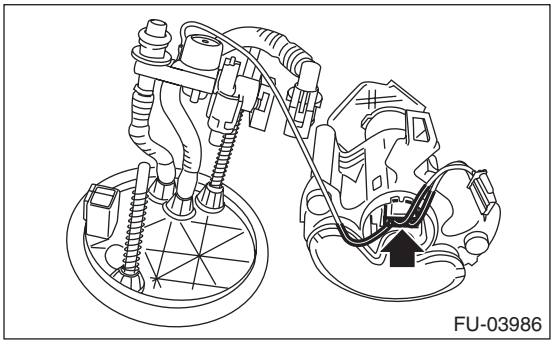
6) Push down the fuel filter assembly in the arrowed direction to remove clip (A), and then disconnect the sub tank bracket assembly and fuel filter assembly.

CAUTION:
Be careful not to damage the ground line while disconnecting the sub tank bracket assembly and fuel filter assembly.



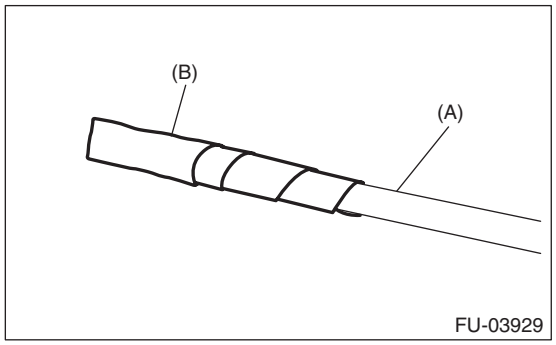
FU-03852

7) Disconnect connectors from the pump assembly.


FU-03986

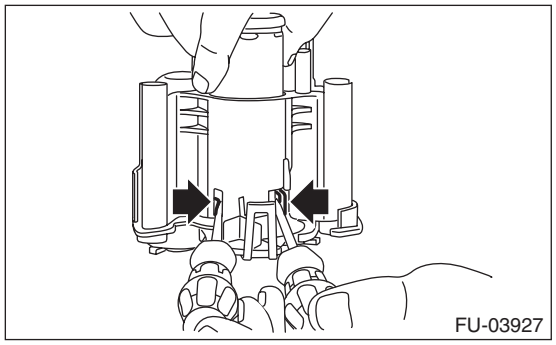
8) Lift the two claw holding portions where the pump assembly is connected to the fuel filter using a flat tip screwdriver [dia. approx. 3 mm (0.12 in)] to disconnect the fuel filter and pump assembly.

CAUTION:
• Wrap the tip of screwdriver (A) with tape (B) before operation to prevent damage to the pump assembly claws.



• Be careful not to drop or impact on the pump assembly.

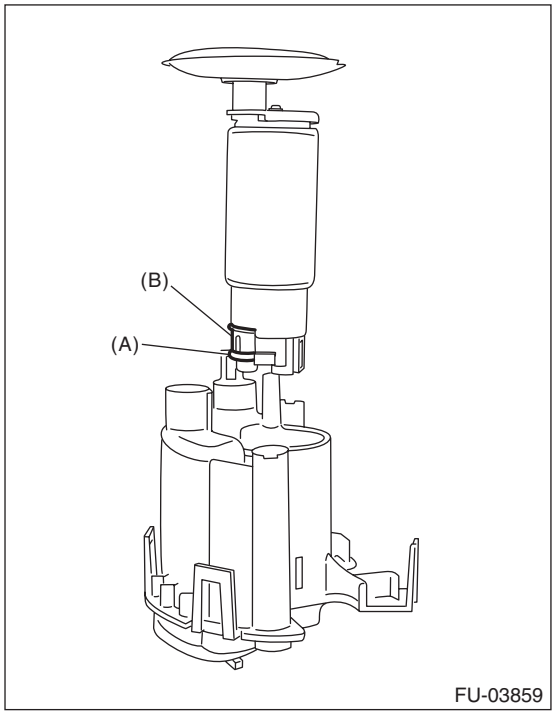
NOTE:
If spacer or O-ring remains on the pump assembly, remove it.



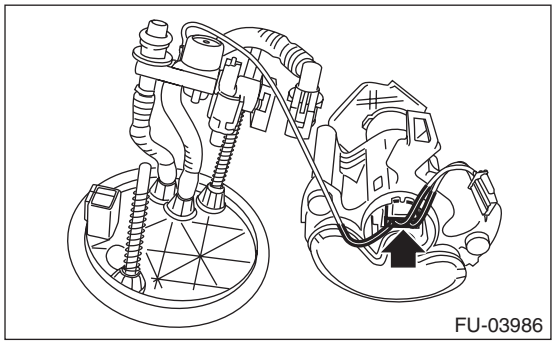
B: INSTALLATION

1) Attach O-ring (A) and spacer (B) to pump assembly, and install the pump assembly to the fuel filter.

NOTE:
• Use a new O-ring [inner dia. approx. 8 mm (0.31 in)].
• Use a new spacer.
• Apply gasoline to the O-ring.
• Insert the pump assembly until it gives off a snapping sound.

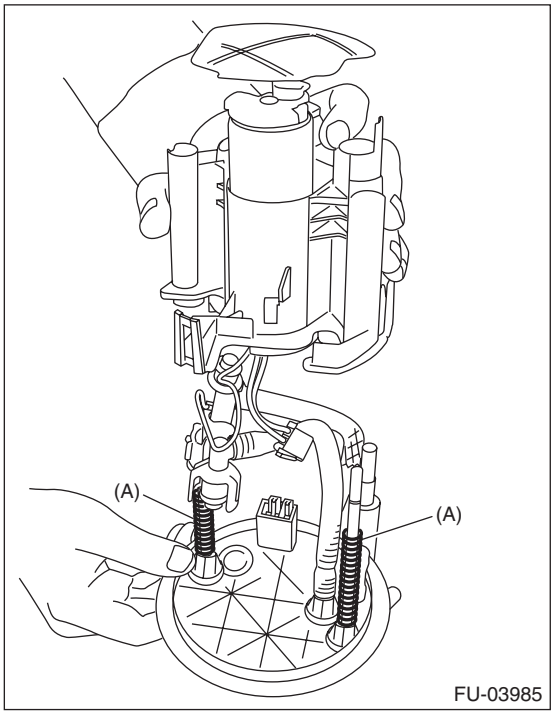


2) Connect the connector to the pump assembly.



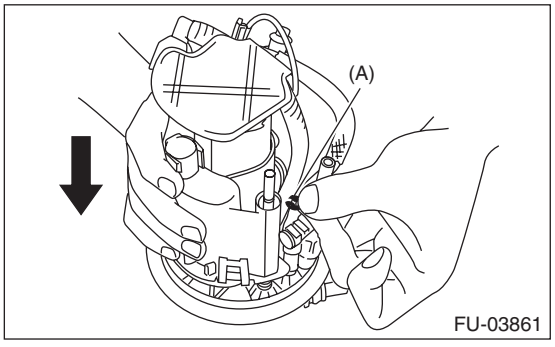
3) Attach springs (A) to the metal bars of the sub tank bracket assembly, and assemble the fuel filter assembly.

NOTE:
Use new springs.



4) Push down the fuel filter assembly in the arrowed direction and attach clip (A).

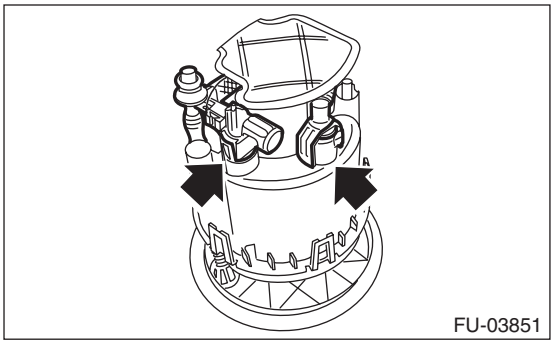
NOTE:
Use a new clip.



5) Connect the fuel delivery pipe connector to the fuel filter assembly.

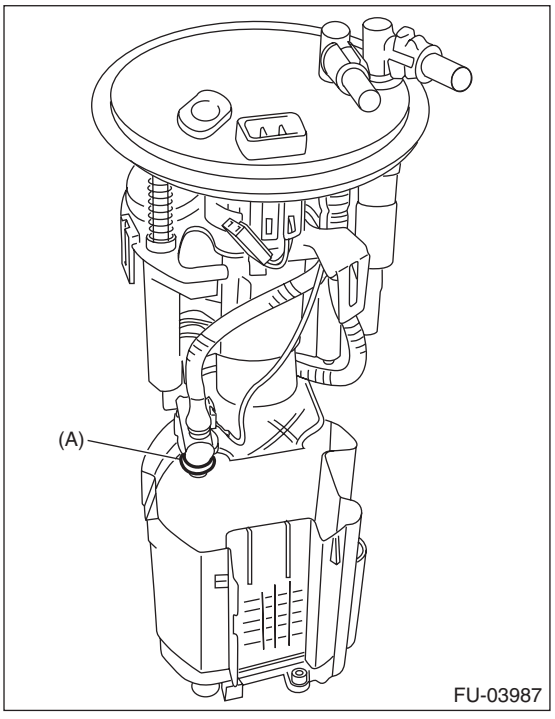
NOTE:
- Use new O-rings.
- Apply gasoline to the O-ring.
- O-rings for black connector and white connector differ in inner diameter. Do not confuse them when assembling.

O-ring inner diameter:
O-ring for black connector [approx. 7 mm (0.28 in)]
O-ring for white connector [approx. 8 mm (0.31 in)]

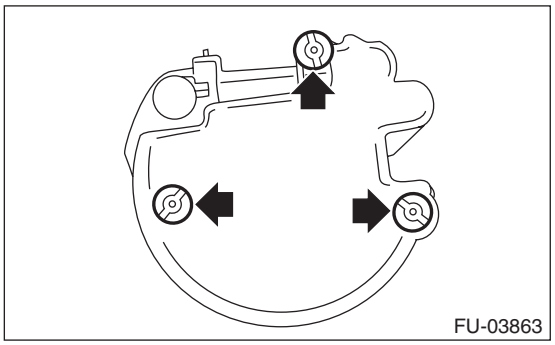


6) Attach O-ring (A) to the fuel filter assembly, and install the sub tank to the sub tank bracket assembly.

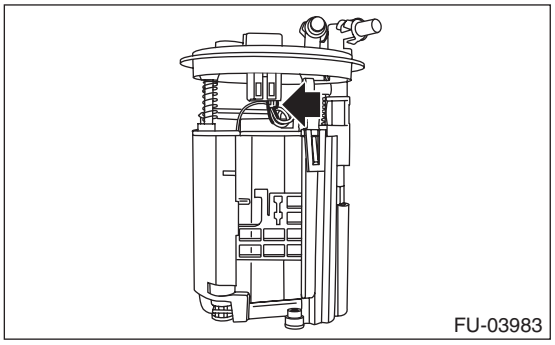
NOTE:
- Use a new O-ring [inner dia. approx. 8 mm (0.31 in)].
- Apply gasoline to the O-ring.
- Insert the pump assembly until it gives off a snapping sound.



7) Replace the cushion on the sub tank backside with a new part.



8) Connect the pump assembly connector to sub tank bracket assembly.

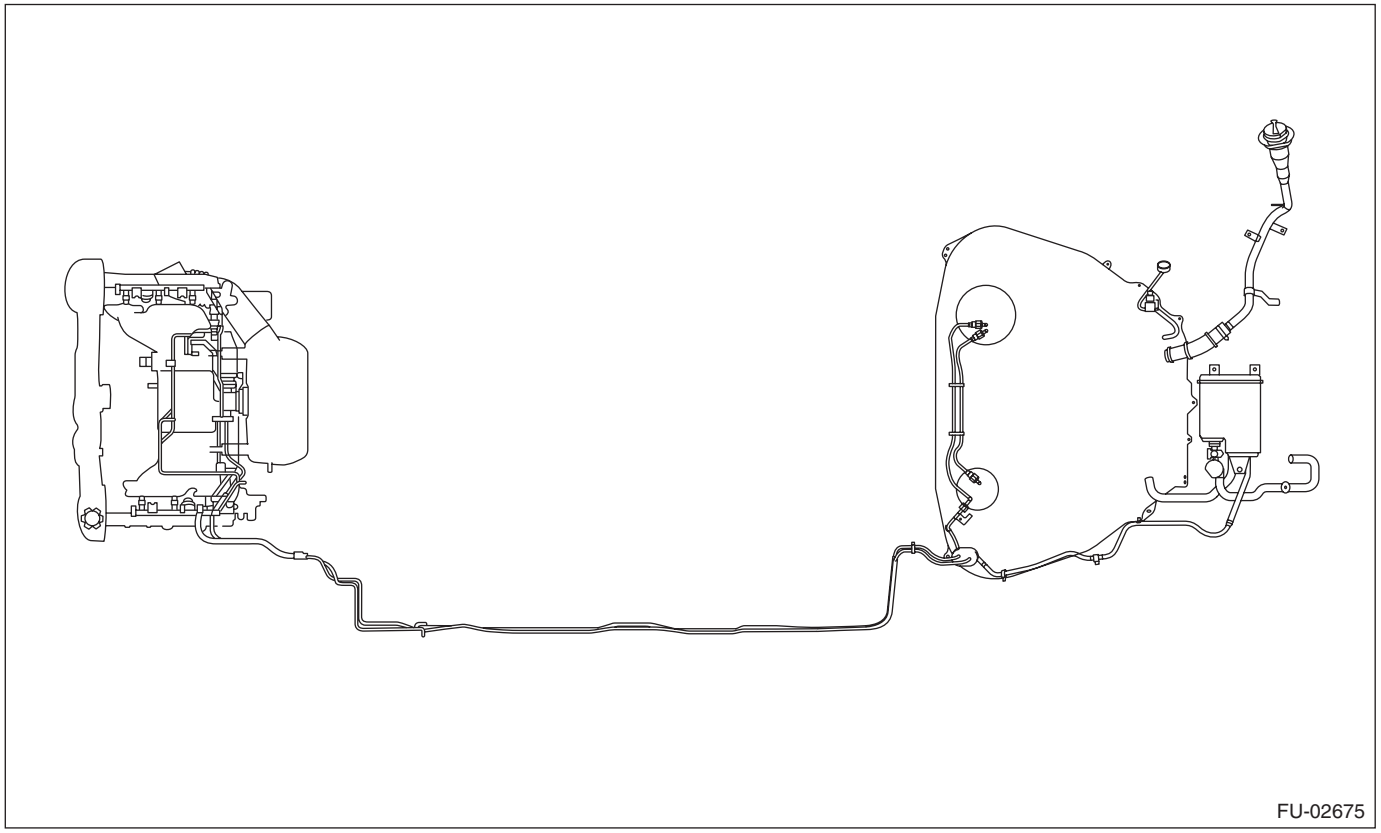


9) Install the fuel level sensor and fuel temperature sensor. <Ref. to FU(H6DO)-52, INSTALLATION, Fuel Level Sensor.>

10) Install the fuel pump assembly. <Ref. to FU(H6DO)-50, INSTALLATION, Fuel Pump.>

29.Fuel Delivery & Evaporation Lines

A: REMOVAL



WARNING:
Place "NO OPEN FLAMES" signs near the working area.

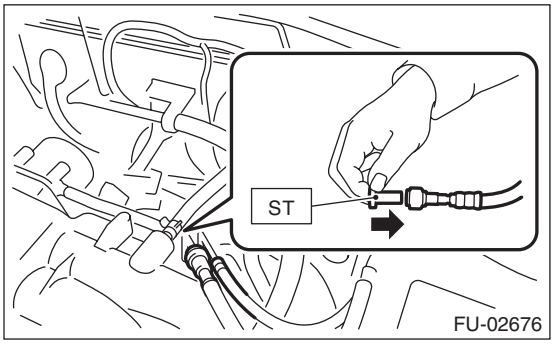
CAUTION:
Be careful not to spill fuel.

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H6DO)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler lid, and remove the fuel filler cap.
4) Remove the floor mat. <Ref. to EI-48, REMOVAL, Floor Mat.>
5) Disconnect the fuel delivery pipe and hose and the evaporation pipe and hose.
6) In the engine compartment, disconnect the fuel delivery hoses and evaporation hose.
   (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

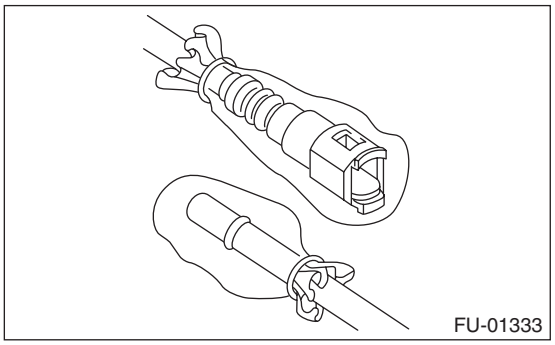
   (2) Remove the clip, and disconnect the evaporation hose from the pipe.

CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**



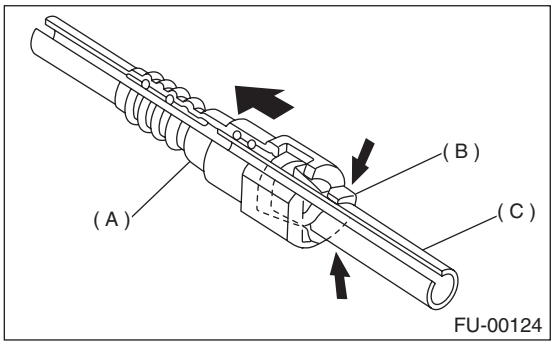
7) Lift up the vehicle.
8) Remove the fuel tank. <Ref. to FU(H6DO)-45, REMOVAL, Fuel Tank.>

9) Separate the quick connector of fuel line.
(1) Clean the pipe and connector, if they are covered with dust.
(2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag etc.



(3) Hold the connector (A) and push the retainer (B) down.
(4) Pull out the connector (A) from the retainer (B).

NOTE:
Always use a new retainer except in use of engine compartment.



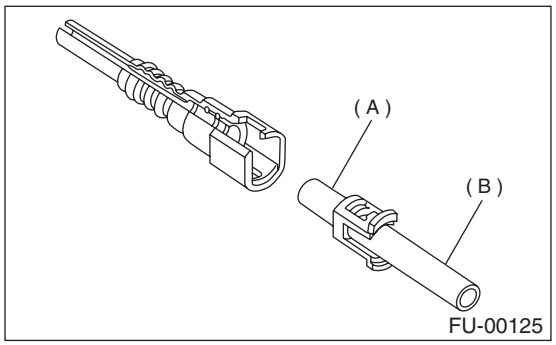
(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel line.

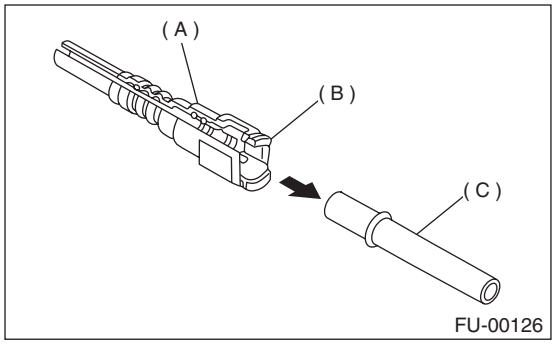
CAUTION:
Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface of pipe.

NOTE:
Always use a new retainer except in use of engine compartment.



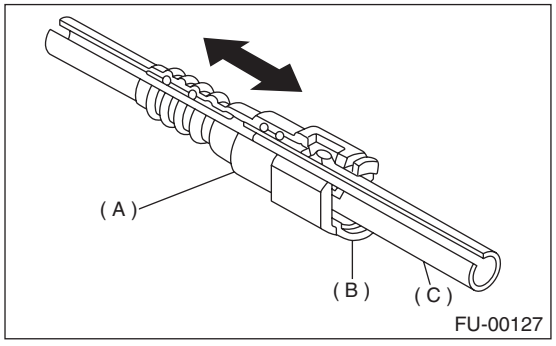
(A) Seal surface
(B) Pipe

(1) Set the new retainer (B) to connector (A).
(2) Push the pipe into the connector completely.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
• Pull the connector to ensure it is connected securely.
• Make sure the two retainer pawls are engaged in their mating positions in the connector.
• Be sure to inspect the hoses and their connections for fuel leakage.

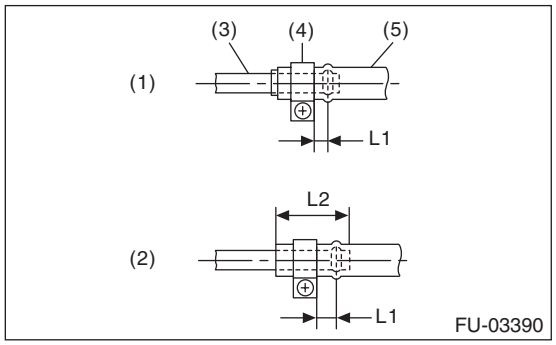


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose to the pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the amount of inserting is specified.
Type B: When the amount to be inserted is not specified.

L1: 2.5±1.5 mm (0.098±0.059 in)

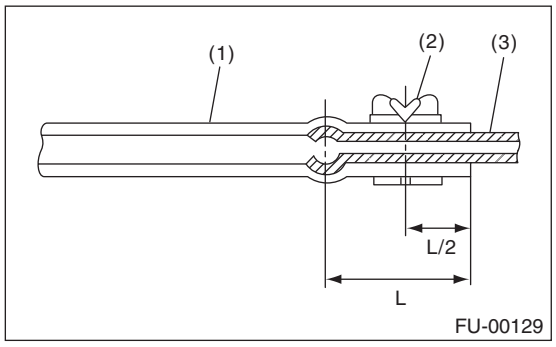
L2: 22.5±2.5 mm (0.886±0.098 in)



(1) Type A
(2) Type B
(3) Pipe
(4) Clamp
(5) Hose

3) 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)

CAUTION:
Be sure to inspect the hoses and their connections for fuel leakage.



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

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure the fuel pipe and fuel hose connections are tightened firmly.

30.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to injector		
1)	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.
2)	Decline of fuel pump function	Replace the fuel pump.
3)	Clogged fuel filter	Replace the fuel filter and clean or replace the fuel tank if necessary.
4)	Clogged or bent fuel pipe or hose	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent air breather hose or pipe	Clean, correct or replace the air breather hose or pipe.
7)	Damaged diaphragm of pressure regulator	Replace the fuel pump.
2. Leakage or blow out of fuel		
1)	Loose joints of the fuel pipe	Retighten.
2)	Cracked fuel pipe, hose and fuel tank	Replace.
3)	Defective welding part on the fuel tank	Replace.
4)	Clogged or bent air breather hose or air vent tube	Clean, correct or replace the air breather hose or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather hose, air vent tube and fuel filler pipe	Retighten.
2)	Defective gasket air tightness on the fuel saucer	Correct or replace the gasket.
3)	Inoperative fuel pump modulator or circuit	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor	Replace.
2)	Defective operation of fuel meter	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump	Replace.

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 below 0°C (32°F) 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	8
8.	Fuel Temperature Sensor	9
9.	Fuel Sub Level Sensor	10
10.	Fuel Tank Pressure Sensor	11
11.	Drain Filter	12
12.	Drain Valve	13
13.	PCV Valve	14

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)-9, 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)-11, 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)-13, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0017	Crank And Cam Timing B System Failure (Bank 1)	<Ref. to GD(H6DO)-15, 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)-17, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0019	Crank and Cam Timing B System Failure (Bank 2)	<Ref. to GD(H6DO)-17, 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)-17, 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)-17, 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)-18, 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)-20, 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)-22, 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)-24, 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)-26, 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.>
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.>

DTC	Item	Index
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)-69, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0151	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-71, 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)-71, 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)-71, 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)-71, 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)-71, DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0158	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-71, 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)-71, 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)-71, DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H6DO)-72, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H6DO)-73, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0174	System Too Lean (Bank 2)	<Ref. to GD(H6DO)-74, DTC P0174 SYSTEM TOO LEAN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0175	System Too Rich (Bank 2)	<Ref. to GD(H6DO)-74, 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)-75, 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)-78, 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)-79, 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)-80, 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)-82, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0198	Engine Oil Temperature Sensor High	<Ref. to GD(H6DO)-83, 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)-84, 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)-85, 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)-86, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H6DO)-93, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H6DO)-93, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H6DO)-93, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0305	Cylinder 5 Misfire Detected	<Ref. to GD(H6DO)-93, DTC P0305 CYLINDER 5 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0306	Cylinder 6 Misfire Detected	<Ref. to GD(H6DO)-93, 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)-94, 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)-96, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0332	Knock Sensor 2 Circuit Low (Bank 2)	<Ref. to GD(H6DO)-97, 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)-97, 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)-98, 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)-100, 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)-102, 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)-103, 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)-104, 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)-105, DTC P0390 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0400	Exhaust Gas Recirculation Flow	<Ref. to GD(H6DO)-106, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency below Threshold (Bank 1)	<Ref. to GD(H6DO)-109, 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)-111, 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)-127, 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)-129, 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)-131, 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)-133, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H6DO)-135, 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)-136, 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)-136, 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)-137, 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)-139, 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)-141, DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0462	Fuel Level Sensor “A” Circuit Low	<Ref. to GD(H6DO)-143, 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)-145, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H6DO)-147, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0500	Vehicle Speed Sensor “A”	<Ref. to GD(H6DO)-150, 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)-151, 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)-152, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H6DO)-153, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(H6DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H6DO)-155, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H6DO)-157, 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)-158, 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)-159, 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)-161, 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)-163, 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)-164, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(H6DO)-166, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1154	O2 Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-168, 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)-168, 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)-169, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H6DO)-171, 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)-173, 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)-175, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to GD(H6DO)-177, 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)-177, 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)-177, 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)-177, 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)-177, 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)-177, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH 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.>
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.>

DTC	Item	Index
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)-192, 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)-193, 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)-194, 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)-195, 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)-197, 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)-199, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to GD(H6DO)-201, 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)-203, 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)-205, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2227	Barometric Pressure Circuit Range/ Performance	<Ref. to GD(H6DO)-207, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2228	Barometric Pressure Circuit Low	<Ref. to GD(H6DO)-208, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2229	Barometric Pressure Circuit High	<Ref. to GD(H6DO)-209, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

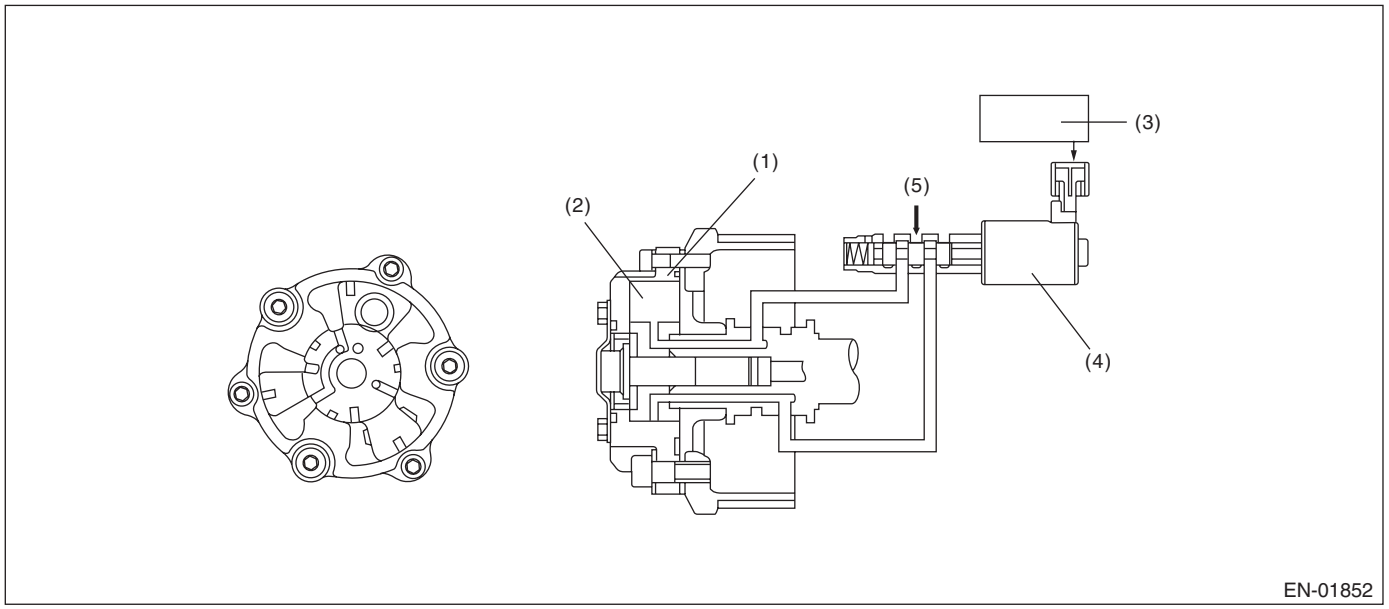
2. Diagnostic Trouble Code (DTC) Detecting Criteria

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 Judgement**

Judge as NG when the following conditions are established within the predetermined time.

Judgement 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 Judgement**

Judge as OK and clear the NG if the following conditions are established within the predetermined time.

Judgement 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)

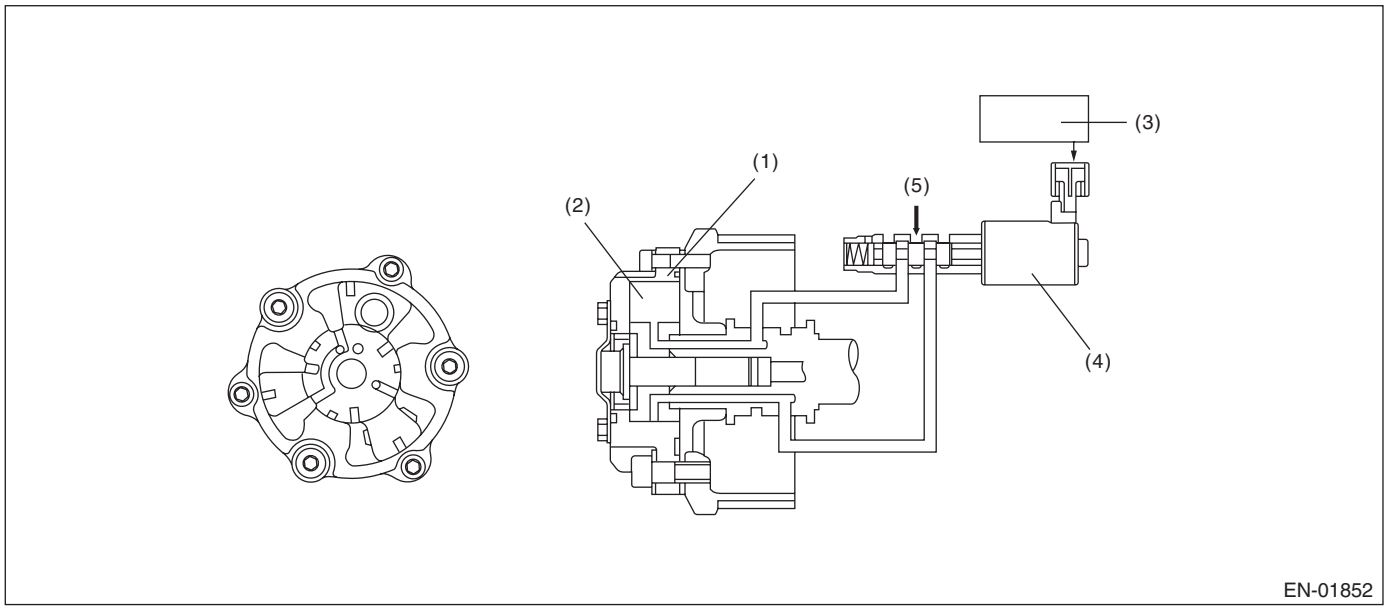
Time Needed for Diagnosis: 60000 ms

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 Judgement**

Judge as NG when the following conditions are established within the predetermined time.

Judgement 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 Judgement**

Judge as OK and clear the NG if the following conditions are established within the predetermined time.

Judgement 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)

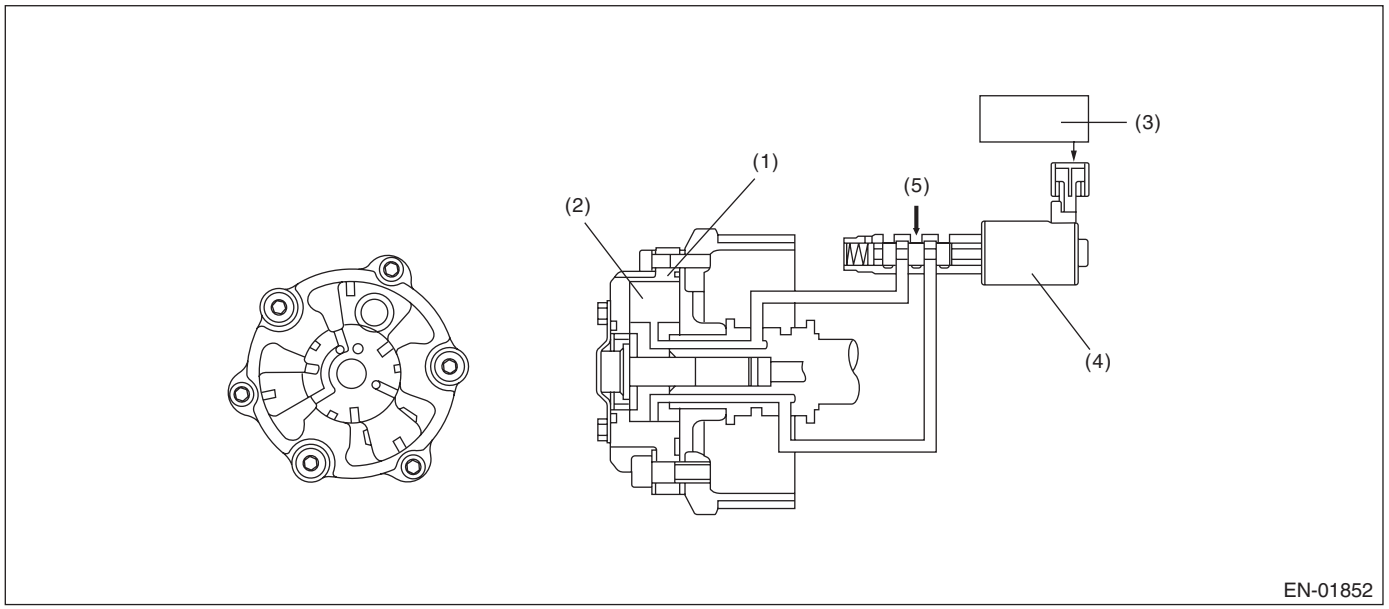
Time Needed for Diagnosis: 50000 ms

C: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.
Judge as NG when the timing advance is outside the normal range.

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	≥ 500 rpm
Engine coolant temperature	≥ 50 °C (122 °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 camshaft sensor input position is not within the normal range.

- **Abnormality Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Crankshaft position when camshaft position sensor signal is input	< BTDC 22 °CA (Bank 1) < BTDC 22 °CA (Bank 2) or > BTDC 58 °CA (Bank 1) > BTDC 58 °CA (Bank 2)

Time Needed for Diagnosis: 20000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Crankshaft position when camshaft position sensor signal is input	≥ BTDC 22 °CA (Bank 1) ≥ BTDC 22 °CA (Bank 2) and ≤ BTDC 58 °CA (Bank 1) ≤ BTDC 58 °CA (Bank 2)

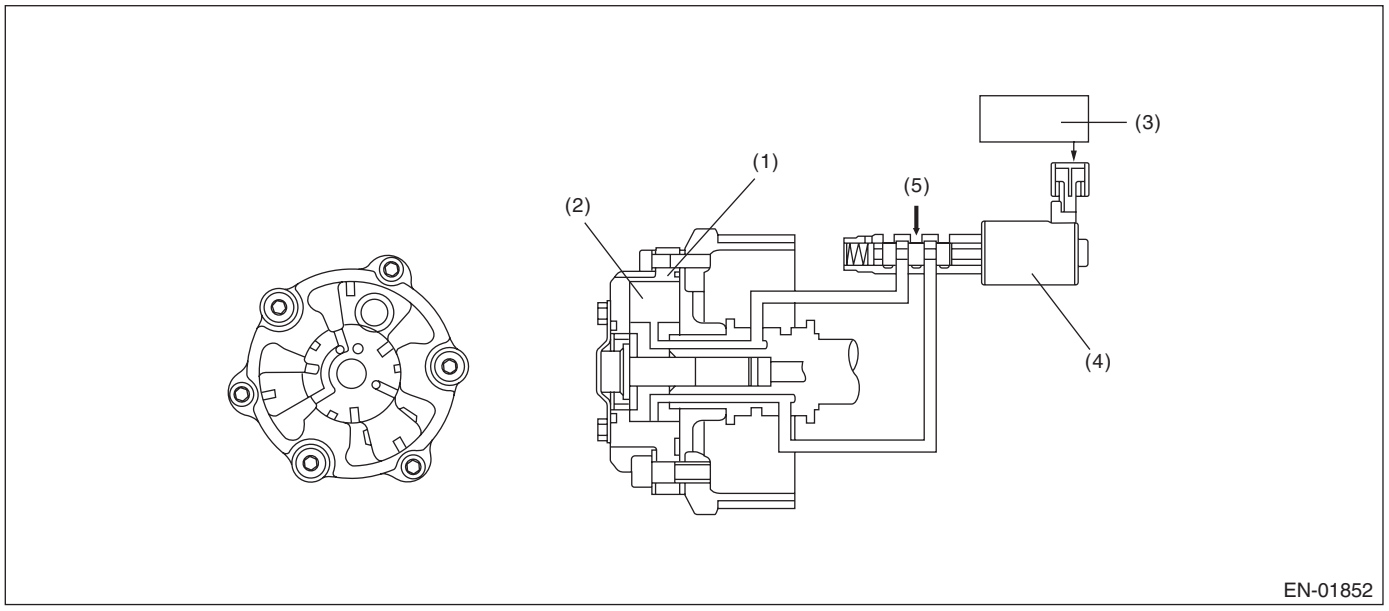
Time Needed for Diagnosis: 1000 ms

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 the timing advance is outside the normal range.

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	≥ 500 rpm
Engine coolant temperature	≥ 50 °C (122 °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 camshaft sensor input position is not within the normal range.

- **Abnormality Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Crankshaft position when camshaft position sensor signal is input	< BTDC 32 °CA (Bank 1) < BTDC 32 °CA (Bank 2) or > BTDC 68 °CA (Bank 1) > BTDC 68 °CA (Bank 2)

Time Needed for Diagnosis: 20000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Crankshaft position when camshaft position sensor signal is input	≥ BTDC 32 °CA (Bank 1) ≥ BTDC 32 °CA (Bank 2) and ≤ BTDC 68 °CA (Bank 1) ≤ BTDC 68 °CA (Bank 2)

Time Needed for Diagnosis: 1000 ms

E: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0016. <Ref. to GD(H6DO)-13, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), 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)-15, 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)-9, 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

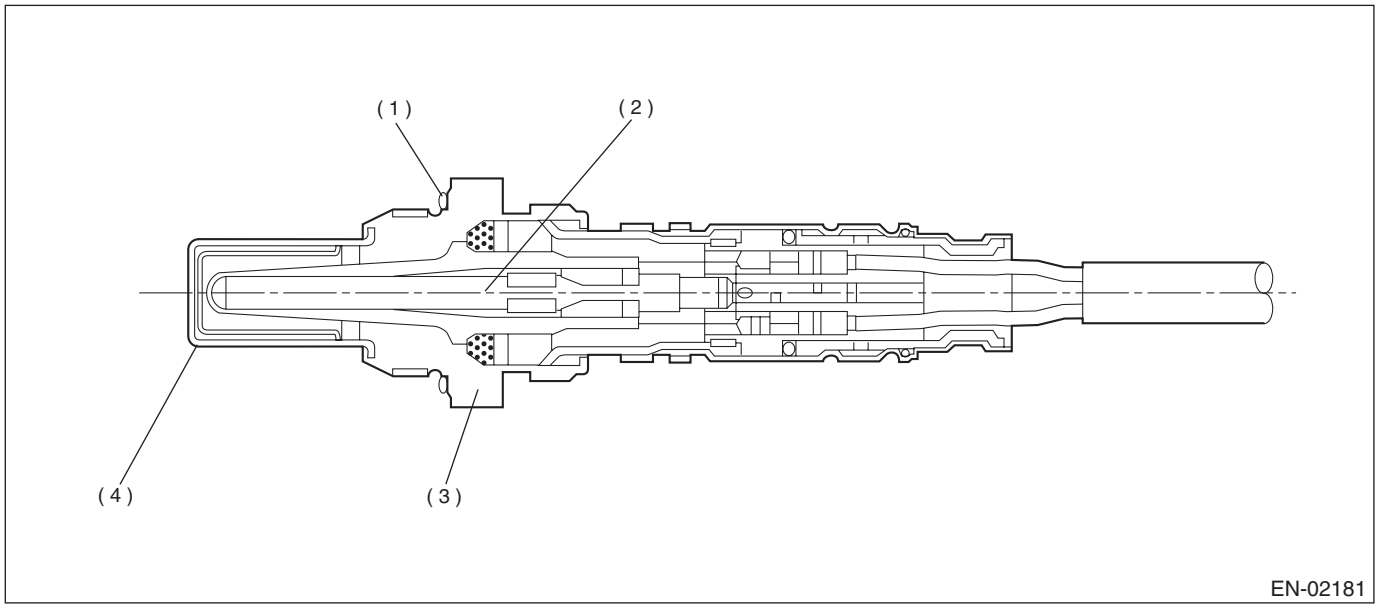
NOTE:
For the detection standard, refer to DTC P0014. <Ref. to GD(H6DO)-11, DTC P0014 EXHAUST AVCS SYSTEM 1 (RANGE/PERFORMANCE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	≤ 50 Ω

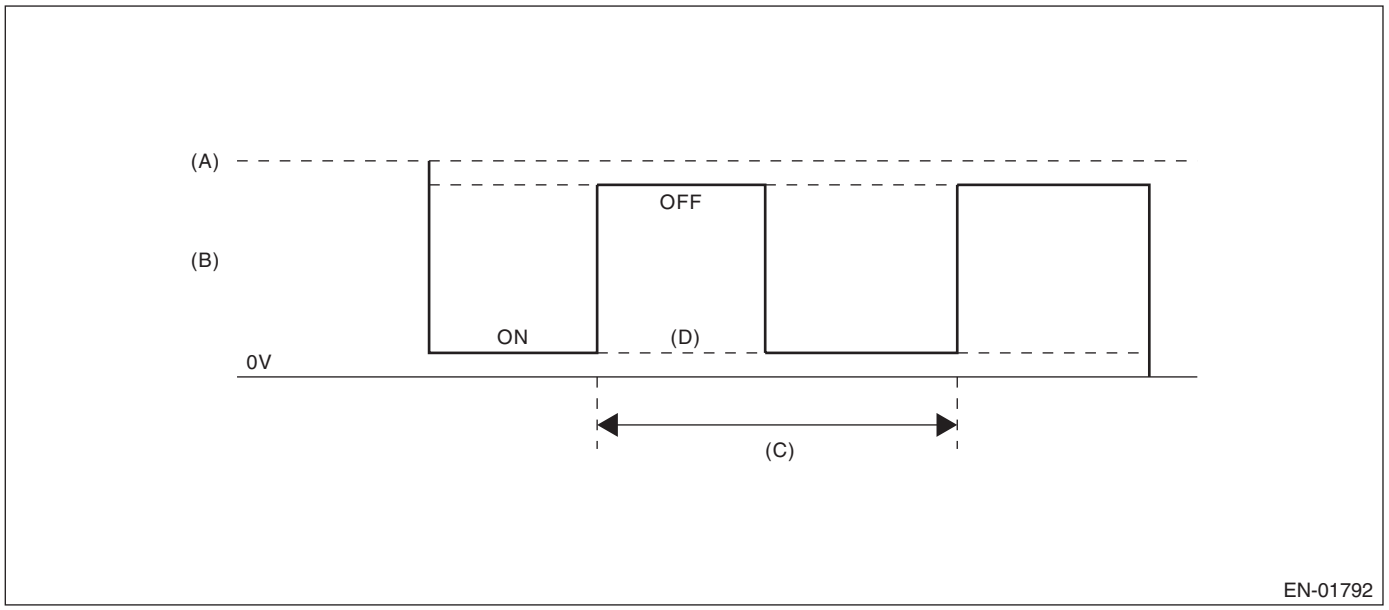
Time Needed for Diagnosis: 10000 ms

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 milliseconds
(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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level Front oxygen (A/F) sensor heater control duty	Low < 87.5 %

Time Needed for Diagnosis: 4 ms × 250 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	High

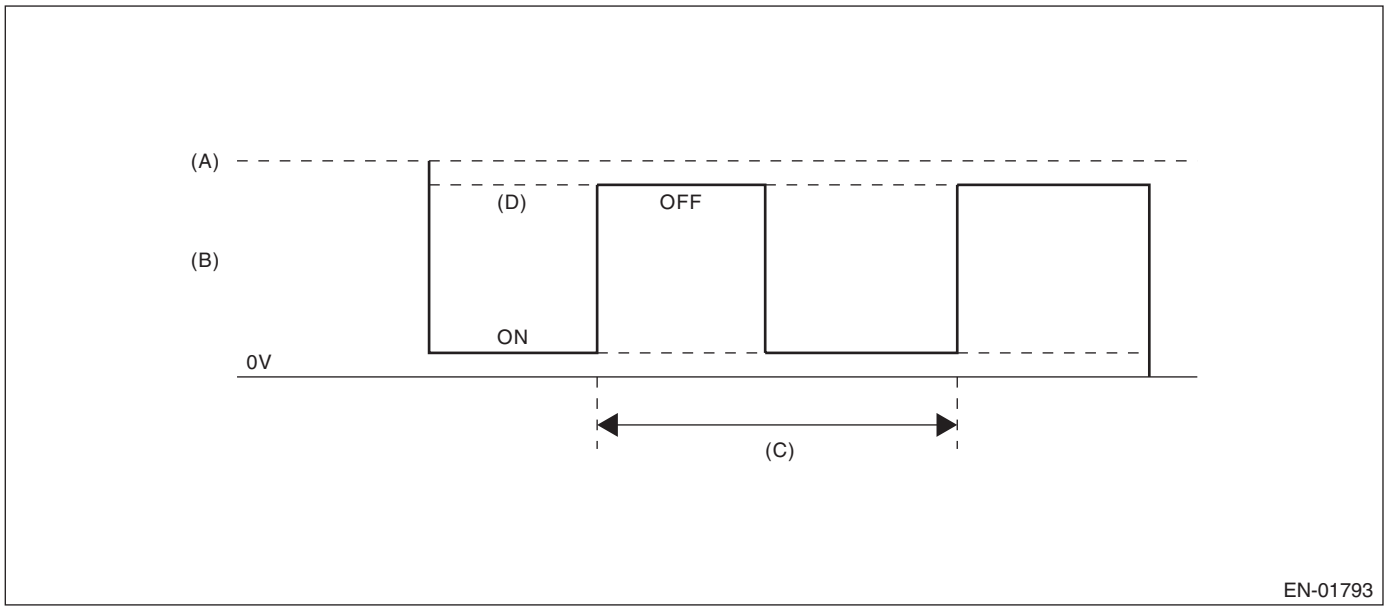
Time Needed for Diagnosis: Less than 1 second

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 milliseconds
(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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level Front oxygen (A/F) sensor heater control duty	High ≥ 12.5 %

Time Needed for Diagnosis: 4 ms × 250 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

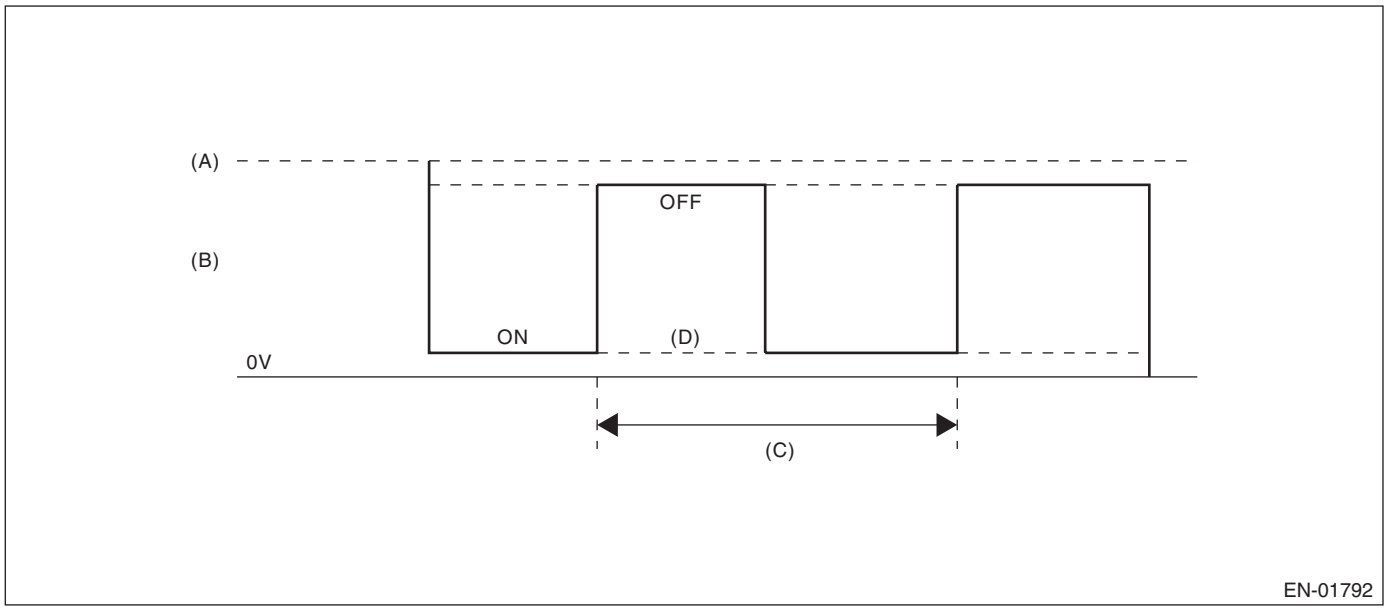
Time Needed for Diagnosis: Less than 1 second

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 milliseconds (cycles)
(D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after engine starting	≥ 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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	High

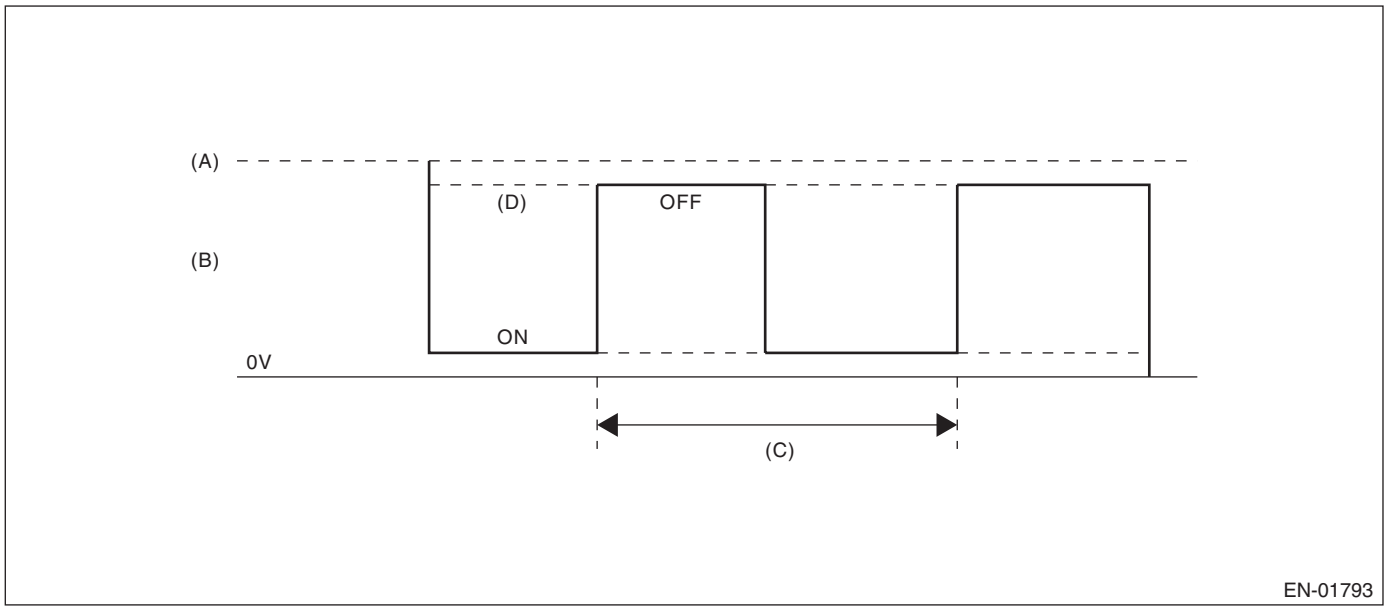
Time Needed for Diagnosis: Less than 1 second

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 milliseconds (cycles)
(D) High error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after engine starting	≥ 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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 15 %

Time Needed for Diagnosis:8 ms × 320 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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)-18, 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)-20, 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)-22, 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)-24, 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

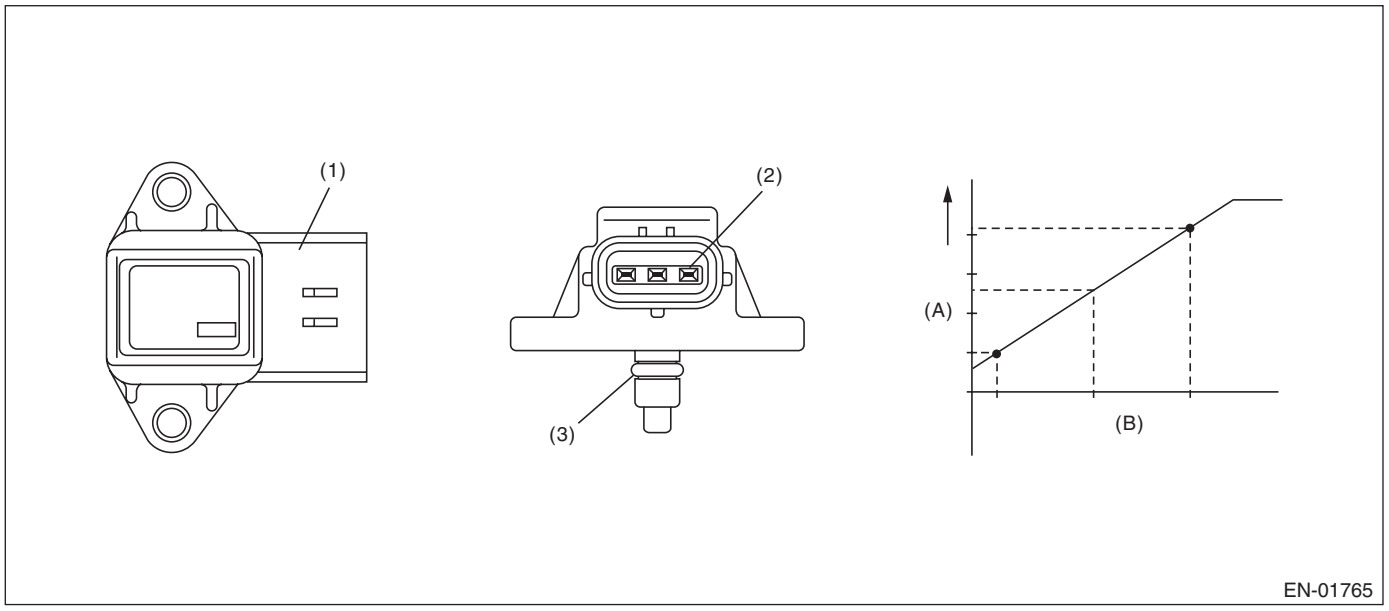
NOTE:
For the detection standard, refer to DTC P0038. <Ref. to GD(H6DO)-26, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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 Judgement

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.

Judgement 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 Judgement

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.

Judgement 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)

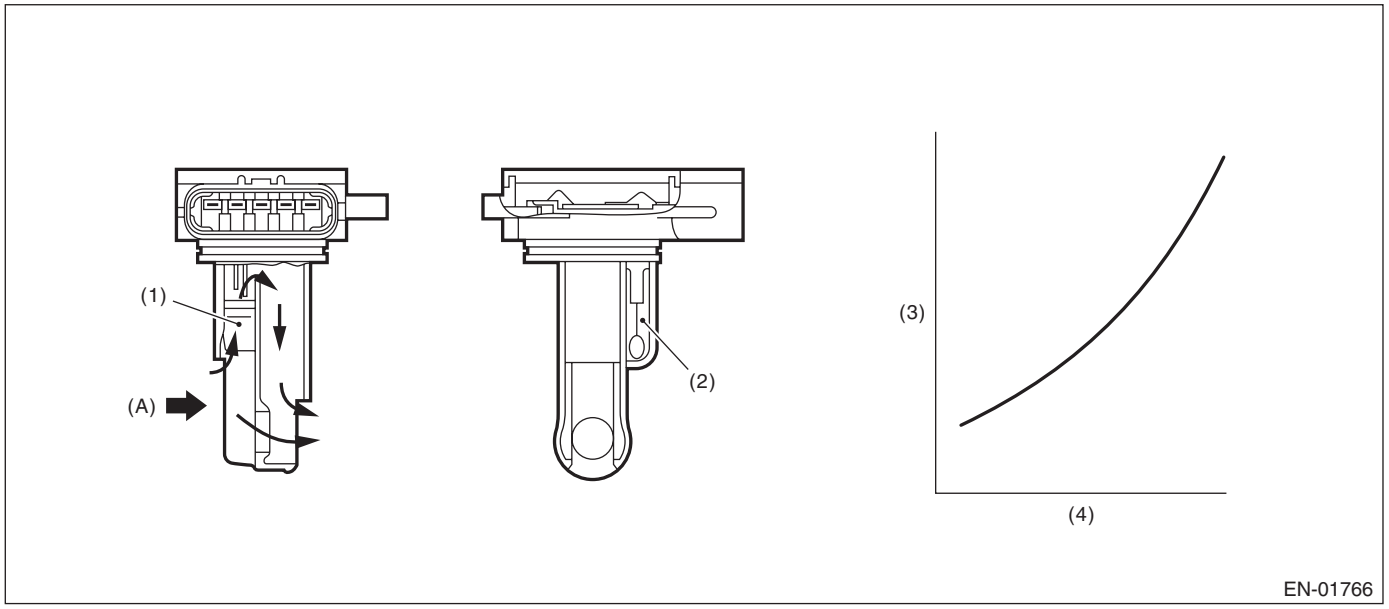
Time Needed for Diagnosis:
Low side: Less than 1 second
High side: Less than 1 second

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	≥ 75 °C (167 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

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.

Judgement 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 Judgement

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.

Judgement 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

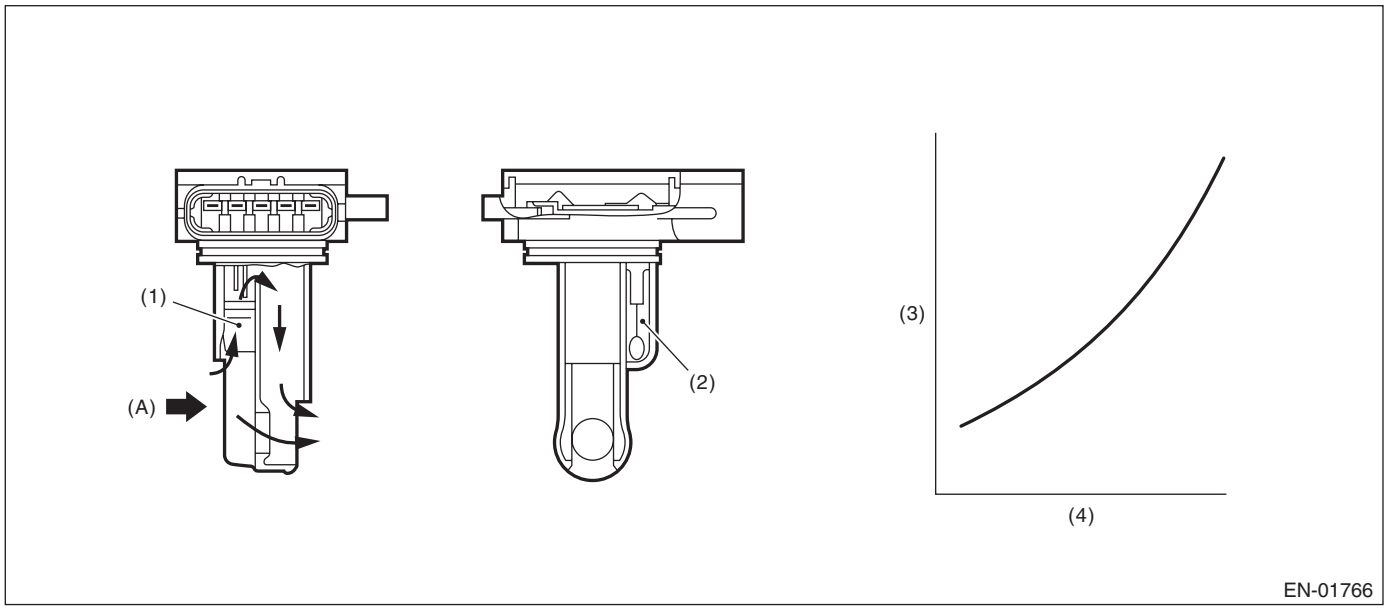
Time Needed for Diagnosis:
Low: Less than 1 second
High: Less than 1 second

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	> 0.2 V

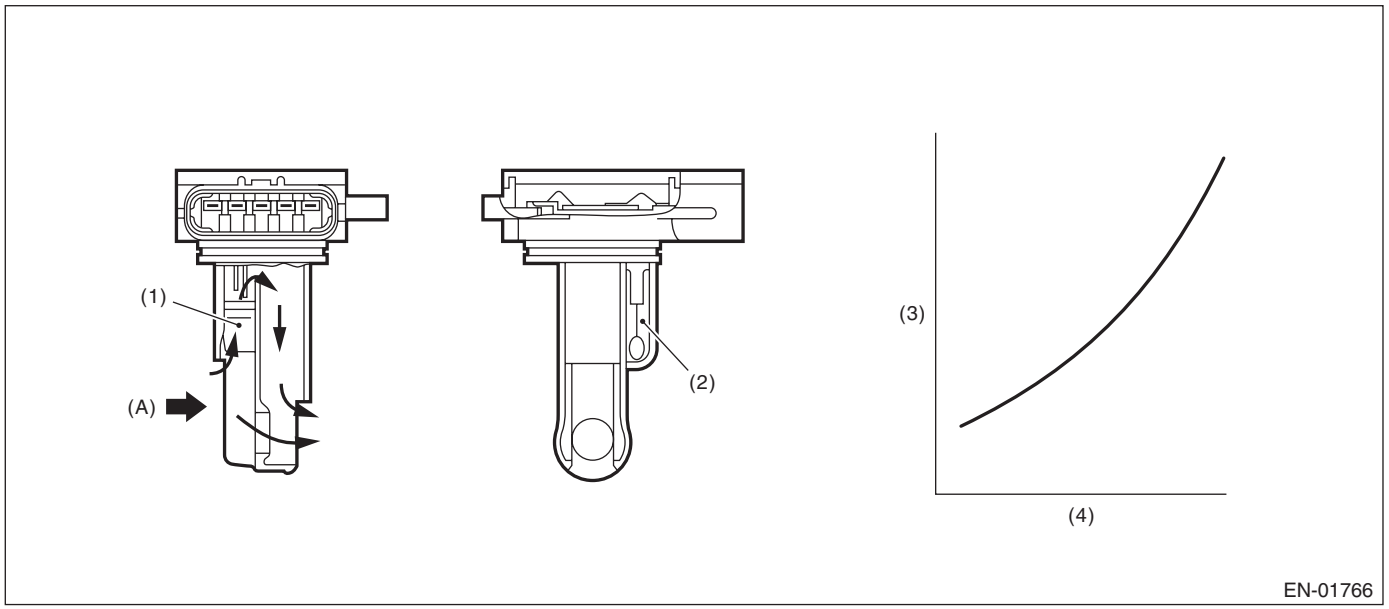
Time Needed for Diagnosis: Less than 1 second

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.939 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.939 V

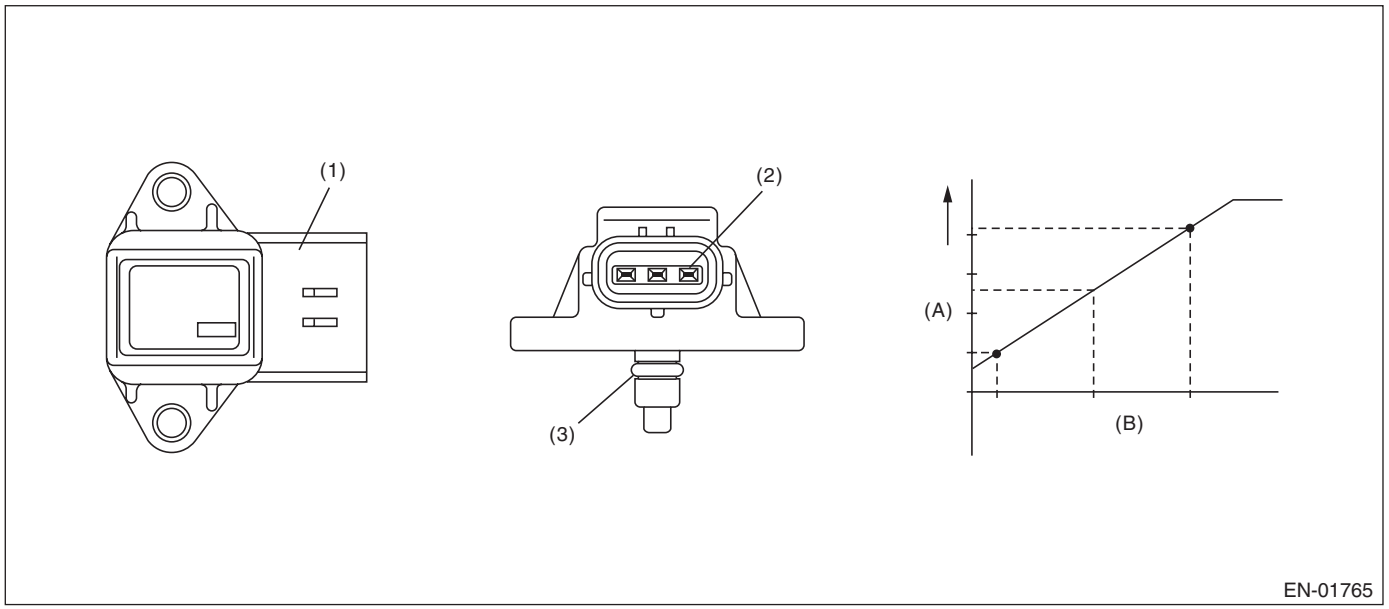
Time Needed for Diagnosis: Less than 1 second

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	> 0.573 V

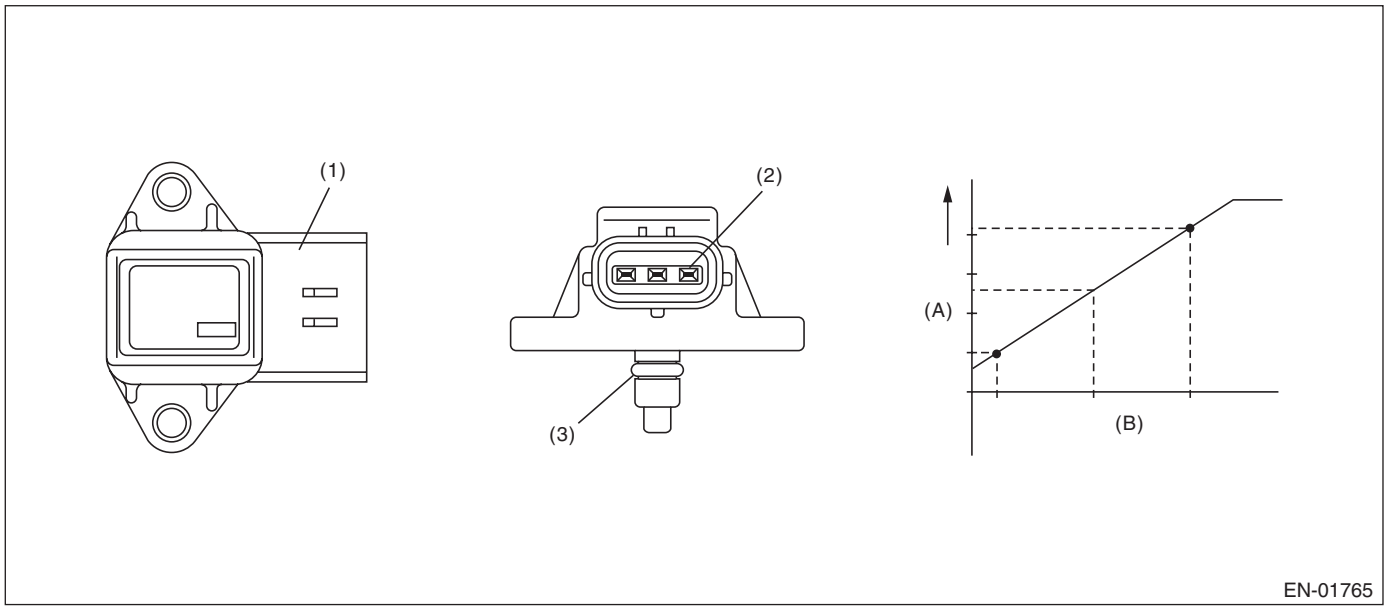
Time Needed for Diagnosis: Less than 1 second

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.388 V

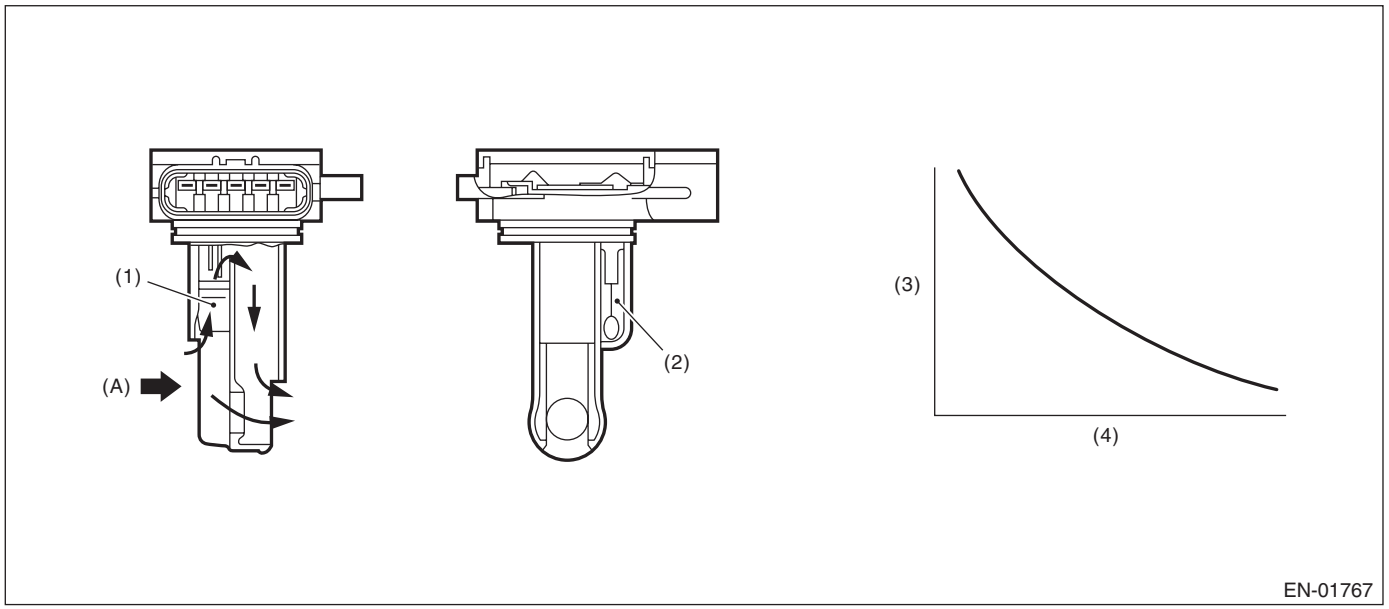
Time Needed for Diagnosis: Less than 1 second

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	< 30 °C (86 °F)
Engine coolant temperature	≥ 95 °C (203 °F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 60 km/h (37.3 MPH)	≥ 600 s

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 Judgement

Judge as NG when the following conditions are established.

Judgement 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 Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 0.02 V

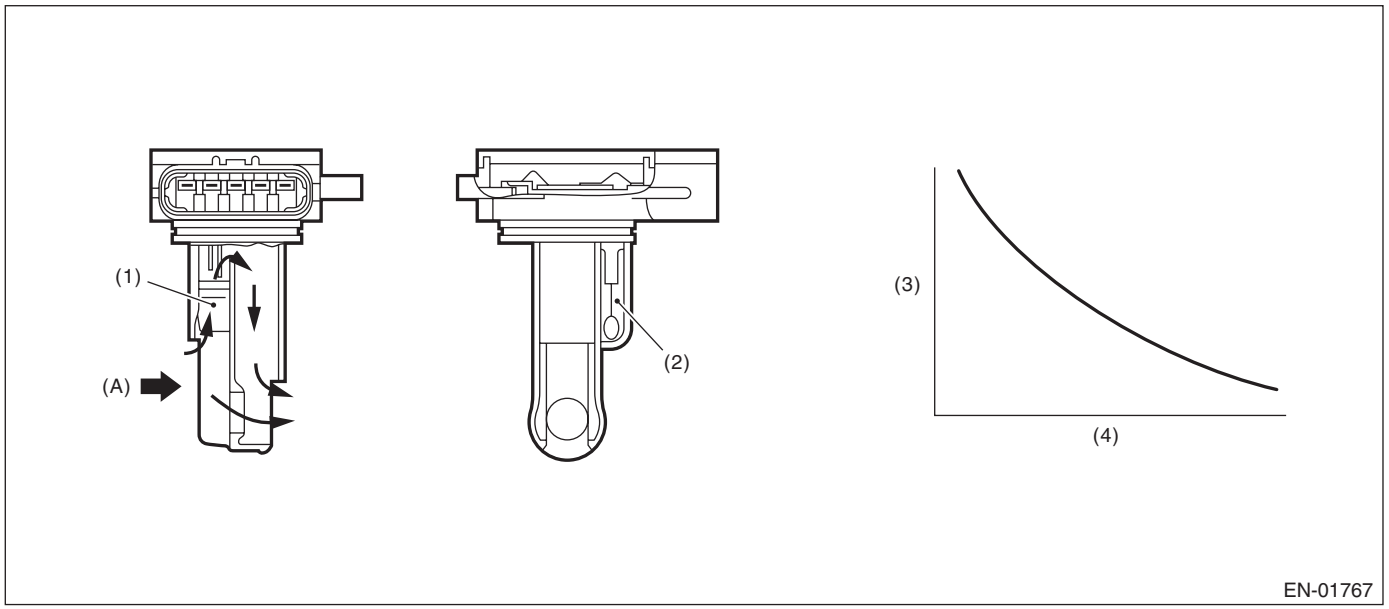
Time Needed for Diagnosis: Less than 1 second

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.231 V

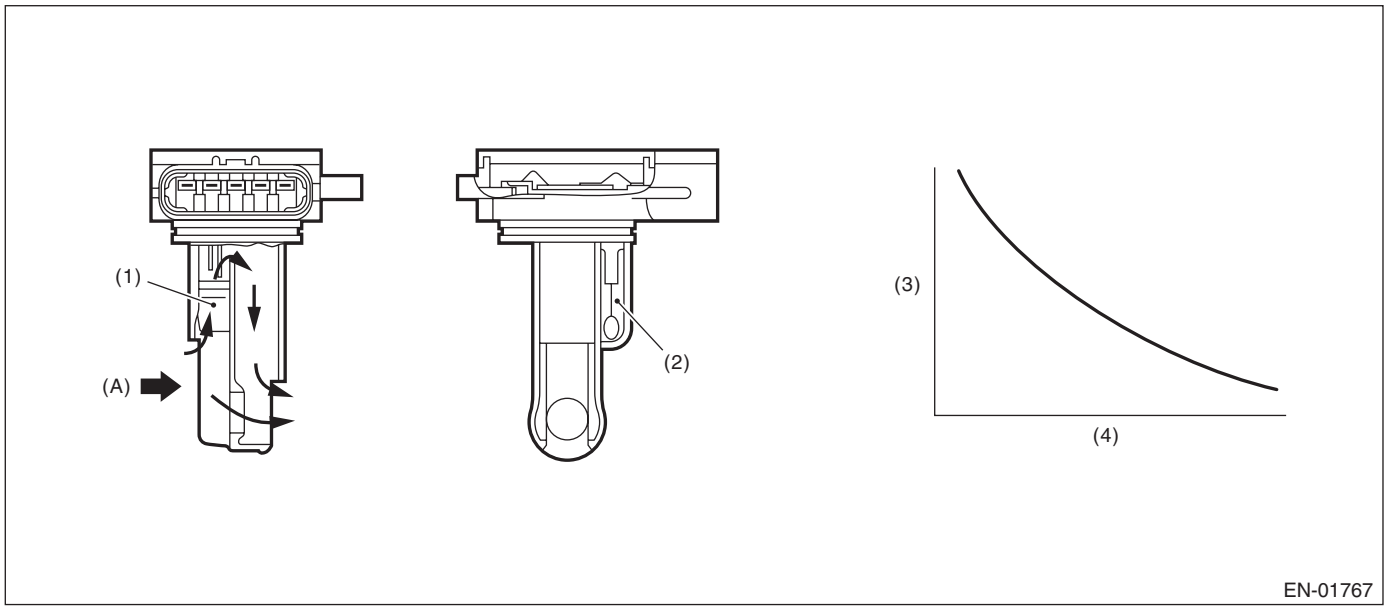
Time Needed for Diagnosis: Less than 1 second

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.716 V

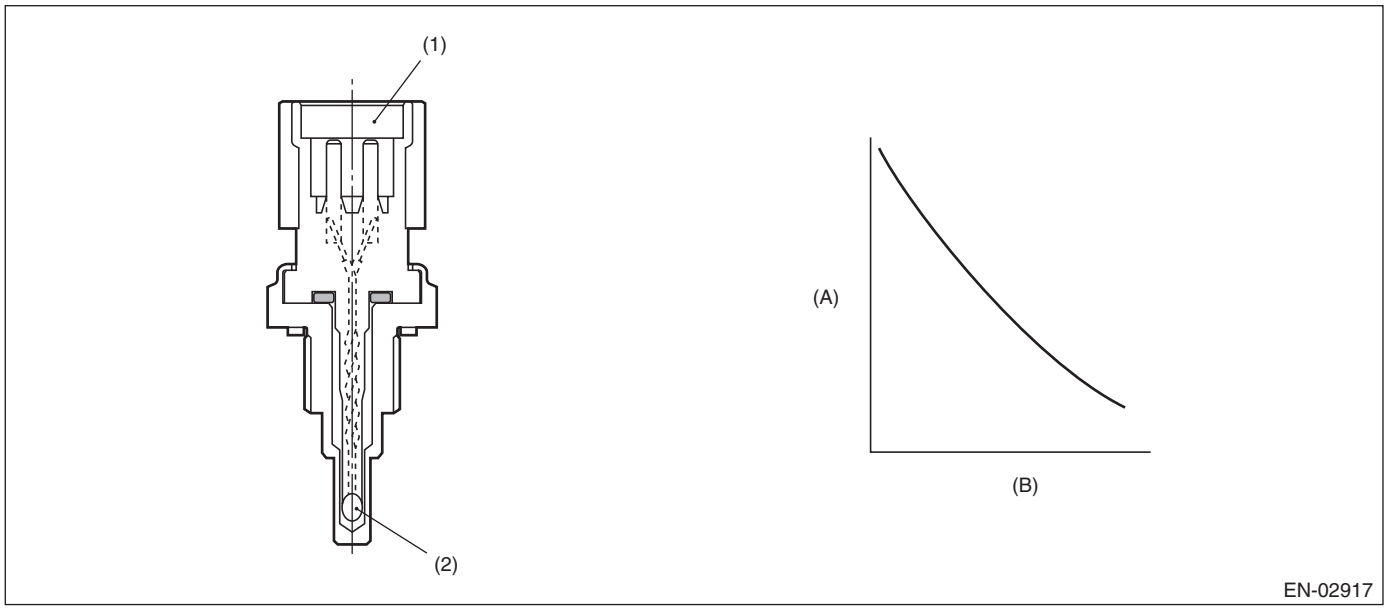
Time Needed for Diagnosis: Less than 1 second

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.265 V

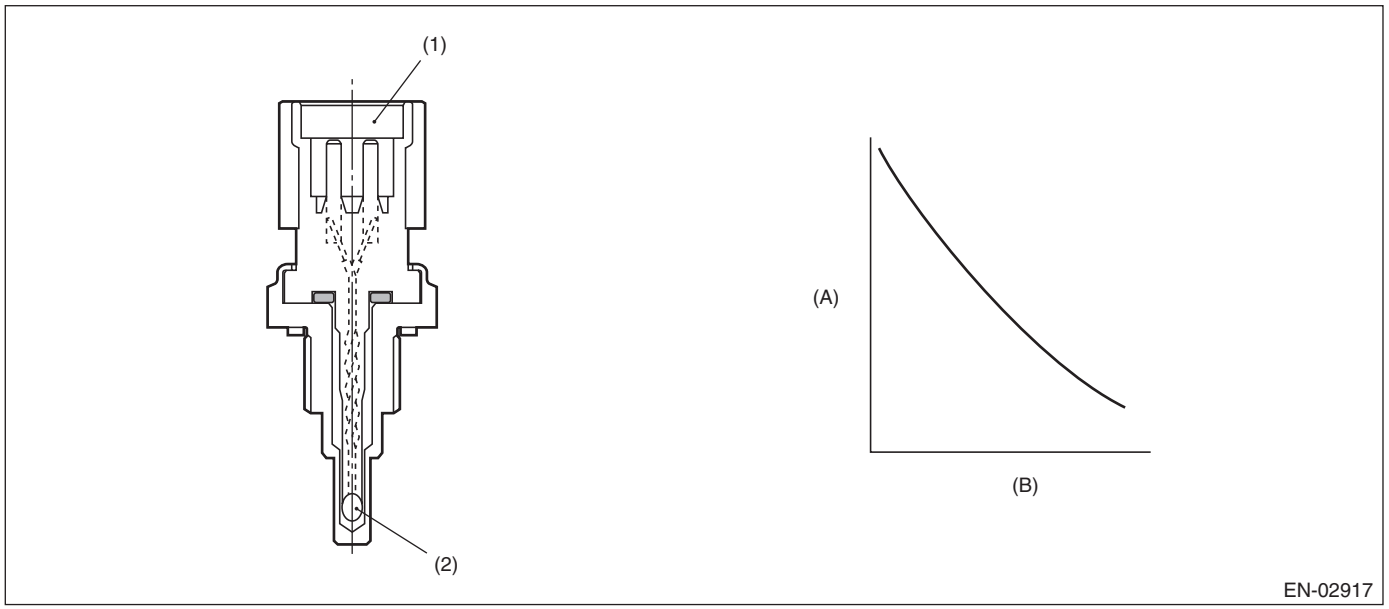
Time Needed for Diagnosis: Less than 1 second

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.716 V

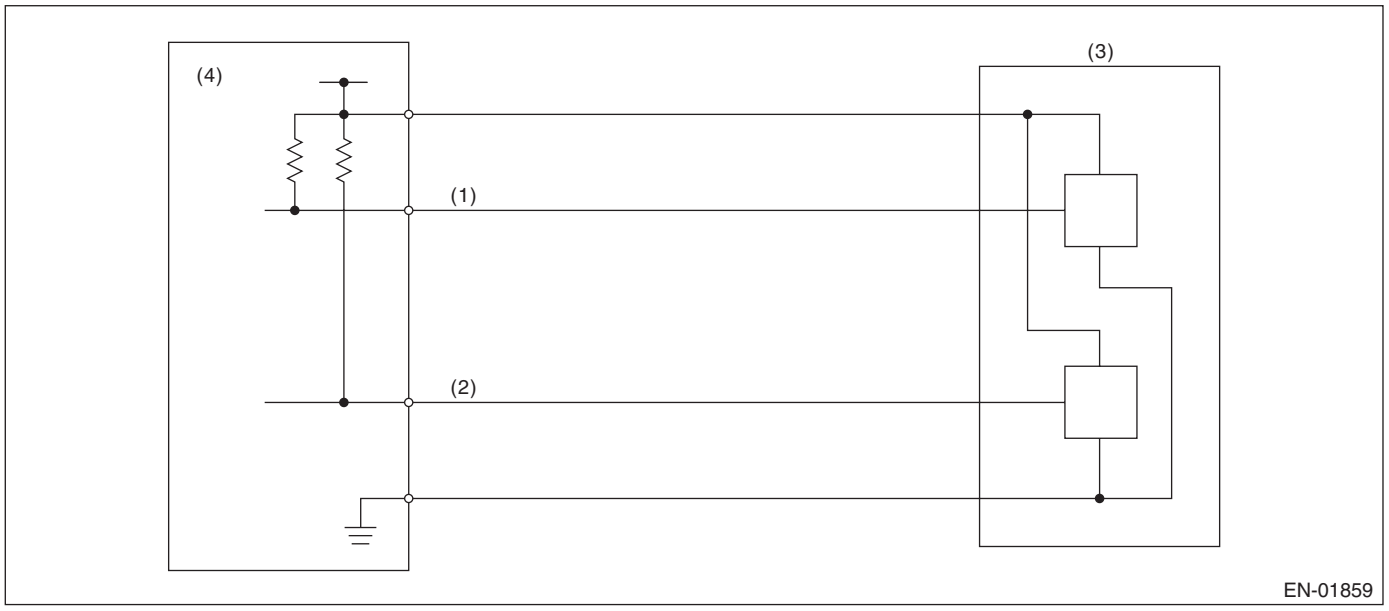
Time Needed for Diagnosis: Less than 1 second

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.217 V

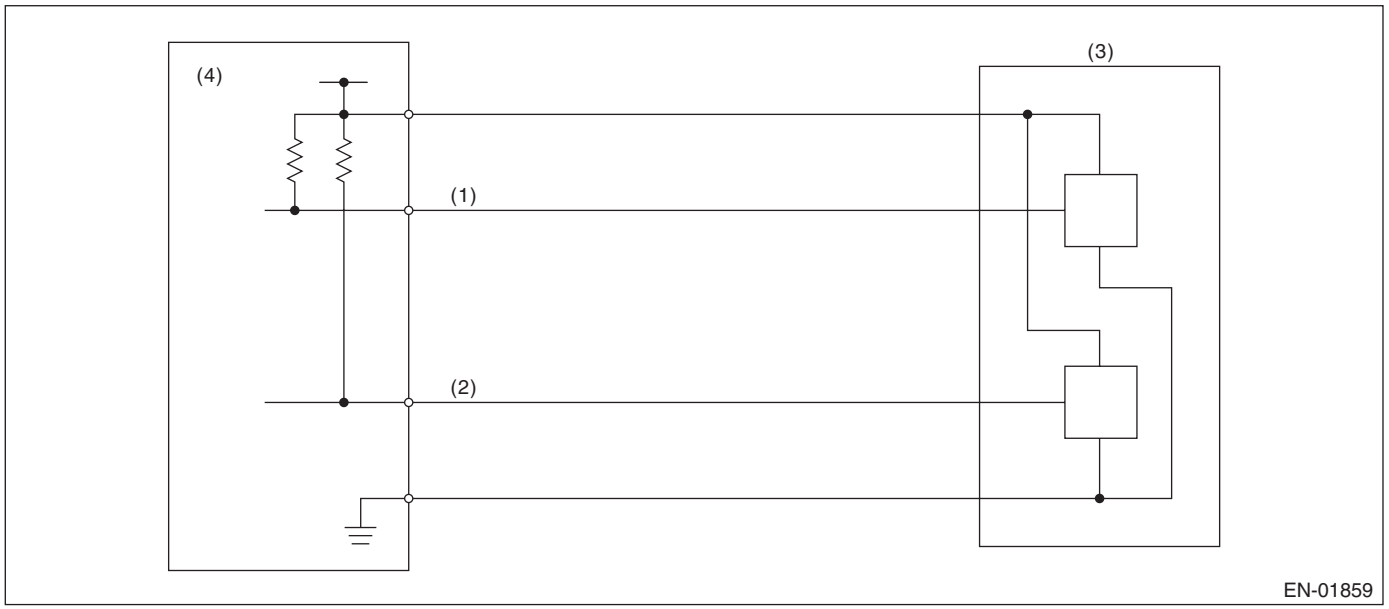
Time Needed for Diagnosis: 24 ms

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.858 V

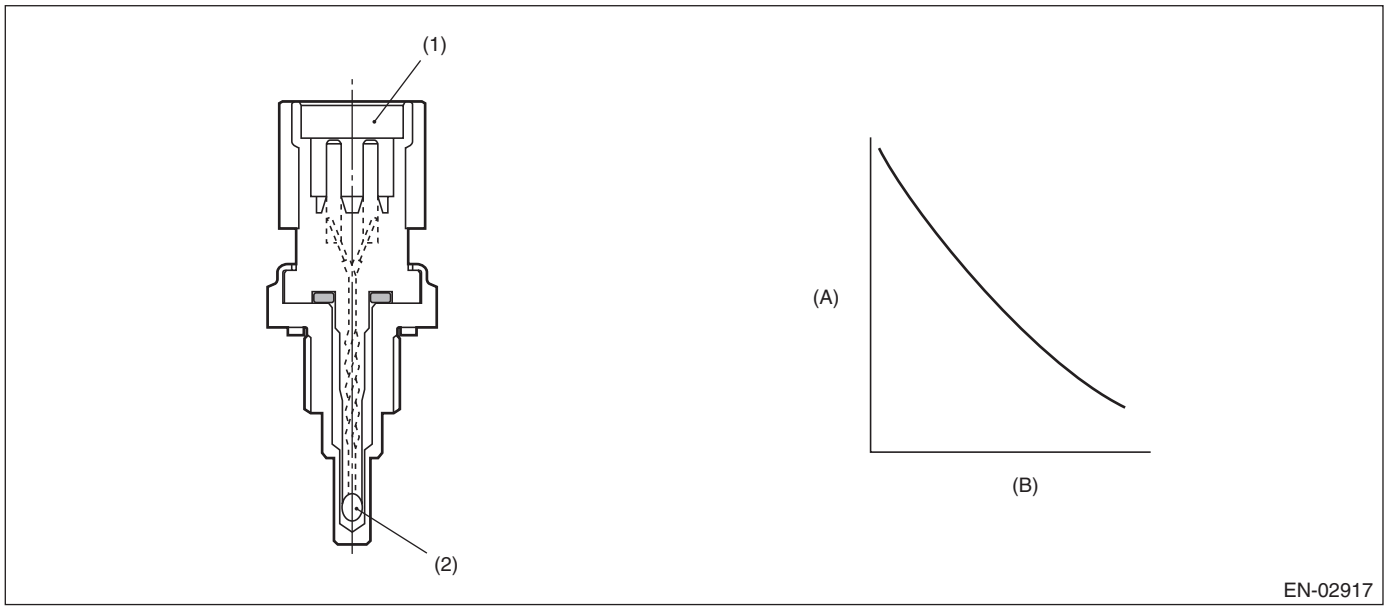
Time Needed for Diagnosis: 24 ms

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 Judgement

Judge as NG if the criteria below are met.

Judgement Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20 °C (68 °F)
Timer for diagnosis after engine start	≥ Judgement 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 milliseconds + TWCNT milliseconds (the time of at 64 milliseconds)
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

Judgement 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 Judgement

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgement Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20 °C (68 °F)

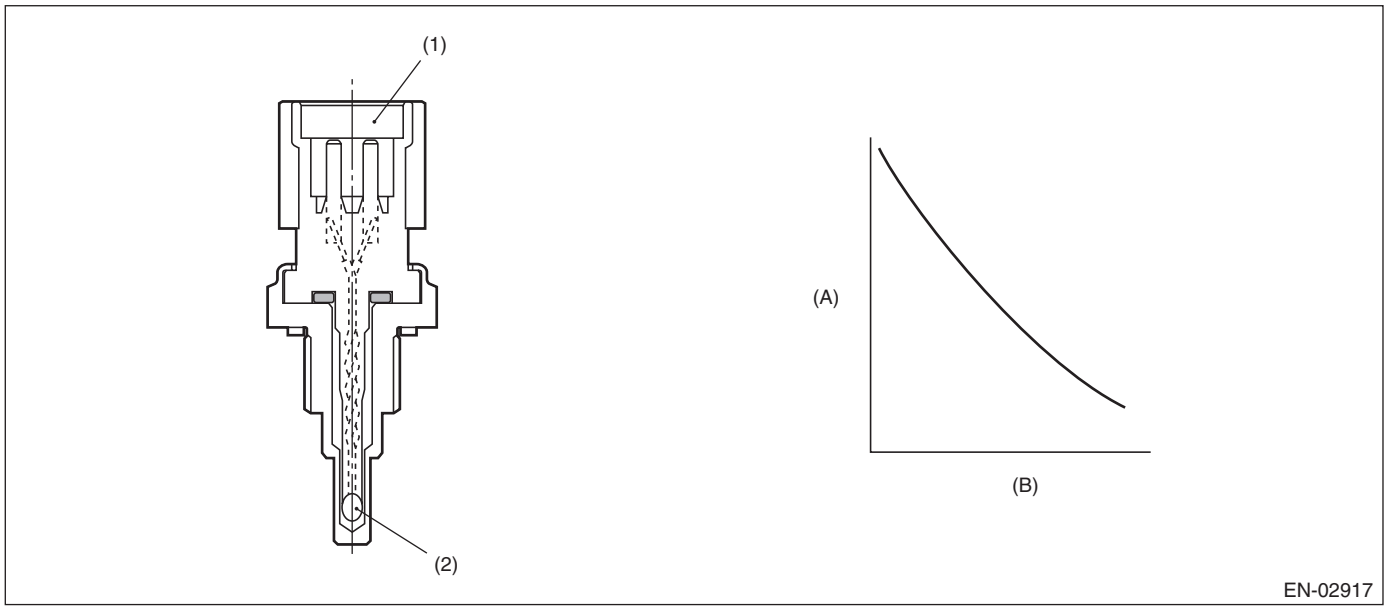
Time Needed for Diagnosis: Less than 1 second

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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)

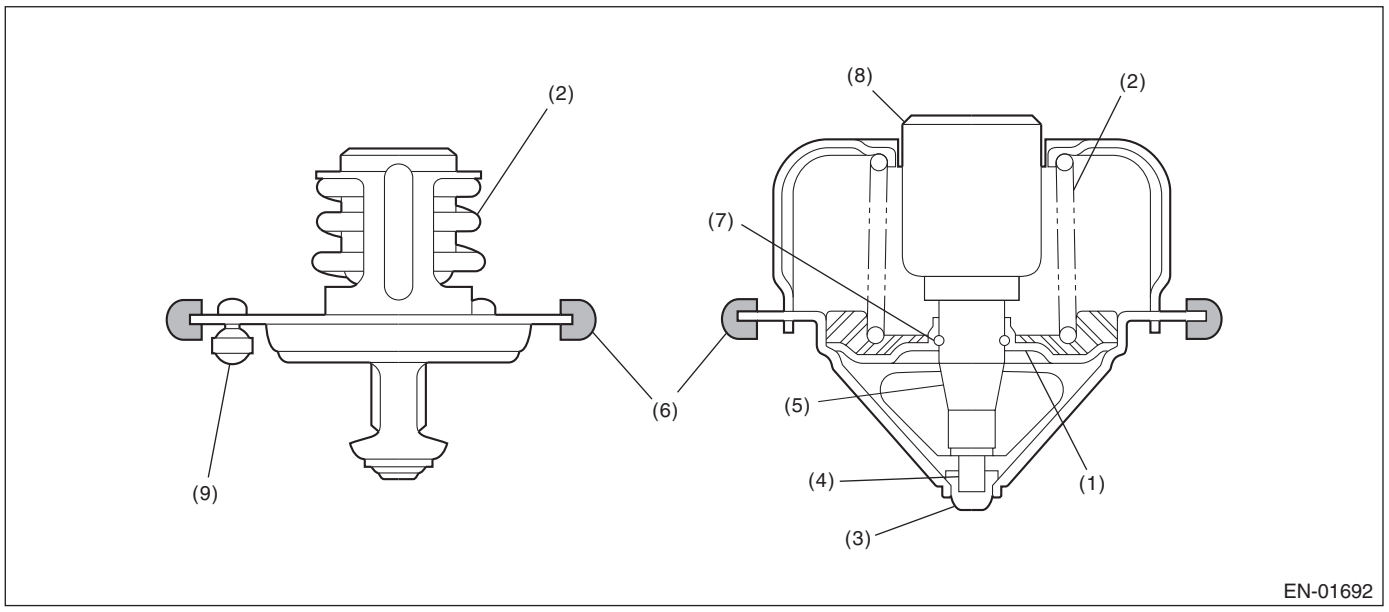
Time Needed for Diagnosis: Less than 1 second

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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)

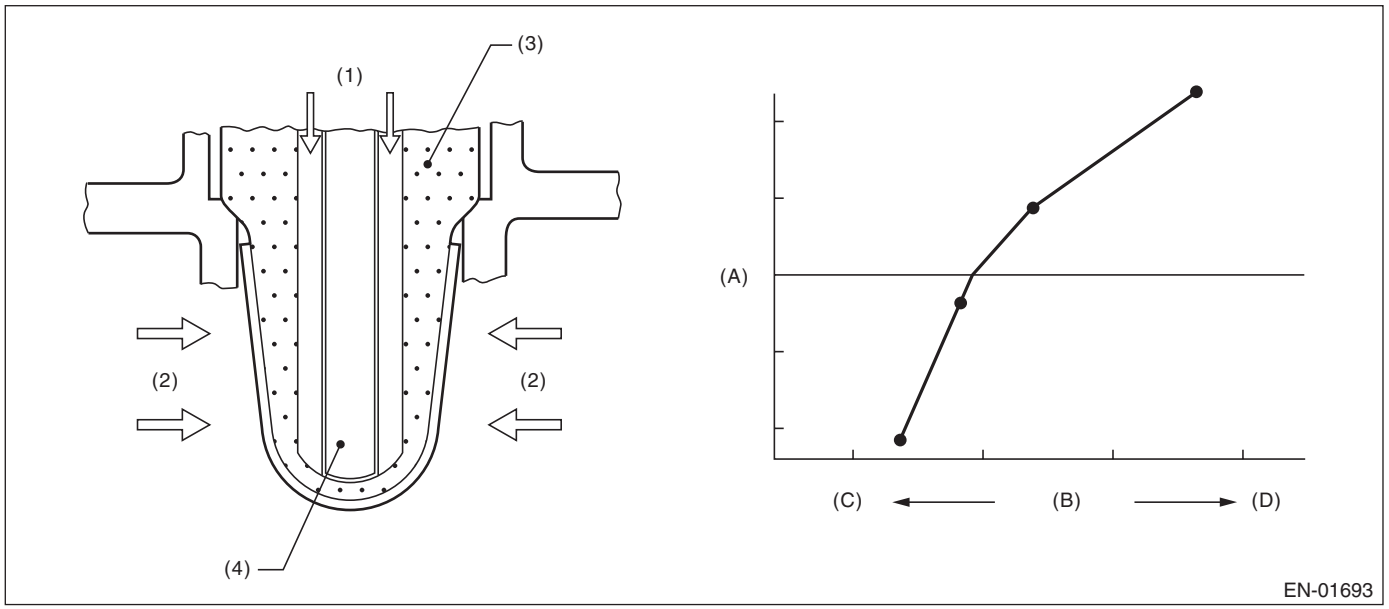
Time Needed for Diagnosis: Less than 1 second

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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Input voltage (+)	< 1.128 V
or	
Input voltage (–)	< 0.230 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Input voltage (+)	≥ 1.128 V
Input voltage (–)	≥ 0.230 V
|Input voltage (+) – Input voltage (–)|	≥ 0.644 V

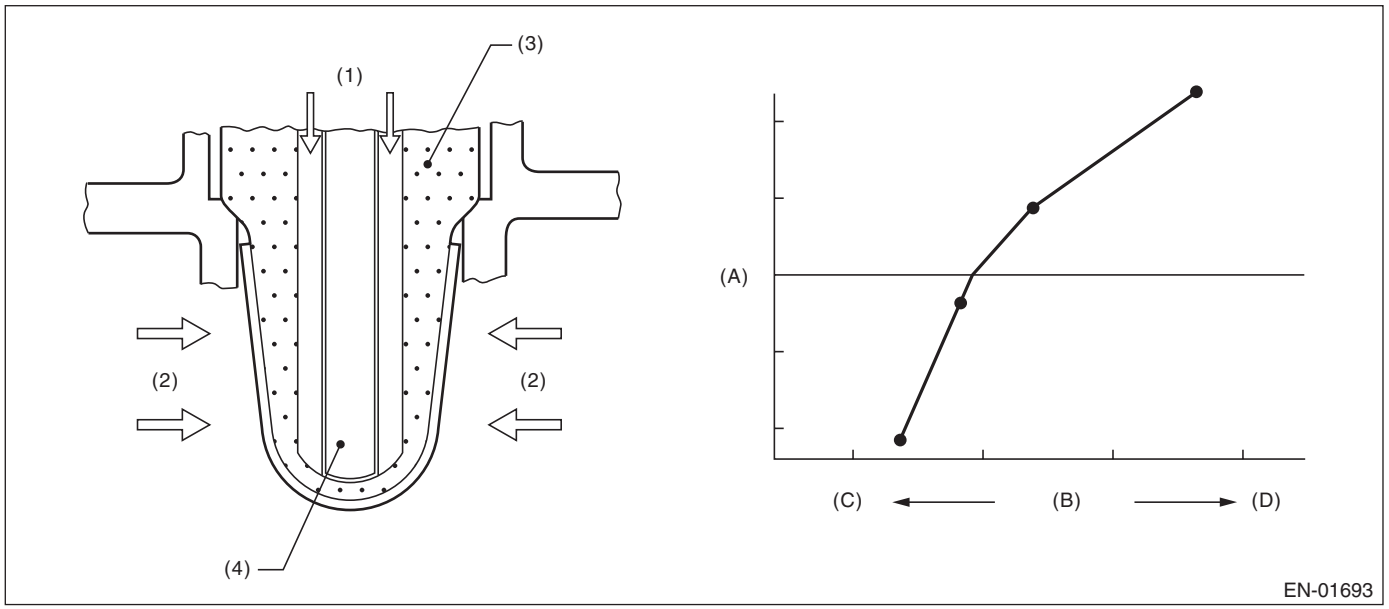
Time Needed for Diagnosis: Less than 1 second

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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

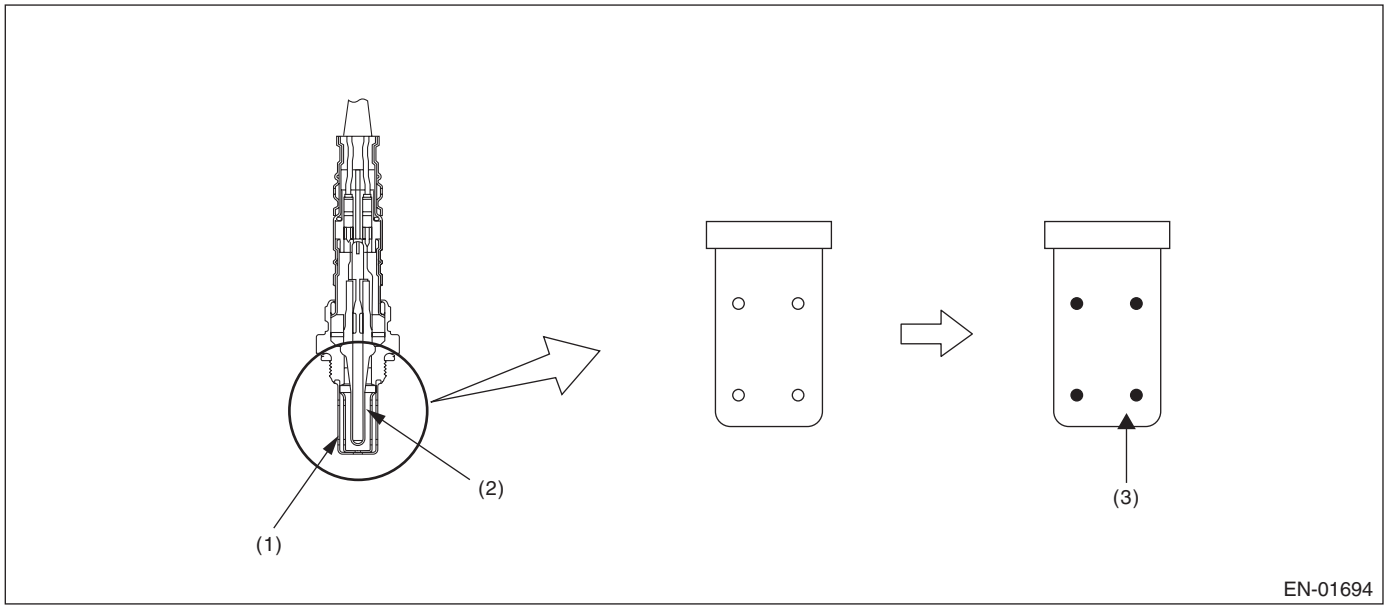
Malfunction Criteria	Threshold Value
Input voltage (+)	≤ 3.589 V
Input voltage (–)	≤ 3.541 V

Time Needed for Diagnosis: Less than 1 second

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

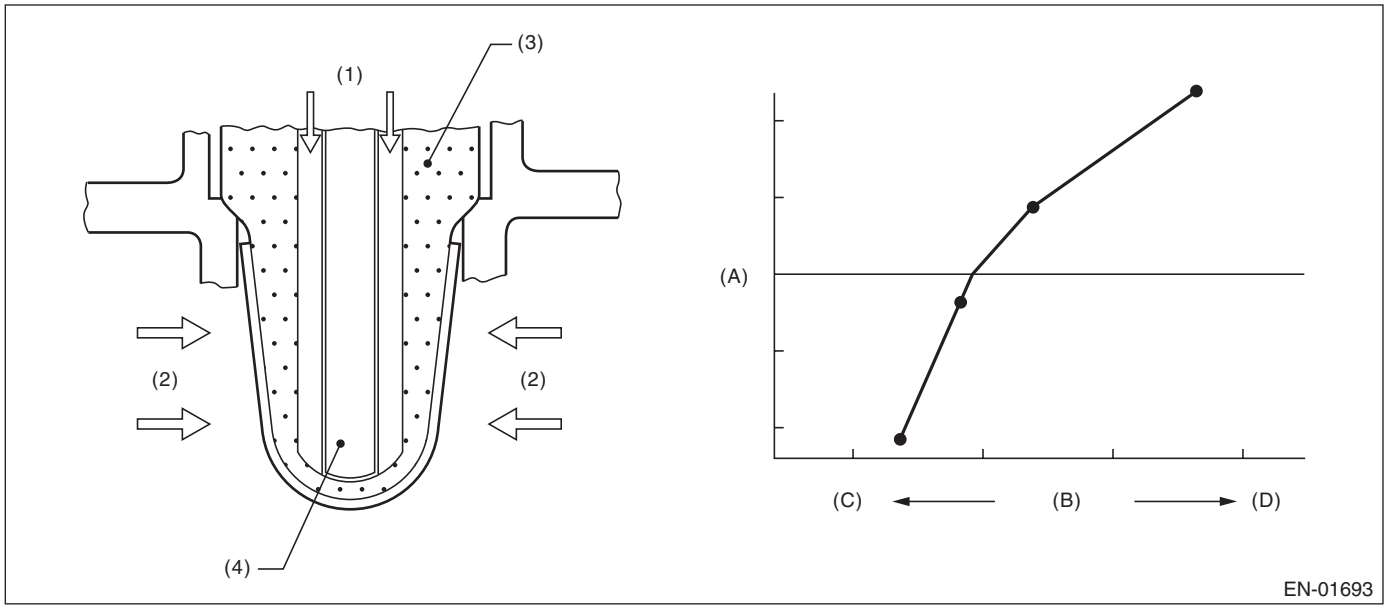
1. OUTLINE OF DIAGNOSIS

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 judgement 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 and the λ value difference every 32ms × 4 . Calculate the diagnosis value after calculating 820 time(s).

- **Abnormality Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

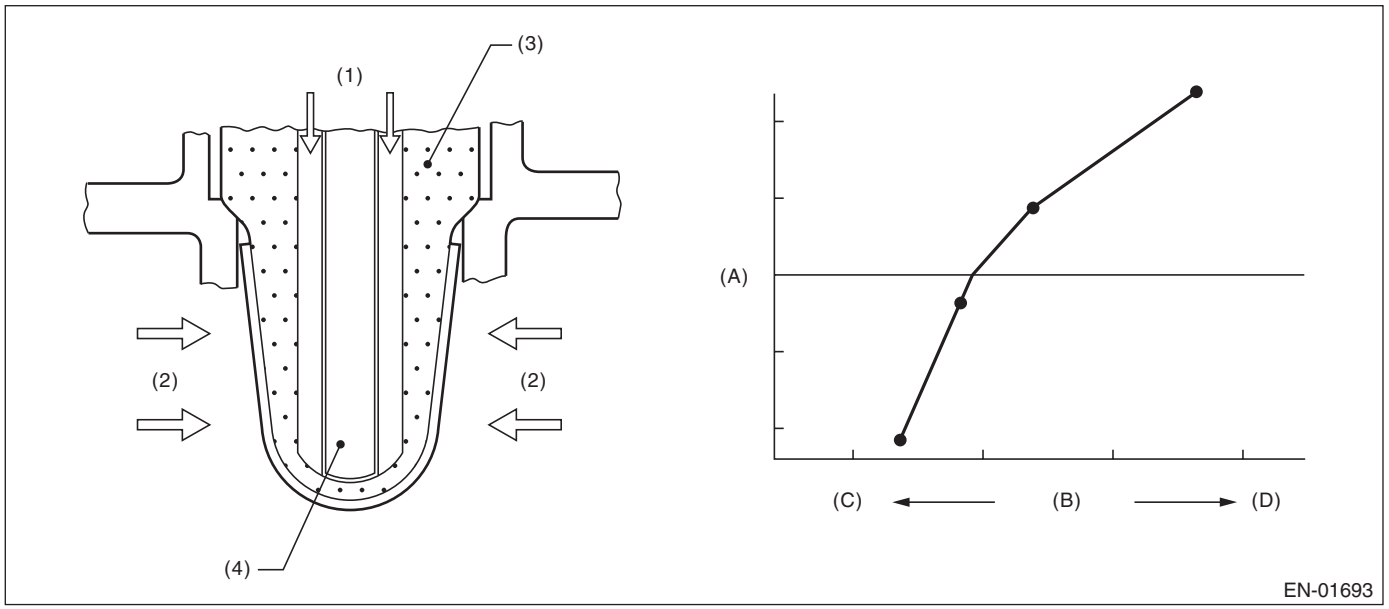
Time Needed for Diagnosis: 32 ms × 4 × 820 time(s)

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Front oxygen (A/F) sensor impedance.	≤ 500 Ω

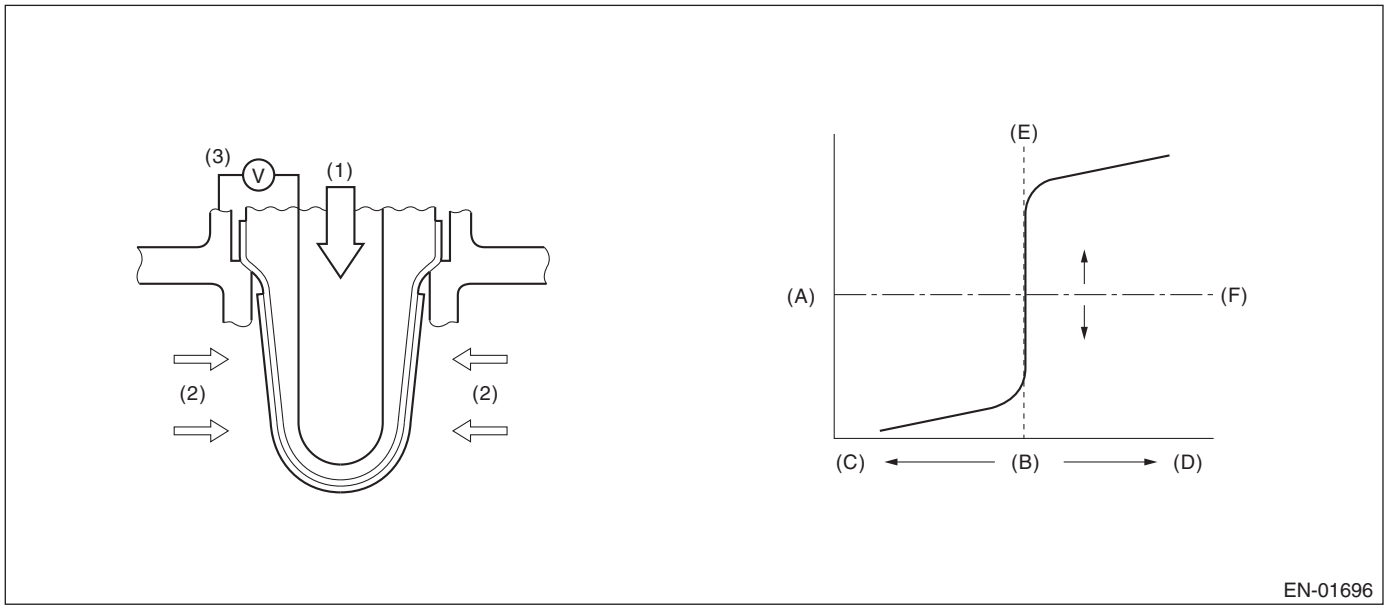
Time Needed for Diagnosis: Less than 1 second

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	(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 for abnormality judgement

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 judgement

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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)

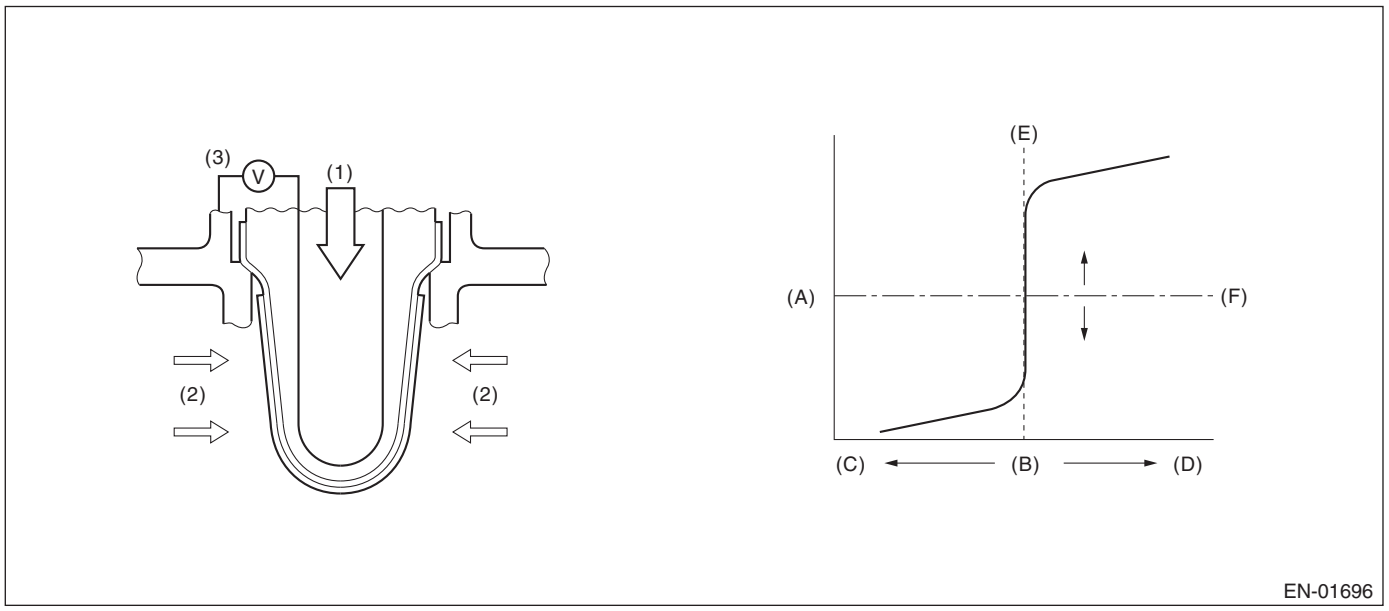
1. OUTLINE OF DIAGNOSIS

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.
2. Judge as NG when the oxygen sensor voltage is large (rich) when recovering from a deceleration fuel cut.
[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	(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

Rich → lean diagnosis response

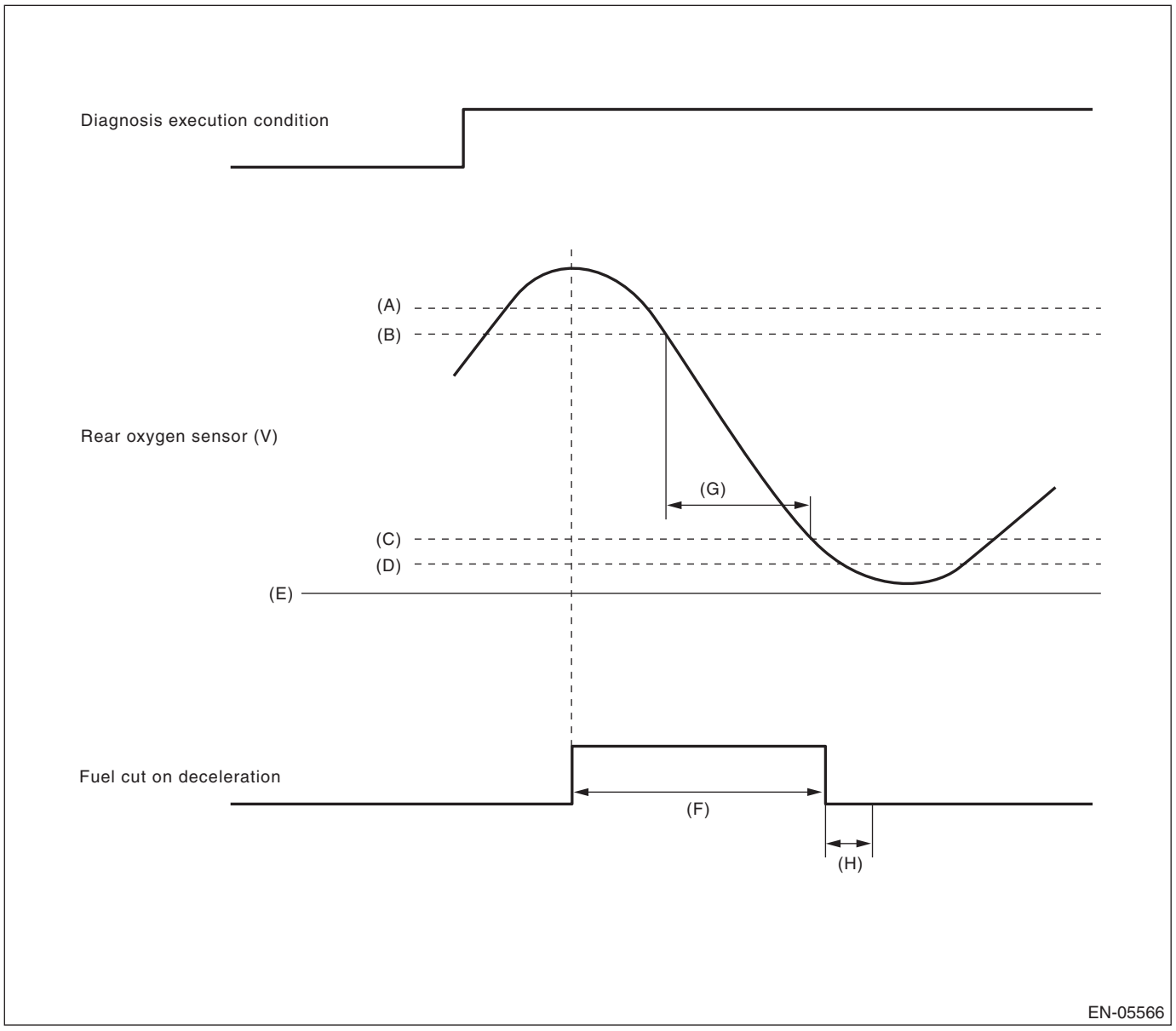
Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
A/F main feedback control condition	Completed
Deceleration fuel cut time is 5000 ms or more.	Experienced
After fuel cut	≥ 2000 ms
Current calculation time of the rear oxygen sensor heater	≥ 40000 ms
Current continuation time of the rear oxygen sensor heater	≥ 20000 ms
Estimated catalyst temperature	≥ 400 °C (752 °F)
Number of deceleration fuel cut	≥ 1 time(s)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

5. DIAGNOSTIC METHOD

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 judgement 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 judgement in 2000 ms from the recovery of fuel cut on deceleration.

• Abnormality Judgement

1) Judge as NG when the judgement value is larger than the threshold value after deceleration fuel cut.
Response time (diagnosis value) > threshold value → abnormal

NOTE:
Variation time of rear oxygen sensor output voltage is short during fuel cut in deceleration. NG judgement should be performed after deceleration fuel cut. Even without deceleration fuel cut, judge as OK if the value is below the threshold.
When the deceleration fuel cut time is 5000 ms or more, judge as NG if the following criteria are met 2000 ms after recovering from the deceleration fuel cut.
2) Judge as NG when the oxygen sensor voltage at recovery from a deceleration fuel cut, is large.
If the fuel cut time in a deceleration fuel cut is long (5000 ms or more), and even after recovering from a deceleration fuel cut, the oxygen sensor voltage is high (0.55 V or more), judge as NG.

Judgement Value

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

Time Needed for Diagnosis: 1 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

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 (judgement 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.

Judgement Value

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

Time Needed for Diagnosis: 1 time(s)

6. ENABLE CONDITION

Lean → rich response diagnosis

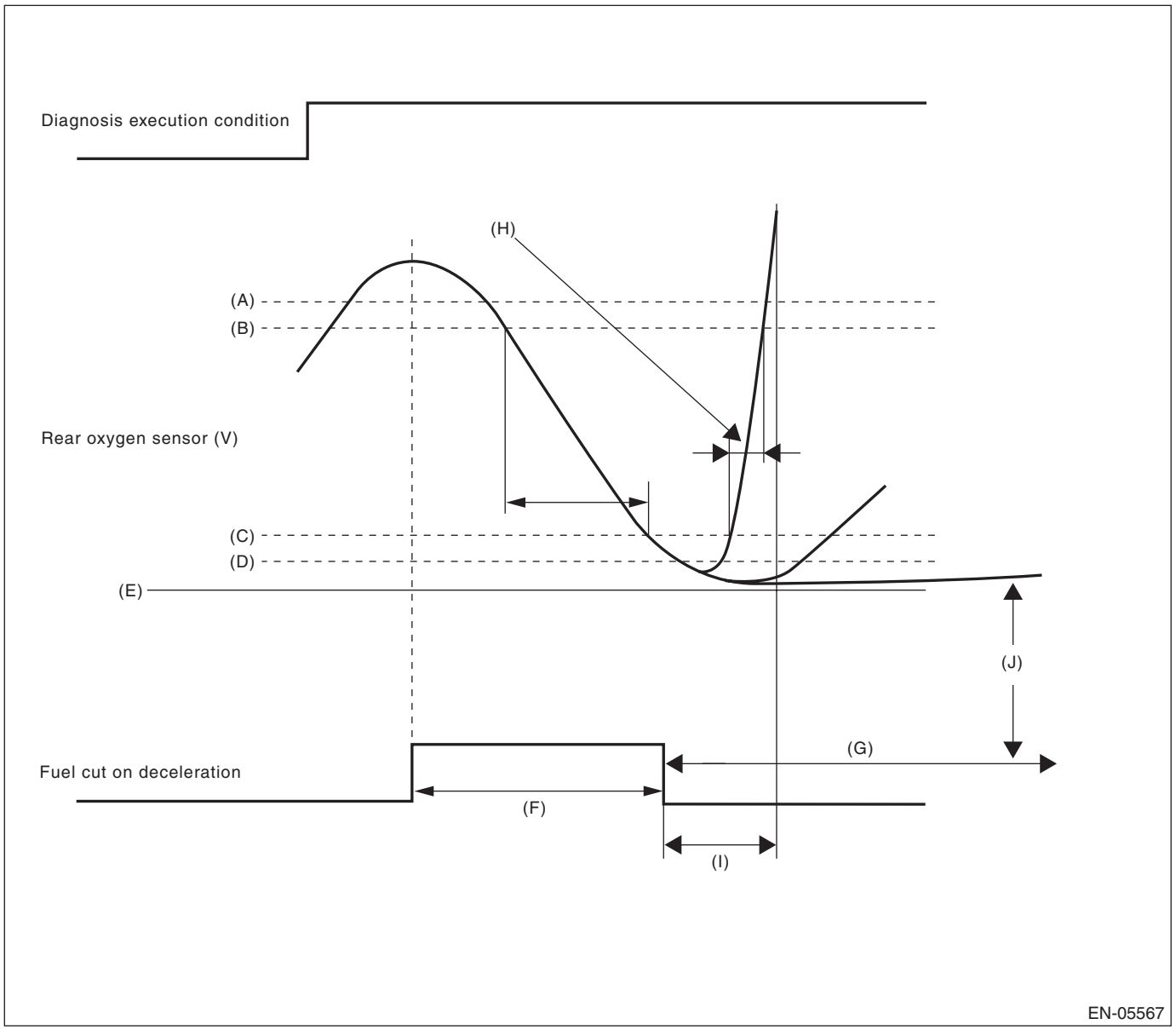
Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
A/F main feedback control condition	Completed
Deceleration fuel cut time is 5000 ms or more.	Experienced
After fuel cut	≥ 2000 ms
Current calculation time of the rear oxygen sensor heater	≥ 0 ms
Current continuation time of the rear oxygen sensor heater	≥ 0 ms
Estimated catalyst temperature	≥ 0 °C (32 °F)
Number of deceleration fuel cut	≥ 1 time(s)

7. GENERAL DRIVING CYCLE

Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (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 judgement 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 judgement in 4000 ms from the recovery of fuel cut on deceleration.
(J) Judge as 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 Judgement**

1) Judge as NG when the judgement 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.

Judgement 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 Judgement**

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 (judgement 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.

Judgement 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

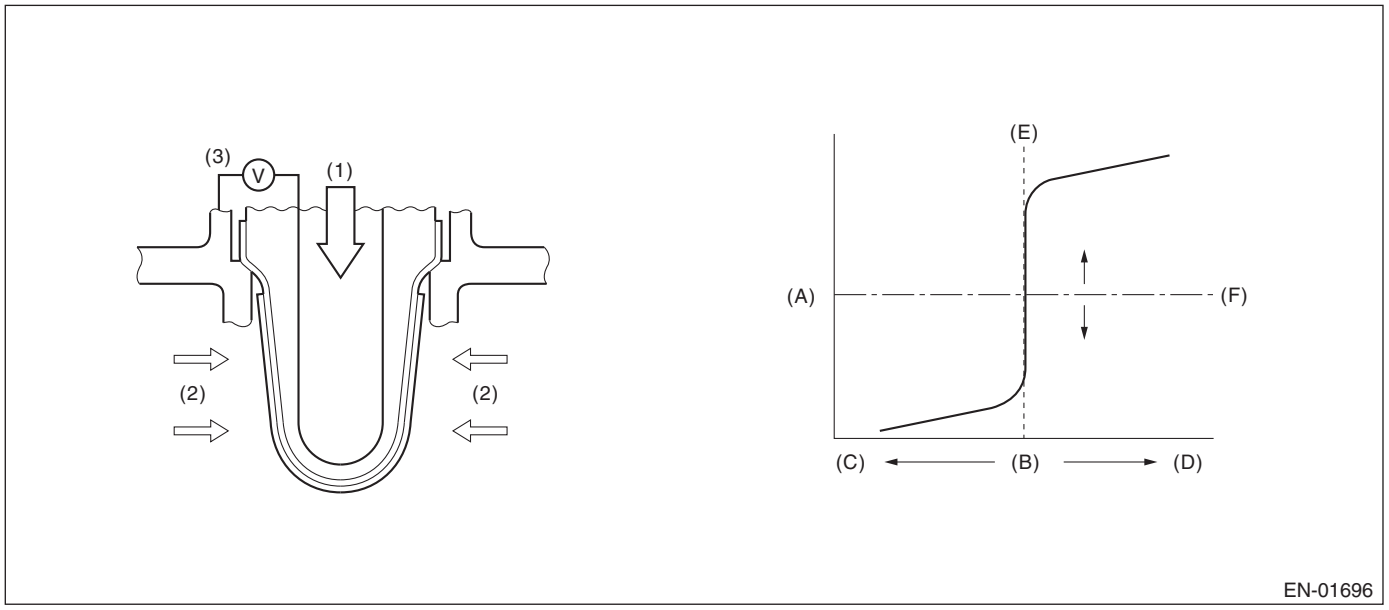
Time Needed for Diagnosis: 1 time(s)

AP:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

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
(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 ONLY FOR MALFUNCTION JUDGEMENT)

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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the following conditions are established.

Judgement 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 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.>

AR: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.>

AS: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.>

AT: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.>

AU: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.>

AV: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.>

AW: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.>

AX:DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0140. <Ref. to GD(H6DO)-69, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AY: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 Judgement

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.

Judgement 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

Map2

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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	< 1.2

Time Needed for Diagnosis: 10 s

AZ: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 Judgement

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.

Judgement 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

Map2

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 Judgement

Judge as OK when the malfunction criteria below continues for 10 seconds.

Judgement Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ 0.8

Time Needed for Diagnosis: 10 s

BA:DTC P0174 SYSTEM TOO LEAN (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0171. <Ref. to GD(H6DO)-72, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BB:DTC P0175 SYSTEM TOO RICH (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0172. <Ref. to GD(H6DO)-73, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BC: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.

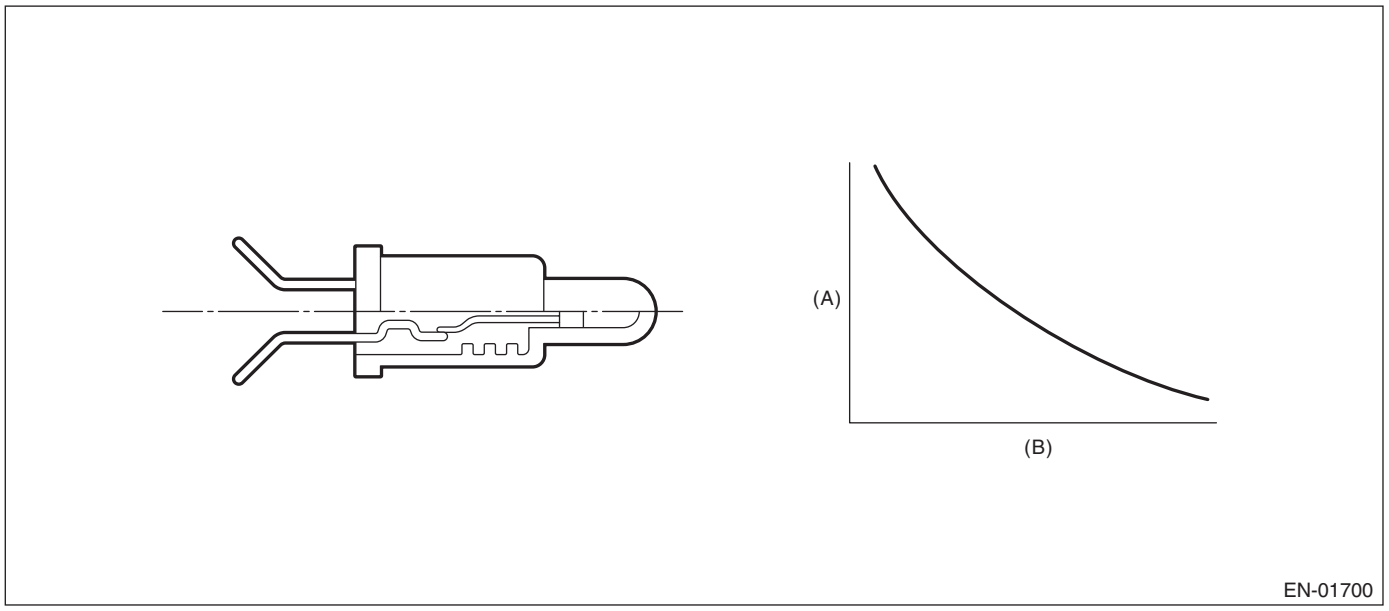
Drift Diagnosis

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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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 Judgement**

Judge as NG when the following conditions are established.

Judgement 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 Judgement**

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Fuel temperature difference between Max. and Min.	≥ 2 °C (35.6 °F)

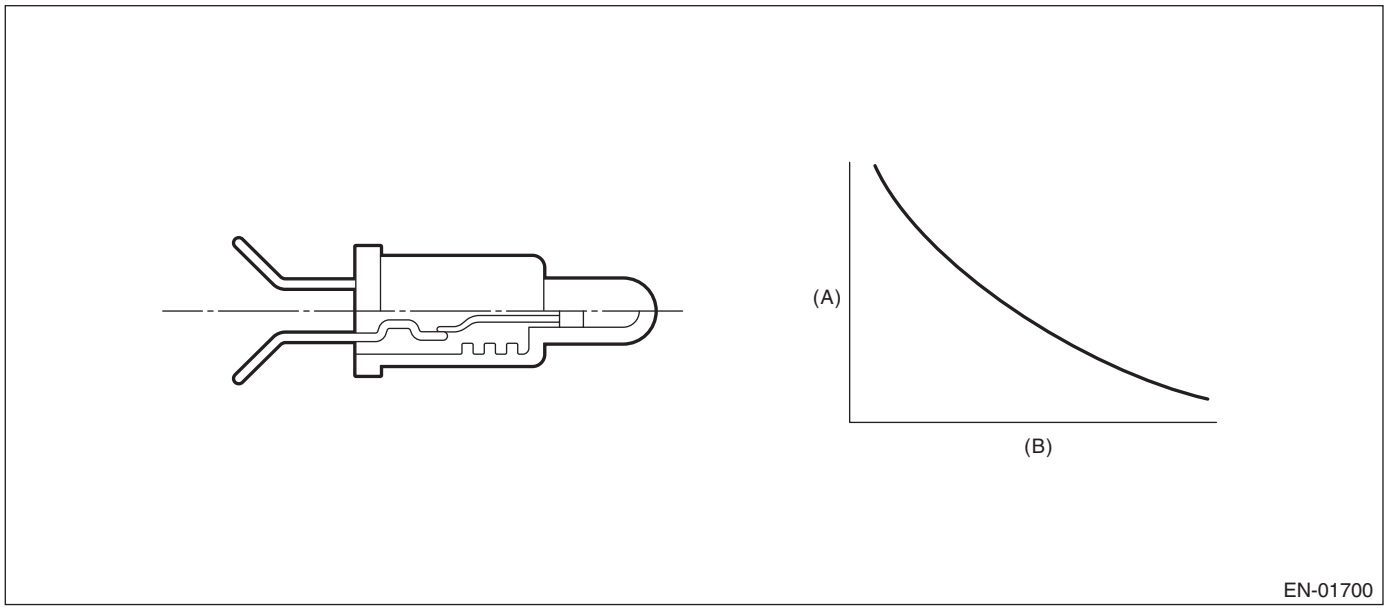
Time Needed for Diagnosis: Less than 1 second

BD: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.344 V
Battery voltage	≥ 10.9 V

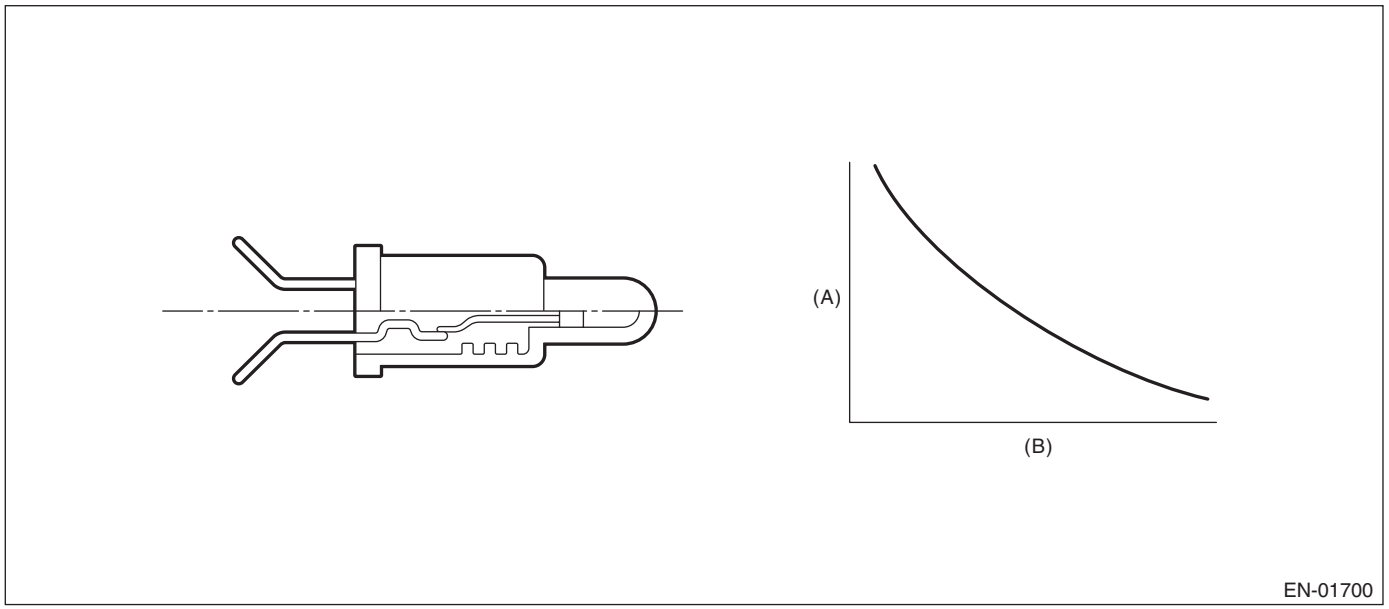
Time Needed for Diagnosis: Less than 1 second

BE: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.881 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: Less than 1 second

BF: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 Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Engine oil temperature After engine start oil temperature sensor characteristic diagnosis timer.	< 15 °C (59 °F) ≥ Judgement 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 milliseconds + TOILCNT milliseconds (at the time of 64 milliseconds).
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 judgement value (t).
$t = 2400000 \text{ ms} - 60000 \text{ ms} \times Ti$ ($t \geq 2400000$)
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 Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Engine oil temperature	≥ 15 °C (59 °F)

Time Needed for Diagnosis: Less than 1 second

BG: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 judgement value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.188 V

Time Needed for Diagnosis: Less than 1 second

BH: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 judgement value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.694 V

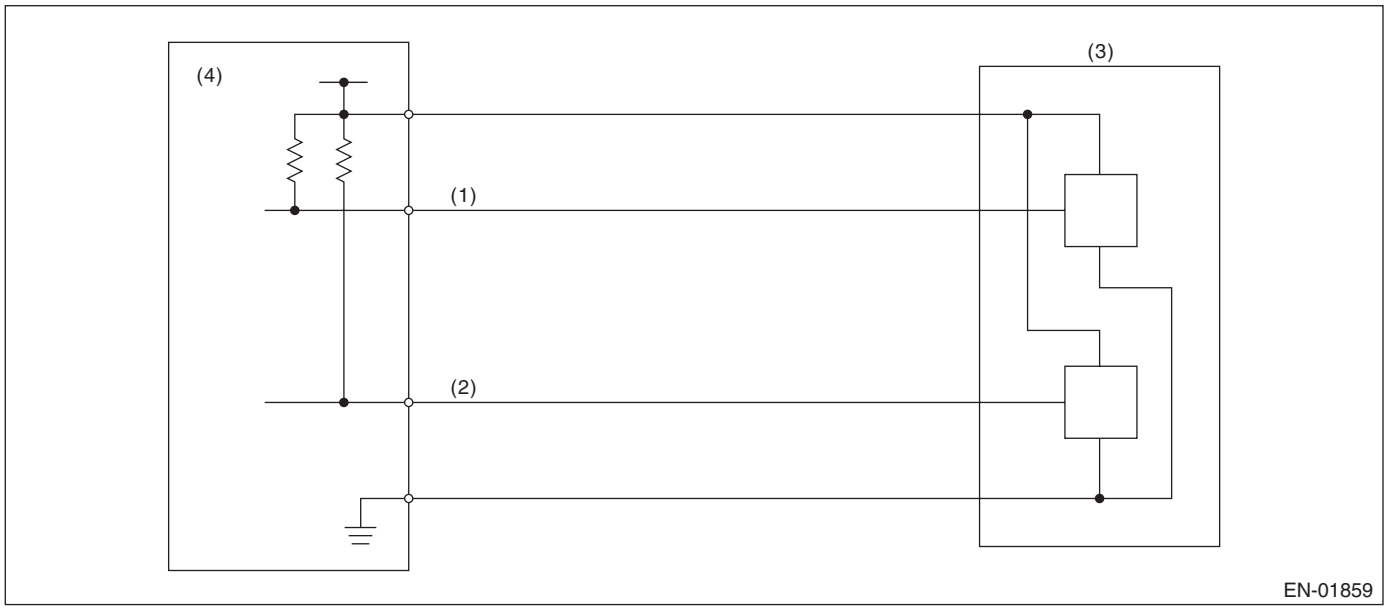
Time Needed for Diagnosis: Less than 1 second

BI: 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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	> 0.926 V

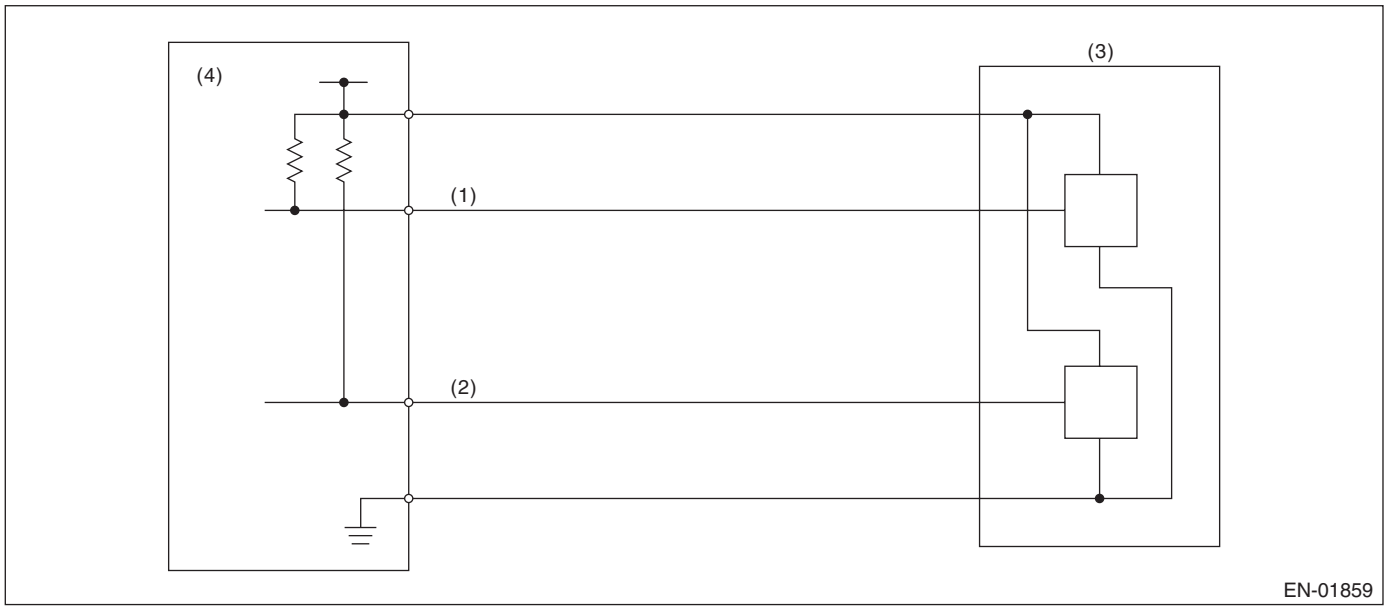
Time Needed for Diagnosis: 24 ms

BJ: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	< 4.858 V

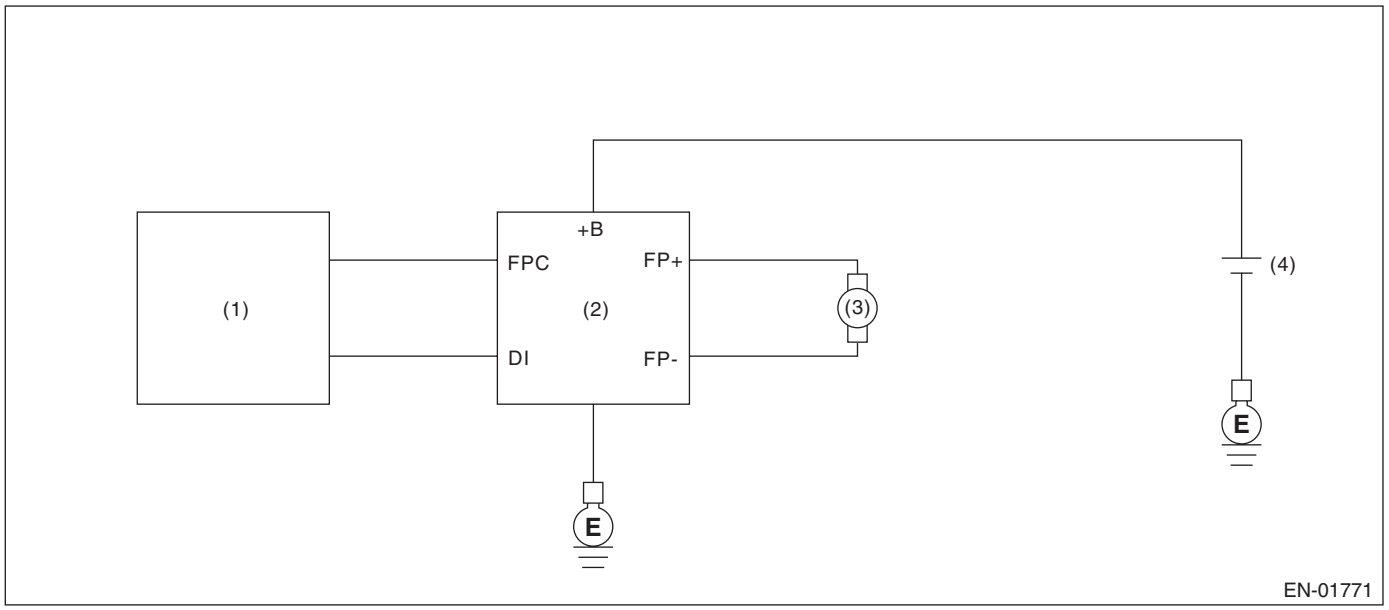
Time Needed for Diagnosis: 24 ms

BK: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

BL: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	≥ 9.6 ℓ (2.54 US gal, 2.11 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 of 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)	27.3 (205.0, 8.1)	25.3 (190.0, 7.5)	25.3 (190.0, 7.5)	25.3 (190.0, 7.5)	24 (180.0, 7.1)	25.3 (190.0, 7.5)	29.9 (224.0, 8.8)	29.7 (223.0, 8.8)	30.9 (232.0, 9.1)	31.5 (236.0, 9.3)	34 (255.0, 10)	37.9 (284.0, 11.2)	42.7 (320.0, 12.6)	42.7 (320.0, 12.6)

3. GENERAL DRIVING CYCLE

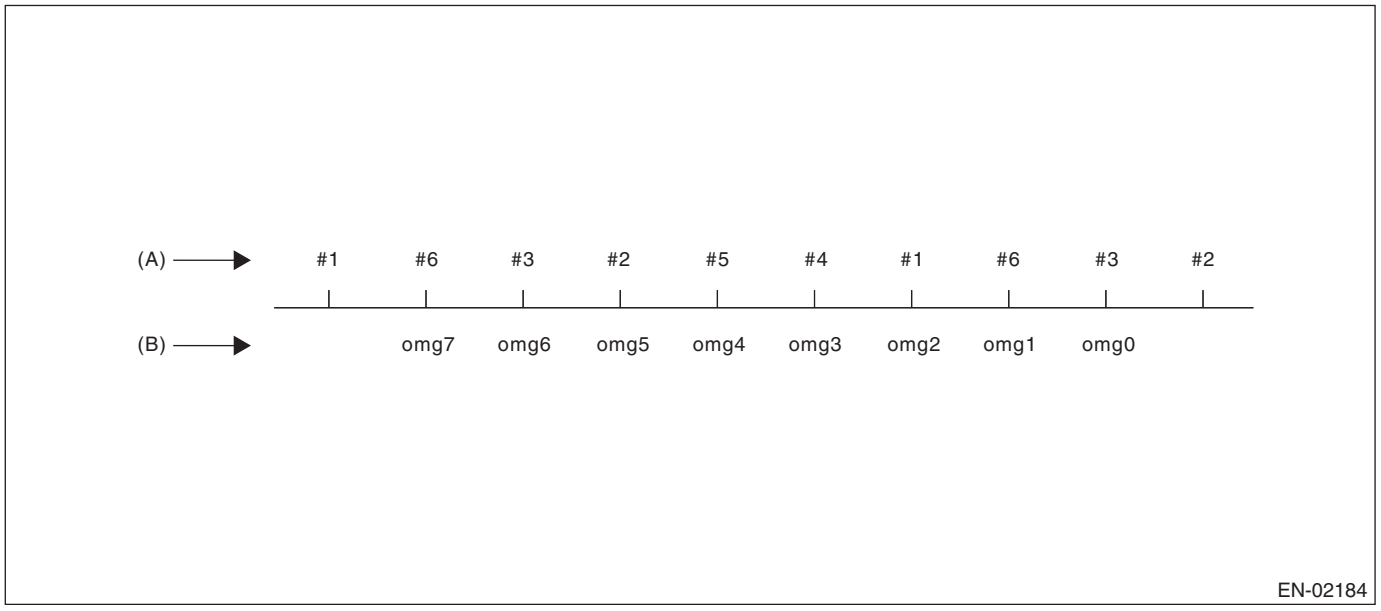
- If conditions are met, it is possible to detect the misfires from idling to high engine speed. However, to avoid excessive load or harm to the engine, perform diagnosis at idle.
- Perform the diagnosis continuously.

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 judgement 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 judgement value) →	NG judgement (Misfire occurrence judgement required by the law) (Compare number of misfire with judgement)
	• 120° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method	• FTP 1.5 times misfire NG judgement • Catalyst damage misfire NG judgement

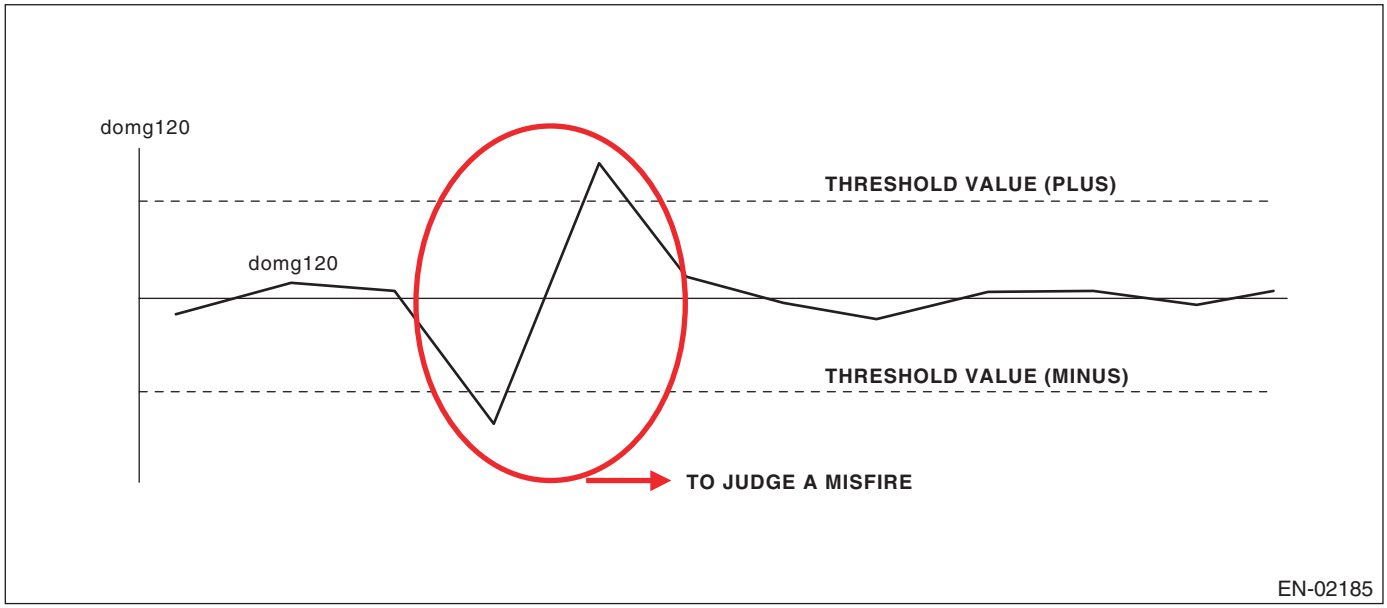
As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.



(A) Ignition order (B) Crankshaft position speed

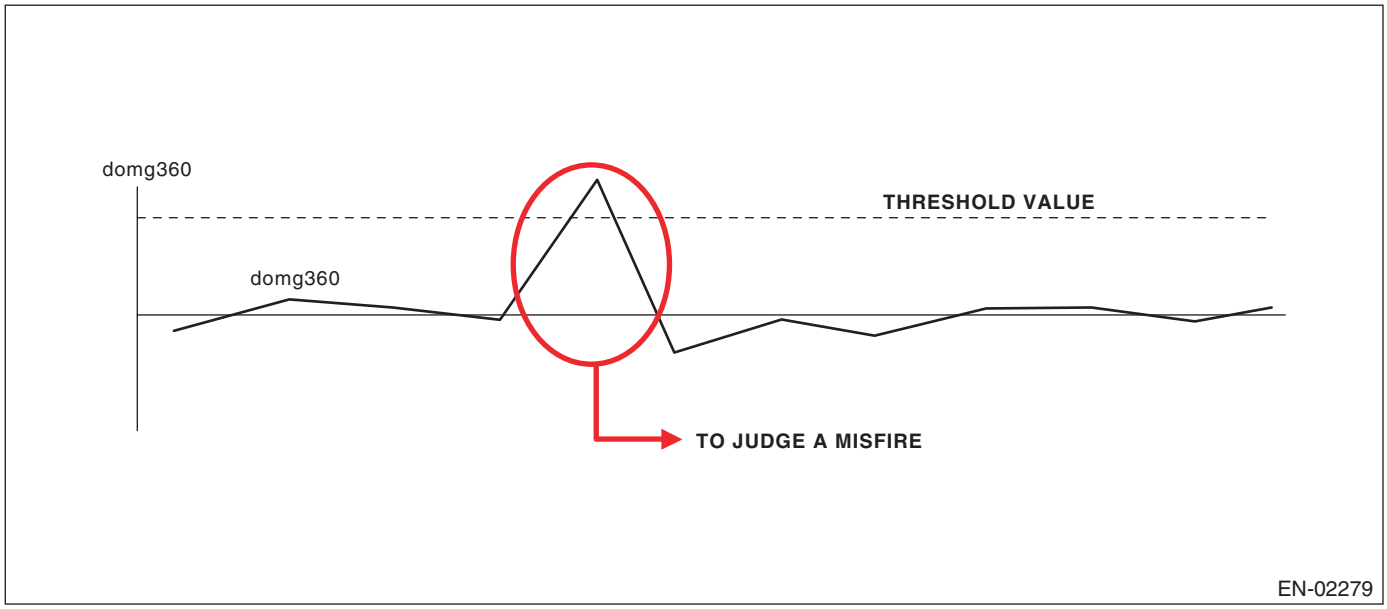
120° Interval Difference Method

Diagnostic value	domg 120 = (omg 1 – omg 0) – (omg 7 – omg 1)/6
Judge as a misfire in the following cases. • domg 120 > judgement value of positive side • domg 121 ≤ judgement value of negative side (Judgement value before 120° CA)	



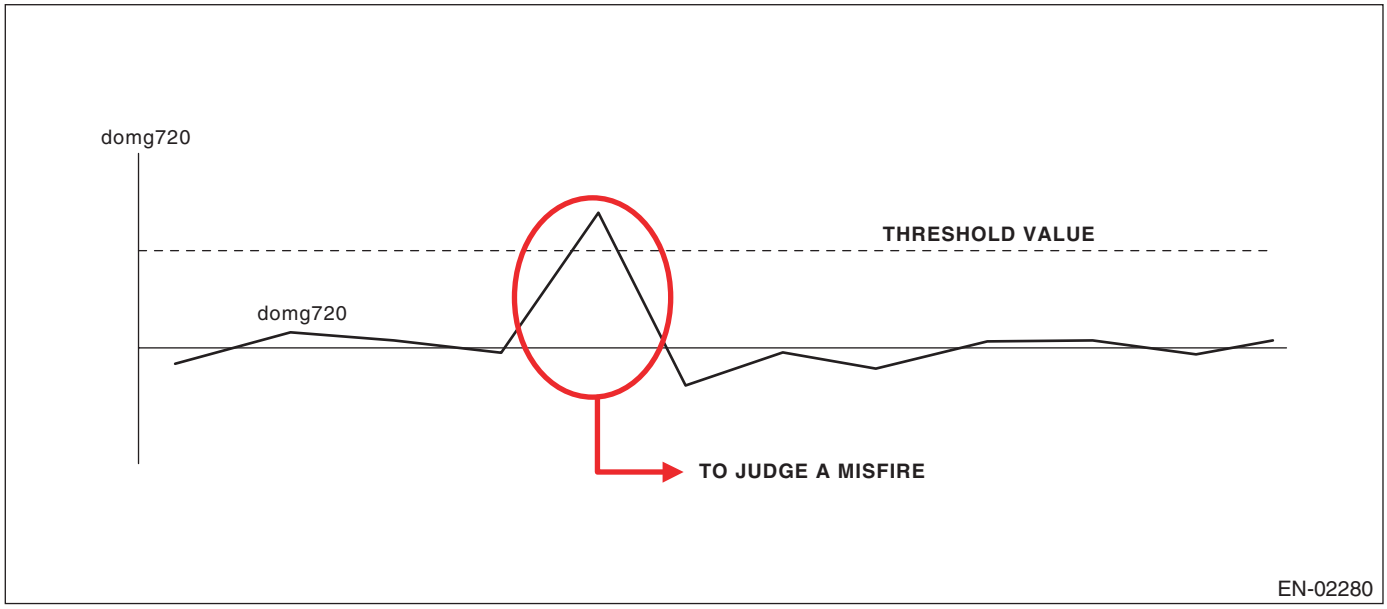
360° Interval Difference Method

Diagnostic value	domg 360 = (omg 1 – omg 0) – (omg 4 – omg 3)
Misfire judgement	domg 360 > Judgement value → Judge as misfire



720° Interval Difference Method

Diagnostic value	domg 720 = (omg 1 – omg 0) – (omg 7 – omg 6)
Misfire judgement	domg 720 > Judgement value → Judge as misfire



- **FTP 1.5 times misfire (Misfire occurrence level which influences exhaust gas)**
- **Abnormality Judgement**

Judgement Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgement 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 Judgement**

Judgement Value

Malfunction Criteria	Threshold Value
FTP emission judgement value	< 50 × 100/3000% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.

- **Catalyst damage misfire (Misfire occurrence level damaging catalyst)**
- **Abnormality Judgement**

Judgement Value

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgement 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 Judgement**

Judgement Value

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgement value	< Value of Map 2

Time Needed for Diagnosis: 200 engine revs.

BM:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BN:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BO:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BP:DTC P0305 CYLINDER 5 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BQ:DTC P0306 CYLINDER 6 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

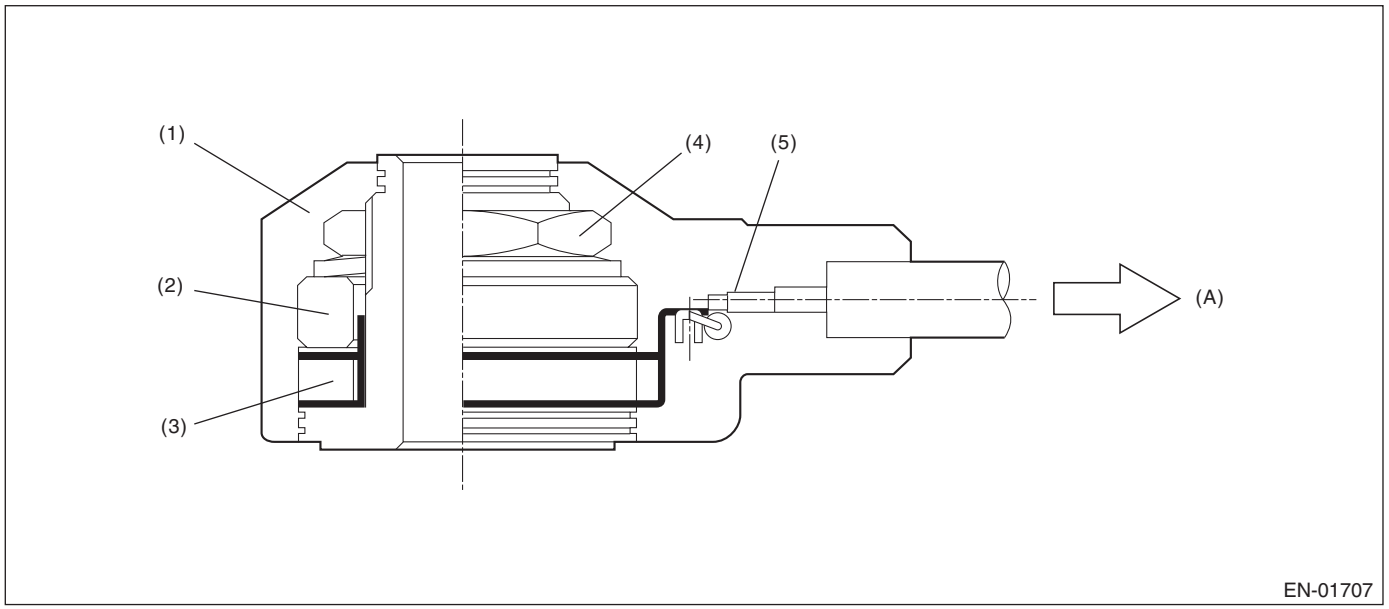
NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BR: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.243 V

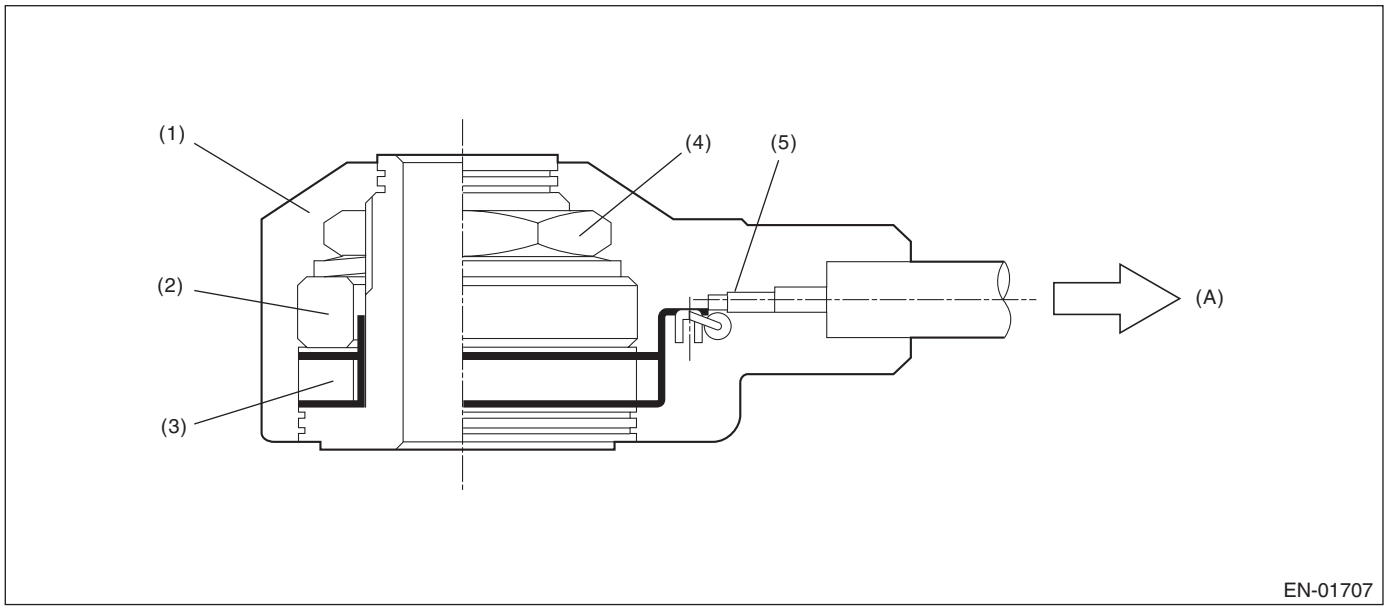
Time Needed for Diagnosis: Less than 1 second

BS: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.709 V

Time Needed for Diagnosis: Less than 1 second

BT: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)-94, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

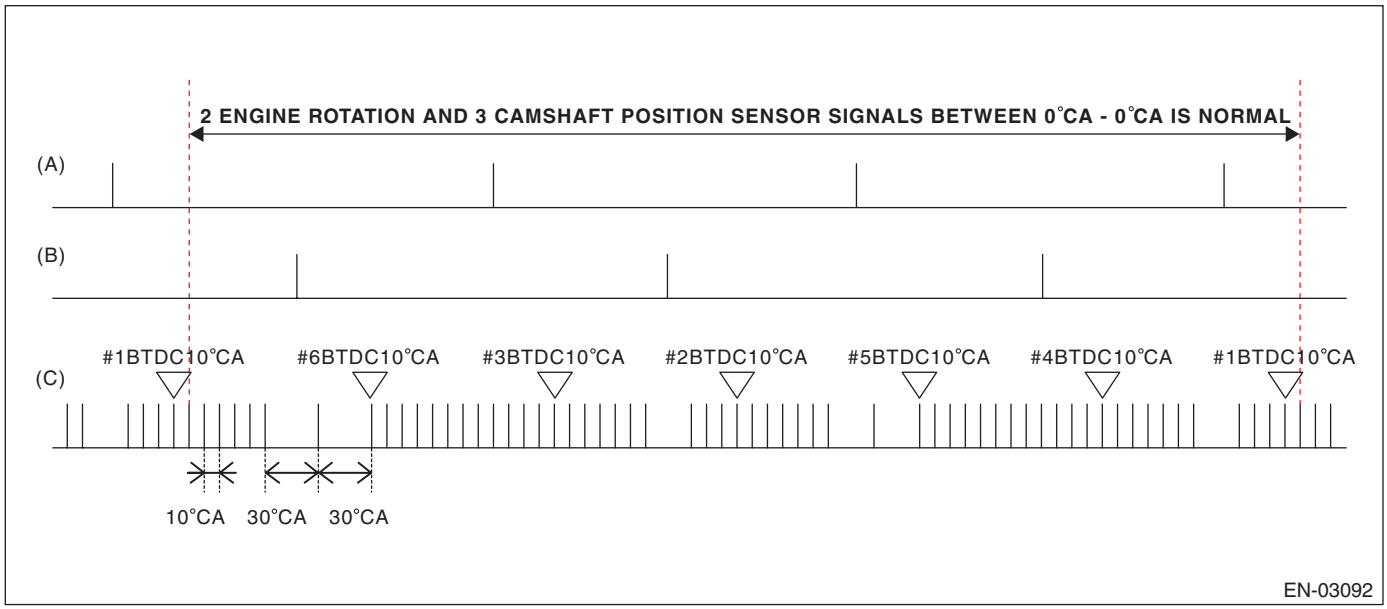
NOTE:
For the detection standard, refer to DTC P0328. <Ref. to GD(H6DO)-96, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BV:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

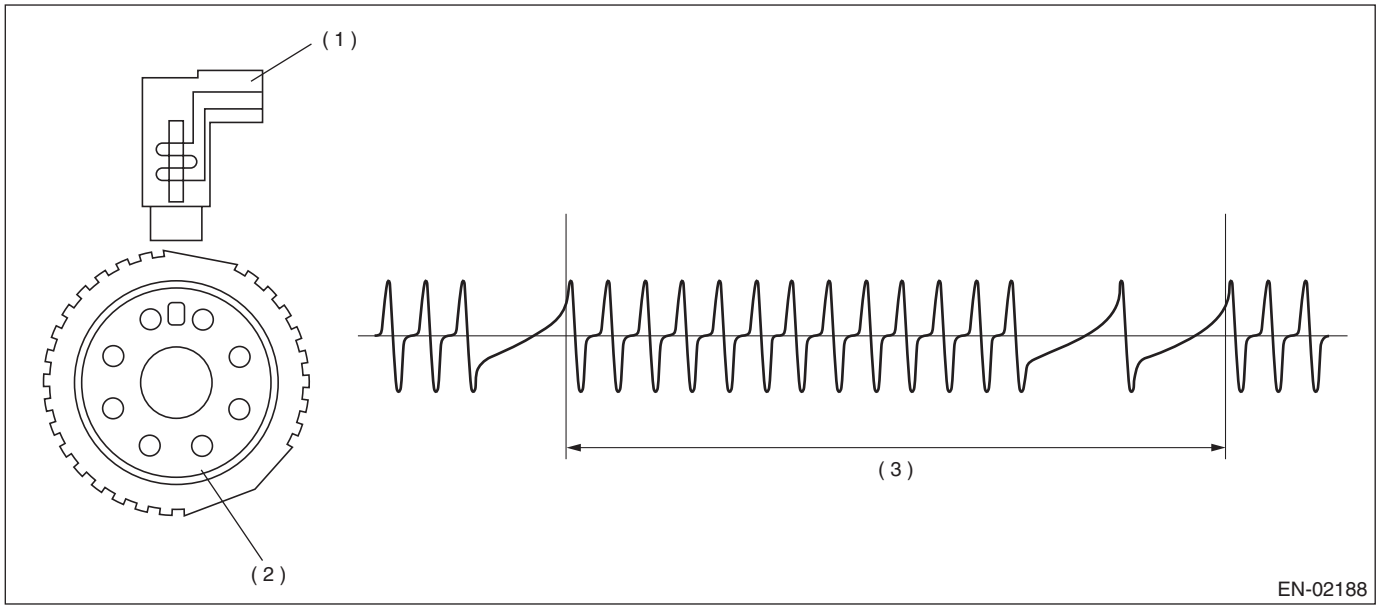
1. OUTLINE OF DIAGNOSIS

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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

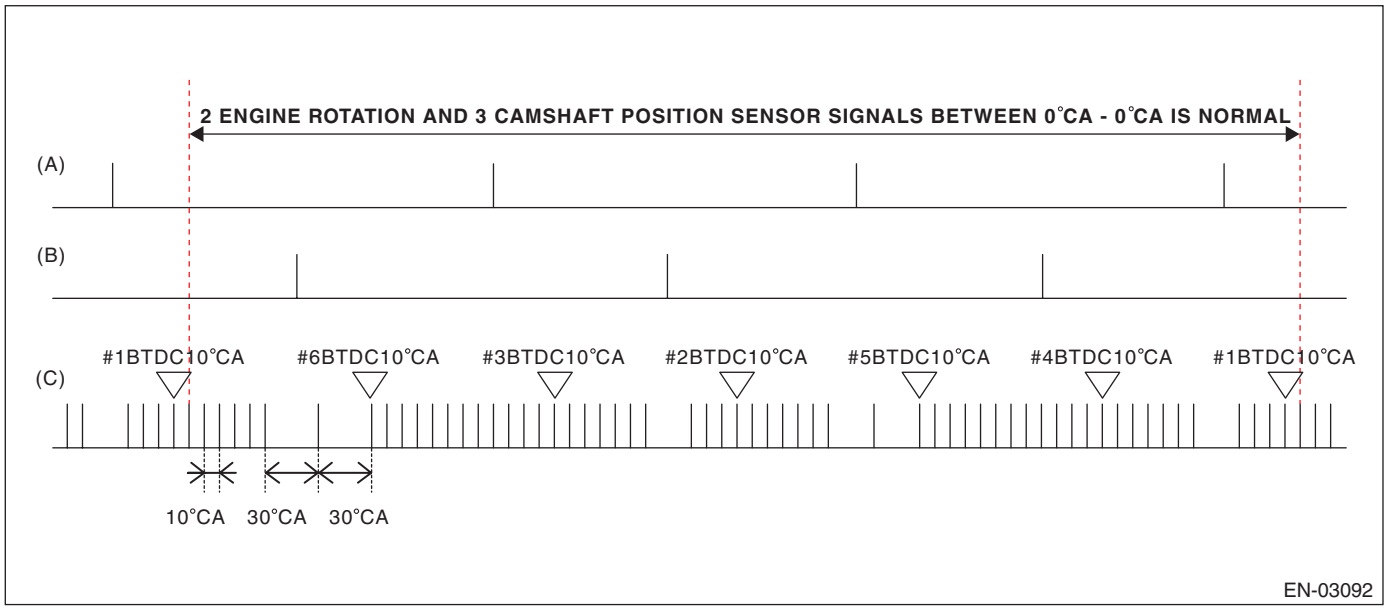
Time Needed for Diagnosis: Less than 1 second

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

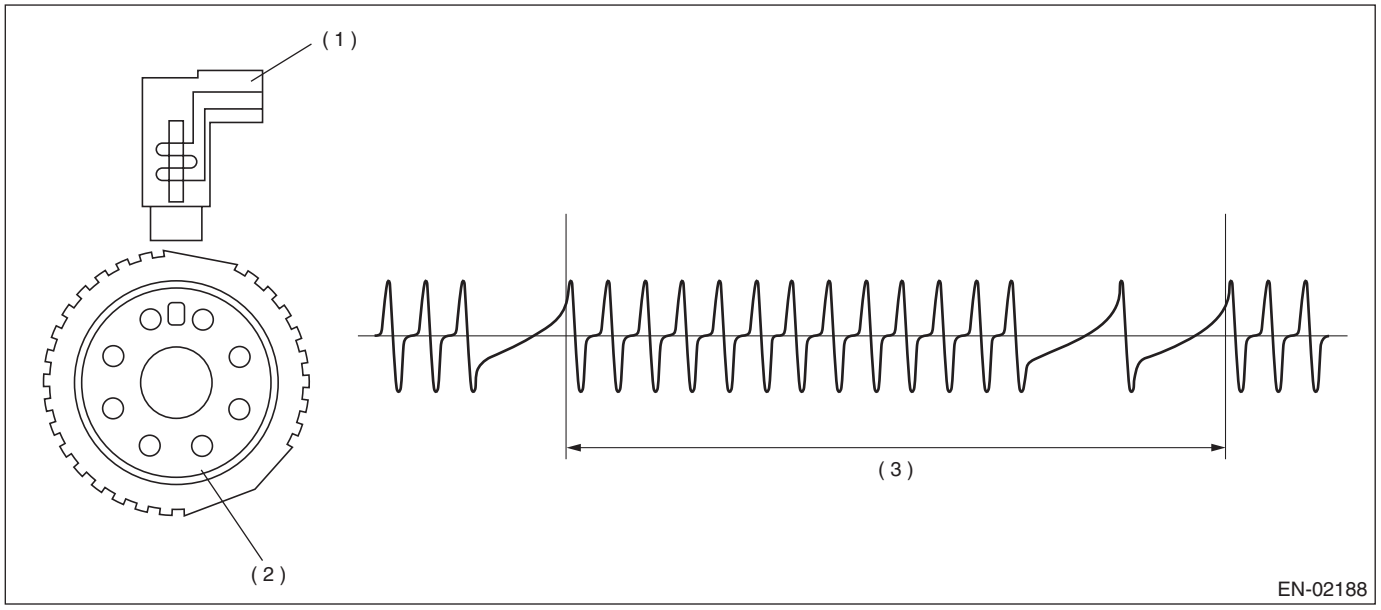
1. OUTLINE OF DIAGNOSIS

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 Judgement

Judge as NG when the following conditions are established.

Judgement 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.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev.	= 30

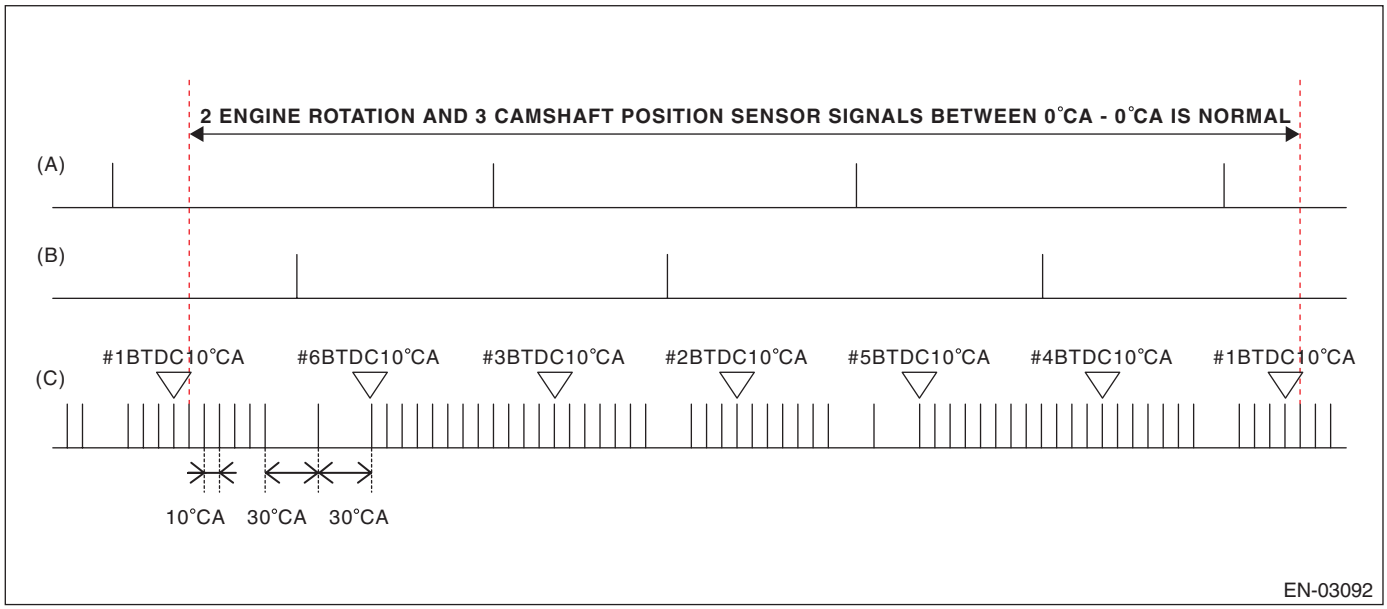
Time Needed for Diagnosis: Less than 1 second

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

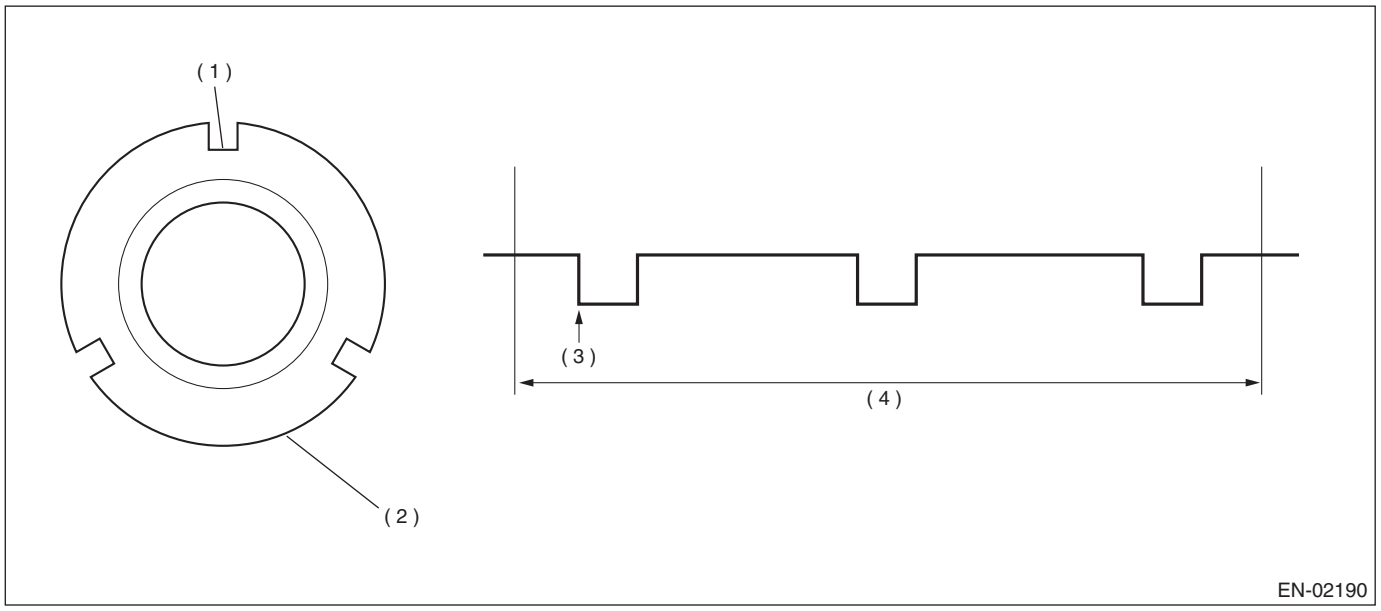
1. OUTLINE OF DIAGNOSIS

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 Judgement 1**

Judge as NG when the condition where the number of camshaft position sensor signals are less than 3 times during 2 engine revs. continues.

Judgement Value

Malfunction Criteria	Threshold Value
Amount of camshaft sensor signal during 2 revs.	< 3 time(s)

Time Needed for Diagnosis: Two engine revolutions × 4 °CA
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgement 1**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgement Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	≥ 3 time(s)

Time Needed for Diagnosis: Two engine revolutions

- **Abnormality Judgement 2**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Starter	ON
Camshaft position sensor signal	No input

Time Needed for Diagnosis: 3000 ms

- **Normality Judgement 2**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	Input exists

Time Needed for Diagnosis: Less than 1 second

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

1. OUTLINE OF DIAGNOSIS

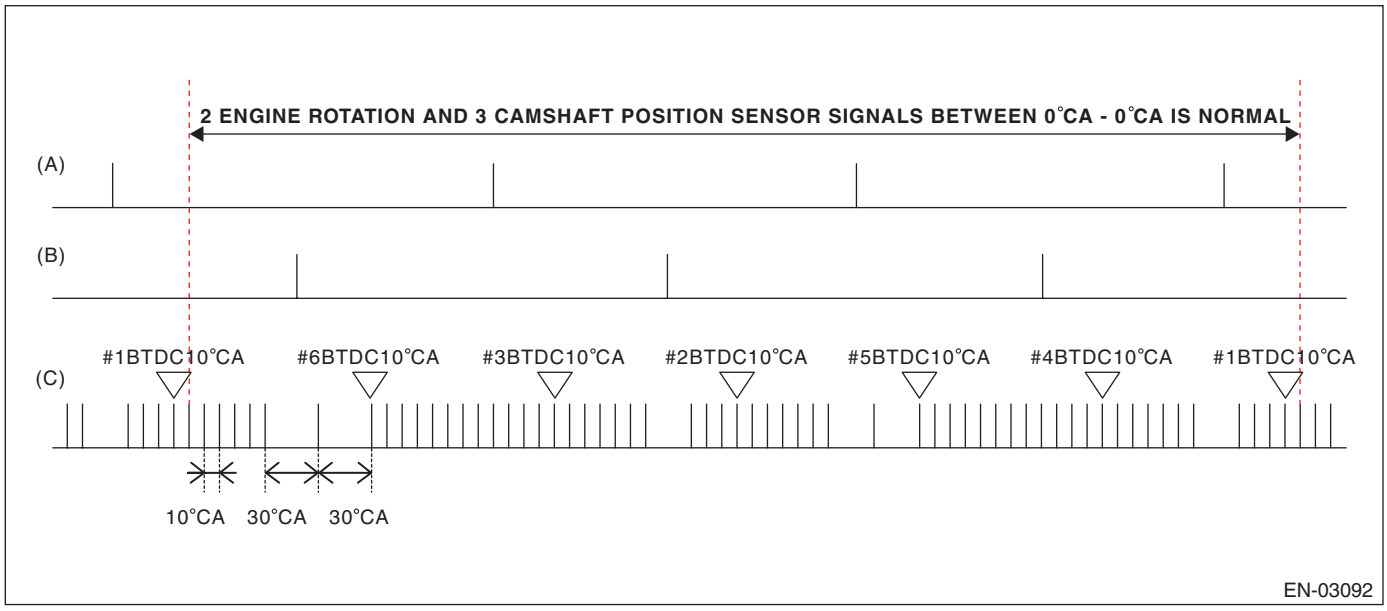
NOTE:
For the detection standard, refer to DTC P0340. <Ref. to GD(H6DO)-102, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

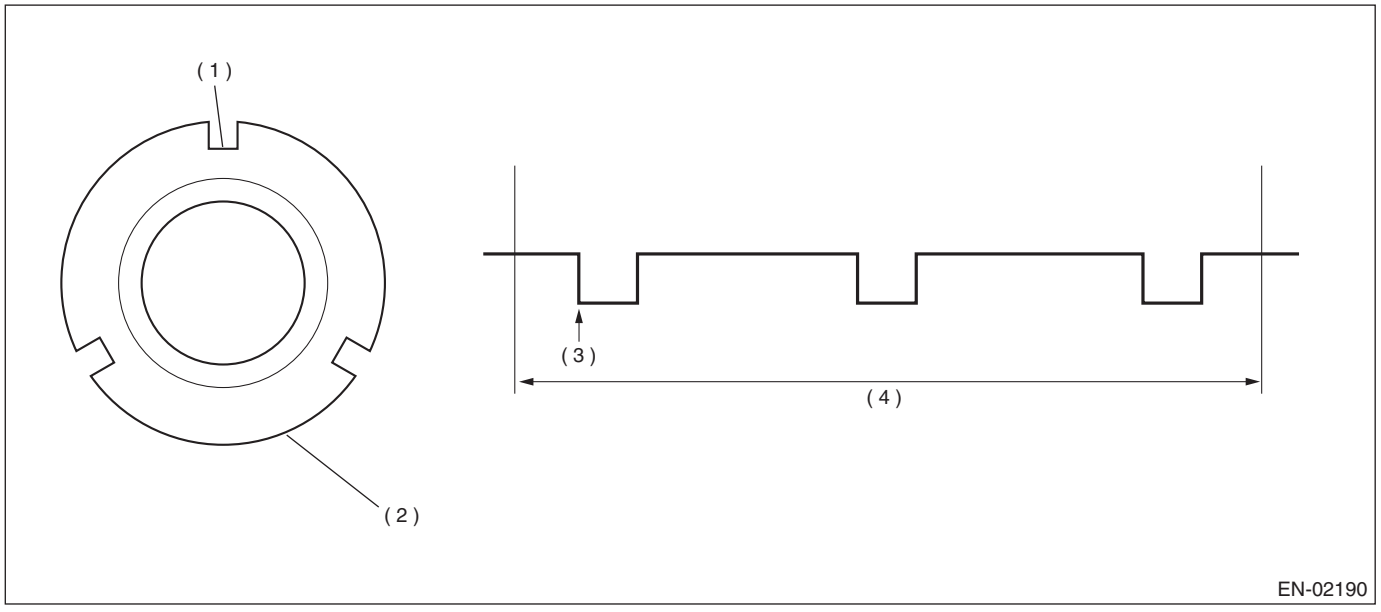
1. OUTLINE OF DIAGNOSIS

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 Judgement**

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.

Judgement 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 Judgement**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgement Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	≥ 3 time(s)

Time Needed for Diagnosis: Two engine revolutions

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

1. OUTLINE OF DIAGNOSIS

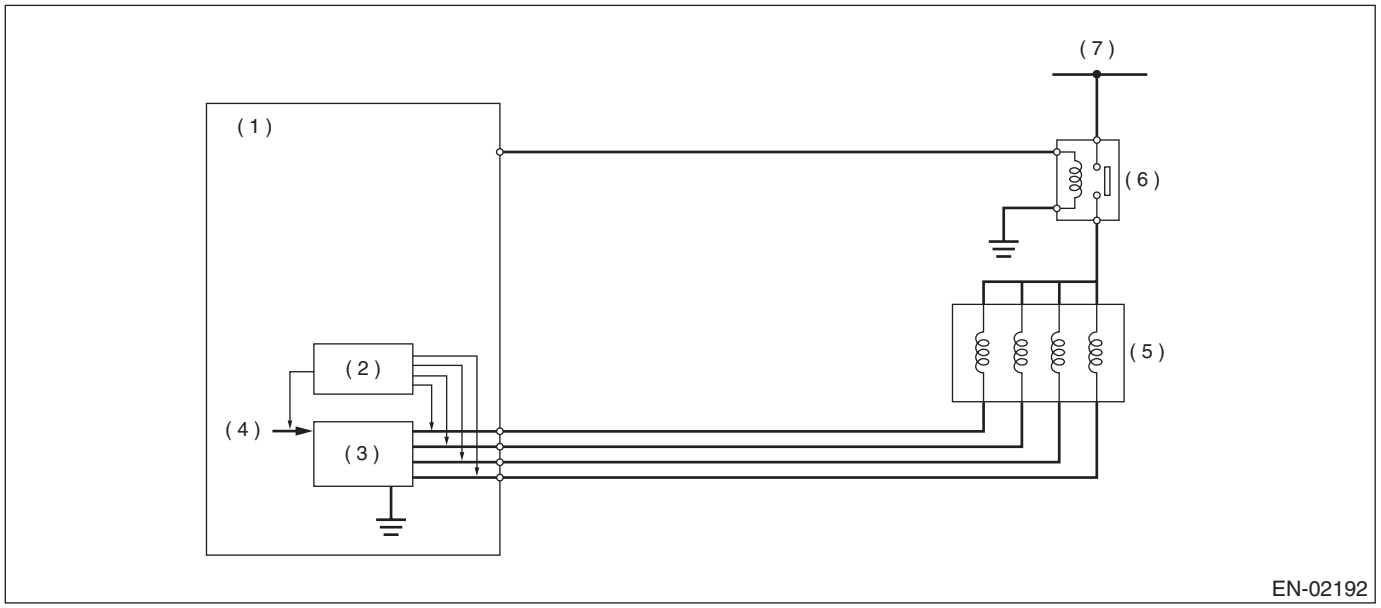
NOTE:
For the detection standard, refer to DTC P0365. <Ref. to GD(H6DO)-104, DTC P0365 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CB: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).

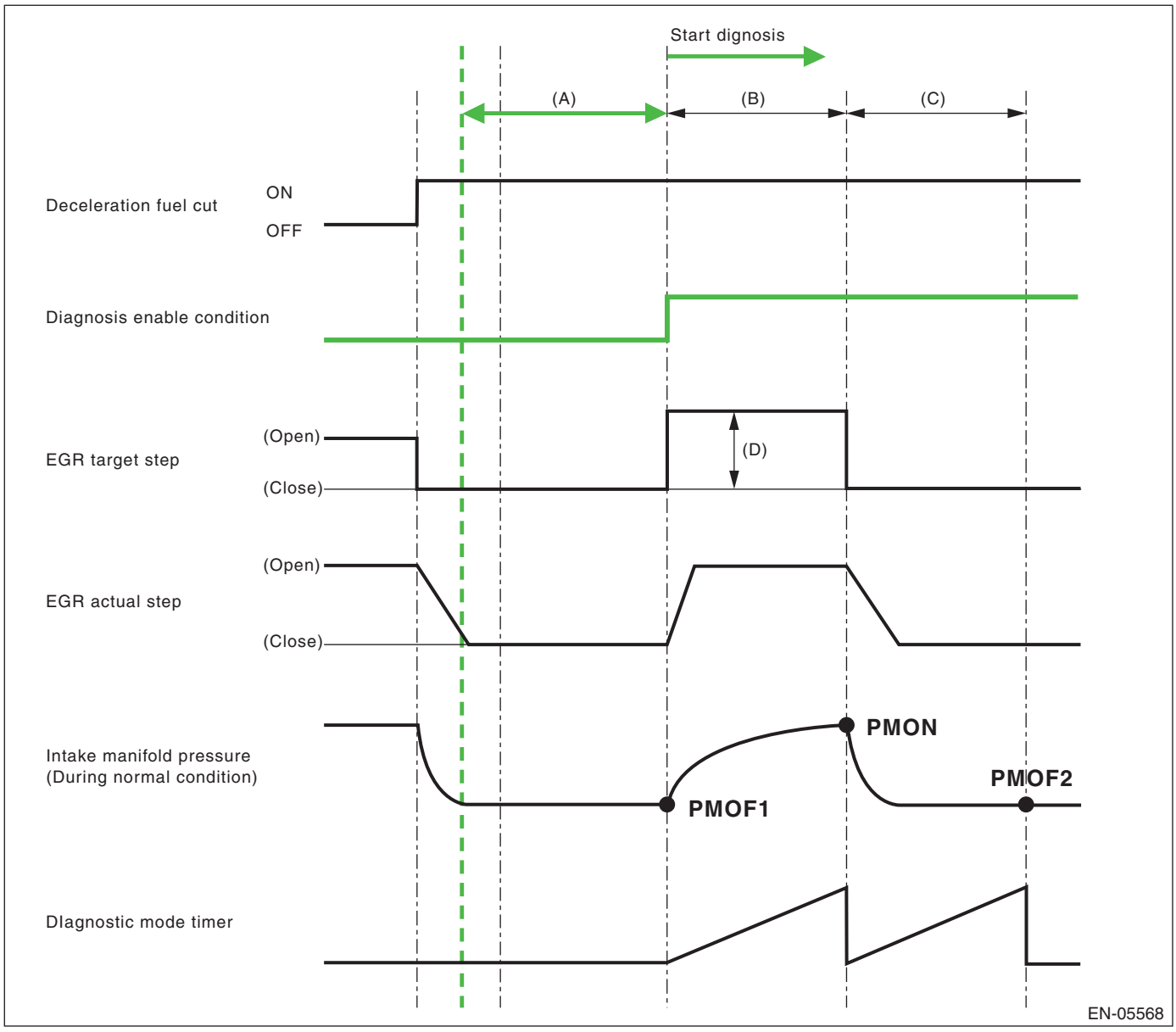
- **Abnormality Judgement**

Judge as NG when the following conditions are established.

Judgement 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 Judgement**

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
PMON – (PMOF1 + PMOF2)/2	≥ 1.6 kPa (11.8 mmHg, 0.5 inHg)

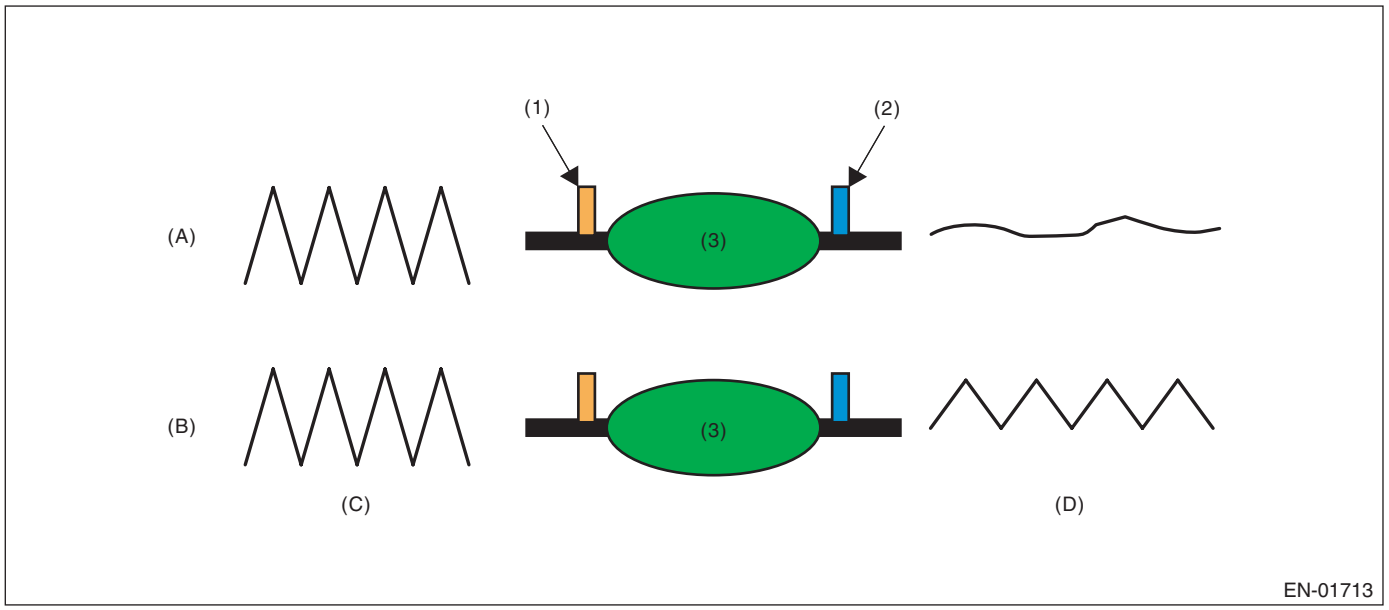
Time Needed for Diagnosis: 1 time

CC: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
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 75 °C (167 °F)
Estimated catalyst temperature	≥ 520 °C (968 °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 speed.	< 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 (Σ |(sglmd$_n$ – sglmd$_{n-1}$)|) and rear oxygen sensor output voltage deviation cumulative value (Σ |(ro2sad$_n$ – ro2sad$_{n-1}$)|) per 32 milliseconds × 4 , 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 Judgement

If the duration of time while the following conditions are met is within the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is within the predetermined time.

Judgement Value

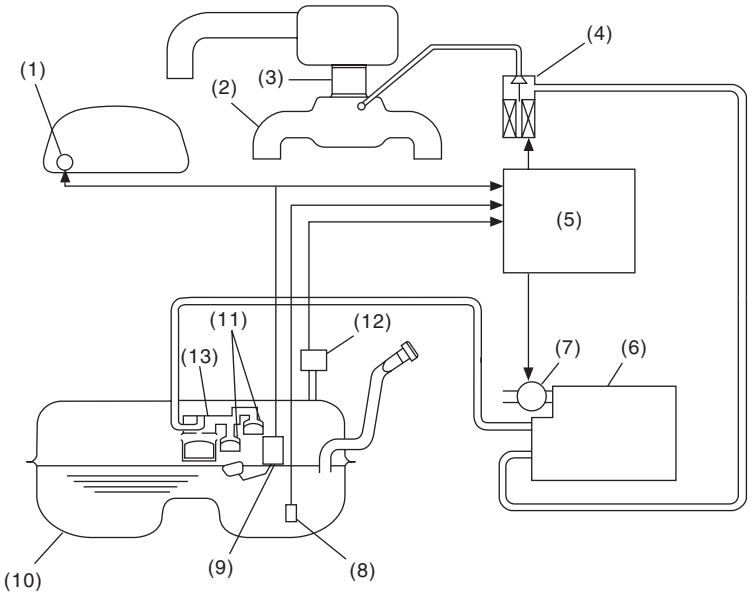
Malfunction Criteria	Threshold Value
Σ |(ro2sad$_n$ – ro2sad$_{n-1}$)| / Σ |(sglmd$_n$ – sglmd$_{n-1}$)|	≤ 25

Time Needed for Diagnosis: 30 — 55 seconds

CD: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.

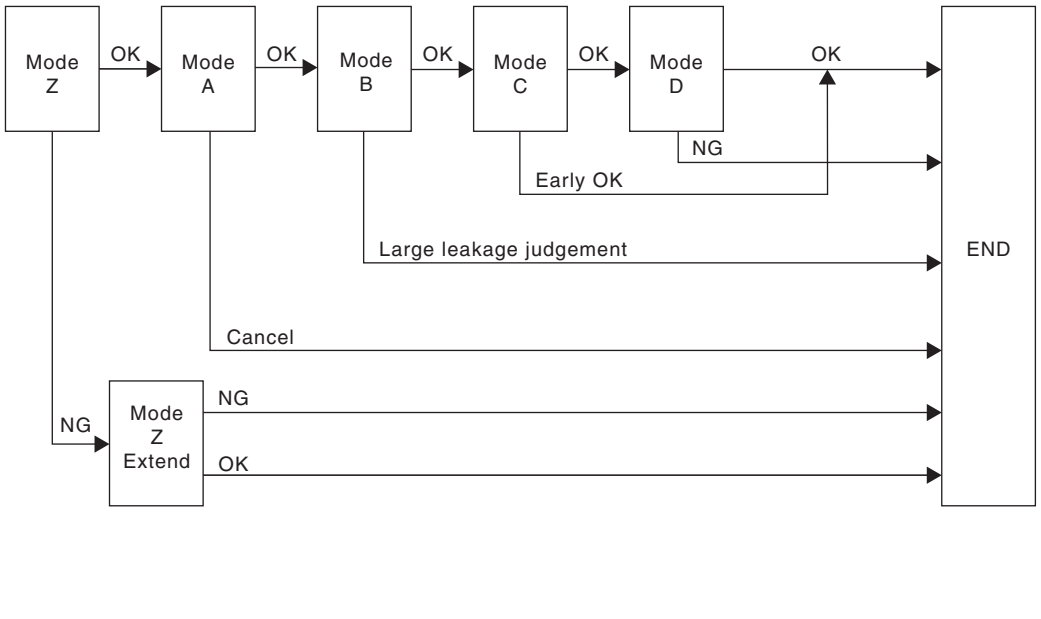


EN-03722

(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

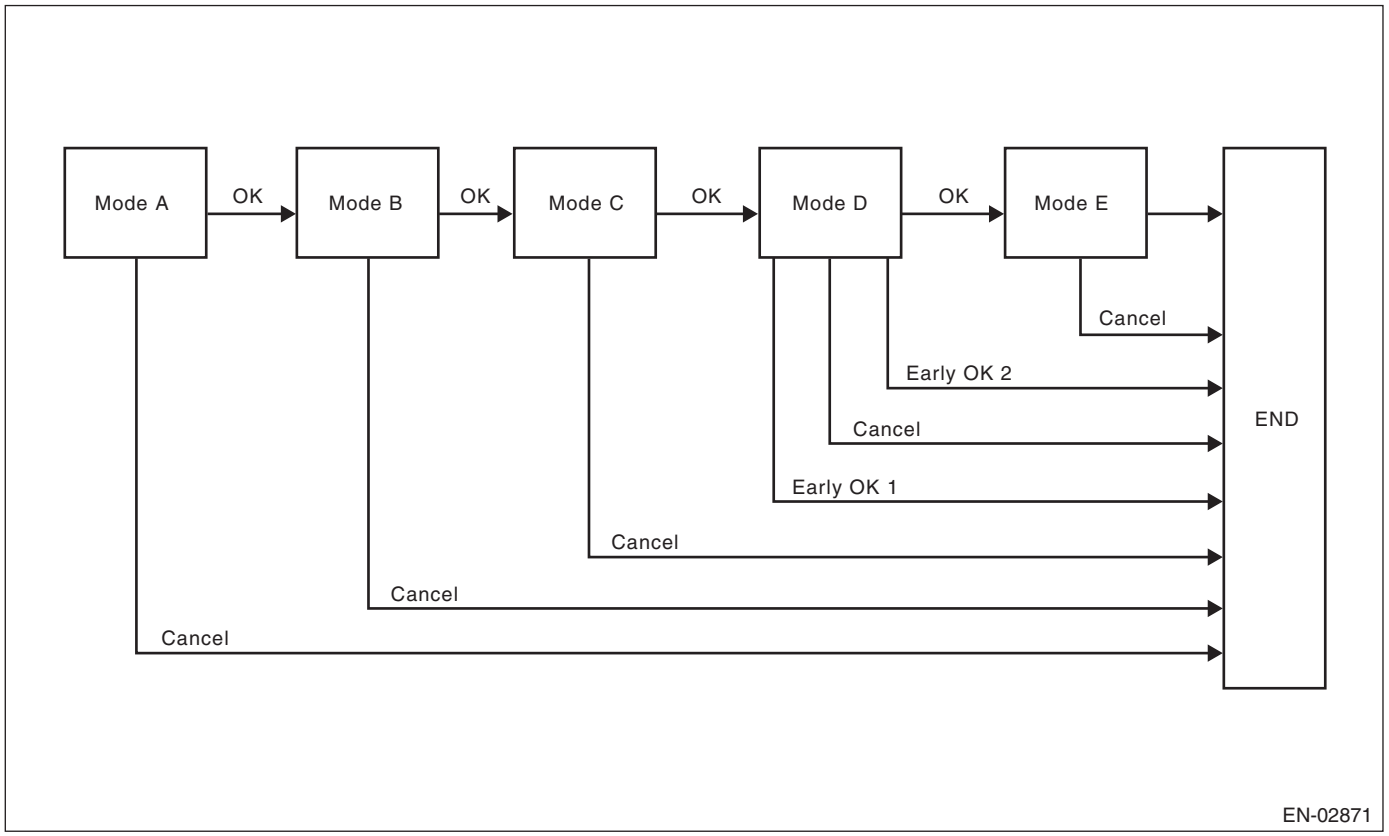


Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve opening failure diagnosis)	Perform purge control solenoid valve opening failure diagnosis from the size of tank pressure variation from diagnosis start.	5000 ms + 3000 ms — 5000 ms + 3000 ms + 13000 ms
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10000 ms
Mode B (Sealed negative pressure, large leakage judgement)	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 judgement)	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 judgement.	0 — 14000 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).	0 — 20000 ms + 0 + Value of Map 2
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 judgement.	0 — 0 ms + 200000 ms
Mode E (Evaporation generated amount calculation)	Calculate the amount of evaporation (P1).	0 — 0 ms + 200000 ms + Value of Map 3

Map1

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

Map2

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

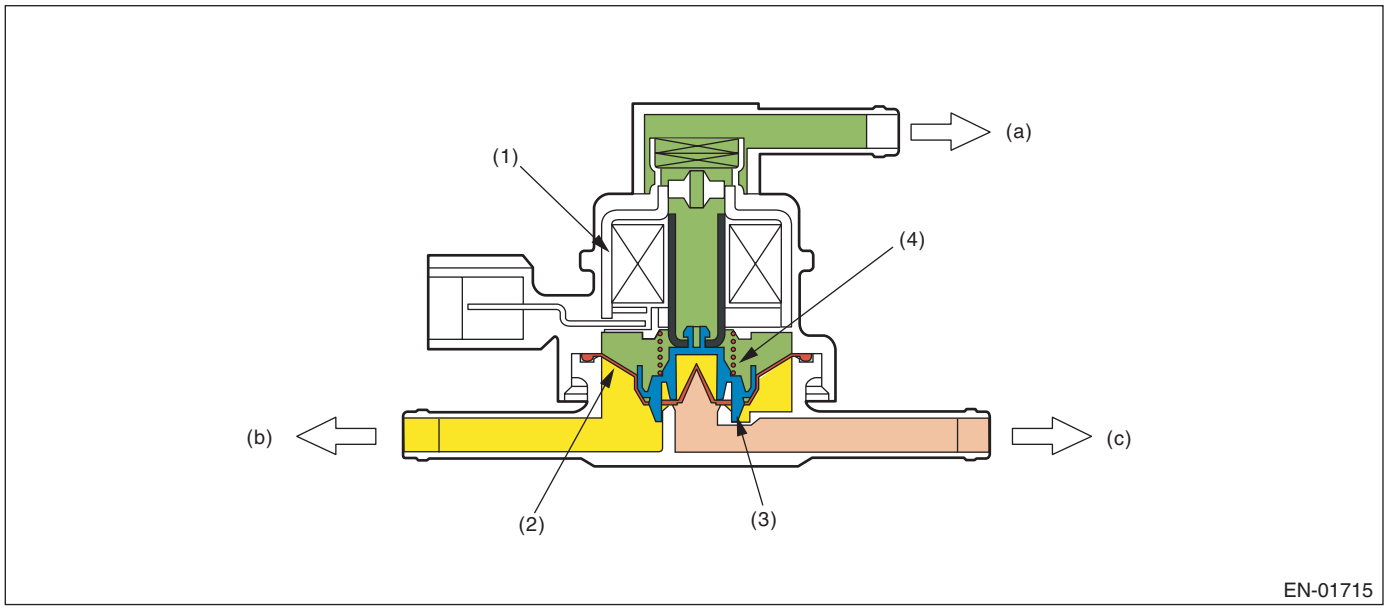
Map 3

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
Time Needed for Diagnosis (ms)	70000	70000	65000	60000	60000	60000	60000

2. COMPONENT DESCRIPTION

Pressure control solenoid valve

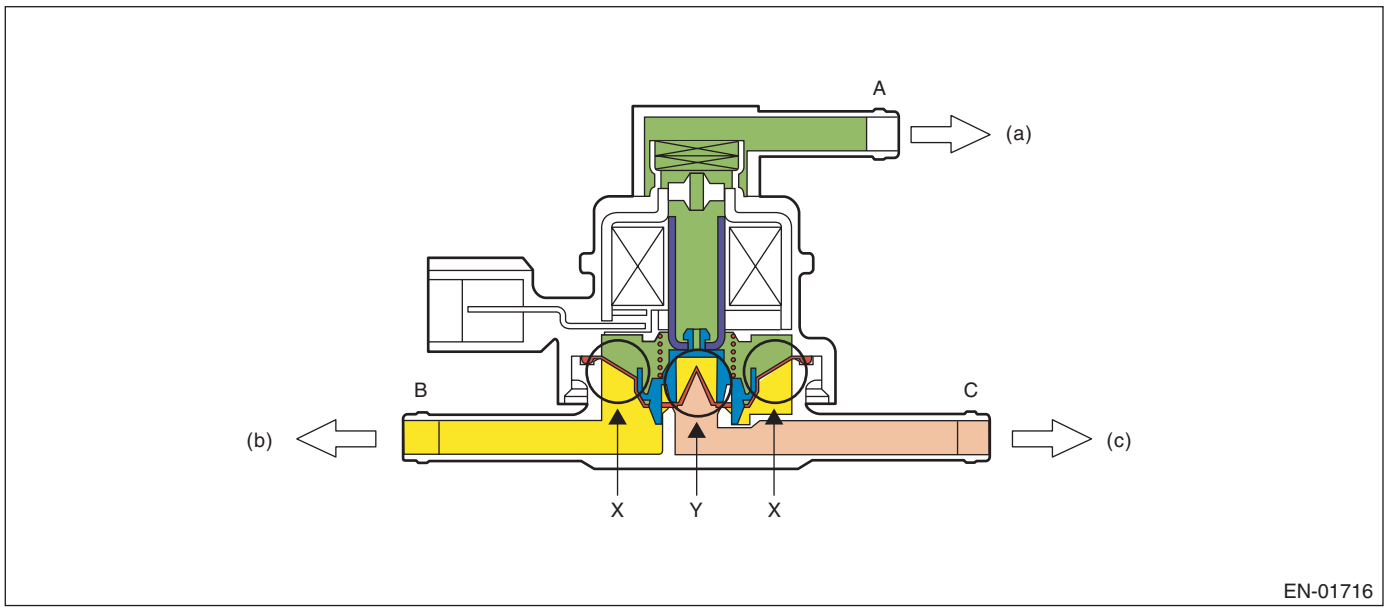
PCV controls the fuel tank pressure to be equal to the atmospheric air pressure. Normally, the solenoid is set to OFF. The valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



(a)	Barometric pressure	(b)	Fuel tank	(c)	Canister
(1)	Solenoid	(3)	Valve	(4)	Spring
(2)	Diaphragm				

Valve Operation and Air Flow

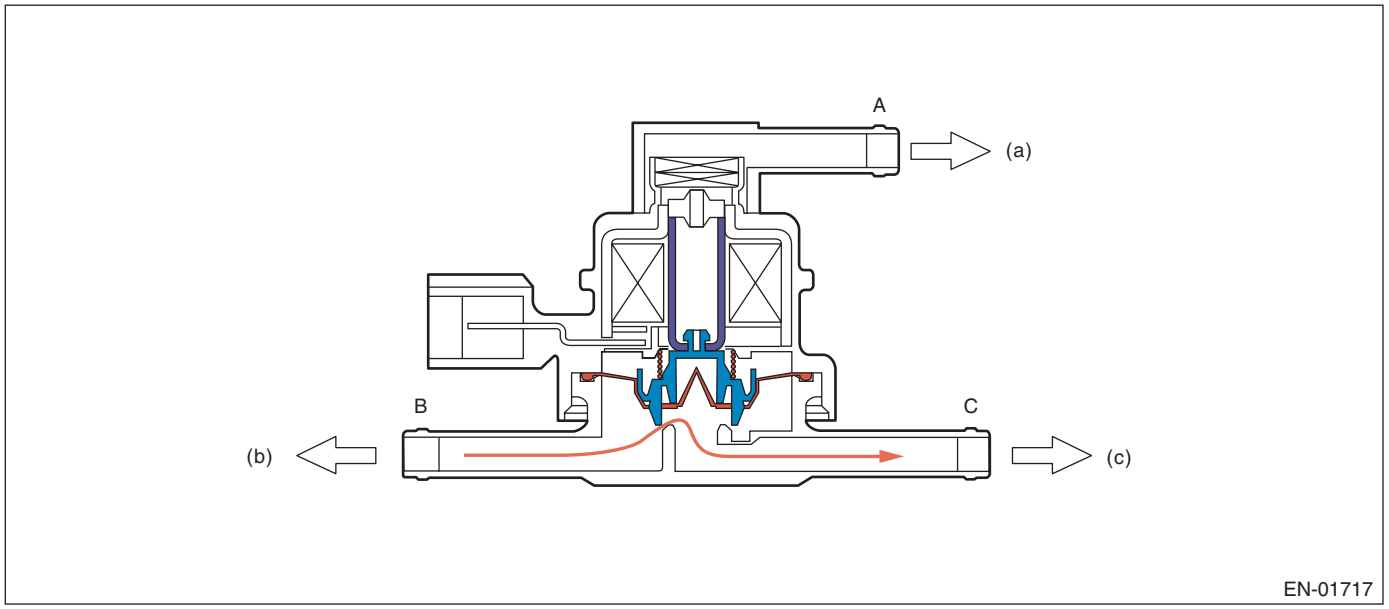
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



(a) Barometric pressure (b) Fuel tank (c) Canister

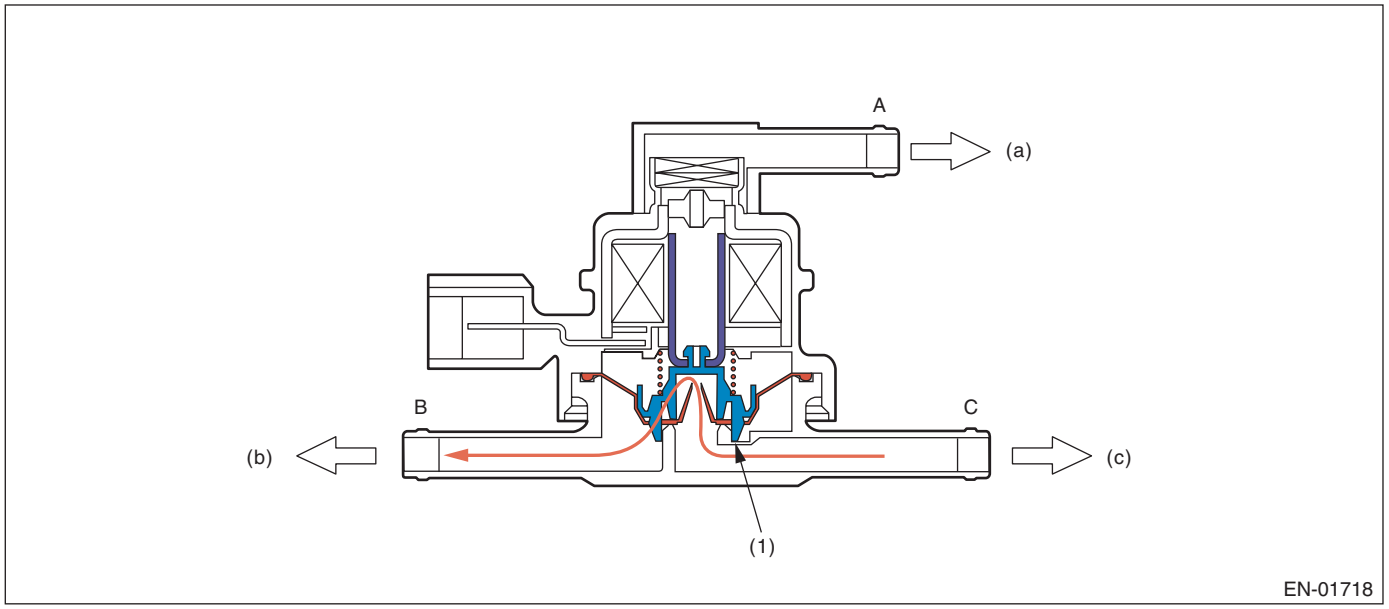
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ← → C

When A < B (solenoid OFF)



(a) Barometric pressure (b) Fuel tank (c) Canister

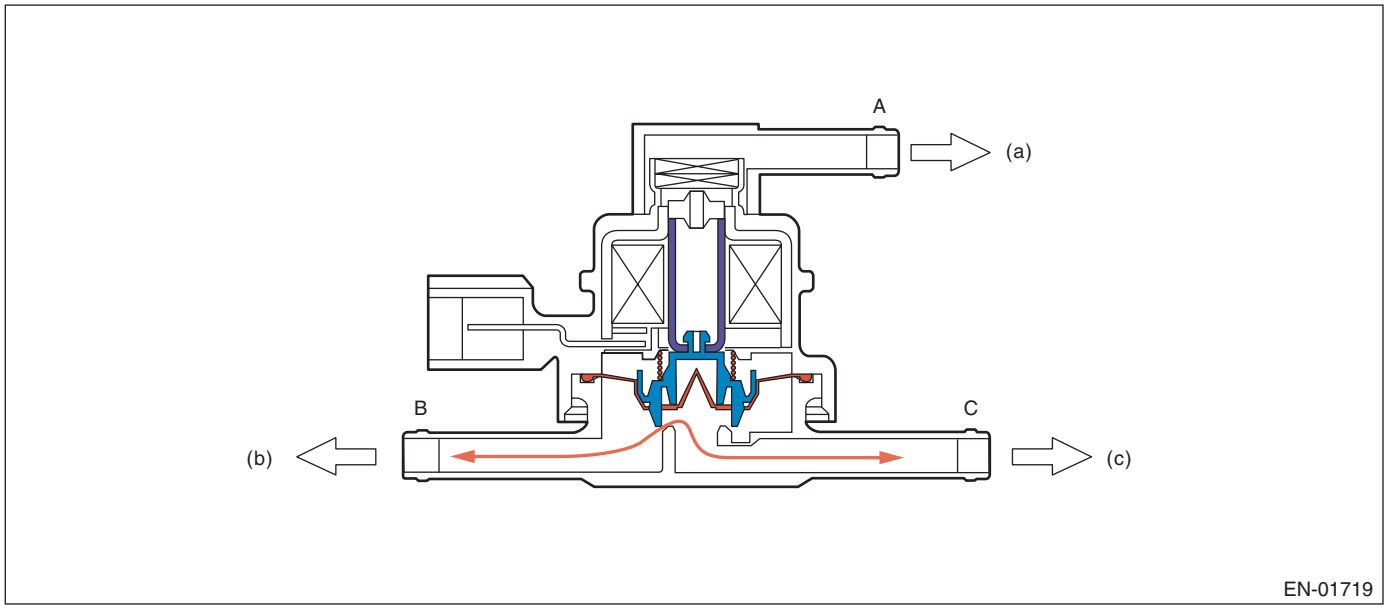
When B < C (solenoid OFF)



(a) Barometric pressure (b) Fuel tank (c) Canister

(1) Valve

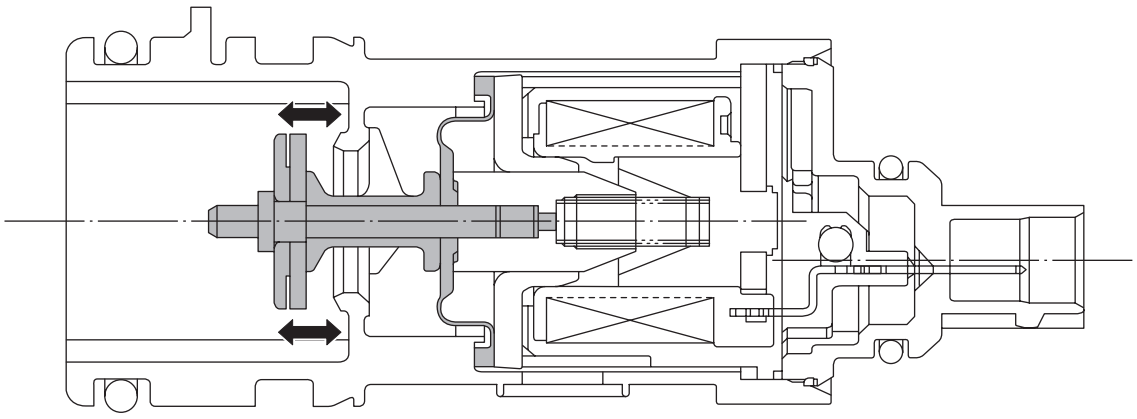
When Solenoid is ON



(a) Barometric pressure (b) Fuel tank (c) Canister

Drain valve

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
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	≥ 120000 ms
Elapsed time after starting the engine	≥ 851 s
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)
Vehicle speed	≥ 32 km/h (19.9 MPH)
Fuel level	9.6 ℓ (2.54 US gal, 2.11 Imp gal) — 54.4 ℓ (14.37 US gal, 11.97 Imp gal)
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 one 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)
Change of fuel level per 128 milliseconds	< 2 ℓ (0.53 US gal, 0.44 Imp gal)
Air fuel ratio	0.76 — 1.25

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
At starting a diagnosis	
Evap. diagnosis	Incomplete
Battery voltage	≥ 10.9 V
Barometric 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)
Fuel level	9.6 ℓ (2.54 US gal, 2.11 Imp gal) — 54.4 ℓ (14.37 US gal, 11.97 Imp gal)
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)
Vehicle speed	50 km/h (31.1 MPH) — 510 km/h (316.9 MPH) continues for 125000 ms
Closed air/fuel ratio control	In operation
Engine speed	1050 rpm — 7000 rpm
During diagnosis	
Change of fuel level	≤ Value of Map 4
Pressure change every one 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)
| Pressure change in tank every 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)

Map4

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
Change (ℓ , US gal, Imp gal)	4.5, 1.19, 0.99	4.5, 1.19, 0.99	4.6, 1.22, 1.01	4.7, 1.24, 1.03	4.85, 1.28, 1.07	5, 1.32, 1.1	6, 1.59, 1.32

4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis

- Perform the diagnosis only once in 856 seconds or more after starting the engine, at a constant speed of 32 km/h (20 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

0.02-inch Diagnosis

- Perform the diagnosis when 125 seconds or more have passed at a constant engine speed of 50 km/h (31 MPH) or higher to judge as NG or OK.
- If judgement 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 Judgement**

If OK judgement cannot be made, extend Mode Z, and Judge as NG when the following conditions are established after predetermined amount of time.

Judgement 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 of 2 ℓ (0.53 US gal, 0.44 Imp gal) or more fuel no sloshing	≥ 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 judgement for purge control solenoid valve stuck open NG is made, end the evaporative diagnosis.

Cancel the evaporative diagnosis when the OK/NG judgement for purge control solenoid valve stuck open cannot be made in Mode Z.

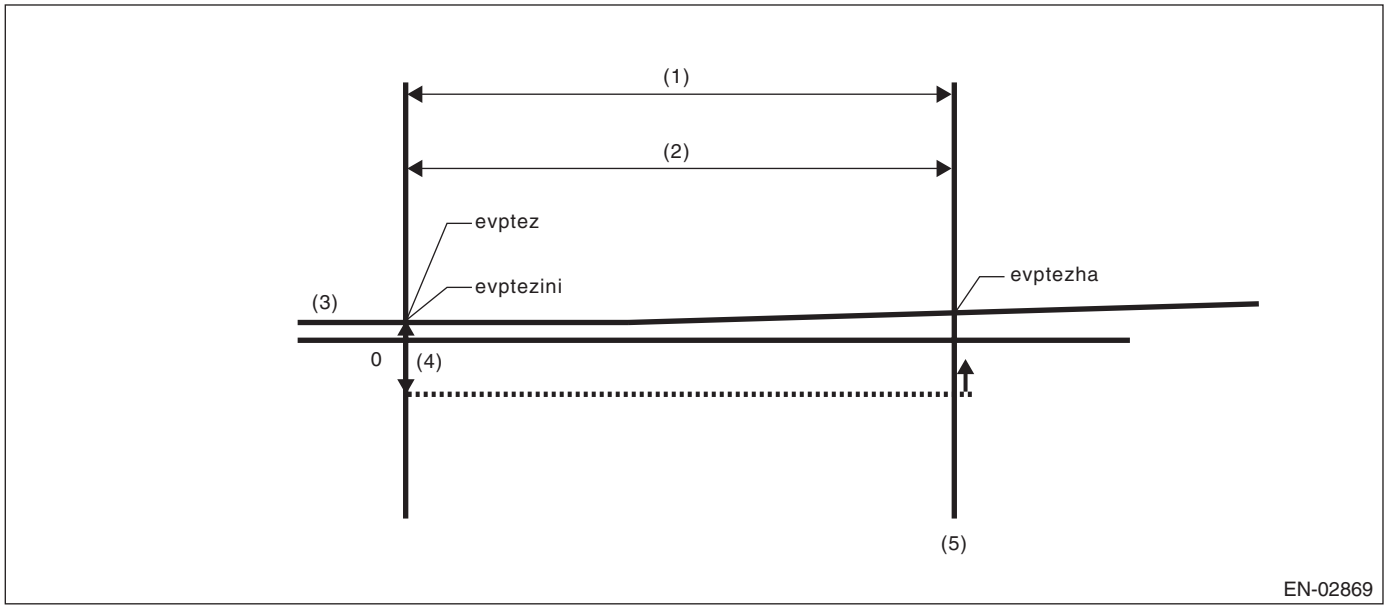
- **Normality Judgement**

Judge as OK and change to Mode A when the following conditions are established after predetermined time has passed since Mode Z started.

Judgement Value

Malfunction Criteria	Threshold Value	DTC
evptez – evptezha	≤ 0.4 kPa (3 mmHg, 0.1 inHg)	P0457

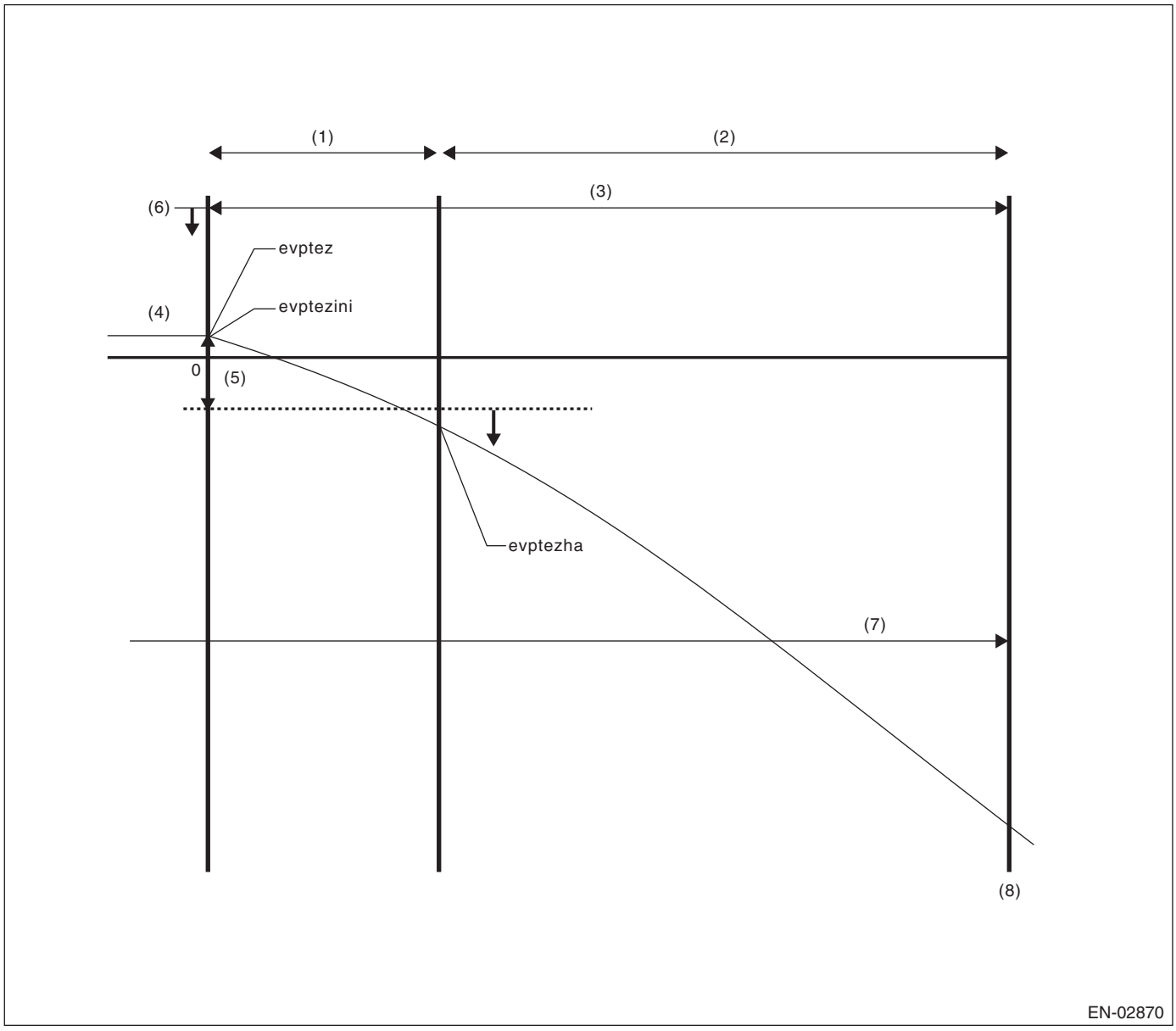
Normal



(1) Mode Z
(2) 3000 ms
(3) Fuel tank pressure
(4) 0.4 kPa (3 mmHg, 0.1 inHg)
(5) OK judgement

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	(4)	Fuel tank pressure	(7)	40000 ms no fuel sloshing
(2)	Extended mode Z	(5)	0.6 kPa (4.5 mmHg, 0.2 inHg)	(8)	NG judgement
(3)	3000 ms + 13000 ms	(6)	0.4 kPa (2.9 mmHg, 0.1 inHg)		

- evptezini ≤ 0.4 kPa (2.9 mmHg, 0.1 inHg)
- evptez – evptezha > 0.6 kPa (4.5 mmHg, 0.2 inHg)
- No fuel sloshing of over 2 ℓ (0.53 US gal, 0.44 Imp gal) lasts for more than 40000 ms.

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 Judgement
Judge as NG (large leakage) when the following conditions are established.
Judgement Value

Malfunction Criteria	Threshold Value	DTC
Time to reach target negative pressure or Mode B time (Min. pressure value in tank when in mode B) – (Tank pressure when mode B started)	≥ 10000 ms + 25000 ms ≥ 10000 ms > –0.5 kPa (–4 mmHg, –0.2 inHg)	P0457

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 judgement
–1.3 kPa (–9.75 mmHg, –0.4 inHg)	14000 ms

Time Needed for Diagnosis: 5000 ms + 3000 ms + 10000 ms + 10000 ms + 25000 ms + 14000 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 judgement value exceeds the threshold value, it is judged to be a malfunction.
Abnormality Judgement
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.
Judgement 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 5	P0442

*1.5 –: Evaporation amount compensation value when below negative pressure (Amount of evaporation occurrence increases as a vacuum condition increases.)

Map 5 Malfunction Criteria limit for evaporation diagnosis

Fuel temperature vs. Fuel level	25 °C (77 °F)	30 °C (86 °F)	35 °C (95 °F)	40 °C (104 °F)	45 °C (113 °F)
0 ℓ (0 US gal, 0 Imp gal)	0.3 kPa (2.1 mmHg, 0.1 inHg)	0.3 kPa (2.2 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.35 mmHg, 0.1 inHg)	0.3 kPa (2.4 mmHg, 0.1 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0.3 kPa (2.1 mmHg, 0.1 inHg)	0.3 kPa (2.2 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.35 mmHg, 0.1 inHg)	0.3 kPa (2.4 mmHg, 0.1 inHg)
20 ℓ (5.28 US gal, 4.4 Imp gal)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.4 mmHg, 0.1 inHg)	0.3 kPa (2.5 mmHg, 0.1 inHg)	0.3 kPa (2.6 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (3.05 mmHg, 0.1 inHg)	0.4 kPa (3.15 mmHg, 0.1 inHg)	0.4 kPa (3.25 mmHg, 0.1 inHg)	0.4 kPa (3.35 mmHg, 0.1 inHg)
40 ℓ (10.57 US gal, 8.8 Imp gal)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (3.15 mmHg, 0.1 inHg)	0.4 kPa (3.3 mmHg, 0.1 inHg)	0.5 kPa (3.4 mmHg, 0.1 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)
50 ℓ (13.21 US gal, 11 Imp gal)	0.4 kPa (3.2 mmHg, 0.1 inHg)	0.4 kPa (3.3 mmHg, 0.1 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.5 kPa (3.6 mmHg, 0.1 inHg)	0.5 kPa (3.7 mmHg, 0.1 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0.4 kPa (3.2 mmHg, 0.1 inHg)	0.4 kPa (3.3 mmHg, 0.1 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.5 kPa (3.6 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 + 14000 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 judgement or cancel the diagnosis according to the value of P2.

Normality Judgement
Judge as OK when the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Advanced OK judgement 1	
Mode D time	≥ 0 ms + 20000 ms
Tank internal pressure	≤ Value of Map 6
Advanced OK judgement 2	
Mode D time	≥ 0 ms + 200000 ms
P2	≤ Value of Map 7

Map6

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

Map7

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 Judgement**

Judge as NG when the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
P1	< Value of Map 8

Map 8 Malfunction Criteria limit for evaporation diagnosis

Time (evpdset) vs. Fuel level	0 ms	50000 ms	65000 ms	120000 ms	150000 ms	200000 ms
0 ℓ (0 US gal, 0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.2 kPa (1.4 mmHg, 0.1 inHg)	0.2 kPa (1.84 mmHg, 0.1 inHg)	0.2 kPa (1.84 mmHg, 0.1 inHg)	0.2 kPa (1.84 mmHg, 0.1 inHg)	0.2 kPa (1.84 mmHg, 0.1 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.2 kPa (1.4 mmHg, 0.1 inHg)	0.2 kPa (1.84 mmHg, 0.1 inHg)	0.2 kPa (1.84 mmHg, 0.1 inHg)	0.2 kPa (1.84 mmHg, 0.1 inHg)	0.2 kPa (1.84 mmHg, 0.1 inHg)
20 ℓ (5.28 US gal, 4.4 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.2 kPa (1.54 mmHg, 0.1 inHg)	0.2 kPa (1.76 mmHg, 0.1 inHg)	0.2 kPa (1.76 mmHg, 0.1 inHg)	0.2 kPa (1.76 mmHg, 0.1 inHg)	0.2 kPa (1.76 mmHg, 0.1 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.2 kPa (1.68 mmHg, 0.1 inHg)	0.2 kPa (1.68 mmHg, 0.1 inHg)	0.2 kPa (1.68 mmHg, 0.1 inHg)	0.2 kPa (1.68 mmHg, 0.1 inHg)	0.2 kPa (1.68 mmHg, 0.1 inHg)
40 ℓ (10.57 US gal, 8.8 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.2 kPa (1.315 mmHg, 0.1 inHg)	0.2 kPa (1.315 mmHg, 0.1 inHg)	0.2 kPa (1.315 mmHg, 0.1 inHg)	0.2 kPa (1.315 mmHg, 0.1 inHg)	0.2 kPa (1.315 mmHg, 0.1 inHg)
50 ℓ (13.21 US gal, 11 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.95 mmHg, 0 inHg)	0.1 kPa (0.95 mmHg, 0 inHg)	0.1 kPa (0.95 mmHg, 0 inHg)	0.1 kPa (0.95 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.95 mmHg, 0 inHg)	0.1 kPa (0.95 mmHg, 0 inHg)	0.1 kPa (0.95 mmHg, 0 inHg)	0.1 kPa (0.95 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)

Time Needed for Diagnosis: Value of Map1+ Value of Map2 + 20000 ms + 0 + Value of Map2 + 0 ms + 200000 ms + Value of Map3 + 0 ms + 200000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgement**

Judge as OK when the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
P1	> Value of Map 9

Map 9 Malfunction Criteria limit for evaporation diagnosis

Time (evpdset) vs. Fuel level	0 ms	50000 ms	65000 ms	120000 ms	150000 ms	200000 ms
0 ℓ (0 US gal, 0 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.4 kPa (2.88 mmHg, 0.1 inHg)	0.4 kPa (3.28 mmHg, 0.1 inHg)	0.4 kPa (3.28 mmHg, 0.1 inHg)	0.4 kPa (3.28 mmHg, 0.1 inHg)	0.4 kPa (3.28 mmHg, 0.1 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.4 kPa (2.88 mmHg, 0.1 inHg)	0.4 kPa (3.28 mmHg, 0.1 inHg)	0.4 kPa (3.28 mmHg, 0.1 inHg)	0.4 kPa (3.28 mmHg, 0.1 inHg)	0.4 kPa (3.28 mmHg, 0.1 inHg)
20 ℓ (5.28 US gal, 4.4 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.4 kPa (2.91 mmHg, 0.1 inHg)	0.4 kPa (3.11 mmHg, 0.1 inHg)	0.4 kPa (3.11 mmHg, 0.1 inHg)	0.4 kPa (3.11 mmHg, 0.1 inHg)	0.4 kPa (3.11 mmHg, 0.1 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.4 kPa (2.93 mmHg, 0.1 inHg)	0.4 kPa (2.93 mmHg, 0.1 inHg)	0.4 kPa (2.93 mmHg, 0.1 inHg)	0.4 kPa (2.93 mmHg, 0.1 inHg)	0.4 kPa (2.93 mmHg, 0.1 inHg)
40 ℓ (10.57 US gal, 8.8 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.4 kPa (2.76 mmHg, 0.1 inHg)	0.4 kPa (2.76 mmHg, 0.1 inHg)	0.4 kPa (2.76 mmHg, 0.1 inHg)	0.4 kPa (2.76 mmHg, 0.1 inHg)	0.4 kPa (2.76 mmHg, 0.1 inHg)
50 ℓ (13.21 US gal, 11 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.3 kPa (2.58 mmHg, 0.1 inHg)	0.3 kPa (2.58 mmHg, 0.1 inHg)	0.3 kPa (2.58 mmHg, 0.1 inHg)	0.3 kPa (2.58 mmHg, 0.1 inHg)	0.2 kPa (1.3 mmHg, 0.1 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.3 kPa (2.58 mmHg, 0.1 inHg)	0.3 kPa (2.58 mmHg, 0.1 inHg)	0.3 kPa (2.58 mmHg, 0.1 inHg)	0.3 kPa (2.58 mmHg, 0.1 inHg)	0.2 kPa (1.3 mmHg, 0.1 inHg)

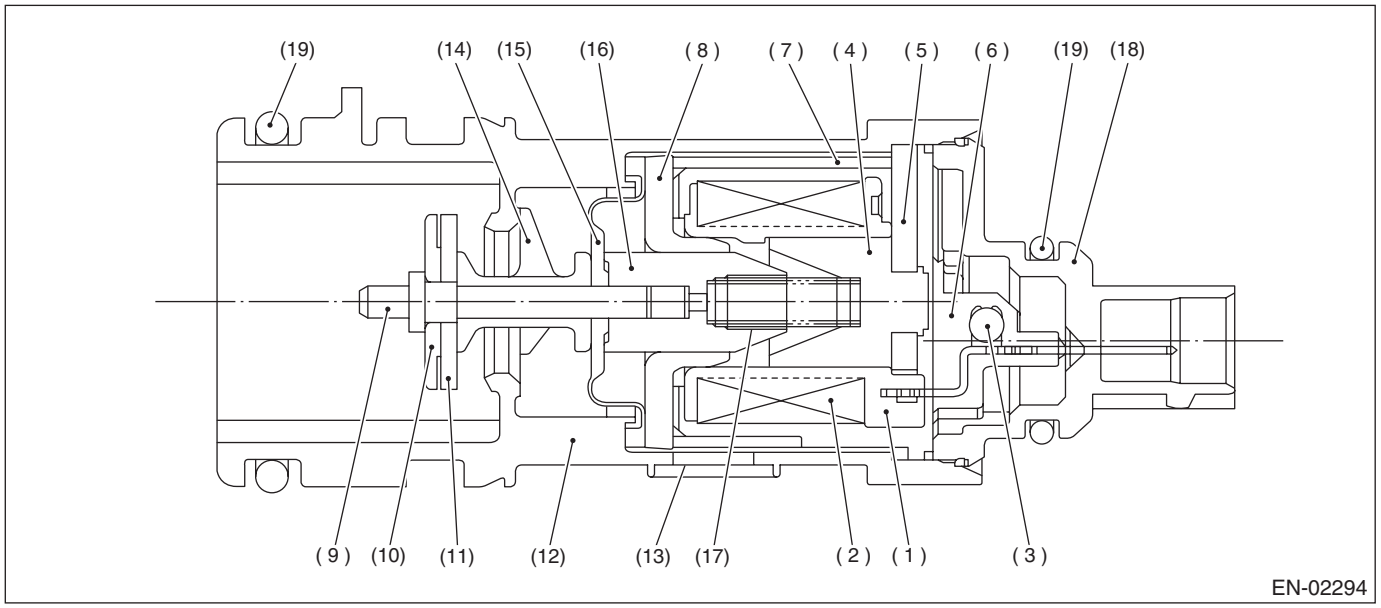
Time Needed for Diagnosis: Value of Map1+ Value of Map2 + 20000 ms + 0 + Value of Map2 + 0 ms + 200000 ms + Value of Map3 + 0 ms + 200000 ms

CE: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

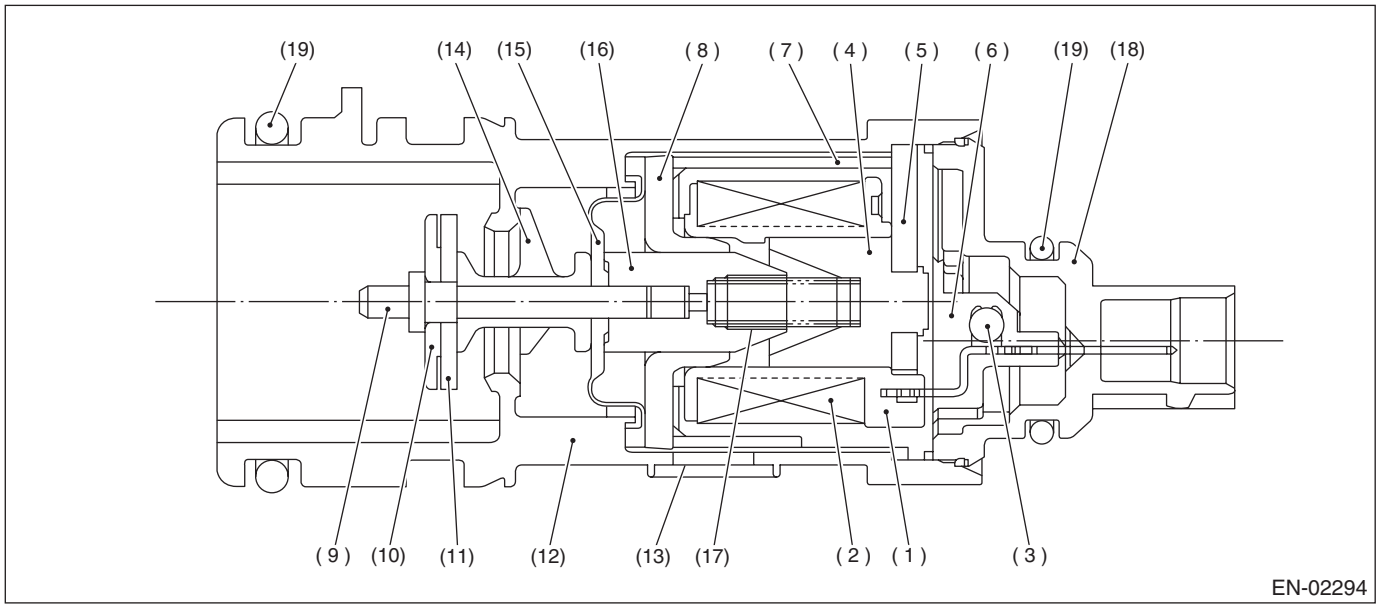
Time Needed for Diagnosis: Less than 1 second

CF: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

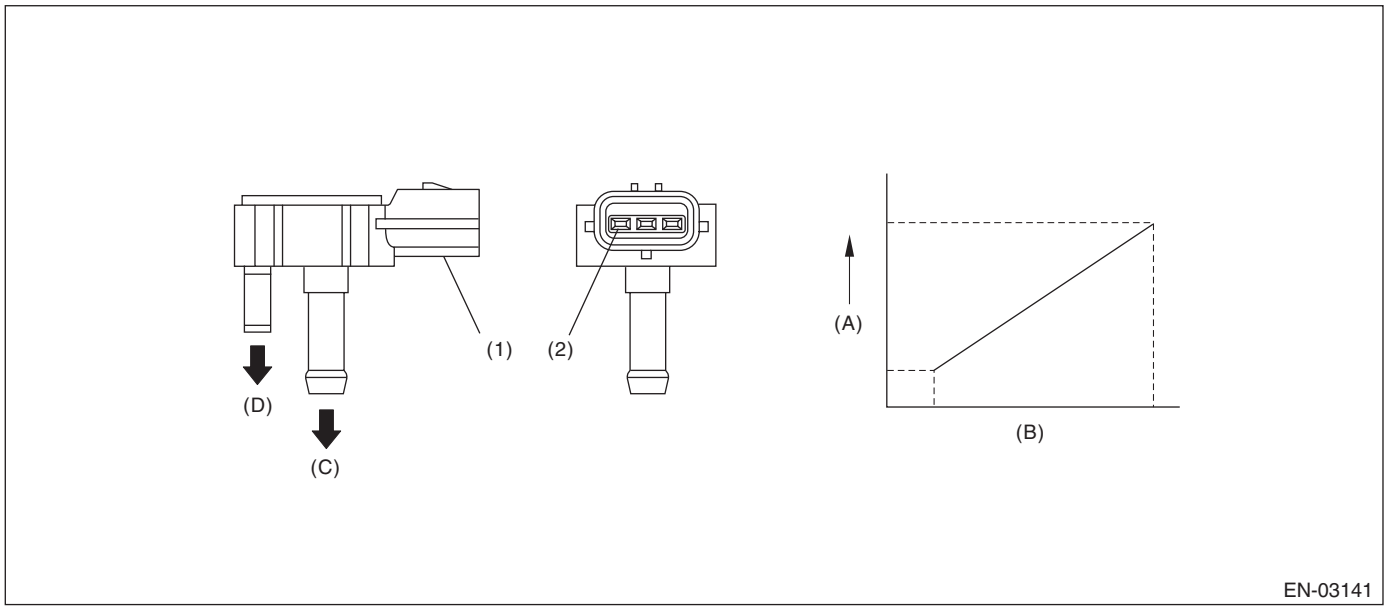
Time Needed for Diagnosis: Less than 1 second

CG: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 judgement with the Max. and Min. values for the fuel level in 60 s × 2. If a difference does not appear, extend the time (60 s × 3, 60 s × 4, 60 s × 5) and continue the judgement. 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Maximum – Minimum tank pressure	≥ 0 kPa (0.375 mmHg, 0 inHg)

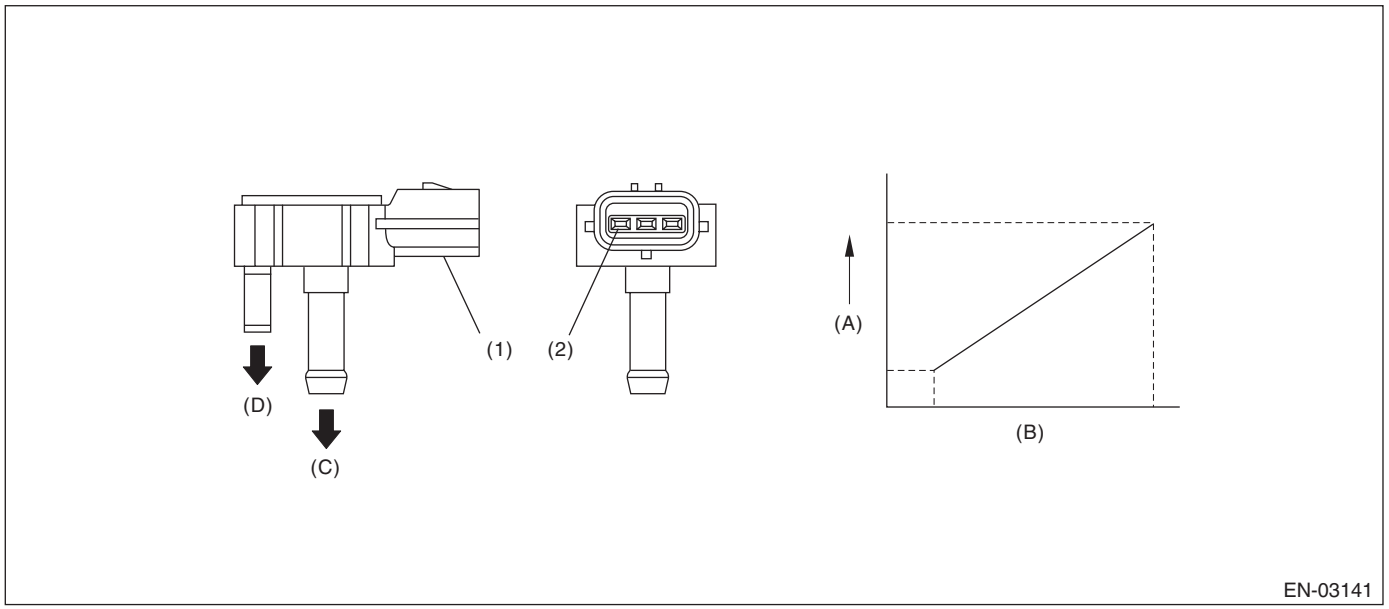
Time Needed for Diagnosis: Less than 1 second

CH: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ –7.4 kPa (–55.6 mmHg, –2.2 inHg)
Battery voltage	≥ 10.9 V

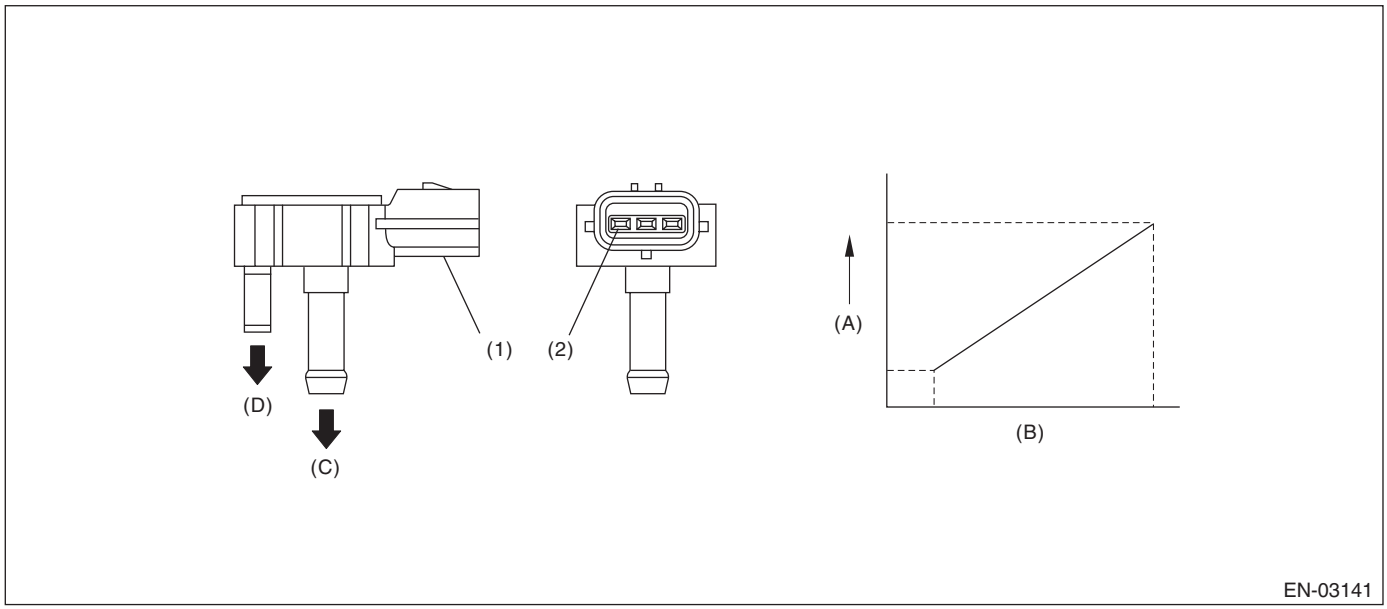
Time Needed for Diagnosis: Less than 1 second

CI: 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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.9 kPa (59.6 mmHg, 2.3 inHg)
Fuel temperature	< 35 °C (95 °F)
Barometric 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

CJ: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)-111, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

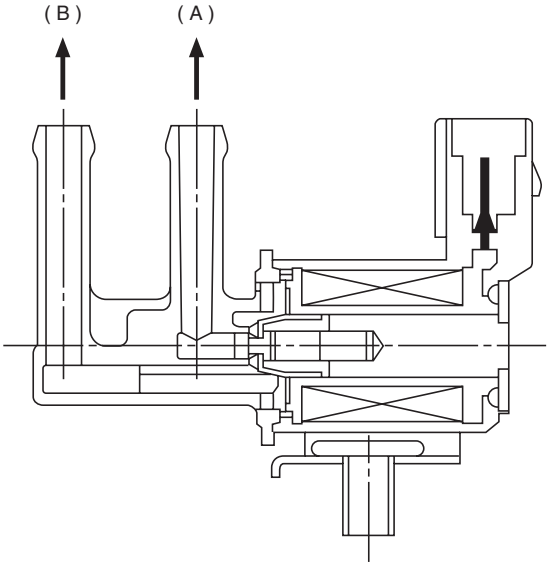
NOTE:
For the detection standard, refer to DTC P0442. <Ref. to GD(H6DO)-111, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CL: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

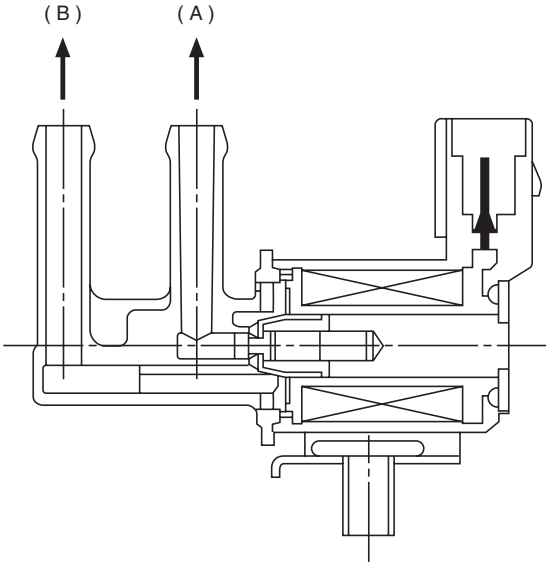
Time Needed for Diagnosis: Less than 1 second

CM: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

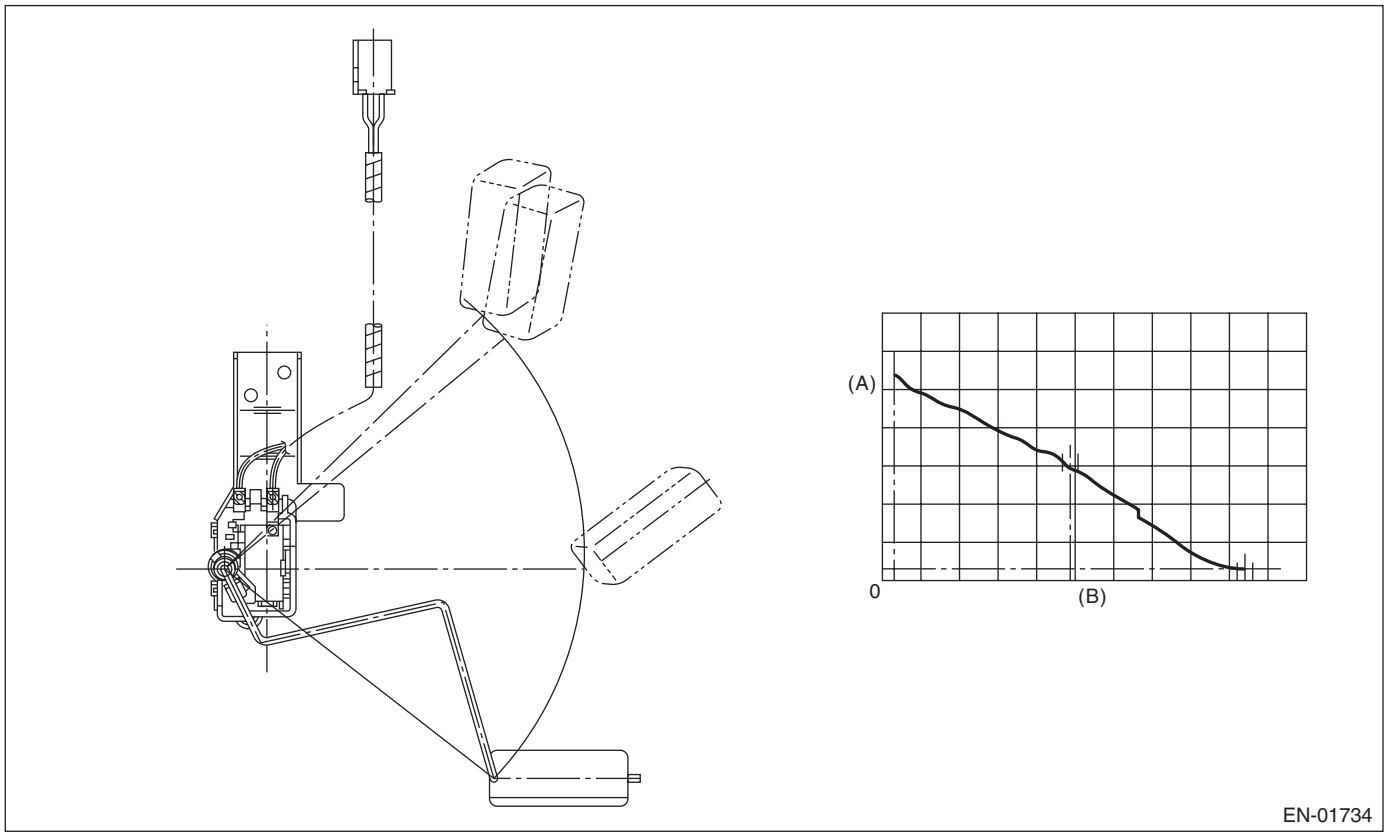
Time Needed for Diagnosis: Less than 1 second

CN: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 Judgement

Judge as NG when the following conditions are established.

Judgement 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 Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement 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

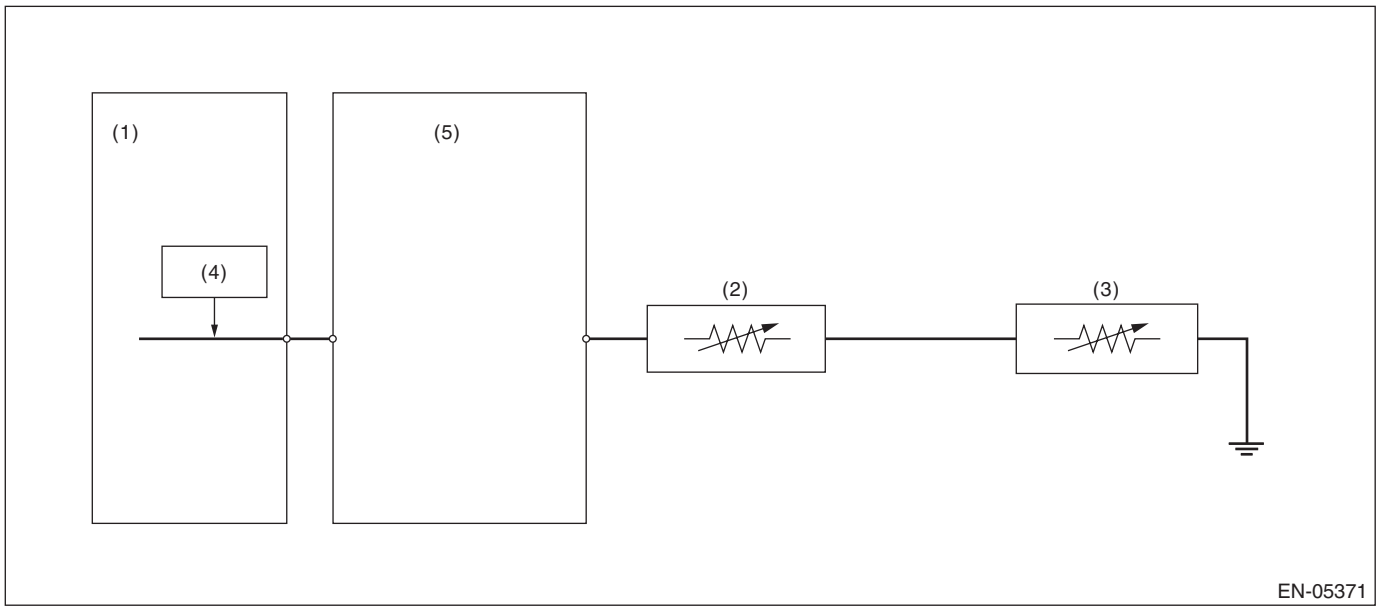
Time Needed for Diagnosis: Less than 1 second

CO: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	≥ 0.173 V

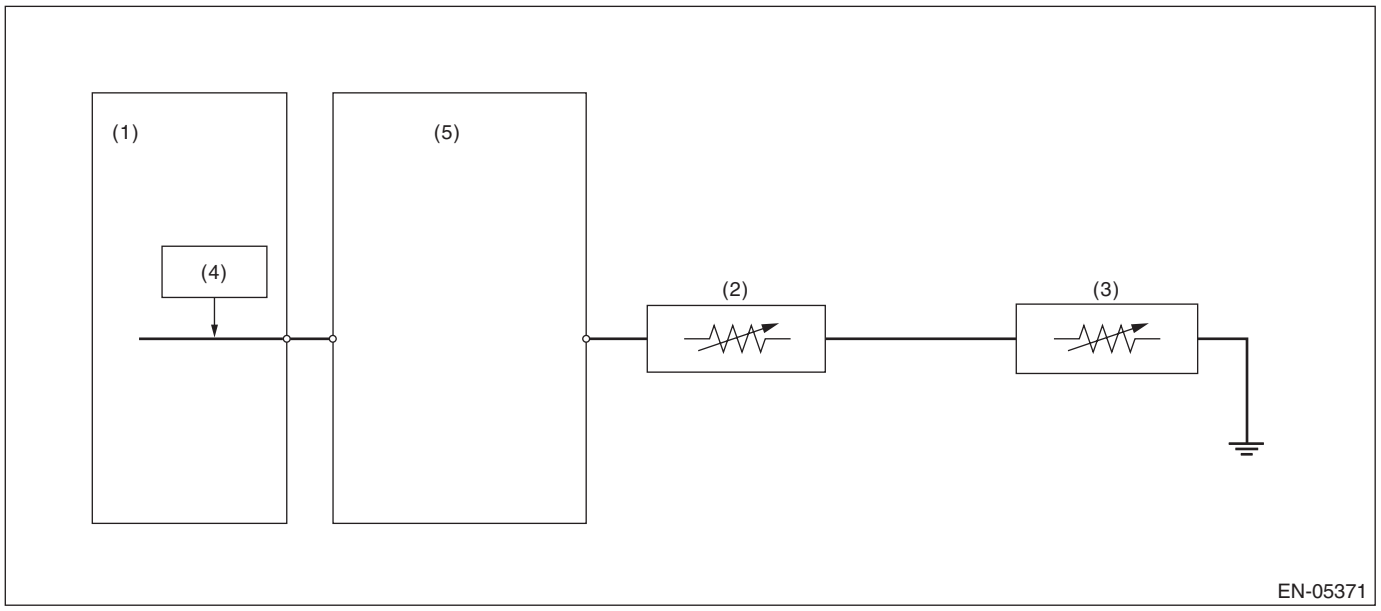
Time Needed for Diagnosis: Less than 1 second

CP: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

CQ: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

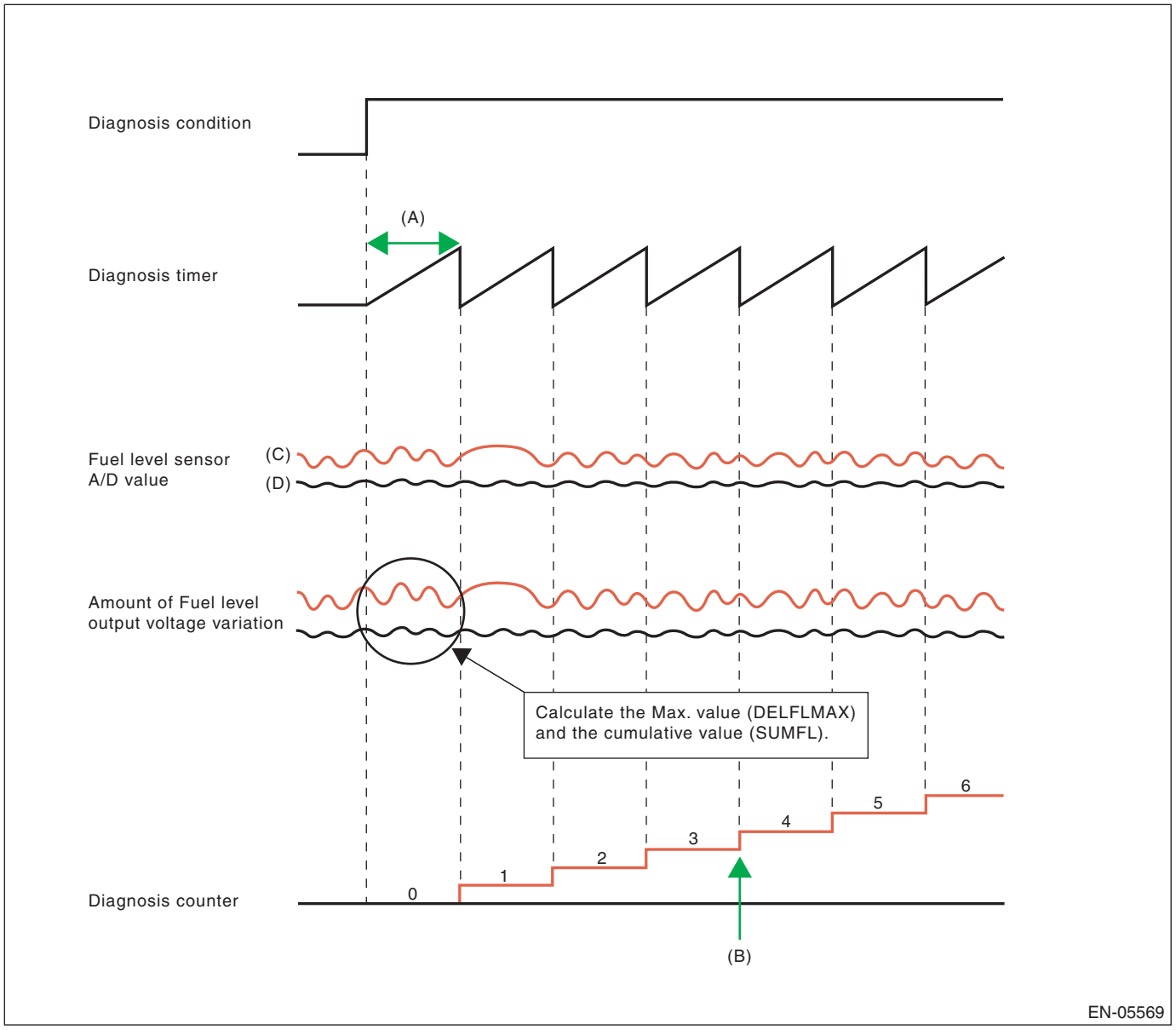
Malfunction Criteria	Threshold Value
Engine speed	≥ 500 rpm
Elapsed time after starting the engine	≥ 1 second
Battery voltage	≥ 10.9 V
Idle switch	ON
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal) and < 54.4 ℓ (14.37 US gal, 11.97 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	≥ 10000 ms

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)
(C) Malfunction
(D) Normal

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

CR:DTC P0500 VEHICLE SPEED SENSOR “A”

1. OUTLINE OF DIAGNOSIS

Judge as NG when outside of the judgement 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 engine starting	≥ 2000 ms

4. GENERAL DRIVING CYCLE

Always perform diagnosis more than 2000 ms after starting the engine.

5. DIAGNOSTIC METHOD

- **Abnormality Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

CS: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Actual engine speed — Targeted engine speed	≥ –100 rpm

Time Needed for Diagnosis: 10 s

CT: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	< 200 rpm

Time Needed for Diagnosis: 10 s

CU: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Starter OFF signal	Detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: Less than 1 second

CV: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.

CW:DTC P0600 SERIAL COMMUNICATION LINK

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.
When CAN communications is not possible, and CAN communications with TCM is not possible, judge as NG if data from the TCM is not normal.

2. COMPONENT DESCRIPTION

ECM and TCM 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 CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement 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 500 milliseconds

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

CX:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of microcomputer (RAM). Perform the zero clear operation to all normal RAM areas with the initial routine, and judge as NG when the sum of all added RAM after clearing is other than $0000.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Diagnosis with the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after turning ignition switch to ON.

4. DIAGNOSTIC METHOD

Judge as NG if the criteria below are met. Judge as OK and clear the NG if not established.

Judgement Value

Malfunction Criteria	Threshold Value
Result of sum of all RAM after performing the zero clear operation to all normal RAM areas	Not = 0

Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

CY: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 Judgement

Judge as NG when the continuous time of meeting the following conditions is 0.5 seconds or more.

Judgement Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard

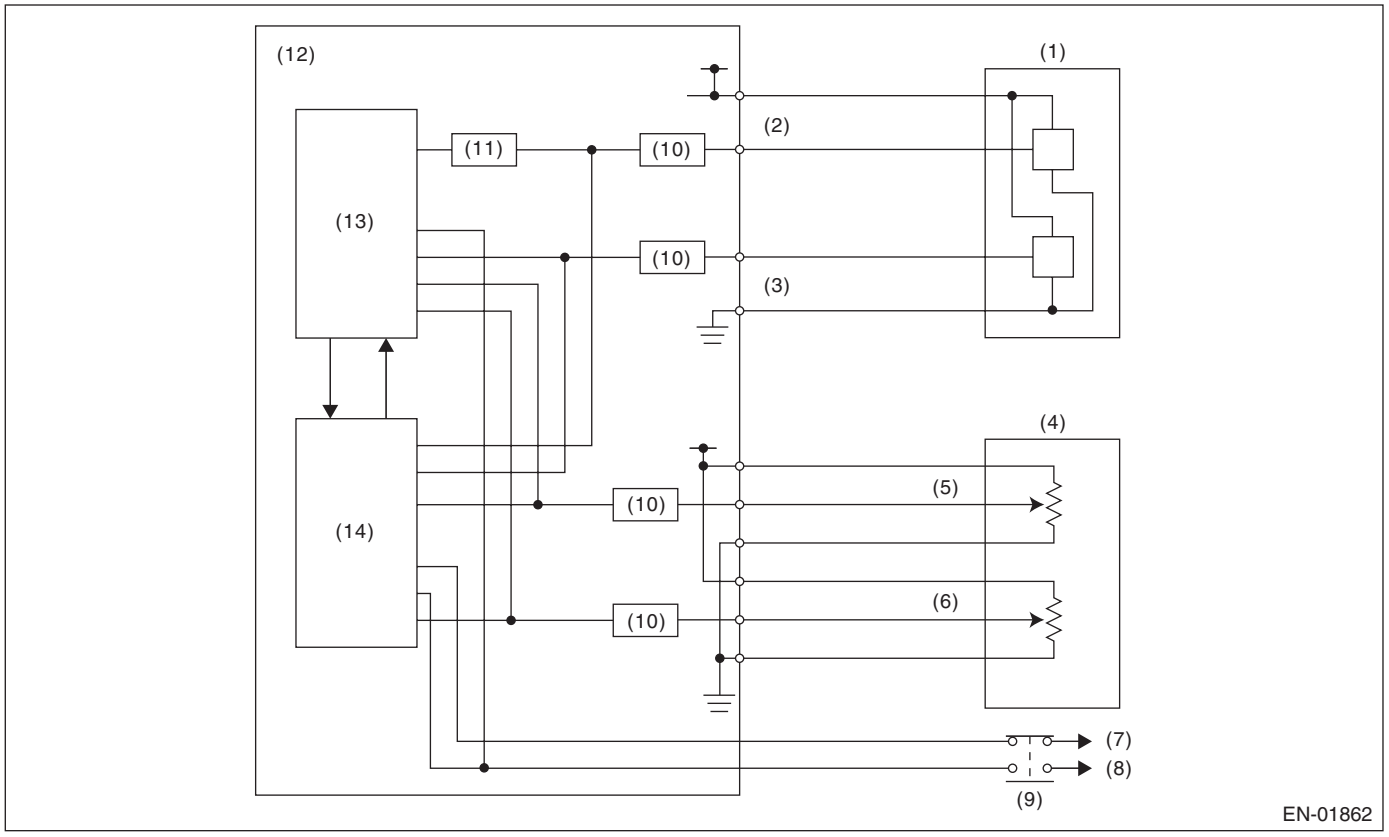
Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

CZ:DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when any one of the followings is established.
- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU ←→ sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from the main CPU is abnormal.

2. COMPONENT DESCRIPTION



(1)	Throttle position sensor	(6)	Accelerator pedal position sensor 2	(11)	Amplifier circuit
(2)	Throttle position sensor 1	(7)	Battery	(12)	Engine control module (ECM)
(3)	Throttle position sensor 2	(8)	Stop light	(13)	Sub CPU
(4)	Accelerator pedal position sensor	(9)	Brake switch	(14)	Main CPU
(5)	Accelerator pedal position sensor 1	(10)	I/F circuit		

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Ignition switch	ON
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	
(6) Brake switch (only with cruise control)	ON
(7) None	—
(8) Cruise control	OFF

4. GENERAL DRIVING CYCLE

(1) — (4): Always perform the diagnosis continuously.
(5): Always perform the diagnosis continuously when idling.
(6): Perform the diagnosis when the brake pedal is depressed.
(7): Always perform the diagnosis continuously.
(8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgement Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU reading value of the throttle position sensor signal	Within 0.085 V
(2) Difference of CPU read value of the accelerator pedal position sensor signal	Within 0.047 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) |Throttle position sensor 1 opening angle — (Throttle position sensor 1 opening angle after passing amplifier) 1/4|	< 3°
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched

Time Needed for Diagnosis:

1. 250 milliseconds
2. 250 milliseconds
3. 200 milliseconds
4. 200 milliseconds
5. 24 milliseconds
6. 250 milliseconds
7. 200 milliseconds

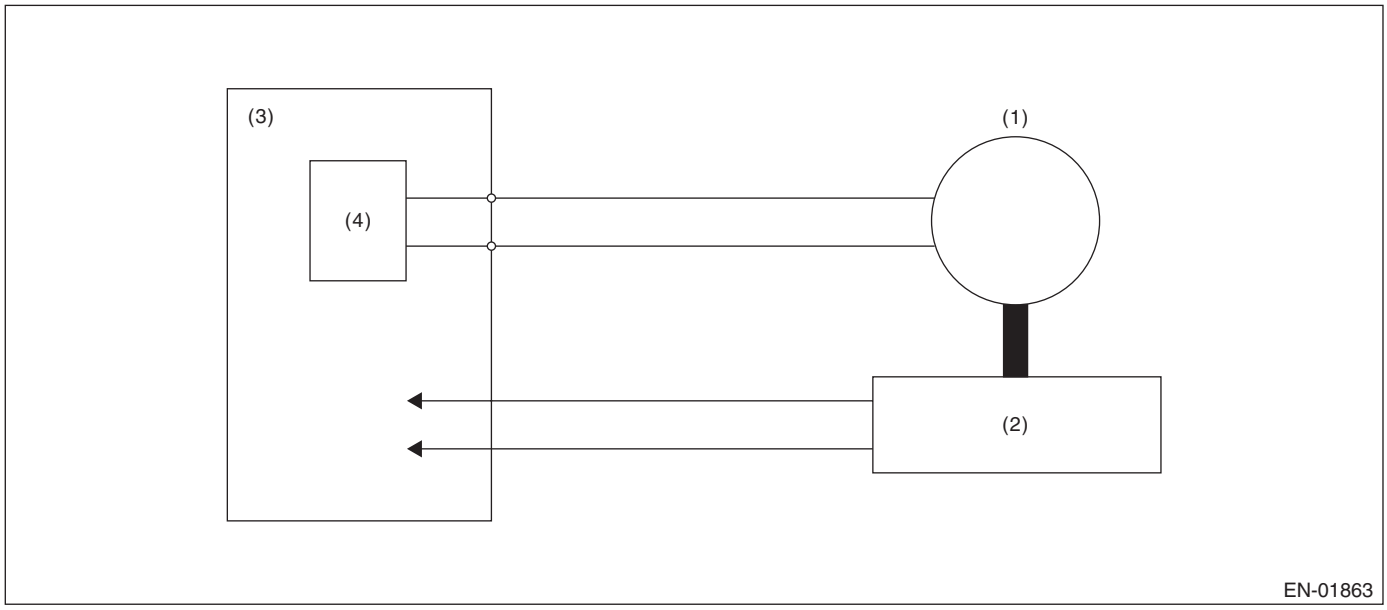
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

DA: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.

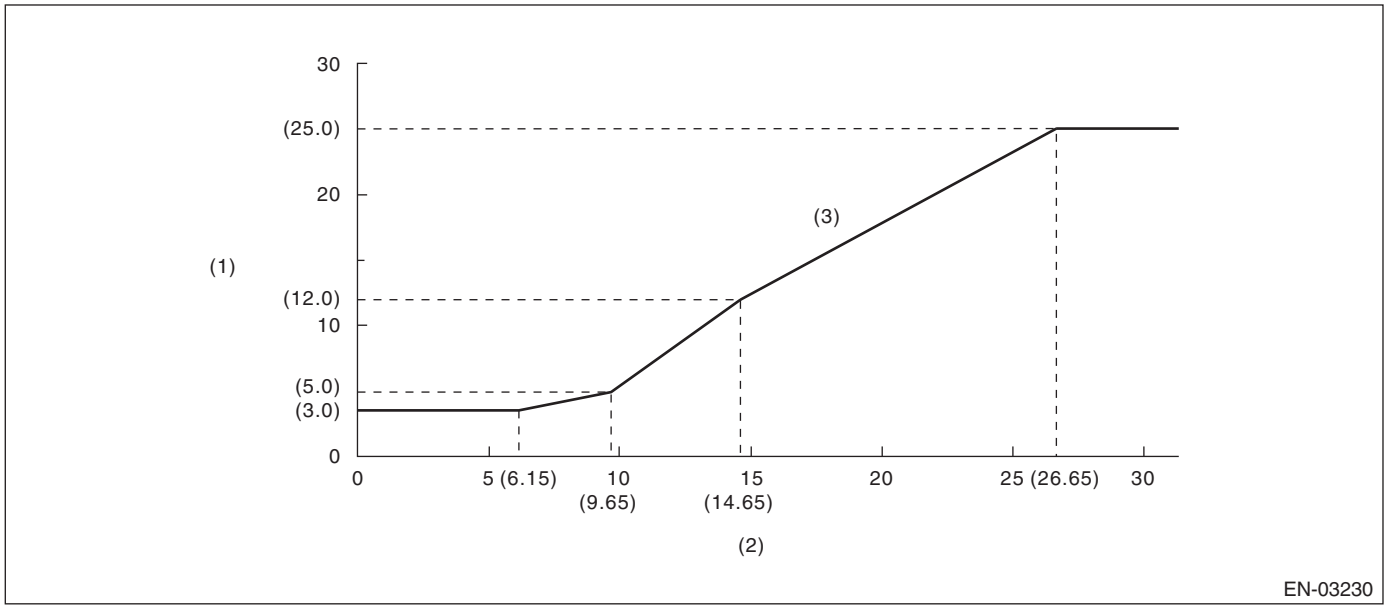
Judgement Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	3° or less
Output duty to drive circuit	95% or less

Time Needed for Diagnosis:

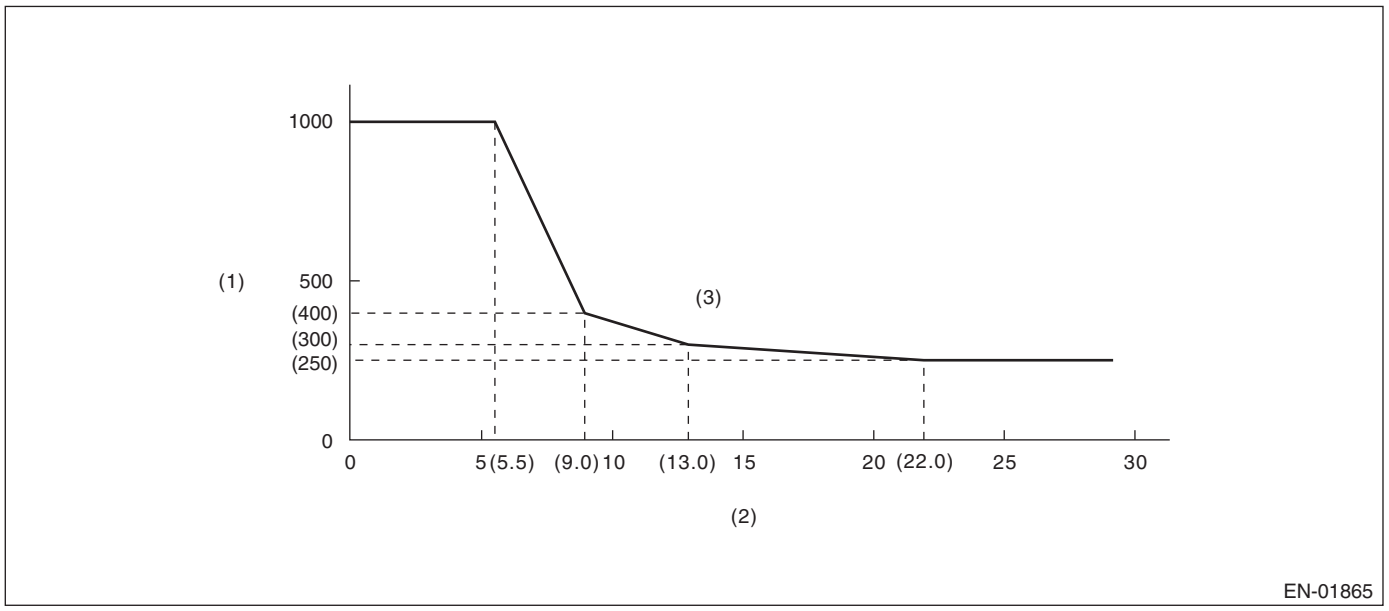
- Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
- Output duty to drive circuit: 2000 milliseconds

Details of Judgement Value



(1) Difference between target opening angle and actual opening angle (°)
(2) Target throttle opening angle (°)
(3) NG area

Details of Judgement time (The actual opening angle ≤ target opening angle is always 1000 milliseconds)



(1) Judgement time (milliseconds)
(2) Throttle position sensor 1 opening angle
(3) NG area

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

DB: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
MIL lighting request from TCM	None

Time Needed for Diagnosis: Less than 1 second

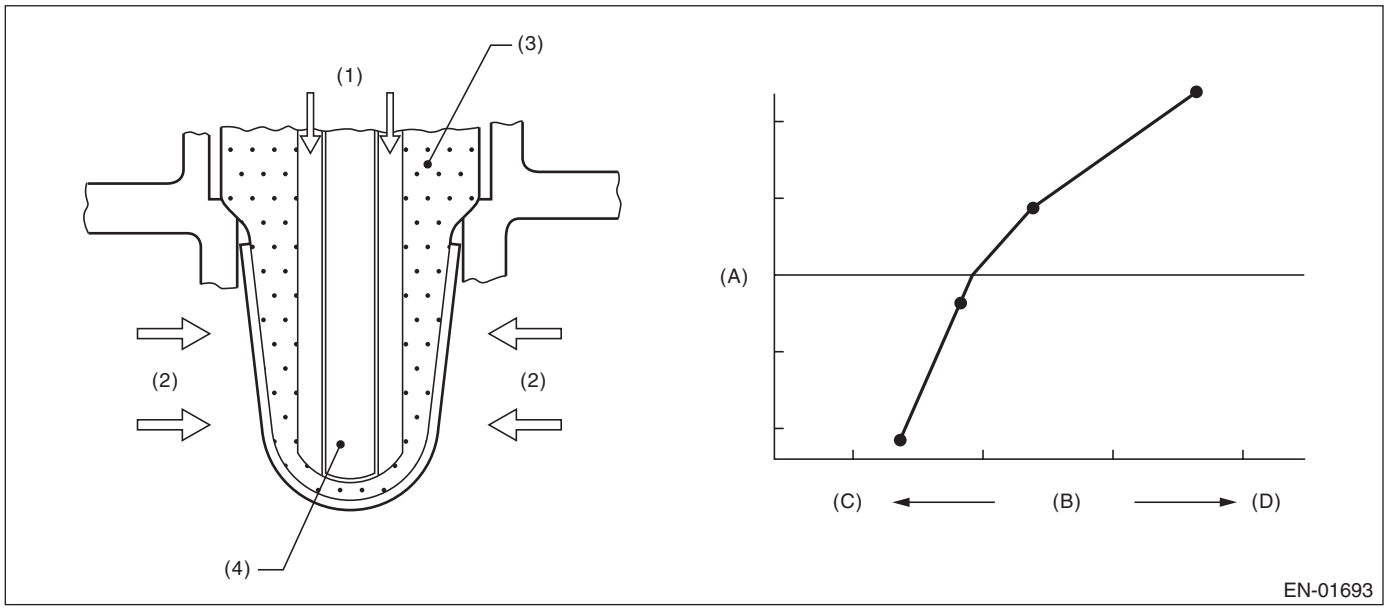
DC:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)

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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
λ value	≥ 0.85

Time Needed for Diagnosis: Less than 1 second

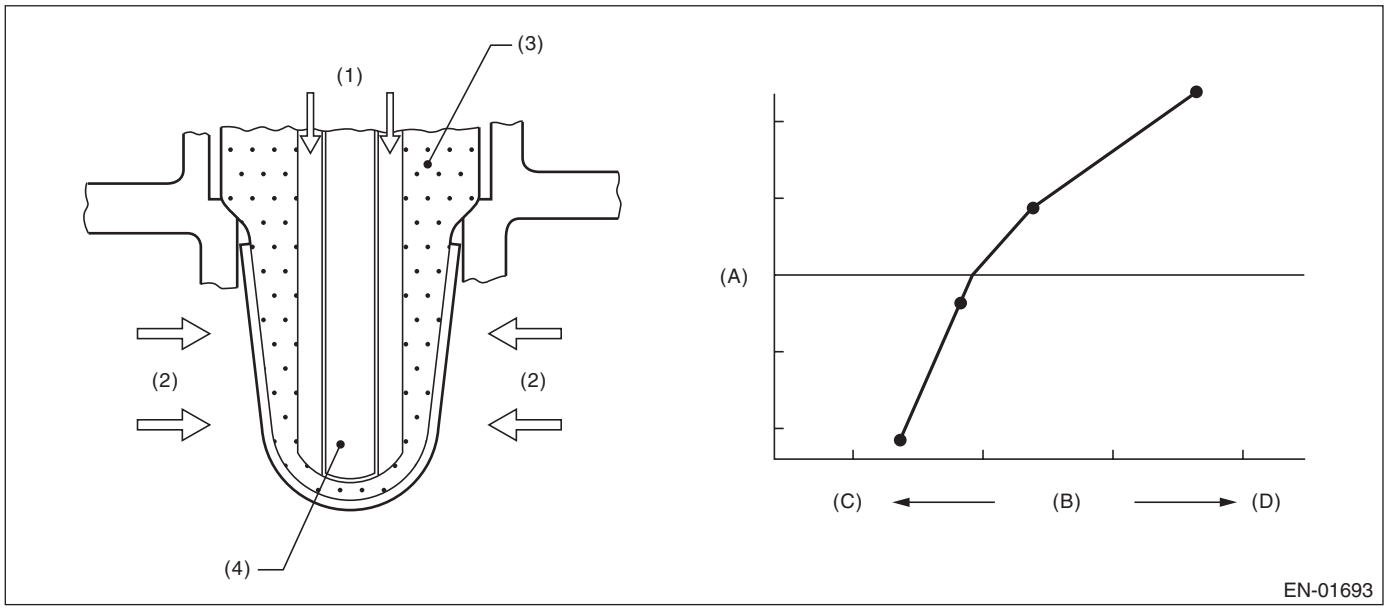
DD:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)

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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
λ value	≤ 1.15

Time Needed for Diagnosis: Less than 1 second

DE: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)-164, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DF:DTC P1155 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

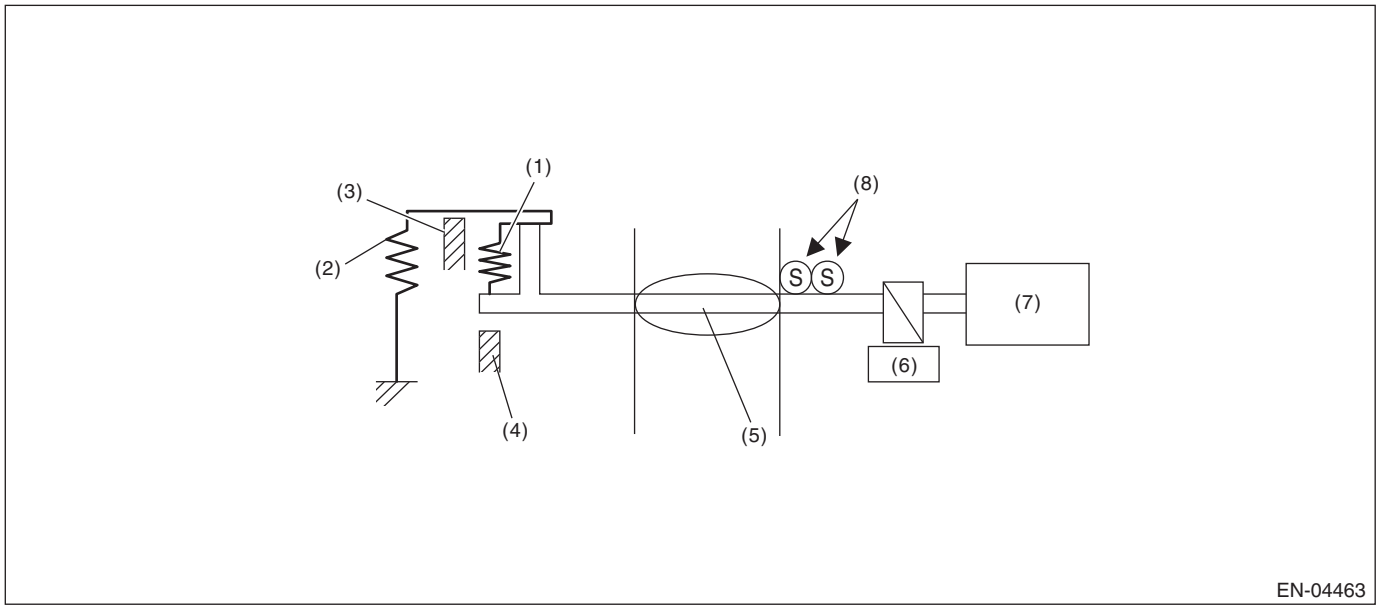
NOTE:
For the detection standard, refer to DTC P1153. <Ref. to GD(H6DO)-166, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DG: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 Judgement**

Judge as NG when the following conditions are established.

Judgement 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 Judgement**

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	≥ 2 °

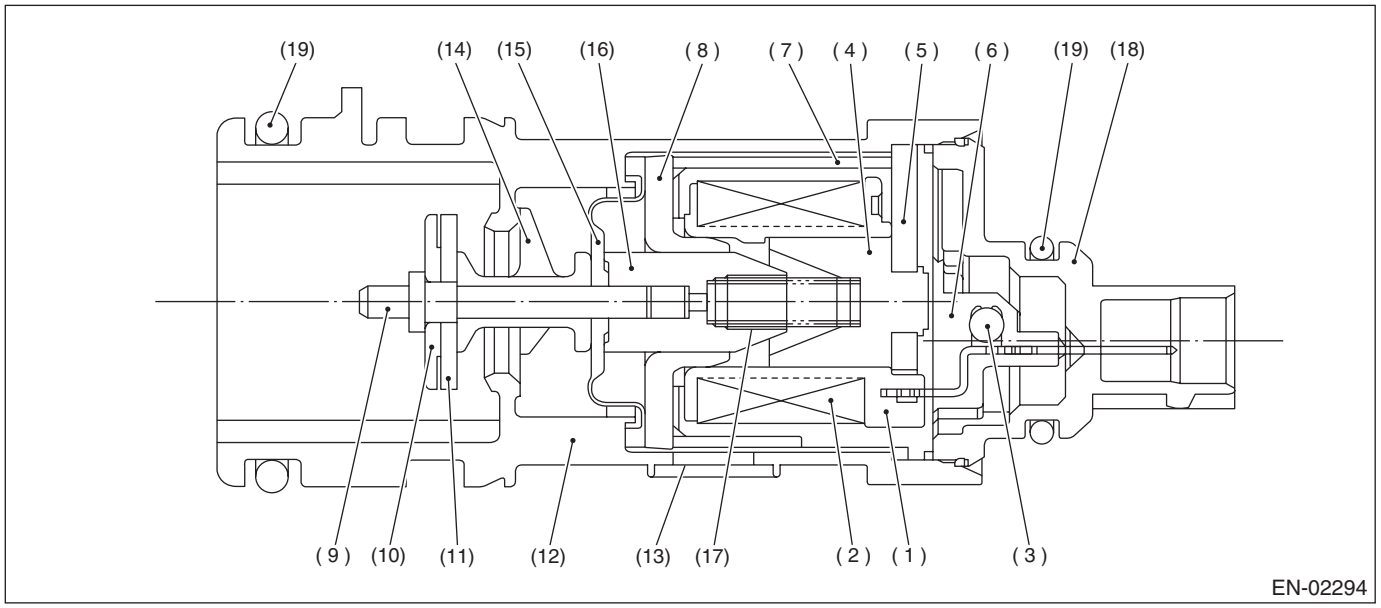
Time Needed for Diagnosis: 3400 ms

DH: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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)

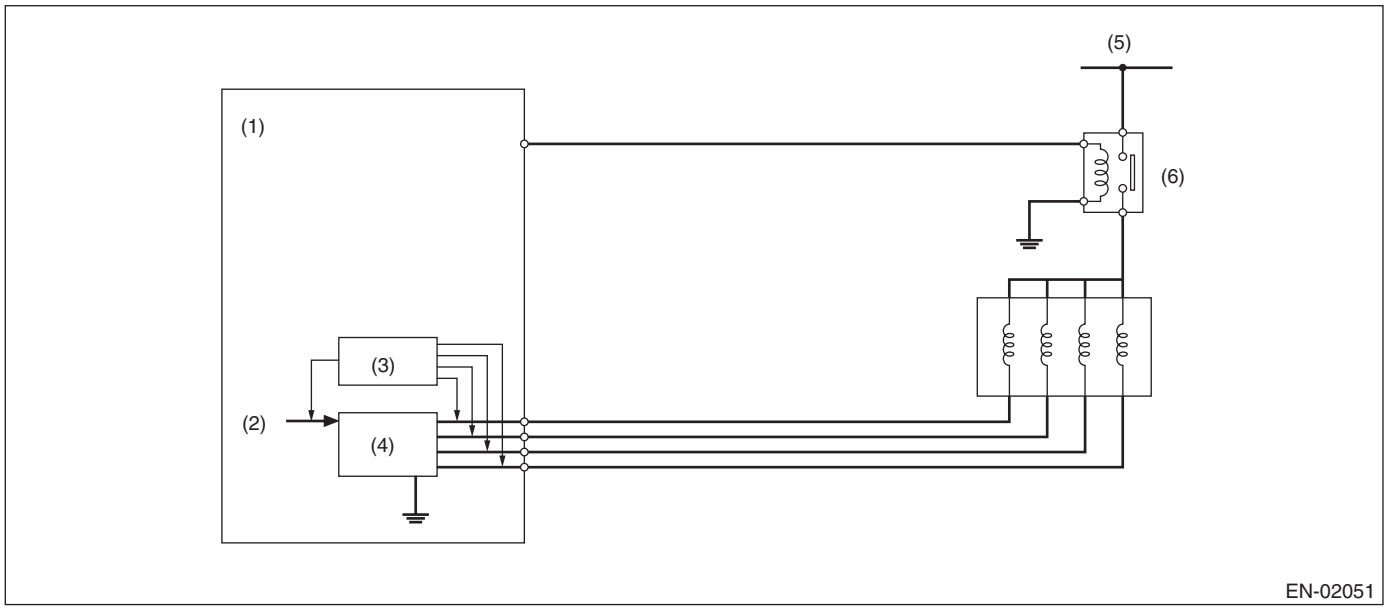
Time Needed for Diagnosis: Less than 1 second

DI: 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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level
Terminal voltage level when EGR operates	High level

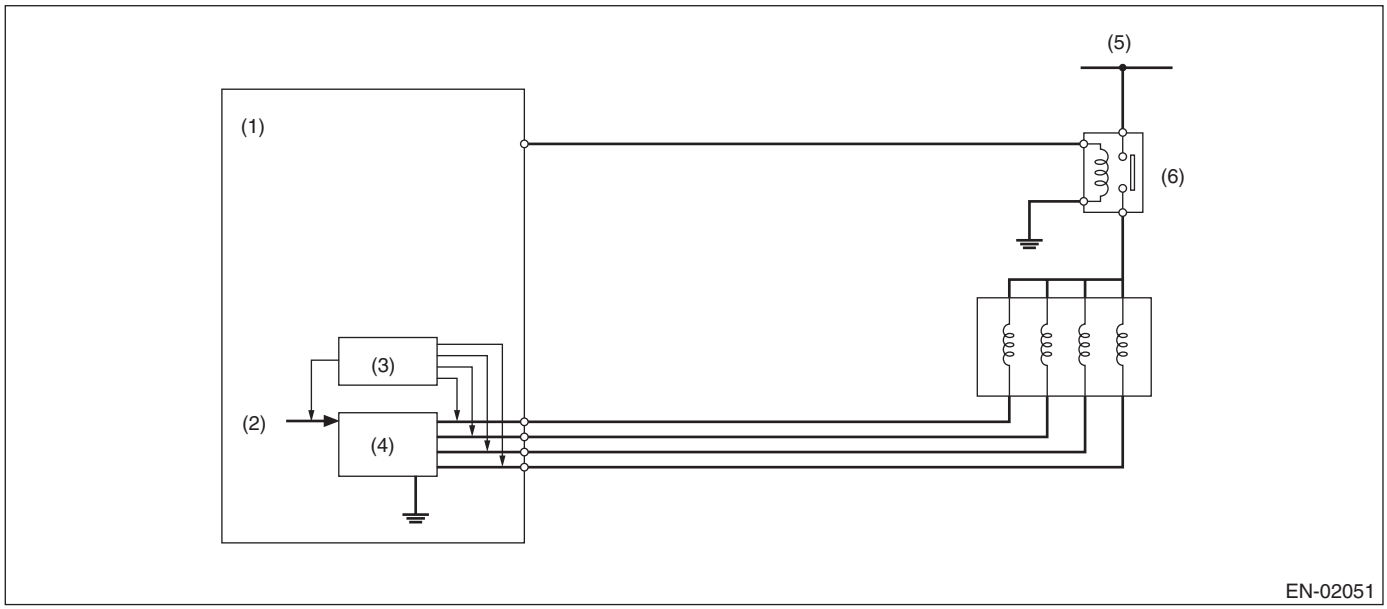
Time Needed for Diagnosis: 256 ms

DJ: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal or Terminal voltage level when EGR operates	High level High level

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

DK: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)-173, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DL: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)-175, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DM: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)-173, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DN: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)-175, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DO: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)-173, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DP: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)-175, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DQ: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

DR:DTC P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DS:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DT: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)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DU:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DV:DTC P1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DW:DTC P1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DX:DTC P1578 METER FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DY: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 and idle speed diagnosis and if either 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.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Atmosphere 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
Time after starting	= 14 seconds

3. GENERAL DRIVING CYCLE

Perform the diagnosis at cold start.

4. DIAGNOSTIC METHOD

• Exhaust gas temperature diagnosis

Abnormality Judgement

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.

Judgement Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	< Value from Map

Map

Coolant temperature after starting the engine	–40 °C (–40 °F)	–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)
Threshold Value	170 °C (338 °F)	170 °C (338 °F)	170 °C (338 °F)	170 °C (338 °F)	170 °C (338 °F)	170 °C (338 °F)	170 °C (338 °F)	155 °C (311 °F)	150 °C (302 °F)	150 °C (302 °F)

Time Needed for Diagnosis: 14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	≥ Value from Map

Time Needed for Diagnosis: Less than 1 second

- **Idle speed diagnosis**

Abnormality Judgement
Judge as NG when the following conditions are established after the predetermined time.

Judgement 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 Judgement
Judge as OK and clear the NG if the following conditions are established.

Judgement 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

DZ: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

EA: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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

EB: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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 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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement 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 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.>

EE: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.>

EF: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.>

EG:DTC P2095 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

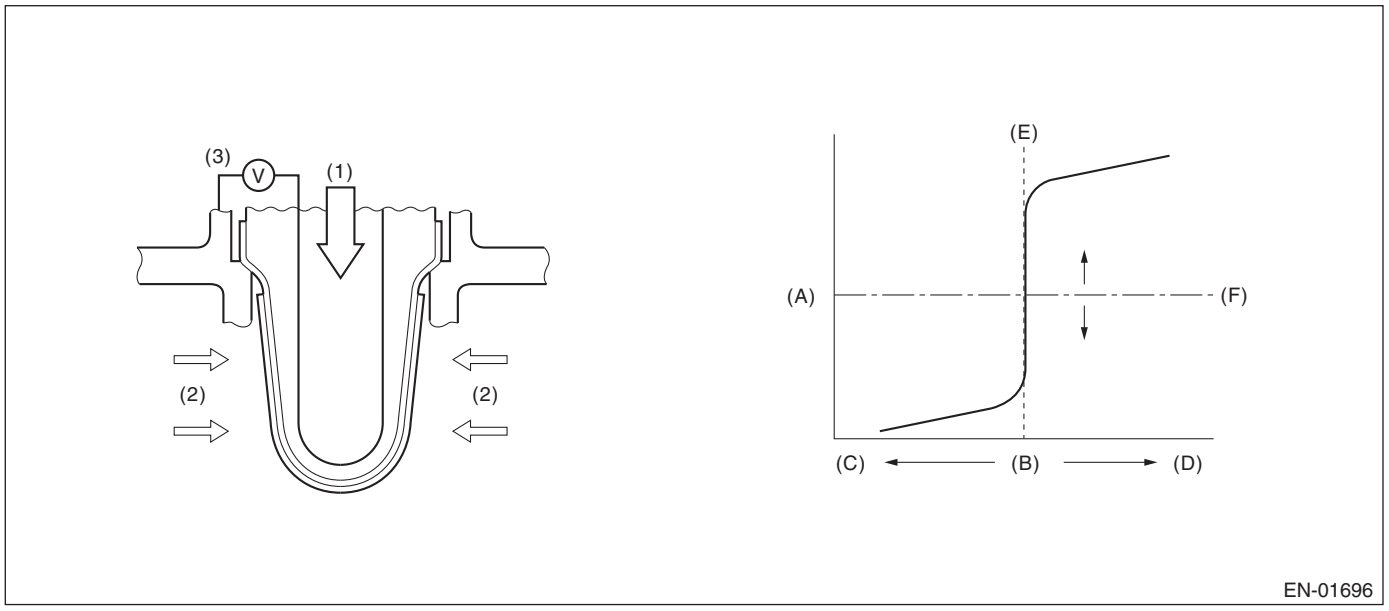
NOTE:
For the detection standard, refer to DTC P2091. <Ref. to GD(H6DO)-185, DTC P2091 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EH: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ –0.035 + 0

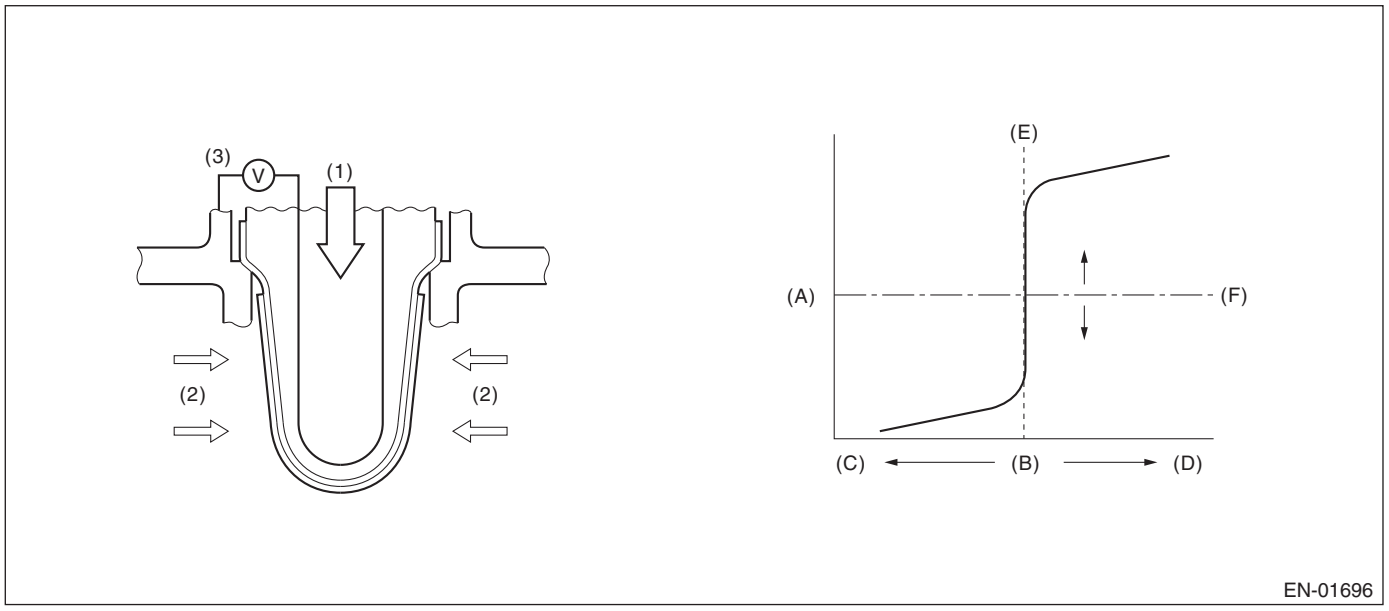
Time Needed for Diagnosis: 5 s

EI: 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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	< 0.031 + 0

Time Needed for Diagnosis: 5 s

EJ: 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.>

EK: DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2

1. OUTLINE OF DIAGNOSIS

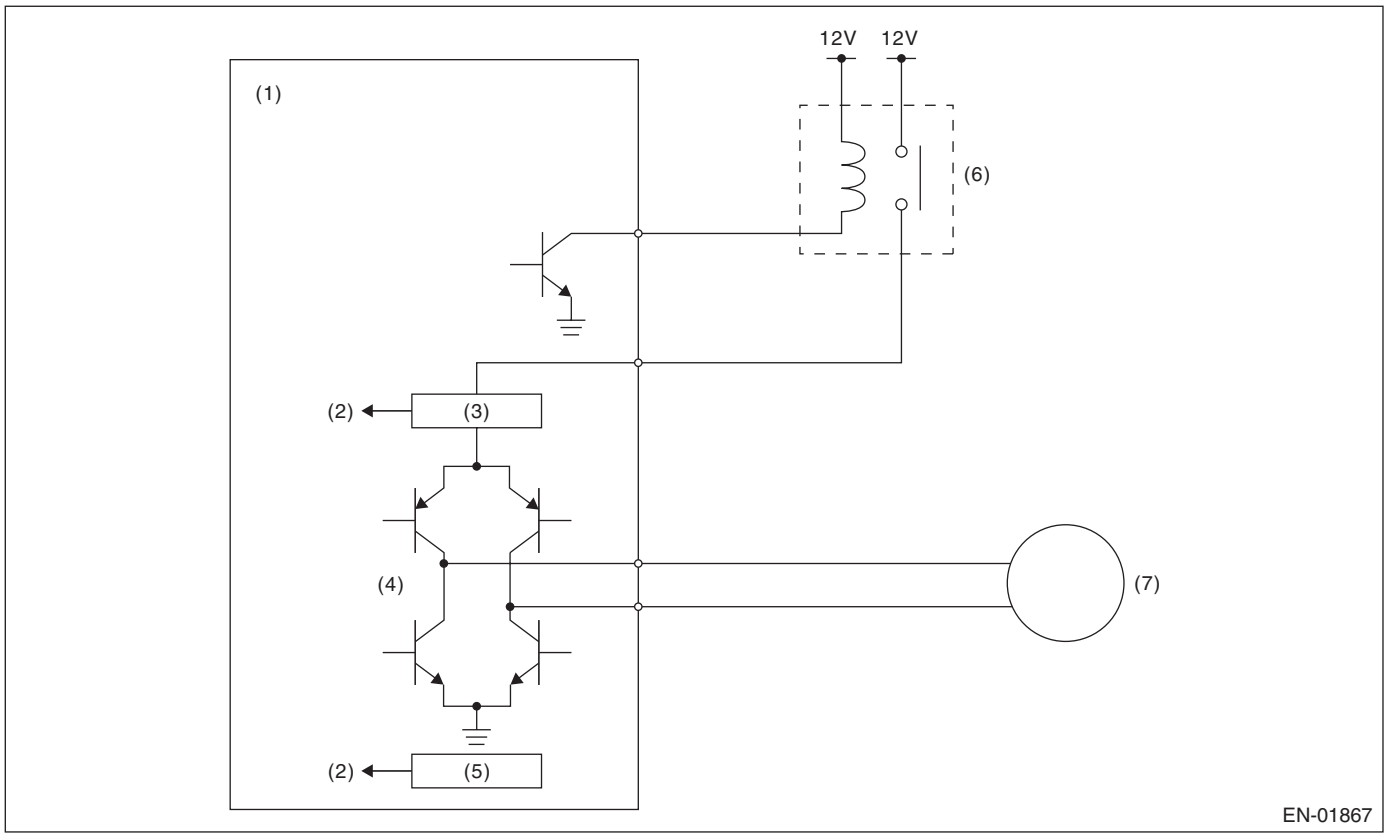
NOTE:
For the detection standard, refer to DTC P2097. <Ref. to GD(H6DO)-189, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EL: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

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgement Value

Malfunction Criteria	Threshold Value
Motor current	≤ 8 A
Drive circuit inner temperature	≤ 175°C (347°F)

Time Needed for Diagnosis:

- 500 milliseconds (For NG)
- 2000 milliseconds (For OK)

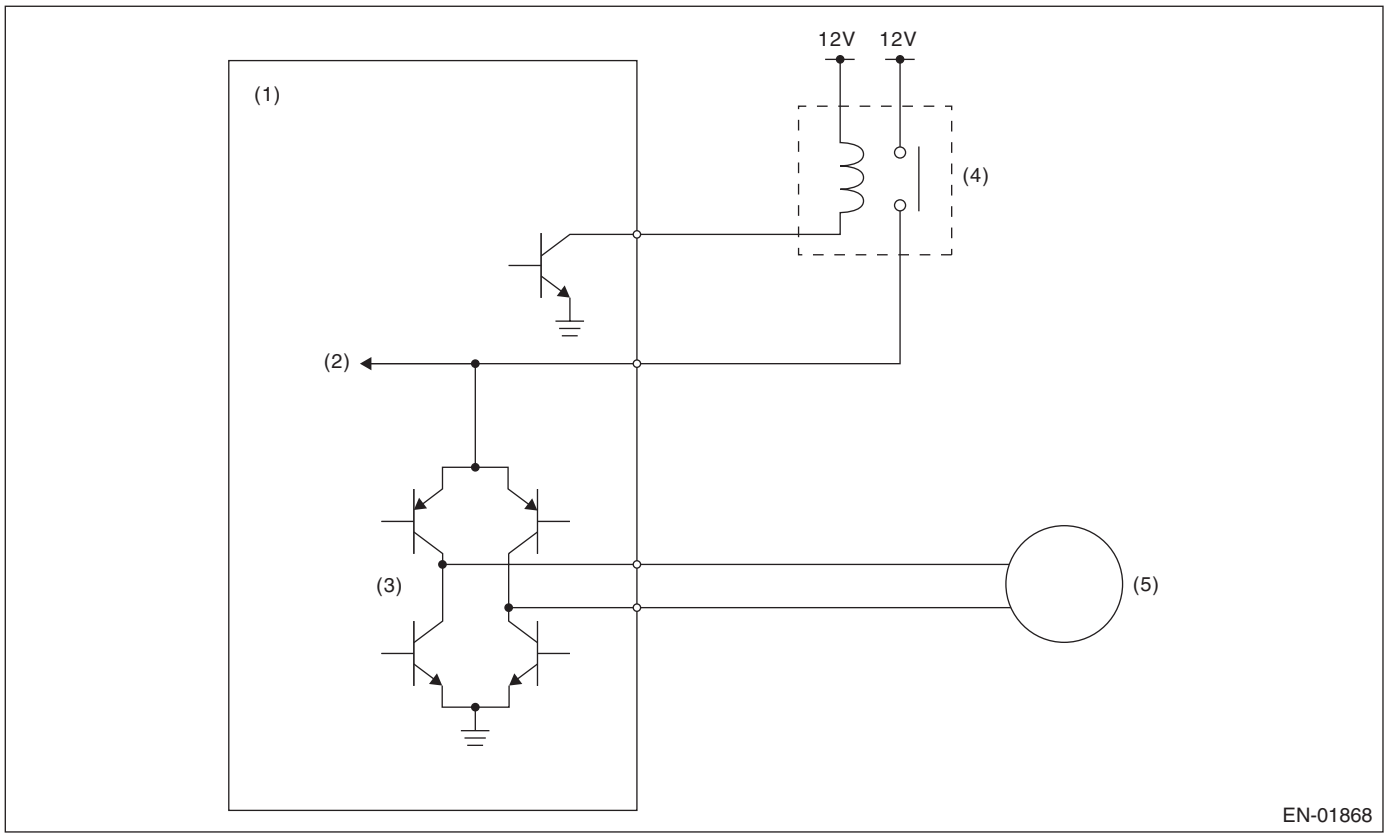
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

EM: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
Electronic throttle control relay output	ON

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.

Judgement Value

Malfunction Criteria	Threshold Value
Motor power voltage	≥ 5 V

Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

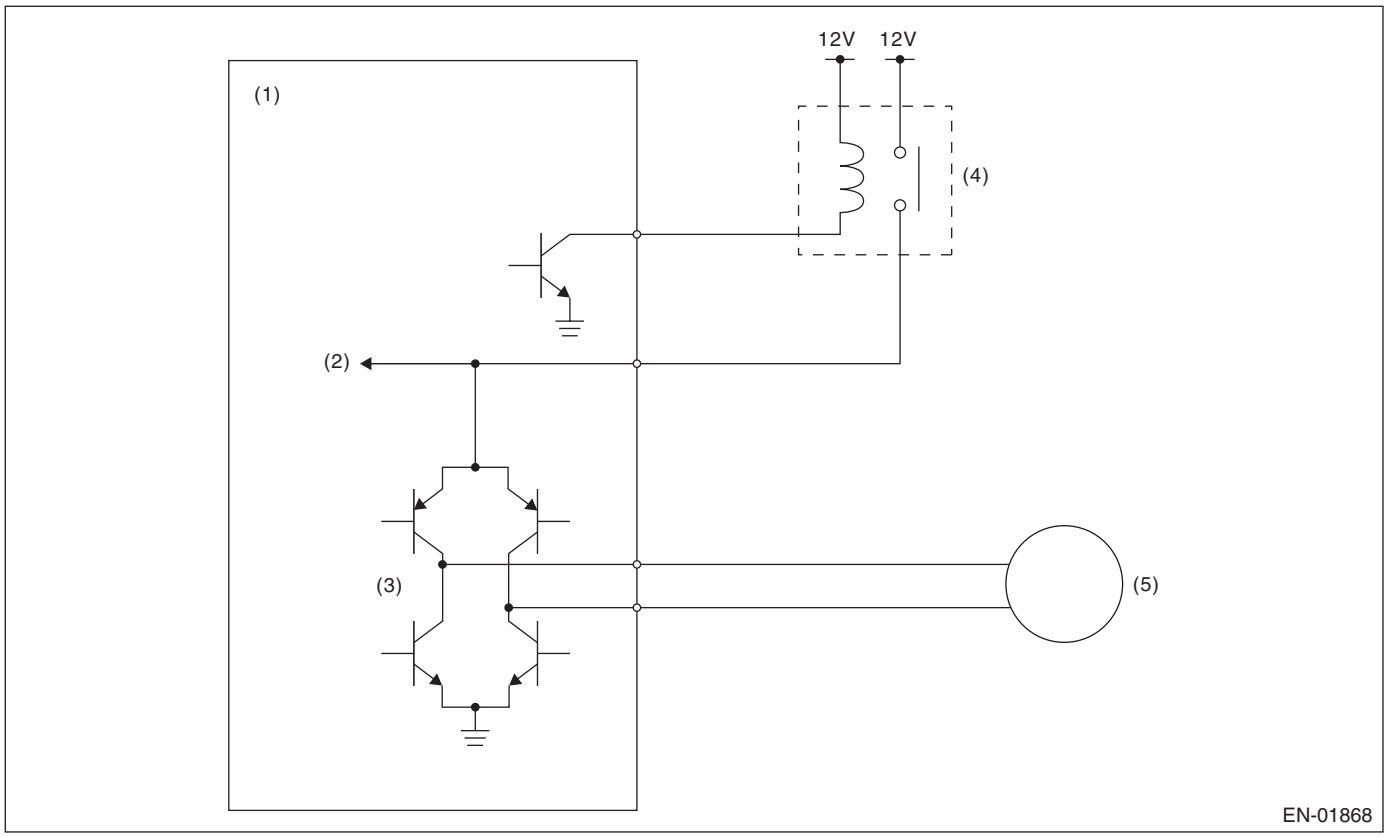
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

EN: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
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

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgement Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

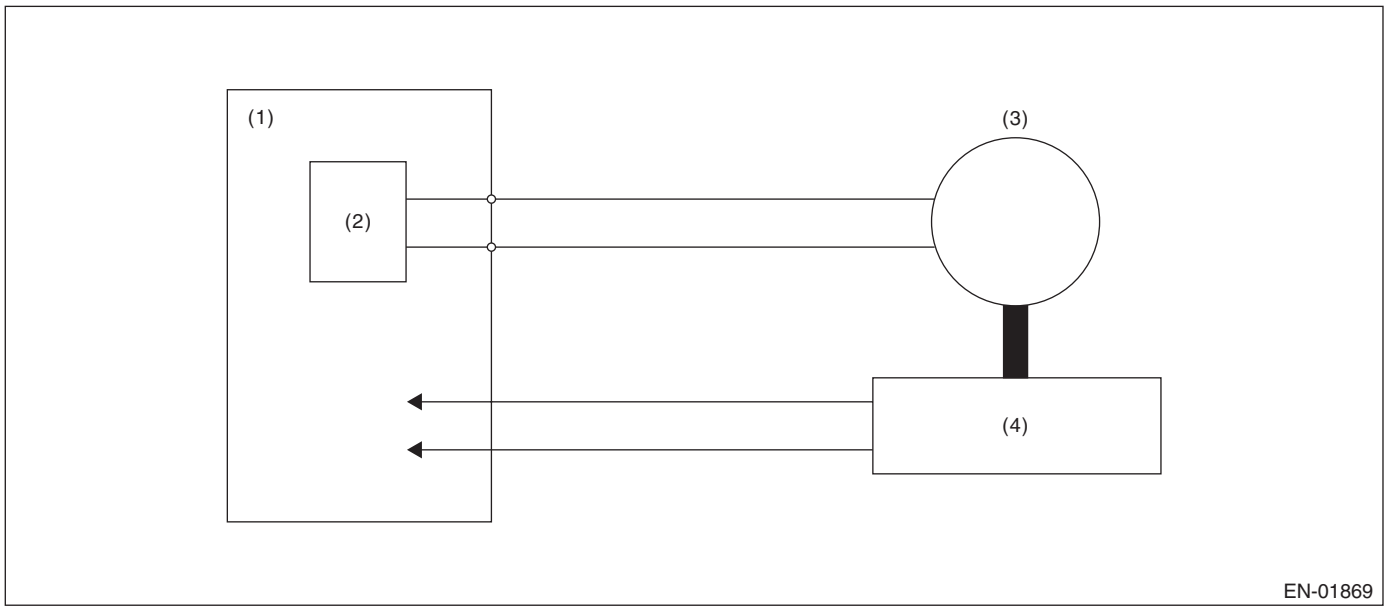
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

EO: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

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgement value 1

Malfunction Criteria	Threshold Value
Main throttle full closed point learning position when IG is ON	10.127° — 19.872°
Main throttle full closed point learning position when IG is OFF	10.127° — 19.872°

Time Needed for Diagnosis: 8 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Judgement value 2

Malfunction Criteria	Threshold Value
Throttle opening angle when the IG is ON – Throttle full closed position	≥ 1.683°

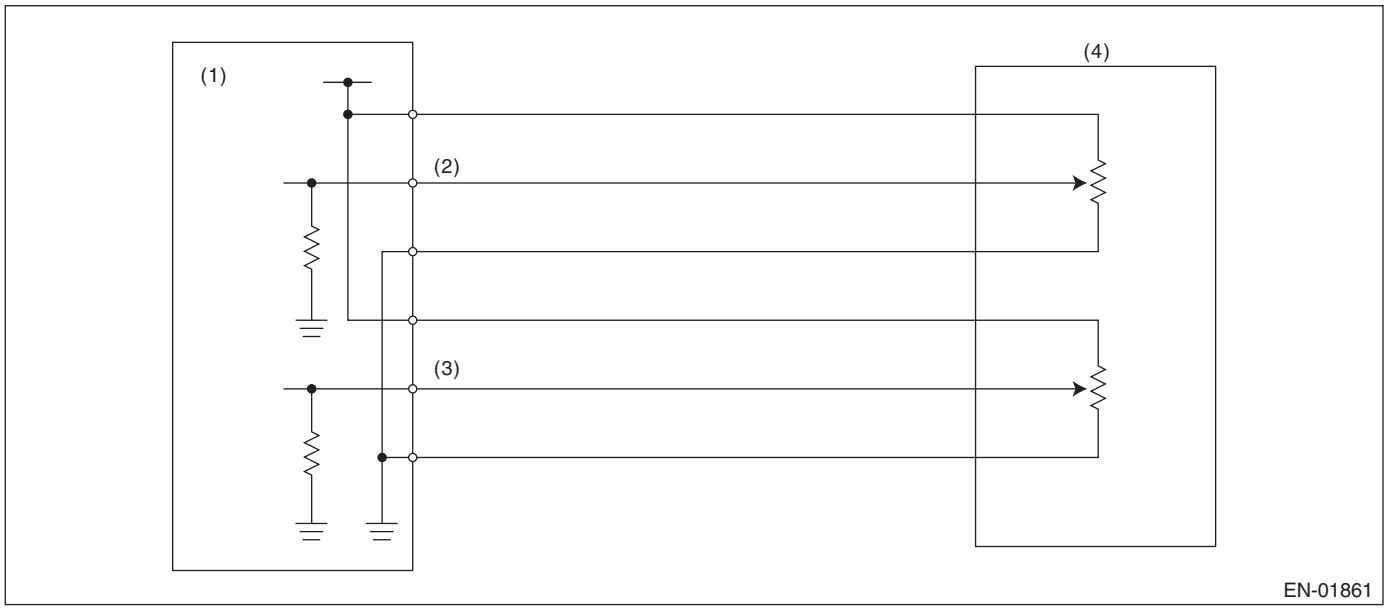
Time Needed for Diagnosis: 80 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

EP: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.217 V

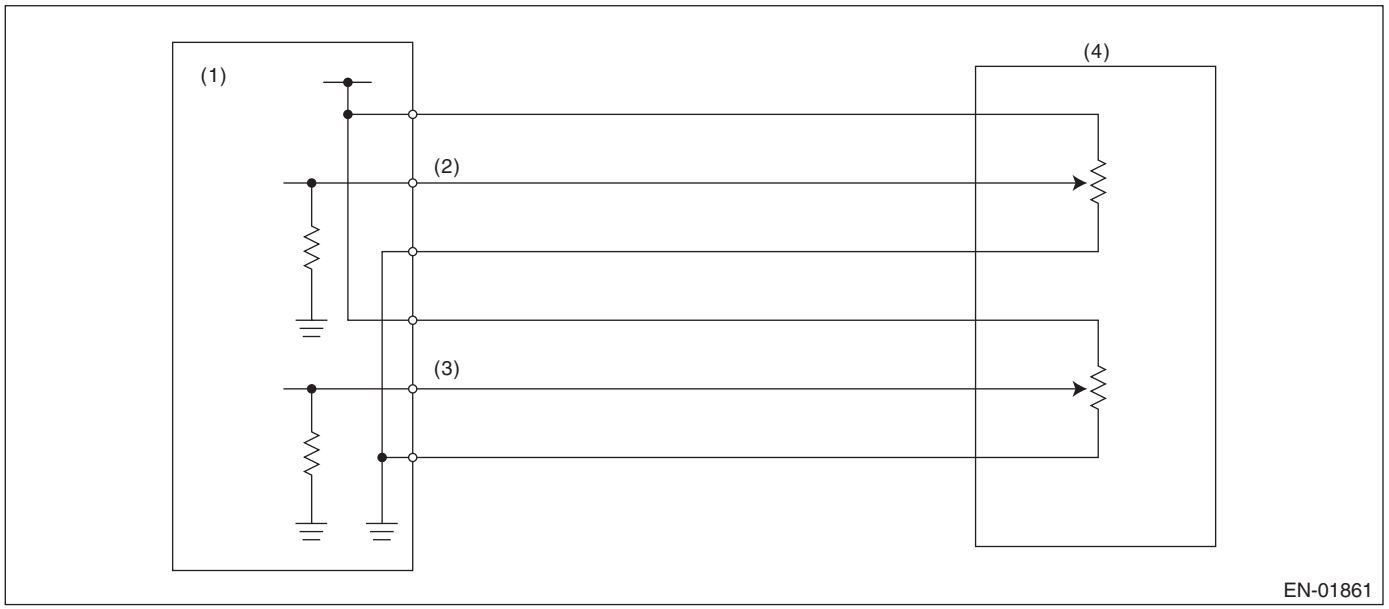
Time Needed for Diagnosis: 100 ms

EQ: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.783 V

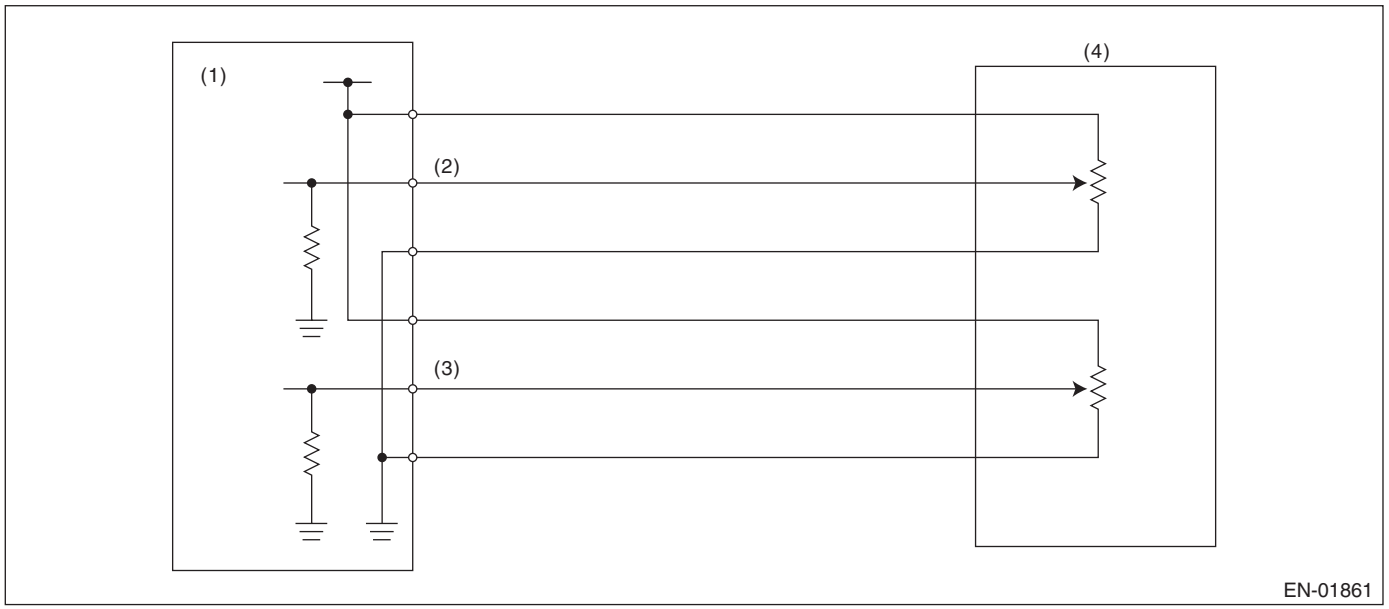
Time Needed for Diagnosis: 32 ms

ER: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 0.217 V

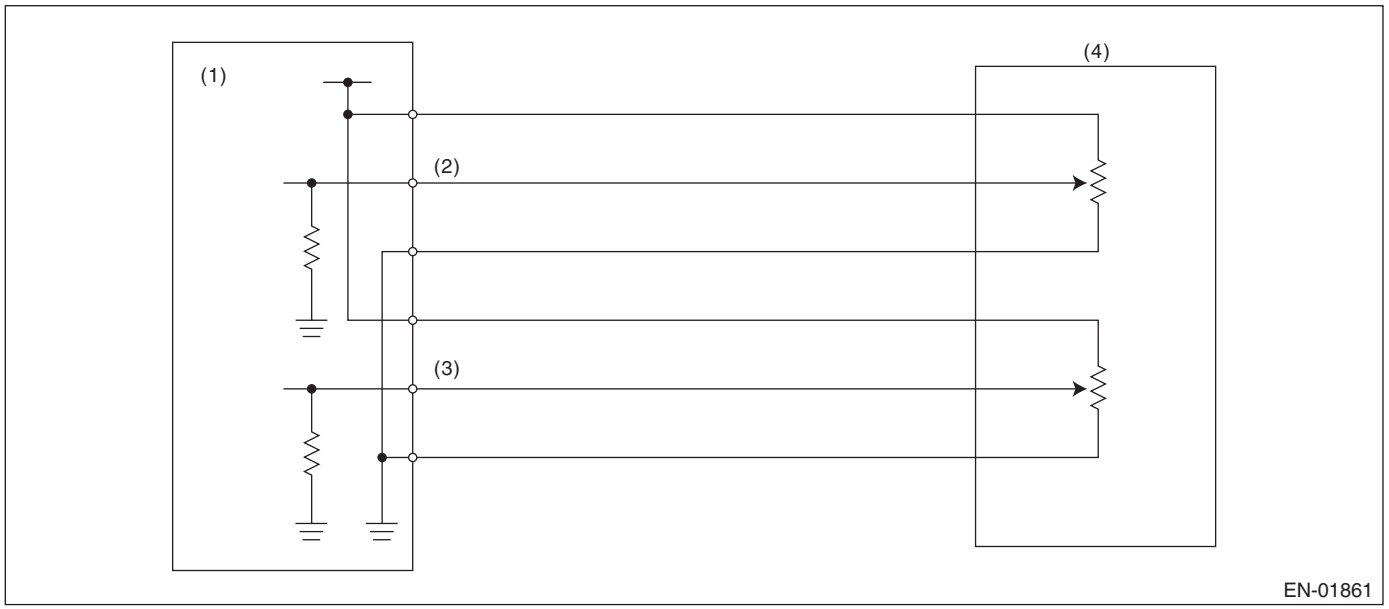
Time Needed for Diagnosis: 100 ms

ES: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	< 4.783 V

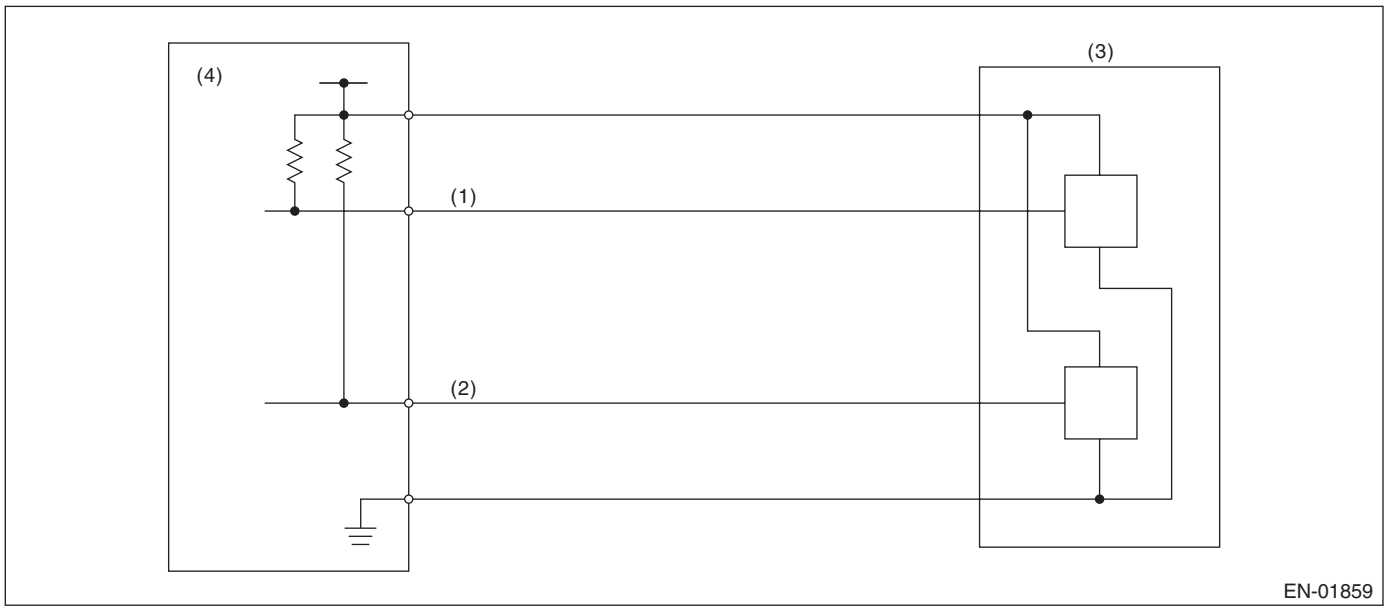
Time Needed for Diagnosis: 100 ms

ET: 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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	> Value from Map

Map

Throttle position sensor 1 opening angle (°) = d	0° ≤ d < 2.125 °	2.125 ° ≤ d < 4.25 °	4.25 ° ≤ d < 9 °	9 ° ≤ d < 31.625 °	31.625 ° ≤ d
Sensor output difference (°)	5.15 °	6.15 °	8.28 °	10.4 °	12.4 °

Time Needed for Diagnosis: 212 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ Value from Map

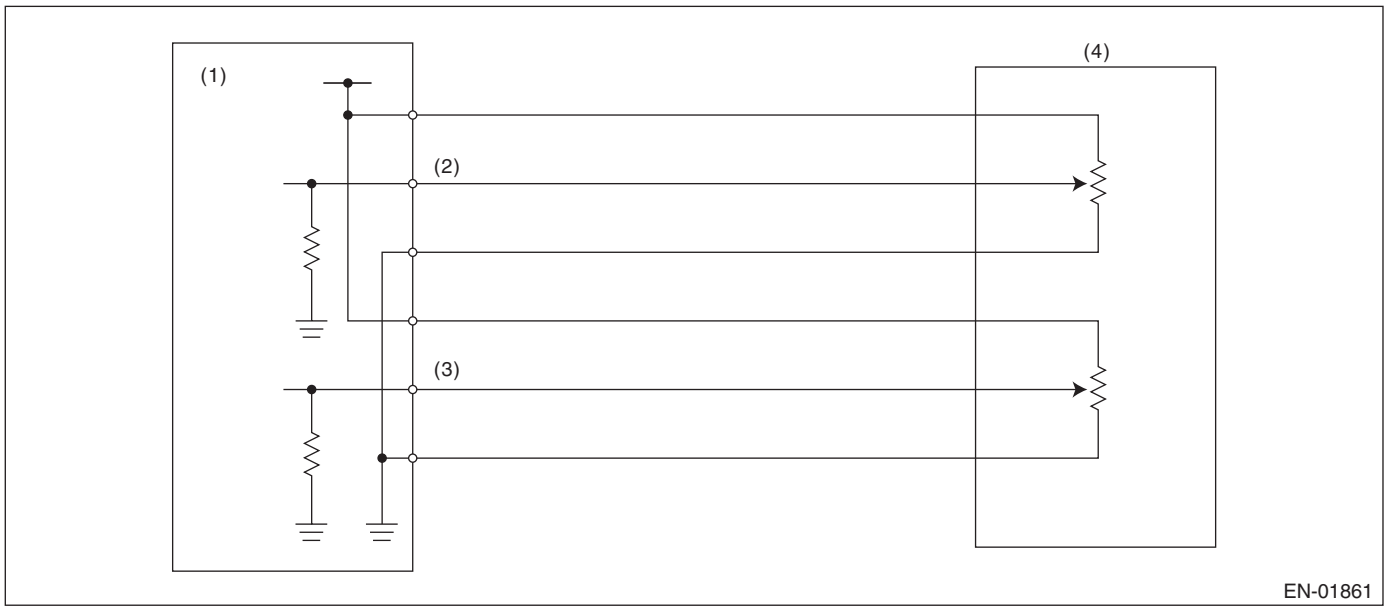
Time Needed for Diagnosis: 24 ms

EU: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	> Value from Map

Map

Throttle position sensor 1 opening angle (°) = d	0° ≤ d < 0.6 °	0.6 ° ≤ d < 1.2 °	1.2 ° ≤ d < 2 °	2 ° ≤ d < 4 °	4 ° ≤ d
Sensor output difference (°)	1.465 °	1.597 °	1.663 °	2.455 °	3.116 °

Time Needed for Diagnosis: 116 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ Value from Map

Time Needed for Diagnosis: 116 ms

EV: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 Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
|Barometric pressure – Intake manifold pressure|	< 26.7 kPa (200 mmHg, 7.9 inHg)

Time Needed for Diagnosis: 262 ms

EW: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 1.707 V

Time Needed for Diagnosis: Less than 1 second

EX: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 Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement 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 Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.234 V

Time Needed for Diagnosis: Less than 1 second

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. G3140BE3

CONTROL SYSTEMS

CS

Page

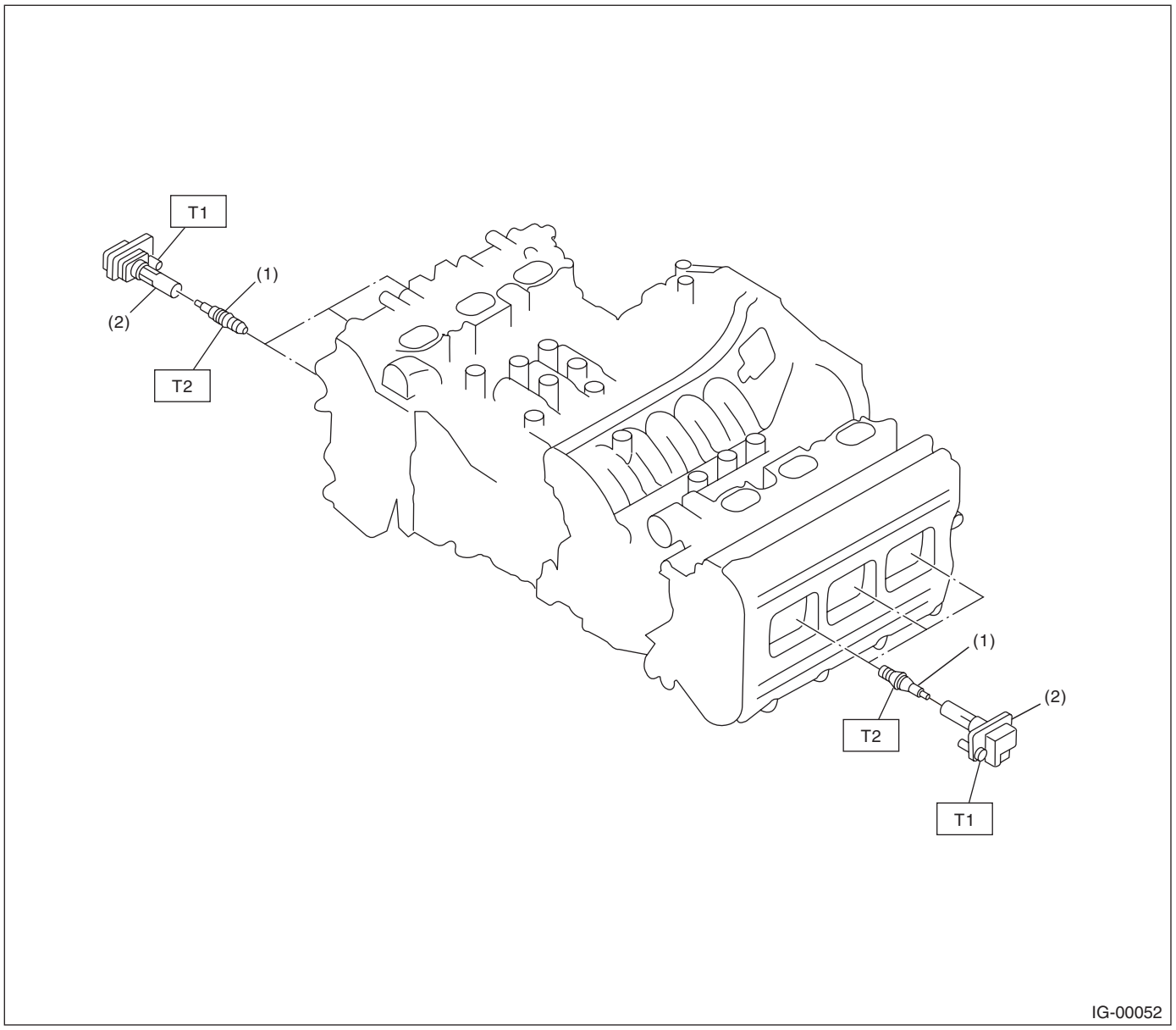
1. General Description 2
2. AT Shift Lock Control System 5
3. Select Lever 20
4. Select Cable 28
5. AT Shift Lock Solenoid and “P” Range Switch 31
6. Body Integrated Unit 34
7. General Diagnostic Table 35

1. General Description

A: SPECIFICATION

Item		Specification
Ignition coil	Type	FK0333
	Ignition system	Independent ignition coil
	Manufacturer	Diamond Electric
Spark plug	Manufacturer and type	NGK: SILFR6A
	Thread size (diameter, pitch, length) mm	14, 1.25, 26.5
	Spark plug gap mm (in)	0.7 — 0.8 (0.028 — 0.031)
	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.

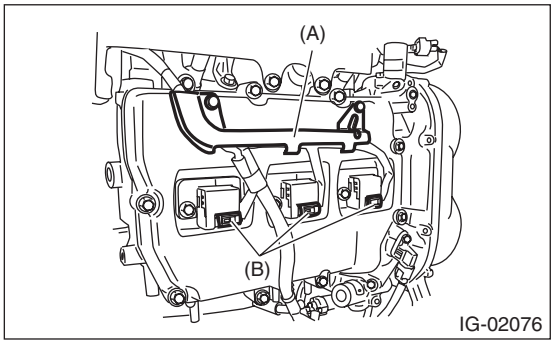
2. Spark Plug

A: REMOVAL

Spark plug:
<Ref. to IG(H6DO)-2, SPECIFICATION, General Description.>

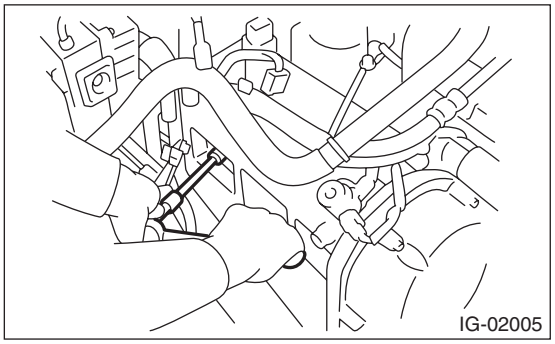
1. RH SIDE

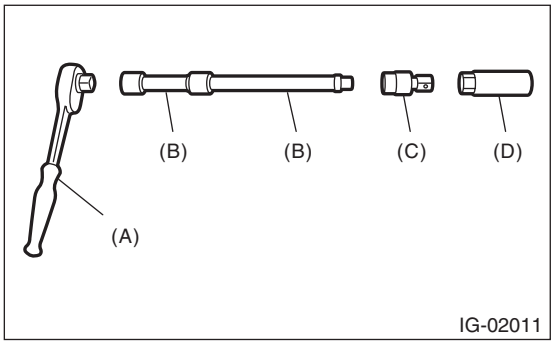
1) Remove the collector cover.
2) Disconnect the ground cable from battery.
3) Remove the air cleaner case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.>
4) Remove the bracket (A).
5) Disconnect the connector (B) from ignition coil.



6) Remove the ignition coil.

NOTE:
Turn the #5 ignition coil to remove it.
7) Remove the spark plug with a spark plug socket.

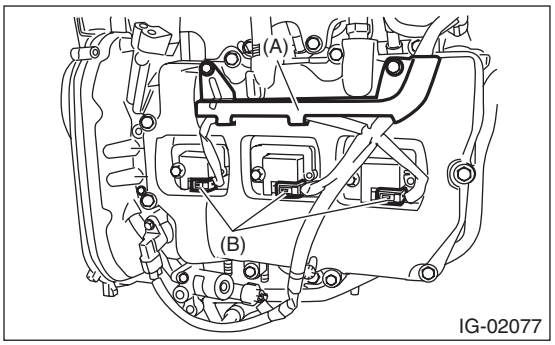




(A) Ratchet handle
(B) Extension bar
(C) Universal joint
(D) Spark plug socket

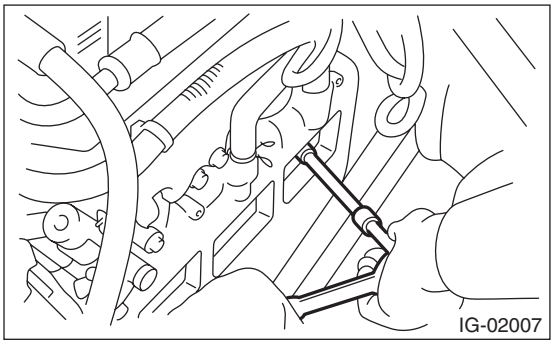
2. LH SIDE

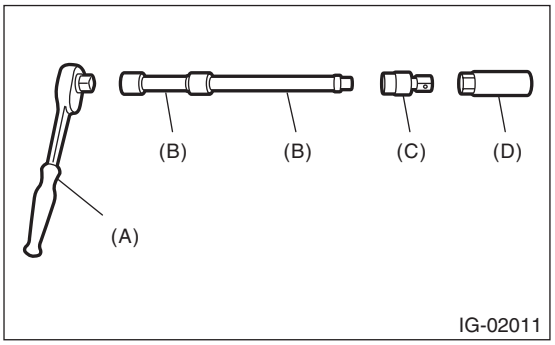
1) Remove the collector cover.
2) Remove the battery and battery carrier.
3) Remove the bracket (A).
4) Disconnect the connector (B) from ignition coil.



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)

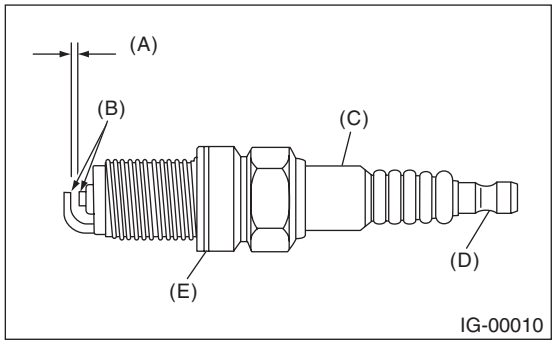
2. LH SIDE

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)

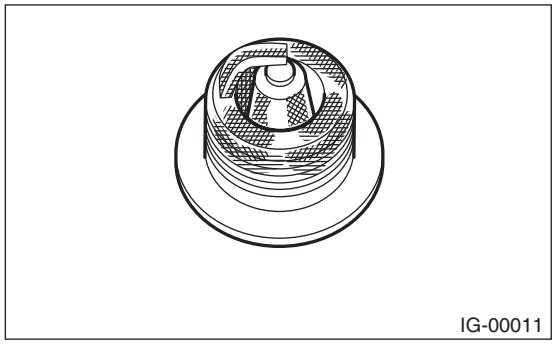
C: INSPECTION

Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.

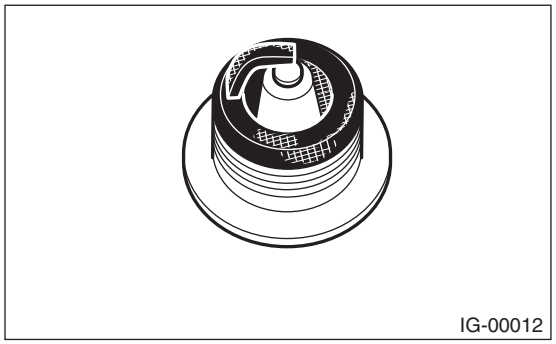


(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

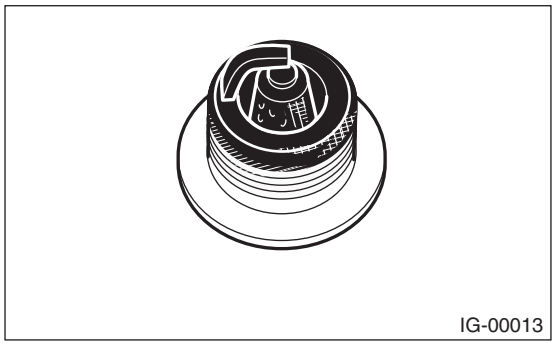
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



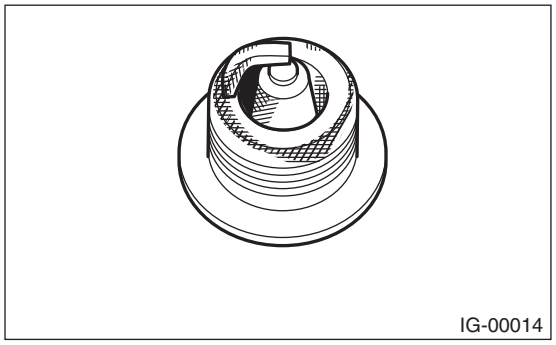
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture and dirty air cleaner.



3) Oil fouled:
Wet black deposits show oil entrance into the combustion chamber through worn rings and excessive clearance between valve guides and stems.



4) Over-heating:
White or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating, incorrect ignition timing, wrong selection of fuel, and loose spark plugs.

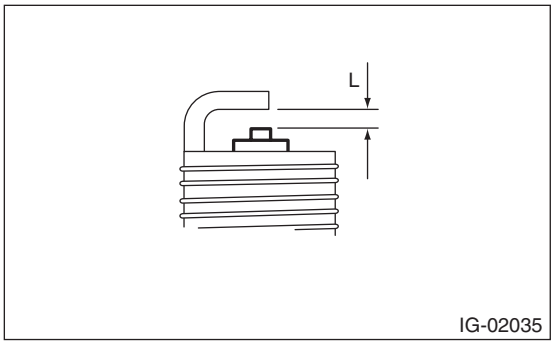


D: ADJUSTMENT

Clean the spark plugs using a nylon brush or the like. Clean and remove the carbon or oxide deposits. If deposits are too stubborn, replace the spark plugs. After cleaning the spark plugs, measure the spark plug gap using a gap gauge.

NOTE:
- Do not use a plug cleaner.
- Never use a metal brush because it makes insulator worn.

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



3. Ignition Coil

A: REMOVAL

Direct ignition type has been adopted. Refer to “Spark Plug” for removal procedure. <Ref. to IG(H6DO)-4, 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)-75, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

STARTING/CHARGING SYSTEMS

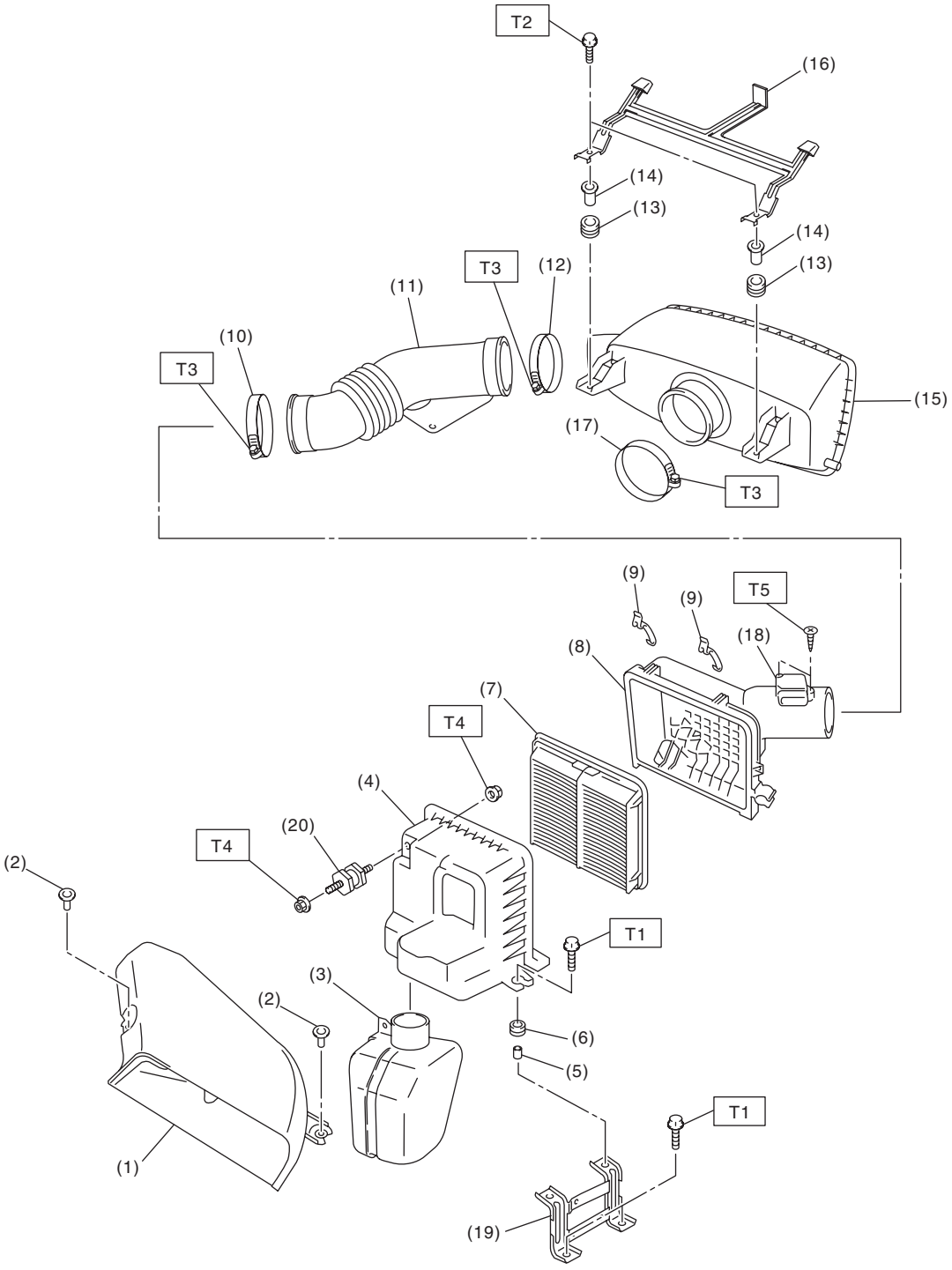
SC(H6DO)

Page

1. General Description 2
2. Starter 6
3. Generator 14
4. Battery 20

1. General Description

A: COMPONENT



(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

Tightening torque:N·m (kgf-m, ft-lb)	
T1:	*6 (0.6, 4.4)*
T2:	*6.5 (0.7, 4.8)*
T3:	*3 (0.3, 2.2)*
T4:	*7.5 (0.8, 5.5)*
T5:	*1 (0.1, 0.7)*

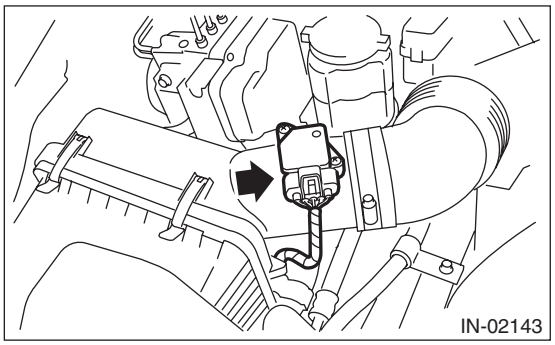
B: CAUTION

• 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.

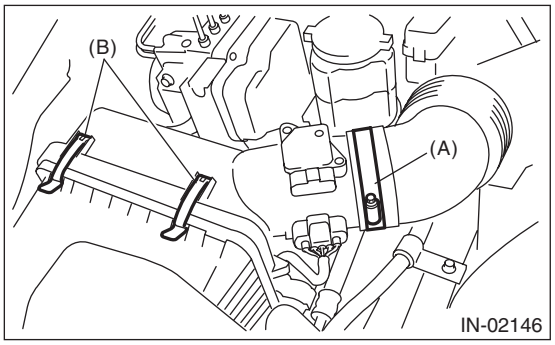
2. Air Cleaner Element

A: REMOVAL

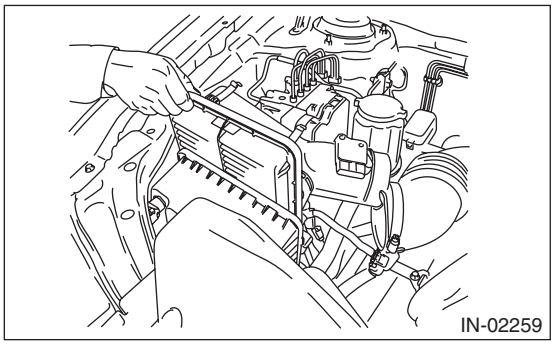
1) Disconnect the ground cable from battery.
2) Disconnect the connector from the mass air flow and intake air temperature sensor.



3) Loosen the clamps (A) which connect the air cleaner case (rear) to intake duct.
4) Remove the clip (B) securing the upper side of air cleaner case.



5) Pull the air cleaner case (rear) backward of the vehicle, and remove the air cleaner element.

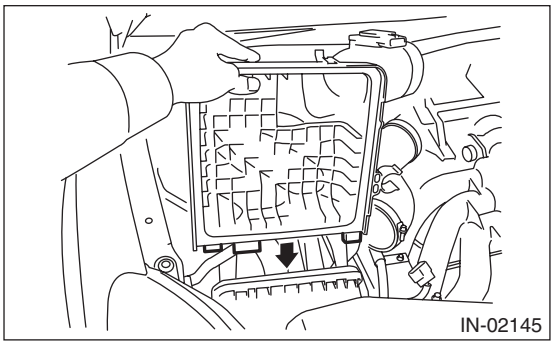


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
When replacing the air cleaner element, use SUBARU genuine air cleaner element according to the engine type. Using other air cleaner element may affect engine performance.

NOTE:
• Make sure there is no foreign material in the air cleaner case.
• When installing the air cleaner case (rear), position the protrusion on the air cleaner case (rear) with the hole in the air cleaner case (front) to install the air cleaner case (rear).



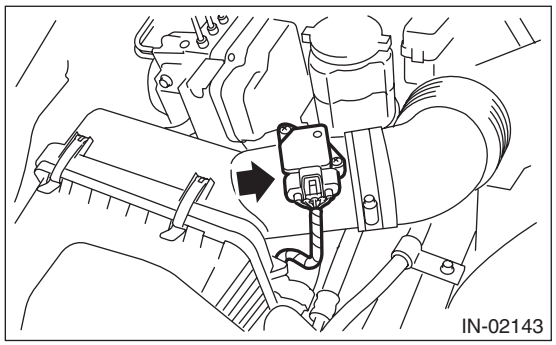
C: INSPECTION

Replace if excessively damaged or dirty.

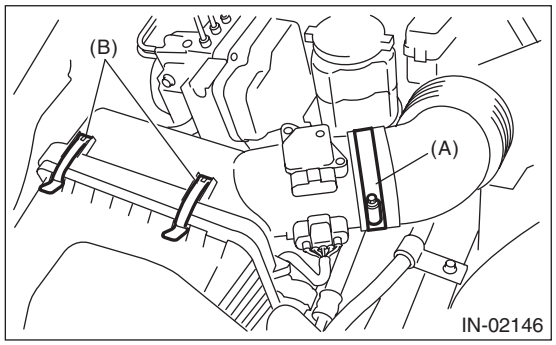
3. Air Cleaner Case

A: REMOVAL

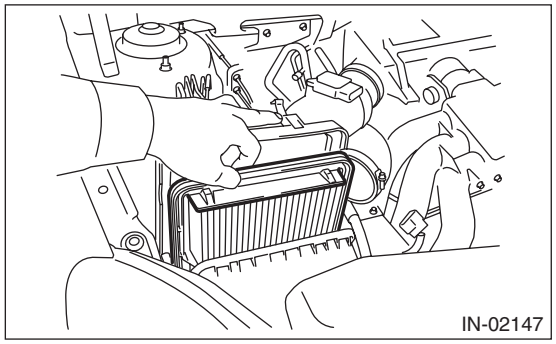
1) Disconnect the ground cable from battery.
2) Remove the air intake duct. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.>
3) Disconnect the connector from the mass air flow and intake air temperature sensor.



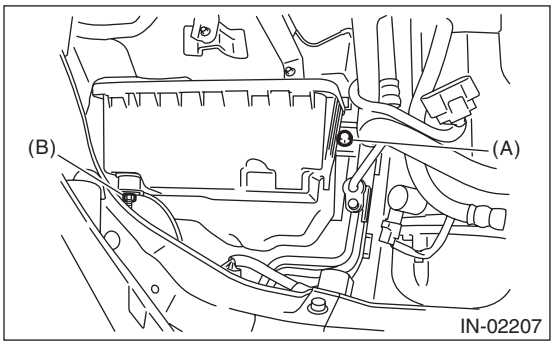
4) Loosen the clamps (A) which connect the air cleaner case (rear) to intake duct.
5) Remove the clip (B) securing the upper side of air cleaner case.



6) Remove the air cleaner case (rear) and air cleaner element.



7) Remove the bolts (A) and nut (B) which secure the air cleaner case to body.

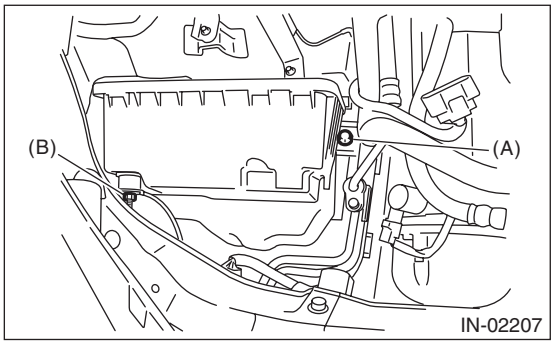


8) Remove the air cleaner case (front).

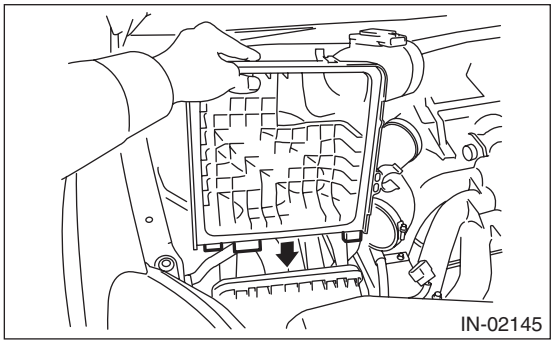
B: INSTALLATION

Install in the reverse order of removal.

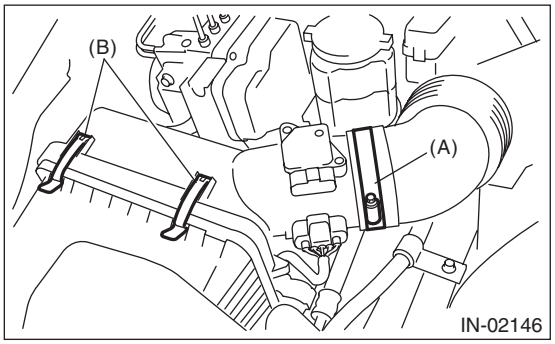
Tightening torque:
Bolt (A):
6 N·m (0.6 kgf-m, 4.4 ft-lb)
Nut (B):
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



NOTE:
When installing the air cleaner case (rear), position the protrusion on the air cleaner case (rear) with the hole in the air cleaner case (front) to install the air cleaner case (rear).



Tightening torque:
Clamp (A)
3 N·m (0.3 kgf-m, 2.2 ft-lb)



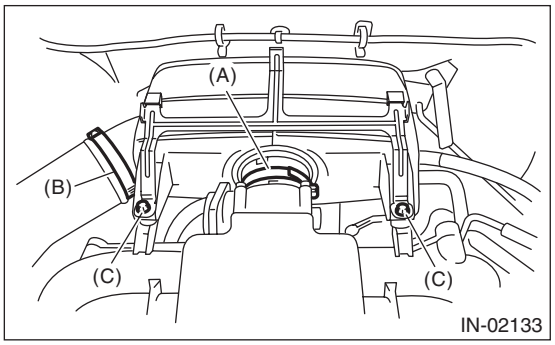
C: INSPECTION

Check for cracks or loose connections.

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.

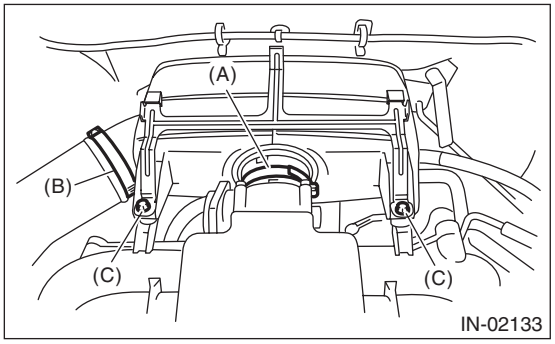


5) Disconnect the blow-by hoses, and then remove air intake chamber.

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)



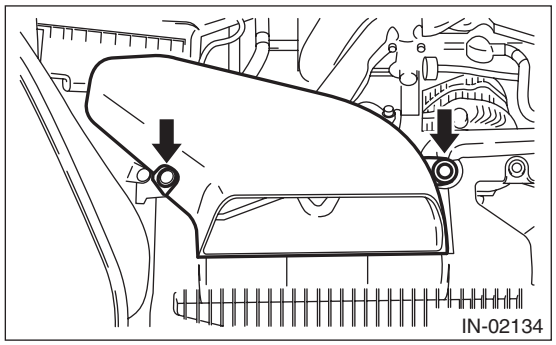
C: INSPECTION

1) Check for cracks or loose connections.
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 for cracks or loose connections.
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)-5, 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)-6, INSTALLATION, Air Cleaner Case.>

C: INSPECTION

Check for cracks or loose connections.

MECHANICAL

ME(H6DO)

		Page
1.	General Description	2
2.	Compression	25
3.	Idle Speed	26
4.	Ignition Timing	27
5.	Intake Manifold Vacuum	28
6.	Engine Oil Pressure	29
7.	Fuel Pressure	30
8.	Valve Clearance	31
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	53
16.	Cam Sprocket	73
17.	Crank Sprocket	74
18.	Camshaft	75
19.	Cylinder Head	82
20.	Cylinder Block	93
21.	Oil Flow Control Solenoid Valve	116
22.	Intake and Exhaust Valve	117
23.	Piston	118
24.	Connecting Rod	119
25.	Crankshaft	120
26.	Engine Trouble in General	121
27.	Engine Noise	127

1. General Description

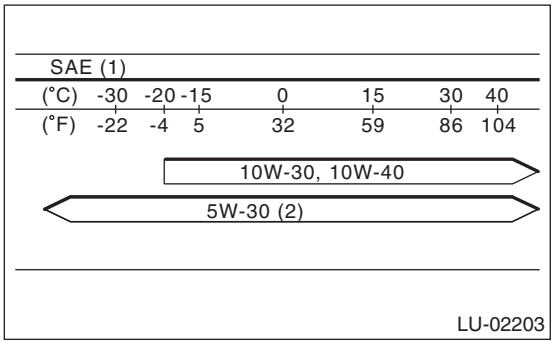
A: SPECIFICATION

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)
Oil filter	Filter type		Full-flow filter type
	Filtration area	cm^2 (sq in)	1,300 (201.5)
	By-pass valve opening pressure	kPa (kg/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
Relief valve working pressure		kPa (kg/cm^2, psi)	708 (7.2, 102.7)
Oil pressure switch	Type		Immersed contact point type
	Operating voltage — power consumption		12 V — 3.4 W or less
	Warning light operating pressure	kPa (kg/cm^2, psi)	15 (0.15, 2.2)
	Proof pressure	kPa (kg/cm^2, psi)	980 (10.0, 142) or more
Engine oil	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:

Oil conforming to one of the following standard

- ***Those with an API standard SM "Energy Conserving" logo***
- ***Those with ILSAC standard GF-4 "Star burst mark" label on the container***



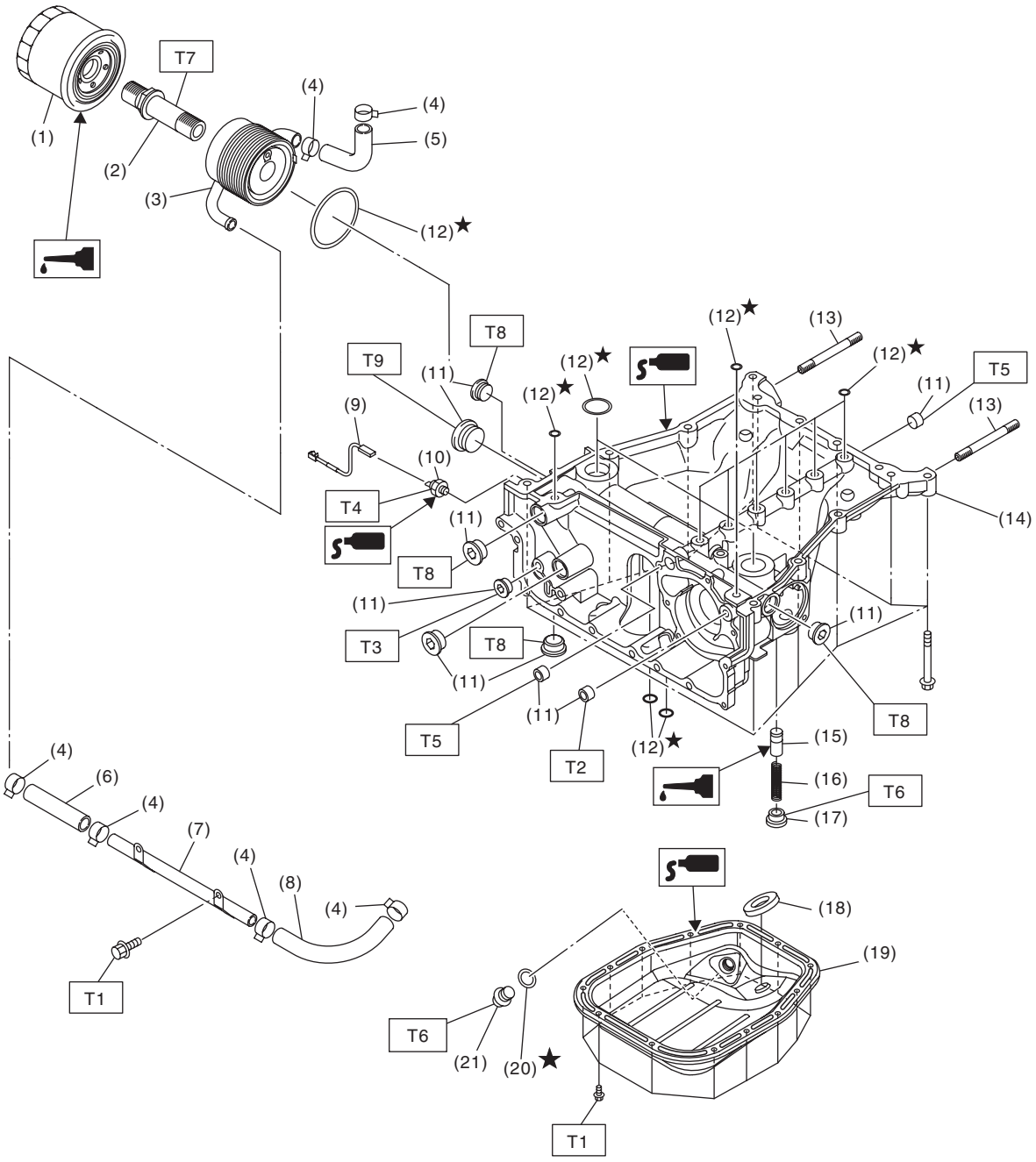
(1) SAE viscosity No. and applicable temperature
(2) Recommended

CAUTION:
It is acceptable to fill an engine with oil of another brand when replacing the oil, but make sure to use an oil with an API standard and SAE viscosity number specified by Subaru.

NOTE:
• The proper viscosity oil helps the engine maintain its ideal temperature, and cranking speed increased by reducing viscosity friction in hot condition.
• If the vehicle is used in regions of high temperatures or in other severe environments, use oil with the viscosities shown below.
API standard: SM or SL
SAE viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

B: COMPONENT

1. OIL PAN UPPER, OIL COOLER, OIL FILTER

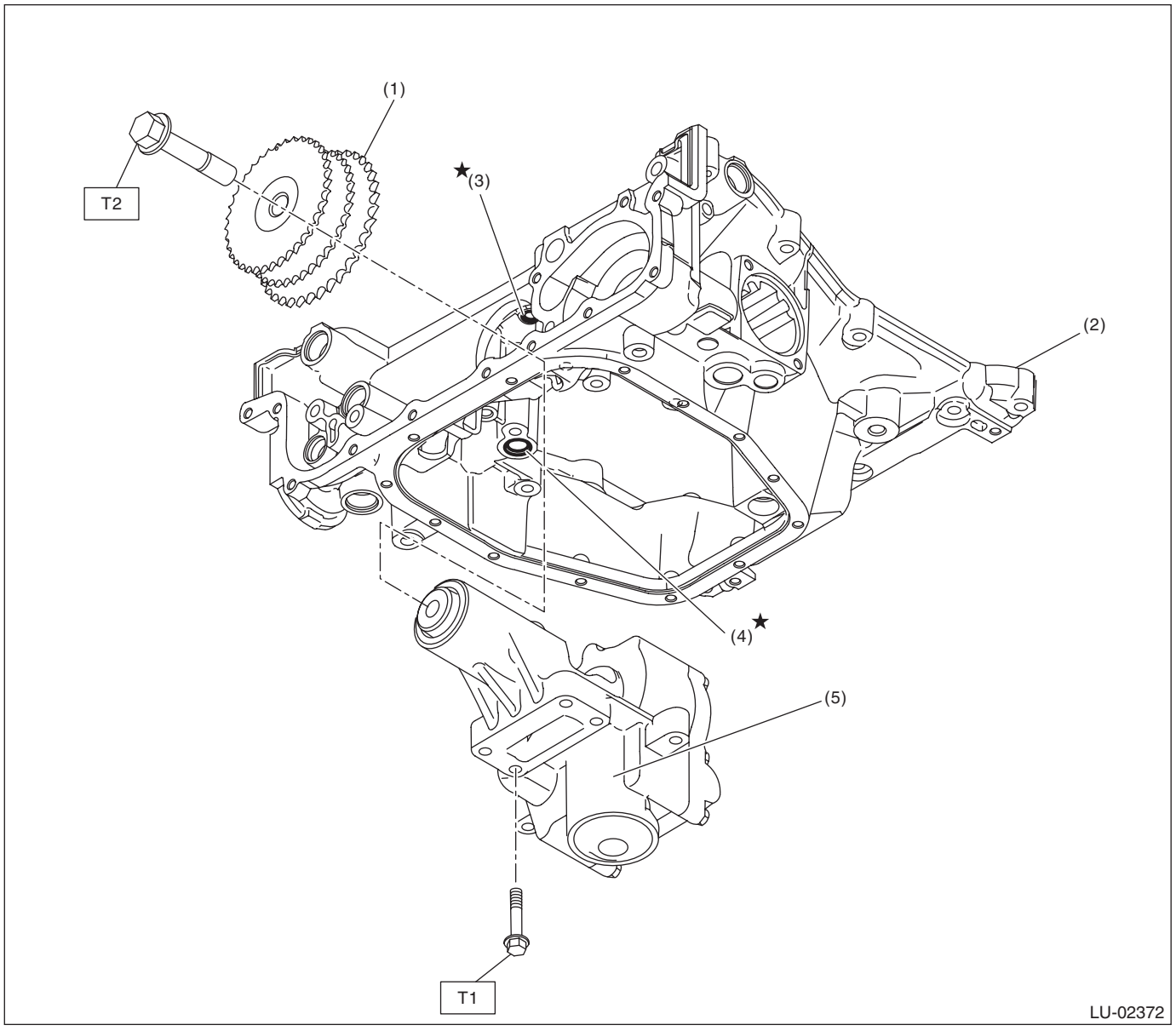


LU-02371

(1)	Oil filter	(12)	O-ring	
(2)	Oil cooler connector	(13)	Stud bolt	
(3)	Oil cooler	(14)	Oil pan upper	
(4)	Clamp	(15)	Relief valve	
(5)	Water hose	(16)	Relief valve spring	
(6)	Water hose	(17)	Relief plug	
(7)	Engine oil cooler water pipe	(18)	Oil pan magnet	
(8)	Water hose	(19)	Oil pan lower	
(9)	Oil pressure switch harness	(20)	Gasket	
(10)	Oil pressure switch	(21)	Drain plug	
(11)	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

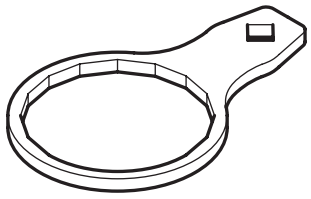
Tightening torque:N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.6)
T2: 120 (12.2, 88.5)

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.

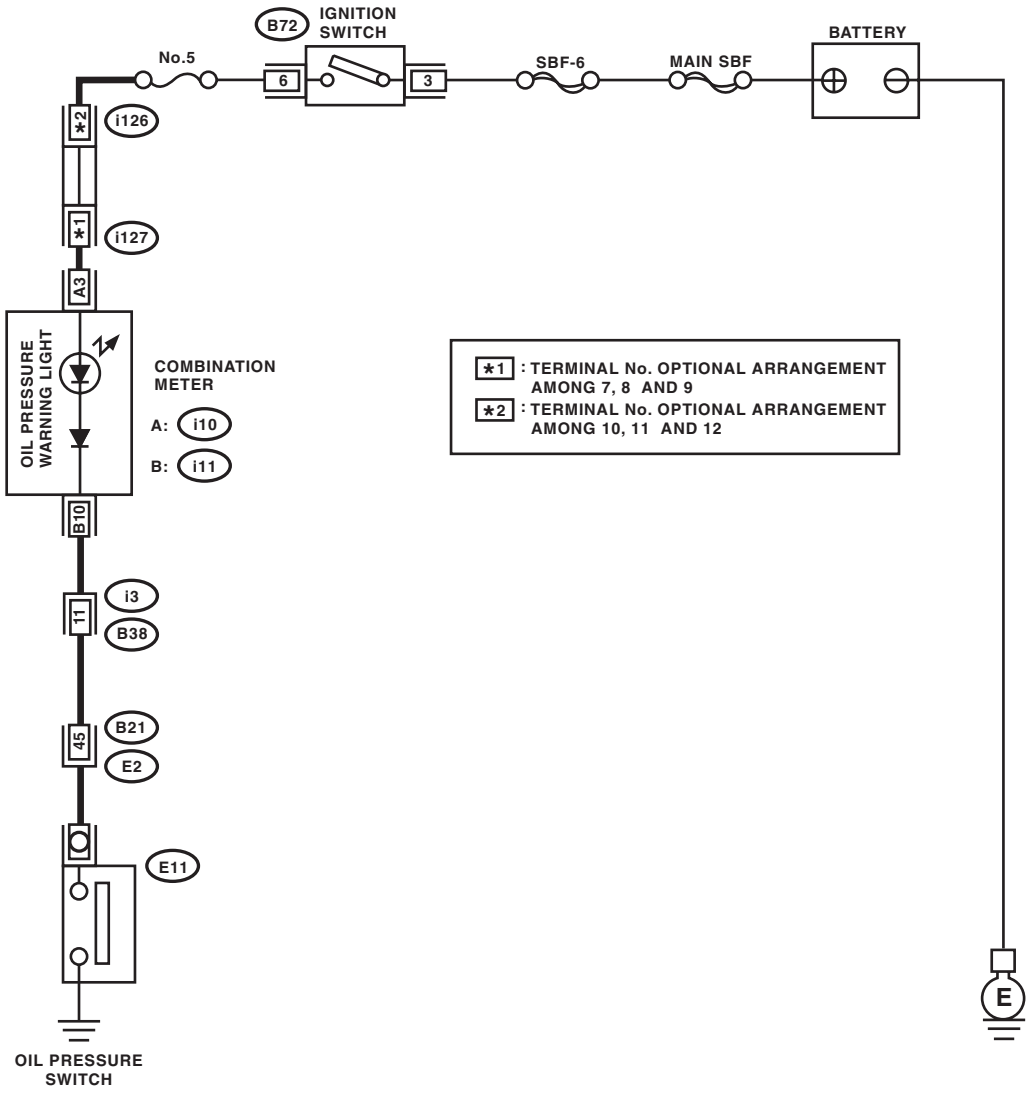
D: PREPARATION TOOL

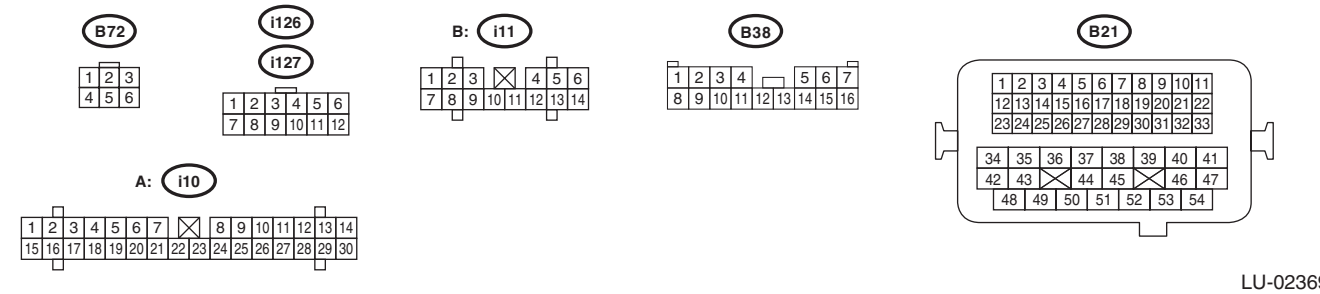
1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA020	18332AA020	OIL FILTER WRENCH	Used for removing and installing oil filter.

2. 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.>

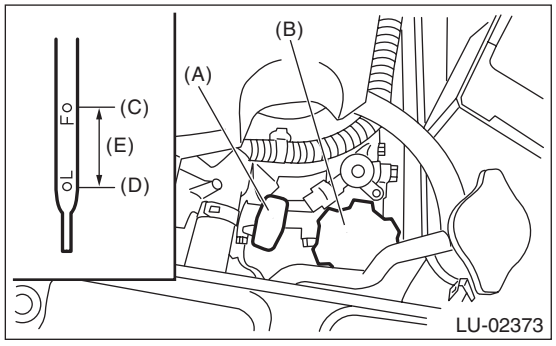
3. Engine Oil

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 level gauge all the way. Be sure that the level gauge is correctly inserted and properly orientated.
4) Remove the oil level gauge again and check the reading. If the oil level is below the “L” line, add oil to bring the level up to the “F” line.
5) 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 over “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.



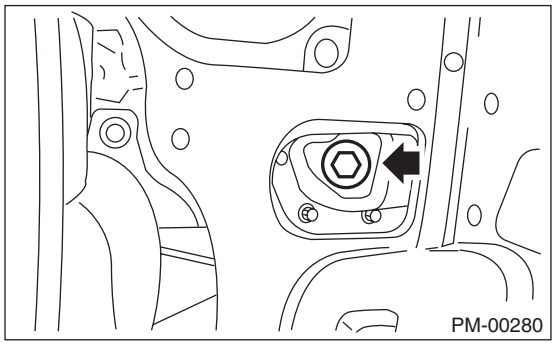
(A) Oil level gauge
(B) Engine oil filler cap
(C) “F” line
(D) “L” line
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

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) Set the vehicle on a lift.
2) Open the engine oil filler cap for quick draining of engine oil.
3) Lift up the vehicle.
4) Drain engine oil by loosening the engine oil drain plug.

NOTE:
Prepare the container for draining of engine oil.



5) Tighten the engine oil drain plug after draining engine oil.

NOTE:
Use a new drain plug gasket.

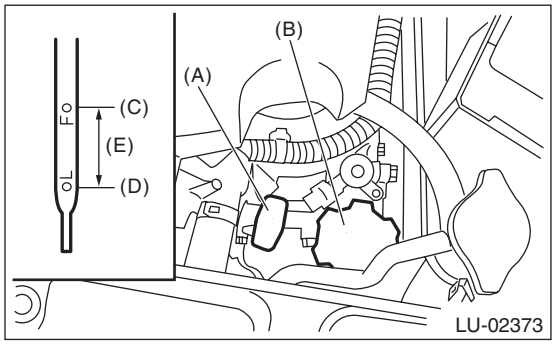
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

6) Lower the vehicle lift.
7) 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.>

8) Close the engine oil filler cap.
9) Start the engine and spread the oil inside the engine.
10) After the engine stops, recheck the oil level. If necessary, add engine oil up to the “F” line on the level gauge.



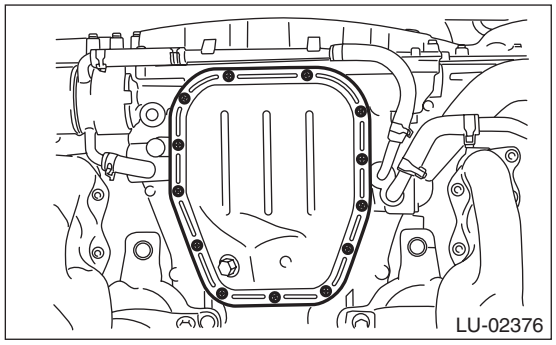
(A) Oil level gauge
(B) Engine oil filler cap
(C) “F” line
(D) “L” line
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

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)-93, REMOVAL, Cylinder Block.>
1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Remove the under cover.
4) Drain the engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>
5) 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.
6) Remove the oil pan lower.



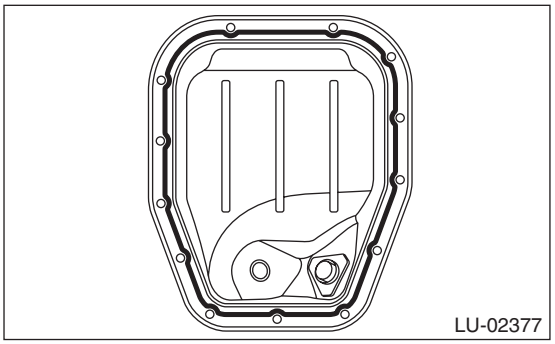
B: INSTALLATION

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.

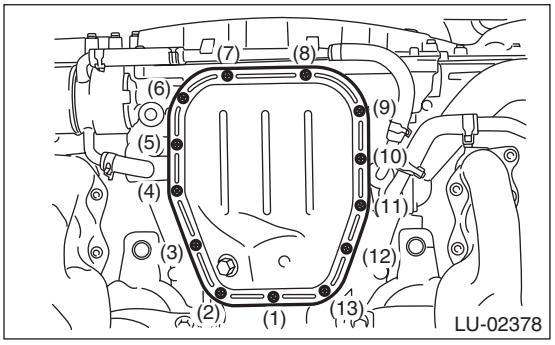
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Applying liquid gasket 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.
4) Lower the vehicle lift.
5) Refill the engine oil. <Ref. to LU(H6DO)-9, INSPECTION, Engine Oil.>

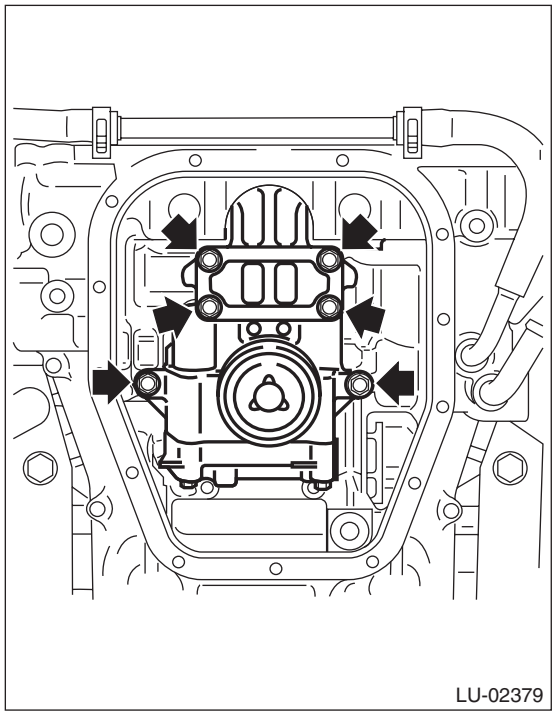
C: INSPECTION

Visually check the oil pan for damage.

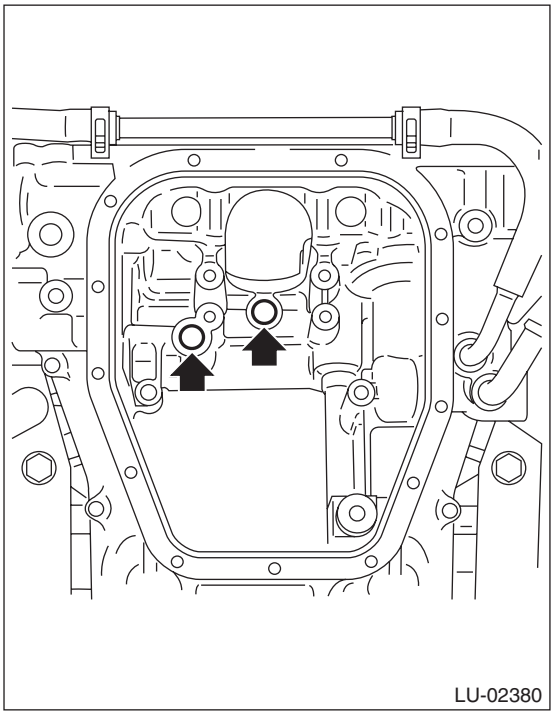
5. Oil Pump

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.
4) Lift up the vehicle.
5) Remove the under cover.
6) Drain engine coolant. <Ref. to CO(H6DO)-12, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Lower the vehicle lift.
8) Remove the radiator. <Ref. to CO(H6DO)-17, 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)-54, REMOVAL, Timing Chain Assembly.>
13) Remove the oil pan lower. <Ref. to LU(H6DO)-10, REMOVAL, Oil Pan.>
14) Remove the oil pump.


LU-02379

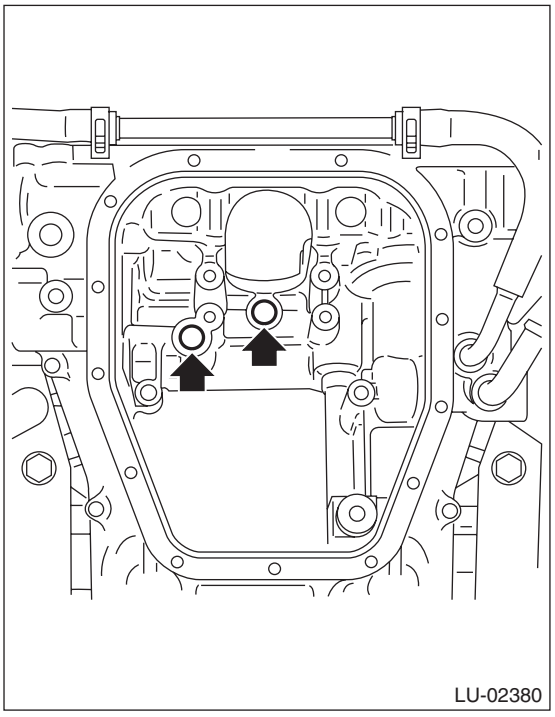
15) Remove the O-ring from the oil pan upper.


LU-02380

B: INSTALLATION

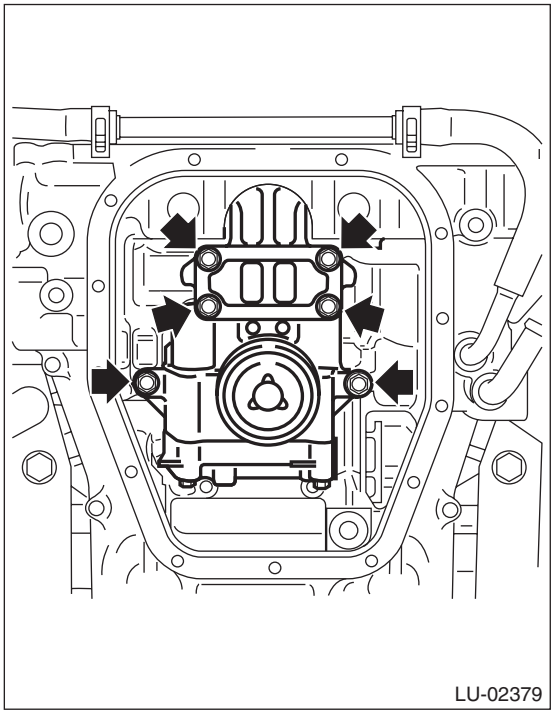
1) Apply the engine oil to the O-ring and install it to the oil pan upper.

NOTE:
Use new O-rings.


LU-02380

2) Install the oil pump.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



3) Install the oil pan lower. <Ref. to LU(H6DO)-10, INSTALLATION, Oil Pan.>
4) Install the timing chain. <Ref. to ME(H6DO)-60, INSTALLATION, Timing Chain Assembly.>
5) Install the chain cover. <Ref. to ME(H6DO)-49, INSTALLATION, Chain Cover.>
6) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
7) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>
8) Install the radiator. <Ref. to CO(H6DO)-19, INSTALLATION, Radiator.>
9) Lift up the vehicle.
10) Install the under cover.
11) Lower the vehicle lift.
12) Fill engine coolant. <Ref. to CO(H6DO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

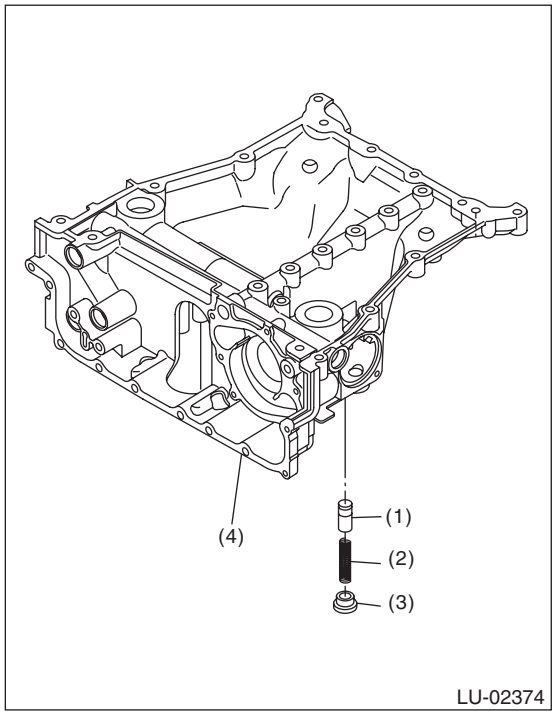
C: INSPECTION

- Visually check the oil pump for breakage.
- Visually check the strainer part for clogging.

6. Oil Pump Relief Valve

A: REMOVAL

1) Remove the oil pan. <Ref. to LU(H6DO)-10, REMOVAL, Oil Pan.>
2) Remove the relief plug, relief valve spring and relief valve.



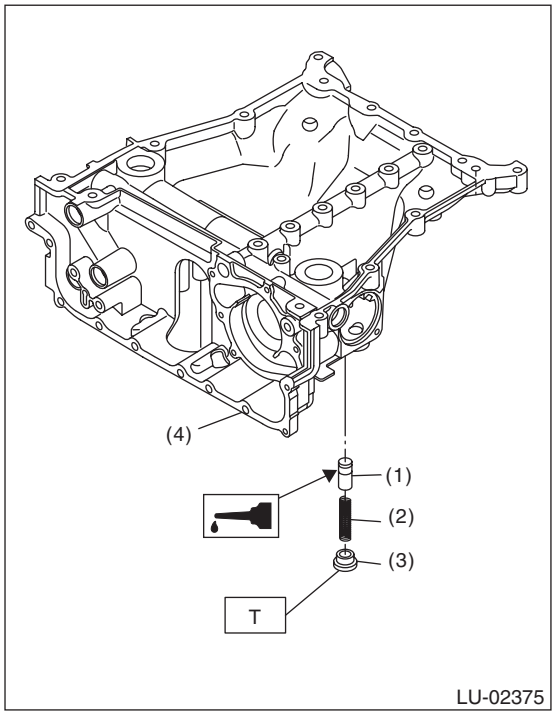
(1) Relief valve
(2) Relief valve spring
(3) Relief plug
(4) Oil pan upper

B: INSTALLATION

1) Install the relief valve, relief valve spring and relief plug.

NOTE:
Apply engine oil to the relief valve.

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



(1) Relief valve
(2) Relief valve spring
(3) Relief plug
(4) Oil pan upper

2) Install the oil pan. <Ref. to LU(H6DO)-10, INSTALLATION, Oil Pan.>

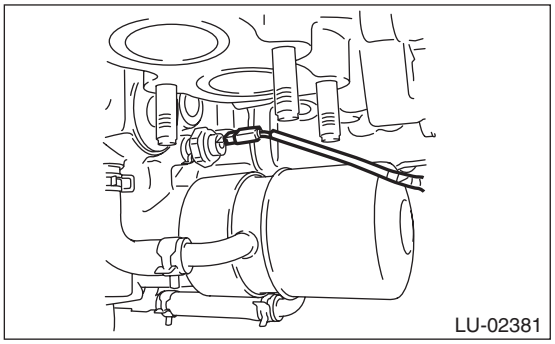
C: INSPECTION

Check the worn oil pump relief valve case, clogged oil passage, crank and other parts for faults.

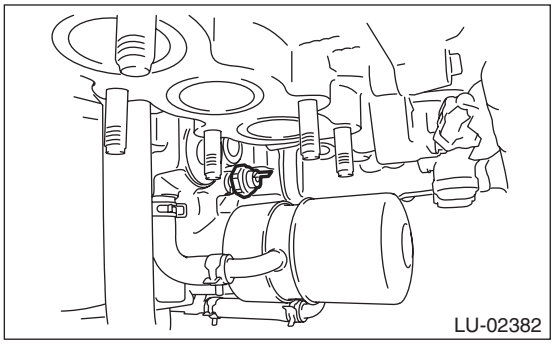
7. Oil Pressure Switch

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.
3) Lift up the vehicle.
4) Remove the under cover.
5) Disconnect the terminal from oil pressure switch.



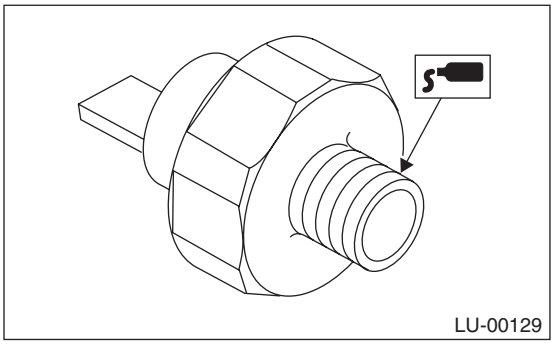
6) Remove the oil pressure switch.



B: INSTALLATION

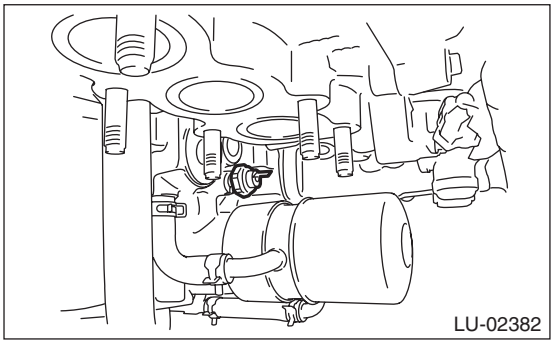
1) Apply liquid gasket to the oil pressure switch threads.

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

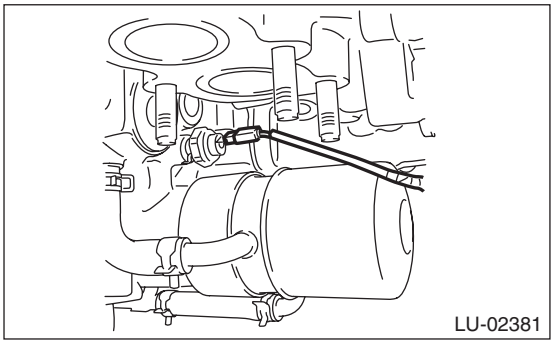


2) Install the oil pressure switch.

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.

C: INSPECTION

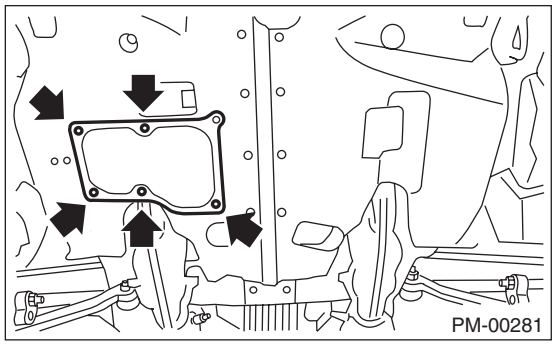
Make sure oil does not leak or seep from where the oil pressure switch is installed.

8. Engine Oil Filter

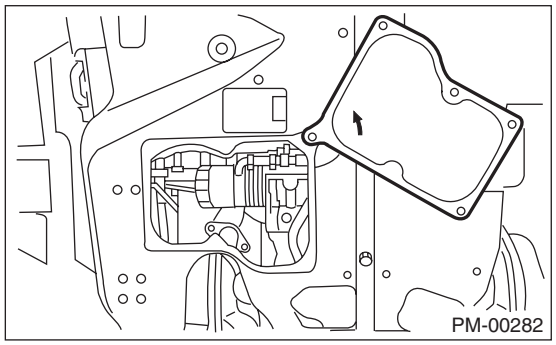
A: REMOVAL

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.

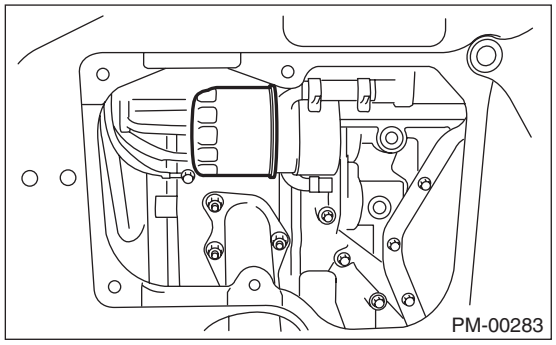
1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Drain the engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>
4) Remove the service hole cover clip.



5) Rotate the service hole cover in the arrow direction.



6) 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 installing surface of 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 lift.
7) Refill the engine oil. <Ref. to LU(H6DO)-9, 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.

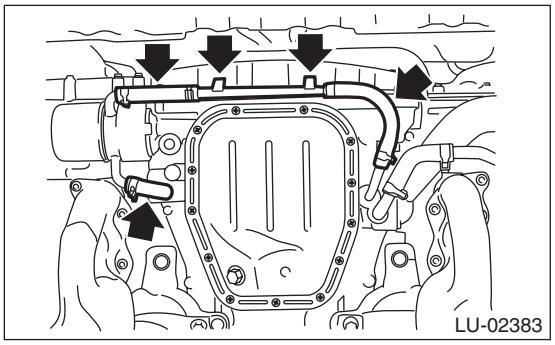
2) Check the engine oil level. <Ref. to LU(H6DO)-9, INSPECTION, Engine Oil.>

9. Oil Cooler

A: REMOVAL

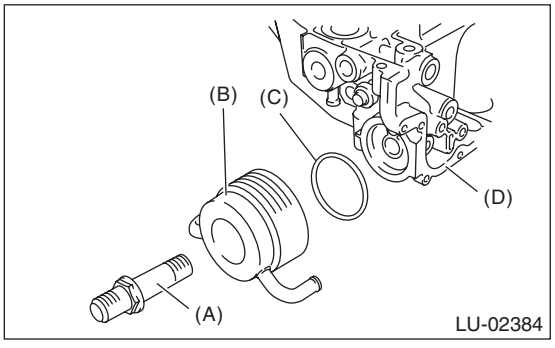
CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Remove the under cover.
4) Drain engine coolant. <Ref. to CO(H6DO)-12, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Drain the engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>
6) Disconnect the water hose from the oil cooler and bolts which secure the engine oil cooler water pipe to the chain cover.



7) Remove the oil filter using the ST. <Ref. to LU(H6DO)-15, REMOVAL, Engine Oil Filter.>
ST 18332AA020 OIL FILTER WRENCH

NOTE:
Set a container under the vehicle.
8) Remove the oil cooler connector and remove oil cooler.



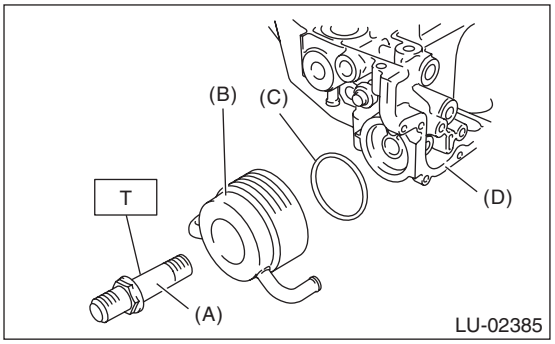
(A) Oil cooler connector
(B) Oil cooler
(C) O-ring
(D) Oil pan upper

B: INSTALLATION

1) Tighten the oil cooler connector and install the oil cooler to oil pan upper.

Tightening torque:
T: 54 N·m (5.5 kgf-m, 39.8 ft-lb)

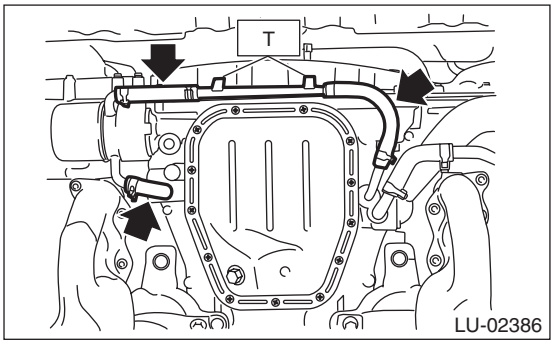
NOTE:
Use new O-rings.



(A) Oil cooler connector
(B) Oil cooler
(C) O-ring
(D) Oil pan upper

2) Install the oil filter. <Ref. to LU(H6DO)-15, INSTALLATION, Engine Oil Filter.>
3) Install the water hose to the oil cooler and bolts which secure the engine oil cooler water pipe to the chain cover.

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



4) Lower the vehicle lift.
5) Refill the engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>
6) Fill engine coolant. <Ref. to CO(H6DO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Check the engine oil level. <Ref. to LU(H6DO)-9, 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.

10.General Diagnostic Table

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Symptom	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogging of oil filter	Replace.
		Malfunction of oil by-pass valve in oil filter	Clean or replace.
		Malfunction of oil relief valve in oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken oil strainer	Replace.
2. Warning light does not turn on.	1) Malfunction of combination meter		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact of terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed 1) — 2).

SPEED CONTROL SYSTEMS

SP(H6DO)

Page

1. General Description 2
2. Accelerator Pedal 3

1. General Description

A: SPECIFICATION

Engine	Cylinder arrangement			Horizontally opposed, liquid cooled, 6-cylinder, 4-stroke gasoline engine
	Valve system mechanism			Chain driven, double overhead camshaft, 4-valve/cylinder
	Inside diameter × stroke mm (in)			92 × 91 (3.622 × 3.583)
	Displacement cm^3 (cu in)			3,630 (222)
	Compression ratio			10.5
	Compression pressure (350 rpm and fully open throttle): kPa (kgf/cm^2, psi)			1,275 — 1,471 (13.0 — 15.0, 185 — 213)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Min. advance	Open	BTDC 40°
			Close	ABDC 24°
		Max. retard	Open	ATDC 10°
			Close	ABDC 74°
	Exhaust valve timing	Min. advance	Open	BBDC 44°
			Close	ATDC 4°
		Max. retard	Open	BBDC 4°
			Close	ATDC 44°
	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 rpm [“P” or “N” range] rpm		No load	700±100
			A/C ON	805±100
	Ignition order			1 → 6 → 3 → 2 → 5 → 4
	Ignition timing BTDC/rpm			15°±8°/700

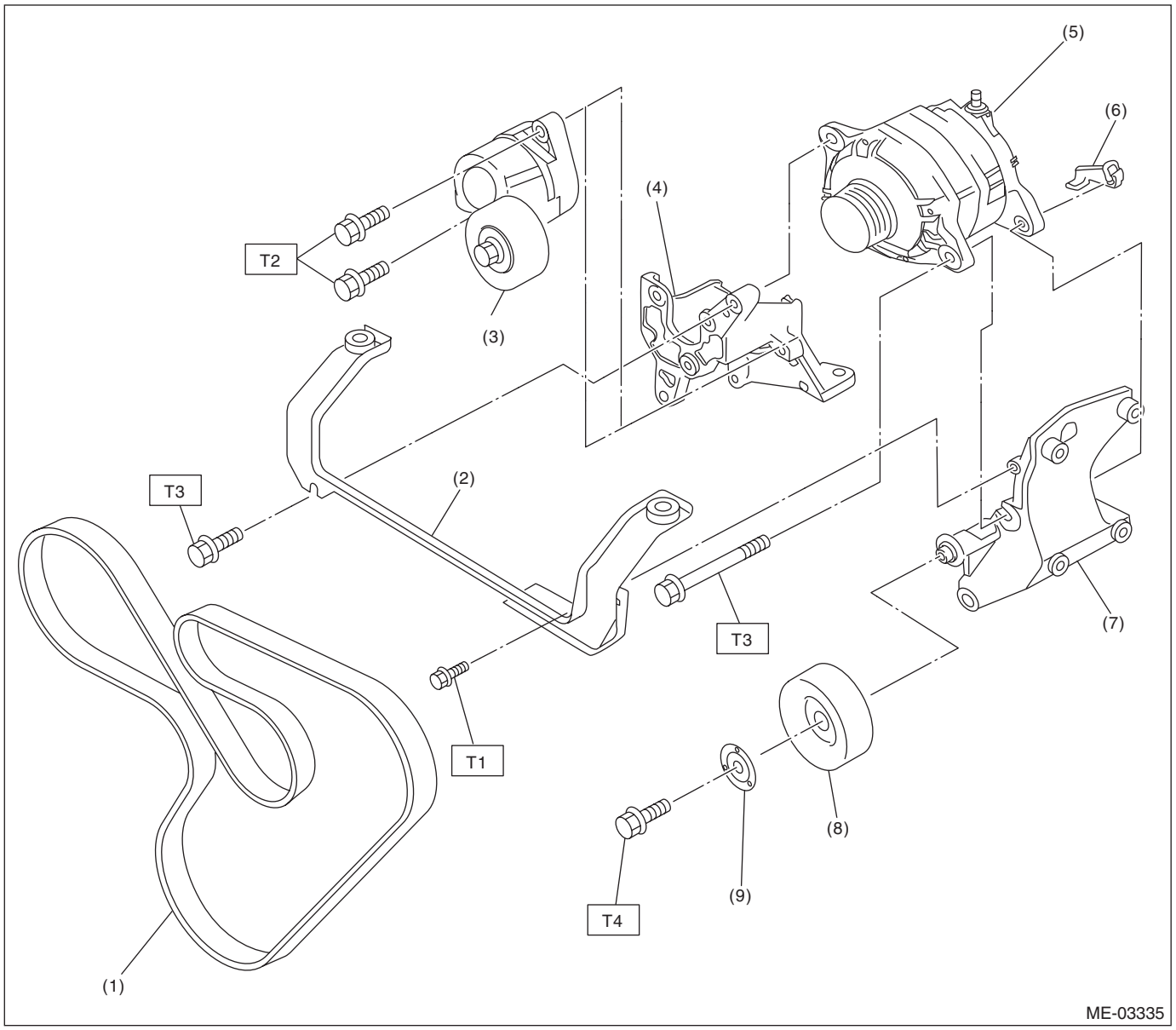
NOTE:
OS: Oversize
US: Undersize

Camshaft	Bending limit			mm (in)	0.020 (0.00079)
	Thrust clearance mm (in)	Intake		Standard	0.075 — 0.135 (0.0030 — 0.0053)
		Exhaust		Standard	0.075 — 0.135 (0.0030 — 0.0053)
	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)
Cylinder Head	Surface warping limit (mating with cylinder block)		mm (in)	Standard	0.02 (0.0008)
	Inner diameter of valve lifter hole			mm (in)	32.994 — 33.016 (1.2990 — 1.2998)
	Standard height			mm (in)	124±0.05 (4.88±0.0020)
Valve seat	Seating angle				90°
	Contacting width mm (in)	Intake		Standard	1.0 (0.039)
		Exhaust		Standard	1.5 (0.059)
Valve guide	Inside diameter			mm (in)	5.500 — 5.512 (0.2165 — 0.2170)
	Protrusion above head	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)
	Stem outer diameter mm (in)		Intake		5.455 — 5.470 (0.2148 — 0.2154)
			Exhaust		5.445 — 5.460 (0.2144 — 0.2150)
	Stem oil clearance mm (in)	Intake		Standard	0.030 — 0.057 (0.0012 — 0.0022)
		Exhaust		Standard	0.040 — 0.067 (0.0016 — 0.0026)
	Overall length mm (in)		Intake		103.5 (4.075)
			Exhaust		103.2 (4.063)
	Outer diameter of valve lifter			mm (in)	32.959 — 32.975 (1.2976 — 1.2982)
Valve spring	Free length mm (in)	Intake			41.51 (1.6342)
		Exhaust			41.51 (1.6342)
	Squareness	Intake			2.5°, 1.8 mm (0.071 in)
		Exhaust			2.5°, 1.8 mm (0.071 in)
Cylinder block	Standard height			mm (in)	202 (7.95)
	Surface warping limit (Mating surface with cylinder head)			mm (in)	Standard	0.02 (0.0008)
	Cylinder inner diameter mm (in)		Standard	A	92.005 — 92.015 (3.6222 — 3.6226)
				B	91.995 — 92.005 (3.6218 — 3.6222)
	Cylindricity			mm (in)	Standard	0.030 (0.0012)
	Out-of-roundness			mm (in)	Standard	0.010 (0.0004)
	Piston clearance			mm (in)	Standard	–0.010 — 0.010 (–0.0004 — 0.0004)
Piston	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	Outer diameter			mm (in)	Standard	21.994 — 22.000 (0.8659 — 0.8661)
	Standard clearance between piston and piston pin			mm (in)	Standard	0.004 — 0.008 (0.0002 — 0.0003)

Piston ring	Ring closed 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)
	Ring groove gap 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	Thrust clearance mm (in)			Standard	0.070 — 0.330 (0.0028 — 0.0130)
Bearing of large end	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	Crank pin and crank journal	Out-of-roundness mm (in)			0.005 (0.0002)
		Cylindricity mm (in)			0.006 (0.0002)
	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)
	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)
Main bearing	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)

B: COMPONENT

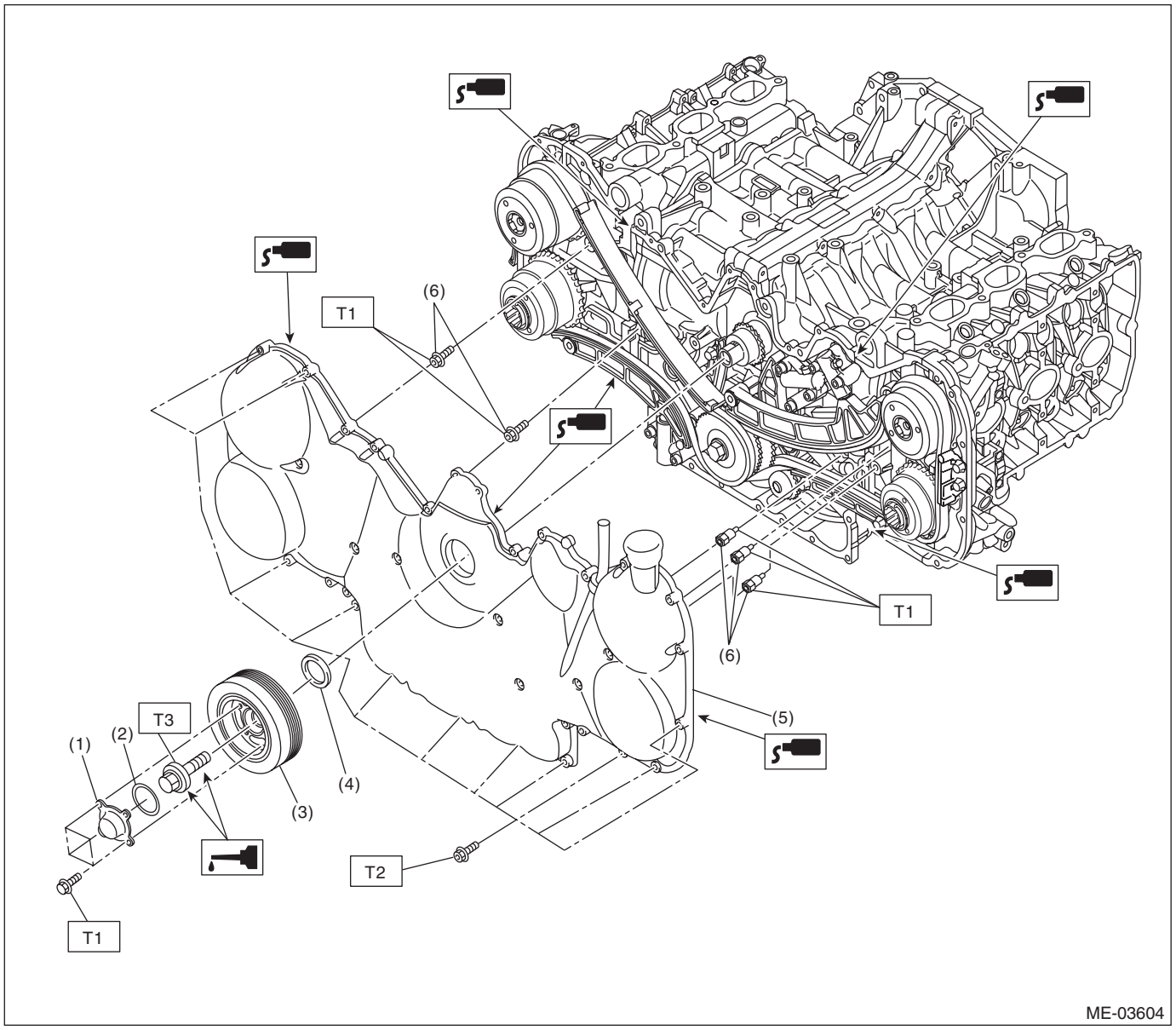
1. V-BELT



(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)

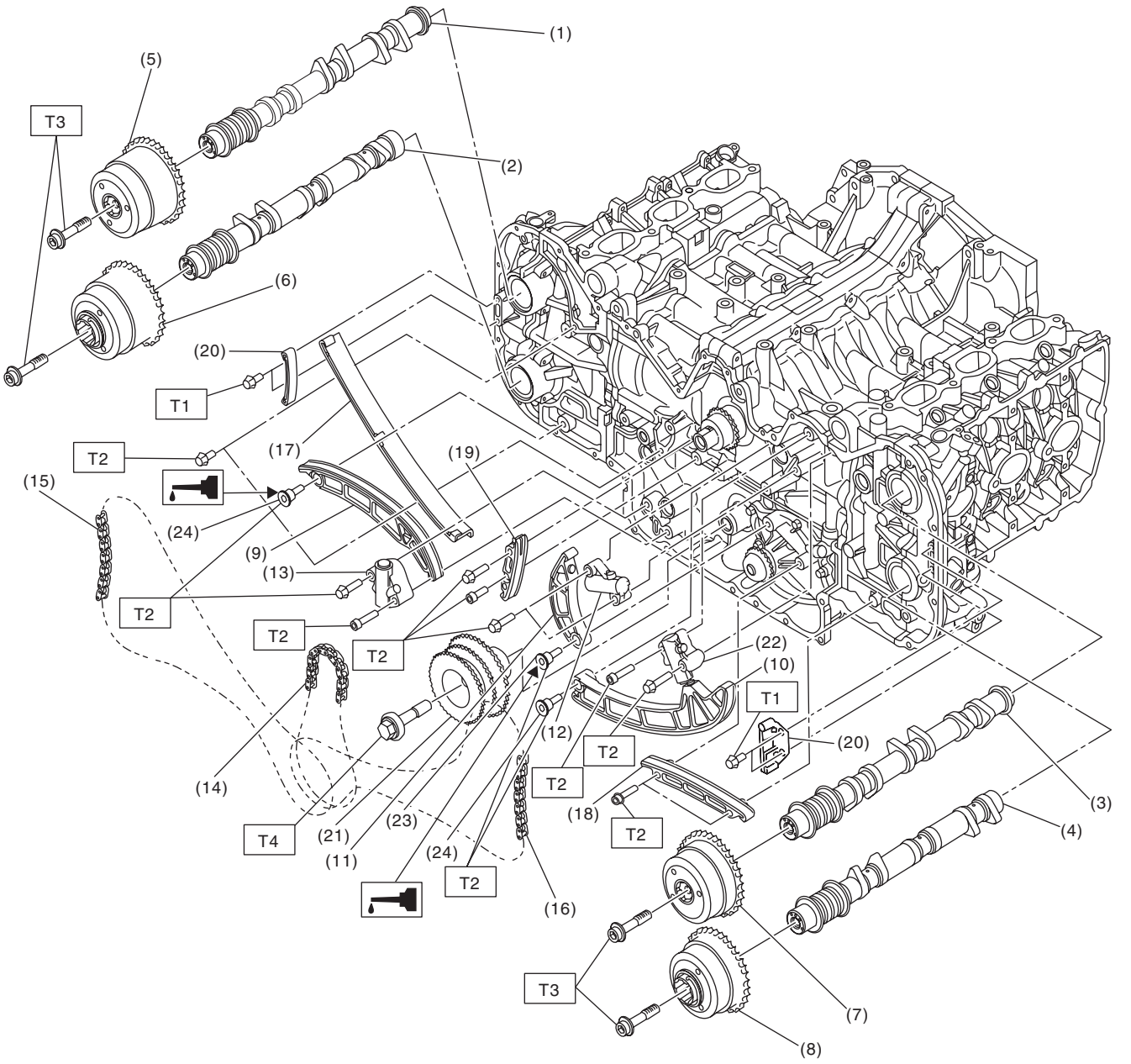
2. TIMING CHAIN COVER



(1) Crank pulley cover
(2) O-ring
(3) Crank pulley
(4) Oil seal
(5) Chain cover
(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



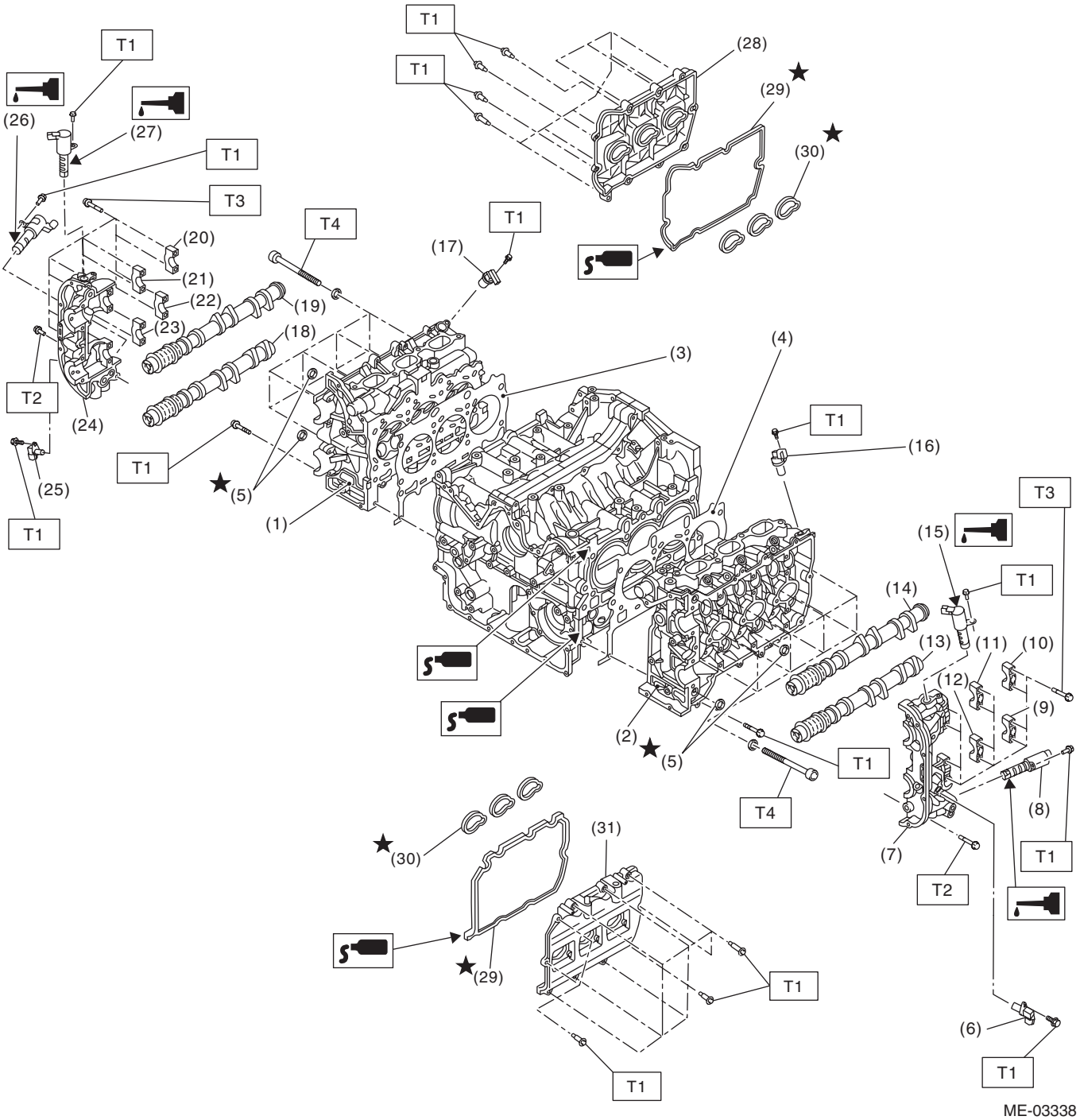
ME-03605

(1) Intake camshaft (RH)
(2) Exhaust camshaft (RH)
(3) Intake camshaft (LH)
(4) Exhaust camshaft (LH)
(5) Intake camshaft sprocket (RH)
(6) Exhaust camshaft sprocket (RH)
(7) Intake camshaft sprocket (LH)
(8) Exhaust camshaft 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
(24) 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)-73, Cam Sprocket.>
T4: 120 (12.2, 88.5)

4. CYLINDER HEAD AND CAMSHAFT

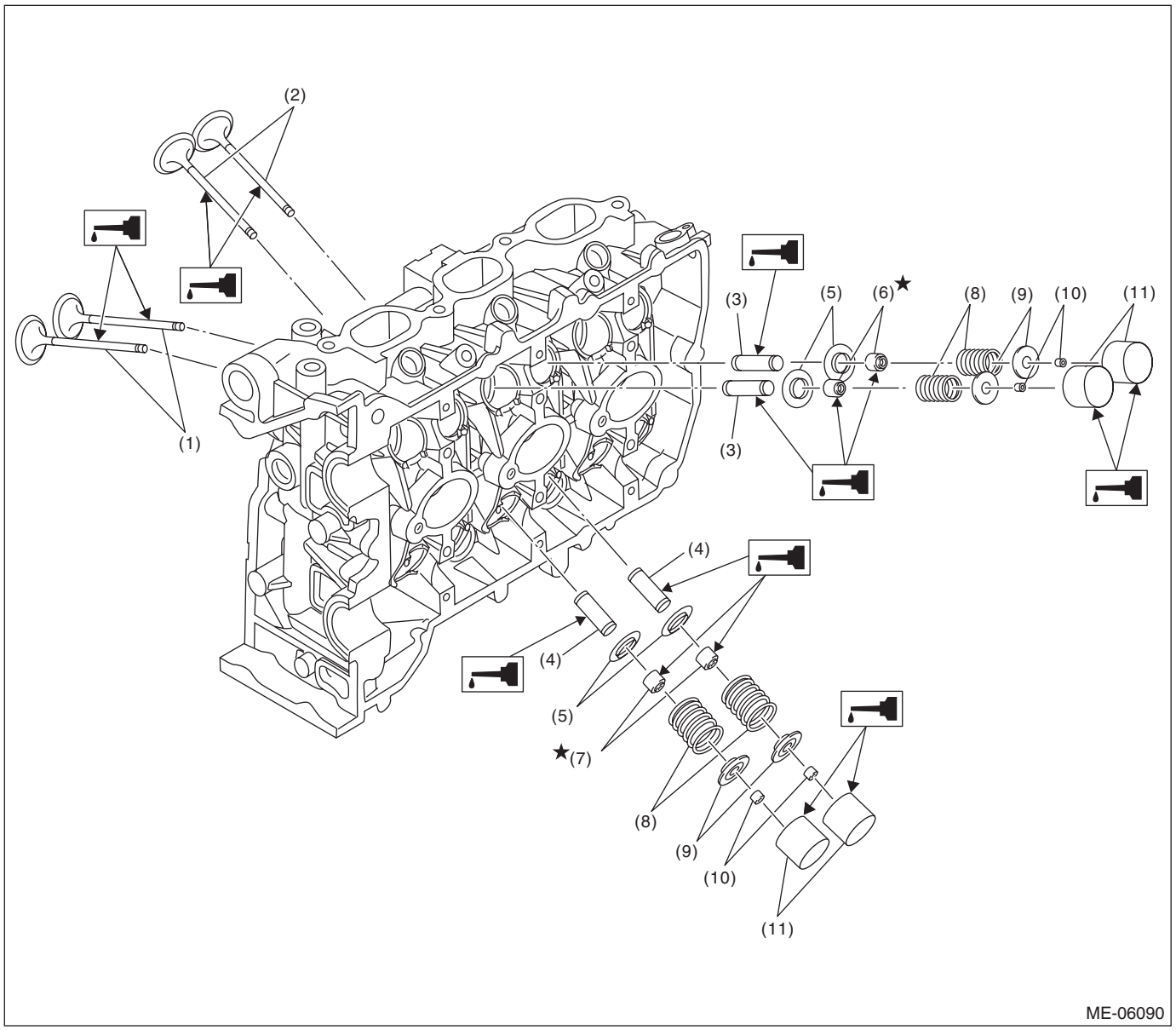


(1) Cylinder head (RH)
(2) Cylinder head (LH)
(3) Cylinder head gasket (RH)
(4) Cylinder head gasket (LH)
(5) O-ring
(6) Exhaust camshaft position sensor (LH)
(7) Front camshaft cap (LH)
(8) Exhaust oil flow control solenoid valve (LH)
(9) Exhaust camshaft cap (Rear LH)
(10) Intake camshaft cap (Rear 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)

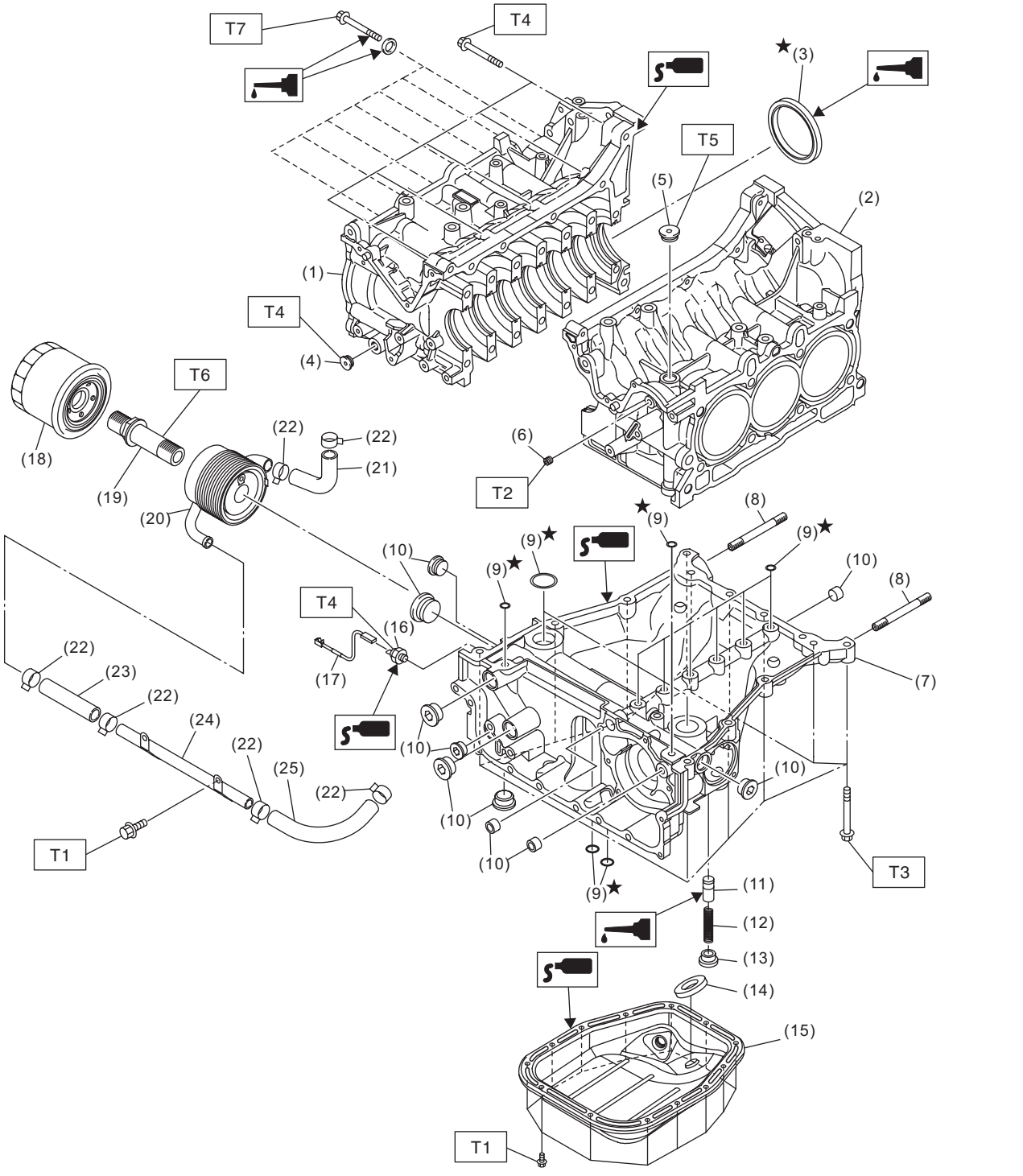
T1: 6.4 (0.7, 4.7)
T2: 9.75 (1.0, 7.2)
T3: 16 (1.6, 11.8)
T4: <Ref. to ME(H6DO)-82, Cylinder Head.>

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

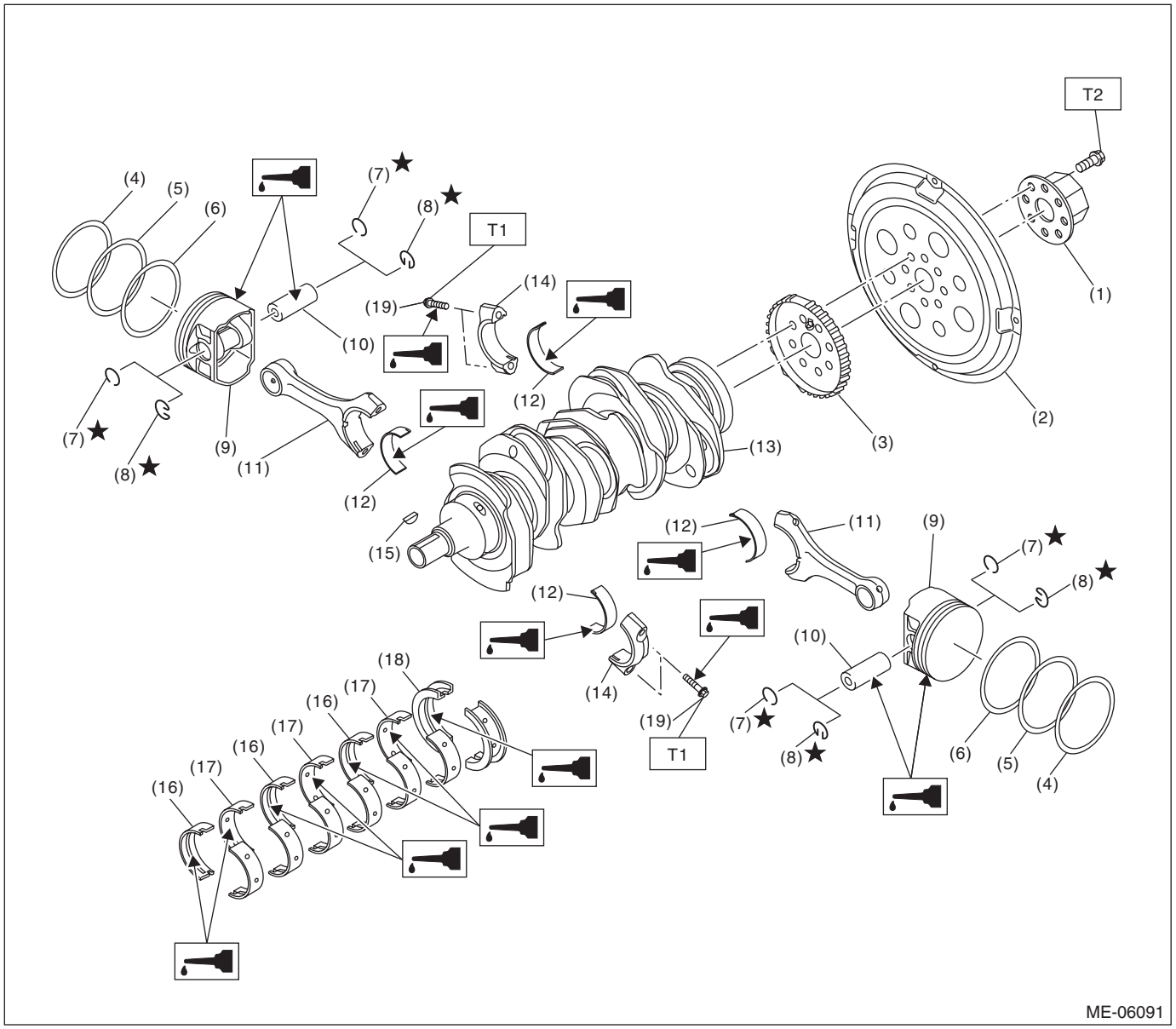


(1) Cylinder block (RH)
(2) Cylinder block (LH)
(3) Oil seal
(4) Plug
(5) Plug
(6) Orifice
(7) Oil pan upper
(8) Stud bolt
(9) O-ring
(10) Plug
(11) Relief valve
(12) Relief valve spring
(13) Relief plug
(14) Magnet
(15) Oil pan lower
(16) Oil pressure switch
(17) Oil pressure switch harness
(18) Oil filter
(19) Oil cooler connector
(20) Oil cooler
(21) Hose
(22) Clamp
(23) Hose
(24) Oil cooler pipe
(25) 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)-93, Cylinder Block.>

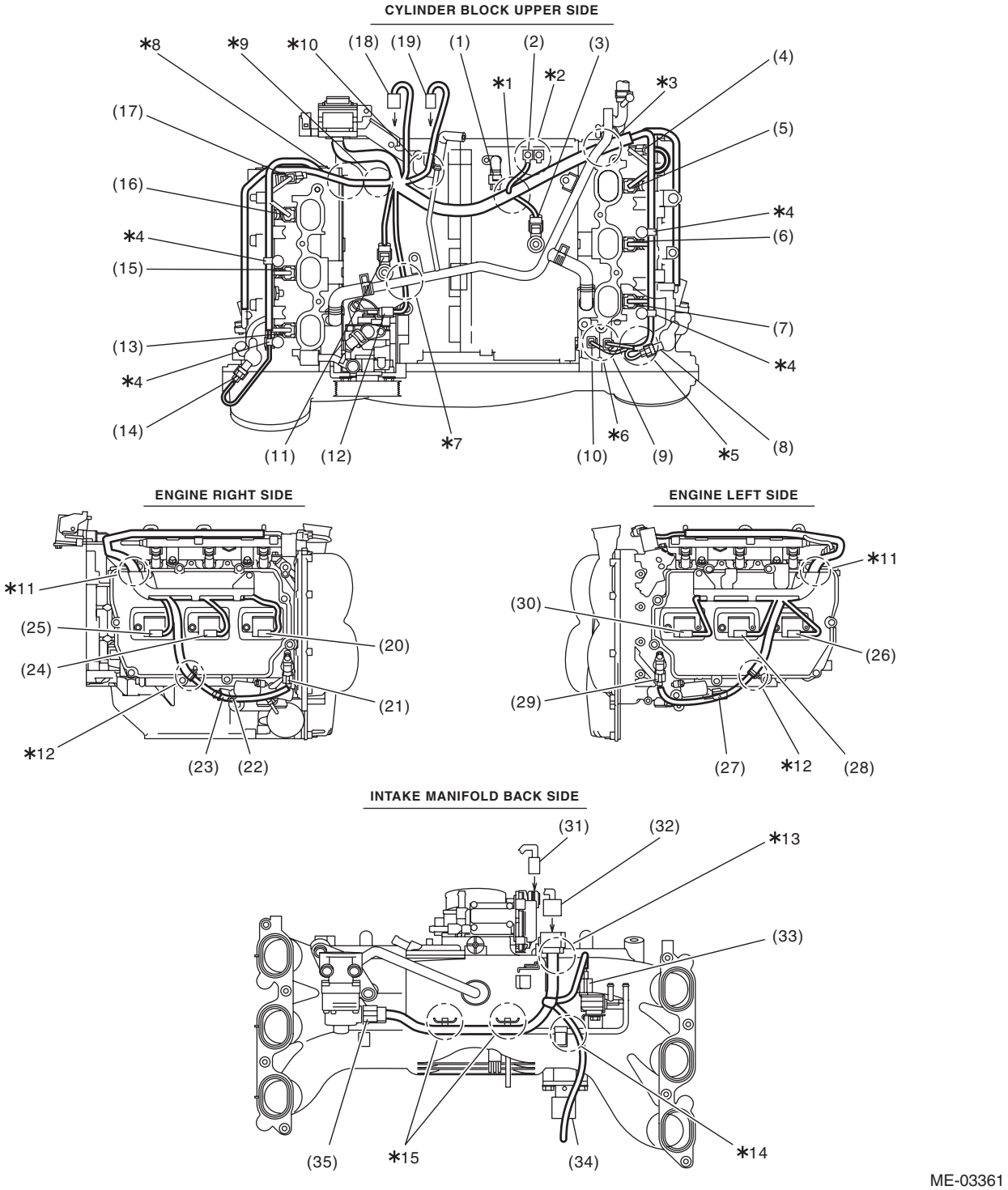
7. CRANKSHAFT AND PISTON



(1) Reinforcement
(2) Drive plate
(3) Crankshaft sensor plate
(4) Top ring
(5) Second ring
(6) Oil ring
(7) Circlip
(8) Snap ring
(9) Piston
(10) Piston pin
(11) Connecting rod
(12) Connecting rod bearing
(13) Crankshaft
(14) Connecting rod cap
(15) Woodruff key
(16) Crankshaft bearing #1, #3, #5
(17) Crankshaft bearing #2, #4, #6
(18) Crankshaft bearing #7
(19) Connecting rod cap bolt

Tightening torque:N·m (kgf-m, ft-lb)
T1: 60 (6.1, 44.3)
T2: 90 (9.2, 66.4)

8. ENGINE HARNESS

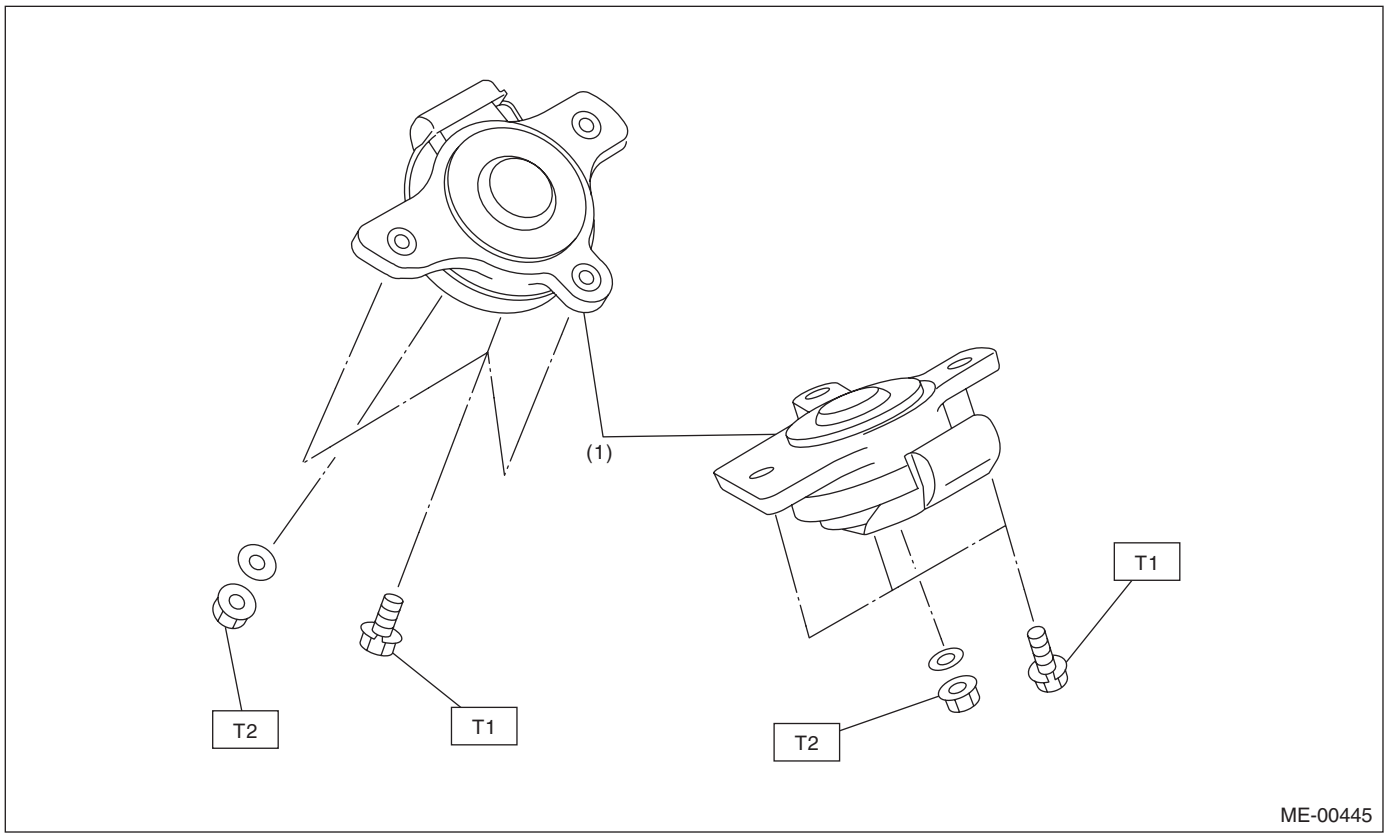


ME-03361

(1) Crankshaft position sensor connector
(2) Engine ground
(3) Knock sensor LH connector
(4) Intake camshaft position sensor LH connector
(5) #6 injector connector
(6) #4 injector connector
(7) #2 injector connector
(8) Intake oil flow control solenoid valve LH connector
(9) Oil temperature sensor connector
(10) Engine coolant temperature sensor connector
(11) Knock sensor RH connector
(12) Power steering switch connector
(13) #1 injector connector
(14) Intake oil flow control solenoid valve RH connector
(15) #3 injector connector
(16) #5 injector connector
(17) Intake camshaft position sensor RH connector
(18) Upper and lower joint connector (to intake manifold)
(19) Electronic throttle control connector (to intake manifold)
(20) #1 ignition coil connector
(21) Exhaust camshaft position sensor RH
(22) Oil pressure switch connector
(23) Exhaust oil flow control solenoid valve RH connector
(24) #3 ignition coil connector
(25) #5 ignition coil connector
(26) #6 ignition coil connector
(27) Exhaust oil flow control solenoid valve LH connector
(28) #4 ignition coil connector
(29) Exhaust camshaft position sensor LH connector
(30) #2 ignition coil connector
(31) Electronic throttle control connector (from cylinder block upper part)
(32) Upper and lower joint connector (from cylinder block upper part)
(33) Purge control solenoid valve connector
(34) Manifold absolute pressure sensor connector
(35) EGR valve connector

*1: Route the harness between the crankshaft position sensor and the knock sensor LH.
*2: Install the engine ground terminal so that it faces the rear of the vehicle.
*3: Route the harness under the heater hose pipe.
*4: Install the engine harness fixing clip to the fuel pipe stay.
*5: Route the harness from the cutout portion of the fuel pipe protector LH.
*6: Do not confuse the oil temperature sensor connector and the engine coolant temperature sensor connector.
*7: Route the harness under the heater hose pipe.
*8: Route the harness under the fuel pipe.
*9: Install the engine harness fixing clip to the fixing boss of the cylinder block.
*10: Route the harness over the heater hose pipe stay.
*11: Align the edges of the engine harness stay and the engine harness identification tape.
*12: Install the engine harness fixing clip to the fixing boss of the rocker cover.
*13: Install the engine harness fixing stay securely.
*14: Route the harness outside the fuel pipe.
*15: Install the engine harness fixing clip to the fixing stay of the intake manifold.

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

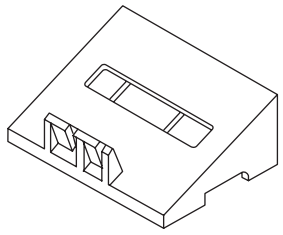
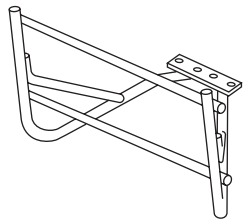
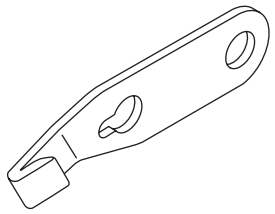
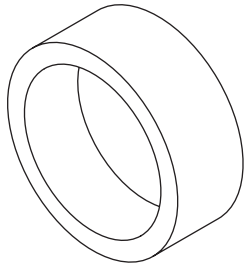
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18250AA010	18250AA010	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve spring.
 ST18232AA000	18232AA000	ENGINE STAND	Used for disassembling and assembling engine.
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of drive plate when loosening / tightening crank pulley bolt.
 ST-398744300	398744300	PISTON GUIDE	Used for installing piston in cylinder.

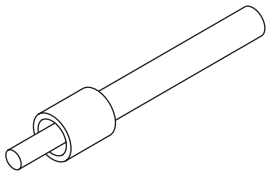
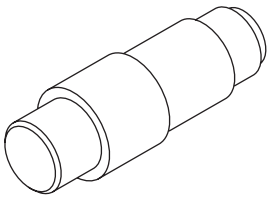
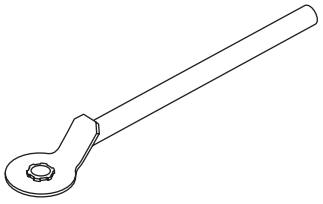
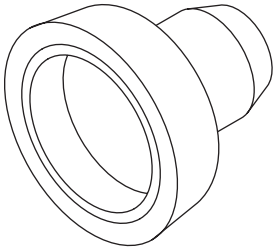
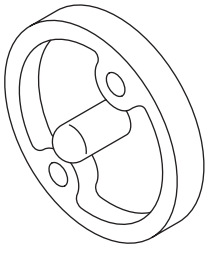
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499585500	499585500	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST18350AA000	18350AA000	CONNECTING ROD BUSHING REMOVER AND INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing camshaft 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).

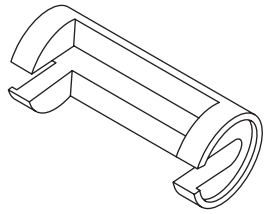
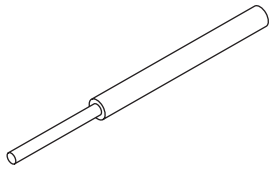
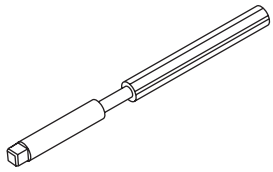
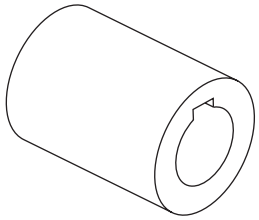
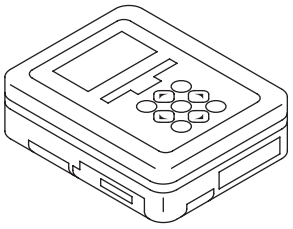
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST-499765700	499765700	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499765900	499765900	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST18252AA000	18252AA000	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting for electrical system.

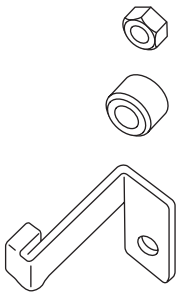
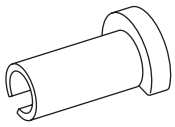
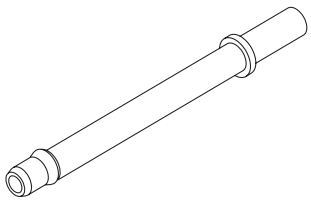
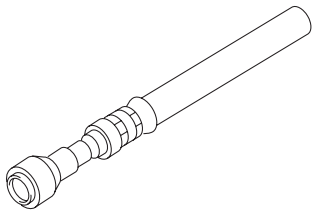
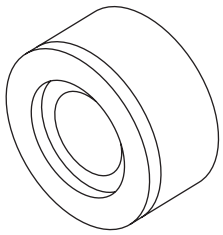
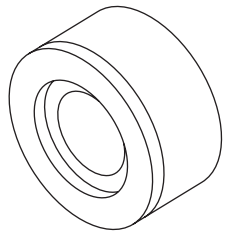
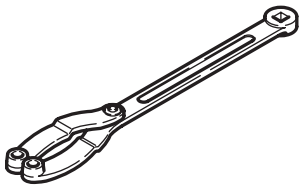
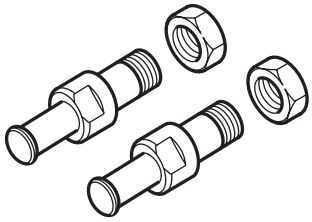
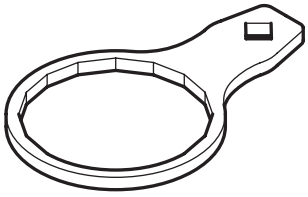
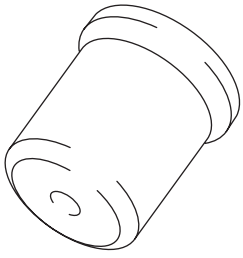
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST42099AE000	42099AE000	QUICK CONNECTOR RELEASE	Used for disconnecting quick connector of the engine compartment.
 ST18471AA000	18471AA000	FUEL PIPE ADAPTER	Used for measuring fuel pressure.
 ST42075AG690	42075AG690	FUEL HOSE	• Used for measuring fuel pressure. • This is a genuine Subaru part.
 ST18251AA050	18251AA050	VALVE GUIDE ADJUSTER	Used for installing intake valve guides.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18251AA060	18251AA060	VALVE GUIDE ADJUSTER	Used for installing exhaust valve guides.
 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.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on vehicle, however, the procedures described in this section are based on the condition that the engine is removed from vehicle.

- V-belt
- Timing chain

2. Compression

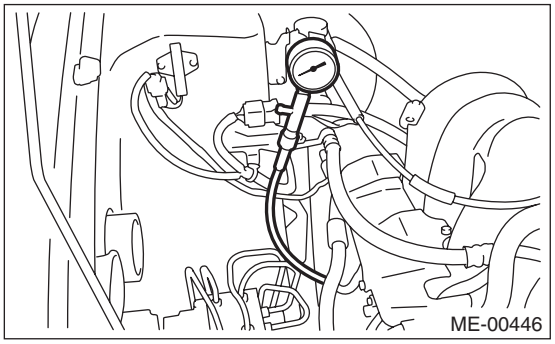
A: INSPECTION

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)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
5) Remove all the spark plugs. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
6) Fully open the throttle valve.
7) Check the starter motor for satisfactory performance and operation.
8) Hold 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.



10) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard:
1,275 — 1,471 kPa (13.0 — 15.0 kgf/cm^2, 185 — 213 psi)
Service limit:
1,128 kPa (11.5 kgf/cm^2, 164 psi)

11) 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) Idle the engine.
3) Read the engine idle speed using Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-35, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>
4) 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]:
700±100 rpm

5) Check the idle speed when loaded. (Turn the air conditioning switch "ON" and operate the compressor for at least one minute before measurement.)

Idle speed [A/C "ON" and gears in "P" or "N" range]:
805±100 rpm

NOTE:
Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted. If the prescribed idle speed cannot be maintained, refer to General Diagnosis Table under "Engine Control System". <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself at measurement.

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) Idle the engine.
3) Read the ignition timing using the Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-35, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

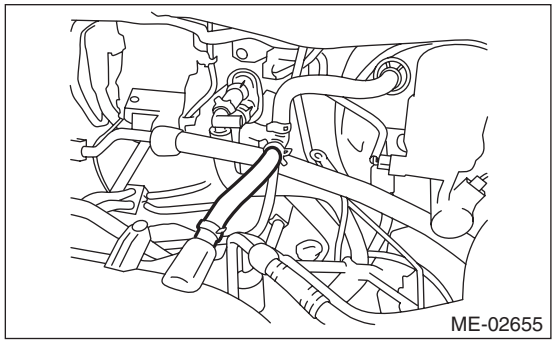
Ignition timing [BTDC/rpm]:
15°±8°/700

If the timing is not correct, check the ignition control system. Refer to “Engine Control System”. <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Idle the engine.
2) Disconnect the brake booster vacuum hose from the intake manifold, and install the vacuum gauge.
3) Keep the engine at idle speed and read the vacuum gauge indication. By observing the vacuum gauge needle movement, internal condition of the engine can be diagnosed as described below.



Vacuum pressure (at idling, A/C OFF):
–60.0 kPa (–450 mmHg, –17.72 inHg) or less

Diagnosis of engine condition by measurement of intake manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Air leakage around intake manifold gasket, disconnection or damage of vacuum hose
2. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
3. Needle drops suddenly and intermittently from normal position.	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 normal position in narrow range.	Defective ignition system

6. Engine Oil Pressure

A: INSPECTION

1) Remove the oil pressure switch from the oil pan, upper. <Ref. to LU(H6DO)-14, REMOVAL, Oil Pressure Switch.>
2) Connect the oil pressure gauge hose to the oil pan upper.
3) Connect the ground cable to battery.
4) Start the engine, and measure the oil pressure.

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)

• If the oil pressure is out of specification, check the oil pump, oil filter and lubrication line. <Ref. to LU(H6DO)-17, INSPECTION, 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)-17, INSPECTION, General Diagnostic Table.>
5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H6DO)-14, INSTALLATION, Oil Pressure Switch.>

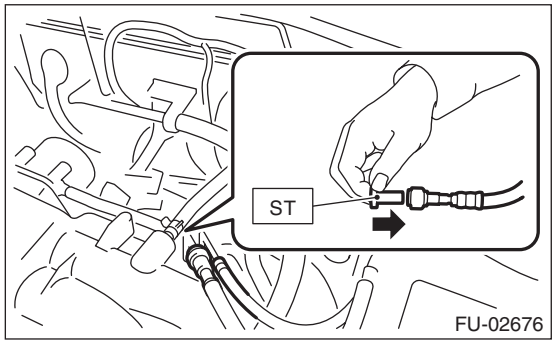
7. Fuel Pressure

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.

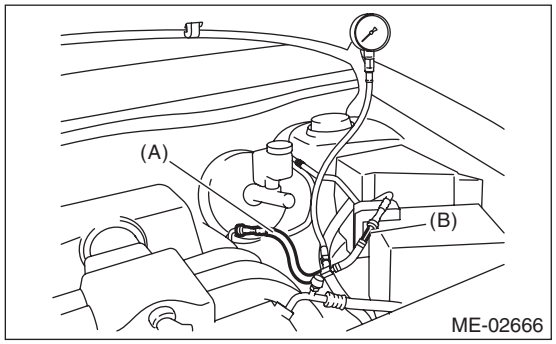
NOTE:
If the fuel pressure is out of specification, check or replace the fuel pump and fuel delivery line.
1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler lid, and remove the fuel filler cap.
4) Disconnect the fuel delivery hose and connect fuel pressure gauge.
(1) Disconnect the fuel delivery hose using the ST1.

ST1 42099AE000 QUICK CONNECTOR RELEASE



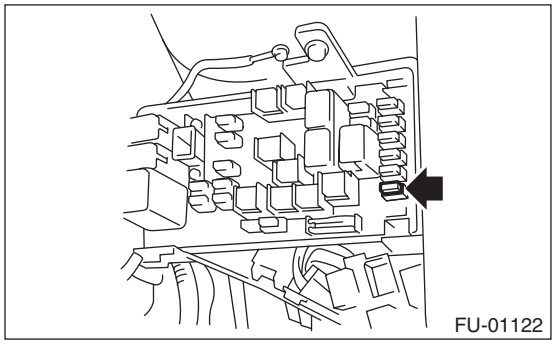
(2) Connect the fuel pressure meter using the ST2 and ST3.

NOTE:
ST2 is a genuine Subaru part.
ST2 42075AG690 FUEL HOSE
ST3 18471AA000 FUEL PIPE ADAPTER



(A) ST2
(B) ST3

5) Install the fuse of fuel pump to the main fuse box.



6) Start the engine.
7) Measure the fuel pressure after warming up the engine.

Fuel pressure:
Standard: 338 — 348 kPa (3.4 — 3.5 kgf/cm^2, 49 — 50.5 psi)

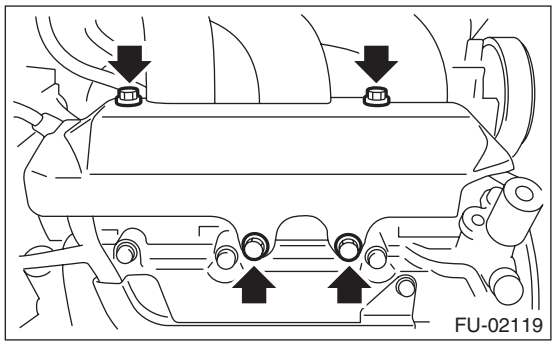
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

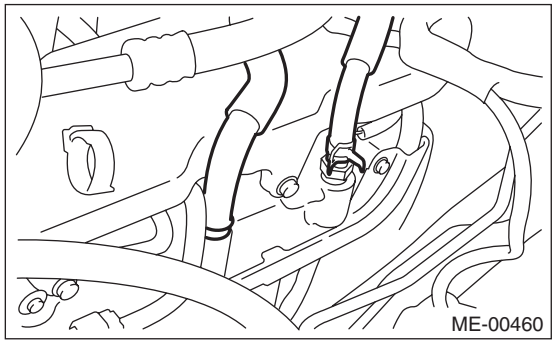
A: INSPECTION

Inspection and adjustment of valve clearance should be performed while engine is cold.

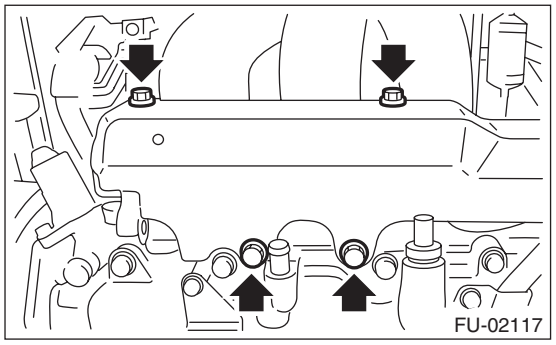
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.
4) Lift up the vehicle.
5) Remove the under cover.
6) Lower the vehicle.
7) When inspecting RH side cylinders:
   (1) Remove the air intake duct and air cleaner case. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.> <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.>
   (2) Remove the fuel pipe protector (RH).



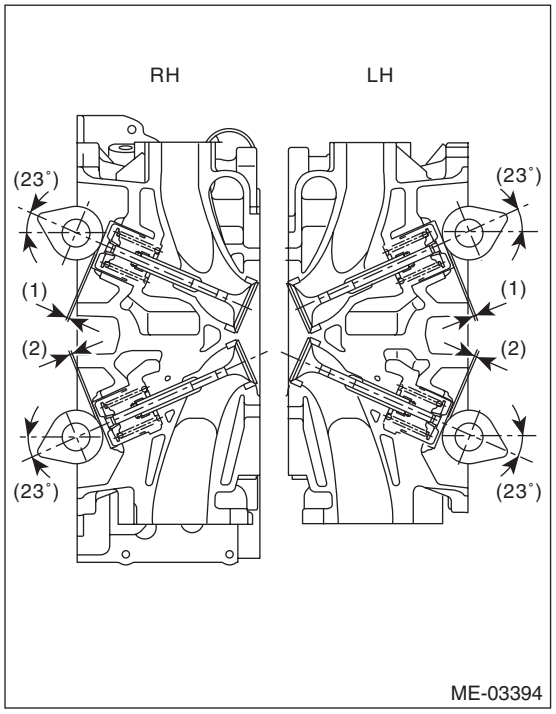
   (3) Disconnect the connector of oil pressure switch.
   (4) Remove the ignition coil. <Ref. to IG(H6DO)-7, REMOVAL, Ignition Coil.>
   (5) Remove the rocker cover (RH). <Ref. to ME(H6DO)-75, REMOVAL, Camshaft.>
8) When inspecting LH side cylinders:
   (1) Disconnect the battery cable, and then remove the battery and battery carrier.
   (2) Disconnect the PCV hose and blow-by hose from the rocker cover (LH).



   (3) Remove the fuel pipe protector (LH).



   (4) Remove the ignition coil. <Ref. to IG(H6DO)-7, REMOVAL, Ignition Coil.>
   (5) Remove the rocker cover (LH). <Ref. to ME(H6DO)-75, REMOVAL, Camshaft.>
9) Turn the crankshaft clockwise until the cam is set to position shown in the figure.



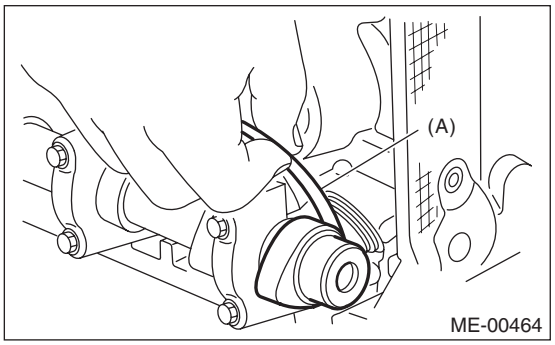
(1) Valve clearance (Intake side)
(2) Valve clearance (Exhaust side)

10) 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.

Valve clearance:
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)

• If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



11) If necessary, adjust the valve clearance. <Ref. to ME(H6DO)-32, ADJUSTMENT, Valve Clearance.>
12) Further turn the crank pulley clockwise and then measure the valve clearances again.
13) After inspection, install the related parts in the reverse order of removal. <Ref. to ME(H6DO)-77, INSTALLATION, Camshaft.>

B: ADJUSTMENT

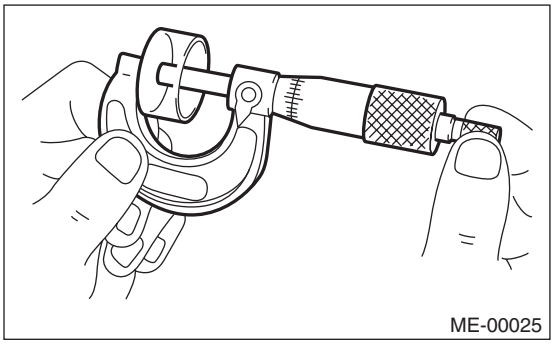
1. INTAKE SIDE

NOTE:
• Adjustment of valve clearance should be performed while engine is cold.
• Do not wear gloves during removal and installation of valve lifter.
• Do not use valve lifters that were dropped or otherwise exposed to strong impacts.

1) Measure all valve clearances. <Ref. to ME(H6DO)-31, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after measurement.

2) Remove the timing chain assembly. <Ref. to ME(H6DO)-54, REMOVAL, Timing Chain Assembly.>
3) Remove the cam sprocket. <Ref. to ME(H6DO)-73, REMOVAL, Cam Sprocket.>
4) Remove the camshaft. <Ref. to ME(H6DO)-75, REMOVAL, Camshaft.>
5) Remove the valve lifter.
6) Measure the thickness of valve lifter using micrometer.



7) Select and install a valve lifter of suitable thickness from the following table using the measured valve clearance and valve lifter thickness.

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

Part number	Thickness mm (in)
13228AD181	4.32 (0.1701)
13228AD191	4.34 (0.1709)
13228AD201	4.36 (0.1717)
13228AD211	4.38 (0.1724)
13228AD221	4.40 (0.1732)
13228AD231	4.42 (0.1740)
13228AD241	4.44 (0.1748)
13228AD251	4.46 (0.1756)
13228AD261	4.48 (0.1764)
13228AD271	4.50 (0.1772)
13228AD281	4.52 (0.1780)
13228AD291	4.54 (0.1787)
13228AD301	4.56 (0.1795)
13228AD311	4.58 (0.1803)
13228AD321	4.60 (0.1811)
13228AC581	4.62 (0.1819)
13228AC591	4.63 (0.1823)
13228AC601	4.64 (0.1827)
13228AC611	4.65 (0.1831)
13228AC621	4.66 (0.1835)
13228AC631	4.67 (0.1839)
13228AC641	4.68 (0.1843)
13228AC651	4.69 (0.1846)
13228AC661	4.70 (0.1850)
13228AC671	4.71 (0.1854)
13228AC681	4.72 (0.1858)
13228AC691	4.73 (0.1862)
13228AC701	4.74 (0.1866)
13228AC711	4.75 (0.1870)
13228AC721	4.76 (0.1874)
13228AC731	4.77 (0.1878)
13228AC741	4.78 (0.1882)
13228AC751	4.79 (0.1886)
13228AC761	4.80 (0.1890)
13228AC771	4.81 (0.1894)
13228AC781	4.82 (0.1898)
13228AC791	4.83 (0.1902)
13228AC801	4.84 (0.1906)
13228AC811	4.85 (0.1909)
13228AC821	4.86 (0.1913)
13228AC831	4.87 (0.1917)
13228AC841	4.88 (0.1921)
13228AC851	4.89 (0.1925)
13228AC861	4.90 (0.1929)
13228AC871	4.91 (0.1933)
13228AC881	4.92 (0.1937)
13228AC891	4.93 (0.1941)
13228AC901	4.94 (0.1945)
13228AC911	4.95 (0.1949)
13228AC921	4.96 (0.1953)

Part number	Thickness mm (in)
13228AC931	4.97 (0.1957)
13228AC941	4.98 (0.1961)
13228AC951	4.99 (0.1965)
13228AC961	5.00 (0.1969)
13228AC971	5.01 (0.1972)
13228AC981	5.02 (0.1976)
13228AC991	5.03 (0.1980)
13228AD001	5.04 (0.1984)
13228AD011	5.05 (0.1988)
13228AD021	5.06 (0.1992)
13228AD031	5.07 (0.1996)
13228AD041	5.08 (0.2000)
13228AD051	5.09 (0.2004)
13228AD061	5.10 (0.2008)
13228AD071	5.11 (0.2012)
13228AD081	5.12 (0.2016)
13228AD091	5.13 (0.2020)
13228AD101	5.14 (0.2024)
13228AD111	5.15 (0.2028)
13228AD121	5.16 (0.2032)
13228AD131	5.17 (0.2035)
13228AD141	5.18 (0.2039)
13228AD151	5.19 (0.2043)
13228AD161	5.20 (0.2047)
13228AD171	5.21 (0.2051)
13228AD331	5.23 (0.2059)
13228AD341	5.25 (0.2067)
13228AD351	5.27 (0.2075)
13228AD361	5.29 (0.2083)
13228AD371	5.31 (0.2091)
13228AD381	5.33 (0.2098)
13228AD391	5.35 (0.2106)
13228AD401	5.37 (0.2114)
13228AD411	5.39 (0.2122)
13228AD421	5.41 (0.2130)
13228AD431	5.43 (0.2138)
13228AD441	5.45 (0.2146)
13228AD451	5.47 (0.2154)
13228AD461	5.49 (0.2161)
13228AD471	5.51 (0.2169)
13228AD481	5.53 (0.2177)
13228AD491	5.55 (0.2185)
13228AD501	5.57 (0.2193)
13228AD511	5.59 (0.2201)

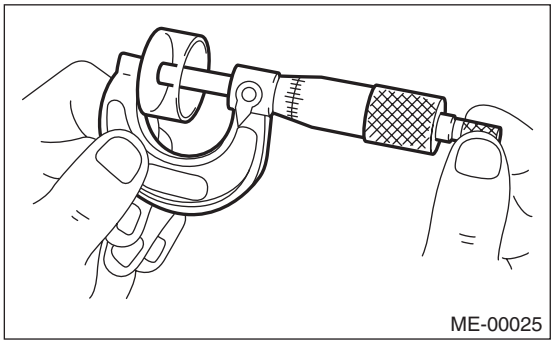
8) Install the camshaft. <Ref. to ME(H6DO)-77, INSTALLATION, Camshaft.>
9) Install the cam sprocket. <Ref. to ME(H6DO)-73, INSTALLATION, Cam Sprocket.>
10) Install the timing chain assembly. <Ref. to ME(H6DO)-60, INSTALLATION, Timing Chain Assembly.>
11) Re-measure all valve clearance at this time.
If the valve clearance is not appropriate, repeat from the first step.
12) After measurement, install the related parts in the reverse order of removal.

NOTE:
Use a new rocker cover gasket.

2. EXHAUST SIDE

NOTE:
• Adjustment of valve clearance should be performed while engine is cold.
• Do not wear gloves during removal and installation of valve lifter.
• Do not use valve lifters that were dropped or otherwise exposed to strong impacts.
1) Measure all valve clearances. <Ref. to ME(H6DO)-31, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after measurement.
2) Remove the camshaft. <Ref. to ME(H6DO)-75, REMOVAL, Camshaft.>
3) Remove the valve lifter.
4) Measure the thickness of valve lifter using micrometer.


ME-00025

5) Select and install a valve lifter of suitable thickness from the following table using the measured valve clearance and valve lifter thickness.

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

Part number	Thickness mm (in)
13228AD181	4.32 (0.1701)
13228AD191	4.34 (0.1709)
13228AD201	4.36 (0.1717)
13228AD211	4.38 (0.1724)
13228AD221	4.40 (0.1732)
13228AD231	4.42 (0.1740)
13228AD241	4.44 (0.1748)
13228AD251	4.46 (0.1756)
13228AD261	4.48 (0.1764)
13228AD271	4.50 (0.1772)
13228AD281	4.52 (0.1780)
13228AD291	4.54 (0.1787)
13228AD301	4.56 (0.1795)
13228AD311	4.58 (0.1803)
13228AD321	4.60 (0.1811)
13228AC581	4.62 (0.1819)
13228AC591	4.63 (0.1823)
13228AC601	4.64 (0.1827)
13228AC611	4.65 (0.1831)
13228AC621	4.66 (0.1835)
13228AC631	4.67 (0.1839)
13228AC641	4.68 (0.1843)
13228AC651	4.69 (0.1846)
13228AC661	4.70 (0.1850)
13228AC671	4.71 (0.1854)
13228AC681	4.72 (0.1858)
13228AC691	4.73 (0.1862)
13228AC701	4.74 (0.1866)
13228AC711	4.75 (0.1870)
13228AC721	4.76 (0.1874)
13228AC731	4.77 (0.1878)
13228AC741	4.78 (0.1882)
13228AC751	4.79 (0.1886)
13228AC761	4.80 (0.1890)
13228AC771	4.81 (0.1894)
13228AC781	4.82 (0.1898)
13228AC791	4.83 (0.1902)
13228AC801	4.84 (0.1906)
13228AC811	4.85 (0.1909)
13228AC821	4.86 (0.1913)
13228AC831	4.87 (0.1917)
13228AC841	4.88 (0.1921)
13228AC851	4.89 (0.1925)
13228AC861	4.90 (0.1929)
13228AC871	4.91 (0.1933)
13228AC881	4.92 (0.1937)
13228AC891	4.93 (0.1941)
13228AC901	4.94 (0.1945)
13228AC911	4.95 (0.1949)
13228AC921	4.96 (0.1953)

Part number	Thickness mm (in)
13228AC931	4.97 (0.1957)
13228AC941	4.98 (0.1961)
13228AC951	4.99 (0.1965)
13228AC961	5.00 (0.1969)
13228AC971	5.01 (0.1972)
13228AC981	5.02 (0.1976)
13228AC991	5.03 (0.1980)
13228AD001	5.04 (0.1984)
13228AD011	5.05 (0.1988)
13228AD021	5.06 (0.1992)
13228AD031	5.07 (0.1996)
13228AD041	5.08 (0.2000)
13228AD051	5.09 (0.2004)
13228AD061	5.10 (0.2008)
13228AD071	5.11 (0.2012)
13228AD081	5.12 (0.2016)
13228AD091	5.13 (0.2020)
13228AD101	5.14 (0.2024)
13228AD111	5.15 (0.2028)
13228AD121	5.16 (0.2032)
13228AD131	5.17 (0.2035)
13228AD141	5.18 (0.2039)
13228AD151	5.19 (0.2043)
13228AD161	5.20 (0.2047)
13228AD171	5.21 (0.2051)
13228AD331	5.23 (0.2059)
13228AD341	5.25 (0.2067)
13228AD351	5.27 (0.2075)
13228AD361	5.29 (0.2083)
13228AD371	5.31 (0.2091)
13228AD381	5.33 (0.2098)
13228AD391	5.35 (0.2106)
13228AD401	5.37 (0.2114)
13228AD411	5.39 (0.2122)
13228AD421	5.41 (0.2130)
13228AD431	5.43 (0.2138)
13228AD441	5.45 (0.2146)
13228AD451	5.47 (0.2154)
13228AD461	5.49 (0.2161)
13228AD471	5.51 (0.2169)
13228AD481	5.53 (0.2177)
13228AD491	5.55 (0.2185)
13228AD501	5.57 (0.2193)
13228AD511	5.59 (0.2201)

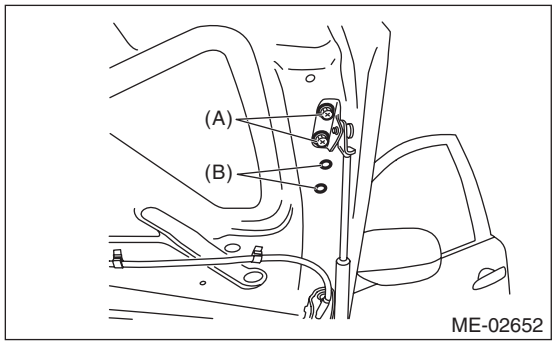
6) Install the camshaft. <Ref. to ME(H6DO)-77, INSTALLATION, Camshaft.>
7) Install the cam sprocket. <Ref. to ME(H6DO)-73, INSTALLATION, Cam Sprocket.>
8) Install the timing chain assembly. <Ref. to ME(H6DO)-60, INSTALLATION, Timing Chain Assembly.>
9) Re-measure all valve clearance at this time.
If the valve clearance is not appropriate, repeat from the first step.
10) After measurement, install the related parts in the reverse order of removal.

NOTE:
Use a new rocker cover gasket.

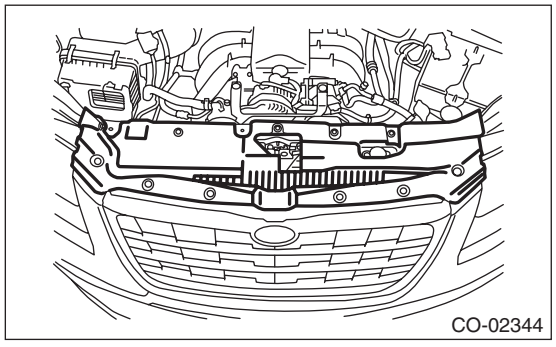
9. Engine Assembly

A: REMOVAL

1) Set the vehicle on a lift.
2) Change the bolt mounting position from (A) to (B), then completely open the front hood.



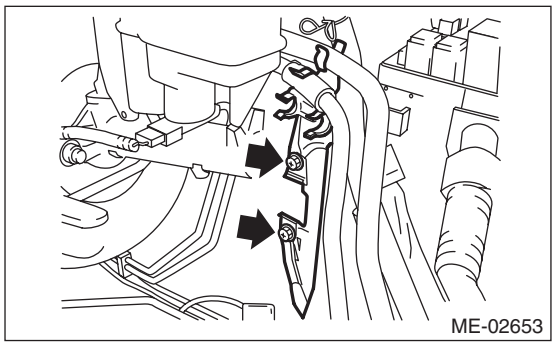
3) Remove the collector cover.
4) Collect the refrigerant from A/C system. <Ref. to AC-22, PROCEDURE, Refrigerant Recovery Procedure.>
5) Release the fuel pressure. <Ref. to FU(H6DO)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
6) Remove the battery from vehicle. <Ref. to SC(H6DO)-20, REMOVAL, Battery.>
7) Remove the air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.> <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
8) Remove the front upper cover.



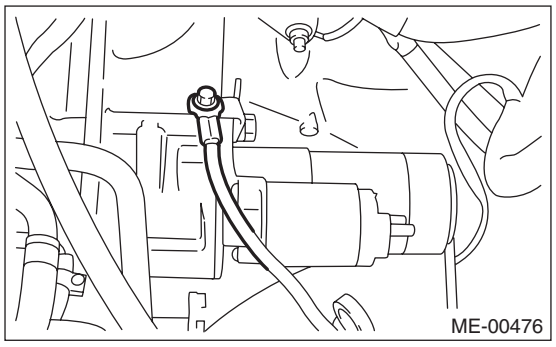
9) Remove the front bumper. <Ref. to EI-22, FRONT BUMPER FACE, REMOVAL, Front Bumper.>
10) Remove the radiator from vehicle. <Ref. to CO(H6DO)-17, REMOVAL, Radiator.>

NOTE:
Protect the condenser so that it will not be damaged.

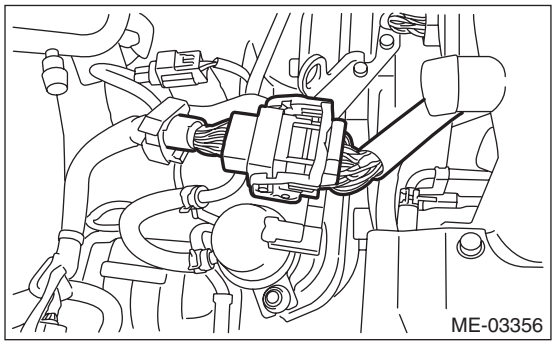
11) Remove the fuel hose bracket.



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-40, REMOVAL, Hose and Pipe.>
14) Remove the engine ground terminal.

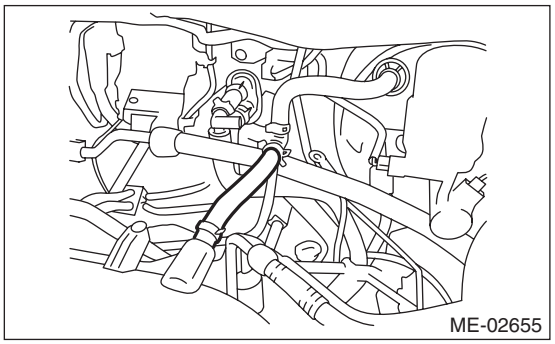


15) Disconnect the following connector.
(1) Engine harness connectors



(2) Generator connector, terminal and A/C compressor connector
(3) Power steering switch connector

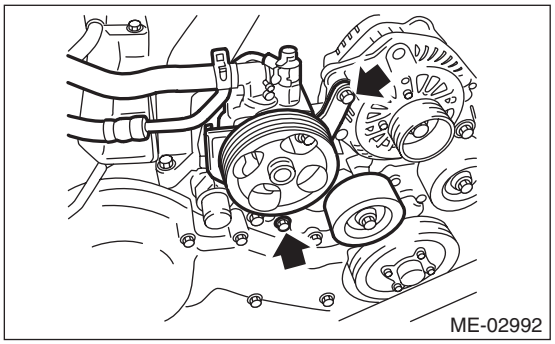
16) Disconnect the following hoses.
(1) Brake booster vacuum hose

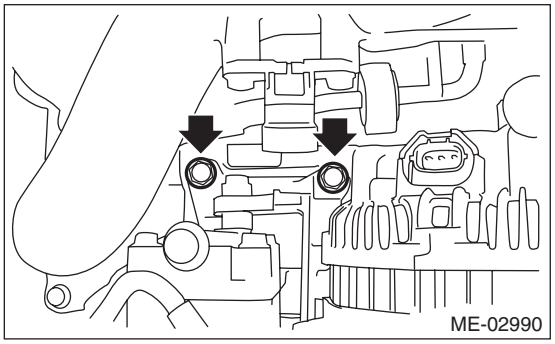

ME-02655

(2) Heater inlet and outlet hoses

17) Remove the power steering pump together with the bracket.

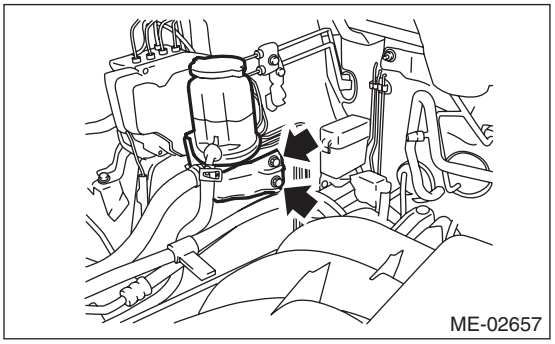
NOTE:
Do not disconnect the hose and pipe from the power steering pump body.


ME-02992

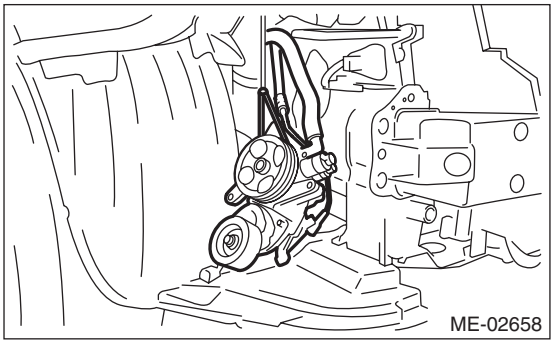

ME-02990

18) Remove the power reserve tank together with the bracket.

NOTE:
Do not disconnect the hose from the reservoir tank body.


ME-02657

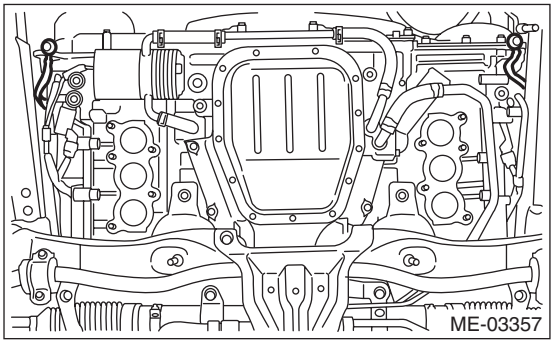
19) Suspend the power steering pump using wire, etc.


ME-02658

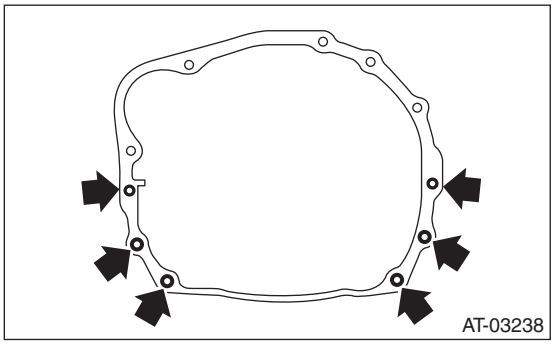
20) Remove the bolts which hold the vacuum pump bracket to the engine. <Ref. to BR-10, BRAKE VACUUM PUMP, COMPONENT, General Description.>
21) Lift up the vehicle.
22) Remove the front exhaust pipe. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>

NOTE:
Be careful not to let the front exhaust pipe interfere with water pipes on engine side.

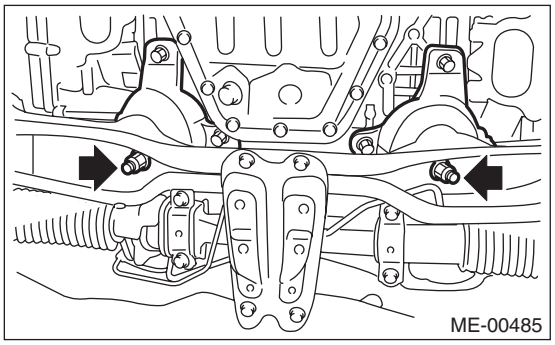
23) Remove the ground cable from the chain cover lower (left and right).


ME-03357

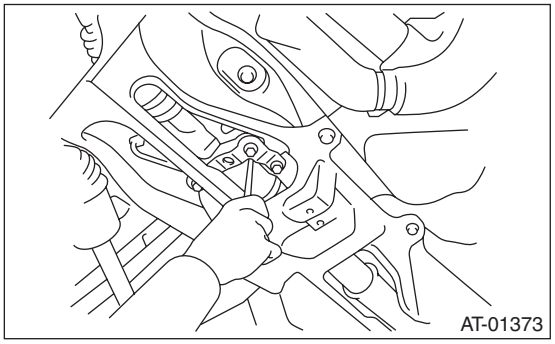
24) Remove the bolts which hold the vacuum pump bracket to the transmission, then remove the vacuum pump together with the bracket. <Ref. to BR-10, BRAKE VACUUM PUMP, COMPONENT, General Description.>
25) Remove the bolts and nuts which hold lower side of transmission to engine.

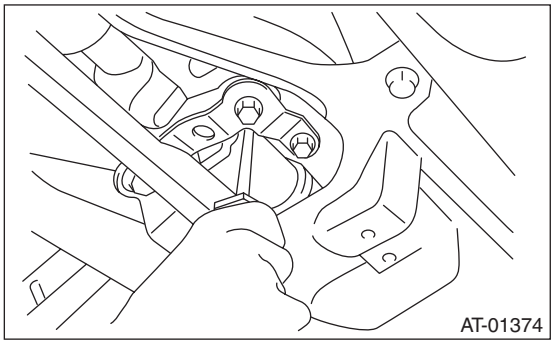


26) Remove the nuts which install front cushion rubber onto front crossmember.



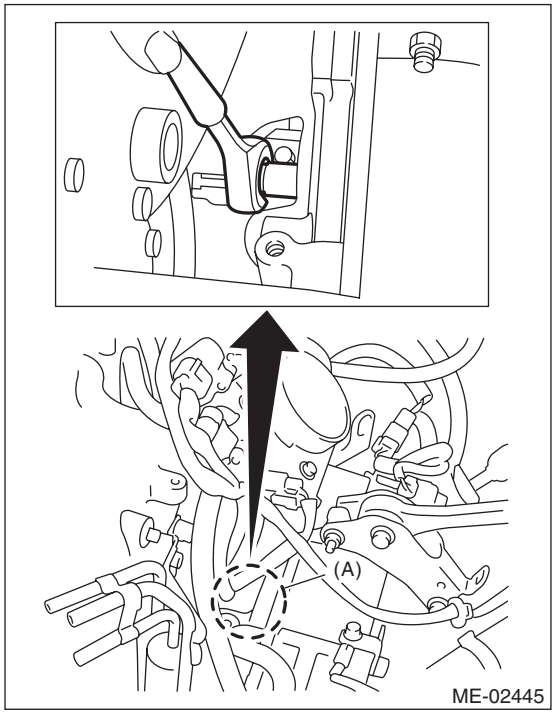
27) Remove the two clutch housing securing bolts.





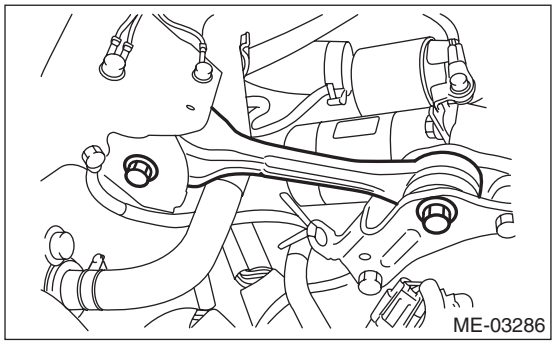
28) Lower the vehicle.

29) Separate the torque converter clutch from drive plate.
(1) Remove the throttle body securing bolts to and slide the throttle body over.
(2) Remove the service hole plug.
(3) Remove the bolts which hold torque converter clutch to drive plate.
(4) Remove other bolts while rotating the crankshaft using socket wrench.



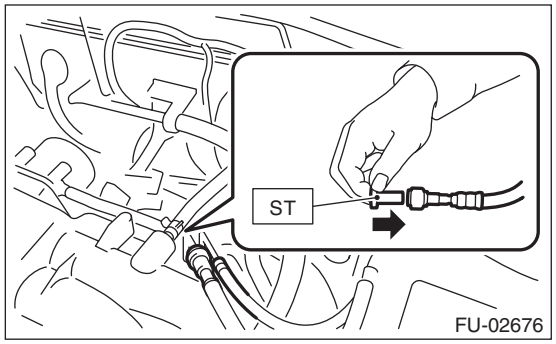
(A) Service hole plug

30) Remove the pitching stopper.

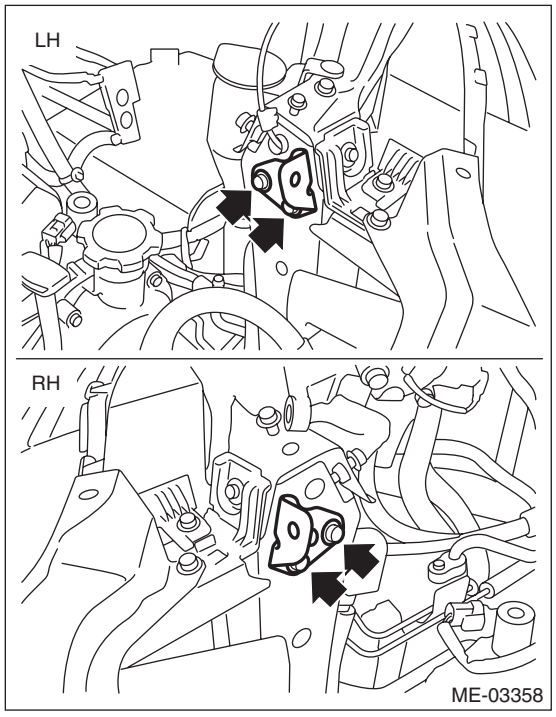


31) Disconnect the fuel delivery hose and evaporation hose.
(1) Disconnect the connector of fuel pipe by pushing the ST in the direction of arrow.
ST 42099AE000 QUICK CONNECTOR RELEASE
(2) Remove the clamp, and disconnect the evaporation hose from the pipe.

CAUTION:
• Be careful not to spill fuel.
• Catch the fuel from hoses using a container or cloth.



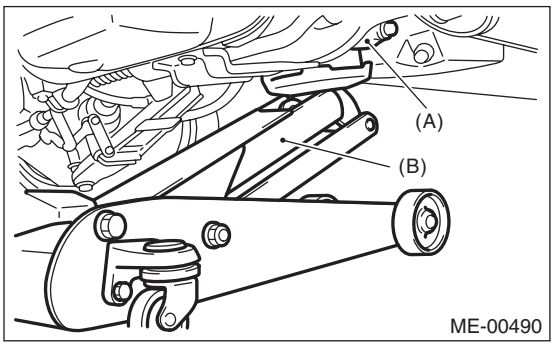
32) Remove the radiator center bracket.



33) Support the engine with a lifting device and wire ropes.

34) Support the transmission with a garage jack.

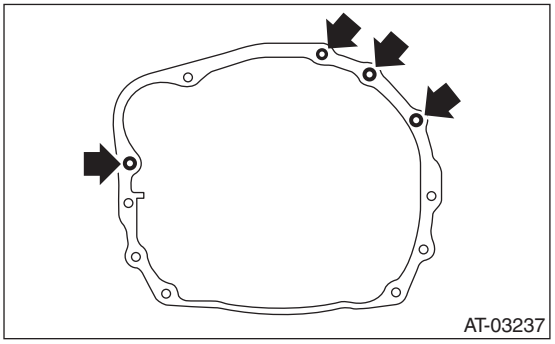
CAUTION:
Be sure to perform this procedure to prevent the transmission from lowering by its own weight.



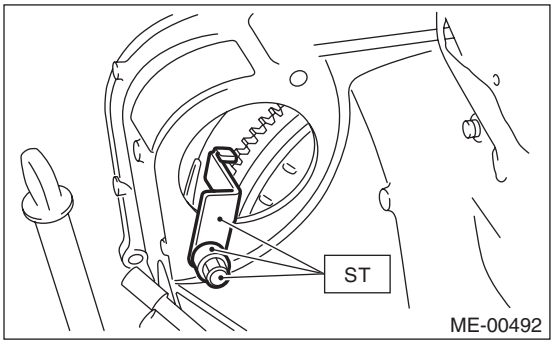
(A) Transmission
(B) Garage jack

35) 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.

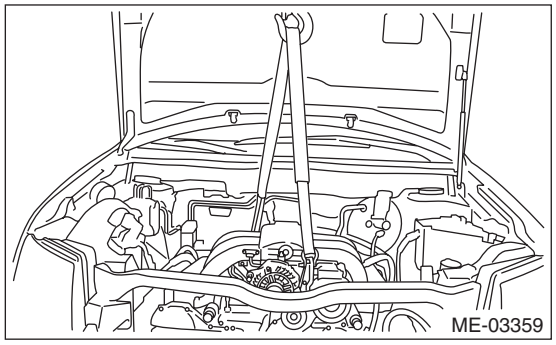


36) Attach the ST to converter case.
ST 498277200 STOPPER SET

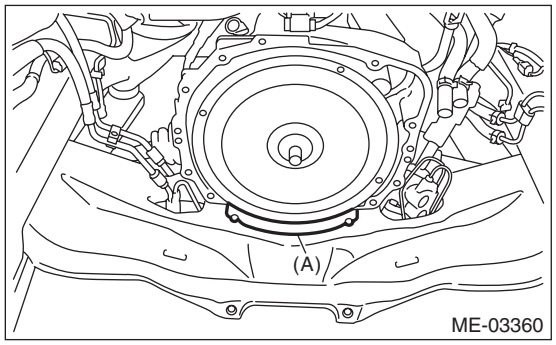


37) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until main shaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



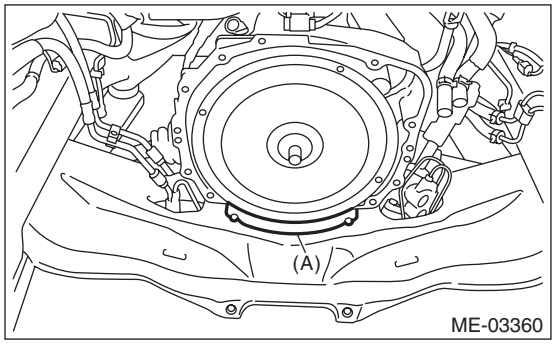
38) Remove the engine mount.
39) Remove the clutch housing cover from vehicle.



(A) Clutch housing cover

B: INSTALLATION

1) Set the clutch housing cover to the vehicle.



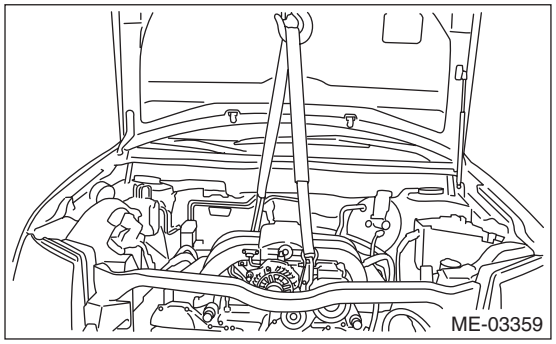
(A) Clutch housing cover

2) Install the engine mount.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

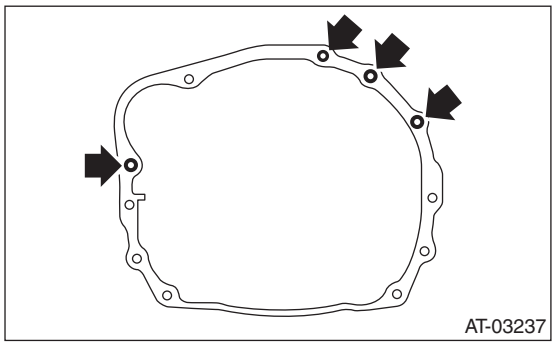
3) Position the engine in engine compartment and align it with transmission.

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.

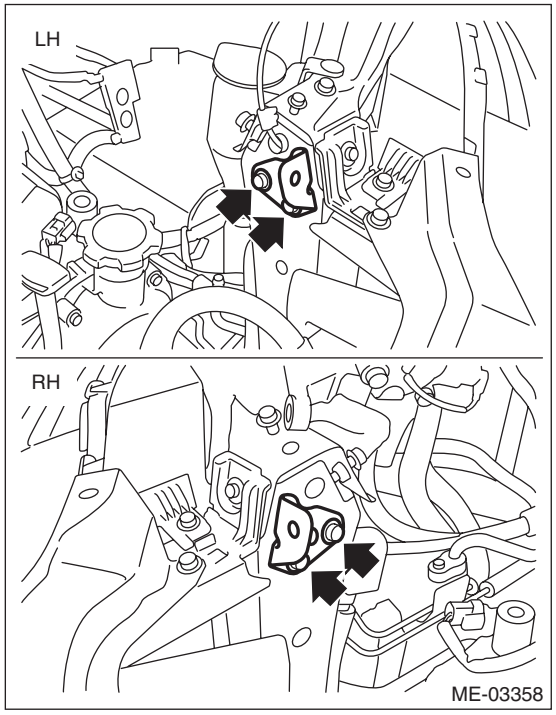
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



5) Remove the lifting device and wire ropes.
6) Remove the garage jack.

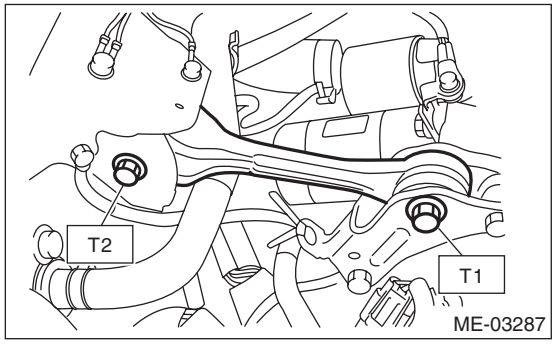
7) Install the radiator center bracket.

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)



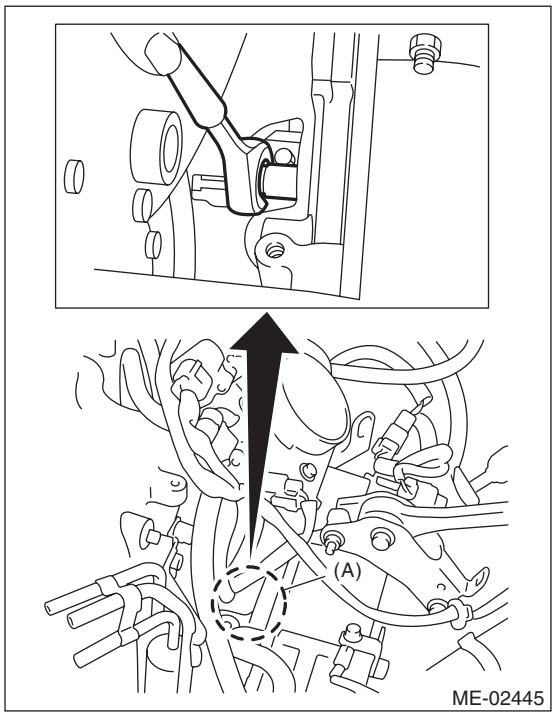
9) Remove the ST from converter case.

NOTE:
Be careful not to drop the ST into the converter case when removing the ST.
ST 498277200 STOPPER SET

10) Install the starter. <Ref. to SC(H6DO)-6, INSTALLATION, Starter.>

11) Install the torque converter clutch to drive plate.
(1) Tighten the bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the crankshaft using socket wrench.

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



(A) Service hole plug

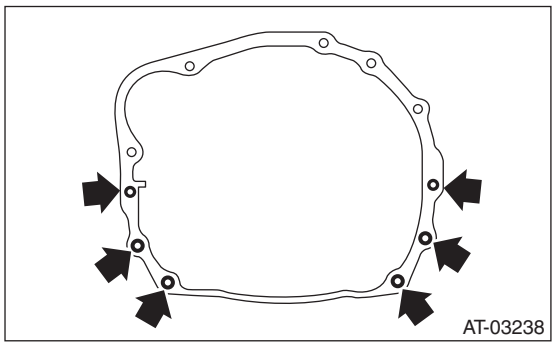
(3) Install the service hole plug to prevent foreign matter from being mixed.
(4) Install the throttle body to intake manifold.

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

12) Lift up the vehicle.

13) 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)



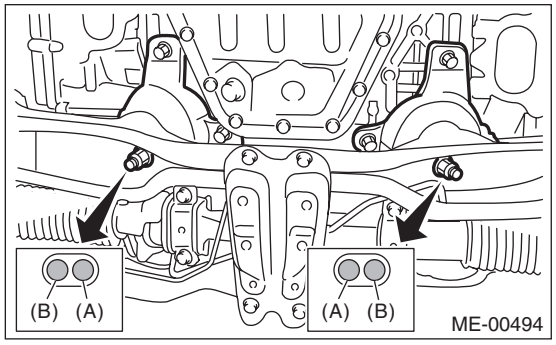
14) Tighten the bolts which holds the vacuum pump bracket to the transmission. <Ref. to BR-10, BRAKE VACUUM PUMP, COMPONENT, General Description.>

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

15) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
75 N·m (7.6 kgf-m, 55.3 ft-lb)

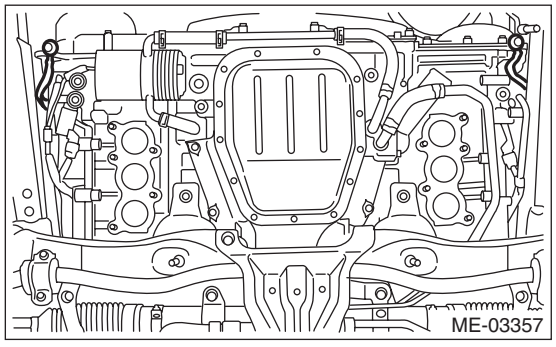
NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



16) Install the front exhaust pipe. <Ref. to EX(H6DO)-5, INSTALLATION, Front Exhaust Pipe.>

NOTE:
- Be care not to let the front exhaust pipe interfere with water pipes and crossmember on engine side.
- Be care not to scratch the flange surface of front exhaust pipe with stud bolt on engine.

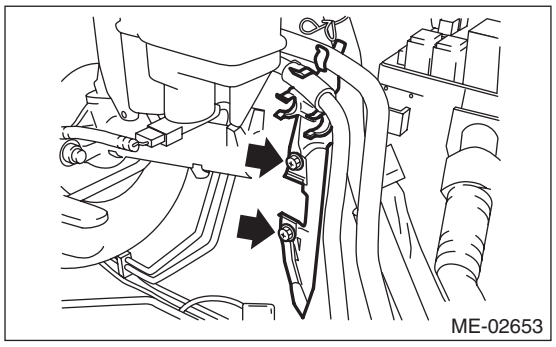
17) Connect the ground cable to the chain cover lower (left and right).



18) Lower the vehicle.

19) Install the fuel hose bracket.

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

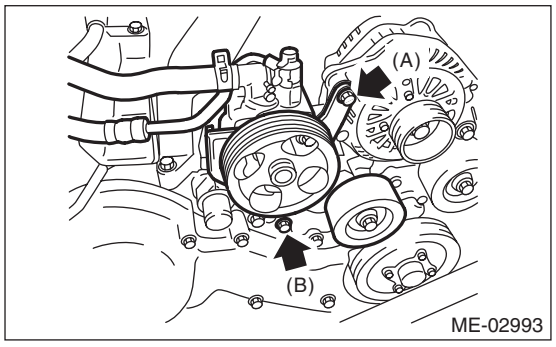


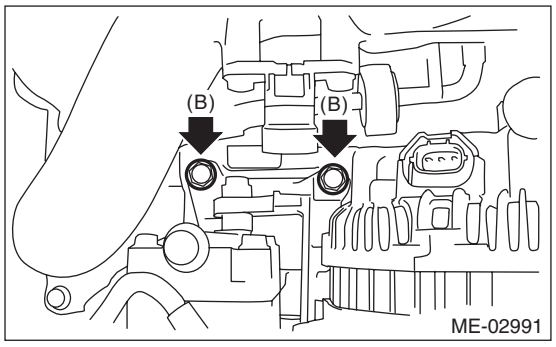
20) Tighten the bolts which holds the vacuum pump bracket to the engine. <Ref. to BR-10, BRAKE VACUUM PUMP, COMPONENT, General Description.>

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

21) Install the power steering pump.

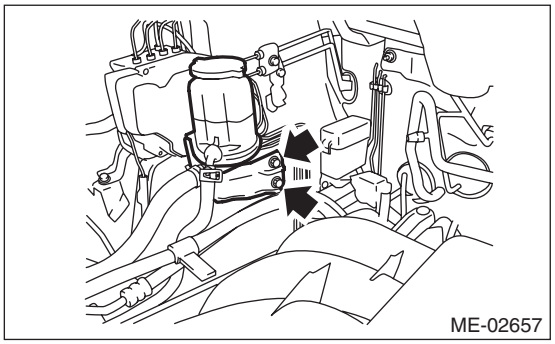
Tightening torque:
(A) 25 N·m (2.5 kgf-m, 18.4 ft-lb)
(B) 33 N·m (3.4 kgf-m, 24.3 ft-lb)



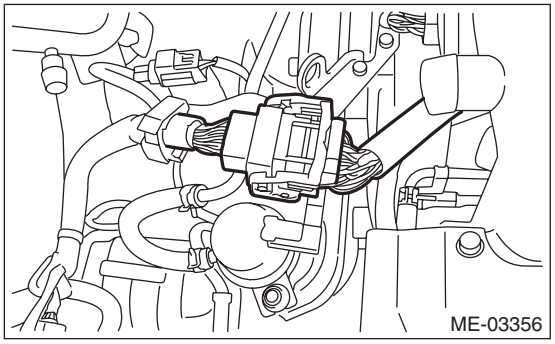


22) Install the reservoir tank.

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

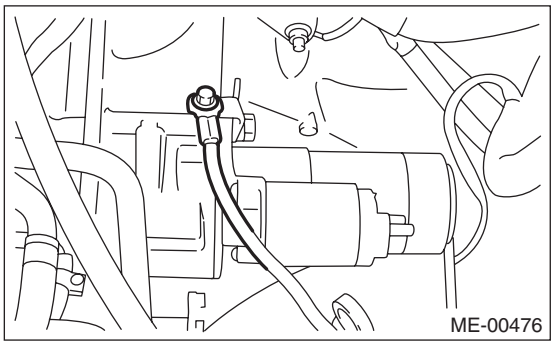

ME-02657

23) Connect the following hoses.
(1) Fuel delivery hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
24) Connect the following connectors.
(1) Engine harness connectors

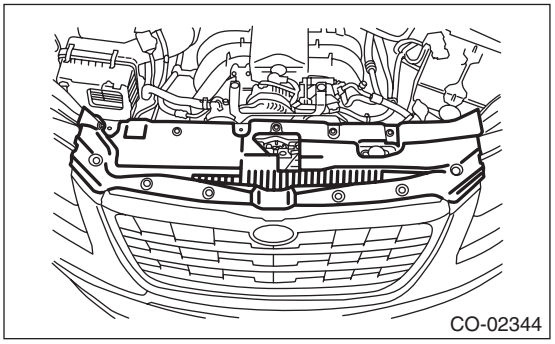

ME-03356

(2) Generator connector and terminal
(3) A/C compressor connector
(4) Power steering switch connector
25) Connect the engine ground terminal.

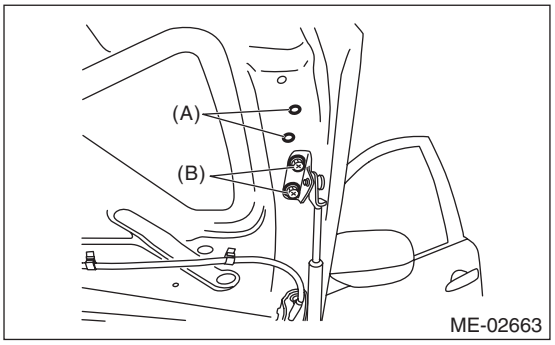
Tightening torque:
14 N·m (1.4 kgf-m, 10.3 ft-lb)


ME-00476

26) Install the A/C pressure hoses. <Ref. to AC-42, INSTALLATION, Hose and Pipe.>
27) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>
28) Install the radiator to vehicle. <Ref. to CO(H6DO)-19, INSTALLATION, Radiator.>
29) Install the front bumper. <Ref. to EI-23, FRONT BUMPER FACE, INSTALLATION, Front Bumper.>
30) Install the fuse of fuel pump to the main fuse box.
31) Install the battery to the vehicle. <Ref. to SC(H6DO)-20, INSTALLATION, Battery.>
32) Fill engine coolant. <Ref. to CO(H6DO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
33) Check the ATF level and replenish it if necessary. <Ref. to 5AT-29, INSPECTION, Automatic Transmission Fluid.>
34) Charge the A/C system with refrigerant. <Ref. to AC-23, PROCEDURE, Refrigerant Charging Procedure.>
35) Install the front upper cover.


CO-02344

36) Install the air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H6DO)-8, INSTALLATION, Air Intake Duct.> <Ref. to IN(H6DO)-6, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Chamber.>
37) Install the collector cover.
38) Change the bolt mounting position from (B) to (A), then close the front hood.



ME-02663

39) Lower the vehicle from lift.

C: INSPECTION

1) Check the pipes and hoses are installed firmly.
2) Check the engine coolant and ATF are at specified levels.
3) Start the engine and check for leaks of fuel, exhaust gas, engine coolant, etc. Also check for noise and vibrations.

10.Engine Mounting

A: REMOVAL

1) Remove the engine unit. <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)

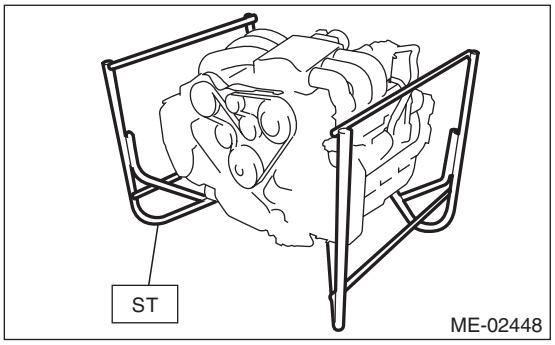
C: INSPECTION

Make sure that no crack or other damages do not exist.

11.Preparation for Overhaul

A: REMOVAL

1) Remove the engine from the body. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.>
2) Set the engine on ST.
ST 18232AA000 ENGINE STAND

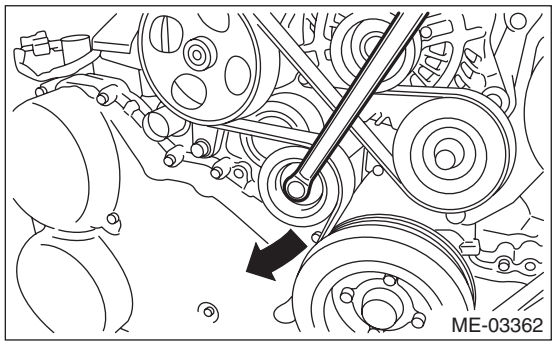


3) Before servicing overhaul, remove the sensor, pipe and hose that installed to engine.
(1) Remove the intake manifold. <Ref. to FU(H6DO)-16, REMOVAL, Intake Manifold.>
(2) Remove the generator. <Ref. to SC(H6DO)-14, REMOVAL, Generator.>
(3) Remove the A/C compressor. <Ref. to AC-35, REMOVAL, Compressor.>
(4) Disconnect the water pipe and hose.
(5) Disconnect the engine harness.
(6) Remove the spark plug. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
(7) Remove the camshaft position sensor. <Ref. to FU(H6DO)-24, REMOVAL, Camshaft Position Sensor.>
(8) Remove the crankshaft position sensor. <Ref. to FU(H6DO)-23, REMOVAL, Crankshaft Position Sensor.>
(9) Remove the knock sensor. <Ref. to FU(H6DO)-25, REMOVAL, Knock Sensor.>
(10) Remove the engine coolant temperature sensor. <Ref. to FU(H6DO)-22, REMOVAL, Engine Coolant Temperature Sensor.>
(11) Remove the oil temperature sensor. <Ref. to FU(H6DO)-33, REMOVAL, Oil Temperature Sensor.>
(12) Remove the oil flow control solenoid valve. <Ref. to FU(H6DO)-32, REMOVAL, Oil Flow Control Solenoid Valve.>
(13) Remove the oil pressure switch. <Ref. to LU(H6DO)-14, REMOVAL, Oil Pressure Switch.>
(14) Remove the oil filter. <Ref. to LU(H6DO)-15, REMOVAL, Engine Oil Filter.>
(15) Remove the oil cooler. <Ref. to LU(H6DO)-16, REMOVAL, Oil Cooler.>

12.V-belt

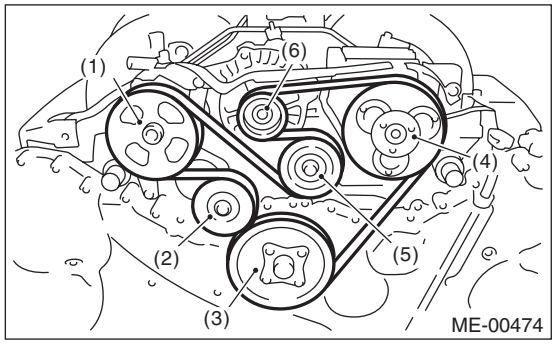
A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part.
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

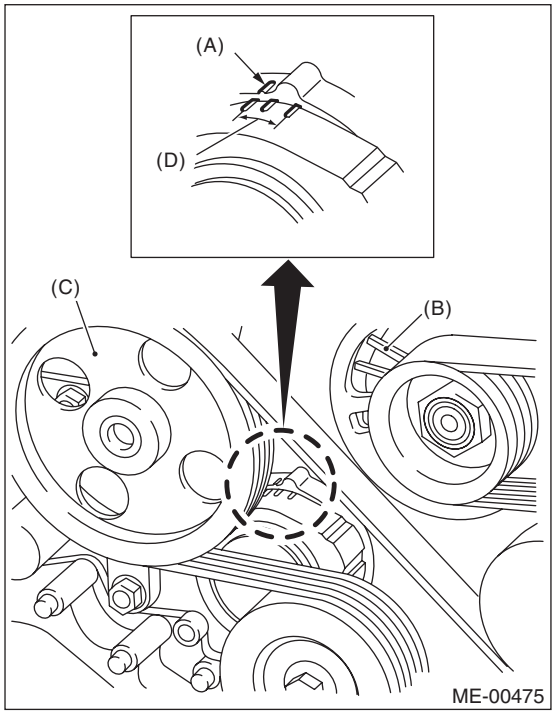
Install in the reverse order of removal.



(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).

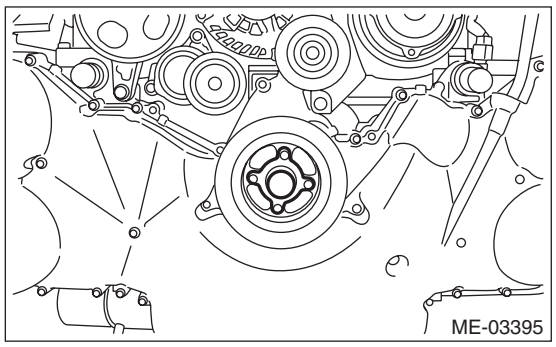


(A) Indicator
(B) Generator
(C) Power steering oil pump pulley
(D) Service limit

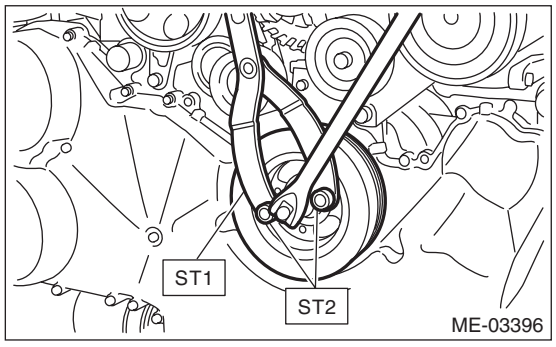
13.Crank Pulley

A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part.
1) Remove the V-belt. <Ref. to ME(H6DO)-46, REMOVAL, V-belt.>
2) Remove the crank pulley cover.



3) Remove the crank pulley bolt. To lock the crankshaft, use ST.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET

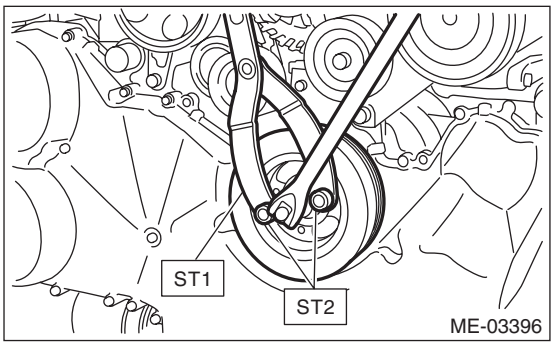


4) Remove the crank pulley.

B: INSTALLATION

1) Install the crank pulley.
2) Install the crank pulley bolt. To lock the crankshaft, use ST.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET
(1) Clean the crankshaft thread using compressed air.
(2) Apply engine oil to the crank pulley bolt seat and thread.
(3) Tighten the crank pulley bolts.

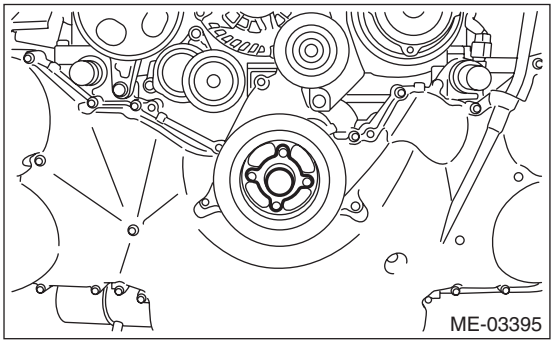
Tightening torque:
195 N·m (19.9 kgf-m, 143.8 ft-lb)



3) Install the crank pulley cover.

NOTE:
Assemble the O-ring to crank pulley cover.

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



4) Install the V-belt. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>

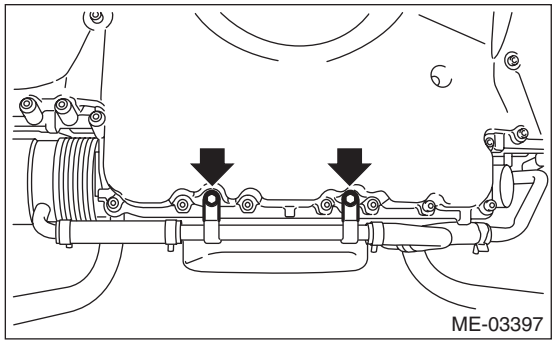
C: INSPECTION

1) Check the crank pulley cover for oil and air leakage.
2) Check the crank pulley for looseness.

14.Chain Cover

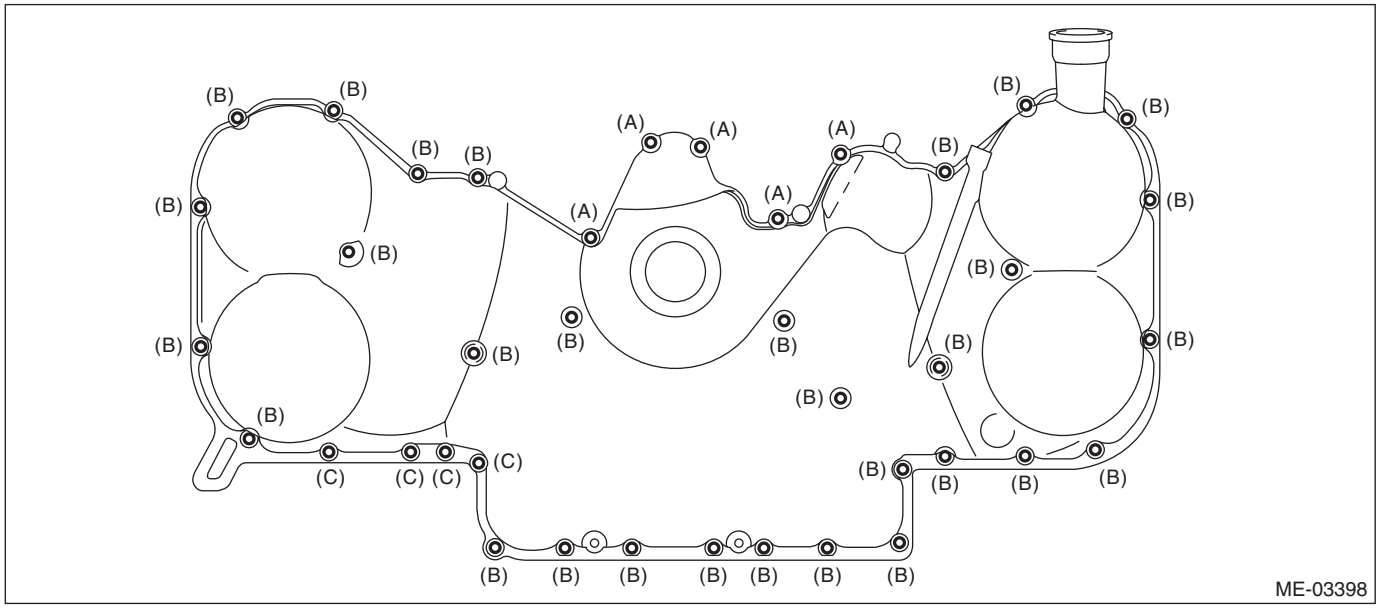
A: REMOVAL

NOTE:
When replacing the single part, perform the work with the engine installed to body.
1) Drain the engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>
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 bolts which hold oil cooler pipe to chain cover.



5) 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.

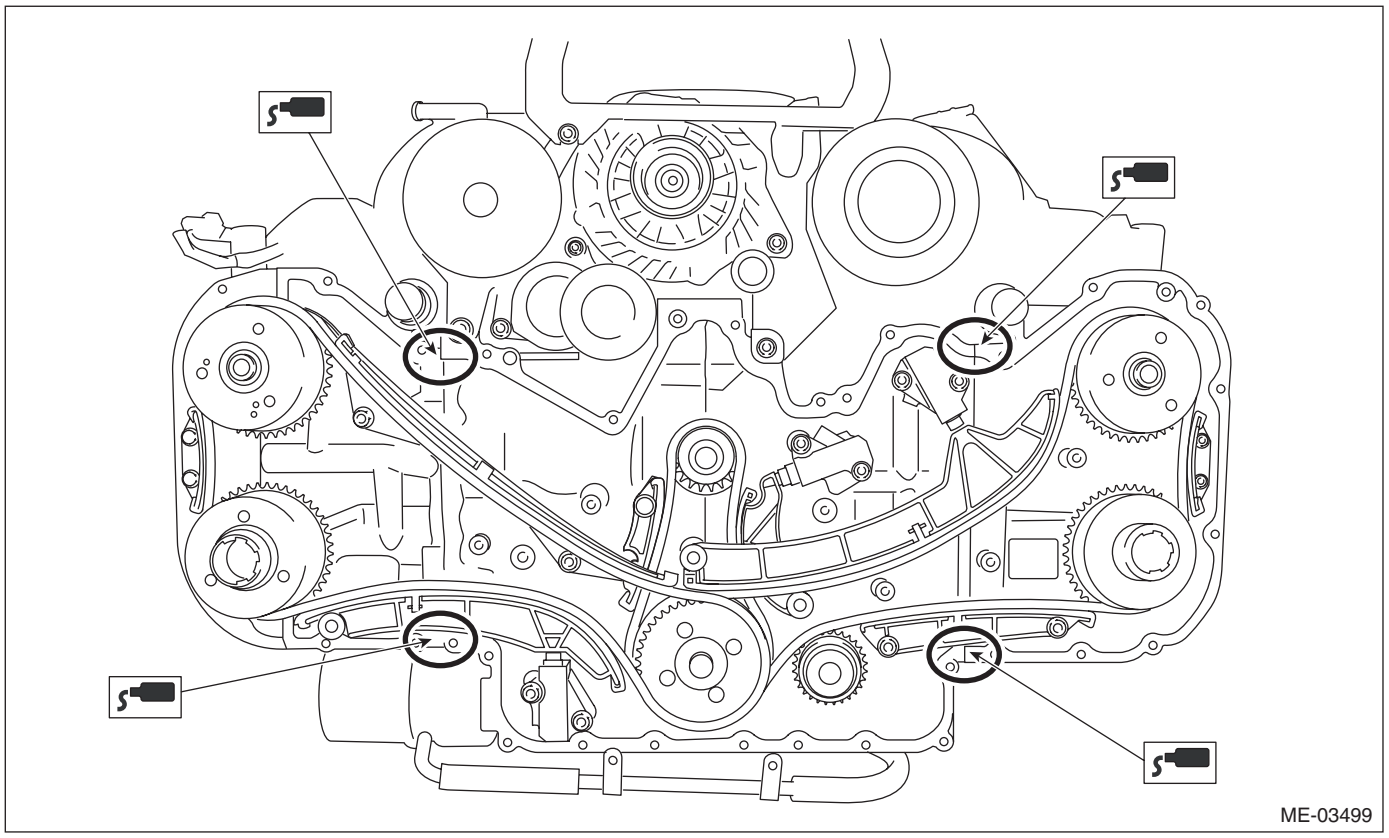


(A) M6 × 21 (B) M6 × 30 (C) M6 × 53

B: INSTALLATION

1) Apply liquid gasket to the mating surfaces of cylinder block, cylinder head and oil pan upper as shown in the figure.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

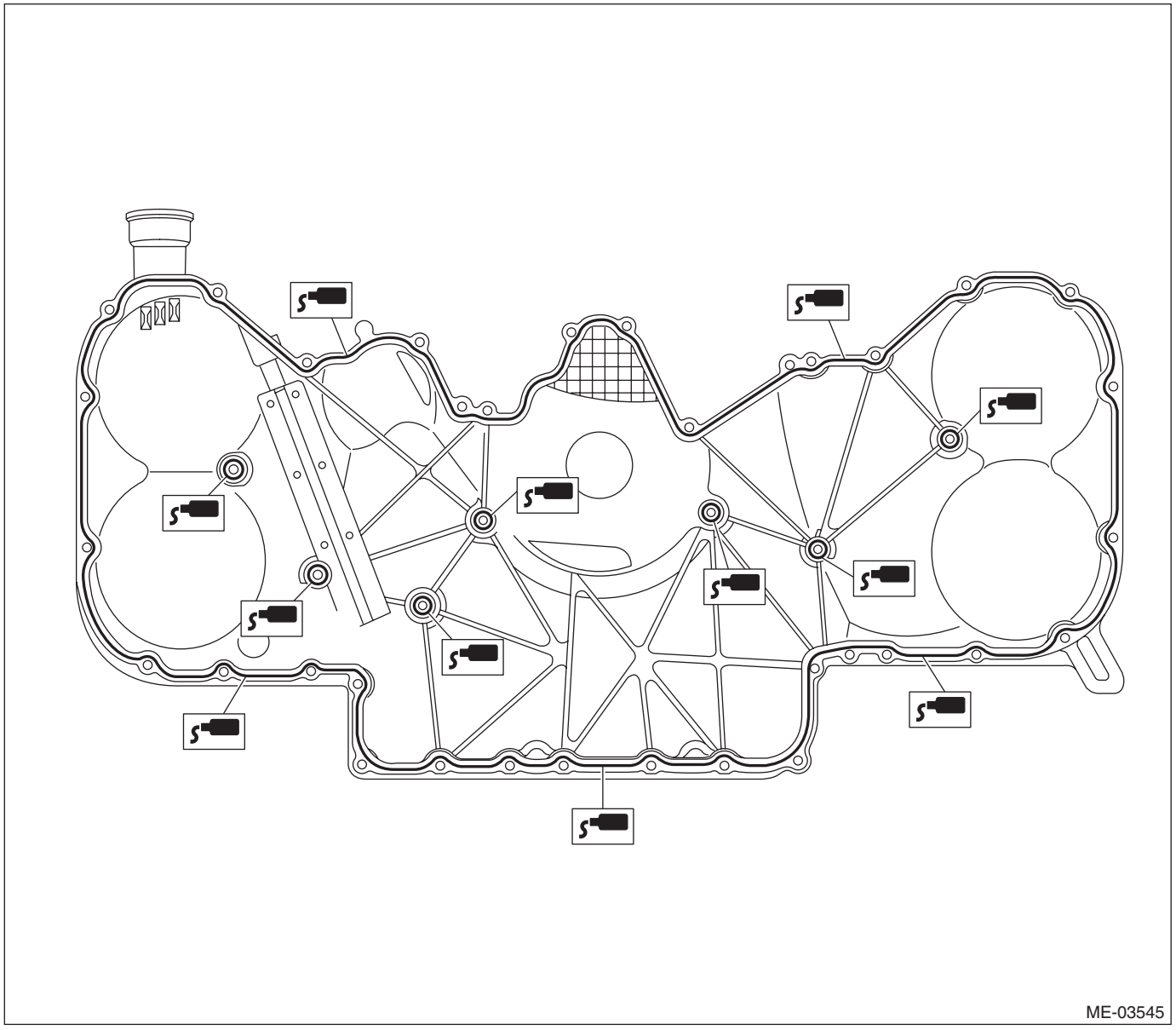


2) Apply liquid gasket to the mating surface of chain cover.

NOTE:
Install within 5 minutes after applying liquid gasket.

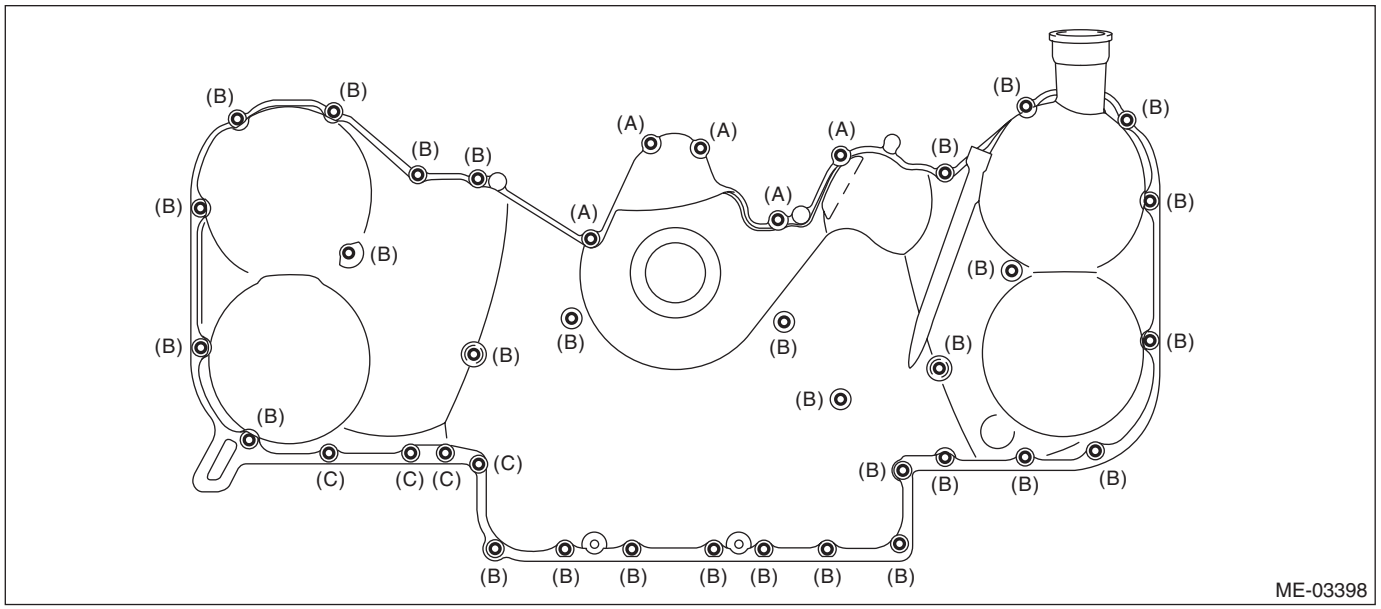
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Applying liquid gasket diameter:
3.5±0.5 mm (0.138 ±0.020 in)



3) Install the chain cover and temporarily tighten the bolts.

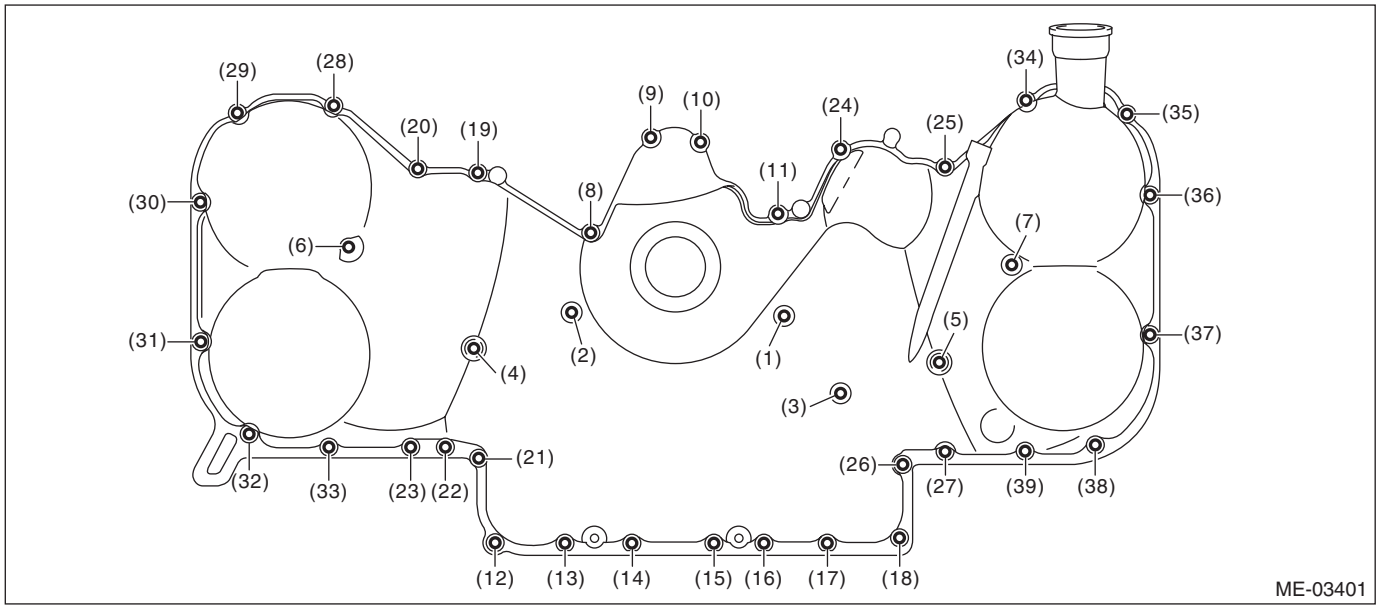
CAUTION:
Do not install the bolts in wrong place.



(A) M6 × 21 (B) M6 × 30 (C) M6 × 53

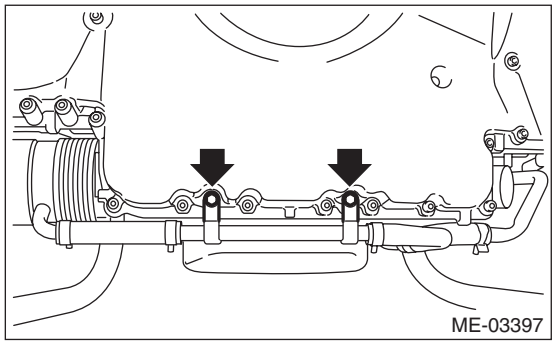
4) Tighten the bolts in the numerical order as shown in the figure.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



5) Tighten the bolts which install oil cooler pipe on chain cover.

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

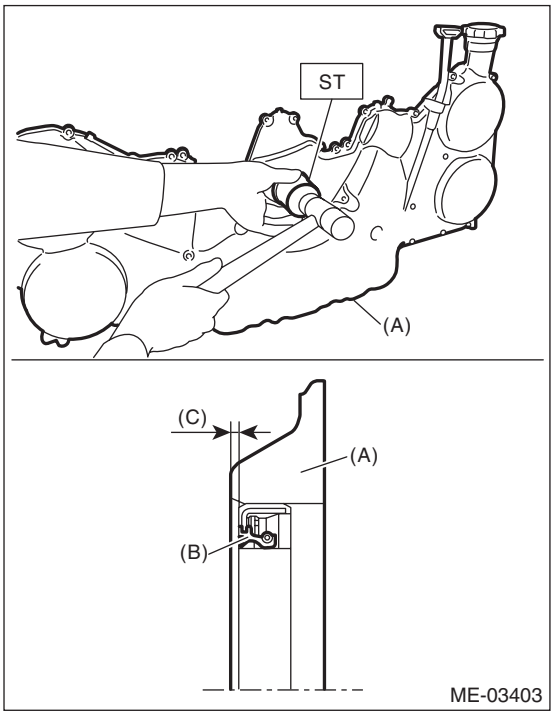


6) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
7) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>
8) Fill with engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>
9) Confirm that there are no oil leakage at the chain cover mating surface.

C: INSPECTION

1) Check the cover surface for scratch or dent.
2) Check for oil leakage on cover mating surface and installation part of crank pulley.
If the oil leakage is found at the oil seal, replace the oil seal with a new part.
ST 499585700 OIL SEAL GUIDE

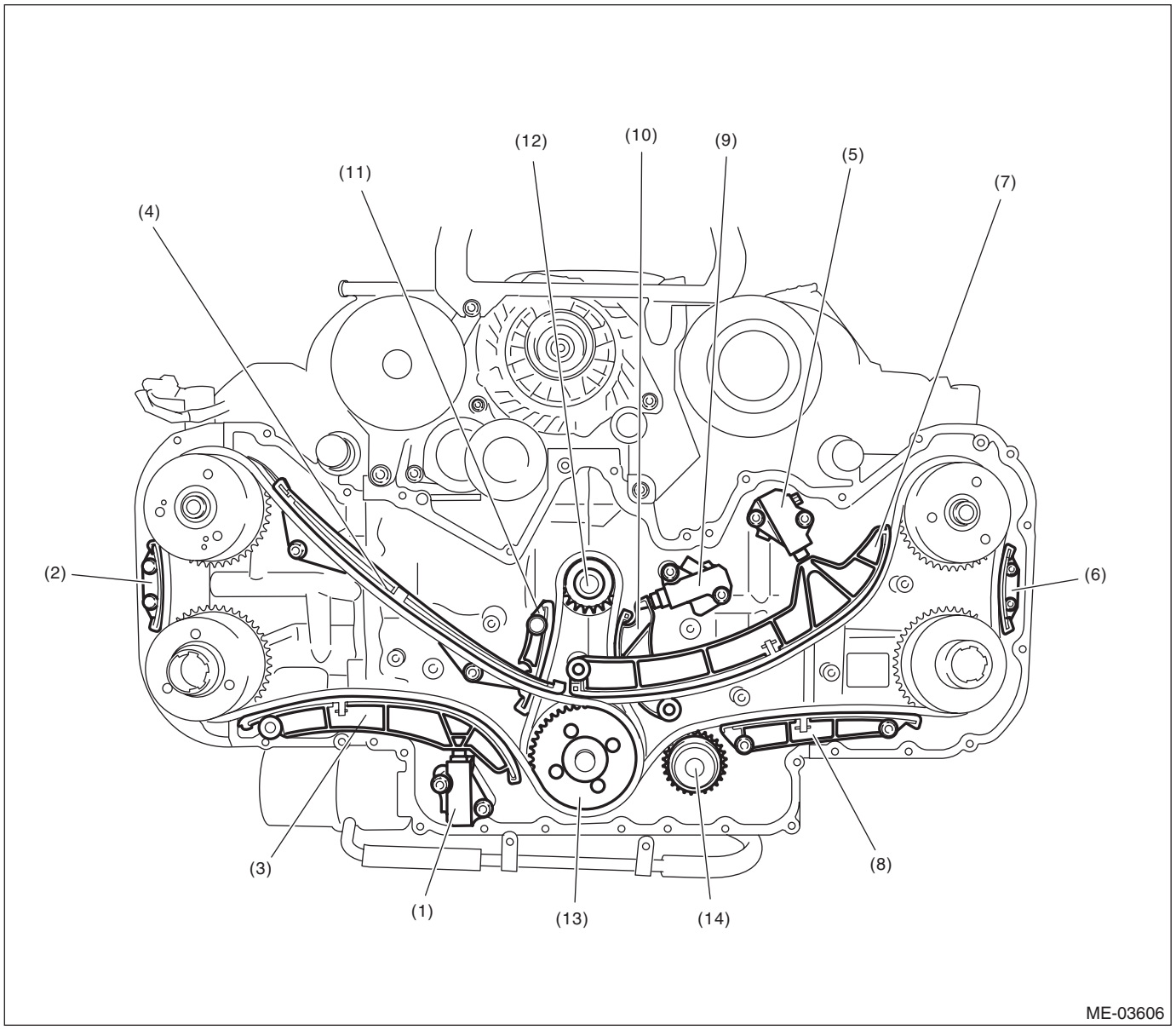
Oil seal press-fit position:
Chain cover edge — –1 mm (–0.039 in) position from chain cover edge



(A) Chain cover
(B) Oil seal
(C) Oil seal press-fit position (Chain cover edge — –1 mm (–0.039 in) position from chain cover edge)

15.Timing Chain Assembly

A: LOCATION



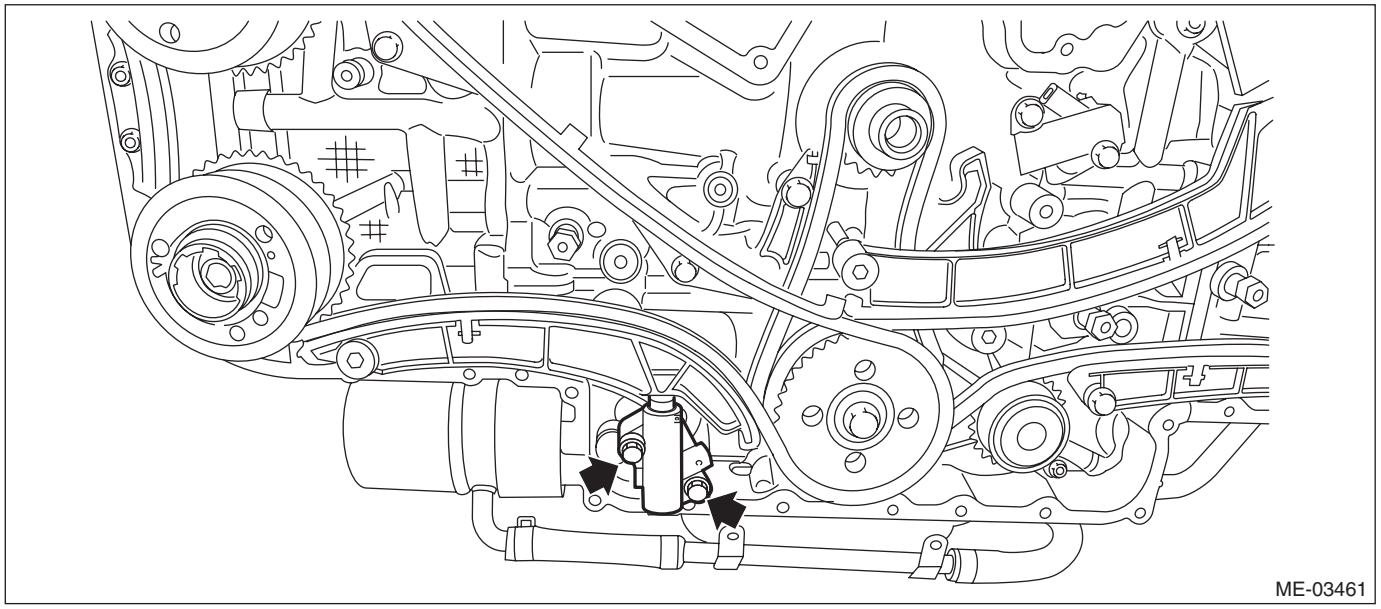
(1) Chain tensioner (RH)
(2) Chain guide (RH: between cams)
(3) Chain tensioner lever (RH)
(4) Chain guide (RH)
(5) Chain tensioner (LH)
(6) Chain guide (LH: between cams)
(7) Chain tensioner lever (LH)
(8) Chain guide (LH)
(9) Chain tensioner (Main)
(10) Chain tensioner lever (Main)
(11) Chain guide (Main)
(12) Crank sprocket
(13) Idler sprocket
(14) Water pump sprocket

B: REMOVAL

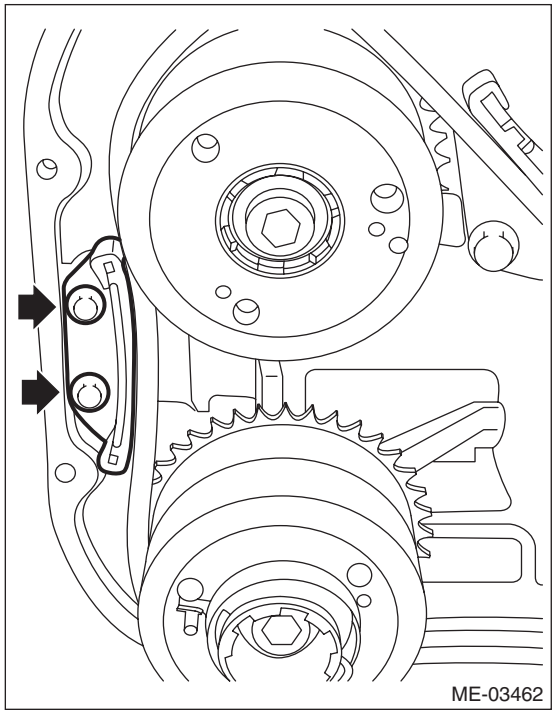
NOTE:
- When replacing the single part, perform the work with the engine installed to body.
- After removal, arrange the timing chain components in proper order, to prevent confusion.

1) Drain the engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>
2) Remove the radiator. <Ref. to CO(H6DO)-17, 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).

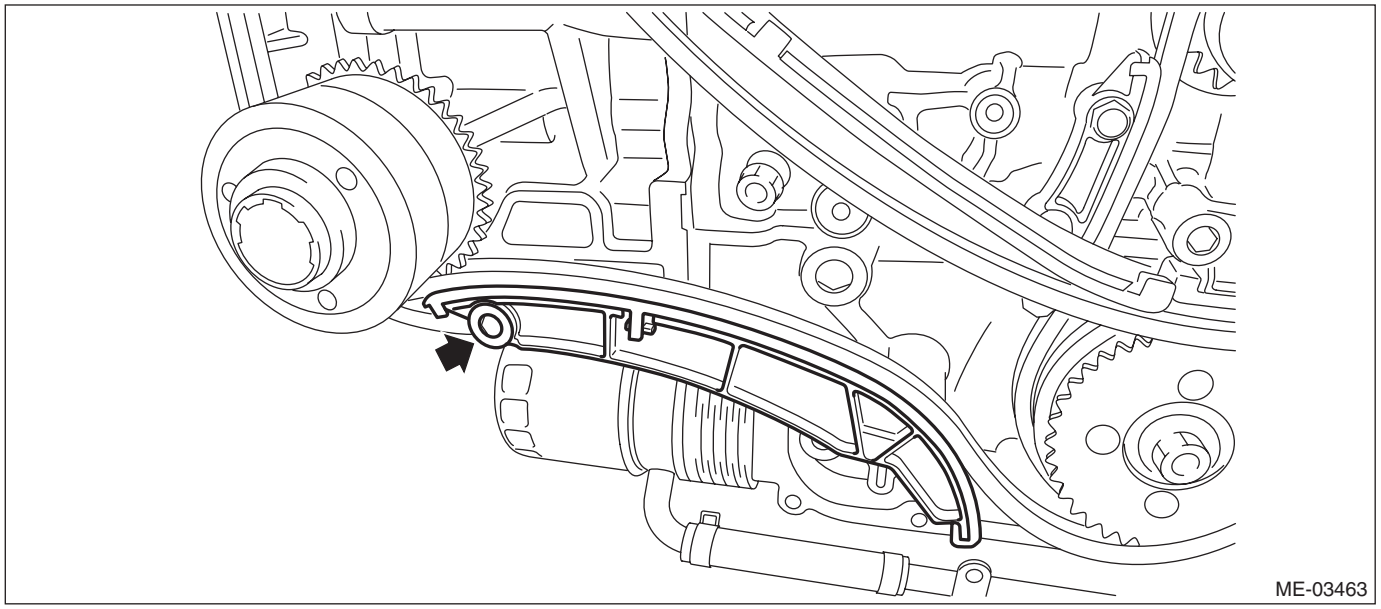
NOTE:
During removal of chain tensioner (RH) from chain tensioner lever (RH), press the plunger by hand to prevent it from popping out.


ME-03461

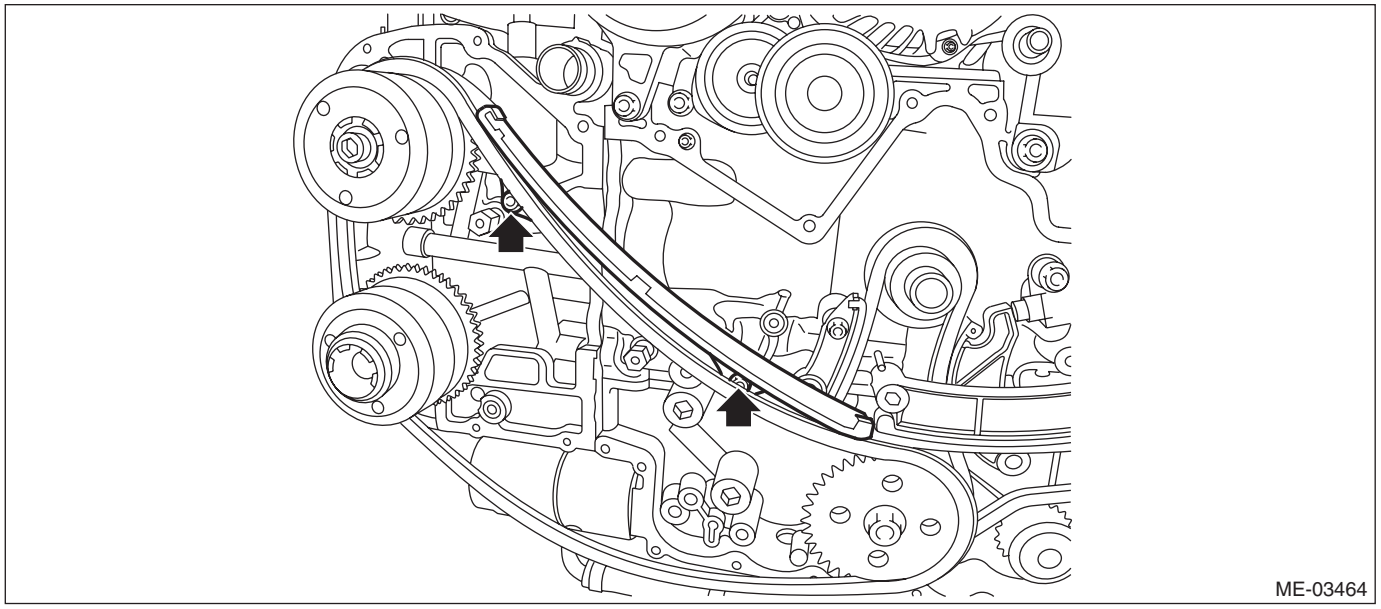
7) Remove the chain guide (RH: between cams).


ME-03462

8) Remove the chain tensioner lever (RH).



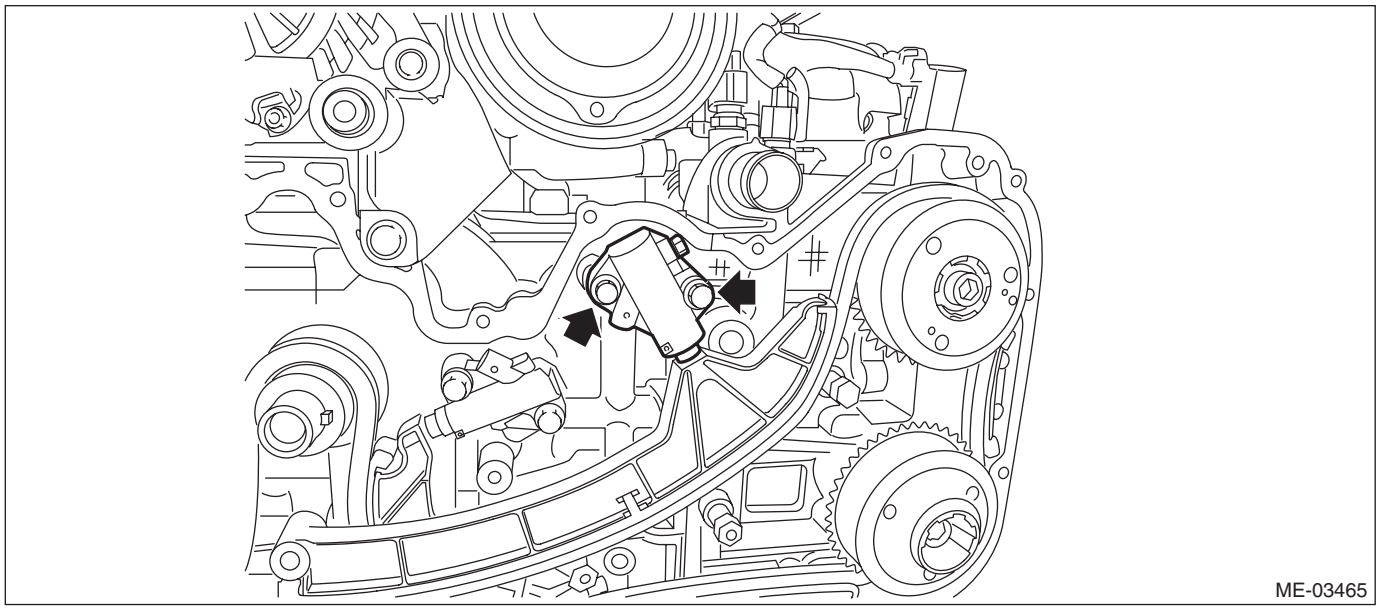
9) Remove the chain guide (RH).



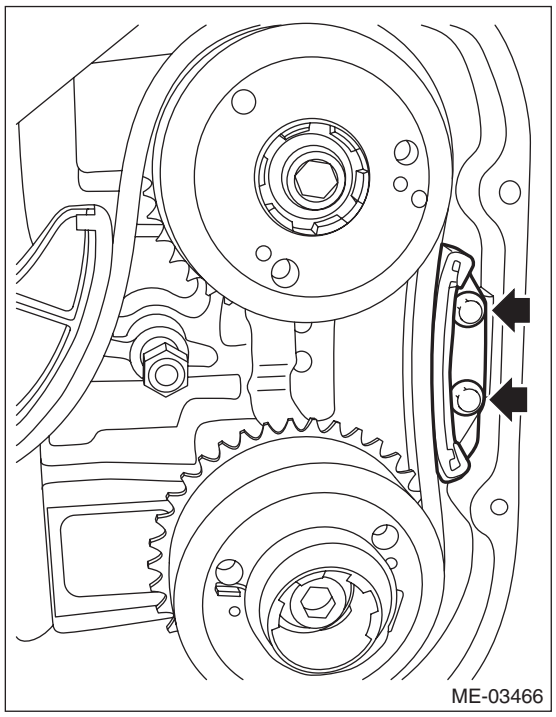
10) Remove the timing chain (RH).

11) Remove the chain tensioner (LH).

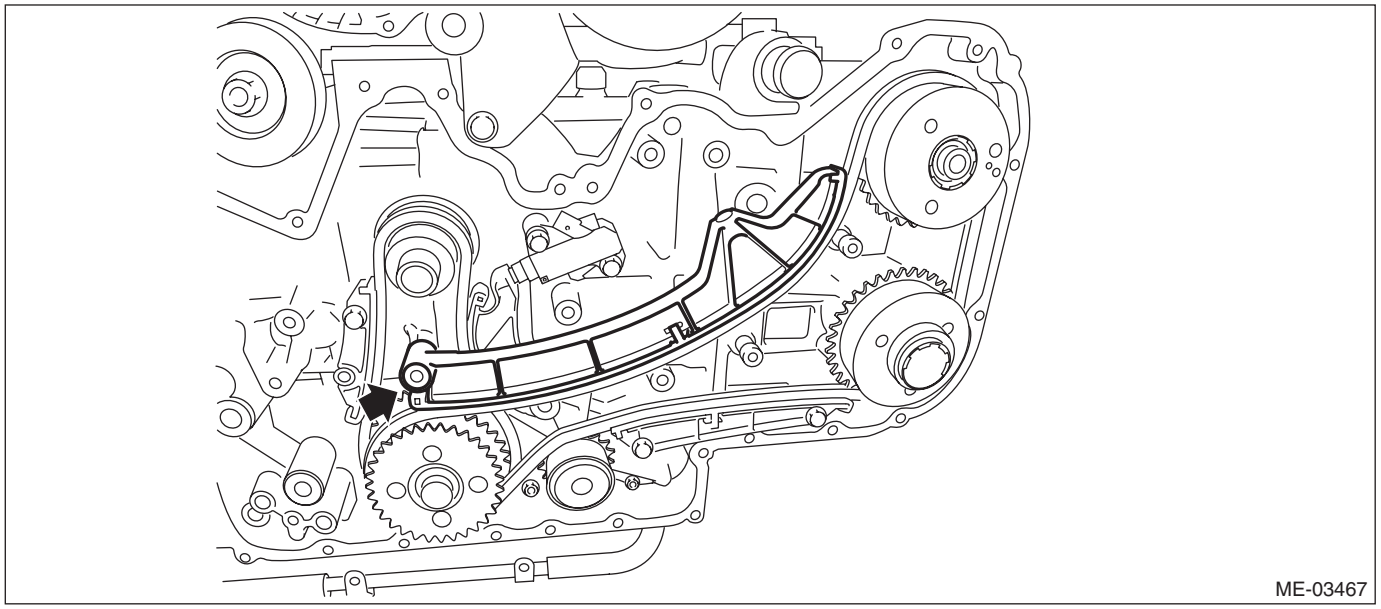
NOTE:
During removal of chain tensioner (LH) from chain tensioner lever (LH), press the plunger by hand to prevent it from popping out.



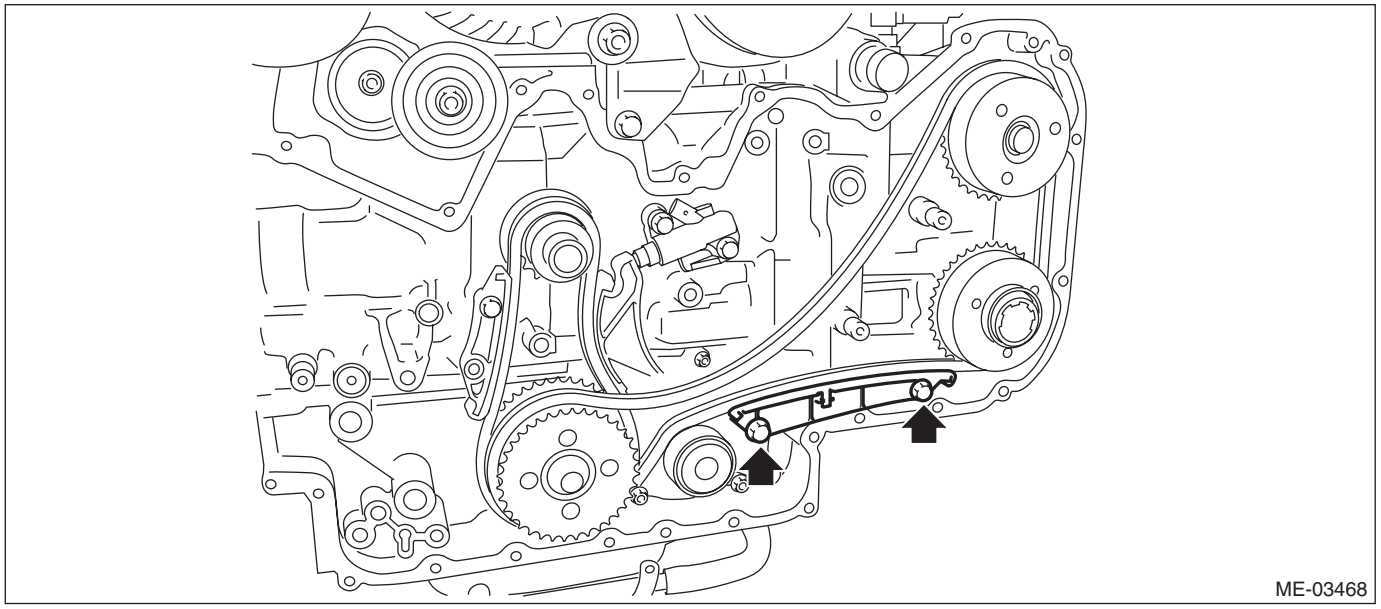
12) Remove the chain guide (LH: between cams).



13) Remove the chain tensioner lever (LH).



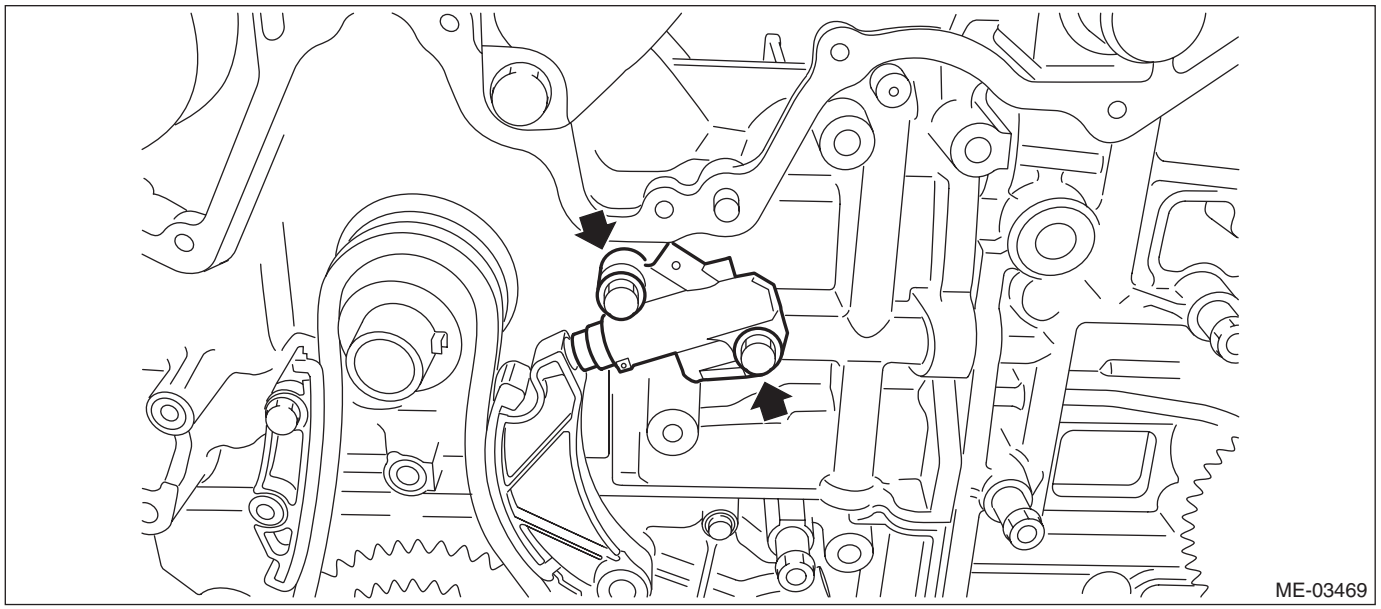
14) Remove the chain guide (LH).



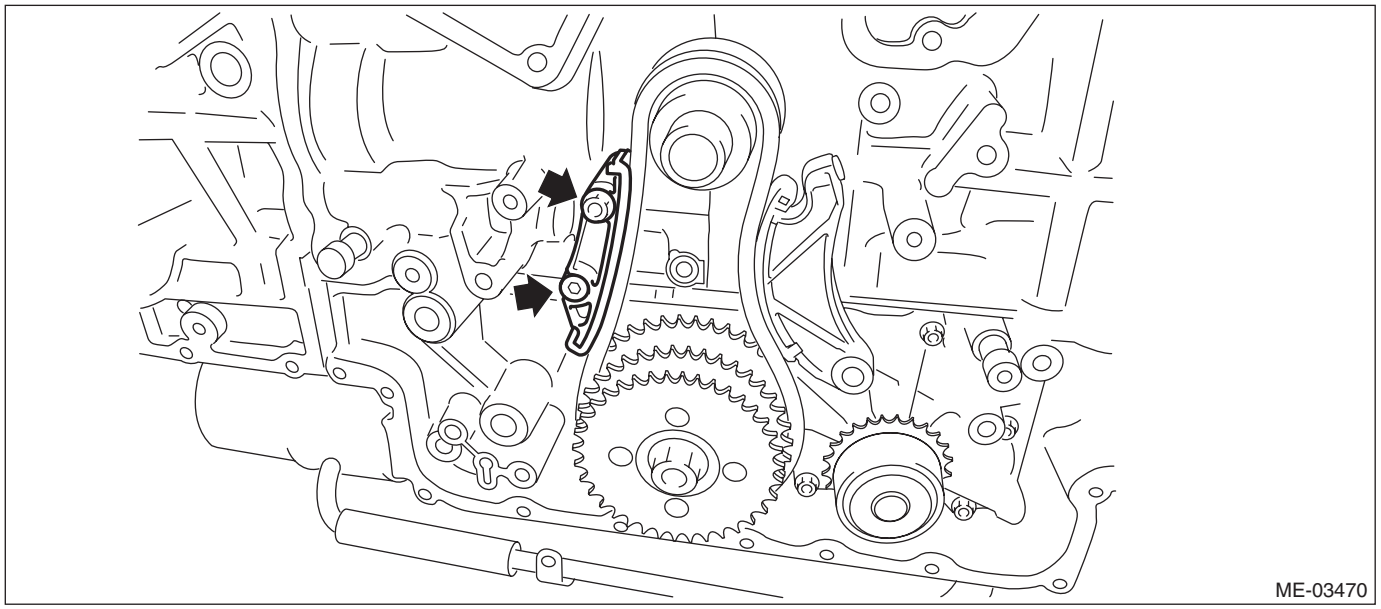
15) Remove the timing chain (LH).

16) Remove the chain tensioner (Main).

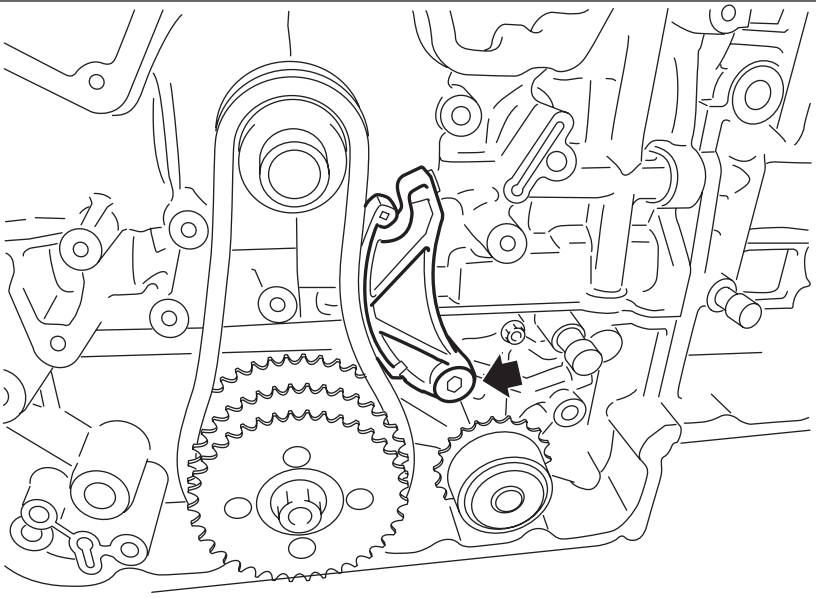
NOTE:
During removal of chain tensioner (Main) from chain tensioner lever (Main), press the plunger by hand to prevent it from popping out.



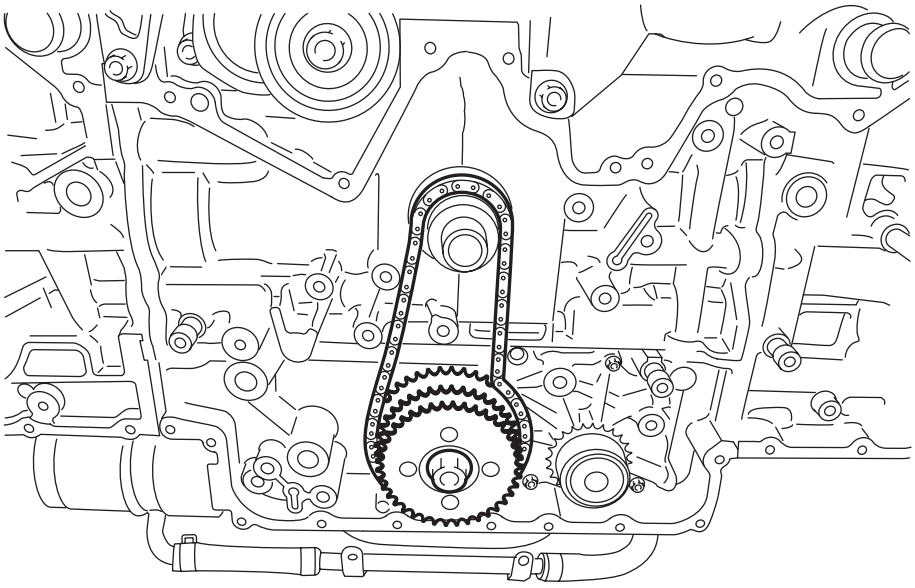
17) Remove the chain guide (Main).



18) Remove the chain tensioner lever (Main).



19) Remove the idler sprocket, and then remove the idler sprocket and timing chain (Main).
ST1 18355AAA000 PULLEY WRENCH
ST2 18334AAA000 PULLEY WRENCH PIN SET

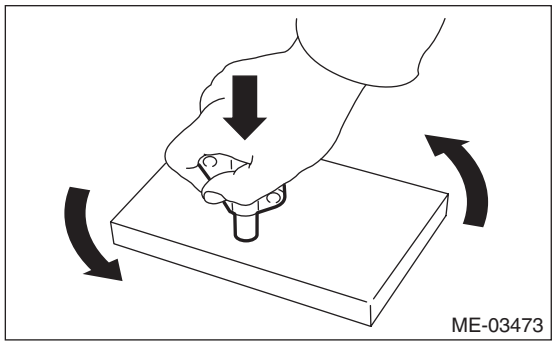


C: INSTALLATION

NOTE:
• Be careful that the foreign matter is not into or onto assembled component during installation.
• Apply engine oil to the all timing chain components.

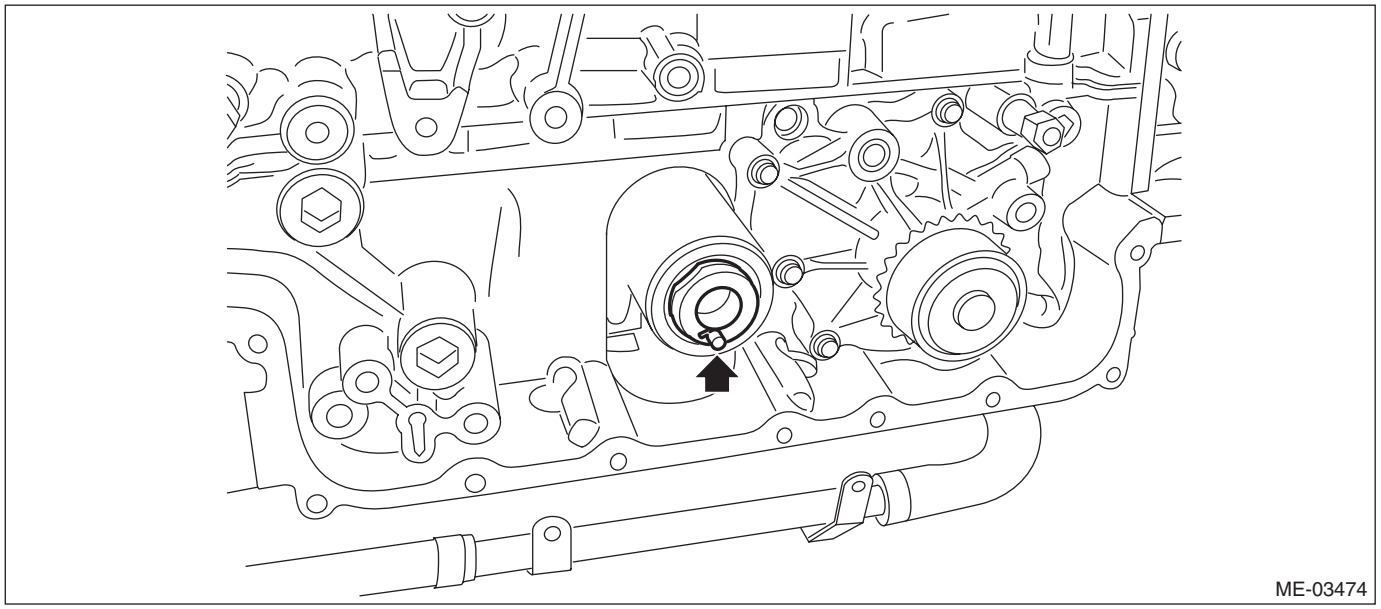
1) Prepare for chain tensioner installation.
   (1) Insert the screw, spring pin and plunger into the tensioner body.
   (2) Rotate the rubber mat counterclockwise while pressing the chain tensioner from upper side by hand as shown in the figure.

NOTE:
Degrease the contact surface of the plunger head and rubber mat so that they do not slip.

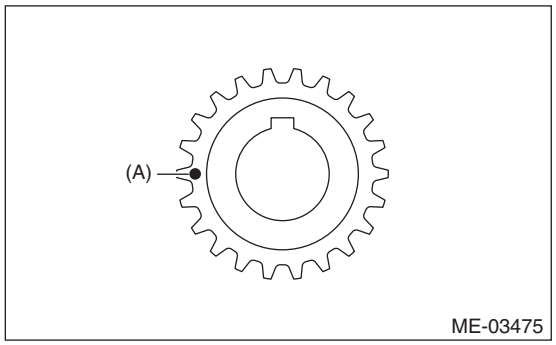

ME-03473

   (3) Insert the stopper pin into the chain tensioner body hole.

2) Set the oil pump shaft knock pin at the six o'clock position as shown in the figure.

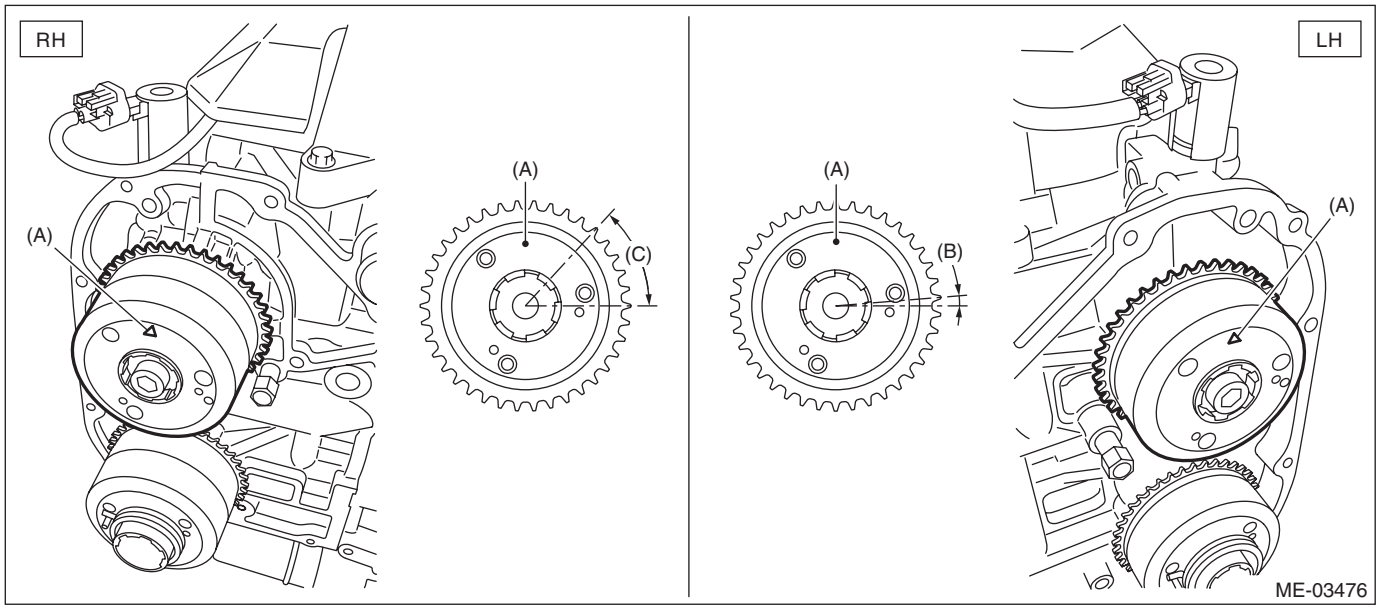

ME-03474

3) Using the ST, align the “Top mark” on crank sprocket to nine o’clock position as shown in the figure



(A) Top mark

4) Align the intake cam sprocket to 12 o’clock position as shown in the figure.

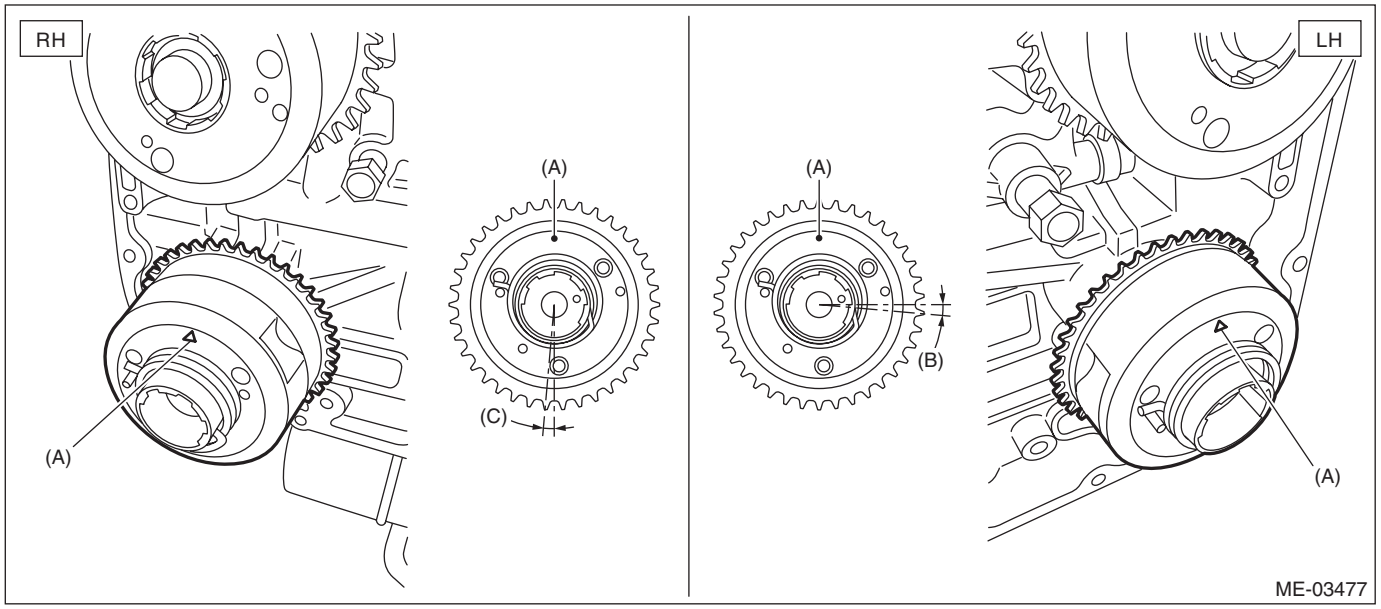


(A) Align the marking (Top mark) position to 12 o’clock position.

(B) 6°

(C) 47°

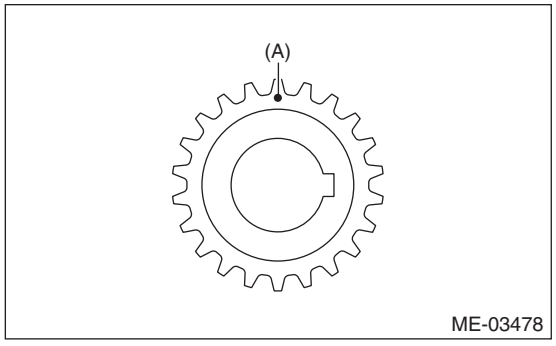
5) Align the exhaust cam sprocket to 12 o'clock position as shown in the figure.



(A) Align the marking (Top mark) position to 12 o'clock position.
(B) 5.5°
(C) 3.5°

6) Using the ST, align the "Top mark" on crank sprocket to 12 o'clock position as shown in the figure

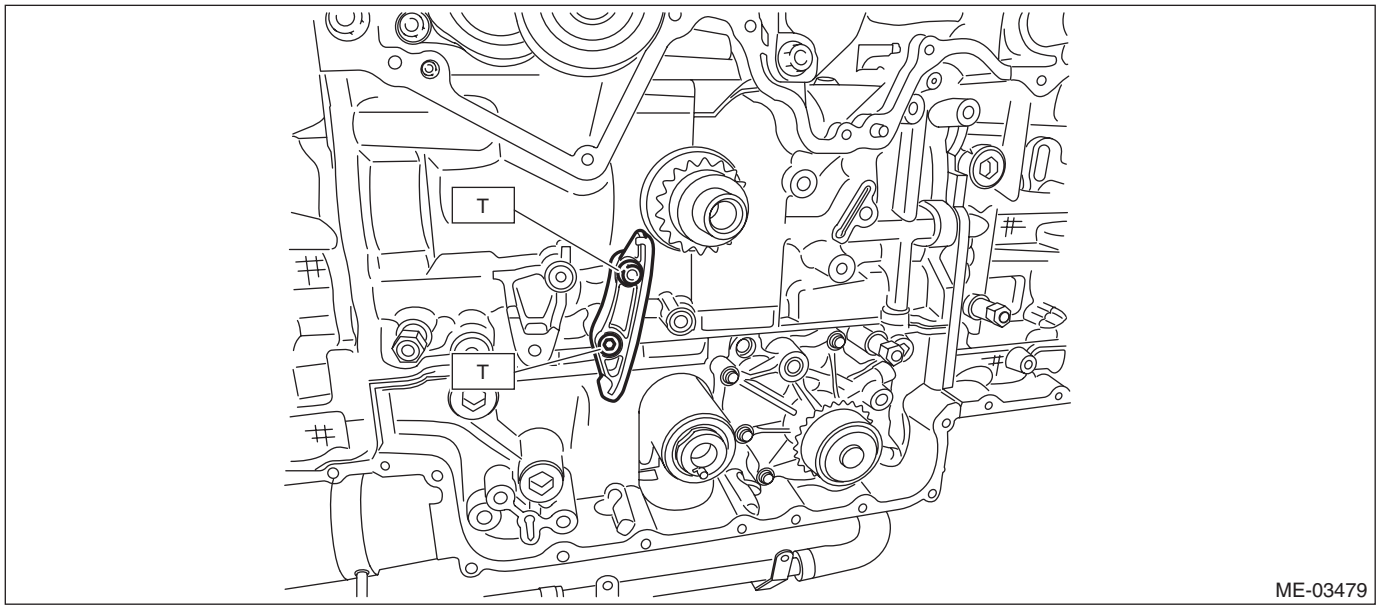
NOTE:
- Piston #1 is in top dead center (TDC) position.
- Do not rotate the crankshaft and cam sprocket before completing timing chain installation.
- Crank sprocket key is located at three o'clock position.



(A) Top mark

7) Install the chain guide (Main).

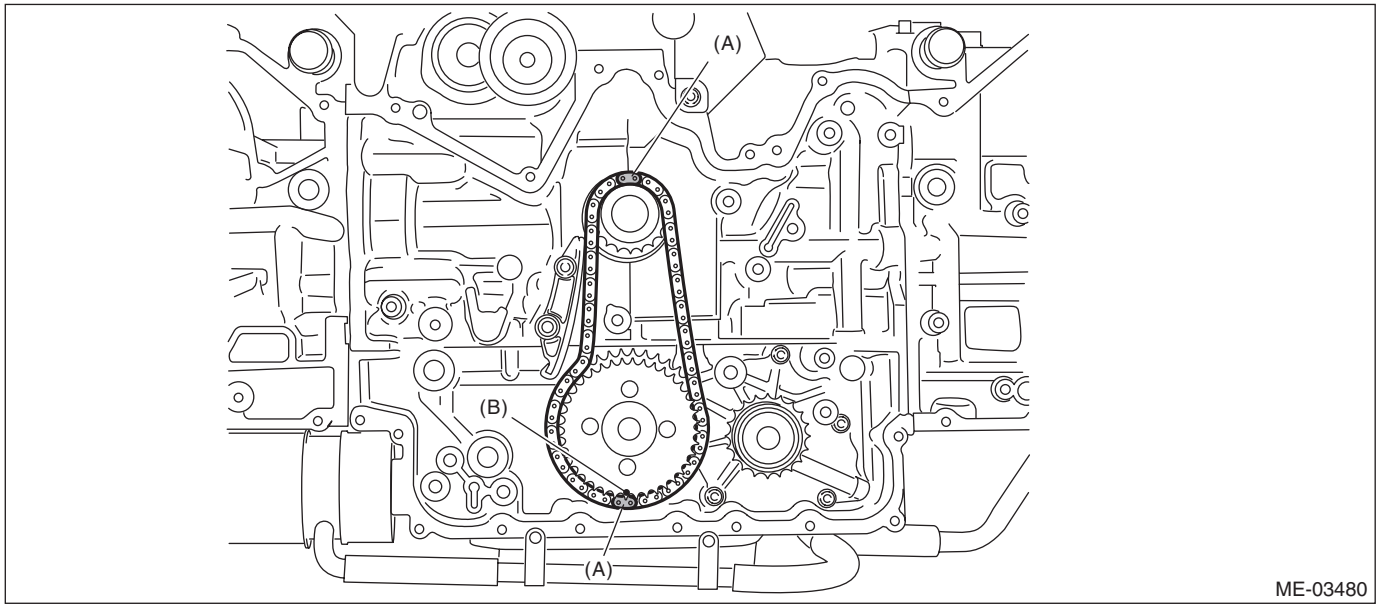
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



8) Install the idler sprocket and timing chain (Main).
(1) Align the timing chain mark (gold) to the idler sprocket timing mark position.
(2) Align the idler sprocket timing mark to the six o'clock position, and then install the idler sprocket and timing chain.
(3) Confirm the timing chain mark (gold) is set to the crank sprocket 12 o'clock position.
(4) Install the idler sprocket bolt.

ST1 18355AAA000 PULLEY WRENCH
ST2 18334AAA000 PULLEY WRENCH PIN SET

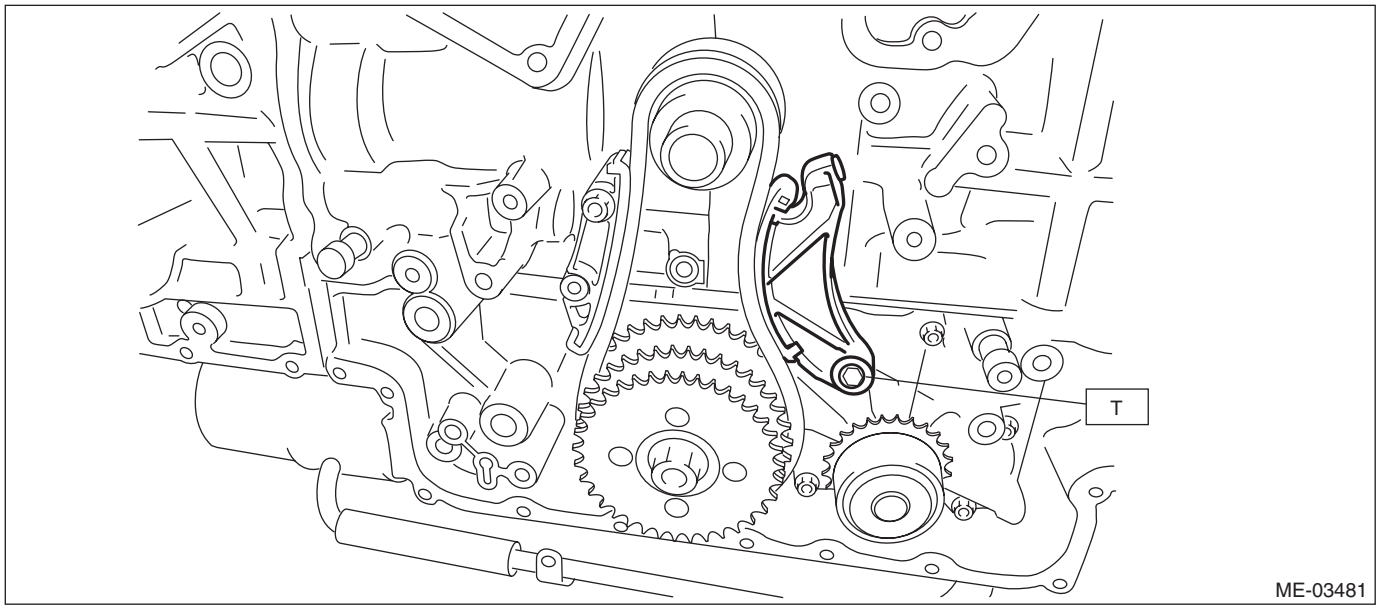
Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)



(A) Gold
(B) Timing mark

9) Install the chain tensioner lever (main).

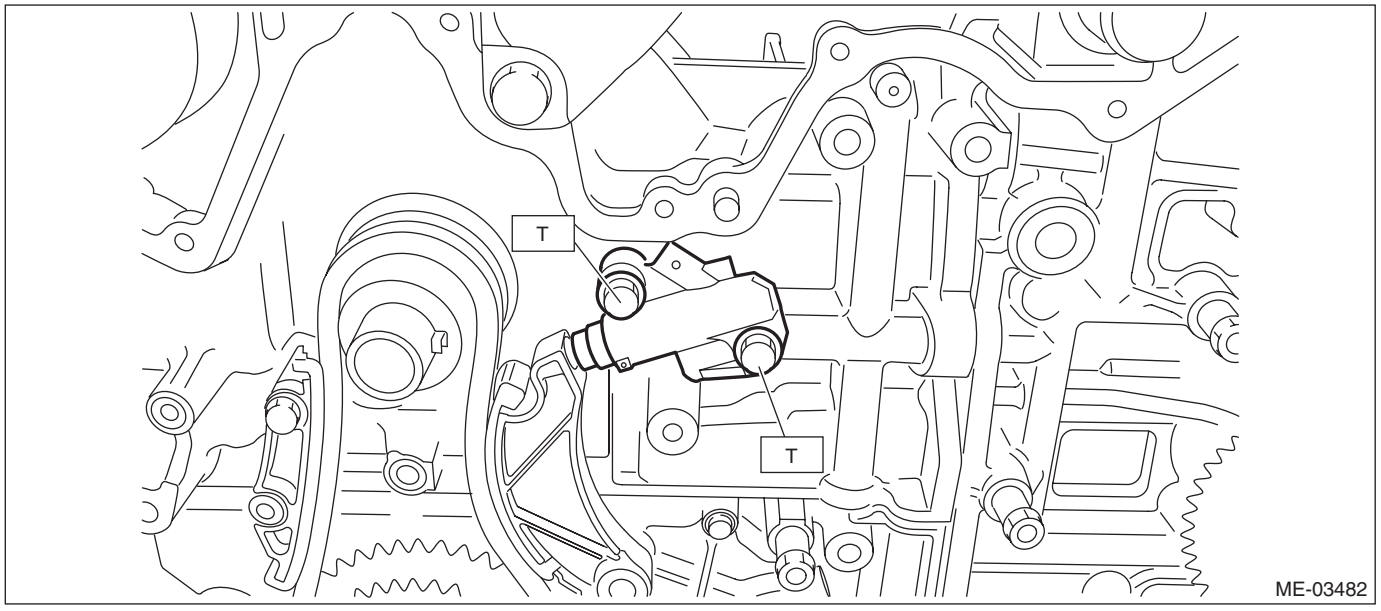
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



10) Install the chain tensioner (main) and pull out the stopper pin.

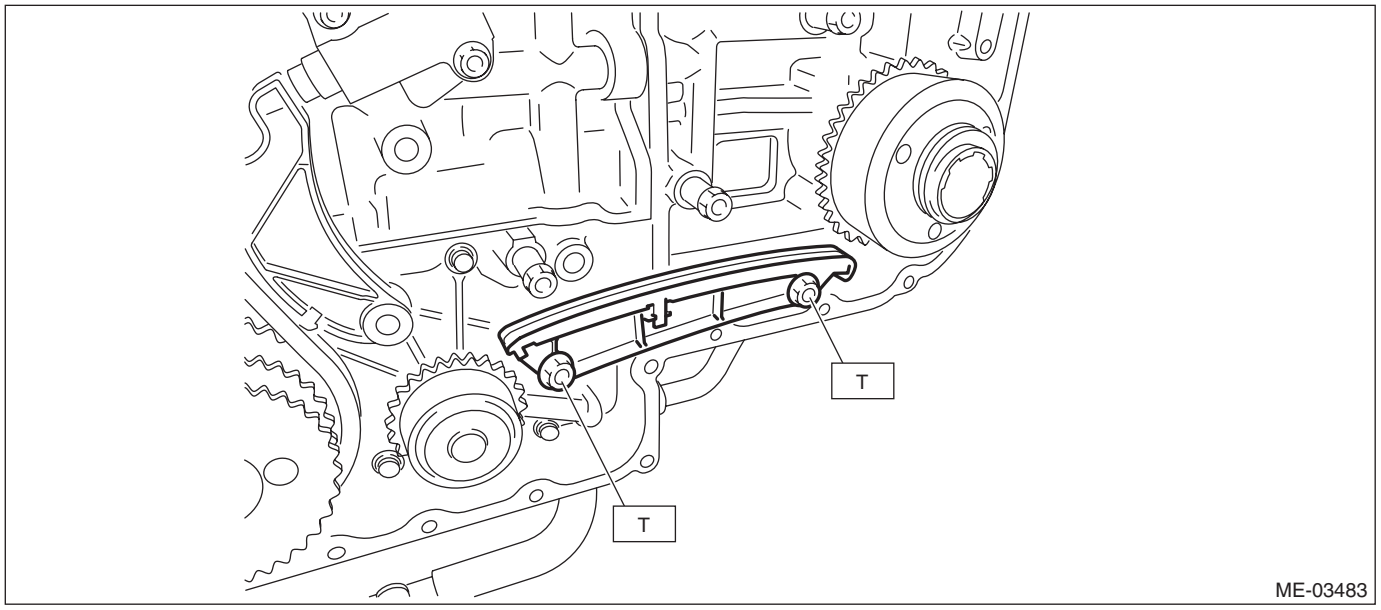
NOTE:
Timing chain (main) components assembly is completed.

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



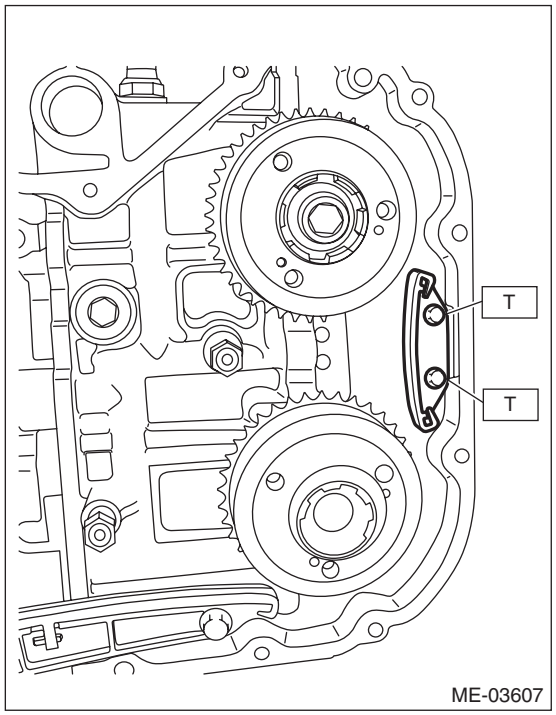
11) Install the chain guide (LH).

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

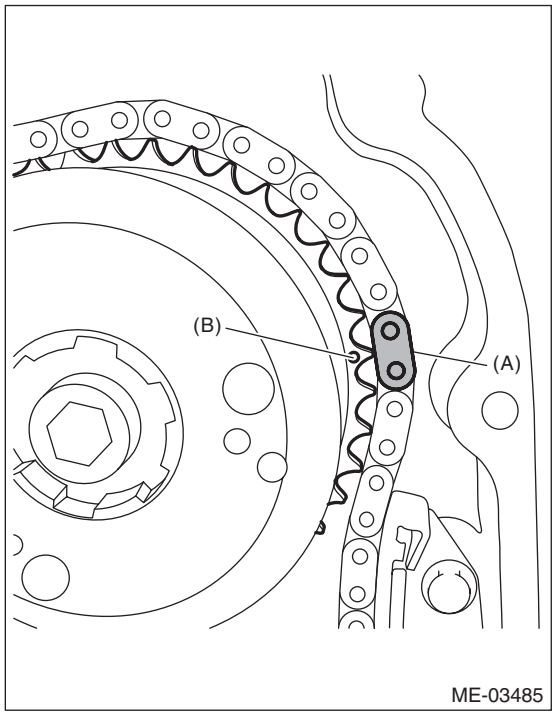


12) Install the chain guide (LH: between cams).

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

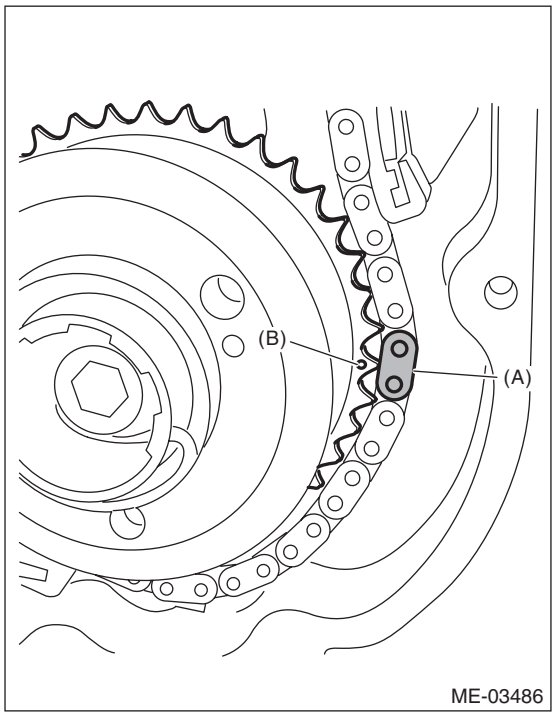


13) Install the timing chain (LH).
(1) Match the timing mark of the intake cam sprocket (LH) with the mark (blue) of the timing chain.



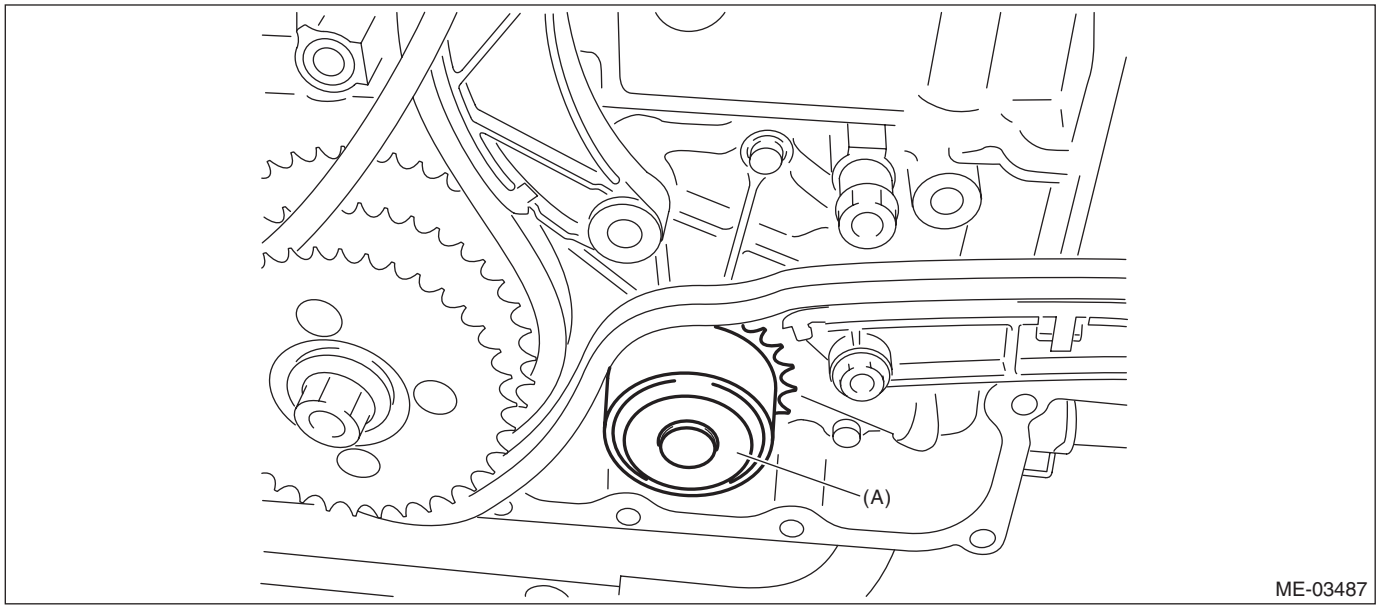
(A) Blue
(B) Timing mark

(2) Match the timing mark of the exhaust cam sprocket (LH) with the mark (blue) of the timing chain.



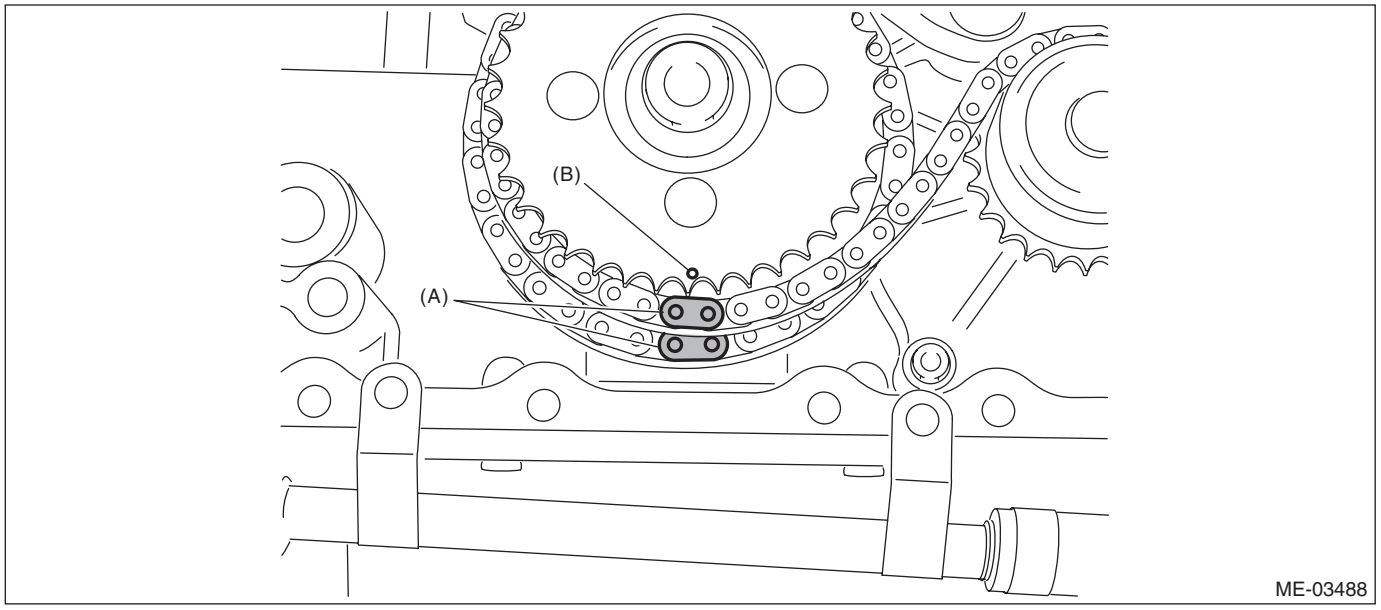
(A) Blue
(B) Timing mark

(3) Install the timing chain to the water pump sprocket.



(A) Water pump sprocket

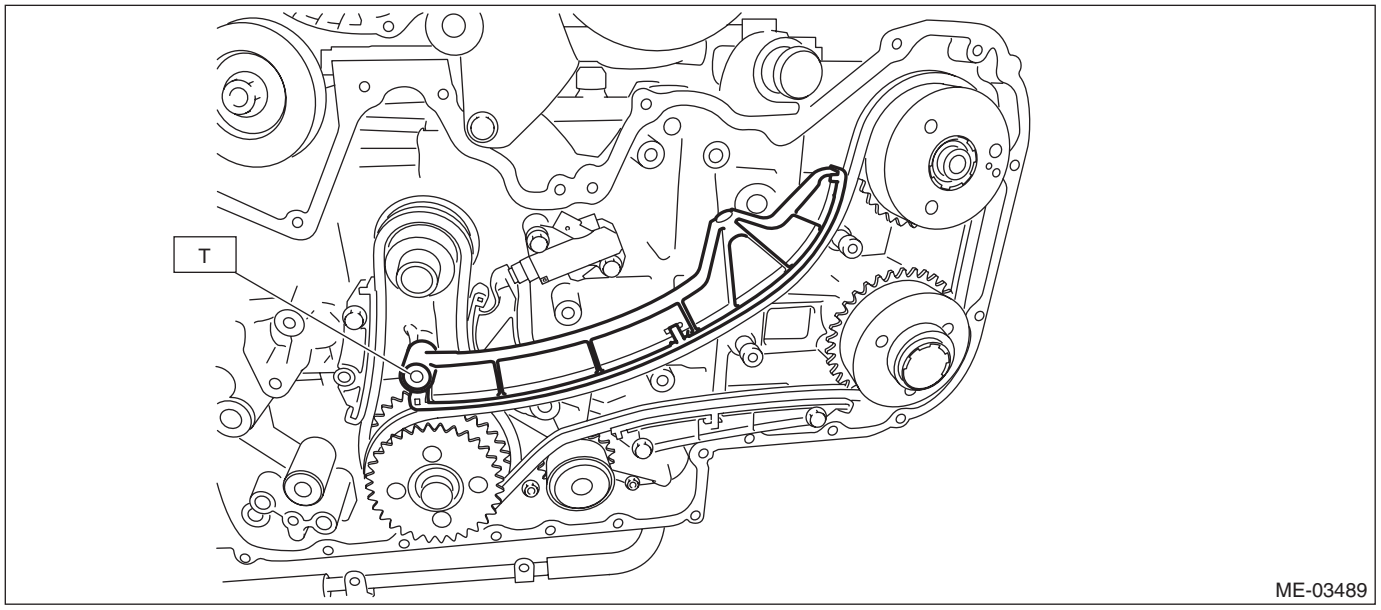
(4) Align the idler sprocket timing mark to the timing chain mark (gold).



(A) Gold (B) Timing mark

14) Install the chain tensioner lever (LH).

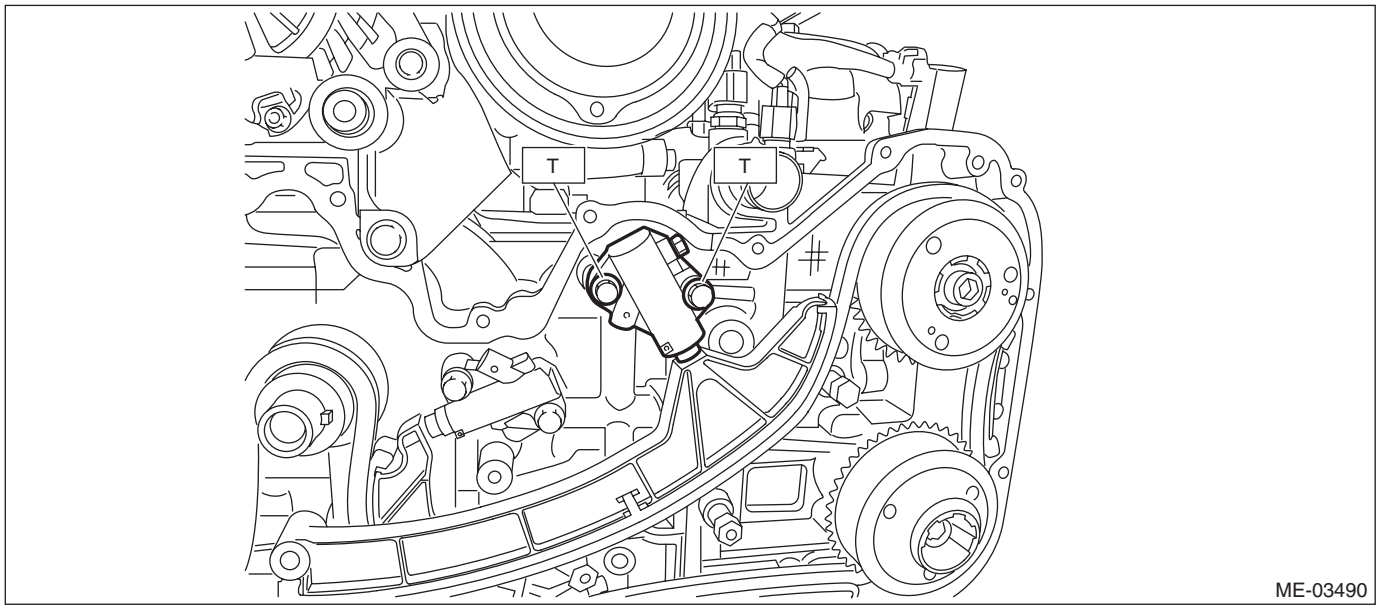
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



15) Install the chain tensioner (LH) and pull out the stopper pin.

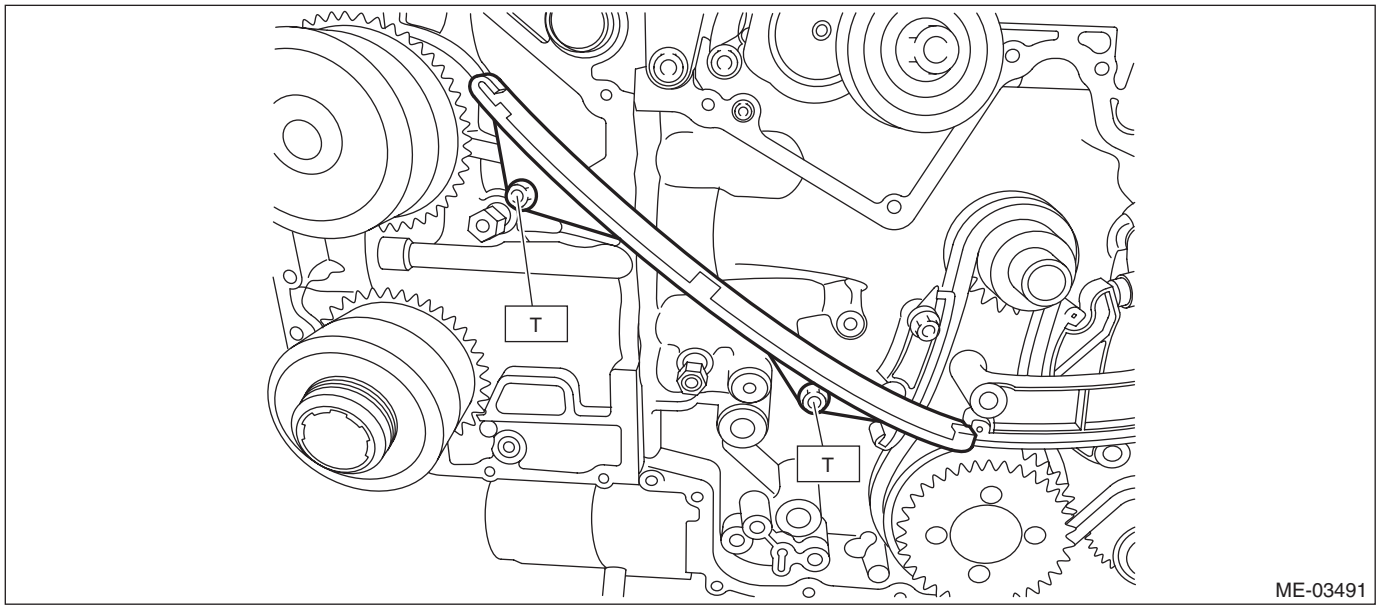
NOTE:
- Confirm the bolt is attached on the side of chain tensioner housing.
- Timing chain (LH) components assembly is completed.

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



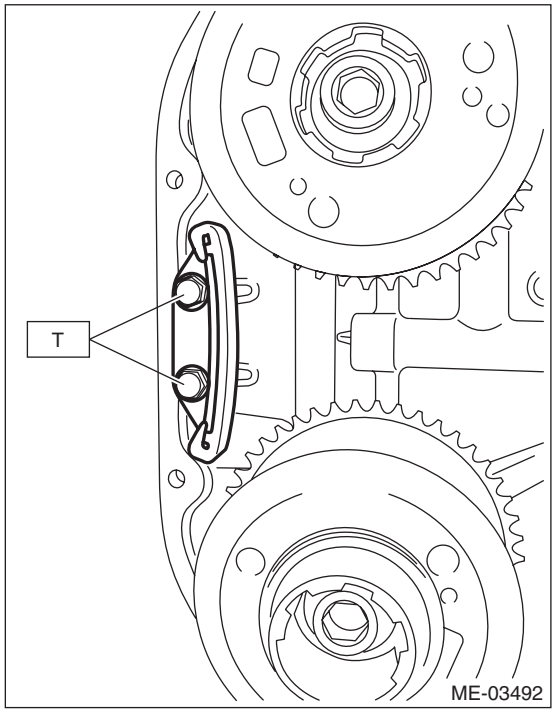
16) Install the chain guide (RH).

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

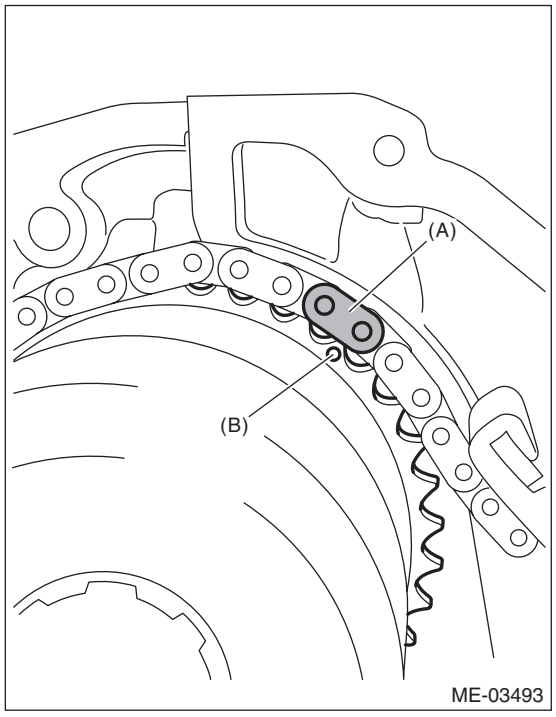


17) Install the chain guide (RH: between cams).

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

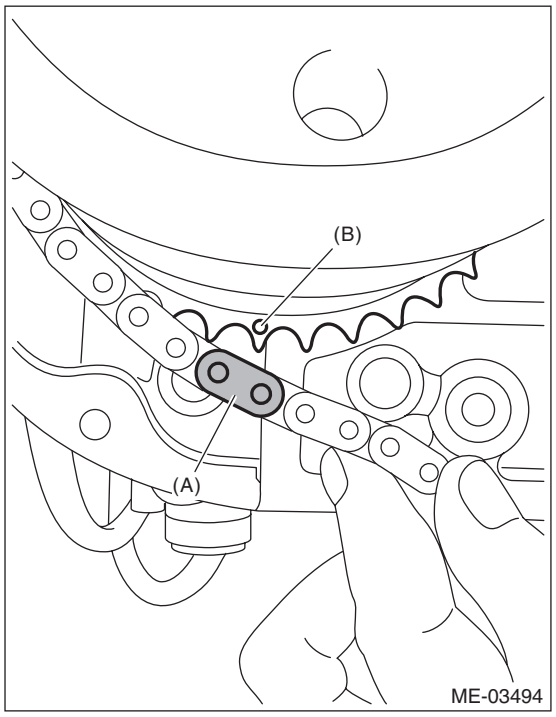


18) Install the timing chain (RH).
(1) Match the timing mark of the intake cam sprocket (RH) with the mark (blue) of the timing chain.



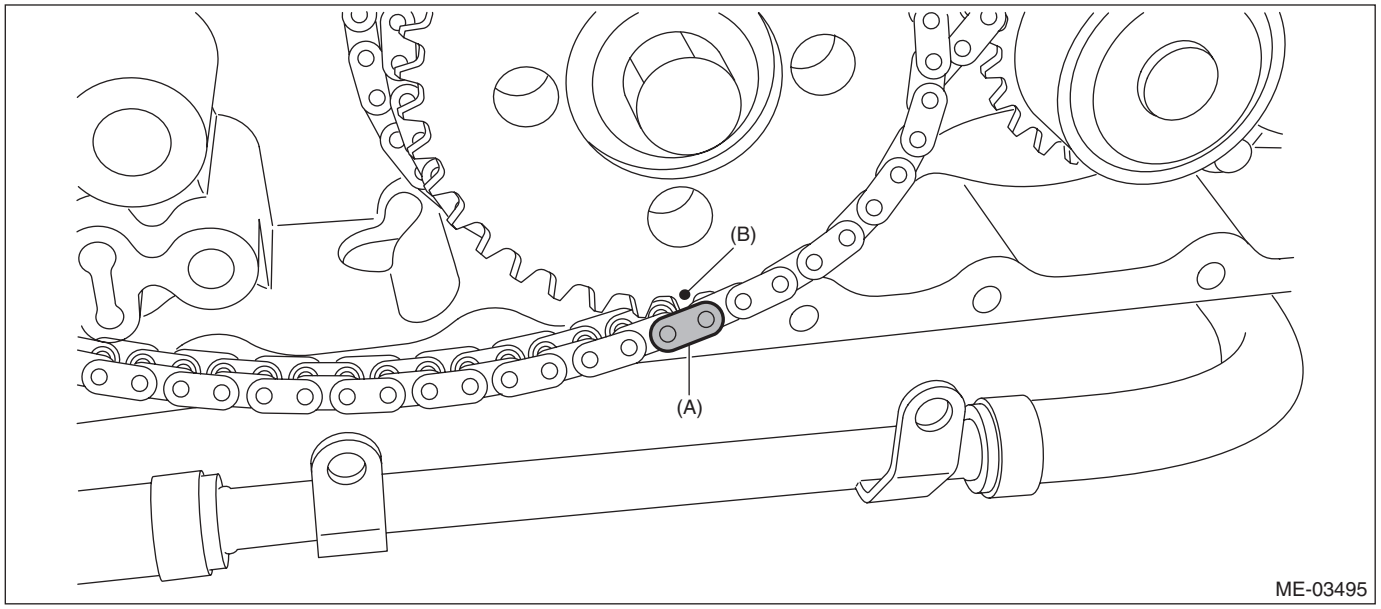
(A) Blue
(B) Timing mark

(2) Match the timing mark of the exhaust cam sprocket (RH) with the mark (blue) of the timing chain.



(A) Blue
(B) Timing mark

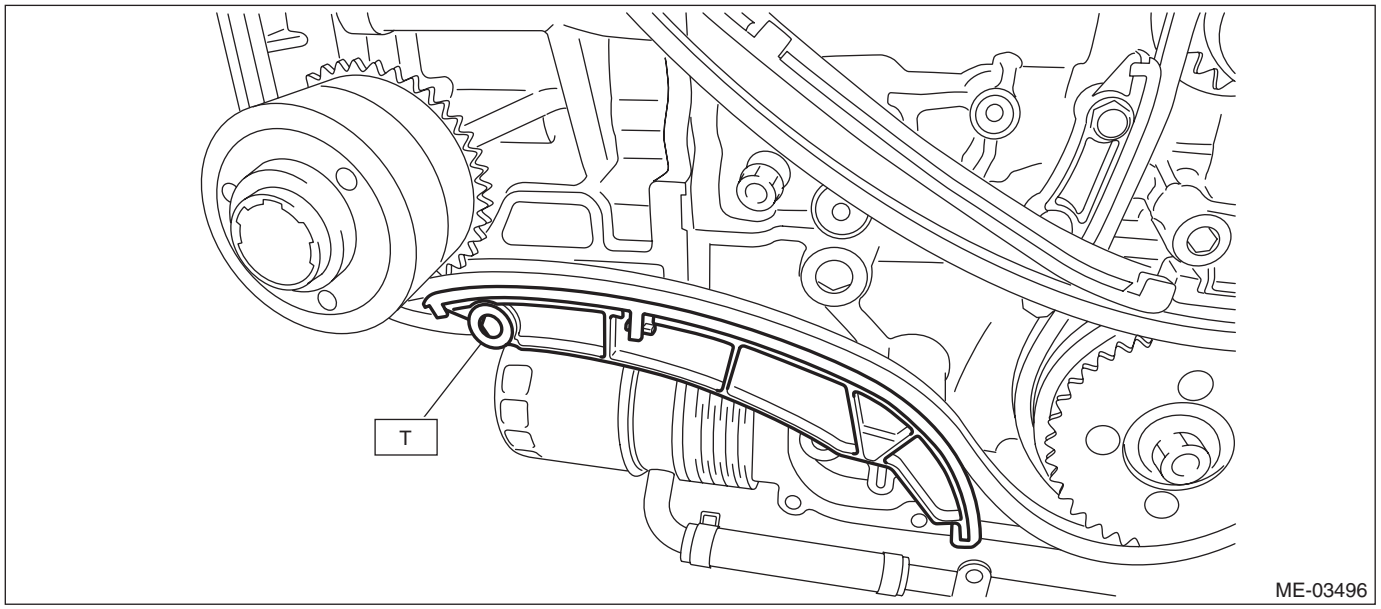
(3) Align the idler sprocket timing mark to the timing chain mark (gold).



(A) Gold (B) Timing mark

19) Install the chain tensioner lever (RH).

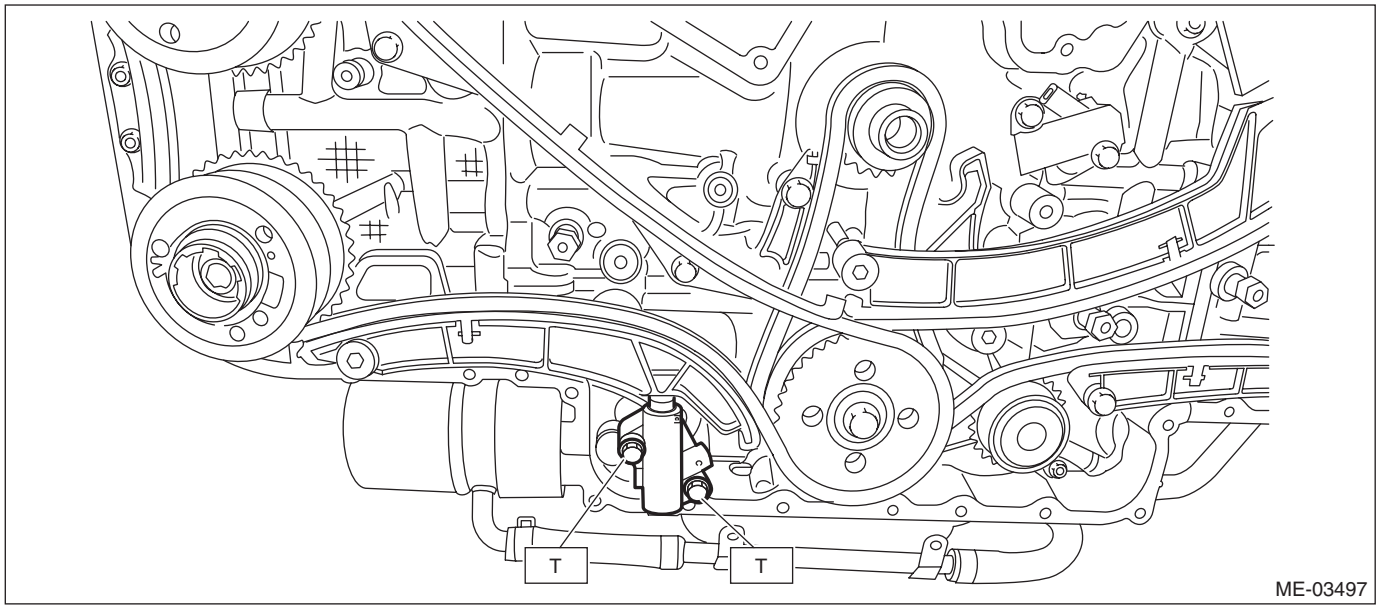
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



20) Install the chain tensioner (RH) and pull out the stopper pin.

NOTE:
Timing chain (RH) components assembly is completed.

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



21) Confirm the following after installation.

CAUTION:
Be sure to perform this confirmation.
(1) Confirm that the idler sprocket timing mark and three timing chain marks (gold) are aligned.
(2) Confirm that the crank sprocket 12 o'clock position and timing chain (main) mark (gold) are aligned.
(3) Confirm that the LH cam sprocket timing mark and timing chain mark (blue) are aligned.
(4) Confirm that the RH cam sprocket timing mark and timing chain mark (blue) are aligned.
(5) Confirm that the bolts are tightened to the specified tightening torque.

22) Confirm that there are no abnormalities, while turning the crankshaft in the engine rotating direction using ST.

CAUTION:
Be sure to perform this confirmation.

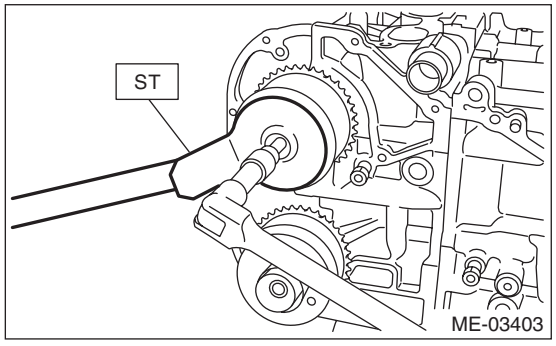
23) Install the chain cover. <Ref. to ME(H6DO)-49, INSTALLATION, Chain Cover.>
24) Install the crank pulley. <Ref. to ME(H6DO)-47, INSTALLATION, Crank Pulley.>
25) Install the V-belts. <Ref. to ME(H6DO)-46, INSTALLATION, V-belt.>
26) Fill with engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>
27) Confirm that there are no oil leakage at the chain cover mating surface.
28) Install the radiator. <Ref. to CO(H6DO)-19, INSTALLATION, Radiator.>

16.Cam Sprocket

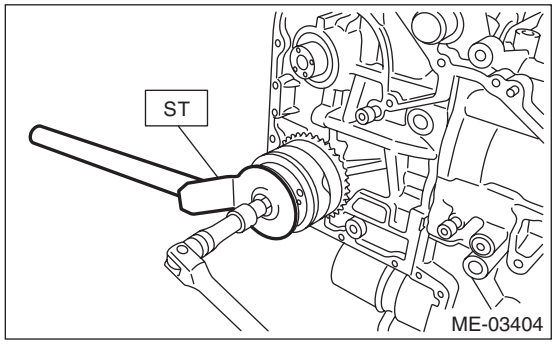
A: REMOVAL

NOTE:
When replacing the single part, perform the work with the engine installed to body.
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)-54, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. To lock the camshaft, use the ST.
ST 499977500 CAM SPROCKET WRENCH

- Intake side



- Exhaust side



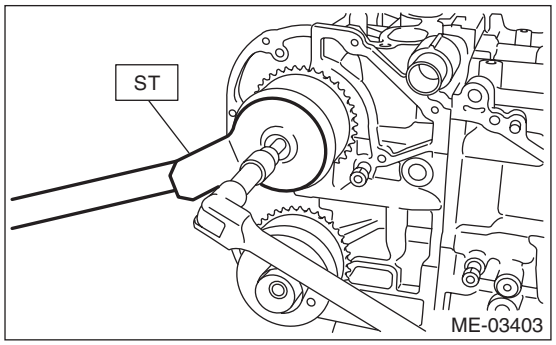
B: INSTALLATION

1) Install the cam sprocket. To lock the camshaft, use the ST.

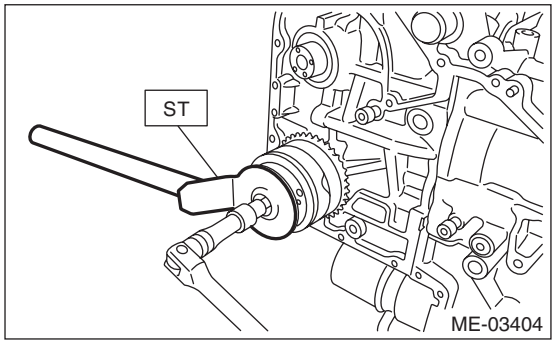
Tightening torque:
29.5 N·m (3.0 kgf-m, 21.8 ft-lb)
2) Further tighten the bolt.

Tightening angle:
45°±5°
ST 499977500 CAM SPROCKET WRENCH

- Intake side



- Exhaust side



3) Install the timing chain assembly. <Ref. to ME(H6DO)-60, INSTALLATION, Timing Chain Assembly.>
4) Install the chain cover. <Ref. to ME(H6DO)-49, 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.>

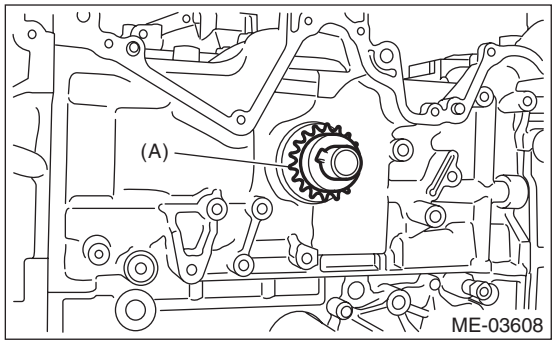
C: INSPECTION

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

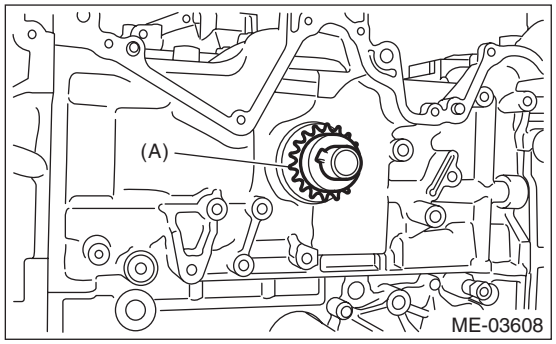
A: REMOVAL

NOTE:
When replacing the single part, perform the work with the engine installed to body.
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)-54, 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)-60, INSTALLATION, Timing Chain Assembly.>
3) Install the chain cover. <Ref. to ME(H6DO)-49, 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

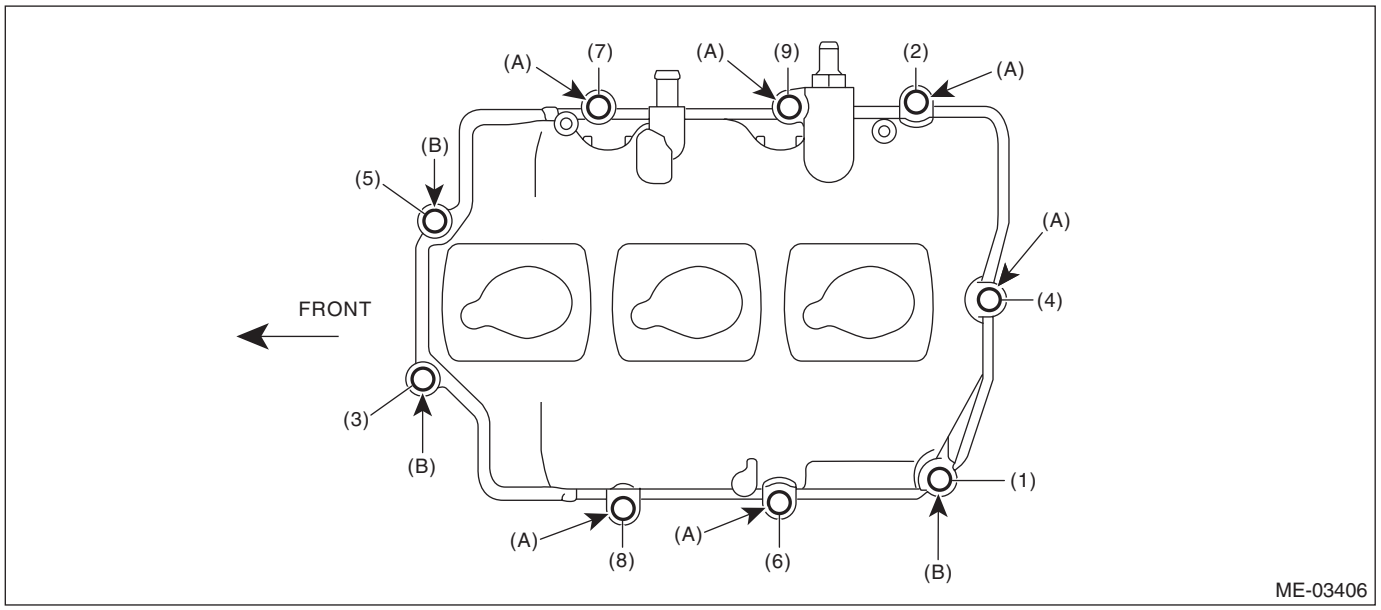
1) Check the crank sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between crank sprocket and key.

18.Camshaft

A: REMOVAL

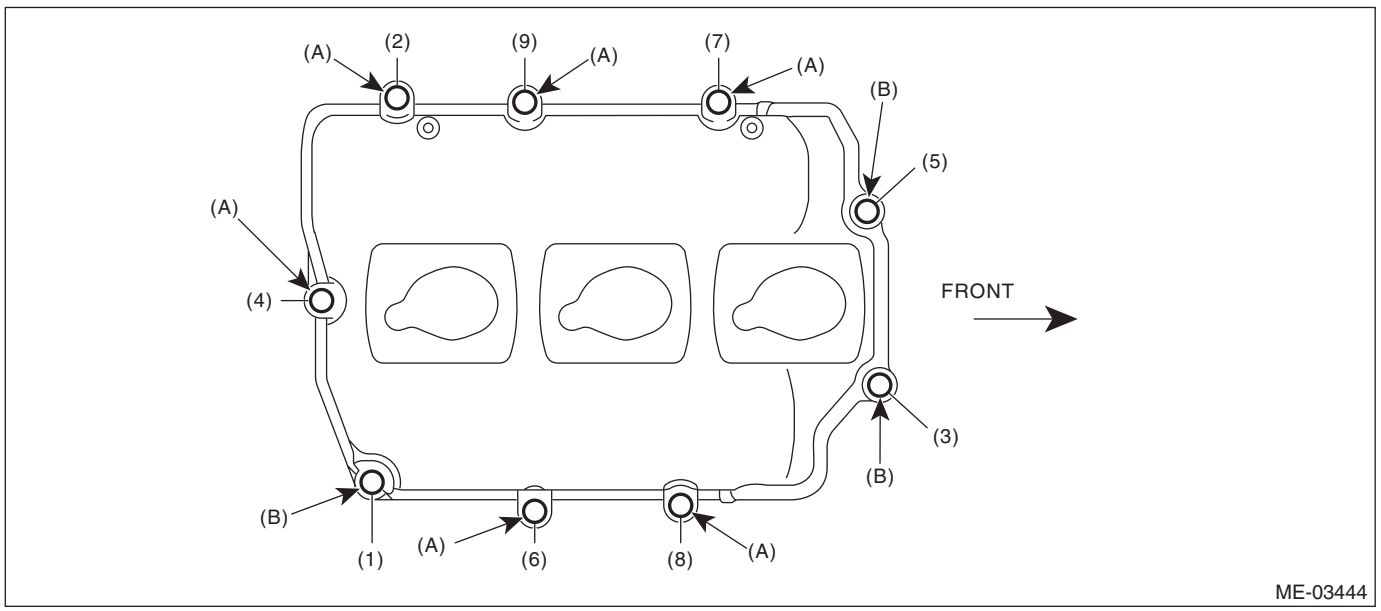
1) Remove the engine from vehicle. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
3) Remove the chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-54, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. <Ref. to ME(H6DO)-73, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H6DO)-74, REMOVAL, Crank Sprocket.>
7) Remove the exhaust oil flow control solenoid valve. <Ref. to FU(H6DO)-32, REMOVAL, Oil Flow Control Solenoid Valve.>
8) Remove the camshaft position sensor. <Ref. to FU(H6DO)-24, REMOVAL, Camshaft Position Sensor.>
9) Loosen the rocker cover bolt in the numerical order as shown in the figure, then remove the rocker cover.

- LH side



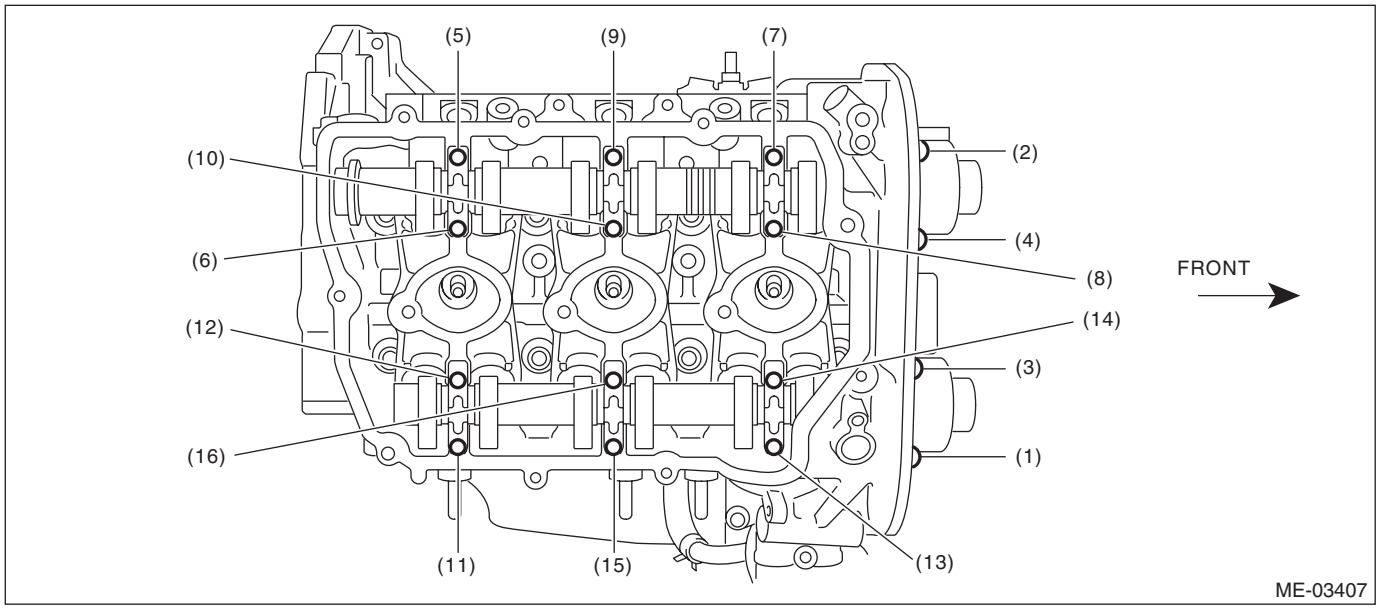
(A) M6 × 37 (B) M6 × 23

- RH side



(A) M6 × 37 (B) M6 × 23

10) Loosen the camshaft cap bolts equally, a little at a time in numerical sequence 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

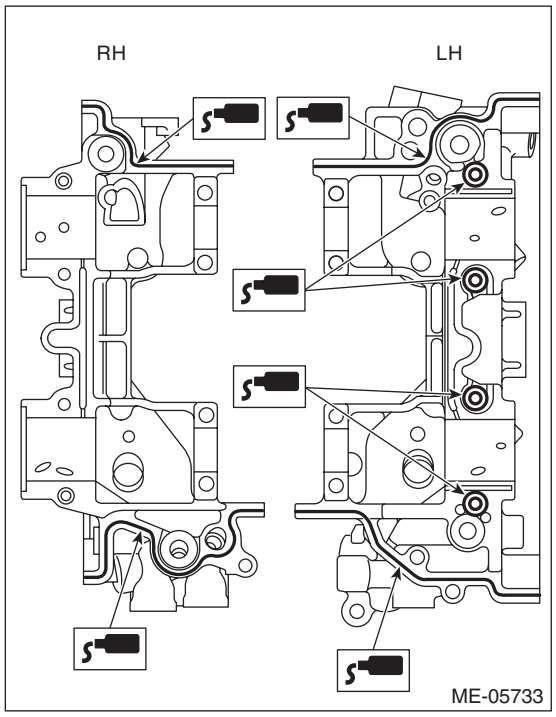
1) Apply engine oil to camshaft journals, and install the camshaft.
2) Install the camshaft cap.
   (1) Apply liquid gasket sparingly to back side of front camshaft cap as shown in the figure.

CAUTION:
Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to flow toward cam journal, resulting in engine seizure.

NOTE:
Install within 5 minutes after applying liquid gasket.

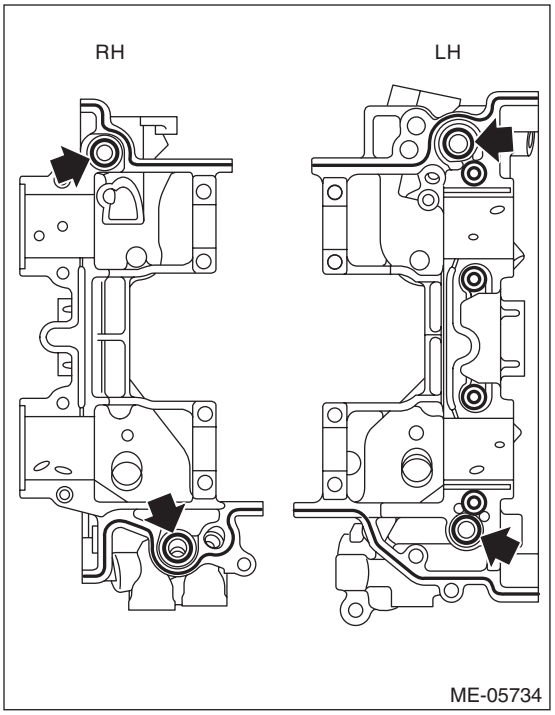
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Applying liquid gasket diameter:
2.0±0.5 mm (0.079±0.020 in)



(2) Install O-rings to the front camshaft cap.

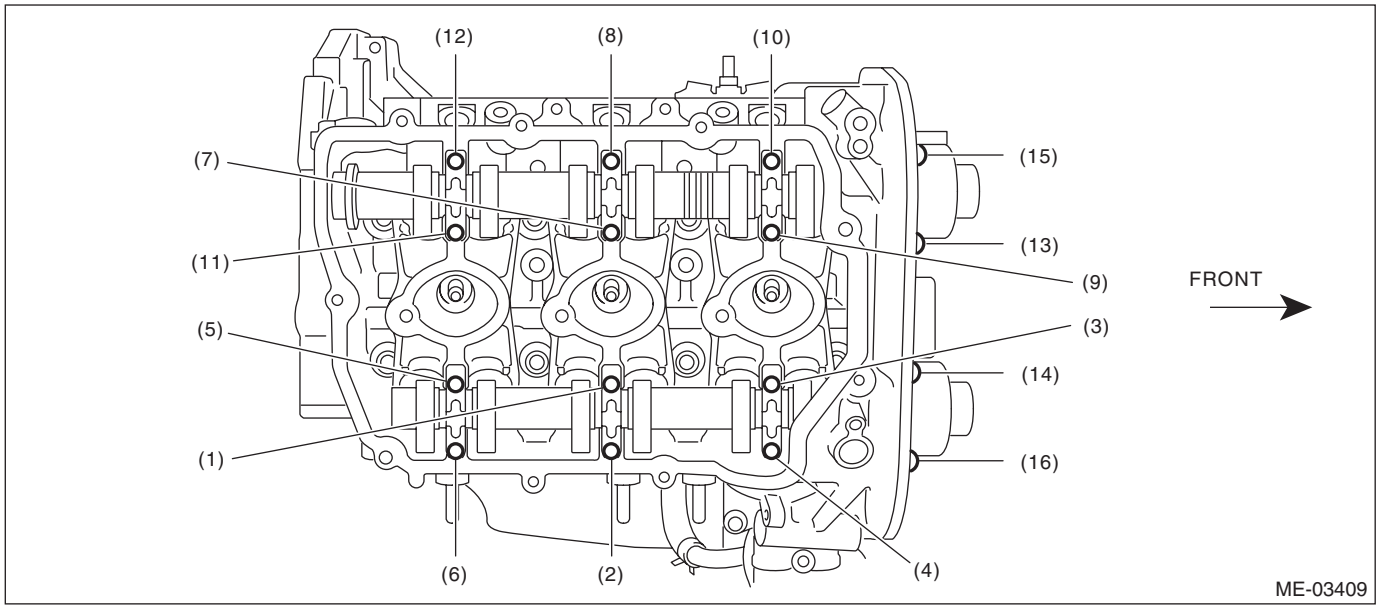
NOTE:
Use new O-rings.



(3) Apply engine oil to cap bearing surface, and install the cap to camshaft.

(4) Tighten the camshaft cap bolts in the numerical order as shown in the figure.

Tightening torque:
(1) — (12): 16 N·m (1.6 kgf-m, 11.8 ft-lb)
(13) — (16): 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



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.

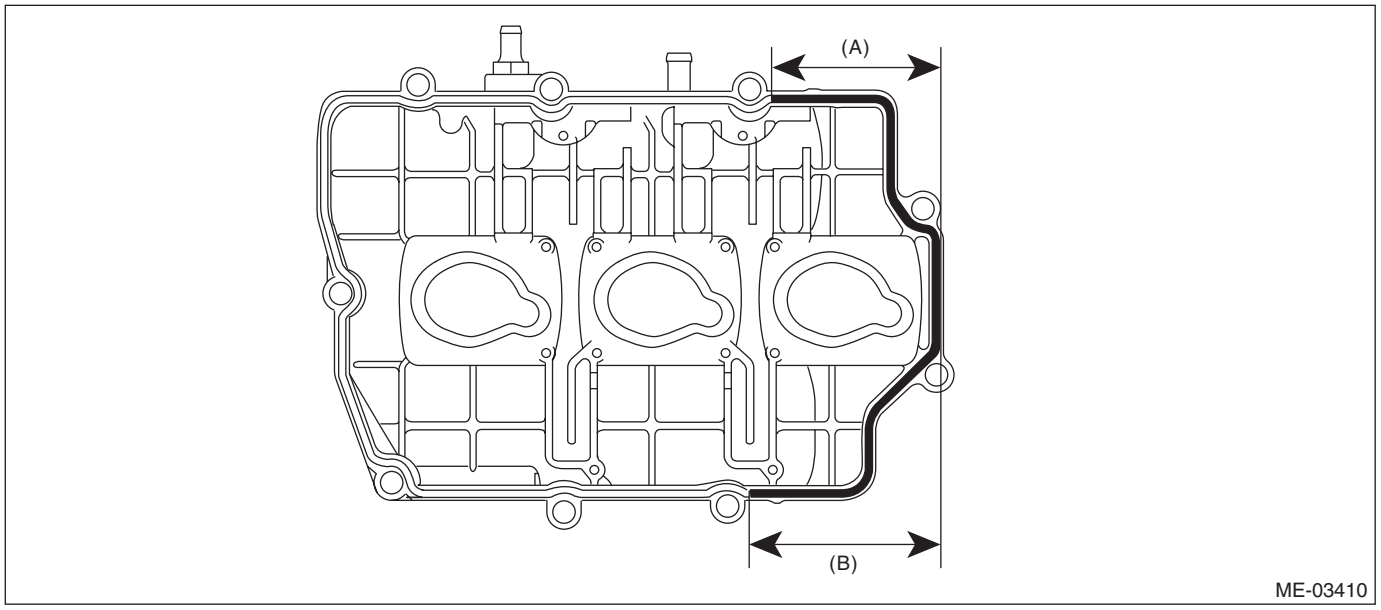
CAUTION:
Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to flow toward cam journal, resulting in engine seizure.

NOTE:
Install within 5 minutes after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

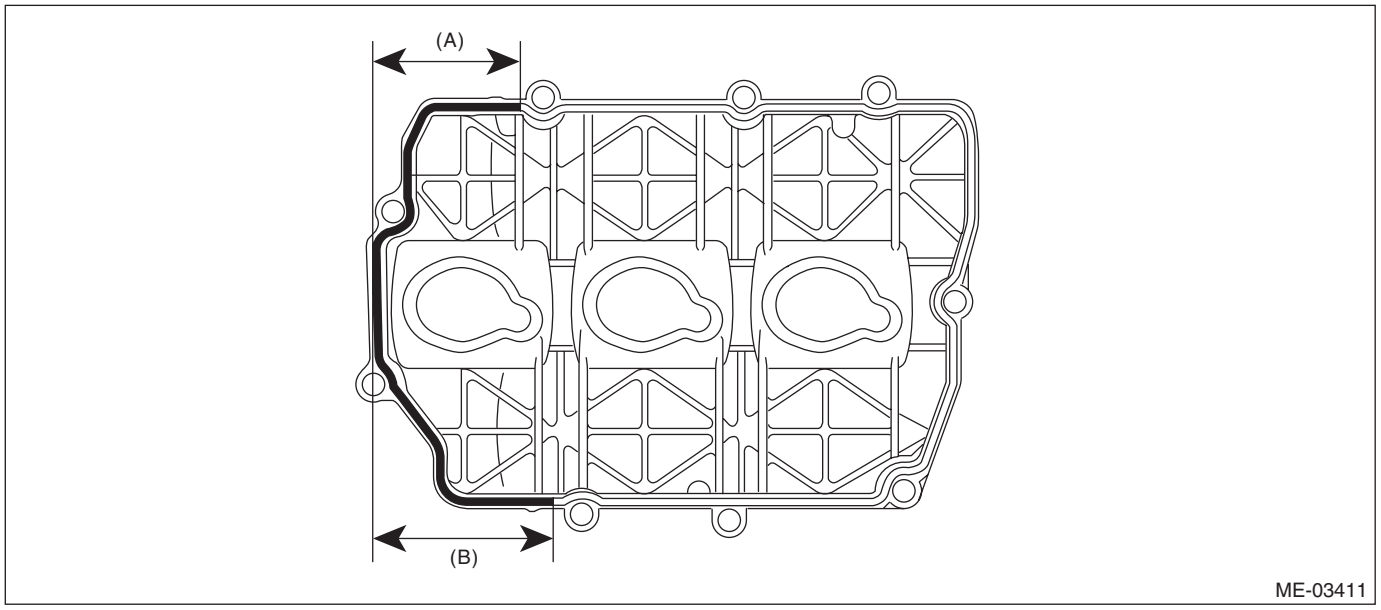
Applying liquid gasket diameter:
3.5±0.5 mm (0.138 ±0.020 in)

- LH side



(A) 90 mm (3.543 in) or more (B) 105 mm (4.134 in) or more

- RH side

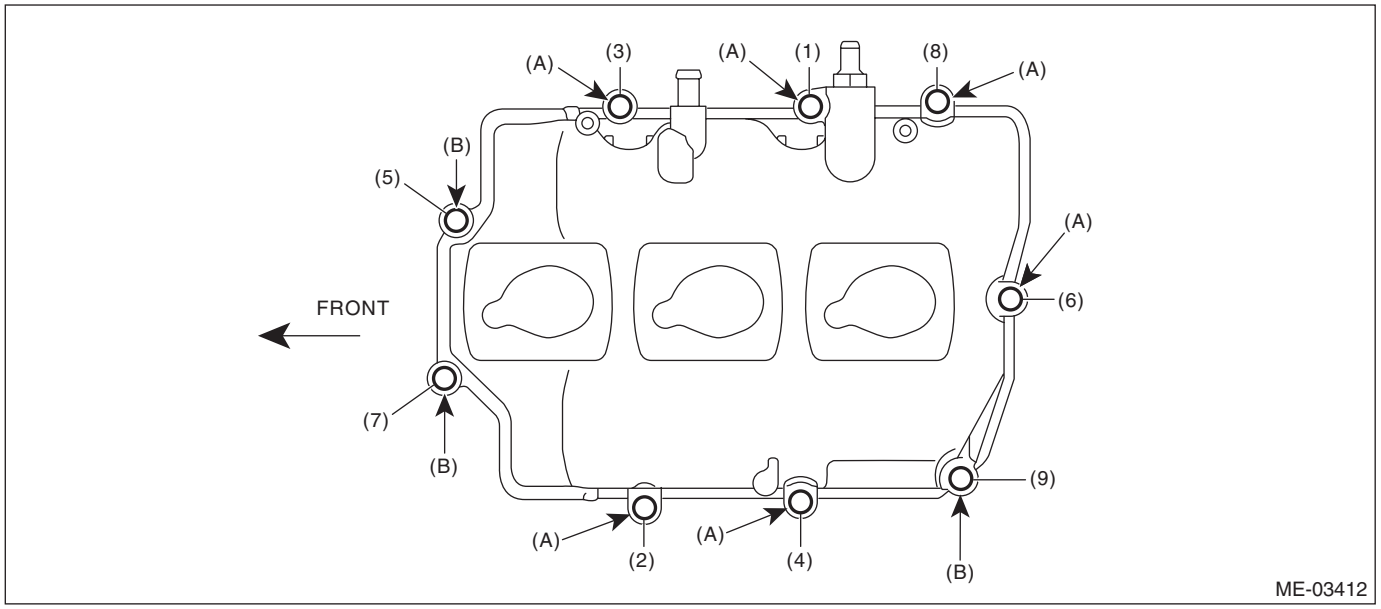


(A) 80 mm (3.150 in) or more (B) 100 mm (3.937 in) or more

(3) Tighten the rocker cover bolts in the numerical order as shown in the figure.

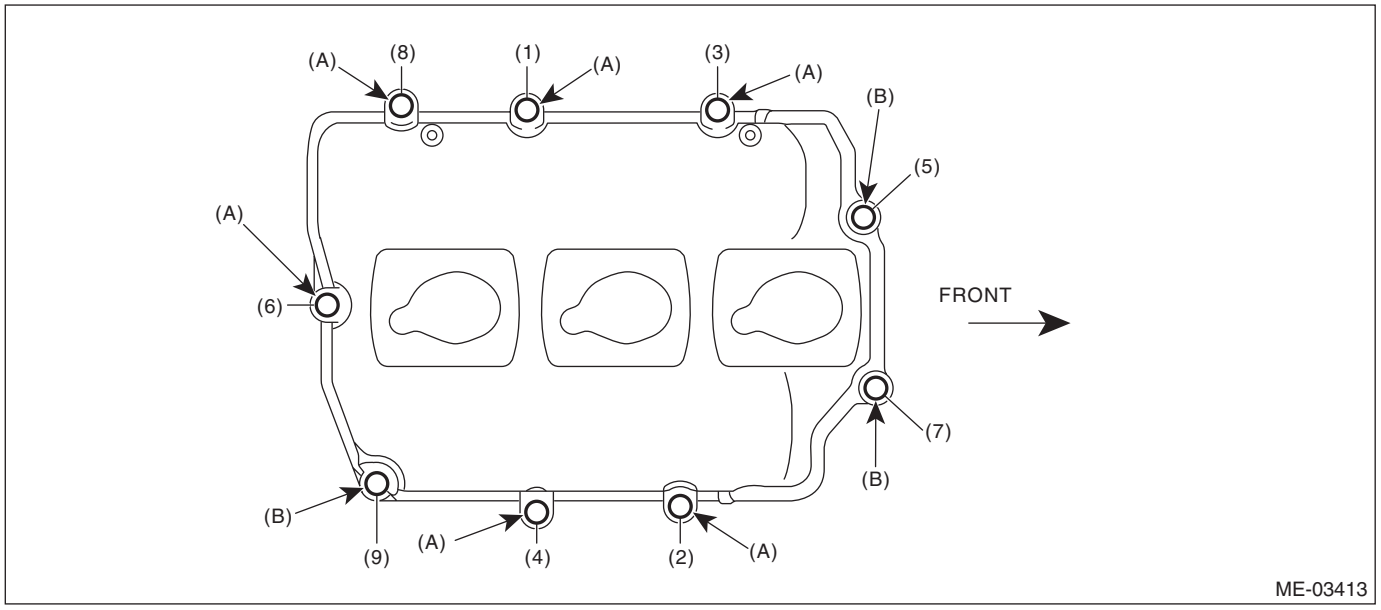
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

- LH side



(A) M6 × 37 (B) M6 × 23

- RH side



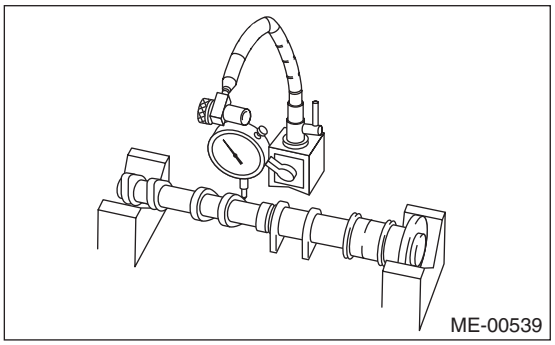
(A) M6 × 37 (B) M6 × 23

4) Install the crank sprocket. <Ref. to ME(H6DO)-74, INSTALLATION, Crank Sprocket.>
5) Install the cam sprocket. <Ref. to ME(H6DO)-73, INSTALLATION, Cam Sprocket.>
6) Install the timing chain assembly. <Ref. to ME(H6DO)-60, INSTALLATION, Timing Chain Assembly.>
7) Install the chain cover. <Ref. to ME(H6DO)-49, 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 of camshaft. Repair or replace if bended.

Service 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) Measure the outside diameter of camshaft journal. If the journal diameter is not within specification, check the oil clearance.

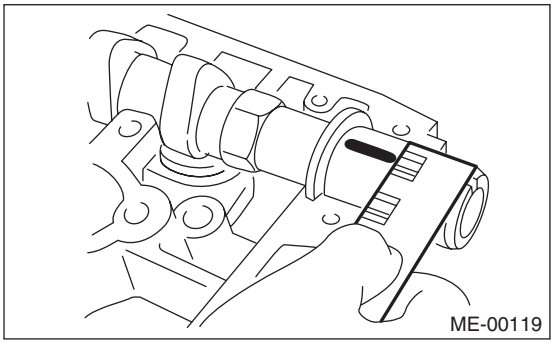
	Camshaft journal	
	Front	Except for front
Standard mm (in)	37.946 — 37.963 (1.4939 — 1.4946)	25.946 — 25.963 (1.0215 — 1.0222)

5) Measurement of the camshaft journal oil clearance:
(1) Clean the camshaft cap and cylinder head camshaft journal.
(2) Place the camshafts on the cylinder head. (Without installing the valve rocker.)
(3) Place a plastigauge across each camshaft journals.
(4) Install the camshaft cap.

NOTE:
Do not turn the camshaft.

(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.

Standard:
0.037 — 0.072 mm (0.0015 — 0.0028 in)



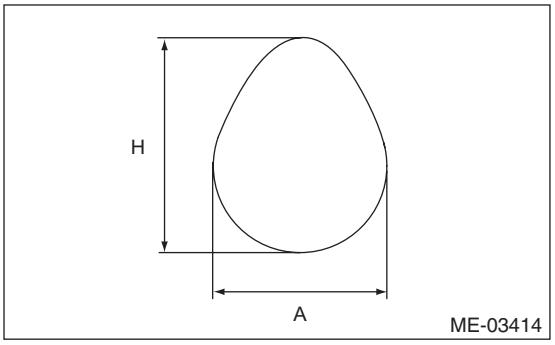
(7) Completely remove the plastigauge.

6) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H. If it exceeds the standard or offset wear occurs, replace it.

Cam 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:
Intake:
36.00 mm (1.4173 in)
Exhaust:
36.00 mm (1.4173 in)



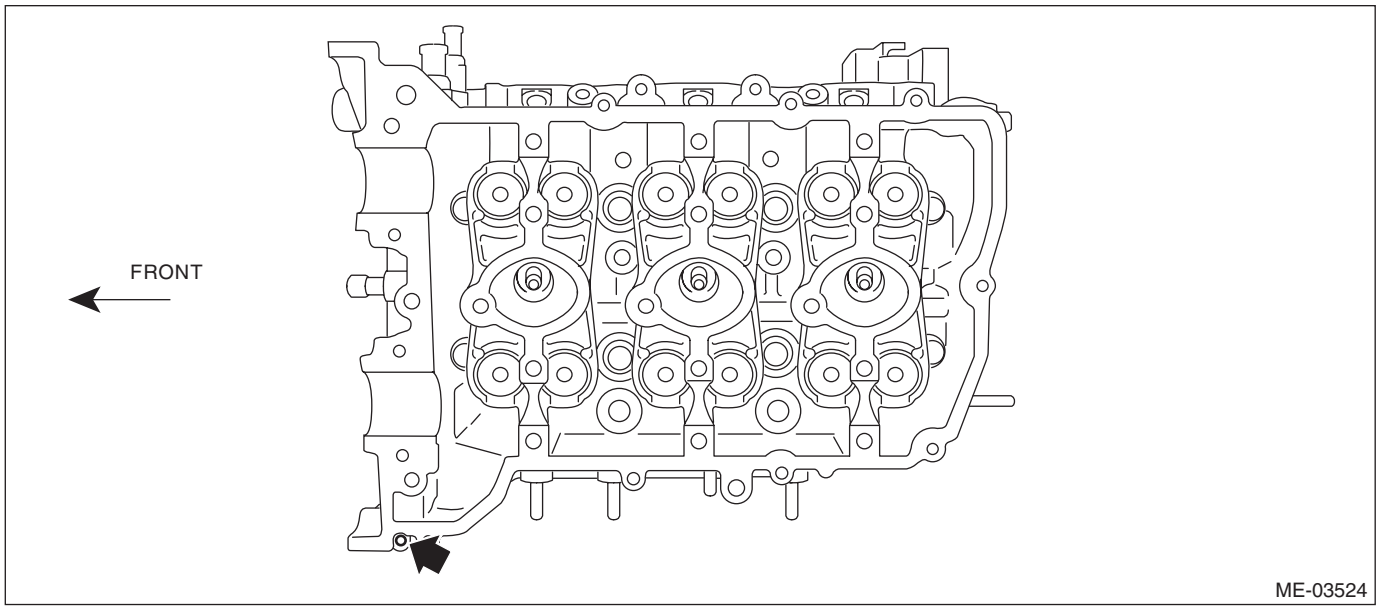
7) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the standard or offset wear occurs, replace the camshaft caps and cylinder head as a set. If necessary replace the camshaft.

Standard:
Intake
0.075 — 0.135 mm (0.0030 — 0.0053 in)
Exhaust
0.075 — 0.135 mm (0.0030 — 0.0053 in)

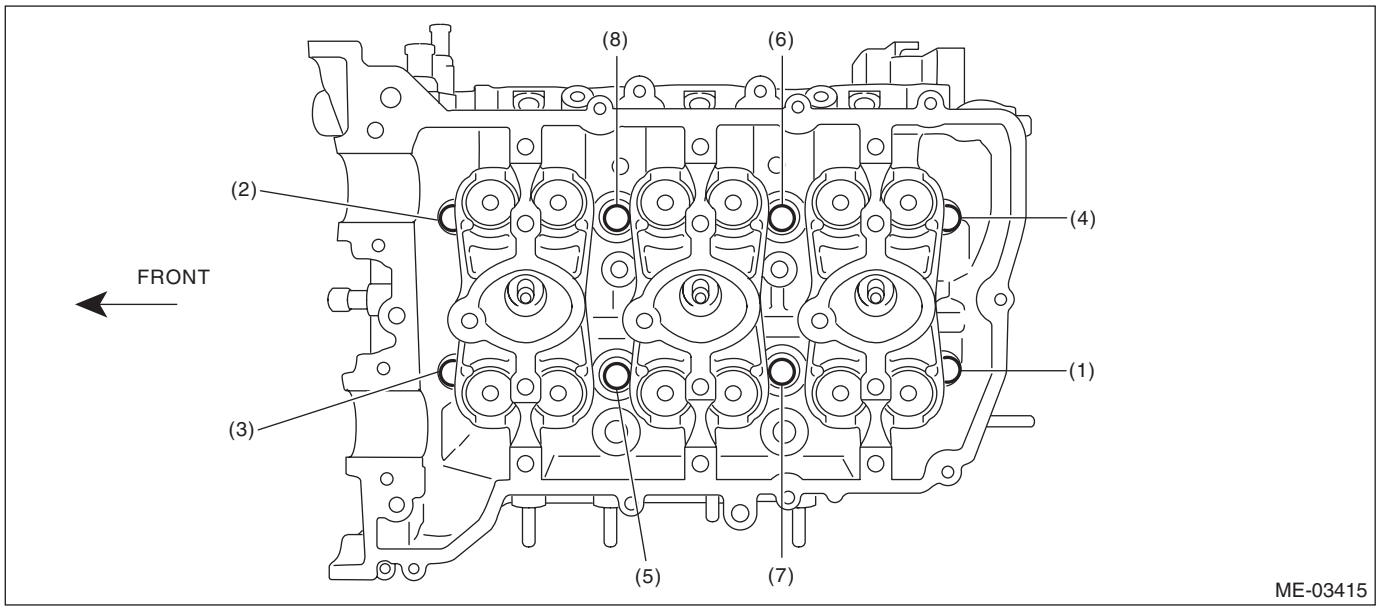
19.Cylinder Head

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)-54, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. <Ref. to ME(H6DO)-73, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H6DO)-74, REMOVAL, Crank Sprocket.>
7) Remove the camshaft. <Ref. to ME(H6DO)-75, REMOVAL, Camshaft.>
8) Remove the seal bolts as shown in the figure.



9) Remove the cylinder head bolts in the numerical order as shown in the figure. 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 surfaces of the 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 as shown in the figure.

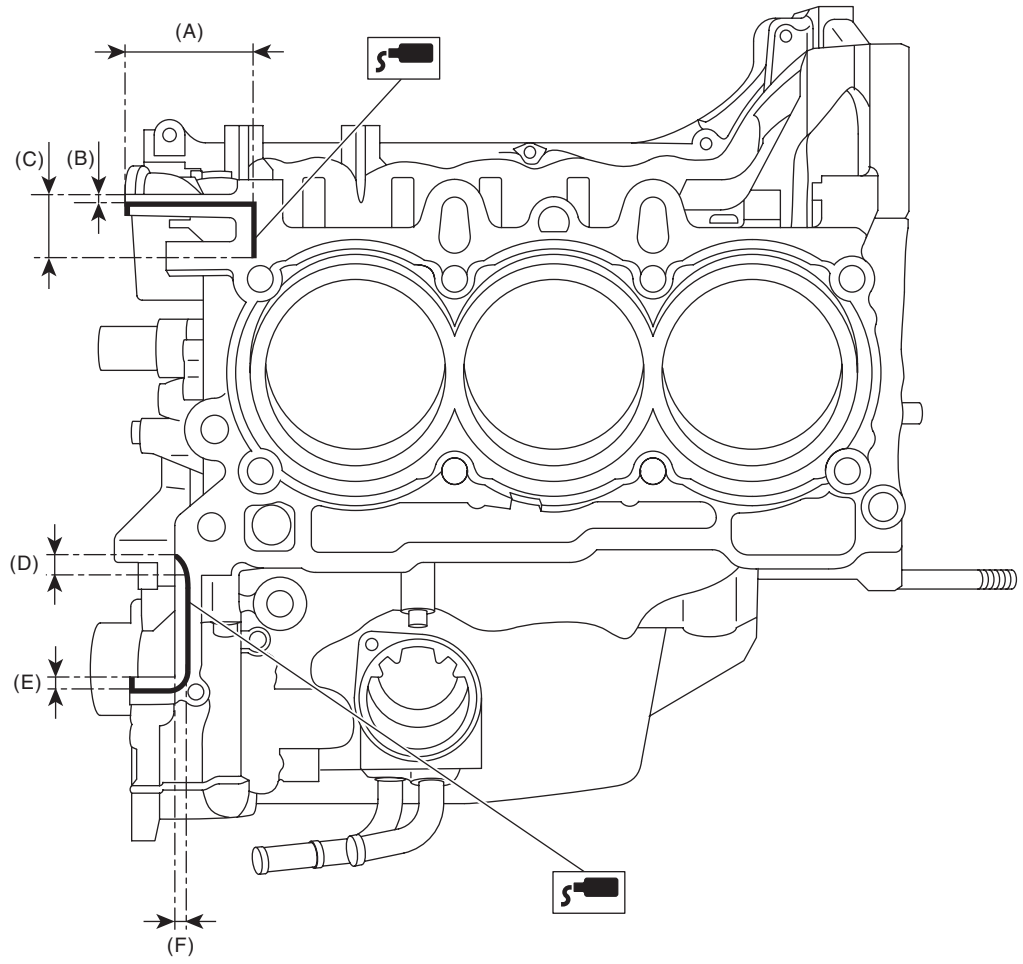
CAUTION:
Do not apply liquid gasket excessively. If applying excessively, remove the excess liquid gasket that flowed out.

NOTE:
Install within 5 minutes after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Applying liquid gasket diameter:
3.5±1.0 mm (0.138 ±0.039 in)

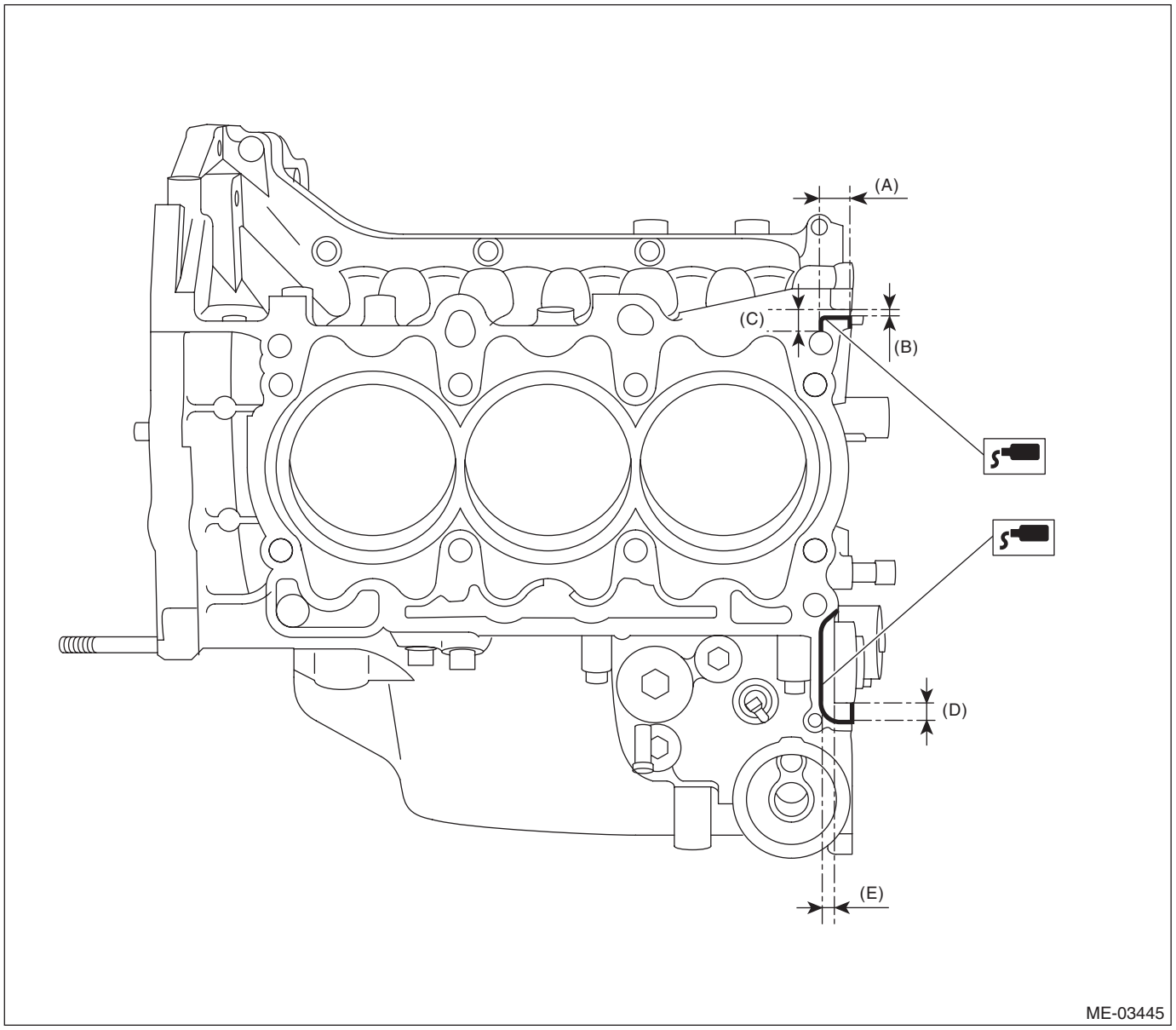
- LH side



ME-03416

(A) 59 mm (2.323 in)
(B) 2 mm (0.079 in)
(C) 20 mm (0.787 in)
(D) 7 mm (0.276 in)
(E) 4 mm (0.157 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) on cylinder blocks.

NOTE:
Use a new cylinder head gasket.

3) Apply liquid gasket to the mating surface of cylinder head gasket as shown in the figure.

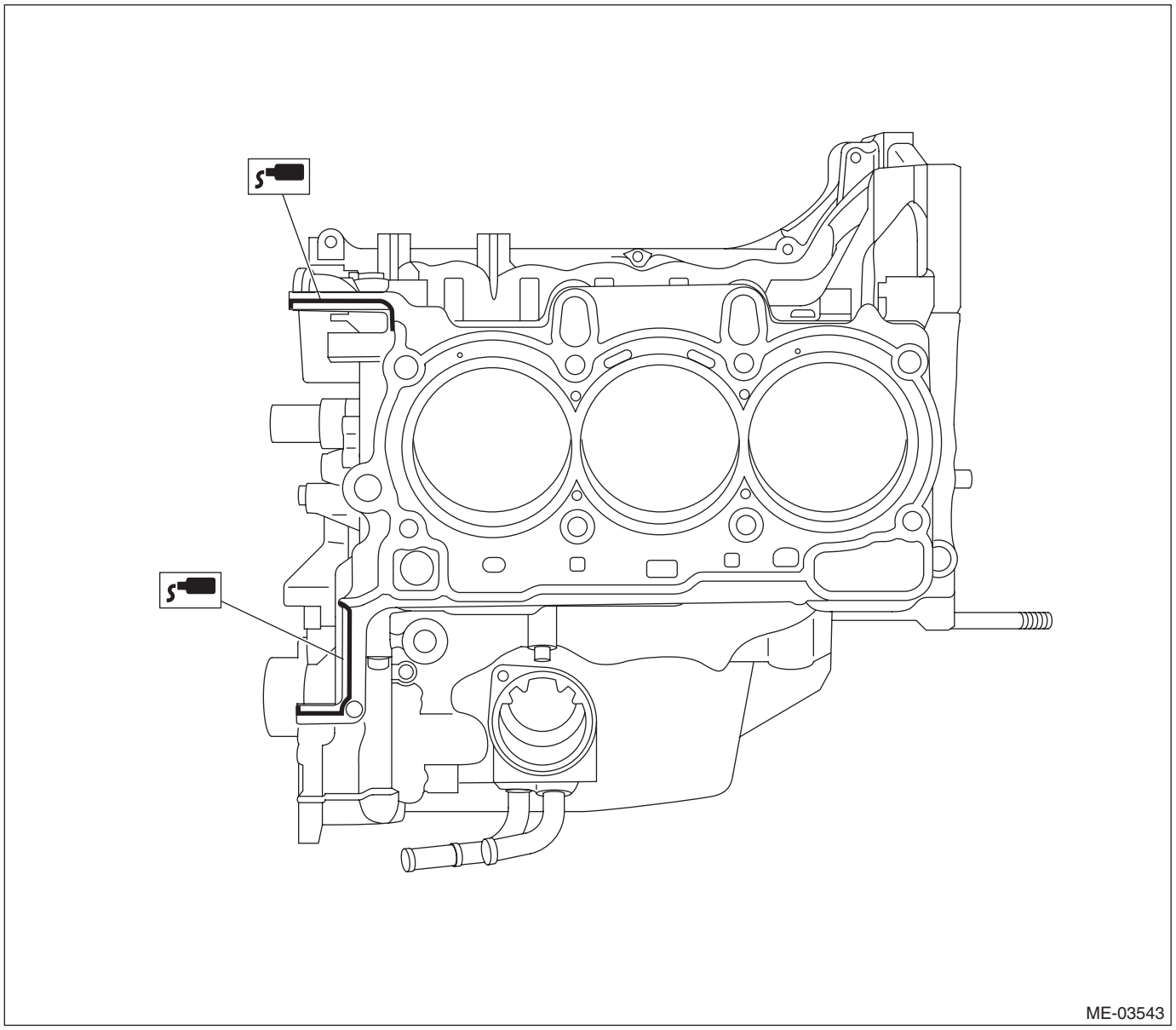
CAUTION:
Do not apply liquid gasket excessively. If applying excessively, remove the excess liquid gasket that flowed out.

NOTE:
Install within 5 minutes after applying liquid gasket.

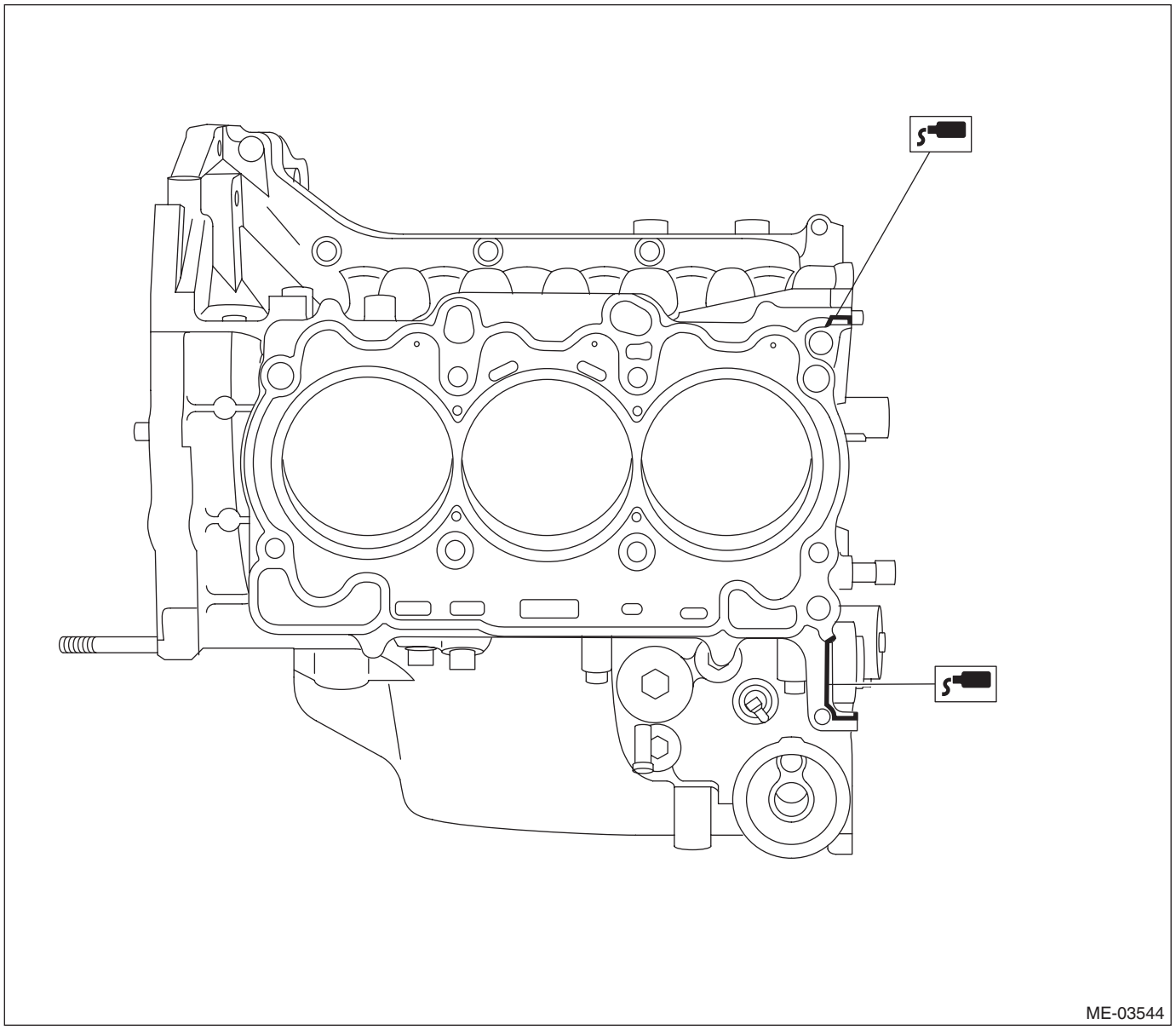
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Applying liquid gasket diameter:
3.5±1.0 mm (0.138 ±0.039 in)

- LH side



- RH side

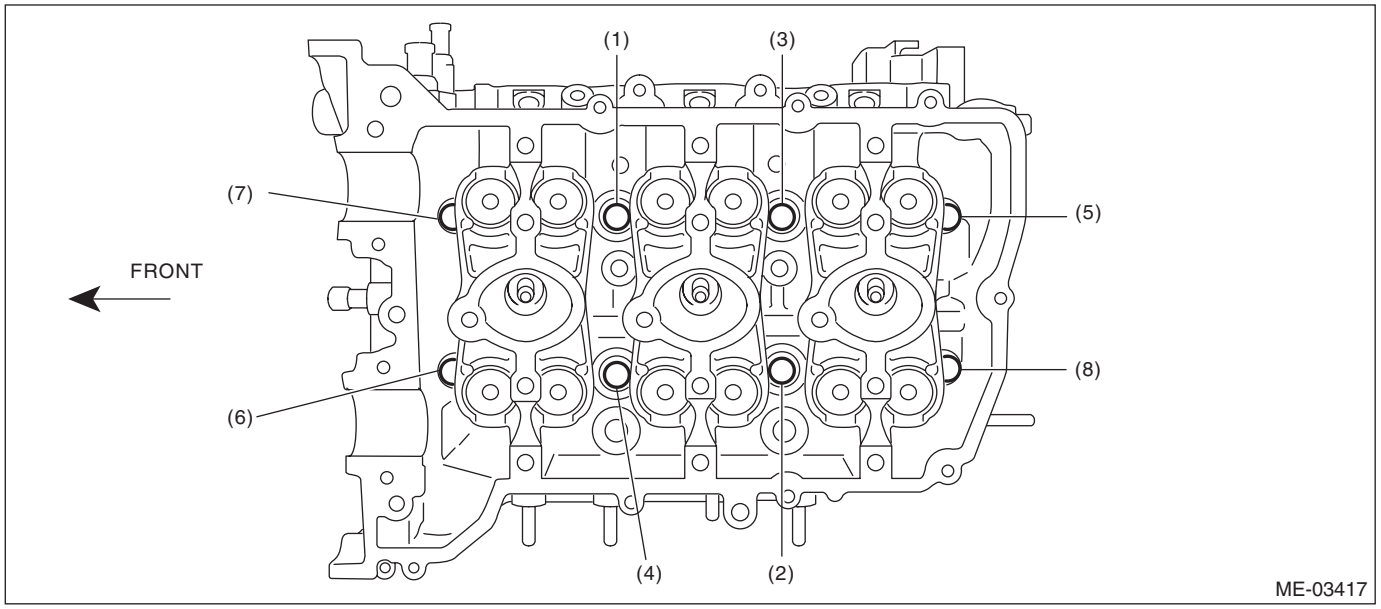


4) Install the cylinder head to cylinder block.

CAUTION:
Be careful not to scratch the mating surfaces of the cylinder head and cylinder block.

5) Tighten the cylinder head bolts.
(1) Apply a coat of engine oil to washers and cylinder head bolt threads.
(2) Install the cylinder head to cylinder block, and then 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.
(3) Tighten the bolts with torque of 50 N·m (5.1 kgf-m, 36.9 ft-lb) in numerical sequence as shown 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) with torque of 48 N·m (4.9 kgf-m, 35.4 ft-lb) in numerical sequence.
(7) Tighten the bolts (5) — (8) with torque of 44 N·m (4.5 kgf-m, 32.5 ft-lb) in numerical sequence.
(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.

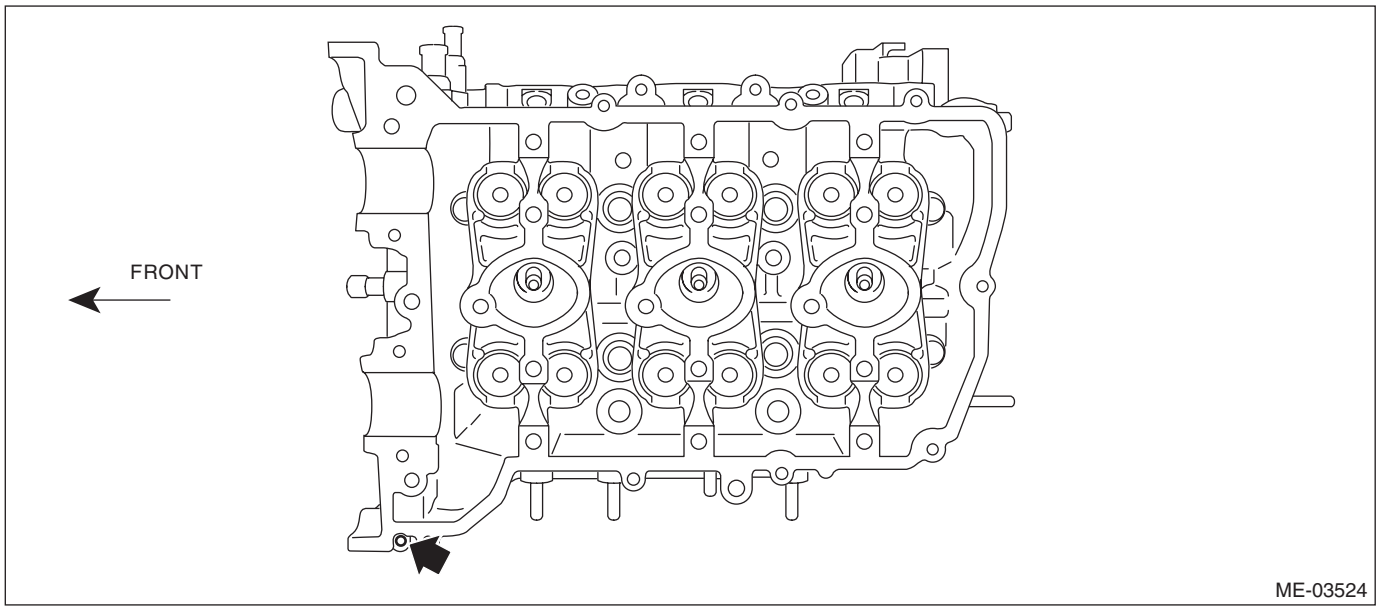


6) Install the seal bolts as shown in the figure.

NOTE:
Apply seal material on the bolt threads before installing the seal bolts.

Seal material:
THREE BOND 1324 (Part No. 004403042) or equivalent

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

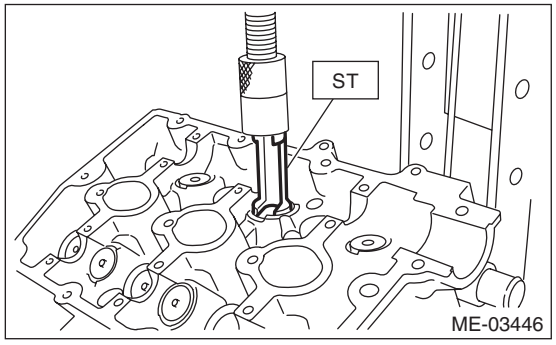


7) Install the camshaft. <Ref. to ME(H6DO)-77, INSTALLATION, Camshaft.>
8) Install the crank sprocket. <Ref. to ME(H6DO)-74, INSTALLATION, Crank Sprocket.>
9) Install the cam sprocket. <Ref. to ME(H6DO)-73, INSTALLATION, Cam Sprocket.>
10) Install the timing chain assembly. <Ref. to ME(H6DO)-60, INSTALLATION, Timing Chain Assembly.>
11) Install the chain cover. <Ref. to ME(H6DO)-49, 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) Set the ST on valve spring retainer. Compress the valve spring and remove the valve spring retainer key. Remove 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.
- Refer to INSPECTION for removal and installation procedures of valve guide, intake valve oil seal and exhaust valve oil seal. <Ref. to ME(H6DO)-89, VALVE GUIDE, INSPECTION, Cylinder Head.> <Ref. to ME(H6DO)-91, INTAKE AND EXHAUST VALVE OIL SEAL, INSPECTION, Cylinder Head.>

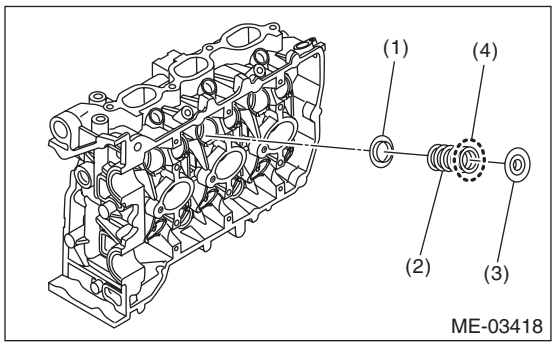


D: ASSEMBLY

1) Installation of 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.

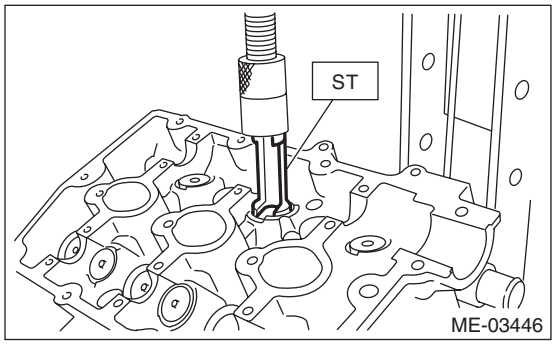
NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.
(3) Install the valve spring and retainer.

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.

E: INSPECTION

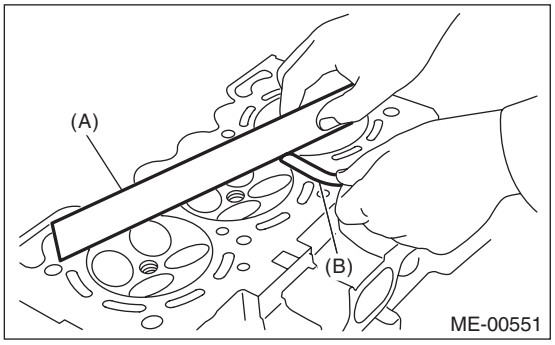
1. CYLINDER HEAD

1) Make sure that no crack or other damages do not exist. In addition to visual inspection, inspect important areas using liquid penetrant tester. 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.

Surface warpage limit:
0.02 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 warping. When reinstalling, pay special attention to the torque so as to tighten evenly.



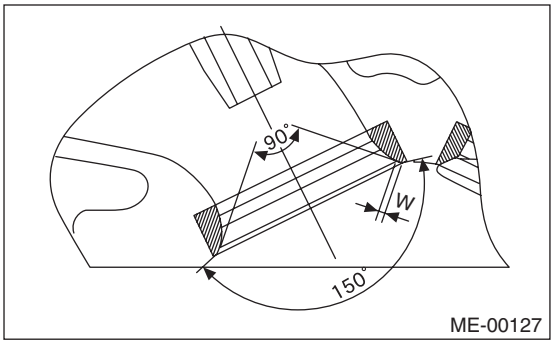
2. VALVE SEAT

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.

Valve seat width W:

Intake:
Standard:
1.0 mm (0.039 in)

Exhaust:
Standard:
1.5 mm (0.059 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the valve stem outer diameter with a micrometer and valve guide inner diameter with a caliper gauge respectively.

Clearance between the valve guide and valve stem:

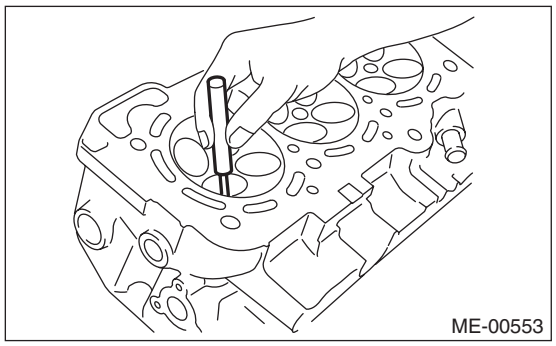
Standard:
Intake:
0.030 — 0.057 mm (0.0012 — 0.0022 in)
Exhaust:
0.040 — 0.067 mm (0.0016 — 0.0026 in)
2) If the clearance between valve guide and stem exceeds the standard, replace the valve guide or valve itself whichever shows greater amount of wear or damaged and etc. See the following procedure 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)

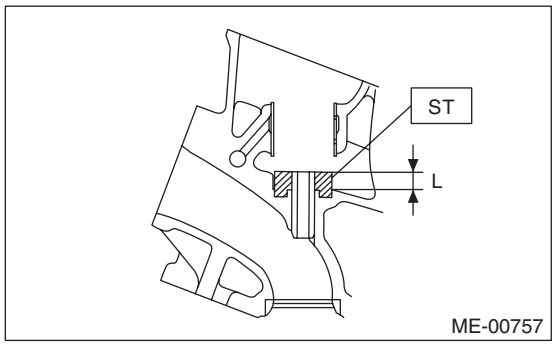
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 18250AA010 CYLINDER HEAD TABLE
ST2 499765700 VALVE GUIDE REMOVER



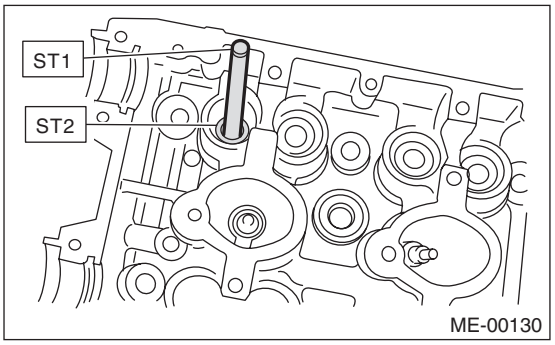
(3) Turn the cylinder head upside down and place the ST as shown in the figure.

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 cylinder, 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.

Valve guide protrusion 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 reamer in valve guide, and rotate the reamer slowly clockwise while pushing it lightly. Bring the reamer back while rotating it clockwise.

ST 499765900 VALVE GUIDE REAMER

NOTE:
• Apply engine oil to the reamer when reaming.
• If the inner surface of valve guide is damaged, the edge of reamer should be slightly ground with oil stone.
• If the inner surface of valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

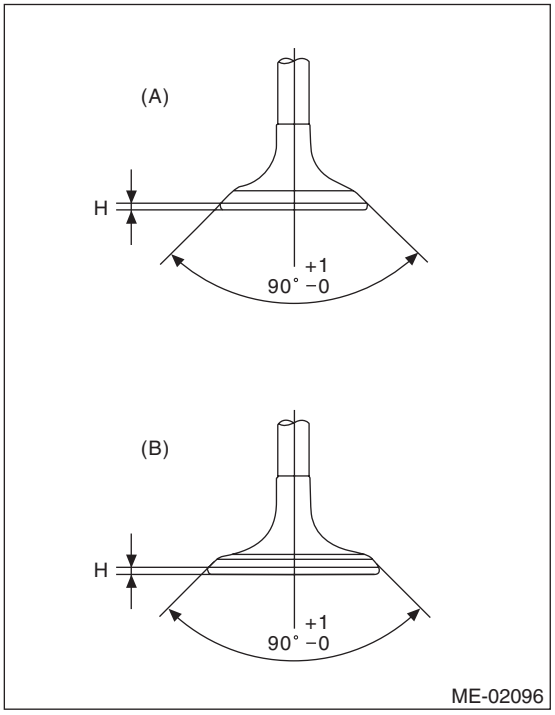
(8) After reaming, clean the valve guide to remove chips.
(9) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn or deformed, or if dimension of “H” in the figure exceeds the standard, or if offset wear occurs.

Head edge thickness H:
Intake (A):
Standard
1.0 mm (0.039 in)
Exhaust (B):
Standard
1.2 mm (0.047 in)

Valve overall length:
Intake (A):
103.5 mm (4.075 in)
Exhaust (B):
103.2 mm (4.063 in)



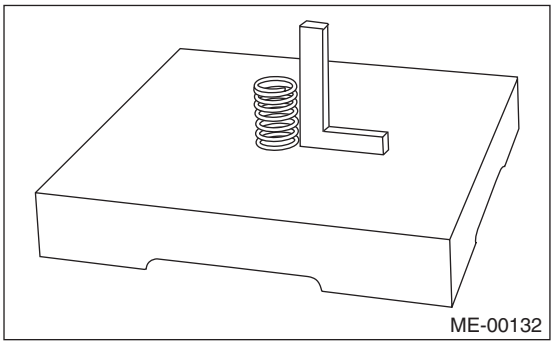
2) Put a small amount of grinding compound on the seat surface, and lap the valve and seat surface. Install a new valve oil seal after lapping.

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.

Free length mm (in)	Intake	41.51 (1.6342)
	Exhaust	41.51 (1.6342)
Squareness	Intake	2.5°, 1.8 mm (0.071 in)
	Exhaust	2.5°, 1.8 mm (0.071 in)

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 valve spring using a try square.



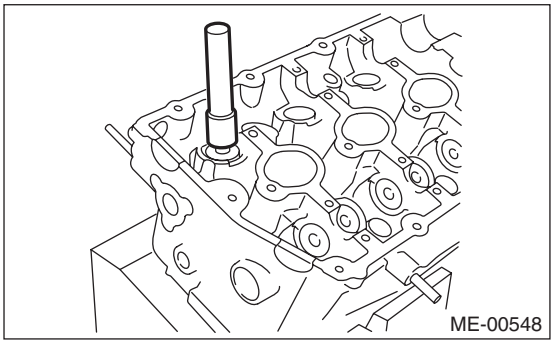
6. INTAKE AND EXHAUST VALVE OIL SEAL

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 intake valve and valve seat.
- When replacing the intake valve guide.

1) Set the cylinder head on ST1.
2) Using the ST2, press in the oil seal.

ST1 18250AA010 CYLINDER HEAD TABLE
ST2 499585500 VALVE OIL SEAL GUIDE

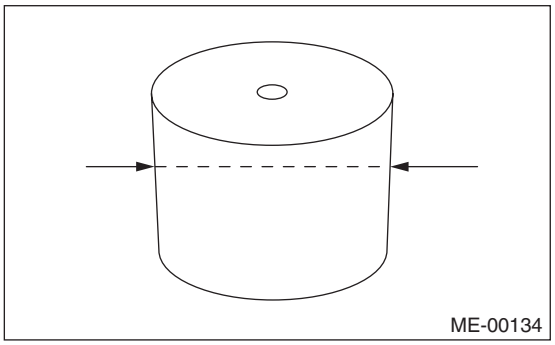
NOTE:
- Apply engine oil to oil seal before press-fitting.
- When press-fitting the oil seal, do not use a hammer to strike in.



7. VALVE LIFTER

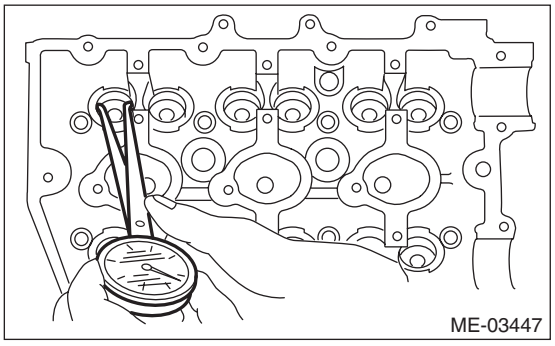
1) Check the valve lifter visually.
2) Measure the outer diameter of valve lifter.

Outer diameter:
32.959 — 32.975 mm (1.2976 — 1.2982 in)



3) Measure the inner diameter of valve lifter hole of cylinder head.

Inner diameter:
32.994 — 33.016 mm (1.2990 — 1.2998 in)



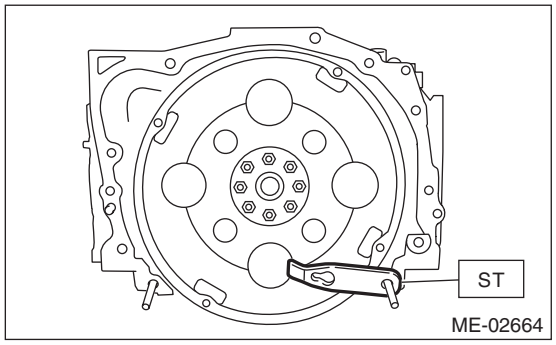
NOTE:
If difference between outer diameter of valve lifter and inner diameter of valve lifter hole is out of the standard or offset wearing exists, replace the cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

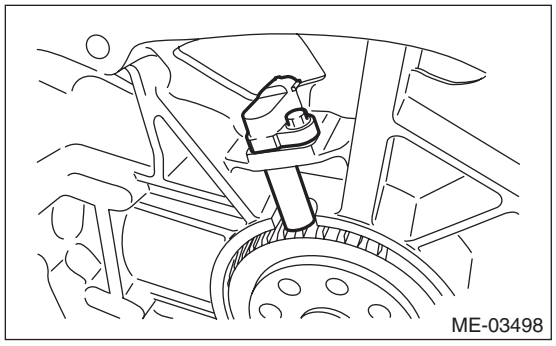
20.Cylinder Block

A: REMOVAL

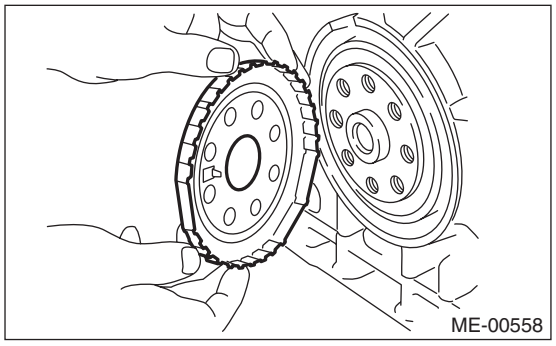
NOTE:
Before conducting this procedure, drain the engine oil completely.
1) Remove the engine from vehicle. <Ref. to ME(H6DO)-36, REMOVAL, Engine Assembly.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-47, REMOVAL, Crank Pulley.>
3) Remove the chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-54, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. <Ref. to ME(H6DO)-73, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H6DO)-74, REMOVAL, Crank Sprocket.>
7) Remove the camshaft. <Ref. to ME(H6DO)-75, REMOVAL, Camshaft.>
8) Remove the cylinder head. <Ref. to ME(H6DO)-82, REMOVAL, Cylinder Head.>
9) Using the ST, lock the crankshaft and remove drive plate.
ST 498497100 CRANKSHAFT STOPPER



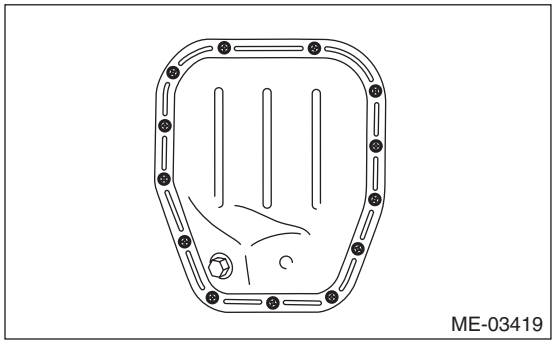
10) Remove the crankshaft position sensor.



11) Remove the crankshaft position sensor plate.

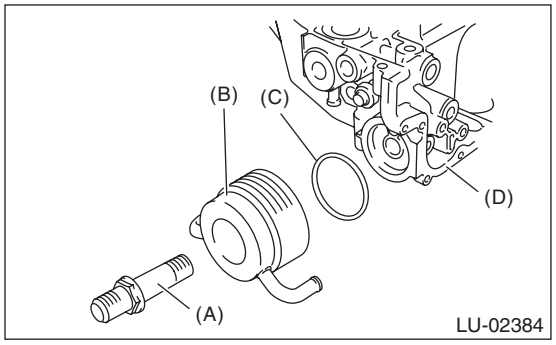


12) Rotate the engine to set oil pan upper.
13) Remove the bolts which secure oil pan lower to oil pan upper.



14) Insert an oil pan cutter blade into the gap between oil pan upper and oil pan lower, and remove the oil pan lower.

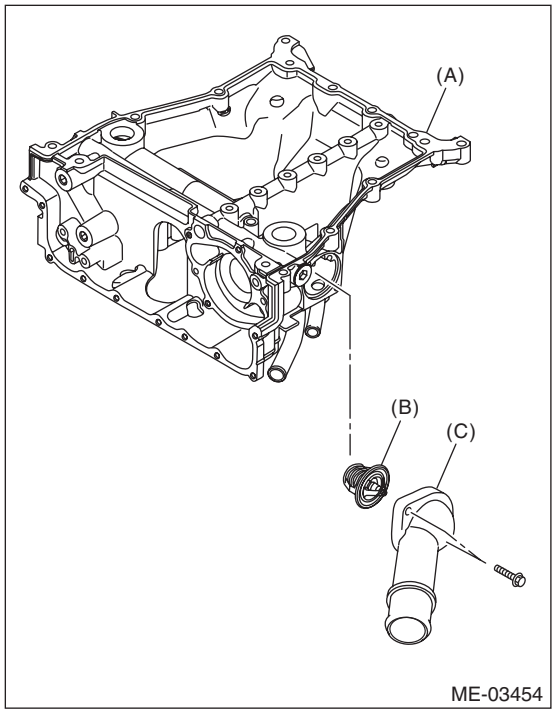
CAUTION:
Do not use a screwdriver or similar tools in place of oil pan cutter.
15) Remove the oil cooler connector and remove oil cooler.



(A) Oil cooler connector
(B) Oil cooler
(C) O-ring
(D) Oil pan upper

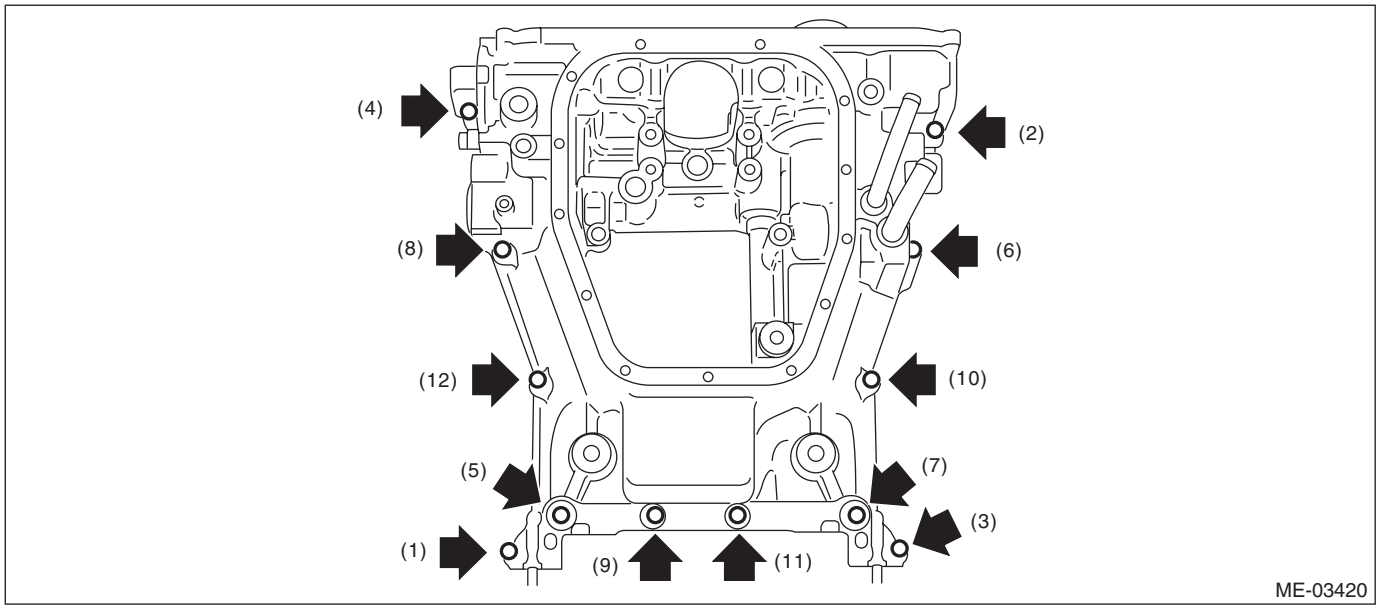
16) Remove the oil pump. <Ref. to LU(H6DO)-11, REMOVAL, Oil Pump.>

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

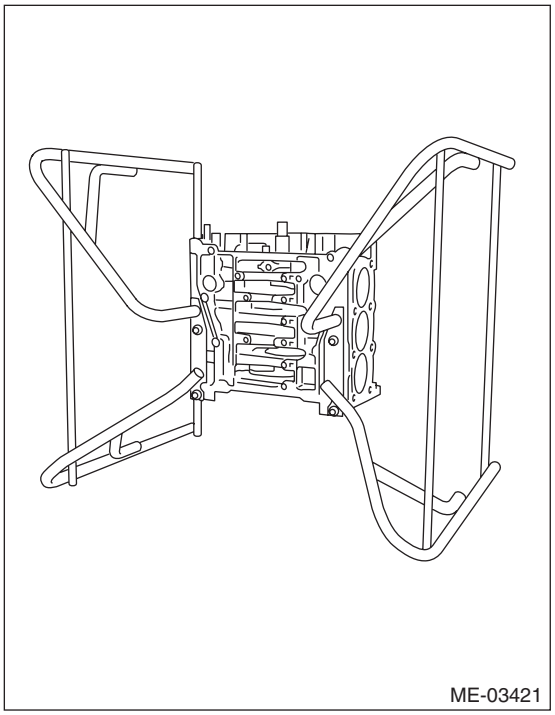


(A) Oil pan upper
(B) Thermostat
(C) Thermostat cover

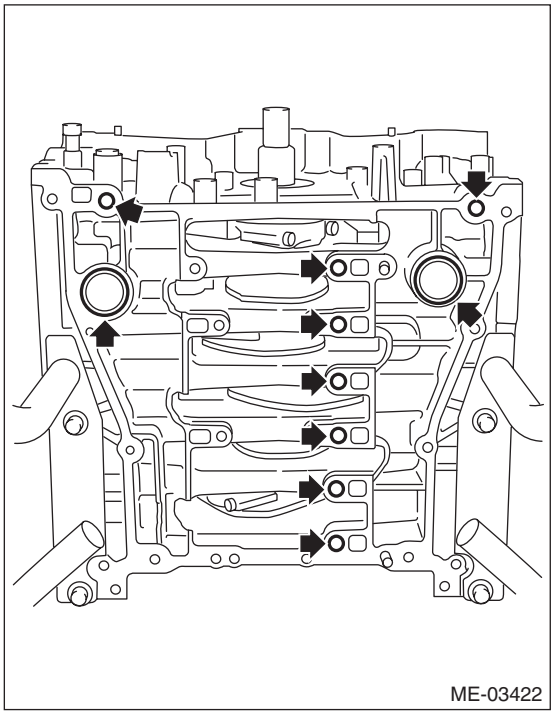
18) Remove the oil pan upper.



19) Set the engine with front side facing upward.



20) Remove the O-rings (10 pcs) under the cylinder block.



21) Mark the all connecting rod caps with the front direction and the number of cylinder from which they were removed.

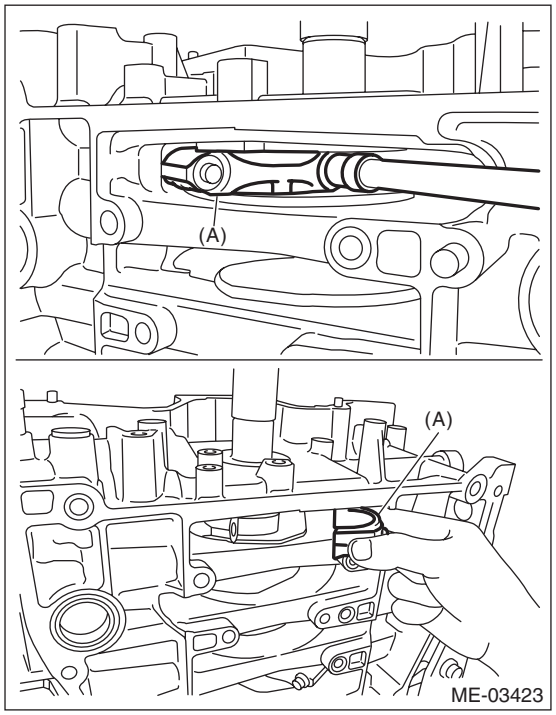
22) Remove the # 1, # 4 connecting rod caps and pistons from cylinder block.

NOTE:
• Use the 3/8 inch (9.5 sq.) for extension and TORX® socket (E12).
• Remove the connecting rod cap by turning the crankshaft (ST) in counterclockwise direction after removing two connecting rod joint bolts.
• Mark the all connecting rod caps and pistons with the number of the cylinder from which they were removed.
• Removal of the connecting rod caps and pistons should be performed in three stages. First, remove the # 1, # 4 connecting rod caps and pistons at the same time, then remove the # 2, # 5 connecting rod caps and pistons at the same time, then # 3, # 6 connecting rod caps and pistons at the same time.

(1) Turn the crankshaft using ST, to set the # 1 piston at the middle position between top dead center and bottom dead center.

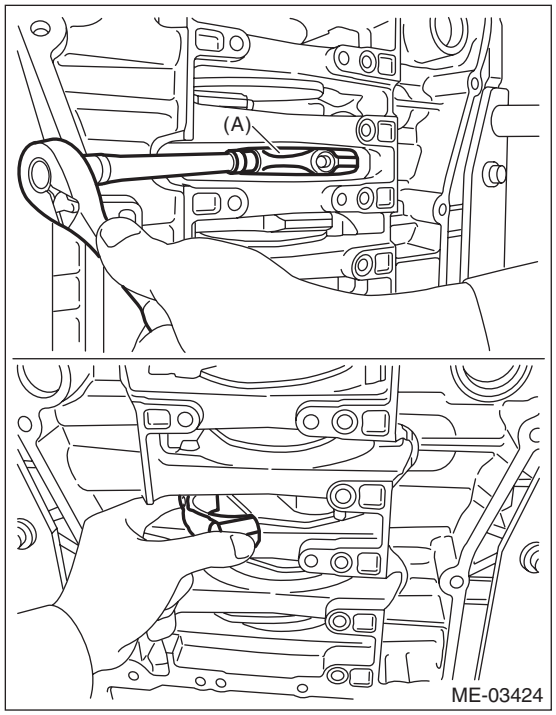
ST 18252AA000 CRANKSHAFT SOCKET

(2) Remove the two # 1 connecting rod cap joint bolts, then remove the connecting rod cap.



(A) # 1 connecting rod cap

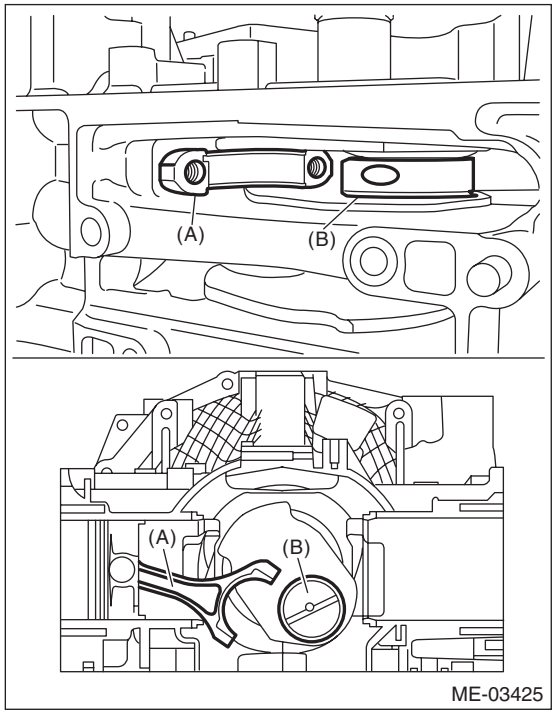
(3) Remove the two # 4 connecting rod cap joint bolts, then remove the connecting rod cap.



(A) # 4 connecting rod cap

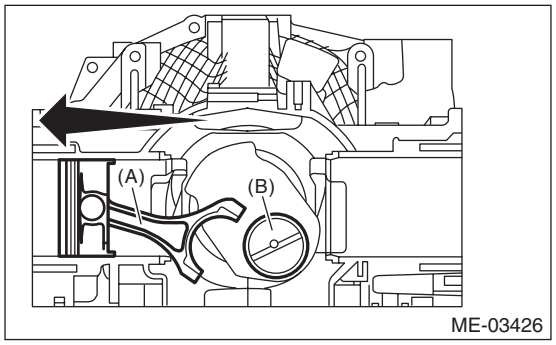
(4) Turn the crankshaft using ST, to set apart the crank pin and the # 1 connecting rod large end position.

ST 18252AA000 CRANKSHAFT SOCKET



(A) # 1 connecting rod
(B) Crank pin

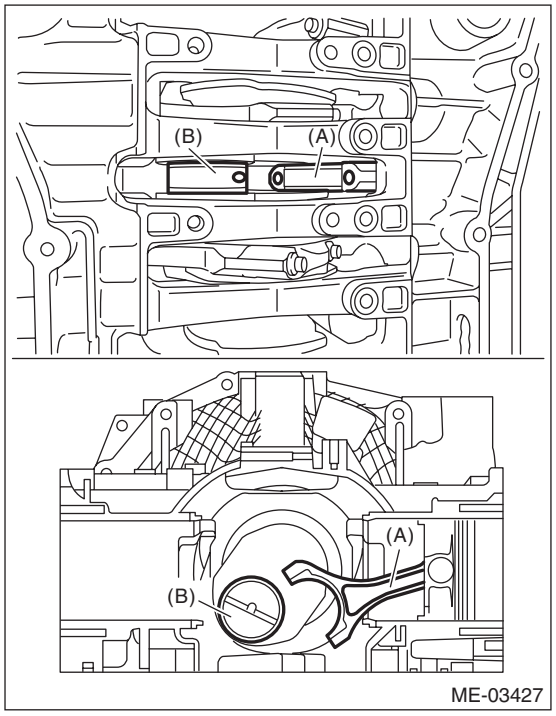
(5) Push the # 1 connecting rod to the arrow direction, then remove the # 1 piston and connecting rod from cylinder block.



(A) # 1 connecting rod
(B) Crank pin

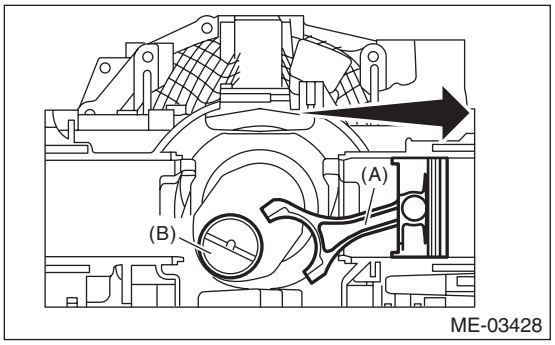
(6) Turn the crankshaft using ST, to set apart the crank pin and the # 4 connecting rod large end position.

ST 18252AA000 CRANKSHAFT SOCKET



(A) # 4 connecting rod
(B) Crank pin

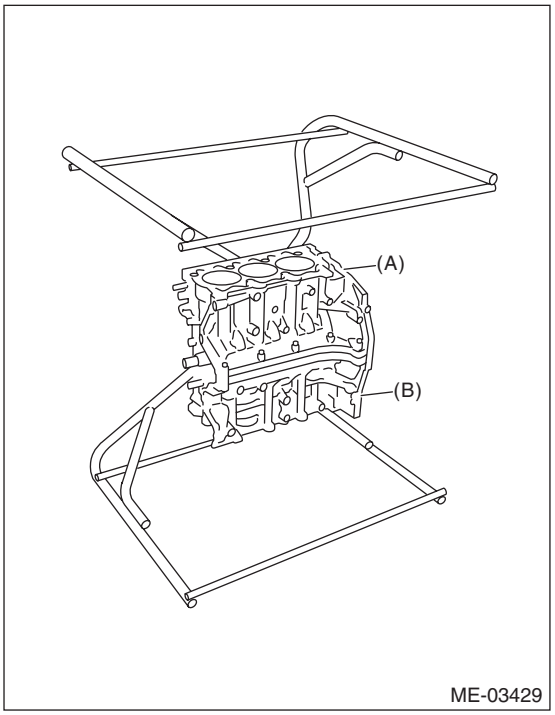
(7) Push the # 4 connecting rod to the arrow direction, then remove the # 4 piston and connecting rod from cylinder block.



(A) # 4 connecting rod
(B) Crank pin

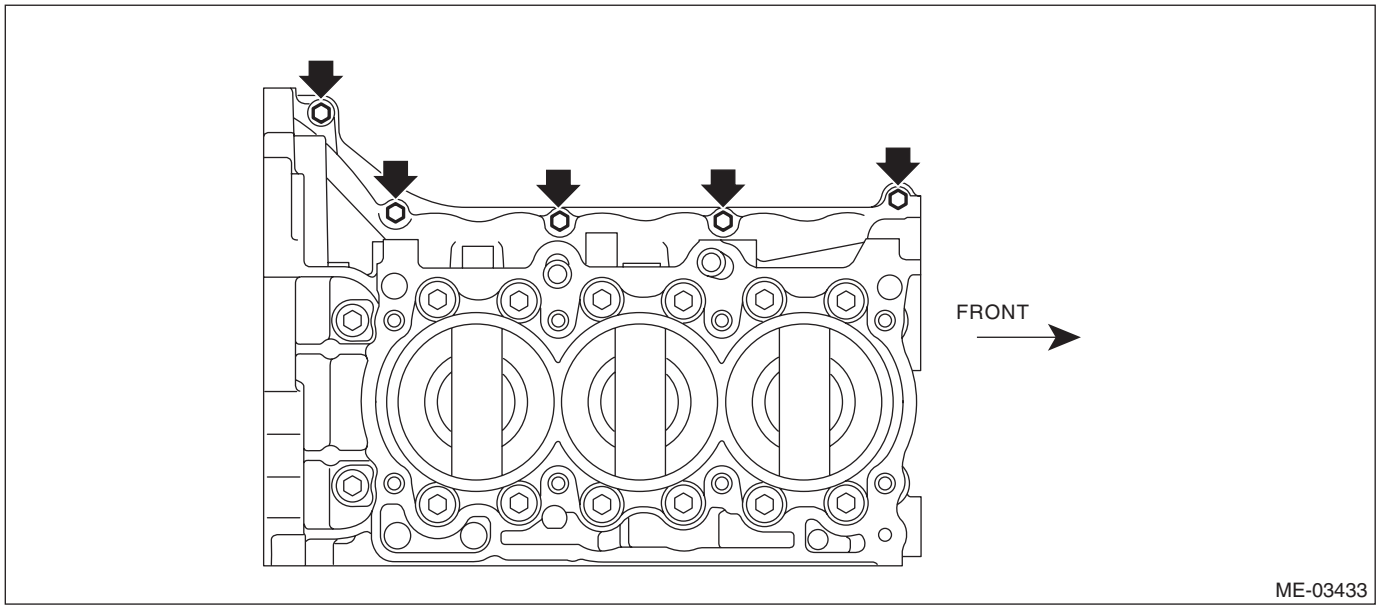
23) Remove the # 2, # 5 connecting rods and pistons from cylinder block in the same way.
ST 18252AA000 CRANKSHAFT SOCKET
24) Remove the # 3, # 6 connecting rods and pistons from cylinder block in the same way.
ST 18252AA000 CRANKSHAFT SOCKET

25) Set the engine with the cylinder block (RH) facing upward.



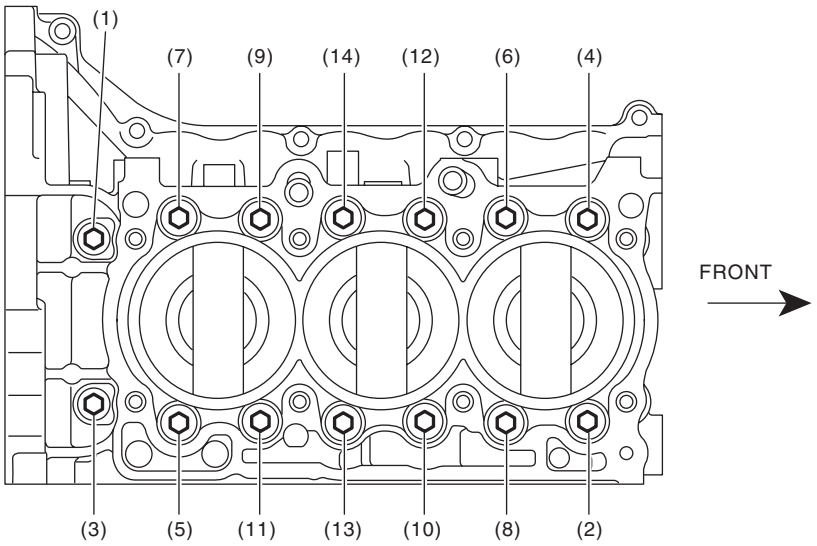
(A) Cylinder block (RH)
(B) Cylinder block (LH)

26) Remove the upper bolt.



27) Loosen the cylinder block bolts in the numerical order as shown in the figure, then separate the cylinder block (RH) and (LH).

NOTE:
Make sure that the crankshaft remains in the cylinder block (LH).
Separating the cylinder block (RH) carelessly by lifting it will cause the crankshaft inside the cylinder block (RH) to fall down.



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

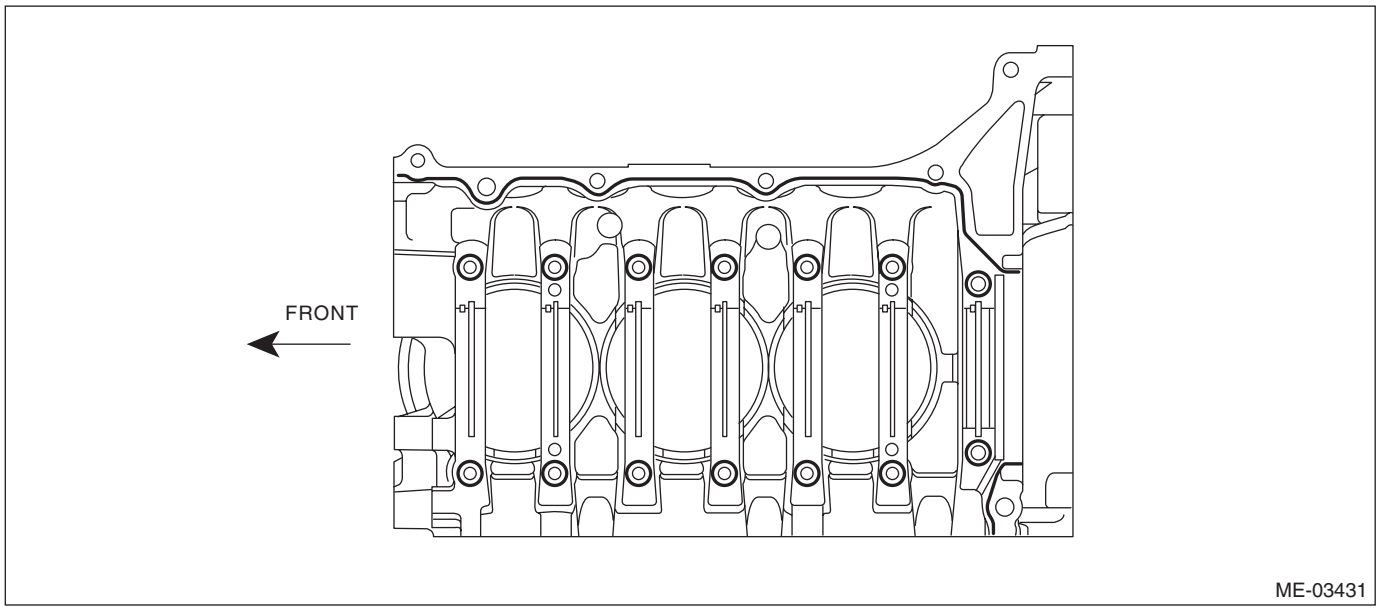
NOTE:
Apply a coat of engine oil to the bearing and crankshaft journal.
2) Install the crankshaft to cylinder block (LH).
3) Apply liquid gasket to the matching surface of cylinder block (RH).

CAUTION:
Do not allow liquid gasket to run over to oil passages, bearing grooves, etc.

NOTE:
Install within 5 minutes after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

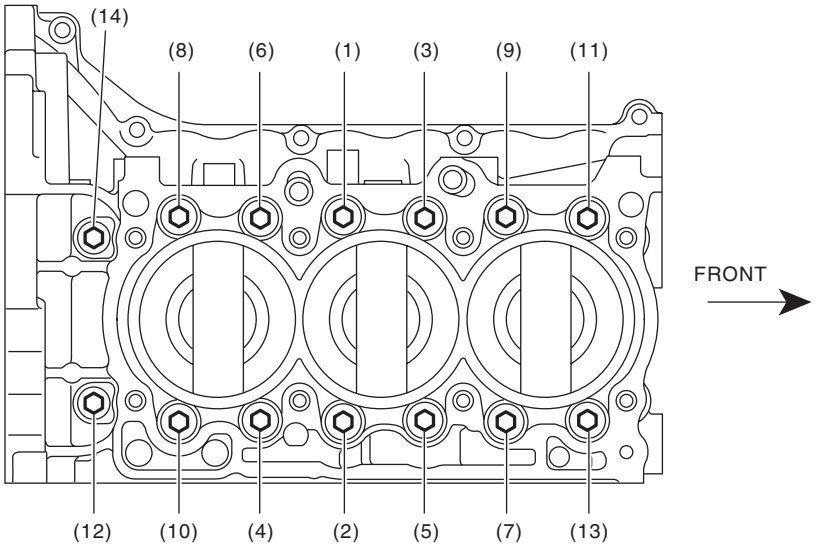
Applying liquid gasket diameter:
1.0±0.2 mm (0.039 ±0.008 in)



4) Install the cylinder block (RH) to cylinder block (LH).
5) Apply a coat of engine oil to the washer and bolt thread.

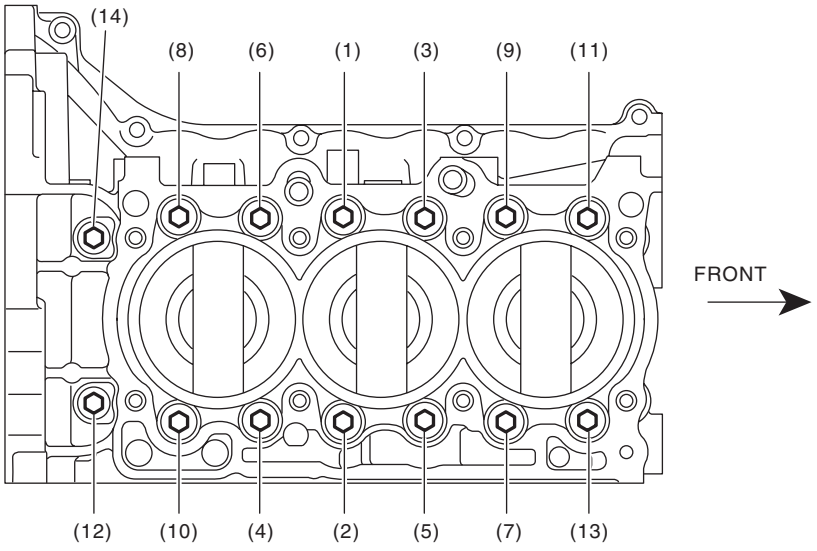
6) Tighten all bolts in the numerical order as shown in the figure.

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

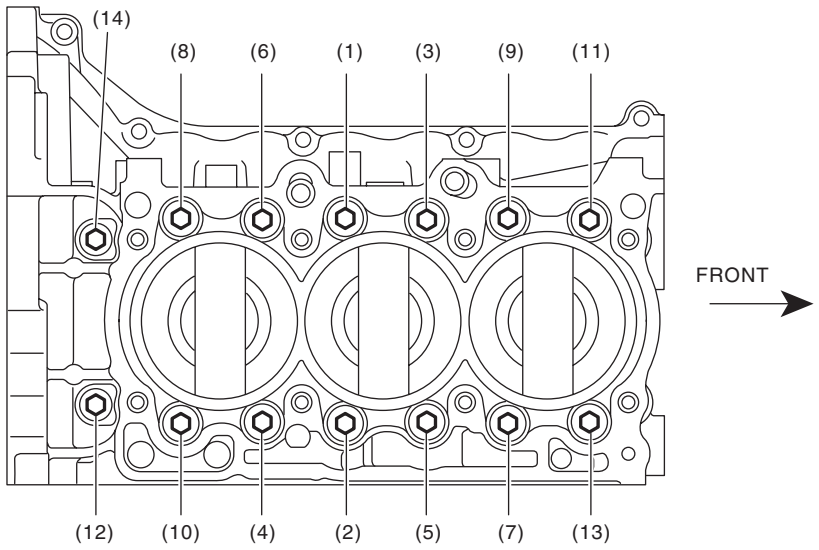


7) Retighten all bolts in the numerical order as shown in the figure.

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



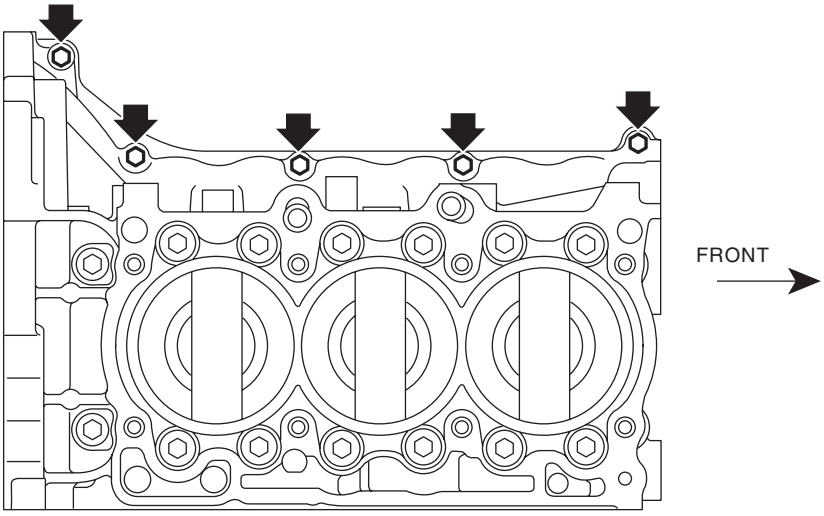
8) Tighten all bolts 90° in the numerical order as shown in the figure.



9) Install the upper bolt to cylinder block.

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

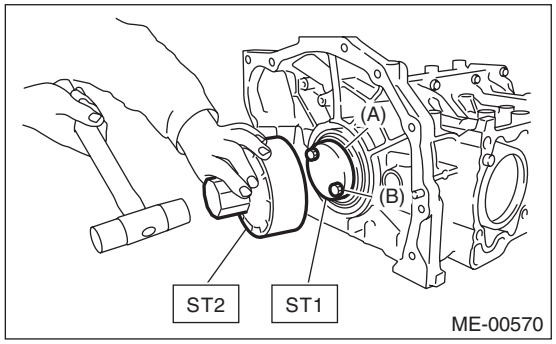
NOTE:
After tightening the cylinder block connecting bolts, remove the liquid gasket which is running over to the sealing surface for chain cover and oil pan upper.



10) Apply a coat of engine oil to the oil seal periphery, then install the rear oil seal using ST1 and ST2.

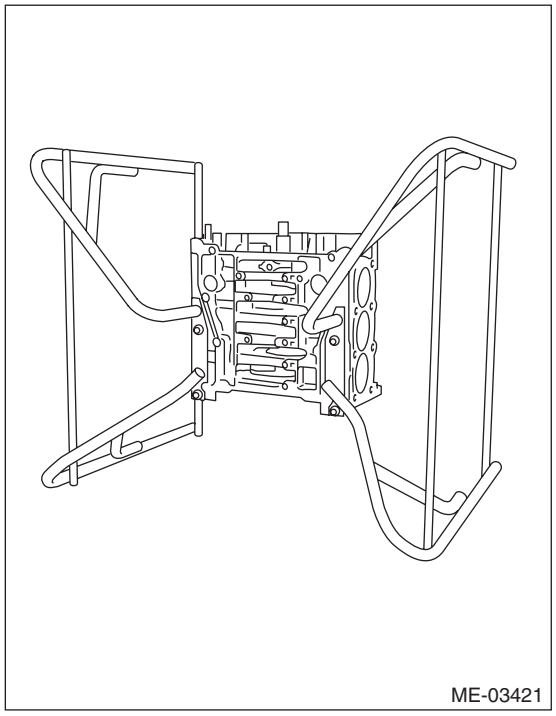
NOTE:
Use a new rear oil seal.

ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER

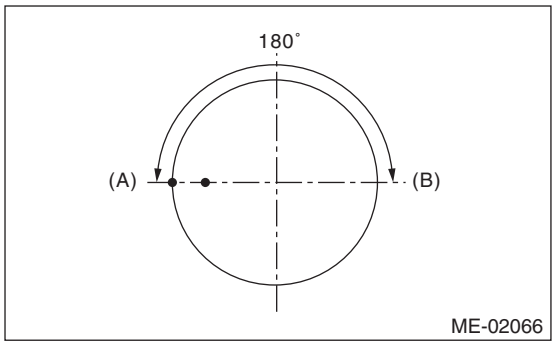


(A) Rear oil seal
(B) Drive plate installation bolt

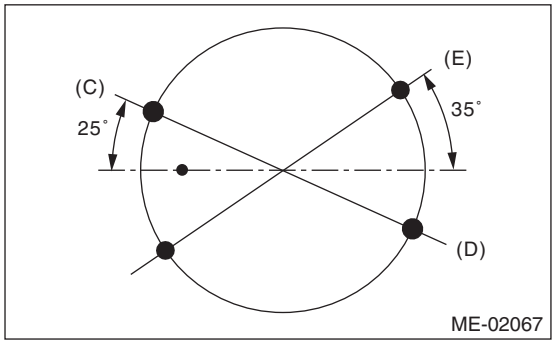
11) Set the engine with front side facing upward.



12) Install 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.

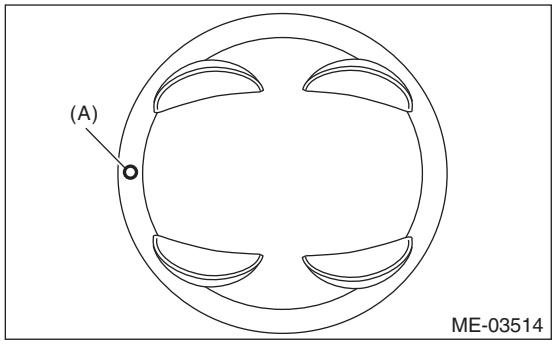


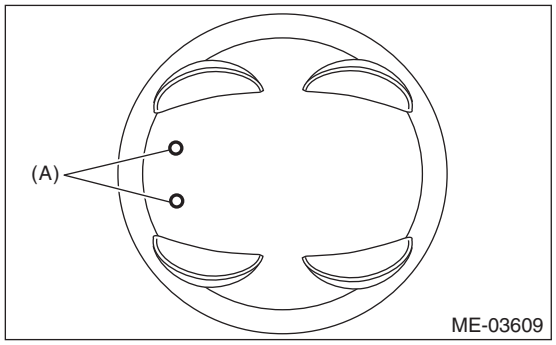
CAUTION:
• Make sure ring gaps do not face the same direction.
• Make sure ring gaps are not within the piston skirt area.
• Assemble it so that R mark faces to top side of piston.

13) Install the # 1 piston and connecting rod on the cylinder block.

(1) Apply engine oil to the periphery of piston and cylinder block inner surface.

(2) Set the piston in the ST with the front mark (A) facing the front of engine.



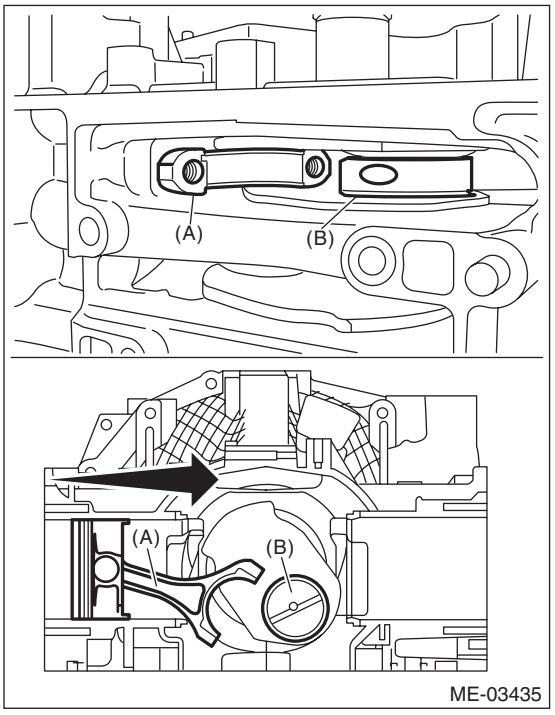


(3) Using the ST, press-fit the piston into cylinder block.

NOTE:
Follow the notes below while inserting the piton into the cylinder block.

- Insert the piston while tapping the top of piston using a plastic hammer handle.
- Continually check during insertion that the large end of the connecting rod will not scratch the cylinder liner.
- Insert the piston so that the connecting rod large end does not touche the crankshaft.

ST 398744300 PISTON GUIDE



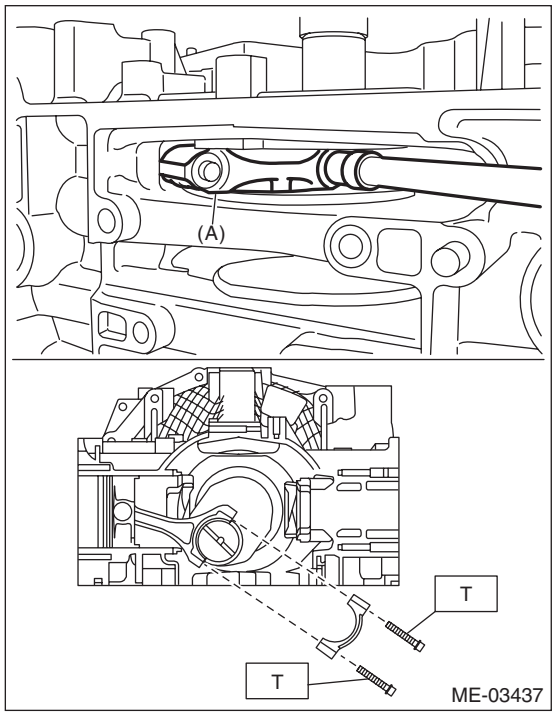
(A) # 1 connecting rod
(B) Crank pin

(4) Turn the crankshaft using ST, to align the crank pin and the connecting rod large end position.

ST 18252AA000 CRANKSHAFT SOCKET

(5) Install the connecting rod cap.

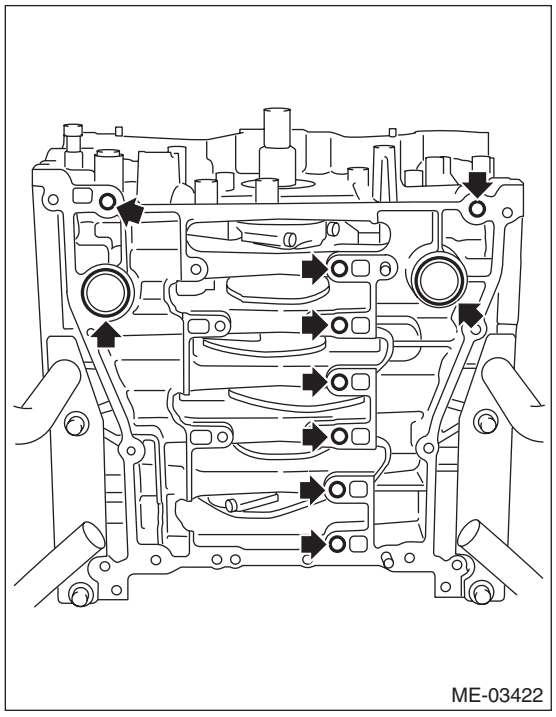
Tightening torque:
60 N·m (6.1 kgf-m, 44.3 ft-lb)



(A) # 1 connecting rod

14) In the same way as #1 piston, install the pistons and connecting rods to the cylinder block in the order of #2, #3, #4, #5, #6.
15) Install the O-ring under the cylinder block.

NOTE:
Use new O-rings.

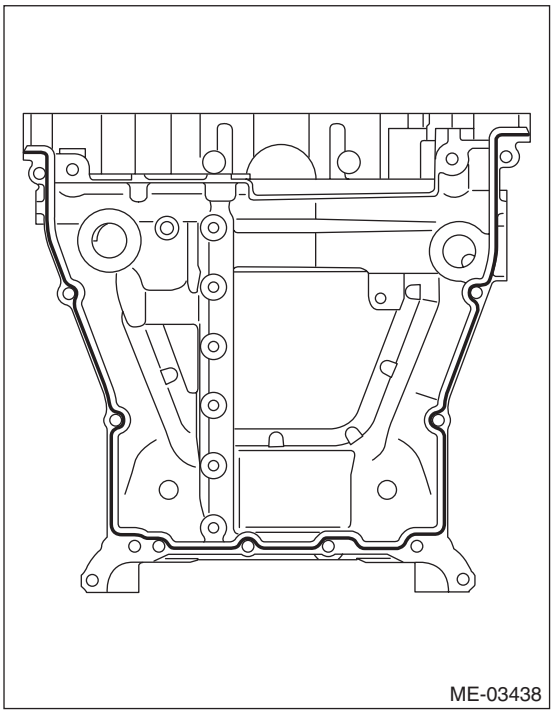


16) Apply liquid gasket to the mating surface of oil pan upper.

NOTE:
Install within 5 minutes after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

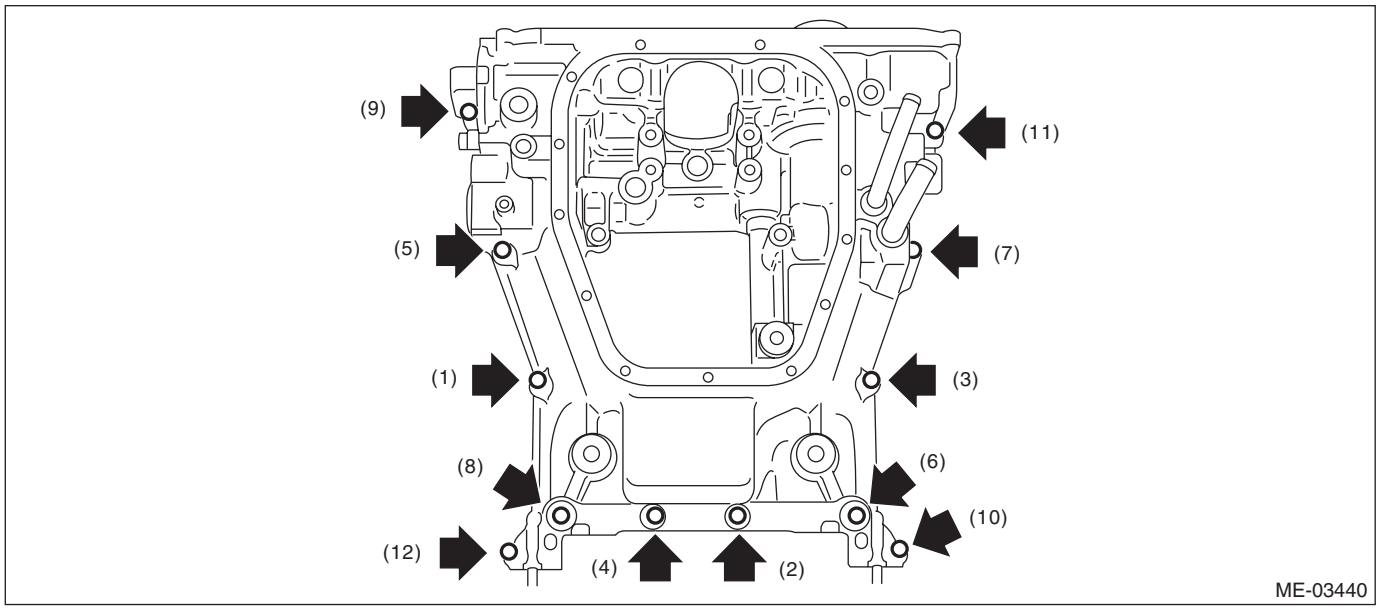
Applying liquid gasket diameter:
5.0±1.0 mm (0.20 ±0.04 in)



17) Temporarily tighten the oil pan upper.

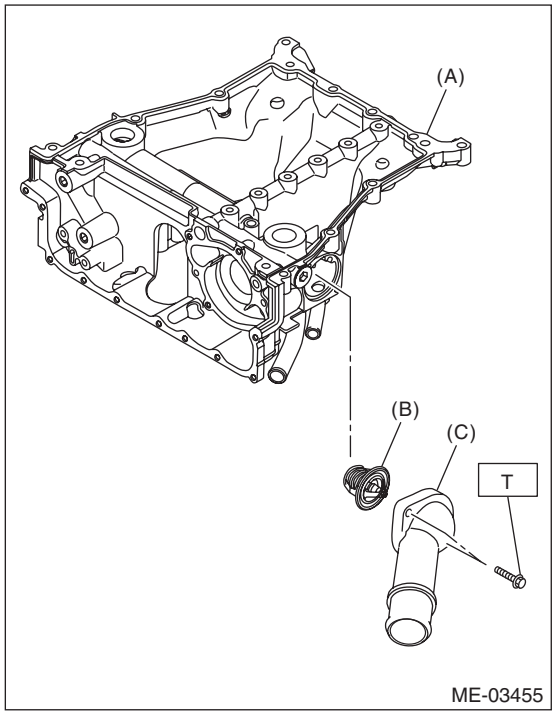
18) Tighten the oil pan upper installing bolts in the numerical order as shown in the figure.

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



19) Install the oil pump. <Ref. to LU(H6DO)-11, INSTALLATION, Oil Pump.>
20) Install the thermostat and thermostat cover.

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

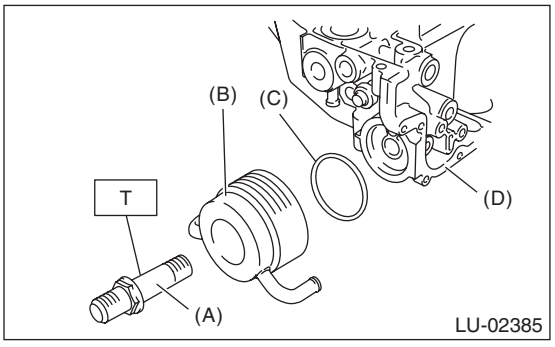


(A) Oil pan upper
(B) Thermostat
(C) Thermostat cover

21) Tighten the oil cooler connector and install the oil cooler to oil pan upper.

Tightening torque:
54 N·m (5.5 kgf-m, 39.8 ft-lb)

NOTE:
Use new O-rings.



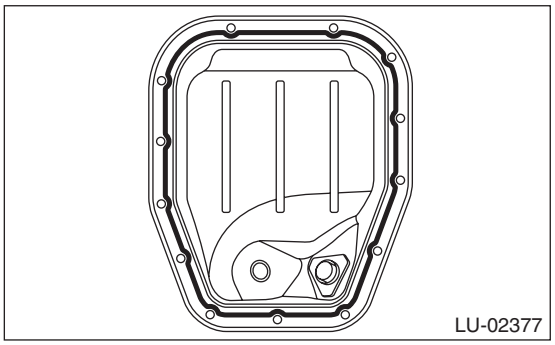
(A) Oil cooler connector
(B) Oil cooler
(C) O-ring
(D) Oil pan upper

22) Apply liquid gasket to the matching surface of oil pan lower.

NOTE:
Install within 5 minutes after applying liquid gasket.

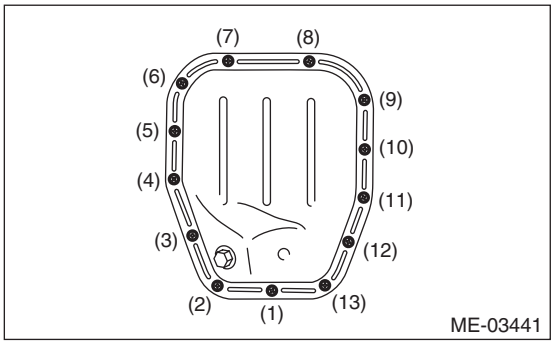
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Applying liquid gasket diameter:
5.0±1.0 mm (0.20 ±0.04 in)

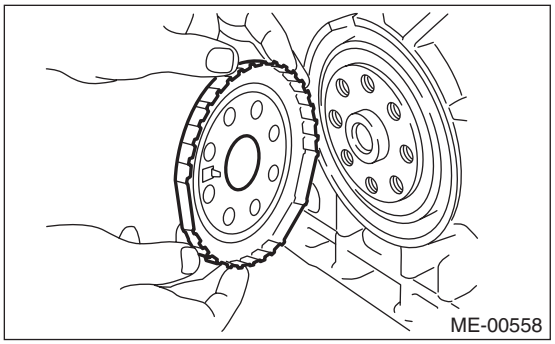


23) Tighten the oil pan lower installing bolts in the numerical order as shown in the figure.

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

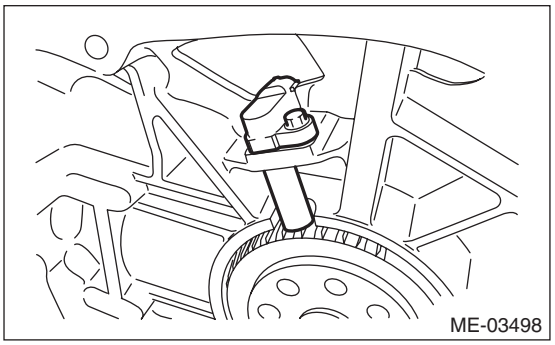


24) Install the crankshaft position sensor plate.



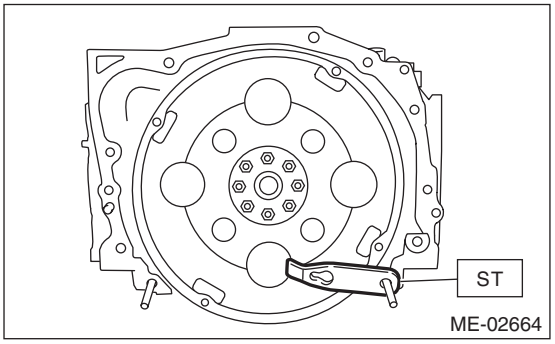
25) Install the crankshaft position sensor.

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



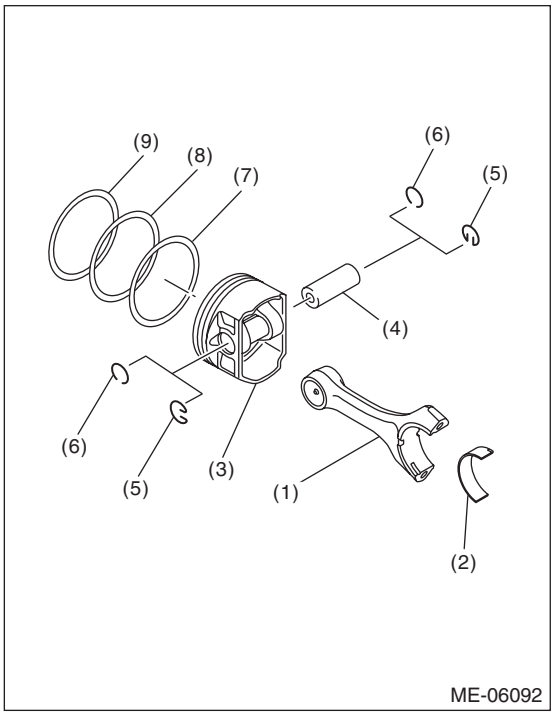
26) Using the ST, lock the crankshaft and install drive plate.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
90 N·m (9.2 kgf-m, 66.4 ft-lb)



27) Install the cylinder head. <Ref. to ME(H6DO)-83, INSTALLATION, Cylinder Head.>
28) Install the camshaft. <Ref. to ME(H6DO)-77, INSTALLATION, Camshaft.>
29) Install the crank sprocket. <Ref. to ME(H6DO)-74, INSTALLATION, Crank Sprocket.>
30) Install the cam sprocket. <Ref. to ME(H6DO)-73, INSTALLATION, Cam Sprocket.>
31) Install the timing chain assembly. <Ref. to ME(H6DO)-60, INSTALLATION, Timing Chain Assembly.>
32) Install the chain cover. <Ref. to ME(H6DO)-49, 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.

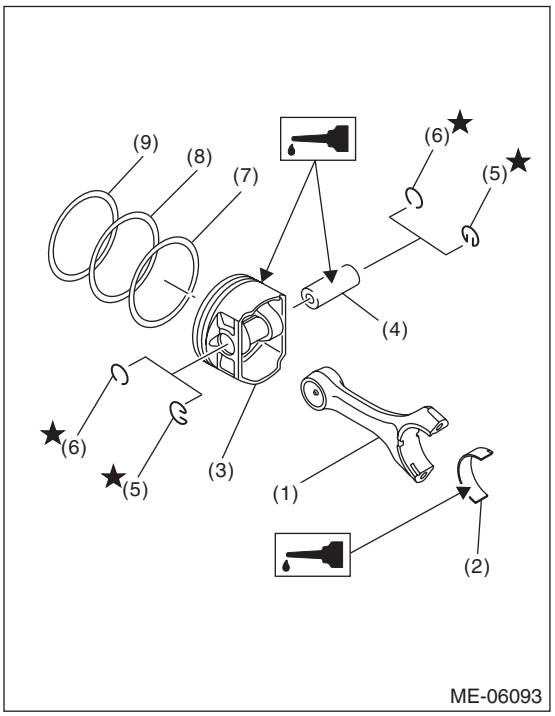
NOTE:
Arrange the removed piston rings in proper order, to prevent confusion.
4) Remove the snap ring on one end from the piston using a snap ring pliers. (Snap ring type)
5) Remove the circlip on one end from the piston using a flat tip screwdriver. (Circlip type)

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)-12, CYLINDER BLOCK, COMPONENT, General Description.>

D: ASSEMBLY

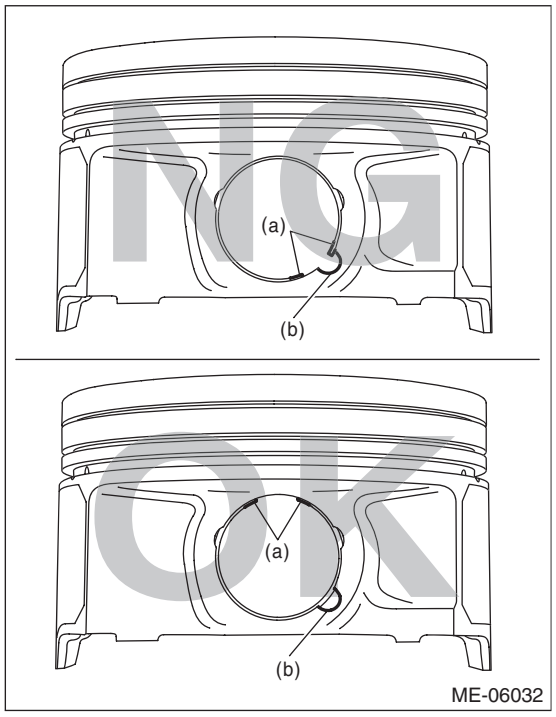


(1) Connecting rod
(2) Connecting rod bearing
(3) Piston
(4) Piston pin
(5) Snap ring
(6) Circlip
(7) Oil ring
(8) Second ring
(9) Top ring

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.

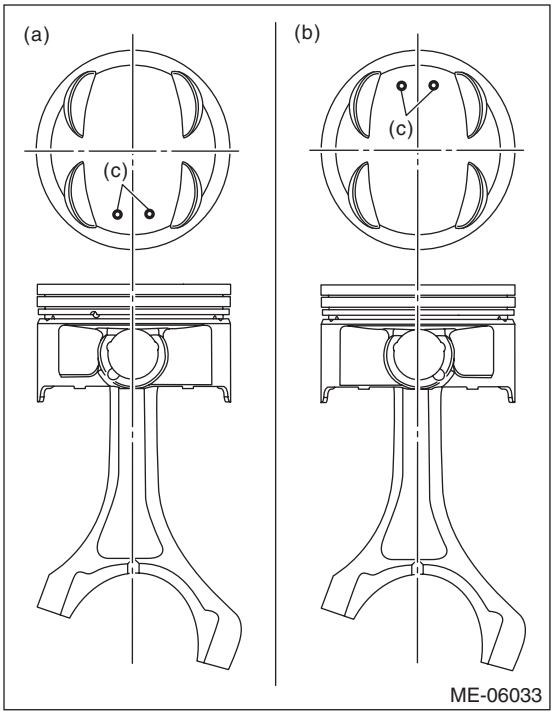


3) Install the snap ring on one end of the piston using a snap ring pliers. (Snap ring type)

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.

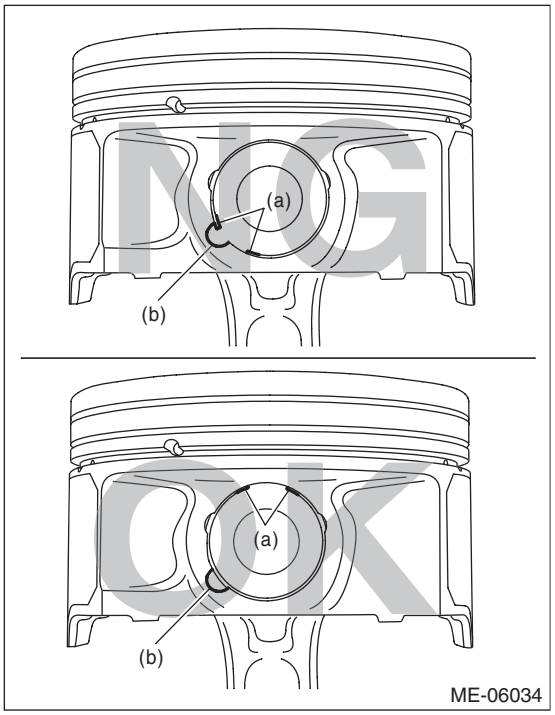


(a) RH side (#1, #3 and #5)
(b) LH side (#2, #4 and #6)
(c) Front mark

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)-12, CYLINDER BLOCK, COMPONENT, General Description.>

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts using liquid penetrant tester.

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.

Surface warpage limit:
0.02 mm (0.0008 in)

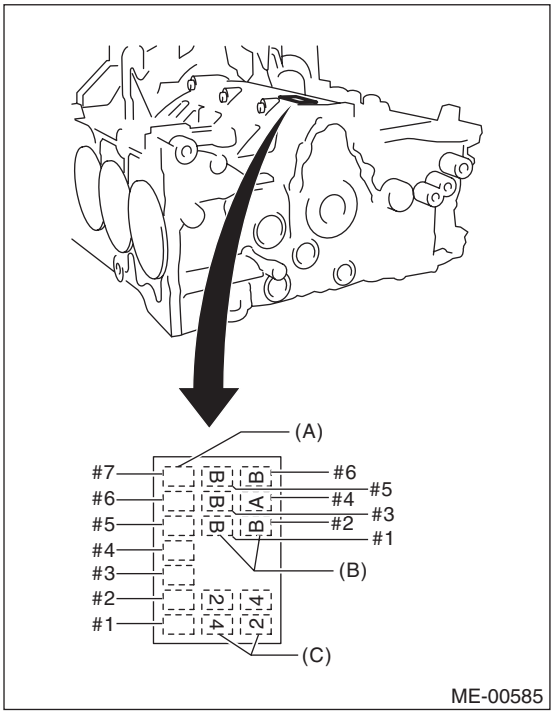
Standard height of cylinder block:
202 mm (7.95 in)

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)



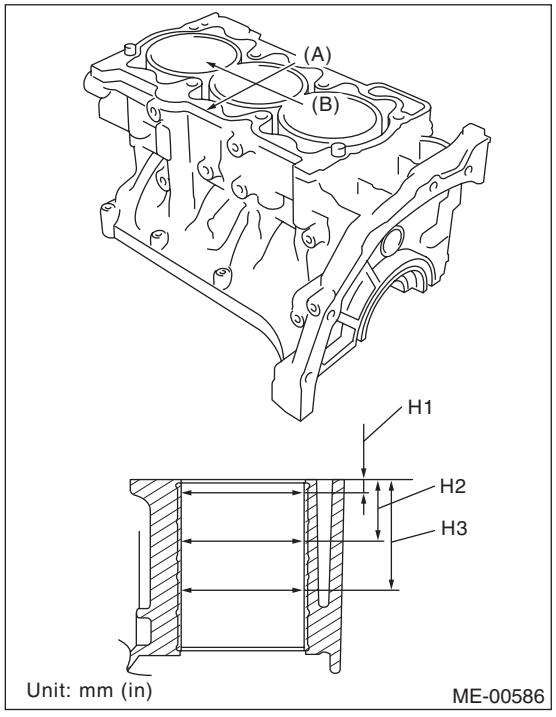
(A) Main journal size mark
(B) Cylinder bore size mark
(C) Cylinder block (RH) – (LH) combination mark

2) How to measure the 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)

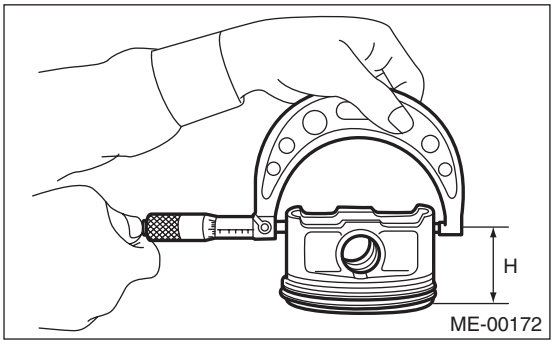
3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the 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).

Cylinder to piston clearance at 20°C (68°F):
Standard:
–0.010 — 0.010 mm (–0.0004 — 0.0004 in)

6) Boring and honing:
(1) If the value of cylindricality, out-of-roundness, or cylinder-to-piston clearance measured is out of standard or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

CAUTION:
• When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons.
• Do not perform boring on one cylinder only. Nor use an oversize piston for one cylinder only.

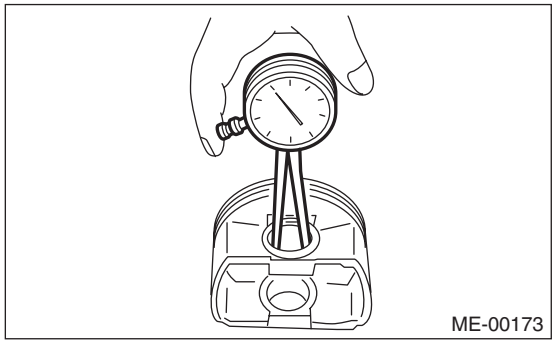
(2) If the cylinder inner diameter exceeds 92.515 mm (3.6317 in) after boring and honing, replace the cylinder block.

NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

3. PISTON AND PISTON PIN

1) Check the pistons and piston pins for damage, cracks and wear, and the piston ring grooves for wear and damage. Replace if faulty.
2) Measure the clearance between each cylinder piston and cylinders. <Ref. to ME(H6DO)-109, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within standard, replace the piston, or bore the cylinder to use an oversize piston.
3) Check that the piston pin can be inserted into the piston pin hole just by using your thumb at 20°C (68°F). Replace if faulty.

Standard clearance between piston pin and hole in piston:
Standard:
0.004 — 0.008 mm (0.0002 — 0.0003 in)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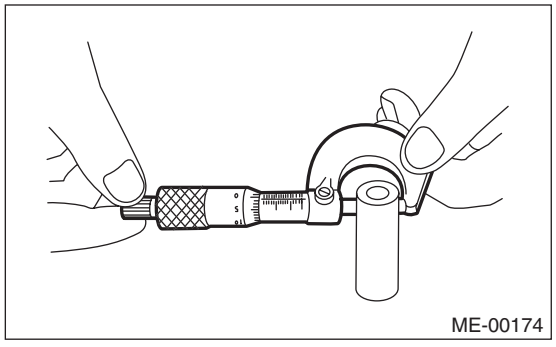
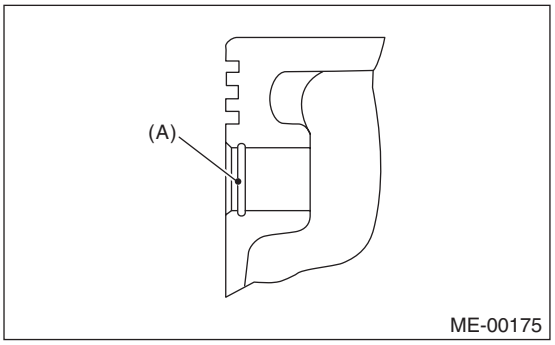

ME-00174

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.



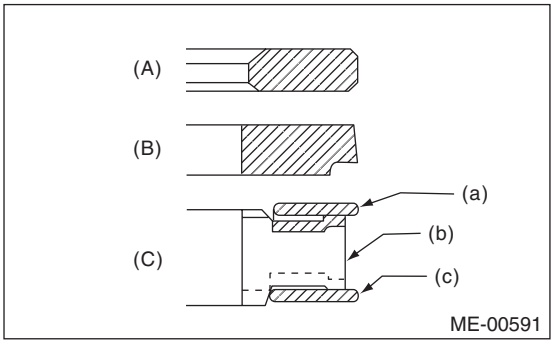
ME-00175

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.

CAUTION:
• Marks are displayed on the end of top and second rings. When installing the ring to piston, face this mark upward.
• Oil ring consists of the upper rail, expander and lower rail. When installing on the piston, be careful of the direction of each rail

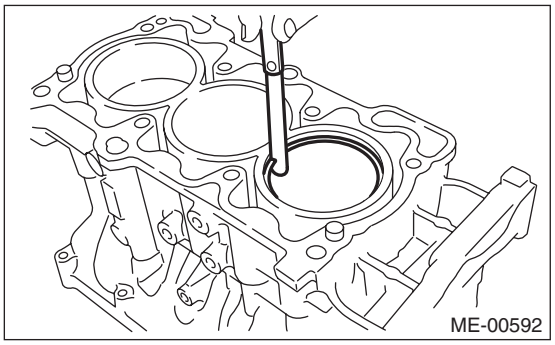


ME-00591

(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.

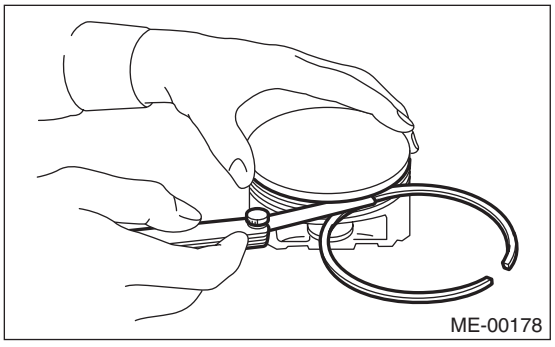
		Standard mm (in)
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)
	Second ring	0.40 — 0.50 (0.0157 — 0.0197)
	Oil ring	0.20 — 0.50 (0.0079 — 0.0197)



3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

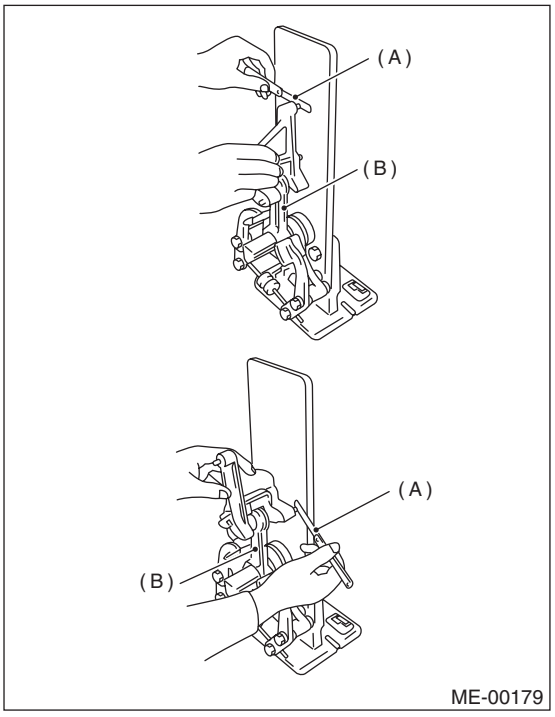
NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

		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)



5. CONNECTING ROD

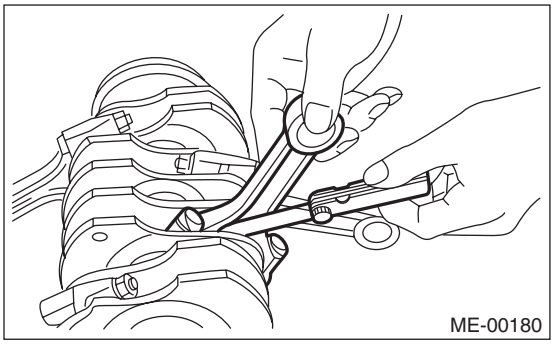
1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if it has the bend or twist.



(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft and measure the thrust clearance. If the clearance exceeds the standard or offset wear occurs, replace the connecting rod.

Connecting rod thrust clearance:
Standard:
0.070 — 0.330 mm (0.0028 — 0.0130 in)



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. (See the table below.)

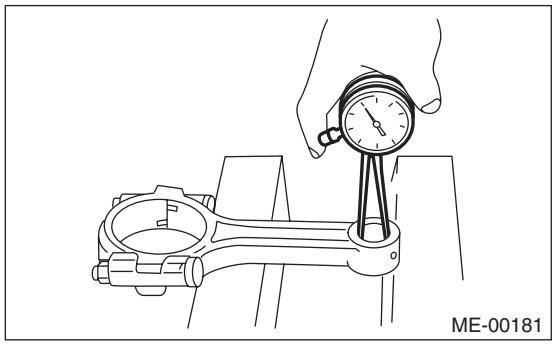
Connecting rod oil clearance:
Standard:
0.016 — 0.043 mm (0.0006 — 0.0017 in)

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 if worn or damaged. Also measure the piston pin clearance on the smaller end of the connecting rod.

Clearance between piston pin and bushing:
Standard:
0 — 0.022 mm (0 — 0.0009 in)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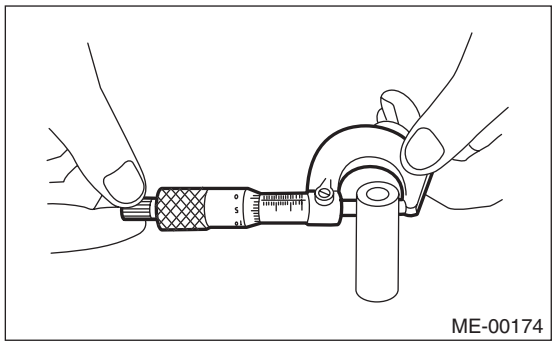
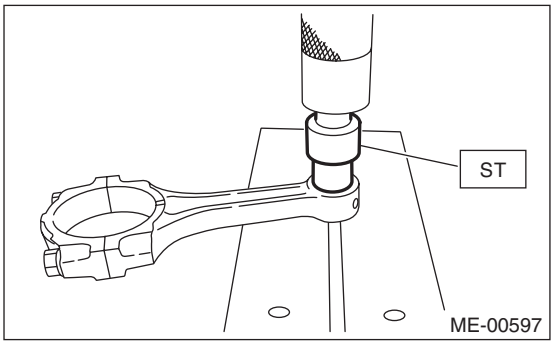

ME-00174

7) Replacement procedure is as follows.
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of the new bushing.

ST 18350AA000 CONNECTING ROD BUSHING REMOVER AND INSTALLER

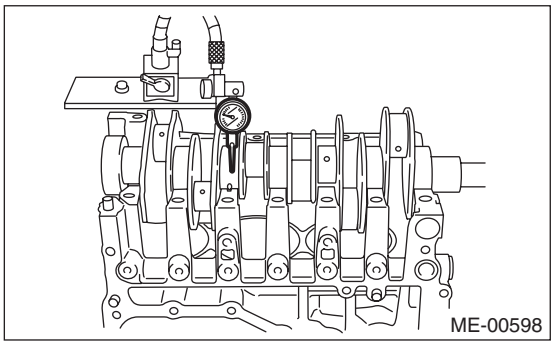


(3) Make two 3 mm (0.12 in) holes in the pressed bushing by aligning with the pre-manufactured holes on the connecting rod. Ream the inside of bushing.
(4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

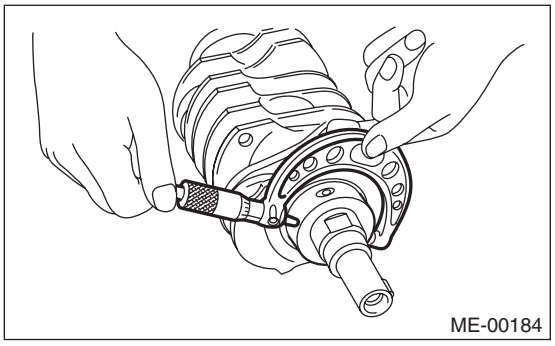
1) Clean the crankshaft completely, and check it for cracks using liquid penetrant tester. Replace if defective.
2) Check the crankshaft for bend, and repair or replace if needed. Repair or replace if bended.

NOTE:
If a suitable V-block is not available, install #1 and #7 crankshaft bearing on cylinder block, position the crankshaft on these bearings, and then check the crankshaft bend using a dial gauge.



3) Inspect the crank journal and crank pin for wear. If they are not within the specification, replace the bearing with a suitable (undersize) one, and replace or readjust 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 and crank journal:
Out-of-roundness:
0.005 mm (0.0002 in)
Cylindricality:
0.006 mm (0.0002 in)

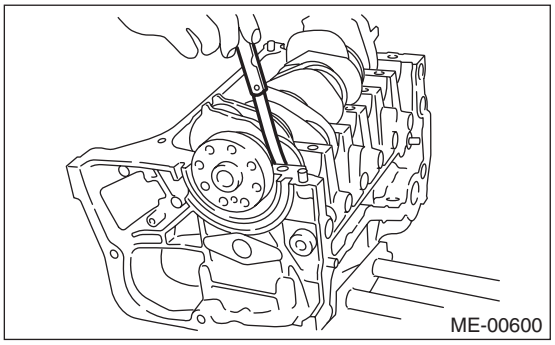


Unit: mm (in)

		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 — 1.501 (0.0586 — 0.0591)
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)		2.015 — 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)		2.025 — 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)		2.125 — 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 recondition 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)-32, REMOVAL, Oil Flow Control Solenoid Valve.>

B: INSTALLATION

The oil flow control solenoid valve is listed in the FU section. <Ref. to FU(H6DO)-32, 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)-82, REMOVAL, Cylinder Head.> <Ref. to ME(H6DO)-83, INSTALLATION, Cylinder Head.>

23.Piston

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of pistons. <Ref. to ME(H6DO)-93, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-99, INSTALLATION, Cylinder Block.>

24.Connecting Rod

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of connecting rod. <Ref. to ME(H6DO)-93, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-99, INSTALLATION, Cylinder Block.>

25.Crankshaft

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of crankshaft. <Ref. to ME(H6DO)-93, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-99, 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 “most likely” to “rarely”.
A — Most likely
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 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 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 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 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 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
	Cooling system	Over-heating	C
		Over-cooling	C
	Others	Evaporative emission control system malfunction	A
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 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

Symptoms	Problem parts etc.	Possible cause	RANK
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
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

Symptoms	Problem parts etc.	Possible cause	RANK
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 thermal value spark plug • Gasoline of improper octane number
Clank when engine speed is between 1,000 and 2,000 rpm.	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn connecting rod bearing (large end)
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• 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. (NOTE*)	• 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	—	• Loose drive 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 • Contact of timing chain with adjacent part
Valve lifter noise	—	Incorrect valve clearance

(NOTE*)
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)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-44, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(H6DO)

Page

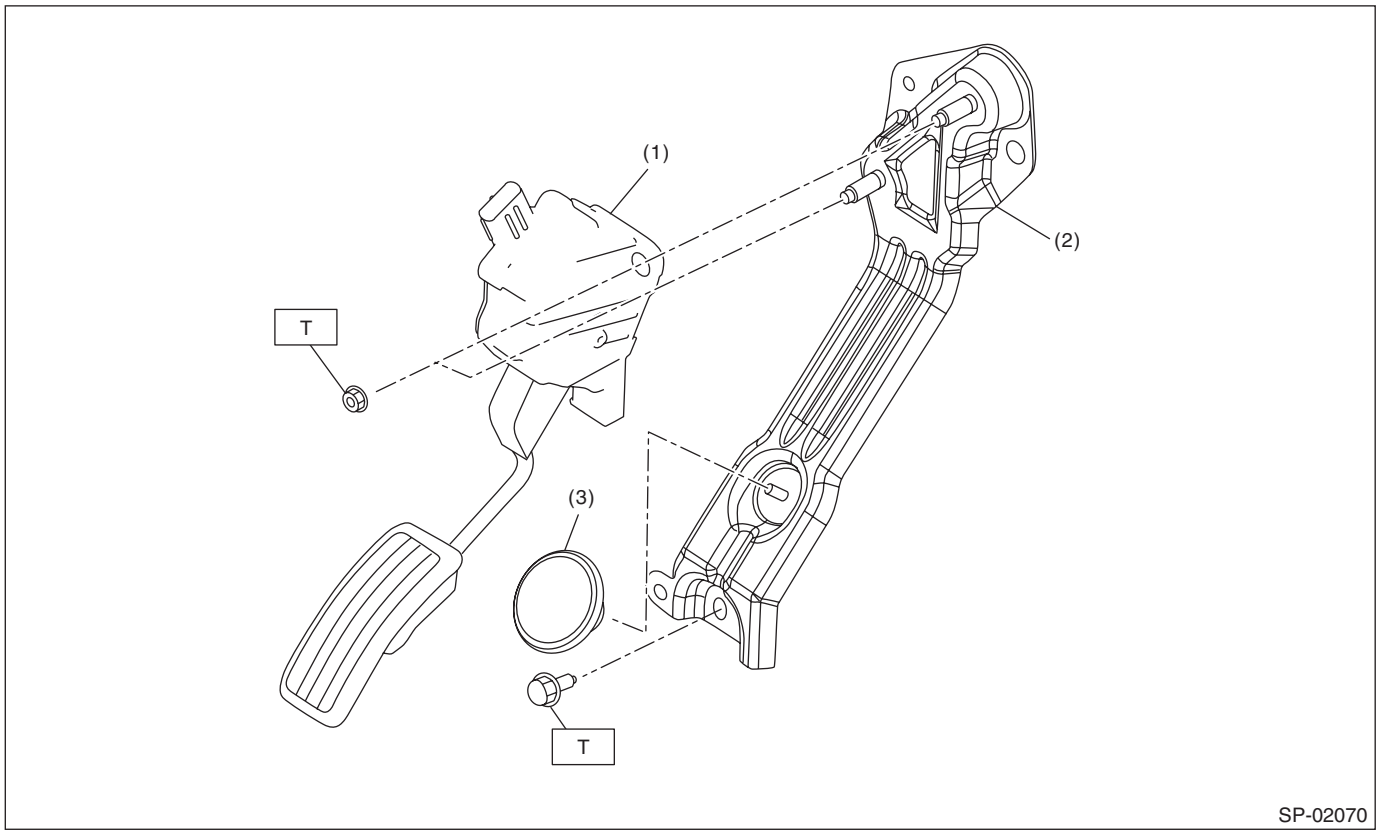
1. General Description 2
2. Front Exhaust Pipe 4
3. Rear Exhaust Pipe 7
4. Muffler 9

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)

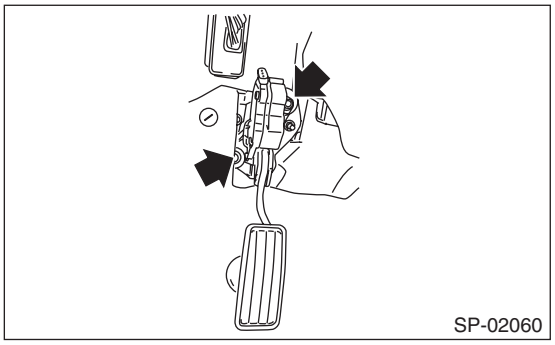
C: CAUTION

• 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.

2. Accelerator Pedal

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Disconnect the connector.
3) Remove the nut securing 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 for smooth operation when the accelerator pedal is depressed.
2) 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 4
3. Ignition Coil 7

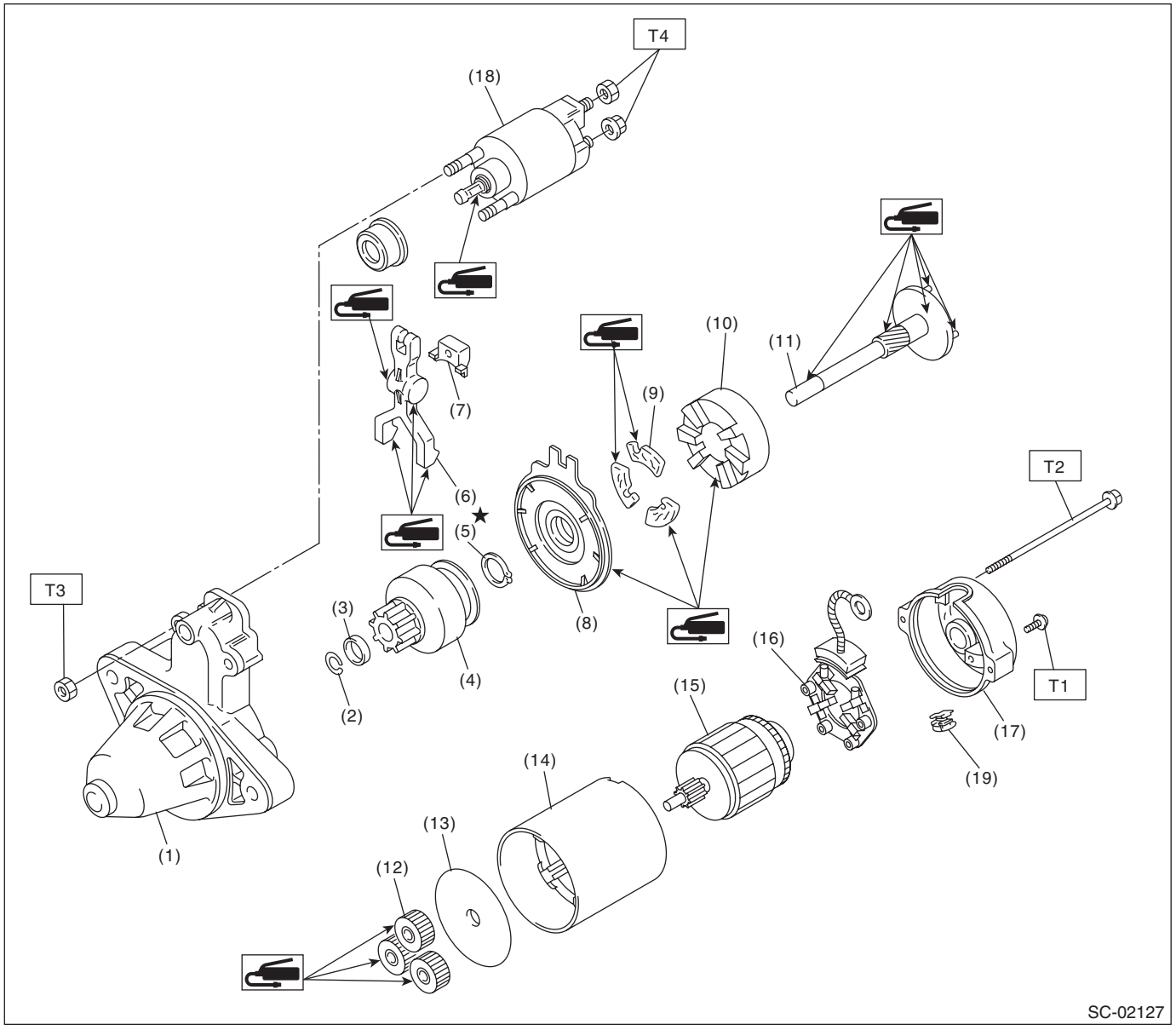
1. General Description

A: SPECIFICATION

Item			Specification
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 (1.31 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		A003TJ2091
	Manufacturer		MITSUBISHI ELECTRIC
	Voltage and output		12 V — 130 A
	Polarity on ground side		Negative
	Direction of rotation		Clockwise (when observed from pulley side)
	Stator coil connection		3-phase delta connection
	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)]
Battery	Type and capacity		12 V — 52 AH (75D23L)

B: COMPONENT

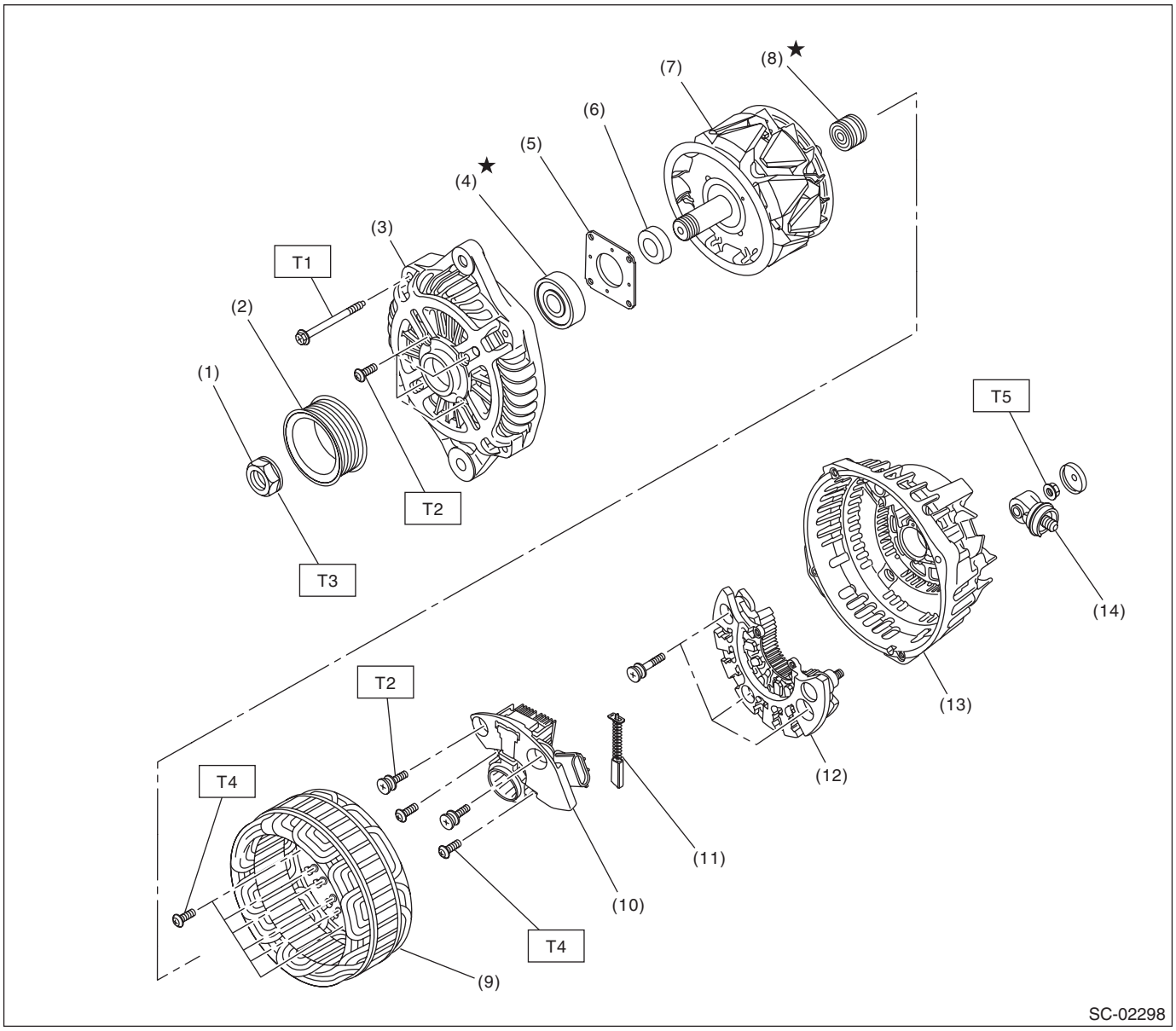
1. STARTER



(1) Starter housing
(2) Snap ring
(3) Stopper
(4) Overrunning clutch
(5) Snap ring
(6) Shift lever
(7) Starter seal
(8) Shock absorber bearing
(9) Shock absorber
(10) Internal gear
(11) Shaft
(12) Planetary gear
(13) Starter plate
(14) Yoke
(15) Armature
(16) Brush holder ASSY
(17) Starter cover
(18) Magnet switch ASSY
(19) Drain duct

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
(2) Pulley
(3) Front cover
(4) Ball bearing
(5) Bearing retainer
(6) Spacer
(7) Rotor
(8) Bearing
(9) Stator coil
(10) IC regulator
(11) Brush
(12) Rectifier
(13) Rear cover
(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)

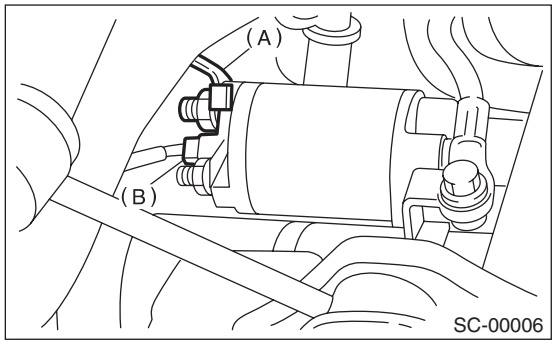
C: CAUTION

• 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.

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)-7, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector and terminal from starter.



(A) Terminals
(B) Connector

5) Remove the starter from transmission.

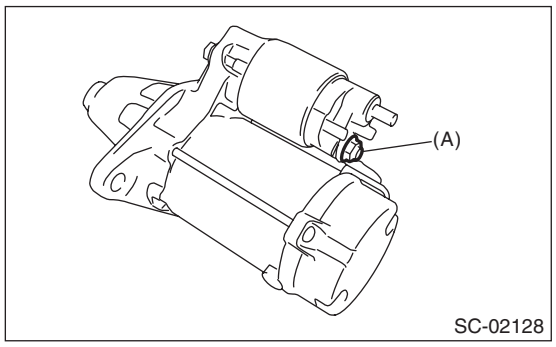
B: INSTALLATION

Install in the reverse order of removal.

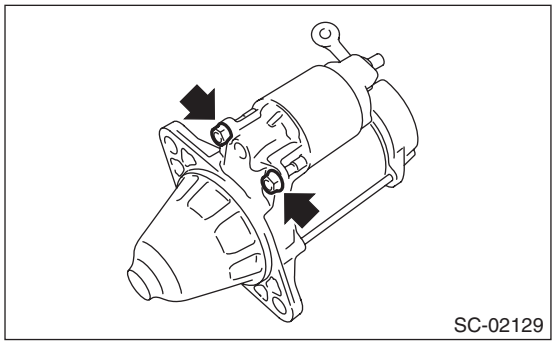
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

C: DISASSEMBLY

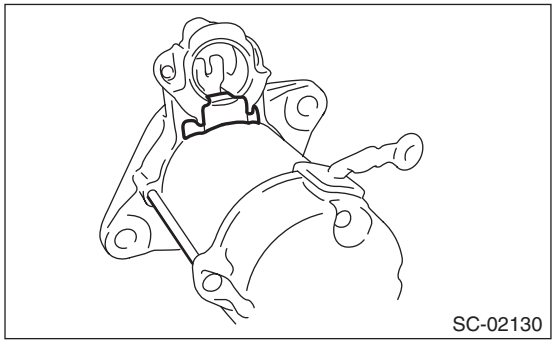
1) Loosen the nut which holds terminal M (A) of the magnet switch assembly, then disconnect the harness from the terminal.



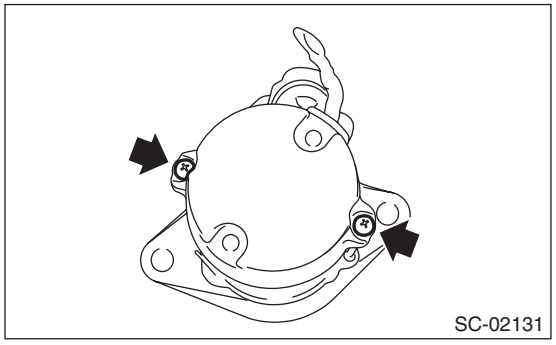
2) Remove the nuts holding the magnet switch assembly, and remove the magnet switch assembly.

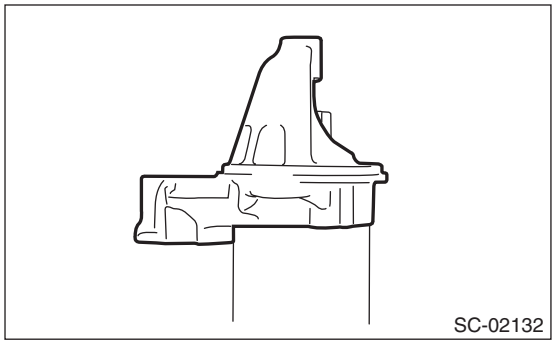


3) Remove the starter seal.

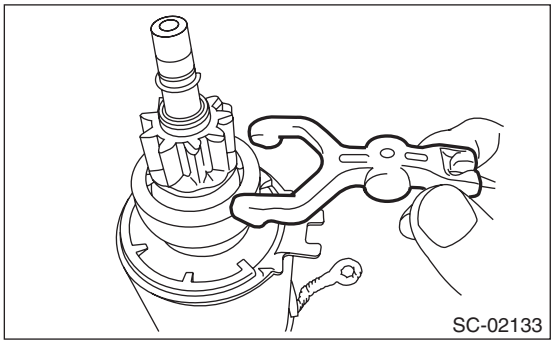


4) Remove the through bolts on both sides, and then remove the starter housing.

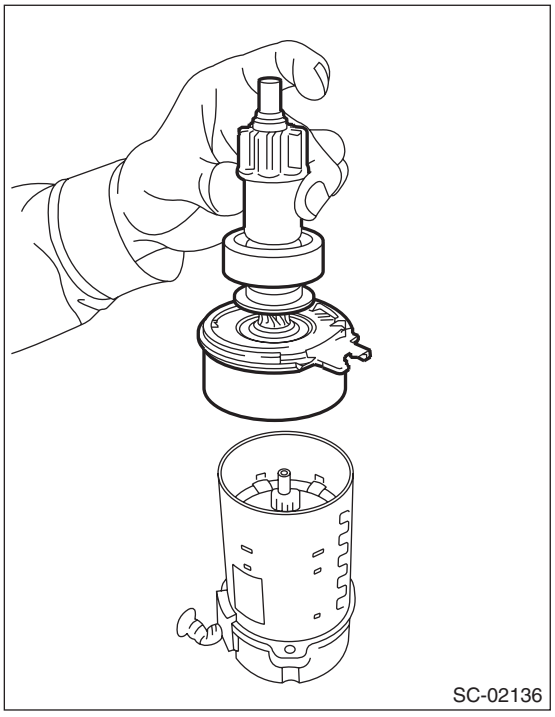




5) Remove the shift lever.

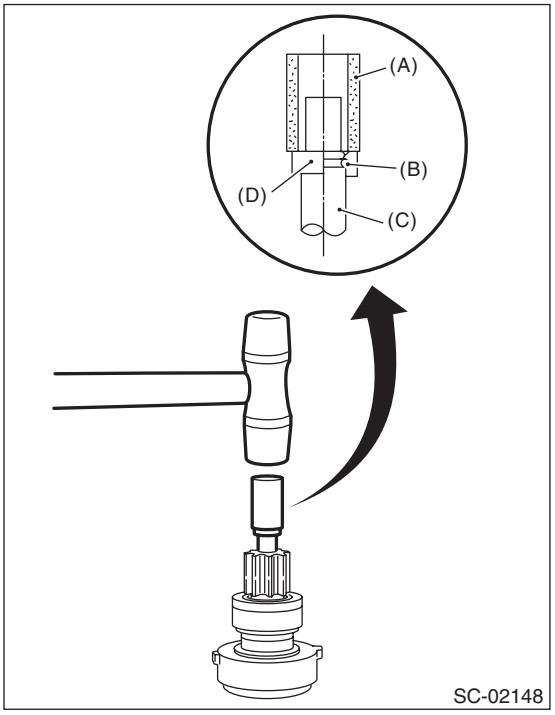


6) Remove the overrunning clutch, shock absorber bearing and shaft from the yoke as an assembly.



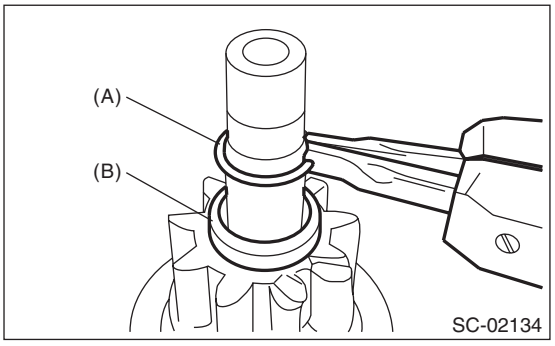
7) Remove the overrunning clutch from shaft assembly as follows:

(1) Using a plastic hammer, remove the stopper from snap ring by lightly tapping the stopper with an appropriate tool (such as a fit socket wrench).

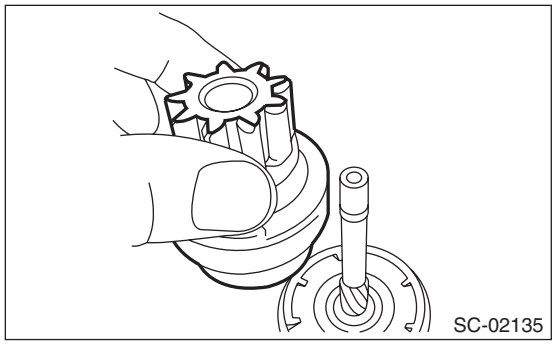


(A) Appropriate tool
(B) Snap ring
(C) Shaft
(D) Stopper

(2) Remove the snap ring (A) from the shaft, and then remove the stopper (B).

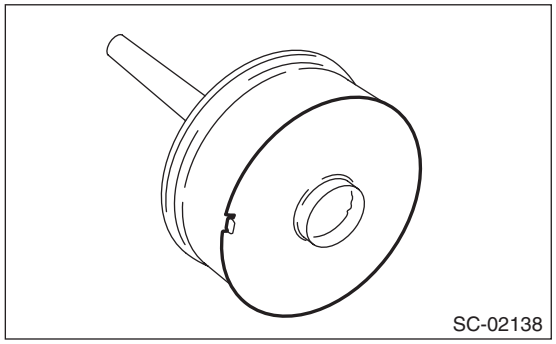


(3) Remove the overrunning clutch from the shaft.

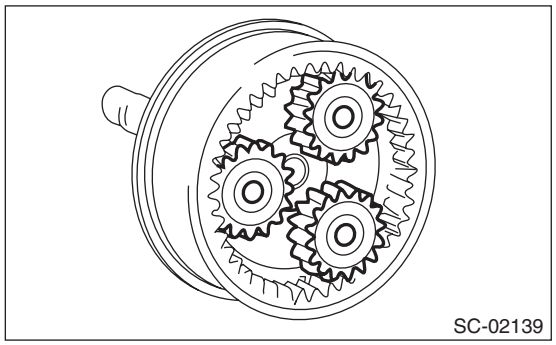

SC-02135

8) Remove the shock absorber as follows:

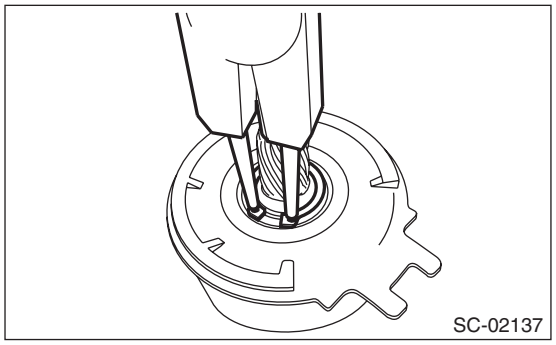
(1) Remove the starter plate.


SC-02138

(2) Remove the planetary gear.


SC-02139

(3) Remove the snap ring, and then remove the shaft.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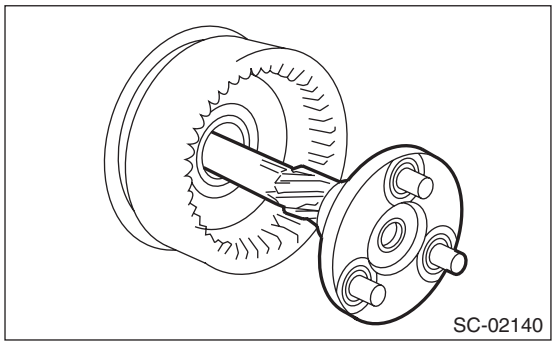
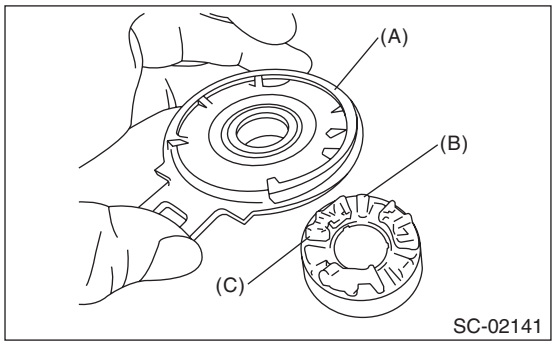

SC-02140

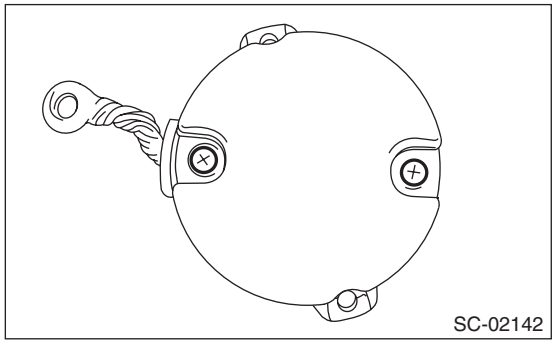
(4) Separate the shock absorber bearing (A) from the internal gear (B), and then remove the shock absorber (C).

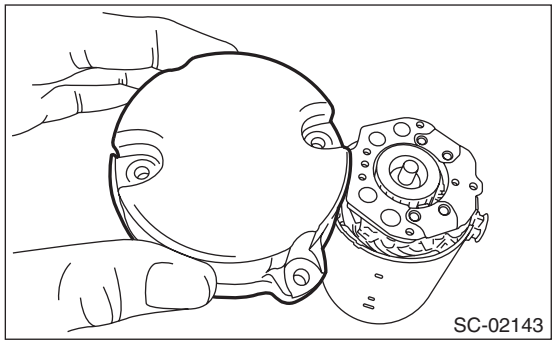


SC-02141

9) Remove the screws, and remove the starter cover from the brush holder assembly.

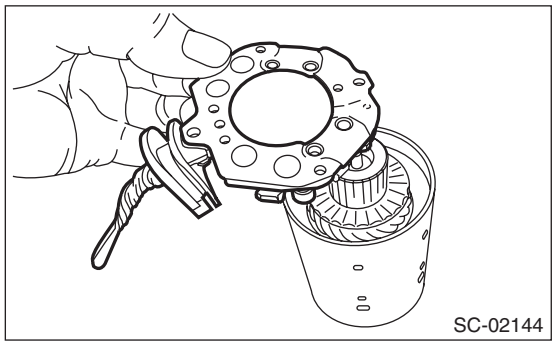
NOTE:
Hold with the screw so that the brush holder assembly will remain on the armature side, and separate.


SC-02142

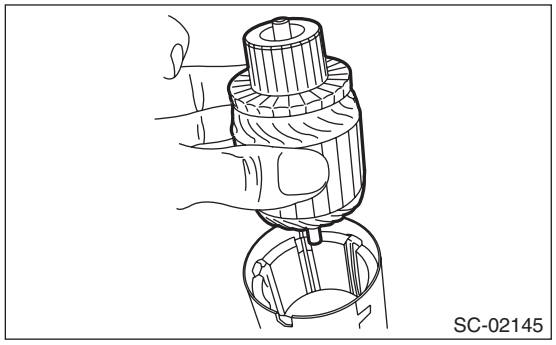

SC-02143

10) Remove the brush holder assembly from the armature by hand.

NOTE:
Spread the brushes with your fingers, being careful not to damage them.

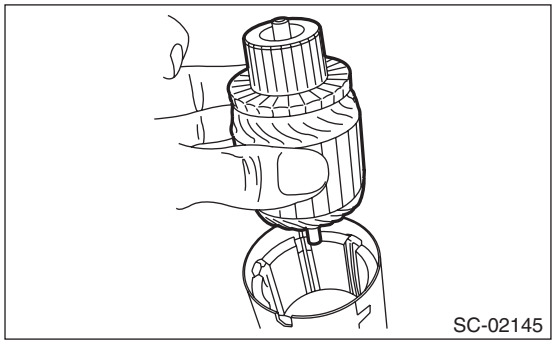

SC-02144

11) Remove the armature from the yoke.


SC-02145

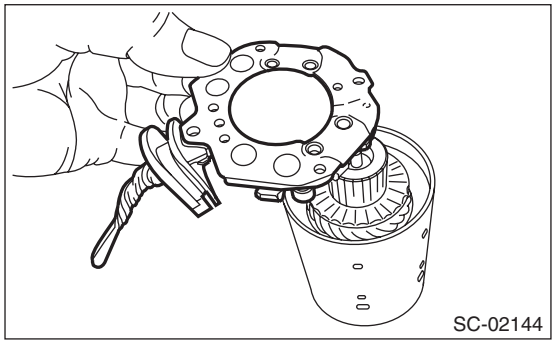
D: ASSEMBLY

1) Install the armature to yoke.

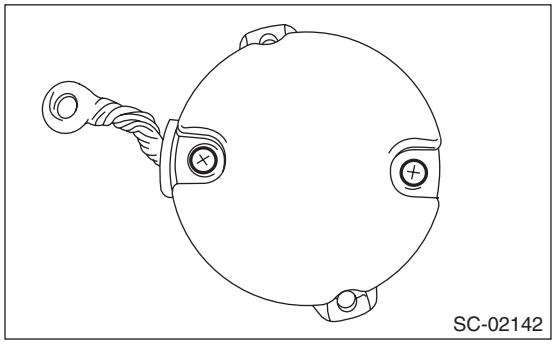

SC-02145

2) Install the brush holder assembly to the armature.

NOTE:
Push the brushes against the springs by hand to avoid the damage to the brushes.


SC-02144

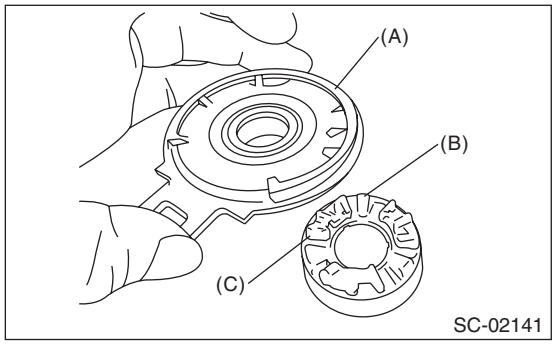
3) Install the starter cover, and then secure it to the brush holder assembly with the screws.


SC-02142

4) Assemble the shock absorber as follows:
(1) Apply grease to the shock absorber (C), and install the internal gear (B) to the shock absorber bearing (A).

NOTE:
Align with the claw position of internal gear to install shock absorber bearing.

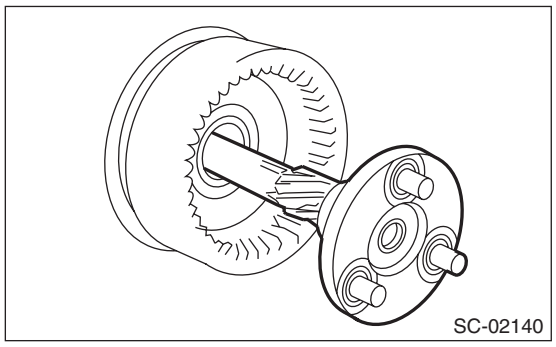
Grease:
DENSO HL50



(2) Install the shaft to the internal gear.

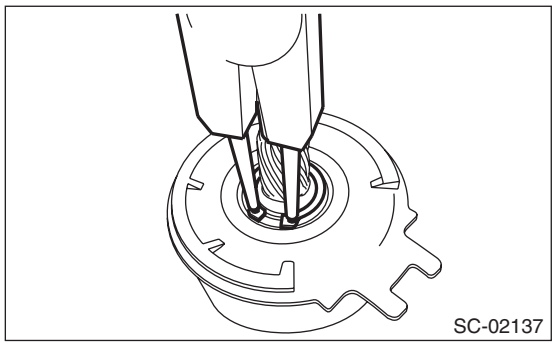
NOTE:
Apply grease to the sliding part for the shaft inside the internal gear.

Grease:
DENSO HL50



(3) Install the snap ring to shaft.

NOTE:
Use new snap rings.



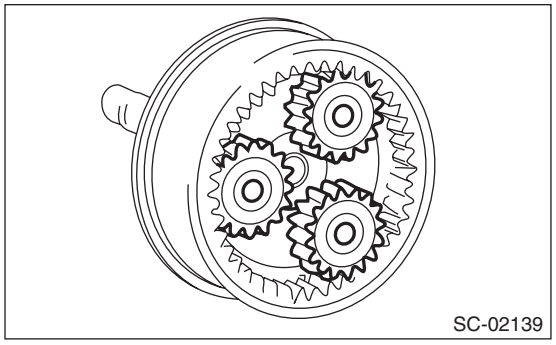
5) Install the planetary gear to the internal gear.
(1) Apply grease to the installation part of the planetary gear.

Grease:
DENSO HL50

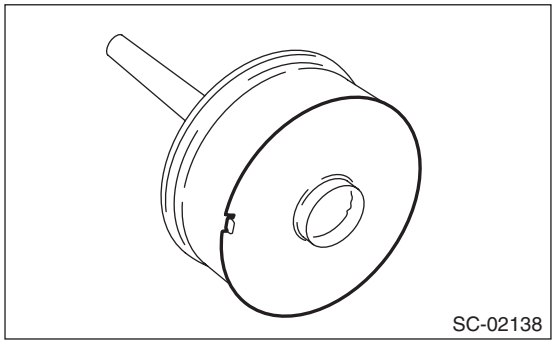
(2) Install the planetary gear to pin.
(3) Apply grease to the planetary gear, internal gear and upper part of the pin.

NOTE:
- Apply grease so that it contacts each gear.
- Be careful not to allow dirt to get in.

Grease:
DENSO HL50



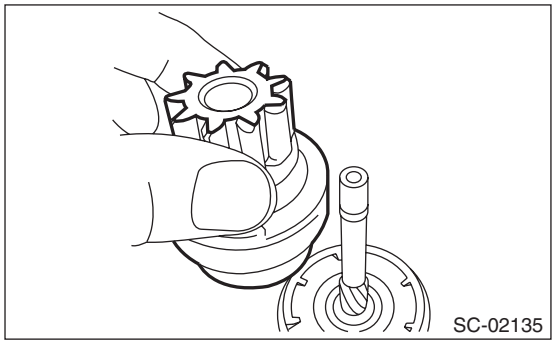
(4) Install the starter plate.



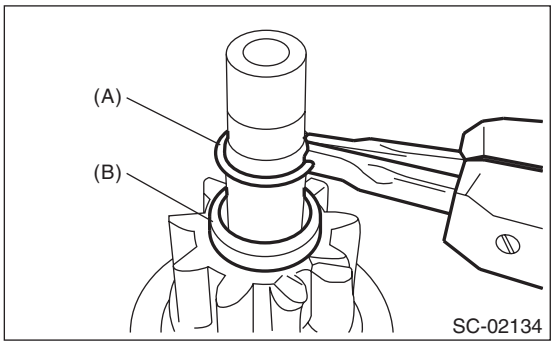
6) Assemble the overrunning clutch as follows:
(1) Apply grease to the spline portion of the shaft.

Grease:
DENSO HL50

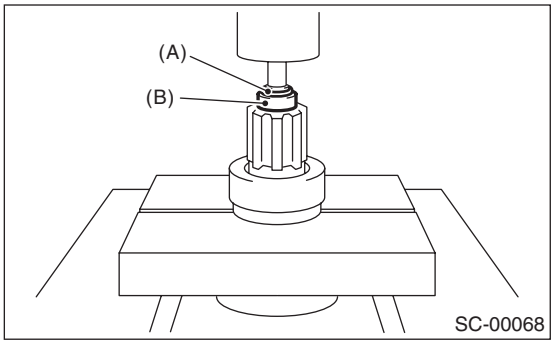
(2) Install the overrunning clutch to shaft.



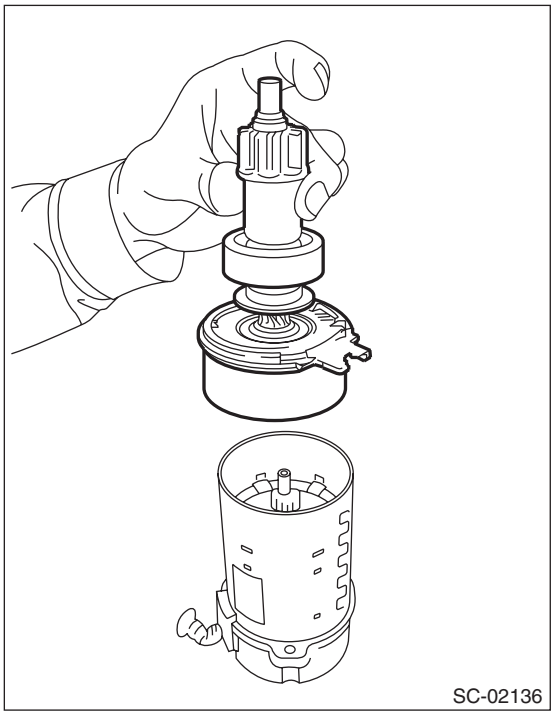
(3) Install the stopper (B) to the shaft, and install the snap ring (A).



(4) Press-fit the stopper (B) to snap ring (A) using a press.



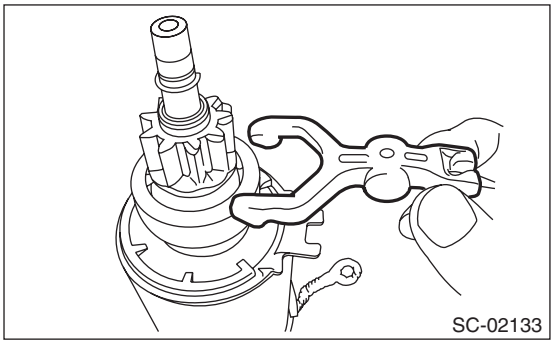
7) Assemble the overrunning clutch, shock absorber and shaft to the yoke as one unit.



8) Install the shift lever.

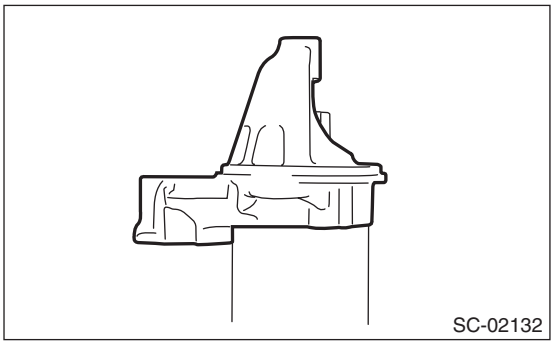
NOTE:
Apply grease to the contact portion of the shift lever.

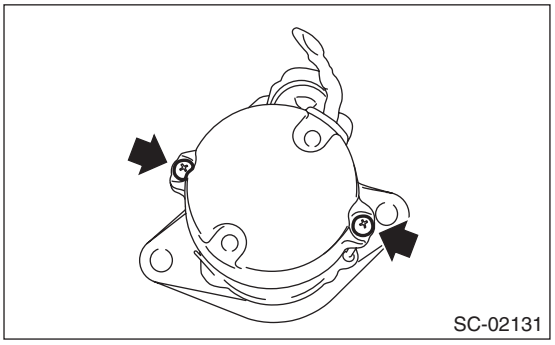
Grease:
DENSO HL50



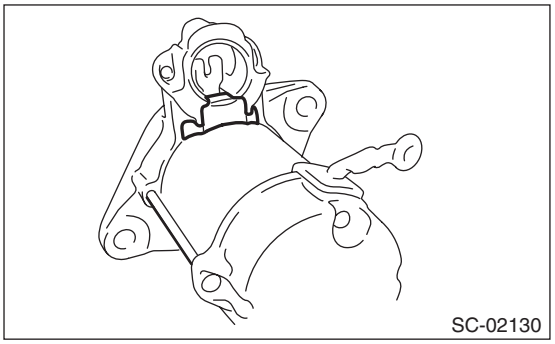
9) Install the starter housing, and tighten the through bolts on both sides.

Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)





10) Install the starter seal.

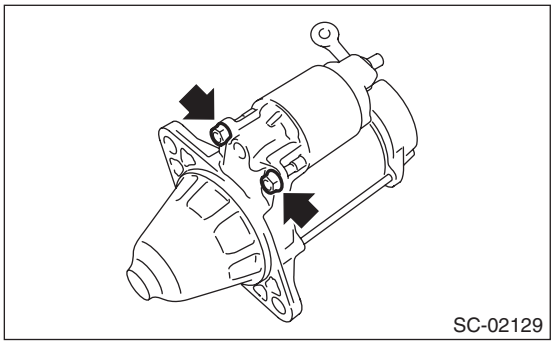


11) Install the magnet switch assembly to the starter housing, and tighten the nuts.

NOTE:
Apply grease to the installation part of the shift lever.

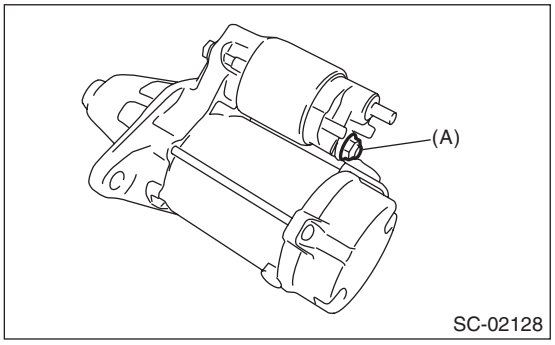
Grease:
DENSO HL50

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


SC-02129

12) 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)



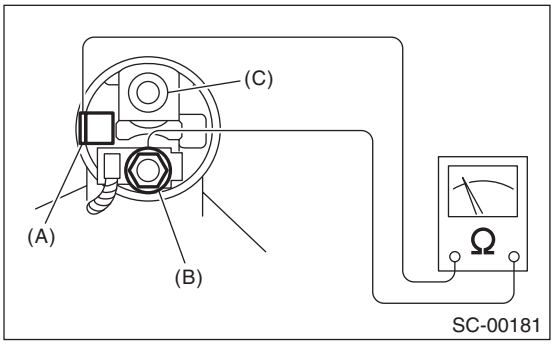
SC-02128

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

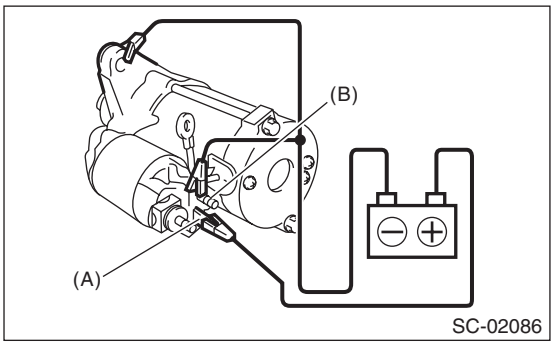


SC-00181

(A) Terminal S
(B) Terminal M
(C) Terminal B

2. SWITCH ASSEMBLY OPERATION

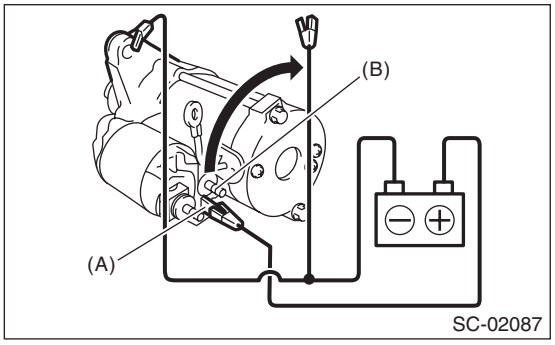
NOTE:
Test period of each test must be within short time (3 — 5 seconds).
1) Vacuum test
Disconnect the harness from terminal M and connect it as shown in the figure. Make sure the pinion gear sticks out.



SC-02086

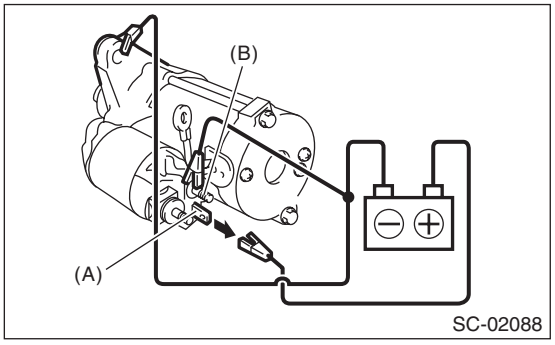
(A) Terminal S
(B) Terminal M

2) Hold test
Make sure the pinion gear remains stick out even after disconnecting terminal M in the above condition.



(A) Terminal S
(B) Terminal M

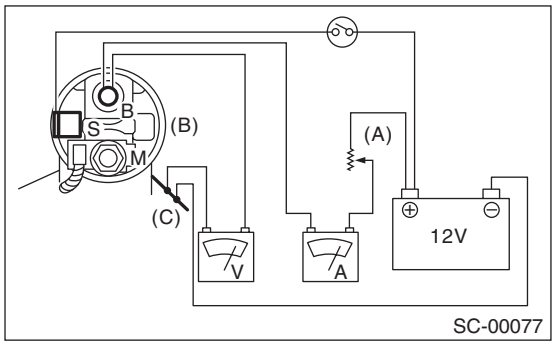
3) Return test
Connect the positive terminal to terminal S and the negative terminal to terminal M and starter body to pull the pinion gear at the main contact point. Make sure the pinion gear returns to its original position when the terminal S is disconnected.



(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
With switch on, adjust the variable resistance until the voltage is 11 V, read the value of 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 satisfactory if the current draw and rotating speed are within specifications.

Load test (standard):

Voltage/Load
8 V/12.8 N·m (1.31 kgf-m, 9.4 ft-lb)

Current/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):

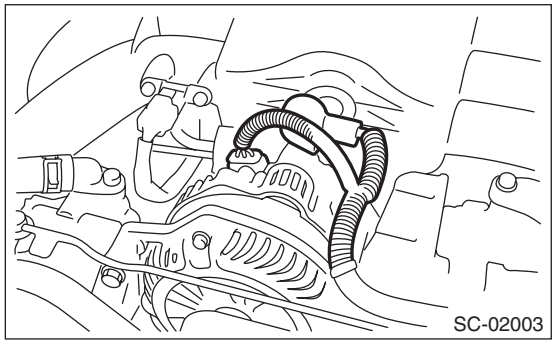
Voltage/Current
3 V/750 A or less

Torque
19.0 N·m (1.9 kgf-m, 14.0 ft-lb)

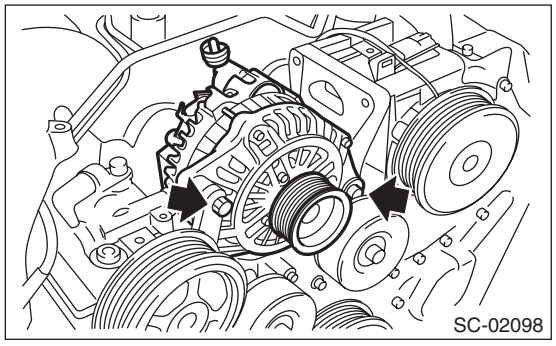
3. Generator

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from the battery.
3) Disconnect the connector and terminal B from generator.


SC-02003

4) Remove the V-belt. <Ref. to ME(H6DO)-46, REMOVAL, V-belt.>
5) Remove the generator.

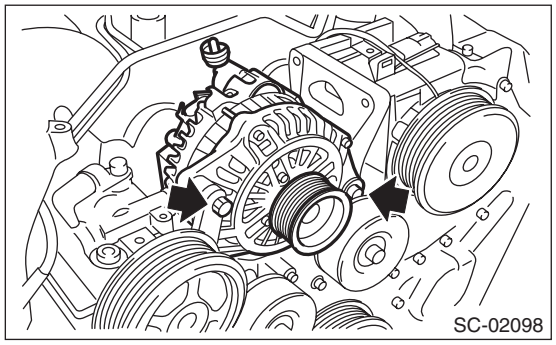

SC-02098

B: INSTALLATION

Install in the reverse order of removal.

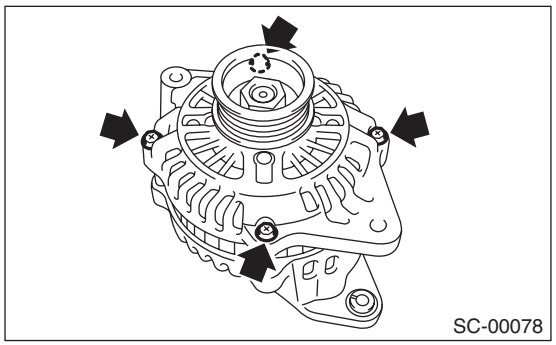
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

CAUTION:
Check and adjust the V-belt tension.
<Ref. to ME(H6DO)-46, INSPECTION, V-belt.>

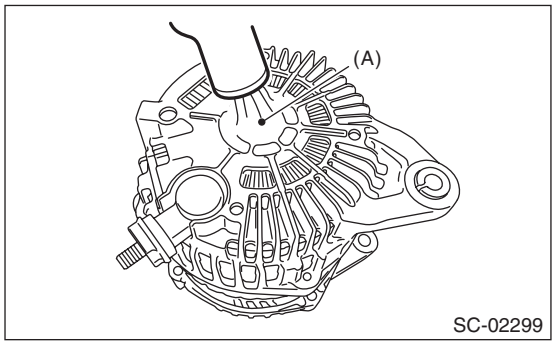

SC-02098

C: DISASSEMBLY

1) Remove the four through-bolts.

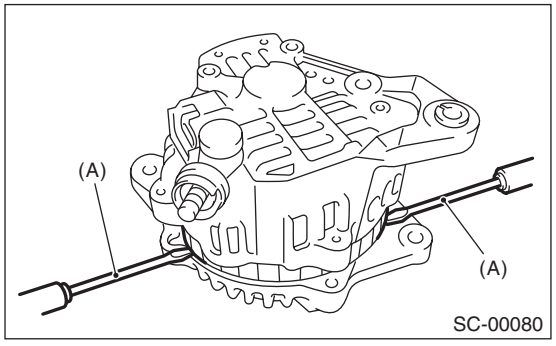

SC-00078

2) Heat the portion (A) of rear cover to 50 — 60°C (122 — 140°F) with a heater drier.



SC-02299

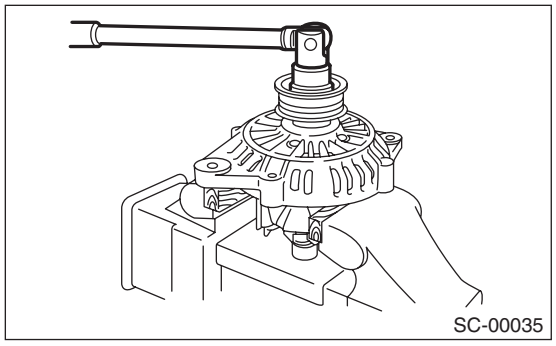
3) Then insert the tip of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.



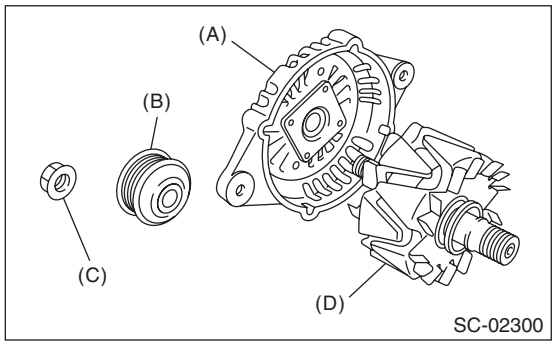
SC-00080

(A) Screwdriver

4) Hold the rotor with a vise and remove pulley nut.

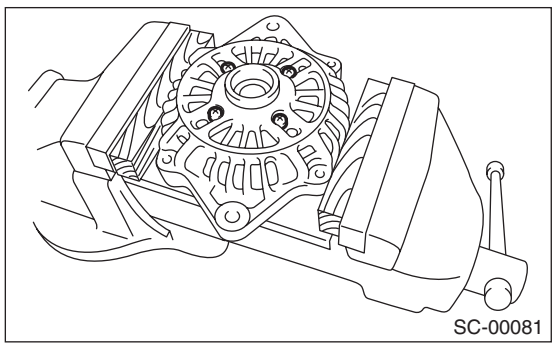


CAUTION:
When holding the rotor with a vise, place aluminum plates or wooden pieces on the vise jaws to prevent rotor from damage.

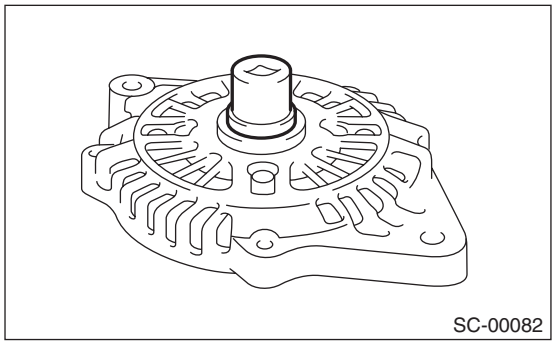


(A) Front cover
(B) Pulley
(C) Nut
(D) Rotor

5) Use the following procedures to remove the ball bearings.
(1) Remove the bolt, and then remove the bearing retainer.

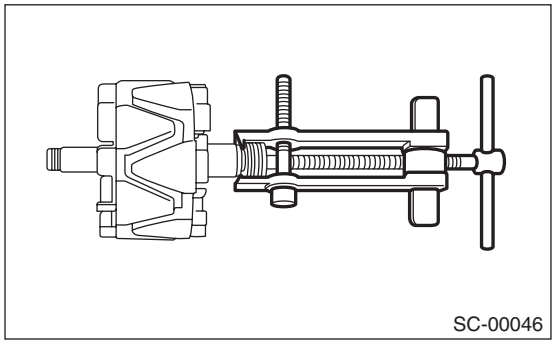


(2) Firmly install an appropriate tool (such as a fit socket wrench) to bearing inner race.

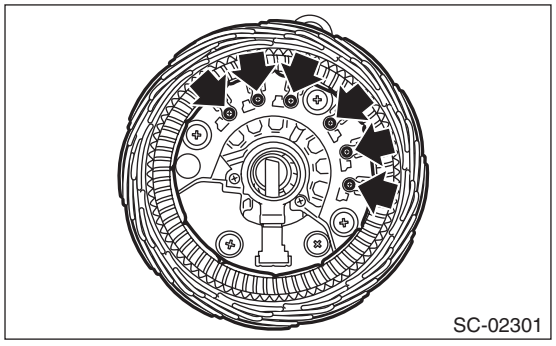


(3) Push the ball bearing off the front cover using a press.

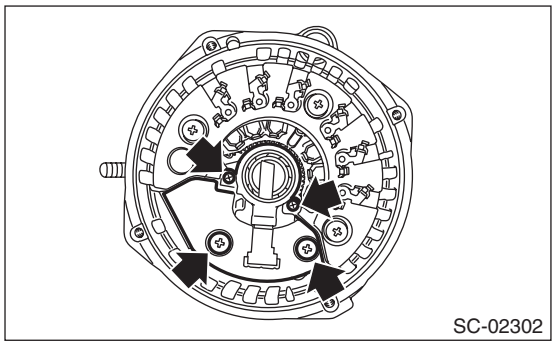
6) Remove the bearing from rotor using a bearing puller.



7) Remove six bolts between rectifier and stator coil, then remove the stator coil.

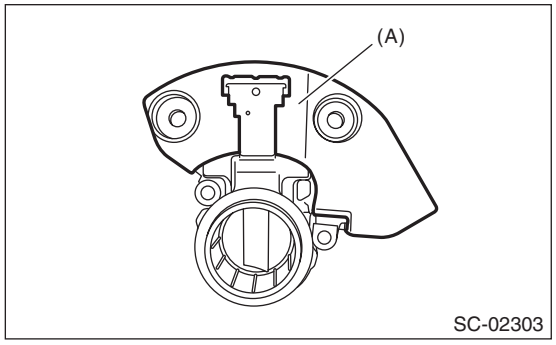


8) Remove four screws which secure the IC regulator to the rear cover, then remove the IC regulator.



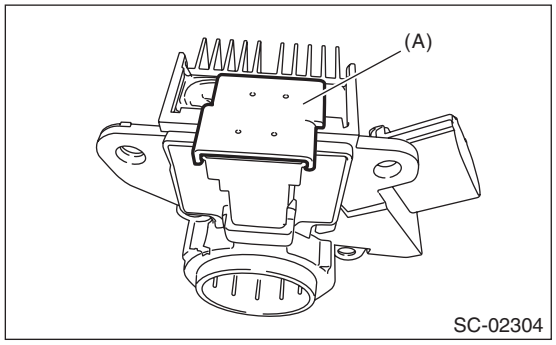
9) Use the following procedures to remove the brush.

(1) Remove the cover A.



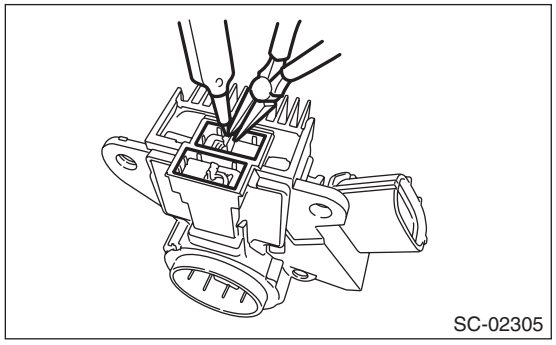
(A) Cover A

(2) Remove the cover B.



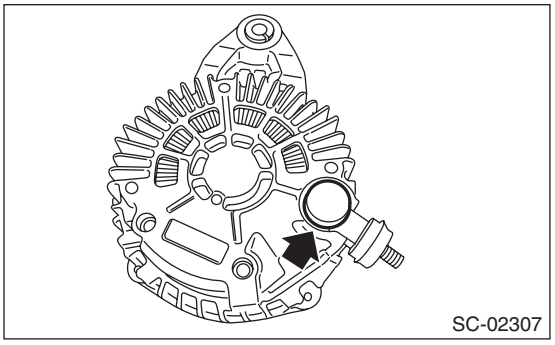
(A) Cover B

(3) Separate the brush from connection to remove.

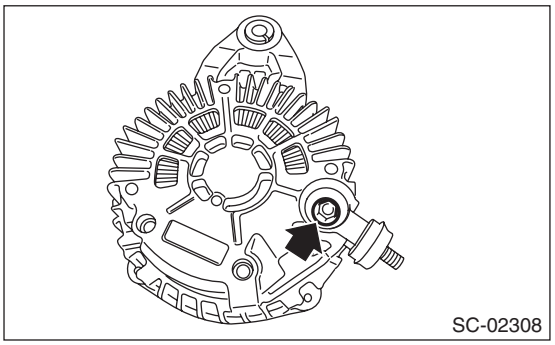


10) Use the following procedures to remove the rectifier.

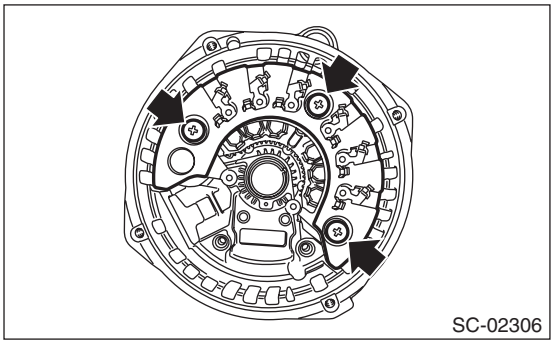
(1) Remove the cover of terminal B.



(2) Remove the nut of terminal B.



(3) Remove the bolts which secure the rectifier, then remove the rectifier.



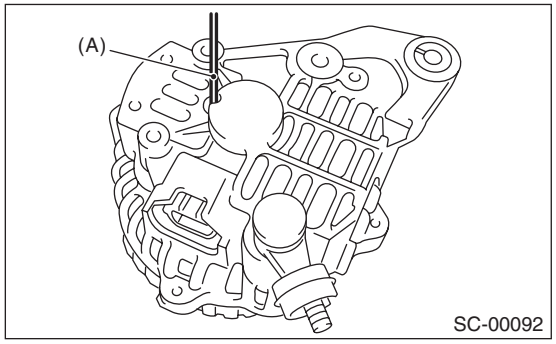
D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
Refer to “COMPONENT” for tightening torques of each section. <Ref. to SC(H6DO)-4, GENERATOR, COMPONENT, General Description.>

1) Push of the brush
Before assembling the front and rear parts, press the brush down into brush holder, and then fix them in that position by passing 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:
Be sure to remove the wire after reassembly.



(A) Wire

2) Install the ball bearing.
(1) Set the ball bearing on the front cover, and then securely install an appropriate tool (such as a fit socket wrench) to the bearing outer race.
(2) Press the ball bearing into the specified position using a press.
(3) Install the bearing retainer.

3) Press the bearing (rear side) into the rotor shaft using a press to install.

4) Heat the bearing box in rear cover up to 50 — 60°C (122 — 140°F), and then press the rear bearing into rear cover.

CAUTION:
Grease should not be applied to rear bearing. Remove the oil completely if it is found on bearing box.

5) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

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.

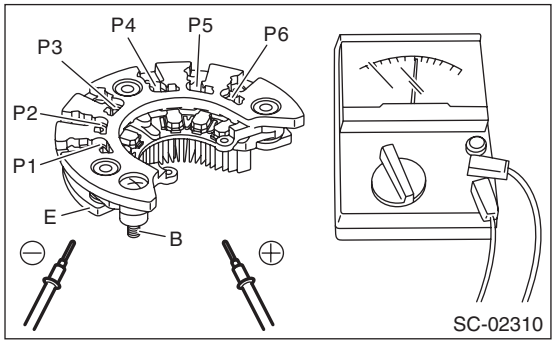
1) Check for continuity between the diode lead and terminal E or B. If continuity is not as shown in the table, replace the rectifier.

- 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



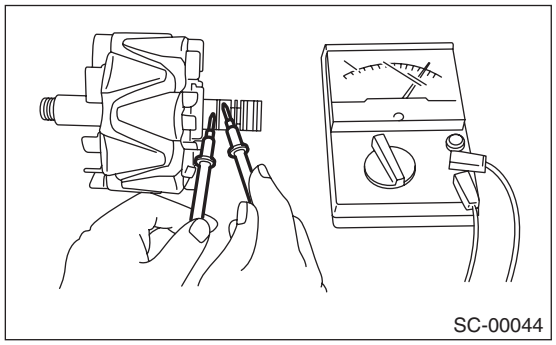
2. ROTOR

1) Slip ring surface
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) Slip ring outer diameter
Measure the slip ring outer diameter. Replace the rotor assembly if the slip ring is worn.

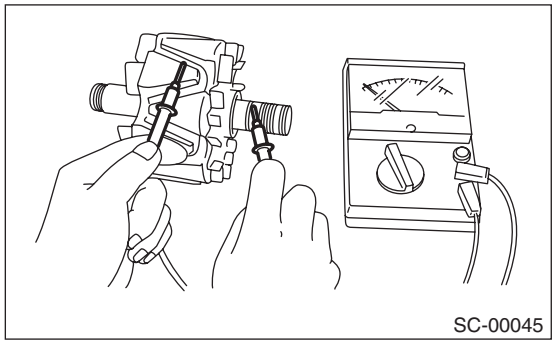
Slip ring outer diameter:
Standard
22.7 mm (0.894 in)
Service limit
22.1 mm (0.870 in)

3) Continuity test
Using a circuit tester, check the resistance between slip rings. If the resistance is not within the standard, replace the rotor assembly.

Specified resistance:
Approximately 2.0 — 2.3 Ω


SC-00044

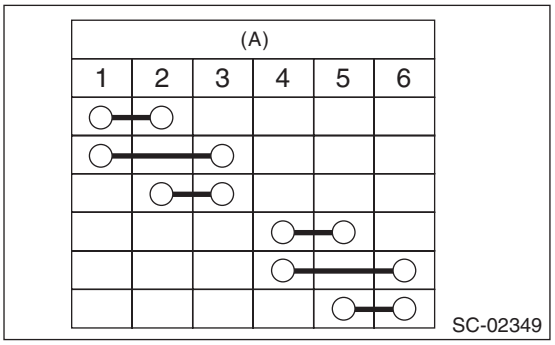
4) Insulation test
Check the continuity between slip ring and rotor core or shaft. If there is continuity, replace the rotor assembly because the rotor coil is grounded.


SC-00045

5) Bearing (rear side)
Check the bearing (rear side). If there is any noise, or the rotor does not rotate smoothly, replace the bearings.

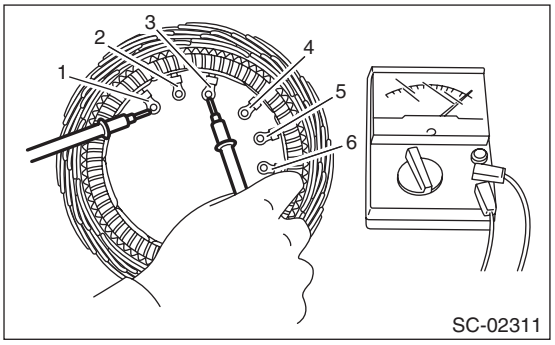
3. STATOR COIL

1) Continuity test
Inspect the continuity between the stator coil terminals. If continuity is not as shown in the table, replace the stator coil.



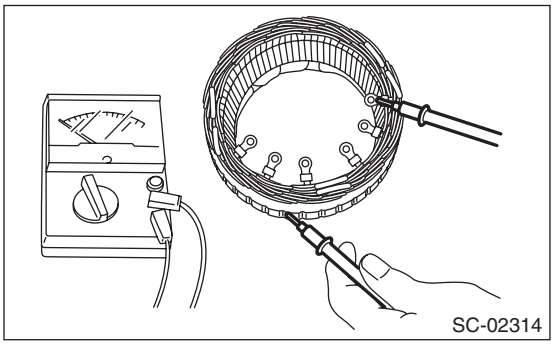
SC-02349

(A) Terminal



SC-02311

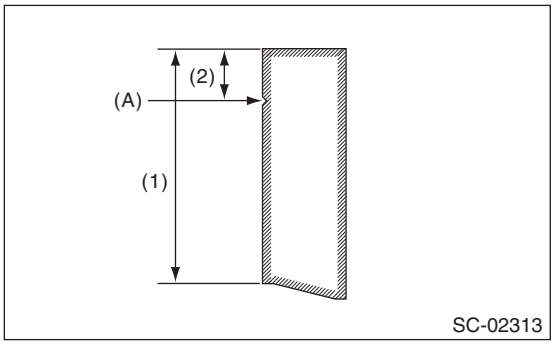
2) Insulation test
Inspect the continuity between the stator coil stator core and lead wire terminals. If there is continuity, replace the stator coil because the stator coil is grounded.


SC-02314

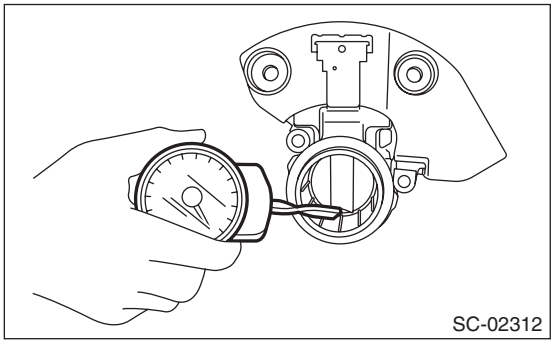
4. BRUSH

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)
Service limit (2)
5.0 mm (0.197 in)



2) Check that there is appropriate pressure on the brush spring. 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.



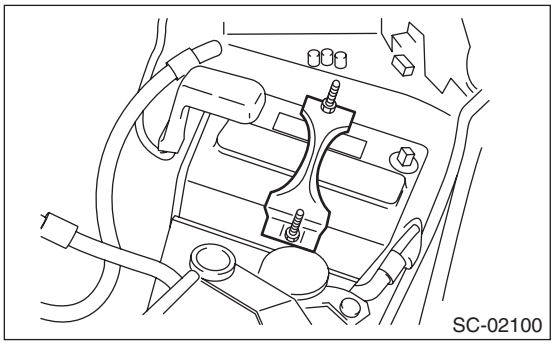
5. BALL BEARING (FRONT SIDE)

Check the ball bearings. Replace the ball bearings if there is resistance in the rotation, or if there is any abnormal noise.

4. Battery

A: REMOVAL

1) Disconnect the positive (+) terminal after disconnecting the negative (–) terminal of battery.
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

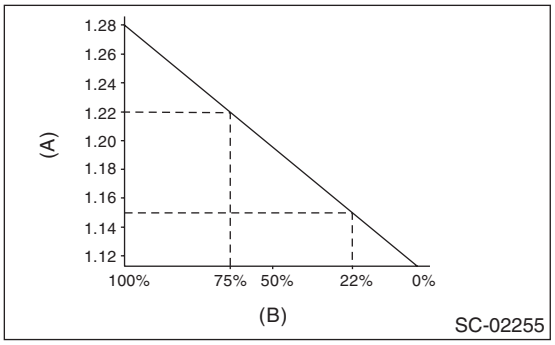
Check the electrolyte level in each cell. If the level is below MIN level, bring the level to MAX level by pouring distilled water into the battery cell. Do not fill beyond MAX level.

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

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, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F). 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.

CAUTION:
• Observe the items in 3. NORMAL CHARGING.
• Never use more than 10 A when charging the battery because it will shorten the battery life.

ENGINE (DIAGNOSTICS)

EN(H6DO)(diag)

		Page
1.	Basic Diagnostic Procedure	2
2.	Check List for Interview	3
3.	General Description	5
4.	Electrical Component Location	8
5.	Engine Control Module (ECM) I/O Signal	17
6.	Engine Condition Data	27
7.	Data Link Connector	28
8.	General Scan Tool	29
9.	Subaru Select Monitor	34
10.	Read Diagnostic Trouble Code (DTC)	43
11.	Inspection Mode	44
12.	Drive Cycle	49
13.	Clear Memory Mode	54
14.	Compulsory Valve Operation Check Mode	55
15.	System Operation Check Mode	56
16.	Malfunction Indicator Light	59
17.	Diagnostics for Engine Starting Failure	68
18.	Diagnostic Procedure for Subaru Select Monitor Communication	81
19.	List of Diagnostic Trouble Code (DTC)	83
20.	Diagnostic Procedure with Diagnostic Trouble Code (DTC)	91
21.	General Diagnostic Table	362