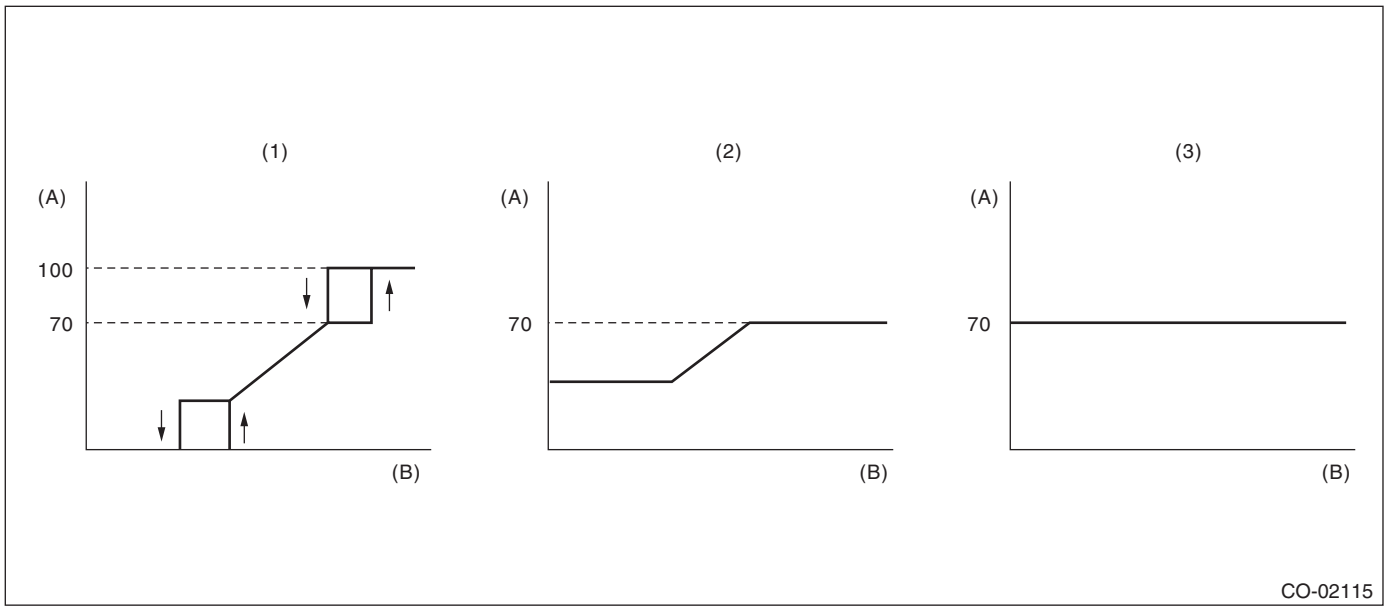
1. General Description

A: SPECIFICATION

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			Approx. 7.2 (7.6, 6.3)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge rate ℓ (US gal, Imp gal)/min	320 (84.5, 70.4)
		Pump speed — Discharge pressure	5,500 rpm — 176.5 kPa (18 mAq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter mm (in)		73.2 (2.88)
	Number of impeller vanes		6
	Number of pump sprocket teeth		22
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	160
		Sub fan W	160
	Fan diameter / Blade	Main fan	320 mm (12.6 in)/5
		Sub fan	320 mm (12.6 in)/7
Radiator	Type		Down flow, pressure type
	Core dimensions	Width × Height × Thickness mm (in)	690 × 349 × 16 (27.17 × 13.74 × 0.63)
	Pressure range in which cap valve is open kPa (kgf/cm^2, psi)		Above: 108±14.7 (1.1±0.15, 16±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)

Coolant	Recommended materials	Item number	Alternative
Coolant	SUBARU coolant	000016218	Phosphoric acid (non-amine) type
Water for dilution	Distilled water	—	Soft water or tap water
Cooling system protective agent	Cooling system conditioner	SOA345001	None

A/C compressor	A/C middle pressure switch	Engine coolant temperature		
		Increase: less than 95°C (203°F) Decrease: less than 93°C (199°F)	Increase: 95 — 101°C (203 — 214°F) Decrease: 93 — 99°C (199 — 210°F)	Increase: 102°C (216°F) or more Decrease: 100°C (212°F) or more
OFF		0%	Refer to fig. (1)	100%
ON	OFF	Refer to fig. (2)		100%
	ON	Refer to fig. (3)		100%



(A) Fan speed (%)

(B) Water temperature

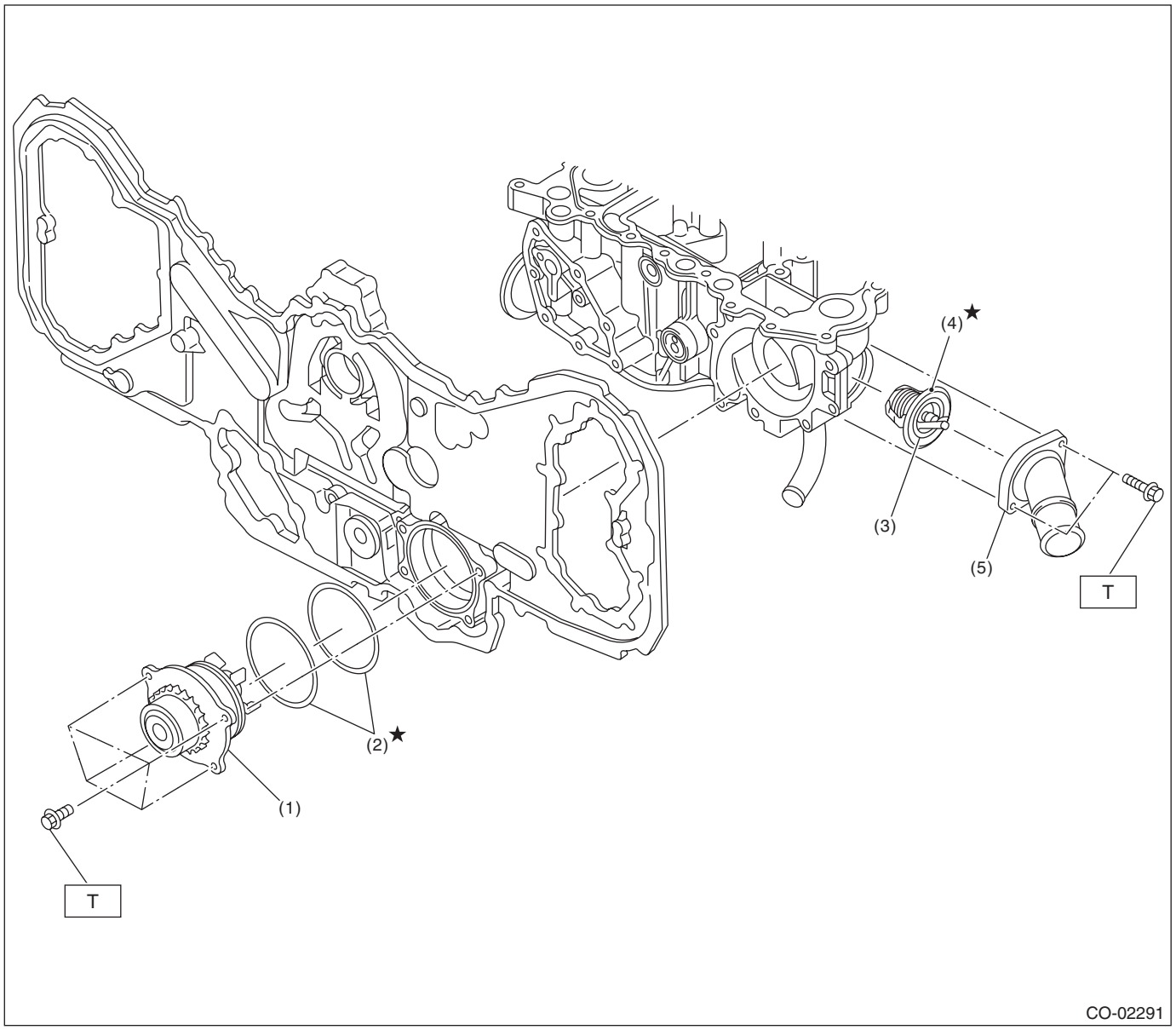
(1) A/C OFF control

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

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

B: COMPONENT

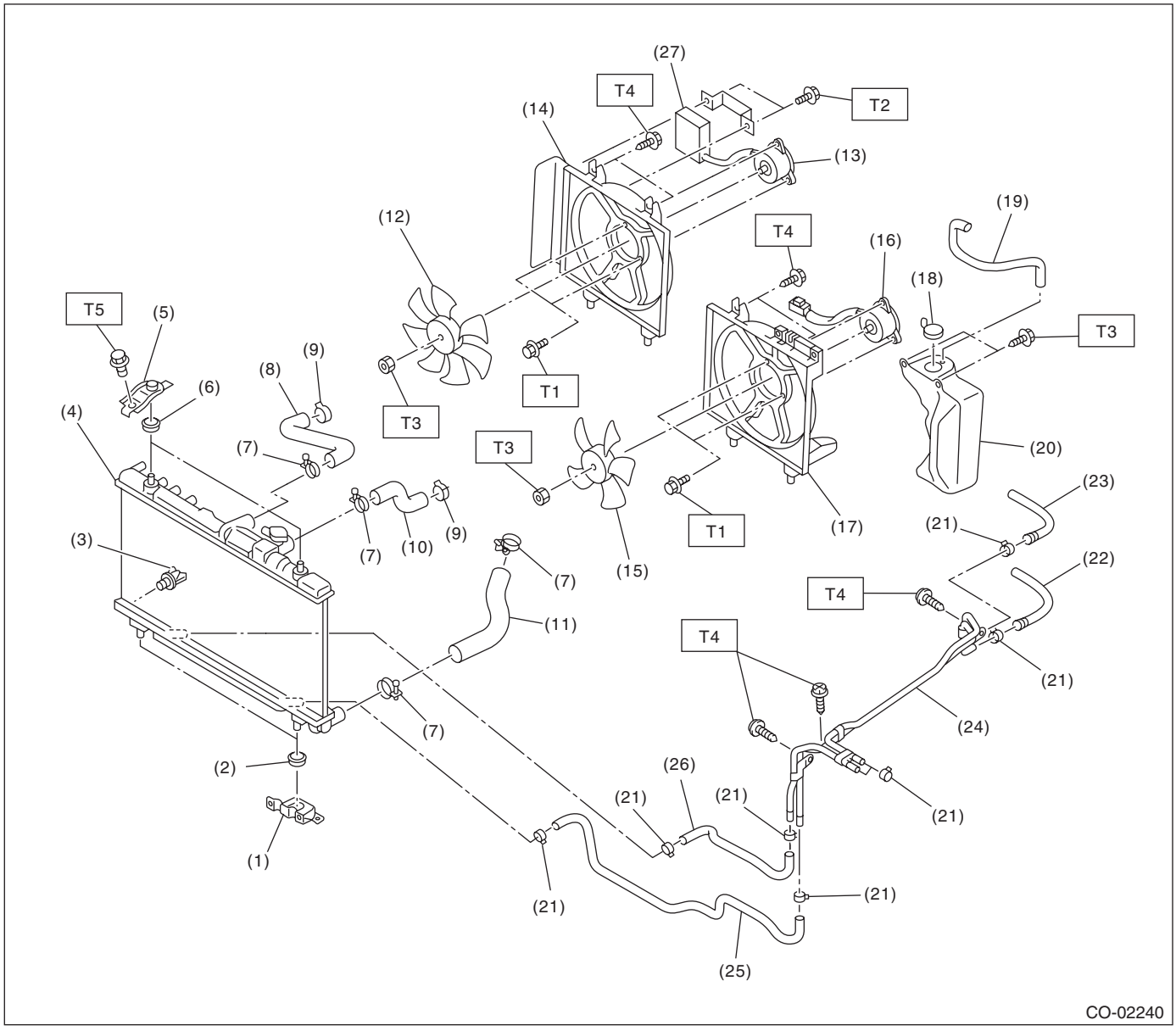
1. WATER PUMP



(1) Water pump ASSY
(2) O-ring
(3) Thermostat
(4) Gasket
(5) Thermostat cover

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

2. RADIATOR AND RADIATOR FAN



CO-02240

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

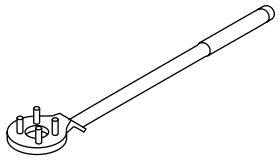
Tightening torque:N·m (kgf-m, ft-lb)	
T1:	*3.8 (0.39, 2.8)*
T2:	*5.4 (0.55, 4.0)*
T3:	*6.2 (0.63, 4.6)*
T4:	*7.5 (0.76, 5.5)*
T5:	*12 (1.2, 8.9)*

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 the battery.

D: PREPARATION TOOL

1. SPECIAL TOOL

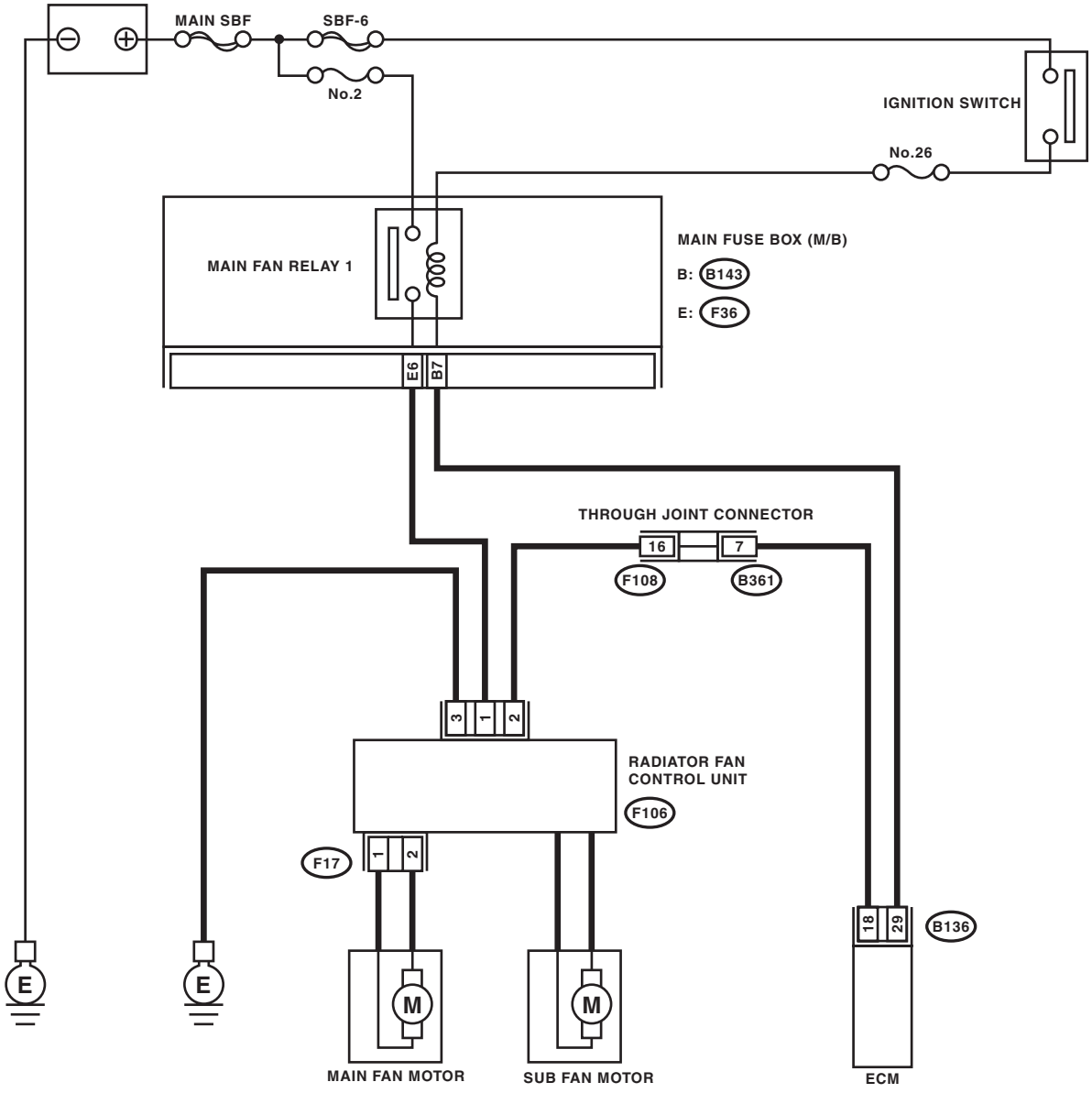
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolts.

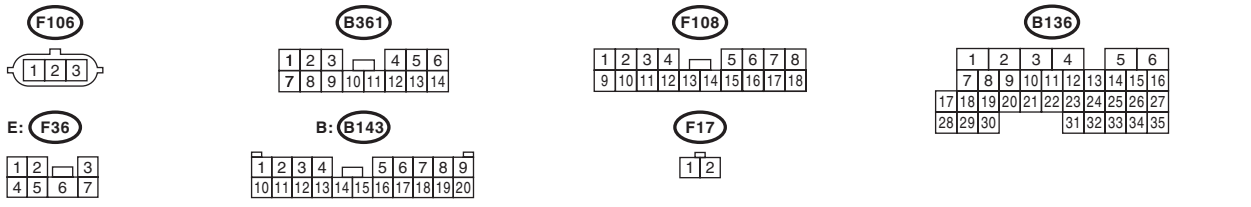
2. GENERAL TOOL

TOOL NAME	REMARKS
Radiator cap tester	Used for measuring pressure.

2. Radiator Fan System

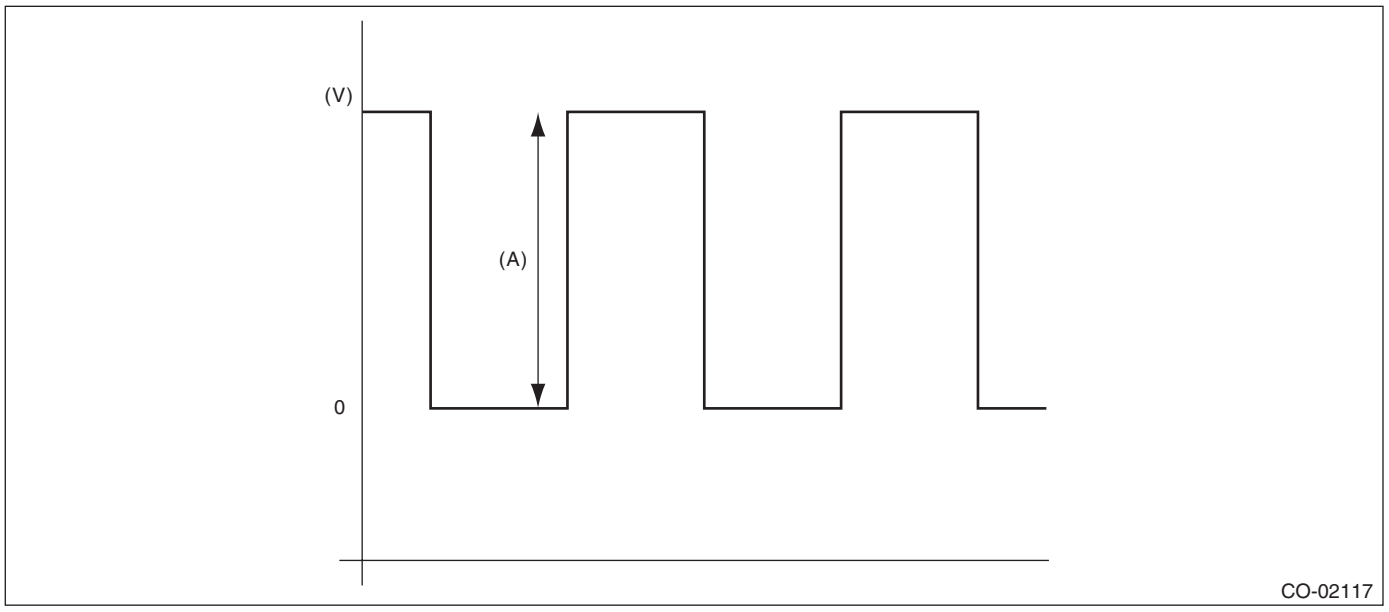
A: WIRING DIAGRAM





CO-02254

B: RADIATOR FAN CONTROL OUTPUT WAVEFORM



(A) 5 V

C: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is 93°C (199°F) or more.
- A/C switch is turned OFF.
- Vehicle speed is 19 km/h (12 MPH) or less.

TROUBLE SYMPTOMS:

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

	Step	Check	Yes	No
1	**CHECK MAIN FAN RELAY 1.** 1) Turn the ignition switch to OFF. 2) Remove main fan relay 1 from the main fuse box. 3) Measure the resistance of terminal in main fan relay 1 switch.	Is the resistance 1 MΩ or more?	Go to step **2**.	Replace the main fan relay 1.
2	**CHECK MAIN FAN RELAY 1.** 1) Connect the battery to the main fan relay 1 coil side terminal. 2) Measure the resistance between terminals of main fan relay 1 switch.	Is the resistance less than 1 Ω?	Go to step **3**.	Replace the main fan relay 1.
3	**CHECK POWER SUPPLY FOR ECM.** 1) Disconnect the connectors from the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector 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 connector and chassis ground. ***Connector & terminal*** ***(F106) No. 1 (+) — 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 the ECM. 3) Measure the resistance of harness between radiator fan control unit and ECM connector. ***Connector & terminal*** ***(B136) No. 18 — (F106) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit of harness between ECM and radiator fan control unit.
6	**CHECK 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. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **7**.	Repair the open circuit of harness between radiator fan control unit connector and chassis ground.
7	**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 radiator fan control unit, and the ground (–) terminal to terminal No. 3.	Does the fan motor rotate?	Go to step **8**.	Replace the fan motor which does not rotate.
8	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Check the output waveform using oscilloscope. <Ref. to CO(H6DO)-8, RADIATOR FAN CONTROL OUTPUT WAVEFORM, Radiator Fan System.> ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (–):***	Is waveform being output?	Replace the radiator fan control unit. <Ref. to CO(H6DO)-25, Radiator Fan Control Unit.>	Replace the ECM. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>

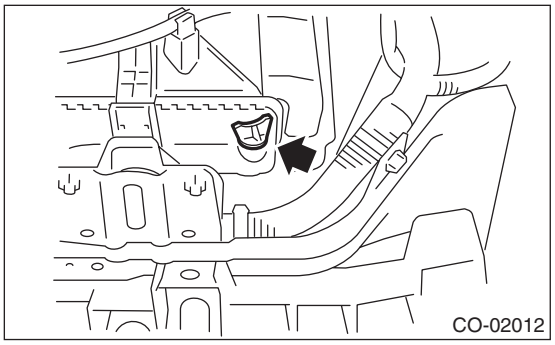
3. Engine Coolant

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.



5) Install the drain plug.

2. FILLING OF ENGINE COOLANT

1) Pour cooling system conditioner through the filler neck.

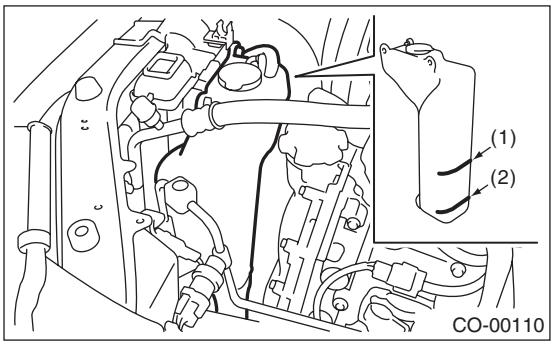
Cooling system protective agent:
Refer to "SPECIFICATION" for the cooling system protective agent. <Ref. to CO(H6DO)-2, SPECIFICATION, General Description.>

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

3) Fill engine coolant into the reservoir tank up to "FULL" level.



(1) FULL
(2) LOW

4) 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.)
5) 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.
6) Perform the procedures 4) and 5) again.
7) Attach the radiator cap and reservoir tank cap properly.
8) Start the engine and operate the heater at maximum hot position and the blower speed setting to "LO".
9) Run the engine at 2,000 rpm or less until radiator fan starts and stops.

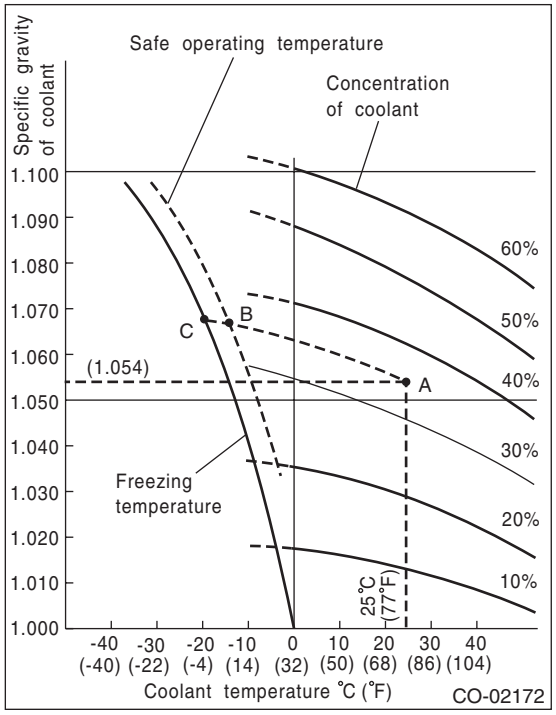
NOTE:
Be careful with the engine coolant temperature gauge to prevent overheating.
10) Stop the engine and wait until the engine coolant temperature lowers to 30°C (86°F) or less.
11) Open the radiator cap. If the engine coolant level drops, add engine coolant into radiator up to the filler neck position and reservoir tank to the "FULL" level.
12) Attach the radiator cap and reservoir tank cap properly.
13) 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 9).

B: INSPECTION

1. RELATIONSHIP OF COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of coolant is shown in the diagram 1. Measuring the temperature and specific gravity of the coolant will provide this information.
[Example]
If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is –14°C (7°F) (point B), and the freezing temperature is –20°C (–4°F) (point C).

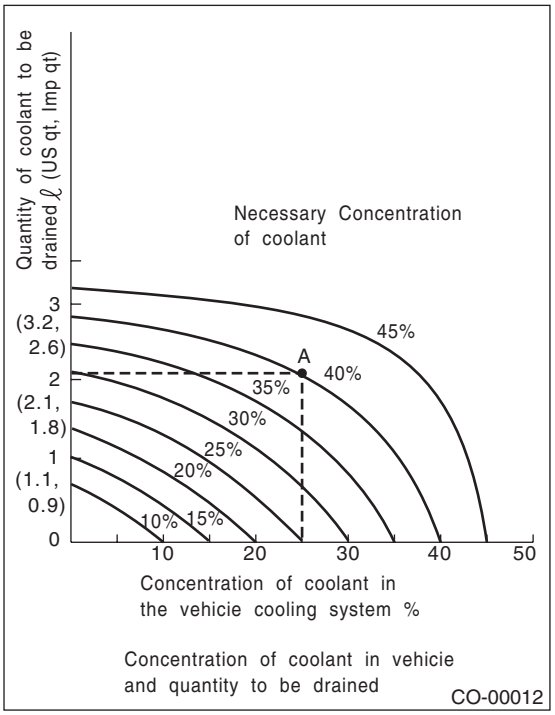
- Diagram 1



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

To adjust the concentration of coolant according to temperature, find the proper fluid concentration in the diagram 1 and replace the necessary amount of coolant with an undiluted solution of coolant (concentration 50%).
The amount of engine coolant that should be replaced can be determined using the diagram 2.
[Example]
Assume that the engine coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of engine coolant concentration intersects with the 40% curve of the necessary engine coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) undiluted coolant solution.
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.

- Diagram 2

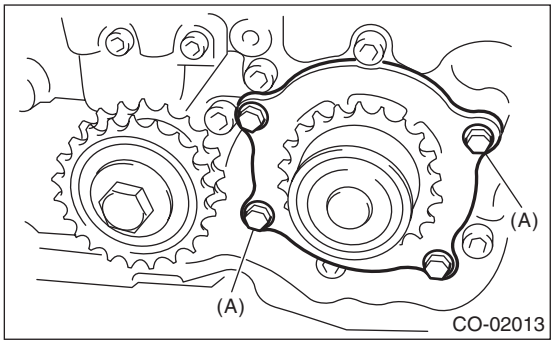


4. Water Pump

A: REMOVAL

1) Remove the radiator. <Ref. to CO(H6DO)-15, REMOVAL, Radiator.>
2) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
3) Remove the crank pulley. <Ref. to ME(H6DO)-39, REMOVAL, Crank Pulley.>
4) Remove the front chain cover. <Ref. to ME(H6DO)-40, REMOVAL, Front Chain Cover.>
5) Remove the timing chain assembly. <Ref. to ME(H6DO)-42, REMOVAL, Timing Chain Assembly.>
6) Remove the water pump.

NOTE:
When the water pump cannot be removed easily, screw-in the bolt (A) to the threaded end to remove water pump.

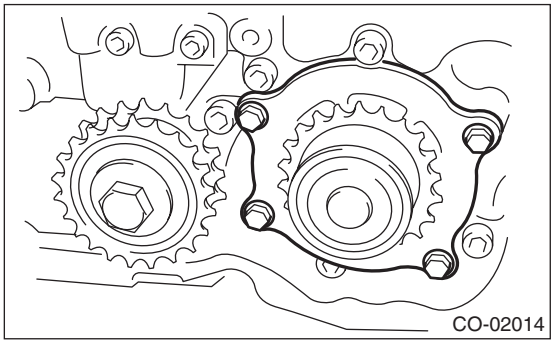


B: INSTALLATION

1) Install the water pump to rear chain cover.

NOTE:
- Use new O-rings.
- Apply engine coolant to O-ring.

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



2) Install the timing chain assembly. <Ref. to ME(H6DO)-43, INSTALLATION, Timing Chain Assembly.>
3) Install the front chain cover. <Ref. to ME(H6DO)-40, INSTALLATION, Front Chain Cover.>
4) Install the crank pulley. <Ref. to ME(H6DO)-39, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>
6) Install the radiator. <Ref. to CO(H6DO)-16, INSTALLATION, Radiator.>
7) Fill engine coolant. <Ref. to CO(H6DO)-10, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

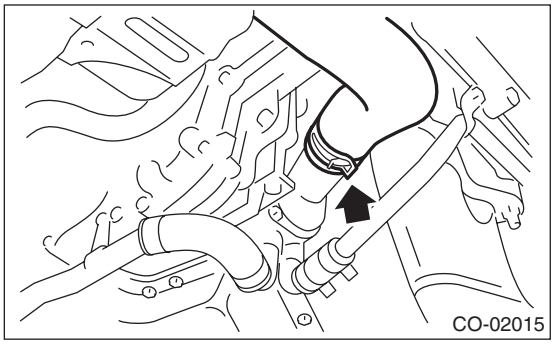
C: INSPECTION

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

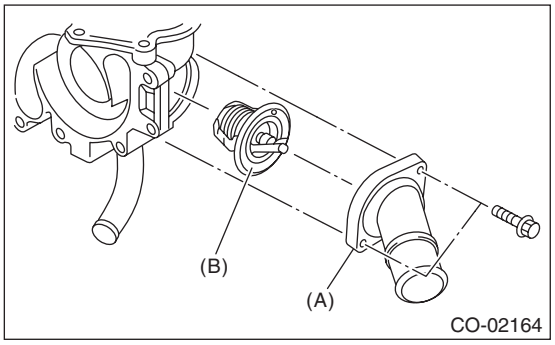
5. Thermostat

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)-10, 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.



(A) Thermostat cover
(B) Thermostat

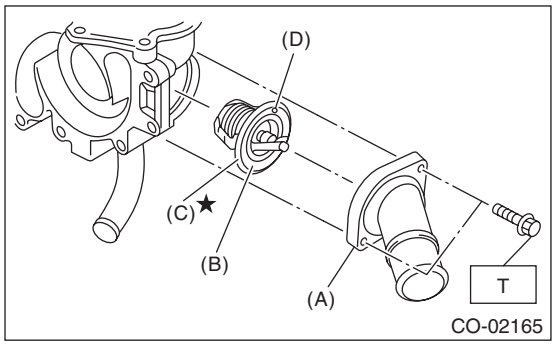
B: INSTALLATION

1) Install a gasket to thermostat.

NOTE:
Use a new gasket.
2) Install the thermostat and thermostat cover.

NOTE:
The jiggle pin must face upward when installing.

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



(A) Thermostat cover
(B) Thermostat
(C) Gasket
(D) Jiggle pin

3) Connect the radiator outlet hose to thermostat cover.
4) Install the under cover.
5) Lower the vehicle.
6) Fill engine coolant. <Ref. to CO(H6DO)-10, 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 the following test shows unsatisfactory results.

- 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.

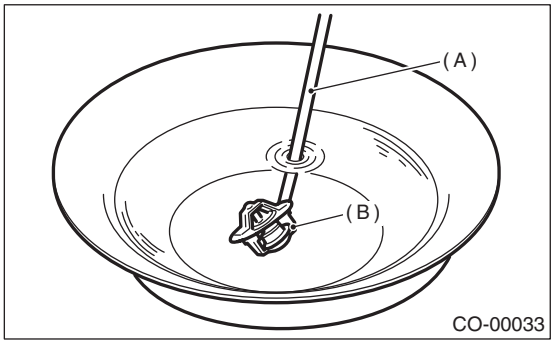
NOTE:

- 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.

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

Fully opens:
95°C (203°F)

Valve lift:
9.0 mm (0.354 in) or more



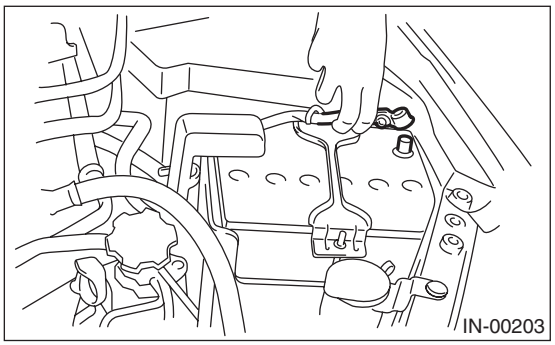
(A) Thermometer
(B) Thermostat

6. Radiator

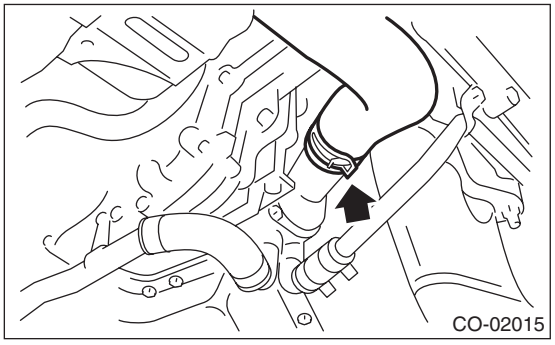
A: REMOVAL

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

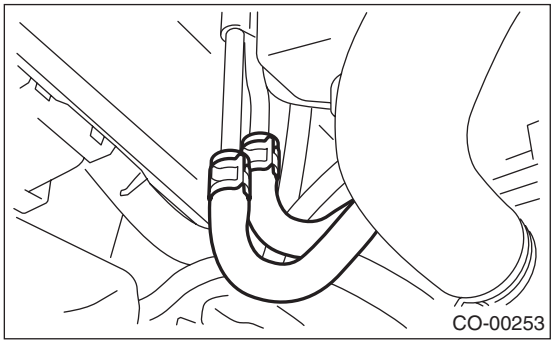
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from the battery.



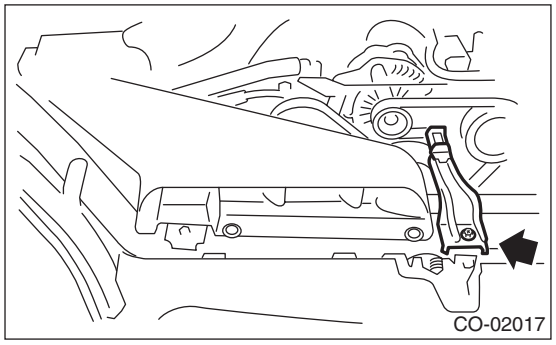
4) Lift up the vehicle.
5) Remove the under cover.
6) Drain engine coolant completely. <Ref. to CO(H6DO)-10, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Disconnect the radiator outlet hose from the radiator.



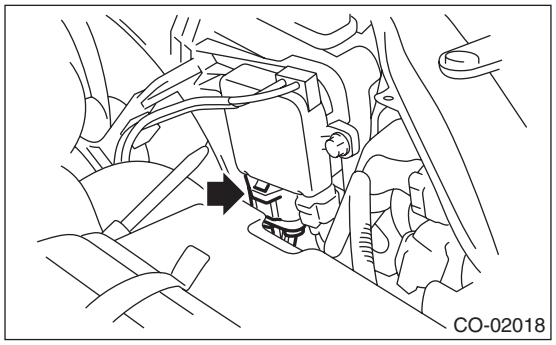
8) Disconnect the ATF cooler hose from the radiator.



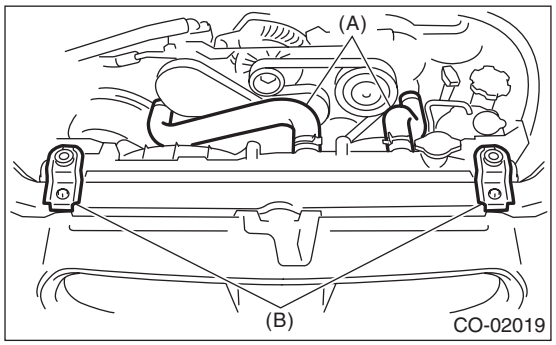
9) Lower the vehicle.
10) Remove the hood stay holder.



11) Remove the air intake duct. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
12) Disconnect the connector from radiator fan control unit.



13) Remove the reservoir tank. <Ref. to CO(H6DO)-24, REMOVAL, Reservoir Tank.>
14) Disconnect the radiator inlet hose from radiator.
15) Remove the radiator upper brackets.

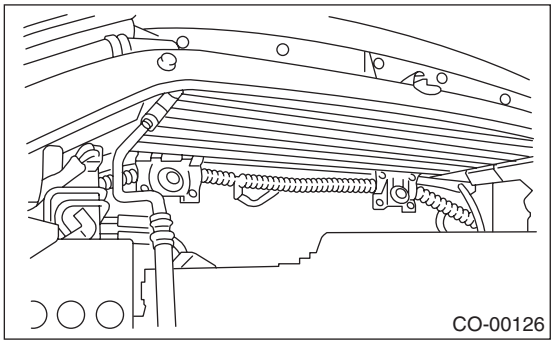


(A) Radiator inlet hose
(B) Radiator upper bracket

16) Lift the radiator up and away from vehicle.

B: INSTALLATION

1) Attach the radiator lower cushions to holes on the vehicle.



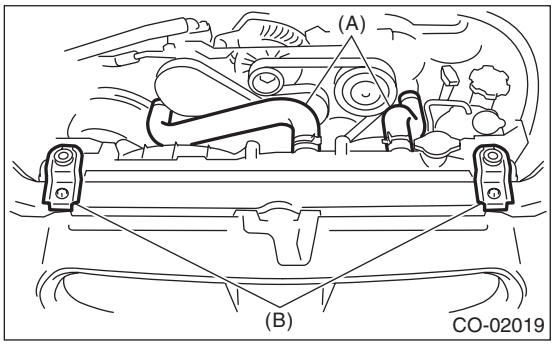
2) Install the radiator to vehicle.

NOTE:
Make pins on the lower side of radiator be fitted into the radiator lower cushions on body side.

3) Install the radiator upper brackets and tighten the bolts.

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

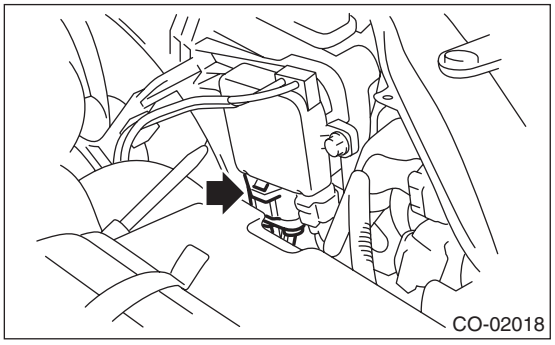
4) Connect the radiator inlet hose.



(A) Radiator inlet hose
(B) Radiator upper bracket

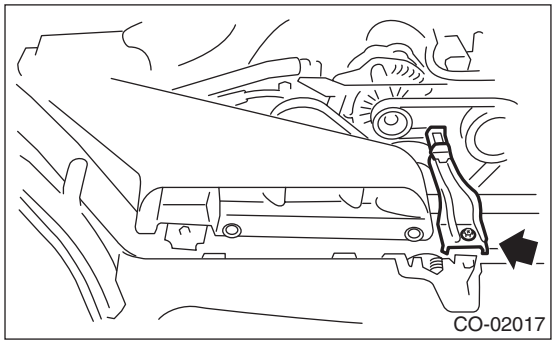
5) Install the reservoir tank. <Ref. to CO(H6DO)-24, INSTALLATION, Reservoir Tank.>

6) Connect the connector to the radiator fan control unit.



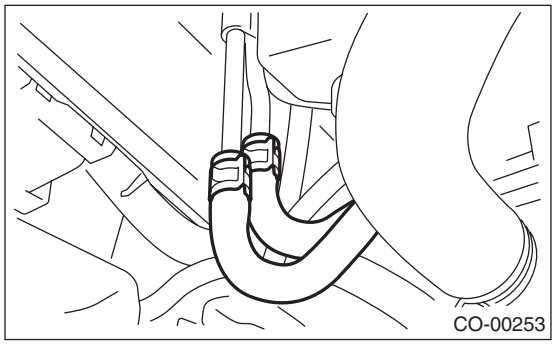
7) Install the air intake duct. <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.>

8) Install the hood stay holder.

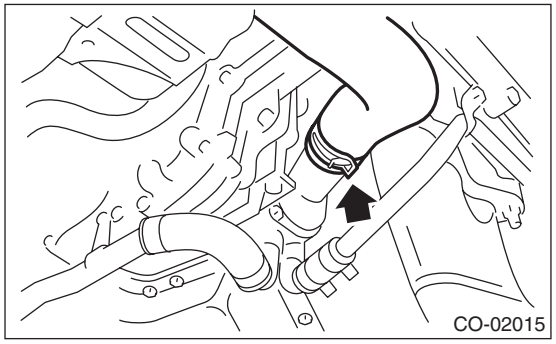


9) Lift up the vehicle.

10) Connect the ATF cooler hoses.



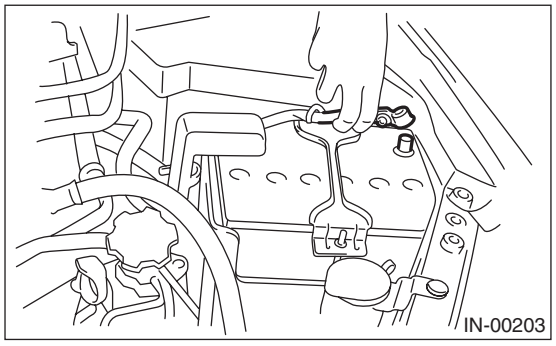
11) Connect the radiator outlet hose.



12) Install the under cover.

13) Lower the vehicle.

14) Connect the battery ground cable to battery.



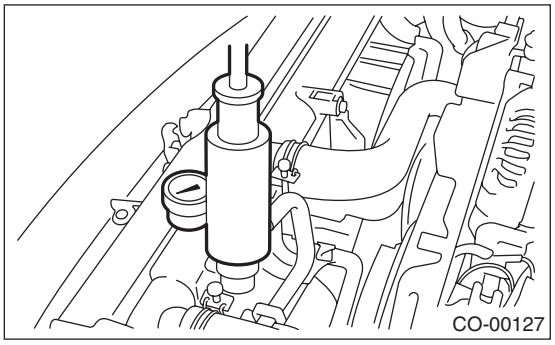
15) Fill engine coolant. <Ref. to CO(H6DO)-10, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

16) Check the ATF level. <Ref. to 5AT-28, INSPECTION, Automatic Transmission Fluid.>

17) 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.



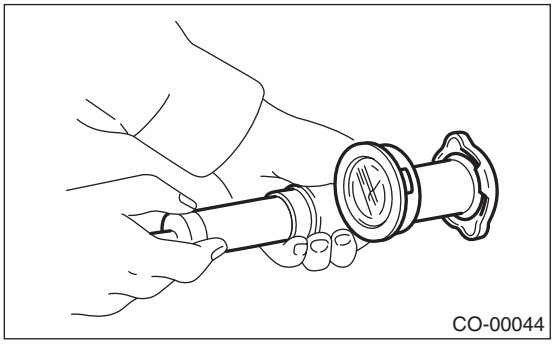
2) Apply a pressure of 157 kPa (1.6 kgf/cm^2, 23 psi) to the radiator and check the following points:
- Leakage from the radiator or its vicinity
- Leakage from the hose or its connections

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 to six seconds.

Specified pressure:
93 — 123 kPa (0.95 — 1.25 kgf/cm^2, 14 — 18 psi)

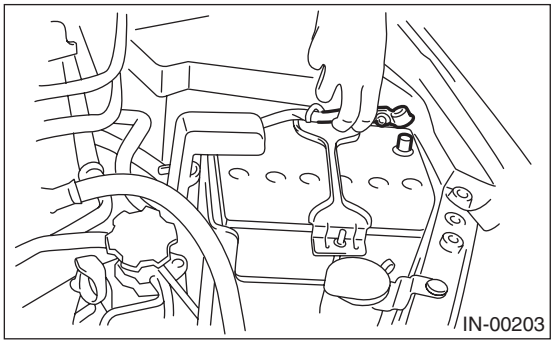
Service limit pressure:
83 kPa (0.85 kgf/cm^2, 12 psi)

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

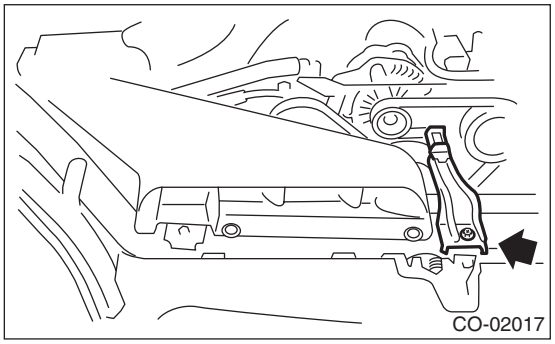
8. Radiator Main Fan and Fan Motor

A: REMOVAL

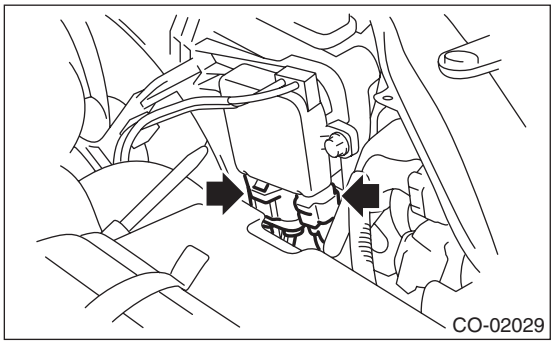
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from the battery.



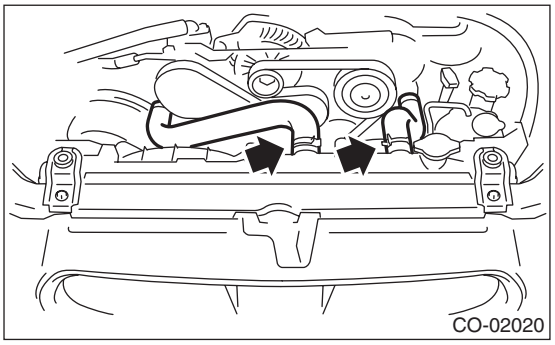
4) Remove the hood stay holder.



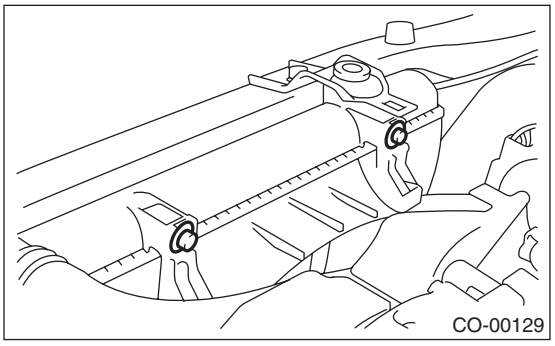
5) Remove the air intake duct. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
6) Disconnect the connector from radiator fan control unit.



7) Lift up the vehicle.
8) Remove the under cover.
9) Drain engine coolant completely. <Ref. to CO(H6DO)-10, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
10) Remove the ATF hose from the clip of the radiator main fan shroud.
11) Remove the radiator main fan motor harness from the clip.
12) Lower the vehicle.
13) Remove the reservoir tank. <Ref. to CO(H6DO)-24, REMOVAL, Reservoir Tank.>
14) Disconnect the inlet hose from radiator.

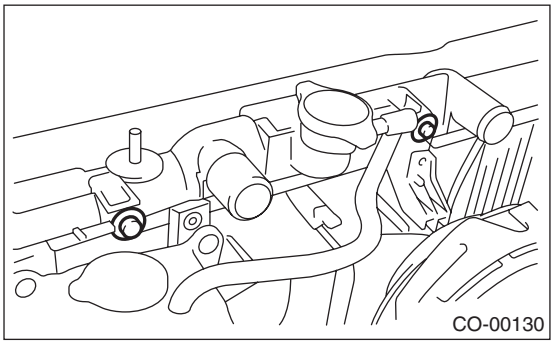


15) Remove the radiator sub fan motor assembly.



16) Remove the radiator main fan motor assembly.

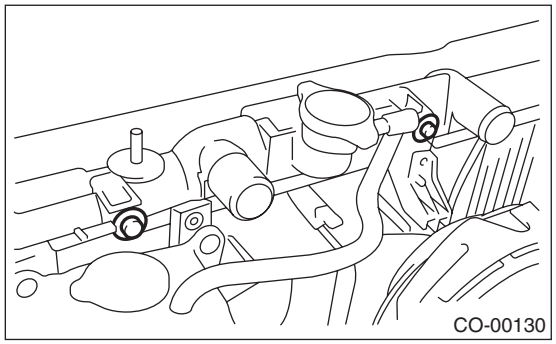
NOTE:
When removing the main fan assembly with lifting it up, the main fan shroud contacts to inlet part of engine coolant. To avoid contacting it, move the main fan assembly to sub fan assembly side before removal.



B: INSTALLATION

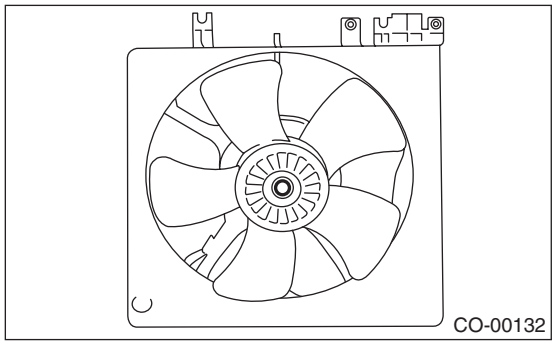
Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

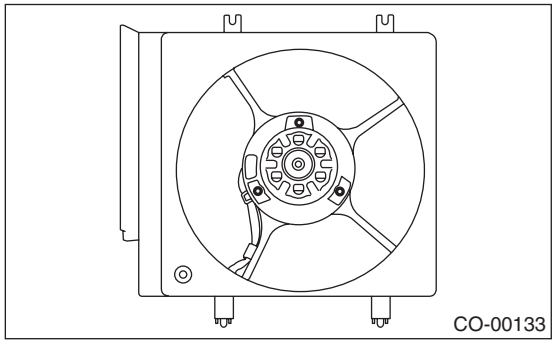


C: DISASSEMBLY

1) Remove the nut which holds fan to fan motor and shroud assembly.



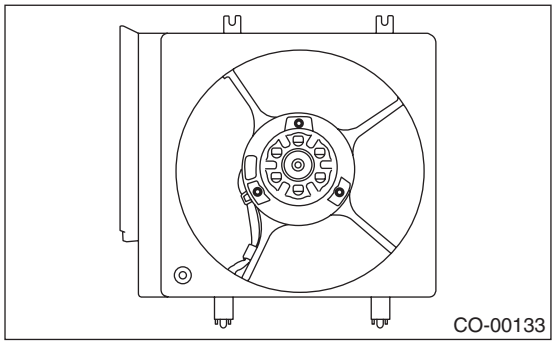
2) Remove the clip which holds the fan motor onto the shroud.



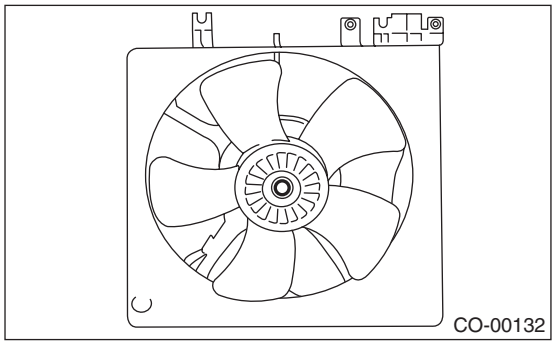
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
3.8 N·m (0.39 kgf-m, 2.8 ft-lb)



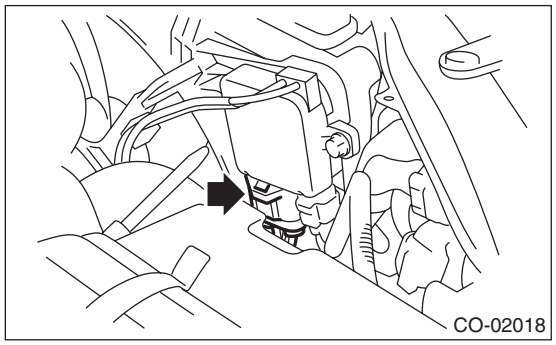
Tightening torque:
6.2 N·m (0.63 kgf-m, 4.6 ft-lb)



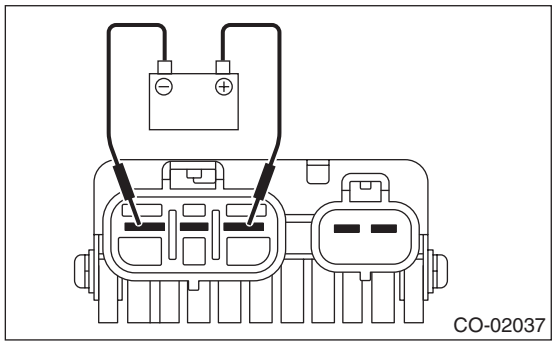
E: INSPECTION

1) Disconnect the connector from radiator fan control unit.

NOTE:
Do not remove the main fan motor harness connector.



2) Connect the battery to radiator fan control unit as shown in the figure.

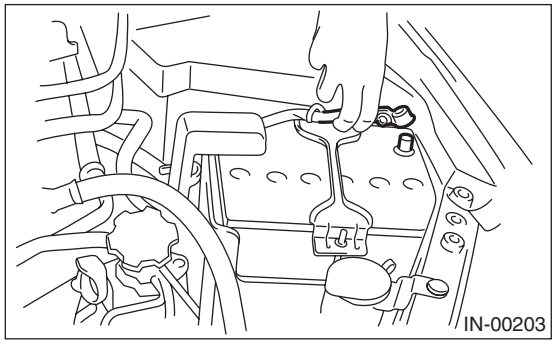


3) Check the fan motor for operations. If it does not operate, check the fan motor.

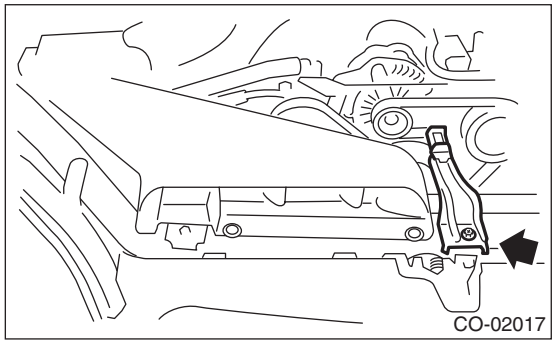
9. Radiator Sub Fan and Fan Motor

A: REMOVAL

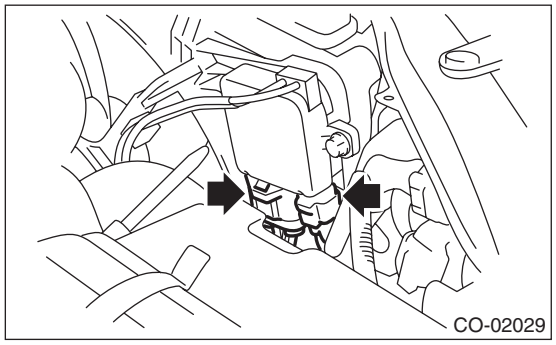
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from the battery.



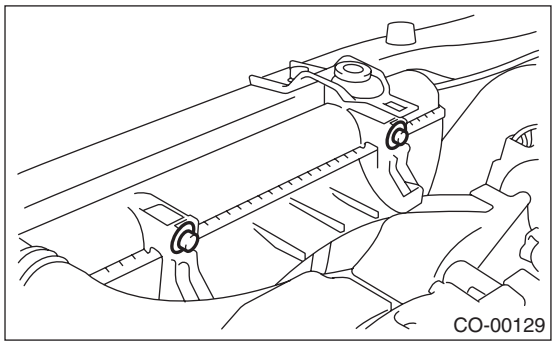
4) Remove the hood stay holder.



5) Remove the air intake duct. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
6) Disconnect the connector from radiator fan control unit.



7) Remove the bolts which hold the sub shroud to the radiator.

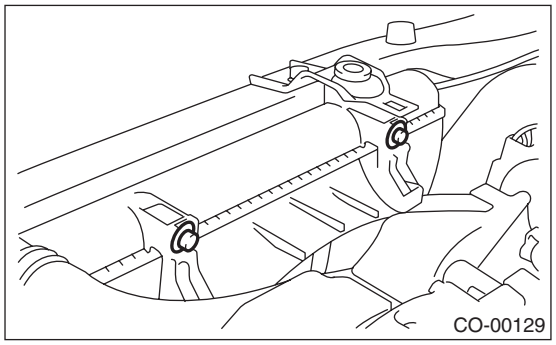


8) Lift up the vehicle.
9) Remove the under cover.
10) Remove the radiator sub fan shroud through the under side of vehicle.

B: INSTALLATION

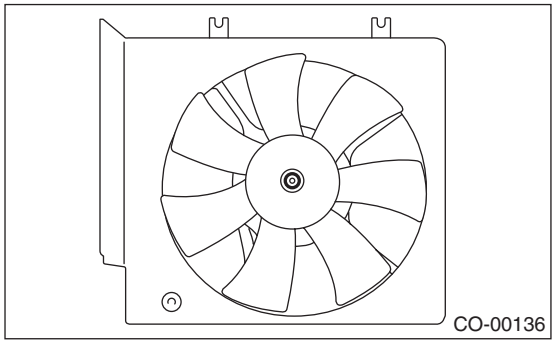
Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

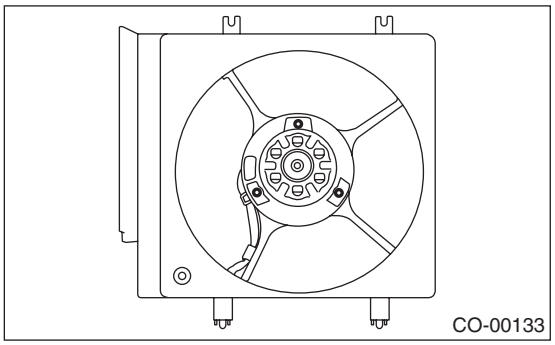


C: DISASSEMBLY

1) Remove the nut which holds fan to fan motor and shroud assembly.



2) Remove the clip which holds the fan motor onto the shroud.



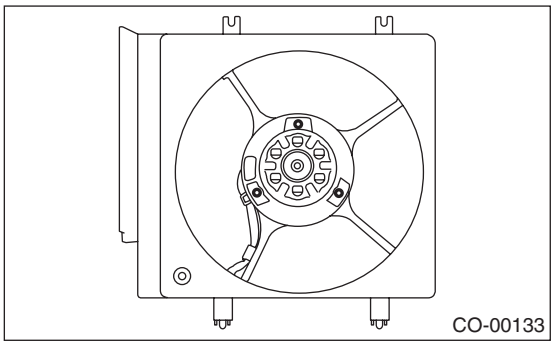
3) Remove the bolts which hold the radiator fan control unit to the shroud.

D: ASSEMBLY

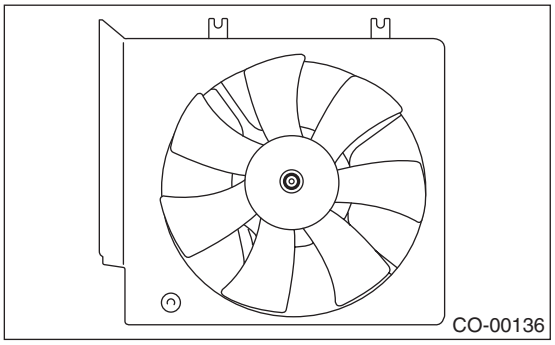
Assemble in the reverse order of disassembly.

Radiator fan control unit bolt tightening torque:
5.4 N·m (0.55 kgf-m, 4.0 ft-lb)

Tightening torque:
3.8 N·m (0.39 kgf-m, 2.8 ft-lb)



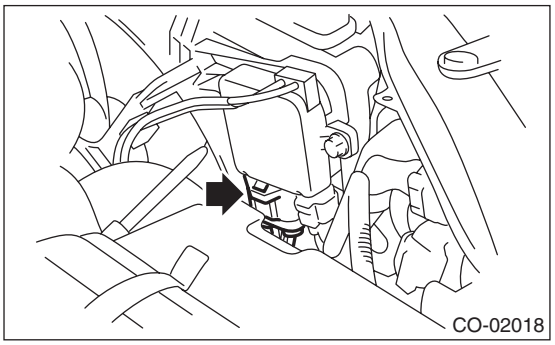
Tightening torque:
6.2 N·m (0.63 kgf-m, 4.6 ft-lb)



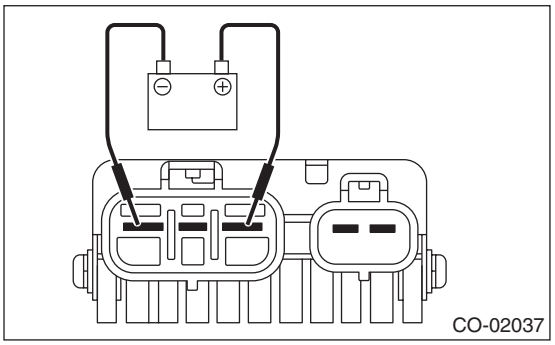
E: INSPECTION

1) Disconnect the connector from radiator fan control unit.

NOTE:
Do not remove the main fan motor harness connector.



2) Connect the battery to radiator fan control unit as shown in the figure.

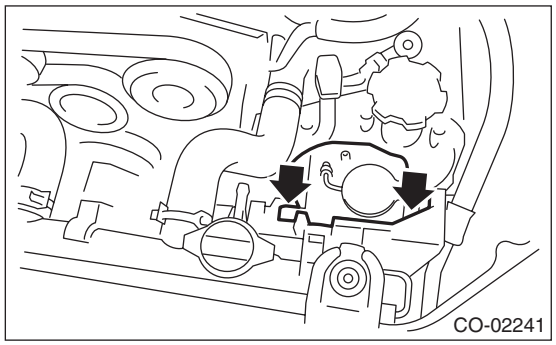


3) Check the fan motor for operations. If it does not operate, check the fan motor.

10.Reservoir Tank

A: REMOVAL

1) Disconnect the over flow hose.
2) Remove the bolts which hold the reservoir tank to the fan shroud, then remove the reservoir tank.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
6.2 N·m (0.63 kgf-m, 4.6 ft-lb)

C: INSPECTION

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

11.Radiator Fan Control Unit

A: SPECIFICATION

Radiator fan control unit forms a unit with radiator sub fan motor. Refer to “Radiator Sub Fan and Fan Motor” for removal and installation procedure. <Ref. to CO(H6DO)-22, REMOVAL, Radiator Sub Fan and Fan Motor.> <Ref. to CO(H6DO)-22, INSTALLATION, Radiator Sub Fan and Fan Motor.> <Ref. to CO(H6DO)-22, DISASSEMBLY, Radiator Sub Fan and Fan Motor.> <Ref. to CO(H6DO)-23, ASSEMBLY, Radiator Sub Fan and Fan Motor.>

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Overheat	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. If still no improvement, inspect, repair or replace the engine related parts.
	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. Slipping clutch	Correct or replace.
	l. Dragging brake	Adjust.
	m. Faulty transmission gear oil	Replace.
	n. 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	Correct or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Correct or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and cylinder block	Correct or replace.
	f. Damaged or cracked thermostat case	Correct or replace.
	g. Leakage from radiator	Correct or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

LUBRICATION

LU(H6DO)

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7.	Oil Pressure Switch	14
8.	Engine Oil Filter	15
9.	Oil Cooler	16
10.	Engine Lubrication System Trouble in General	18

1. General Description

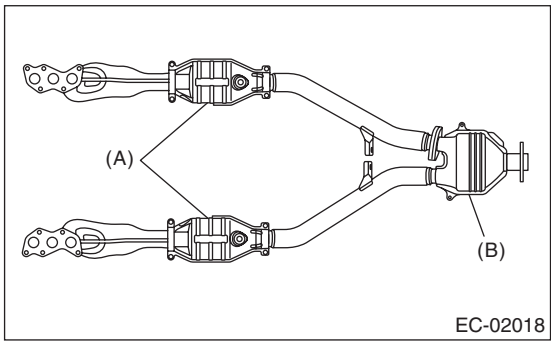
A: CAUTION

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

2. Front Catalytic Converter

A: REMOVAL

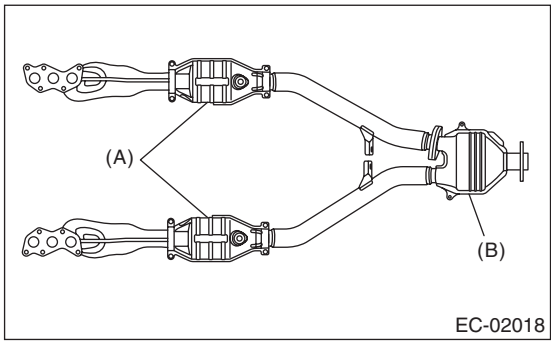
The front and rear catalytic converters are integrated into the front exhaust pipe; therefore, refer to “Front Exhaust Pipe” for the removal procedure. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>



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

B: INSTALLATION

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



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

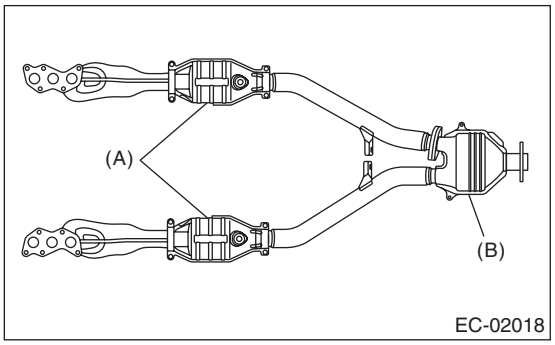
C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Check for hole or rust.

3. Rear Catalytic Converter

A: REMOVAL

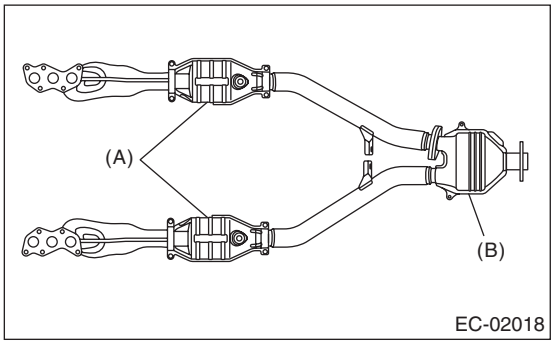
The front and rear catalytic converters are integrated into the front exhaust pipe; therefore, refer to “Front Exhaust Pipe” for the removal procedure. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>



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

B: INSTALLATION

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



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

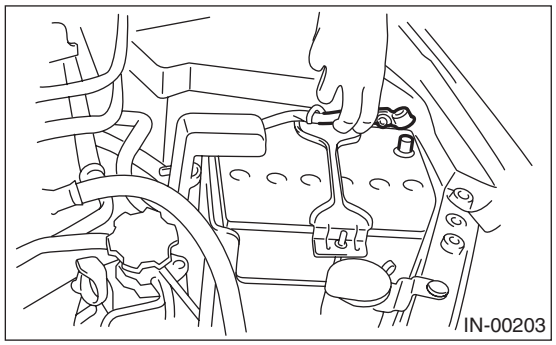
C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Check for hole or rust.

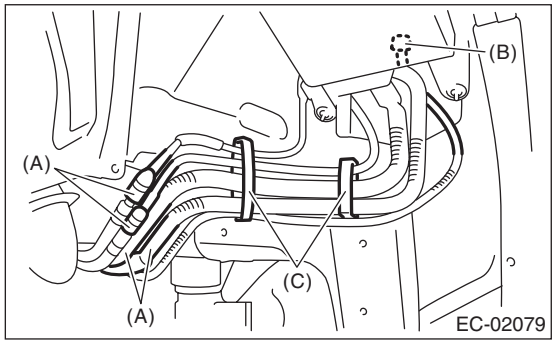
4. Canister

A: REMOVAL

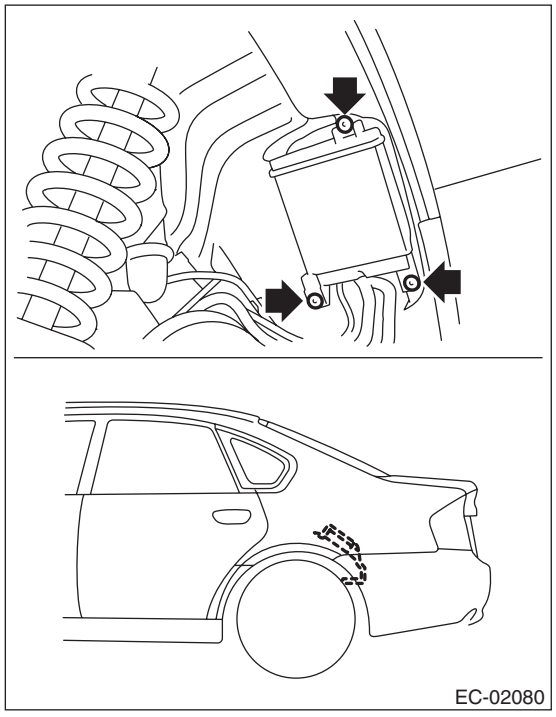
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Lift-up the vehicle.
4) Remove the rear wheel LH.
5) Remove the rear mud guard LH.
6) Disconnect quick connector (A).
7) Disconnect the drain valve connector (B).
8) Remove clip (C).



9) Remove the canister from body.

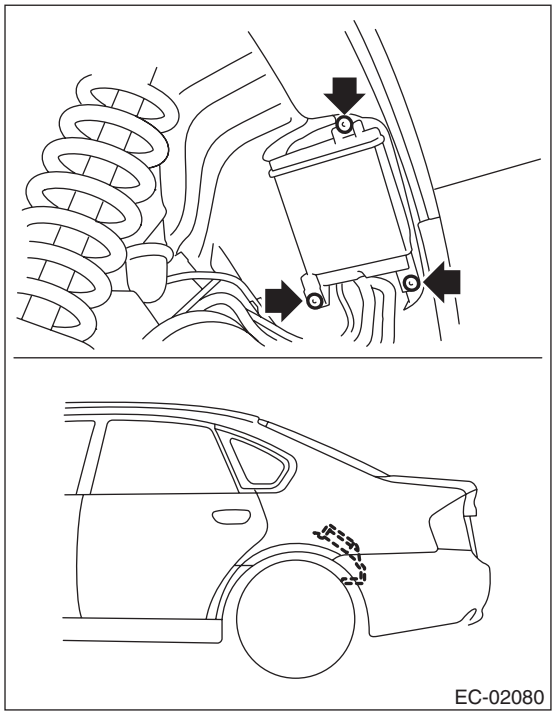


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Check that there is no damage or dust on the quick connector. If necessary, clean the seal surface of the pipe.

Tightening torque:
8.0 N·m (0.82 kgf-m, 5.9 ft-lb)



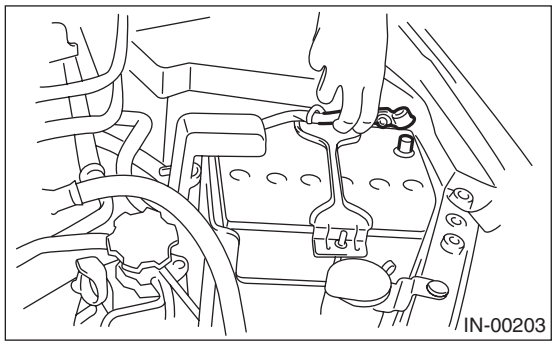
C: INSPECTION

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

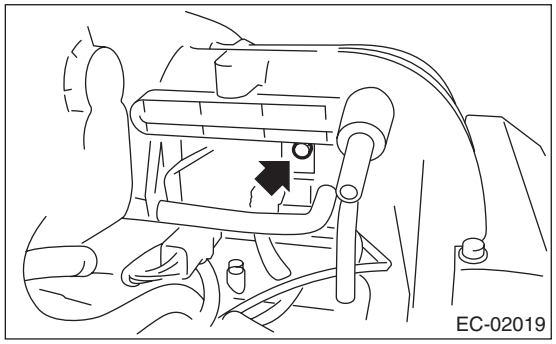
5. Purge Control Solenoid Valve

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



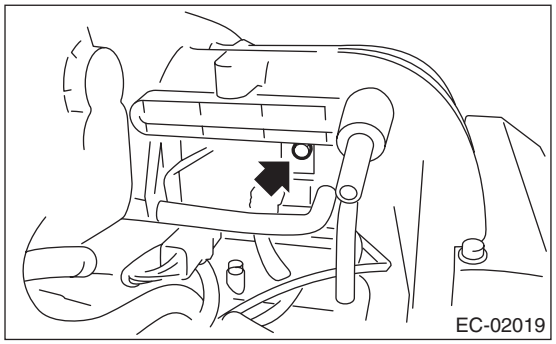
3) Remove the air intake chamber.
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector and hoses of purge control solenoid valve, and then remove the purge control solenoid valve.



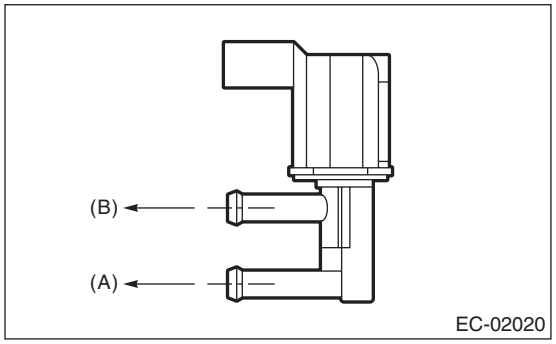
B: INSTALLATION

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.

6. Fuel Level Sensor

A: REMOVAL

For removal procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-51, REMOVAL, Fuel Level Sensor.>

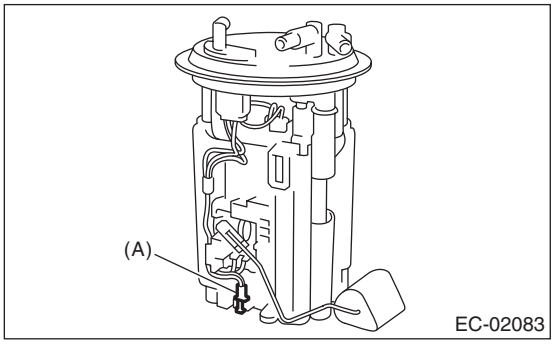
B: INSTALLATION

For installation procedure, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-51, INSTALLATION, Fuel Level Sensor.>

7. Fuel Temperature Sensor

A: REMOVAL

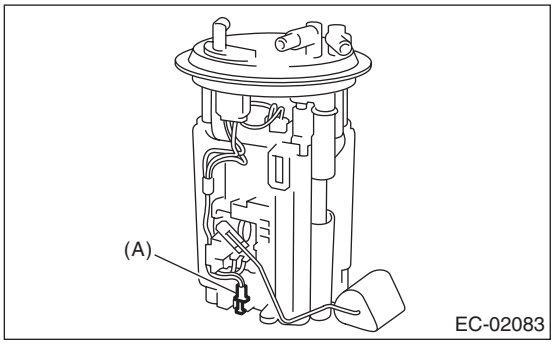
The fuel temperature sensor is integrated into fuel level sensor as one unit; therefore, refer to “Fuel Level Sensor” for removal procedure. <Ref. to FU(H6DO)-51, REMOVAL, Fuel Level Sensor.>



(A) Fuel temperature sensor

B: INSTALLATION

The fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, refer to “Fuel Level Sensor” for installation procedure. <Ref. to FU(H6DO)-51, INSTALLATION, Fuel Level Sensor.>



(A) Fuel temperature sensor

8. Fuel Sub Level Sensor

A: REMOVAL

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

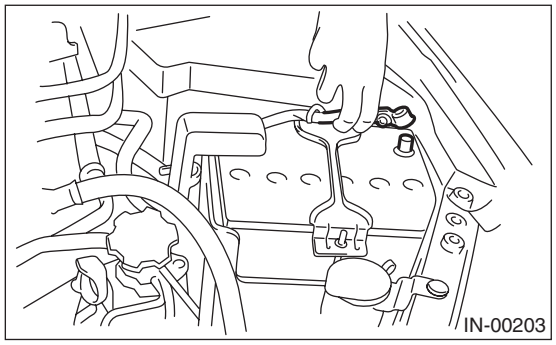
B: INSTALLATION

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

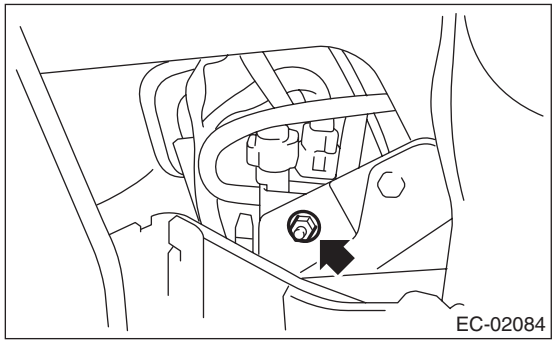
9. Fuel Tank Pressure Sensor

A: REMOVAL

1) Set the vehicle on a lift.
2) Open the fuel filler flap lid, and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



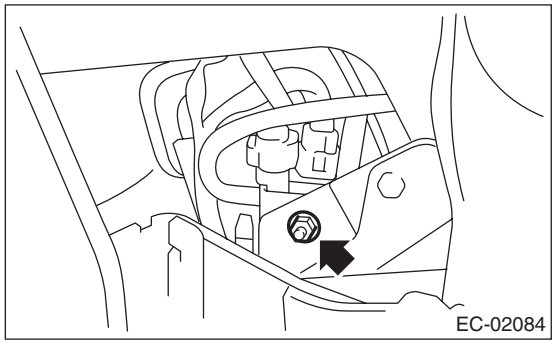
4) Lift-up the vehicle.
5) Disconnect the connector from the fuel tank pressure sensor.
6) Disconnect the pressure hose from the fuel tank pressure sensor.
7) Remove the fuel tank pressure sensor along with the bracket.



B: INSTALLATION

Install in the reverse order of removal.

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



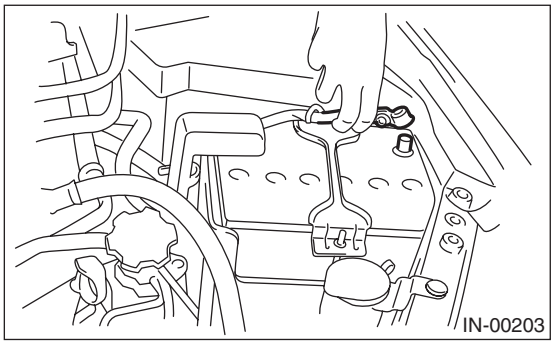
C: INSPECTION

Make sure the hoses are not cracked or loose.

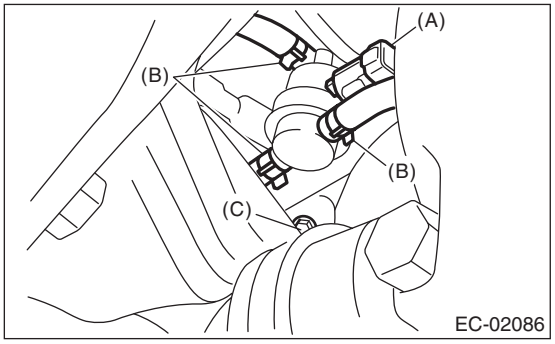
10.Pressure Control Solenoid Valve

A: REMOVAL

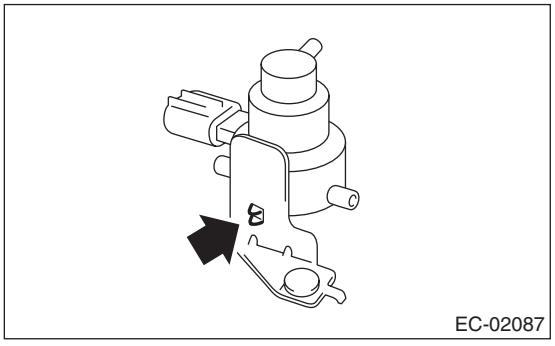
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Lift-up the vehicle.
4) Disconnect connector (A) from the pressure control solenoid valve.
5) Disconnect the evaporation hose (B) from the pressure control solenoid valve.
6) Remove the bolts (C) which secure the bracket to the fuel tank.



7) Remove the pressure control solenoid valve from the bracket.



B: INSTALLATION

Install in the reverse order of removal.

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

C: INSPECTION

Make sure the hoses are not cracked or loose.

11.Drain Filter

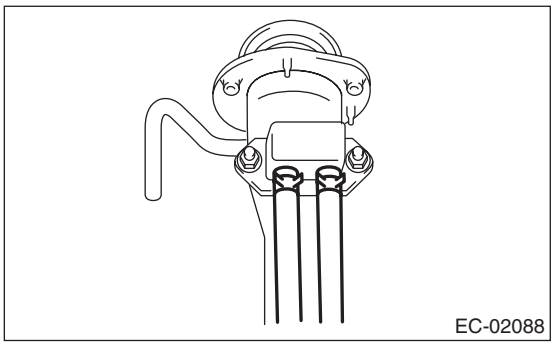
A: SPECIFICATION

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)-5, REMOVAL, Canister.> <Ref. to EC(H6DO)-5, INSTALLATION, Canister.>

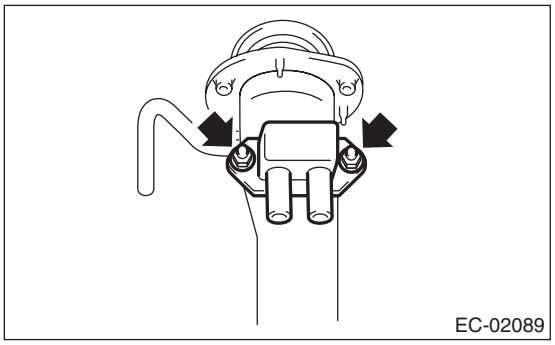
12.Shut Valve

A: REMOVAL

1) Remove the fuel filler pipe.
<Ref. to FU(H6DO)-46, REMOVAL, Fuel Filler Pipe.>
2) Disconnect the evaporation hose from the shut valve.



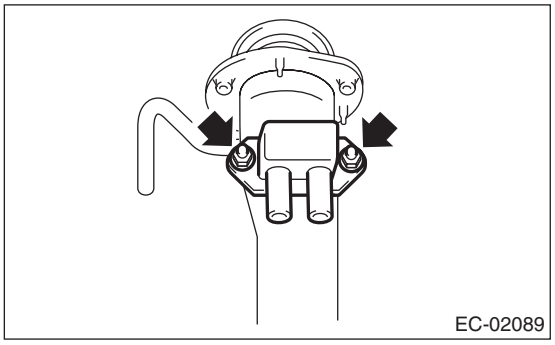
3) Remove the shut valve from the fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

13.Drain Valve

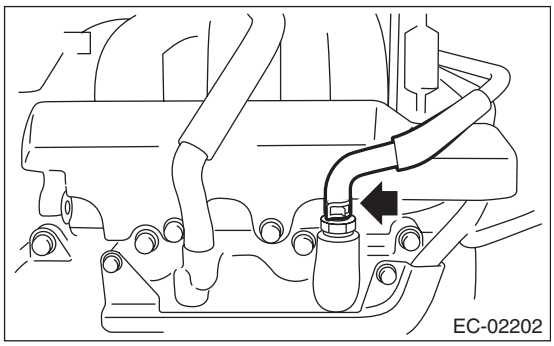
A: SPECIFICATION

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)-5, REMOVAL, Canister.> <Ref. to EC(H6DO)-5, INSTALLATION, Canister.>

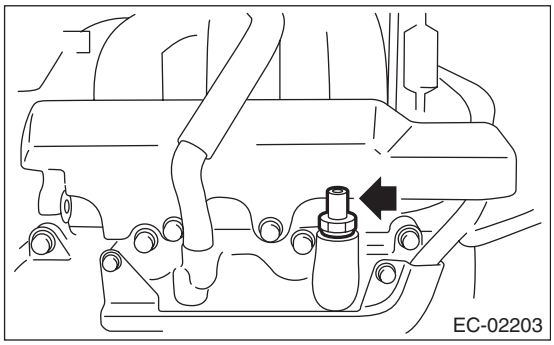
14.PCV Valve

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)

Tightening torque:
25 N·m (2.5 kgf-m, 18 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 6
5. Air Intake Duct 7
6. Resonator Chamber 8

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)-67, 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)-344, INSPECTION, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and run the Subaru Select Monitor or general scan tool. 4) Read the DTC on Subaru Select Monitor or general scan tool.	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Record the DTC. Repair the trouble cause. <Ref. to EN(H6DO)(diag)-80, List of Diagnostic Trouble Code (DTC).> Go to step **4**.	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)-58, Malfunction Indicator Light.>
4	**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)-43, 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)-88, 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.

<table>
<tr><td>Customer's name</td><td></td><td>Engine No.</td><td></td></tr>
<tr><td>Date of purchase</td><td></td><td>Fuel brand</td><td></td></tr>
<tr><td>Date of repair</td><td></td><td rowspan="2">Odometer reading</td><td>km</td></tr>
<tr><td>V.I.N.</td><td></td><td>miles</td></tr>
<tr><td>Weather</td><td colspan="3">❑ Fine
❑ Cloudy
❑ Rainy
❑ Snowy
❑ Various/Others:</td></tr>
<tr><td rowspan="2">Ambient air temperature</td><td>°C (°F)</td><td colspan="2"></td></tr>
<tr><td colspan="3">❑ Hot
❑ Warm
❑ Cool
❑ Cold</td></tr>
<tr><td>Place</td><td colspan="3">❑ Highway
❑ Suburbs
❑ Inner city
❑ Uphill
❑ Downhill
❑ Rough road
❑ Others:</td></tr>
<tr><td>Engine temperature</td><td colspan="3">❑ Cold
❑ Warming-up
❑ After warming-up
❑ Any temperature
❑ Others:</td></tr>
<tr><td>Engine speed</td><td>rpm</td><td colspan="2"></td></tr>
<tr><td>Vehicle speed</td><td>km/h (MPH)</td><td colspan="2"></td></tr>
<tr><td>Driving conditions</td><td colspan="3">❑ Not affected
❑ At starting
❑ While idling
❑ At racing
❑ While accelerating
❑ While cruising
❑ While decelerating
❑ While turning (RH/LH)</td></tr>
<tr><td>Headlight</td><td>❑ ON/❑ OFF</td><td>Rear defogger</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>Blower</td><td>❑ ON/❑ OFF</td><td>Audio</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>A/C compressor</td><td>❑ ON/❑ OFF</td><td>Car phone</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>Radiator fan</td><td>❑ ON/❑ OFF</td><td colspan="2"></td></tr>
<tr><td>Front wiper</td><td>❑ ON/❑ OFF</td><td colspan="2"></td></tr>
<tr><td>Rear wiper</td><td>❑ ON/❑ OFF</td><td colspan="2"></td></tr>
</table>

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 illuminate. ❑ Yes / ❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostic indicator light ❑ ABS warning light ❑ Oil pressure indicator light
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:
• All airbag system wiring harnesses and connectors are yellow. Do not use electrical test equipment on these 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(H4DOTC)(diag)-56, Clear Memory Mode.>

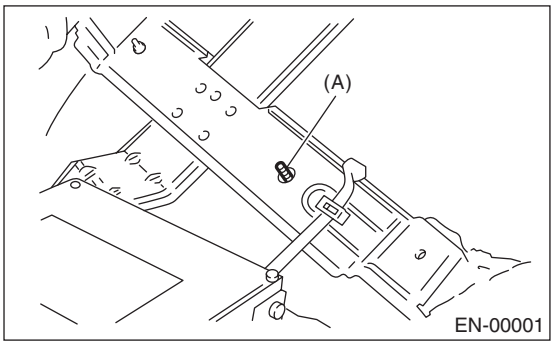
5) Measure the voltage or resistance of individual sensor or all electrical control modules using a tapered pin with a diameter of less than 0.6 mm (0.024 in). Do not insert the pin 4 mm (0.16 in) or more into the part.

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”.

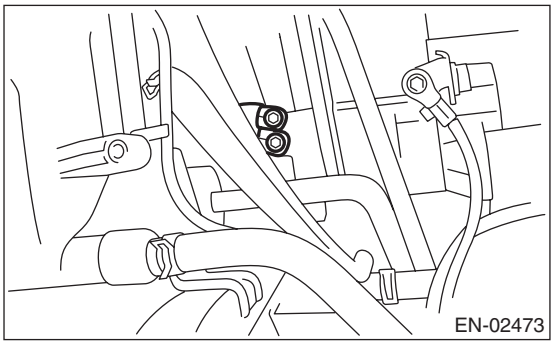
6) Connectors of each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. Even if the connectors are waterproof, take care not to allow water to get into them when washing the vehicle, or when servicing the vehicle in rainy weather.

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

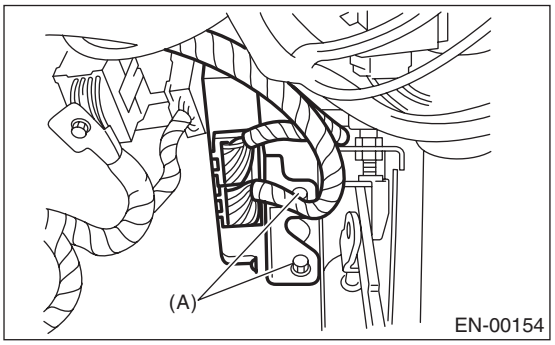


(A) Stud bolt

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



9) Use TCM mounting stud bolts at the body side grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

10) Every MFI-related part is a precision part. Do not drop them.

11) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from control unit. (The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• 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.
12) Before disconnecting the fuel hoses, disconnect the fuel pump connector and crank the engine for 5 seconds or more to release the pressure of fuel system. If engine starts during this operation, run it until it stops.
13) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic throttle control system, the transmission body, or by a combination of these. These three causes (engine, electrical control system, transmission) must be distinguished clearly when performing diagnostics.
14) When performing the diagnosis, start with simple and easy operations and proceed to more complicated and harder operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes (engine, electrical control system, transmission).
15) In AT models, do not continue the stall for five seconds or more at a time. (from closed throttle, fully open throttle to stall speed reading, and then decrease engine speed.).
16) For the model with ABS, the ABS 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.

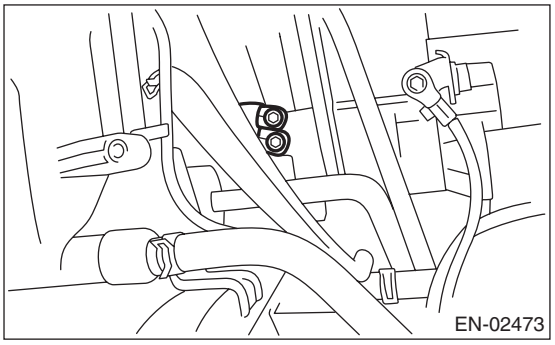
Standard voltage: 12 V

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

1. GENERAL DESCRIPTION

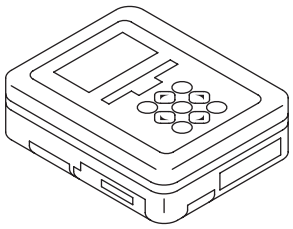
• The on-board diagnostic (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic throttle control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the 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 first when it detects a malfunction.
• If the OBD system detects malfunctions such as the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or 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.

2. ENGINE AND EMISSION CONTROL SYSTEM

• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Furthermore, all operating conditions of the engine are converted into electronic signals, and this enables additional system features with greatly improved adaptability, making it easier to add compensation features.
The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduction in fuel consumption
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

D: PREPARATION TOOL

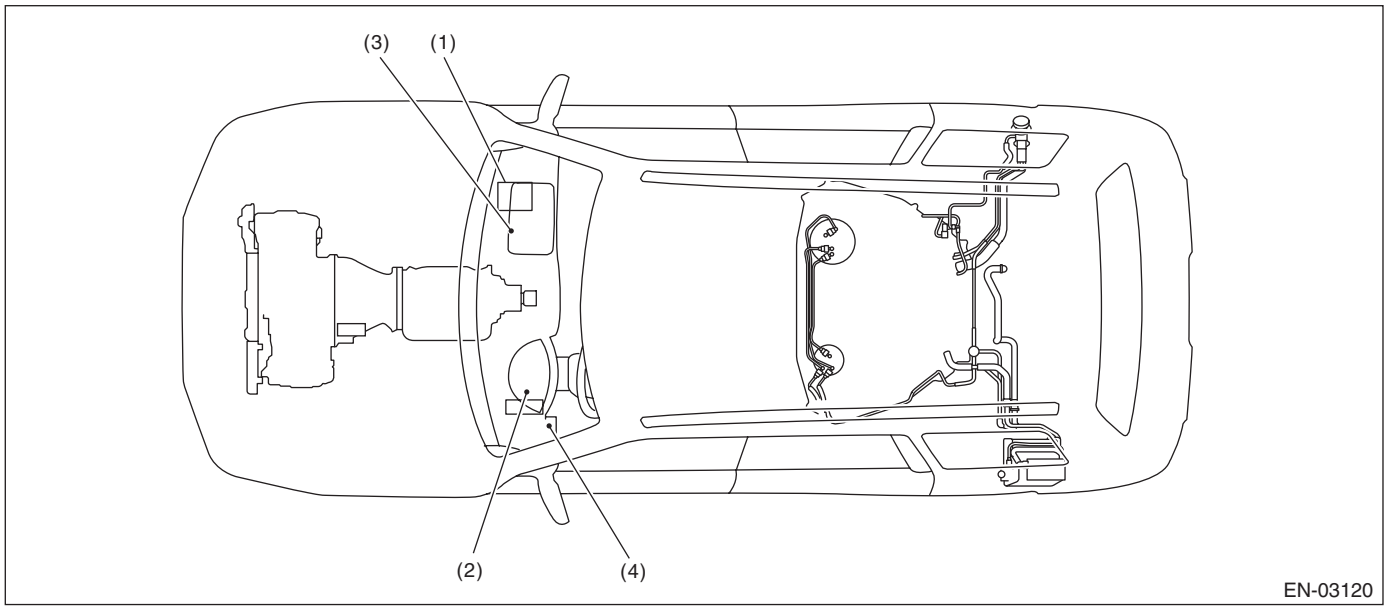
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting the electrical system.

4. Electrical Component Location

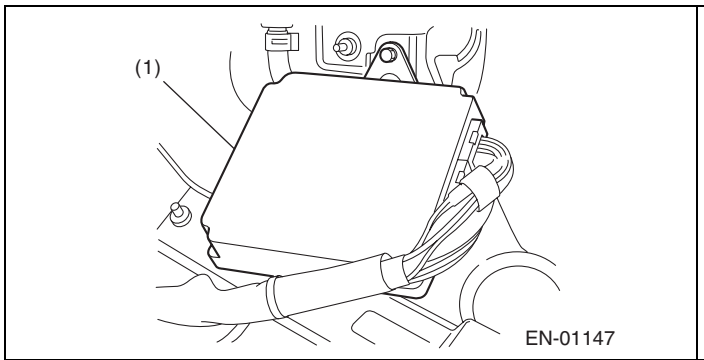
A: LOCATION

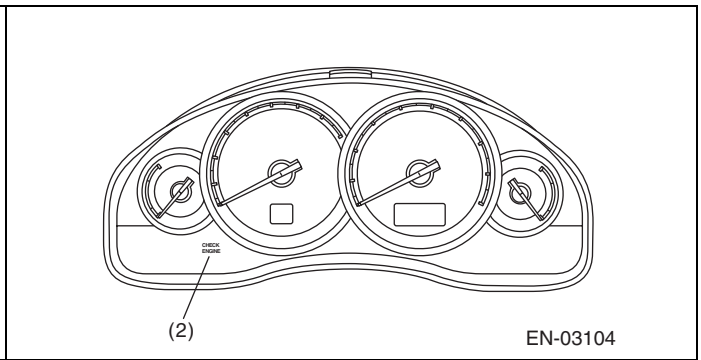
1. ENGINE

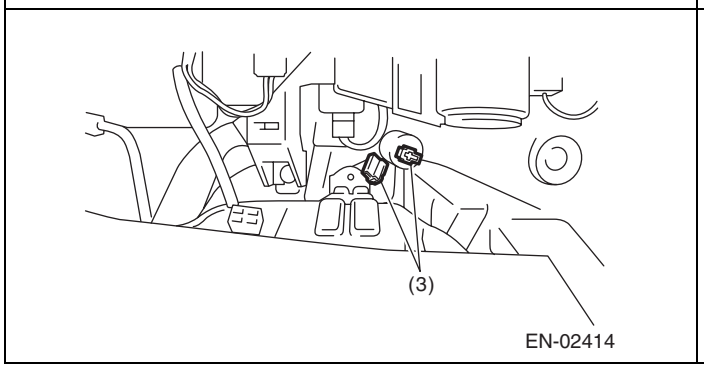
- Control module

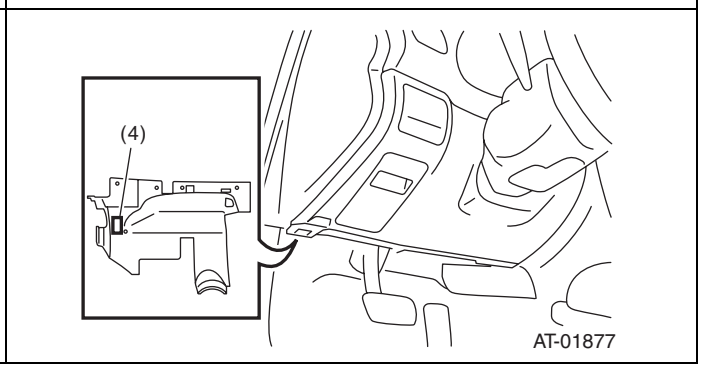


(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Test mode connector
(4) Data link connector

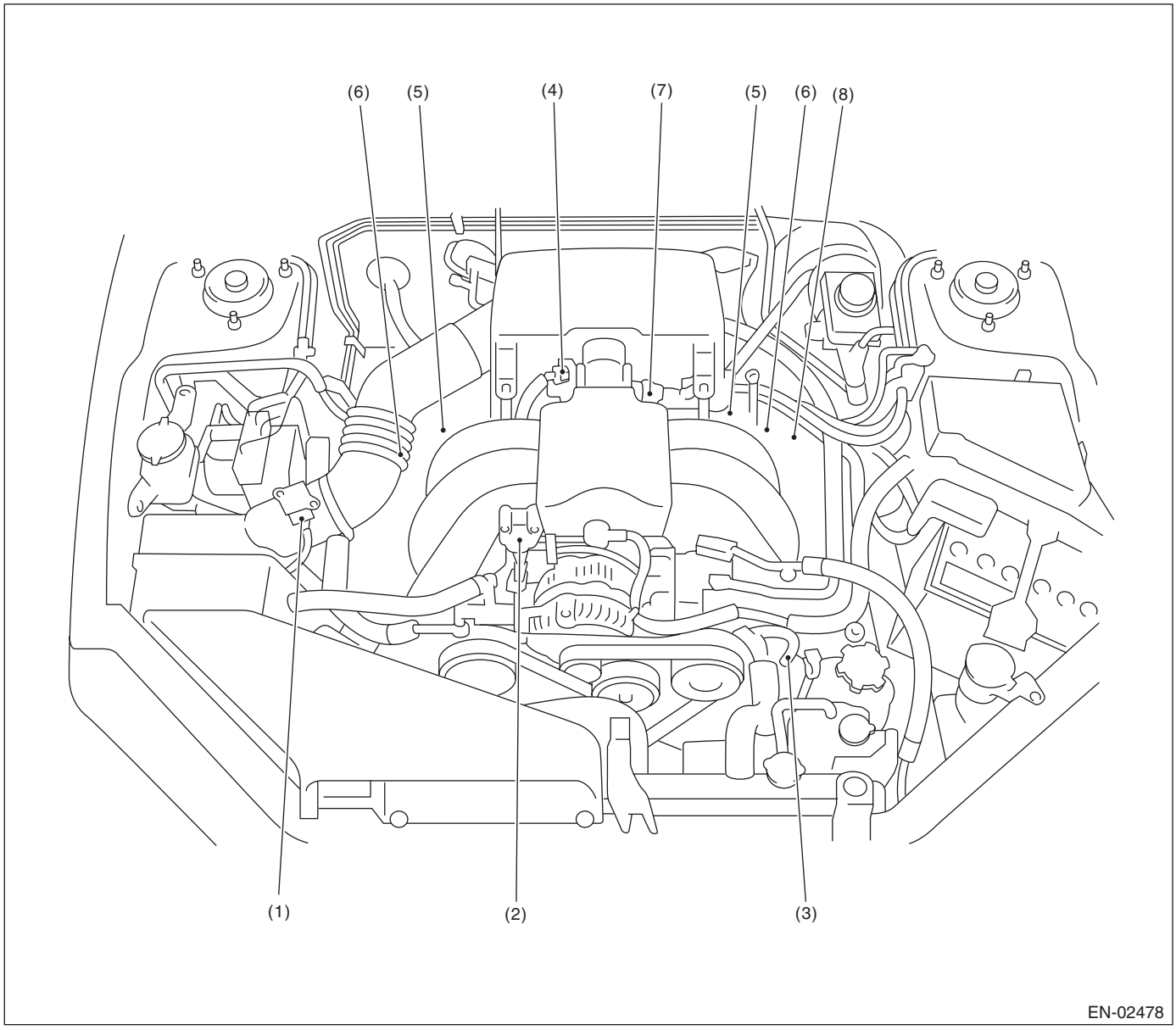




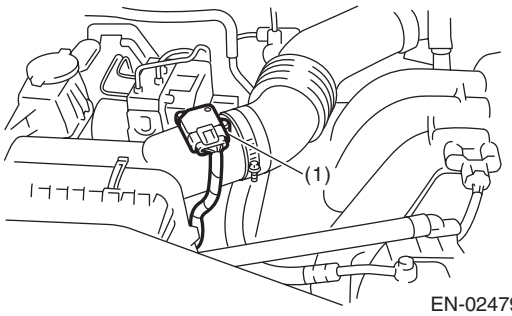




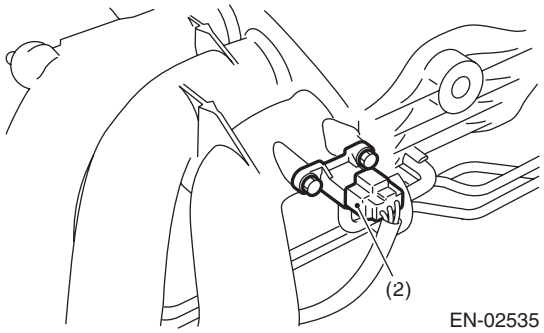
- Sensor



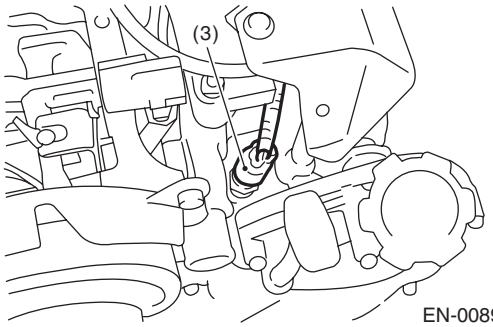
(1) Mass air flow and intake air temperature sensor
(2) Manifold absolute pressure sensor
(3) Engine coolant temperature sensor
(4) Electronic throttle
(5) Knock sensor
(6) Camshaft position sensor
(7) Crankshaft position sensor
(8) Oil temperature sensor



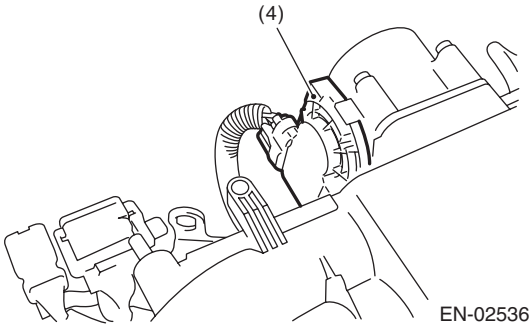
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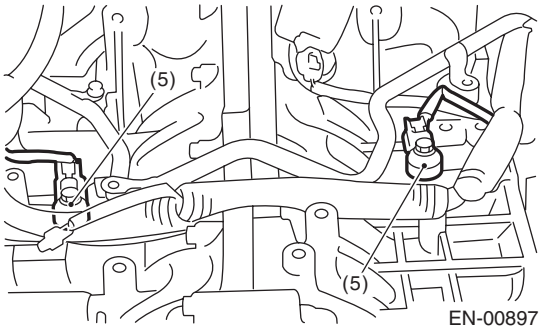
EN-02535



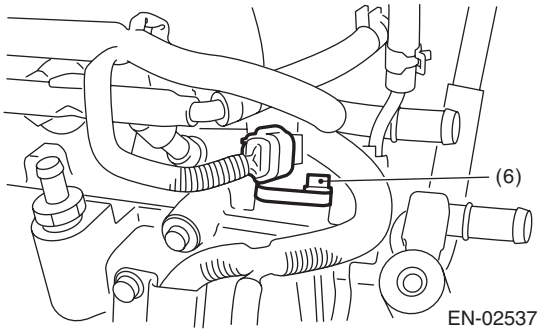
EN-00895



EN-02536



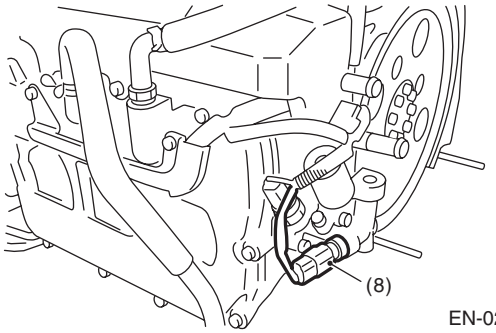
EN-00897



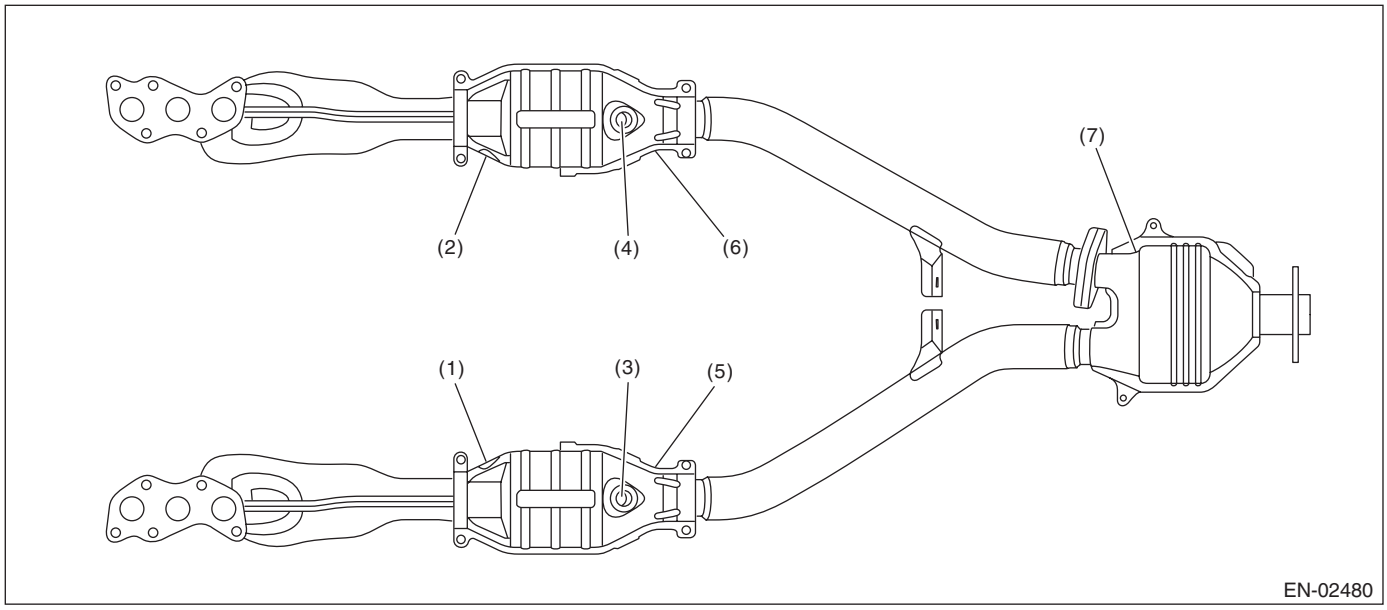
EN-02537



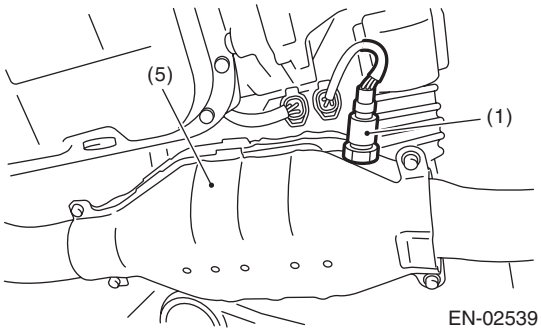
EN-00899

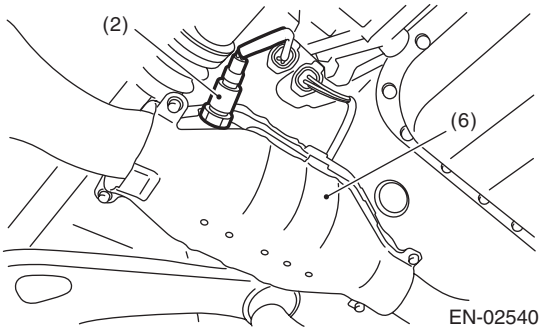


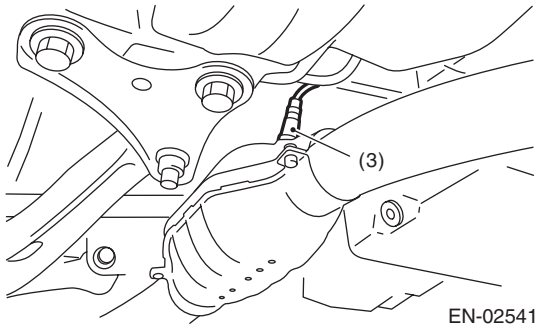
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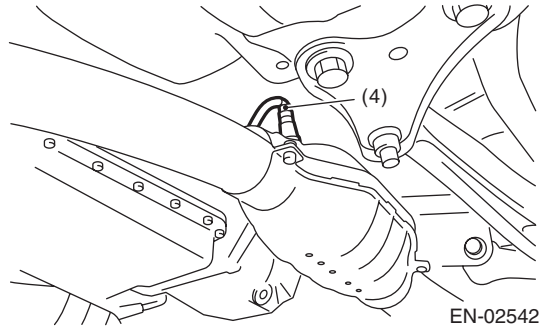


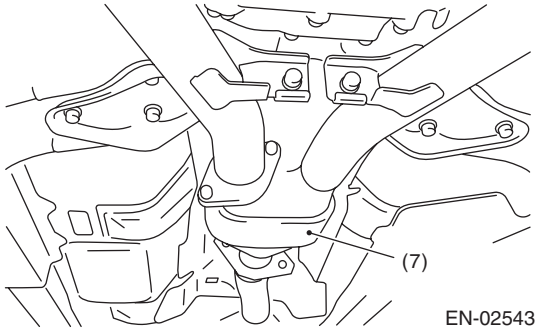
(1) Front oxygen (A/F) sensor LH
(2) Front oxygen (A/F) sensor RH
(3) Rear oxygen sensor LH
(4) Rear oxygen sensor RH
(5) Front catalytic converter LH
(6) Front catalytic converter RH
(7) Rear catalytic converter

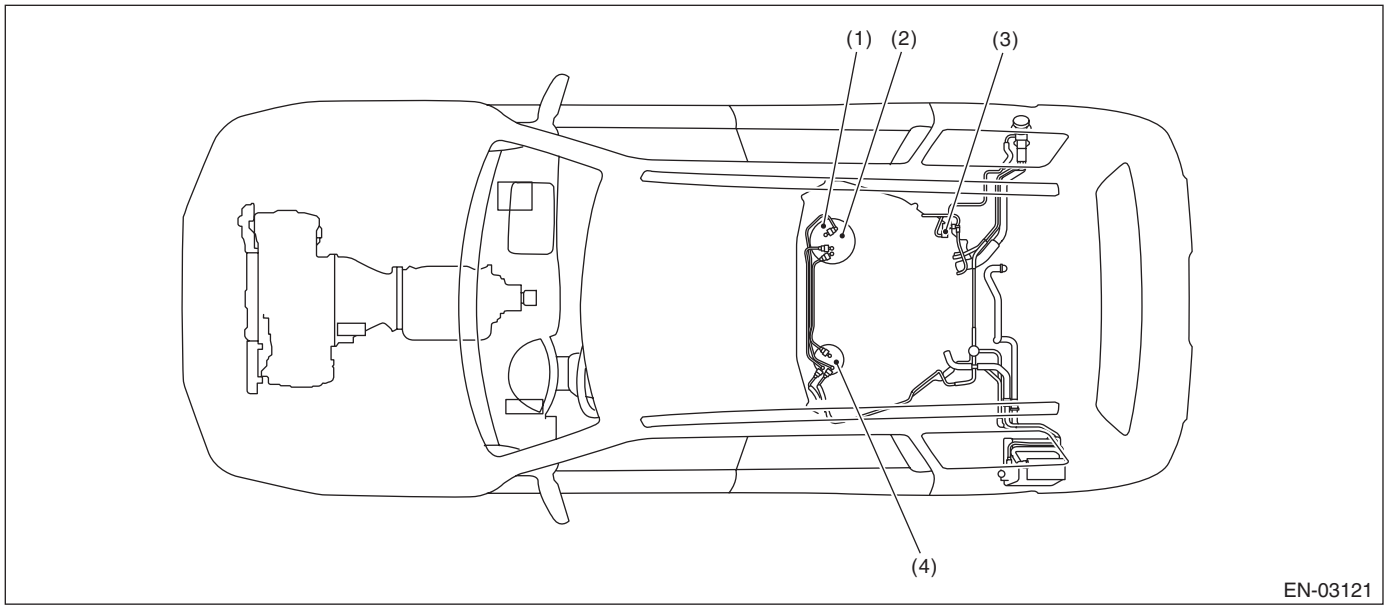




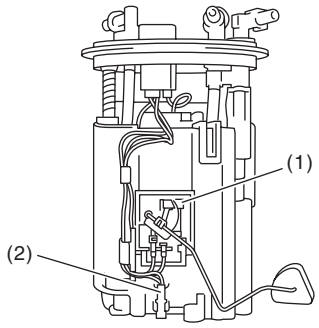


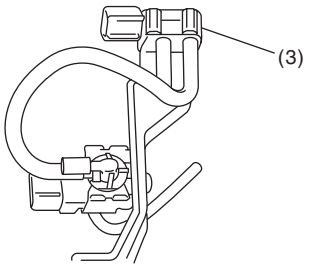


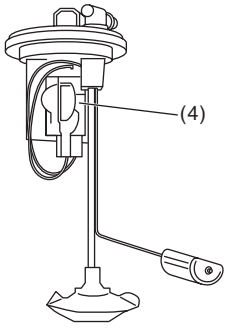




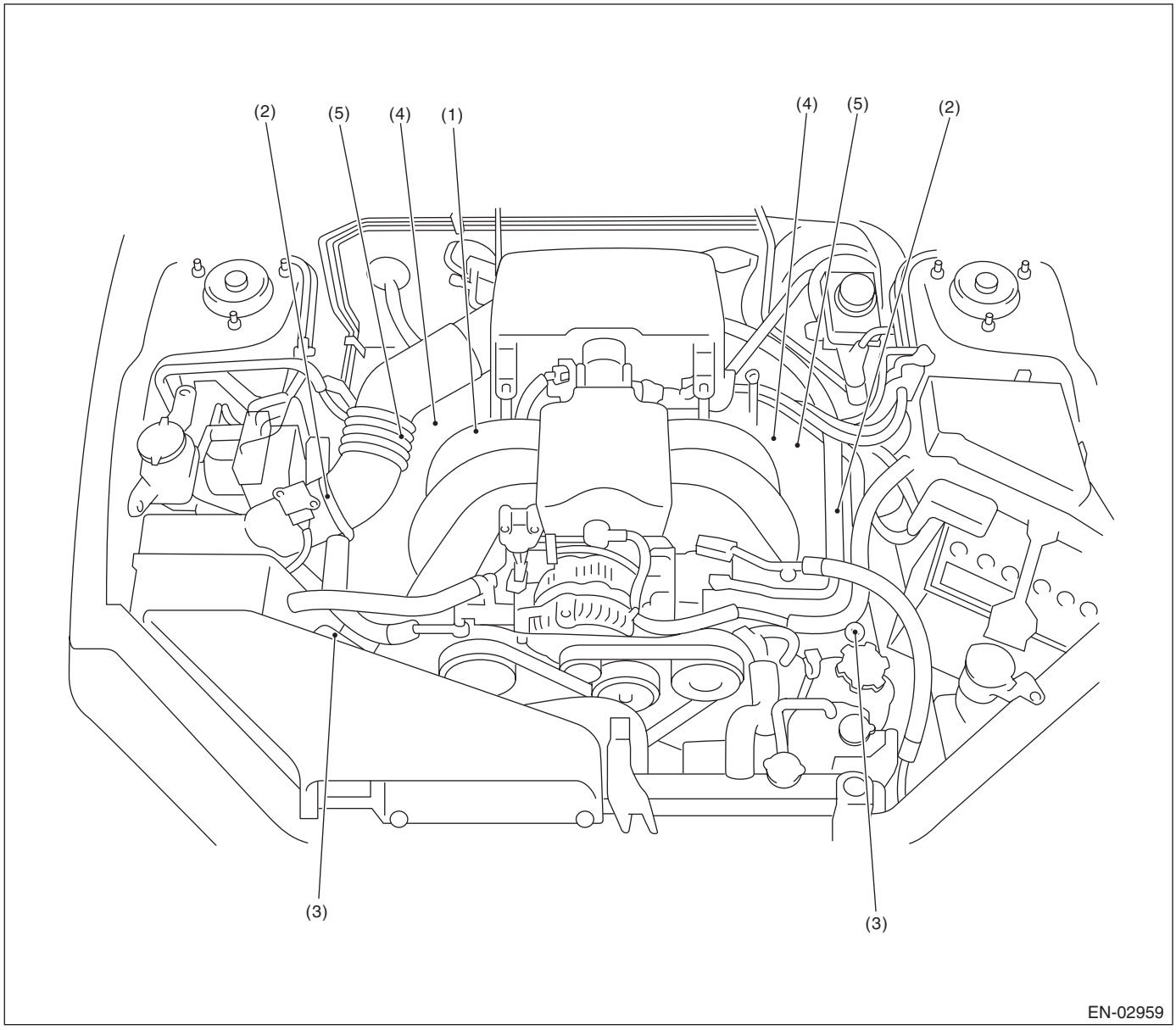
(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor



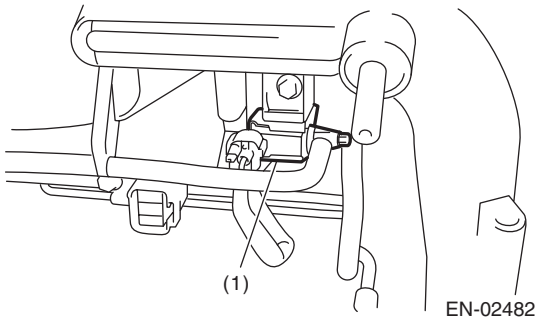


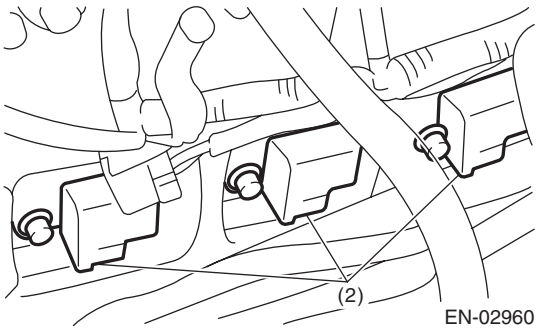


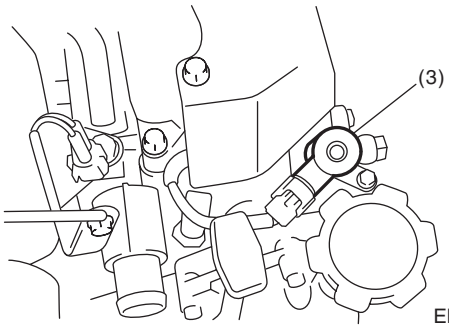
- Solenoid valve, actuator, emission control system parts and ignition system parts

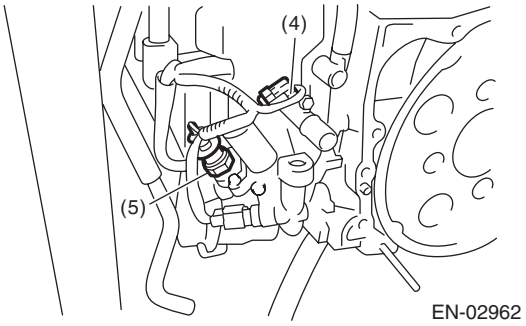


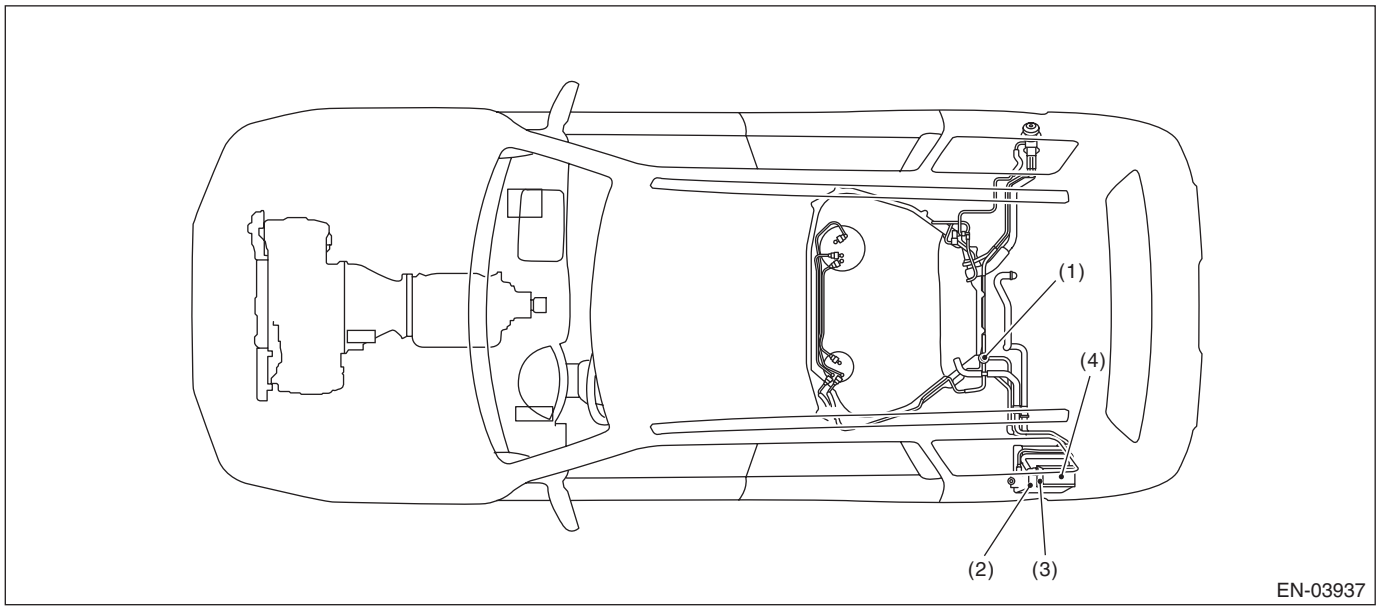
(1) Purge control solenoid valve
(2) Ignition coil and ignitor ASSY
(3) Oil flow control solenoid valve
(4) Oil switching solenoid valve
(5) Variable valve lift diagnosis oil pressure switch



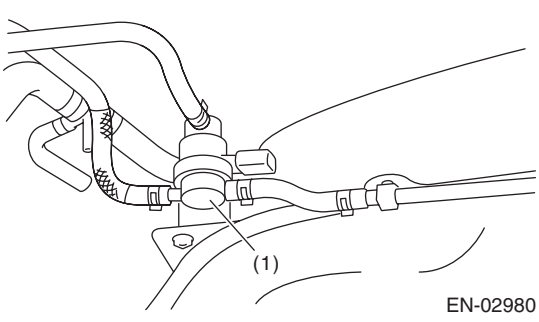


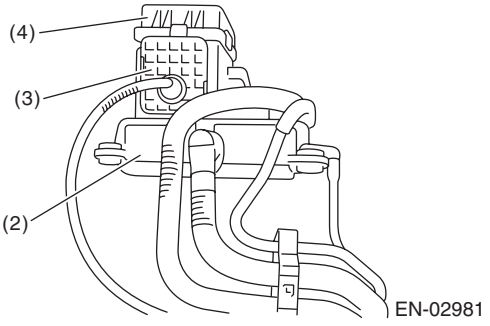


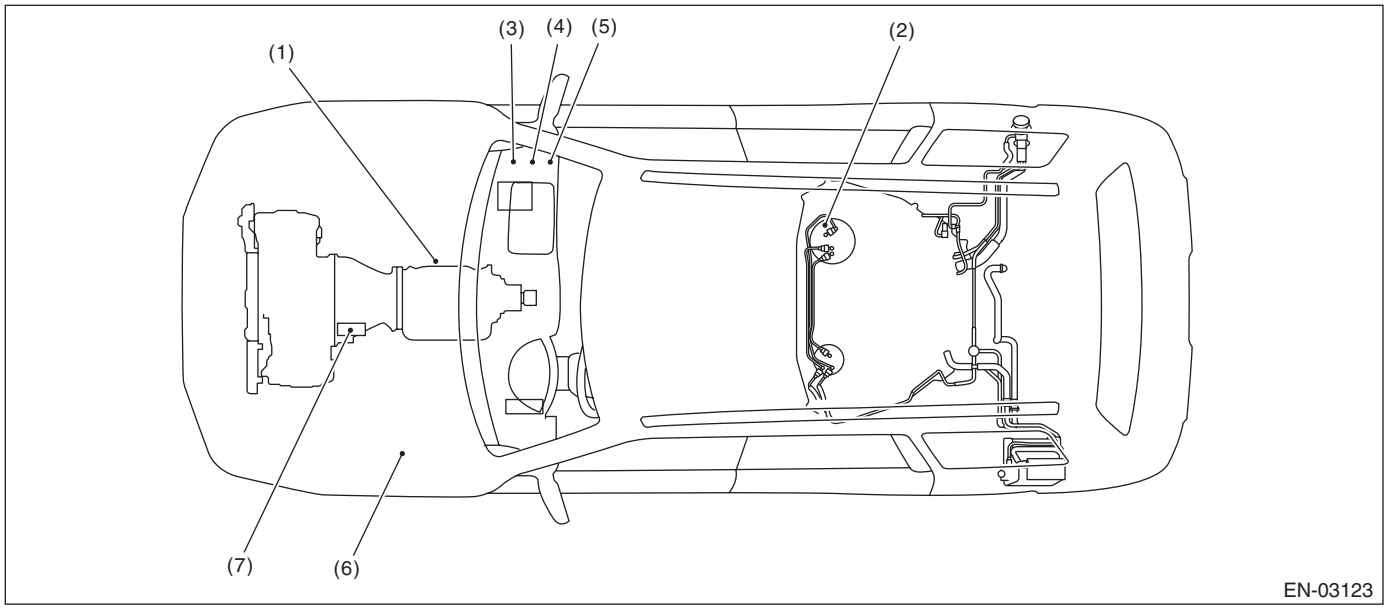




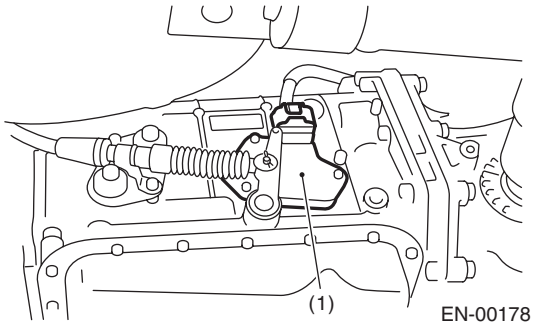
(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter

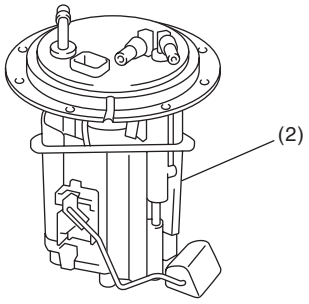


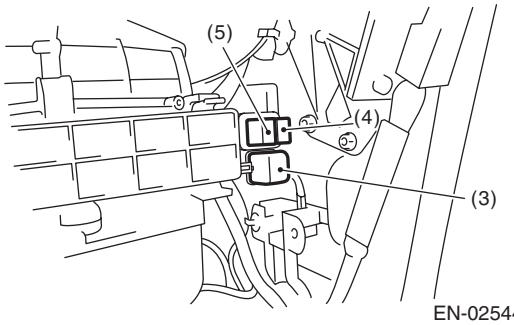


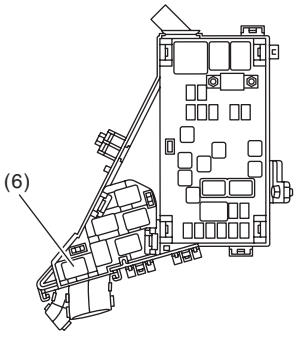


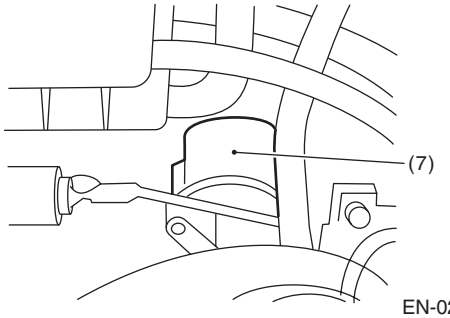
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Electronic throttle control relay
(6) Radiator fan relay
(7) Starter





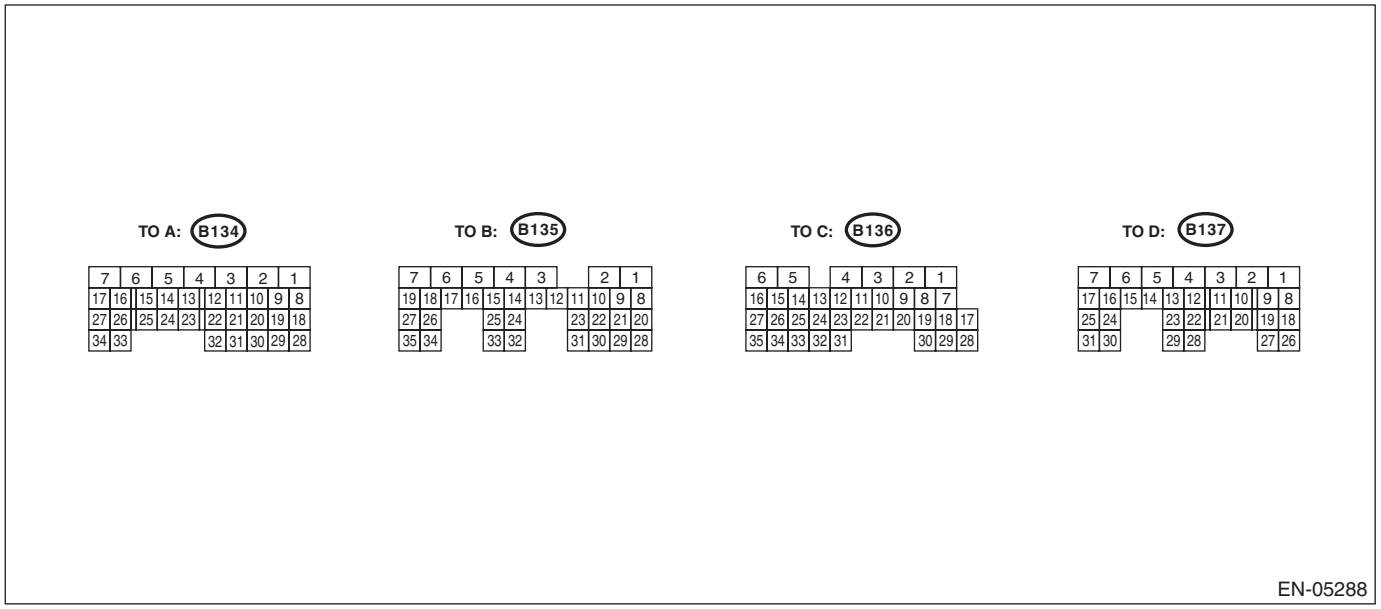






5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



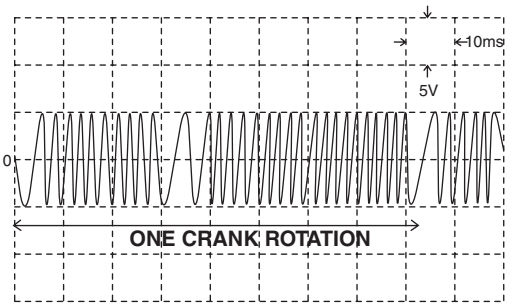
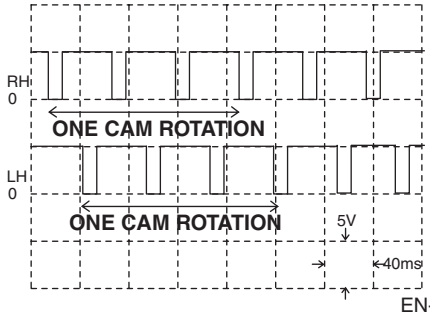
Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B134	13	0	–7 — +7	Waveform
	Signal (–)	B134	14	0	0	—
	Shield	B134	24	0	0	—
Camshaft position sensor (LH)	Power supply	B134	21	0.275	0 or 5	Waveform
	GND	B134	22	0	0	—
Camshaft position sensor (RH)	Power supply	B134	11	0.275	0 or 5	Waveform
	GND	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	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	When ignition switch is turned to ON: ON

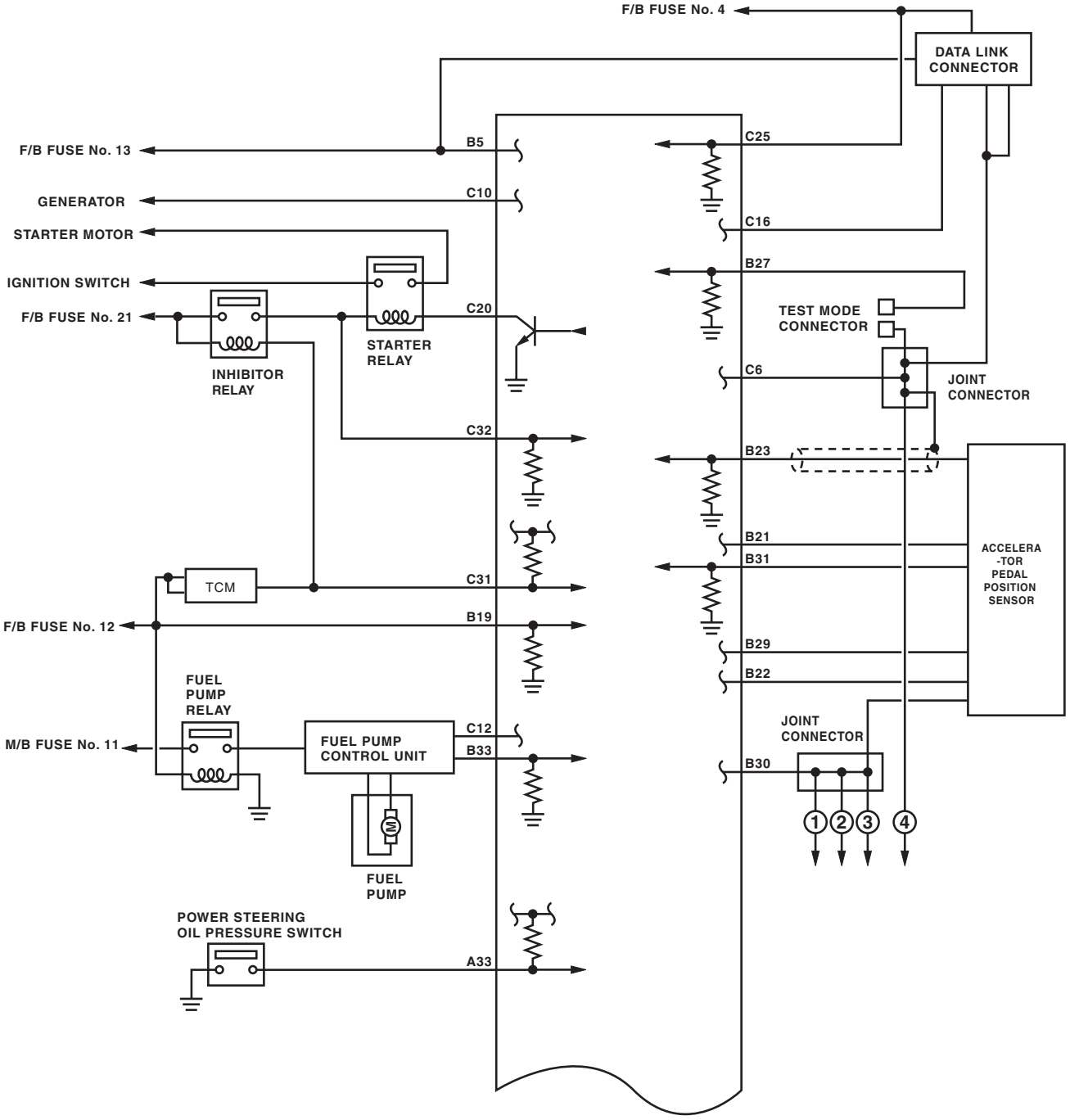
Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Accelerator pedal position sensor	Main sensor signal	B135	23	Fully closed: 1 Fully opened: 3.6	Fully closed: 1 Fully opened: 3.3	—
	Main power supply	B135	21	5	5	—
	GND (main sensor)	B135	29	0	0	—
	Sub sensor signal	B135	31	Fully closed: 1 Fully opened: 3.7	Fully closed: 1 Fully opened: 3.3	—
	Sub power supply	B135	22	5	5	—
	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: 12 — 14	—
A/C switch		B136	24	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
A/C lock sensor		B135	14	Duty waveform	Duty waveform	—
A/C middle pressure switch		B136	33	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Ignition switch		B135	19	10 — 13	12 — 14	—
Neutral position switch		B136	31	ON: 0 OFF: 12±0.5		Switch is ON when select lever is shifted into “P” or “N” range.
Test mode connector		B135	27	12 — 14	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	12 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B135	2	10 — 13	12 — 14	—
		B134	7	10 — 13	12 — 14	—
Sensor power supply		B134	19	5	5	—
Ignition control	#1	B137	18	0	0 — 14	Waveform
	#2	B137	19	0	0 — 14	Waveform
	#3	B137	20	0	0 — 14	Waveform
	#4	B137	21	0	0 — 14	Waveform
	#5	B137	22	0	0 — 14	Waveform
	#6	B137	23	0	0 — 14	Waveform
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: 12 — 14	—

Engine Control Module (ECM) I/O Signal

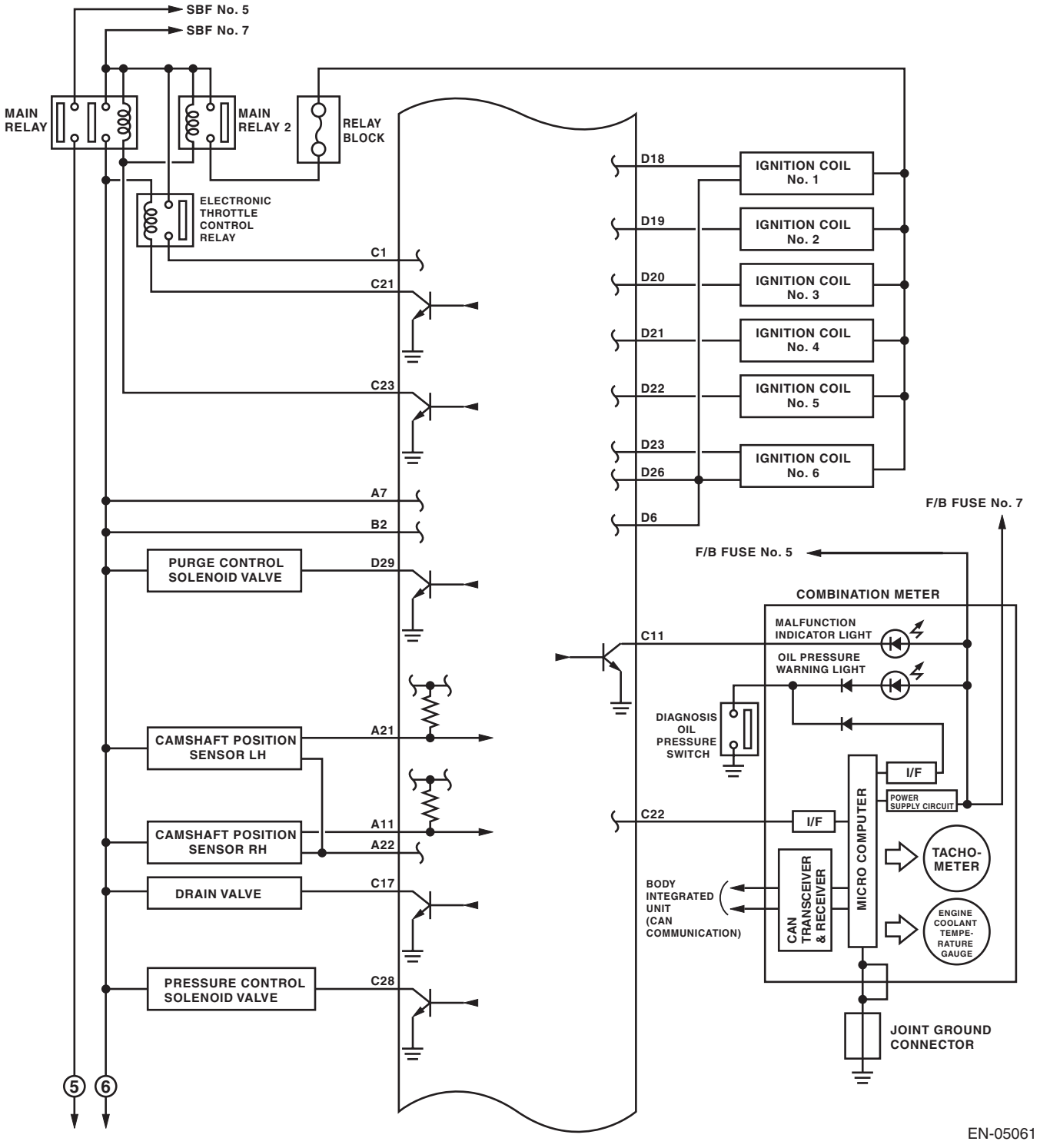
Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Radiator fan control		B136	18	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan control power supply		B136	29	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Self-shutoff 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: 12 — 14	—
Power steering switch		B134	33	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 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	—
Fuel pump control unit	Signal 1	B135	33	0	12 — 14	—
	Signal 2	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: 12 — 14	—
Brake switch 2		B135	28	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 12 — 14 When brake pedal is released: 0	—

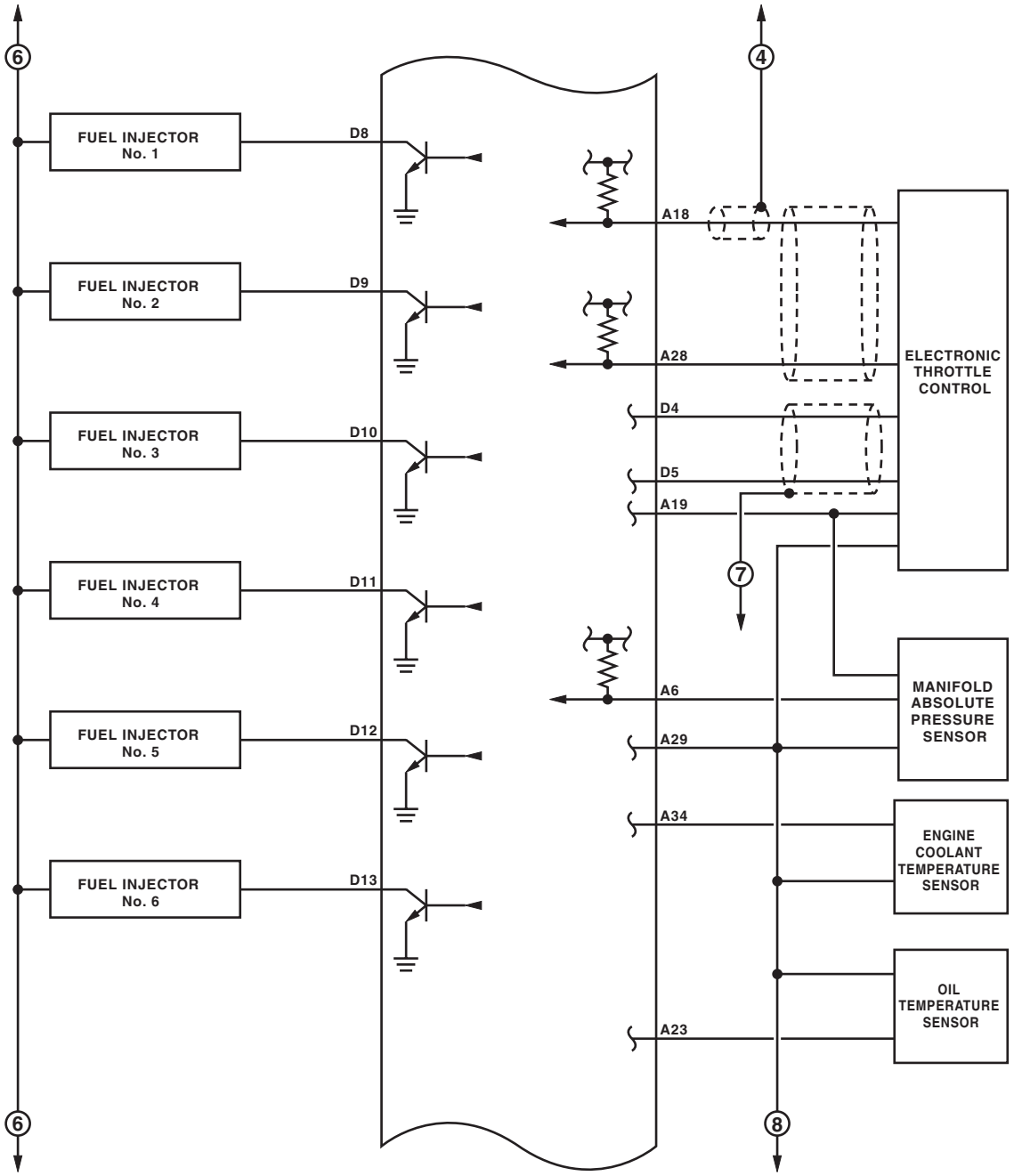
Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Cruise control command switch		B135	24	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/ COAST: 0.5 — 1.5 When operating cancel: 0 — 0.5	When operating nothing: 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	—
Oil flow control solenoid valve RH	Signal (+)	B137	17	0	0.6	—
	Signal (–)	B137	16	0	0	—
Oil flow control solenoid valve LH	Signal (+)	B137	15	0	0.6	—
	Signal (–)	B137	14	0	0	—
Oil switching solenoid valve RH	Signal (+)	B137	25	0	1.9	—
	Signal (–)	B137	24	0	0	—
Oil switching solenoid valve LH	Signal (+)	B137	31	0	1.9	—
	Signal (–)	B137	30	0	0	—
Oil temperature sensor signal		B134	23	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
Variable valve lift diagnosis oil pressure switch RH		B134	31	0	0	—
Variable valve lift diagnosis oil pressure switch LH		B134	32	0	0	—
Generator control		B136	10	0 — 6.5	0 — 6.5	—
SSM communication line		B136	16	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—
GND (sensor)		B135	30	0	0	—
GND (ignition system)	Ignition 1	B137	26	0	0	—
	Ignition 2	B137	6	0	0	—
GND	Engine 1	B134	5	0	0	—
	Engine 2	B137	7	0	0	—
	Engine 3	B137	2	0	0	—
	Engine 4	B137	1	0	0	—
	Engine 5	B137	3	0	0	—
	Engine 6	B134	3	0	0	—
	Body	B136	6	0	0	—
Sensor GND (engine side)		B134	29	0	0	—
Fuel tank pressure sensor		B135	32	2.3	2.7	—
Pressure control solenoid valve		B136	28	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Drain valve		B136	17	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 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 — 4.5	2.0 — 4.5	Waveform
CAN communication (–)		B136	35	0.5 — 3.0	0.5 — 3.0	Waveform

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

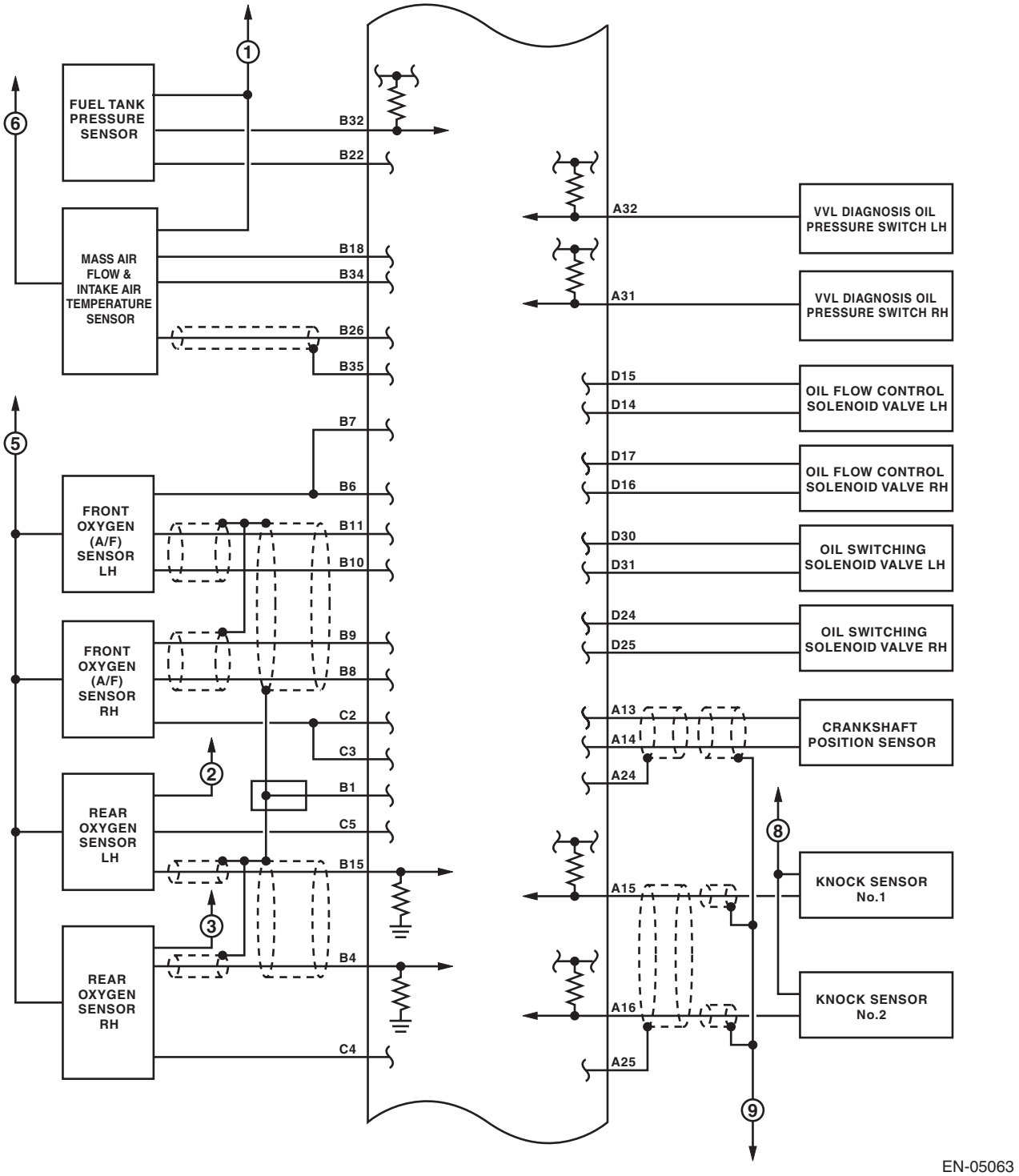

F/B FUSE No. 4
DATA LINK CONNECTOR
F/B FUSE No. 13
B5
C25
GENERATOR
C10
C16
STARTER MOTOR
IGNITION SWITCH
B27
F/B FUSE No. 21
C20
TEST MODE CONNECTOR
STARTER RELAY
INHIBITOR RELAY
C6
JOINT CONNECTOR
C32
B23
ACCELERA -TOR PEDAL POSITION SENSOR
B21
B31
TCM
C31
F/B FUSE No. 12
B19
B29
B22
FUEL PUMP RELAY
JOINT CONNECTOR
M/B FUSE No. 11
FUEL PUMP CONTROL UNIT
C12
B33
B30
1
2
3
4
FUEL PUMP
POWER STEERING OIL PRESSURE SWITCH
A33

EN-05060


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
CAMSHAFT POSITION SENSOR LH
A21
CAMSHAFT POSITION SENSOR RH
A11
A22
DRAIN VALVE
C17
PRESSURE CONTROL SOLENOID VALVE
C28
5
6
D18
D19
D20
D21
D22
D23
D26
D6
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
C11
MALFUNCTION INDICATOR LIGHT
OIL PRESSURE WARNING LIGHT
DIAGNOSIS OIL PRESSURE SWITCH
C22
I/F
POWER SUPPLY CIRCUIT
MICRO COMPUTER
CAN TRANSCEIVER & RECEIVER
BODY INTEGRATED UNIT (CAN COMMUNICATION)
TACHO-METER
ENGINE COOLANT TEMPE-RATURE GAUGE
JOINT GROUND CONNECTOR
EN-05061

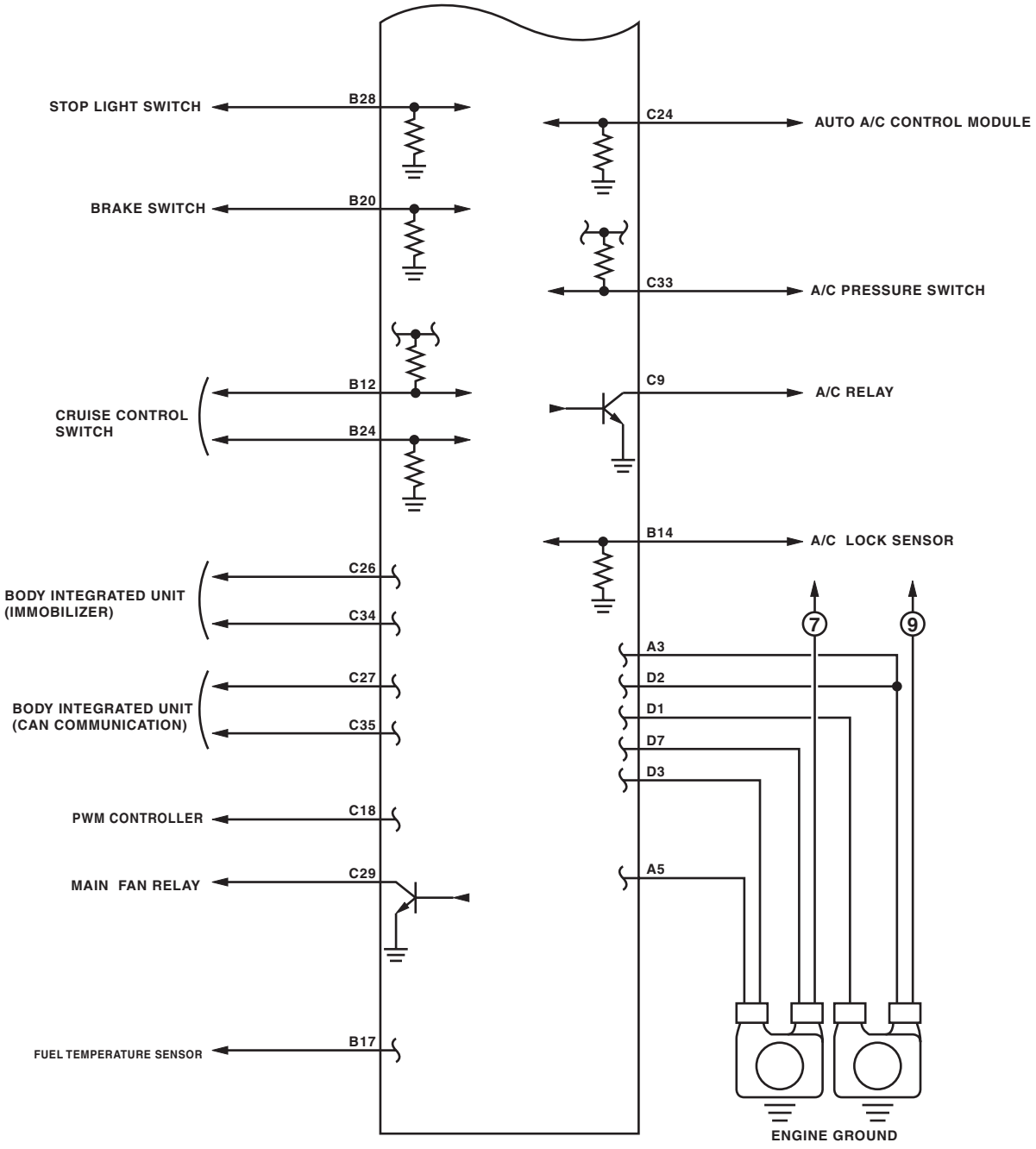

6
FUEL INJECTOR No. 1
D8
FUEL INJECTOR No. 2
D9
FUEL INJECTOR No. 3
D10
FUEL INJECTOR No. 4
D11
FUEL INJECTOR No. 5
D12
FUEL INJECTOR No. 6
D13
6
4
A18
A28
D4
D5
A19
7
A6
A29
A34
A23
8
ELECTRONIC THROTTLE CONTROL
MANIFOLD ABSOLUTE PRESSURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
OIL TEMPERATURE SENSOR

EN-05062


FUEL TANK PRESSURE SENSOR
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR
FRONT OXYGEN (A/F) SENSOR LH
FRONT OXYGEN (A/F) SENSOR RH
REAR OXYGEN SENSOR LH
REAR OXYGEN SENSOR RH
B32
B22
B18
B34
B26
B35
B7
B6
B11
B10
B9
B8
C2
C3
B1
C5
B15
B4
C4
A32
A31
D15
D14
D17
D16
D30
D31
D24
D25
A13
A14
A24
A15
A16
A25
VVL DIAGNOSIS OIL PRESSURE SWITCH LH
VVL DIAGNOSIS OIL PRESSURE SWITCH RH
OIL FLOW CONTROL SOLENOID VALVE LH
OIL FLOW CONTROL SOLENOID VALVE RH
OIL SWITCHING SOLENOID VALVE LH
OIL SWITCHING SOLENOID VALVE RH
CRANKSHAFT POSITION SENSOR
KNOCK SENSOR No.1
KNOCK SENSOR No.2
1
2
3
5
6
8
9

EN-05063

Engine Control Module (ECM) I/O Signal



EN-05064

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

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

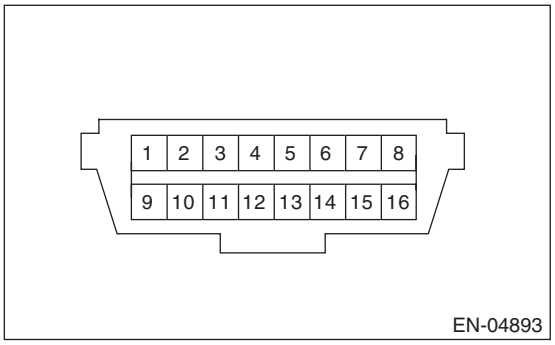
Measuring condition:
- After engine is warmed-up.
- Gear position is in “N” or “P” range.
- Turn the A/C to OFF.
- Turn all the accessory switches to OFF.

7. Data Link Connector

A: NOTE

This connector is used for Subaru Select Monitor.

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



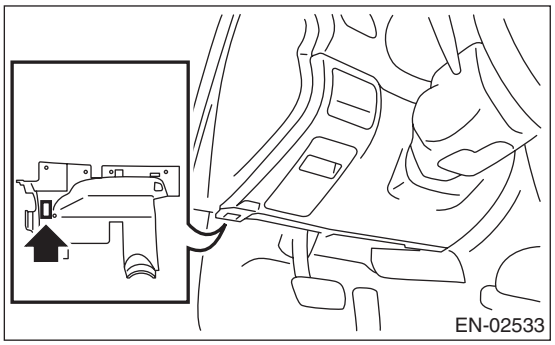
Terminal No.	Contents	Terminal No.	Contents
1	Blank	9	Blank
2	Blank	10	Blank
3	Blank	11	Blank
4	Ground	12	Blank
5	Ground	13	Blank
6	CAN communication (+)	14	CAN communication (–)
7	Subaru Select Monitor signal	15	Blank
8	Blank	16	Power supply

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

NOTE:
For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-80, 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	ON/OFF
$03	Fuel system control status	—
$04	Calculated engine load value	%
$05	Engine coolant temperature	°C or °F
$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	km/h, MPH
$0E	Ignition timing advance	°
$0F	Intake air temperature	°C or °F
$10	Air flow rate of manifold absolute pressure sensor	g/sec
$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	Travel distance after the malfunction indicator light illuminates	km
$24	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (bank 1)	V and %
$28	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (bank 2)	V and %
$2E	Evaporative purge	%
$2F	Fuel level	%

PID	Data	Unit of measure
$30	Number of warm ups after DTC clear	—
$31	Travel distance after DTC clear	km
$32	Fuel tank pressure	mmHg
$33	Atmospheric pressure	mmHg
$34	A/F sensor lambda value (Bank 1 Sensor 1)	—
$34	A/F sensor current value (Bank 1 Sensor 1)	mA
$38	A/F sensor lambda value (Bank 2 Sensor 1)	—
$38	A/F sensor current value (Bank 2 Sensor 1)	mA
$3C	Catalyst temperature #1	°C
$3D	Catalyst temperature #2	°C
$41	Diagnostic monitor of each drive cycle	—
$42	ECM power voltage	V
$43	Absolute load	%
$44	A/F target lambda	—
$45	Relative throttle opening angle	%
$46	Ambient temperature	°C
$47	Absolute throttle opening angle 2	%
$49	Absolute accelerator opening angle 1	%
$4A	Absolute accelerator opening angle 2	%
$4C	Target throttle opening angle	%
$4D	Engine operating time while malfunction indicator light lit	min
$4E	Elapsed time after DTC clear	min
$51	Fuel used	—
$5A	Relative accelerator opening angle	%

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

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

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

PID	Data	Unit of measure
$02	DTC that caused the freeze frame data storage required by CARB	—
$03	Fuel system control status	—
$04	Calculated engine load value	%
$05	Engine coolant temperature	°C
$06	Short term fuel trim (Bank 1)	%
$07	Long term fuel trim (Bank 1)	%
$08	Short term fuel trim (Bank 2)	%
$09	Long term fuel trim (Bank 2)	%
$0B	Intake manifold absolute pressure	kPa
$0C	Engine speed	rpm
$0D	Vehicle speed	km/h
$0E	Ignition timing advance	°
$0F	Intake air temperature	°C or °F
$10	Air flow rate of manifold absolute pressure sensor	g/sec
$11	Throttle valve opening angle	%
$13	Air fuel ratio sensor	—
$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
$2E	Evaporative purge	%
$2F	Fuel level	%
$32	Fuel tank pressure	mmHg
$33	Atmospheric pressure	mmHg
$42	ECM power voltage	V
$43	Absolute load	%
$44	A/F target lambda	—
$45	Relative throttle opening angle	%
$46	Ambient temperature	°C
$47	Absolute throttle opening angle 2	%
$49	Absolute accelerator opening angle 1	%
$4A	Absolute accelerator opening angle 2	%
$4C	Target throttle opening angle	%

NOTE:
Refer to general scan tool manufacturer's instruction 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)-80, List of Diagnostic Trouble Code (DTC).>

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

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

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

6. MODE $06

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

OBDMID	TID	SID	Diagnostic item
$01	$81	$0A	A/F sensor conduction abnormal (Bank 1 Sensor 1)
	$82	$8D	
	$83	$14	
	$84	$1E	A/F sensor range abnormal (Bank 1 Sensor 1)
	$85	$1E	
	$86	$20	A/F sensor response abnormal (Bank 1 Sensor 1)
$02	$87	$0B	Oxygen sensor circuit abnormal (Bank 1 Sensor 2)
	$88	$0B	
	$07	$0B	Oxygen sensor drop abnormal (Bank 1 Sensor 2)
	$08	$0B	
	$A5	$0B	
	$05	$10	Oxygen sensor response abnormal (Bank 1 Sensor 2)
	$06	$10	
$05	$81	$0A	A/F sensor conduction abnormal (Bank 2 Sensor 1)
	$82	$8D	
	$83	$14	
	$84	$1E	A/F sensor range abnormal (Bank 2 Sensor 1)
	$85	$1E	
	$86	$20	A/F sensor response abnormal (Bank 2 Sensor 1)
$06	$87	$0B	Oxygen sensor circuit abnormal (Bank 2 Sensor 2)
	$88	$0B	
	$07	$0B	Oxygen sensor drop abnormal (Bank 2 Sensor 2)
	$08	$0B	
	$A5	$0B	
	$05	$10	Oxygen sensor response abnormal (Bank 2 Sensor 2)
	$06	$10	
$21	$89	$20	Catalyst degradation diagnosis (Bank 1)
$39	$93	$FE	Evaporative emission control system (Cap off)
$3B	$94	$FE	Evaporative emission control system (0.04 inch leak)
	$95	$FE	
$3C	$96	$FE	Evaporative emission control system (0.02 inch leak)
	$97	$FE	
$3D	$98	$FE	Evaporative emission control system (Purge flow)
$41	$99	$24	A/F sensor heater abnormal (Bank 1 Sensor 1)
	$9A	$24	
	$9B	$14	A/F sensor heater characteristic abnormal (Bank 1 Sensor 1)
$42	$9C	$24	Oxygen sensor heater abnormal (Bank 1 Sensor 2)
	$9D	$24	
$45	$99	$24	A/F sensor heater abnormal (Bank 2 Sensor 1)
	$9A	$24	
	$9B	$14	A/F sensor heater characteristic abnormal (Bank 2 Sensor 1)
$46	$9C	$24	Oxygen sensor heater abnormal (Bank 2 Sensor 2)
	$9D	$24	
$A1	$0B	$24	Misfire monitoring (All cylinders)
	$0C	$24	
$A2	$0B	$24	Misfire monitoring (#1 cylinder)
	$0C	$24	

OBDMID	TID	SID	Diagnostic item
$A3	$0B	$24	Misfire monitoring (#2 cylinder)
	$0C	$24	
$A4	$0B	$24	Misfire monitoring (#3 cylinder)
	$0C	$24	
$A5	$0B	$24	Misfire monitoring (#4 cylinder)
	$0C	$24	
$A6	$1B	$24	Misfire monitoring (#5 cylinder)
	$1C	$24	
$A7	$1B	$24	Misfire monitoring (#6 cylinder)
	$1C	$24	

7. MODE $07

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

8. MODE $09

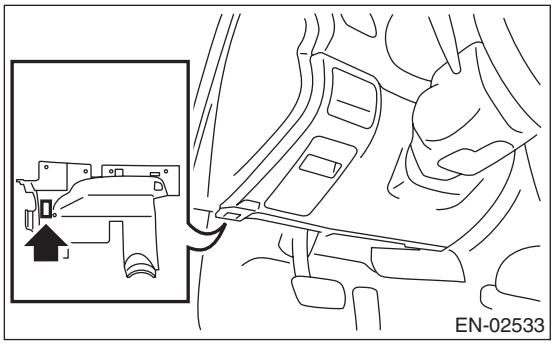
Refer to the data of vehicle specification (V.I.N., calibration ID, diagnosis frequency, etc.).

9. Subaru Select Monitor

A: OPERATION

1. HOW TO USE THE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-7, PREPARATION TOOL, General Description.>
2) Connect the diagnosis cable to the Subaru Select Monitor.
3) Connect the Subaru Select Monitor to the data link connector.
   (1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



   (2) Connect the diagnosis cable to the data link connector.

CAUTION:
Do not connect the scan tools except for the Subaru Select Monitor or general scan tool.
4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
5) Using the Subaru Select Monitor, call up DTCs and data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (NORMAL MODE)

Refer to "Read Diagnostic Trouble Code" for information about how to indicate DTC. <Ref. to EN(H6DO)(diag)-42, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (OBD MODE)

Refer to "Read Diagnostic Trouble Code" for information about how to indicate DTC. <Ref. to EN(H6DO)(diag)-42, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA FOR ENGINE (NORMAL MODE)

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select {Engine Control System}.
3) Select the [OK] after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display/Save}.
5) On the «Data Display Menu» screen, select {Data Display}.
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	Engine coolant temperature	°C or °F	≥ 85°C or 185°F (After engine is warmed-up.)
A/F correction 1	A/F Compensation 1	%	–10% — +10%
A/F learning 1	A/F learning 1	%	–10% — +10%
A/F correction 2	A/F Compensation 2	%	–10% — +10%
A/F learning 2	A/F learning 2	%	–10% — +10%
Intake manifold absolute pressure	Intake manifold 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	Meter 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 temperature	°C or °F	(Ambient air temperature)
Amount of intake air	Amount of intake air	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 valve angle	%	2%
Front oxygen sensor voltage value 1	Front oxygen sensor voltage value 1	V	0.900 V
Front oxygen sensor voltage value 2	Front oxygen sensor voltage value 2	V	0.900 V
Battery voltage	Battery Voltage	V	12 — 13 V
Mass air flow voltage	Mass air flow voltage	V	1.2 — 1.3 V
Injection 1 pulse width	Injection 1 pulse width	ms	2.5 ms — 3.5 ms
Injection 2 pulse width	Injection 2 pulse width	ms	2.5 ms — 3.5 ms
Atmospheric pressure signal	Atmosphere Pressure	mmHg, kPa, inHg or psig	(Atmosphere pressure)
Intake manifold relative pressure	Intake manifold relative pressure	mmHg, kPa, inHg or psig	(Intake manifold absolute pressure — atmosphere pressure)
Ignition learning value	Learned Ignition Timming	deg	+0.0 deg
Acceleration opening angle signal	Acceleration opening angle	%	0%
Fuel temperature signal	Fuel Temp.	°C or °F	+28°C or +82°F
Radiator fan output	Radiator fan output	%	0% (Water temperature 90°C (194°F) when air conditioner is OFF)
Purge control solenoid valve duty ratio	CPC duty	%	18%
Fuel pump duty	Fuel pump duty	%	33%
Variable valve timing advance angle amount R	VVT advance angle amount R	deg	+0 deg — +1 deg
Variable valve timing advance angle amount L	VVT advance angle amount L	deg	+0 deg — +1 deg

Contents	Display	Unit of measure	Note (at idling)
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
Front oxygen (A/F) sensor current value 1	A/F sensor current value 1	mA	0.0 mA
Front oxygen (A/F) sensor current value 2	A/F sensor current value 2	mA	0.0 mA
Front oxygen (A/F) sensor resistance value 1	A/F sensor resistance value 1	Ω	31 Ω
Front oxygen (A/F) sensor resistance value 2	A/F sensor resistance value 2	Ω	31 Ω
Front oxygen (A/F) sensor output lambda 1	A/F sensor output lambda 1	—	1.01
Front oxygen (A/F) sensor output lambda 2	A/F sensor output lambda 2	—	1.01
A/F correction 3	A/F Compensation 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 power supply voltage	V	(Battery voltage)
Sub throttle sensor voltage	Sub throttle sensor voltage	V	1.4 V — 1.5 V
Main throttle sensor voltage	Main throttle sensor voltage	V	0.62 V — 0.70 V
Sub accelerator sensor voltage	Sub acceleration sensor voltage	V	1.0 V — 1.2 V
Main accelerator sensor voltage	Main acceleration sensor voltage	V	0.9 V — 1.1 V
Memory vehicle speed	Memory vehicle speed	km/h or MPH	0 km/h or 0 MPH
A/F correction 4	A/F Compensation 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.)
Oil switching solenoid valve duty R	OSV duty R	%	18.4%
Oil switching solenoid valve duty L	OSV duty L	%	18.8%
Oil switching solenoid valve current R	OSV current R	mA	192 mA
Oil switching solenoid valve current L	OSV current L	mA	192 mA
Lift mode of variable valve lift	VVL Lift Mode	—	1
#1 cylinder roughness monitor	#1 cylinder roughness monitor	—	0
#2 cylinder roughness monitor	#2 cylinder roughness monitor	—	0
#3 cylinder roughness monitor	#3 cylinder roughness monitor	—	0
#4 cylinder roughness monitor	#4 cylinder roughness monitor	—	0
#5 cylinder roughness monitor	#5 cylinder roughness monitor	—	0
#6 cylinder roughness monitor	#6 cylinder roughness monitor	—	0
Knock sensor correction	Knock correction	deg	0 deg
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig	0 mmHg, 0 kPa, 0 inHg or 0 psig
AT/MT identification	AT Vehicle ID Signal	—	OFF
Test mode terminal	Test mode terminal	—	U check

Contents	Display	Unit of measure	Note (at idling)
System operation check mode	D-check Require Flag	—	OFF
Test mode terminal	Delivery Mode Connector	—	OFF
Neutral position switch signal	Neutral SW	—	Neutral
Idle switch signal	Soft Idle SW	—	At idle
Ignition switch signal	Ignition SW	—	ON input
Power steering switch signal	Power steering SW input signal	—	OFF input (when OFF)
Air conditioning switch signal	A/C SW	—	OFF input (when OFF)
Starter switch signal	Starter SW	—	OFF input
Front oxygen monitor 1	Front oxygen monitor 1	—	Rich, Lean
Front oxygen monitor 2	Front oxygen monitor 2	—	Rich, Lean
Knocking signal	Knock signal	—	None
Crankshaft position sensor signal	Crankshaft angle signal	—	Provided
Camshaft position sensor signal	Camshaft angle signal	—	Provided
Rear defogger switch signal	Rear Defogger SW	—	OFF input (when OFF)
Blower fan switch signal	Blower fan SW	—	OFF input (when OFF)
Light switch signal	Light SW	—	OFF input (when OFF)
A/C lock signal	A/C lock signal	—	OFF input
A/C middle pressure switch signal	A/C middle pressure SW	—	OFF input (when air conditioner is OFF)
A/C compressor relay signal	A/C compressor relay output	—	OFF output (when air conditioner is OFF)
Pressure control solenoid valve signal	PCV Solenoid	—	OFF output (when OFF)
Drain valve signal	Vent Control Solenoid	—	OFF output (when OFF)
Variable valve lift diagnosis oil pressure switch signal 1	Oil Temperature SW1	—	ON
Variable valve lift diagnosis oil pressure switch signal 2	Oil Temperature SW2	—	ON
AT coordinate retard angle demand signal	AT coordinate retard angle demand	—	None
AT coordinate fuel cut demand signal	AT coordinate fuel cut demand	—	None
Vehicle dynamics control (VDC) torque down prohibition output	VDC torque down prohibition output	—	Permission
Vehicle dynamics control (VDC) torque down demand	VDC torque down demand	—	None
AT cooperative permission signal	AT coordinate permission signal	—	Permission
Electronic throttle control motor relay signal	ETC motor relay	—	ON
Clutch switch signal	Clutch Switch	—	OFF (when clutch is OFF)
Stop light switch signal	Stop light SW	—	OFF (when brake is OFF)
SET/COAST switch signal	SET/COAST SW	—	OFF (when levers are not operated)
RESUME/ACCEL switch signal	RESUME/ACCEL SW	—	OFF (when levers are not operated)
Brake switch signal	Brake SW	—	OFF (when brake is OFF)
Main switch signal	Main SW	—	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 Lit Flag	—	Light OFF

5. READ CURRENT DATA FOR ENGINE (OBD MODE)

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select {Engine Control System}.
3) Select the [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 {Current Data Display/Save}.
6) On the «Data Display Menu» screen, select {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	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
Test of secondary air system	Secondary air system	Supp NO
Test of secondary air system	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 senor	Supp YES
Test of oxygen sensor	Oxygen senor	Rdy NO
Test of oxygen sensor heater	Oxygen sensor heater	Supp YES
Test of oxygen sensor heater	Oxygen sensor heater	Rdy YES
Test of EGR system	EGR system	Supp NO
Test of EGR system	EGR system	Rdy N/A
A/F control #1	Fuel system for Bank 1	Normal CLOSE
A/F control #2	Fuel system for Bank 2	Normal CLOSE
Load	Calculated load value	%
Engine coolant temperature	Coolant Temp.	°C or °F
A/F correction value #1	Short term fuel trim B1	%
A/F learning value #1	Long term fuel trim B1	%
A/F correction value #2	Short term fuel trim B2	%
A/F learning value #2	Long term fuel trim B2	%
Intake manifold absolute pressure	Mani. Absolute Pressure	mmHg, kPa, inHg or psig
Engine speed	Engine Speed	rpm
Vehicle speed	Vehicle speed	km/h or MPH
Ignition timing #1	Ignition timing adv.#1	°
Intake air temperature	Intake Air Temp.	°C or °F
Amount of intake air	Mass Air Flow	g/s or lb/m
Throttle opening angle	Throttle Opening Angle	%
Oxygen sensor #12	Oxygen sensor #12	V
A/F correction value #12	Short term fuel trim #12	%

Contents	Display	Unit of measure
Oxygen sensor #22	Oxygen sensor #22	V
A/F correction value #22	Short term fuel trim #22	%
OBD 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
Travel distance after the malfunction indicator light illuminates	Lighted MI lamp history	km or miles
A/F sensor #11	A/F sensor #11	—
A/F sensor #11	A/F sensor #11	V
A/F sensor #21	A/F sensor #21	—
A/F sensor #21	A/F sensor #21	V
Evaporative purge	Commanded Evap Purge	%
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 or miles
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig
Atmospheric pressure	Atmospheric pressure	mmHg, kPa, inHg or psig
A/F sensor #11	A/F sensor #11	—
A/F sensor #11	A/F sensor #11	mA
A/F sensor #21	A/F sensor #21	—
A/F sensor #21	A/F sensor #21	mA
Catalyst temperature #1	Catalyst Temperature #1	°C or °F
Catalyst temperature #2	Catalyst Temperature #2	°C or °F
Monitoring test of misfire	Misfire monitoring	Enable YES or NO
Monitoring test of misfire	Misfire monitoring	Comp YES or NO
Monitoring test of fuel system	Fuel system monitoring	Enable YES or NO
Monitoring test of fuel system	Fuel system monitoring	Comp YES or NO
Monitoring test of comprehensive component	Component monitoring	Enable YES or NO
Monitoring test of comprehensive component	Component monitoring	Comp YES or NO
Test of catalyst	Catalyst Diagnosis	Enable YES or NO
Test of catalyst	Catalyst Diagnosis	Comp YES or NO
Test of heating-type catalyst	Heated catalyst	Enable N/A
Test of heating-type catalyst	Heated catalyst	Comp N/A
Test of evaporative emission purge control system	Evaporative purge system	Enable YES or NO
Test of evaporative emission purge control system	Evaporative purge system	Comp YES or NO
Test of secondary air system	Secondary air system	Enable N/A
Test of secondary air system	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 senor	Enable YES or NO
Test of oxygen sensor	Oxygen senor	Comp YES or NO
Test of oxygen sensor heater	Oxygen sensor heater	Enable YES or NO
Test of oxygen sensor heater	Oxygen sensor heater	Comp YES or NO
Test of EGR system	EGR system	Enable N/A
Test of EGR system	EGR system	Comp N/A
ECM power voltage	Control module voltage	V
Absolute load	Absolute Load Value	%
A/F target lambda	Target Equivalence Ratio	—

Contents	Display	Unit of measure
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.	%
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 accelerator opening angle	Relative Accelera. Pos.	%

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

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

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select {Engine Control System}.
3) Select the [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 {Freeze Frame Data}.

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

Contents	Display	Unit of measure
DTC of freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	—
Air fuel ratio control system for bank 2	Fuel system for Bank2	—
Engine load data	Engine Load	%
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 #1	Ignition timing adv. #1	°
Intake air temperature	Intake Air Temp.	°C or °F
Amount of intake air	Mass Air Flow	g/s
Throttle opening angle	Throttle Opening Angle	%
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
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	—
Elapsed time after engine start	Time Since Engine Start	sec
Evaporative purge	Commanded Evap Purge	%
Fuel level signal	Fuel Level	%
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig
Atmospheric pressure	Atmospheric pressure	mmHg, kPa, inHg or psig
ECM power 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 “SUBARU SELECT MONITOR OPERATION MANUAL”.

7. V.I.N. REGISTRATION

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

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

10. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select {Engine Control System}.
3) Select the [OK] after the information of engine type has been displayed.
4) On the «Engine Diagnosis» screen, select the {DTC Display}.
5) On the «Diagnostic Code(s) Display» screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}.

NOTE:
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-80, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select {Engine Control System}.
3) Select the [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 {Diagnostic Code(s) Display}.
6) Make sure DTC is shown on the screen.

NOTE:
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-80, 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)-80, 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 the item on the drive cycle. <Ref. to EN(H6DO)(diag)-48, Drive Cycle.>

DTC	Item	Condition
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	—
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	—
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	—
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	—
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)	—
P0077	Intake Valve Control Solenoid Circuit High (Bank 1)	—
P0083	Intake Valve Control Solenoid Circuit High (Bank 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 (Bank1 Sensor2)	—
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 (Bank2 Sensor2)	—
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)	—
P0332	Knock Sensor 2 Circuit Low (Bank 2)	—
P0333	Knock Sensor 2 Circuit High (Bank 2)	—

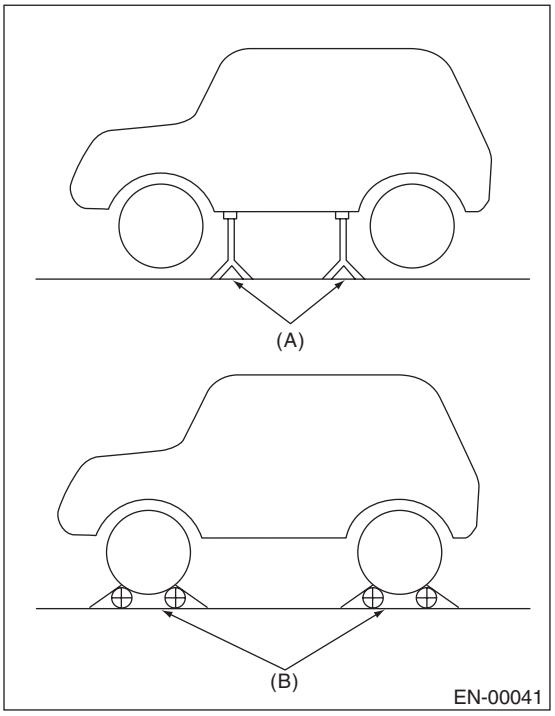
DTC	Item	Condition
P0335	Crankshaft Position Sensor “A” Circuit	—
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	—
P0447	Evaporative Emission Control System Vent 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	—
P0519	Idle Air Control System Performance	—
P0600	Serial Communication Link	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Control Module Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
P0691	Fan 1 Control Circuit Low	—
P0692	Fan 1 Control Circuit High	—
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	—
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1518	Starter Switch Circuit Low Input	—
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)	—
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	—
P2093	Intake 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	—
P2123	Throttle/Pedal Position Sensor/Switch “D” Circuit High Input	—
P2127	Throttle/Pedal Position Sensor/Switch “E” Circuit Low Input	—

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

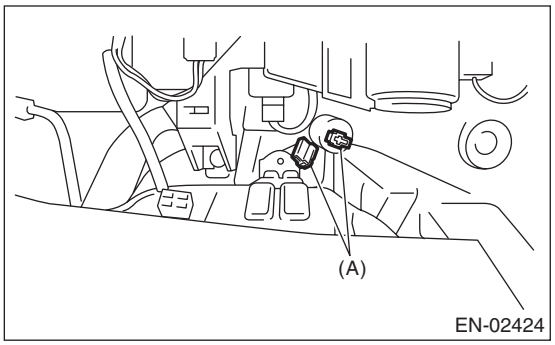
WARNING:
• Before lifting-up the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release clutch pedal or accelerator pedal during works even when the engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



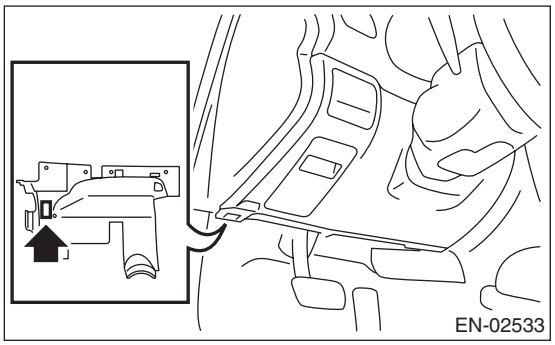
(A) Rigid rack
(B) Free roller

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.>
4) Connect the diagnosis cable to the Subaru Select Monitor.
5) Connect the test mode connector (A) located under the glove box.



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

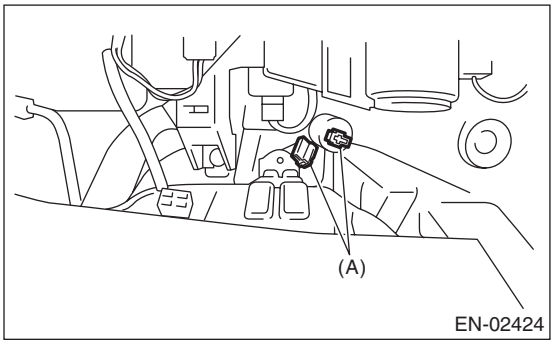


CAUTION:
Do not connect the scan tools except for the Subaru Select Monitor or general scan tool.
7) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
8) On the «Main Menu» display screen, select {Each System Check}.
9) On the «System Selection Menu» display screen, select {Engine Control System}.
10) Select the [OK] after the information of engine type has been displayed.
11) On the «Engine Diagnosis» display screen, select the {D Check}.
12) When the "Perform D Check?" is shown on the screen, select the [OK].
13) 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 "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
<Ref. to EN(H6DO)(diag)-80, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may illuminate the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis function.

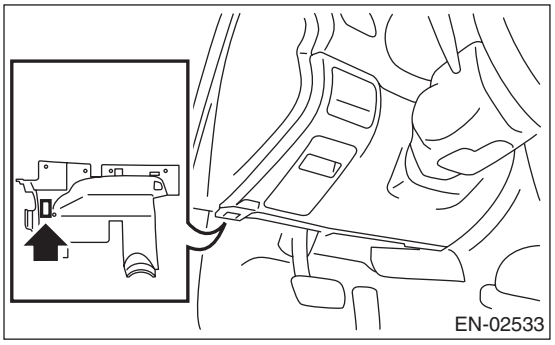
3. GENERAL SCAN TOOL

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



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

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



5) Start the engine.

NOTE:
Ensure the selector lever is placed in “P” range before starting.

6) Using the select lever, turn the “P” position switch and the “N” position switch to ON.
7) Depress the brake pedal to turn the brake switch ON.
8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
9) Shift the select lever in the “D” range and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
- For AWD model, release the parking brake.
- The speed difference between front and rear wheels may illuminate the ABS warning light, but this 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 for DTC and record the result(s).

NOTE:
- For detailed operation procedure, 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)-80, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: PROCEDURE

For the troubleshooting, there are five driving patterns of drive cycles A to E. 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 that the battery voltage is 12 V or more and fuel remains approx. half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)(diag)-54, Clear Memory Mode.>
3) Disconnect the test mode connector.

NOTE:
• Perform the diagnosis after warming up the engine except when the engine coolant temperature at starting is specified.
• 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 THEN IDLE THE ENGINE FOR A MINUTE.

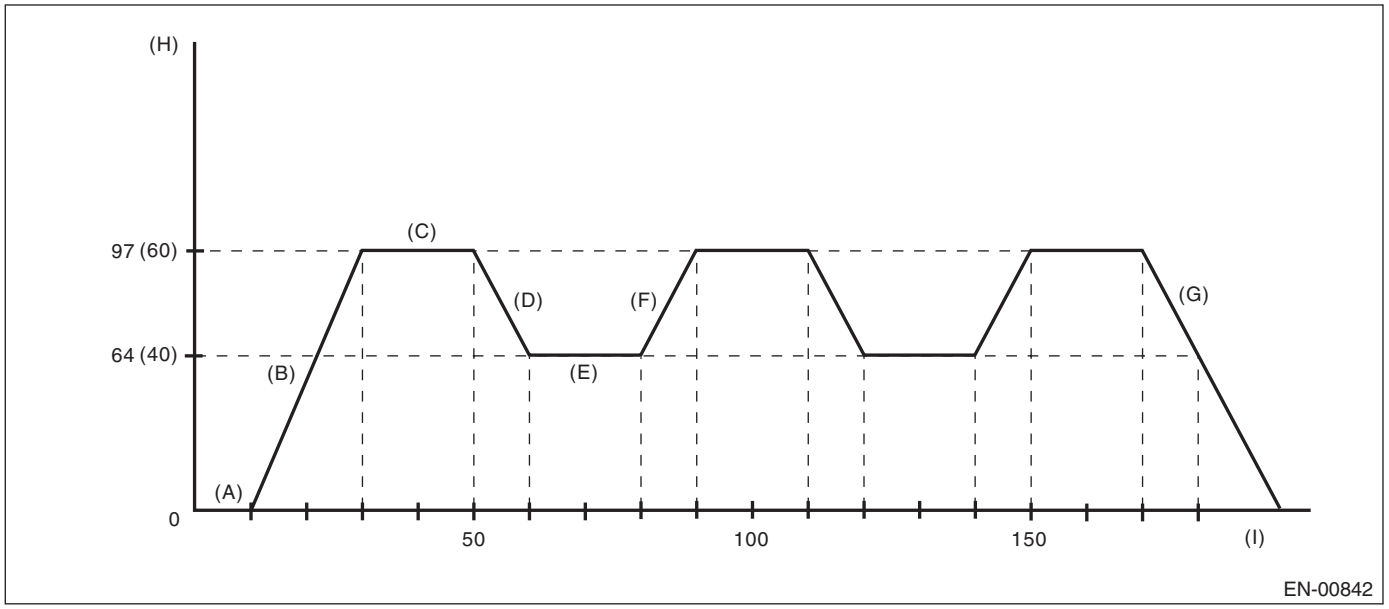
DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature at engine start is less than 20°C (68°F).
*P0126	Insufficient Engine Coolant Temperature For Stable Operation	—
*P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	—
*P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0153	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	—
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle B or C as well.
*P0172	System Too Rich (Bank 1)	Diagnosis completes in drive cycle B or C as well.
*P0174	System Too Lean (Bank 2)	Diagnosis completes in drive cycle B or C as well.
*P0175	System Too Rich (Bank 2)	Diagnosis completes in drive cycle B or C as well.
*P0196	Engine Oil Temperature Sensor Circuit Range/Performance	—
*P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0305	Cylinder 5 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0306	Cylinder 6 Misfire Detected	Diagnosis completes in 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	Diagnosis completes in drive cycle B or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle B or C as well.
*P2098	Post Catalyst Fuel Trim System Too Lean Bank 2	Diagnosis completes in drive cycle B or C as well.
*P2099	Post Catalyst Fuel Trim System Too Rich Bank 2	Diagnosis completes in 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
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle A or C as well.
*P0172	System Too Rich (Bank 1)	Diagnosis completes in drive cycle A or C as well.
*P0174	System Too Lean (Bank 2)	Diagnosis completes in drive cycle A or C as well.
*P0175	System Too Rich (Bank 2)	Diagnosis completes in drive cycle A or C as well.
*P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0305	Cylinder 5 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0306	Cylinder 6 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0459	Evaporative Emission System Purge Control Valve Circuit High	—
*P0483	Fan Rationality Check	—
*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	Diagnosis completes in drive cycle A or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle A or C as well.
*P2098	Post Catalyst Fuel Trim System Too Lean Bank 2	Diagnosis completes in drive cycle A or C as well.
*P2099	Post Catalyst Fuel Trim System Too Rich Bank 2	Diagnosis completes in drive cycle A or C as well.

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



(A) Idle the engine for 10 seconds or more.

(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
P0026	Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)	—
P0028	Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)	—
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
*P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	—
*P0068	MAP/MAF - Throttle Position Correlation	—
P0076	Intake Valve Control Solenoid Circuit Low (Bank 1)	—
P0082	Intake Valve Control Solenoid Circuit Low (Bank 2)	—
*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)	Diagnosis completes in drive cycle A or B as well.
*P0172	System Too Rich (Bank 1)	Diagnosis completes in drive cycle A or B as well.
*P0174	System Too Lean (Bank 2)	Diagnosis completes in drive cycle A or B as well.
*P0175	System Too Rich (Bank 2)	Diagnosis completes in drive cycle A or B as well.
*P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0305	Cylinder 5 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0306	Cylinder 6 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle A or B as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle A or B as well.
*P2098	Post Catalyst Fuel Trim System Too Lean Bank 2	Diagnosis completes in drive cycle A or B as well.
*P2099	Post Catalyst Fuel Trim System Too Rich Bank 2	Diagnosis completes in drive cycle A or B as well.

5. DRIVE CYCLE D

DRIFT DIAGNOSIS

1) Check that the engine coolant temperature at engine start 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 (50°F) or more, and reaches 75°C (167°F) or more, when the engine is warmed up.
4) Idle the engine for 120 seconds or more in the condition of step 3.

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 terminal of battery during diagnosis. (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 terminal of battery during diagnosis. (Data will be cleared by disconnecting the battery terminals.)

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

7. DRIVE CYCLE F

DRIFT DIAGNOSIS

1) Check that the engine coolant temperature at engine start is less than 30°C (86°F).
2) Start the engine, and warm it up until engine coolant temperature reachs to 95°C (203°F) or more.
3) After the engine has reached the state of procedure 2), idle the engine for 10 minutes or more.

NOTE:
Do not disconnect the terminal of battery during diagnosis. (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)-34, 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.

4) Idle the engine for 1 minute under the conditions in step 3).

DTC	Item	Condition
*P1602	Control Module Programming Error	—

13.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

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

NOTE:
• Initial diagnosis of electronic throttle 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.
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select {Engine Control System}.
3) Select the [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 {DTC Clear}.
6) When the “Clear Diagnostic Code?” is shown on the screen, select the [OK].
7) Turn the ignition switch to OFF and then close the Subaru Select Monitor.

NOTE:
• Initial diagnosis of electronic throttle 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.
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

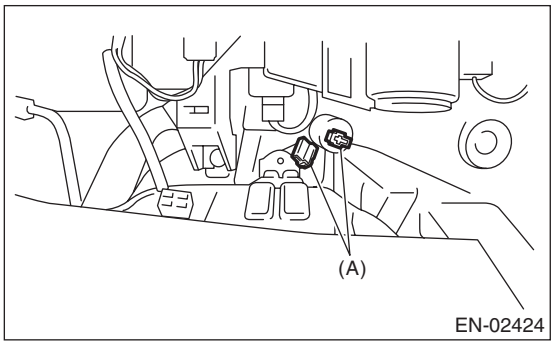
3. GENERAL SCAN TOOL

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

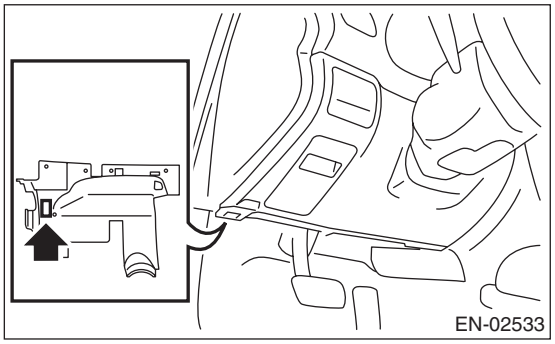
14.Compulsory Valve Operation Check Mode

A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-7, PREPARATION TOOL, General Description.>
2) Connect the diagnosis cable to the Subaru Select Monitor.
3) Connect the test mode connector (A) located under the glove box.



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



CAUTION:
Do not connect the scan tools except for the Subaru Select Monitor or general scan tool.
5) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
6) On the «Main Menu» display screen, select {Each System Check}.
7) On the «System Selection Menu» display screen, select {Engine Control System}.
8) Select the [OK] after the information of engine type has been displayed.
9) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode}.
10) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation}.
11) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen.
12) Selecting the [NO] 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
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
Compulsory pressure control solenoid valve operation check	PCV Solenoid
Compulsory drain valve operation check	Vent Control Solenoid

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

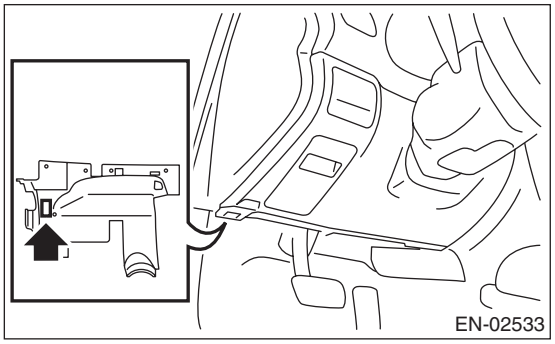
Display
EGR Solenoid
ASV Solenoid
FICD Solenoid
Pressure Switching Solenoid 1
Pressure Switching Solenoid 2
Wastegate solenoid
AAI Solenoid
Exhaust Bypass Valve Control Permit Flag
Secondary Air Combination Valve
Fuel Tank Sensor Control Valve

• For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".

15. System Operation Check Mode

A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-7, PREPARATION TOOL, General Description.>
2) Connect the diagnosis cable to the Subaru Select Monitor.
3) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect anything other than the Subaru Select Monitor and general scan tool.
4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
5) On the «Main Menu» display screen, select {Each System Check}.
6) On the «System Selection Menu» display screen, select {Engine Control System}.
7) Select the [OK] after the information of engine type has been displayed.
8) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode}.
9) The following items will be displayed on screen.

Display
Fuel Pump Control
Idling Ignition Timing Fixed
Idle Speed Control
Injector Control

1. FUEL PUMP CONTROL (OFF OPERATION)

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.> and the Inspection Mode <Ref. to EN(H6DO)(diag)-43, PROCEDURE, Inspection Mode.>.
1) On the «System Operation Check Mode» display screen, 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 select the [OK].
4) Select the [NO] to end the OFF operation. The screen will return to the «Fuel Pump Control» screen.

2. FUEL PUMP CONTROL (ON/OFF OPERATION)

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.> and the Inspection Mode <Ref. to EN(H6DO)(diag)-43, PROCEDURE, Inspection Mode.>.
1) On the «System Operation Check Mode» display screen, select the {Fuel Pump Control}.
2) On the «Fuel Pump Control» display screen, select the {ON/OFF Operation}.
3) On the «Turn Ignition Switch ON with Engine Stalled» display screen, select the [OK].
4) Select the [NO] to end the ON/OFF operation. The screen will return to the «Fuel Pump Control» screen.

3. IDLING IGNITION TIMING FIXED

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.> and the Inspection Mode <Ref. to EN(H6DO)(diag)-43, PROCEDURE, Inspection Mode.>.
1) On the «System Operation Check Mode» display screen, select {Idling Ignition Timing Fixed}.
2) On the «Start the Engine» display screen, start the engine and select the [OK].
3) Select the [NO] to end the idle ignition timing fixed. The screen will return to the «System Operation Check Mode» screen.

4. IDLE SPEED CONTROL

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.> and the Inspection Mode <Ref. to EN(H6DO)(diag)-43, PROCEDURE, Inspection Mode.>.

1) On the «System Operation Check Mode» display screen, select {Idle Speed Control}.
2) On the «Start the Engine» display screen, start the engine and select the [OK].
3) In the «Idle Speed Control» screen, press the [△] key or the [▽] key to change the setting values, then select the [OK].
Setting is possible in a range between 500 rpm — 2000 rpm, in increments of 50 rpm. However, the engine speed that can actually be controlled will vary depending on the vehicle.
4) Select the [NO] to end the idle engine speed control. The screen will return to the «System Operation Check Mode» screen.

5. INJECTOR CONTROL (INJECTION STOP MODE)

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.> and the Inspection Mode <Ref. to EN(H6DO)(diag)-43, PROCEDURE, Inspection Mode.>.

1) On the «System Operation Check Mode» display screen, select {Injector Control}.
2) On the «Injector Control» display screen, select {Injection Stop Mode}.
3) Start the engine on the desired injector number in the «Injection Stop Mode» screen, and select the [OK].
4) On the «Start the Engine» display screen, start the engine and select the [OK] .
5) Select the [NO] to end the injection stop mode. The screen will return to the «Injector Control» screen.

6. INJECTOR CONTROL (INJECTION QUANTITY CONTROL)

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H6DO)(diag)-54, OPERATION, Clear Memory Mode.> and the Inspection Mode <Ref. to EN(H6DO)(diag)-43, PROCEDURE, Inspection Mode.>.

1) On the «System Operation Check Mode» display screen, select {Injector Control}.
2) On the «Injector Control» display screen, select {Injection Quantity Control}.
3) On the «Start the Engine» display screen, start the engine and select the [OK].
4) In the «Injection Quantity Control» screen, press the [△] key or the [▽] key to change the setting values, then select the [OK].
Setting is possible in a range between 0 — 20%, in increments of 1%.
5) Select the [NO] to end the injection quantity control. The screen will return to the «Injector Control» screen.

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

16.Malfunction Indicator Light

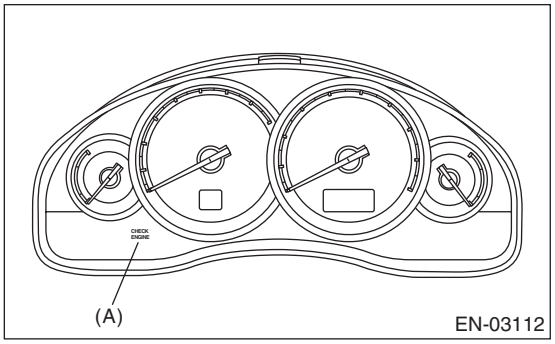
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H6DO)(diag)-59, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Malfunction indicator light does not come on. <Ref. to EN(H6DO)(diag)-60, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Malfunction indicator light does not go off. <Ref. to EN(H6DO)(diag)-62, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>
↓
4. Malfunction indicator light does not blink. <Ref. to EN(H6DO)(diag)-63, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK, Malfunction Indicator Light.>
↓
5. Malfunction indicator light remains blinking. <Ref. to EN(H6DO)(diag)-65, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING, Malfunction Indicator Light.>

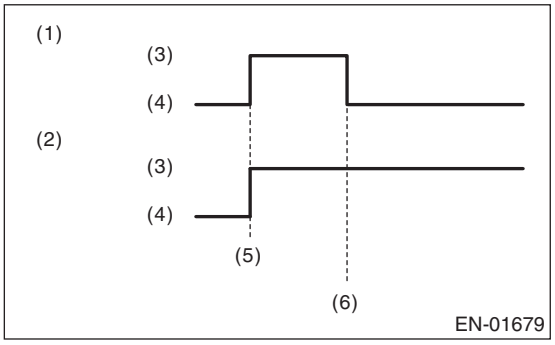
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

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)-60, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>

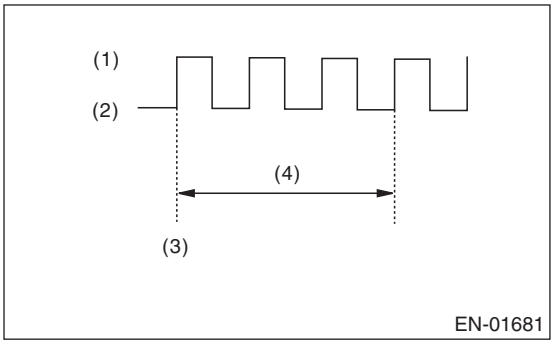


2) After starting the engine, the malfunction indicator light goes out. If it does not go off, either the engine or emission control system has malfunction.



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

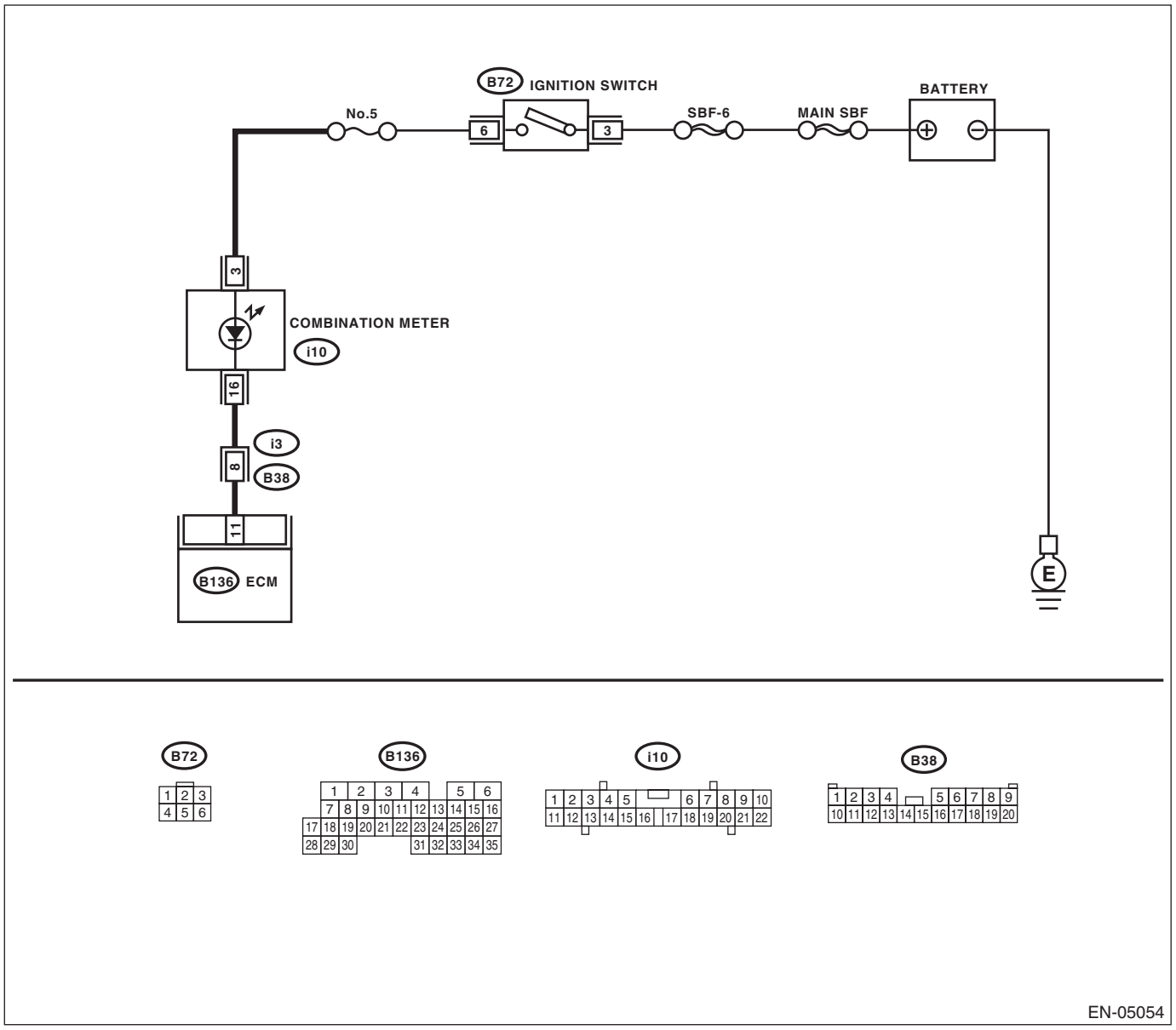
3) Turn the ignition switch to OFF and connect the test mode connector.
(1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light illuminates.
(2) After the engine starts, malfunction indicator light blinks in a cycle of 0.5 Hz. (During diagnosis)
(3) Malfunction indicator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

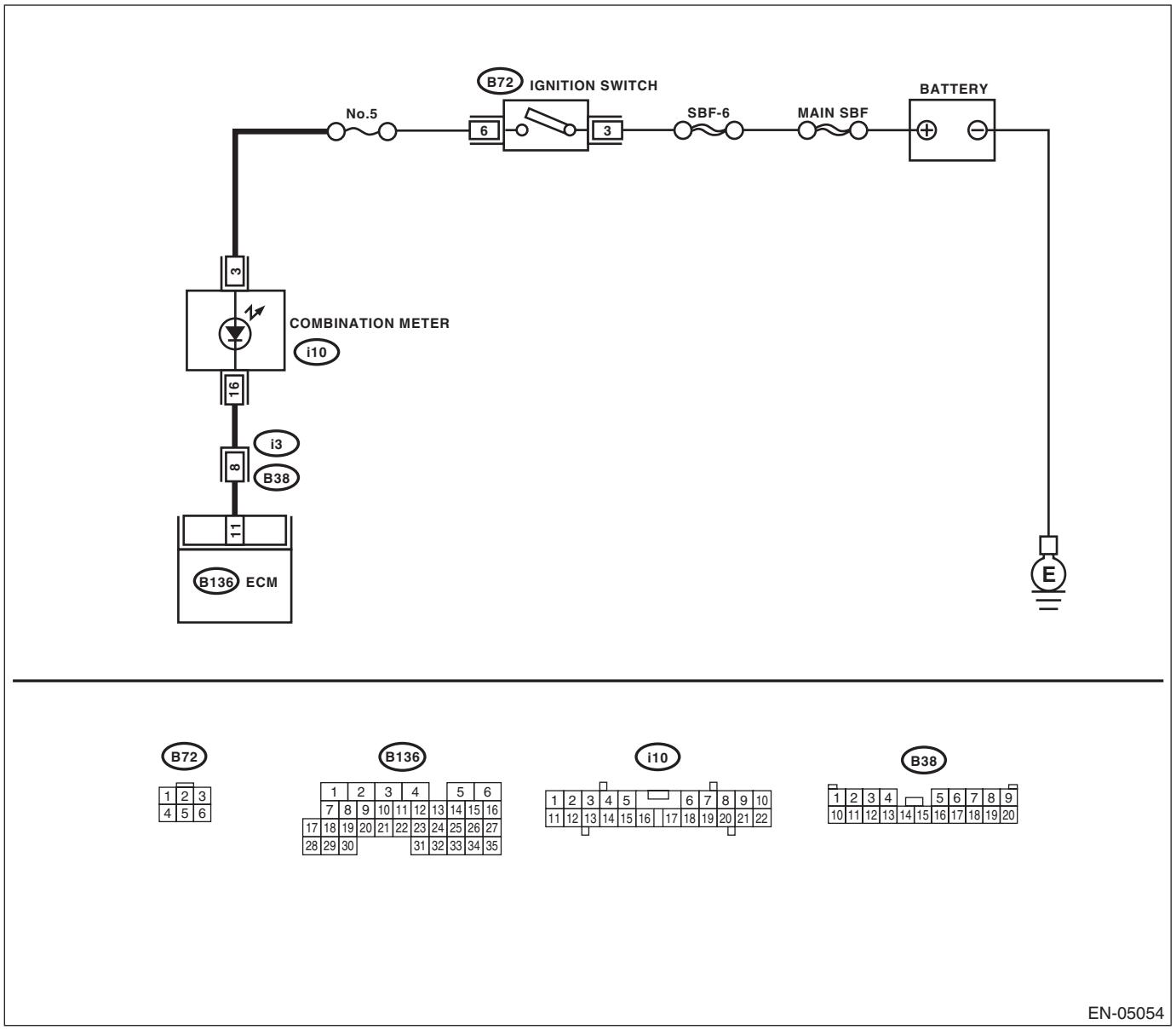


EN-05054

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Go to step **2**.
2	**CHECK POOR CONTACT.** Check for poor connection by shaking or pulling ECM connector and harness.	Does the malfunction indicator light illuminate?	Repair poor contact of the ECM connector.	Go to step **3**.
3	**CHECK ECM CONNECTOR.** Check the connection of ECM connector.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-19, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM connector and combination meter connector. ***Connector & terminal*** ***(B136) No. 11 — (i10) No. 16:***	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 combination meter connector • Poor contact of coupling connector
5	**CHECK POOR CONTACT.** Check 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 **6**.
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the combination meter circuit board. <Ref. to IDI-19, 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 of ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF

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



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from 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)-33, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK

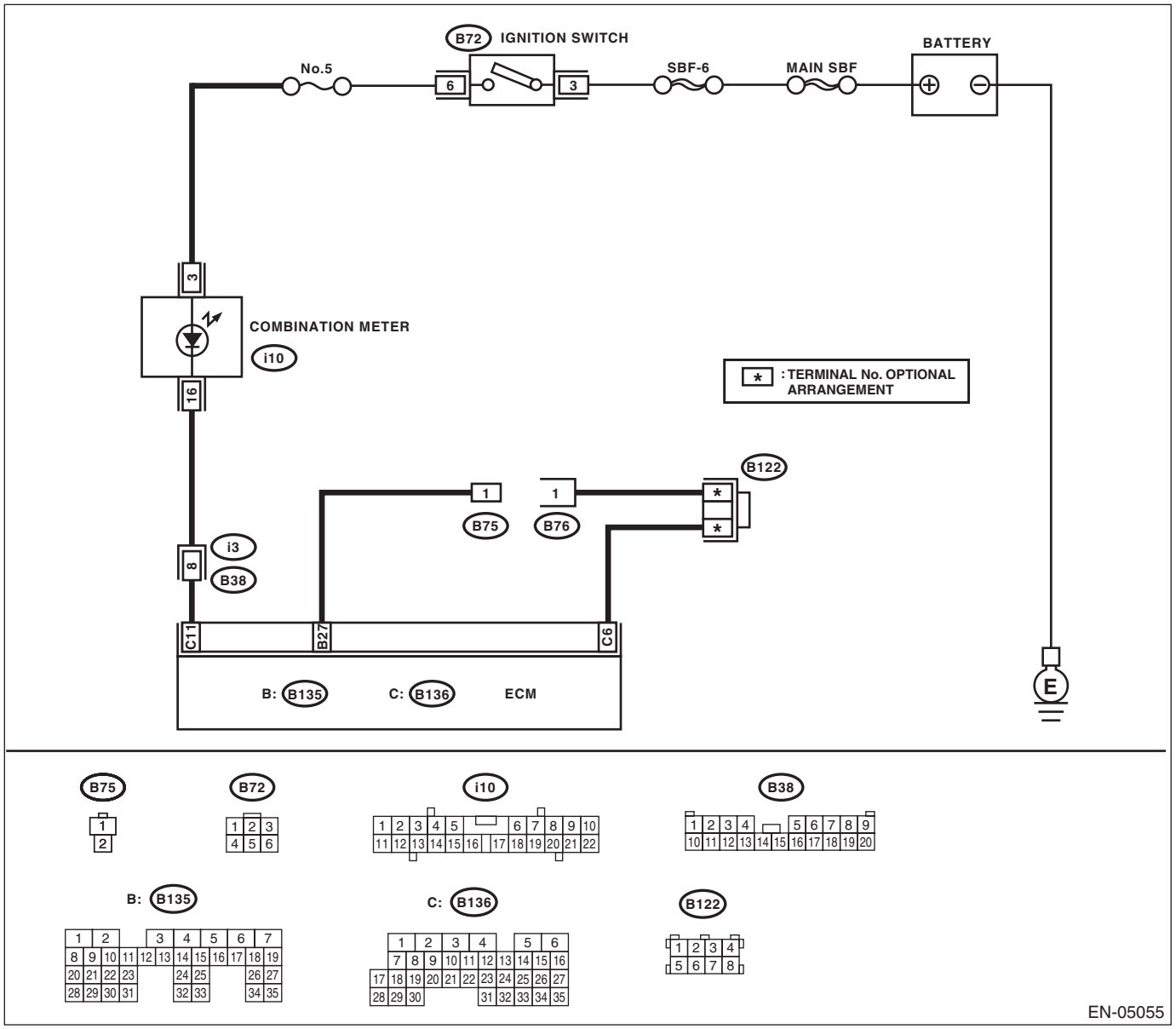
DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is open.

TROUBLE SYMPTOM:

Malfunction indicator light does not blink during Inspection Mode.

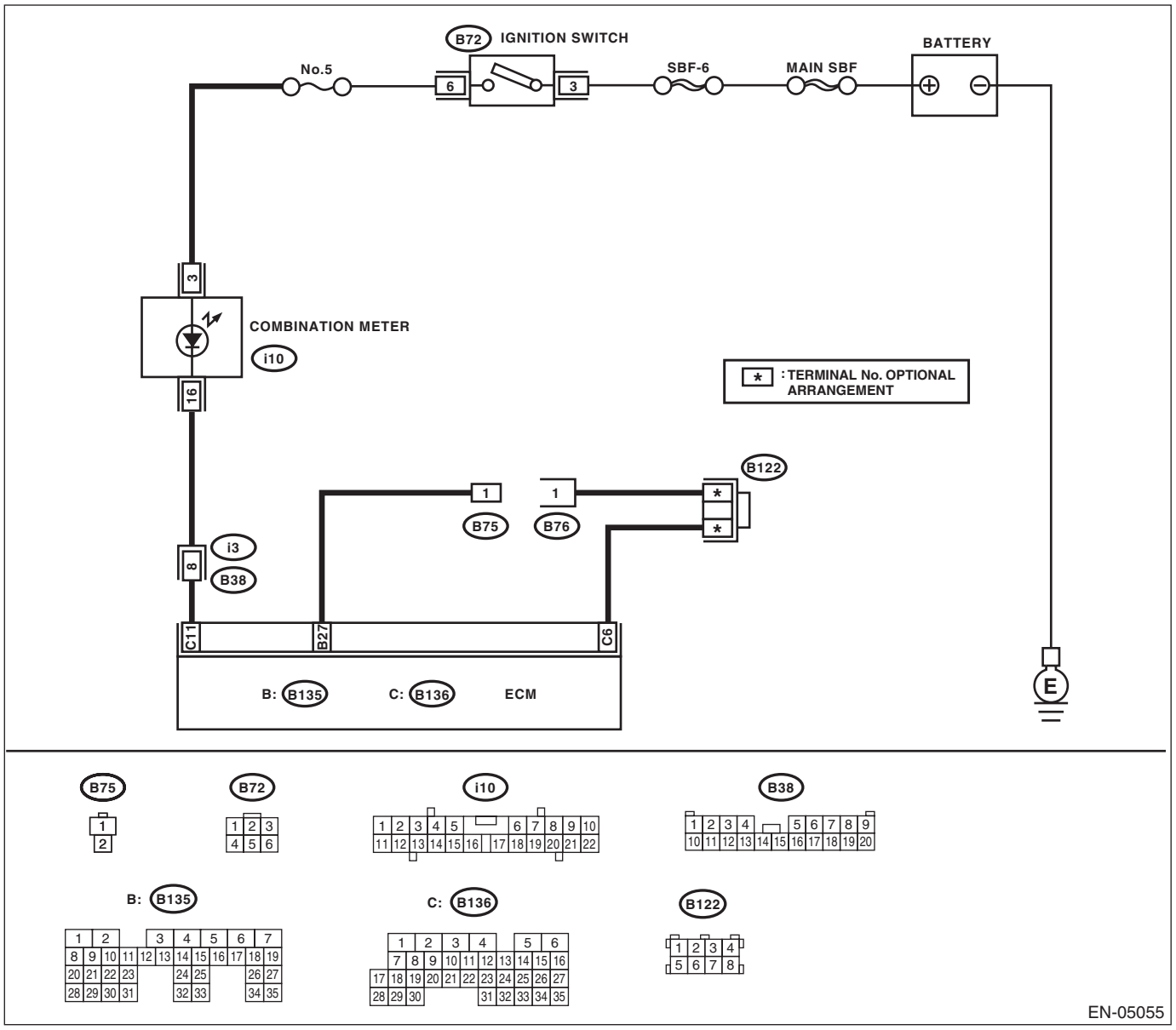
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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)-60, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from 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 TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of harness between test mode connector and ECM connector. ***Connector & terminal*** ***(B76) 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 test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair poor contact of the ECM connector.	Go to step **5**.
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 27 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit of harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair poor contact of the ECM connector.	Replace the ECM. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING

DIAGNOSIS:
Test mode connector circuit is shorted.
TROUBLE SYMPTOM:
Malfunction indicator light blinks when test mode connector is not connected.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect the 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 test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND CHASSIS GROUND TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of harness between ECM connector 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 test mode connector.	Replace the ECM. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>

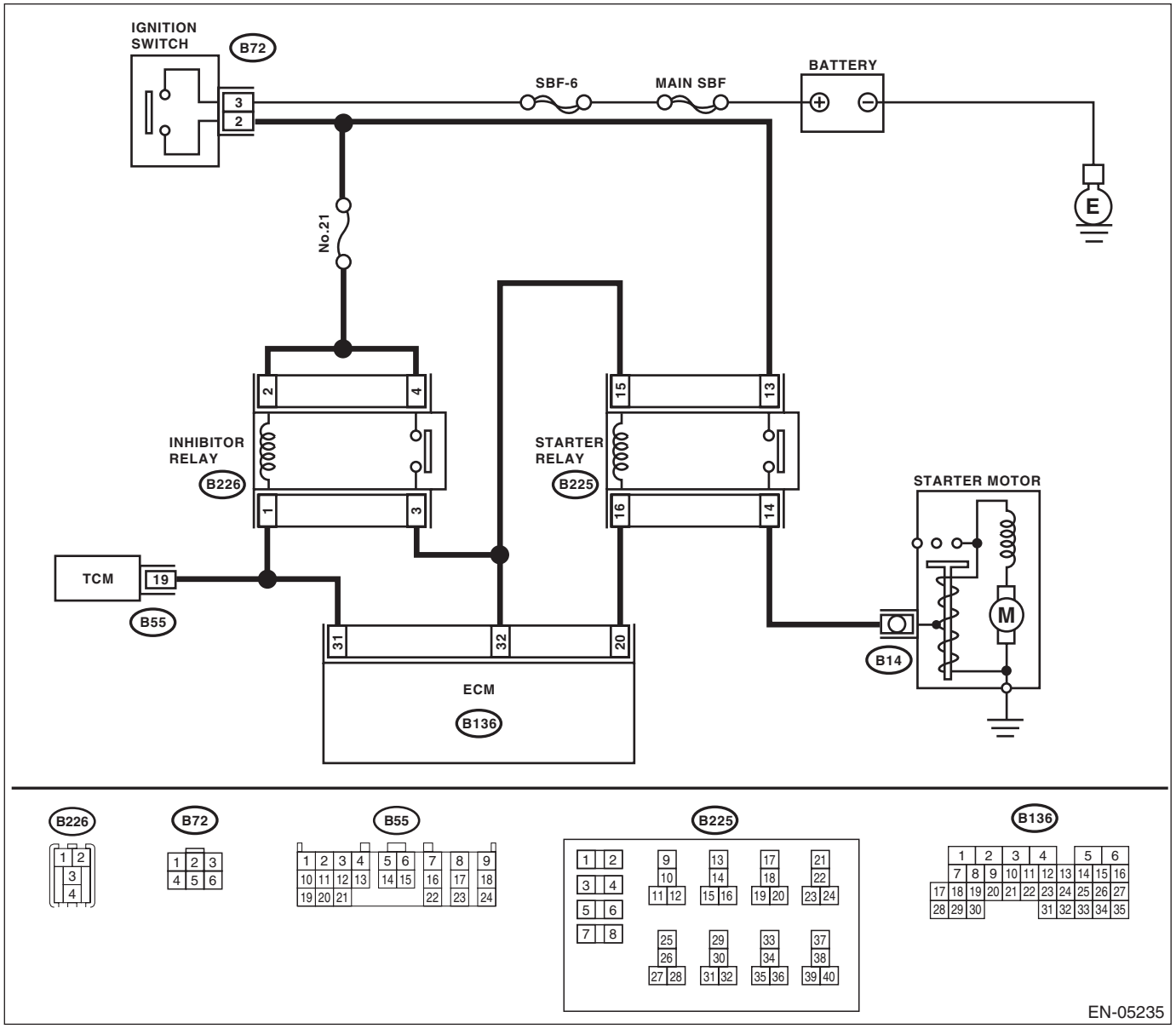
17.Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Check of the fuel amount
↓
2. Inspection of starter motor circuit. <Ref. to EN(H6DO)(diag)-68, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H6DO)(diag)-72, 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)-74, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit <Ref. to EN(H6DO)(diag)-77, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel indicator circuit <Ref. to EN(H6DO)(diag)-78, 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)-43, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



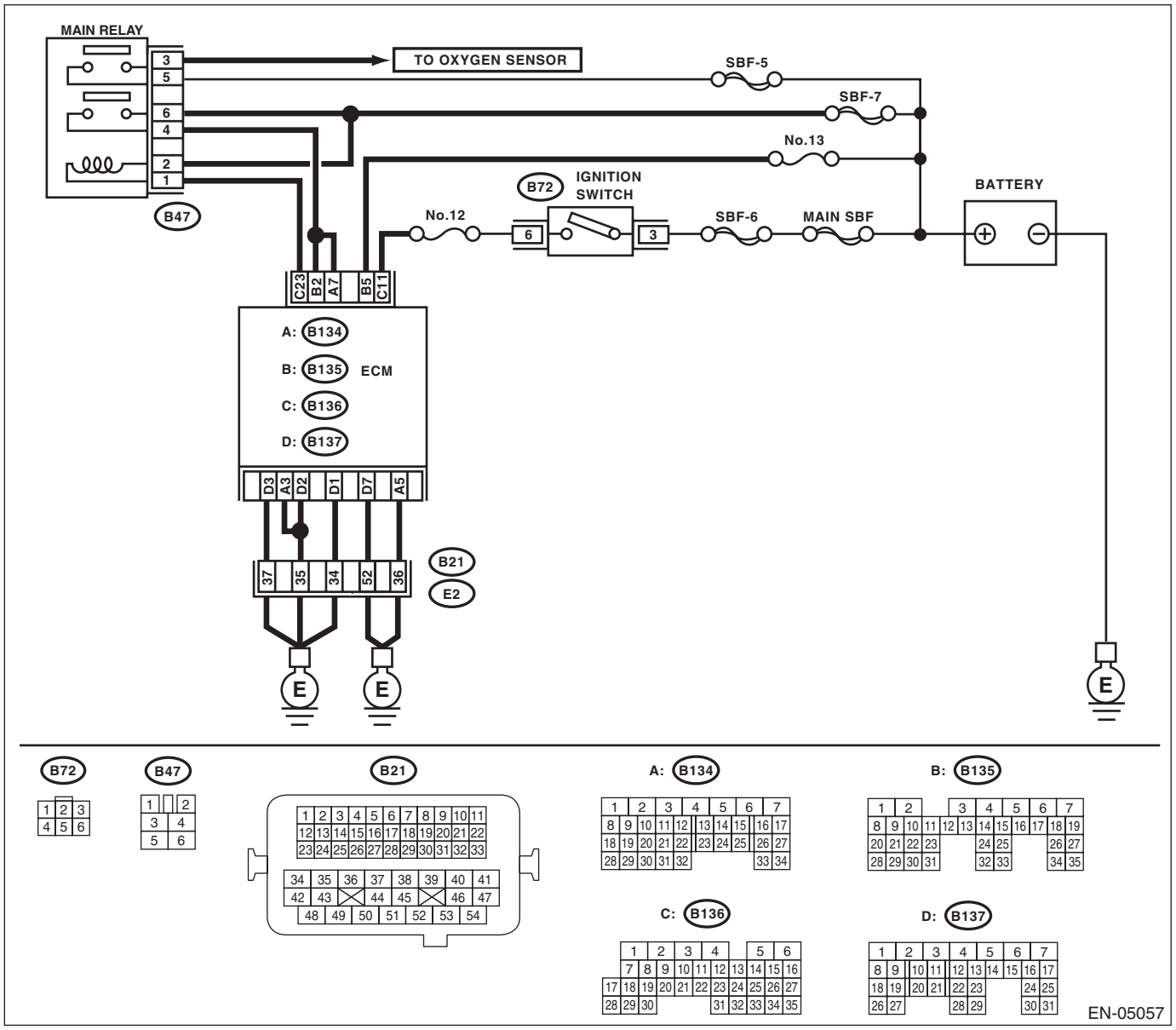
	Step	Check	Yes	No
1	**CHECK BATTERY.** Check the battery voltage.	Is the voltage 12 V or more?	Go to step **2**.	Charge or replace the battery.
2	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **3**.	Go to step **4**.
3	**CHECK DTC.**	Is DTC displayed? <Ref. to EN(H6DO)(diag)-42, OPERATION, Read Diagnostic Trouble Code (DTC).>	Check the appropriate DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-80, List of Diagnostic Trouble Code (DTC).>	The circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
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” 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(H4SO)-6, Starter.>	Go to step **5**.
5	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Place the select lever in “P” 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-47, 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 the 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) Place the select lever in “P” 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. 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 — (B226) No. 1:*** ***(B136) No. 32 — (B226) No. 3:***	Is the resistance less than 1 Ω?	Check the ECM power supply and ground line. <Ref. to EN(H6DO)(diag)-72, 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*** ***(B226) No. 2 (+) — Chassis ground (–):*** ***(B226) 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*** ***(B226) 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)-43, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

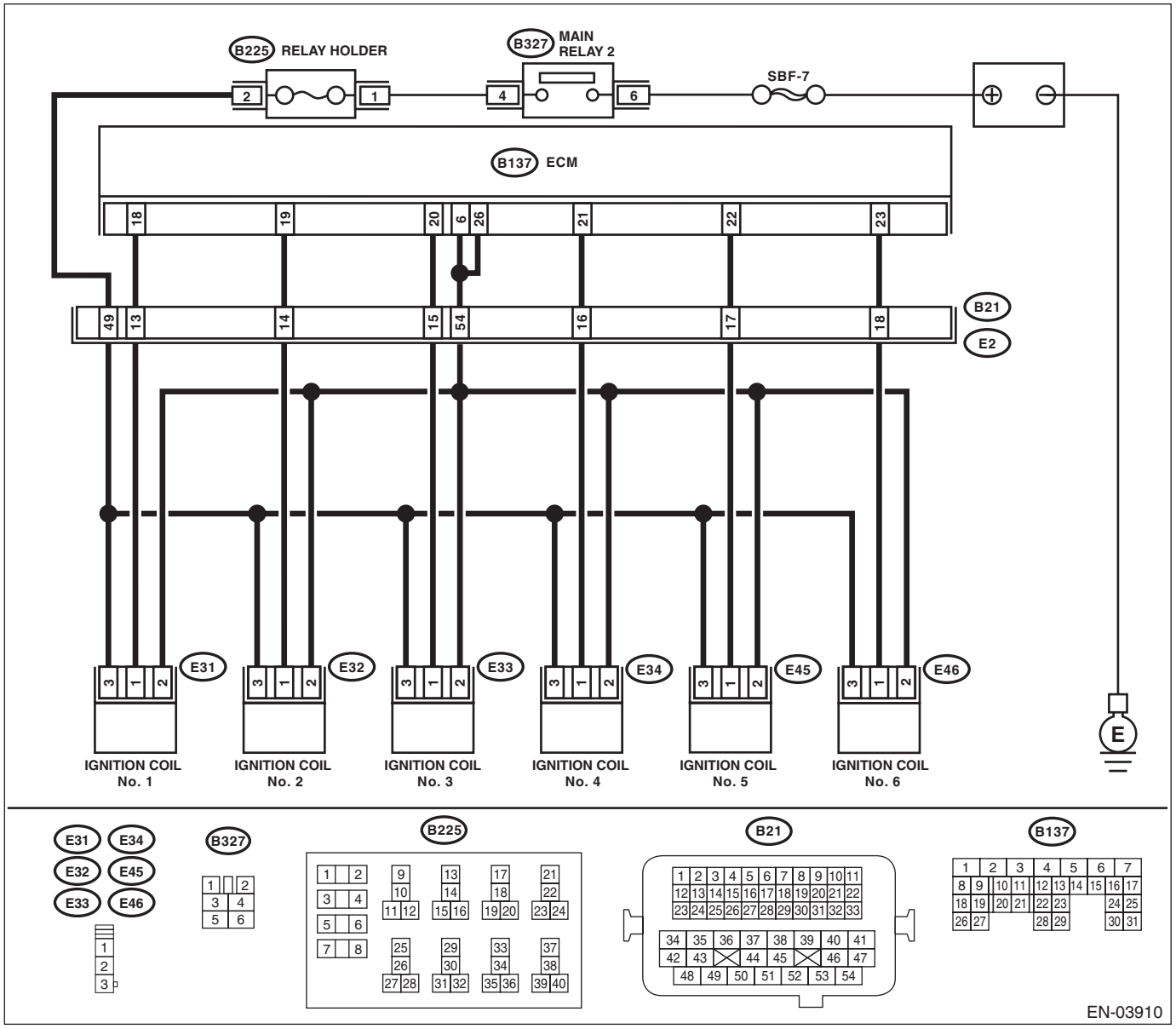


Step		Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2**.	Replace the main relay.

	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance of harness between ECM connector 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 connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — 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 ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 11 (+) — 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 INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Repair the open circuit of harness between ECM connector and main relay connector.
6	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Connect the connectors to ECM and main relay. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 23 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **7**.	Repair the open or ground short circuit of harness between ECM connector and main relay connector.
7	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **8**.	Repair the open or ground short circuit of harness of power supply circuit.
8	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector 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)-74, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit of harness between ECM connector 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)-43, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

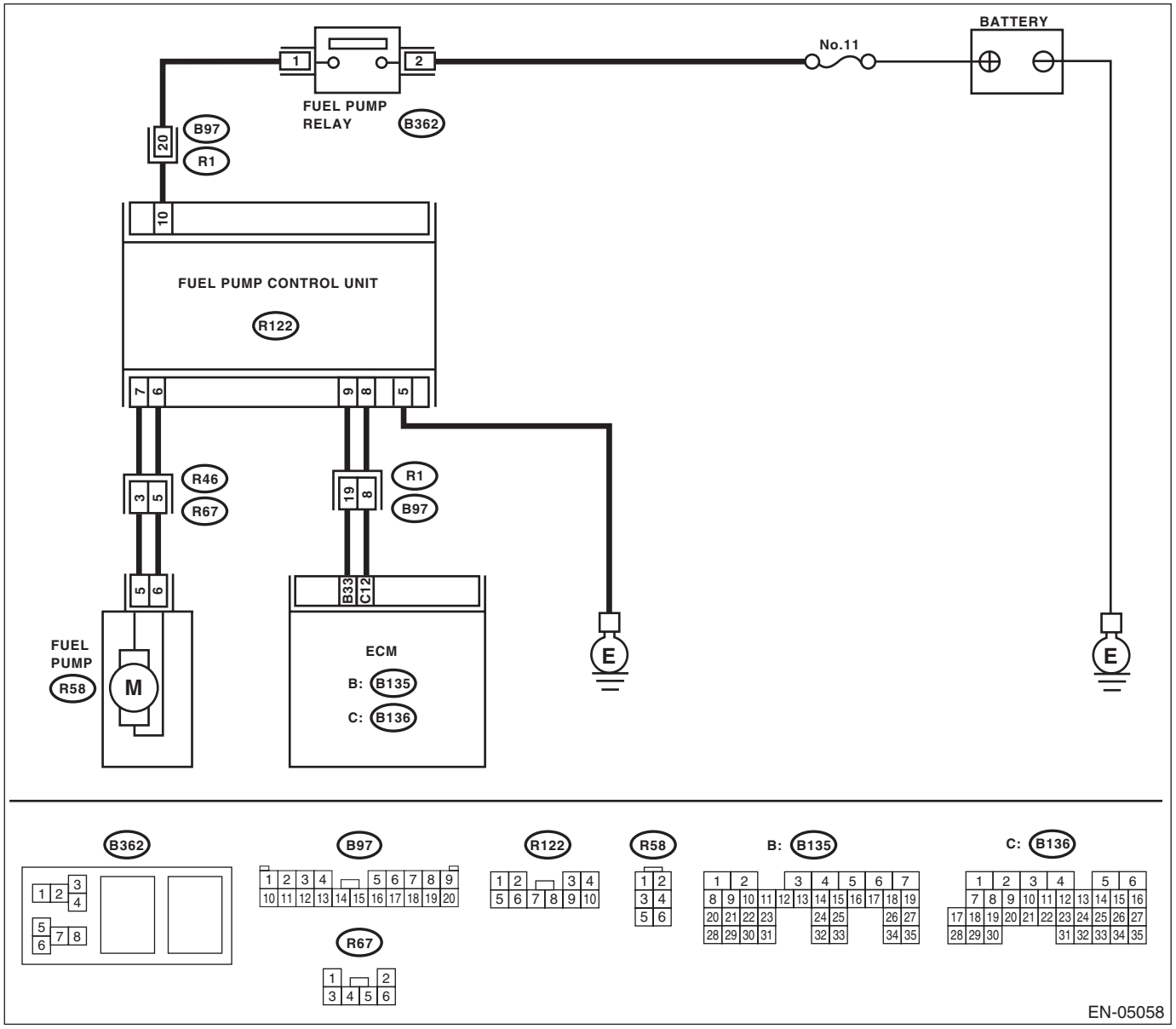


	Step	Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H6DO)-5, INSPECTION, Spark Plug.>	Is the spark plug condition notmal?	Go to step **2**.	Replace the spark plug.
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. 3) Contact the spark plug thread portion to engine. 4) While opening the throttle valve fully, start the engine to check if spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H6DO)(diag)-77, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3**.
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL AND IGNITOR ASSEMBLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ignition coil & ignitor assembly. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil and ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (–):*** ***(E32) No. 3 (+) — Engine ground (–):*** ***(E33) No. 3 (+) — Engine ground (–):*** ***(E34) No. 3 (+) — Engine ground (–):*** ***(E45) No. 3 (+) — Engine ground (–):*** ***(E46) No. 3 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between the ignition coil and ignitor assembly and ignition switch connector • Poor contact of coupling connector
4	**CHECK HARNESS OF IGNITION COIL AND IGNITOR ASSEMBLY GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ignition coil and ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — (B137) No. 6:*** ***(E32) No. 2 — (B137) No. 6:*** ***(E33) No. 2 — (B137) No. 6:*** ***(E34) No. 2 — (B137) No. 6:*** ***(E45) No. 2 — (B137) No. 6:*** ***(E46) No. 2 — (B137) No. 6:*** ***(E31) No. 2 — (B137) No. 26:*** ***(E32) No. 2 — (B137) No. 26:*** ***(E33) No. 2 — (B137) No. 26:*** ***(E34) No. 2 — (B137) No. 26:*** ***(E45) No. 2 — (B137) No. 26:*** ***(E46) No. 2 — (B137) No. 26:***	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 ignition coil and ignitor assembly connector and engine grounding terminal

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Disconnect the connector from the ignition coil & ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil and ignitor assembly 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 in harness between ECM and ignition coil and ignitor assembly connector • Poor contact of coupling connector
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM connector and engine ground. ***Connector & terminal:*** ***(B137) No. 18 — Engine ground:*** ***(B137) No. 19 — Engine ground:*** ***(B137) No. 20 — Engine ground:*** ***(B137) No. 21 — Engine ground:*** ***(B137) No. 22 — Engine ground:*** ***(B137) No. 23 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the ground short circuit of harness between ECM and ignition coil and ignitor assembly connector.
7	**CHECK POOR CONTACT.** Check for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair poor contact of the ECM connector.	Check the fuel pump circuit. <Ref. to EN(H6DO)(diag)-77, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

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)-43, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

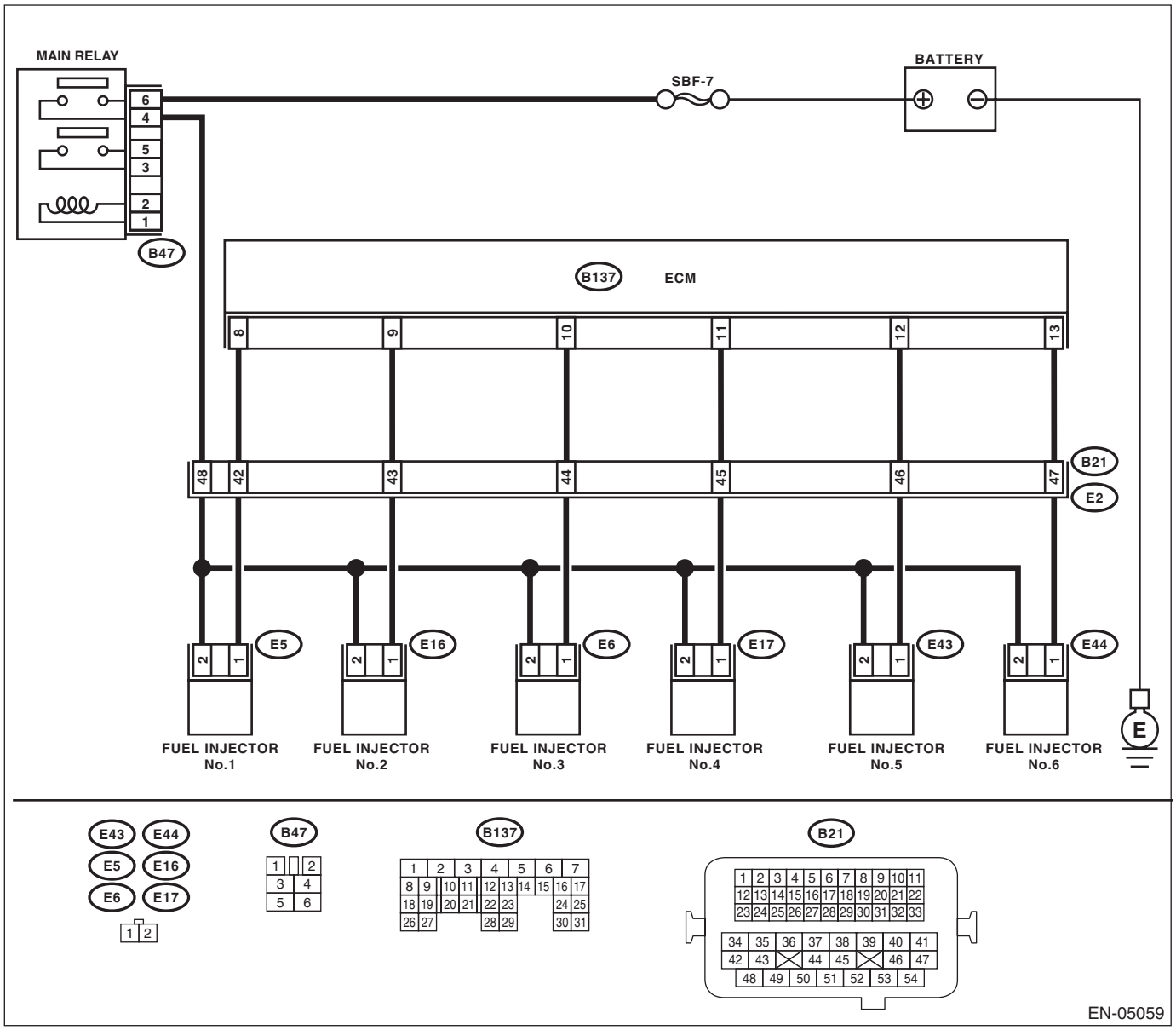


Step		Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump operates for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can also be executed using Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <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)-78, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(H6DO)(diag)-42, 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)-43, PROCEDURE, Inspection Mode.>.**

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check each fuel injector emits operating sound. Use a sound scope or attach a screwdriver to the injector for this check.	Does the fuel pump emit operating sound?	Check the fuel pressure. <Ref. to ME(H6DO)-26, INSPECTION, Fuel Pressure.>	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):*** ***#5 (E43) No. 2 (+) — Engine ground (–):*** ***#6 (E44) No. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and fuel injector connector • Poor contact of main relay connector • Poor contact of coupling connector • Poor contact of fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect the connectors from the ECM. 2) 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 ground short circuit of 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.
6	**CHECK POOR CONTACT.** Check for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair poor contact of the ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H6DO)(diag)-344, INSPECTION, General Diagnostic Table.>

18.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)-88, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	<Ref. to EN(H6DO)(diag)-89, DTC P0016 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to EN(H6DO)(diag)-90, DTC P0018 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (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)-91, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0026	Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)	<Ref. to EN(H6DO)(diag)-92, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0028	Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)	<Ref. to EN(H6DO)(diag)-94, DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-96, 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)-98, 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)-100, 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)-102, 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)-104, 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)-106, 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)-108, 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)-110, 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)-112, DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-114, 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)-116, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0076	Intake Valve Control Solenoid Circuit Low (Bank 1)	<Ref. to EN(H6DO)(diag)-118, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0077	Intake Valve Control Solenoid Circuit High (Bank 1)	<Ref. to EN(H6DO)(diag)-120, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0082	Intake Valve Control Solenoid Circuit Low (Bank 2)	<Ref. to EN(H6DO)(diag)-122, DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0083	Intake Valve Control Solenoid Circuit High (Bank 2)	<Ref. to EN(H6DO)(diag)-124, DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-126, 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)-128, 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)-130, 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)-132, 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)-134, 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)-136, 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)-138, 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)-140, 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)-142, 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)-144, 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)-146, 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)-148, 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)-150, 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)-151, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(H6DO)(diag)-152, 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)-153, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-155, 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)-157, 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)-159, 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)-161, 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)-163, 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)-165, 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 (Bank1 Sensor2)	<Ref. to EN(H6DO)(diag)-167, 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)-170, 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)-172, 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)-174, 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)-176, 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)-178, 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)-180, 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)-182, 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 (Bank2 Sensor2)	<Ref. to EN(H6DO)(diag)-184, 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)-186, 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)-186, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0174	System Too Lean (Bank 2)	<Ref. to EN(H6DO)(diag)-186, 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)-187, 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)-189, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to EN(H6DO)(diag)-191, 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)-193, 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)-195, 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)-197, 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)-199, 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)-201, 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)-203, 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)-215, 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)-217, 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)-219, 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)-221, 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)-223, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-225, 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)-227, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	<Ref. to EN(H6DO)(diag)-229, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H6DO)(diag)-231, 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)-235, 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)-238, 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)-240, 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)-242, 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)-244, 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)-246, 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)-248, 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)-251, 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)-254, 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)-256, 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)-258, 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)-258, 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)-258, 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)-259, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Fan Rationality Check	<Ref. to EN(H6DO)(diag)-259, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle Speed Sensor “A”	<Ref. to EN(H6DO)(diag)-260, 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)-261, 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)-263, 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)-265, 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).>
P0519	Idle Air Control System Performance	<Ref. to EN(H6DO)(diag)-267, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial Communication Link	<Ref. to EN(H6DO)(diag)-267, 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)-268, 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)-269, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(H6DO)(diag)-270, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/ Performance (Bank 1)	<Ref. to EN(H6DO)(diag)-271, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Fan 1 Control Circuit Low	<Ref. to EN(H6DO)(diag)-272, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Fan 1 Control Circuit High	<Ref. to EN(H6DO)(diag)-272, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H6DO)(diag)-272, 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)-273, 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)-275, 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)-277, 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)-279, 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)-280, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H6DO)(diag)-281, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to EN(H6DO)(diag)-283, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(H6DO)(diag)-285, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H6DO)(diag)-287, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to EN(H6DO)(diag)-289, 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)-291, 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)-300, 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)-302, DTC P2089 INTAKE 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)-304, 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)-306, DTC P2093 INTAKE 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)-307, 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)-308, 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)-313, 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)-314, 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)-320, 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)-325, 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)-327, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance	<Ref. to EN(H6DO)(diag)-328, 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)-329, 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)-331, 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)-333, 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)-335, 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)-337, 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)-340, 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)-342, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2228	Barometric Pressure Circuit Low	<Ref. to EN(H6DO)(diag)-342, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2229	Barometric Pressure Circuit High	<Ref. to EN(H6DO)(diag)-343, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-9, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous 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)-43, 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 procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-33, 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 (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)
2	**CHECK CURRENT DATA.** 1) Drive (accelerate or decelerate) the vehicle at 80 km/h (50 MPH) or less. NOTE: Drive the vehicle so that duty output of the oil flow control solenoid valve increases. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H6DO)-7, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-15, Engine Oil Filter.>

B: DTC P0016 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-11, 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)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-33, 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)-7, 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 (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft) • Timing belt chain (matching of timing mark)

C: DTC P0018 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-12, 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)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-33, 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)-7, 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 (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft) • Timing belt chain (matching of timing mark)

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-12, 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)-43, 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 procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-33, 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 (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)
2	**CHECK CURRENT DATA.** 1) Drive (accelerate or decelerate) the vehicle at 80 km/h (50 MPH) or less. NOTE: Drive the vehicle so that duty output of the oil flow control solenoid valve increases. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H6DO)-7, REPLACEMENT, Engine Oil.> <Ref. to LU(H6DO)-15, Engine Oil Filter.>

E: DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-13, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

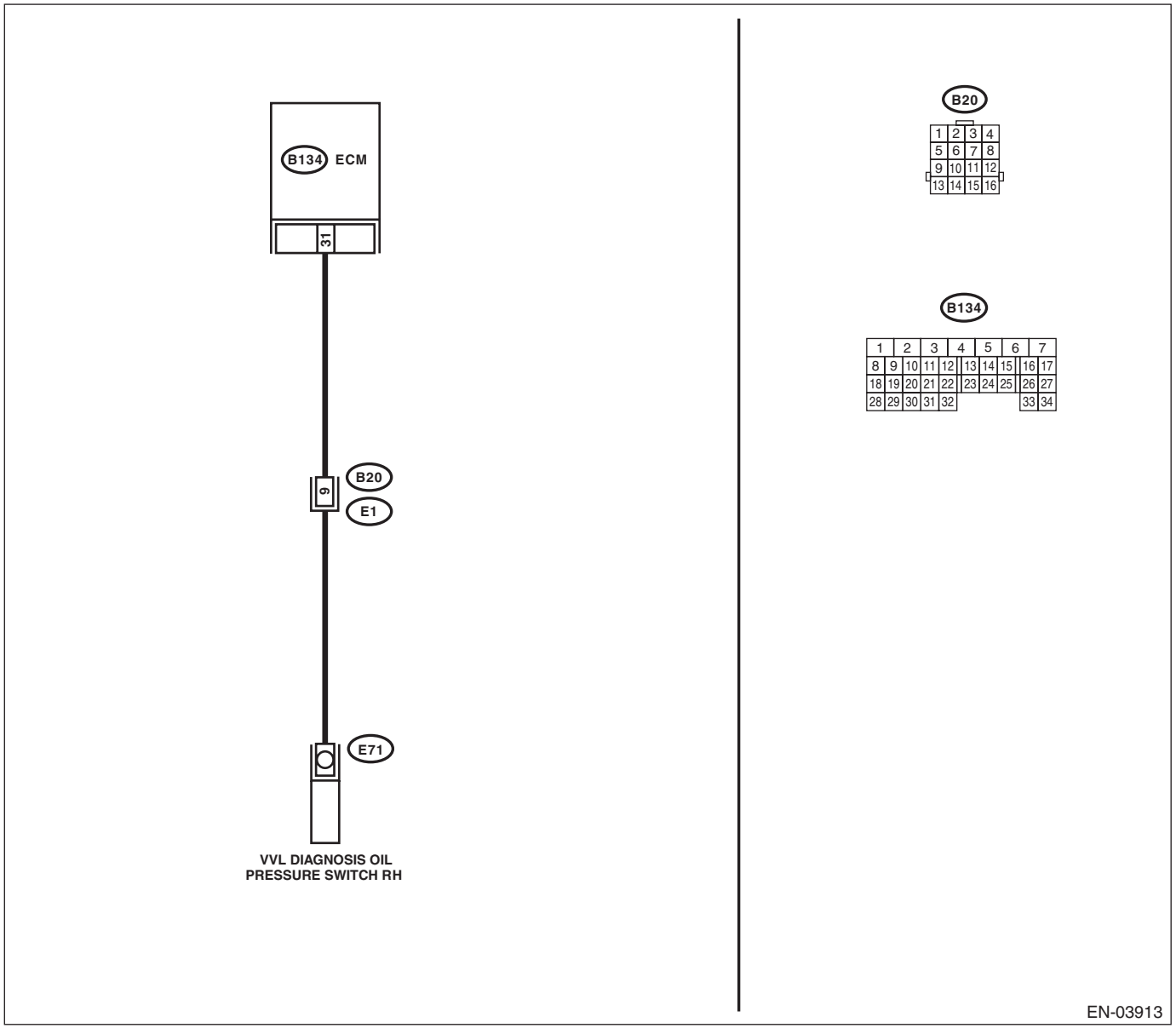
TROUBLE SYMPTOM:

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH.** 1) Warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from the ECM and variable valve lift diagnosis oil pressure switch. 4) Measure the resistance of harness between ECM and variable valve lift diagnosis oil pressure switch connector. ***Connector & terminal*** ***(B134) No. 31 — (E71) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and variable valve lift diagnosis oil pressure switch connector.
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH.** Measure the resistance between the variable valve lift diagnosis oil pressure switch connector and engine ground. ***Connector & terminal*** ***(E71) 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 variable valve lift diagnosis oil pressure switch connector.
3	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the variable valve lift diagnosis oil pressure switch connector and engine ground. ***Connector & terminal*** ***(E71) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power of the harness between the ECM and variable valve lift diagnosis oil pressure switch connector.	Go to step **4**.
4	**CHECK DTC.** 1) Perform the Clear Memory Mode. 2) After idling the engine, check the DTC. NOTE: For detailed procedures, refer to “Clear Memory Mode”. <Ref. to EN(H6DO)(diag)-54, Clear Memory Mode.>	Is DTC displayed?	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-75, Oil Switching Solenoid Valve.> Go to step **5**.	END.
5	**CHECK DTC.** 1) Perform the Clear Memory Mode. 2) After idling the engine, check the DTC. NOTE: For detailed procedures, refer to “Clear Memory Mode”. <Ref. to EN(H6DO)(diag)-54, Clear Memory Mode.>	Is DTC displayed?	Check for oil routing.	END.

F: DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-15, DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

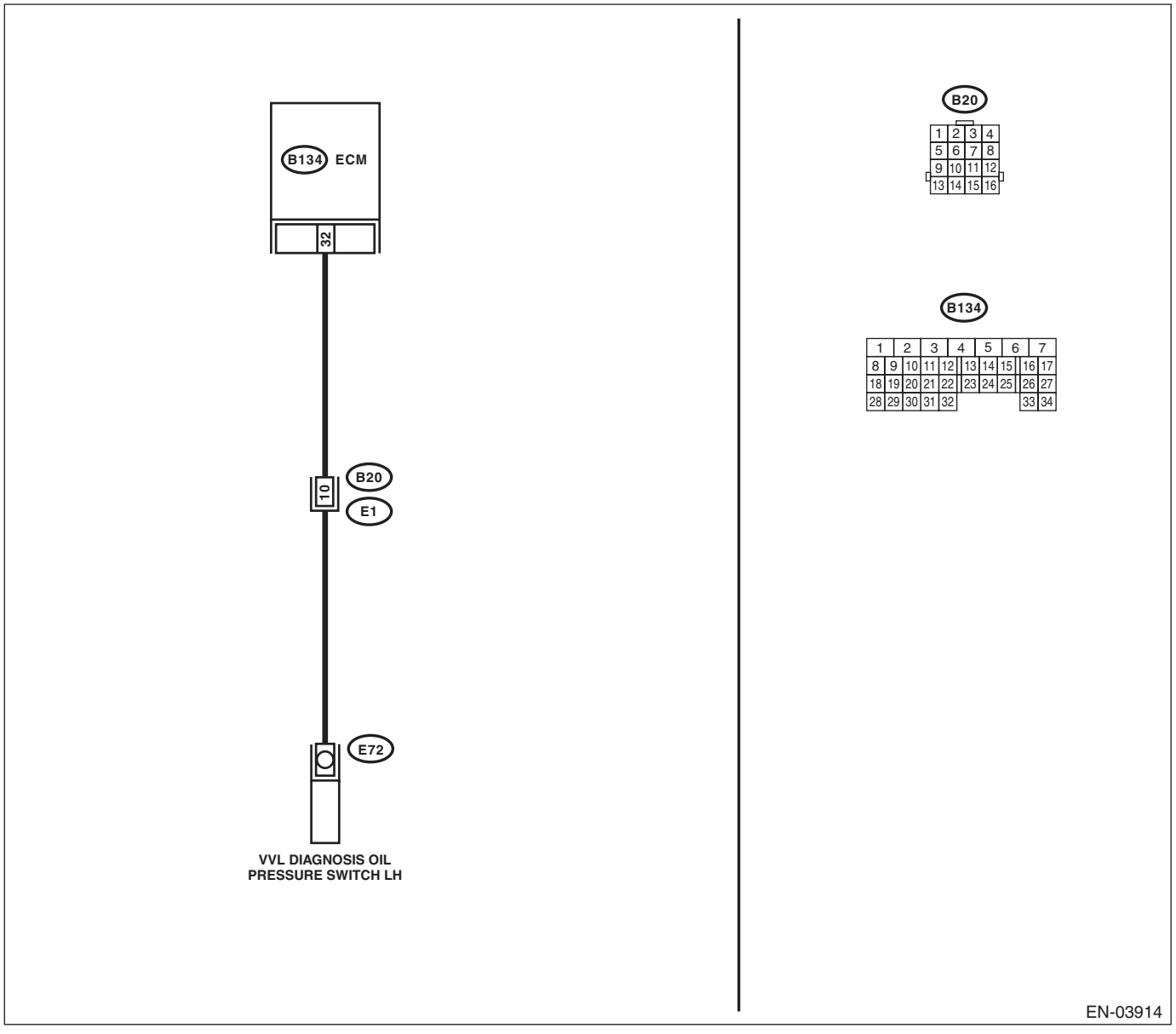
TROUBLE SYMPTOM:

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH.** 1) Warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from the ECM and variable valve lift diagnosis oil pressure switch. 4) Measure the resistance of harness between ECM and variable valve lift diagnosis oil pressure switch connector. ***Connector & terminal*** ***(B134) No. 32 — (E72) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and variable valve lift diagnosis oil pressure switch connector.
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH.** Measure the resistance between the variable valve lift diagnosis oil pressure switch connector and engine ground. ***Connector & terminal*** ***(E72) 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 variable valve lift diagnosis oil pressure switch connector.
3	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the variable valve lift diagnosis oil pressure switch connector and engine ground. ***Connector & terminal*** ***(E72) No. 1 (+) — Engine ground(–):***	Is the voltage 10 V or more?	Repair the short circuit to power of the harness between the ECM and variable valve lift diagnosis oil pressure switch connector.	Go to step **4**.
4	**CHECK DTC.** 1) Perform the Clear Memory Mode. 2) After idling the engine, check the DTC. NOTE: For detailed procedures, refer to “Clear Memory Mode”. <Ref. to EN(H6DO)(diag)-54, Clear Memory Mode.>	Is DTC displayed?	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-75, Oil Switching Solenoid Valve.> Go to step **5**.	END
5	**CHECK DTC.** 1) Perform the Clear Memory Mode. 2) After idling the engine, check the DTC. NOTE: For detailed procedures, refer to “Clear Memory Mode”. <Ref. to EN(H6DO)(diag)-54, Clear Memory Mode.>	Is DTC displayed?	Check for oil routing.	END

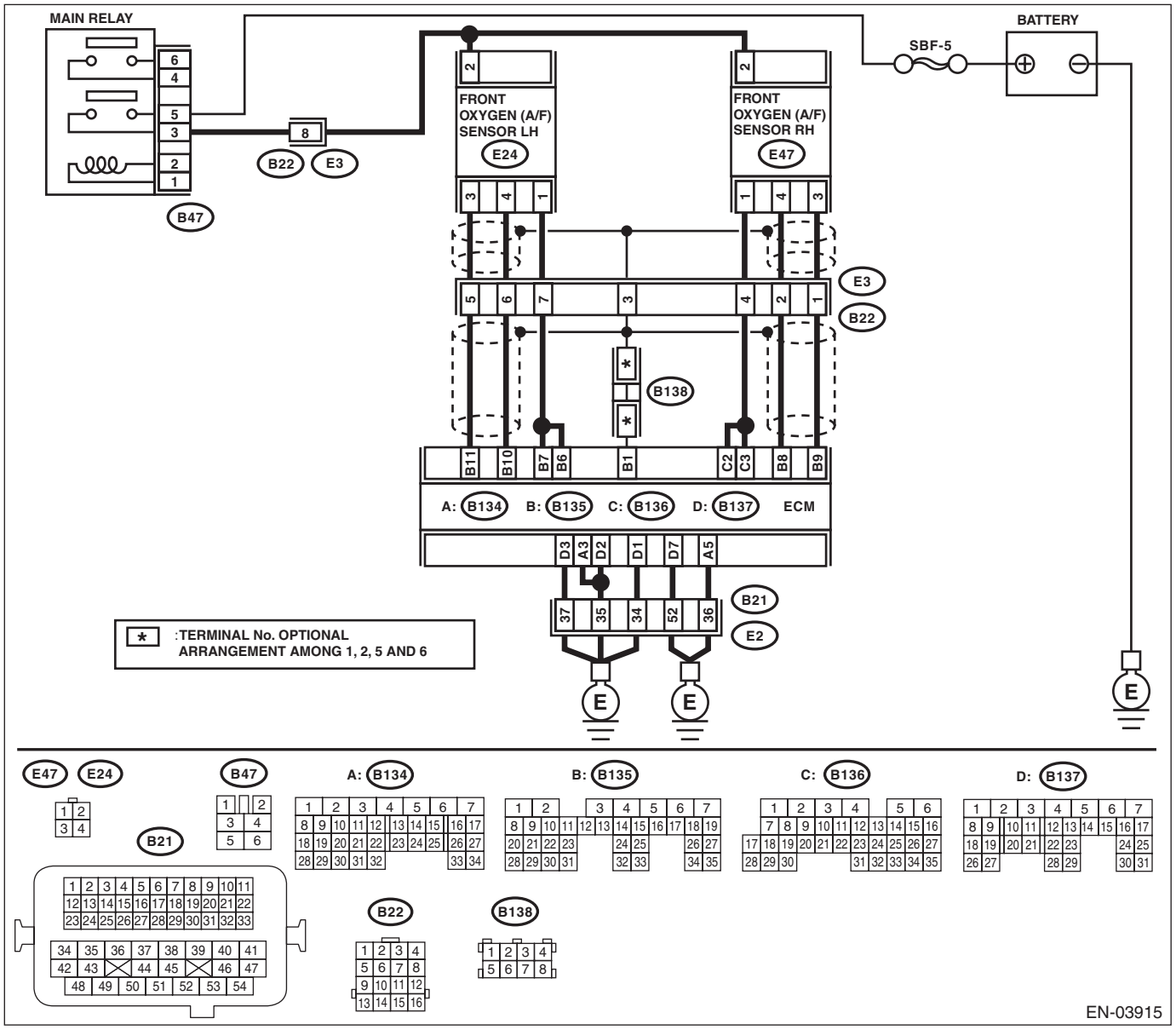
G: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-16, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from the 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 open circuit of harness between ECM and front oxygen (A/F) sensor 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 open circuit of harness between ECM and front oxygen (A/F) sensor 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 between 2 — 3 Ω?	Go to step **4**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-29, Front Oxygen (A/F) Sensor.>
4	**CHECK POOR CONTACT.** Check 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 of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-29, Front Oxygen (A/F) Sensor.>

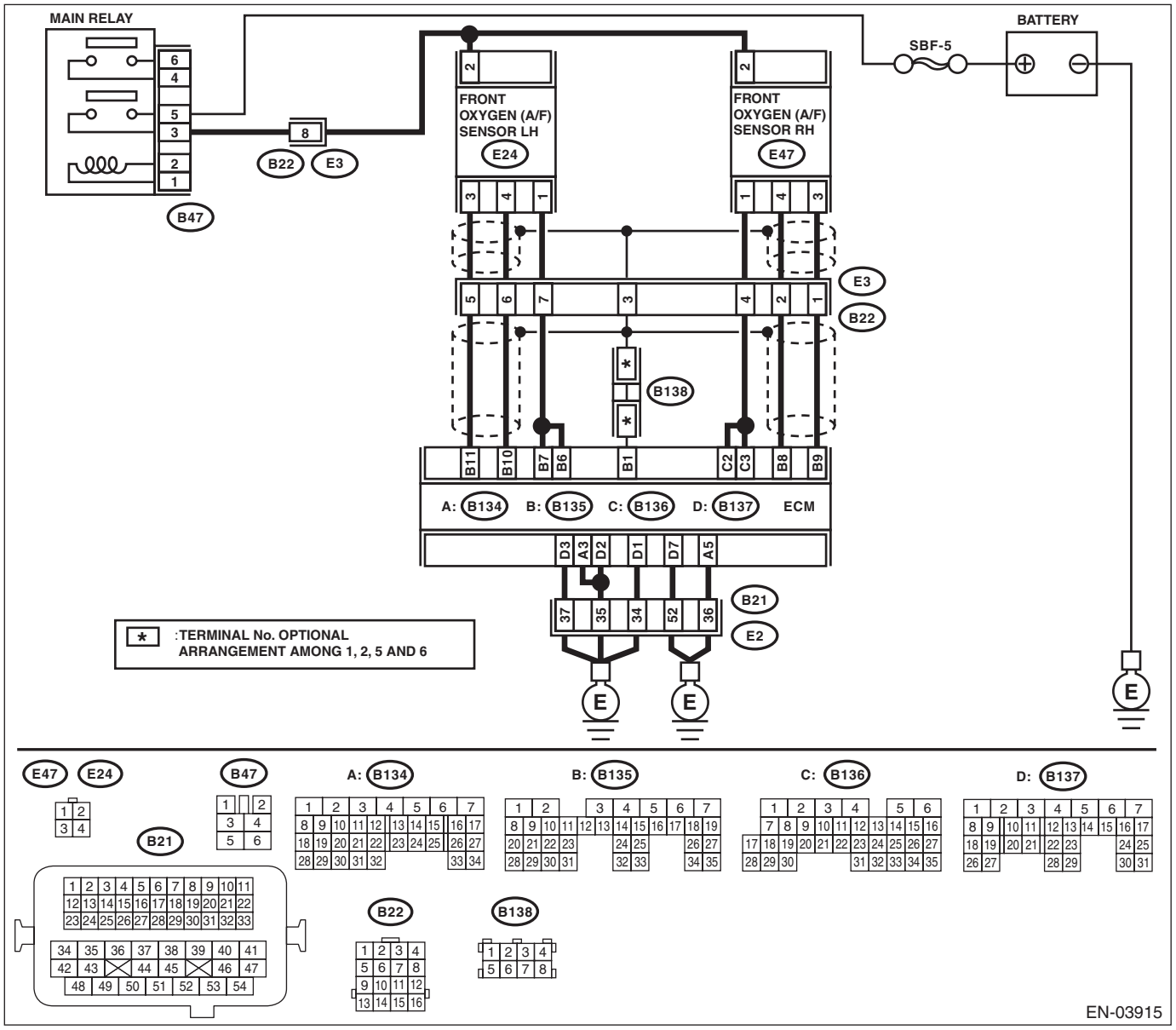
H: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-18, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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 in coupling connector • Malfunction in main relay
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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 open circuit of harness between ECM and front oxygen (A/F) sensor.
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 in ECM connector • 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 poor contact of the ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-29, Front Oxygen (A/F) Sensor.>

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

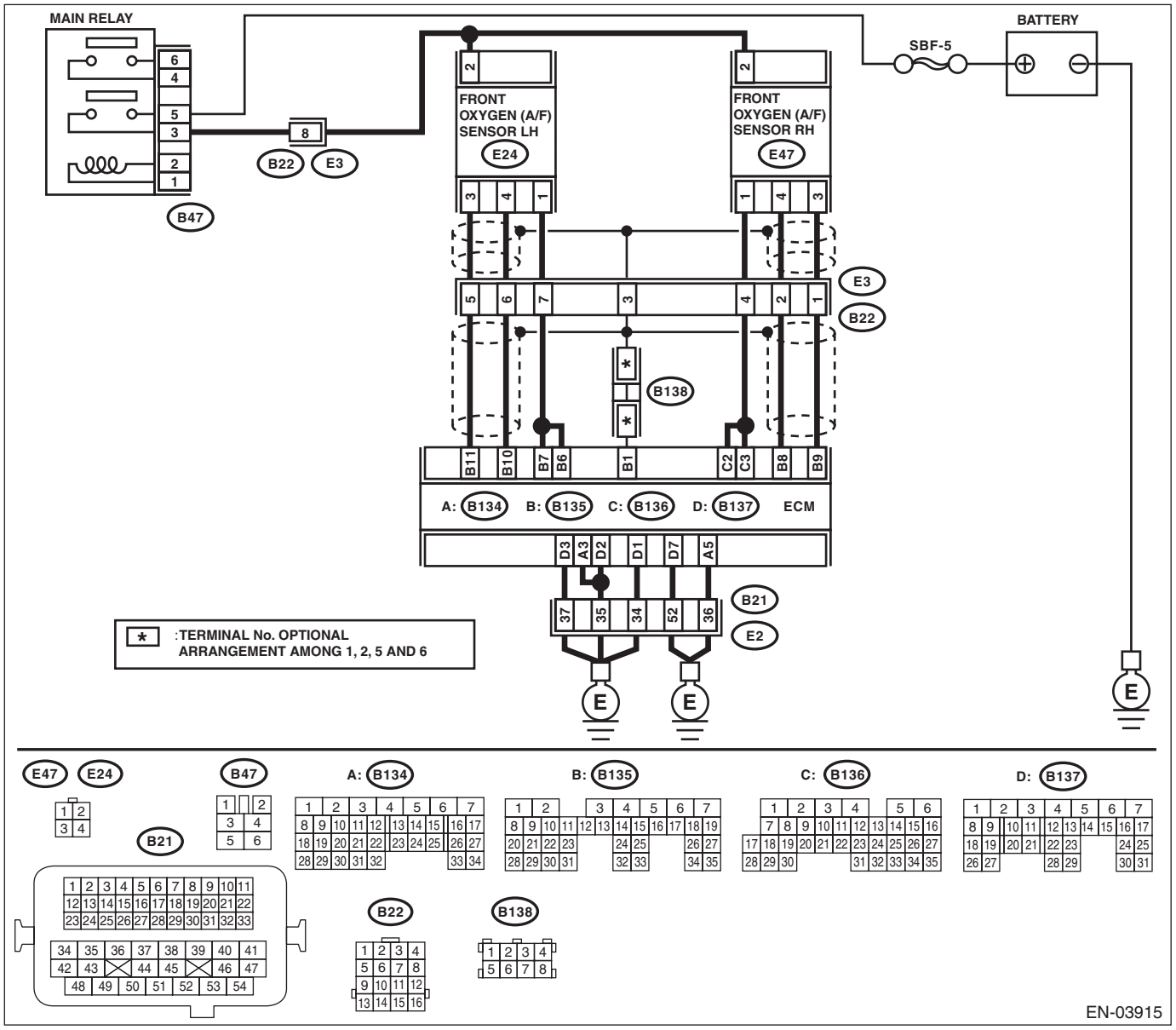
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-20, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 the ECM and front oxygen (A/F) sensor connector.	Go to step **2**.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the 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 in 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

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

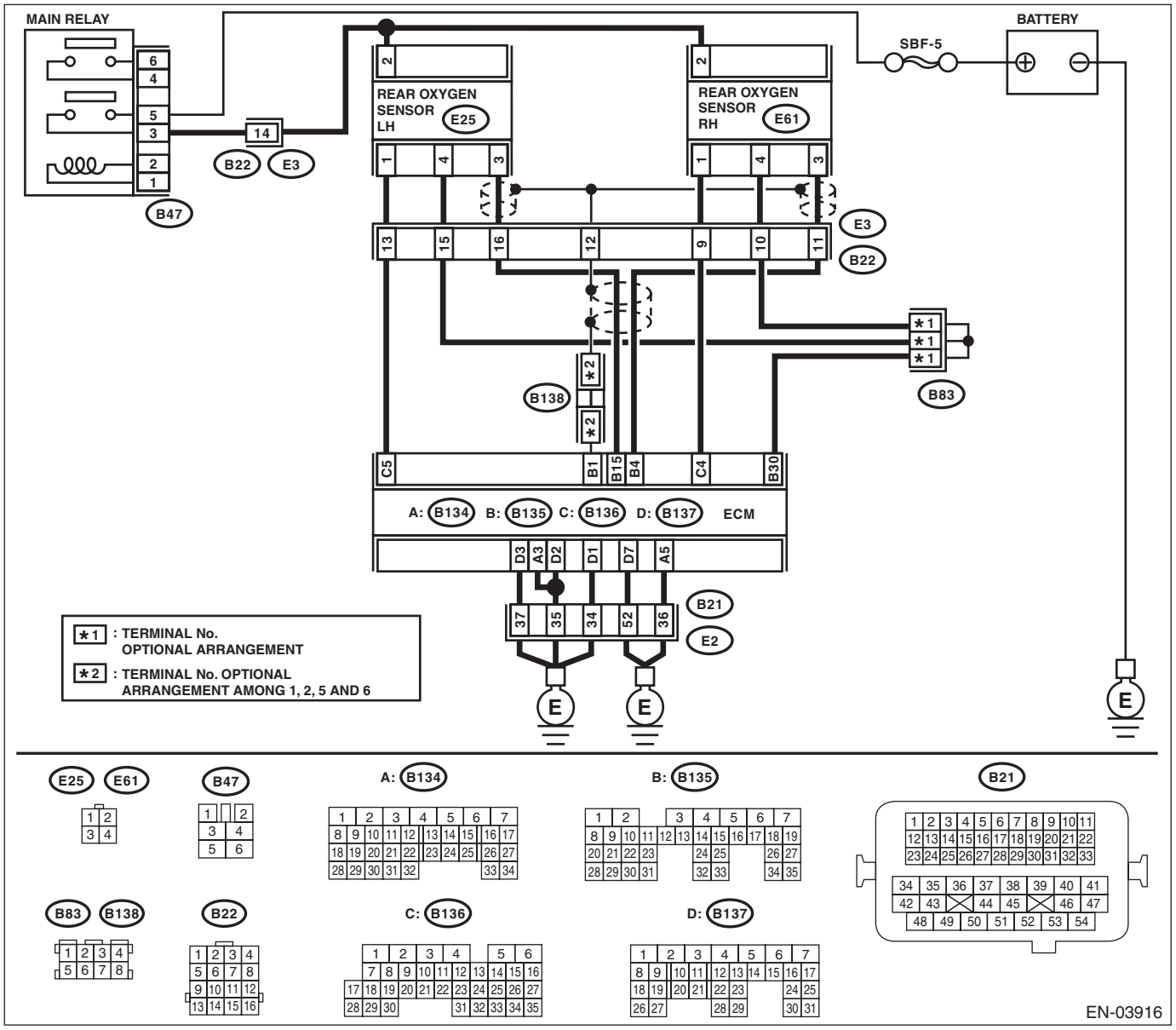
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-22, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the 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 • Poor contact of main relay connector • Poor contact in coupling connector • Malfunction in main relay
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM and oxygen sensor connector. ***Connector & terminal*** ***(B136) No. 4 — (E61) No. 1:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of the harness between ECM and rear oxygen sensor.
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 in ECM connector • 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 poor contact of the ECM connector.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-31, Rear Oxygen Sensor.>

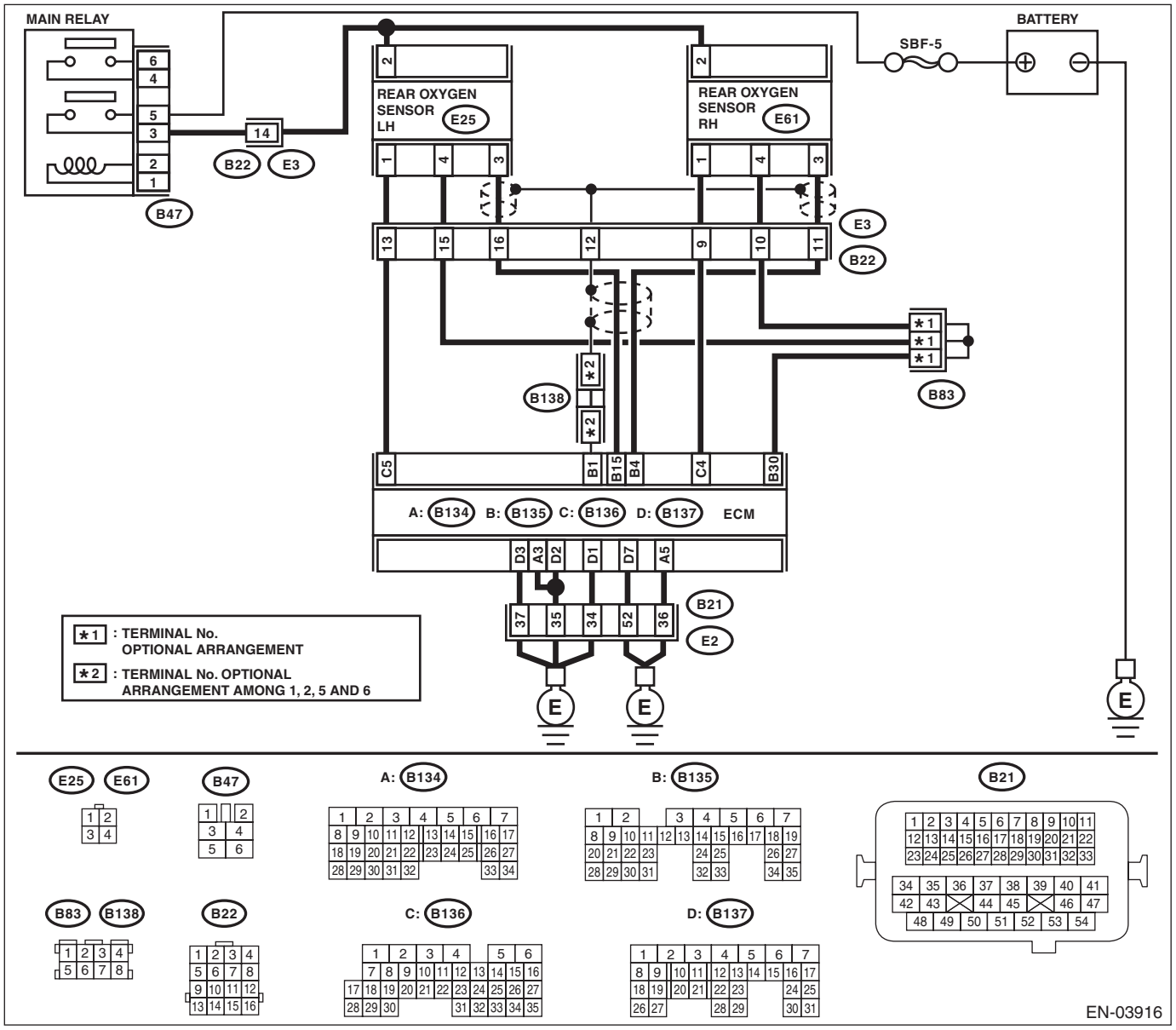
K: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-24, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 the 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 in ECM connectorr.	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

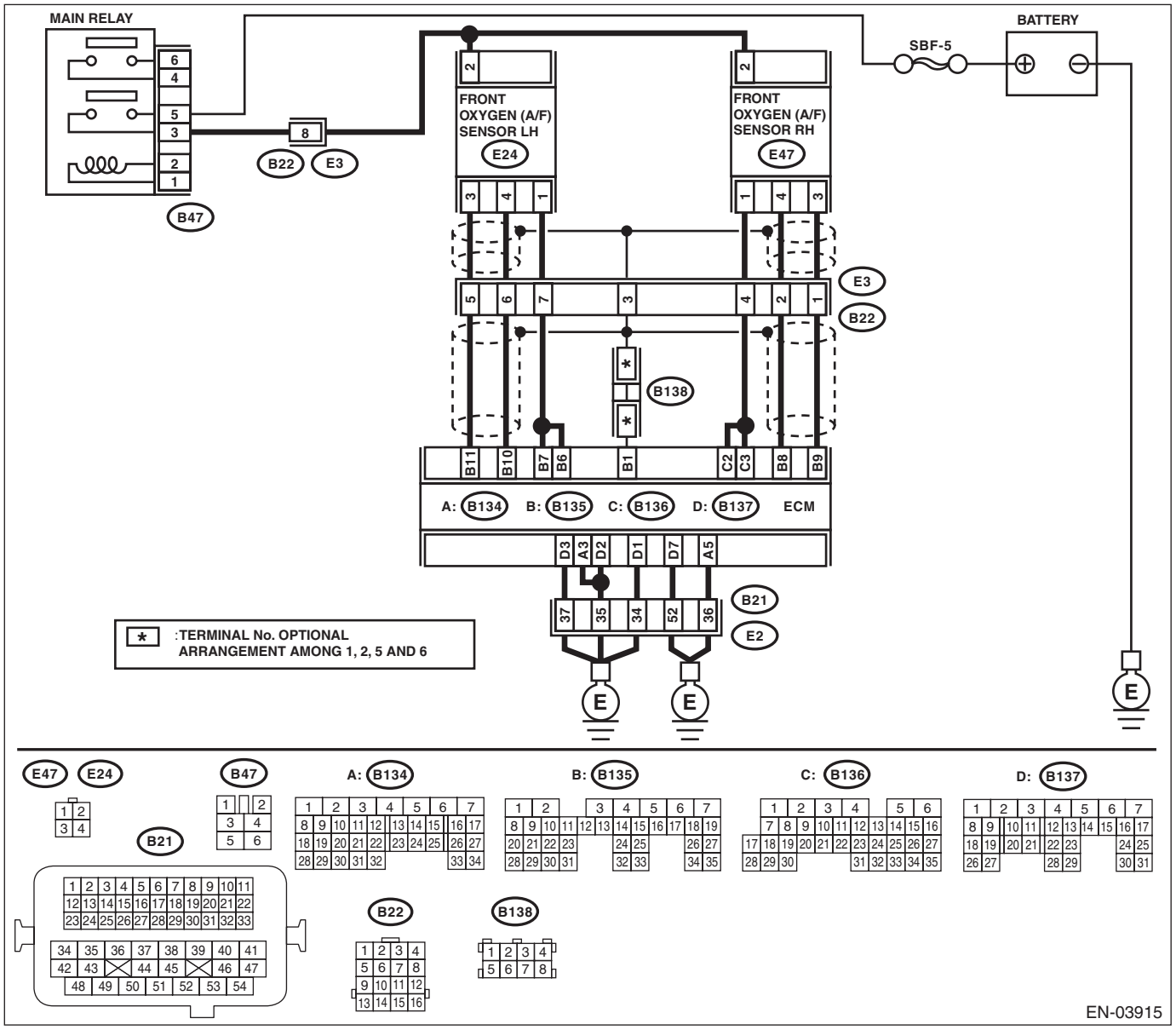
L: DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-26, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from the 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 open circuit of harness between ECM and front oxygen (A/F) sensor 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 open circuit of harness between ECM and front oxygen (A/F) sensor 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 2 — 3 Ω?	Go to step **4**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-29, Front Oxygen (A/F) Sensor.>
4	**CHECK POOR CONTACT.** Check 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 of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-29, Front Oxygen (A/F) Sensor.>

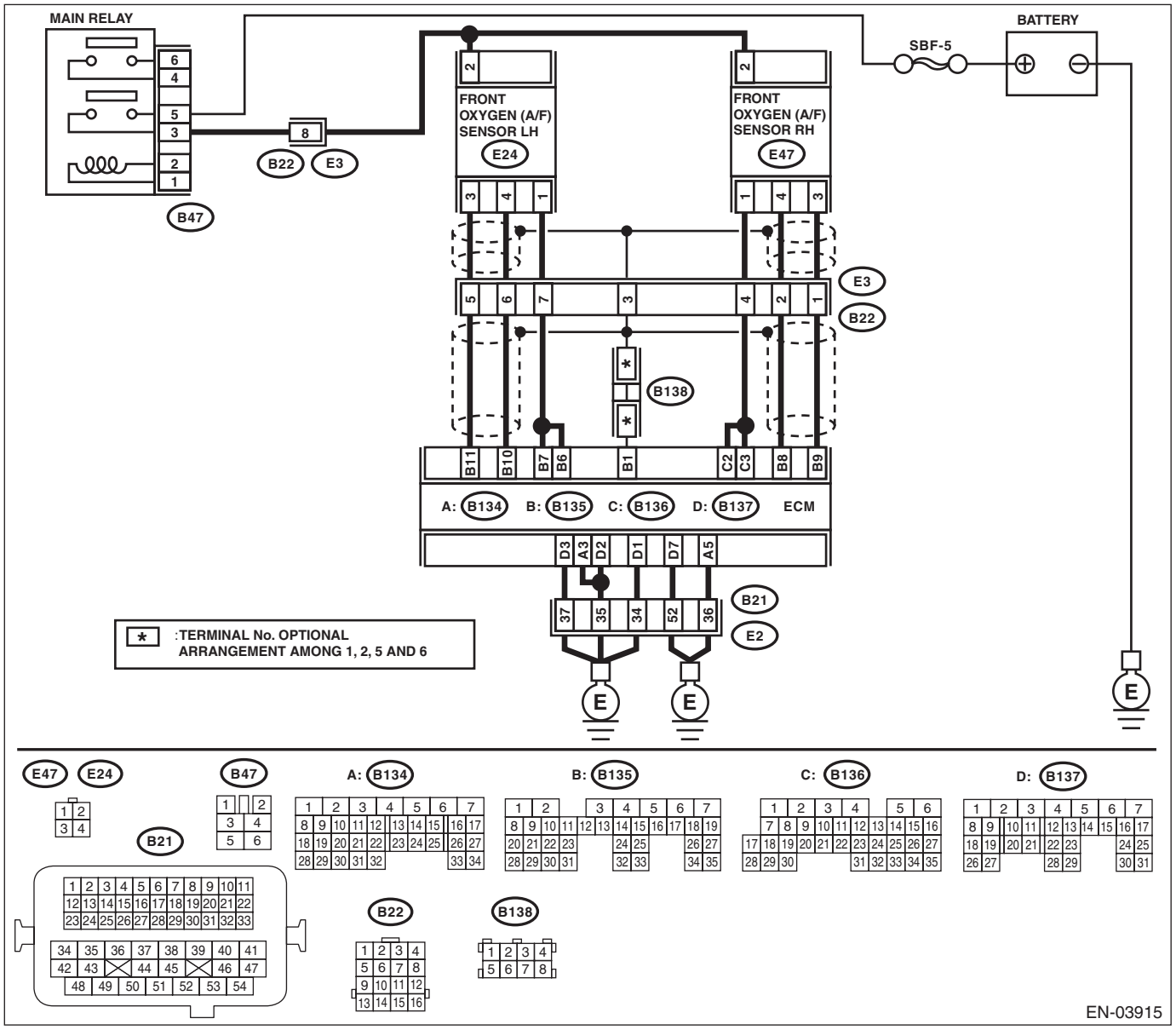
M: DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-26, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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 in coupling connector • Malfunction in main relay
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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 open circuit of harness between ECM and front oxygen (A/F) sensor.
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 in ECM connector • 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 poor contact of the ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-29, Front Oxygen (A/F) Sensor.>

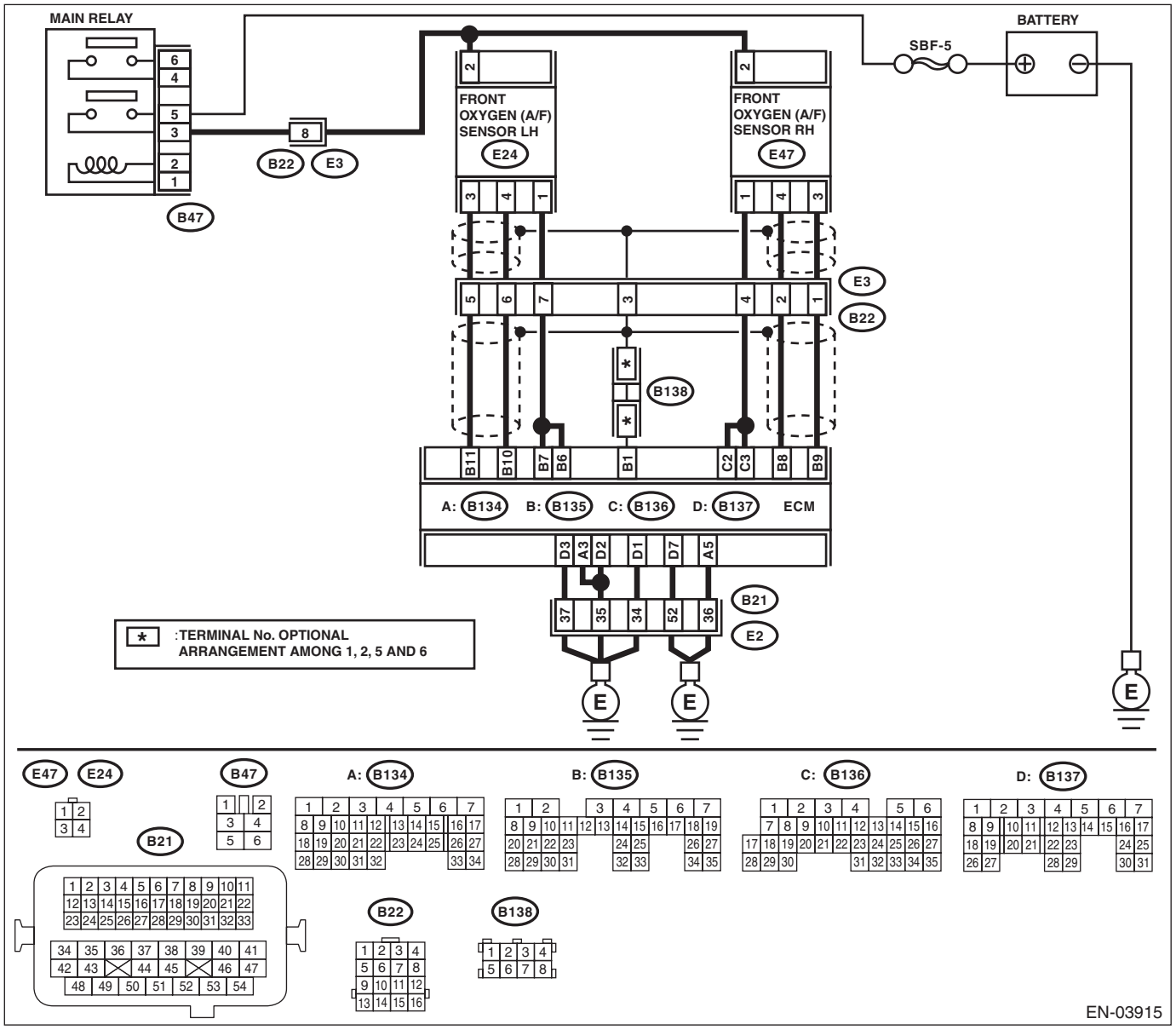
N: DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-26, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 the ECM and front oxygen (A/F) sensor connector.	Go to step **2**.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the 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 in 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

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

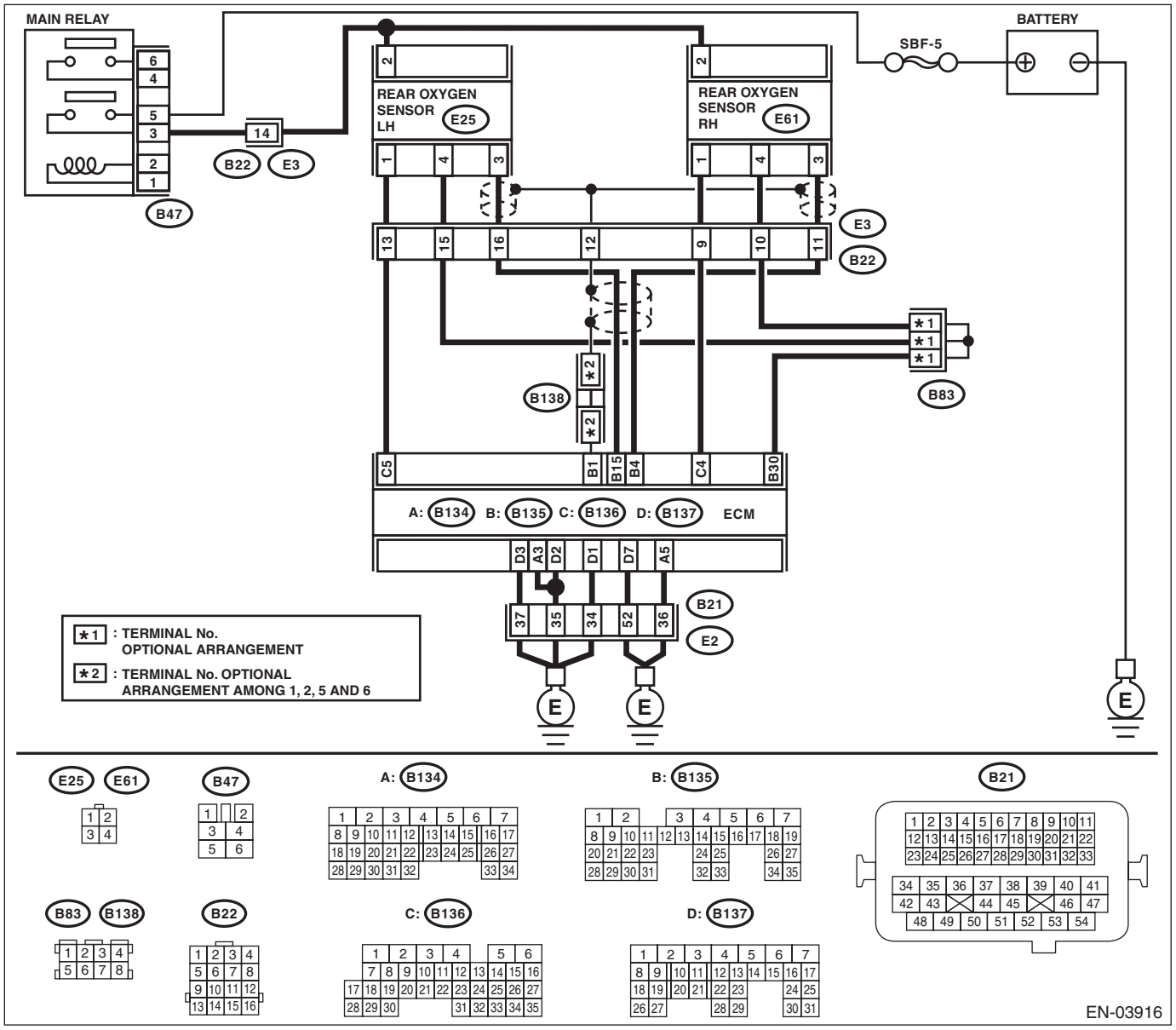
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-26, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the 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 • Poor contact of main relay connector • Poor contact in coupling connector • Malfunction in main relay
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between 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 open circuit of the harness between ECM and rear oxygen sensor.
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 in ECM connector • 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 poor contact of the ECM connector.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-31, Rear Oxygen Sensor.>

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

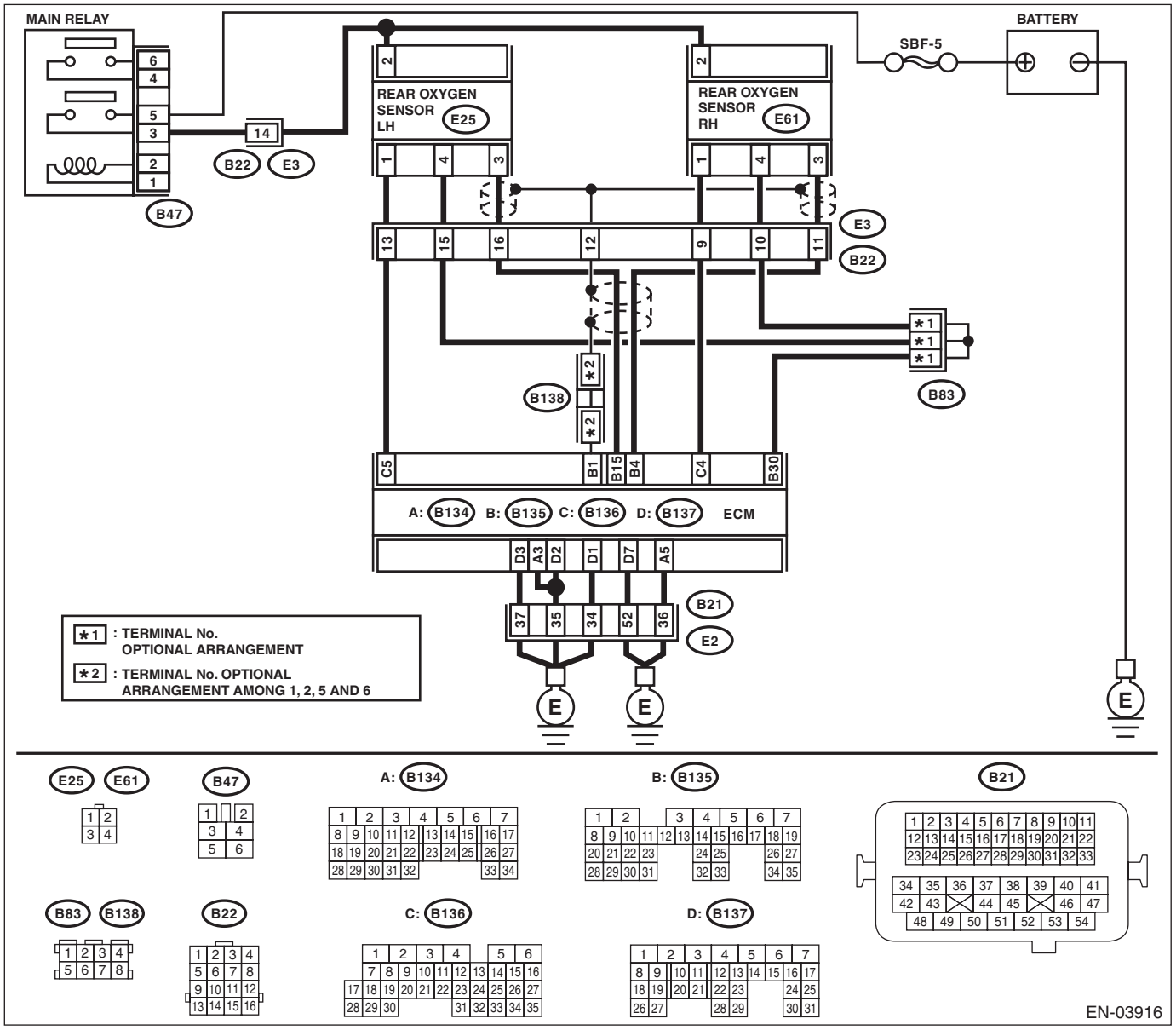
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-26, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



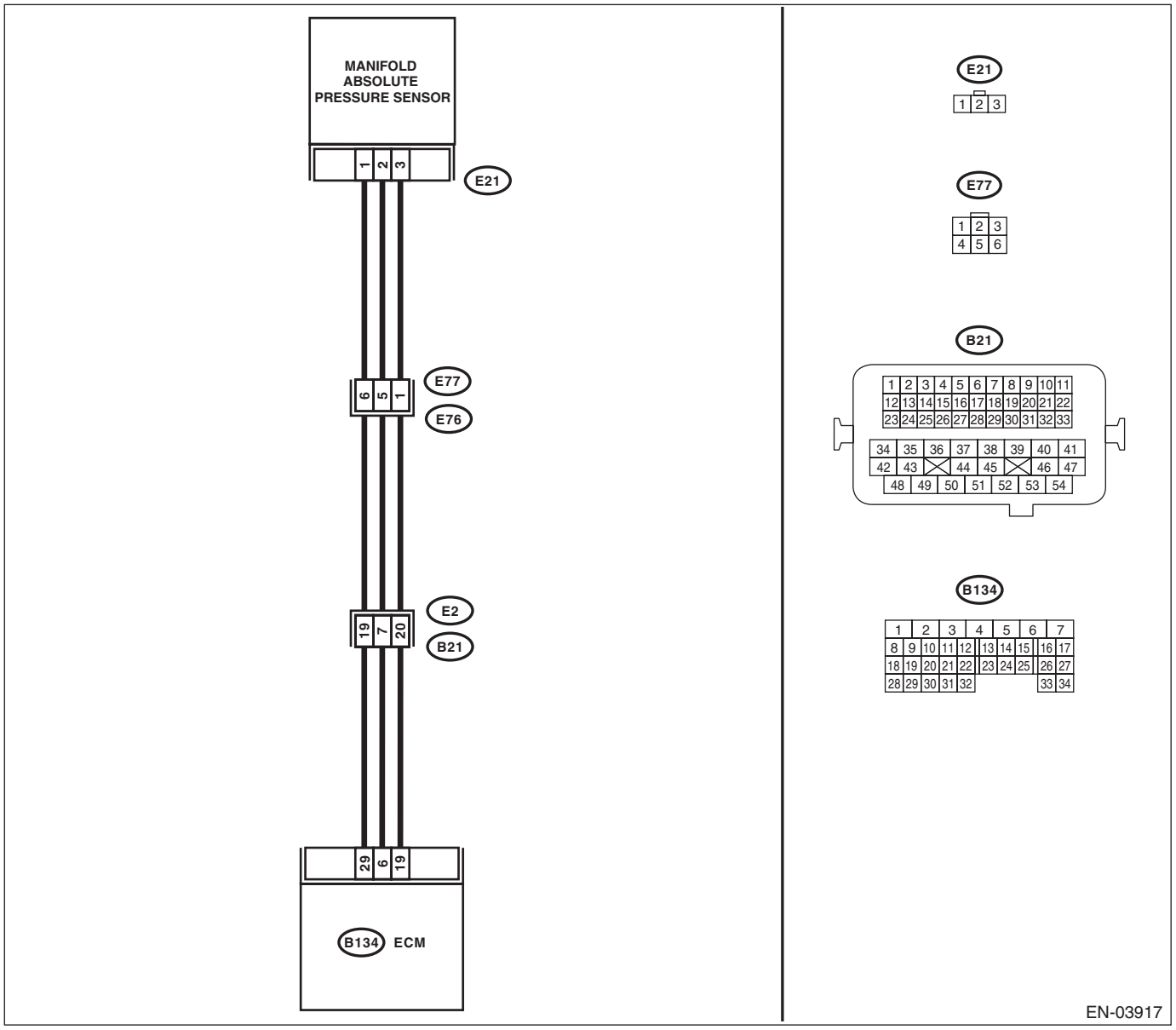
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 5 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and rear oxygen sensor connector.	Go to step **2**.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the 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 in 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 P0068 MAP/MAF - THROTTLE POSITION CORRELATION

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-27, 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)-43, 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 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-23, Manifold Absolute Pressure Sensor.>
3	**CHECK THROTTLE OPENING ANGLE.** Read the data of throttle position signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-12, 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)-23, Manifold Absolute Pressure Sensor.>	Replace the electronic throttle control. <Ref. to FU(H6DO)-12, Throttle Body.>

R: DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-29, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

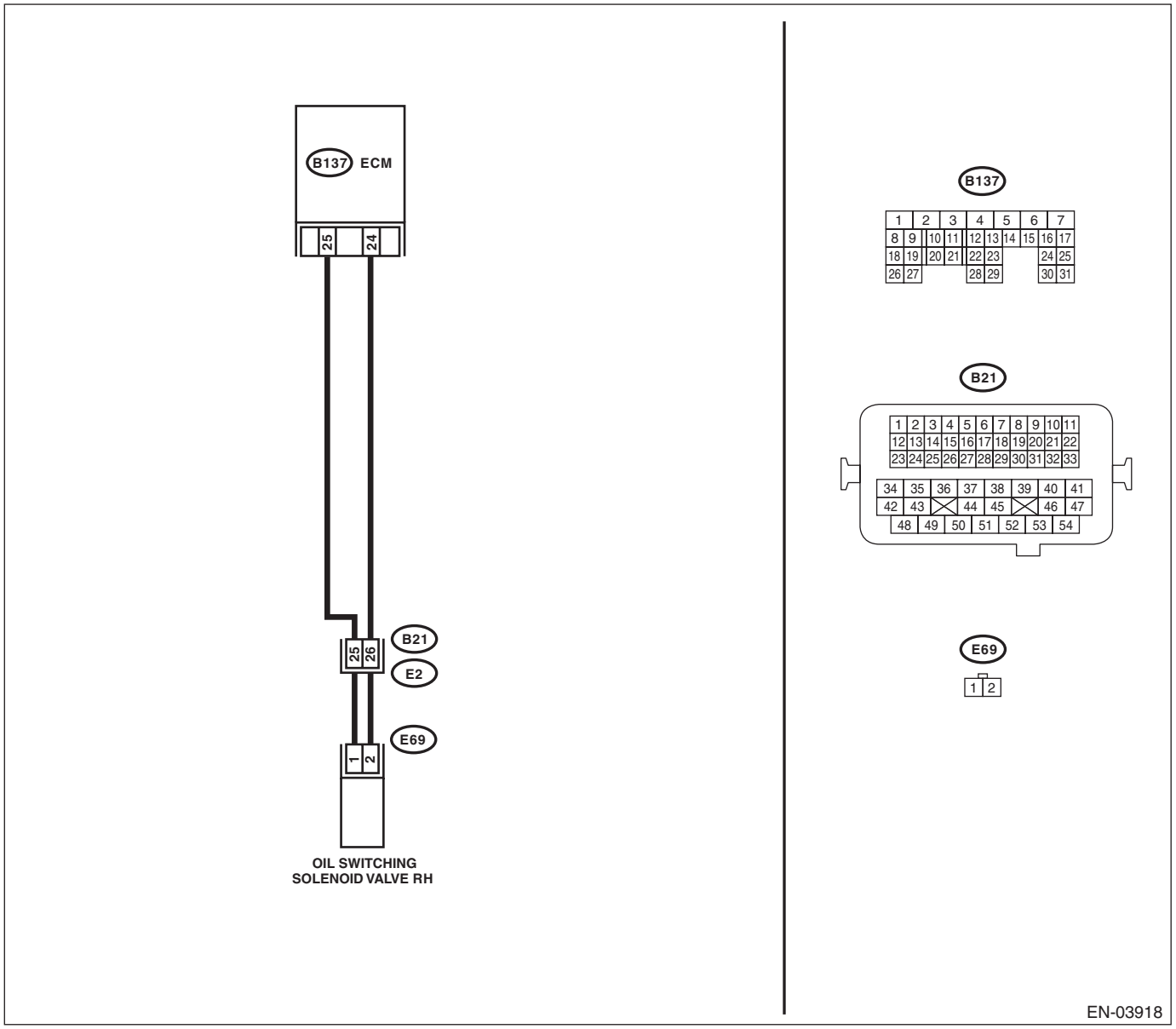
TROUBLE SYMPTOM:

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and oil switching solenoid valve. 3) Measure the resistance of harness between ECM and oil switching solenoid valve. ***Connector & terminal*** ***(B137) No. 25 — (E69) No. 1:*** ***(B137) No. 24 — (E69) 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 harness between ECM and oil switching solenoid valve connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING 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 ground short circuit of harness between ECM and oil switching solenoid valve connector.
3	**CHECK OIL SWITCHING SOLENOID VALVE.** Measure the resistance between oil switching solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of ECM and oil switching solenoid valve connector.	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-75, Oil Switching Solenoid Valve.>

S: DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-30, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

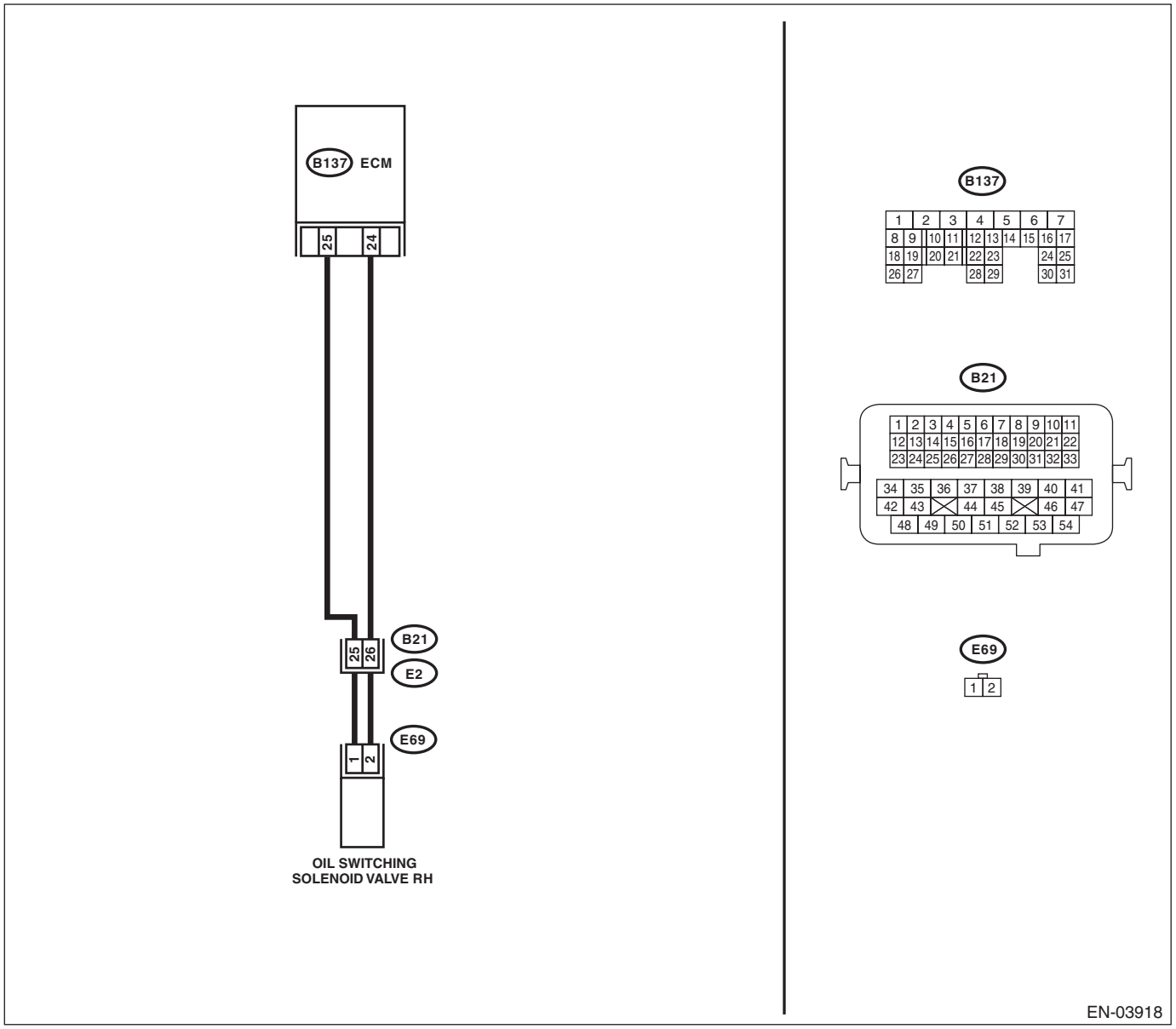
TROUBLE SYMPTOM:

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and oil switching 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 the harness between ECM and oil switching solenoid valve connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.** Measure the resistance of harness between ECM and oil switching solenoid valve connector. ***Connector & terminal*** ***(B137) No. 25 — (E69) No. 1:*** ***(B137) No. 24 — (E69) 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 harness between ECM and oil switching solenoid valve connector • Poor contact of coupling connector
3	**CHECK OIL SWITCHING SOLENOID VALVE.** Measure the resistance between oil switching solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of ECM and oil switching solenoid valve connector.	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-75, Oil Switching Solenoid Valve.>

T: DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-29, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

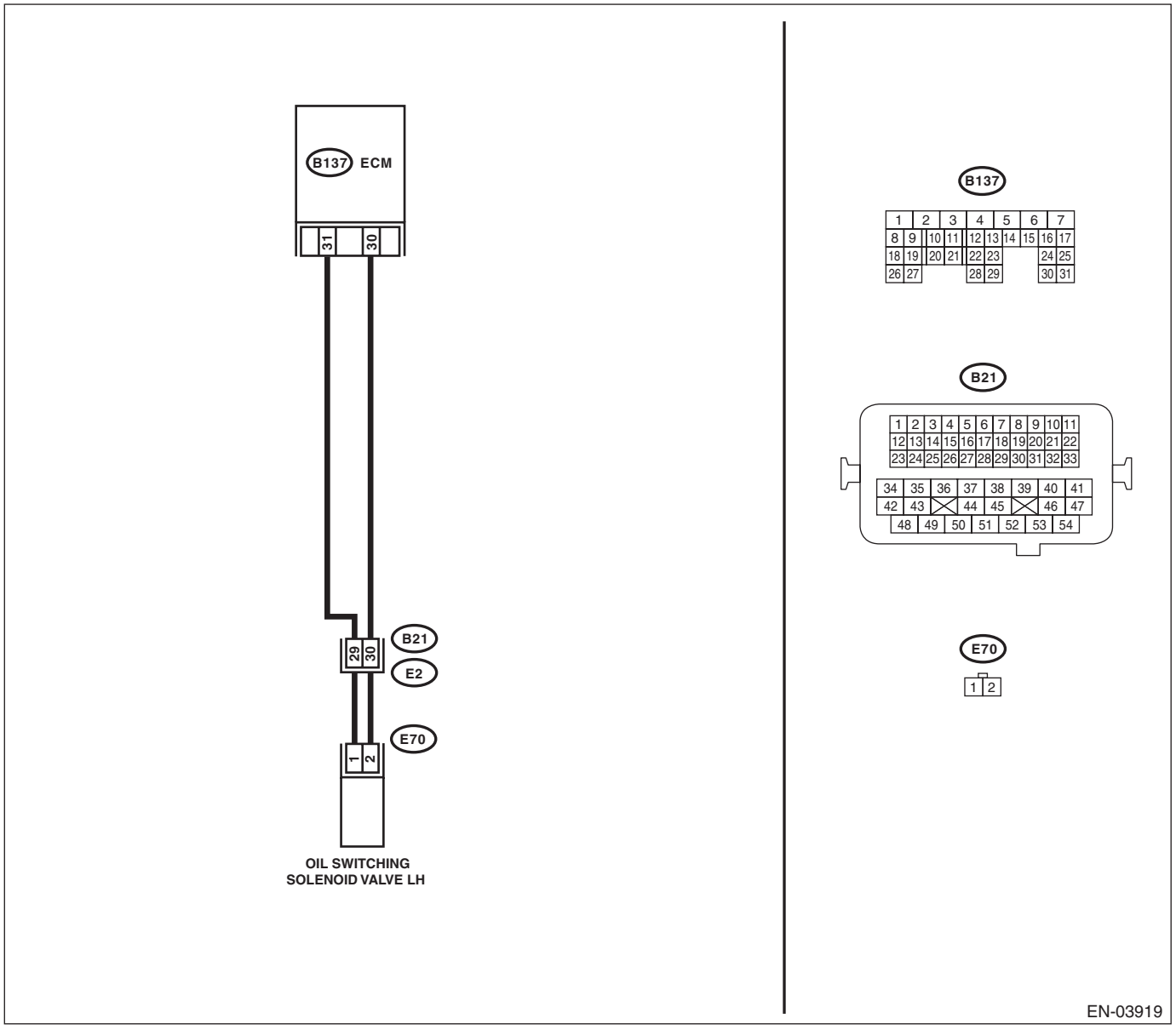
TROUBLE SYMPTOM:

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and oil switching solenoid valve. 3) Measure the resistance between ECM and oil switching solenoid valve. ***Connector & terminal*** ***(B137) No. 31 — (E70) No. 1:*** ***(B137) No. 30 — (E70) 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 harness between ECM and oil switching solenoid valve connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING 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 ground short circuit of harness between ECM and oil switching solenoid valve connector.
3	**CHECK OIL SWITCHING SOLENOID VALVE.** Measure the resistance between oil switching solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of ECM and oil switching solenoid valve connector.	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-75, Oil Switching Solenoid Valve.>

U: DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-30, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

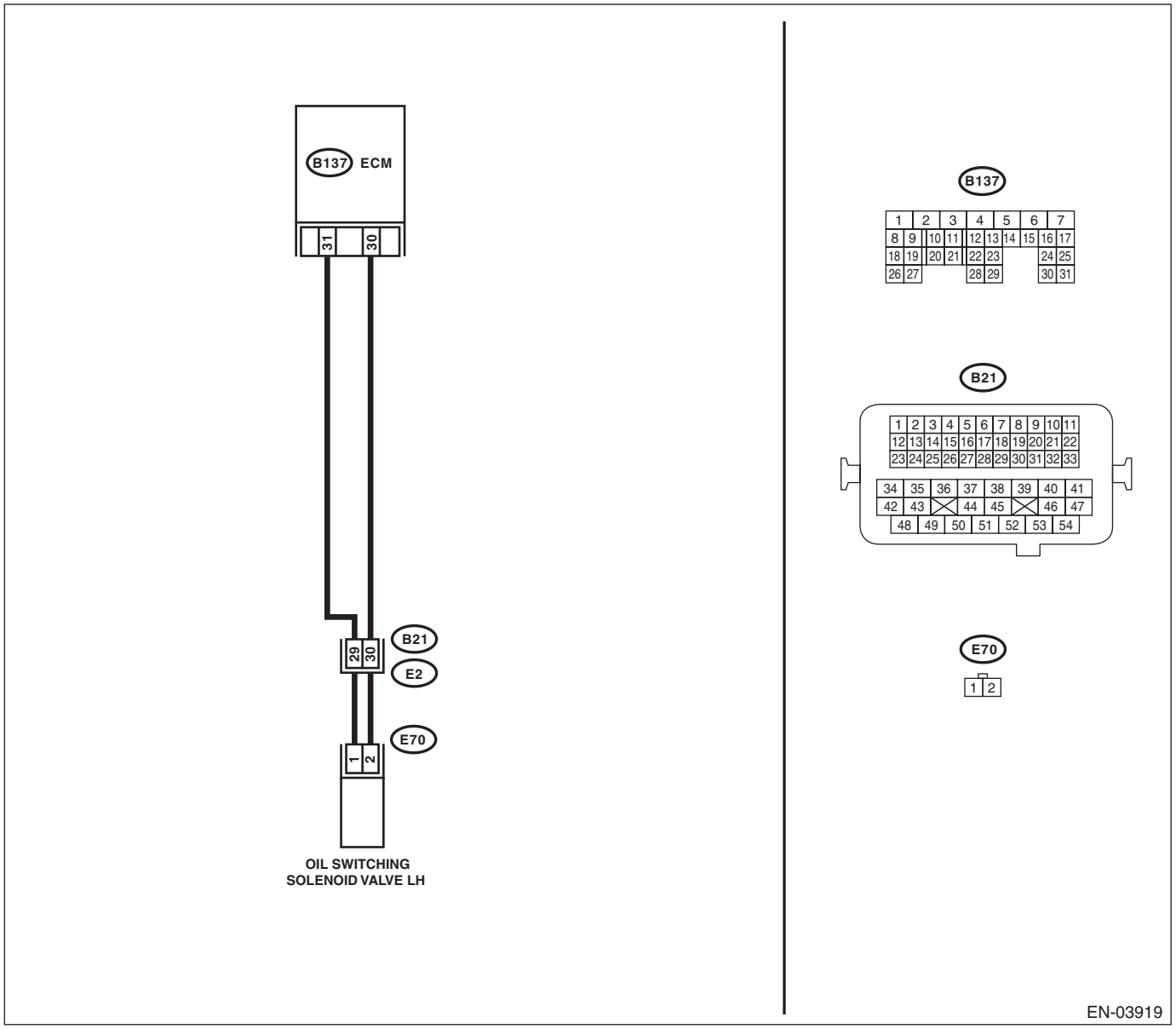
TROUBLE SYMPTOM:

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and oil switching 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 the harness between ECM and oil switching solenoid valve connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.** Measure the resistance between the ECM and oil switching solenoid valve connector. ***Connector & terminal*** ***(B137) No. 31 — (E70) No. 1:*** ***(B137) No. 30 — (E70) 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 harness between ECM and oil switching solenoid valve connector • Poor contact of coupling connector
3	**CHECK OIL SWITCHING SOLENOID VALVE.** Measure the resistance between oil switching solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of ECM and oil switching solenoid valve connector.	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-75, Oil Switching Solenoid Valve.>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-32, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

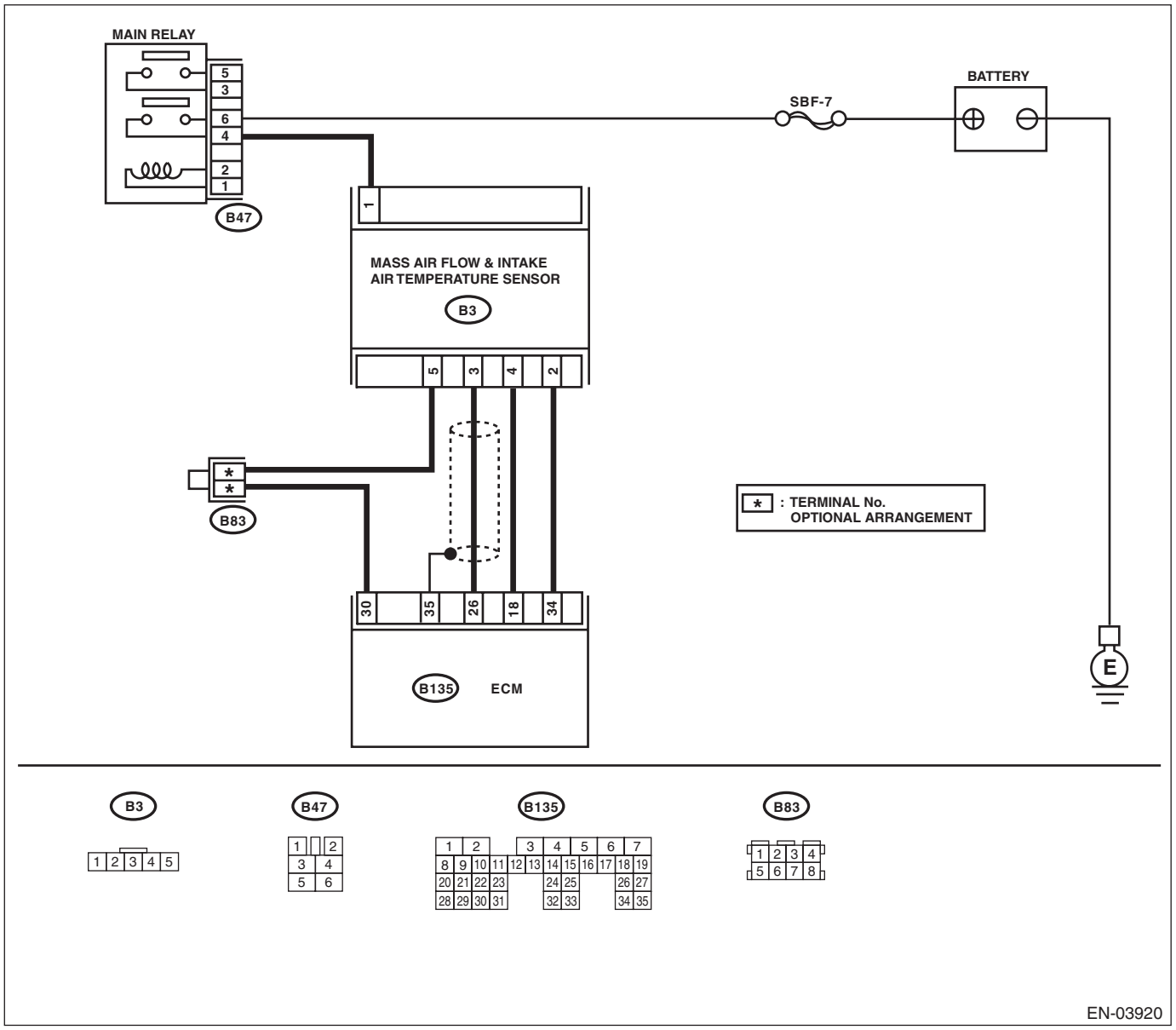
TROUBLE SYMPTOM:

- 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)-43, 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)-80, List of Diagnostic Trouble Code (DTC).>	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-24, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

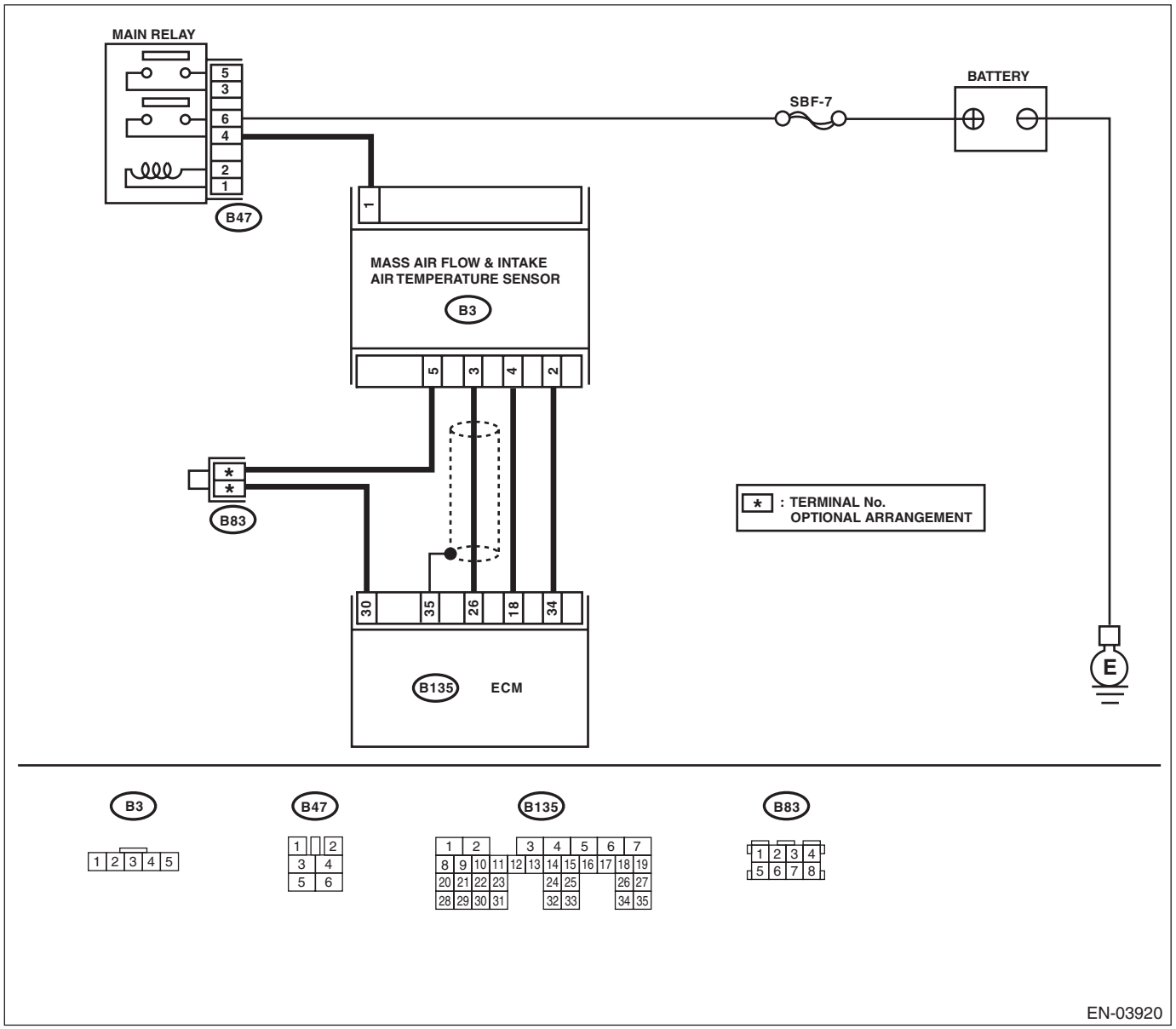
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-35, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, 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 the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 of harness between ECM and the mass air flow and intake air temperature sensor connector. • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connector. ***Connector & terminal*** ***(B135) No. 26 — (B3) 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 of harness between ECM and the mass air flow and intake air temperature sensor connector. • Poor contact of coupling 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 connector.
5	**CHECK POOR CONTACT.** Check for any 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 any 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)-24, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

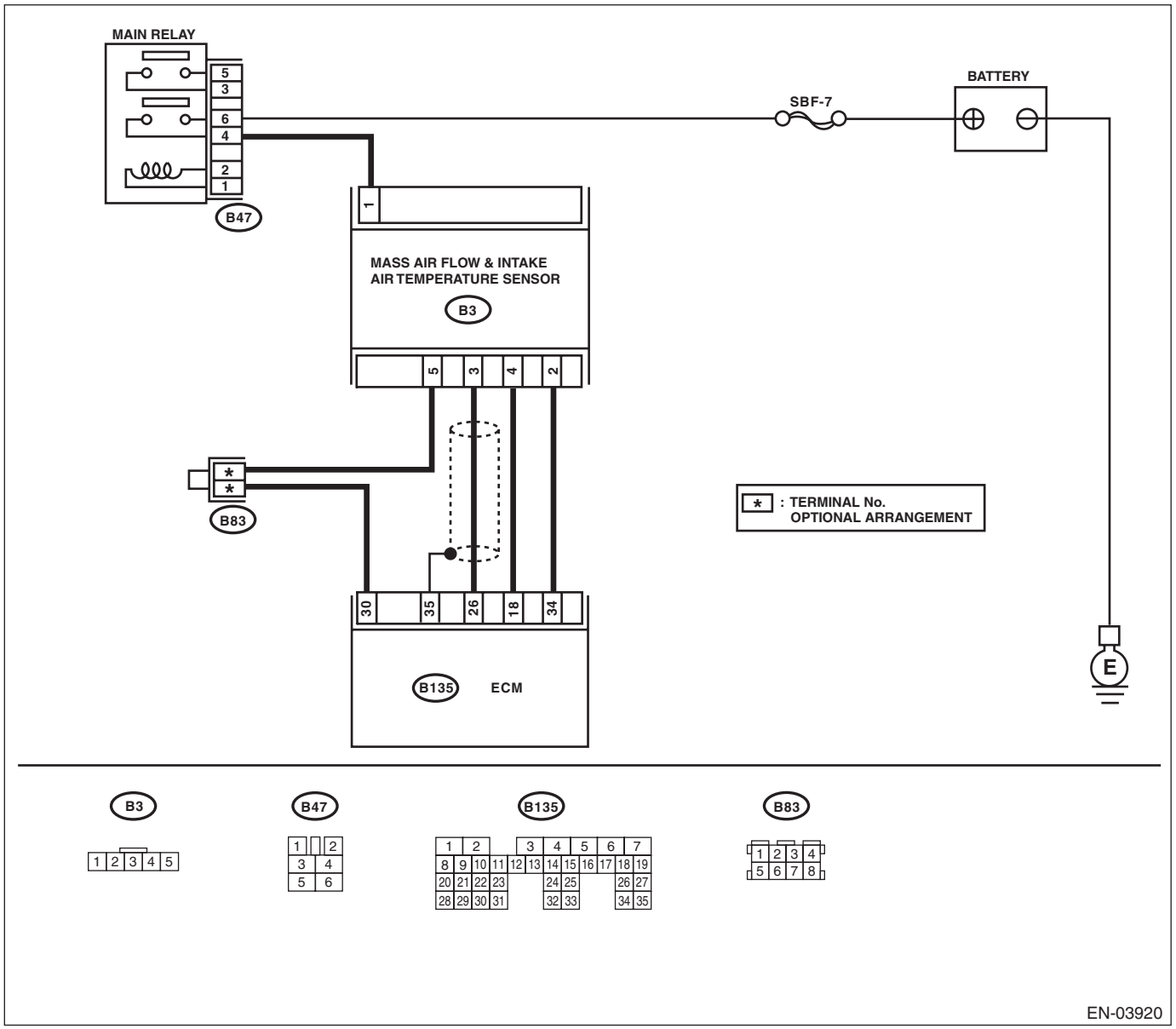
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-37, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



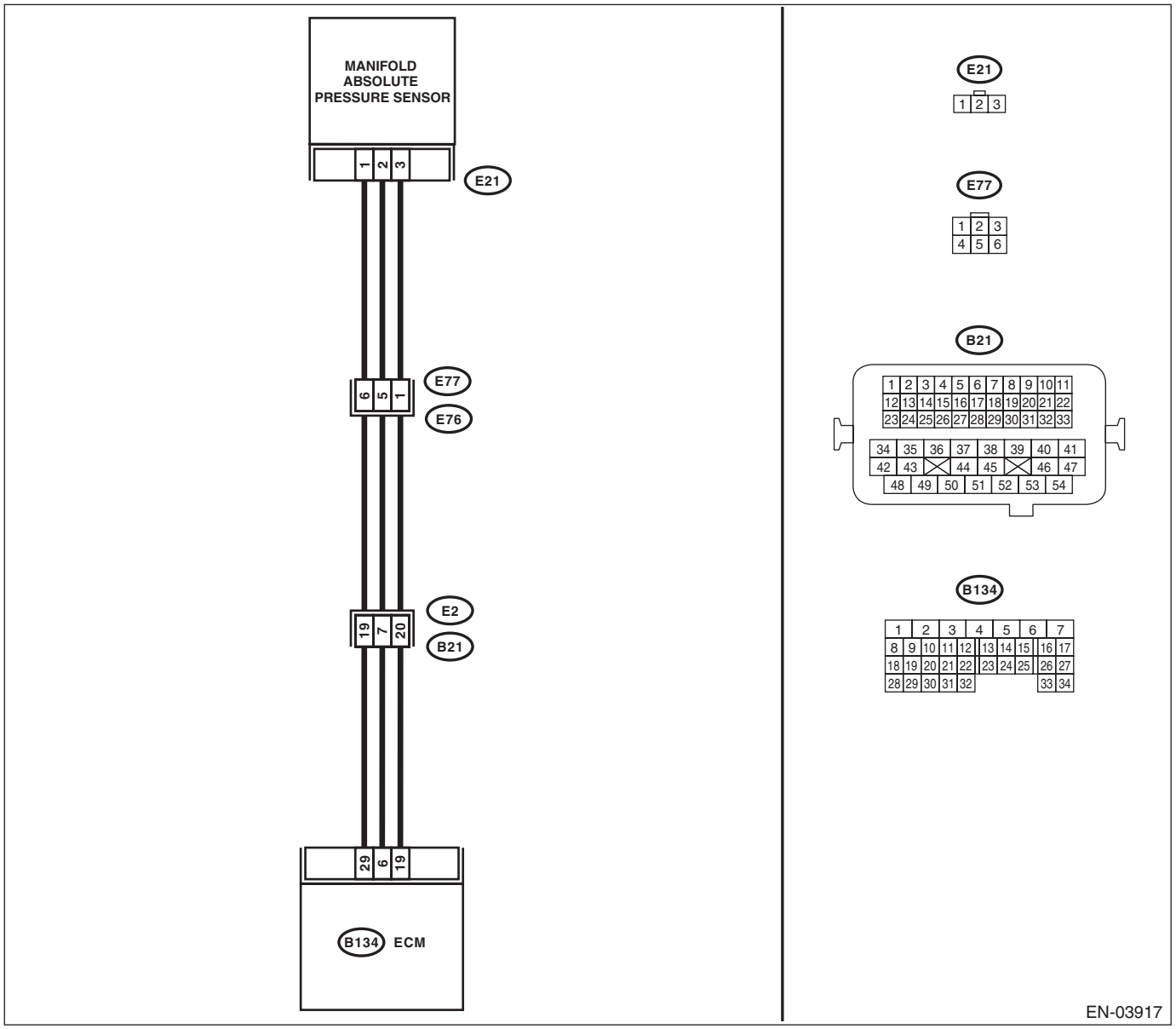
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of air flow sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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: • Open circuit of harness between ECM and the mass air flow and intake air temperature sensor connector. • Poor contact in ECM connector • Poor contact of coupling 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)-24, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-39, 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)-43, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



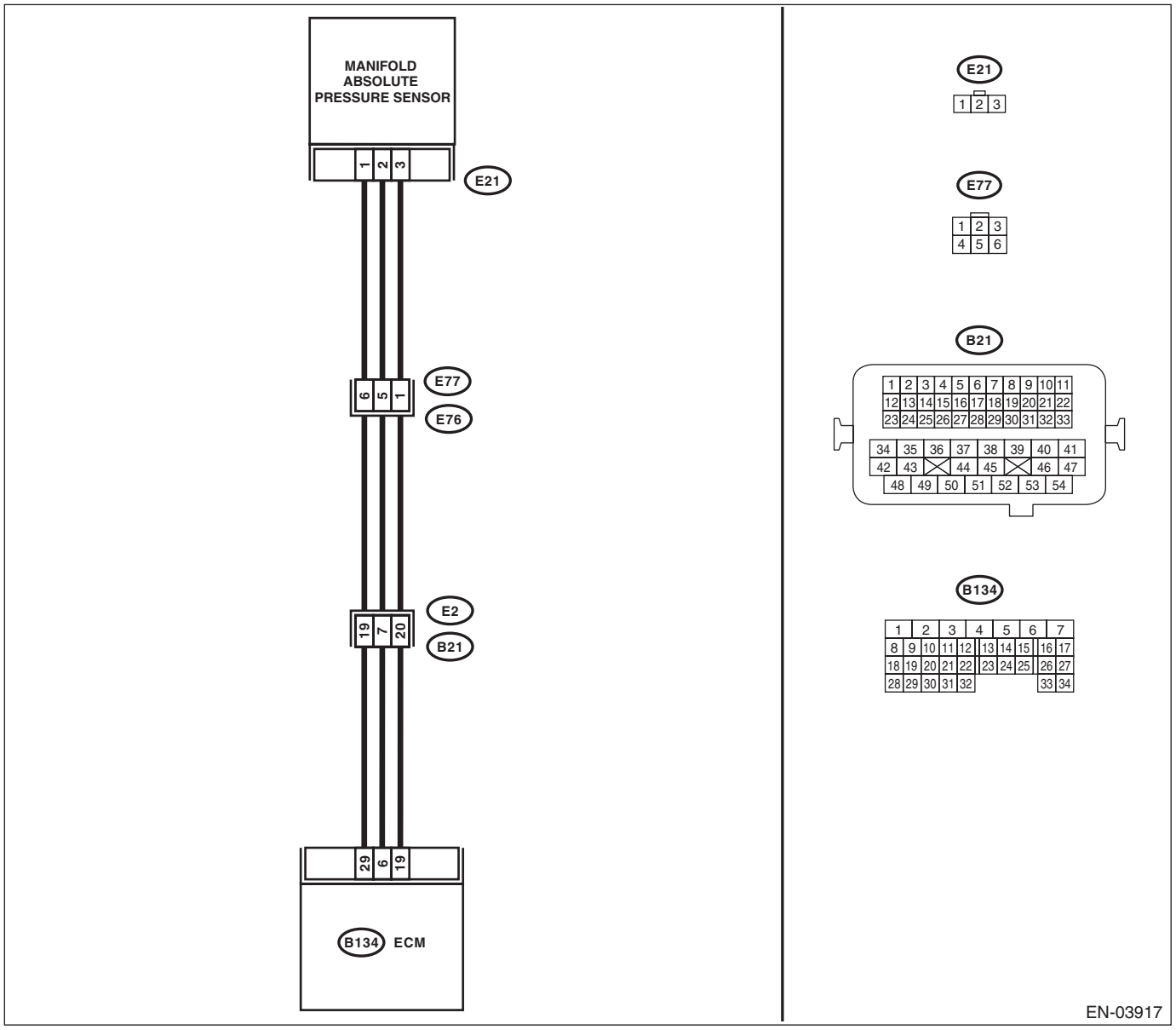
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than 13.3 kPa (100 mmHg, 3.94 inHg) ?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 THE 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*** ***(E21) 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 the connectors from the ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B134) No. 6 — (E21) 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 between the ECM and manifold pressure sensor connector.	Is there poor contact in the ECM or manifold absolute pressure sensor connector?	Repair the poor contact in the ECM or manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H6DO)-23, Manifold Absolute Pressure Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-41, 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)-43, 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 119.5 kPa (896.5 mmHg, 35.29 inHg) or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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 the 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*** ***(E21) 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 of the 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)-23, Manifold Absolute Pressure Sensor.>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-43, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

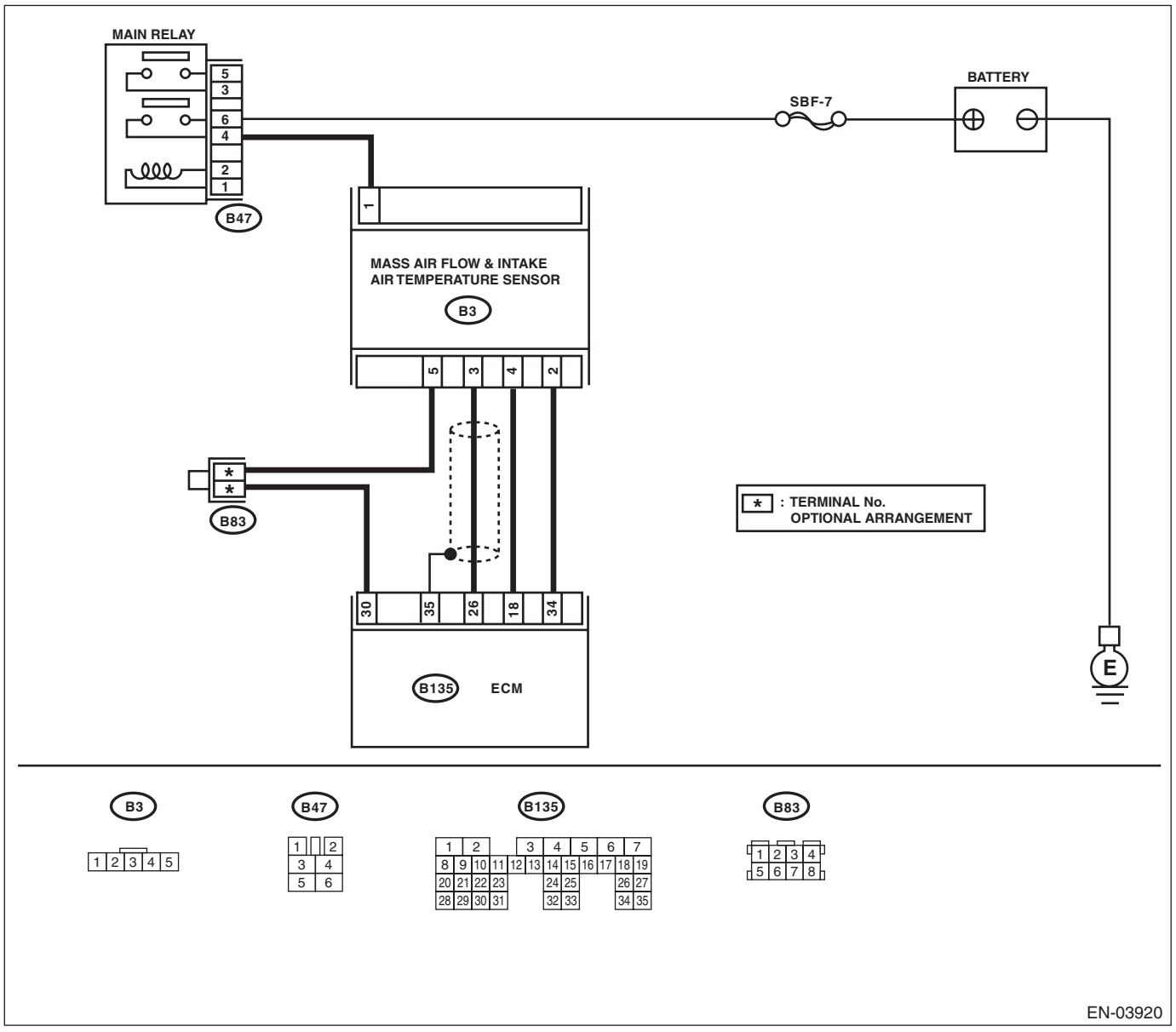
TROUBLE SYMPTOM:

- 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)-43, 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 70°C (158°F) or higher?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-24, Mass Air Flow and Intake Air Temperature Sensor.>	Check DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-80, List of Diagnostic Trouble Code (DTC).>

AB:DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

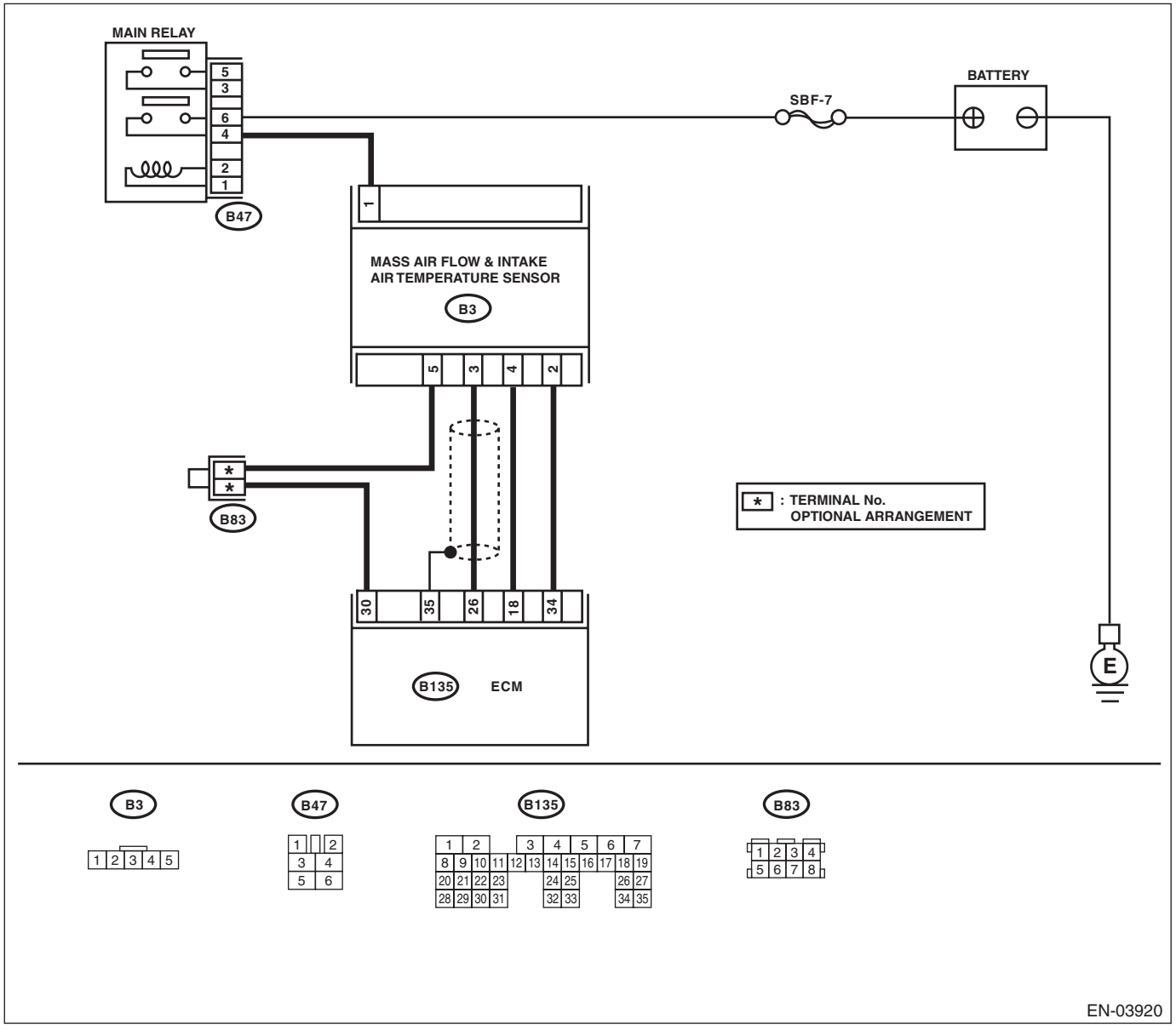
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-45, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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**.	Even if the malfunction indicator light illuminates, 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 ECM and the 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)-24, 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 connector.

AC:DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

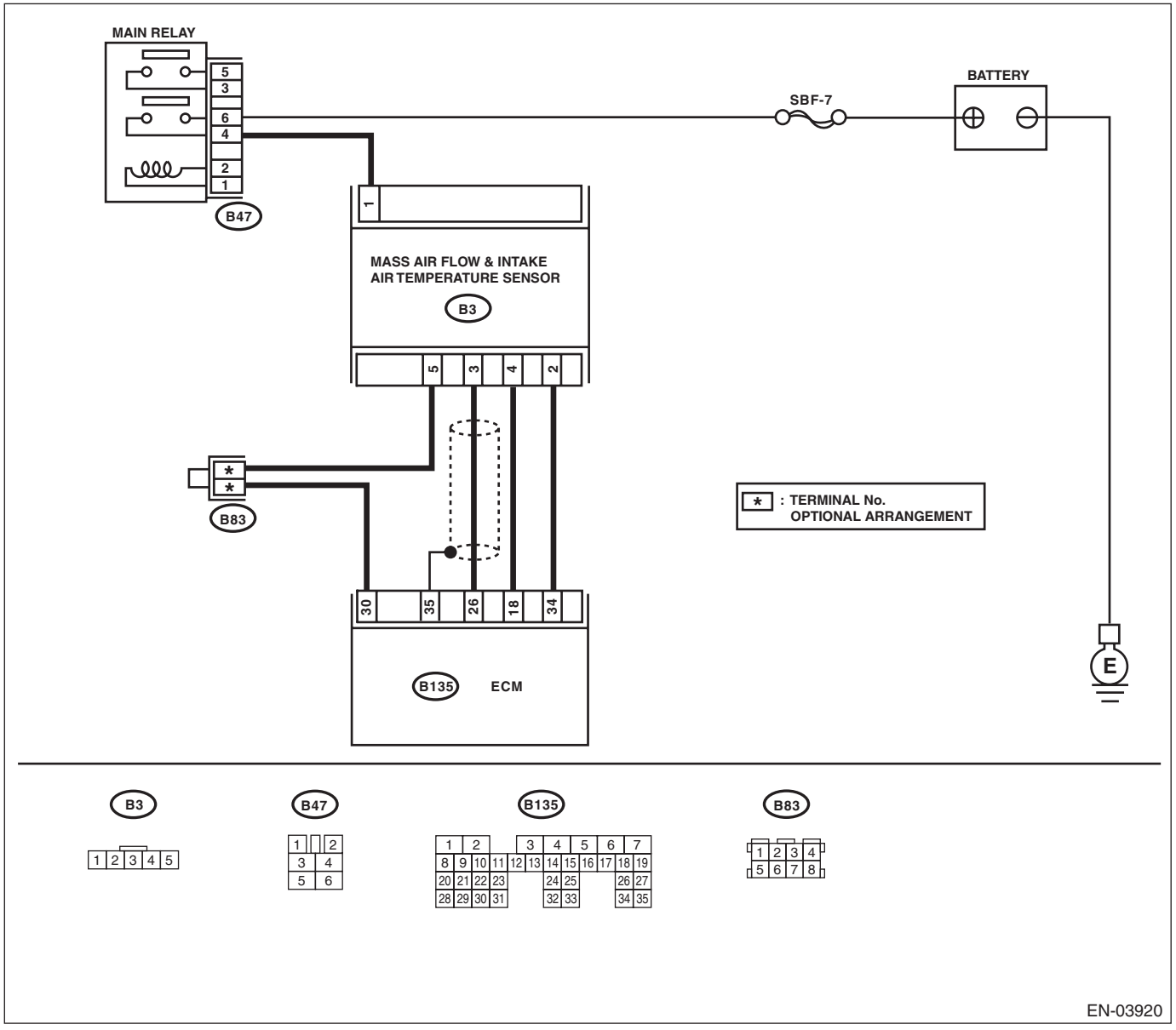
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-47, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the intake air temperature less than –40°C (–40°F) ?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 any 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 the ECM and the mass air flow and intake air temperature sensor. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connector. ***Connector & terminal*** ***(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 harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and the mass air flow and intake air temperature sensor connector. • Poor contact in ECM connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Disconnect the connector from the mass air flow and intake air temperature sensor. 4) 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)-24, Mass Air Flow and Intake Air Temperature Sensor.>

AD:DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

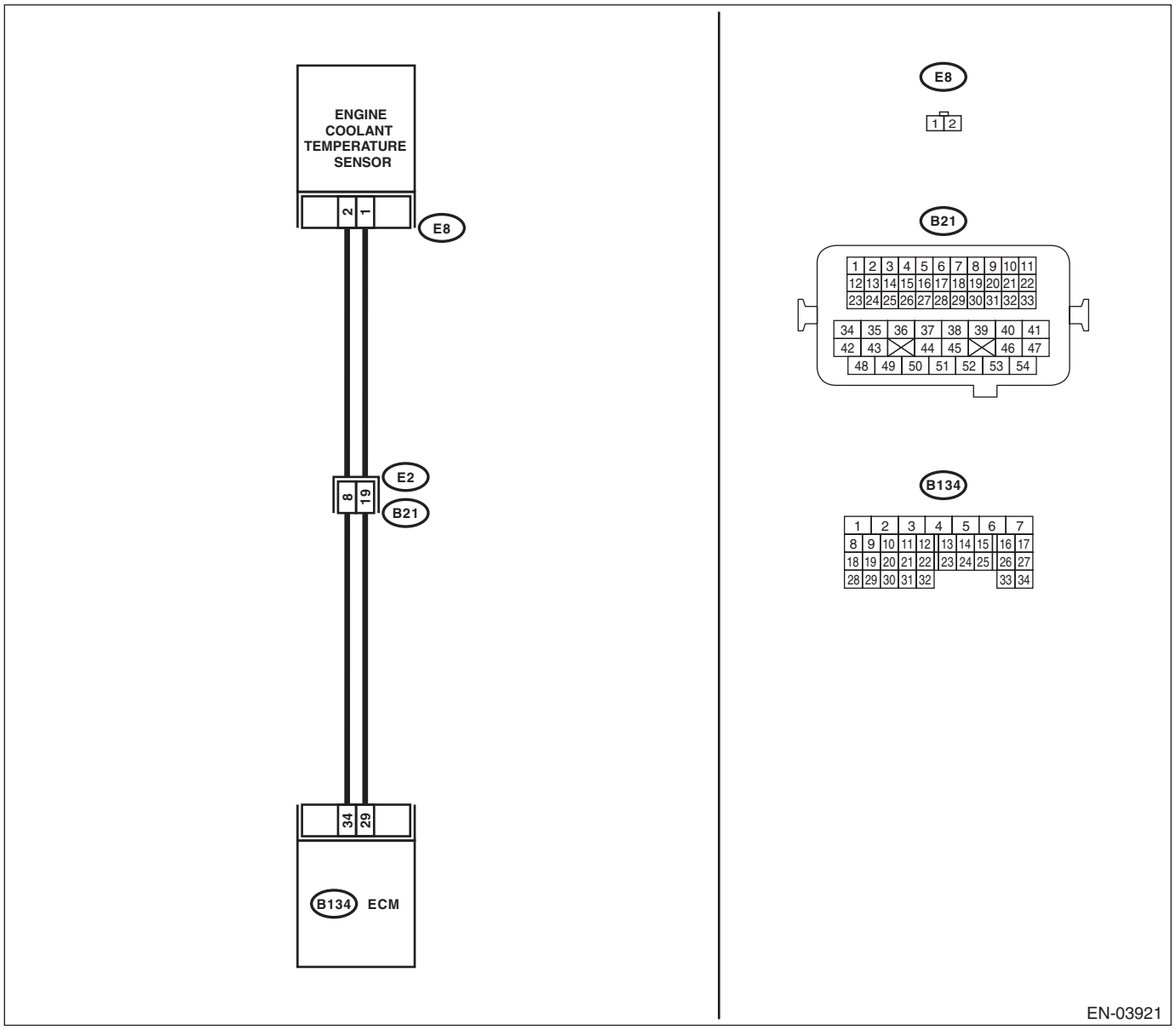
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-49, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 150°C (302°F) or higher?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 the 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)-18, Engine Coolant Temperature Sensor.>	Repair the ground short circuit of the harness between the ECM and engine coolant temperature sensor.

AE:DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

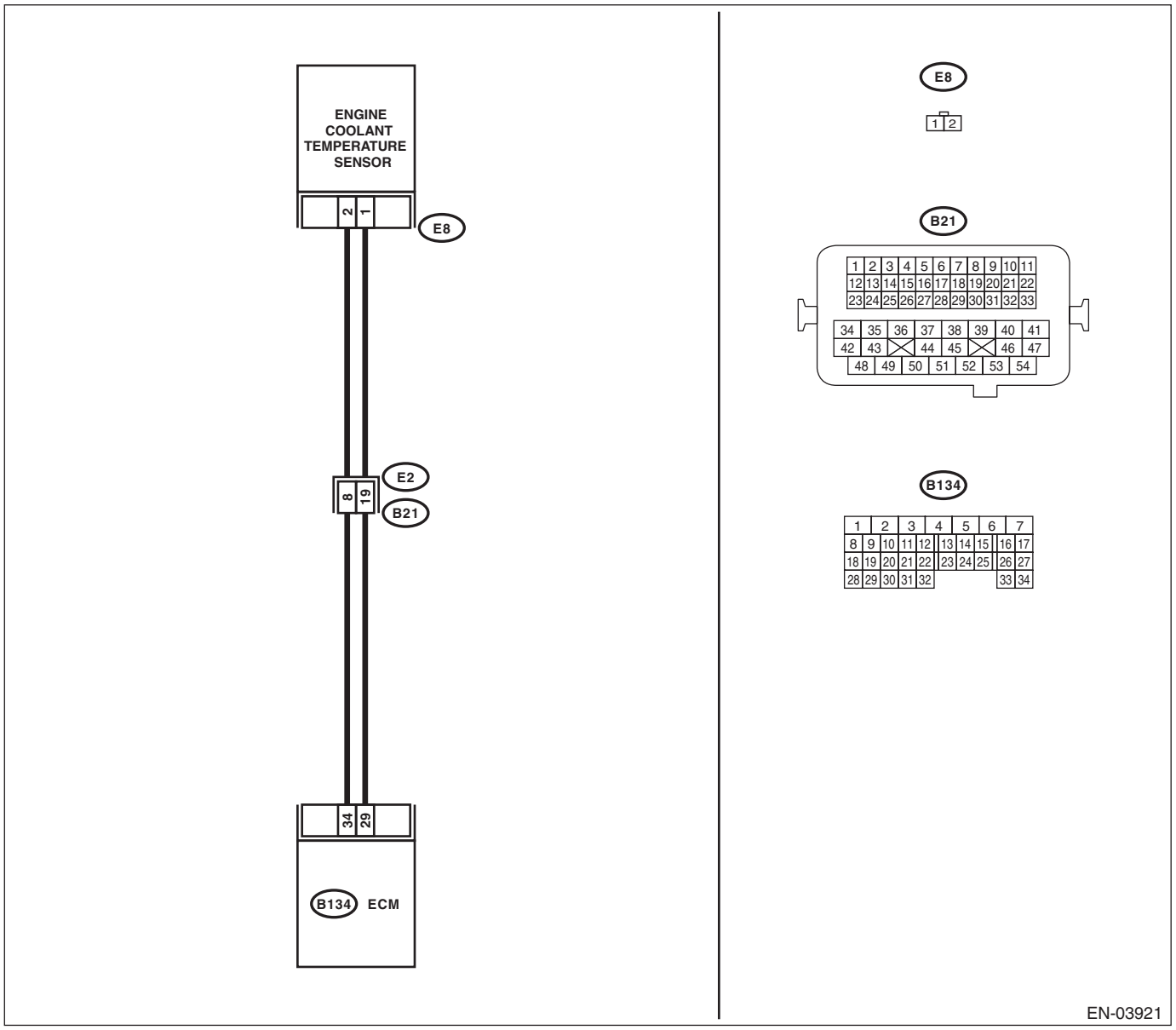
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-51, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature less than –40°C (–40°F) ?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 engine coolant temperature sensor connectors.	Is there poor contact in the ECM or engine coolant temperature sensor connectors?	Repair any poor contact between the ECM and engine coolant temperature sensor connectors.	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 the ECM and engine coolant temperature sensor. 3) Measure the resistance of the harness between the 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 open circuit of the harness between the ECM and engine coolant temperature sensor 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 the harness between the ECM and engine coolant temperature sensor connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, Engine Coolant Temperature Sensor.>

AF:DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-53, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

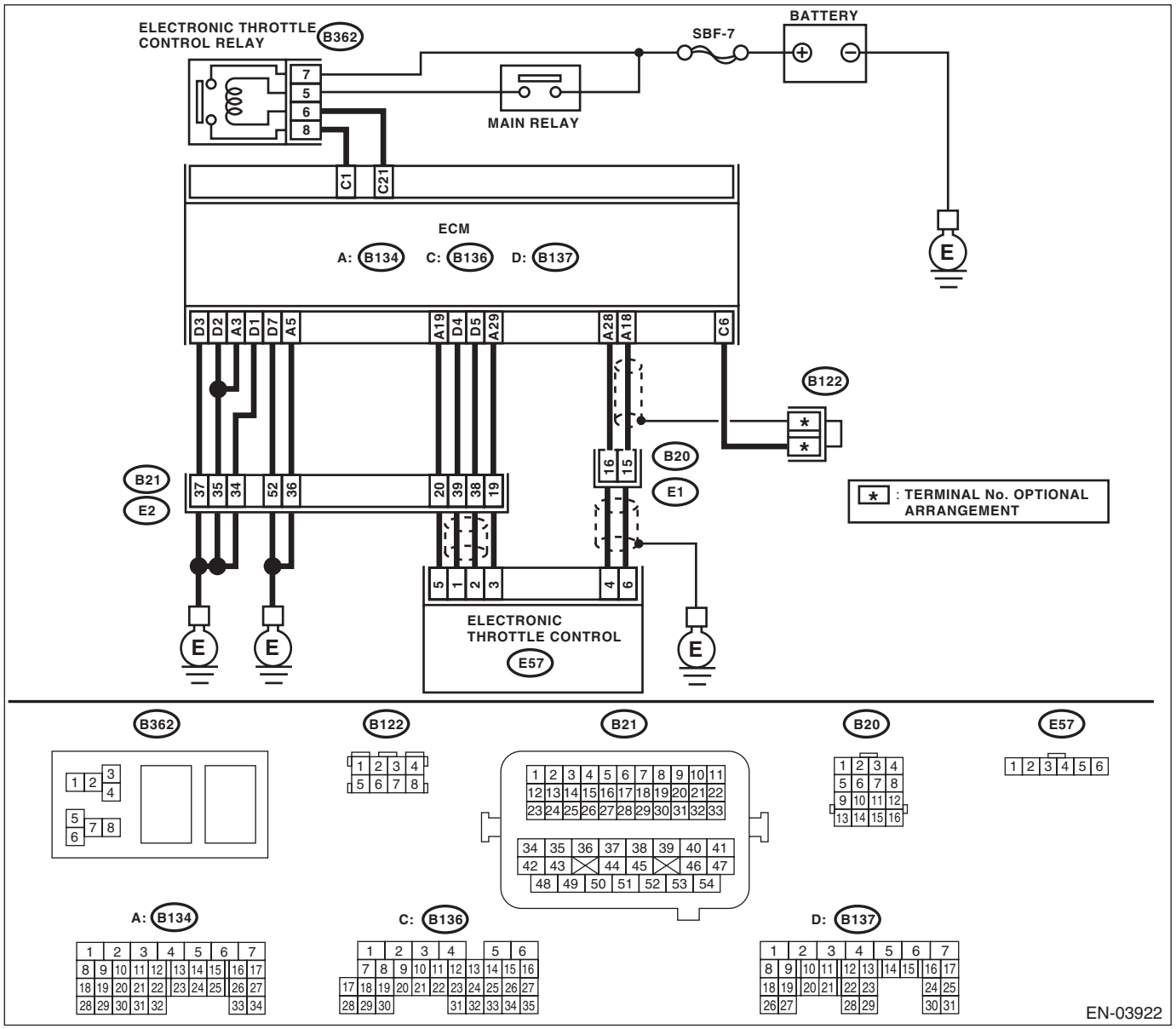
TROUBLE SYMPTOM:

- 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 6:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the ground short circuit of 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*** ***(B134) No. 18 — Engine ground:***	Is the resistance 1 MΩ or more?	Replace the electronic throttle control. <Ref. to FU(H6DO)-12, Throttle Body.>	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-55, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

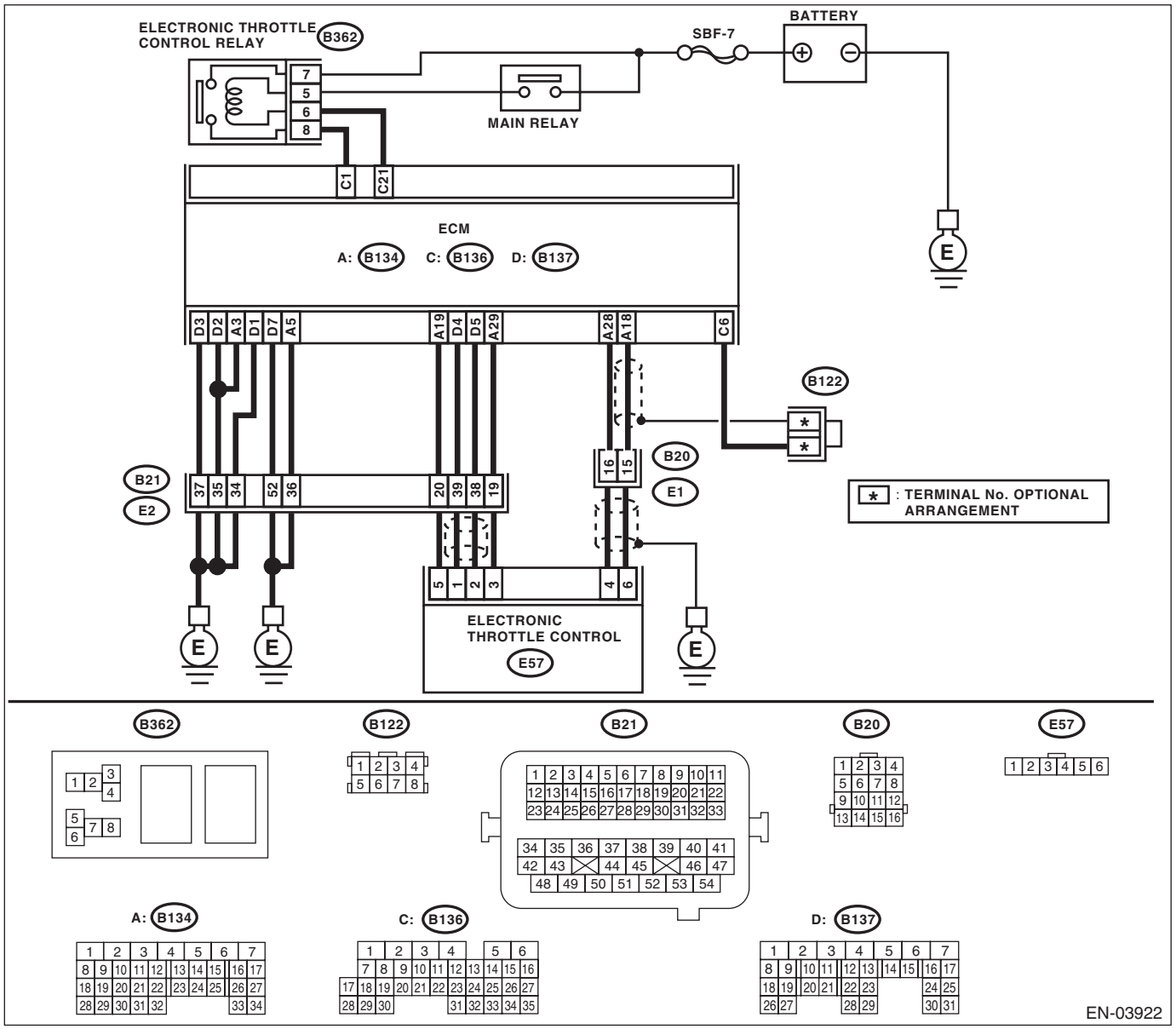
TROUBLE SYMPTOM:

- 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 18 — (E57) No. 6:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and electronic throttle control 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 in 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 the 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)-12, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-57, 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)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK TIRE SIZE.**	Is the tire size as specified? and the same size as other three 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)-11, INSPECTION, Engine Coolant.>
3	**CHECK THERMOSTAT.**	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H6DO)-13, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, Engine Coolant Temperature Sensor.>

AI: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-59, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

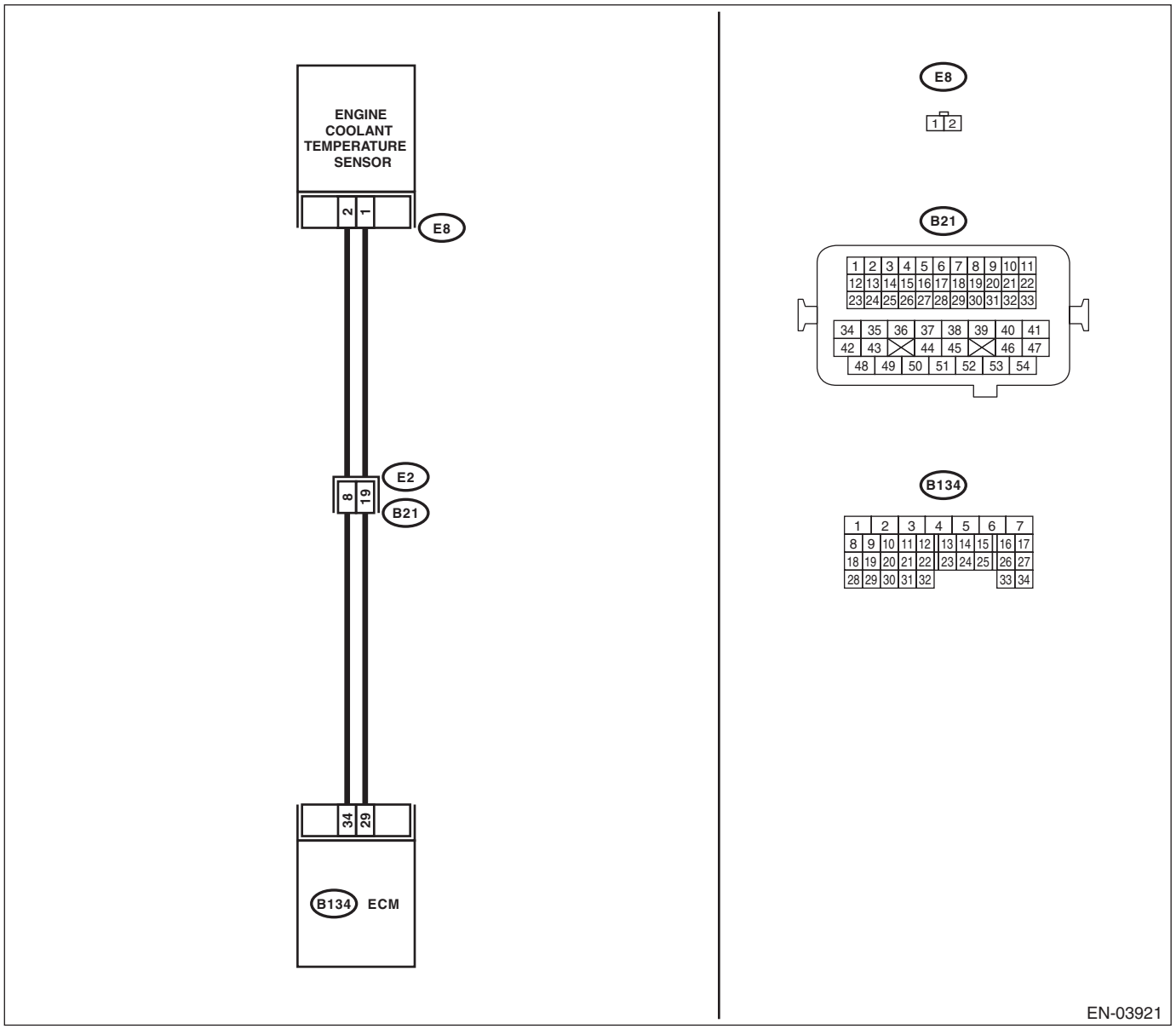
TROUBLE SYMPTOM:

- 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)-43, 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 poor contact in ECM connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, Engine Coolant Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-61, 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)-43, 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)-10, 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)-19, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H6DO)-22, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO(H6DO)-13, Thermostat.>

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

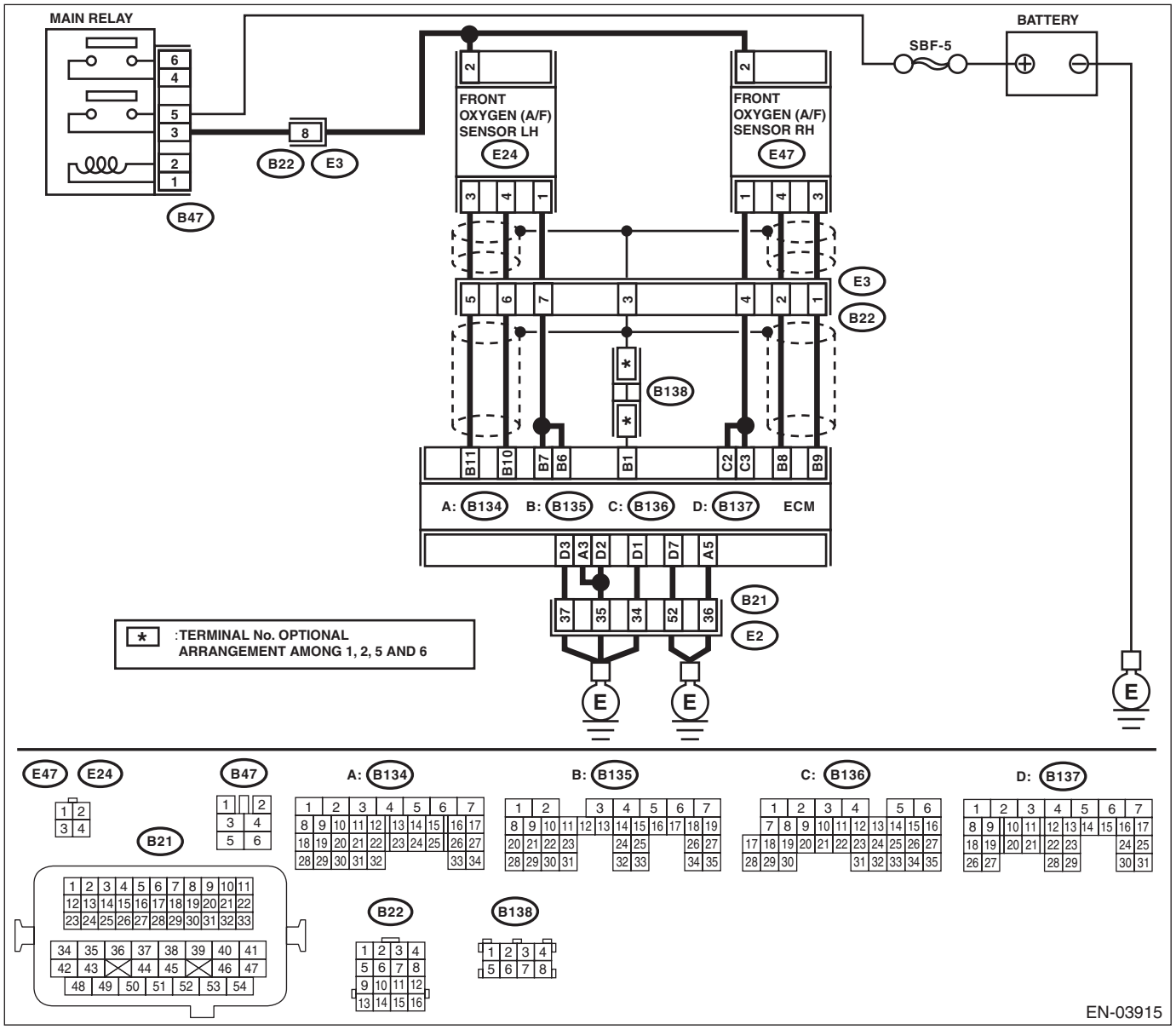
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-63, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 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 poor contact of 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)-29, Front Oxygen (A/F) Sensor.>

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

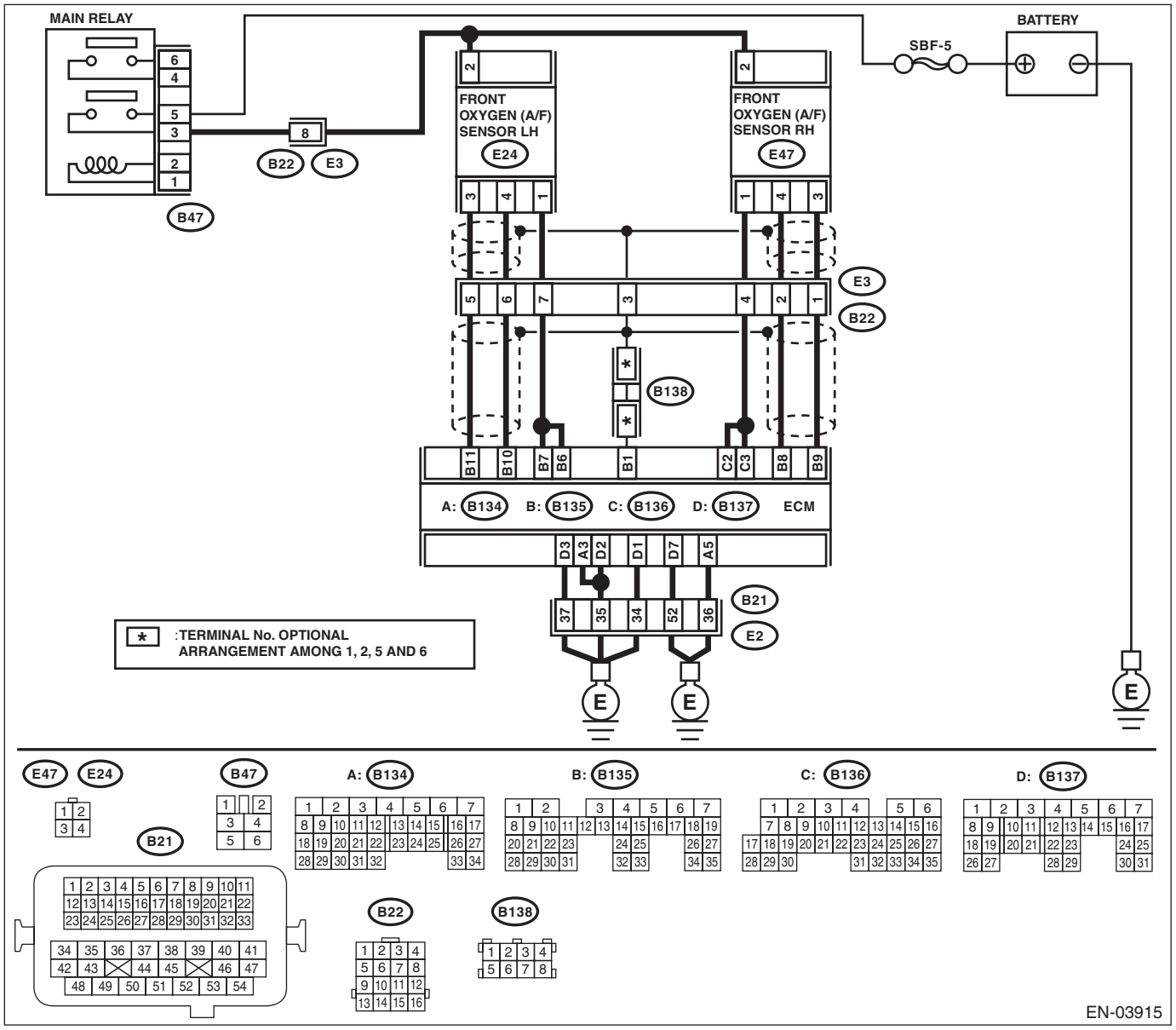
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-65, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
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 the ECM and front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-29, Front Oxygen (A/F) Sensor.>

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

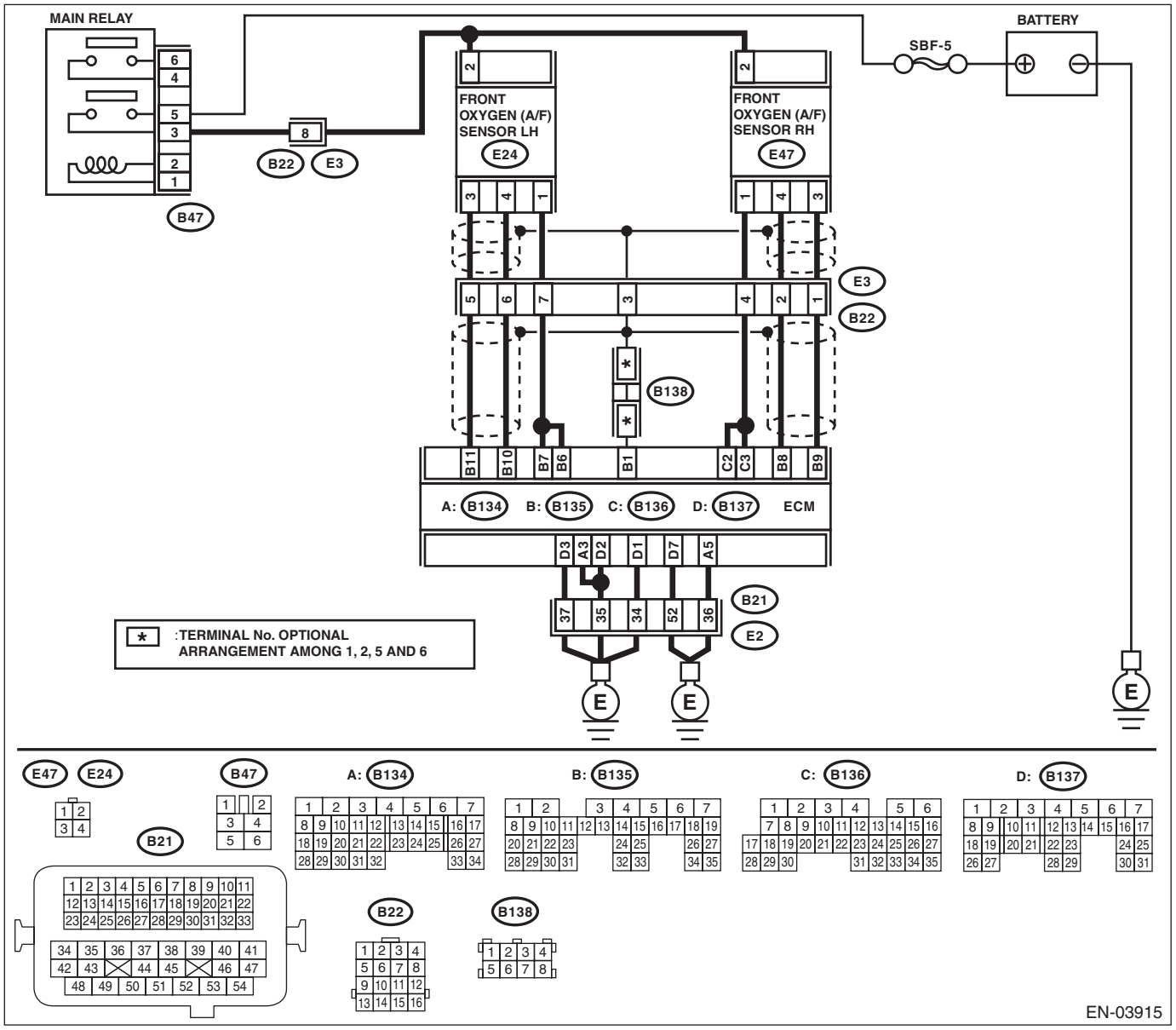
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-67, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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)-29, Front Oxygen (A/F) Sensor.>

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

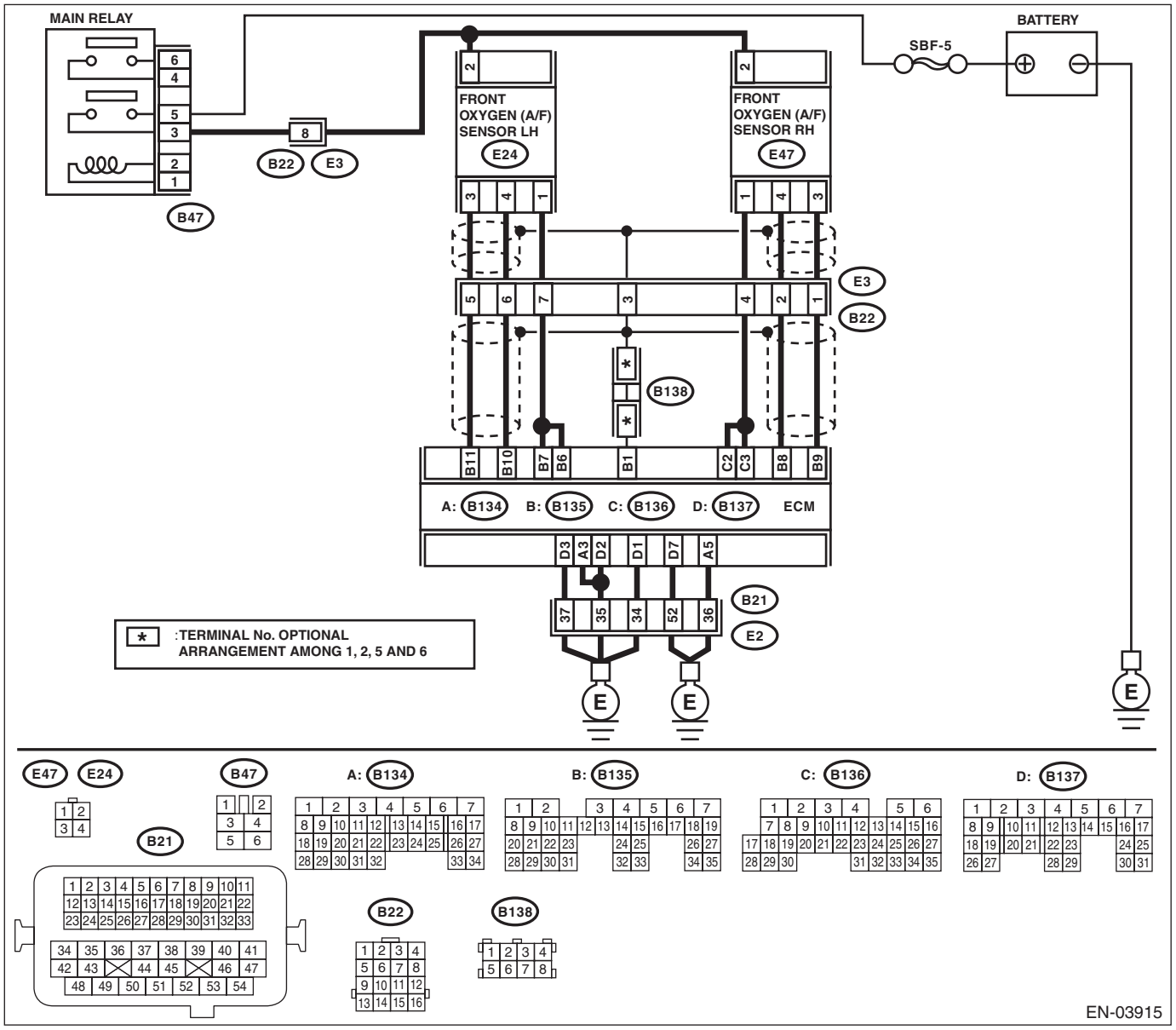
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-70, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the 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 **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and front oxygen (A/F) sensor connector • Poor contact in coupling connector
2	**CHECK POOR CONTACT.** Check 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 of the ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-29, Front Oxygen (A/F) Sensor.>

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

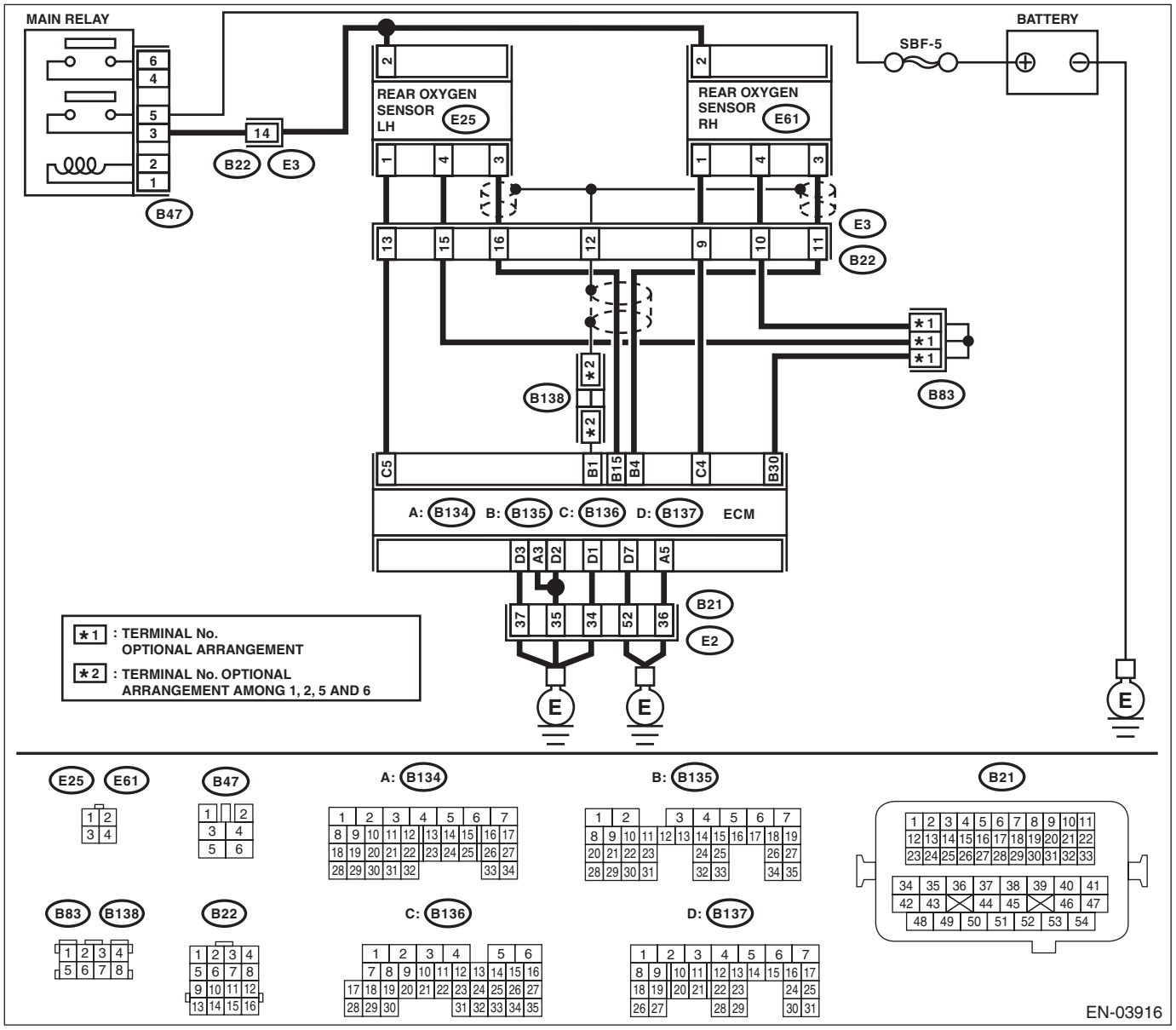
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-72, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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 open circuit of harness between ECM and rear oxygen sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the 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)-31, 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. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-31, Rear Oxygen Sensor.>

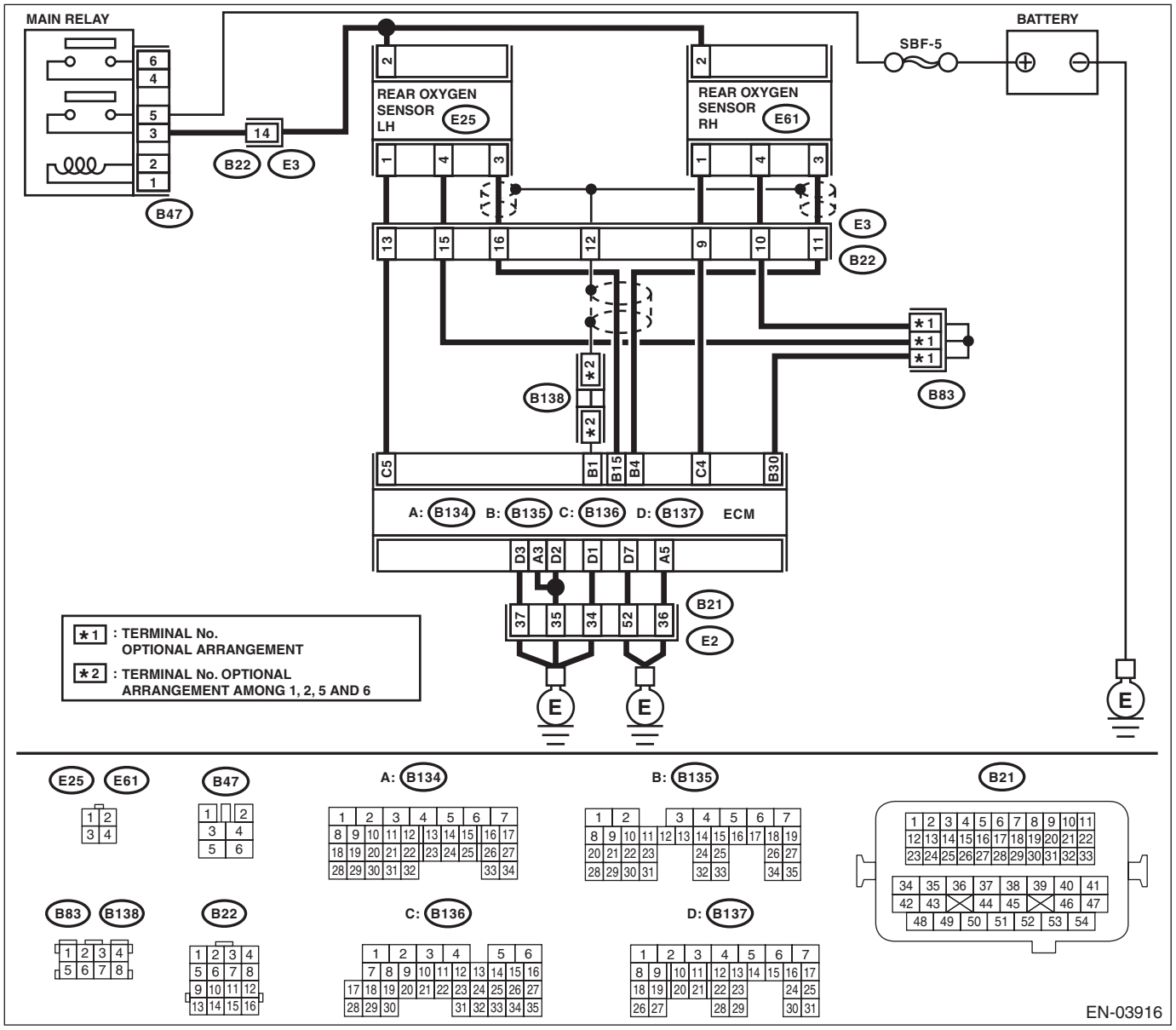
AP:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-74, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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 open circuit of harness between ECM and rear oxygen sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the 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)-31, 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. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-31, Rear Oxygen Sensor.>

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

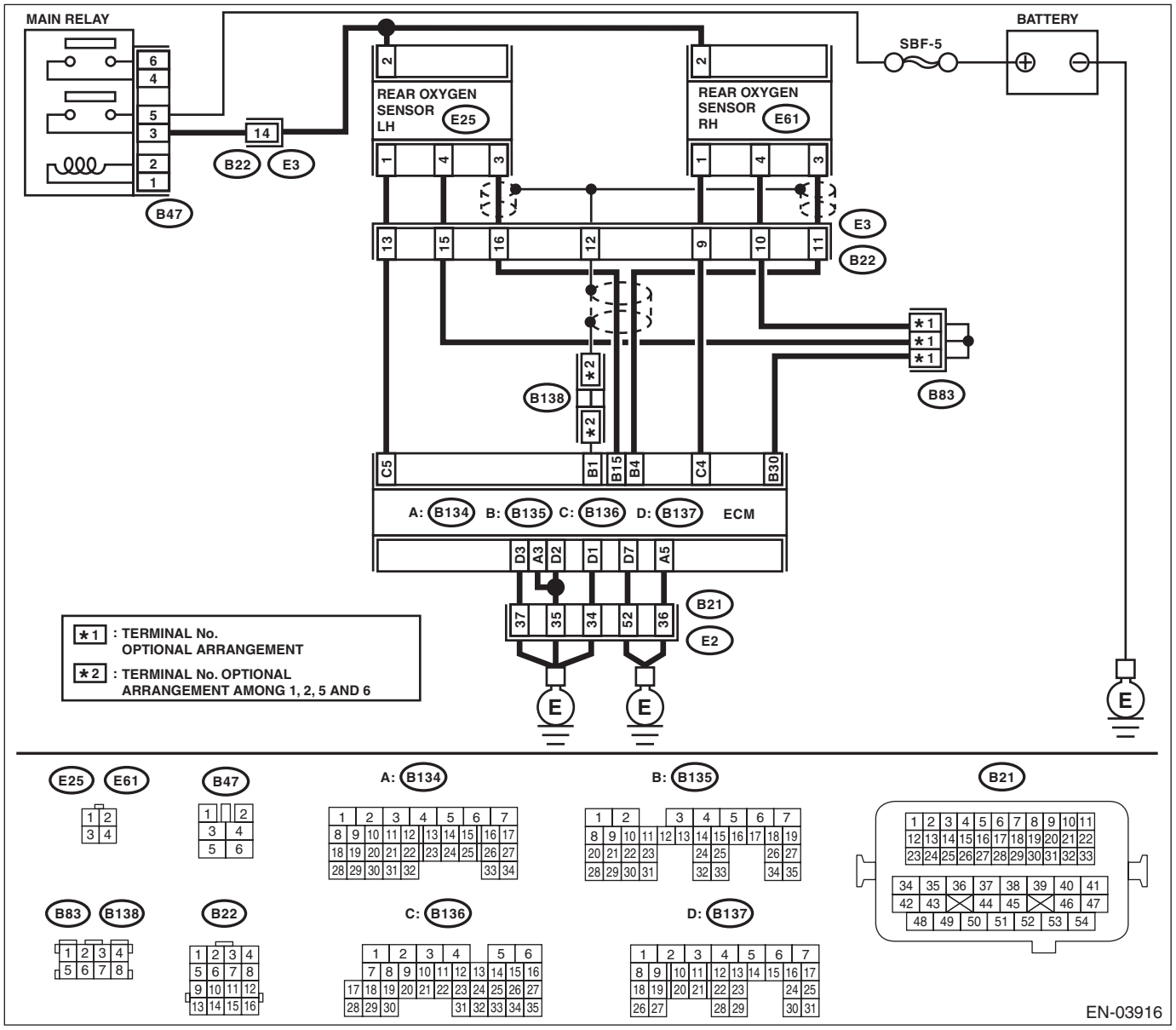
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-75, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (E61) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and rear oxygen sensor 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)-31, Rear Oxygen Sensor.>	Even if the malfunction indicator light illuminates, 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.

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

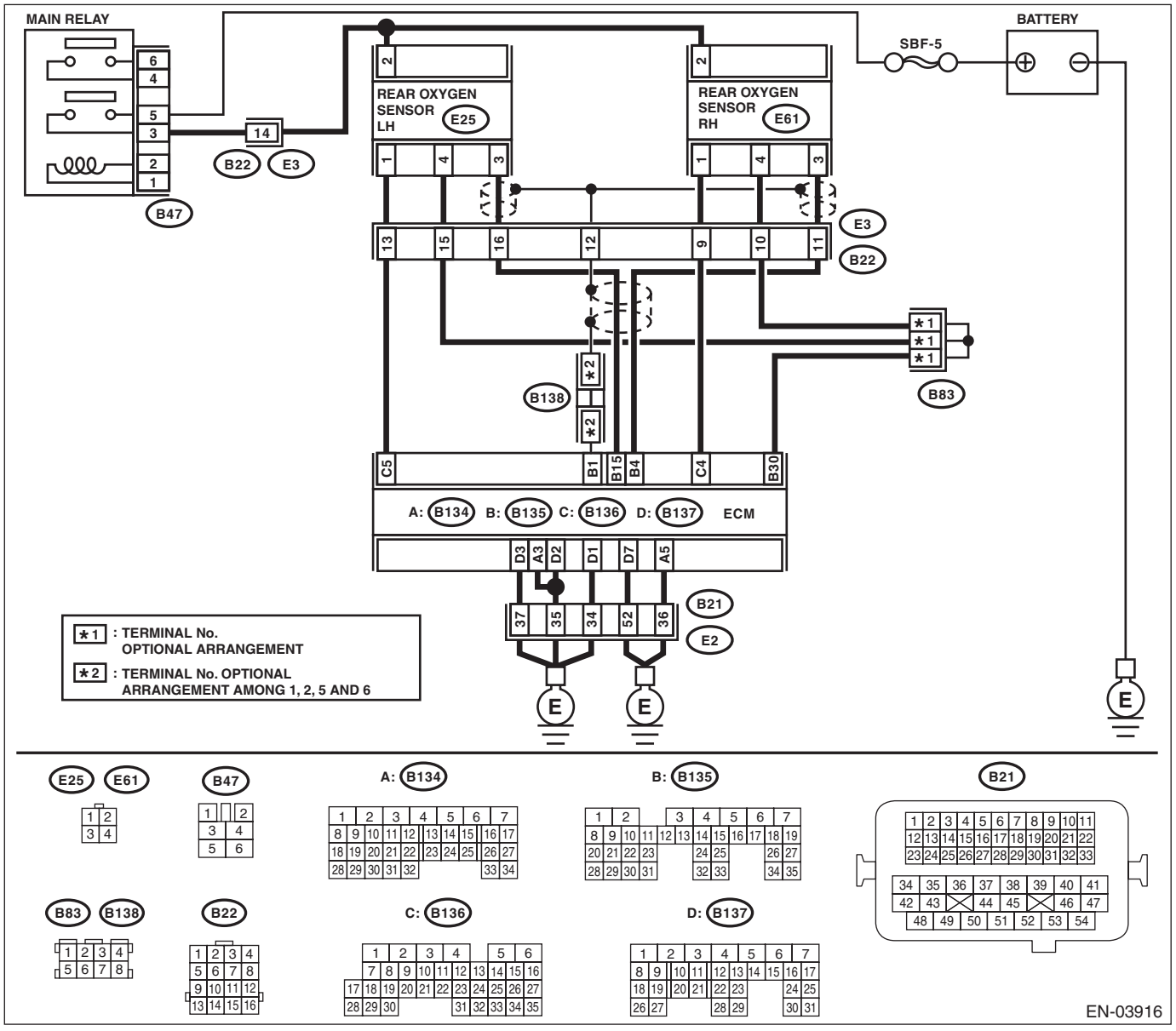
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-80, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **6**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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 open circuit of harness between ECM and rear oxygen sensor 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 the 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)-31, 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. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-31, Rear Oxygen Sensor.>

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

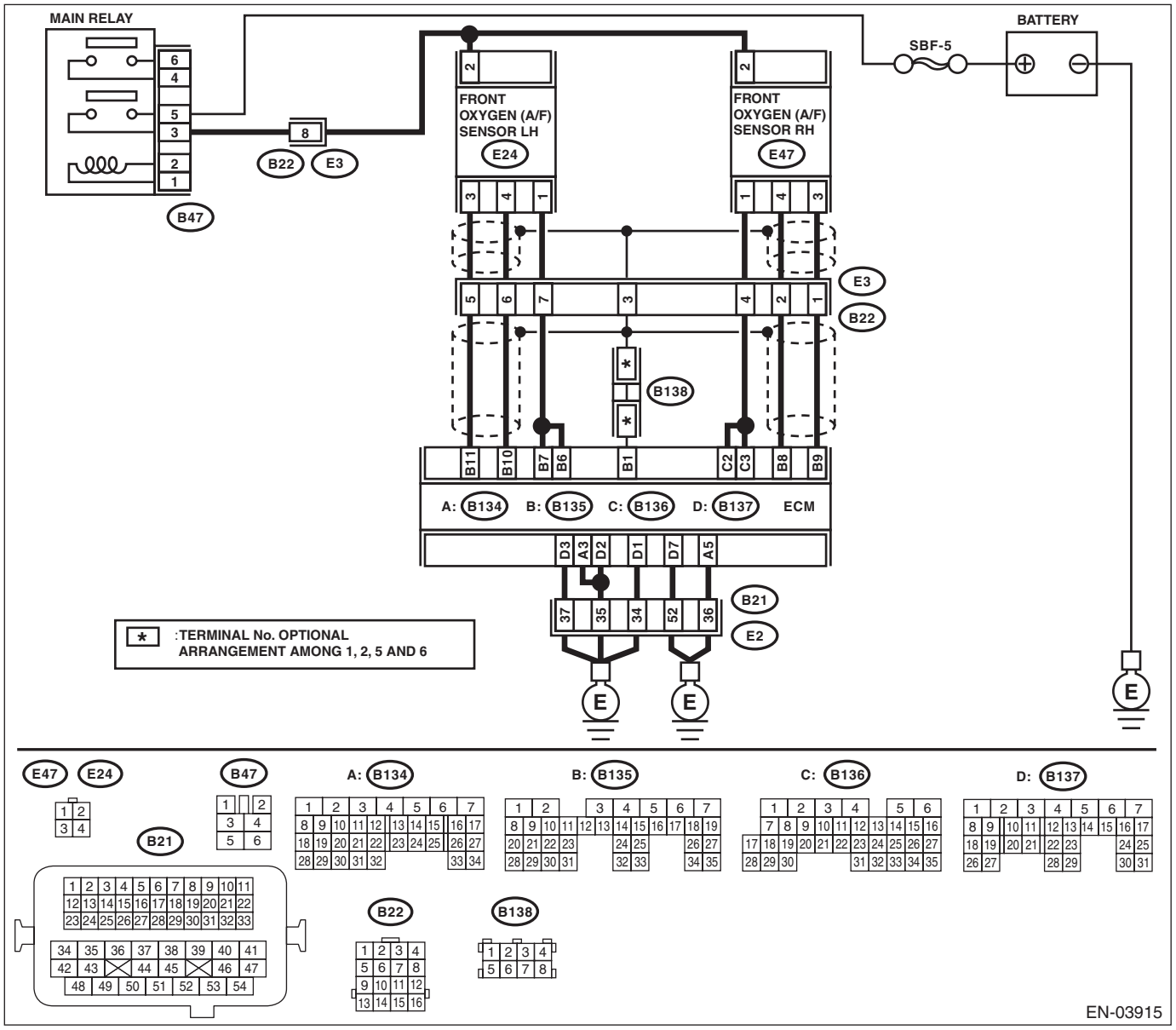
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-82, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 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 poor contact of 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)-29, Front Oxygen (A/F) Sensor.>

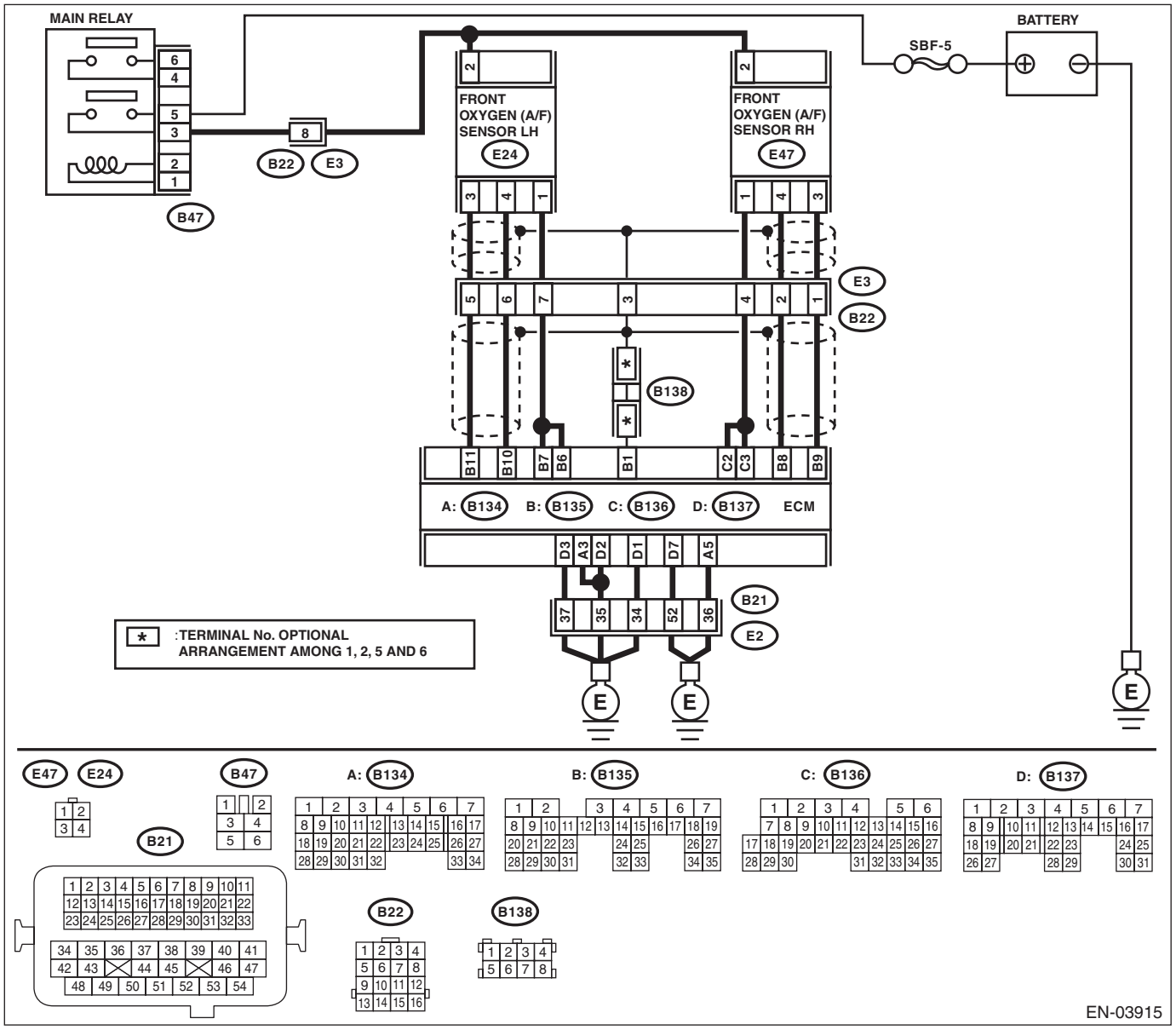
AT:DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-82, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
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 the ECM and front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-29, Front Oxygen (A/F) Sensor.>

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

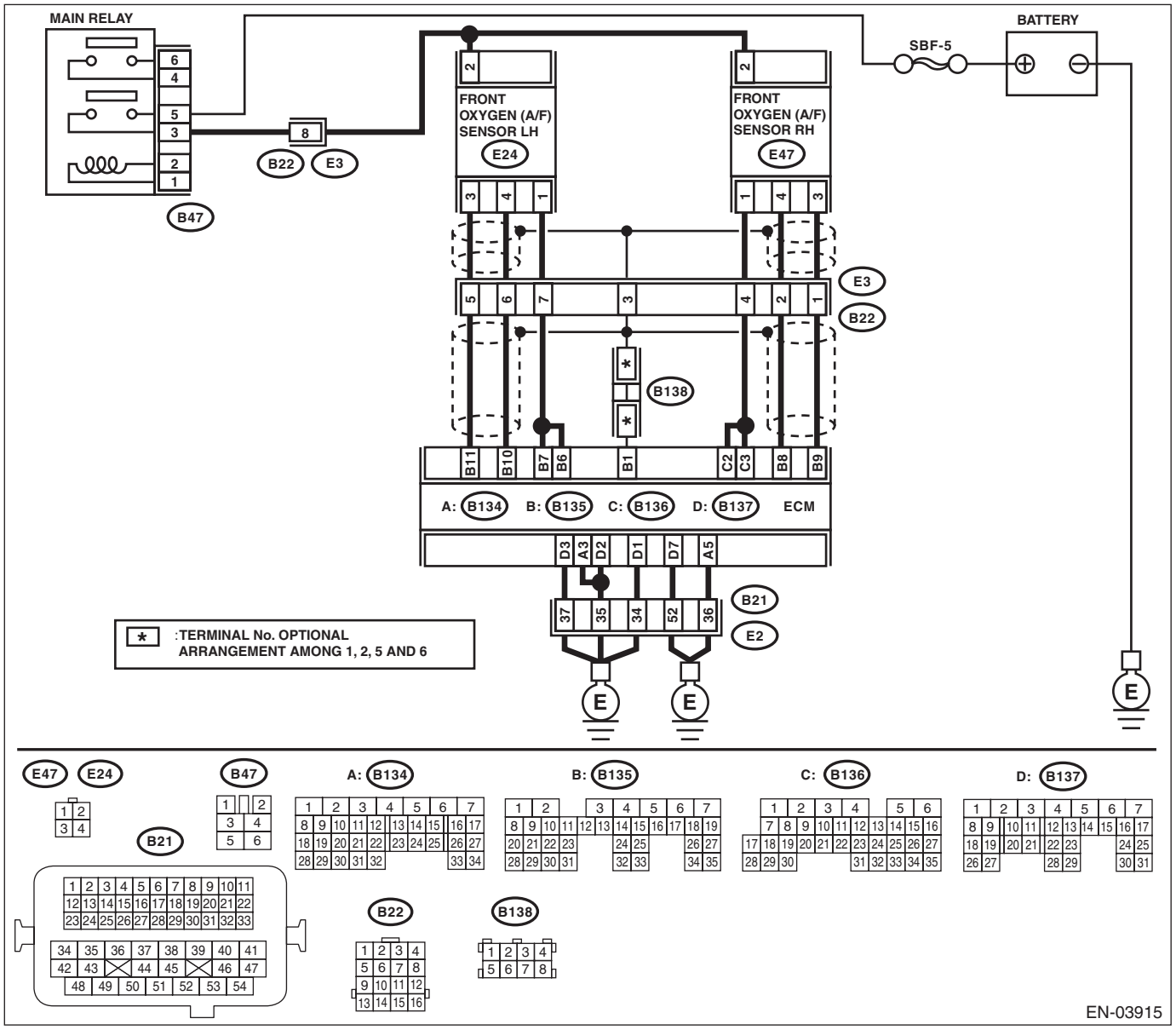
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-82, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-29, Front Oxygen (A/F) Sensor.>

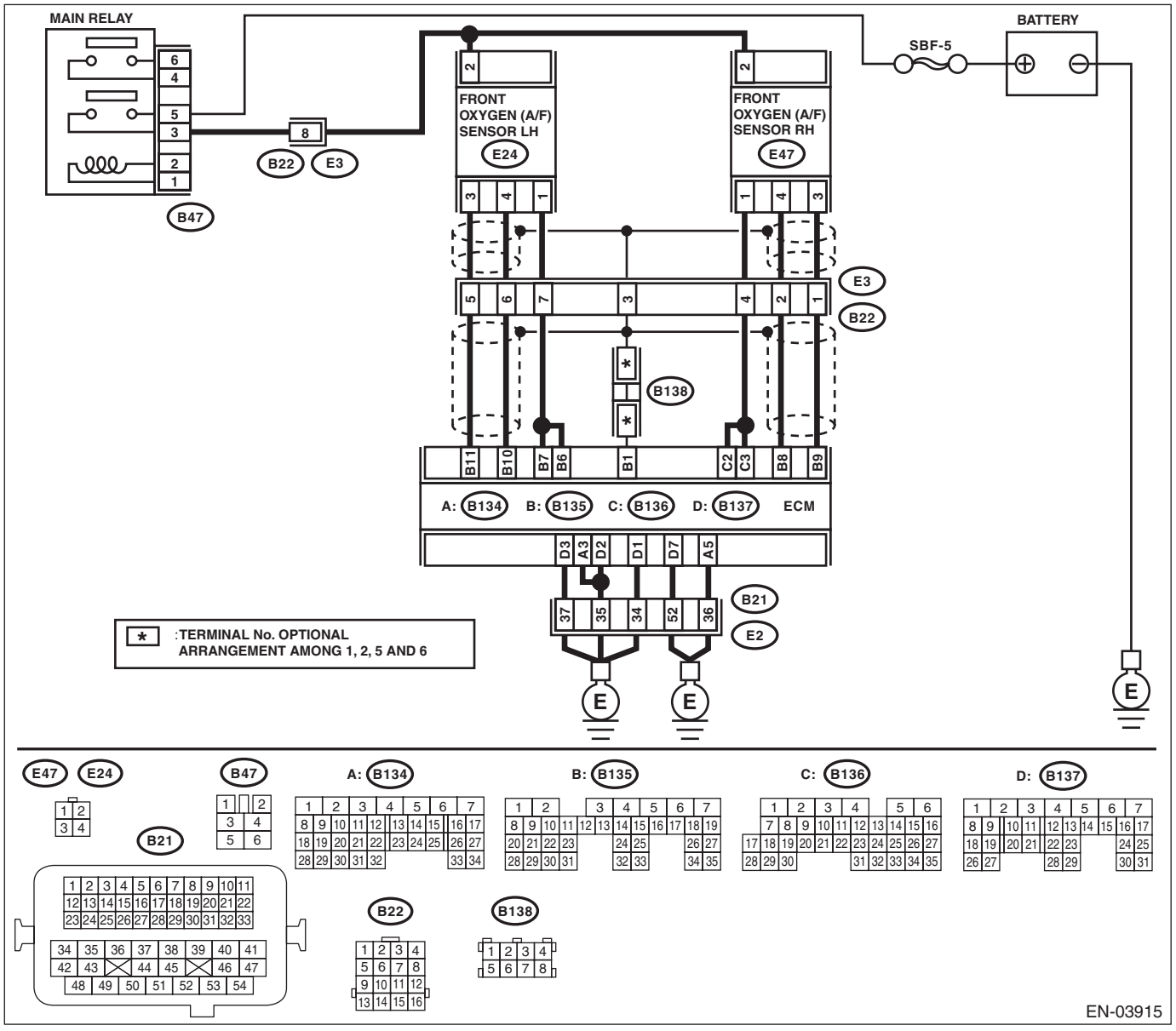
AV:DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-82, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the 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 **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and front oxygen (A/F) sensor connector • Poor contact of couling connector
2	**CHECK POOR CONTACT.** Check 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 of the ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-29, Front Oxygen (A/F) Sensor.>

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

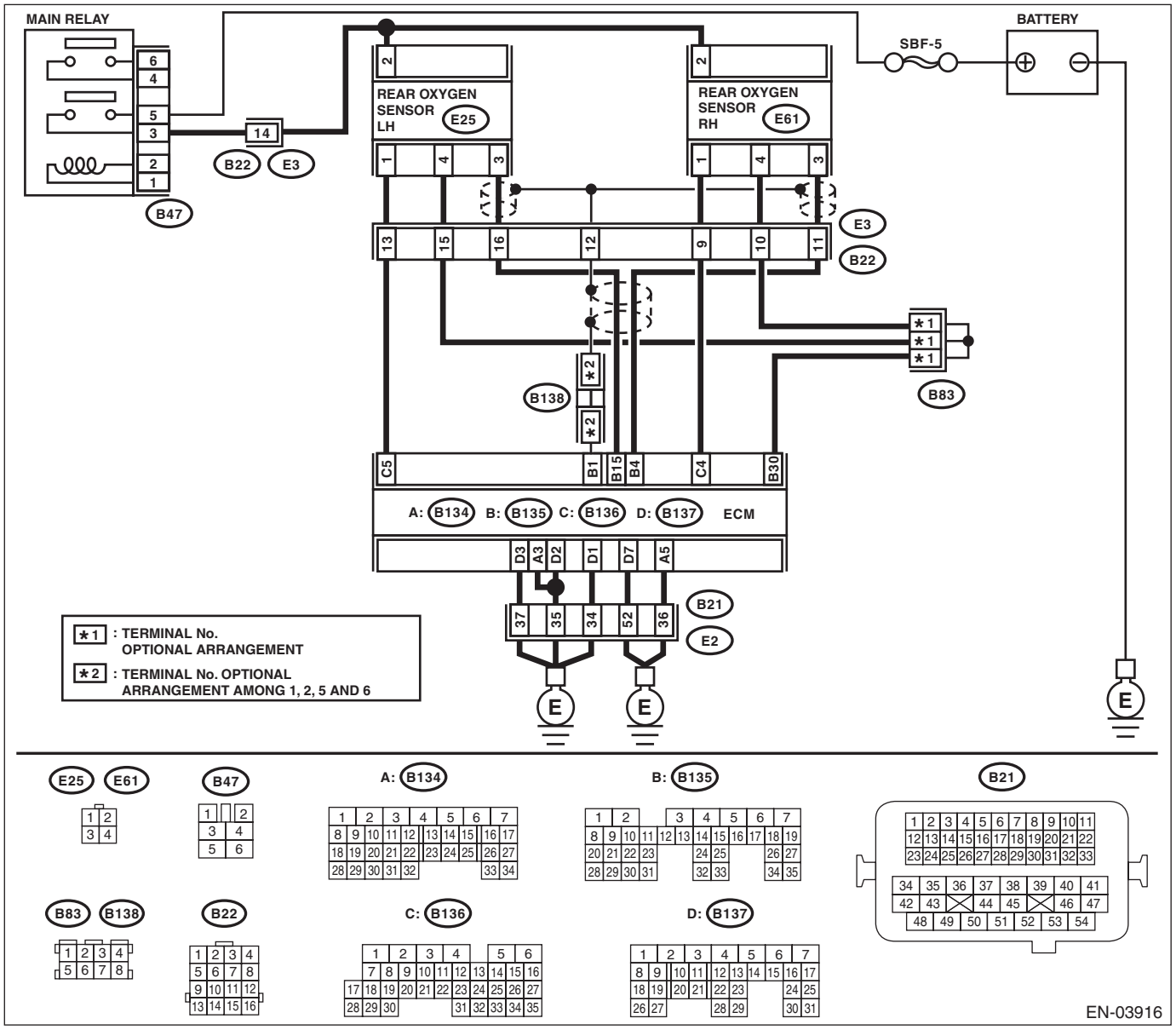
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-82, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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 open circuit of harness between ECM and rear oxygen sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the 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)-31, 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. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-31, Rear Oxygen Sensor.>

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

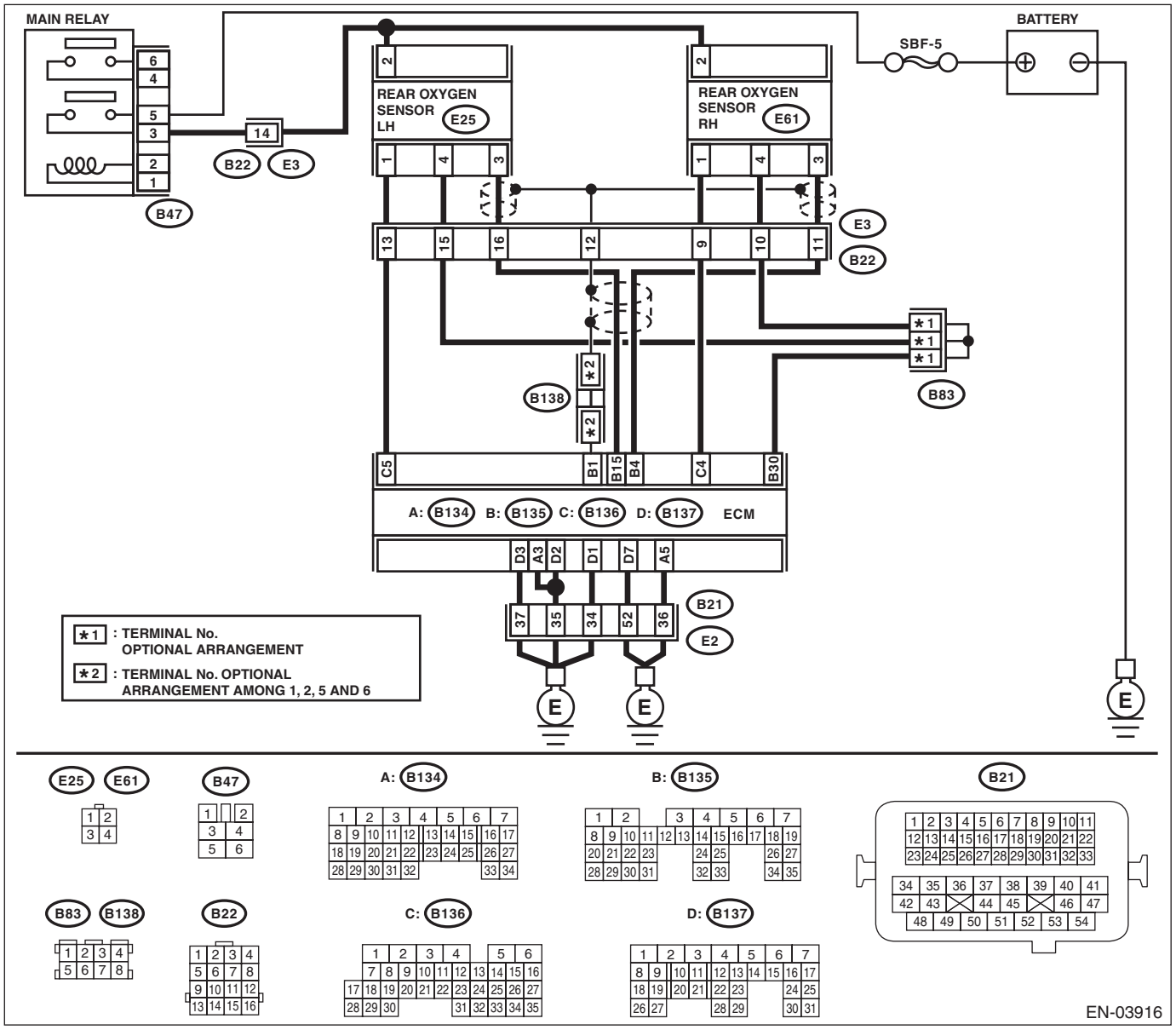
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-82, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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 open circuit of harness between ECM and rear oxygen sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the 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)-31, 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. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-31, Rear Oxygen Sensor.>

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

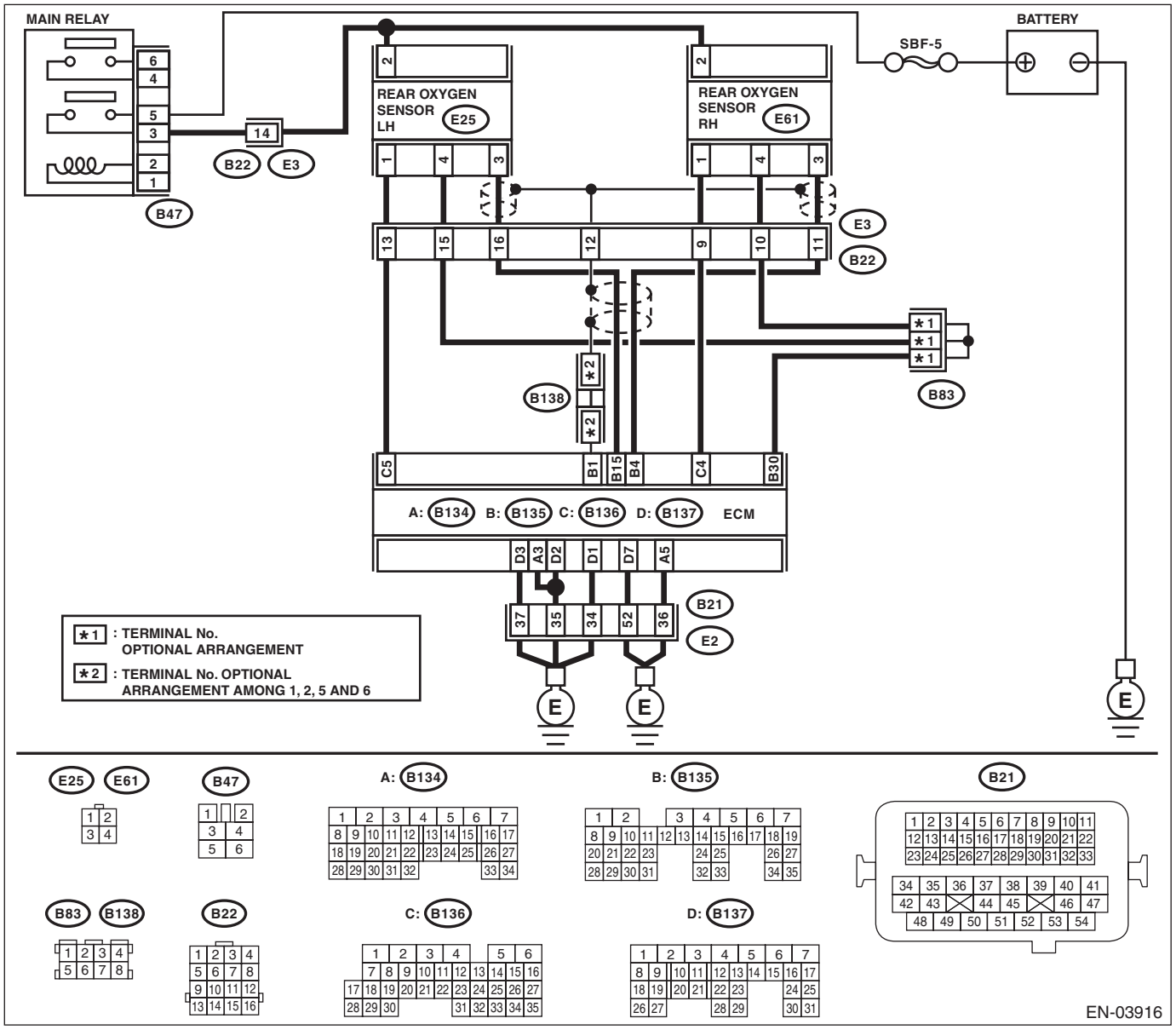
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-82, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 15 — (E25) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and rear oxygen sensor 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)-31, Rear Oxygen Sensor.>	Even if the malfunction indicator light illuminates, 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.

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

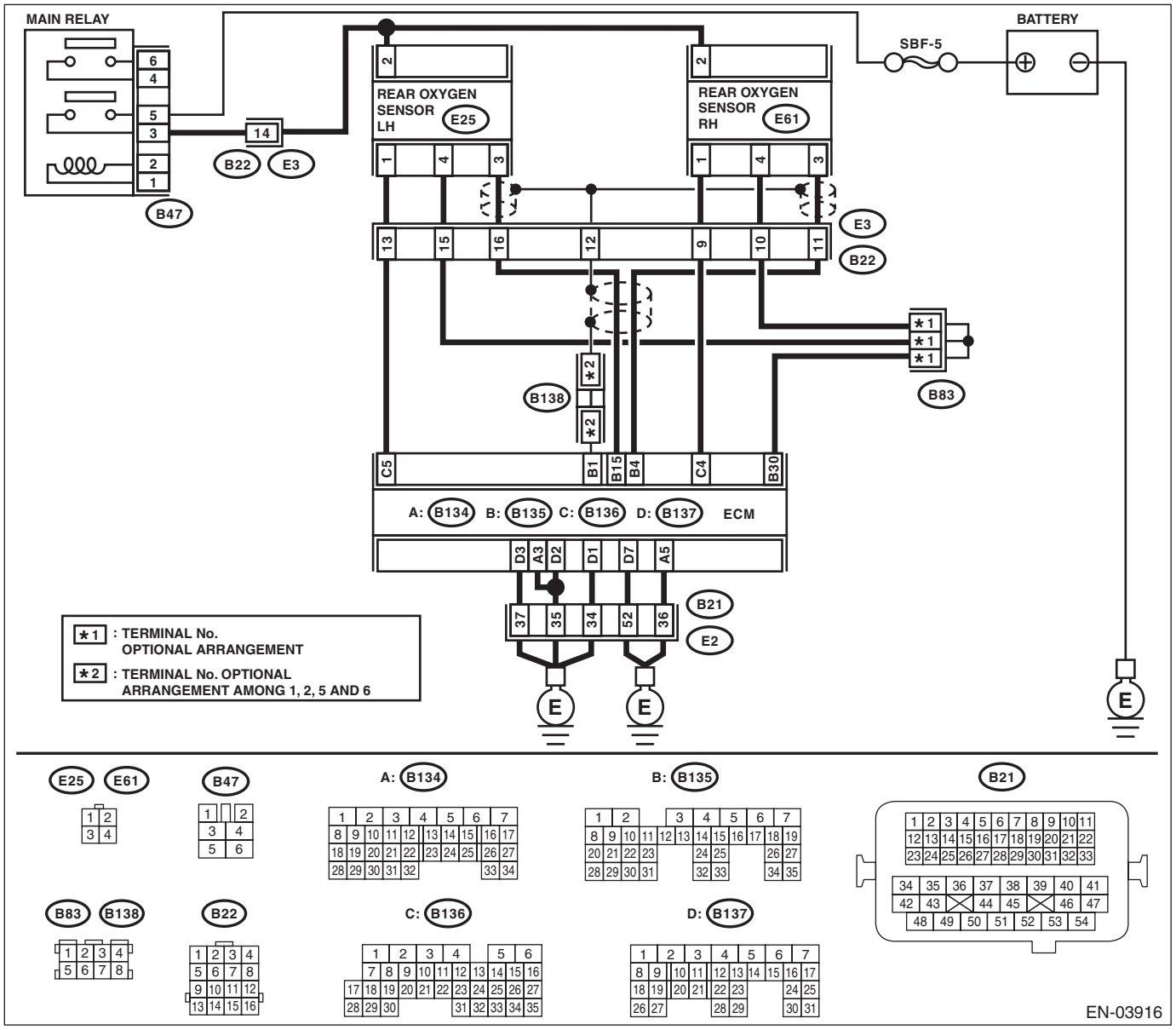
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-82, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **6**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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 open circuit of harness between ECM and rear oxygen sensor 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 the 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)-31, 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. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-31, Rear Oxygen Sensor.>

BA:DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:
Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-187, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BB:DTC P0172 SYSTEM TOO RICH (BANK 1)

NOTE:
Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-187, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BC:DTC P0174 SYSTEM TOO LEAN (BANK 2)

NOTE:
Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-187, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BD:DTC P0175 SYSTEM TOO RICH (BANK 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-86, 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)-43, 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)-26, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 333 — 363 kPa (3.4 — 3.7 kg/cm^2, 48 — 53 psi)?	Go to step **4**.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
4	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 70°C (158°F) or higher ?	Go to step **5**.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, 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 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-24, 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 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 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 mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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 poor contact in ECM connecor.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-24, Mass Air Flow and Intake Air Temperature Sensor.>

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

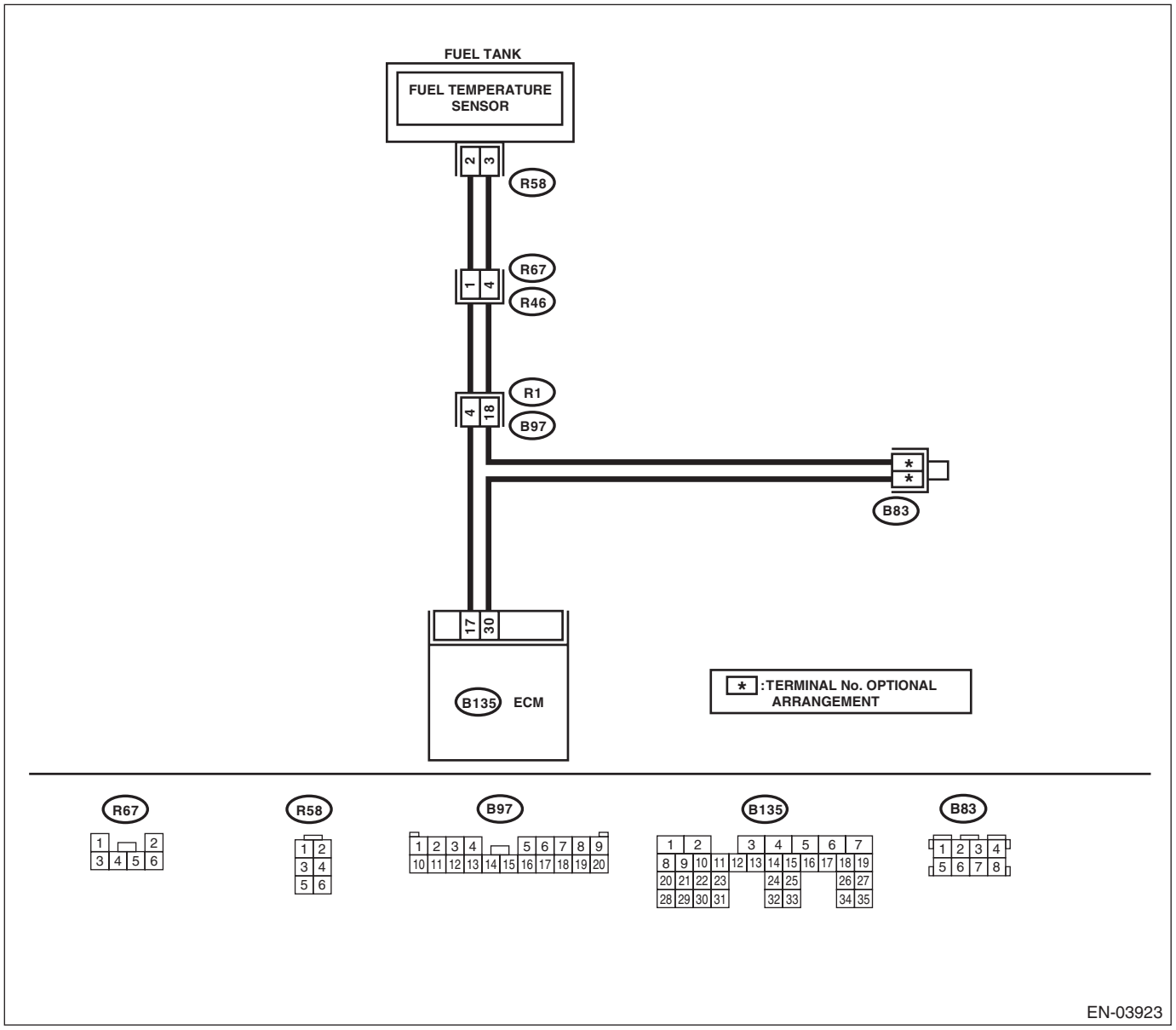
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-87, 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)-43, 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)-80, List of Diagnostic Trouble Code (DTC).>	Replace the fuel temperature sensor. <Ref. to EC(H6DO)-8, Fuel Temperature Sensor.>

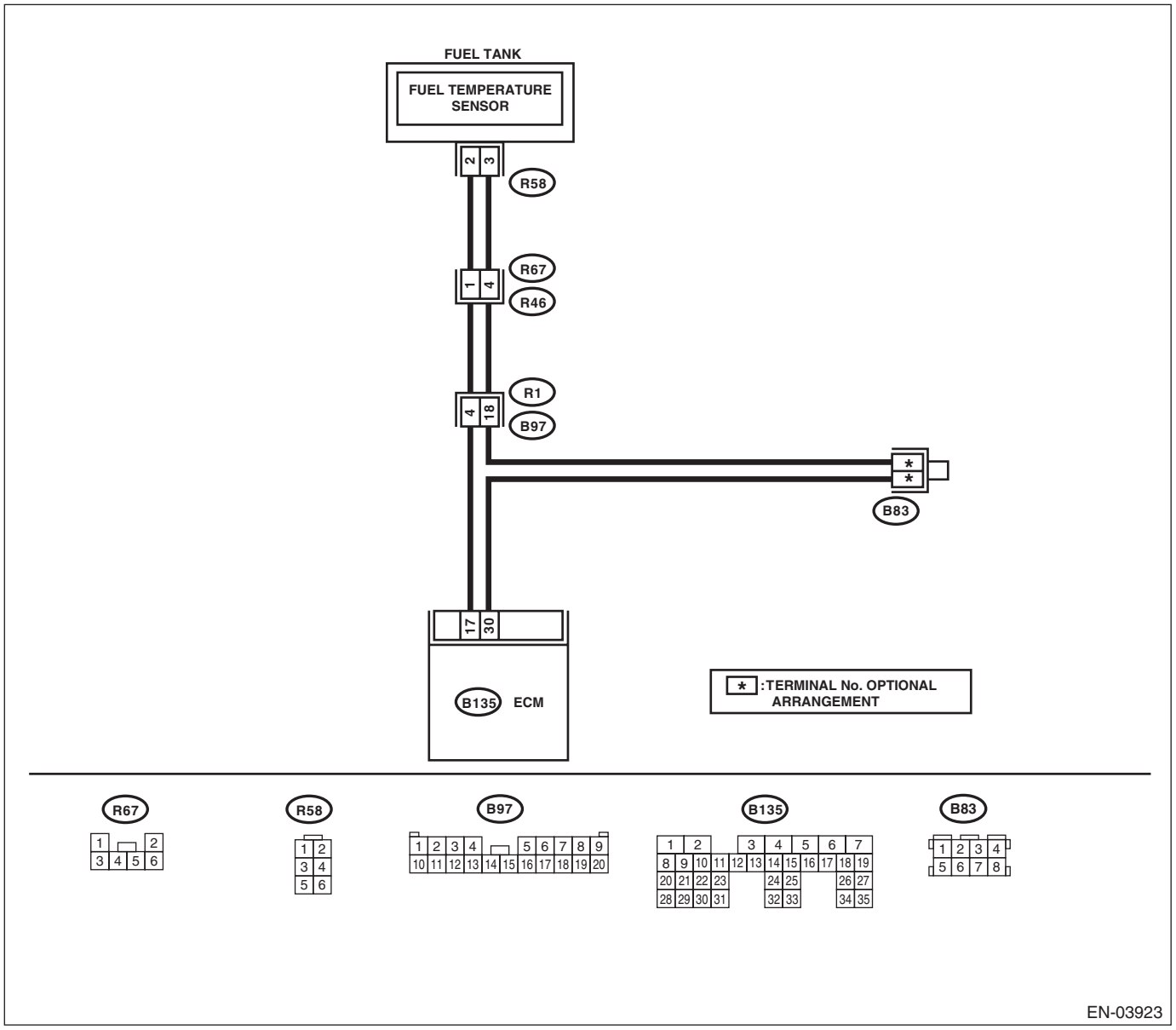
BF:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-90, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.>	Is the temperature 120°C (248°F) or higher?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 connectors from the 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)-8, Fuel Temperature Sensor.>	Repair the ground short circuit of harness between ECM and fuel pump.

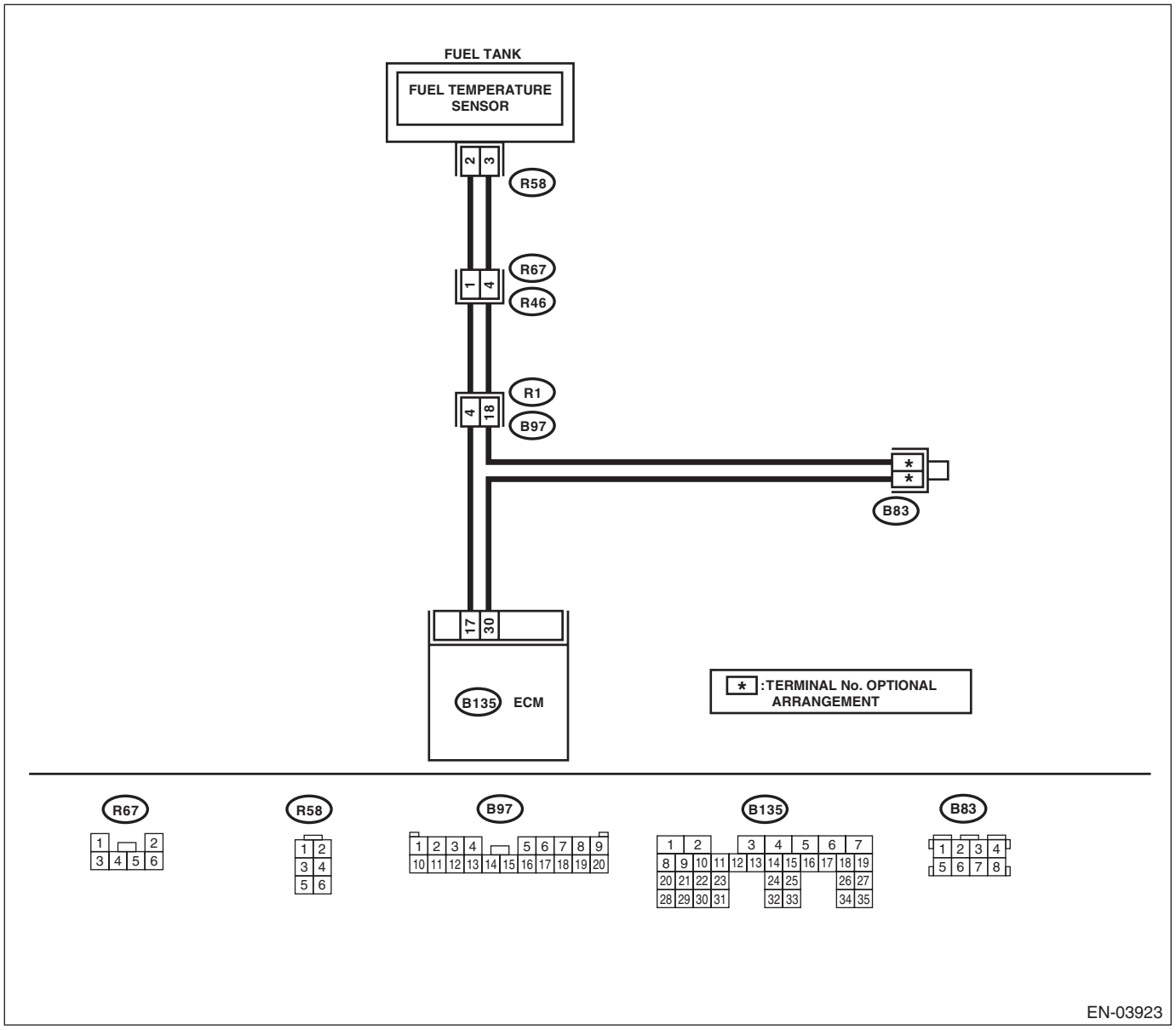
BG:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-92, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.>	Is the temperature less than –40°C (–40°F)?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 connectors from the 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 open circuit of the harness between the ECM and fuel temperature sensor 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)-8, Fuel Temperature Sensor.>

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

DTC DETECTING CONDITION:

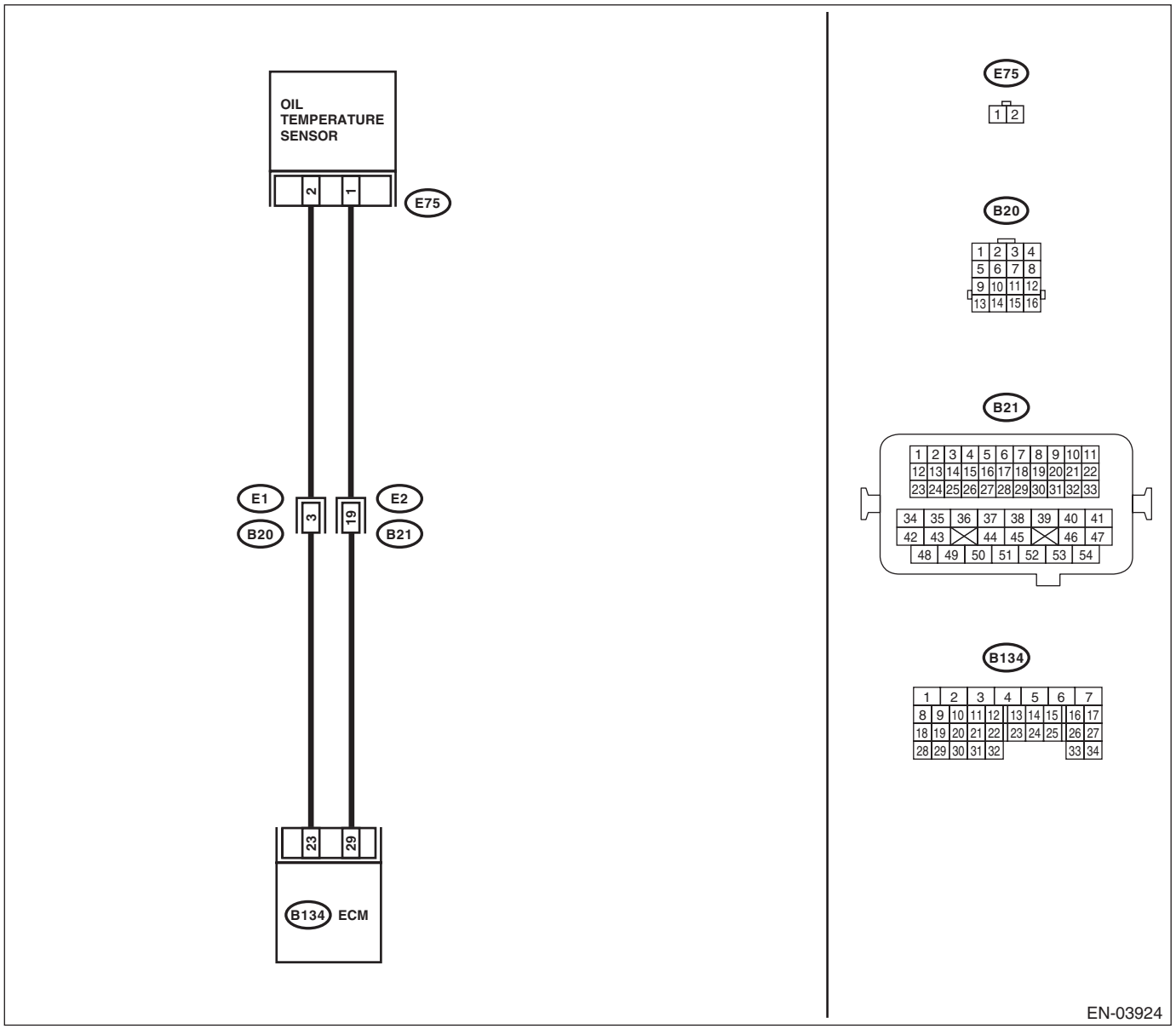
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-94, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, 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)-80, List of Diagnostic Trouble Code (DTC).>	Replace the oil temperature sensor. <Ref. to FU(H6DO)-28, Oil Temperature Sensor.>

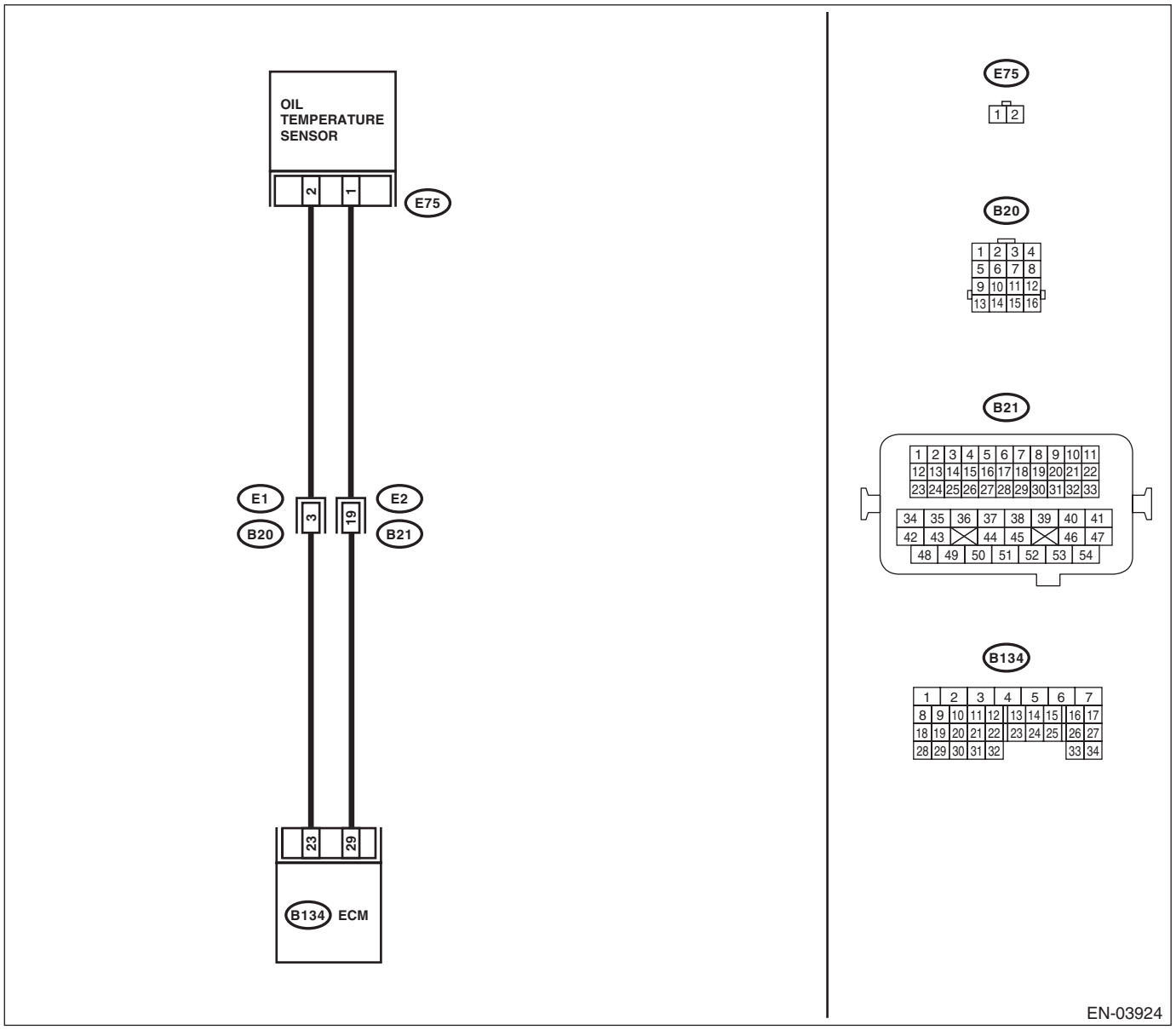
BI: DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

DTC DETECTING CONDITION:
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-96, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of the oil temperature sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the oil temperature 215°C (419°F) or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 the 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)-28, Oil Temperature Sensor.>	Repair the ground short circuit of harness between ECM and oil temperature sensor.

BJ:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

DTC DETECTING CONDITION:

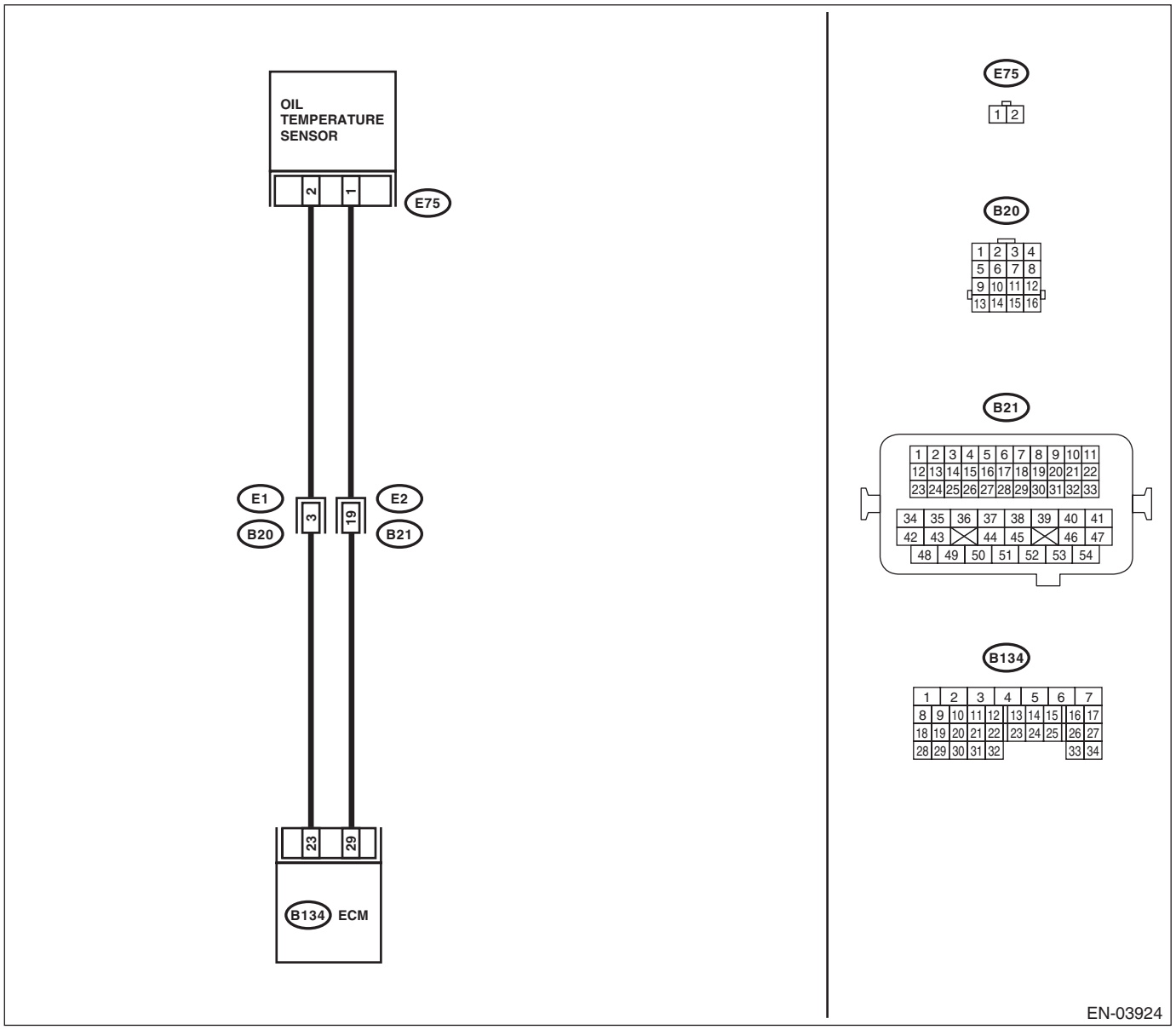
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-97, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of the oil temperature sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the oil temperature less than –40°C (–40°F)?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 the ECM and oil temperature sensor connector.	Is there poor contact in the ECM or oil temperature sensor connector?	Repair the poor contact in the ECM or the oil temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND OIL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and oil temperature sensor. 3) Measure the resistance of the harness between the 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 open circuit of harness between ECM and oil temperature sensor 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 the harness between the ECM and oil temperature sensor connector.	Replace the oil temperature sensor. <Ref. to FU(H6DO)-28, Oil Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-98, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

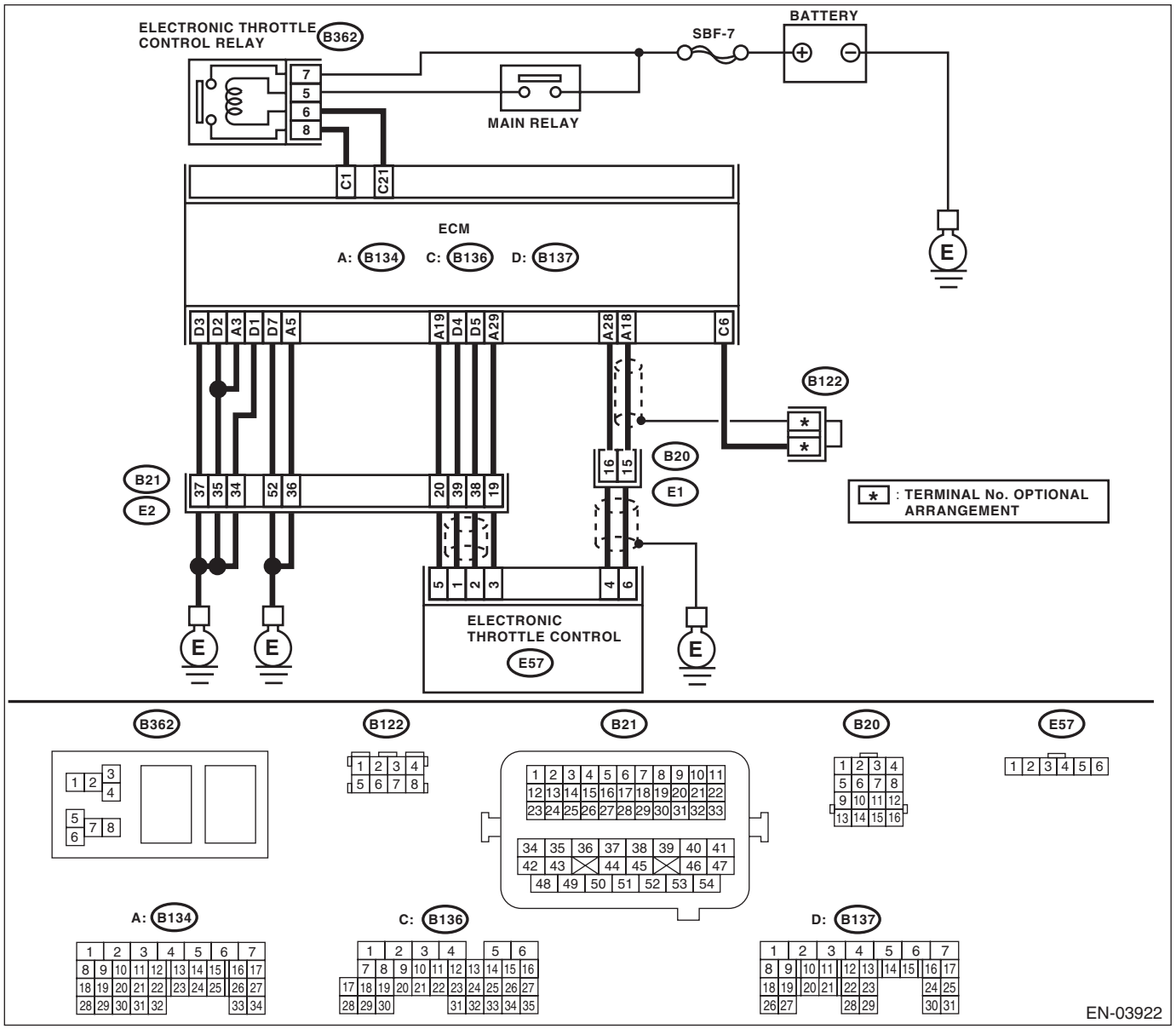
TROUBLE SYMPTOM:

- 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the ground short circuit of 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)-12, Throttle Body.>	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-100, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

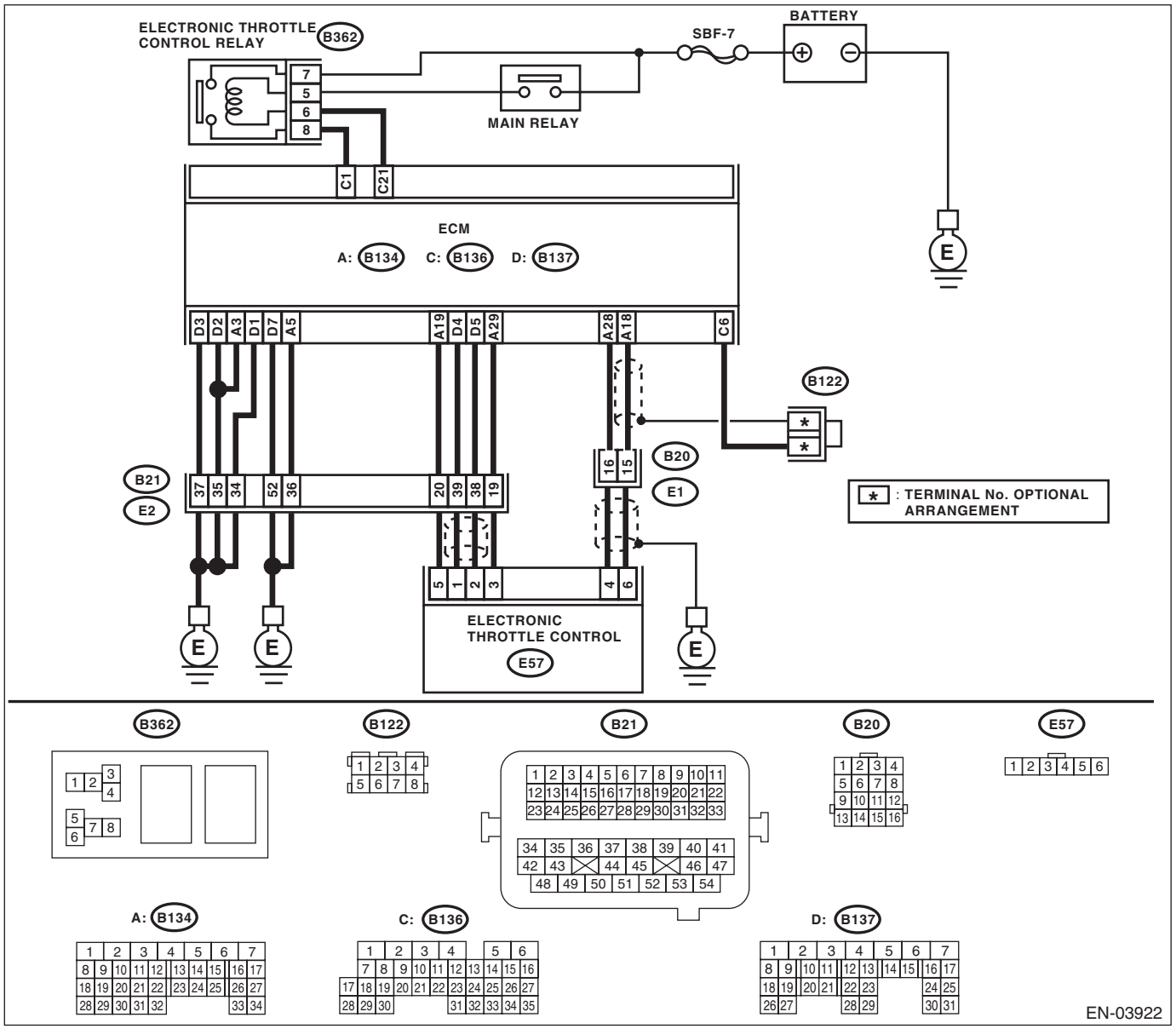
TROUBLE SYMPTOM:

- 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 28 — (E57) No. 4:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and electronic throttle control 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 connecor. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engie 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 the 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)-12, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

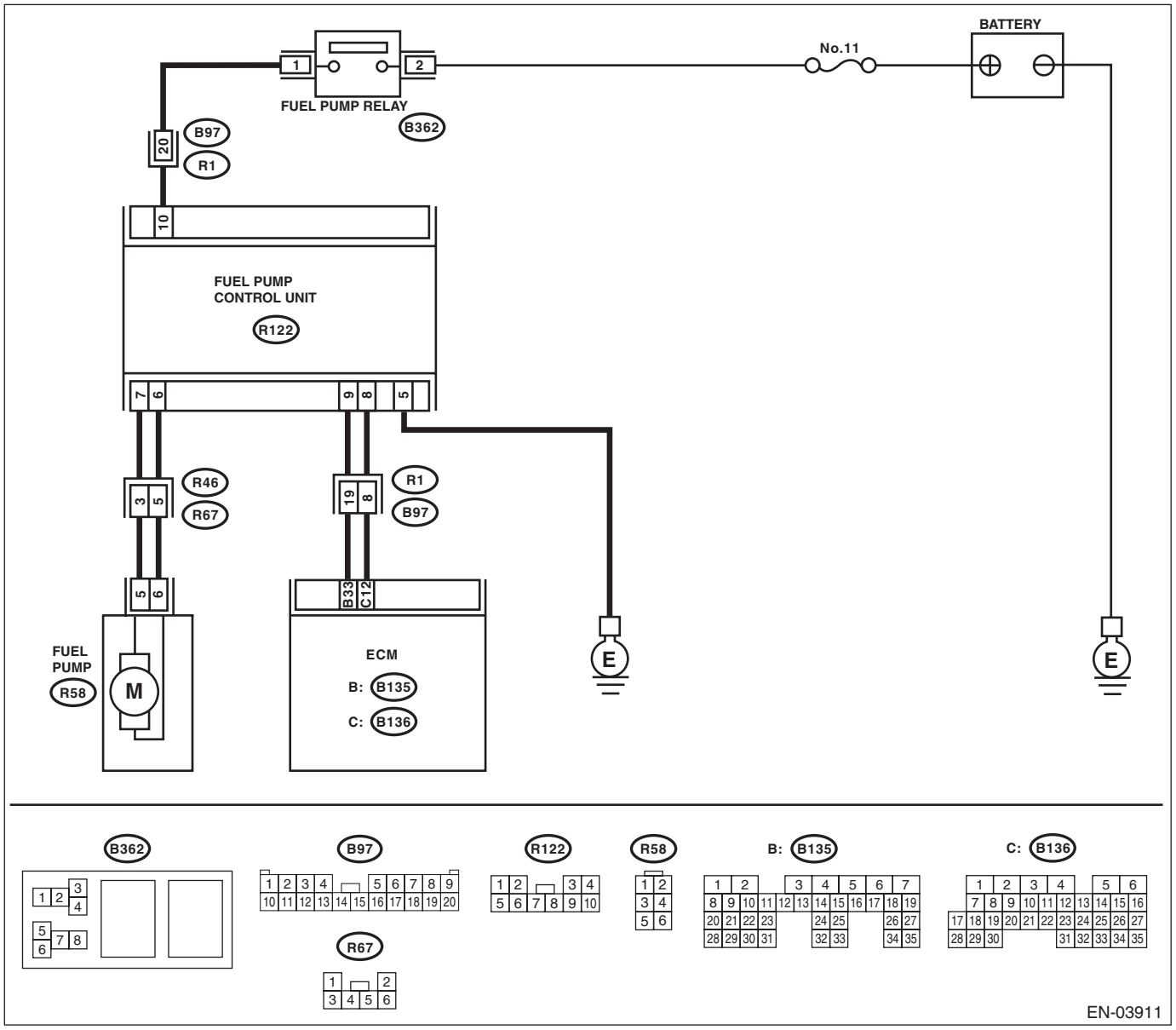
BM:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-102, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply circuit. NOTE: In this case, repair the following item: • Open or ground short circuit of harness between fuel pump relay and fuel pump control unit • 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 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 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 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 open circuit between fuel pump control unit and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** Measure the resistance between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between fuel pump control unit and fuel pump.
5	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONTROL UNIT.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance of the harness between the ECM and fuel pump control unit. ***Connector & terminal*** ***(B136) No. 12 — (R122) No. 8:*** ***(B135) No. 33 — (R122) No. 9:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit between the ECM and fuel pump control unit • Poor contact between ECM and fuel pump control unit

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONTROL UNIT.** Measure the resistance between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 8 — Chassis ground:*** ***(R122) No. 9 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the ground short circuit of harness between ECM and fuel pump control unit.
7	**CHECK POOR CONTACT.** Check 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)-37, Fuel Pump Control Unit.>

BN:DTC P0301 CYLINDER 1 MISFIRE DETECTED

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

BO:DTC P0302 CYLINDER 2 MISFIRE DETECTED

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

BP:DTC P0303 CYLINDER 3 MISFIRE DETECTED

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

BQ:DTC P0304 CYLINDER 4 MISFIRE DETECTED

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

BR:DTC P0305 CYLINDER 5 MISFIRE DETECTED

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

BS:DTC P0306 CYLINDER 6 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-109, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

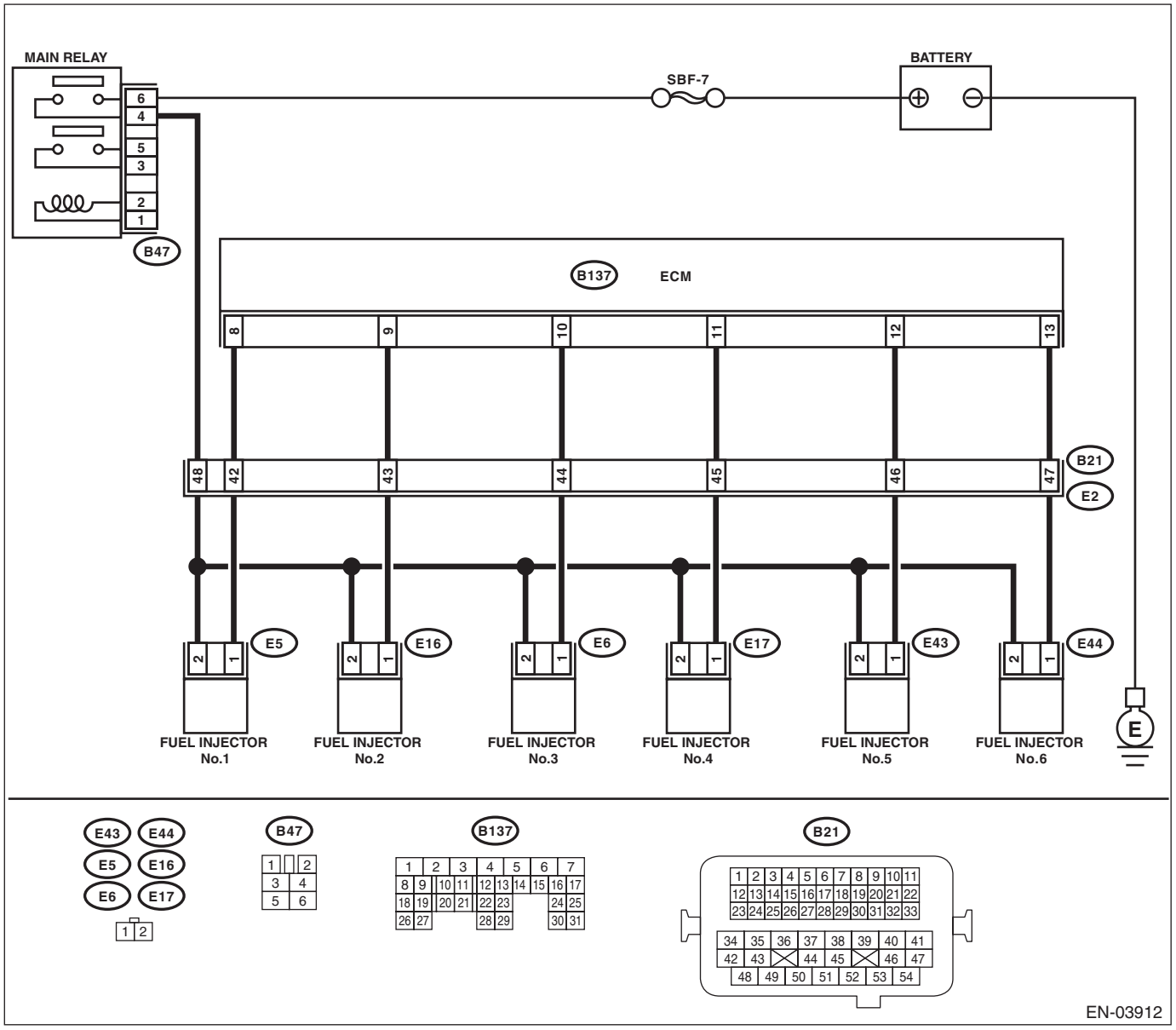
TROUBLE SYMPTOM:

- 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)-43, 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 the ECM and chassis ground for 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 the 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 the 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 **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)-25, Fuel Injector.>

	Step	Check	Yes	No
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 of harness between main relay and fuel injector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector • Poor contact of fuel injector connector on faulty cylinders
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 the ECM and chassis ground for 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)-25, 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)-60, Cylinder Block.>	Go to step **10**.
10	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn the crankshaft using ST, and align alignment mark on crank sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET	Is the timing chain dislocated from its proper position?	Correct the installation condition of timing chain. <Ref. to ME(H6DO)-42, Timing Chain Assembly.>	Go to step **11**.

Step		Check	Yes	No
11	**CHECK FUEL LEVEL.**	Is the fuel meter indication lower than the “Lower” level?	Replenish 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 the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual. 2) Start the engine, and drive the vehicle 10 minutes or more.	Does the malfunction indicator light illuminate or blink?	Go to step **14**.	Go to step **13**.
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 of 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**.

	Step	Check	Yes	No
15	**CHECK MISFIRE SYMPTOM.** 1) Turn the ignition switch to ON. 2) Read the DTC. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Does the Subaru Select Monitor or general scan tool indicate only one DTC?	Go to step **21**.	Go to step **16**.
16	**CHECK 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**.
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)-80, 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 are not found, check the "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side. <Ref. to EN(H6DO)(diag)-74, 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)-80, List of Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
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 are not found, check the "IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(H6DO)(diag)-74, 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)-80, List of Diagnostic Trouble Code (DTC).>
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 are not found, check the "IGNITION CONTROL SYSTEM" of #5 and #6 cylinders side. <Ref. to EN(H6DO)(diag)-74, 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)-80, 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)-80, List of Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
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)-80, 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)-80, List of Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-110, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

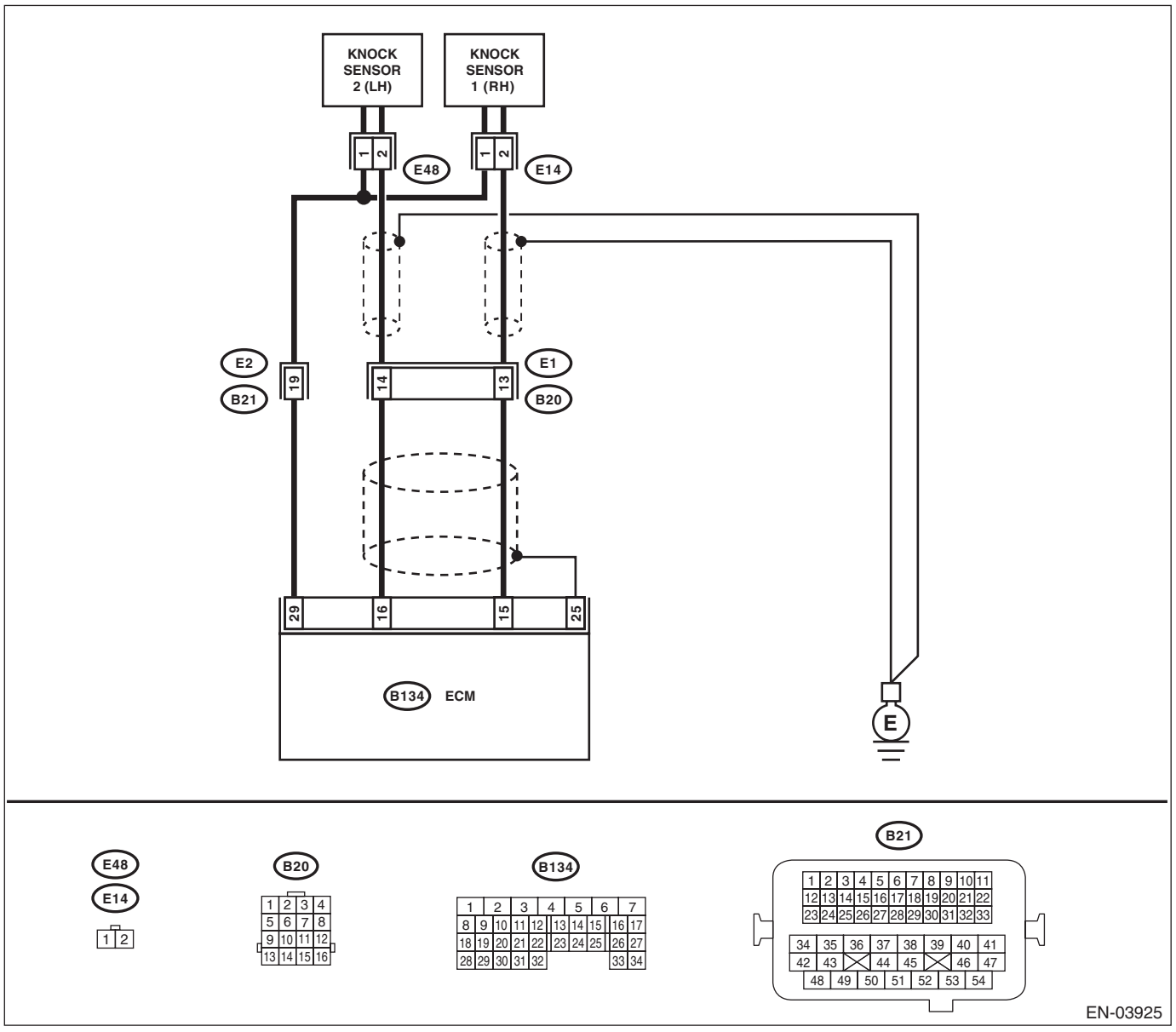
TROUBLE SYMPTOM:

- 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)-43, 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 the 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 poor contact of the 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)-21, 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 P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-112, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

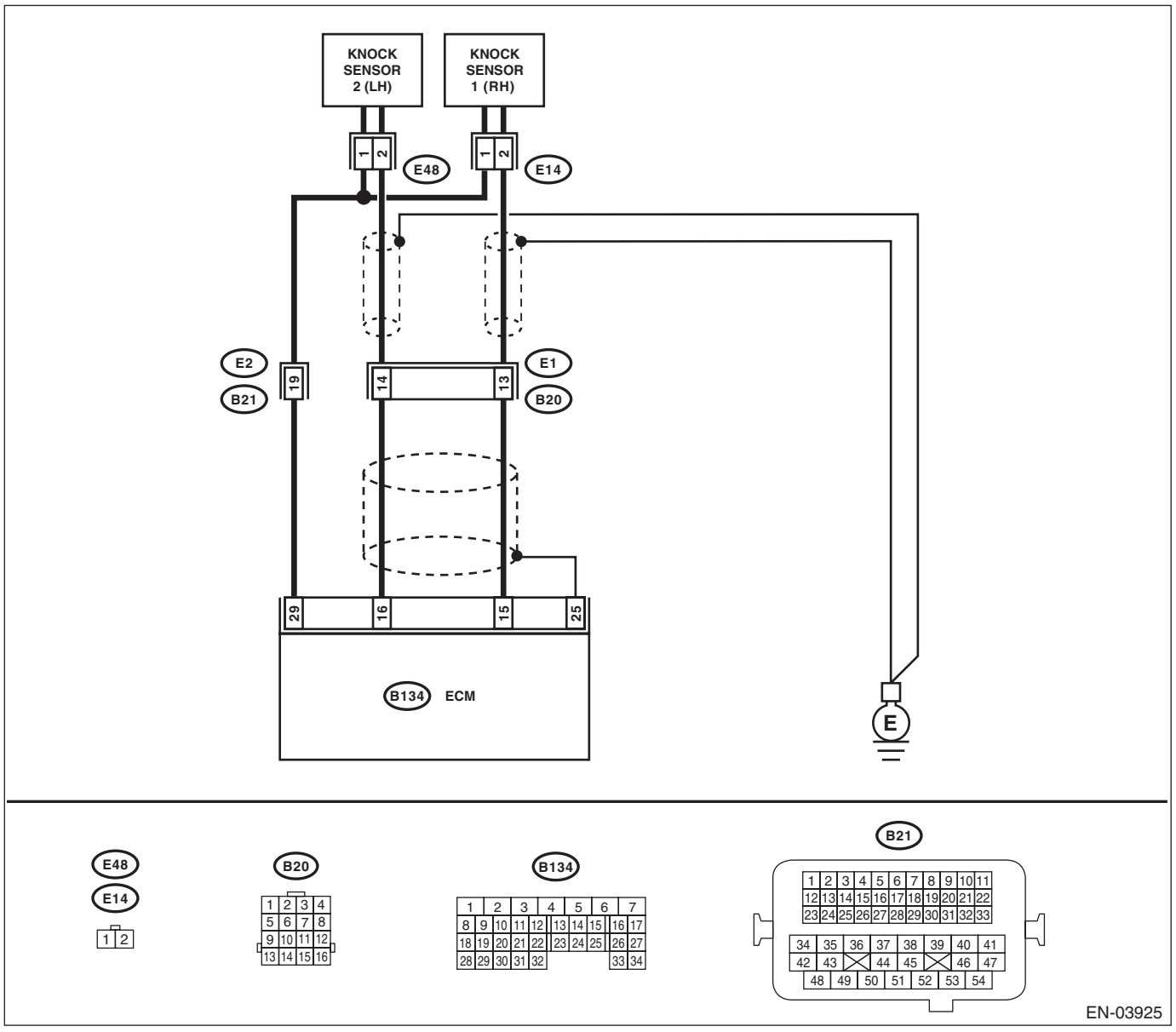
TROUBLE SYMPTOM:

- 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)-43, 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 the 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)-21, Knock Sensor.>	Repair the ground short circuit of harness between the 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?	Even if the malfunction indicator light illuminates, 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 poor contact of the ECM connector.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-113, DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

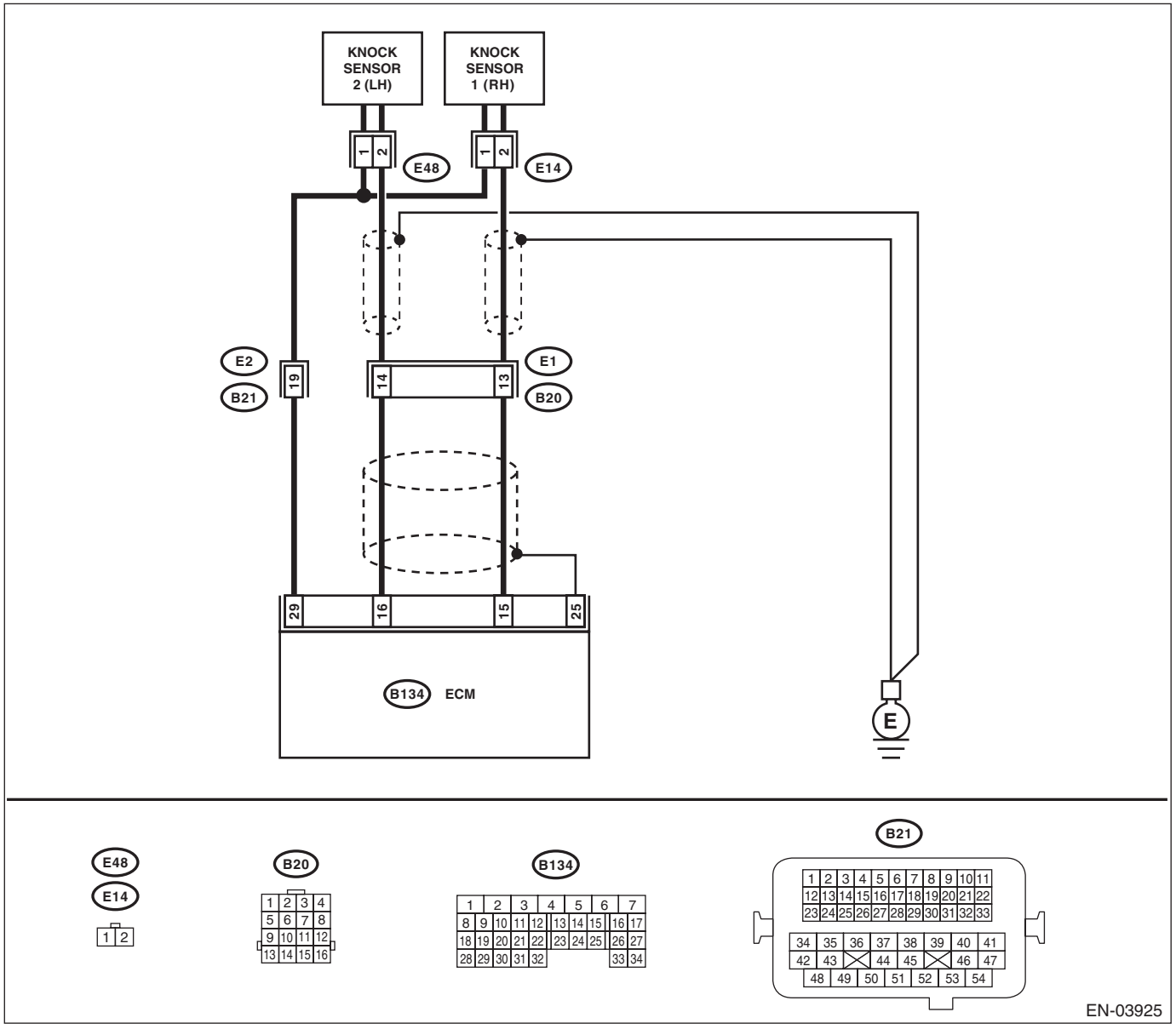
TROUBLE SYMPTOM:

- 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)-43, 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 the 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 poor contact of the 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)-21, 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

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-113, DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

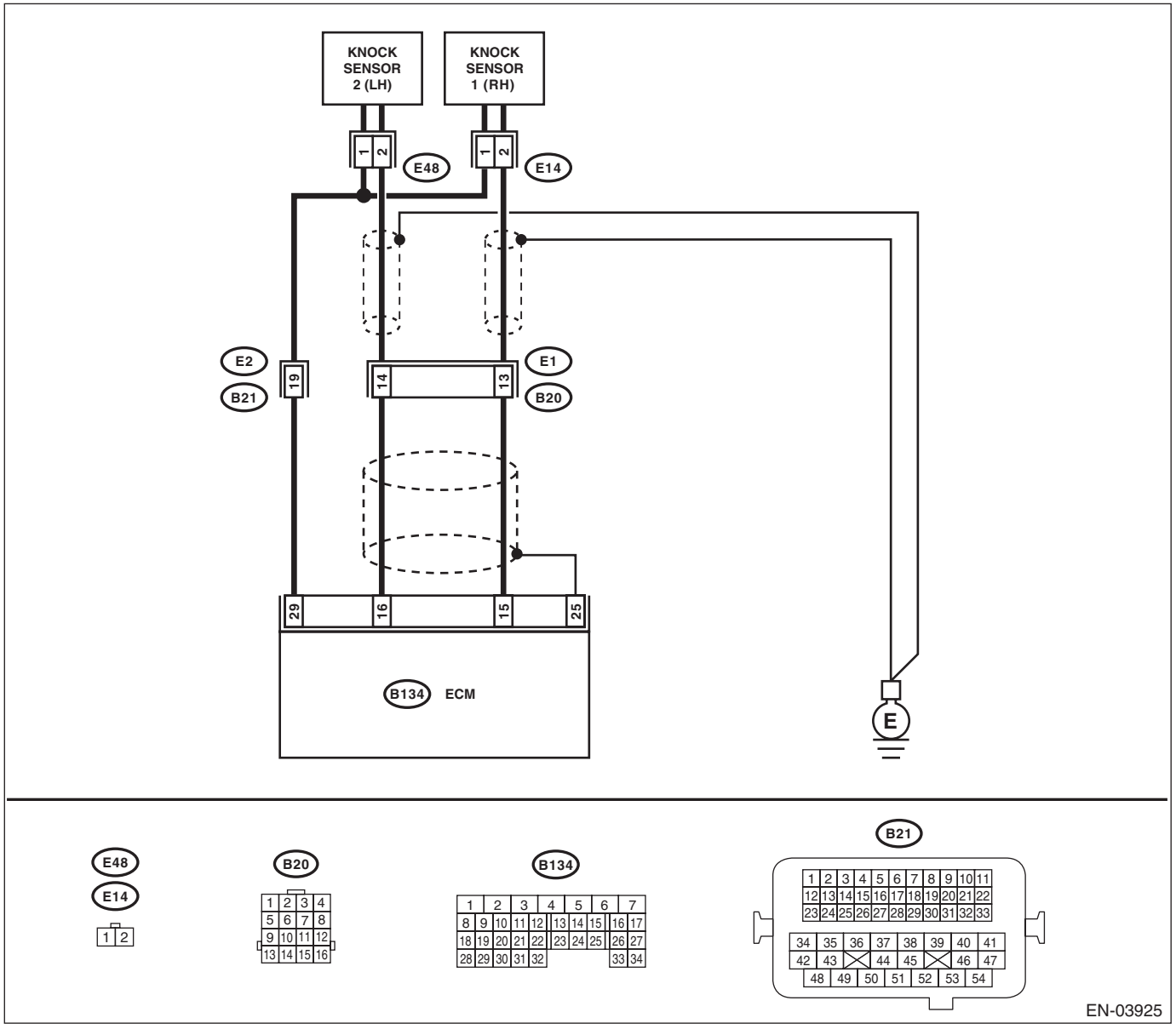
TROUBLE SYMPTOM:

- 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)-43, 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 the 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)-21, Knock Sensor.>	Repair the ground short circuit of harness between the 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?	Even if the malfunction indicator light illuminates, 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 poor contact of the ECM connector.

BX:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

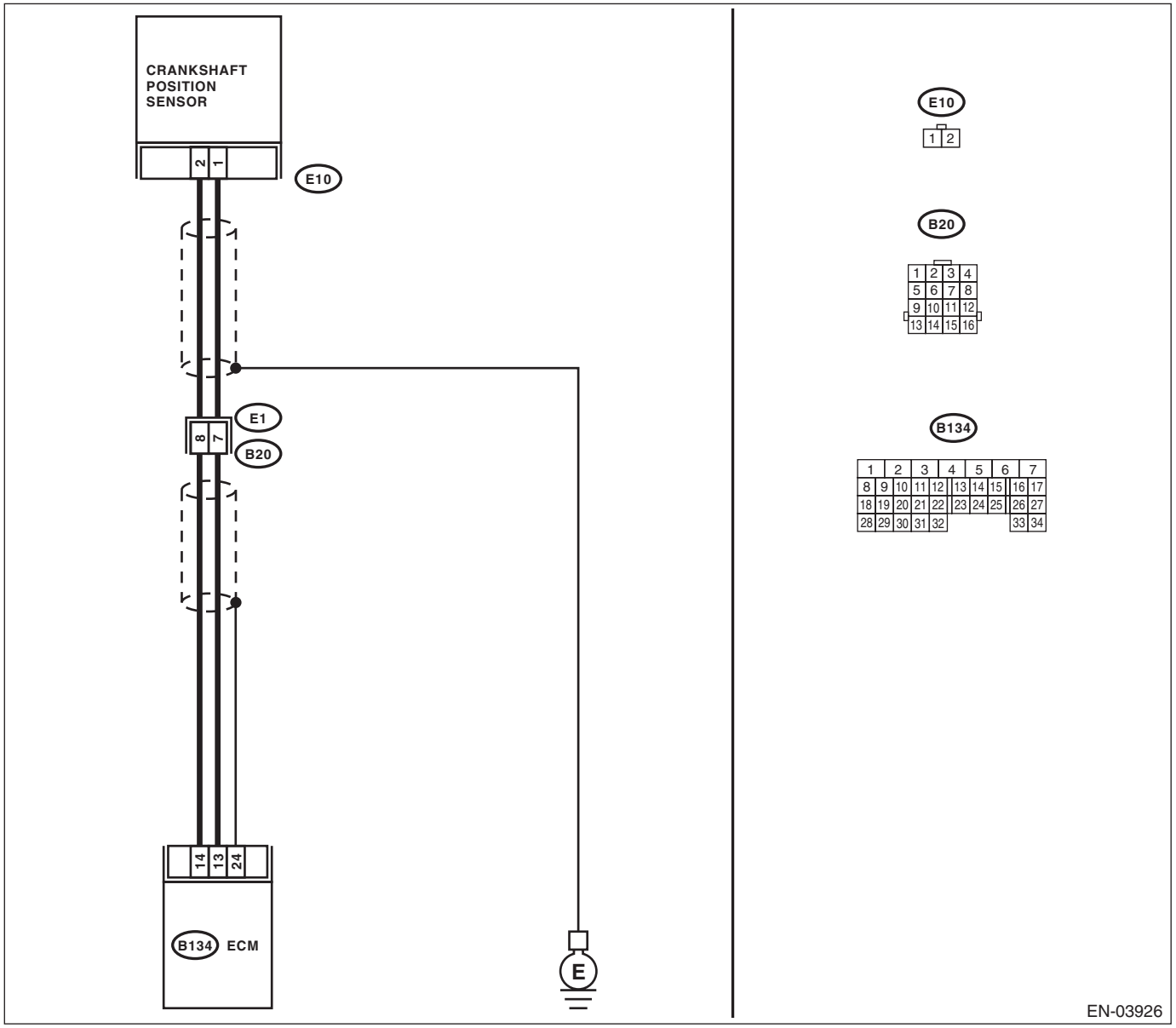
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-114, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, 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 — 4 kΩ?	Go to step **3**.	Replace the crankshaft position sensor. <Ref. to FU(H6DO)-19, Crankshaft Position Sensor.>
3	**CHECK HARNESS BETWEEN ECM AND CRANK SHAFT POSITION SENSOR.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance of harness between the 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 the ECM and crankshaft position sensor connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and crankshaft position sensor connector • Poor contact of coupling connector

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-116, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

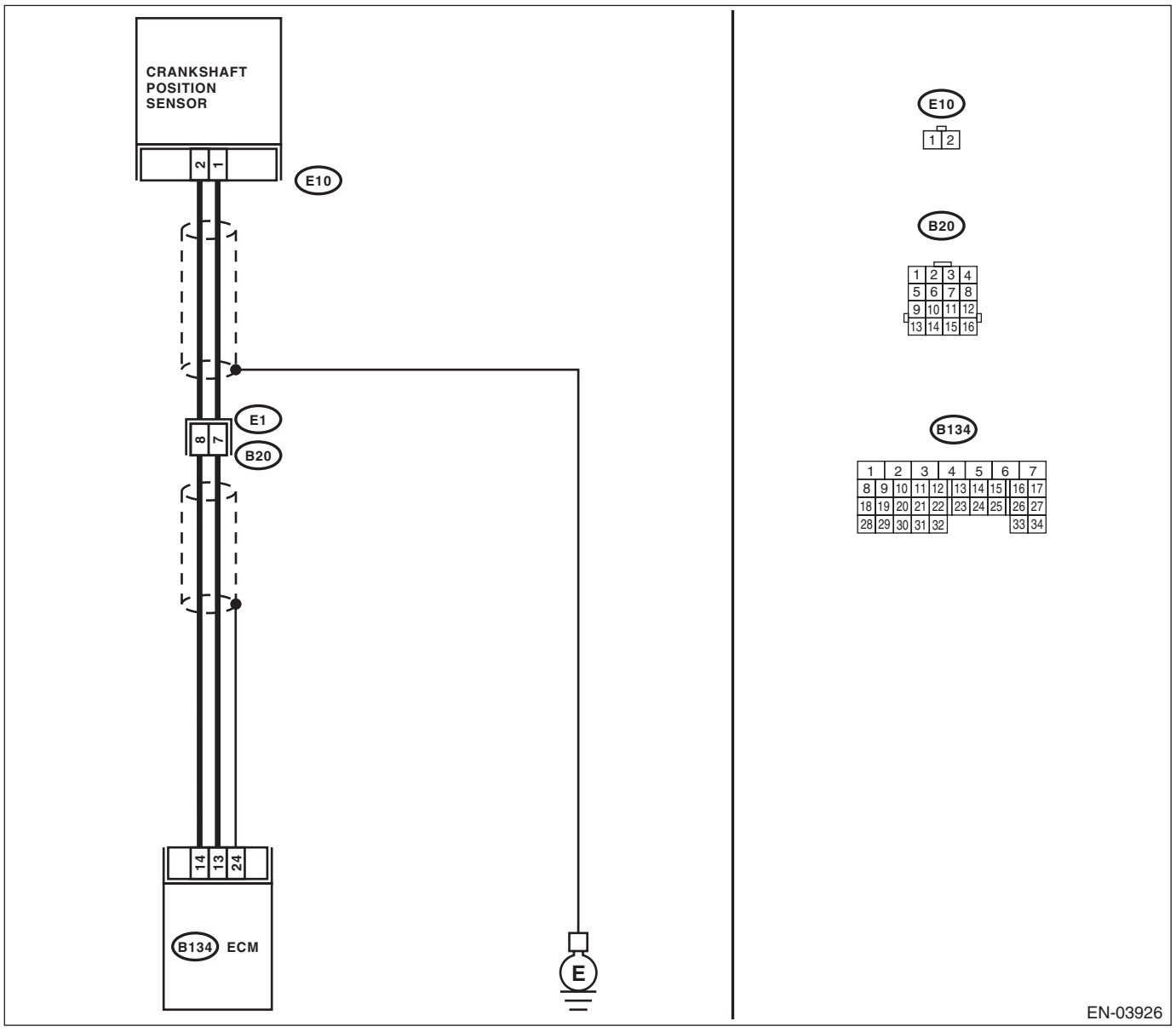
TROUBLE SYMPTOM:

- 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)-43, 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)-42, Timing Chain Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(H6DO)-19, Crankshaft Position Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-118, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

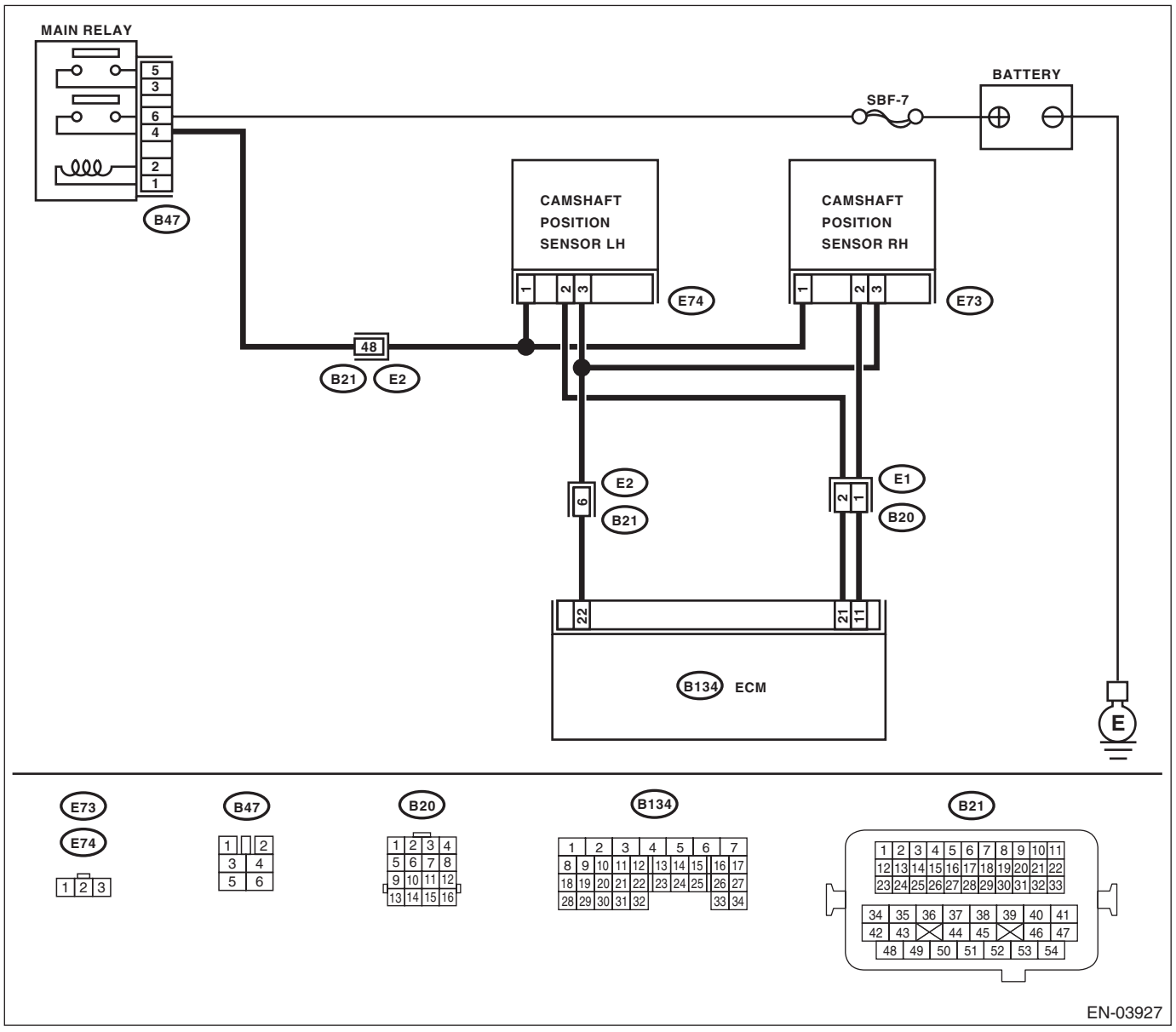
TROUBLE SYMPTOM:

- 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)-43, 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 of 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 the 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 open circuit of harness between the ECM and camshaft position sensor.
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 the short circuit to ground of harness between the ECM and camshaft position sensor.
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 the ECM and camshaft position sensor.	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)-16, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-20, Camshaft Position Sensor.>	In this case, repair the following item: • Open circuit of ECM connector • Open circuit of camshaft position sensor connector • Poor contact of coupling connector

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-120, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

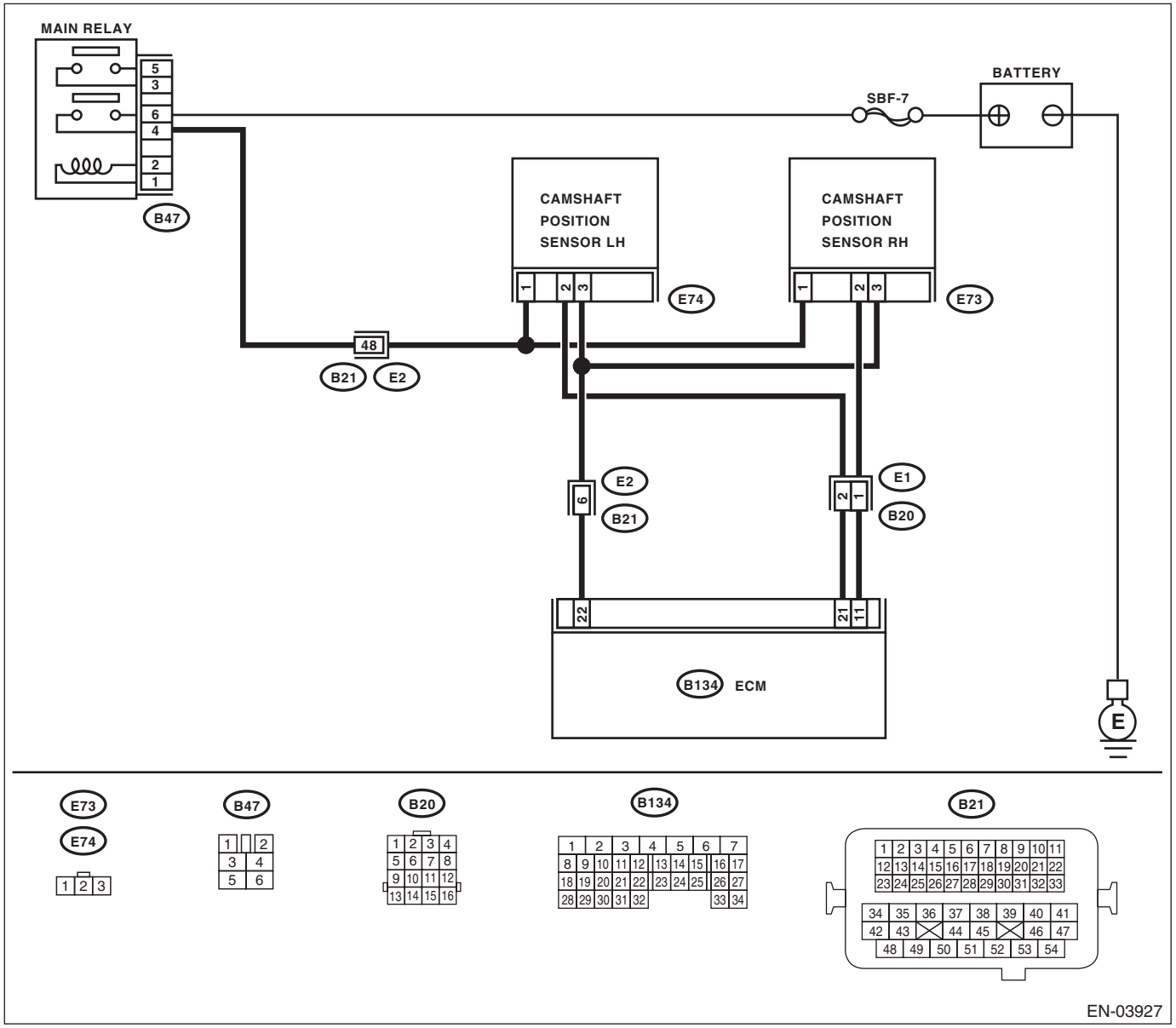
TROUBLE SYMPTOM:

- 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)-43, 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 of 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 the 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 open circuit of harness between the ECM and camshaft position sensor.
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. 21 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit to ground of harness between the ECM and camshaft position sensor.
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. 21 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and camshaft position sensor.	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)-16, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-20, Camshaft Position Sensor.>	In this case, repair the following item: • Open circuit of ECM connector • Open circuit of camshaft position sensor connector • Poor contact of coupling connector

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-121, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

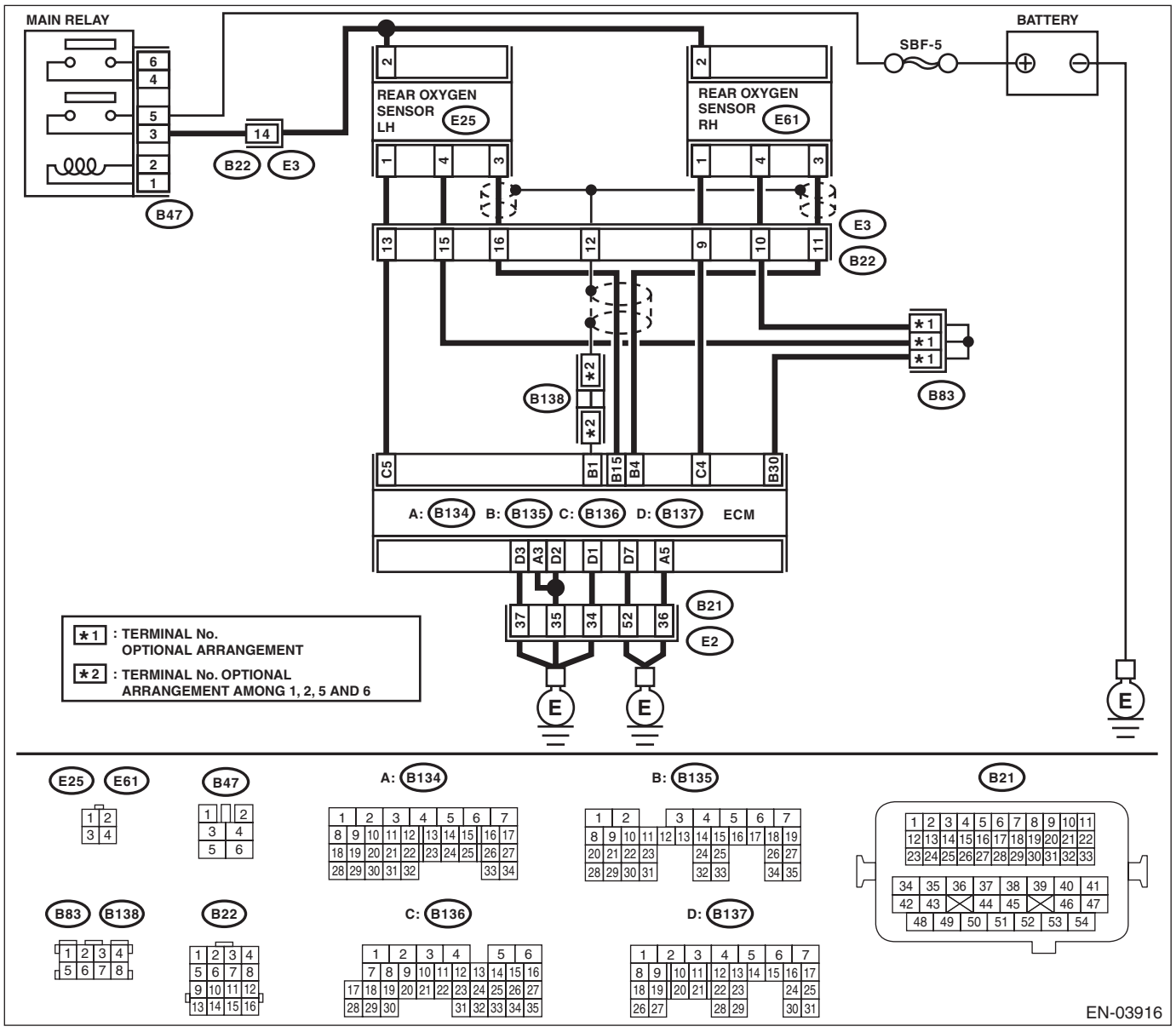
TROUBLE SYMPTOM:

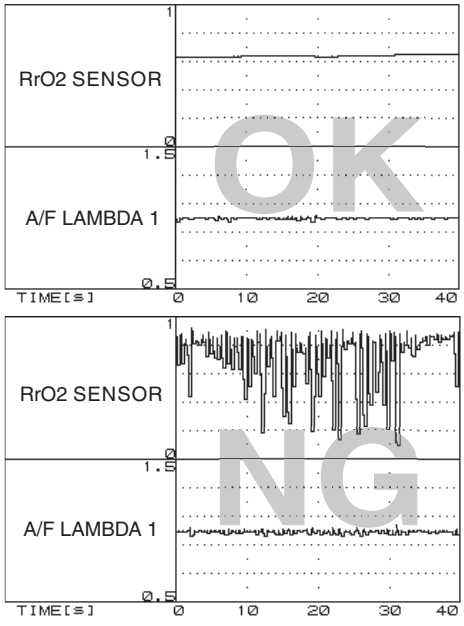
- Engine stalls.
- Idle mixture is out of specifications.

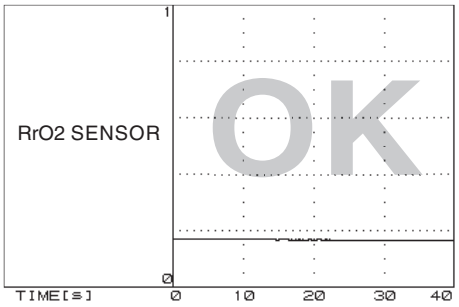
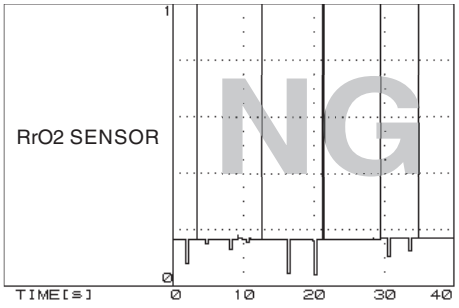
CAUTION:

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter • Loose or improperly attached front oxygen (A/F) sensor or rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H6DO)-2, General Description.>	Go to step **2**.
2	**CHECK WAVEFORM DATA ON THE SUBARU SELECT MONITOR (WHILE DRIVING).** 1) Drive at a constant speed between 80 — 112 km/h (50 — 70 MPH). 2) After 5 minutes have elapsed in the condition of step 1), use the Subaru Select Monitor while still driving to read the waveform data. 	Is a normal waveform displayed?	Even if the malfunction indicator light iluminates, 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.   EN-04896	Is a normal waveform displayed?	Go to step **4**.	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**.
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 open circuit of harness between ECM and rear oxygen sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E61) No. 3 (+) — Chassis ground (–):*** ***(E25) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Go to step **8**.	Repair the harness and connector. NOTE: Repair the following locations. • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the 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)-31, Rear Oxygen Sensor.>	Repair the open circuit in the rear oxygen sensor harness.

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

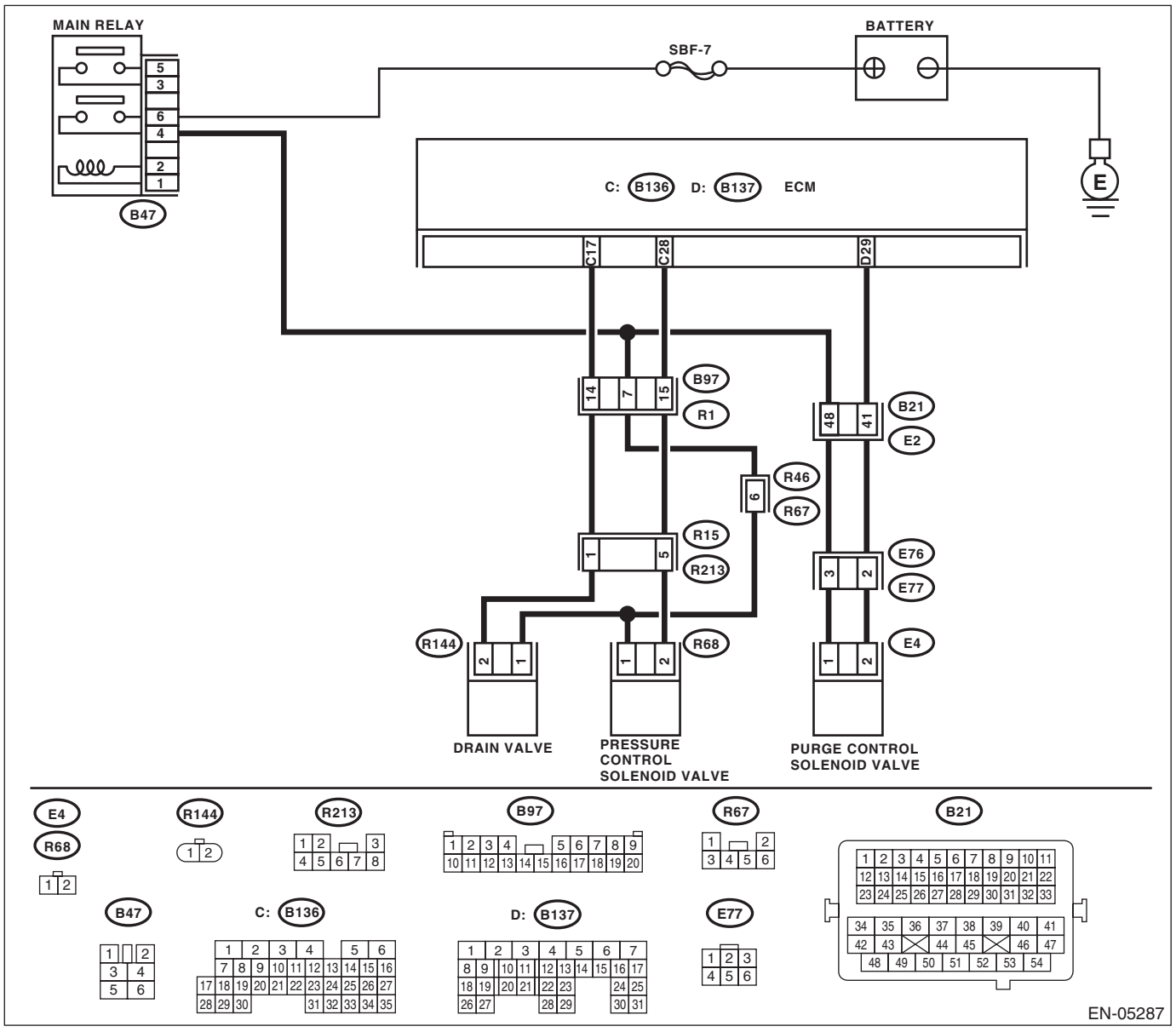
TROUBLE SYMPTOM:

- 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-46, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Connect the 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 Subaru Select Monitor. Regarding 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)-14, 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. Regarding 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)-6, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **7**.	Replace the pressure control solenoid valve. <Ref. to EC(H6DO)-11, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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)-55, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8**.

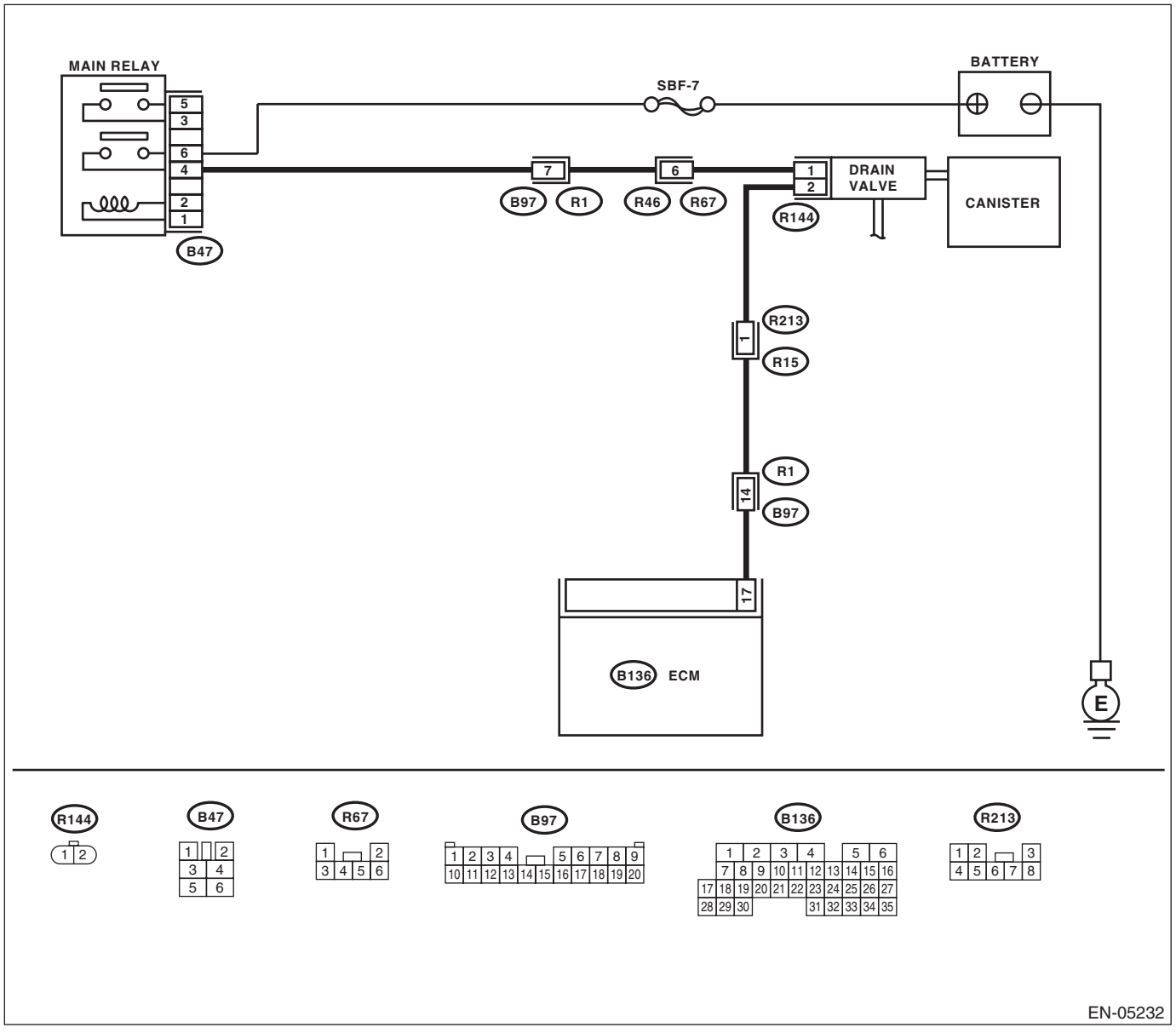
Step		Check	Yes	No
8	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H6DO)-5, Canister.>	Go to step **9**.
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H6DO)-40, Fuel Tank.>	Is the fuel tank 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)-40, Fuel Tank.>	Go to step **10**.
10	**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 poor contact in ECM connector.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-138, 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)-43, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



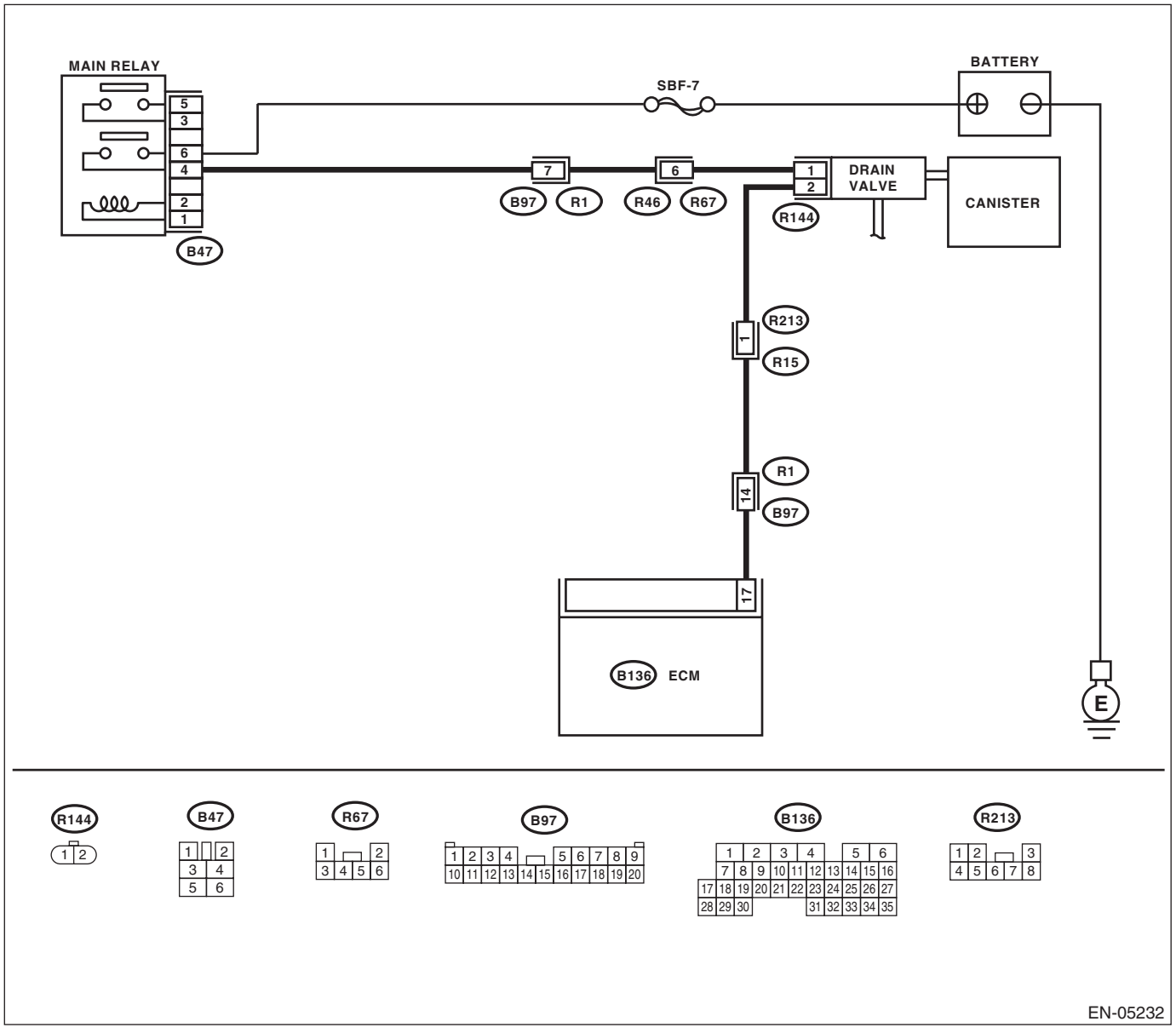
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair poor contact of the ECM connector.	Go to step **2**.
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*** ***(R144) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and 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 — (R144) 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 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)-14, 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*** ***(R144) No. 1 (+) — 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

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-140, 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)-43, 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 power in the harness between ECM and drain valve connector.	Go to step **2**.
2	**CHECK DRAIN VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the drain valve. <Ref. to EC(H6DO)-14, Drain Valve.>	Repair poor contact of the ECM connector.

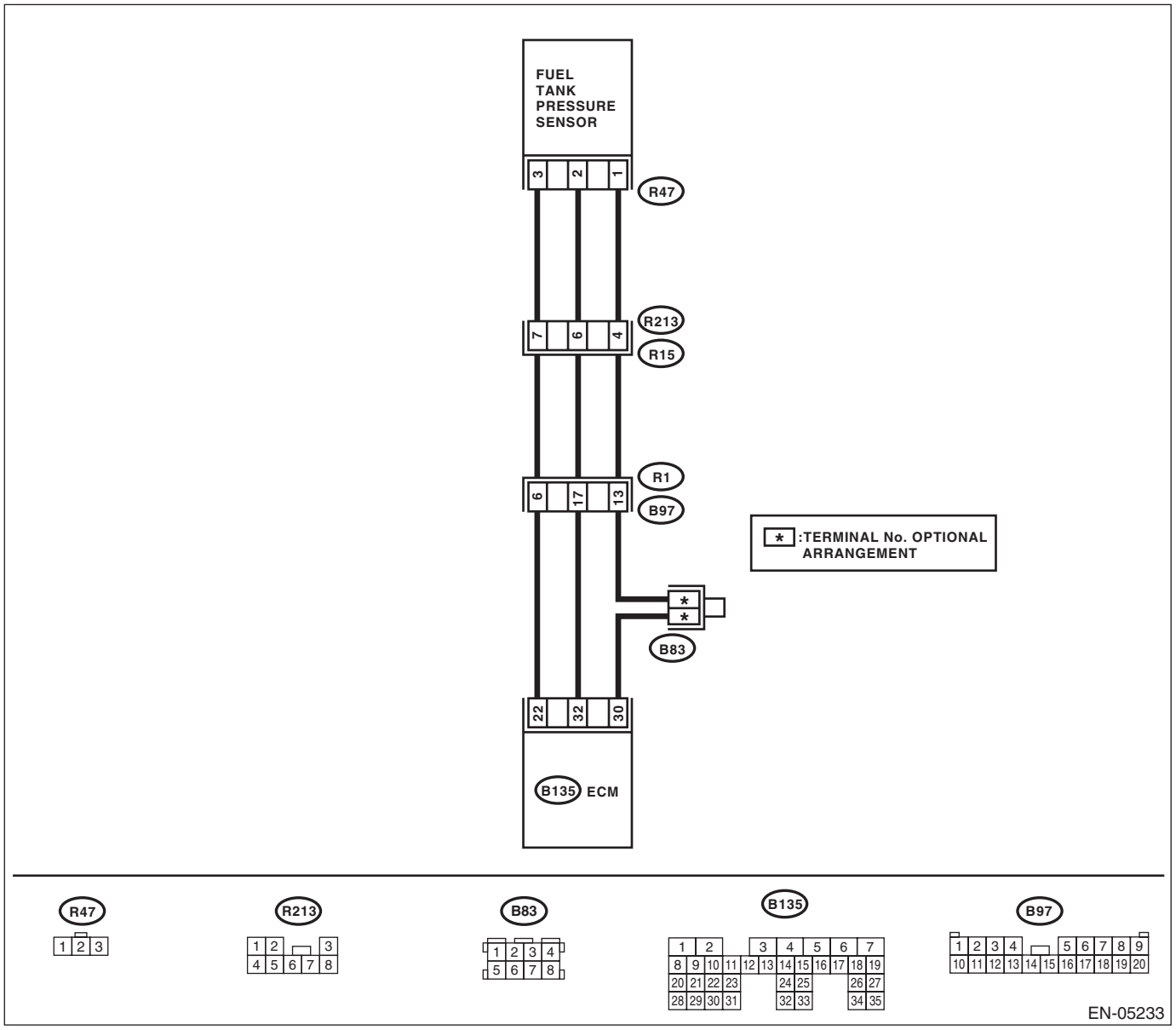
CF:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-142, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



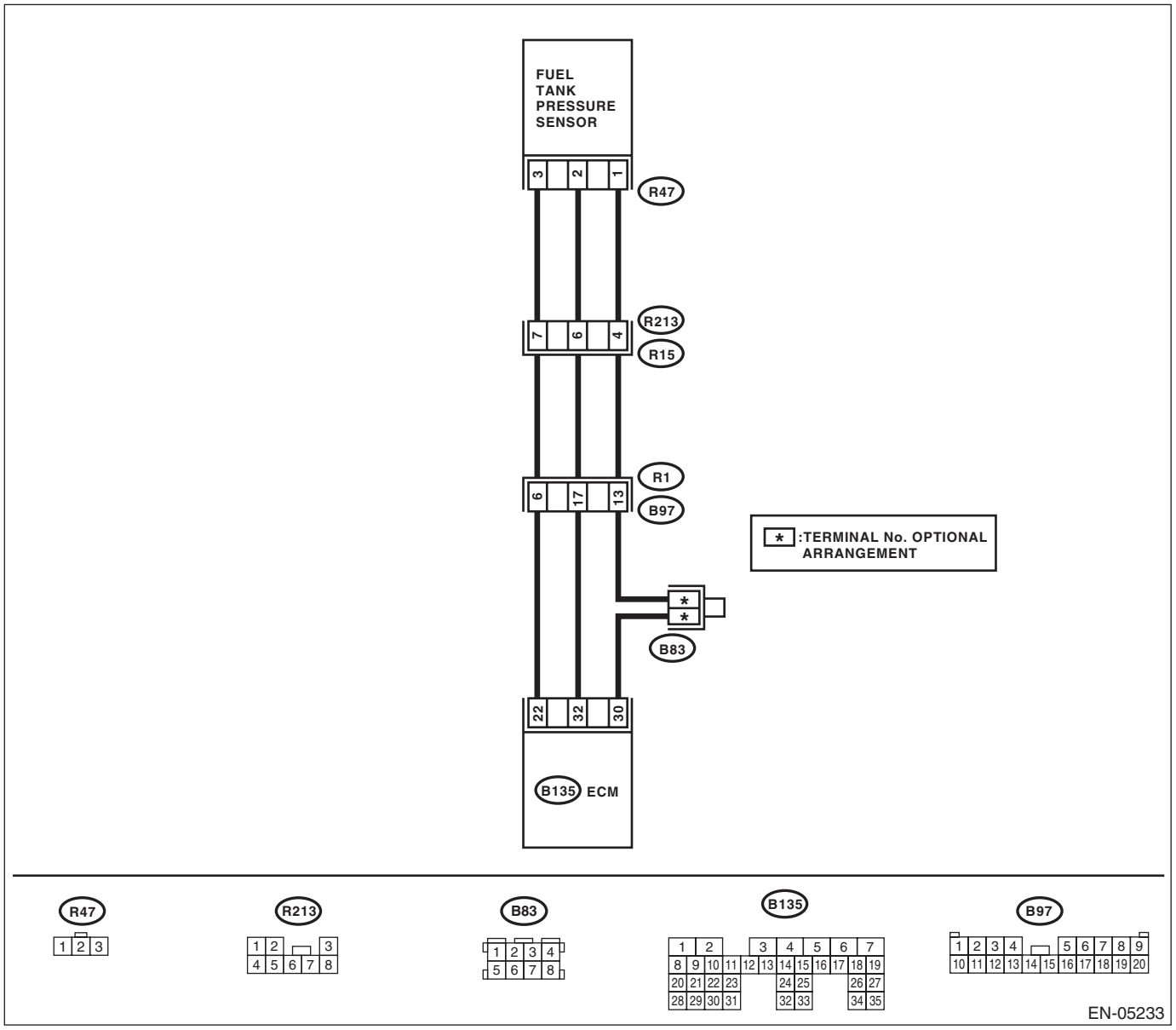
	Step	Check	Yes	No
1	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK PRESSURE VACUUM LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging 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)-10, Fuel Tank Pressure Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-144, 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)-43, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



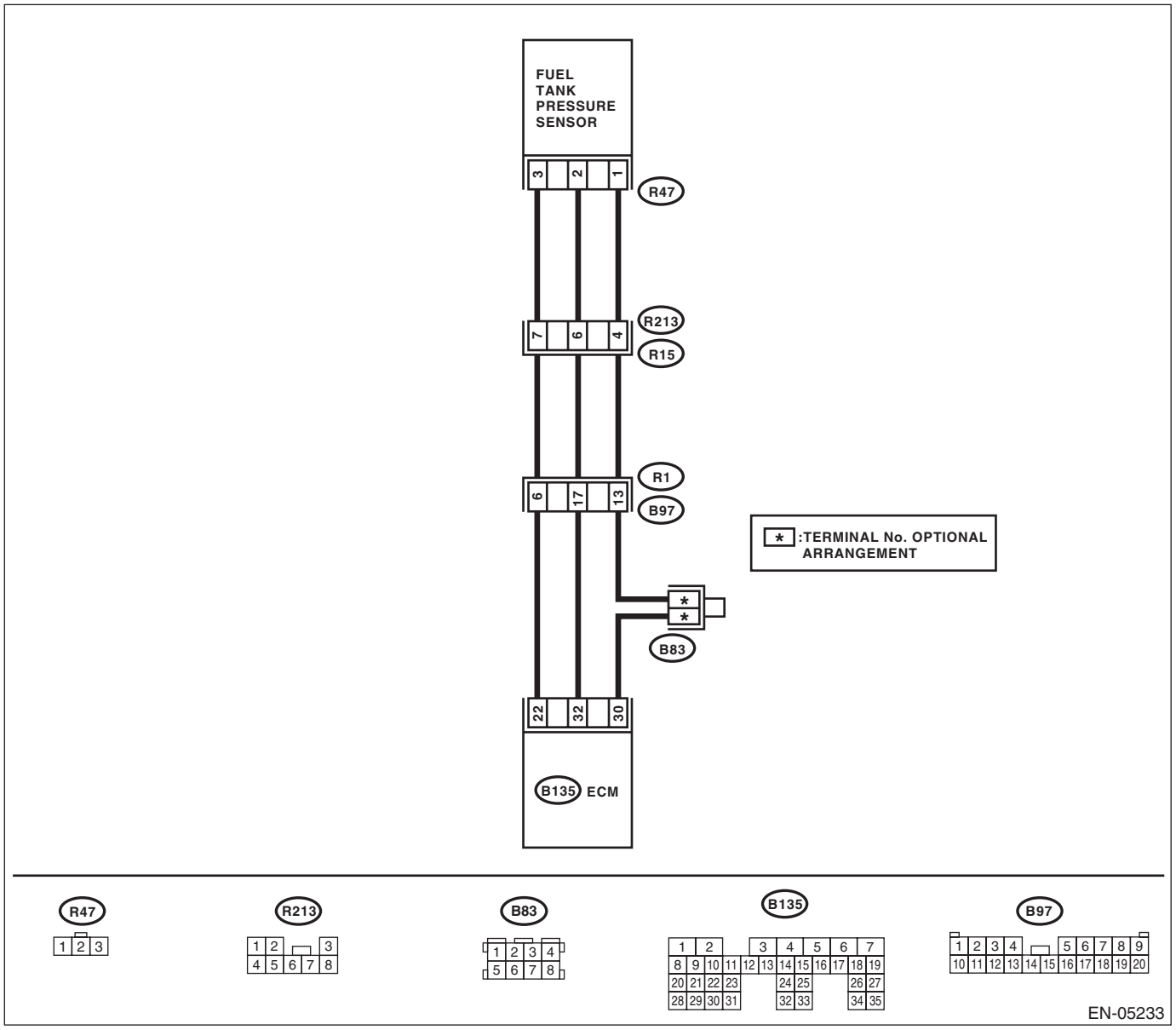
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of fuel tank pressure sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than –7.45 kPa (–55.85 mmHg, –2.2 inHg) ?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 the 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)-10, Fuel Tank Pressure Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-146, 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)-43, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of fuel tank pressure sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 7.98 kPa (59.85 mmHg, 2.36 inHg) or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 7.98 kPa (59.85 mmHg, 2.36 inHg) or more?	Repair the short circuit to power in the harness between ECM and fuel tank pressure sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. ***Connector & terminal*** ***(R47) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel tank pressure sensor connector • Poor contact 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)-10, Fuel Tank Pressure Sensor.>

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

DTC DETECTING CONDITION:

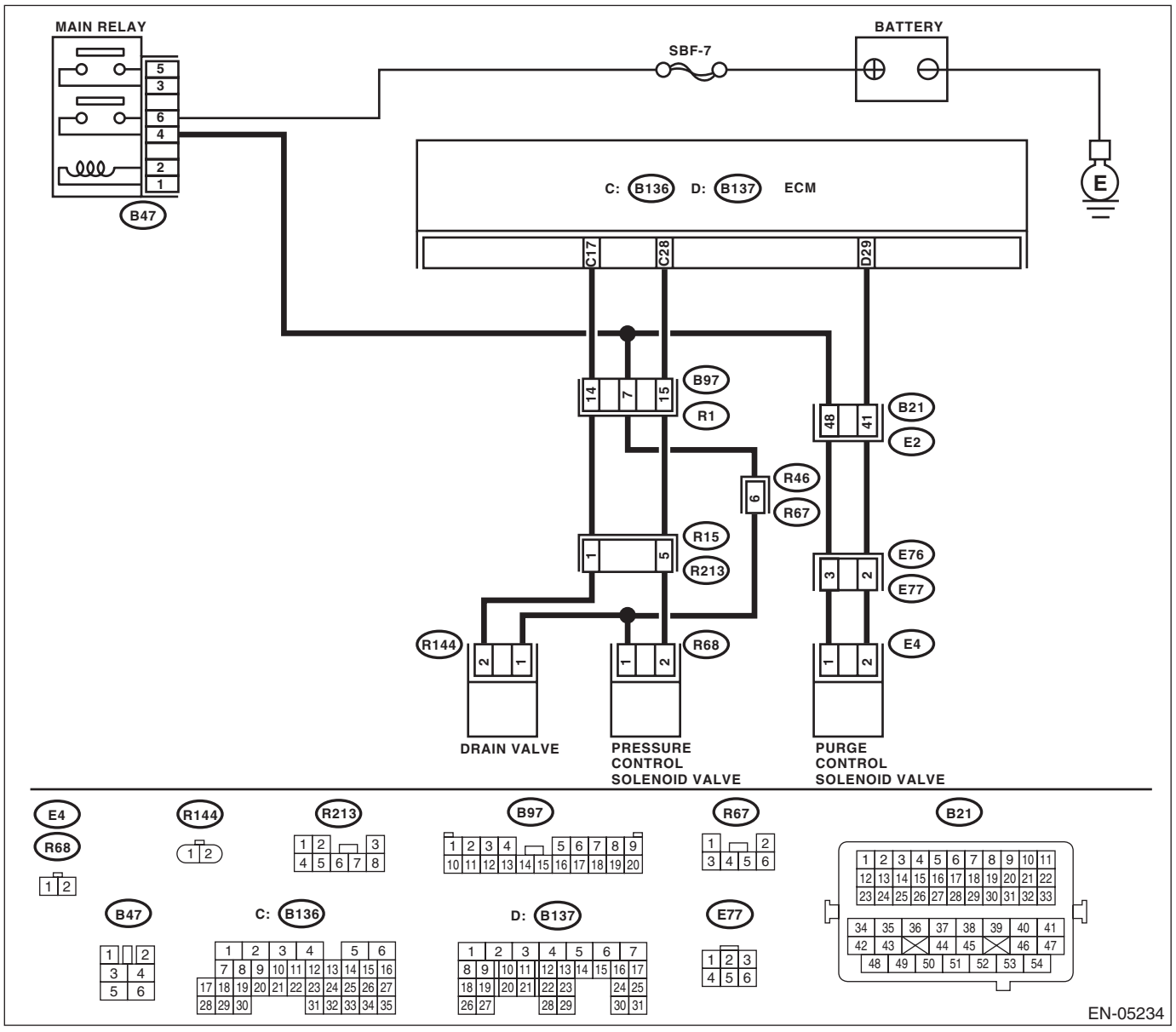
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-147, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 was 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)-46, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Connect the 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. Regarding 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)-14, 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. Regarding 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)-6, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **7**.	Replace the pressure control solenoid valve. <Ref. to EC(H6DO)-11, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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)-55, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8**.

Step		Check	Yes	No
8	**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)-5, Canister.>	Go to step **9**.
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H6DO)-40, 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)-40, Fuel Tank.>	Go to step **10**.
10	**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 poor contact in ECM connector.

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-147, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

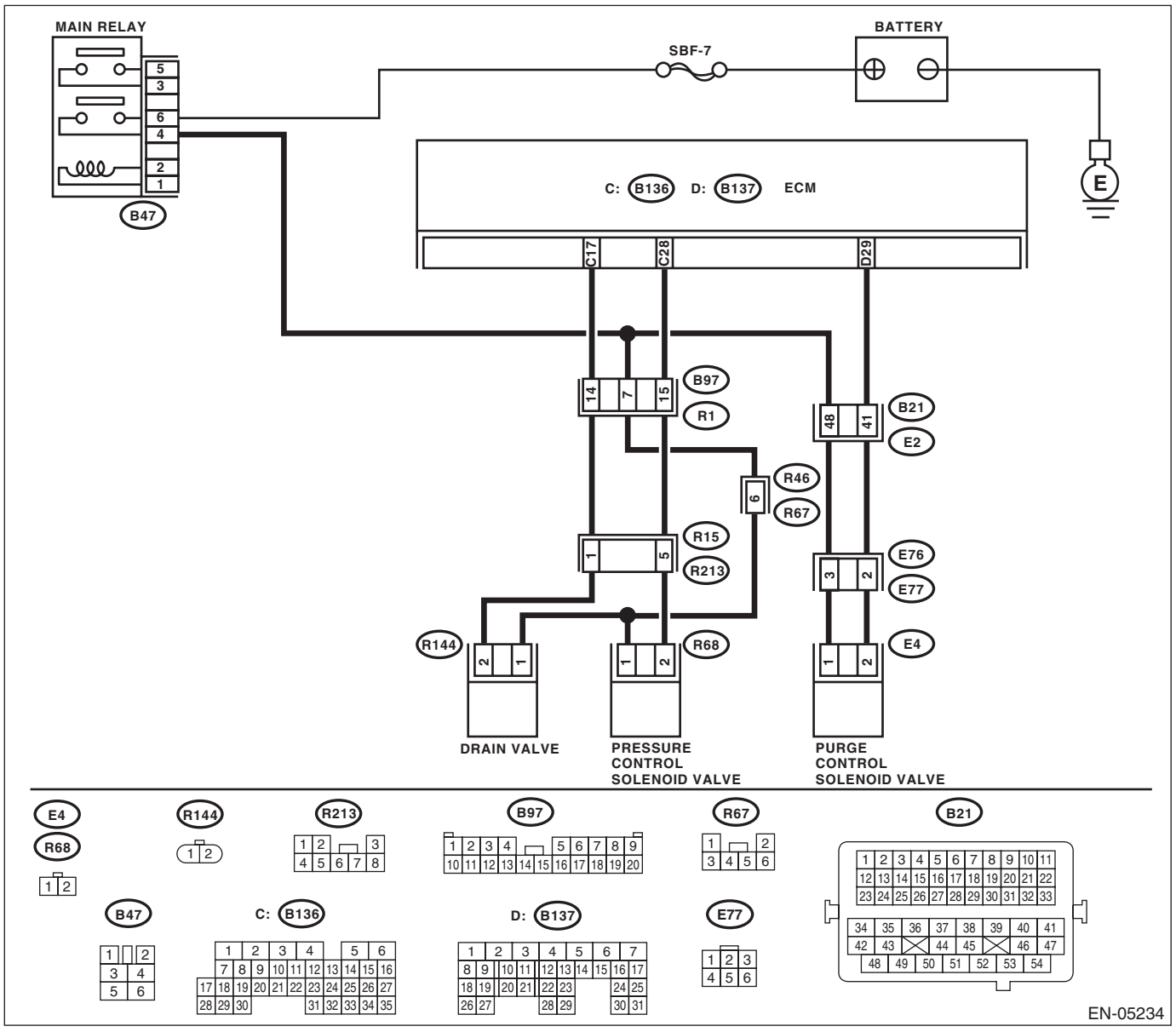
TROUBLE SYMPTOM:

- 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-46, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Connect the 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. Regarding 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)-14, 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. Regarding 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)-6, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **7**.	Replace the pressure control solenoid valve. <Ref. to EC(H6DO)-11, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector.	Are there any disconnected, broken or clogged evaporation lines?	Repair or replace the evaporation line. <Ref. to FU(H6DO)-55, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8**.

	Step	Check	Yes	No
8	**CHECK CANISTER.**	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H6DO)-5, Canister.>	Go to step **9**.
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H6DO)-40, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H6DO)-40, Fuel Tank.>	Go to step **10**.
10	**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 poor contact in ECM connector.

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-148, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

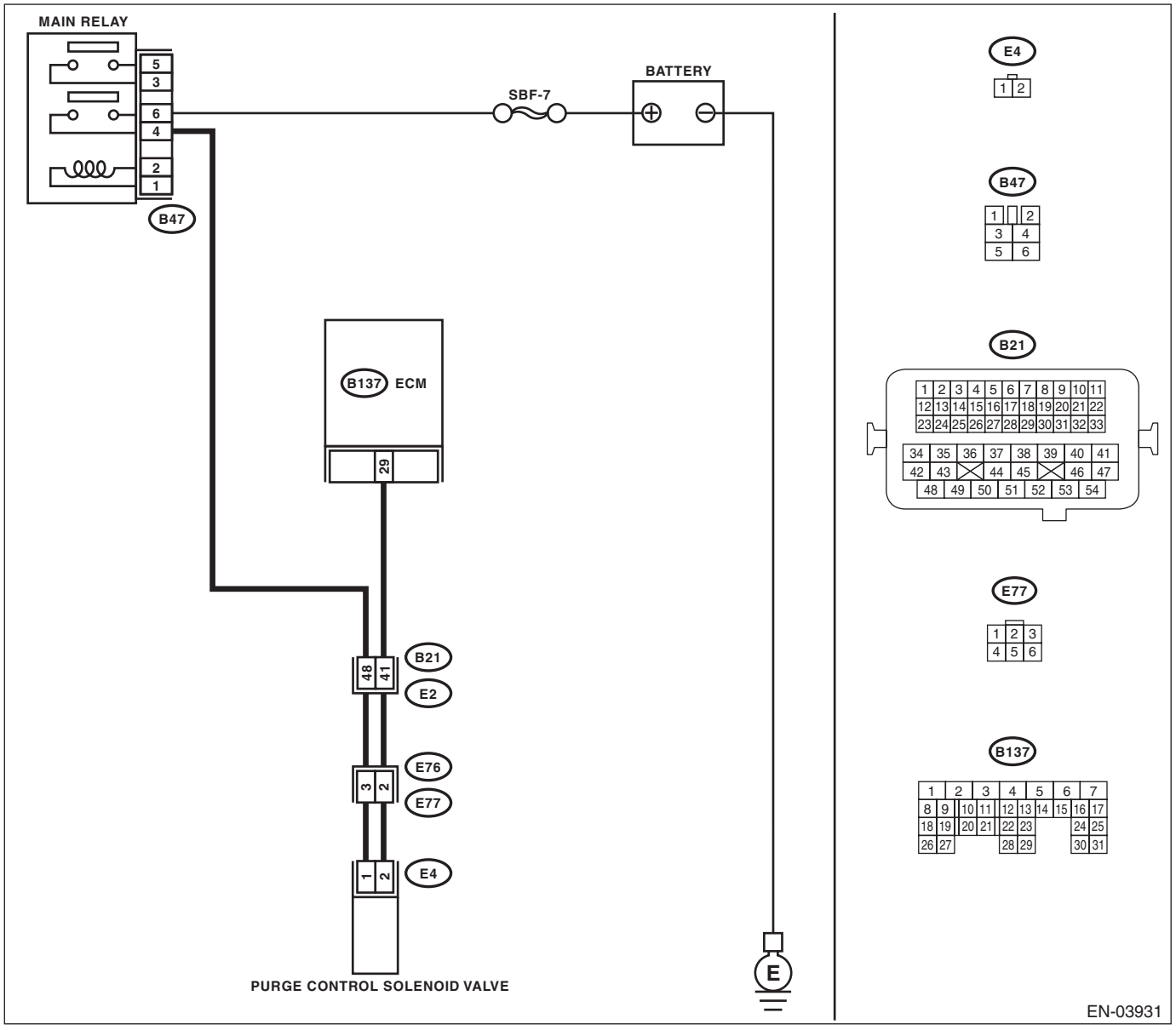
TROUBLE SYMPTOM:

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)-43, 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 poor contact of the 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 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 of 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)-6, 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 of harness between the main relay and purge control solenoid valve • Poor contact of coupling connector • Poor contact of main relay connector

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-150, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

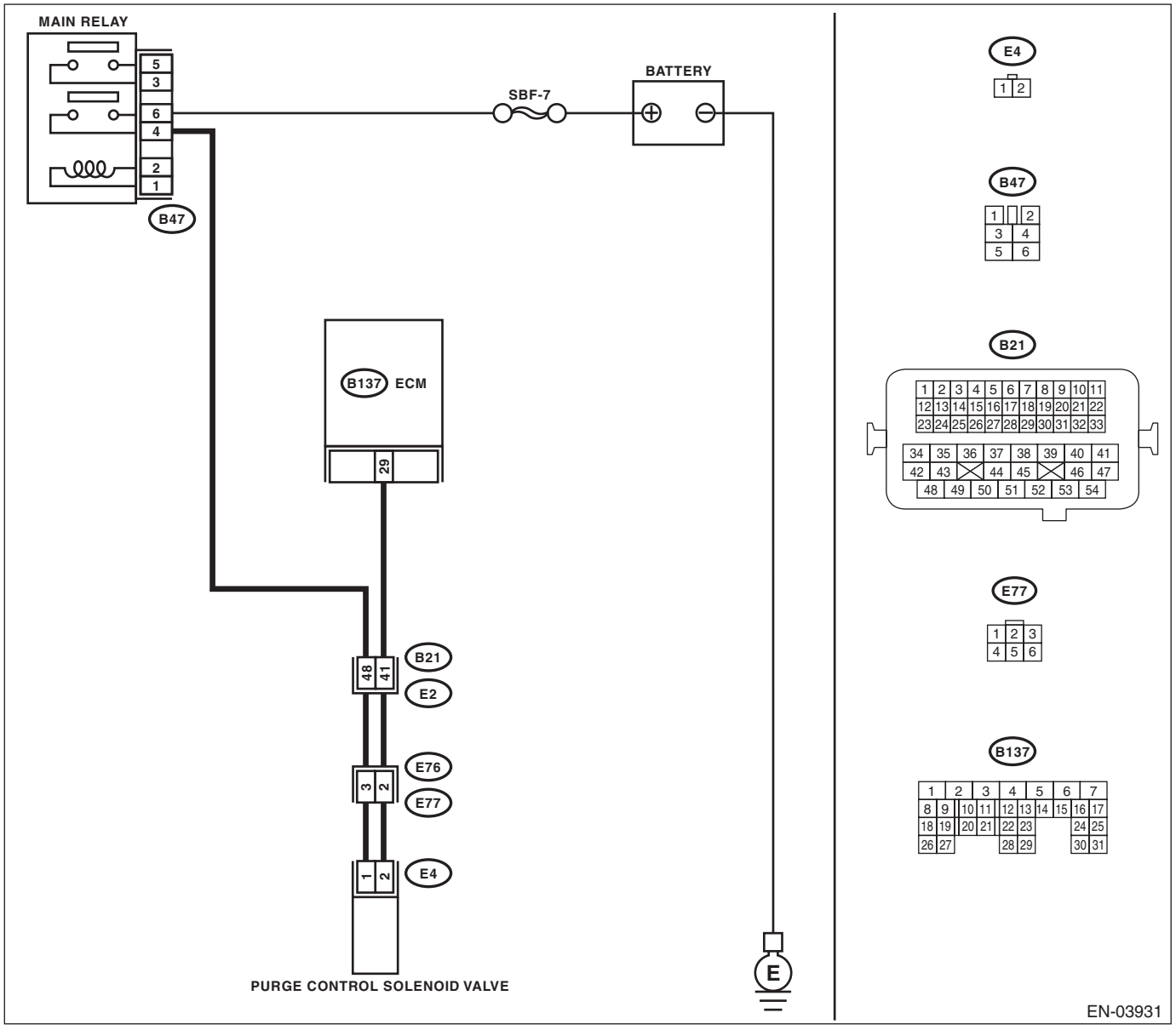
TROUBLE SYMPTOM:

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)-43, 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 the 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)-6, Purge Control Solenoid Valve.>	Repair poor contact of the ECM connector.

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-152, 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)-43, 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)-80, List of Diagnostic Trouble Code (DTC).>	Replace the fuel level sensor and fuel sub level sensor. <Ref. to FU(H6DO)-51, Fuel Level Sensor.> <Ref. to FU(H6DO)-52, Fuel Sub Level Sensor.>

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

NOTE:
For the diagnostic procedure, refer to DTC P0463. <Ref. to EN(H6DO)(diag)-258, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-156, 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)-43, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is DTC P0462 or P0463 displayed on the Subaru Select Monitor?	Check the combination meter. <Ref. to IDI-4, COMBINATION METER, INSPECTION, Combination Meter System.>	Even if the malfunction indicator light illuminates, 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.

CP:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-158, 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)-43, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is DTC P0464 displayed on the display?	Check the combination meter. <Ref. to IDI-4, COMBINATION METER, INSPECTION, Combination Meter System.>	Even if the malfunction indicator light illuminates, 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 P0483 FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-161, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

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)-43, PROCEDURE, Inspection Mode.>.

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

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)-80, List of Diagnostic Trouble Code (DTC).>	Check radiator fan, fan motor and thermostat and if thermostat is stuck, replace thermostat. <Ref. to CO(H6DO)-19, Radiator Main Fan and Fan Motor.> <Ref. to CO(H6DO)-22, Radiator Sub Fan and Fan Motor.>

CR:DTC P0500 VEHICLE SPEED SENSOR “A”

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-162, 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)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK DTC OF ABS.** Check DTC of ABS.	Is DTC of ABS displayed?	Perform the diagnosis according to DTC. <Ref. to ABS(diag)-33, List of Diagnostic Trouble Code (DTC).>	Repair poor contact of the ECM connector.

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-164, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

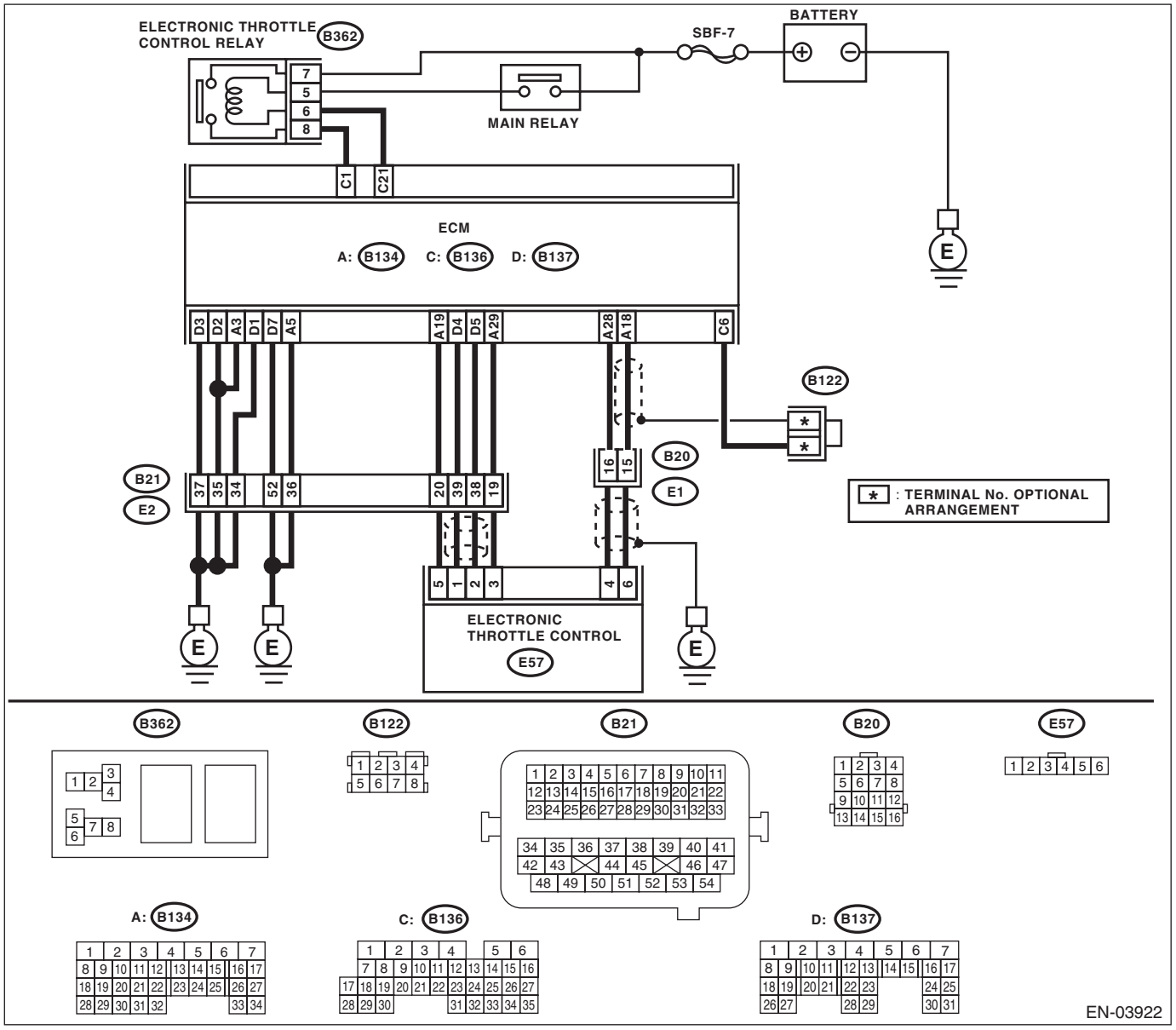
TROUBLE SYMPTOM:

- 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)-43, 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)-80, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK AIR CLEANER ELEMENT.** 1) Turn the ignition switch to OFF. 2) Check the air cleaner element.	Is there excessive clogging on air cleaner element?	Replace the air cleaner element. <Ref. to IN(H6DO)-4, Air Cleaner Element.>	Go to step **3**.
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Remove the electronic throttle control. 2) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101. <Ref. to EN(H6DO)(diag)-320, 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:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-166, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

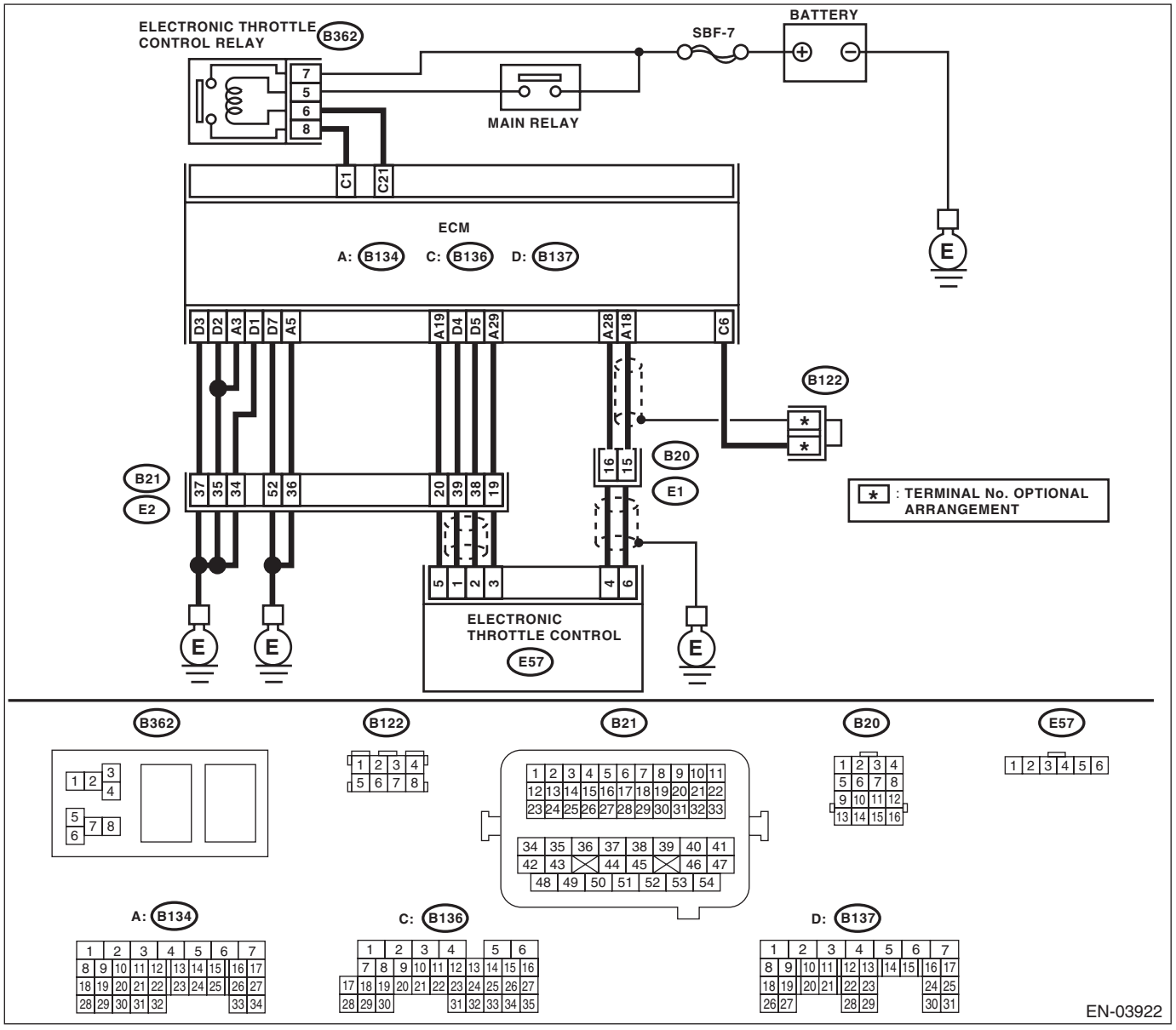
TROUBLE SYMPTOM:

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)-43, 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)-80, 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 control. 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)-320, 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)-168, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

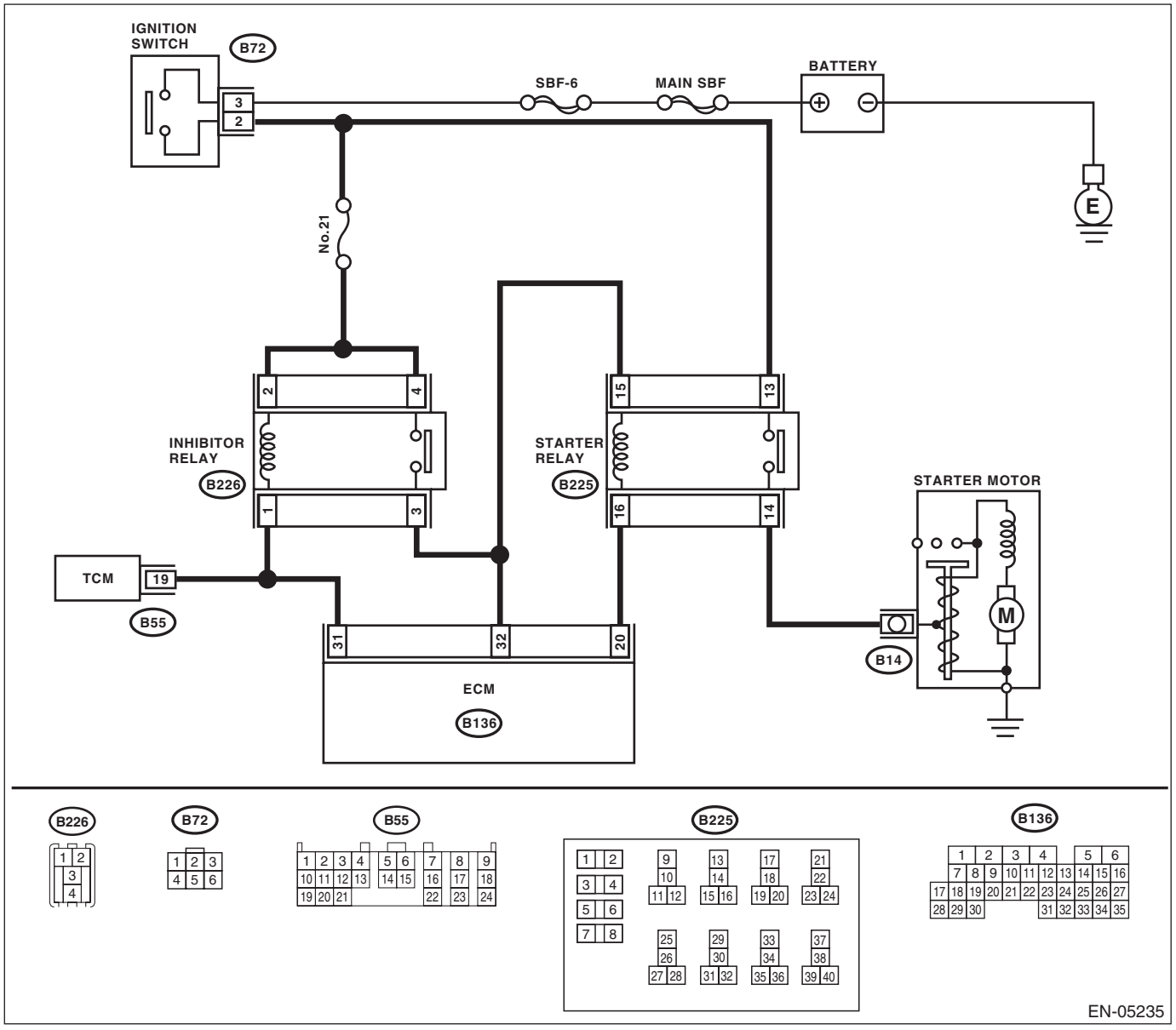
TROUBLE SYMPTOM:

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)-43, 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)-80, 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 the 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 poor contact in ECM connector.

CV:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-170, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, 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)-43, 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)-80, 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)-320, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CW:DTC P0600 SERIAL COMMUNICATION LINK

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

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-172, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

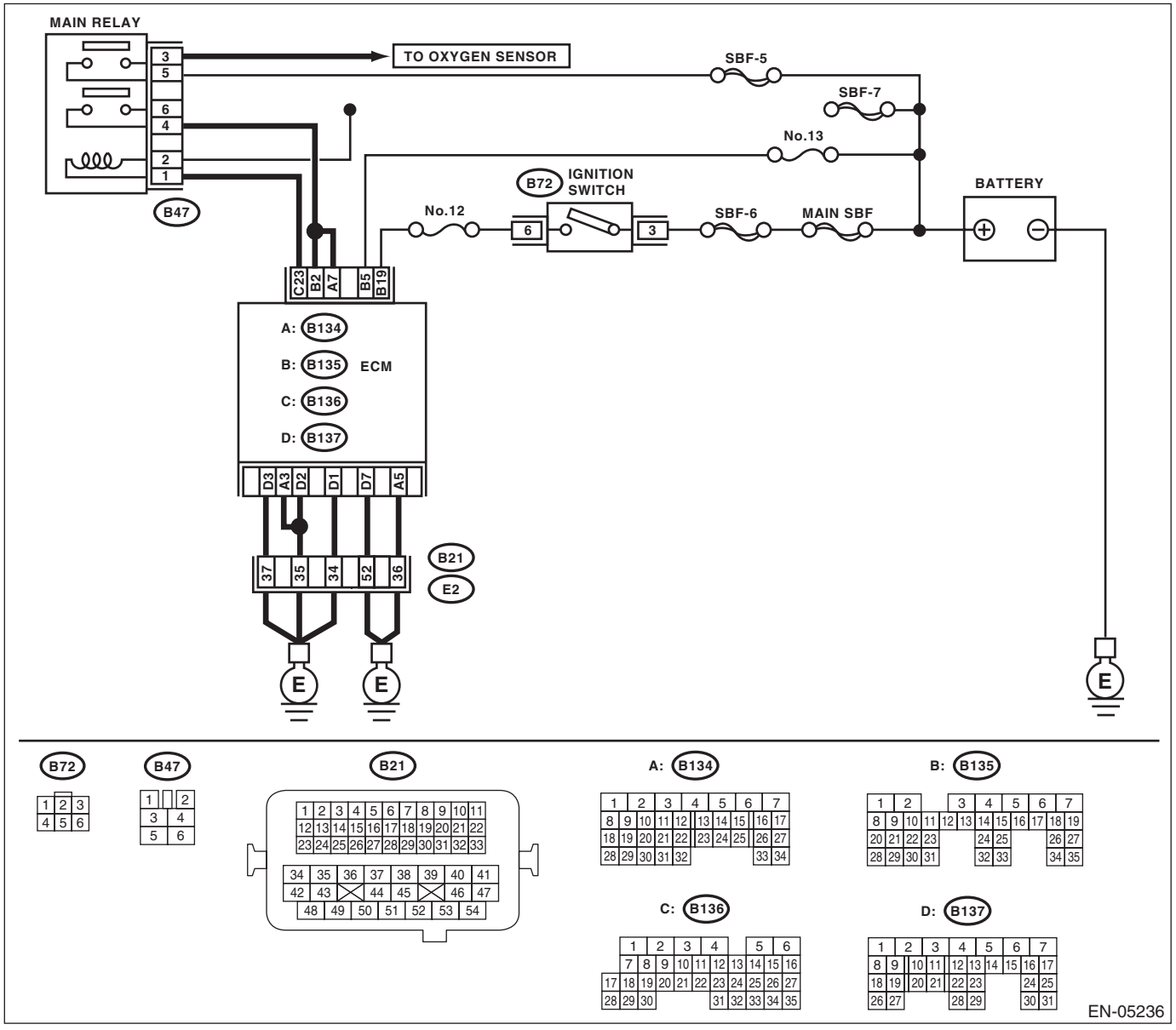
TROUBLE SYMPTOM:

- 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)-43, 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)-80, List of Diagnostic Trouble Code (DTC).>	Even if the malfunction indicator light illuminates, 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.

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

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H6DO)(diag)-270, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CZ:DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-175, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

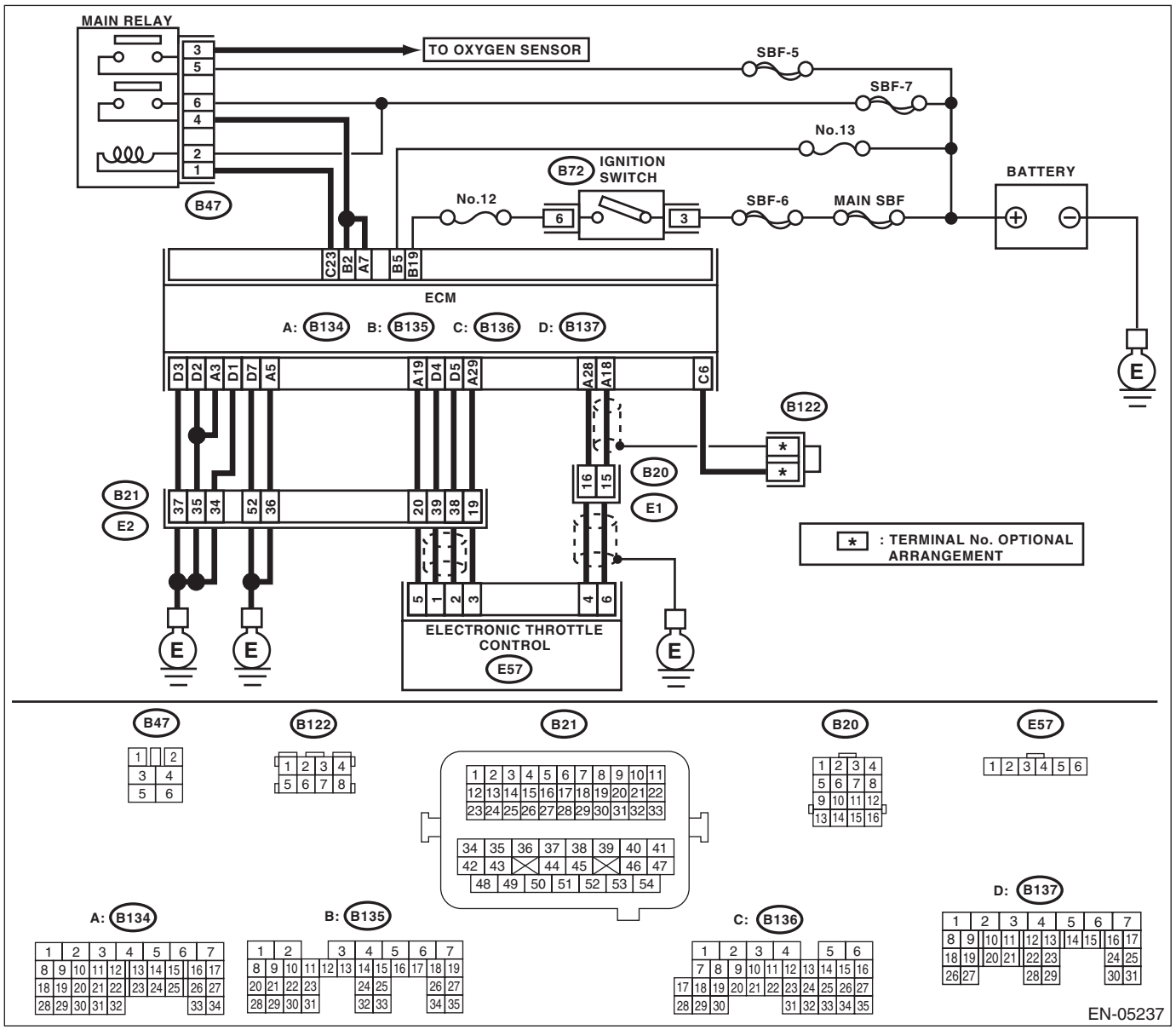
TROUBLE SYMPTOM:

- 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE FROM 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 FROM 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 open circuit of harness between ECM and electronic throttle control connector.
4	**CHECK ECM GROUND HARNESS.** 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 poor contact in ECM connector.	Repair the following item. • Open circuit of ground circuit • Retightening of engine ground terminals • Poor contact of coupling connector

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

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-320, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DB:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-180, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheat

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)-43, 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)-80, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan system. <Ref. to CO(H6DO)-7, Radiator Fan System.>

DC:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-181, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheat

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)-43, 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)-80, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan system. <Ref. to CO(H6DO)-7, Radiator Fan System.>

DD:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

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

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

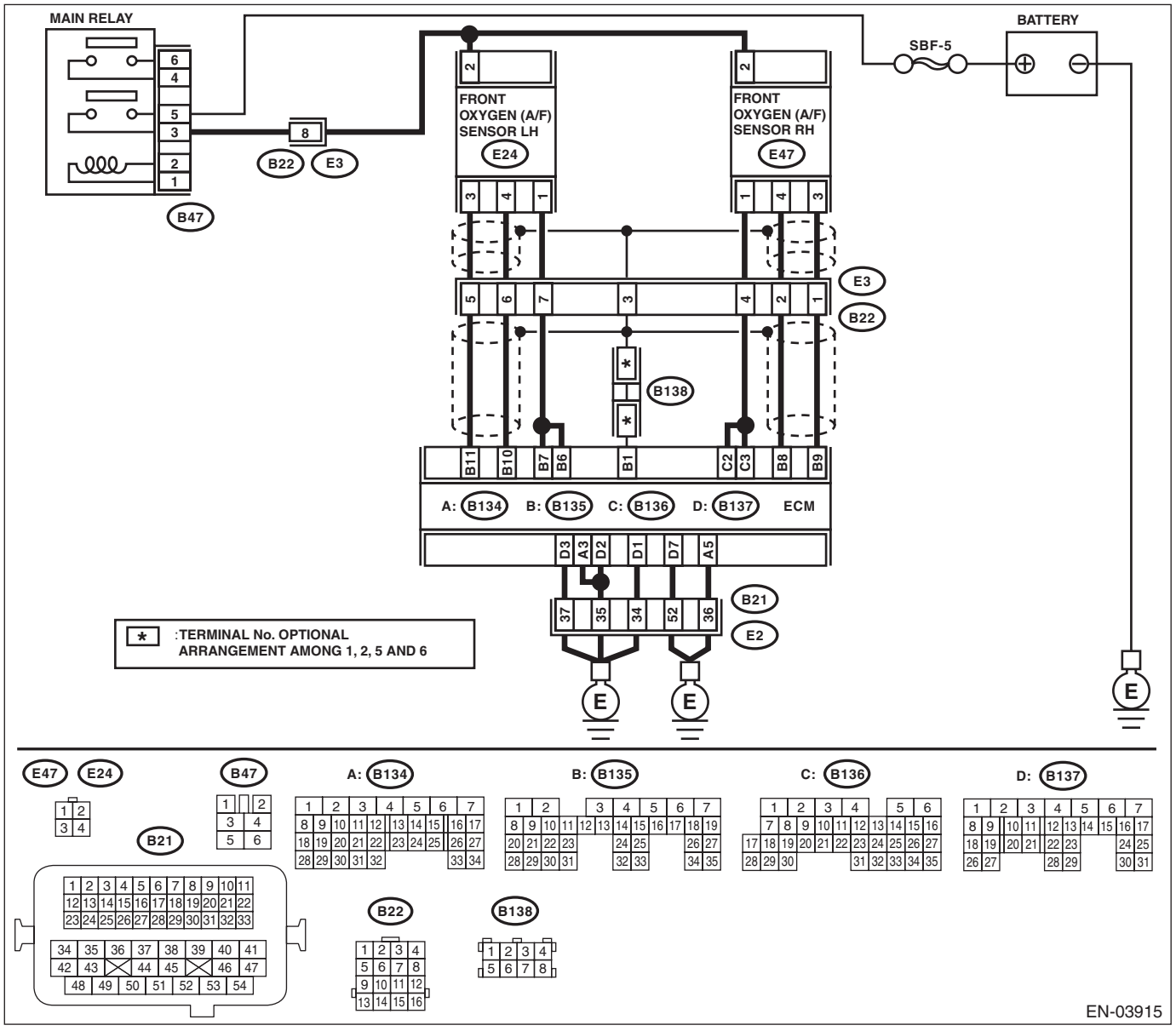
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-183, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the 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 in front oxygen (A/F) sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK POOR CONTACT.** Check poor contact of 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)-29, Front Oxygen (A/F) Sensor.>

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

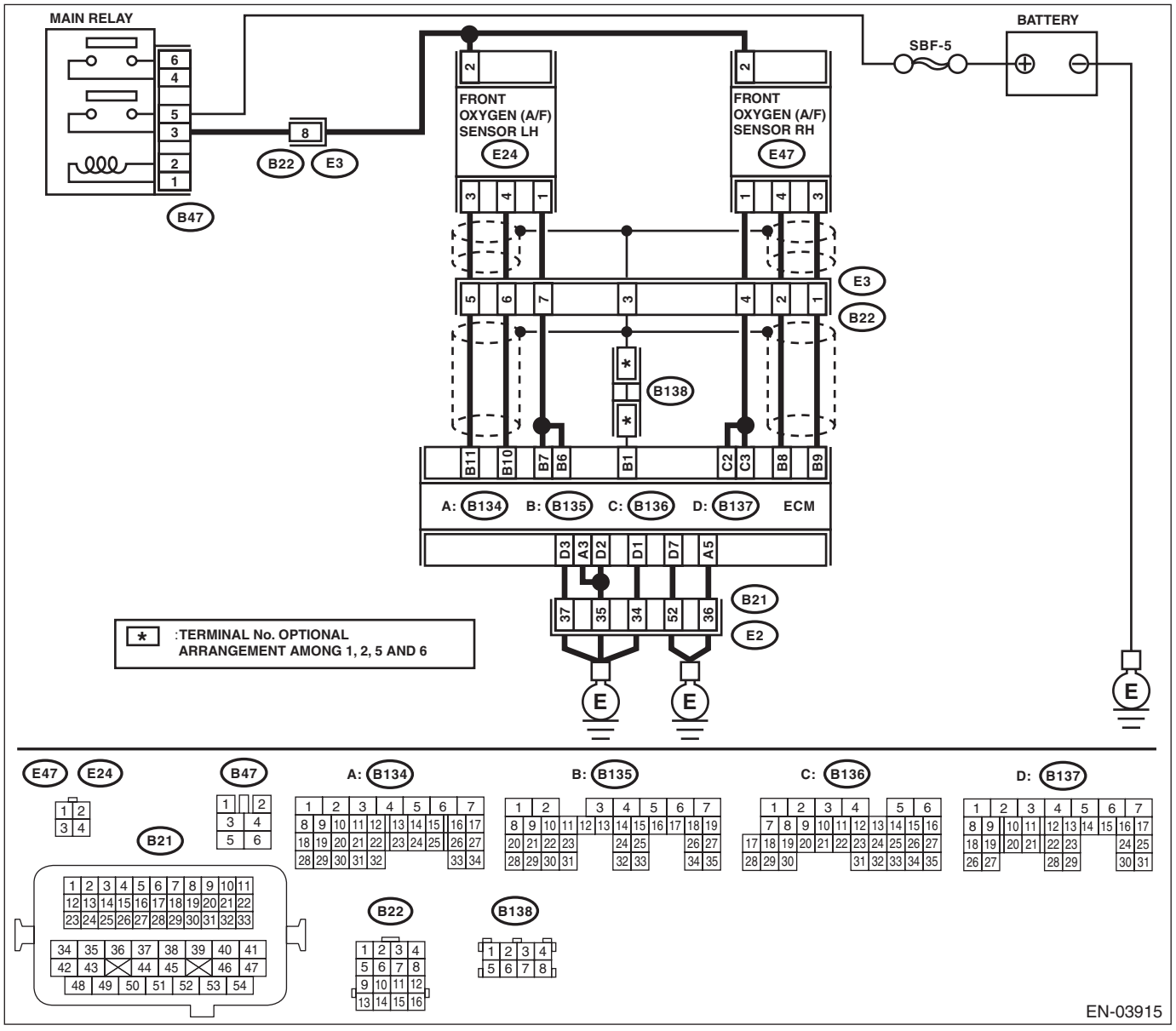
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-185, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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)-29, 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 the ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>	Repair poor contact of the ECM connector.

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

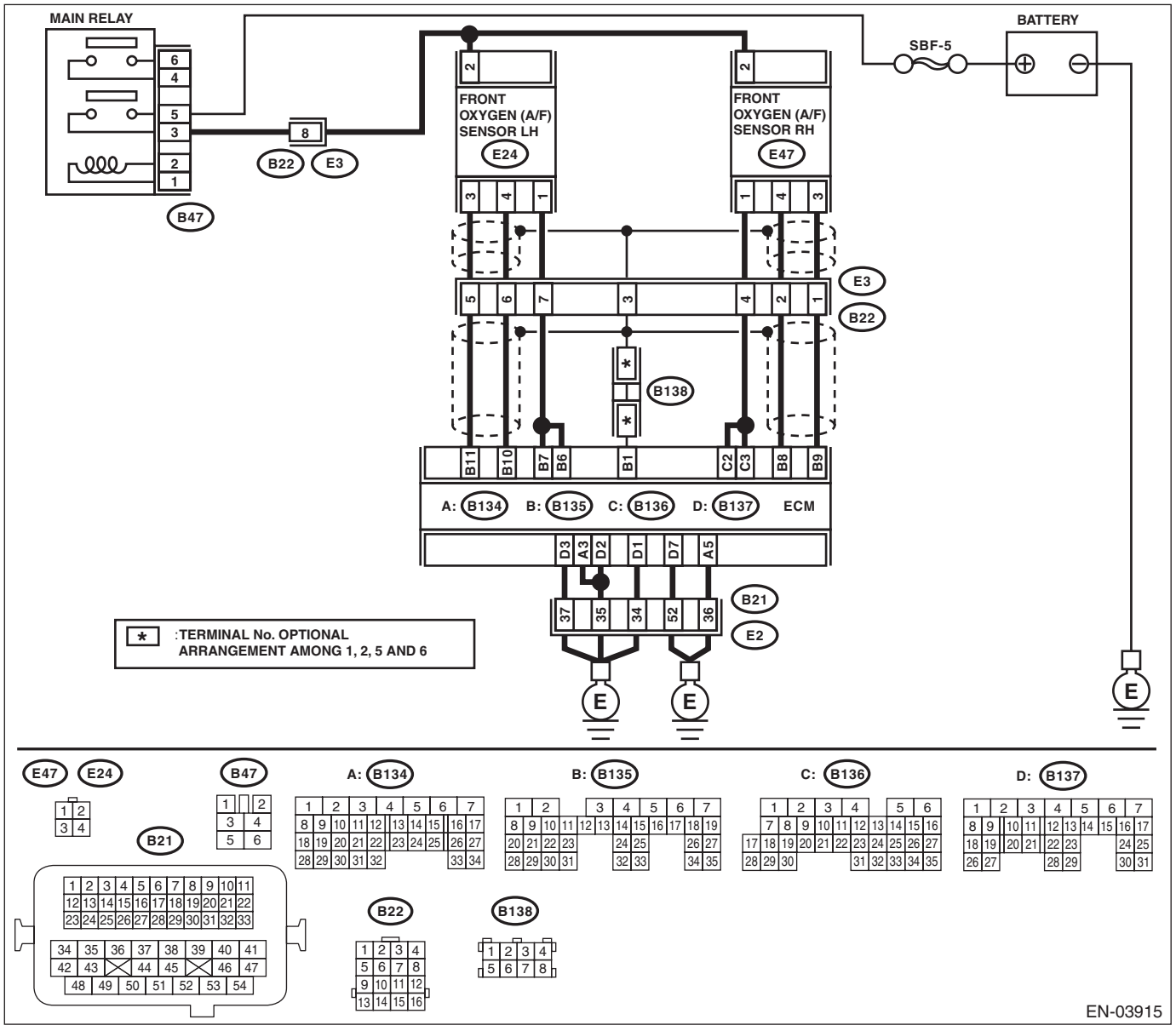
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-187, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the 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 in front oxygen (A/F) sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK POOR CONTACT.** Check poor contact of 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)-29, Front Oxygen (A/F) Sensor.>

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

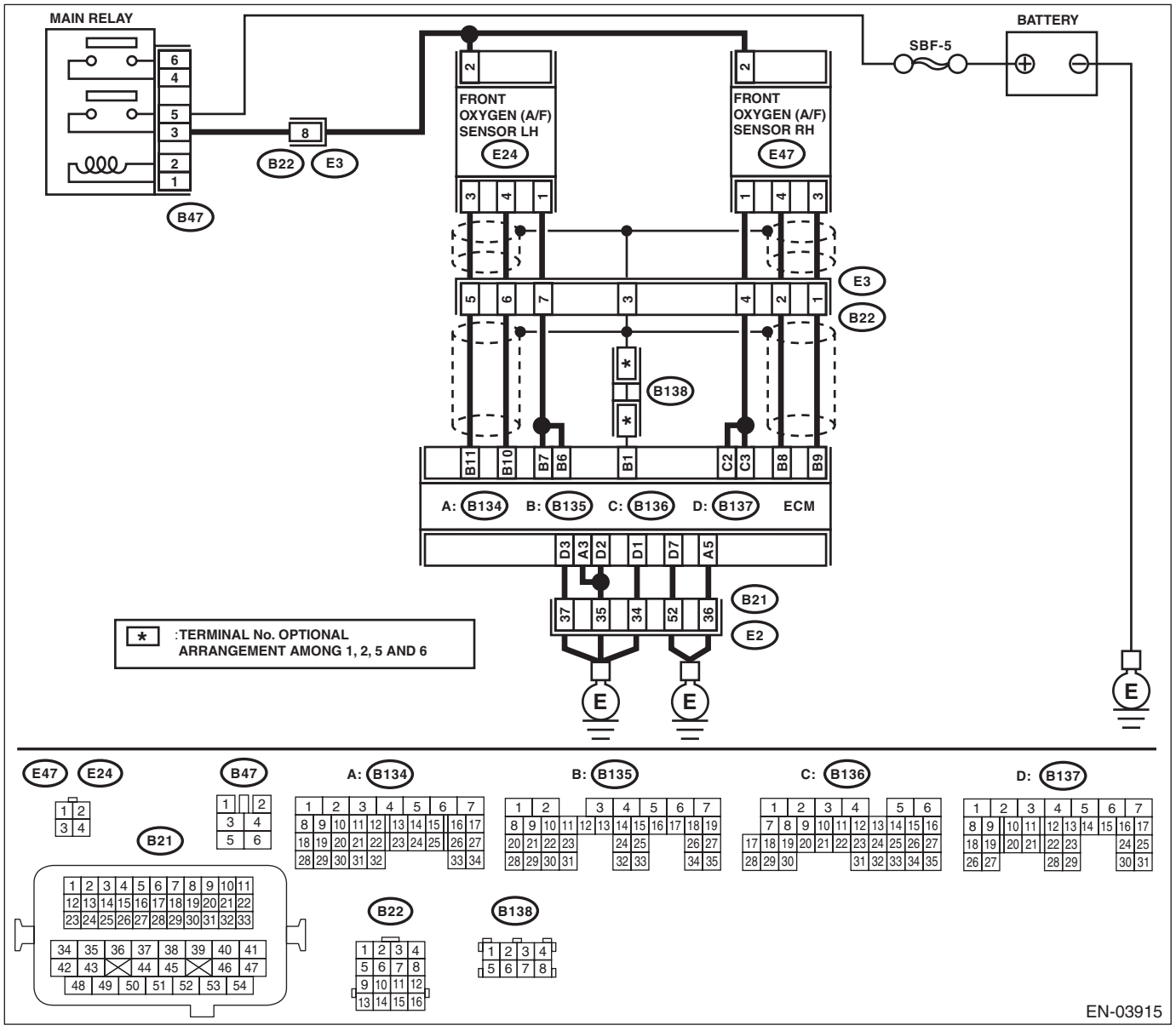
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-187, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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)-29, 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 the ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>	Repair poor contact of the ECM connector.

DI: DTC P1160 RETURN SPRING FAILURE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-320, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

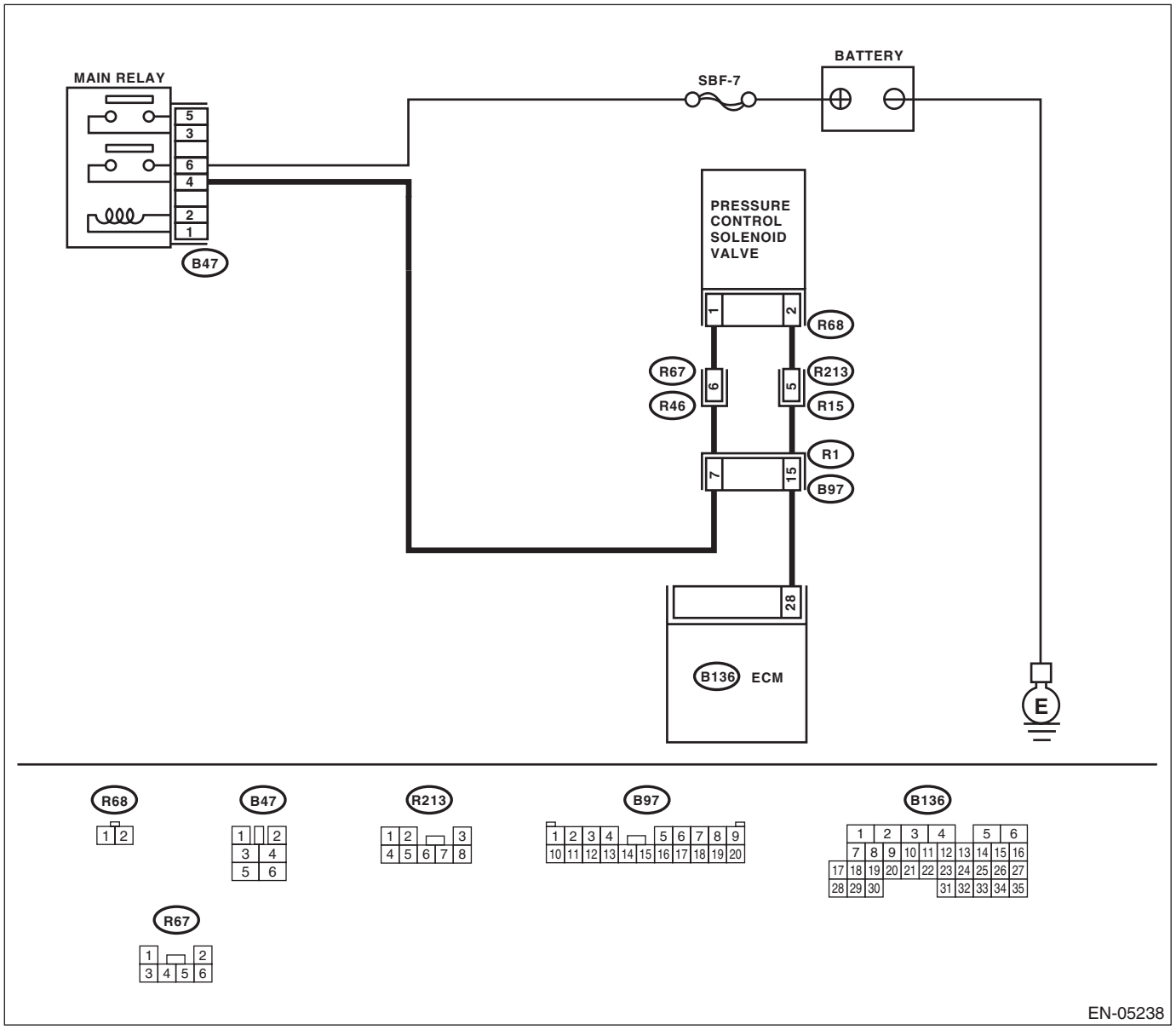
DJ:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-190, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE 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)-43, 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. 28 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair poor contact of the ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and pressure control solenoid valve. 3) Measure the resistance between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and pressure control solenoid valve connector.
3	**CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and pressure control solenoid valve connector. ***Connector & terminal*** ***(B136) No. 28 — (R68) 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 pressure control solenoid valve connector • Poor contact of coupling connector
4	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 — 100 Ω?	Go to step **5**.	Replace the pressure control solenoid valve. <Ref. to EC(H6DO)-11, Pressure Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO THE PRESSURE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of pressure 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 pressure control solenoid valve connector • Poor contact of coupling connector • Poor contact of main relay connector

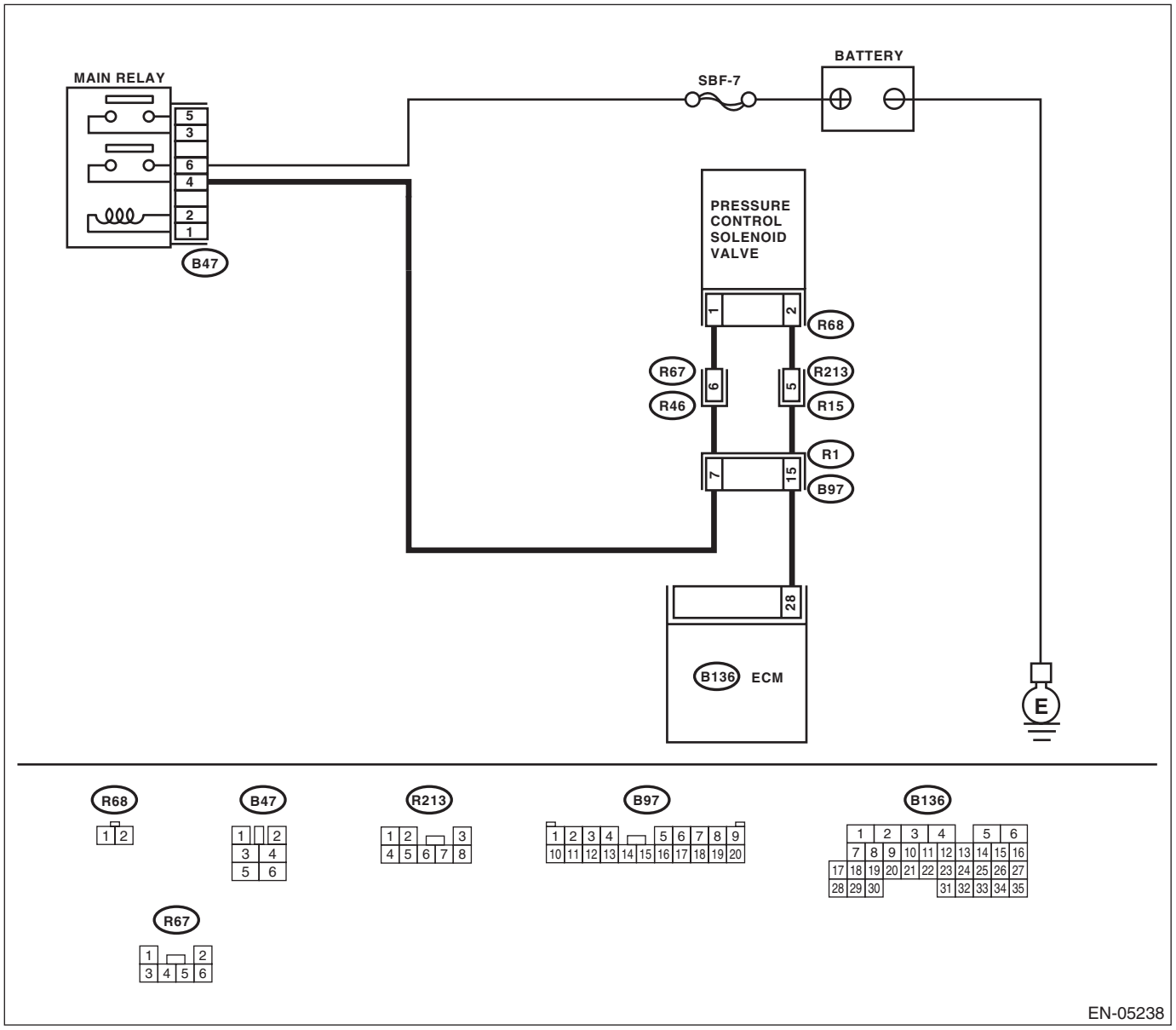
DK:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-192, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and pressure control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and pressure control solenoid valve connector.	Go to step **2**.
2	**CHECK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the pressure control solenoid valve. <Ref. to EC(H6DO)-11, Pressure Control Solenoid Valve.>	Repair poor contact of the ECM connector.

DL:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-194, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

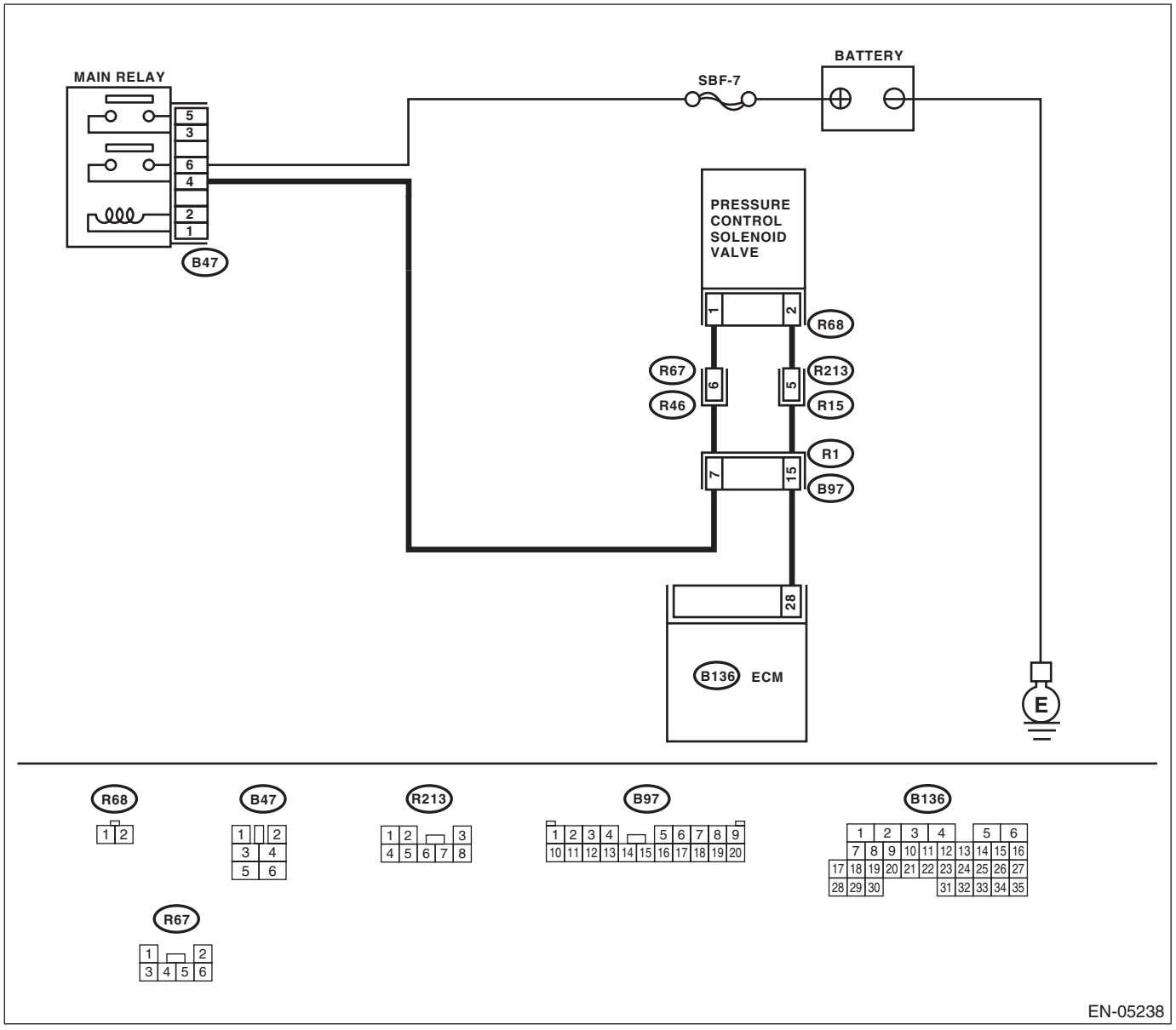
TROUBLE SYMPTOM:

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)-43, 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)-80, 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 test mode connector at the lower portion of instrument panel (on the driver’s side). 3) Turn the ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can be executed using the Subaru Select Monitor. Regarding 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 poor contact of rhe ECM connector.	Replace the drain valve. <Ref. to EC(H6DO)-14, Drain Valve.>

DM:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-196, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

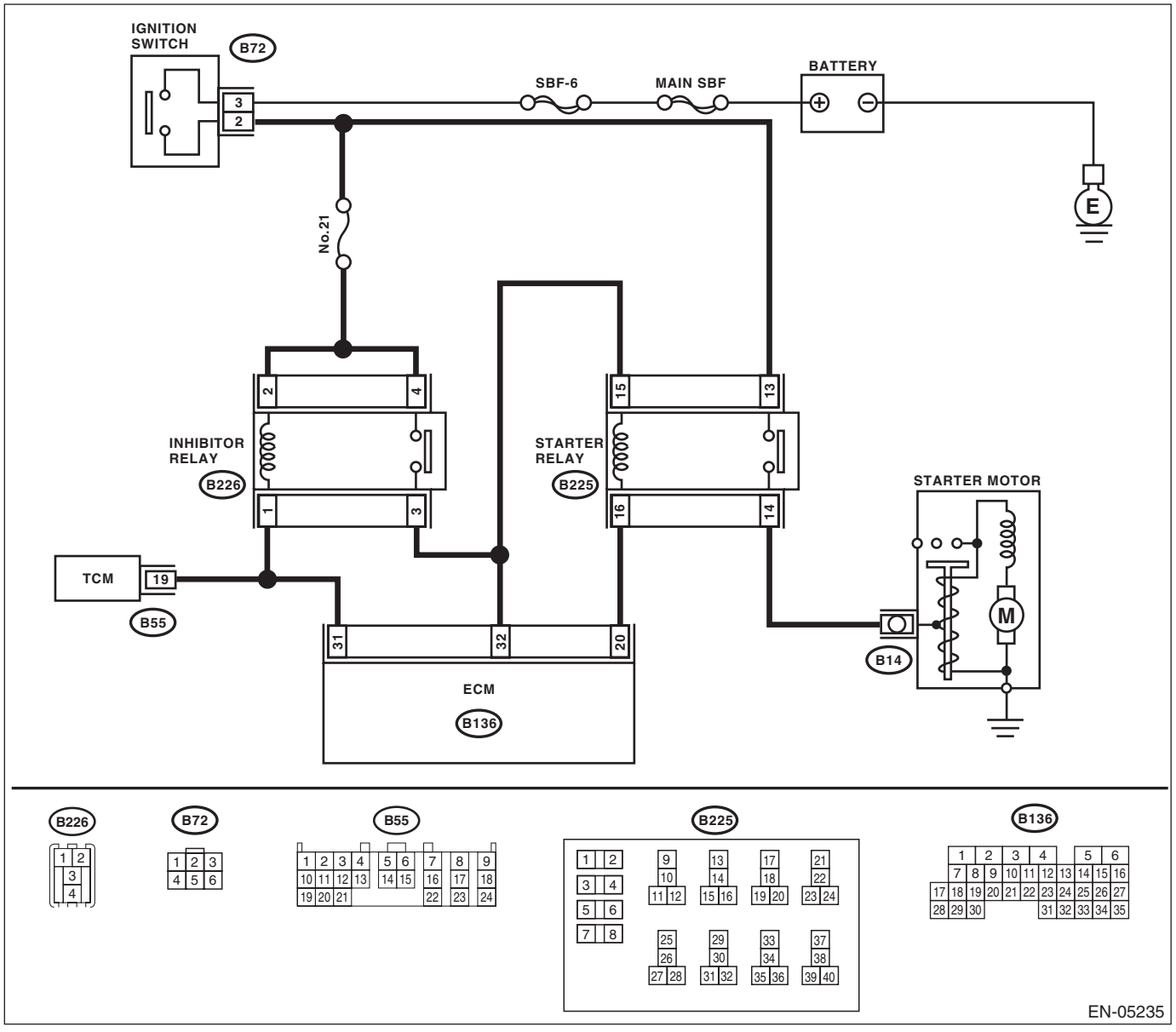
TROUBLE SYMPTOM:

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-80, List of Diagnostic Trouble Code (DTC).>	Repair poor contact of the ECM connector.

DN:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

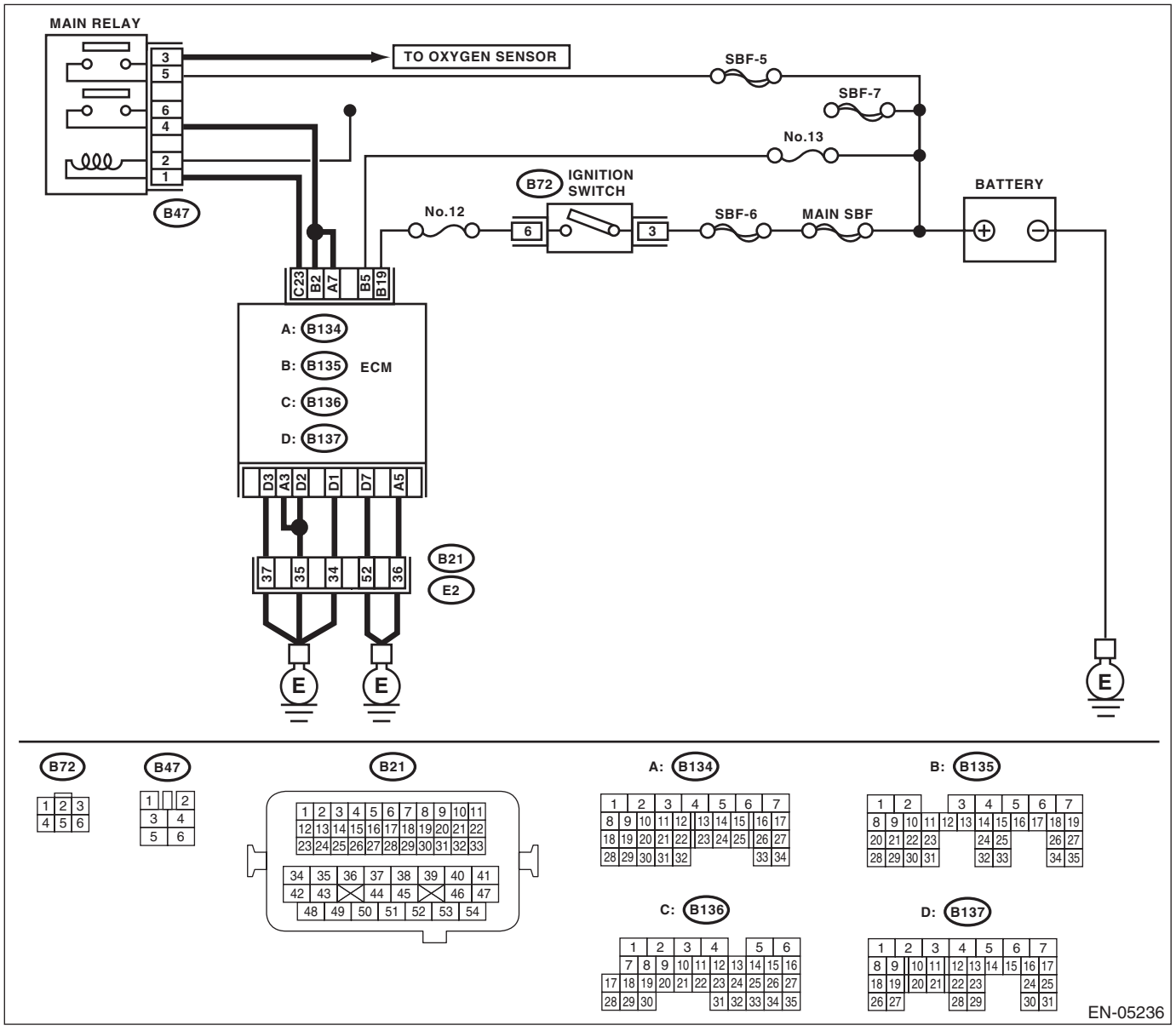
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-197, 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)-43, 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 poor contact of the ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the 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 of harness between ECM and battery • Poor contact in ECM connector • Poor contact of battery terminal

DO:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-199, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

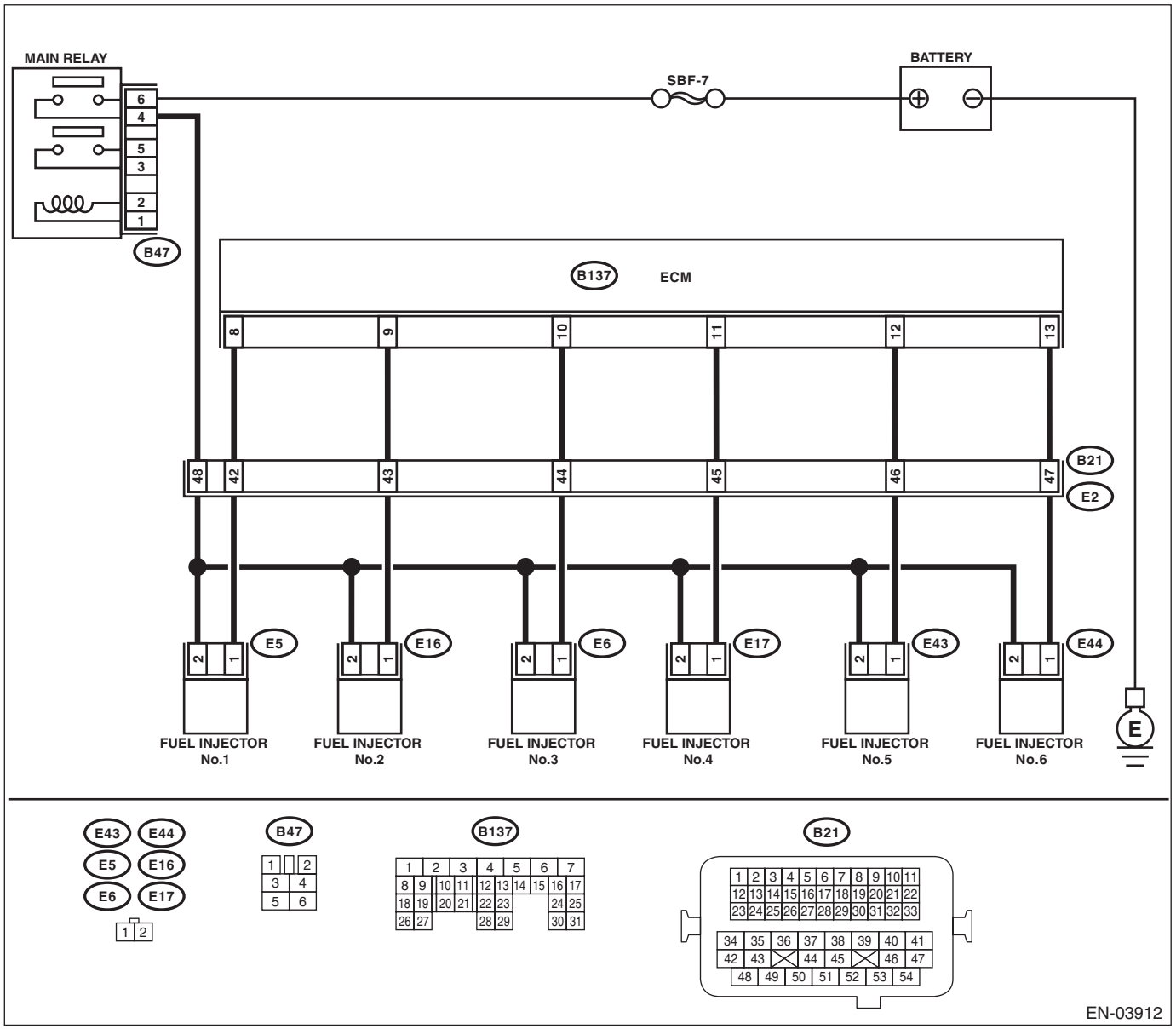
TROUBLE SYMPTOM:

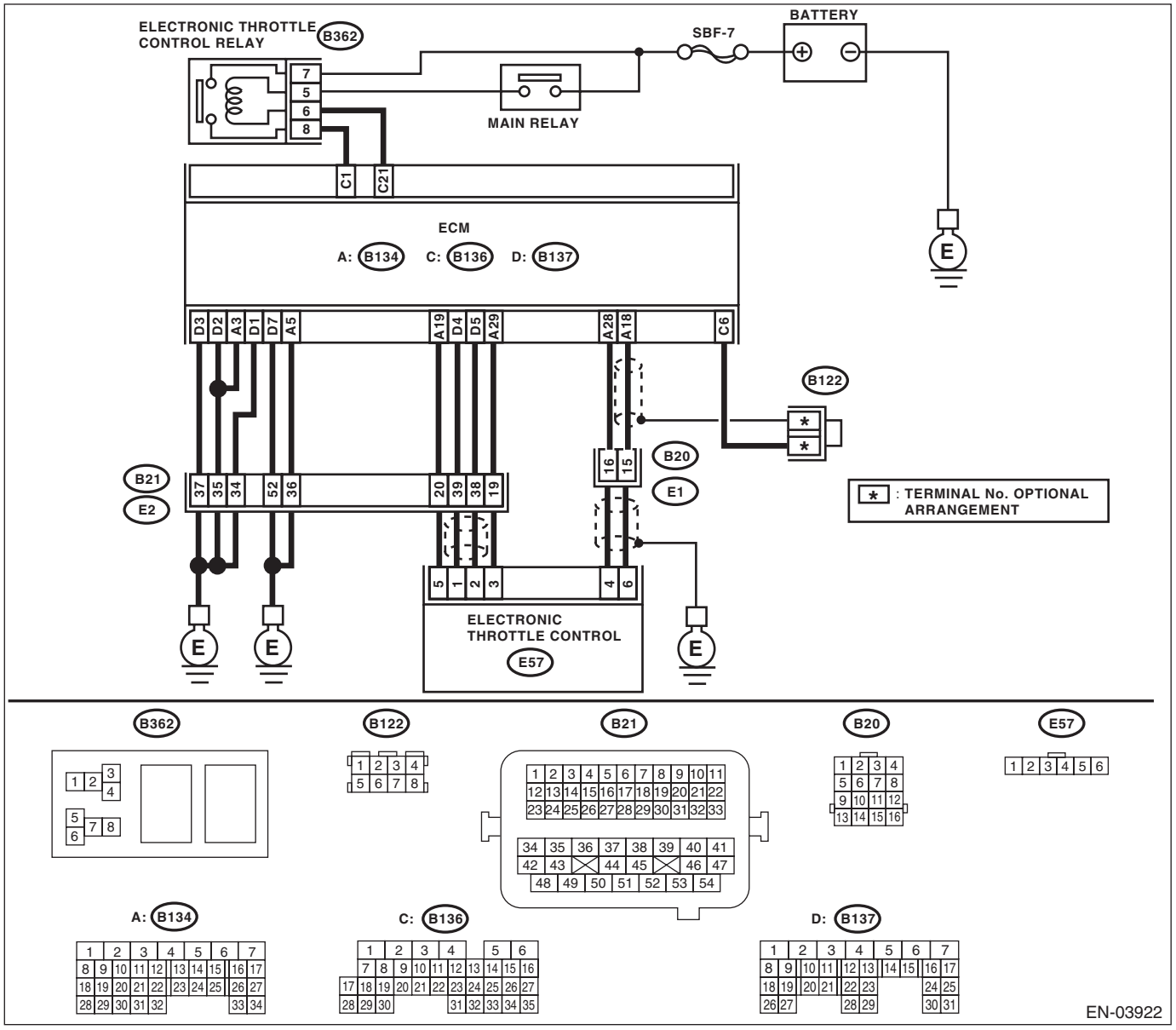
- Engine keeps running at higher speed than specified idle speed.
- Engine keeps running at a lower speed than the specified idle speed.
- Engine stalls.

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:




ELECTRONIC THROTTLE CONTROL RELAY
B362
7
5
6
8
SBF-7
BATTERY
MAIN RELAY
C1
C21
ECM
A: B134
C: B136
D: B137
D3
D2
A3
D1
D7
A5
A19
D4
D5
A29
A28
A18
C6
B122
B20
16
15
E1
B21
E2
37
35
34
52
36
20
39
38
19
* : TERMINAL No. OPTIONAL ARRANGEMENT
5
1
2
3
4
6
ELECTRONIC THROTTLE CONTROL
E57
E
B362
B122
B21
B20
E57
A: B134
C: B136
D: B137
EN-03922

	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)-80, 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)-7, 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)-26, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 333 — 363 kPa (3.4 — 3.7 kg/cm^2, 48 — 53 psi)?	Go to step **6**.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
6	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 70°C (158°F) or higher ?	Go to step **7**.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, 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 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-24, 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 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 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 mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-24, 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 the ECM and chassis ground for 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 the 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 the 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)-25, 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 of harness between main relay and fuel injector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector • Poor contact of fuel injector connector on faulty cylinders

	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 the ECM and chassis ground for 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)-25, 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)-60, Cylinder Block.>	Go to step **18**.
18	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn the crankshaft using ST, and align alignment mark on crank sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET	Is the timing chain dislocated from its proper position?	Correct the installation condition of timing chain. <Ref. to ME(H6DO)-42, 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 the 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 the 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 the 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 ground short circuit of 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 ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>
26	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect the 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 open circuit of harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
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 the 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 procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-33, 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)-12, Throttle Body.>
31	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-33, 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)-12, Throttle Body.>

	Step	Check	Yes	No
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. 1 — (E57) No. 1:***	Is the resistance less than 1 Ω?	Go to step **33**.	Repair the open circuit of harness between ECM and electronic throttle control.
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 the ECM and electronic throttle control.	Go to step **34**.
34	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from 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 ground short circuit of harness between the 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 in the harness between the 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 of the harness between the ECM and engine ground.
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)-12, 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 poor contact in ECM connector.	Replace the electronic throttle control. <Ref. to FU(H6DO)-12, Throttle Body.>

DP:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-201, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

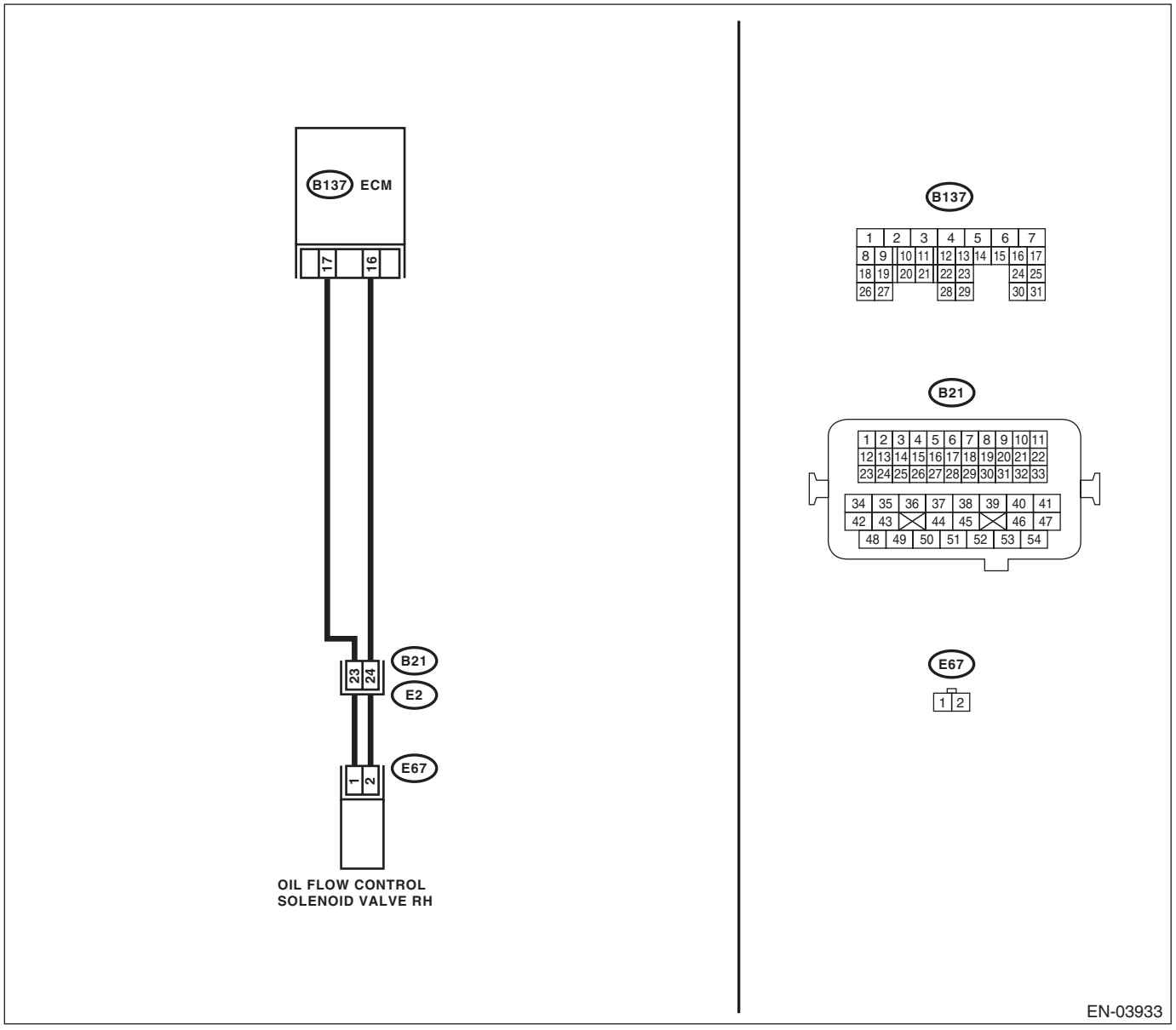
TROUBLE SYMPTOM:

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)-43, 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 ground short circuit of 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 the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-74, Oil Flow Control Solenoid Valve.>

DQ:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-203, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

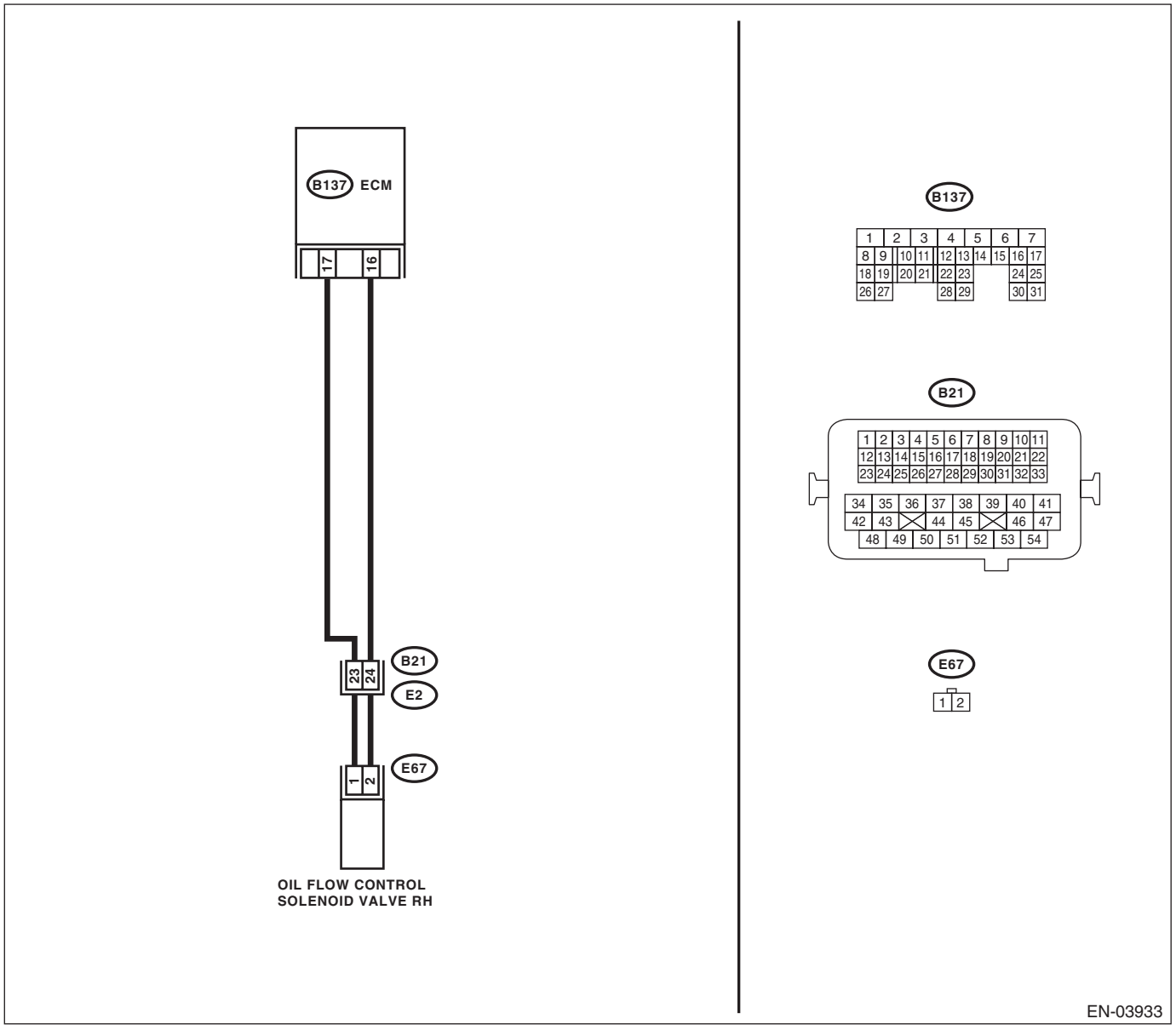
TROUBLE SYMPTOM:

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)-43, 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 the harness between the 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 the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-74, Oil Flow Control Solenoid Valve.>

DR:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-204, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

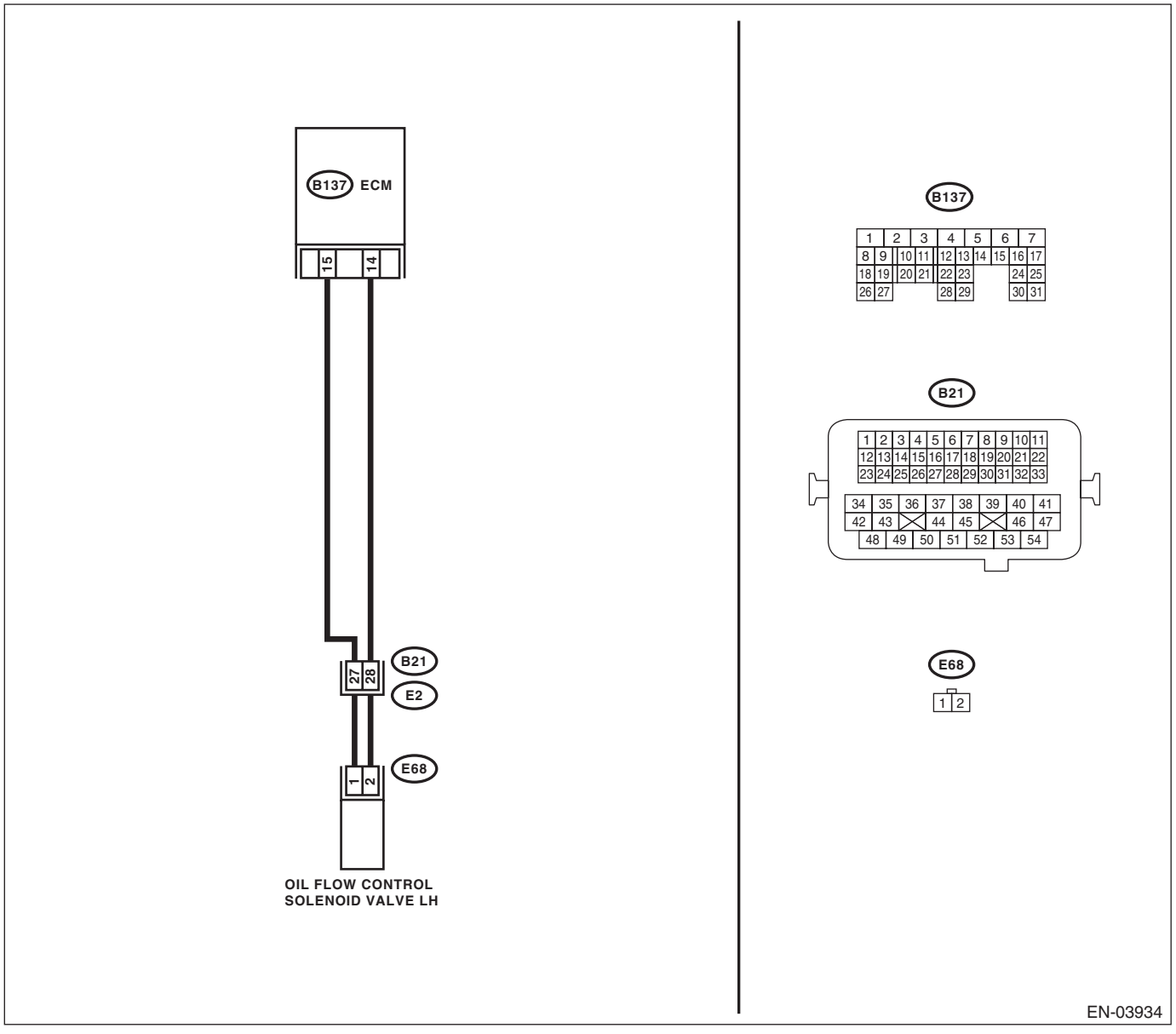
TROUBLE SYMPTOM:

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)-43, 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 ground short circuit of 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 the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-74, Oil Flow Control Solenoid Valve.>

DS:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-204, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

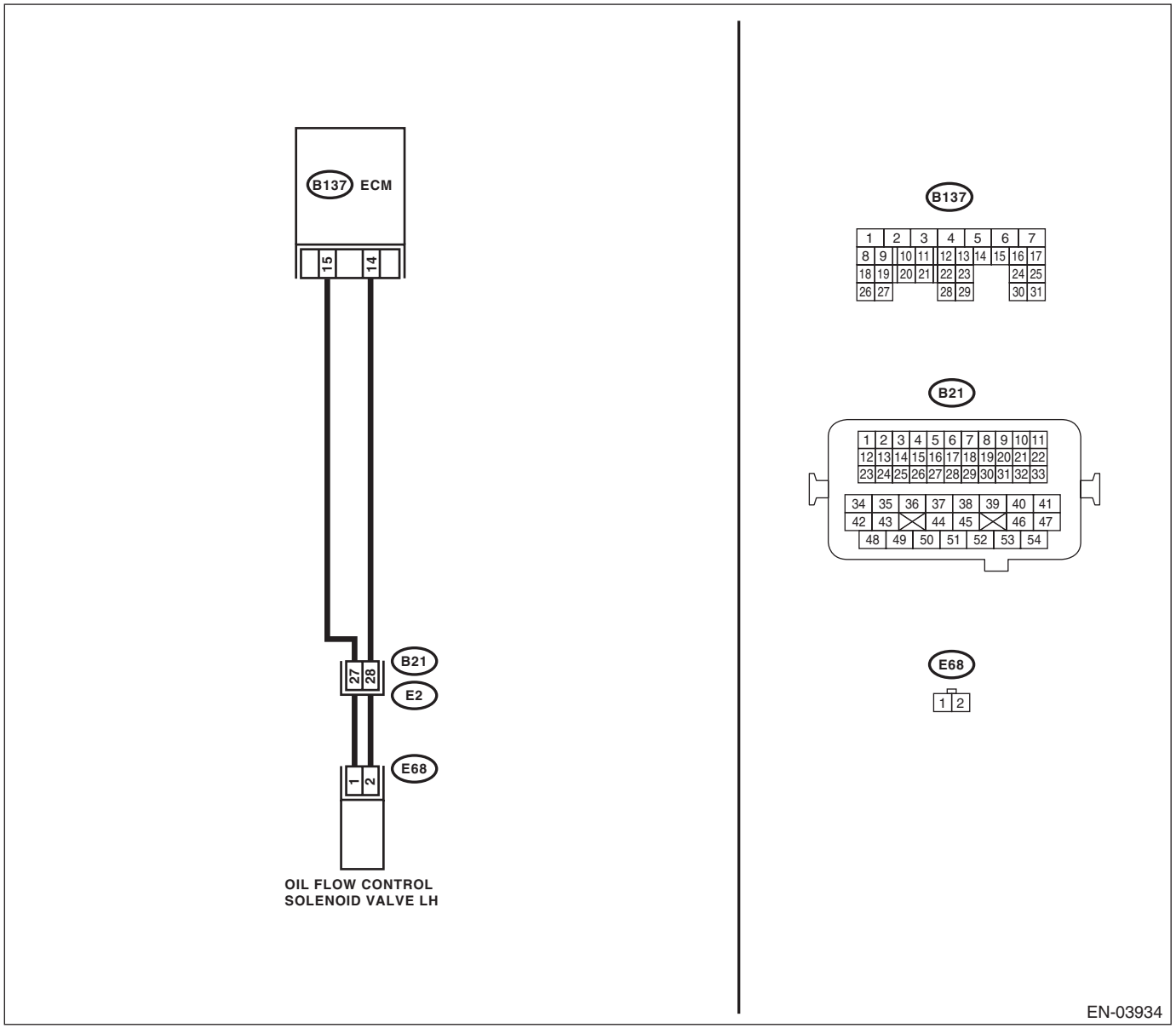
TROUBLE SYMPTOM:

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)-43, 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 the harness between the 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 the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-74, Oil Flow Control Solenoid Valve.>

DT:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

NOTE:
Refer to DTC P2097 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-308, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DU:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

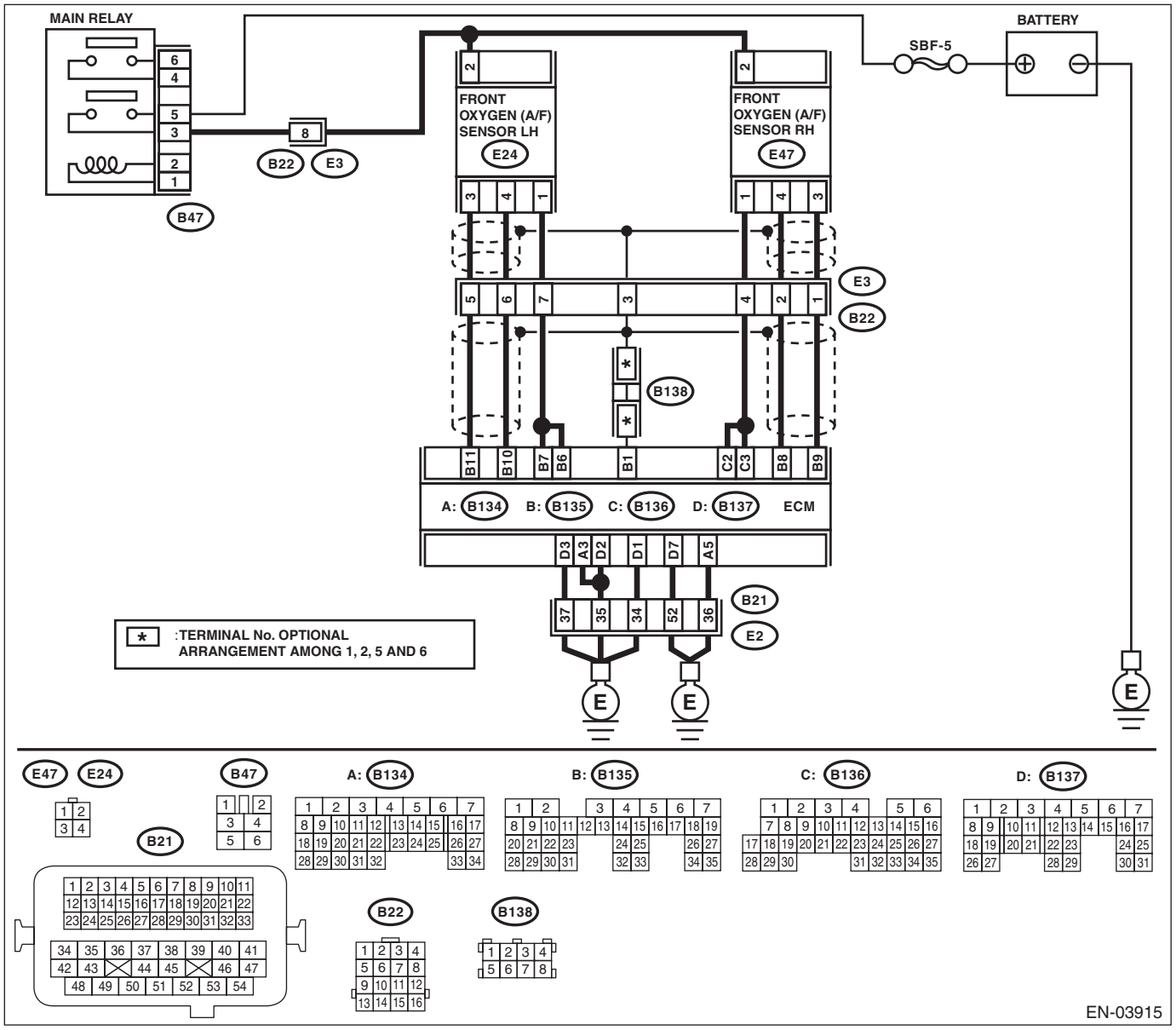
DTC DETECTING CONDITION:

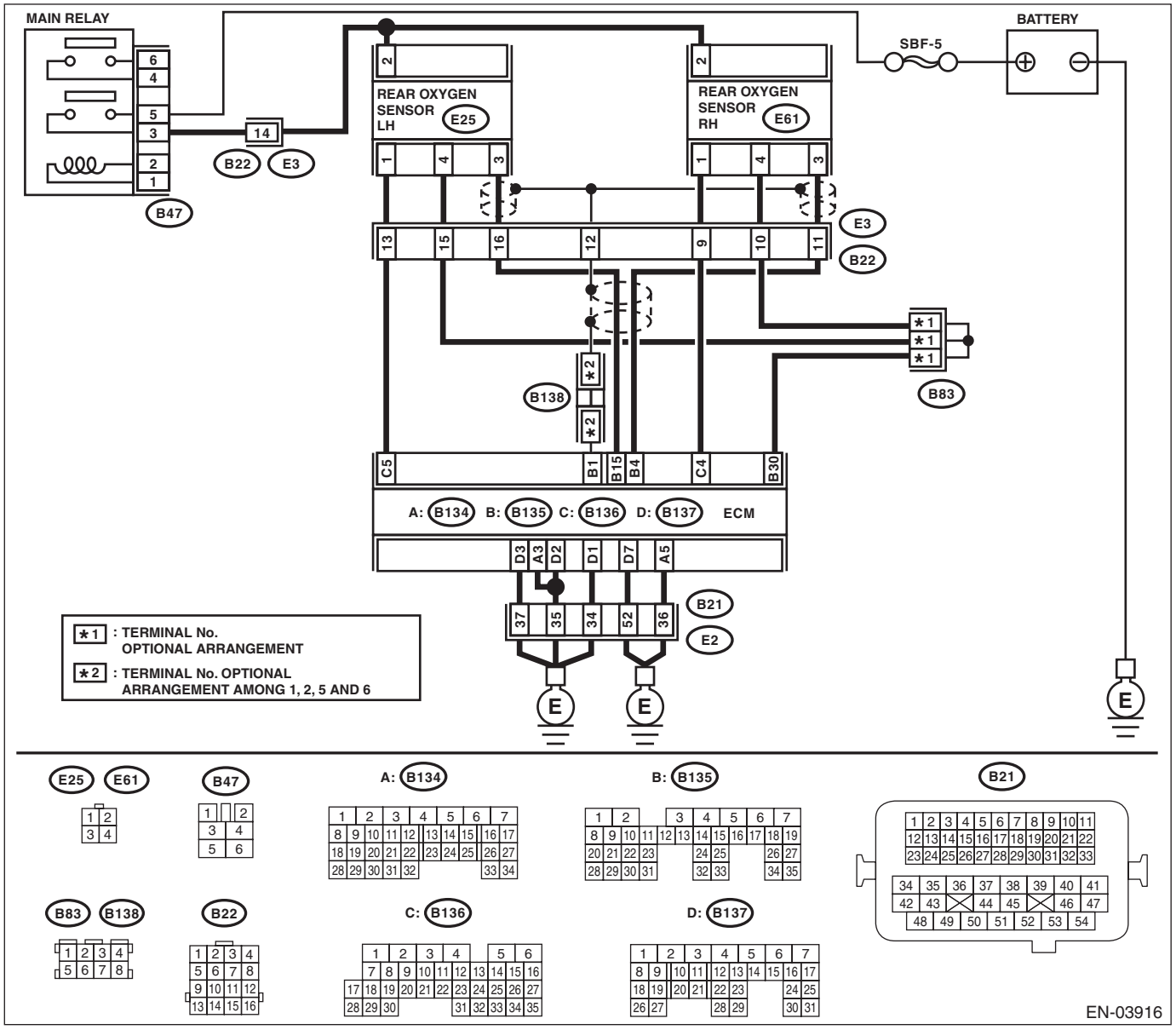
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-207, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-80, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the 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 in front oxygen (A/F) sensor connector • Poor contact in ECM 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 the ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>	Repair poor contact of the ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10**.

	Step	Check	Yes	No
10	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure. <Ref. to ME(H6DO)-26, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 333 — 363 kPa (3.4 — 3.7 kgf/cm^2, 48 — 53 psi)?	Go to step **11**.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
11	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 70°C (158°F) or higher ?	Go to step **12**.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, 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 70°C (158°F). 2) Place the select lever in the "P" or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-24, 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 70°C (158°F). 2) Place the select lever in the "P" 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 mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-24, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Depress the clutch pedal. (MT model) • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **15**.	Go to step **16**.
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°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: • Depress the clutch pedal. (MT model) • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **17**.	Go to step **16**.

	Step	Check	Yes	No
16	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **18**.
17	**CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-29, 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 open circuit of harness between ECM and rear oxygen sensor 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)-31, 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

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

NOTE:
Refer to DTC P2099 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-314, DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

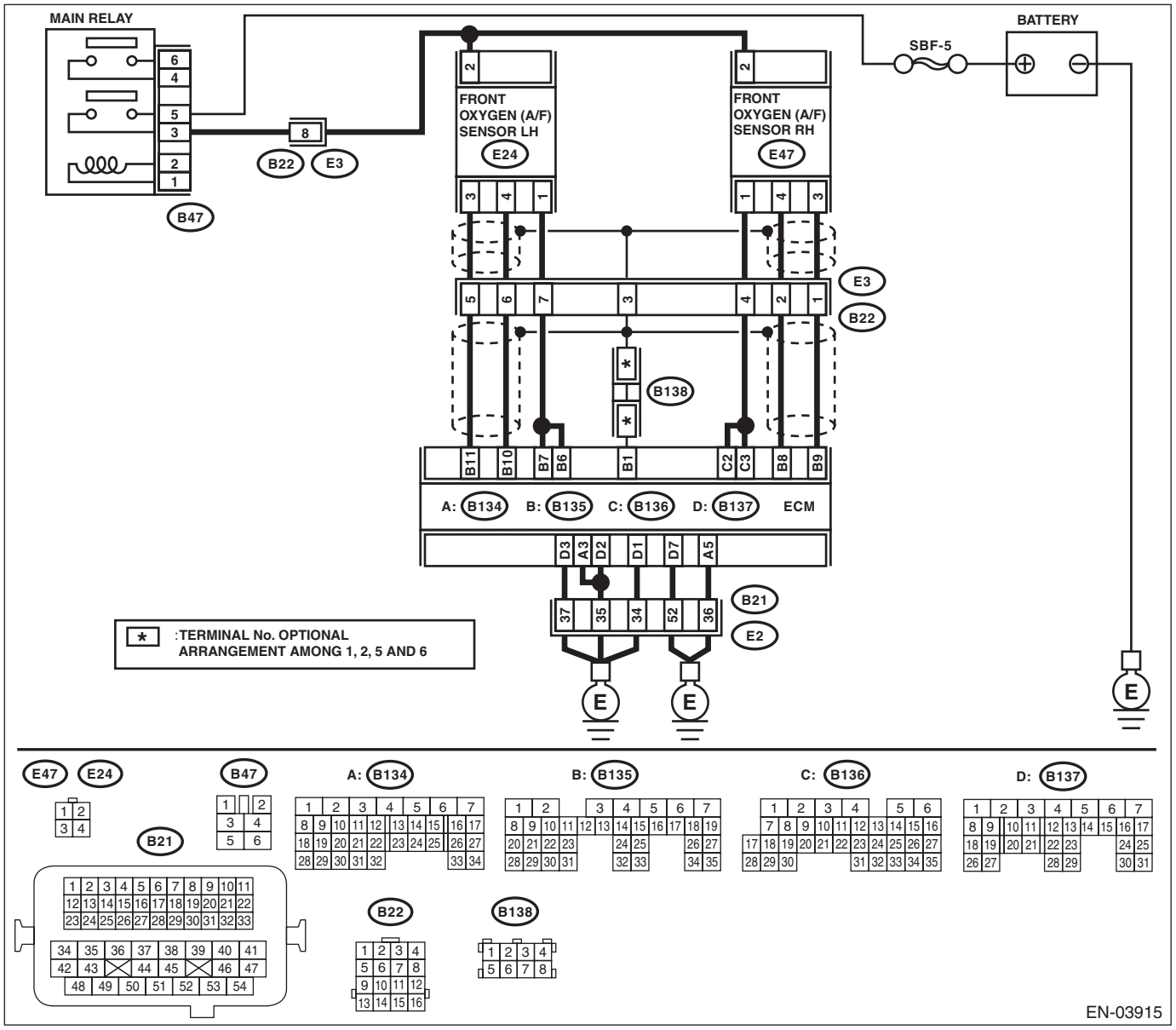
DW:DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2

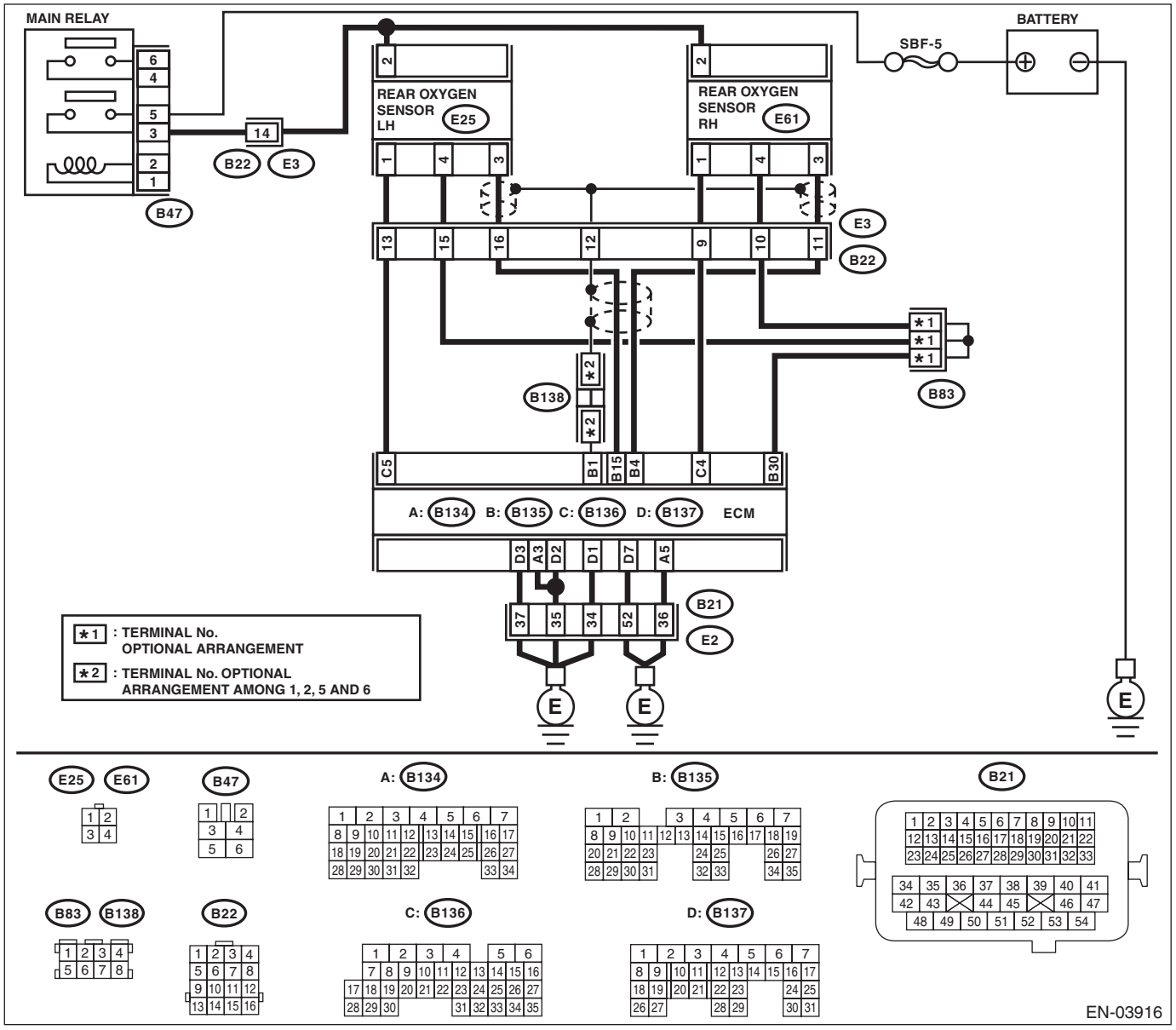
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-208, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:




MAIN RELAY
BATTERY
SBF-5
REAR OXYGEN SENSOR LH E25
REAR OXYGEN SENSOR RH E61
B47
B22
E3
B138
B83
B21
E2
A: B134 B: B135 C: B136 D: B137 ECM
*1 : TERMINAL No. OPTIONAL ARRANGEMENT
*2 : TERMINAL No. OPTIONAL ARRANGEMENT AMONG 1, 2, 5 AND 6
EN-03916

	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)-80, 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 the 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 in front oxygen (A/F) sensor connector • Poor contact in ECM 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**.

	Step	Check	Yes	No
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 the ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>	Repair poor contact of the ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10**.
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)-26, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 333 — 363 kPa (3.4 — 3.7 kgf/cm^2, 48 — 53 psi)?	Go to step **11**.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
11	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 70°C (158°F) or higher ?	Go to step **12**.	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is higher than 70°C (158°F). 2) Place the select lever in the "P" or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-24, Mass Air Flow and Intake Air Temperature Sensor.>
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is higher than 70°C (158°F). 2) Place the select lever in the "P" 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 mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-24, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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**.

	Step	Check	Yes	No
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **17**.	Go to step **16**.
16	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **18**.
17	**CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-29, 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 open circuit of harness between ECM and rear oxygen sensor 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)-31, 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

DX:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-209, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

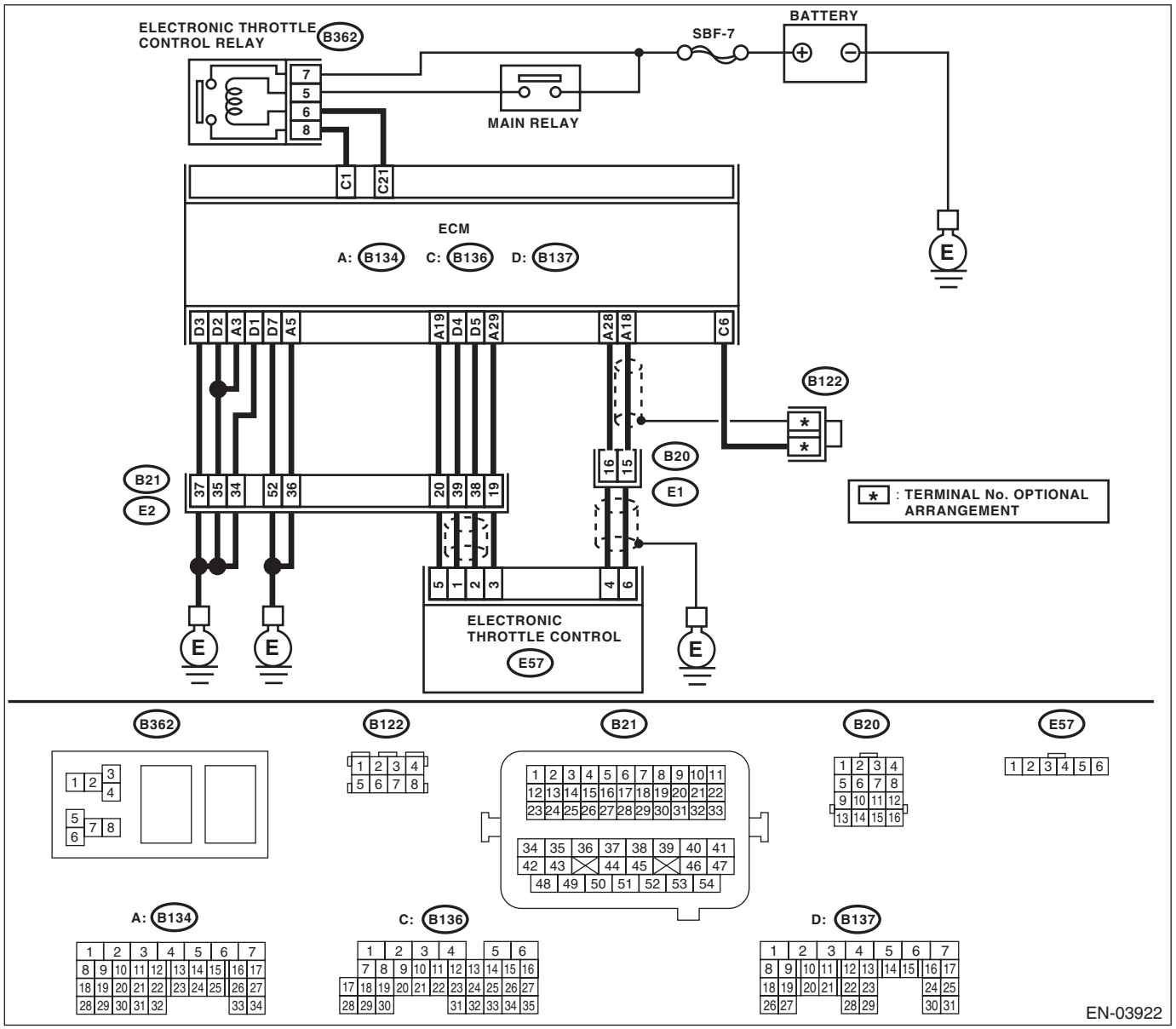
TROUBLE SYMPTOM:

- 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 5 and No. 6 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the electronic throttle control relay.
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Disconnect the connectors from 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 the 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 the 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 ground short circuit of 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 ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>
8	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect the 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 open circuit of harness between ECM and electronic throttle control 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 the 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.
12	**CHECK SENSOR OUTPUT.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-12, Throttle Body.>

	Step	Check	Yes	No
13	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-33, 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)-12, 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 open circuit of harness between ECM and electronic throttle control.
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 the ECM and electronic throttle control.	Go to step **16**.
16	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from 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 ground short circuit of harness between the 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.
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 of the harness between the ECM and engine ground.

	Step	Check	Yes	No
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)-12, 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 poor conntact in ECM connector.	Replace the electronic throttle control. <Ref. to FU(H6DO)-12, Throttle Body.>

DY:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-211, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

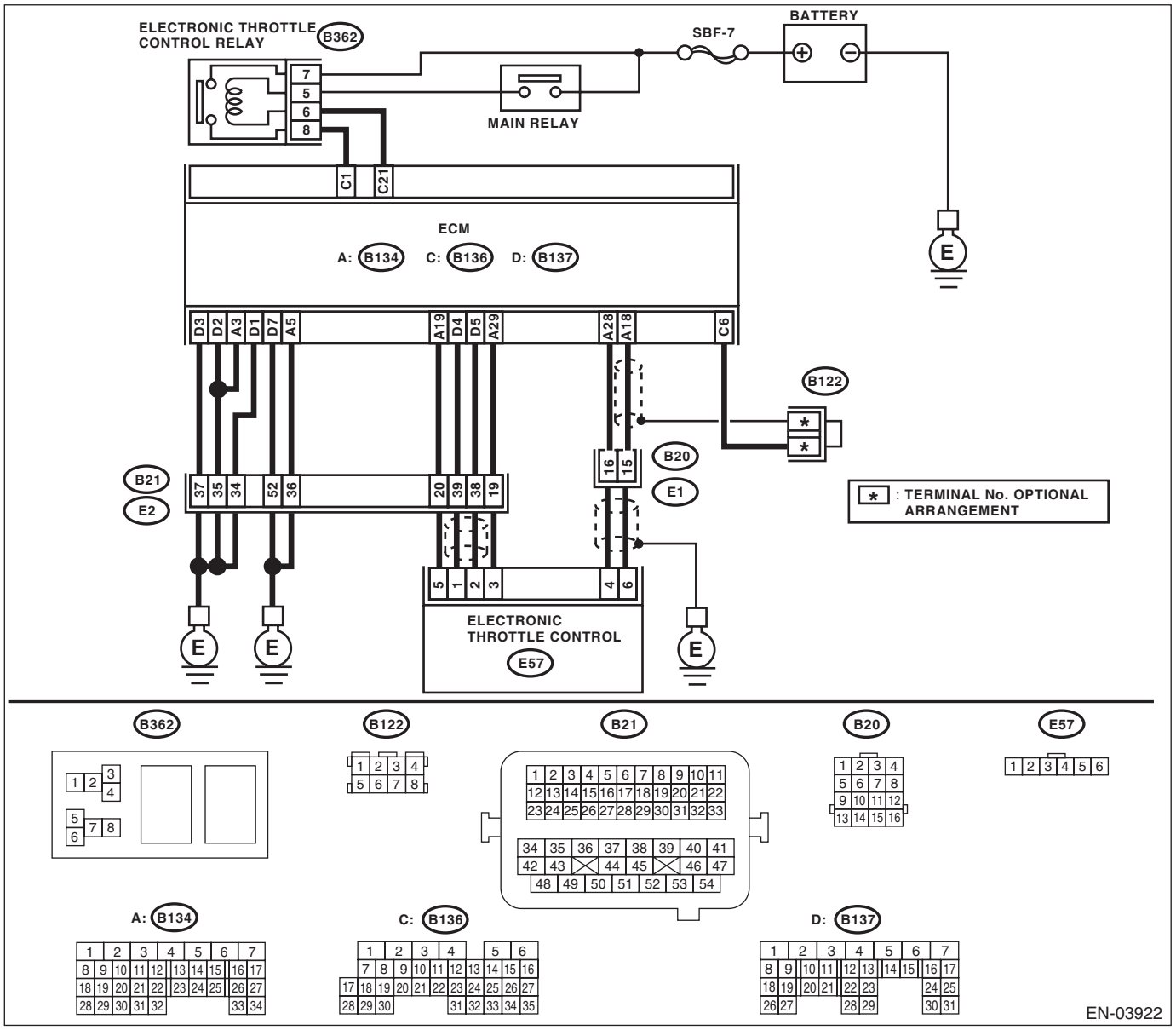
TROUBLE SYMPTOM:

- 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 5 and No. 6 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the electronic throttle control relay.
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Disconnect the connectors from 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 the 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 the 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 poor contact in ECM connector.	Repair the open circuit of harness between ECM and electronic throttle control relay.

DZ:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

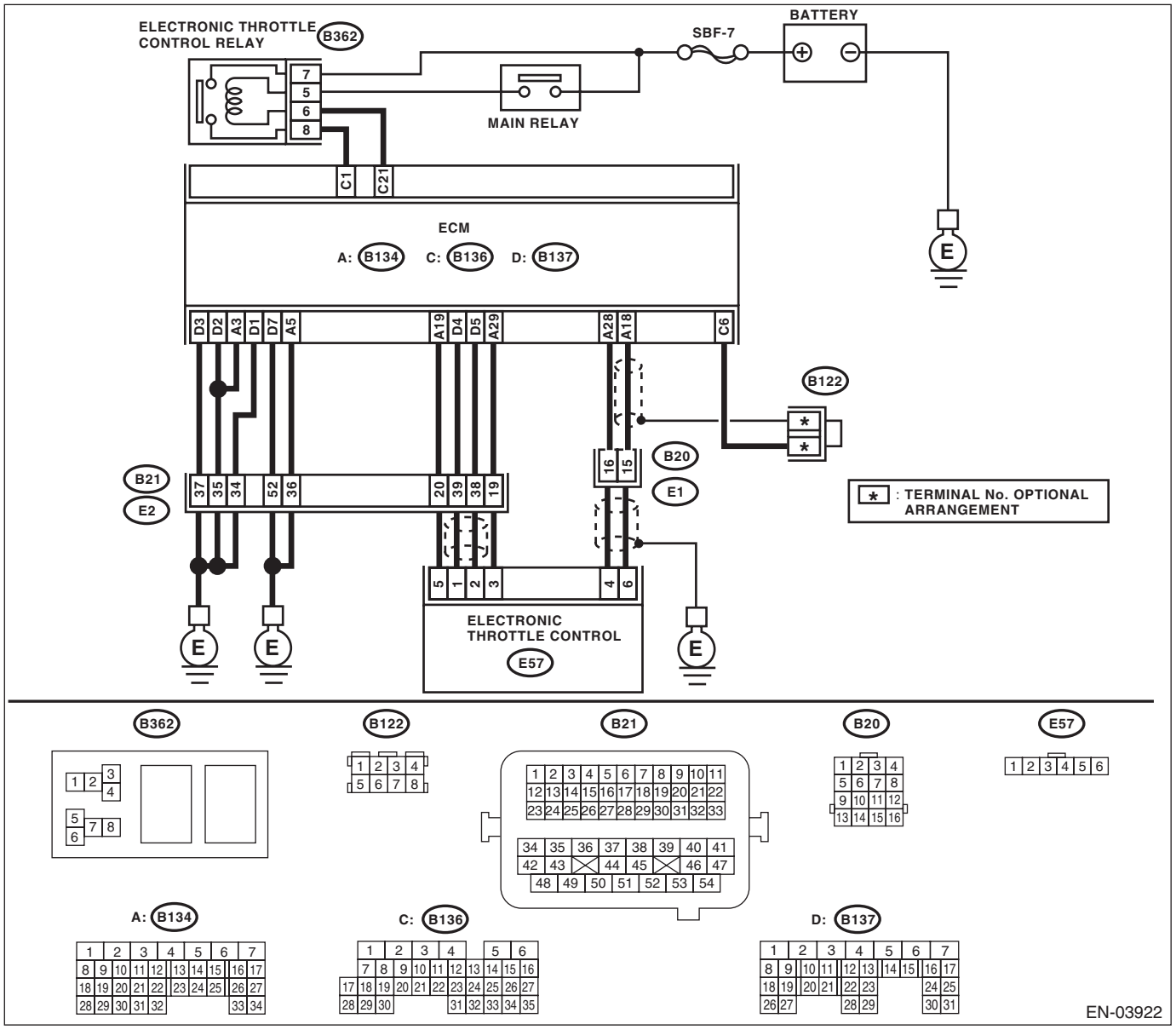
DTC DETECTING CONDITION:

- Immediately at fault recognition Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-213, 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Replace the electronic throttle control relay.
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 the harness between ECM and electronic throttle control relay.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from 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 poor contact in ECM connector.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.

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

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-320, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-217, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

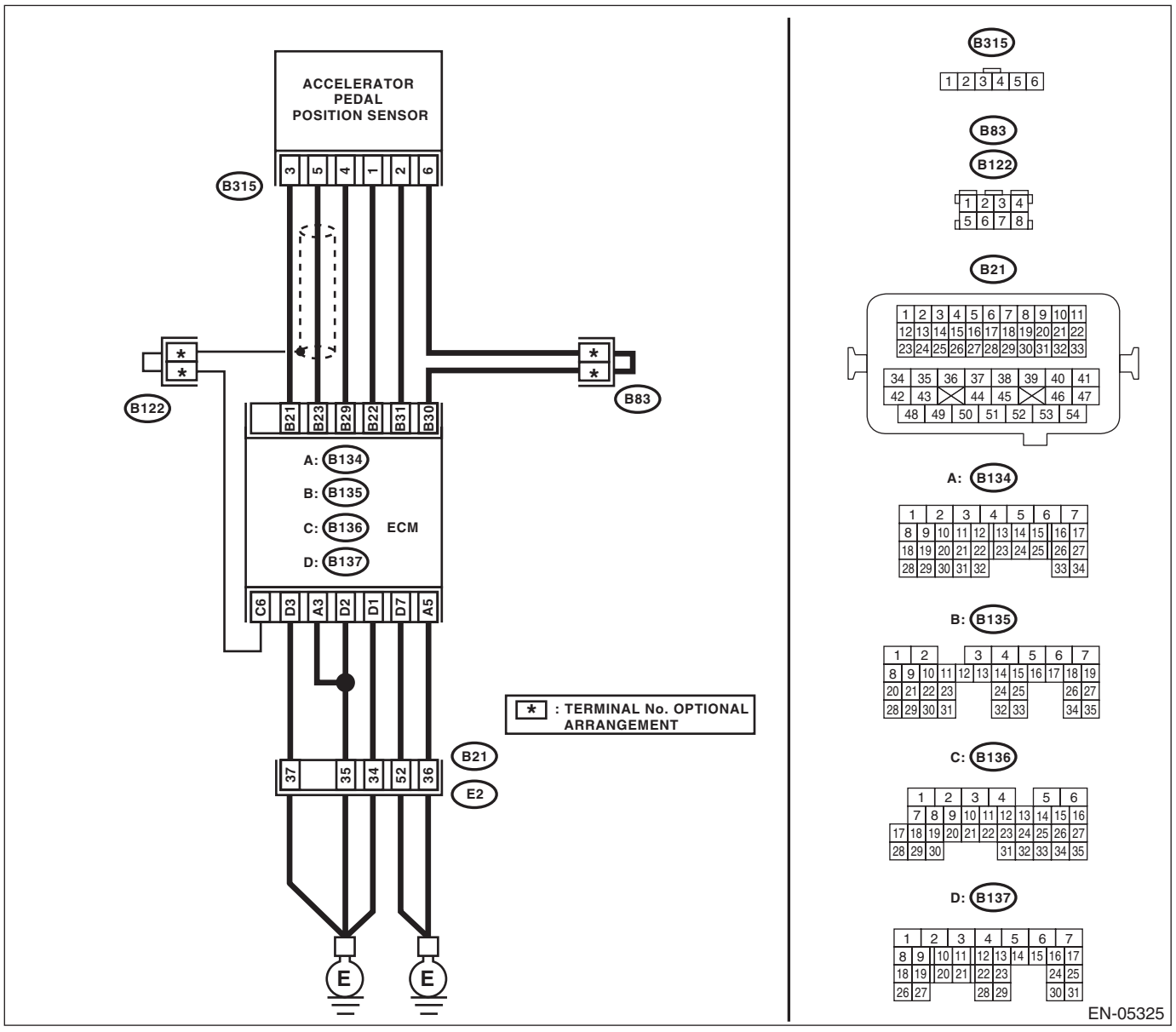
TROUBLE SYMPTOM:

- 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)-43, 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 the 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 of the harness between the 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. 5 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H6DO)-3, Accelerator Pedal.>	Repair the ground short of the harness between the ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-219, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

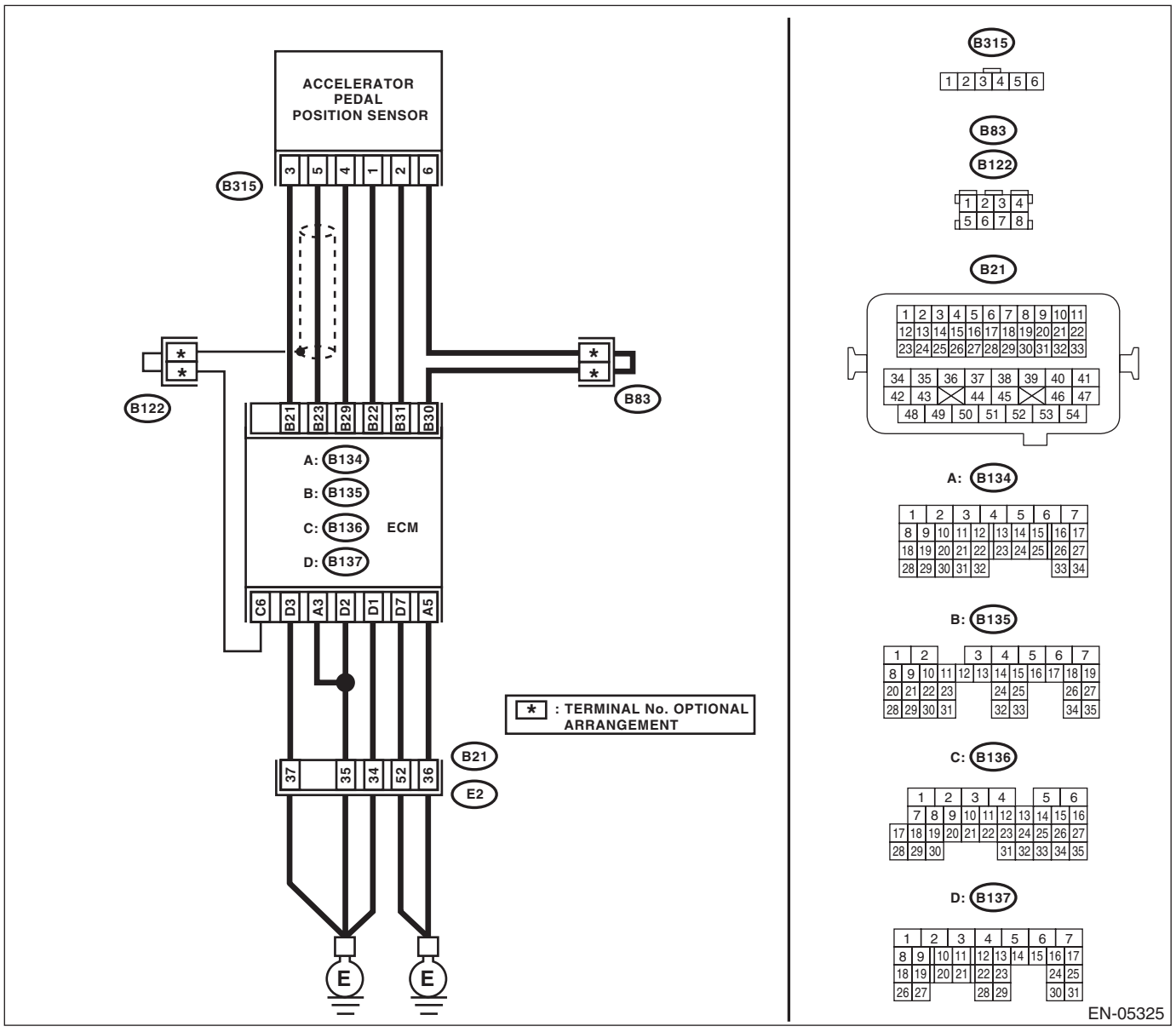
TROUBLE SYMPTOM:

- 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)-43, 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 the 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. 5:*** ***(B135) No. 29 — (B315) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of the harness between the 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. 4 — 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 • 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. 5 (+) — Chassis ground (–):***	Is the voltage 4.85 V or more?	Repair the short circuit to power source in the harness between the ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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 to power source in the harness between the ECM and accelerator pedal position sensor connector.

ED:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

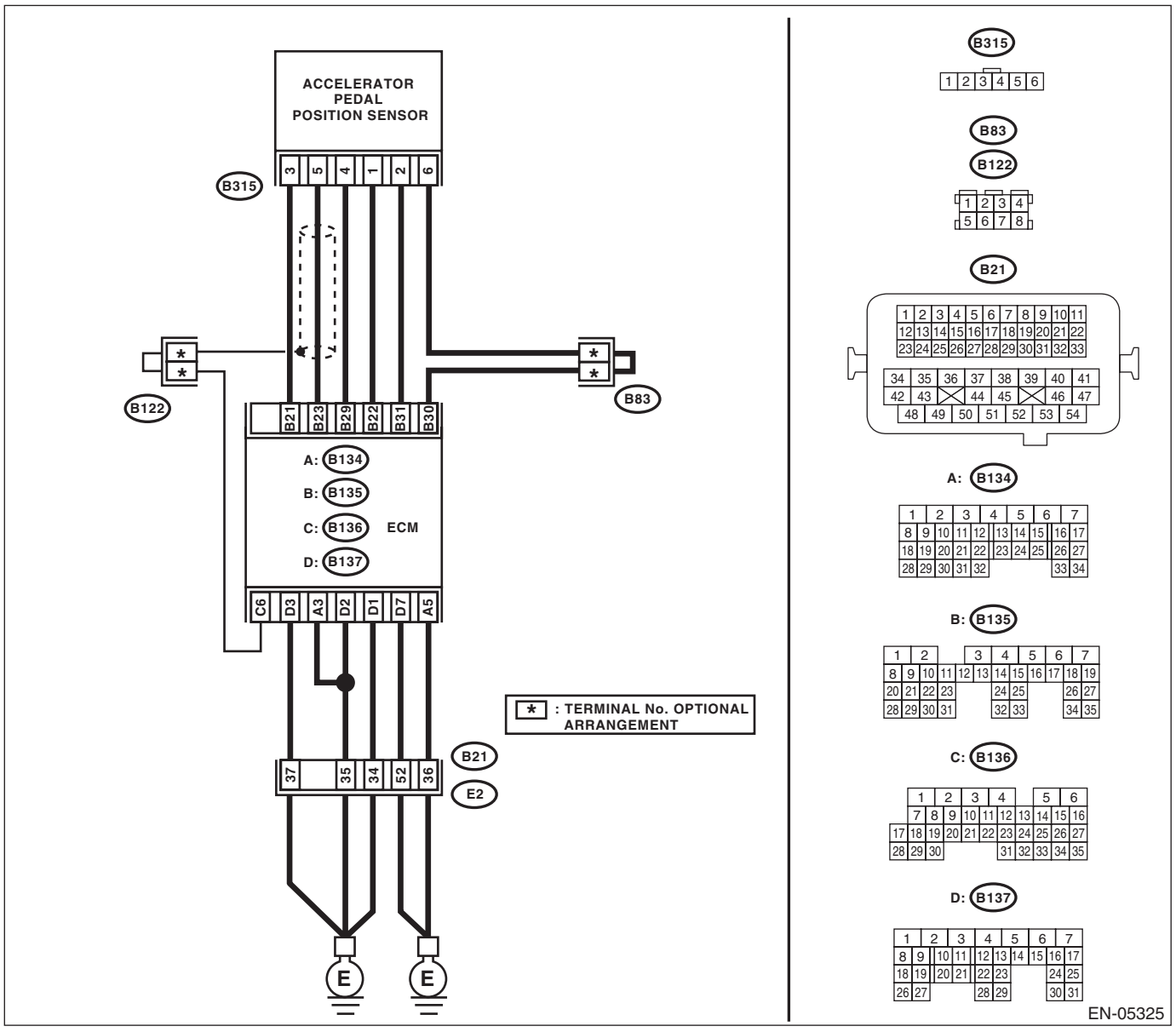
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-221, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, 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 the 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 of the harness between the 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. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H6DO)-3, Accelerator Pedal.>	Repair the ground short of the harness between the ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-223, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

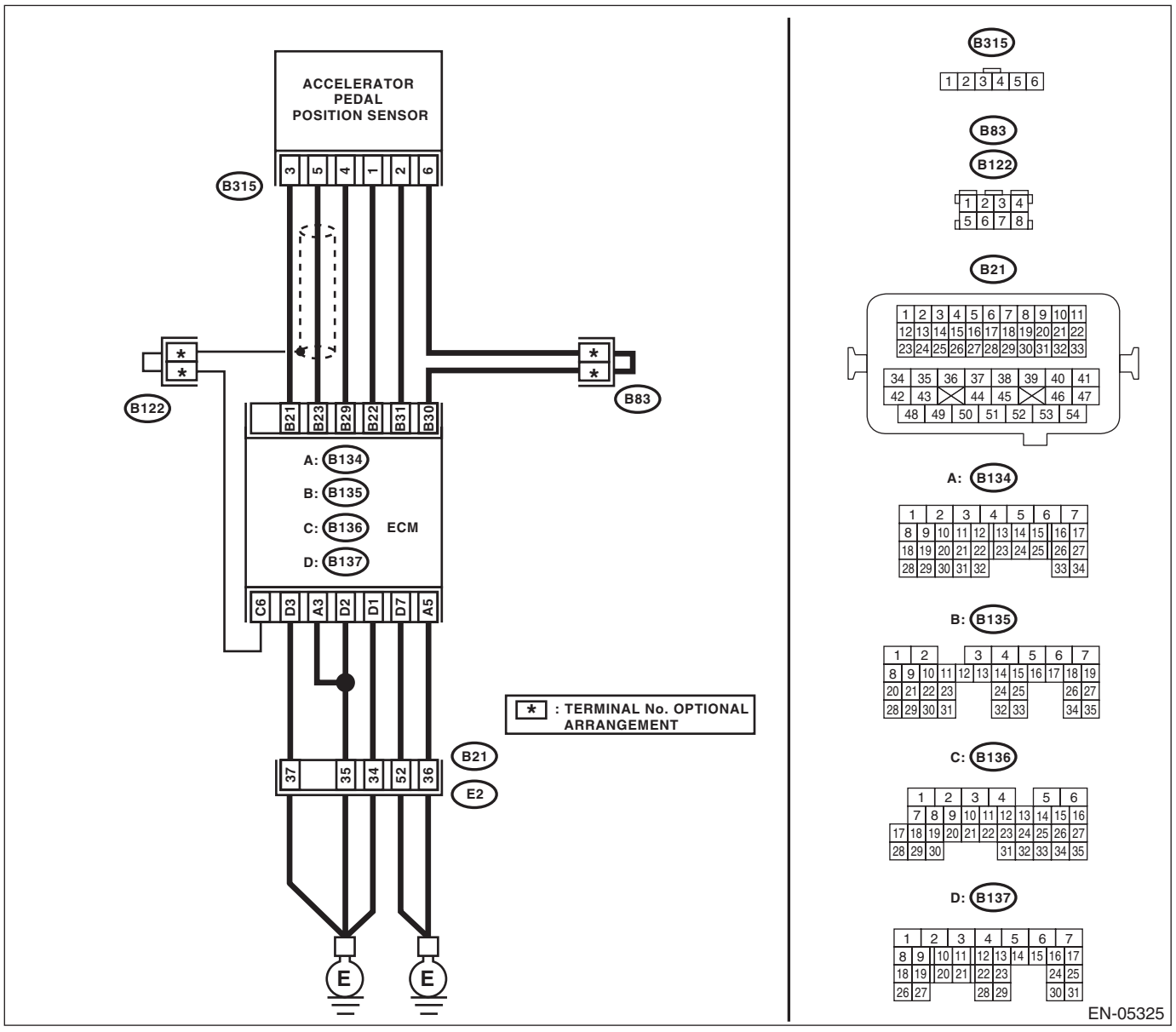
TROUBLE SYMPTOM:

- 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)-43, 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 the 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. 2:*** ***(B135) No. 30 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of the harness between the 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. 6 — 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. 2 (+) — Chassis ground (–):***	Is the voltage 4.85 V or more?	Repair the short circuit to power source in the harness between the ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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 to power source in the harness between the ECM and accelerator pedal position sensor connector.

EF:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-225, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

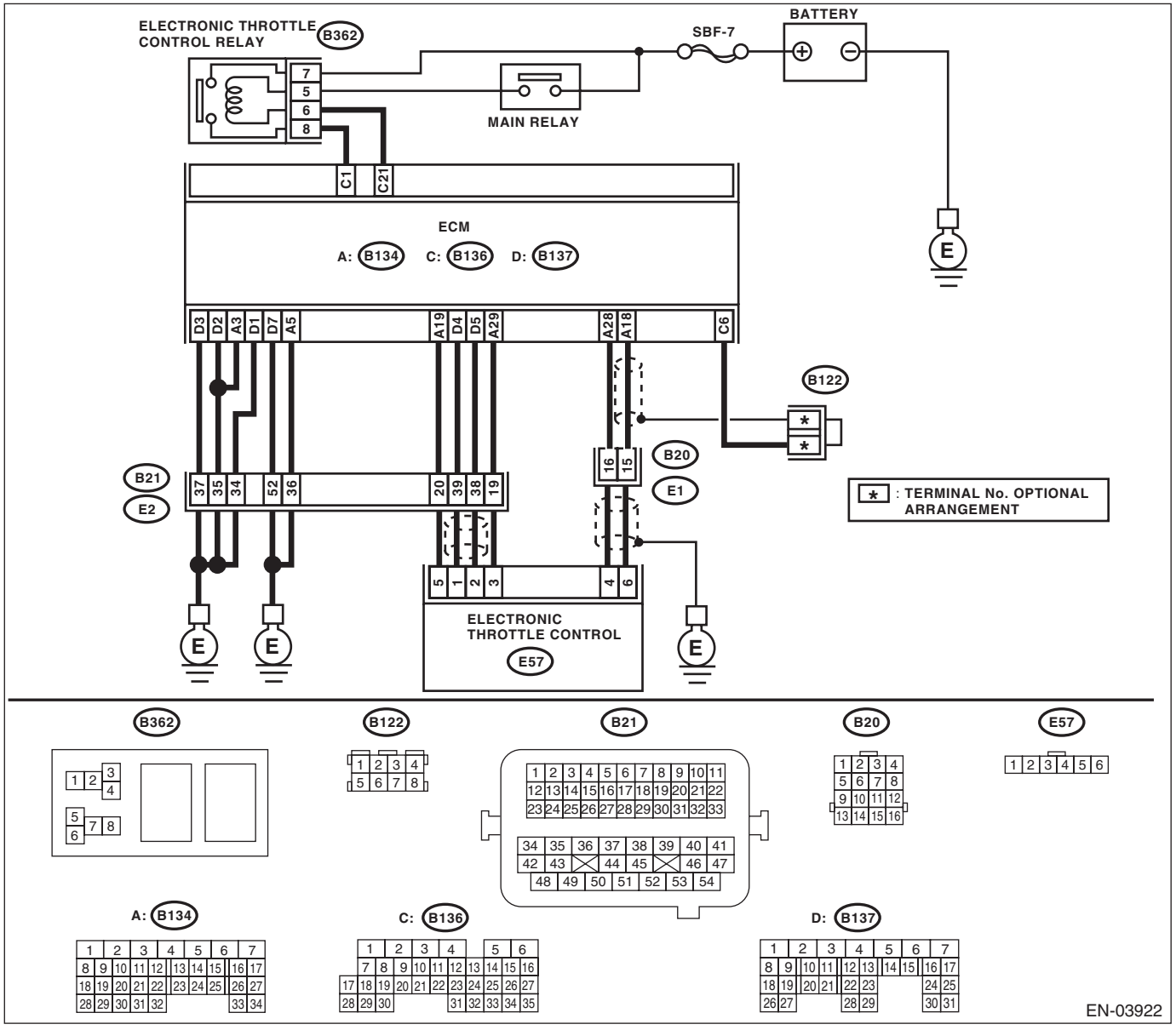
TROUBLE SYMPTOM:

- 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)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 6:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the ground short circuit of 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 ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect the 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 open circuit of harness between ECM and electronic throttle control 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 connecor. 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 the 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)-12, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

EG:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

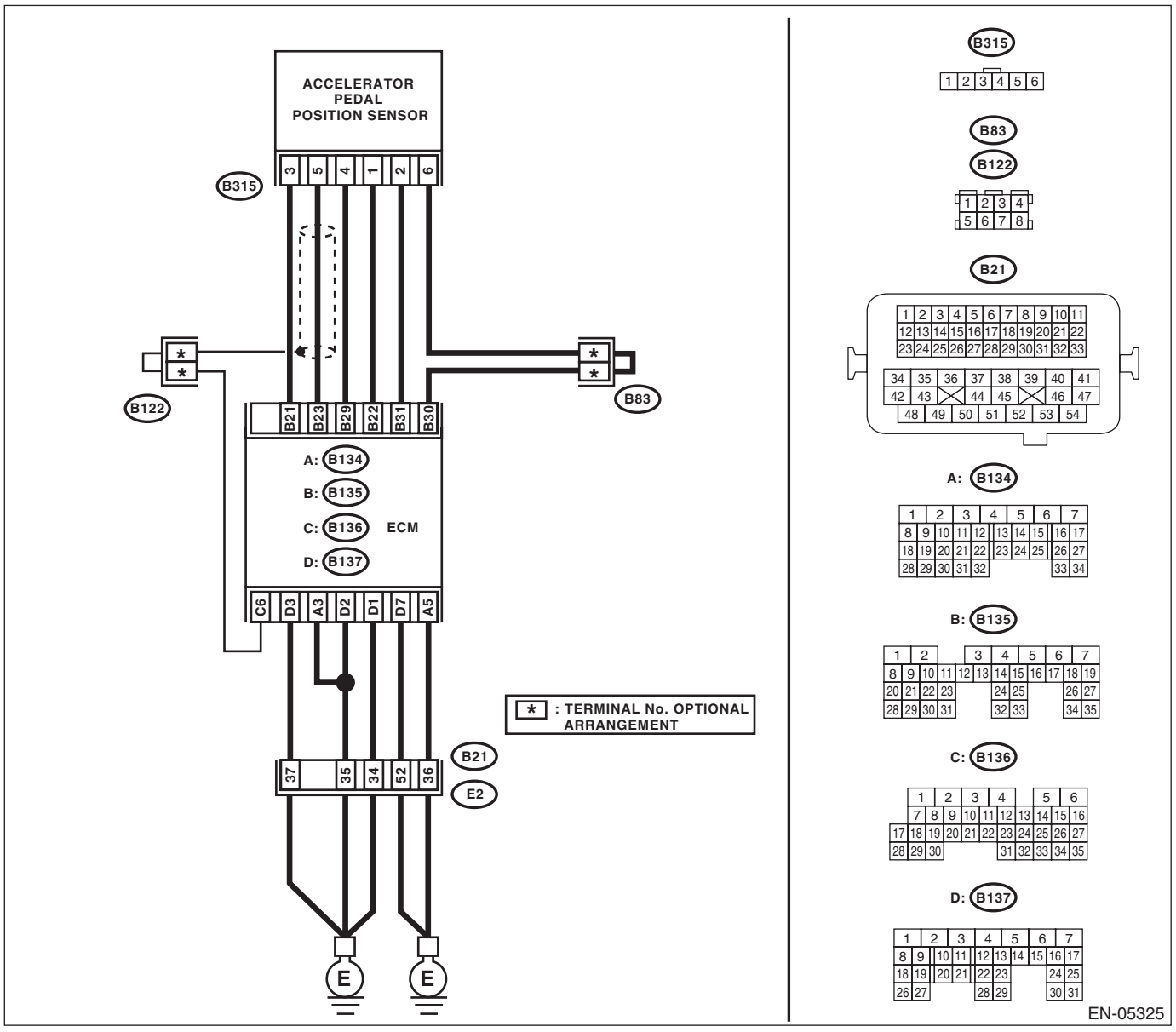
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-227, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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)-43, PROCEDURE, Inspection Mode.>.

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 23 (+) — Chassis ground (–):*** ***(B135) No. 31 (+) — Chassis ground (–):***	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelrator pedal position sensor signal 0 V?	Go to step **3**.	Go to step **2**.
2	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Chassis ground (–):*** ***(B315) No. 2 (+) — Chassis ground (–):***	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelrator 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. • Ground short circuit of harness between the ECM and accelerator pedal position sensor connectors. • Poor contact of coupling 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. 4 — Chassis ground:*** ***(B315) No. 6 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair poor contact in 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 of coupling connector

EH:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-229, 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)-43, 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)-80, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).> NOTE: The barometric pressure sensor is built into the ECM.

EI: DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-230, 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)-43, 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)-80, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).> NOTE: The barometric pressure sensor is built into the ECM.

EJ: DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H6DO)-231, 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)-43, 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)-80, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H6DO)-33, Engine Control Module (ECM).> NOTE: The barometric pressure sensor is built into the ECM.

20.General Diagnostic Table

A: INSPECTION

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H6DO)-80, Engine Trouble in General.>

Symptom	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 9) Fuel pump and fuel pump relay

Symptom	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 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 burning in exhaust system	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil and ignitor assembly 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

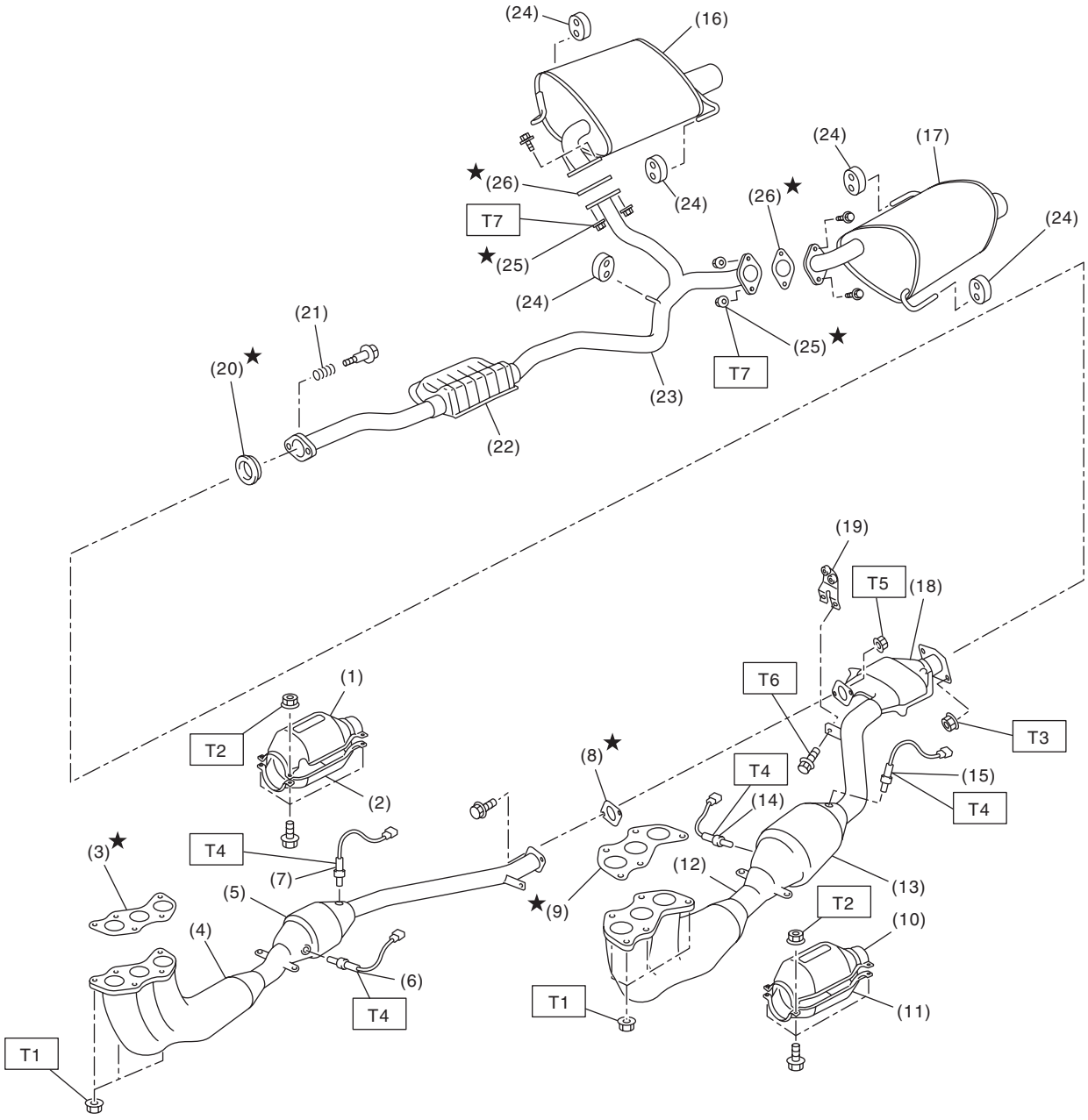
GD(H6DO)

Page

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

1. General Description

A: COMPONENT



EX-02175

(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:	*70 (7.1, 51.6)*
T2:	*13 (1.3, 9.4)*
T3:	*18 (1.8, 13.0)*
T4:	*21 (2.1, 15.2)*
T5:	*30 (3.1, 22.4)*
T6:	*35 (3.6, 26.0)*
T7:	*48 (4.9, 35.4)*

B: CAUTION

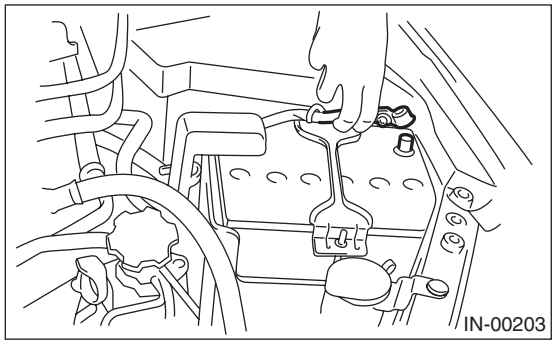
• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal,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

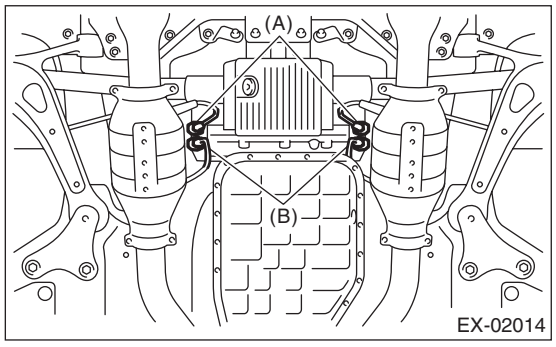
A: REMOVAL

CAUTION:
Be careful not to burn yourself, because the exhaust pipe becomes extremely hot after running.

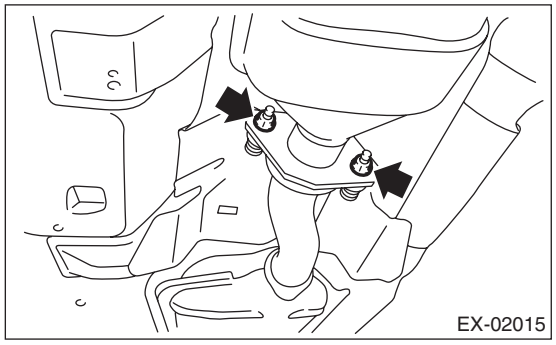
1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.



3) Lift up the vehicle.
4) Remove the under cover.
5) Remove the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B).

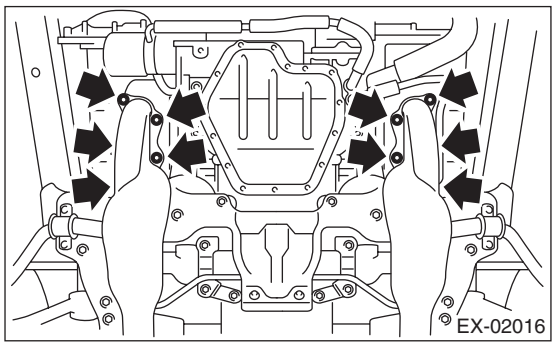


6) Separate the front exhaust pipe assembly from the rear exhaust pipe.

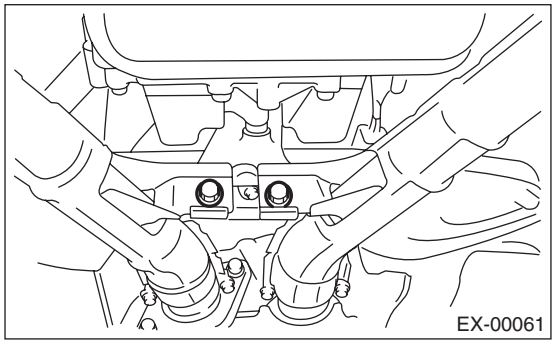


7) Remove the nuts which hold front exhaust pipe assembly onto cylinder heads.

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



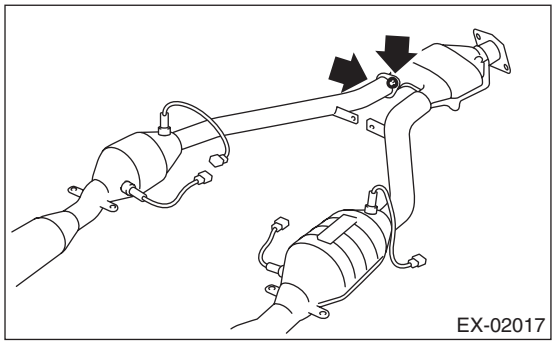
8) Remove the bolts which hold front exhaust pipe assembly to hanger bracket.



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.



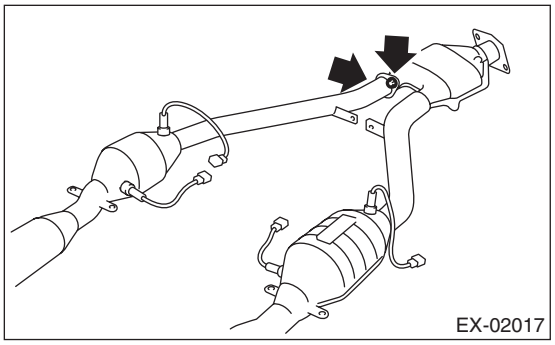
11) Remove the front oxygen (A/F) sensor and rear oxygen sensor. <Ref. to FU(H6DO)-29, REMOVAL, Front Oxygen (A/F) Sensor.> <Ref. to FU(H6DO)-31, REMOVAL, Rear Oxygen Sensor.>

B: INSTALLATION

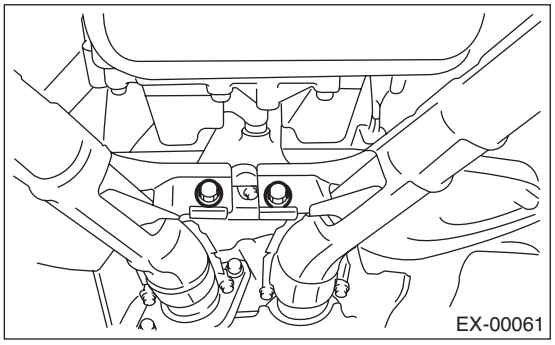
1) Install the front oxygen (A/F) sensor and rear oxygen sensor. <Ref. to FU(H6DO)-30, INSTALLATION, Front Oxygen (A/F) Sensor.> <Ref. to FU(H6DO)-32, INSTALLATION, Rear Oxygen Sensor.>
2) Install the front exhaust pipe (RH) to front exhaust pipe (LH).

NOTE:
Use a new gasket.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



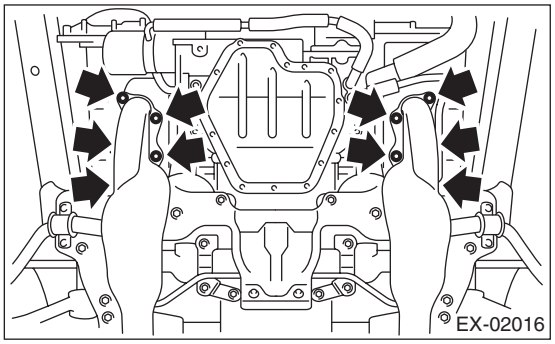
3) Install the front exhaust pipe assembly to vehicle.
4) Temporarily tighten the bolts which hold front exhaust pipe assembly to hanger bracket.



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

NOTE:
Use a new gasket.

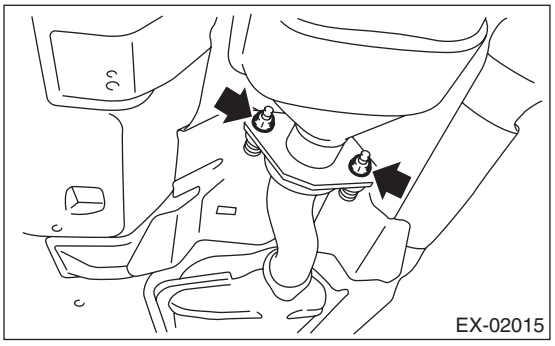
Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)



6) Install the under cover.
7) Tighten the bolts which install front exhaust pipe to rear exhaust pipe.

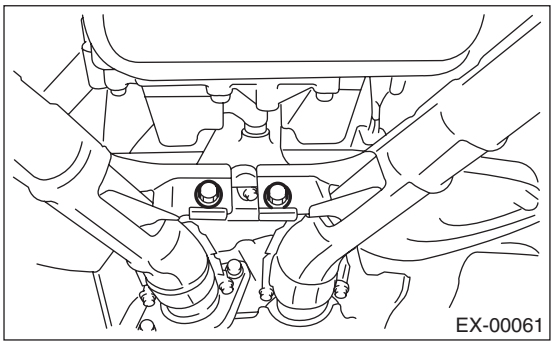
NOTE:
Use a new gasket.

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

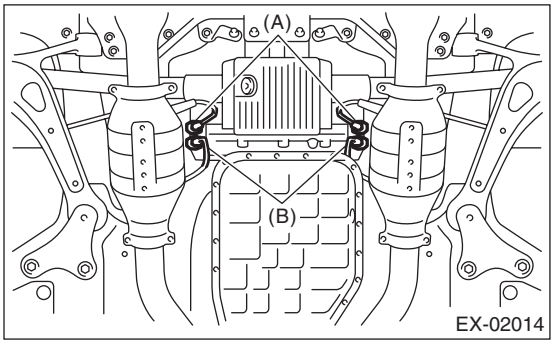


8) Tighten the bolts which hold front exhaust pipe assembly to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

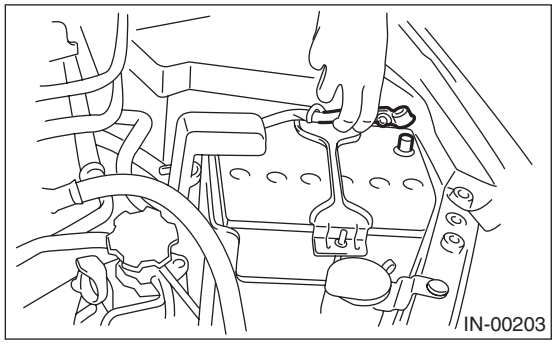


9) Connect the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B).



10) Lower the vehicle.

11) Connect the battery ground cable to battery.



C: INSPECTION

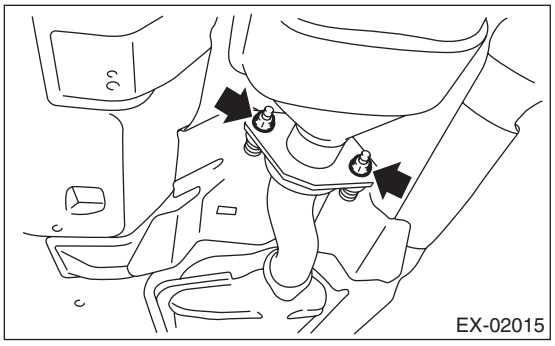
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.

3. Rear Exhaust Pipe

A: REMOVAL

CAUTION:
Be careful not to burn yourself, because the exhaust pipe becomes extremely hot after running.

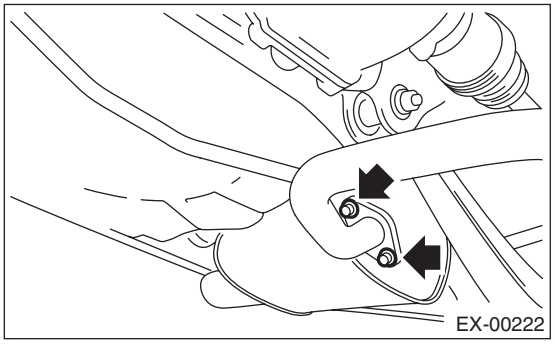
1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Separate the rear exhaust pipe from front exhaust pipe assembly.



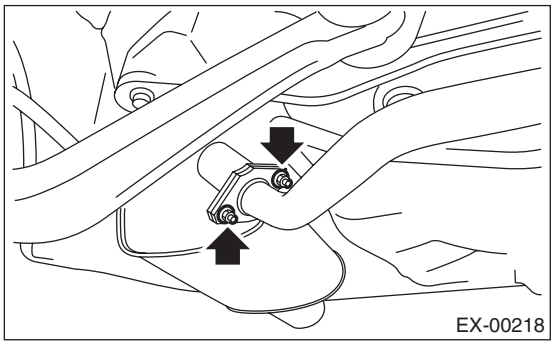
4) Separate the rear exhaust pipe from muffler.

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

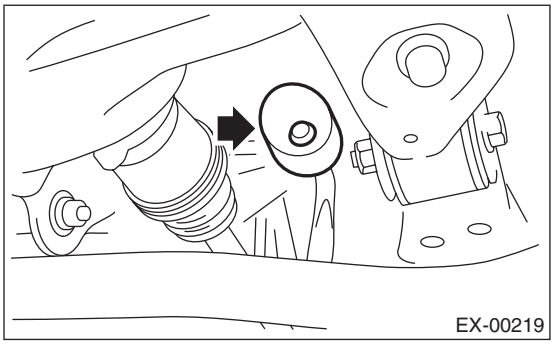
- LH side



- RH side



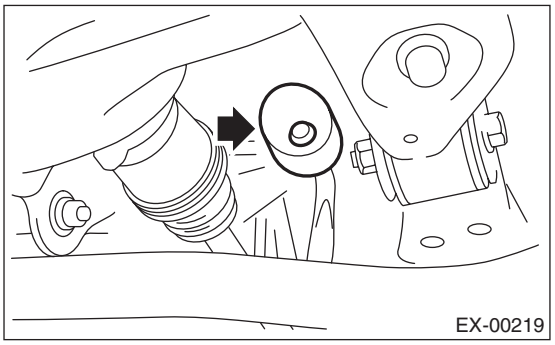
5) Apply a coat of spray type lubricant to the mating area of cushion rubber.
6) Remove the rear exhaust pipe bracket from cushion rubber.



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.

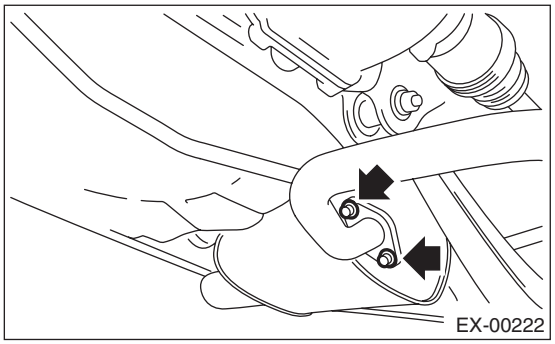


3) Install the rear exhaust pipe to muffler.

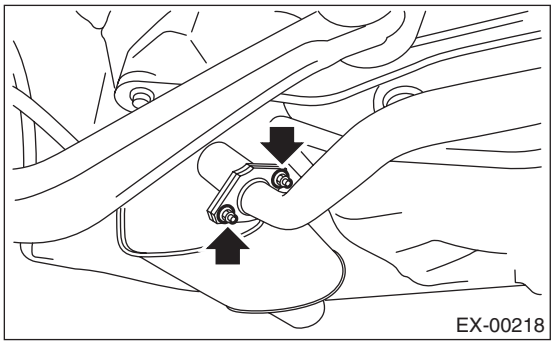
NOTE:
Use a new gasket and self-locking nut.

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

- LH side



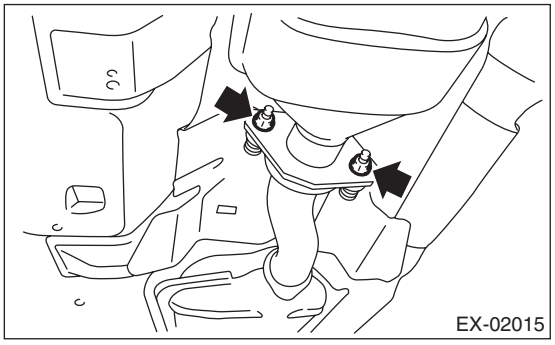
- RH side



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

NOTE:
Use a new gasket.

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



C: INSPECTION

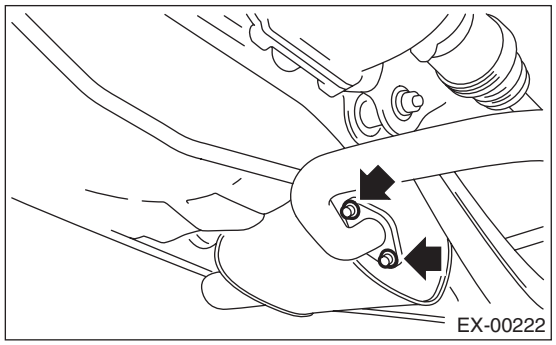
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.
3) Check the cushion rubber for wear or crack.

4. Muffler

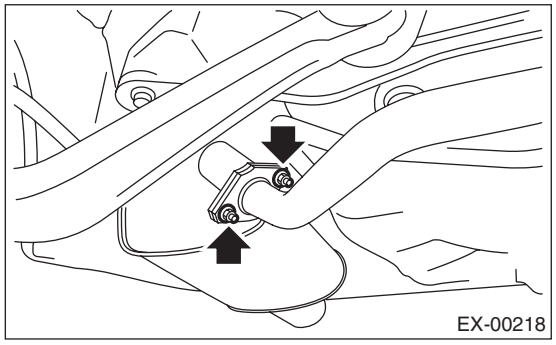
A: REMOVAL

CAUTION:
Be careful not to burn yourself, because the exhaust pipe becomes extremely hot after running.

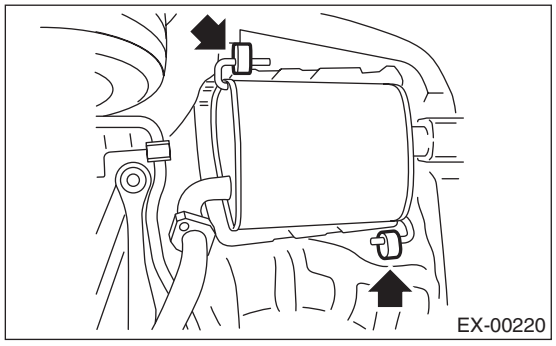
1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Separate the muffler from rear exhaust pipe.
- LH side



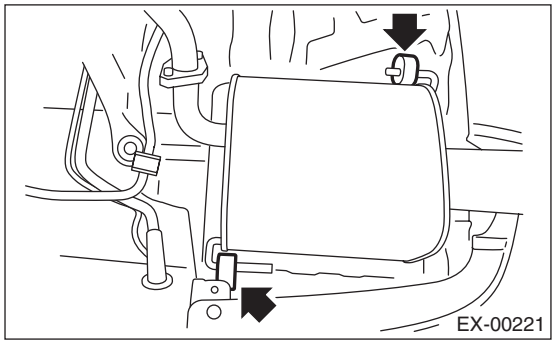
- RH side



4) Apply a coat of spray type lubricant to the mating area of cushion rubber.
- LH side



- RH side



5) Remove the front and rear cushion rubber, and then remove the muffler.

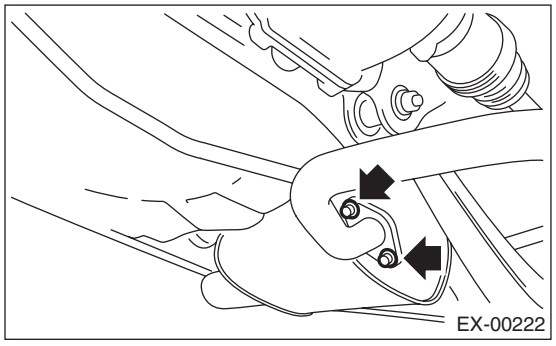
B: INSTALLATION

Install in the reverse order of removal.

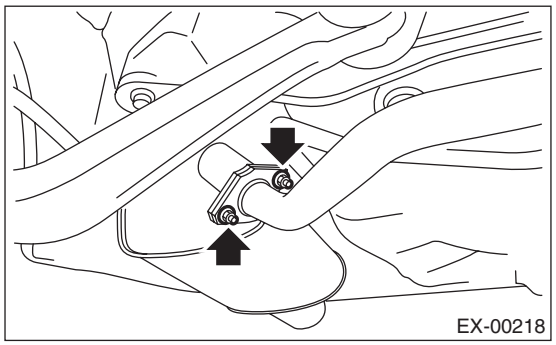
NOTE:
- Use a new gasket and self-locking nut.
- After assembling, degrease the lubricant which was applied to the cushion rubber while removing/installing.

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	7
3.	Engine Coolant	10
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6.	Radiator	15
7.	Radiator Cap	18
8.	Radiator Main Fan and Fan Motor	19
9.	Radiator Sub Fan and Fan Motor	22
10.	Reservoir Tank	24
11.	Radiator Fan Control Unit	25
12.	Engine Cooling System Trouble in General	26

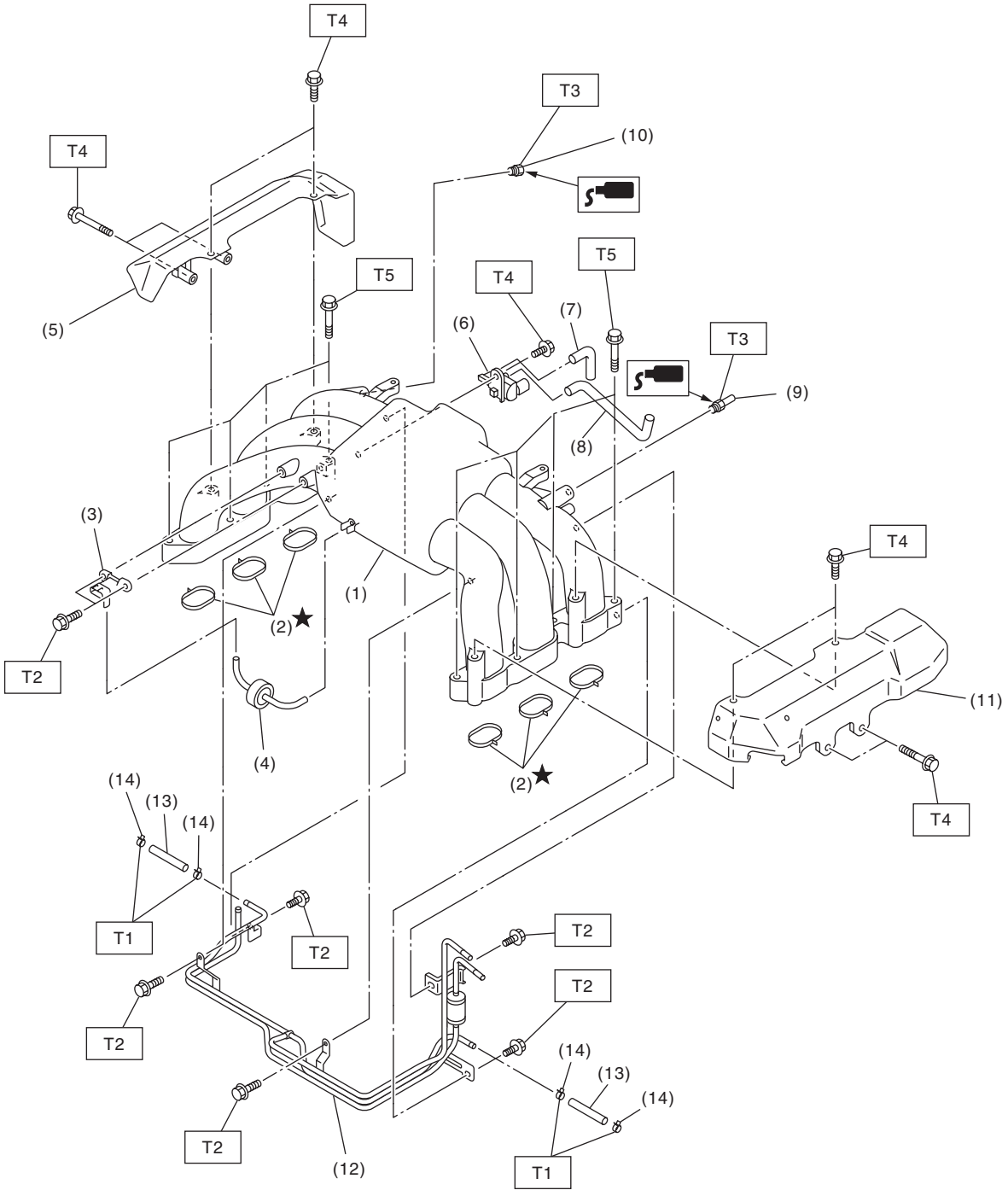
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	550 — 850 kPa (5.61 — 8.67 kg/cm^2, 79.8 — 123.3 psi)
	Discharge rate	125 ℓ (33 US gal, 27.5 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

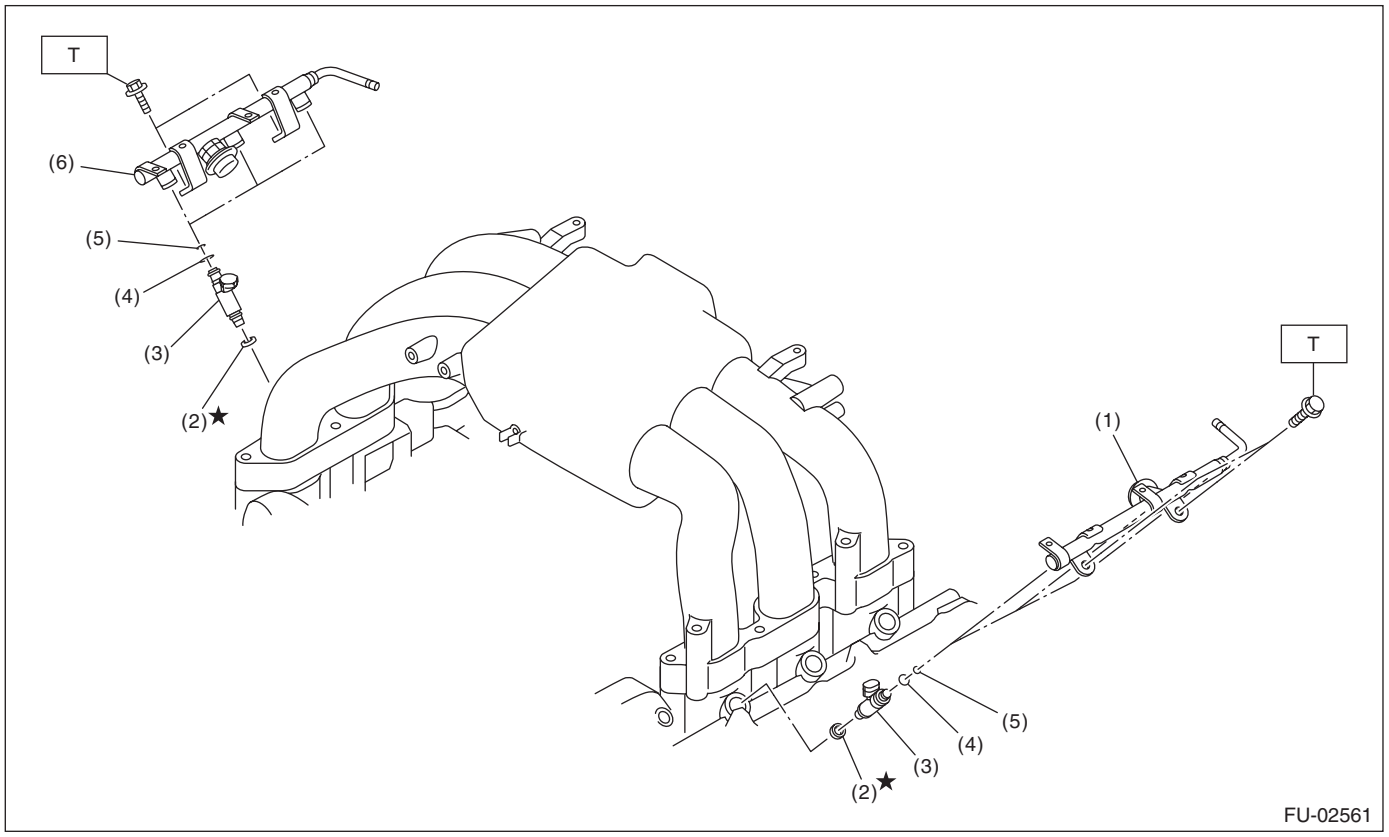


FU-02706

(1) Intake manifold
(2) O-ring
(3) Manifold absolute pressure sensor
(4) Filter
(5) Fuel pipe protector RH
(6) Purge control solenoid valve
(7) Hose
(8) Hose
(9) Nipple
(10) Plug
(11) Fuel pipe protector LH
(12) Fuel pipe ASSY
(13) Hose
(14) Clamp

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.5 (0.15, 1.1)
T2: 6.4 (0.65, 4.7)
T3: 17 (1.7, 12.5)
T4: 19 (1.9, 14)
T5: 25 (2.5, 18)

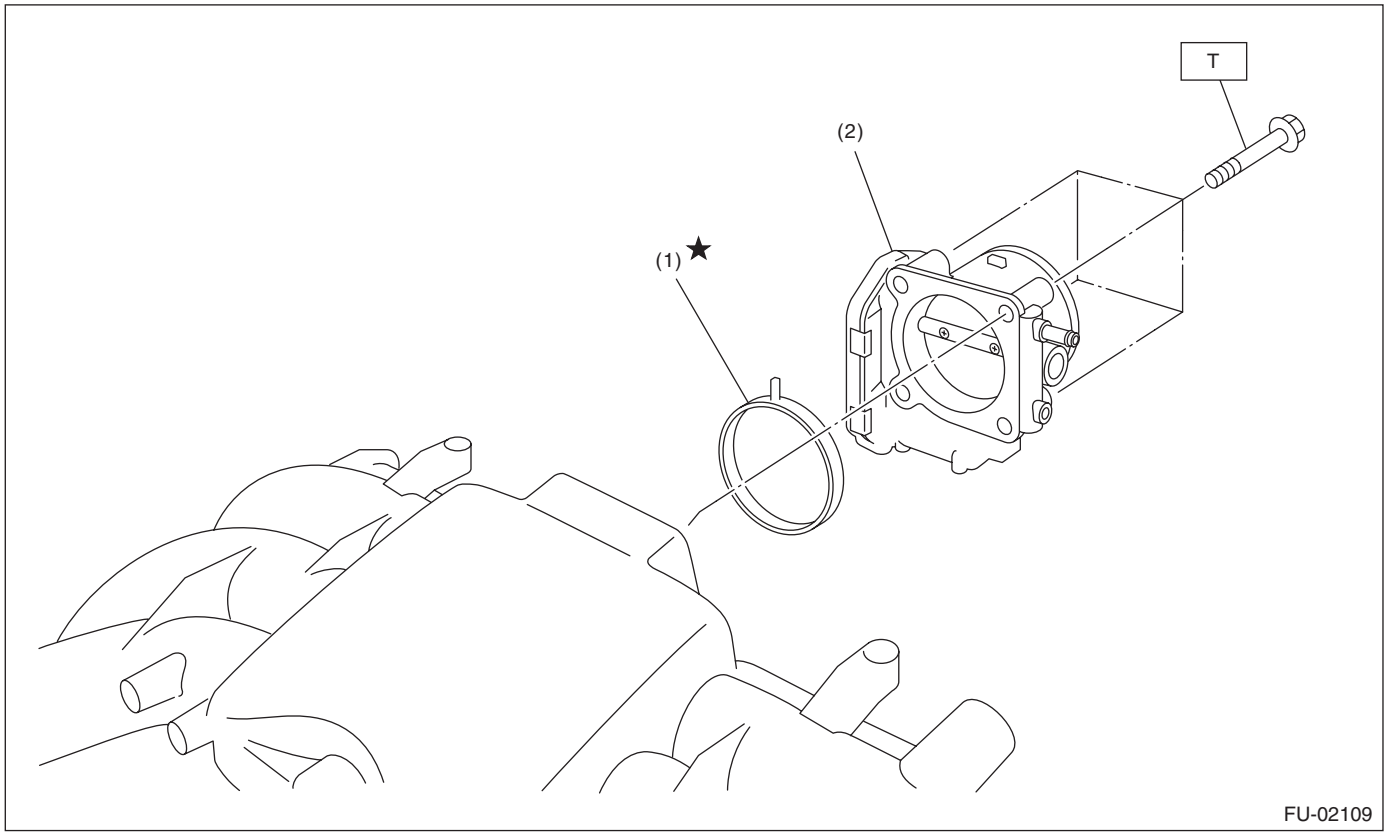
2. FUEL INJECTOR



(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)

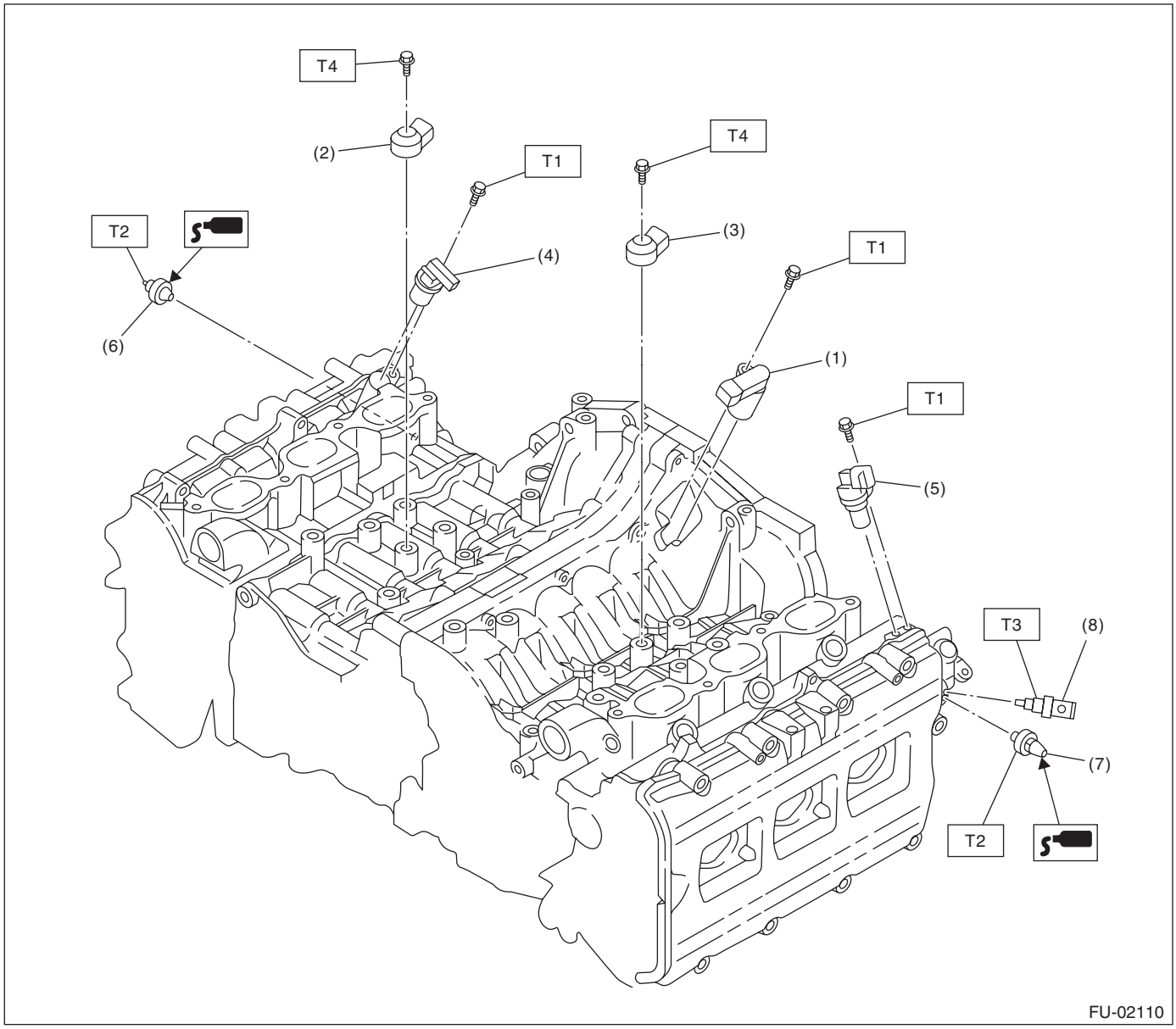
3. AIR INTAKE SYSTEM



(1) O-ring
(2) Throttle body

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

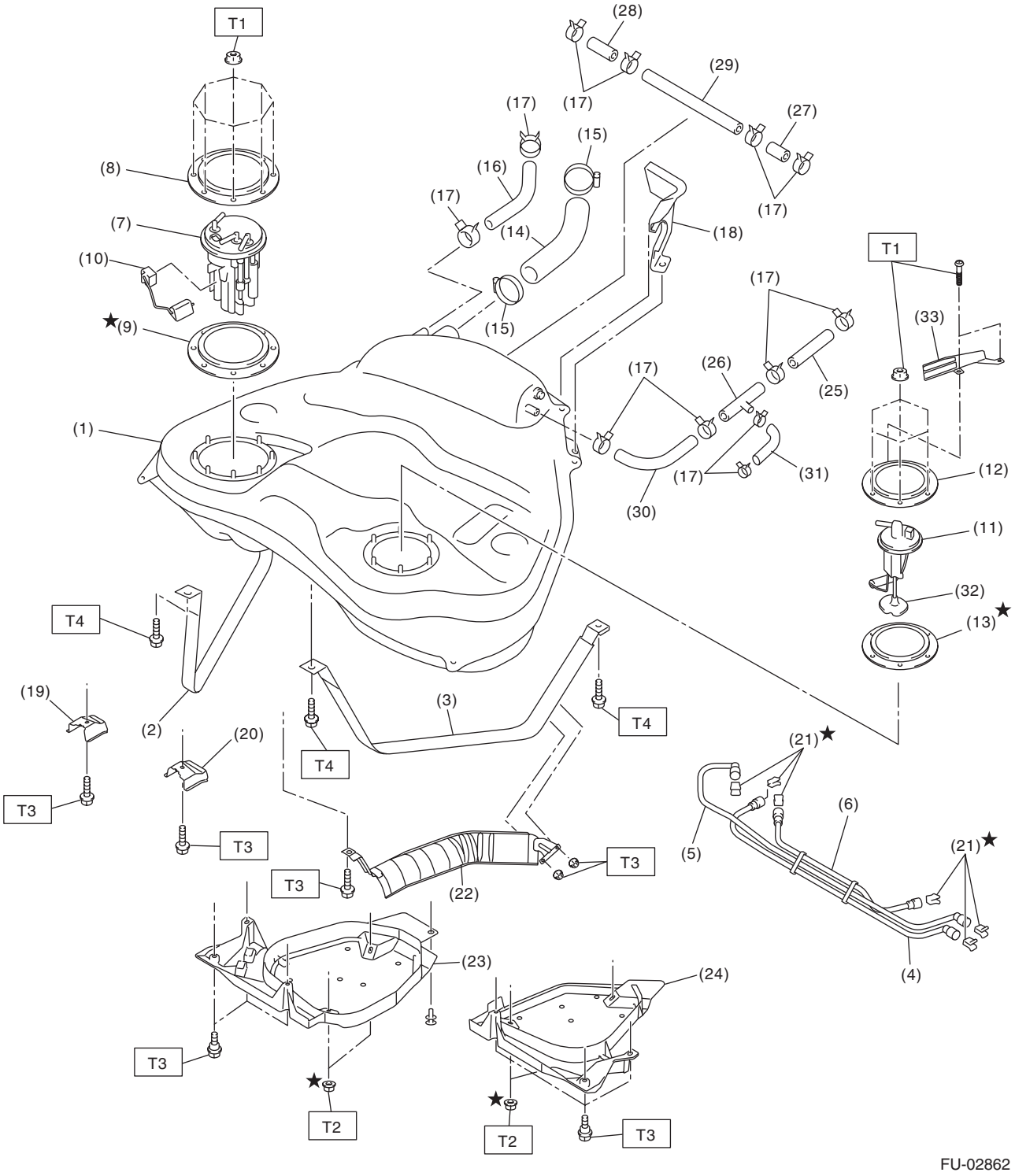
4. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor RH
(3) Knock sensor LH
(4) Camshaft position sensor RH
(5) Camshaft position sensor LH
(6) Variable valve lift diagnosis oil pressure switch RH
(7) Variable valve lift diagnosis oil pressure switch LH
(8) Oil temperature sensor

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 17 (1.7, 12.5)
T3: 18 (1.8, 13.3)
T4: 25 (2.5, 18)

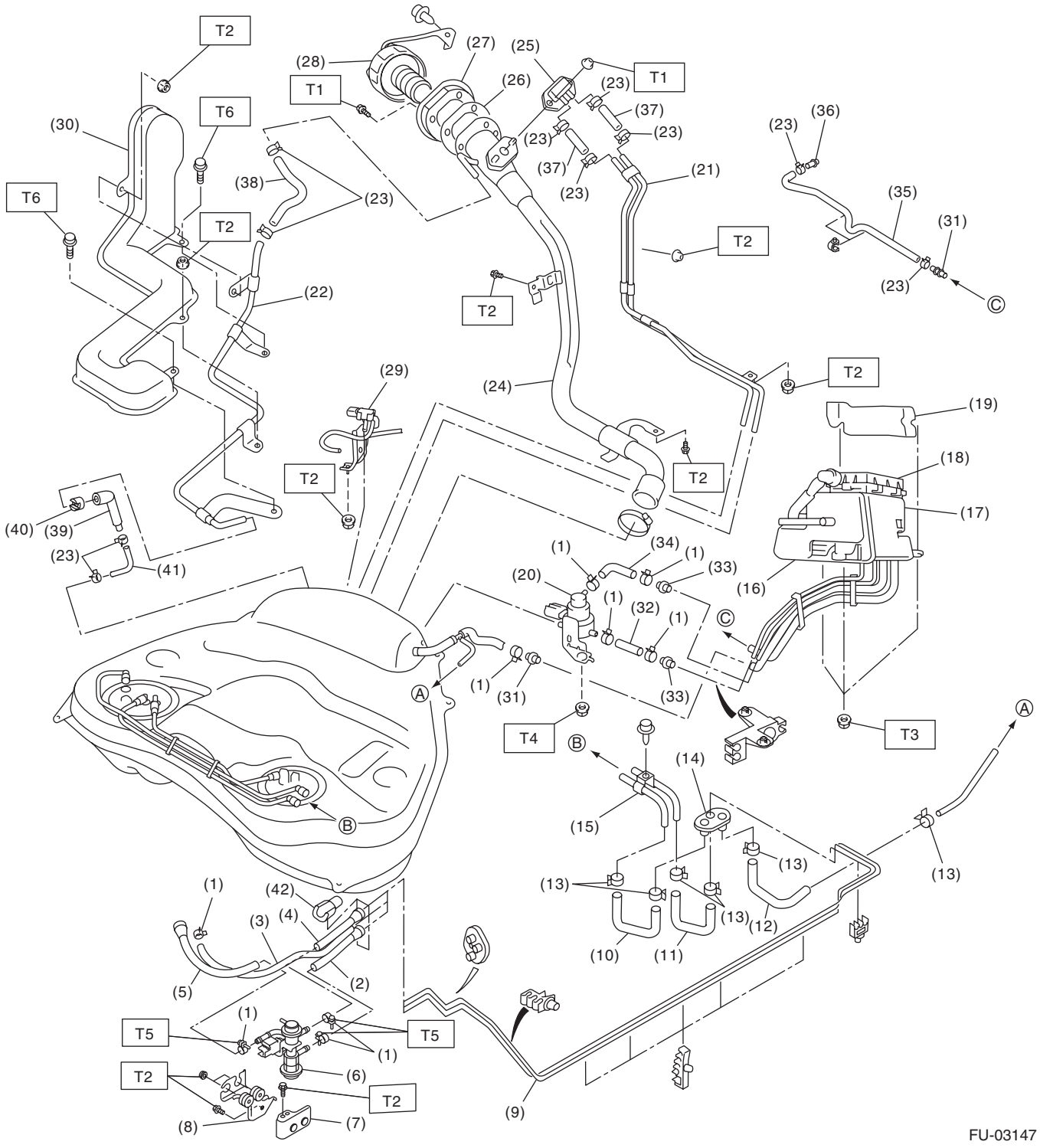
5. FUEL TANK


T1
(28)
(29)
(17)
(17)
(27)
(15)
(16)
(17)
(8)
(17)
(14)
(18)
(7)
(10)
★(9)
(15)
T1
(17)
(33)
(26)
(17)
(25)
(1)
(17)
(31)
(12)
(30)
(11)
(32)
T4
(13)★
(19)
(3)
(2)
(20)
T4
T4
(21)★
T3
(6)
T3
T3
(22)
(5)
(21)★
(23)
(24)
T3
★
★
T2
T2
T3
(4)
FU-02862

(1) Fuel tank
(2) Fuel tank band RH
(3) Fuel tank band LH
(4) Delivery tube
(5) Return tube
(6) Jet pump tube
(7) Fuel pump ASSY
(8) Fuel pump upper plate
(9) Fuel pump gasket
(10) Fuel level sensor
(11) Fuel sub level sensor
(12) Fuel sub level sensor upper plate
(13) Fuel sub level sensor gasket
(14) Fuel filler hose
(15) Clamp
(16) Evaporation hose A
(17) Clip
(18) Fuel tank protector LH (Rear)
(19) Stopper RH
(20) Stopper LH
(21) Retainer
(22) Heat shield cover
(23) Fuel tank protector RH (Front)
(24) Fuel tank protector LH (Front)
(25) Evaporation hose B
(26) Connector
(27) Evaporation hose C
(28) Evaporation hose D
(29) Evaporation pipe
(30) Evaporation hose E
(31) Evaporation hose F
(32) Fuel sub level sensor filter
(33) Fuel sub level sensor protector

Tightening torque:N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.2)
T2: 9 (0.9, 6.6)
T3: 17.5 (1.78, 12.9)
T4: 33 (3.4, 24.3)

6. FUEL LINE


T2
(28)
(27)
(25)
T1
T1
(26)
(23)
T1
(37)
(30)
T6
(23)
(23)
(23)
(36)
(23)
(37)
(23)
(21)
(38)
(23)
(35)
T6
T2
T2
(31)
(22)
(23)
T2
T2
(29)
(24)
T2
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T2
T2
(18)
(40)
(39)
(17)
(23)
(41)
(1)
(34)
(1)
(33)
(20)
(1)
(32)
(1)
(16)
(1)
(31)
(33)
T4
T3
(14)
(15)
(13)
(13)
(13)
(13)
(12)
(10)
(11)
(1)
(42)
(3)
(4)
(2)
(5)
(1)
T5
T5
(1)
T2
(6)
T2
(8)
(7)
(9)
FU-03147

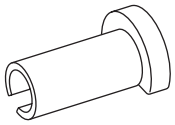
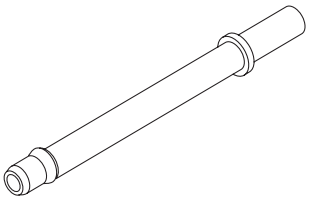
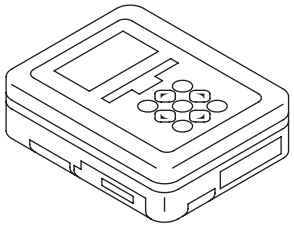
(1) Clip
(2) Fuel return hose A
(3) Evaporation hose A
(4) Fuel delivery hose A
(5) Fuel delivery hose B
(6) Fuel by-pass valve
(7) Bracket
(8) Bracket
(9) Fuel pipe ASSY A
(10) Fuel delivery hose C
(11) Fuel return hose B
(12) Evaporation hose B
(13) Clamp
(14) Grommet
(15) Fuel pipe ASSY B
(16) Canister
(17) Drain valve
(18) Drain filter
(19) Canister protector
(20) Pressure control solenoid valve
(21) Evaporation pipe A
(22) Evaporation pipe B
(23) Clip
(24) Fuel filler pipe
(25) Shut valve
(26) Gasket
(27) Filler ring
(28) Fuel filler cap
(29) Fuel tank pressure sensor
(30) Evaporation pipe protector
(31) Connector A
(32) Canister hose A
(33) Connector B
(34) Canister hose B
(35) Drain hose
(36) Drain hose connector
(37) Evaporation hose C
(38) Evaporation hose D
(39) Evaporation tube
(40) Retainer
(41) Evaporation hose E
(42) Quick connector check cover

Tightening torque:N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.2)
T2: 7.5 (0.76, 5.5)
T3: 8 (0.8, 5.9)
T4: 17.6 (1.8, 13)
T5: 1.25 (0.13, 0.94)
T6: 1.0 (0.1, 0.7)

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.

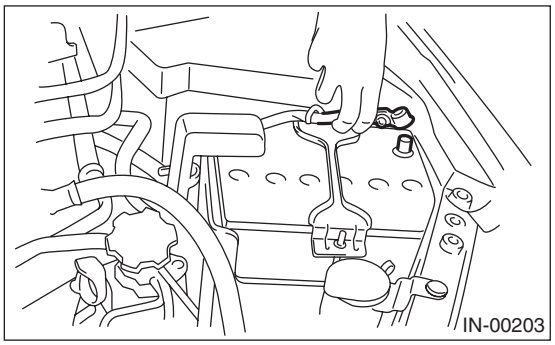
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for disconnecting quick connector of the engine compartment.
 ST18471AA000	18471AA000	FUEL PIPE ADAPTER	Used for draining fuel.
 ST1B021XU0	1B021XU0	SUBARU SELECT MONITOR III KIT	Used for draining fuel.

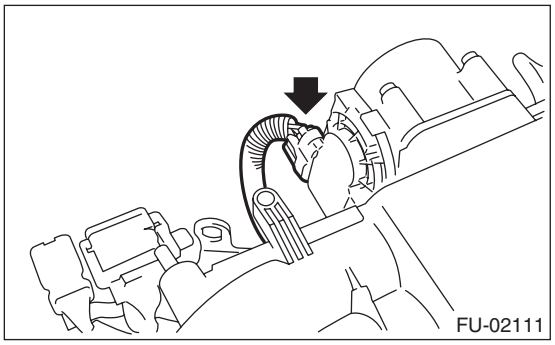
2. Throttle Body

A: REMOVAL

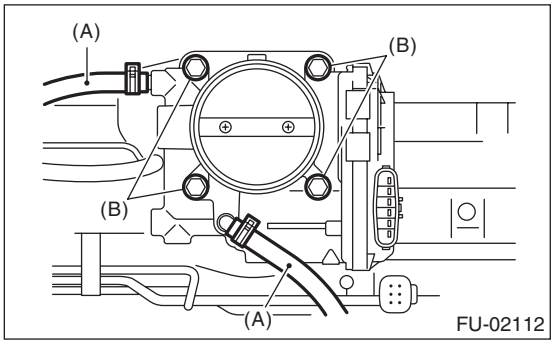
1) Remove the collector cover.
2) Disconnect the ground cable from the battery.



3) Remove the air intake chamber. <Ref. to IN(H6DO)-6, 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.

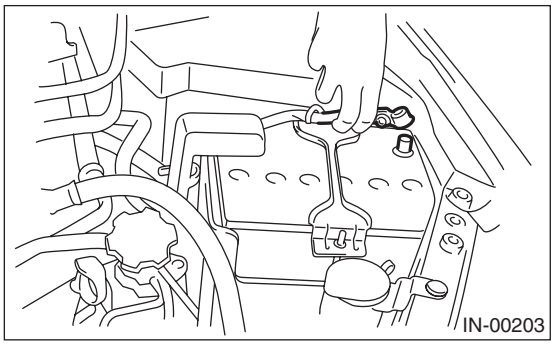
NOTE:
Use new O-rings.

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

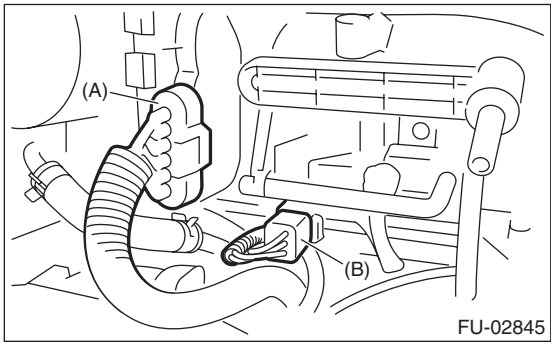
3. Intake Manifold

A: REMOVAL

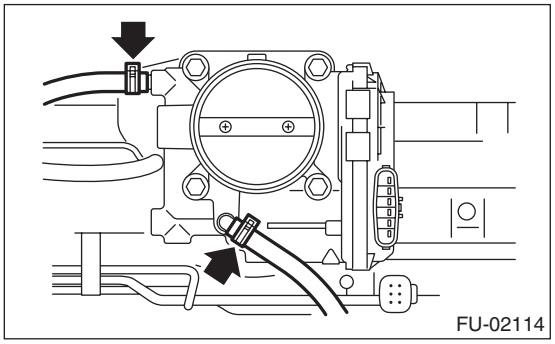
1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Disconnect the ground cable from the battery.



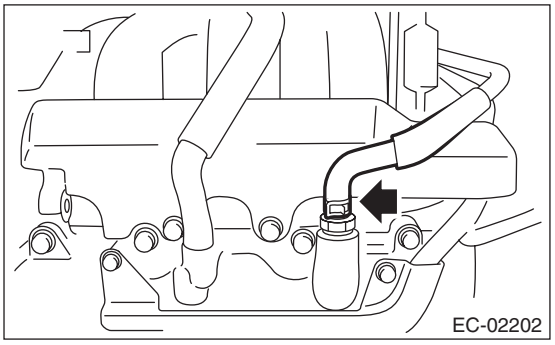
5) Remove the air cleaner case and air intake chamber. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
6) Disconnect the connector (A) from the throttle body.
7) Disconnect the engine harness connector (B).



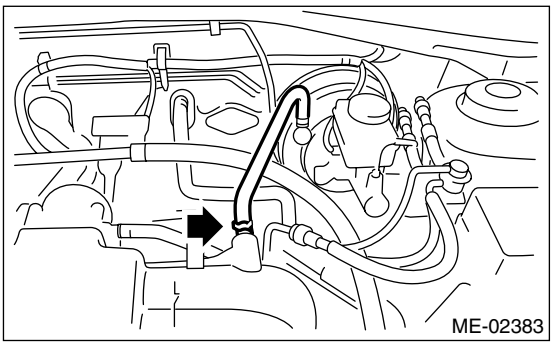
8) Disconnect the engine coolant hose from throttle body.



9) Disconnect the PCV hose.

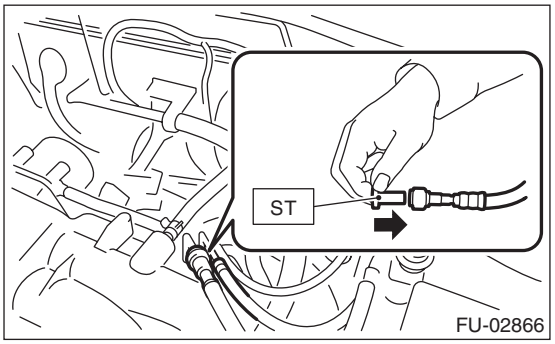


10) Disconnect the brake booster hose.

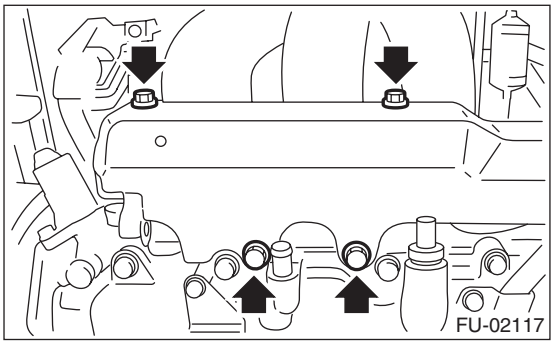


11) Disconnect the fuel hoses from the fuel pipe.
(1) Disconnect the connector of fuel pipe by pushing the ST in the direction of arrow.
ST 42099AE000 CONNECTOR REMOVER
(2) Remove the clip and disconnect the evaporation hose from the pipe.

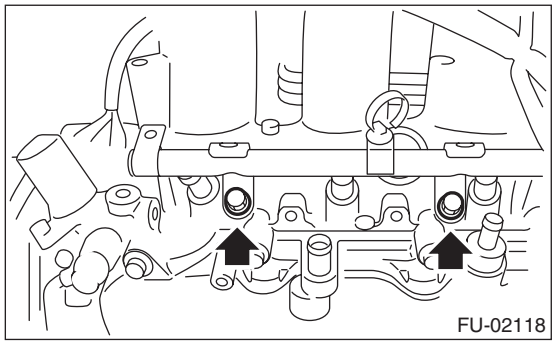
CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**



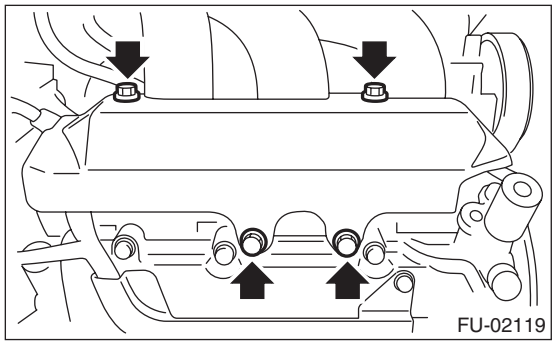
12) Remove the fuel pipe protector LH.



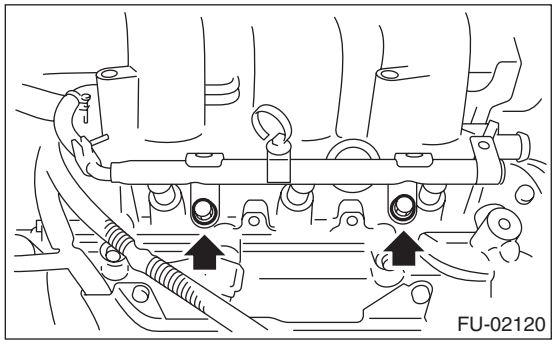
13) Remove the engine harness from the fuel injector pipe LH.
14) Remove the bolts which hold fuel injector pipe LH to cylinder head.



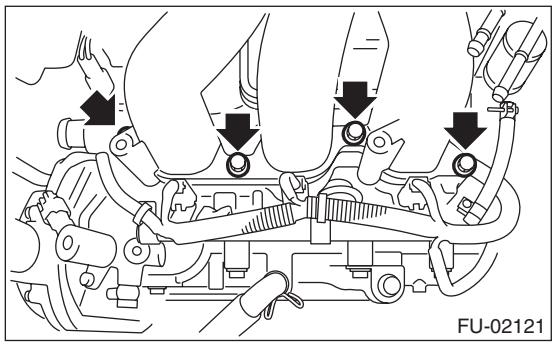
15) Remove the fuel pipe protector RH.



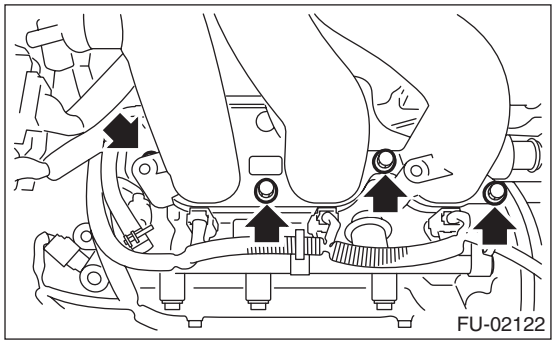
16) Remove the engine harness from the fuel injector pipe RH.
17) Remove the bolts which hold the fuel injector pipe RH to the cylinder head.



18) Remove the bolts which hold the intake manifold to the cylinder head.
- LH side



- RH side



19) Remove the intake manifold.

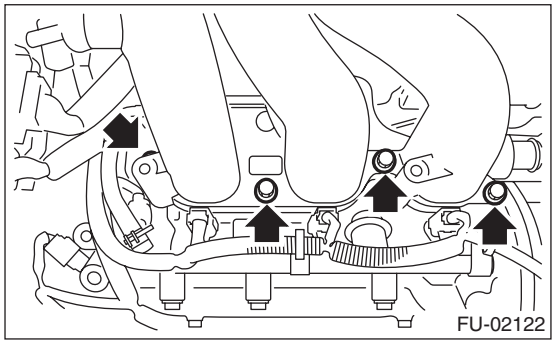
B: INSTALLATION

1) Install the intake manifold onto cylinder heads.

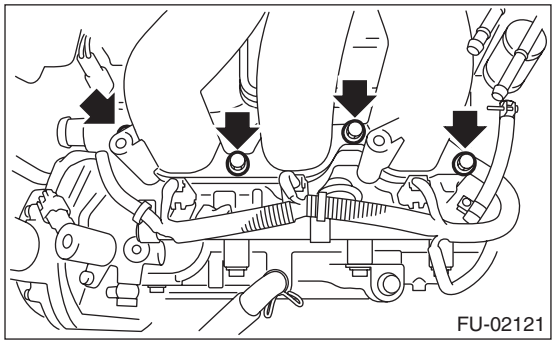
NOTE:
Use new O-rings.

Tightening torque:
25 N·m (2.5 kgf-m, 18 ft-lb)

- RH side

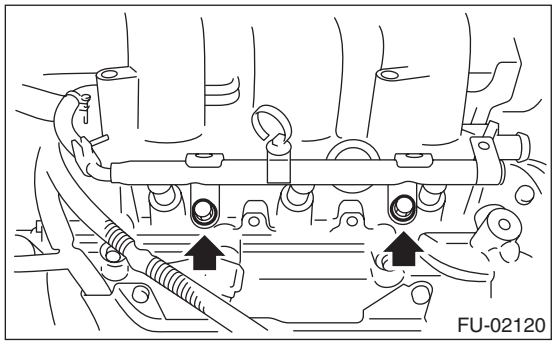


- LH side



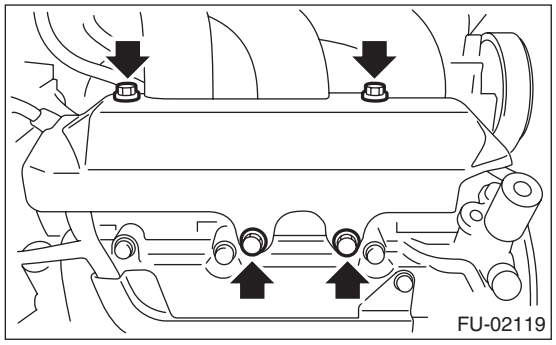
2) Install the bolts which hold fuel injector pipe RH to cylinder head.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



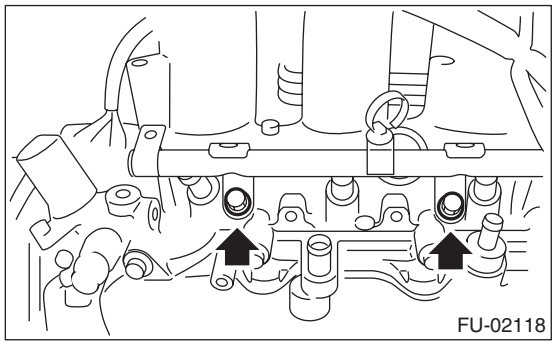
3) Install the engine harness to fuel injector pipe RH.
4) Install the fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



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

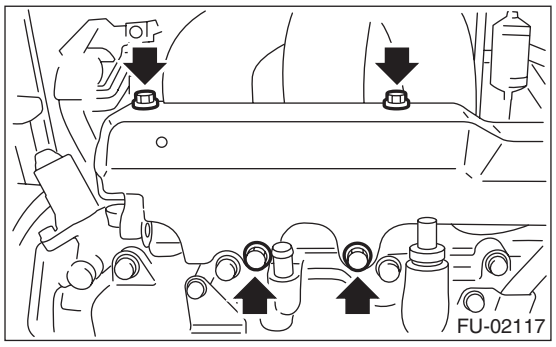
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



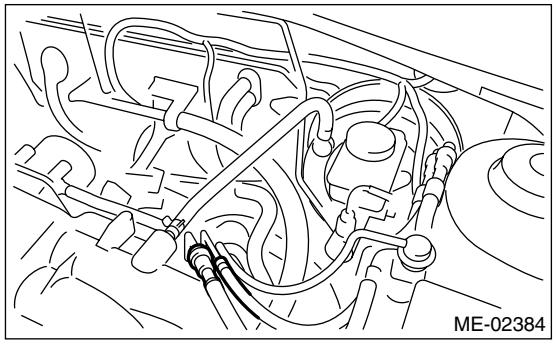
6) Install the engine harness to fuel injector pipe LH.

7) Install the fuel pipe protector LH.

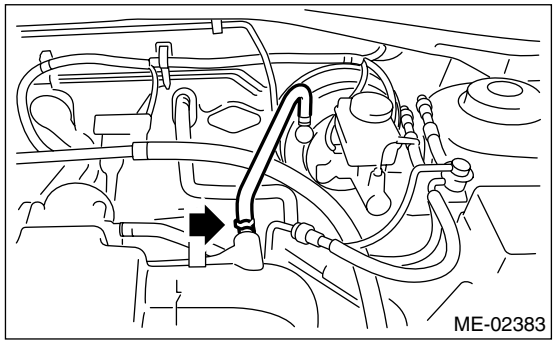
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



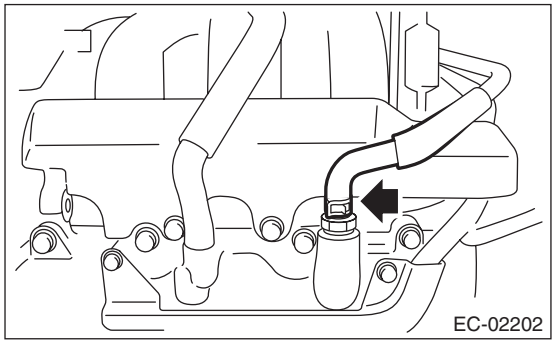
8) Connect the fuel hoses to fuel pipe.



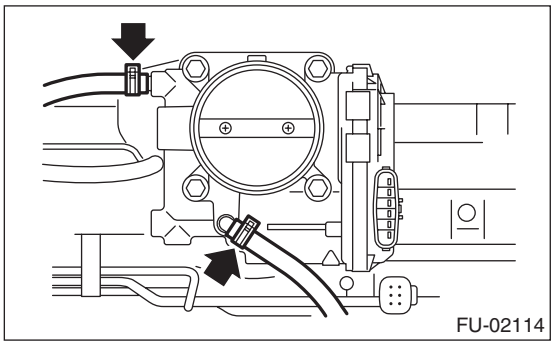
9) Connect the brake booster hose.



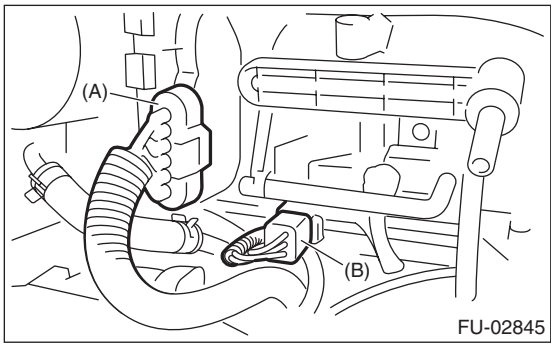
10) Connect the PCV hose.



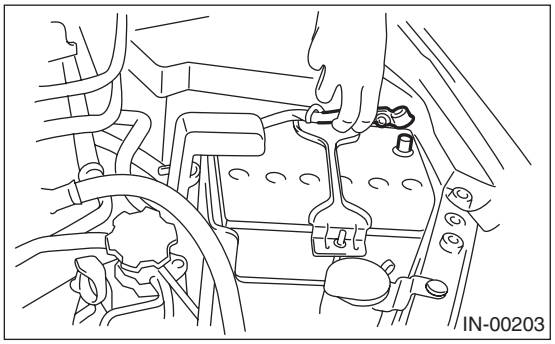
11) Connect the engine coolant hoses to throttle body.



12) Connect the connector (A) to throttle body.
13) Connect the engine harness connector (B).



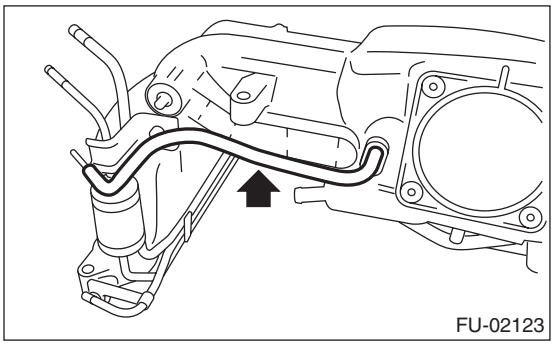
14) Install the air cleaner case and air intake chamber. <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
15) Install the fuse of fuel pump to the main fuse box.
16) Connect the battery ground cable to battery.



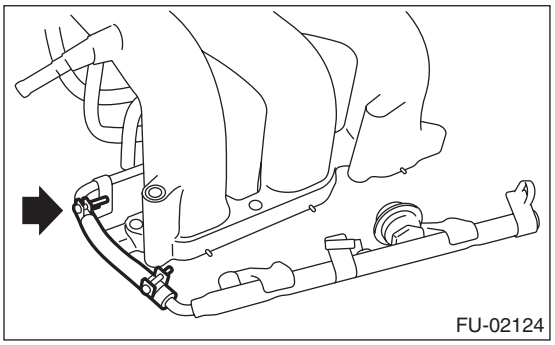
17) Install the collector cover.

C: DISASSEMBLY

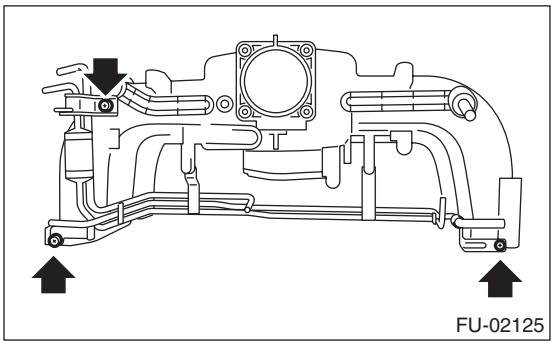
1) Remove the engine harness from intake manifold.
2) Remove the throttle body. <Ref. to FU(H6DO)-12, REMOVAL, Throttle Body.>
3) Remove the pressure regulator vacuum hose from the intake manifold.

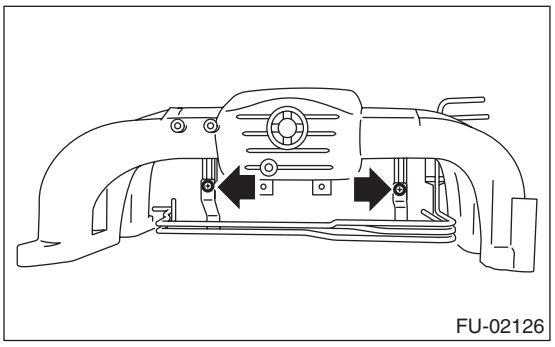


4) Remove the manifold absolute pressure sensor. <Ref. to FU(H6DO)-23, REMOVAL, Manifold Absolute Pressure Sensor.>
5) Remove the purge control solenoid valve. <Ref. to EC(H6DO)-6, REMOVAL, Purge Control Solenoid Valve.>
6) Loosen the clamp which holds fuel injector pipe to the fuel hose, and then disconnect the pipe from fuel hose.



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





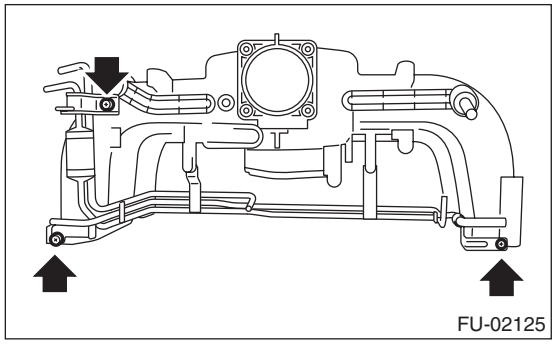
D: ASSEMBLY

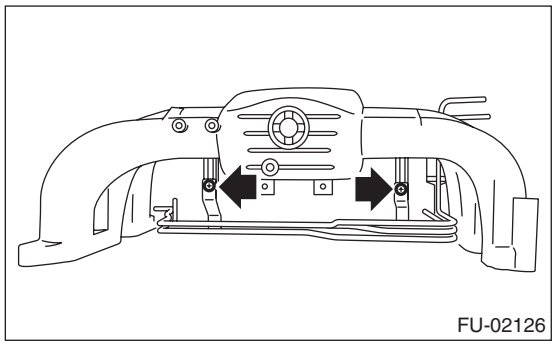
NOTE:
When assembling the nipple, apply liquid gasket.

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

1) Tighten the bolts which install fuel pipes on intake manifold.

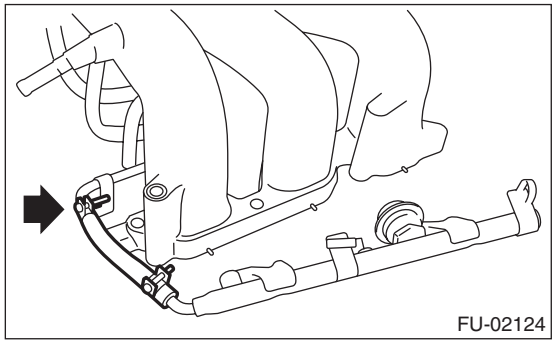
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


FU-02125

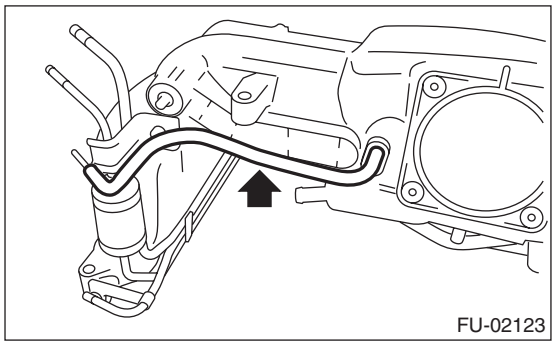

FU-02126

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

Tightening torque:
1.5 N·m (0.15 kgf-m, 1.1 ft-lb)


FU-02124

3) Install the purge control solenoid valve. <Ref. to EC(H6DO)-6, INSTALLATION, Purge Control Solenoid Valve.>
4) Install the manifold absolute pressure sensor. <Ref. to FU(H6DO)-23, INSTALLATION, Manifold Absolute Pressure Sensor.>
5) Connect the pressure regulator vacuum hose to the intake manifold.


FU-02123

6) Install the throttle body to intake manifold. <Ref. to FU(H6DO)-12, INSTALLATION, Throttle Body.>
7) Install the engine harness to the intake manifold.

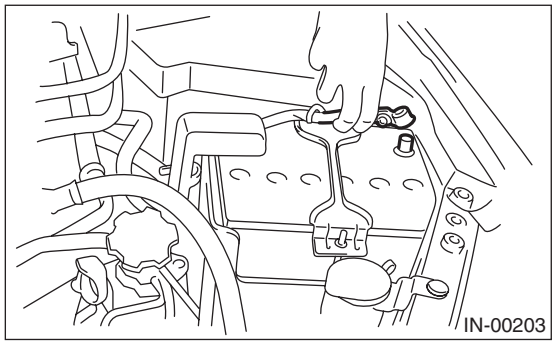
E: INSPECTION

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

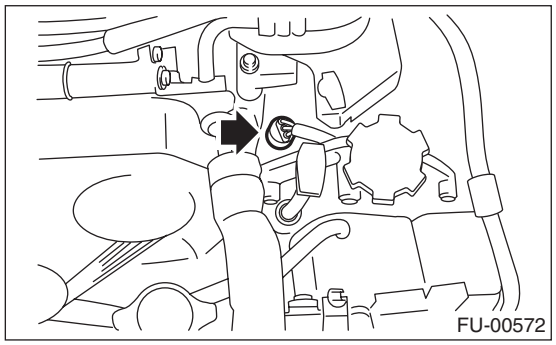
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from the battery.



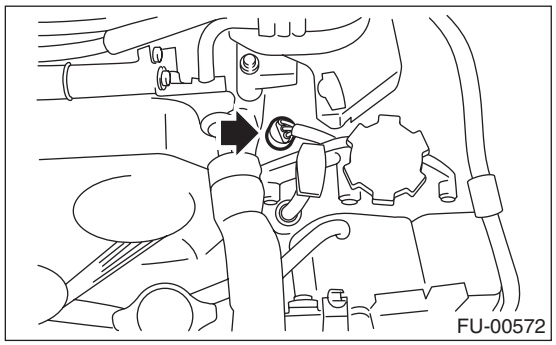
3) Disconnect the connectors from the engine coolant temperature sensor.
4) Remove the engine coolant temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

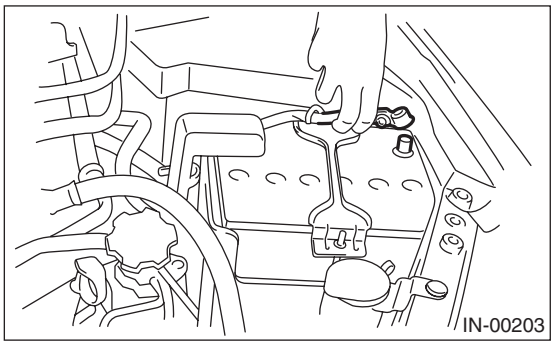
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



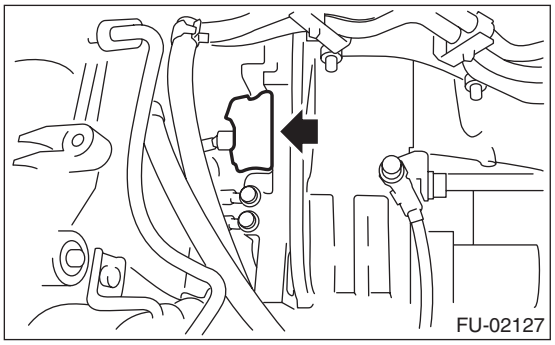
5. Crankshaft Position Sensor

A: REMOVAL

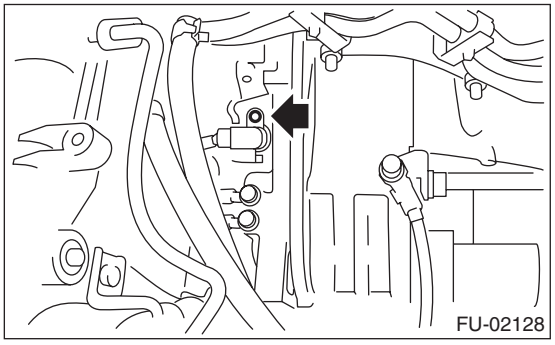
1) Remove the collector cover.
2) Disconnect the ground cable from the battery.



3) Remove the air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
4) Remove the service hole cover.



5) Remove the crankshaft position sensor.

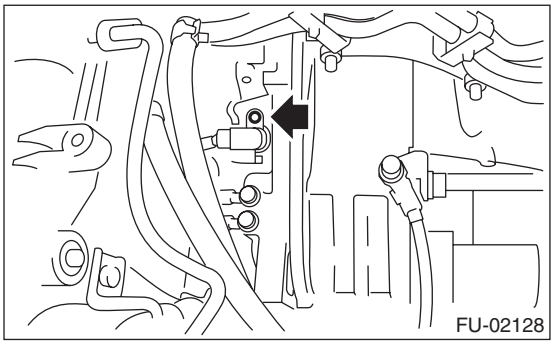


6) Disconnect the connector from crankshaft position sensor.

B: INSTALLATION

Install in the reverse order of removal.

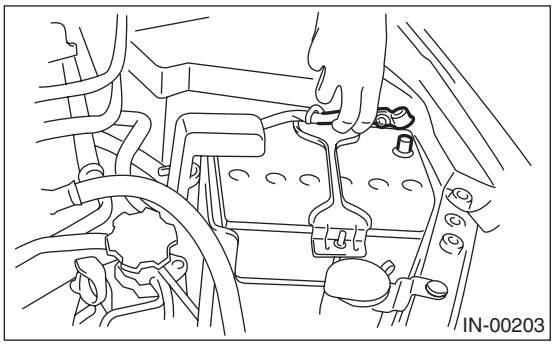
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



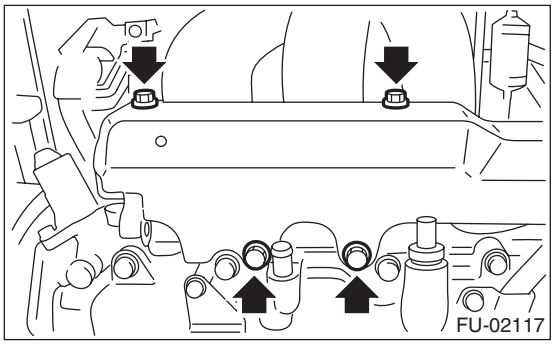
6. Camshaft Position Sensor

A: REMOVAL

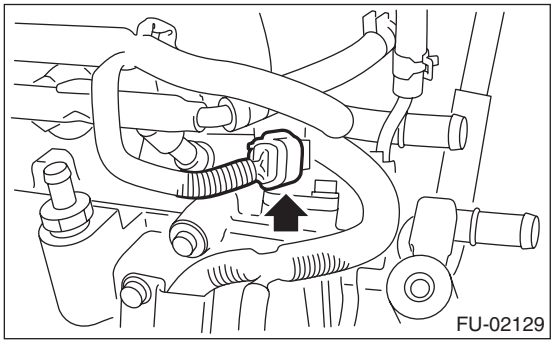
1) Remove the collector cover.
2) Disconnect the ground cable from the battery.



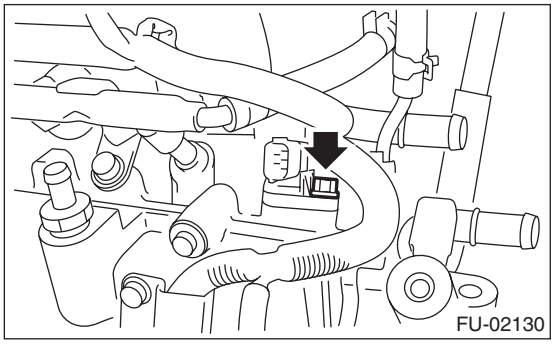
3) Remove the generator harness from the fuel pipe protector LH.
4) Remove the fuel pipe protector LH.



5) Disconnect the connector from camshaft position sensor LH.



6) Remove the camshaft position sensor LH.



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

B: INSTALLATION

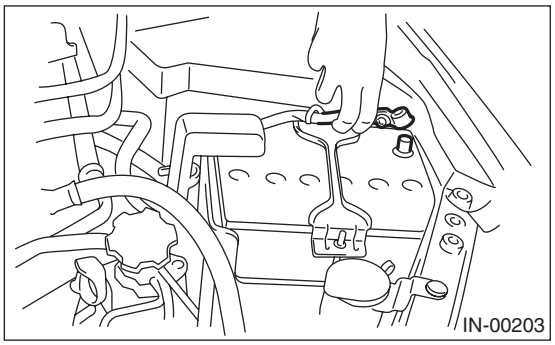
Install in the reverse order of removal.

Tightening torque:
Camshaft position sensor
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
Fuel pipe protector
19 N·m (1.9 kgf-m, 14 ft-lb)

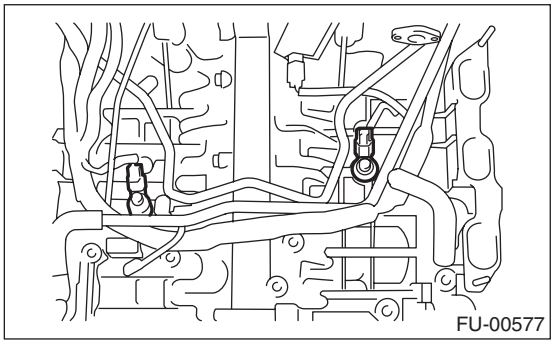
7. Knock Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from the battery.



3) Remove the intake manifold. <Ref. to FU(H6DO)-13, REMOVAL, Intake Manifold.>
4) Disconnect the knock sensor connector.
5) Remove the knock sensor from the cylinder block.

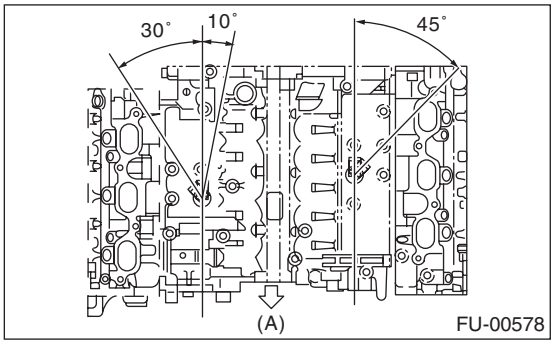


B: INSTALLATION

1) Install the knock sensor to cylinder block.

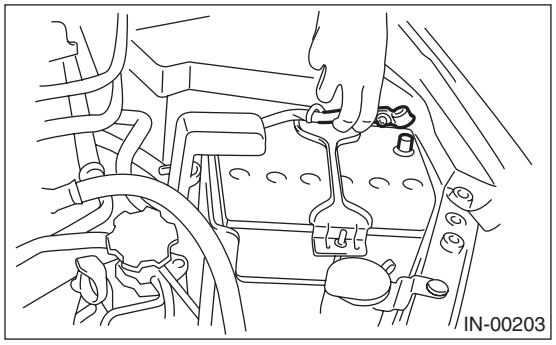
Tightening torque:
25 N·m (2.5 kgf-m, 18 ft-lb)

NOTE:
For the knock sensor installation angle, refer to the figure below.



(A) Front side

2) Connect the knock sensor connector.
3) Install the intake manifold. <Ref. to FU(H6DO)-14, INSTALLATION, Intake Manifold.>
4) Connect the battery ground cable to battery.



5) Install the collector cover.

8. Throttle Position Sensor

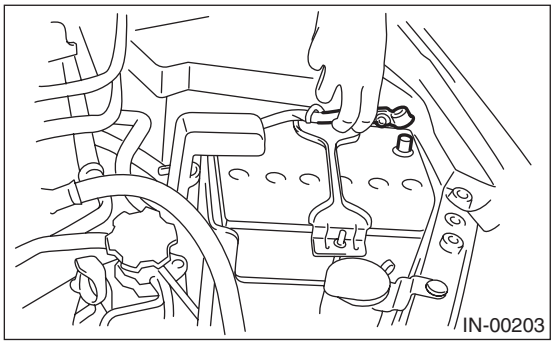
A: SPECIFICATION

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)-12, REMOVAL, Throttle Body.> <Ref. to FU(H6DO)-12, INSTALLATION, Throttle Body.>

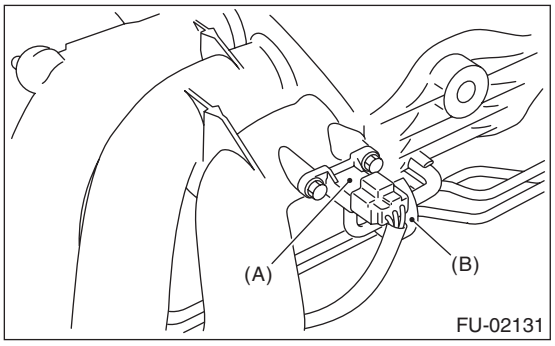
9. Manifold Absolute Pressure Sensor

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

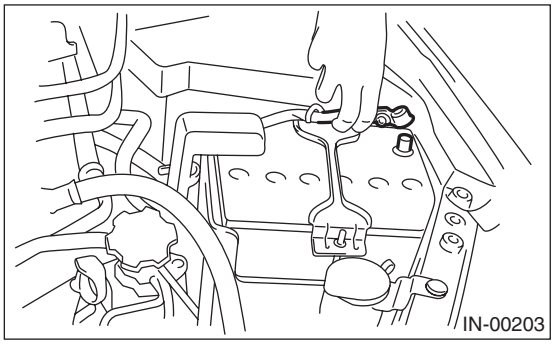
Install in the reverse order of removal.

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

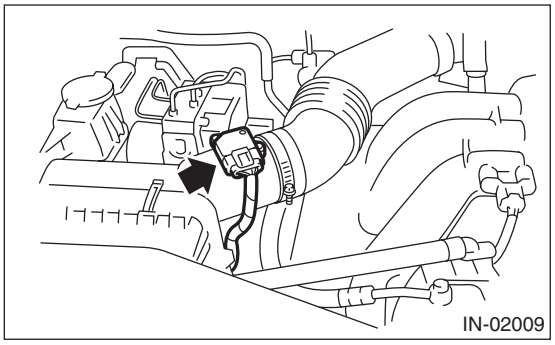
10.Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

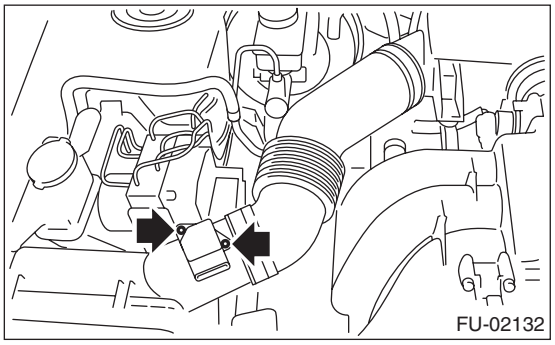
1) Disconnect the ground cable from the battery.



2) Disconnect the connectors from the 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.

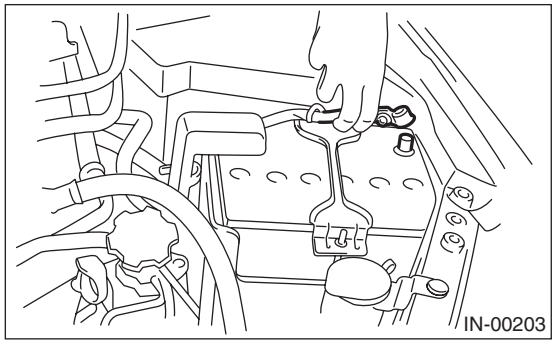
Tightening torque:
1 N·m (0.1 kgf-m, 0.7 ft-lb)

11.Fuel Injector

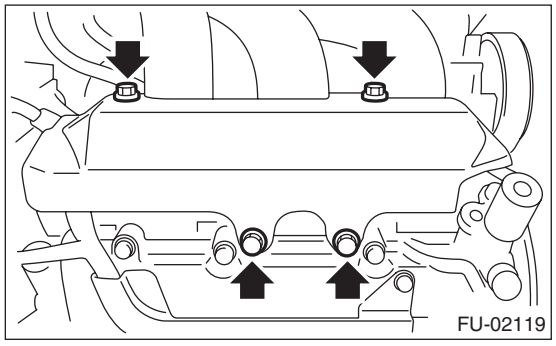
A: REMOVAL

1. RH SIDE

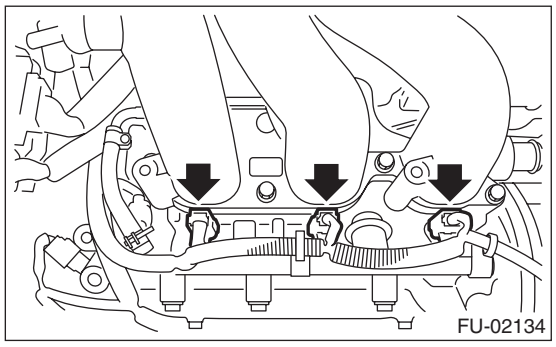
1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Disconnect the ground cable from the battery.



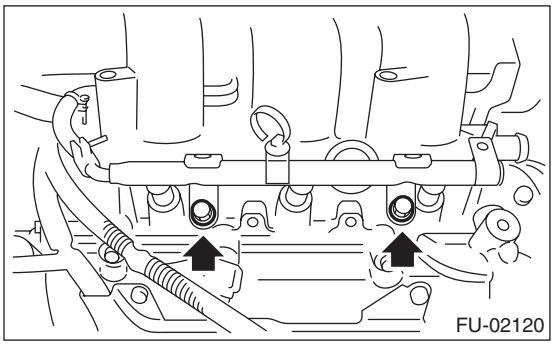
5) Remove the air cleaner case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.>
6) Remove the fuel pipe protector RH.



7) Disconnect the connector from fuel injector.



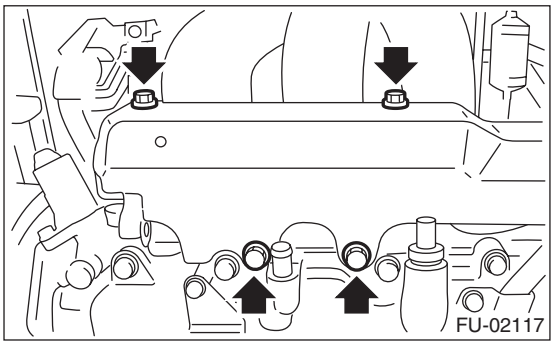
8) Remove the engine harness from the fuel injector pipe RH.
9) Remove the bolt which holds fuel injector pipe onto intake manifold.



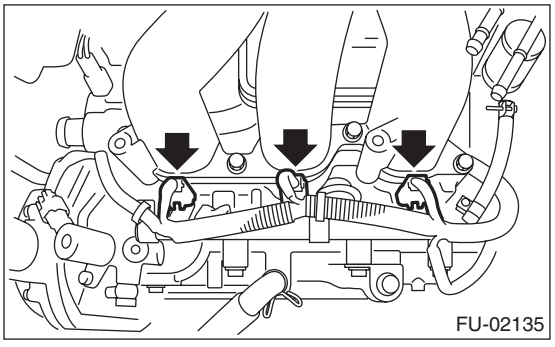
10) Remove the fuel injector while lifting up the fuel injector pipe.

2. LH SIDE

1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the battery.
5) Remove the generator harness from the fuel pipe protector LH.
6) Remove the fuel pipe protector LH.

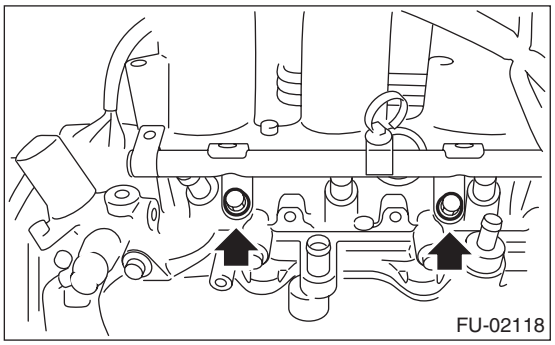


7) Disconnect the connector from fuel injector.



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

9) Remove the bolt which holds fuel injector pipe onto intake manifold.



10) Remove the fuel injector while lifting up the fuel injector pipe.

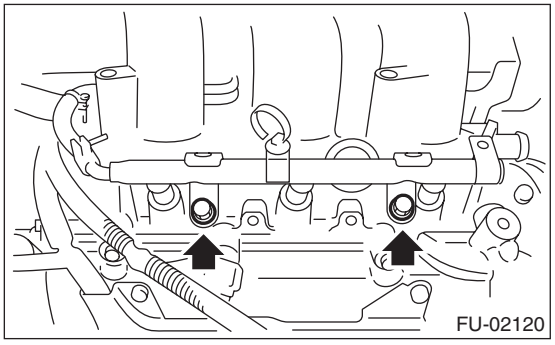
B: INSTALLATION

1. RH SIDE

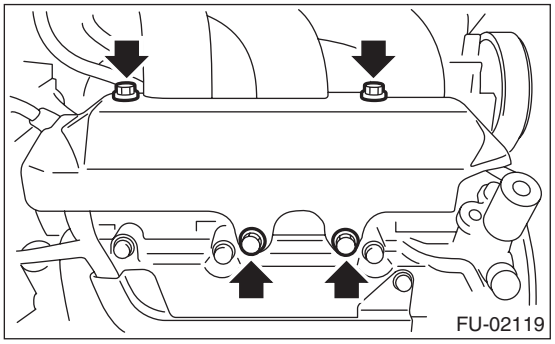
Install in the reverse order of removal.

NOTE:
Use new O-rings.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

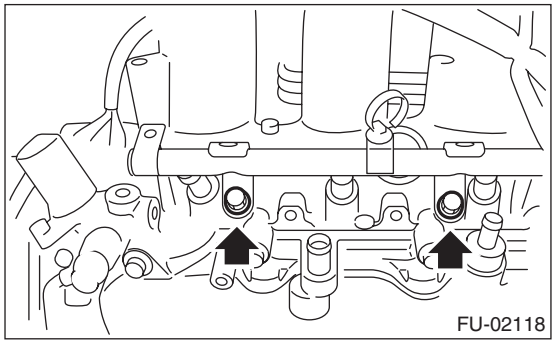


2. LH SIDE

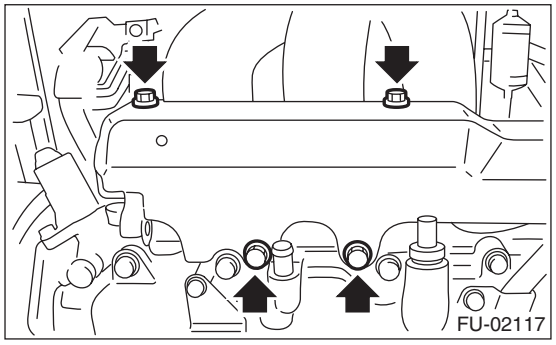
Install in the reverse order of removal.

NOTE:
Use new O-rings.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



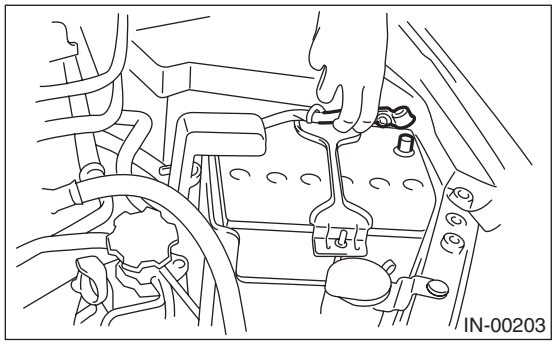
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



12. Variable Valve Lift Diagnosis Oil Pressure Switch

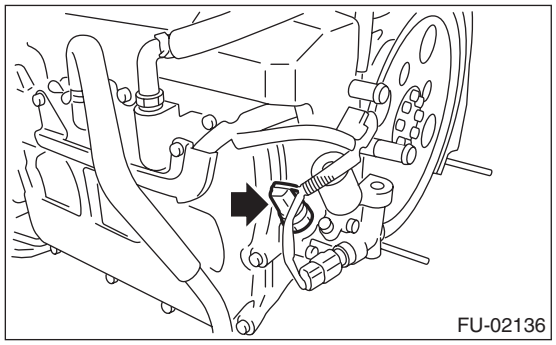
A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from the battery.

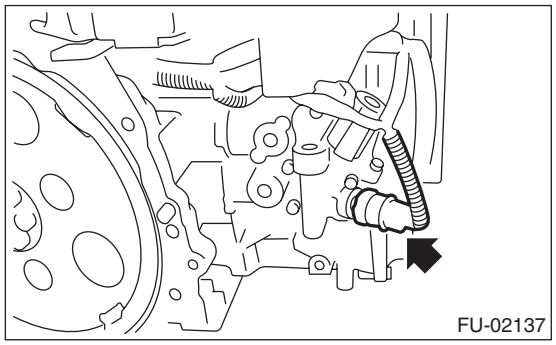


3) Remove the air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector from the variable valve lift diagnosis oil pressure switch.
5) Remove the variable valve lift diagnosis oil pressure switch.

- LH side



- RH side



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Apply liquid gasket to the variable valve lift diagnosis oil pressure switch threads.

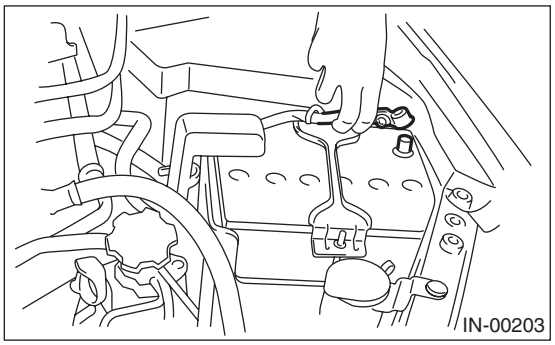
Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

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

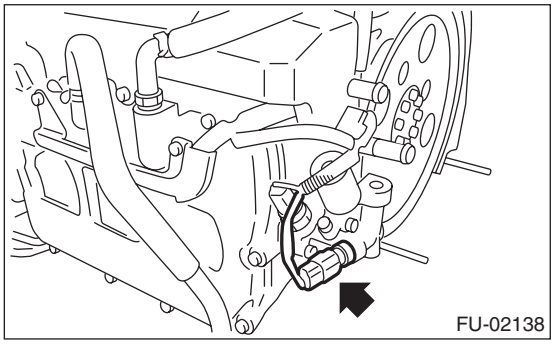
13.Oil Temperature Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from the battery.



3) Remove the air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector from the oil temperature sensor.
5) Remove the oil temperature sensor.



B: INSTALLATION

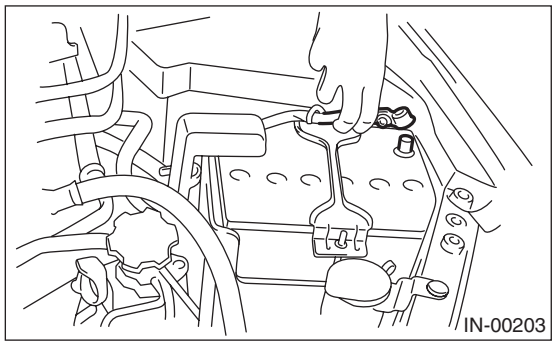
Install in the reverse order of removal.

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

14.Front Oxygen (A/F) Sensor

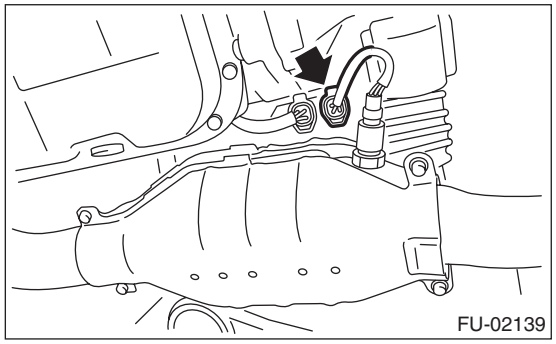
A: REMOVAL

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

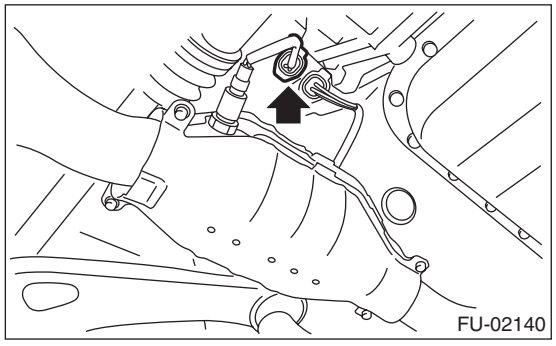


3) Lift up the vehicle.
4) Disconnect the connector of front oxygen (A/F) sensor.

- LH side



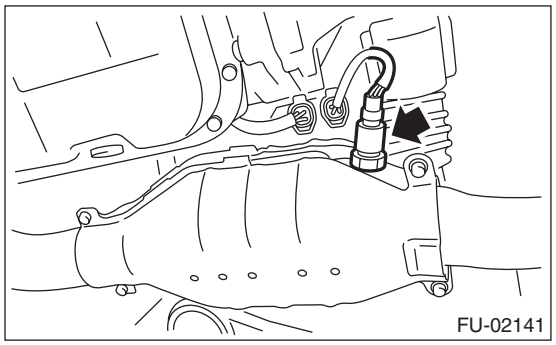
- RH side



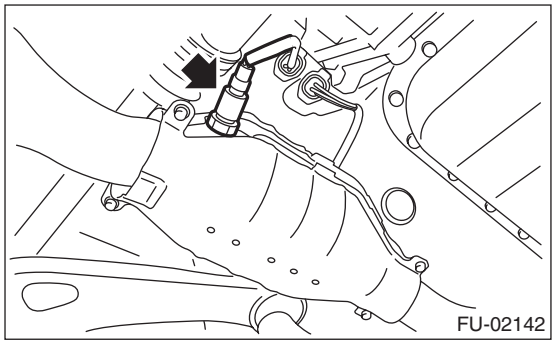
5) Apply spray-type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
6) Remove the front oxygen (A/F) sensor.

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

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.

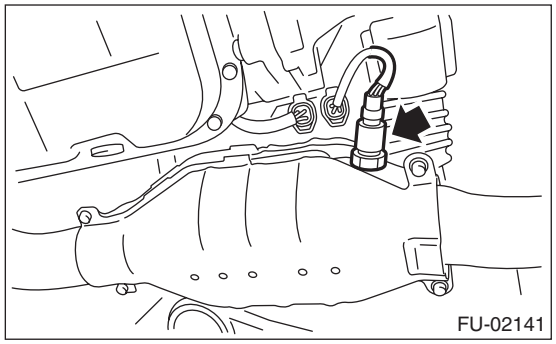
Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30

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

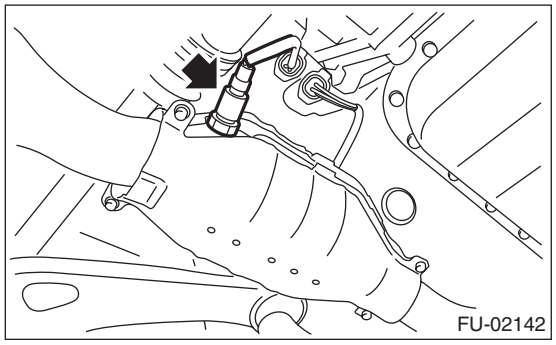
2) Install the front oxygen (A/F) sensor.

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

- LH side

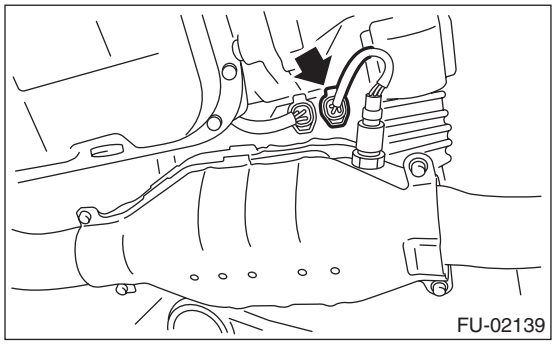


- RH side

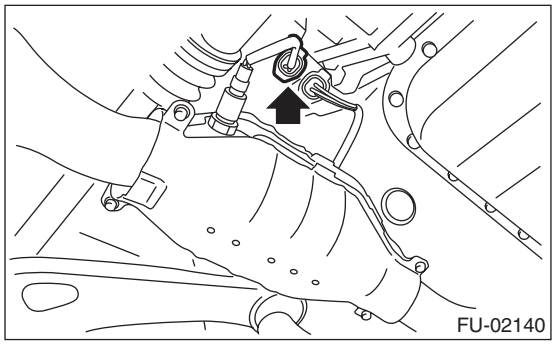


3) Connect the connector of front oxygen (A/F) sensor.

- LH side

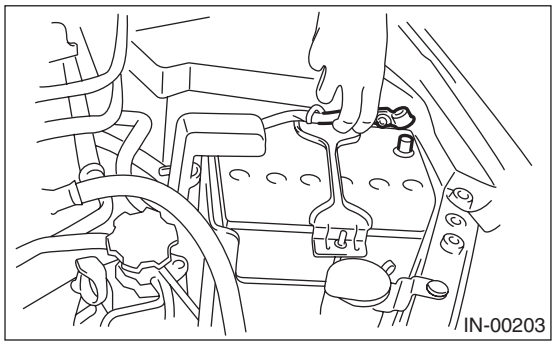


- RH side



4) Lower the vehicle.

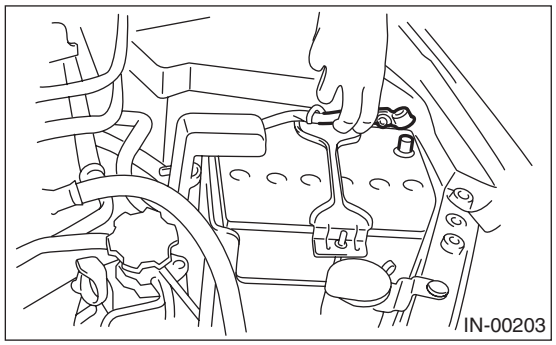
5) Connect the battery ground cable to battery.



15.Rear Oxygen Sensor

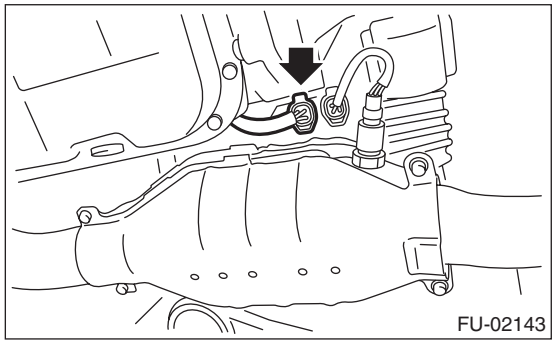
A: REMOVAL

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

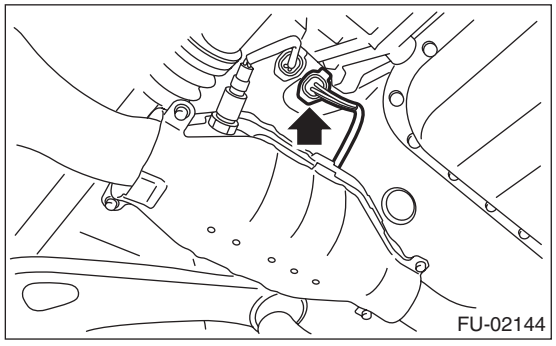


3) Lift up the vehicle.
4) Disconnect the connector from rear oxygen sensor.

- LH side



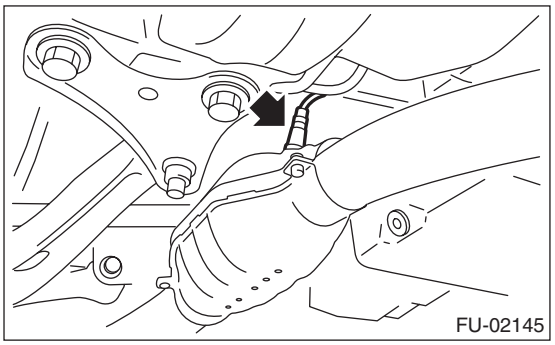
- RH side



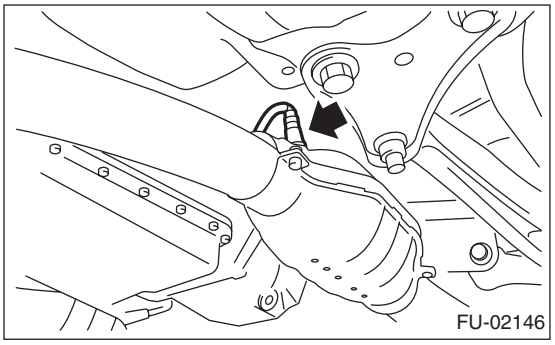
5) Remove the clip holding the harness.
6) Apply spray-type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
7) Remove the rear oxygen sensor.

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

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.

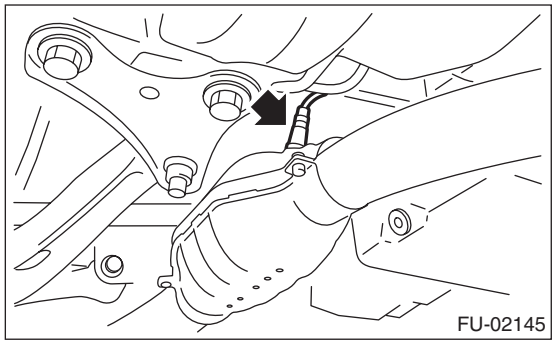
Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30

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

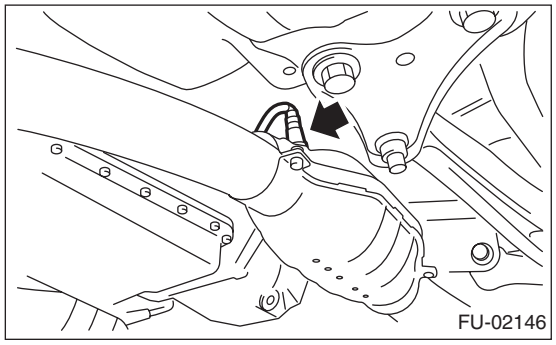
2) Install the rear oxygen sensor.

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

- LH side



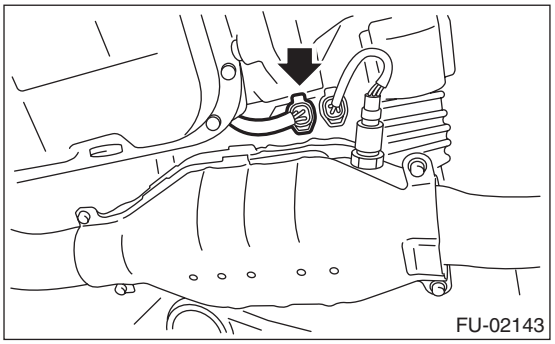
- RH side



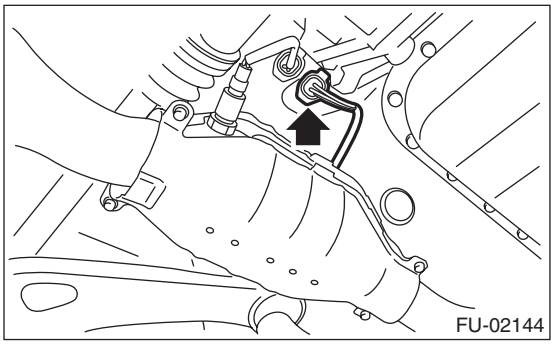
3) Hold the harness with clip.

4) Connect the connector to rear oxygen sensor.

- LH side

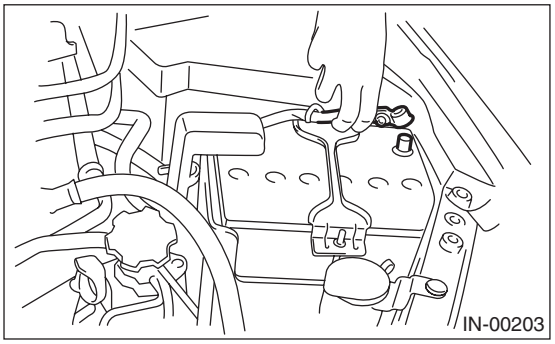


- RH side



5) Lower the vehicle.

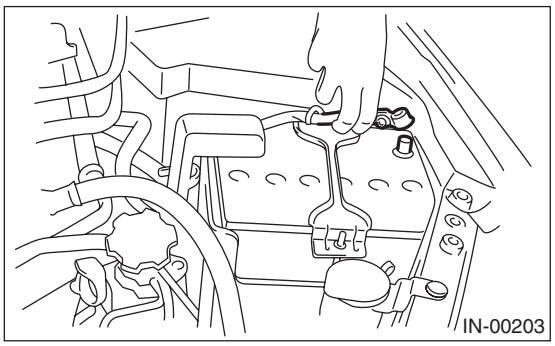
6) Connect the battery ground cable to battery.



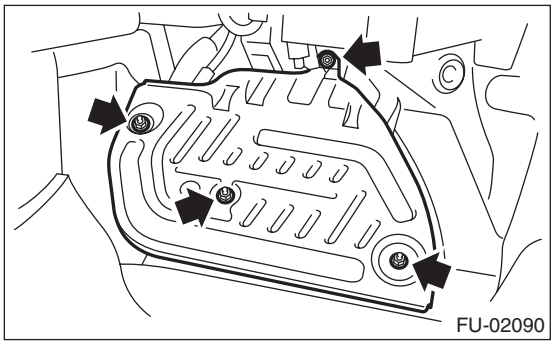
16.Engine Control Module (ECM)

A: REMOVAL

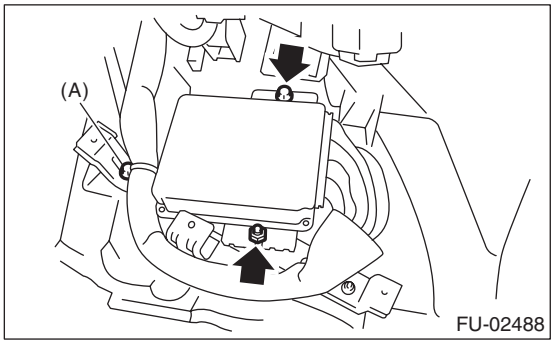
1) Disconnect the ground cable from the battery.



2) Remove the lower inner trim of passenger's side. <Ref. to EI-58, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of passenger's seat.
4) Remove the protect cover.



5) Remove the bolts and nuts which hold the ECM to the bracket.
6) Remove the clip (A) from bracket.



7) Disconnect the ECM connectors, and take out the ECM.

B: INSTALLATION

Install in the reverse order of removal.

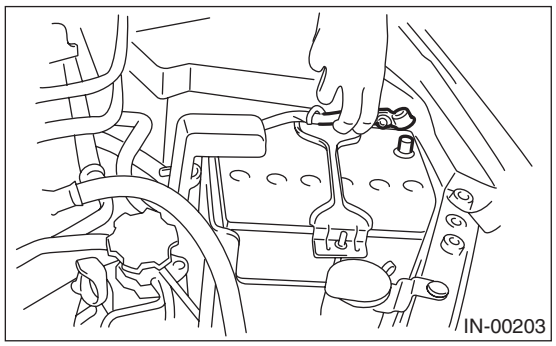
NOTE:
• When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.
• When replacing the ECM, immobilizer system must be registered. To do so, all ignition keys and ID cards need to be prepared. Refer to the "IMMOBILIZER TEACHING OPERATION MANUAL".

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

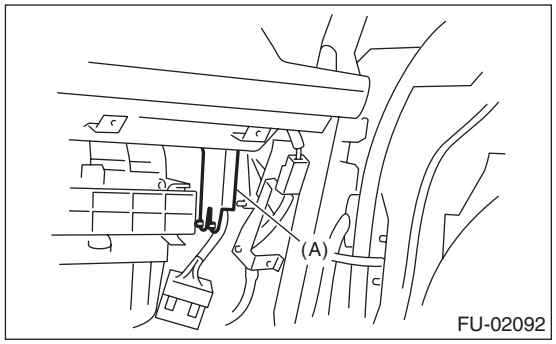
17.Main Relay

A: REMOVAL

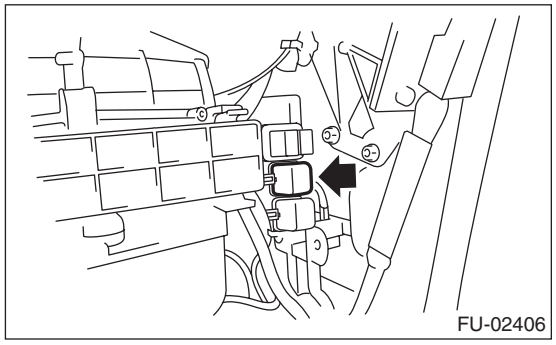
1) Disconnect the ground cable from the battery.



2) Remove the glove box. <Ref. to EI-50, REMOVAL, Glove Box.>
3) Remove the harness cover (A).



4) Disconnect the connectors from main relay.



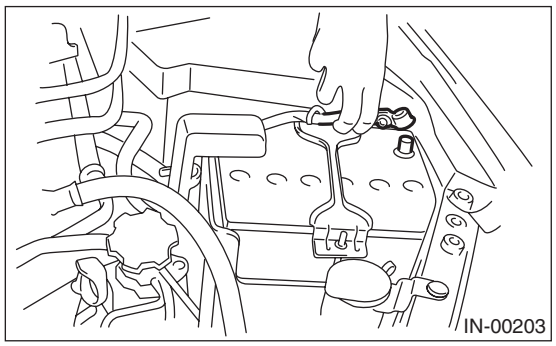
B: INSTALLATION

Install in the reverse order of removal.

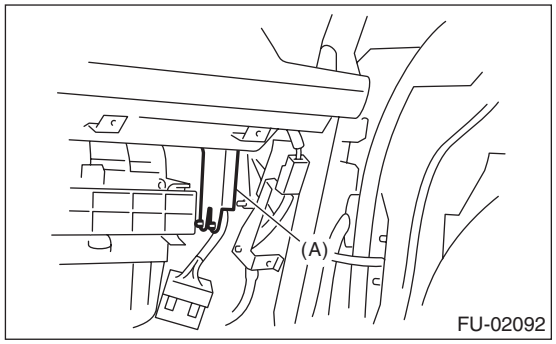
18.Fuel Pump Relay

A: REMOVAL

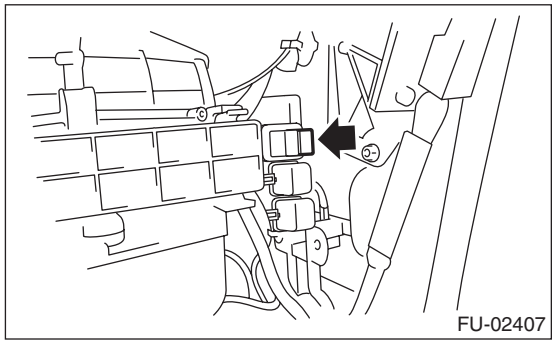
1) Disconnect the ground cable from the battery.



2) Remove the glove box. <Ref. to EI-50, REMOVAL, Glove Box.>
3) Remove the harness cover (A).



4) Disconnect the connector from fuel pump relay.



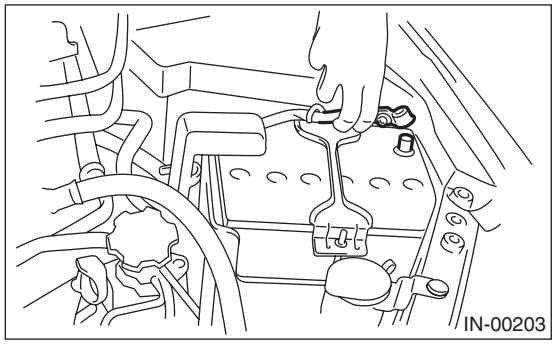
B: INSTALLATION

Install in the reverse order of removal.

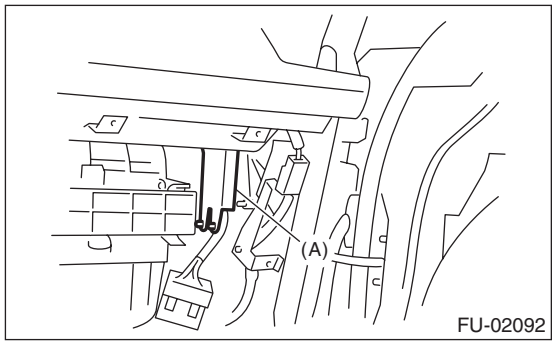
19.Electronic Throttle Control Relay

A: REMOVAL

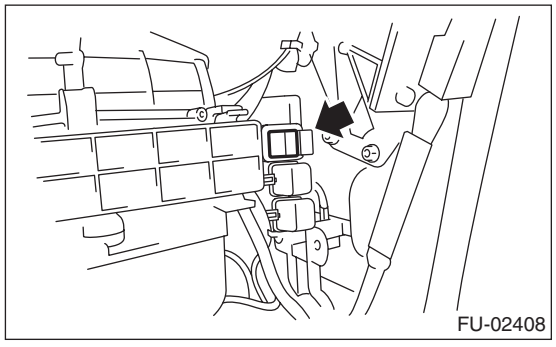
1) Disconnect the ground cable from the battery.



2) Remove the glove box. <Ref. to EI-50, REMOVAL, Glove Box.>
3) Remove the harness cover (A).



4) Disconnect the connector from electric throttle control relay.



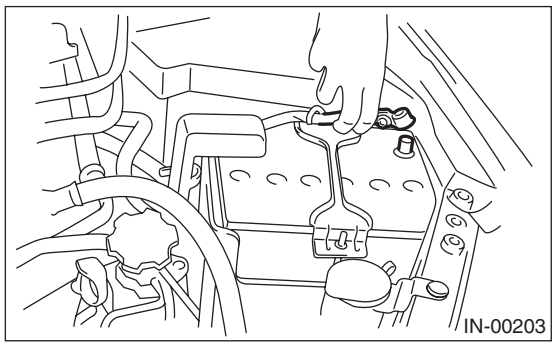
B: INSTALLATION

Install in the reverse order of removal.

20.Fuel Pump Control Unit

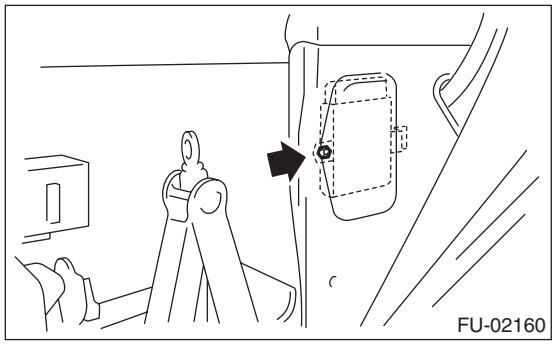
A: REMOVAL

1) Disconnect the ground cable from the battery.

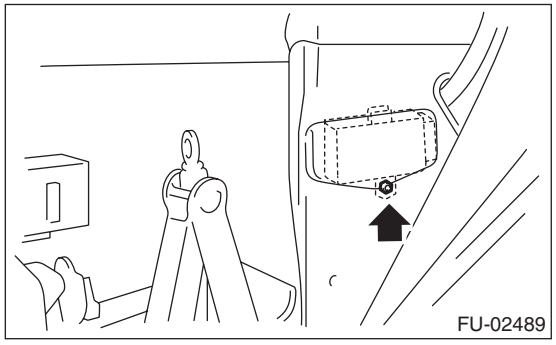


2) Remove the rear quarter trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>
3) Remove the fuel pump control unit.

- Wagon model



- Sedan model



4) Disconnect the connector from fuel pump control unit.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

21.Fuel

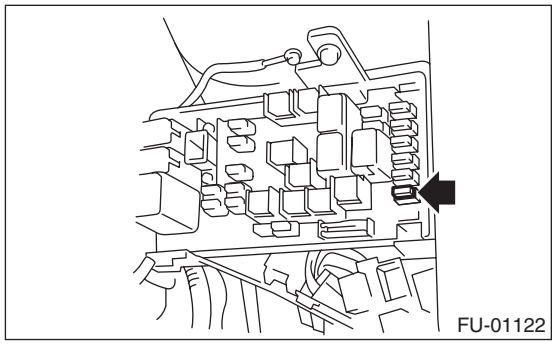
A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
Be careful not to spill fuel.

1) Remove the fuse of fuel pump from main fuse box.



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

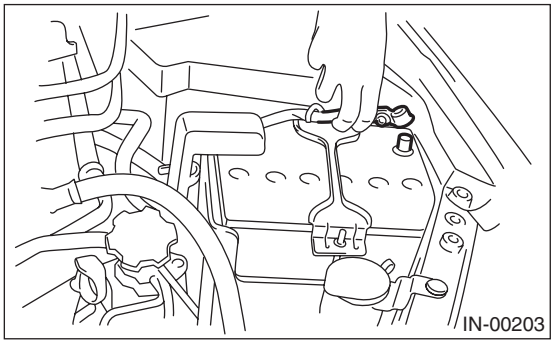
2. DRAINING FUEL

WARNING:
Place “NO OPEN FLAMES” signs near the working area.

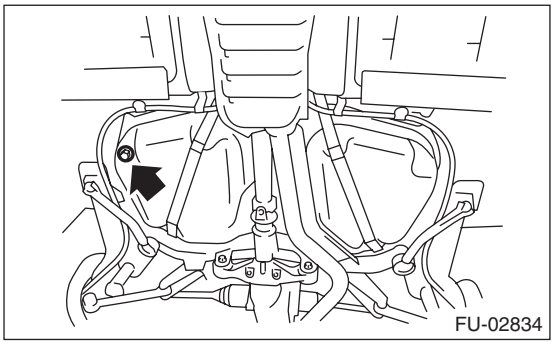
CAUTION:
Be careful not to spill fuel.

NOTE:
For the fuel tank without fuel drain plug, refer to DRAINING FUEL (WITH SUBARU SELECT MONITOR). <Ref. to FU(H6DO)-39, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>

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



3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Lift up the vehicle.
5) Remove the fuel tank protector.
6) Set a container under the vehicle and remove the fuel drain plug from fuel tank to drain fuel from fuel tank.



7) Tighten the fuel drain plugs.

NOTE:
Use a new gasket.

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

8) Install the fuel tank protector.

NOTE:
Use a new nut.

Tightening torque:
Nut
9 N·m (0.9 kgf-m, 6.6 ft-lb)
Bolt
17.5 N·m (1.78 kgf-m, 12.9 ft-lb)

9) Lower the vehicle.

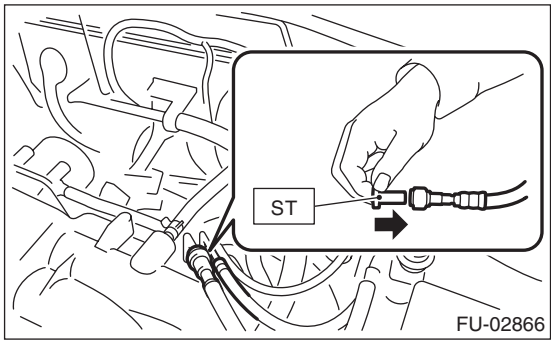
3. DRAINING FUEL (WITH SUBARU SELECT MONITOR)

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)-39, DRAINING FUEL (THROUGH THE FUEL FILLER HOSE), PROCEDURE, Fuel.>.
• Be careful not to allow the battery to go flat.
1) Release the fuel pressure. <Ref. to FU(H6DO)-38, 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 CONNECTOR REMOVER

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 hose end into the container.
5) Actuate the fuel pump and drain the fuel using Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-57, IDLE SPEED CONTROL, OPERATION, System Operation Check Mode.>

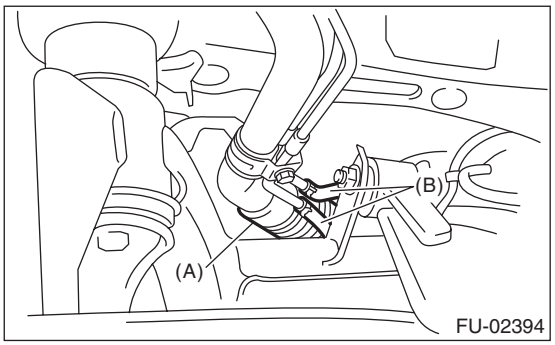
CAUTION:
Be careful not to spill fuel.

4. 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. Perform the work after 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).
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 flap 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).
6) Disconnect the fuel filler hose (A) 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) Evaporation hose

7) Set a container under the vehicle and insert the gasoline proof hose (ø10 or less) into the fuel filler hose to drain the fuel.

CAUTION:
Be careful not to spill fuel.

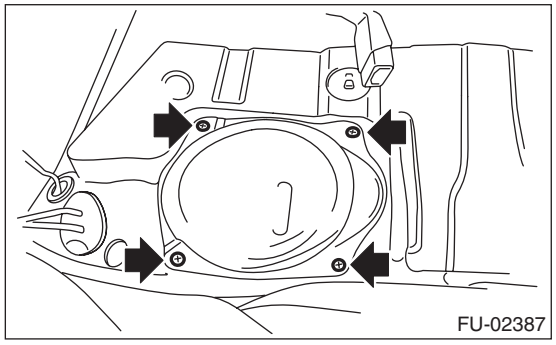
22.Fuel Tank

A: REMOVAL

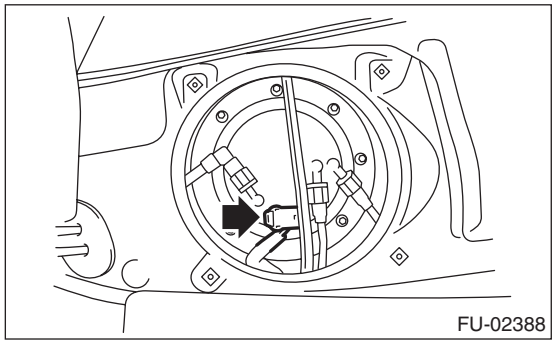
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

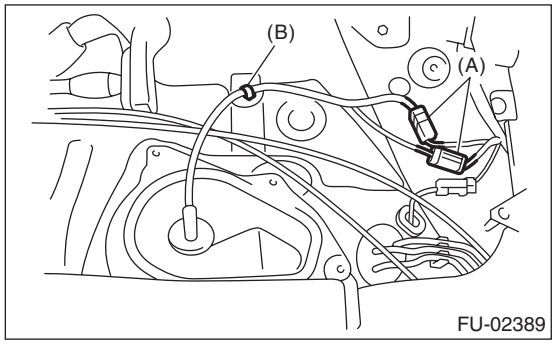
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H6DO)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Drain fuel from the fuel tank. <Ref. to FU(H6DO)-38, DRAINING FUEL, PROCEDURE, Fuel.>
4) Remove the rear seat.
5) Remove the service hole cover of fuel pump.


FU-02387

6) Disconnect the connector from fuel pump.

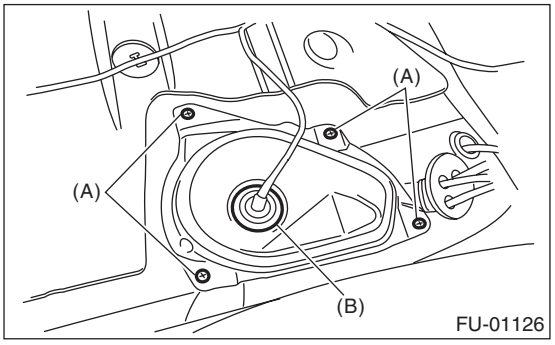

FU-02388

7) Remove the connector (A) and clip (B).



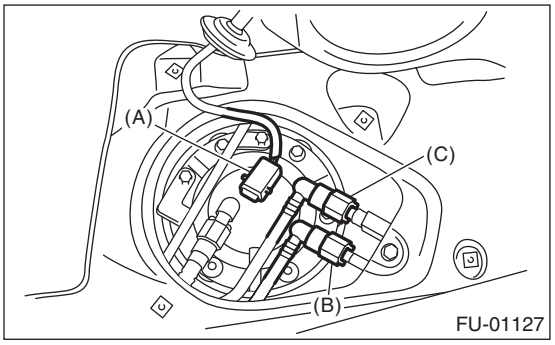
FU-02389

8) Remove the service hole cover of fuel sub level sensor.
(1) Remove the bolt (A).
(2) Push the grommet (B) down and remove the service hole cover.



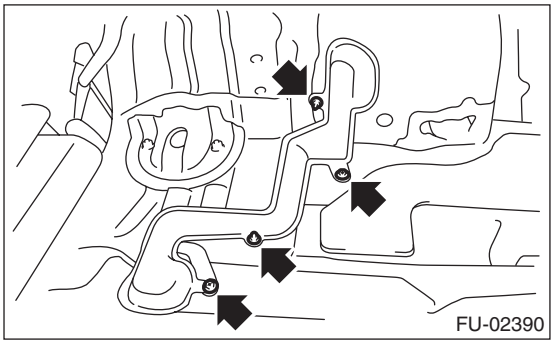
FU-01126

9) Disconnect connector (A) from fuel sub level sensor.
10) Disconnect the quick connector of fuel delivery hose (B) and return hose (C). <Ref. to FU(H6DO)-55, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

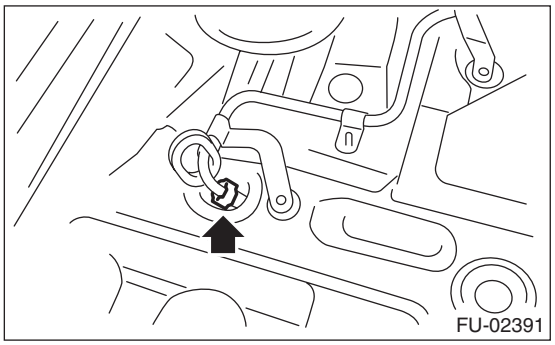


FU-01127

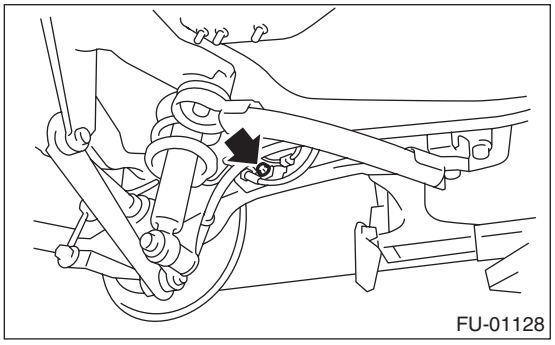
11) Remove the trunk room trim. (Sedan model) <Ref. to EI-67, REMOVAL, Trunk Room Trim.>
12) Remove the rear quarter trim. (Wagon model) <Ref. to EI-60, WAGON MODEL, REMOVAL, Rear Quarter Trim.>
13) Remove the pipe protector.


FU-02390

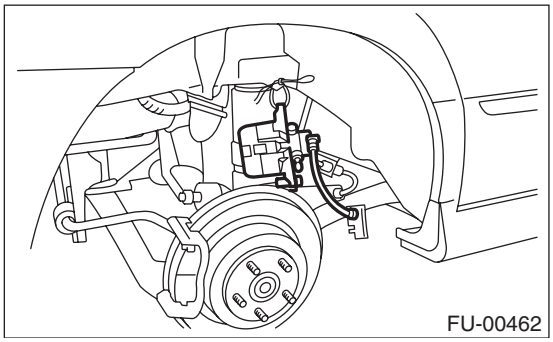
14) Remove the grommet and disconnect the quick connector of the evaporation pipe. <Ref. to FU(H6DO)-55, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>


FU-02391

15) Remove the rear wheels.
16) Lift up the vehicle.
17) Remove the bolts which secure the rear brake hose mounting bracket.

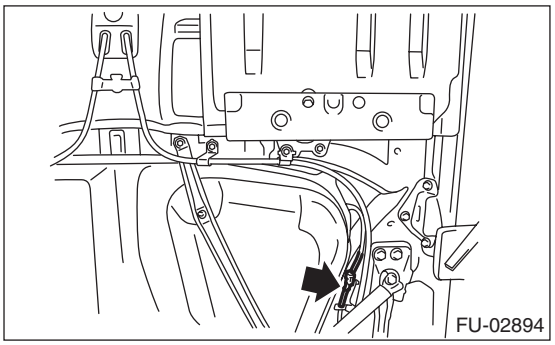

FU-01128

18) Remove the rear brake caliper and tie it to the body side of the vehicle.

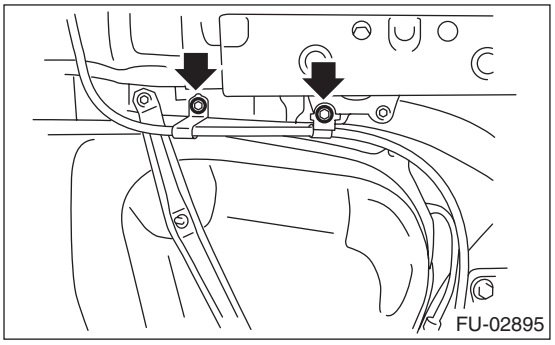

FU-00462

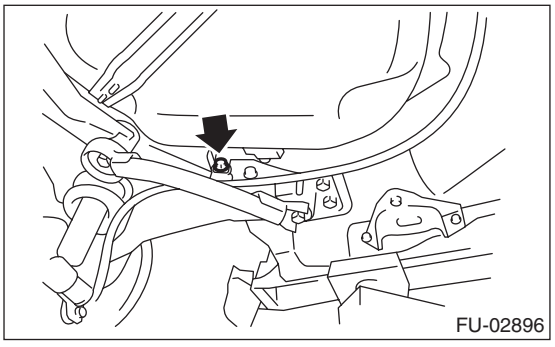
19) Remove the parking brake cable from the parking brake assembly. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
20) Remove the rear exhaust pipe. <Ref. to EX(H6DO)-7, REMOVAL, Rear Exhaust Pipe.>
21) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
22) Remove the heat shield cover.

23) Disconnect the connector from the rear ABS wheel speed sensor.


FU-02894

24) Remove the bolts securing the parking brake cable clamp.

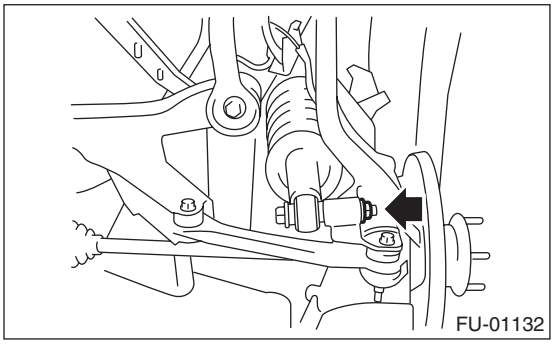

FU-02895


FU-02896

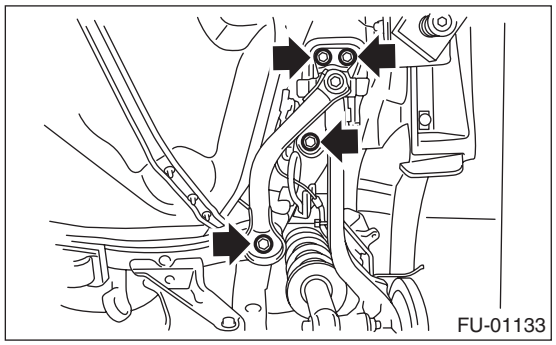
25) Remove the rear suspension assembly.

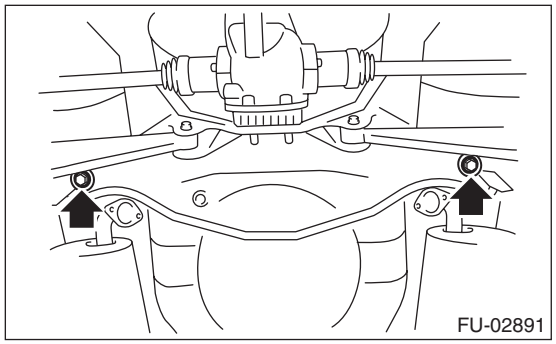
CAUTION:
A helper is required to perform this work.

(1) Support the rear differential with the transmission jack.
(2) Remove the bolts which hold the rear shock absorber to the rear suspension arm.


FU-01132

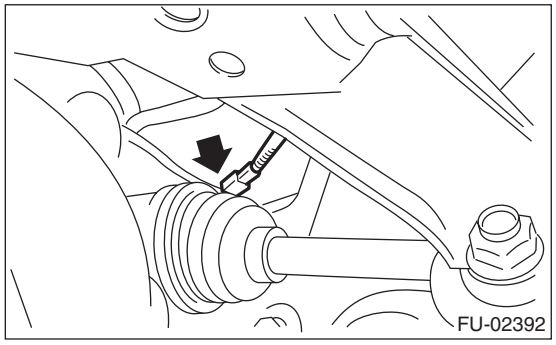
(3) Remove the bolts which secure the rear suspension assembly to the body.



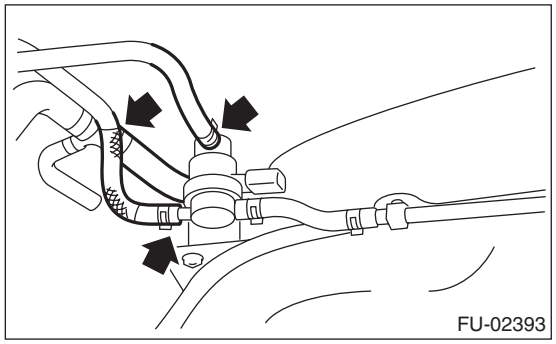


(4) Remove the rear suspension assembly.

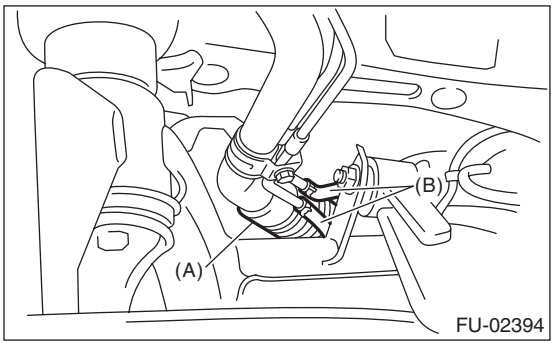
26) Disconnect the connector.



27) Disconnect the evaporation hose.

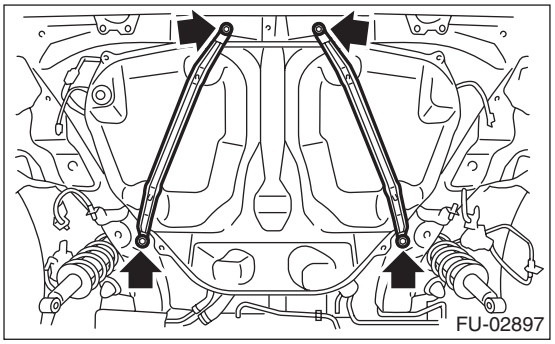


28) Disconnect the fuel filler hose (A) and evaporation hose (B).



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

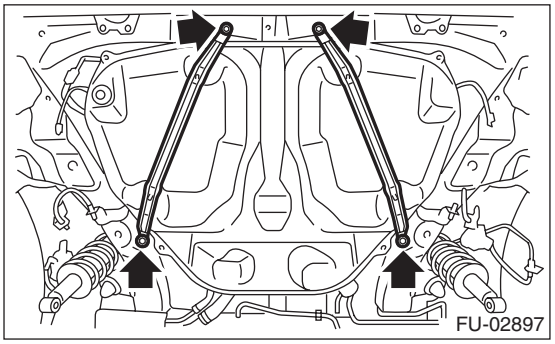
WARNING:
- **A helper is required to perform this work.**
- **Fuel may remain in the side which does not have drain plug of fuel tank. Be careful not to let the fuel tank fall off when removing as it is bad balance on either side.**



B: INSTALLATION

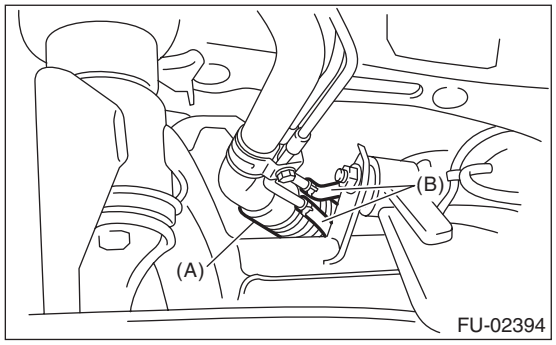
1) Support the fuel tank with a transmission jack, set the fuel tank in place, and temporarily tighten the bolts of the fuel tank band.

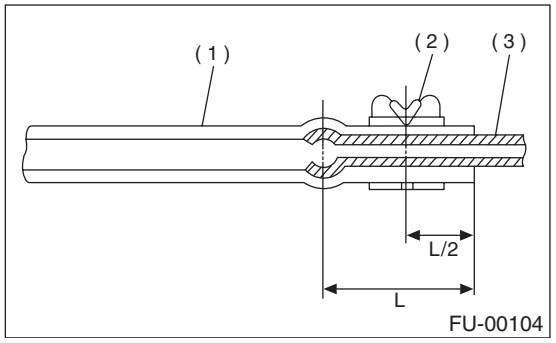
WARNING:
A helper is required to perform this work.



2) Securely insert the fuel filler hose (A) and evaporation hose (B) to the specified position, then tighten the clamp.

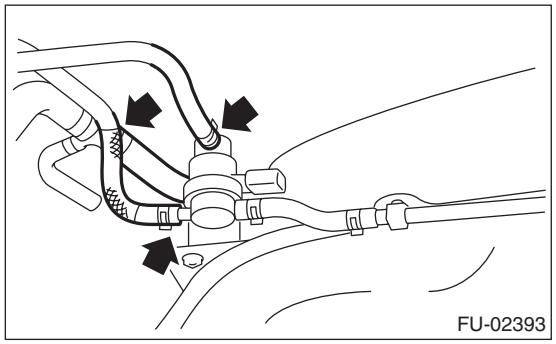
Tightening torque:
2.5 N·m (0.25 kgf-m, 1.8 ft-lb)





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

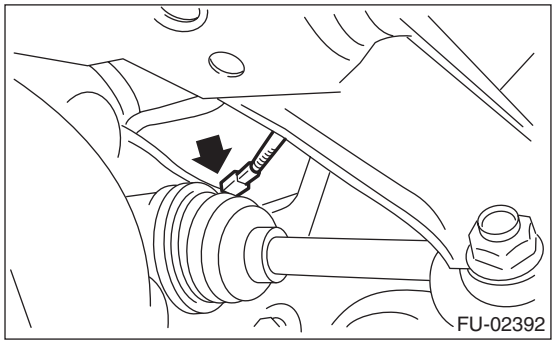
3) Connect the evaporation hose.



4) Tighten the fuel tank band bolts.

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

5) Connect the connector.

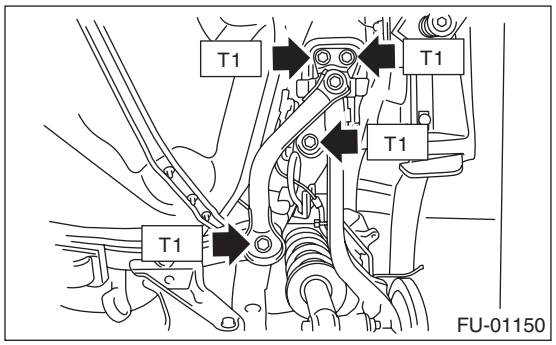


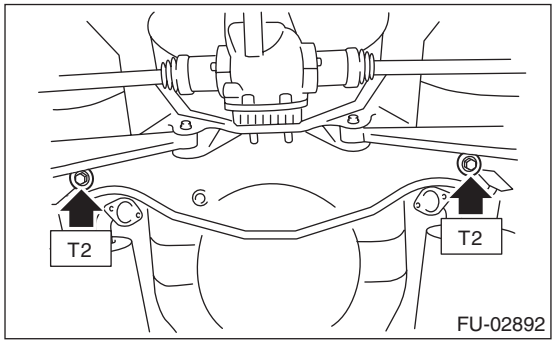
6) Install the rear suspension assembly.

CAUTION:
A helper is required to perform this work.

(1) Support the rear differential with the transmission jack.
(2) Support the rear suspension assembly, and tighten the bolts which secure the rear suspension assembly to the body.

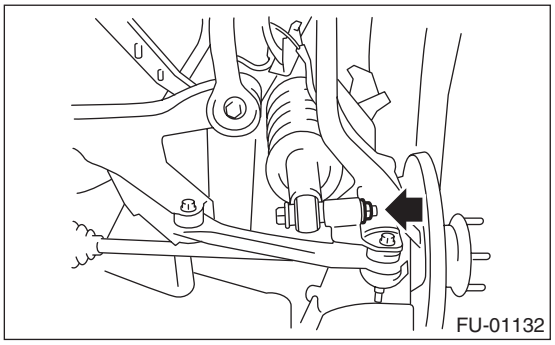
Tightening torque:
T1: 125 N·m (12.7 kgf-m, 92.2 ft-lb)
T2: 175 N·m (17.8 kgf-m, 129 ft-lb)





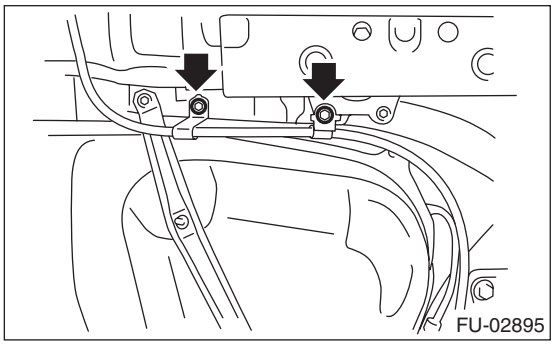
(3) Tighten the bolts which hold the rear shock absorber to the rear suspension arm. <Ref. to RS-10, INSTALLATION, Rear Arm.>

Tightening torque:
62 N·m (6.3 kgf-m, 46 ft-lb)

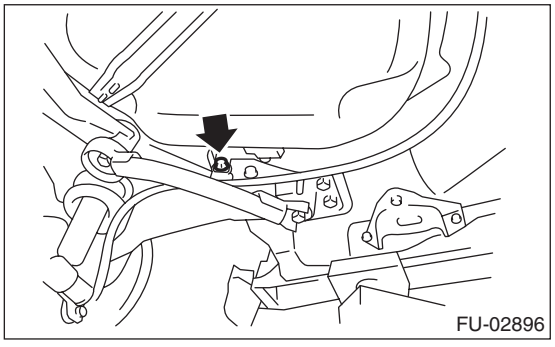


7) Tighten the bolts holding the parking brake cable clamp.

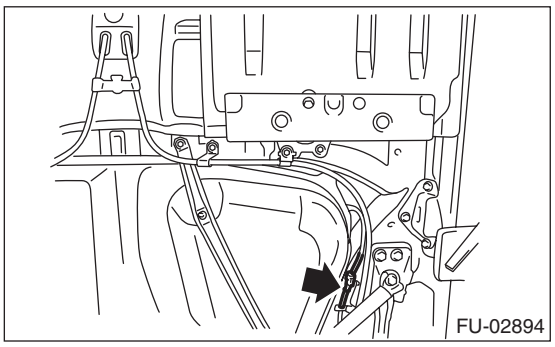
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



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



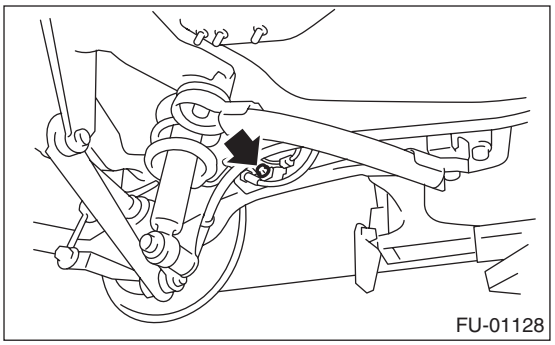
8) Connect the connector to the rear ABS wheel speed sensor.



9) Install the heat shield cover.

10) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
11) Install the rear exhaust pipe. <Ref. to EX(H6DO)-7, INSTALLATION, Rear Exhaust Pipe.>
12) Lower the vehicle.
13) Connect the parking brake cable to the parking brake assembly. <Ref. to PB-7, INSTALLATION, Parking Brake Assembly (Rear Disc Brake).>
14) Install the rear brake caliper.
15) Tighten the bolts which secure the rear brake hose mounting bracket.

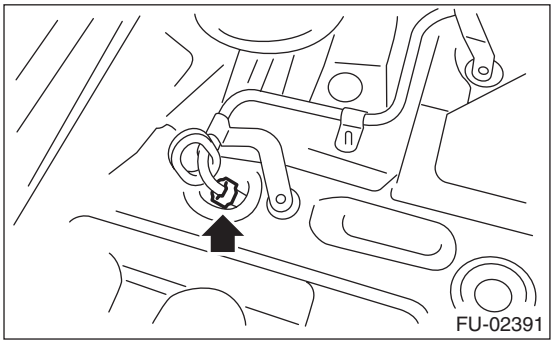
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)



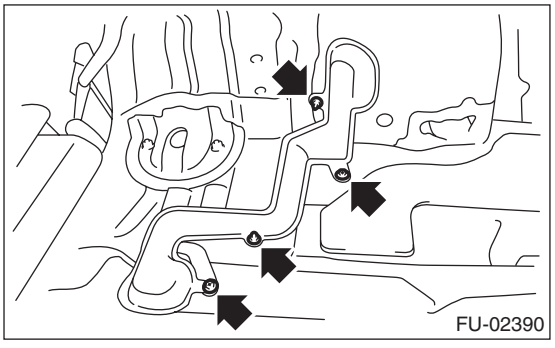
16) Install the rear wheels.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

17) Connect the quick connector of the evaporation pipe. <Ref. to FU(H6DO)-56, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

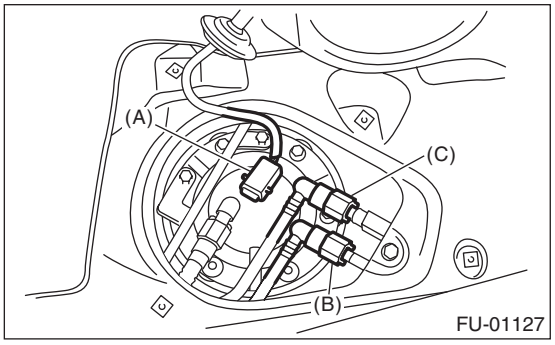


18) Install the pipe protector.

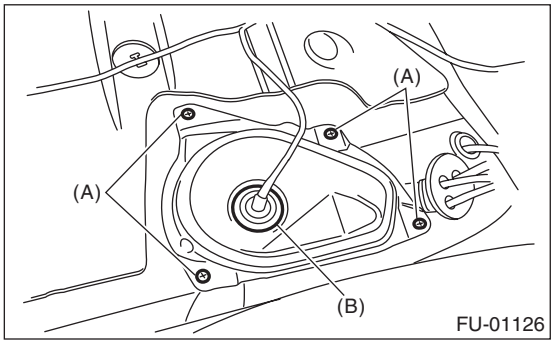


19) Install the trunk room trim. (Sedan model) <Ref. to EI-68, INSTALLATION, Trunk Room Trim.>
20) Install the rear quarter trim. (Wagon model) <Ref. to EI-61, INSTALLATION, Rear Quarter Trim.>
21) Connect connector (A) to the fuel sub level sensor.
22) Connect the quick connector of fuel delivery hose (B) and return hose (C). <Ref. to FU(H6DO)-56, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

NOTE:
When connecting, be careful not to reverse the delivery side and return side.

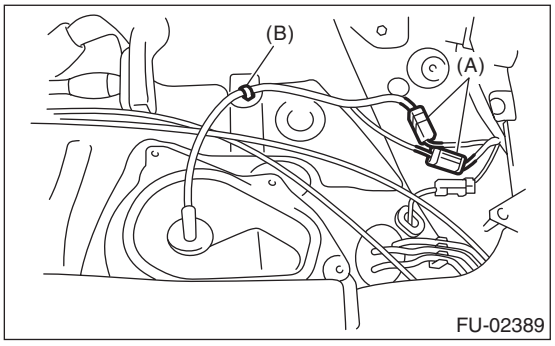


23) Install the service hole cover of fuel sub level sensor.

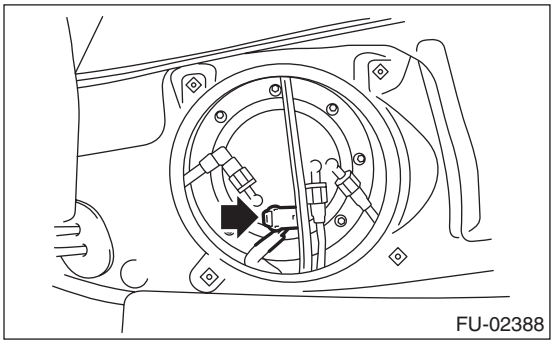


(A) Bolt
(B) Grommet

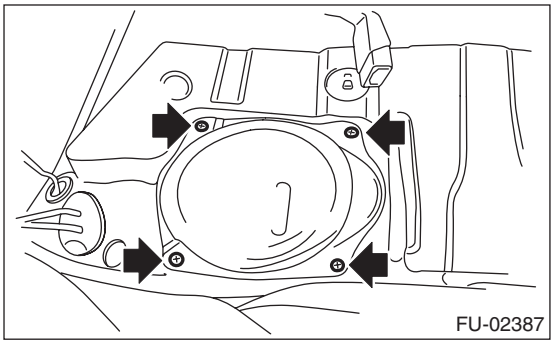
24) Connect connector (A), and install clip (B).



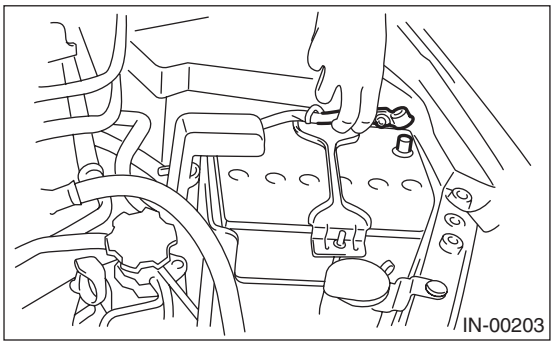
25) Connect the connector to the fuel pump.



26) Install the service hole cover of fuel pump.



27) Install the rear seat.
28) Install the fuse of fuel pump to the main fuse box.
29) Connect the battery ground cable to battery.



30) Inspect the wheel alignment and adjust if necessary.

C: INSPECTION

1) Check that the fuel tank does not have holes, cracks or is damaged in any way.
2) Make sure that the fuel pipe and fuel hose are not cracked and that the connections are tight.

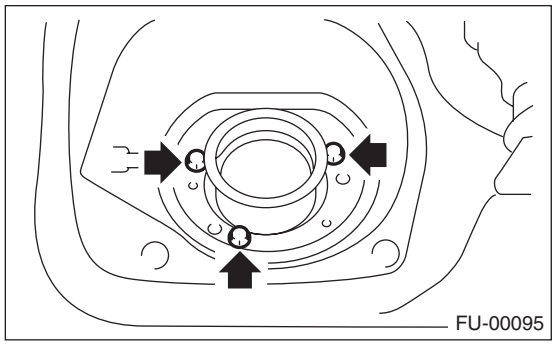
23.Fuel Filler Pipe

A: REMOVAL

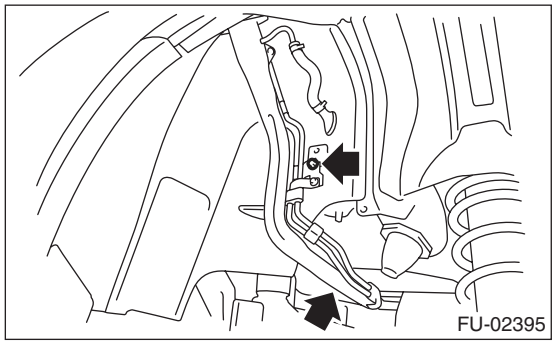
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

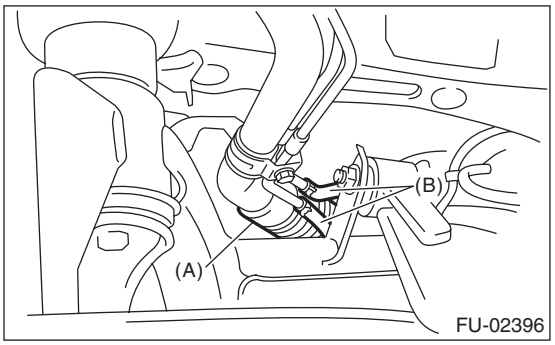
1) Drain fuel from the fuel tank. <Ref. to FU(H6DO)-38, DRAINING FUEL, PROCEDURE, Fuel.>
2) Remove the screws which secure gasket.

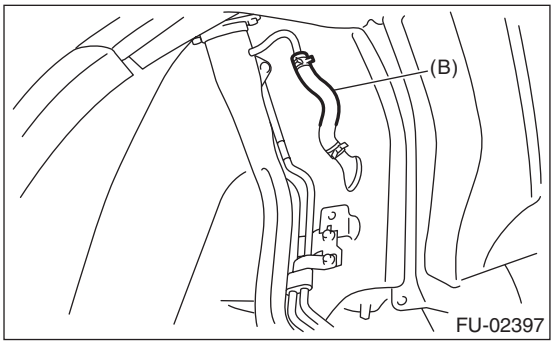


3) Remove the rear wheel RH.
4) Lift up the vehicle.
5) Remove the mud guard. <Ref. to EI-29, REMOVAL, Mud Guard.>
6) Remove the rear sub frame. <Ref. to RS-21, REMOVAL, Rear Sub Frame.>
7) Remove the bolts which hold fuel filler pipe bracket on the body.



8) Loosen the clamp, and disconnect the fuel filler hose (A) and evaporation hose (B).



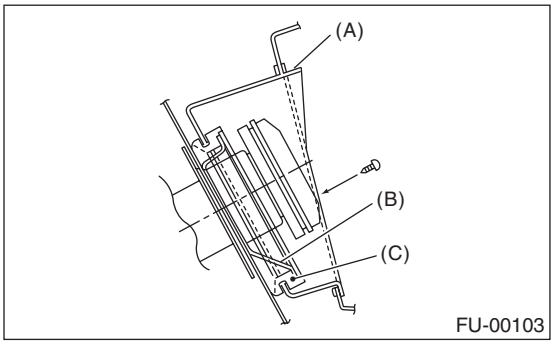


9) Remove the fuel filler pipe to the underside of the vehicle.

B: INSTALLATION

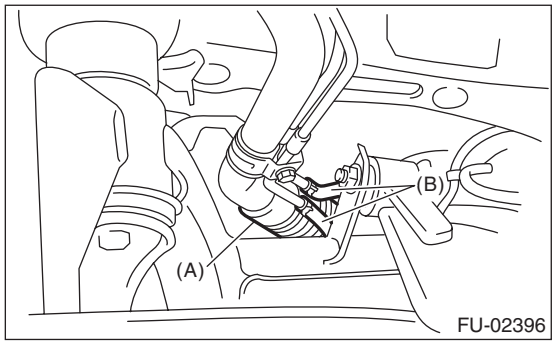
1) Open the fuel filler flap lid.
2) Set the fuel saucer (A) with rubber seal (C), and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

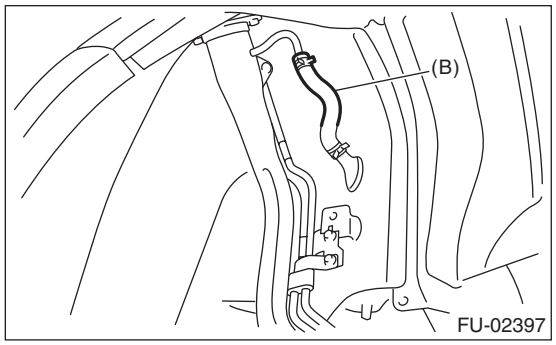
NOTE:
If the edges of rubber seal are folded toward inside, straighten it with a flat tip screwdriver.

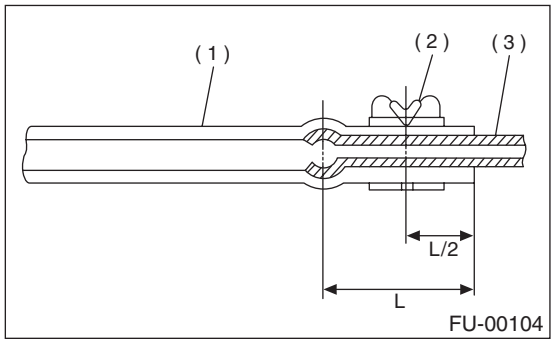


4) Securely insert the fuel filler hose (A) and evaporation hose (B) to the specified position, then tighten the clamp.

Tightening torque:
(A) 2.5 N·m (0.3 kgf-m, 1.8 ft-lb)



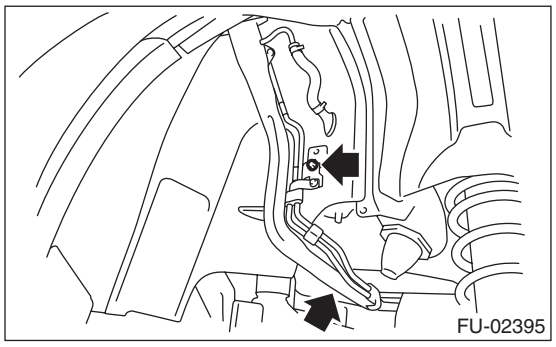




(1) Hose
(2) Clip or clamp
(3) Pipe

5) Tighten the bolts which hold fuel filler pipe bracket on the body.

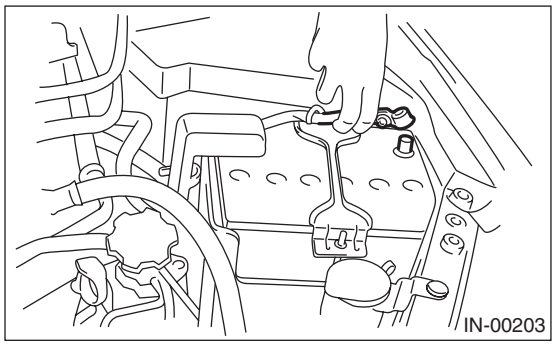
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



6) Install the rear sub frame. <Ref. to RS-21, INSTALLATION, Rear Sub Frame.>
7) Install the mud guard. <Ref. to EI-29, INSTALLATION, Mud Guard.>
8) Lower the vehicle.
9) Install the rear wheel RH.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

10) Connect the battery ground cable to battery.

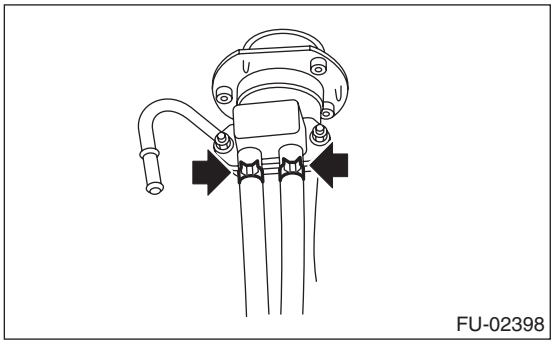


C: INSPECTION

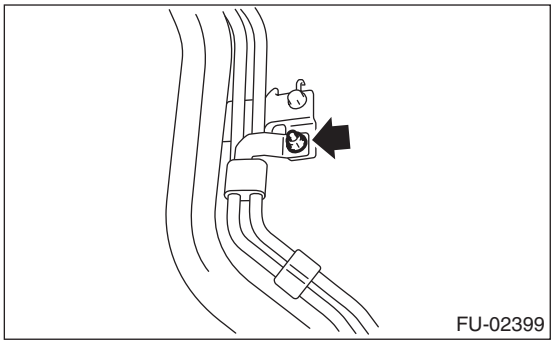
1) Check that the fuel tank does not have holes, cracks or is damaged in any way.
2) Make sure that the fuel hose is not cracked and that the connections are tight.

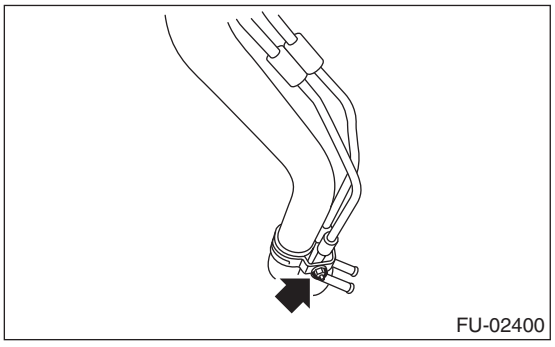
D: DISASSEMBLY

1) Move the clamp and disconnect the evaporation hose from the shut valve.



2) Remove the nut which holds the evaporation pipe assembly to the fuel filler pipe.



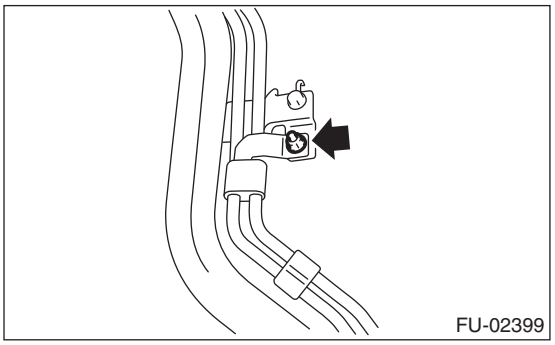


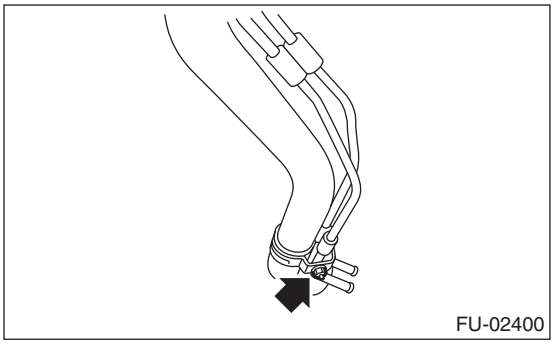
3) Remove the shut valve from the fuel filler pipe. <Ref. to EC(H4SO)-14, REMOVAL, Shut Valve.>

E: ASSEMBLY

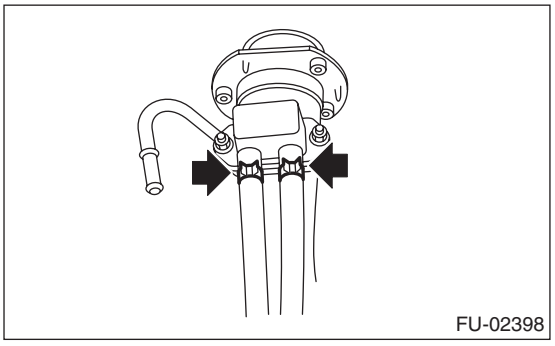
1) Install the shut pipe to the fuel filler pipe. <Ref. to EC(H4SO)-14, INSTALLATION, Shut Valve.>
2) Tighten the nuts which secure the evaporation pipe assembly to the fuel filler pipe.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)





3) Connect the evaporation hose to the shut valve.



24.Fuel Pump

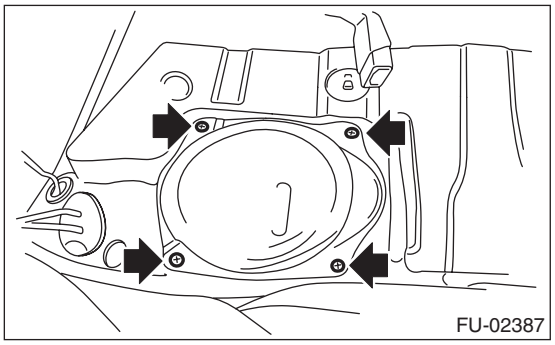
A: REMOVAL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

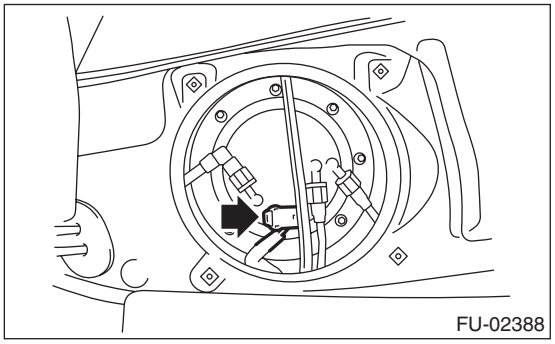
CAUTION:
- **Be careful not to spill fuel.**
- **Before starting work, be sure to reduce fuel in the fuel tank to 3/4 of the tank or less. If there is more fuel in the tank, fuel may spill out.**

NOTE:
Fuel pump assembly consists of fuel pump, fuel filter and fuel level sensor.

1) Release the fuel pressure. <Ref. to FU(H6DO)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H6DO)-38, DRAINING FUEL, PROCEDURE, Fuel.>
3) Remove the rear seat.
4) Remove the service hole cover.

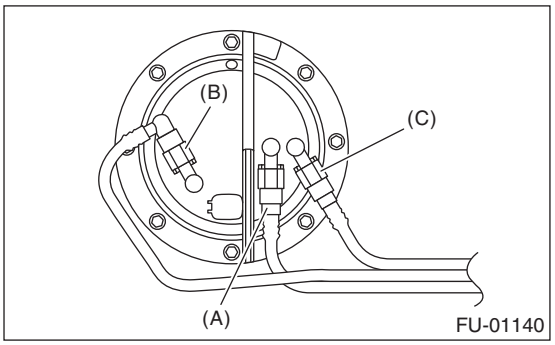

FU-02387

5) Disconnect the connector from fuel pump.


FU-02388

6) Disconnect the quick connector, then disconnect the fuel delivery hose, return hose and jet pump hose. <Ref. to FU(H6DO)-55, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

7) Remove the nuts which install fuel pump assembly onto fuel tank.



FU-01140

(A) Delivery hose
(B) Return hose
(C) Jet pump hose

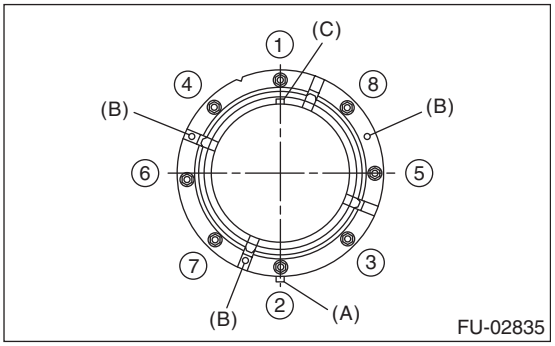
8) Remove the fuel pump assembly from the fuel tank.

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 so that the protrusion (A) of gasket is pointed towards the front of the vehicle.
- Insert the protrusion (B) of the gasket into the upper plate. (3 places)
- Align the protrusion (C) of fuel pump assembly with the cutout on the upper plate.
- Tighten the nuts to the specified torque in the order as shown in the figure.

NOTE:
Use a new gasket and a retainer.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.2 ft-lb)

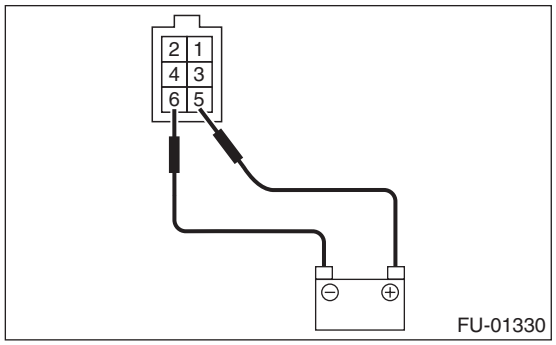


FU-02835

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.**



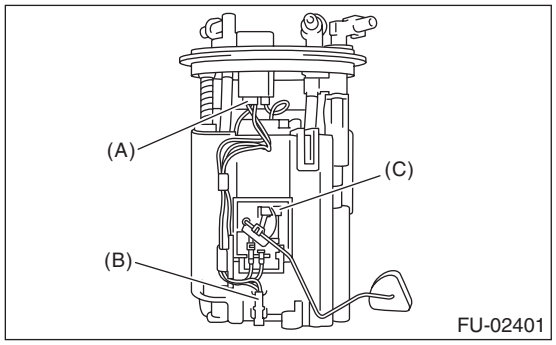
25.Fuel Level Sensor

A: REMOVAL

WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **Before starting work, be sure to reduce fuel in the fuel tank to 3/4 of the tank or less. If there is more fuel in the tank, fuel may spill out.**

NOTE:
The fuel level sensor is built in fuel pump assembly.
1) Remove the fuel pump assembly. <Ref. to FU(H6DO)-49, REMOVAL, Fuel Pump.>
2) Disconnect the connector from fuel pump bracket.
3) Remove the fuel temperature sensor.
4) Remove the fuel level sensor.



(A) Connector
(B) Fuel temperature sensor
(C) Fuel level sensor

B: INSTALLATION

Install in the reverse order of removal.

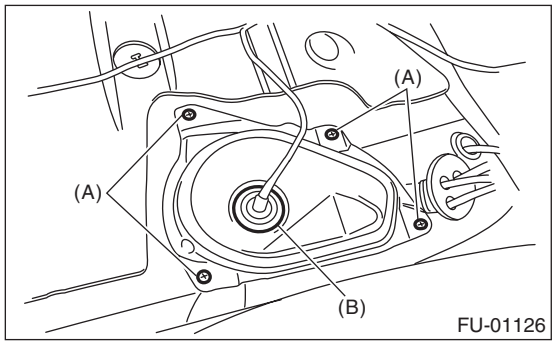
26.Fuel Sub Level Sensor

A: REMOVAL

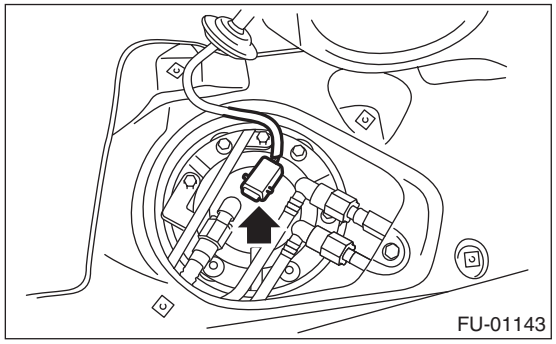
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **Before starting work, be sure to reduce fuel in the fuel tank to 3/4 of the tank or less. If there is more fuel in the tank, fuel may spill out.**

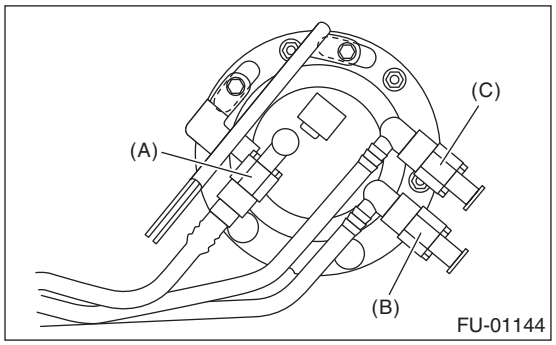
1) Release the fuel pressure. <Ref. to FU(H6DO)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H6DO)-38, DRAINING FUEL, PROCEDURE, Fuel.>
3) Remove the rear seat.
4) Remove the service hole cover.
   (1) Remove bolt (A).
   (2) Push the grommet (B) down and remove the service hole cover.



5) Disconnect the connector from the fuel sub level sensor.



6) Disconnect the quick connector, then disconnect the fuel delivery hose, return hose and jet pump hose. <Ref. to FU(H6DO)-55, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
7) Remove the nuts and bolts which install fuel sub level sensor on fuel tank.



(A) Jet pump hose
(B) Delivery hose
(C) Return hose

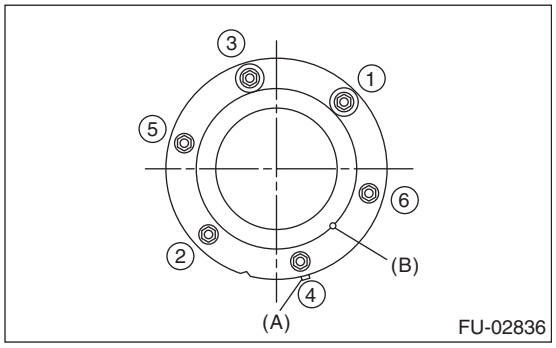
8) Remove the fuel sub level sensor.

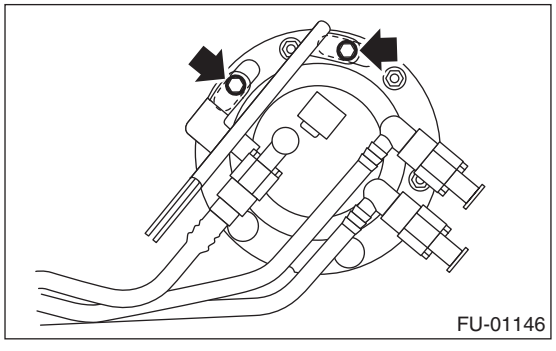
B: INSTALLATION

Install in the reverse order of removal while being careful of the following.
- Make sure the sealing portion is free from fuel or foreign matter before installation.
- Align the protrusion (A) of gasket with the position shown in the figure.
- Align the protrusion (B) of fuel sub level sensor with the cutout on the upper plate of fuel sub level sensor.
- Tighten the nuts and bolts 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 (0.45 kgf-m, 3.2 ft-lb)





27.Fuel Filter

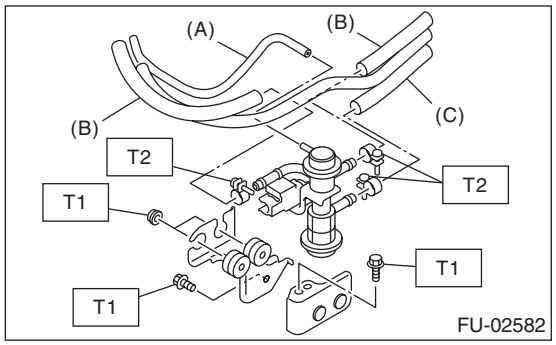
A: SPECIFICATION

Fuel filter forms a single unit with fuel pump. Refer to “Fuel Pump” for removal and installation. <Ref. to FU(H6DO)-49, REMOVAL, Fuel Pump.> <Ref. to FU(H6DO)-49, INSTALLATION, Fuel Pump.>

28.Fuel Bypass Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H6DO)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the pressure regulator vacuum hose.
3) Disconnect the fuel delivery line and return line from the fuel by-pass valve.
4) Remove the fuel by-pass valve from the vehicle.
5) Disconnect the fuel delivery hose and fuel return hose from the fuel by-pass valve.

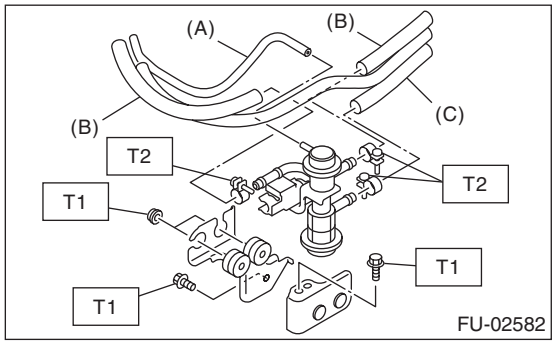


(A) Pressure regulator vacuum hose
(B) Fuel delivery line
(C) Fuel return line

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
T1: 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
T2: 1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



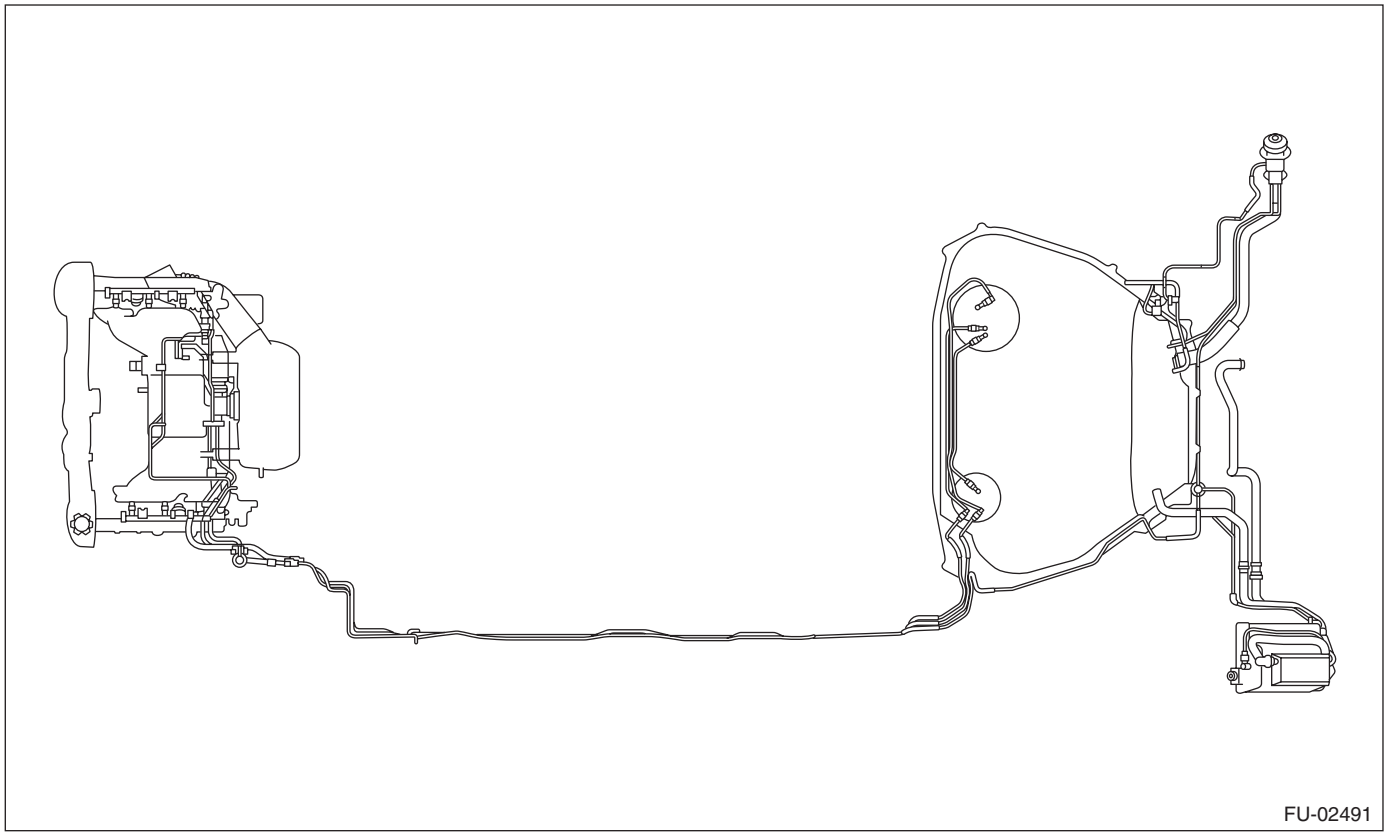
29.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

WARNING:
Place “NO OPEN FLAMES” signs near the working area.

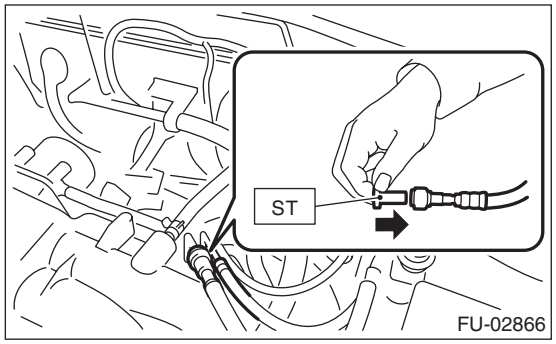
CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H6DO)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the floor mat. <Ref. to EI-69, REMOVAL, Floor Mat.>
5) Disconnect the fuel delivery pipes and hoses, and then disconnect the fuel return pipes and hoses, evaporation pipes and hoses.


FU-02491

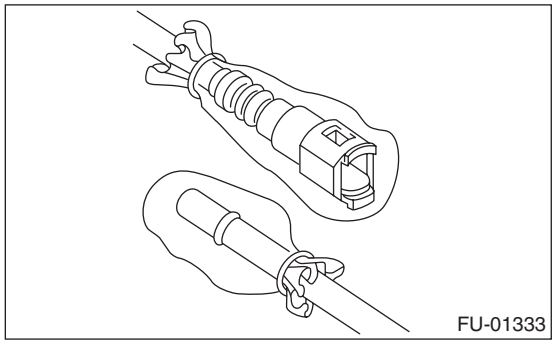
6) In the engine compartment, disconnect the fuel delivery hoses and evaporation hose.
(1) Disconnect the quick connector on the fuel delivery line and return line by pushing the ST in the direction of the arrow.
ST 42099AE000 CONNECTOR REMOVER
(2) Remove the clip and disconnect the evaporation hose from the pipe.

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

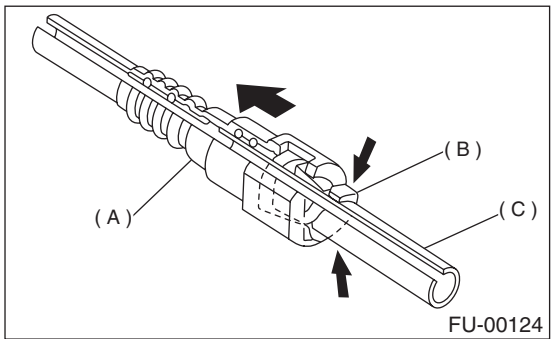


(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

7) Lift up the vehicle.
8) Remove the fuel tank. <Ref. to FU(H6DO)-40, 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).



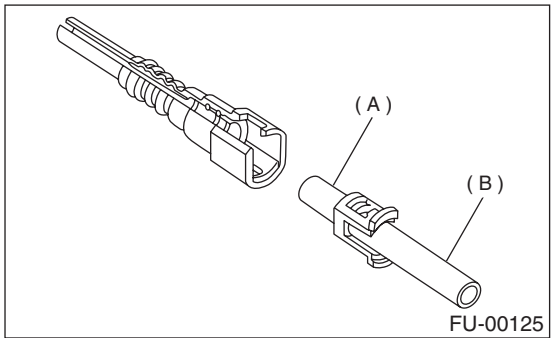
(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel line.

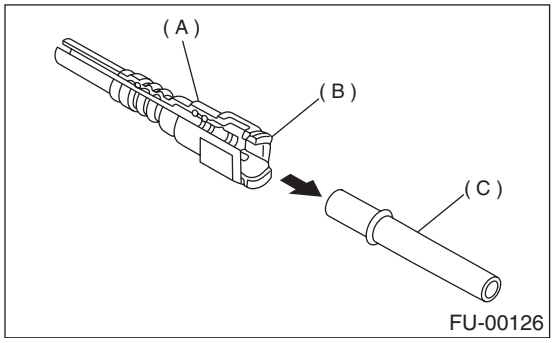
CAUTION:
Make sure there is no damage or dust on the connections. If necessary, clean seal surface of pipe.

NOTE:
Use a new retainer.



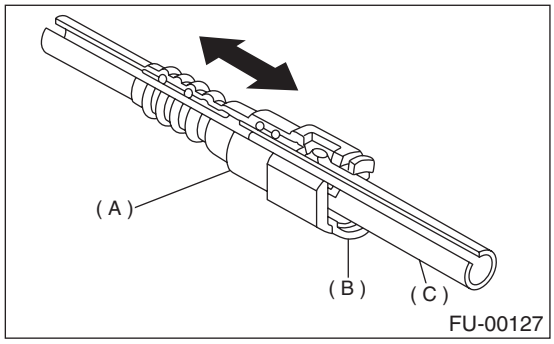
(A) Seal surface
(B) Pipe

(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 hoses and their connections for any leakage of fuel.



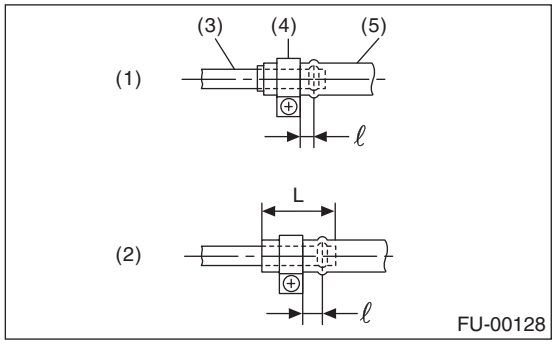
(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose and return hose to the pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the amount to be inserted is specified.
Type B: When the amount to be inserted is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

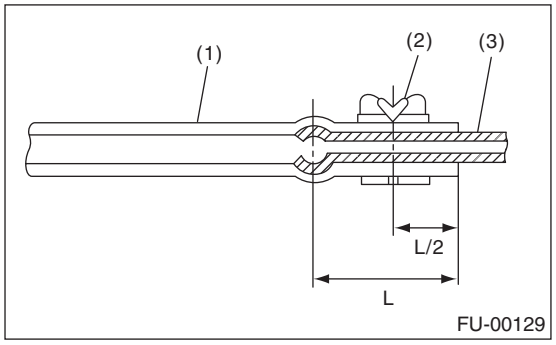
CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



(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)



(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 pump and clean or replace the fuel tank.
4)	Clogged or bent fuel pipe or hose	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent air breather tube or pipe	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator	Replace.
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)	Defective drain gasket of the fuel tank	Replace.
5)	Clogged or bent air breather tube or air vent tube	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe	Retighten.
2)	Problem in tightness of the fuel saucer gasket air	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)

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7.	Fuel Temperature Sensor	8
8.	Fuel Sub Level Sensor	9
9.	Fuel Tank Pressure Sensor	10
10.	Pressure Control Solenoid Valve	11
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14.	PCV Valve	15

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.>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	<Ref. to GD(H6DO)-11, DTC P0016 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to GD(H6DO)-12, DTC P0018 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H6DO)-12, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0026	Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)	<Ref. to GD(H6DO)-13, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0028	Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)	<Ref. to GD(H6DO)-15, DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-16, 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)-18, 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)-20, 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)-22, 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)-24, 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)-26, 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)-26, 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)-26, 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)-26, 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)-26, 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)-27, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0076	Intake Valve Control Solenoid Circuit Low (Bank 1)	<Ref. to GD(H6DO)-29, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0077	Intake Valve Control Solenoid Circuit High (Bank 1)	<Ref. to GD(H6DO)-30, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0082	Intake Valve Control Solenoid Circuit Low (Bank 2)	<Ref. to GD(H6DO)-31, DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0083	Intake Valve Control Solenoid Circuit High (Bank 2)	<Ref. to GD(H6DO)-31, DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H6DO)-32, 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)-35, 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)-37, 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)-39, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H6DO)-41, 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)-43, 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)-45, 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)-47, 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)-49, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(H6DO)-51, 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)-53, 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)-55, 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)-57, 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)-59, 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)-61, 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)-63, 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)-65, 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)-67, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-70, 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)-72, 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)-74, 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)-75, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0140	O2 Sensor Circuit No Activity Detected (Bank1 Sensor2)	<Ref. to GD(H6DO)-80, 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)-82, 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)-82, 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)-82, 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)-82, 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)-82, DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0158	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-82, 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)-82, DTC P0159 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0160	O2 Sensor Circuit No Activity Detected (Bank2 Sensor2)	<Ref. to GD(H6DO)-82, 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)-83, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H6DO)-85, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0174	System Too Lean (Bank 2)	<Ref. to GD(H6DO)-86, DTC P0174 SYSTEM TOO LEAN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0175	System Too Rich (Bank 2)	<Ref. to GD(H6DO)-86, 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)-87, 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)-90, 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)-92, 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)-94, 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)-96, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0198	Engine Oil Temperature Sensor High	<Ref. to GD(H6DO)-97, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low	<Ref. to GD(H6DO)-98, 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)-100, 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)-102, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H6DO)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H6DO)-109, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H6DO)-109, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H6DO)-109, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0305	Cylinder 5 Misfire Detected	<Ref. to GD(H6DO)-109, DTC P0305 CYLINDER 5 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0306	Cylinder 6 Misfire Detected	<Ref. to GD(H6DO)-109, 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)-110, 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)-112, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0332	Knock Sensor 2 Circuit Low (Bank 2)	<Ref. to GD(H6DO)-113, 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)-113, 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)-114, 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)-116, 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)-118, 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)-120, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H6DO)-121, 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)-123, 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)-138, 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)-140, 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)-142, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H6DO)-144, 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)-146, 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)-147, 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)-147, 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)-148, 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)-150, 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)-152, DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor “A” Circuit Low	<Ref. to GD(H6DO)-154, 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)-156, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H6DO)-158, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Fan Rationality Check	<Ref. to GD(H6DO)-161, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0500	Vehicle Speed Sensor “A”	<Ref. to GD(H6DO)-162, 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)-164, 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)-166, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H6DO)-168, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Air Control System Performance	<Ref. to GD(H6DO)-170, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H6DO)-171, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H6DO)-172, 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)-174, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H6DO)-175, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H6DO)-177, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0691	Fan 1 Control Circuit Low	<Ref. to GD(H6DO)-180, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Fan 1 Control Circuit High	<Ref. to GD(H6DO)-181, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	Transmission Control System (MIL Request)	<Ref. to GD(H6DO)-182, 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)-183, 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)-185, 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)-187, 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)-187, 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)-188, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H6DO)-190, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H6DO)-192, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H6DO)-194, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H6DO)-196, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to GD(H6DO)-197, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(H6DO)-198, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(H6DO)-198, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(H6DO)-198, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(H6DO)-198, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(H6DO)-198, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(H6DO)-198, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1578	Meter Failure	<Ref. to GD(H6DO)-198, DTC P1578 METER FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1602	Control Module Programming Error	<Ref. to GD(H6DO)-199, 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)-201, 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)-203, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to GD(H6DO)-204, 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)-204, DTC P2093 INTAKE 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)-205, 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)-207, 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)-208, 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)-208, 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)-209, 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)-211, 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)-213, 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)-215, 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)-217, 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)-219, 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)-221, 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)-223, 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)-225, 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)-227, 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)-229, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2228	Barometric Pressure Circuit Low	<Ref. to GD(H6DO)-230, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2229	Barometric Pressure Circuit High	<Ref. to GD(H6DO)-231, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

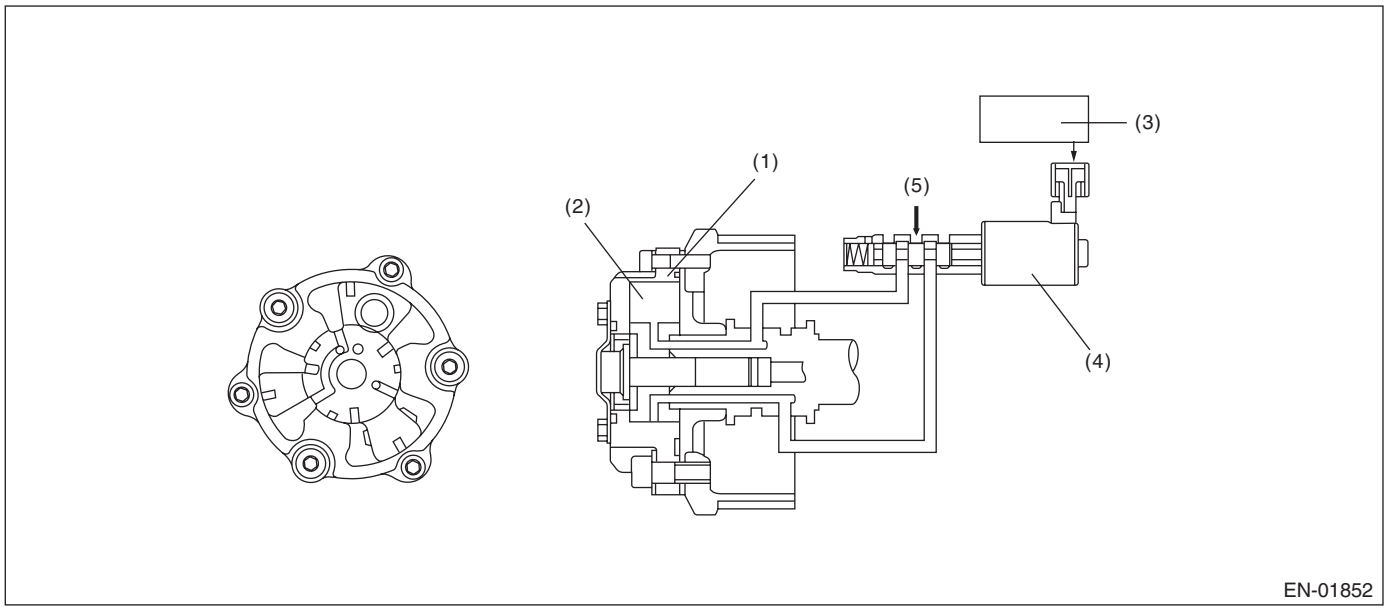
2. Diagnostic Trouble Code (DTC) Detecting Criteria

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

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.

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	≥ 3 seconds
Battery voltage	≥ 10.9 V
Engine speed	≥ 1500 rpm
Engine coolant temperature	≥ 50°C (122°F)
AVCS control	Operation
Target advance angle	0°CA or more
Target timing advance change amount	< 1.07°CA/64 ms

4. GENERAL DRIVING CYCLE

Always perform the diagnosis 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 AVCS target timing advance amount and AVCS actual timing advance amount is calculated for certain amount of time and the difference is the specified value or larger.

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 30 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Σ(Target position – actual position) or Σ(Target position – actual position)	> 12000°CA or < –2500°CA

Time Needed for Diagnosis:
30 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

1) Judge as OK and clear the NG when the continuous time of meeting the following criteria is 1 second or more.
2) OK, when the following criteria are satisfied.

Judgment Value

Malfunction criteria	Threshold value
Σ(Target position – actual position)	≤ 12000°CA and ≥ –2500°CA

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Fix valve lift amount to High

9. ECM OPERATION AT DTC SETTING

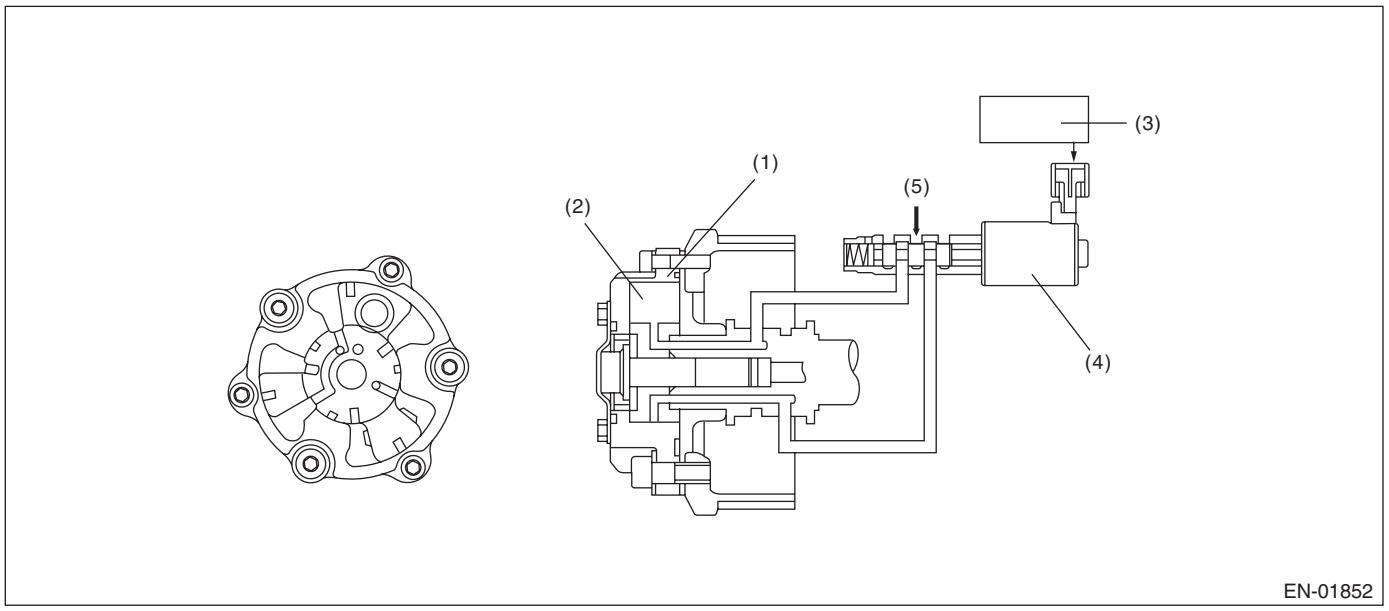
Memorize the freeze frame data. (For test mode $02)

B: DTC P0016 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.

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	Uncontrolled

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after warming up the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the camshat sensor input position is not within the normal range.

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 20 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Camshaft input position	< BTDC 22°CA or > BTDC 58°CA

Time Needed for Diagnosis: 20 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG when the continuous time of meeting the following criteria is 1 second or more.

Judgment Value

Malfunction criteria	Threshold value
Camshaft input position	≥ BTDC 22°CA and ≤ BTDC 58°CA

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Fix valve lift amount to High

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

C: DTC P0018 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 2)

NOTE:
For diagnostic procedures, refer to DTC P0016. <Ref. to GD(H6DO)-11, DTC P0016 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

NOTE:
For the diagnostic procedure, 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.>

E: DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Judge as NG with either Low NG or High NG.
A variable valve lift diagnosis oil pressure switch is installed for diagnosis. It is possible to determine whether the intake valve is in high mode (increase the amount of lift) or in low mode (suppressing the amount of lift) when the variable valve lift diagnosis oil pressure switch is turned ON or OFF.

- **Normal**

Oil switching solenoid valve duty	Intake valve	Variable valve lift diagnosis oil pressure switch
Large	High mode	OFF
Minimum	Low mode	ON

- **Low NG**

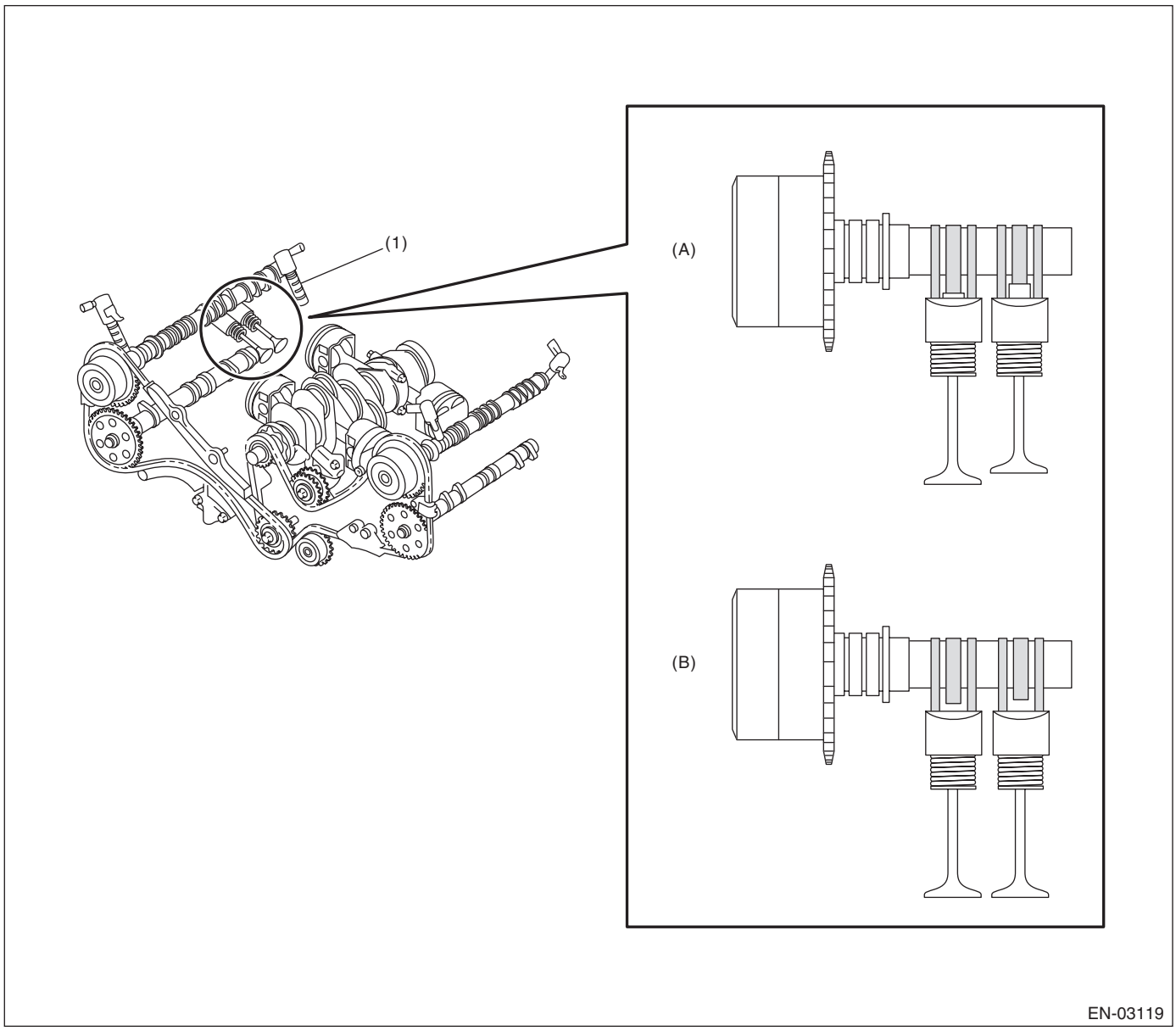
When the variable valve lift diagnosis oil pressure switch remains ON even though the intake valve tried to enter high mode (oil switching solenoid valve duty is large), this is judged as a Low NG.

- **High NG**

When the variable valve lift diagnosis oil pressure switch remains OFF even though the intake valve tried to enter low mode (oil switching solenoid valve duty is small), this is judged as a High NG.

2. COMPONENT DESCRIPTION

The variable valve lift system optimizes the intake valve lift by switching between the low lift cam and the high lift cam according to the engine speed.The amount of intake valve lift is varied by controlling the oil switching solenoid valve duty according to signals from the ECM.



(1) Oil switching solenoid valve
(A) When at low speed
(B) When at high speed

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	≥ 10.9 V
After engine starting	≥ 6 seconds
Engine oil temperature	≥ 0°C (0°F)
Variable valve lift control	Operation

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously 6 seconds after engine start while variable valve lift is being controlled

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the follwing conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction criteria	Threshold value
Low NG	
Duty ratio	≥ 62%
Variable valve lift diagnosis oil pressure switch	ON
High NG	
Duty ratio	< 33%
Variable valve lift diagnosis oil pressure switch	OFF

Time Needed for Diagnosis:
Low side: 0.784 seconds
High side: 3.0 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following criteria are met is more than the predetermined time.

Judgment Value

Malfunction criteria	Threshold value
Low OK	
Duty ratio	≥ 62%
Variable valve lift diagnosis oil pressure switch	OFF
High OK	
Duty ratio	< 33%
Variable valve lift diagnosis oil pressure switch	ON

Time Needed for Diagnosis:
Low side: 0.208 seconds
High side: 3.0 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

F: DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2)

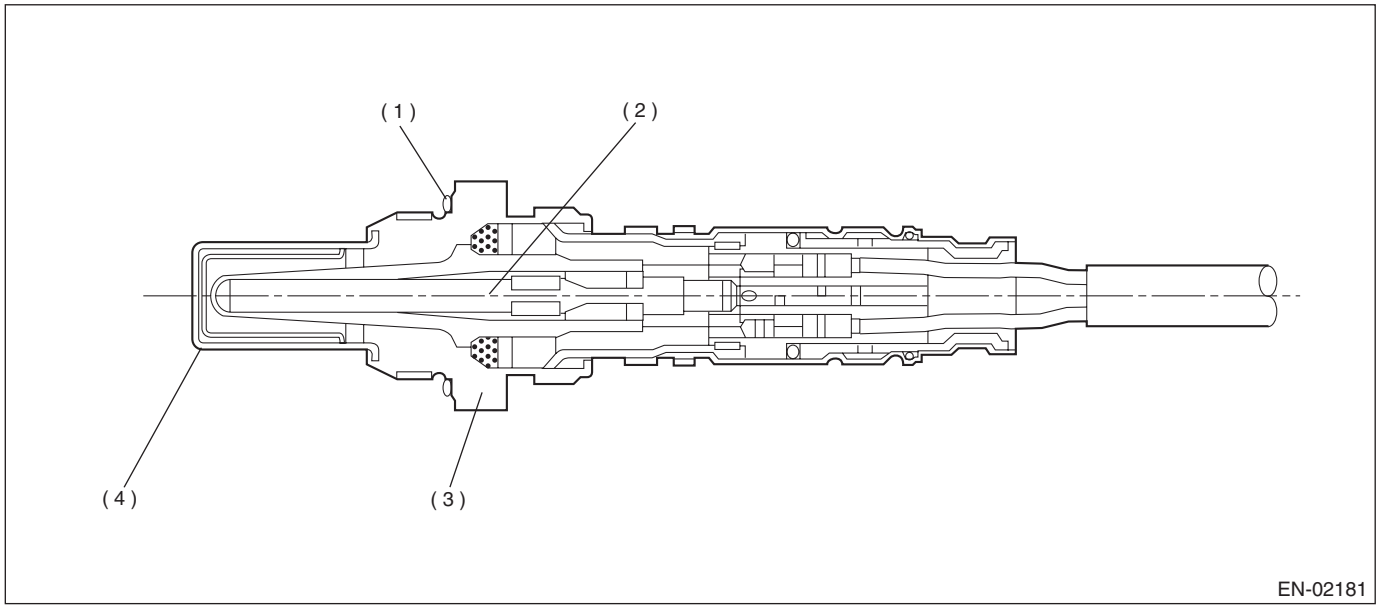
NOTE:
For diagnostic procedures, refer to DTC P0026. <Ref. to GD(H6DO)-13, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

G: 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	30 seconds or more
Battery voltage	> 10.9 V
Control duty ≥ 35%	Experienced
After fuel cut	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 30 seconds or more have passed since the engine started.

5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is the time needed for diagnosis (10 seconds) or more. Judge as OK and clear NG when the continuous time of not completing the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

Judgment Value

Malfunction criteria	Threshold value
Front oxygen (A/F) sensor impedance	> 50 Ω

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Rear oxygen sensor sub learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

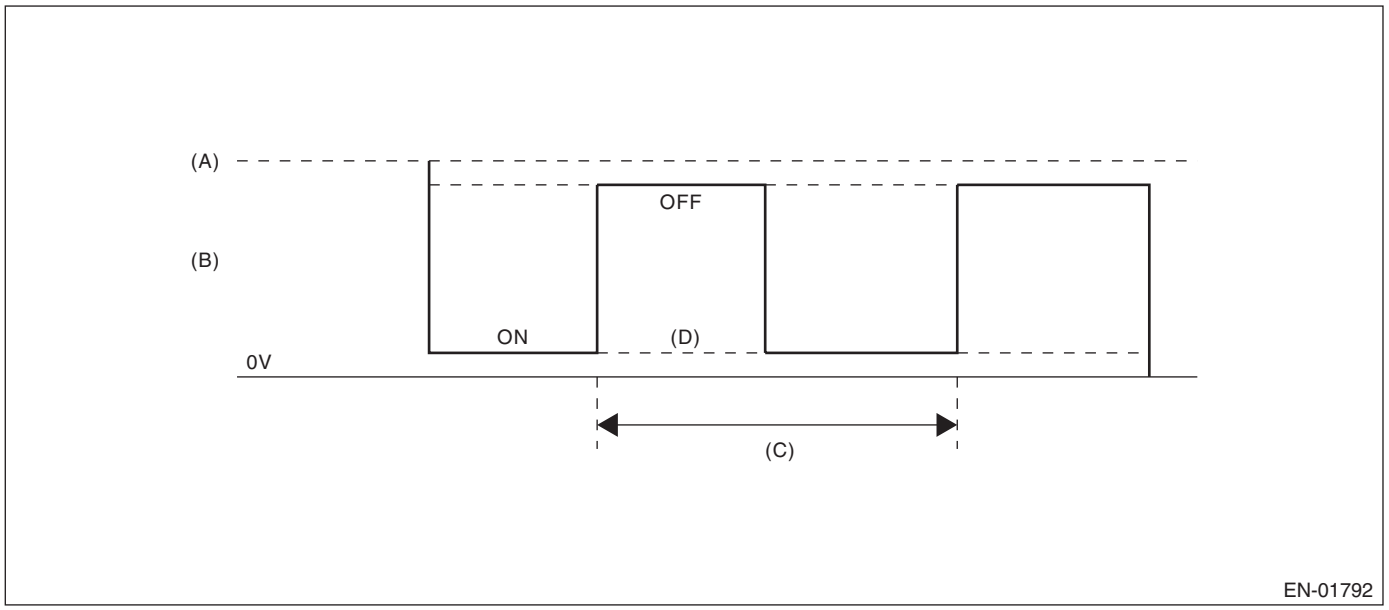
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The 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 Judgment

Judge as NG if the duration of time while the following criteria are met is 1 second (8 cycles) or more.

Judgment Value

Malfunction criteria	Threshold value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	< 87.5%

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

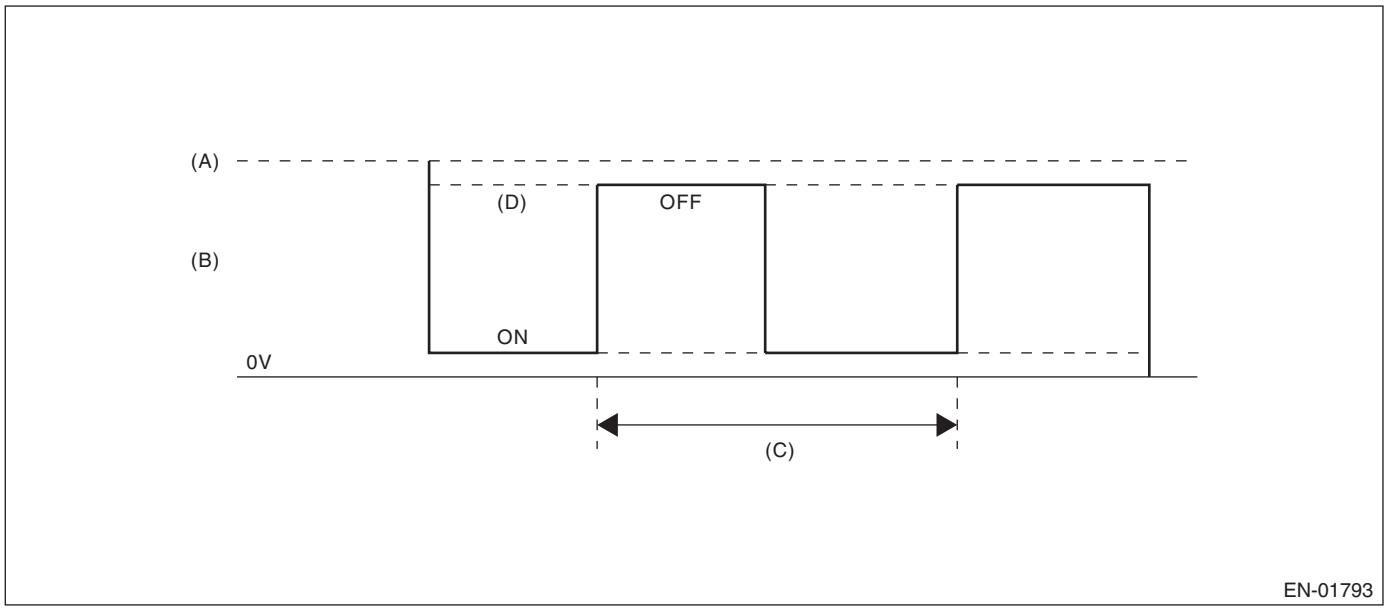
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The 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 Judgment

Judge as NG if the duration of time while the following criteria are met is 1 second (8 cycles) or more.

Judgment Value

Malfunction criteria	Threshold value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	≥ 12.5%

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

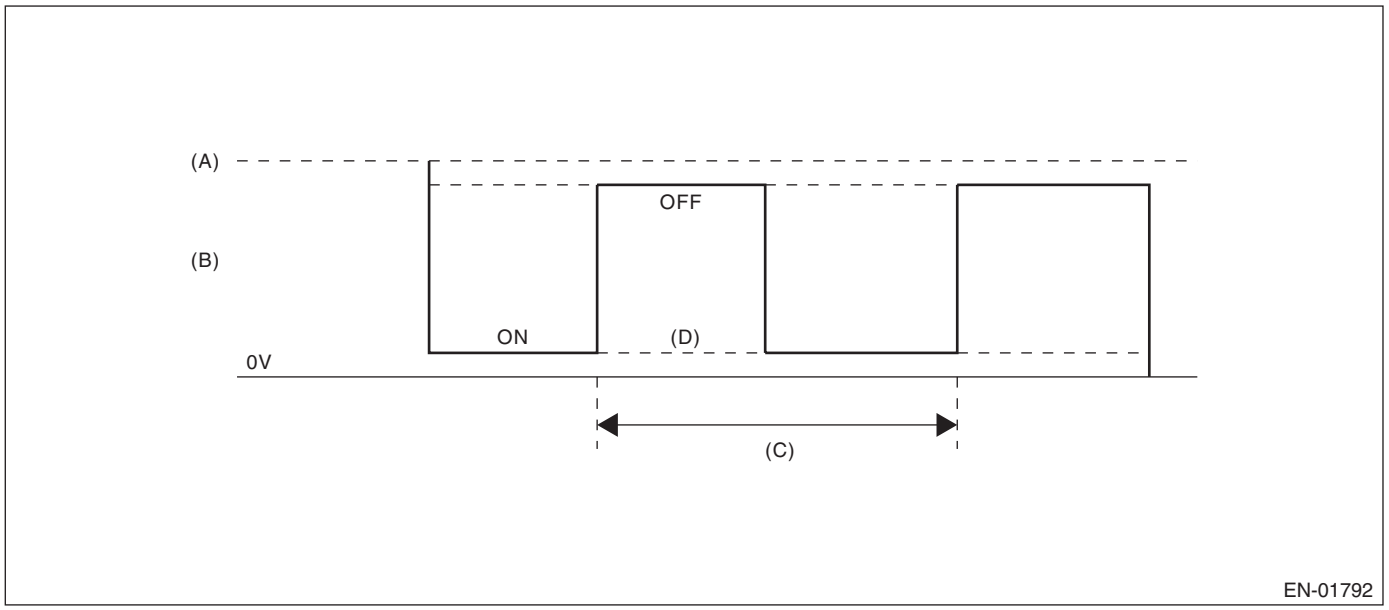
Memorize the freeze frame data. (For test mode $02)

J: 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

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting all the malfunction criteria below becomes 2560 milliseconds (10 cycles) or more.

Judgment Value

Malfunction criteria	Threshold value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75%

Time Needed for Diagnosis: 2.56 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

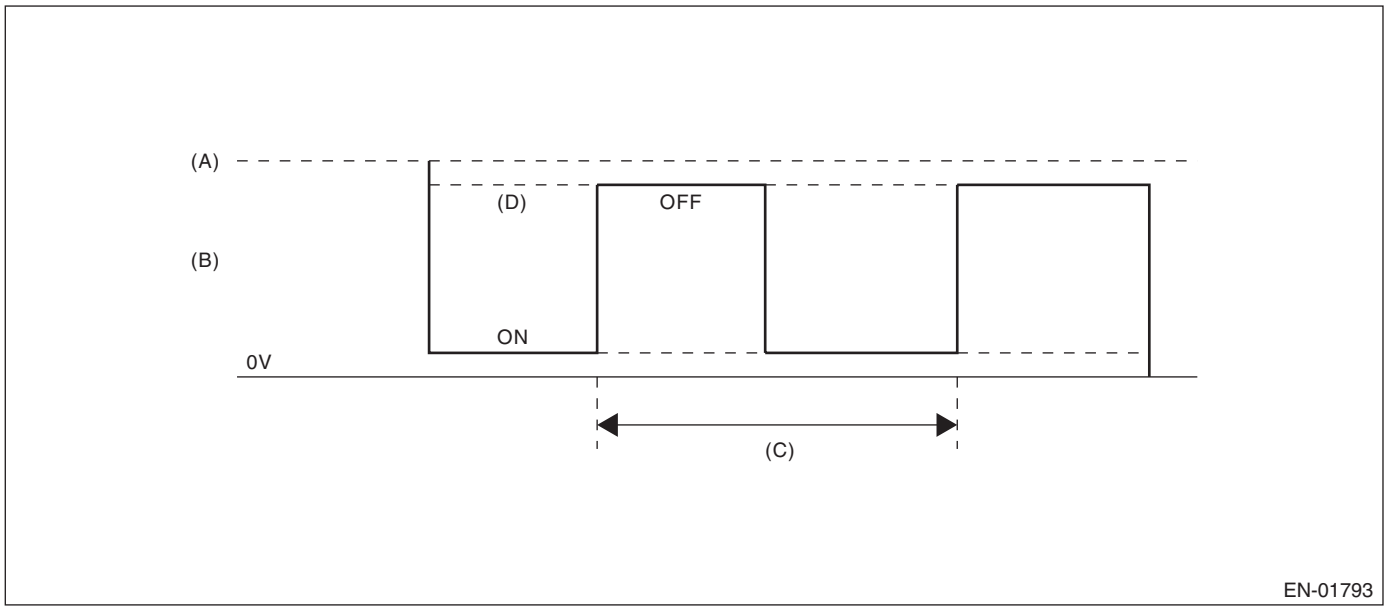
Memorize the freeze frame data. (For test mode $02)

K: 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

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting all the malfunction criteria below becomes 2560 milliseconds (10 cycles) or more.

Judgment Value

Malfunction criteria	Threshold value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 15%

Time Needed for Diagnosis: 2.56 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

L: 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)-16, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

M: 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)-18, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

N: 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)-20, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

O: 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)-22, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

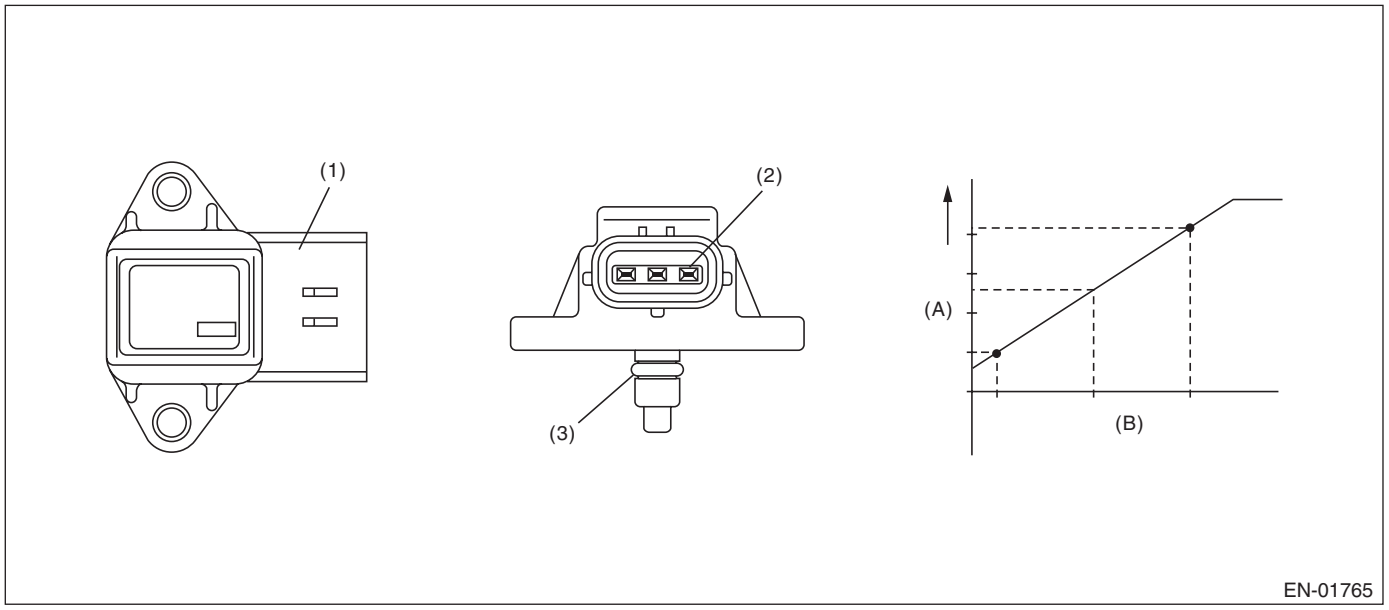
NOTE:
For the detection standard, refer to DTC P0038. <Ref. to GD(H6DO)-24, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Q: 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



(1) Connector
(2) Terminals
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when either Low side or High side becomes NG.
Judge as NG if the continuous time while the following criteria are met exceeds the determined time.

Judgment Value

Malfunction criteria	Threshold value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 15°
Output voltage	< 2.12 V
Engine load	> 0.87 g/rev
High side	
Engine speed	500 ←→ 850 rpm
Throttle position	< 3.5°
Output voltage	≥ 2.66 V
Engine load	< 0.6 g/rev

Time Needed for Diagnosis:
3 seconds (Low side)
10 seconds (High side)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG when both Low side and High side become OK.
Judge as OK when the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 15°
Output voltage	≥ 2.12 V
Engine load	> 0.87 g/rev
High side	
Engine speed	500 ←→ 850 rpm
Throttle position	< 3.5°
Output voltage	< 2.66 V
Engine load	< 0.6 g/rev

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from the engine speed and size of the throttle opening.When the throttle opening is also NG, fix at 66.7 kPa (500 mmHg, 19.69 inHg).
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Fuel cut will operate at engine high speed.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knocking compensation

When normal: Learning ignition advance angle value = knock F/B advance angle + entire learning advance angle value + portional learning advance angle value
Failure: learned ignition advance value = –6°CA. (6°CA retard)
Knock F/B advance angle value = 0°CA
Whole learning prohibited
Portional learning prohibited

- ISC control: ISC feedback amount calculation prohibited

Amount of ISC open-loop compensation = Fixed at 6.82%

- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

R: DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of the oil switching solenoid valve.
Judge as NG when the current is small even though the output duty is large.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the following conditions is 2 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Duty ratio	≥ 30%
Control current	< 0.026 A

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the following conditions is 2 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
|Oil switching solenoid valve target current value – oil switching solenoid valve current value|	< 0.08 A
Target current	≥ 0.11 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

S: DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect short circuits of the oil switching solenoid valve.
Judge as a short NG when the current is large even though the output duty is small.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the following conditions is 2 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Duty ratio	< 7%
Control current	≥ 0.465 A

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the following conditions is 2 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
|Oil switching solenoid valve target current value – oil switching solenoid valve current value|	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

T: DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0076. <Ref. to GD(H6DO)-29, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

U: DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

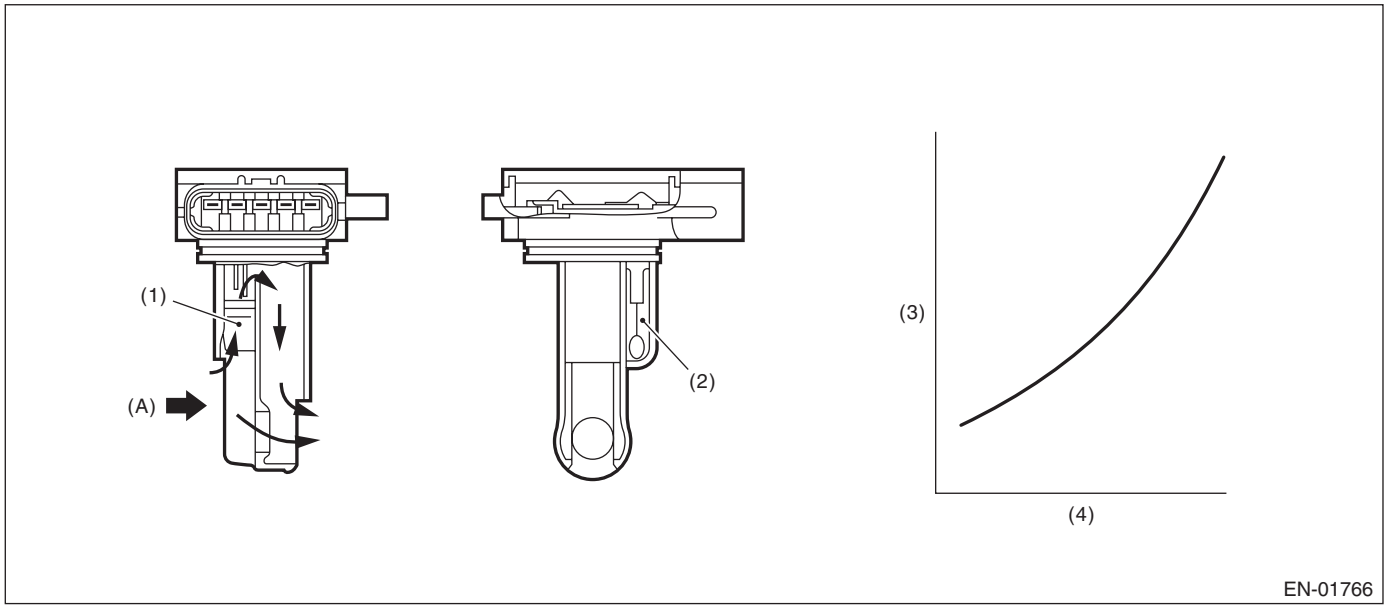
NOTE:
For the detection standard, refer to DTC P0077. <Ref. to GD(H6DO)-30, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

V: 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



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg/s)
(A) Air

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG if the continuous time while the following criteria are met exceeds the determined time.

Judgment Value

Malfunction criteria	Threshold value
Low side error	
Output voltage	< 1.79 V
Engine speed	≥ 2000 rpm
Throttle valve angle	≥ 15°
Intake manifold pressure	≥ 73.3 kPa (550 mmHg, 21.7 inHg)
High side error (1)	
Output voltage	≥ 1.83 V
Engine speed	500 ←→ 850 rpm
Throttle valve angle	< 3.5°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)
High side error (2)	
Output voltage	≥ 1.73 V
Engine speed	500 ←→ 850 rpm
Throttle valve 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 side: 5 seconds
High side: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
(Low side error)	
Output voltage	≥ 1.79 V
Engine speed	≥ 2000 rpm
Throttle valve angle	≥ 15°
Intake manifold pressure	≥ 73.3 kPa (550 mmHg, 21.7 inHg)
(High side error)	
Output voltage	< 1.83 V
Engine speed	500 ←→ 850 rpm
Throttle valve angle	< 3.5°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)
Fuel system diagnosis	Rich side normal

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

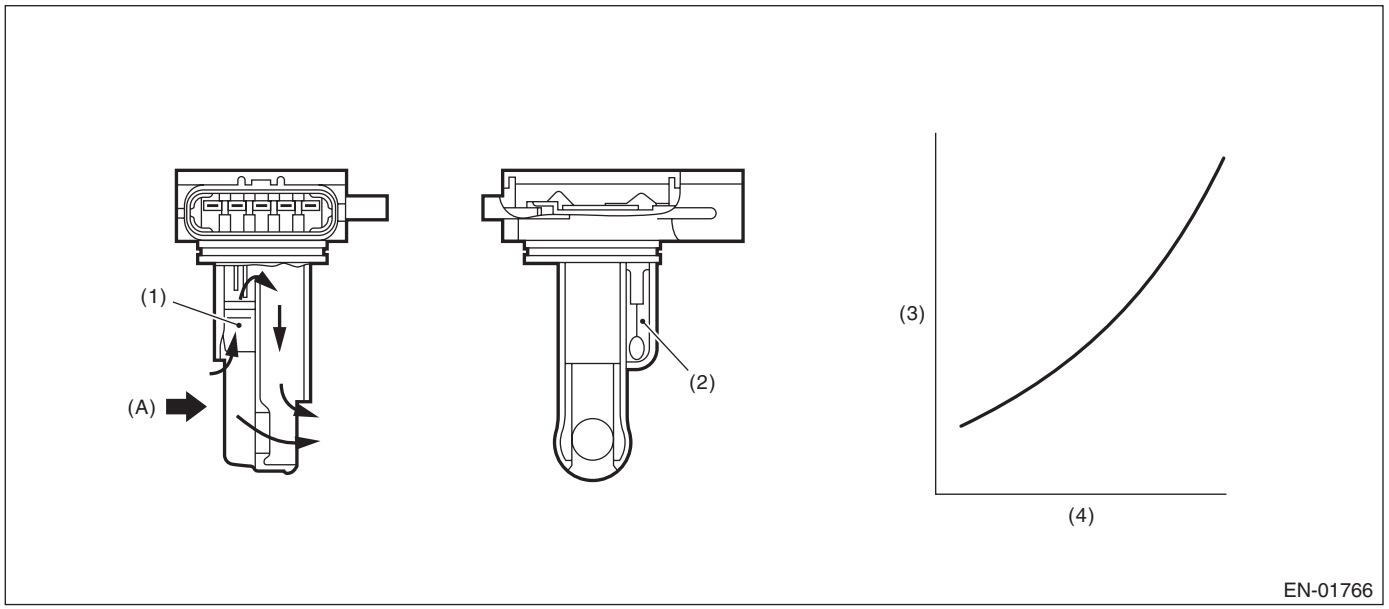
Memorize the freeze frame data. (For test mode $02)

W: 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



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)
(A) Air

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≤ 0.2 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
  - When normal: Knock compensation value = Fixed at 0°CA
  - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
  - Whole learning compensation coefficient update not allowed
  - Portional learning zone compensation value calculation not allowed
- ISC control: Open loop compensation is set to (1 g (0.04 oz)/s). Stop calculation of throttle sensor temperature compensation (hold previous value)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

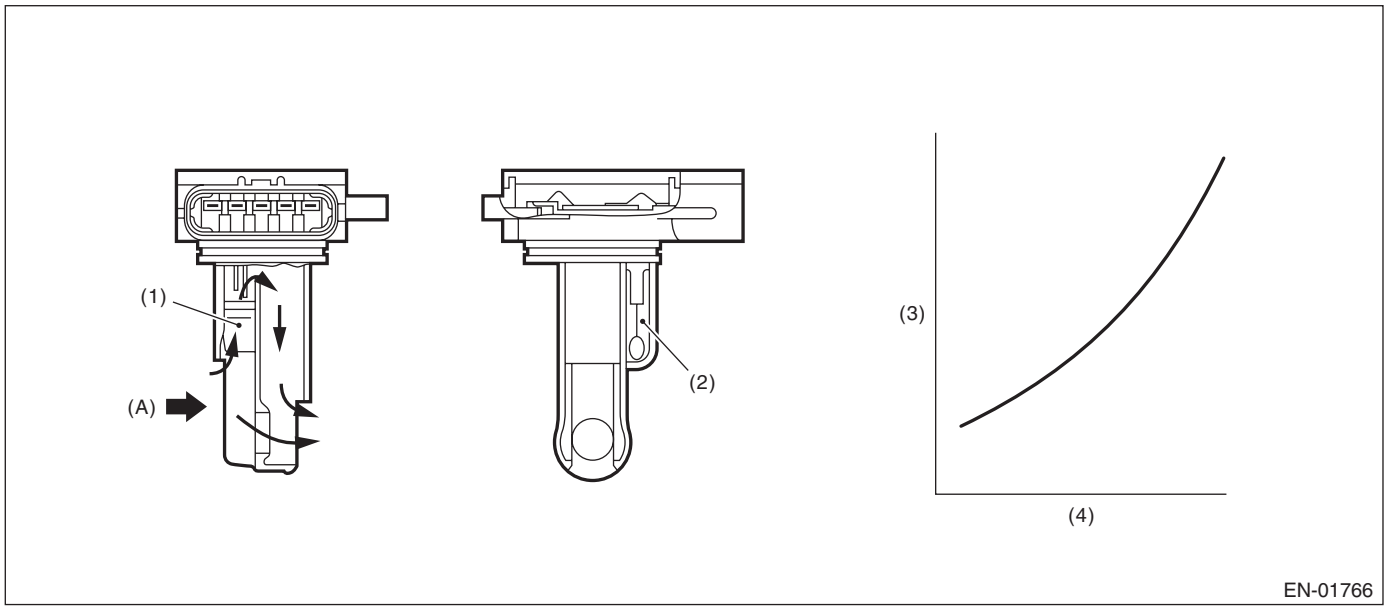
Memorize the freeze frame data. (For test mode $02)

X: 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



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)
(A) Air

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the criteria below is 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≥ 4.985 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
  - When normal: Knock compensation value = Fixed at 0°CA
  - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
  - Whole learning compensation coefficient update not allowed
  - Portional learning zone compensation value calculation not allowed
- ISC control: Open loop compensation is set to (1 g (0.04 oz)/s). Stop calculation of throttle sensor temperature compensation (hold previous value)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

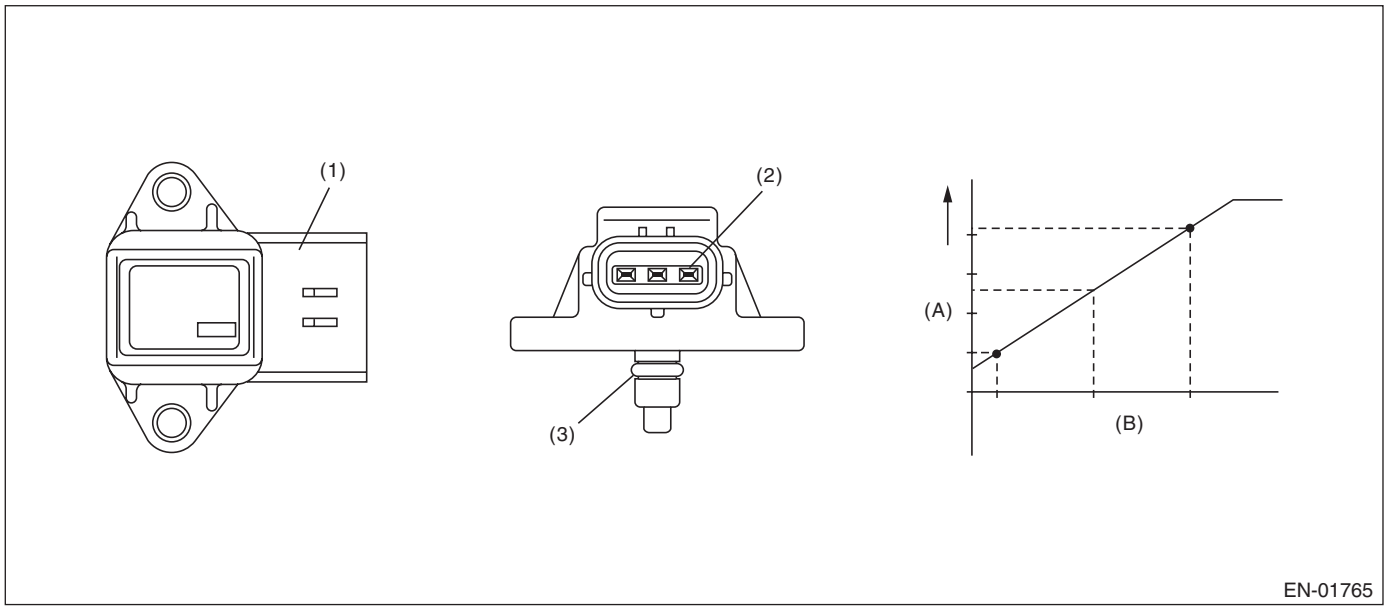
Memorize the freeze frame data. (For test mode $02)

Y: 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



(1) Connector
(2) Terminals
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

• Intake manifold pressure sensor process: Estimate the pressure from the engine speed and size of the throttle opening.When the throttle opening is also NG, fix at 66.7 kPa (500 mmHg, 19.69 inHg).
• Heavy fuel judgment: Not allowed to carry out the heavy judgment.
• Fuel cut control: Fuel cut will operate at engine high speed.
• EVAP conc. learning (fuel): Not allowed to learn.
• Knocking compensation
When normal: Learning ignition advance angle value = knock F/B advance angle + entire learning advance angle value + portional learning advance angle value
Failure: learned ignition advance value = –6°CA. (6°CA retard)
Knock F/B advance angle value = 0°CA
Whole learning prohibited
Portional learning prohibited
• ISC control: ISC feedback amount calculation prohibited
Amount of ISC open-loop compensation = Fixed at 6.82%
• Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

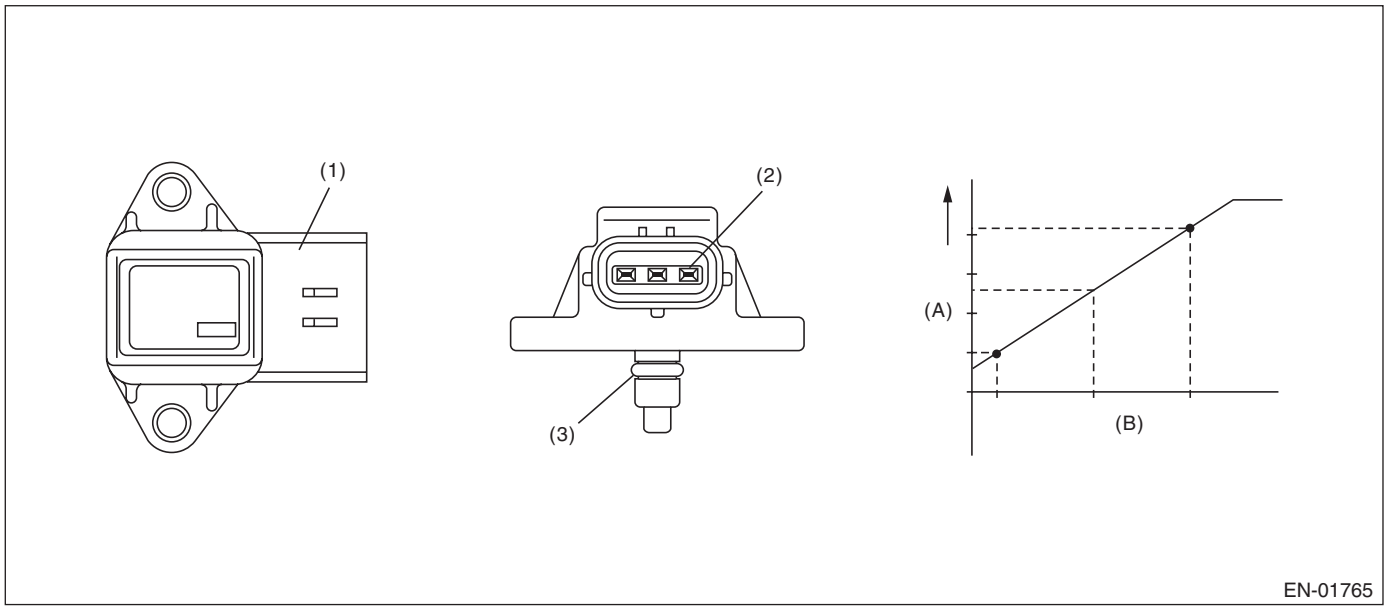
Memorize the freeze frame data. (For test mode $02)

Z: 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



(1) Connector
(2) Terminals
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

• Intake manifold pressure sensor process: Estimate the pressure from the engine speed and size of the throttle opening.When the throttle opening is also NG, fix at 66.7 kPa (500 mmHg, 19.69 inHg).
• Heavy fuel judgment: Not allowed to carry out the heavy judgment.
• Fuel cut control: Fuel cut will operate at engine high speed.
• EVAP conc. learning (fuel): Not allowed to learn.
• Knocking compensation
When normal: Learning ignition advance angle value = knock F/B advance angle + entire learning advance angle value + portional learning advance angle value
Failure: learned ignition advance value = –6°CA. (6°CA retard)
Knock F/B advance angle value = 0°CA
Whole learning prohibited
Portional learning prohibited
• ISC control: ISC feedback amount calculation prohibited
Amount of ISC open-loop compensation = Fixed at 6.82 %
• Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

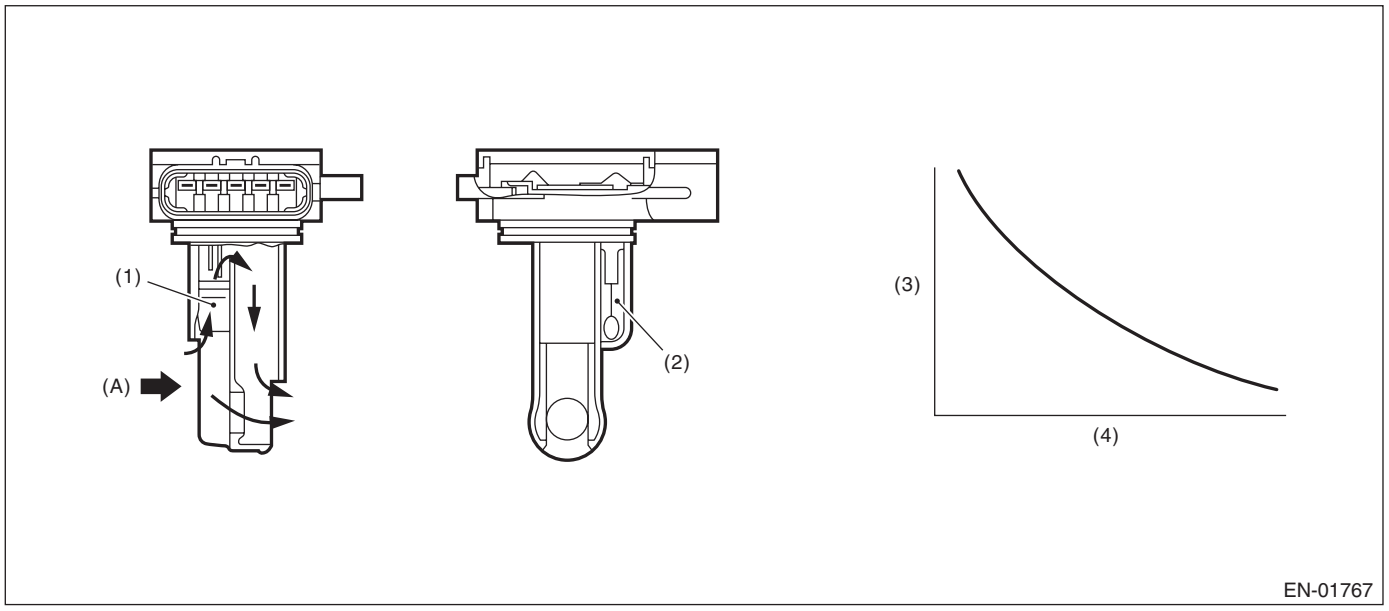
Memorize the freeze frame data. (For test mode $02)

AA: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



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Coolant temp. before engine start	< 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 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is met after warming up from a cold condition.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction criteria	Threshold value
Output voltage difference between Max. and Min.	< 20 mV (Equivalent to approximately 0.5°C (0.9°F) near 25°C)

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

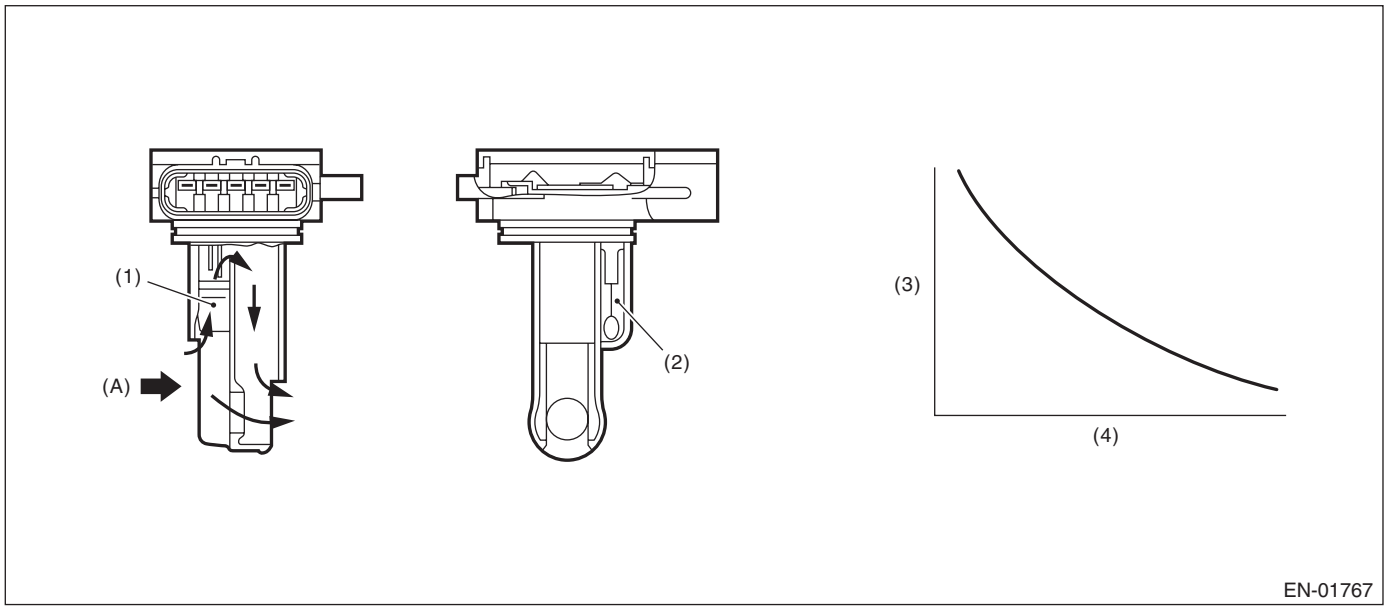
Memorize the freeze frame data. (For test mode $02)

AB: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



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 0.166 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≥ 0.166 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

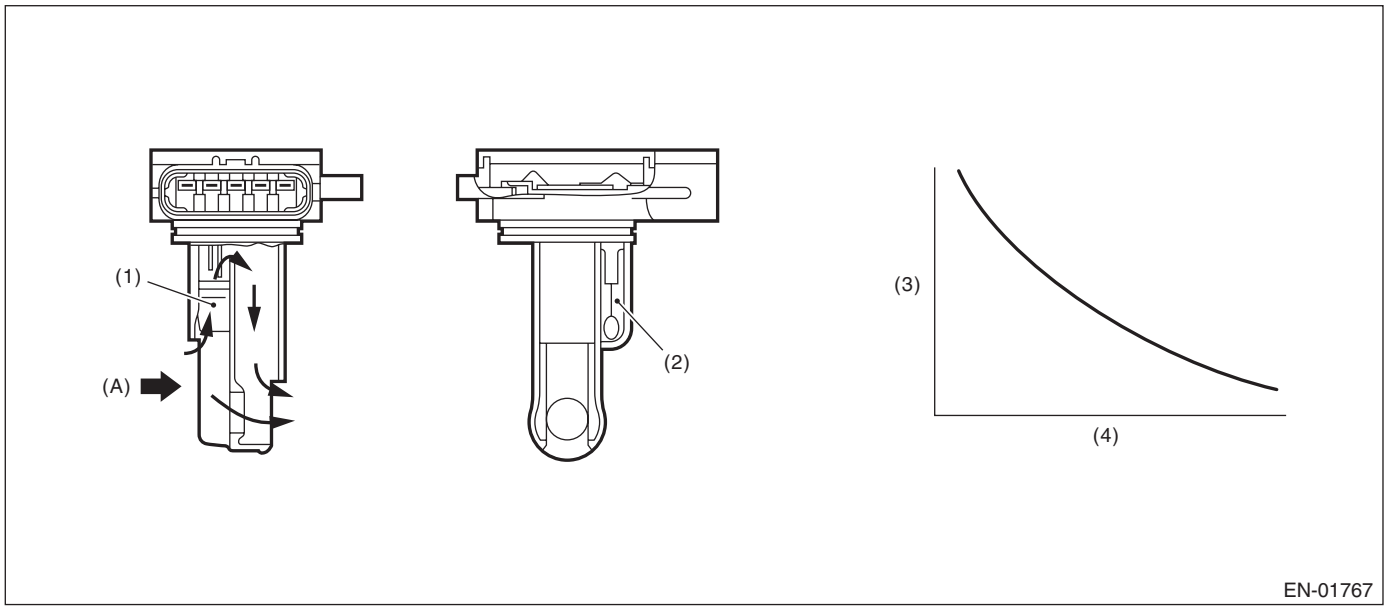
Memorize the freeze frame data. (For test mode $02)

AC: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



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≥ 4.716 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 4.716 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

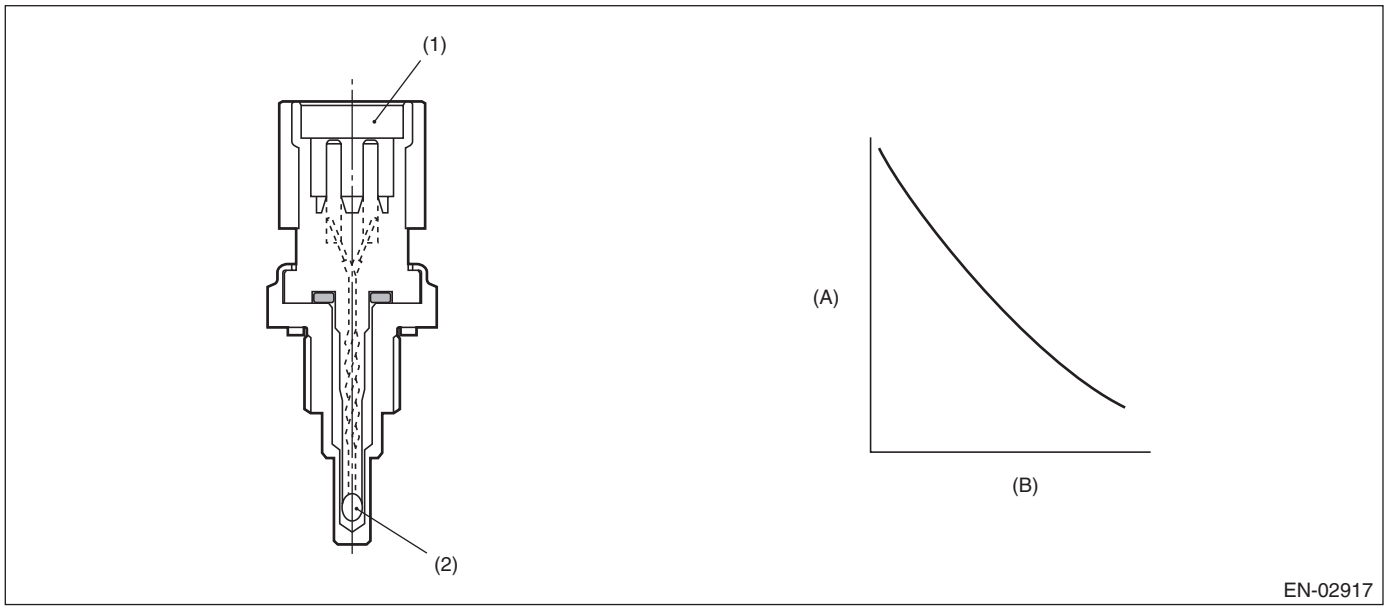
Memorize the freeze frame data. (For test mode $02)

AD: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



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 0.166 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.

9. ECM OPERATION AT DTC SETTING

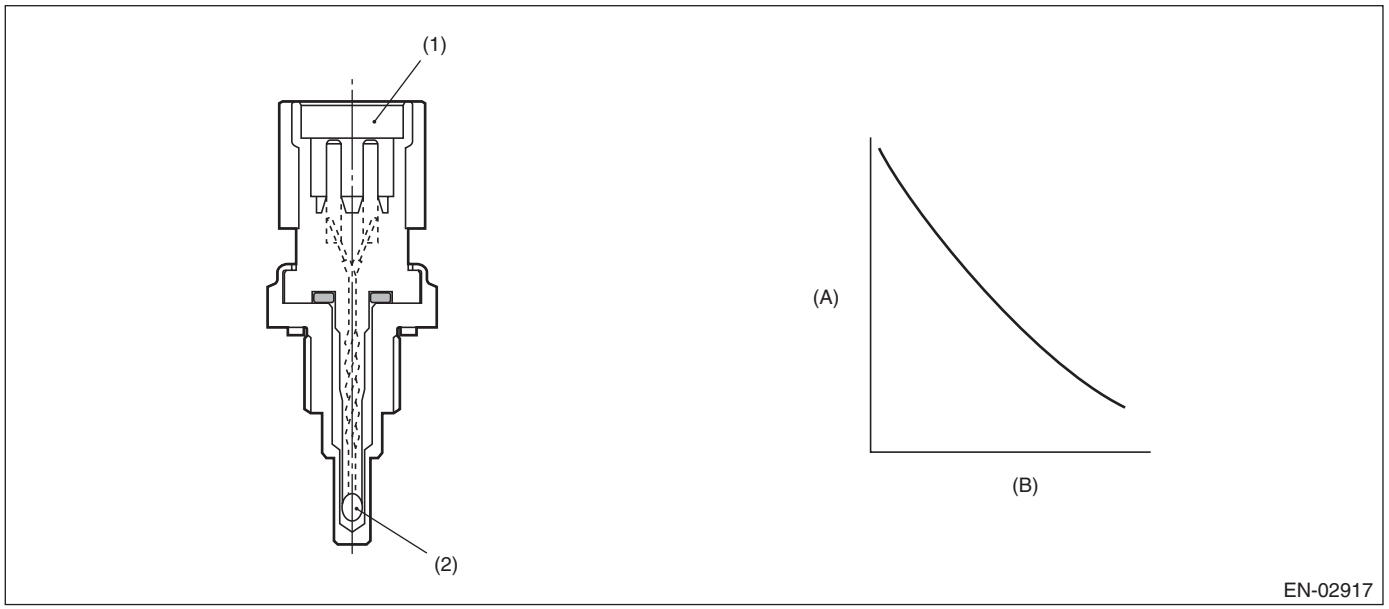
Memorize the freeze frame data. (For test mode $02)

AE: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



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.

9. ECM OPERATION AT DTC SETTING

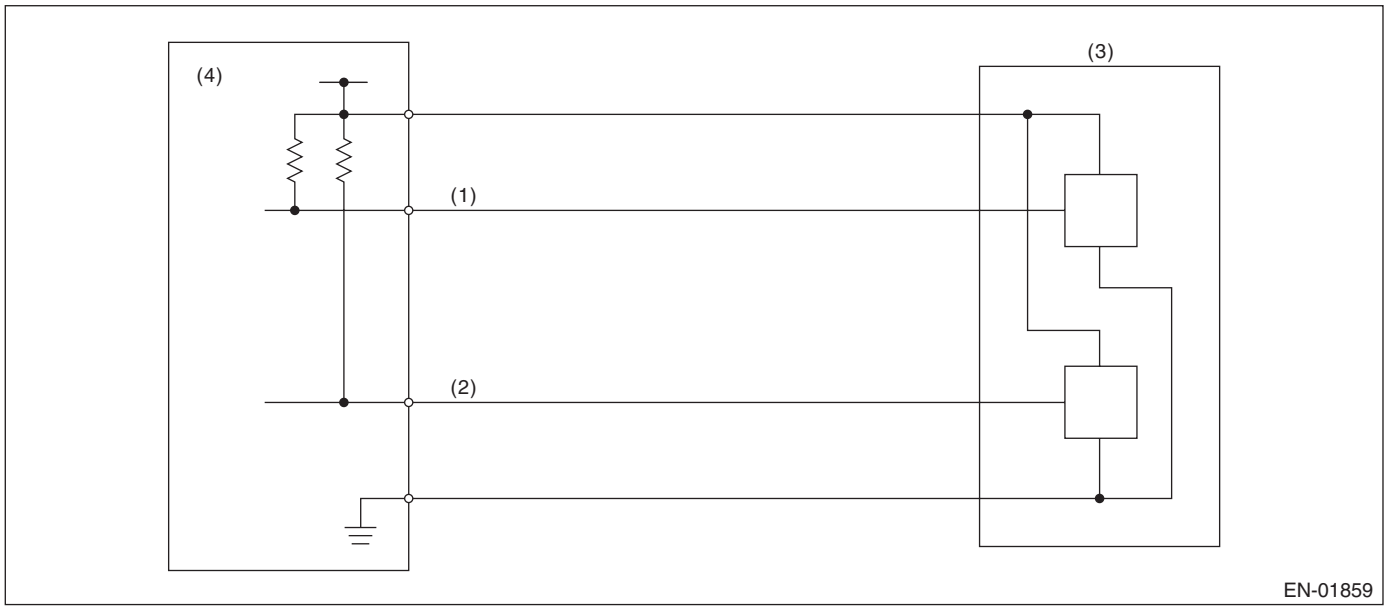
Memorize the freeze frame data. (For test mode $02)

AF: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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	≥ 0.224 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

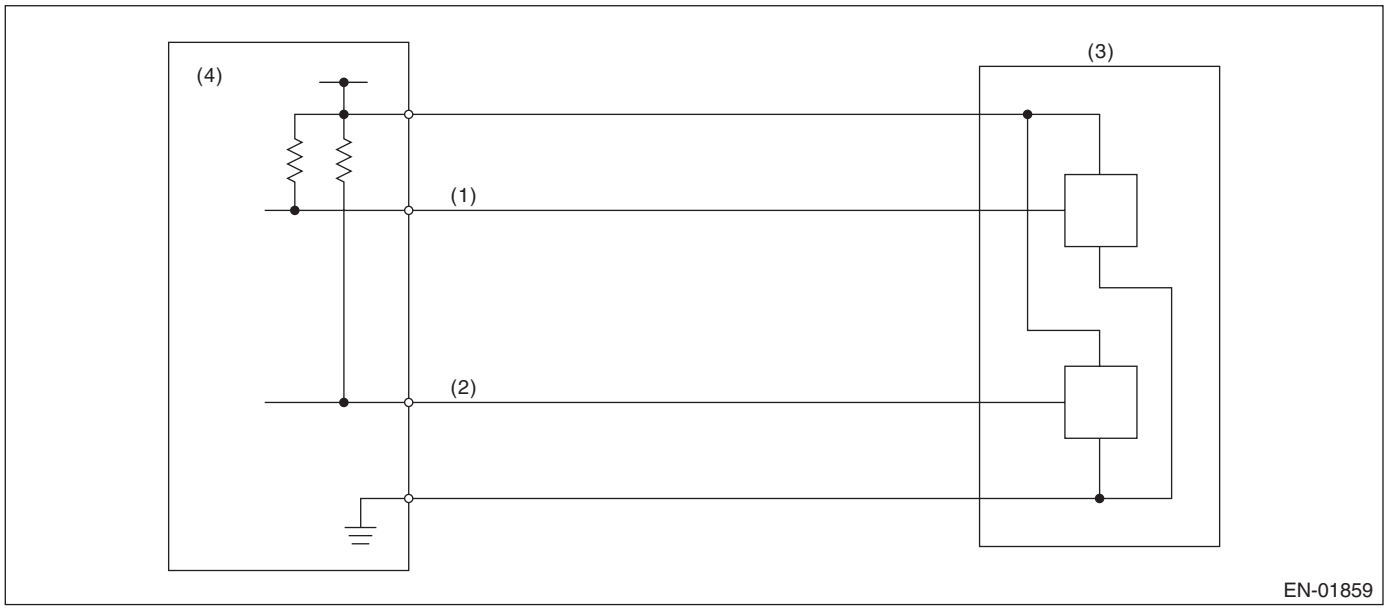
Memorize the freeze frame data. (For test mode $02)

AG: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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	≤ 4.851 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

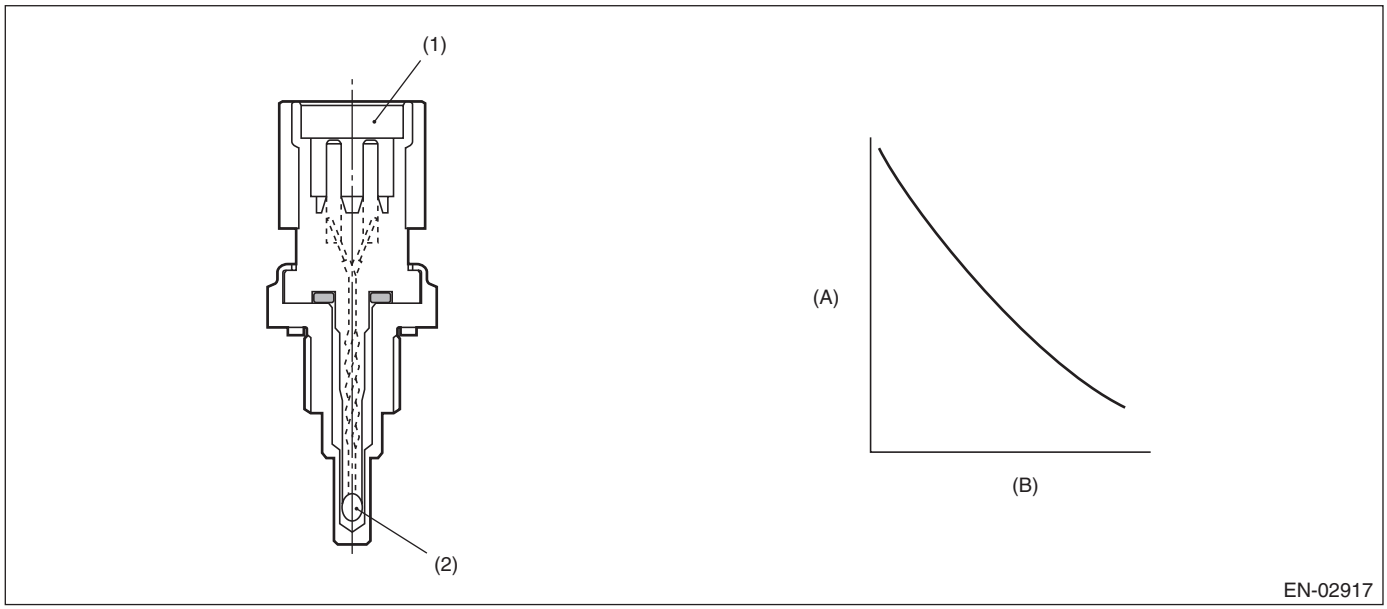
Memorize the freeze frame data. (For test mode $02)

AH: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



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine start.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine start	≥ Judgment value of timer after engine start

Timer for diagnosis after engine start
a. Timer stop at fuel cut
b. During the driving conditions except a) above, timer counts up as follows.
64 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 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
Temperature °C (°F)	–20 (–4)	0 ms	37.1 ms	74.3 ms	111.4 ms	126.7 ms	141.9 ms	163.6 ms	185.3 ms
	–10 (–14)	0 ms	27.4 ms	54.8 ms	82.2 ms	99.7ms	117.1 ms	136.0 ms	154.8 ms
	0 (32)	0 ms	17.6 ms	35.3 ms	52.9 ms	72.6 ms	92.3 ms	108.3 ms	124.3 ms
	10 (50)	0 ms	7.9 ms	15.8 ms	23.7 ms	45.6 ms	67.6 ms	80.7 ms	93.9 ms
	20 (68)	0 ms	7.9 ms	15.8 ms	23.7 ms	45.6 ms	67.6 ms	80.7 ms	93.9 ms

Judgment value of timer after engine starting
$t = 429.5 – 28.605 \times Ti$
Ti : The lowest coolant temperature after engine start
Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature	≥ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.

9. ECM OPERATION AT DTC SETTING

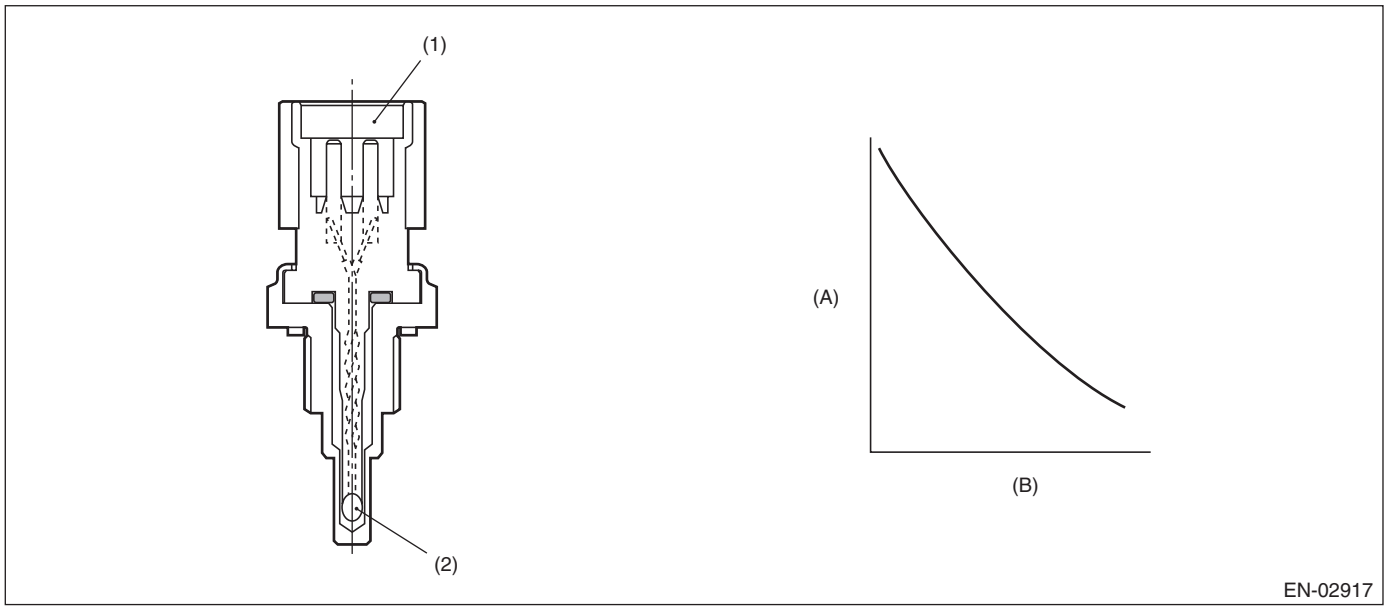
Memorize the freeze frame data. (For test mode $02)

AI: 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
Engine coolant temperature at the last engine stop	≥ 75°C (167°F) and < 95°C (203°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time of meeting the following conditions is 2.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	< 2.5°C (4.5°F)
Fuel temperature at the last engine stop — fuel temperature	≥ 5°C (9°F)
Intake air temperature — fuel temperature	< 2.5°C (4.5°F)
Fuel temperature	< 35°C (95°F)

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

When the following conditions are established, judged as OK.

Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	≥ 2.5°C (4.5°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

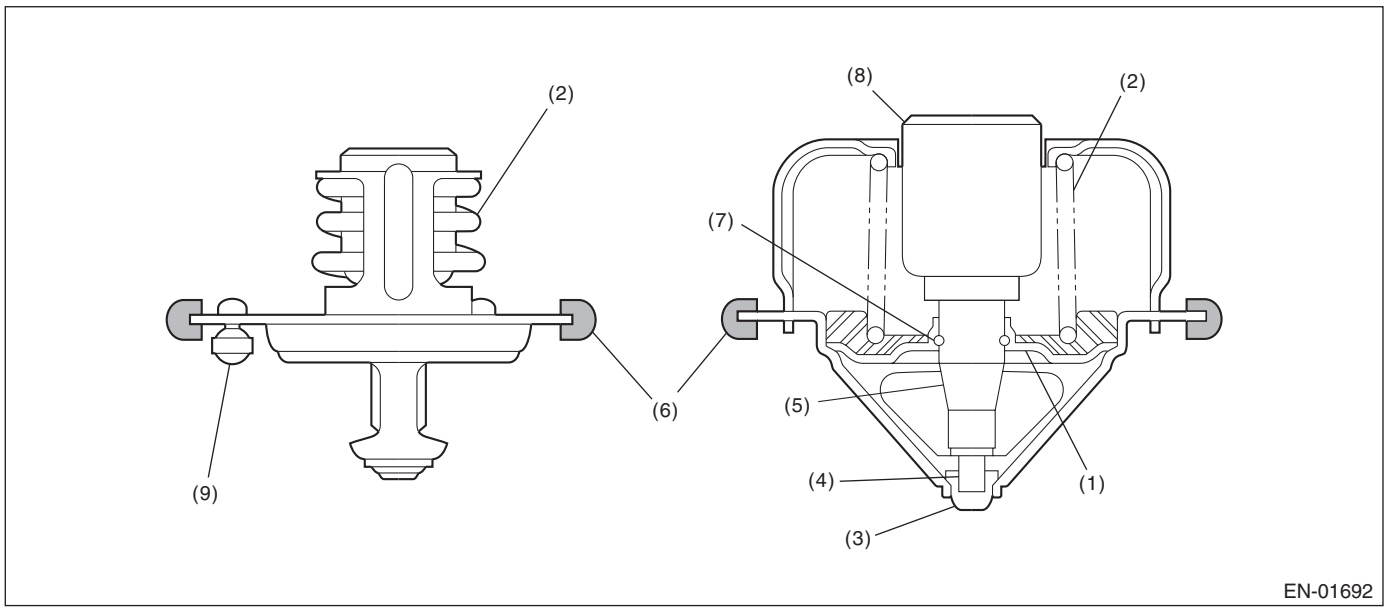
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the thermostat function.
Judge as NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge as OK when the engine coolant temperature becomes to 75°C (167°F), and the difference is small, before judging NG.

2. COMPONENT DESCRIPTION



(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber seal
(7) Stop ring
(8) Wax element
(9) Jiggle valve

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 23 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Battery voltage	≥ 10.9 V
Estimate ambient temperature	≥ –7°C (19.4°F)
Thermostat malfunction diagnosis	Incomplete
Engine coolant temperature at engine starting	< 55°C (131°F)
Estimated coolant temperature	≥ 75°C (167°F)
Engine coolant temperature	≤ 75°C (167°F)
(Estimated – measured) Engine coolant temperature	> 20°C (36°F)
Vehicle speed	≥ 20 km/h (12 MPH)

Time Needed for Diagnosis: 23 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
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 (36°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

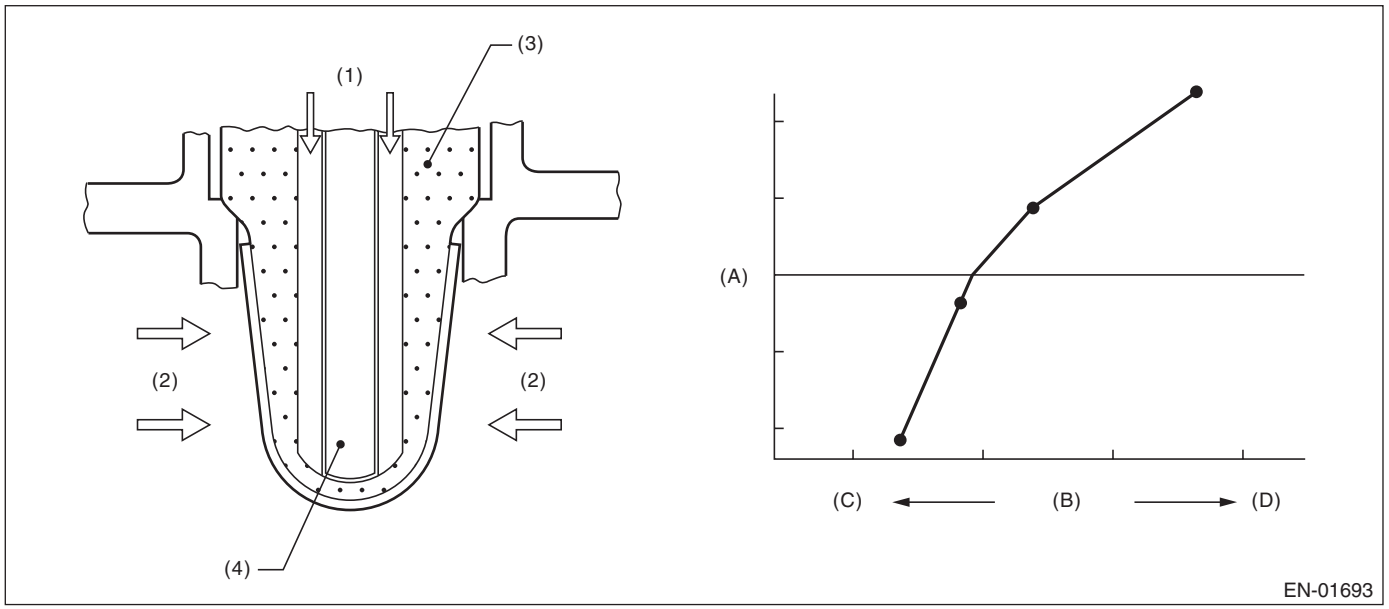
Memorize the freeze frame data. (For test mode $02)

AK: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 applied voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is 1 second or more.

Judgment Value

Malfunction criteria	Threshold value
Input voltage	< 1.8 V
Input current	< –0.005 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.06 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

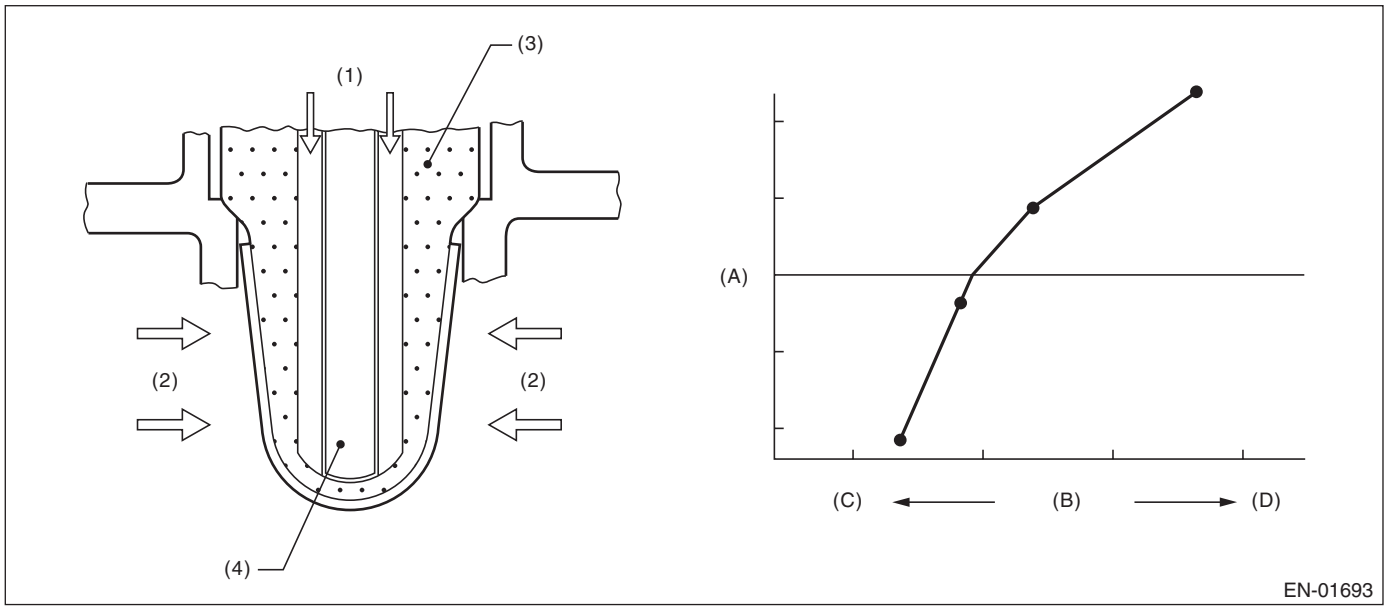
Memorize the freeze frame data. (For test mode $02)

AL: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 applied voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is 1 second or more.

Judgment Value

Malfunction criteria	Threshold value
Input voltage	≥ 3.8 V
Input current	≥ 0.005 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.06 → 0, normally.
- Purge control: Not allowed to purge.

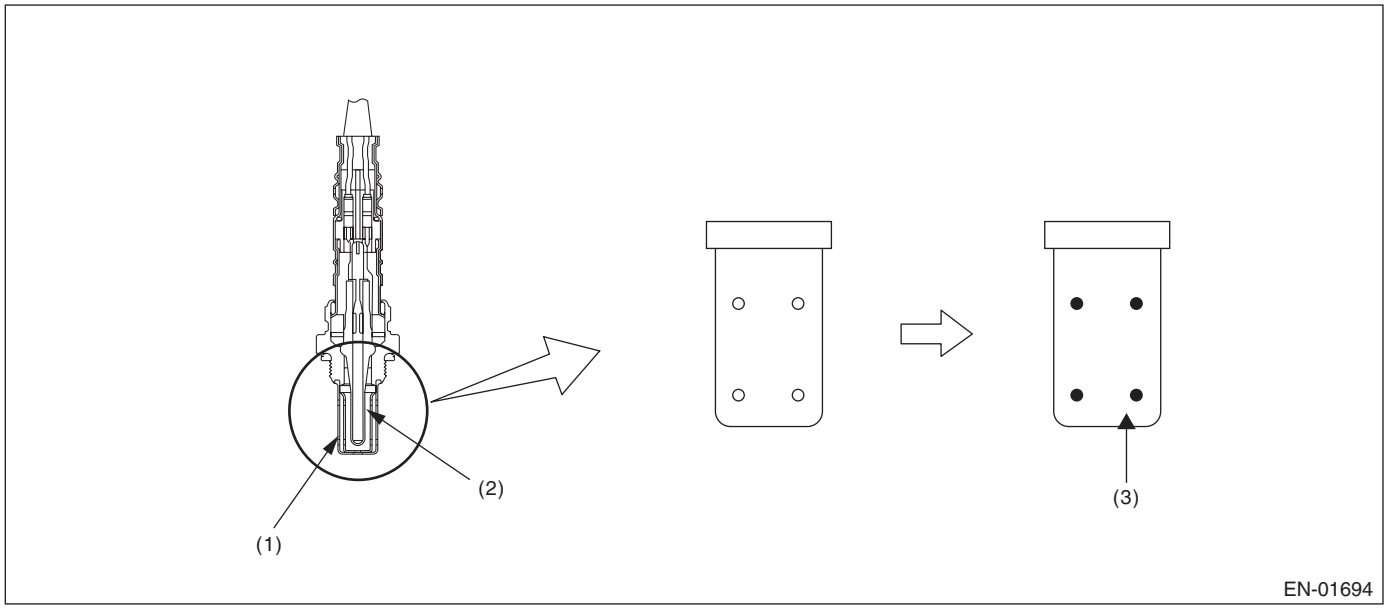
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

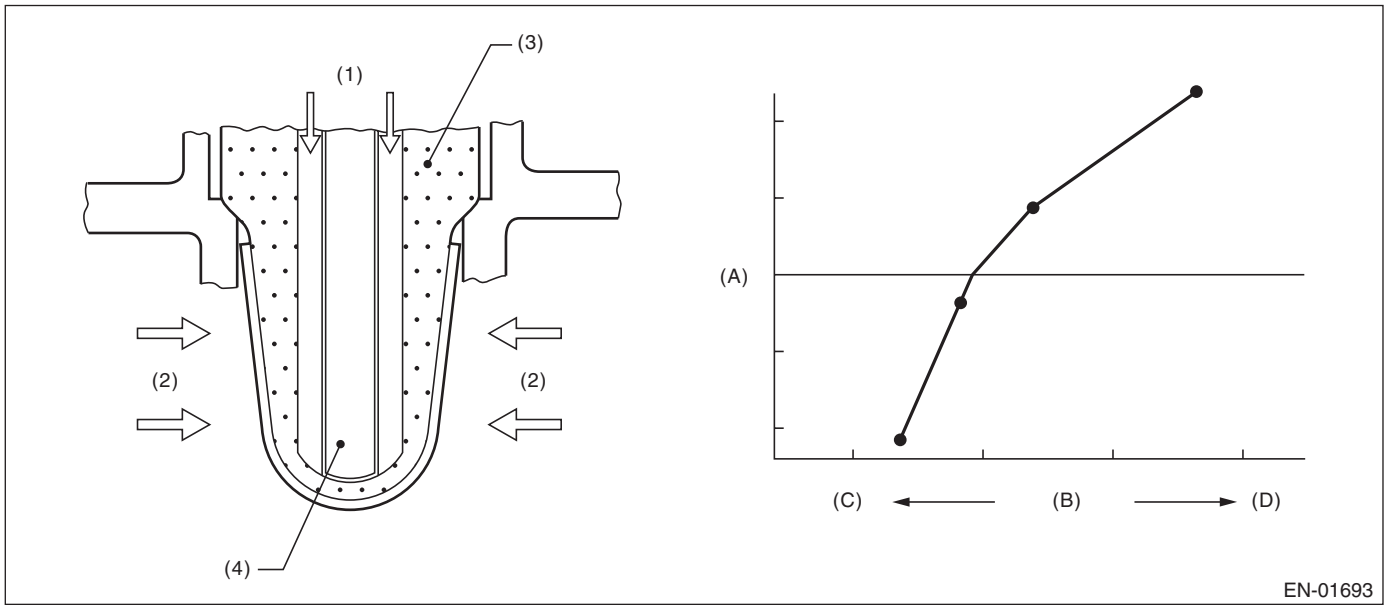
1. OUTLINE OF DIAGNOSIS

Detect the slow response of front oxygen (A/F) sensor.
Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed.
When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient.Therefore, if the sensor cover holes are clogged, the rich to lean judgment in the ECM is delayed when the actual change from rich to lean occurs.
Judge as NG when the actual movement in comparison to the ECM control amount is slow.



(1) Cover (2) Zirconia (3) Clogging

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary parameters	Enable conditions
All secondary parameters enable conditions	1 second or more
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	0 ←→ 50 Ω
After engine starting	120 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1000 ←→ 2500 rpm
Vehicle speed	10 ←→ 120 km/h (6.21 ←→ 74.6 MPH)
Amount of intake air	10 ←→ 40 g/s
Engine load	< 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) 60 seconds or more after starting the engine.

5. DIAGNOSTIC METHOD

Calculate faf difference every 128 milliseconds, and the λ value difference. Calculate the diagnosis value after calculating 1,640 times (210 seconds).
Judge as NG if the criteria below are met. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n–1) + |d2faf (n)| td2lmd (N) = td2lmd (n–1) + |d2lmd (n)| add up to a total of 210 seconds 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	≥ 0.325

Time Needed for Diagnosis: 210 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Rear oxygen sensor sub learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

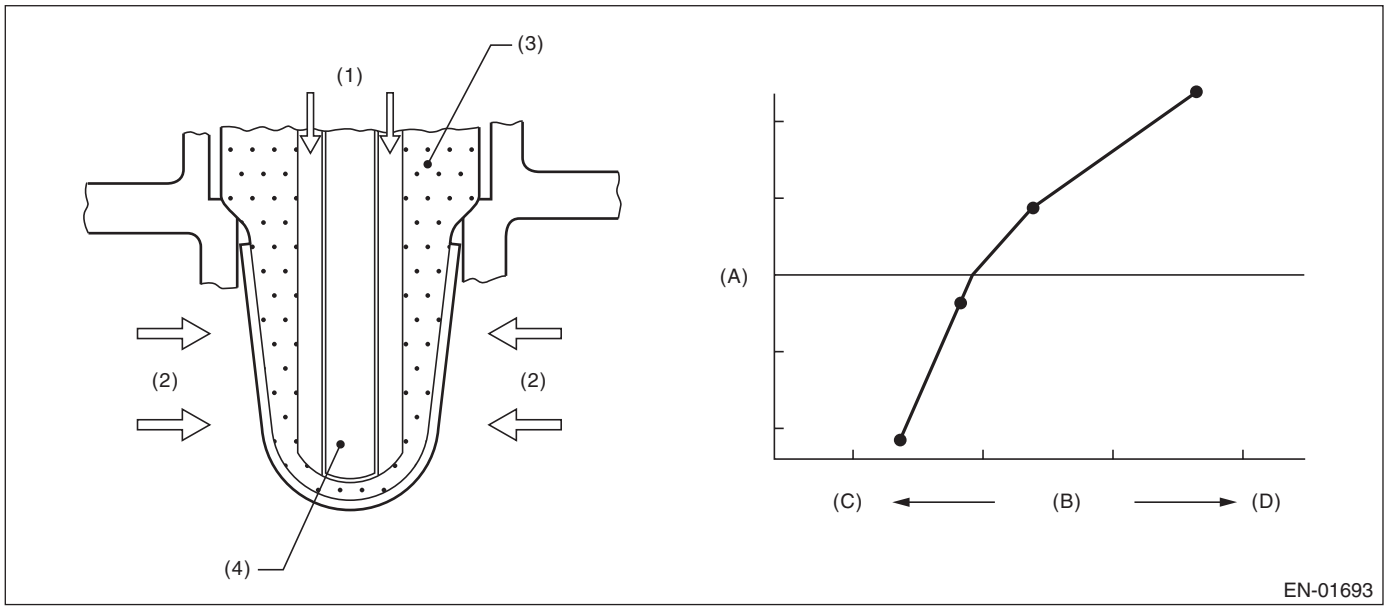
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AN: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



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes 5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Voltage	≥ 10.9 V
Time of heater control duty at 70% or more	≥ 30 seconds
Front oxygen (A/F) sensor impedance.	≥ 500 Ω

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor IC communication: Not allowed to communicate.
- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

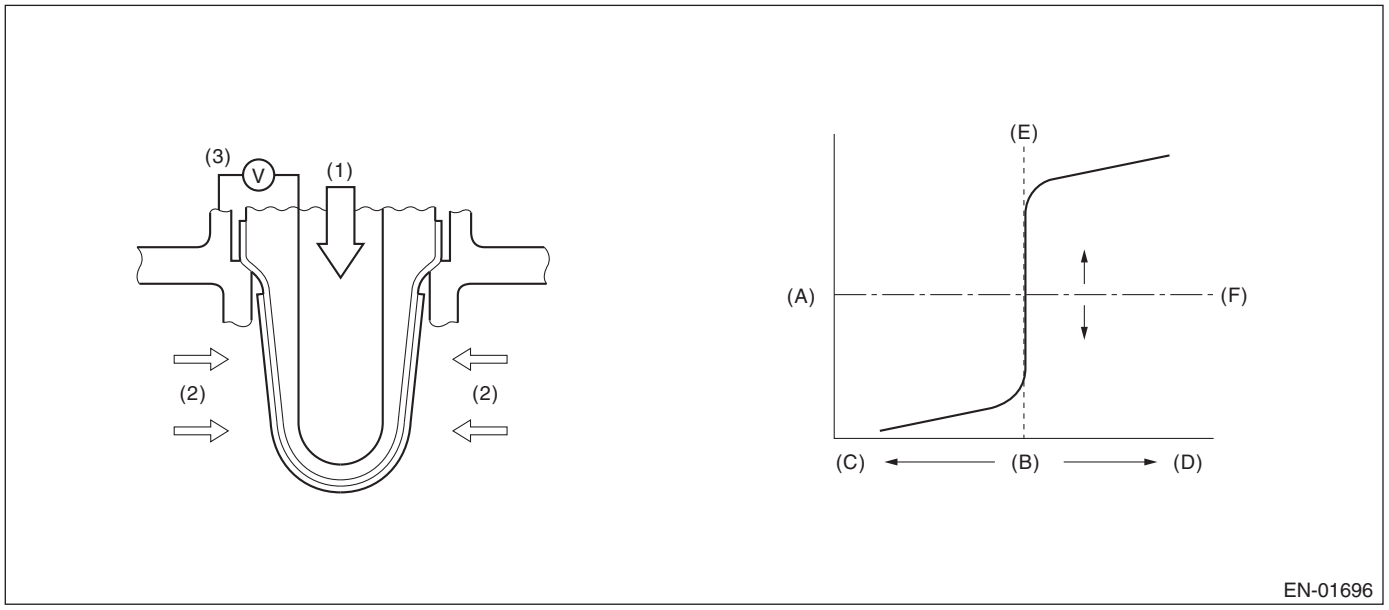
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect continuity NG of the oxygen sensor. If the oxygen sensor voltage reading is not within the probable range considering the operating conditions, judge as NG.

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force

3. ENABLE CONDITION

Used for Abnormality Judgment

Secondary parameters	Enable conditions
High side	
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Low side 1	
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	≥ 10 g/second
Low side 2	
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g/second
Current continuation time of the rear oxygen sensor heater	25 seconds or more
Low side 3	
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g/second
Current continuation time of the rear oxygen sensor heater	25 seconds or more
Fuel cut	Experienced

Used for normality judgment

Secondary parameters	Enable conditions
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

After starting the engine, continuously perform the diagnosis with the same engine condition.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time during which the following conditions are established exceeds the predetermined time, and judge as OK if it does not.

Judgment Value

Malfunction criteria	Threshold value	DTC
High side Maximum output voltage without continuity	≥ 1200 mV	P0138
Low side Minimum output voltage without continuity	< 30 mV	P0137

Time Needed for Diagnosis

High side: 2.5 seconds
Low side 1: 20 seconds
Low side 2: 40 seconds
Low side 3: Value from Map

Map

Fuel Cut Time (Second)	Time needed for diagnosis (second)
0	40
2	40
10	60

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

NOTE:
For the detection standard, refer to DTC P0137. <Ref. to GD(H6DO)-72, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

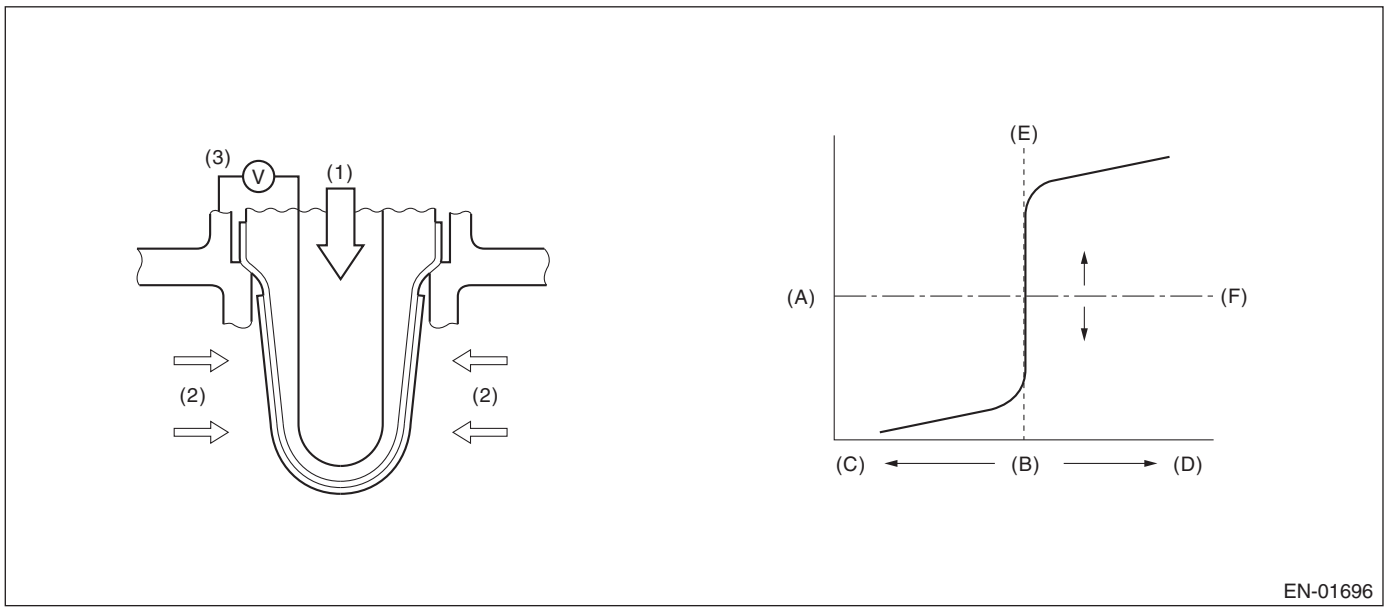
1. OUTLINE OF DIAGNOSIS

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



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Rich → lean diagnosis response

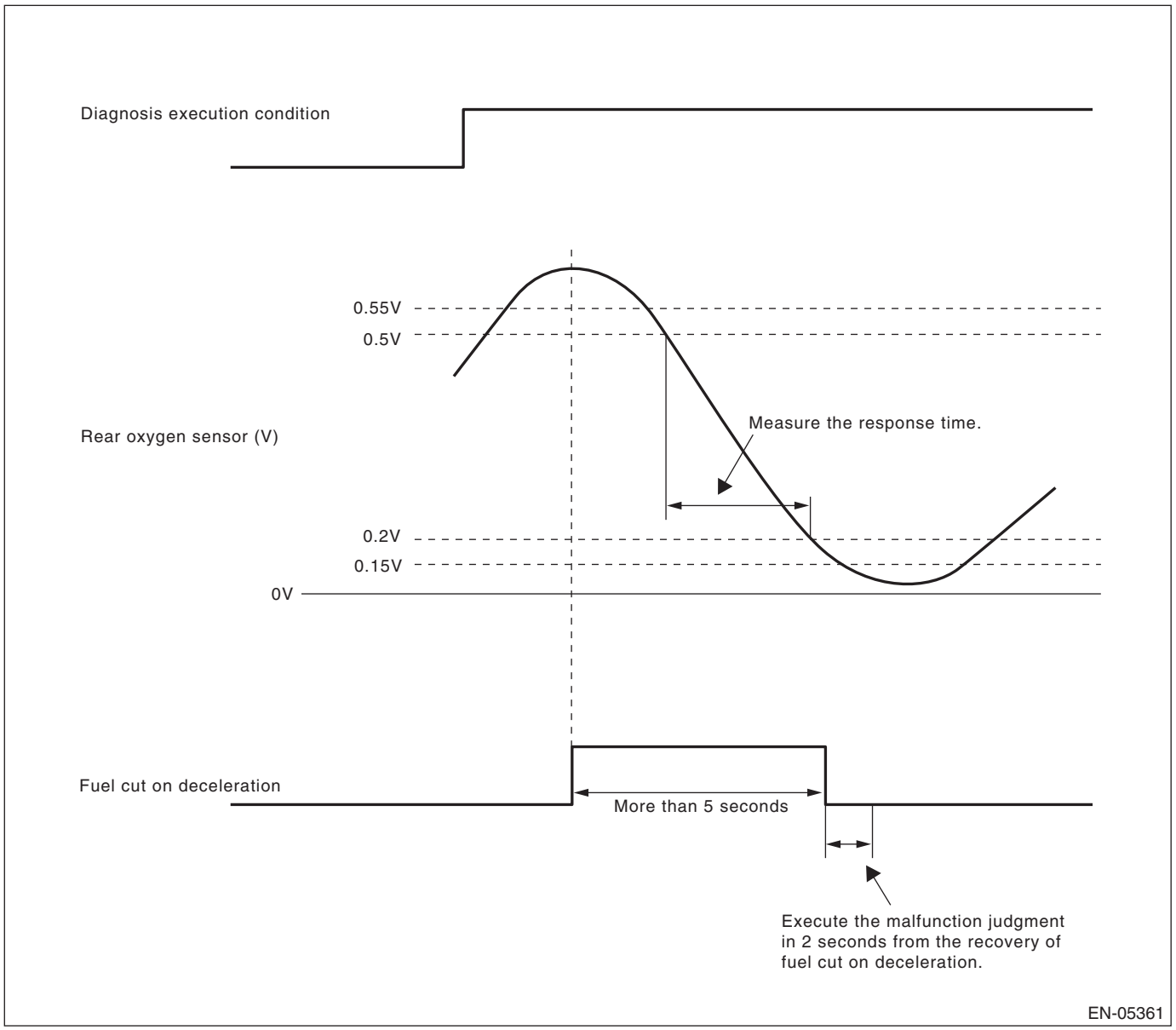
Secondary parameters	Enable conditions
Battery voltage	> 10.9 V
A/F sub feedback control condition	Completed
Deceleration fuel cut time is 5 seconds or more.	Experienced
After fuel cut	≥ 2 seconds
Current calculation time of the rear oxygen sensor heater	≥ 40 seconds
Current continuation time of the rear oxygen sensor heater	≥ 20 seconds
Estimated catalyst temperature	≥ 400°C (752°F)

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 judgment criteria.



- **Abnormality Judgment**

1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnosis value) > threshold value → abnormal

NOTE:
Variation time of rear oxygen sensor output voltage is short during fuel cut in deceleration. NG judgment 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 5 seconds or more, judge as NG if the following criteria are met 2 seconds 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 (5 s 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.

Judgment Value

Malfunction criteria	Threshold value
Shortest time change from rich (500 mV O_2 output) to lean (200 mV) when voltage reduces from 550 mV to 150 mV	> 0.491 seconds
or	
Longest time over 550 mV	> 2 seconds

Time Needed for Diagnosis: 1 time
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

1) Regardless of a deceleration fuel cut, if the response time (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.
Response time (diagnosis value) ≤ threshold value → normal
2) Do not judge as a normal condition.
Judge as OK when the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Shortest time change from rich (500 mV O_2 output) to lean (200 mV) when voltage reduces from 550 mV to 150 mV	≤ 0.491 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

10.ENABLE CONDITION

- Lean → rich response diagnosis

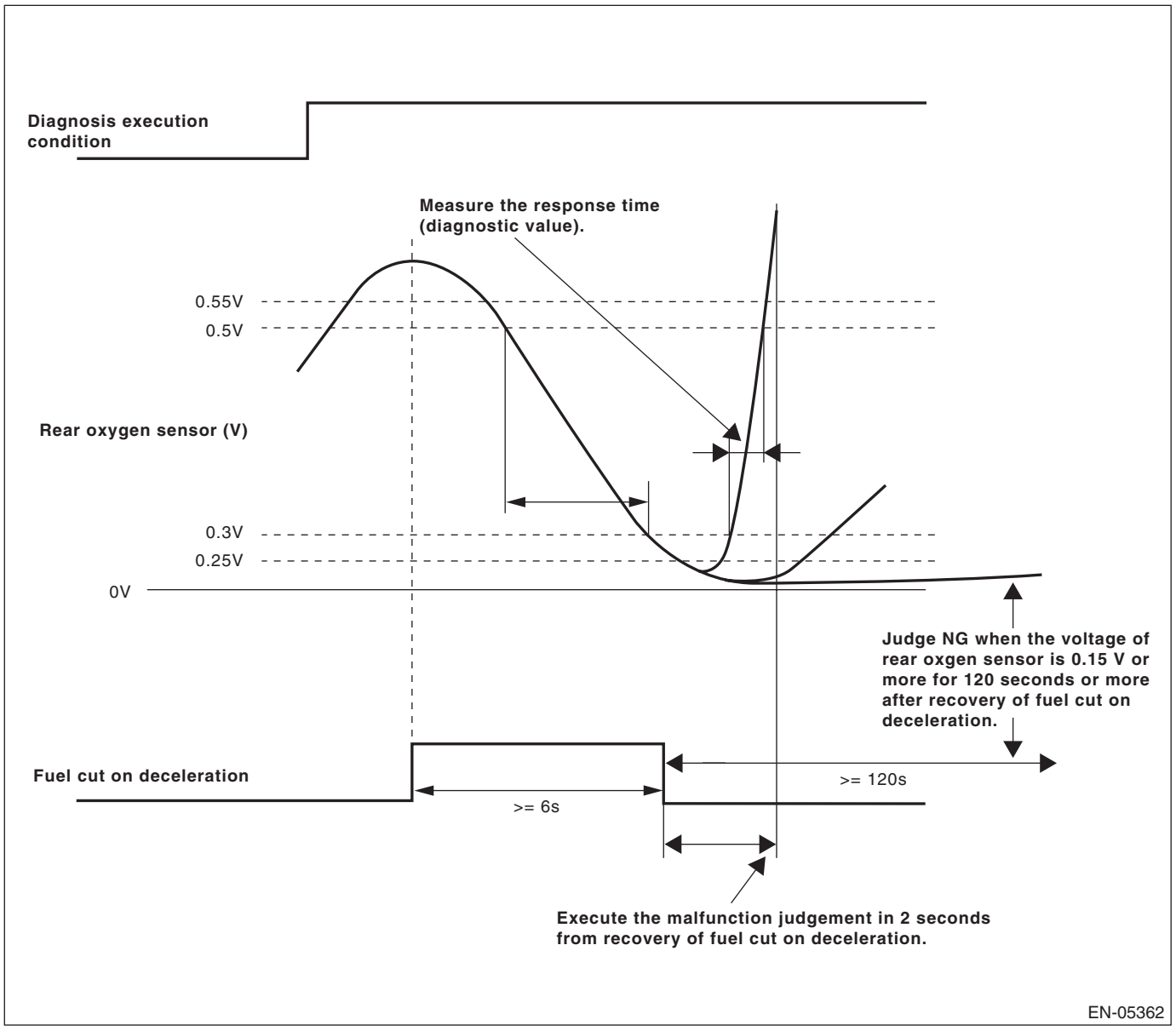
Secondary parameters	Enable conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
5 seconds or more deceleration fuel cut.	Experienced
After fuel cut	≥ 2 seconds

11.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.)

12.DIAGNOSTIC METHOD

Calculate the minimum value of 0.3 V to 0.5 V output change response time as judgment value, when the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich).



• **Abnormality Judgment**

1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnosis value) > threshold value → abnormal
2) If the oxygen sensor voltage is small after recovering from a deceleration fuel cut, and remains small, judge as NG.

Judgment Value

Malfunction criteria	Threshold value
Shortest time change from lean (300 mV O_2 output) to rich (500 mV) when voltage changes from 250 mV to 550 mV	> 2 seconds
or	
Longest time under 150 mV	> 120 seconds

Time Needed for Diagnosis: 1 time
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• **Normality Judgment**

1) Regardless of a deceleration fuel cut, if the response time (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.
Response time (diagnosis value) ≤ threshold value → normal
2) Do not judge as a normal condition.
Judge as OK when the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Shortest time change from lean (300 mV O_2 output) to rich (500 mV) when voltage changes from 250 mV to 550 mV	≤ 2 seconds

13.DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

15.FAIL SAFE

Sub feedback control: Not allowed

16.ECM OPERATION AT DTC SETTING

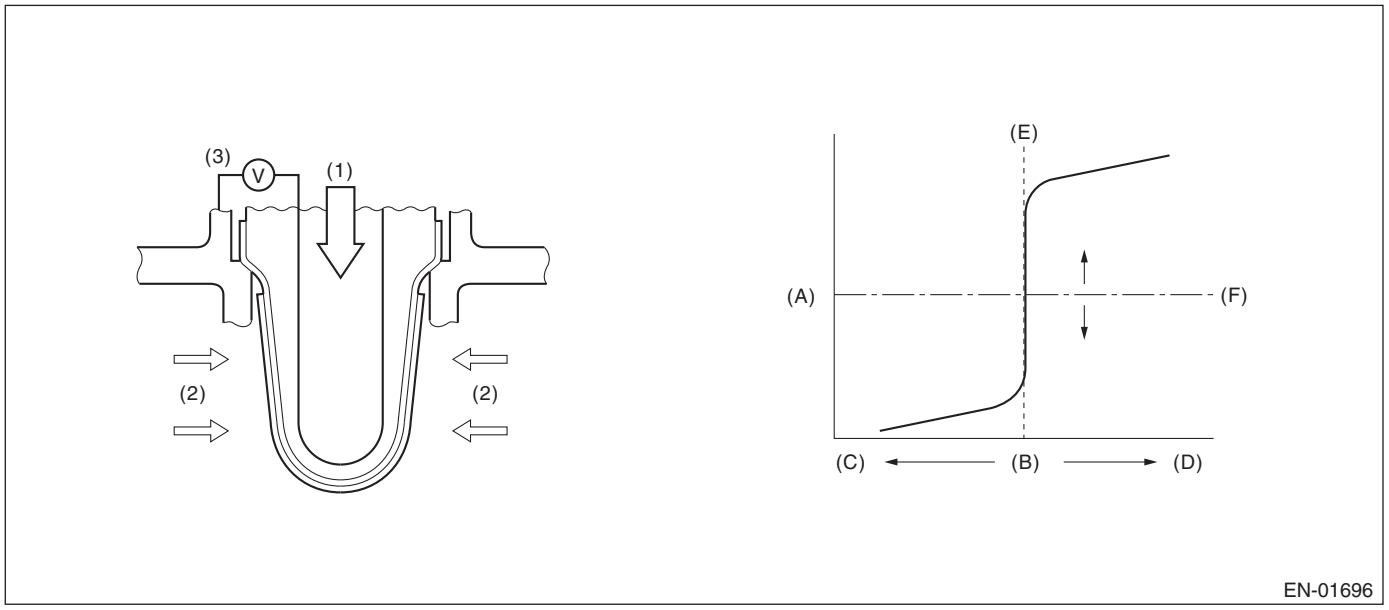
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AR: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	(C)	Rich	(E)	Theoretical air fuel ratio
(B)	Air fuel ratio	(D)	Lean	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary parameters	Enable conditions
Closed loop control at the rear oxygen sensor	In operation
Target output voltage of rear oxygen sensor	≥ 0.6 V
Amount of intake air	≥ 10 g/second
Engine coolant temperature	≥ 75°C (167°F)
Misfire detection every 200 rotations	≤ 7 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	> 10.9 V
Deceleration fuel cut of 5 seconds or more.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Minimum output voltage	> 150 mV
Maximum output voltage	< 500 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Diagnosis of the rear oxygen sensor voltage low side	Incomplete
Minimum output voltage	≤ 150 mV
Maximum output voltage	≥ 500 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AS: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)-63, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AT: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)-65, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AU: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)-67, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV: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)-70, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AW: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)-72, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0138. <Ref. to GD(H6DO)-74, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AY: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)-75, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AZ: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)-80, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BA:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

DIAGNOSTIC METHOD

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 75°C (167°F)
Engine load	≤ 0.02 g/rev
Amount of intake air	≥ Map 5

Map 5

Engine speed (rpm)	Idling	700	1000	1500	2000	2500	3000	3500	4000	4500	5000
Measured value (g(oz)/rev)	na	0.357 (0.013)	0.25 (0.009)	0.25 (0.009)	0.317 (0.011)	0.326 (0.011)	0.337 (0.012)	0.397 (0.014)	0.439 (0.015)	0.454 (0.016)	0.454 (0.016)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition meeting the malfunction criteria below continues for 50 seconds or more, judge that there is a fault in the fuel system.

Judgment Value

Malfunction criteria	Threshold value
fsobd = (sglmd – tglmda) + faf + flaf In this case: sglmd = measured lambda, tglmda = target lambda, faf = main feedback compensation coefficient (every 64 milliseconds), flaf = main feedback learning compensation coefficient	≥ fsobdL1 See Map 4 fsobdL1 = lean side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g (oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)
fsobdL1 (%)	40	40	33.2	26.5	26.5	26.5	26.5

Time Needed for Diagnosis: 10 seconds × 5 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK when the malfunction criteria below are met for 10 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
fsobd = (sglmd – tglmda) + faf + flaf	< 20%

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BB:DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

DIAGNOSTIC METHOD

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 75°C (167°F)
Engine load	≤ 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more
Intake manifold absolute pressure	≥ Map 5

Map 5

Engine speed (rpm)	Idling	700	1000	1500	2000	2500	3000	3500	4000	4500	5000
Measured value (g(oz)/rev)	na	0.357 (0.013)	0.25 (0.009)	0.25 (0.009)	0.317 (0.011)	0.326 (0.011)	0.337 (0.012)	0.397 (0.014)	0.439 (0.015)	0.454 (0.016)	0.454 (0.016)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition where the malfunction criteria are met continues for 50 seconds or more, judge that there is a fault in the fuel system.

Judgment Value

Malfunction criteria	Threshold value
fsobd = (sglmd – tglmda) + faf + flaf	≤ fsobdR1
In this case: sglmd = measured lambda, tglmda = target lambda, faf = main feedback compensation coefficient (every 64 milliseconds), flaf = main feedback learning compensation coefficient	Refer to Map 4. fsobdR1 = rich side threshold value of fsobd

Map 4

Amount of air (g (oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)
fsobdR1 (%)	–40	–40	–31.2	–26.5	–26.5	–26.5	26.5

Time Needed for Diagnosis: 10 seconds × 5 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• **Normality Judgment**

Judge as OK when the malfunction criteria below continues for 10 seconds.

Judgment Value

Malfunction criteria	Threshold value
fsobd = (sglmd – tglmda) + faf + flaf	≥ –20%

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

7. FAIL SAFE

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BC:DTC P0174 SYSTEM TOO LEAN (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0171. <Ref. to GD(H6DO)-83, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BD:DTC P0175 SYSTEM TOO RICH (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0172. <Ref. to GD(H6DO)-85, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

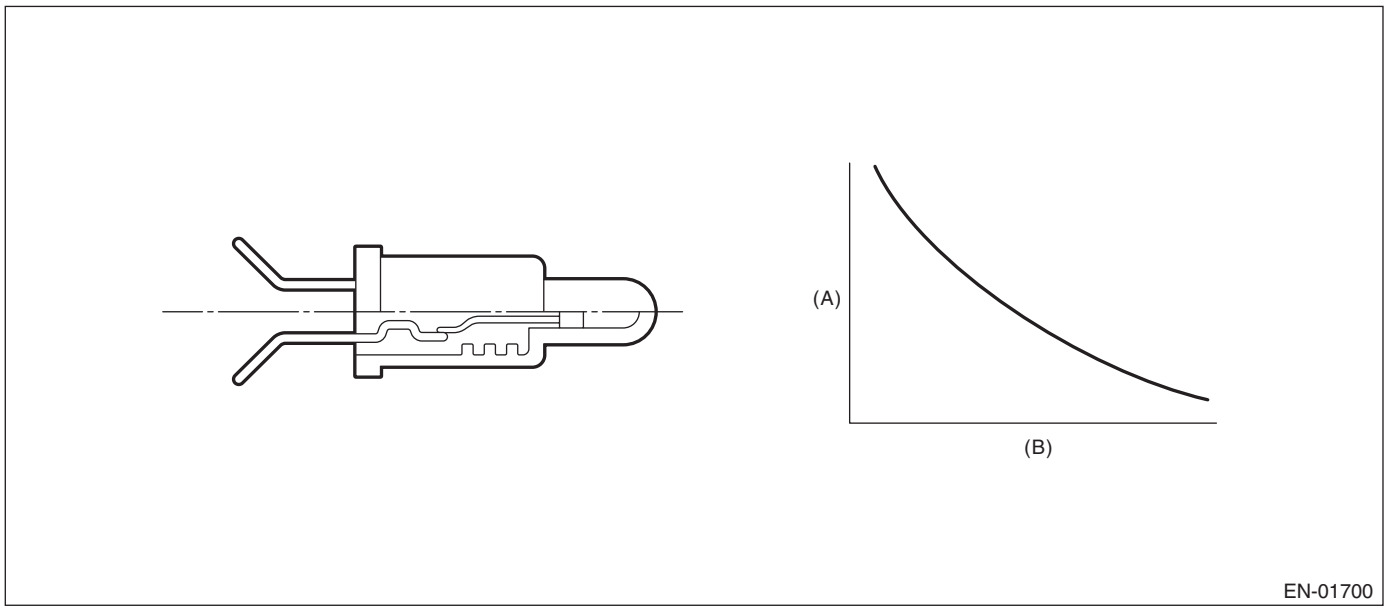
1. OUTLINE OF DIAGNOSIS

Detect faults in the fuel temperature sensor output properties.
Diagnosis is performed in two methods (drift diagnosis and stuck diagnosis). If either is NG, judge as NG.If both are OK, Judge as OK and clear the NG.

Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and judged as NG.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 120 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Fuel level	≥ 9.6 ℓ (25.4 US gal, 2.11 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature - engine coolant temperature at engine starting	> 10°C (18°F)
Fuel temperature – Engine coolant temperature	≥ 10°C (18°F)
Battery voltage	> 10.9 V

Time Needed for Diagnosis: 120 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Fuel level	≥ 9.6 ℓ (25.4 US gal, 2.11 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature - engine coolant temperature at engine starting	> 10°C (18°F)
Fuel temperature – Engine coolant temperature	< 10°C (18°F)
Battery voltage	> 10.9 V
Engine coolant temperature	< 75°C (167°F)

• 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.

6. ENABLE CONDITION

Secondary parameters	Enable conditions
After engine starting	20 seconds or more
Battery voltage	> 10.9 V

7. GENERAL DRIVING CYCLE

Always perform diagnosis after 20 seconds have passed since the engine started.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Accumulated amount of intake air	≥ 551 kg (1215 lb)
Fuel temperature difference between Max. and Min.	< 2°C (3.6°F)

Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Accumulated amount of intake air	≥ 551 kg (1215 lb)
Fuel temperature difference between Max. and Min.	≥ 2°C (3.6°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

11.FAIL SAFE

None

12.ECM OPERATION AT DTC SETTING

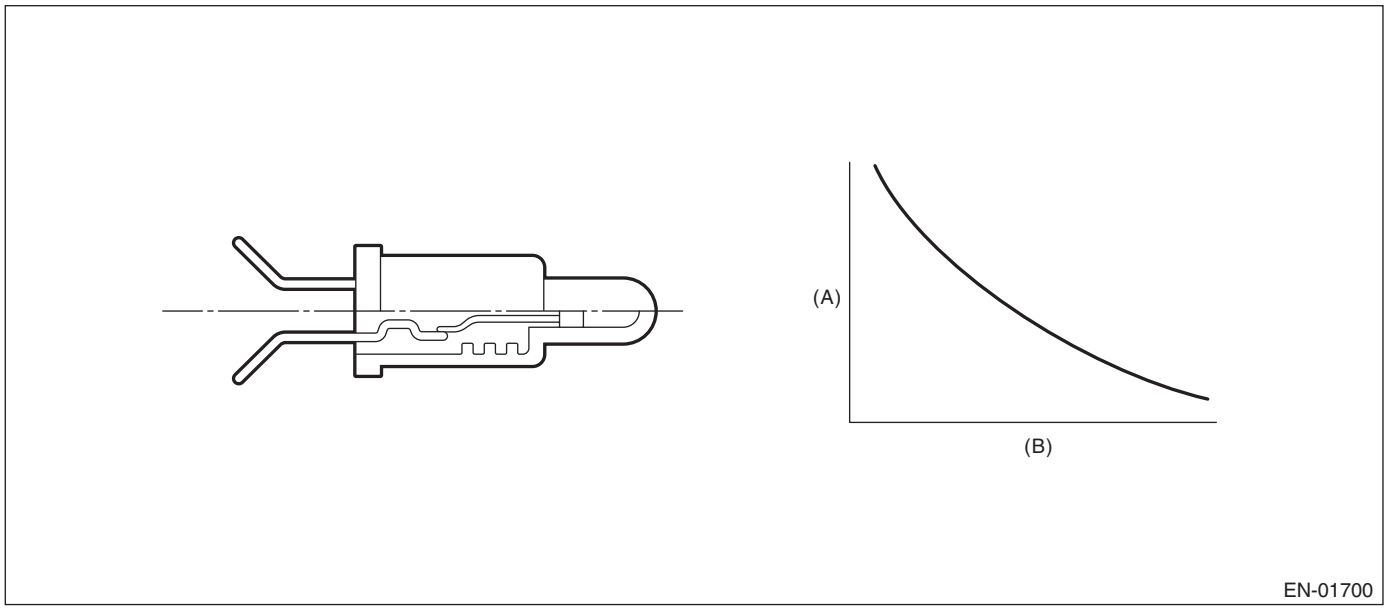
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 0.166 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≥ 0.166 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

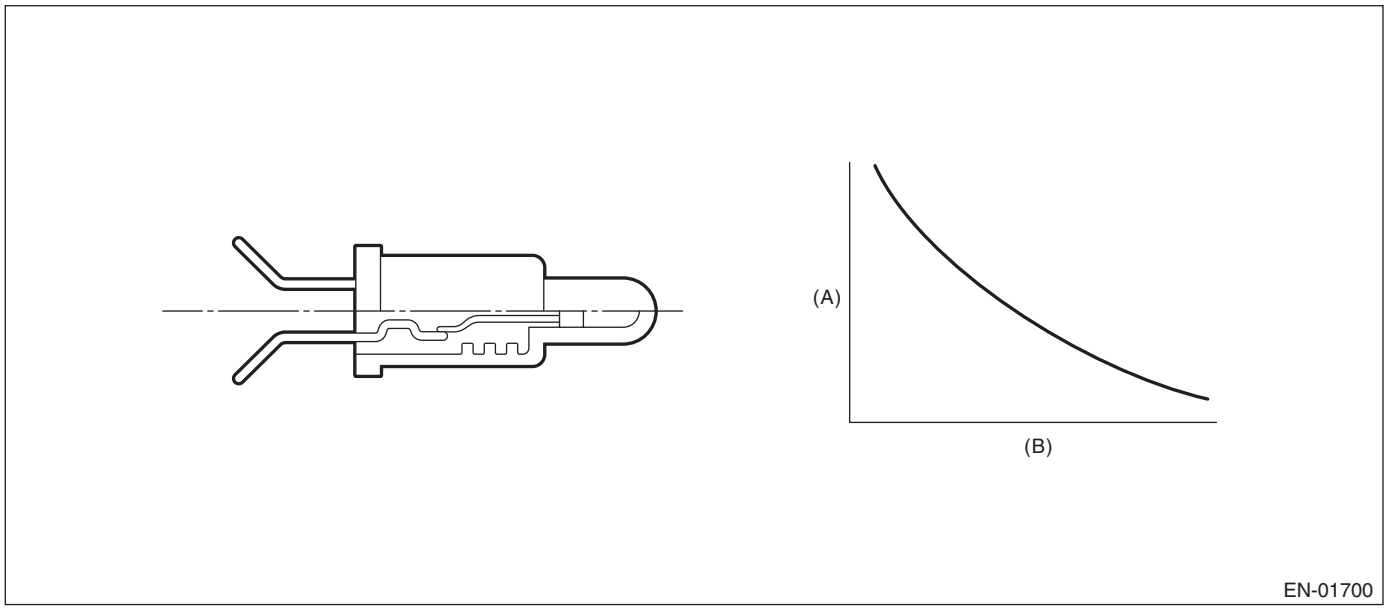
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≥ 4.716 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 4.716 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect for abnormal values in the oil temperature sensor output properties.
Judge as NG when the oil temperature does not rise even though the engine is running under a condition where it should rise.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	≥ 10.9 V
Engine speed	500 rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

If the following conditions are met, judge as NG.

Judgment Value

Malfunction criteria	Threshold value
Engine oil temperature After engine start oil temperature sensor characteristic diagnosis timer.	< 15°C (59°F) ≥ Judgment value for after engine start oil temperature sensor characteristic diagnosis timer

After engine start oil temperature sensor characteristic diagnosis timer (timer for diagnosis).
a. Timer stop at fuel cut
b. During the driving conditions except a) above, timer counts up as follows.
64 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 (10)	24 (15)	32 (20)	40 (25)	48 (30)	56 (35)
Temperature °C (°F)	–40 (–40)	0 milliseconds	32 milliseconds	76 milliseconds	130 milliseconds	149 milliseconds	171 milliseconds	176 milliseconds	181 milliseconds
	–30 (–22)	67 milliseconds	93 milliseconds	121 milliseconds	157 milliseconds	170 milliseconds	184 milliseconds	193 milliseconds	203 milliseconds
	–20 (–4)	98 milliseconds	123 milliseconds	148 milliseconds	184 milliseconds	193 milliseconds	204 milliseconds	214 milliseconds	226 milliseconds
	–10 (14)	145 milliseconds	166 milliseconds	187 milliseconds	208 milliseconds	223 milliseconds	239 milliseconds	242 milliseconds	245 milliseconds
	0 (32)	161 milliseconds	187 milliseconds	212 milliseconds	243 milliseconds	252 milliseconds	262 milliseconds	266 milliseconds	270 milliseconds

After engine start oil temperature characteristic diagnosis timer judgment value (t).
$t = 2400000 - 60000 \times Ti$ ($t \geq 2400000$)
Ti = The lowest coolant temperature after starting the engine.
Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

When the following conditions are established, judged as OK.

Judgment Value

Malfunction criteria	Threshold value
Engine oil temperature	≥ 15°C (59°F)

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Oil temperature sensor process: Engine oil temperature is fixed at 70°C (158°F).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BI: DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the oil temperature sensor.
Judge as NG when out of the possible range.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the following conditions is 0.5 seconds or more. Judge as OK and clear the NG when the following conditions are not established.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≤ 0.166 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Oil temperature sensor process: Engine oil temperature is fixed at 70°C (158°F).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BJ:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the oil temperature sensor.
Judge as NG when outside of the judgment value.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the following conditions is 0.5 seconds or more. Judge as OK and clear the NG when the following conditions are not established.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Oil temperature sensor process: Engine oil temperature is fixed at 70°C (158°F).

8. ECM OPERATION AT DTC SETTING

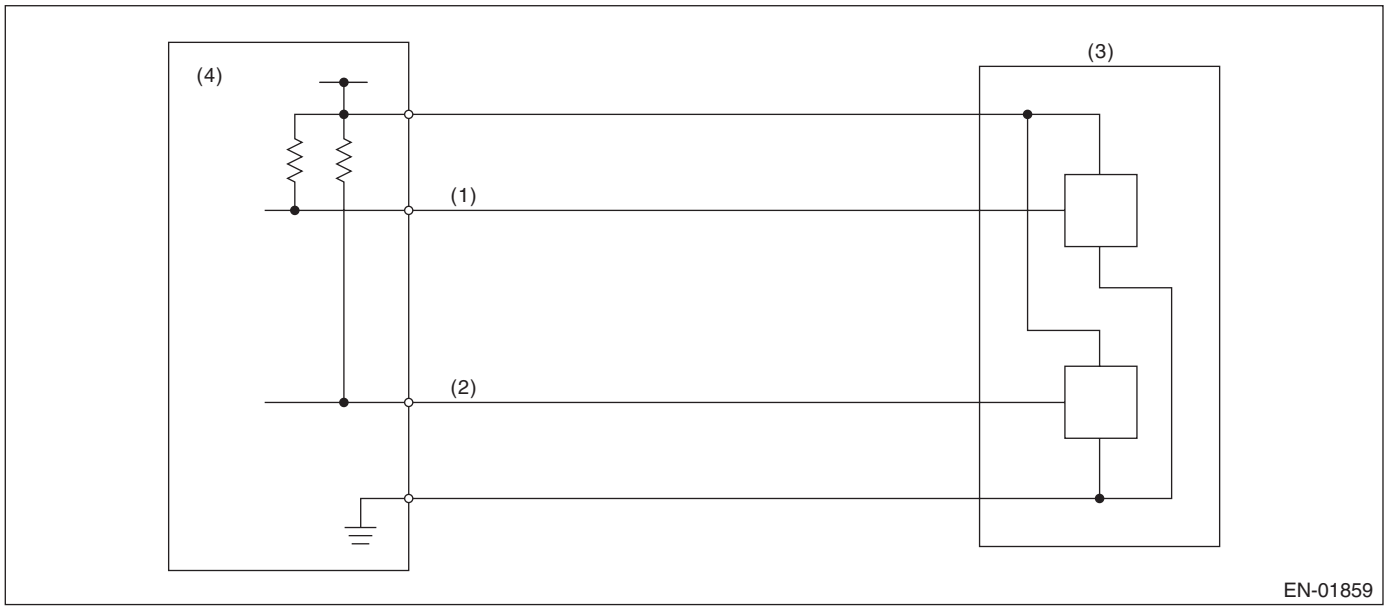
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	≥ 0.224 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

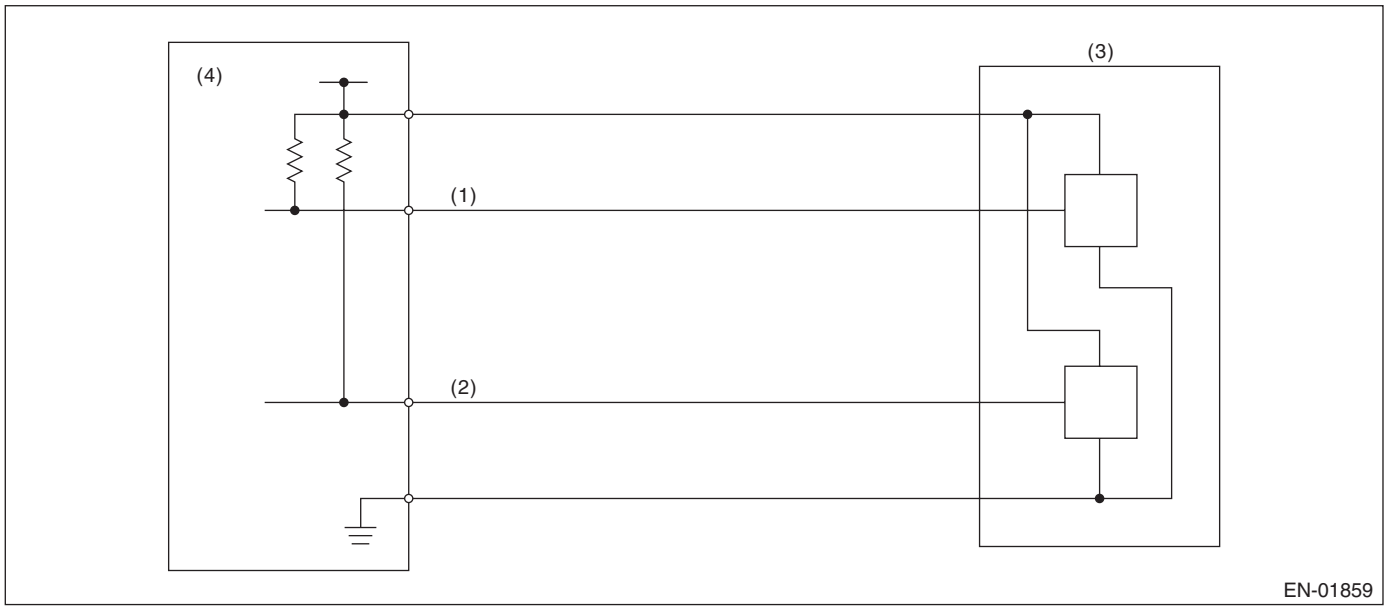
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	≤ 4.851 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

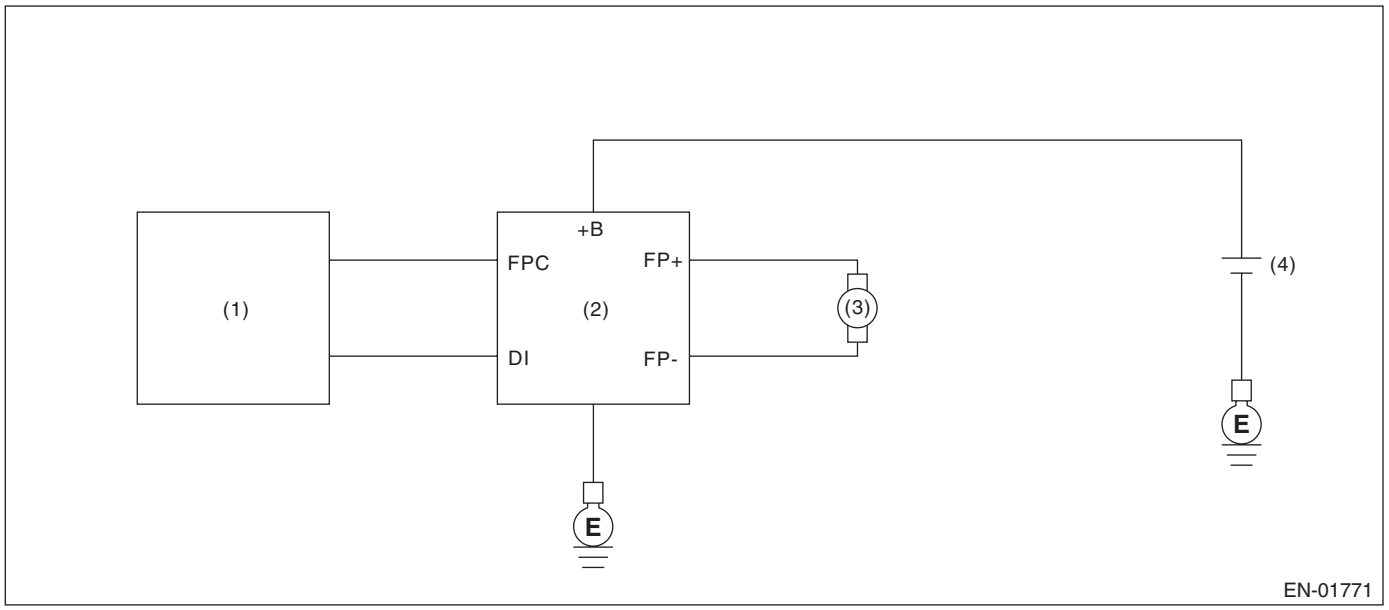
Memorize the freeze frame data. (For test mode $02)

BM:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit.
Judge as NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit.
Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel pump control unit
(3) Fuel pump
(4) Battery

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Battery voltage	≥ 8 V
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Fuel pump control unit output diagnosis signal	Low
Elapsed time after engine starting	≥ 180 seconds

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Battery voltage	≥ 8 V
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Fuel pump control unit output diagnosis signal	High
Elapsed time after engine starting	≥ 180 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BN:DTC P0301 CYLINDER 1 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

Detect the presence of misfire occurrence. (Revolution fluctuation method)
Monitoring Misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three 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	1 second or more
Intake manifold pressure change at 120°CA	< 20 kPa (150 mmHg, 5.9 inHg)
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 — 8000 rpm
Intake manifold pressure	> Value of Map 3 or more
Battery voltage	≥ 8 V
Barometric pressure	≥ 75.0 kPa (563 mmHg, 22.17 inHg)
Fuel parameter determination	Not extremely low volatility

Map 3

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
kPa (mmHg, inHg)	26.7 (200.0, 7.87)	26.7 (200.0, 7.87)	24.0 (180.0, 7.09)	24.1 (181.0, 7.13)	24.3 (182.0, 7.17)	24.7 (185.0, 7.28)	28.3 (212.3, 8.36)	30.9 (232.1, 9.14)	32.9 (247.0, 9.72)	33.1 (248.0, 9.76)	34.3 (257.0, 10.12)	38.1 (286.0, 11.26)	41.9 (314.0, 12.36)	48.9 (367.0, 14.45)

3. GENERAL DRIVING CYCLE

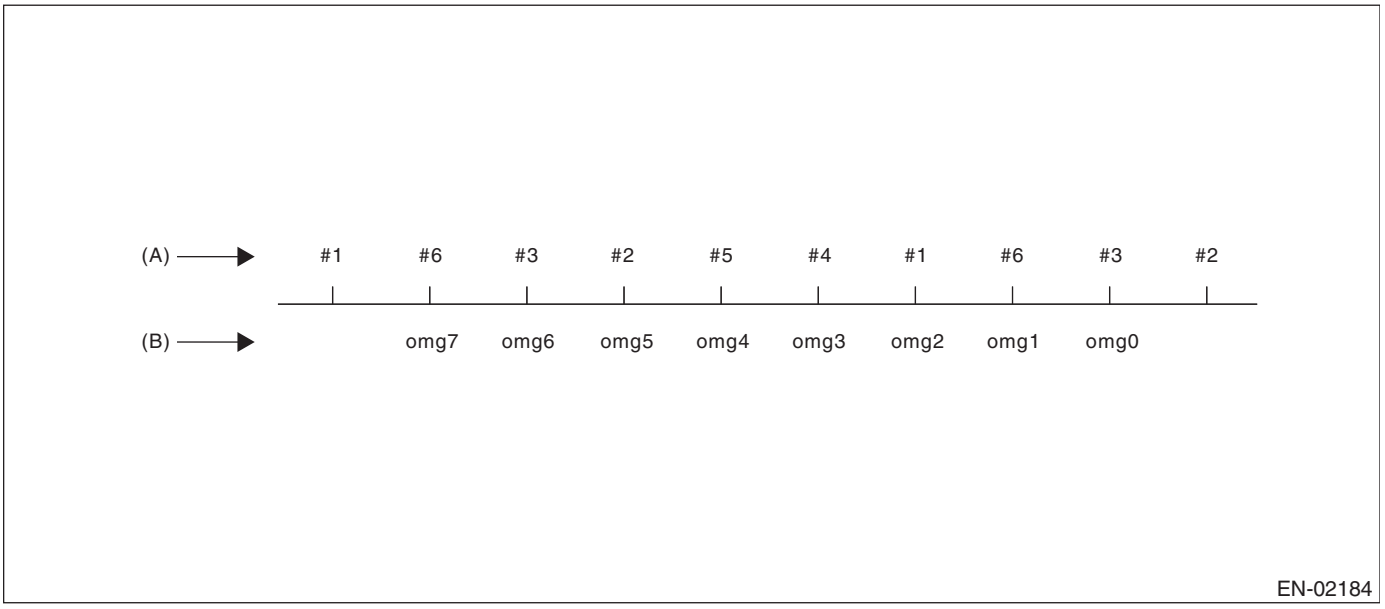
- If conditions are met, detect misfire from idling to high rotation.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

When a misfire occurs, the engine speed will decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether a misfire is occurring or not comparing the calculated result with judgment value. Counting the number of misfires. If the misfire ratio is higher during 1000 revs. or 200 revs., Judge corresponding cylinders as NG.

Diagnostic value calculation (Calculate from angle speed) →	Misfire detection every single ignition (Compare diagnostic value with judgment value) →	NG judgment (Misfire occurrence judgment required by the law) (Compare number of misfire with judgment)
	• 120° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method	• FTP 1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

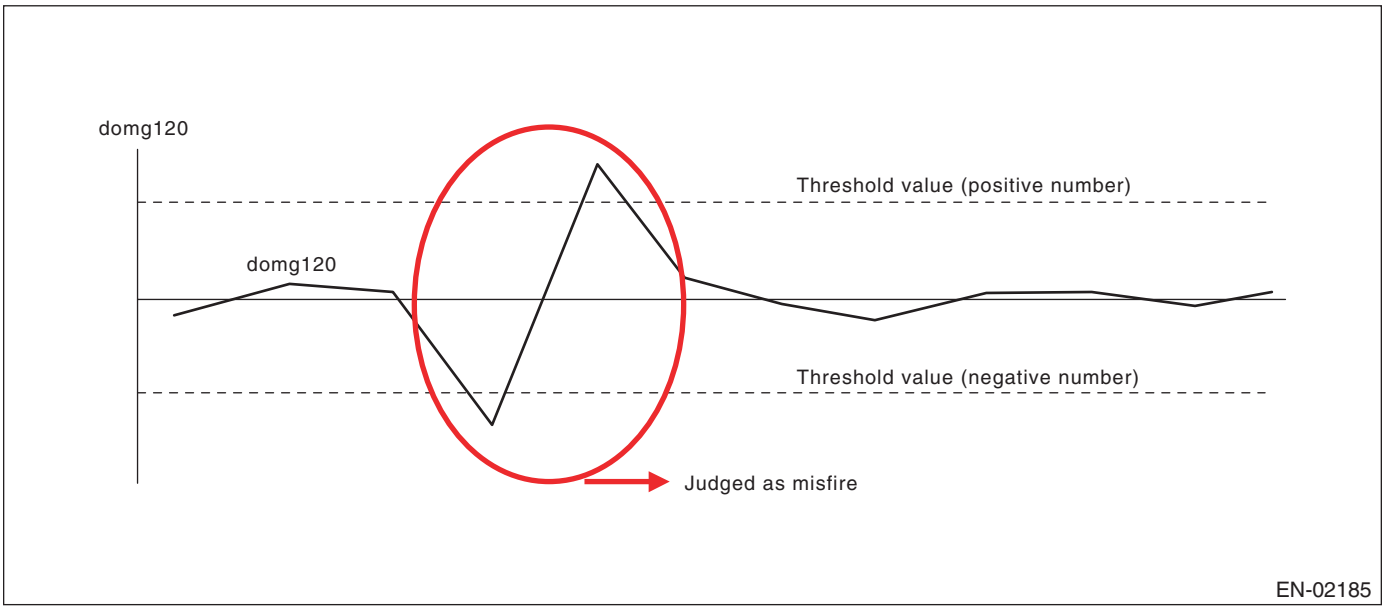
As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.



(A) Ignition order (B) Crankshaft position speed

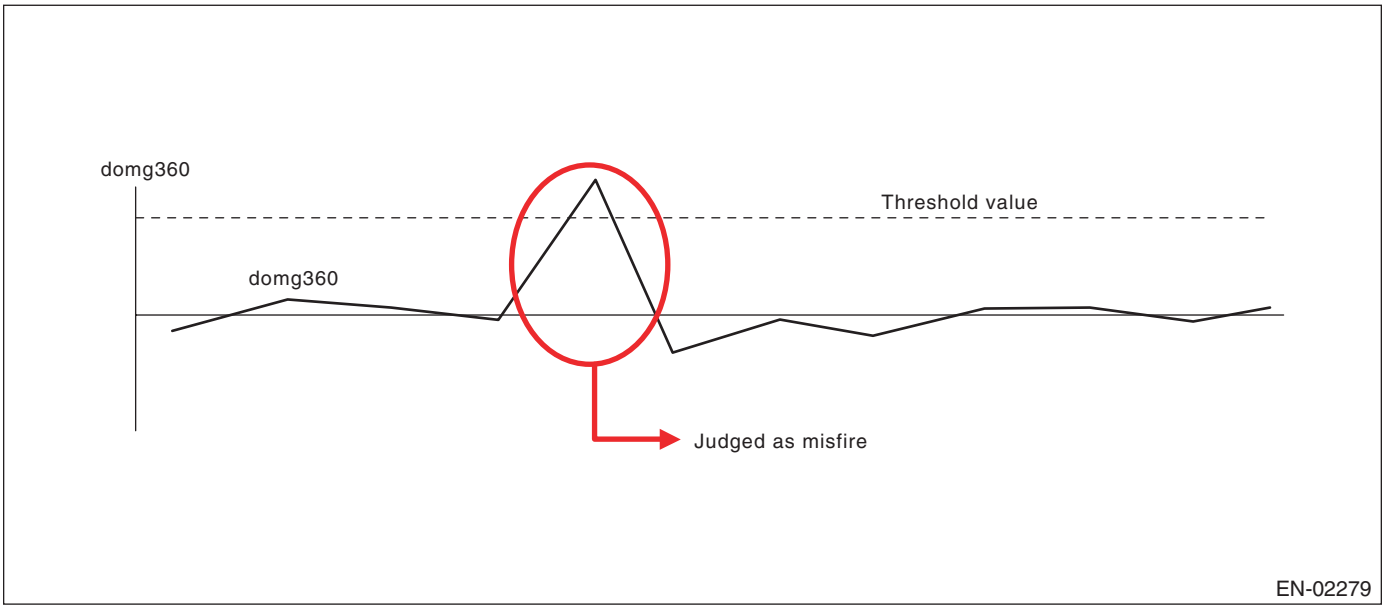
• 120° Interval Difference Method

Diagnostic value	domg 120 = (omg 1 – omg 0) – (omg 7 – omg 1)/6
Judge as a misfire in the following cases. • domg 120 > judgment value of positive side • domg 121 ≤ judgment value of negative side (Judgment value before 120° CA)	



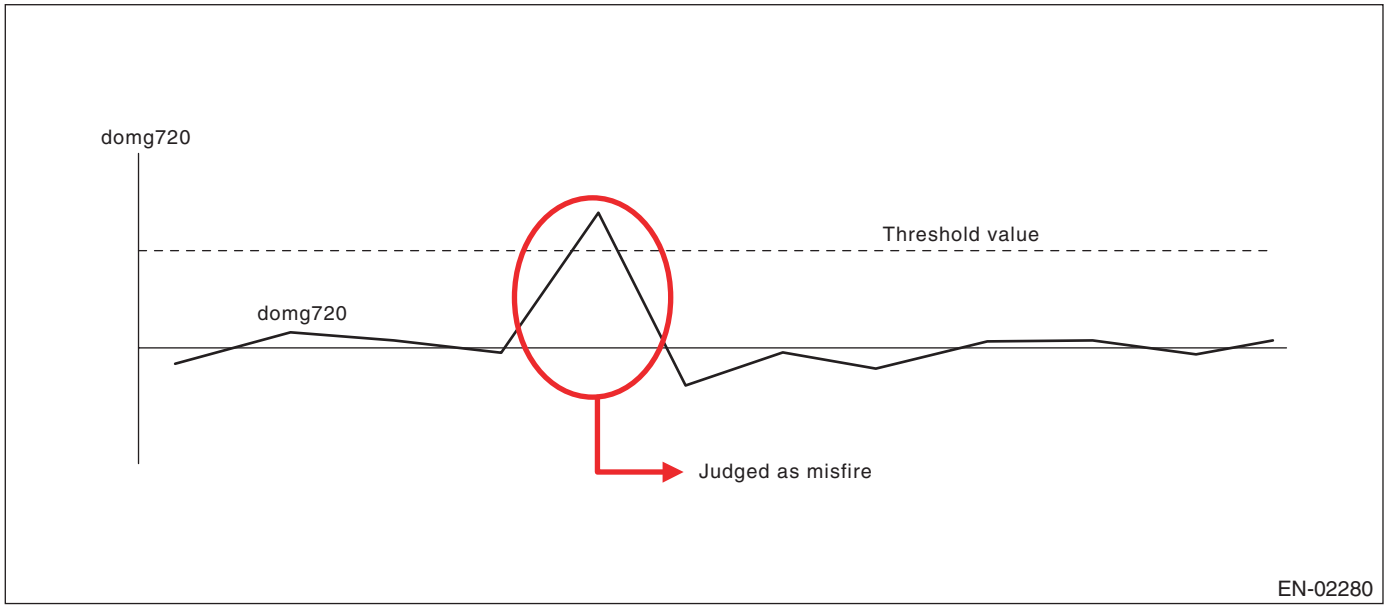
• 360° Interval Difference Method

Diagnostic value	domg 360 = (omg 1 – omg 0) – (omg 4 – omg 3)
Misfire judgment	domg 360 > Judgment value → Judge as misfire



- **720° Interval Difference Method**

Diagnostic value	domg 720 = (omg 1 – omg 0) – (omg 7 – omg 6)
Misfire judgment	domg 720 > Judgment value → Judge as misfire



- **FTP 1.5 times misfire (Misfire occurrence level which influences exhaust gas)**

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction criteria	Threshold value
FTP emission judgment value	> 1.0 % in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Catalyst damage misfire (Misfire occurrence level damaging catalyst)**

Judgment Value

Malfunction criteria	Threshold value
Catalyst damage misfire judgment value	Refer to Map.

Map

		Intake air (g(oz)/rev)									
		0.2 (0.035)	0.4 (0.014)	0.6 (0.021)	0.8 (0.028)	1 (0.035)	1.2 (0.042)	1.4 (0.049)	1.6 (0.056)	1.8 (0.063)	2 (0.071)
Engine speed (rpm)	700	90	90	88	76	68	78	78	78	78	78
	1000	90	90	88	76	68	78	78	78	78	78
	1500	89	88	80	64	56	62	62	62	62	62
	2000	88	84	64	40	36	35	35	35	35	35
	2500	88	80	56	36	30	34	34	34	34	34
	3000	64	56	30	30	30	33	33	33	33	33
	3500	50	40	30	30	32	32	32	32	32	32
	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.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BO:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BP:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BQ:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BR:DTC P0305 CYLINDER 5 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BS:DTC P0306 CYLINDER 6 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

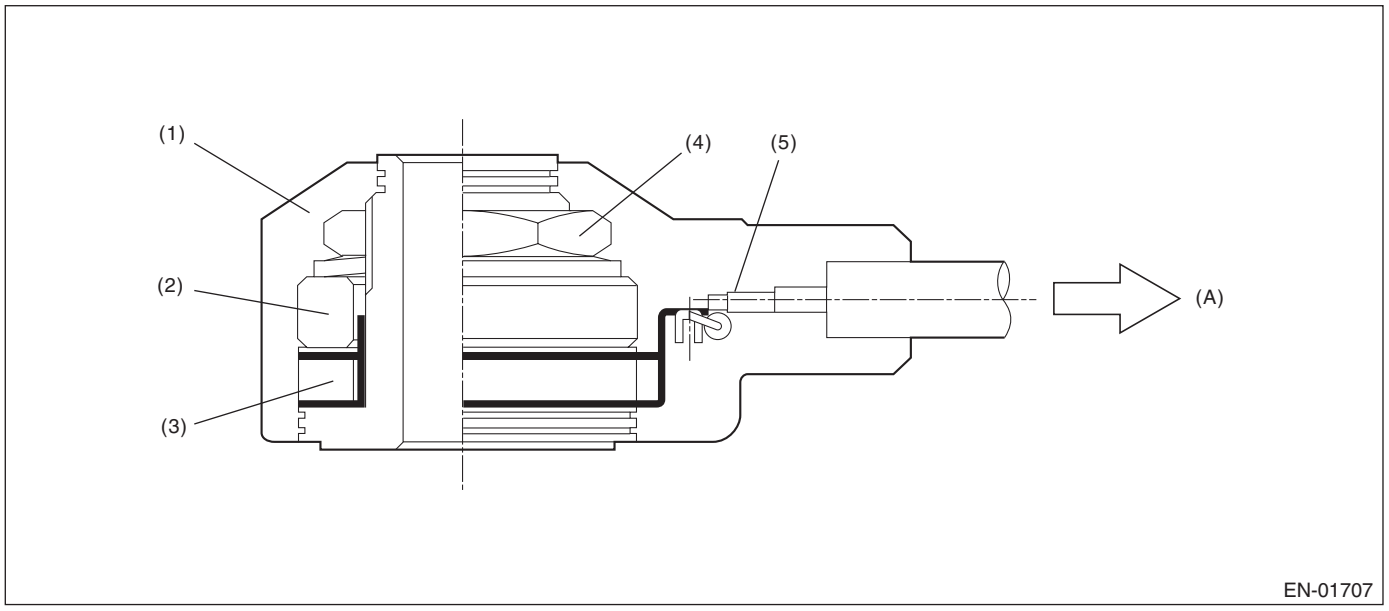
NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 0.238 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≥ 0.238 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Knocking compensation
When normal: Learning ignition advance angle value = knock F/B advance angle + entire learning advance angle value + portional learning advance angle value
Failure: learned ignition advance value = –6°CA. (6°CA retard)
Knock F/B advance angle value = 0°CA
Whole learning prohibited
Portional learning prohibited

9. ECM OPERATION AT DTC SETTING

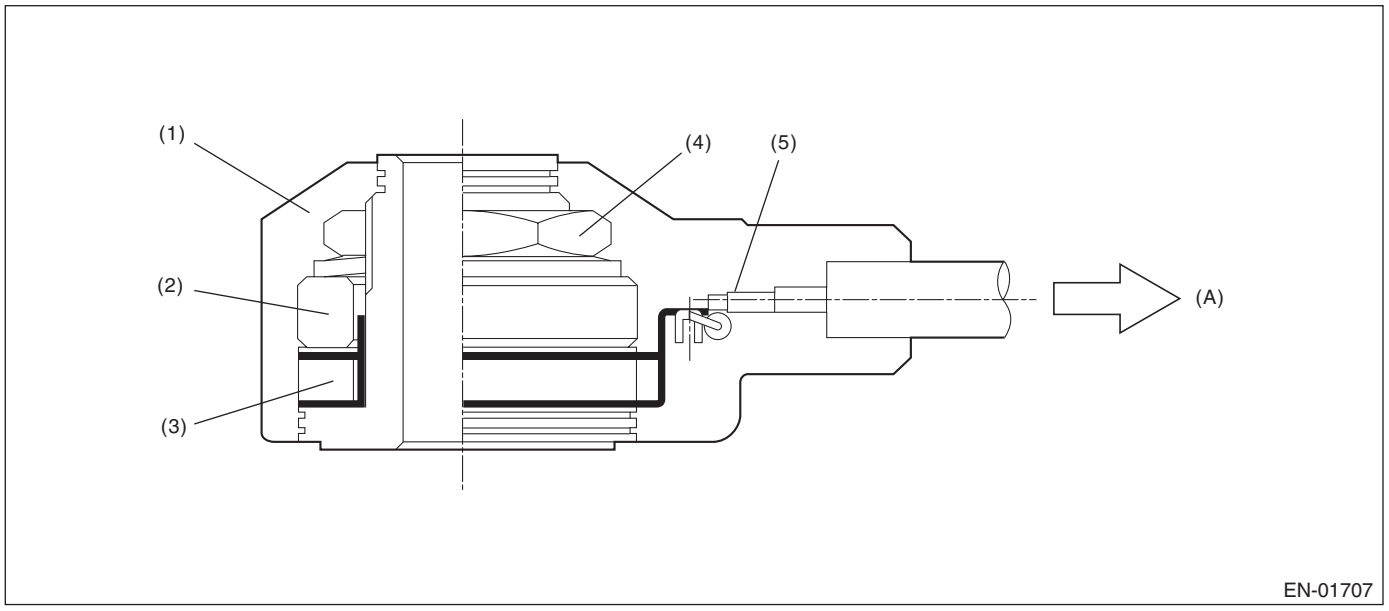
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	≥ 4.714 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Output voltage	< 4.714 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Knocking compensation
When normal: Learning ignition advance angle value = knock F/B advance angle + entire learning advance angle value + portional learning advance angle value
Failure: learned ignition advance value = –6°CA. (6°CA retard)
Knock F/B advance angle value = 0°CA
Whole learning prohibited
Portional learning prohibited

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0327. <Ref. to GD(H6DO)-110, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

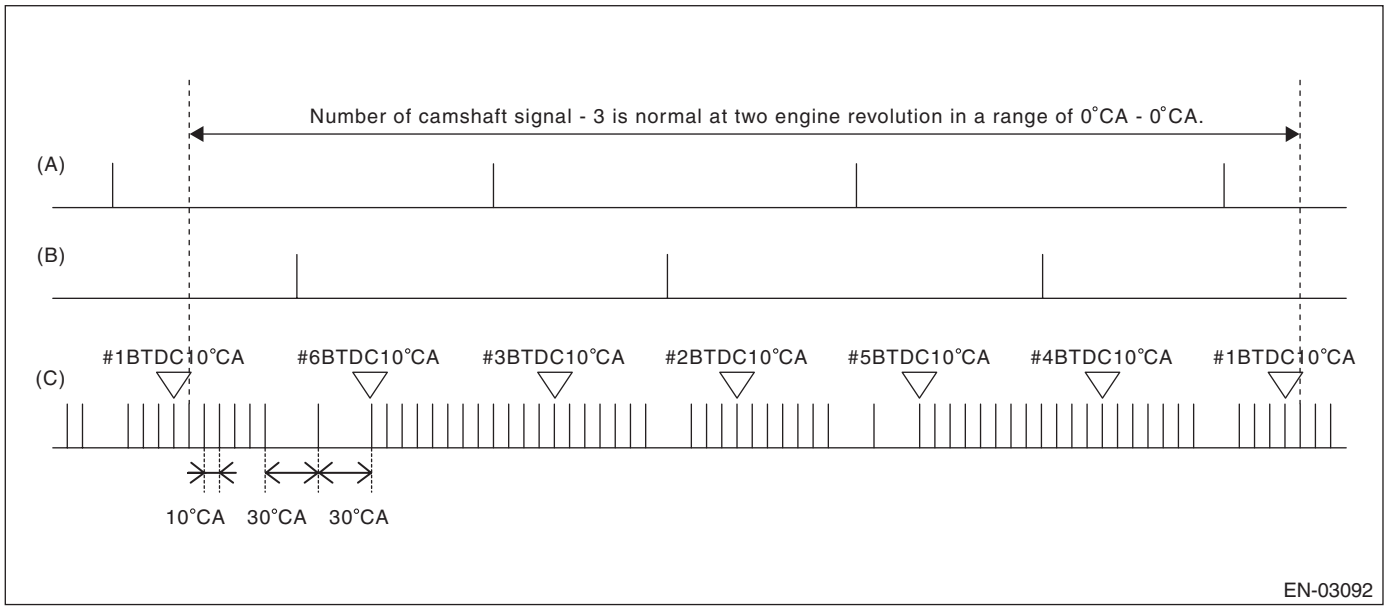
NOTE:
For the detection standard, refer to DTC P0328. <Ref. to GD(H6DO)-112, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BX:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

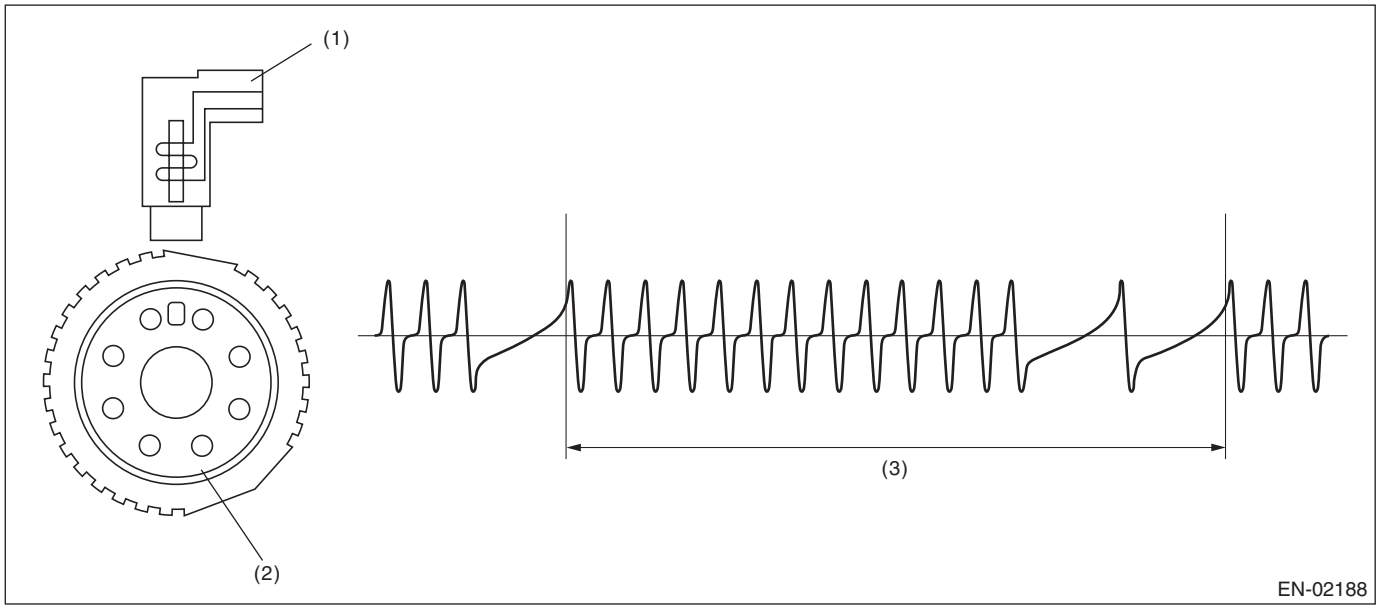
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the crankshaft position sensor.
Judge as NG when the crank signal is not input even though the starter was rotated.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH) (B) Camshaft signal (LH) (C) Crankshaft signal



(1) Crankshaft position sensor (2) Crank sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 3 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK when the continuous time of meeting the malfunction criteria below is 3 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

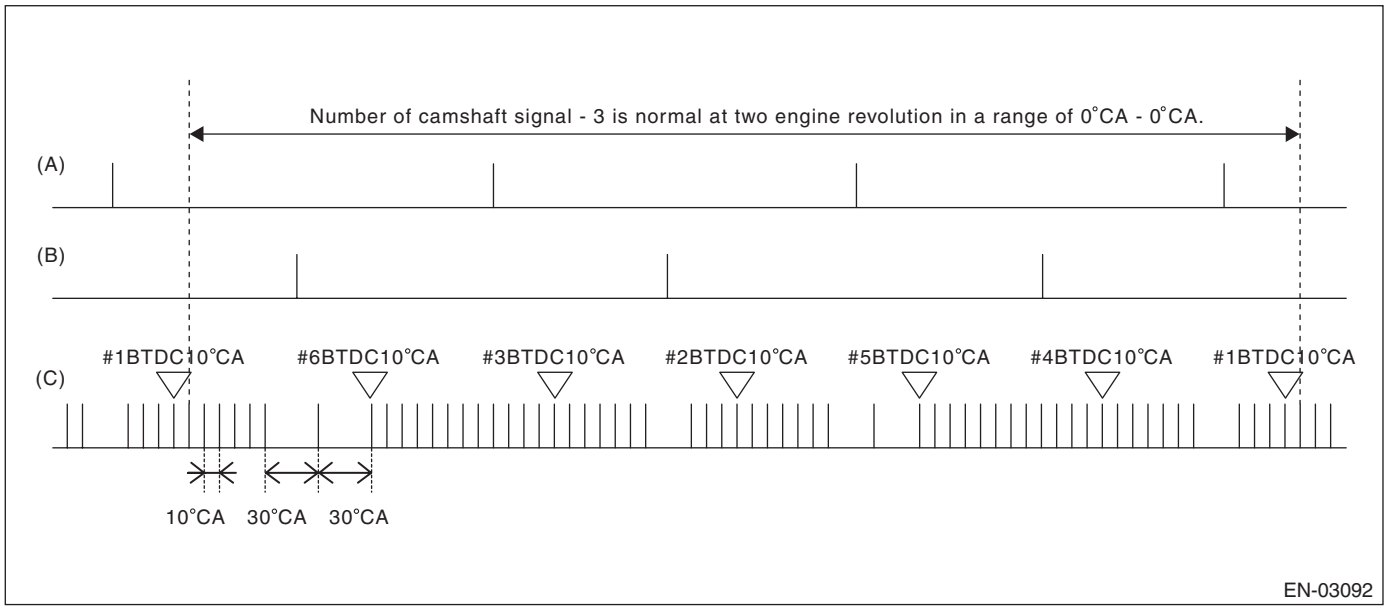
Memorize the freeze frame data. (For test mode $02)

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

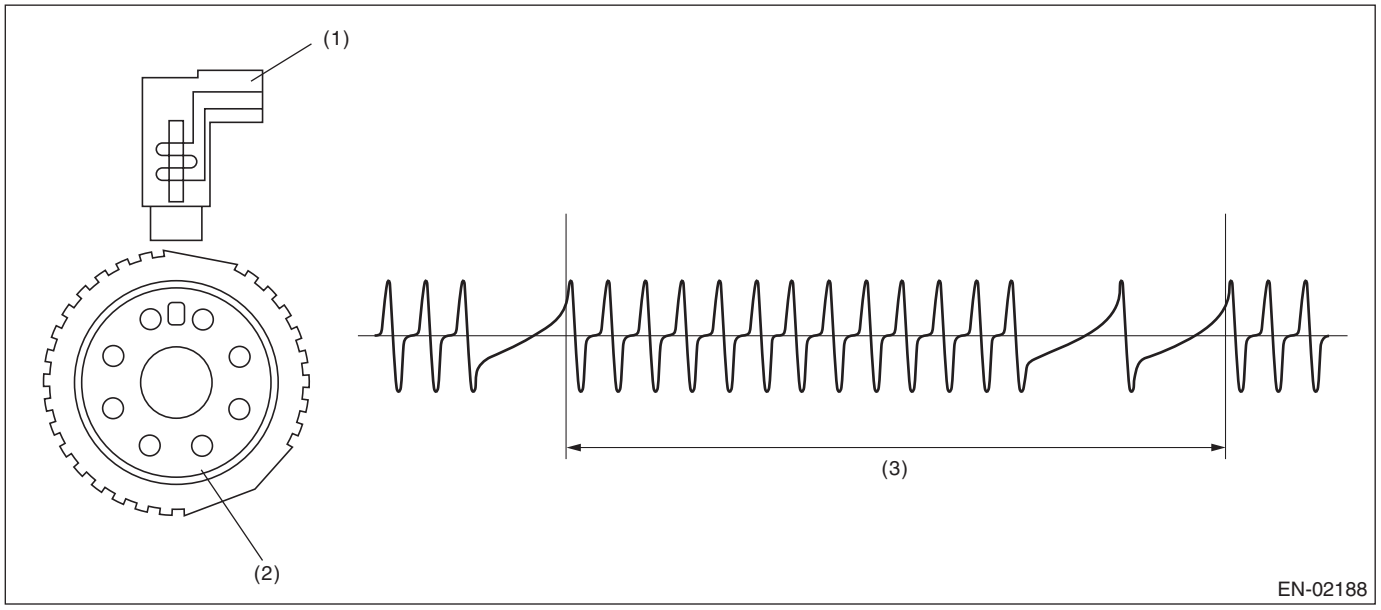
1. OUTLINE OF DIAGNOSIS

Detect for faults in crankshaft position sensor output properties.
Judge as NG when there is a problem in the number of crankshaft signals for every revolution.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH) (B) Camshaft signal (LH) (C) Crankshaft signal



(1) Crankshaft position sensor (2) Crank sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	≥ 8 V
Engine speed	< 3000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG if the following criteria are met continuously 10 times or more in a row.

Judgment Value

Malfunction criteria	Threshold value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

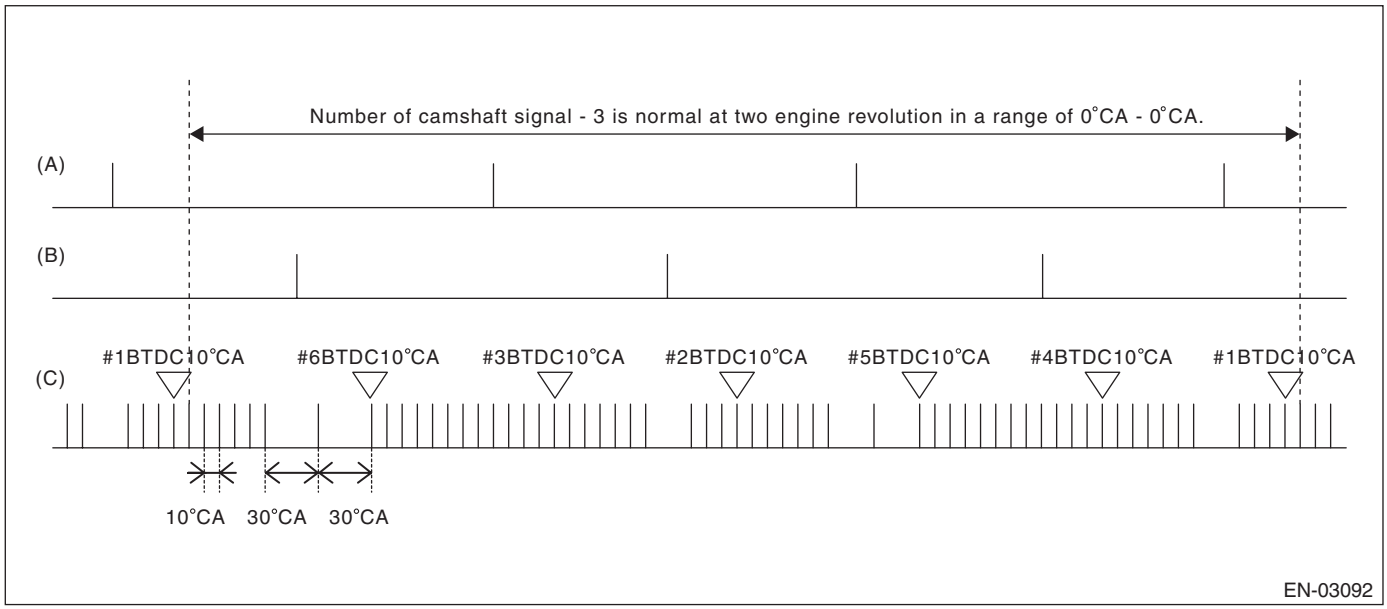
Memorize the freeze frame data. (For test mode $02)

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

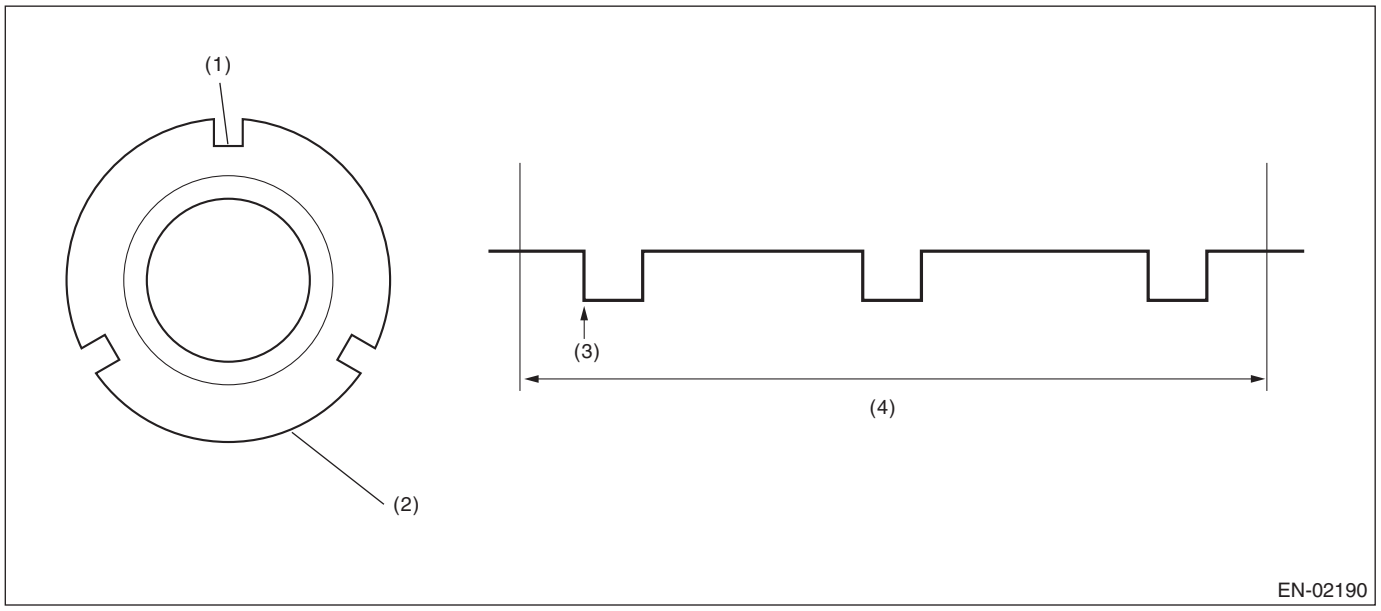
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the camshaft position sensor.
Judge as NG when the number of camshaft signals remains abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)
(B) Camshaft signal (LH)
(C) Crankshaft signal



(1) Throttle
(2) Camshaft plate
(3) Detecting point
(4) Camshaft one revolution (engine two revolutions)

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment 1**

Judge as NG when the condition where the number of camshaft position sensor signals are less than 3 times during 2 engine revs. continues.

Judgment Value

Malfunction criteria	Threshold value
Amount of camshaft sensor signal during 2 revs.	< 3

Time Needed for Diagnosis: 8 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment 1**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Camshaft position sensor signal	= 3

- **Abnormality Judgment 2**

Judge as NG when the continuous time when the following conditions are established is 3 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Starter	ON
Camshaft position sensor signal	No input

Time Needed for Diagnosis: 3 seconds

- **Normality Judgment 2**

Judge as OK and clear the NG when the following criteria are established.

Judgment Value

Malfunction criteria	Threshold value
Camshaft position sensor signal	Input exists

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0° CA) to the compensation value of partial learning zone with IG OFF.
  – Enter the initial value (0° CA) to the compensation value of the partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control: Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

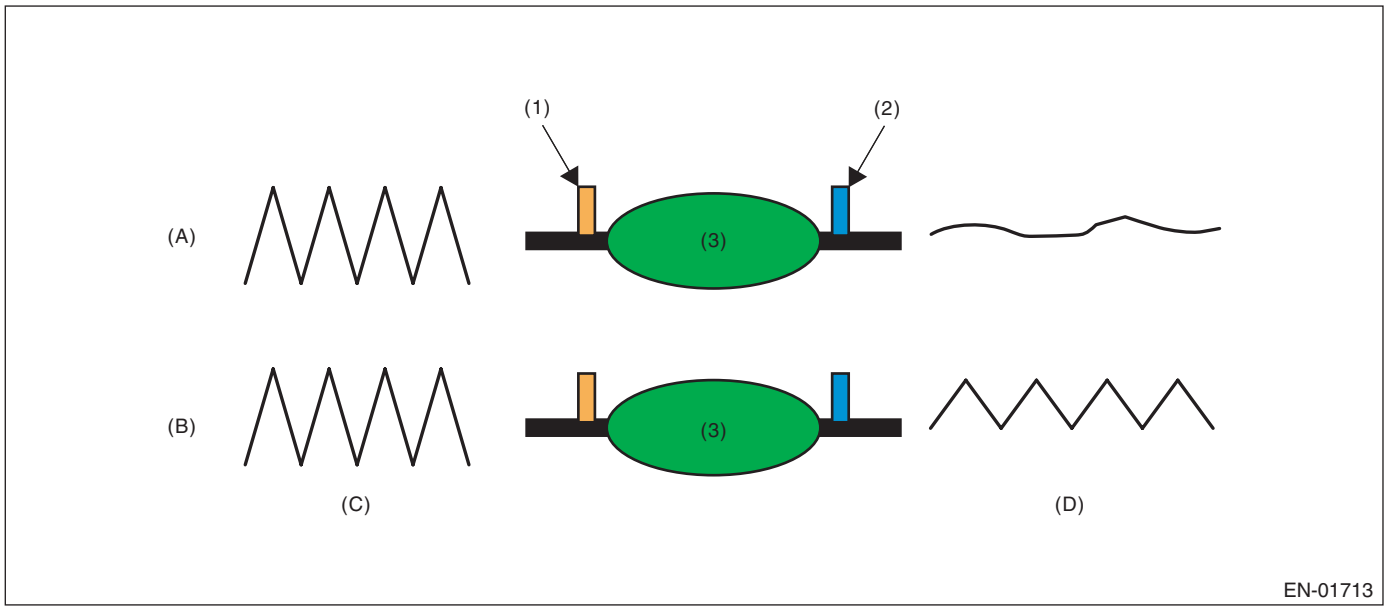
NOTE:
For the detection standard, refer to DTC P0340. <Ref. to GD(H6DO)-118, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of the catalyst function.
Though the rear 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 rear oxygen sensor output and comparing it with the front oxygen (A/F) sensor output.

2. COMPONENT DESCRIPTION



(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Catalytic converter
(A) Normal
(B) Deterioration
(C) Output waveform from the front oxygen (A/F) sensor
(D) Output waveform from the rear oxygen sensor

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 75°C (167°F)
Estimated catalyst temperature	≥ 580°C (1076°F)
Misfire detection every 200 rotations	< 7 times
Sub feedback	In operation
Evaporative system diagnosis	Not in operation
Time of difference (< 0.10) between actual and target lambda	1000 milliseconds or more
Vehicle speed	≥ 70 km/h (43 MPH)
Amount of intake air	10 ←→ 40 g (0.35 ←→ 1.41 oz)/s
Rear oxygen output change from 600 mV or lower to 600 mV or higher	Experienced after fuel cut
Load change absolute value	< 0.02 g (0.007 oz)/rev
Total time of canister purge operation	≥ 5 seconds
Learning value of evaporation gas density	≤ 0.2
After engine starting	≥ 205 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at a constant 70 km/h (43 MPH) or higher.

5. DIAGNOSTIC METHOD

After the execution criteria are established, calculate the output fluctuation value of front oxygen (A/F) sensor (averaged for the right and left) and output fluctuation value of rear oxygen sensor. Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value is the specified value or more. A/F response properties and diagnosis values are parameters for the judgment value.
Judge as NG if the criteria below are met. Judge as OK if the criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds × 4 divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds × 4	≥ 20.2

Time Needed for Diagnosis: 30 — 55 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

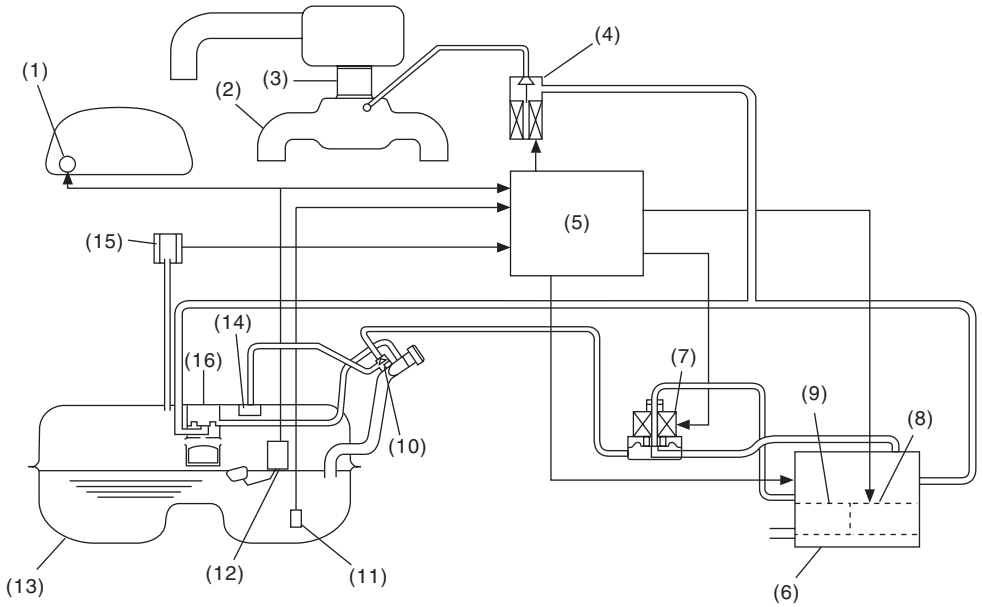
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

1. OUTLINE OF DIAGNOSIS

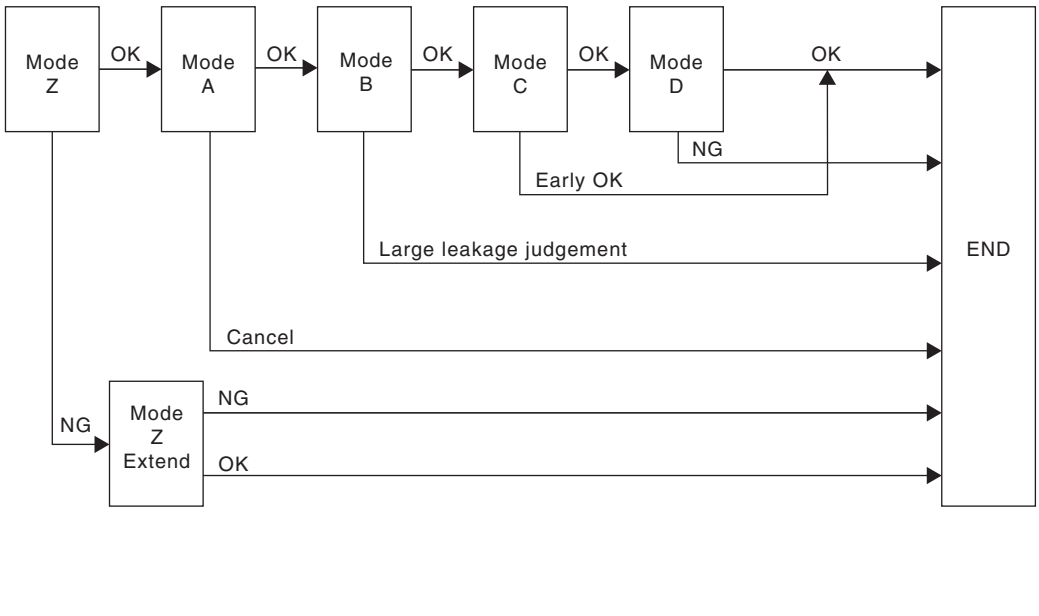
Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.



(1)	Fuel gauge	(7)	Pressure control solenoid valve	(12)	Fuel level sensor
(2)	Intake manifold	(8)	Drain valve	(13)	Fuel tank
(3)	Throttle body	(9)	Drain filter	(14)	Fuel cut valve
(4)	Purge control solenoid valve	(10)	Shut-off valve	(15)	Fuel tank pressure sensor
(5)	Engine control module (ECM)	(11)	Fuel temperature sensor	(16)	Vent valve
(6)	Canister				

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 → mode D;
When in 0.02 inch diagnosis, perform in the order of mode A → mode B → mode C → mode D → mode E.

0.04-inch Diagnosis



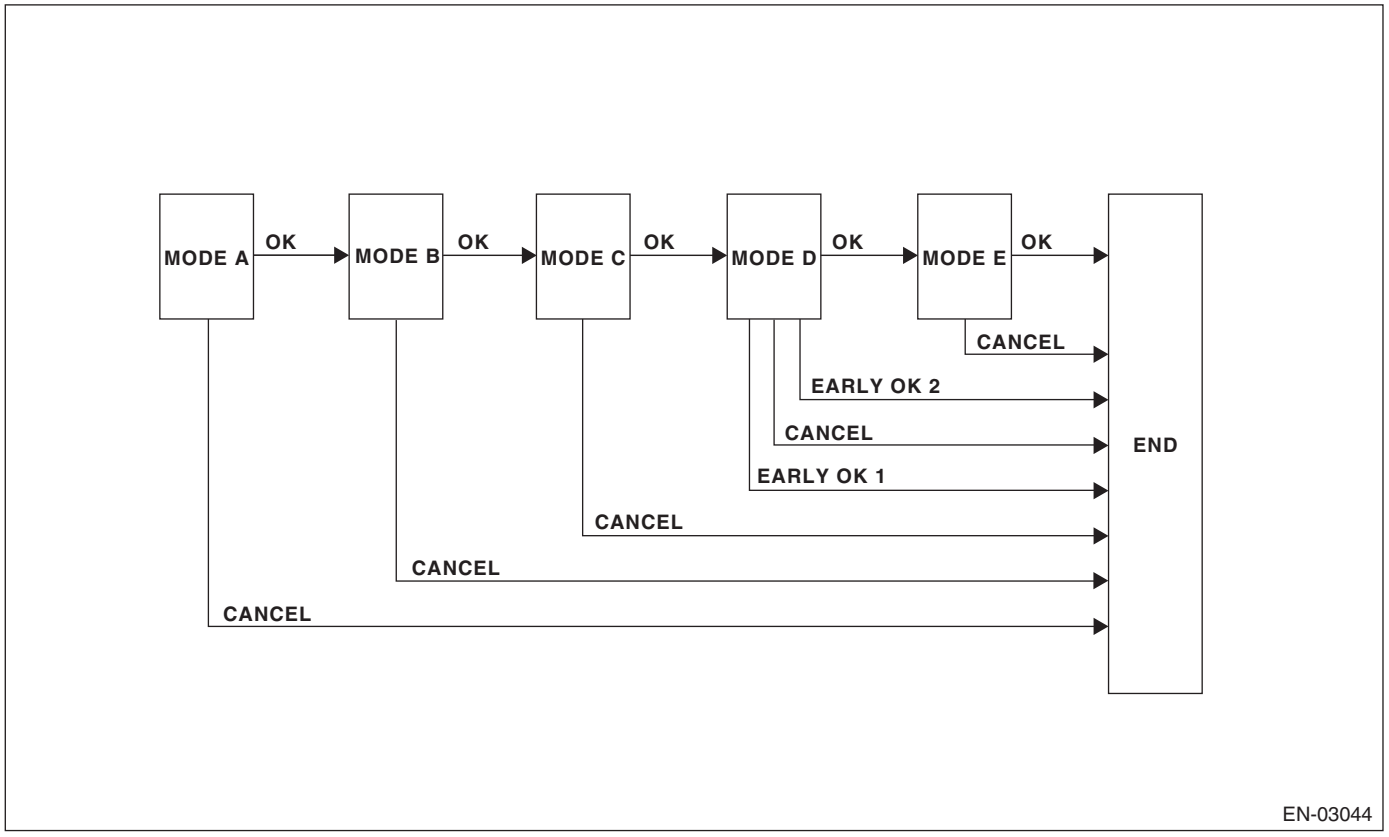
EN-02872

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.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Decrease the pressure in the tank to the target value by introducing intake manifold pressure to the fuel tank. If the tank pressure cannot be reduced, it is diagnosed as large leak.	5 — 25 seconds
Mode C (Pressure increase check, advanced OK judgment)	Wait until the tank pressure returns to the targeted pressure (start level of P2 calculation). If the tank pressure does not become the value, make advanced OK judgment.	1 — 15 seconds
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.	10 seconds

Mode Table for Evaporative Emission Control System Diagnosis

Mode	When normal	Diagnostic item	DTC
Mode Z	Roughly same as barometric pressure (Same pressure 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.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leak	P0457
Mode C	Reaches target pressure	—	—
Mode D	Pressure change is small.	EVAP system large leak [1.0 mm (0.04 in)]	P0442

0.02-inch Diagnosis

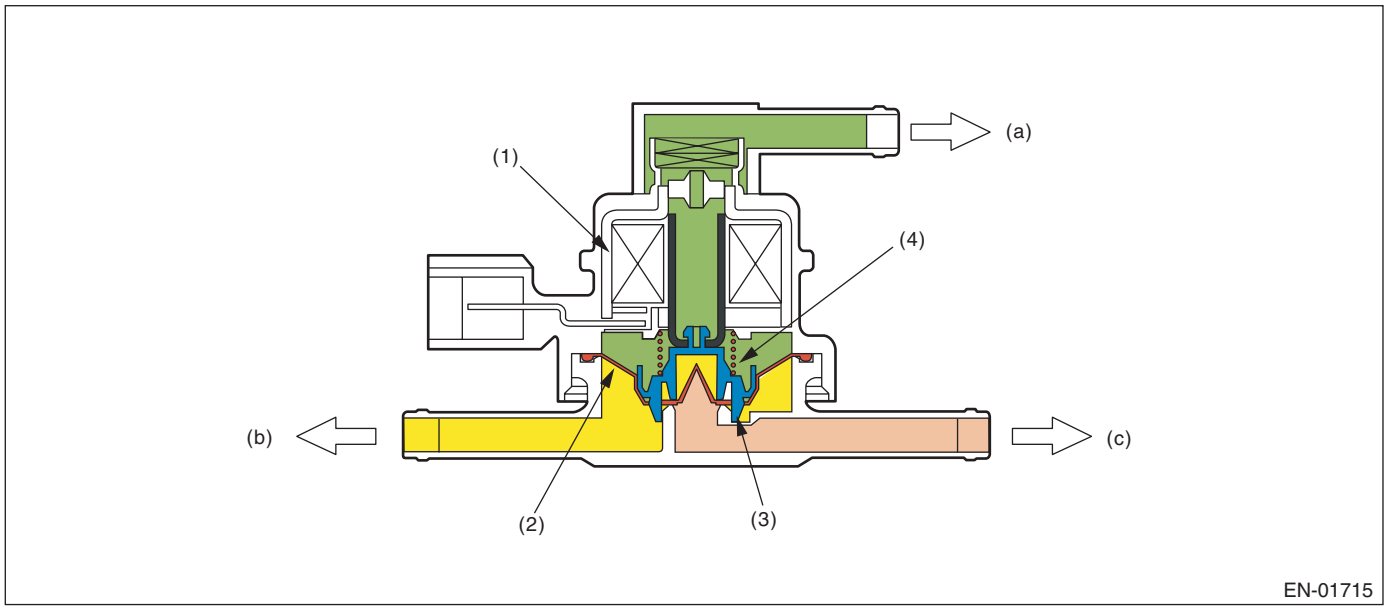


Mode	Mode Description	Diagnosis Period
Mode A (0 point compensation)	When pressure in tank is high, wait for 0 point (Near 0 kPa (0 mmHg, 0 inHg)) to return.	0 — 12 seconds
Mode B (Negative pressure introduced)	Decrease the pressure in the tank to the target value by introducing the intake hose pressure to the fuel tank.	0 — 27 seconds
Mode C (Negative pressure maintained)	Wait until the tank pressure returns to the target (start level of P2 calculation).	0 — 20 seconds
Mode D (Negative pressure change calculated)	Calculate the time it takes for the tank pressure to return to the P2 calculation complete pressure. If the tank pressure does not return to the P2 calculation complete pressure, make advanced OK judgment.	0 — 200 seconds
Mode E (Evaporation generated amount calculation)	Calculate the amount of evaporation (P1).	0 — 280 seconds

2. COMPONENT DESCRIPTION

• Pressure control solenoid valve

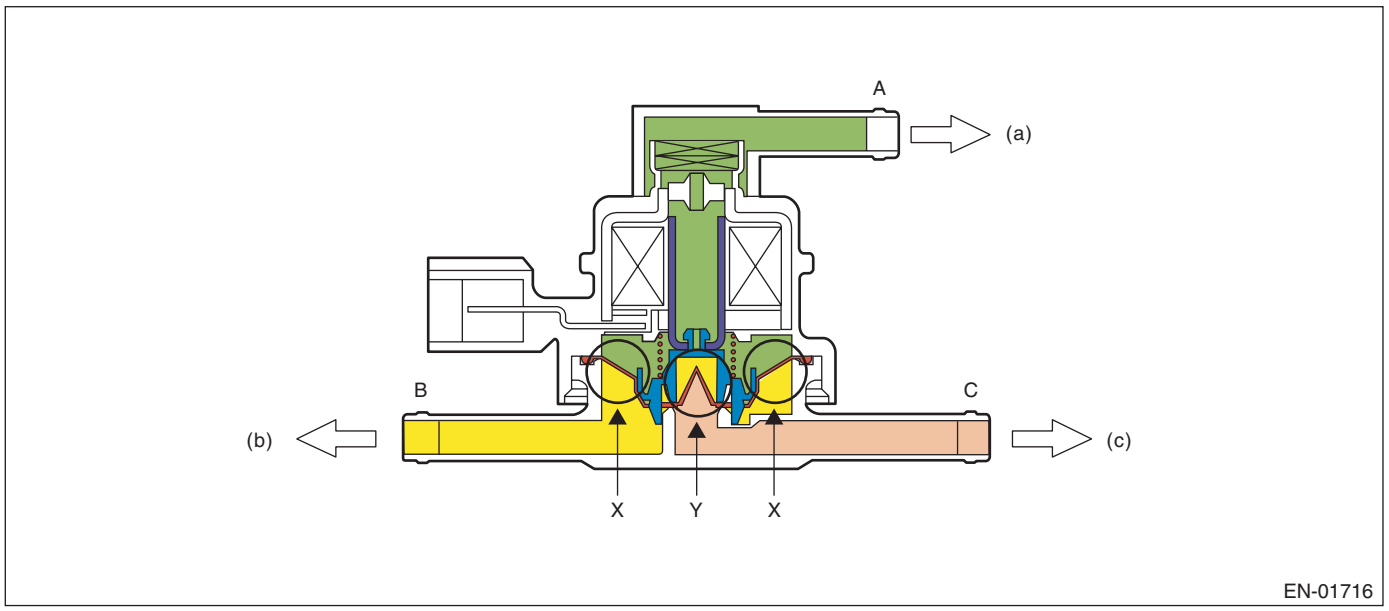
PCV controls the fuel tank pressure to be equal to the atmospheric air pressure. Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
The valve is forcibly opened by setting 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**

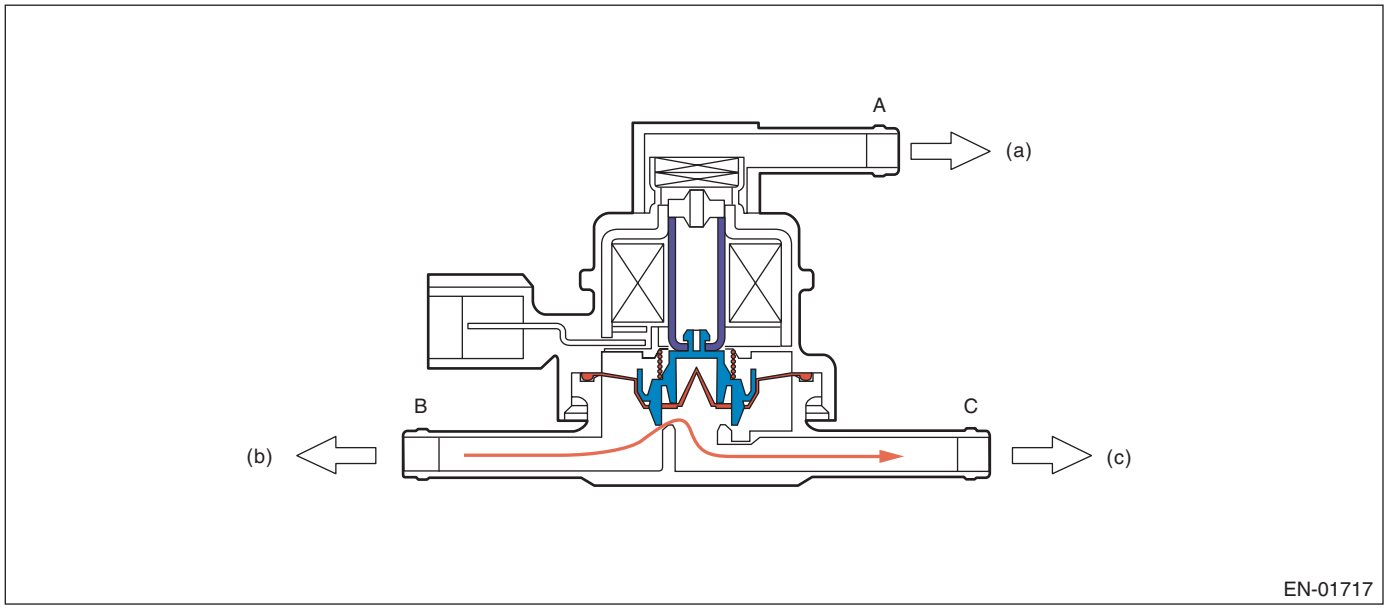
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port 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

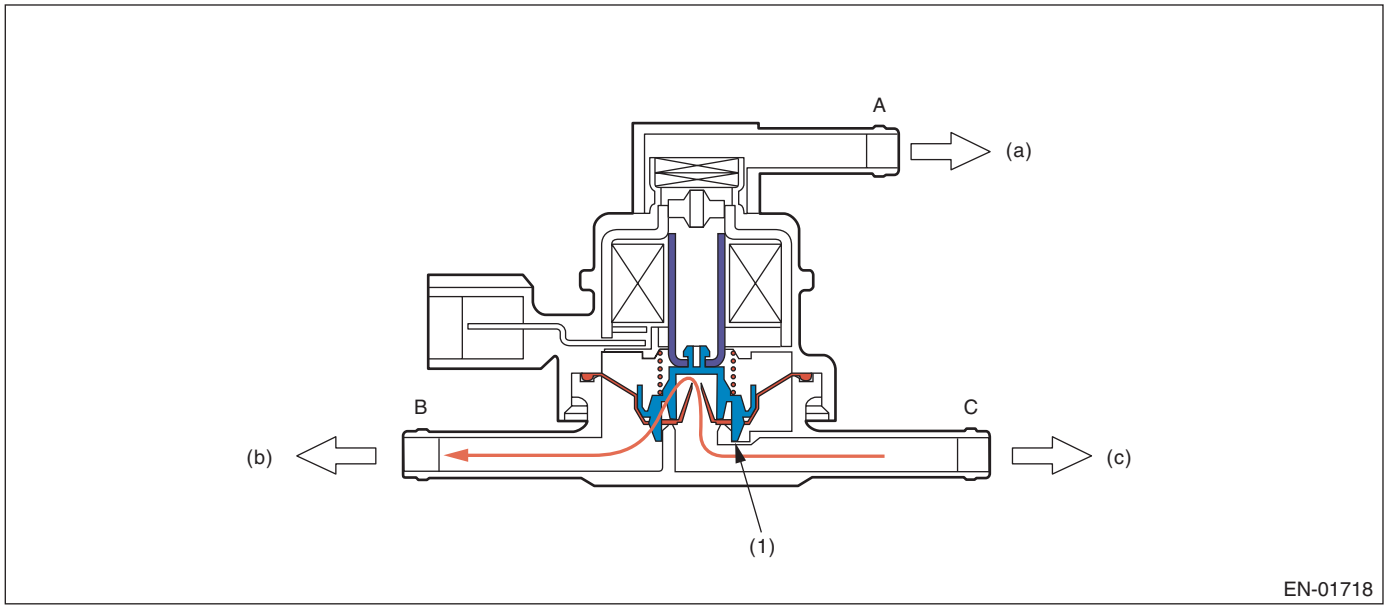
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ←→ C

When A < B (solenoid OFF)



(a) Barometric pressure (b) Fuel tank (c) Canister

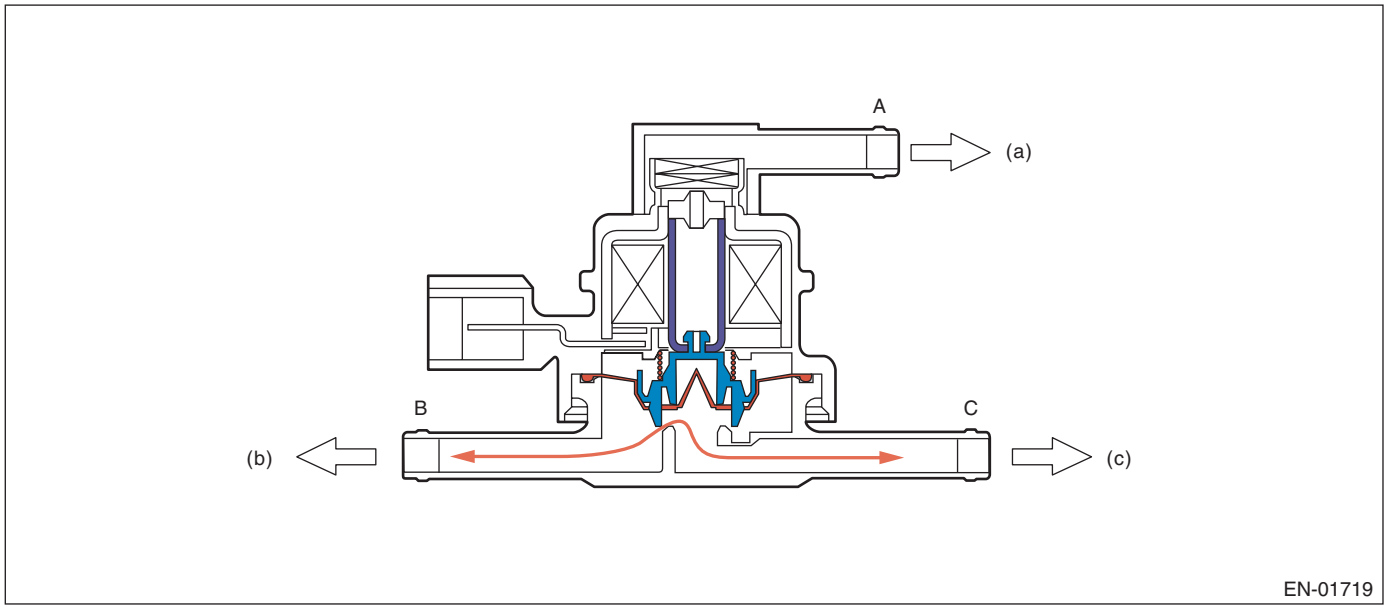
When B < C (solenoid OFF)



(a) Barometric pressure (b) Fuel tank (c) Canister

(1) Valve

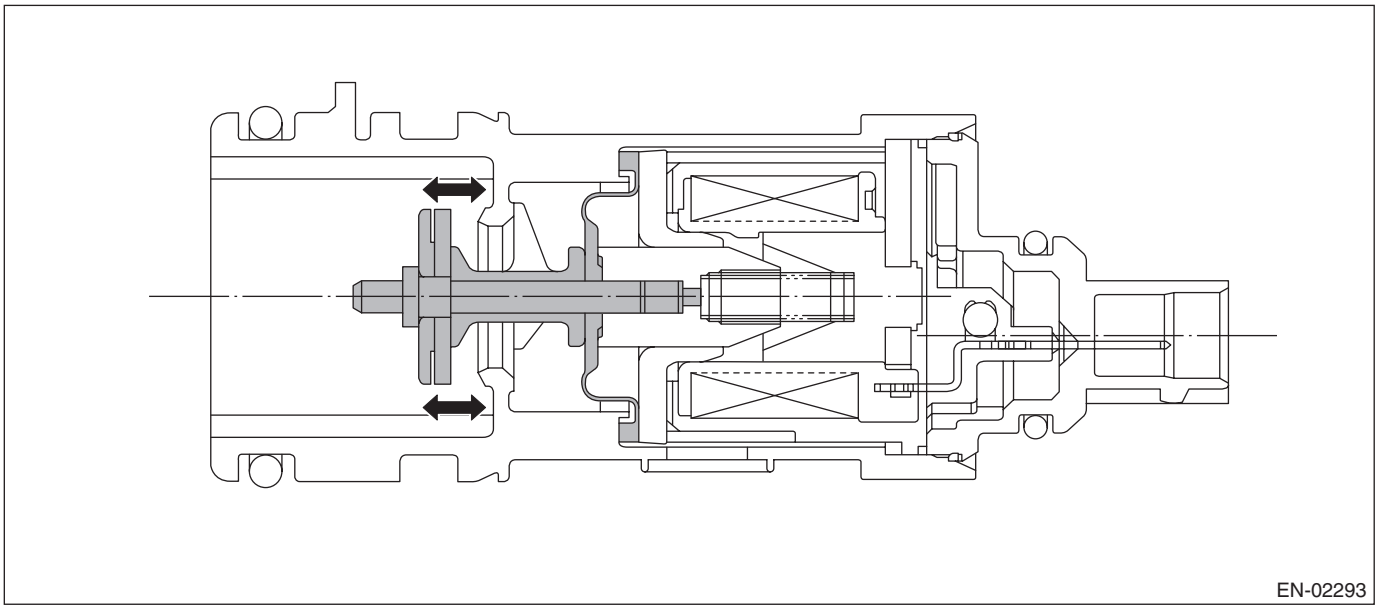
When Solenoid is ON



(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	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	120 seconds or more
After engine starting	856 seconds or more
Learning value of evaporation gas density	≤ 0.08
Engine speed	1050 ←→ 6500 rpm
Fuel tank pressure	≥ –4.0 kPa (–30 mmHg, –1.18 inHg)
Intake manifold relative vacuum (relative pressure)	< –26.7 kPa (–200 mmHg, –7.87 inHg)
Vehicle speed	≥ 32 km/h (20 MPH)
Fuel level	9.6 ←→ 54.4 ℓ (2.53 ←→ 14.37 US gal, 2.11 ←→ 12.00 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	–10 ←→ 45°C (14 ←→ 113°F)
Intake air temperature	≥ –10°C (14°F)
Pressure change every one second	< 0.23 kPa (1.7 mmHg, 0.07 inHg)
Minimum pressure change value every one second – Maximum pressure change value	< 0.23 kPa (1.7 mmHg, 0.07 inHg)
Change of fuel level	< 2 ℓ (2.1 US qt, 1.76 Imp qt)/128 milliseconds
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	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Time since the last incomplete 0.02 inch leak diagnosis (when canceled at mode A)	> 120 seconds
Time since the last incomplete 0.02 inch leak diagnosis (when canceled at modes other than mode A)	> 600 seconds
Total time of canister purge operation	120 seconds or more
After engine starting	120 seconds or more
Fuel temperature	–10 ←→ 55°C (14 ←→ 131°F)
Fuel level	9.6 ←→ 54.4 ℓ (2.54 ←→ 14.37 US gal, 2.11 ←→ 12.00 Imp gal)
Intake manifold relative vacuum (relative pressure)	< –8.0 kPa (–60 mmHg, –2.36 inHg)
Fuel tank pressure	–0.43 — 1.43 kPa (–3.2 — 10.7 mmHg, –0.13 — 0.42 inHg)
Vehicle speed	≥ 50 km/h (31 MPH) continues for 125 seconds
Closed air/fuel ratio control	In operation
Engine speed	500 — 7000 rpm
(During diagnosis)	
Change of fuel level	≤ 5 ℓ (1.3 US qt, 1.1 Imp qt)
Pressure change every one second	< 0.06 kPa (0.44 mmHg, 0.02 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 0.07 kPa (0.51 mmHg, 0.02 inHg)
|Pressure change in tank every second|	≤ 0.01 kPa (0.75 mmHg, 0.03 inHg)
Barometric pressure change (Mode D)	–0.47 ←→ 0.32 kPa (–3.5 ←→ 2.4 mmHg, –0.14 ←→ 0.09 inHg)
Barometric pressure change (Mode E)	–0.32 ←→ 0.32 kPa (–2.4 ←→ 2.4 mmHg, –0.09 ←→ 0.09 inHg)

4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis
Perform the diagnosis only once 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 120 seconds or more after starting the engine, at a constant vehicle speed of 50 km/h (31 MPH) or faster, to judge as NG or OK.
If OK/NG judgment is not possible, repeat the diagnosis.
Pay attention to the fuel temperature and fuel level.

5. DIAGNOSTIC METHOD

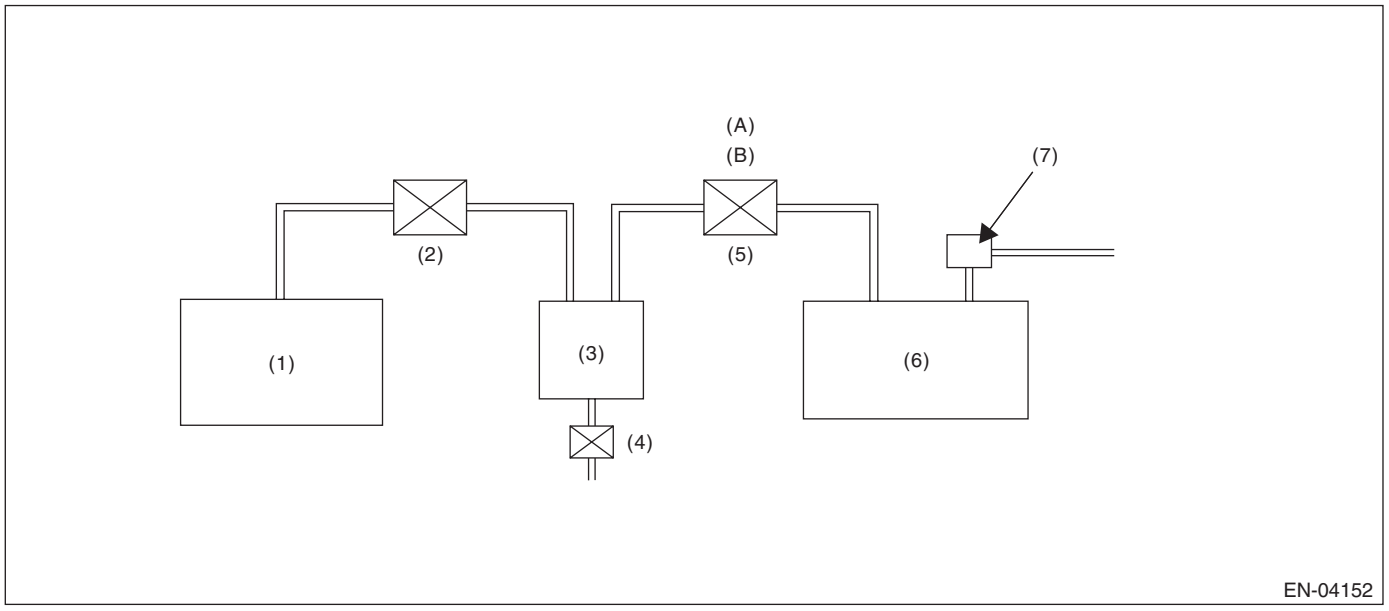
0.04-inch Diagnosis
Mode Z: (Purge control solenoid valve opening failure diagnosis)
When performing the leakage diagnosis of the EVAP system, the purge control solenoid valve must operate properly. Therefore, mode Z is used to diagnose a stuck open condition of the purge control solenoid valve by monitoring the tank pressure.
Note that if a purge control solenoid valve stuck open fault is detected, the EVAP system leakage diagnosis is cancelled.

- **PURGE CONTROL SOLENOID VALVE STUCK OPEN DIAGNOSIS**

DTC
P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

- **DIAGNOSTIC METHOD**

Purge control solenoid valve stuck open diagnosis is performed in mode Z as shown in the figure below.



(1) Engine
(2) Purge control solenoid valve
(3) Canister
(4) Drain valve
(5) Pressure control solenoid valve
(6) Fuel tank
(7) Fuel tank pressure sensor

(A) Normal condition: mechanical control
(B) During diagnosis: electronic throttle control

- **Purge Control Solenoid Valve Function Diagnosis**

DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purge control solenoid valve functional diagnosis is performed by monitoring the tank pressure in mode Z.

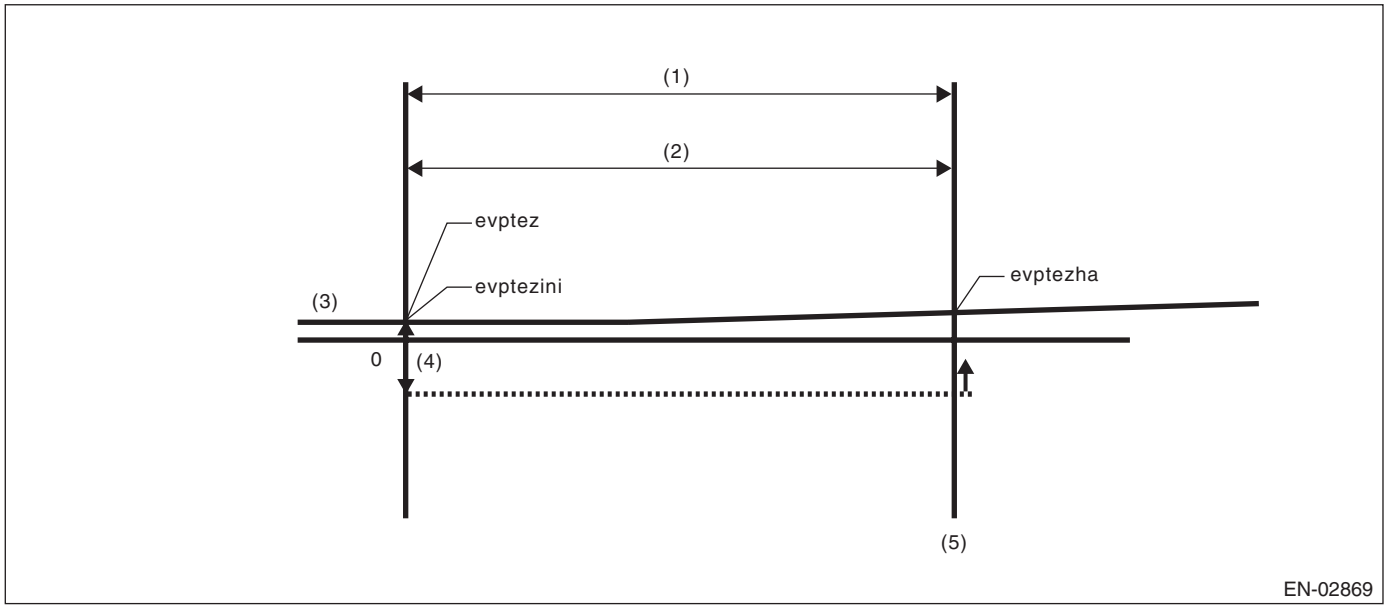
Normality Judgment

Make OK judgment 3 seconds after Mode Z starts, and change to Mode A if OK.

Judgment Value

Malfunction criteria	Threshold value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3 mmHg, 0.12 inHg)	P0457

- **Normal**



(1) Mode Z
(2) 3 seconds
(3) Fuel tank pressure
(4) 0.4 kPa (3.0 mmHg, 0.12 inHg)
(5) OK judgment

- evptez – evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)

Normal when above is established

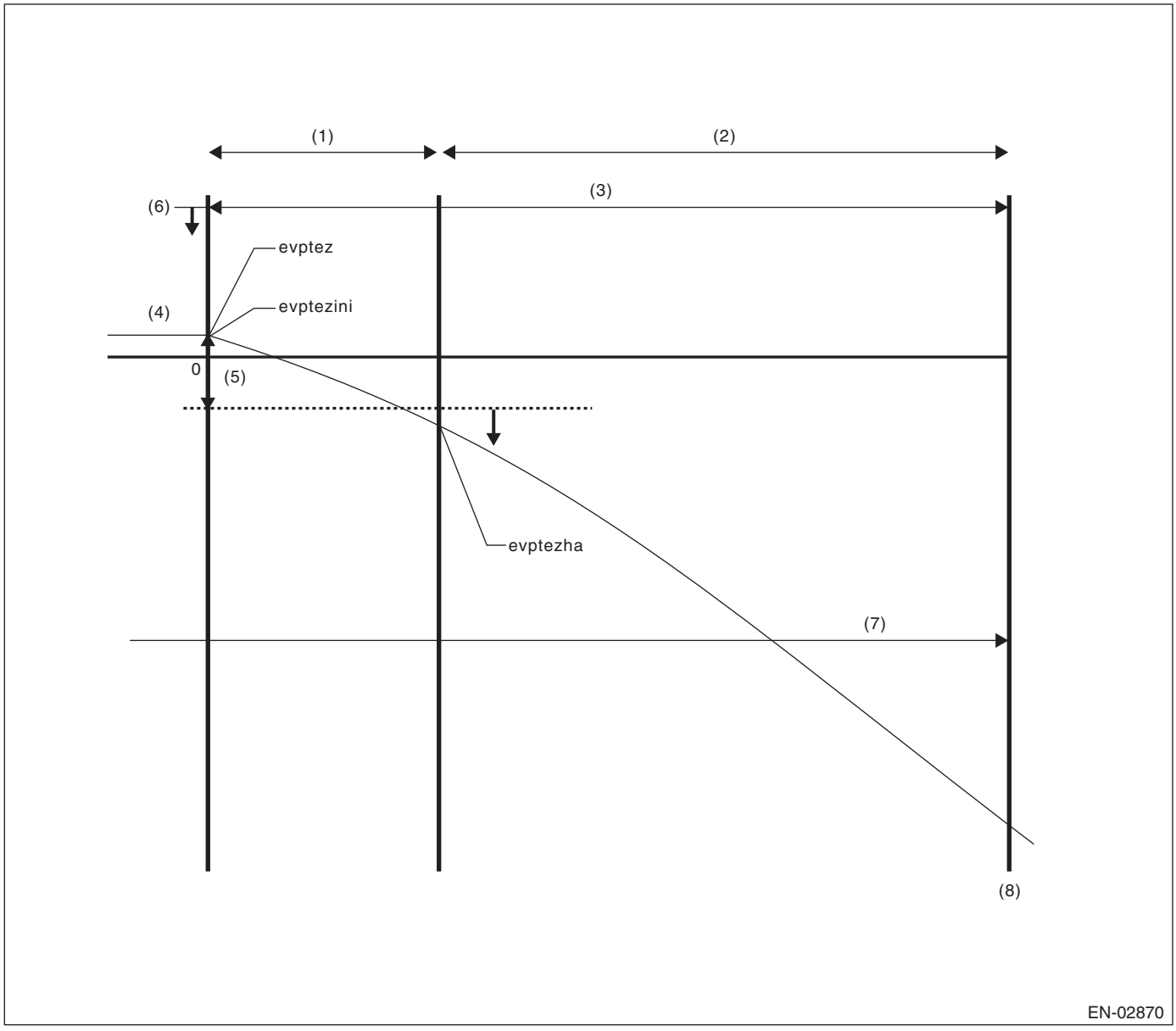
Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)	
Time of 2 ℓ or more fuel no sloshing	≥ 40 seconds	

Time Needed for Diagnosis: 16 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
When judgment for purge control solenoid valve stuck open NG is made, end the evaporative diagnosis.
Cancel the evaporative diagnosis when the OK/NG judgment for drain valve stuck closed and purge control solenoid valve stuck open cannot be made in Mode Z.



(1)	Mode Z	(4)	Fuel tank pressure	(7)	40 seconds no fuel sloshing
(2)	Extended mode Z	(5)	0.6 kPa (4.5 mmHg, 0.18 inHg)	(8)	NG judgment
(3)	16 seconds	(6)	1.43 kPa (10.7 mmHg, 0.42 inHg)		

- evptezini ≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)
- evptez – evptezha ≤ 0.6 kPa (4.5 mmHg, 0.18 inHg)
- No fuel sloshing of over 2 ℓ (0.79 US gal, 0.67 Imp gal) lasts for more than 40 seconds.

Judge as normal 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)

- **DIAGNOSTIC METHOD**

The diagnostic method 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.

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 (0 → –10.5, 0 → –0.41) kPa (mmHg, inHg)
When the pressure above (desired negative pressure) is reached, enters Mode C.
In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage (10 seconds or 35 seconds) in the system.

Abnormality Judgment
Judge as NG (large leak) when the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value	DTC
Time to reach target negative pressure	≥ 35 seconds	P0457
Or mode B time	≥ 10 seconds	
(Min. pressure value in tank when in mode B) – (Tank pressure when mode B started)	< –0.33 kPa (–2.5 mmHg, –0.1 inHg)	

Mode C: (Check pressure rise)
Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)
Change to Mode D when the tank pressure returns to the start level of P2 calculation.
Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

Tank pressure when starting calculation of P2	Time for advanced OK judgment
–1.3 kPa (–9.75 mmHg, –0.38 inHg)	17 seconds

Mode D: (Measure amount of negative pressure change)
Monitor the tank pressure change amount when using mode D. In this case, the tank pressure increases, (nears barometric pressure) because evaporation occurs. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.
After calculating P2, perform a small leak diagnosis according to the items below.

When Mode D is ended
Assign tank variations measured in Mode A and Mode D, P1 and P2, to the formula below, judge small leaks in the system. If the measured judgment value exceeds the threshold value, it is judged to be a malfunction.
Judge as NG when the criteria below are completed and Judge as OK when not completed.

Judgment Value

Malfunction criteria	Threshold value	DTC
P2 – 1.5 × P1 P2: Tank pressure that changes every 10 seconds in mode D P1: Tank pressure that changes every 10 seconds in mode A	> Value from Map 7 * Threshold value: Figure (Remaining Fuel vs Tank temperature)	P0442

* 1.5: Evaporation amount compensation value when below negative pressure (Amount of evaporation occurrence increases as a vacuum condition increases.)

Map 7 Failure Diagnosis Reference Limit for 0.04 in Leaks for Evaporation Diagnosis

Fuel temperature & fuel level	25°C (77°F)	30°C (86°F)	35°C (95°F)	40°C (104°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.28 kPa (2.1 mmHg, 0.083 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)	0.31 kPa (2.3 mmHg, 0.090 inHg)	0.31 kPa (2.35 mmHg, 0.092 inHg)	0.32 kPa (2.4 mmHg, 0.094 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.31 kPa (2.3 mmHg, 0.091 inHg)	0.32 kPa (2.4 mmHg, 0.094 inHg)	0.33 kPa (2.5 mmHg, 0.098 inHg)	0.35 kPa (2.6 mmHg, 0.102 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.41 kPa (3.05 mmHg, 0.120 inHg)	0.42 kPa (3.15 mmHg, 0.124 inHg)	0.43 kPa (3.25 mmHg, 0.128 inHg)	0.45 kPa (3.35 mmHg, 0.134 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.42 kPa (3.15 mmHg, 0.124 inHg)	0.44 kPa (3.3 mmHg, 0.130 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.47 kPa (3.5 mmHg, 0.138 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.43 kPa (3.2 mmHg, 0.126 inHg)	0.44 kPa (3.3 mmHg, 0.130 inHg)	0.47 kPa (3.5 mmHg, 0.138 inHg)	0.48 kPa (3.6 mmHg, 0.142 inHg)	0.49 kPa (3.7 mmHg, 0.146 inHg)

Time Needed for Diagnosis: 30 — 100 seconds
0.02-inch Diagnosis
DTC
P0456 Evaporative Emission Control System Leak Detected (very small leak)

- **DIAGNOSTIC METHOD**

The diagnostic method 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.
Mode A: (0 point compensation)
When pressure in tank is high, wait for 0 point 0 kPa (Near 0 mmHg, 0 inHg) to return. Shift to mode B when 0 point returns.
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 → –2.0 kPa (0 mmHg → –15 mmHg, 0 → –0.59 inHg)
When the pressure above (desired negative pressure) is reached, Mode C is entered.
Cancel the diagnosis when the targeted pressure in the tank is not reached.
Mode C: (Negative pressure maintained)
Stop the introduction of negative pressure and 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 (P2) the pressure change in the tank, and measure the time (evpdset) for the tank pressure to return when calculation of P2 is completed. Shift to mode E when pressure returns. Make an advance OK judgment using the value of P2, or cancel, when the pressure in the tank does not return after calculation of P2 is completed even when the predetermined amount of time has passed.
When the following conditions are established, judged as OK.

Judgment Value

Malfunction criteria	Threshold value	DTC
Advanced OK judgment 1		P0456
When in Mode D	≥ 30 s	
Fuel tank pressure	≤ –12 — –13.5 mmHg (–0.47 — –0.53 inHg)	
Advanced OK judgment 2		
When in Mode D	≥ 200 s	
P2	≥ 0.9 — 1.3 kPa (7 — 9.6 mmHg, 0.28 — 0.38 inHg)	

Mode E: (Evaporation occurrence amount calculation)

Calculate the change of tank pressure with the time evpdset to judge as NG/OK according to the value of P1. (ambiguous determination acceptable).

Abnormality Judgment

If the following conditions are met, judge as NG.

Judgment Value

Malfunction criteria	Threshold value	DTC
P1	< Value from Map 7 * Threshold value: Figure (Residual Fuel Amount vs evpdset)	P0456

Map 7 Failure diagnosis reference limit for 0.02 in leaks for evaporation diagnosis

Time evpdset & fuel level	0 seconds	30 seconds	50 seconds	100 seconds	160 seconds	200 seconds
10 L (2.6 US gal, 2.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.07 kPa (0.5 mmHg, 0.020 inHg)	0.23 kPa (1.7 mmHg, 0.067 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.07 kPa (0.5 mmHg, 0.020 inHg)	0.23 kPa (1.7 mmHg, 0.067 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.07 kPa (0.5 mmHg, 0.020 inHg)	0.23 kPa (1.7 mmHg, 0.067 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.07 kPa (0.5 mmHg, 0.020 inHg)	0.25 kPa (1.85 mmHg, 0.073 inHg)	0.33 kPa (2.5 mmHg, 0.098 inHg)	0.33 kPa (2.5 mmHg, 0.098 inHg)	0.33 kPa (2.5 mmHg, 0.098 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.07 kPa (0.5 mmHg, 0.020 inHg)	0.27 kPa (2.0 mmHg, 0.079 inHg)	0.31 kPa (2.3 mmHg, 0.091 inHg)	0.31 kPa (2.3 mmHg, 0.091 inHg)	0 kPa (0 mmHg, 0 inHg)

Normality Judgment

When the following conditions are established, judged as OK.

Judgment Value

Malfunction criteria	Threshold value	DTC
P1	> Value from Map 8 * Threshold value: Figure (Residual Fuel Amount vs evpdset)	P0456

Map 8

Time evpdset & fuel level	0 seconds	30 seconds	50 seconds	100 seconds	160 seconds	200 seconds
10 L (2.6 US gal, 2.2 Imp gal)	0.13 kPa (1.0 mmHg, 0.039 inHg)	0.47 kPa (3.5 mmHg, 0.138 inHg)	0.56 kPa (4.2 mmHg, 0.165 inHg)	0.56 kPa (4.2 mmHg, 0.165 inHg)	0.56 kPa (4.2 mmHg, 0.165 inHg)	0.56 kPa (4.2 mmHg, 0.165 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.13 kPa (1.0 mmHg, 0.039 inHg)	0.43 kPa (3.25 mmHg, 0.128 inHg)	0.55 kPa (4.1 mmHg, 0.161 inHg)	0.55 kPa (4.1 mmHg, 0.161 inHg)	0.55 kPa (4.1 mmHg, 0.161 inHg)	0.55 kPa (4.1 mmHg, 0.161 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.13 kPa (1.0 mmHg, 0.039 inHg)	0.4 kPa (3 mmHg, 0.118 inHg)	0.52 kPa (3.9 mmHg, 0.154 inHg)	0.52 kPa (3.9 mmHg, 0.154 inHg)	0.52 kPa (3.9 mmHg, 0.154 inHg)	0.52 kPa (3.9 mmHg, 0.154 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.13 kPa (1.0 mmHg, 0.039 inHg)	0.30 kPa (2.25 mmHg, 0.089 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.13 kPa (1.0 mmHg, 0.039 inHg)	0.20 kPa (1.5 mmHg, 0.059 inHg)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.39 kPa (2.9 mmHg, 0.114 inHg)

Time Needed for Diagnosis: 65 — 514 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

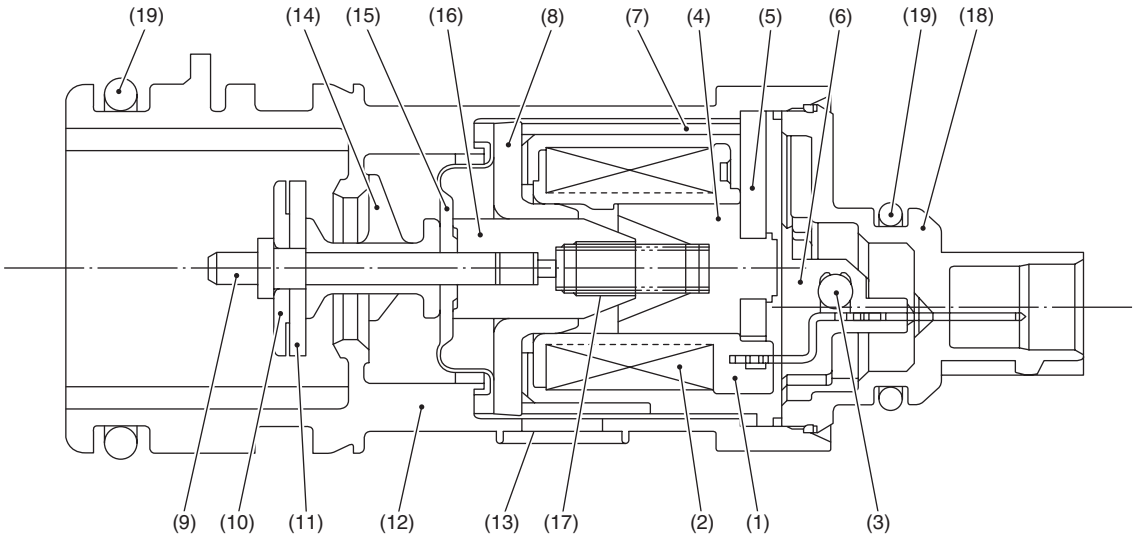
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.
Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

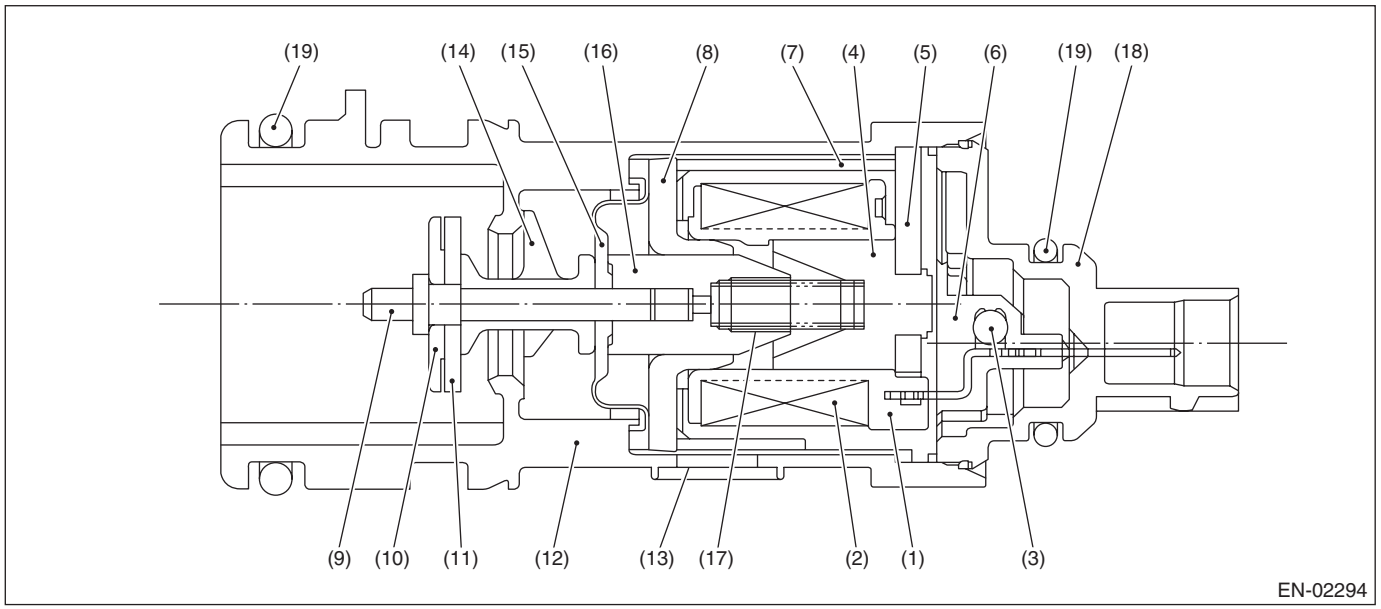
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.
Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

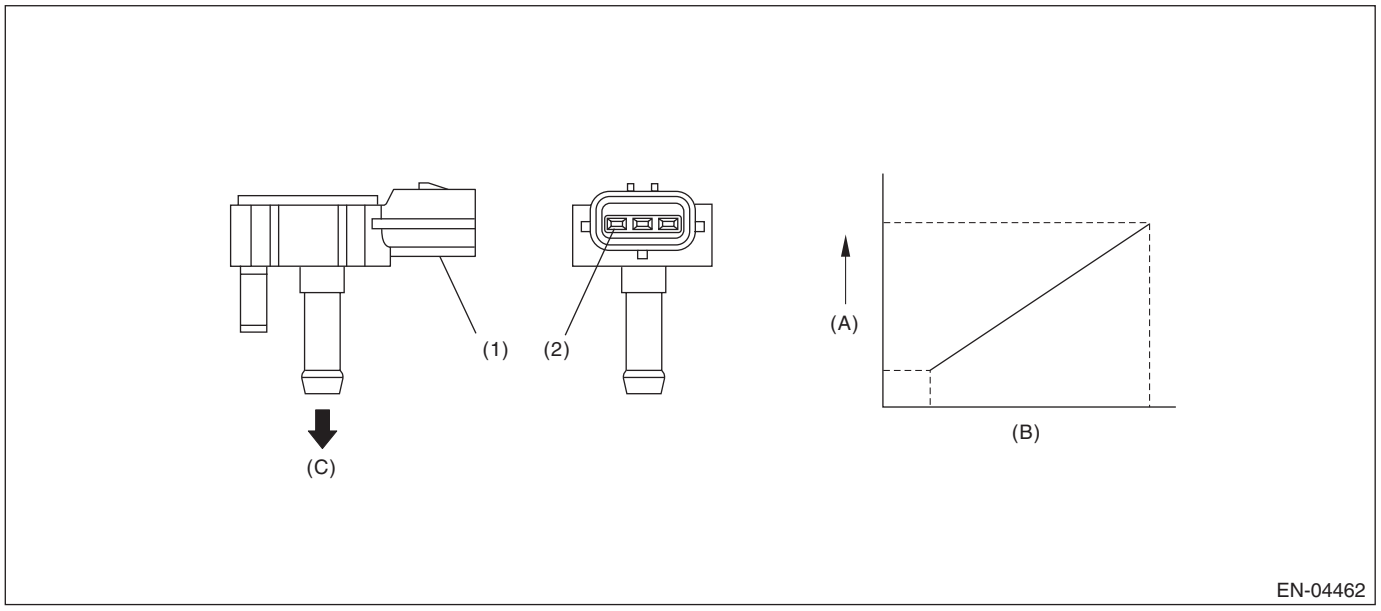
Memorize the freeze frame data. (For test mode $02)

CF: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



(1) Connector
(2) Terminals
(A) Output voltage
(B) Input voltage
(C) To fuel tank

3. ENABLE CONDITION

Secondary parameters	Enable conditions
After engine starting	60 seconds or more
Fuel level	≥ 9.6 ℓ (2.45 US gal, 2.11 Imp gal)
Fuel temperature	< 35°C (95°F)
Battery voltage	≥ 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously after 60 seconds or more have passed since the engine started.
- Be sure to check the fuel level and fuel temperature.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Number of times the difference between the Max. fuel level and the Min. fuel level every 60 seconds is 2 ℓ (0.52 US gal, 0.44 Imp gal) or more (with enable condition completed)	≥ 16 times
Maximum - Minimum Tank Pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Maximum - Minimum Fuel Temperature (with enable condition completed)	≥ 7°C (12.6°F)

If the maximum value – minimum value for the fuel level is less than 2 liters (0.52 US gal, 0.44 Imp gal) every 60 seconds, extend 60 seconds more and make judgment with the maximum and minimum values for the fuel level in 120 seconds. If a difference does not appear though the time was extended 60 seconds, extend the time (180, 240, 300 seconds) and continue the judgment. If the maximum value – minimum value for the fuel level is 2 liters (0.52 US gal, 0.44 Imp gal) or more, the diagnosis counter counts up.
Time Needed for Diagnosis: 60 seconds × 16 times or more
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Maximum - minimum tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixed mode is prohibited.

9. ECM OPERATION AT DTC SETTING

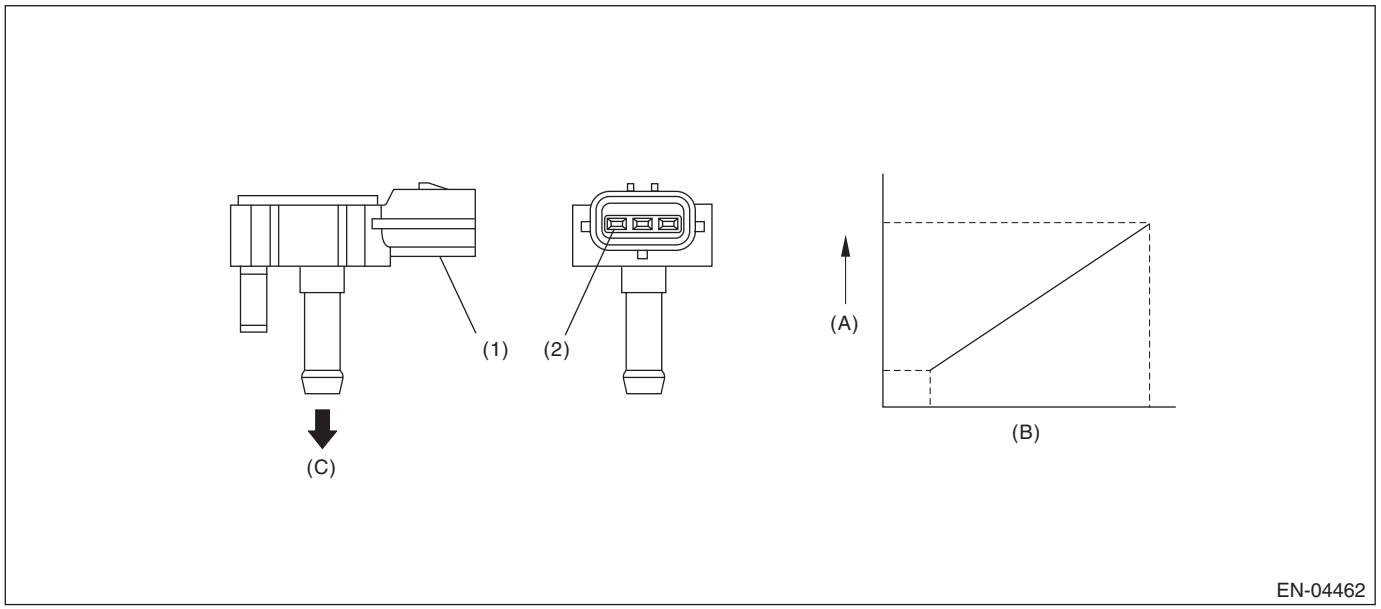
Memorize the freeze frame data. (For test mode $02)

CG: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



(1) Connector
(2) Terminals
(A) Output voltage
(B) Input voltage
(C) To fuel tank

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	< –7.4 kPa (–55.85 mmHg, –2.20 inHg)
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	≥ –7.4 kPa (–55.85 mmHg, –2.20 inHg)
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixed mode is prohibited.

9. ECM OPERATION AT DTC SETTING

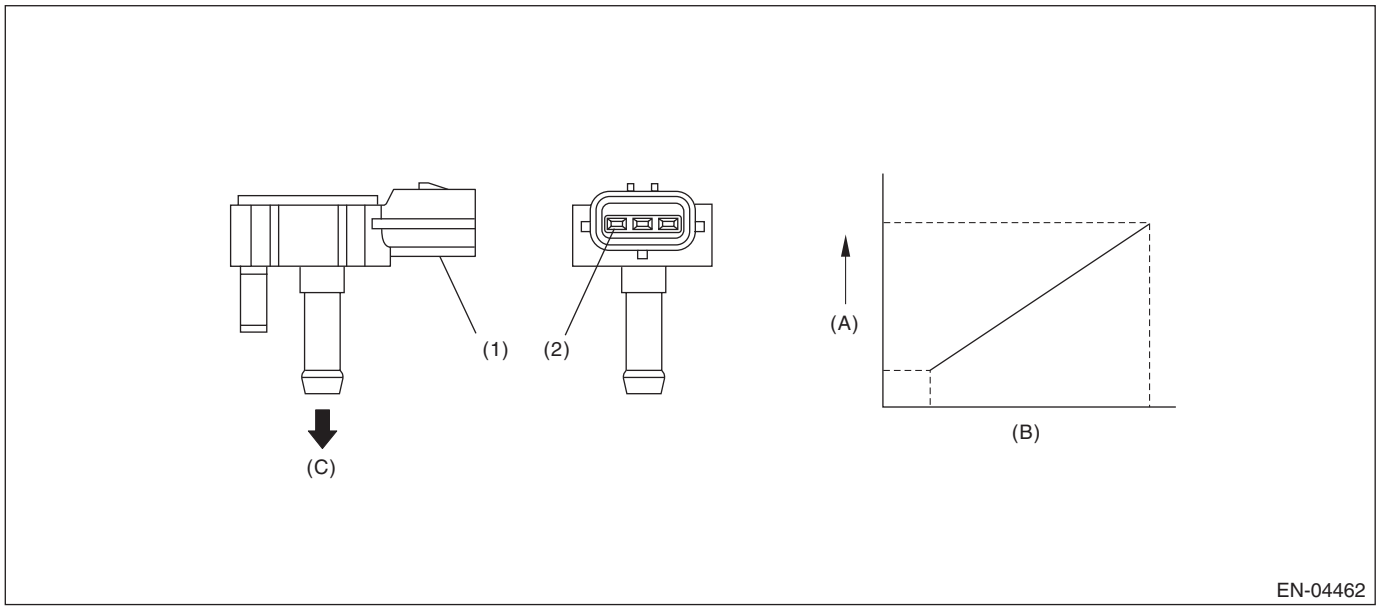
Memorize the freeze frame data. (For test mode $02)

CH: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



(1) Connector
(2) Terminals
(A) Output voltage
(B) Input voltage
(C) To fuel tank

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Vehicle speed	≥ 2 km/h (1.24 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.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	≥ 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	< 35°C (95°F)
Barometric pressure	75.1 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	< 7.98 kPa (59.85 mmHg, 2.36 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixed mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0442 Evaporative system (Small leak). <Ref. to GD(H6DO)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

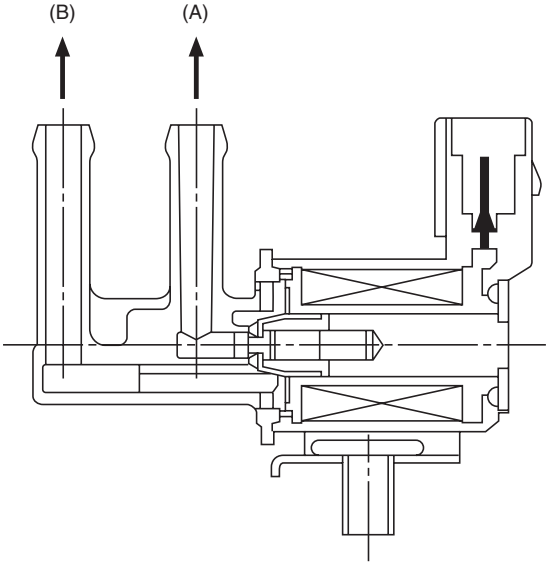
For the detection standard, refer to DTC P0442 Evaporative system (Small leak). <Ref. to GD(H6DO)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CK: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
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes time needed for diagnosis (2.5 seconds) or more.

Judgment Value

Malfunction criteria	Threshold value
Duty ratio of “ON”	< 75%
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

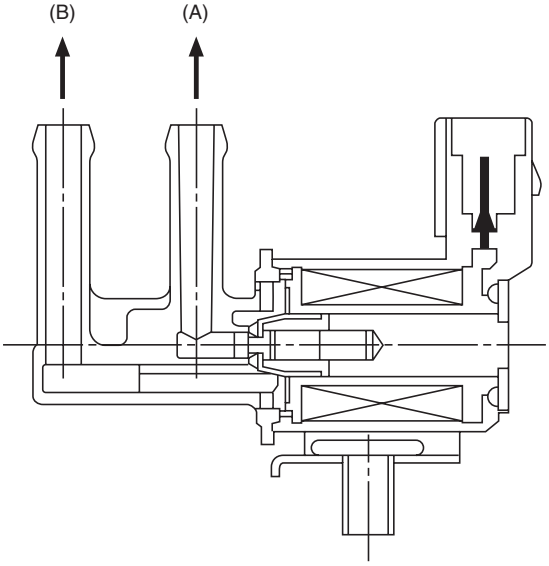
Memorize the freeze frame data. (For test mode $02)

CL: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
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes time needed for diagnosis (2.5 seconds) or more.

Judgment Value

Malfunction criteria	Threshold value
Duty ratio of “ON”	≥ 25%
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

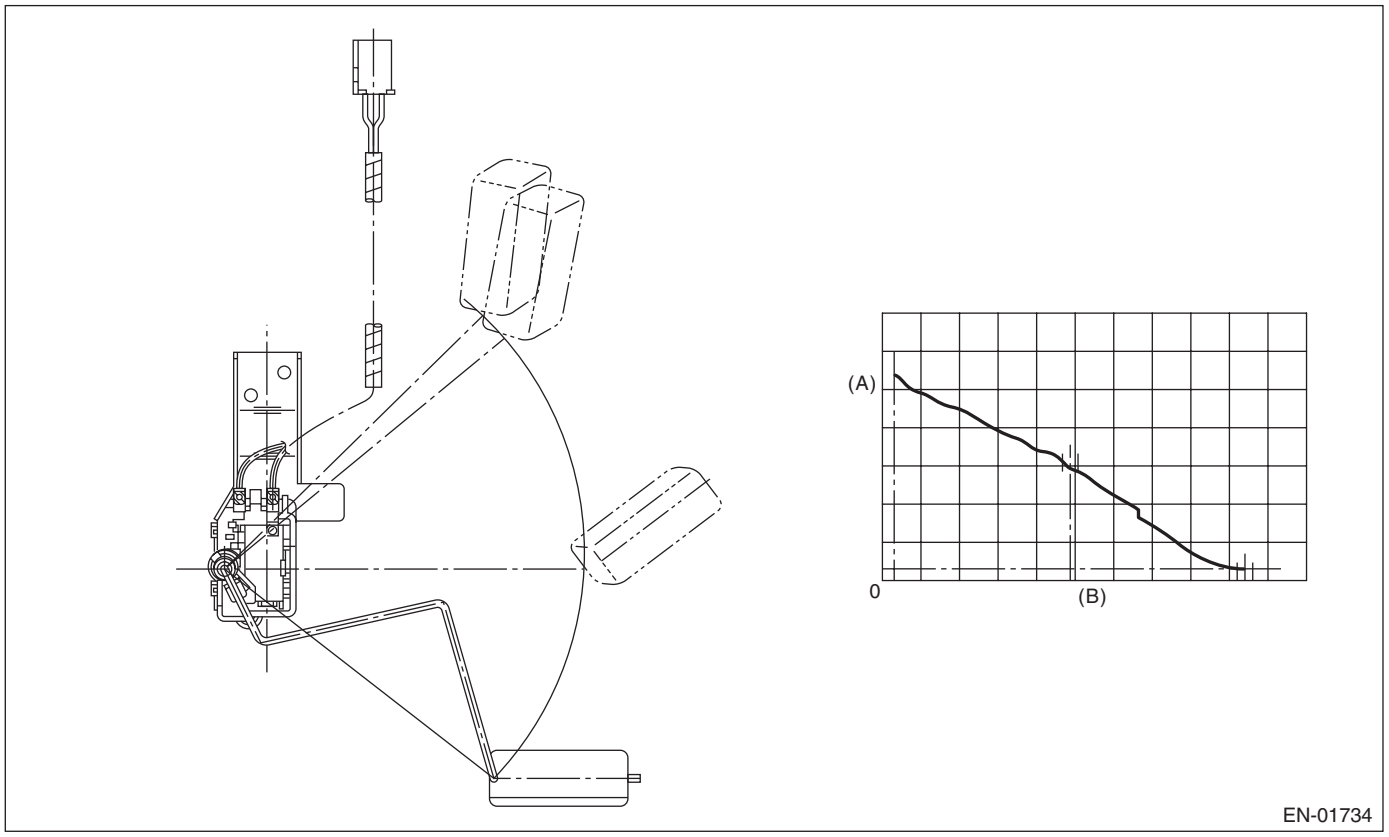
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the fuel level sensor output property.
If the fuel level does not vary in a particular driving condition / engine condition where it should, judge as NG.

2. COMPONENT DESCRIPTION



(A) Fuel level (B) Resistance

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – min. values of fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	5 seconds or more

Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – min. values of fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	5 seconds or more

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

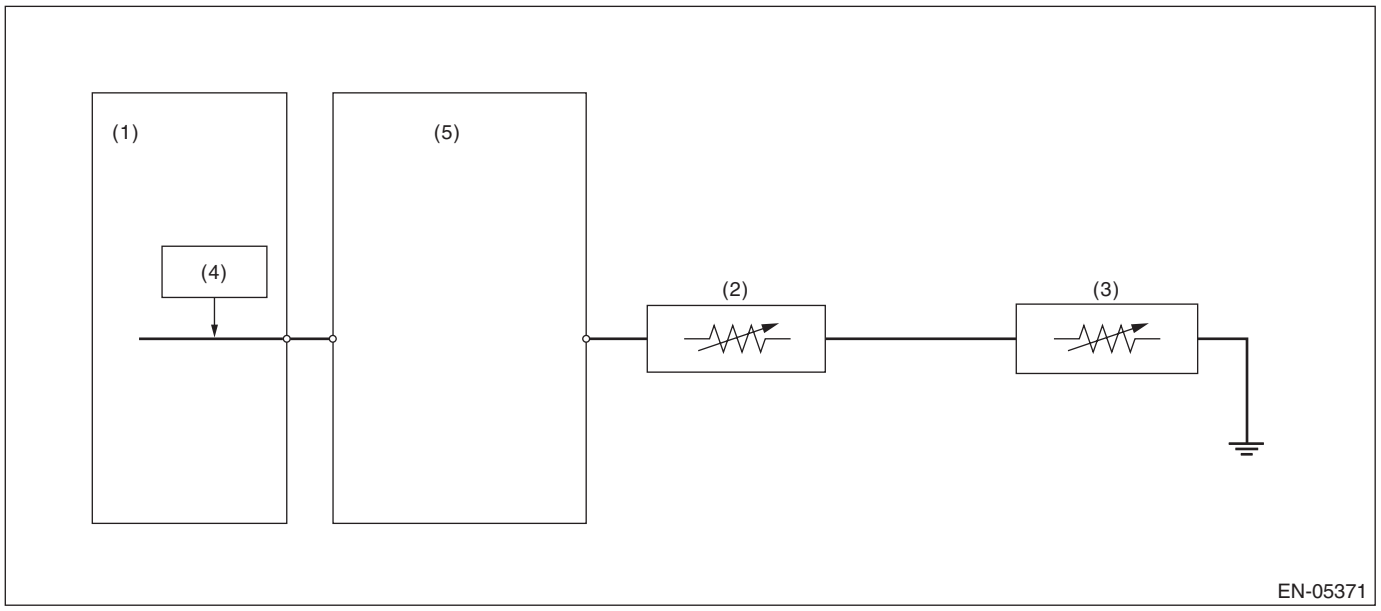
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit
(5) Body integrated unit

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes time needed for diagnosis (2.5 seconds) or more.

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 0.173 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 0.173 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

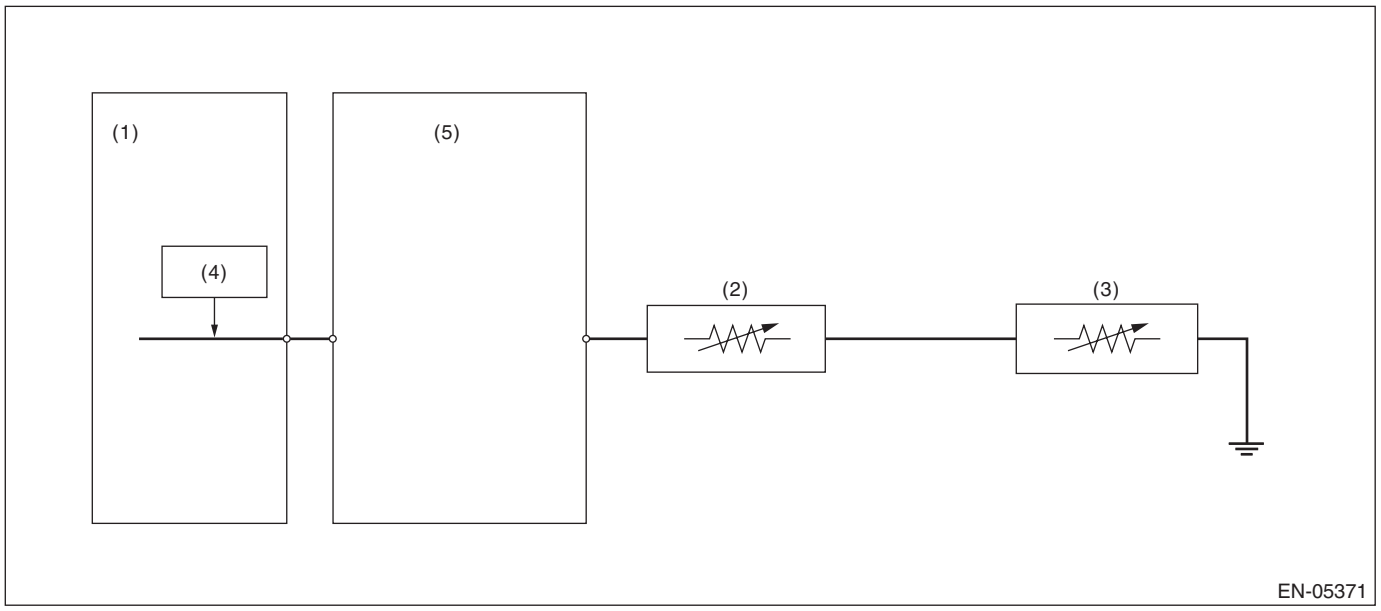
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit
(5) Body integrated unit

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when when the continuous time of meeting the malfunction criteria below exceeds the time required for diagnosis (2.5 seconds).

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 7.212 V

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 7.212 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CP: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

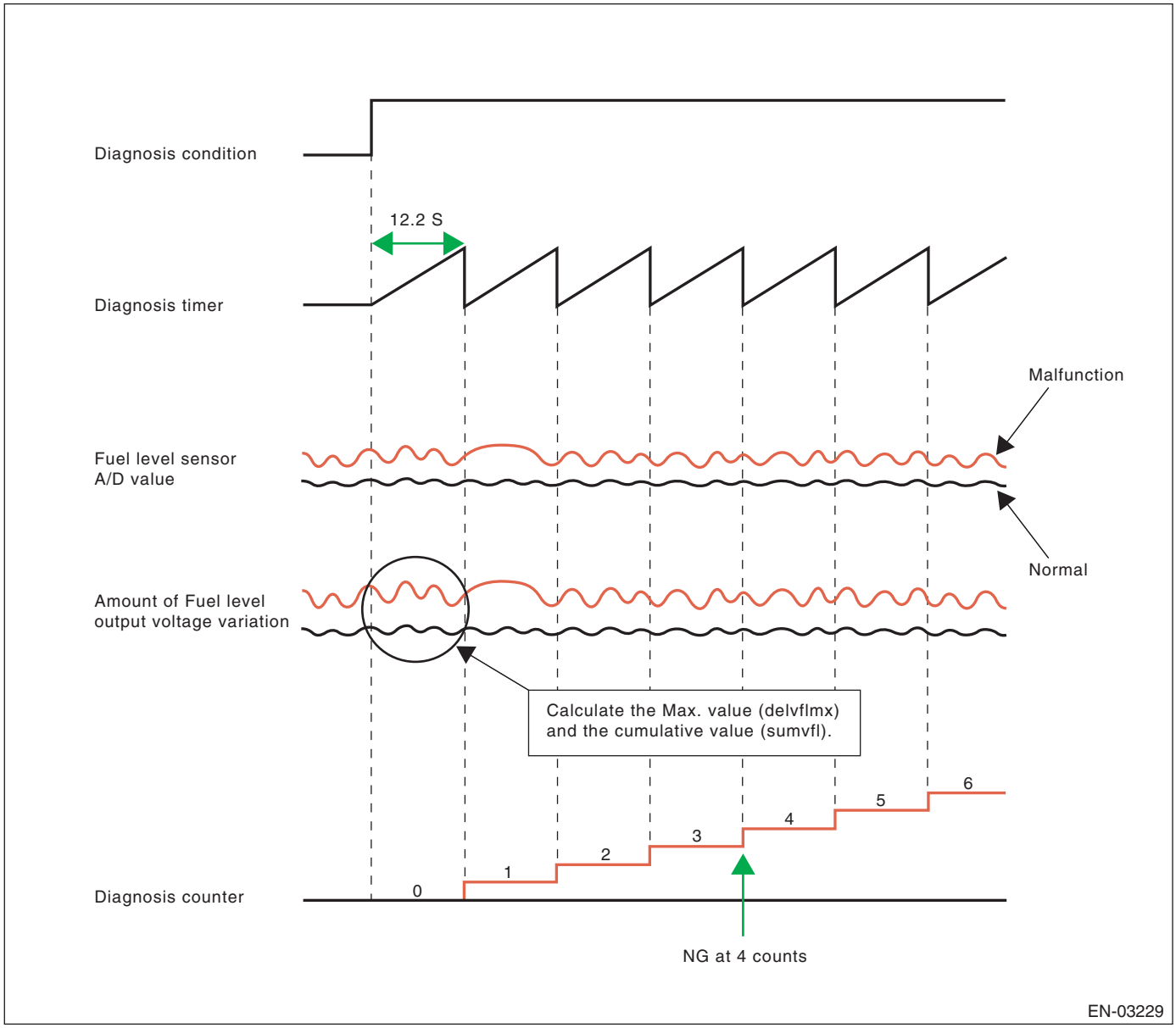
Malfunction criteria	Threshold value
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9.6 ←→ 54.4 ℓ (2.54 ←→ 14.37 US gal, 2.11 ←→ 11.97 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

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 counts.



- **Abnormality Judgment**

Judge as NG if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Integrated times of the condition reaching follows, DELFLMAX 0.27 ←→ 0.894 V or SUMFL ≥ 25.92 V At that time, DELFLMAX: Maximum difference of sensor output for 12.2 seconds; SUMFL: Integrated value of the sensor output deviation for 12.2 seconds	≥ 4 times

The diagnosis counter does not count up when the following conditions are completed within 12.2 seconds.

Maximum value – minimum value of change of tank pressure during 12.2 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Maximum value – minimum value of battery voltage during 12.2 seconds	≥ 0.609 V

Time Needed for Diagnosis: 12.2 seconds × 4 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
DELFLMAX	0.27 ←→ 0.894 V
SUMFL	< 25.92 V
At that time, DELFLMAX: Maximum difference of sensor output for 12.2 seconds; SUMFL: Integrated value of the sensor output deviation for 12.2 seconds	

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CQ:DTC P0483 FAN RATIONALITY CHECK

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.
Judge as NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is established if the radiator fan changes from OFF → ON when all of the conditions below are met.
When one of the conditions below is not met, the diagnostic enable condition is not established.

Secondary parameters	Enable conditions
Engine speed	500 — 900 rpm
Idle switch	ON
Vehicle speed	< 2 km/h (1 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF → ON when idling.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 5 minutes or more.

Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature	≥ 102°C (216°F)
Engine coolant temperature	Does not decrease

Time Needed for Diagnosis: 5 minutes
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Engine coolant temperature	Decreases

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CR:DTC P0500 VEHICLE SPEED SENSOR “A”

1. OUTLINE OF DIAGNOSIS

Judge as NG when outside of the judgment value.
Judge as NG when the data received from the ABS control module and hydraulic control unit indicates the erroneous vehicle speed, and when the displayed vehicle speed data is out of the normal range.

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	≥ 2 seconds

4. GENERAL DRIVING CYCLE

Always perform diagnosis more than 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Front ABS wheel speed sensor status	Malfunction
Either of the following is established	
Front left wheel speed	≥ 300 km/h (186 MPH)
Front right wheel speed	≥ 300 km/h (186 MPH)

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when all of the following criteria are established.

Judgment Value

Malfunction criteria	Threshold value
Front left wheel speed	> 0 km/h (0 MPH) or < 300 km/h (186 MPH)
Front right wheel speed	> 0 km/h (0 MPH) or < 300 km/h (186 MPH)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Accelerator sensor signal process: Not allowed full closed point learning (hold the previous value)
- ABS wheel speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4400 rpm or more).
- ISC control: Open loop compensation is set to (1 g (0.04 oz) oz/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Both main and sub fan ON drive
- Gear ratio judgment: Gear = Control as fixed in sixth gear

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback of ISC	In operation
Lambda value (left and right)	0.9 ←→ 1.1
After switching air conditioner to ON/OFF	5.1 seconds or more
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5.1 seconds
After neutral switch ON/OFF change	> 5.1 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling after warming up engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criterion below is 10 seconds × 3 times.

Judgment Value

Malfunction criteria	Threshold value
Actual - target engine speed	< –100 rpm
Feedback value for ISC	Max.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

Judgment Value

Malfunction criteria	Threshold value
Actual - target engine speed	≥ –100 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback of ISC	In operation
Lambda value (left and right)	0.9 ←→ 1.1
After switching air conditioner to ON/OFF	5.1 seconds or more
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5.1 seconds
After neutral switch ON/OFF change	> 5.1 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling after warming up engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criterion below is 10 seconds × 3 times.

Judgment Value

Malfunction criteria	Threshold value
Actual – Target engine speed	≥ 200 rpm
Feedback value for ISC	Min.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

Judgment Value

Malfunction criteria	Threshold value
Actual – Target engine speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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 Judgment

Judge as ON NG when the continuous time of meeting the malfunction criteria below becomes 3 minutes or more.

Judgment Value

Malfunction criteria	Threshold value
Engine speed	> 500 rpm
Starter OFF signal	Not detected
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as ON OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Starter switch	OFF
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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 P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions that the engine speed continues to rise during idling.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	≥ 10.9 V
Feedback of ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously if the vehicle speed is at less than 4 km/h (2.49 MPH).

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the all malfunction criteria below becomes the time needed for diagnosis (2 seconds) or more.

Judgment Value

Malfunction criteria	Threshold value
Engine speed - Targeted engine speed	≥ 1500 rpm
Feedback value for ISC	≤ 0
Change of engine speed for every engine 120°CA	≥ –5 rpm

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting all the malfunction criteria below becomes the time needed for diagnosis (5 seconds) or more.

Judgment Value

Malfunction criteria	Threshold value
Engine speed - Targeted engine speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Fuel cut: Cuts off fuel only #1 and #2 cylinders, or for all cylinders according to vehicle speed, engine speed, and throttle position.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CX:DTC P0600 SERIAL COMMUNICATION LINK

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.
When CAN communications is not possible, and CAN communications with AT is not possible, judge as NG if data from the AT 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
Battery voltage	≥ 10.9 V
Starter switch	OFF
Engine	run

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

When any one of the following conditions are established, judge as NG.
Judge as OK and clear the NG when the continuous time of meeting the following all criteria is the predetermined time (1 s) or more.

Judgment Value

Malfunction criteria	Threshold value
bus off flag or error warning flag	set
ID from body integrated unit is not received.	= 500 milliseconds
Data from body integrated unit is not updated.	= 500 milliseconds

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of microcomputer (RAM).
When there is a problem in the main CPU normal RAM, or the sub CPU normal RAM, judge as NG. Judge as OK when both are operating properly.
If it is possible to write data to the whole area of RAM in the initial routine, and is possible to read the same data, it is judged as OK, and if not, NG.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

Diagnosis with the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis as soon as the ignition switch is turned to ON.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Main CPU normal RAM abnormal	
Write 5AA5A55A and then read. (Whole area of RAM)	5AA5A55A cannot be read.
Write A55A5AA5 and then read. (Whole area of RAM)	A55A5AA5 cannot be read.
Sub CPU normal RAM abnormal	
Write 5AA5 and then read. (Whole area of RAM)	5AA5 cannot be read.
Write A55A and then read. (Whole area of RAM)	A55A cannot be read.

Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Main CPU normal RAM abnormal	
Write 5AA5A55A and then read. (Whole area of RAM)	5AA5A55A can be read.
And write A55A5AA5 and then read. (Whole area of RAM)	A55A5AA5 can be read.
Sub CPU normal RAM abnormal	
Write 5AA5 and then read. (Whole area of RAM)	5AA5 can be read.
And write A55A and then read. (Whole area of RAM)	A55A can be read.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Judge as NG when SUM value of ROM is outside the standard value.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
SUM value of ROM	Standard

Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

8. ECM OPERATION AT DTC SETTING

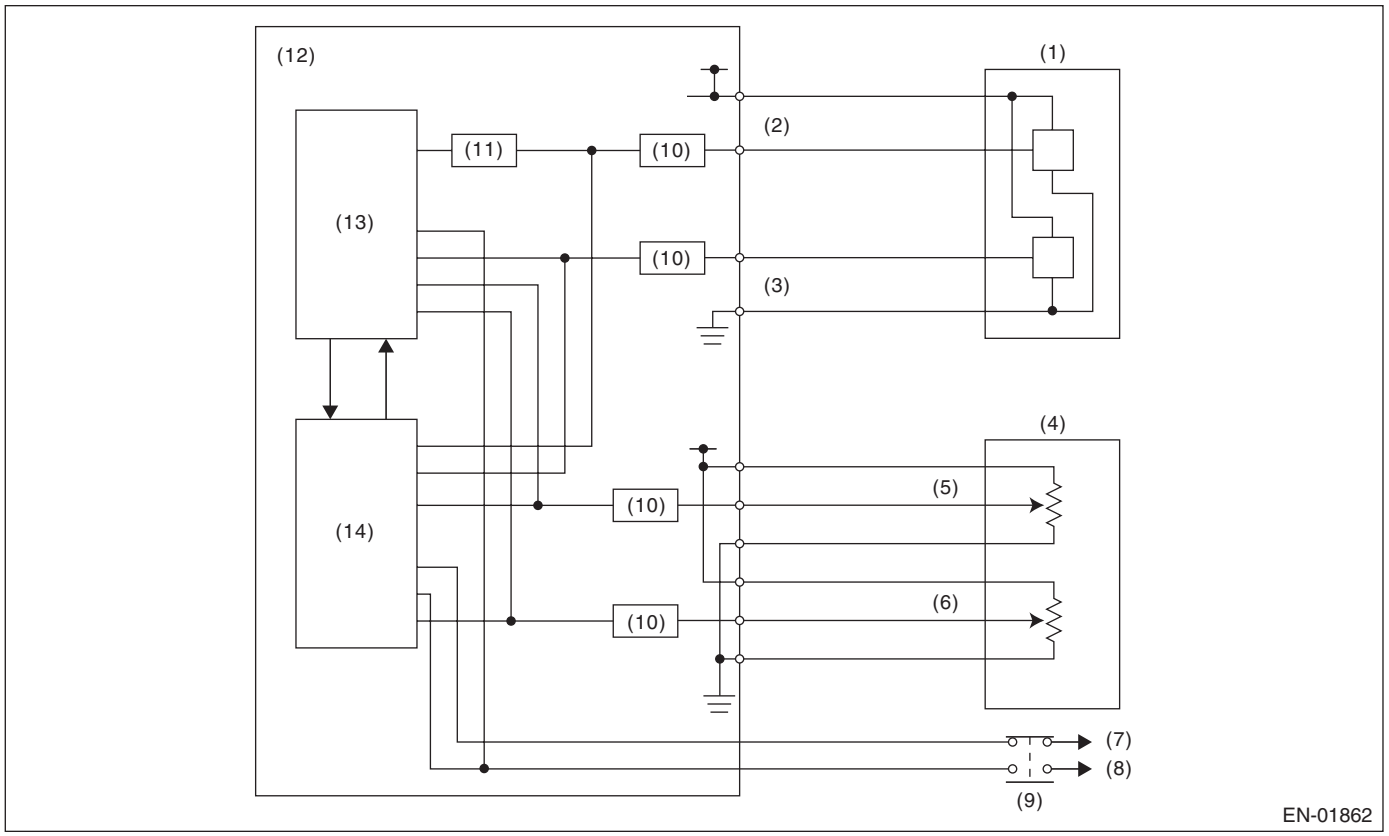
Memorize the freeze frame data. (For test mode $02)

DA:DTC P0607 CONTROL MODULE PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when any one of the followings is established.
(1) When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
(2) When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
(3) When the sub CPU operates abnormally.
(4) When the communication between main CPU ←→ sub CPU is abnormal.
(5) When the input amplifier circuit of throttle position sensor 1 is abnormal.
(6) When the cruise control cannot be canceled correctly.
(7) When the signal of brake SW1 and 2 is mismatched.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor
(2) Throttle position sensor 1
(3) Throttle position sensor 2
(4) Accelerator pedal position sensor
(5) Accelerator pedal position sensor 1
(6) Accelerator pedal position sensor 2
(7) Battery
(8) Stop light
(9) Brake switch
(10) I/F circuit
(11) Amplifier circuit
(12) Engine control module (ECM)
(13) Sub CPU
(14) Main CPU

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	—

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.
(9): Always perform the diagnosis continuously.
(10): Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
(1) Difference of CPU reading value of the throttle position sensor signal	Within 0.0858 V
(2) Difference of CPU read value of the accelerator pedal position sensor signal	Within 0.039 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Difference of signal on connection of amplifier	1/4 times ±3 deg
(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) : 600 miliseconds
(2) : 800 miliseconds
(3) : 200 miliseconds
(4) : 200 miliseconds
(5) : 24 miliseconds
(6) : 250 miliseconds
(7) : 200 miliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

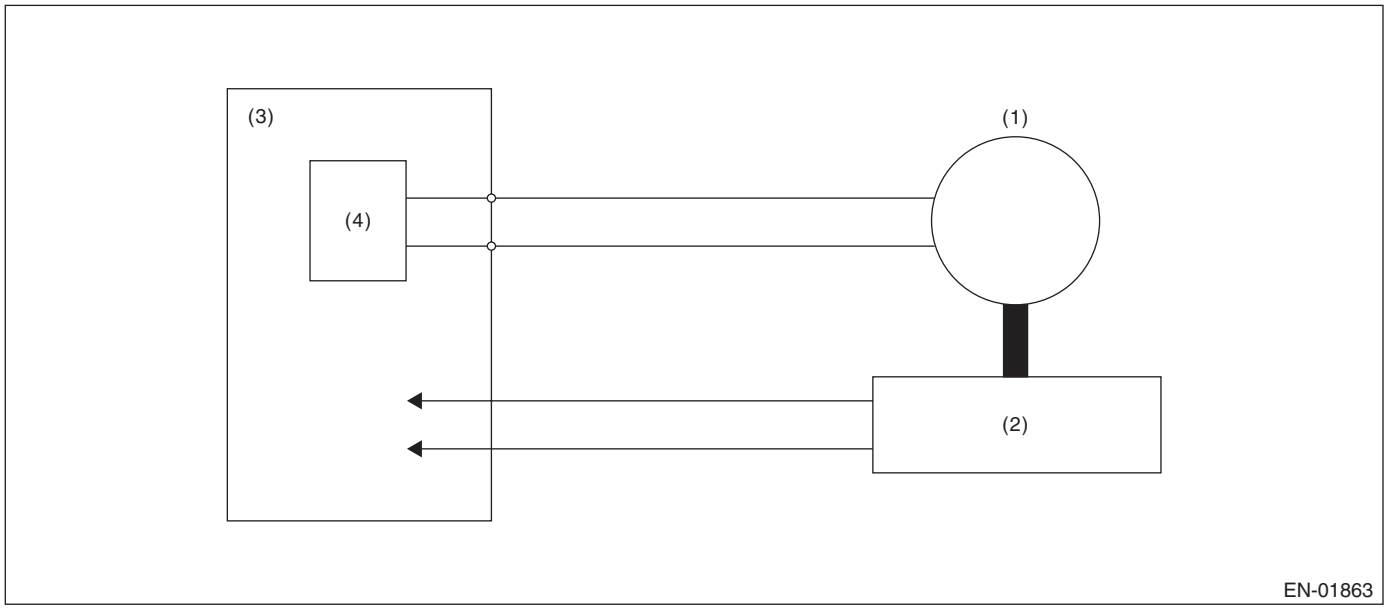
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Judge as NG when the target opening angle and actual opening angle is mismatched or the current to motor is the specified duty or more for specified time continuously.

2. COMPONENT DESCRIPTION



(1) Motor
(2) Throttle position sensor
(3) Engine control module (ECM)
(4) Drive circuit

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Normal operation of electronic throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

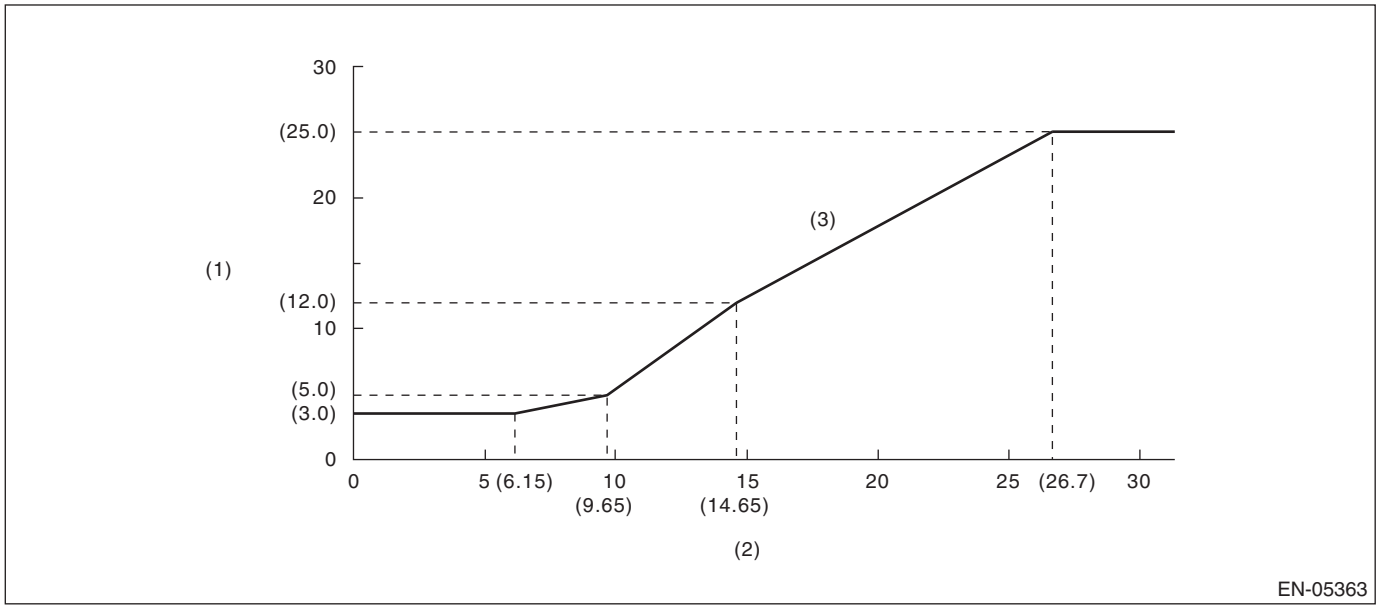
Judgment Value

Malfunction criteria	Threshold value
Difference between target opening angle and actual opening angle	3° or less
Output duty to drive circuit	95% or less

Time Needed for Diagnosis:

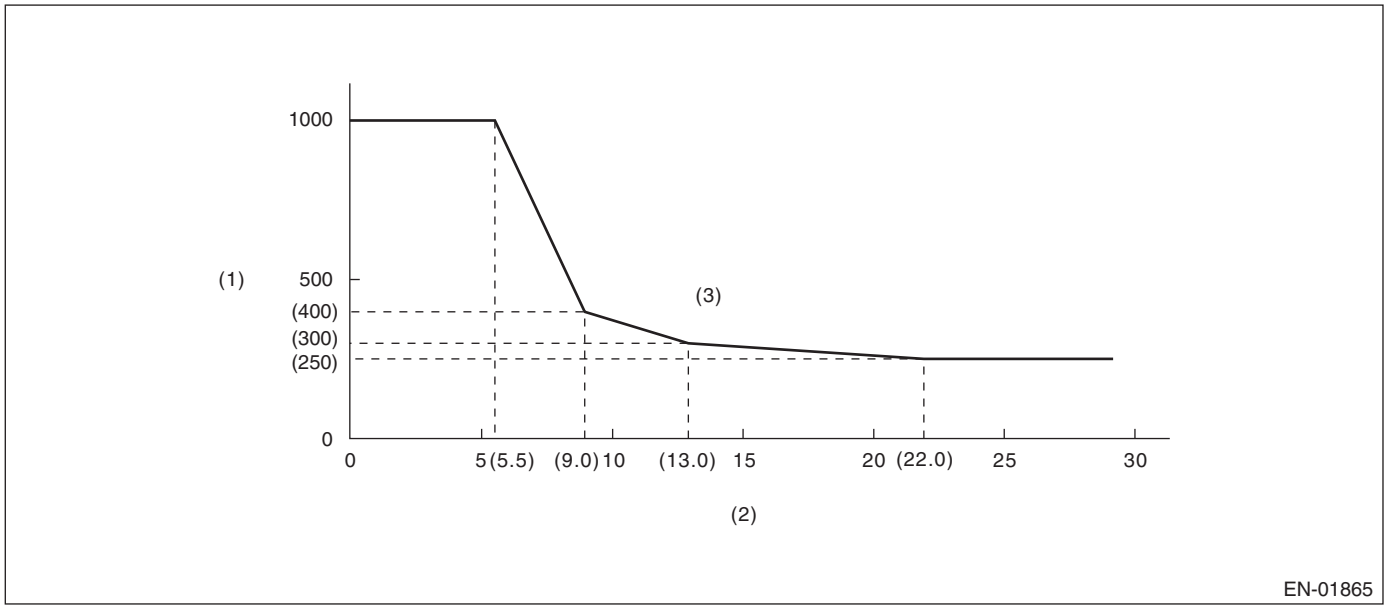
- Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
- Output duty to drive circuit: 2000 milliseconds

Details of Judgment Value



(1) Difference between target opening angle and actual opening angle (°)
(2) Target throttle opening angle (°)
(3) NG area

Details of Judgment time (The actual opening angle ≤ target opening angle is always 1000 milliseconds)



(1) Judgment time (milliseconds)
(2) Throttle position sensor 1 opening angle
(3) NG area

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DC:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of radiator fan circuit.
Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	≥ 1 second
Engine speed	500 ←→ 850 rpm

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when idling.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Duty ratio	= 100%
Terminal voltage level	Low level
Duty ratio	5% ←→ 95%
Terminal voltage level	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Duty ratio	= 100%
Terminal voltage level	High level
Duty ratio	5% ←→ 95%
Terminal voltage level	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DD:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of radiator fan circuit.
Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	≥ 1 second
Engine speed	500 ←→ 850 rpm

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when idling.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Duty ratio	= 0%
Terminal voltage level	High level
Duty ratio	5% ←→ 95%
Terminal voltage level	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Duty ratio	= 0%
Terminal voltage level	Low level
Duty ratio	5% ←→ 95%
Terminal voltage level	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DE:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

1. OUTLINE OF DIAGNOSIS

Judge as NG when there is CAN communication with the AT and there is a MIL lighting request.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the following conditions is the predetermined time (2.5 seconds) or more.
Judge as OK when the following conditions are not established, and clear the NG.

Judgment Value

Malfunction criteria	Threshold value
MIL lighting request from TCM	set

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

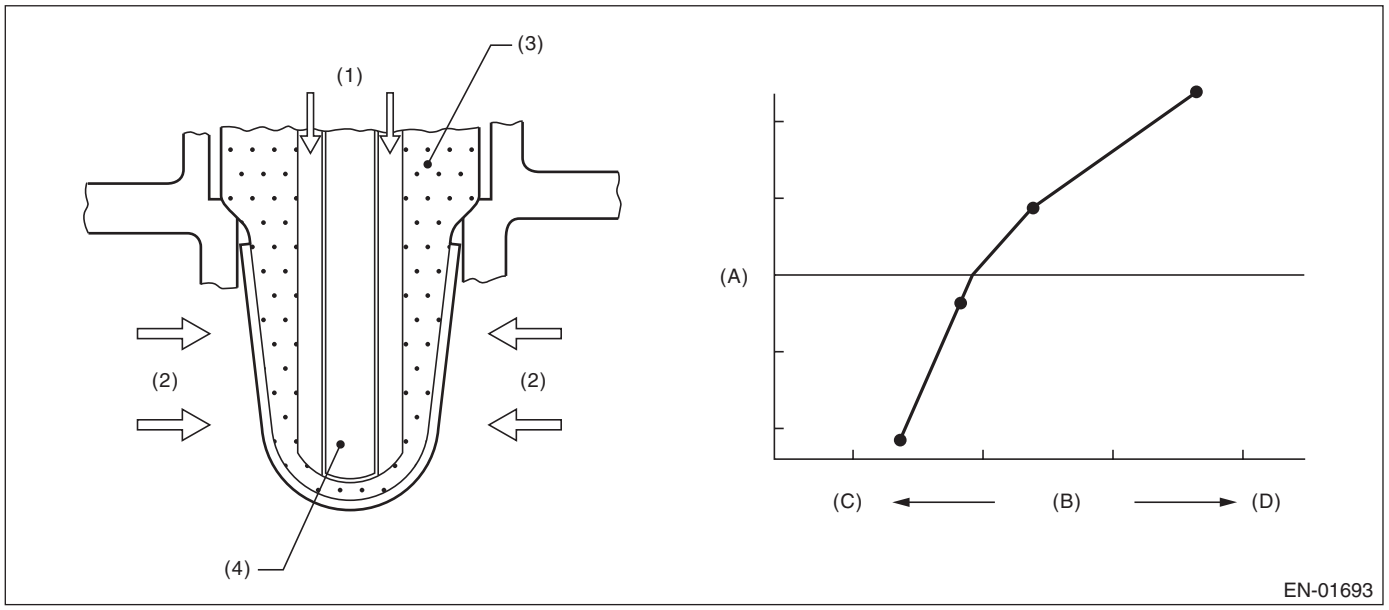
DF:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)

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



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary parameters	Enable conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 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.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 8 g (0.28 oz)/s
Load change in 1/3 engine revolution.	≤ 0.02g (0.001 oz)/rev
Front oxygen (A/F) sensor impedance	0 ←→ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more
Targeted lambda value load compensation coefficient	–0.05 ←→ 0.05

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more after 60 seconds have passed since the engine started.

5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is the time needed for diagnosis (10 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
Output λ value when rear oxygen sensor sub feedback compensation coefficient is not at maximum limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Rear oxygen sensor sub learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

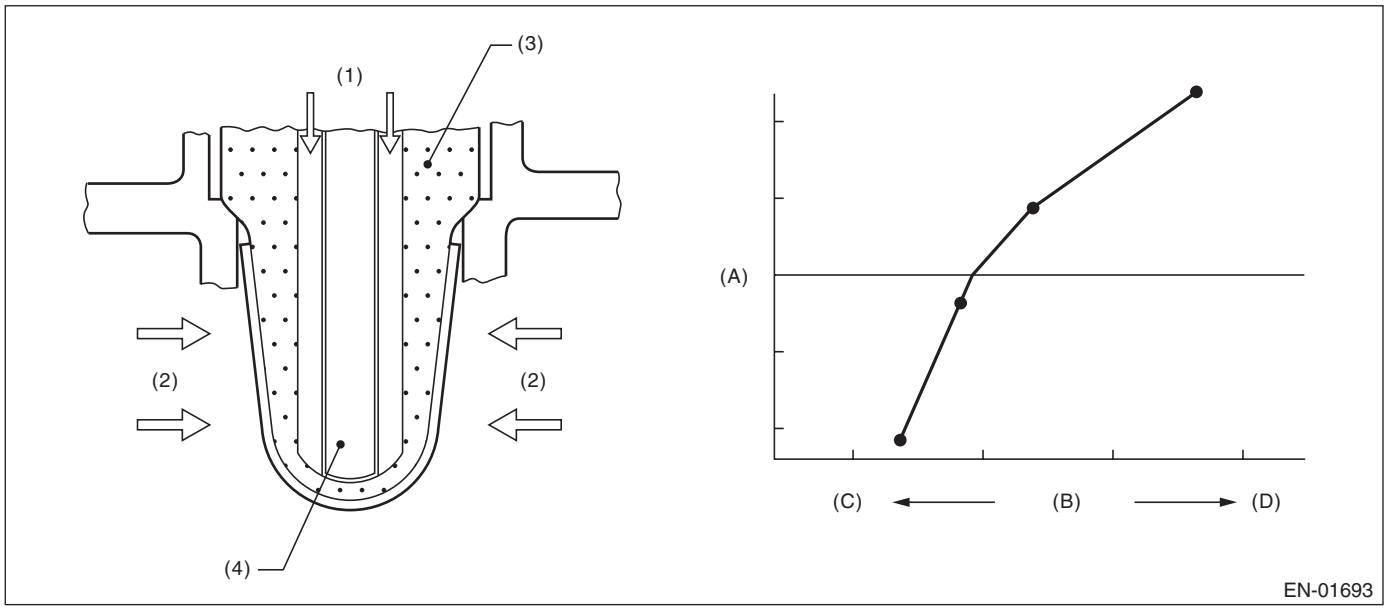
DG:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)

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



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary parameters	Enable conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 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.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 8 g (0.28 oz)/s
Load change in 1/3 engine revolution.	≤ 0.02g (0.001 oz)/rev
Front oxygen (A/F) sensor impedance	0 ←→ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more
Targeted lambda value load compensation coefficient	–0.05 ←→ 0.05

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant vehicle speed of 20 km/h (12 MPH) or more after 60 seconds have passed since the engine started.

5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is the time needed for diagnosis (10 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
Output λ value when rear oxygen sensor sub feedback compensation coefficient cannot be at minimum limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Rear oxygen sensor sub learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DH: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)-183, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

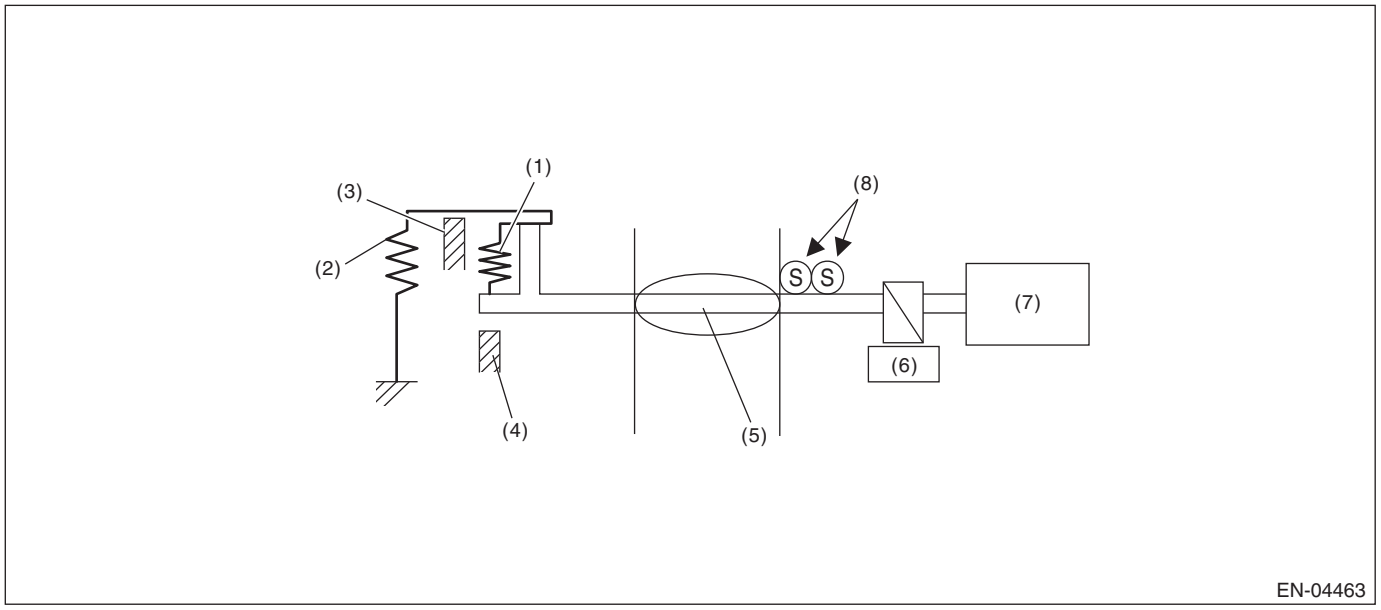
NOTE:
For the detection standard, refer to DTC P1153. <Ref. to GD(H6DO)-185, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DJ: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 sensor

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1.88 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Opening variation after continuity is set to OFF	≤ 2°

Time Needed for Diagnosis: 1880 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

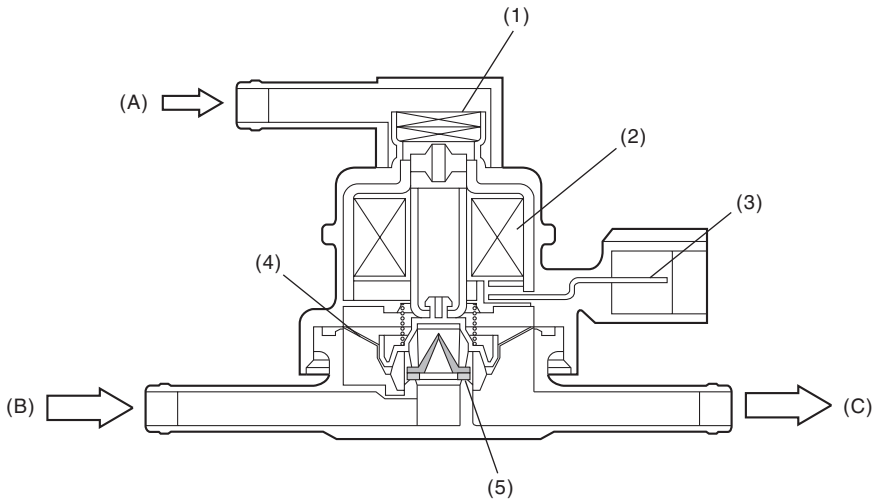
Memorize the freeze frame data. (For test mode $02)

DK:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.
Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Barometric pressure
(B) Shut-off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes time needed for diagnosis (2.5 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

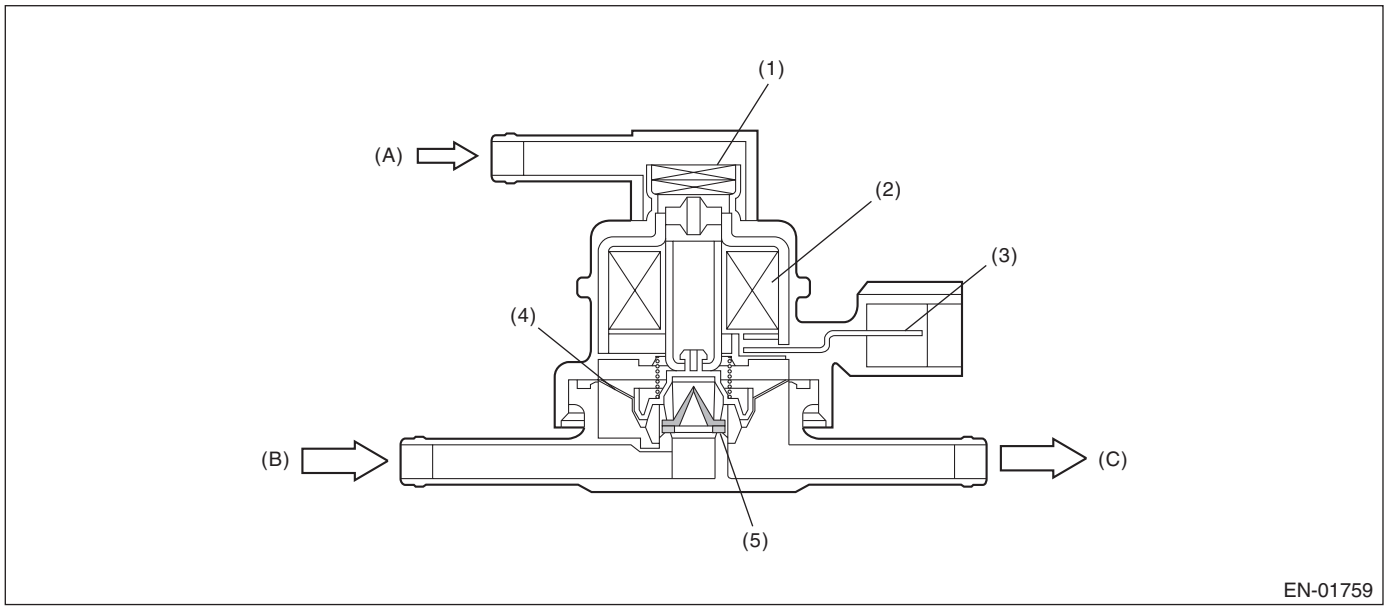
Memorize the freeze frame data. (For test mode $02)

DL:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.
Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Barometric pressure
(B) Shut-off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes time needed for diagnosis (2.5 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction criteria	Threshold value
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

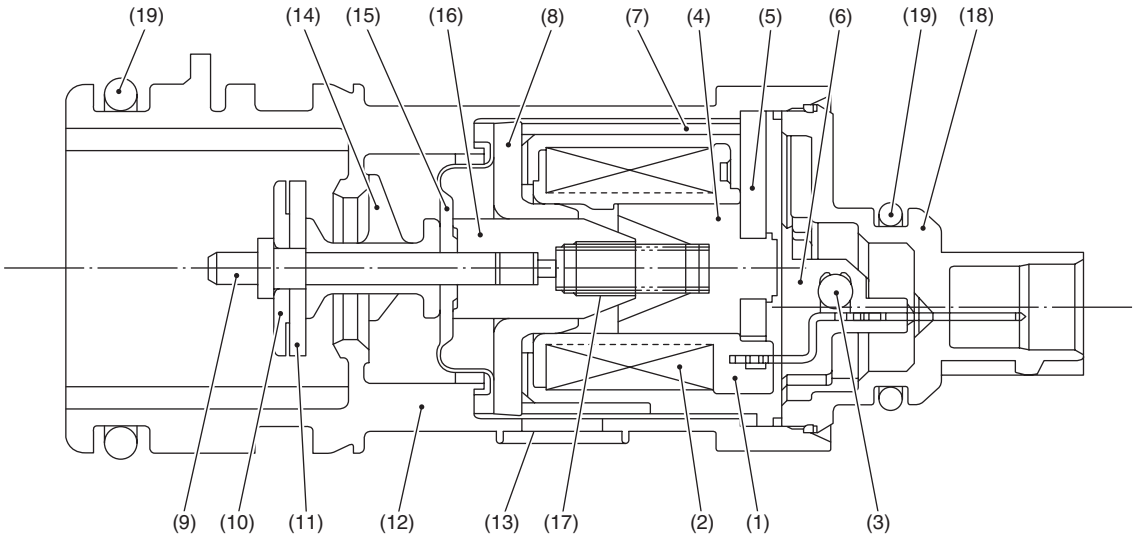
Memorize the freeze frame data. (For test mode $02)

DM:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the abnormal functioning (stuck closed) of 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
Battery voltage	≥ 10.9 V
Ignition switch	ON
Barometric pressure	≥ 75.0 kPa (563 mmHg, 22.17 inHg)
Tank pressure when starter is OFF → ON	–0.43 ←→ 1.42 kPa (–3.2 ←→ 10.7 mmHg, –0.13 ←→ 0.42 inHg)
Drain valve	Open

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 3 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	≤ –4.0 kPa (–30 mmHg, –1.18 inHg)

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Fuel tank pressure	> –4.0 kPa (–30 mmHg, –1.18 inHg)
Cumulative time when all the malfunction criteria below are met.	≥ 30 seconds
Purge control solenoid valve duty	Not = 0
Fuel temperature	–10 ←→ 55°C (14 ←→ 131°F)
Intake manifold relative pressure	≤ –26.7 kPa (–200 mmHg, –7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DN:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge as OFF NG when the engine starts without starter ON experience.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as OFF NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Vehicle speed	< 1 km/h (0.62 MPH)
Starter ON signal	Not detected
Engine speed after engine speed of less than 500 rpm continues for 0.8 seconds or more.	≥ 500 rpm

Time Needed for Diagnosis: 800 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OFF OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Starter ON	Experienced
Starter ON diagnosis	Not diagnosed
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DO:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of back-up power supply circuit.
Judge as NG when the backup power voltage is low.

2. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Voltage of back-up power supply	Low
Battery voltage	≥ 10.9 V
Engine speed	> 500 rpm

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Engine speed	> 500 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DP:DTC P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DQ:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DR:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DS:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DT:DTC P1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DU:DTC P1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DV:DTC P1578 METER FAILURE

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H6DO)-169, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DW: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
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Cold start diagnosis	Incomplete
Engine	Starting
Vehicle speed	≤ 2 km/h (1 MPH)
Misfire within 200 engine revs.	< 7
Time after starting	= 14 seconds

3. GENERAL DRIVING CYCLE

Perform the diagnosis at cold start.

4. DIAGNOSTIC METHOD

- Exhaust gas temperature diagnosis

Abnormality Judgment
Calculate the estimated exhaust gas temperature when the diagnostic enable condition is established. Judge as NG when the following conditions are established in 14 seconds after starting the engine.

Judgment Value

Malfunction criteria	Threshold value
Estimated exhaust gas temperature	< Value from Map 1

Map 1

Engine 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	200°C (392°F)	200°C (392°F)	200°C (392°F)	200°C (392°F)	200°C (392°F)	180°C (356°F)	180°C (356°F)	170°C (338°F)	168°C (334°F)	153°C (307°F)

Time Needed for Diagnosis: 14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Normality Judgment
Judge as OK when the following conditions are established after the specified amount of time has passed.

Judgment Value

Malfunction criteria	Threshold value
Estimated exhaust gas temperature	≥ Value from Map 1

- Idle speed diagnosis

Judge as NG when all of the following conditions are established, and judge as OK when the following conditions are met.

Judgment Value

Malfunction criteria	Threshold value
Continuous time of (Target engine speed – Actual engine speed > 100 rpm)	≥ 5500 ms

Time Needed for Diagnosis: 14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DX: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
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Oil flow control solenoid valve control duty	≥ 99.61%
Oil control solenoid valve control present current	< 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
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

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0° CA) to the compensation value of partial learning zone with IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
  – Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
  – ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DY: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
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Oil flow control solenoid valve control duty	< 0.39%
Oil control solenoid valve control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
|Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value|	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0° CA) to the compensation value of partial learning zone with IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
  – Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
  – ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DZ: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)-201, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EA:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

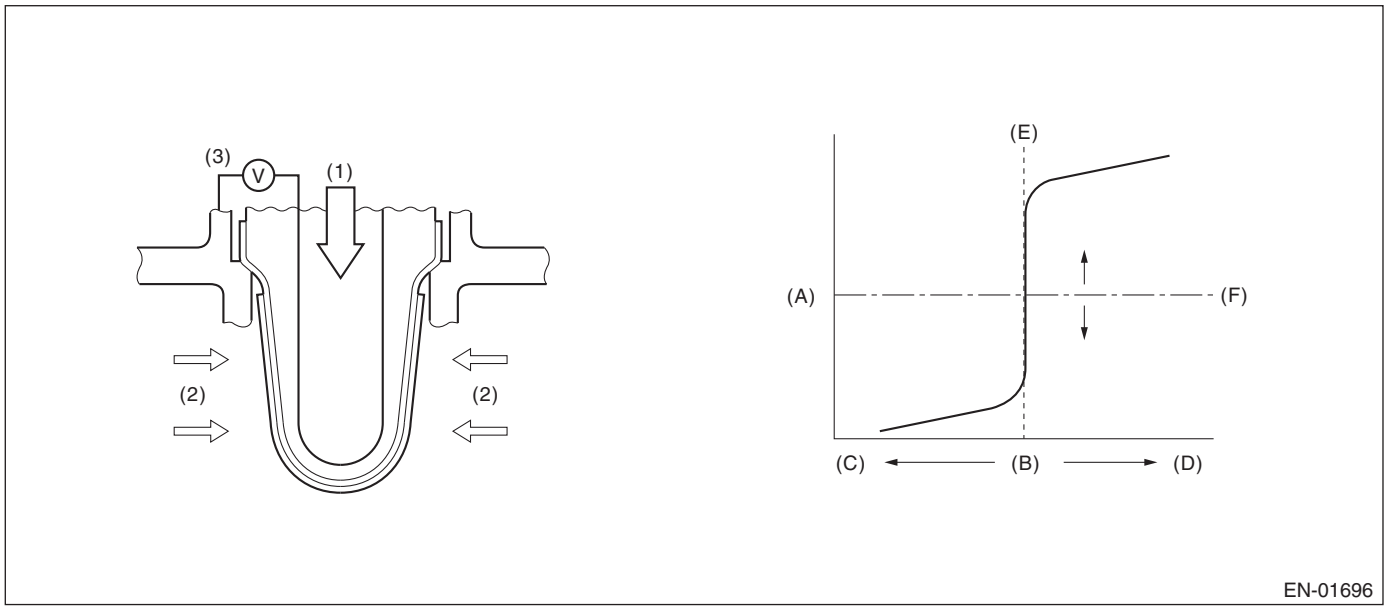
NOTE:
For the detection standard, refer to DTC P2089. <Ref. to GD(H6DO)-203, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EB: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



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Continuous time when all conditions are established.	≥ 1 second
Conditions for carrying out the sub feedback learning	Completed

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

Judge as NG when the continuous time of meeting the following conditions is 5 seconds or more.
Judge as OK and clear the NG when the continuous time of not meeting the following conditions is 5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Sub feedback learning value	< –0.035

Time Needed for Diagnosis: 5 seconds × 1 time
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

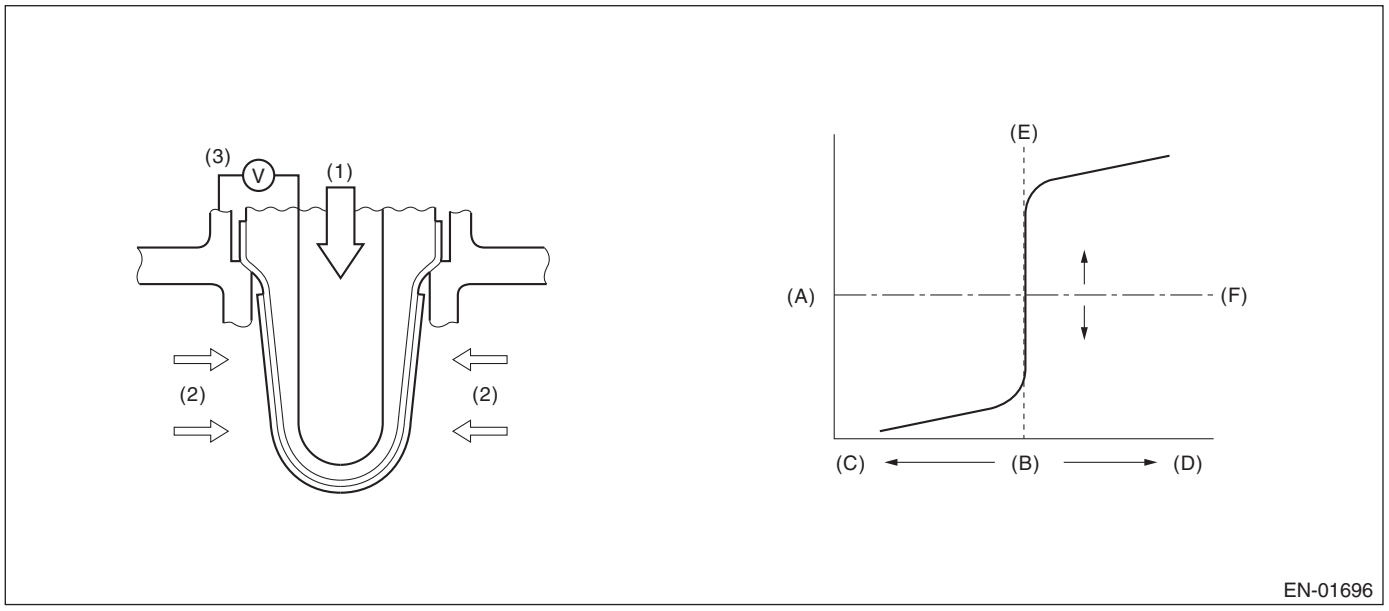
Memorize the freeze frame data. (For test mode $02)

EC: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



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary parameters	Enable conditions
Continuous time when all conditions are established.	≥ 1 second
Conditions for carrying out the sub feedback learning	Completed

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

Judge as NG when the continuous time of meeting the following conditions is 5 seconds or more.
Judge as OK and clear the NG when the continuous time of not meeting the following conditions is 5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Sub feedback learning value	≥ 0.035

Time Needed for Diagnosis: 5 seconds × 1 time
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

ED: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)-205, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

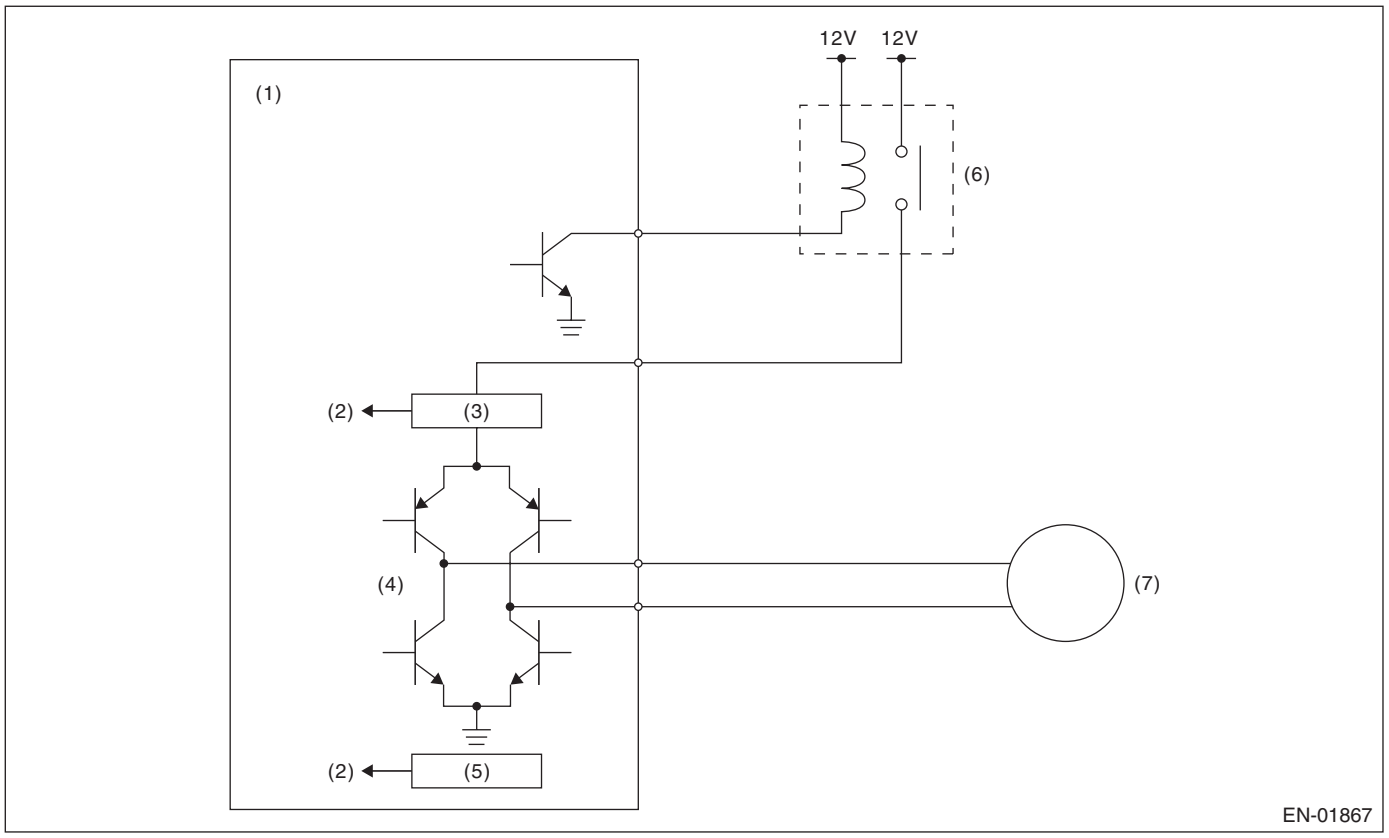
NOTE:
For the detection standard, refer to DTC P2097. <Ref. to GD(H6DO)-207, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EF: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
CPU communication line sub → main normal judgment	Normal

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
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.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

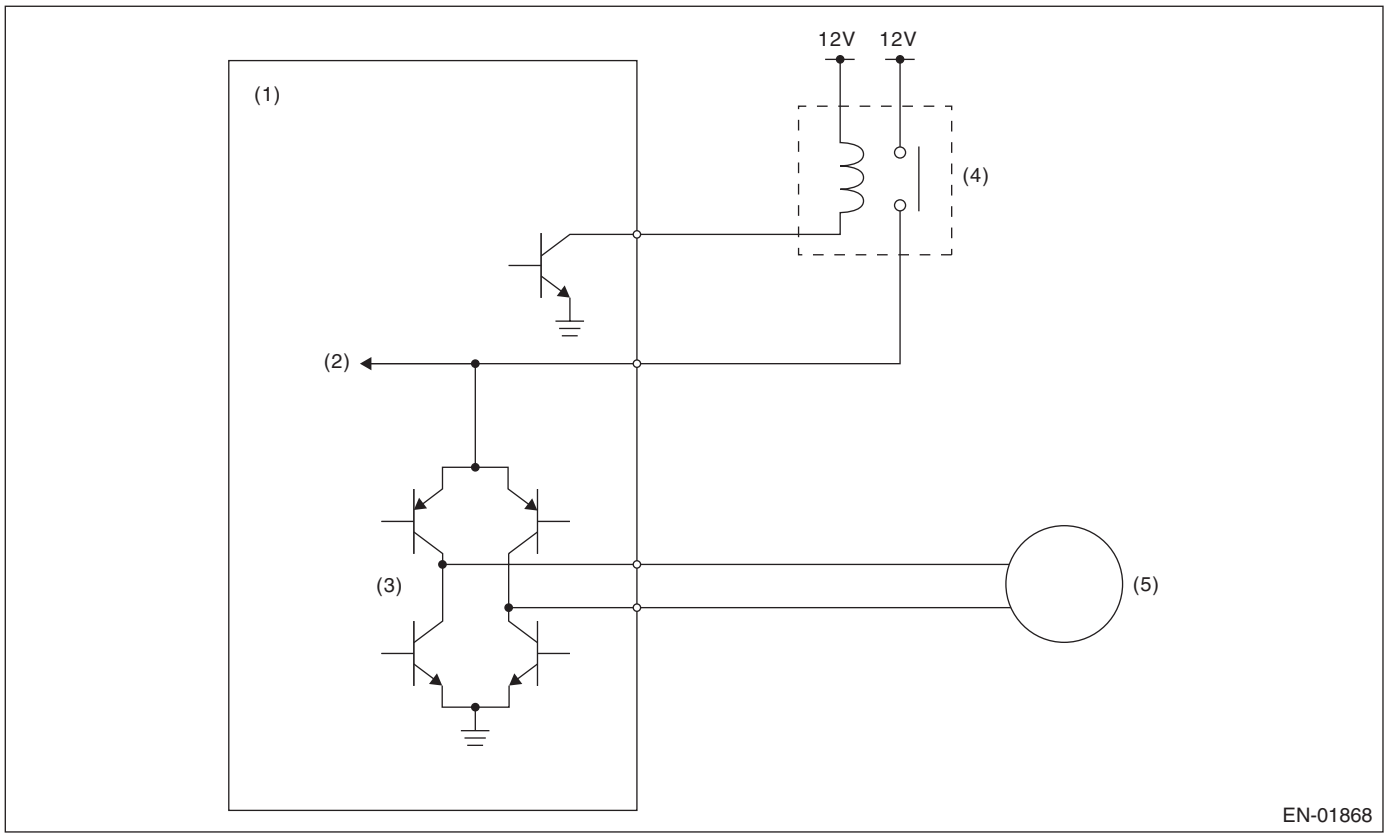
Memorize the freeze frame data. (For test mode $02)

EG: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.

Judgment 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.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

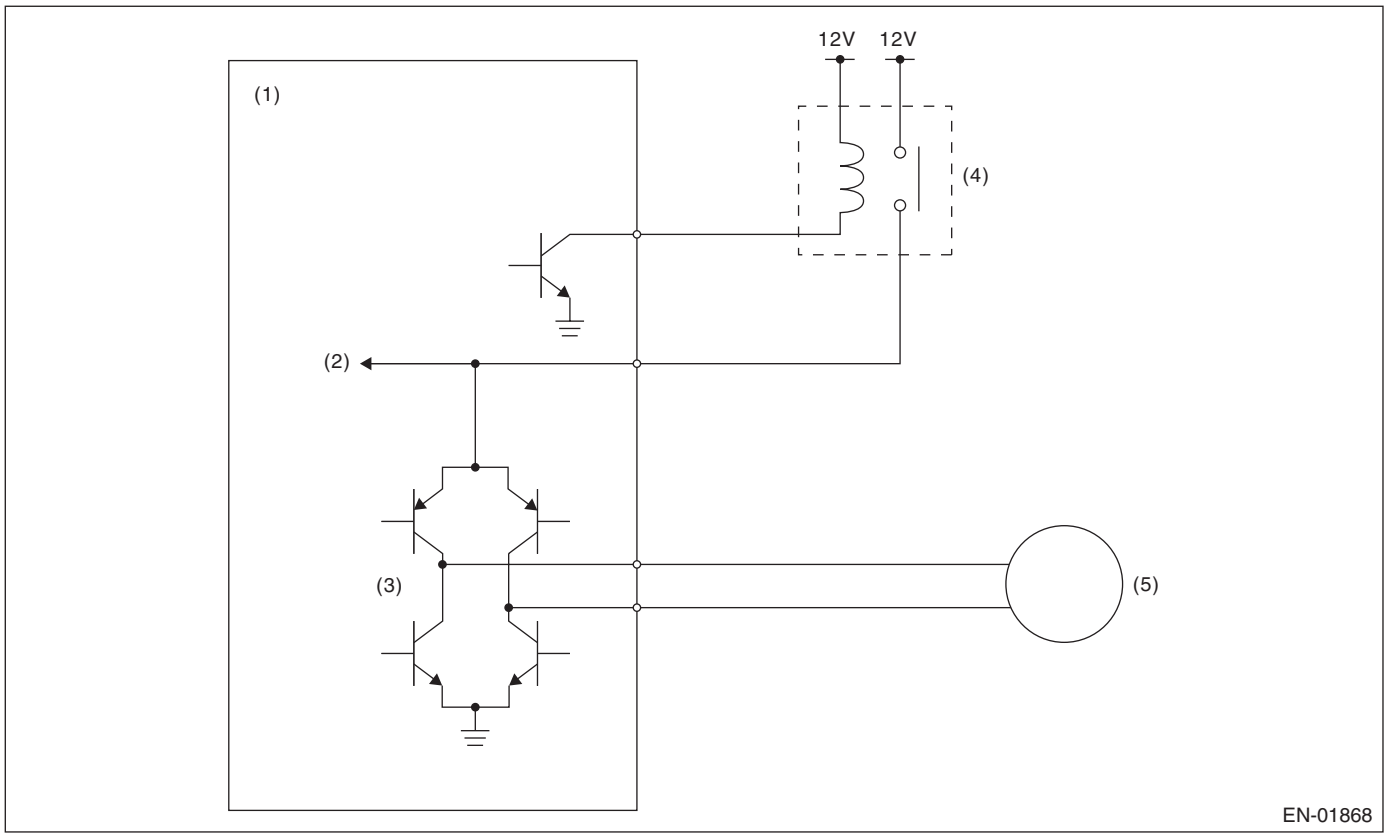
Memorize the freeze frame data. (For test mode $02)

EH: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.

Judgment 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.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

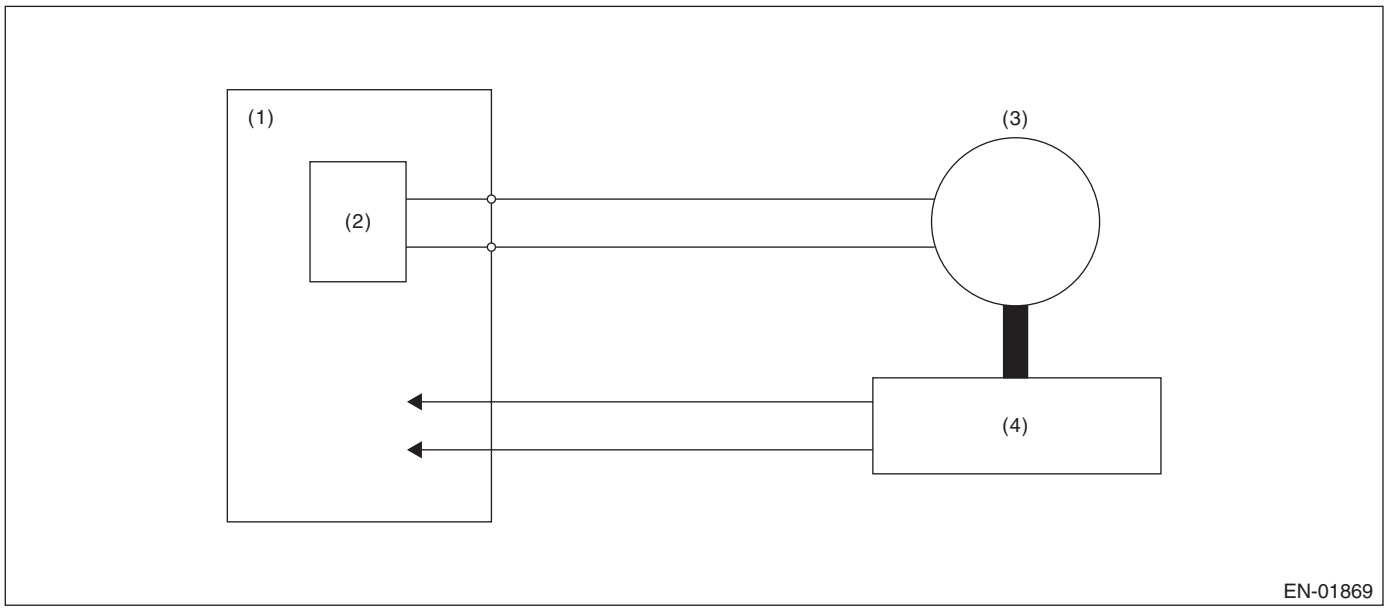
Memorize the freeze frame data. (For test mode $02)

EI: 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.

Judgment Value

Malfunction criteria	Threshold value
Throttle sensor opening angle at full close point learning	10.127 deg — 19.872 deg

Time Needed for Diagnosis: 8 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

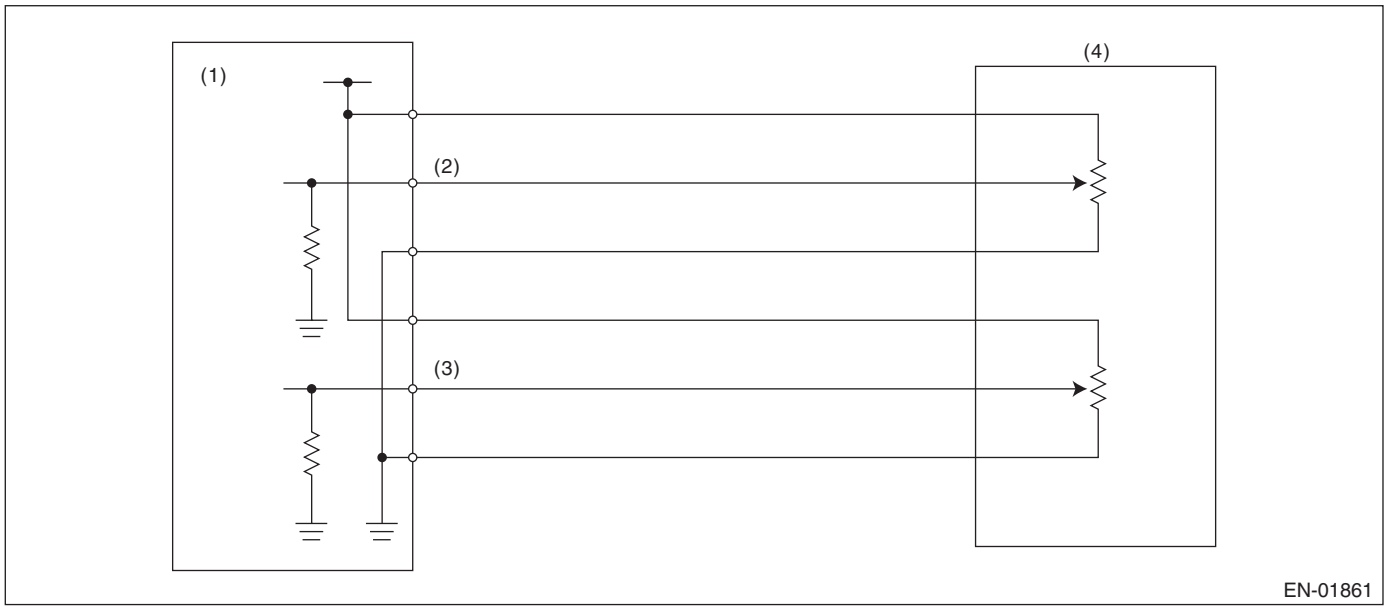
Memorize the freeze frame data. (For test mode $02)

EJ: 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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

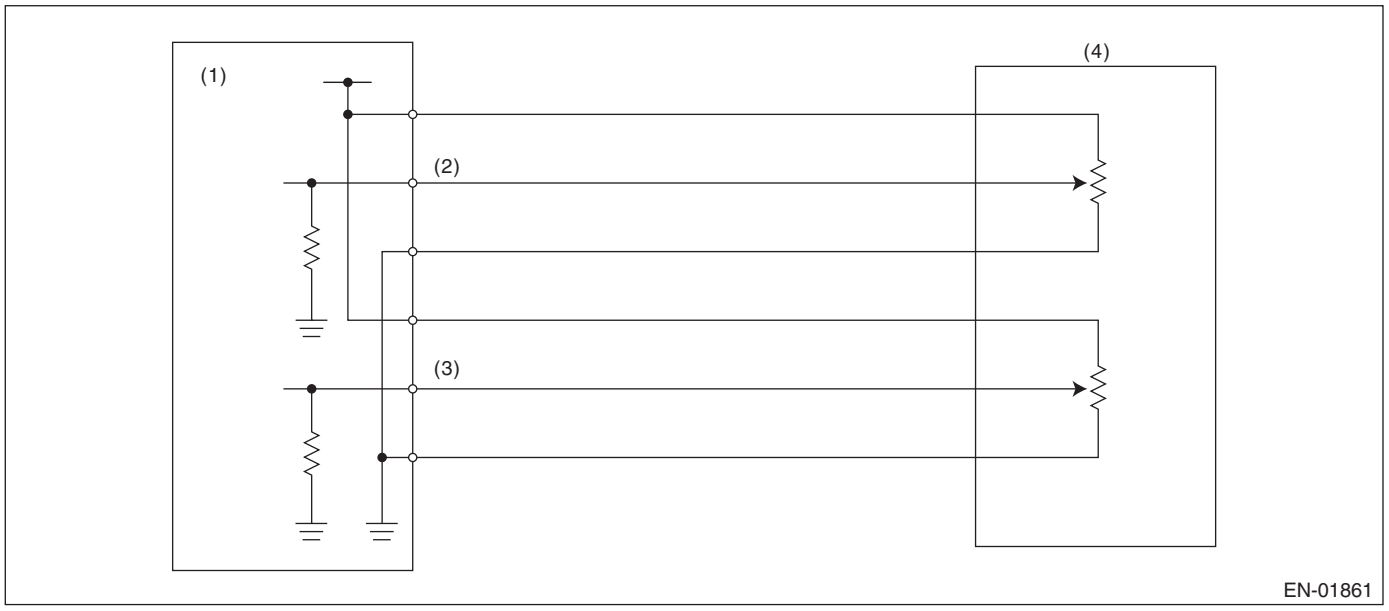
Memorize the freeze frame data. (For test mode $02)

EK: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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	≤ 4.856 V

Time Needed for Diagnosis: 32 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

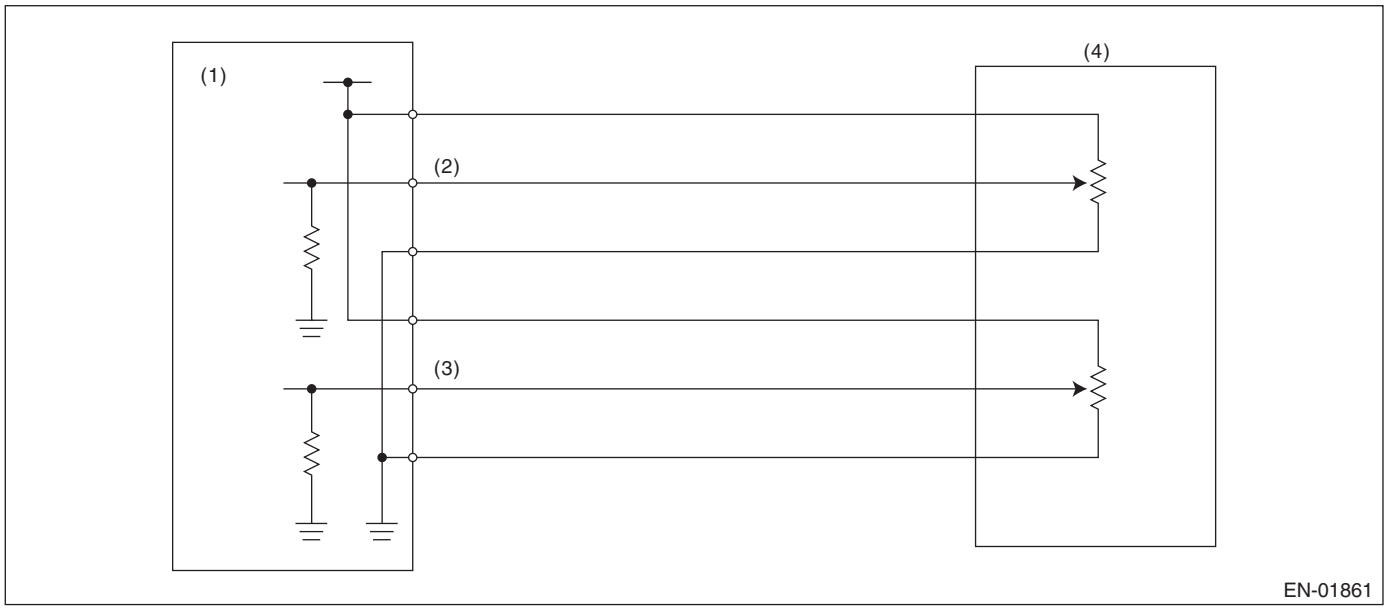
Memorize the freeze frame data. (For test mode $02)

EL: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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

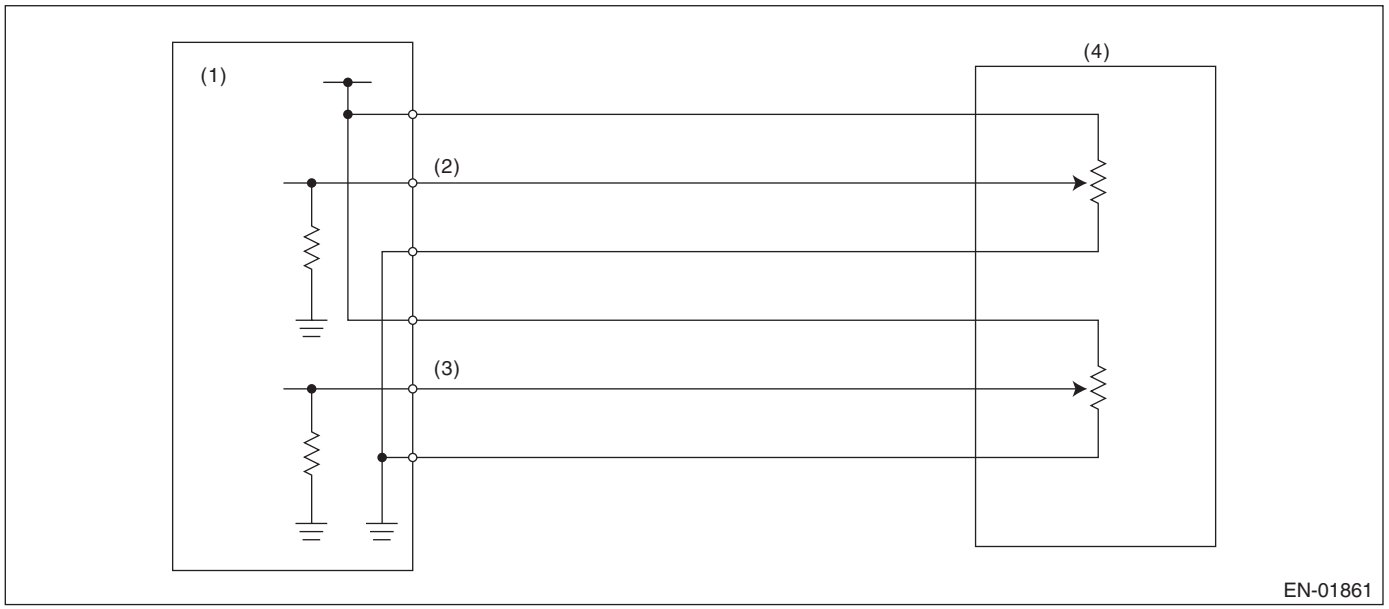
Memorize the freeze frame data. (For test mode $02)

EM: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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	≤ 4.865 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

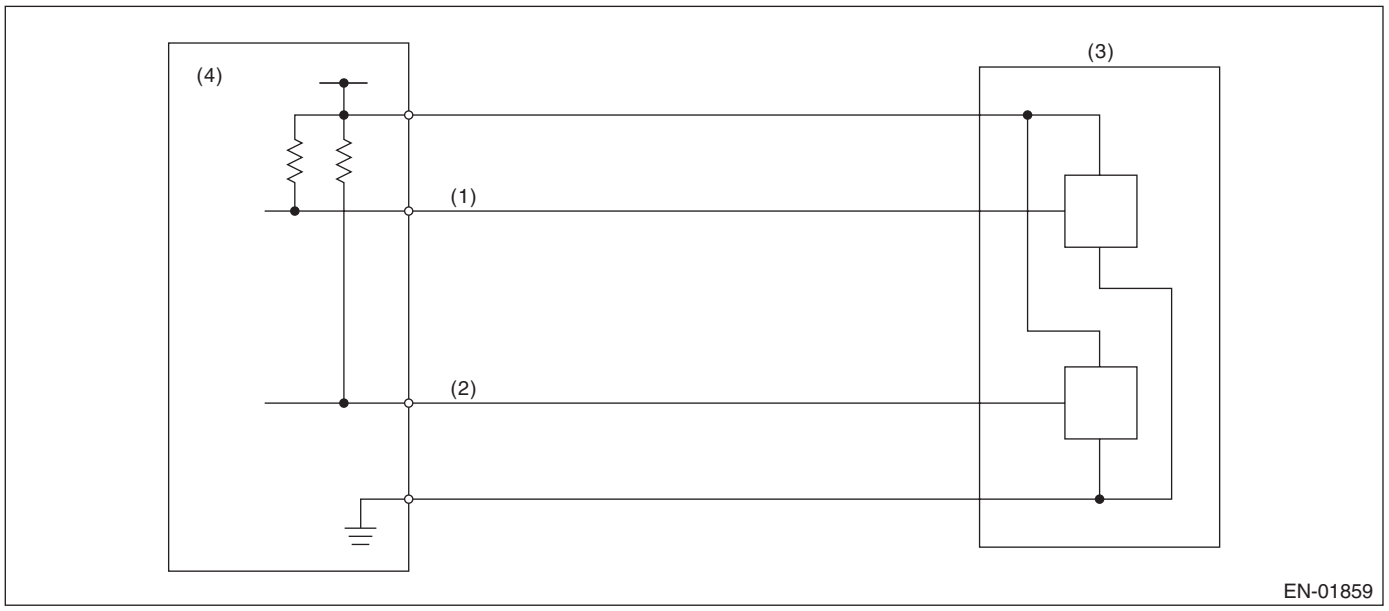
Memorize the freeze frame data. (For test mode $02)

EN: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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

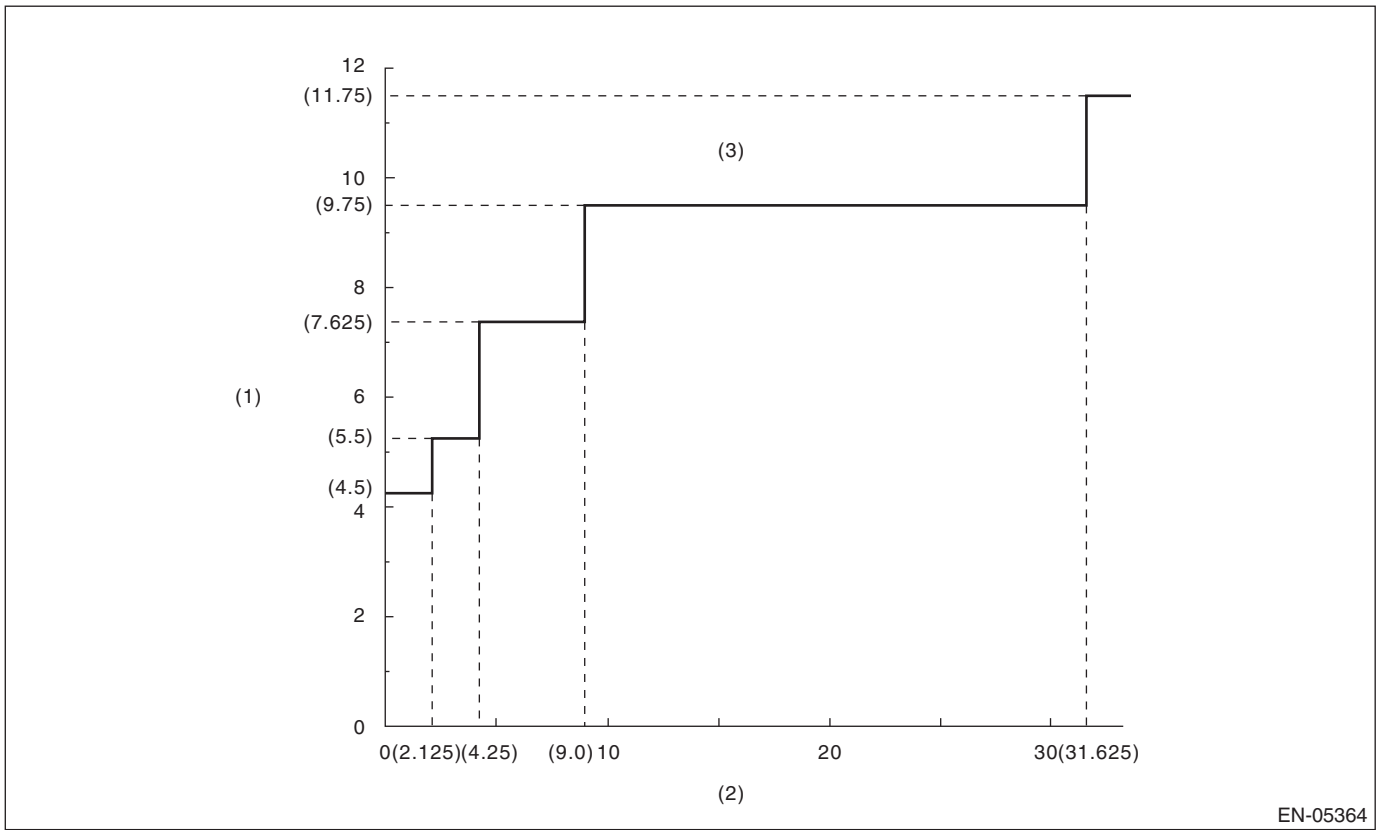
5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Signal difference between two sensors	≤ 4.5 deg

Details of Judgment Value



(1) Sensor output difference (°)
(2) Throttle position sensor 1 opening angle (°)
(3) NG area

Time Needed for Diagnosis: 212 milliseconds (For NG), 24 milliseconds (For OK)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

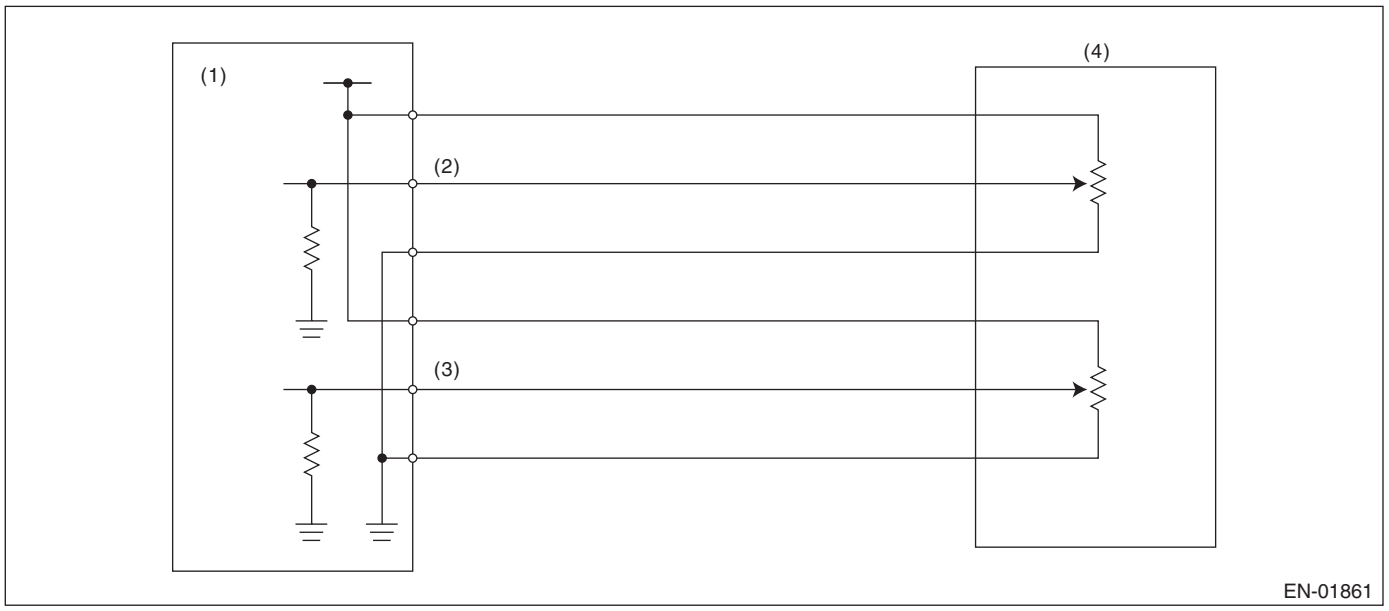
Memorize the freeze frame data. (For test mode $02)

EO: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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

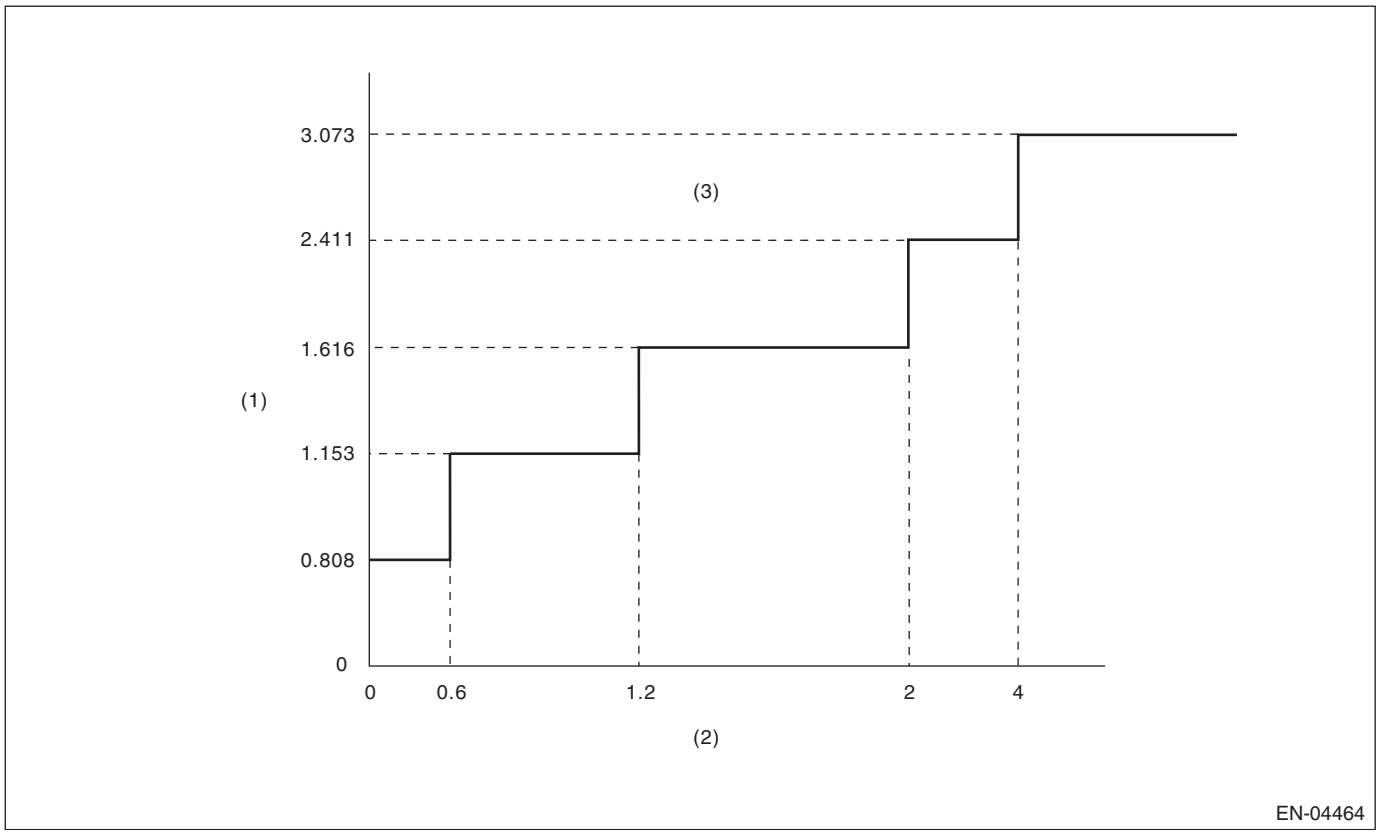
5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Signal difference between two sensors	≤ 0.808°

Details of Judgment Value



(1) Sensor output difference (°)
(2) Throttle position sensor 2 opening angle (°)
(3) NG area

Time Needed for Diagnosis:
- 116 milliseconds (For NG)
- 116 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EP: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 at engine start	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)
Diagnosis for barometric pressure sensor property	Incomplete

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at ignition switch ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.3 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
|Atmospheric pressure – Manifold pressure|	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
|Intake manifold pressure at engine start – Manifold pressure|	< 1.33 kPa (10 mmHg, 2.95 inHg)

Time Needed for Diagnosis: 0.3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes 0.262 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
|Atmospheric pressure – manifold pressure|	< 26.7 kPa (200 mmHg, 7.88 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Barometric pressure sensor process: Fix the barometric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EQ:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the barometric pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION

The barometric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Output voltage	< 0.118 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Output voltage	≥ 0.118 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Barometric pressure sensor process: Fix the barometric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

ER:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the barometric pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION

The barometric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary parameters	Enable conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Output voltage	≥ 4.936 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction criteria	Threshold value
Ignition switch	ON
Output voltage	< 4.936 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Barometric pressure sensor process: Fix the barometric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

TRANSMISSION SECTION

CONTROL SYSTEMS	CS
AUTOMATIC TRANSMISSION	4AT
AUTOMATIC TRANSMISSION (DIAGNOSTICS)	4AT(diag)
AUTOMATIC TRANSMISSION	5AT
AUTOMATIC TRANSMISSION (DIAGNOSTICS)	5AT(diag)
MANUAL TRANSMISSION AND DIFFERENTIAL	5MT
MANUAL TRANSMISSION AND DIFFERENTIAL	6MT
CLUTCH SYSTEM	CL

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.

G2420BE5

CONTROL SYSTEMS

CS

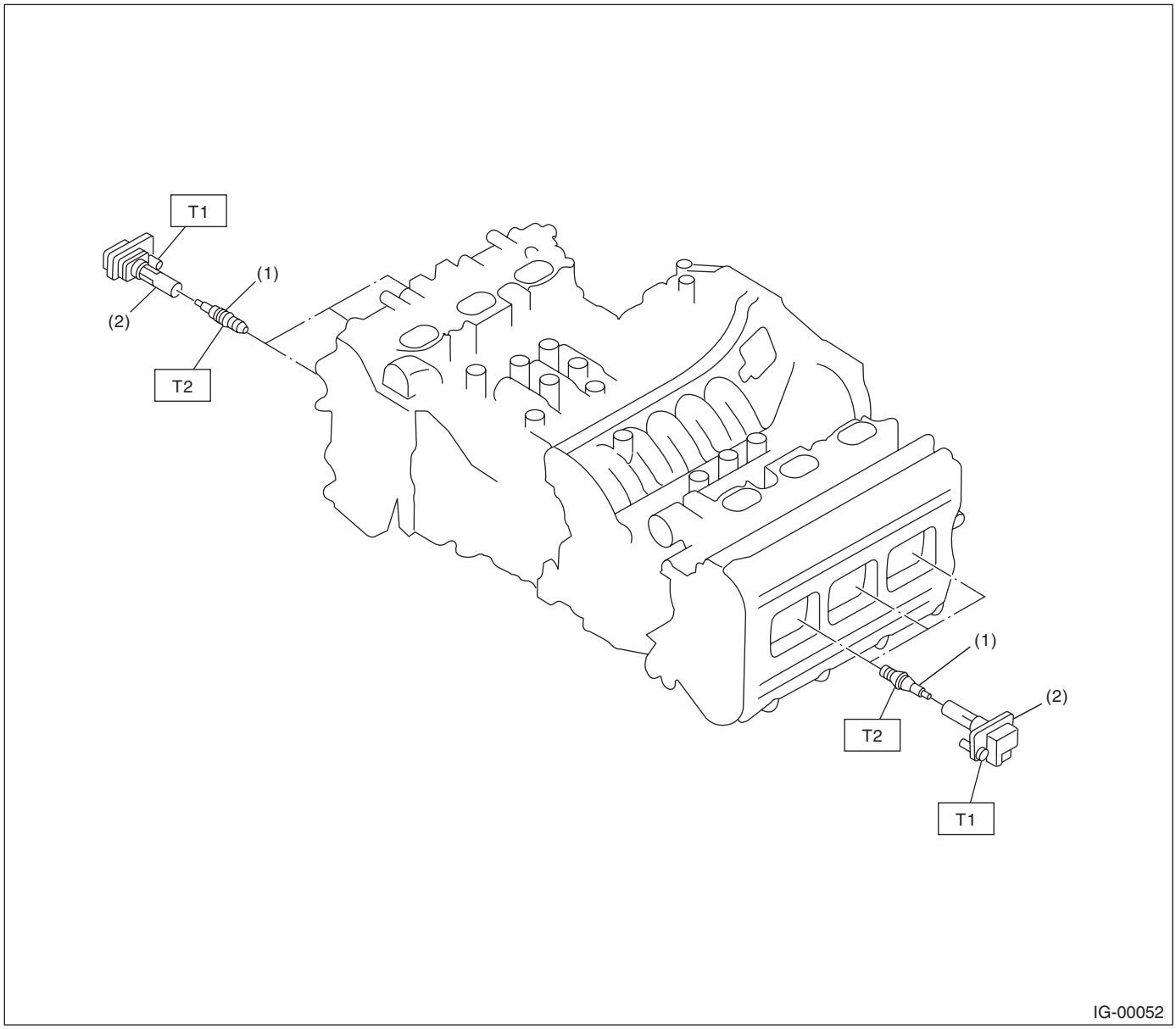
		Page
1.	General Description	2
2.	AT Shift Lock Control System	9
3.	Select Lever	24
4.	Select Cable	28
5.	AT Steering Shift Switch	33
6.	AT Shift Lock Solenoid and “P” Range Switch	35
7.	Body Integrated Unit	37
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1. General Description

A: SPECIFICATION

Item		Specification
Ignition coil	Type	FK0140
	Ignition system	Independent ignition coil
	Manufacturer	Diamond Electric
Spark plug	Manufacturer and type	NGK: ILFR6B
	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, 11.7)
T2: 21 (2.1, 15.2)

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.

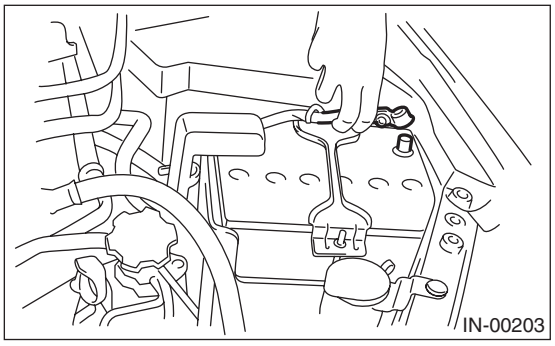
2. Spark Plug

A: REMOVAL

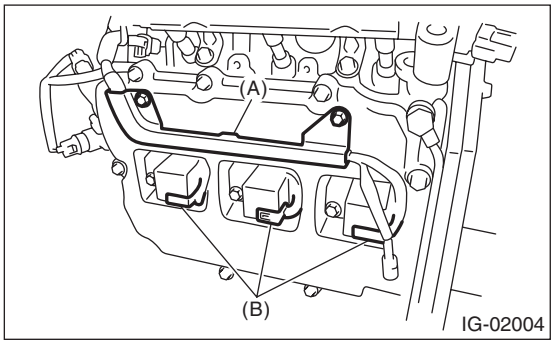
Spark plug:
Refer to "SPECIFICATION" for the spark plug. <Ref. to IG(H6DO)-2, SPECIFICATION, General Description.>

1. RH SIDE

1) Remove the collector cover.
2) Disconnect the ground cable from the battery.



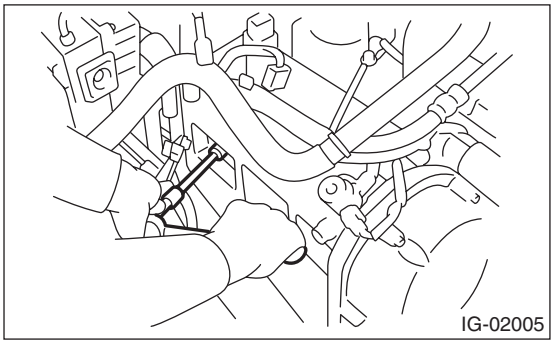
3) Remove the air cleaner case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.>
4) Remove the bracket (A).
5) Disconnect the connector (B) from ignition coil.

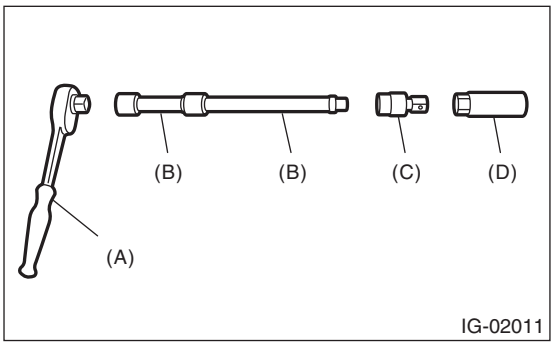


6) Remove the ignition coil.

NOTE:
Turn the #5 ignition coil to remove it.

7) Remove the spark plug with a spark plug socket.

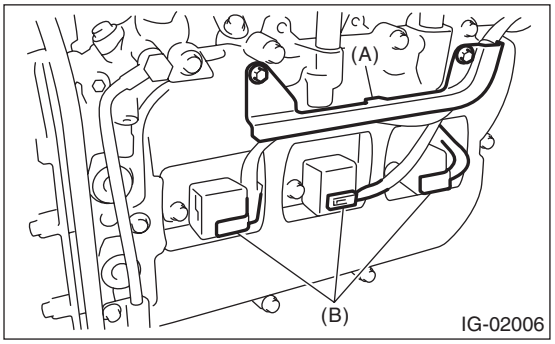




(A) Ratchet handle
(B) Extension bar
(C) Universal joint
(D) Spark plug socket

2. LH SIDE

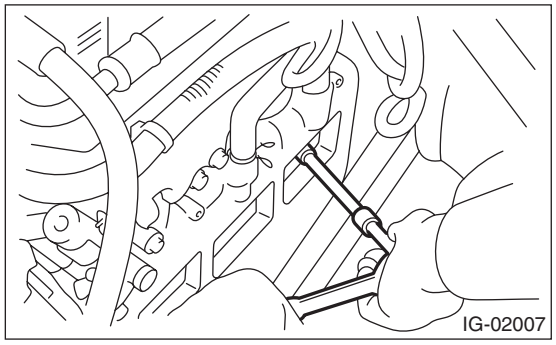
1) Remove the collector cover.
2) Remove the battery and battery carrier.
3) Remove the bracket (A).
4) Disconnect the connector (B) from ignition coil.

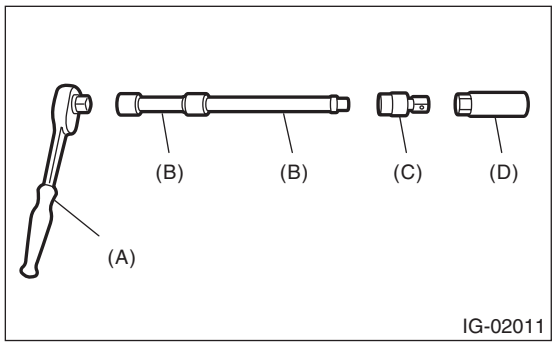


5) Remove the ignition coil.

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, 15.2 ft-lb)

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

2. LH SIDE

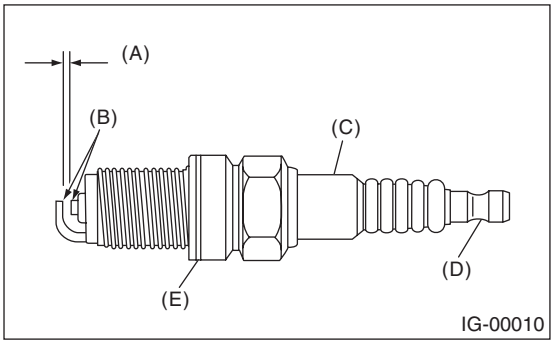
Install in the reverse order of removal.

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

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

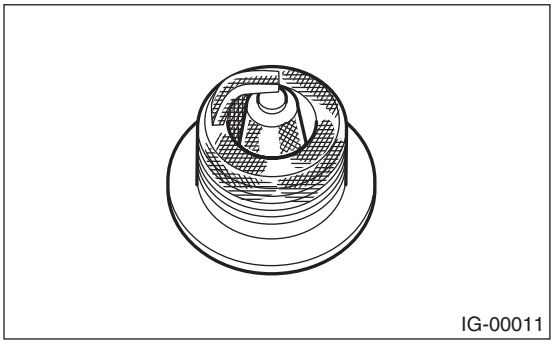
C: INSPECTION

Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.

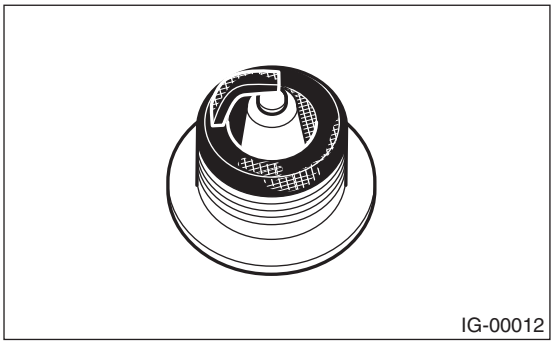


(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Crack
(D) Damage
(E) Damaged gasket

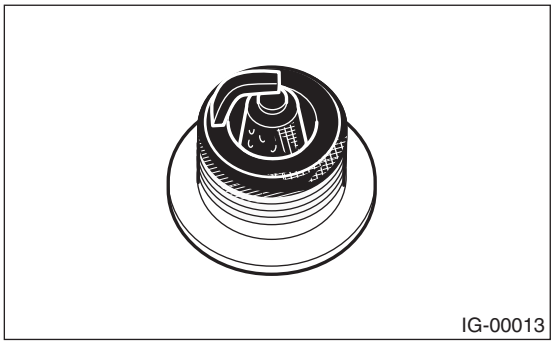
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



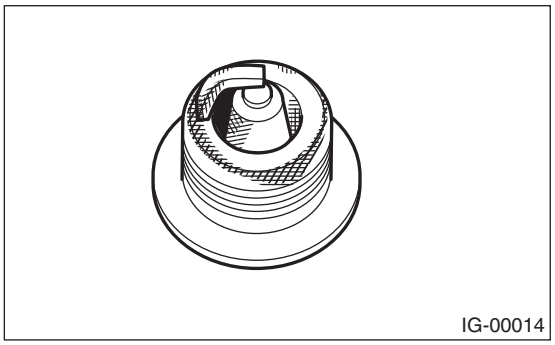
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture and dirty air cleaner.



3) Oil fouled:
Wet black deposits show oil entrance into the combustion chamber through worn rings and excessive clearance between valve guides and stems.


IG-00013

4) Overheating:
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.

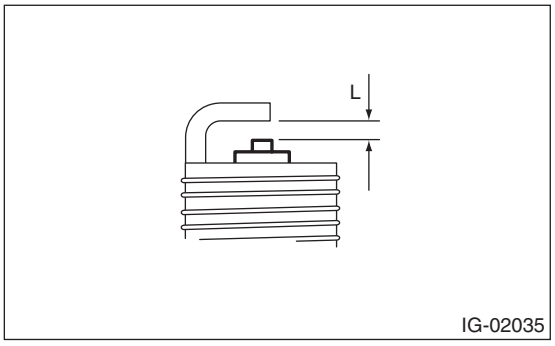

IG-00014

D: ADJUSTMENT

Clean up the spark plug using nylon brush or equivalent. Clean and remove the carbon or oxide deposits. If deposits are too stubborn, replace the spark plugs.

NOTE:
- Never 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)



IG-02035

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, 11.7 ft-lb)

C: INSPECTION

For inspection procedure, refer to “Diagnostics for Engine Starting Failure”. <Ref. to EN(H6DO)(diag)-74, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

STARTING/CHARGING SYSTEMS

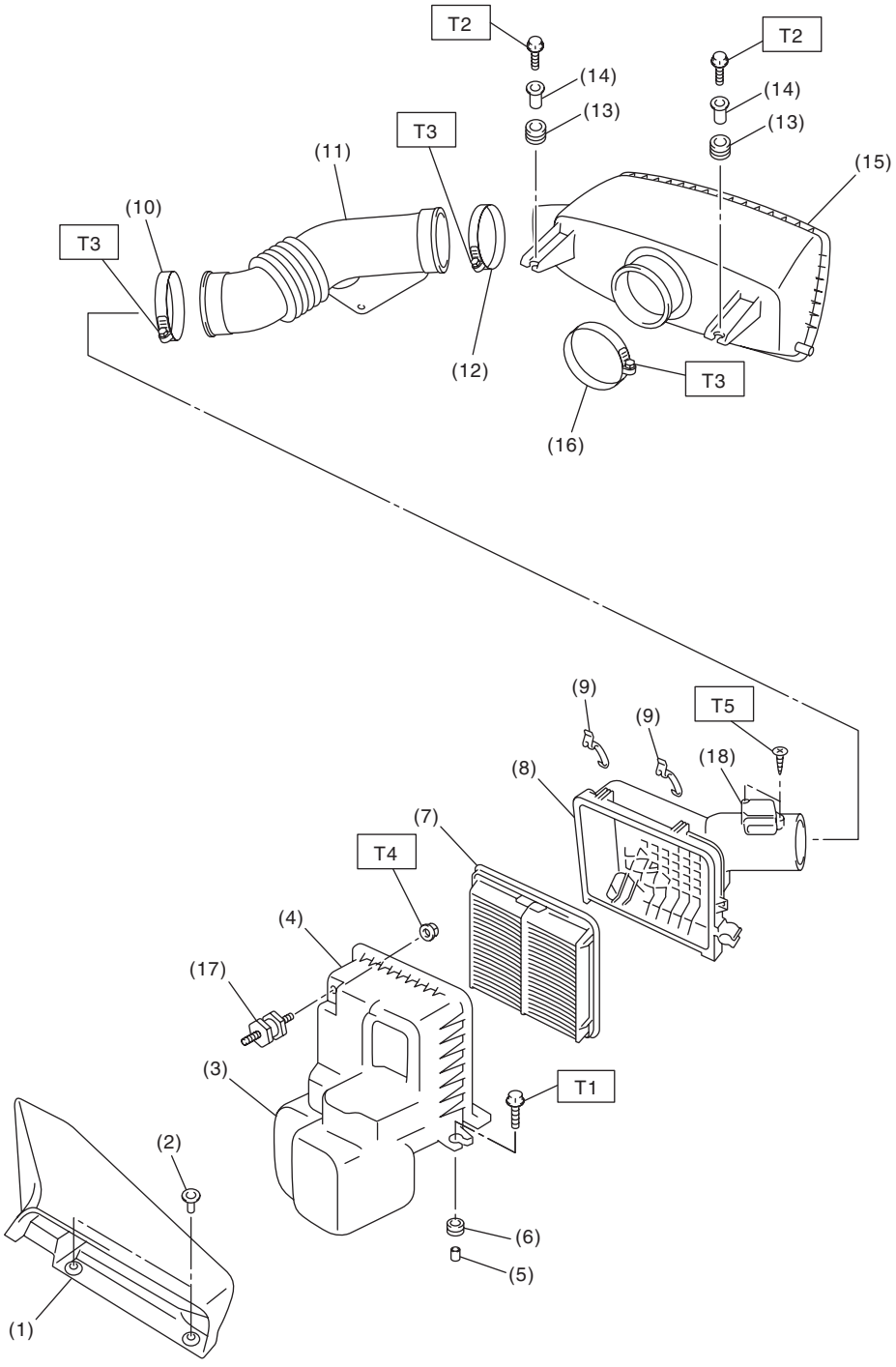
SC(H6DO)

Page

1. General Description 2

1. General Description

A: COMPONENT



IN-02212

(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) Clamp
(17) Cushion
(18) Mass air flow and intake air temperature sensor

Tightening torque:N·m (kgf-m, ft-lb)	
T1:	*6.0 (0.6, 4.4)*
T2:	*6.5 (0.66, 4.8)*
T3:	*3.0 (0.3, 2.2)*
T4:	*7.5 (0.76, 5.5)*
T5:	*1.0 (0.10, 0.7)*

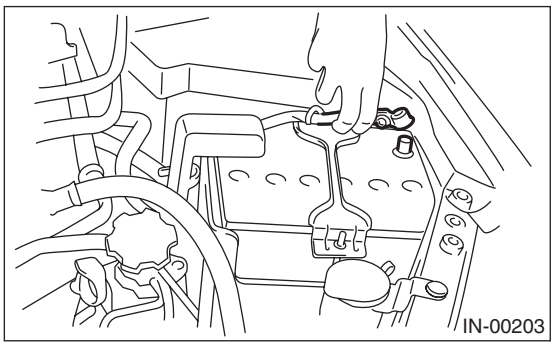
B: CAUTION

• 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.

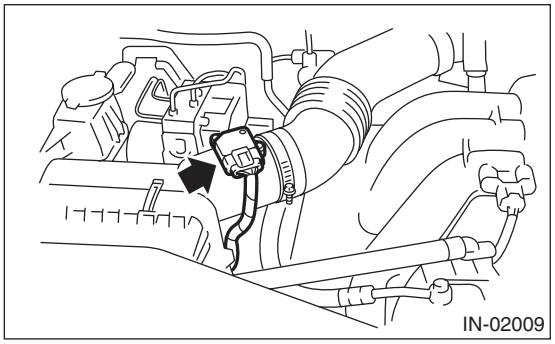
2. Air Cleaner Element

A: REMOVAL

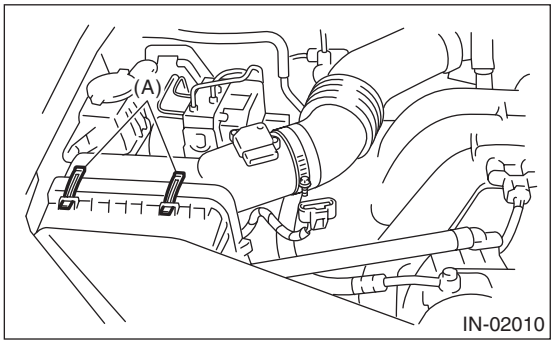
1) Disconnect the ground cable from the battery.



2) Disconnect the connector from mass air flow and intake air temperature sensor.



3) Remove the clip (A) securing upper side of air cleaner case.



4) Pull the air cleaner case (rear) backward of the vehicle, and remove the air cleaner element.

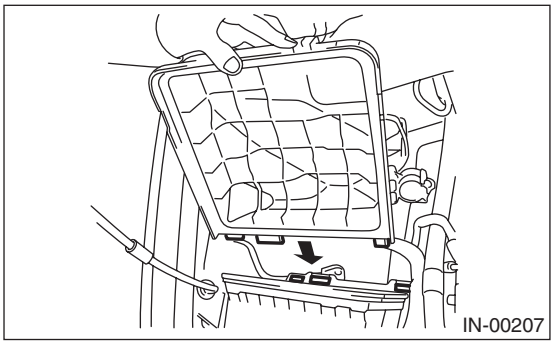
NOTE:
Be careful of the power steering hose fixed to the bottom of the air cleaner case (rear).

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to use SUBARU genuine air cleaner element depending on the engine type when replacing the air cleaner elements. Otherwise engine performance may be damaged.

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



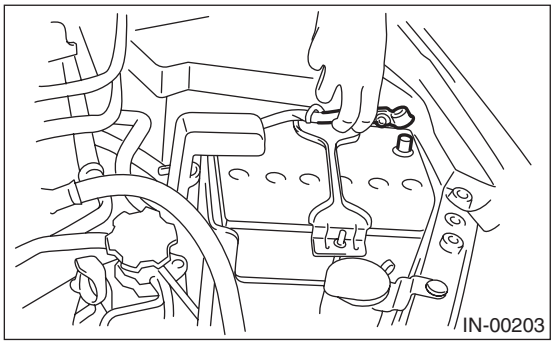
C: INSPECTION

Replace if excessively damaged or dirty.

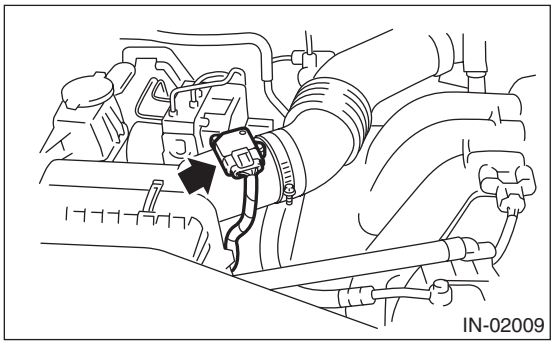
3. Air Cleaner Case

A: REMOVAL

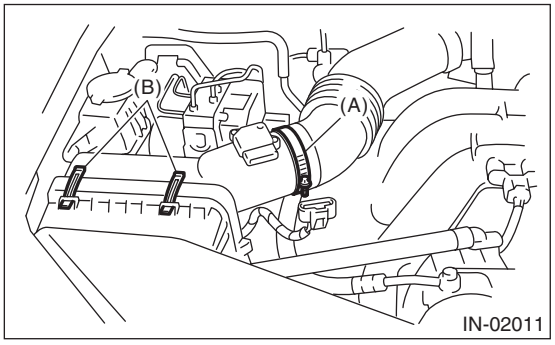
1) Disconnect the ground cable from the battery.



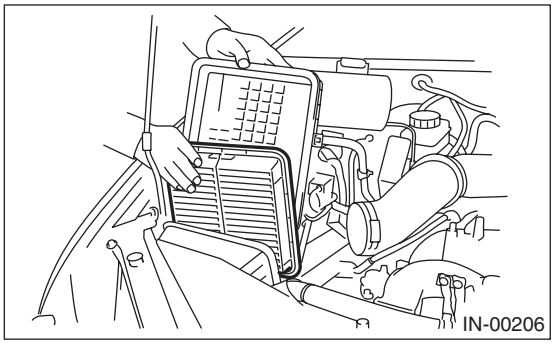
2) Remove the air intake duct. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
3) Disconnect the connector from mass air flow and intake air temperature sensor.



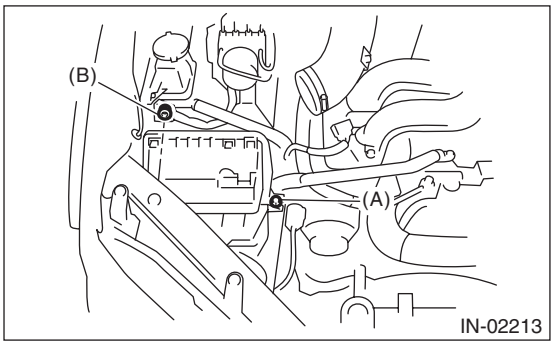
4) Loosen the clamps (A) which connect the air cleaner case and the intake boot.
5) Remove the clip (B) securing the upper side of air cleaner case.



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.

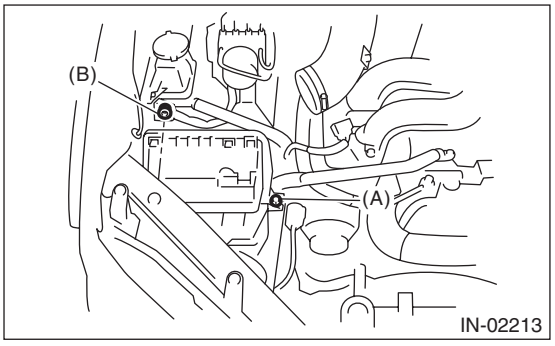


8) Remove the air cleaner case (front).

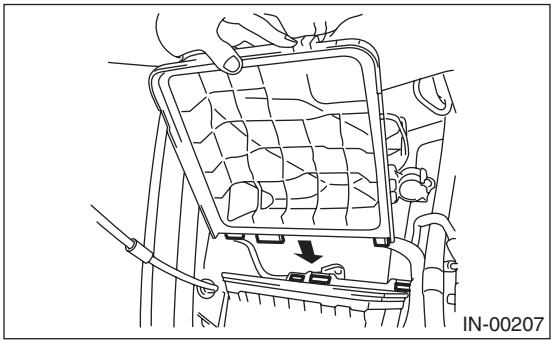
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Bolt (A): 6.0 N·m (0.6 kgf-m, 4.4 ft-lb)
Nut (B): 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



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



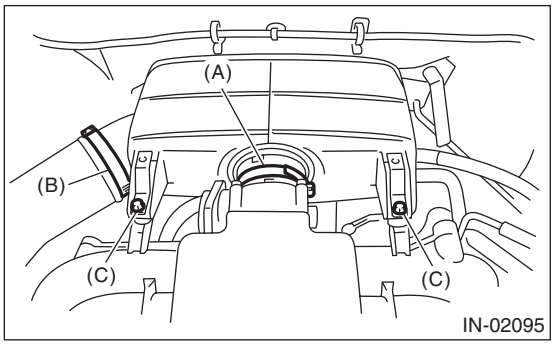
C: INSPECTION

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 to the stay.

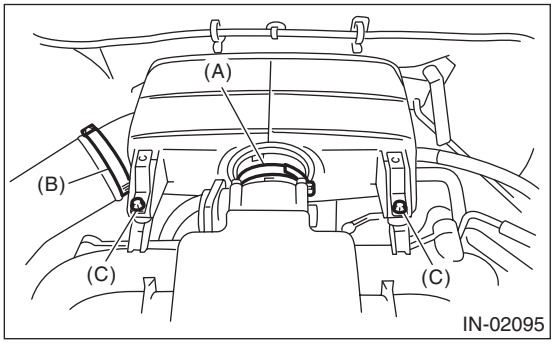


5) Disconnect the blow-by hoses, then remove the air intake chamber.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Clamp (A), (B)
3.0 N·m (0.3 kgf-m, 2.2 ft-lb)
Bolt (C)
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



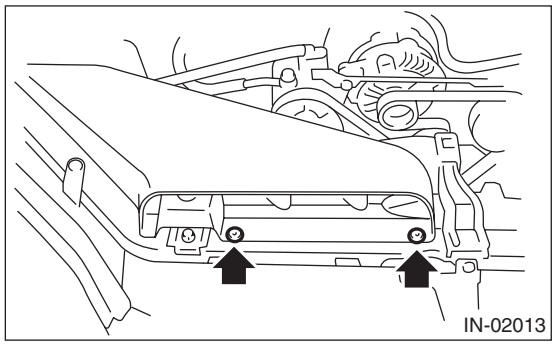
C: INSPECTION

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 which installs the air intake duct on the front side of body.
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 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)-5, INSTALLATION, Air Cleaner Case.>

C: INSPECTION

Check for cracks or loose connections.

MECHANICAL

ME(H6DO)

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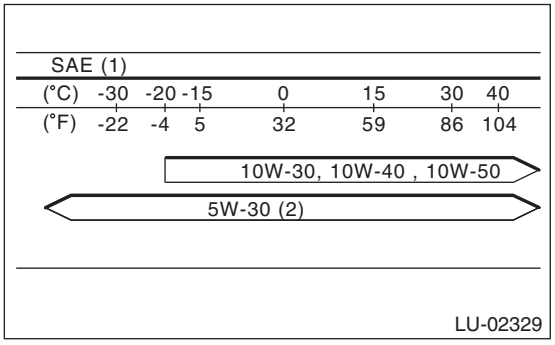
1. General Description

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)	86 × 13 (3.39 × 0.51)
	Tip clearance between inner and outer rotors	mm (in)	0.04 — 0.14 (0.0016 — 0.0055)
	Side clearance between inner rotor and pump case	mm (in)	0.020 — 0.046 (0.0008 — 0.0018)
	Case clearance between outer rotor and pump case	mm (in)	0.110 — 0.175 (0.0043 — 0.0069)
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	Total capacity (Overhaul)	ℓ (US qt, Imp qt)	7.2 (7.6, 6.3)
	When replacing engine oil and oil filter	ℓ (US qt, Imp qt)	5.7 (6.0, 5.0)
	When replacing engine oil only	ℓ (US qt, Imp qt)	5.5 (5.8, 4.8)

Recommended oil:

Items having the API standard SM "Energy Conserving" logo
ILSAC standard GF-4 Star burst mark label on the container

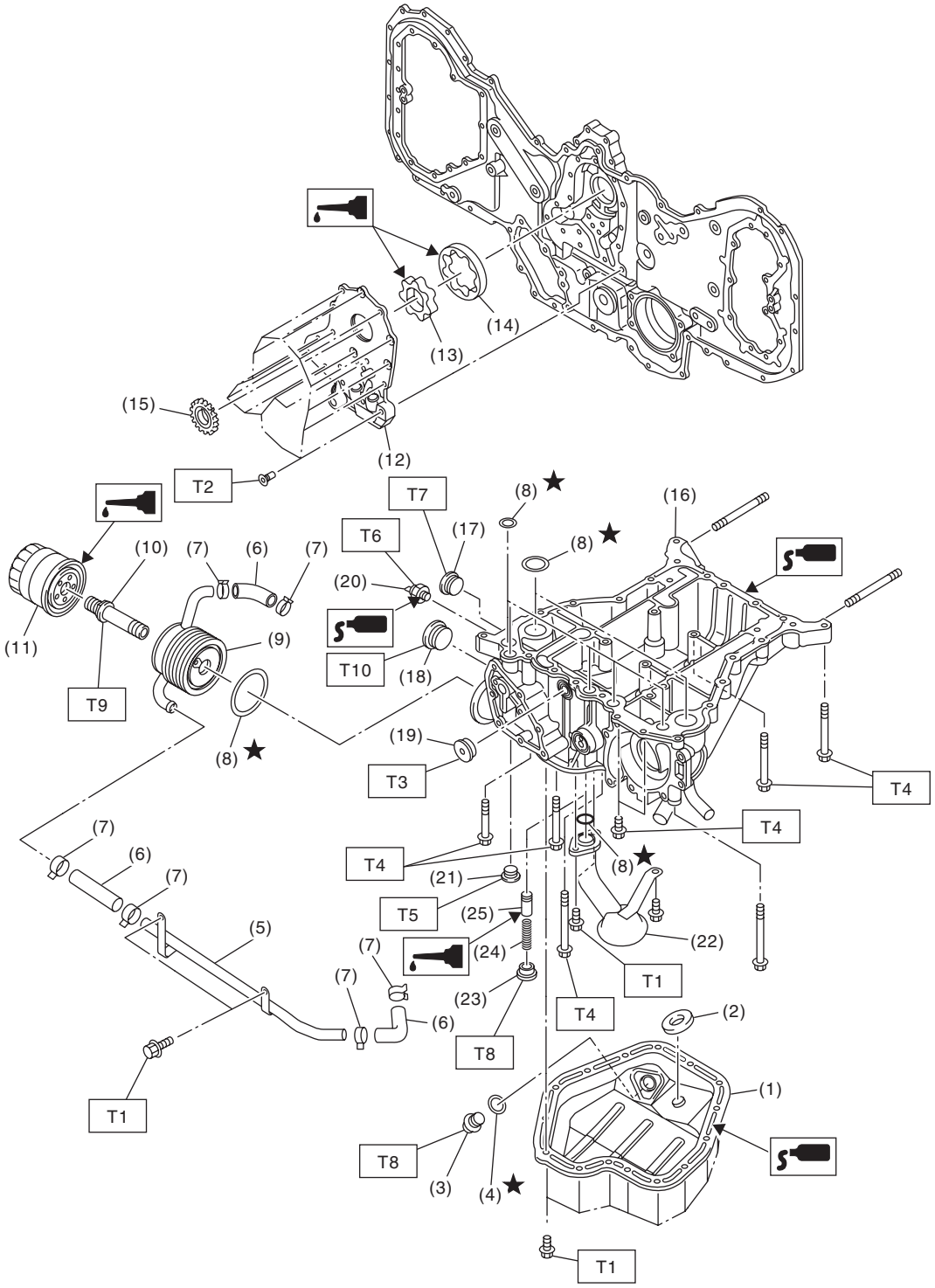


(1) SAE viscosity No. and applicable temperature
(2) Recommended

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:
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)
(2)
(3)
(4)
(5)
(6)
(7)
(8)
(9)
(10)
(11)
(12)
(13)
(14)
(15)
(16)
(17)
(18)
(19)
(20)
(21)
(22)
(23)
(24)
(25)
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
LU-02282

(1) Oil pan lower
(2) Magnet
(3) Drain plug
(4) Gasket
(5) Oil cooler pipe
(6) Hose
(7) Clamp
(8) Gasket
(9) Oil cooler
(10) Oil cooler connector
(11) Oil filter
(12) Oil pump cover
(13) Inner rotor
(14) Outer rotor
(15) Crank sprocket
(16) Oil pan upper
(17) Plug
(18) Plug
(19) Plug
(20) Oil pressure switch
(21) Plug
(22) Oil strainer
(23) Plug
(24) Relief valve spring
(25) Relief valve

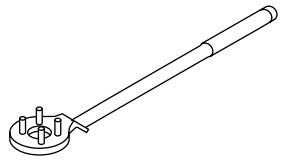
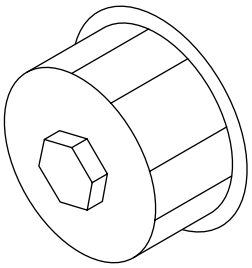
Tightening torque:N·m (kgf-m, ft-lb)	
T1:	*6.4 (0.65, 4.7)*
T2:	*<Ref. to LU(H6DO)-8, INSTALLATION, Oil Pump.>*
T3:	*16 (1.6, 12)*
T4:	*18 (1.8, 13)*
T5:	*23 (2.3, 17)*
T6:	*25 (2.5, 18.4)*
T7:	*37 (3.8, 27)*
T8:	*44 (4.5, 33)*
T9:	*54 (5.5, 40)*
T10:	*90 (9.2, 66)*

C: CAUTION

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

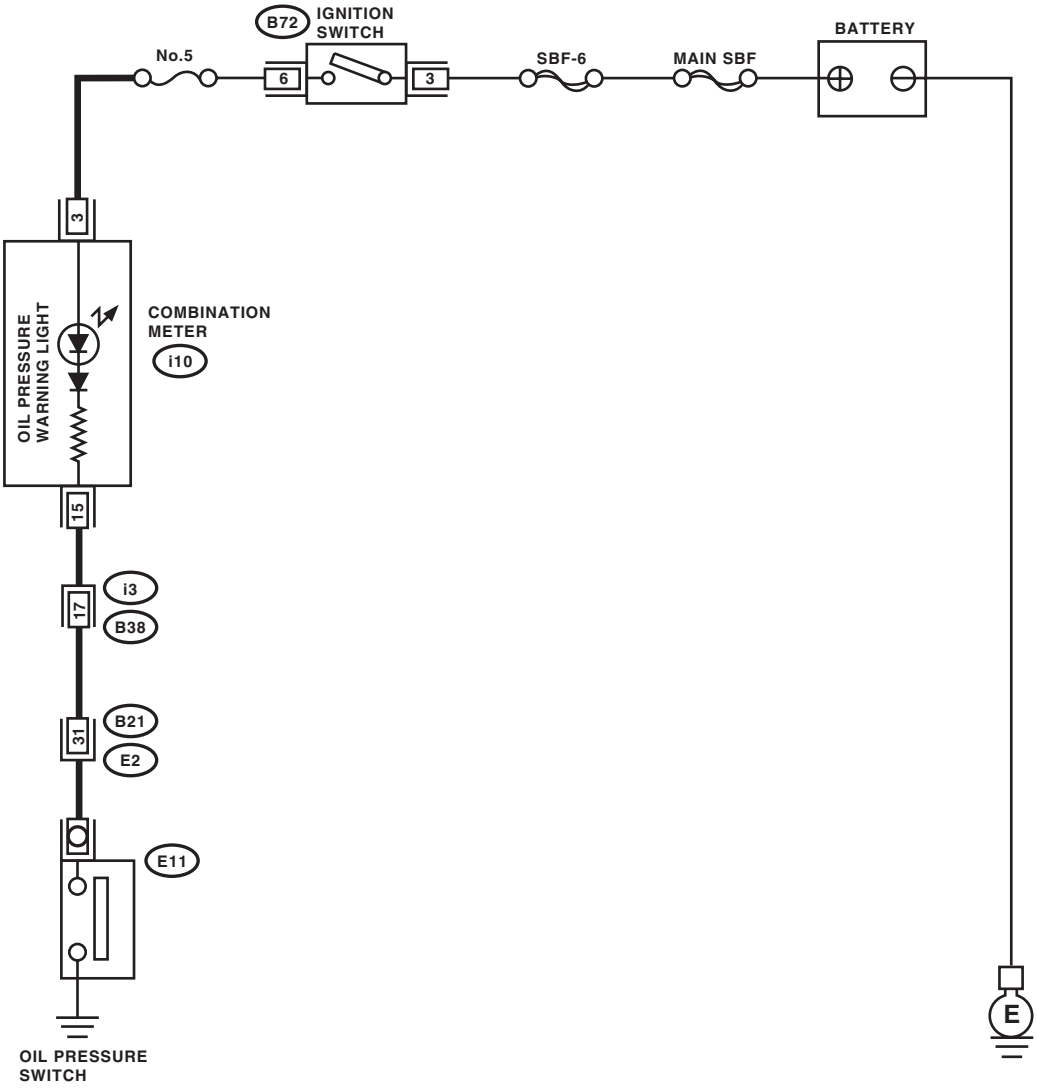
D: PREPARATION TOOL

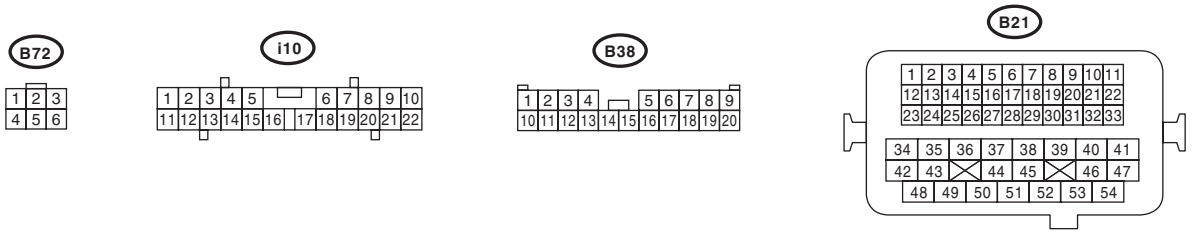
1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when removing and tightening crank pulley bolt.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.

2. Oil Pressure System

A: WIRING DIAGRAM





LU-02306

B: INSPECTION

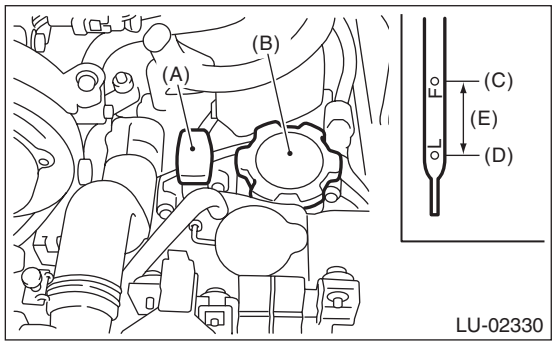
Step		Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (engine OFF) 2) Check the warning light of combination meter.	Does the warning light illuminate?	Go to step **2**.	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2	**CHECK 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 between the oil pressure switch connector and the engine ground. ***Connector & terminal*** ***(E11) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Replace the oil pressure switch. <Ref. to LU(H6DO)-14, 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 — (i10) No. 15:***	Is the resistance less than 10 Ω?	Repair the harness and connector. NOTE: In this case, repair the following item: • 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

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe away the oil.
3) Reinsert the oil level gauge all the way. Be sure that the oil level gauge is correctly inserted and properly orientated.
4) Remove it again and check the reading. If the engine oil level is below “L” line, add oil to bring the level up to “F” line.
5) After turning off the engine, wait a few minutes for the oil to return to the oil pan before checking the oil level.

NOTE:
To prevent overfilling of engine oil, do not add oil above “F” line when the engine is cold.

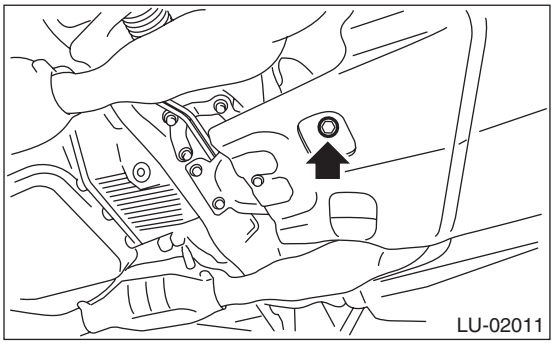


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

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.



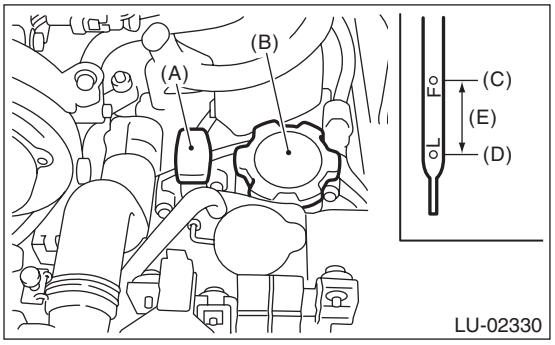
5) Tighten the engine oil drain plug after draining engine oil.

NOTE:
Use a new drain plug gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)
6) Lower the vehicle.
7) Using engine oil of proper quality and viscosity, fill engine oil through the oil filler duct to the upper level on level gauge. Make sure that the vehicle is parked on a level surface when checking oil level.

Recommended oil:
Refer to “SPECIFICATION” for the recommended oil. <Ref. to LU(H6DO)-2, SPECIFICATION, General Description.>

Engine oil capacity:
Refer to “SPECIFICATION” for the engine oil capacity. <Ref. to LU(H6DO)-2, SPECIFICATION, General Description.>
8) Close the engine oil filler cap.
9) Start the engine and warm it up for a time.
10) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

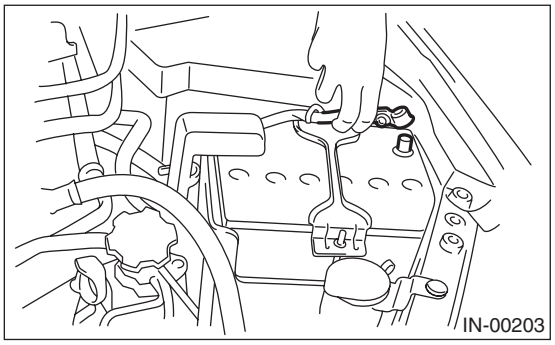


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

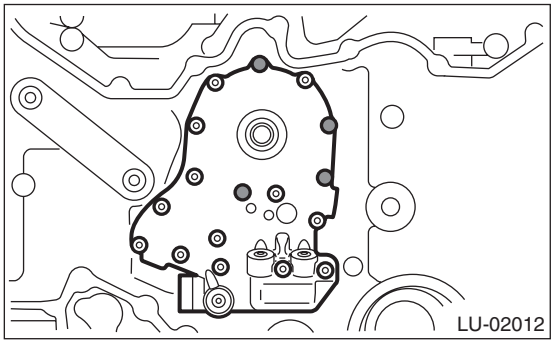
4. Oil Pump

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from the battery.



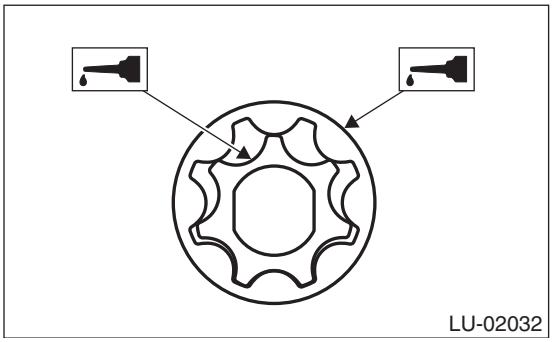
4) Lift up the vehicle.
5) Remove the under cover.
6) Drain engine coolant. <Ref. to CO(H6DO)-10, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Lower the vehicle.
8) Remove the radiator. <Ref. to CO(H6DO)-15, REMOVAL, Radiator.>
9) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
10) Remove the front chain cover. <Ref. to ME(H6DO)-40, REMOVAL, Front Chain Cover.>
11) Remove the timing chain. <Ref. to ME(H6DO)-42, REMOVAL, Timing Chain Assembly.>
12) Remove the crank sprocket.
13) Remove the oil pump cover.



14) Remove the inner rotor and outer rotor.

B: INSTALLATION

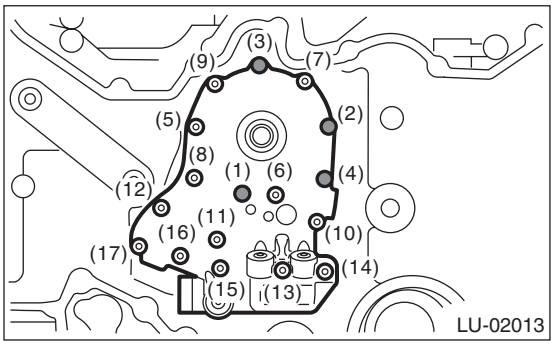
1) Apply a coat of engine oil to the whole area of inner rotor and outer rotor.



2) Install the inner rotor to the crank shaft, then assemble the outer rotor.
3) Install the oil pump cover.
4) Tighten the bolts in the numerical order as shown in the figure.

CAUTION:
Make sure that the bolt is installed in correct position.

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



Bolt installing position	Bolt dimension
(1) and (3)	6 × 14 × 14
(2) and (4)	6 × 35 × 18
(5), (6), (7), (8), (9), (10) and (11)	6 × 35 × 15
(12), (15), (16) and (17)	6 × 16 × 16
(13) and (14)	6 × 26 × 15

5) Install the crank sprocket.
6) Install the timing chain. <Ref. to ME(H6DO)-43, INSTALLATION, Timing Chain Assembly.>
7) Install the front chain cover. <Ref. to ME(H6DO)-40, INSTALLATION, Front Chain Cover.>
8) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>
9) Install the radiator. <Ref. to CO(H6DO)-16, INSTALLATION, Radiator.>
10) Lift up the vehicle.
11) Install the under cover.
12) Lower the vehicle.

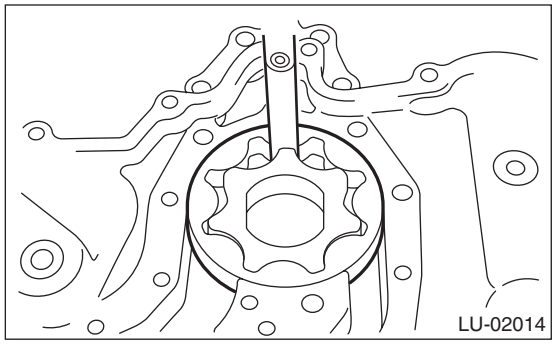
13) Fill engine coolant. <Ref. to CO(H6DO)-10, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance exceeds specification, replace the rotors as a matched set.

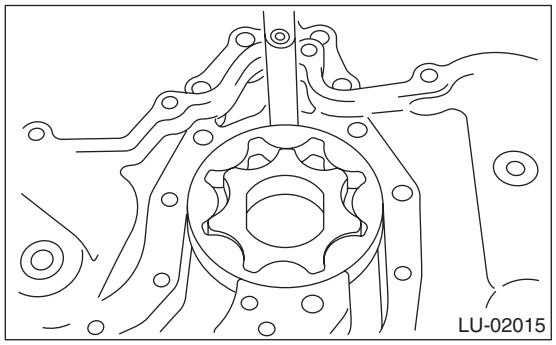
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and rear chain cover rotor housing. If the clearance exceeds the standard value, replace the outer rotor.

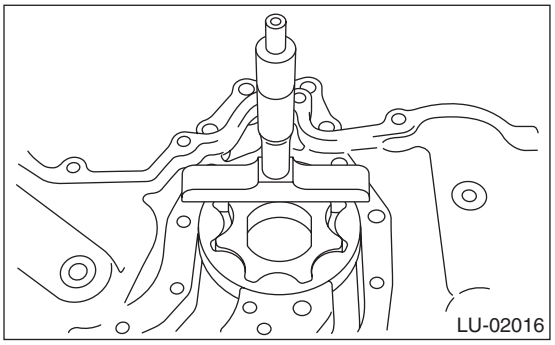
Case clearance:
Standard
0.110 — 0.175 mm (0.0043 — 0.0069 in)



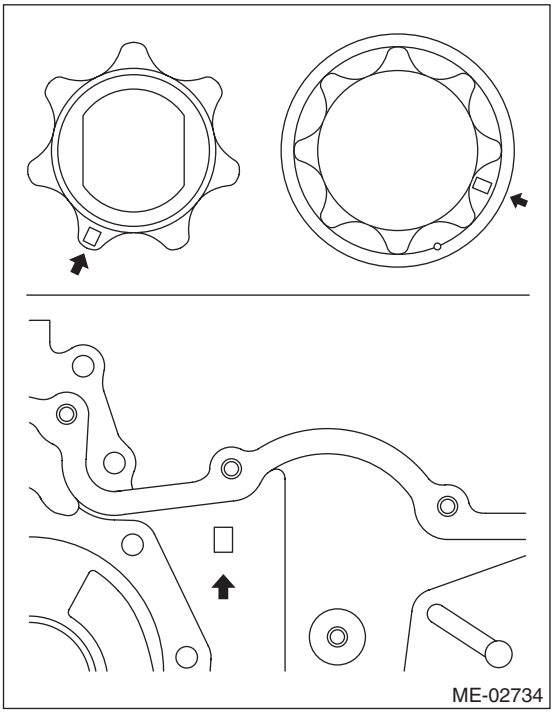
3. SIDE CLEARANCE

Measure the clearance between oil pump inner rotor and rear chain cover. If the clearance exceeds specification, replace the rotors as a matched set.

Side clearance:
Standard
0.020 — 0.046 mm (0.0008 — 0.0018 in)



Perform the replacement parts selection as follows.
• When replacing all inner rotor, outer rotor and rear chain cover with new parts
On the inner rotor, outer rotor and the rear chain cover, there are identification marks in locations shown on the figure. When replacing, use those with matching identification marks.



• When replacing any one of the inner rotor, outer rotor and rear chain cover with new part, select suitable size from the following table so that side clearance meets the standard.

Inner rotor

Classification	Part No.	Rotor thickness mm (in)
A	15015AA250	12.993 — 13.006 (0.51153 — 0.51205)
No	15015AA300	12.980 — 12.993 (0.51102 — 0.51153)
C	15015AA310	12.967 — 12.980 (0.51051 — 0.51102)

Outer rotor

Classification	Part No.	Rotor thickness mm (in)
A	15016AA250	12.993 — 13.006 (0.51153 — 0.51205)
No	15016AA300	12.980 — 12.993 (0.51102 — 0.51153)
C	15016AA310	12.967 — 12.980 (0.51051 — 0.51102)

Rear chain cover

Classification	Part No.	Rotor thickness mm (in)
A	13119AA020	13.026 — 13.039 (0.51295 — 0.51335)
B	13119AA050	13.013 — 13.026 (0.51232 — 0.51284)
C	13119AA060	13.000 — 13.013 (0.51181 — 0.51232)

4. OIL PUMP CASE

Check the worn shaft hole, clogged oil passage, crank and other parts for faults.

5. Oil Pump Relief Valve

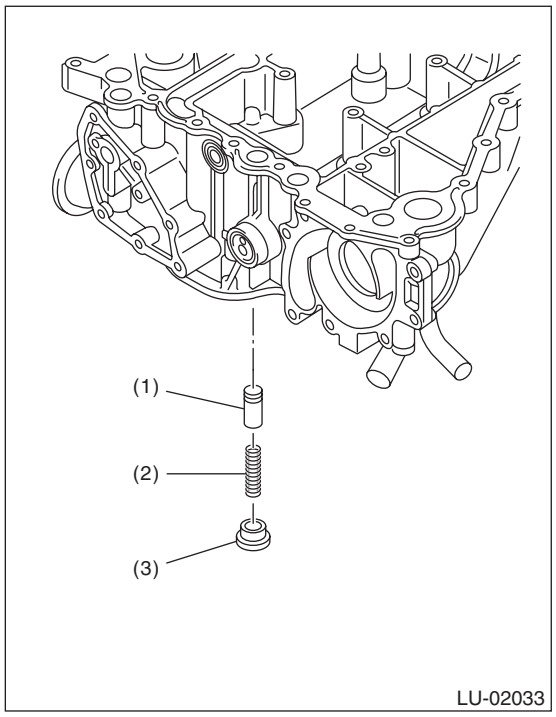
A: REMOVAL

1. REAR CHAIN COVER SIDE

Oil pump relief valve is integrated into oil pump cover as one unit; therefore, refer to “Oil Pump” for removal procedure. <Ref. to LU(H6DO)-8, REMOVAL, Oil Pump.>

2. OIL PAN UPPER SIDE

1) Remove the oil pan. <Ref. to LU(H6DO)-12, REMOVAL, Oil Pan and Strainer.>
2) Remove the plug, relief valve spring and relief valve.



(1) Relief valve
(2) Relief valve spring
(3) Plug

B: INSTALLATION

1. REAR CHAIN COVER SIDE

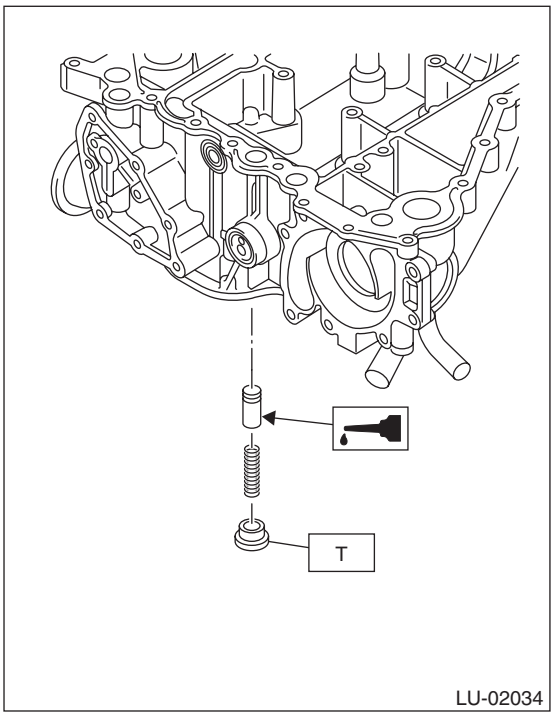
Oil pump relief valve is integrated into oil pump cover as one unit; therefore, refer to “Oil Pump” for installation procedure. <Ref. to LU(H6DO)-8, INSTALLATION, Oil Pump.>

2. OIL PAN UPPER SIDE

1) Install the relief valve, relief valve spring and plug.

NOTE:
Apply engine oil to the relief valve.

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



2) Install the oil pan. <Ref. to LU(H6DO)-12, INSTALLATION, Oil Pan and Strainer.>

C: INSPECTION

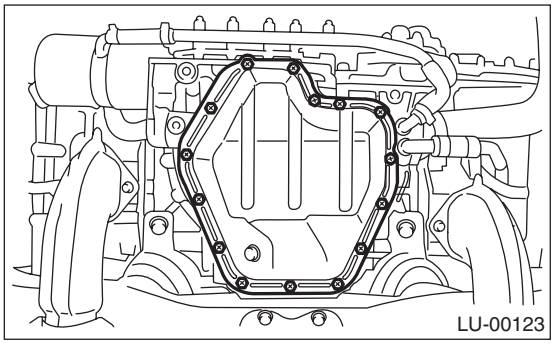
Check the worn shaft hole of oil pump relief valve case, clogged oil passage, crank and other parts for faults.

6. Oil Pan and Strainer

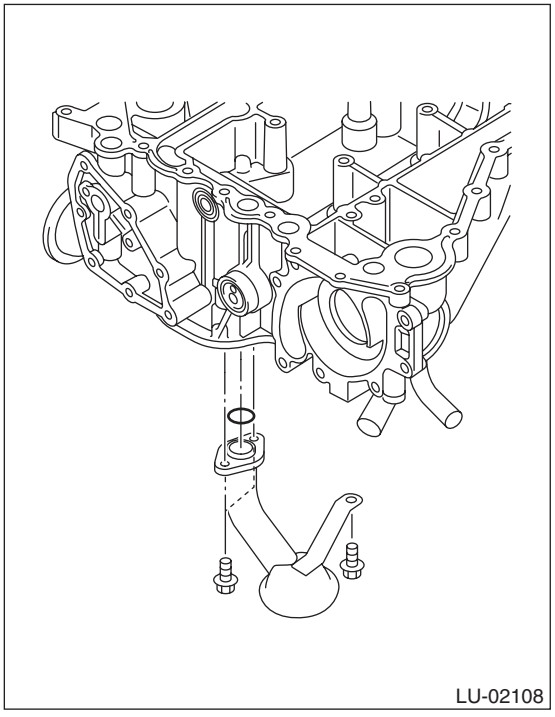
A: REMOVAL

NOTE:
Before removing the oil pan upper, remove the engine from vehicle. <Ref. to ME(H6DO)-31, REMOVAL, Engine Assembly.> <Ref. to ME(H6DO)-60, 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)-7, REPLACEMENT, Engine Oil.>
5) Insert the oil pan cutter blade between oil pan upper and oil pan lower.

CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.
6) Remove the oil pan lower.


LU-00123

7) Remove the oil strainer.

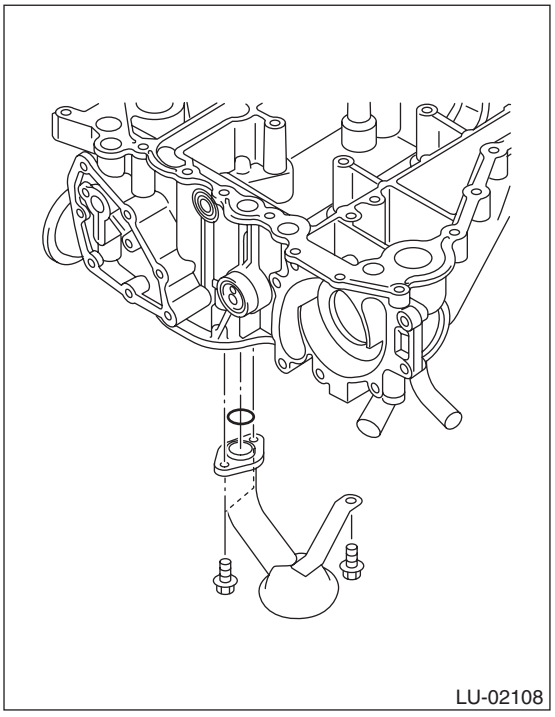

LU-02108

B: INSTALLATION

NOTE:
Before installing the oil pan, wipe clean the mating surface of oil pan lower and oil pan upper.
1) Install the oil strainer onto oil pan upper.

NOTE:
Use new O-rings.

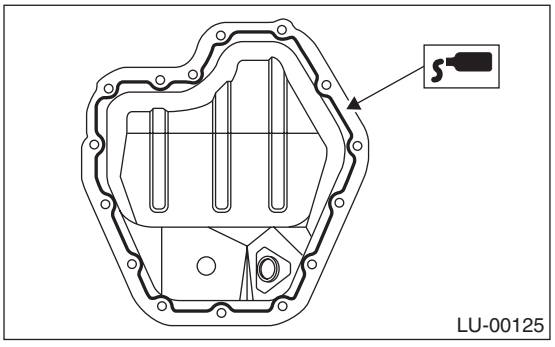
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


LU-02108

2) Apply liquid gasket to the mating surfaces, and install the oil pan.

Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

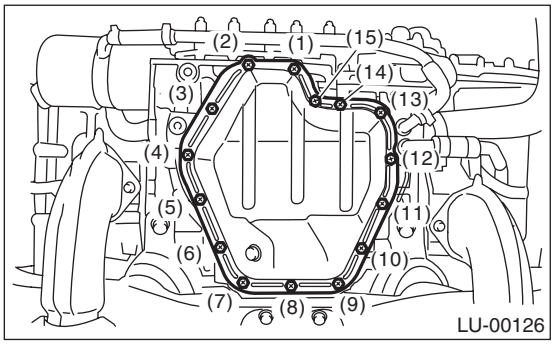
Applying liquid gasket diameter:
5.0±1.0 mm (0.197±0.039 in)



LU-00125

3) Tighten the oil pan lower installing bolts in the numerical order as shown in the figure.

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



4) Install the under cover.
5) Lower the vehicle.
6) Refill the engine oil. <Ref. to LU(H6DO)-7, INSPECTION, Engine Oil.>

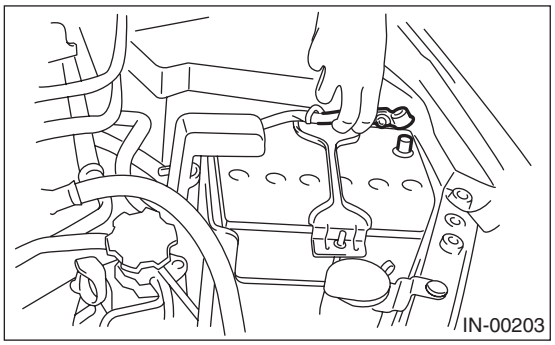
C: INSPECTION

Visually check that the oil pan, oil strainer and oil strainer stay are not damaged.

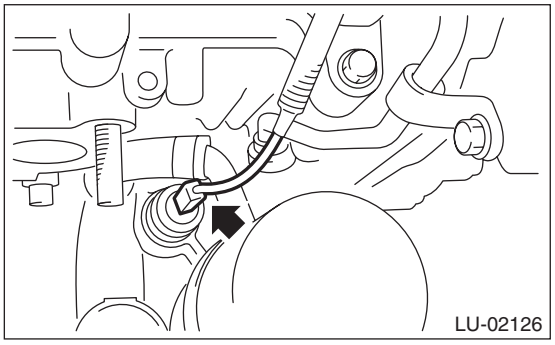
7. Oil Pressure Switch

A: REMOVAL

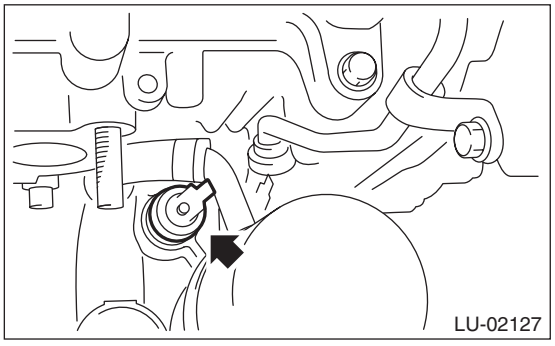
1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.



3) Lift up the vehicle.
4) Remove the under cover.
5) Disconnect the terminal from oil pressure switch.



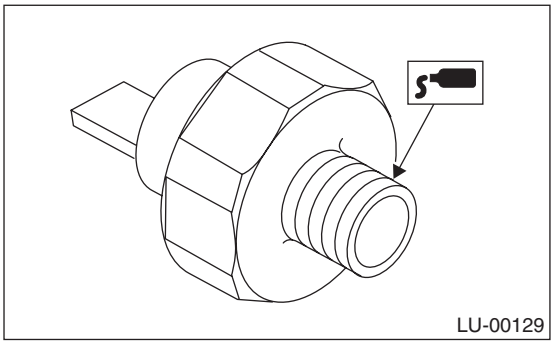
6) Remove the oil pressure switch.



B: INSTALLATION

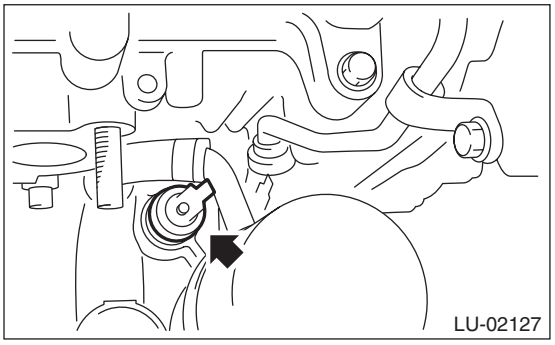
1) Apply liquid gasket to the oil pressure switch threads.

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

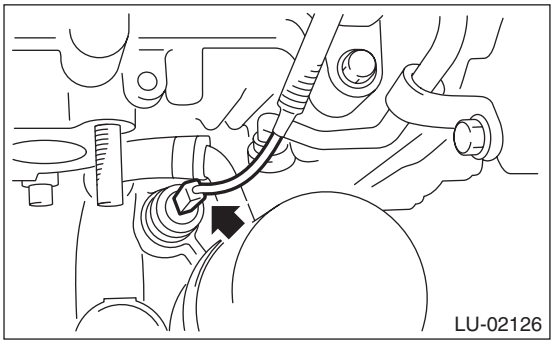


2) Install the oil pressure switch.

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.

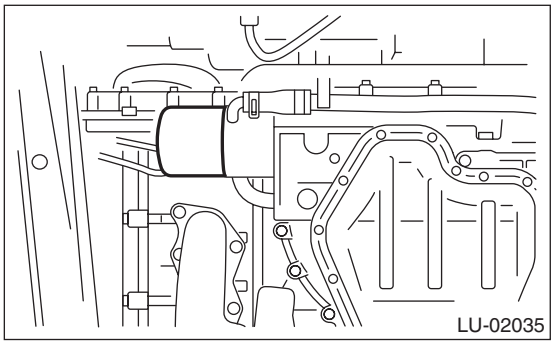
C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

8. Engine Oil Filter

A: REMOVAL

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)-7, REPLACEMENT, Engine Oil.>
5) Remove the oil filter using the ST.
ST 4985447000 OIL FILTER WRENCH



B: INSTALLATION

CAUTION:
Do not overtighten. Doing so may cause an oil 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 under cover.
6) Lower the vehicle.
7) Refill the engine oil. <Ref. to LU(H6DO)-7, INSPECTION, Engine Oil.>

C: INSPECTION

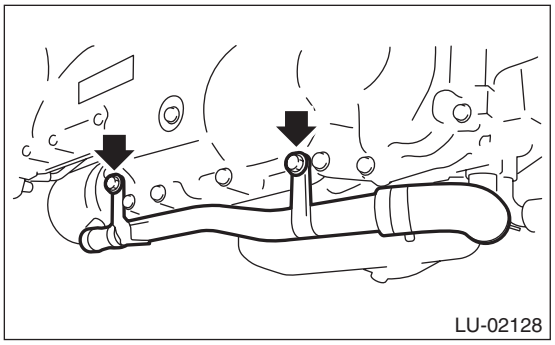
1) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

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)-7, INSPECTION, Engine Oil.>

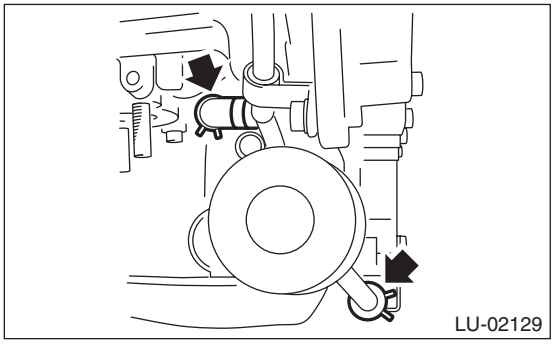
9. Oil Cooler

A: REMOVAL

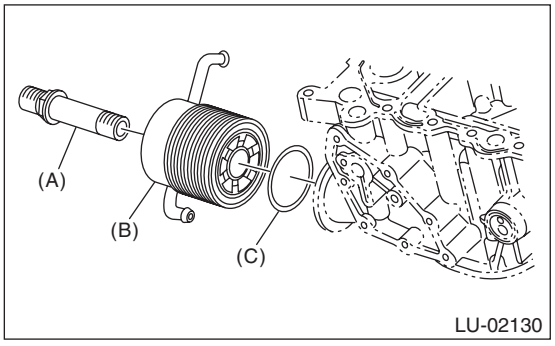
1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Remove the under cover.
4) Drain engine coolant. <Ref. to CO(H6DO)-10, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Drain the engine oil. <Ref. to LU(H6DO)-7, REPLACEMENT, Engine Oil.>
6) Remove the bolts which hold the water pipe to engine.


LU-02128

7) Disconnect the water hose from oil cooler.


LU-02129

8) Remove the oil filter using the ST. <Ref. to LU(H6DO)-15, REMOVAL, Engine Oil Filter.>
9) Remove the oil cooler connector and remove the oil cooler.



LU-02130

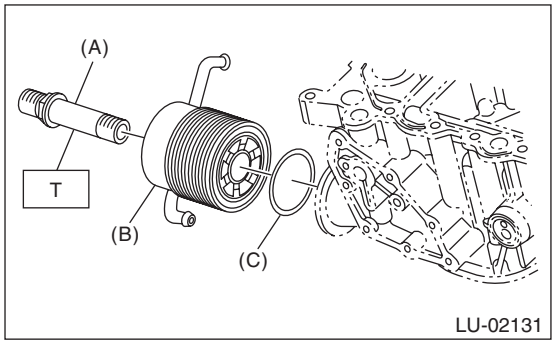
(A) Oil cooler connector
(B) Oil cooler
(C) Gasket

B: INSTALLATION

1) Install the oil cooler to oil pan upper with oil cooler connector.

NOTE:
Use a new gasket.

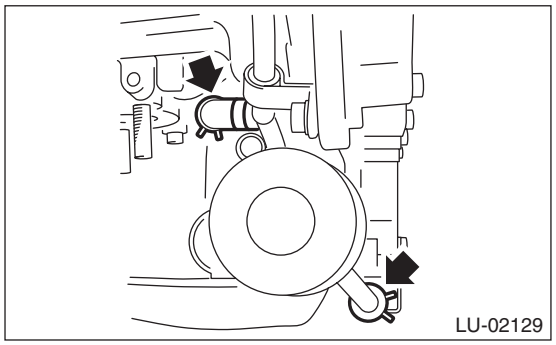
Tightening torque:
T: 54 N·m (5.5 kgf-m, 40 ft-lb)



LU-02131

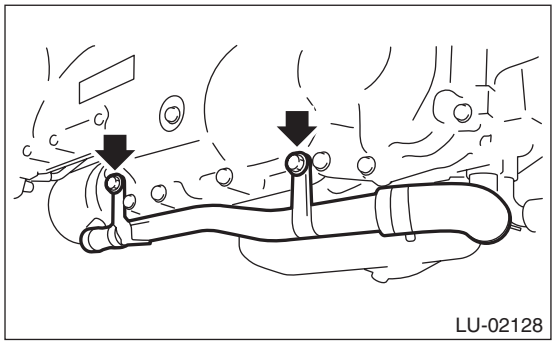
(A) Oil cooler connector
(B) Oil cooler
(C) Gasket

2) Install the oil filter. <Ref. to LU(H6DO)-15, INSTALLATION, Engine Oil Filter.>
3) Connect the water hose.


LU-02129

4) Install the water pipe onto engine.

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


LU-02128

5) Lower the vehicle.
6) Refill the engine oil. <Ref. to LU(H6DO)-7, REPLACEMENT, Engine Oil.>

7) Fill engine coolant. <Ref. to CO(H6DO)-10, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
8) Check the engine oil level. <Ref. to LU(H6DO)-7, 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.Engine Lubrication System Trouble in General

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.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil (including deterioration)	Replace.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	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
	Bore × Stroke mm (in)			89.2 × 80 (3.512 × 3.150)
	Displacement cm^3 (cu in)			3,000 (183)
	Compression ratio			10.7
	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 47°
			Close	ABDC 23°
		Max. retard	Open	ATDC 3°
			Close	ABDC 73°
	Exhaust valve timing		Open	BBDC 60°
			Close	ATDC 6°
	Valve clearance mm (in)	Intake		$0.20^{+0.04}_{-0.06}$ ($0.0079^{+0.0016}_{-0.0024}$)
		Exhaust		0.35±0.05 (0.0138±0.020)
	Idle rpm [“P” or “N” range] rpm		No load	650±50
			A/C ON	770±50
	Ignition order			1 → 6 → 3 → 2 → 5 → 4
	Ignition timing BTDC/rpm			15°±8°/650

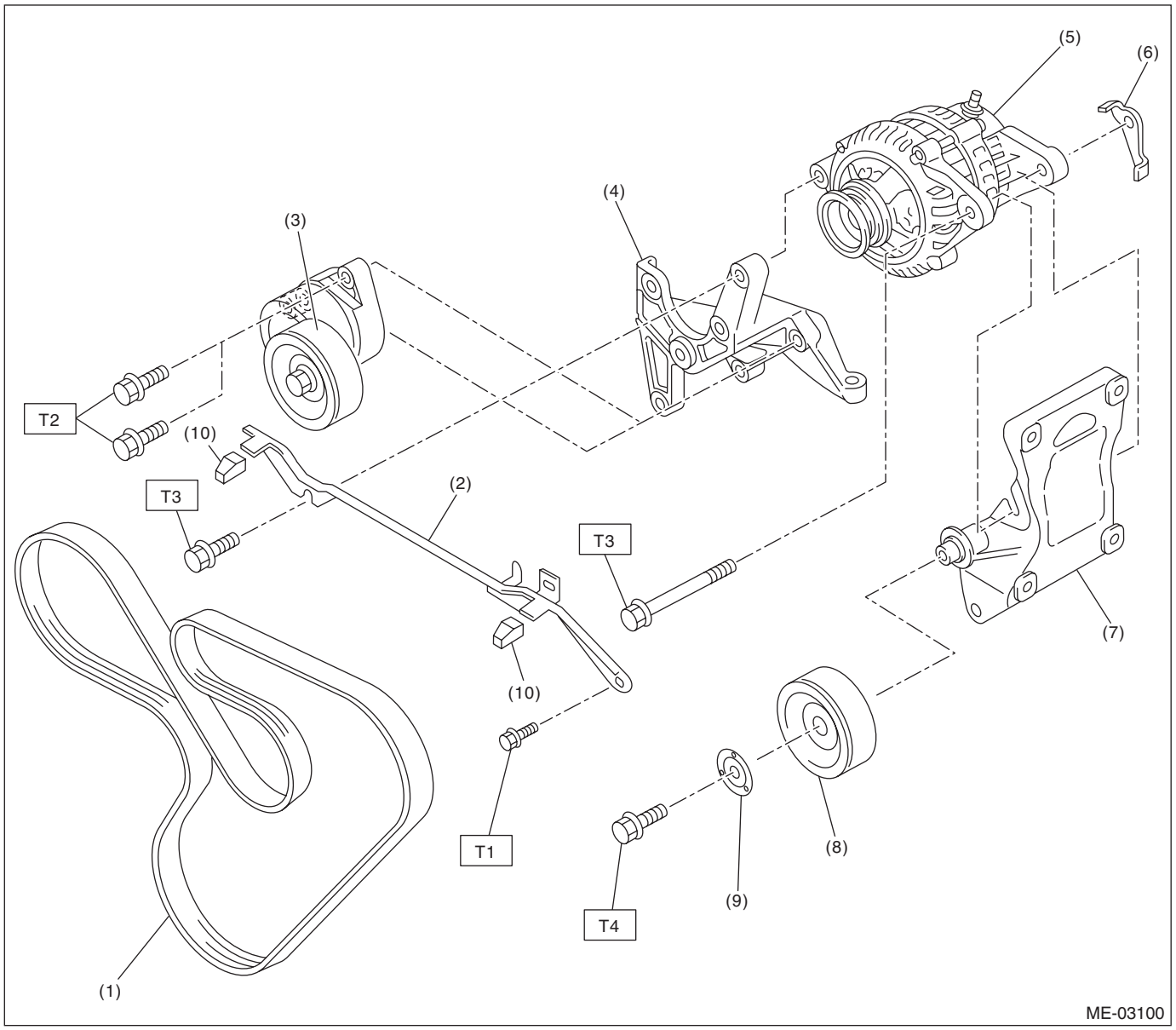
NOTE:
OS: Oversize US: Undersize

Camshaft	Side clearance mm (in)	Intake		Standard	0.075 — 0.135 (0.0030 — 0.0053)
		Exhaust		Standard	0.030 — 0.090 (0.0012 — 0.0035)
	Cam lobe height mm (in)	Intake	HIGH	Standard	42.09 — 42.19 (1.6571 — 1.6610)
			LOW1	Standard	38.14 — 38.24 (1.5016 — 1.5055)
			LOW2	Standard	34.94 — 35.04 (1.3756 — 1.3795)
		Exhaust		Standard	41.65 — 41.75 (1.6398 — 1.6437)
	Cam base circle diameter mm (in)	Intake	HIGH	Standard	32.00 (1.2598)
			LOW1	Standard	31.84 (1.2535)
			LOW2	Standard	31.84 (1.2535)
		Exhaust		Standard	32.00 (1.2598)
	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	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 mm (in)				11.4 — 11.8 (0.449 — 0.465)
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			99.7 (3.925)
		Exhaust			105.2 (4.142)
	Outer diameter of valve lifter mm (in)				32.959 — 32.975 (1.2976 — 1.2982)
Valve spring	Free length mm (in)	Intake		Inner	39.55 (1.5571)
				Outer	41.18 (1.6213)
		Exhaust			46.32 (1.8236)
	Squareness	Intake		Inner	2.5°, 1.7 mm (0.067 in) or less
				Outer	2.5°, 1.8 mm (0.071 in) or less
		Exhaust			2.5°, 2.0 mm (0.079 in) or less
Cylinder block	Standard height mm (in)				202 (7.95)
	Warping limit (Mating with cylinder head) mm (in)			Standard	0.02 (0.0008)
	Cylinder inner diameter mm (in)	Standard		A	89.205 — 89.215 (3.5120 — 3.5124)
				B	89.195 — 89.205 (3.5116 — 3.5120)
	Cylindricality 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)
	Cylinder inner diameter boring limit (diameter) mm (in)				To 89.715 (3.5321)
Piston	Outer diameter mm (in)	Standard		A	89.205 — 89.215 (3.5120 — 3.5124)
				B	89.195 — 89.205 (3.5116 — 3.5120)
		0.25 (0.0098) OS			89.445 — 89.465 (3.5215 — 3.5222)
		0.50 (0.0197) OS			89.695 — 89.715 (3.5313 — 3.5321)
	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 — 0.35 (0.0079 — 0.0138)
		Second ring		Standard	0.35 — 0.50 (0.0138 — 0.0197)
		Oil ring		Standard	0.20 — 0.60 (0.0079 — 0.0236)
	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	0.045 — 0.125 (0.0018 — 0.0049)
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		1.490 — 1.506 (0.0587 — 0.0593)
			0.03 (0.0012) US		1.509 — 1.513 (0.0594 — 0.0596)
			0.05 (0.0020) US		1.519 — 1.523 (0.0598 — 0.0600)
			0.25 (0.0098) US		1.619 — 1.623 (0.0637 — 0.0639)
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)
		Cylindricality mm (in)			0.006 (0.0002)
	Crank pin outer diameter mm (in)		Standard		51.984 — 52.000 (2.0466 — 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 — 64.008 (2.5194 — 2.5200)
			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 — 64.008 (2.5194 — 2.5200)
			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, #7	Standard		1.992 — 2.005 (0.0784 — 0.0789)
			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 — 2.009 (0.0786 — 0.0791)
			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)

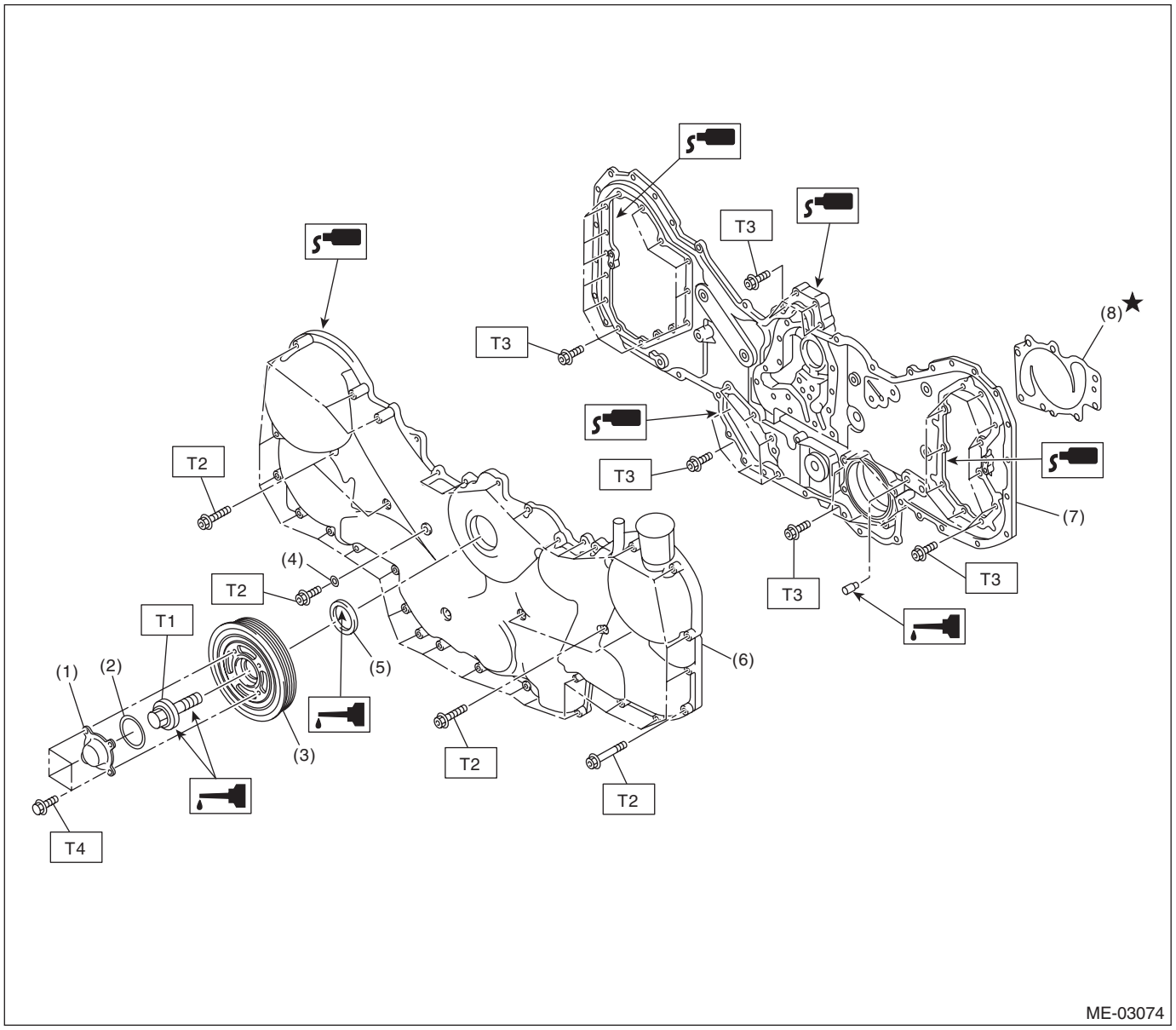
B: COMPONENT

1. V-BELT



(1)	V-belt	(6)	Generator plate	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Collector cover bracket	(7)	A/C compressor stay	***T1: 6.4 (0.65, 4.7)***
(3)	Belt tension adjuster ASSY	(8)	Idler pulley	***T2: 20 (2.0, 14)***
(4)	Power steering pump bracket	(9)	Idler pulley cover	***T3: 25 (2.5, 18.4)***
(5)	Generator	(10)	Cushion	***T4: 33 (3.4, 25)***

2. TIMING CHAIN COVER



(1) Crank pulley cover
(2) O-ring
(3) Crank pulley
(4) Sealing washer
(5) Oil seal
(6) Front chain cover
(7) Rear chain cover
(8) Water pump gasket

Tightening torque:N·m (kgf-m, ft-lb)

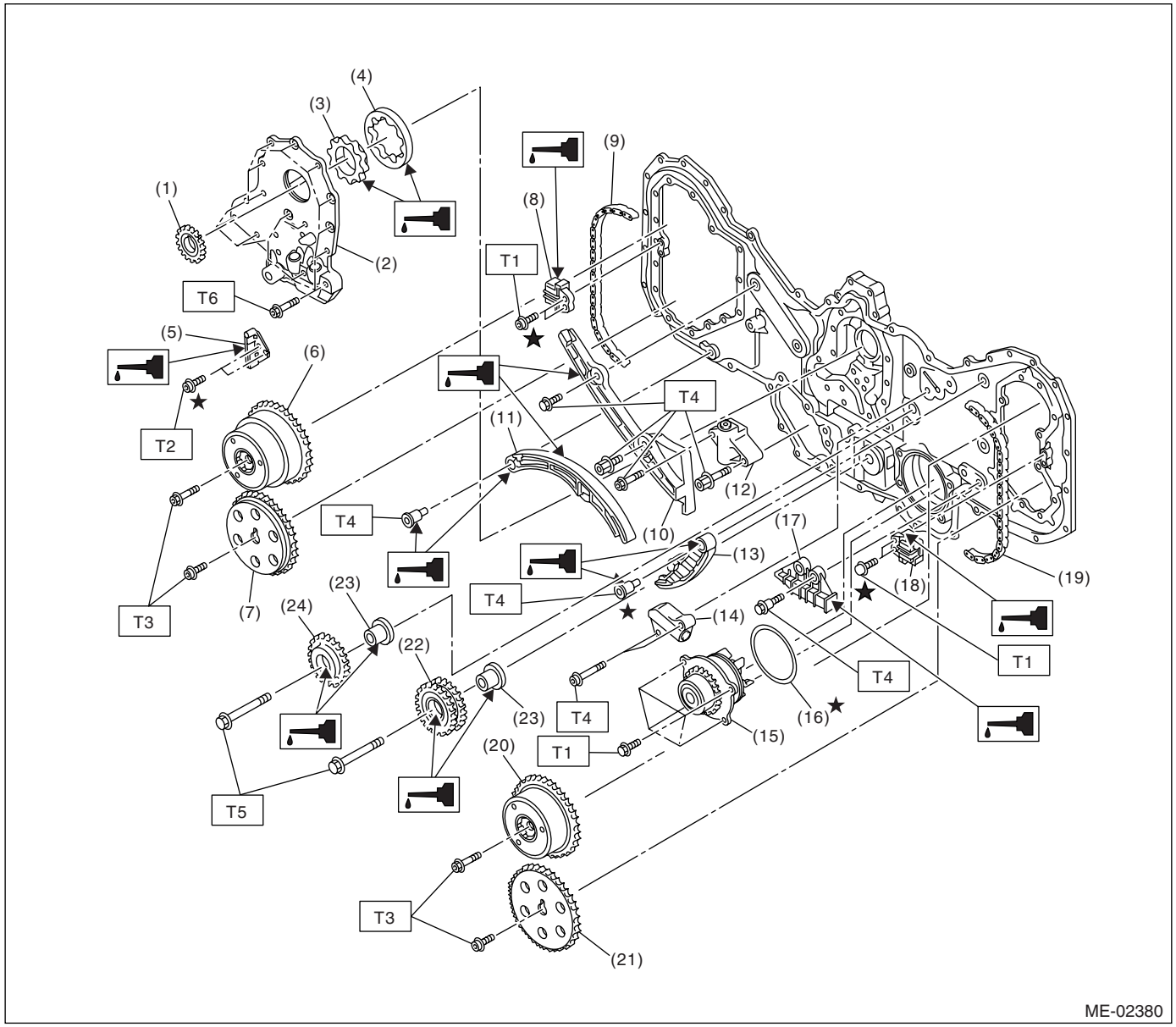
T1: <Ref. to ME(H6DO)-39, Crank Pulley.>

T2: <Ref. to ME(H6DO)-40, Front Chain Cover.>

T3: <Ref. to ME(H6DO)-49, Rear Chain Cover.>

T4: 6.4 (0.65, 4.7)

3. TIMING CHAIN

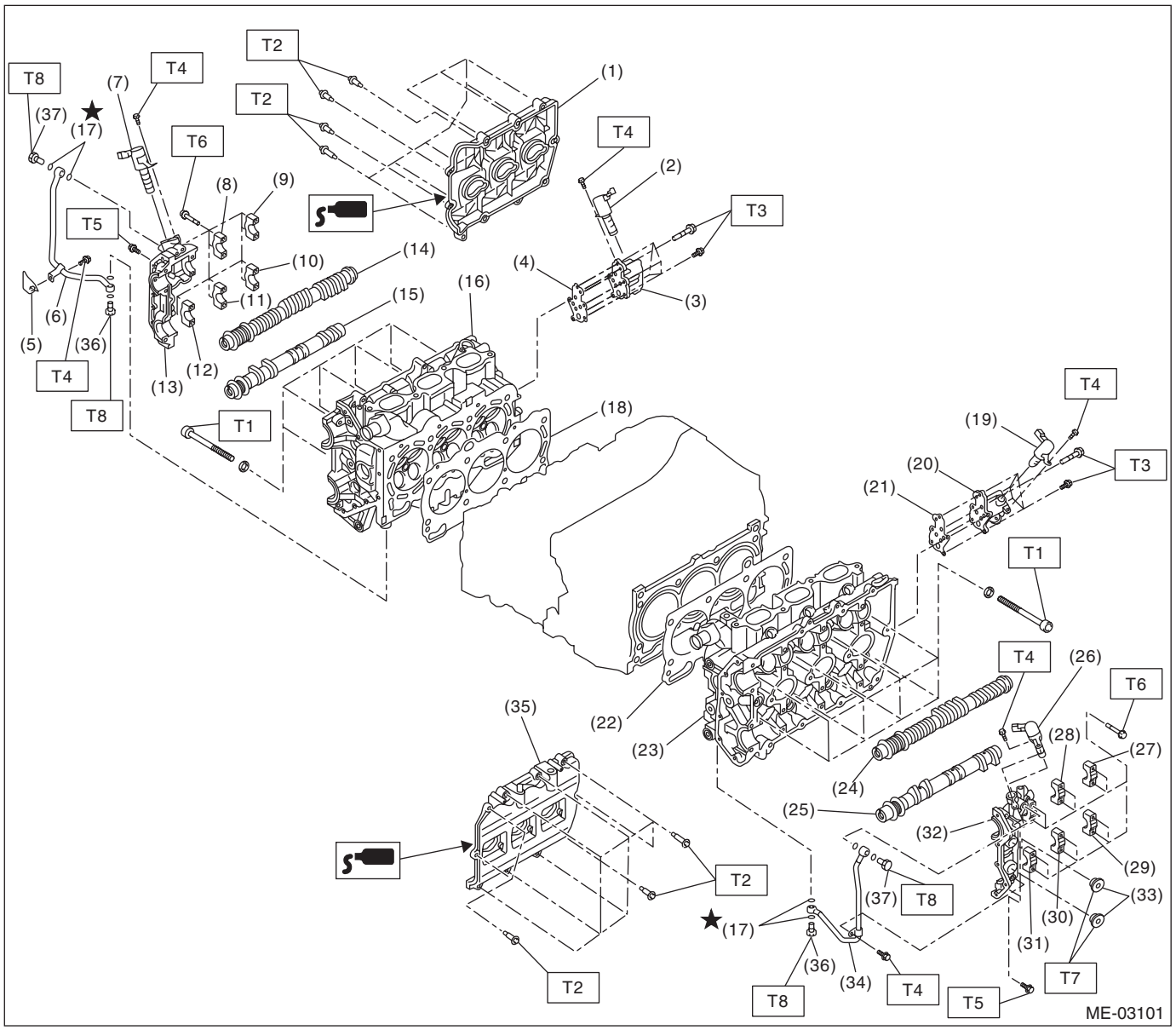


(1) Crank sprocket
(2) Oil relief case
(3) Inner rotor
(4) Outer rotor
(5) Chain guide (center)
(6) Intake cam sprocket (RH)
(7) Exhaust cam sprocket (RH)
(8) Chain guide (RH: between cams)
(9) Timing chain (RH)
(10) Chain guide (RH)
(11) Chain tensioner lever (RH)
(12) Chain tensioner (RH)
(13) Chain tensioner lever (LH)
(14) Chain tensioner (LH)
(15) Water pump
(16) O-ring
(17) Chain guide (LH)
(18) Chain guide (LH: between cams)
(19) Timing chain (LH)
(20) Intake cam sprocket (LH)
(21) Exhaust cam sprocket (LH)
(22) Idler sprocket (lower)
(23) Idler sprocket collar
(24) Idler sprocket (upper)

Tightening torque:N·m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)
T2: 7.8 (0.8, 5.8)
T3: <Ref. to ME(H6DO)-47, Cam Sprocket.>
T4: 16 (1.6, 12)
T5: 69 (7.0, 50.6)
T6: <Ref. to LU(H6DO)-8, Oil Pump.>

4. CYLINDER HEAD AND CAMSHAFT

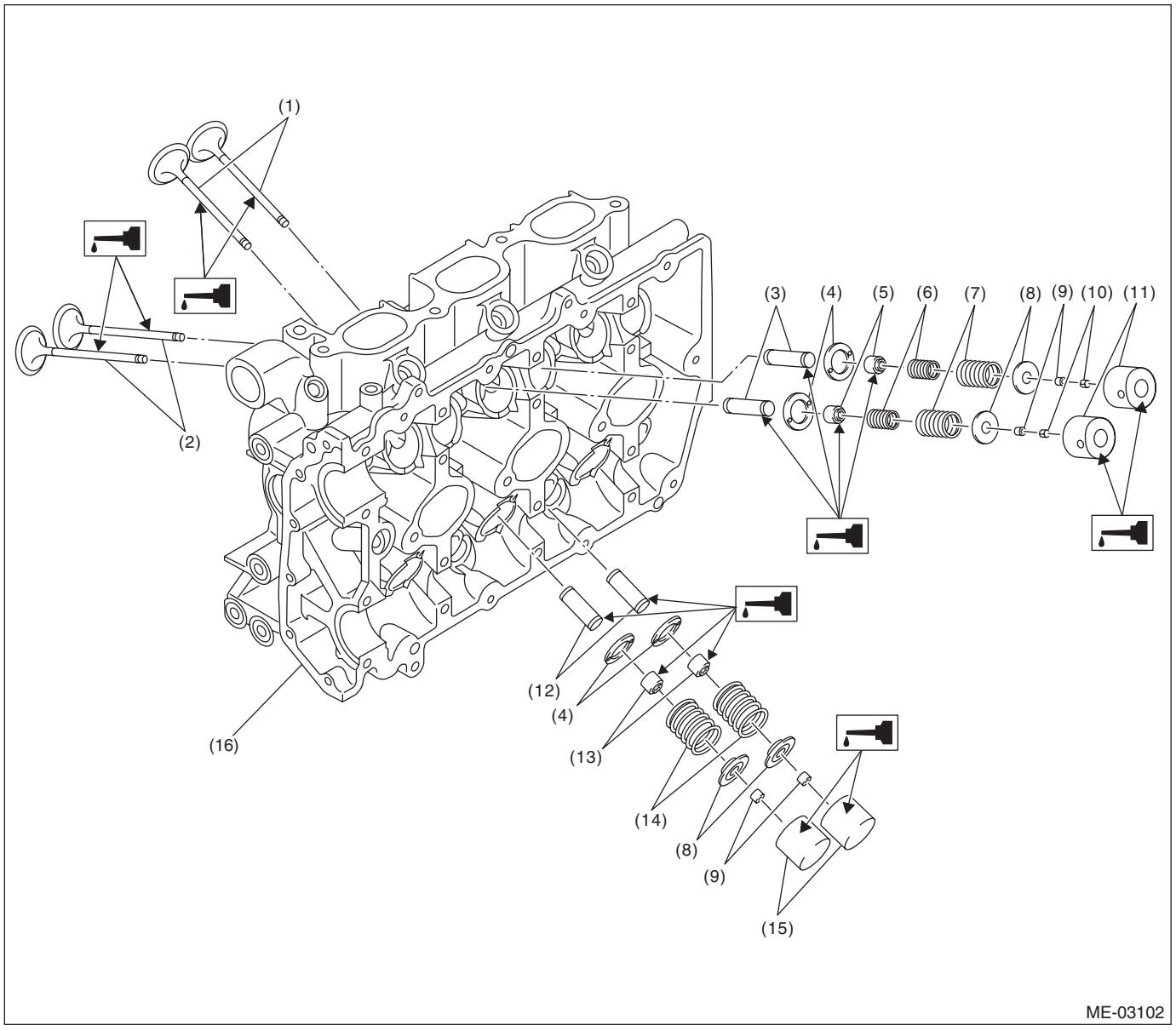


(1) Rocker cover (RH)
(2) Oil switching solenoid valve (RH)
(3) Oil switching solenoid valve holder (RH)
(4) Oil switching solenoid valve gasket (RH)
(5) Front chain cover
(6) Oil pipe (RH)
(7) Oil flow control solenoid valve (RH)
(8) Intake camshaft cap (Center RH)
(9) Intake camshaft cap (Rear RH)
(10) Exhaust camshaft cap (Rear RH)
(11) Exhaust camshaft cap (Center RH)
(12) Exhaust camshaft cap (Front RH)
(13) Front camshaft cap (RH)
(14) Intake camshaft (RH)
(15) Exhaust camshaft (RH)
(16) Cylinder head (RH)
(17) Gasket
(18) Cylinder head gasket (RH)
(19) Oil switching solenoid valve (LH)
(20) Oil switching solenoid valve holder (LH)
(21) Oil switching solenoid valve gasket (LH)
(22) Cylinder head gasket (LH)
(23) Cylinder head (LH)
(24) Intake camshaft (LH)
(25) Exhaust camshaft (LH)
(26) Oil flow control solenoid valve (LH)
(27) Intake camshaft cap (Rear LH)
(28) Intake camshaft cap (Center LH)
(29) Exhaust camshaft cap (Rear LH)
(30) Exhaust camshaft cap (Center LH)
(31) Exhaust camshaft cap (Front LH)
(32) Front camshaft cap (LH)
(33) Plug
(34) Oil pipe (LH)
(35) Rocker cover (LH)
(36) Union screw with filter (with protrusion)
(37) Union screw without filter (without protrusion)

Tightening torque:N·m (kgf-m, ft-lb)

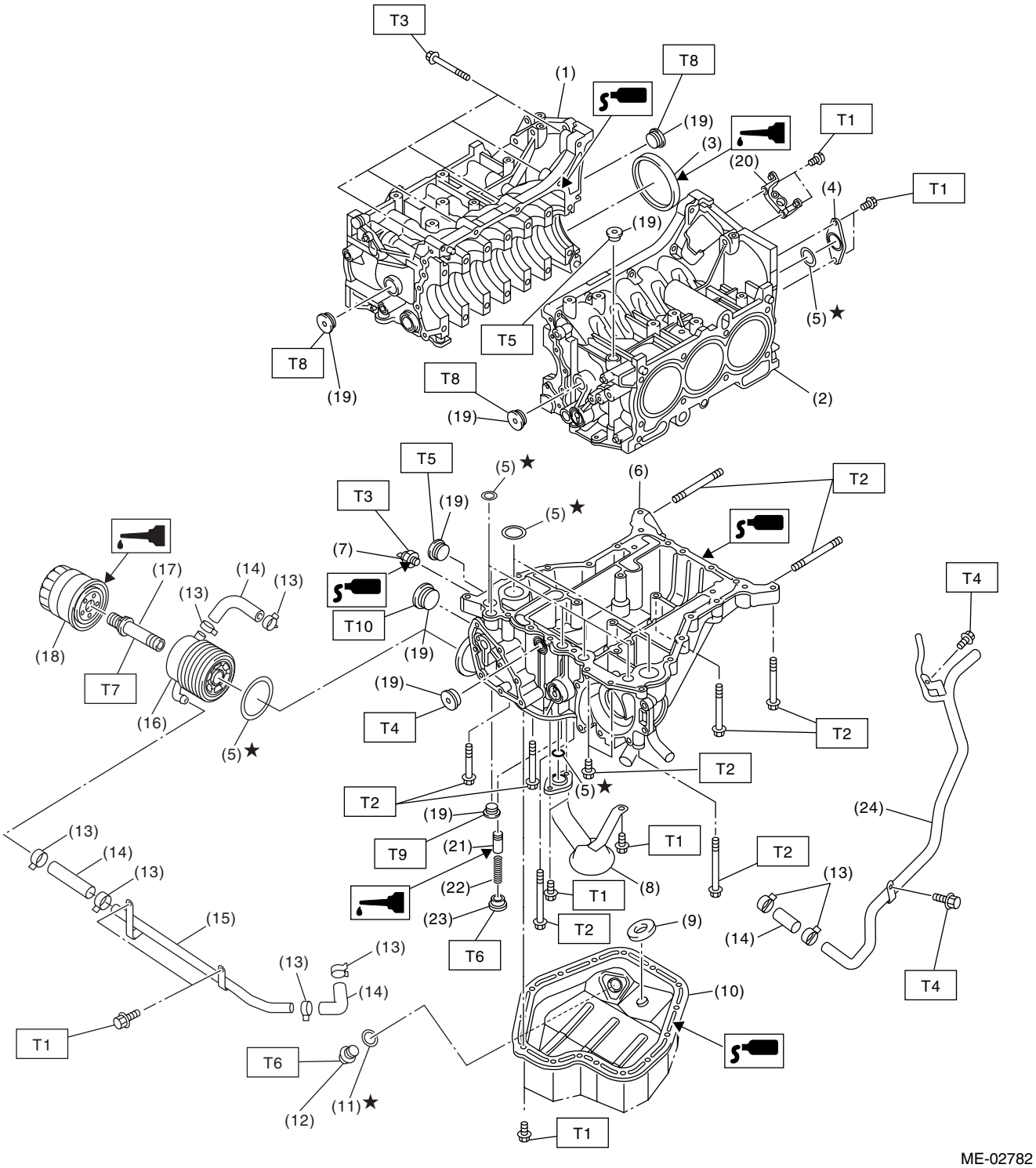
T1: <Ref. to ME(H6DO)-55, Cylinder Head.>
T2: <Ref. to ME(H6DO)-51, Camshaft.>
T3: <Ref. to ME(H6DO)-75, Oil Switching Solenoid Valve.>
T4: 6.4 (0.65, 4.7)
T5: 9.75 (1.0, 7.2)
T6: 16 (1.6, 12)
T7: 60 (6.1, 44)
T8: 29 (3.0, 21.4)

5. CLINDER HEAD AND VALVE ASSEMBLY



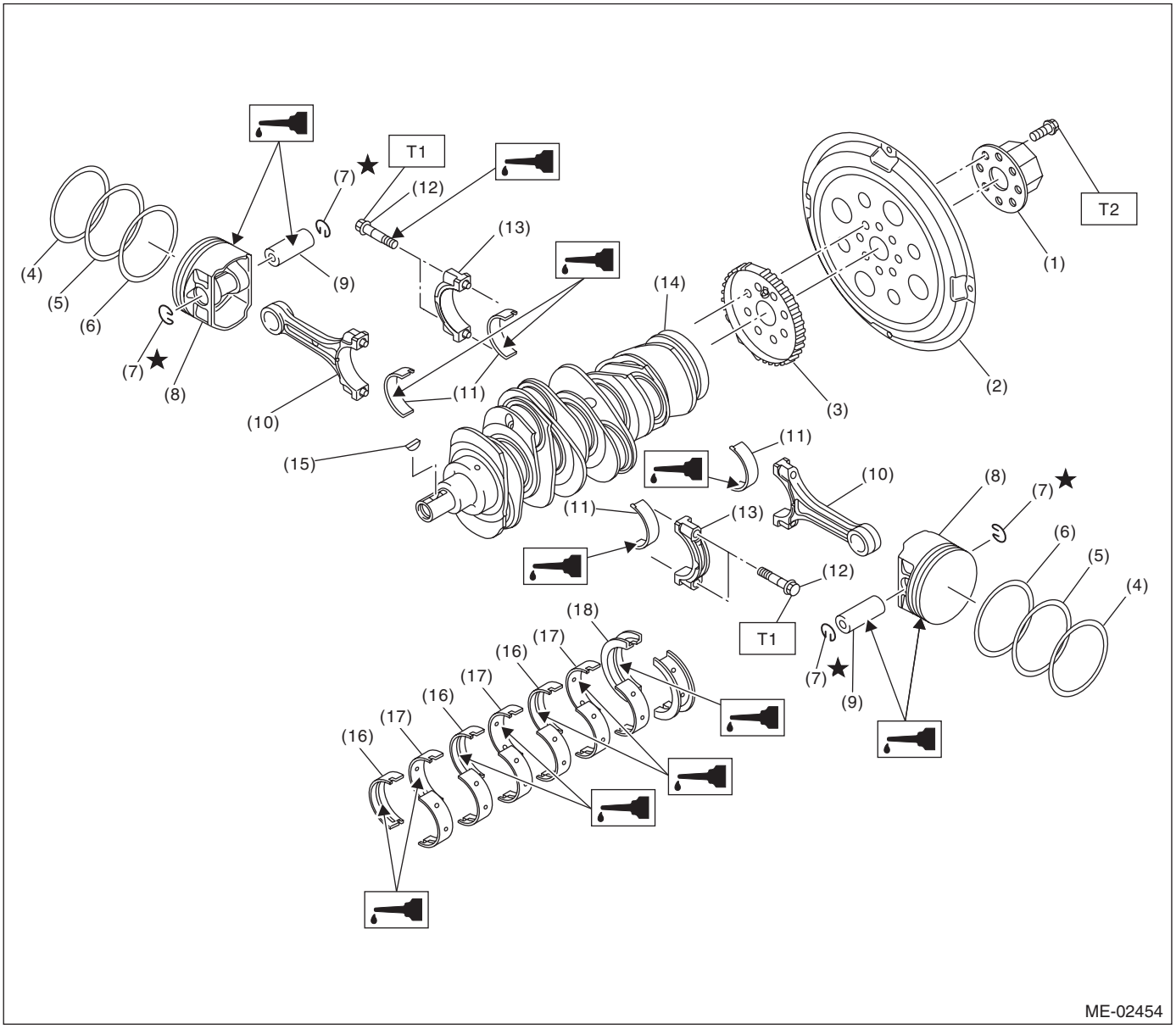
(1) Exhaust valve
(2) Intake valve
(3) Intake valve guide
(4) Valve spring seat
(5) Intake valve stem seal
(6) Valve spring (Inner)
(7) Valve spring (Outer)
(8) Retainer
(9) Retainer key
(10) Shim
(11) Valve lifter (Intake)
(12) Exhaust valve guide
(13) Exhaust valve stem seal
(14) Valve spring
(15) Valve lifter (Exhaust)
(16) Cylinder head

6. CYLINDER BLOCK



(1)	Cylinder block (RH)	(13)	Clamp	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Cylinder block (LH)	(14)	Hose	***T1: 6.4 (0.65, 4.7)***
(3)	Rear oil seal	(15)	Oil cooler pipe	***T2: 18 (1.8, 13.3)***
(4)	Service hole cover	(16)	Oil cooler	***T3: 25 (2.5, 18.4)***
(5)	O-ring	(17)	Connector	***T4: 16 (1.6, 12)***
(6)	Oil pan upper	(18)	Oil filter	***T5: 37 (3.8, 27)***
(7)	Oil pressure switch	(19)	Plug	***T6: 44 (4.5, 33)***
(8)	Oil strainer	(20)	Crankshaft position sensor holder	***T7: 54 (5.5, 40)***
(9)	Magnet	(21)	Relief valve	***T8: 70 (7.1, 52)***
(10)	Oil pan lower	(22)	Relief valve spring	***T9: 23 (2.3, 17)***
(11)	Metal gasket	(23)	Plug	***T10: 90 (9.2, 67)***
(12)	Drain plug	(24)	Water pipe	

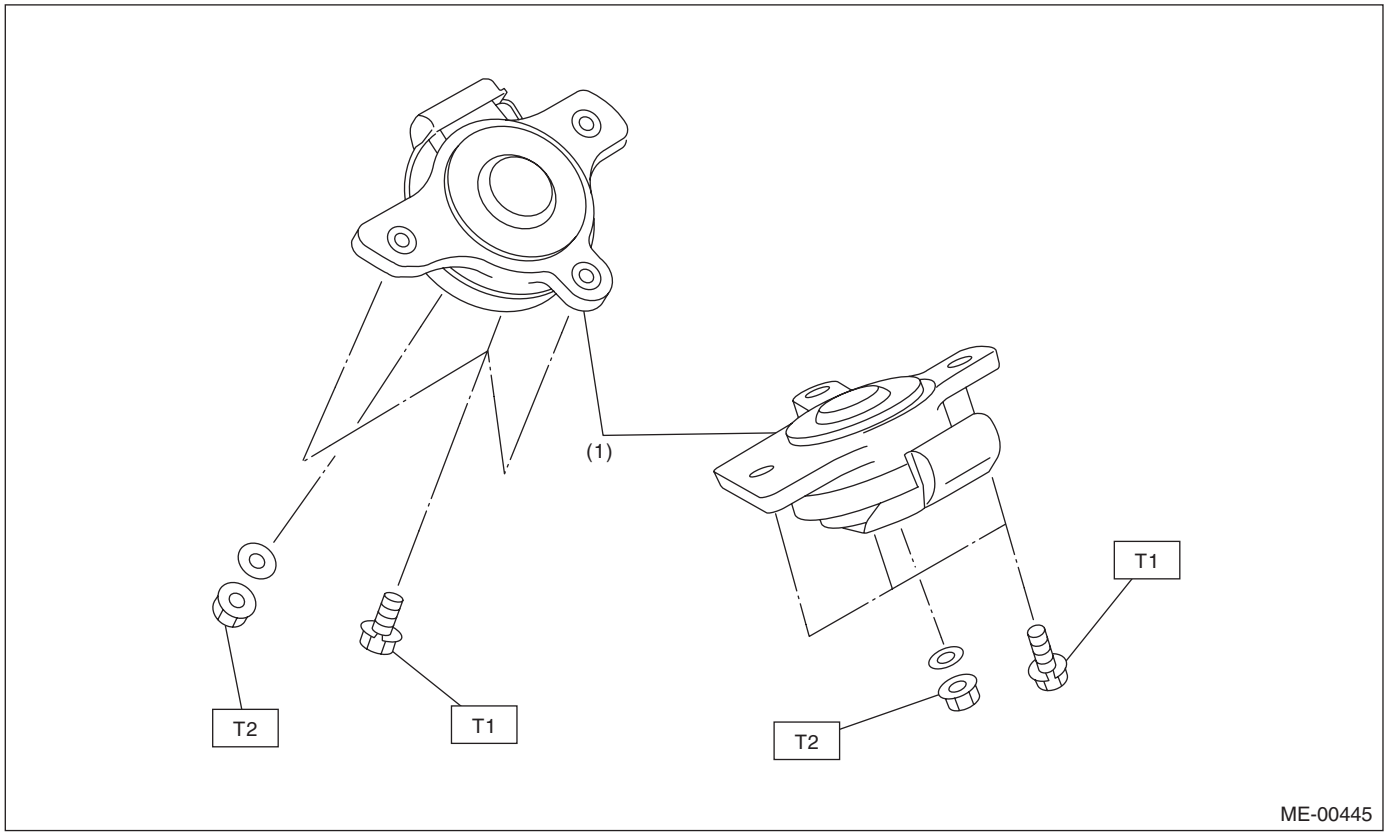
7. CRANKSHAFT AND PISTION



(1) Reinforcement
(2) Drive plate
(3) Crankshaft sensor plate
(4) Top ring
(5) Second ring
(6) Oil ring
(7) Snap ring
(8) Piston
(9) Piston pin
(10) Connecting rod
(11) Connecting rod bearing
(12) Connecting rod bolt
(13) Connecting rod cap
(14) Crankshaft
(15) Woodruff key
(16) Crankshaft bearing #1, #3, #5
(17) Crankshaft bearing #2, #4, #6
(18) Crankshaft bearing #7

Tightening torque:N·m (kgf-m, ft-lb)
T1: 53 (5.4, 39)
T2: 81 (8.3, 60)

8. ENGINE MOUNTING



(1) Front cushion rubber

Tightening torque:N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 85 (8.7, 63)

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.
- 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

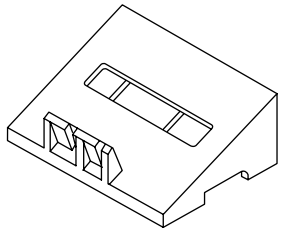
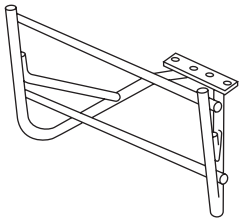
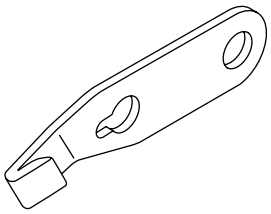
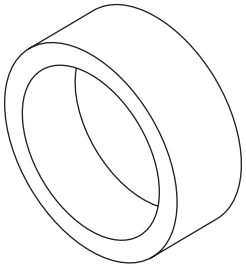
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18250AA010	18250AA010	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve spring.
 ST18232AA000	18232AA000	ENGINE STAND	Used for disassembling and assembling engine.
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for removing and installing the flywheel and the drive plate.
 ST18254AA000	18254AA000	PISTON GUIDE	Used for installing piston in cylinder.

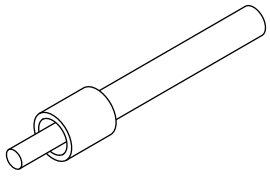
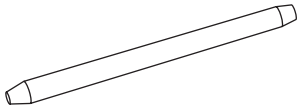
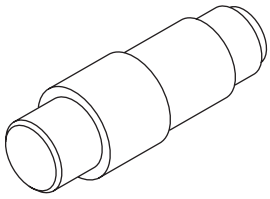
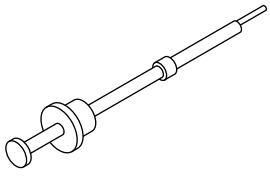
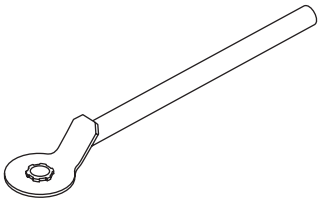
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499585500	499585500	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST18253AA000	18253AA000	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST18350AA000	18350AA000	CONNECTING ROD BUSHING REMOVER AND INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket.

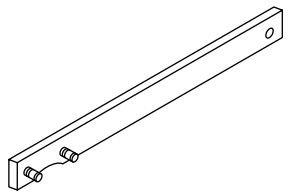
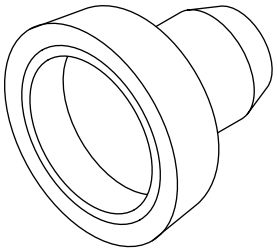
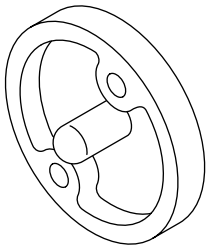
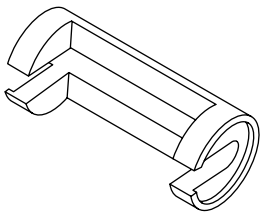
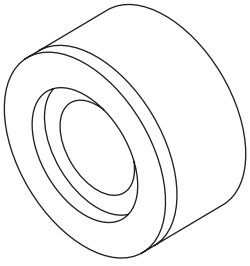
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18231AA020	18231AA020	CAM SPROCKET WRENCH	Used for removing and installing exhaust cam sprocket.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used together with the CRANKSHAFT OIL SEAL GUIDE (499597100).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used together with the CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA040	18251AA040	VALVE GUIDE ADJUSTER	Used for installing valve guides.

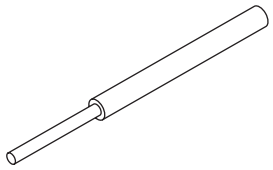
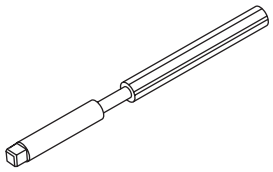
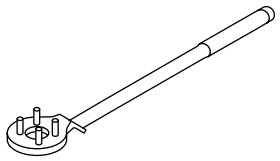
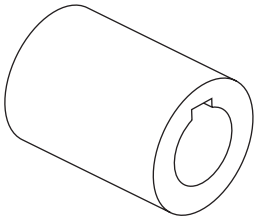
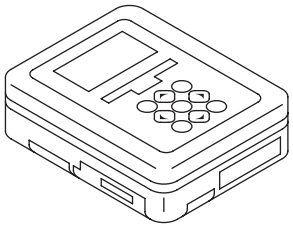
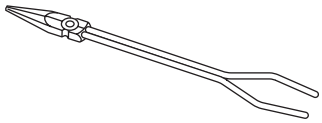
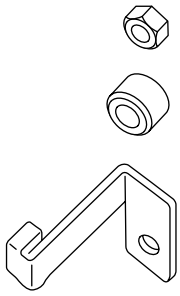
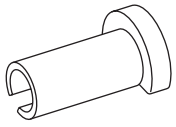
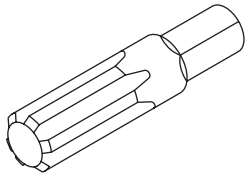
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499765700	499765700	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499765900	499765900	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening/tightening crank pulley bolt.
 ST18252AA000	18252AA000	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting the electrical system.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18233AA000	18233AA000	PISTON PIN SNAP RING PLIERS	Used for removing and installing snap ring of piston pin.
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for disconnecting quick connector of the engine compartment.
 ST-499057000	499057000	TORX PLUS®	Used for removing and installing the flywheel (dual mass flywheel type) and the drive plate.

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.
Timing light	Used for measuring ignition timing.

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
- Camshaft
- Cylinder head

2. Compression

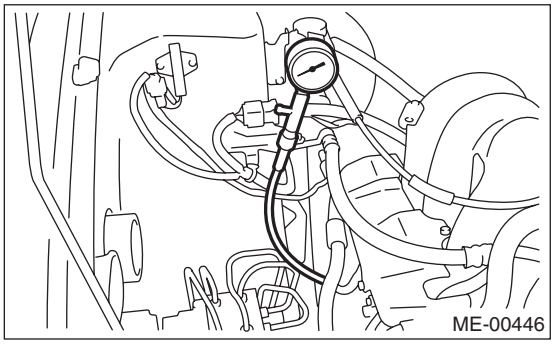
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release the fuel pressure. <Ref. to FU(H6DO)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
5) Check the starter motor for satisfactory performance and operation.
6) 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.

7) Fully open the throttle valve.
8) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.



9) 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)

3. Idle Speed

A: INSPECTION

1) Before checking the idle speed, check the following item:
   (1) Check the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and hoses are connected properly.
   (2) Check the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn the ignition switch to OFF.
4) Connect the Subaru Select Monitor to the data link connector.
5) Turn the ignition switch to ON and run Subaru Select Monitor.
6) Select {Each System Check} in Main Menu.
7) Select {Engine Control System} in Selection Menu.
8) Select {Current Data Display & Save} in Engine Control System Diagnosis.
9) Select {Data Display} in Data Display Menu.
10) Start the engine, and read the engine idle speed.
11) 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]:
650±50 rpm

12) Check the idle speed when loaded. (Turn the A/C switch to "ON" and operate the compressor for at least one minute before measurement.)

Idle speed [A/C ON and gears in "P" or "N" range]:
770±50 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 On-board 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. METHOD WITH SUBARU SELECT MONITOR

1) Before checking the ignition timing, check the following item:
   (1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.
   (2) Check the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn the ignition switch to OFF.
4) Connect the Subaru Select Monitor to the data link connector.
5) Turn the ignition switch to ON and run the Subaru Select Monitor.
6) Select {Each System Check} in Main Menu.
7) Select {Engine Control System} in Selection Menu.
8) Select {Current Data Display & Save} in Engine Control System Diagnosis.
9) Select {Data Display} in Data Display Menu.
10) Start the engine and check the ignition timing at idle speed.

Ignition timing [BTDC/rpm]:
15°±8°/650

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.>

2. METHOD WITH TIMING LIGHT

1) Before checking the ignition timing, check the following item:
   (1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.
   (2) Check the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn the ignition switch to OFF.
4) Remove the air cleaner case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.>
5) Connect the timing light to the power wire of #1 ignition coil.
6) Install the air cleaner case. <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner Case.>
7) Start the engine, turn the timing light to the crank pully, and check the ignition timing by means of crank pully indicator.

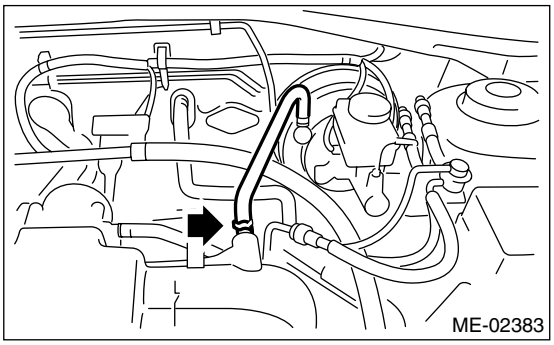
Ignition timing [BTDC/rpm]:
15°±8°/650

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) Warm-up the engine.
2) Disconnect the brake 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):
Less than –60.0 kPa (–450 mmHg, –17.72 inHg)

Diagnosis of engine condition by measurement of intake manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than 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 or throttle chamber idle adjustment

6. Engine Oil Pressure

A: INSPECTION

1) Remove the oil pressure switch from the cylinder block. <Ref. to LU(H6DO)-14, REMOVAL, Oil Pressure Switch.>
2) Connect the oil pressure gauge hose to the cylinder block.
3) Connect the battery ground cable to the battery.
4) Start the engine, and measure the oil pressure.

OIL PRESSURE (at oil temperature of 80°C (176°F)):
Standard:
135 kPa (1.4 kgf/cm^2, 20 psi) or more (at 600 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 oil pump, oil filter and lubrication line. <Ref. to LU(H6DO)-18, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is ON and oil pressure is within specification, check the oil pressure switch. <Ref. to LU(H6DO)-18, INSPECTION, Engine Lubrication System Trouble in General.>

5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H6DO)-14, INSTALLATION, Oil Pressure Switch.>

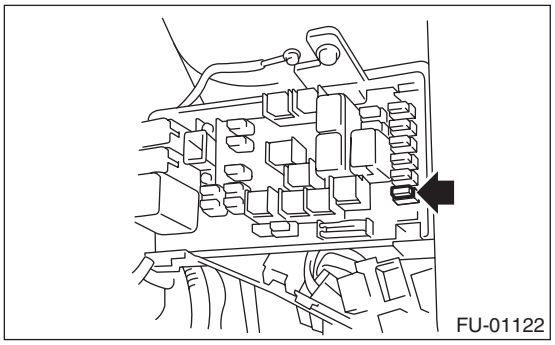
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

7. Fuel Pressure

A: INSPECTION

WARNING:
Before removing the fuel pressure gauge, release the fuel pressure.

NOTE:
If the fuel pressure is out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.
1) Release the fuel pressure. <Ref. to FU(H6DO)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid, and remove the fuel filler cap.
3) Disconnect the fuel delivery hose and connect fuel pressure gauge.
4) Install the fuse of fuel pump to main fuse box.



5) Start the engine.
6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard: 333 — 363 kPa (3.4 — 3.7 kgf/cm^2, 48 — 53 psi)

7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard: 279 — 309 kPa (2.85 — 3.15 kgf/cm^2, 40 — 45 psi)

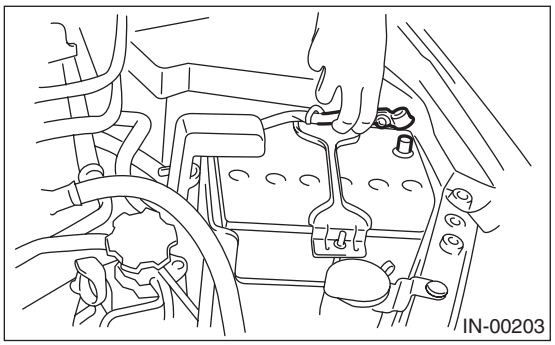
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

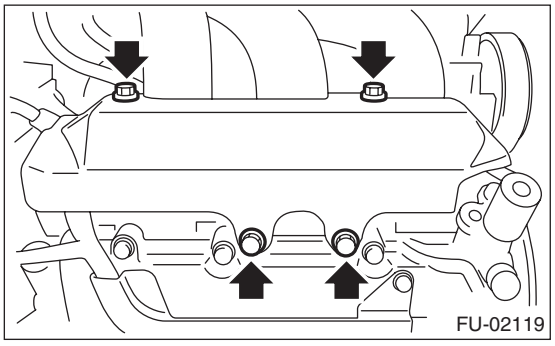
A: INSPECTION

NOTE:
Inspection and adjustment of valve clearance should be performed while engine is cold.

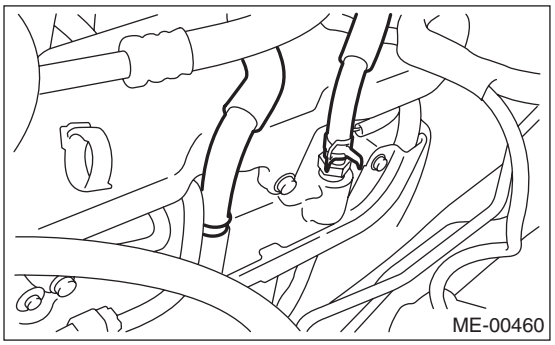
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.



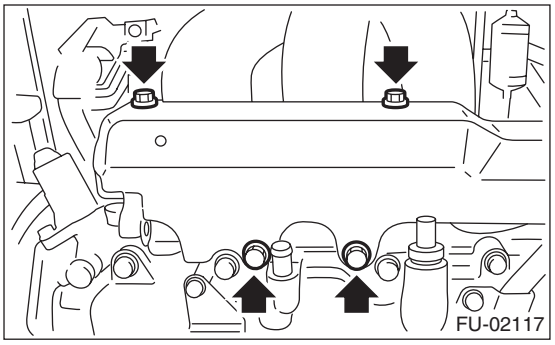
4) Lift the vehicle.
5) Remove the under cover.
6) Lower the vehicle.
7) When inspecting RH side cylinders:
   (1) Remove the air intake duct and air cleaner case. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.> <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.>
   (2) Remove the fuel pipe protector (RH).



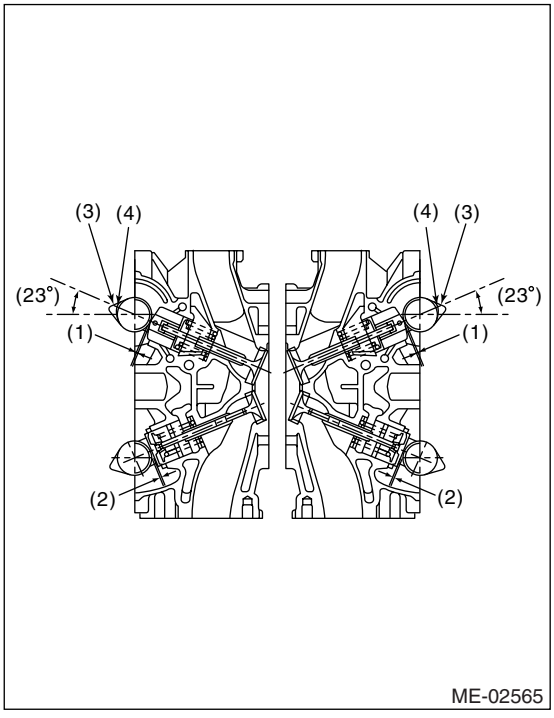
   (3) Disconnect the connector of oil pressure switch.
   (4) Remove the ignition coil. <Ref. to IG(H6DO)-7, REMOVAL, Ignition Coil.>
   (5) Remove the rocker cover (RH).
8) When inspecting LH side cylinders:
   (1) Disconnect the battery cable, and then remove the battery and battery carrier.
   (2) Disconnect 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).
9) Turn the crankshaft clockwise until the cam is set to position shown in the figure.



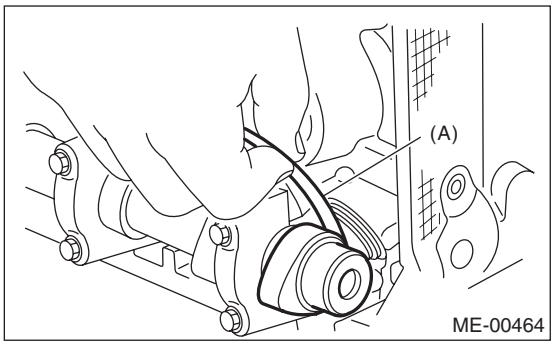
(1) Valve clearance (Intake side)
(2) Valve clearance (Exhaust side)
(3) High lift cam
(4) Low lift cam

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.
• Measure it in low lift cam for intake side.
• 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)-28, 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.

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.
• When installing the valve lifter, align the anti-rotation of valve lifter with groove on cylinder head, and insert the valve lifter.

1) Measure all the valve clearances. <Ref. to ME(H6DO)-27, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after measurement.

2) Remove the camshaft. <Ref. to ME(H6DO)-51, REMOVAL, Camshaft.>
3) Remove the valve lifter.
4) Remove the shim from valve lifter.
5) Check the thickness of the shim from the markings on the side of the shim that was removed.
6) Select a shim of suitable thickness from the following table using the measured valve clearance and shim thickness.

Unit: (mm)
S = (V + T) – 0.20
S: Required shim thickness V: Measured valve clearance T: Shim thickness to be used

Part No.	Thickness mm (in)
13218AK890	1.92 (0.0756)
13218AK900	1.94 (0.0764)
13218AK910	1.96 (0.0772)
13218AK920	1.98 (0.0780)
13218AK930	2.00 (0.0787)
13218AK940	2.02 (0.0795)
13218AK950	2.04 (0.0803)
13218AK960	2.06 (0.0811)
13218AK970	2.07 (0.0815)
13218AK980	2.08 (0.0819)
13218AK990	2.09 (0.0823)
13218AL000	2.10 (0.0827)
13218AL010	2.11 (0.0831)
13218AL020	2.12 (0.0835)
13218AL030	2.13 (0.0839)
13218AL040	2.14 (0.0843)
13218AL050	2.15 (0.0846)
13218AL060	2.16 (0.0850)
13218AL070	2.17 (0.0854)
13218AL080	2.18 (0.0858)
13218AL090	2.19 (0.0862)
13218AL100	2.20 (0.0866)
13218AL110	2.21 (0.0870)
13218AL120	2.22 (0.0874)
13218AL130	2.23 (0.0878)
13218AL140	2.24 (0.0882)
13218AL150	2.25 (0.0886)
13218AL160	2.26 (0.0890)
13218AL170	2.27 (0.0894)
13218AL180	2.28 (0.0898)
13218AL190	2.29 (0.0902)
13218AL200	2.30 (0.0906)
13218AL210	2.31 (0.0909)
13218AL220	2.32 (0.0913)
13218AL230	2.33 (0.0917)
13218AL240	2.34 (0.0921)
13218AL250	2.35 (0.0925)
13218AL260	2.36 (0.0929)
13218AL270	2.37 (0.0933)
13218AL280	2.38 (0.0937)
13218AL290	2.39 (0.0941)
13218AL300	2.40 (0.0945)
13218AL310	2.41 (0.0949)
13218AL320	2.42 (0.0953)
13218AL330	2.43 (0.0957)
13218AL340	2.44 (0.0961)
13218AL350	2.45 (0.0965)
13218AL360	2.46 (0.0969)
13218AL370	2.47 (0.0972)
13218AL380	2.48 (0.0976)
13218AL390	2.49 (0.0980)
13218AL400	2.50 (0.0984)
13218AL410	2.51 (0.0988)
13218AL420	2.52 (0.0992)
13218AL430	2.53 (0.0996)
13218AL440	2.54 (0.1000)
13218AL450	2.55 (0.1004)
13218AL460	2.56 (0.1008)
13218AL470	2.57 (0.1012)
13218AL480	2.58 (0.1016)
13218AL490	2.59 (0.1020)
13218AL500	2.60 (0.1024)
13218AL510	2.61 (0.1028)
13218AL520	2.62 (0.1032)
13218AL530	2.64 (0.1039)
13218AL540	2.66 (0.1047)
13218AL550	2.68 (0.1055)
13218AL560	2.70 (0.1063)
13218AL570	2.72 (0.1071)
13218AL580	2.74 (0.1079)
13218AL590	2.76 (0.1087)

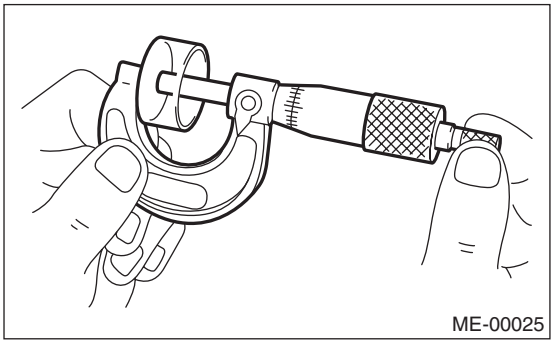
2. EXHAUST SIDE

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 the valve clearances. <Ref. to ME(H6DO)-27, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after measurement.

2) Remove the camshaft. <Ref. to ME(H6DO)-51, REMOVAL, Camshaft.>
3) Remove the valve lifter.
4) Measure the thickness of valve lifter using micrometer.


ME-00025

5) Select a valve lifter of suitable thickness from the following table using the measured valve clearance and valve lifter thickness.

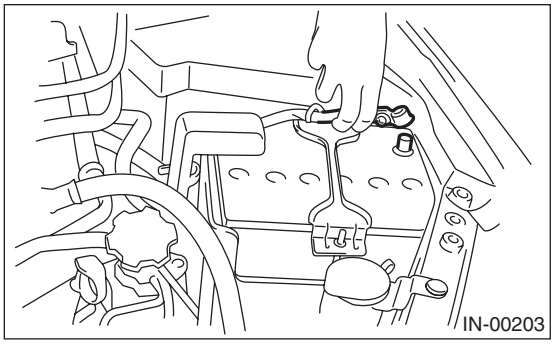
Unit: (mm)
S = (V + T) – 0.35
S: Valve lifter thickness required V: Measured valve clearance T: Valve lifter thickness to be used

Part No.	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)
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)

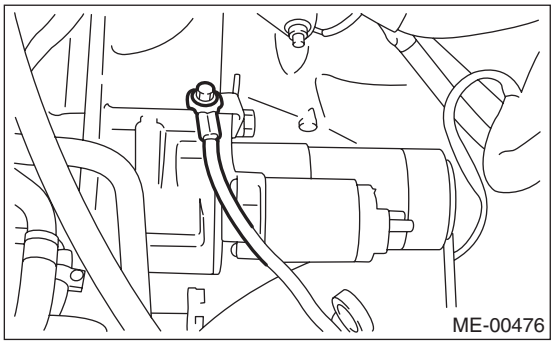
9. Engine Assembly

A: REMOVAL

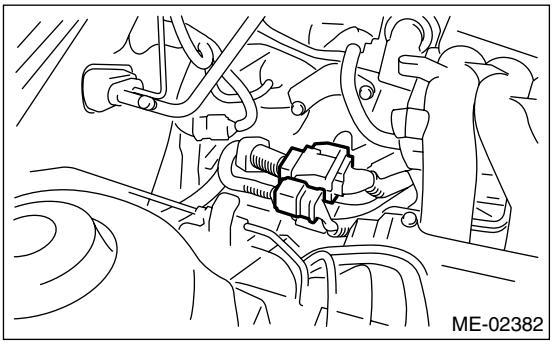
1) Set the vehicle on a lift.
2) Open the front hood fully and support with the front food stay.
3) Remove the collector cover.
4) Collect the refrigerant from the A/C system. <Ref. to AC-19, PROCEDURE, Refrigerant Recovery Procedure.>
5) Release the fuel pressure. <Ref. to FU(H6DO)-38, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
6) Remove the fuel filler cap.
7) Remove the battery.


IN-00203

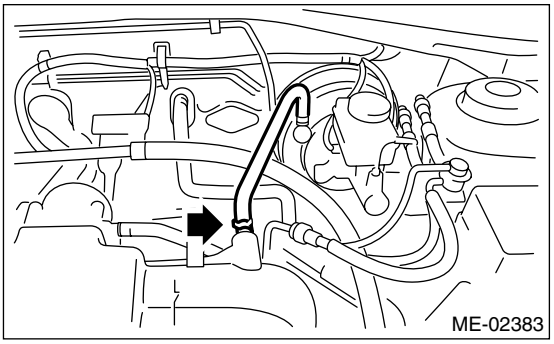
8) Remove the air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.> <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
9) Remove the radiator from vehicle. <Ref. to CO(H6DO)-15, REMOVAL, Radiator.>
10) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
11) Disconnect the A/C pressure hoses from the A/C compressor. <Ref. to AC-37, REMOVAL, Hose and Tube.>
12) Remove the engine ground terminal.


ME-00476

13) Disconnect the following connector.
(1) Engine harness connectors

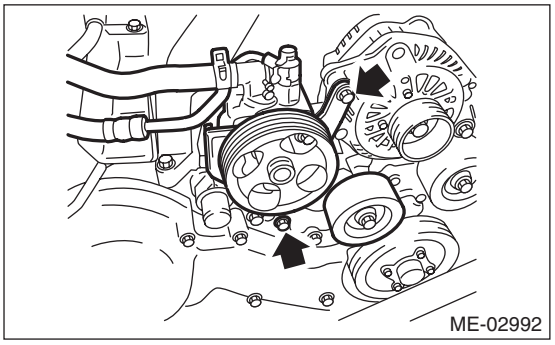

ME-02382

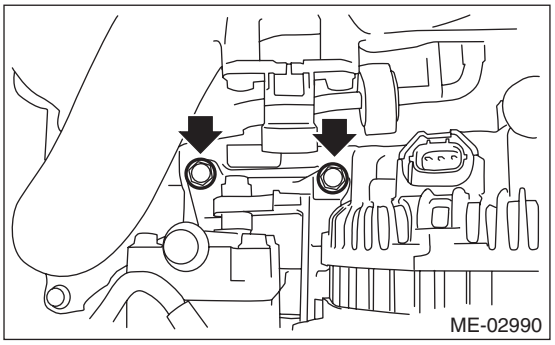
(2) Generator connector and terminal
(3) A/C compressor connector
(4) Power steering switch connector
14) Disconnect the following hoses.
(1) Brake booster vacuum hose


ME-02383

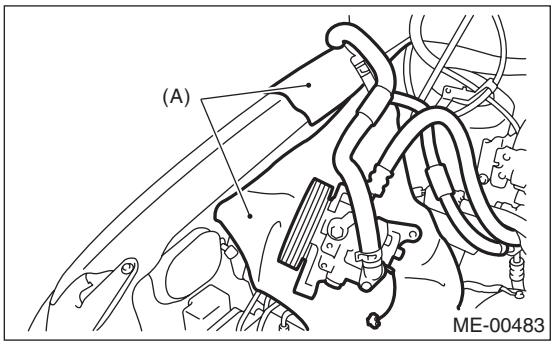
(2) Heater inlet and outlet hoses
(3) Pressure regulator vacuum hose
15) Remove the power steering pump together with the bracket.

NOTE:
Do not disconnect the hose and pipe from the pump body.


ME-02992


ME-02990

16) Place the power steering pump on the right side wheel apron.

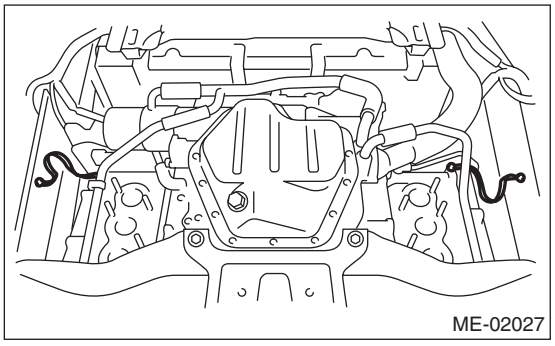


(A) Cloth

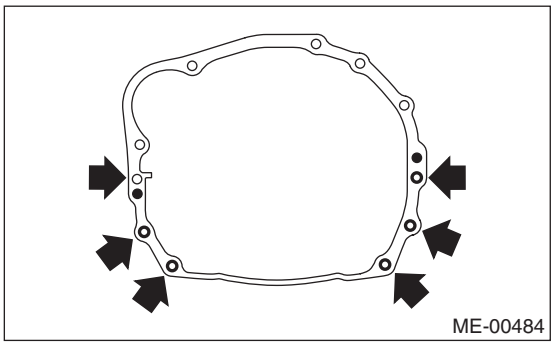
17) Lift the vehicle.
18) Remove the under cover.
19) Remove the front exhaust pipe. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>

NOTE:
Be careful not to let the front exhaust pipe interfere with water pipes on engine side.

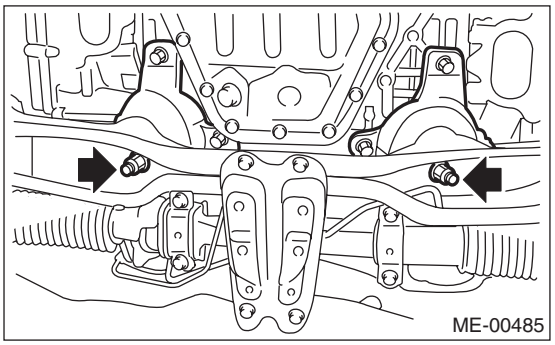
20) Remove the ground cable.



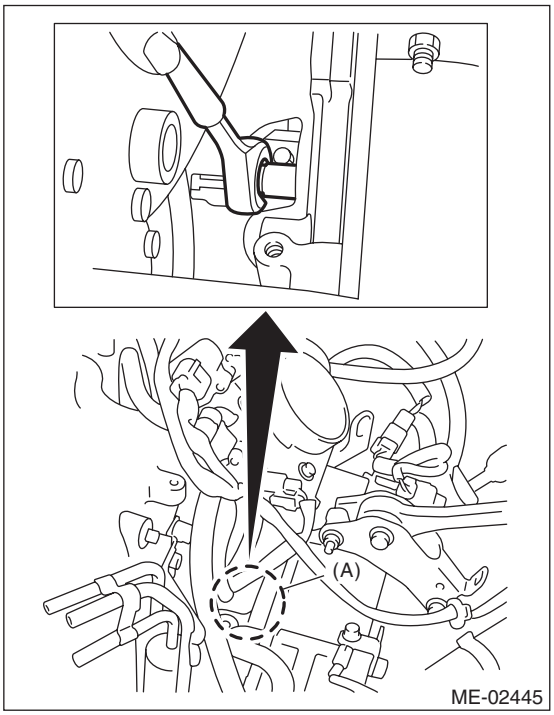
21) Remove the bolts and nuts which hold lower side of transmission to engine.



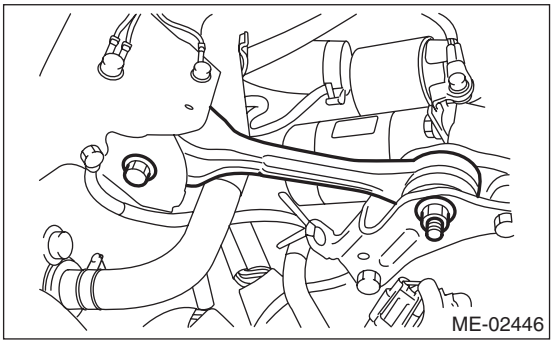
22) Remove the nuts which install front cushion rubber onto front crossmember.



23) Separate the torque converter clutch from drive plate.
(1) Lower the vehicle.
(2) Remove the service hole plug (A).
(3) Remove the bolts which hold torque converter clutch to drive plate.
(4) Remove other bolts while rotating the crankshaft using socket wrench.



24) Remove the pitching stopper.



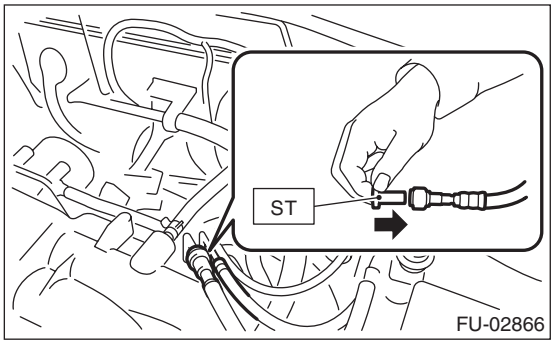
25) Disconnect the fuel delivery hose and evaporation hose.

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

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

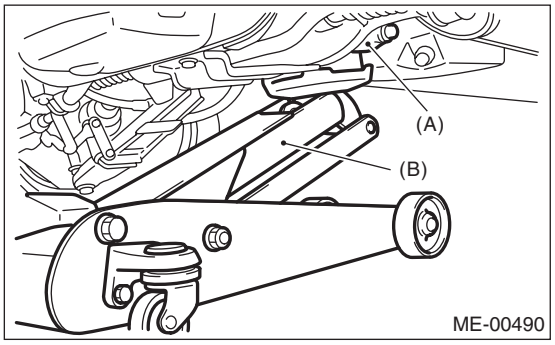
ST 42099AE000 CONNECTOR REMOVER

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



26) Support the engine with a lifting device and wire ropes.
27) Support the transmission with a garage jack.

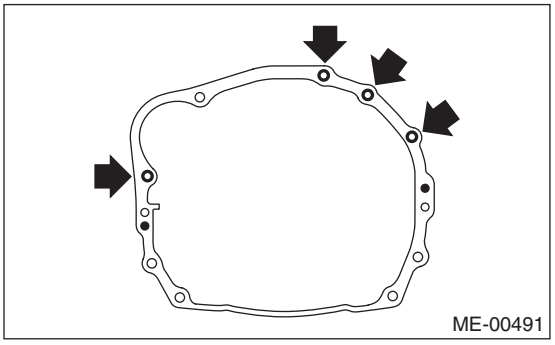
CAUTION:
Doing this is very important to prevent the transmission from lowering due to its own weight.



(A) Transmission
(B) Garage jack

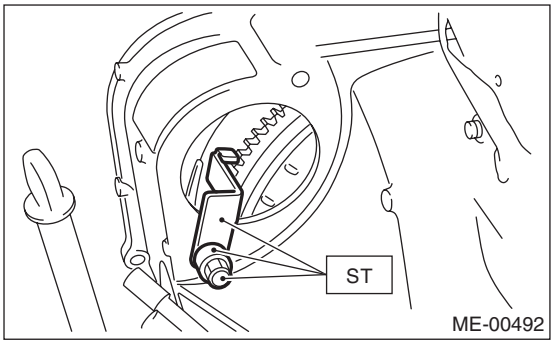
CAUTION:
Before removing the engine away from transmission, check to be sure no work has been overlooked.

28) Separation of engine and transmission:
(1) Remove the starter. <Ref. to SC(H4SO)-6, REMOVAL, Starter.>
(2) Remove the bolts which hold upper side of transmission to engine.



29) Attach the ST to the converter case.

ST 498277200 STOPPER SET



30) 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.

31) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the front cushion rubbers.

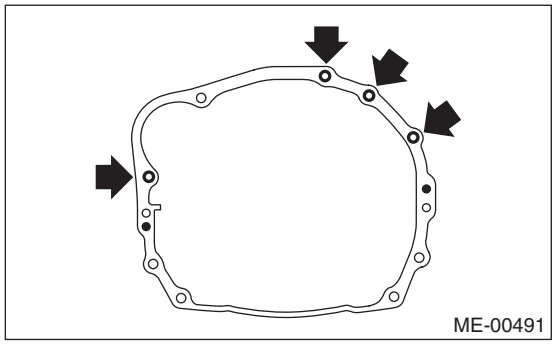
Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

2) 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.

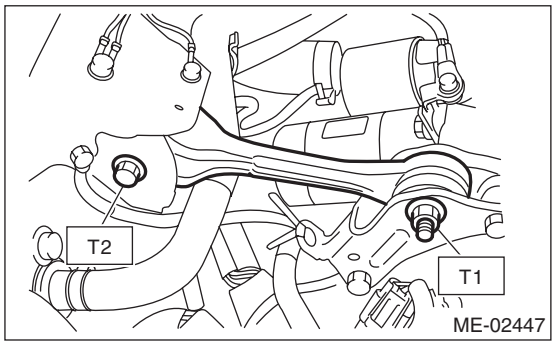
3) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)



4) Remove the lifting device and wire ropes.
5) Remove the garage jack.
6) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



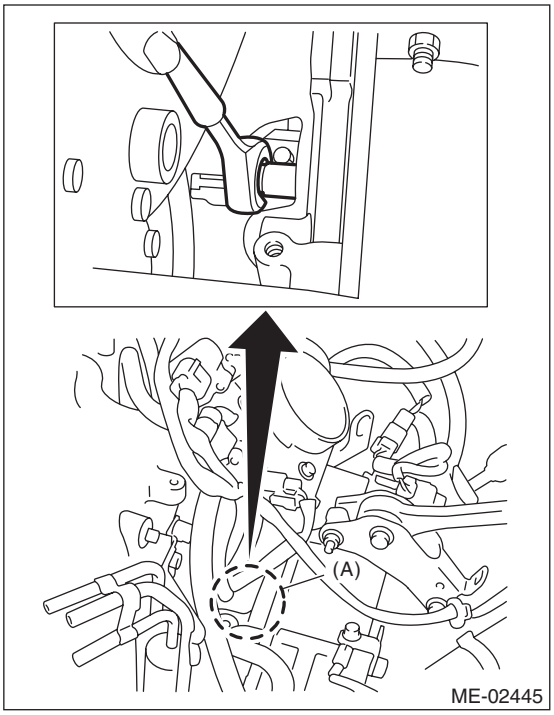
7) Remove the ST from converter case.

NOTE:
Be careful not to drop the ST into the converter case when removing the ST.
ST 498277200 STOPPER SET

8) Install the starter. <Ref. to SC(H4SO)-6, INSTALLATION, Starter.>
9) 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.

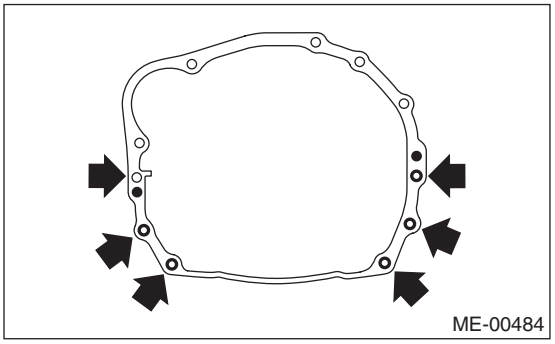
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

(3) Install the service hole plug (A) to prevent getting foreign matter inside.



10) Install the power steering pump. <Ref. to PS-47, INSTALLATION, Oil Pump.>
11) Lift the vehicle.
12) Tighten the bolts and nuts which hold lower side of the transmission to engine.

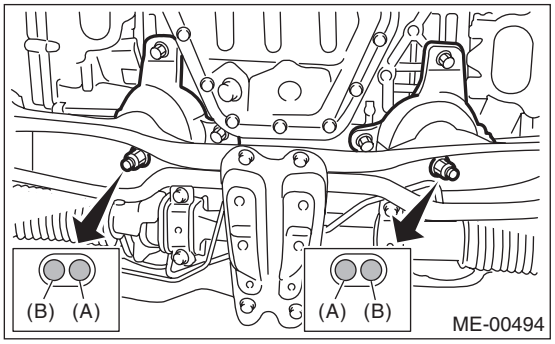
Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)



13) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 63 ft-lb)

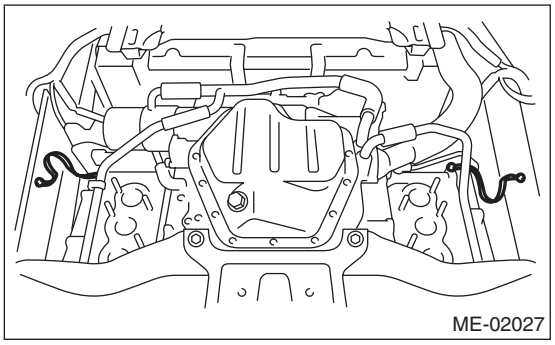
NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



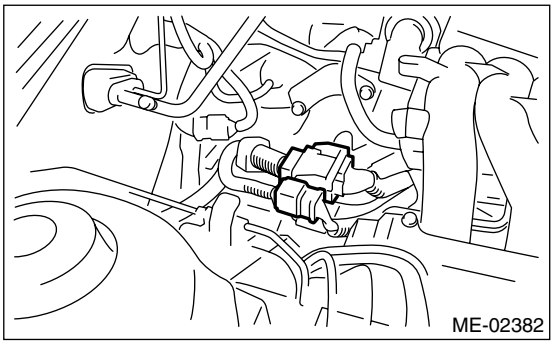
14) Install the front exhaust pipe. <Ref. to EX(H6DO)-5, INSTALLATION, Front Exhaust Pipe.>

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.

15) Connect the ground cable.

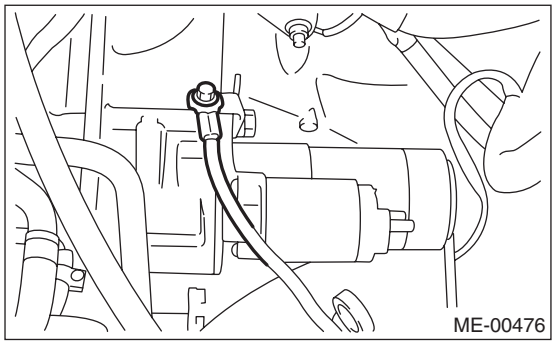


16) Install the under cover.
17) Lower the vehicle.
18) Connect the following hoses.
(1) Fuel delivery hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
(4) Pressure regulator vacuum hose
19) Connect the following connectors.
(1) Engine harness connectors



(2) Generator connector and terminal
(3) A/C compressor connector
(4) Power steering switch connector
20) Install the engine ground terminals.

Tightening torque:
14 N·m (1.4 kgf-m, 10.1 ft-lb)



21) Install the A/C pressure hoses. <Ref. to AC-37, INSTALLATION, Hose and Tube.>
22) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>
23) Install the radiator to vehicle. <Ref. to CO(H6DO)-16, INSTALLATION, Radiator.>
24) Install the air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.> <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
25) Install the battery in the vehicle, and connect cables.
26) Fill engine coolant. <Ref. to CO(H6DO)-10, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
27) Check the ATF level and replenish it if necessary. <Ref. to 5AT-28, INSPECTION, Automatic Transmission Fluid.>
28) Charge the A/C system with refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Charging Procedure.>
29) Install the collector cover.
30) Remove the front hood stay, and close the front hood.
31) Lower the vehicle from the 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)-31, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

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

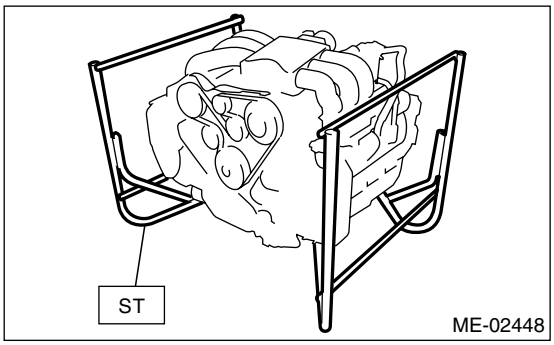
C: INSPECTION

Make sure that no crack or other damages do not exist.

11.Preparation for Overhaul

A: REMOVAL

1) Remove the engine assembly from the body. <Ref. to ME(H6DO)-31, REMOVAL, Engine Assembly.>
2) Set the engine on ST.
ST 18232AA000 ENGINE STAND

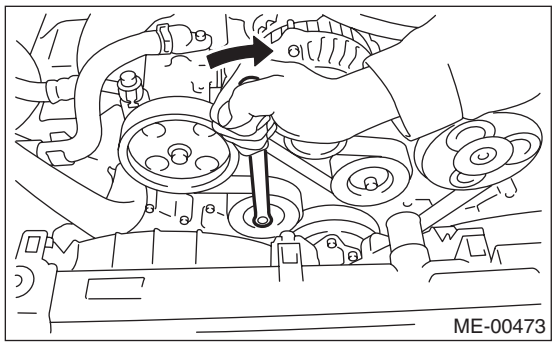


3) Before servicing overhaul, remove the sensor, pipe and hose that installed to engine.
(1) Remove the intake manifold. <Ref. to FU(H6DO)-13, REMOVAL, Intake Manifold.>
(2) Remove the generator. <Ref. to SC(H4SO)-20, REMOVAL, Generator.>
(3) Remove the A/C compressor. <Ref. to AC-33, REMOVAL, Compressor.>
(4) Disconnect the water pipe and hose.
(5) Disconnect the engine harness.
(6) Remove the spark plug. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
(7) Remove the camshaft position sensor. <Ref. to FU(H6DO)-20, REMOVAL, Camshaft Position Sensor.>
(8) Remove the crankshaft position sensor. <Ref. to FU(H6DO)-19, REMOVAL, Crankshaft Position Sensor.>
(9) Remove the knock sensor. <Ref. to FU(H6DO)-21, REMOVAL, Knock Sensor.>
(10) Remove the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, REMOVAL, Engine Coolant Temperature Sensor.>
(11) Remove the oil pressure switch. <Ref. to LU(H6DO)-14, REMOVAL, Oil Pressure Switch.>
(12) Remove the oil filter. <Ref. to LU(H6DO)-15, REMOVAL, Engine Oil Filter.>
(13) Remove the oil cooler. <Ref. to LU(H6DO)-16, REMOVAL, Oil Cooler.>

12.V-belt

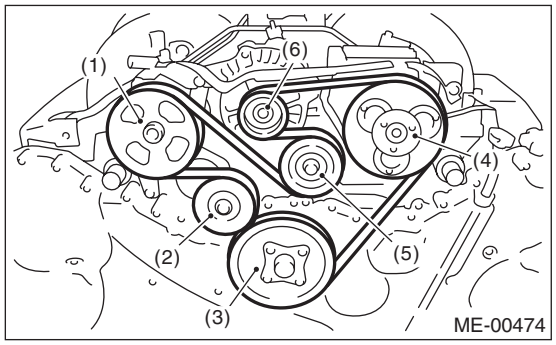
A: REMOVAL

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

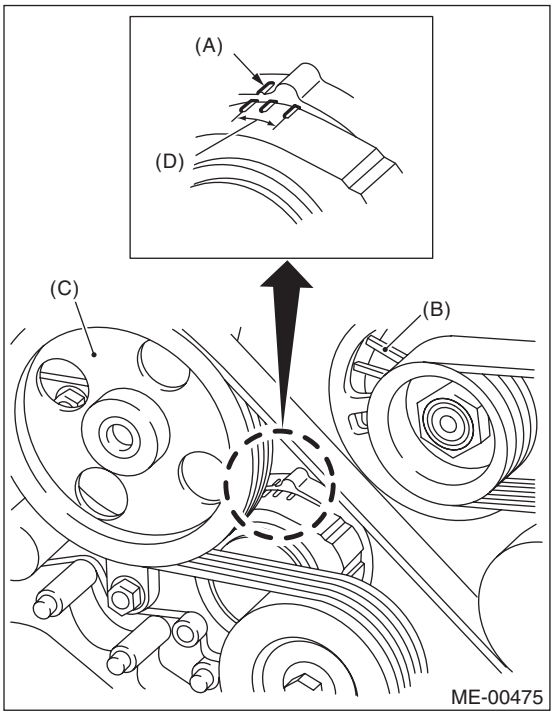
Install in the reverse order of removal.



(1) Power steering oil pump pulley
(2) Belt tension adjuster ASSY
(3) Crank pulley
(4) A/C compressor
(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).

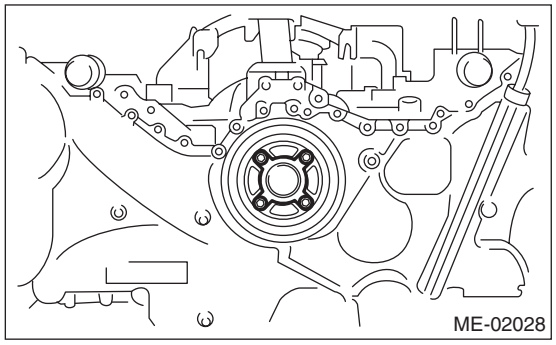


(A) Indicator
(B) Generator
(C) Power steering oil pump pulley
(D) Service limit

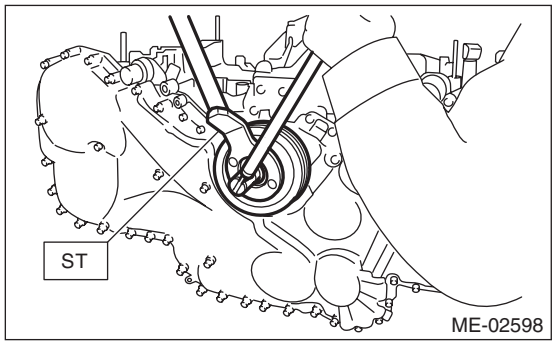
13.Crank Pulley

A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part.
1) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
2) Remove the crank pulley cover.



3) Remove the crank pulley bolt. To lock the crankshaft, use ST.
ST 499977100 CRANK PULLEY WRENCH

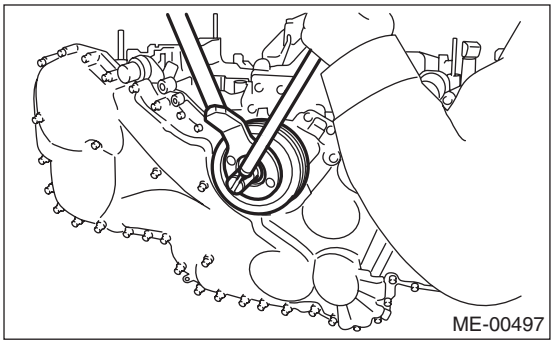


4) Remove the crank pulley.

B: INSTALLATION

1) Install the crank pulley.
2) Install the crank pulley bolt. To lock the crankshaft, use ST.
ST 499977100 CRANK PULLEY WRENCH
(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.

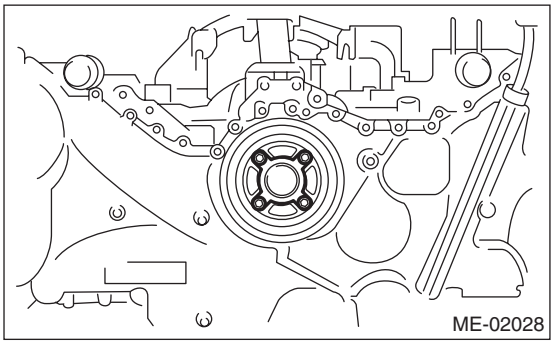
Tightening torque:
178 N·m (18.1 kgf-m, 131 ft-lb)



3) Install the crank pulley cover.

NOTE:
Assemble the O-ring to crank pulley cover.

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



4) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>

C: INSPECTION

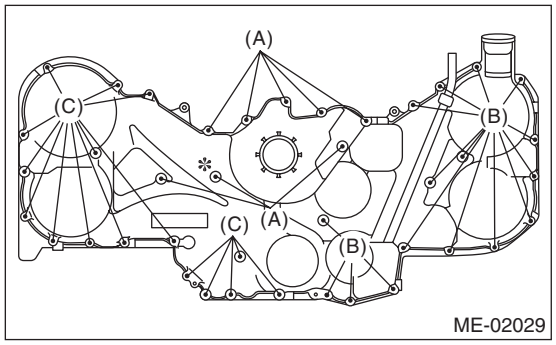
1) Check the crank pulley cover for oil and air leakage.
2) Check the crank pulley for looseness.

14.Front Chain Cover

A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part.
1) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-39, REMOVAL, Crank Pulley.>
3) Remove the bolts which install oil pipe (RH) onto the front chain cover.
4) Remove the front chain cover.

NOTE:
Chain cover installation bolt has three different sizes. To prevent the confusion in installation, keep these bolts on container individually.



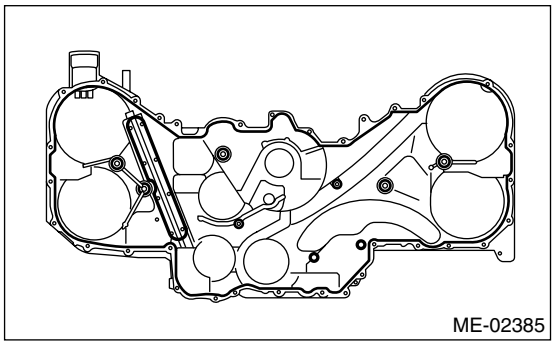
(A) M6 × 16
(B) M6 × 30
(C) M6 × 45
*: Sealing washer

B: INSTALLATION

1) Remove the used liquid gasket from mating surface, and degrease it.
2) Apply liquid gasket to the mating surface of front chain cover.

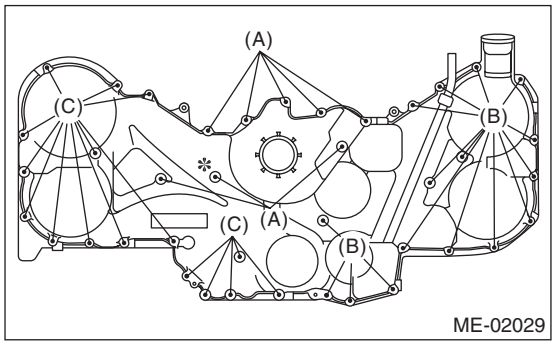
Liquid gasket
THREE BOND 1280B (Part No. K0877YA018)

Applying liquid gasket diameter
2.5±0.5 mm (0.098±0.020 in)



3) Install the front chain cover. Temporarily tighten the bolts.

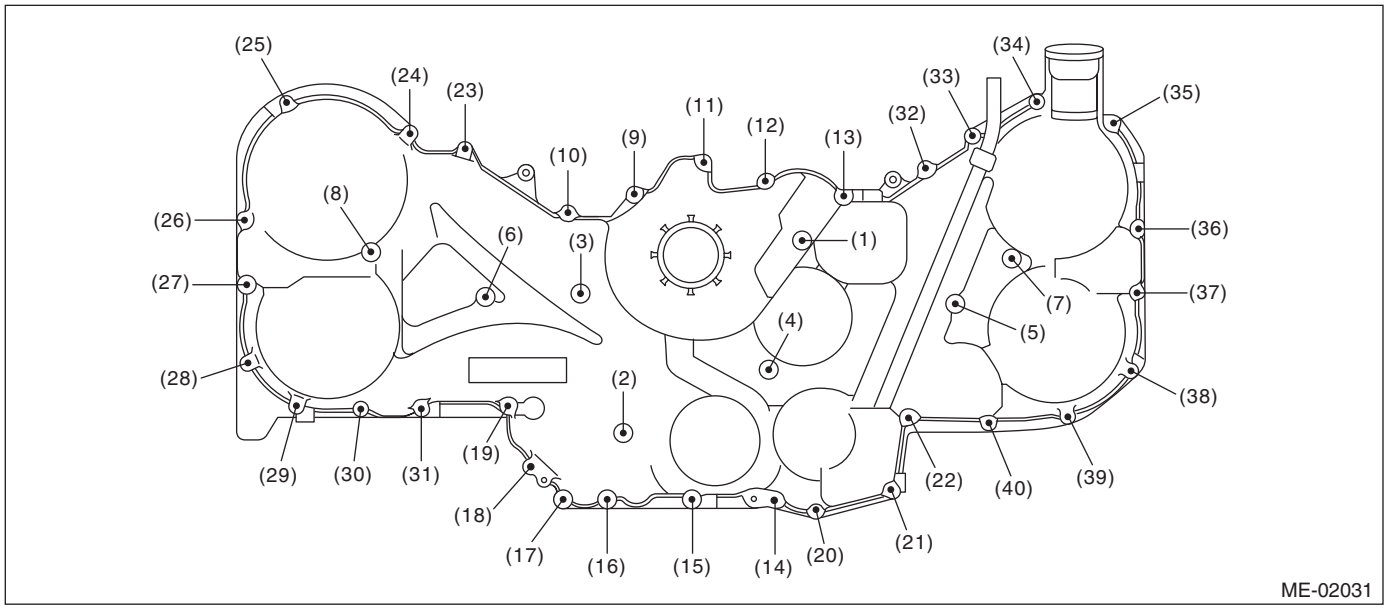
CAUTION:
Do not install the bolts in wrong place.



(A) M6 × 16
(B) M6 × 30
(C) M6 × 45
*: Sealing washer

4) Tighten the bolts in the numerical order as shown in the figure.

Tightening torque:
6.6 N·m (0.67 kgf-m, 4.8 ft-lb)



5) Tighten the bolts which install oil pipe (RH) onto the front chain cover.

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

6) Install the crank pulley. <Ref. to ME(H6DO)-39, INSTALLATION, Crank Pulley.>

7) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>

C: INSPECTION

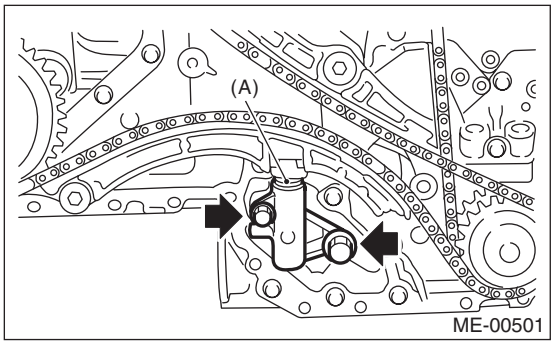
Check the cover surface for scratch and damage.
Check for oil leakage on cover mating surface and installation part of crank pulley.

15.Timing Chain Assembly

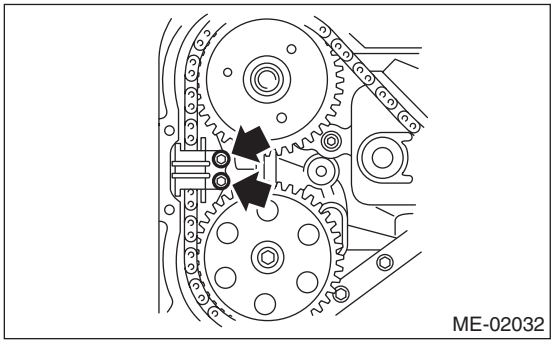
A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part.
1) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-39, REMOVAL, Crank Pulley.>
3) Remove the front chain cover. <Ref. to ME(H6DO)-40, REMOVAL, Front Chain Cover.>
4) Remove the chain tensioner (RH).

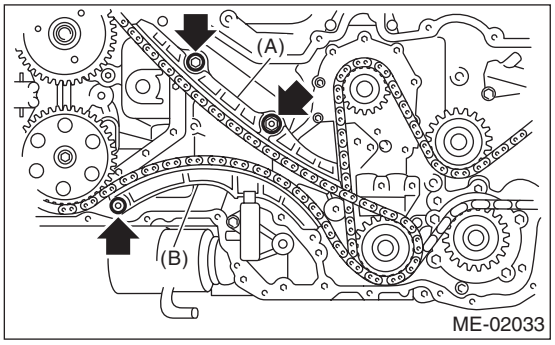
NOTE:
Be careful not to come out the plunger (A).



5) Remove the chain guide (RH: between cams).



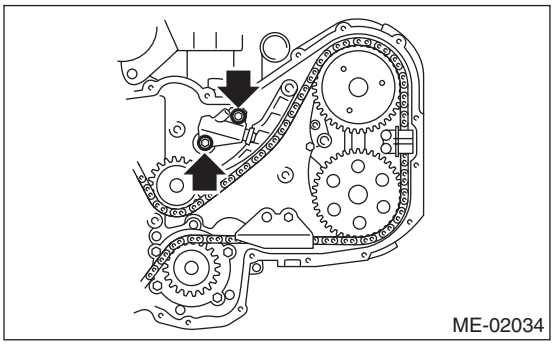
6) Remove the chain guide (RH).
7) Remove the chain tensioner lever (RH).



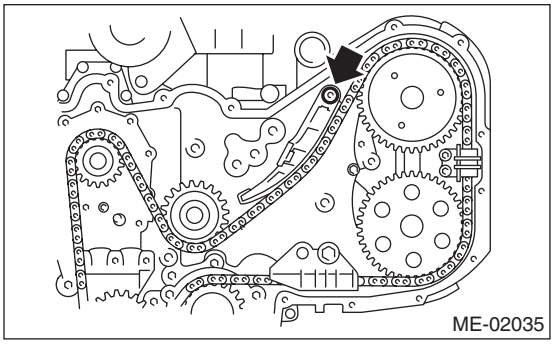
(A) Chain guide (RH)
(B) Chain tensioner lever (RH)

8) Remove the timing chain (RH).
9) Remove the chain tensioner (LH).

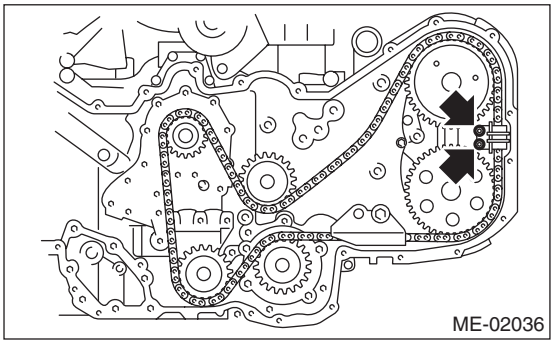
NOTE:
Be careful not to come out the plunger.



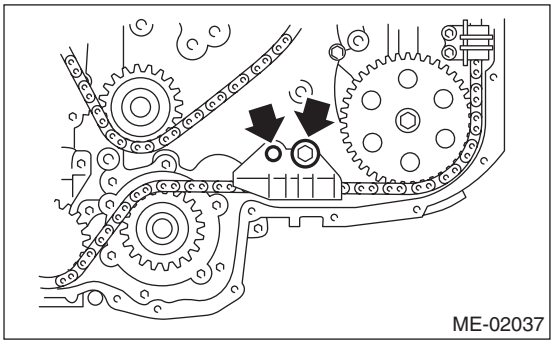
10) Remove the chain tensioner lever (LH).



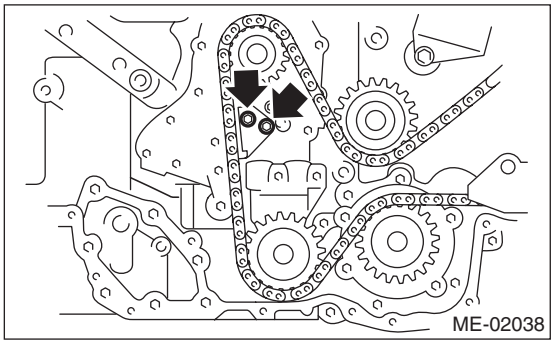
11) Remove the chain guide (LH: between cams).



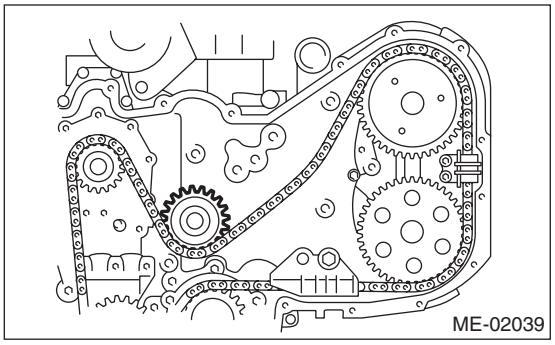
12) Remove the chain guide (LH).



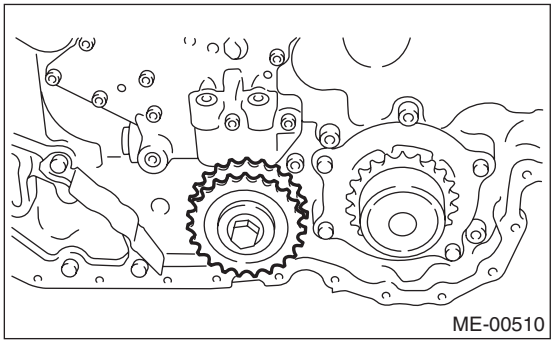
13) Remove the chain guide (center).



14) Remove the idler sprocket (upper).



15) Remove the timing chain (LH).
16) Remove the idler sprocket (lower).

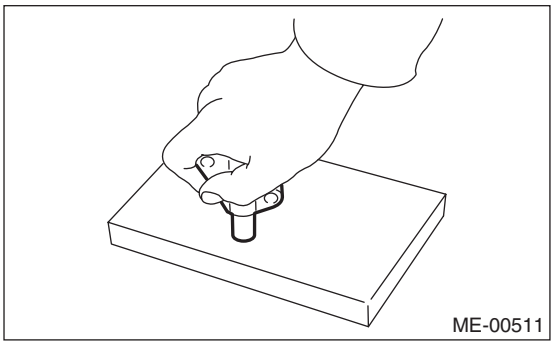


B: INSTALLATION

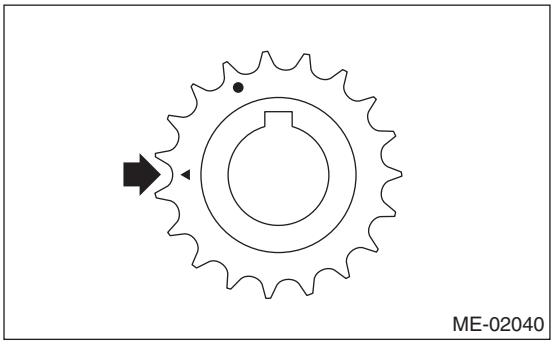
NOTE:
• Be careful that the foreign matter is not into or onto assembled component during installation.
• Apply engine oil to the chain guide, chain tensioner lever and idler sprocket when installing.

1) Preparation for chain tensioner installation
   (1) Insert the screw, spring pin and tension rod into tensioner body.
   (2) While depressing the tensioner onto rubber mat, twist it to shorten tension rod. Then insert the thin pin into the hole between tension rod and tension body to keep it.

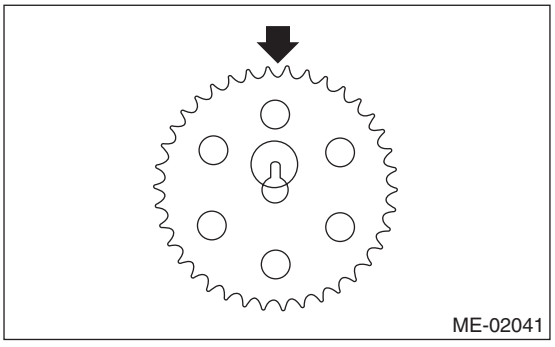
NOTE:
Work on the rubber mat or other anti-skid materials.



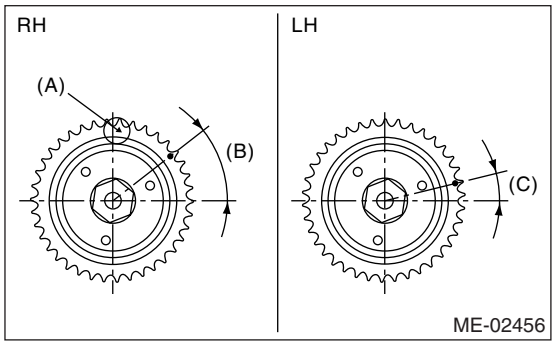
2) Using the ST, align the “Top mark” on crank sprocket to 9 o’clock position as shown in the figure
ST 18252AA000 CRANKSHAFT SOCKET



3) Align the key groove on exhaust cam sprocket to 12 o’clock position as shown in the figure.



4) Align the intake cam sprocket as shown in the figure.



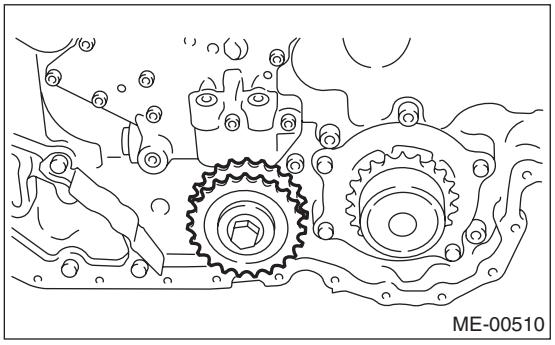
(A) Top mark
(B) 40°
(C) 15°

5) Turn the crank sprocket clockwise, align the "Top mark" to 12 o'clock position. (Piston #1 is in TDC position)

NOTE:
Do not rotate the crank shaft and cam sprocket before completing timing chain installation.

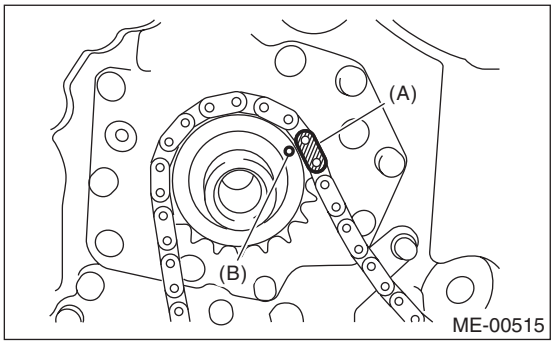
6) Install the idler sprocket (lower).

Tightening torque:
69 N·m (7.0 kgf-m, 50.6 ft-lb)



7) Install the timing chain (LH).

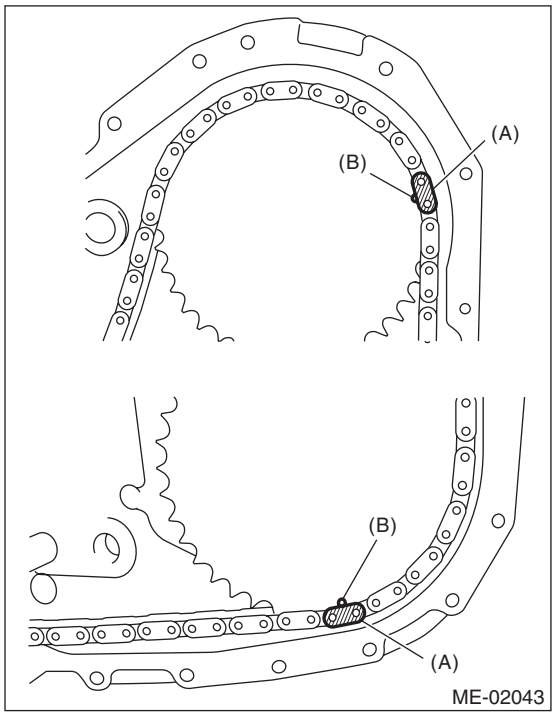
(1) Align the timing mark (B) on the crank sprocket with mark (A) on the timing chain (LH).



(A) Gold
(B) Mark

(2) Install the timing chain (LH) to the idler sprocket (lower), water pump, exhaust cam sprocket (LH) and intake cam sprocket (LH) in this order.

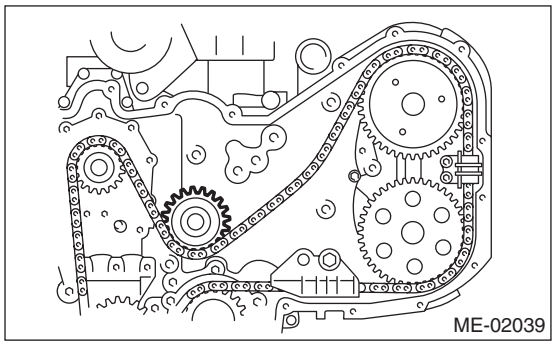
NOTE:
Check that the mark on timing chain (A) and cam sprocket (B) is aligned as same as aligned on crank sprocket.



(A) Blue
(B) Mark

(3) Install the chain idler (upper).

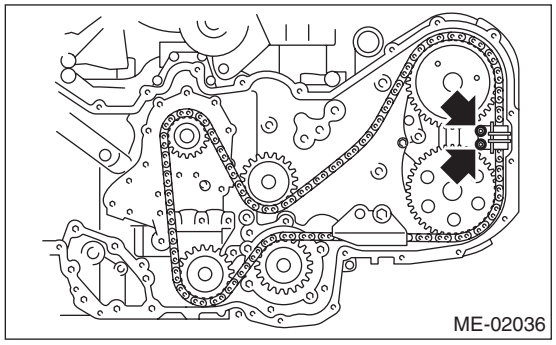
Tightening torque:
69 N·m (7.0 kgf-m, 50.6 ft-lb)



(4) Install the chain guide (LH: between cams).

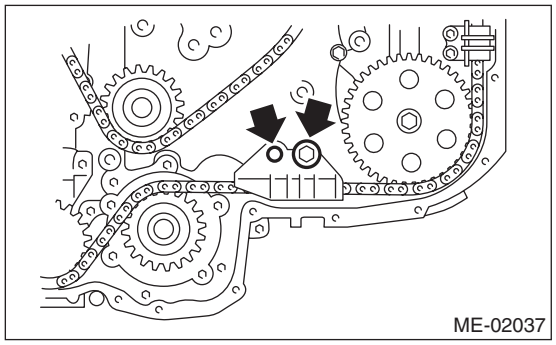
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:
Use a new installing bolt.



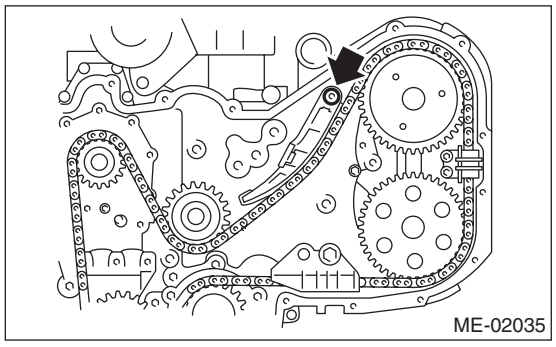
(5) Install the chain guide (LH).

Tightening torque:
16 N·m (1.6 kgf-m, 12 ft-lb)



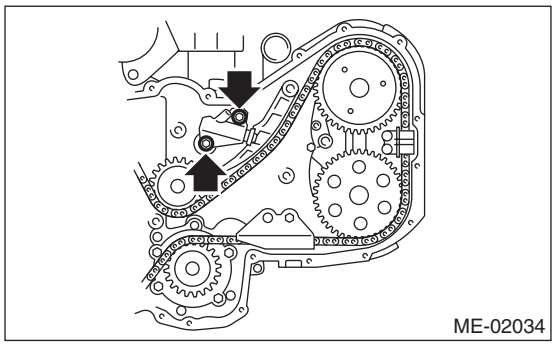
(6) Install the chain tensioner lever (LH).

Tightening torque:
16 N·m (1.6 kgf-m, 12 ft-lb)

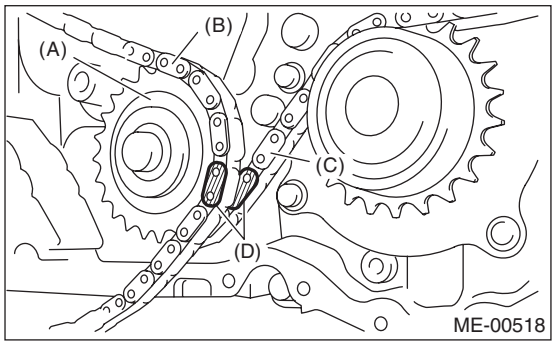


(7) Install the chain tensioner (LH).

Tightening torque:
16 N·m (1.6 kgf-m, 12 ft-lb)



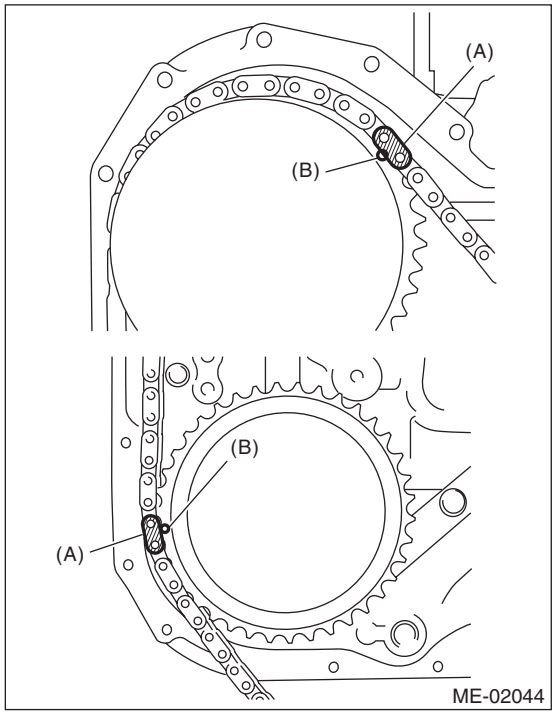
8) Install the timing chain (RH).
(1) Align the marks of timing chain LH and RH on the idler sprocket (lower).



(A) Idler sprocket (lower)
(B) Timing chain (RH)
(C) Timing chain (LH)
(D) Blue

(2) Install the timing chain (RH) to the intake cam sprocket (RH) and exhaust cam sprocket (RH) in this order.

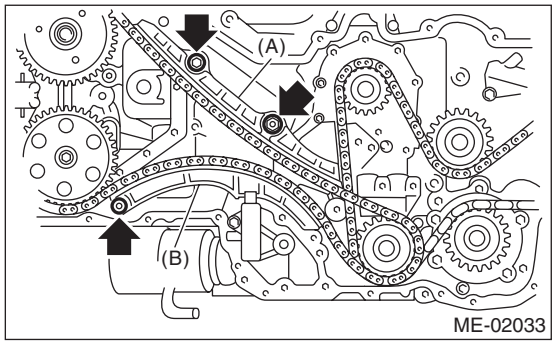
NOTE:
Check that the mark on timing chain (A) and cam sprocket (B) is aligned as same as aligned on crank sprocket.



(A) Gold
(B) Mark

(3) Install the chain guide (RH).
(4) Install the chain tensioner lever (RH).

Tightening torque:
16 N·m (1.6 kgf-m, 12 ft-lb)

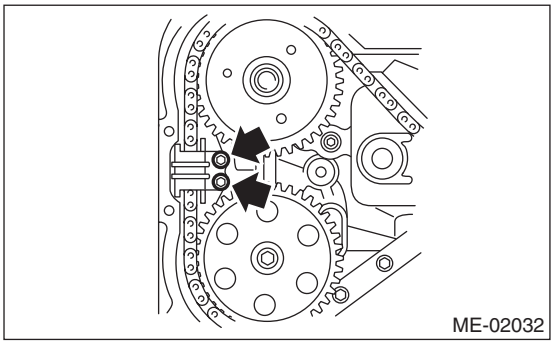


(A) Chain guide (RH)
(B) Chain tensioner lever (RH)

(5) Install the chain guide (RH: between cams).

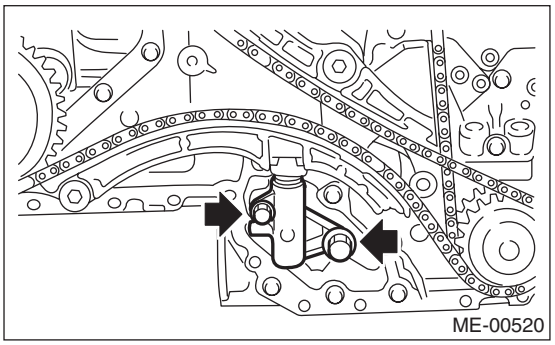
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:
Use a new installing bolt.



(6) Install the chain tensioner (RH).

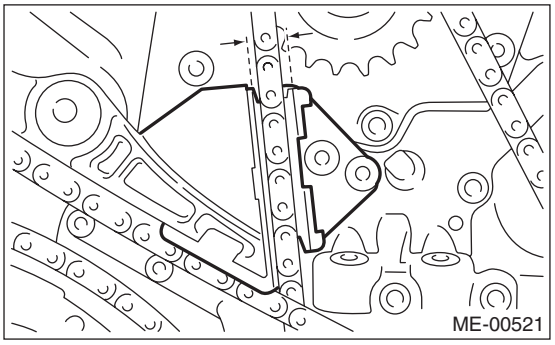
Tightening torque:
16 N·m (1.6 kgf-m, 12 ft-lb)



(7) Adjust the clearance between chain guide (RH) and chain guide (center) within 8.4 — 8.6 mm (0.331 — 0.339 in). Install the chain guide (center).

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

NOTE:
Use a new installing bolt.



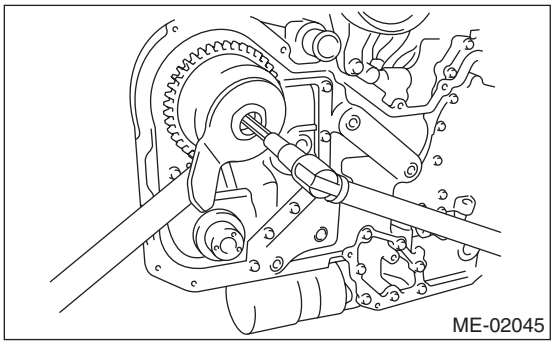
(8) Check that each mark on the sprocket and timing chain is matched, and then draw out the stopper pin from chain tensioner.

9) Install the front chain cover. <Ref. to ME(H6DO)-40, INSTALLATION, Front Chain Cover.>
10) Install the crank pulley. <Ref. to ME(H6DO)-39, INSTALLATION, Crank Pulley.>
11) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>

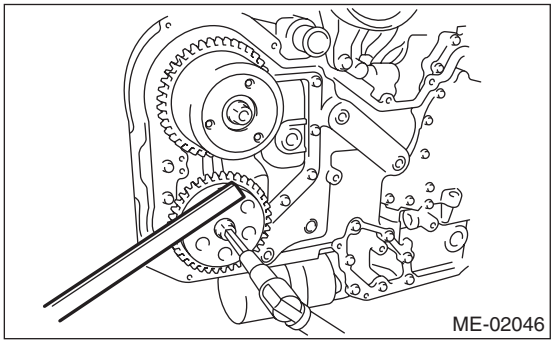
16.Cam Sprocket

A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part.
1) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-39, REMOVAL, Crank Pulley.>
3) Remove the front chain cover. <Ref. to ME(H6DO)-40, REMOVAL, Front Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-42, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. To lock the camshaft, use the ST.
ST 499977500 CAM SPROCKET WRENCH



ST 18231AA020 CAM SPROCKET WRENCH

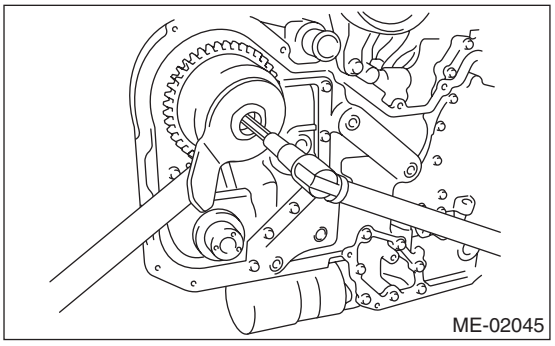


B: INSTALLATION

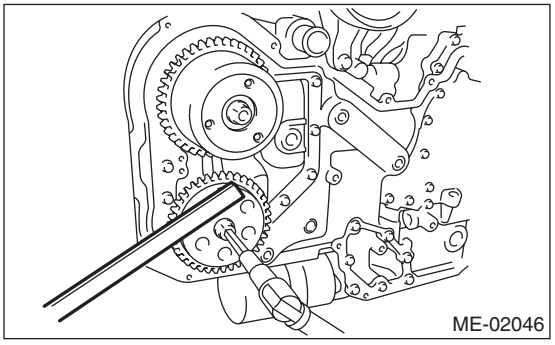
1) Install the cam sprocket. To lock the camshaft, use the ST.

Tightening torque:
29.5 N·m (3.0 kgf-m, 21.8 ft-lb)
2) Further tighten the bolt.

Tightening angle:
Intake side
45°±5°
Exhaust side
25°±5°
ST 499977500 CAM SPROCKET WRENCH



ST 18231AA020 CAM SPROCKET WRENCH



3) Install the timing chain assembly. <Ref. to ME(H6DO)-43, INSTALLATION, Timing Chain Assembly.>
4) Install the front chain cover. <Ref. to ME(H6DO)-40, INSTALLATION, Front Chain Cover.>
5) Install the crank pulley. <Ref. to ME(H6DO)-39, INSTALLATION, Crank Pulley.>
6) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>

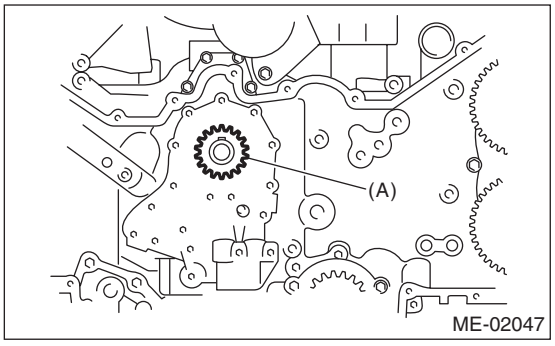
C: INSPECTION

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

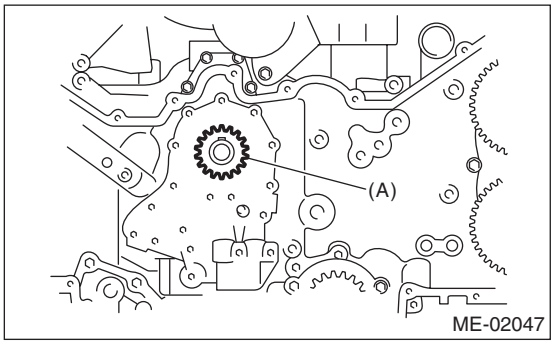
A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part.
1) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-39, REMOVAL, Crank Pulley.>
3) Remove the front chain cover. <Ref. to ME(H6DO)-40, REMOVAL, Front Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-42, 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)-43, INSTALLATION, Timing Chain Assembly.>
3) Install the front chain cover. <Ref. to ME(H6DO)-40, INSTALLATION, Front Chain Cover.>
4) Install the crank pulley. <Ref. to ME(H6DO)-39, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>

C: INSPECTION

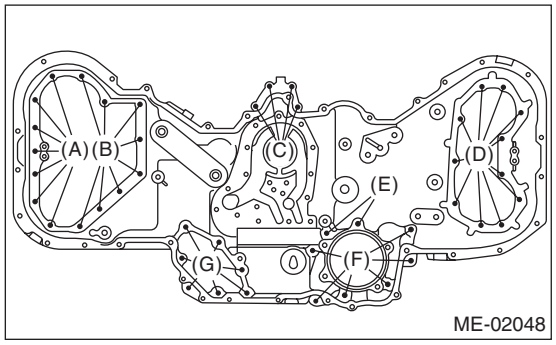
1) Check the crank sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between crank sprocket and key.

18.Rear Chain Cover

A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part.
1) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-39, REMOVAL, Crank Pulley.>
3) Remove the front chain cover. <Ref. to ME(H6DO)-40, REMOVAL, Front Chain Cover.>
4) Remove the timing chain. <Ref. to ME(H6DO)-42, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H6DO)-48, REMOVAL, Crank Sprocket.>
7) Remove the oil pump. <Ref. to LU(H6DO)-8, REMOVAL, Oil Pump.>
8) Remove the water pump. <Ref. to CO(H6DO)-12, REMOVAL, Water Pump.>
9) Remove the rear chain cover.

NOTE:
Installation bolt has seven different sizes. To prevent the confusion in installation, keep these bolts on container individually.



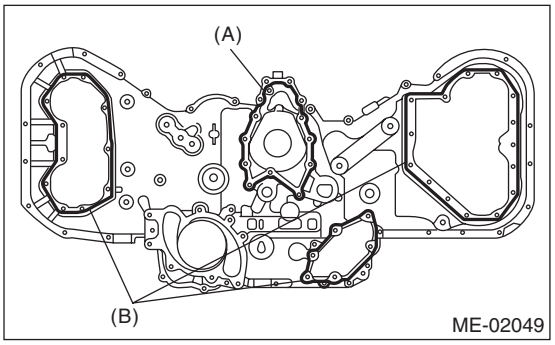
(A) M6 × 14
(B) M6 × 18 (Light green coating)
(C) M6 × 30
(D) M6 × 18
(E) M8 × 40
(F) M8 × 30
(G) M6 × 22

B: INSTALLATION

NOTE:
When replacing the rear chain cover, suitable size cover must be selected. <Ref. to LU(H6DO)-9, INSPECTION, Oil Pump.>
1) Remove the used liquid gasket from mating surface, and degrease it.
2) Apply liquid gasket to the mating surface of rear chain cover.

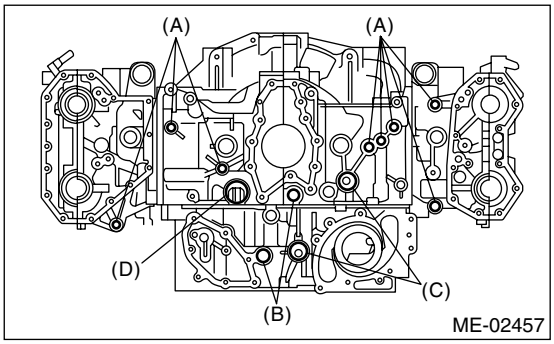
Liquid gasket
THREE BOND 1280B (Part No. K0877A018)

Applying liquid gasket diameter
(A) 1.0±0.5 mm (0.039±0.020 in)
(B) 3.0±1.0 mm (0.118±0.039 in)



3) Install the O-ring.

NOTE:
- Use new O-rings.
- Do not install the O-ring in wrong place.



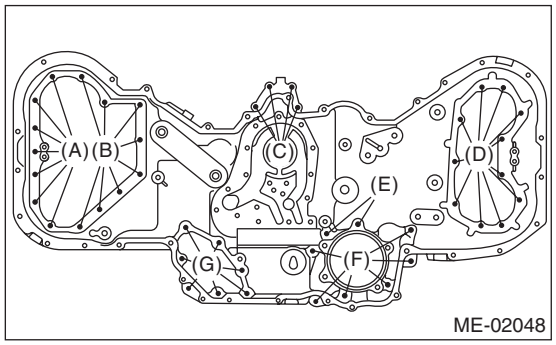
(A) 14.2 × 1.9
(B) 19.2 × 2.4
(C) 25 × 2
(D) 31.2 × 1.9

4) Install the water pump gasket.

NOTE:
Use a new gasket.

5) Temporarily tighten the rear chain cover.

NOTE:
Do not install the bolts in wrong place.

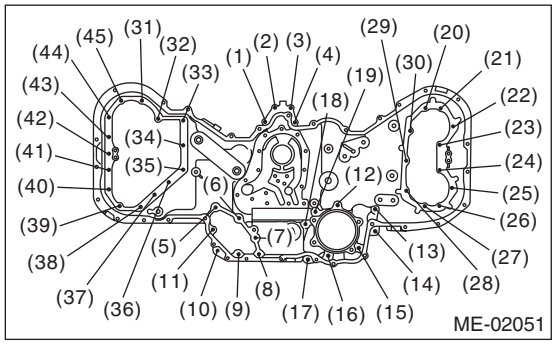


(A) M6 × 14
(B) M6 × 18 (Light green coating)
(C) M6 × 30
(D) M6 × 18
(E) M8 × 40
(F) M8 × 30
(G) M6 × 22

6) Tighten the bolts in the numerical order as shown in the figure.

Tightening torque:

(1) — (11)	9 N·m (0.9 kgf-m, 6.5 ft-lb)
(12) — (19)	20 N·m (2.0 kgf-m, 14 ft-lb)
(20) — (30)	9 N·m (0.9 kgf-m, 6.5 ft-lb)
(31) — (38)	12 N·m (1.2 kgf-m, 8.7 ft-lb)
(39) — (45)	9 N·m (0.9 kgf-m, 6.5 ft-lb)

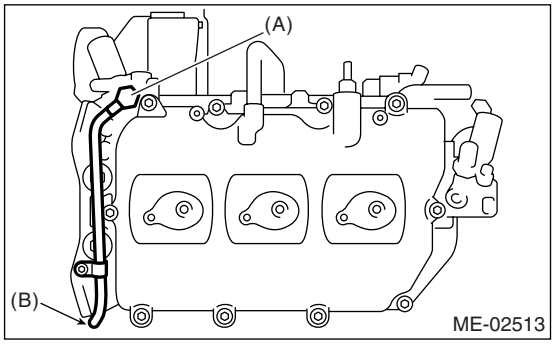


7) Install the water pump. <Ref. to CO(H6DO)-12, INSTALLATION, Water Pump.>
8) Install the oil pump. <Ref. to LU(H6DO)-8, INSTALLATION, Oil Pump.>
9) Install the crank sprocket. <Ref. to ME(H6DO)-48, INSTALLATION, Crank Sprocket.>
10) Install the cam sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Cam Sprocket.>
11) Install the timing chain. <Ref. to ME(H6DO)-43, INSTALLATION, Timing Chain Assembly.>
12) Install the front chain cover. <Ref. to ME(H6DO)-40, INSTALLATION, Front Chain Cover.>
13) Install the crank pulley. <Ref. to ME(H6DO)-39, INSTALLATION, Crank Pulley.>
14) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>

19.Camshaft

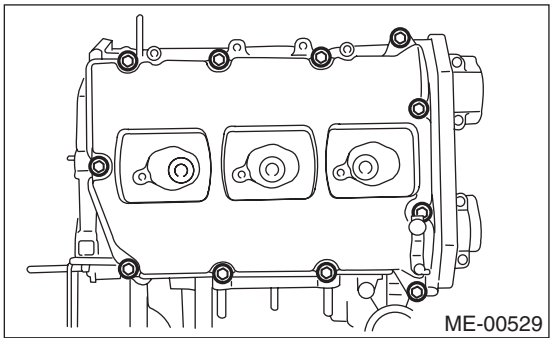
A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part. Refer to “Valve Clearance” for preparation. <Ref. to ME(H6DO)-27, Valve Clearance.>
1) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-39, REMOVAL, Crank Pulley.>
3) Remove the front chain cover. <Ref. to ME(H6DO)-40, REMOVAL, Front Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-42, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H6DO)-48, REMOVAL, Crank Sprocket.>
7) Remove the rear chain cover. <Ref. to ME(H6DO)-49, REMOVAL, Rear Chain Cover.>
8) Disconnect the oil pipe.

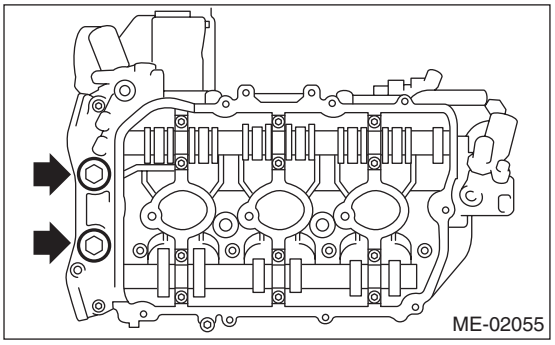


(A) Bolt without filter (without protrusion)
(B) Bolt with filter (with protrusion)

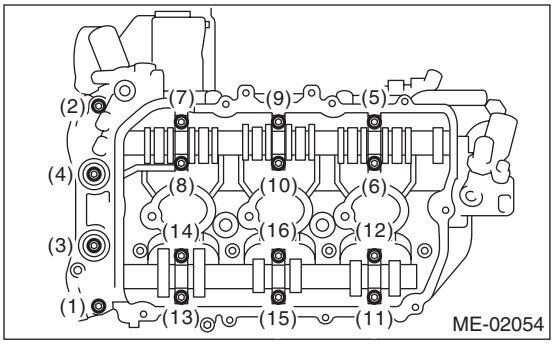
9) Remove the rocker cover (LH).



10) Remove the plugs (LH).



11) Loosen the camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



12) Remove the camshaft caps and camshaft (LH).

NOTE:
Arrange camshaft caps in order so that they can be installed in their original positions.
13) Similarly, remove the camshafts (RH) and related parts.

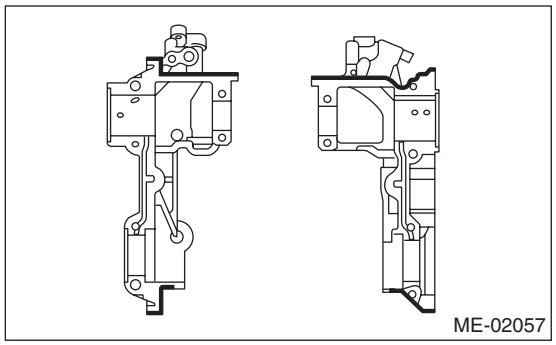
B: INSTALLATION

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.

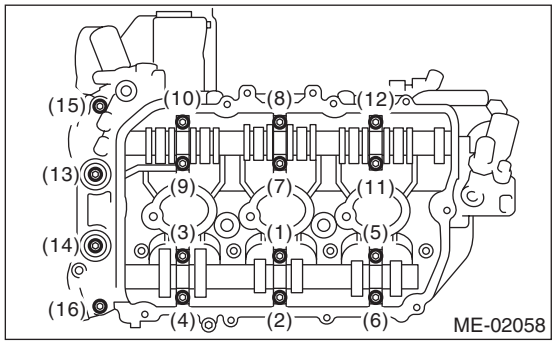
Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

Applying liquid gasket diameter:
2.0±0.5 mm (0.079±0.020 in)



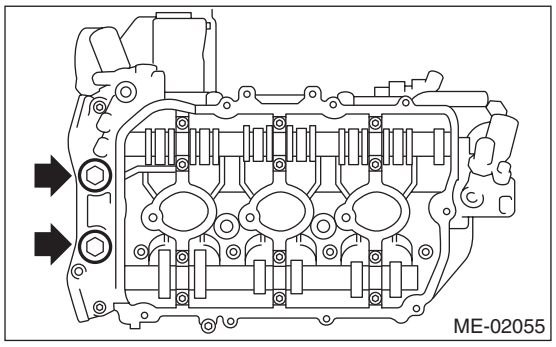
(2) Apply engine oil to cap bearing surface, and install the cap to camshaft.
(3) Tighten the rocker cover bolts in the numerical order as shown in the figure.

Tightening torque:
(1) — (12): 16 N·m (1.6 kgf-m, 12 ft-lb)
(13) — (16): 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



3) Install the plugs.

Tightening torque:
60 N·m (6.1 kgf-m, 44 ft-lb)

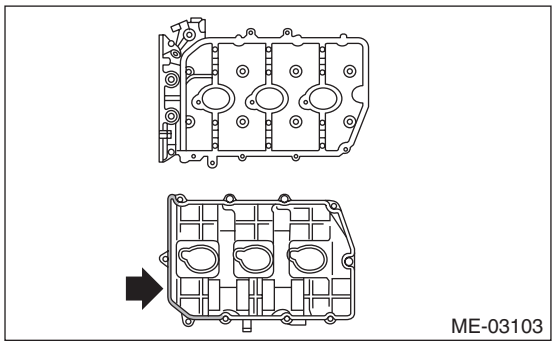


4) Install the rocker cover.
(1) Apply liquid gasket sparingly to the mating surface of cylinder head and rocker cover as shown in the figure.

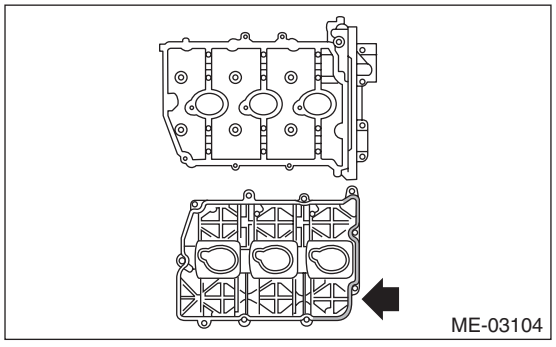
CAUTION:
Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to flow toward cam journal, resulting in engine seizure.

Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

- LH side



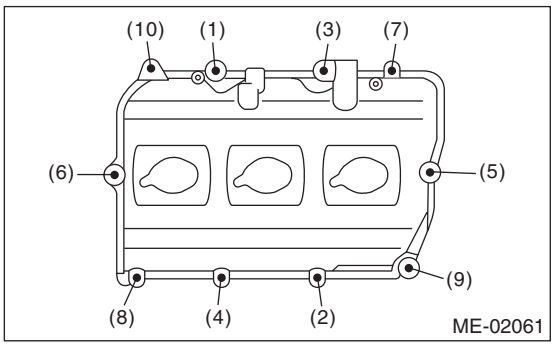
- RH side



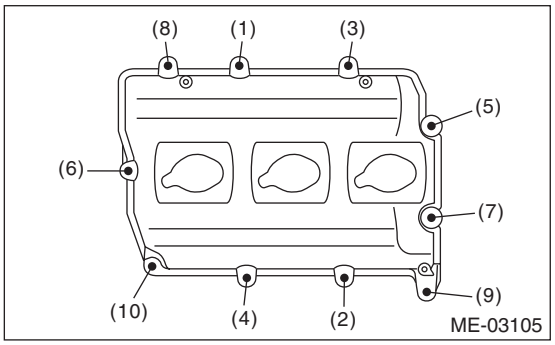
(2) Tighten the rocker cover bolts in the numerical order as shown in the figure.

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

- LH side



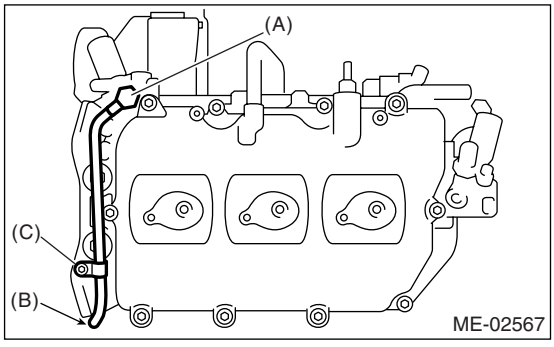
- RH side



5) Connect the oil pipe.

NOTE:
- Be careful not to mistake the location of (A) and (B).
- Use a new gasket.

Tightening torque:
(A), (B)
29 N·m (3.0 kgf-m, 21.4 ft-lb)
(C)
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



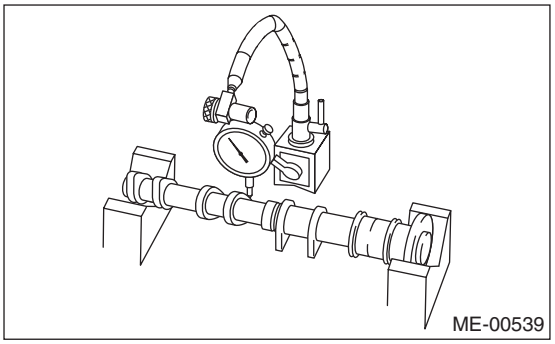
(A) Bolt without filter (without protrusion)
(B) Bolt with filter (with protrusion)
(C) Oil pipe bolt

6) Install the rear chain cover. <Ref. to ME(H6DO)-49, INSTALLATION, Rear Chain Cover.>

7) Install the crank sprocket. <Ref. to ME(H6DO)-48, INSTALLATION, Crank Sprocket.>
8) Install the cam sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Cam Sprocket.>
9) Install the timing chain assembly. <Ref. to ME(H6DO)-43, INSTALLATION, Timing Chain Assembly.>
10) Install the front chain cover. <Ref. to ME(H6DO)-40, INSTALLATION, Front Chain Cover.>
11) Install the crank pulley. <Ref. to ME(H6DO)-39, INSTALLATION, Crank Pulley.>
12) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend of camshaft. Repair or replace if bended.



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)

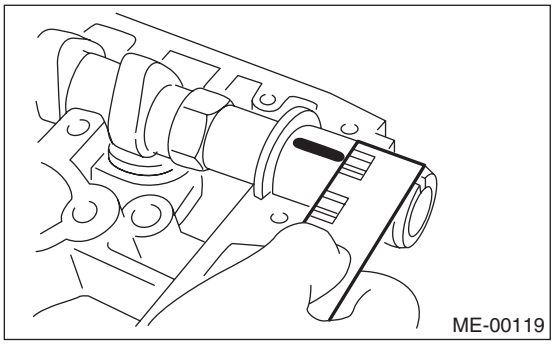
5) Measurement of the camshaft journal oil clearance:
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on cylinder head. (Without installing the valve rocker.)
(3) Place a plastigauge across each camshaft journals.
(4) Install the bearing cap.

NOTE:
Do not turn the camshaft.

(5) Remove the bearing caps.

(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)



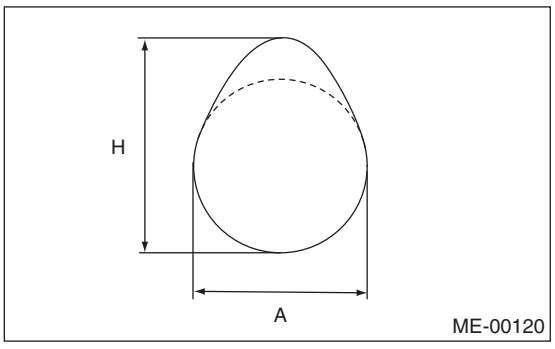
(7) Completely remove the plastigauge.

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
HIGH 42.09 — 42.19 mm (1.6571 — 1.6610 in)
LOW1 38.14 — 38.24 mm (1.5016 — 1.5055 in)
LOW2 34.94 — 35.04 mm (1.3756 — 1.3795 in)
Exhaust
41.65 — 41.75 mm (1.6398 — 1.6437 in)

Cam base circle diameter A:
Intake
HIGH 32.0 mm (1.2598 in)
LOW1 31.84 mm (1.2535 in)
LOW2 31.84 mm (1.2535 in)
Exhaust
32.0 mm (1.2598 in)



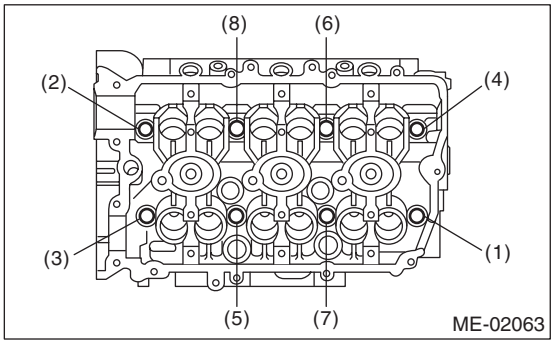
7) Measure the side clearance of the camshaft with a dial gauge. If the side clearance exceeds the standard or there is offset wear, replace the caps and cylinder head as a set. If necessary replace the camshaft.

Standard
Intake
0.075 — 0.135 mm (0.0030 — 0.0053 in)
Exhaust
0.030 — 0.090 mm (0.0012 — 0.0035 in)

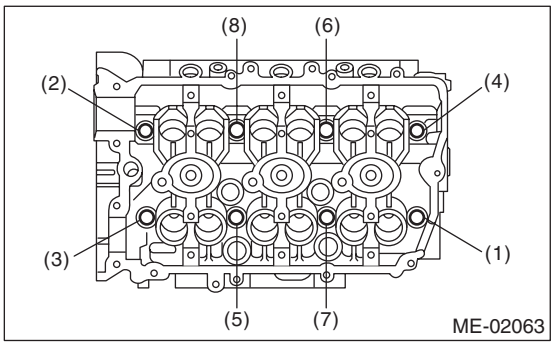
20.Cylinder Head

A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part. Refer to “Valve Clearance” for preparation. <Ref. to ME(H6DO)-27, Valve Clearance.>
1) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-39, REMOVAL, Crank Pulley.>
3) Remove the front chain cover. <Ref. to ME(H6DO)-40, REMOVAL, Front Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-42, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H6DO)-48, REMOVAL, Crank Sprocket.>
7) Remove the rear chain cover. <Ref. to ME(H6DO)-49, REMOVAL, Rear Chain Cover.>
8) Remove the camshaft. <Ref. to ME(H6DO)-51, REMOVAL, Camshaft.>
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.

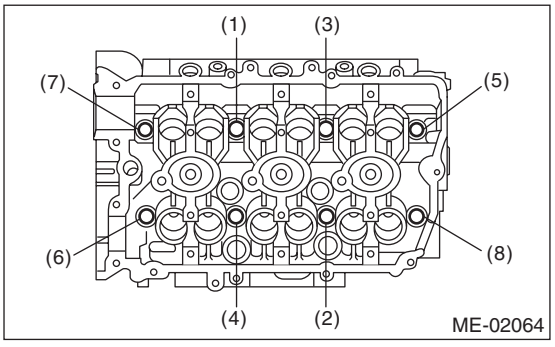
CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.
13) Similarly, remove the cylinder head (RH).

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.

NOTE:
Use a new cylinder head gasket.
2) 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 ft-lb) in numerical sequence as shown in the figure.
(3) Tighten the bolts with torque of 50 N·m (5.1 kgf-m, 37 ft-lb) in numerical sequence as shown in the figure.
(4) Loosen all the bolts by 180° in reverse order of installation, and loosen again by 180°.
(5) Tighten the bolts with torque of 20 N·m (2.0 kgf-m, 14 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, 33 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.



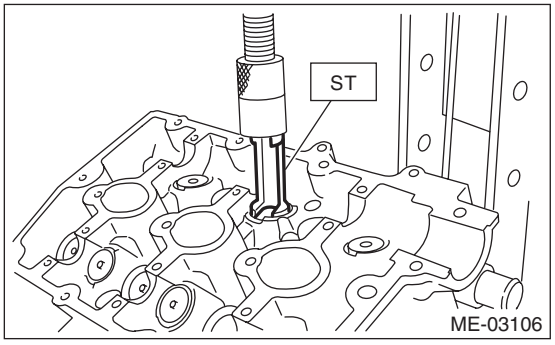
3) Install the camshaft. <Ref. to ME(H6DO)-52, INSTALLATION, Camshaft.>
4) Install the rear chain cover. <Ref. to ME(H6DO)-49, INSTALLATION, Rear Chain Cover.>
5) Install the crank sprocket. <Ref. to ME(H6DO)-48, INSTALLATION, Crank Sprocket.>

6) Install the cam sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Cam Sprocket.>
7) Install the timing chain assembly. <Ref. to ME(H6DO)-43, INSTALLATION, Timing Chain Assembly.>
8) Install the front chain cover. <Ref. to ME(H6DO)-40, INSTALLATION, Front Chain Cover.>
9) Install the crank pulley. <Ref. to ME(H6DO)-39, INSTALLATION, Crank Pulley.>
10) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>

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.



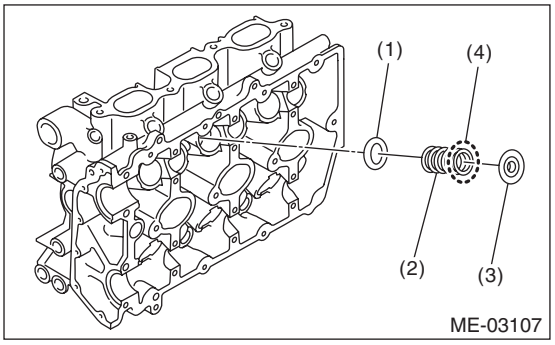
D: ASSEMBLY

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 the valve guide.

NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

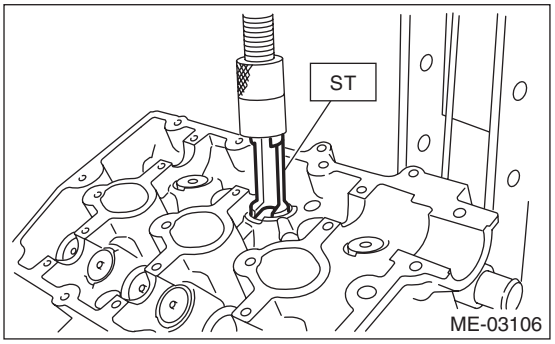
(3) Install the valve spring and retainer.

NOTE:
• Be sure to install the valve spring with its close-coiled end facing the seat on cylinder head.
• For the valve spring on intake side, install two of them (inner and outer).
• Install the valve spring with the painted side facing to retainer.



(1) Valve spring 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 and valve shim.
3) Install the valve lifter and valve shim.

E: INSPECTION

1. CYLINDER HEAD

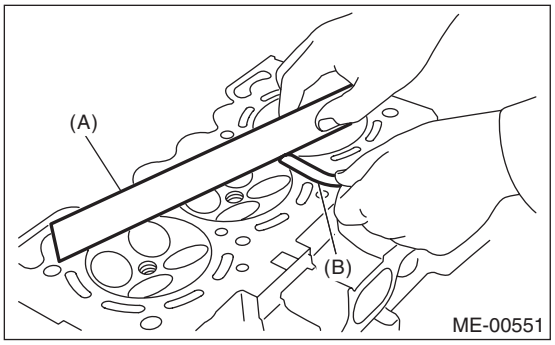
1) Check for cracks or damage. Use liquid penetrant tester on the important sections to check for fissures. Check that there are no marks of gas leaking or water leaking on gasket installing surface.
2) Set the cylinder head on ST.
ST 18250AA010 CYLINDER HEAD TABLE

3) Inspect the cylinder head surface that mates with cylinder block for warping by using a straight edge (A) and thickness gauge (B). If the warping exceeds the limit, replace the cylinder head.

Warping 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.

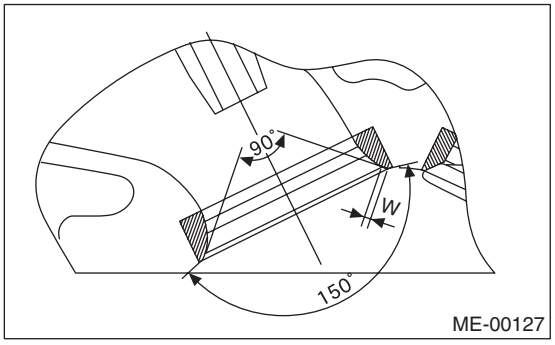


2. VALVE SEAT

Inspect the intake and exhaust valve seats. Correct the contact surfaces with a valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width W:

Standard
Intake
1.0 mm (0.039 in)
Exhaust
1.5 mm (0.059 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and 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)

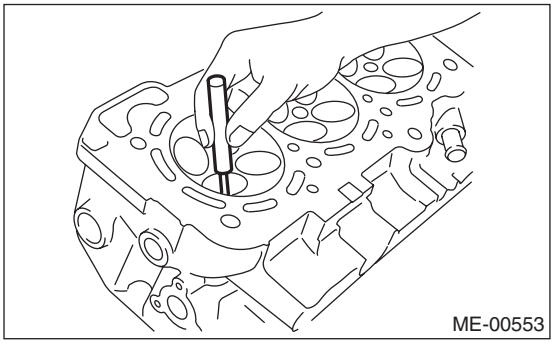
2) If the clearance between valve guide and stem exceeds the standard, replace the valve guide or valve itself whichever shows greater amount of wear or damaged and etc. See the following procedure for valve guide replacement.

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)

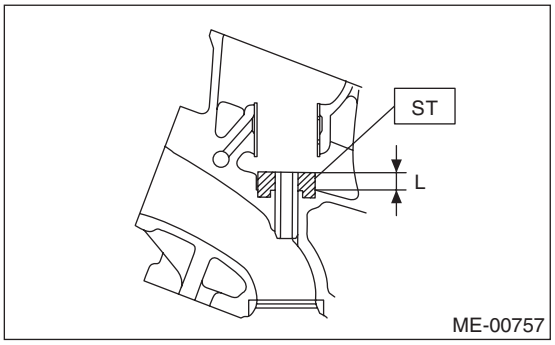
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

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.

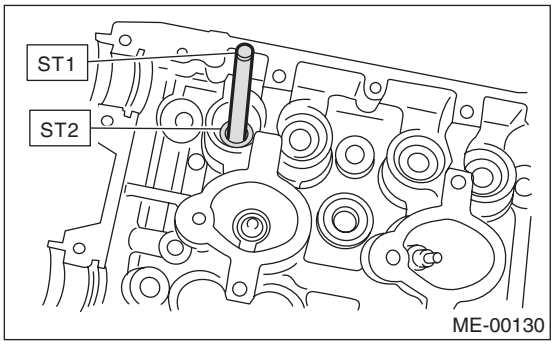
ST 18251AA040 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inner surface of valve guide holes in cylinder head.

(5) Put a new valve guide, coated with sufficient oil, in the cylinder head, and insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499765700 VALVE GUIDE REMOVER
ST2 18251AA040 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion L:
11.4 — 11.8 mm (0.449 — 0.465 in)

(7) Ream the inside of valve guide using ST. Put the ST in valve guide, and rotate the ST slowly clockwise while pushing it lightly. Bring the ST back while rotating it clockwise.

ST 499765900 VALVE GUIDE REAMER

NOTE:
• Apply engine oil to the ST when reaming.
• If the inner surface of valve guide is damaged, the edge of ST should be slightly ground with oil stone.
• If the inner surface of valve guide becomes lustrous and the ST does not chip, use a new ST or remedy the ST.

(8) After reaming, clean the valve guide to remove chips.

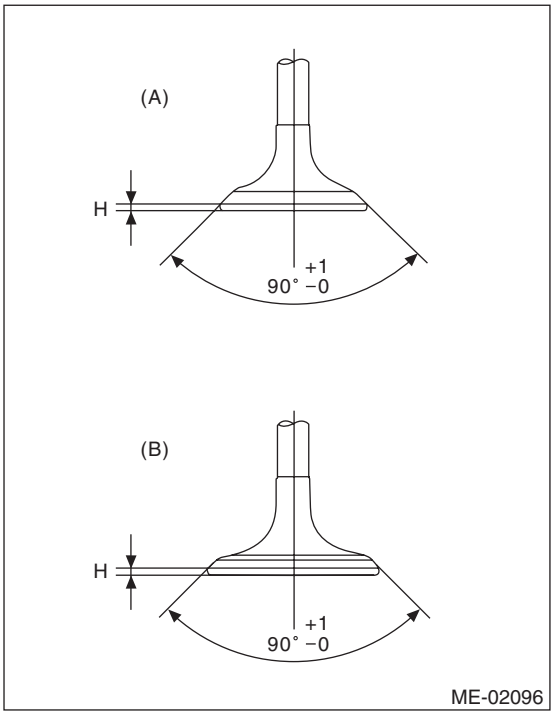
(9) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of the valve, and replace if damaged, worn, or deformed, or if “H” is outside of the standard.

Head edge thickness H:

Standard
Intake (A)
1.0 mm (0.039 in)
Exhaust (B)
1.2 mm (0.047 in)



2) Put a small amount of grinding compound on the seat surface, and lap the valve and valve seat. Install a new valve oil seal after lapping.

NOTE:
It is possible to differentiate between the intake valve and the exhaust valve by their overall length.

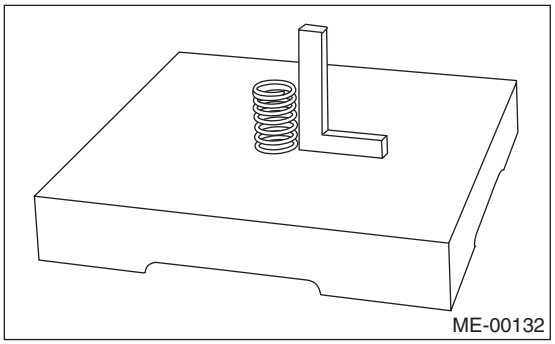
Valve overall length:
Intake
99.7 mm (3.925 in)
Exhaust
105.2 mm (4.142 in)

5. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within the standard value presented in the table.

Free length mm (in)	Intake	Inner	39.55 (1.5571)
		Outer	41.18 (1.6213)
	Exhaust		46.32 (1.8236)
Squareness	Intake	Inner	2.5°, 1.7 mm (0.067 in) or less
		Outer	2.5°, 1.8 mm (0.071 in) or less
	Exhaust		2.5°, 2.0 mm (0.079 in) or less

2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top of spring using a try square.


ME-00132

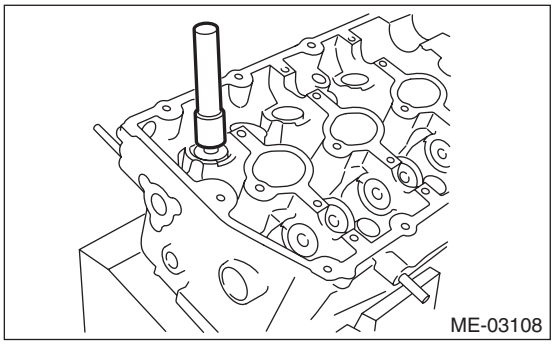
6. INTAKE AND EXHAUST VALVE OIL SEAL

1) For the following, replace the oil seal with a new part.
- When the lip is damaged
- When the spring is out of the specified position
- When readjusting the surfaces of valve and valve seat
- When replacing the valve guide

2) Set the cylinder head on ST1.
3) Using the ST2, press in the oil seal.

ST1 18250AA010 CYLINDER HEAD TABLE
ST2 499585500 VALVE OIL SEAL GUIDE

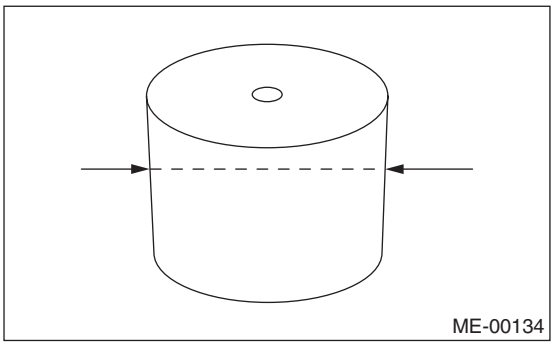
NOTE:
- Apply engine oil to oil seal before press-fitting.
- When press-fitting the oil seal, do not use a hammer to strike in.


ME-03108

7. VALVE LIFTER

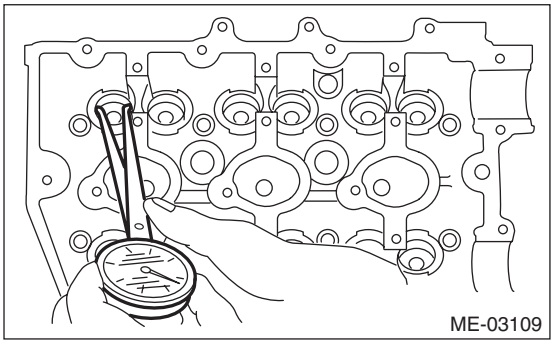
1) Check the valve lifter visually.
2) Measure the outer diameter of valve lifter.

Outer diameter:
32.959 — 32.975 mm (1.2976 — 1.2982 in)


ME-00134

3) Measure the inner diameter of valve lifter hole of cylinder head.

Inner diameter:
32.994 — 33.016 mm (1.2990 — 1.2998 in)


ME-03109

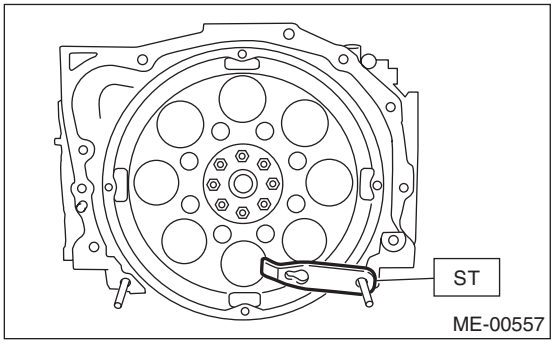
NOTE:
If difference between outer diameter of valve lifter and inner diameter of valve lifter hole is out of the standard or offset wearing is emitted, replace the cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

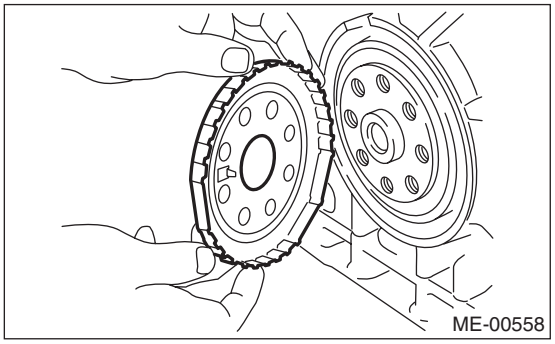
21.Cylinder Block

A: REMOVAL

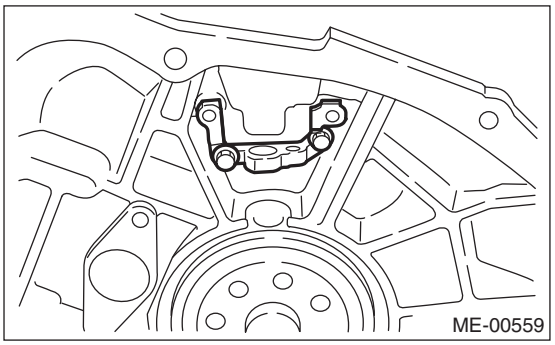
NOTE:
Before conducting this procedure, drain the engine oil completely.
1) Remove the V-belts. <Ref. to ME(H6DO)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H6DO)-39, REMOVAL, Crank Pulley.>
3) Remove the front chain cover. <Ref. to ME(H6DO)-40, REMOVAL, Front Chain Cover.>
4) Remove the timing chain assembly. <Ref. to ME(H6DO)-42, REMOVAL, Timing Chain Assembly.>
5) Remove the cam sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H6DO)-48, REMOVAL, Crank Sprocket.>
7) Remove the rear chain cover. <Ref. to ME(H6DO)-49, REMOVAL, Rear Chain Cover.>
8) Remove the camshaft. <Ref. to ME(H6DO)-51, REMOVAL, Camshaft.>
9) Remove the cylinder head. <Ref. to ME(H6DO)-55, REMOVAL, Cylinder Head.>
10) Using ST, remove the drive plate.
ST1 498497100 CRANKSHAFT STOPPER
ST2 499057000 TORX PLUS®



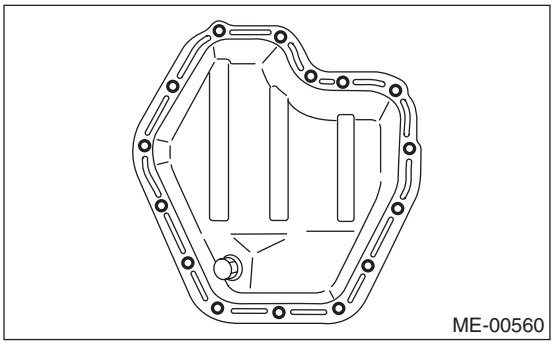
11) Remove the crankshaft position sensor plate.



12) Remove the crankshaft position sensor bracket.

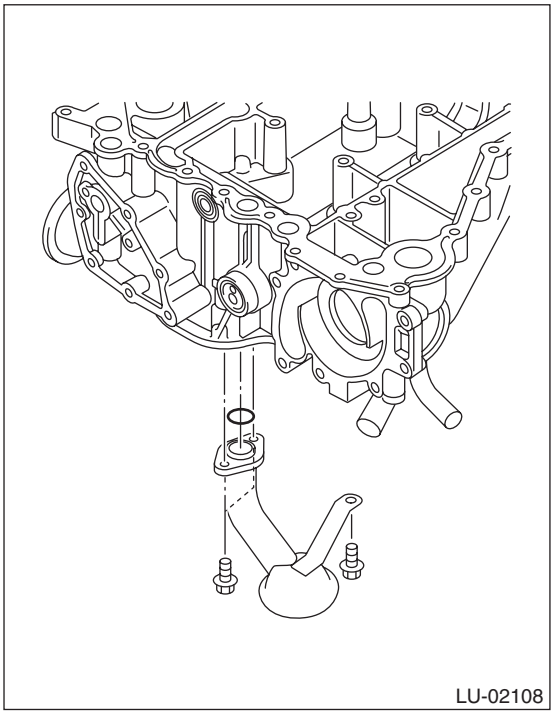


13) Rotate the engine to set oil pan upper.
14) Remove the bolts which secure oil pan lower to oil pan upper.



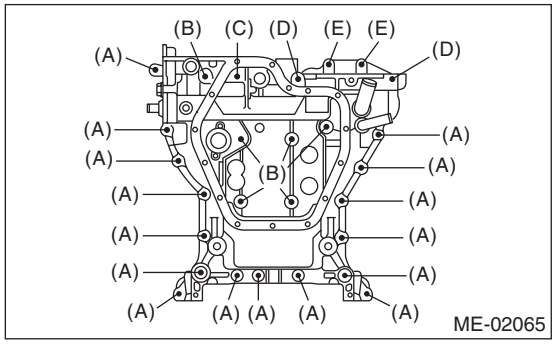
15) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove the oil pan.

CAUTION:
Do not use a screwdriver or similar tools in place of oil pan cutter.
16) Remove the oil strainer.



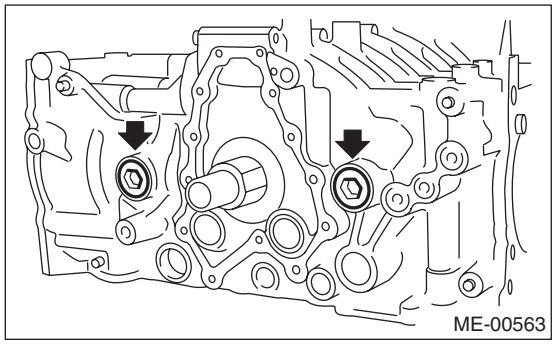
17) Remove the bolts which install oil pan upper onto cylinder block.

NOTE:
Installation bolt has five different sizes. To prevent the confusion in installation, keep these bolts on container individually.

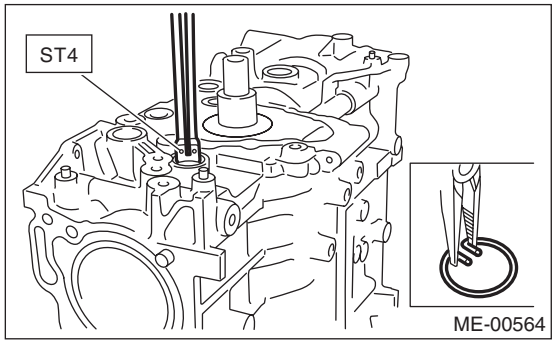


(A) M8 × 40
(B) M8 × 65
(C) M8 × 85
(D) M8 × 130.5
(E) M8 × 24

18) Remove the service hole cover and service hole plugs using a hexagon wrench.

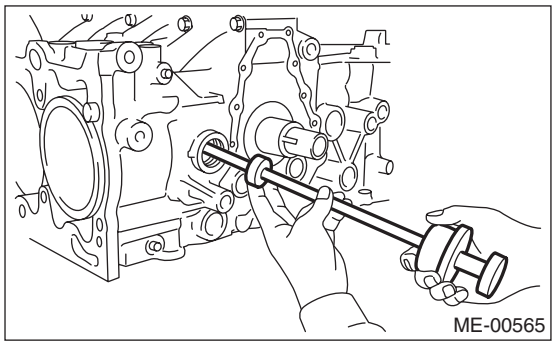


19) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then, using the ST, remove the piston snap ring through service hole of #1 and #2 cylinders.
ST 18233AA000 PISTON PIN SNAP RING PLIERS

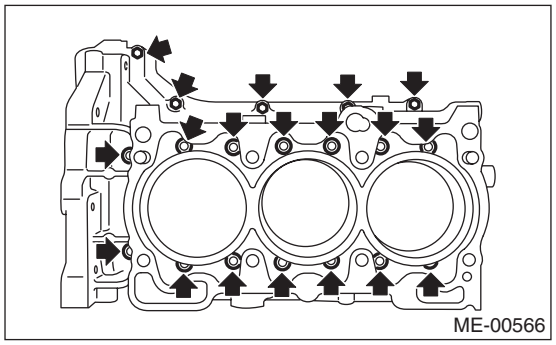


20) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



21) Similarly remove the piston pins from #3, #4, #5, and #6 pistons.
22) Remove the cylinder block connecting bolts.



23) Separate the cylinder block (LH) and (RH).

NOTE:
When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.
24) Remove the rear oil seal.
25) Remove the crankshaft together with connecting rod.
26) 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.
27) Draw out each piston from cylinder block using wooden bar or hammer handle.

NOTE:
Be careful not to confuse the original combination of piston and cylinder.

B: INSTALLATION

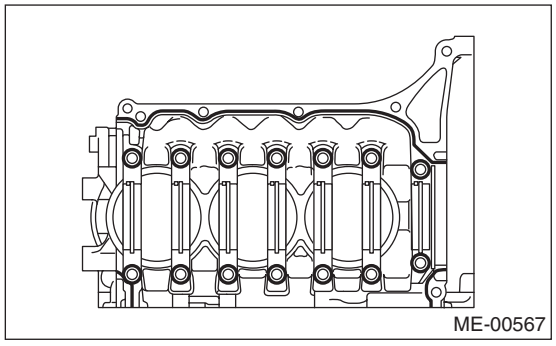
1) After setting the cylinder block to ST, install the crankshaft bearing.
ST 18232AA000 ENGINE STAND

NOTE:
Remove oil on the mating surface of cylinder block before installation. Apply a coat of engine oil to the bearing and crankshaft journal.
2) Position the crankshaft on the cylinder block (RH).
3) Apply liquid gasket to the mating surfaces of cylinder block (RH), and position the cylinder block (LH).

Liquid gasket:
THREE BOND 1215B (Part No. 004403007)

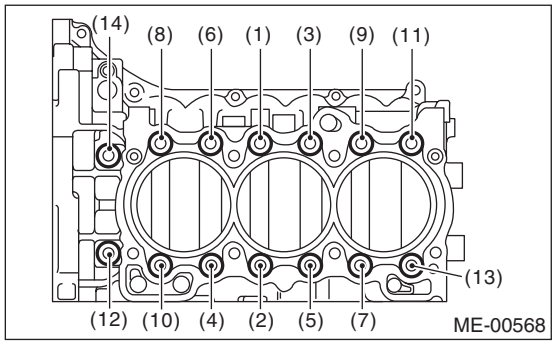
NOTE:
Do not allow liquid gasket to run over to oil passages, bearing grooves, etc.

Applying liquid gasket diameter:
1.0±0.2 mm (0.039±0.008 in)



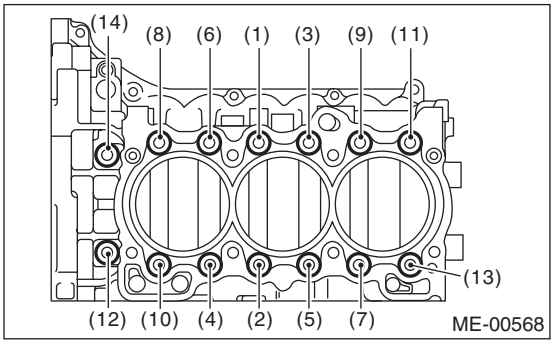
4) Apply a coat of engine oil to the washer and bolt thread.
5) Tighten all bolts in the numerical order as shown in the figure.

Tightening torque:
(1) — (11), (13): 25 N·m (2.5 kgf-m, 18.4 ft-lb)
(12), (14): 20 N·m (2.0 kgf-m, 14 ft-lb)

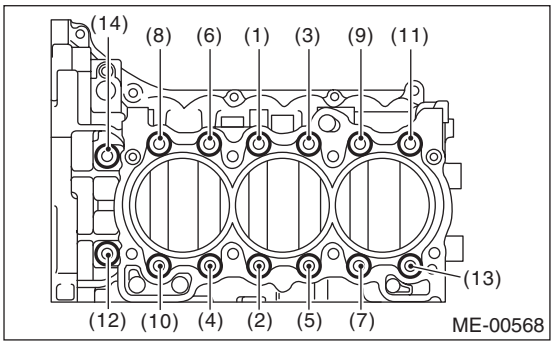


6) Retighten all bolts in the numerical order as shown in the figure.

Tightening torque:
(1) — (11), (13): 25 N·m (2.5 kgf-m, 18.4 ft-lb)
(12), (14): 20 N·m (2.0 kgf-m, 14 ft-lb)



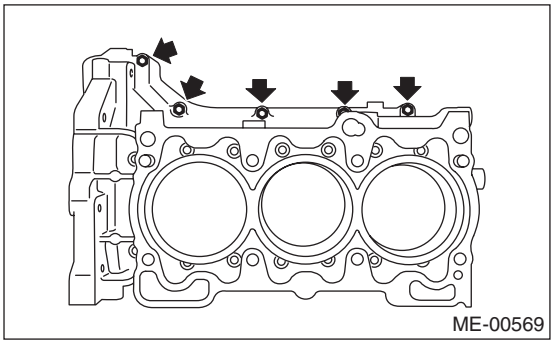
7) Tighten all bolts 90° — 110° in the numerical order as shown in the figure.



8) Install the upper bolt to cylinder block.

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

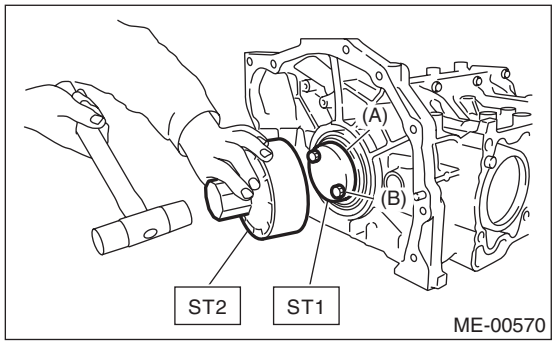
NOTE:
After tightening the cylinder block connecting bolts, remove the liquid gasket which is running over to the sealing surface for rear chain cover and oil pan upper.



9) Apply a coat of engine oil to the oil seal periphery, then install the rear oil seal using ST1 and ST2.

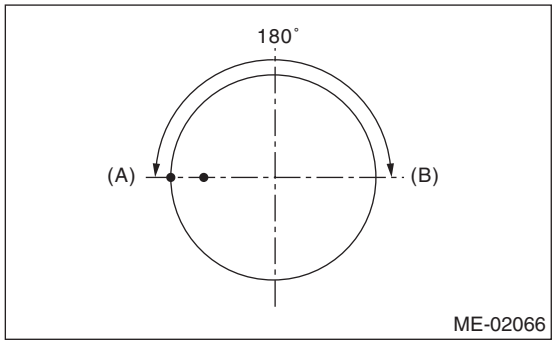
NOTE:
Use a new rear oil seal.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE
ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER

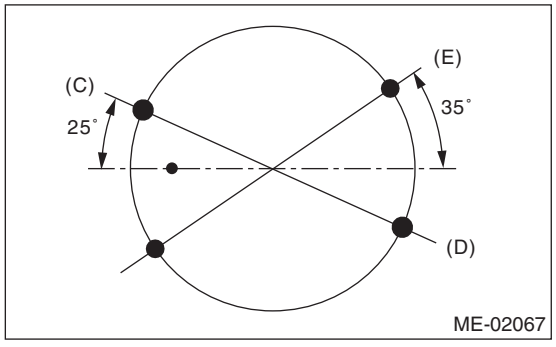


(A) Rear oil seal
(B) Drive plate installation bolt

10) Position the top ring gap at (A) in the figure.
11) Position the second ring gap at (B).



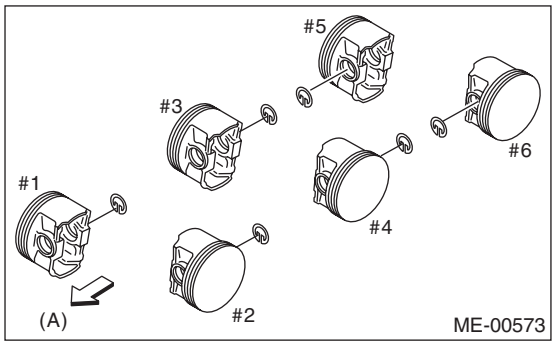
12) Position the upper rail gap at (C) in the figure.
13) Position the expander gap at (D) in the figure.
14) Position the lower rail gap at (E) in the figure.



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.

15) Install the snap ring.
Install the snap rings in the piston holes located opposite to the service holes in cylinder block when positioning all pistons in corresponding cylinders.

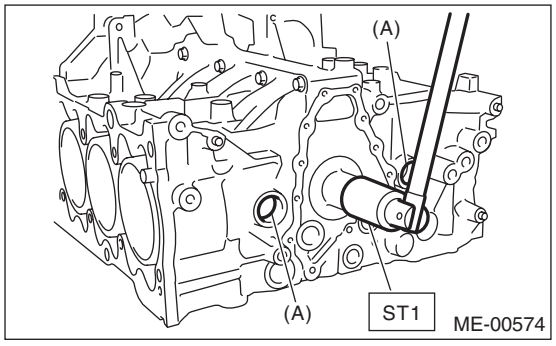
NOTE:
Use new snap rings.



(A) Front side of vehicle

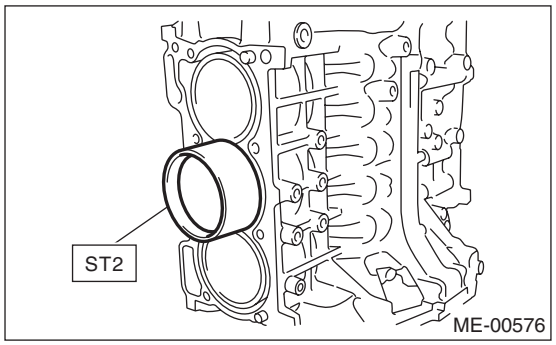
16) Installing piston:
(1) Using the ST1, turn the crankshaft so that #3 and #4 connecting rod small ends are set on the service hole (A).

ST1 18252AA000 CRANKSHAFT SOCKET

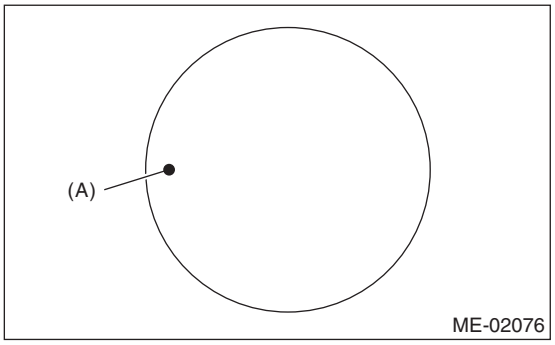


(2) Apply a thin coat of engine oil to piston and cylinder.
(3) Using the ST2, press-fit the piston into cylinder.

ST2 18254AA000 PISTON GUIDE

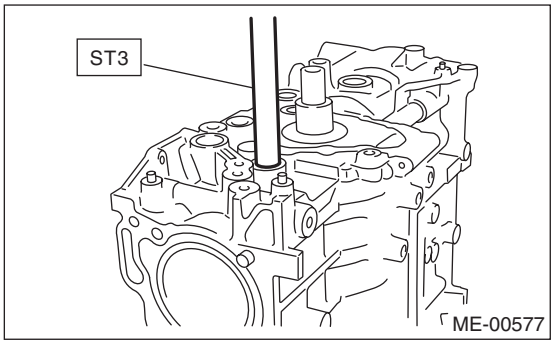


NOTE:
Let the piston front mark (A) face towards the front of engine.



17) Installing piston pin:
(1) Apply a coat of engine oil to ST3 before insertion, and then insert it into the service hole to align piston pin hole with connecting rod small end.

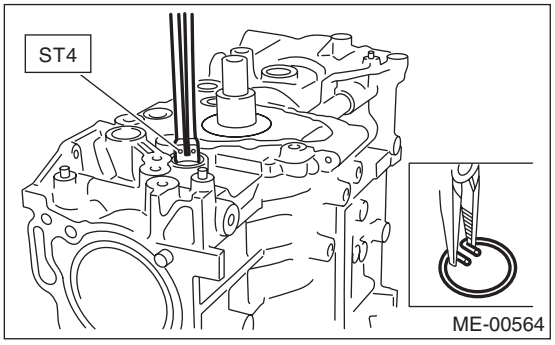
ST3 18253AA000 PISTON PIN GUIDE



(2) Apply a coat of engine oil to piston pin, and insert the piston pin into piston and connecting rod through service hole.
(3) Using the ST4, install the snap ring.

ST4 18233AA000 PISTON PIN SNAP RING PLIERS

NOTE:
Use new snap rings.



(4) Similarly install the #1, #2, #5 and #6 pistons.

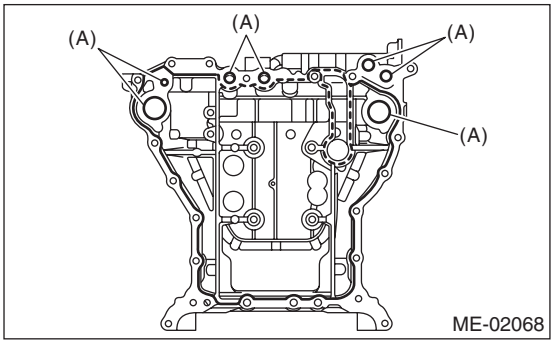
18) Install the service hole plug and O-ring.

NOTE:
Use new O-rings.

19) Apply liquid gasket to the mating surface of oil pan upper.

Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

Applying liquid gasket diameter:
Full line part
3.0±1.0 mm (0.12±0.04 in)
Broken line part
1.0 mm (0.04 in)

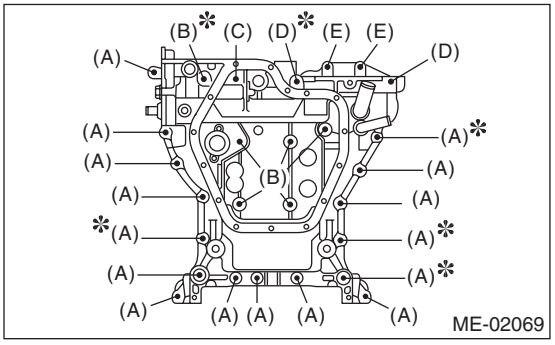


(A) O-ring

NOTE:
Use new O-rings.

20) Temporarily tighten the oil pan upper.

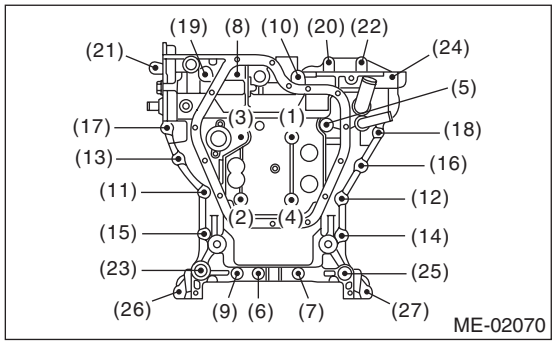
NOTE:
Do not install the bolts in wrong place.



(A) M8 × 40
(B) M8 × 65
(C) M8 × 85
(D) M8 × 130.5
(E) M8 × 24
*: Coating

21) Tighten the oil pan upper installing bolts in the numerical order as shown in the figure.

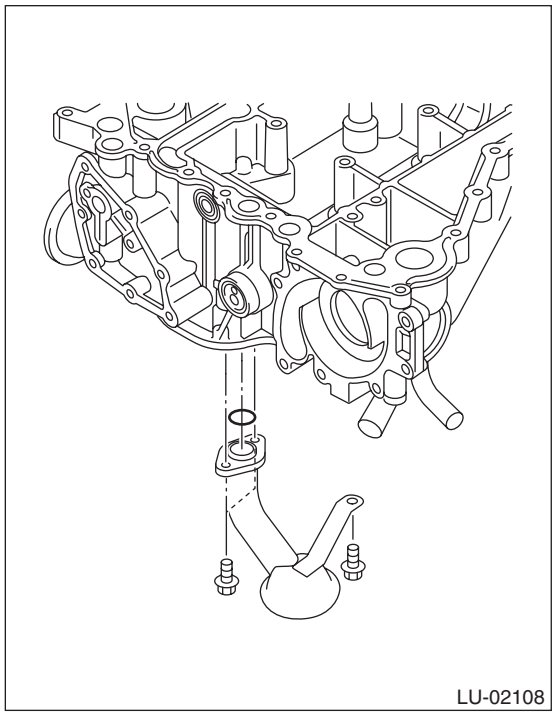
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



22) Install the oil strainer.

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

NOTE:
Use new O-rings.

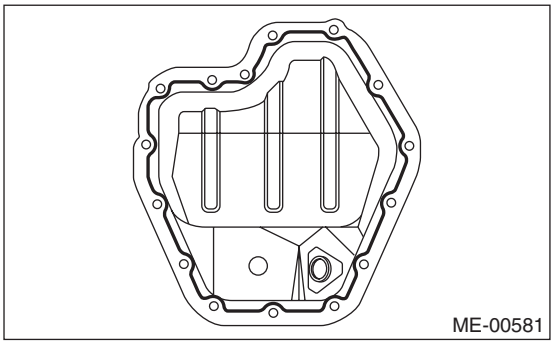


23) Apply liquid gasket to the matching surface of oil pan lower.

NOTE:
Install within 5 min. after applying liquid gasket.

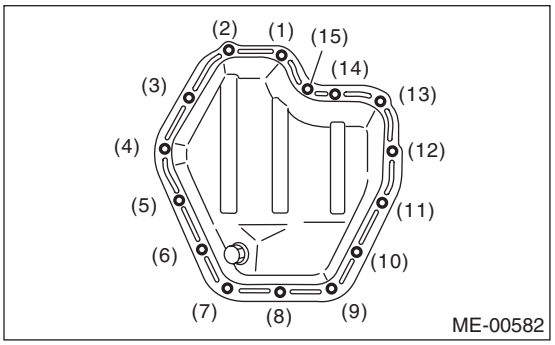
Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

Applying liquid gasket diameter:
5.0±1.0 mm (0.20±0.04 in)



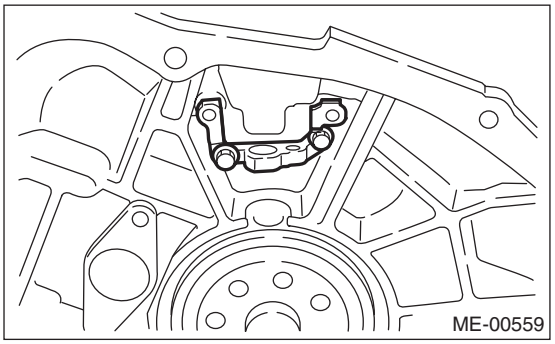
24) Tighten the oil pan lower installing bolts in the numerical order as shown in the figure.

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

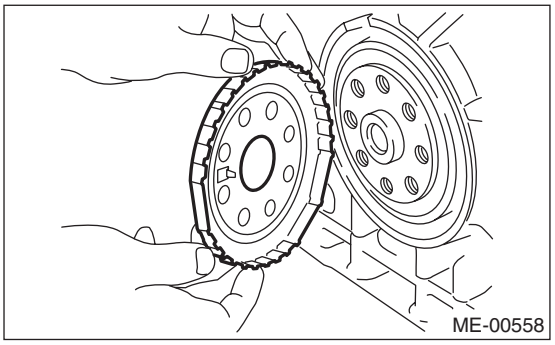


25) Install the crankshaft sensor bracket.

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

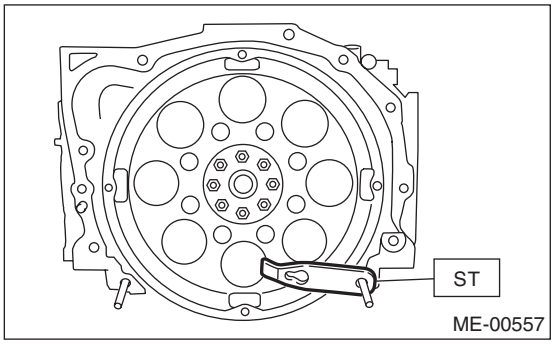


26) Install the crankshaft sensor plate.



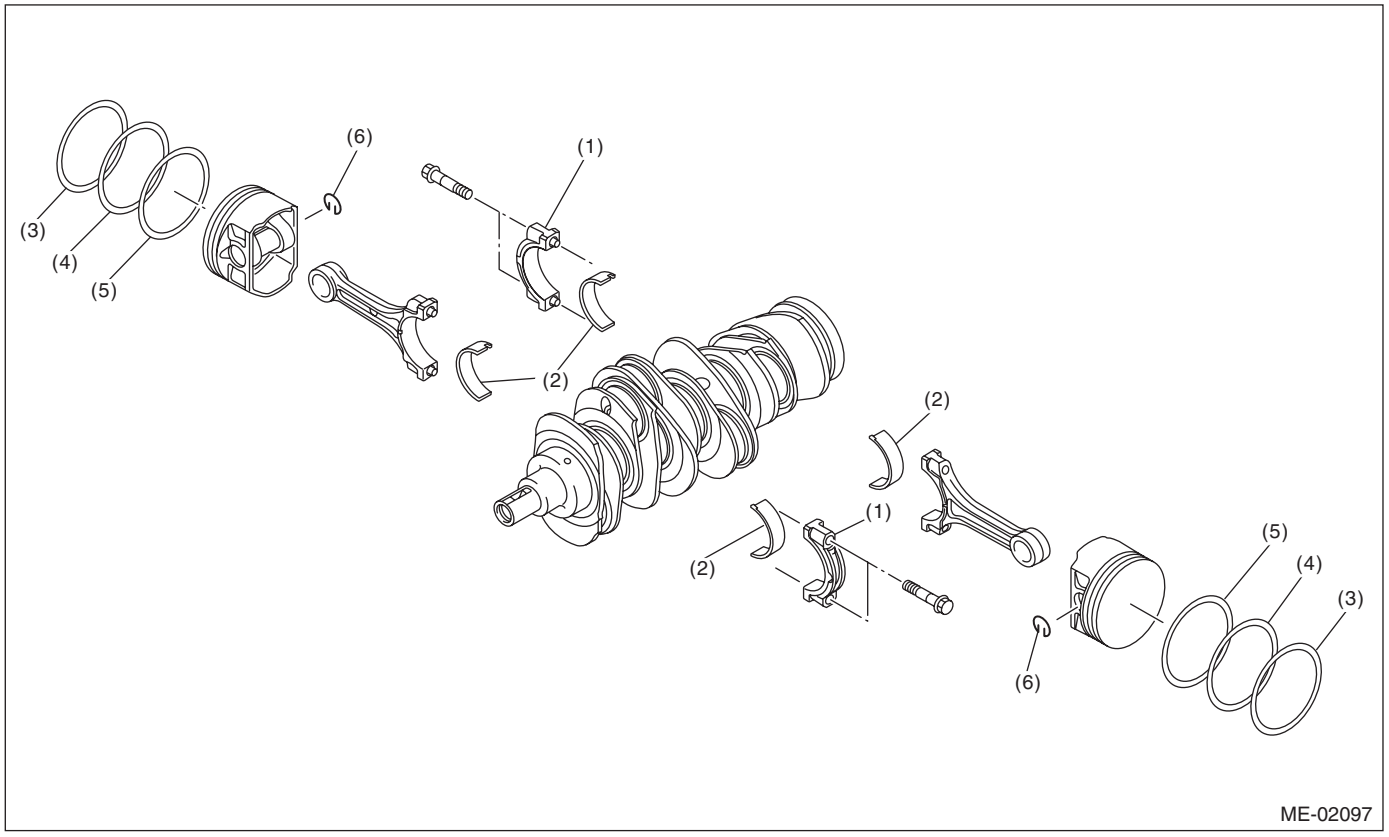
27) Using ST, install the drive plate.
ST1 498497100 CRANKSHAFT STOPPER
ST2 499057000 TORX PLUS®

Tightening torque:
81 N·m (8.3 kgf-m, 60 ft-lb)



28) Install the cylinder head. <Ref. to ME(H6DO)-55, INSTALLATION, Cylinder Head.>
29) Install the camshaft. <Ref. to ME(H6DO)-52, INSTALLATION, Camshaft.>
30) Install the rear chain cover. <Ref. to ME(H6DO)-49, INSTALLATION, Rear Chain Cover.>
31) Install the crank sprocket. <Ref. to ME(H6DO)-48, INSTALLATION, Crank Sprocket.>
32) Install the cam sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Cam Sprocket.>
33) Install the timing chain assembly. <Ref. to ME(H6DO)-43, INSTALLATION, Timing Chain Assembly.>
34) Install the front chain cover. <Ref. to ME(H6DO)-40, INSTALLATION, Front Chain Cover.>
35) Install the crank pulley. <Ref. to ME(H6DO)-39, INSTALLATION, Crank Pulley.>
36) Install the V-belts. <Ref. to ME(H6DO)-38, INSTALLATION, V-belt.>

C: DISASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Snap ring

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

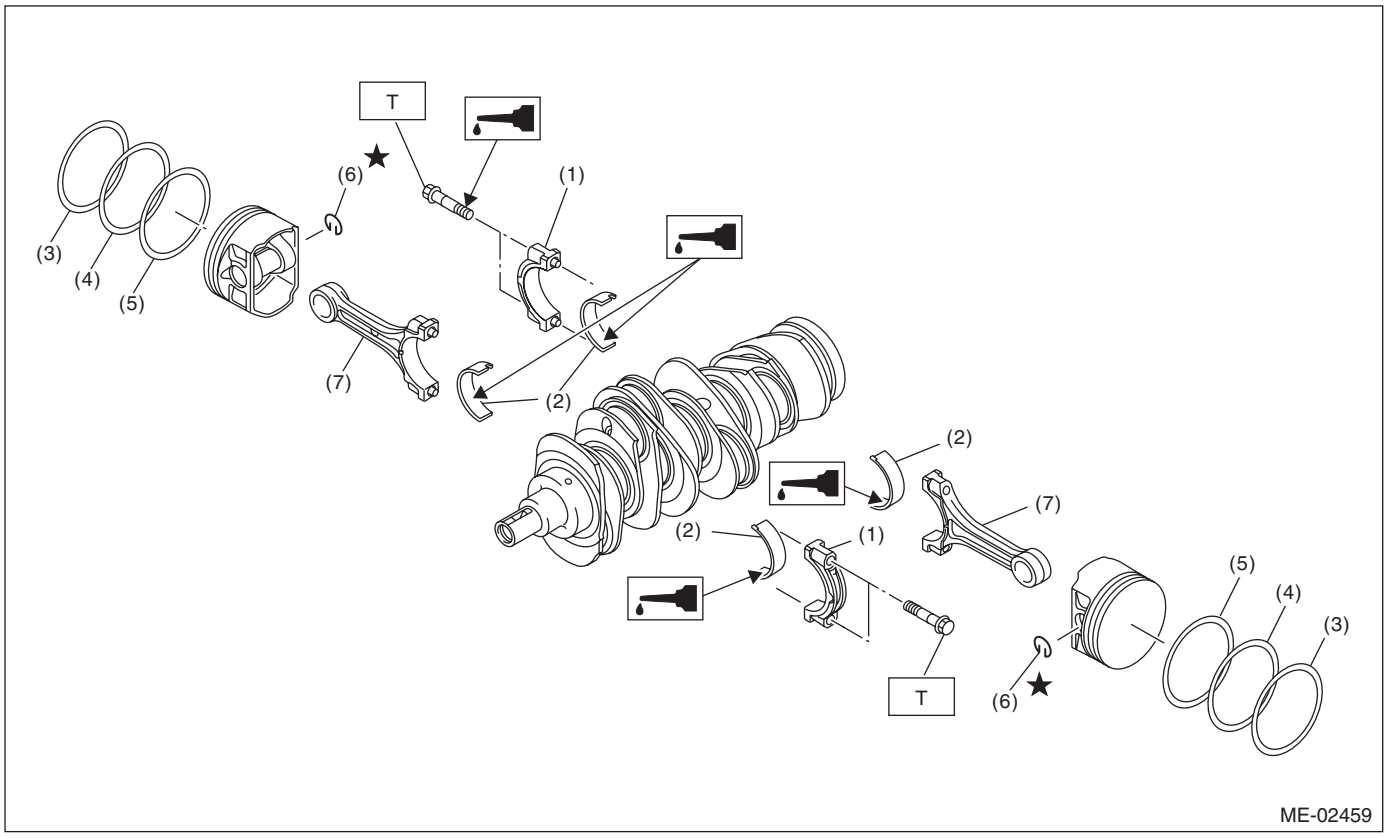
NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order, to prevent confusion.

3) Remove the piston rings using piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in proper order, to prevent confusion.

5) Remove the snap ring.

D: ASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Snap ring
(7) Connecting rod

Tightening torque:N·m (kgf-m, ft-lb)
T: 53 (5.4, 39)

1) Apply oil to the surface of the connecting rod bearings, and install the connecting rod bearings on connecting rods and connecting rod caps.
2) Position each connecting rod with the marking side facing forward.
3) Install the connecting rod cap. Make sure the arrow mark on connecting rod cap facing front during installation.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod bolts, apply oil on the threads and flange end.

Tightening torque:
53 N·m (5.4 kgf-m, 39 ft-lb)
4) Install the oil ring spacer, upper rail and lower rail by hand.
5) Install the second ring and top ring using piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Check for cracks or damage. Use liquid penetrant tester on the important sections to check for fissures. Check that there are no marks of gas leaking or water leaking on gasket installing surface.
2) Check the oil passages for clogging.
3) Inspect the cylinder block surface that mates with cylinder head for warping by using a straight edge. If the warping exceeds the limit, replace the cylinder block.

Warping limit:
0.02 mm (0.0008 in)

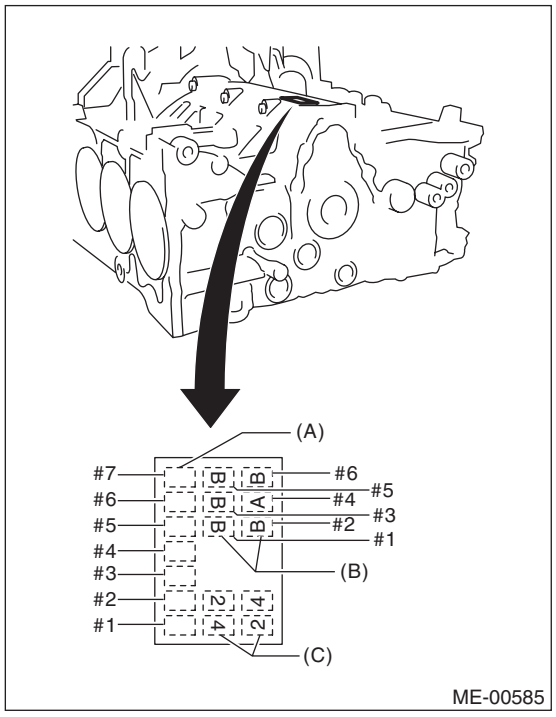
Standard height of cylinder block:
202 mm (7.95 in)

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: 89.205 — 89.215 mm (3.5120 — 3.5124 in)
B: 89.195 — 89.205 mm (3.5116 — 3.5120 in)



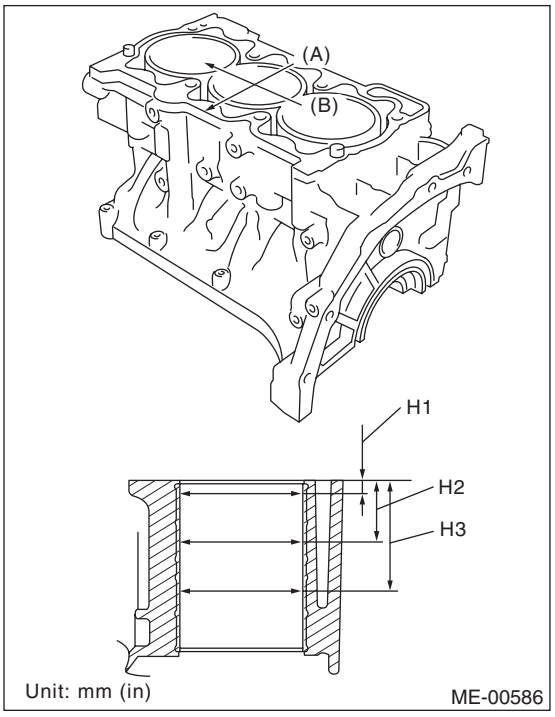
(A) Main journal size mark
(B) Cylinder bore size mark
(C) Cylinder block (RH) – (LH) combination mark

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)



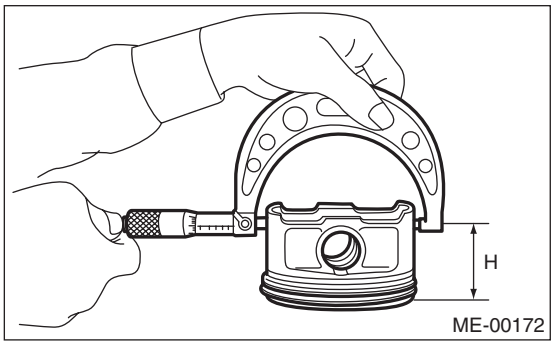
(A) Piston pin direction
(B) Thrust direction
H1: 10 mm (0.39 in)
H2: 45 mm (1.77 in)
H3: 80 mm (3.15 in)

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: 89.205 — 89.215 mm (3.5120 — 3.5124 in)
B: 89.195 — 89.205 mm (3.5116 — 3.5120 in)
0.25 mm (0.0098 in) oversize
89.445 — 89.465 mm (3.5215 — 3.5222 in)
0.50 mm (0.0197 in) oversize
89.695 — 89.715 mm (3.5313 — 3.5321 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, other cylinders must be bored at the same time, and replaced with oversize pistons.
• Do not perform boring on one cylinder only. Do not replace only a single cylinder for an oversize piston.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the cylinder block.

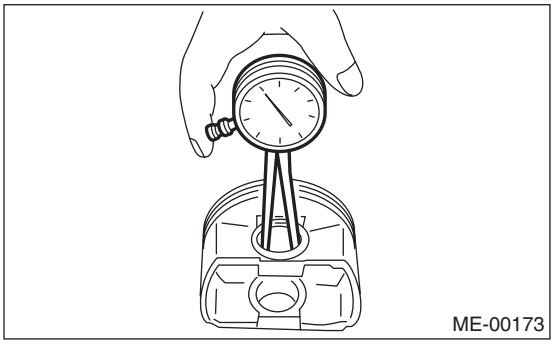
Cylinder inner diameter boring limit (diameter):
To 89.715 mm (3.5321 in)

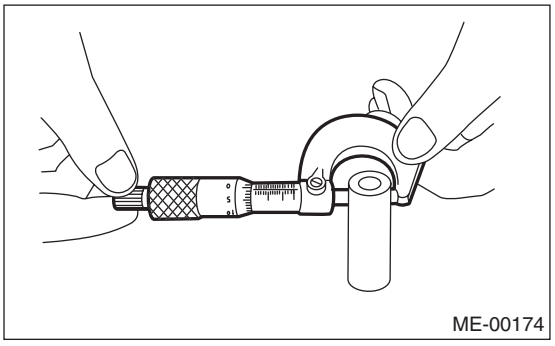
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

3. PISTON AND PISTON PIN

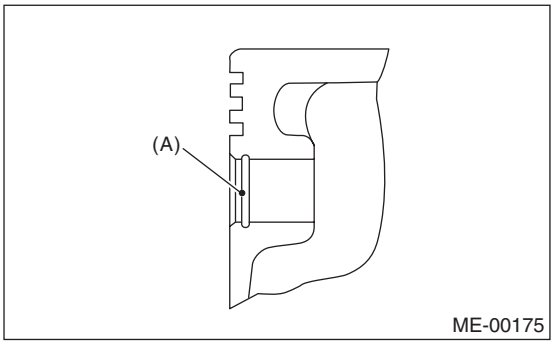
1) Check the piston and piston pin for breaks, cracks or wear. Replace if faulty.
2) Check the piston ring groove for wear or damage. Replace if faulty.
3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if faulty.

Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)





4) Check the snap ring installation groove (A) on the piston for burr. If necessary, remove burr from the groove so that the piston pin can lightly move.

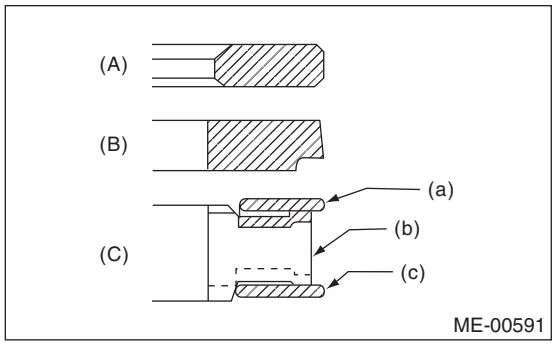


5) Check the piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new part of the same size as piston.

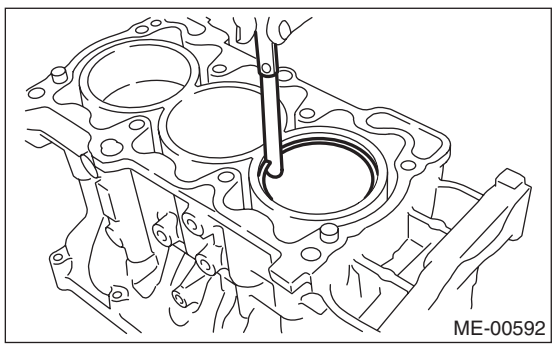
NOTE:
• The top ring and second ring have the mark to determine the direction to install on them. When installing the ring to piston, face this mark to the top side.
• Oil ring consists of the upper rail, expander and lower rail. When installing on the piston, be careful of the direction of each rail.



(A) Top ring
(B) Second ring
(C) Oil ring
(a) Upper rail
(b) Expander
(c) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

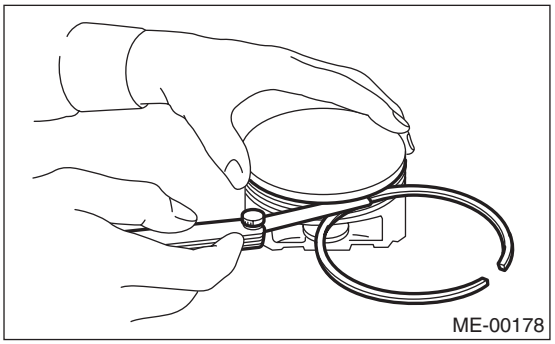
		Standard mm (in)
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)
	Oil ring	0.20 — 0.60 (0.0079 — 0.0236)



3) Fit the piston ring straight into the piston ring groove, then measure the clearance between piston ring and piston ring groove with a thickness gauge.

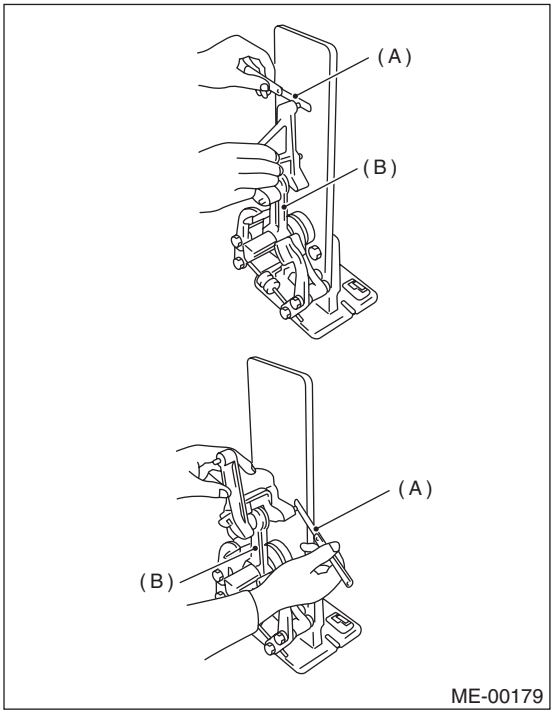
NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

		Standard mm (in)
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)
Clearance between oil ring and oil ring groove		0.045 — 0.125 (0.0018 — 0.0049)



5. CONNECTING ROD

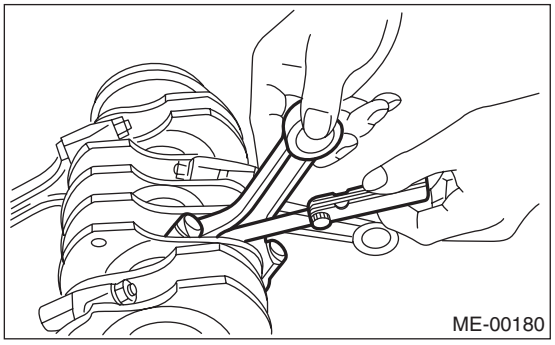
1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if it has the bend or twist.



(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft and measure the thrust clearance. If the thrust clearance exceeds the standard or uneven wear is found, replace the connecting rod.

Connecting rod thrust clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)



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)

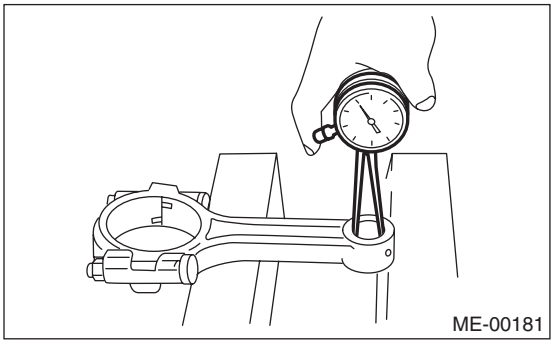
Unit: mm (in)

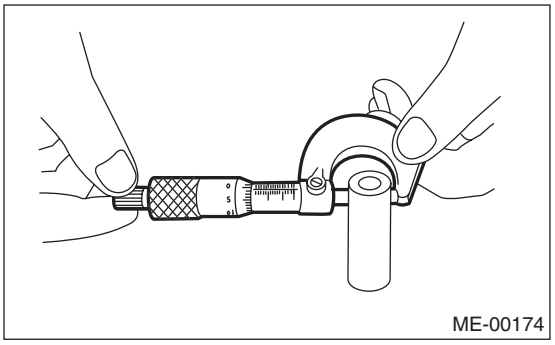
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.506 (0.0587 — 0.0593)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.509 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.519 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.619 — 1.623 (0.0637 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged.

7) Measure the piston pin clearance at connecting rod small end. If the measured value is not within the standard, replace it with a new part.

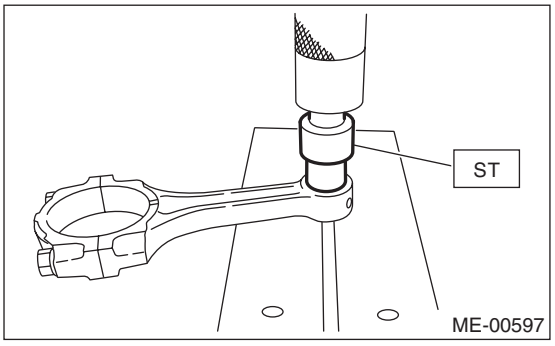
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)





8) The replacement procedure for the connecting rod small end bushing is as follows.
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 18350AA000 CONNECTING ROD BUSHING REMOVER AND INSTALLER

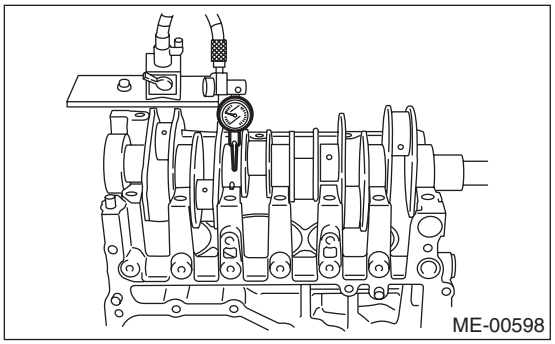


(3) Make two 3 mm (0.12 in) holes in the pressed bushing by aligning with the pre-manufactured holes on the connecting rod, and ream the inside of the bushing.
(4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

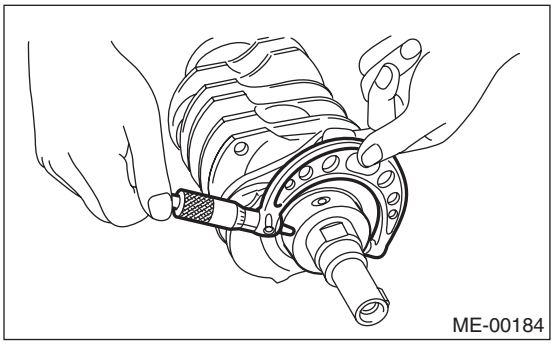
1) Clean the crankshaft completely, and check it for cracks using liquid penetrant tester. Replace if defective.
2) Check the crankshaft for bend, and repair or replace if needed. Repair or replace if bended.

NOTE:
If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings, and then check the crankshaft bend using a dial gauge.


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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)

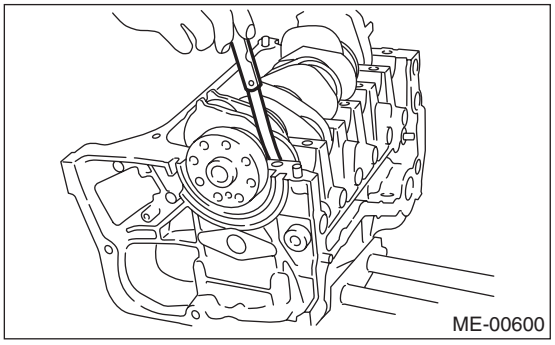

ME-00184

Unit: mm (in)

		Crank journal diameter		Crank pin outer diameter
		#1, #3, #5, #7	#2, #4, #6	
Standard	Journal O.D.	63.992 — 64.008 (2.5194 — 2.5200)		51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.992 — 2.005 (0.0784 — 0.0789)	1.996 — 2.009 (0.0786 — 0.0791)	1.490 — 1.506 (0.0587 — 0.0593)
0.03 (0.0012) undersize	Journal O.D.	63.962 — 63.978 (2.5182 — 2.5188)		51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.011 — 2.014 (0.0792 — 0.0793)	2.015 — 2.018 (0.0793 — 0.0794)	1.509 — 1.513 (0.0594 — 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)	1.519 — 1.523 (0.0598 — 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)	1.619 — 1.623 (0.0637 — 0.0639)

4) Measure the thrust clearance of crankshaft at center bearing by using thickness gauge. If the thurst clearance is not within 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)

22. Oil Flow Control Solenoid Valve

A: REMOVAL

Oil flow control solenoid valve is a unit with camshaft cap. Refer to “Camshaft” for removal procedure. <Ref. to ME(H6DO)-51, REMOVAL, Camshaft.>

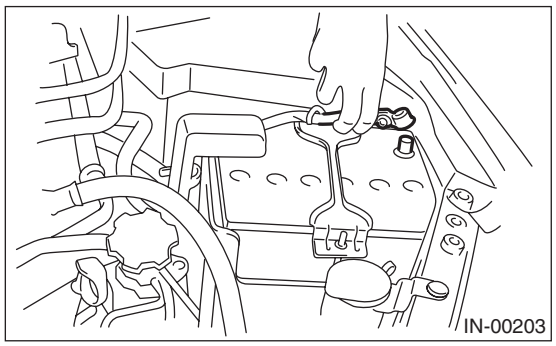
B: INSTALLATION

Install in the reverse order of removal.

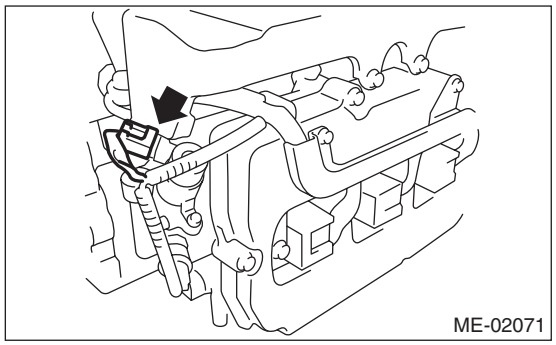
23.Oil Switching Solenoid Valve

A: REMOVAL

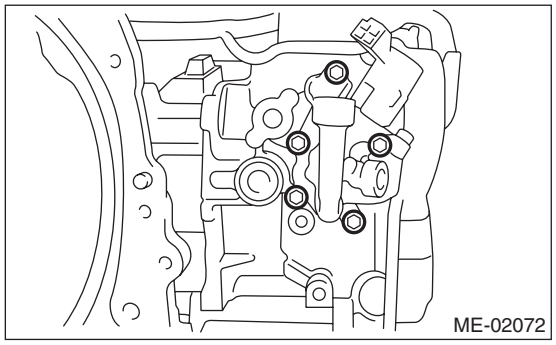
1) Disconnect the ground cable from battery.



2) Remove the air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
3) Disconnect the connector from the oil switching solenoid valve.



4) Remove the oil switching solenoid valve.
5) Remove the variable valve lift diagnosis oil pressure switch. <Ref. to FU(H6DO)-27, REMOVAL, Variable Valve Lift Diagnosis Oil Pressure Switch.>
6) Remove the oil temperature sensor. <Ref. to FU(H6DO)-28, REMOVAL, Oil Temperature Sensor.>
7) Remove the oil switching solenoid valve holder from the cylinder head.

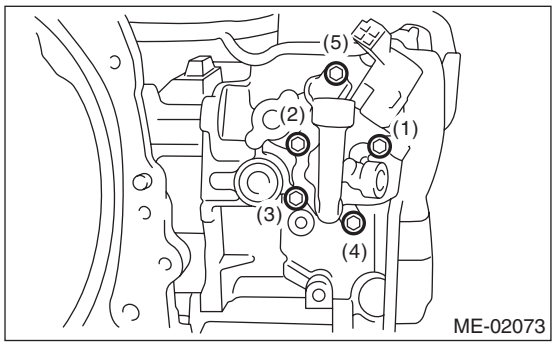


B: INSTALLATION

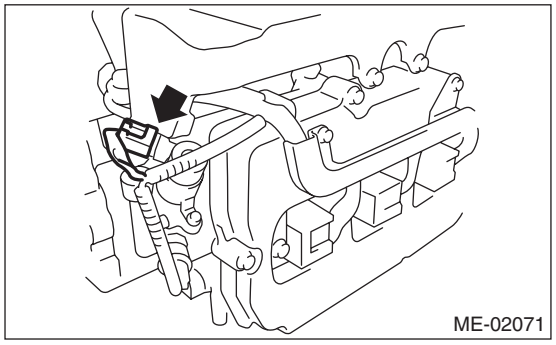
1) Install the oil switching solenoid valve holder.

NOTE:
Use a new gasket.

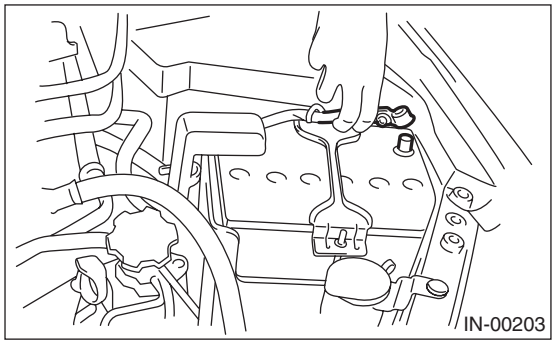
(1) Temporarily tighten the bolts by tightening torque of 5 — 10 N·m (0.5 — 1.0 kgf-m, 3.7 — 7.4 ft-lb) in order shown in the figure.
(2) Tighten the bolts by tightening torque of 10±0.5 N·m (1.0±0.05 kgf-m, 7.4±0.37 ft-lb) in order shown in the figure.



2) Install the oil temperature sensor. <Ref. to FU(H6DO)-28, INSTALLATION, Oil Temperature Sensor.>
3) Install the variable valve lift diagnosis oil pressure switch. <Ref. to FU(H6DO)-27, INSTALLATION, Variable Valve Lift Diagnosis Oil Pressure Switch.>
4) Install the oil switching solenoid valve.
5) Connect the connector to oil switching solenoid valve.



6) Install the air intake chamber. <Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
7) Connect the battery ground cable to the battery.



24.Intake and Exhaust Valve

A: SPECIFICATION

Refer to “Cylinder Head” for removal and installation procedures of intake and exhaust valves. <Ref. to ME(H6DO)-55, REMOVAL, Cylinder Head.> <Ref. to ME(H6DO)-55, INSTALLATION, Cylinder Head.>

25.Piston

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of pistons. <Ref. to ME(H6DO)-60, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-62, INSTALLATION, Cylinder Block.>

26.Connecting Rod

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of connecting rod. <Ref. to ME(H6DO)-60, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-62, INSTALLATION, Cylinder Block.>

27.Crankshaft

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of crankshaft. <Ref. to ME(H6DO)-60, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-62, INSTALLATION, Cylinder Block.>

28.Engine Trouble in General

A: INSPECTION

NOTE:
The “RANK” shown in the chart shows the possibilities of the cause of trouble in order from “Very often” to “Rarely”.
A — Very often
B — Sometimes
C — Rarely

Symptoms	Problem parts etc.	Possible cause	RANK
1. Engine does not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch or neutral 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
		Trouble of valve lifter	C
		Trouble of valve lifter. In case noise occurs with valve moving. Or when the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	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
		Trouble of valve lifter	C
		Trouble of valve lifter. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	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
		Trouble of valve lifter	C
		Trouble of valve lifter. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	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
		Trouble of valve lifter	C
		Trouble of valve lifter. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Overheat	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
		Trouble of valve lifter	C
		Trouble of valve lifter. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Overheat	C
		Over-cooling	C
	Others	Evaporative emission control system malfunction	A

Symptoms	Problem parts etc.	Possible cause	RANK
4. Surging	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of 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
		Trouble of valve lifter	C
		Trouble of valve lifter. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
	Cooling system	Overheat	B
	Others	Evaporative emission control system malfunction	C
5. Engine does not return to idle.	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheat	B
	Others	Evaporative emission control system malfunction	B

Symptoms	Problem parts etc.	Possible cause	RANK
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
		Trouble of valve lifter	C
		Trouble of valve lifter. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
	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
		Trouble of valve lifter	C
		Trouble of valve lifter. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
	Cooling system	Overheat	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
		Trouble of valve lifter	C
		Trouble of valve lifter. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over-cooling	C

29.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 crankshaft 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 spark plug • Improper gasoline
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 • Chain contacting with case/adjacent part
Valve noise	—	• Incorrect valve clearance • Trouble of valve lifter

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)-43, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(H6DO)

Page

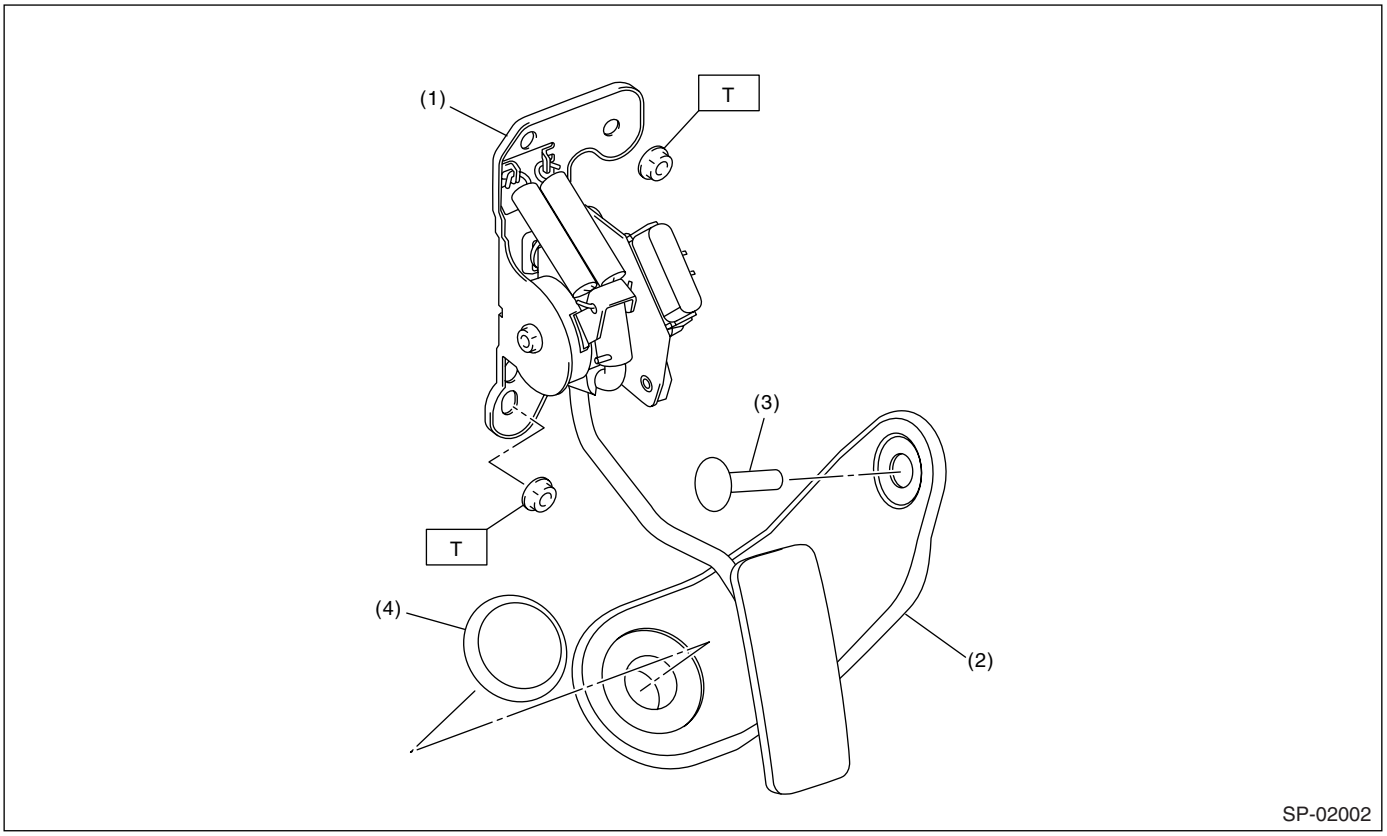
1. General Description 2
2. Front Exhaust Pipe 4
3. Rear Exhaust Pipe 7
4. Muffler 9

1. General Description

A: SPECIFICATION

Accelerator pedal	Stroke	At pedal pad	50 — 63 mm (1.97 — 2.48 in)

B: COMPONENT



(1) Accelerator pedal ASSY
(2) Accelerator plate
(3) Clip
(4) Stopper

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

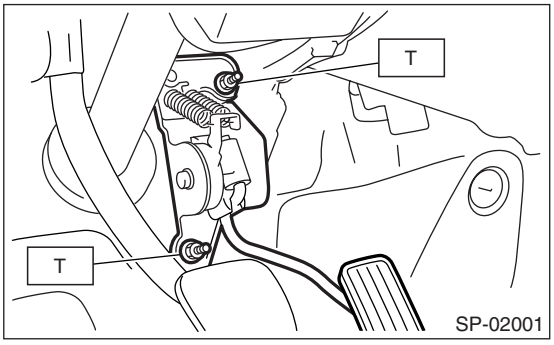
C: CAUTION

• 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, 13.0 ft-lb)

C: DISASSEMBLY

NOTE:
The accelerator pedal cannot be disassembled.

IGNITION

IG(H6DO)

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1. General Description

A: SPECIFICATION

Specifications for the 3.0 L DOHC non-turbo model are included in the SC(H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(H6DO)(diag)

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