1. General Description

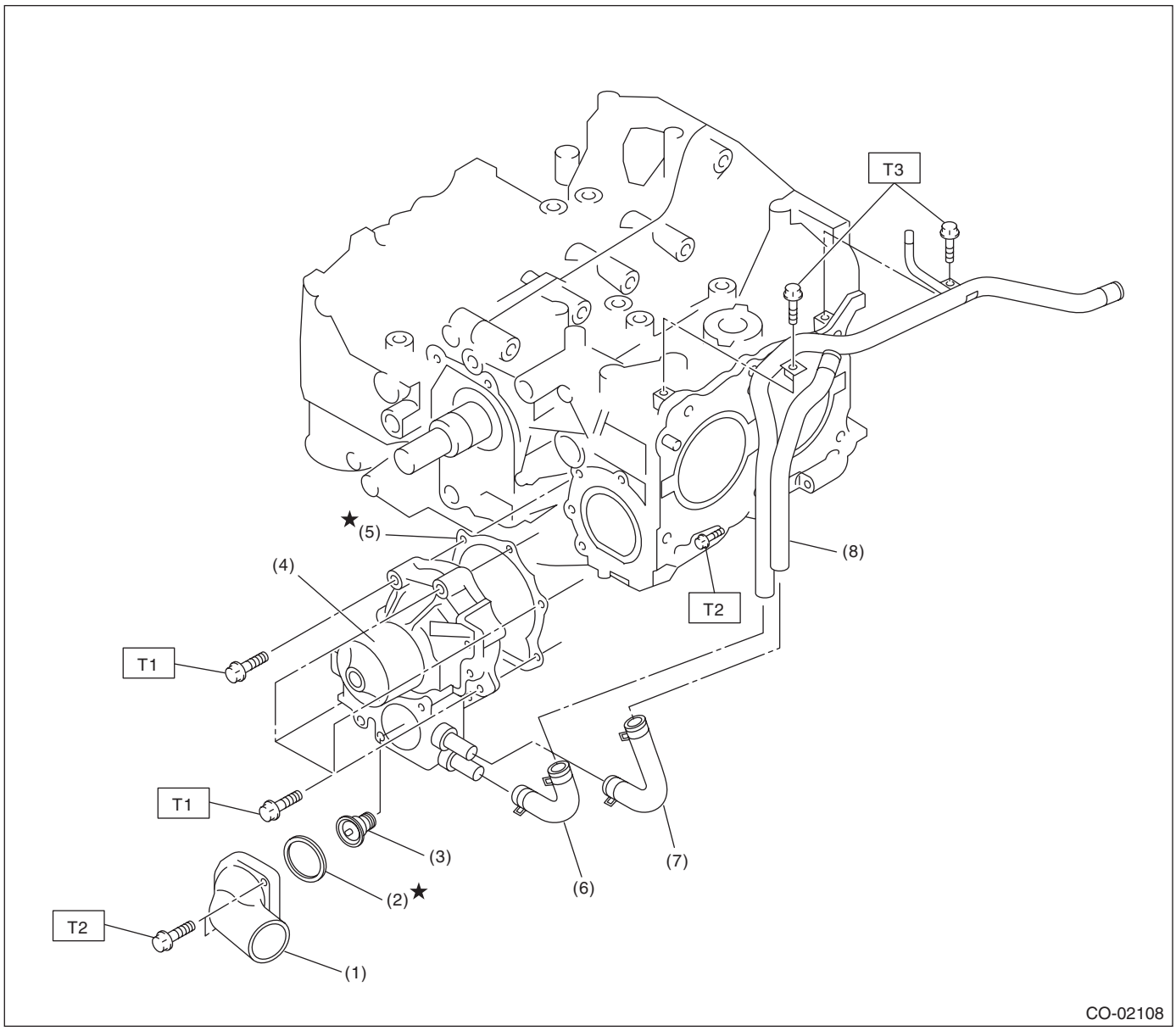
A: SPECIFICATION

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity		ℓ (US qt, Imp qt)	MT: Approx. 7.3 (7.7, 6.4) AT: Approx. 7.2 (7.6, 6.3)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge rate ℓ (US gal, Imp gal) /min	20 (5.3, 4.4)
		Pump speed — Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance II	Discharge rate ℓ (US gal, Imp gal) /min	100 (26.4, 22.0)
		Pump speed — Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance III	Discharge rate ℓ (US gal, Imp gal) /min	200 (52.8, 44.0)
		Pump speed — Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter	mm (in)	76 (2.99)
	Number of impeller vanes		8
	Pump pulley diameter	mm (in)	60 (2.36)
	Clearance between impeller and case	Standard mm (in)	0.5 — 1.5 (0.020 — 0.059)
Thermostat	Type		Wax pellet type
	Starting temperature to open		76 — 80°C (169 — 176°F)
	Fully opens		91°C (196°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	120
		Sub fan W	120
	Fan diameter / Blade	Main fan	320 mm (12.6 in)/5
		Sub fan	320 mm (12.6 in)/7
Radiator	Type		Down flow
	Core dimensions	Width × Height × Thickness mm (in)	687.4 × 340 × 16 (27.06 × 13.39 × 0.63)
	Pressure range in which cap valve is open	Coolant filler tank side kPa (kg/cm^2, psi)	Above: 108±15 (1.1±0.15, 16±2) Below: –1.0 — –4.9 (–0.01 — –0.05, –0.1 — –0.7)
		Radiator side kPa (kg/cm^2, psi)	Above only: 137±14.7 (1.40±0.15, 20±2.1)
	Fins		Corrugated fin type
Reservoir tank	Capacity	ℓ (US qt, Imp qt)	0.45 (0.48, 0.40)

Vehicle speed	A/C compressor load	Engine coolant temperature		
		Increase: 94°C (201°F) or less Decrease: 91°C (196°F) or less	Increase: 95 — 96°C (203 — 205°F) Decrease: 92 — 94°C (198 — 201°F)	Increase: 97°C (207°F) or more Decrease: 95°C (203°F) or more
		Radiator fan operation	Radiator fan operation	Radiator fan operation
During acceleration: 19 km/h (12 MPH) or less During deceleration: 10 km/h (6 MPH) or less	OFF	OFF	Low-Speed	High-Speed
	Low	Low-Speed	Low-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed
During acceleration: 20 — 69 km/h (12 — 43 MPH) During deceleration: 11 — 64 km/h (7 — 40 MPH)	OFF	OFF	Low-Speed	High-Speed
	Low	High-Speed	High-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed
During acceleration: 70 — 105 km/h (43 — 65 MPH) During deceleration: 65 — 100 km/h (40 — 62 MPH)	OFF	OFF	Low-Speed	High-Speed
	Low	High-Speed	High-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed
During acceleration: 106 km/h (66 MPH) or more During deceleration: 101 km/h (63 MPH) or more	OFF	OFF	High-Speed	High-Speed
	Low	High-Speed	High-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed

B: COMPONENT

1. WATER PUMP

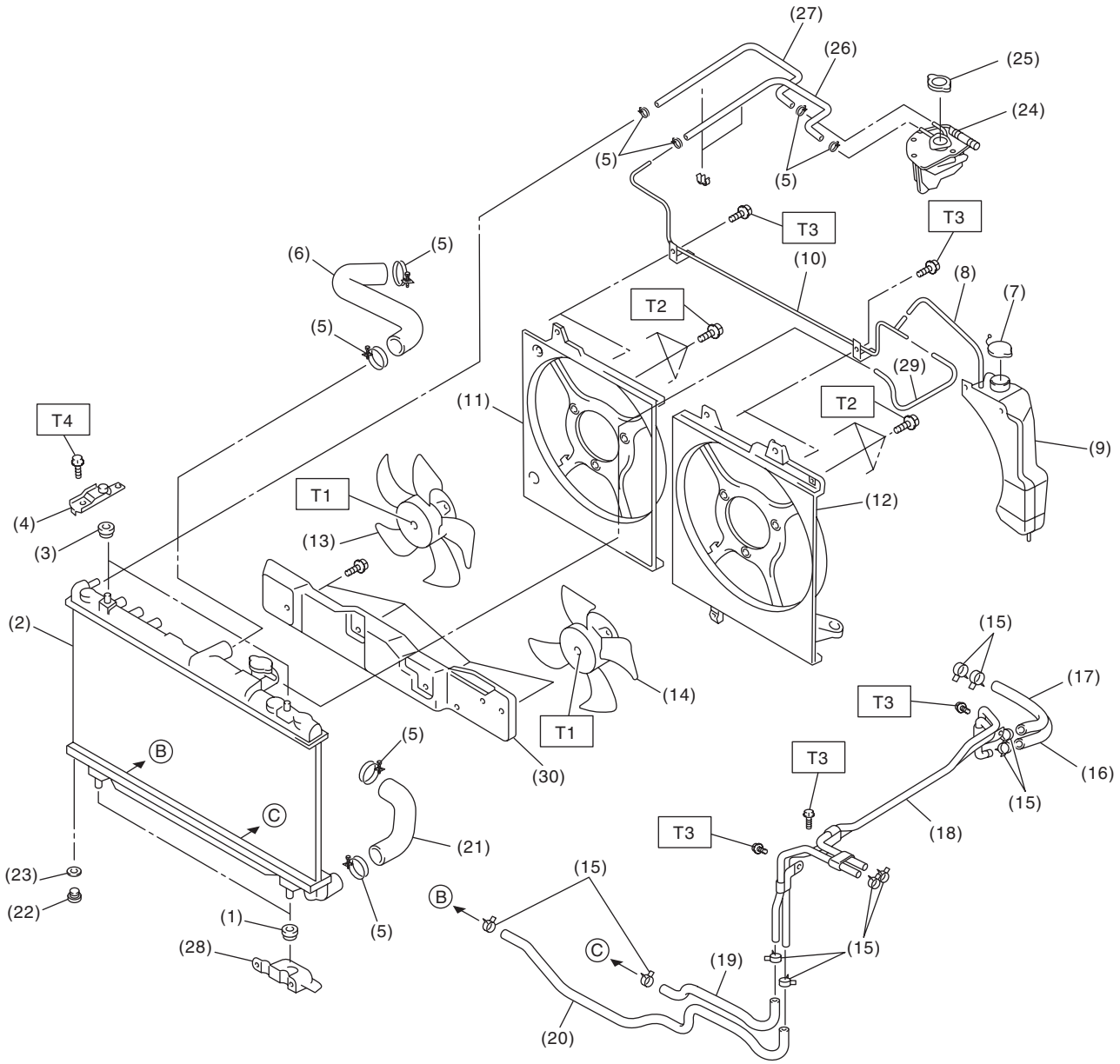


(1)	Thermostat cover	(5)	Gasket
(2)	Gasket	(6)	Heater by-pass hose
(3)	Thermostat	(7)	Coolant filler by-pass hose
(4)	Water pump ASSY	(8)	Water by-pass pipe

Tightening torque: N·m (kgf-m, ft-lb)

T1: First 12 (1.2, 8.9)
Second 12 (1.2, 8.9)
T2: 12 (1.2, 8.9)
T3: 6.5 (0.7, 4.8)

2. RADIATOR AND RADIATOR FAN



CO-02132

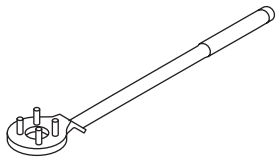
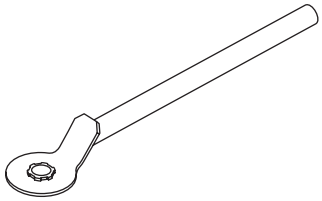
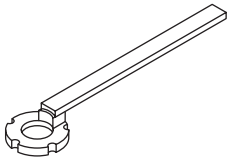
(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator hose A
(7) Engine coolant reservoir tank cap
(8) Overflow hose A
(9) Engine coolant reservoir tank
(10) Overflow pipe
(11) Radiator sub fan shroud
(12) Radiator main fan shroud
(13) Radiator sub fan ASSY
(14) Radiator main fan ASSY
(15) ATF hose clamp (AT model)
(16) ATF hose A (AT model)
(17) ATF hose B (AT model)
(18) ATF pipe (AT model)
(19) ATF hose C (AT model)
(20) ATF hose D (AT model)
(21) Radiator hose B
(22) Radiator drain plug
(23) O-ring
(24) Engine coolant filler tank
(25) Radiator cap (Engine coolant filler tank cap)
(26) Coolant filler tank hose A
(27) Coolant filler tank hose B
(28) Radiator lower bracket
(29) Overflow hose B
(30) Heat shield cover (AT model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3.4 (0.35, 2.5)
T2: 5 (0.5, 3.6)
T3: 7.5 (0.76, 5.5)
T4: 12 (1.2, 8.9)

C: CAUTION

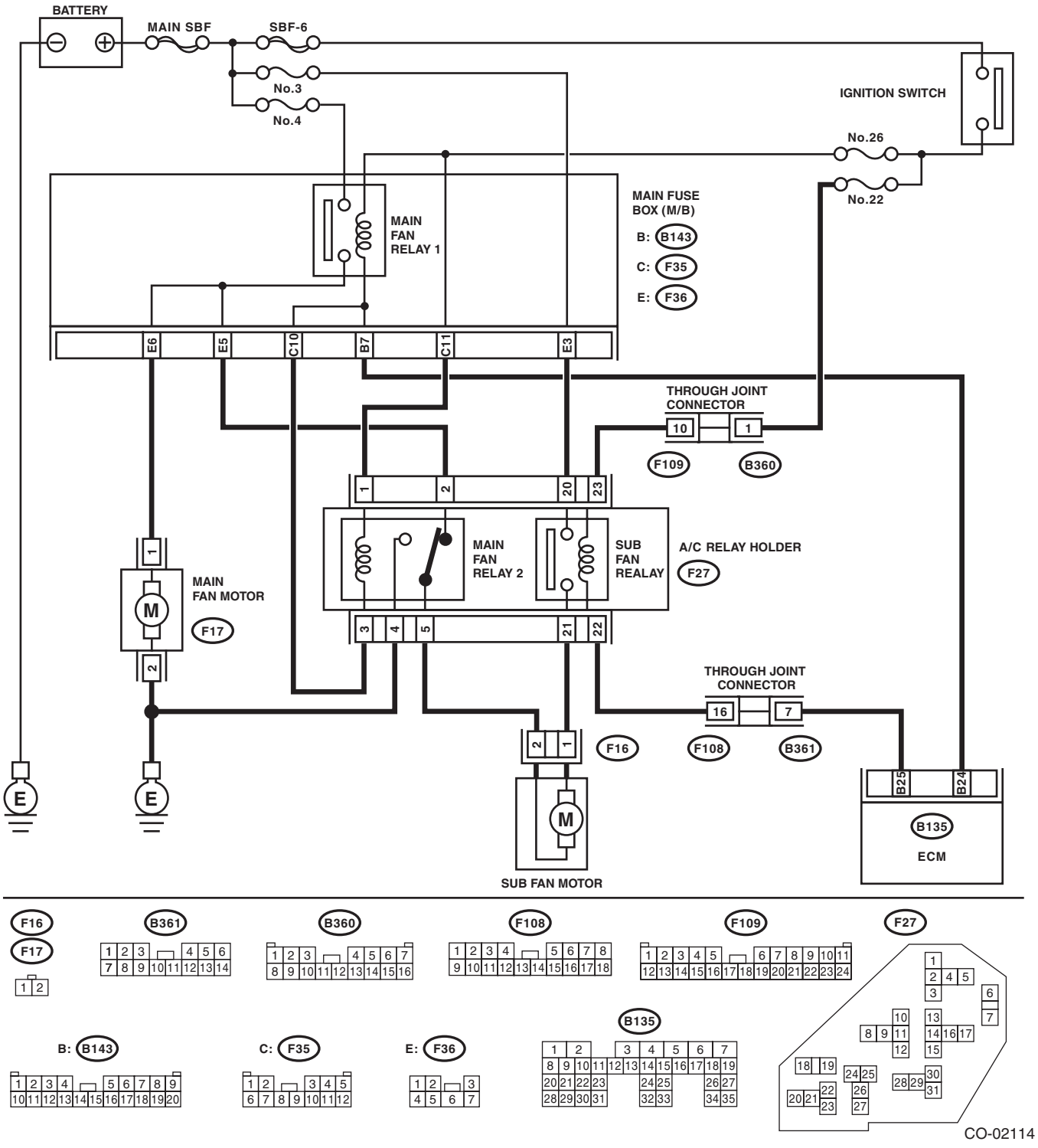
• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal,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

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used to stop rotation of the crank pulley when loosening or tightening crank pulley bolts.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket.
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing exhaust cam sprocket.

2. Radiator Fan System

A: WIRING DIAGRAM



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B: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is 96°C (205°F) or above.
- Vehicle speed is 19 km/h (12 MPH) or below.

TROUBLE SYMPTOMS:

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

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Using the Subaru Select Monitor, check the forced operation of the radiator fan relay. NOTE: • When performing a forced operation radiator fan relay check using the Subaru Select Monitor, the radiator main fan and sub fan will repeat low speed revolution → high speed revolution → OFF in this order. • Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Do the radiator main and sub fans rotate at low speed?	Go to step **2**.	Go to step **3**.
2	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform the compulsory operation check for the radiator fan relay using Subaru Select Monitor. NOTE: • When performing a forced operation radiator fan relay check using the Subaru Select Monitor, the radiator main fan and sub fan will repeat low speed revolution → high speed revolution → OFF in this order. • Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Do the radiator main and sub fans rotate at high speed?	Radiator main fan system is normal.	Go to step **27**.
3	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from the A/C relay holder. 3) Measure the voltage between the sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 20 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Go to step **5**.
4	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 23 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7**.	Go to step **6**.
5	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 3. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.

	Step	Check	Yes	No
6	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 22. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
7	**CHECK SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 20 — No. 21:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Replace the sub fan relay.
8	**CHECK SUB FAN RELAY.** 1) Connect the battery to terminals No. 22 and No. 23 of the sub fan relay. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 20 — No. 21:***	Is the resistance less than 1 Ω?	Go to step **9**.	Replace the sub fan relay.
9	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** 1) Disconnect the connector from the sub fan motor. 2) Measure the resistance of harness between the sub fan relay terminal and sub fan motor connector. ***Connector & terminal*** ***(F16) No. 1 — (F27) No. 21:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair the open circuit of harness between sub fan relay terminal and sub fan motor connector.
10	**CHECK HARNESS BETWEEN SUB MOTOR CONNECTOR AND MAIN FAN RELAY 2 CONNECTOR.** 1) Remove the main fan relay 2 from A/C relay holder. 2) Measure the resistance of harness between sub fan motor connector and main fan relay 2 connector. ***Connector & terminal*** ***(F16) No. 2 — (F27) No. 5:***	Is the resistance less than 1 Ω?	Go to step **11**.	Repair the open circuit of the harness between sub fan motor connector and main fan relay 2 connector.
11	**CHECK POOR CONTACT.** Check poor contact of sub fan motor connector.	Is there poor contact in the sub fan motor connector?	Repair the poor contact of sub fan motor connector.	Go to step **12**.
12	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 1, and the ground (–) terminal to terminal No. 2 of sub fan motor.	Does the sub fan rotate?	Go to step **13**.	Replace the sub fan motor.
13	**CHECK MAIN FAN RELAY 2.** Measure the resistance of main fan relay 2. ***Terminals*** ***No. 2 — No. 5:***	Is the resistance less than 1 Ω?	Go to step **14**.	Replace the main fan relay 2.
14	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 TERMINAL AND MAIN FAN MOTOR CONNECTOR.** 1) Disconnect the connector from the main fan motor. 2) Measure the resistance of the harness between main fan relay 2 terminal and main fan motor connector. ***Connector & terminal*** ***(F17) No. 1 — (F27) No. 2:***	Is the resistance less than 1 Ω?	Go to step **15**.	Repair the open circuit of the harness between main fan relay 2 terminal and main fan motor connector.

	Step	Check	Yes	No
15	**CHECK MAIN FAN MOTOR AND GOURND CIRCUIT.** Measure the resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 2 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **16**.	Repair the open circuit of the harness between main fan motor connector and chassis ground.
16	**CHECK POOR CONTACT.** Check poor contact of main fan motor connector.	Is there poor contact in the main fan motor connector?	Repair the poor contact of main fan motor connector.	Go to step **17**.
17	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 1, and the ground (–) terminal to terminal No. 2 of main fan motor.	Does the main fan rotate?	Go to step **18**.	Replace the main fan motor.
18	**CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.** 1) Disconnect the connectors from ECM. 2) Measure the resistance between the sub fan relay terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 25 — (F27) No. 22:***	Is the resistance less than 1 Ω?	Go to step **19**.	Repair the open circuit of harness between sub fan relay terminal and ECM.
19	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Check the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-32, Read Diagnostic Trouble Code (DTC).>
20	**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 **21**.	Replace the main fan relay 1.
21	**CHECK MAIN FAN RELAY 1.** 1) Connect the main fan relay 1 coil side terminal to the battery. 2) Measure the resistance between terminals of main fan relay 1 switch.	Is the resistance less than 1 Ω?	Go to step **22**.	Replace the main fan relay 1.
22	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 TERMINAL AND MAIN FAN MOTOR CONNECTOR.** 1) Disconnect the connector from the main fan motor. 2) Measure the resistance of the harness between main fan relay 1 terminal and main fan motor connector. ***Connector & terminal*** ***(F17) No. 1 — (F36) No. 6:***	Is the resistance less than 1 Ω?	Go to step **23**.	Repair the open circuit of the harness between main fan relay 1 terminal and main fan motor connector.
23	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 AND ECM.** 1) Disconnect the connectors from ECM. 2) Measure the resistance between main fan relay 1 terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 24 — (B143) No. 7:***	Is the resistance less than 1 Ω?	Go to step **24**.	Repair the open circuit of the harness between main fan relay 1 terminal and ECM.

	Step	Check	Yes	No
24	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 AND ECM.** Measure the resistance between main fan relay 2 terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 24 — (F27) No. 3:***	Is the resistance less than 1 Ω?	Go to step **25**.	Repair the open circuit of the harness between main fan relay 2 terminal and ECM.
25	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 4 and 26. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **26**.
26	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Repair the power supply circuit to the main fuse box.
27	**CHECK OPERATION OF RADIATOR FAN.** If the both fans do not rotate at high speed in the condition of step 2, check whether the sub fan is rotating.	Does the sub fan rotate?	Go to step **20**.	Go to step **28**.
28	**CHECK GROUND CIRCUIT OF MAIN FAN RELAY 2.** 1) Remove the main fan relay 2 from A/C relay holder. 2) Measure the resistance between main fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **29**.	Repair the open circuit of harness between main fan relay 2 and chassis ground.
29	**CHECK POWER SUPPLY TO MAIN FAN RELAY 2.** 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **30**.	Repair the power supply line.
30	**CHECK MAIN FAN RELAY 2.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay 2. 3) Measure the resistance of main fan relay 2. ***Terminals*** ***(F27) No. 4 — (F27) No. 5:***	Is the resistance 1 MΩ or more?	Go to step **31**.	Replace the main fan relay 2.
31	**CHECK MAIN FAN RELAY 2.** 1) Connect the battery to main fan relay 2 terminals No. 1 and No. 3. 2) Measure the resistance of main fan relay 2. ***Terminals*** ***(F27) No. 4 — (F27) No. 5:***	Is the resistance less than 1 Ω?	Go to step **23**.	Replace the main fan relay 2.

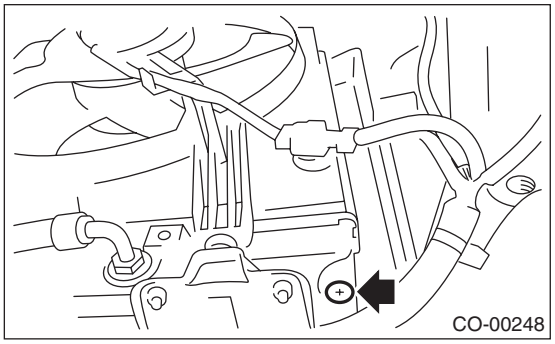
3. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the drain plug to drain engine coolant into container.

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



4) Install the drain plug.

2. FILLING OF ENGINE COOLANT

1) Remove the collector cover.
2) Pour cooling system conditioner through the filler neck.

Cooling system protective agent:
Cooling system conditioner (part number SOA635071)

3) Flll the engine coolant into coolant filler tank up to the filler neck position.

Coolant capacity (fill up to "FULL" level):
AT model
Approx. 7.2 ℓ (7.6 US qt, 6.3 Imp qt)
MT model
Approx. 7.3 ℓ (7.7 US qt, 6.4 Imp qt)

CAUTION:
Do not confuse the cap of coolant filler tank and cap of radiator.

NOTE:
• When pouring the engine coolant, the radiator side cap must not be removed.
• The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

4) Fill engine coolant into the reservoir tank up to "FULL" level.
5) Close the coolant filler tank 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.)
6) Wait for one minute after the engine stops, then open the coolant filler tank cap. If the engine coolant level drops, add engine coolant into the coolant filler tank up to the filler neck position.
7) Perform the procedures 5) and 6) again.
8) Install the coolant filler tank cap and reservoir tank cap properly.
9) Start the engine and operate the heater at maximum hot position and the blower speed setting to "LO."
10) Run the engine at 2,000 rpm or less until radiator fan starts and stops.

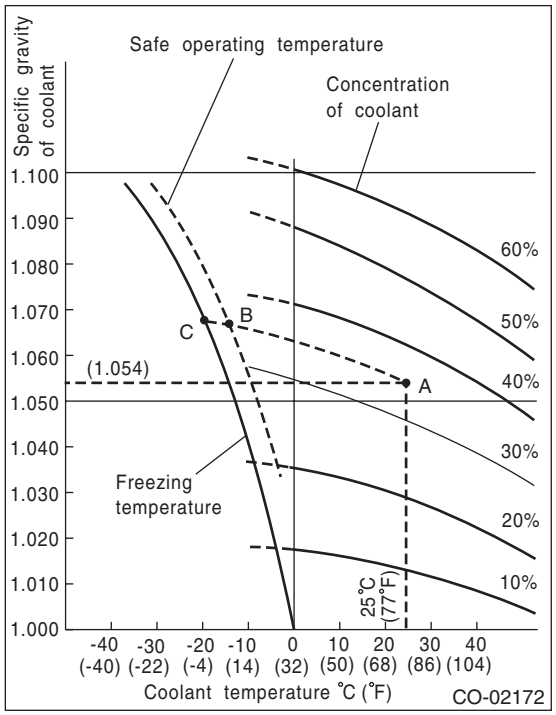
NOTE:
• Be careful with the engine coolant temperature gauge to prevent overheating.
• If the radiator hose becomes harden by engine coolant pressure at this time, air purge seems to be mostly completed.

11) Stop the engine and wait until the engine coolant temperature lowers to 30°C (86°F).
12) Open the coolant filler tank cap. If the engine coolant level drops, add engine coolant into the coolant filler tank up to the filler neck position and the reservoir tank to "FULL" level.
13) Install the coolant filler tank cap and reservoir tank cap properly.
14) 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 10).
15) Install the collector cover.

B: INSPECTION

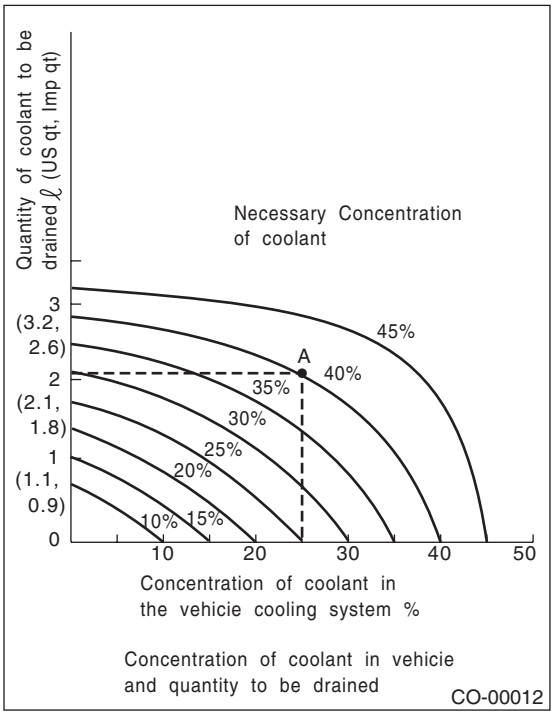
1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of SUBARU coolant is shown in the diagram. 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).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

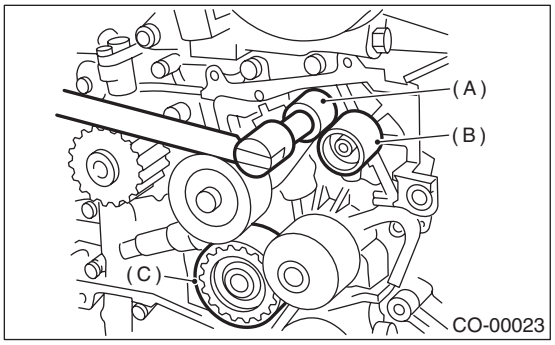
To adjust the concentration of coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU Genuine Coolant (concentration 50%).
The amount of engine coolant that should be replaced can be determined using the diagram.
[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) of the undiluted solution of SUBARU coolant.
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



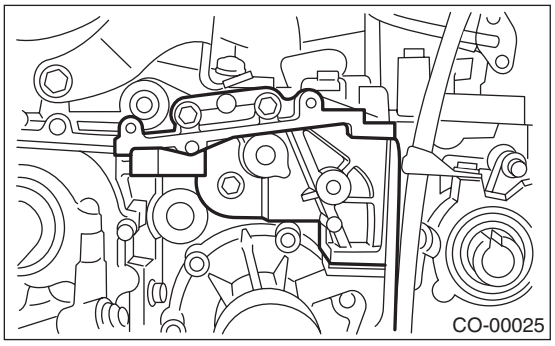
4. Water Pump

A: REMOVAL

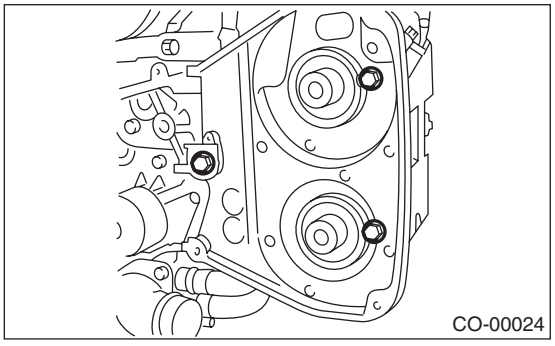
1) Remove the collector cover.
2) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
3) Remove the V-belts. <Ref. to ME(H4DOTC)-36, REMOVAL, V-belt.>
4) Remove the timing belt. <Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt.>
5) Remove the automatic belt tension adjuster (A).
6) Remove the belt idler (B).
7) Remove the belt idler No. 2 (C).



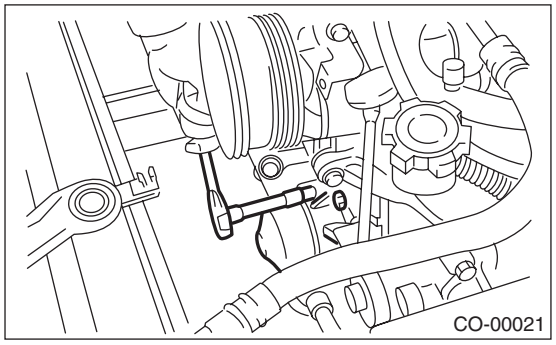
8) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-23, REMOVAL, Camshaft Position Sensor.>
9) Remove the cam sprocket (LH) using ST. <Ref. to ME(H4DOTC)-50, REMOVAL, Cam Sprocket.>
10) Remove the tensioner bracket.



11) Remove the belt cover (LH) No. 2.



12) Disconnect the hose from water pump.
13) Remove the water pump.

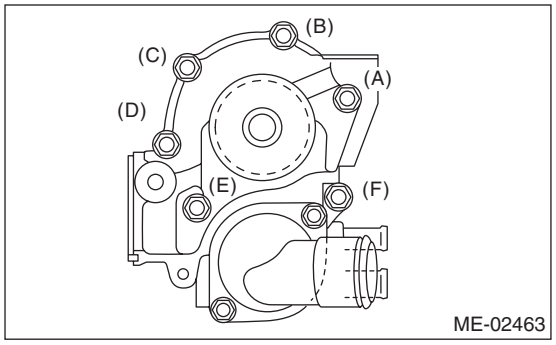


B: INSTALLATION

1) Install the water pump onto cylinder block (LH).

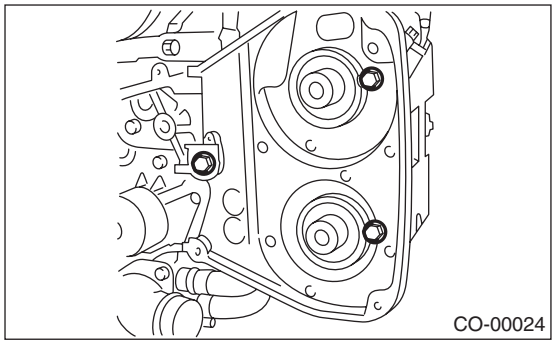
NOTE:
- Always use new gaskets.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in figure.

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



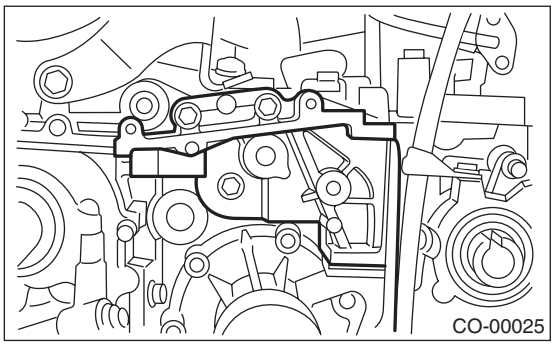
2) Install the hose to water pump.
3) Install the belt cover No. 2 (LH).

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



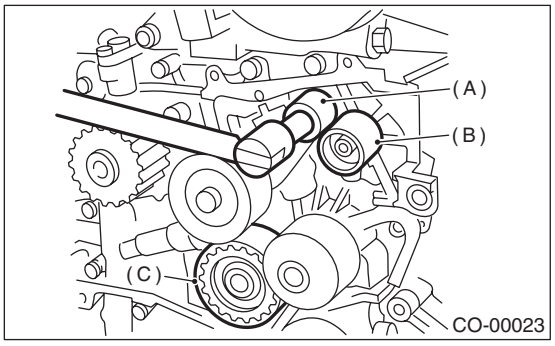
4) Install the tensioner bracket.

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



5) Install the cam sprocket (LH) using ST. <Ref. to ME(H4DOTC)-50, INSTALLATION, Cam Sprocket.>
6) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-23, INSTALLATION, Camshaft Position Sensor.>
7) Install the belt idler No. 2 (C).
8) Install the belt idler (B).
9) Install the automatic belt tension adjuster (A) which has a tension rod held by a pin. <Ref. to ME(H4DOTC)-44, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

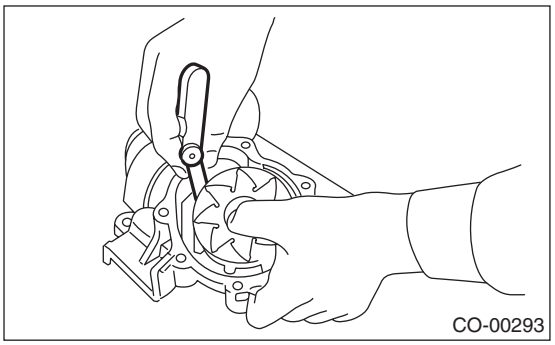


10) Install the timing belt. <Ref. to ME(H4DOTC)-45, TIMING BELT, INSTALLATION, Timing Belt.>
11) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>
12) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, Radiator.>
13) Install the collector cover.

C: INSPECTION

1) Check the water pump bearing for smooth rotation.
2) Check the water pump pulley for abnormalities.
3) Make sure the impeller is not deformed or damaged.
4) Inspect the clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 1.5 mm (0.020 — 0.059 in)

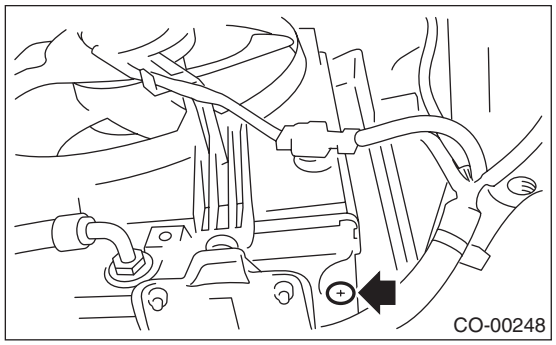


5) After water pump installation, check pulley shaft for engine coolant leaks or noise. If leaks or noise are noted, replace the water pump assembly.

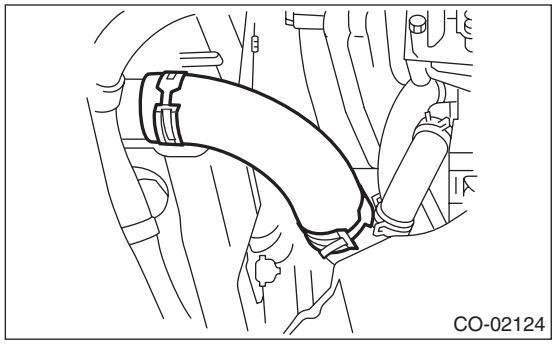
5. Thermostat

A: REMOVAL

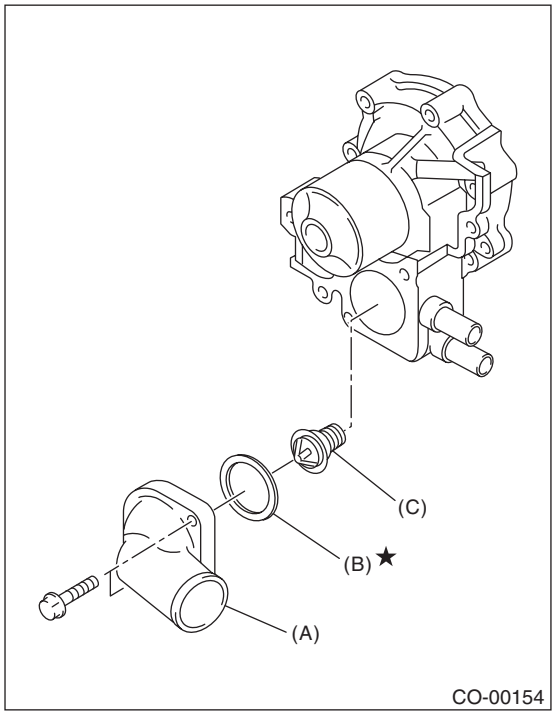
1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Drain engine coolant completely.
<Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



5) Disconnect the radiator outlet hose from thermostat cover.



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



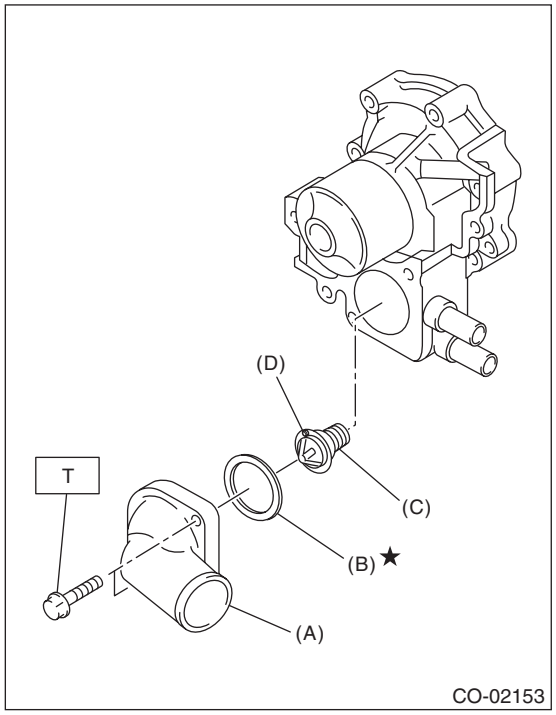
(A) Thermostat cover
(B) Gasket
(C) Thermostat

B: INSTALLATION

1) Install a gasket to thermostat, and install the thermostat and gasket to water pump as a unit. Then, install the thermostat cover.

NOTE:
• When reinstalling the thermostat, use a new gasket.
• The thermostat must be installed with the jiggle pin facing upward.

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



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

2) Connect the radiator outlet hose to thermostat cover.
3) Install the under cover.
4) Lower the vehicle.
5) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

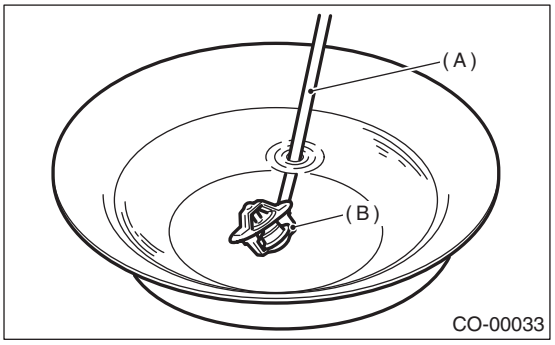
Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
• Inspection method
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the 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 more than five minutes before measuring the valve lift.
• Hold the thermostat with a wire or the like to avoid contacting the container bottom.

Starting temperature to open:
76 — 80°C (169 — 176°F)

Fully opens:
91°C (196°F)

Valve lift:
9.0 mm (0.354 in) or more

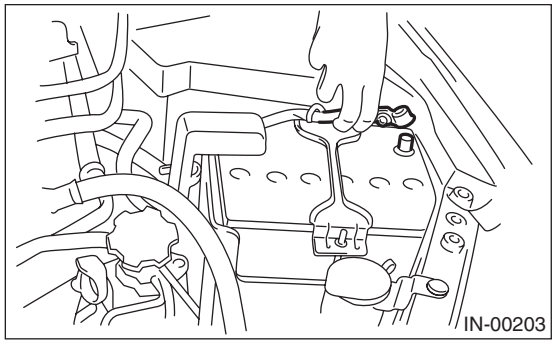


(A) Thermometer
(B) Thermostat

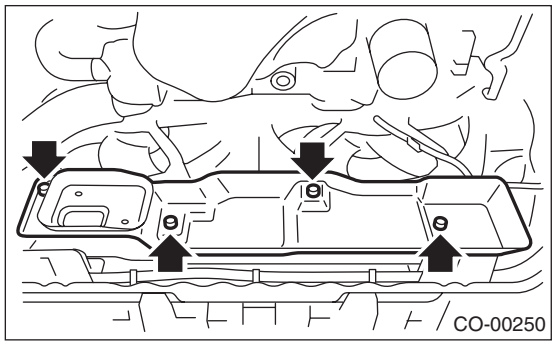
6. Radiator

A: REMOVAL

WARNING:
The radiator is pressurized. Wait until engine cools down before working on the radiator.
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.

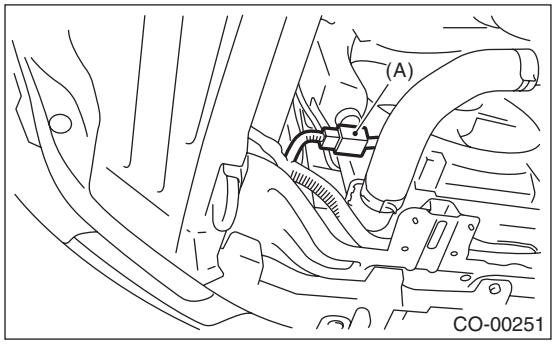


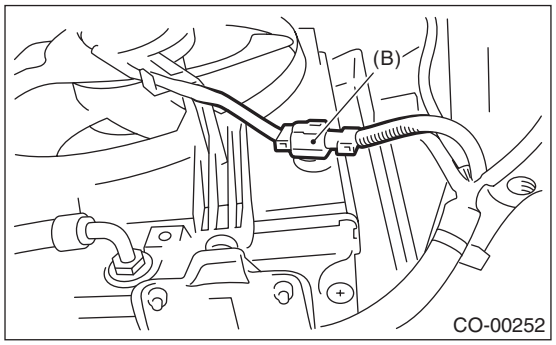
4) Lift-up the vehicle.
5) Remove the under cover.
6) Remove the heat shield cover from radiator. (AT model)



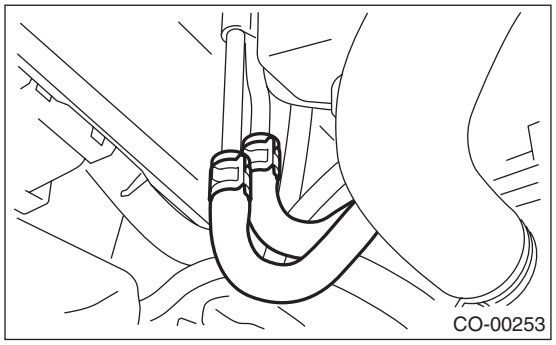
7) Drain engine coolant completely.
<Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

8) Disconnect the connectors of radiator main fan (A) and sub fan motor (B).

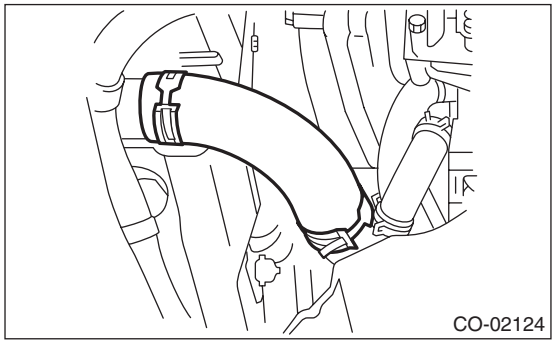




9) Disconnect the ATF cooler hoses from ATF pipes.
Plug the ATF pipe to prevent ATF from leaking. (AT model)

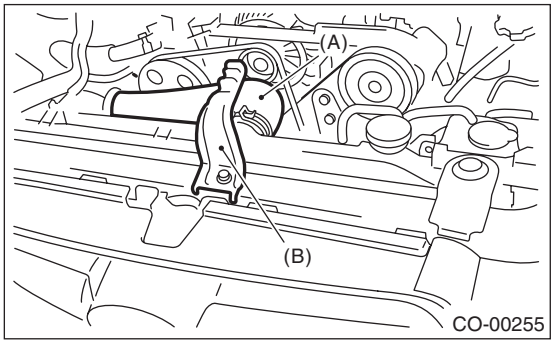


10) Disconnect the radiator outlet hose from thermostat cover.

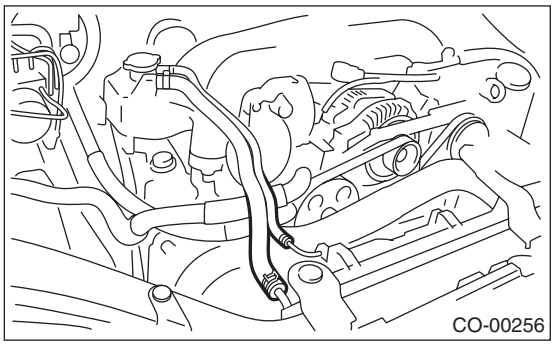


11) Lower the vehicle.
12) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
13) Disconnect the over flow hose.

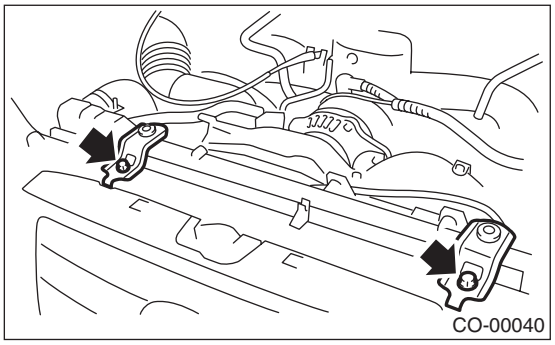
14) Remove the reservoir tank. <Ref. to CO(H4DOTC)-30, REMOVAL, Reservoir Tank.>
15) Disconnect the radiator inlet hose (A) from the radiator.
16) Remove the hood stay holder (B).



17) Disconnect the two coolant filler tank hoses from the radiator.



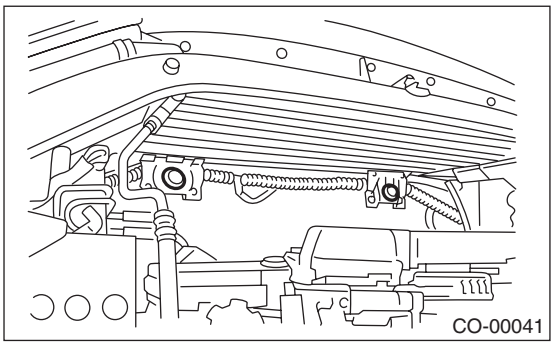
18) Remove the radiator upper brackets.



19) Move the radiator to the left while lifting it upward.
20) Lift the radiator up and away from vehicle.

B: INSTALLATION

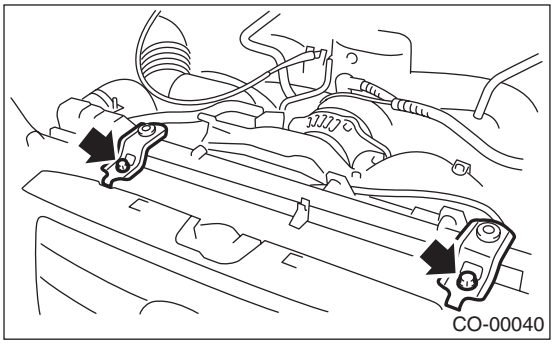
1) Attach the radiator lower cushion to the hole on the radiator lower bracket.



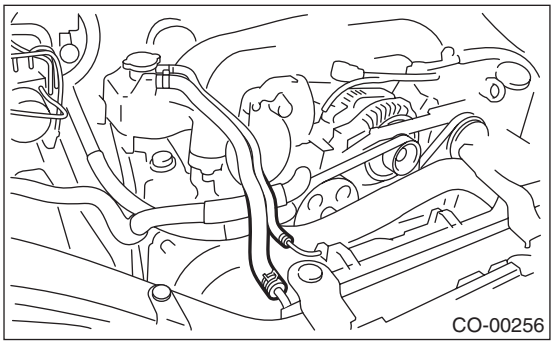
2) Install the radiator to vehicle.

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)

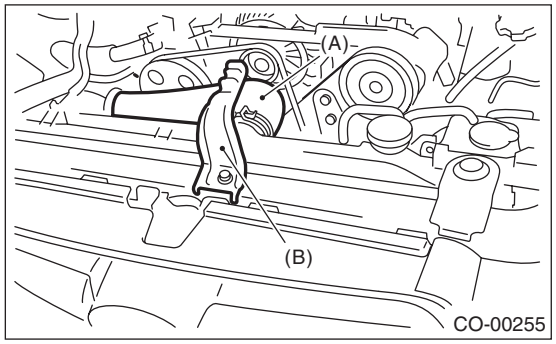


4) Connect the two coolant filler tank hoses to the radiator.

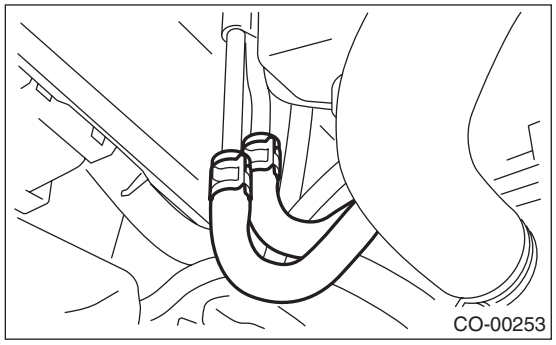


5) Connect the radiator inlet hose (A).

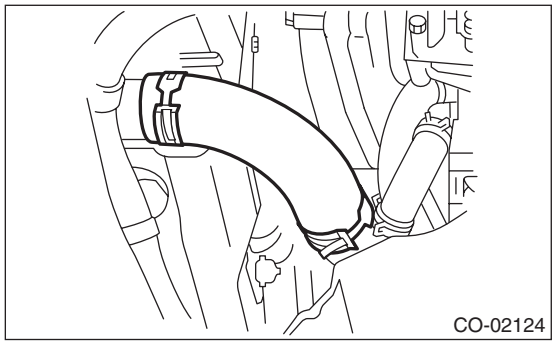
6) Install the hood stay holder (B).



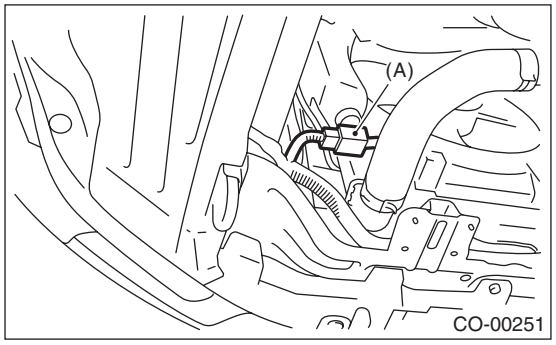
7) Install the reservoir tank. <Ref. to CO(H4DOTC)-30, INSTALLATION, Reservoir Tank.>
8) Connect the over flow hose.
9) Install the air intake duct.
<Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.>
10) Lift-up the vehicle.
11) Connect the ATF cooler hoses. (AT model)

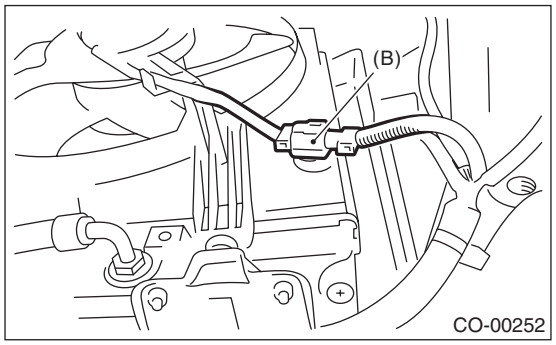


12) Connect the radiator outlet hose.

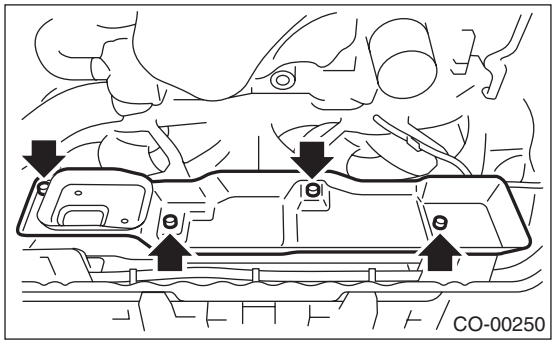


13) Connect the connectors to the radiator main fan motor (A) and sub fan motor (B).

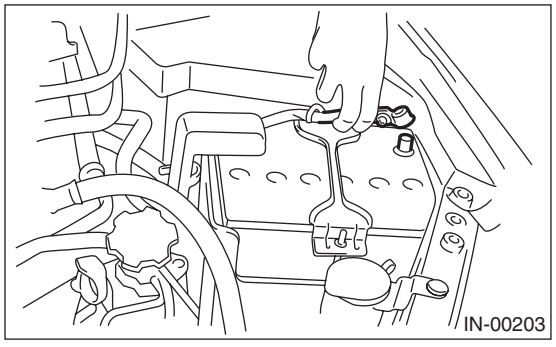




14) Install the heat shield cover. (AT model)



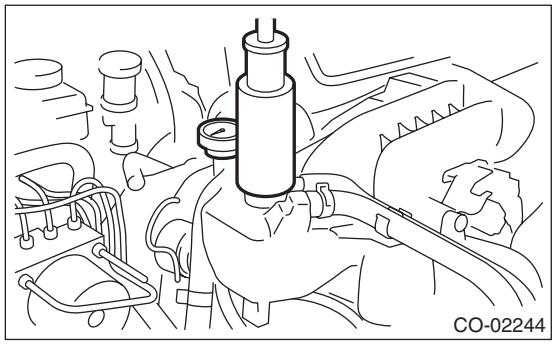
15) Install the under cover.
16) Lower the vehicle.
17) Connect the battery ground cable to the battery.



18) Fill engine coolant.
<Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
19) Check the ATF level. <Ref. to 5AT-26, INSPECTION, Automatic Transmission Fluid.>
20) Install the collector cover.

C: INSPECTION

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



2) In the following cases, apply a pressure of 122 kPa (1.2 kg/cm^2, 18 psi) to the radiator.

- There is coolant leaking from the radiator or its vicinity.
- There is coolant leaking from the hoses or connections.

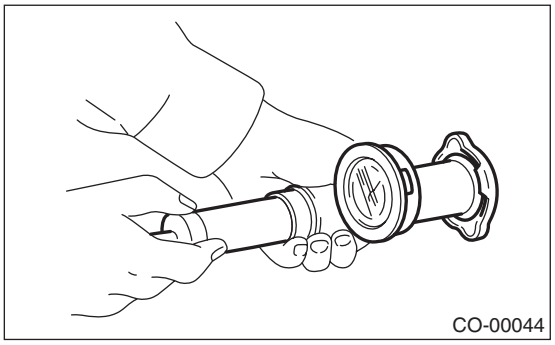
CAUTION:

- **Inspection must be carried out at the side of coolant filler tank, not at the side of radiator.**
- **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 the coolant filler tank 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.

Coolant filler tank side

Specified pressure:

93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)

Service limit pressure:

83 kPa (0.85 kg/cm^2, 12 psi)

Radiator side

Specified pressure:

122 — 152 kPa (1.24 — 1.55 kg/cm^2, 18 — 22 psi)

Service limit pressure:

112 kPa (1.14 kg/cm^2, 16 psi)

CAUTION:

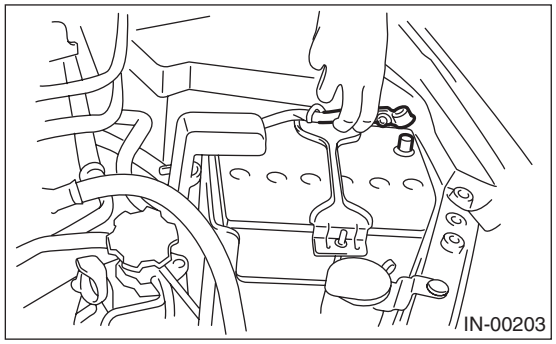
• Be sure to remove foreign matter and rust from the cap in advance. Otherwise, results of pressure test will be incorrect.

• Do not confuse the cap of coolant filler tank and cap of radiator.

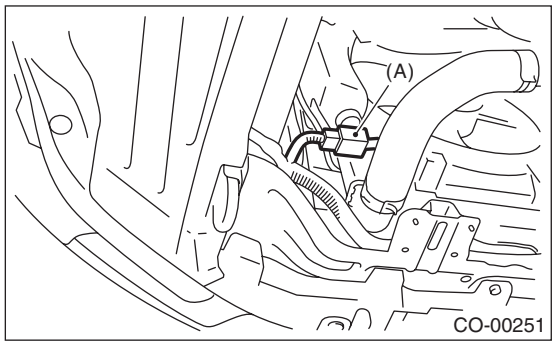
8. Radiator Main Fan and Fan Motor

A: REMOVAL

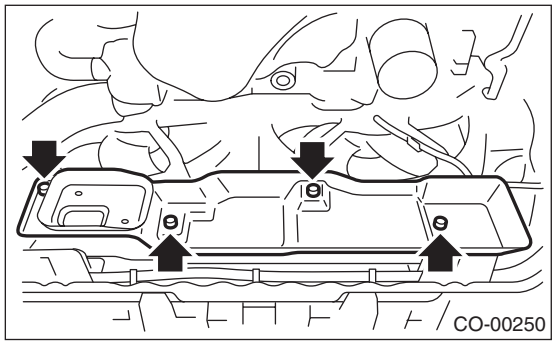
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Lift-up the vehicle.
4) Remove the under cover.
5) Disconnect the main fan motor connector (A).

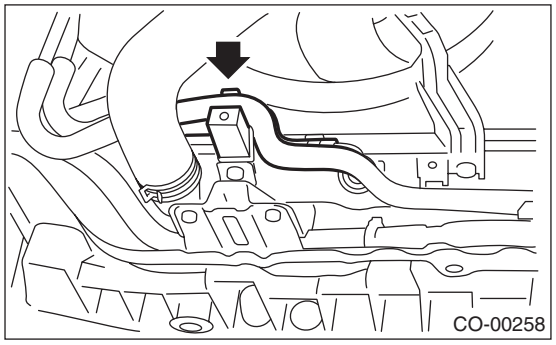


6) Remove the heat shield cover from radiator. (AT model)

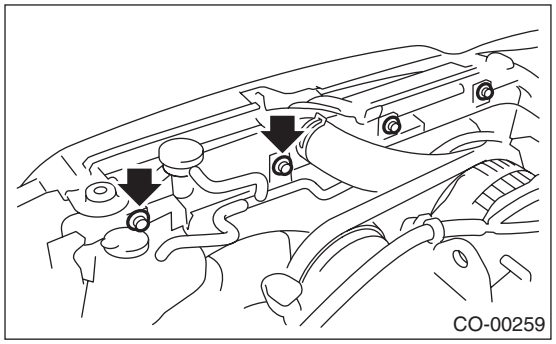


7) Drain the coolant about 1 ℓ (1.06 US qt, 0.88 Imp qt). <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

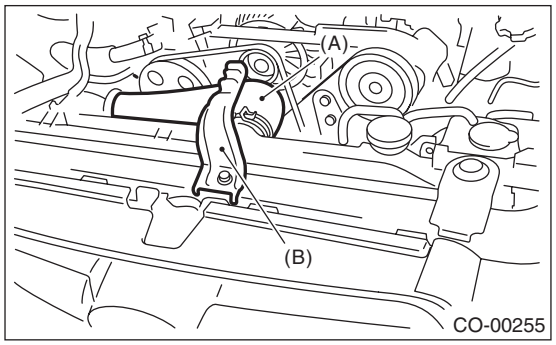
8) Remove the ATF hose from the clip of the radiator main fan motor assembly. (AT model)



9) Lower the vehicle.
10) Remove the air intake duct.
11) Disconnect the over flow hose.
12) Remove the over flow pipe.
13) Remove the reservoir tank. <Ref. to CO(H4DOTC)-30, REMOVAL, Reservoir Tank.>
14) Remove the mounting bolts from radiator main fan motor assembly.



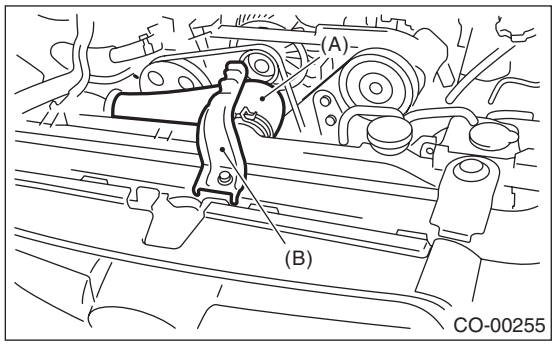
15) Disconnect the radiator inlet hose (A) from the radiator.
16) Remove the hood stay holder (B).



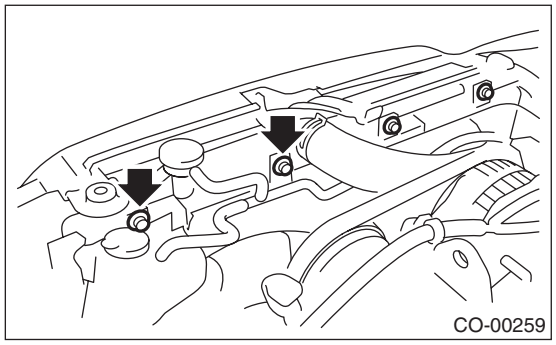
17) Remove the radiator main fan motor assembly from vehicle.

B: INSTALLATION

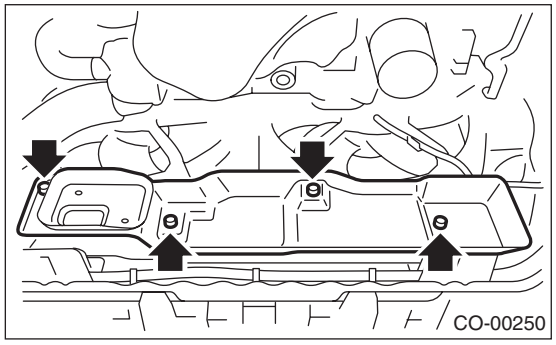
1) Install the radiator main fan motor assembly to the vehicle.
2) Connect the radiator inlet hose (A) to the radiator.
3) Install the hood stay holder (B).



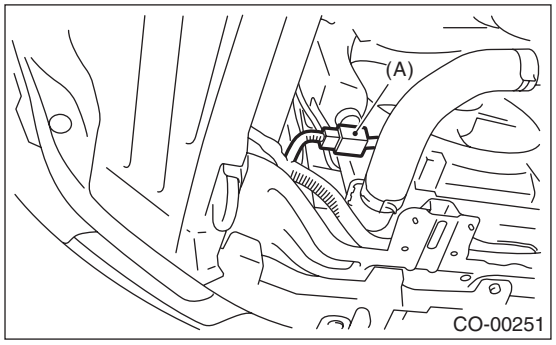
4) Install the mounting bolts to radiator main fan motor assembly.



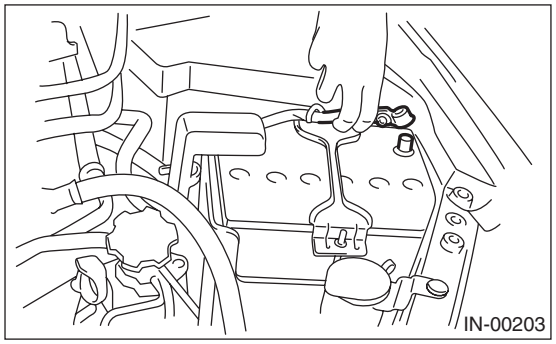
5) Install the reservoir tank.
<Ref. to CO(H4DOTC)-30, INSTALLATION, Reservoir Tank.>
6) Install the over flow pipe.
7) Connect the over flow hose.
8) Install the air intake duct.
9) Lift-up the vehicle.
10) Connect the ATF hose to the clip of the radiator main fan motor assembly. (AT model)
11) Install the heat shield cover to the radiator. (AT model)



12) Connect the main fan motor connector (A).



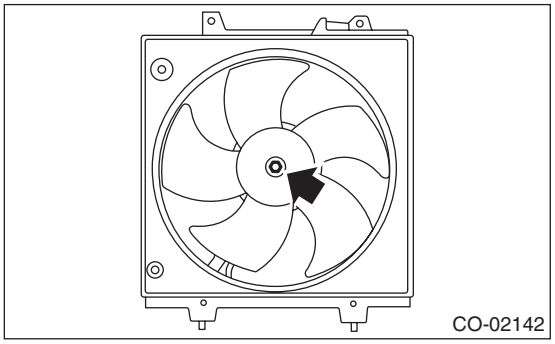
13) Install the under cover.
14) Lower the vehicle.
15) Connect the battery ground cable to the battery.



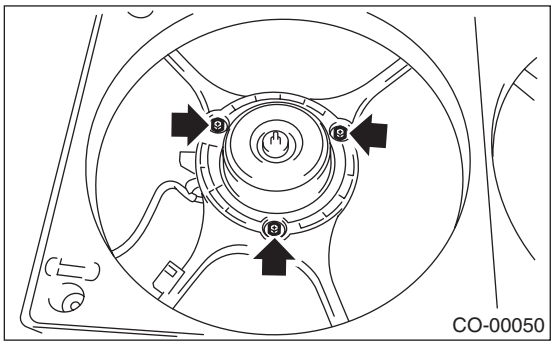
16) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
17) Install the collector cover.

C: DISASSEMBLY

1) Remove the clip which holds the fan motor connector onto the shroud.
2) Remove the nut which holds fan to fan motor and shroud assembly.



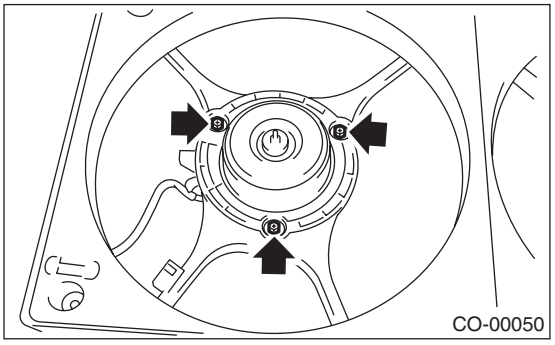
3) Remove the bolts which hold fan motor onto shroud.



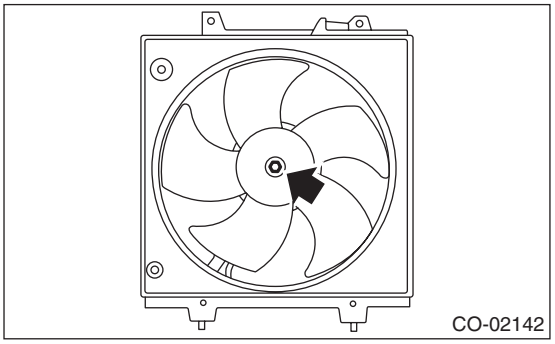
D: ASSEMBLY

Assemble in the reverse order of disassembly.

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



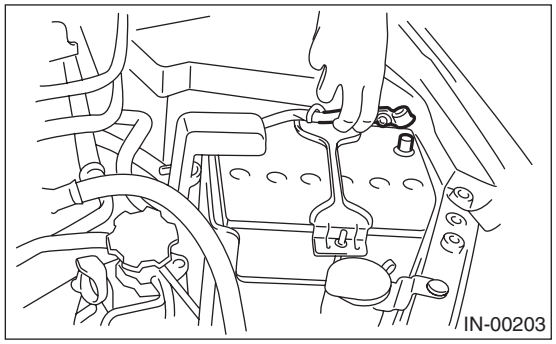
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



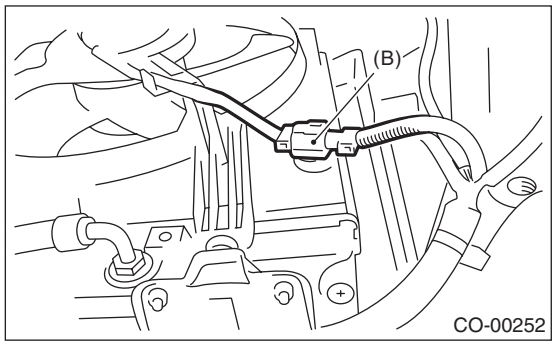
9. Radiator Sub Fan and Fan Motor

A: REMOVAL

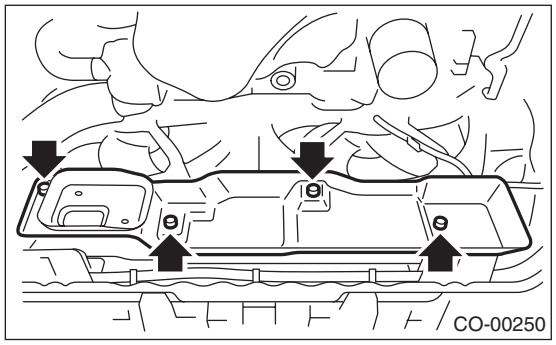
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



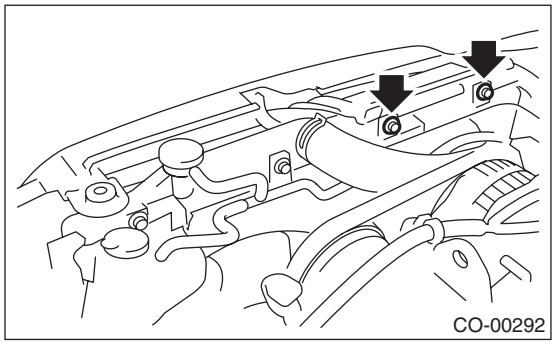
3) Lift-up the vehicle.
4) Remove the under cover.
5) Disconnect the sub fan motor connector (B).



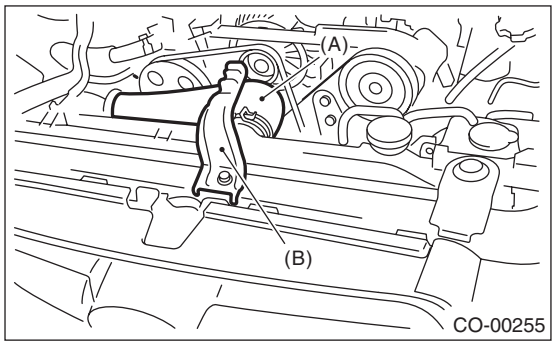
6) Remove the heat shield cover from radiator. (AT model)



7) Drain the coolant about 1 ℓ (1.06 US qt, 0.88 Imp qt). <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
8) Remove the ATF hose from the clip of the radiator sub fan motor assembly. (AT model)
9) Lower the vehicle.
10) Remove the air intake duct.
11) Disconnect the over flow hose.
12) Remove the over flow pipe.
13) Remove the reservoir tank. <Ref. to CO(H4DOTC)-30, REMOVAL, Reservoir Tank.>
14) Remove the mounting bolts from the radiator sub fan motor assembly.



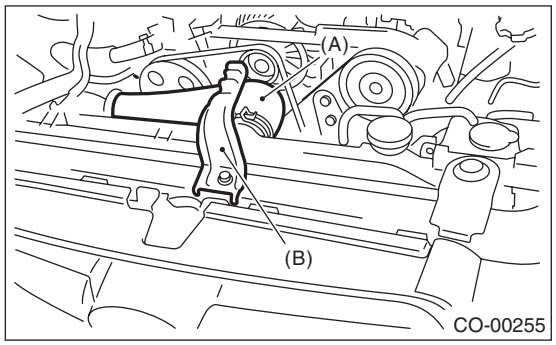
15) Disconnect the radiator inlet hose (A) from the radiator.
16) Remove the hood stay holder (B).



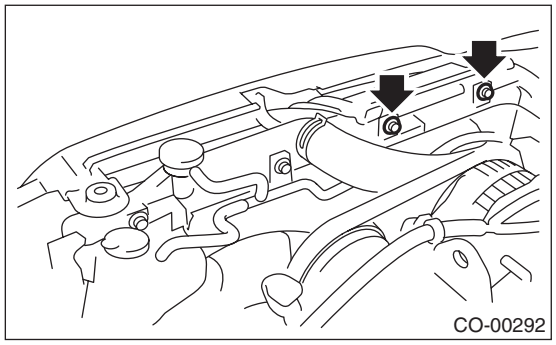
17) Remove the radiator sub fan motor assembly from the vehicle.

B: INSTALLATION

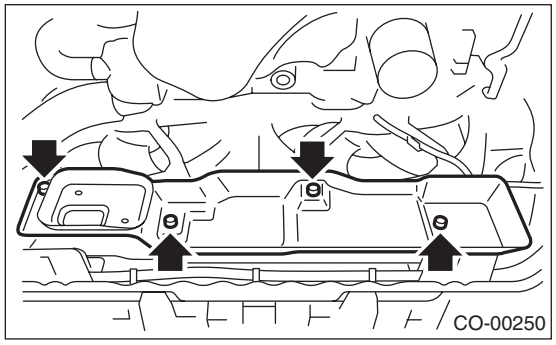
1) Install the radiator sub fan motor assembly to the vehicle.
2) Connect the radiator inlet hose (A) to the radiator.
3) Install the hood stay holder (B).



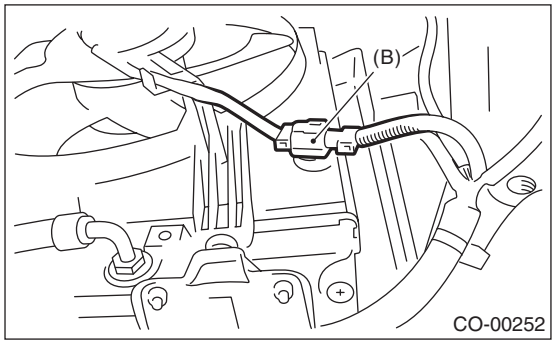
4) Install the mounting bolts to the radiator sub fan motor assembly.



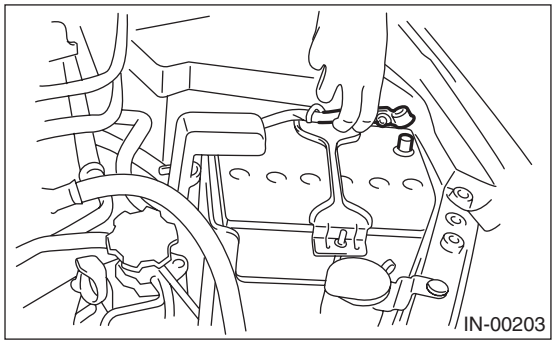
5) Install the reservoir tank.
<Ref. to CO(H4DOTC)-30, INSTALLATION, Reservoir Tank.>
6) Install the over flow pipe.
7) Connect the over flow hose.
8) Install the air intake duct.
9) Lift-up the vehicle.
10) Connect the ATF hose to the clip of the radiator sub fan motor assembly. (AT model)
11) Install the heat shield cover to the radiator. (AT model)



12) Connect the sub fan motor connector (B).



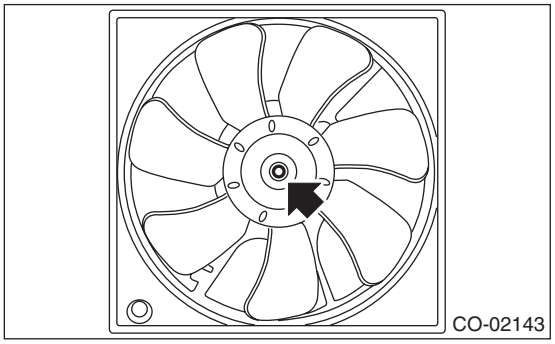
13) Install the under cover.
14) Lower the vehicle.
15) Connect the battery ground cable to the battery.



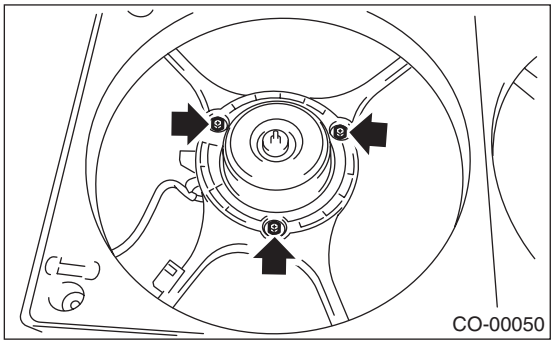
16) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
17) Install the collector cover.

C: DISASSEMBLY

1) Remove the clip which holds the fan motor connector onto the shroud.
2) Remove the nut which holds fan to fan motor and shroud assembly.



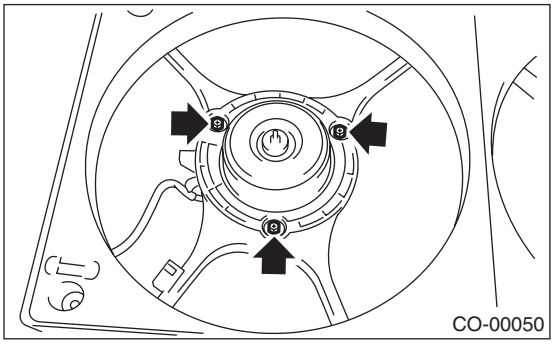
3) Remove the bolts which hold fan motor onto shroud.



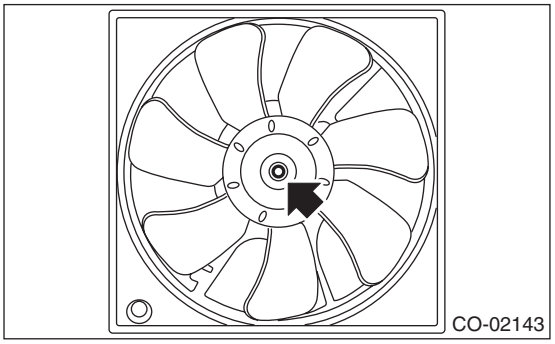
D: ASSEMBLY

Assemble in the reverse order of disassembly.

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



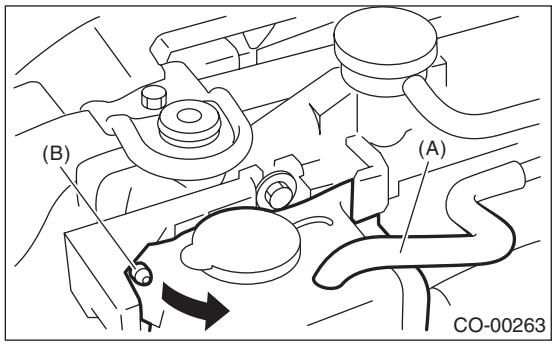
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



10.Reservoir Tank

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the over flow hose (A).
3) Pull out the reservoir tank to the arrow direction while pushing the claw (B).



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

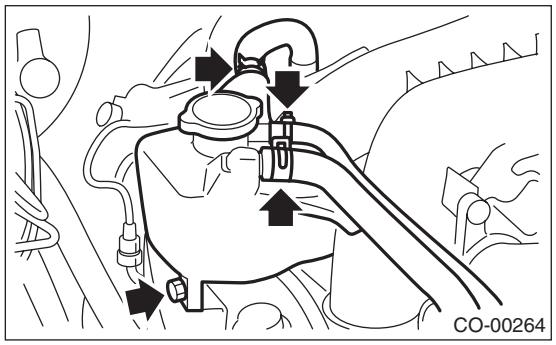
Make sure the engine coolant level is between “FULL” and “LOW”.

11.Coolant Filler Tank

A: REMOVAL

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

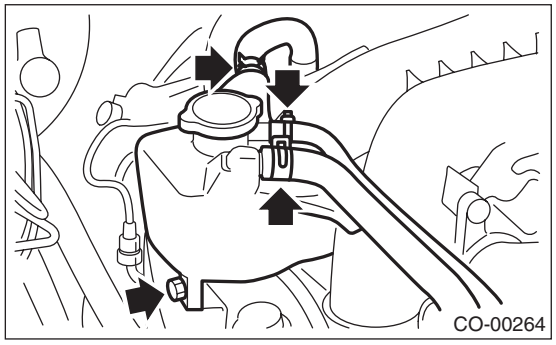
1) Remove the collector cover.
2) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt). <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
3) Disconnect the engine coolant hoses from coolant filler tank.
4) Remove the bolts which install the coolant filler tank.
5) Disconnect the engine coolant hose which connects the under side of coolant filler tank.
6) Remove the coolant filler tank.



B: INSTALLATION

1) Install in the reverse order of removal.

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



2) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair it if necessary.
	b. Loose timing belt	Repair or replace timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean, repair or replace.
	i. Engine oil mixed in engine coolant	Replace engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Correct or replace.
	n. Dragging brake	Adjust.
	o. Defective radiator fan	Inspect the radiator fan relay, engine coolant temperature sensor or fan motor and replace them.
Over-cooling	a. Ambient temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks	a. Loosened or damaged connecting units on hoses	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(H4DOTC)

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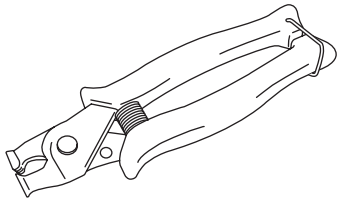
1. General Description

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.

B: PREPARATION TOOL

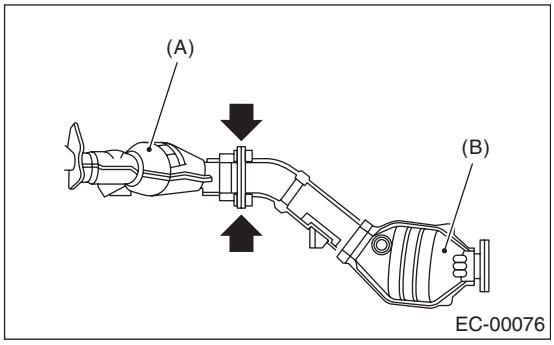
1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18353AA000	18353AA000	CLAMP PLIERS	• Used for removing and installing the PCV hose. • This is a general tool made by the French company CAILLAU. (code) 54.0.000.205 To make this easier to obtain in the same way as genuine Subaru parts, it has been provided with a tool number as an ST.

2. Front Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
2) Disconnect the front catalytic converter (A) from the rear catalytic converter (B).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.

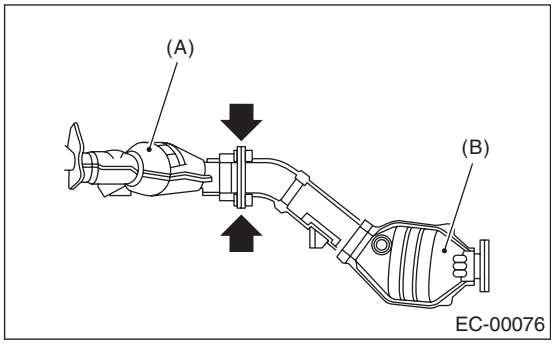
C: INSPECTION

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

3. Rear Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
2) Disconnect the rear catalytic converter (B) from the front catalytic converter (A).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.

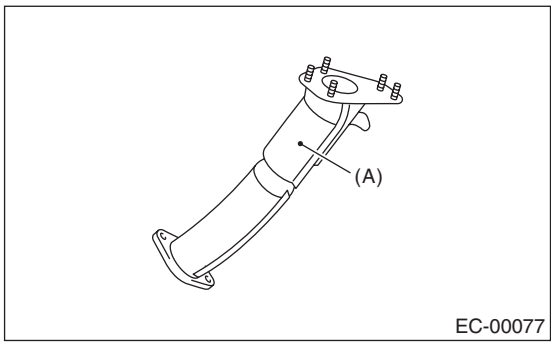
C: INSPECTION

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

4. Precatalytic Converter

A: REMOVAL

The precatalytic converter is built into the joint pipe. Refer to joint pipe removal for the removal procedures. <Ref. to EX(H4DOTC)-11, REMOVAL, Joint Pipe.>



B: INSTALLATION

Install in the reverse order of removal.

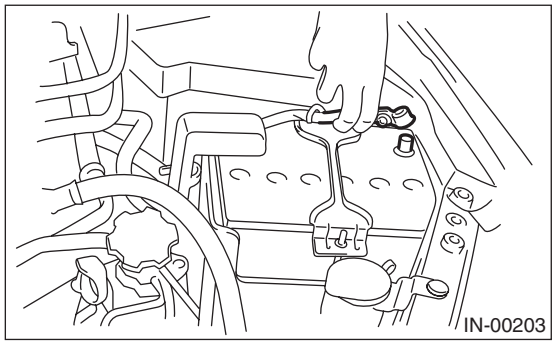
C: INSPECTION

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

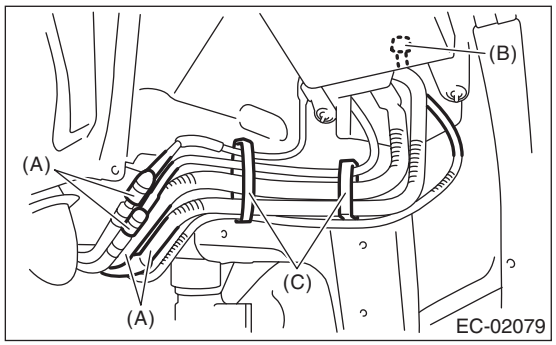
5. Canister

A: REMOVAL

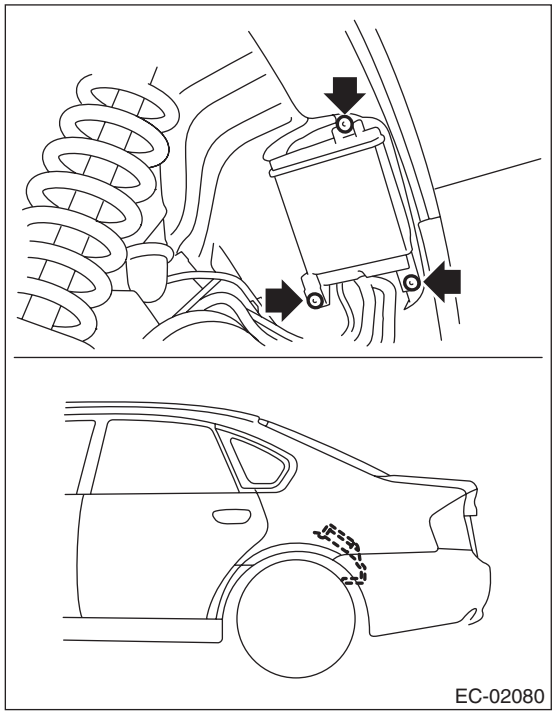
1) Disconnect the ground cable from battery.



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



8) Remove the canister from body.

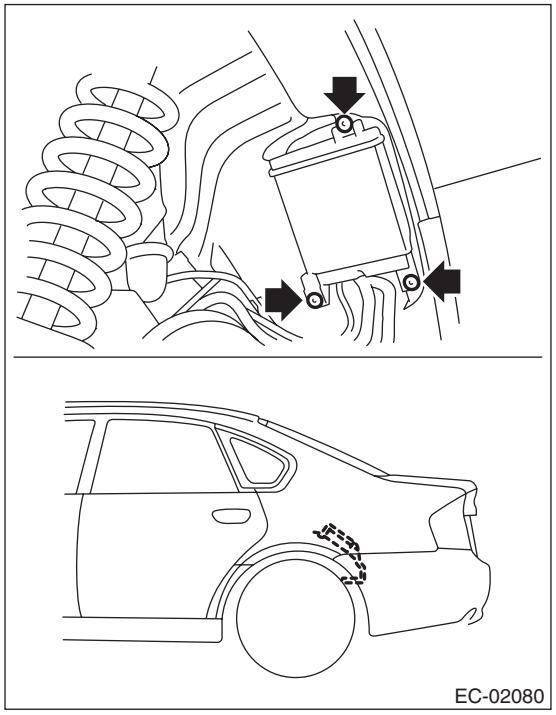


B: INSTALLATION

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 N·m (0.8 kgf-m, 5.9 ft-lb)



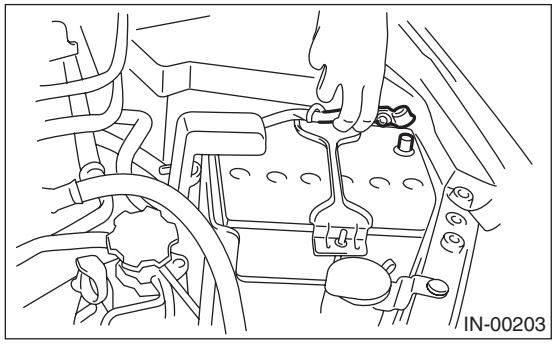
C: INSPECTION

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

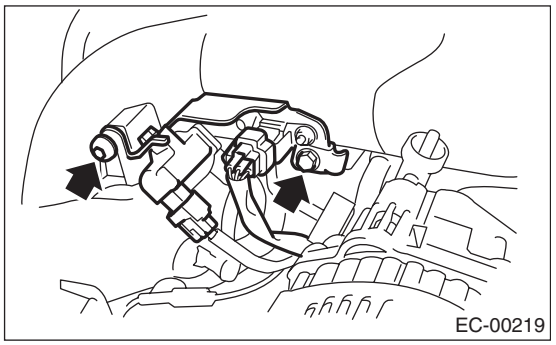
6. Purge Control Solenoid Valve

A: REMOVAL

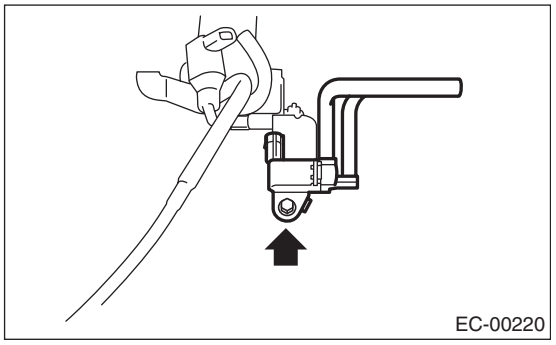
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the solenoid valve bracket assembly from intake manifold.



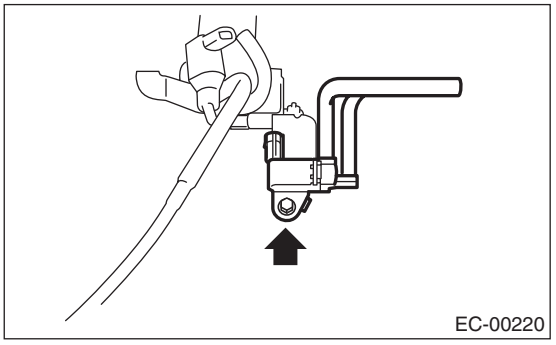
4) Disconnect the connector from purge control solenoid valve.
5) Disconnect the evaporation hose from the intake manifold and fuel pipe assembly.
6) Remove the purge control solenoid valve from the solenoid valve bracket assembly.



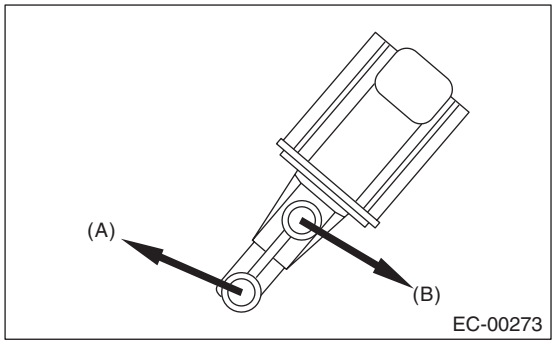
B: INSTALLATION

Install in the reverse order of removal.

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

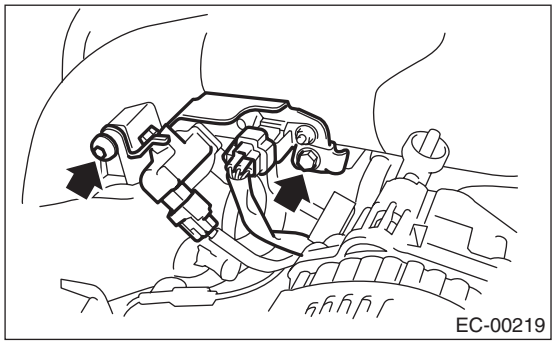


NOTE:
Connect the evaporation hose as shown in the figure.



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

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



C: INSPECTION

Make sure the hoses are not cracked or loose.

7. Fuel Level Sensor

A: REMOVAL

For removal procedure, refer to “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-55, REMOVAL, Fuel Level Sensor.>

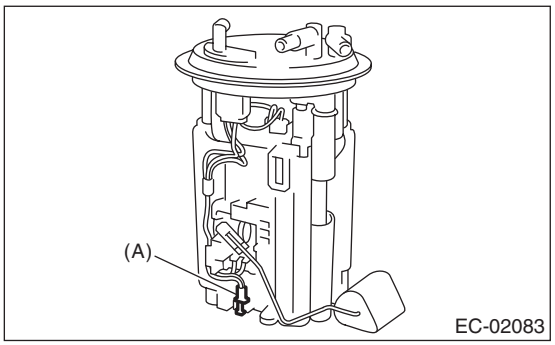
B: INSTALLATION

For installation procedure, refer to “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-55, INSTALLATION, Fuel Level Sensor.>

8. Fuel Temperature Sensor

A: REMOVAL

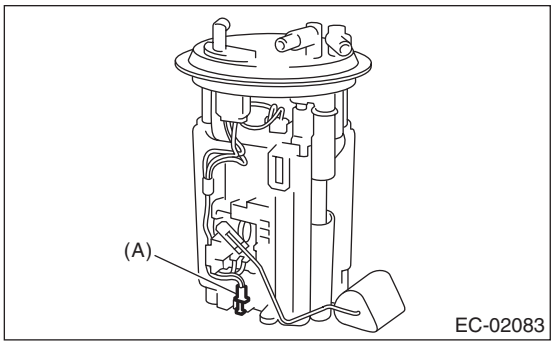
The fuel temperature sensor is integrated into fuel level sensor as one unit; therefore, refer to “Fuel Level Sensor” for removal procedure. <Ref. to FU(H4DOTC)-55, REMOVAL, Fuel Level Sensor.>



(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(H4DOTC)-55, INSTALLATION, Fuel Level Sensor.>



(A) Fuel temperature sensor

9. Fuel Sub Level Sensor

A: REMOVAL

For removal procedure, refer to “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-56, REMOVAL, Fuel Sub Level Sensor.>

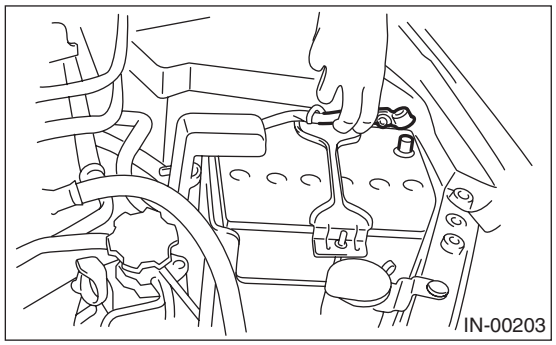
B: INSTALLATION

For installation procedure, refer to “FU(F4DOTC)” section. <Ref. to FU(H4DOTC)-57, INSTALLATION, Fuel Sub Level Sensor.>

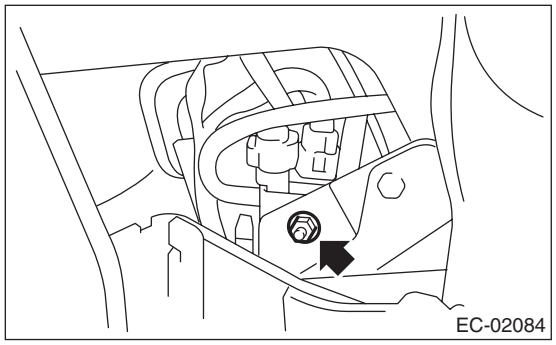
10.Fuel Tank Pressure Sensor

A: REMOVAL

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



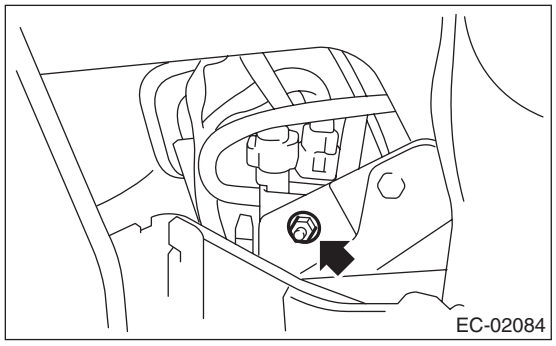
4) Lift-up the vehicle.
5) Disconnect the connector from the fuel tank pressure sensor.
6) Disconnect the pressure hose from the fuel tank pressure sensor.
7) Remove the fuel tank pressure sensor along with the bracket.



B: INSTALLATION

Install in the reverse order of removal.

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



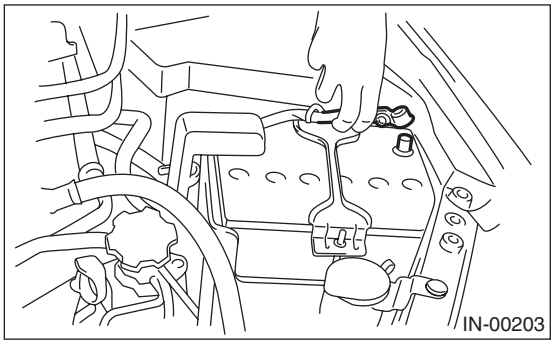
C: INSPECTION

Make sure the hoses are not cracked or loose.

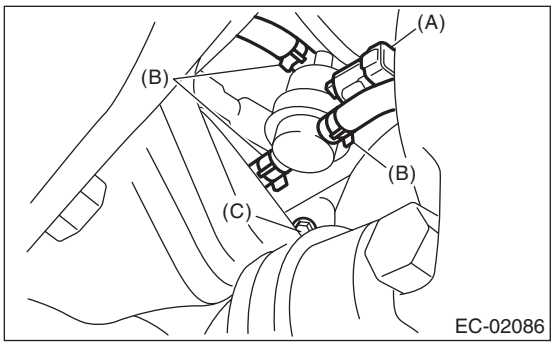
11.Pressure Control Solenoid Valve

A: REMOVAL

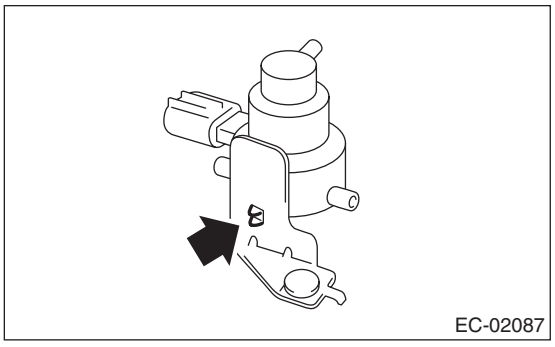
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



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 (0.7 kgf-m, 5.4 ft-lb)

C: INSPECTION

Make sure the hoses are not cracked or loose.

12.Drain Filter

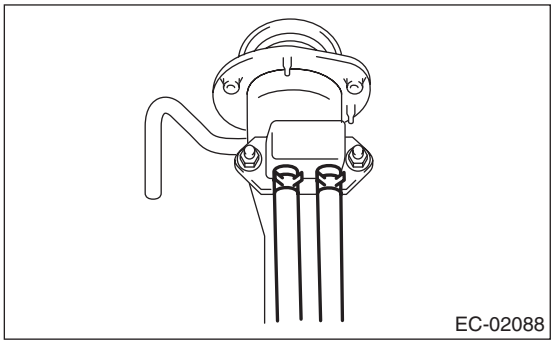
A: SPECIFICATION

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(H4DOTC)-6, REMOVAL, Canister.> <Ref. to EC(H4DOTC)-6, INSTALLATION, Canister.>

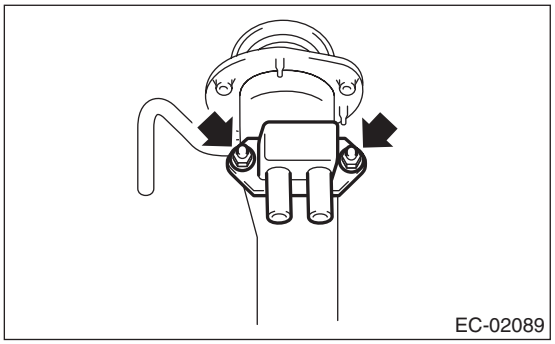
13.Shut Valve

A: REMOVAL

1) Remove the fuel filler pipe.
<Ref. to FU(H4DOTC)-50, REMOVAL, Fuel Filler Pipe.>
2) Disconnect the evaporation hose from the shut valve.



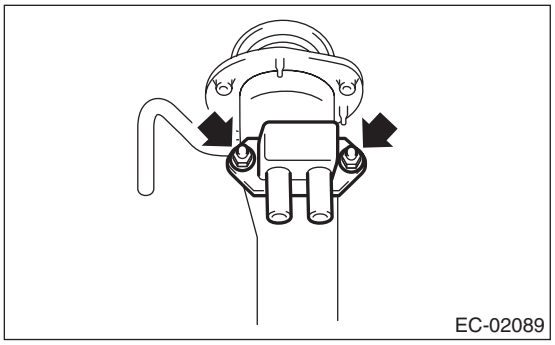
3) Remove the shut valve from the fuel filler pipe.



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.

14.Drain Valve

A: SPECIFICATION

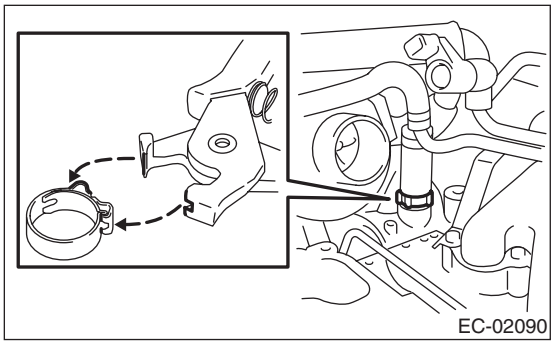
Canister is a non-disassembled part, so do not remove the drain valve from canister.
Refer to “Canister” for removal and installation procedure. <Ref. to EC(H4DOTC)-6, REMOVAL, Canister.> <Ref. to EC(H4DOTC)-6, INSTALLATION, Canister.>

15.PCV Hose Assembly

A: REMOVAL

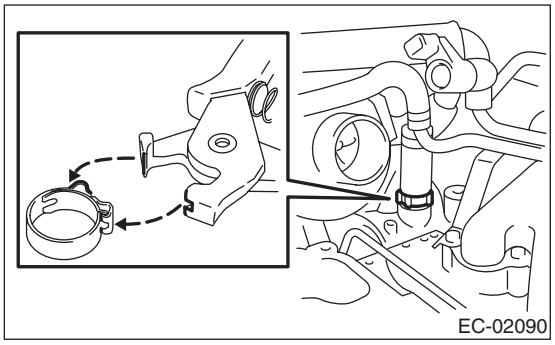
CAUTION:
Do not remove if the PCV hose, diagnostics connector and PCV valve are not damaged.

1) Remove the intake manifold.
<Ref. to FU(H4DOTC)-11, REMOVAL, Intake Manifold.>
2) Fit the depression in the ST with the protrusion on the clamp to unlock.
3) Remove the PCV hose assembly.
ST 18353AA000 CLAMP PLIERS



B: INSTALLATION

NOTE:
Replace the clamp with a new part.
1) Install the PCV hose assembly, then lock by fitting the ST on the clamp protrusion.
ST 18353AA000 CLAMP PLIERS



2) Install the intake manifold.
<Ref. to FU(H4DOTC)-13, INSTALLATION, Intake Manifold.>

INTAKE (INDUCTION)

IN(H4DOTC)

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1. General Description 2
2. Air Cleaner Element 7
3. Air Cleaner Case 8
4. Air Intake Duct 9
5. Resonator Chamber 10
6. Intake Duct 11
7. Intercooler 12
8. Turbocharger 13
9. Air By-pass Valve 16

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(H4DOTC)(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(H4DOTC)(diag)-54, 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(H4DOTC)(diag)-320, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON SCREEN.** 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 the Subaru Select Monitor or general scan tool power switch to ON. 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(H4DOTC)(diag)-68, 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(H4DOTC)(diag)-45, Malfunction Indicator Light.>
4	**PERFORM DIAGNOSIS.** 1) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-42, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to EN(H4DOTC)(diag)-33, 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(H4DOTC)(diag)-75, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

2. Check List for Interview

A: CHECK

1. CHECK LIST No. 1

Check the following item when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

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

2. CHECK LIST No. 2

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

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ 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 other parts except genuine parts: ❑ Yes / ❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes / ❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes / ❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes / ❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ Does not shift. ❑ Excessive shift shock

3. General Description

A: CAUTION

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

CAUTION:
• All the airbag system wiring harnesses and connectors are colored 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.
The ECM will be destroyed instantly.
The fuel injector and other parts will 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.

5) Poor contact has been identified as a primary cause of this problem. Measure the voltage or resistance of individual sensor or all electrical control modules using a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

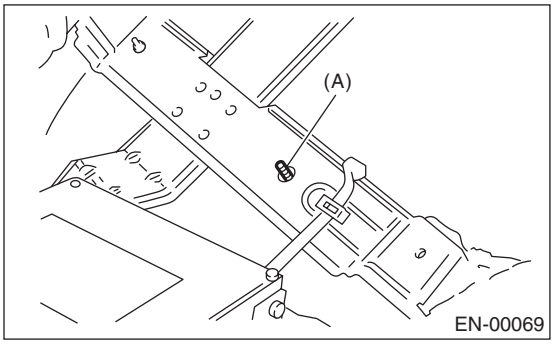
6) Remove the ECM from the located position after disconnecting two cables on battery.
Otherwise, the ECM may be damaged.

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”.

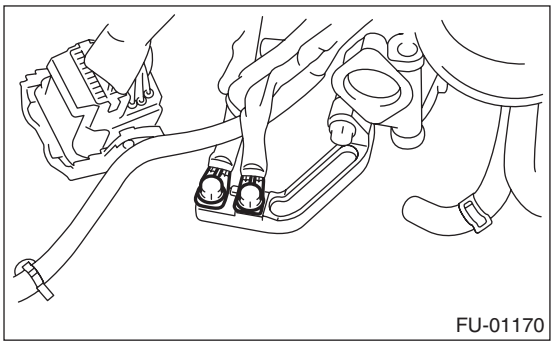
7) Connectors of each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. Even if the connectors are waterproof, take care not to allow water to get into them when washing the vehicle, or when servicing the vehicle in rainy weather.

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



(A) Stud bolt

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



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 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 more than 5 seconds to release the pressure of fuel system. If engine starts during this operation, run it until it stops.

13) When performing the diagnosis, start with simple and easy operations and proceed to more complicated and harder operations. The most important in performing the diagnosis is to closely find the problems that users insist on and to discern these three problems.
14) 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.

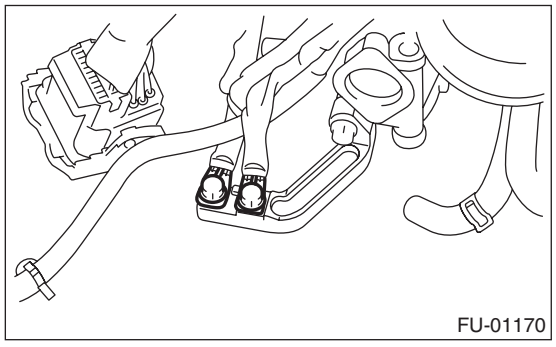
Standard voltage: 12 V

Specific gravity: Above 1.260

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

2. ENGINE GROUNDING

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



C: NOTE

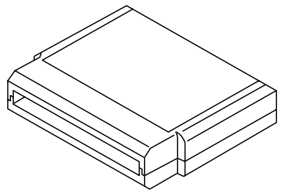
1. GENERAL DESCRIPTION

• The on-board diagnosis (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this type of engine complies with OBD-II regulations. The OBD system monitors the components and the system malfunction listed in “Engine Section” which affects on emissions.
• When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer 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

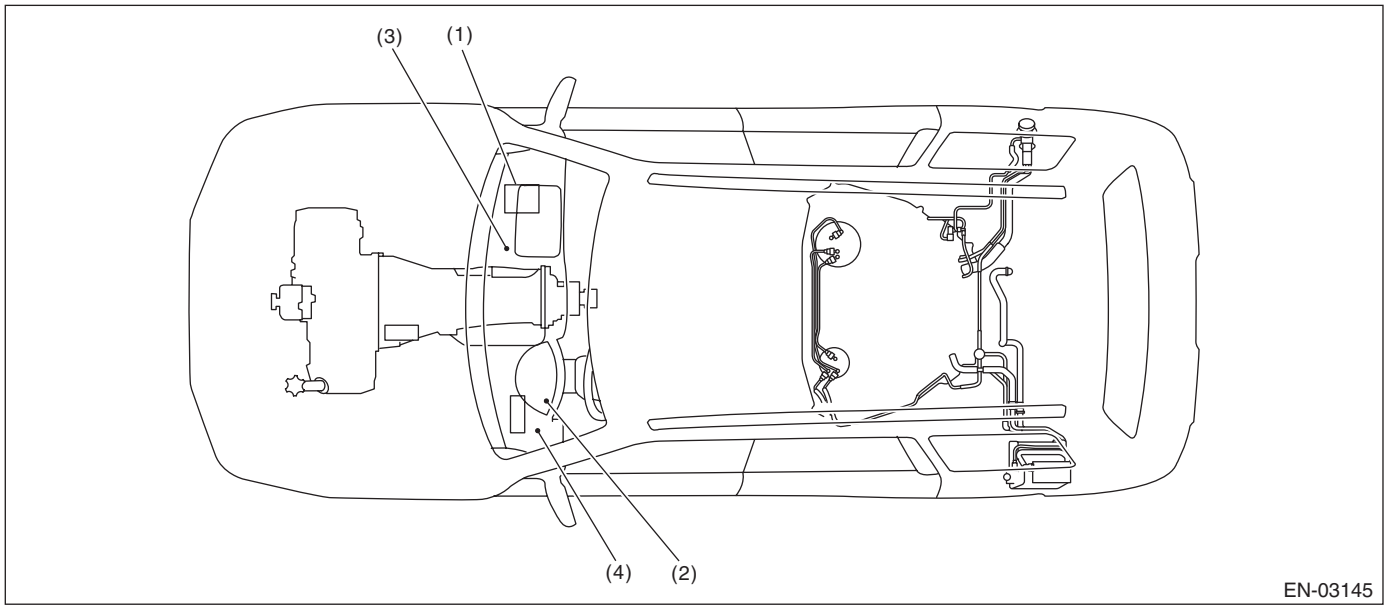
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA010	18482AA010	CARTRIDGE	Troubleshooting for the electrical system
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system

4. Electrical Component Location

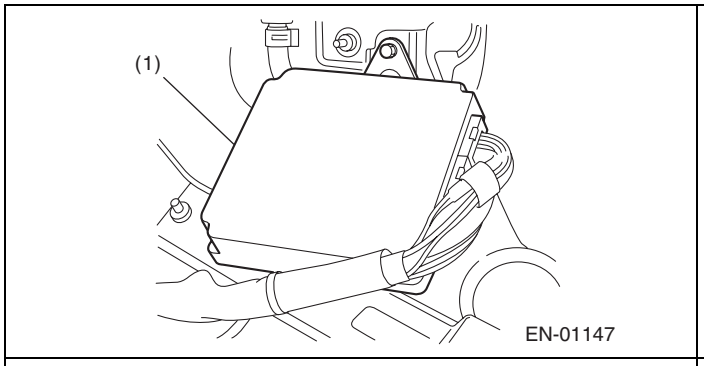
A: LOCATION

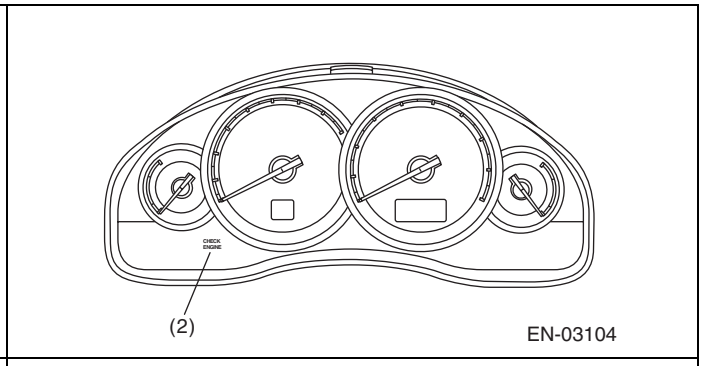
1. ENGINE

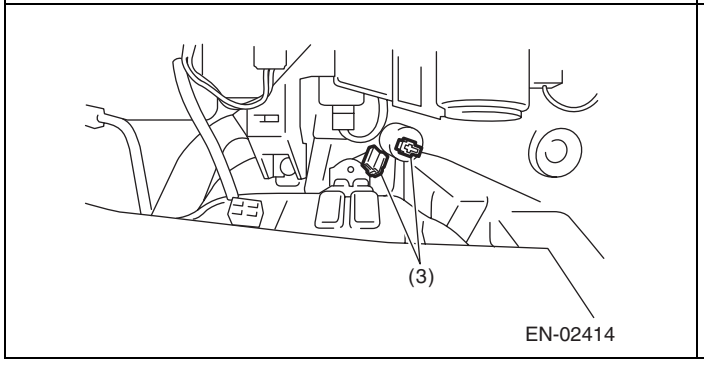
- Control module

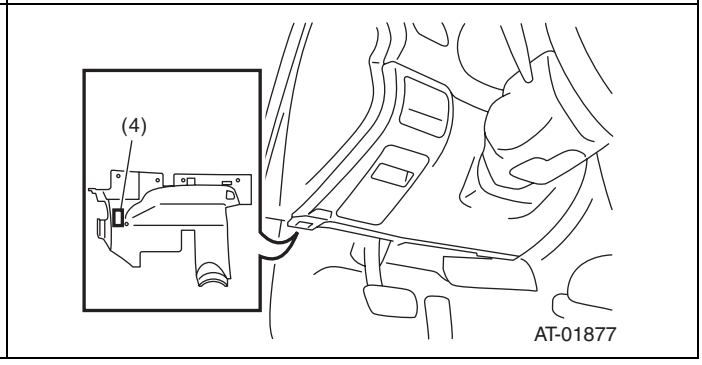


(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Test mode connector
(4) Data link connector

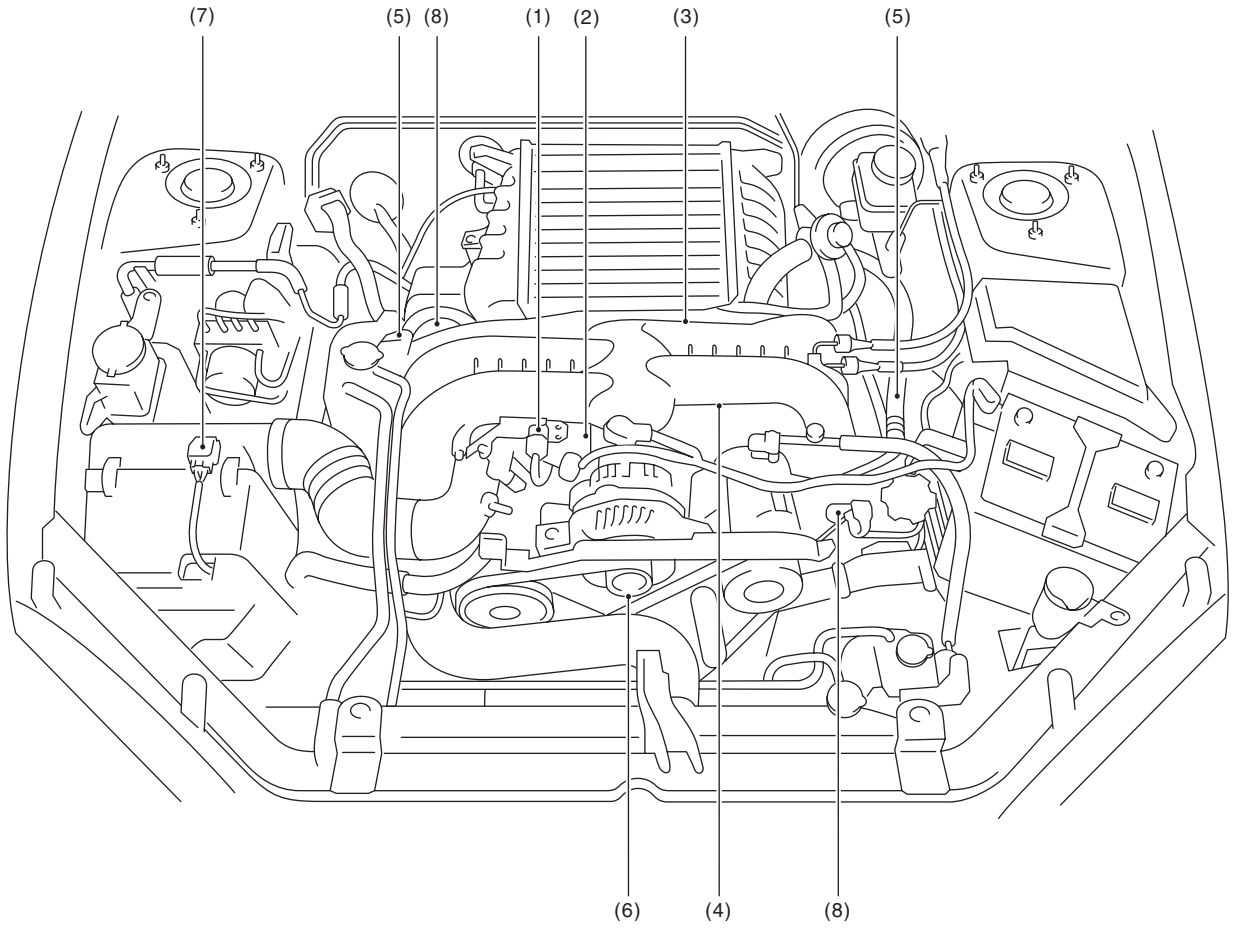




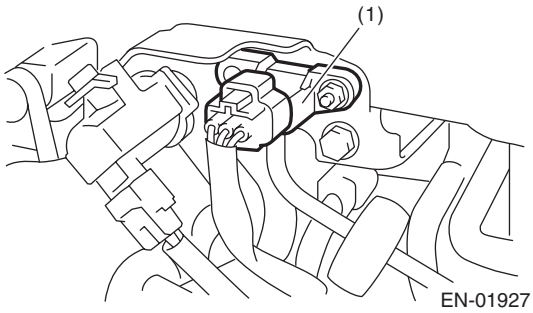




- Sensor



(1) Manifold absolute pressure sensor
(2) Engine coolant temperature sensor
(3) Electronic throttle control
(4) Knock sensor
(5) Intake camshaft position sensor
(6) Crankshaft position sensor
(7) Air flow and intake air temperature sensor
(8) Tumble generator valve position sensor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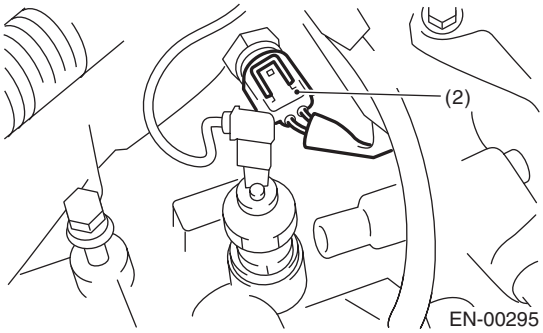
EN-01927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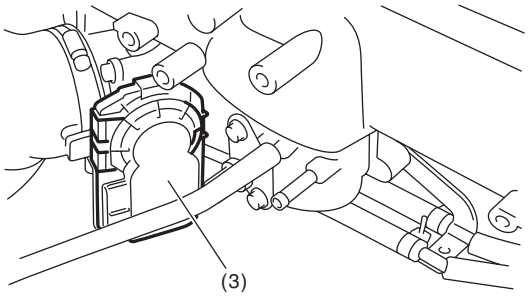
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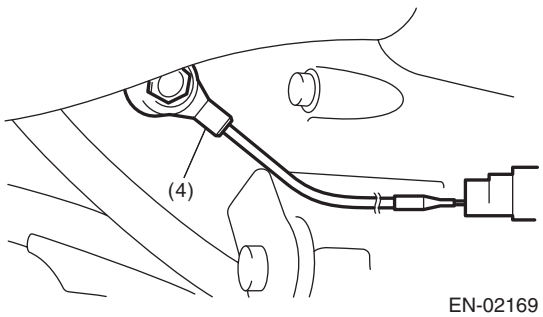
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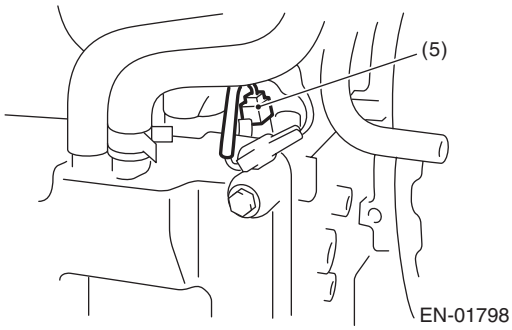
EN-02169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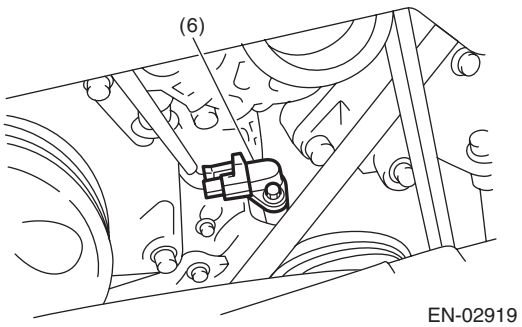
EN-01798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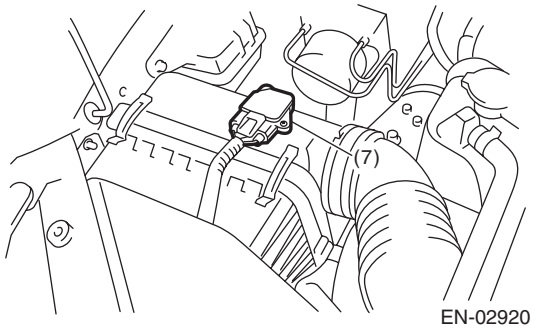
EN-02919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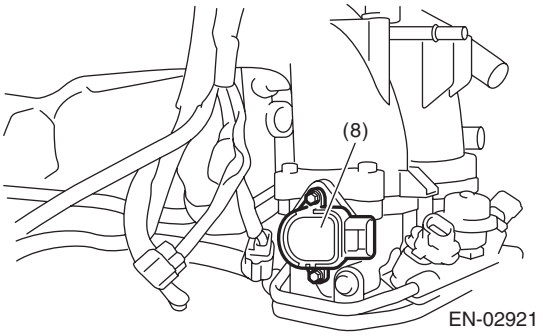
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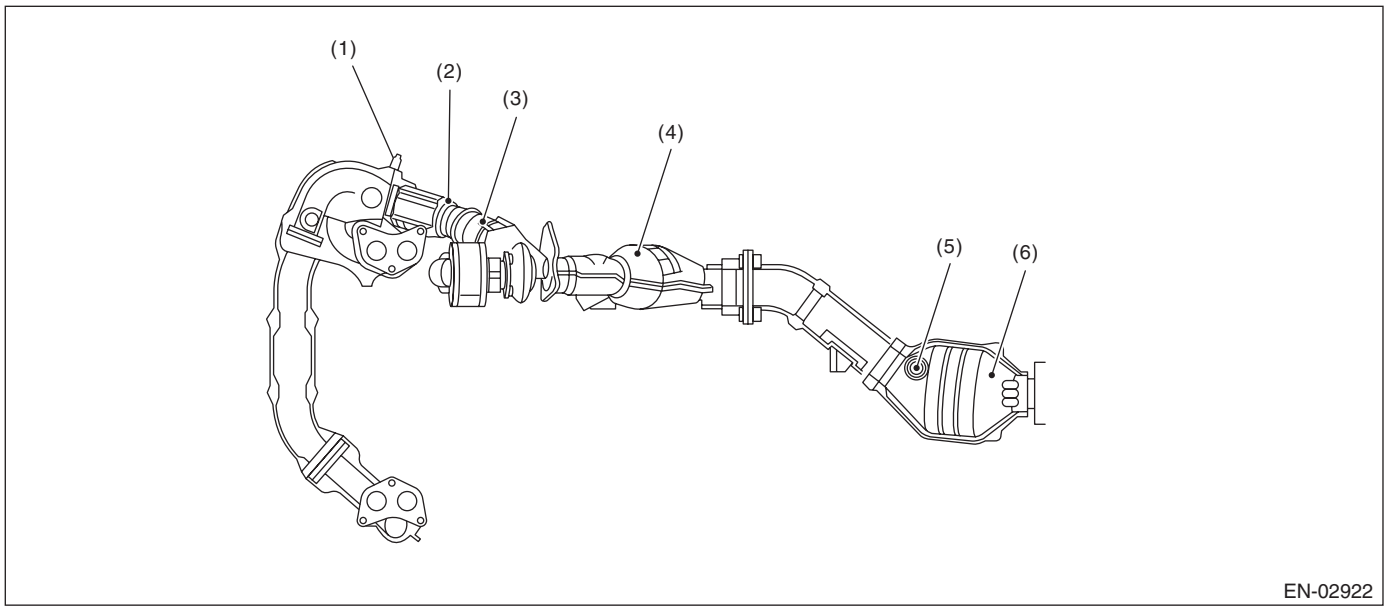
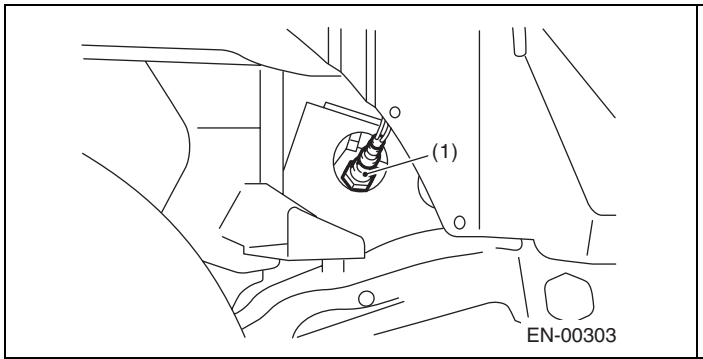
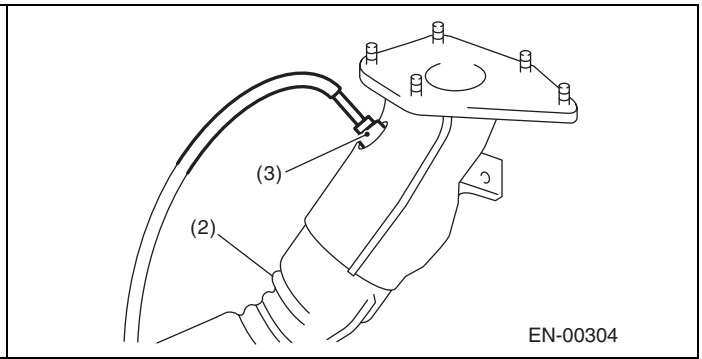
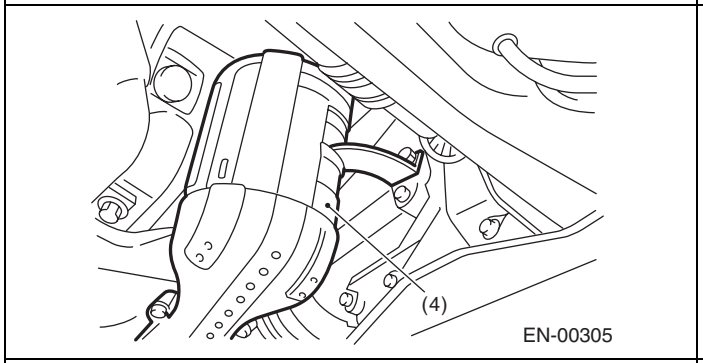
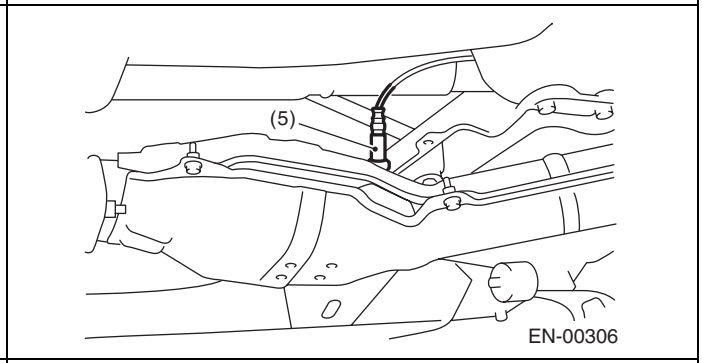


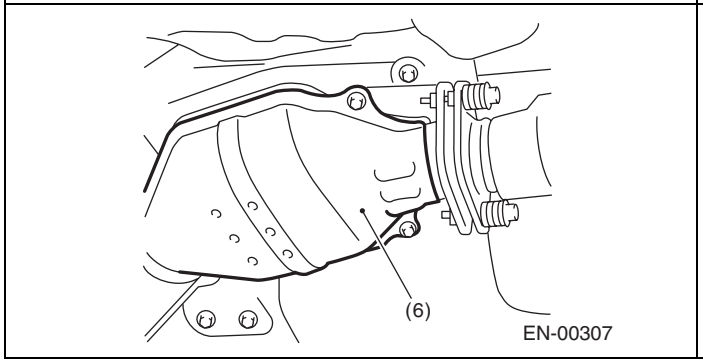
(1) Front oxygen (A/F) sensor
(2) Precatalytic converter
(3) Exhaust temperature sensor
(4) Front catalytic converter
(5) Rear oxygen sensor
(6) Rear catalytic converter

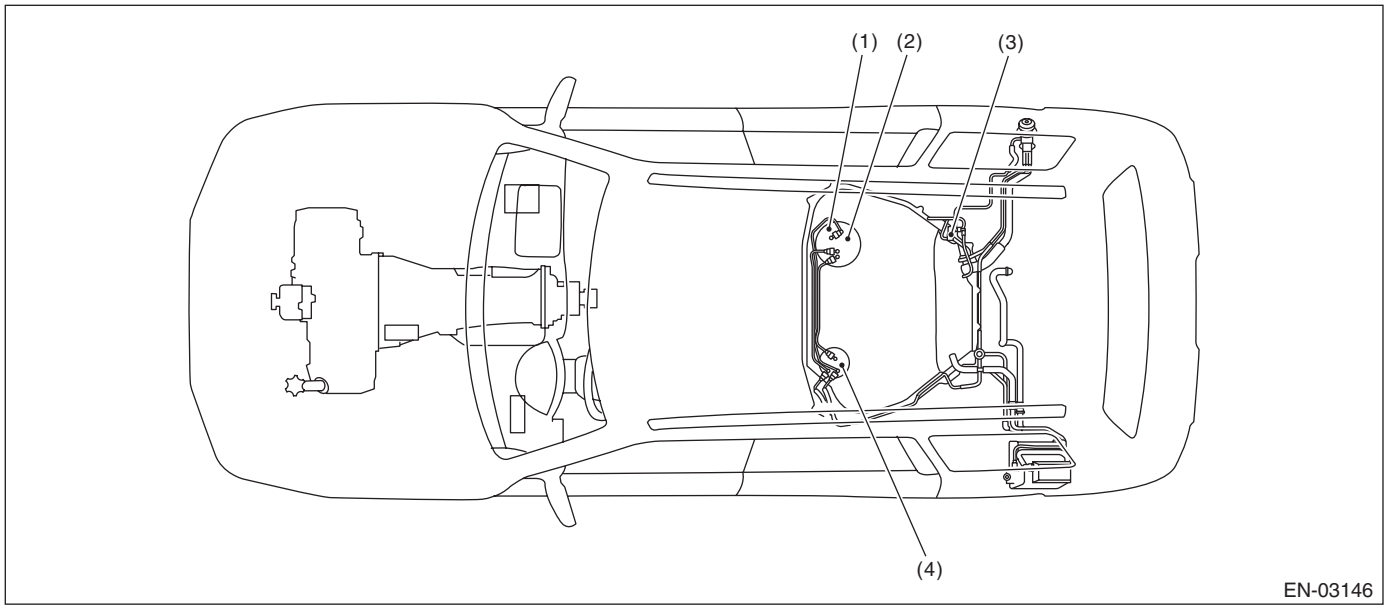




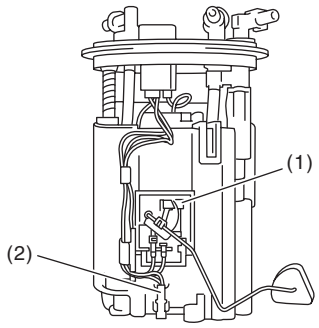


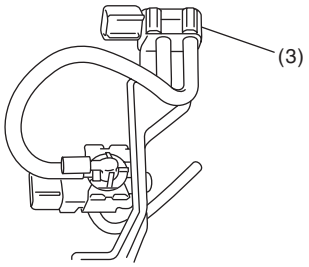


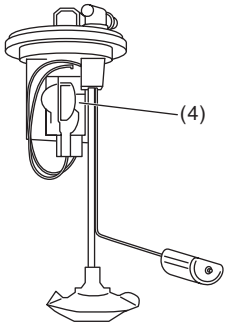




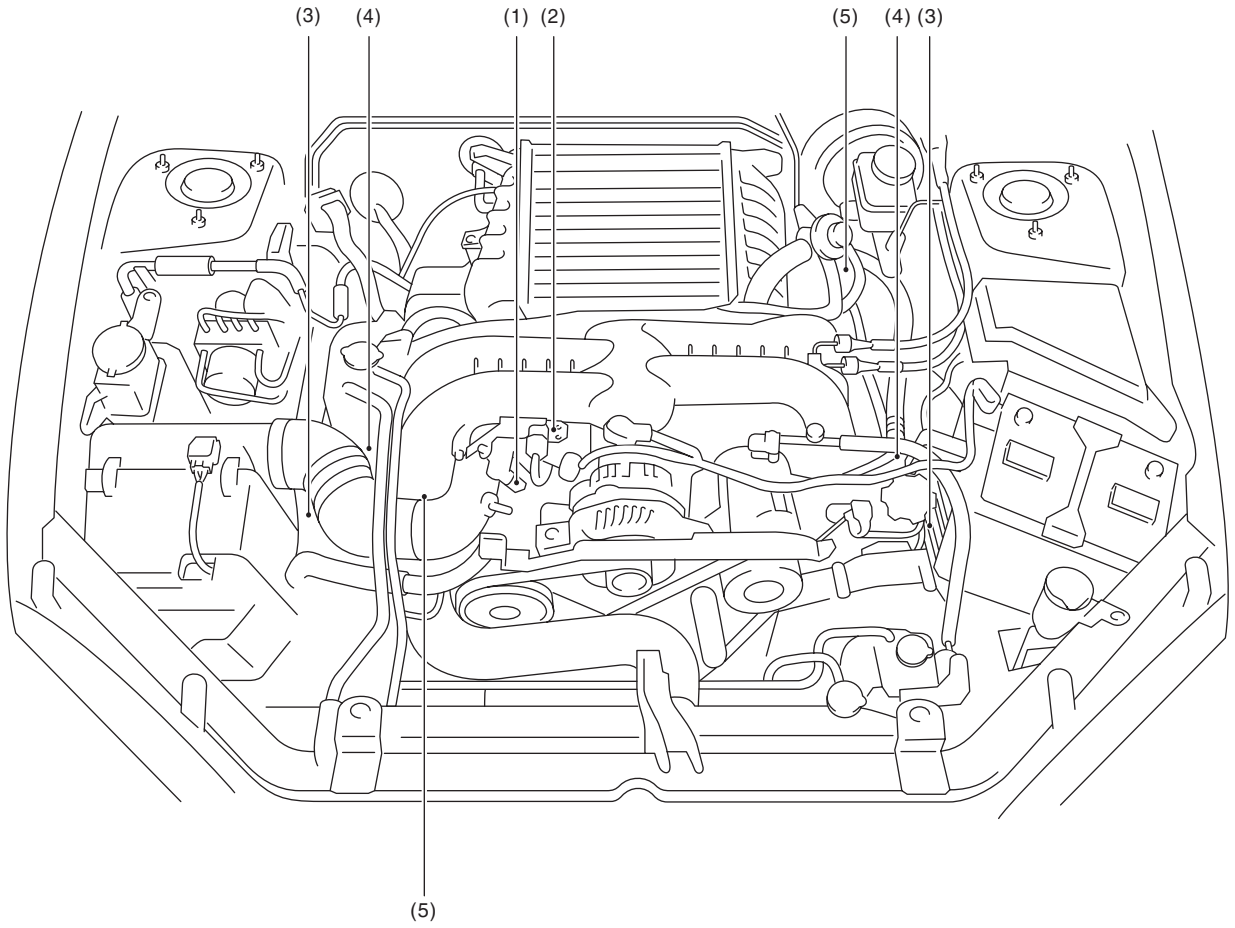
(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor



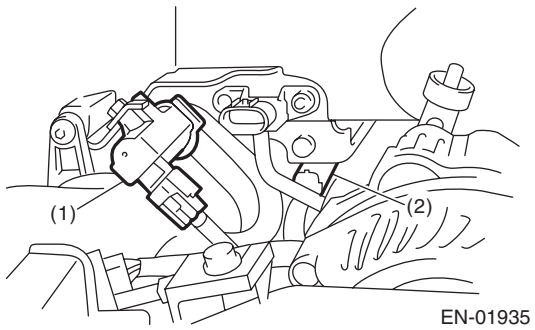


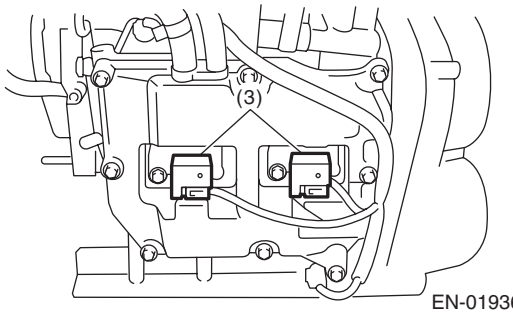


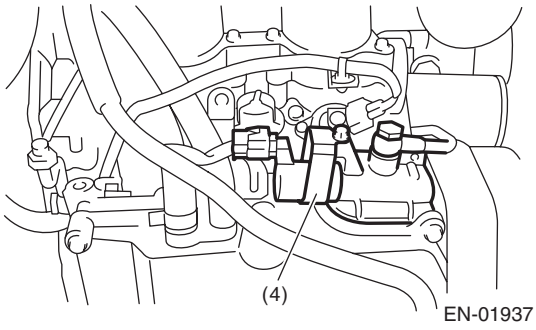
- Solenoid valve, actuator, emission control system parts and ignition system parts

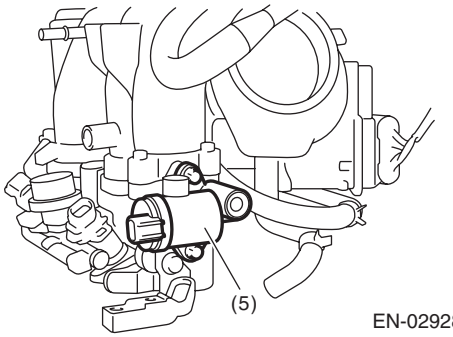


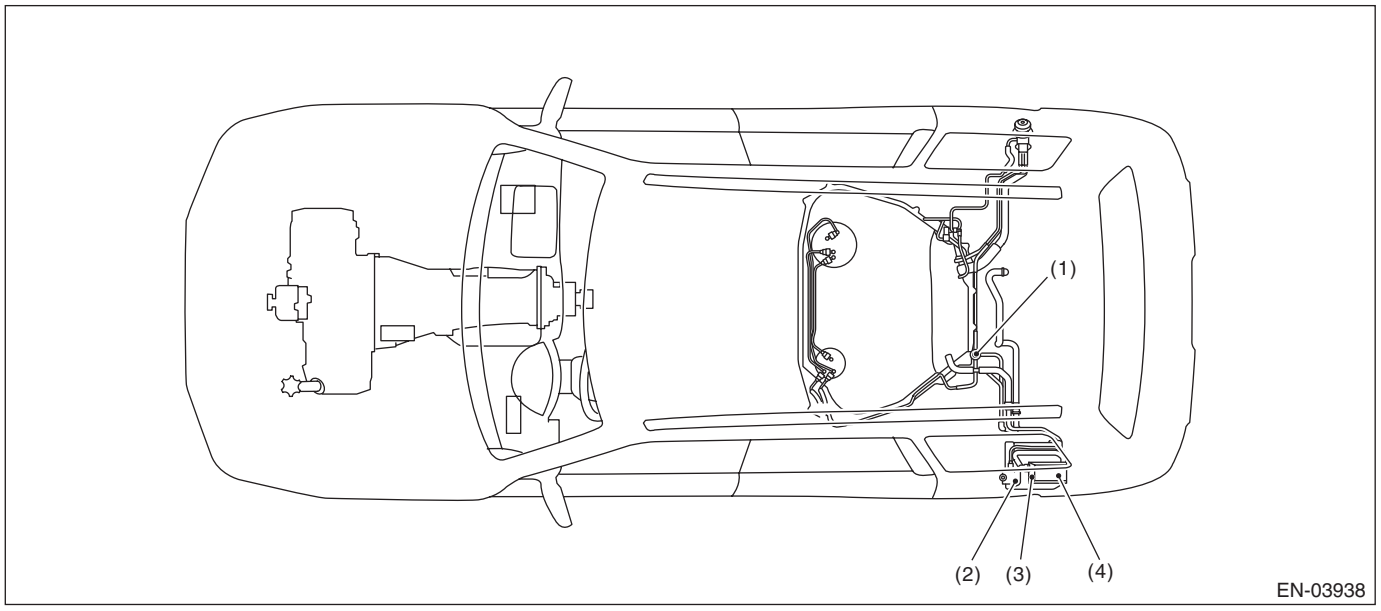
(1) Wastegate control solenoid valve
(2) Purge control solenoid valve
(3) Ignition coil
(4) Intake oil flow control solenoid valve
(5) Tumble generator valve actuator



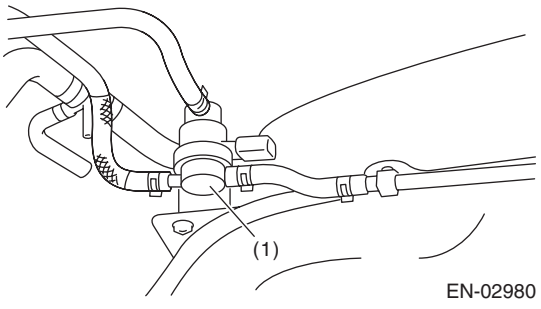


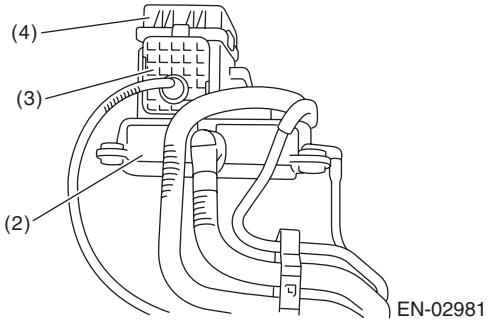


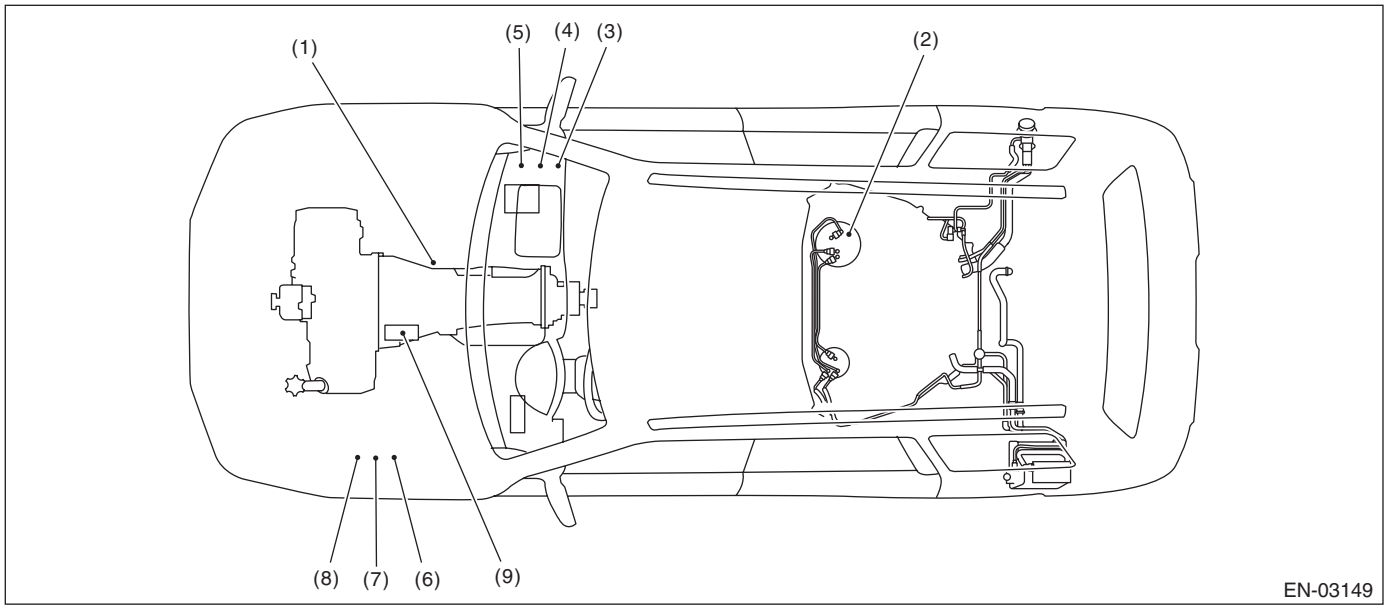




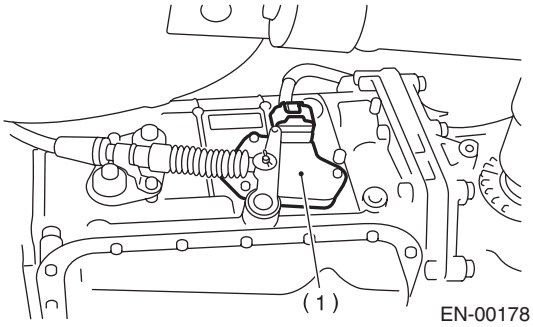
(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter

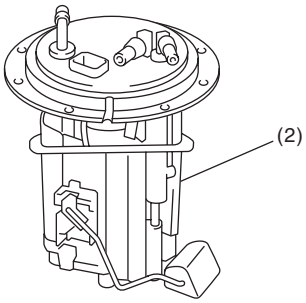


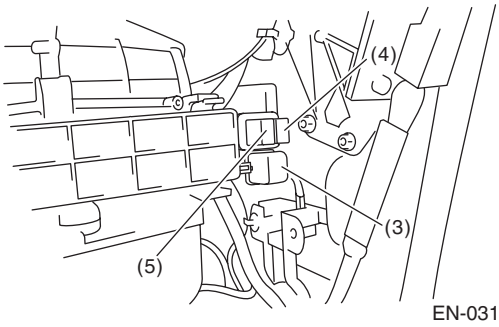


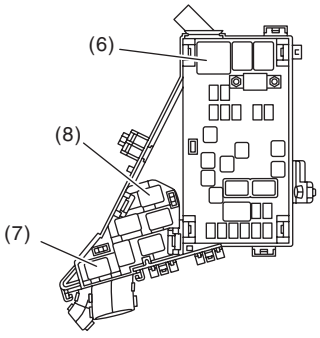


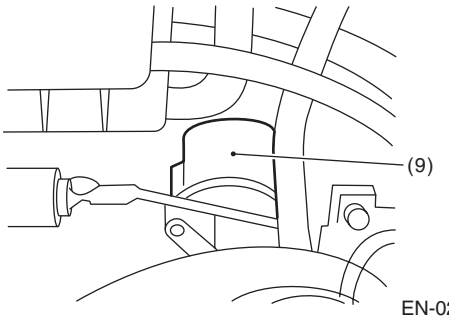
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Electronic throttle control relay
(6) Radiator main fan relay 1
(7) Radiator sub fan relay
(8) Radiator main fan relay 2
(9) Starter





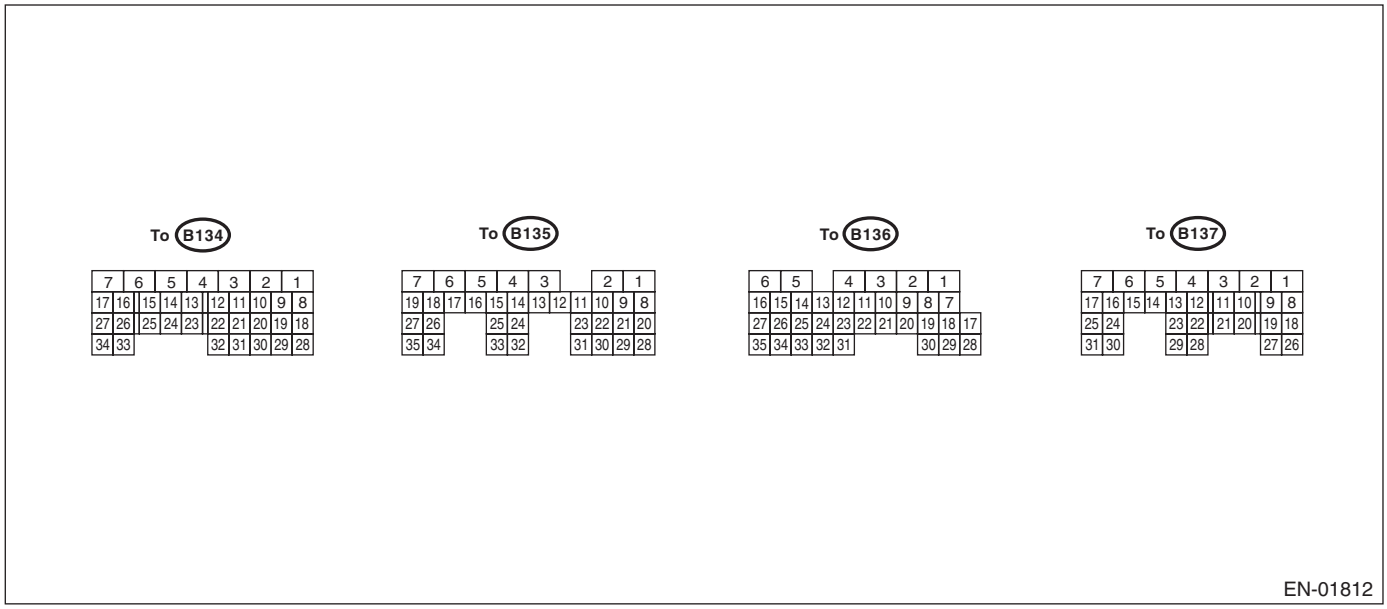






5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B135	10	0	–7 — +7	Waveform
	Signal (–)	B135	22	0	0	—
	Shield	B135	31	0	0	—
Rear oxygen sensor	Signal	B137	25	0	0 — 0.9	—
	Shield	B137	31	0	0	—
	GND (sensor)	B136	35	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B134	3	—	—	Waveform
	Signal 2	B134	2	—	—	Waveform
Rear oxygen sensor heater signal		B135	2	0 — 13	12 — 14	Waveform
Engine coolant temperature sensor	Signal	B136	14	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
	GND (sensor)	B136	35	0	0	After engine is warmed-up.
Air flow sensor	Signal	B136	23	—	0.3 — 4.5	—
	Shield	B136	32	0	0	—
	GND	B136	31	0	0	—
Intake air temperature sensor signal		B136	13	0.3 — 4.6	0.3 — 4.6	—
Wastegate control solenoid valve		B134	32	0 or 10 — 13	0 or 12 — 14	Waveform
Starter switch		B137	8	0	0	Cranking: 8 — 14
A/C switch		B137	17	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Ignition switch		B137	14	10 — 13	12 — 14	—
Neutral position switch (MT model)		B137	9	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—

Engine Control Module (ECM) I/O Signal

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Neutral position switch (AT model)		B137	9	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Test mode connector		B137	15	10 — 13	13 — 14	When connected: 0
Knock sensor	Signal	B136	25	2.8	2.8	—
	Shield	B136	33	0	0	—
Back-up power supply		B135	19	10 — 13	12 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B135	5	10 — 13	12 — 14	—
		B135	6	10 — 13	12 — 14	—
Sensor power supply		B136	16	5	5	—
Ignition control	#1	B135	18	0	12 — 14	Waveform
	#2	B135	17	0	12 — 14	Waveform
	#3	B135	16	0	12 — 14	Waveform
	#4	B135	15	0	12 — 14	Waveform
Fuel Injector	#1	B136	6	10 — 13	1 — 14	Waveform
	#2	B136	5	10 — 13	1 — 14	Waveform
	#3	B136	4	10 — 13	1 — 14	Waveform
	#4	B136	3	10 — 13	1 — 14	Waveform
Fuel pump control unit	Signal 1	B137	28	10 — 13	12 — 14	—
	Signal 2	B135	27	0 or 5	0 or 5	Waveform
A/C relay control		B135	33	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 1 control		B135	25	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 2 control		B135	24	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	Model with A/C only
Malfunction indicator light		B134	17	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B134	23	—	0 — 13 or more	Waveform
Purge control solenoid valve		B134	14	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Waveform
Manifold absolute pressure sensor	Signal	B136	22	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B136	16	5	5	
	GND (sensor)	B136	35	0	0	
Power steering oil pressure switch		B137	10	10 — 13	ON: 0 OFF: 12 — 14	—
Front oxygen (A/F) sensor signal (+)		B134	33	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (–)		B134	26	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B134	25	0	0	—
SSM communication		B137	20	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—
GND (injector)		B137	7	0	0	—
GND (sensor)		B136	35	0	0	—
GND (ignition system)		B135	12	0	0	—
GND (power supply)		B135	4	0	0	—
		B135	1	0	0	—
GND (control system)		B137	1	0	0	—
		B137	2	0	0	—

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
GND (front oxygen (A/F) sensor heater 1)		B134	7	0	0	—
GND (front oxygen (A/F) sensor heater 2)		B134	6	0	0	—
GND (electric throttle control)		B137	3	0	0	—
Intake camshaft position sensor (LH)		B135	8	0 or 5	0 or 5	Waveform
Intake camshaft position sensor (RH)		B135	9	0 or 5	0 or 5	Waveform
electric throttle control	Main	B136	18	0.64 — 0.72 Fully open: 3.96	0.64 — 0.72 (After engine is warmed-up.)	Fully closed: 0.6 Fully open: 3.96
	Sub	B136	29	1.51 — 1.58 Fully open: 4.17	1.51 — 1.58 (After engine is warmed-up.)	Fully closed: 1.48 Fully open: 4.17
	Power supply	B136	16	5	5	—
	GND (sensor)	B136	35	0	0	—
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		B137	6	10 — 13	12 — 14	—
Electronic throttle control motor relay		B135	35	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12— 14	When ignition switch is turned to ON: ON
Intake oil flow control valve (LH)	Signal (+)	B134	19	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	29	0	0	—
Intake oil flow control valve (RH)	Signal (+)	B134	18	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	28	0	0	—
Accelerator position sensor	Main sensor signal	B136	17	Fully closed: 1 Fully opened: 3.3	Fully closed: 1 Fully opened: 3.3	—
	Main power supply	B136	15	5	5	—
	GND (main sensor)	B136	34	0	0	—
	Shield	B137	2	0	0	—
	Sub sensor signal	B136	28	Fully closed: 1 Fully opened: 3.3	Fully closed: 1 Fully opened: 3.3	—
	Sub power supply	B136	16	5	5	—
	GND (sub sensor)	B136	35	0	0	—
Starter relay		B135	32	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	ON: cranking

Description	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (engine OFF)	Engine ON (idling)	
A/C middle pressure switch	B136	30	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Clutch switch	B134	1	When clutch pedal is depressed: 0 When brake pedal is released: 10 — 13	When clutch pedal is depressed: 0 When brake pedal is released: 12 — 14	—
Brake switch 1	B136	9	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	B136	8	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	—
Cruise control command switch	B136	11	When not operating: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating cancel: 0 — 0.5	When not operating: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating cancel: 0 — 0.5	—
Cruise control main switch	B136	7	ON: 0 OFF: 5	ON: 0 OFF: 5	—
Exhaust temperature sensor	B136	24	—	—	—
Fuel tank pressure sensor	B136	21	2.3 — 2.7	2.3 — 2.7	—
Pressure control solenoid valve	B134	12	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Drain valve	B134	13	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Fuel temperature sensor	B136	12	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C(77°F)
Immobilizer Signal 1	B137	19	—	—	—
Immobilizer Signal 2	B137	27	—	—	—
CAN communication line (+)	B137	18	—	—	—
CAN communication (–)	B137	26	—	—	—
AT/MT identification	B134	34	0	0	—
Blow-by leak diagnosis signal	B137	24	0	0	At the time of open circuit (fault): 5
Tumble generator valve position sensor signal (RH)	B136	27	Fully closed: 3.8 — 4.9 Fully open: 0.2 — 0.9	Fully closed: 3.8 — 4.9 Fully open: 0.2 — 0.9	—
Tumble generator valve position sensor signal (LH)	B136	26	Fully closed: 3.8 — 4.9 Fully open: 0.2 — 0.9	Fully closed: 3.8 — 4.9 Fully open: 0.2 — 0.9	—
Tumble generator valve RH (closed)	B134	8	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve LH (closed)	B134	10	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve RH (open)	B134	9	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve LH (open)	B134	11	0 or 10 — 13	0 or 12 — 14	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Remarks	Specification
Engine Load	17.6 — 35.64 (%): Idling
	13.2 — 26.73 (%): 2,500 rpm racing

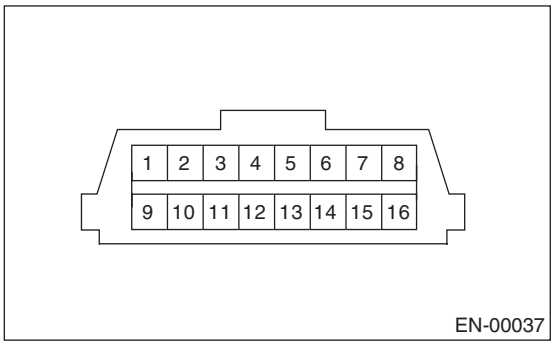
Measuring condition:
- After engine is warmed-up.
- Gear position is in neutral.
- Turn the A/C to OFF.
- Turn all the accessory switches to OFF.

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.



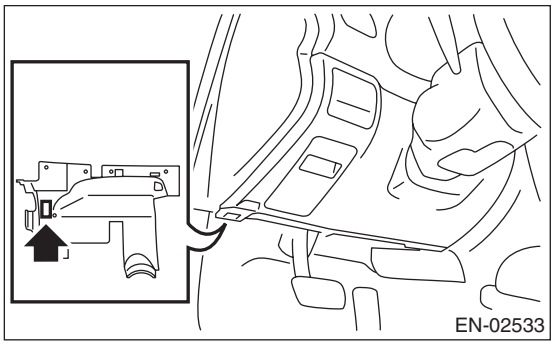
Terminal No.	Remarks	Terminal No.	Remarks
1	Power supply	9	Blank
2	Blank	10	Subaru Select Monitor signal
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Blank	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

8. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

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



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

NOTE:
For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-68, 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 and diagnosis support information	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine speed	rpm
0D	Vehicle speed	MPH
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	gm/s
11	Throttle valve absolute opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—
21	Running distance after MIL turns on	miles
24	A/F value and A/F sensor output voltage	— and V

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 sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine speed	rpm
0D	Vehicle speed	MPH
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	gm/s
11	Throttle valve absolute opening angle	%

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

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

Refer to "List of Diagnostic Trouble Code (DTC)" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)(diag)-68, 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.

TID	CID	Test value & Test limit
$81	$01	Catalyst System Efficiency Below Threshold (Bank 1)
$83	$01	Evaporative emission control system (0.04 inch leak)
	$02	Evaporative emission control system (0.04 inch leak)
	$03	Evaporative emission control system 0.04 inch leak (judgement on early stage)
	$04	Evaporative emission control system (0.04 inch leak)
	$05	Evaporative emission control system (0.02 inch leak)
	$86	Evaporative emission control system (0.02 inch leak)
$84	$01	A/F sensor circuit slow response (Bank 1 Sensor 1)
$85	$01	O2 sensor circuit slow response (Bank 1 Sensor 2) (rich → lean)
	$02	O2 sensor circuit slow response (Bank 1 Sensor 2) (lean → rich)
$41	$81	O2 sensor circuit (Bank 1 Sensor 2)
	$02	

7. MODE $07

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

8. MODE $09

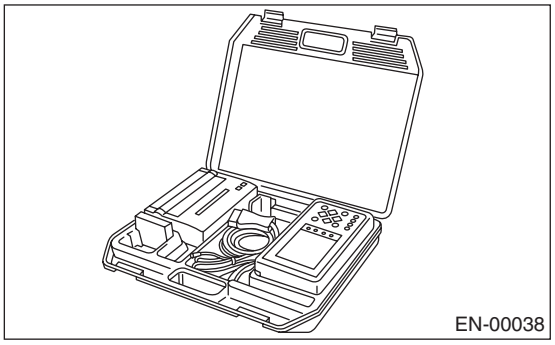
Refer to the data of vehicle specification (V.I.N., calibration ID, etc.).

9. Subaru Select Monitor

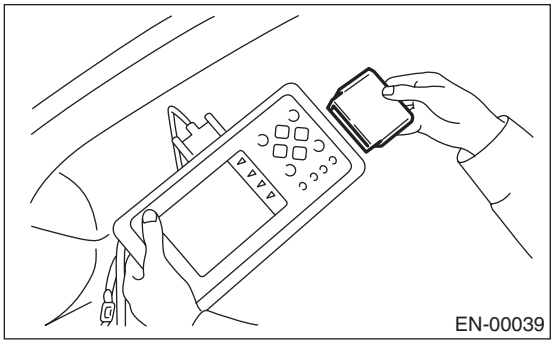
A: OPERATION

1. HOW TO USE THE SUBARU SELECT MONITOR

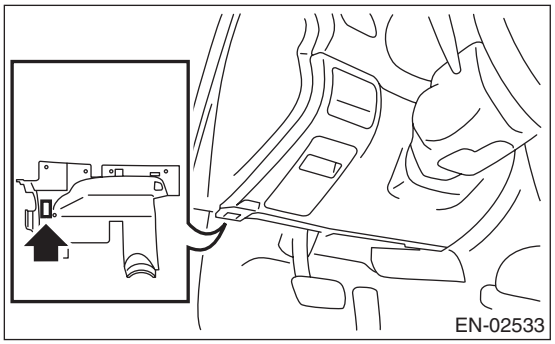
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



2) Connect the diagnosis cable to the Subaru Select Monitor.
3) Insert the cartridge to the Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



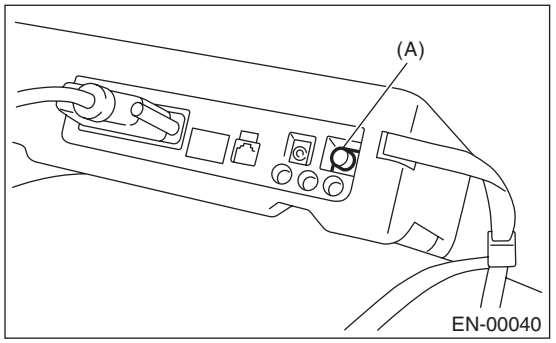
4) Connect the Subaru Select Monitor to the data link connector.
(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



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

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

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up DTC 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 display a DTC. <Ref. to EN(H4DOTC)(diag)-32, 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 display a DTC. <Ref. to EN(H4DOTC)(diag)-32, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA FOR ENGINE (NORMAL MODE)

1) On the «Main Menu» display screen, select {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Display Menu» screen, select the {Data Display} and press the [YES] key.
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.

Remarks	Display	Unit of measure	Note (at idling)
Engine coolant temperature signal	Coolant Temp.	°C or °F	80 — 100°C or 176 — 212°F
A/F correction 1	A/F Correction #1	%	–10 — +10%
A/F learning 1	A/F Learning #1	%	–15 — +15%
Intake manifold absolute pressure	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	220 — 275 mmHg, 29.5 — 37 kPa, 8.7 — 10 inHg or 4.2 — 5.3 psig
Engine speed signal	Engine Speed	rpm	630 — 770 rpm (Agree with the tachometer indication)
Meter vehicle speed signal	Meter Vehicle Speed	km/h or MPH	0 km/h or 0 MPH (at parking)
Ignition timing signal	Ignition Timing	deg	10 — 15 deg
Intake air temperature signal	Intake Air Temp.	°C or °F	20 — 50°C or 68 — 122°F
Intake air amount	Mass Air Flow	g/s or lb/m	2.1 — 3.1 g/s or 0.35 — 0.40 lb/m
Throttle opening angle signal	Throttle Opening Angle	%	2.0 — 2.4%
Rear oxygen sensor voltage	Rear O2 Sensor	V	0 — 1.0 V
Battery voltage	Battery Voltage	V	12 — 15 V
Mass air flow voltage	Air Flow Sensor Voltage	V	1.0 — 1.7 V
Injection 1 pulse width	Fuel Injection #1 Pulse	ms	1.2 — 2.2 ms
Knock sensor correction	Knock Correction	deg	0.0 deg
Acceleration opening angle signal	Accel. Opening Angle	%	0.0%
Primary supercharged pressure control signal	Primary Control	%	0.0%
Purge control solenoid duty ratio	CPC Valve Duty Ratio	%	0 — 25%
Generator duty ratio	ALT Duty	%	0 — 100%
Fuel pump duty ratio	Fuel Pump Duty	%	30 — 40%
AVCS advance angle amount RH	VVT Adv. Ang. Amount R	deg	5 deg
AVCS advance angle amount LH	VVT Adv. Ang. Amount L	deg	5 deg
Oil flow control solenoid valve duty RH (AVCS)	OCV Duty R	%	0 — 20%
Oil flow control solenoid valve duty LH (AVCS)	OCV Duty L	%	0 — 20%
Oil flow control solenoid valve current RH	OCV Current R	mA	40 — 100 mA
Oil flow control solenoid valve current LH	OCV Current L	mA	40 — 100 mA
A/F sensor current value 1	A/F Sensor #1 Current	mA	–20 — 20 mA
A/F sensor resistance value 1	A/F Sensor #1 Resistance	Ω	27 — 35 mA
A/F sensor output lambda 1	A/F Sensor #1	—	1.0
A/F correction 3	A/F Correction #3	%	0.00%
Throttle motor duty	Throttle Motor Duty	%	–5%
Throttle power supply voltage	Throttle Motor Voltage	V	12 — 15 V
Sub throttle sensor voltage	Sub-throttle Sensor	V	1.5 V
Main throttle sensor voltage	Main-throttle Sensor	V	0.6 V
Sub accelerator sensor voltage	Sub-accelerator Sensor	V	1.1 V
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig	+8.8 mmHg, +1.2 kPa, +0.4 inHg or 0.2 psig

Remarks	Display	Unit of measure	Note (at idling)
Fuel temperature signal	Fuel Temp.	°C or °F	+28°C or 82°F
Main accelerator sensor voltage	Main-accelerator Sensor	V	1.0 V
Atmospheric pressure	Atmospheric Pressure	mmHg, kPa, inHg or psig	—
Intake manifold relative pressure	Mani. Relative Pressure	mmHg, kPa, inHg or psig	(Intake manifold absolute pressure — atmospheric pressure)
Memory vehicle speed	Memorized Cruise Speed	km/h or MPH	—
Odd Meter	Estimated Cumulative Driving Distance	km	—
Fuel level signal	Fuel Level	V	5.10
Tumble generator valve RH opening signal	TGV Position Sensor R	V	0.34
Tumble generator valve LH opening signal	TGV Position Sensor L	V	0.32
Exhaust temperature signal	Exhaust Gas Temperature	°C or °F	385°C or 725°F
#1 cylinder roughness monitor	Roughness Monitor #1	—	0
#2 cylinder roughness monitor	Roughness Monitor #2	—	0
#3 cylinder roughness monitor	Roughness Monitor #3	—	0
#4 cylinder roughness monitor	Roughness Monitor #4	—	0
AT/MT identification terminal	AT Vehicle ID Signal	—	ON/OFF
Test mode terminal	Test Mode Signal	—	U-check
Neutral position switch signal	Neutral Position Switch	—	Neutral
Soft idle switch signal	Soft Idle Switch Signal	—	Idling
Ignition switch signal	Ignition Switch	—	ON input
Power steering switch signal	P/S Switch	—	OFF input (At OFF)
Air conditioning switch signal	A/C Switch	—	OFF input (At OFF)
Starter switch signal	Starter Switch	—	OFF input
Rear oxygen monitor	Rear O2 Rich Signal	—	Rich/Lean
Knocking signal	Knock Signal	—	None
Crankshaft position sensor signal	Crankshaft Position Sig.	—	Provided
Camshaft position sensor signal	Camshaft Position Sig.	—	Provided
Rear defogger switch signal	Rear Defogger SW	—	OFF input (At OFF)
Blower fan switch signal	Blower Fan SW	—	OFF input (At OFF)
Light switch signal	Light Switch	—	OFF input (At OFF)
A/C middle pressure switch signal	A/C Mid Pressure Switch	—	OFF input (At OFF)
Air conditioner compressor relay output signal	A/C Compressor Signal	—	OFF output (At OFF)
Radiator fan relay 1 signal	Radiator Fan Relay #1	—	OFF output (At OFF)
Radiator fan relay 2 signal	Radiator Fan Relay #2	—	OFF output (At OFF)
PCV hose assembly diagnosis signal	Blow-by Leak Connector	—	Connected
Pressure control solenoid valve signal	PCV Solenoid	—	OFF output (At OFF)
Tumble generator valve output signal	TGV Output	—	None
Tumble generator valve drive signal	TGV Drive	—	Opening direction
Drain valve signal	Vent Control Solenoid	—	OFF output (At OFF)
AT coordinate retard angle demand signal	Retard Signal from AT	—	None
AT coordinate fuel cut demand signal	Fuel Cut Signal from AT	—	None
AT coordinate permission signal	Torque Permission Signal	—	ON/OFF
ETC motor relay signal	ETC Motor Relay	—	ON
Clutch switch signal	Clutch Switch	—	OFF (At OFF)
Stop light switch signal	Stop Light Switch	—	OFF (At OFF)
SET/COAST switch signal	SET/COAST Switch	—	OFF (At OFF)
RES/ACC switch signal	RESUME/ACCEL Switch	—	OFF (At OFF)

Remarks	Display	Unit of measure	Note (at idling)
Brake switch signal	Brake Switch	—	OFF (At OFF)
Main switch signal	Main Switch	—	OFF (At OFF)
Integrated unit data reception	Body Int. Unit Data	—	Provided
Integrated unit data update	Body Int. Unit Count	—	Provided
Cruise control cancel switch signal	CC Cancel SW	—	OFF (At OFF)

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

5. READ CURRENT DATA FOR ENGINE (OBD MODE)

1) On the «Main Menu» display screen, select {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Current Data Display/Save}, and then press the [YES] key.
6) On the «Display Menu» screen, select the {Data Display} and press the [YES] key.
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.

Description	Display	Unit of measure	Note (at idling)
Number of diagnosis code	Number of Diag. Code:	—	—
Condition of malfunction indicator light	MI (MIL)	—	ON or OFF
Monitoring test of misfire	Misfire Monitoring	—	Finish or incomplete
Monitoring test of fuel system	Fuel system monitoring	—	Finish or incomplete
Monitoring test of comprehensive component	Component monitoring	—	Finish or incomplete
Test of catalyst	Catalyst Diagnosis	—	Finish or incomplete
Test of heating-type catalyst	Heated catalyst	—	No support
Test of evaporative emission purge control system	Evaporative purge system	—	Finish or incomplete
Test of secondary air system	Secondary air system	—	No support
Test of air conditioning system refrigerant	A/C system refrigerant	—	No support
Oxygen sensor test	Oxygen sensor	—	Finish or incomplete
Oxygen sensor heater test	O2 Heater Diagnosis	—	Finish or incomplete
Test of EGR system	EGR system	—	No support
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—	CLOSE normal
Engine load data	Calculated load value	%	1.6%
Engine coolant temperature signal	Coolant Temp.	°C or °F	+91°C or 196°F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%	+0.0 %
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%	+1.6 %
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	256 mmHg
Engine speed signal	Engine Speed	rpm	693 rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH	0 km/h
#1 Cylinder ignition timing	Ignition timing adv. #1	°	+16.0°
Intake air temperature signal	Intake Air Temp.	°C or °F	54°C or 129°F
Intake air amount	Mass Air Flow	g/s or lb/m	3.1 g/s
Throttle position signal	Throttle Opening Angle	%	13%
Oxygen sensor #12	Oxygen Sensor #12	V	+0.800 V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%	+0.8%
On-board diagnostic system	OBD System	—	CARB-OBD2
Oxygen sensor #11	Oxygen Sensor #11	—	Support
Rear oxygen sensor output signal	Oxygen Sensor #12	—	Support
A/F lambda signal	A/F sensor #11	—	0.984
A/F sensor output signal	A/F sensor #11	V	2.712V
A/F lambda signal #11	A/F sensor #11	—	0.992
A/F sensor current #11	A/F sensor #11	mA	–0.03 mA

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} and press the [YES] key.
2) On the «System Selection Menu» display screen, select {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
• A list of the support data is shown in the following table.

Description	Display	Unit of measure
DTC of freeze frame data	Freeze frame data	Diagnostic code
Air fuel ratio control system for bank 1	Fuel system for Bank1	—
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	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing adv.#1	Ignition timing adv. #1	°
Intake air temperature	Intake Air Temp.	°C
Amount of intake air	Mass Air Flow	g/s
Throttle valve angle	Throttle Opening Angle	%

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

7. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display» screen, select the {Data LED Display} and press the [YES] key.
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.

Remarks	Display	Message	LED “ON” requirements
AT/MT identification signal	AT Vehicle ID Signal	ON or OFF	Illuminate (AT model)
Test mode signal	Test Mode Signal	ON or OFF	Test mode connector connected
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is input.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is input.
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch is entered.
Starter switch signal	Starter Switch	ON or OFF	When starter switch is input.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is input.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	Lean or Rich	When rear oxygen sensor mixture ratio is rich.
Knocking signal	Knocking Signal	Provided or None	When knocking signal is input.
Crankshaft position sensor signal	Crankshaft Position Signal	Provided or None	When crankshaft position sensor signal is input.

Remarks	Display	Message	LED “ON” requirements
Camshaft position sensor signal	Camshaft Position Signal	Provided or None	When camshaft position sensor signal is input.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is turned to ON.
Blower fan switch signal	Blower Fan Switch	ON or OFF	When blower fan switch is turned to ON.
Small light switch signal	Light Switch	ON or OFF	When small light switch is turned to ON.
A/C middle pressure switch signal	A/C Mid Pressure Switch	ON or OFF	When A/C middle pressure switch is turned to ON.
Air conditioning relay signal	A/C Compressor Signal	ON or OFF	When air conditioning relay is in function.
Radiator fan relay 1 signal	Radiator Fan Relay #1	ON or OFF	When radiator fan relay 1 is in function.
Radiator fan relay 2 signal	Radiator Fan Relay #2	ON or OFF	When radiator fan relay 2 is in function.
PCV hose assembly diagnosis signal	Blow-by Leak Connector	Connect or Unconnect	PCV hose assembly connected
Pressure control solenoid valve signal	PCV Solenoid	ON or OFF	When pressure control valve is ON.
Tumble generator valve signal	TGV Output	Provided or None	Tumble generator valve signal is input.
Tumble generator valve drive signal	TGV Drive	Open or Close	Tumble generator valve open
Drain valve signal	Vent Control Solenoid	ON or OFF	When drain valve is ON.
AT retard angle demand signal	Retard Signal	Provided or None	When AT retard angle demand signal is input.
AT fuel cut signal	Fuel Cut	Provided or None	When AT fuel cut signal is input.
AT cooperative permission signal	Torque Control Permission	Provided or None	When AT coordinate permission signal is input.
Electronic throttle control motor relay signal	ETC Motor Relay	ON or OFF	When electronic throttle control motor relay is in function.
Clutch switch signal	Clutch Switch	ON or OFF	When clutch switch is turned to ON.
Stop light switch signal	Stop Light Switch	ON or OFF	When stop light switch is turned ON.
SET/COAST switch signal	SET/COAST Switch	ON or OFF	When SET/COAST switch is turned to ON.
RES/ACC switch signal	RESUME/ACCEL Switch	ON or OFF	When RES/ACC switch is turned to ON.
Brake switch signal	Brake Switch	ON or OFF	When brake switch is turned to ON.
Main switch signal	Main Switch	ON or OFF	When main switch is turned to ON.
Cancel switch signal	Cancel Switch	ON or OFF	When cancel switch is turned to ON.
data reception signal	Body Int. Unit Data	Provided or None	Data reception signal input
Counter update signal	Body Int. Unit Count	Provided or None	Counter update signal input

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

8. V.I.N. REGISTRATION

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

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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the Diagnostic Code(s) Display and press the [YES] key.
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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>

11.Inspection Mode

A: PROCEDURE

Perform the diagnosis shown in the following DTC table.
When performing the diagnosis not listed in “List of Diagnostic Trouble Code (DTC)”, refer to the item on the drive cycle. <Ref. to EN(H4DOTC)(diag)-38, Drive Cycle.>

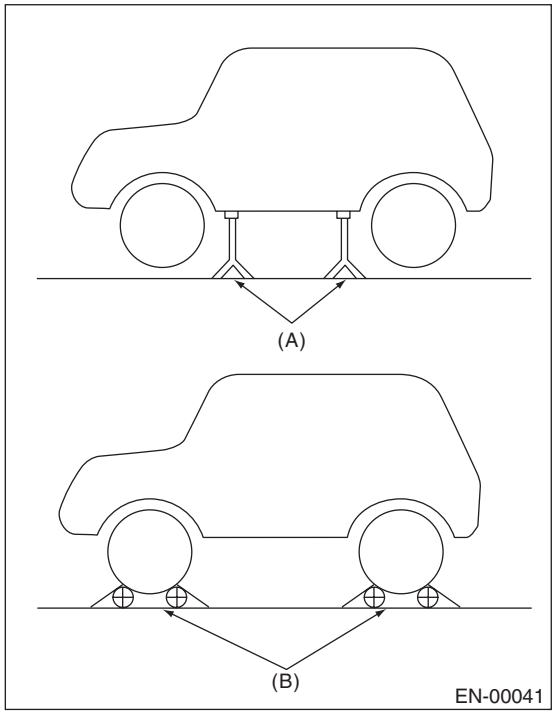
DTC	Item	Condition
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	—
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
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)	—
P0182	Fuel Temperature Sensor “A” Circuit Low Input	—
P0183	Fuel Temperature Sensor “A” Circuit High Input	—
P0222	Throttle/Pedal Position Sensor/Switch “B” Circuit Low	—
P0223	Throttle/Pedal Position Sensor/Switch “B” Circuit High	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	—
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	—
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	—
P0545	Exhaust Gas Temperature Sensor Circuit Low (Bank 1 Sensor 1)	—
P0600	Serial Communication Link	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—

DTC	Item	Condition
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	—
P0700	Transmission Control System (MIL Request)	—
P0851	Park/Neutral Switch Input Circuit Low	—
P0852	Park/Neutral Switch Input Circuit High	—
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	—
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	—
P1160	Return Spring Failure	—
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
P1544	Exhaust Gas Temperature Too High	—
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	—
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	—
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	—
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	—
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	—
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	—
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	—
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	—
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	—
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	—
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	—
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	—
P2128	Throttle/Pedal Position Sensor/Switch “E” Circuit High Input	—
P2135	Throttle/Pedal Position Sensor/Switch “A”/“B” Voltage Correlation	—
P2138	Throttle/Pedal Position Sensor/Switch “D”/“E” Voltage Correlation	—
P2227	Barometric Pressure Circuit Range/Performance	—
P2228	Barometric Pressure Circuit Low	—
P2229	Barometric Pressure Circuit High	—

1. PREPARATION FOR THE INSPECTION MODE

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

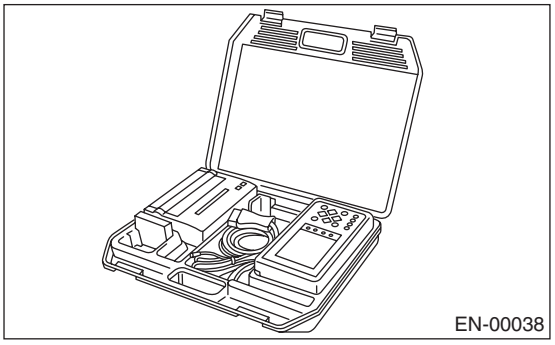
WARNING:
• Before raising the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release clutch pedal or accelerator pedal 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.



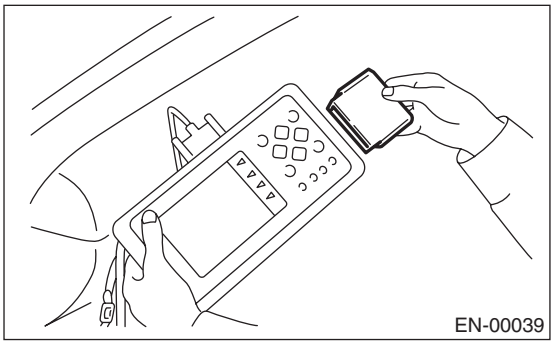
(A) Rigid racks
(B) Free rollers

2. SUBARU SELECT MONITOR

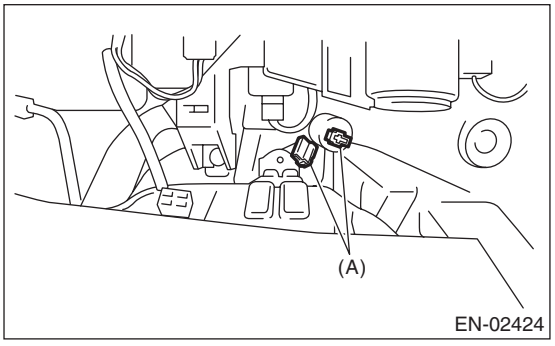
1) After clearing the memory, check for any remaining unresolved trouble data.
<Ref. to EN(H4DOTC)(diag)-42, Clear Memory Mode.>
2) Warm-up the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



4) Connect the diagnosis cable to the Subaru Select Monitor.
5) Insert the cartridge to the Subaru Select Monitor.
<Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>

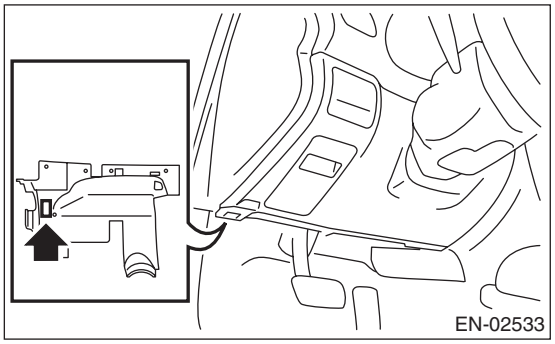


6) Connect the test mode connector (A) located under the glove box.



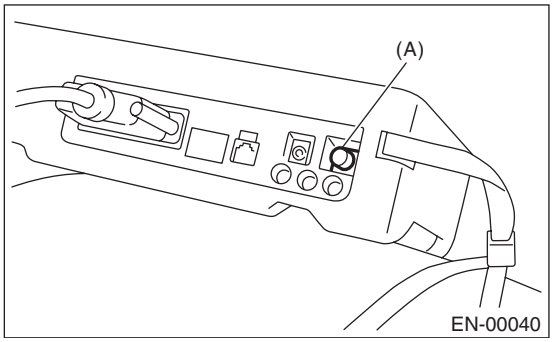
(A) Test mode connector

7) 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 any scan tools except the Subaru Select Monitor or the general scan tool.

8) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



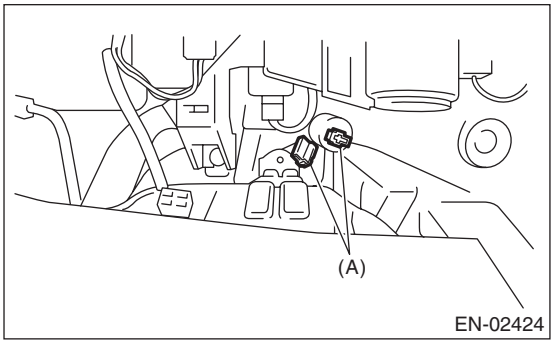
(A) Power switch

9) On the «Main Menu» display screen, select {Each System Check} and press the [YES] key.
10) On the «System Selection Menu» display screen, select {Engine Control System} and press the [YES] key.
11) Press the [YES] key after the information of engine type has been displayed.
12) On the «Engine Diagnosis» display screen, select {D Check} and press the [YES] key.
13) When the "Perform Inspection (Dealer Check) Mode" is shown on the screen, press the [YES] key.
14) 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light the ABS warning light, but this does not indicate a malfunction. When engine control diagnosis is finished, perform the ABS memory clearance procedure of the self-diagnosis system. <Ref. to ABS(diag)-25, Clear Memory Mode.>

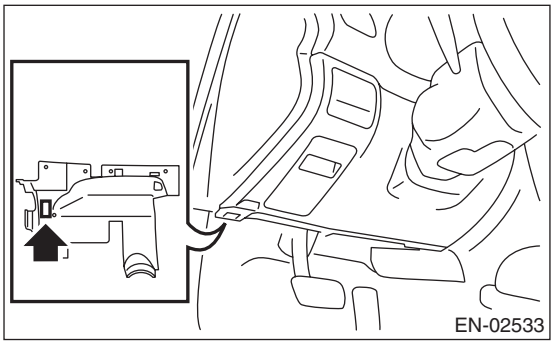
3. GENERAL SCAN TOOL

1) After clearing the memory, check for any remaining unresolved trouble data.
<Ref. to EN(H4DOTC)(diag)-42, 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 any scan tools except the Subaru Select Monitor or the general scan tool.



5) Start the engine.

NOTE:
• Make sure the select lever is placed in the “P” position before starting. (AT model)
• Depress the clutch pedal when starting engine. (MT model)

6) Using the select lever or shift lever, turn the “P” position switch and “N” position switch on.
7) Depress the brake pedal to turn the brake switch ON. (AT model)
8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
9) Place the selector lever or shift lever in D range (AT model) or 1st gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• For AWD model, release the parking brake.
• The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of the self-diagnosis system. <Ref. to ABS(diag)-25, Clear Memory Mode.>

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

NOTE:
• For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”.
<Ref. to EN(H4DOTC)(diag)-68, 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 battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)(diag)-42, 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 20°C (68°F) or less.
*P0126	Insufficient Engine Coolant Temperature for Stable Operation	—
*P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	Engine coolant temperature at engine start is 55°C (131°F) or less.
*P0133	O2 Sensor Circuit Slow Response (Bank 1 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.
*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.
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (Small Leak)	Coolant temperature at 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)	Coolant temperature at start is less than 25°C (77°F).
*P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	Coolant temperature at start is less than 25°C (77°F).
P0459	Evaporative Emission System Purge Control Valve Circuit High	—
P0546	Exhaust Gas Temperature Sensor Circuit High (Bank 1 Sensor 1)	—
P0692	Fan 1 Control Circuit High	—
P1301	Misfire Detected (High Temperature Exhaust Gas)	Diagnosis completes in drive cycle B or C as well.

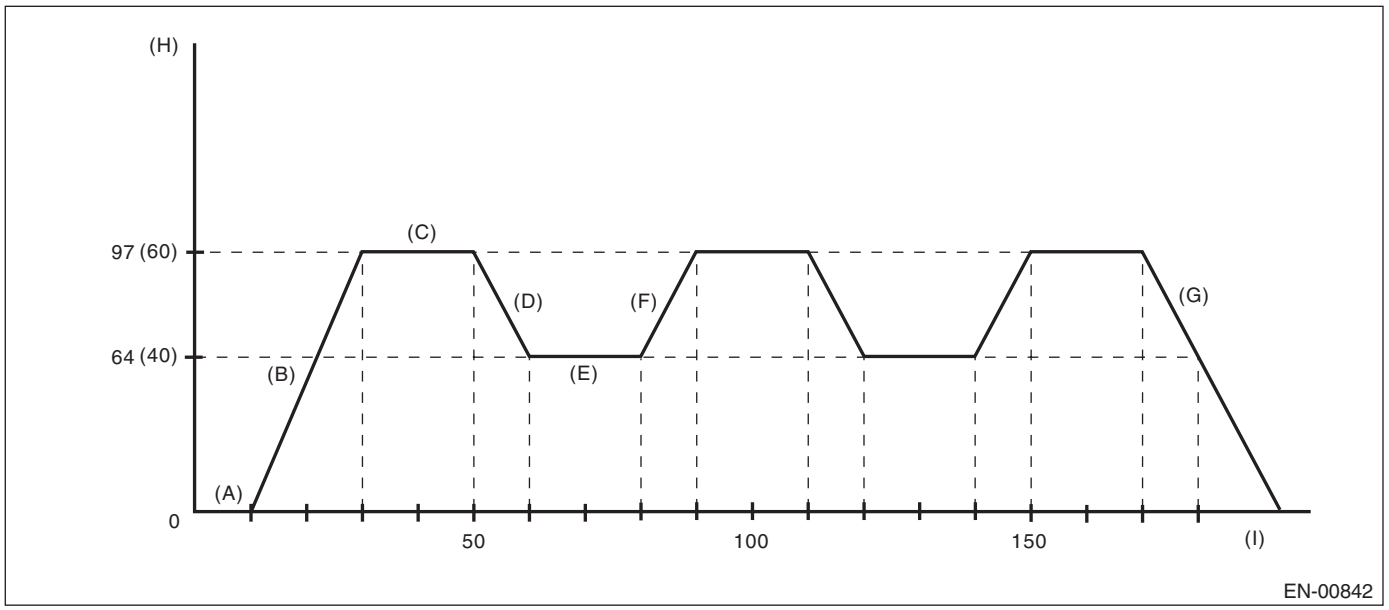
DTC	Item	Condition
P1312	Exhaust Gas Temperature Sensor Malfunction	Engine coolant temperature at engine start is 30°C (86°F) or less.
P1443	Vent Control Solenoid Valve Function Problem	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle B or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle B or C as well.

3. DRIVE CYCLE B (TEN MINUTES IDLING)

NOTE:
Drive the vehicle in more than 10 km/h (6 MPH) before diagnosis.

DTC	Item	Condition
*P0101	Mass or Volume Air Flow Circuit Range/Performance	Engine coolant temperature at engine start is 30°C (86°F) or less.
*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.
*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.
*P0464	Fuel Level Sensor Circuit Intermittent	—
*P0483	Fan Rationality Check	—
*P0506	Idle Air Control System RPM Lower Than Expected	—
*P0507	Idle Air Control System RPM Higher Than Expected	—
P1301	Misfire Detected (High Temperature Exhaust Gas)	Diagnosis completes in drive cycle A or C as well.
*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.

4. DRIVE CYCLE C (DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN)



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

DTC	Item	Condition
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
P0068	MAP/MAF - Throttle Position Correlation	—
*P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
*P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*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.
*P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	—
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	—
*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.
P1301	Misfire Detected (High Temperature Exhaust Gas)	Diagnosis completes in drive cycle A or B as well.
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	—
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	—
*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.

5. DRIVE CYCLE D

DRIFT DIAGNOSIS

1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
2) Make sure that fuel remains more than 9.6 ℓ (2.5 US gal, 2.1 Imp gal) and the battery voltage is more than 10.9 V.
3) Make sure that the engine coolant temperature rises for more than 10°C (18°F) from the level of engine starting and is also above 75°C (167°F).
4) Idle the engine for more than 120 seconds in the condition of step 3.

STUCK DIAGNOSIS

1) Make sure that the battery voltage is more than 10.9 V.
2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-42, Clear Memory Mode.>
3) Drive the vehicle for the distance equal to the fuel of 50 ℓ (13.2 US gal, 11 Imp gal).

NOTE:
• It is possible to drive intermittently.
• Do not disconnect the terminal of battery during diagnosis. (Data will be cleared when 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 more than 10.9 V.
2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-42, Clear Memory Mode.>
3) Drive the vehicle for the distance equal to the fuel of 30 ℓ (7.9 US gal, 6.6 Imp gal).

NOTE:
• It is possible to drive intermittently.
• Do not disconnect the terminal of battery during diagnosis. (Data will be cleared when disconnecting the battery terminals.)

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

13.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

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

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance.Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

2. SUBARU SELECT MONITOR (OBD MODE)

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

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance.Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

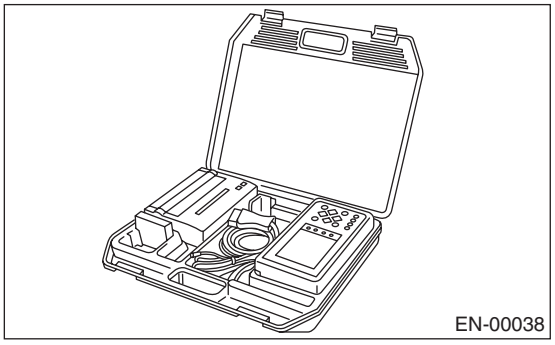
3. GENERAL SCAN TOOL

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

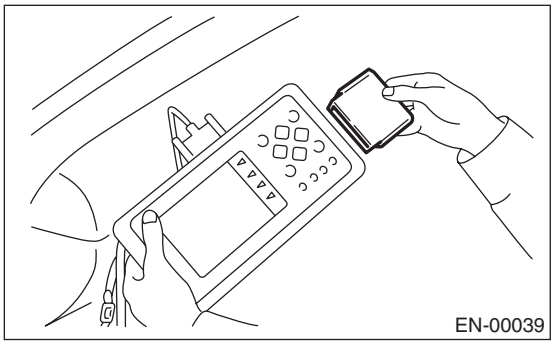
14.Compulsory Valve Operation Check Mode

A: OPERATION

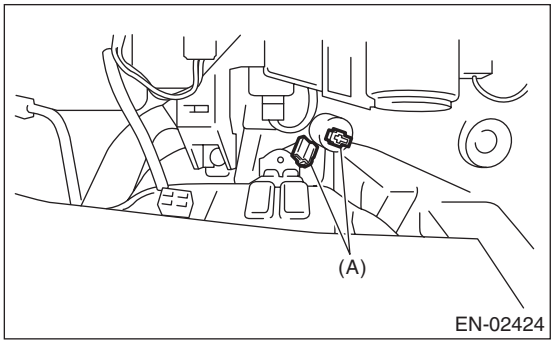
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



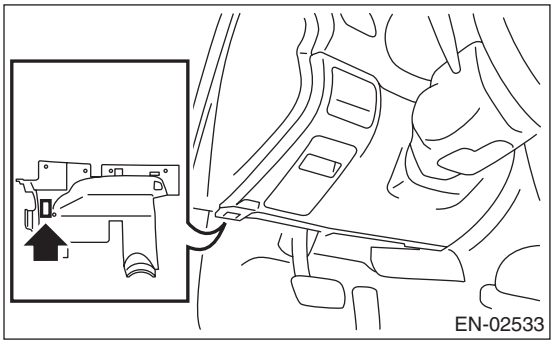
2) Connect the diagnosis cable to the Subaru Select Monitor.
3) Insert the cartridge to the Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



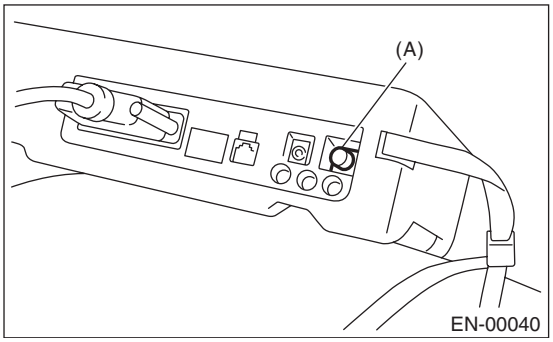
4) Connect the test mode connector (A) located under the glove box.



5) 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 any scan tools except the Subaru Select Monitor or the general scan tool.
6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select {Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select {Engine Control System} and press the [YES] key.
9) Press the [YES] key after the information of engine type has been displayed.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

13) Pressing the [NO] key 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 wastegate control solenoid valve operation check	Wastegate control 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
AAI Solenoid
EXH. Bypass Control Permit Flag

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

15.Malfunction Indicator Light

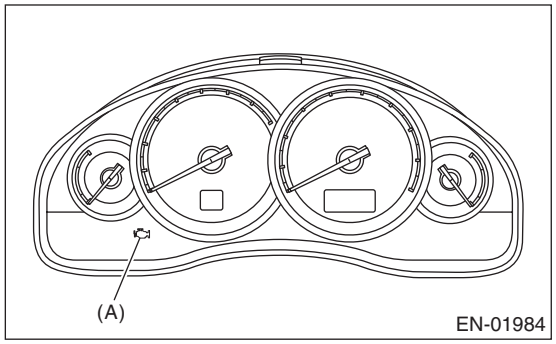
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H4DOTC)(diag)-46, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Malfunction indicator light does not come on. <Ref. to EN(H4DOTC)(diag)-47, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Malfunction indicator light does not go off. <Ref. to EN(H4DOTC)(diag)-49, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>
↓
4. Malfunction indicator light does not blink. <Ref. to EN(H4DOTC)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK, Malfunction Indicator Light.>
↓
5. Malfunction indicator light keep blinking. <Ref. to EN(H4DOTC)(diag)-52, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING, Malfunction Indicator Light.>

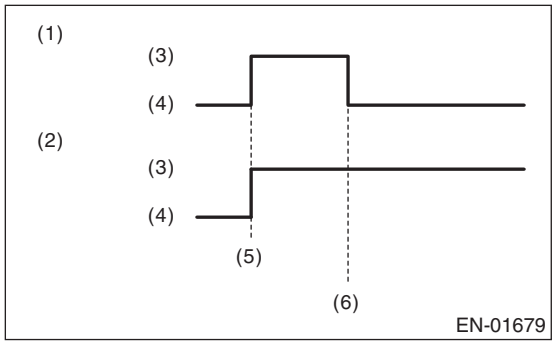
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

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(H4DOTC)(diag)-47, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>

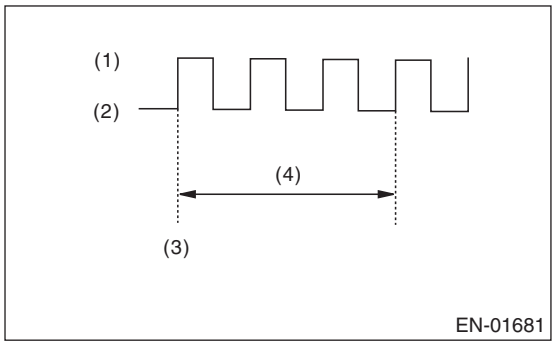


2) After starting the engine, the malfunction indicator light goes out. If it does not go off, either the engine or emission control system has malfunction.



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

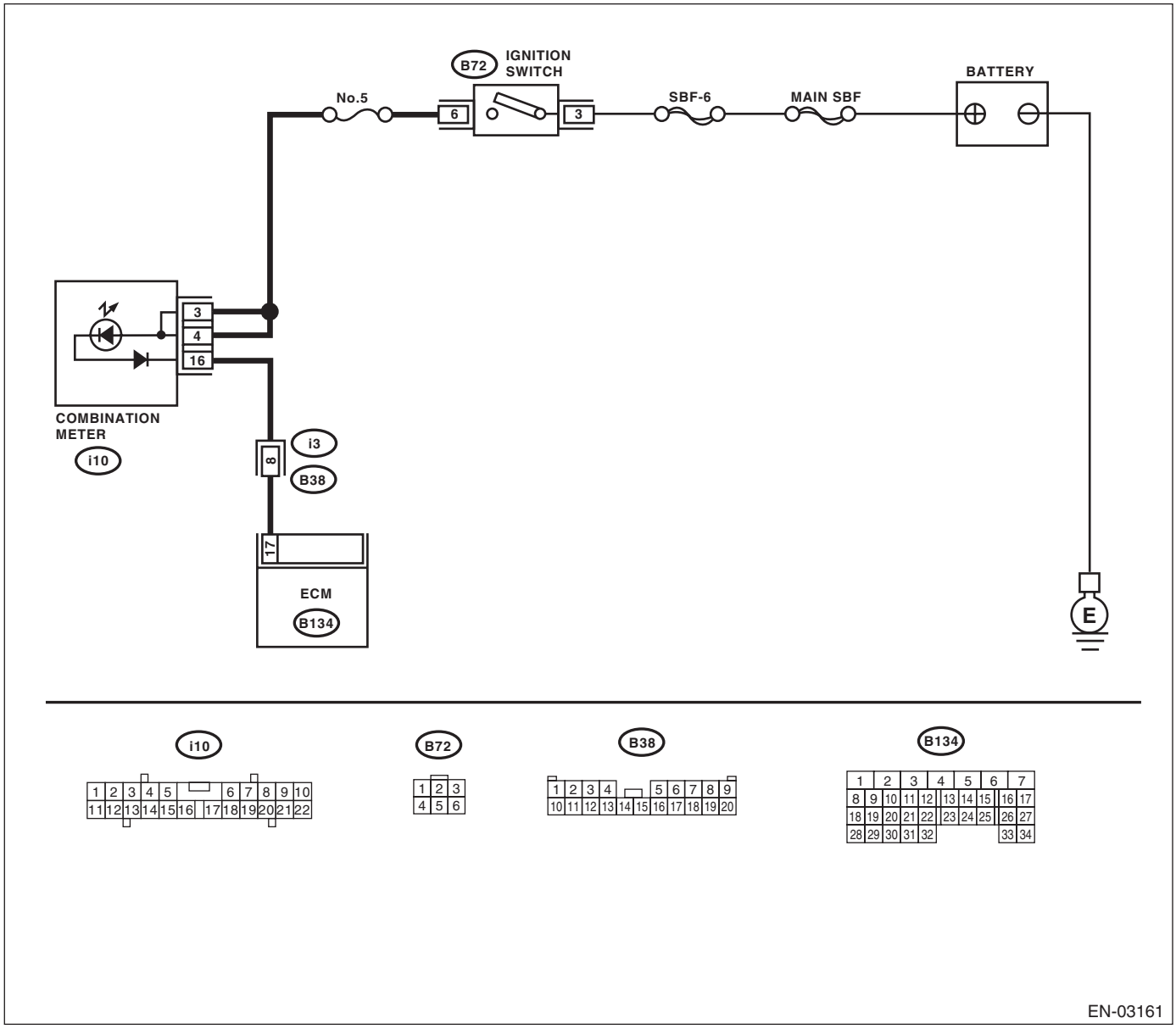
3) Turn the ignition switch to OFF and connect the test mode connector.
(1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light illuminates.
(2) After the engine starts, malfunction indicator light blinks in a cycle of 0.5 Hz. (During diagnosis)
(3) Malfunction indicator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



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*** ***(B134) No. 17 (+) — 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 the poor contact of ECM connector.	Go to step **3**.

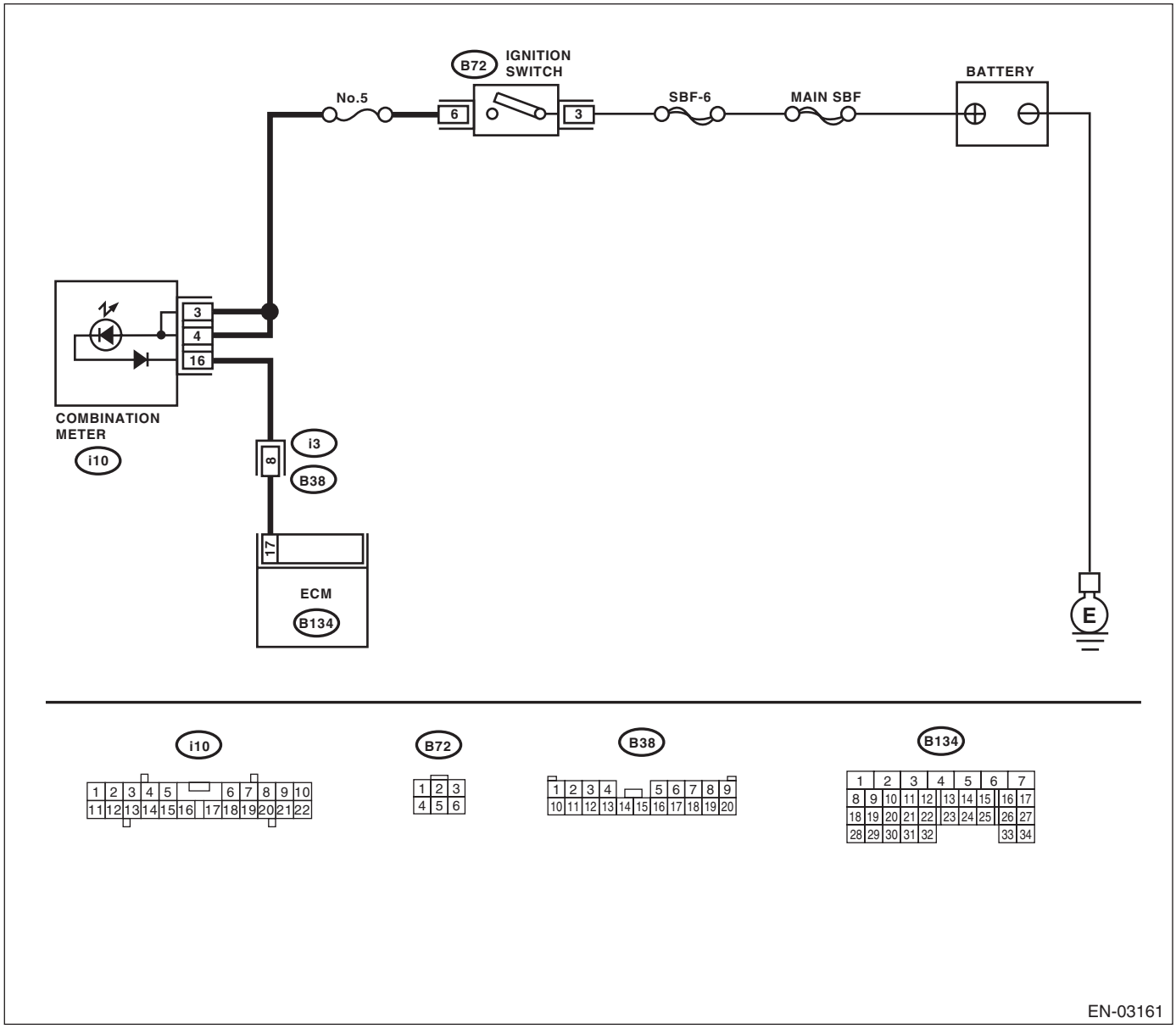
	Step	Check	Yes	No
3	**CHECK ECM CONNECTOR.** Check the connection of ECM connector.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-14, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 17 — (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 in harness between ECM and combination meter connector • Poor contact in 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 (–):*** ***(i10) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Replace the combination meter circuit board. <Ref. to IDI-14, Combination Meter.>	Check the following item and repair if necessary. NOTE: • Blown out of fuse • Open or short circuit of harness between fuse and battery terminal • Poor contact in 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 comes on when the engine runs, DTC is not shown on the Subaru Select Monitor display.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the short circuit of harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK

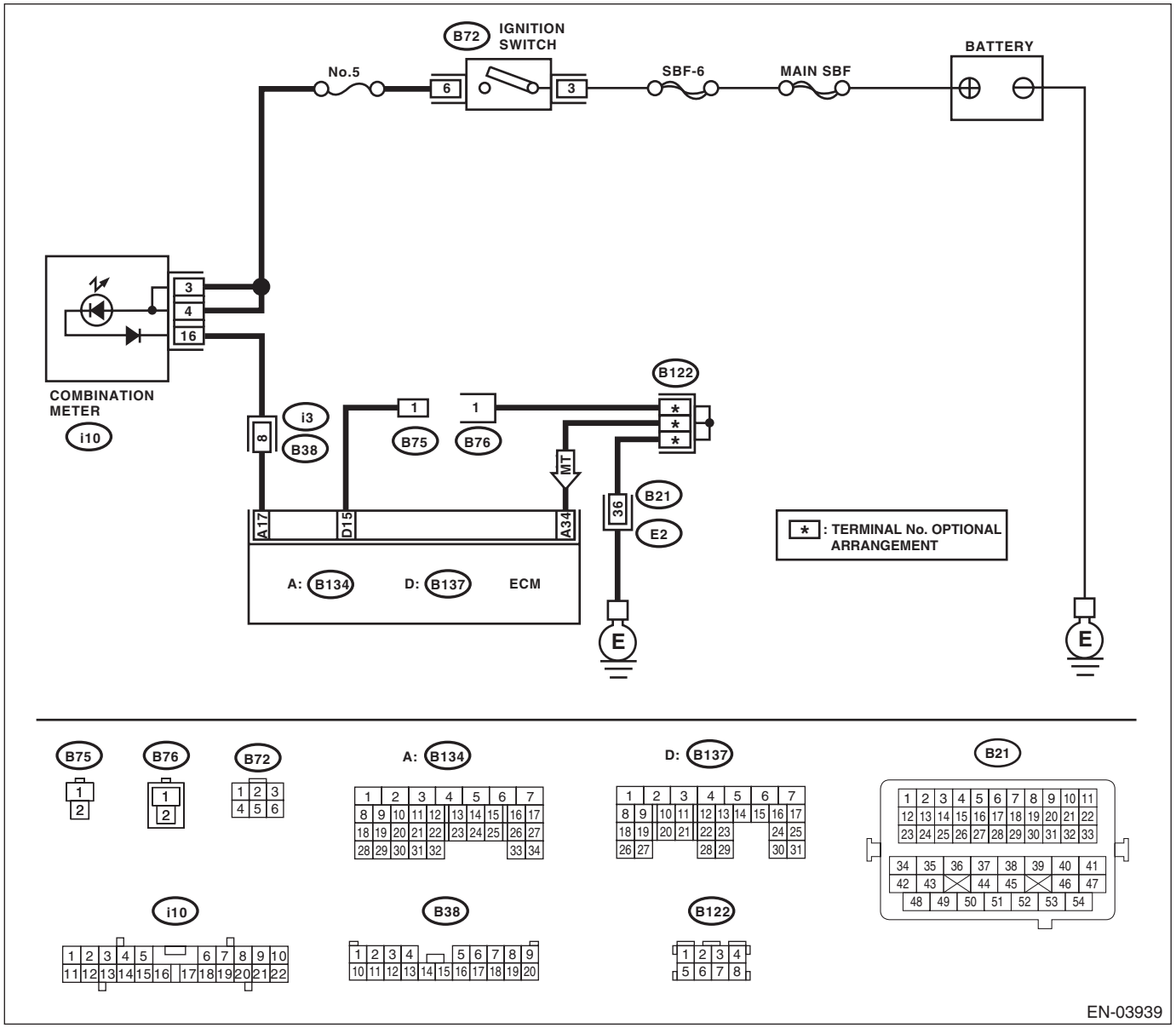
DIAGNOSIS:

- 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:



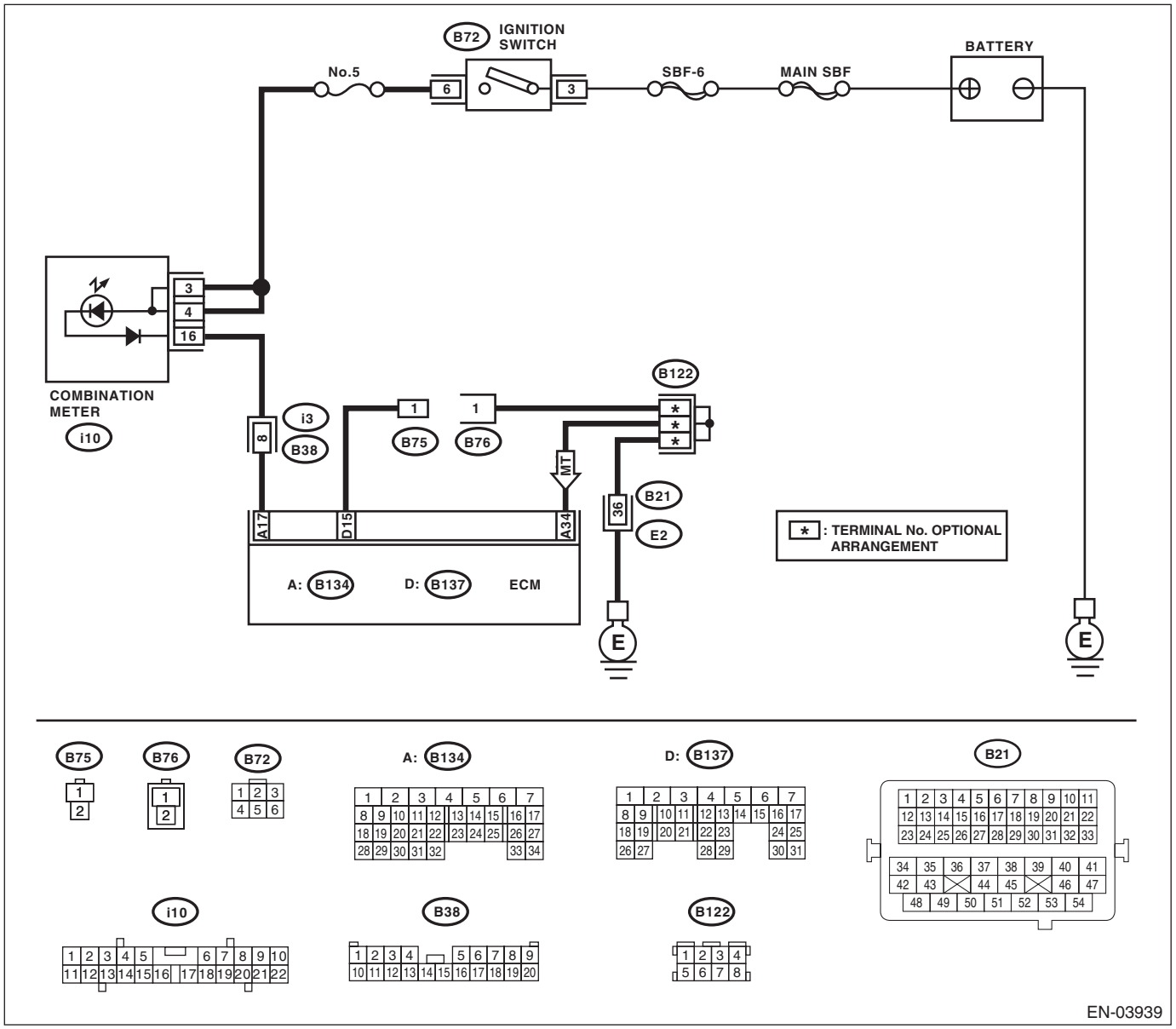
	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector. 3) Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light illuminate?	Go to step **2**.	Repair the malfunction indicator light circuit. <Ref. to EN(H4DOTC)(diag)-47, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the ground short circuit of harness between combination meter and ECM connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	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 • Poor contact in joint connector
4	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of 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*** ***(B137) No. 15 — 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 the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, 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 at a cycle of 3 Hz 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 ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 15 — 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(H4DOTC)-38, Engine Control Module (ECM).>

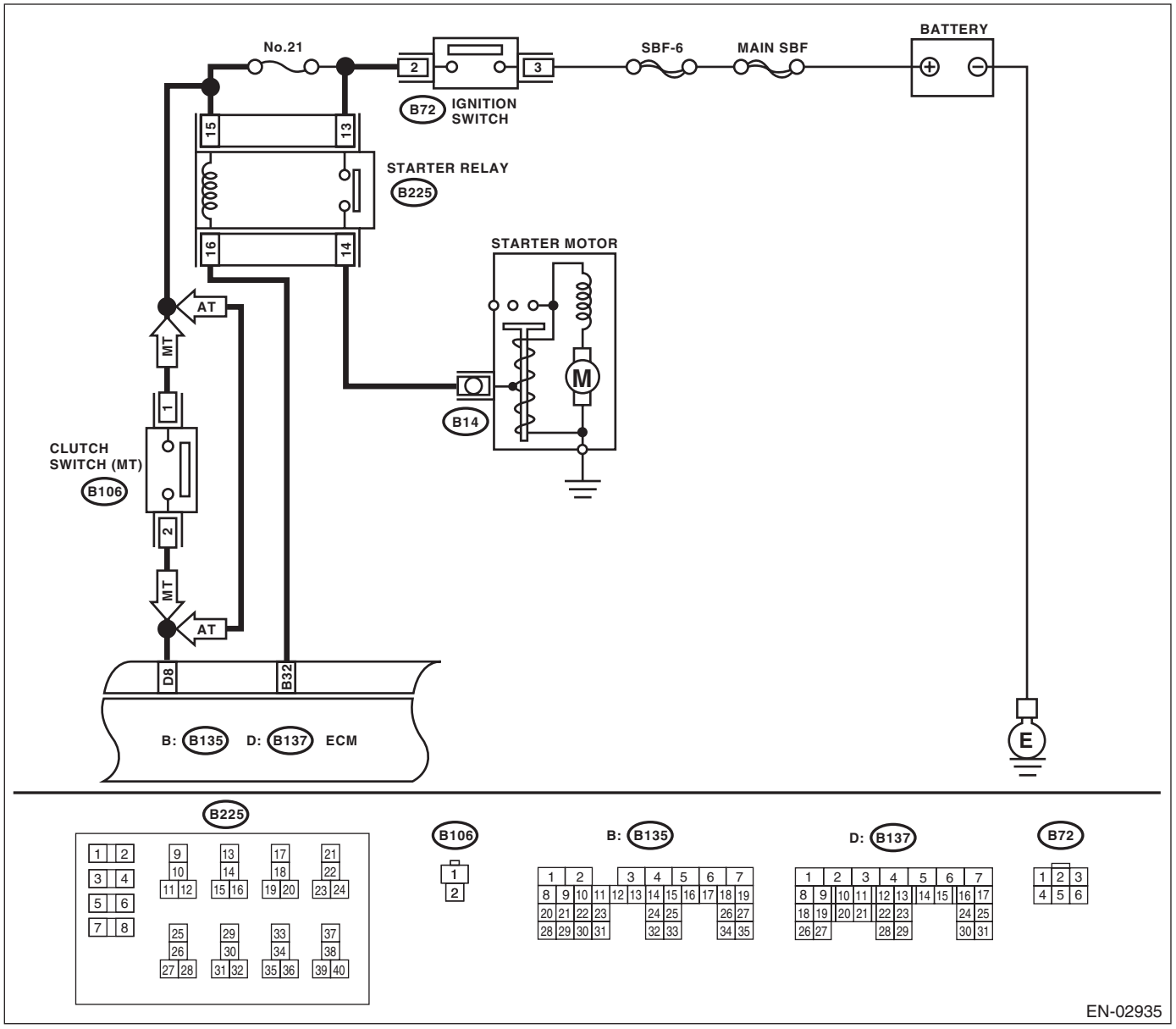
16.Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Check of the fuel amount
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)(diag)-55, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-59, 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(H4DOTC)(diag)-61, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-64, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-66, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



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

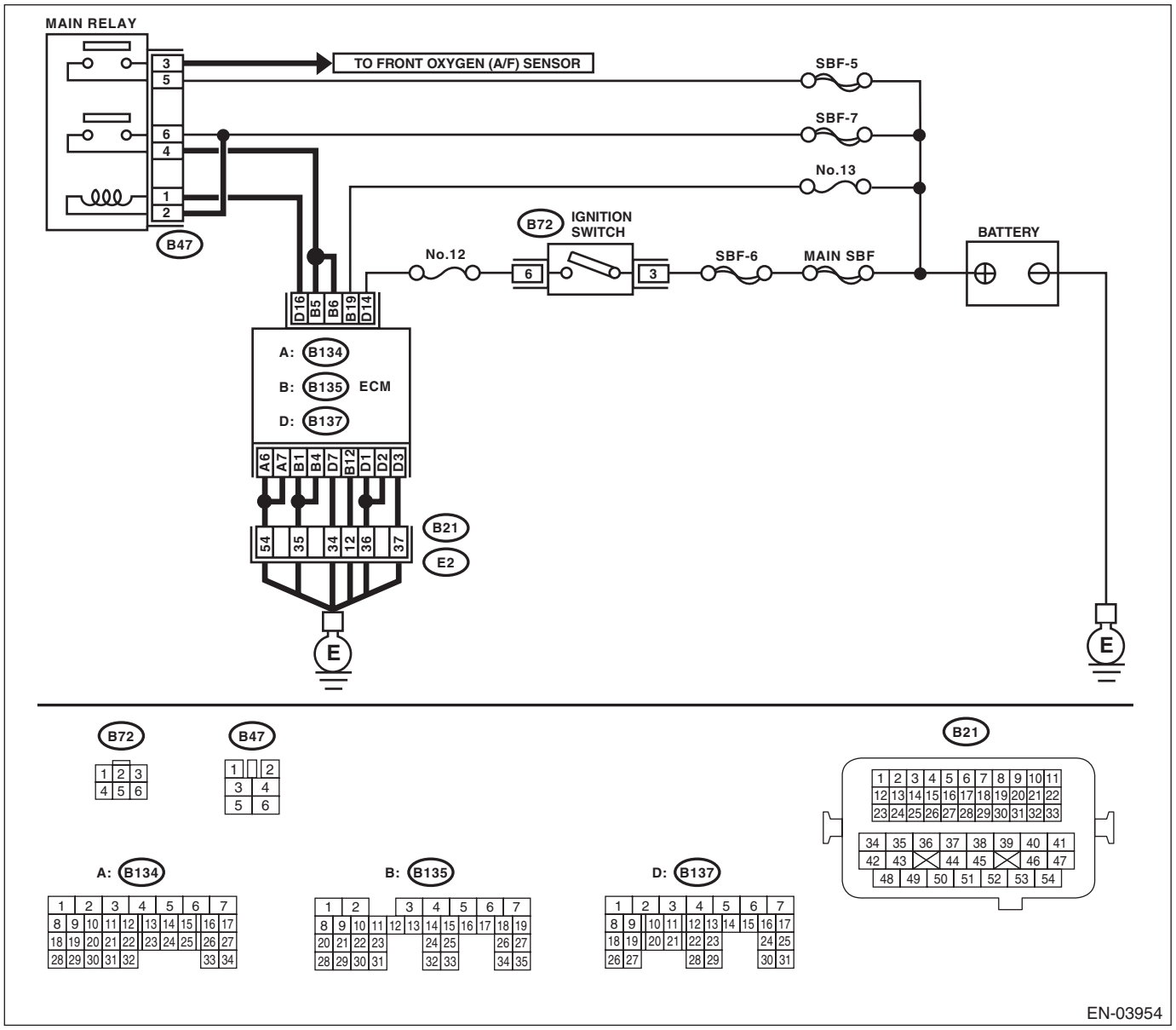
	Step	Check	Yes	No
3	**CHECK DTC.**	Is DTC displayed? <Ref. to EN(H4DOTC)(diag)-32, OPERATION, Read Diagnostic Trouble Code (DTC).>	Check the appropriate DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact of ECM connector.
4	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** NOTE: • For AT model, place the select lever in “P” or “N” range. • For MT model, depress the clutch pedal.	Is the voltage more than 10 V?	Check the starter motor. <Ref. to SC(H4SO)-6, Starter.>	Go to step **5**.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6**.	Check the following item and repair if necessary. • Blown out of fuse • Open circuit of harness between ignition switch and battery
6	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) 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 5 Ω?	Go to step **7**.	Replace the ignition switch.
7	**CHECK INPUT VOLTAGE OF STARTER RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter relay connector and chassis ground after turning the ignition switch to START position. ***Connector & terminal*** ***(B225) No. 14 (+) — Chassis ground (–):*** ***(B225) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **8**.	Repair open or short circuit to ground in harness between starter relay and ignition switch.
8	**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 **9**.	Replace the starter relay.

	Step	Check	Yes	No
9	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Connect the starter relay connector. 3) Disconnect the connectors from ECM. 4) Measure the resistance of harness between ECM and starter relay connector. ***Connector & terminal*** ***(B135) No. 32 — (B225) No. 15:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair the open circuit of harness between ECM and starter relay.
10	**CHECK INPUT VOLTAGE OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ECM. 3) Turn the ignition switch to START. 4) Measure the voltage between the starter motor and the engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **15**.	Repair open or short circuit to ground in harness between starter relay and starter.
11	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **15**.	Go to step **12**.
12	**CHECK INPUT VOLTAGE OF CLUTCH SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from clutch switch. 3) Turn the ignition switch to START. 4) Measure the voltage between the clutch switch connector and chassis ground. ***Connector & terminal*** ***(B106) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **13**.	Repair the open circuit of harness between clutch switch and ignition switch.
13	**CHECK CLUTCH SWITCH.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between clutch switch terminals while depressing the clutch pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **14**.	Replace the clutch switch. <Ref. to CL-27, Clutch Switch.>
14	**CHECK HARNESS BETWEEN CLUTCH SWITCH AND ECM.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between clutch switch and ECM connector. ***Connector & terminal*** ***(B137) No. 8 — (B106) No. 2:***	Is the resistance less than 1 Ω?	Check the engine control module (ECM) power supply and ground line. <Ref. to EN(H4DOTC)(diag)-59, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>	Repair the open circuit between clutch switch and ignition switch.

	Step	Check	Yes	No
15	**CHECK HARNESS BETWEEN IGNITION SWITCH AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ignition switch and ECM. 3) Measure the resistance of harness between clutch switch and ECM connector. ***Connector & terminal*** ***(B137) No. 8 — (B72) No. 2:***	Is the resistance less than 1 Ω?	Check the engine control module (ECM) power supply and ground line. <Ref. to EN(H4DOTC)(diag)-59, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>	Repair the open circuit between ignition switch and ECM.

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

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

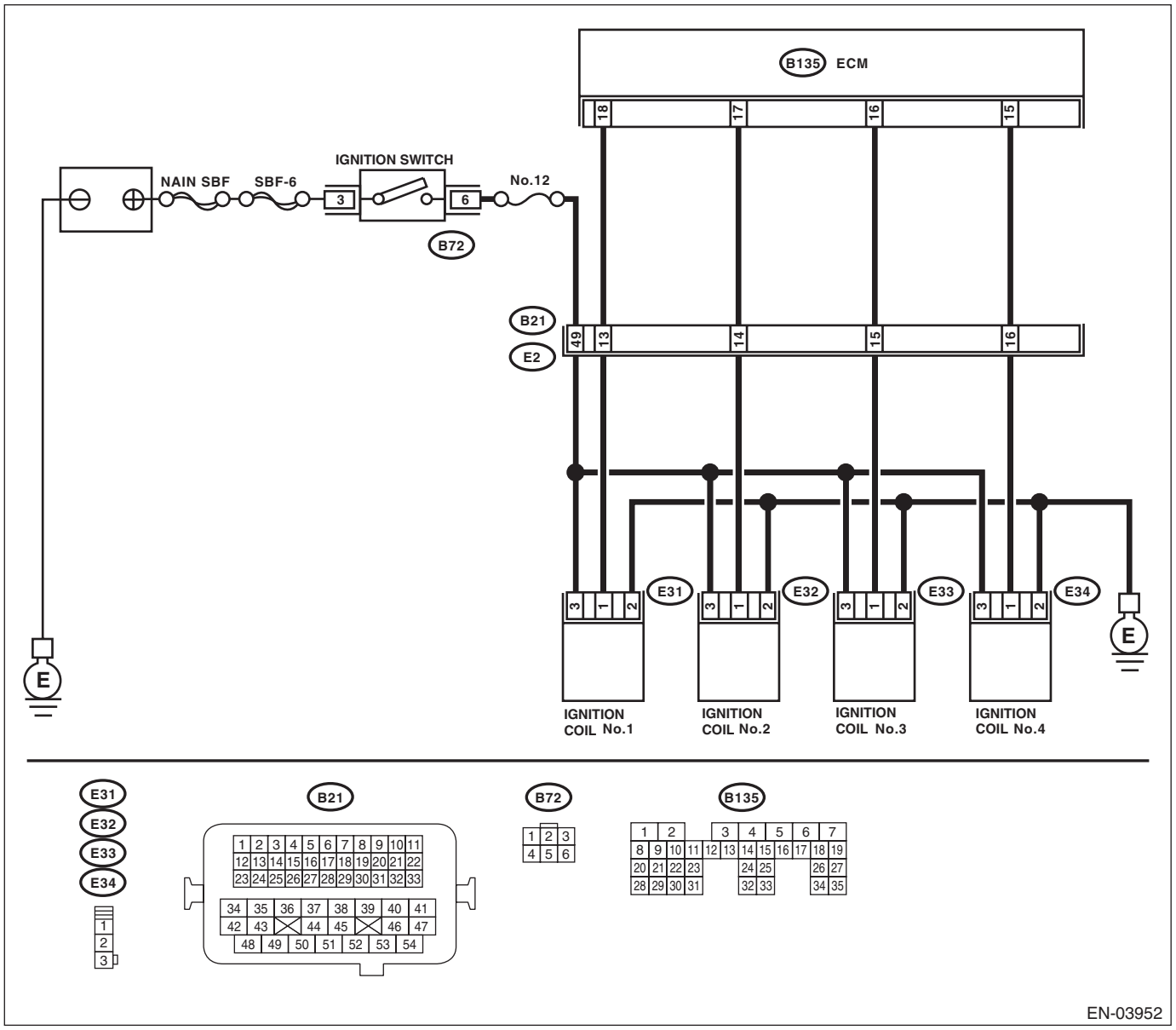


Diagnostics for Engine Starting Failure

	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2**.	Replace the main relay.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:*** ***(B135) No. 1 — Chassis ground:*** ***(B135) No. 4 — Chassis ground:*** ***(B135) No. 12 — 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. 19 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	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*** ***(B137) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	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 (–):*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6**.	Repair the open or ground short circuit of harness of power supply circuit.
6	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (–):*** ***(B135) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(H4DOTC)(diag)-61, 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 repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



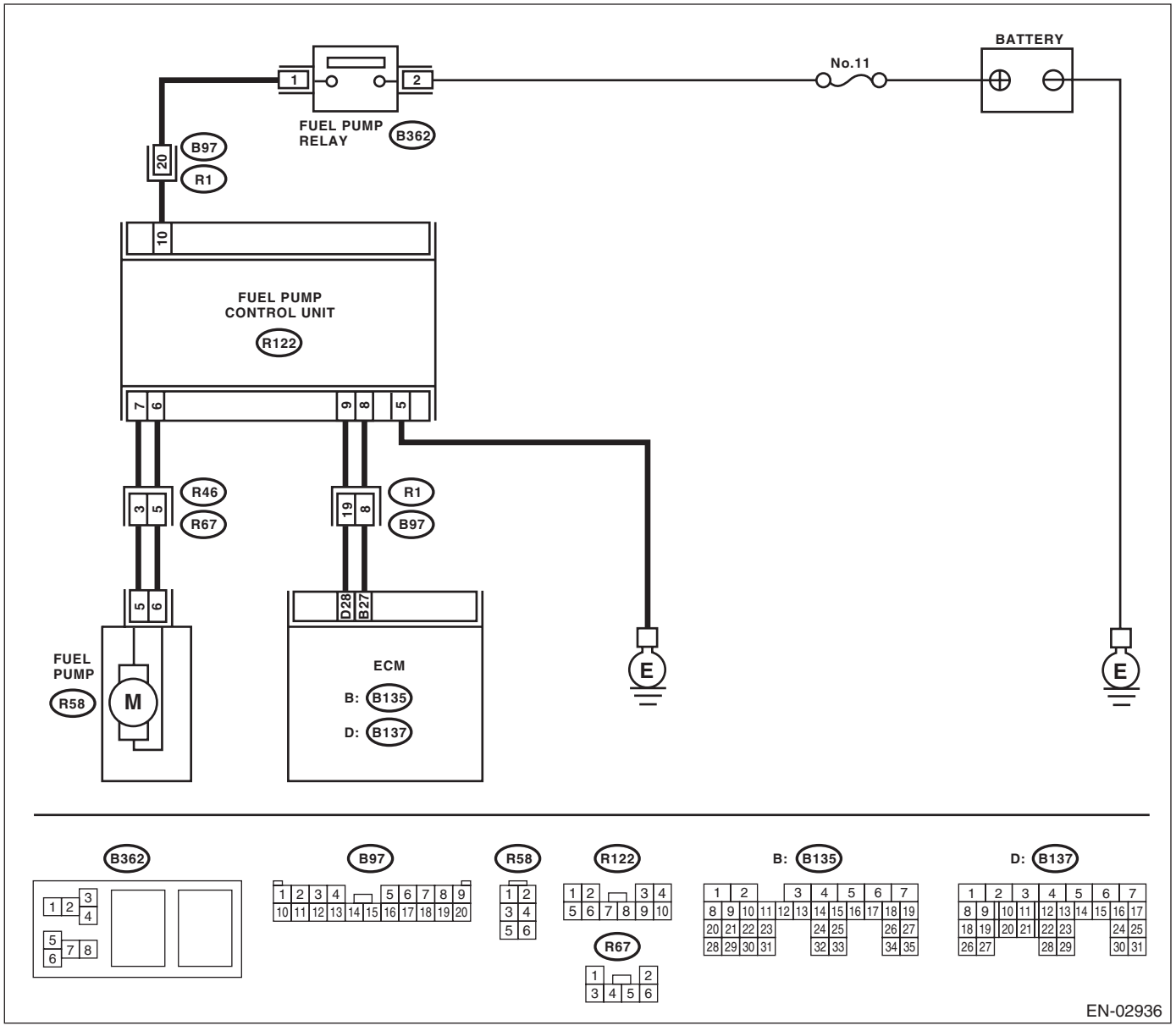
Diagnostics for Engine Starting Failure

	Step	Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DOTC)-5, INSPECTION, Spark Plug.>	Is the spark plug condition OK?	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. <Ref. to FU(H4DOTC)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Contact the spark plug thread portion to engine. 4) While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H4DOTC)(diag)-64, 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 ignition coil and 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 (–):***	Is the voltage more than 10 V?	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 in 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 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: Open circuit of harness between ignition coil and ignitor assembly connector and engine grounding terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connector from ignition coil and ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil and ignitor assembly connector. ***Connector & terminal*** ***(B135) No. 15 — (E34) No. 1:*** ***(B135) No. 16 — (E33) No. 1:*** ***(B135) No. 17 — (E32) No. 1:*** ***(B135) No. 18 — (E31) 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 in coupling connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B135) No. 15 — Engine ground:*** ***(B135) No. 16 — Engine ground:*** ***(B135) No. 17 — Engine ground:*** ***(B135) No. 18 — Engine ground:***	Is the resistance more than 1 MΩ?	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 the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ignition coil and ignitor assembly.

E: FUEL PUMP CIRCUIT

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

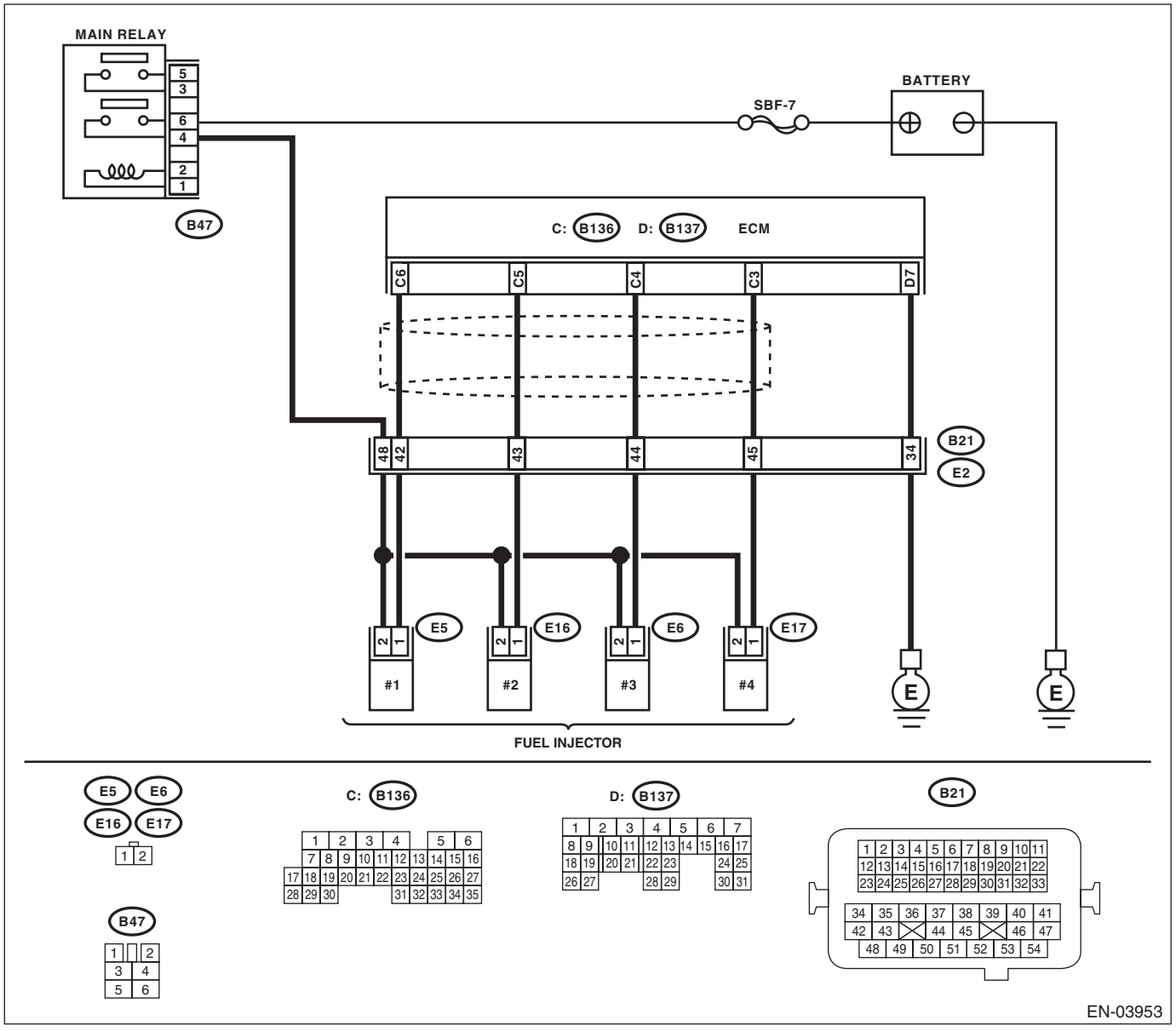


	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump operates for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can also be executed using Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the fuel pump emit operating sound?	Check the fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-66, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(H4DOTC)(diag)-32, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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 injector emit operating sound?	Check the fuel pressure. <Ref. to ME(H4DOTC)-24, INSPECTION, Fuel Pressure.>	Go to step **2**.
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the 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 (–):***	Is the voltage more than 10 V?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B136) No. 6 — (E5) No. 1:*** ***(B136) No. 5 — (E16) No. 1:*** ***(B136) No. 4 — (E6) No. 1:*** ***(B136) No. 3 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 4 — Chassis ground:*** ***(B136) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	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 the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Inspection using “General Diagnostic Table” <Ref. to EN(H4DOTC)(diag)-320, INSPECTION, General Diagnostic Table.>

17.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 EN(H4DOTC)(diag)-75, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(H4DOTC)(diag)-76, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-77, 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(H4DOTC)(diag)-79, 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(H4DOTC)(diag)-81, 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(H4DOTC)(diag)-83, 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(H4DOTC)(diag)-86, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to EN(H4DOTC)(diag)-88, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-90, 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(H4DOTC)(diag)-92, 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(H4DOTC)(diag)-95, 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(H4DOTC)(diag)-97, 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(H4DOTC)(diag)-99, 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(H4DOTC)(diag)-101, 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(H4DOTC)(diag)-103, 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(H4DOTC)(diag)-105, 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(H4DOTC)(diag)-108, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High	<Ref. to EN(H4DOTC)(diag)-110, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low	<Ref. to EN(H4DOTC)(diag)-113, 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(H4DOTC)(diag)-115, 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(H4DOTC)(diag)-117, 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(H4DOTC)(diag)-119, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(H4DOTC)(diag)-121, 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(H4DOTC)(diag)-122, 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(H4DOTC)(diag)-124, 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(H4DOTC)(diag)-126, 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(H4DOTC)(diag)-128, 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(H4DOTC)(diag)-130, 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(H4DOTC)(diag)-133, 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(H4DOTC)(diag)-136, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4DOTC)(diag)-137, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System Too Rich (Bank 1)	<Ref. to EN(H4DOTC)(diag)-138, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-140, 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(H4DOTC)(diag)-142, 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(H4DOTC)(diag)-144, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low	<Ref. to EN(H4DOTC)(diag)-147, 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(H4DOTC)(diag)-149, 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(H4DOTC)(diag)-151, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to EN(H4DOTC)(diag)-154, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to EN(H4DOTC)(diag)-156, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to EN(H4DOTC)(diag)-158, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-159, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-159, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-159, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-160, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-164, 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(H4DOTC)(diag)-166, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H4DOTC)(diag)-168, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-170, 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(H4DOTC)(diag)-172, 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(H4DOTC)(diag)-174, 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(H4DOTC)(diag)-176, 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(H4DOTC)(diag)-180, 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(H4DOTC)(diag)-183, 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(H4DOTC)(diag)-186, 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(H4DOTC)(diag)-188, 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(H4DOTC)(diag)-190, 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(H4DOTC)(diag)-193, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to EN(H4DOTC)(diag)-196, 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(H4DOTC)(diag)-199, 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(H4DOTC)(diag)-202, 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(H4DOTC)(diag)-204, 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(H4DOTC)(diag)-206, 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(H4DOTC)(diag)-206, 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(H4DOTC)(diag)-207, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H4DOTC)(diag)-207, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Fan Rationality Check	<Ref. to EN(H4DOTC)(diag)-208, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle Speed Sensor “A”	<Ref. to EN(H4DOTC)(diag)-208, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to EN(H4DOTC)(diag)-209, 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(H4DOTC)(diag)-211, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DOTC)(diag)-213, 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(H4DOTC)(diag)-214, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0545	Exhaust Gas Temperature Sensor Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-215, DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0546	Exhaust Gas Temperature Sensor Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-217, DTC P0546 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial Communication Link	<Ref. to EN(H4DOTC)(diag)-219, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DOTC)(diag)-219, 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(H4DOTC)(diag)-219, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(H4DOTC)(diag)-220, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0638	Throttle Actuator Control Range/ Performance (Bank 1)	<Ref. to EN(H4DOTC)(diag)-221, 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(H4DOTC)(diag)-221, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Fan 1 Control Circuit High	<Ref. to EN(H4DOTC)(diag)-222, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H4DOTC)(diag)-222, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Park/Neutral Switch Input Circuit Low	<Ref. to EN(H4DOTC)(diag)-222, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Park/Neutral Switch Input Circuit High	<Ref. to EN(H4DOTC)(diag)-222, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-223, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-225, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4DOTC)(diag)-227, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1301	Misfire Detected (High Temperature Exhaust Gas)	<Ref. to EN(H4DOTC)(diag)-228, DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1312	Exhaust Gas Temperature Sensor Malfunction	<Ref. to EN(H4DOTC)(diag)-230, DTC P1312 EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-232, 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(H4DOTC)(diag)-234, 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(H4DOTC)(diag)-236, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to EN(H4DOTC)(diag)-238, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-240, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1544	Exhaust Gas Temperature Too High	<Ref. to EN(H4DOTC)(diag)-242, DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to EN(H4DOTC)(diag)-244, 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).>

DTC	Item	Index
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)-24, 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).>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-246, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-247, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	<Ref. to EN(H4DOTC)(diag)-248, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to EN(H4DOTC)(diag)-249, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-250, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-252, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-254, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-256, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-258, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	<Ref. to EN(H4DOTC)(diag)-261, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-263, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	<Ref. to EN(H4DOTC)(diag)-266, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-268, 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(H4DOTC)(diag)-270, 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(H4DOTC)(diag)-272, 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(H4DOTC)(diag)-274, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Index
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(H4DOTC)(diag)-276, 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(H4DOTC)(diag)-283, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-290, 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(H4DOTC)(diag)-296, 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(H4DOTC)(diag)-298, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance	<Ref. to EN(H4DOTC)(diag)-299, 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(H4DOTC)(diag)-300, 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(H4DOTC)(diag)-303, 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(H4DOTC)(diag)-305, 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(H4DOTC)(diag)-308, 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(H4DOTC)(diag)-310, 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(H4DOTC)(diag)-314, 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(H4DOTC)(diag)-318, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2228	Barometric Pressure Circuit Low	<Ref. to EN(H4DOTC)(diag)-318, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2229	Barometric Pressure Circuit High	<Ref. to EN(H4DOTC)(diag)-319, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-9, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Inspect the output of AVCS advance angle and oil flow control solenoid valve duty. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is AVCS advance approximately 0 degrees, and the oil flow control solenoid valve duty output approx. 10%?	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, clog of valve) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-11, 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 repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Inspect the output of AVCS advance angle and oil flow control solenoid valve duty. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is AVCS advance approximately 0 degrees, and the oil flow control solenoid valve duty output approx. 10%?	Check the following item and repair or replace if necessary. • Engine oil (amount, dirt) • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring, clog of valve) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

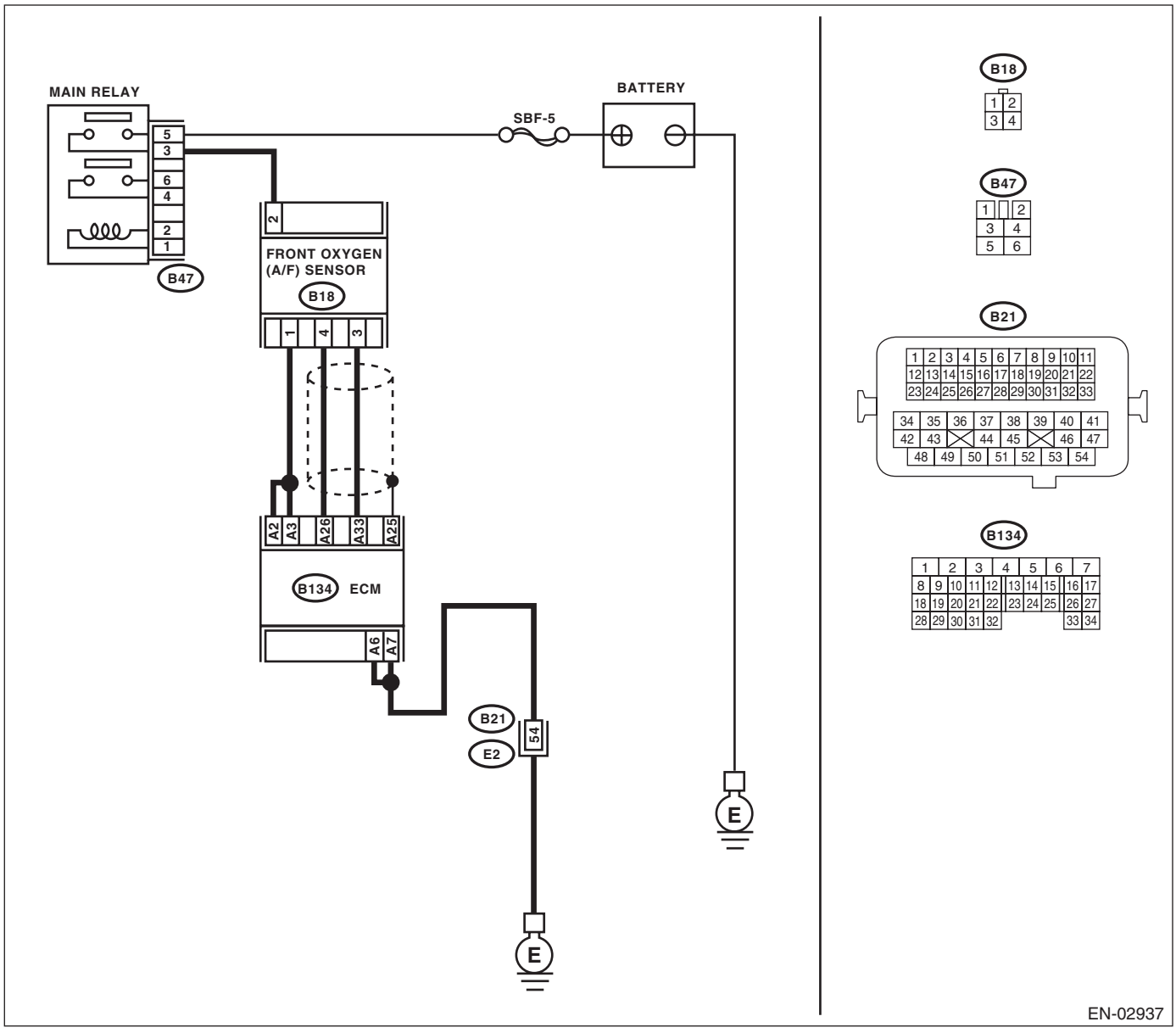
C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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 engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 2 — (B18) No. 1:*** ***(B134) No. 3 — (B18) 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*** ***(B134) No. 26 — (B18) No. 4:*** ***(B134) No. 33 — (B18) No. 3:***	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 HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 3 — (B18) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 5 Ω?	Go to step **5**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-34, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check the poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact in the ECM or front oxygen (A/F) sensor connector?	Repair poor contact of the ECM or front oxygen (A/F) sensor.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-34, Front Oxygen (A/F) Sensor.>

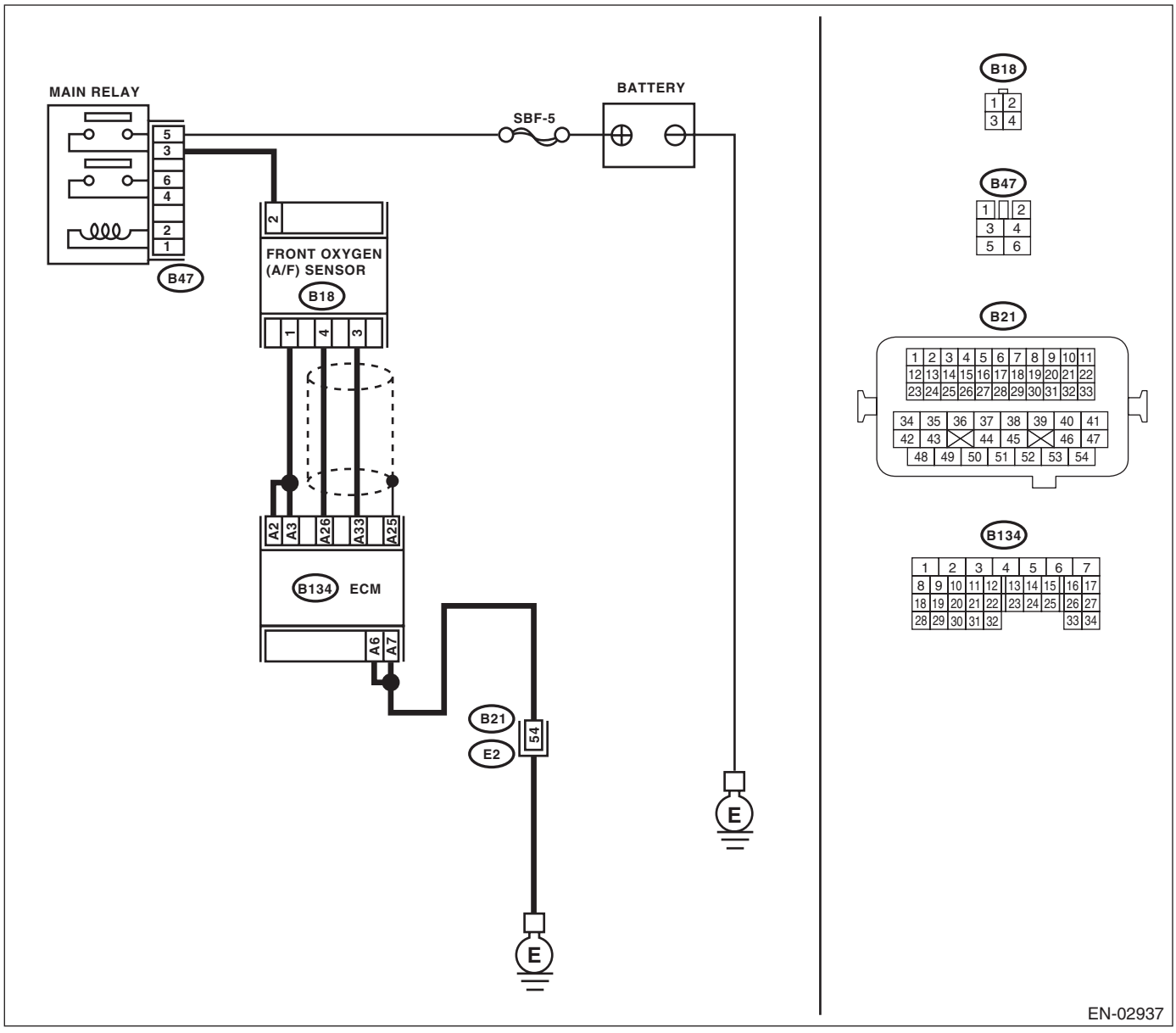
D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-14, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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*** ***(B18) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	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 • Malfunction in main relay
2	**CHECK HARNESS BETWEEN FRONT OXYGEN (A/F) SENSOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between front oxygen (A/F) sensor connector and ECM connector. ***Connector & terminal*** ***(B18) No. 1 — (B134) No. 2:*** ***(B18) No. 1 — (B134) No. 3:***	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 HARNESS BETWEEN FRONT OXYGEN (A/F) SENSOR AND ECM.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 — Chassis ground:*** ***(B134) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 2.4 Ω?	Repair the poor contact of ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-34, Front Oxygen (A/F) Sensor.>

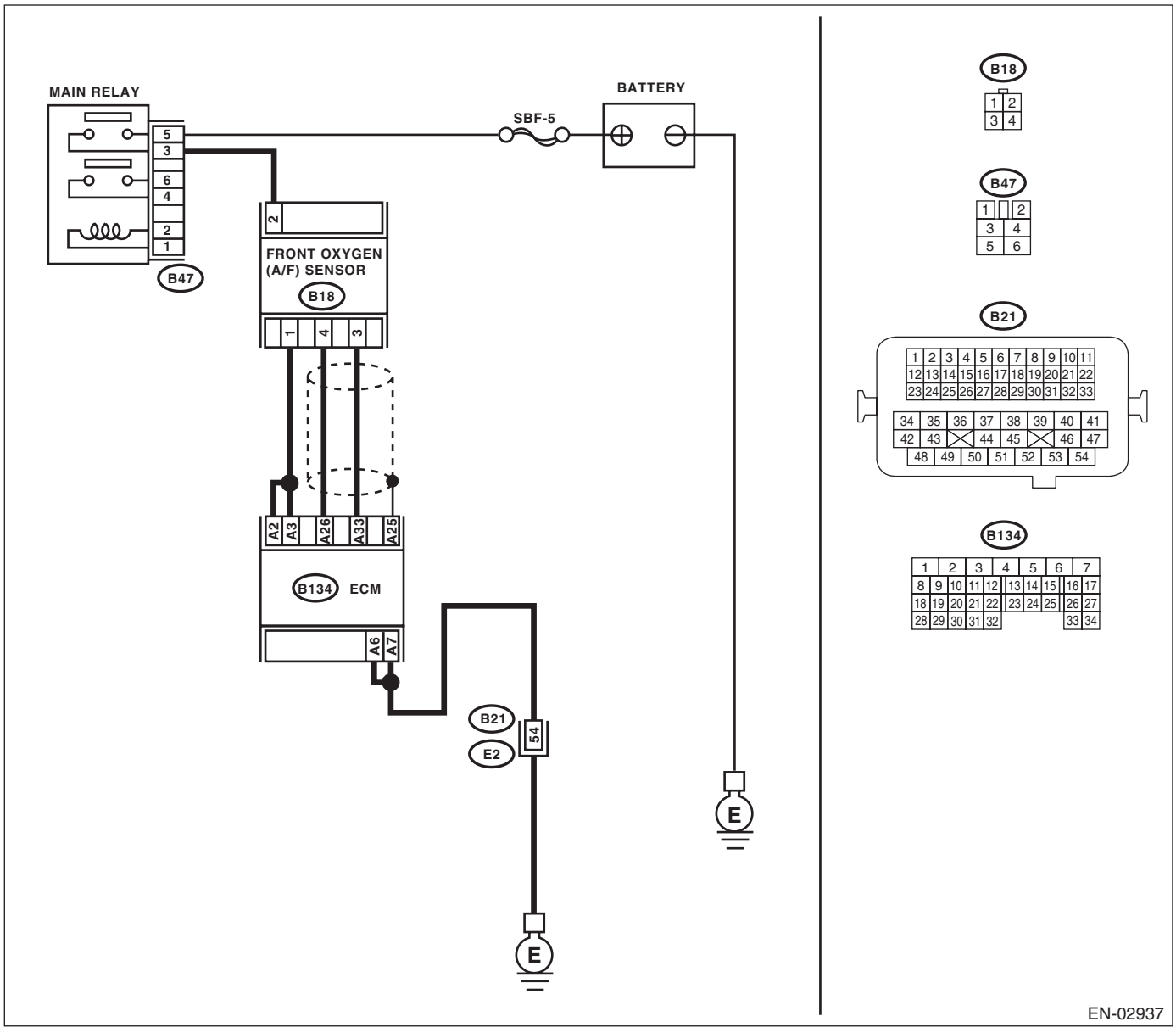
E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-16, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B136) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM connector and chassis ground.
2	**CHECK THE VOLTAGE BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 2 (+) — Chassis ground (–):*** ***(B137) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.	Repair the poor contact of ECM connector.

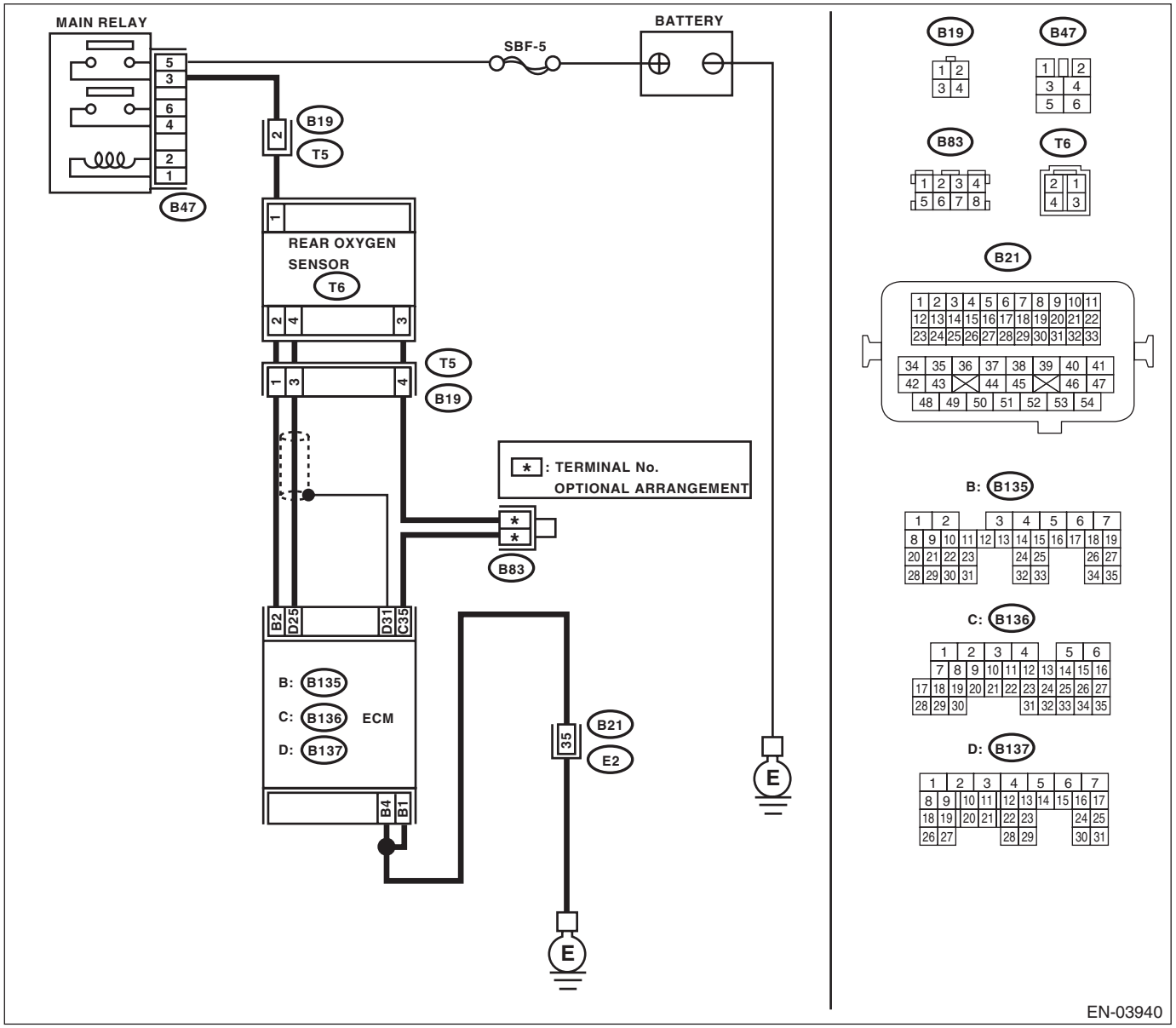
F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-18, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 1 — Chassis ground:*** ***(B135) No. 4 — Chassis ground:***	Is the resistance less than 5 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 engine ground cable • Poor contact in ECM connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Disconnect the connector from the rear oxygen sensor. 2) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair the ground short circuit of harness between ECM and rear oxygen sensor.
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 — Chassis ground:***	Does the resistance change when shaking the ECM harness and connector?	Repair the poor contact of ECM connector.	Go to step **4**.
4	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5**.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in main relay connector • Poor contact of coupling connector • Malfunction in main relay

	Step	Check	Yes	No
5	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 30 Ω?	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector • Poor contact of coupling connector	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-36, Rear Oxygen Sensor.>

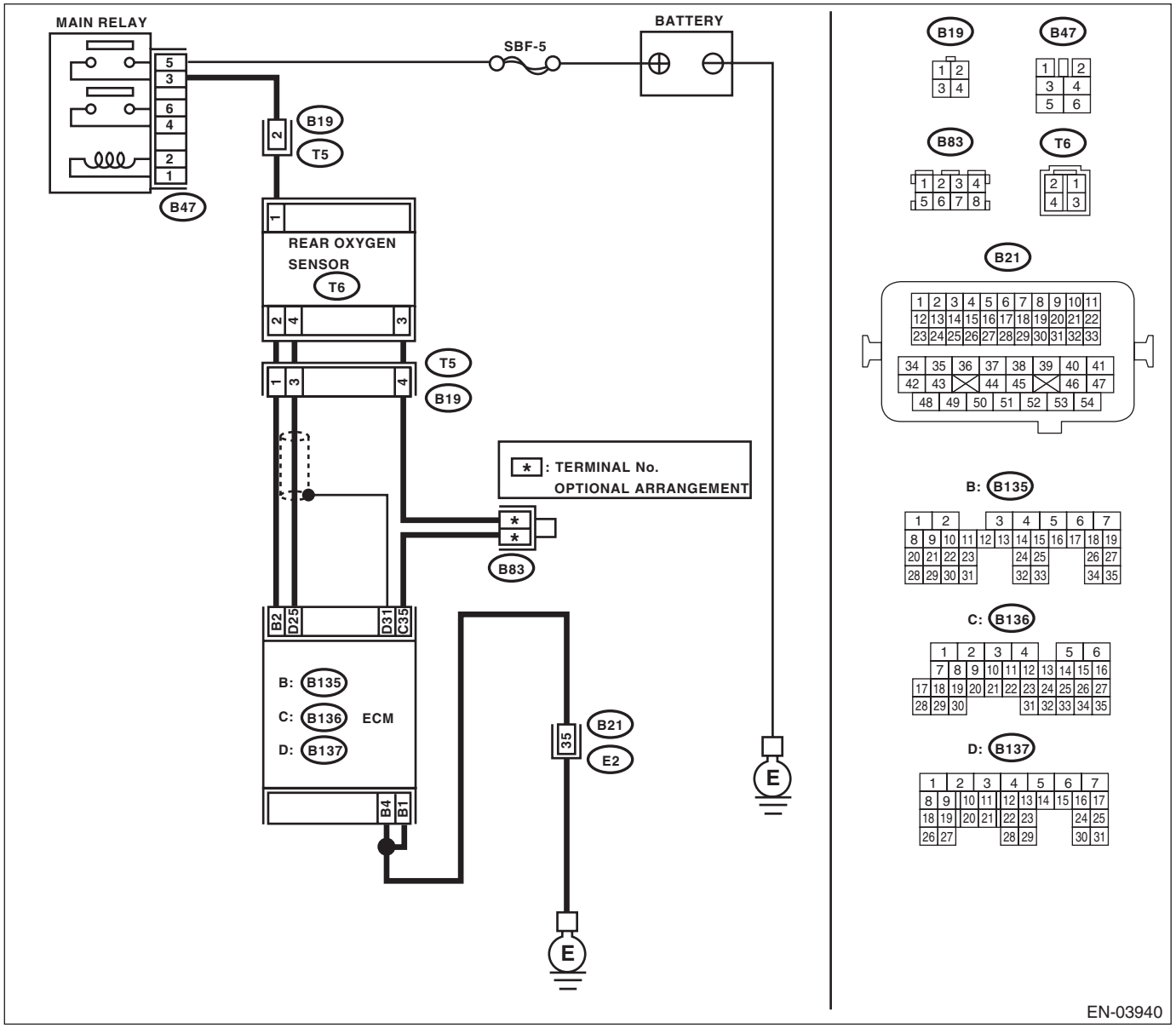
G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-20, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:*** ***(B135) No. 1 — Chassis ground:***	Is the resistance less than 5 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 engine ground cable • Poor contact in ECM connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and rear oxygen sensor.	Repair the poor contact of ECM connector.

H: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-22, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

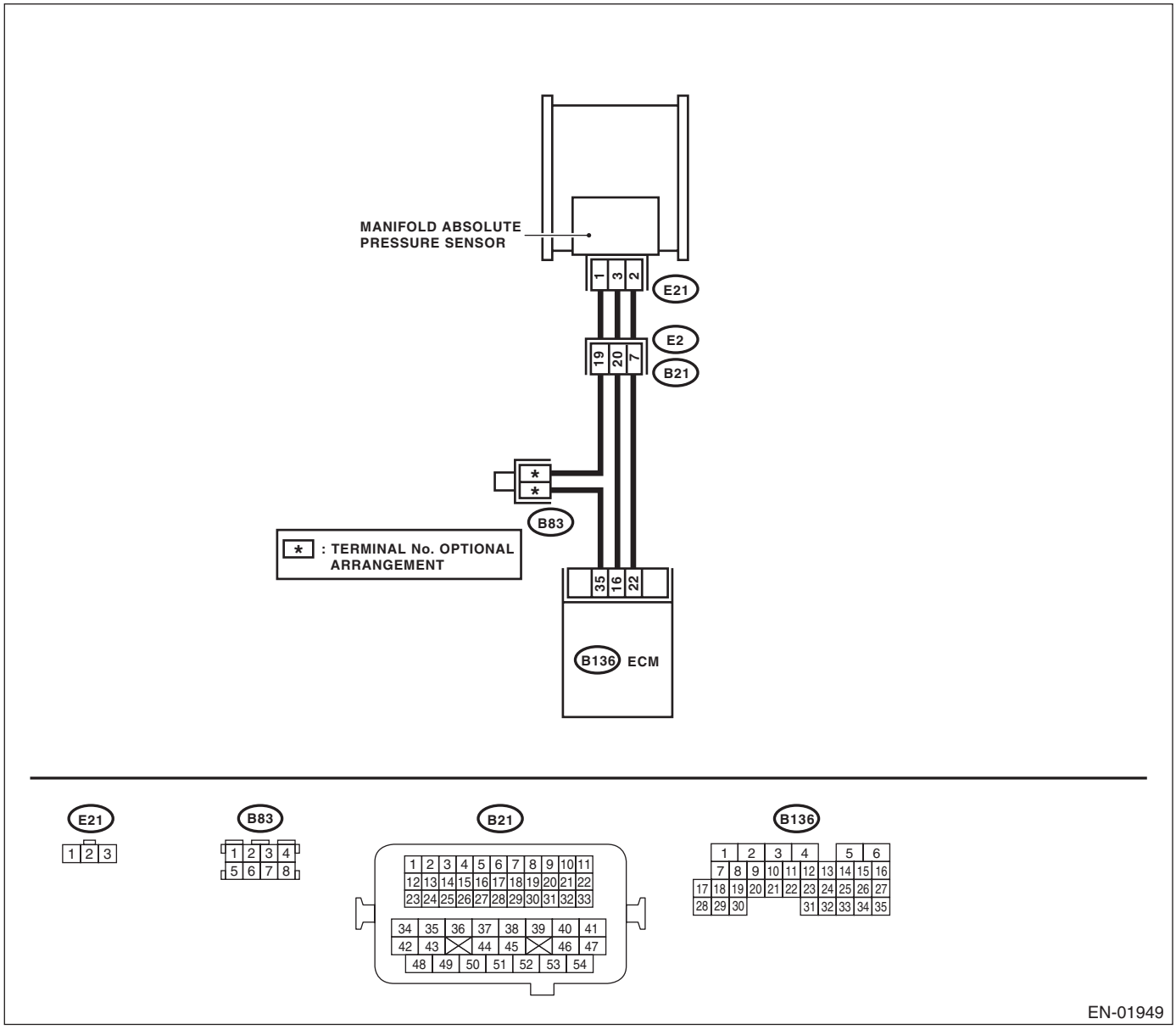
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK IDLE SWITCH SIGNAL.** 1) Turn the ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Does the LED of {Idle Switch Signal} come on?	Go to step **2**.	Check the throttle position sensor circuit. <Ref. to EN(H4DOTC)(diag)-310, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the relative DTC. "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step **3**.
3	**CHECK CONDITION OF MANIFOLD ABSOLUTE PRESSURE SENSOR.**	Is the manifold absolute pressure sensor installation bolt tightened securely?	Go to step **4**.	Securely tighten the manifold absolute pressure sensor installation bolt.
4	**CHECK CONDITION OF THROTTLE BODY.**	Is the throttle body installation bolt tightened securely?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-27, Manifold Absolute Pressure Sensor.>	Tighten the throttle body installation bolt securely.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-24, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

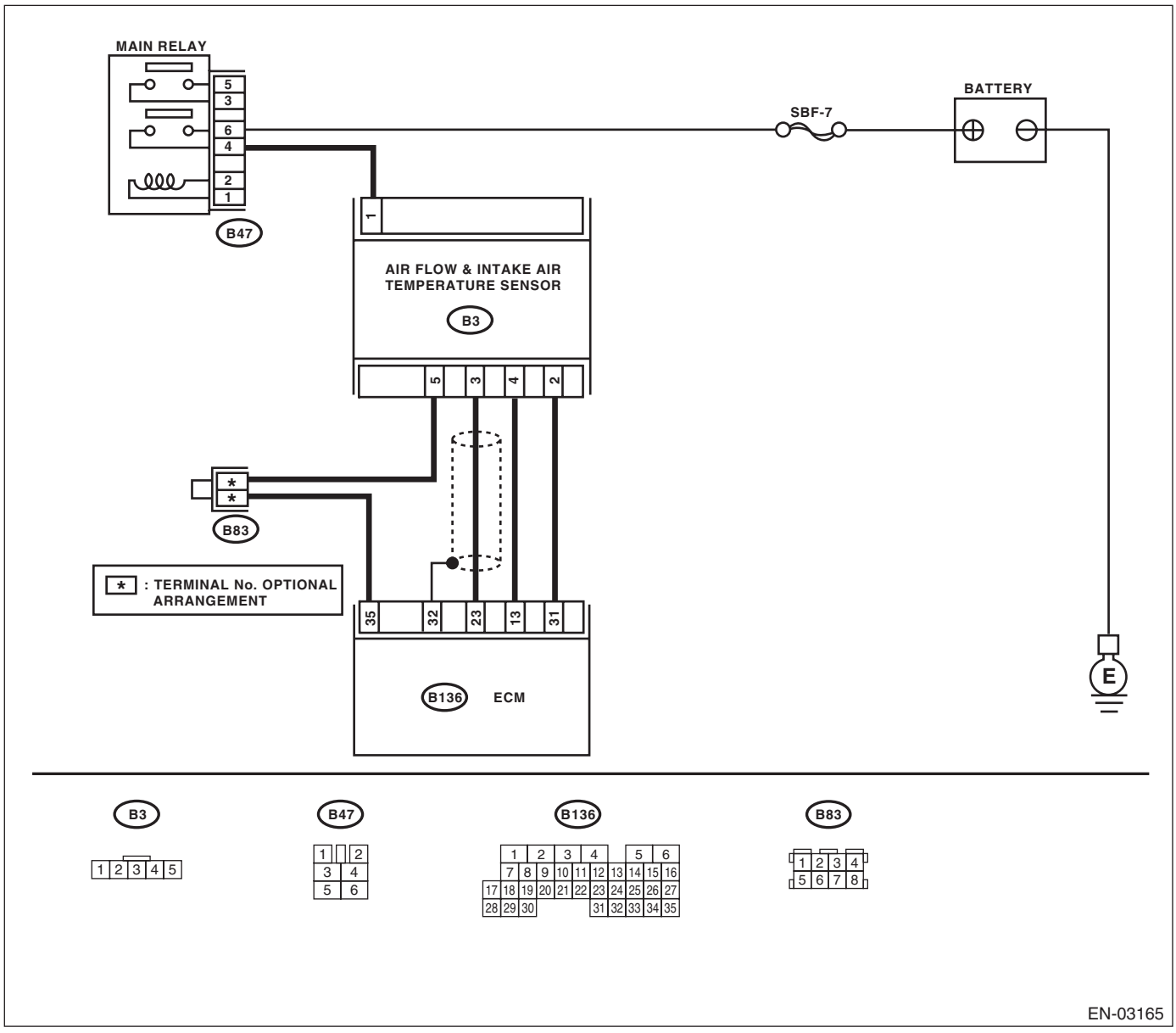
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-27, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

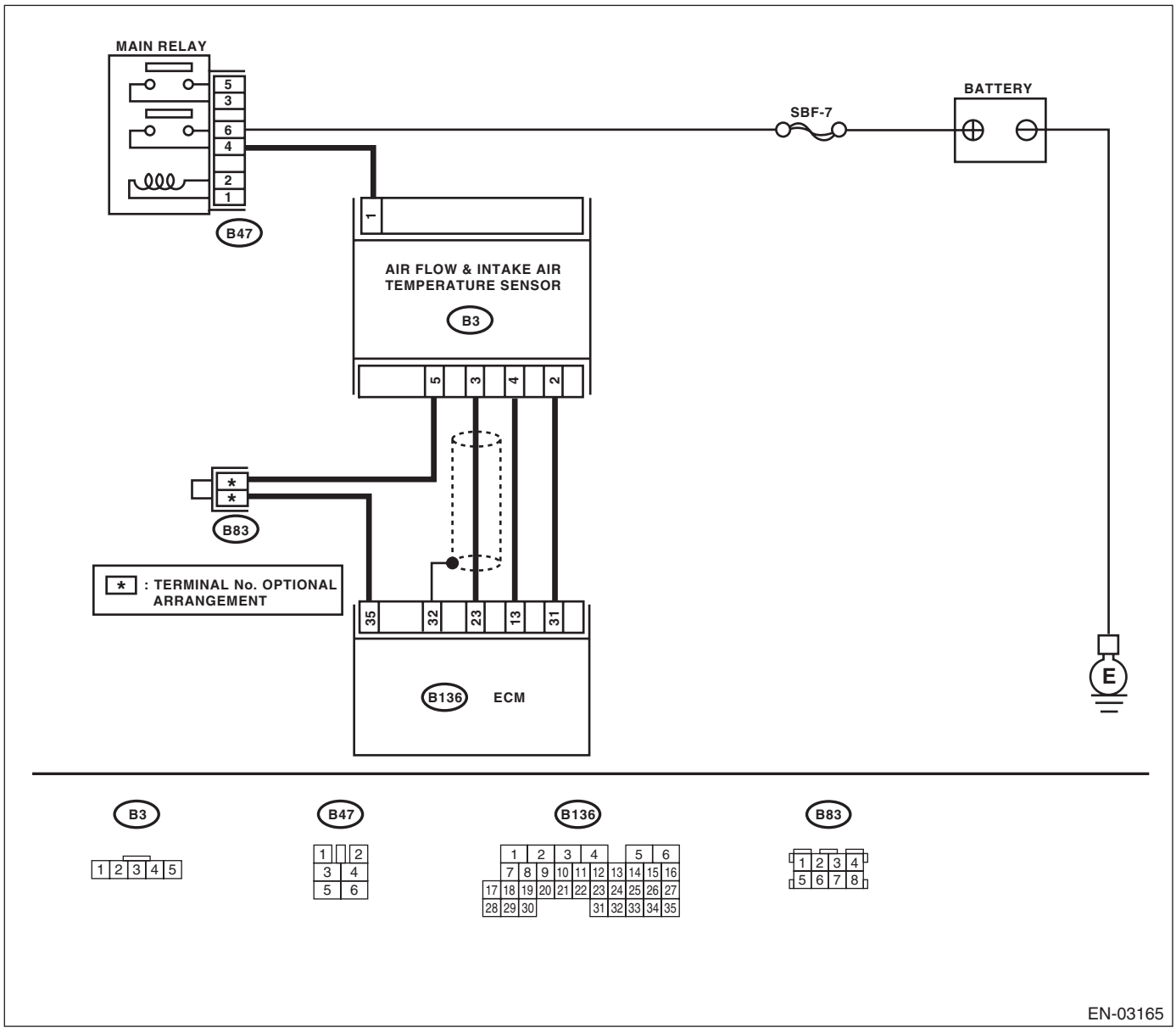
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ THE DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to the data link connector. 3) Turn the ignition switch to ON, and the Subaru Select Monitor power switch to ON. 4) Start and idle the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.Temporary poor contact of connector or harness may be the cause. Repair the harness or connector in mass air flow sensor. NOTE: In this case, repair the following item: • Open or ground short circuit of harness between mass air flow sensor and ECM connector • Poor contact of mass air flow sensor or ECM connector	Go to step **2**.
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground while engine is idling. ***Connector & terminal*** ***(B136) No. 23 (+) — Chassis ground (–):***	Is the voltage more than 0.2 V?	Go to step **4**.	Go to step **3**.
3	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground while engine is idling.	Does the voltage change by shaking the harness and connector of the ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact of ECM connector.	Replace and inspect again because ECM may be faulty.
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5**.	Repair the open circuit between mass air flow sensor and main relay.
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B136) No. 23 — (B3) No. 3:*** ***(B136) No. 31 — (B3) No. 2:*** ***(B136) No. 35 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit between ECM and mass air flow sensor connector.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 23 — Chassis ground:*** ***(B136) No. 31 — Chassis ground:*** ***(B136) No. 35 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7**.	Repair the ground short circuit between ECM and mass air flow sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact of mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair the poor contact of mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-29, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

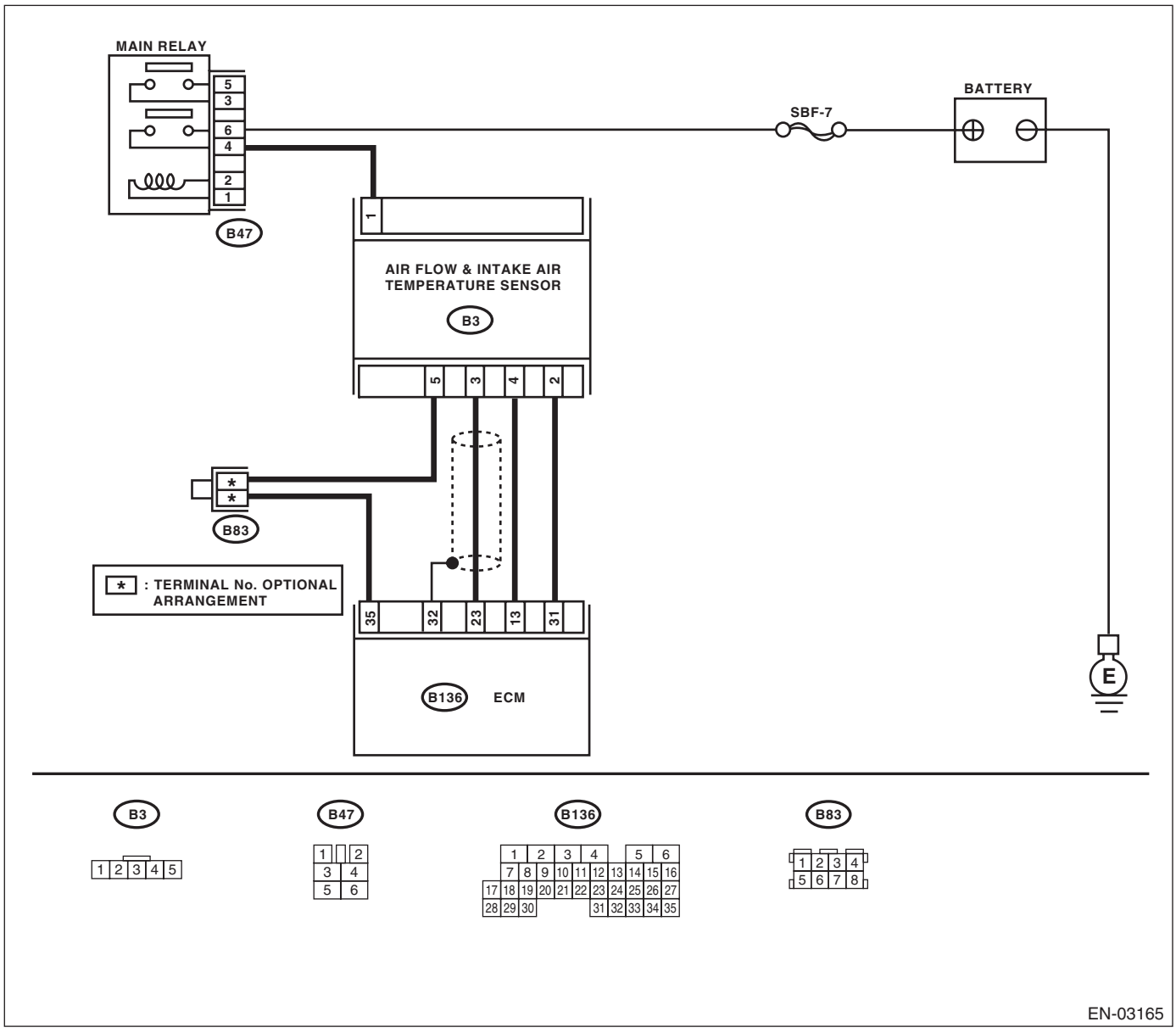
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ THE DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to the data link connector. 3) Turn the ignition switch to ON, and the Subaru Select Monitor power switch to ON. 4) Start and idle the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass airflow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 5 V?	Repair the battery short circuit of harness between mass air flow sensor connector and ECM connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and mass air flow sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B136) No. 31:***	Is the resistance less than 1 Ω?	Replace the mass air flow sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the open circuit of harness between mass air flow sensor connector and ECM connector.

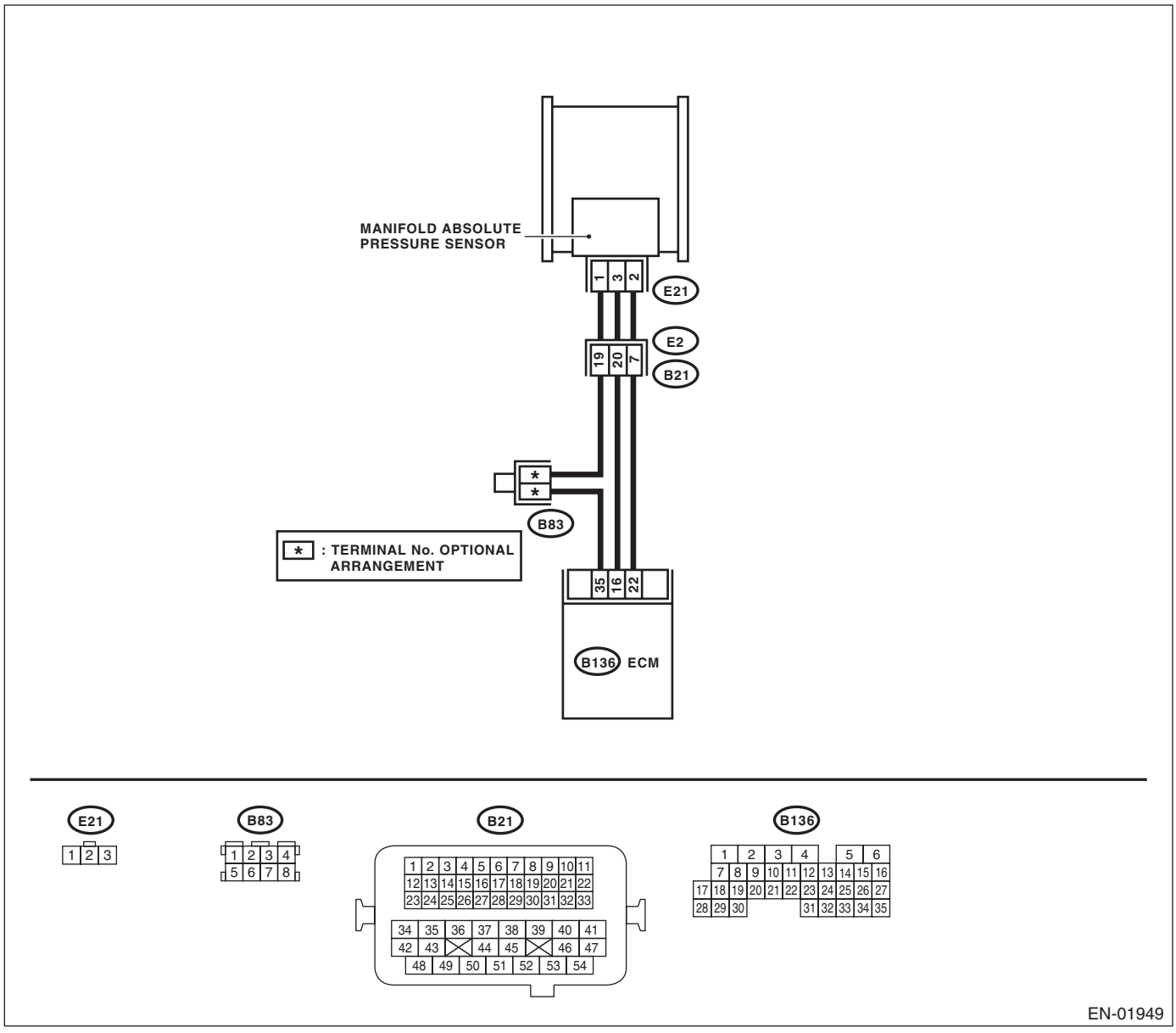
L: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-31, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **3**.	Go to step **2**.
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
3	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (–):***	Is the voltage less than 0.7 V?	Go to step **4**.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
4	**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) 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 more than 4.5 V?	Go to step **5**.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7**.	Repair ground short circuit of harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact of 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(H4DOTC)-27, Manifold Absolute Pressure Sensor.>

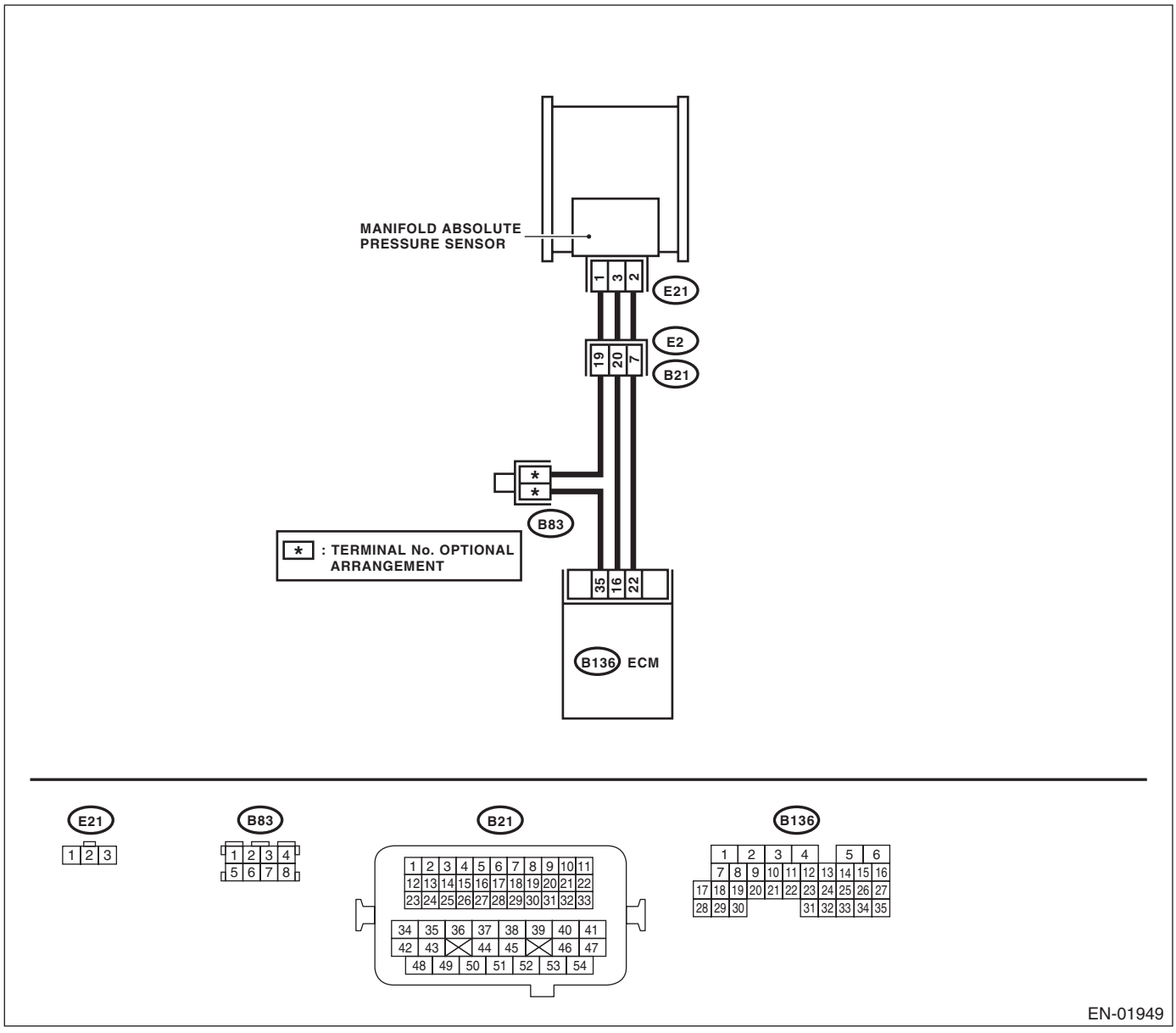
M: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-33, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **3**.	Go to step **2**.
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
3	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4**.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
4	**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) 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 more than 4.5 V?	Go to step **5**.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 22 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **7**.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact of 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(H4DOTC)-27, Manifold Absolute Pressure Sensor.>

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

DTC DETECTING CONDITION:

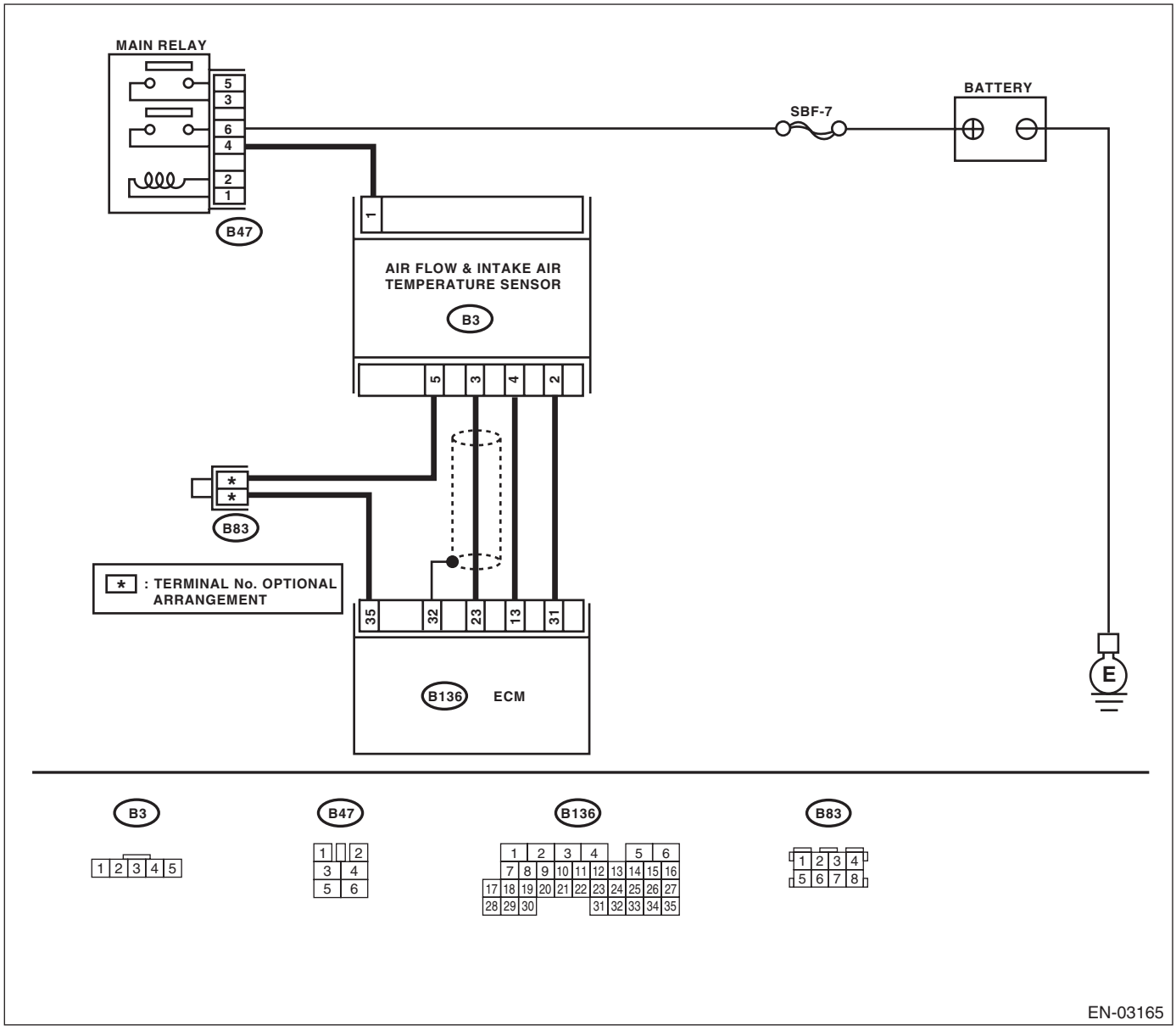
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-35, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step **2**.
2	**CHECK ENGINE COOLANT TEMPERATURE.** 1) Start the engine and warm-up completely. 2) Measure the engine coolant temperature using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature 75 — 95°C (167 — 203°F) ?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>	Check DTC P0125 using “List of Diagnostic Trouble Code (DTC).” <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>

O: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

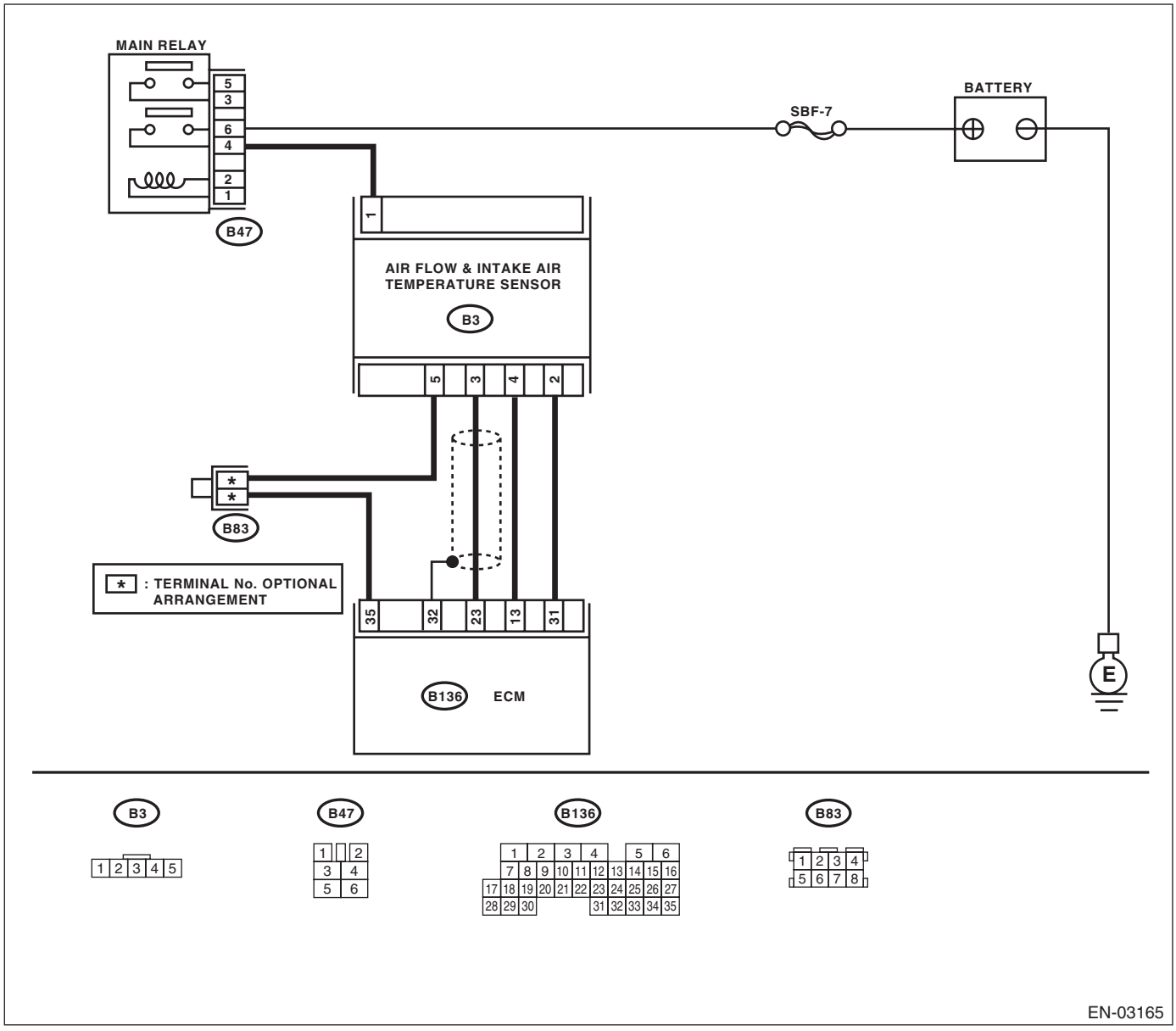
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-37, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 55°C (131°F)?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.** 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) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature less than –36°C (–33°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit of the harness between the mass air flow and intake air temperature sensor and ECM connector.

P: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

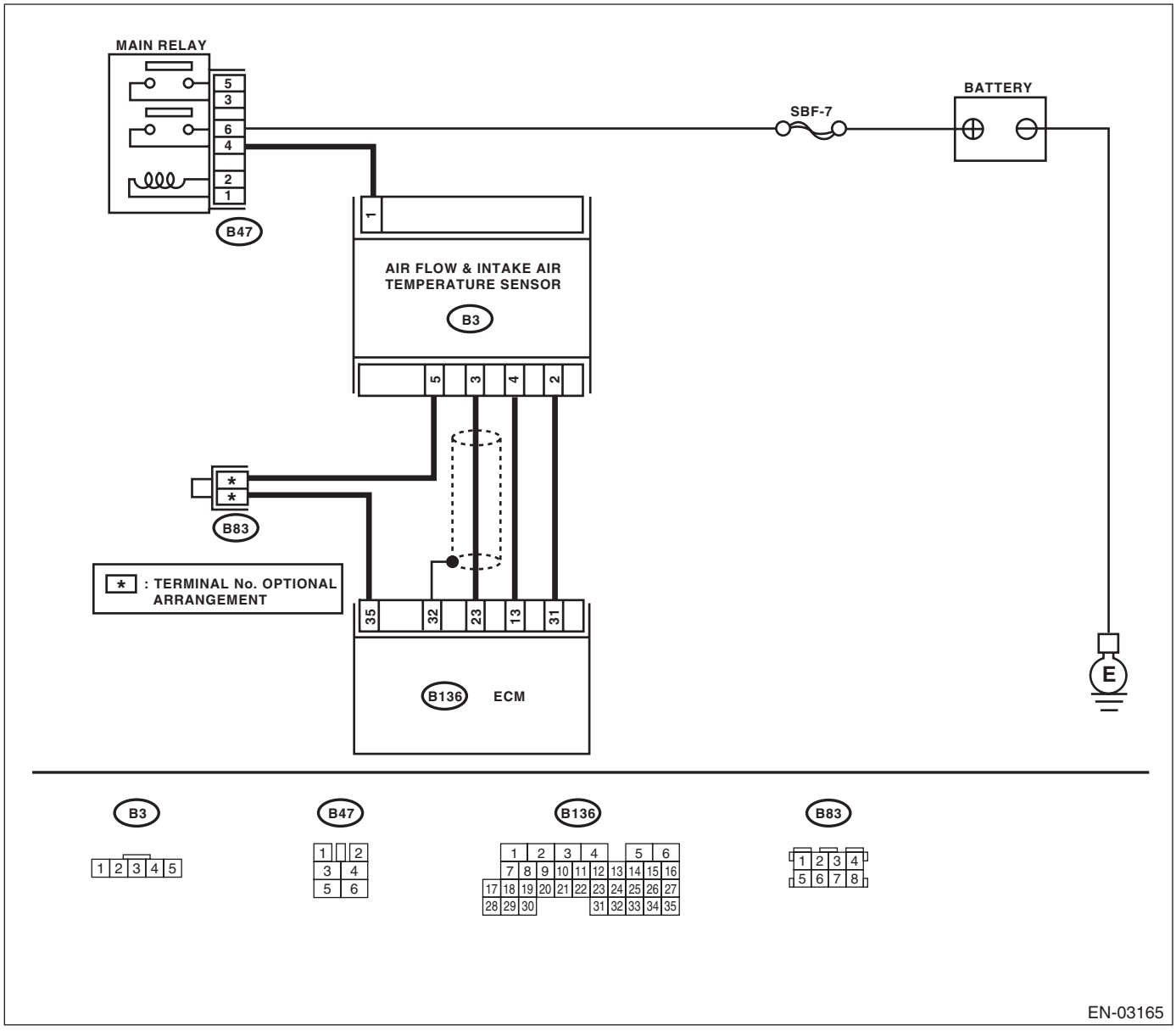
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-39, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature less than –36°C (–33°F)?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the mass air flow and intake air temperature sensor. 3) Measure the voltage between the mass air flow and intake air temperature sensor connectors and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of the harness between mass air flow and intake air temperature sensor, and the ECM connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the mass air flow and intake air temperature sensor connectors and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of the harness between mass air flow and intake air temperature sensor, and the ECM connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.** Measure the voltage between the mass air flow and intake air temperature sensor connectors and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit between mass air flow and intake air temperature sensor and ECM connector. • Poor contact of mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact of joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. ***Connector & terminal*** ***(B3) No. 5 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit between mass air flow and intake air temperature sensor and ECM connector. • Poor contact of mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact of joint connector

Q: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-41, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

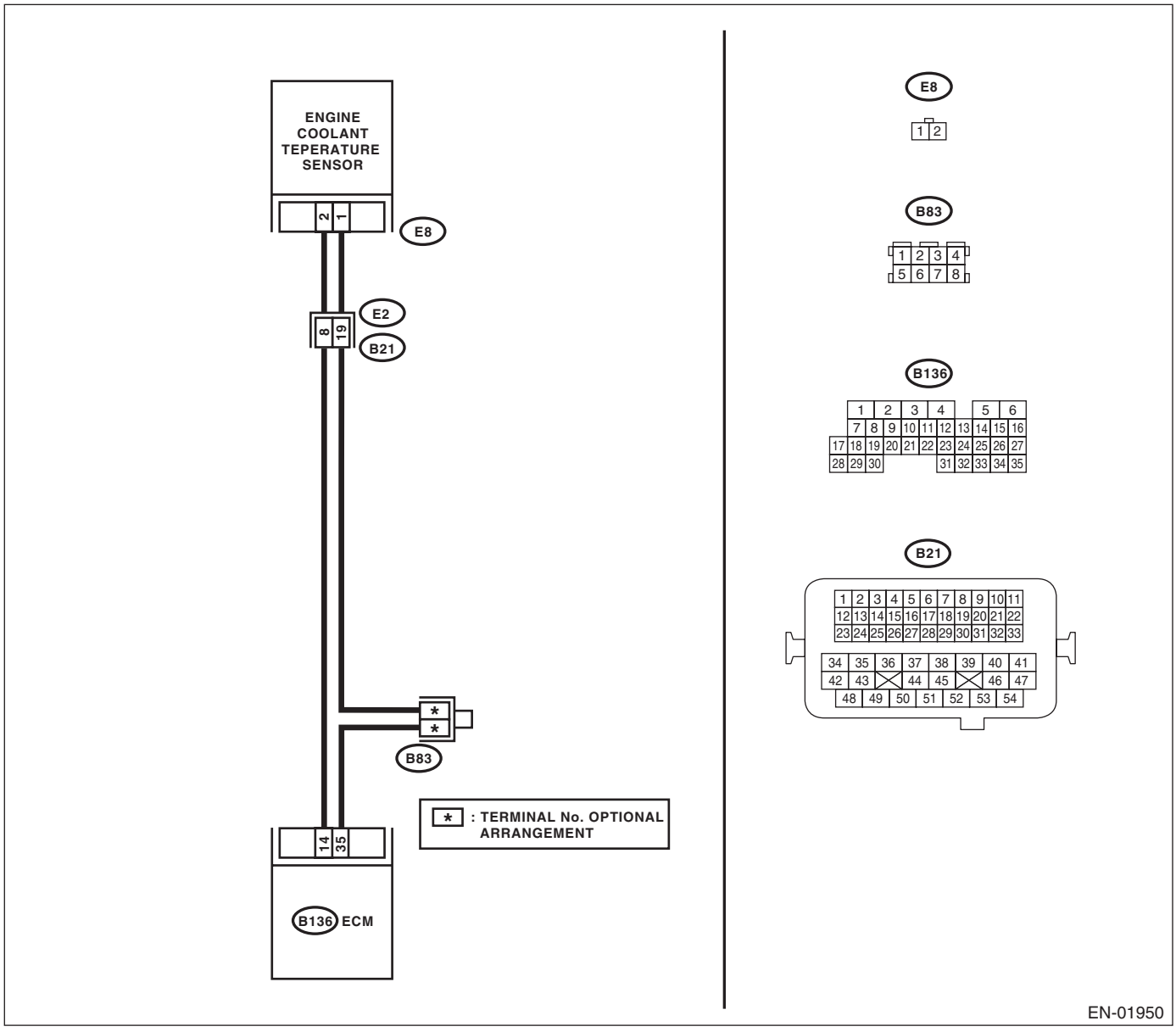
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 120°C (248°F)?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of engine coolant temperature sensor • Poor contact in ECM • Poor contact of coupling connector • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature less than –40°C (–40°F) ?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-21, Engine Coolant Temperature Sensor.>	Repair the ground short circuit of harness between engine coolant temperature sensor and ECM connector.

R: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-43, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

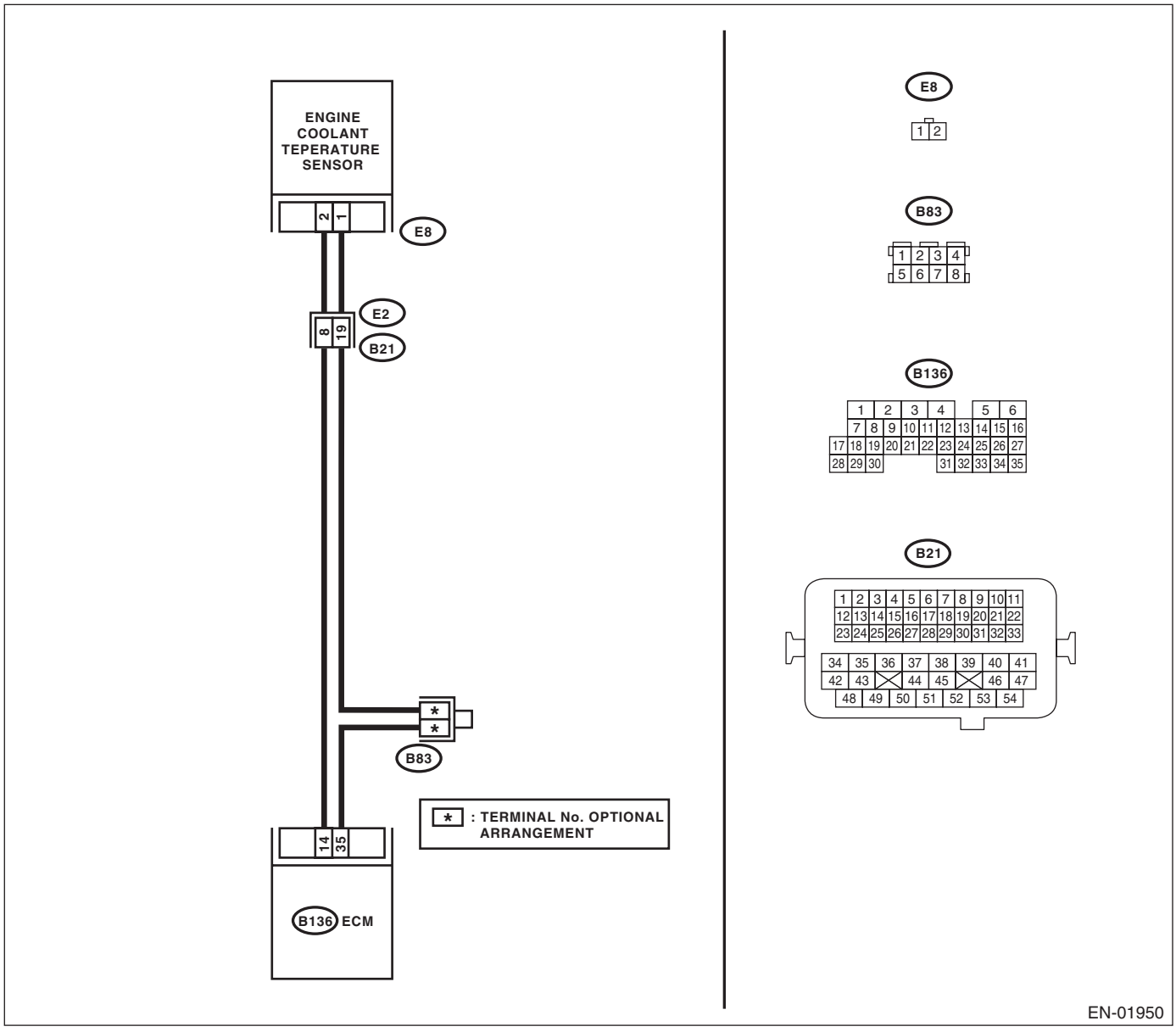
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature less than –40°C (–40°F) ?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of engine coolant temperature sensor • Poor contact in ECM • Poor contact of coupling connector • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and engine coolant temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and engine coolant temperature sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact of engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector

Step		Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-21, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact of engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-45, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

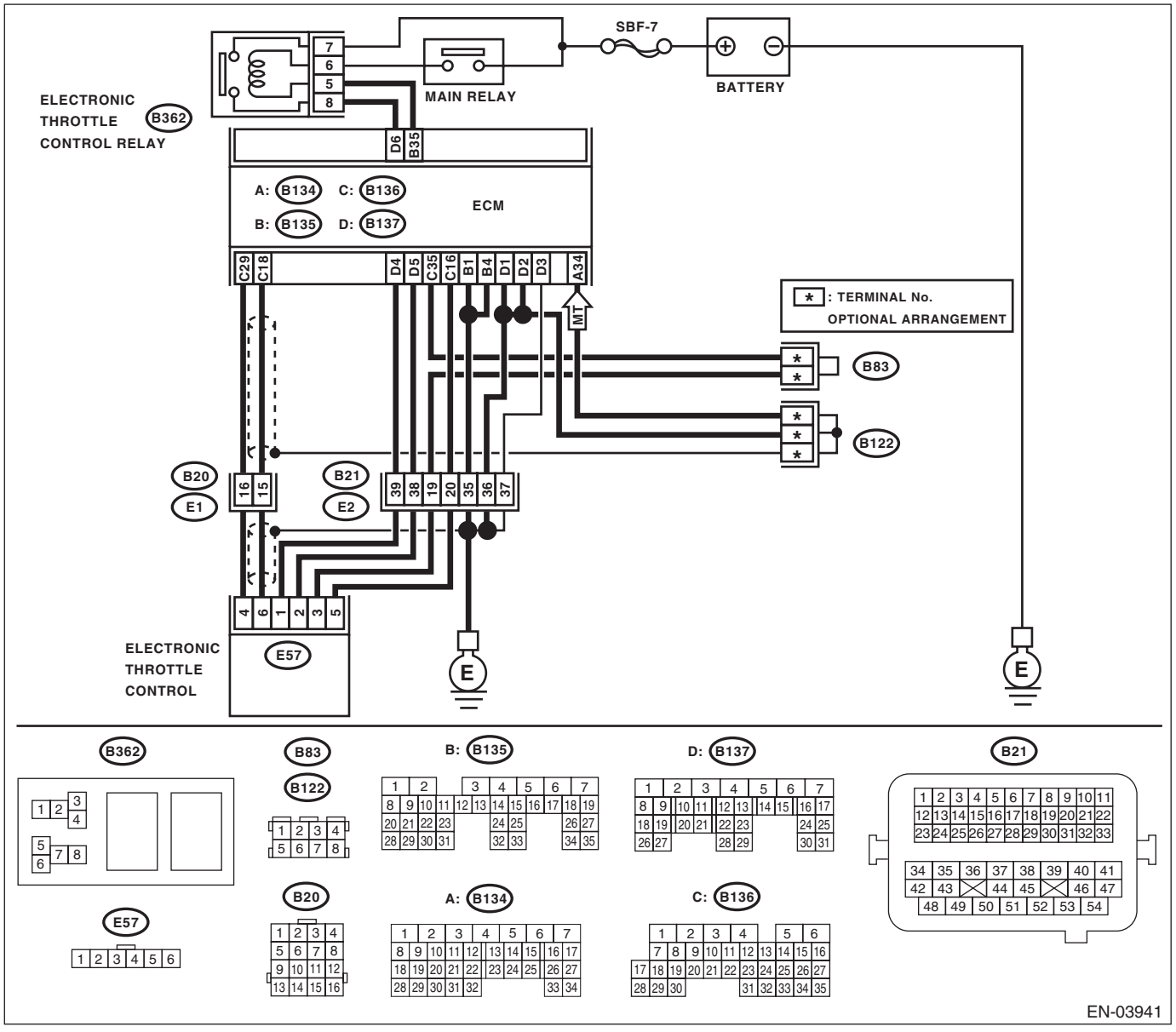
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor or general scan tool. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:*** ***(B136) No. 18 — (E57) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **6**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
6	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:***	Is the resistance more than 10 Ω?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-47, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

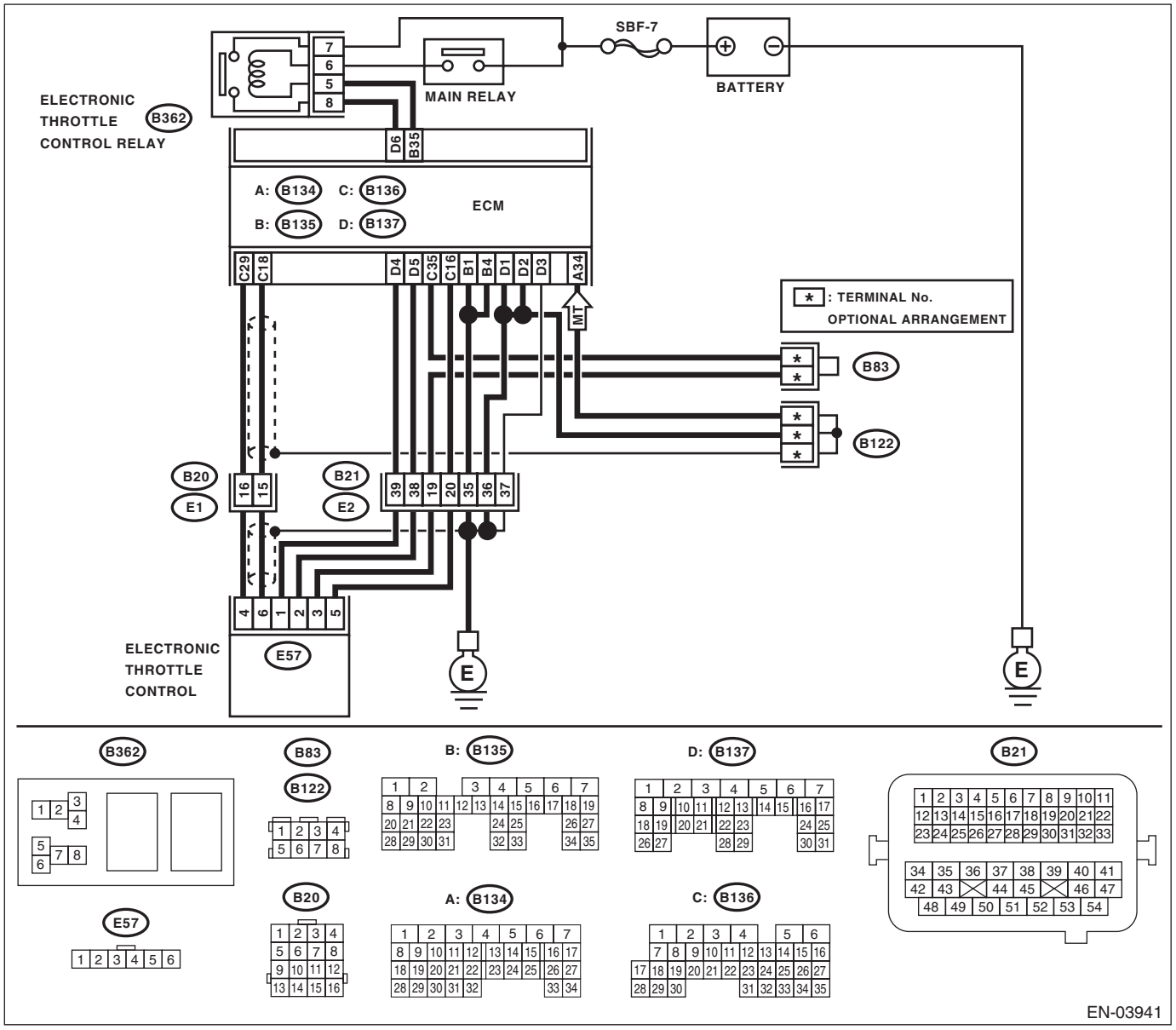
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.63 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 35 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**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 (–):*** 3) Check the voltage change by shaking the harness and connector of ECM, and engine harness connector, while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step **5**.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact of harness. Replace the electronic throttle control.	Repair the short circuit to sensor power supply.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-49, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

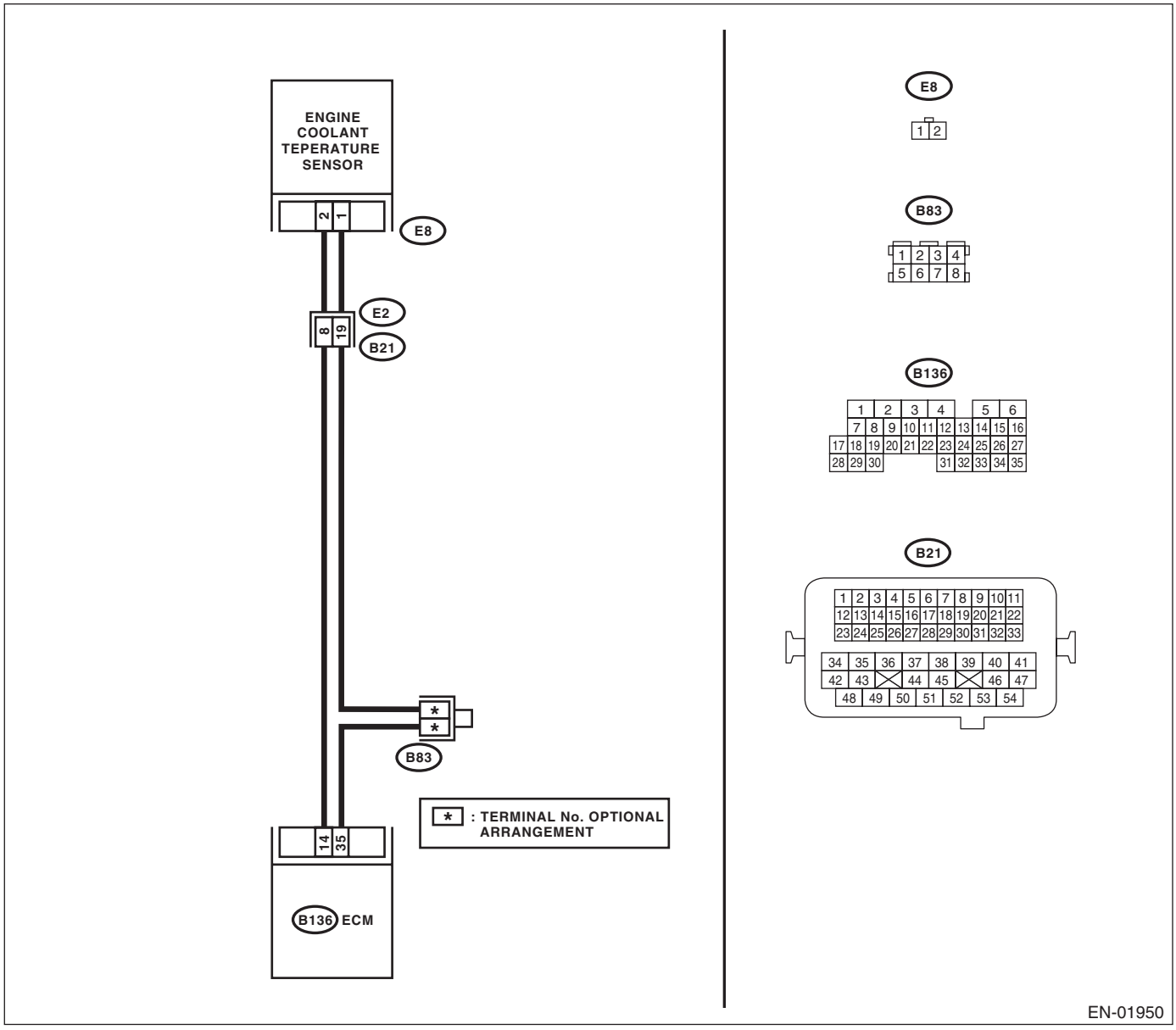
TROUBLE SYMPTOM:

Engine does not return to idle.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2**.
2	**CHECK ENGINE COOLING SYSTEM.** NOTE: Check the following items. • Thermostat open stuck • Coolant level • Engine coolant freeze • Tire diameter	Is there any fault in engine cooling system?	Replace the thermostat. <Ref. to CO(H4SO)-17, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-21, Engine Coolant Temperature Sensor.>

V: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-51, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

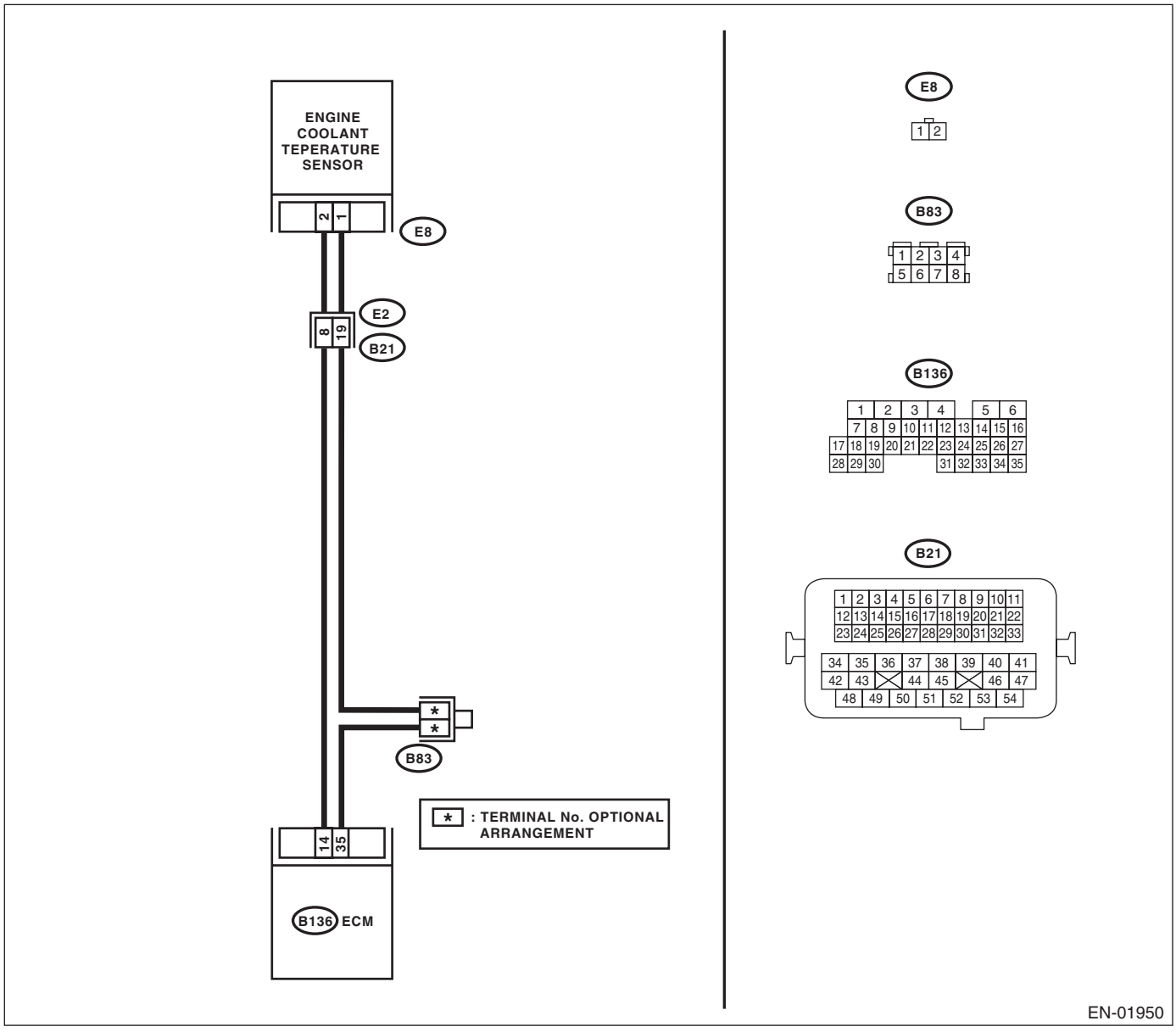
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**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 is cold and after warmed-up?	Contact with SOA Service Center.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-21, Engine Coolant Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-53, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK VEHICLE CONDITION.**	Was the vehicle driven or idled with the engine partially submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step **2**.
2	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **3**.
3	**CHECK ENGINE COOLANT.**	Are the coolant level and mixture ratio of engine coolant to anti-freeze solution correct?	Go to step **4**.	Replace the engine coolant. <Ref. to CO(H4SO)-12, REPLACEMENT, Engine Coolant.>
4	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check the radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4SO)-23, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4SO)-25, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO(H4SO)-17, Thermostat.>

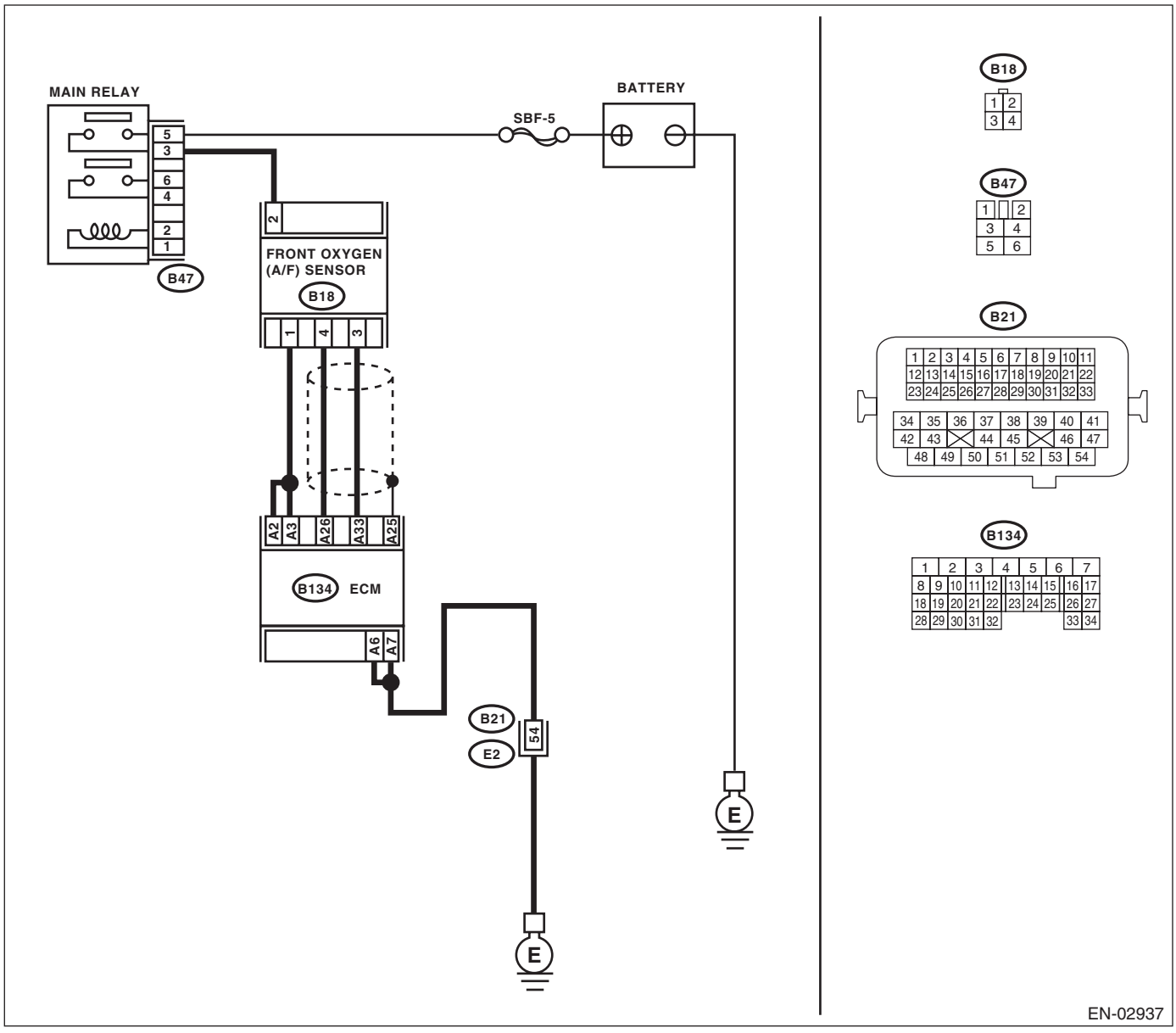
X: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-55, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:*** ***(B134) No. 33 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-34, Front Oxygen (A/F) Sensor.>	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.

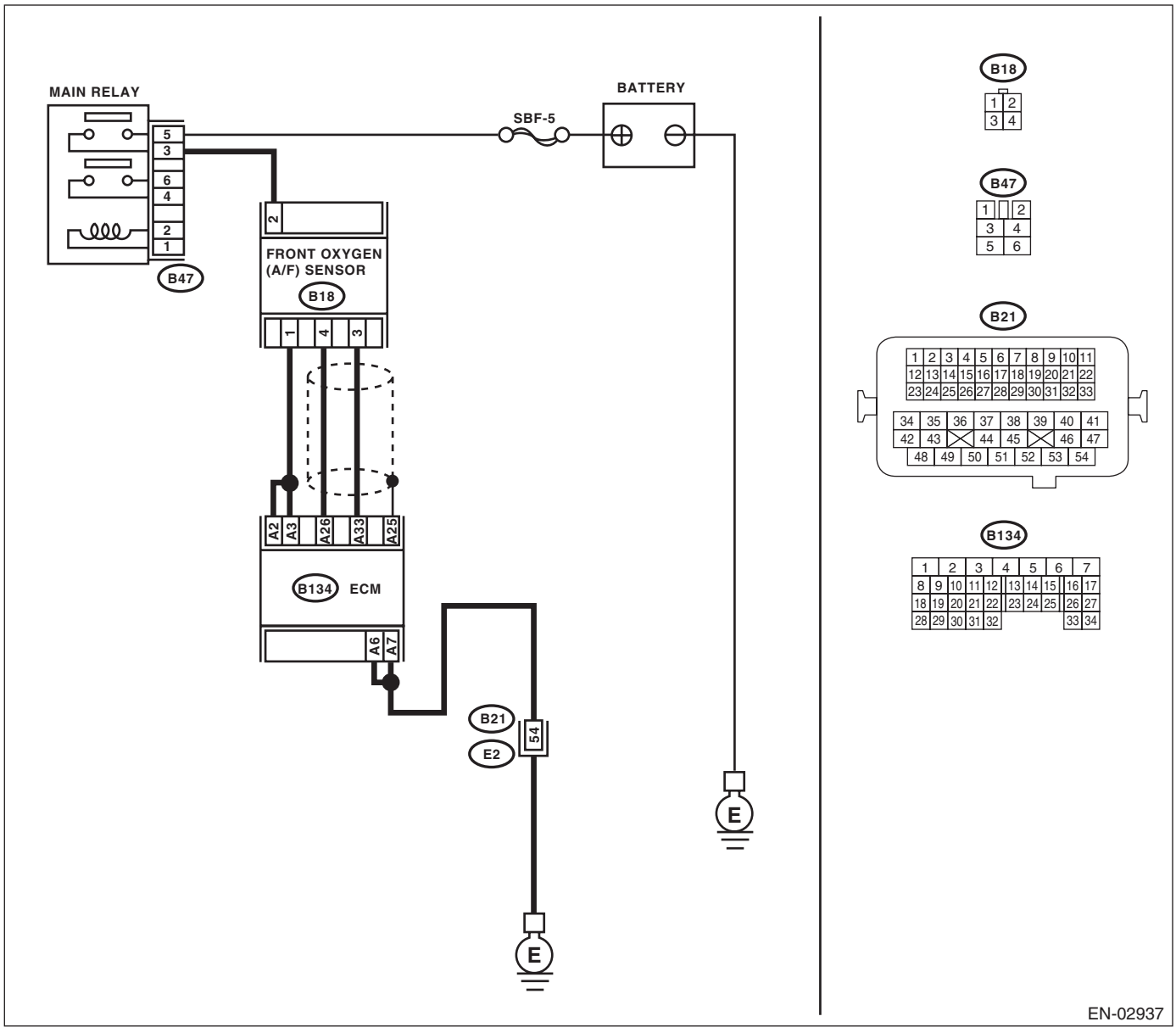
Y: DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-57, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-34, Front Oxygen (A/F) Sensor.>	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.

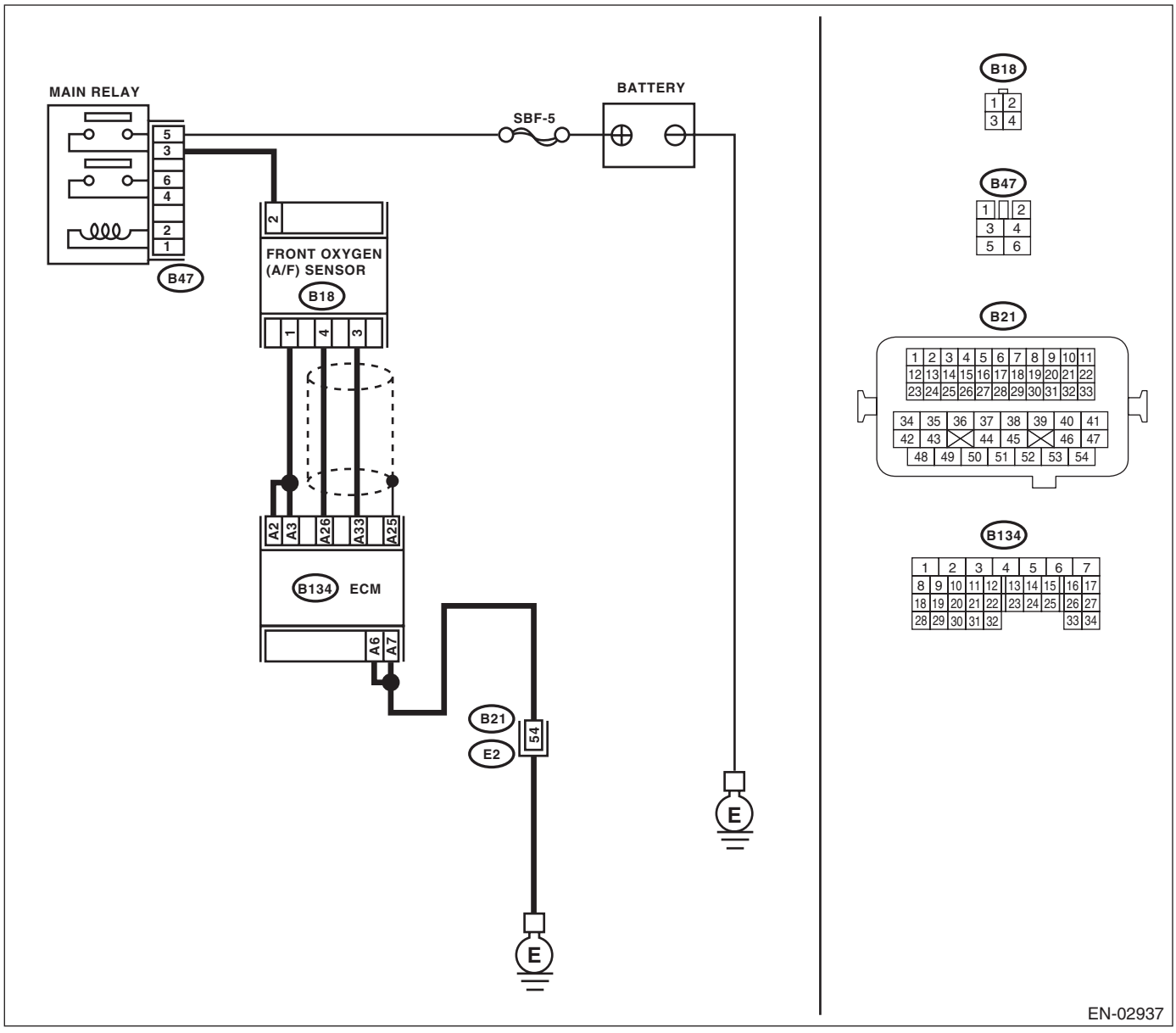
Z: DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-59, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2**.
2	**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(H4DOTC)-34, Front Oxygen (A/F) Sensor.>

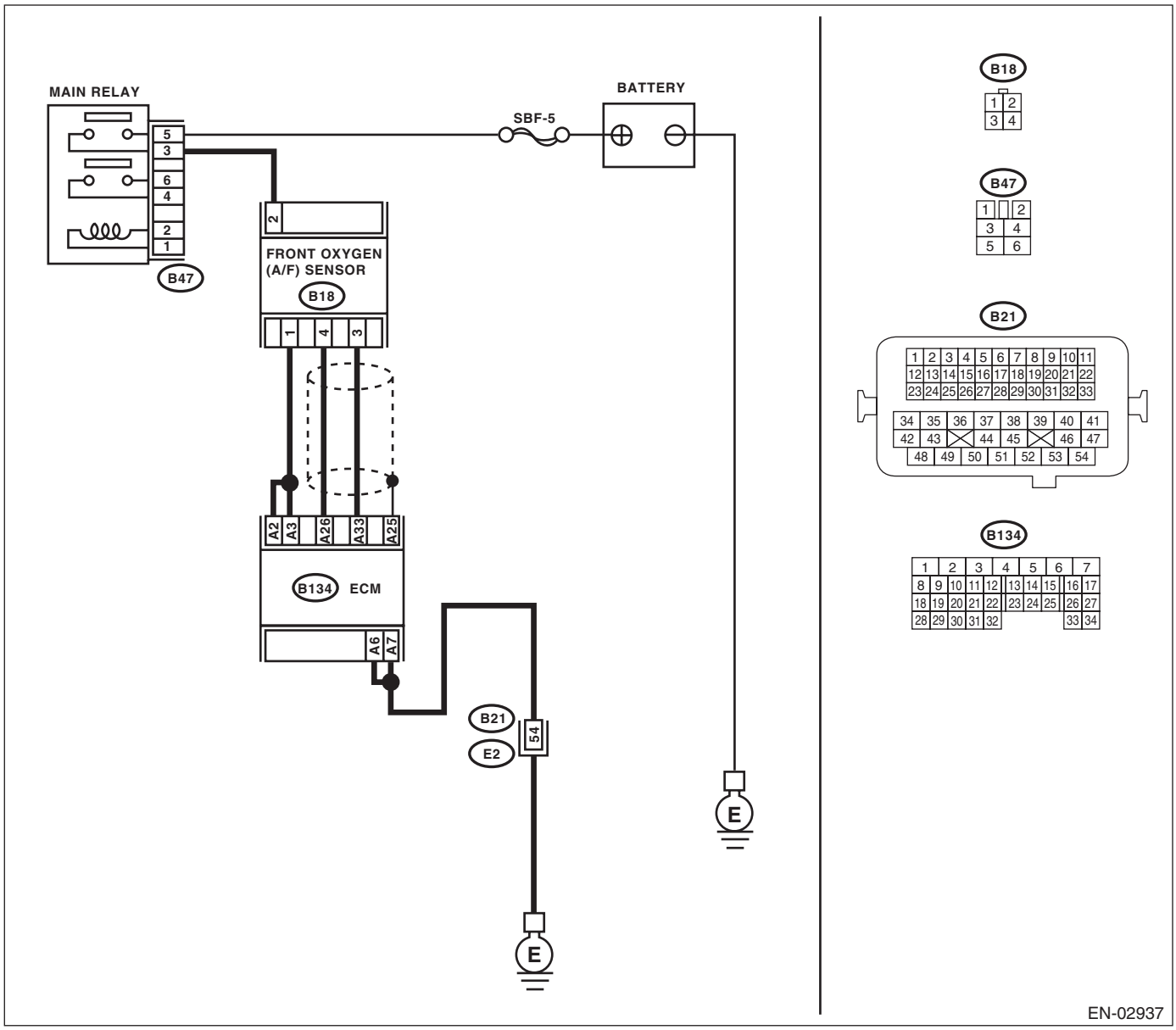
AA:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-62, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (B18) No. 4:*** ***(B134) No. 33 — (B18) No. 3:***	Is the resistance less than 1 Ω?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-34, Front Oxygen (A/F) Sensor.>	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.

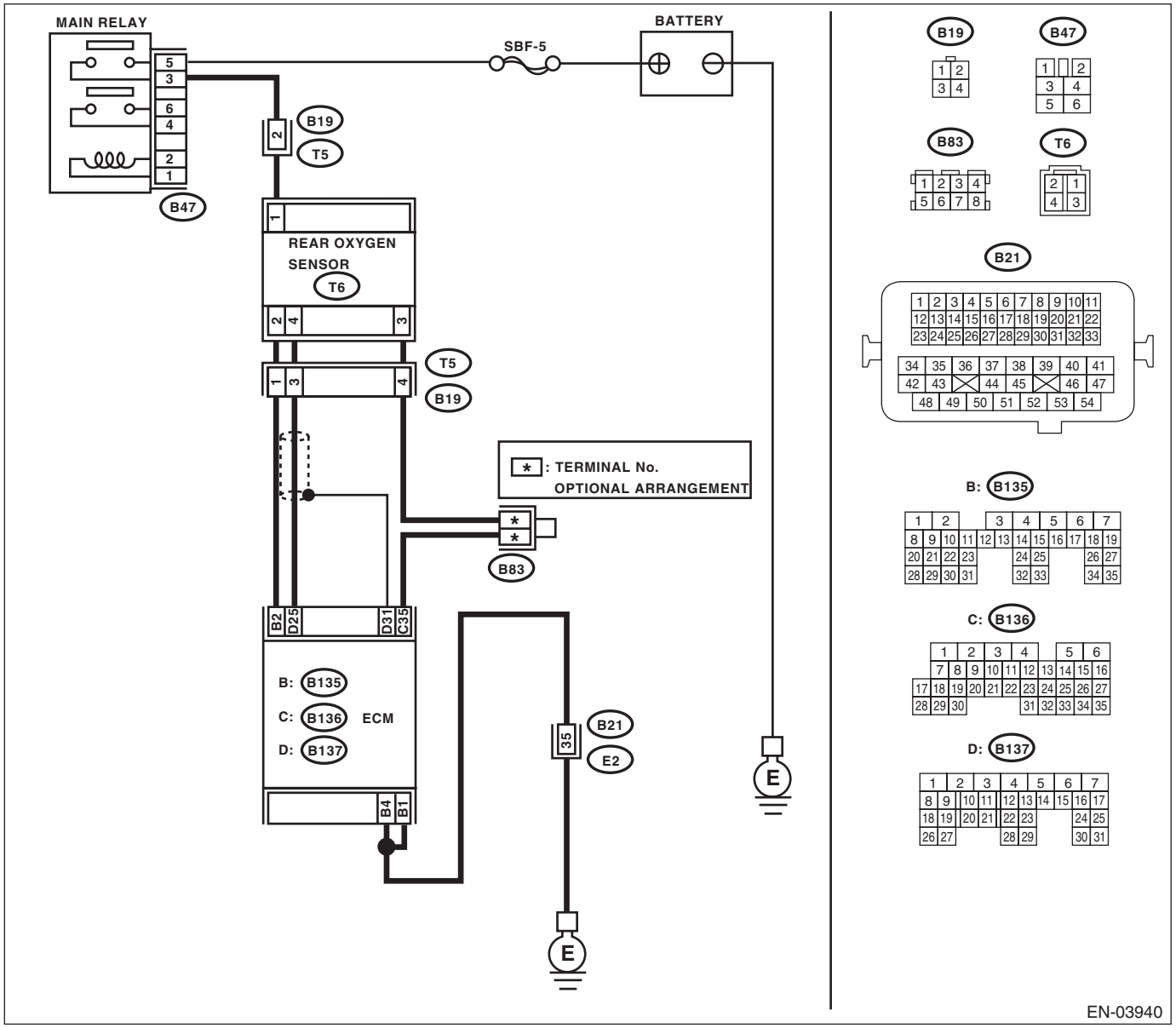
AB:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-64, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 490 mV?	Go to step **6**.	Go to step **3**.
3	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (T6) No. 4:*** ***(B136) No. 35 — (T6) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **5**.
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 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 harness connector and chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
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(H4DOTC)-36, Rear Oxygen Sensor.>

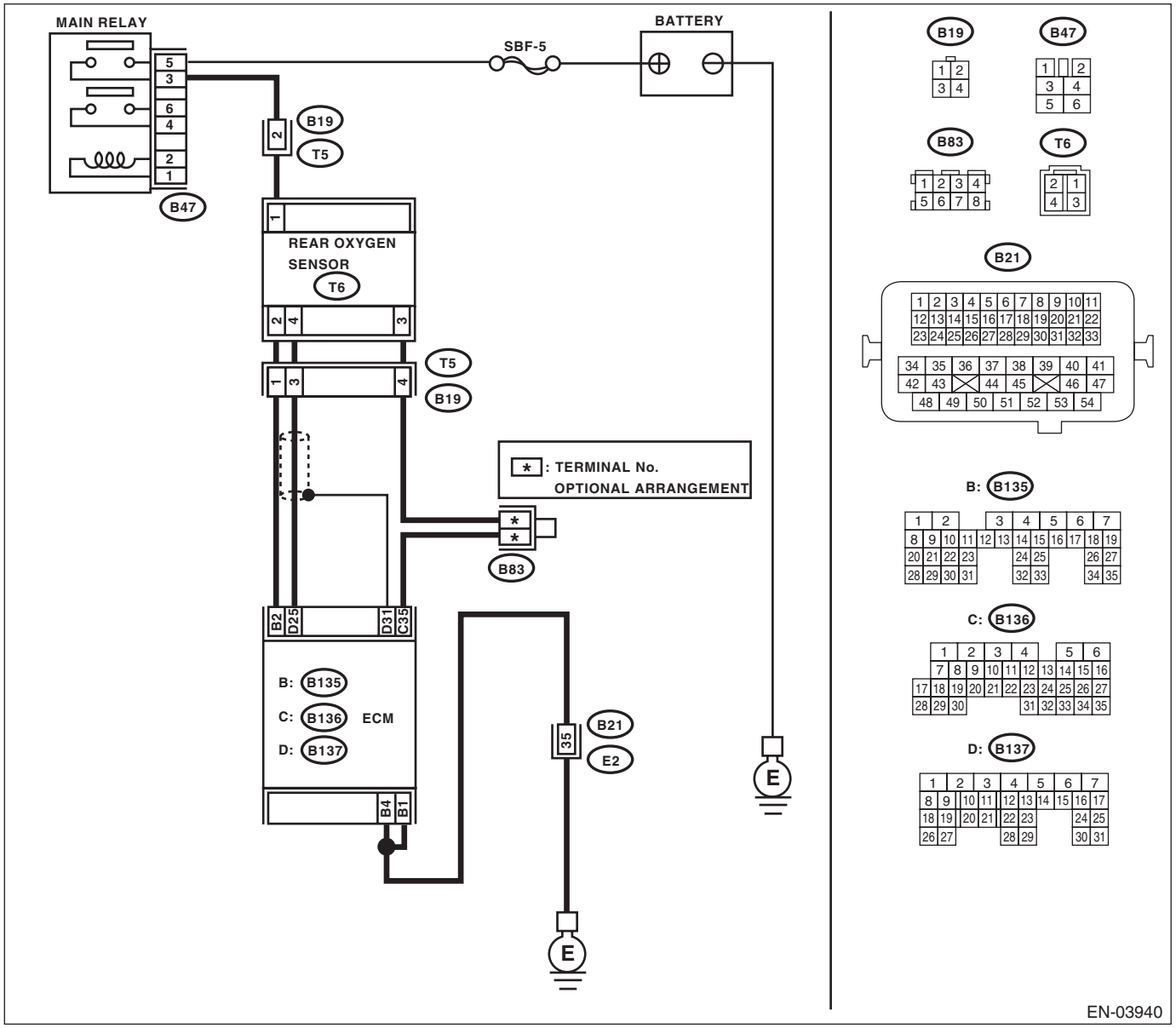
AC:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-66, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and drop the engine speed suddenly from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clucth pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 250 mV?	Go to step **6**.	Go to step **3**.
3	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (T6) No. 4:*** ***(B136) No. 35 — (T6) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **5**.
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 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 harness connector and chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
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(H4DOTC)-36, Rear Oxygen Sensor.>

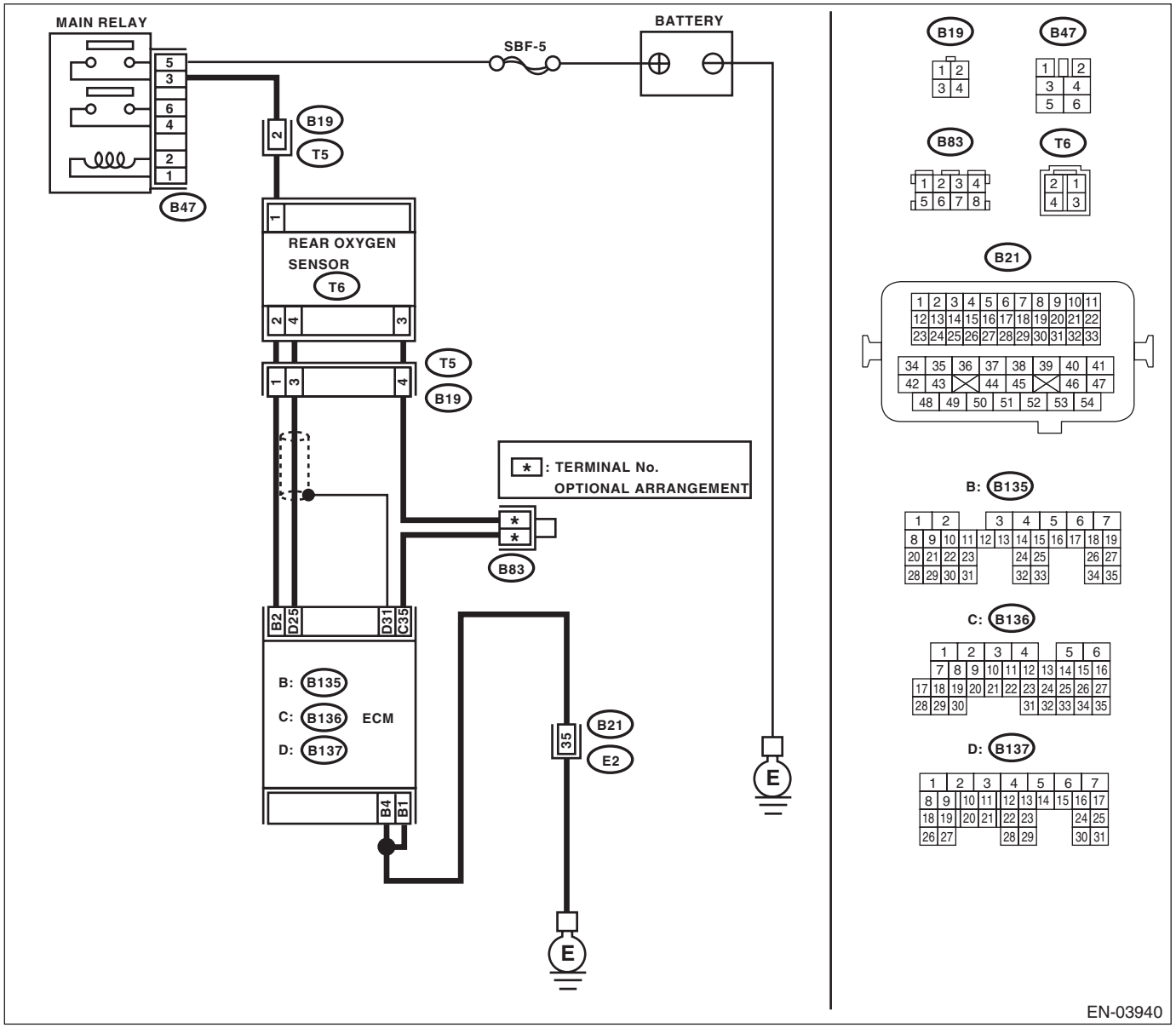
AD:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-68, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Go to step **2**.
2	**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*** ***(B137) No. 25 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness between ECM and rear oxygen sensor connector.
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*** ***(B137) No. 25 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness between ECM and rear oxygen sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** Measure the resistance between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(T6) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the chassis short circuit of harness.
4	**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(H4DOTC)-36, Rear Oxygen Sensor.>	Temporary poor contact occurs. Check the poor contact of connector.

AE:DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC)(diag)-138, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AF:DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-76, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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 FIRE" signs near the working area.** **• Be careful not to spill fuel.** Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-24, INSPECTION, Fuel Pressure.> **WARNING:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)?	Go to step **4**.	Repair the following item. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line
4	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-24, INSPECTION, Fuel Pressure.> **WARNING:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If the measured value at this step is out of specification, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)?	Go to step **5**.	Repair the following item. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 60°C (140°F)?	Go to step **6**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-21, Engine Coolant Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?	Go to step **7**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Subtract the ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>

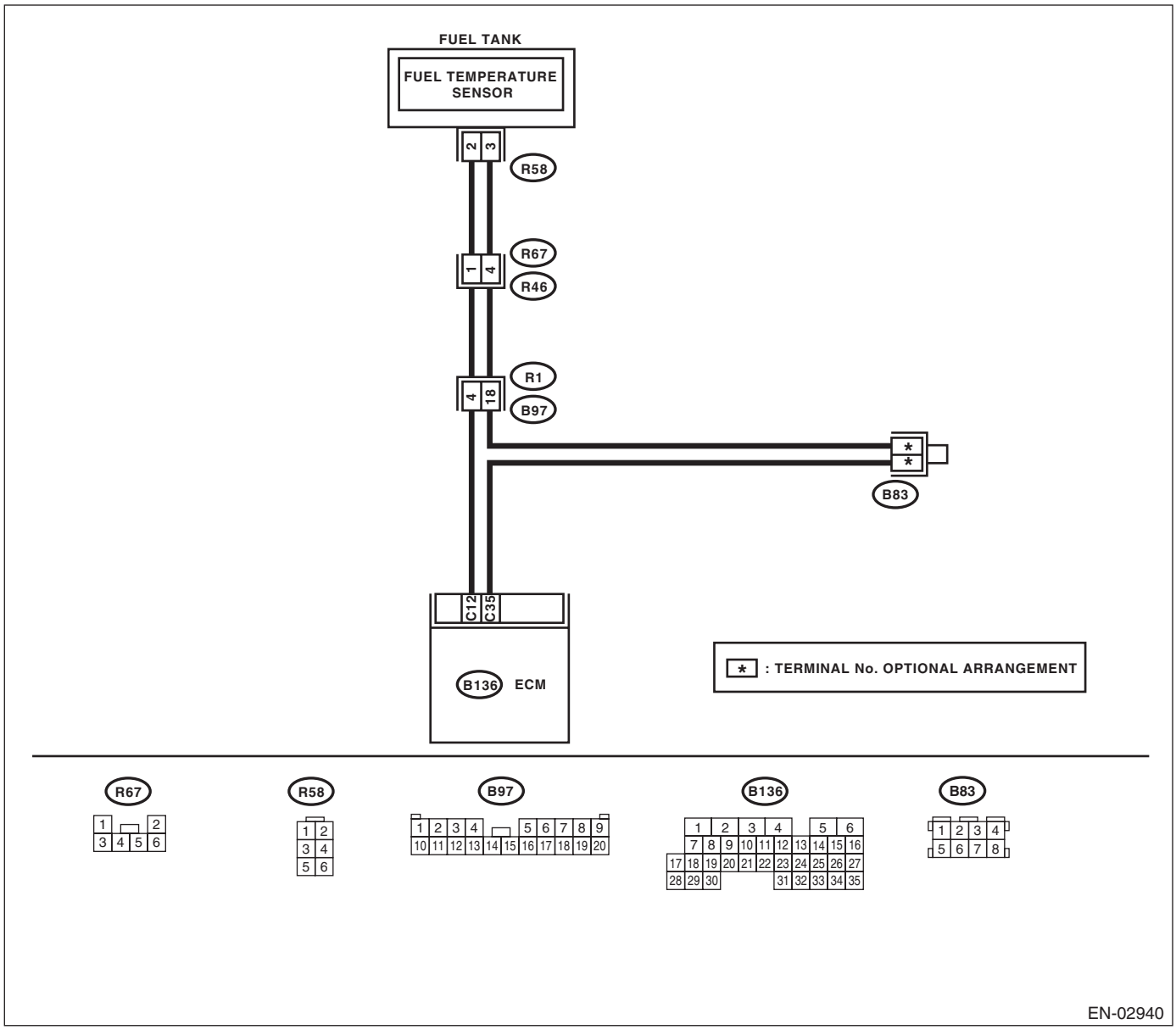
AG:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-78, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-9, Fuel Temperature Sensor.>

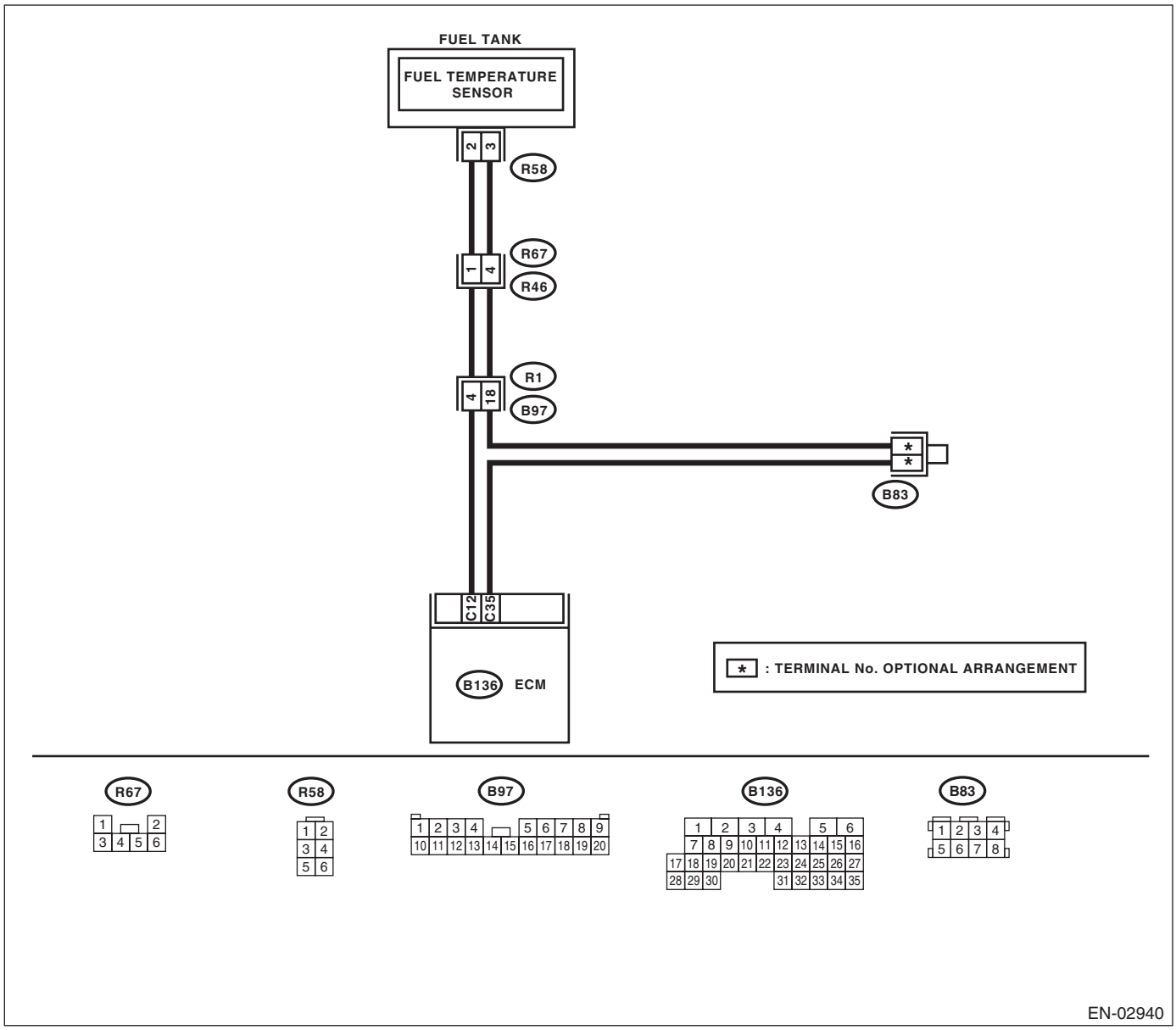
AH:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-81, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the temperature above 150°C (302°F)?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.
2	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Turn the ignition switch to ON. 5) Read the data of fuel temperature sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the temperature less than –40°C (–40°F)?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-9, Fuel Temperature Sensor.>	Repair ground short circuit of harness between fuel pump and ECM connector.

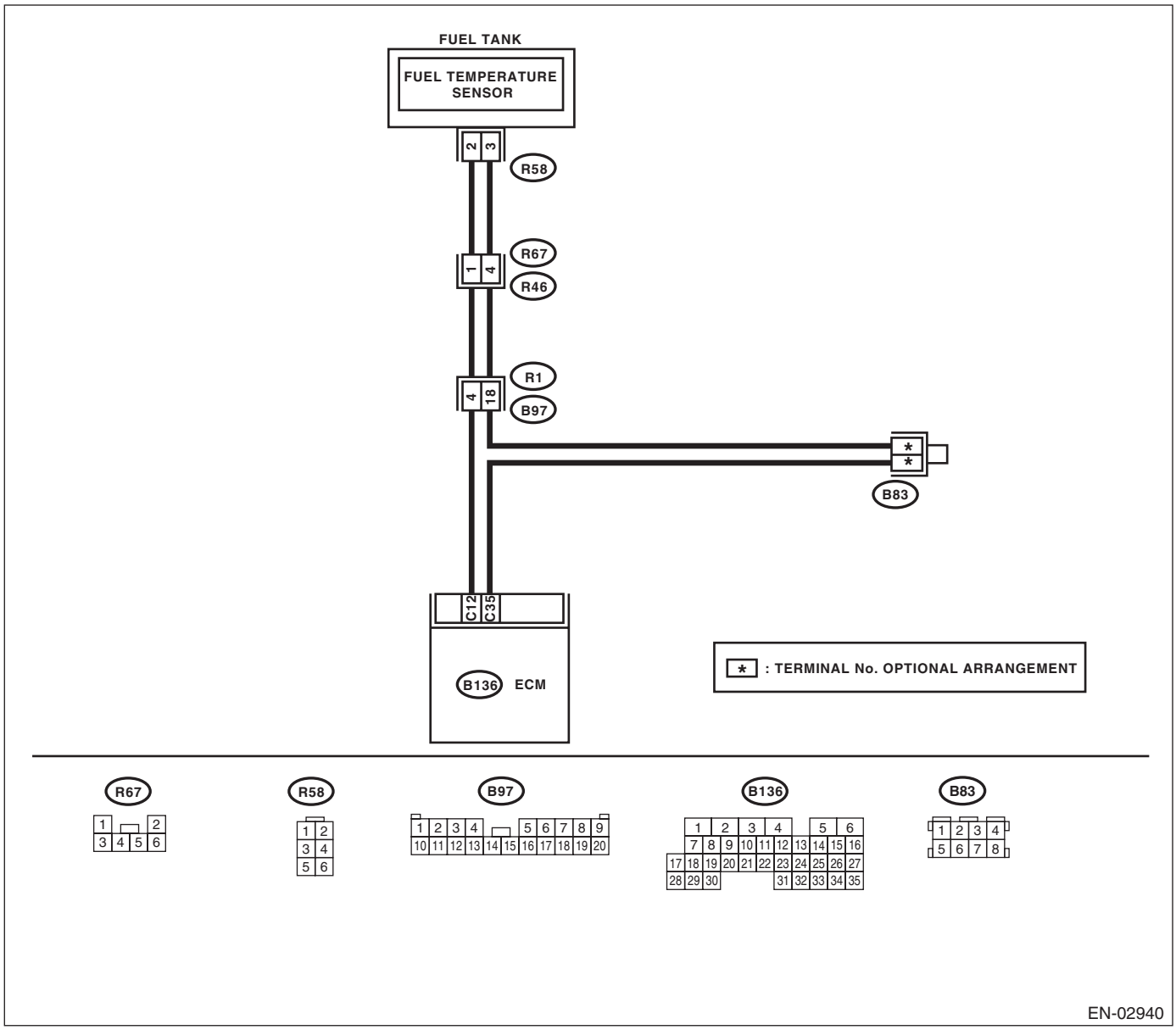
AI: DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-83, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the temperature less than –40°C (–40°F)?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit of harness between ECM and fuel pump connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit of harness between ECM and fuel pump connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 4 V?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact of coupling connector

Step		Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between fuel pump connector and ECM. ***Connector & terminal*** ***(R58) No. 3 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-9, Fuel Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-85, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

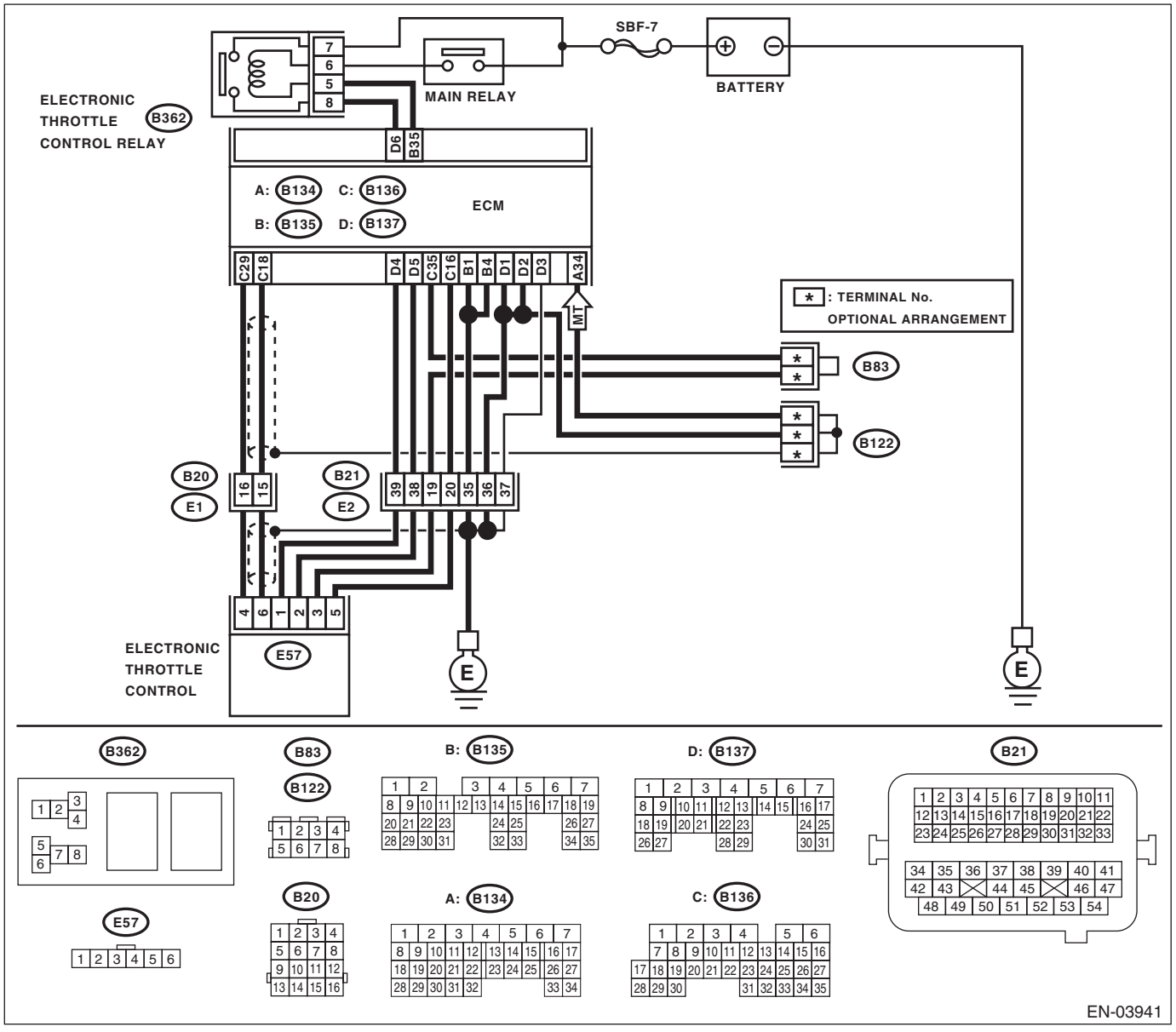
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage more than 0.8 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 29 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the chassis short circuit of harness.
5	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **6**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
6	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-87, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

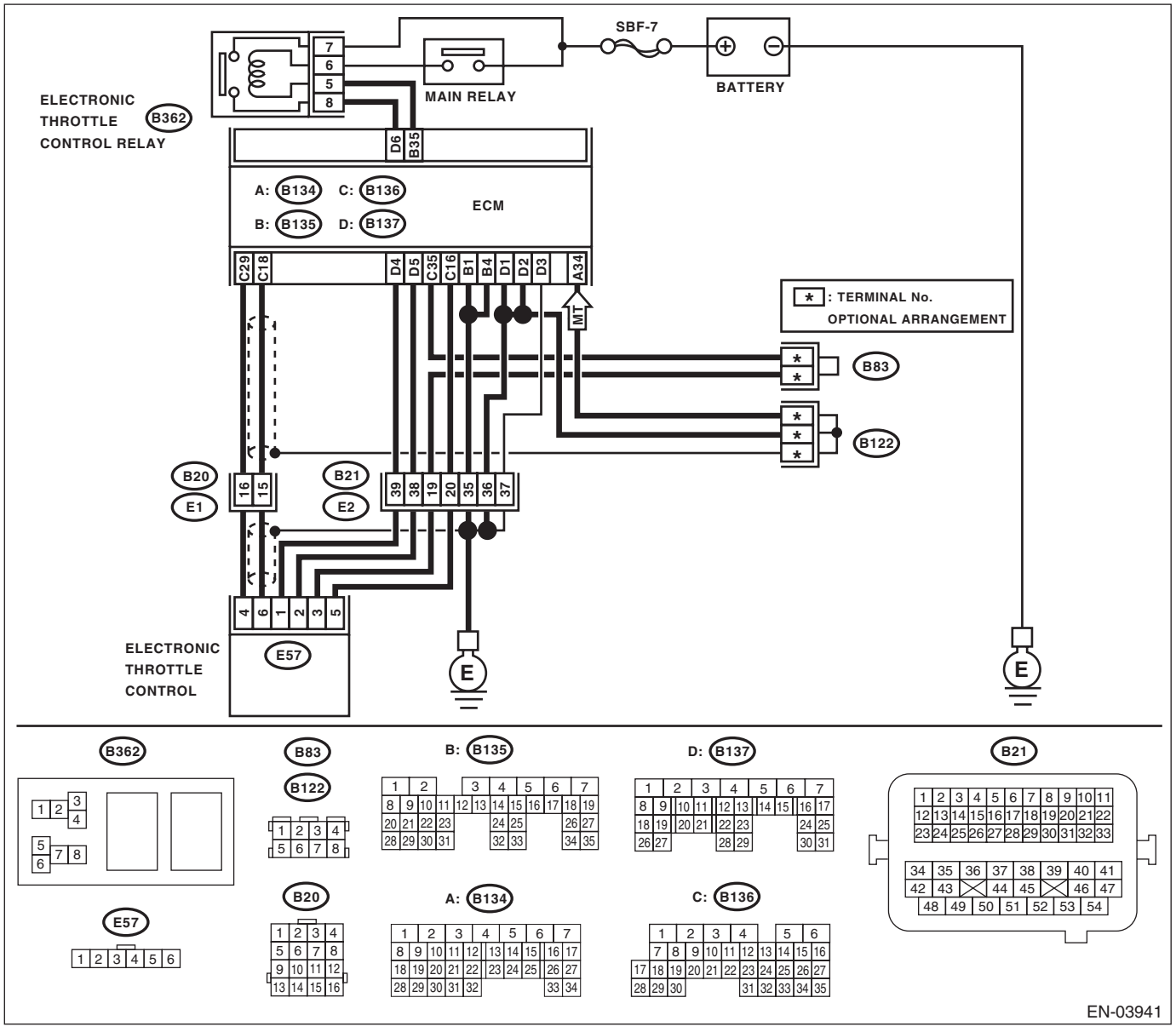
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.73 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage less than 10 V?	Go to step **5**.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between connector terminals. ***Connector & terminal*** ***(B136) No. 29 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact. Replace the electronic throttle control.	Sensor power supply circuit may be shorted.

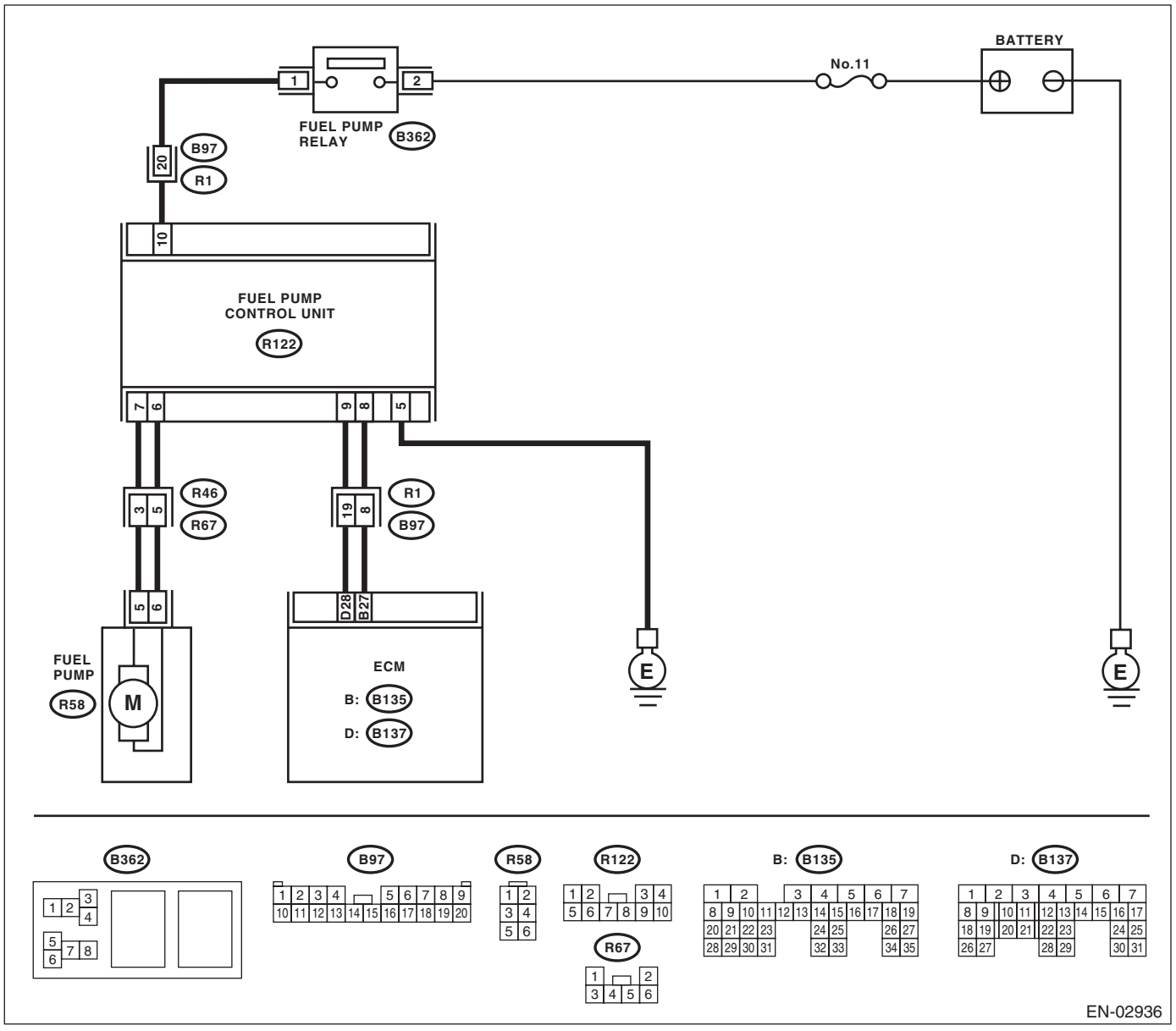
AL:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-89, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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 more than 10 V?	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 of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the ground short circuit between fuel pump control unit and fuel pump.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between fuel pump control unit and ECM connector. ***Connector & terminal*** ***(R122) No. 9 — (B137) No. 28:*** ***(R122) No. 8 — (B135) No. 27:***	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 fuel pump control unit and ECM • Poor contact of fuel pump control unit and ECM connector
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7**.	Repair the ground short circuit between fuel pump control unit and ECM.
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 poor contact in ECM and fuel pump control unit.	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(H4DOTC)-42, Fuel Pump Control Unit.>

AM:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-91, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

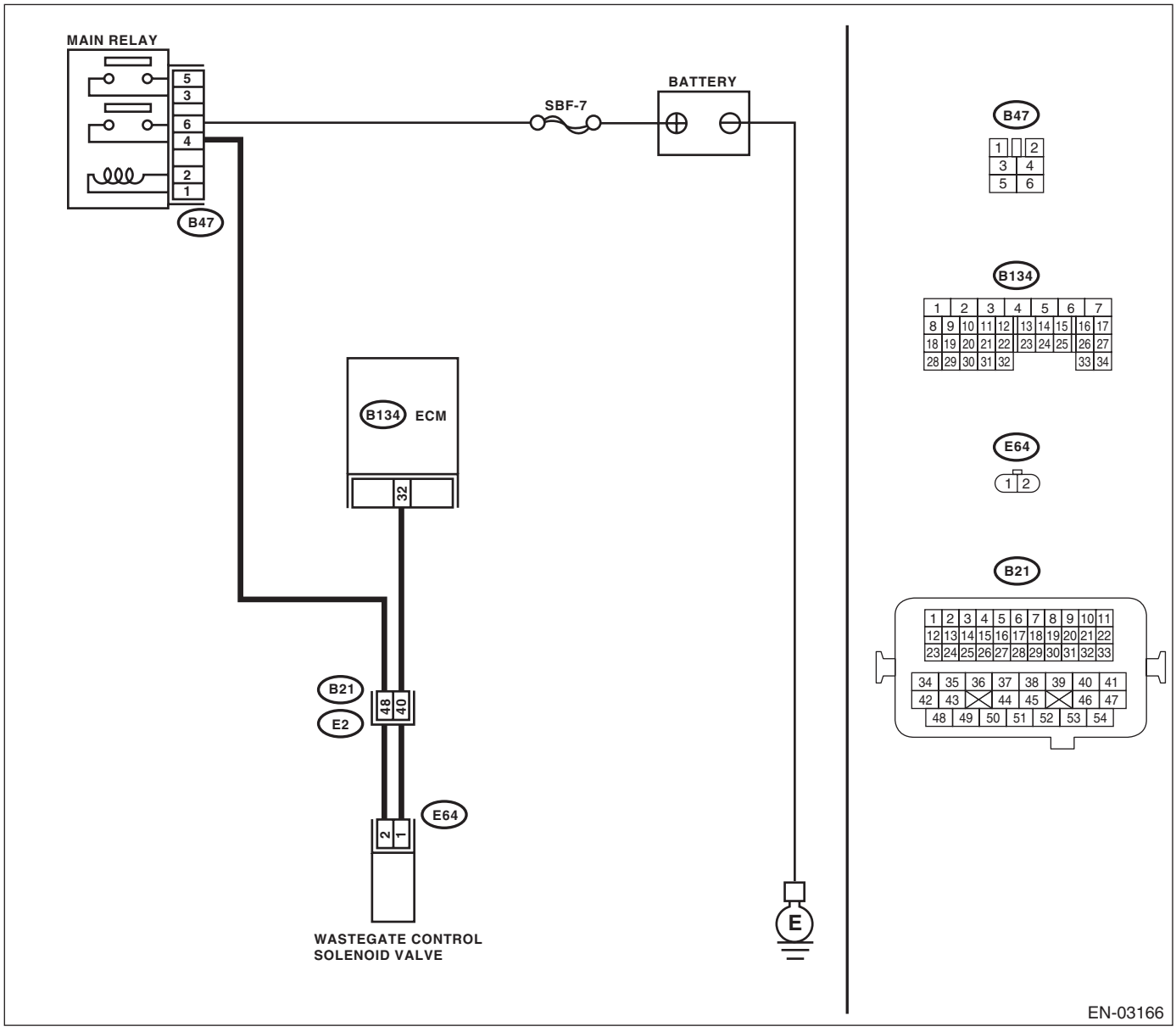
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-33, Wastegate Control Solenoid Valve.>

AN:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-93, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

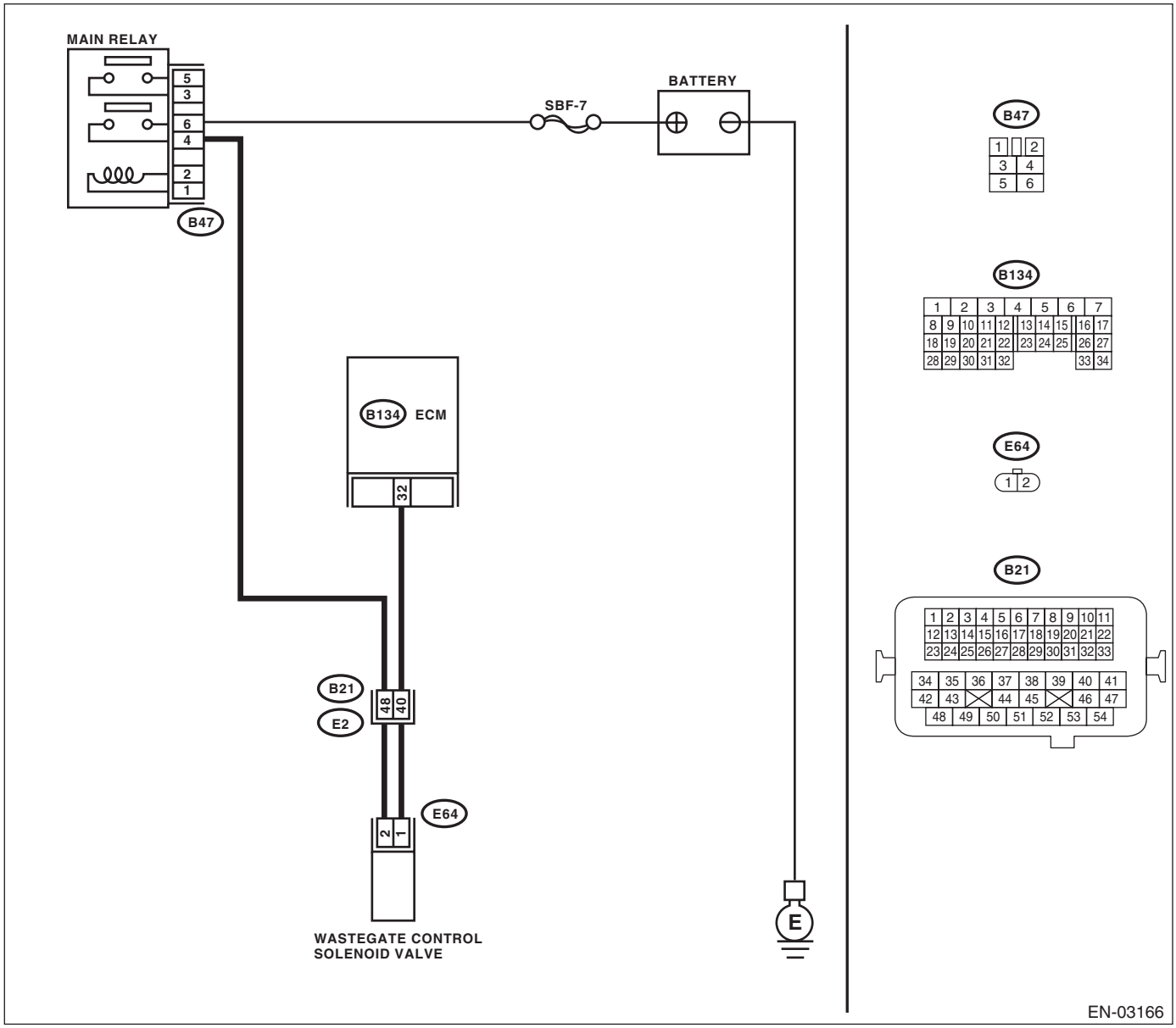
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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*** ***(B134) No. 32 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2**.
2	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E64) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair ground short circuit of harness between ECM and wastegate control solenoid valve connector.
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between wastegate control solenoid valve of harness connector and ECM. ***Connector & terminal*** ***(B134) No. 32 — (E64) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair open circuit of harness between ECM and wastegate control solenoid valve connector. NOTE: In this case, repair the following item: Open circuit of harness between ECM and wastegate control solenoid valve connector
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 30 — 34 Ω?	Go to step **5**.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-33, Wastegate Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. ***Connector & terminal*** ***(E64) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **6**.	Repair open circuit of harness between main relay and wastegate control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact of wastegate control solenoid valve connector.	Is there poor contact of wastegate control solenoid valve connector?	Repair poor contact in wastegate control solenoid valve connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

AO:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-95, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

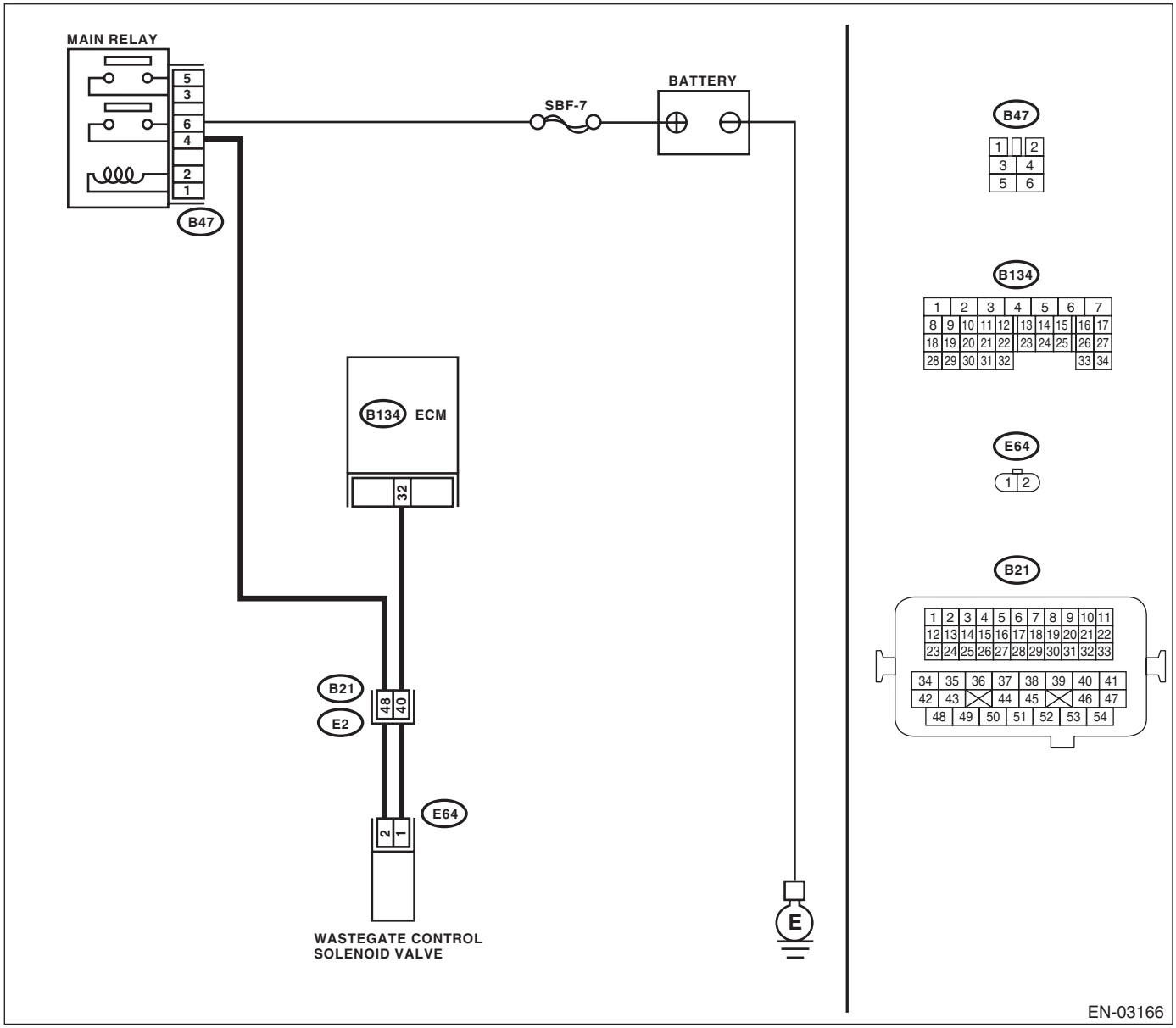
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC) (diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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*** ***(B134) No. 32 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3**.	Go to step **2**.
2	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit of harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Go to step **4**.
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the wastegate control solenoid valve and ECM. <Ref. to FU(H4DOTC)-33, Wastegate Control Solenoid Valve.> <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Go to step **5**.
5	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

AP:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-160, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AQ:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-160, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AR:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-160, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AS:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

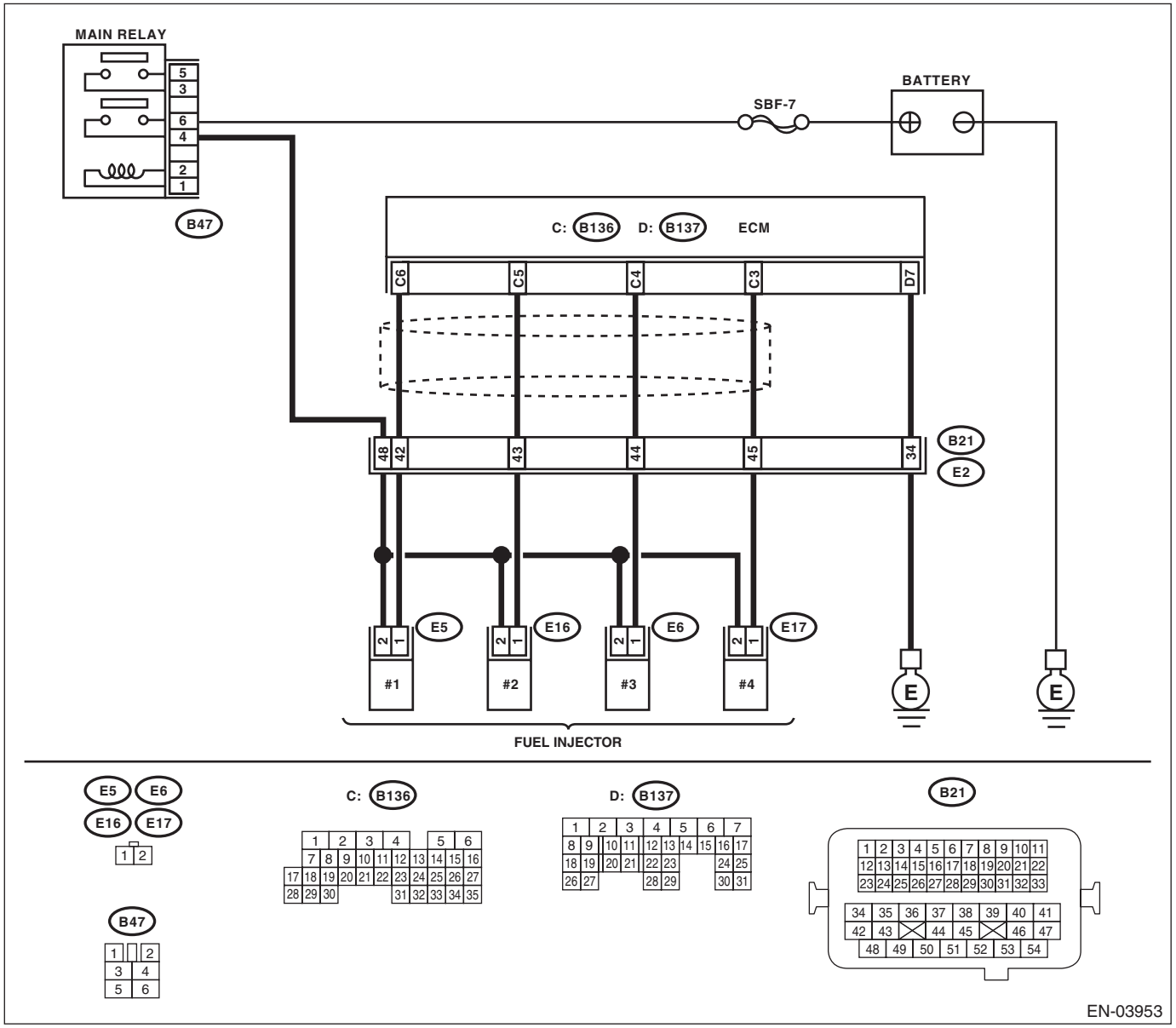
- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-102, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling
- Rough driving

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 (+) — Chassis ground (–):*** ***#2 (B136) No. 5 (+) — Chassis ground (–):*** ***#3 (B136) No. 4 (+) — Chassis ground (–):*** ***#4 (B136) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7**.	Go to step **3**.
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Disconnect the connectors from ECM. 4) Measure the resistance between ECM 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:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the ground short circuit of harness between fuel injector and ECM connector.
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 — (E5) No. 1:*** ***#2 (B136) No. 5 — (E16) No. 1:*** ***#3 (B136) No. 4 — (E6) No. 1:*** ***#4 (B136) No. 3 — (E17) No. 1:***	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 fuel injector connector • Poor contact of coupling connector
5	**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 **6**.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-28, Fuel Injector.>

	Step	Check	Yes	No
6	**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 (–):***	Is the voltage more than 10 V?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector • Poor contact of fuel injector connector on faulty cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 (+) — Chassis ground (–):*** ***#2 (B136) No. 5 (+) — Chassis ground (–):*** ***#3 (B136) No. 4 (+) — Chassis ground (–):*** ***#4 (B136) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Go to step **8**.
8	**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 between 5 — 20 Ω?	Go to step **9**.	Replace the faulty fuel injector and ECM. <Ref. to FU(H4DOTC)-28, Fuel Injector.> <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
9	**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 **10**.
10	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover.	Is the crank sprocket rusted or does it have broken teeth?	Replace the crankshaft sprocket. <Ref. to ME(H4DOTC)-51, Crank Sprocket.>	Go to step **11**.
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-42, Timing Belt.>	Go to step **12**.

	Step	Check	Yes	No
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **13**.	Replenish fuel so fuel meter indication is higher than the “Lower” level. After refueling, Go to step **13**.
13	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-42, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Does the malfunction indicator light illuminate or blink?	Go to step **15**.	Go to step **14**.
14	**CHECK CAUSE OF MISFIRE.**	Has the cause of misfire diagnosed when the engine is running?	Finish diagnostics operation, if the engine has no abnormality.	Repair the poor contact. 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
15	**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 **16**.
16	**CHECK CYLINDER.**	Is there any fault in the cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel Injector • Compression	Go to DTC P0171 and P0172. <Ref. to EN(H4DOTC)(diag)-137, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

DTC DETECTING CONDITION:

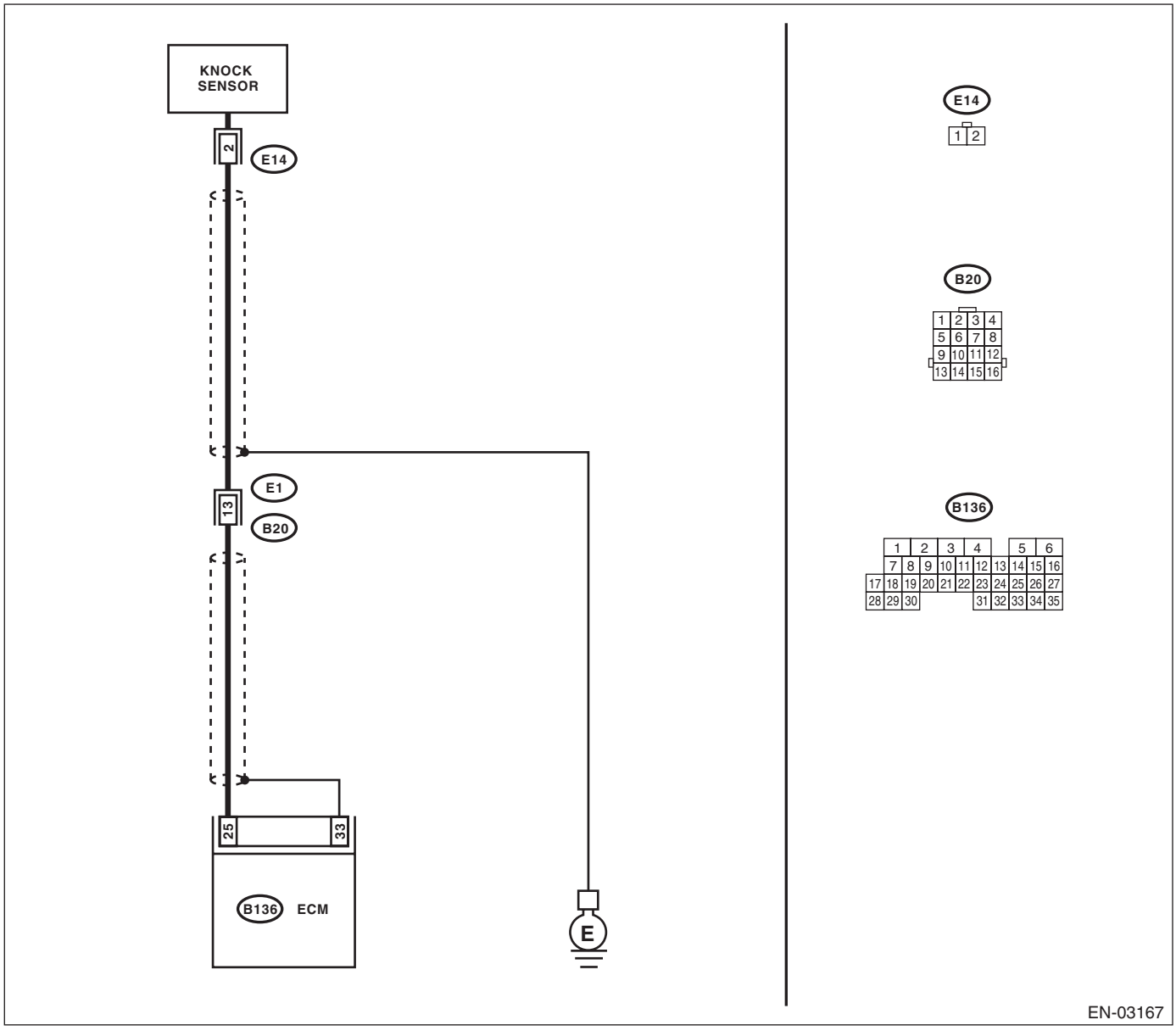
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-103, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between knock sensor and ECM connector • Poor contact of knock sensor connector • Poor contact of coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance more than 700 kΩ?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Poor contact of knock sensor connector • Poor contact of coupling connector
3	**CHECK INSTALLATION CONDITION OF KNOCK SENSOR.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4DOTC)-24, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

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

DTC DETECTING CONDITION:

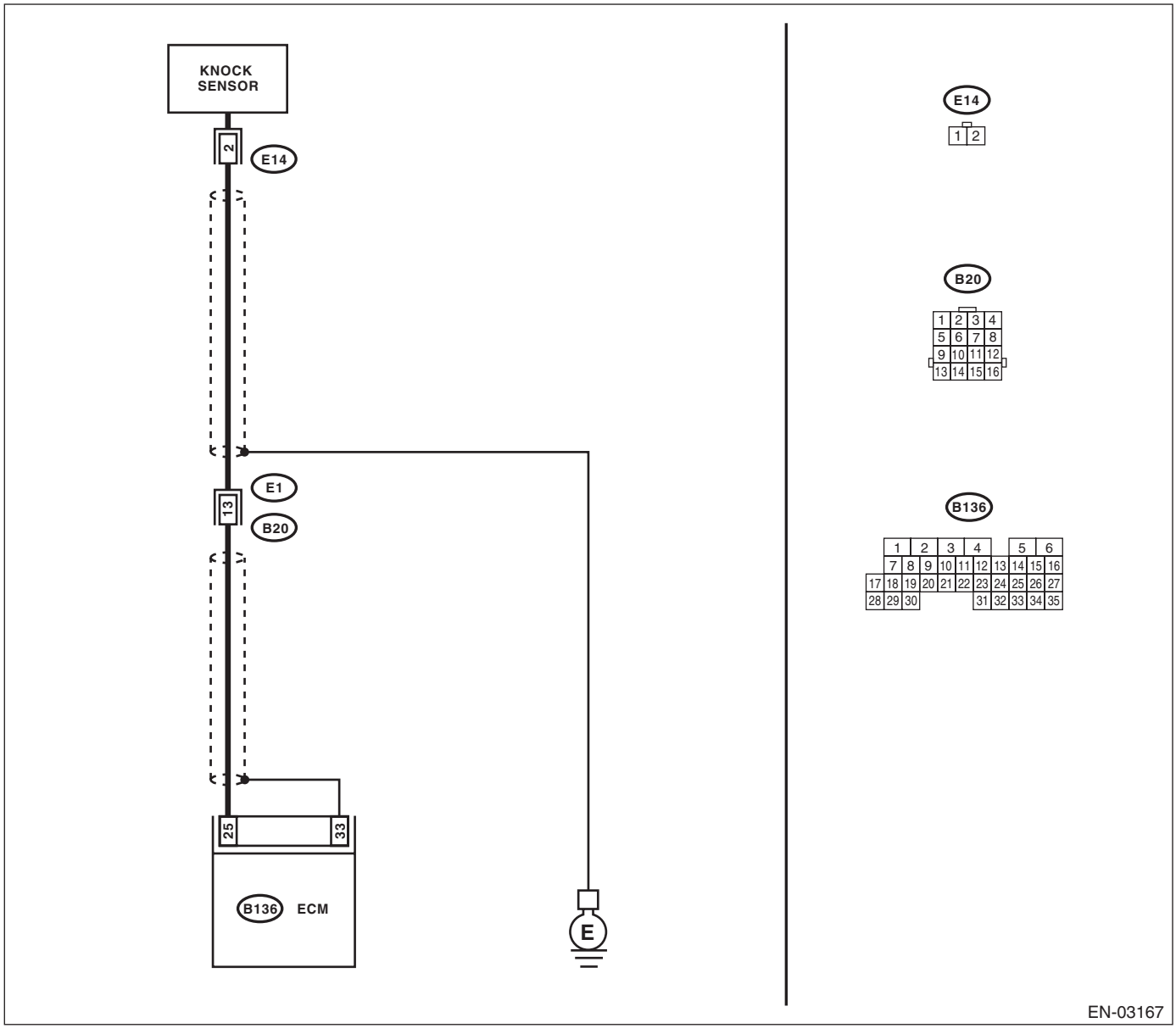
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-105, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the resistance less than 400 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 connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC)-24, Knock Sensor.>	Repair the ground short circuit of harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors are shielded. Repair the short circuit of harness covered with shield.
3	**CHECK INPUT SIGNAL OF ECM.** 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 25 (+) — Chassis ground (–):***	Is the voltage more than 2 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following item: • Poor contact of knock sensor connector • Poor contact in ECM connector • Poor contact of coupling connector	Repair the poor contact of ECM connector.

AV:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

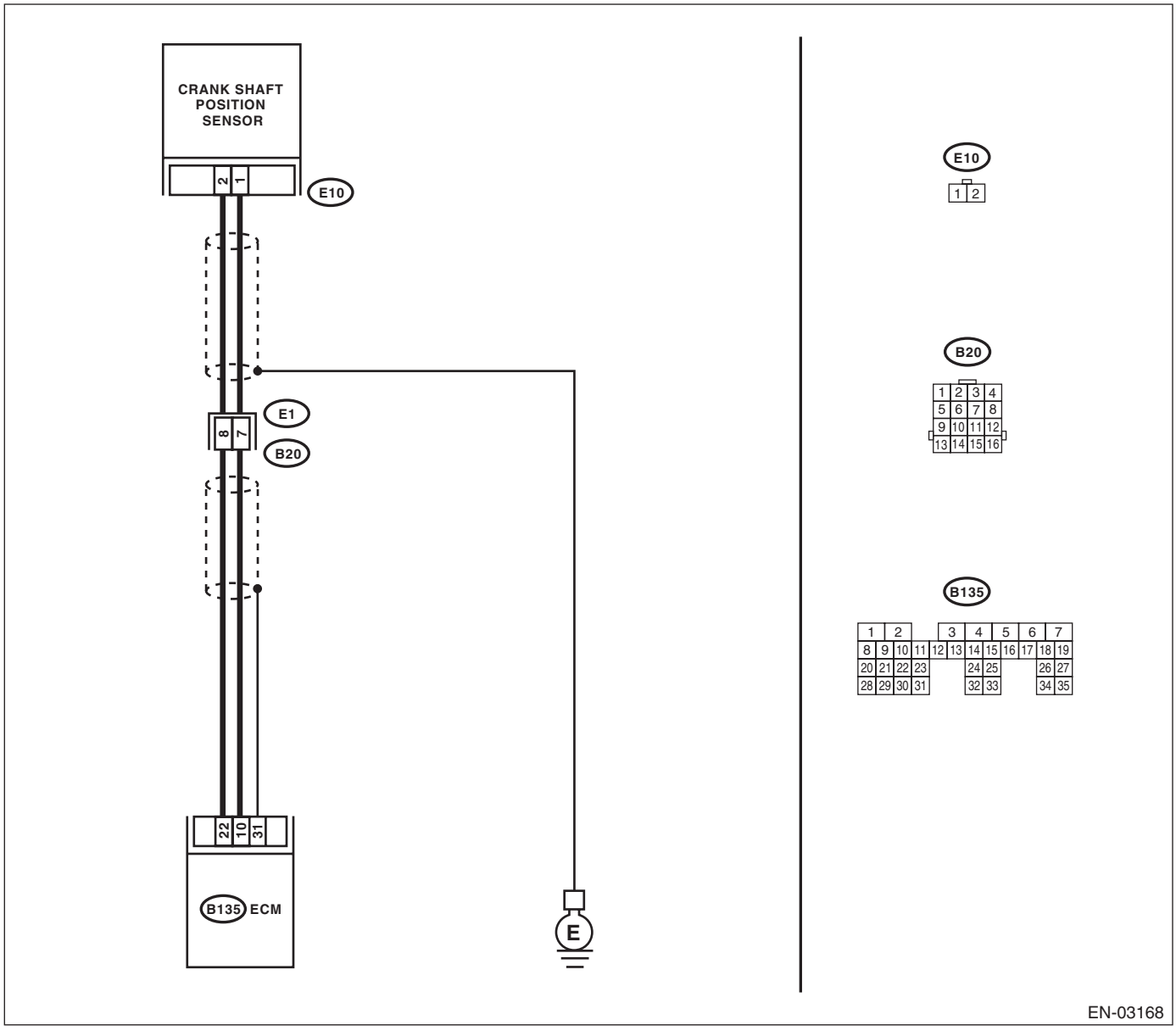
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-107, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — (B135) No. 10:*** ***(E10) No. 2 — (B135) No. 22:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact of coupling connector	Go to step **3**.
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:*** ***(E10) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the ground short circuit of harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit of harness with shield.
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5**.	Tighten the crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 1 and 4 kΩ?	Repair the poor contact of crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-22, Crankshaft Position Sensor.>

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

DTC DETECTING CONDITION:

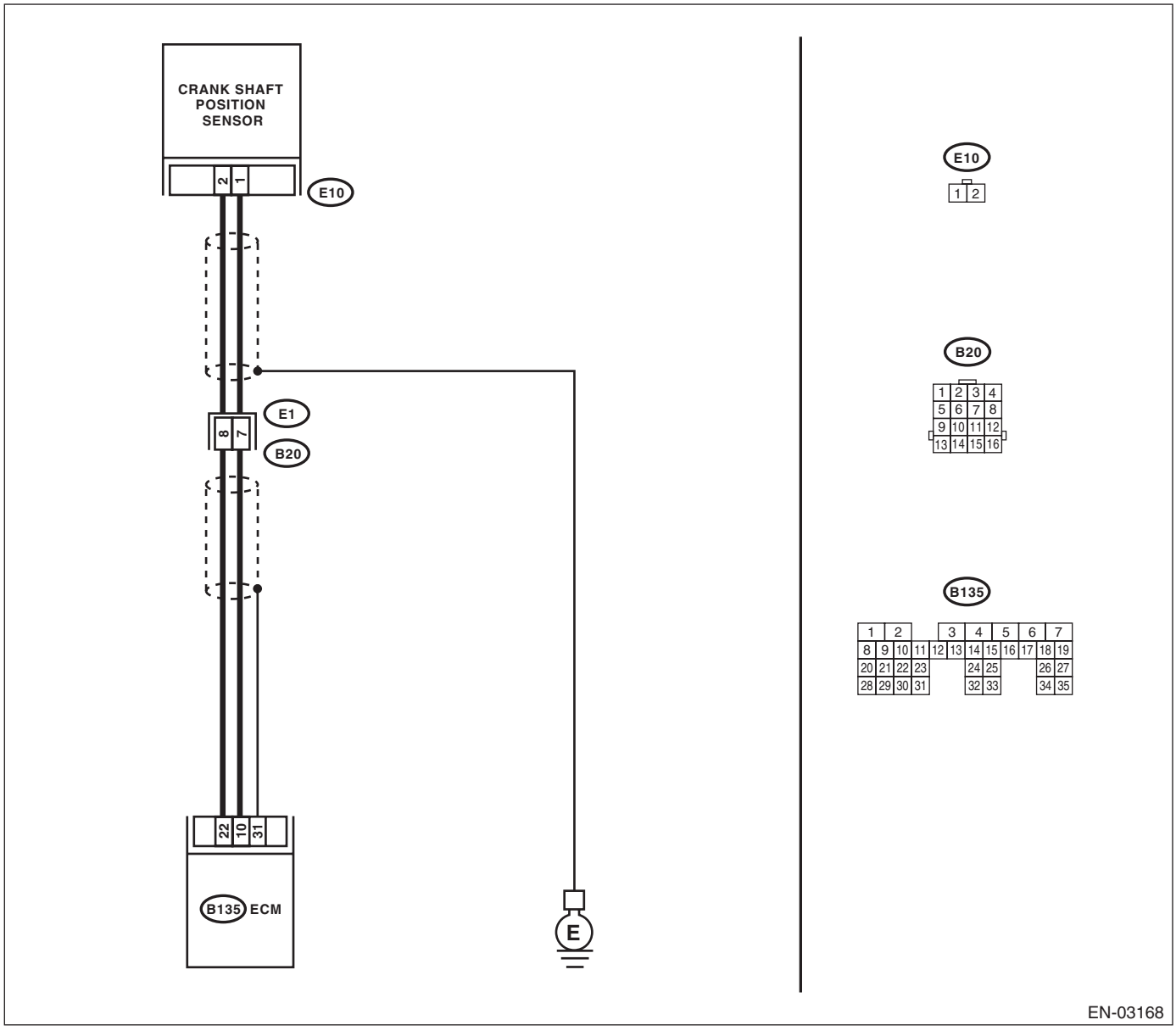
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-109, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3**.	Tighten the crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove the front belt cover.	Are crank sprocket teeth cracked or damaged?	Replace the crankshaft sprocket. <Ref. to FU(H4DOTC)-22, Crankshaft Position Sensor.>	Go to step **4**.
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-42, Timing Belt.>	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-22, Crankshaft Position Sensor.>

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

DTC DETECTING CONDITION:

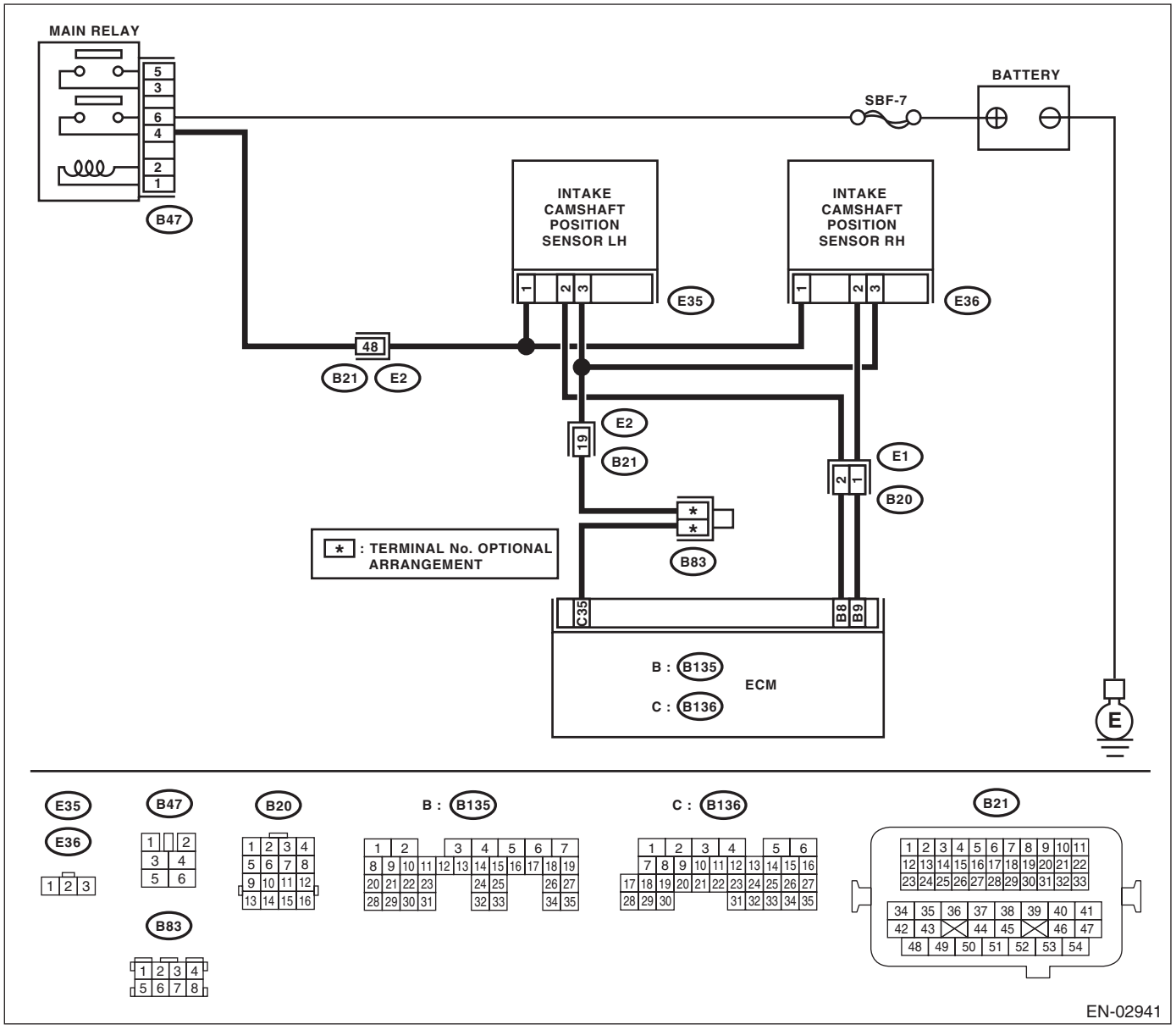
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-111, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **3**.
3	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **4**.	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor connector and ECM. ***Connector & terminal*** ***(E36) No. 2 — (B135) No. 9:*** ***(E36) No. 3 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit between camshaft position sensor and ECM.
5	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **6**.	Repair the ground short circuit between camshaft position sensor and ECM.
6	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **7**.	Tighten the camshaft position sensor installation bolt securely.
7	**CHECK CAMSHAFT POSITION SENSOR.** Check waveform of camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-16, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-23, Camshaft Position Sensor.>	Go to step **8**.
8	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-113, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

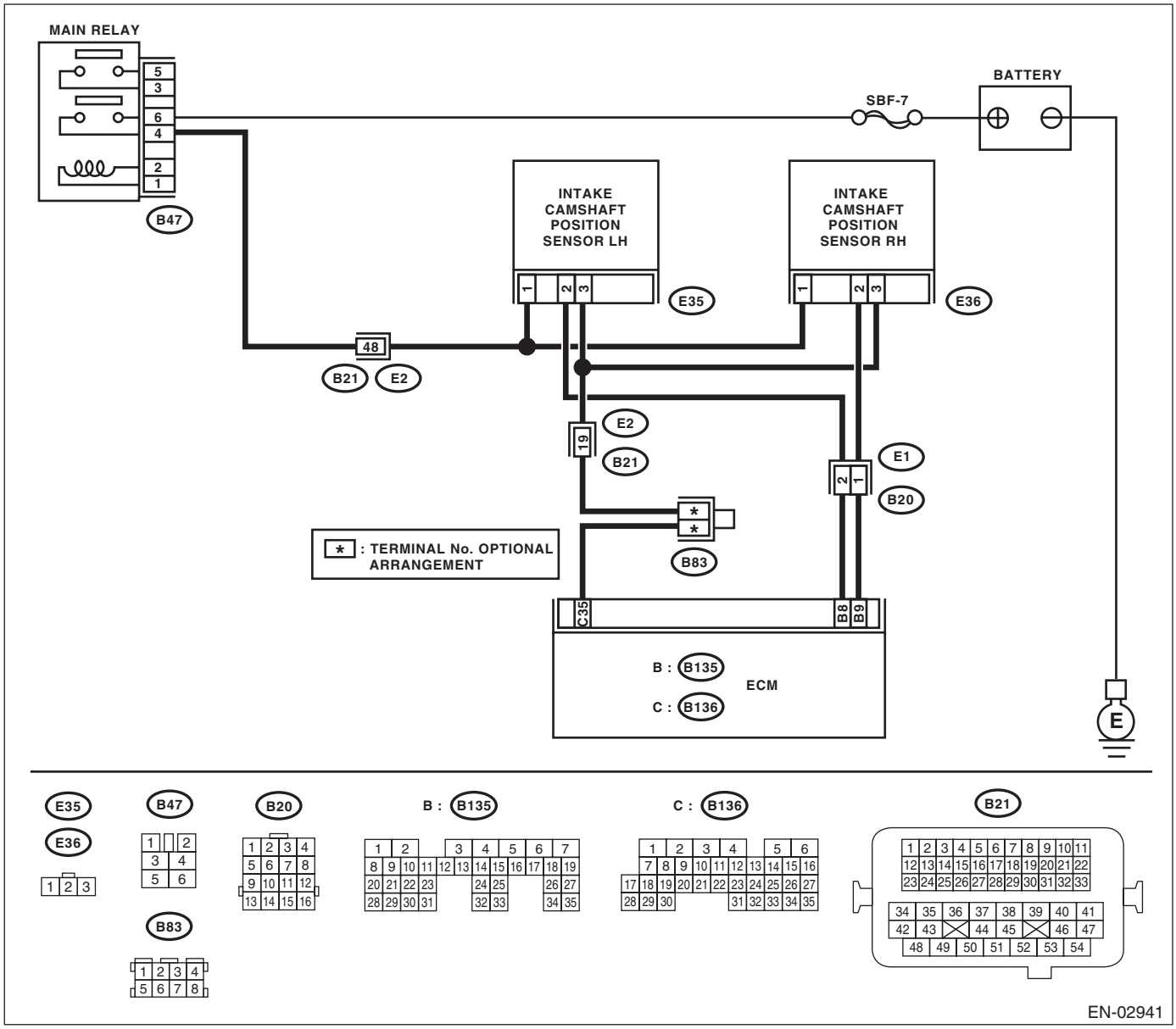
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **3**.
3	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **4**.	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor connector and ECM. ***Connector & terminal*** ***(E35) No. 2 — (B135) No. 8:*** ***(E35) No. 3 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit between camshaft position sensor and ECM.
5	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **6**.	Repair the ground short circuit between camshaft position sensor and ECM.
6	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **7**.	Tighten the camshaft position sensor installation bolt securely.
7	**CHECK CAMSHAFT POSITION SENSOR.** Check waveform of camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-16, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-23, Camshaft Position Sensor.>	Go to step **8**.
8	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

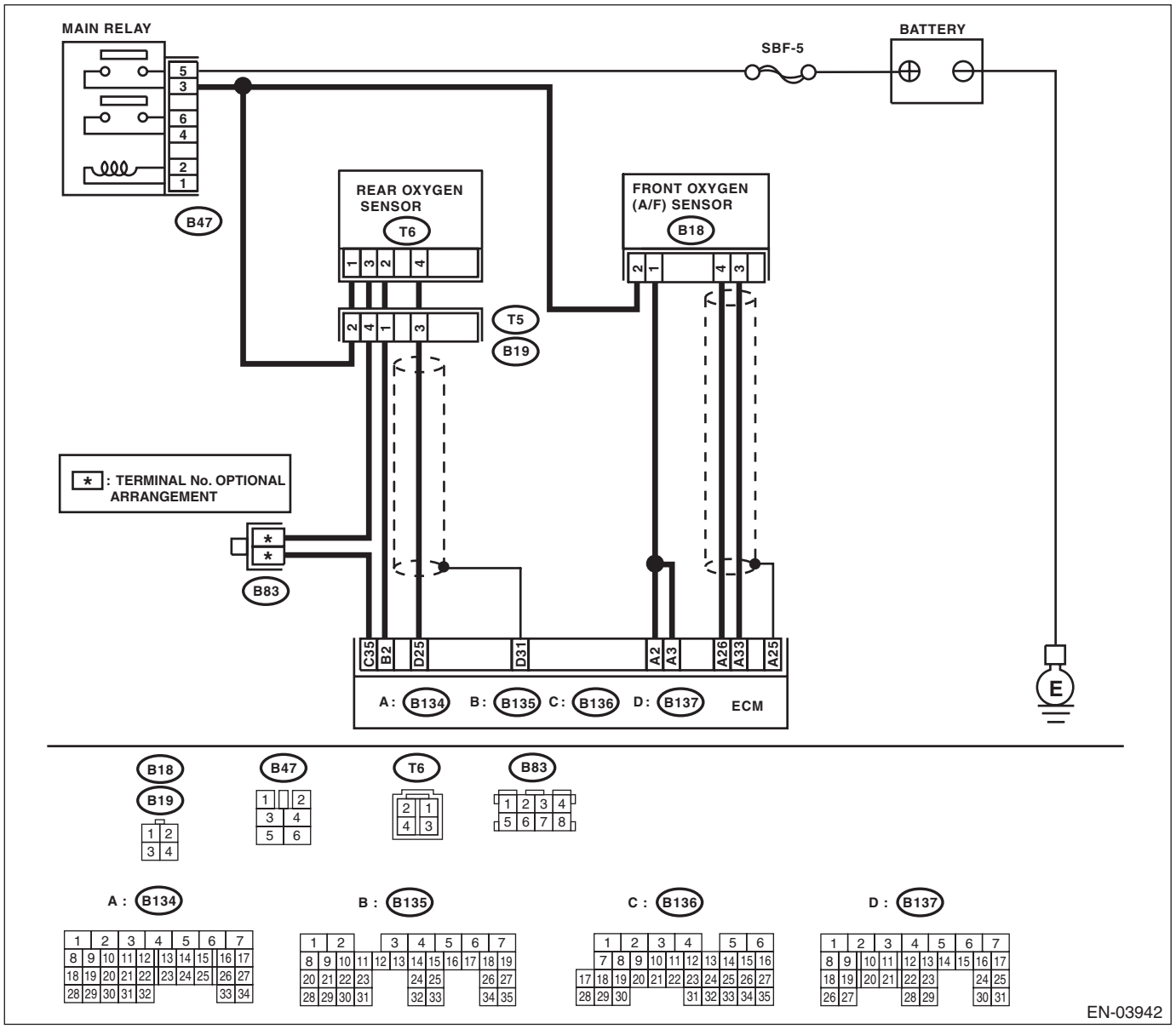
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-113, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

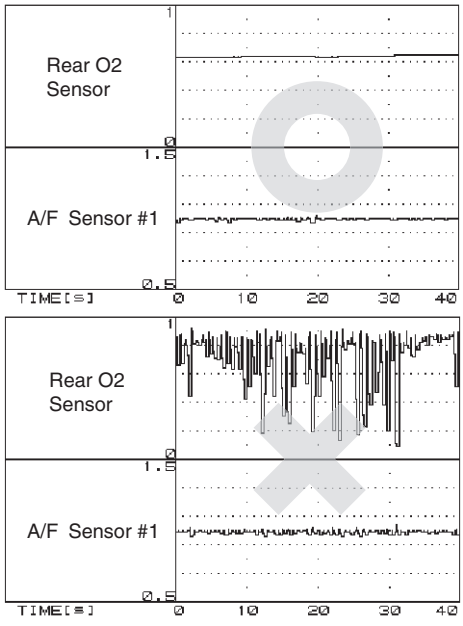
TROUBLE SYMPTOM:

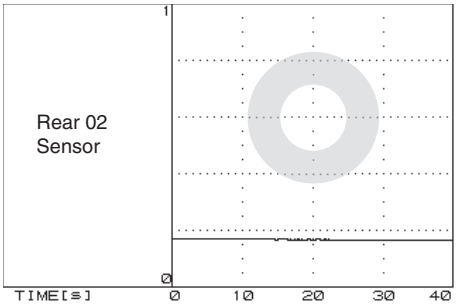
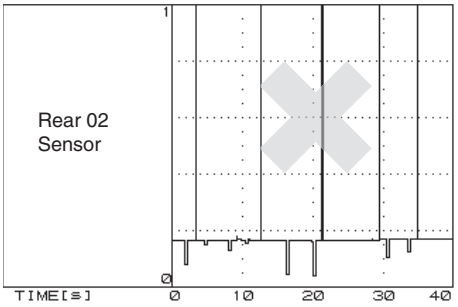
- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2**.
2	**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 part and improper installation of front oxygen (A/F) sensor or rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4DOTC)-2, General Description.>	Go to step **3**.
3	**CHECK WAVEFORM DATA ON SUBARU SELECT MONITOR (WHILE DRIVING).** 1) Drive the vehicle at a constant speed of 80 — 112 km/h (50 — 70 MPH). 2) Keep the condition of step 1) for 5 minutes, then read the waveform data in a driving condition using Subaru Select Monitor.  EN-04680	Is normal waveform pattern displayed?	Contact your SOA Service Center. NOTE: The probable cause is considered as the deterioration of multiple parts.	Go to step **4**.

	Step	Check	Yes	No
4	**CHECK WAVEFORM DATA ON SUBARU SELECT MONITOR (WHILE IDLING).** 1) Idle the engine. 2) Under the condition of step 1), read the waveform data using Subaru Select Monitor.   EN-04681	Is normal waveform pattern displayed?	Go to step **10**.	Go to step **5**.
5	**CHECK REAR OXYGEN SENSOR VOLTAGE.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the voltage of rear oxygen (A/F) sensor using Subaru Select Monitor. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage more than 490 mV?	Go to step **9**.	Go to step **6**.
6	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **7**.
7	**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*** ***(B137) No. 25 — (T6) No. 4:*** ***(B136) No. 35 — (T6) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **8**.

	Step	Check	Yes	No
8	**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*** ***(T6) No. 4 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Go to step **11**.	Repair the harness and connector. NOTE: Repair the following. • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor and ECM connector • Poor contact in ECM connector
9	**CHECK REAR OXYGEN SENSOR VOLTAGE.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the voltage of rear oxygen (A/F) sensor using Subaru Select Monitor. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage 250 mV or less?	Contact your SOA Service Center. NOTE: The probable cause is considered as the deterioration of multiple parts.	Go to step **6**.
10	**CHECK CATALYTIC CONVERTER.**	Is the catalytic converter damaged?	Replace the catalytic converter. <Ref. to EC(H4DOTC)-3, Front Catalytic Converter.>	Contact your SOA Service Center. NOTE: The probable cause is considered as the deterioration of multiple parts.
11	**CHECK REAR OXYGEN SENSOR SHIELD.** 1) Turn the ignition switch to OFF. 2) Bare the harness sensor shield on the body side of rear oxygen sensor connector. 3) Measure the resistance between sensor shield and chassis ground.	Is resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-36, Rear Oxygen Sensor.>	Repair the open circuit of rear oxygen sensor harness.

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

DTC DETECTING CONDITION:

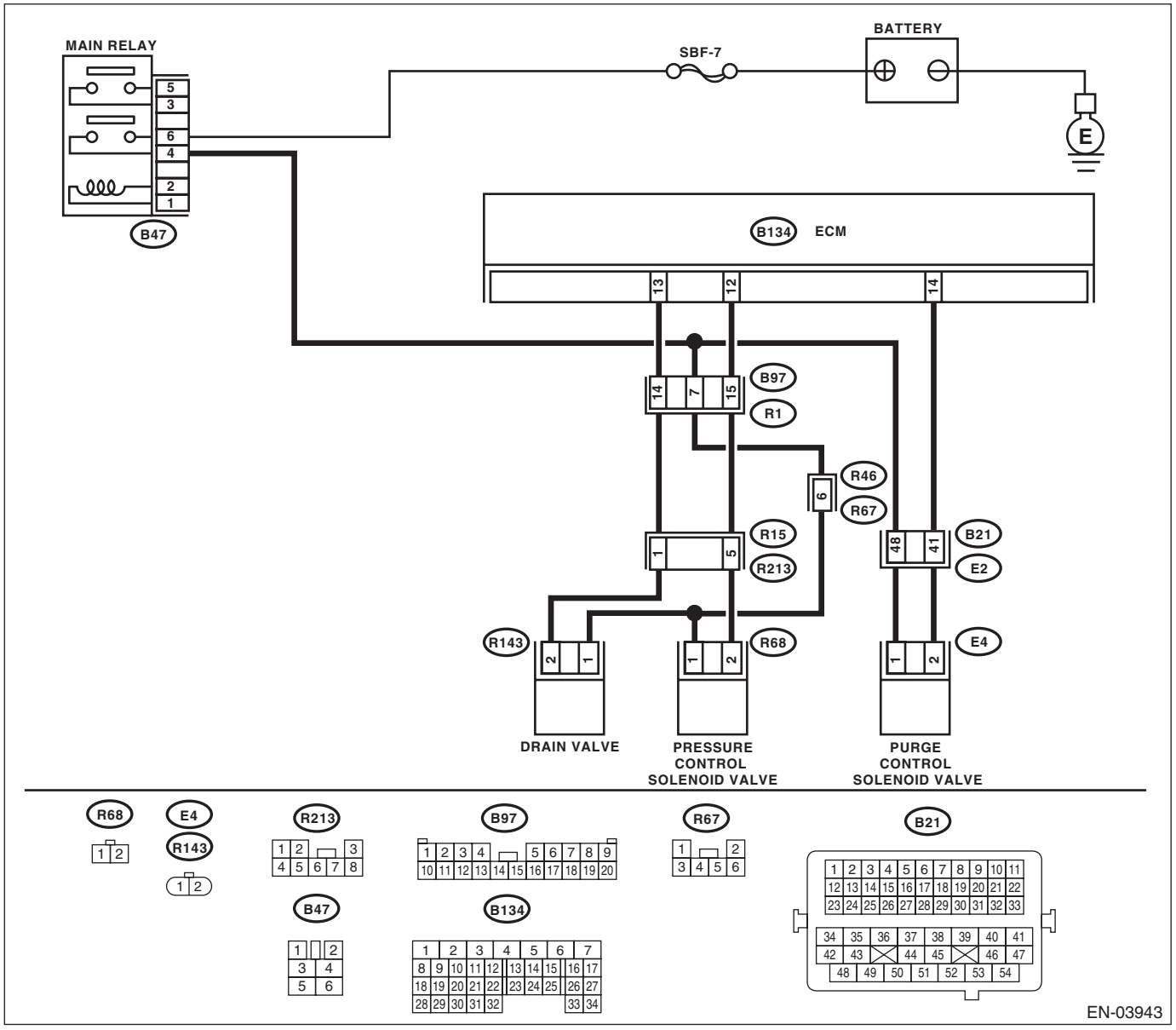
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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 repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**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 **3**.	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4**.	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	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(H4DOTC)-50, Fuel Filler Pipe.>	Go to step **5**.
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6**.	Replace the drain valve. <Ref. to EC(H4DOTC)-15, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-12, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn the ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. in evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-60, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9**.
9	**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(H4DOTC)-6, Canister.>	Go to step **10**.
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-44, 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(H4DOTC)-44, Fuel Tank.>	Go to step **11**.
11	**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.	Contact with SOA Service Center.

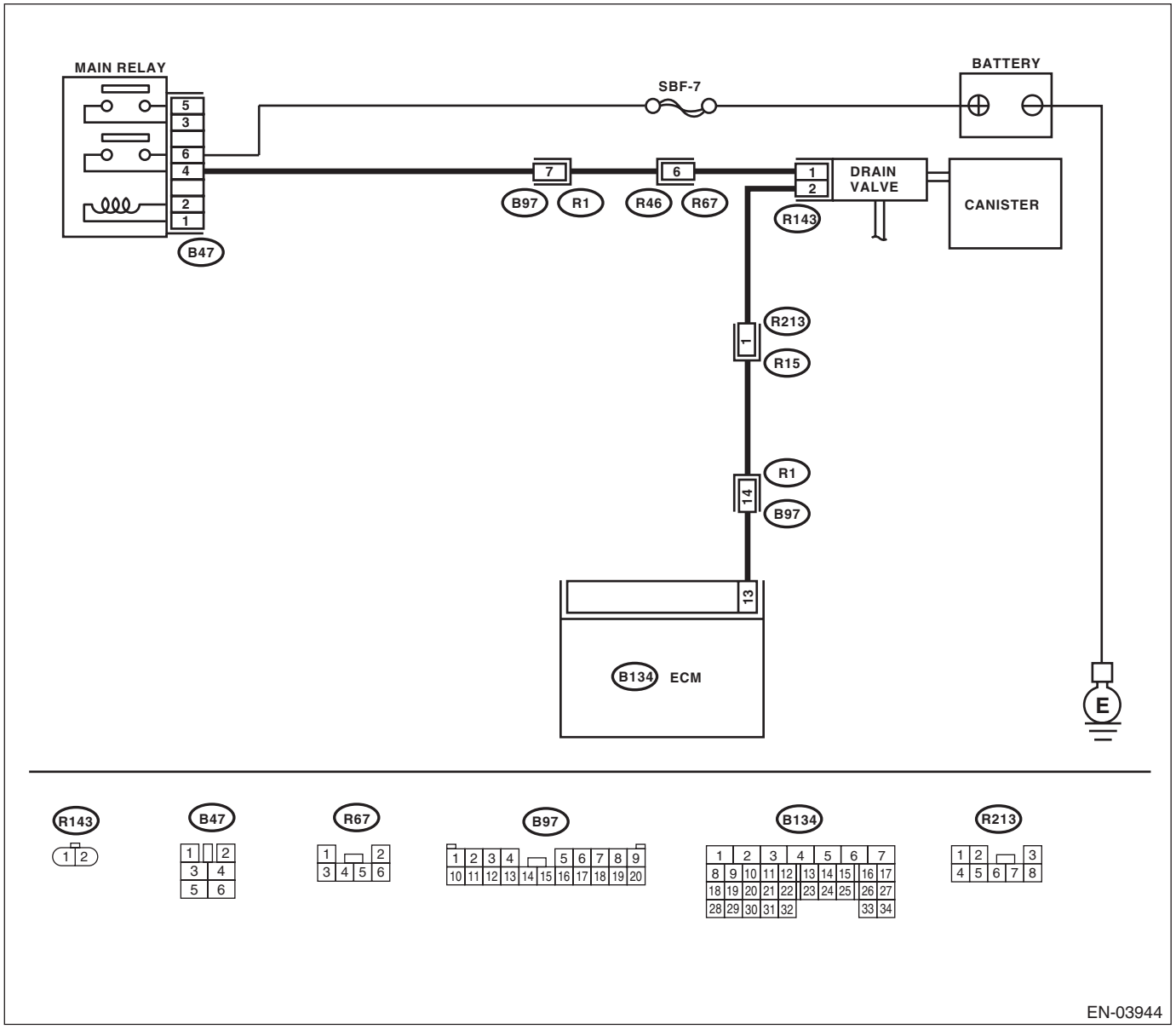
BB:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-131, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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*** ***(B134) No. 13 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following item: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from drain valve and ECM. 3) Measure the resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R143) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the ground short circuit of harness between ECM and drain valve connector.
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B134) No. 13 — (R143) No. 2:***	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 drain valve connector • Poor contact of coupling connector
5	**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 **6**.	Replace the drain valve. <Ref. to EC(H4DOTC)-15, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R143) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7**.	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
7	**CHECK POOR CONTACT.** Check for poor contact in the drain valve connector.	Is there poor contact in drain valve connector?	Repair the poor contact of drain valve connector.	Contact with SOA Service Center.

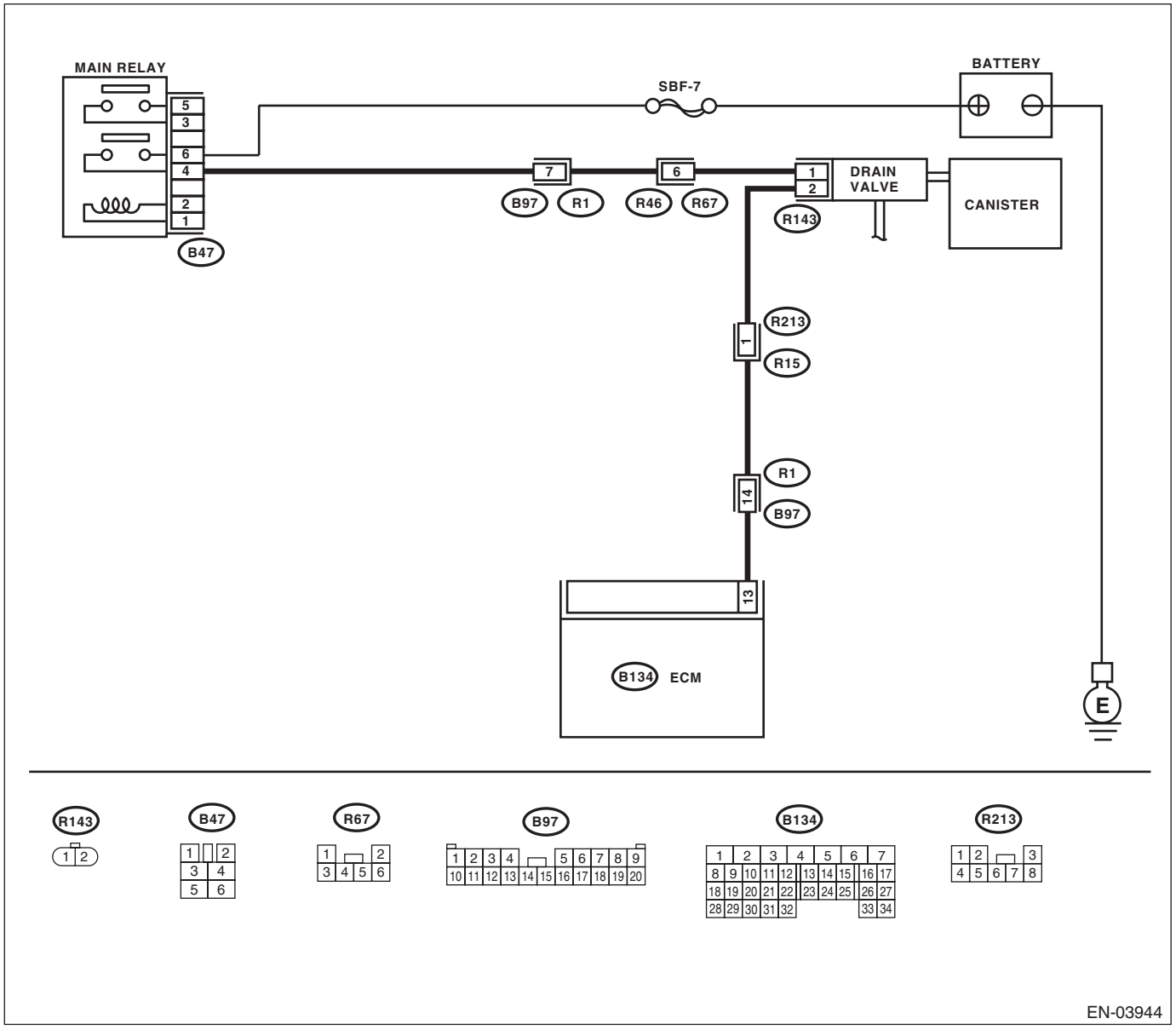
BC:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-133, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 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) While operating the drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (–):***	Is the voltage 0 — 10 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4**.	Go to step **3**.
3	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the drain valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Go to step **5**.
5	**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(H4DOTC)-15, Drain Valve.> and ECM <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>.	Go to step **6**.
6	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

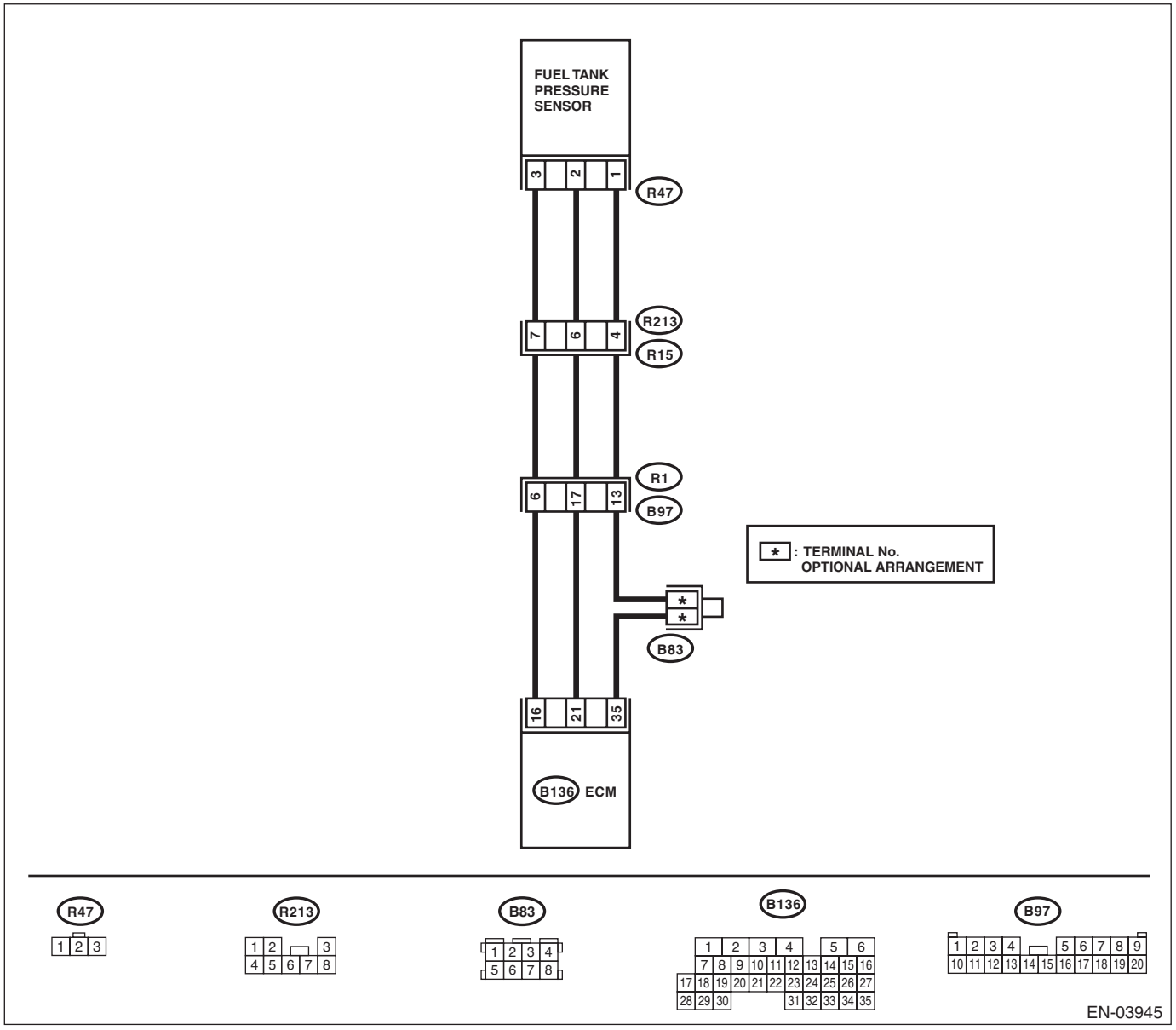
BD:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-135, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**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 **3**.	Tighten fuel filler cap securely.
3	**CHECK PRESSURE VACUUM LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there any fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-11, Fuel Tank Pressure Sensor.>

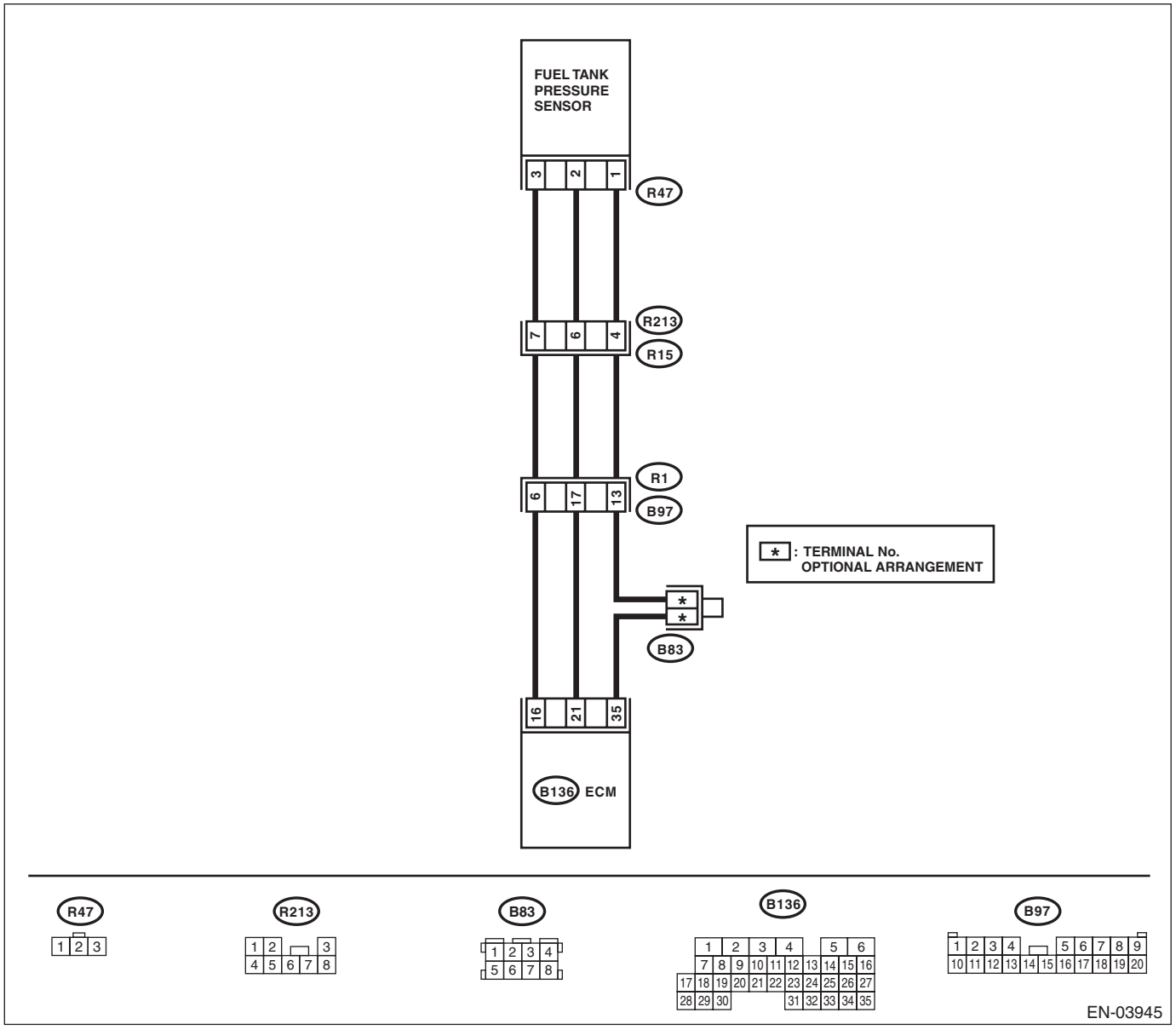
BE:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-137, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn the ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the measured value less than –2.8 kPa (–21.0 mmHg, –0.827 inHg)?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4**.	Go to step **3**.
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Repair the poor contact of ECM connector.	Contact with SOA Service Center.
4	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):***	Is the voltage less than 0.2 V?	Go to step **6**.	Go to step **5**.
5	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Does the measured value change by shaking the ECM harness and connector?	Repair the poor contact of ECM connector.	Go to step **6**.
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn the ignition switch to ON. 5) Measure the voltage between the rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **7**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and rear wiring harness connector • Poor contact of coupling connector

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B136) No. 35 — (R15) No. 4:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and rear wiring harness connector • Poor contact of coupling connector • Poor contact of joint connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure the resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9**.	Repair the ground short circuit of harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R213) No. 7 — (R47) No. 3:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair the open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R213) No. 4 — (R47) No. 1:***	Is the resistance less than 1 Ω?	Go to step **11**.	Repair the open circuit in fuel tank cord.
11	**CHECK FUEL TANK CORD.** Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. ***Connector & terminal*** ***(R47) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **12**.	Repair the ground short circuit of fuel tank cord.
12	**CHECK POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair the poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-11, Fuel Tank Pressure Sensor.>

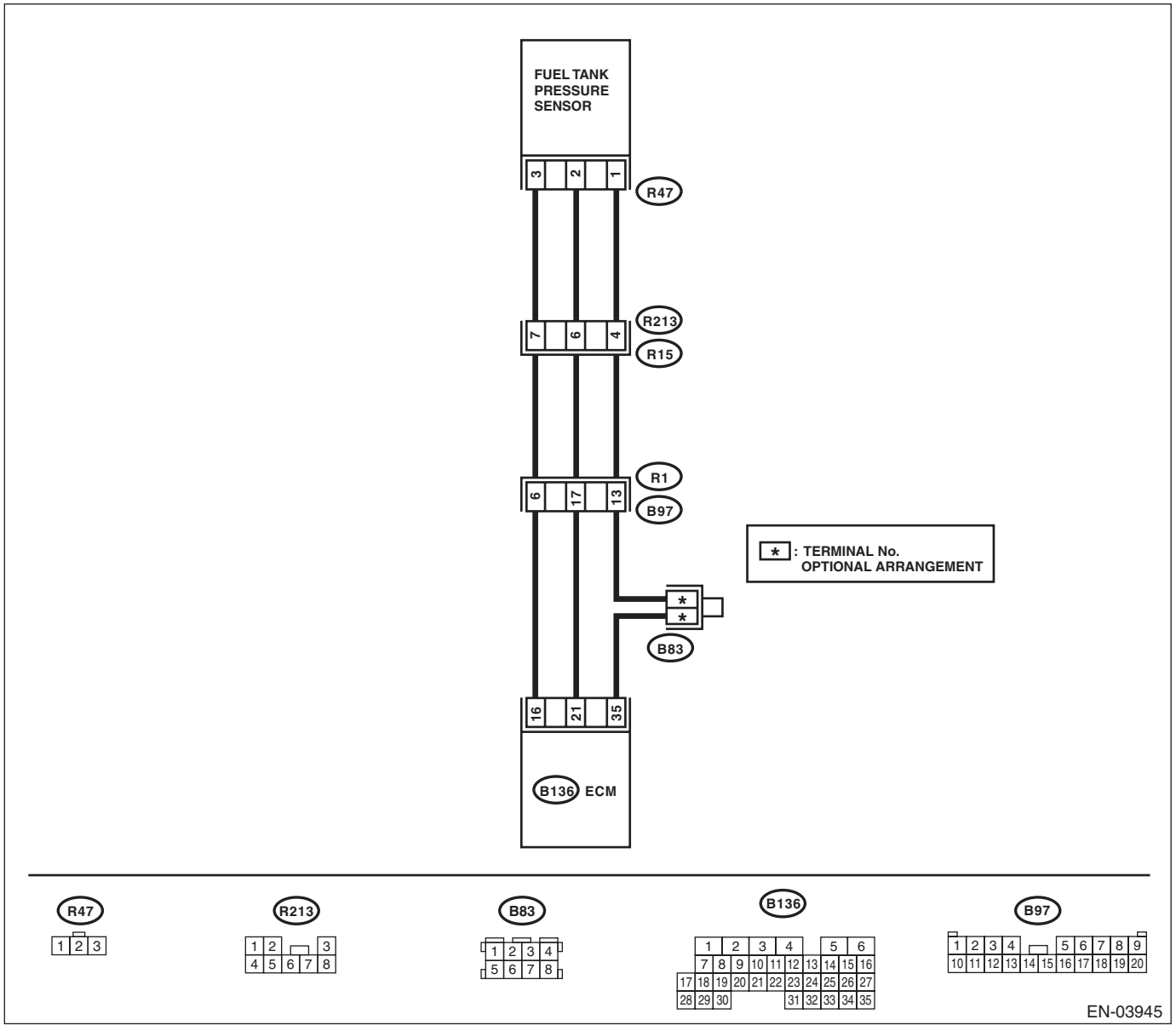
BF:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-139, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn the ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the measured value 2.8 kPa (21.0 mmHg, 0.827 inHg) or more?	Go to step **11**.	Go to step **2**.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4**.	Go to step **3**.
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Does the measured value change by shaking the ECM harness and connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
4	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):***	Is the voltage less than 0.2 V?	Go to step **6**.	Go to step **5**.
5	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the measured value more than –2.8 kPa (–21.0 mmHg, –0.827 inHg) when shaking the ECM harness and connector?	Repair the poor contact of ECM connector.	Go to step **6**.
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn the ignition switch to ON. 5) Measure the voltage between the rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **7**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and rear wiring harness connector • Poor contact of coupling connector

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B136) No. 21 — (R15) No. 6:*** ***(B136) No. 35 — (R15) No. 4:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and rear wiring harness connector • Poor contact of coupling connector
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from the fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R213) No. 6 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the open circuit in fuel tank cord.
9	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R213) No. 4 — (R47) No. 1:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair the open circuit in fuel tank cord.
10	**CHECK POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair the poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-11, Fuel Tank Pressure Sensor.>
11	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the measured value 2.8 kPa (21.0 mmHg, 0.827 inHg) or more?	Repair battery short circuit of harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-11, Fuel Tank Pressure Sensor.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-140, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

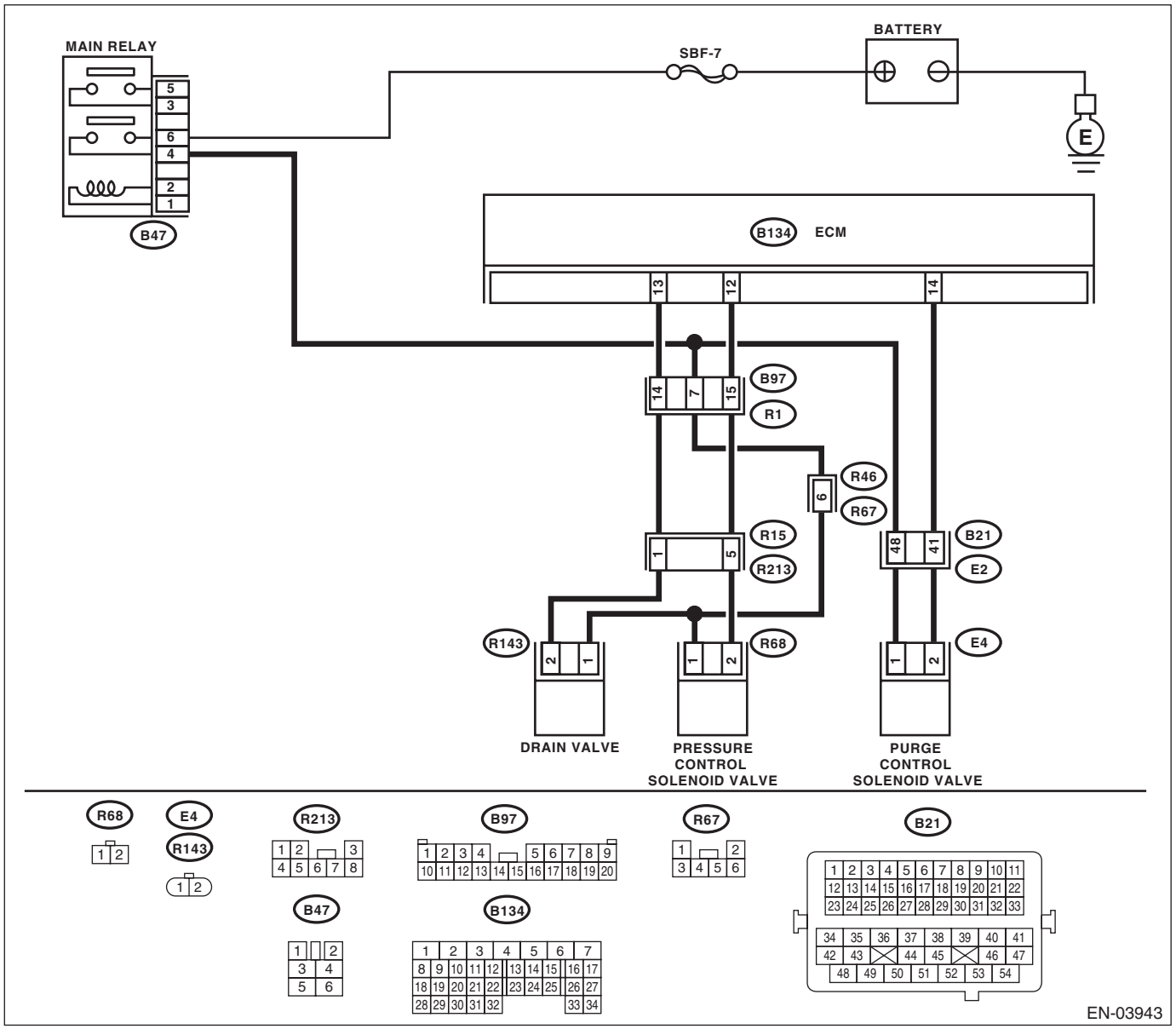
TROUBLE SYMPTOM:

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

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**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 **3**.	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4**.	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	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(H4DOTC)-50, Fuel Filler Pipe.>	Go to step **5**.
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6**.	Replace the drain valve. <Ref. to EC(H4DOTC)-15, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-12, Pressure Control Solenoid Valve.>

Step		Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn the ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. in evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-60, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9**.
9	**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(H4DOTC)-6, Canister.>	Go to step **10**.
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-44, 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(H4DOTC)-44, Fuel Tank.>	Go to step **11**.
11	**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.	Contact with SOA Service Center.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-140, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

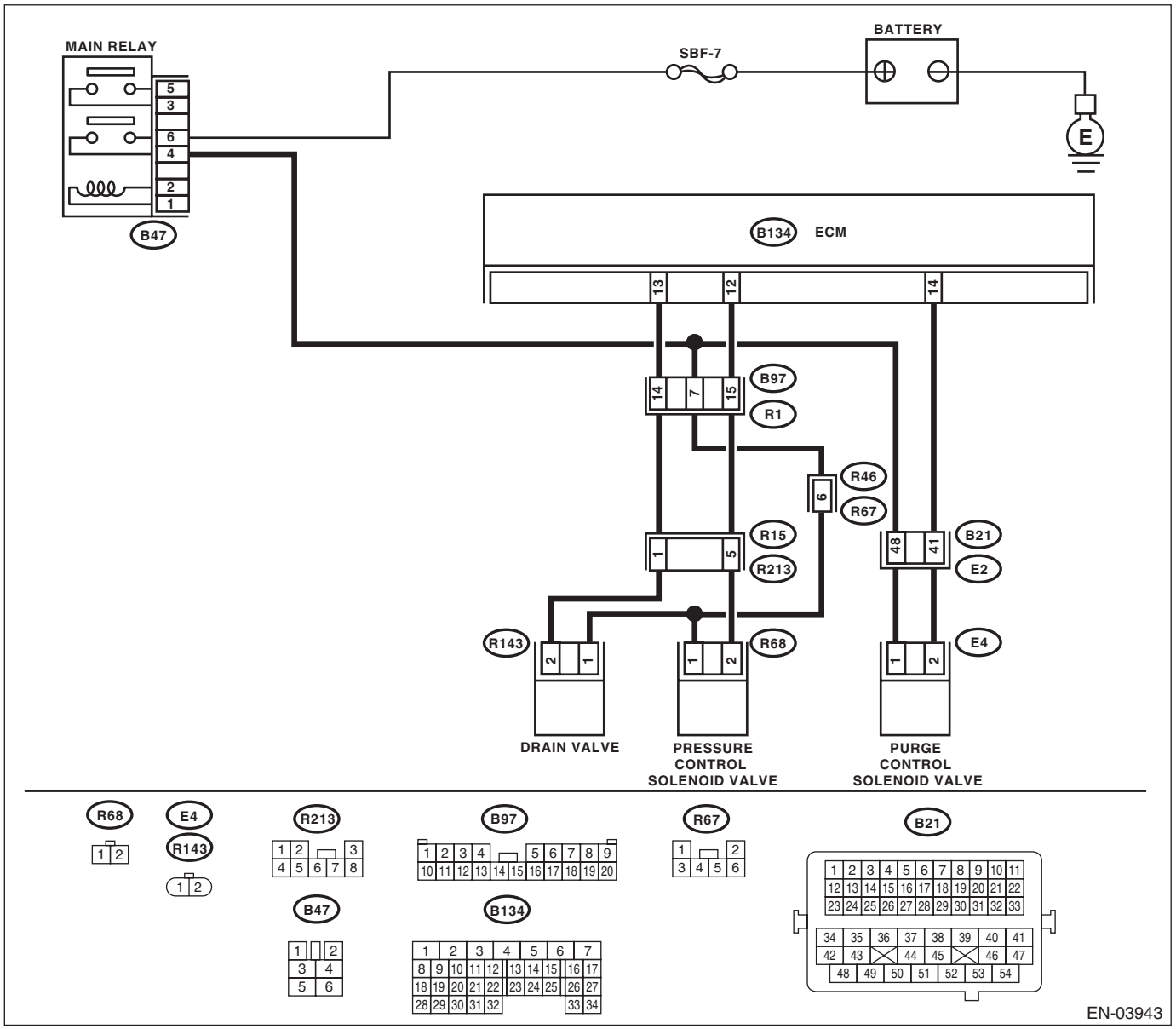
TROUBLE SYMPTOM:

- Fuel odor
- Fuel filler cap loose or lost

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**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 **3**.	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4**.	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	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(H4DOTC)-50, Fuel Filler Pipe.>	Go to step **5**.
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6**.	Replace the drain valve. <Ref. to EC(H4DOTC)-15, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-12, Pressure Control Solenoid Valve.>
8	**CHECK CANISTER.**	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H4DOTC)-6, Canister.>	Go to step **9**.

Step		Check	Yes	No
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-44, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-44, Fuel Tank.>	Go to step **10**.
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-141, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

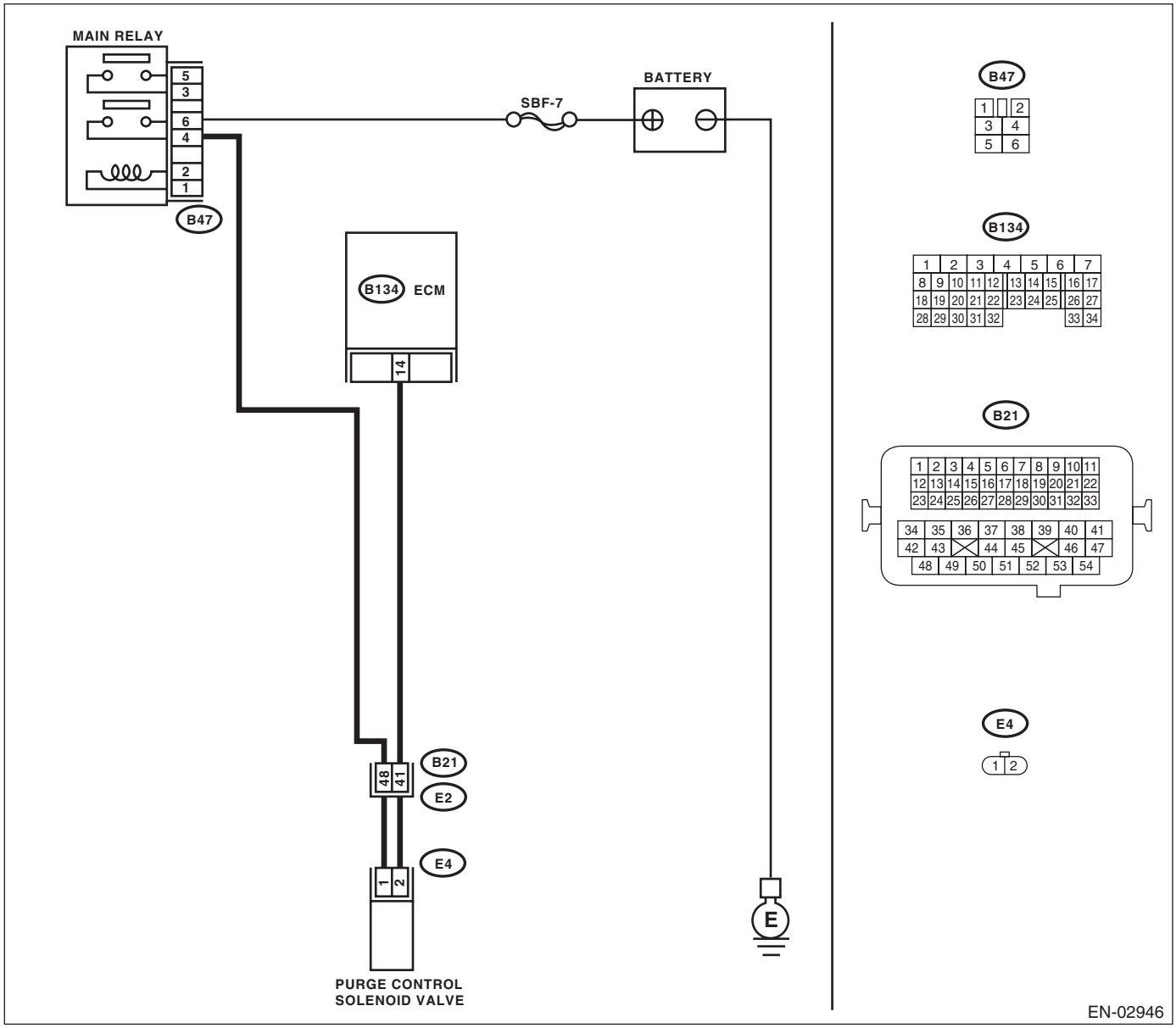
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2**.
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair the ground short circuit of harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve. ***Connector & terminal*** ***(B134) No. 14 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between ECM and purge control solenoid valve 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 29 — 35 Ω?	Go to step **5**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **6**.	Repair the open circuit of harness between main relay and purge control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact of purge control solenoid valve connector.	Is there poor contact of purge control solenoid valve connector?	Repair the poor contact of purge control solenoid valve connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-143, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

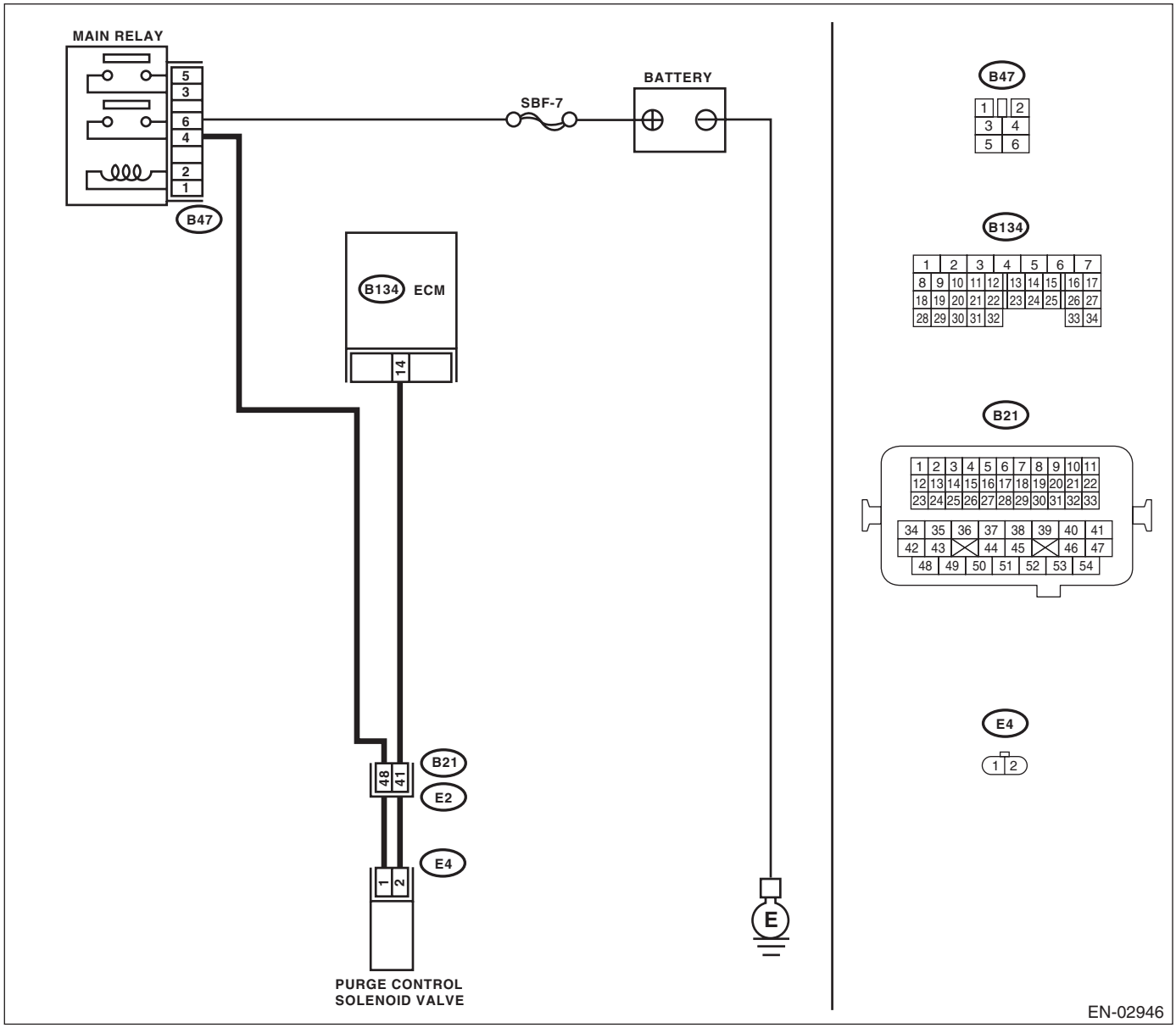
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 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.	Does the purge control solenoid valve operate?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 29 — 35 Ω?	Go to step **3**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Repair the battery short circuit of harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
4	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-145, DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0461.	Replace the fuel level sensor and fuel sub level sensor. <Ref. to FU(H4DOTC)-55, Fuel Level Sensor.> <Ref. to FU(H4DOTC)-56, Fuel Sub Level Sensor.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-147, DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P0462 displayed on the Subaru Select Monitor?	Check the combination meter. <Ref. to IDI-3, Combination Meter System.>	Temporary poor contact occurs.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-149, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P0463 displayed on the Subaru Select Monitor?	Check the combination meter. <Ref. to IDI-3, Combination Meter System.>	Temporary poor contact occurs.

BN:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-151, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P0464 displayed on the Subaru Select Monitor?	Check the combination meter. <Ref. to IDI-3, Combination Meter System.>	Temporary poor contact occurs.

BO:DTC P0483 FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-154, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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.

WIRING DIAGRAM:

Step		Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Check radiator fan, fan motor and thermostat and if thermostat is stuck, replace thermostat. <Ref. to CO(H4DOTC)-24, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-27, Radiator Sub Fan and Fan Motor.>

BP:DTC P0500 VEHICLE SPEED SENSOR “A”

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-155, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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)-34, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact of ECM.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-157, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

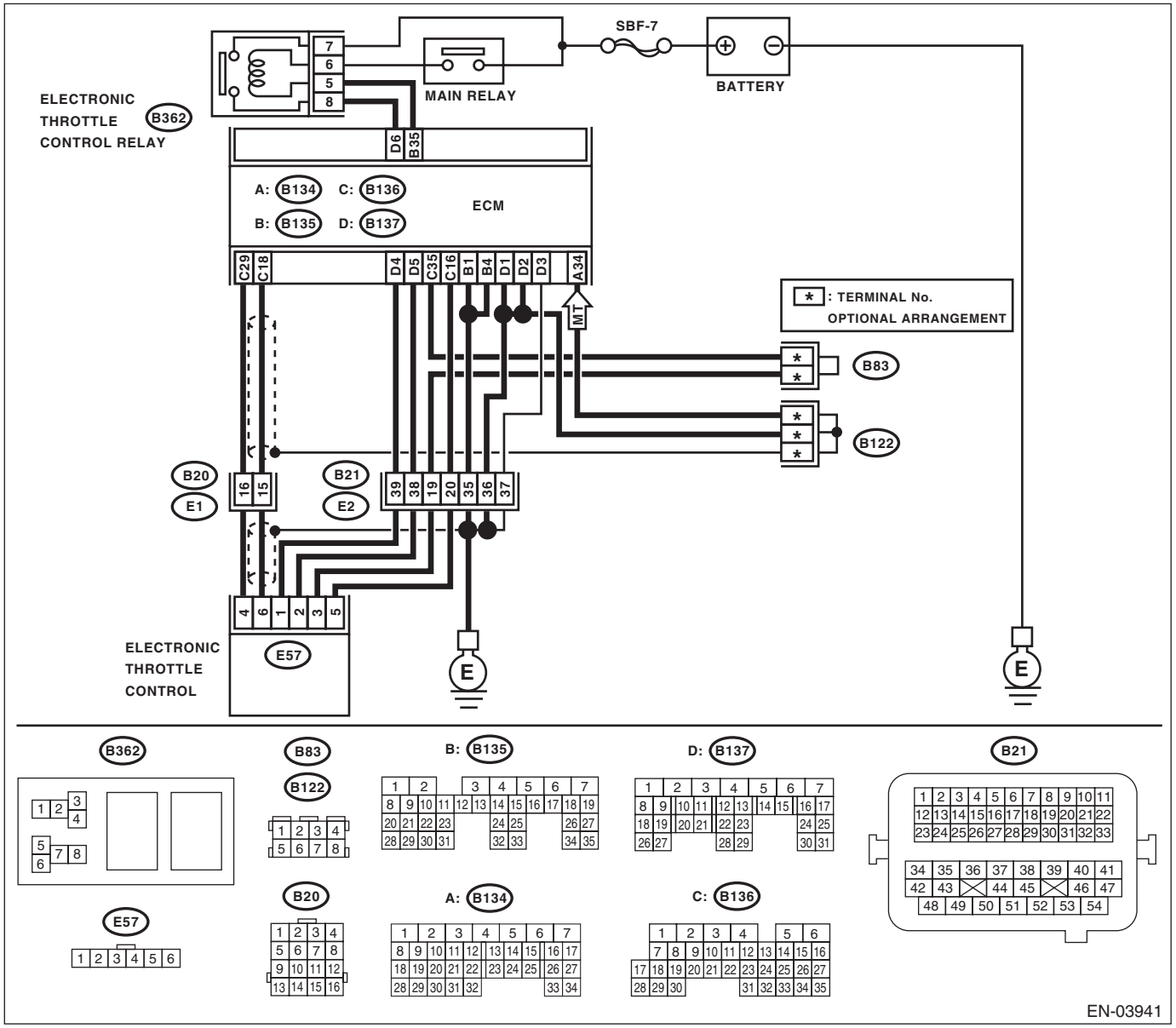
TROUBLE SYMPTOM:

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

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	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(H4DOTC)-7, Air Cleaner Element.>	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.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-159, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

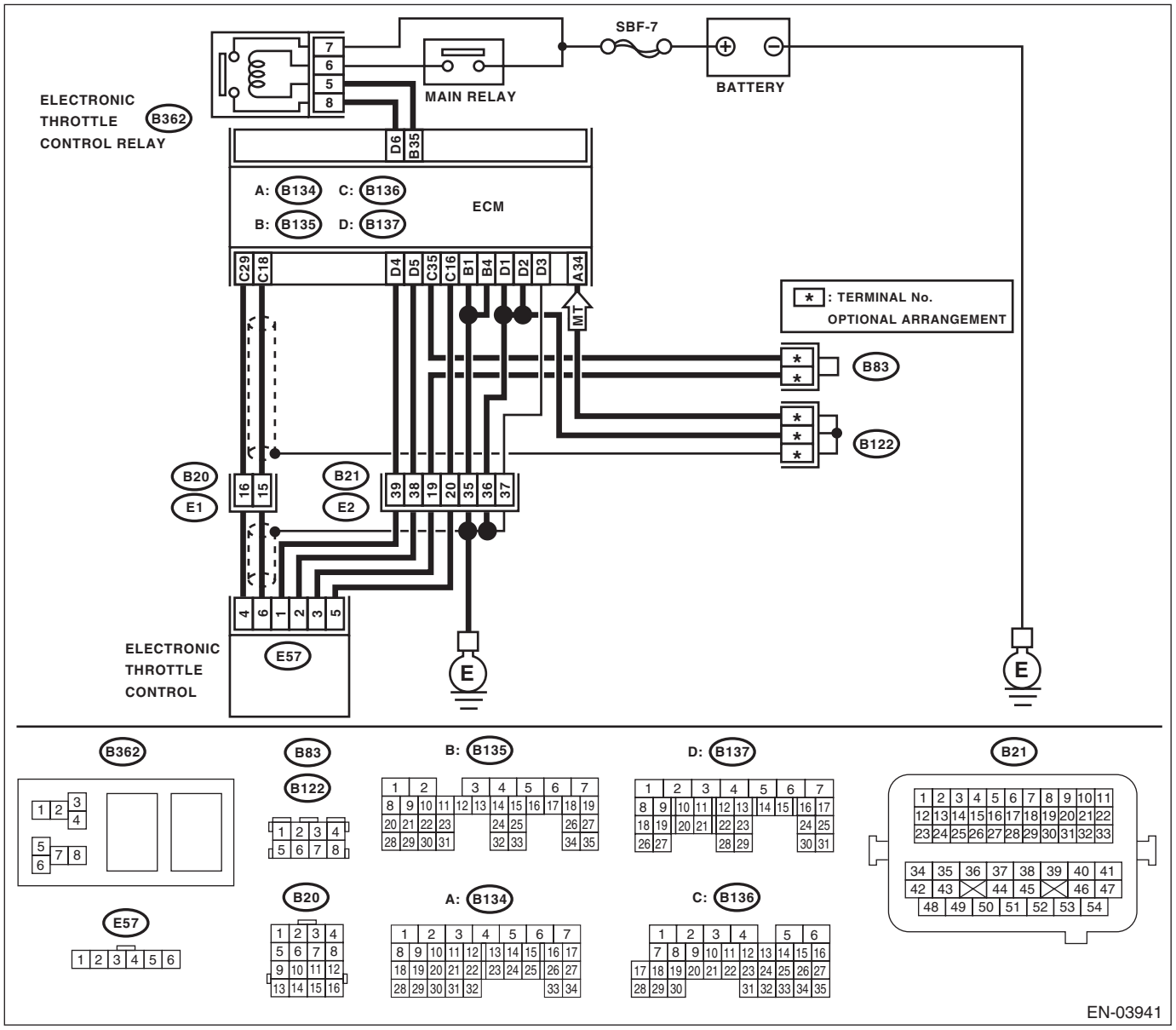
TROUBLE SYMPTOM:

Engine keeps running at higher speed than specified idle speed.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) 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.

BS:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-161, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

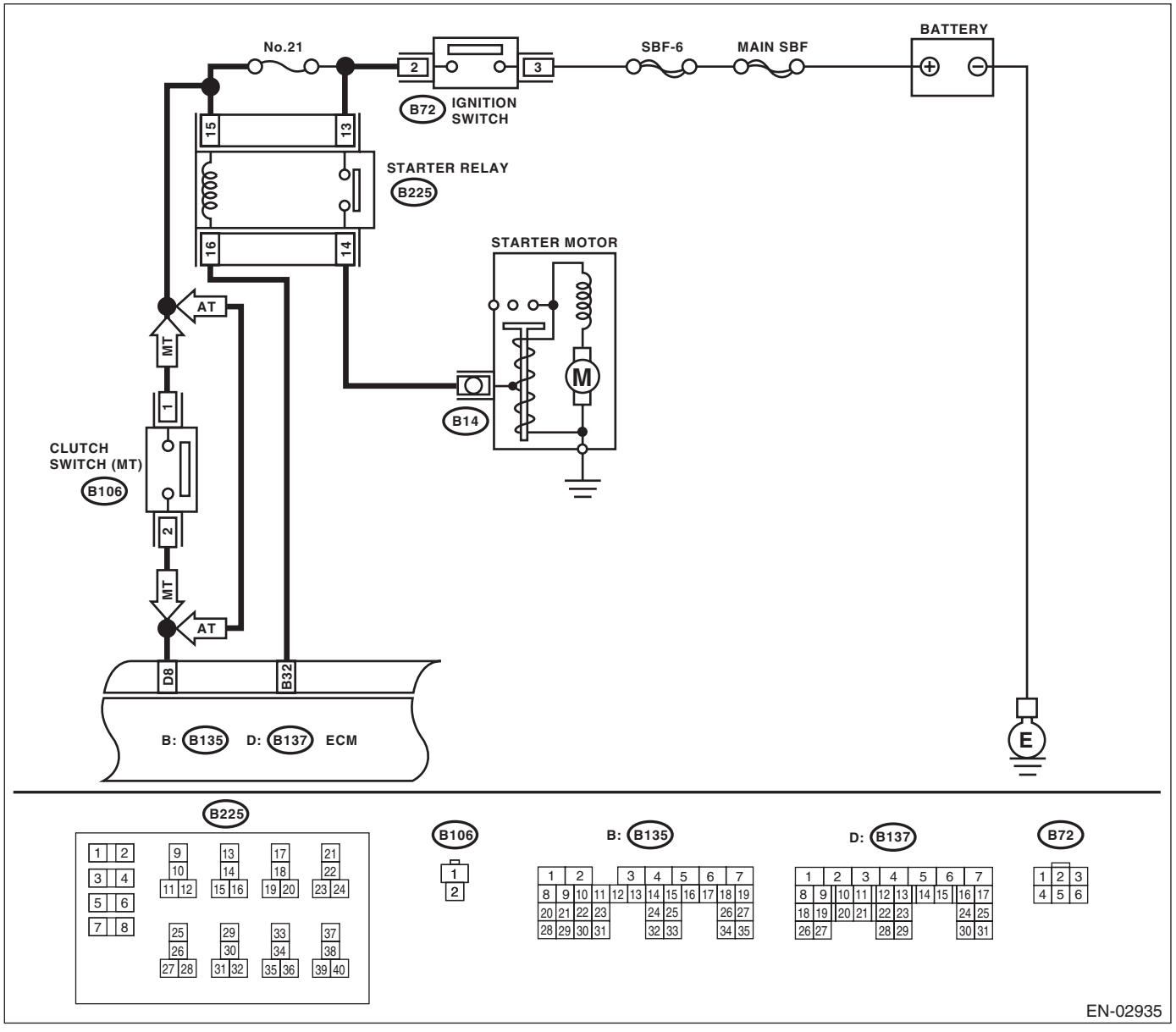
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN IGNITION SWITCH AND ECM.** 1) Disconnect the connectors from ECM. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 32 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ignition switch and ECM.	Repair the poor contact of ECM.

BT:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-163, 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.
- Fuel is cut according to fail-safe function.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) 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.

BU:DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-164, DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

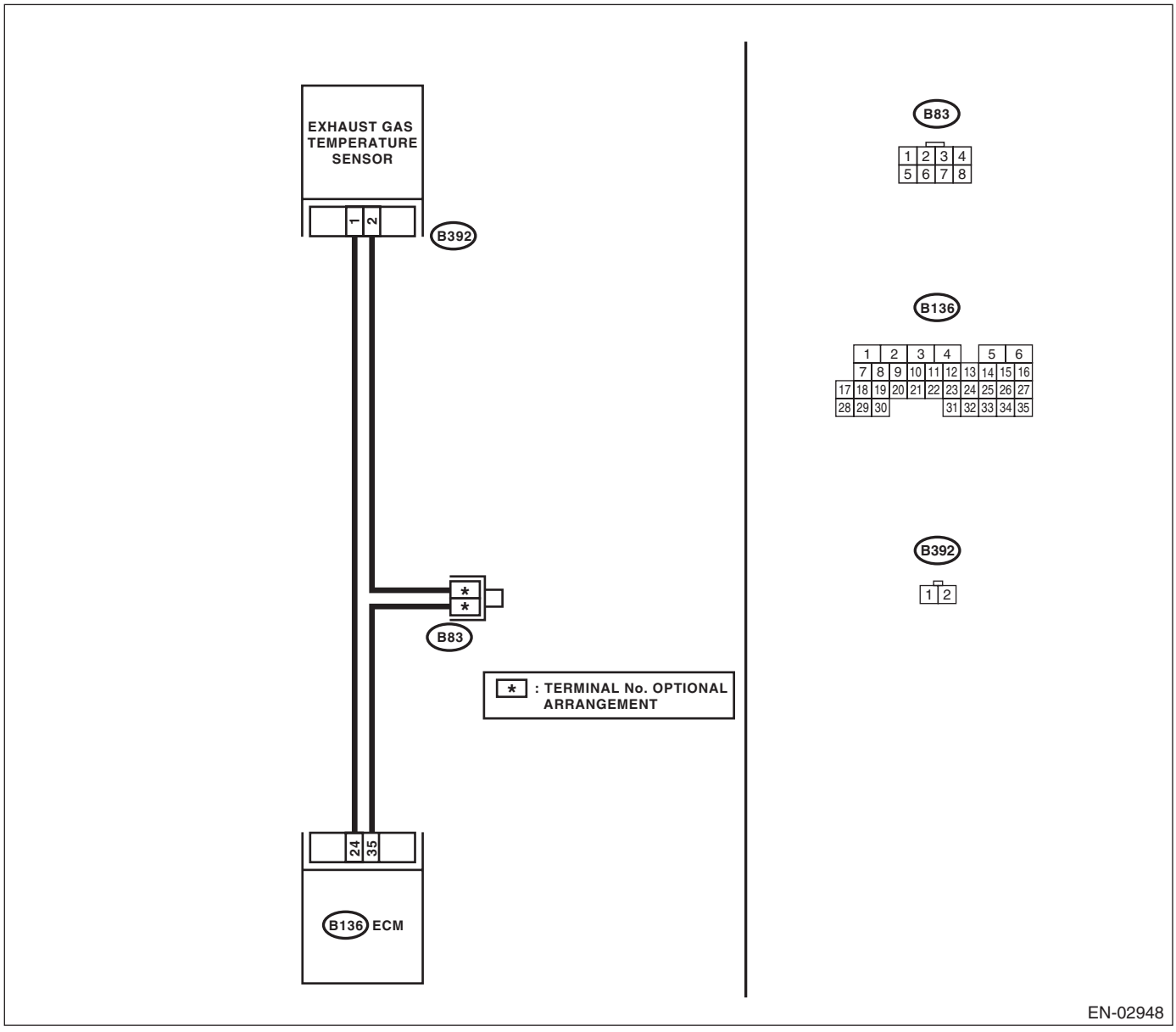
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of exhaust temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 1,200°C (2,192°F)?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of the exhaust temperature sensor • Poor contact in ECM • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of exhaust temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature less than 372°C (702°F)?	Replace the exhaust temperature sensor. <Ref. to FU(H4DOTC)-37, Exhaust Temperature Sensor.>	Repair ground short circuit of harness between exhaust temperature sensor and ECM connector.

BV:DTC P0546 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-166, DTC P0546 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

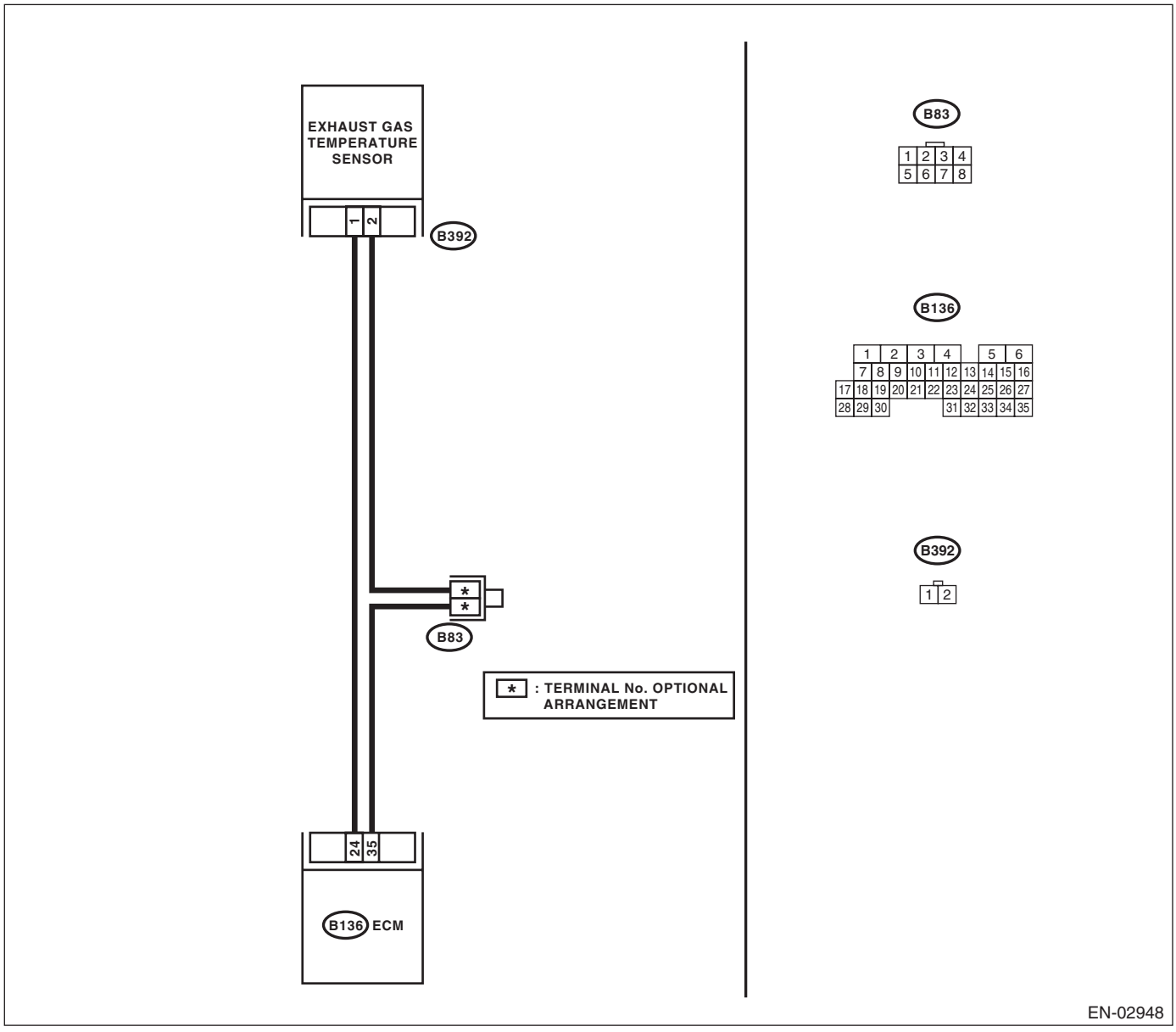
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of exhaust temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature less than 372°C (702°F)?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of the exhaust temperature sensor • Poor contact in ECM • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust temperature sensor. 3) Measure the voltage between the exhaust temperature sensor connector and engine ground. ***Connector & terminal*** ***(B392) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and exhaust temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the exhaust temperature sensor connector and engine ground. ***Connector & terminal*** ***(B392) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and exhaust temperature sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between the exhaust temperature sensor connector and engine ground. ***Connector & terminal*** ***(B392) No. 1 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and exhaust temperature connector • Poor contact of the exhaust temperature sensor connector • Poor contact in ECM connector • Poor contact of joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between exhaust temperature temperature sensor connector and engine ground. ***Connector & terminal*** ***(B392) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the exhaust temperature sensor. <Ref. to FU(H4DOTC)-37, Exhaust Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and exhaust temperature connector • Poor contact of the exhaust temperature sensor connector • Poor contact in ECM connector • Poor contact of joint connector

BW:DTC P0600 SERIAL COMMUNICATION LINK

NOTE:
For the diagnostic procedure, refer to LAN System.

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

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)(diag)-220, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)(diag)-220, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BZ:DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:

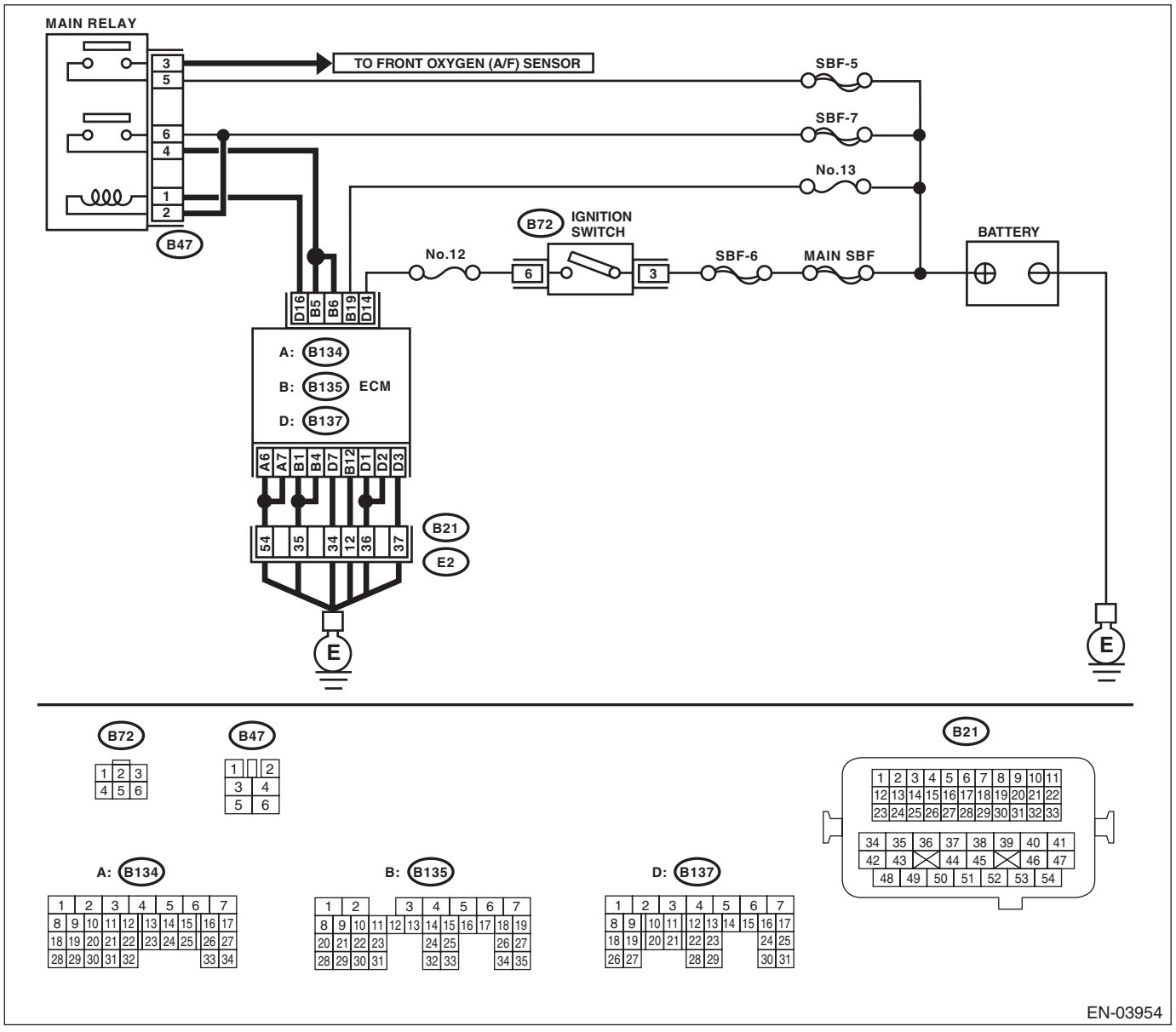
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-172, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (–):*** ***(B135) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **2**.	Repair the open or ground short circuit of power supply circuit.
2	**CHECK INPUT VOLTAGE OF ECM.** 1) Start the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (–):*** ***(B135) No. 6 (+) — 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 ECM GROUND HARNESS.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the following items. • Further tighten the engine ground terminal. • Poor contact in ECM connector. • Poor contact in coupling connector.

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

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-290, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CB:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-178, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P0691 displayed on the Subaru Select Monitor?	Inspect the radiator fan relay. <Ref. to CO(H4DOTC)-8, Radiator Fan System.>	Temporary poor contact occurs.

CC:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-179, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is DTC P0692 displayed on the Subaru Select Monitor?	Inspect the radiator fan relay. <Ref. to CO(H4DOTC)-8, Radiator Fan System.>	Temporary poor contact occurs.

CD:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

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

CE:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW

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

CF:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH

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

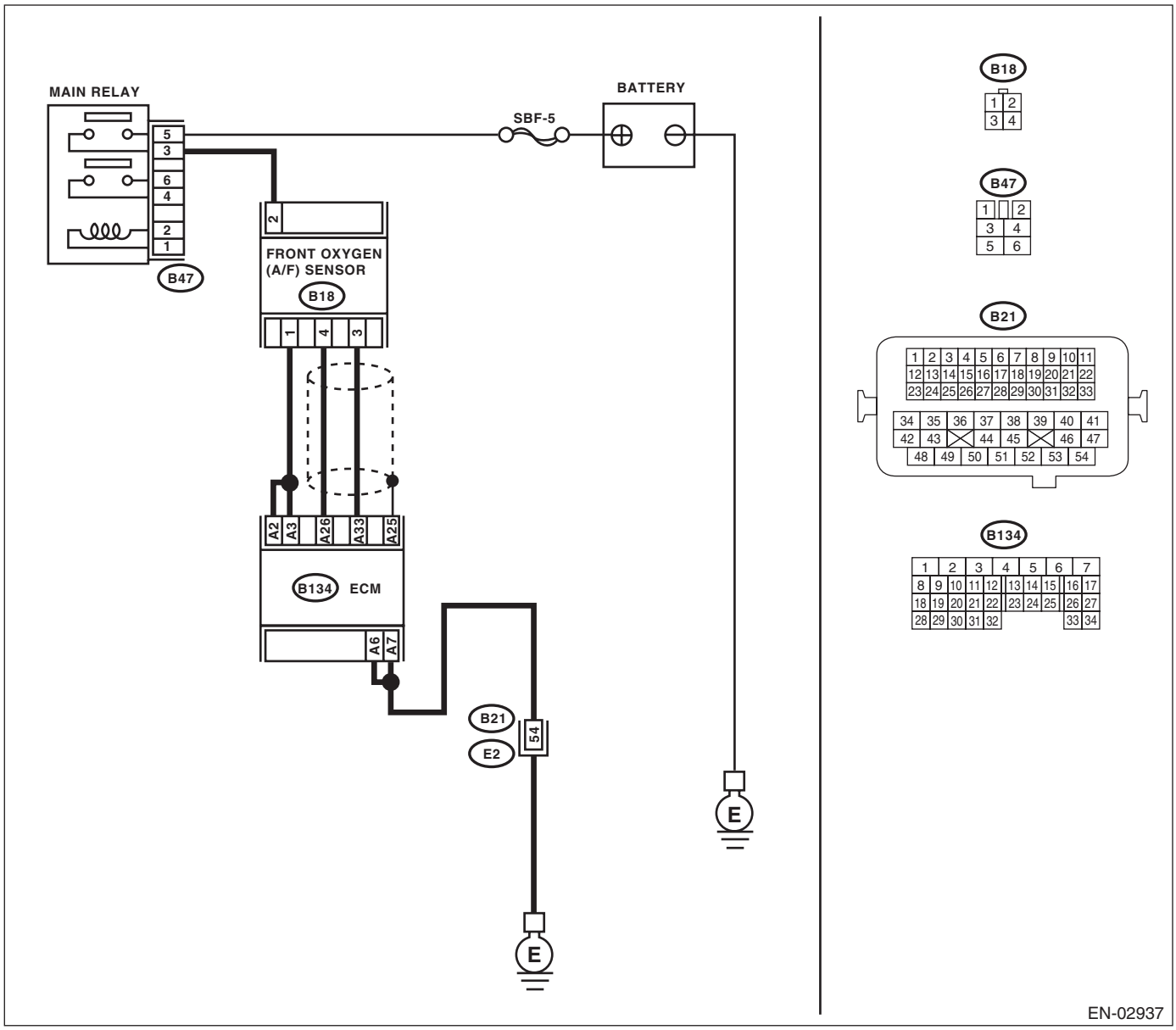
CG:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-185, DTC P1152 O2 SENSOR CIRCUIT RANGE/ PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (B18) No. 4:*** ***(B134) No. 33 — (B18) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3	**CHECK POOR CONTACT.** Check for poor contact of the front oxygen (A/F) sensor connector.	Is there poor contact in the 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(H4DOTC)-34, Front Oxygen (A/F) Sensor.>

CH:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

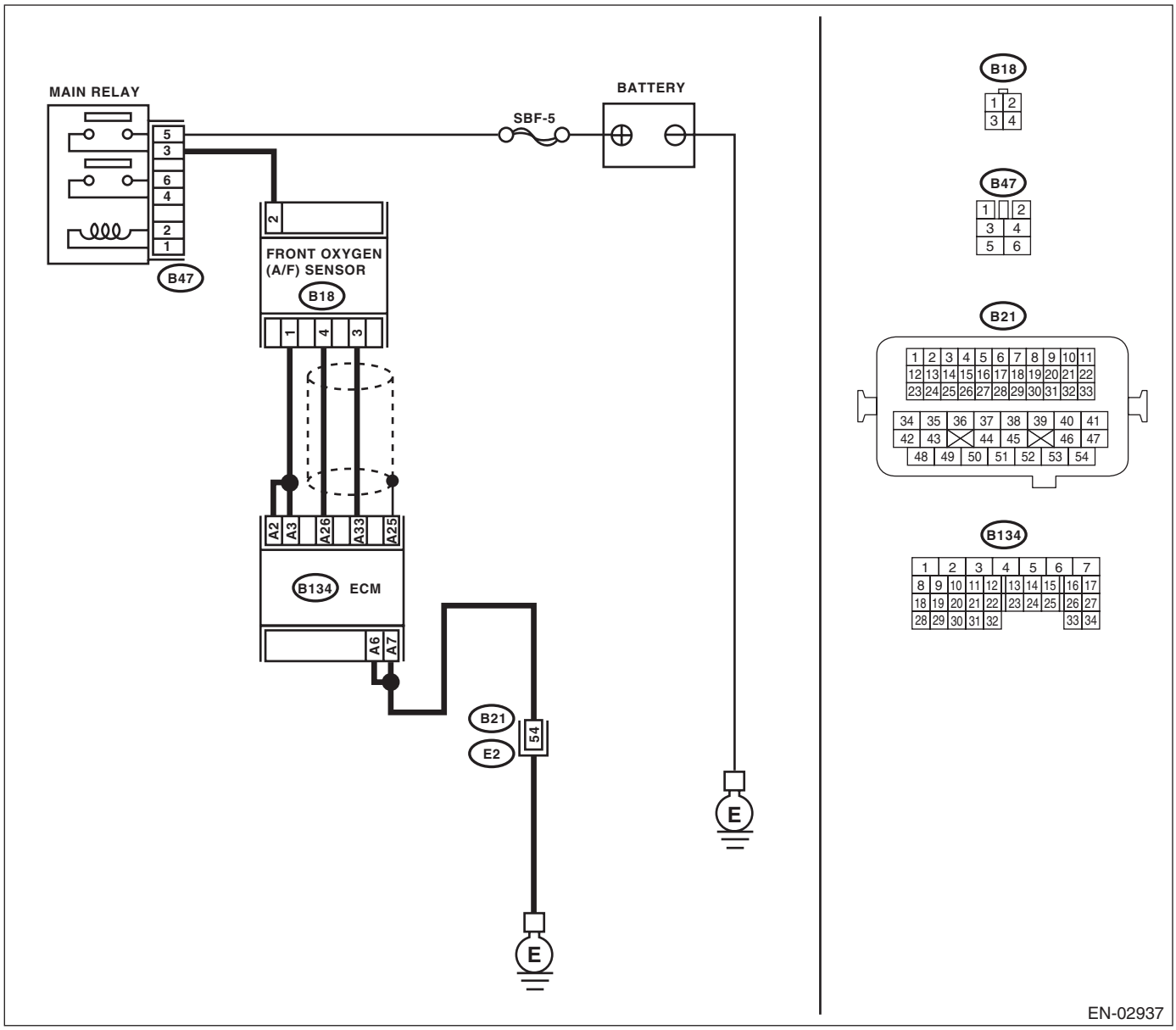
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-187, DTC P1153 O2 SENSOR CIRCUIT RANGE/ PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.	Go to step **4**.
4	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **5**.	Go to step **6**.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the voltage more than 4.95 V?	Go to step **7**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-34, Front Oxygen (A/F) Sensor.>
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.

CI: DTC P1160 RETURN SPRING FAILURE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-290, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CJ:DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-191, DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS), Diagnostic Trouble Code (DTC) Detecting Criteria.>

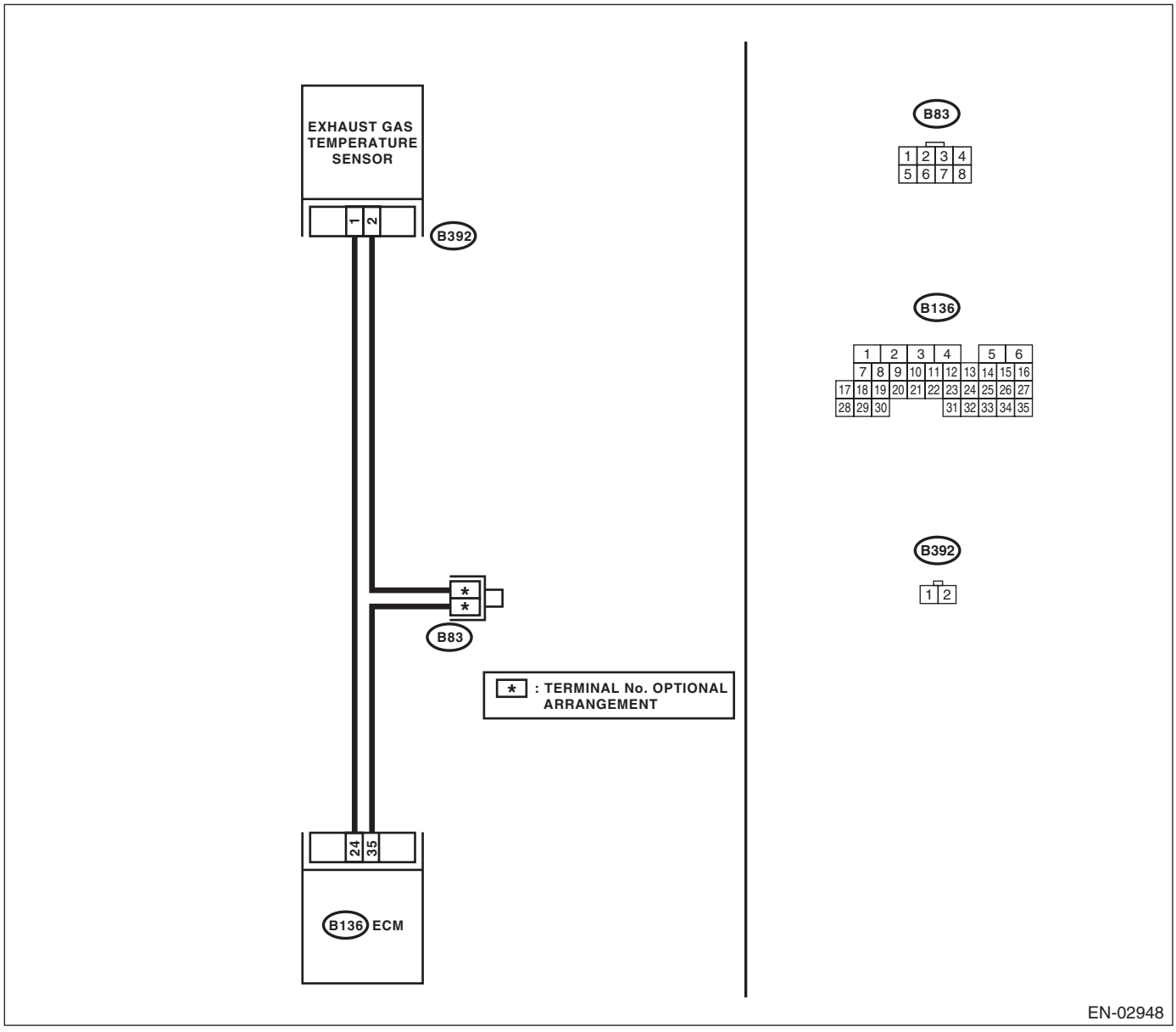
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DTC.** Perform the troubleshooting of DTC P0301, P0302, P0303 and P0304. <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Does any trouble needing repair or replacement exist?	Repair or replacement the faulty parts, and replace the precatalytic converter.	Contact with SOA Service Center.

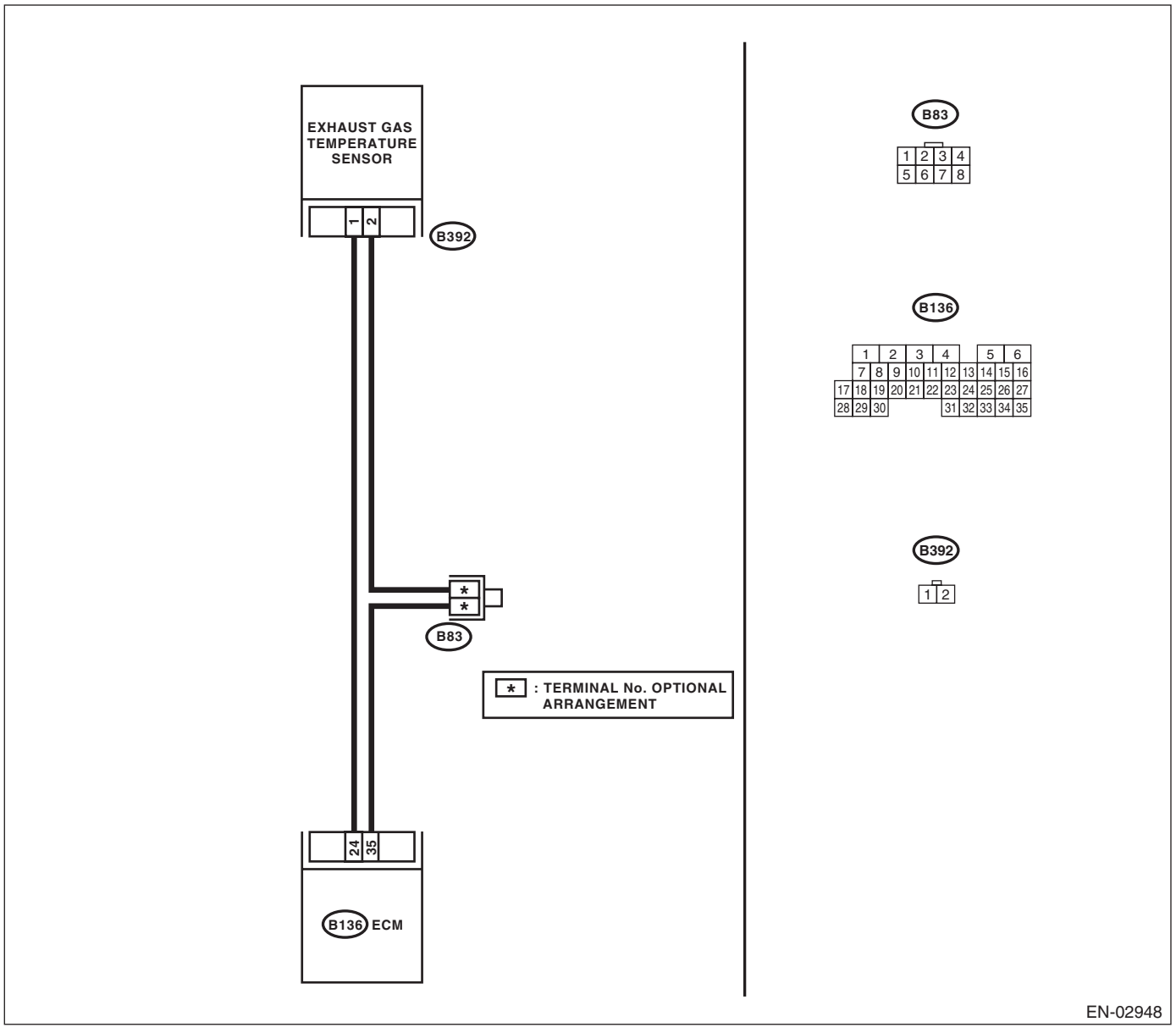
CK:DTC P1312 EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-193, DTC P1312 EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1312.	Replace the exhaust temperature sensor. <Ref. to FU(H4DOTC)-37, Exhaust Temperature Sensor.>

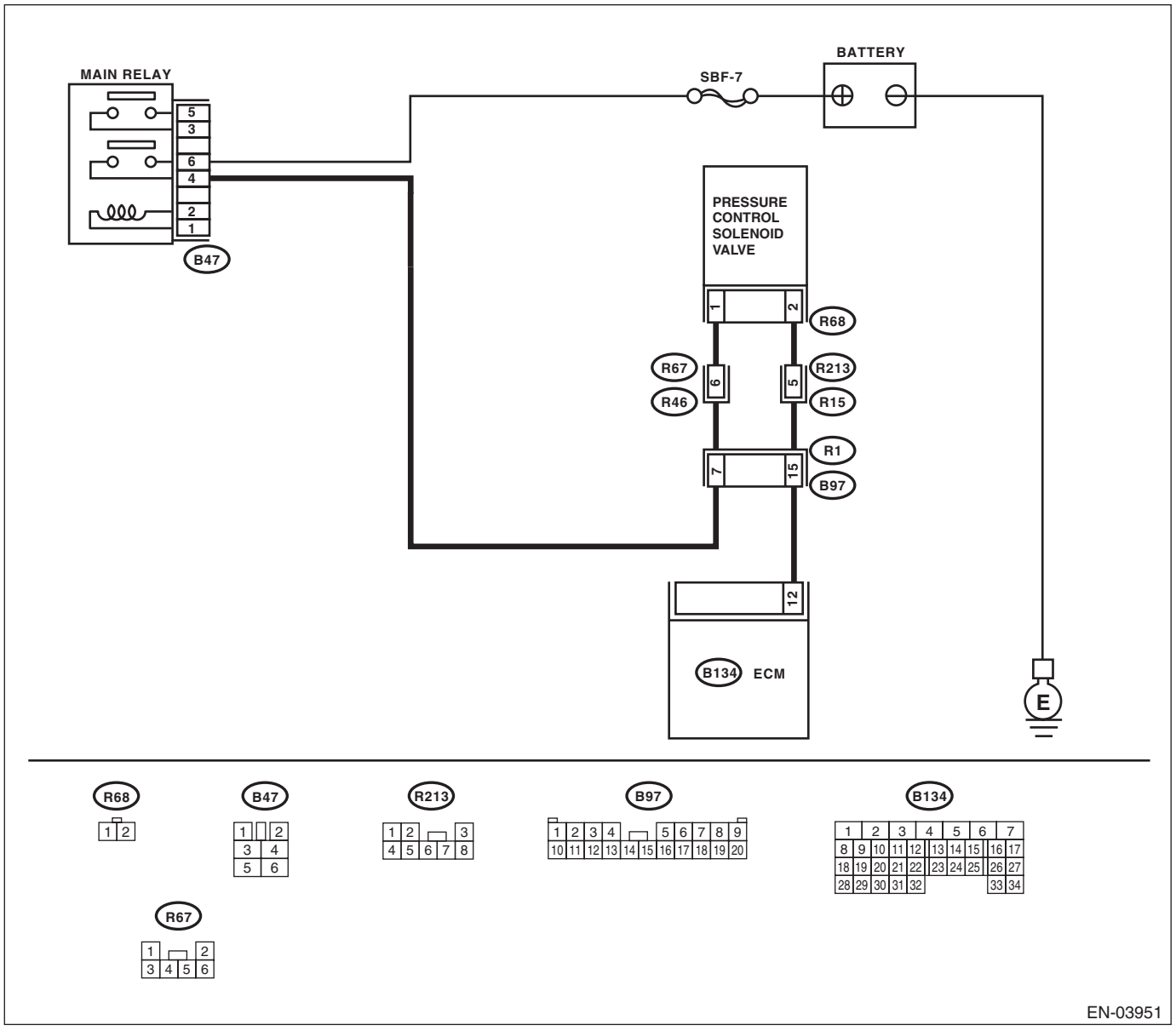
CL:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-194, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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*** ***(B134) No. 12 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2**.	Go to step **3**.

	Step	Check	Yes	No
2	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Contact with SOA Service Center.
3	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the pressure control solenoid valve and ECM. 3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the ground short circuit of harness between ECM and pressure control solenoid valve connector.
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and pressure control solenoid valve connector. ***Connector & terminal*** ***(B134) No. 12 — (R68) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact of coupling connector
5	**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 **6**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-12, Pressure Control Solenoid Valve.>
6	**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 more than 10 V?	Go to step **7**.	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
7	**CHECK POOR CONTACT.** Check poor contact of pressure control solenoid valve connector.	Is there poor contact of the pressure control solenoid valve connector?	Repair the poor contact of pressure control solenoid valve connector.	Contact with SOA Service Center.

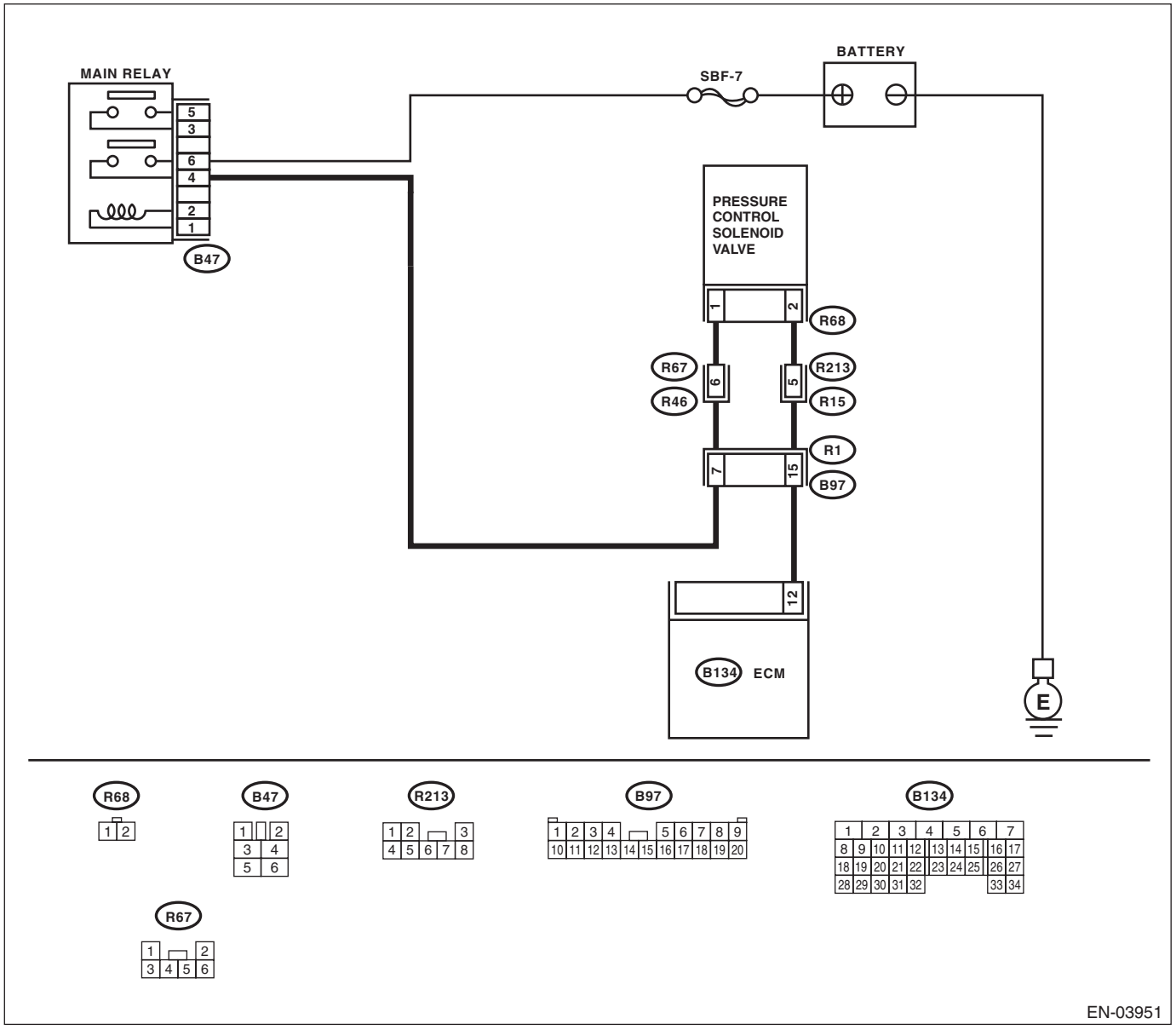
CM:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-196, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 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) Measure the voltage between ECM and chassis ground while operating the pressure control solenoid valve. 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(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):***	Does the voltage change between 0 — 10 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4**.	Go to step **3**.
3	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the pressure control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Go to step **5**.
5	**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 purge control solenoid valve <Ref. to EC(H4DOTC)-12, Pressure Control Solenoid Valve.>and ECM <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Go to step **6**.
6	**CHECK POOR CONTACT.** Check the poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

CN:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-198, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

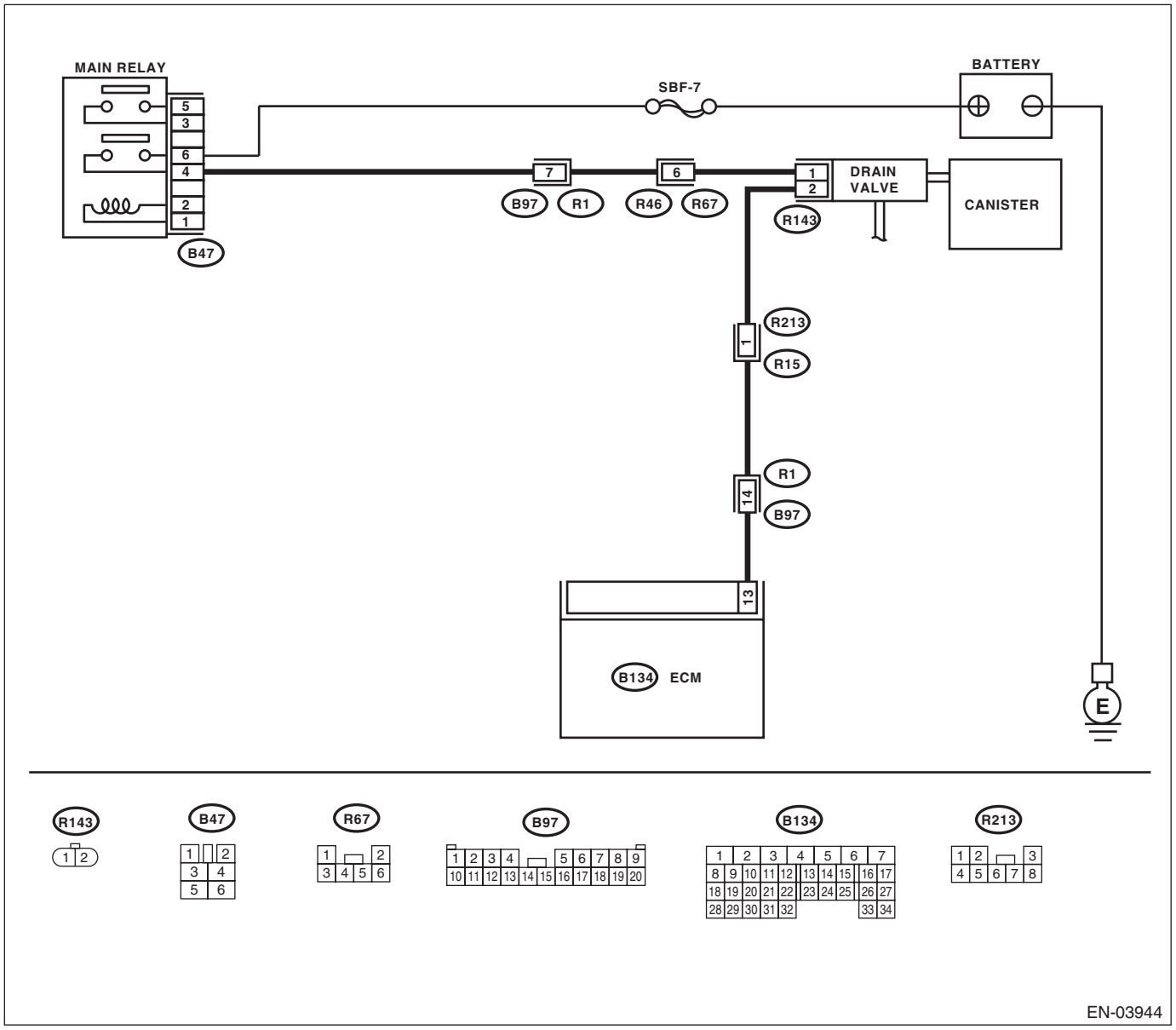
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, 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 Subaru Select Monitor. For procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Contact with SOA Service Center.	Replace the drain valve. <Ref. to EC(H4DOTC)-15, Drain Valve.>

CO:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-200, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

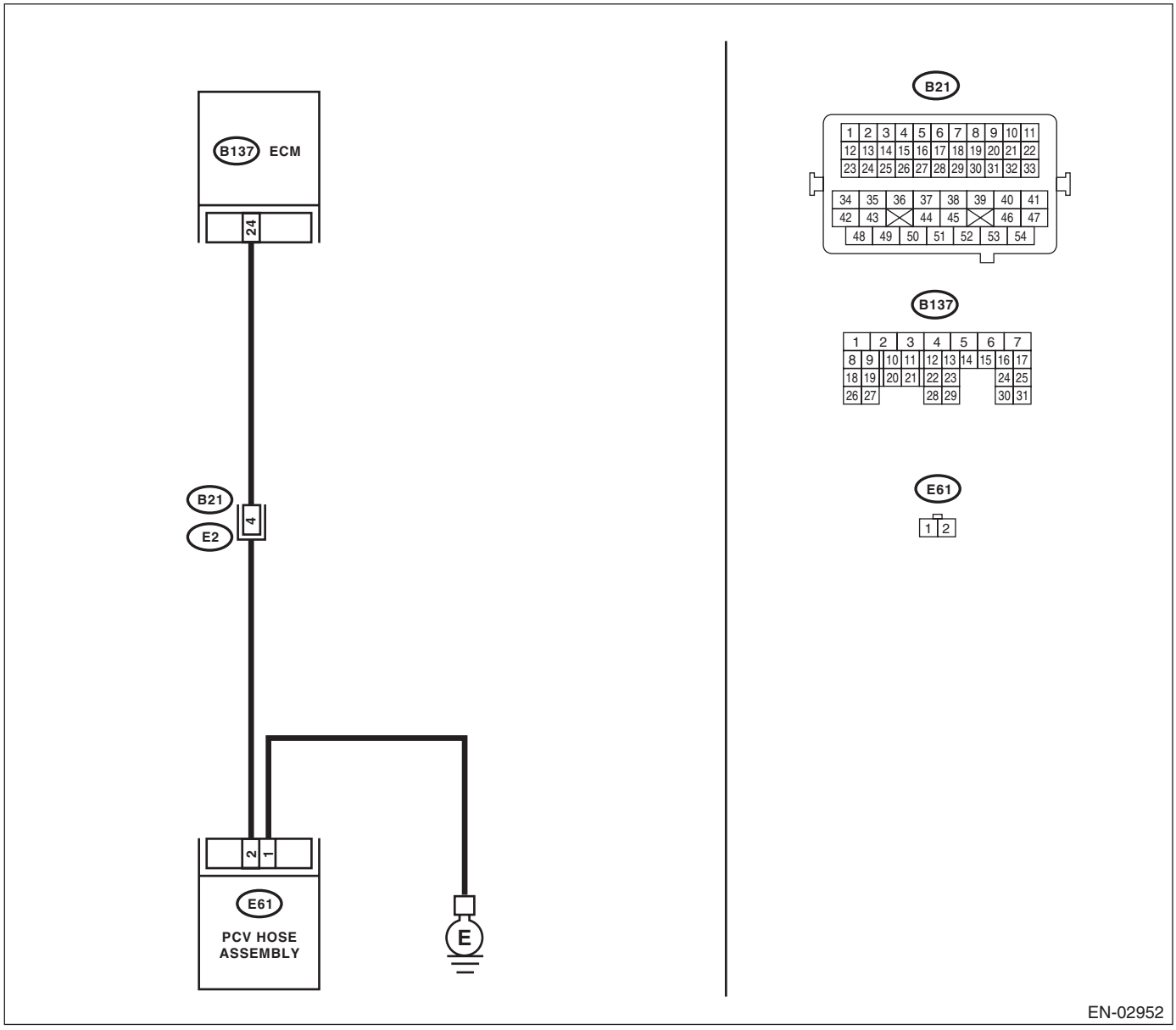
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK BLOW-BY HOSE.** Check the blow-by hose condition.	Is there any disconnection or crack in blow-by hose?	Replace or repair the blow-by hose.	Go to step **2**.
2	**CHECK HARNESS BETWEEN PCV HOSE ASSEMBLY AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the PCV hose assembly and ECM. 3) Measure the resistance of harness between PCV hose assembly and ECM connector. ***Connector & terminal*** ***(B137) No. 24 — (E61) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness between PCV hose assembly and ECM connector.
3	**CHECK HARNESS BETWEEN PCV HOSE ASSEMBLY AND ECM CONNECTOR.** Measure the resistance of harness between PCV hose assembly and chassis ground. ***Connector & terminal*** ***(B137) No. 24 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the ground short circuit of harness between PCV hose assembly and ECM connector.
4	**CHECK GROUND CIRCUIT OF PCV HOSE ASSEMBLY.** Measure the resistance of harness between PCV hose assembly and engine ground. ***Connector & terminal*** ***(E61) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair the ground circuit of PCV hose assembly.
5	**CHECK THE PCV HOSE ASSEMBLY.** Measure the resistance between the PCV hose assembly terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Repair the poor contact in ECM and PCV hose assembly.	Replace the PCV hose assembly.

CP:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-202, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

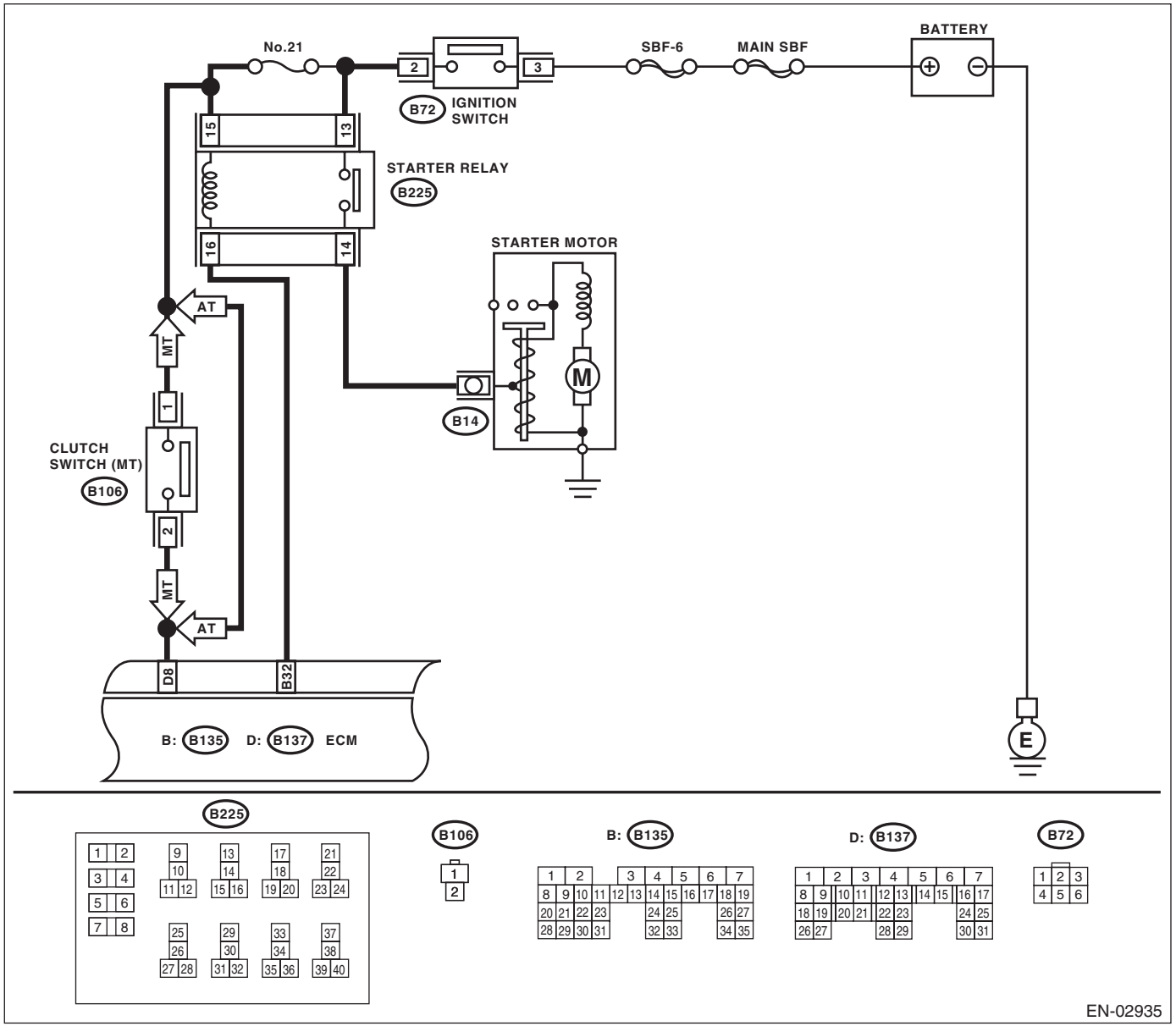
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS BETWEEN STARTER RELAY AND ECM.** 1) Disconnect the connectors from starter relay and ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 32 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the ground short circuit between starter motor and ECM.	Repair the poor contact of ECM connector.

CQ:DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH

DTC DETECTING CONDITION:

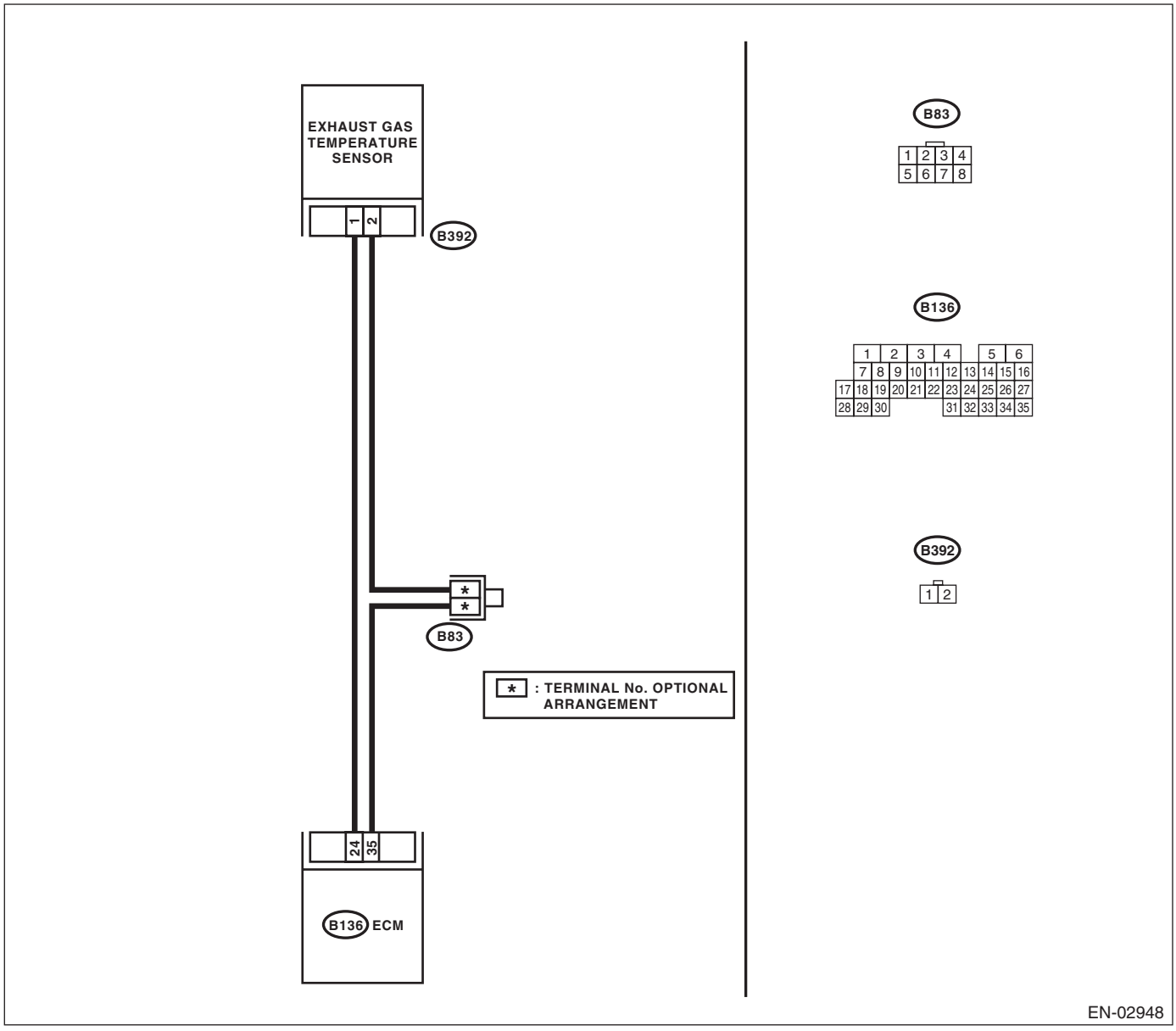
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-203, DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1544.	Go to step **2**.
2	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of the exhaust manifold • Cracks or holes on exhaust manifold • Loose installation of the front oxygen (A/F) sensor	Is there any fault in exhaust system?	Repair or replacement the faulty parts, and replace the precatalytic converter.	Contact with SOA Service Center.

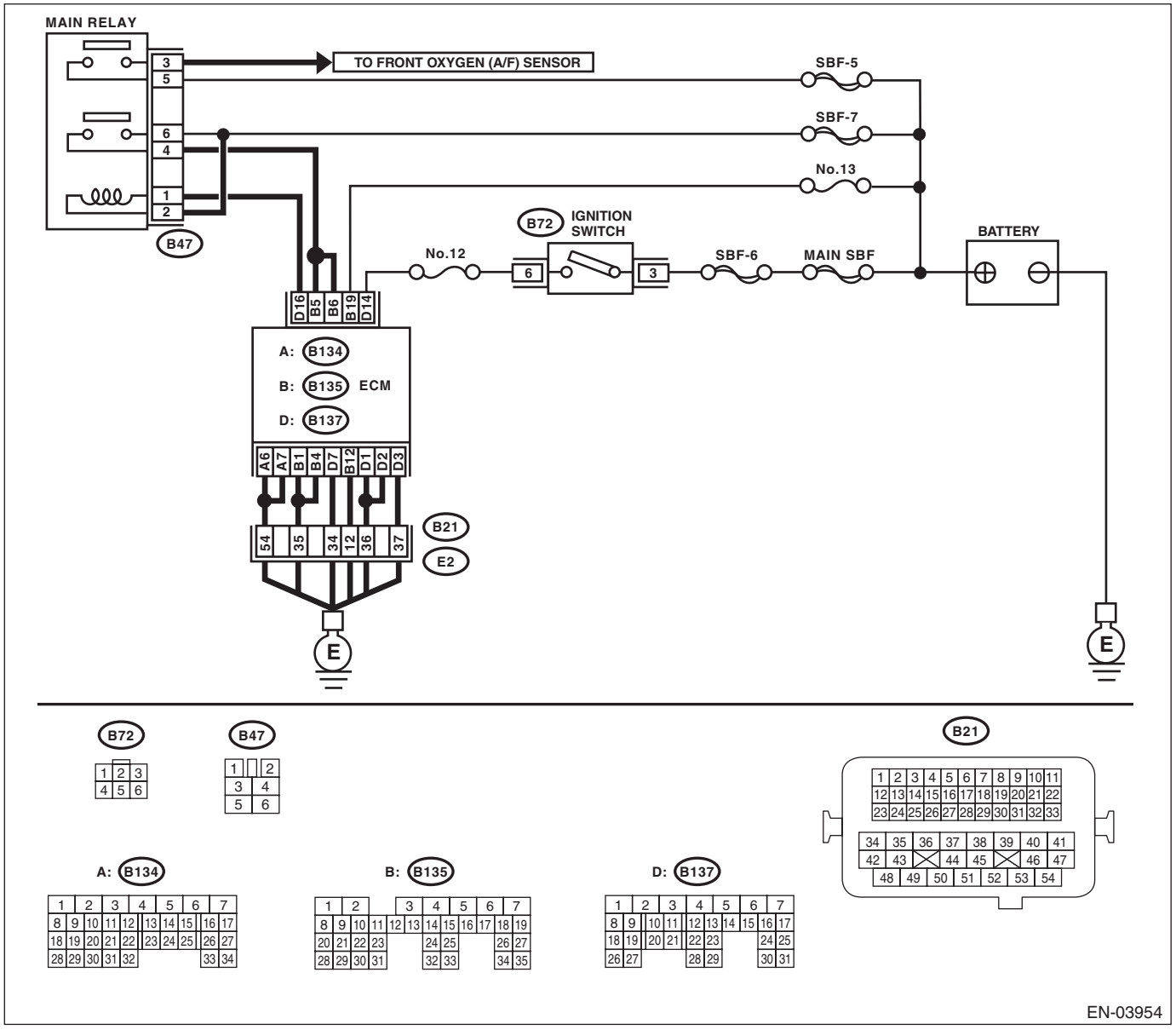
CR:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-204, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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. 19 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the poor contact of ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair the ground short circuit of harness between ECM connector and battery terminal.	Go to step **3**.
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

CS:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-206, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-29, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CT:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-207, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-29, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CU:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-208, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-29, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CV:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-209, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK 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(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-29, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

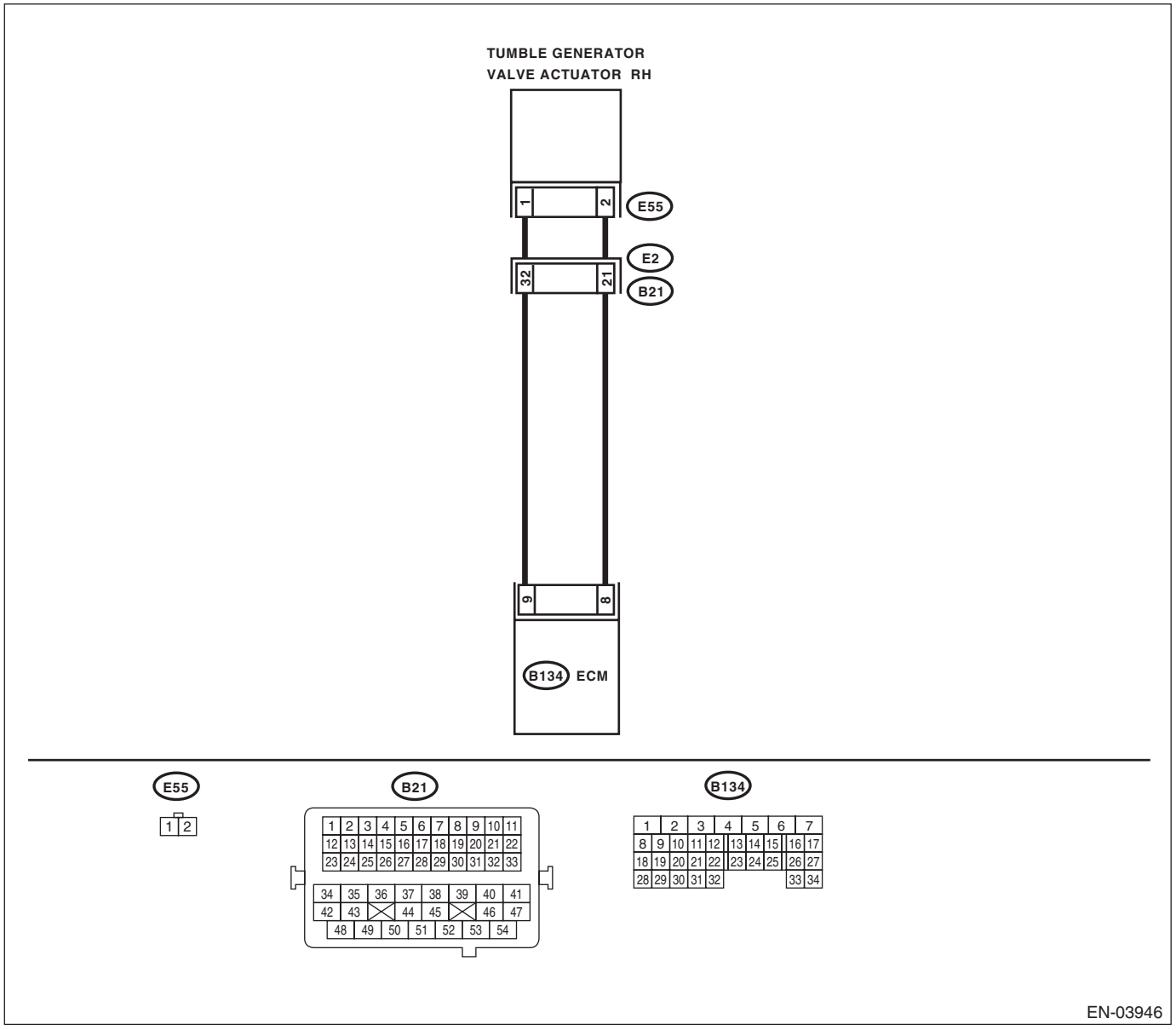
CW:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-210, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E55) No. 1 — (B134) No. 9:*** ***(E55) No. 2 — (B134) No. 8:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve actuator connector • Poor contact of coupling connector
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact of tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-30, Tumble Generator Valve Actuator.>

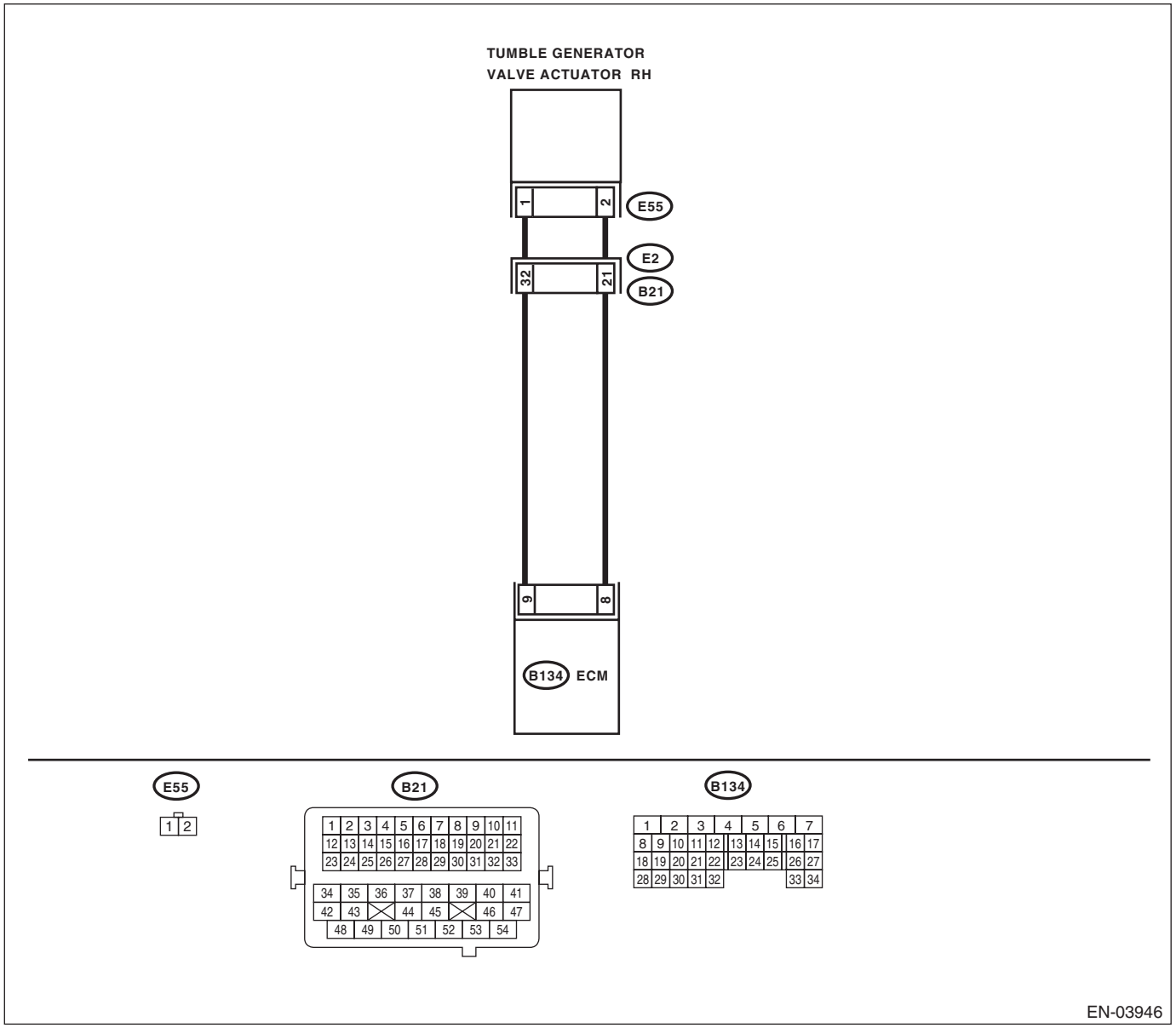
CX:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-212, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E55) No. 1 (+) — Chassis ground (–):*** ***(E55) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-30, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

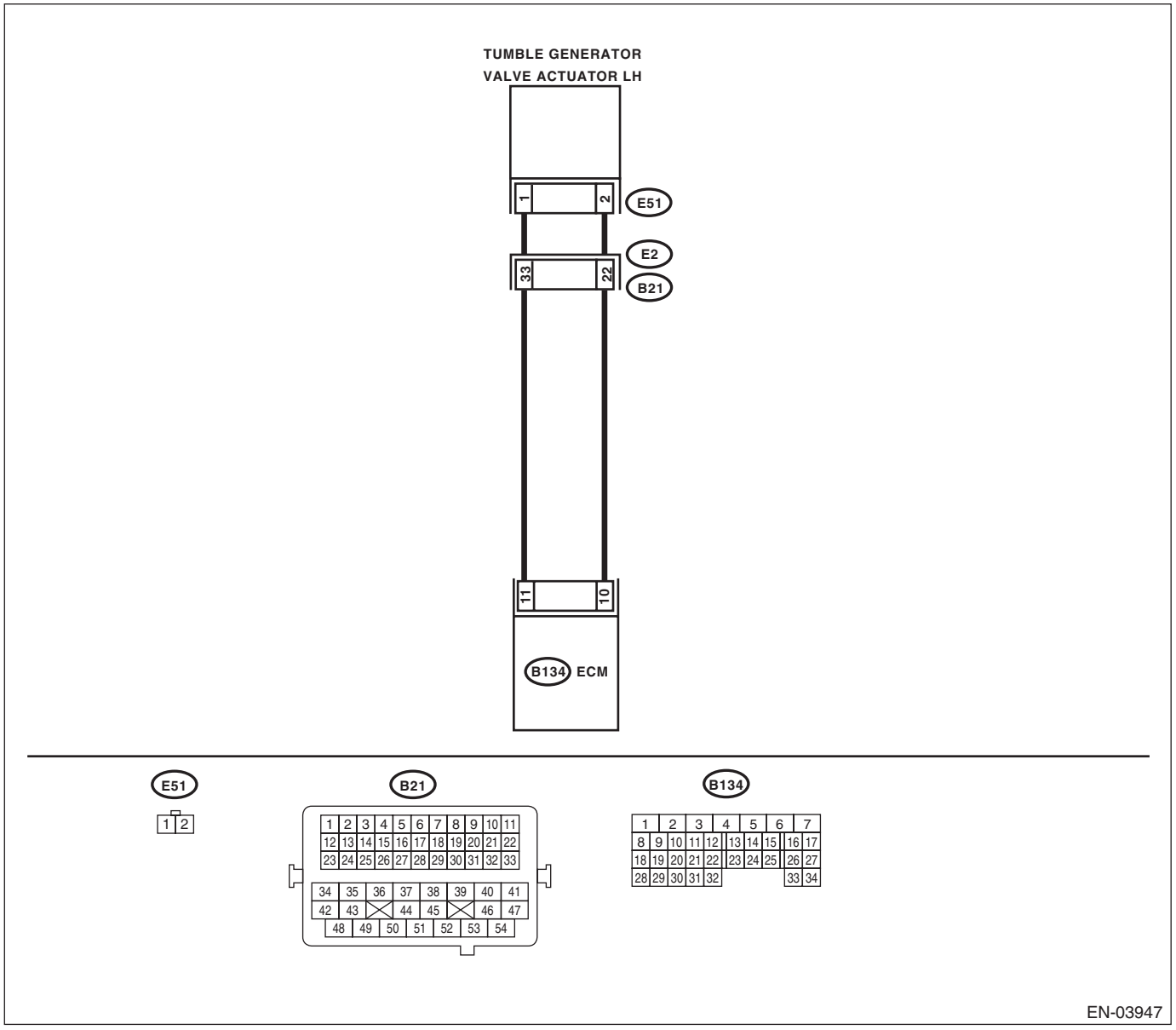
CY:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-214, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E51) No. 1 — (B134) No. 11:*** ***(E51) No. 2 — (B134) No. 10:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve actuator connector • Poor contact of coupling connector
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact of tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-30, Tumble Generator Valve Actuator.>

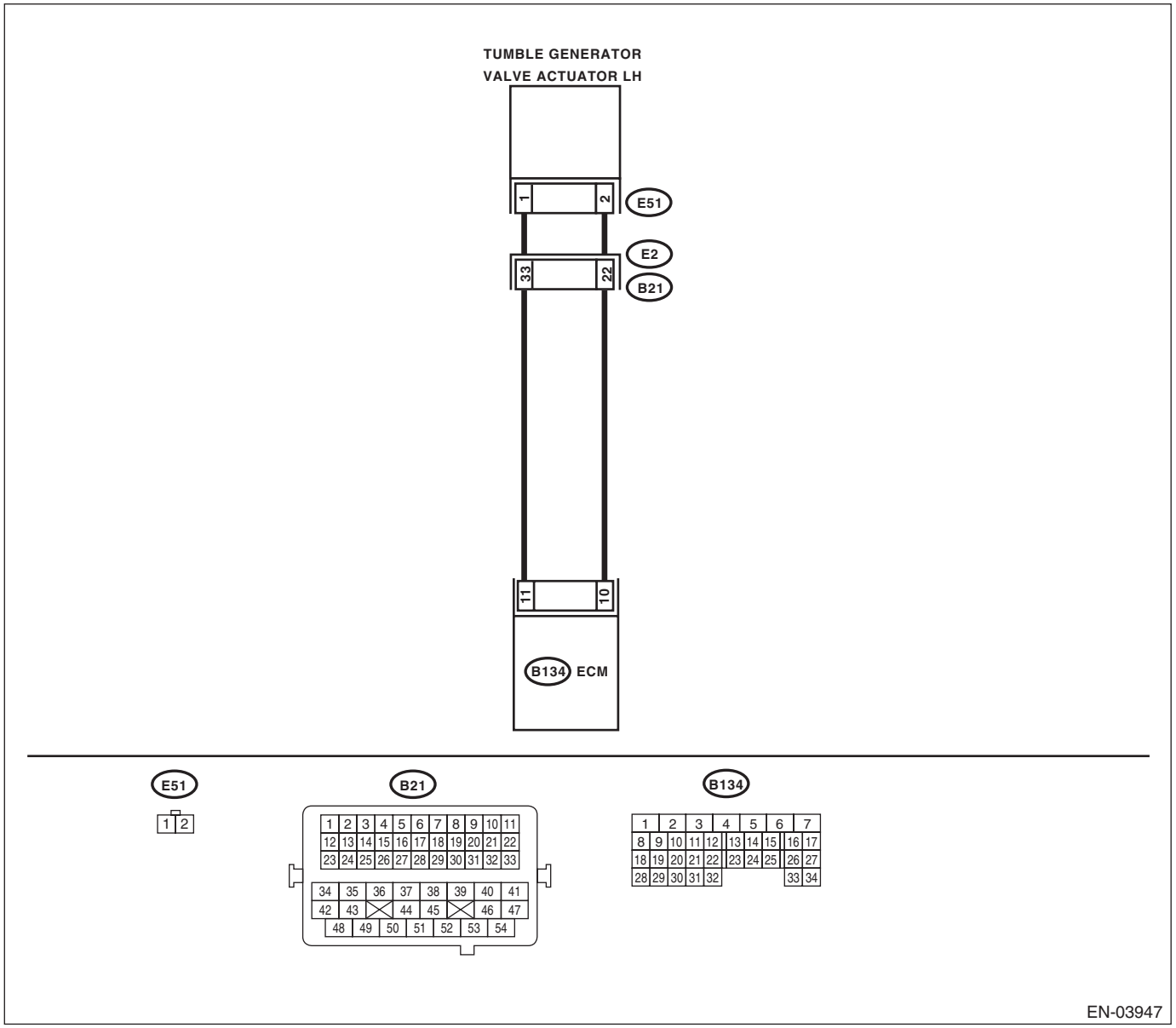
CZ:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-216, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E51) No. 1 (+) — Chassis ground (–):*** ***(E51) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-30, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

DA:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-218, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

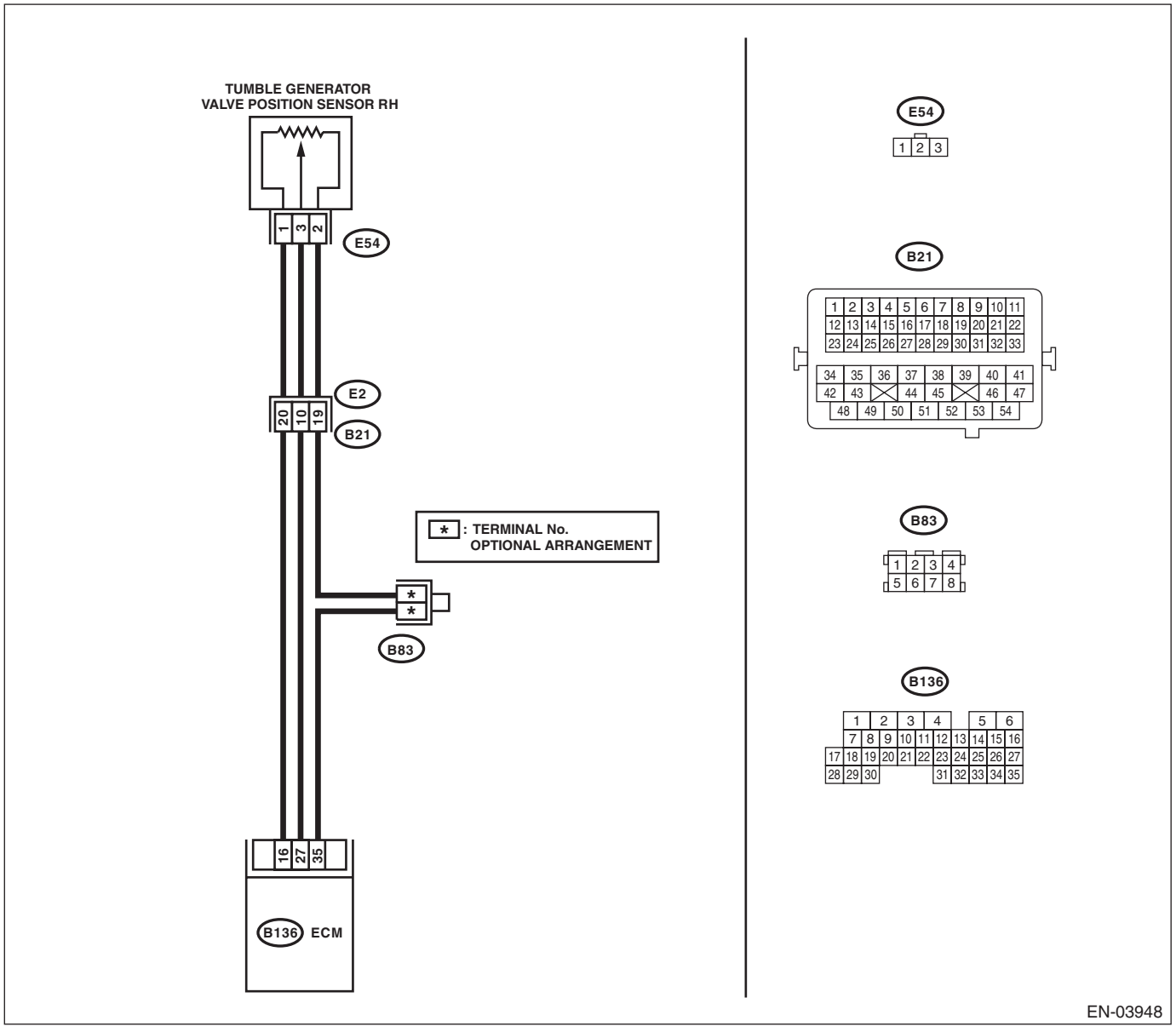
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 0.1 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4**.	Go to step **3**.
3	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair the poor contact of ECM connector.	Contact with SOA Service Center.
4	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 27 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6**.	Go to step **5**.
5	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground.	Does the voltage change by shaking the harness and connector of the ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact of ECM connector.	Go to step **6**.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 1 (+) — Engine ground (–):***	Is the voltage more than 4.5 V?	Go to step **7**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B136) No. 27 — (E54) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact of tumble generator valve position sensor connector • Poor contact of coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of the harness between the tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9**.	Repair the ground short circuit of the harness between the tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check for poor contact in the tumble generator valve position sensor connector.	Is there poor contact in the tumble generator valve position sensor connector?	Repair poor contact of the tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-31, Tumble Generator Valve Position Sensor.>

DB:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-220, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

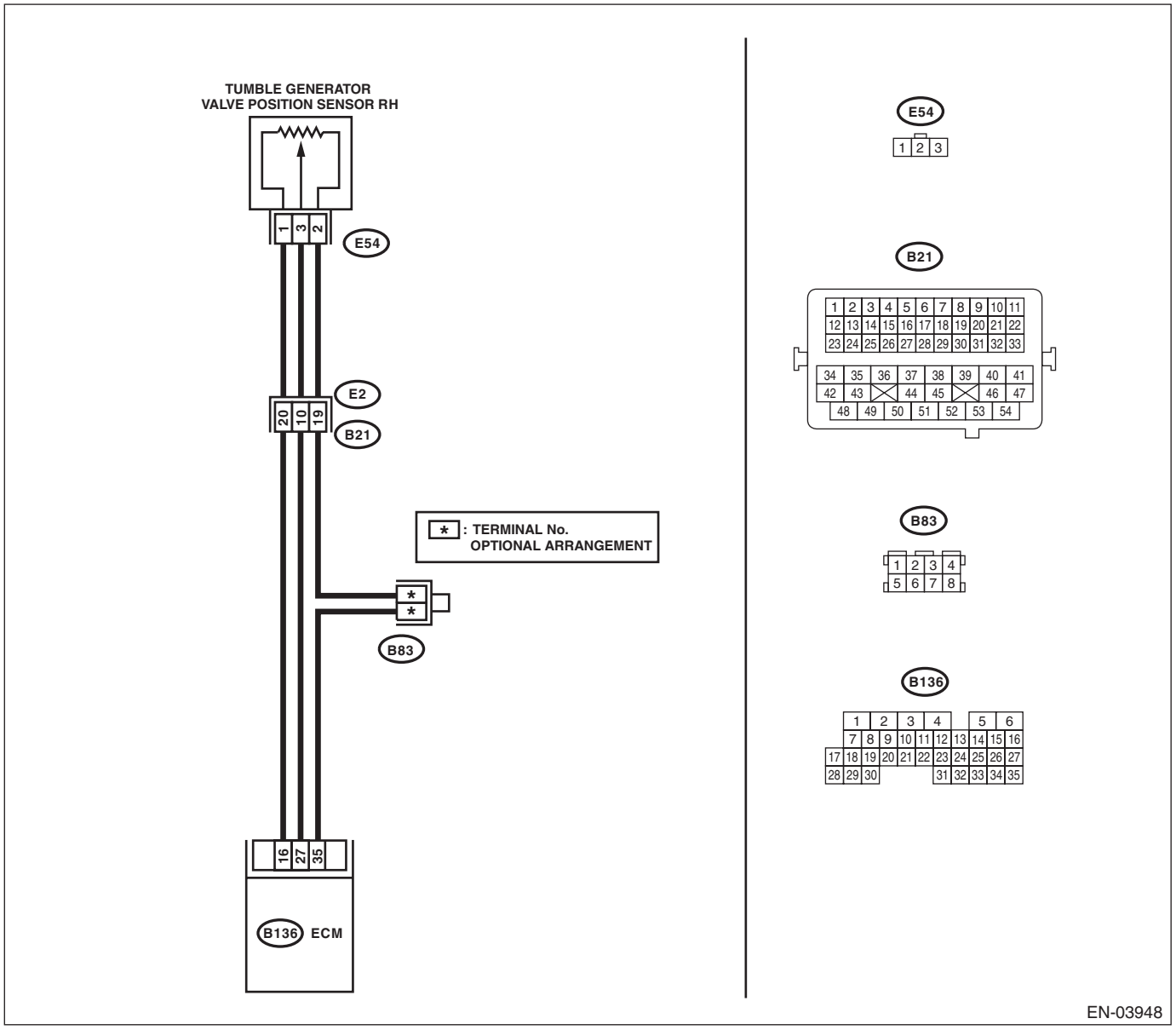
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 4.9 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of the harness between the tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 2 — 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 tumble generator valve position sensor and ECM connector • Poor contact of coupling connector • Poor contact of joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 (+) — Engine ground (–):***	Is the voltage more than 4.9 V?	Repair the battery short circuit of harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-31, Tumble Generator Valve Position Sensor.>

DC:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-222, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

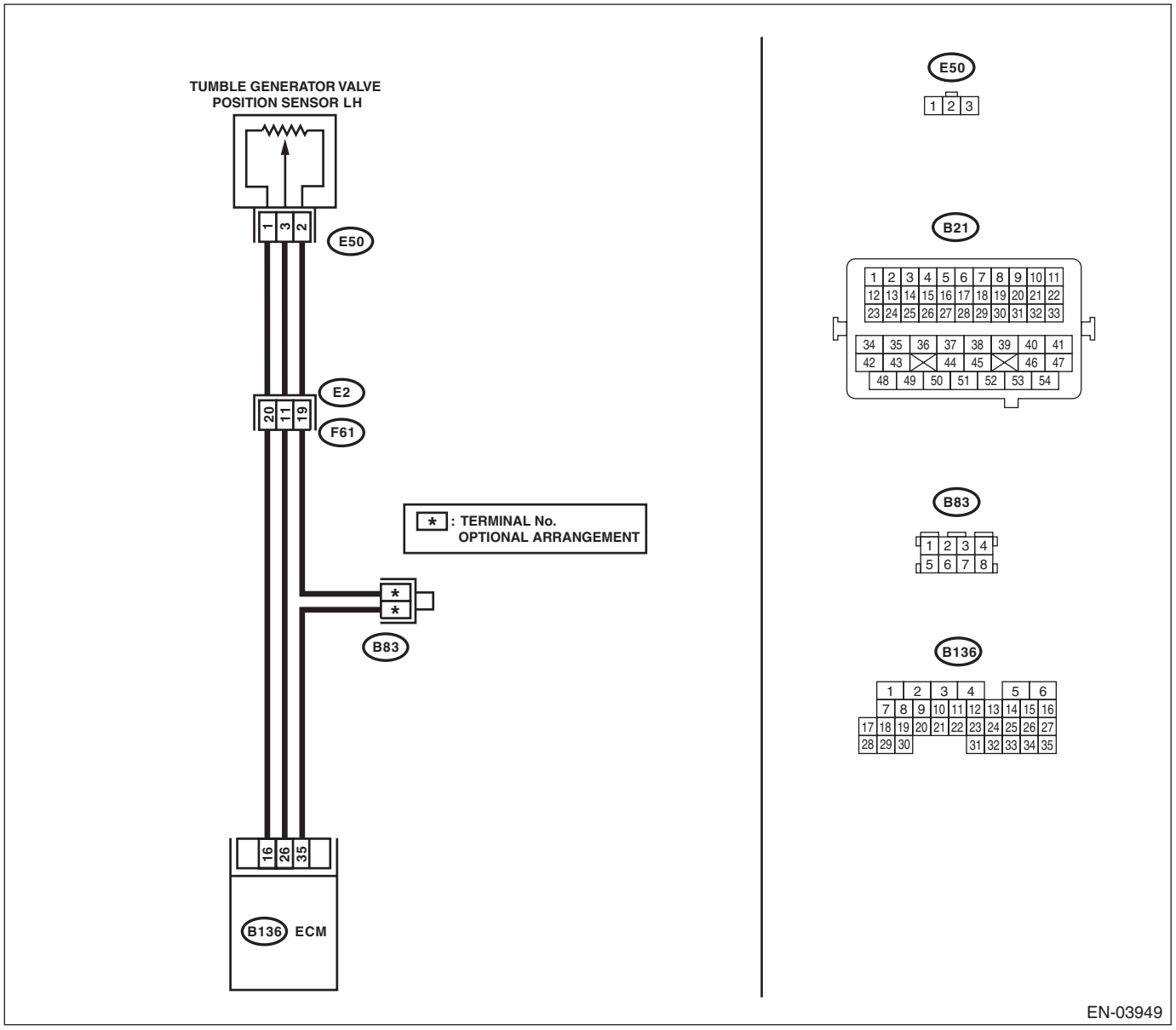
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 0.1 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4**.	Go to step **3**.
3	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair the poor contact of ECM connector.	Contact with SOA Service Center.
4	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 26 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6**.	Go to step **5**.
5	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground.	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact of ECM connector.	Go to step **6**.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 1 (+) — Engine ground (–):***	Is the voltage more than 4.5 V?	Go to step **7**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B136) No. 26 — (E50) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact of tumble generator valve position sensor connector • Poor contact of coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of the harness between the tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9**.	Repair the ground short circuit of the harness between the tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check for poor contact in the tumble generator valve position sensor connector.	Is there poor contact in the tumble generator valve position sensor connector?	Repair poor contact of the tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-31, Tumble Generator Valve Position Sensor.>

DD:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-224, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

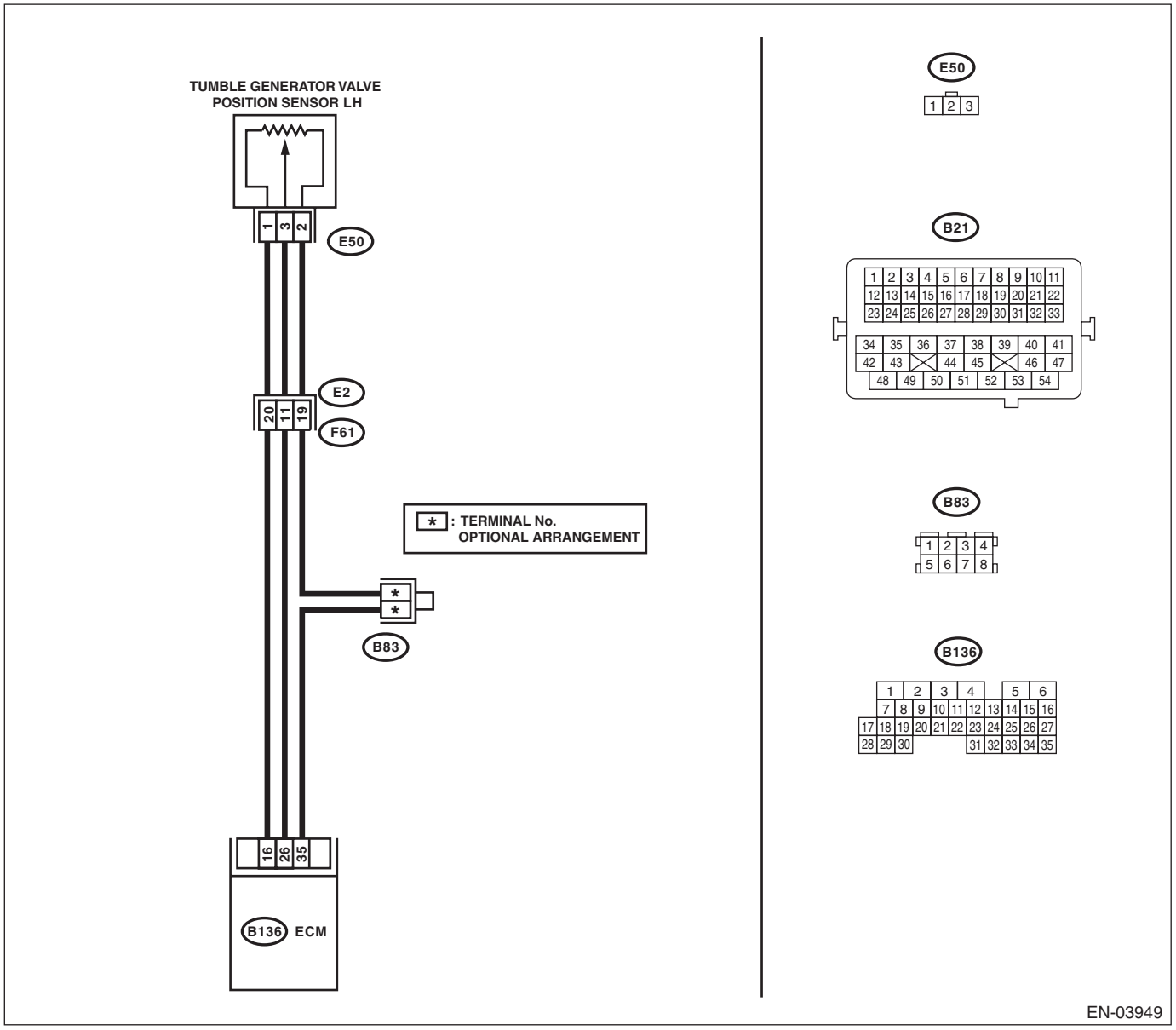
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 4.9 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of the harness between the tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 2 — 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 tumble generator valve position sensor and ECM connector • Poor contact of coupling connector • Poor contact of joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 (+) — Engine ground (–):***	Is the voltage more than 4.9 V?	Repair the battery short circuit of harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-31, Tumble Generator Valve Position Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-225, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

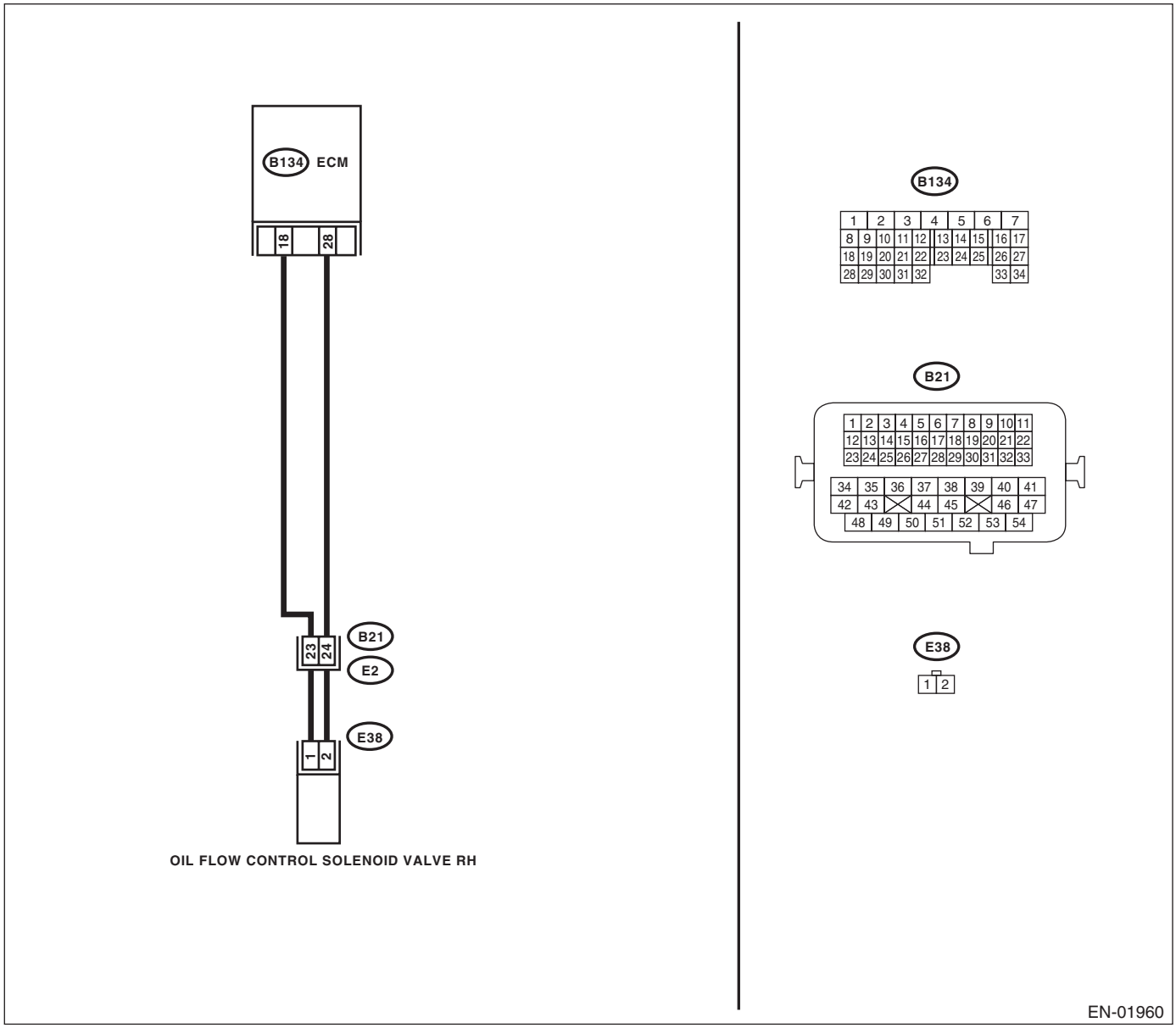
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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 between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 18 — (E38) No. 1:*** ***(B134) No. 28 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-52, Camshaft.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-227, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

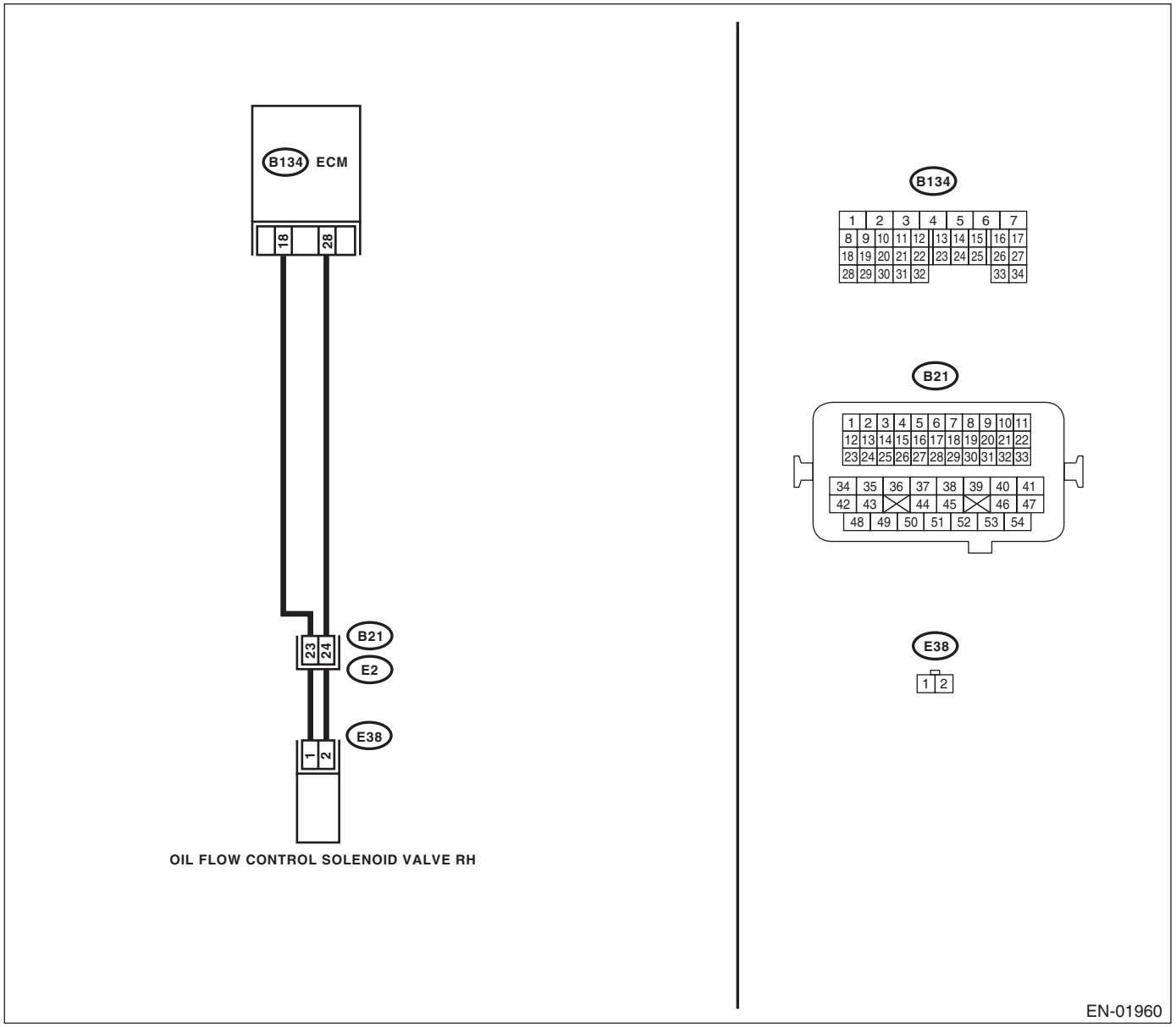
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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 between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2**.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-52, Camshaft.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-228, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

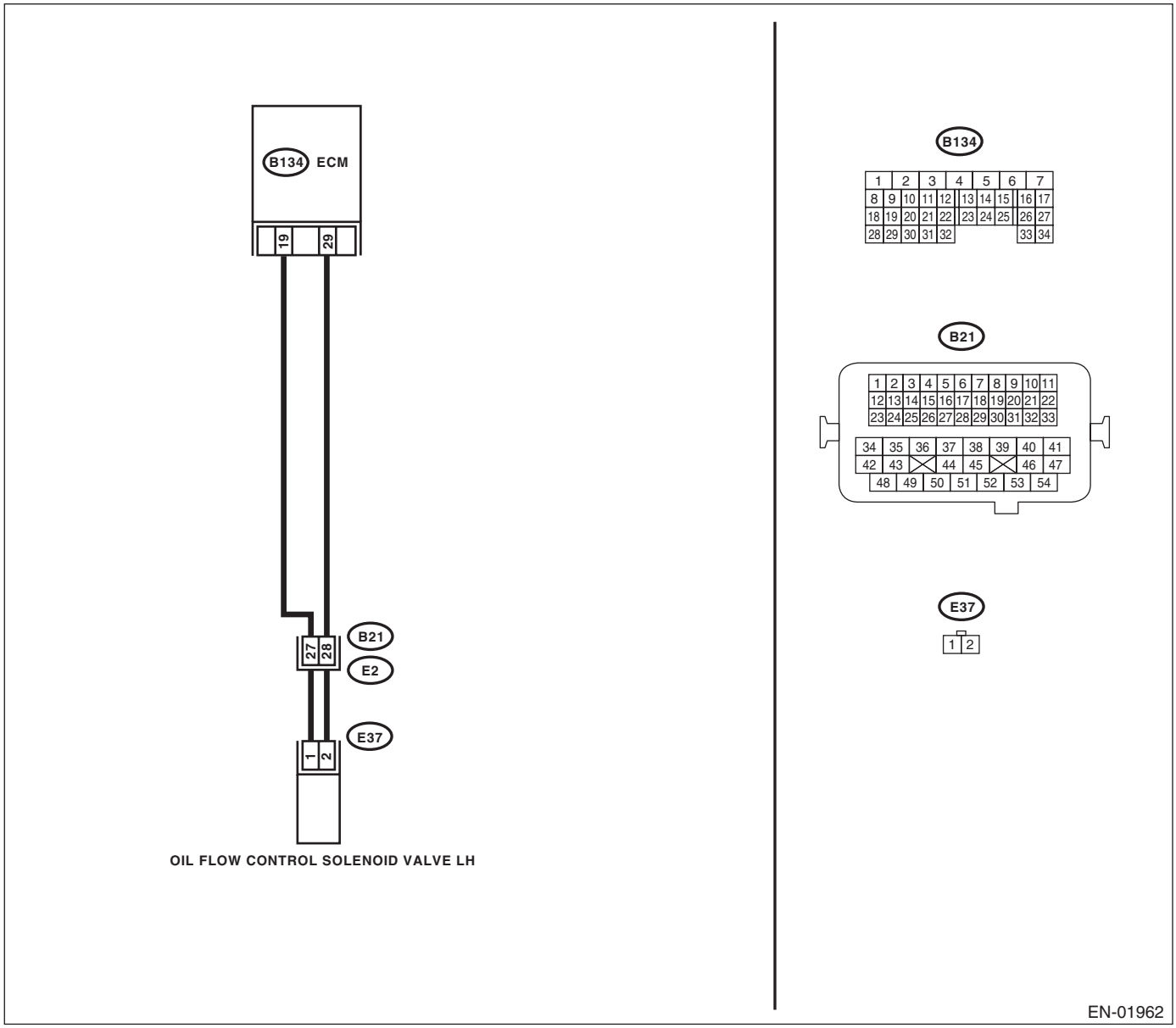
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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 between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 19 — (E37) No. 1:*** ***(B134) No. 29 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-52, Camshaft.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-228, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

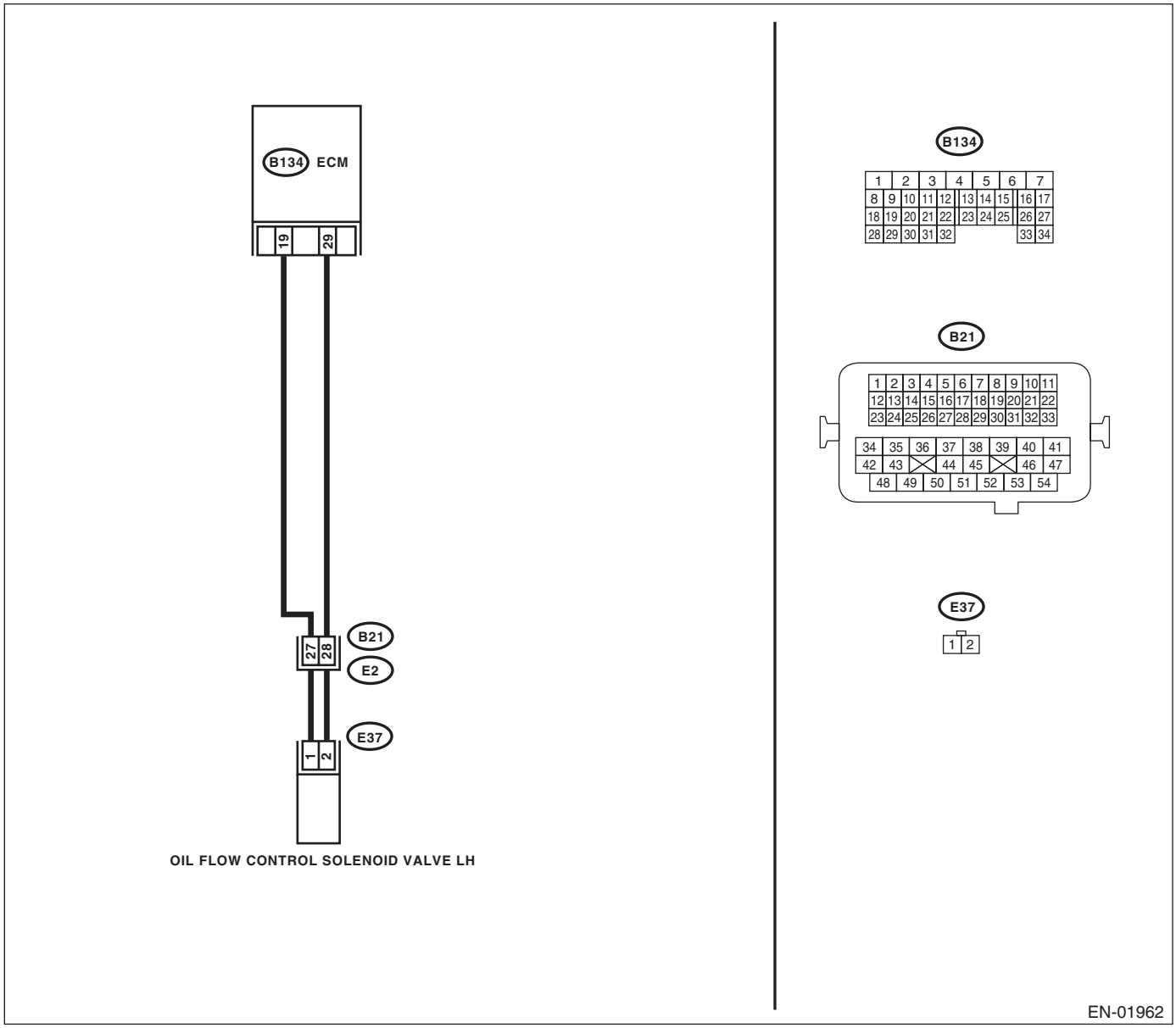
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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 between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2**.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-52, Camshaft.>

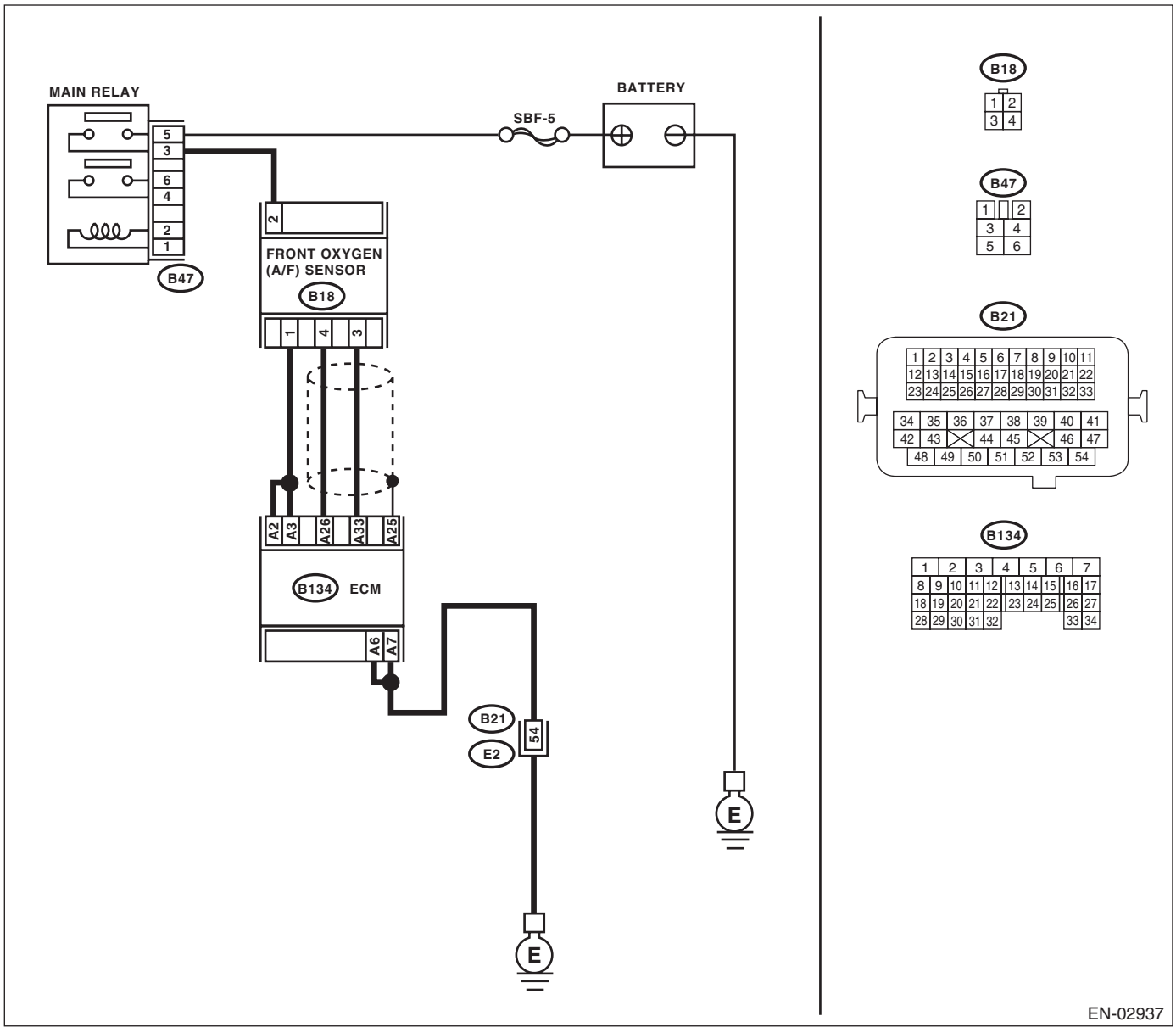
DI: DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

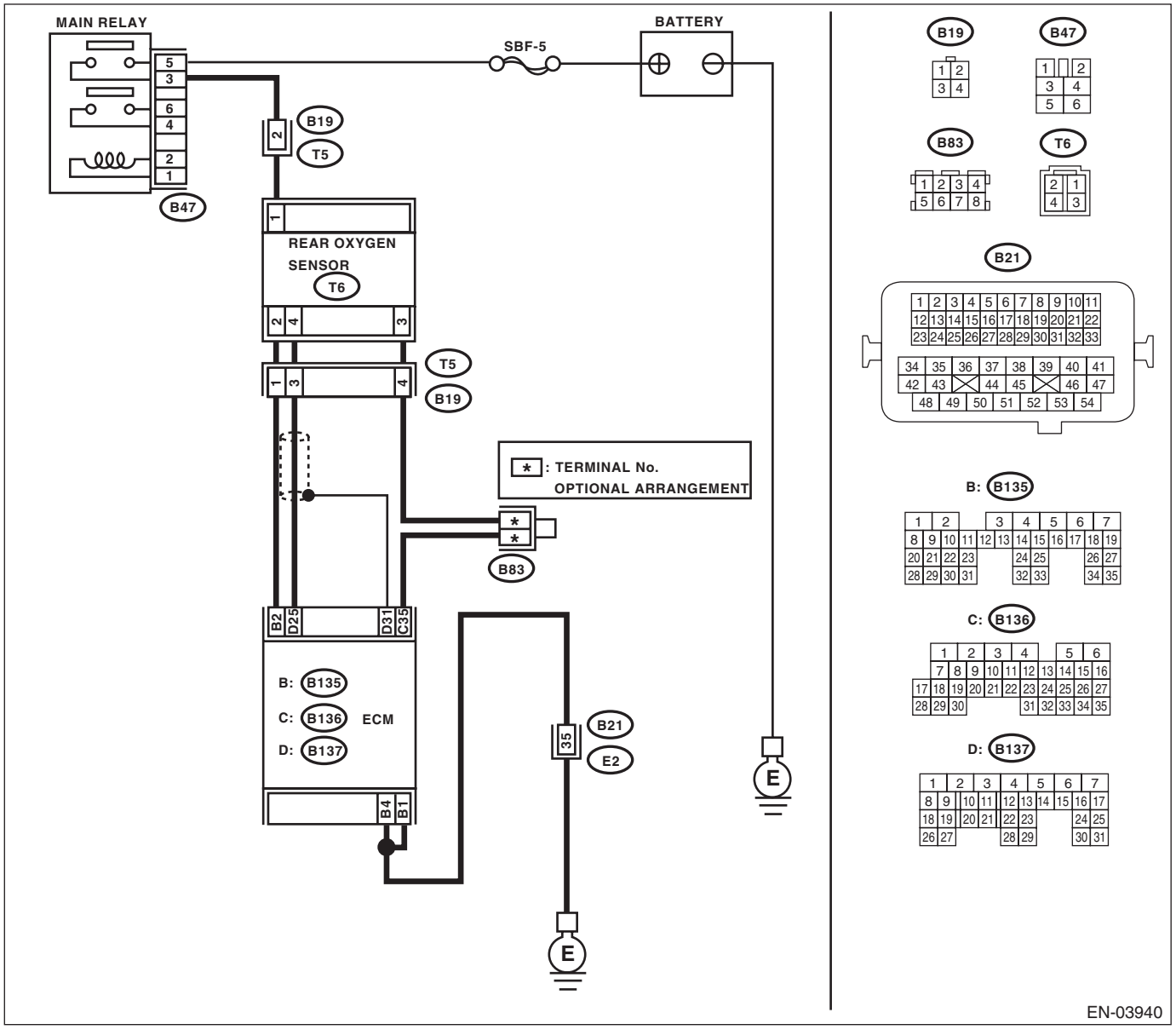
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-229, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2096.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	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 connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (B18) No. 4:*** ***(B134) No. 33 — (B18) No. 3:***	Is the resistance less than 1 MΩ?	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
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:*** ***(B134) No. 33 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5	**CHECK OUTPUT SIGNAL OF ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **6**.	Go to step **7**.
6	**CHECK OUTPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
7	**CHECK OUTPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the voltage more than 4.95 V?	Go to step **8**.	Go to step **9**.

	Step	Check	Yes	No
8	**CHECK OUTPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
9	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **10**.
10	**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 **11**.
11	**CHECK FUEL PRESSURE.** **WARNING:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel.** Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-24, INSPECTION, Fuel Pressure.> **WARNING:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)?	Go to step **12**.	Repair the following item. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line
12	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-24, INSPECTION, Fuel Pressure.> **WARNING:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If the measured value at this step is out of specification, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.36 — 2.65 kgf/cm^2, 33 — 38 psi)?	Go to step **13**.	Repair the following item. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
13	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 60°C (140°F)?	Go to step **14**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-21, Engine Coolant Temperature Sensor.>
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?	Go to step **15**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>
15	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Subtract the ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **16**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
16	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 490 mV?	Go to step **20**.	Go to step **17**.
17	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	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*** ***(B137) No. 25 — (T6) No. 4:*** ***(B136) No. 35 — (T6) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.	Go to step **19**.
19	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 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 harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Engine ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
20	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and drop the engine speed suddenly from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 250 mV?	Go to step **21**.	Go to step **17**.
21	**CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and leave it for 5 minutes or more with idling. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 0.8 V for more than 5 minutes during idling?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-34, Front Oxygen (A/F) Sensor.>	Go to step **18**.

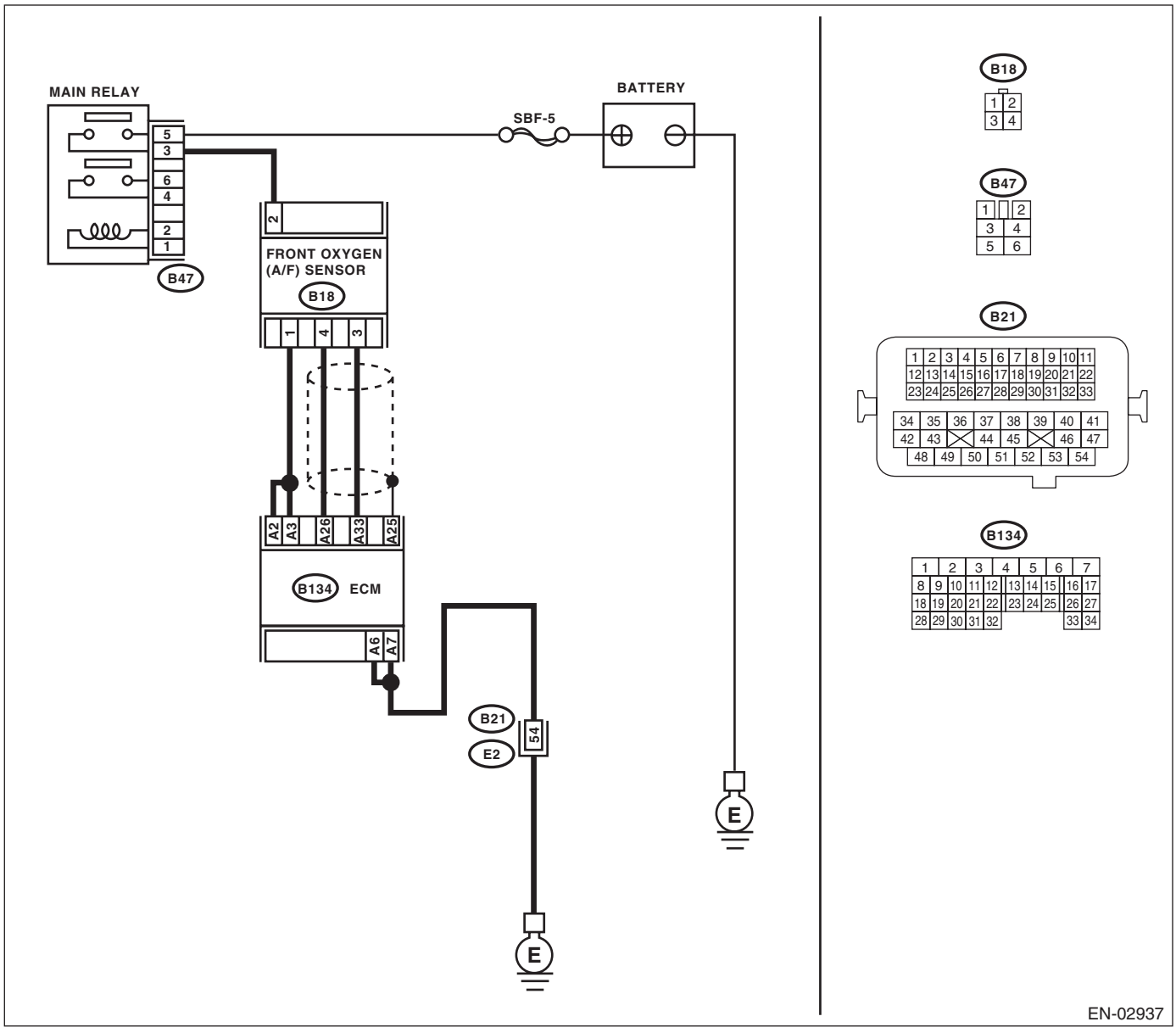
DJ:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

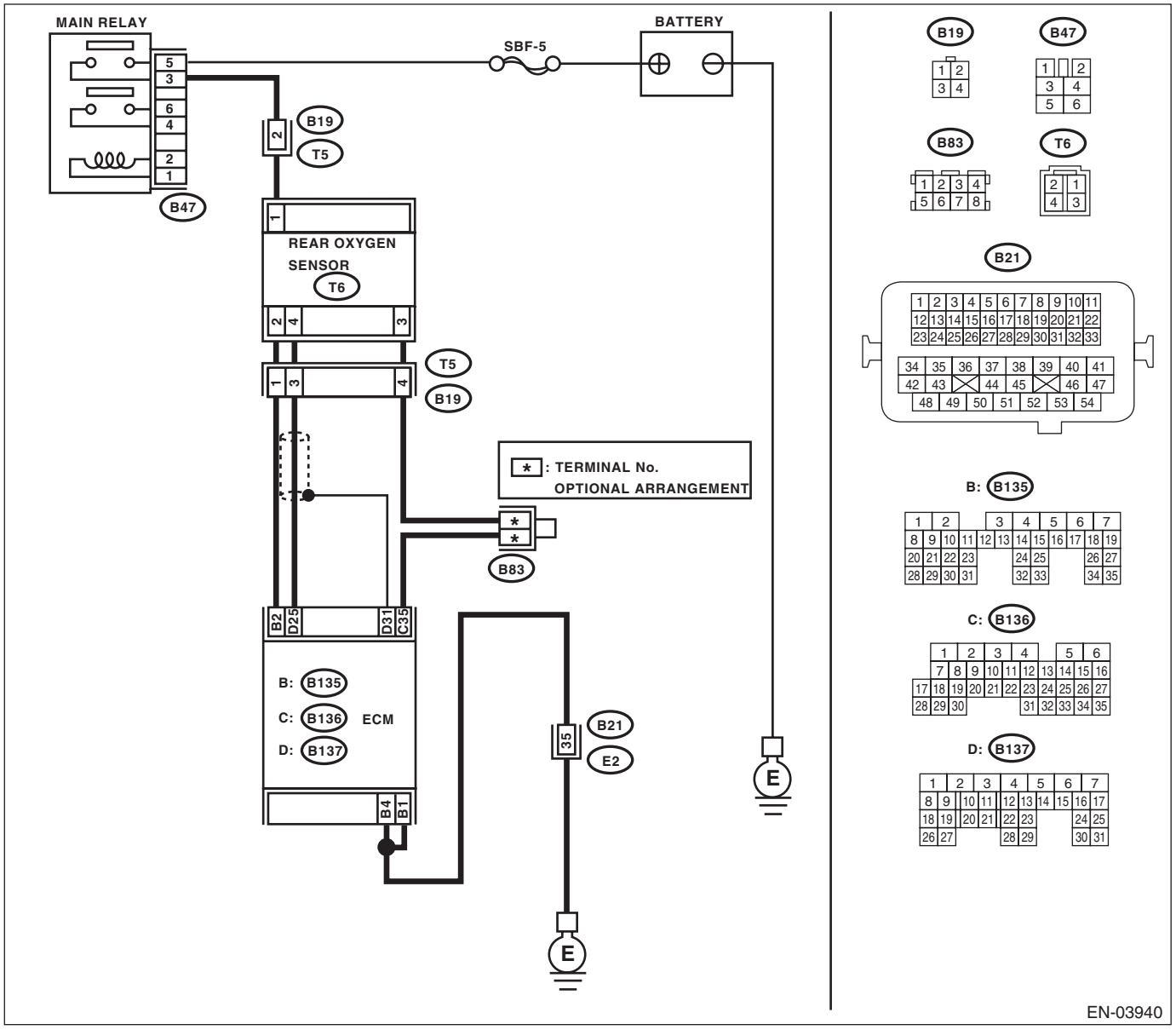
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-231, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2097.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	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 connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (B18) No. 4:*** ***(B134) No. 33 — (B18) No. 3:***	Is the resistance less than 1 MΩ?	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
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:*** ***(B134) No. 33 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5	**CHECK OUTPUT SIGNAL OF ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **6**.	Go to step **7**.
6	**CHECK OUTPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
7	**CHECK OUTPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the voltage more than 4.95 V?	Go to step **8**.	Go to step **9**.

	Step	Check	Yes	No
8	**CHECK OUTPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
9	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **10**.
10	**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 **11**.
11	**CHECK FUEL PRESSURE.** **WARNING:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel.** Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-24, INSPECTION, Fuel Pressure.> **WARNING:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)?	Go to step **12**.	Repair the following item. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line
12	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-24, INSPECTION, Fuel Pressure.> **WARNING:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If the measured value at this step is out of specification, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)?	Go to step **13**.	Repair the following item. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
13	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 60°C (140°F)?	Go to step **14**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-21, Engine Coolant Temperature Sensor.>
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?	Go to step **15**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>
15	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in 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 procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Subtract the ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **16**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-26, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
16	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 490 mV?	Go to step **20**.	Go to step **17**.
17	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	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*** ***(B137) No. 25 — (T6) No. 4:*** ***(B136) No. 35 — (T6) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.	Go to step **19**.
19	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 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 harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Engine ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-36, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
20	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and drop the engine speed suddenly from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 250 mV?	Go to step **21**.	Go to step **17**.
21	**CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and leave it for 5 minutes or more with idling. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 0.8 V for more than 5 minutes during idling?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-34, Front Oxygen (A/F) Sensor.>	Go to step **18**.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-233, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

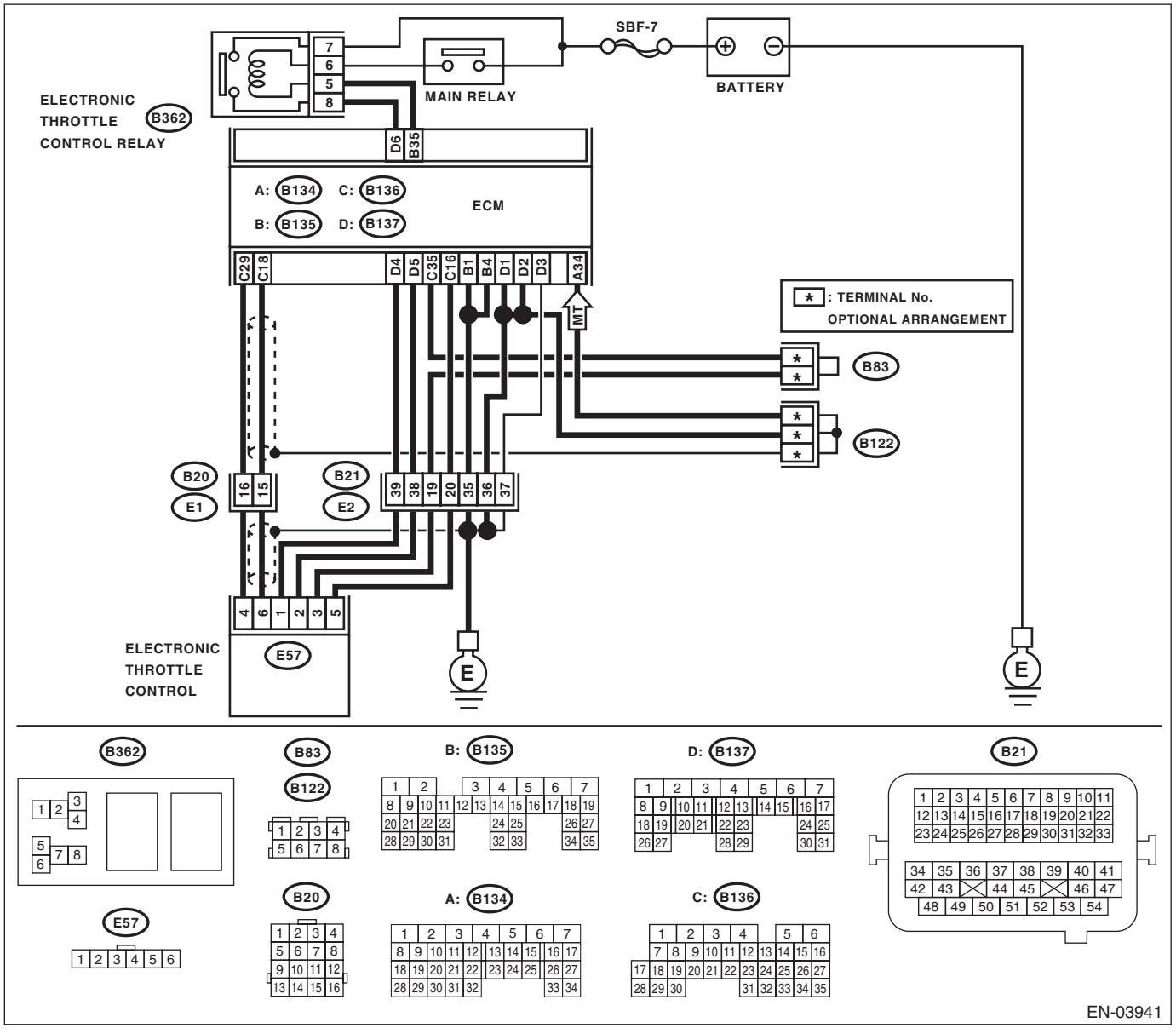
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 7 (+) — Chassis ground (–):*** ***(B362) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 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 RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the power supply short circuit of harness between ECM and electronic throttle control.	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. 5 — Chassis ground:*** ***(B362) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM connector and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B362) No. 5:*** ***(B137) No. 6 — (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 SENSOR OUTPUT.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (–):***	Is the voltage more than 0.4 V?	Go to step **7**.	Go to step **9**.
7	**CHECK SENSOR OUTPUT.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (–):***	Is the voltage more than 0.8 V?	Go to step **8**.	Go to step **9**.

	Step	Check	Yes	No
8	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **13**.
9	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair the open circuit of harness connector.
10	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11**.	Repair the ground short circuit of harness.
11	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **12**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
12	**CHECK SHORT CIRCUIT IN ECM.** 1) Turn the ignition switch to OFF. 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 more than 10 Ω?	Go to step **13**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
13	**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: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage 4.63 V?	Go to step **14**.	Go to step **16**.
14	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage 4.73 V?	Go to step **15**.	Go to step **16**.

	Step	Check	Yes	No
15	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **20**.
16	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **17**.	Repair the open circuit of harness connector.
17	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 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 **18**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
18	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 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 less than 10 V?	Go to step **19**.	Repair the short circuit of harness between ECM connector and electronic throttle control connector.
19	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 35:*** ***(B136) No. 29 — (B136) No. 35:***	Is the resistance more than 1 MΩ?	Go to step **20**.	Repair the short circuit to sensor power supply.
20	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to OFF. 2) Connect the connectors except for electric throttle control relay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **21**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.

	Step	Check	Yes	No
21	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **22**.	Repair the poor contact of ECM connector. Replace the electronic throttle control if defective.
22	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector 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 **23**.	Repair the open circuit of harness connector.
23	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 (+) — Engine ground (–):*** ***(E57) No. 1 (+) — Engine ground (–):***	Is the voltage less than 5 V?	Go to step **24**.	Repair the power supply short circuit of harness between ECM and electronic throttle control.
24	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 — Engine ground:*** ***(E57) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **25**.	Repair the short circuit of harness.
25	**CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.** Measure the resistance between electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance more than 1 MΩ?	Go to step **26**.	Repair the short circuit of harness.
26	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 3 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **27**.	Repair the open circuit of the harness.
27	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 50 Ω?	Go to step **28**.	Replace the electronic throttle control.

Step		Check	Yes	No
28	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Standard value: 3 mm (0.12 in) from fully closed position	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Replace the electronic throttle control.

DL:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-235, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

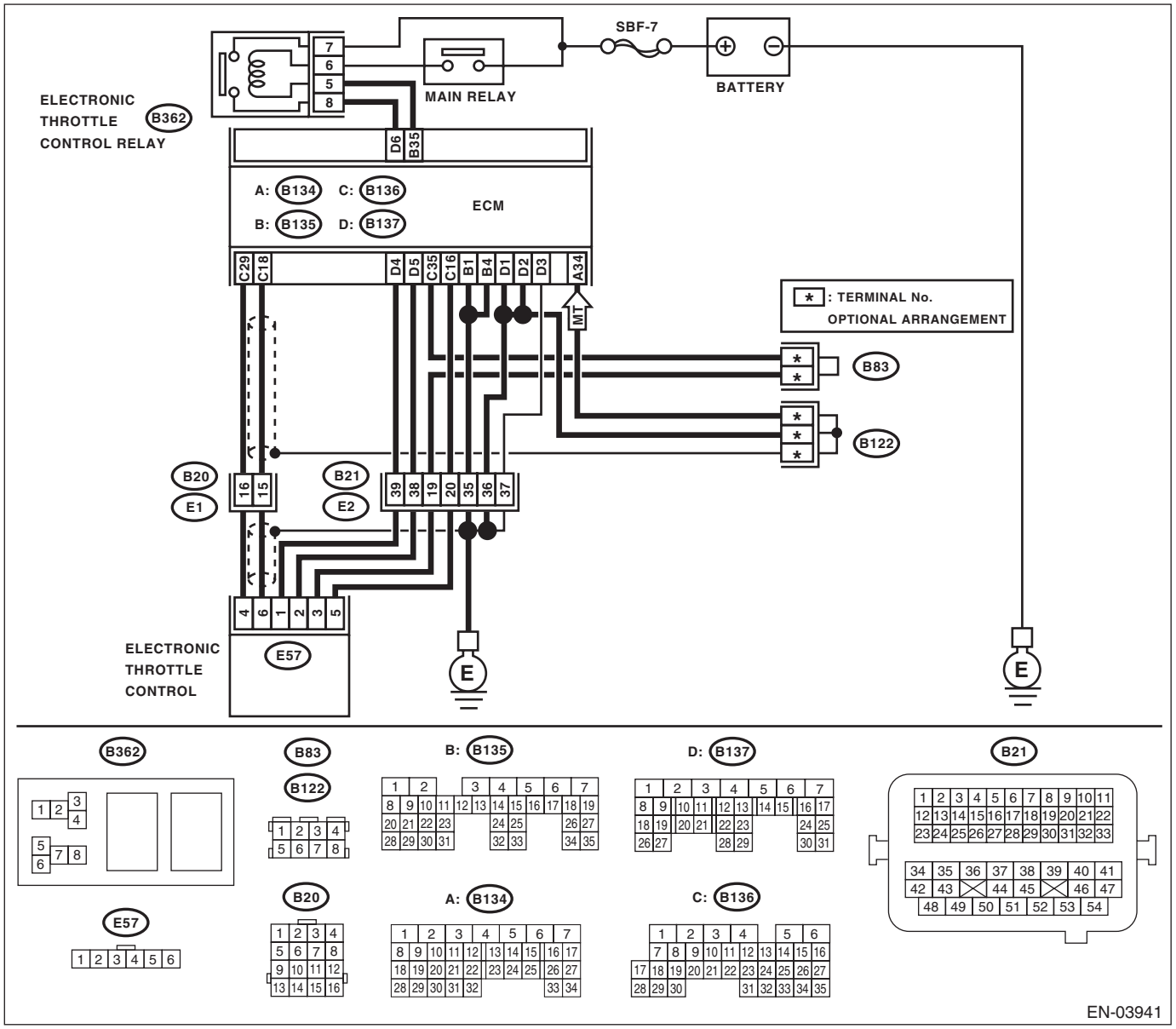
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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 terminals. ***Terminals*** ***(B362) No. 7 — (B362) 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.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 7 (+) — Chassis ground (–):*** ***(B362) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 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 RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the power supply short circuit of 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. 5 — Chassis ground:*** ***(B362) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM connector and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B362) No. 5:*** ***(B137) No. 6 — (B362) No. 8:***	Is the resistance less than 1 Ω?	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the open circuit of harness between ECM and electronic throttle control relay.

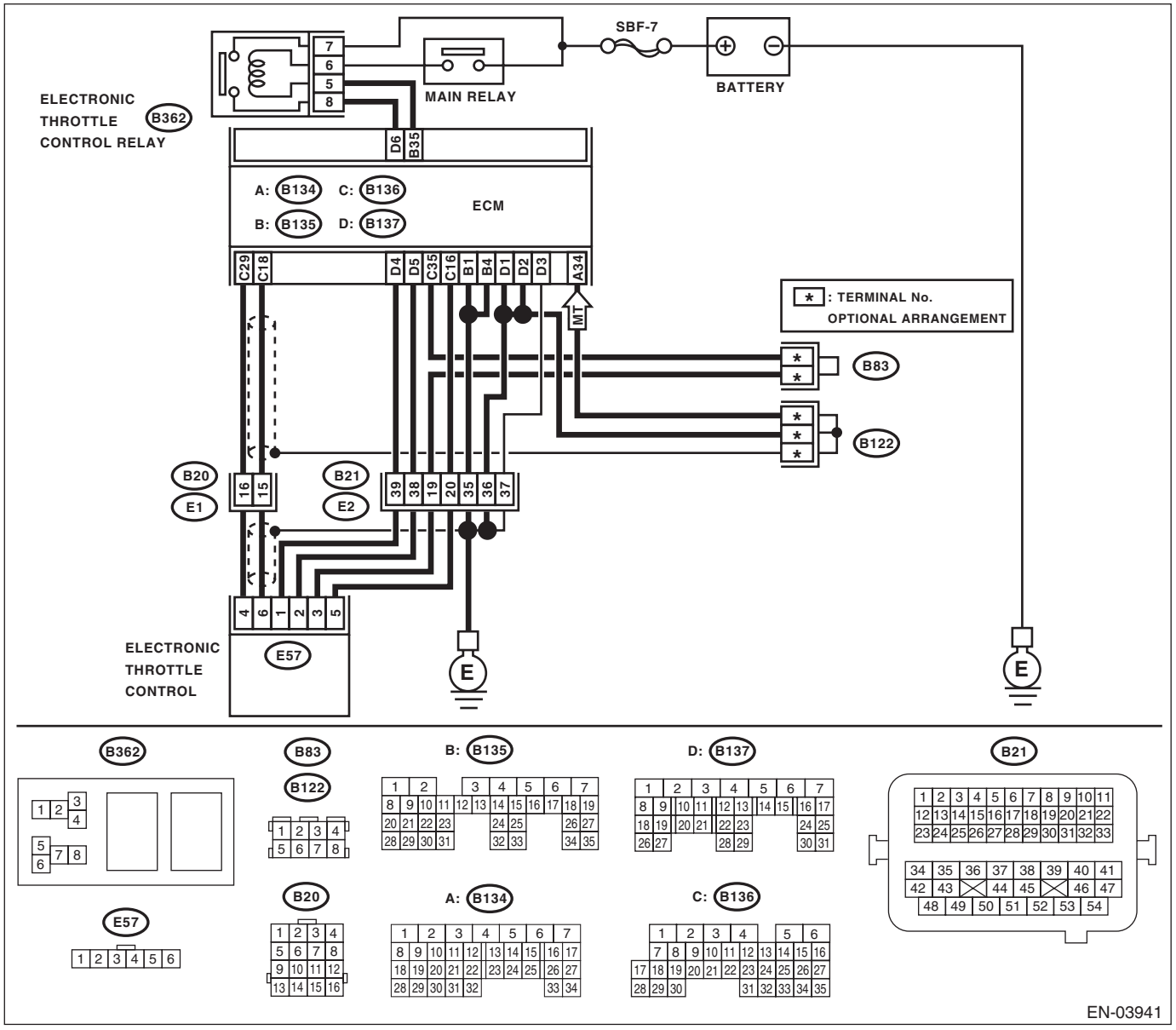
DM:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-237, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, 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 more than 1 MΩ?	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 more than 5 V?	Go to step **3**.	Repair the power supply short circuit of harness between ECM and electronic throttle control relay.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 35 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the ground short circuit of harness between ECM and electronic throttle control relay.

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

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-290, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

DTC DETECTING CONDITION:

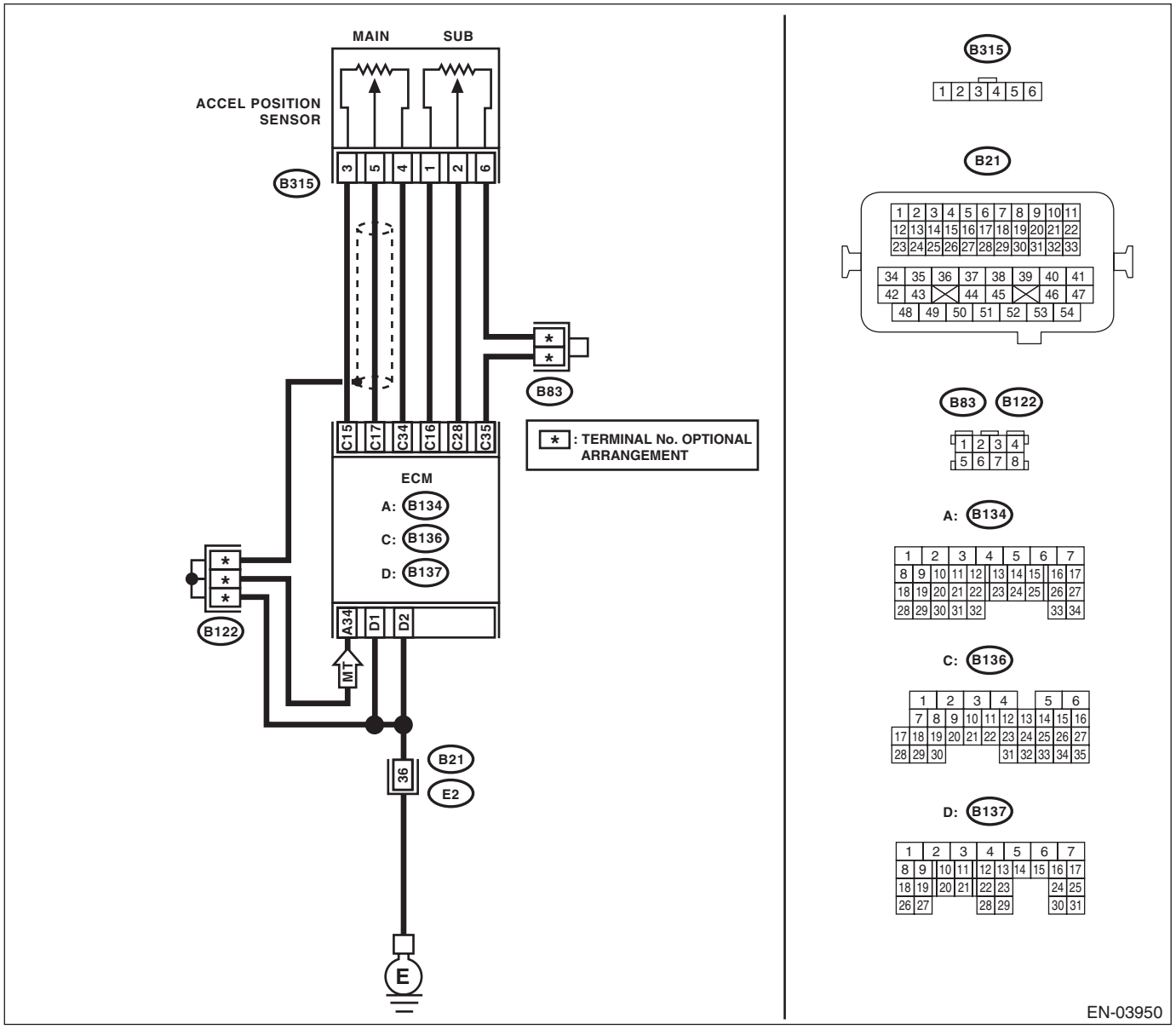
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-241, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 17 — (B315) No. 5:*** ***(B136) No. 15 — (B315) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **6**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance between 1.2 and 4.8 kΩ?	Go to step **7**.	Replace the accelerator pedal position sensor.
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 5 — No. 4:*** Check the measured value is within the specification without depressing the accelerator pedal.	Is the resistance between 0.2 and 1.0 kΩ?	Go to step **8**.	Replace the accelerator pedal position sensor.

Step		Check	Yes	No
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 5 — No. 4:*** Check the measured value is within the specification with the accelerator pedal depressed.	Is the resistance between 0.5 and 2.5 kΩ?	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Replace the accelerator pedal position sensor.

DP:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

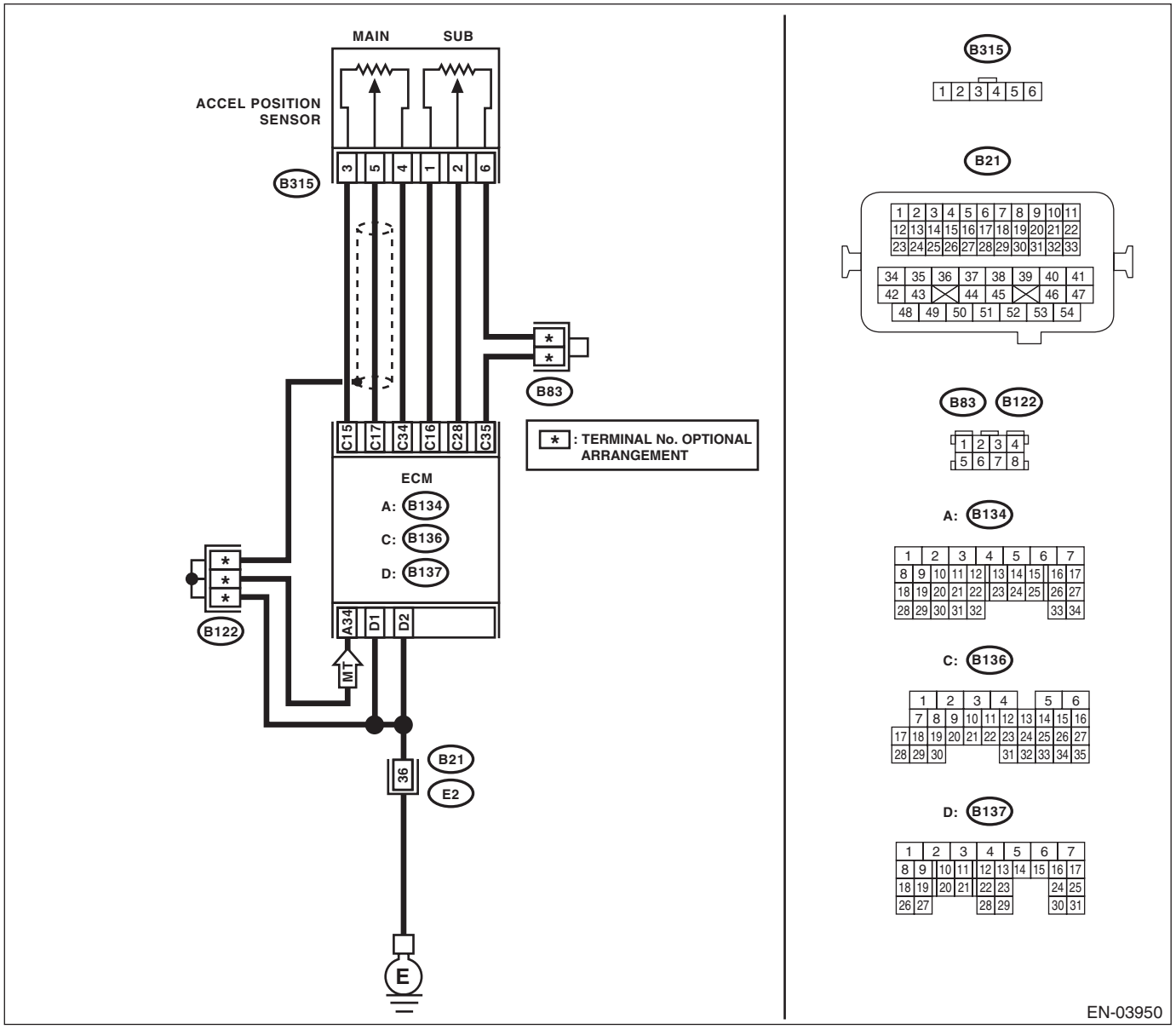
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-243, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 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 **5**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 6 V?	Go to step **6**.	Repair the battery short circuit of harness between ECM connector and accelerator pedal position sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 17 — (B136) No. 15:*** ***(B136) No. 17 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective.	Repair the short circuit to sensor power supply.

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

DTC DETECTING CONDITION:

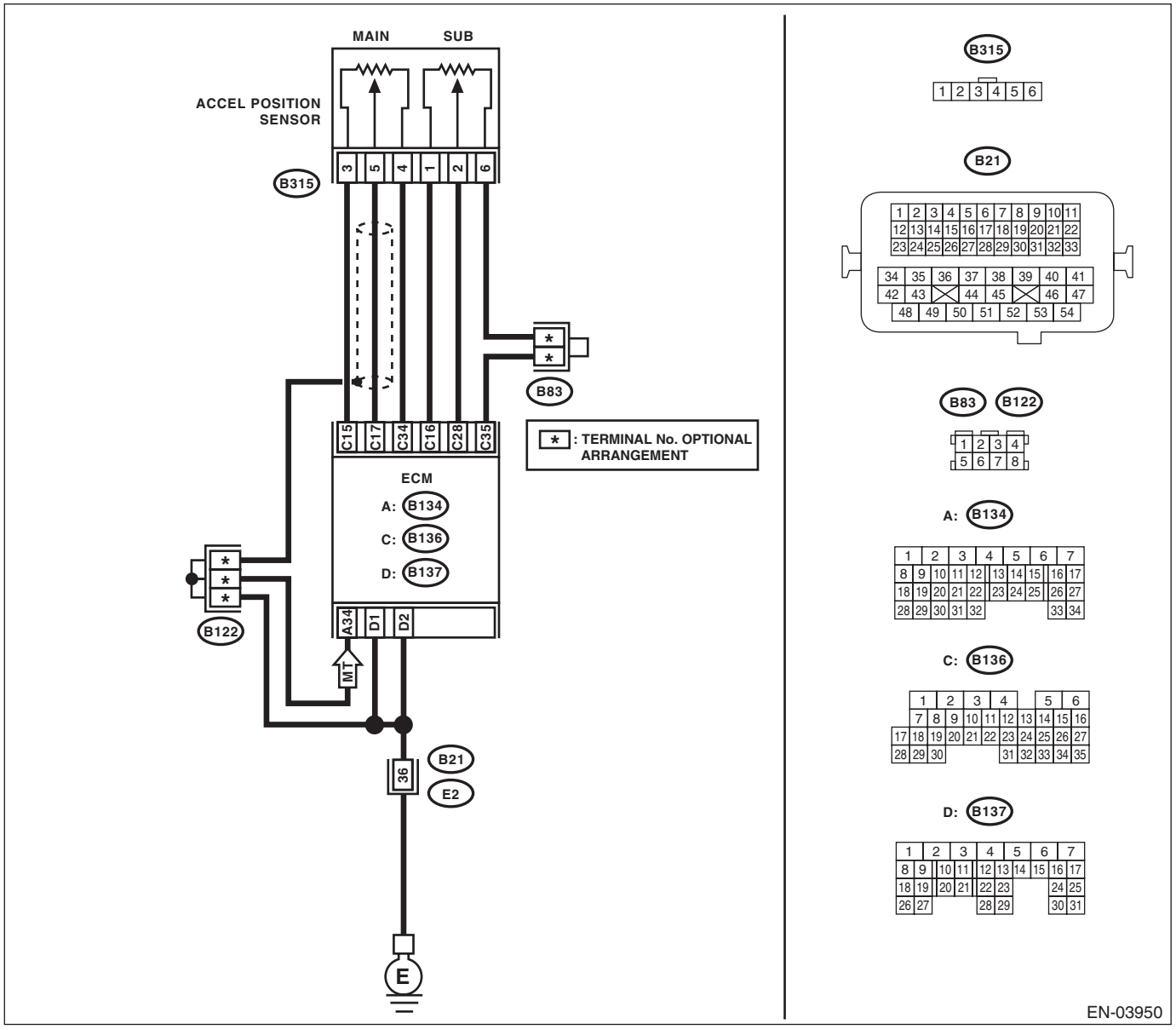
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-245, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 28 — (B315) No. 2:*** ***(B136) No. 16 — (B315) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 28 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Chassis ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **6**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the resistance between 0.75 and 3.15 kΩ?	Go to step **7**.	Replace the accelerator pedal position sensor.
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 2 — No. 6:*** 2) Check the measured value is within the specification without depressing the accelerator pedal.	Is the resistance between 0.15 and 0.63 kΩ?	Go to step **8**.	Replace the accelerator pedal position sensor.

	Step	Check	Yes	No
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 2 — No. 6:*** 2) Check the measured value is within the specification with the accelerator pedal depressed.	Is the resistance between 0.28 and 1.68 kΩ?	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Replace the accelerator pedal position sensor.

DR:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

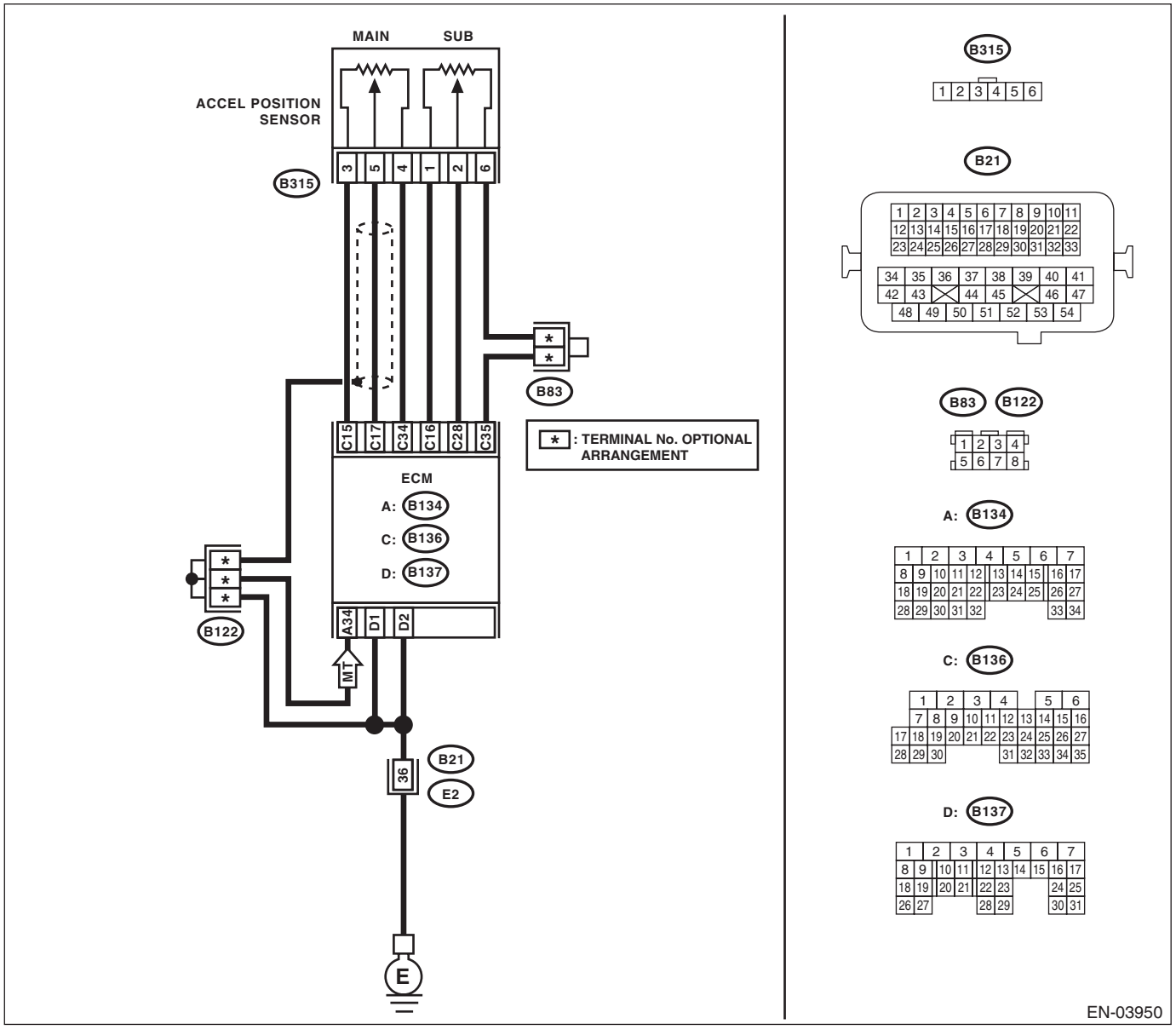
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-247, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 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 5 Ω?	Go to step **5**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 6 V?	Go to step **6**.	Repair the battery short circuit of harness between ECM connector and accelerator pedal position sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 28 — (B136) No. 15:*** ***(B136) No. 28 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective.	Repair the short circuit to sensor power supply.

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

DTC DETECTING CONDITION:

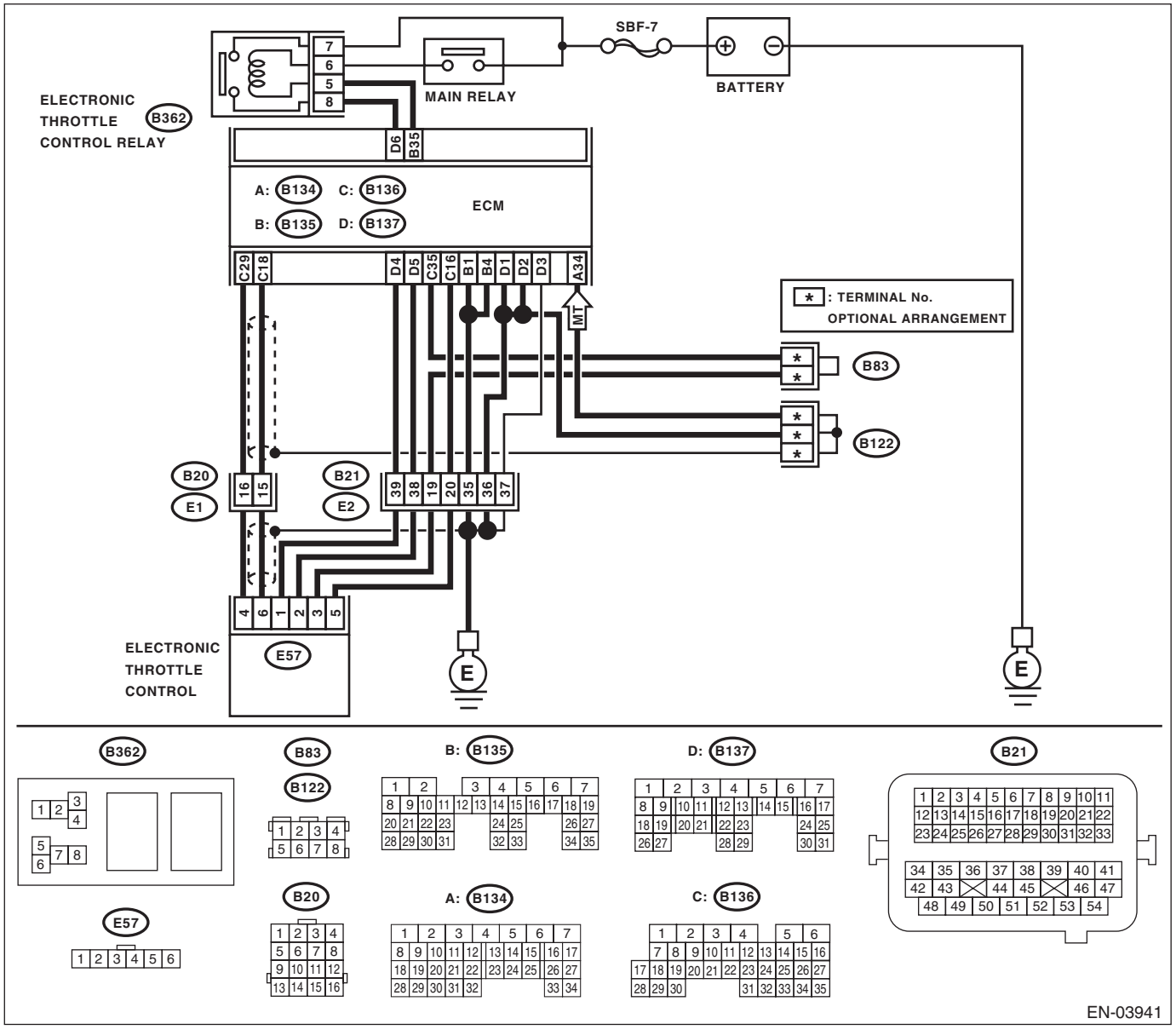
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-249, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (–):***	Is the voltage more than 0.4 V?	Go to step **2**.	Go to step **4**.
2	**CHECK SENSOR OUTPUT.** Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (–):***	Is the voltage more than 0.8 V?	Go to step **3**.	Go to step **4**.
3	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **14**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit of harness connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6**.	Repair the ground short circuit of harness.
6	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **7**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
7	**CHECK SHORT CIRCUIT IN ECM.** 1) Turn the ignition switch to OFF. 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 more than 10 Ω?	Go to step **8**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>

	Step	Check	Yes	No
8	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.63 V?	Go to step **9**.	Go to step **11**.
9	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.73 V?	Go to step **10**.	Go to step **11**.
10	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **12**.	Repair the open circuit of harness connector.
12	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 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 **13**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
13	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):***	Is the voltage less than 10 V?	Go to step **14**.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
14	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 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 less than 10 V?	Go to step **15**.	Repair the short circuit of harness between ECM connector and electronic throttle control connector.

	Step	Check	Yes	No
15	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 35:*** ***(B136) No. 29 — (B136) No. 35:***	Is the resistance more than 1 MΩ?	Go to step **16**.	Repair the short circuit to sensor power supply.
16	**CHECK ELECTRONIC THROTTLE CONTROL HARNESS.** 1) Disconnect the connectors from ECM. 2) Disconnect the connectors from electronic throttle control. 3) Measure the resistance between electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 6 — (E57) No. 4:***	Is the resistance more than 1 MΩ?	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the short circuit of harness.

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

DTC DETECTING CONDITION:

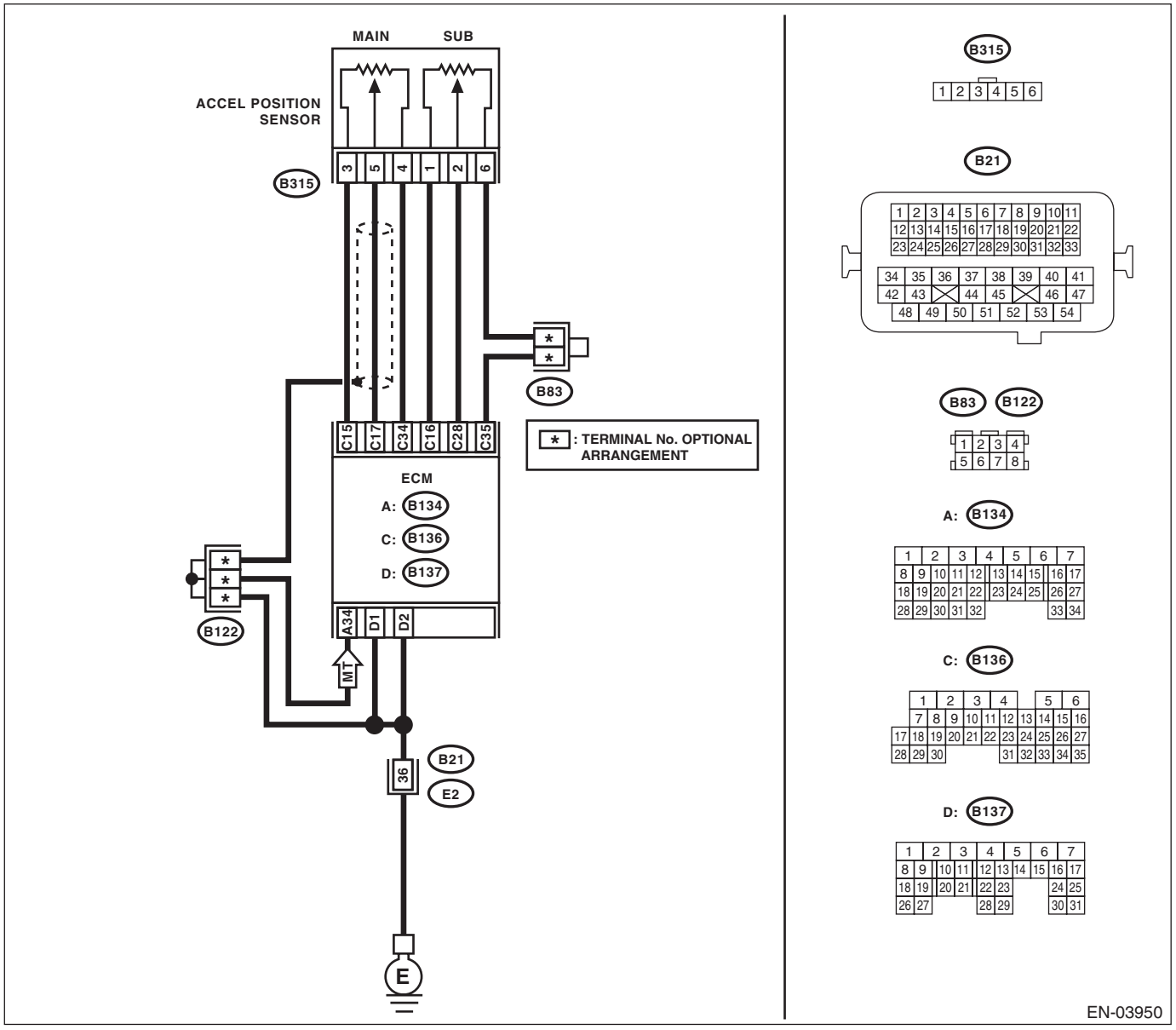
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-251, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Go to step **12**.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 17 — (B315) No. 5:*** ***(B136) No. 15 — (B315) No. 3:*** ***(B136) No. 28 — (B315) No. 2:*** ***(B136) No. 16 — (B315) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 15 — Chassis ground:*** ***(B136) No. 28 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the ground short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Chassis ground (–):*** ***(B315) No. 1 (+) — Chassis ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **6**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance between 1.2 and 4.8 kΩ?	Go to step **7**.	Replace the accelerator pedal position sensor.

	Step	Check	Yes	No
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the resistance between 0.75 and 3.15 kΩ?	Go to step **8**.	Replace the accelerator pedal position sensor.
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor without depressing the accelerator pedal. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance between 0.2 and 0.8 kΩ?	Go to step **9**.	Replace the accelerator pedal position sensor.
9	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor without depressing the accelerator pedal. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance between 0.15 and 0.63 kΩ?	Go to step **10**.	Replace the accelerator pedal position sensor.
10	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor while depressing the accelerator pedal. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance between 0.5 and 2.5 kΩ?	Go to step **11**.	Replace the accelerator pedal position sensor.
11	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor while depressing the accelerator pedal. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance between 0.28 and 1.68 kΩ?	Go to step **12**.	Replace the accelerator pedal position sensor.
12	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor.	Is the voltage less than 4.8 V?	Go to step **13**.	Go to step **14**.
13	**CHECK POOR CONTACT.** Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Go to step **18**.
14	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:*** ***(B136) No. 35 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **15**.	Repair the open circuit of harness connector.

	Step	Check	Yes	No
15	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between 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?	Go to step **16**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>
16	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) 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 voltage less than 6 V?	Go to step **17**.	Repair the battery short circuit of harness between ECM connector and accelerator pedal position sensor connector.
17	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 17 — (B136) No. 15:*** ***(B136) No. 17 — (B136) No. 16:*** ***(B136) No. 28 — (B136) No. 15:*** ***(B136) No. 28 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Go to step **18**.	Repair the short circuit to sensor power supply.
18	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between connector terminals of accelerator pedal position sensor. ***Connector & terminal*** ***(B315) No. 5 — (B315) No. 2:***	Is the resistance more than 1 MΩ?	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).>	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector.

DU:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-253, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).> NOTE: The atmospheric pressure sensor is built into the ECM.

DV:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-254, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).> NOTE: The atmospheric pressure sensor is built into the ECM.

DW:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-255, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-68, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H4DOTC)-38, Engine Control Module (ECM).> NOTE: The atmospheric pressure sensor is built into the ECM.

19.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-89, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Electronic throttle control 2) Manifold absolute pressure sensor 3) Mass air flow and intake air temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Electronic throttle control 2) Manifold absolute pressure sensor 3) Mass air flow and intake air temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 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) Electronic throttle control 2) Engine coolant temperature sensor 3) Manifold absolute pressure sensor 4) Mass air flow 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)
5. Engine stalls, hesitates, or sputters at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Fuel pump and fuel pump relay
6. Surging	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) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay

Symptom	Problem parts
7. Spark knock	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature 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) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature 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 fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.

GENERAL DESCRIPTION

GD(H4DOTC)

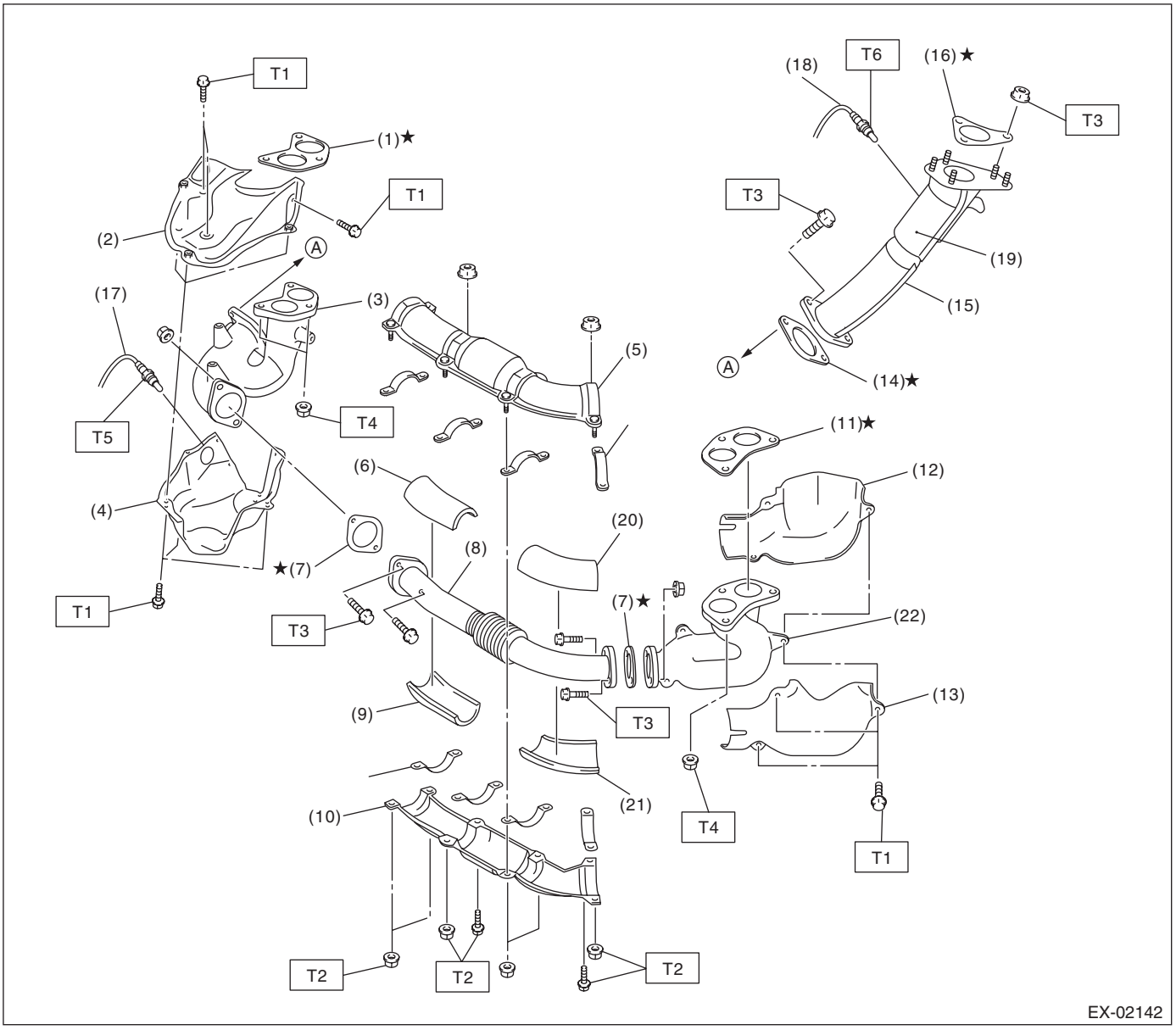
Page

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

1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE

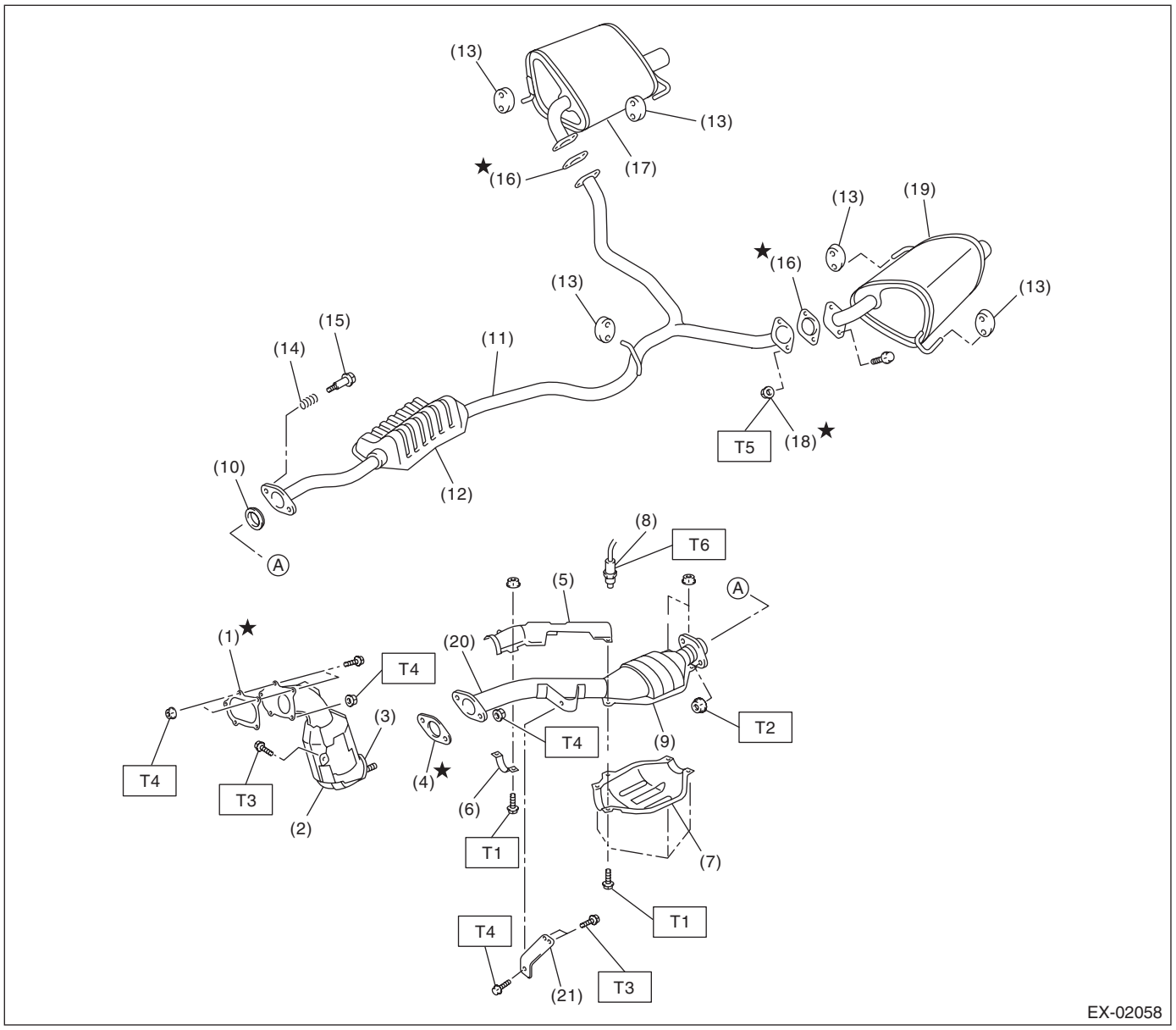


(1) Gasket
(2) Exhaust manifold upper cover (RH)
(3) Exhaust manifold (RH)
(4) Exhaust manifold lower cover (RH)
(5) Front exhaust pipe upper cover
(6) Front exhaust pipe upper insulator (RH)
(7) Gasket
(8) Front exhaust pipe
(9) Front exhaust pipe lower insulator (RH)
(10) Front exhaust pipe lower cover
(11) Gasket
(12) Exhaust manifold upper cover (LH)
(13) Exhaust manifold lower cover (LH)
(14) Gasket
(15) Turbocharger joint pipe
(16) Gasket
(17) Front oxygen (A/F) sensor
(18) Exhaust temperature sensor
(19) Precatalytic converter
(20) Front exhaust pipe upper insulator (LH)
(21) Front exhaust pipe lower insulator (LH)
(22) Exhaust manifold (LH)

Tightening torque: N·m (kgf-m, ft-lb)

T1: 19 (1.9, 13.7)
T2: 7.5 (0.8, 5.5)
T3: 35 (3.6, 26.0)
T4: 40 (4, 28.9)
T5: <Ref. to FU(H4DOTC)-34, INSTALLATION, Front Oxygen (A/F) Sensor.>
T6: <Ref. to FU(H4DOTC)-37, INSTALLATION, Exhaust Temperature Sensor.>

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 13 (1.3, 9.6)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.4)
T4: 35 (3.6, 26.0)
T5: 48 (4.9, 35.4)
T6: <Ref. to FU(H4DOTC)-36, INSTALLATION, Rear Oxygen Sensor.>

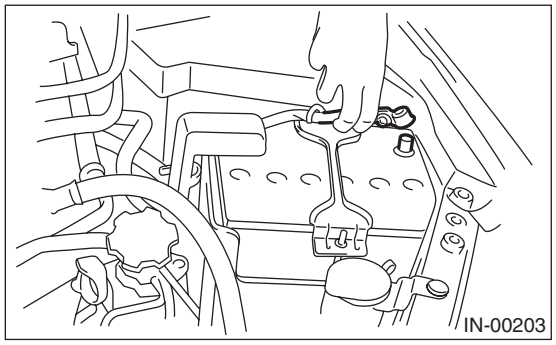
B: CAUTION

• 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 battery.

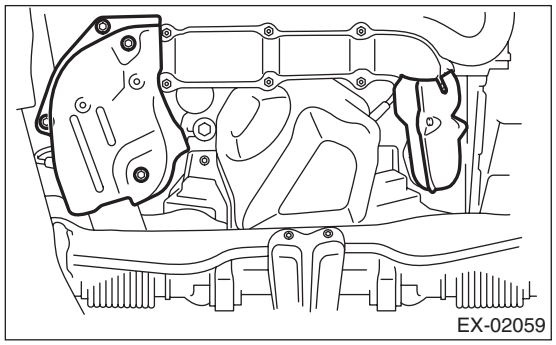
2. Front Exhaust Pipe

A: REMOVAL

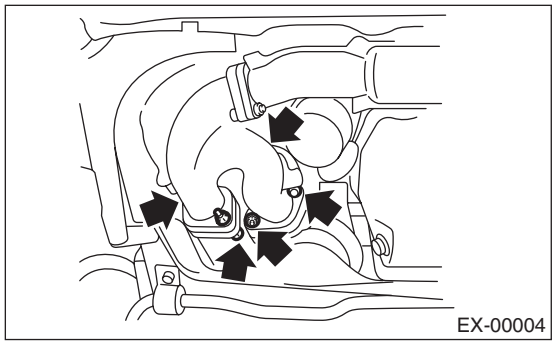
1) Disconnect the ground cable from battery.

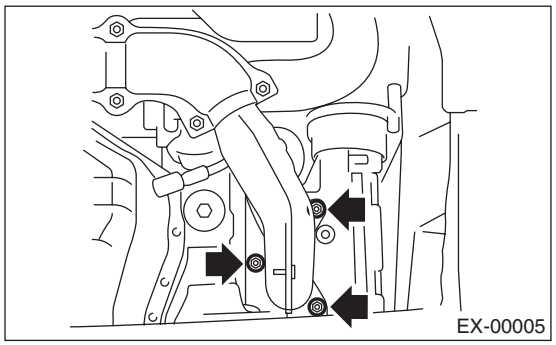


2) Remove the front oxygen (A/F) sensor.
<Ref. to FU(H4DOTC)-34, REMOVAL, Front Oxygen (A/F) Sensor.>
3) Remove the under cover.
4) Remove the exhaust manifold lower cover (RH) and the exhaust manifold lower cover (LH).

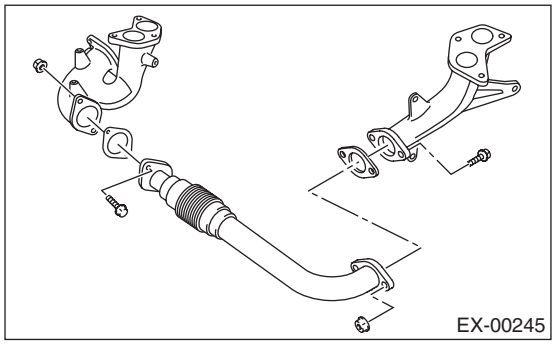


5) Remove the nuts which hold front exhaust pipe assembly onto turbocharger joint pipe.
6) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold the front exhaust pipe assembly to cylinder head exhaust port.





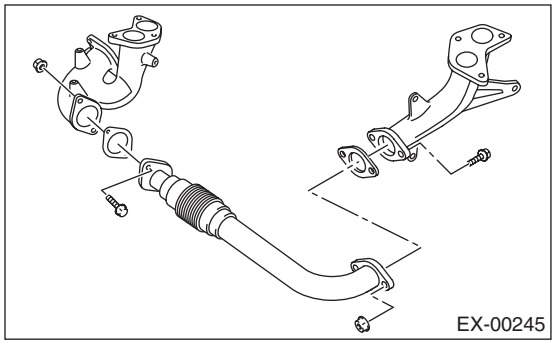
7) Remove the front exhaust pipe assembly.
8) Remove the covers from exhaust manifold and front exhaust pipe.
9) Separate the front exhaust pipe from exhaust manifolds.



B: INSTALLATION

NOTE:
Replace with a new gasket.
1) Install the front exhaust pipe and the exhaust manifold.

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



2) Install the front exhaust pipe cover.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)
3) Install the exhaust manifold upper cover (RH).

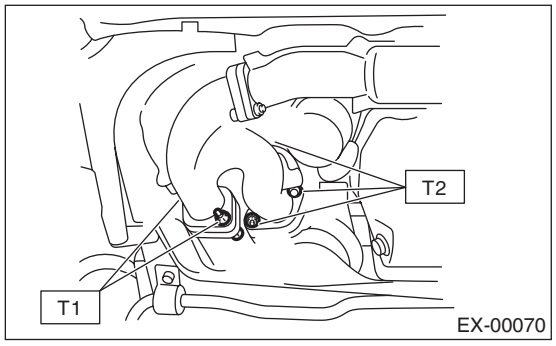
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

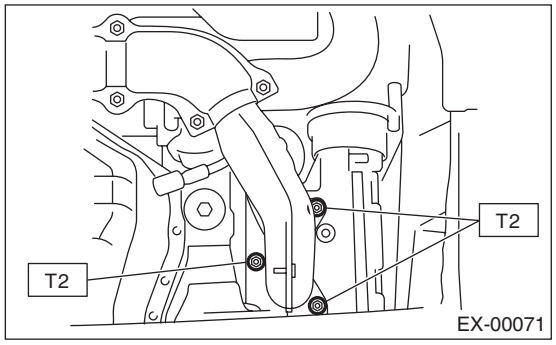
4) Install the front exhaust pipe assembly.

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

5) Connect the exhaust manifold (RH) to turbocharger joint pipe.

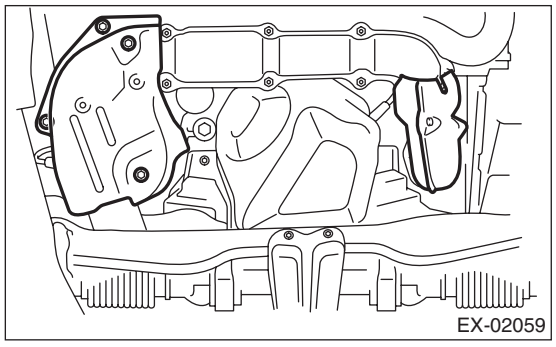
Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26.0 ft-lb)
T2: 40 N·m (4.0 kgf-m, 28.9 ft-lb)





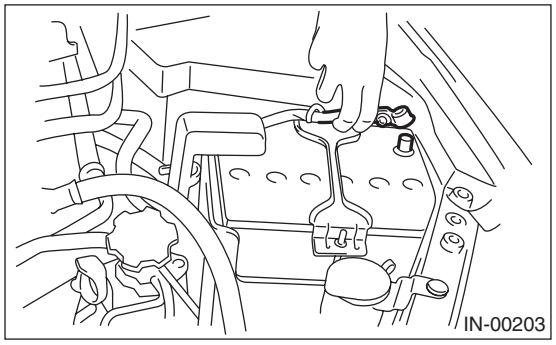
6) Install the exhaust manifold lower cover (RH) and the exhaust manifold lower cover (LH).

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



7) Install the front oxygen (A/F) sensor.
<Ref. to FU(H4DOTC)-34, INSTALLATION, Front Oxygen (A/F) Sensor.>
8) Install the under cover.

9) Connect the battery ground cable to the battery.



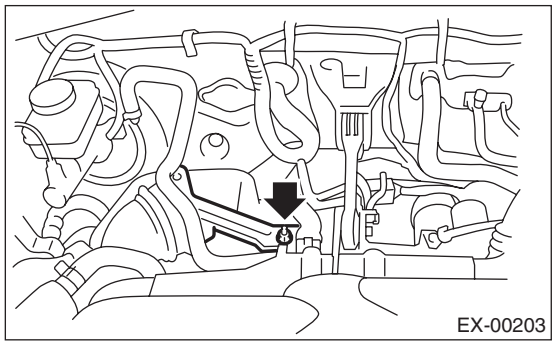
C: INSPECTION

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

3. Center Exhaust Pipe

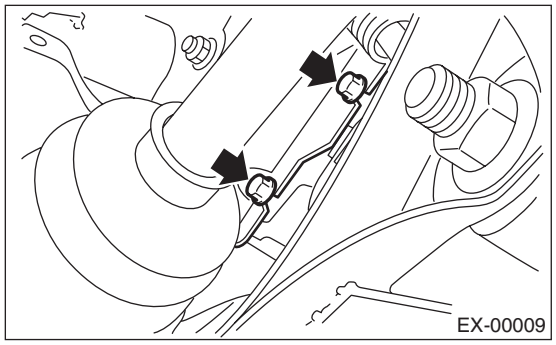
A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.
4) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
5) Remove the intercooler bracket.

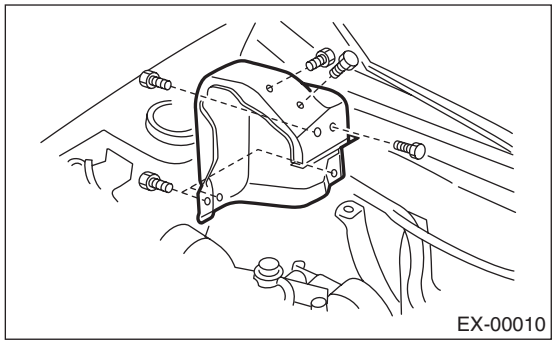

EX-00203

6) Lift-up the vehicle.
7) Remove the under cover.
8) Remove the bolts which install the lower side of turbocharger lower cover.

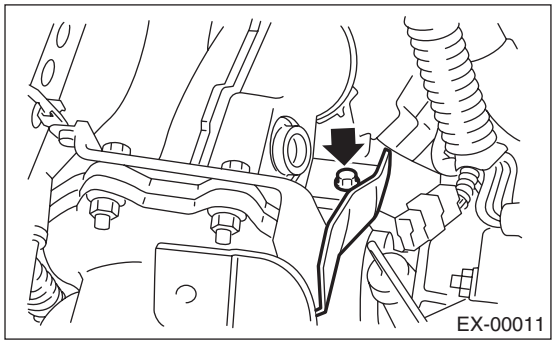
CAUTION:
Be careful, the turbocharger and exhaust pipe are hot.


EX-00009

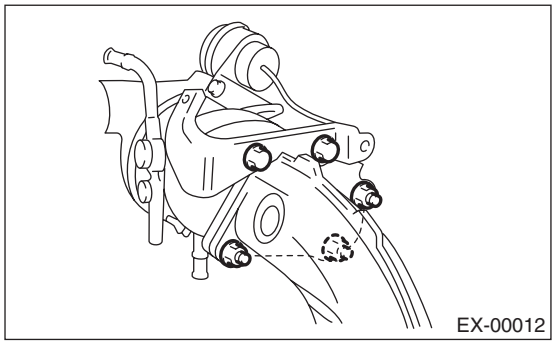
9) Lower the vehicle.
10) Remove the turbocharger upper cover.


EX-00010

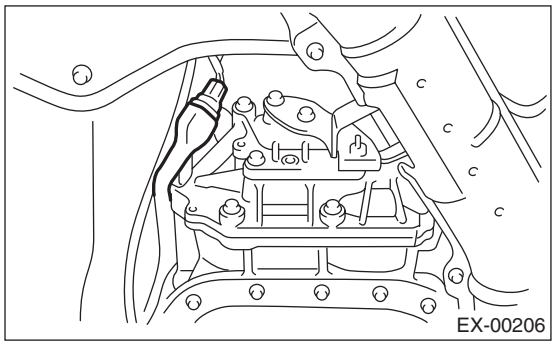
11) Remove the bolts which hold the turbocharger lower cover and center exhaust pipe.


EX-00011

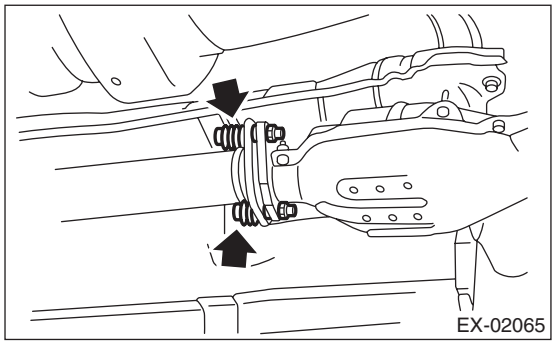
12) Separate the center exhaust pipe from turbocharger.


EX-00012

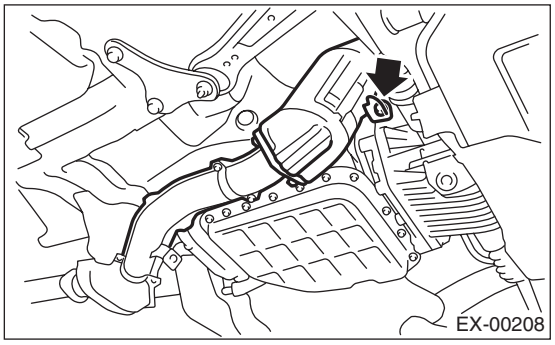
13) Lift-up the vehicle.
14) Disconnect the connector from the rear oxygen sensor.


EX-00206

15) Separate the center exhaust pipe from rear exhaust pipe.

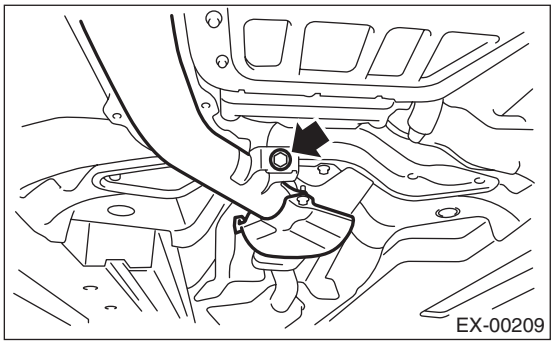

EX-02065

16) Remove the bolt which holds center exhaust pipe bracket to transmission.

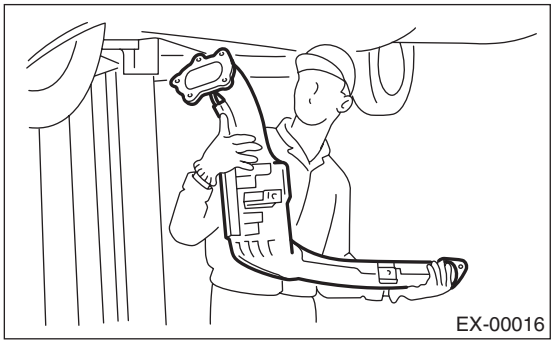


17) Remove the intercooler bracket.
18) Remove the bolt which holds center exhaust pipe to hanger bracket.

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



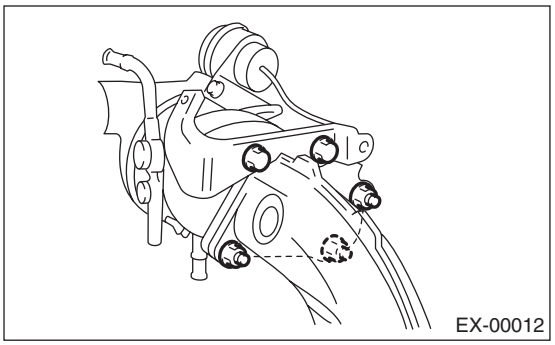
19) Remove the center exhaust pipe.



B: INSTALLATION

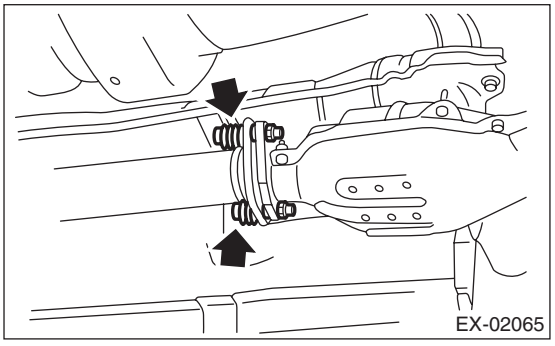
NOTE:
Replace with a new gasket.
1) Install the center exhaust pipe and temporarily tighten the bolt which holds center exhaust pipe to hanger bracket.
2) Temporarily tighten the bolt which holds the center pipe to transmission.
3) Connect the center exhaust pipe to turbocharger.

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

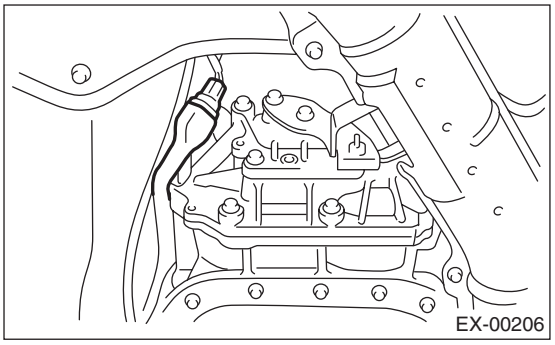


4) Install the center exhaust pipe to rear exhaust pipe.

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

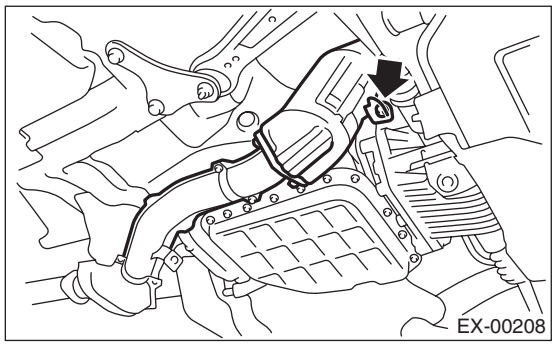


5) Connect the connector to rear oxygen sensor.



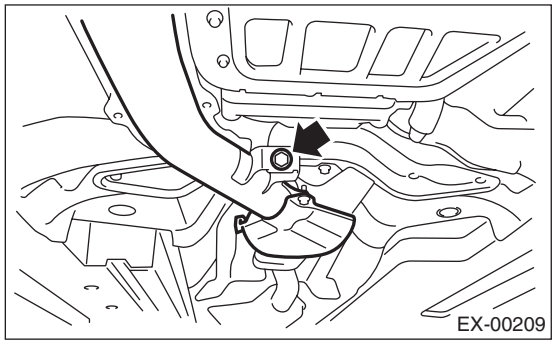
6) Tighten the bolt which holds center exhaust pipe bracket to transmission.

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



7) Tighten the bolt which holds center exhaust pipe to hanger bracket.

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



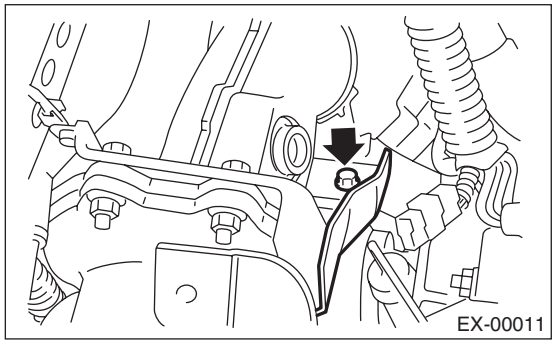
8) Tighten the bolts which hold the intercooler bracket.

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

9) Lower the vehicle.

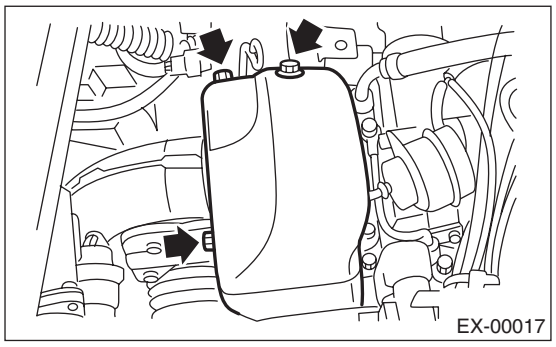
10) Position the turbocharger lower cover, and tighten the bolts which hold the lower cover and center exhaust pipe.

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



11) Position the turbocharger upper cover, and tighten the bolts which install the upper side of upper cover.

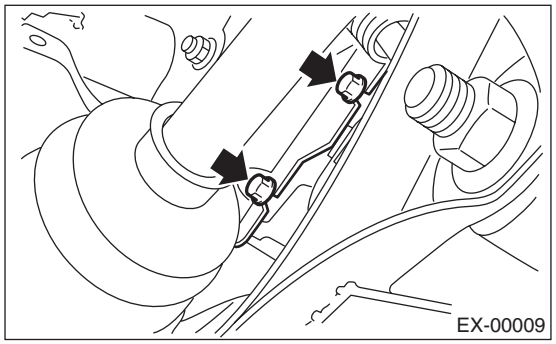
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



12) Lift-up the vehicle.

13) Tighten the bolts which install the under side of turbocharger lower cover.

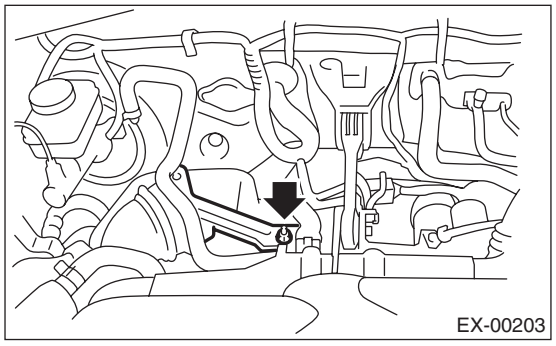
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



14) Install the under cover.

15) Lower the vehicle.

16) Install the intercooler bracket.



17) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>

18) Install the collector cover.

C: INSPECTION

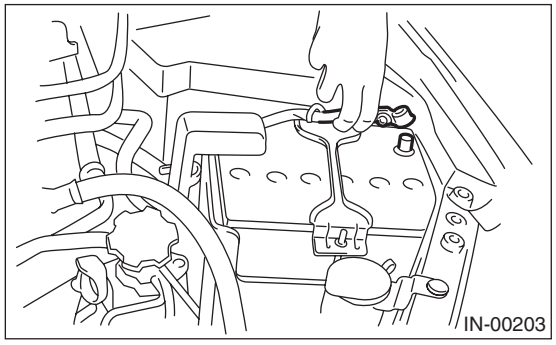
1) Check the connections and welds for exhaust leaks.

2) Make sure there are no holes or rusting.

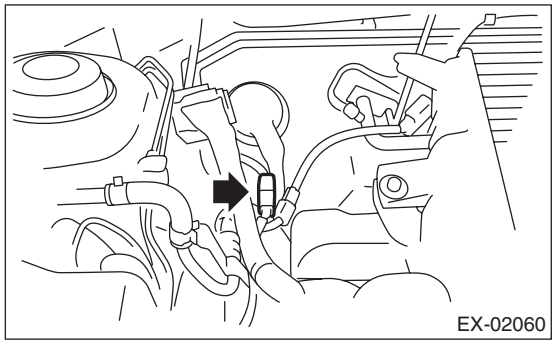
4. Joint Pipe

A: REMOVAL

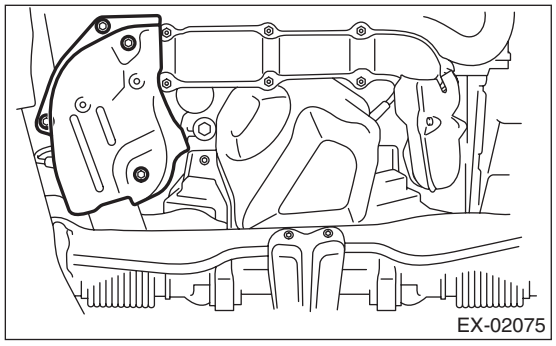
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



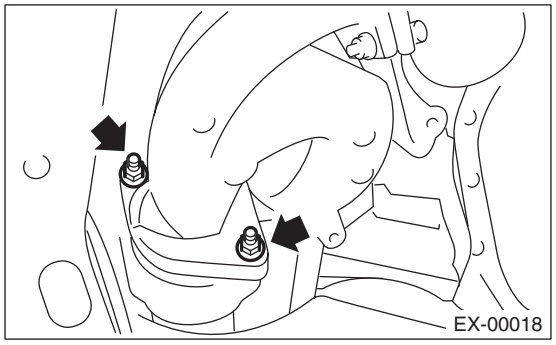
3) Disconnect the exhaust temperature sensor connector.



4) Remove the front oxygen (A/F) sensor.
<Ref. to FU(H4DOTC)-34, REMOVAL, Front Oxygen (A/F) Sensor.>
5) Remove the under cover.
6) Remove the exhaust manifold lower cover (RH).



7) Remove the nuts which hold the front exhaust manifold to joint pipe.

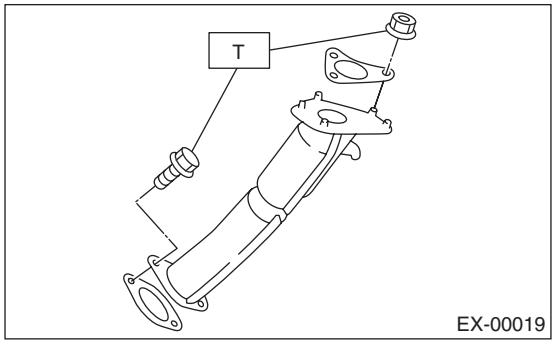


8) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
9) Remove the turbocharger. <Ref. to IN(H4DOTC)-13, REMOVAL, Turbocharger.>
10) Take off the joint pipe in the upward direction.

B: INSTALLATION

Install in the reverse order of removal.

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



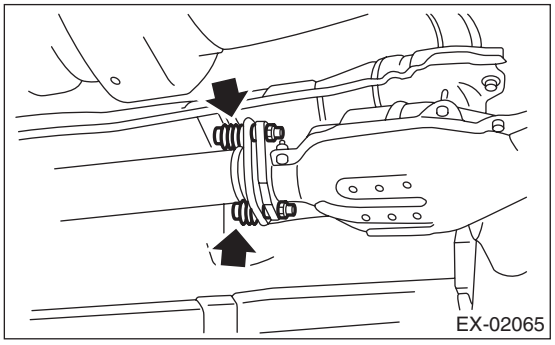
C: INSPECTION

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

5. Rear Exhaust Pipe

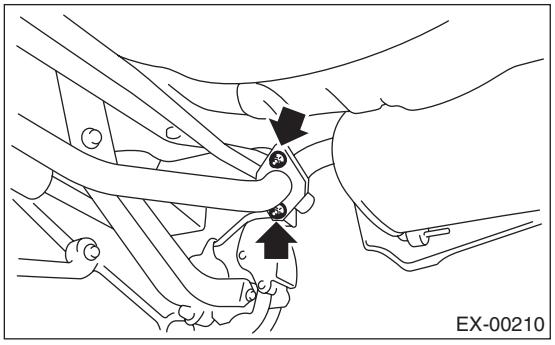
A: REMOVAL

1) Lift-up the vehicle.
2) Separate the rear exhaust pipe from center exhaust pipe.

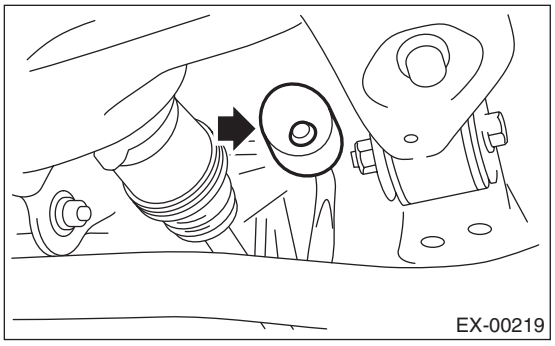


3) Separate the rear exhaust pipe from both mufflers.

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



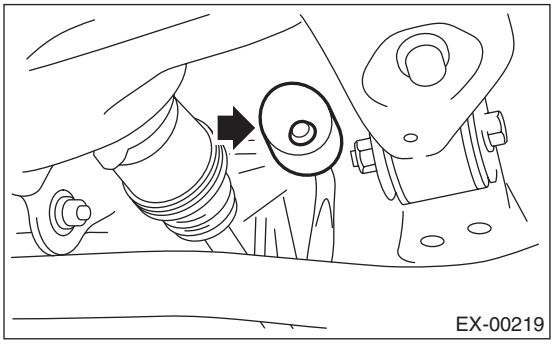
4) Apply a coat of spray type lubricant to the mating area of cushion rubber.
5) Remove the rear exhaust pipe bracket from cushion rubber.



6) Remove the rear exhaust pipe.

B: INSTALLATION

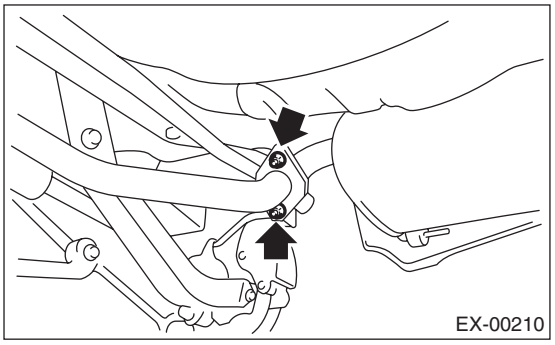
1) Apply a coat of spray type lubricant to the mating area of cushion rubber.
2) Install the rear exhaust pipe bracket to cushion rubber.



3) Install the rear exhaust pipe to both mufflers.

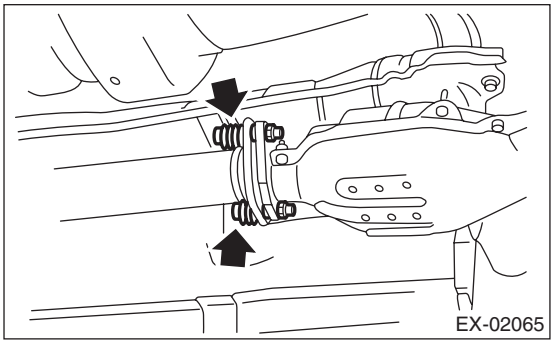
NOTE:
Use a new gasket.

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



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

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



5) Lower the vehicle.

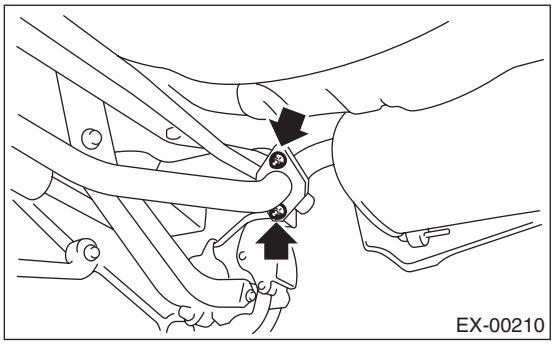
C: INSPECTION

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

6. Muffler

A: REMOVAL

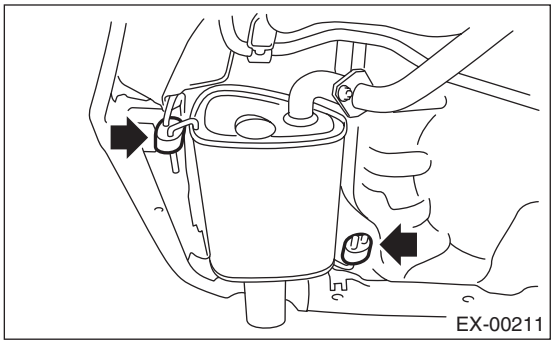
1) Separate the muffler (RH) from the rear exhaust pipe.



2) Remove the cushion rubber, and remove the muffler.

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

NOTE:
To facilitate removal, apply a spray type lubricant to the mating area of the cushion rubber.



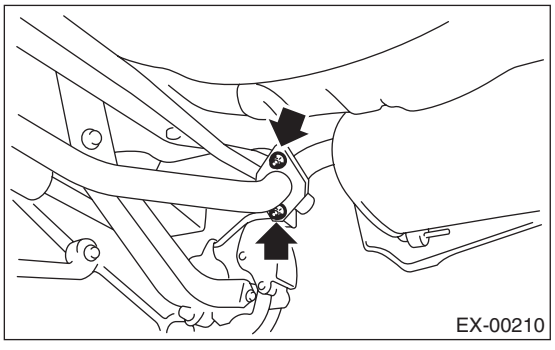
3) Perform the same procedures for the muffler (LH).

B: INSTALLATION

Install in the reverse order of removal.

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

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 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.

COOLING

CO(H4DOTC)

		Page
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7.	Radiator Cap	23
8.	Radiator Main Fan and Fan Motor	24
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11.	Coolant Filler Tank	31
12.	Engine Cooling System Trouble in General	32

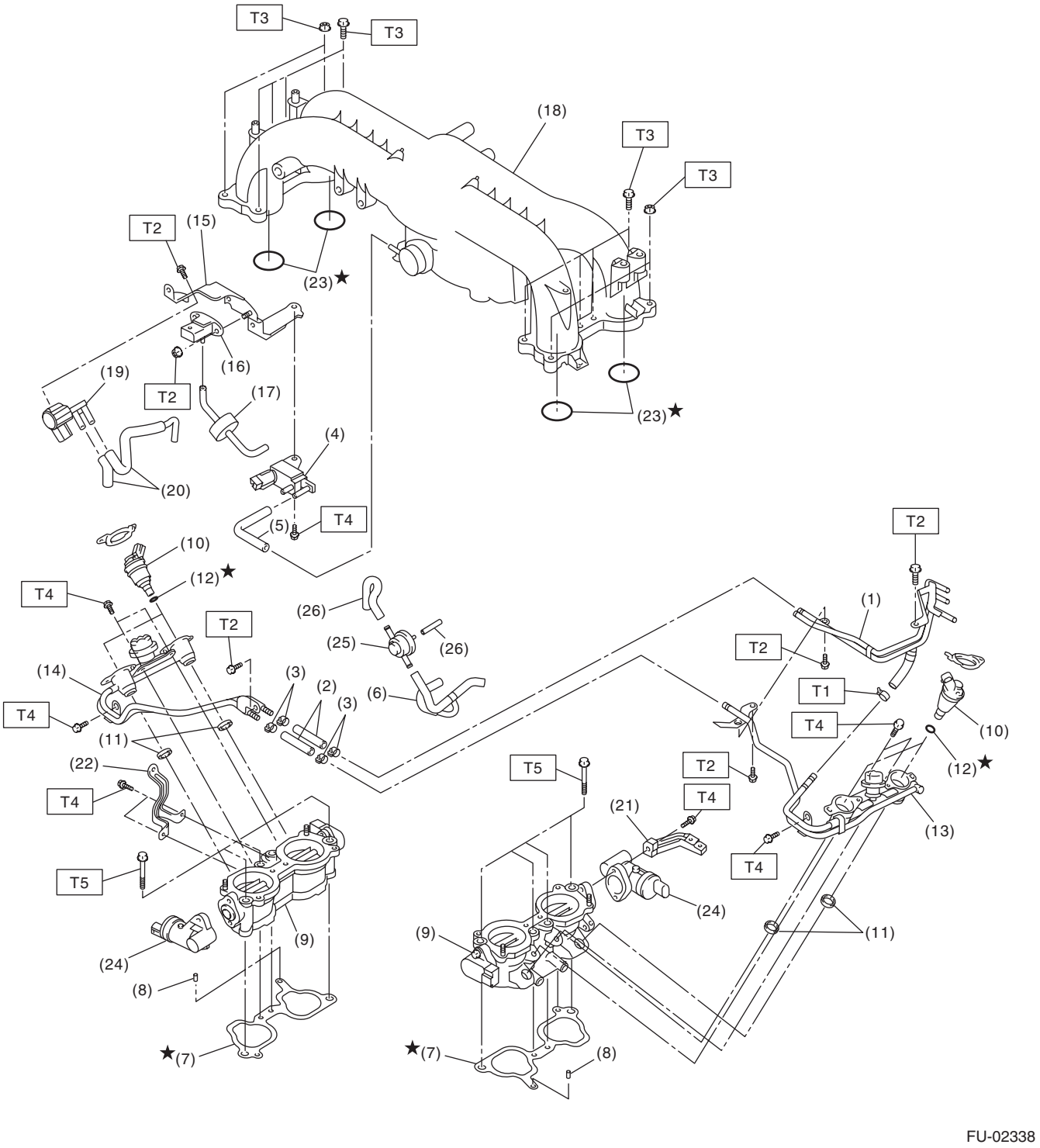
1. General Description

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	155 ℓ (40.9 US gal, 34.1 Imp gal)/h or more. [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		In-tank type

B: COMPONENT

1. INTAKE MANIFOLD

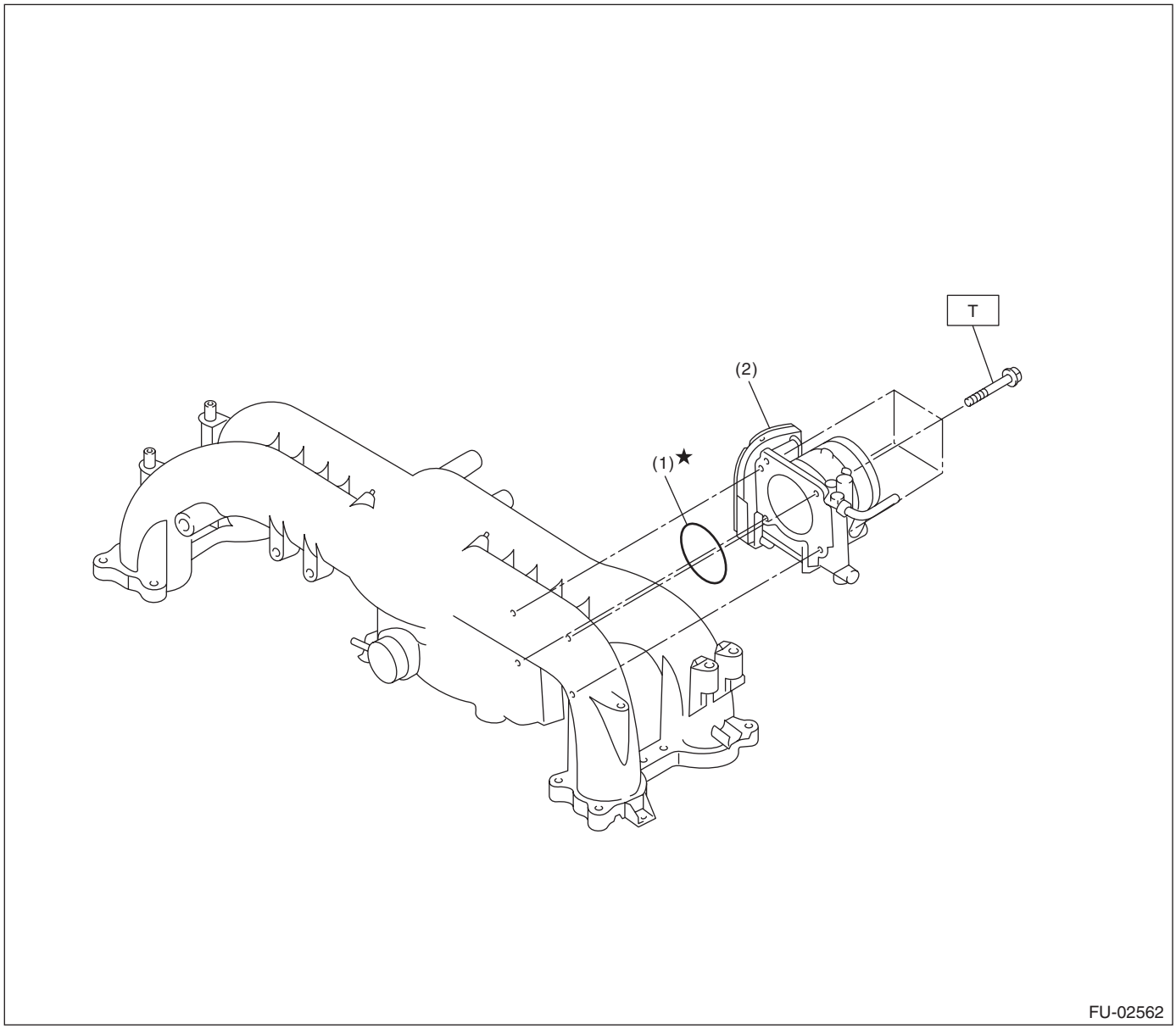


FU-02338

(1) Fuel pipe ASSY
(2) Fuel hose
(3) Clip
(4) Purge control solenoid valve
(5) Vacuum hose
(6) Vacuum control hose
(7) Intake manifold gasket
(8) Guide pin
(9) Intake manifold (lower)
(10) Fuel injector
(11) Seal ring
(12) O-ring
(13) Fuel injector pipe LH
(14) Fuel injector pipe RH
(15) Solenoid valve bracket
(16) Manifold absolute pressure sensor
(17) Filter
(18) Intake manifold
(19) Wastegate control solenoid valve ASSY
(20) Vacuum hose
(21) Ground stay
(22) Coolant filler tank stay
(23) O-ring
(24) Tumble generator valve actuator
(25) Purge valve
(26) Purge hose

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.5 (0.15, 1.1)
T2: 6.5 (0.66, 4.8)
T3: 8.3 (0.85, 6.1)
T4: 19 (1.94, 14)
T5: 25 (2.5, 18)

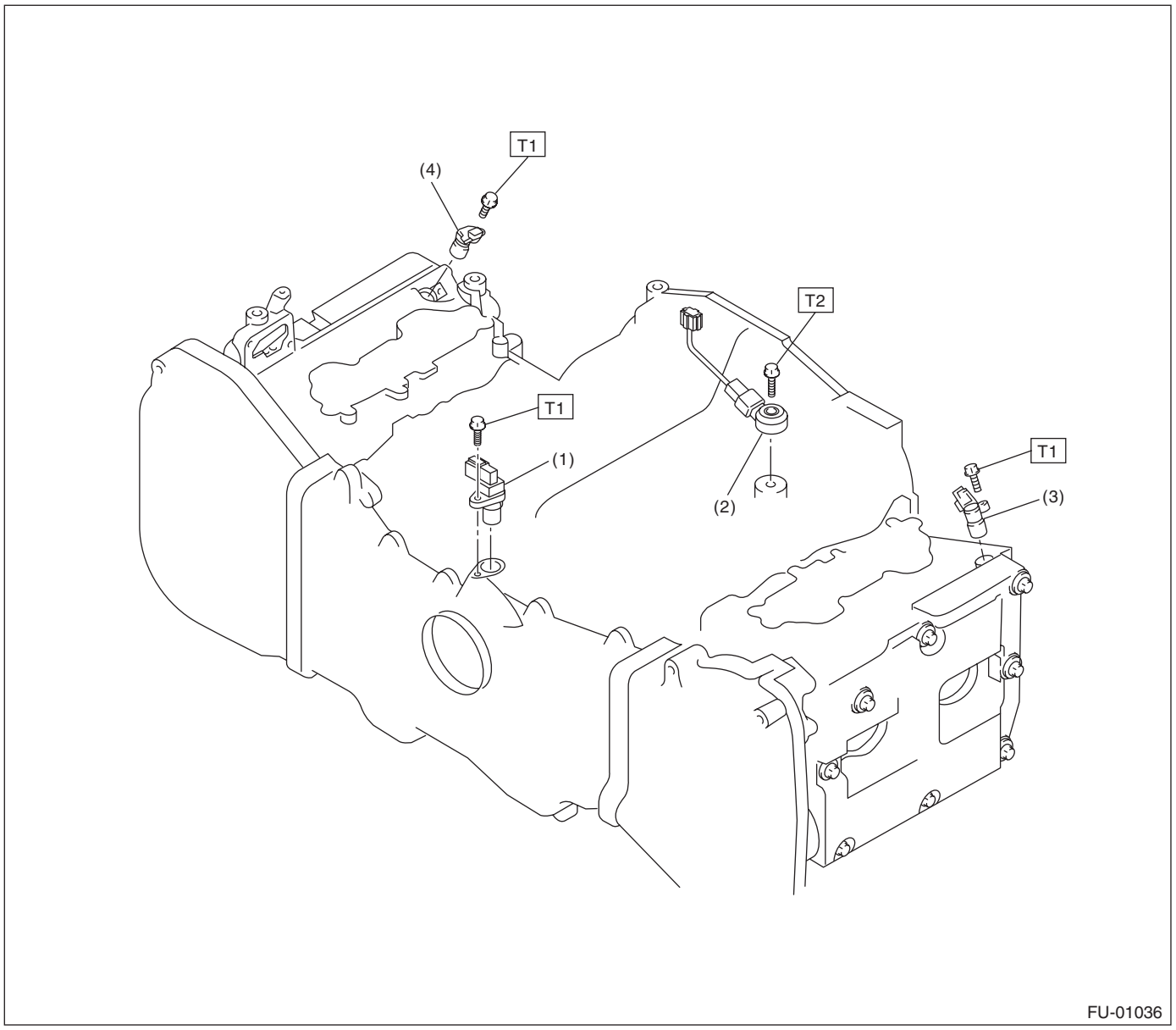
2. AIR INTAKE SYSTEM



(1) O-ring
(2) Throttle body

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

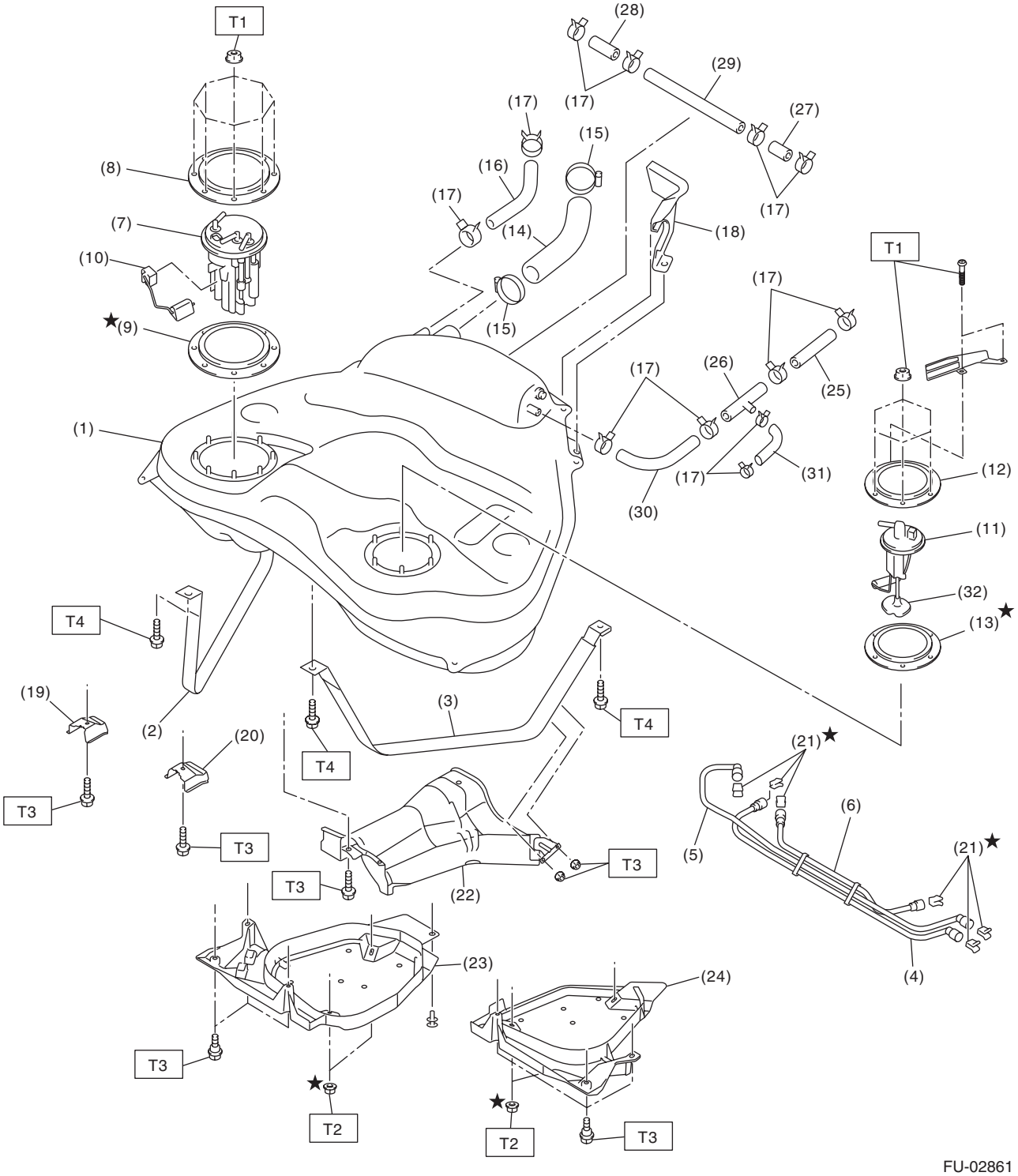
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor LH
(4) Camshaft position sensor RH

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

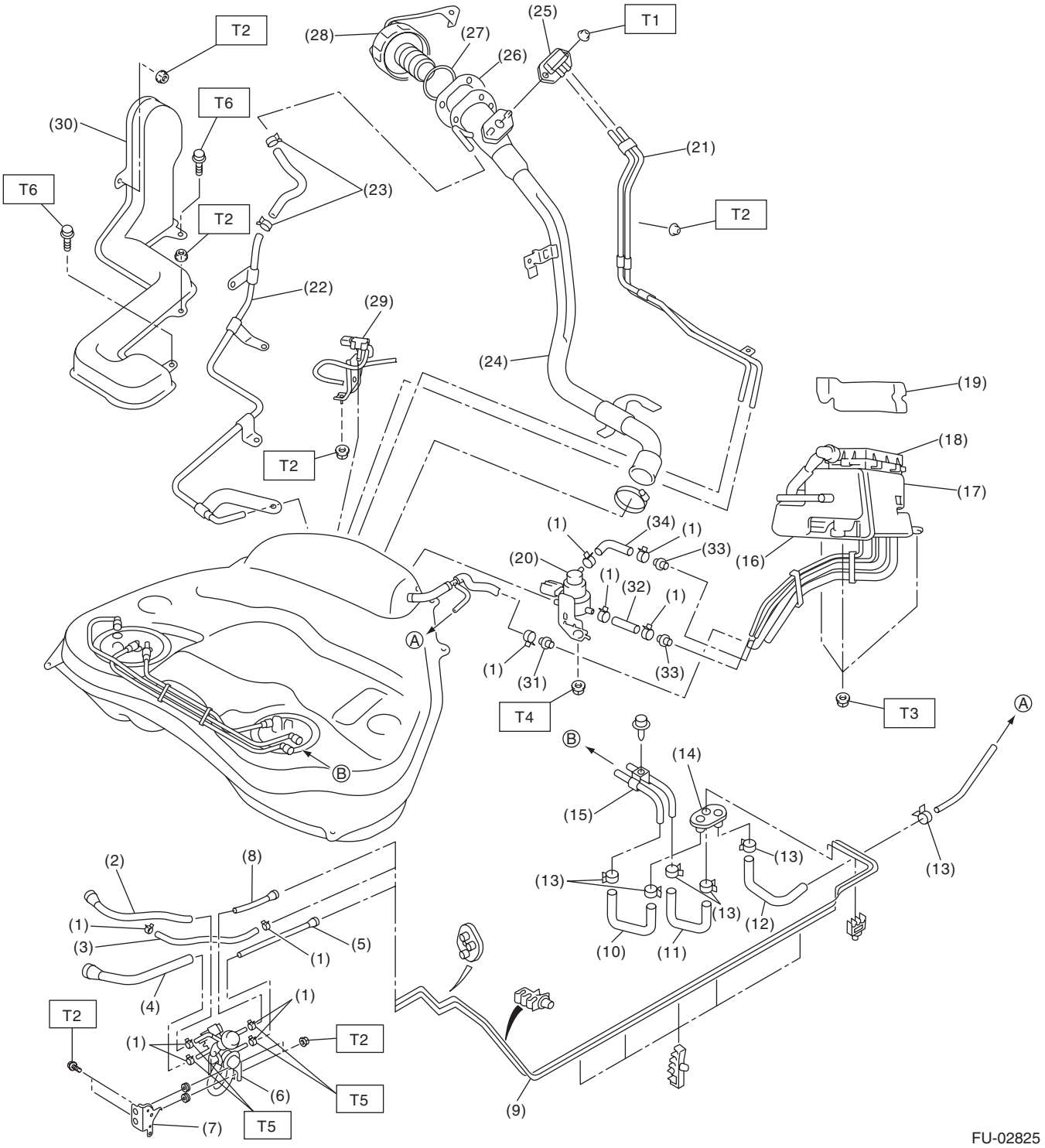
4. FUEL TANK


T1
(28)
(29)
(17)
(17)
(27)
(15)
(16)
(17)
(8)
(17)
(14)
(18)
(7)
(10)
(15)
★(9)
(17)
(26)
(25)
(1)
(17)
(31)
(12)
(30)
(11)
(32)
(13)★
T4
(19)
(3)
(2)
(20)
T4
T4
(21)★
T3
T3
(6)
(5)
(21)★
T3
T3
(22)
(23)
(24)
(4)
T3
★
T2
★
T2
T3
FU-02861

(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, 25)

5. FUEL LINE


T1
T2
T3
T4
T5
T6
(1)
(2)
(3)
(4)
(5)
(6)
(7)
(8)
(9)
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(23)
(24)
(25)
(26)
(27)
(28)
(29)
(30)
(31)
(32)
(33)
(34)
A
B
FU-02825

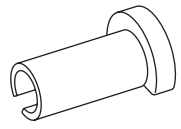
(1) Clamp
(2) Fuel delivery hose A
(3) Evaporation hose
(4) Fuel return hose A
(5) Fuel return hose B
(6) Fuel by-pass valve
(7) Fuel by-pass valve bracket
(8) Fuel delivery hose B
(9) Fuel pipe ASSY
(10) Fuel delivery hose C
(11) Fuel return hose C
(12) Evaporation hose B
(13) Clamp
(14) Grommet
(15) Fuel pipe ASSY
(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

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 battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel.

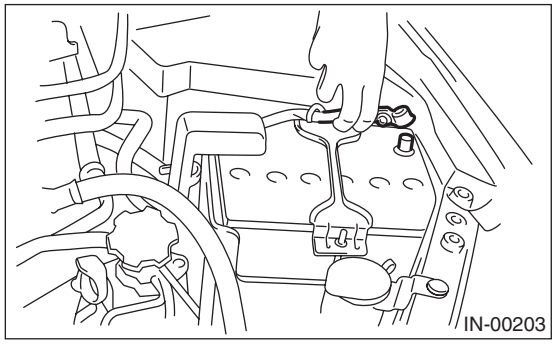
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for disconnecting quick connector of the engine compartment.

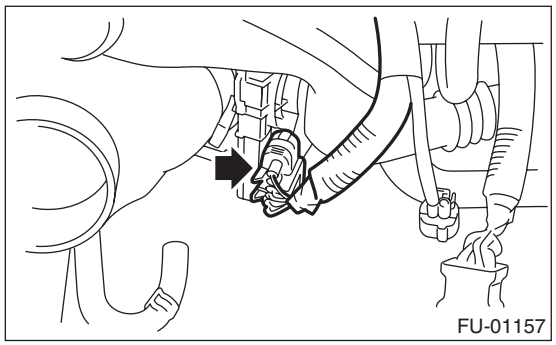
2. Throttle Body

A: REMOVAL

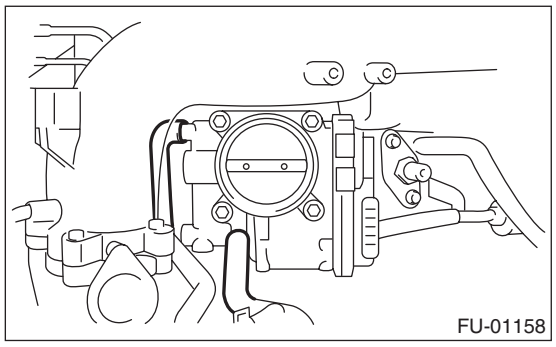
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
4) Disconnect the connectors from the throttle position sensor.



5) Disconnect the engine coolant hoses from throttle body.



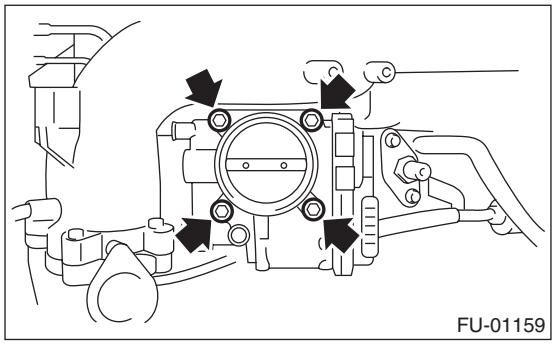
6) Remove the bolts which install throttle body to the intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new O-rings.

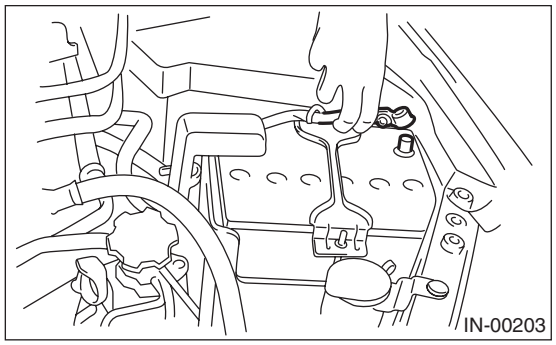
Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



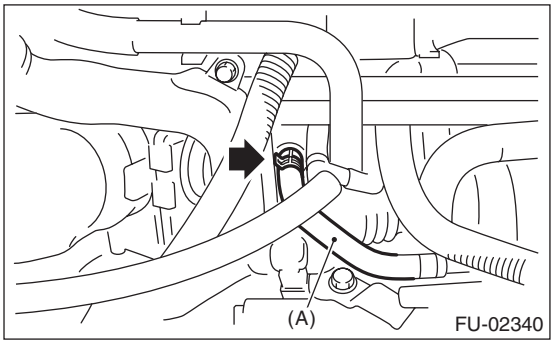
3. Intake Manifold

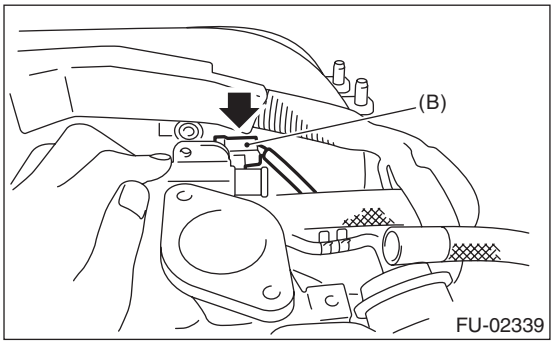
A: REMOVAL

1) Release the fuel pressure.
<Ref. to FU(H4DOTC)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid, and remove the fuel filler cap.
3) Remove the collector cover.
4) Disconnect the ground cable from battery.

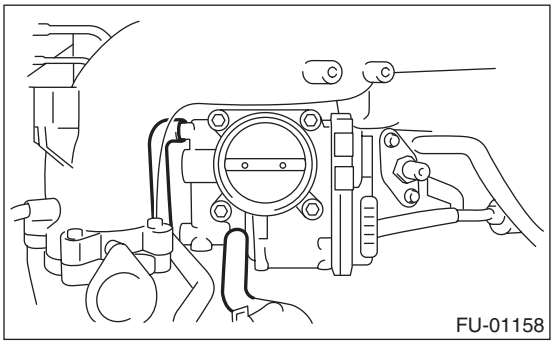


5) Lift-up the vehicle.
6) Remove the under cover.
7) Drain approximately 3.0 ℓ (3.2 US qt, 2.6 Imp qt) of coolant.
8) Remove the intake duct from the air cleaner case.
9) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
10) Remove the generator. <Ref. to SC(H4SO)-21, REMOVAL, Generator.>
11) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-31, REMOVAL, Coolant Filler Tank.>
12) Disconnect the emission hose (A) and the connector (B) from the PCV hose assembly.

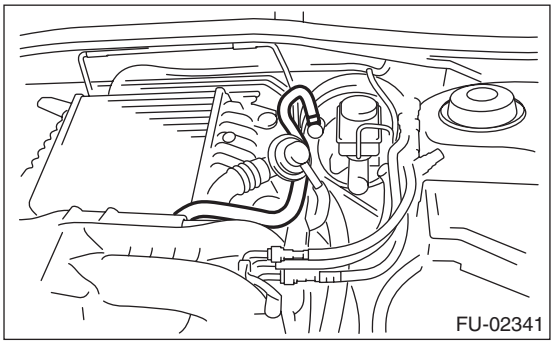




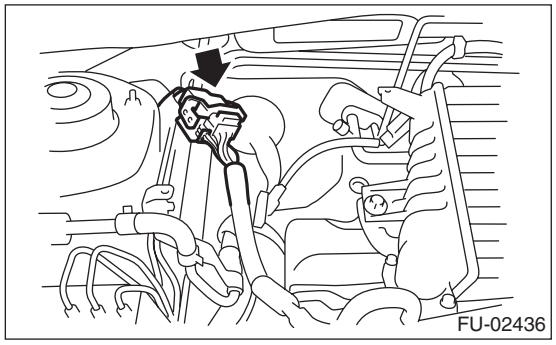
13) Disconnect the engine coolant hose from throttle body.

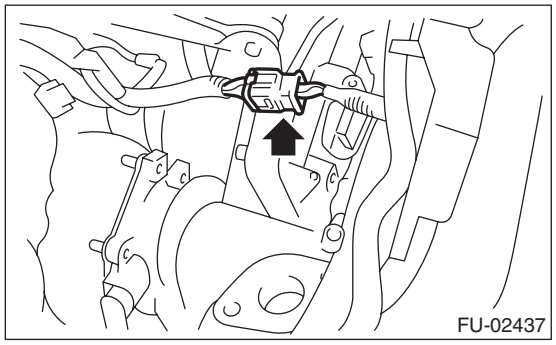


14) Disconnect the brake booster hose.

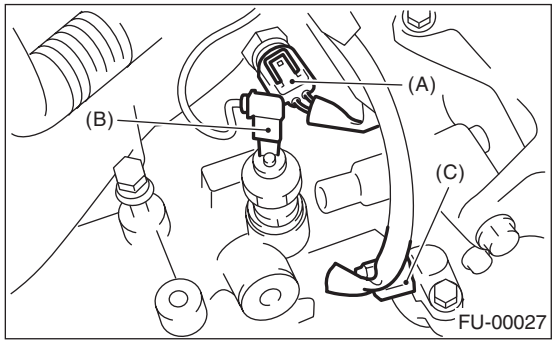


15) Disconnect the engine harness connectors from the bulk head harness connector.

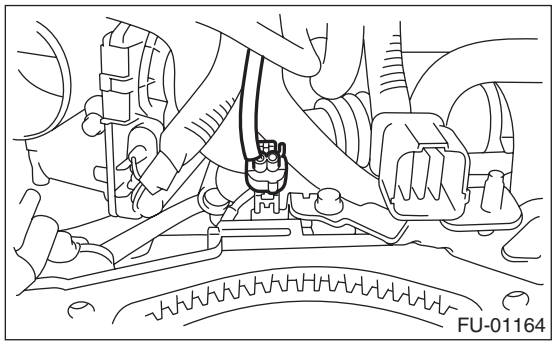




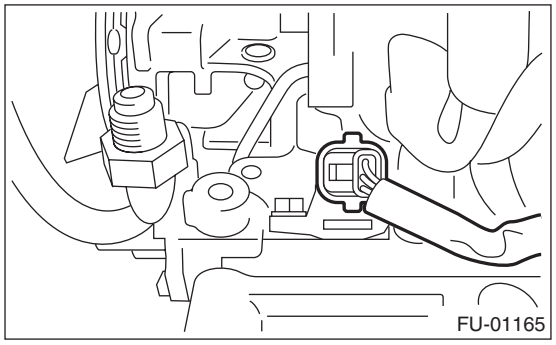
16) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



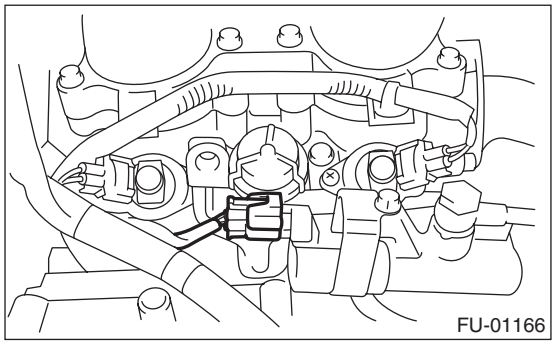
17) Disconnect the knock sensor connector.



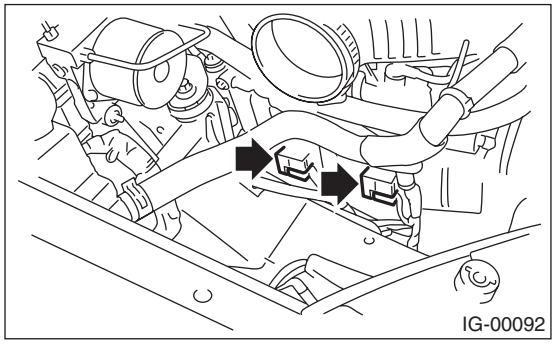
18) Disconnect the connector from camshaft position sensor.



19) Disconnect the connector from the oil flow control solenoid valve.

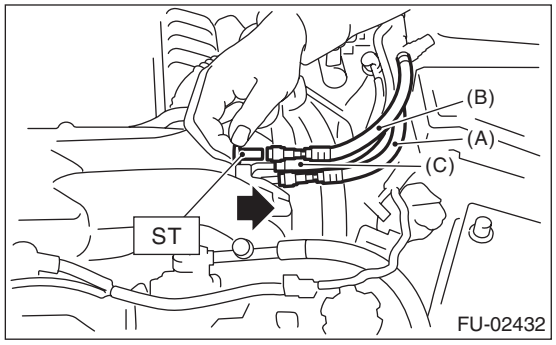


20) Disconnect the connector from ignition coil.



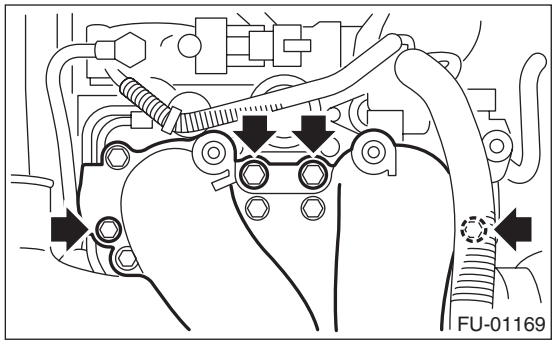
21) Disconnect the fuel delivery hose, return hose and evaporation hose.
(1) Disconnect the connector on the fuel delivery line and return line by pushing the ST in the direction of the arrow.
ST 42099AE000 CONNECTOR REMOVER
(2) Remove the clip and disconnect the evaporation hose from the pipe.

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



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

22) Remove the bolts which hold intake manifold onto the cylinder heads.



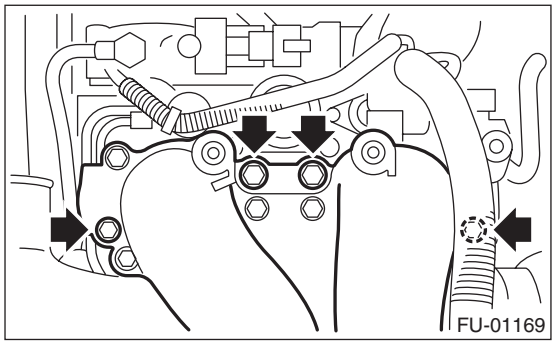
23) Remove the intake manifold.

B: INSTALLATION

1) Install the intake manifold onto cylinder heads.

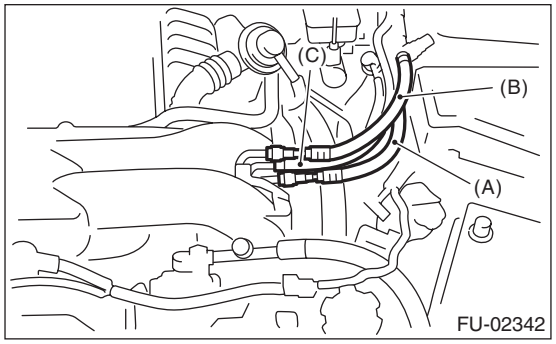
NOTE:
Use a new gasket.

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



2) Connect the fuel delivery hose, return hose, and evaporation hose.
<Ref. to FU(H4DOTC)-61, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

NOTE:
If fuel hoses or clamps are damaged, replace them with new parts.

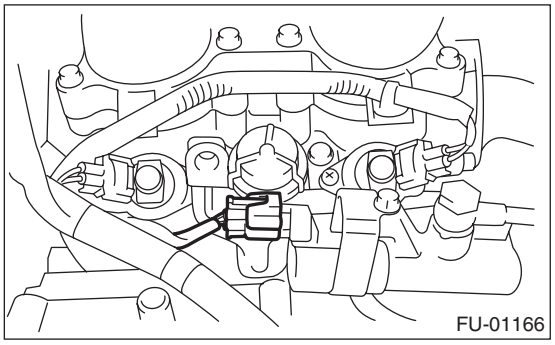


(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

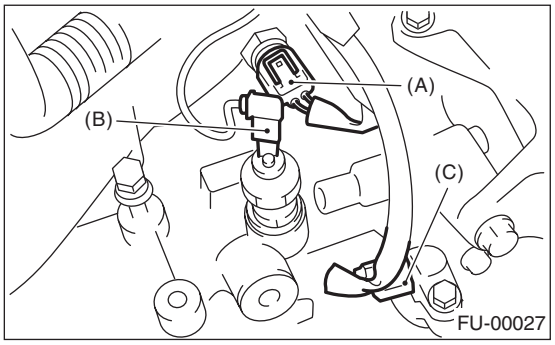
3) Tighten the hose clamp screw.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

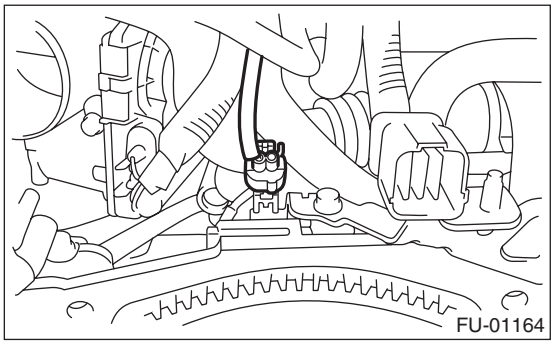
4) Connect the connector to the oil flow control solenoid valve.



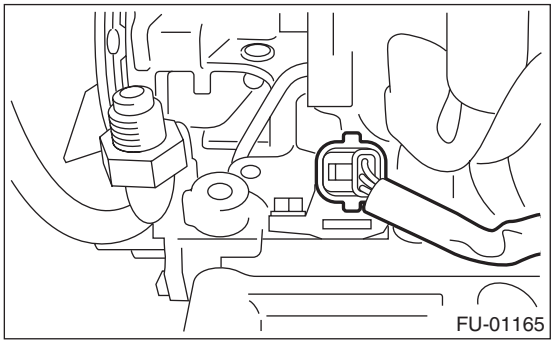
5) Connect the connector to the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



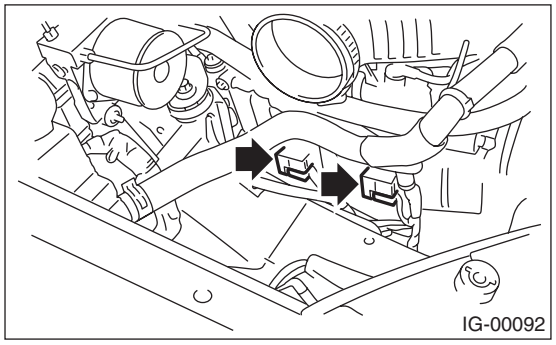
6) Connect the connector to the knock sensor.



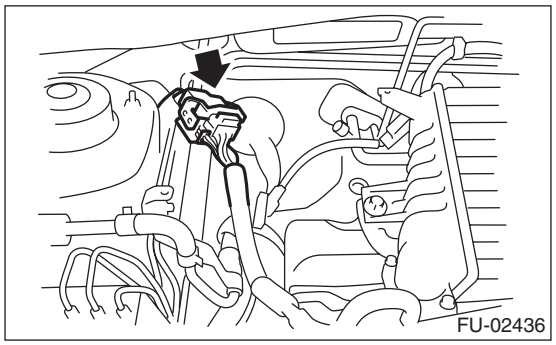
7) Connect the connectors to camshaft position sensor.

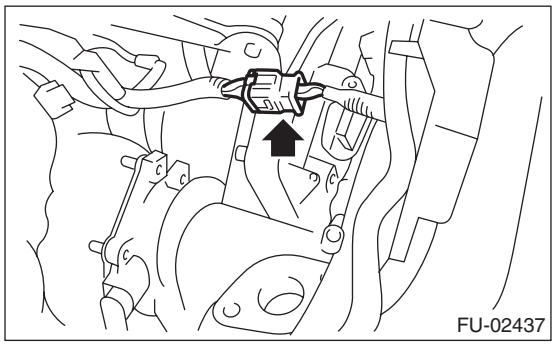


8) Connect the connector to the ignition coil.

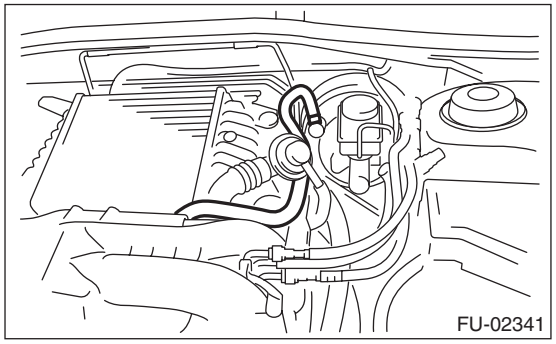


9) Connect the engine harness connectors to bulkhead harness connectors.

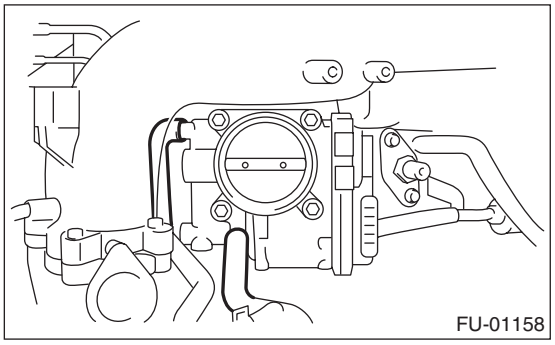




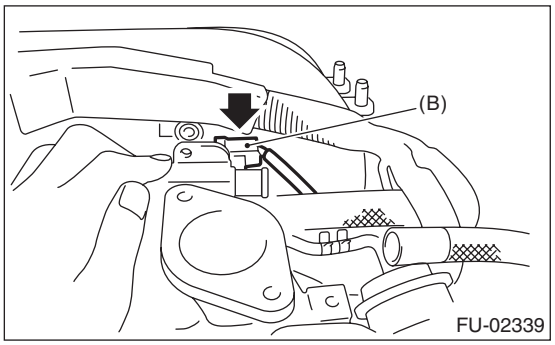
10) Connect the brake booster hose.

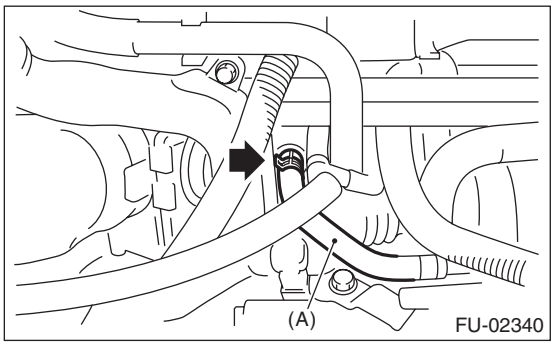


11) Connect the engine coolant hoses to throttle body.



12) Connect the emission hose (A) and the connector (B) to the PCV hose assembly.

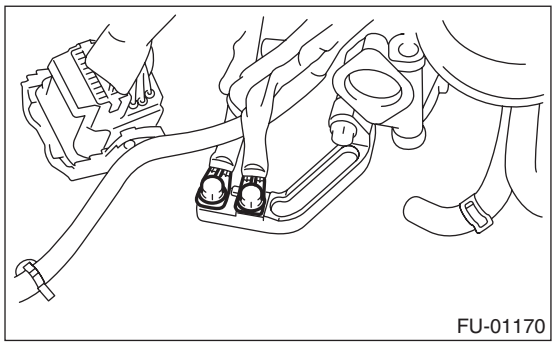




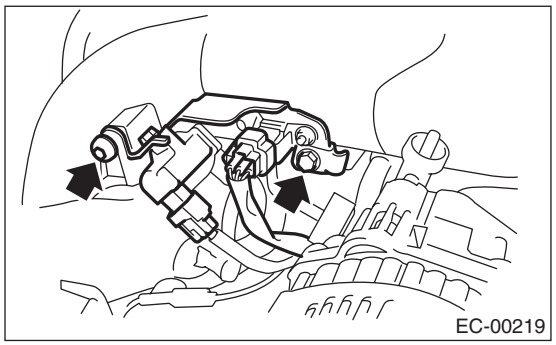
13) Install the coolant filler tank.
<Ref. to CO(H4DOTC)-31, INSTALLATION, Coolant Filler Tank.>
14) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
15) nstall the intake duct to the air cleaner case.
16) Install the fuse of fuel pump to main fuse box.
17) Connect the battery ground cable to the battery.
18) Lift-up the vehicle.
19) Install the under cover.
20) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
21) Install the collector cover.

C: DISASSEMBLY

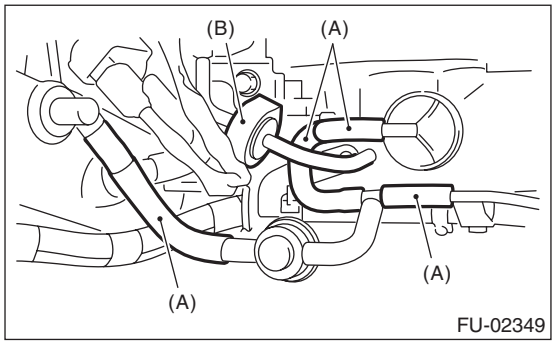
1) Disconnect the engine ground terminal from ground stay.



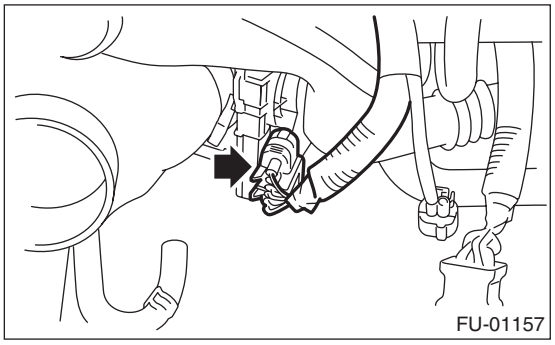
2) Remove the solenoid valve bracket assembly from the intake manifold, and disconnect the connector from wastegate control solenoid valve, manifold absolute pressure sensor and purge control solenoid valve.



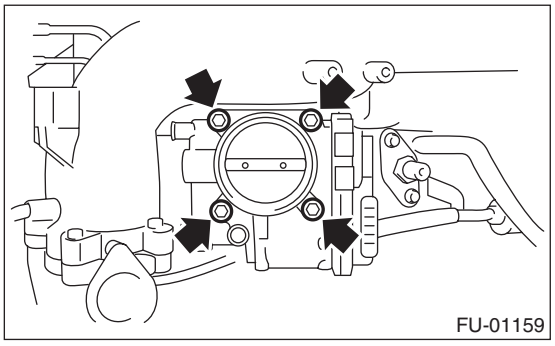
3) Disconnect the evaporation hose (A) and filter assembly (B).



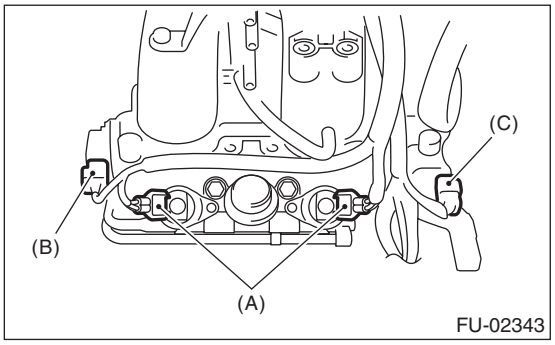
4) Disconnect the connectors from the throttle position sensor.



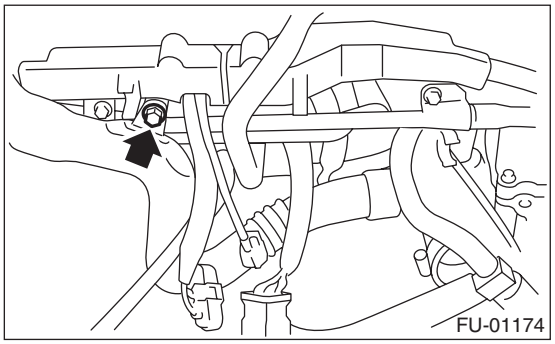
5) Remove the throttle body from intake manifold.



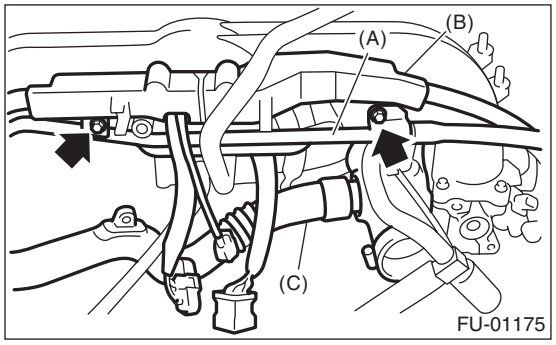
6) Disconnect the connectors from fuel injector (A), tumble generator valve position sensor (B) and tumble generator valve actuator (C).



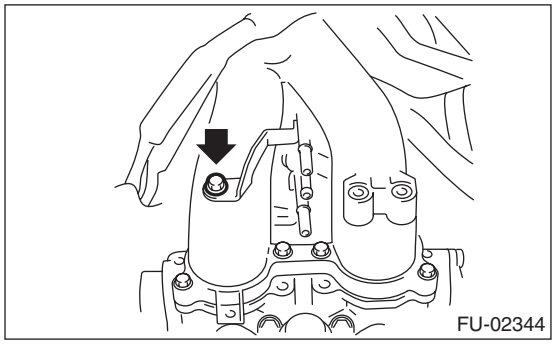
7) Remove the bolts which secures the air by-pass pipe to the intake manifold.



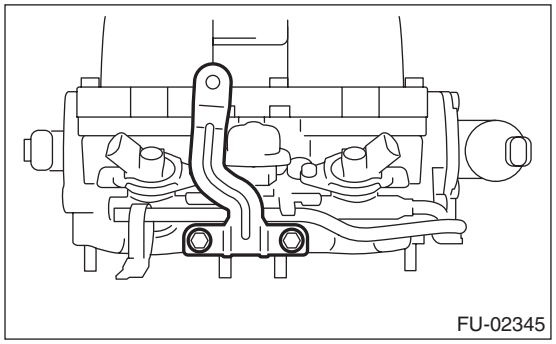
8) Remove the PCV pipe (A) , harness assembly (B) and intake duct (C) from intake manifold.



9) Remove the bolt which secures the fuel injector pipe LH onto the front side of intake manifold.

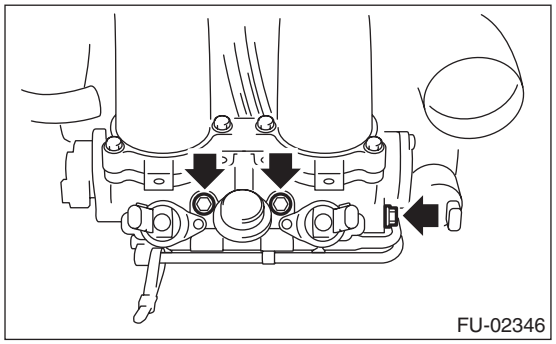


10) Remove the coolant filler tank stay from intake manifold.

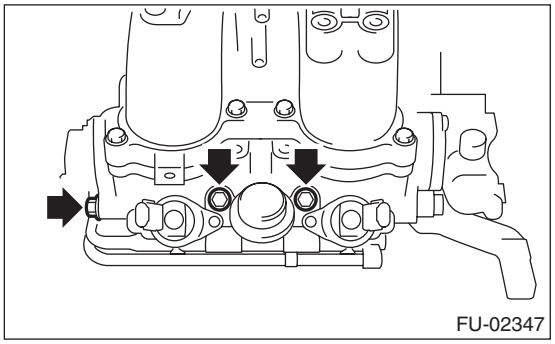


11) Remove the bolt which holds fuel injector pipe onto intake manifold.

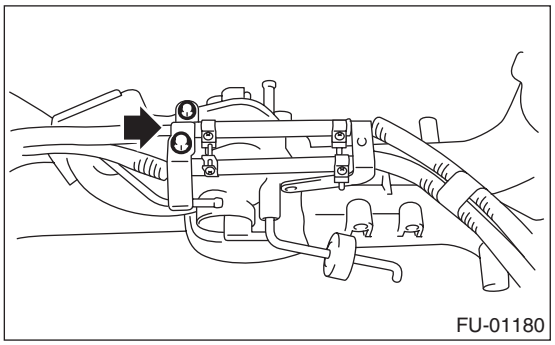
- RH side



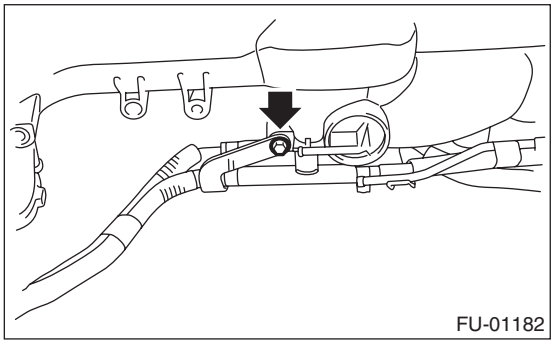
- LH side



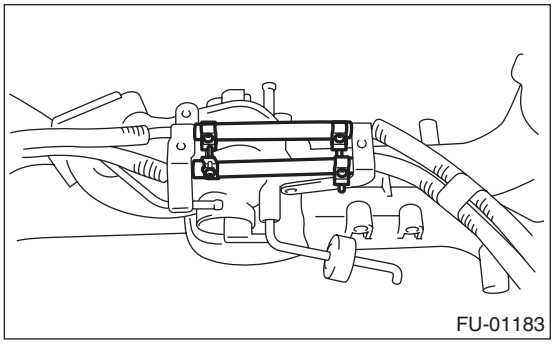
12) Remove the bolt which secures the fuel pipe to the intake manifold.



13) Remove the bolt which secures fuel injector pipe RH onto the lower side of the intake manifold.

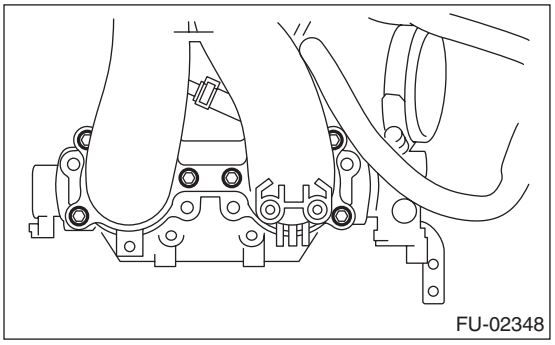


14) Loosen the clamp which holds the fuel hose to the fuel injector pipe, and then disconnect the fuel hose from pipe.



15) Remove the fuel injector pipe.

16) Remove the intake manifold (upper) from the intake manifold (lower).

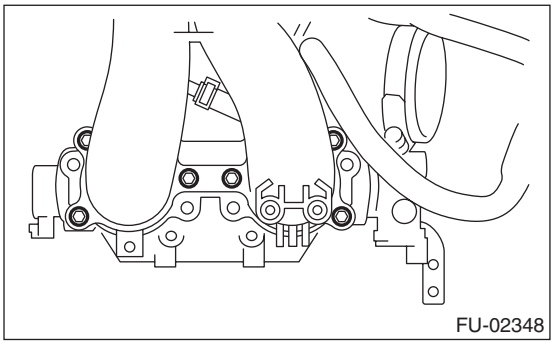


D: ASSEMBLY

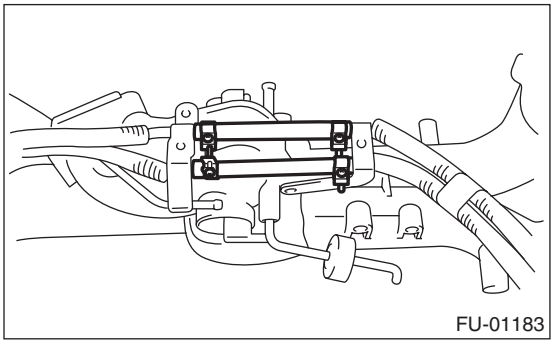
1) Install the intake manifold (lower) to the intake manifold (upper).

NOTE:
Use new O-rings.

Tightening torque:
8.3 N·m (0.85 kgf-m, 6.1 ft-lb)

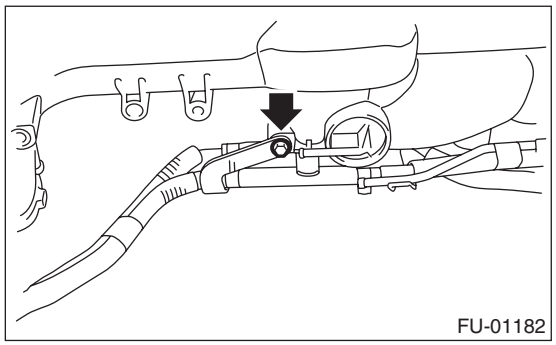


2) Install the fuel injector pipe.
3) Connect fuel hoses to fuel injector pipes on both sides, and secure them with the clamps.



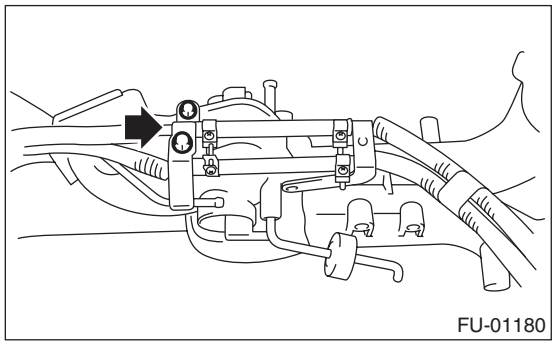
4) Tighten the bolts which secure the fuel injector pipe RH to the lower side of the intake manifold.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



5) Tighten the bolts which secure the fuel pipe to the intake manifold.

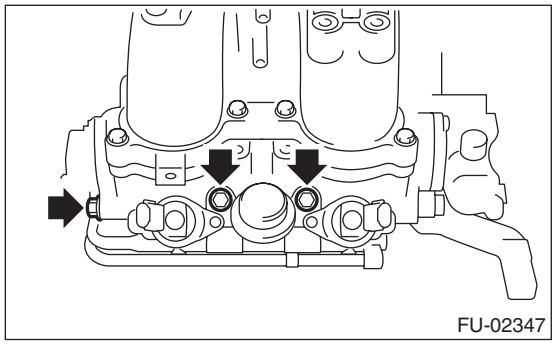
Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



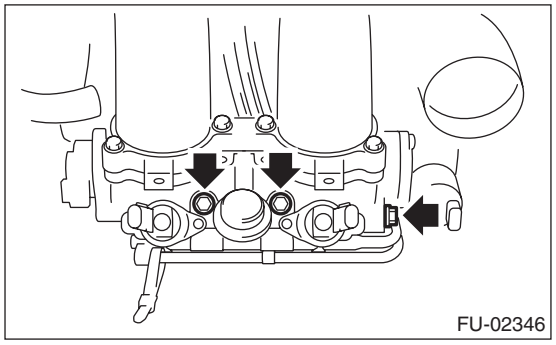
6) Tighten the bolts which secure fuel injector pipe onto intake manifold.

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

- LH side

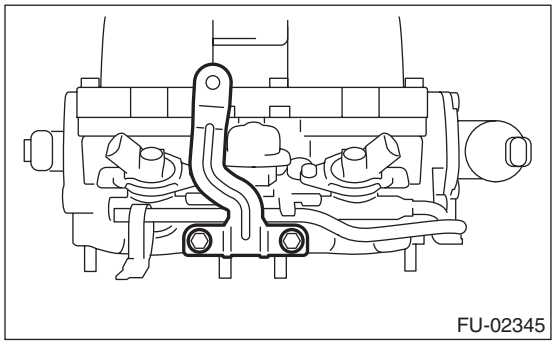


- RH side



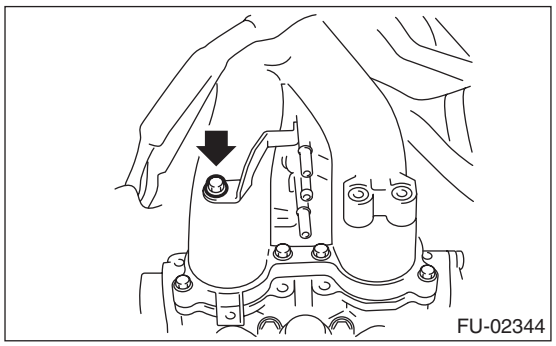
7) Install the coolant filler tank stay to the intake manifold.

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



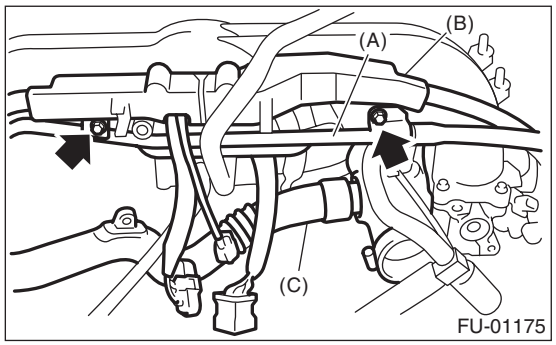
8) Tighten the bolt which holds the fuel injector pipe LH to the front side of the intake manifold.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



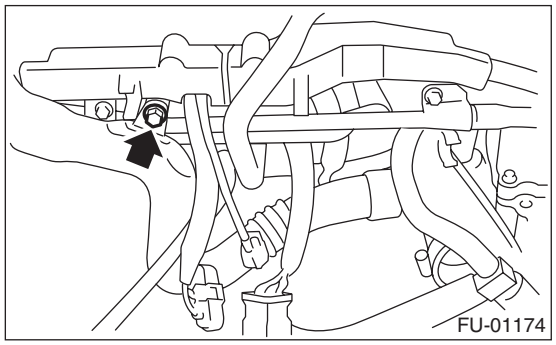
9) Install PCV pipe (A), harness assembly (B) and intake duct (C) to the intake manifold.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

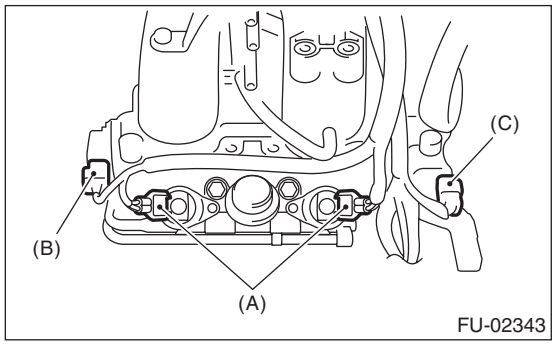


10) Tighten the bolts which secure the air by-pass pipe to the intake manifold.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



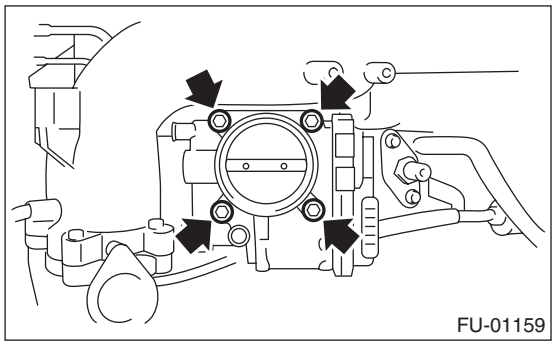
11) Install the connectors to fuel injector (A), tumble generator valve position sensor (B) and tumble generator valve actuator (C).



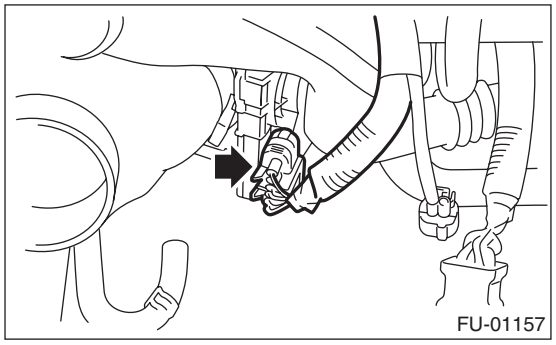
12) Install the throttle body to intake manifold.

NOTE:
Use new O-rings.

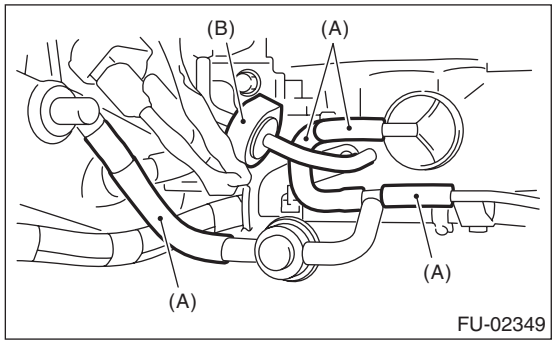
Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



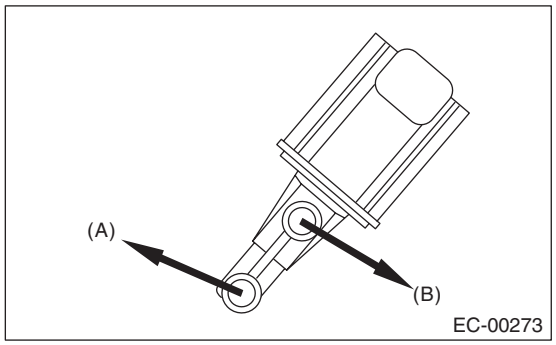
13) Connect the connector to the throttle position sensor.



14) Connect the evaporation hose (A) and filter assembly (B).



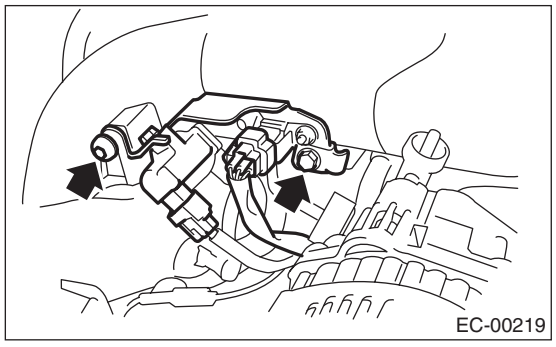
NOTE:
Connect the evaporation hose as shown in the figure.



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

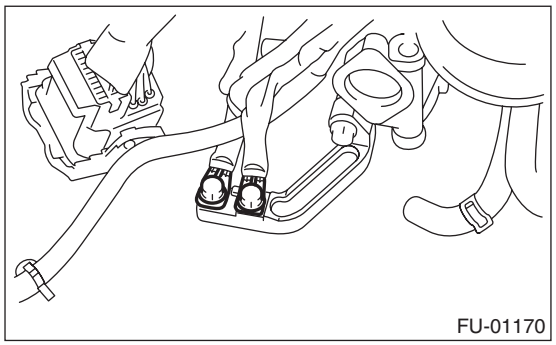
15) Connect the connectors to the wastegate control solenoid valve, manifold absolute pressure sensor and purge control solenoid valve, and install the solenoid valve bracket assembly to intake manifold.

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



16) Install the engine ground terminal to the ground stay.

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



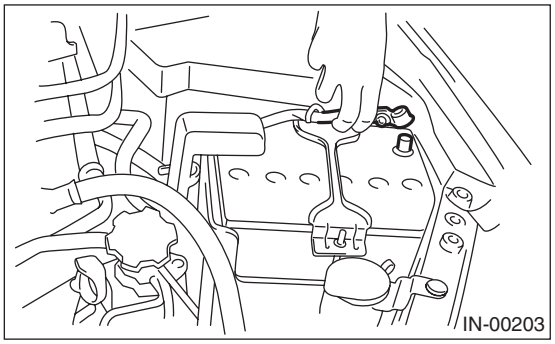
E: INSPECTION

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

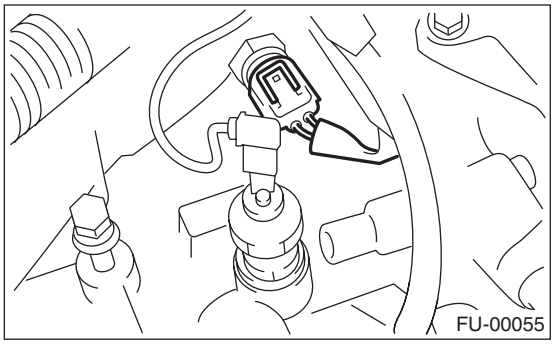
4. Engine Coolant Temperature Sensor

A: REMOVAL

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



3) Remove the generator. <Ref. to SC(H4SO)-21, REMOVAL, Generator.>
4) Drain engine coolant. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Disconnect the connectors from the engine coolant temperature sensor.



6) Remove the engine coolant temperature sensor.

B: INSTALLATION

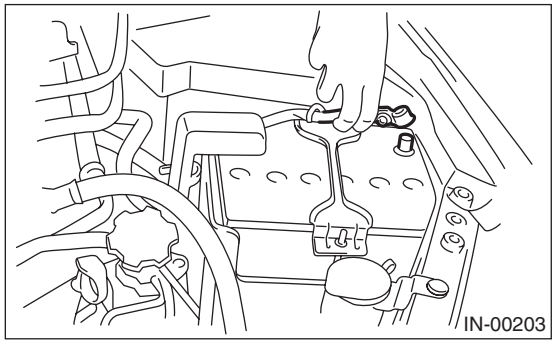
Install in the reverse order of removal.

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

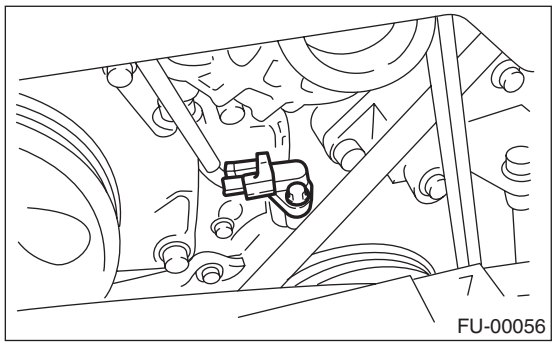
5. Crankshaft Position Sensor

A: REMOVAL

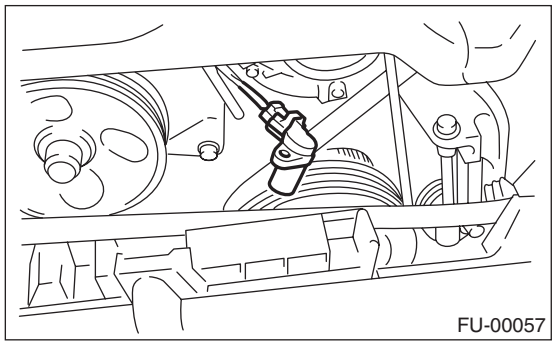
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the generator. <Ref. to SC(H4SO)-21, REMOVAL, Generator.>
4) Remove the bolt which installs crankshaft position sensor to cylinder block.



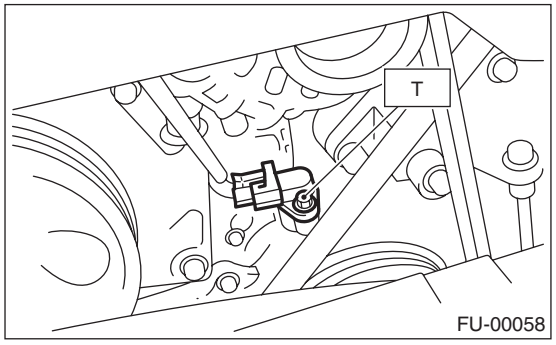
5) Remove the crankshaft position sensor, and then disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

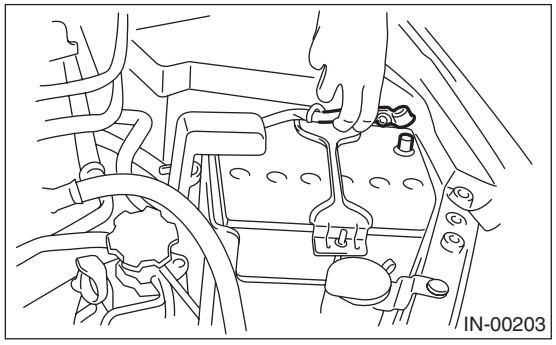
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



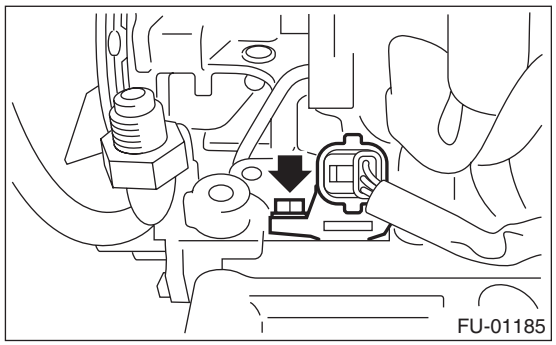
6. Camshaft Position Sensor

A: REMOVAL

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



3) Disconnect the connector from camshaft position sensor RH.
4) Remove the camshaft position sensor RH from the rear side of the cylinder head.



5) Remove the cam shaft position sensor LH in the same way as RH.

B: INSTALLATION

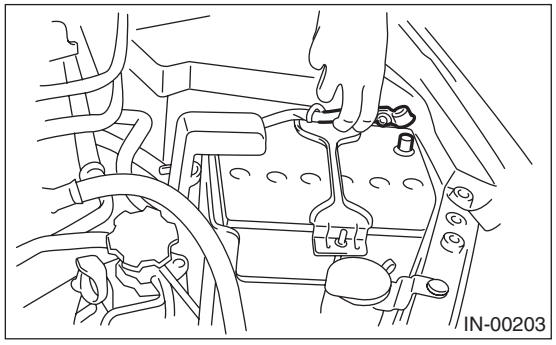
Install in the reverse order of removal.

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

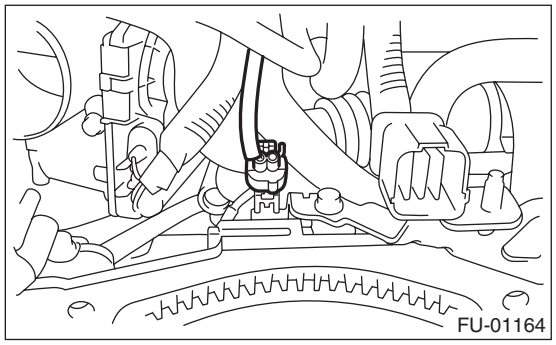
7. Knock Sensor

A: REMOVAL

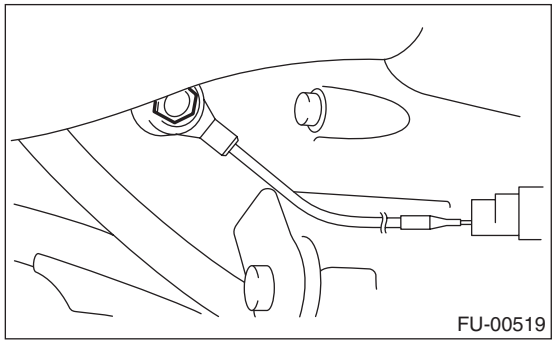
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
4) Disconnect the knock sensor connector.



5) Remove the knock sensor from the cylinder block.

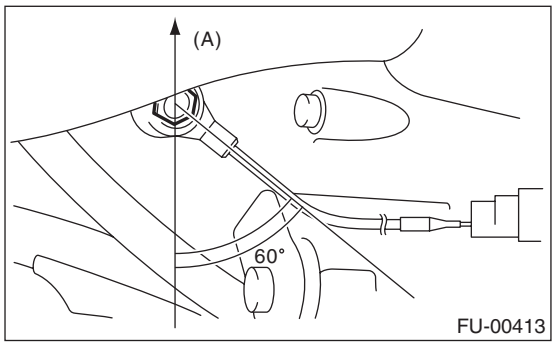


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

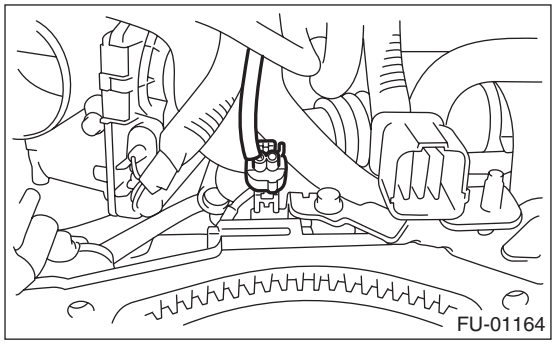
NOTE:
The portion of the knock sensor cord that is pulled out must be positioned at a 60° angle relative to the engine rear.

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

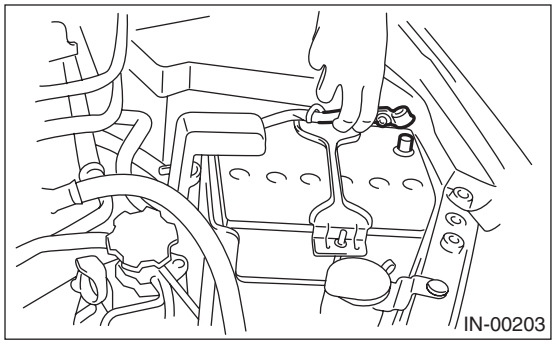


(A) Front side

2) Connect the knock sensor connector.



3) Install the intercooler.
<Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
4) Connect the battery ground cable to the battery.



5) Install the collector cover.

8. Throttle Position Sensor

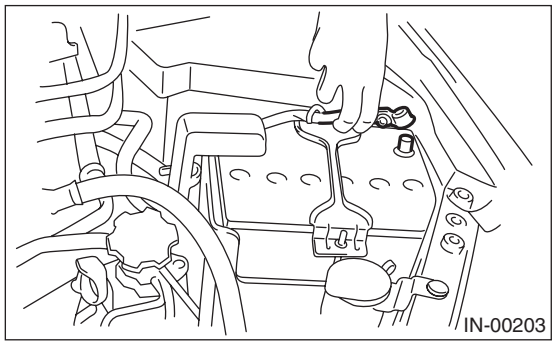
A: SPECIFICATION

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(H4DOTC)-10, REMOVAL, Throttle Body.> <Ref. to FU(H4DOTC)-10, INSTALLATION, Throttle Body.>

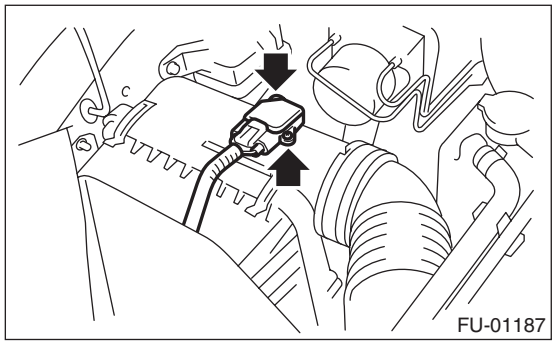
9. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from the mass air flow and intake air temperature sensor.
3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

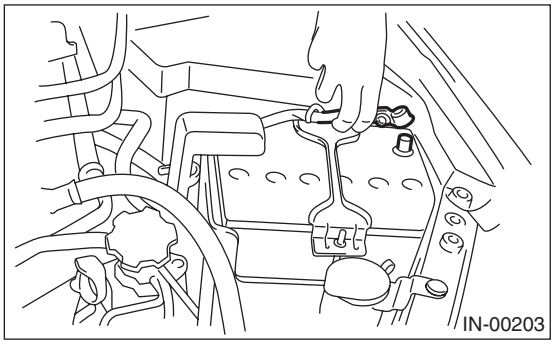
Install in the reverse order of removal.

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

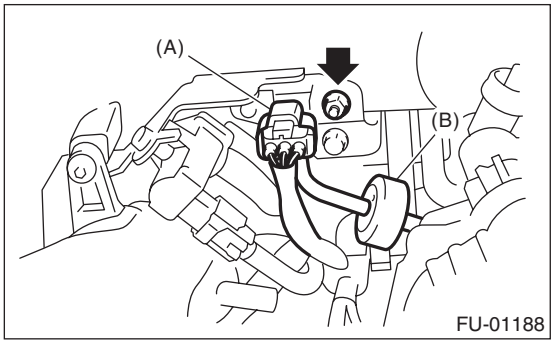
10.Manifold Absolute Pressure Sensor

A: REMOVAL

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



3) Disconnect the connector from manifold absolute pressure sensor (A), and remove the filter assembly (B) from intake manifold.
4) Remove the manifold absolute pressure sensor from the solenoid valve bracket.



B: INSTALLATION

Install in the reverse order of removal.

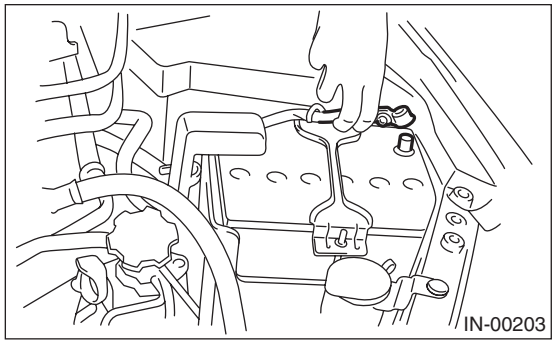
Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

11.Fuel Injector

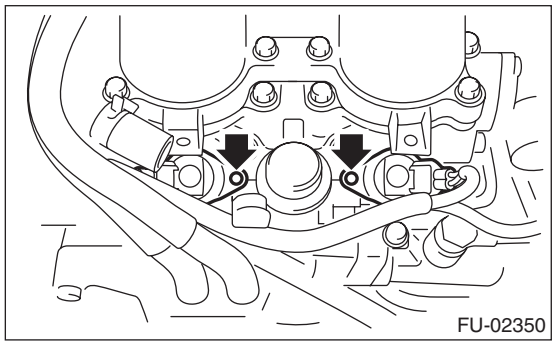
A: REMOVAL

1. RH SIDE

1) Release the fuel pressure.
<Ref. to FU(H4DOTC)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid, and remove the fuel filler cap.
3) Remove the collector cover.
4) Disconnect the ground cable from battery.

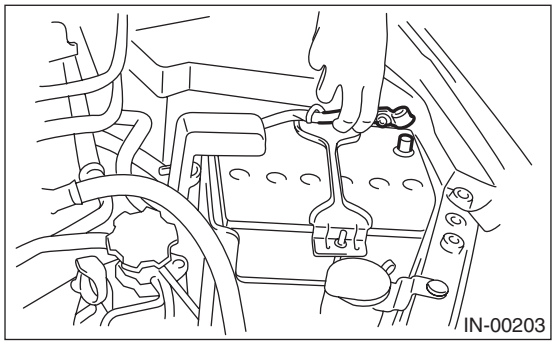


5) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-31, REMOVAL, Coolant Filler Tank.>
6) Disconnect the connector from fuel injector.
7) Remove the screw, then remove the fuel injector.

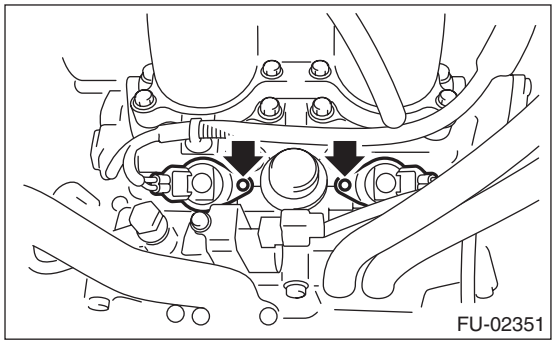


2. LH SIDE

1) Release the fuel pressure.
<Ref. to FU(H4DOTC)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid, and remove the fuel filler cap.
3) Remove the collector cover.
4) Disconnect the ground cable from battery.



5) Disconnect the connector from fuel injector.
6) Remove the screw, then remove the fuel injector.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:
Use new O-rings.

Tightening torque:
3.5 N·m (0.36 kgf-m, 2.6 ft-lb)

2. LH SIDE

Install in the reverse order of removal.

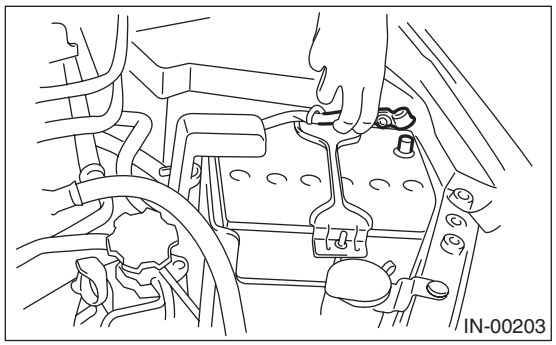
NOTE:
Use new O-rings.

Tightening torque:
3.5 N·m (0.36 kgf-m, 2.6 ft-lb)

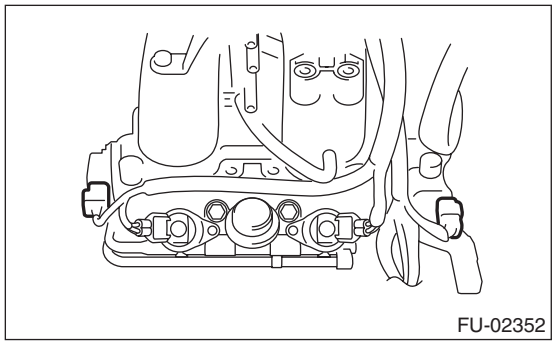
12.Tumble Generator Valve Assembly

A: REMOVAL

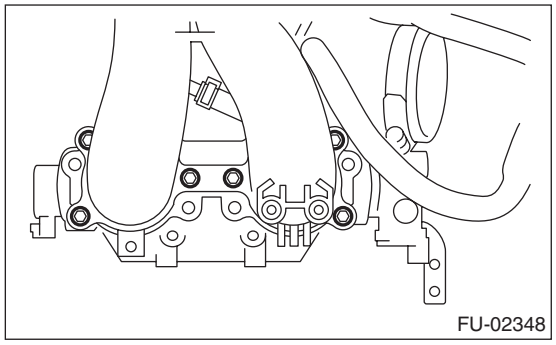
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid, and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



4) Remove the intake manifold.
<Ref. to FU(H4DOTC)-11, REMOVAL, Intake Manifold.>
5) Disconnect the connectors from the tumble generator valve position sensor (A) and tumble generator valve actuator (B).



6) Remove the fuel injector.
<Ref. to FU(H4DOTC)-28, REMOVAL, Fuel Injector.>
7) Remove the tumble generator valve body from intake manifold.

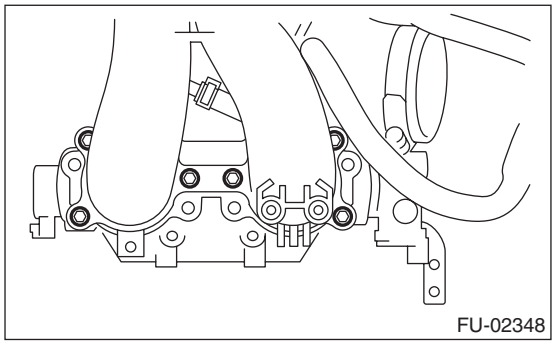


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Always use new gaskets.

Tightening torque:
8.3 N·m (0.85 kgf-m, 6.1 ft-lb)

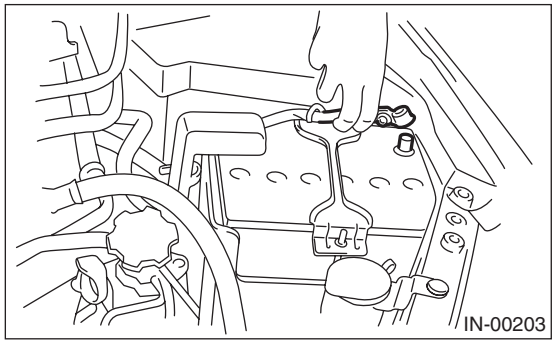


13. Tumble Generator Valve Actuator

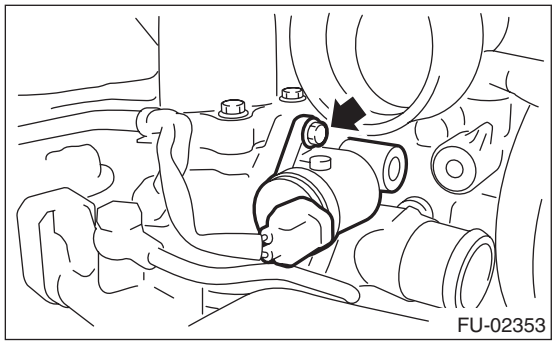
A: REMOVAL

1. RH SIDE

1) Disconnect the ground cable from battery.

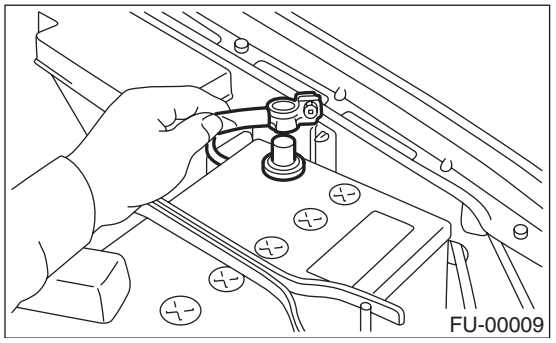


2) Disconnect the connector from the tumble generator valve actuator RH.
3) Remove the tumble generator valve actuator RH.

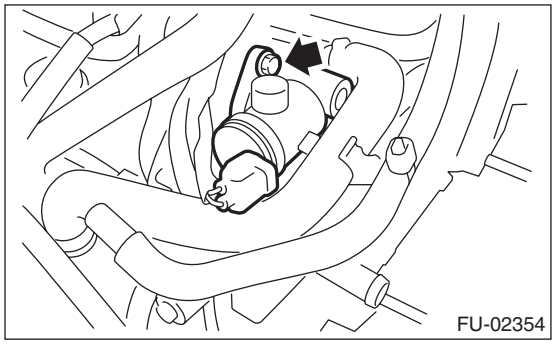


2. LH SIDE

1) Disconnect the ground cable from battery.



2) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
3) Disconnect the connector from tumble generator valve actuator LH.
4) Remove the tumble generator valve actuator LH.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

2. LH SIDE

Install in the reverse order of removal.

14. Tumble Generator Valve Position Sensor

A: SPECIFICATION

The tumble generator valve position sensor cannot be adjusted when installed, so it should not be removed from the tumble generator valve assembly. Refer to “Tumble Generator Valve Assembly” for removal and installation procedure. <Ref. to FU(H4DOTC)-29, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(H4DOTC)-29, INSTALLATION, Tumble Generator Valve Assembly.>

15. 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(H4DOTC)-52, REMOVAL, Camshaft.>

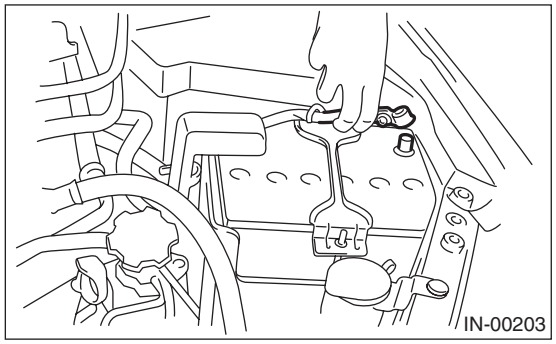
B: INSTALLATION

Install in the reverse order of removal.

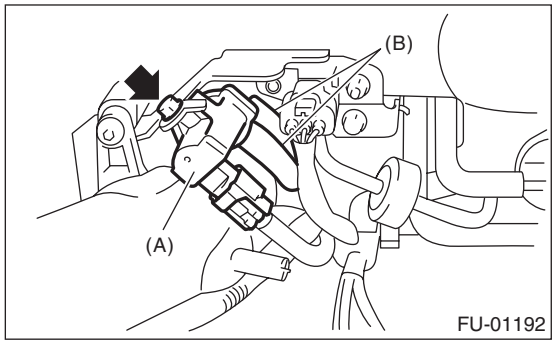
16. Wastegate Control Solenoid Valve

A: REMOVAL

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



3) Disconnect the connector from the wastegate control solenoid valve (A).
4) Disconnect pressure hose (B) from the wastegate control solenoid valve.
5) Remove the wastegate control solenoid valve from the bracket



B: INSTALLATION

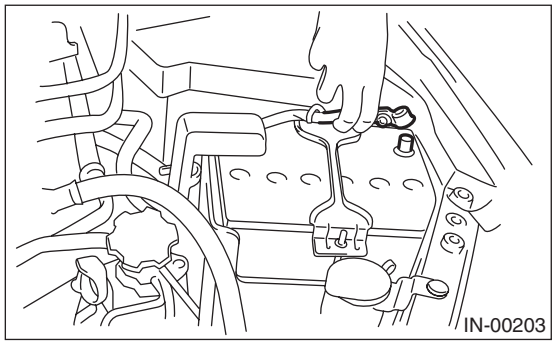
Install in the reverse order of removal.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

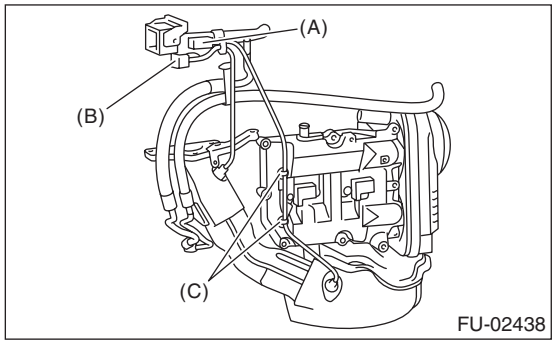
17.Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.

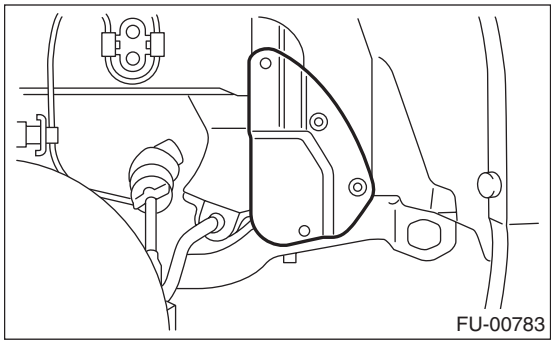


2) Disconnect the connector from front oxygen (A/F) sensor.
3) Disconnect the engine harness fixed by a clip, from the bracket.



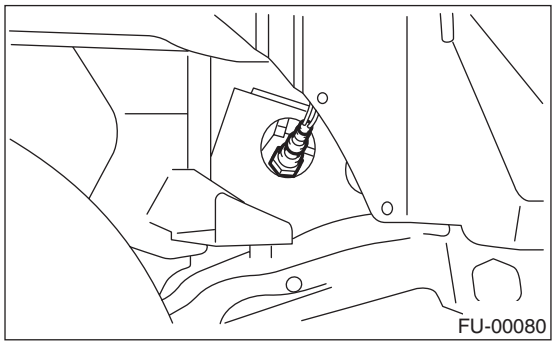
(A) Front oxygen (A/F) sensor connector
(B) Exhaust temperature sensor connector
(C) Clip

4) Remove the front right side wheel.
5) Lift-up the vehicle.
6) Remove the service hole cover.



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

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



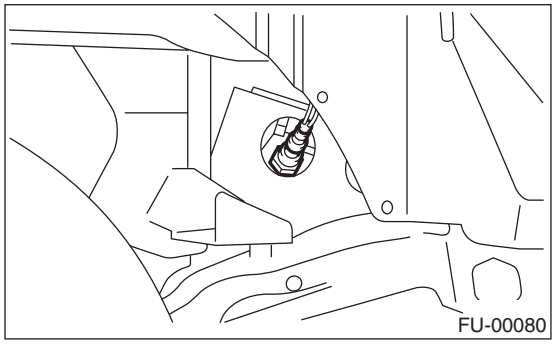
B: INSTALLATION

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

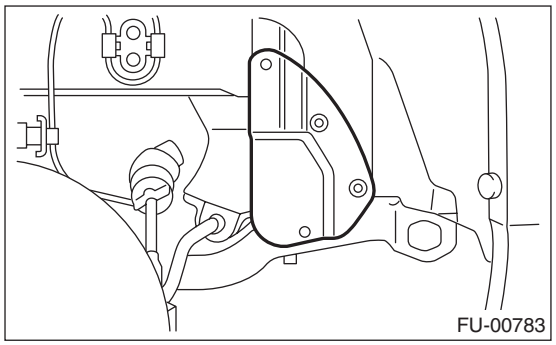
Anti-seize compound:
NEVER-SEEZ NS-165 or the equivalent

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

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

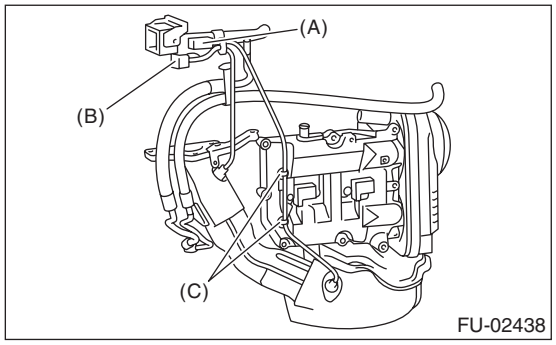


3) Install the service hole cover.



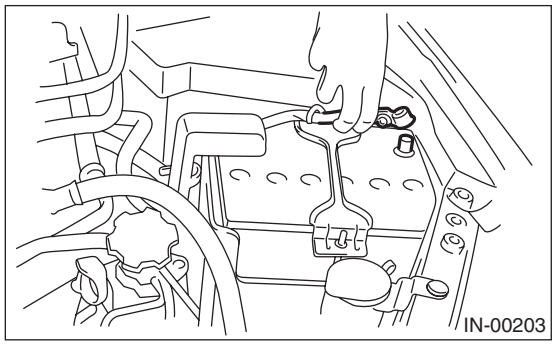
4) Lower the vehicle.
5) Install the front right side wheel.

6) Connect the engine harness to the bracket using a clip.
7) Connect the connector of front oxygen (A/F) sensor.



(A) Front oxygen (A/F) sensor connector
(B) Exhaust temperature sensor connector
(C) Clip

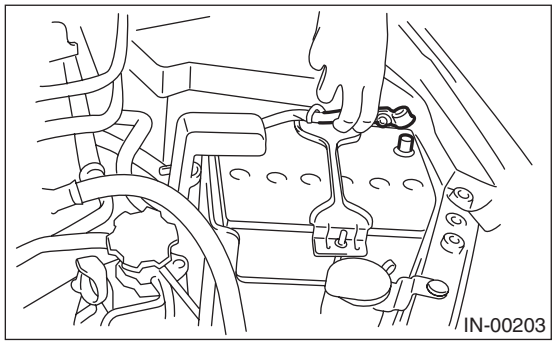
8) Connect the battery ground cable to the battery.



18.Rear Oxygen Sensor

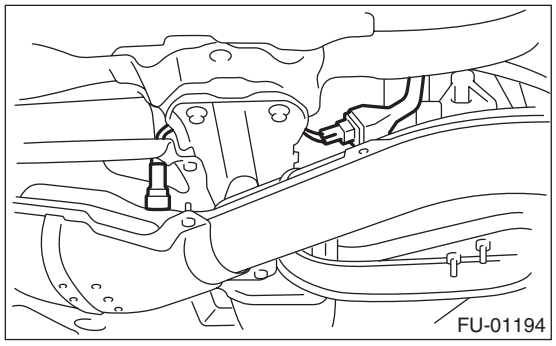
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Disconnect the connector from the rear oxygen sensor.
4) Apply spray-type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
5) Remove the rear oxygen sensor.

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



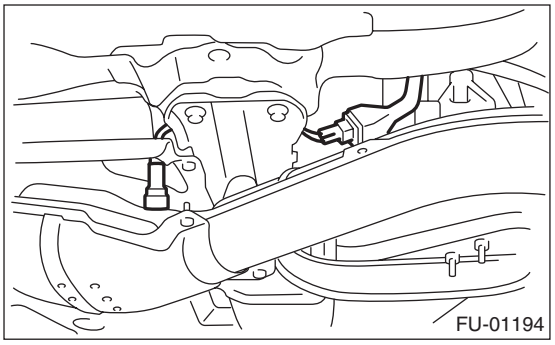
B: INSTALLATION

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.

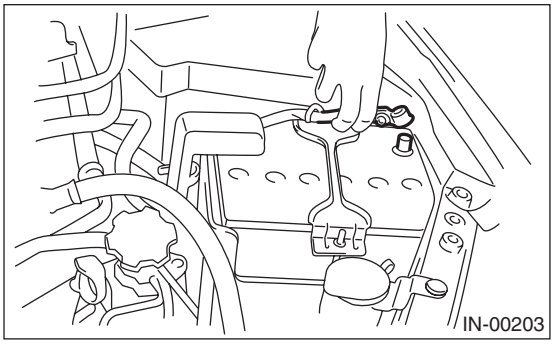
Anti-seize compound:
NEVER-SEEZ NS-165 or the equivalent

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

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



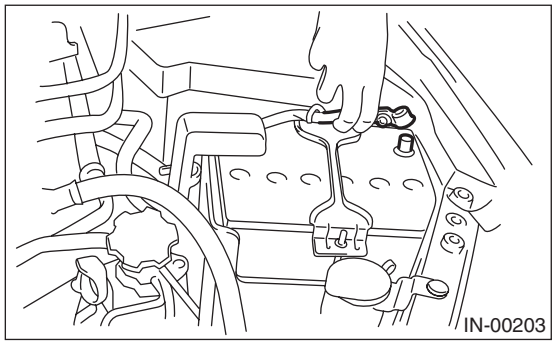
3) Connect the connector to rear oxygen sensor.
4) Lower the vehicle.
5) Connect the battery ground cable to the battery.



19.Exhaust Temperature Sensor

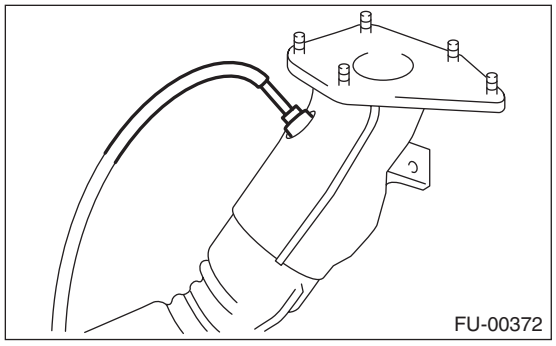
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the joint pipe.
<Ref. to EX(H4DOTC)-11, REMOVAL, Joint Pipe.>
3) Apply spray type lubricant to the threaded portion of exhaust temperature sensor, and leave it for one minute or more.
4) Remove the exhaust temperature sensor.

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



B: INSTALLATION

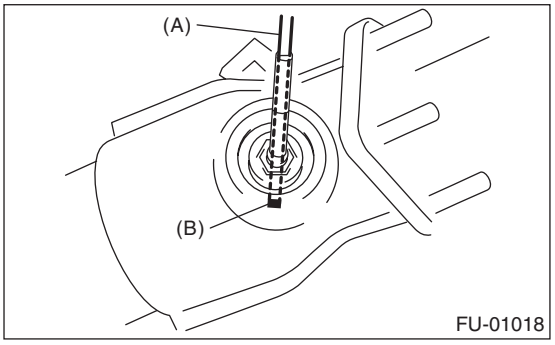
1) Before installing exhaust temperature sensor, apply anti-seize compound only to the threaded portion of exhaust temperature sensor. This facilitates the next removal.

CAUTION:
Never apply anti-seize compound to protector of the exhaust temperature sensor.

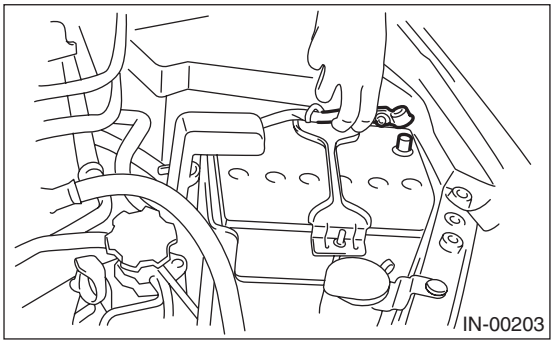
Anti-seize compound:
NEVER-SEEZ NS-165 or the equivalent
2) Install the exhaust temperature sensor.

NOTE:
Align the harness (A) of exhaust temperature sensor to the marking (B) of joint pipe, and tighten the screws.

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



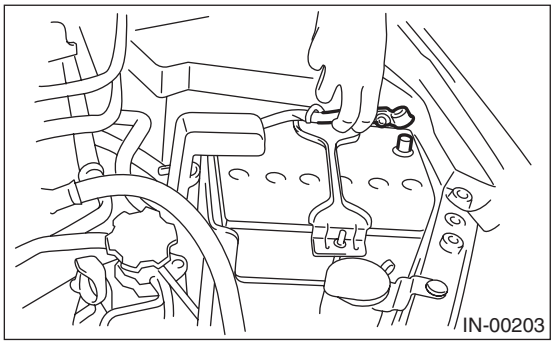
3) Install the joint pipe.
<Ref. to EX(H4DOTC)-11, INSTALLATION, Joint Pipe.>
4) Connect the battery ground cable to the battery.



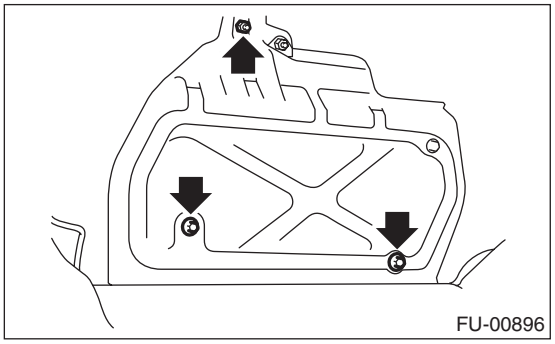
20.Engine Control Module (ECM)

A: REMOVAL

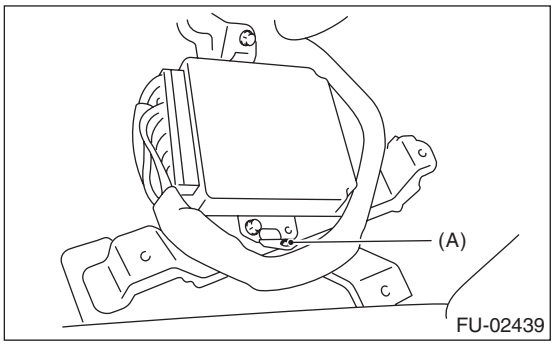
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of passenger's side.
<Ref. to EI-59, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of passenger's seat.
4) Remove the protect cover.



5) Remove the nuts and bolts 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.

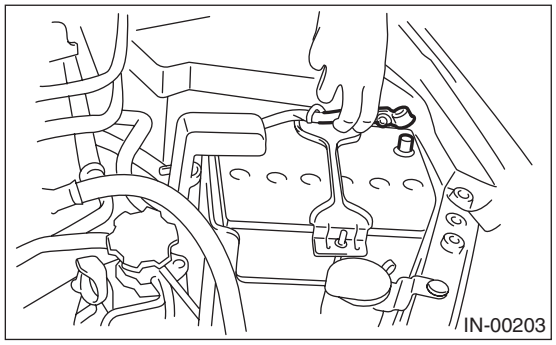
CAUTION:
• When replacing the ECM, be careful not to use the ECM for wrong specifications to avoid any damage to fuel injection system.
• When replacing the ECM, be careful not to damage the harnesses and connectors.

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

21.Main Relay

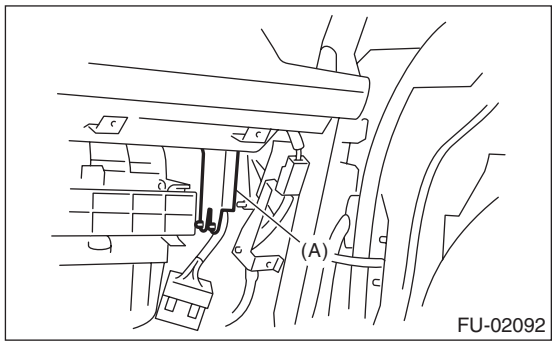
A: REMOVAL

1) Disconnect the ground cable from battery.

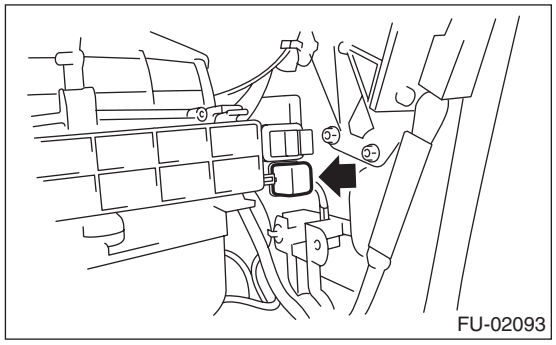


2) Remove the glove box. <Ref. to EI-51, REMOVAL, Glove Box.>

3) Remove the harness cover (A).



4) Disconnect the connectors from main relay.



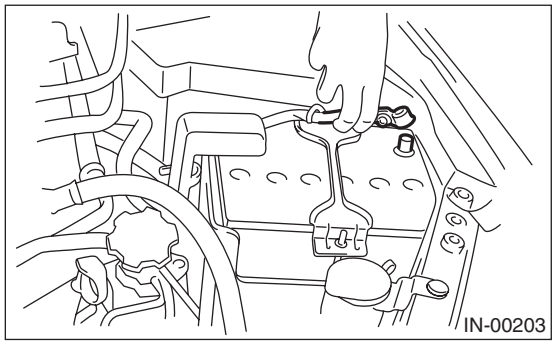
B: INSTALLATION

Install in the reverse order of removal.

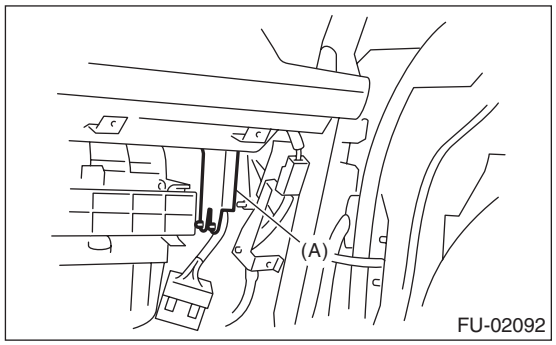
22.Fuel Pump Relay

A: REMOVAL

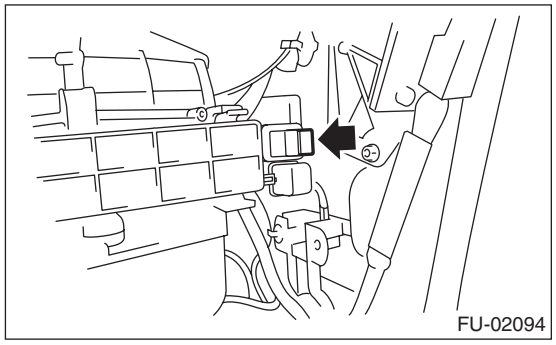
1) Disconnect the ground cable from battery.



2) Remove the glove box. <Ref. to EI-51, REMOVAL, Glove Box.>
3) Remove the harness cover (A).



4) Disconnect the connector from fuel pump relay.



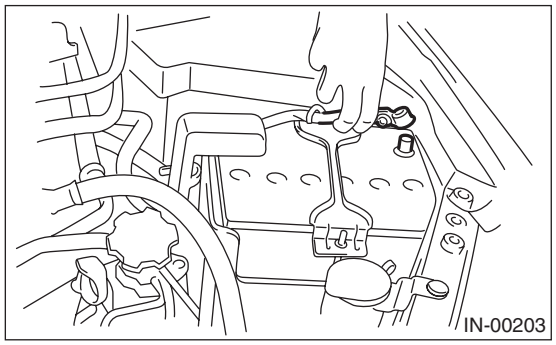
B: INSTALLATION

Install in the reverse order of removal.

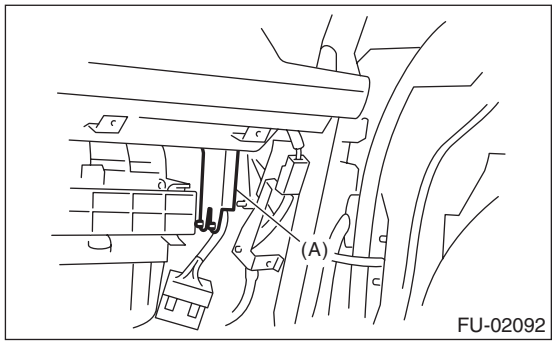
23. Electronic Throttle Control Relay

A: REMOVAL

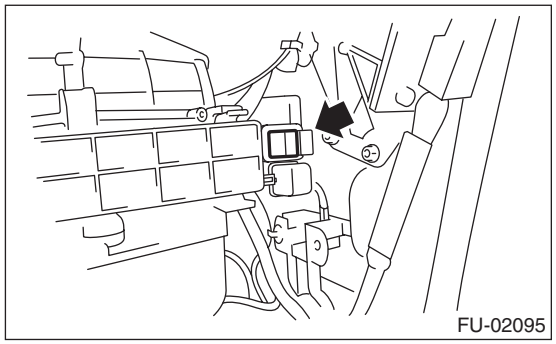
1) Disconnect the ground cable from battery.



2) Remove the glove box. <Ref. to EI-51, REMOVAL, Glove Box.>
3) Remove the harness cover (A).



4) Disconnect the connector from electric throttle control relay.



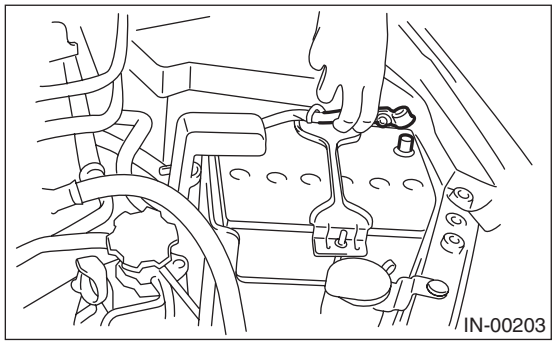
B: INSTALLATION

Install in the reverse order of removal.

24.Fuel Pump Control Unit

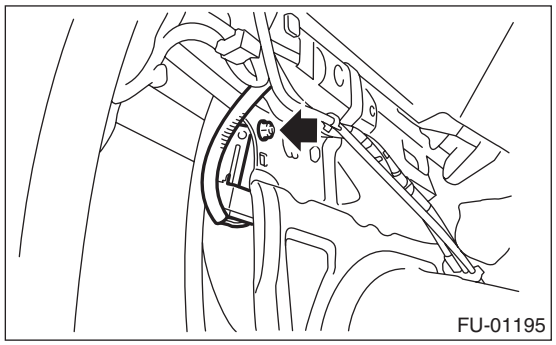
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the rear quarter trim. <Ref. to EI-61, REMOVAL, Rear Quarter Trim.>

3) Remove the fuel pump control unit.



4) Disconnect the connector from fuel pump control unit.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
5.0 N·m (0.5 kgf-m, 3.7 ft-lb)

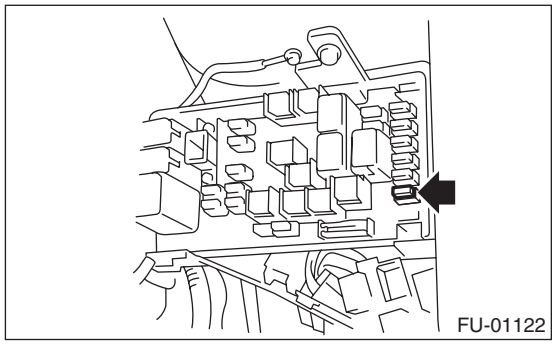
25.Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

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

1) Remove the fuse of fuel pump from main fuse box.

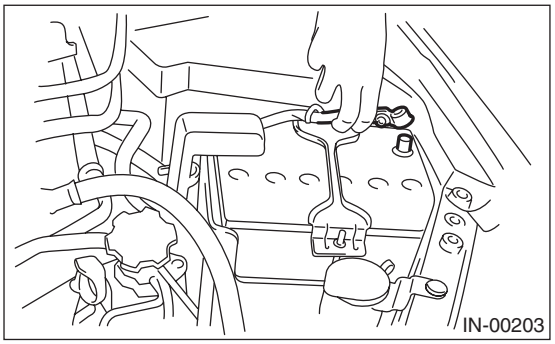


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn the ignition switch to OFF.

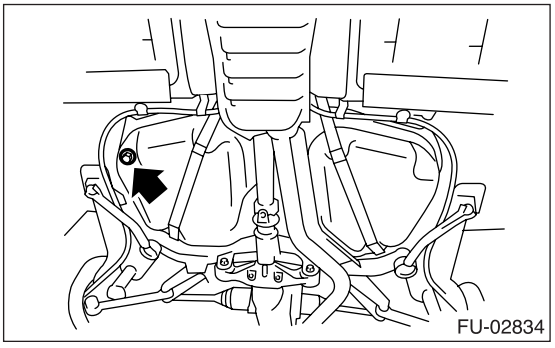
2. DRAINING FUEL

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

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

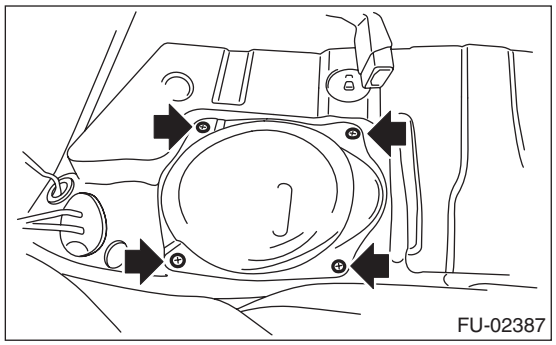
Tightening torque:
Nut
9 N·m (0.9 kgf-m, 6.6 ft-lb)
Bolt
17.5 N·m (1.78 kgf-m, 12.9 ft-lb)

26.Fuel Tank

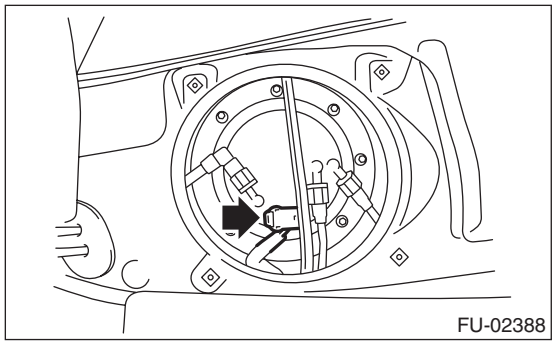
A: REMOVAL

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

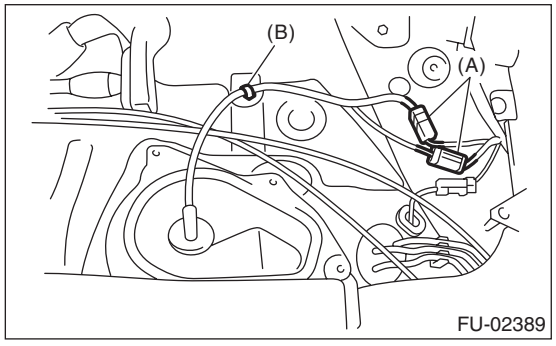
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Drain fuel from fuel tank.
<Ref. to FU(H4DOTC)-43, DRAINING FUEL, PROCEDURE, Fuel.>
4) Remove the rear seat.
5) Remove the service hole cover of fuel pump.


FU-02387

6) Disconnect the connector from fuel pump.

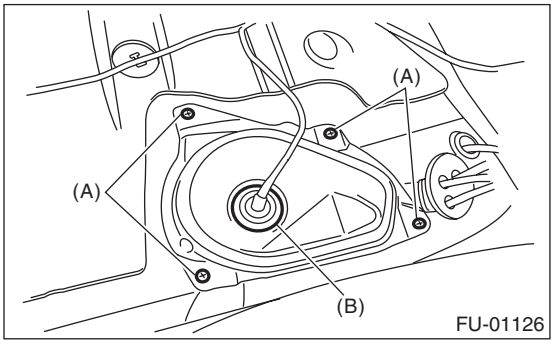

FU-02388

7) Remove the connector (A) and clip (B).



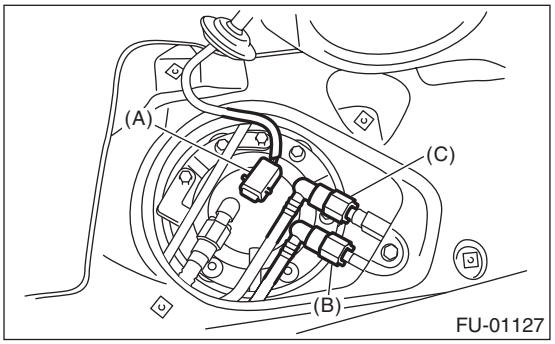
FU-02389

8) Remove the service hole cover of fuel sub level sensor.
(1) Remove bolt (A).
(2) Push the grommet (B) down and remove the service hole cover.



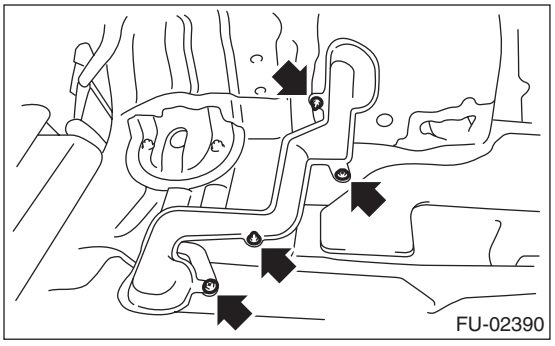
FU-01126

9) Disconnect connector (A) from fuel sub level sensor.
10) Disconnect the quick connector of fuel delivery (B) and return hose (C). <Ref. to FU(H4DOTC)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

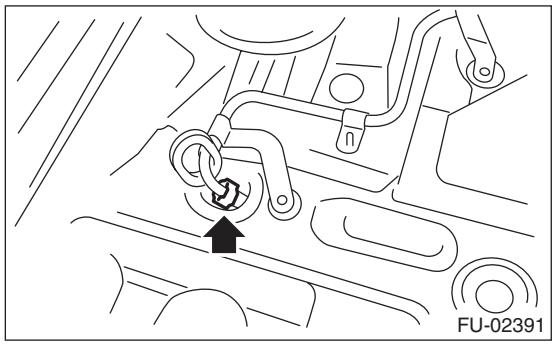


FU-01127

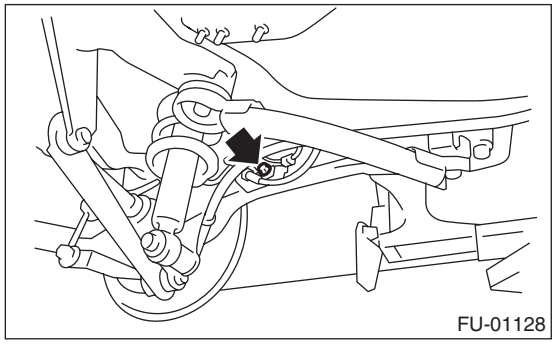
11) Remove the trunk room trim. (Sedan model)
<Ref. to EI-68, REMOVAL, Trunk Room Trim.>
12) Remove the rear quarter trim. (Wagon model)
<Ref. to EI-61, WAGON MODEL, REMOVAL, Rear Quarter Trim.>
13) Remove the pipe protector.


FU-02390

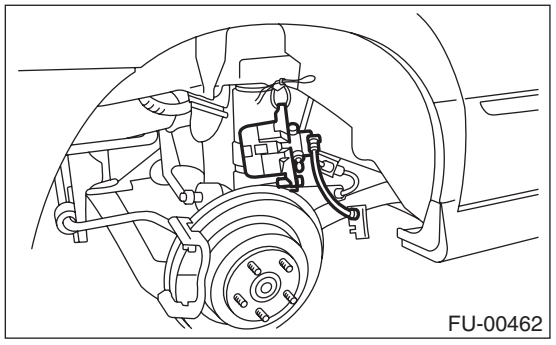
14) Remove the grommet and disconnect the quick connector of the evaporation pipe. <Ref. to FU(H4DOTC)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



15) Remove the rear wheels.
16) Remove the bolts which secure the rear brake hose mounting bracket.

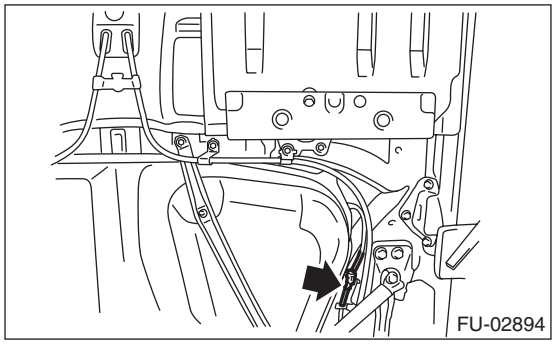


17) Remove the rear brake caliper and tie it to the body side of the vehicle.

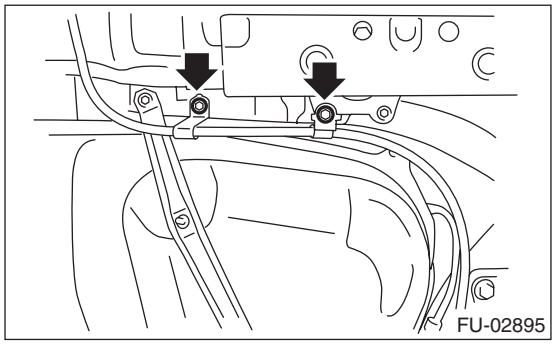


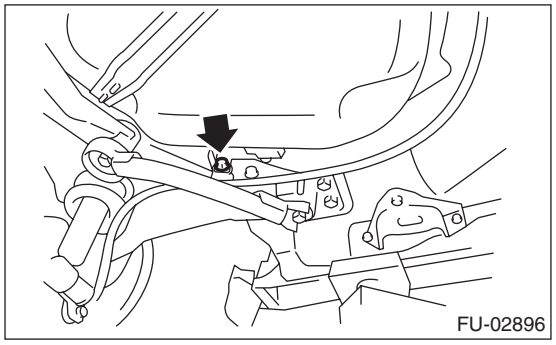
18) Remove the parking brake cable from parking brake assembly. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
19) Lift-up the vehicle.
20) Remove the rear exhaust pipe.
<Ref. to EX(H4DOTC)-12, REMOVAL, Rear Exhaust Pipe.>
21) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
22) Remove the heat shield cover.

23) Disconnect the connector from the rear ABS wheel speed sensor.



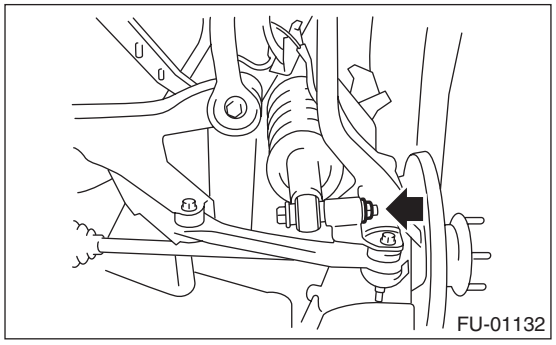
24) Remove the bolts securing the parking brake cable clamp.



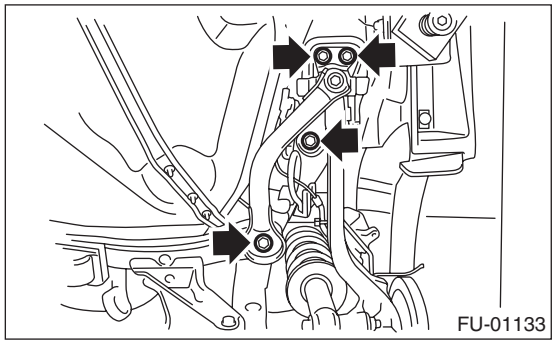


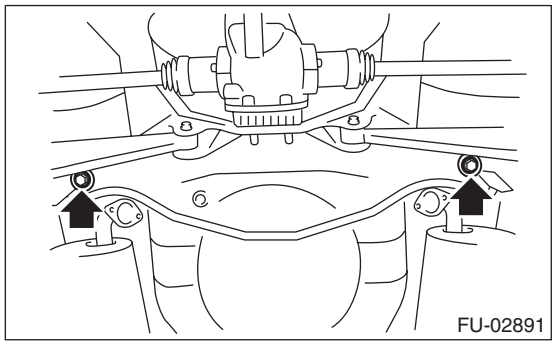
25) Remove the rear suspension assembly.

WARNING:
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.



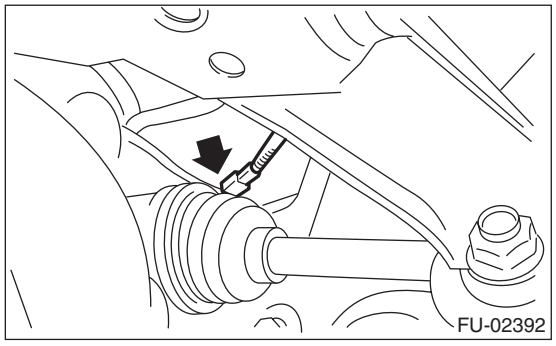
(3) Remove the bolts which secure the rear suspension assembly to the body.



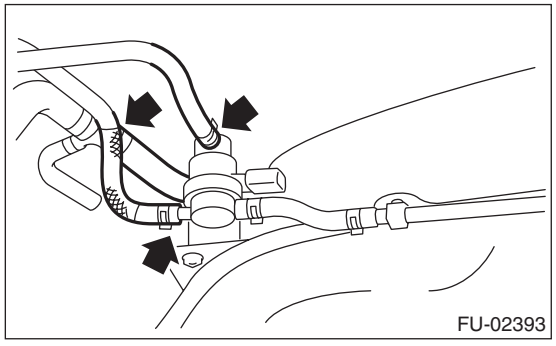


(4) Remove the rear suspension assembly.

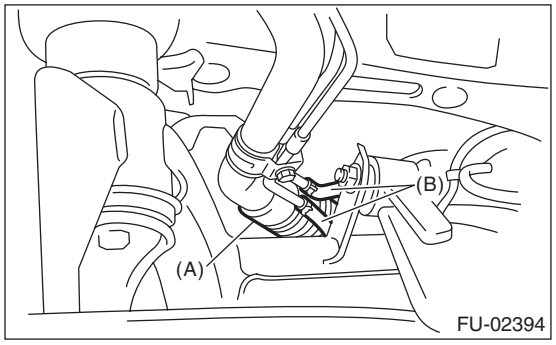
26) Disconnect the connector.



27) Disconnect the evaporation hose.

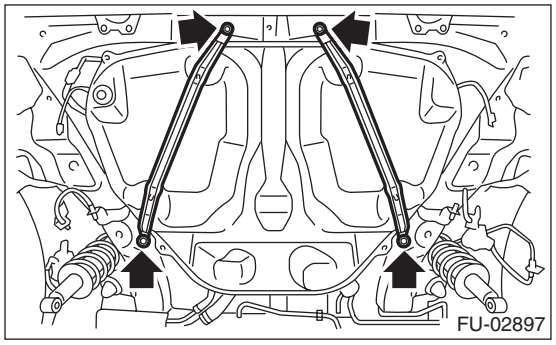


28) Disconnect the fuel filler hose (A) and evaporation hose (B).



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.

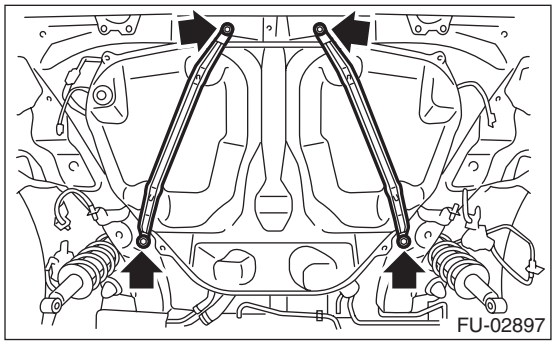
WARNING:
A helper is required to perform this work.



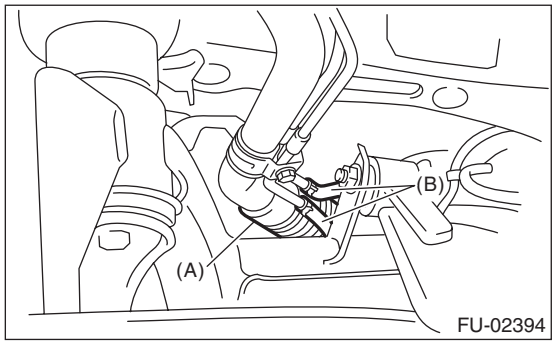
B: INSTALLATION

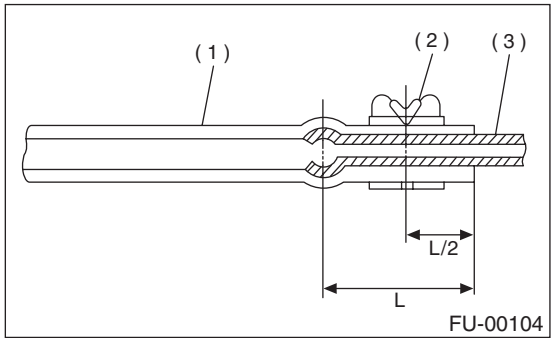
1) Support the fuel tank with a transmission jack, set the fuel tank in place, and temporarily tighten the bolts of the fuel tank band.

WARNING:
A helper is required to perform this work.



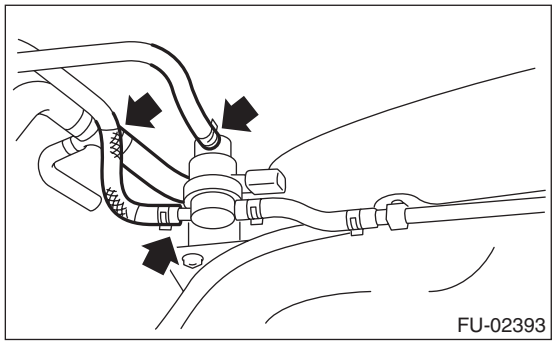
2) Securely insert the fuel filler hose (A) and evaporation hose (B) to the specified position, then tighten the clamp.





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

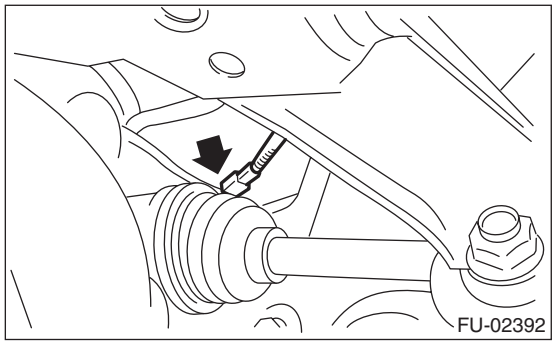
3) Connect the evaporation hose.



4) Tighten the fuel tank band bolts.

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

5) Connect the connector.

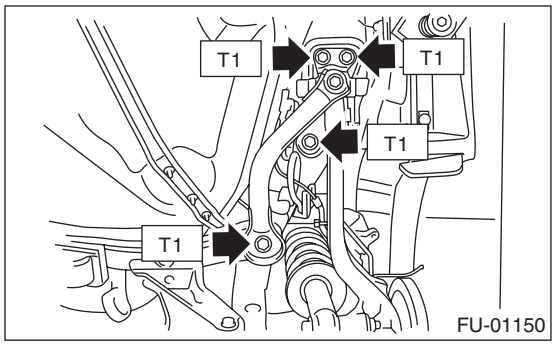


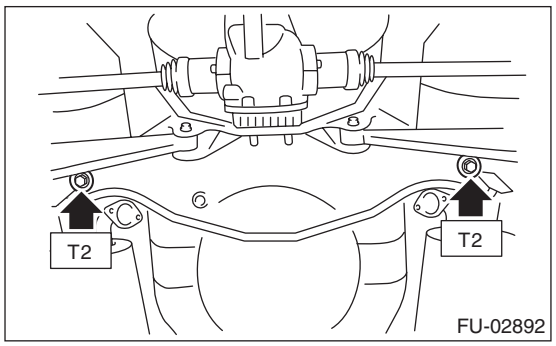
6) Install the rear suspension assembly.

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.

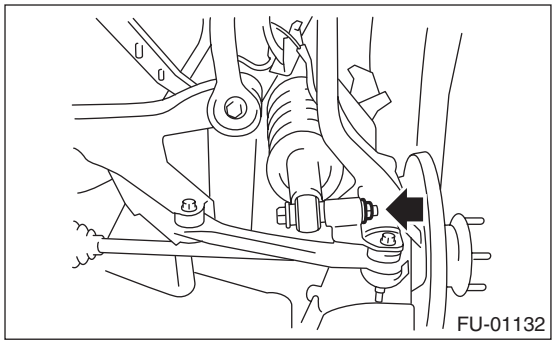
Tightening torque:
T1: 125 N·m (12.7 kgf-m, 92.2 ft-lb)
T2: 175 N·m (17.8 kgf-m, 129 ft-lb)





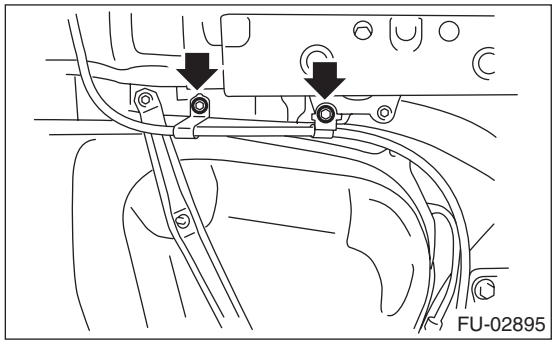
(3) Tighten the bolts which hold the rear shock absorber to the rear suspension arm. <Ref. to RS-10, INSTALLATION, Rear Arm.>

Tightening torque:
62 N·m (6.3 kgf-m, 46 ft-lb)

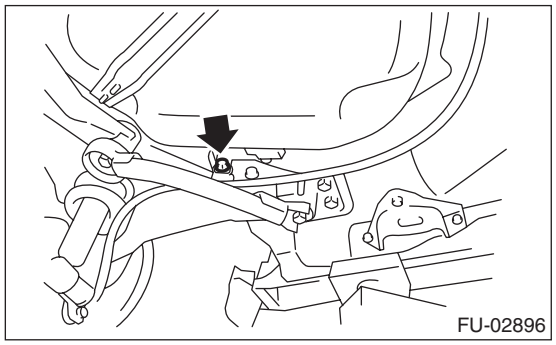


7) Tighten the bolts holding the parking brake cable clamp.

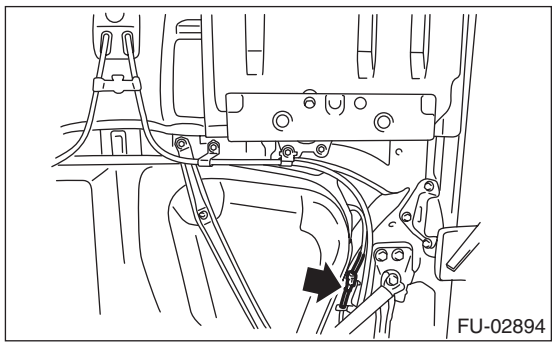
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



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

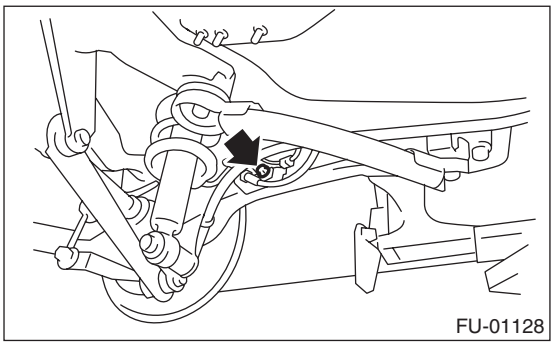


8) Connect the connector to the rear ABS wheel speed sensor.

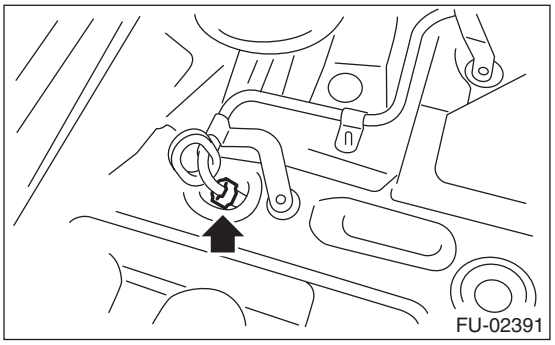


9) Install the heat shield cover.
10) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
11) Install the rear exhaust pipe. <Ref. to EX(H4DOTC)-12, INSTALLATION, Rear Exhaust Pipe.>
12) Lower the vehicle.
13) Connect the parking brake cable to the parking brake assembly. <Ref. 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, 25 ft-lb)

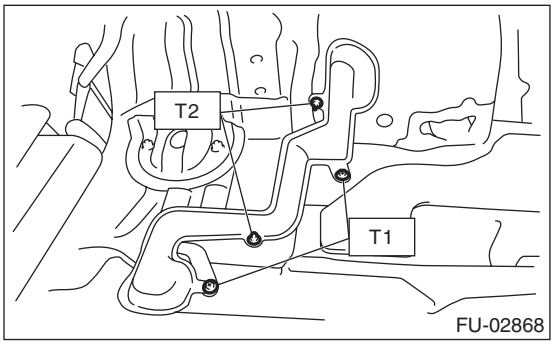


16) Install the rear wheels.
17) Lower the vehicle.
18) Connect the quick connector of the evaporation pipe. <Ref. to FU(H4DOTC)-61, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



19) Install the pipe protector.

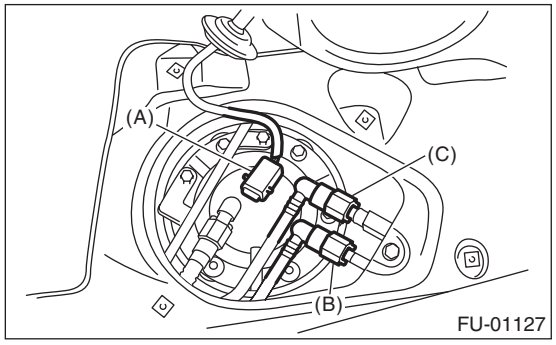
Tightening torque:
T1: 1.0 N·m (1.0 kgf-m, 0.7 ft-lb)
T2: 7.5 N·m (0.7 kgf-m, 5.5 ft-lb)



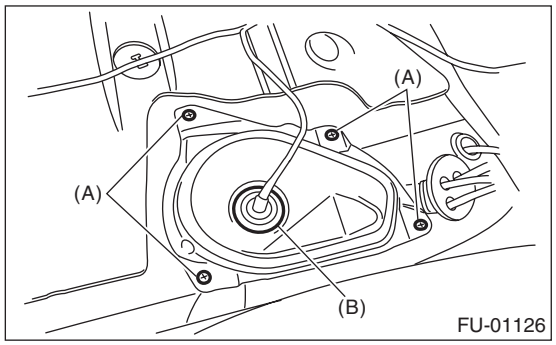
20) Install the trunk room trim. (Sedan model) <Ref. to EI-69, INSTALLATION, Trunk Room Trim.>
21) Install the rear quarter trim. (Wagon model) <Ref. to EI-62, INSTALLATION, Rear Quarter Trim.>
22) Connect connector (A) to the fuel sub level sensor.

23) Connect the quick connector of fuel delivery (B) and return hose (C). <Ref. to FU(H4DOTC)-61, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

NOTE:
When connecting, be careful not to reverse the delivery side and return side.

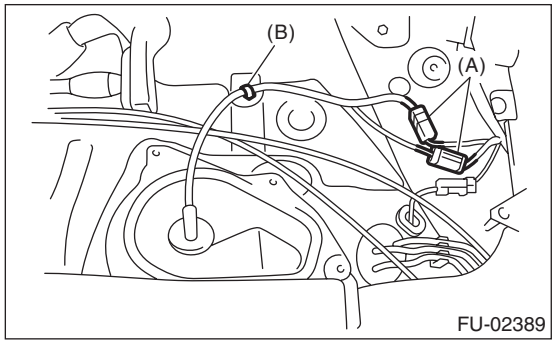


24) Install the service hole cover of fuel sub level sensor.

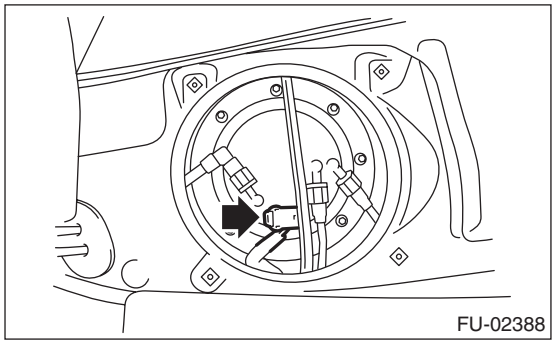


(A) Bolt
(B) Grommet

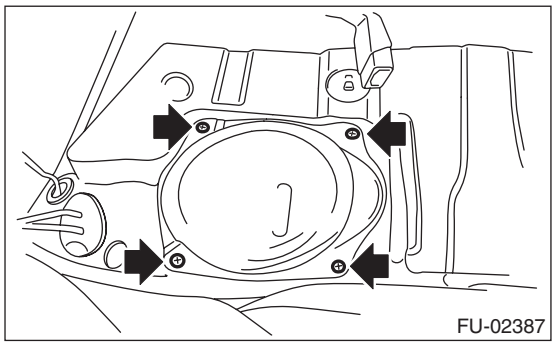
25) Connect connector (A), and install clip (B).



26) Connect the connector to the fuel pump.



27) Install the service hole cover of fuel pump.



28) Install the rear seat.
29) Install the fuse of fuel pump to main fuse box.

C: INSPECTION

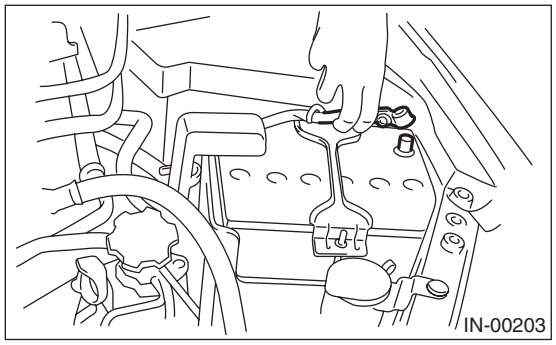
1) Check that the fuel tank does not have holes, cracks or is damaged in any other way.
2) Make sure that the fuel pipe and fuel hose are not cracked and that the connections are tight.

27.Fuel Filler Pipe

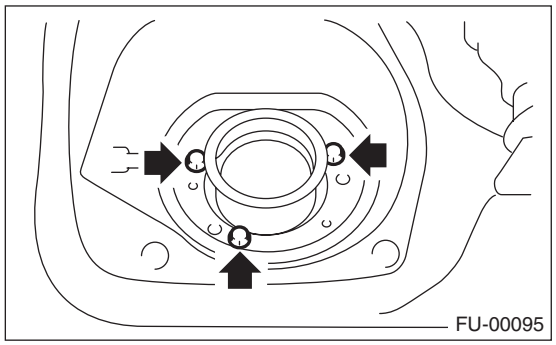
A: REMOVAL

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

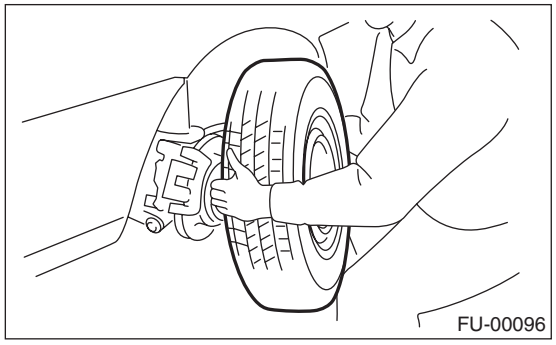
1) Disconnect the ground cable from battery.



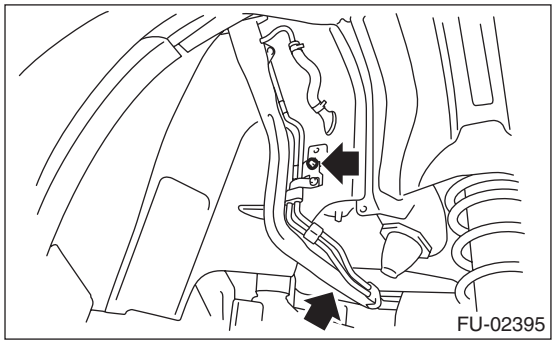
2) Open the fuel filler flap lid, and remove the filler cap.
3) Remove the screws which secure packing.



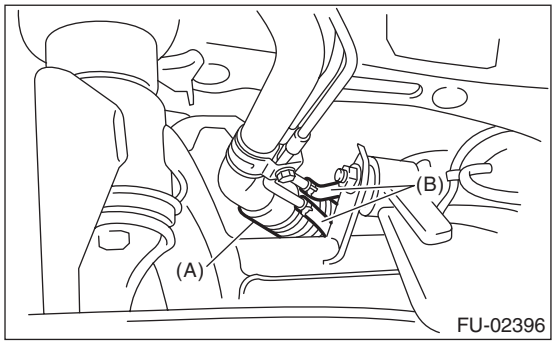
4) Lift-up the vehicle.
5) Remove the rear wheel RH.

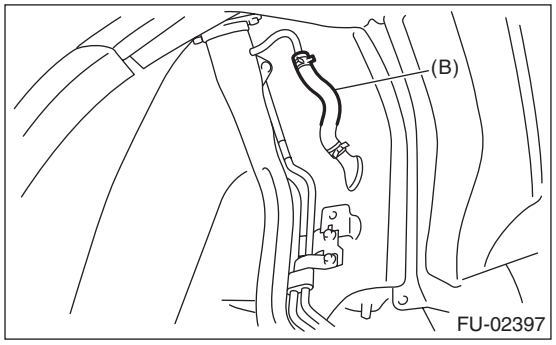


6) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-43, DRAINING FUEL, PROCEDURE, Fuel.>
7) Remove the mud guard. <Ref. to EI-29, REMOVAL, Mud Guard.>
8) Remove the rear sub frame. <Ref. to RS-21, REMOVAL, Rear Sub Frame.>
9) Remove the bolts which hold fuel filler pipe bracket on the body.



10) Loosen the clamp, and disconnect the fuel filler hose (A) and evaporation hose (B).



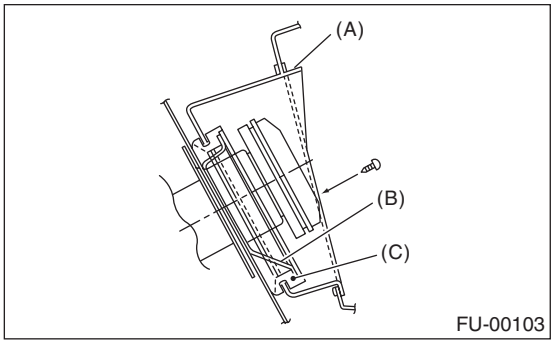


11) Remove the fuel filler pipe to the underside of the vehicle.

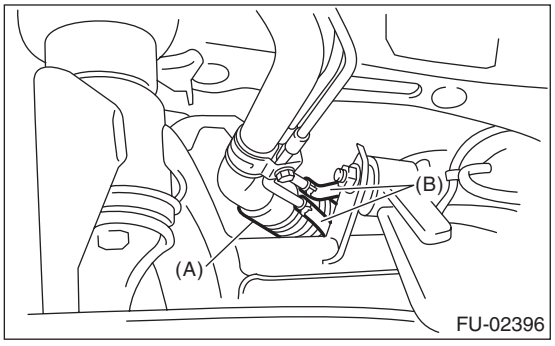
B: INSTALLATION

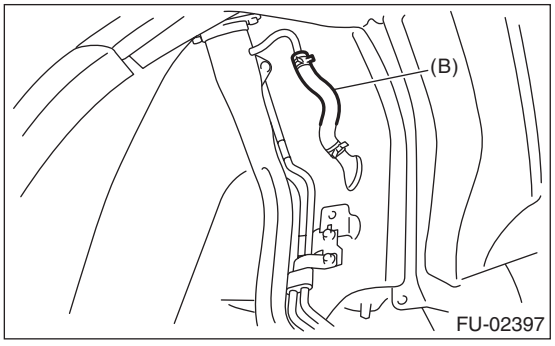
1) Open the fuel filler flap lid.
2) Set the fuel saucer (A) with rubber packing (C), and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

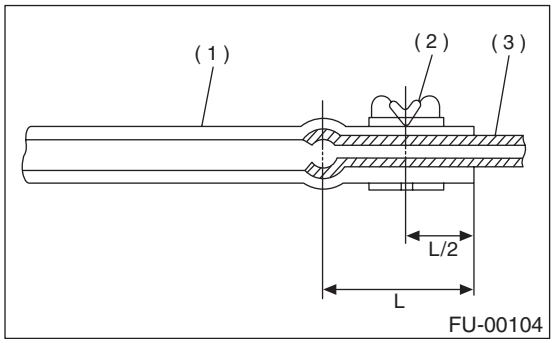
NOTE:
If the edges of rubber packing are folded toward inside, straighten it with a flat tip screwdriver.



4) Securely insert the fuel filler hose (A) and evaporation hose (B) to the specified position, then tighten the clamp.



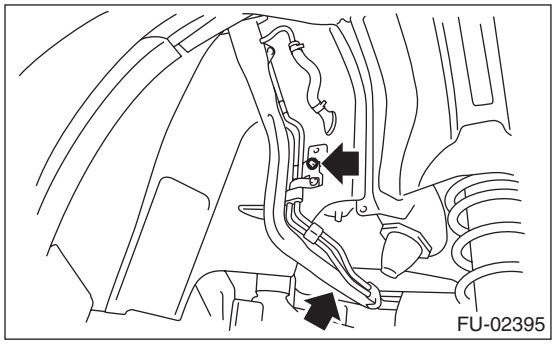




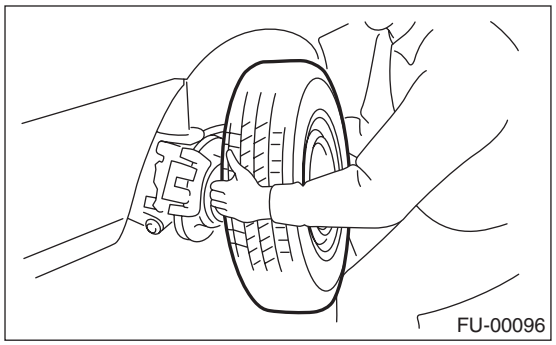
(1) Hose
(2) Clip or clamp
(3) Pipe

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)

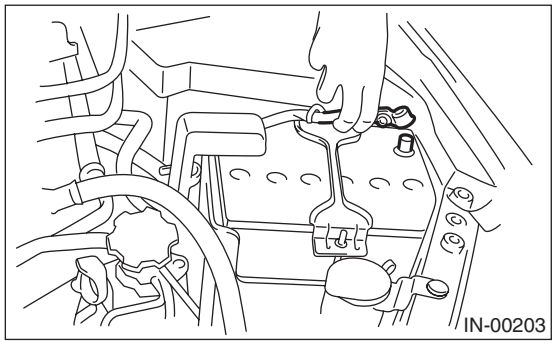


6) Install the rear sub frame. <Ref. to RS-21, INSTALLATION, Rear Sub Frame.>
7) Install the mud guard. <Ref. to EI-29, INSTALLATION, Mud Guard.>
8) Install the rear wheel RH.



9) Lower the vehicle.

10) Connect the battery ground cable to the battery.

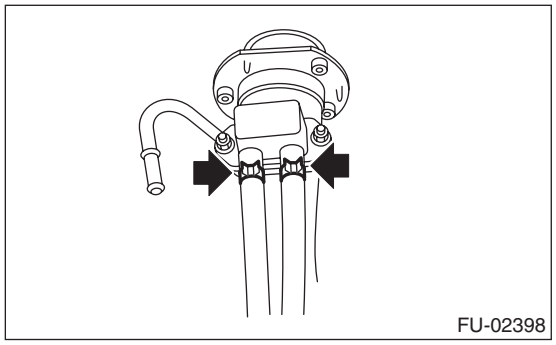


C: INSPECTION

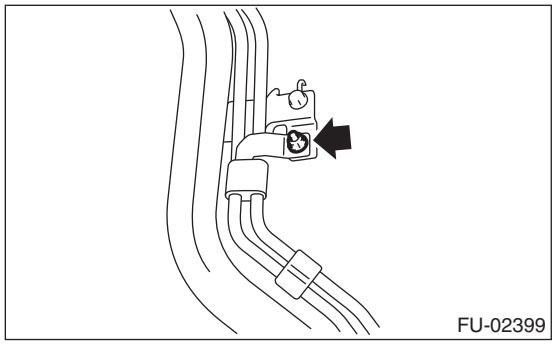
1) Check that the fuel filler pipe does not have holes, cracks or is damaged in any other way.
2) Make sure that the fuel hose is not cracked and that the connections are tight.

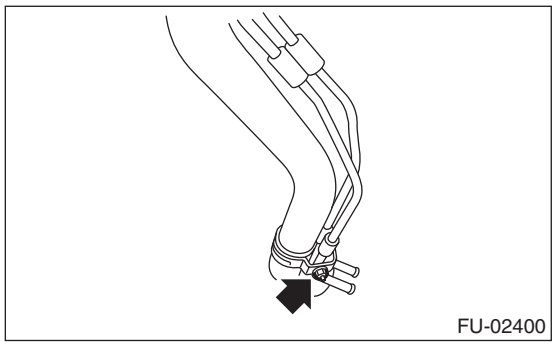
D: DISASSEMBLY

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.

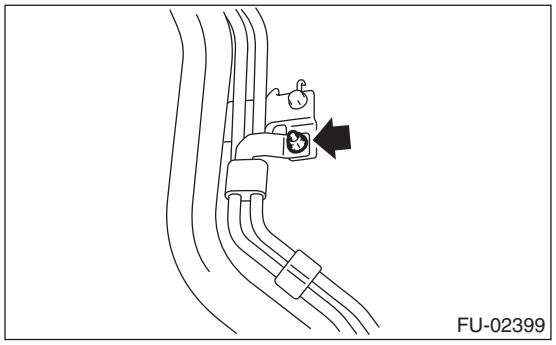


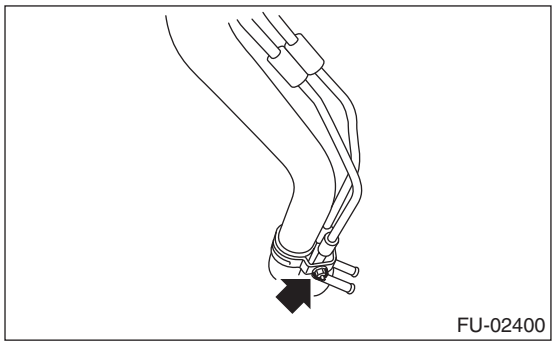


3) Remove the shut valve from the fuel filler pipe. <Ref. to EC(H4DOTC)-14, REMOVAL, Shut Valve.>

E: ASSEMBLY

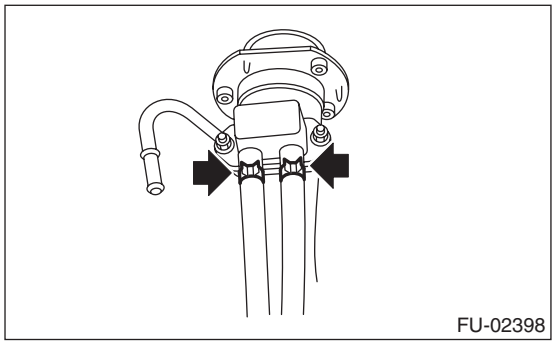
1) Install the shut pipe to the fuel filler pipe. <Ref. to EC(H4DOTC)-14, INSTALLATION, Shut Valve.>
2) Tighten the nuts which secure the evaporation pipe assembly to the fuel filler pipe.





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

3) Connect the evaporation hose to the shut valve.



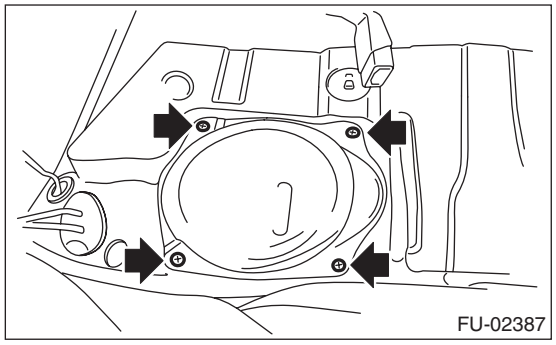
28.Fuel Pump

A: REMOVAL

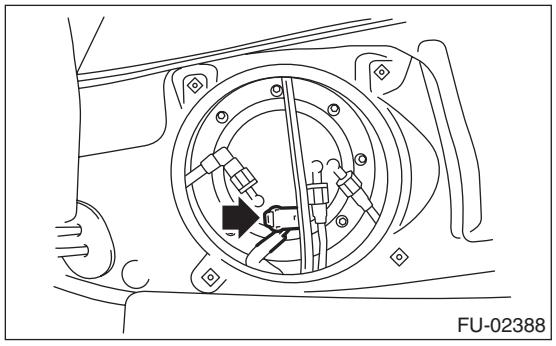
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H4DOTC)-43, DRAINING FUEL, PROCEDURE, Fuel.>
3) Remove the rear seat.
4) Remove the service hole cover.

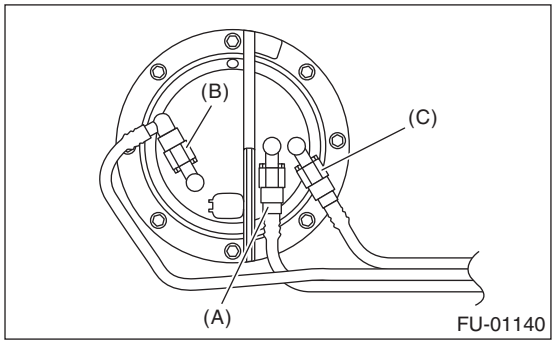

FU-02387

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(H4DOTC)-60, 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

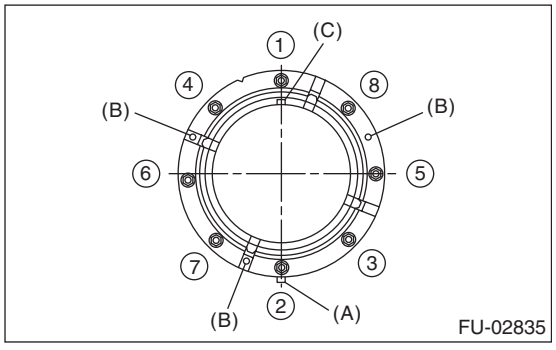
8) Remove the fuel pump assembly from the fuel tank.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Use a new gasket.
- 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 gasket to 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.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.2 ft-lb)

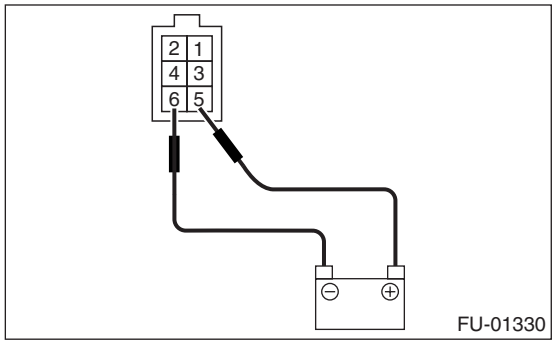


FU-02835

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.

WARNING:
- **Wipe off fuel completely.**
- **Keep the battery as far apart from fuel pump as possible.**
- **Be sure to turn the battery supply to ON and OFF on the battery side.**
- **Do not run the fuel pump for a long time under non-load condition.**

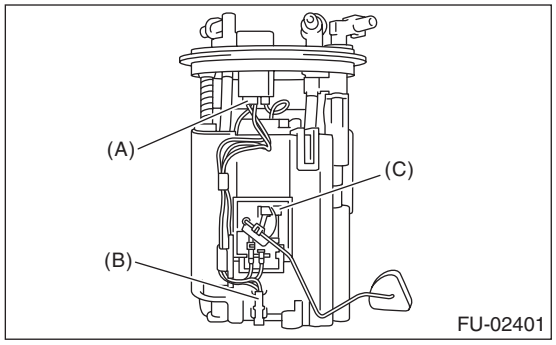


29.Fuel Level Sensor

A: REMOVAL

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

NOTE:
The fuel level sensor is built in fuel pump assembly.
1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-53, 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

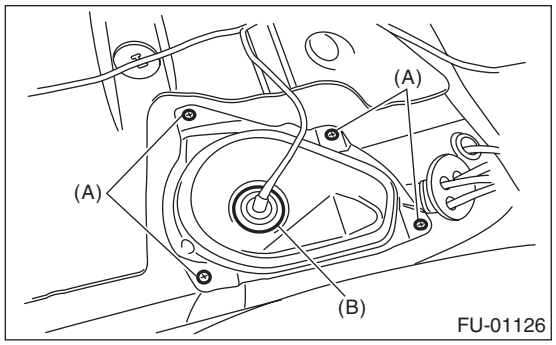
Install in the reverse order of removal.

30.Fuel Sub Level Sensor

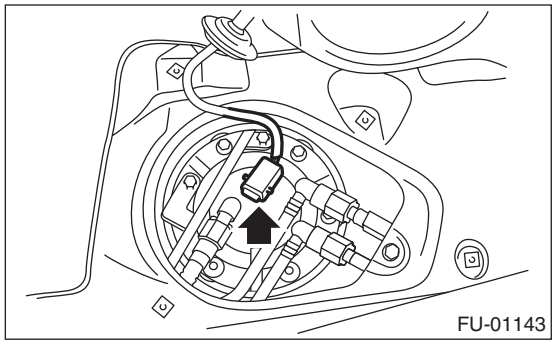
A: REMOVAL

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

1) Drain fuel. <Ref. to FU(H4DOTC)-43, DRAINING FUEL, PROCEDURE, Fuel.>
2) Remove the rear seat.
3) Remove the service hole cover.
   (1) Remove bolt (A).
   (2) Push the grommet (B) down and remove the service hole cover.

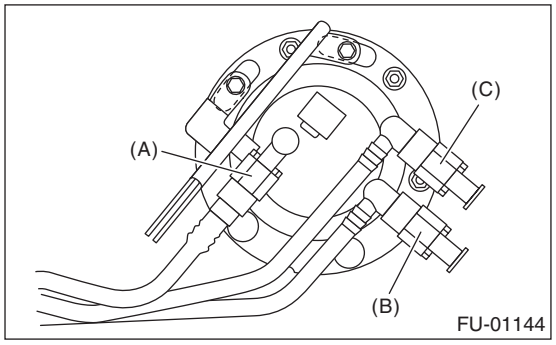


4) Disconnect the connector from fuel sub level sensor.



5) Disconnect the quick connector, then disconnect the fuel delivery hose, return hose and jet pump hose. <Ref. to FU(H4DOTC)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

6) Remove the nuts and bolts which install fuel sub level sensor on fuel tank.



(A) Jet pump hose
(B) Delivery hose
(C) Return hose

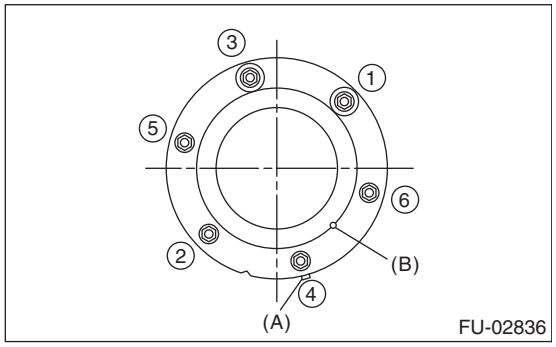
7) Remove the fuel sub level sensor.

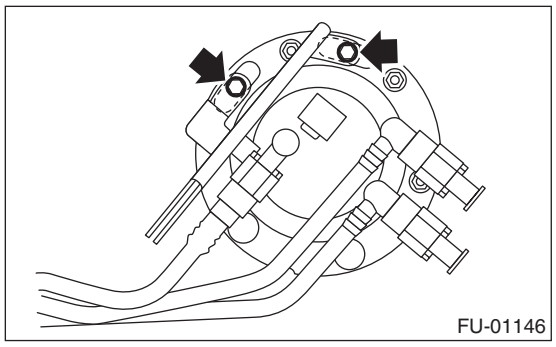
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Use a new gasket.
- 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.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.2 ft-lb)





31.Fuel Filter

A: SPECIFICATION

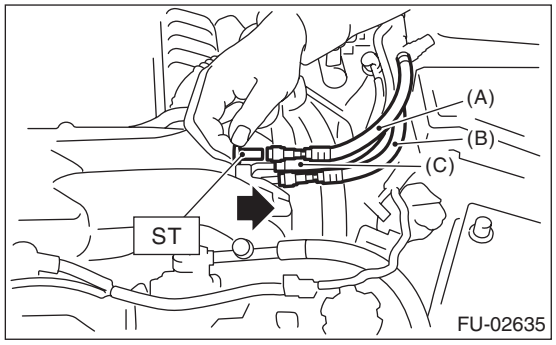
Fuel filter forms a single unit with fuel pump.
Refer to “Fuel Pump” for removal and installation. <Ref. to FU(H4DOTC)-53, REMOVAL, Fuel Pump.> <Ref. to FU(H4DOTC)-53, INSTALLATION, Fuel Pump.>

32.Fuel Bypass Valve

A: REMOVAL

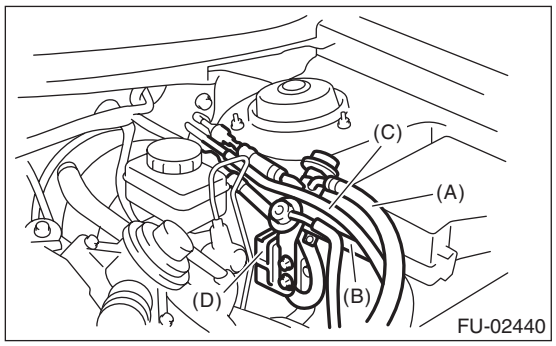
1) Release the fuel pressure.
<Ref. to FU(H4DOTC)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) In the engine compartment, disconnect the fuel delivery hoses, return hoses and evaporation hoses.
(1) Disconnect the quick connector on the fuel delivery line and return line by pushing the ST in the direction of the arrow.
ST 42099AE000 CONNECTOR REMOVER
(2) Remove the clip and disconnect the evaporation hose from the pipe.

WARNING:
• Be careful not to spill fuel.
• Catch the fuel from hoses using a container or cloth.



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

3) Remove the fuel by-pass valve from the vehicle.



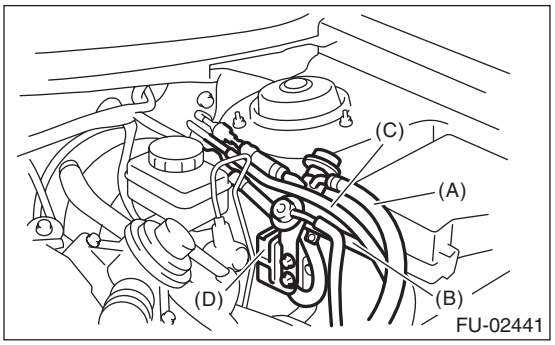
(A) Fuel delivery line
(B) Fuel return line
(C) Evaporation line
(D) Fuel by-pass valve

4) Disconnect the fuel delivery hose and fuel return hose from the fuel by-pass valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Fuel by-pass valve bracket
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
Clamp
1.25 N·m (0.13 kgf-m, 5.5 ft-lb)

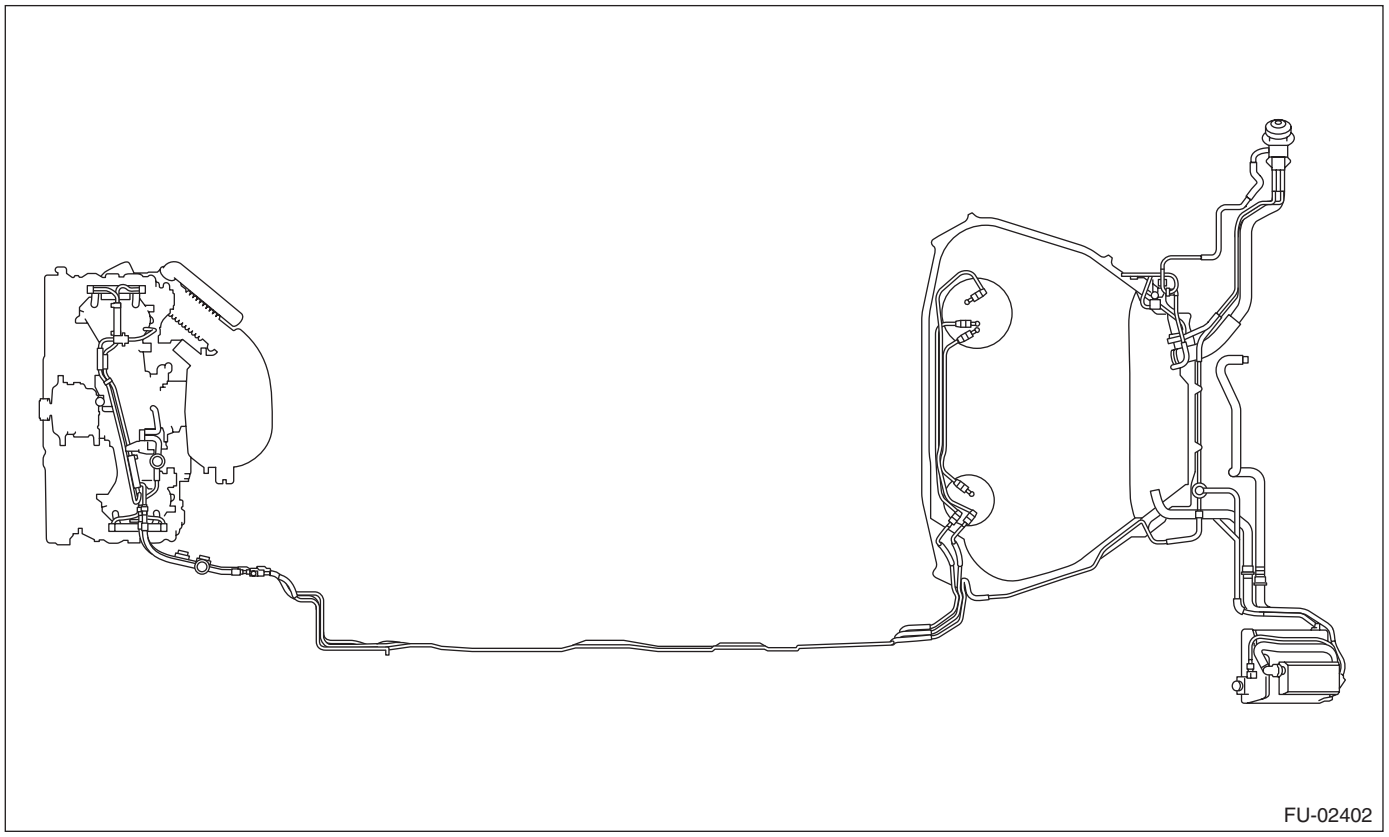


(A) Fuel delivery line
(B) Fuel return line
(C) Evaporation line
(D) Fuel by-pass valve

33.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-43, 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-70, REMOVAL, Floor Mat.>
5) Disconnect the fuel delivery pipes and hoses, and then disconnect the fuel return pipes and hoses, evaporation pipes and hoses.

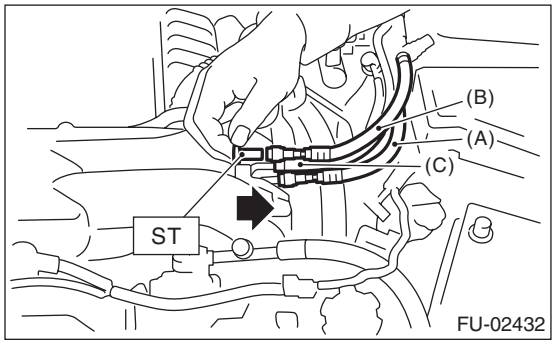

FU-02402

6) In the engine compartment, disconnect the fuel delivery hoses, return hoses and evaporation hoses.
   (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.

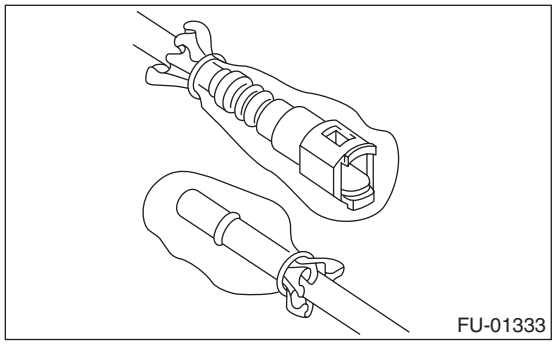
WARNING:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**



FU-02432

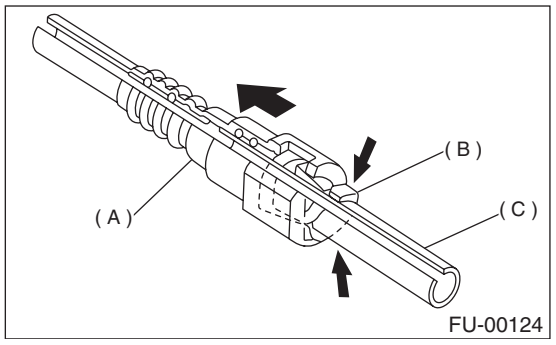
(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

7) Lift-up the vehicle.
8) Remove the fuel tank. <Ref. to FU(H4DOTC)-44, 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).

CAUTION:
Always use a new retainer except in use of engine compartment.

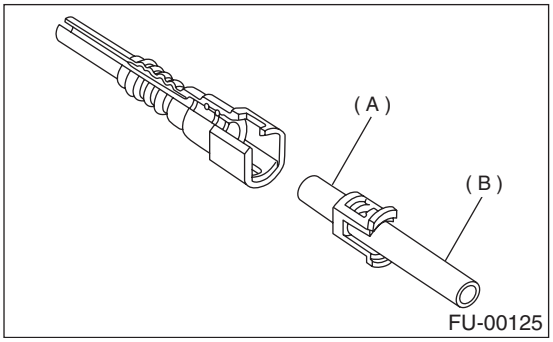


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

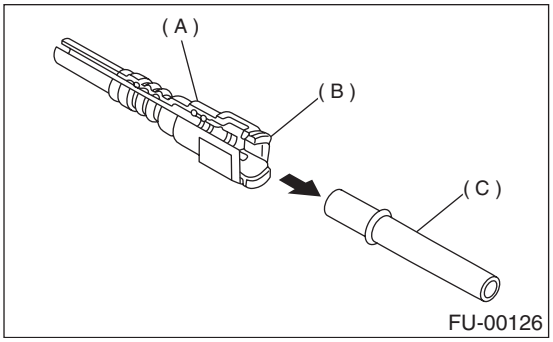
1) Connect the quick connector on fuel line.

CAUTION:
• Always use a new retainer except in use of engine compartment.
• Make sure there are no damage or dust on connections. If necessary, clean seal surface of pipe.



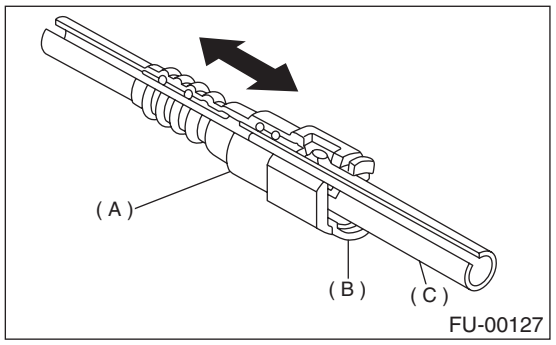
(A) Seal surface
(B) Pipe

(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.

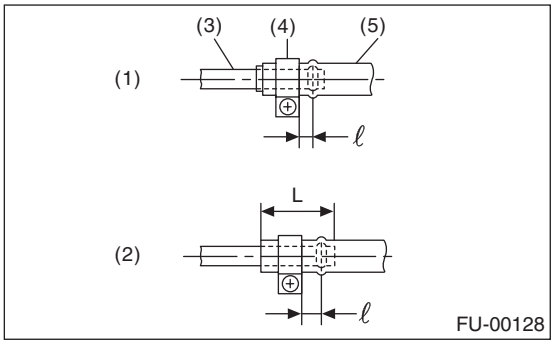


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose 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)

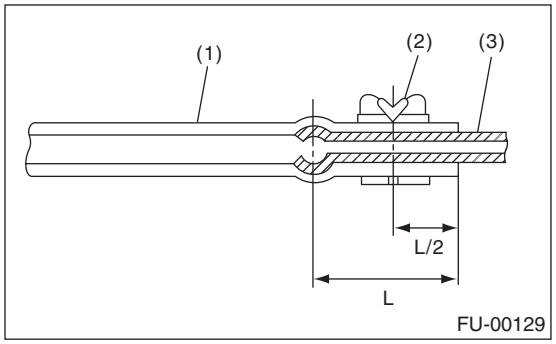
L: 22.5±2.5 mm (0.886±0.098 in)



(1) Type A
(2) Type B
(3) Pipe
(4) Clamp
(5) Hose

3) Connect the return hose and evaporation hose to the pipe by approx. 15 mm (0.59 in) from hose end.
Fuel return hose:
L = 22.5±2.5 mm (0.886±0.098 in)
Fuel evaporation hose:
L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



(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.

34.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 dust or water in the fuel filter	Replace the fuel filter, 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 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. And also drain water from fuel filter.
• 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. Fill the water removing agent at the time when the fuel reduced at half to maintain the advantage.
• When water is accumulated in fuel filter, drain water from both the fuel filter and fuel tank or use 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(H4DOTC)

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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(H4DOTC)-9, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H4DOTC)-11, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-12, 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(H4DOTC)-14, 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(H4DOTC)-16, 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(H4DOTC)-18, 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(H4DOTC)-20, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to GD(H4DOTC)-22, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H4DOTC)-24, 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(H4DOTC)-27, 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(H4DOTC)-29, 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(H4DOTC)-31, 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(H4DOTC)-33, 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(H4DOTC)-35, 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(H4DOTC)-37, 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(H4DOTC)-39, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to GD(H4DOTC)-41, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(H4DOTC)-43, 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(H4DOTC)-45, 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(H4DOTC)-47, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	<Ref. to GD(H4DOTC)-49, 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(H4DOTC)-51, 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(H4DOTC)-53, 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(H4DOTC)-55, 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(H4DOTC)-57, 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(H4DOTC)-59, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-62, 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(H4DOTC)-64, 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(H4DOTC)-66, 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(H4DOTC)-68, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4DOTC)-74, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4DOTC)-76, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to GD(H4DOTC)-78, 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(H4DOTC)-81, 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(H4DOTC)-83, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low	<Ref. to GD(H4DOTC)-85, 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(H4DOTC)-87, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H4DOTC)-89, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to GD(H4DOTC)-91, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to GD(H4DOTC)-93, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to GD(H4DOTC)-95, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4DOTC)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4DOTC)-102, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4DOTC)-102, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4DOTC)-102, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-103, 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(H4DOTC)-105, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to GD(H4DOTC)-107, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to GD(H4DOTC)-109, 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(H4DOTC)-111, 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(H4DOTC)-113, 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(H4DOTC)-113, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H4DOTC)-116, 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(H4DOTC)-131, 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(H4DOTC)-133, 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(H4DOTC)-135, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4DOTC)-137, 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(H4DOTC)-139, 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(H4DOTC)-140, 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(H4DOTC)-140, 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(H4DOTC)-141, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to GD(H4DOTC)-143, 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(H4DOTC)-145, 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(H4DOTC)-147, DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor “A” Circuit High	<Ref. to GD(H4DOTC)-149, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4DOTC)-151, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Fan Rationality Check	<Ref. to GD(H4DOTC)-154, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0500	Vehicle Speed Sensor “A”	<Ref. to GD(H4DOTC)-155, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to GD(H4DOTC)-157, 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(H4DOTC)-159, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4DOTC)-161, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(H4DOTC)-162, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Air Control System Performance	<Ref. to GD(H4DOTC)-163, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0545	Exhaust Gas Temperature Sensor Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-164, DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0546	Exhaust Gas Temperature Sensor Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-166, DTC P0546 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H4DOTC)-168, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4DOTC)-169, 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(H4DOTC)-171, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H4DOTC)-172, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4DOTC)-175, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Fan 1 Control Circuit Low	<Ref. to GD(H4DOTC)-178, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Fan 1 Control Circuit High	<Ref. to GD(H4DOTC)-179, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	Transmission Control System (MIL Request)	<Ref. to GD(H4DOTC)-180, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Park/Neutral Switch Input Circuit Low (AT Model)	<Ref. to GD(H4DOTC)-181, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to GD(H4DOTC)-182, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Park/Neutral Switch Input Circuit High (AT Model)	<Ref. to GD(H4DOTC)-183, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (Mt Model)	<Ref. to GD(H4DOTC)-184, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(H4DOTC)-185, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(H4DOTC)-187, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4DOTC)-189, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1301	Misfire Detected (High Temperature Exhaust Gas)	<Ref. to GD(H4DOTC)-191, DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1312	Exhaust Gas Temperature Sensor Malfunction	<Ref. to GD(H4DOTC)-193, DTC P1312 EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4DOTC)-194, 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(H4DOTC)-196, 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(H4DOTC)-198, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to GD(H4DOTC)-200, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4DOTC)-202, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1544	Exhaust Gas Temperature Too High	<Ref. to GD(H4DOTC)-203, DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to GD(H4DOTC)-204, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(H4DOTC)-205, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(H4DOTC)-205, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(H4DOTC)-205, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(H4DOTC)-205, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(H4DOTC)-205, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(H4DOTC)-205, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1578	Meter Failure	<Ref. to GD(H4DOTC)-205, DTC P1578 METER FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to GD(H4DOTC)-206, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to GD(H4DOTC)-207, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	<Ref. to GD(H4DOTC)-208, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to GD(H4DOTC)-209, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	<Ref. to GD(H4DOTC)-210, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-212, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	<Ref. to GD(H4DOTC)-214, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to GD(H4DOTC)-216, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-218, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	<Ref. to GD(H4DOTC)-220, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	<Ref. to GD(H4DOTC)-222, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	<Ref. to GD(H4DOTC)-224, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-225, 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(H4DOTC)-227, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to GD(H4DOTC)-228, 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(H4DOTC)-228, 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(H4DOTC)-229, 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(H4DOTC)-231, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(H4DOTC)-233, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(H4DOTC)-235, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H4DOTC)-237, 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(H4DOTC)-239, 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(H4DOTC)-241, 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(H4DOTC)-243, 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(H4DOTC)-245, 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(H4DOTC)-247, 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(H4DOTC)-249, 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(H4DOTC)-251, 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(H4DOTC)-253, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2228	Barometric Pressure Circuit Low	<Ref. to GD(H4DOTC)-254, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2229	Barometric Pressure Circuit High	<Ref. to GD(H4DOTC)-255, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

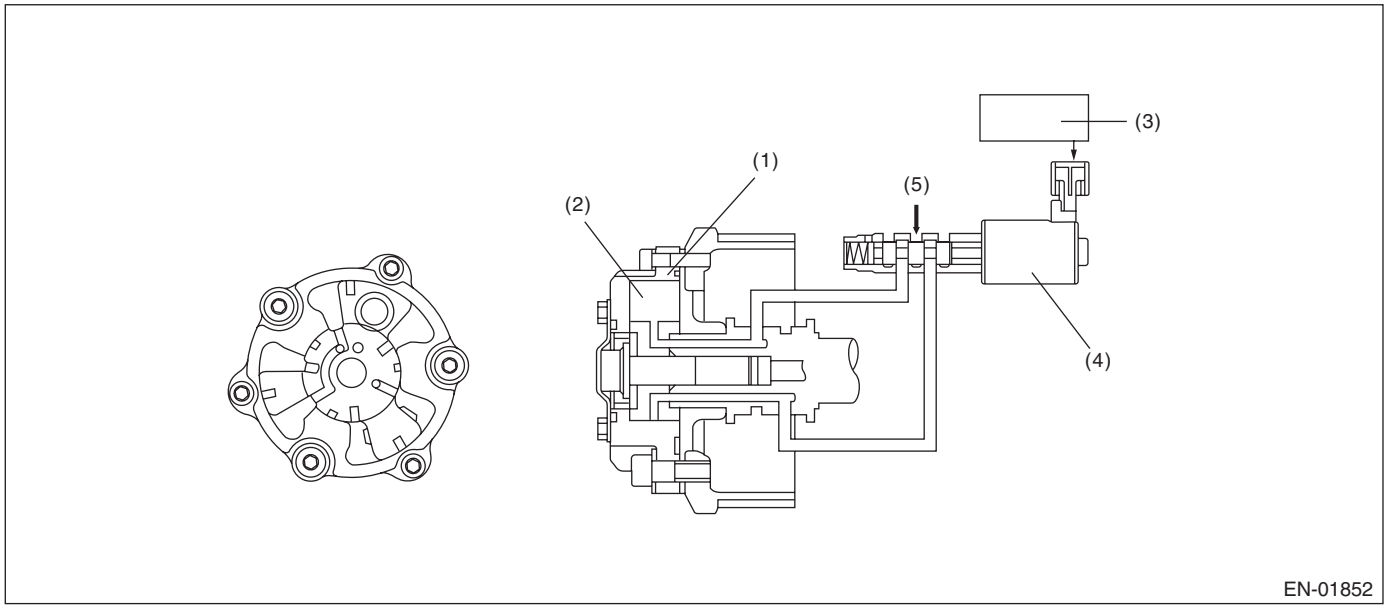
2. Diagnostic Trouble Code (DTC) Detecting Criteria

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.
1) Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.
2) Judge NG when the most retarded learning value is outside of the normal range.

2. COMPONENT DESCRIPTION



(1) AVCS timing controller
(2) Vane
(3) Engine control module (ECM)
(4) Oil flow control solenoid valve
(5) Oil pressure

3. ENABLE CONDITION (FOR ABNORMALITY JUDGMENT ONLY)

Secondary Parameters	Enable Conditions
Abnormality judgment (1)	
Battery voltage	≥ 10.9 V
Engine speed	≥ 1500 rpm
Engine coolant temperature	≥ 60°C (140°F)
AVCS control	Operating
Abnormality judgment (2)	
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
Engine coolant temperature	≥ 60°C (140°F)

4. GENERAL DRIVING CYCLE

1) Always perform the diagnosis after warming up when the engine speed is more than 1500 rpm.
2) Always perform the diagnosis after warming up when the engine speed is more than 500 rpm.

5. DIAGNOSTIC METHOD

1) Judge NG when the difference of the amount of AVCS target timing advance and the amount of AVCS actual timing advance becomes large.
2) Judge NG when the most retarded learning value is outside of the normal range.

- **Abnormality Judgment**

Judge as NG when the continuous time of completing the malfunction criteria below becomes 20 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Judgment value 1	
|AVCS – AVCS actual position|	≥ 0°
(2) Judgment value 1	
AVCS control	During most timing retard learning
Most timing retard learning value	<–13°CA or > 25°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 with the following criteria established is more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Judgment value 1	
AVCS control	Operating
Amount of AVCS target timing advance	5 — 30°CA
AVCS target position – AVCS actual position	< 10°
(2) Judgment value 1	
Most timing retard learning value	–13 — 25°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 CONDITION

- 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)

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

1. OUTLINE OF DIAGNOSIS

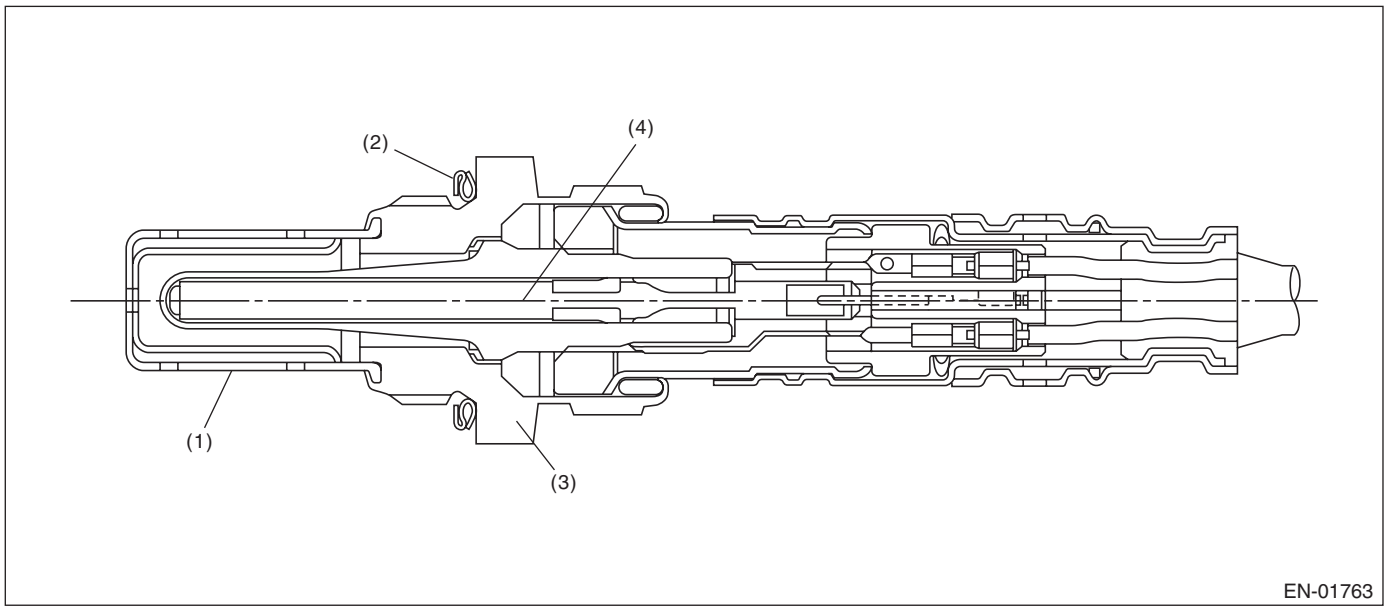
For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-9, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

C: 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 by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION



(1) Protection tube
(2) Gasket
(3) Sensor housing
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	60 seconds or more
Battery voltage	> 10.9 V
Heater current	Permitted
Front oxygen (A/F) sensor heater control duty≥ 35%	Experienced
After fuel cut	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 60 seconds or more have passed since the engine started.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge as OK and clear the NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen sensor (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

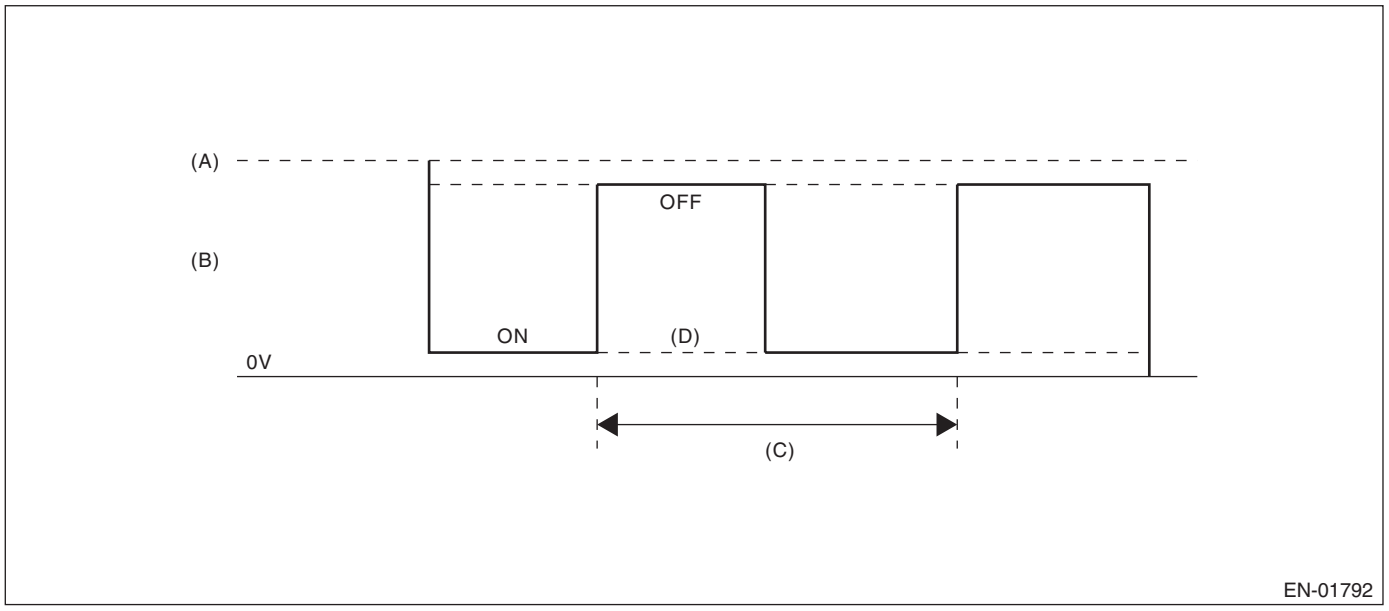
Memorize the freeze frame data. (For test mode $02)

D: 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 when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level Front oxygen (A/F) sensor heater control duty	Low < 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 completed.

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 CONDITION

- 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

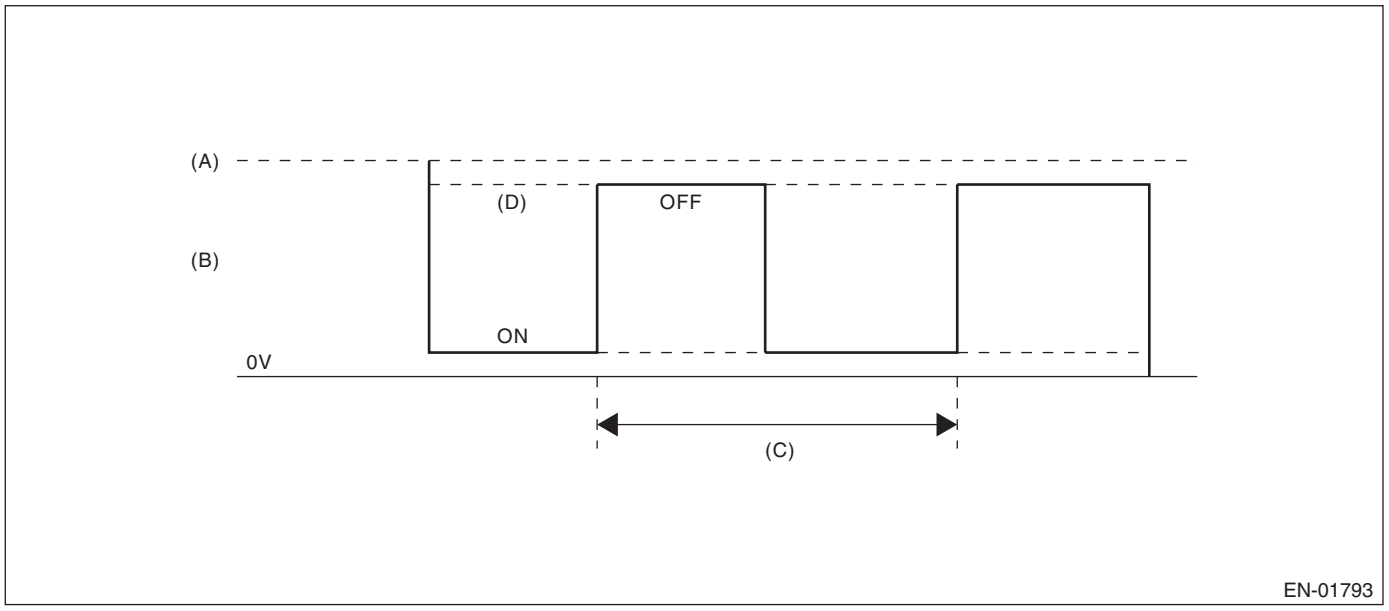
Memorize the freeze frame data. (For test mode $02)

E: 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 malfunction

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 when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level Front oxygen (A/F) sensor heater control duty	High ≥ 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 completed.

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 CONDITION

- 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

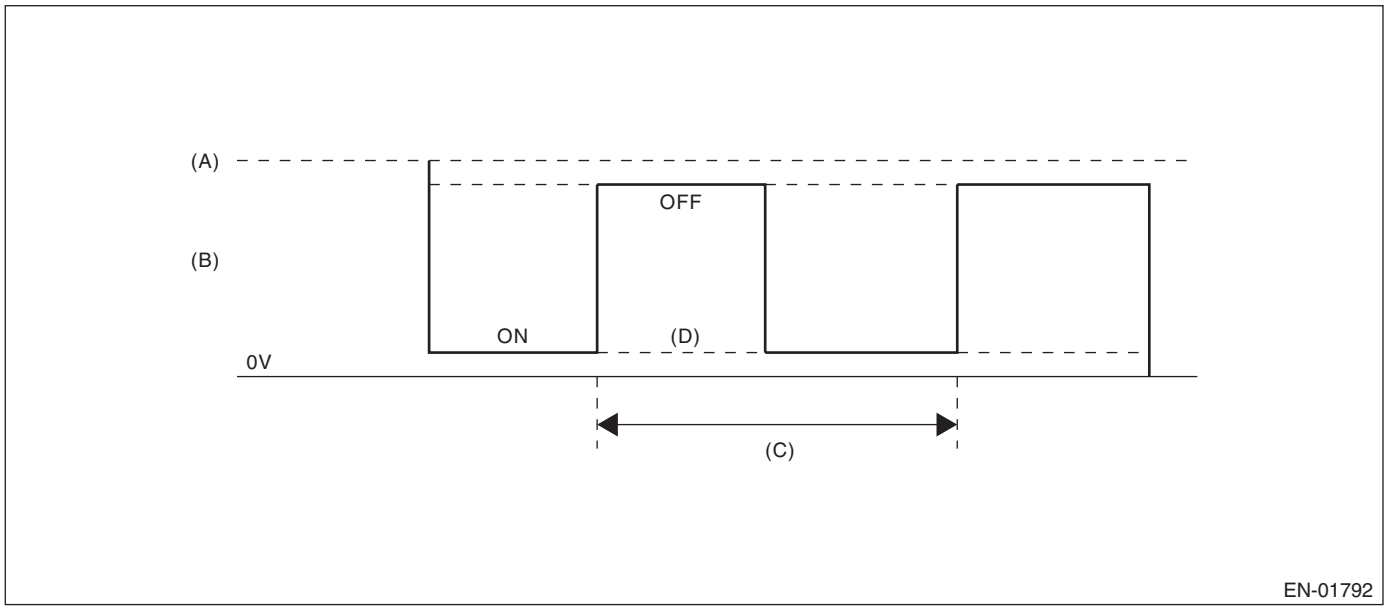
Memorize the freeze frame data. (For test mode $02)

F: 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) Rear oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time until completing all the malfunction criteria below becomes more than 2560 milliseconds.

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 completed.

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 CONDITION

- 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

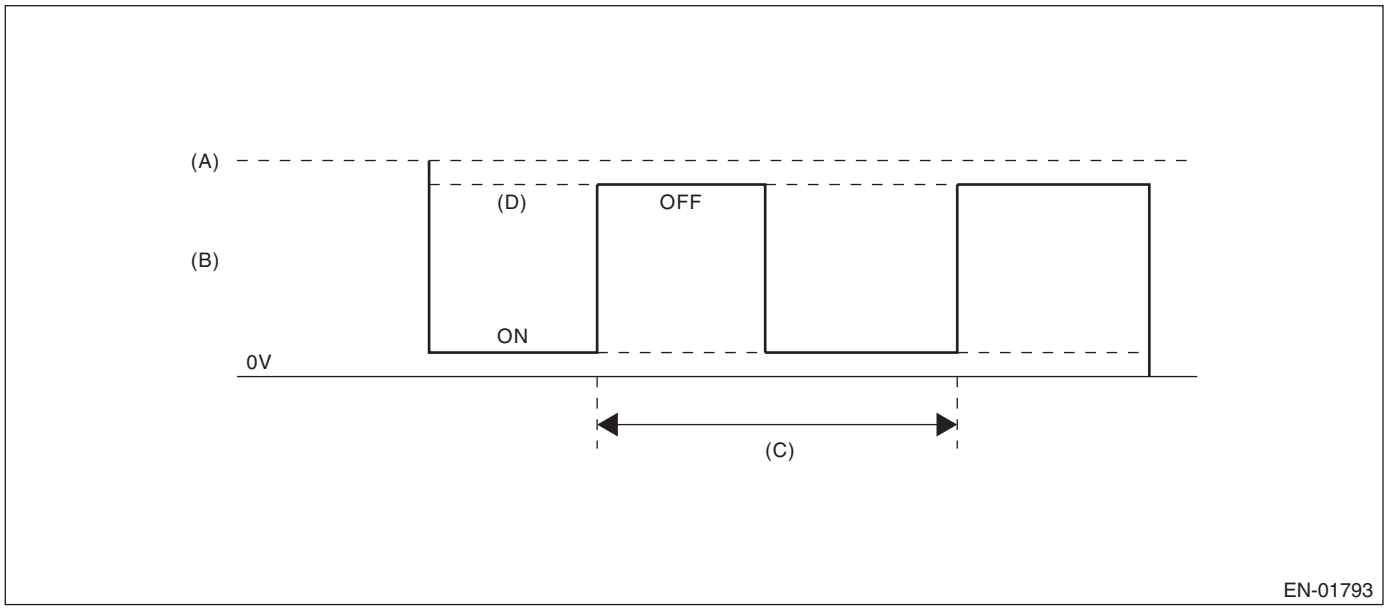
Memorize the freeze frame data. (For test mode $02)

G: 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) Rear oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time until completing all the malfunction criteria below becomes more than 2560 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 25%

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 completed.

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 CONDITION

- 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

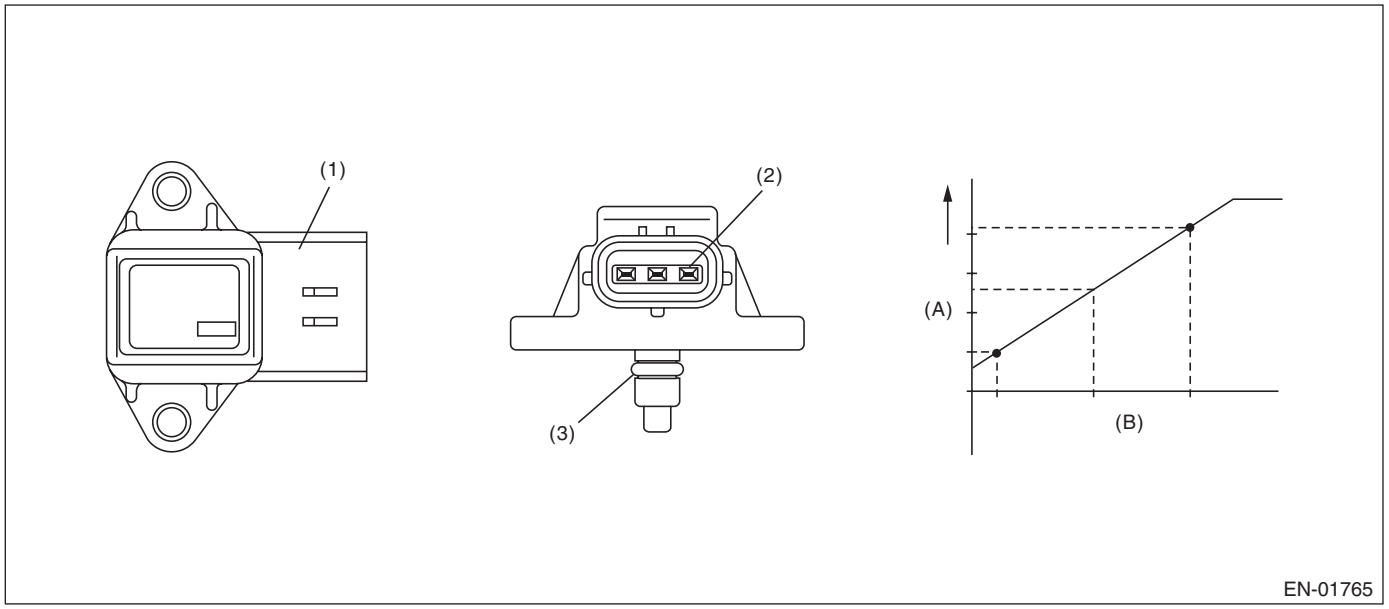
Memorize the freeze frame data. (For test mode $02)

H: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. 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) Terminal
(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 when the continuous time of completing the malfunction criteria below becomes 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 10°
Intake air amount every 0.5 engine revs.	1.356 g (0.048 oz)/rev
Output voltage	< 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Intake air amount every 0.5 engine revs.	0.4 g (0.014 oz)/rev
Output voltage	≥ 2.36 V

Time Needed for Diagnosis: 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 both Low side and High side become OK.
Judge as OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 10°
Output voltage	≥ 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Output voltage	< 2.36 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 CONDITION

- 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 engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

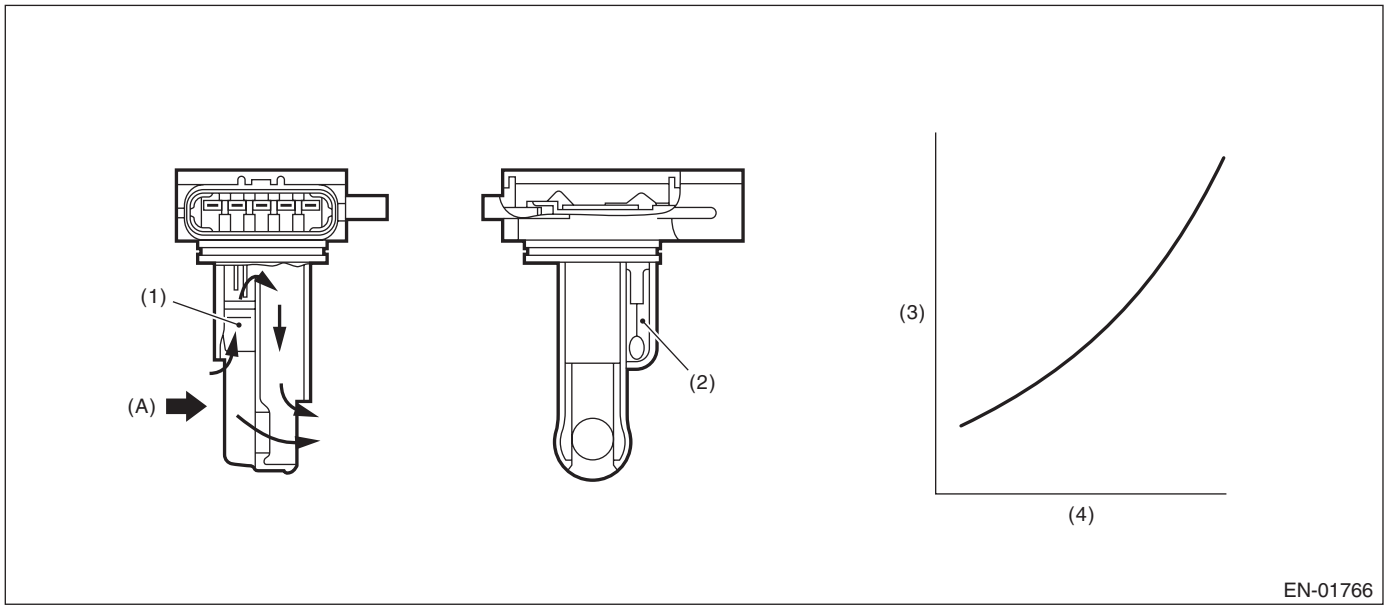
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property.
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 (lb)/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side NG)	
Output voltage	< 1.5 V
Engine speed	≥ 2500 rpm
Throttle opening angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG (1)	
Output voltage	≥ 1.95 V
Engine speed	600 ←→ 900 rpm
Throttle opening angle	< 4.1°
Intake manifold pressure	< 52.7 kPa (395 mmHg, 15.6 inHg)
High side NG (2)	
Output voltage	≥ 1.7 V
Engine speed	600 ←→ 900 rpm
Throttle opening angle	< 4.1°
Intake manifold pressure	< 52.7 kPa (395 mmHg, 15.6 inHg)
Fuel system diagnosis	Rich side malfunction

Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side NG)	
Output voltage	≥ 1.5 V
Engine speed	≥ 2500 rpm
Throttle opening angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
(High side NG)	
Output voltage	< 1.95 V
Engine speed	600 ←→ 900 rpm
Throttle opening angle	< 4.1°
Intake manifold pressure	< 52.7 kPa (395 mmHg, 15.6 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 CONDITION

- 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

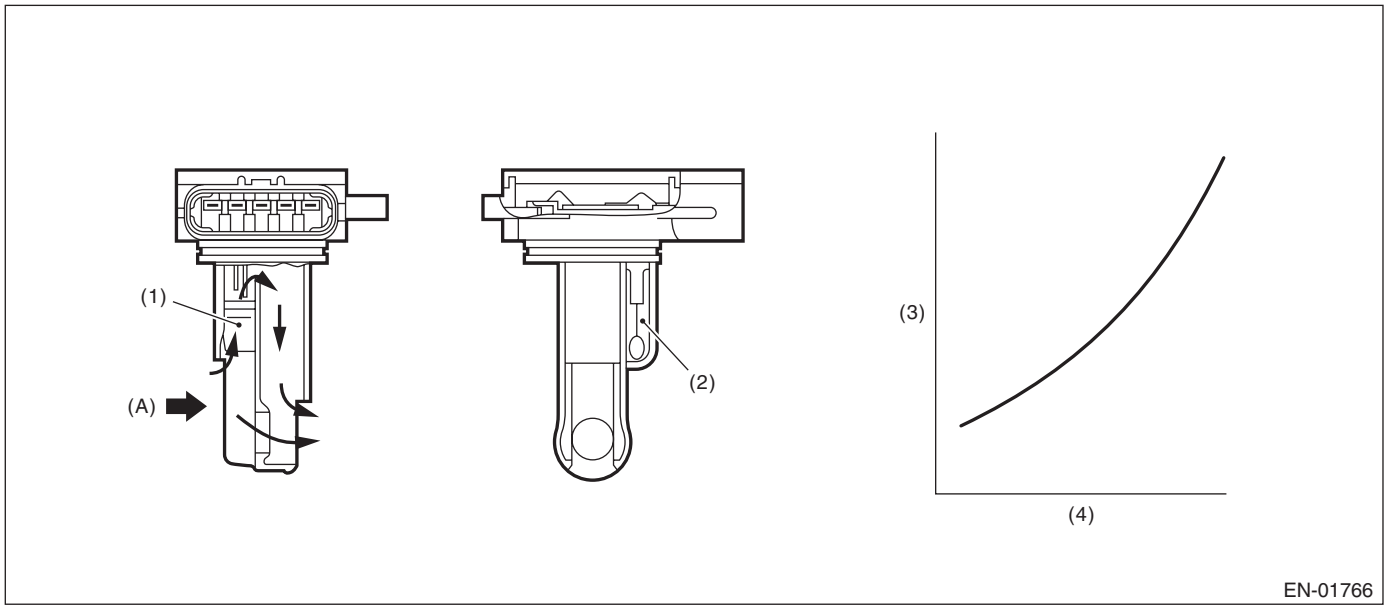
Memorize the freeze frame data. (For test mode $02)

J: 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 it is 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 completing 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 CONDITION

- 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

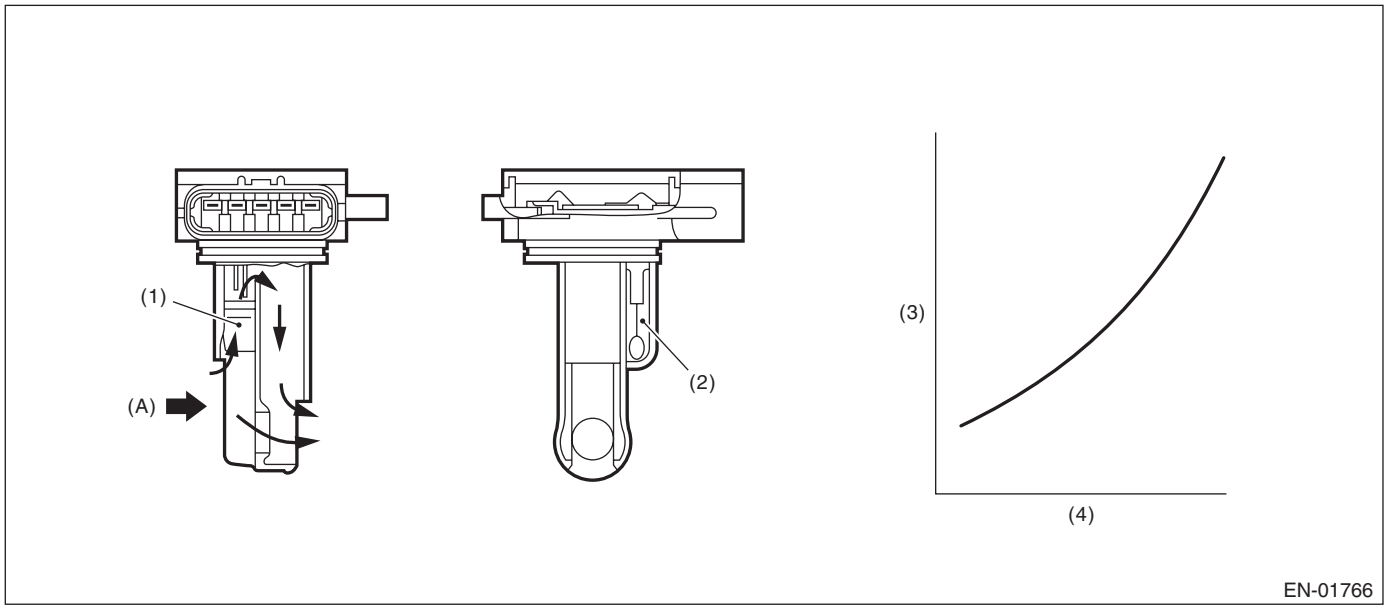
Memorize the freeze frame data. (For test mode $02)

K: 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 it is 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 the following base value is higher than 0.5 seconds. 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 CONDITION

- 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

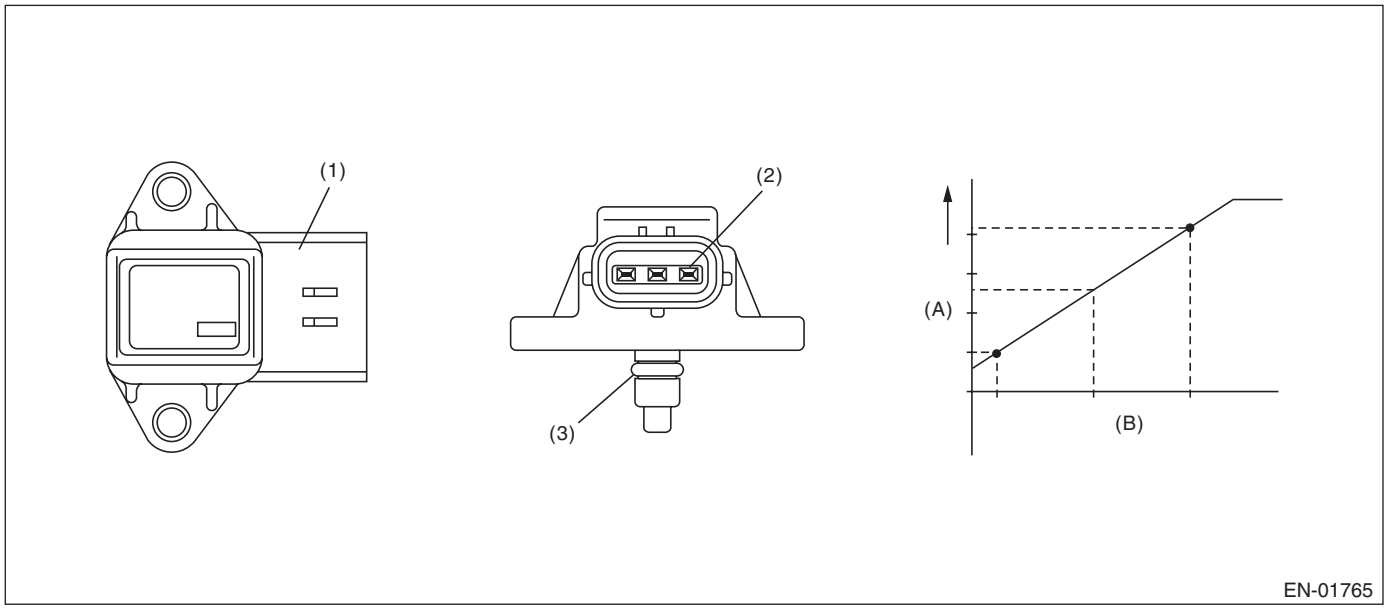
Memorize the freeze frame data. (For test mode $02)

L: 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 it is out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

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 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 CONDITION

- 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 engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

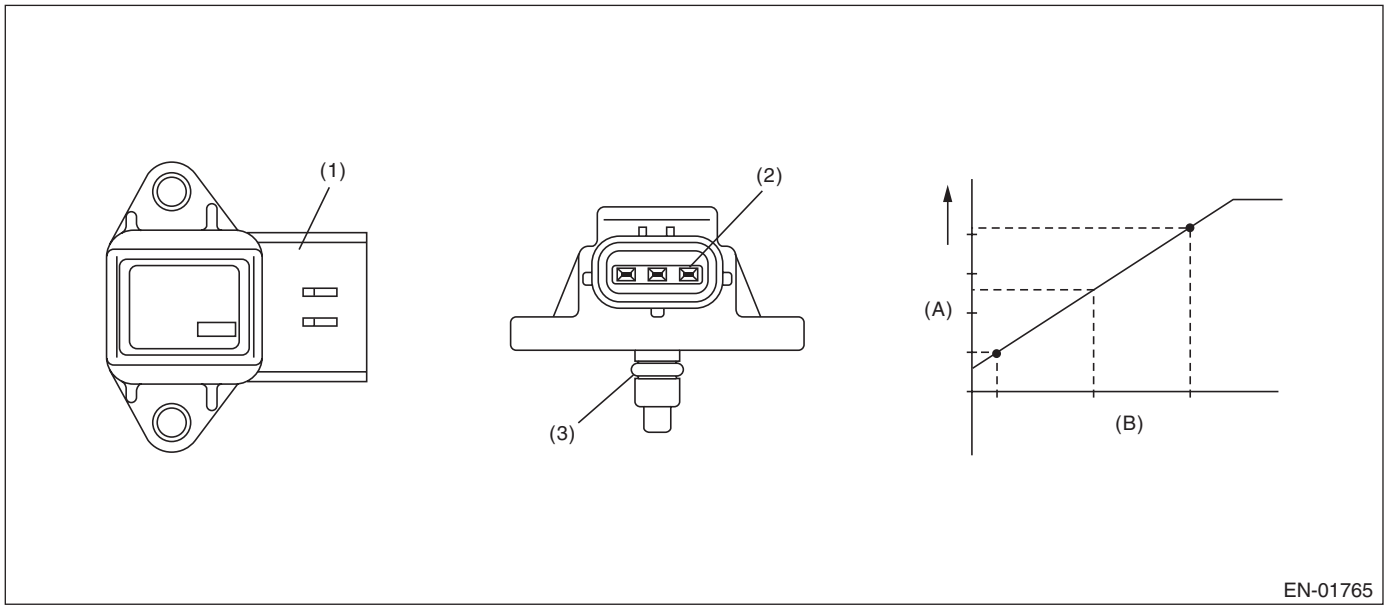
Memorize the freeze frame data. (For test mode $02)

M: 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 it is out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

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 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 CONDITION

- 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 engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

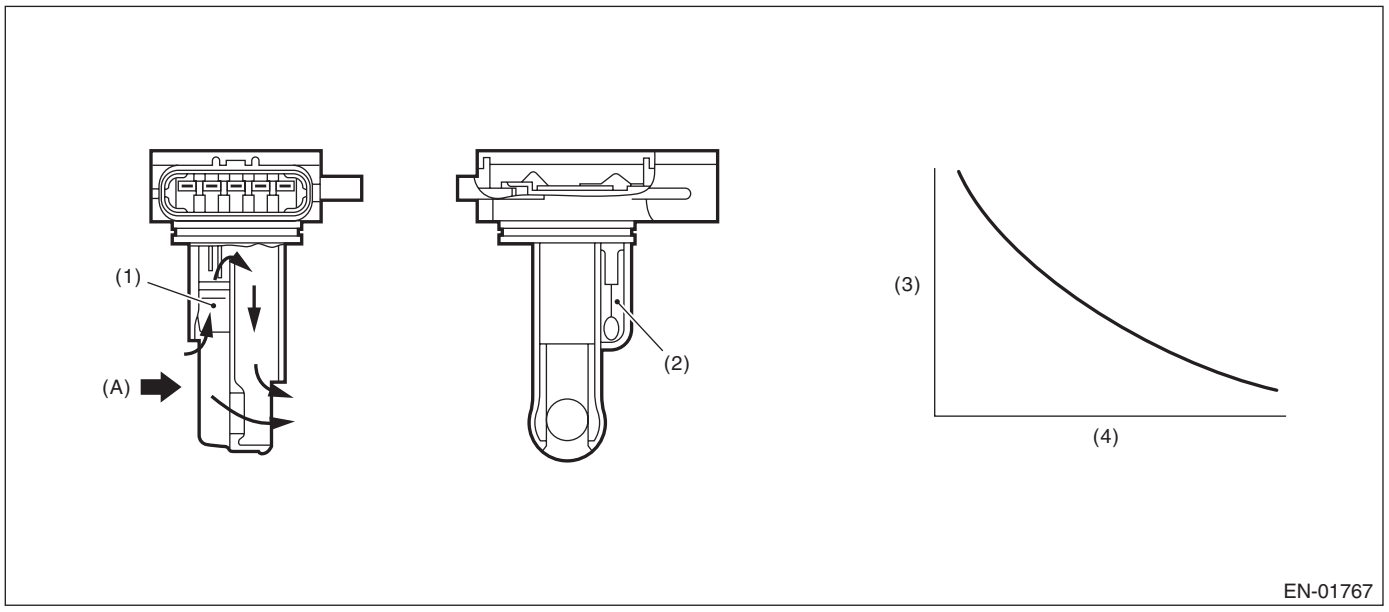
Memorize the freeze frame data. (For test mode $02)

N: 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 50 km/h (31 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of completing 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 (33°F) near 25°C)
Exhaust temperature more than 500°C (932°F)	60 seconds or more

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 CONDITION

- 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

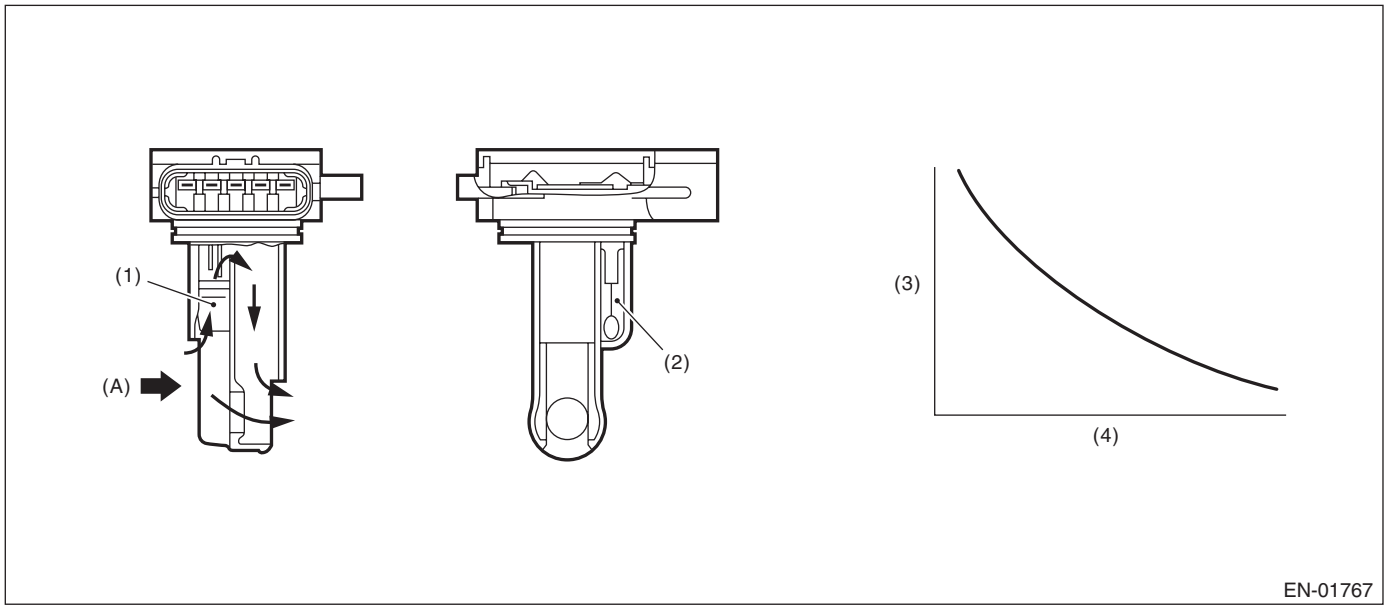
Memorize the freeze frame data. (For test mode $02)

O: 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 it is 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 completing the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 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	≥ 0.165 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 CONDITION

- 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

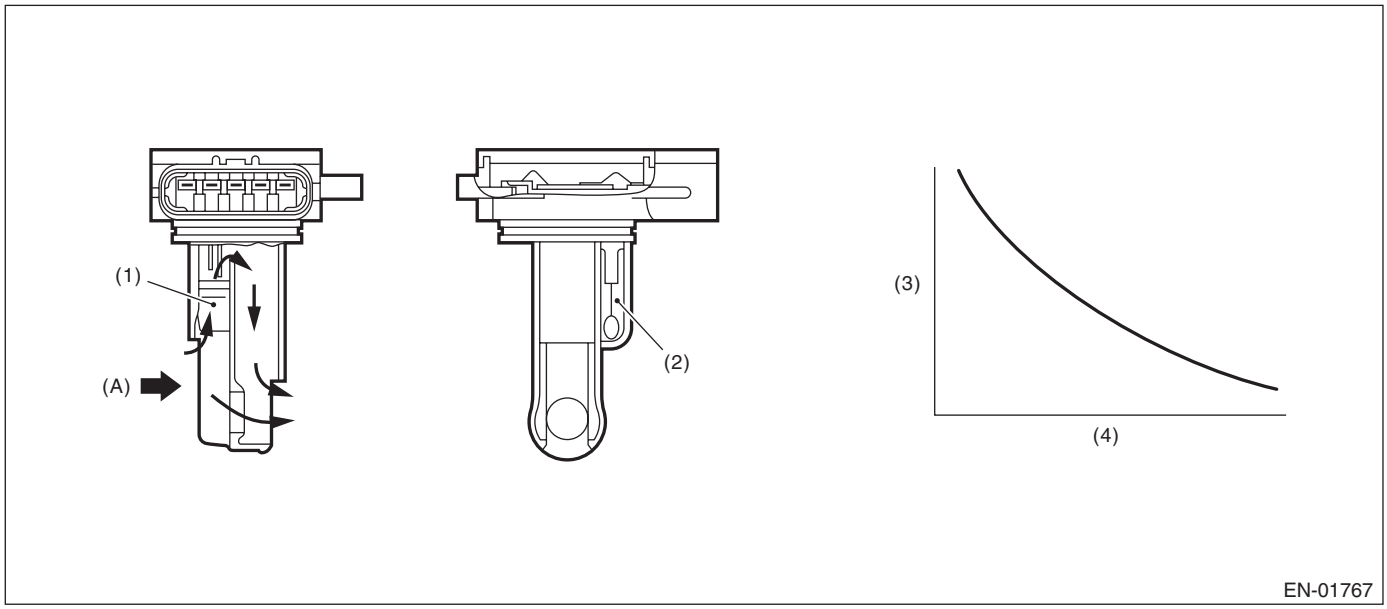
Memorize the freeze frame data. (For test mode $02)

P: 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 it is 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 completing the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 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	≥ 4.72 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 CONDITION

- 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

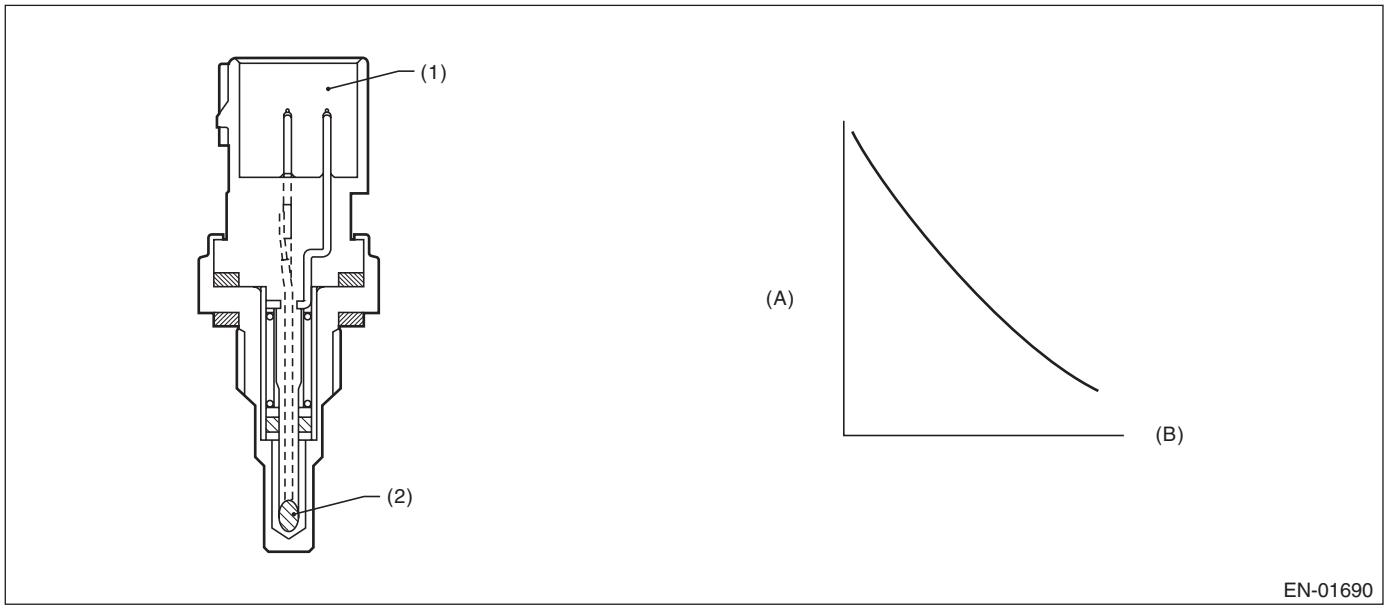
Memorize the freeze frame data. (For test mode $02)

Q: 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 it is 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 completing 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	< 0.165 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 CONDITION

- 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.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0 %.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

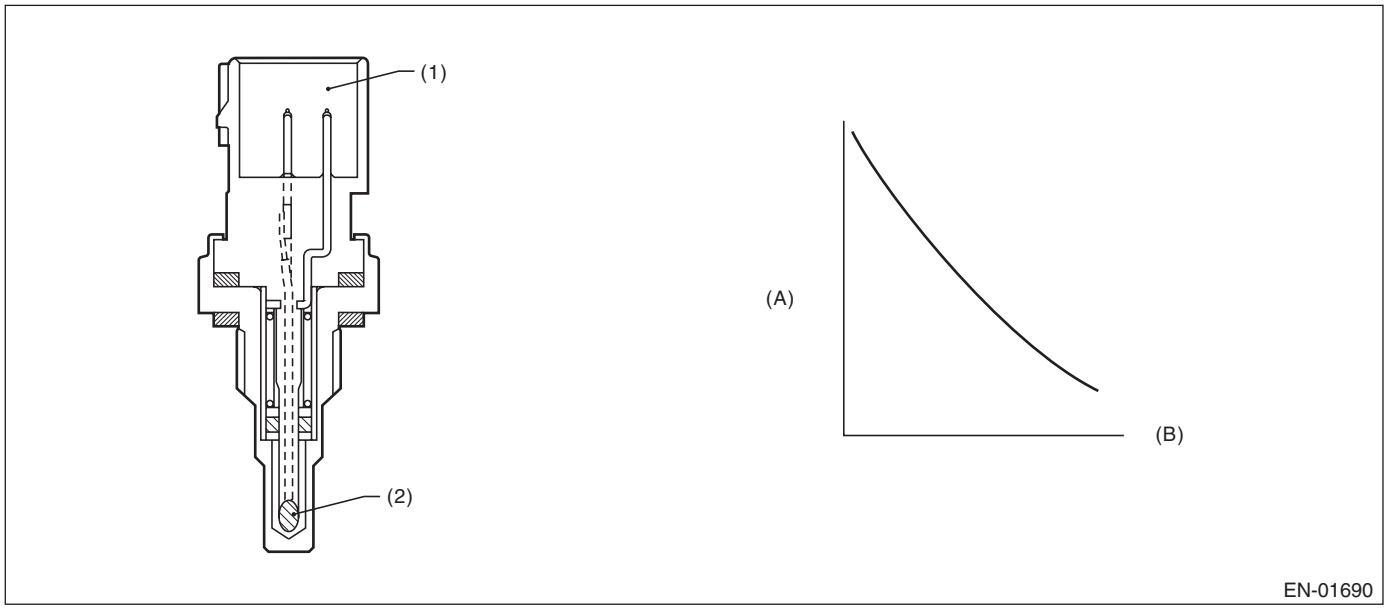
Memorize the freeze frame data. (For test mode $02)

R: 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 it is 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 completing 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	≥ 4.72 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 CONDITION

- 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.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0 %.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

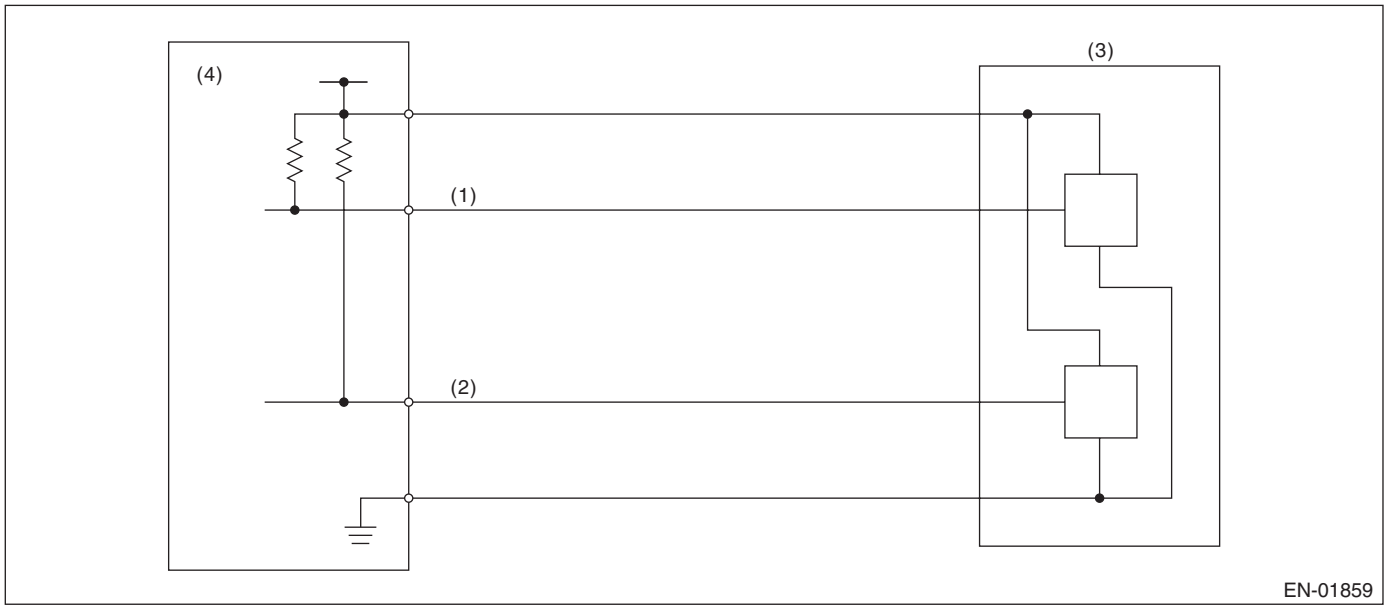
Memorize the freeze frame data. (For test mode $02)

S: 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 it is 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	> 0.309 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 CONDITION

- 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 control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

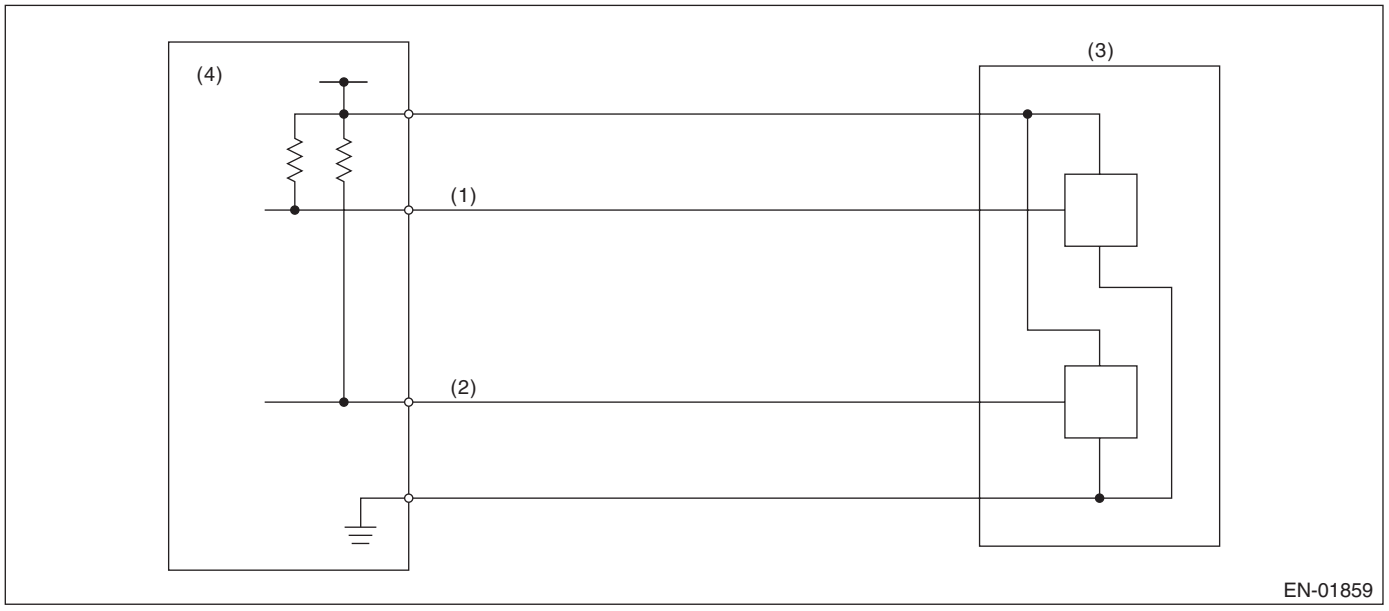
Memorize the freeze frame data. (For test mode $02)

T: 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 it is 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	< 4.646 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 CONDITION

- 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 control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

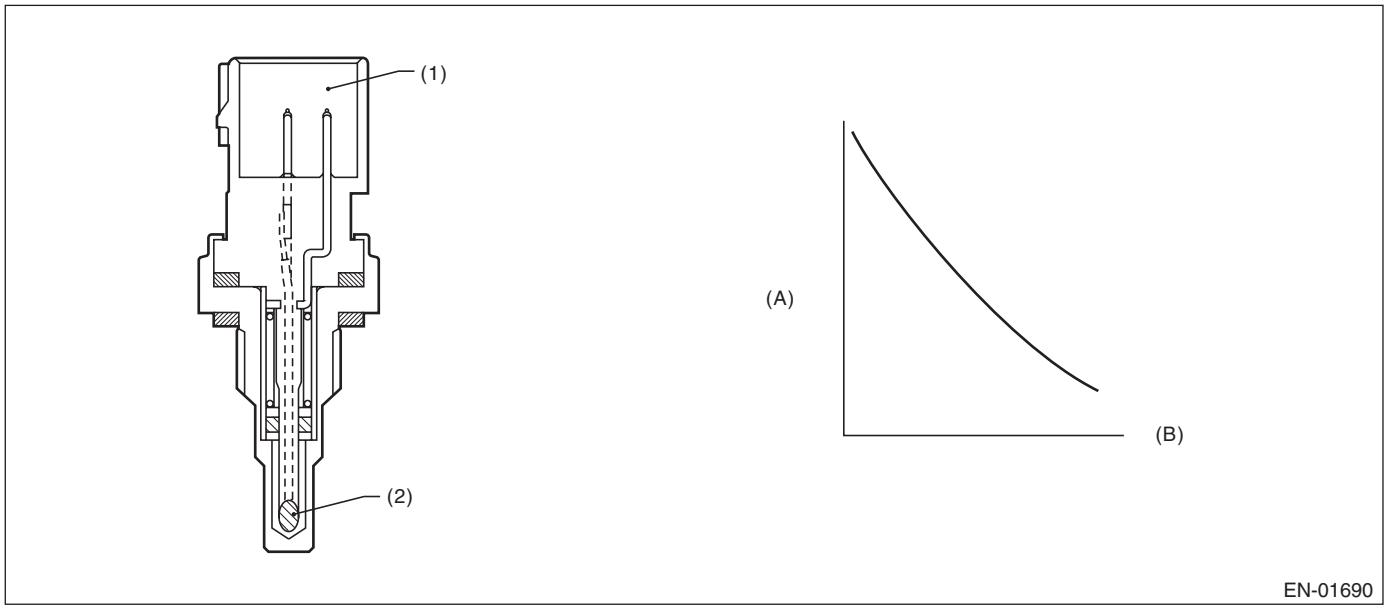
Memorize the freeze frame data. (For test mode $02)

U: 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 starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥Judgment value of timer after engine starting

Timer for diagnosis after engine starting
a. Timer stop at fuel cut mode.
b. During the driving conditions except a) above, timer count up by
64 milliseconds + TWCNT milliseconds at every 64 milliseconds.
TWCNT is defined as follows,
TWCNT = 0 at idle switch ON,
TWCNT show on the following table at idle switch OFF.

Temperature °C (°F)	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)
–20 (–4)	0 ms	37.14 ms	74.27 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
–10 (14)	0 ms	27.39 ms	54.78 ms	82.17 ms	99.65 ms	117.13 ms	135.96 ms	154.80 ms
0 (32)	0 ms	17.65 ms	35.29 ms	52.94 ms	72.64 ms	92.34 ms	108.34 ms	124.33 ms
10 (50)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms
20 (68)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms

Judgment value of timer after engine starting
$t = 451.1 – 28.6 \times Ti$
Ti is the lowest coolant temperature after starting the engine.
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 CONDITION

- 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.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0 %.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

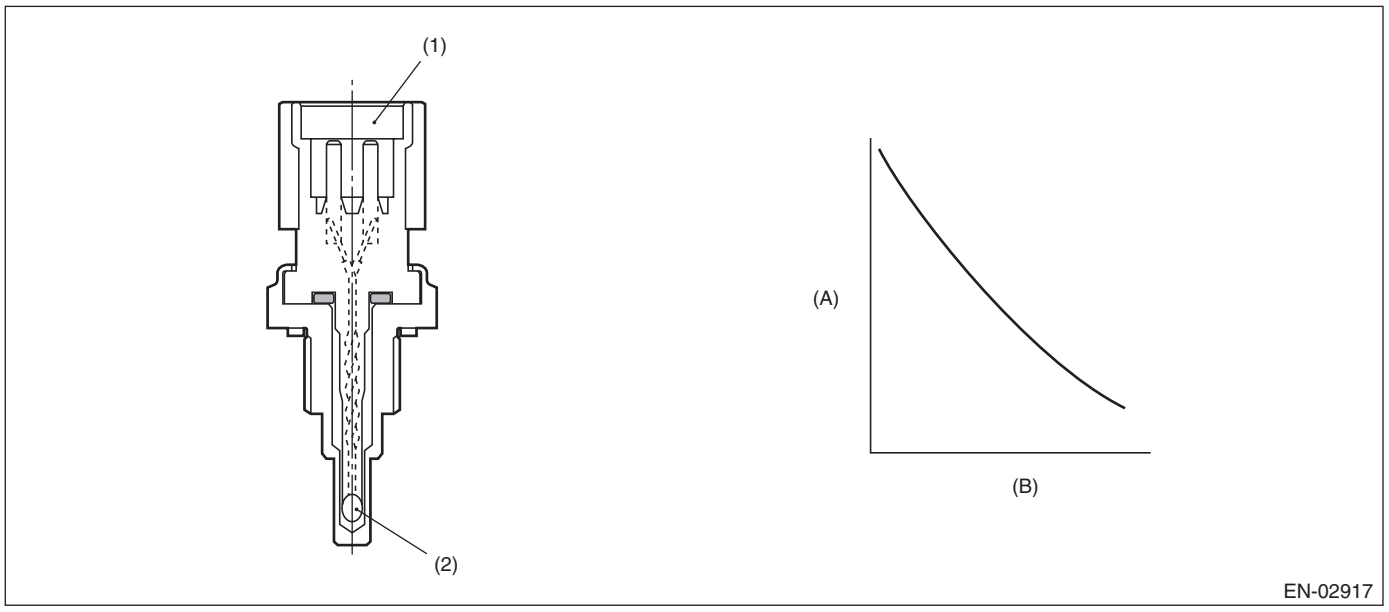
Memorize the freeze frame data. (For test mode $02)

V: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the engine coolant temperature sensor output does not change.
Judge as NG when the engine coolant temperature sensor output does not change whereas engine coolant seemed to change from the view point of the driving condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
More than 20 seconds with vehicle running at 30 km/h (18.6 MPH) or more	Experienced
All conditions below are established continuously 20 seconds.	Experienced
After engine starting	
Idling	
Vehicle speed = 0 km/h	

4. GENERAL DRIVING CYCLE

After idling and running for the specified time, perform the diagnosis only once for OK/NG judgment.

5. DIAGNOSTIC METHOD

Judge as NG when the criteria below are completed and Judge as OK when the criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature sensor Max. voltage — Min. voltage	< 5 mV

Time Needed for Diagnosis: Undecided
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 CONDITION

- 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

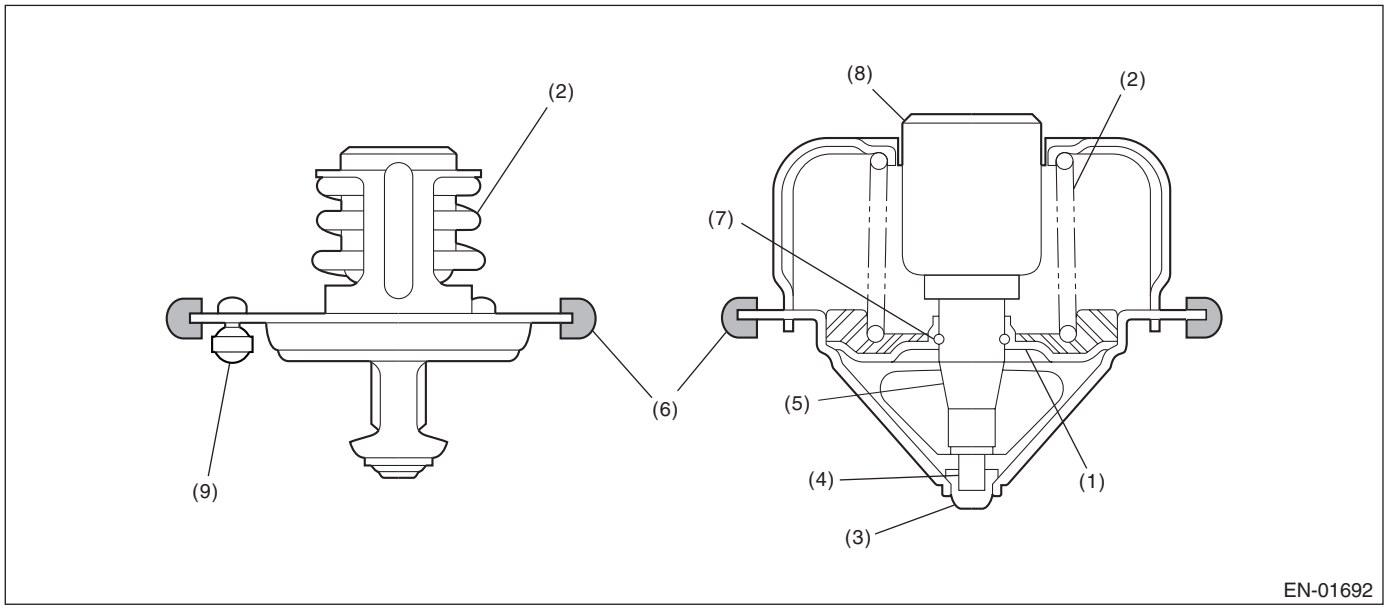
Memorize the freeze frame data. (For test mode $02)

W: DTC 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 packing
(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 completing the malfunction criteria below becomes 30 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimate ambient temperature	≥ –7°C (19.4°F)
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	> 30°C (54°F)
Vehicle speed	≥ 30 km/h (19 MPH)

Time Needed for Diagnosis: 30 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	≤ 30°C (54°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 CONDITION

- 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

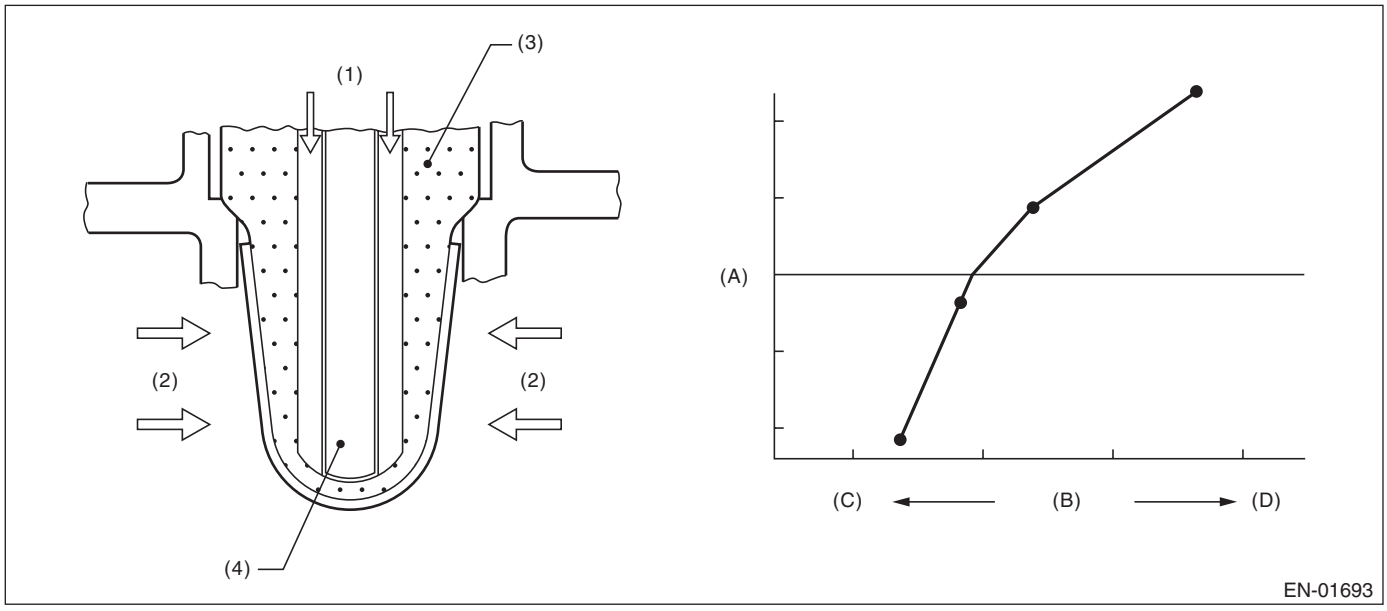
Memorize the freeze frame data. (For test mode $02)

X: 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 impressed 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 completing any malfunction criteria below is more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< –0.01 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 CONDITION

- 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

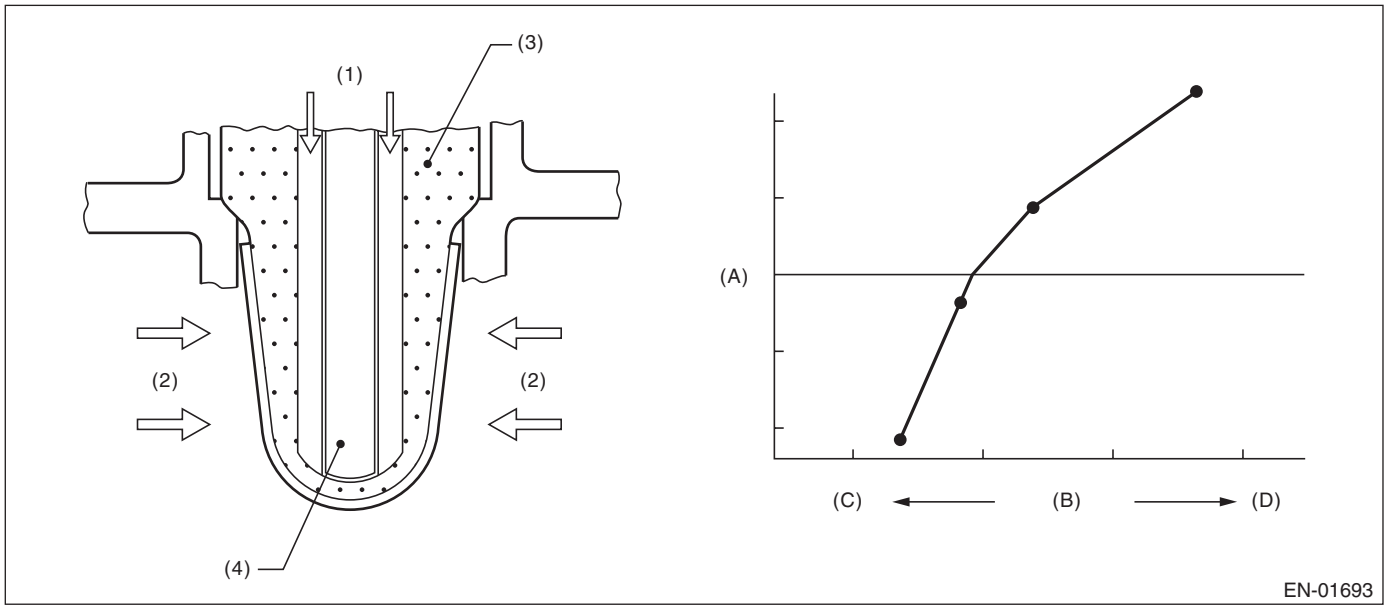
Memorize the freeze frame data. (For test mode $02)

Y: 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 impressed 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 completing any malfunction criteria below is more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.01 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 CONDITION

- 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.

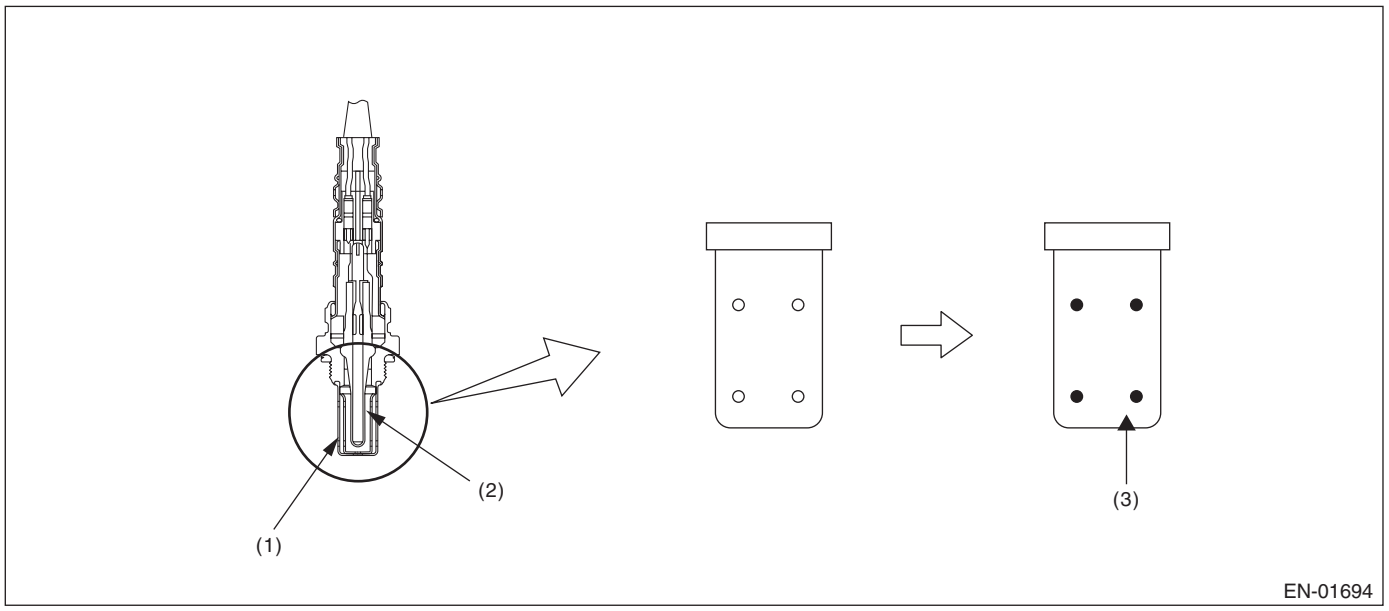
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

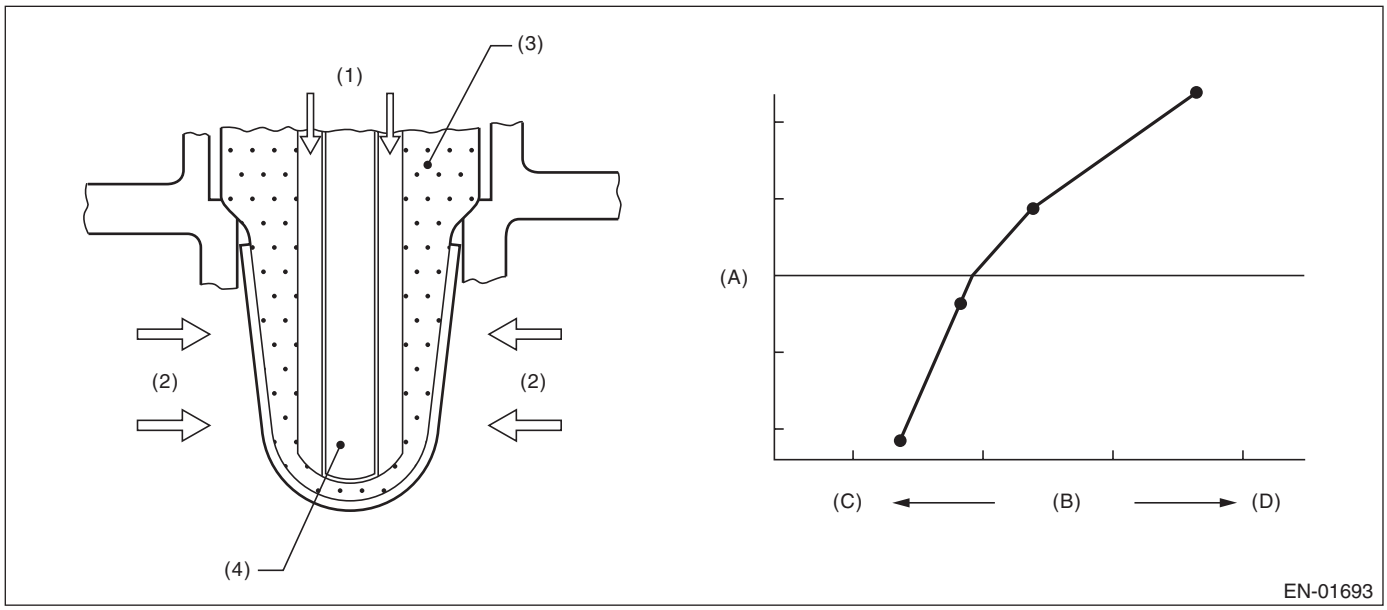
1. OUTLINE OF DIAGNOSIS

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 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
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operating
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 ←→ 3200 rpm
Vehicle speed	10 ←→ 120 km/h (6.21 ←→ 74.6 MPH)
Amount of intake air	10 ←→ 31 g (0.35 ←→ 1.09 oz)/s
Engine load change during 0.5 engine revs.	≤ 0.02 g (0.001 oz)/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) after 120 seconds or more have passed after the engine starting.

5. DIAGNOSTIC METHOD

Calculate faf difference every 128 milliseconds, and the λvalue difference. Calculate the diagnosis value after calculating 1640 times (210 seconds).
Judge as NG when the malfunction criteria below are completed. 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	≥ 0.417

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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen sensor (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

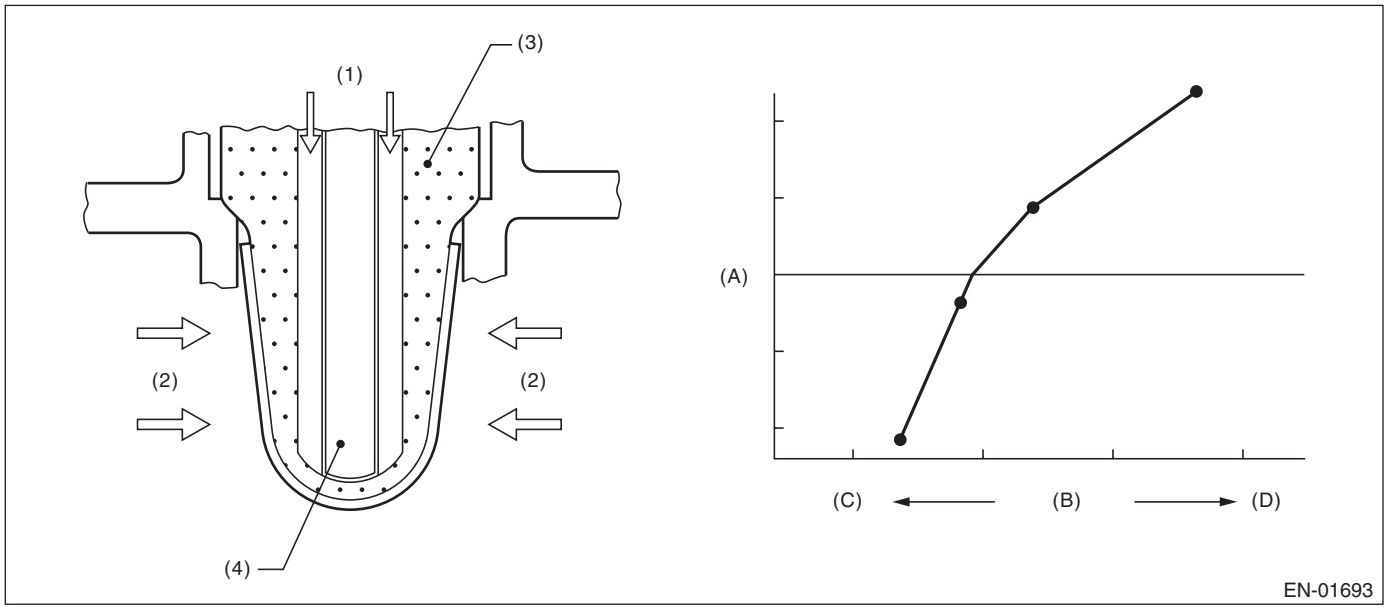
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AA: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 more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 50 sec.
Cumulative amount of the front lambda sensor heater control duty every 128 milliseconds.	≥ 28000%
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 CONDITION

- 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

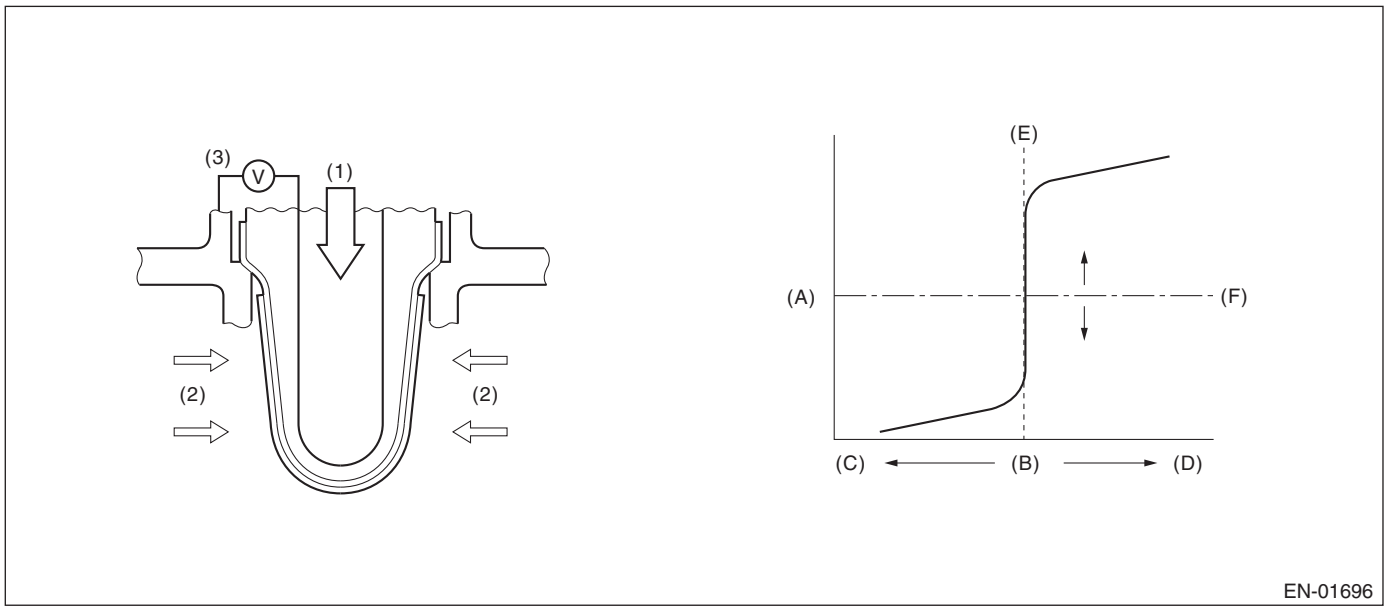
Memorize the freeze frame data. (For test mode $02)

AB:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (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



(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 (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control by main feedback control	In operation
Target output voltage of rear oxygen sensor	≥ 0.54 V
Amount of intake air	≥ 10 g (0.35 oz)/second
Engine coolant temperature	≥ 75°C (167°F)
Misfire detection every 200 rotations	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage	> 10.9 V
Deceleration fuel cut of 5 seconds or more.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after warming-up the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage	< 490 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 when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Diagnosis of the rear oxygen sensor voltage low side	Incomplete
Maximum output voltage	≥ 490 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 CONDITION

- 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

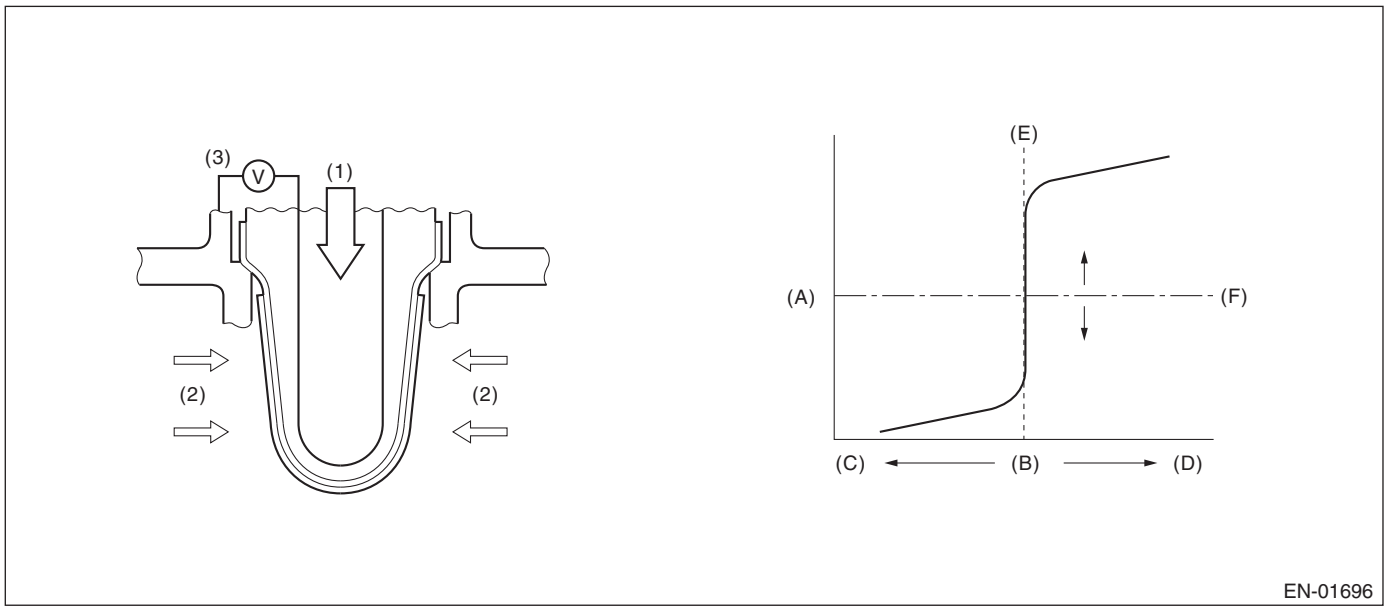
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

1. OUTLINE OF DIAGNOSIS

Detect malfunction of 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



(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 (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control by main feedback control	In operation
Target output voltage of rear oxygen sensor	≥ 0.54 V
Amount of intake air	≥ 10 g (0.35 oz)/second
Engine coolant temperature	≥ 75°C (167°F)
Misfire detection every 200 rotations	< 5 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 warming-up the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Minimum output voltage	> 250 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 when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Diagnosis of the rear oxygen sensor voltage high side	Incomplete
Minimum output voltage	≤ 250 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 CONDITION

- 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)

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

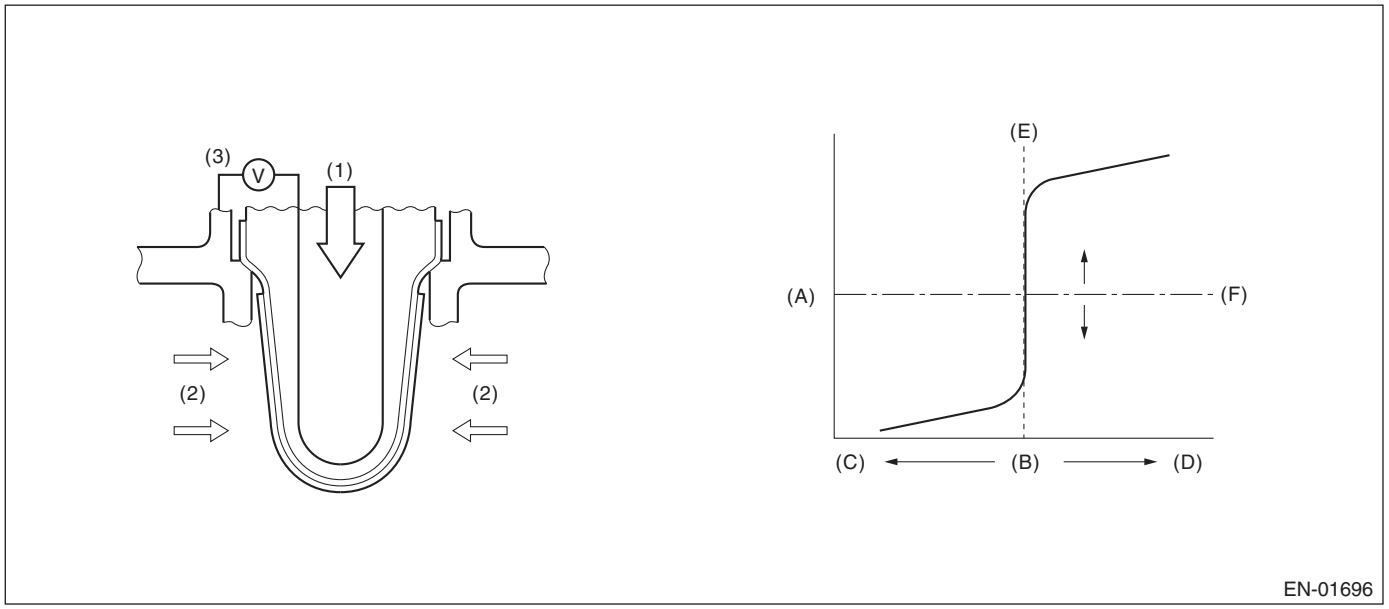
1. OUTLINE OF DIAGNOSIS

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

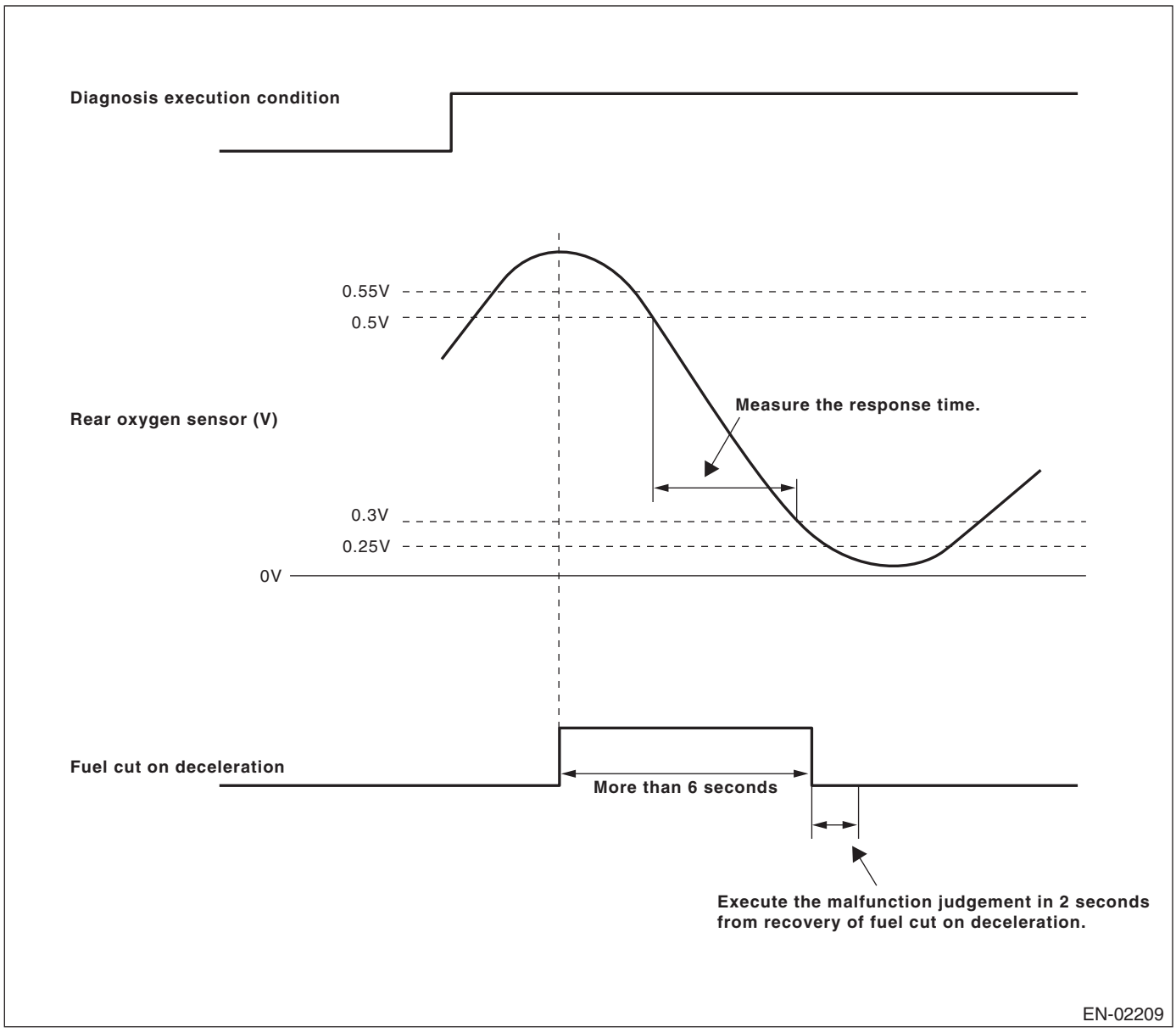
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F sub feedback control condition	Completed
Deceleration fuel cut time is 5 seconds or more.	Experienced
After fuel cut	≥ 2 sec.
Current calculation time of the rear oxygen sensor heater	≥ 60 sec.
Current continuation time of the rear oxygen sensor heater	≥ 30 sec.
Catalyst warm-up counter	≥ 8,000 times
Number of deceleration fuel cut	≥ 1 time

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 0.25 V (lean), calculate the minimum response time for output change between 0.5V and 0.3V 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 shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. Even without deceration fuel cut, judge as OK if the value is below the threshold.
When the deceleration fuel cut off time is more than 6 seconds, 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 (more than 6 s), 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 O2 output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV.	> 0.327 sec.
or	
Longest time over 550 mV	> 2 sec.

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 O2 output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV.	≤ 0.327 sec.

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 CONDITION

- 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

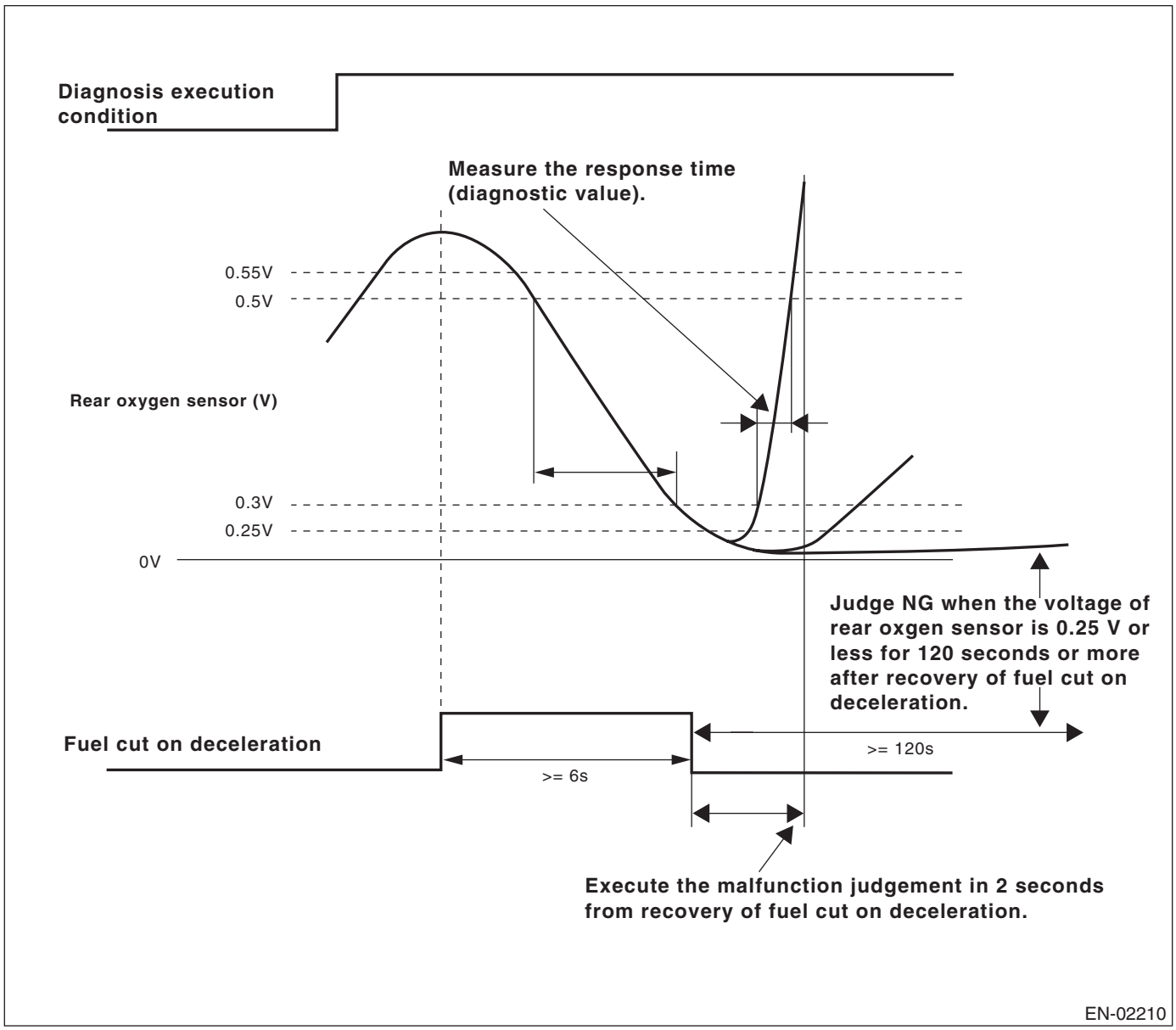
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
5 seconds or more deceleration fuel cut.	Experienced
After fuel cut	≥ 2 sec.
Current calculation time of the rear oxygen sensor heater	≥ 60 sec.
Current continuation time of the rear oxygen sensor heater	≥ 30 sec.
Number of deceleration fuel cut	≥ 1 time

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 rear 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 O2 output) to rich (500 mV) when the voltage drops from 500 mV to 250 mV.	> 2 sec.
or	
Longest time to change to 250 mV	> 120 sec.

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 O2 output) to rich (500 mV) when voltage drops from 550 mV to 250 mV.	≤ 2 sec.

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 CONDITION

- 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)

AE: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	≥ 70°C (158°F)
Engine load	≥ Value from Map 5
Intake air change during 0.5 engine revs.	≤ 0.02 g (0.001 oz)/rev

Map 5

Engine speed (rpm)	Idling	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g(oz)/rev)	Non-turbo	0.236 (0.008)	0.232 (0.008)	0.226 (0.008)	0.231 (0.008)	0.252 (0.009)	0.262 (0.009)	0.243 (0.009)	0.243 (0.009)	0.267 (0.009)	0.270 (0.010)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant vehicle 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 below are met continues for more than 30 seconds, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf where, 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)	2.3 (0.081)	4.7 (0.166)	7 (0.247)	9.4 (0.332)	11.7 (0.413)	14.1 (0.497)
fsobdL1 (%)	40	40	36.9	32.0	27.0	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 completed for 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	< 19%

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 CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

7. FAIL SAFE

Rich side malfunction
- 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)

AF: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	≥ 70°C (158°F)
Engine load	≥ Value from Map 5
Intake air change during 0.5 engine revs.	≤ 0.02 g (0.001 oz)/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

Map 5

Engine speed (rpm)	Idling	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g(oz)/rev)	Non-turbo	0.236 (0.008)	0.232 (0.008)	0.226 (0.008)	0.231 (0.008)	0.252 (0.009)	0.262 (0.009)	0.243 (0.009)	0.243 (0.009)	0.267 (0.009)	0.270 (0.010)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant vehicle 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 below are met continues for more than 30 seconds, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf where, sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	≤ fsobdR1 Refer to Map 4. fsobdR1 = rich side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g(oz)/s)	0(0)	2.4 (0.085)	4.7 (0.166)	7 (0.247)	9.4 (0.332)	11.7 (0.413)
fsobdR1 (%)	–40	–40	–36.9	–32.0	–27.0	–27.0

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 CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

7. FAIL SAFE

Rich side malfunction
- 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)

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

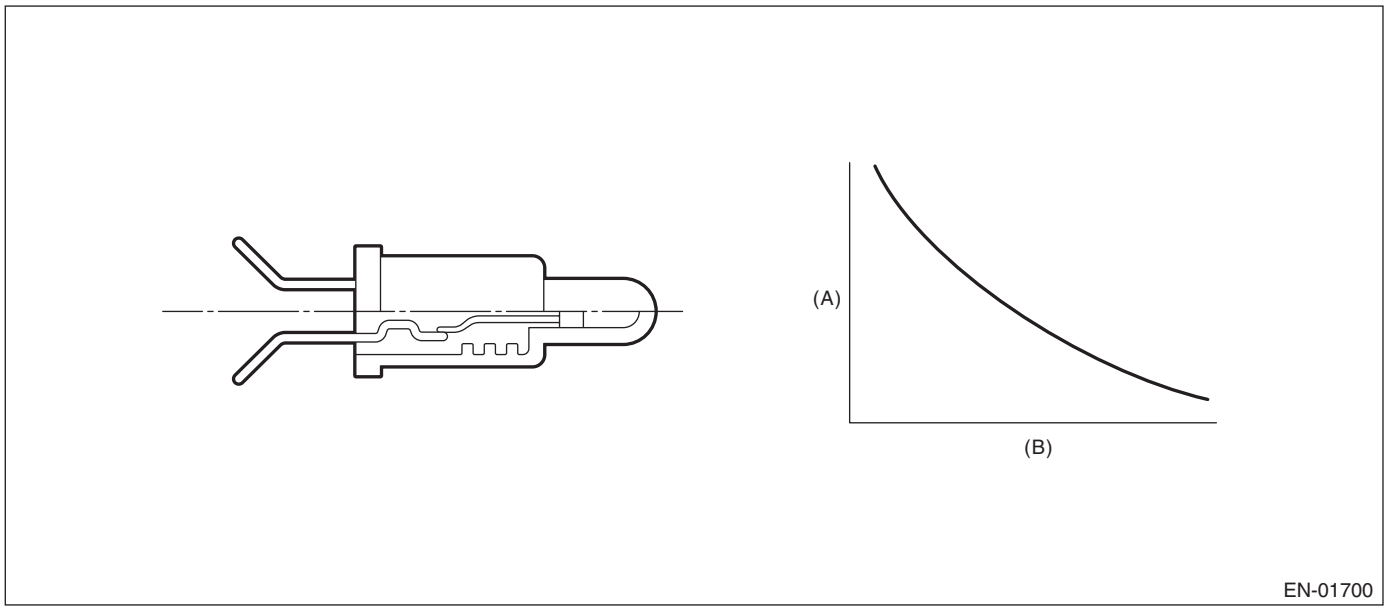
1. OUTLINE OF DIAGNOSIS

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 completing the malfunction criteria below becomes 120 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 9.6 ℓ (2.54 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 when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 9.6 ℓ (2.54 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	< 70°C (158°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 when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.5 lb)
Fuel temperature difference between Max. and Min.	< 2°C (3.6°F)

Time Needed for Diagnosis: Undecided
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.5 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 CONDITION

- 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

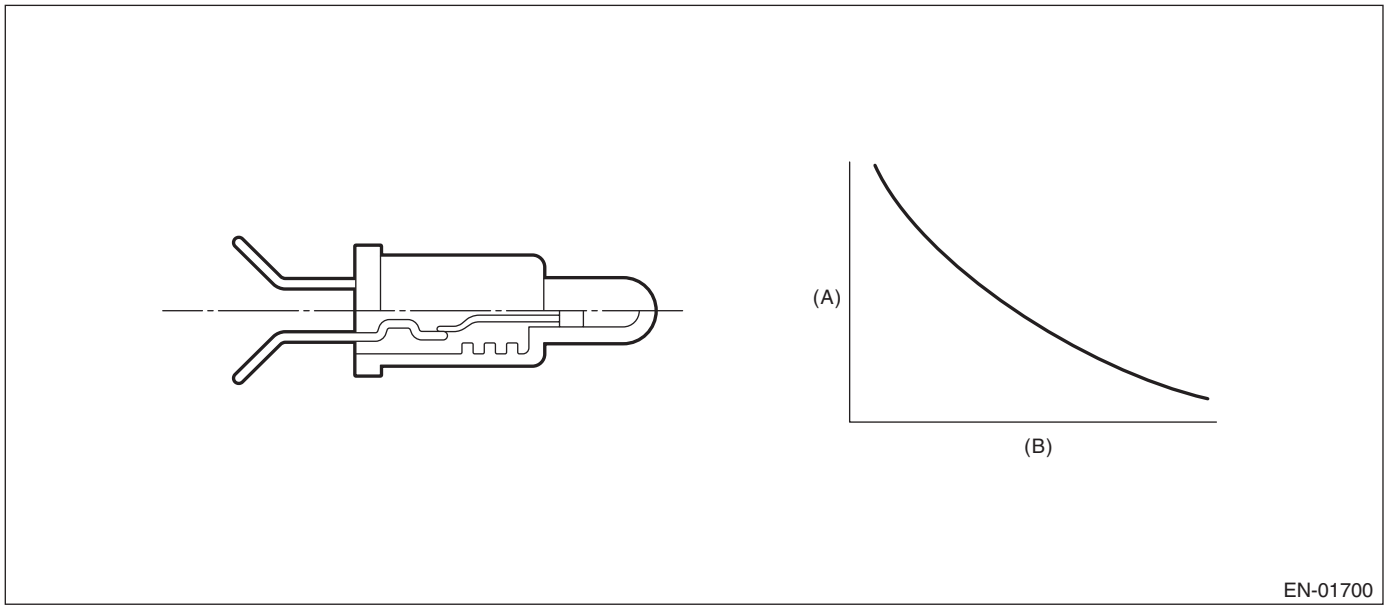
Memorize the freeze frame data. (For test mode $02)

AH: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 it is 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 completing the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.1646 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	≥ 0.1646 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 CONDITION

- 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

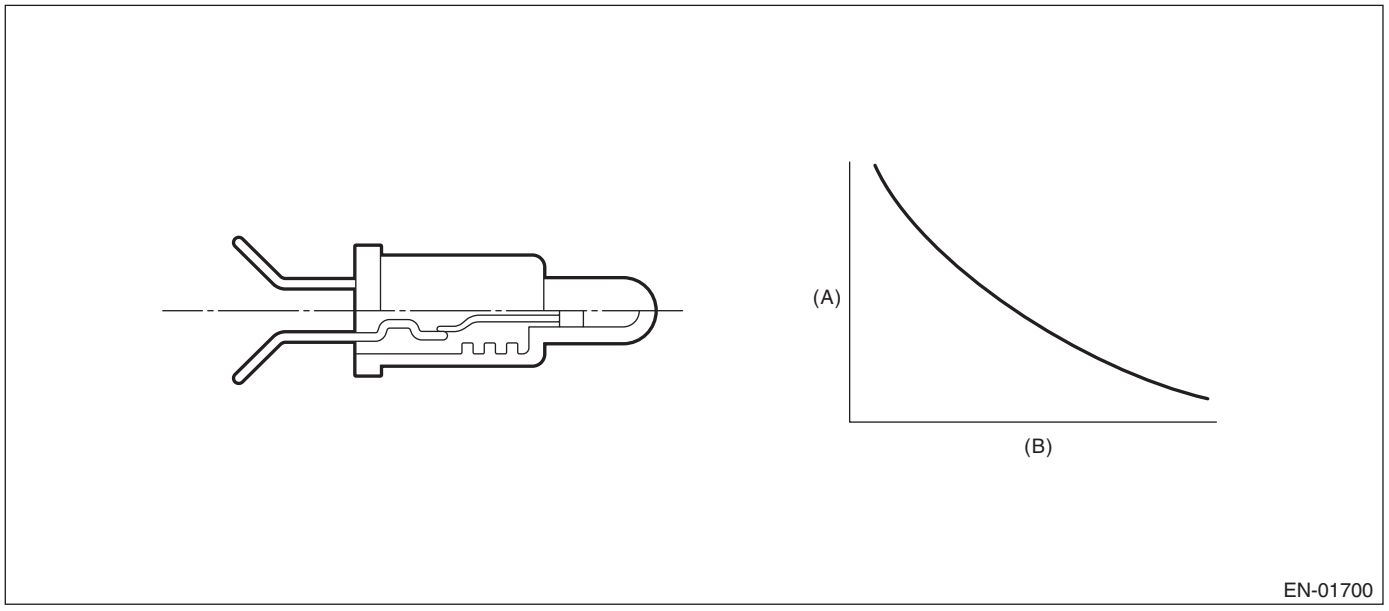
Memorize the freeze frame data. (For test mode $02)

AI: 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 it is 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 completing the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 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	< 4.72 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 CONDITION

- 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

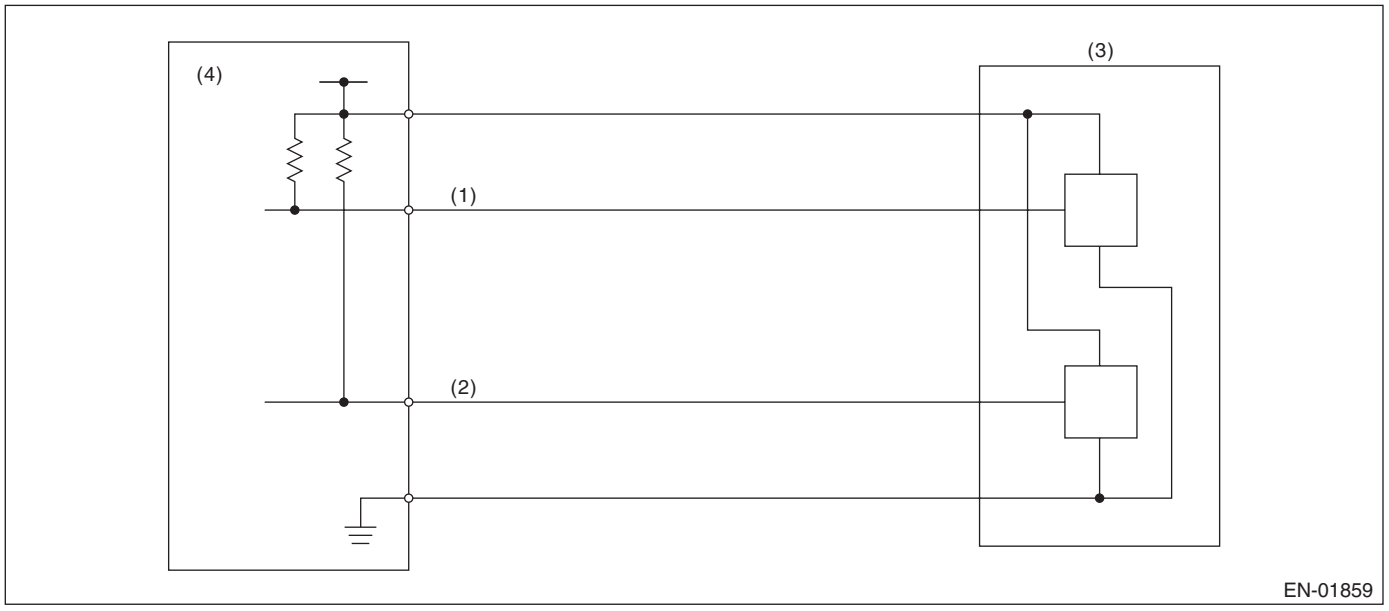
Memorize the freeze frame data. (For test mode $02)

AJ:DTC 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 it is 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	> 0.749 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 CONDITION

- 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 control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

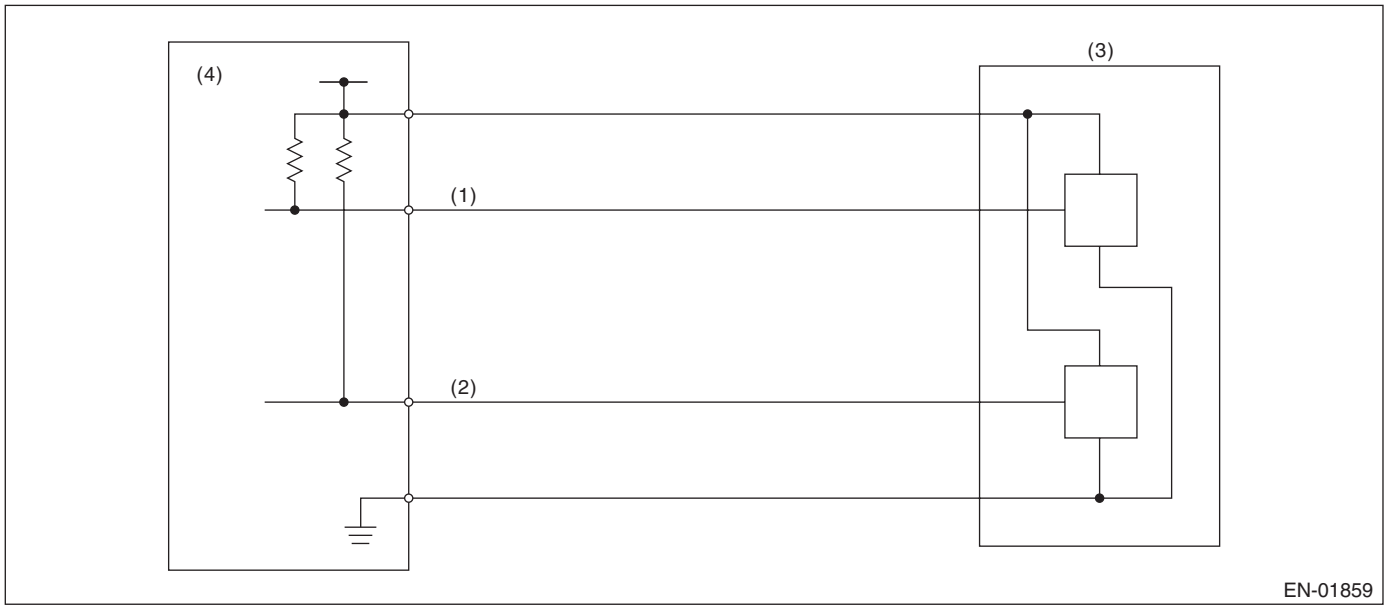
Memorize the freeze frame data. (For test mode $02)

AK: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 it is 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	< 4.747 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 CONDITION

- 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 control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

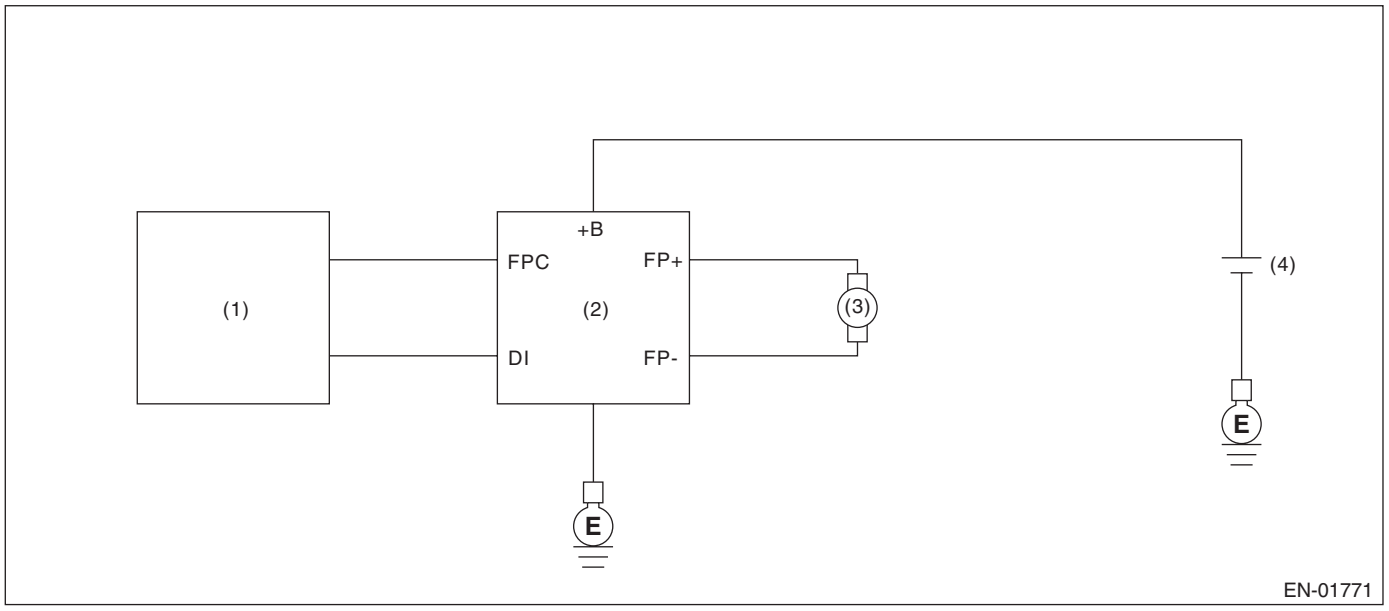
Memorize the freeze frame data. (For test mode $02)

AL: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 completing the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	180 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low
Fuel level	≥ 10 ℓ (2.64 US gal, 2.2 Imp gal)

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
After engine starting	1 second or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High
Fuel level	≥ 10 ℓ (2.64 US gal, 2.2 Imp gal)

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 CONDITION

- 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

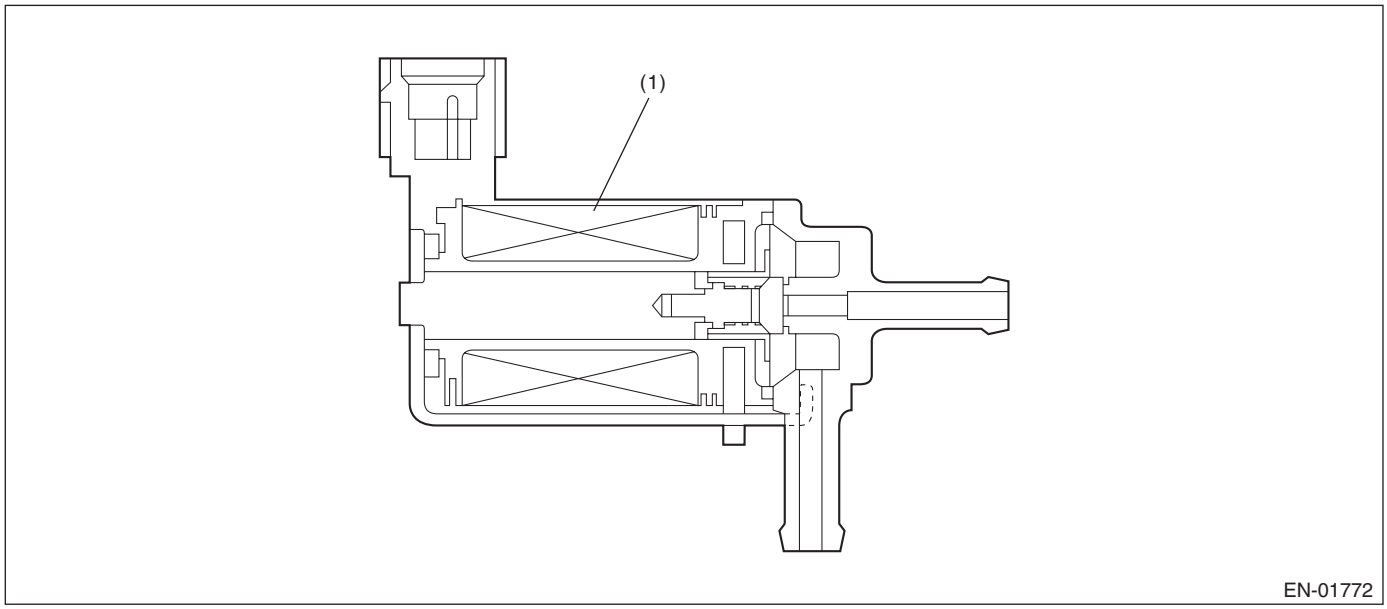
Memorize the freeze frame data. (For test mode $02)

AM:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function.
Judge as NG when becoming high wastegate pressure.

2. COMPONENT DESCRIPTION



(1) Coil

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 completing the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	≥ Map 10

Map 10

Pa (kPa (mmHg, inHg))	56.7 (440,17.3)	67.2 (504, 19.8)	75.7 (568, 22.4)	84.3 (632, 24.9)	92.8 (696, 27.4)	101.3 (760, 29.9)
Abnormal threshold kPa (mmHg, inHg)	160.9 (1207, 47.5)	173.4 (1301, 51.2)	185.8 (1394, 54.9)	198.4 (1488, 58.6)	210.7 (1581, 62.2)	221.3 (1660, 65.4)
Normal threshold kPa (mmHg, inHg)	138.5 (1039, 40.9)	151.0 (1133, 44.6)	163.4 (1226, 48.3)	176.0 (1320, 52.0)	188.4 (1413, 55.6)	198.9 (1492, 58.7)

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
Intake manifold pressure	< Map 10

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 CONDITION

- 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

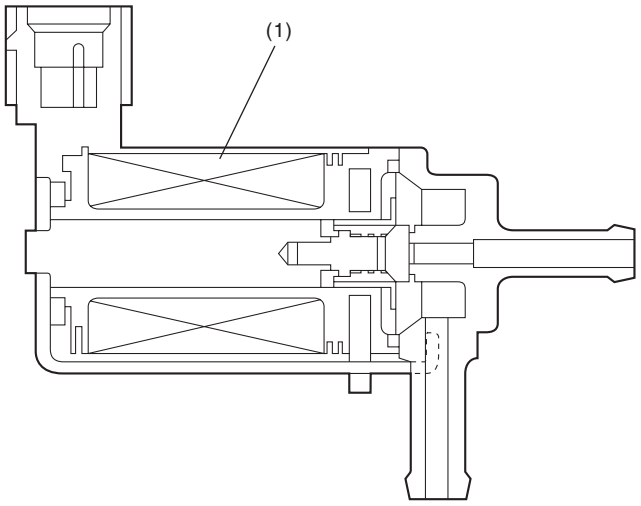
Memorize the freeze frame data. (For test mode $02)

AN:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve.
Judge as NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

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 completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage Duty ratio for turbocharged pressure control	Low < 75%

Time Needed for Diagnosis: 655 milliseconds
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
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 CONDITION

- 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

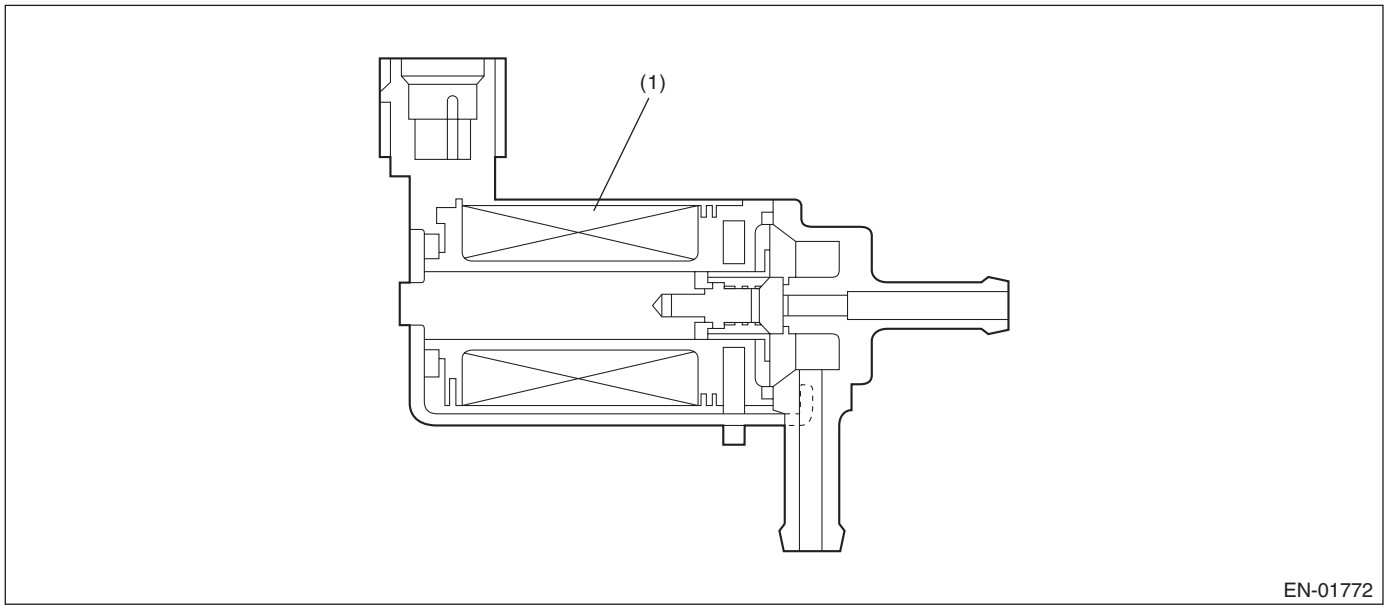
Memorize the freeze frame data. (For test mode $02)

AO:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve.
Judge as NG when the terminal output voltage remains Low or High during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

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 completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage Duty ratio for turbocharged pressure control	High > 25%

Time Needed for Diagnosis: 655 milliseconds
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
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 CONDITION

- 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)

AP: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
- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Misfire every time: FTP 1.5 times misfire, Catalyst damage misfire
- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time of all secondary parameters completed	≥ 1 sec.
Intake manifold pressure change during 0.5 engine revs.	< 16.0 kPa (120 mmHg, 4.72 inHg) (MT) < 14.7 kPa (110 mmHg, 4.33 inHg) (AT)
Engine speed change	< 1000 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 14°
Fuel shut-off function	Not in operation
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
VDC and AT control	Not in operation
Evaporative system check	Not in operation
Engine speed	450 — 6700 rpm
Intake manifold pressure	> Value of map 3 or more
Battery voltage	≥ 8 V

Map 3

- MT (Tumble generator valve open)

Vehicle speed < 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.1 (188, 7.40)	24.8 (186, 7.32)	25.6 (192, 7.56)	23.3 (175, 6.89)	26.3 (197, 7.76)	25.9 (194, 7.64)	28.9 (216.5, 8.52)	30.0 (225, 8.86)	31.7 (237.5, 9.35)	33.1 (248, 9.76)	37.1 (278.5, 10.96)	41.9 (314, 12.36)	47.0 (352.5, 13.88)	51.1 (383, 15.08)

Vehicle speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.5 (191, 7.52)	25.1 (188, 7.40)	30.4 (227.7, 8.96)	35.6 (267.4, 10.52)	38.5 (288.9, 11.37)	40.4 (302.9, 11.93)	41.1 (308.6, 12.15)	40.8 (306, 12.05)	44.8 (335.8, 13.22)	47.3 (354.5, 13.96)	49.1 (368.2, 14.50)	50.9 (381.9, 15.04)	52.8 (396, 15.59)	52.8 (396, 15.59)

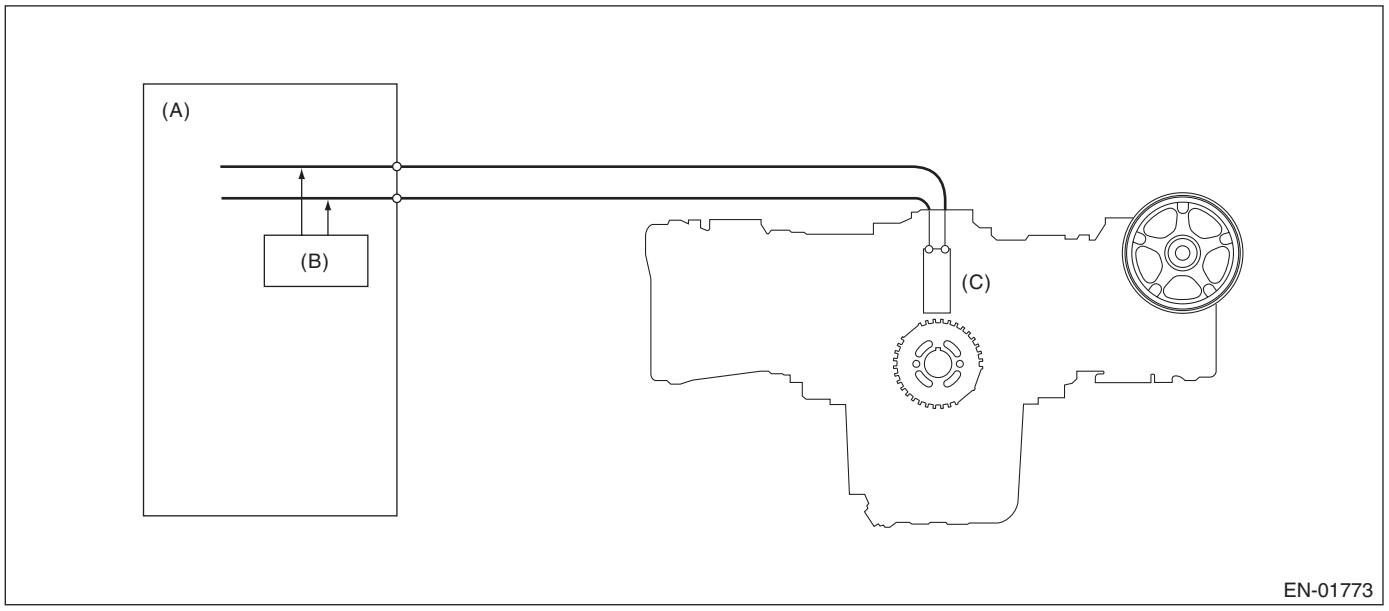
- AT (Tumble generator valve open)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	26.3 (197, 7.76)	24.7 (185, 7.28)	23.6 (177, 6.97)	25.5 (191, 7.52)	27.3 (205, 8.07)	26.1 (196, 7.72)	29.5 (221.5, 8.72)	31.3 (235, 9.25)	32.7 (245.5, 9.67)	34.1 (256, 10.08)	38.2 (286.5, 11.28)	33.6 (252.3, 9.93)	49.5 (371.5, 14.63)	51.5 (386, 15.20)

3. GENERAL DRIVING CYCLE

- If conditions are met, detect misfire from idling to high rotation.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

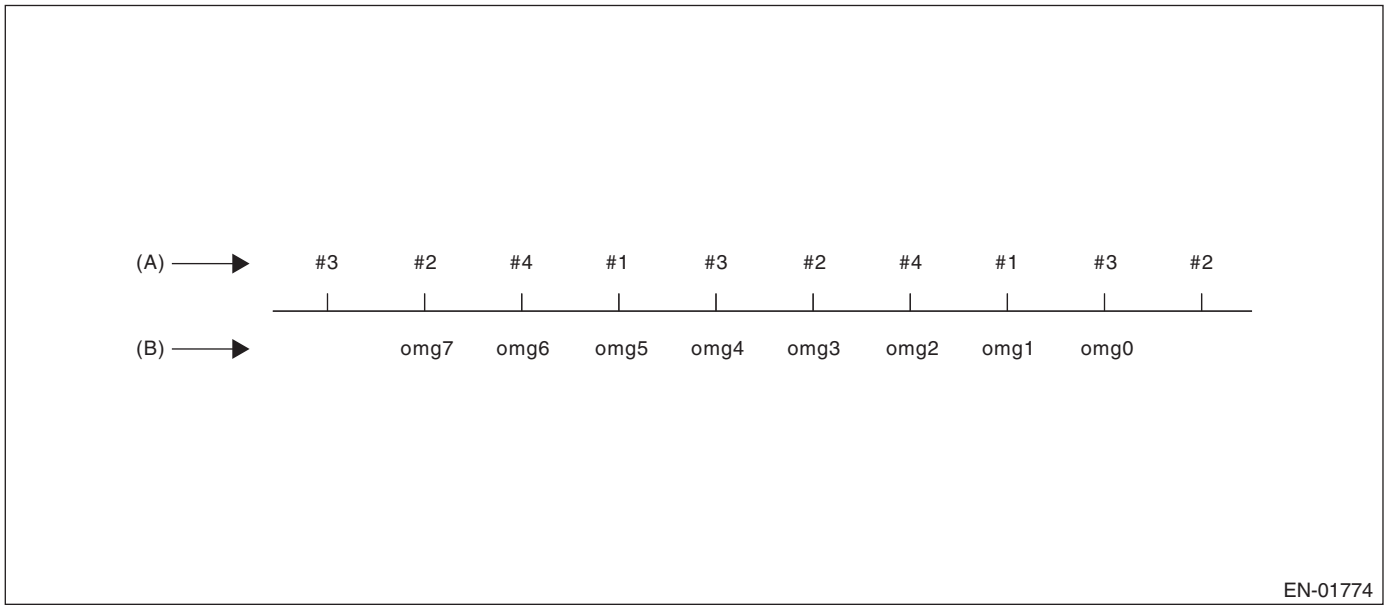


(A) Coil (B) Diagnosis circuit (C) Crankshaft position sensor

When a misfire occurrs, the engin 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)
	• 180° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method	• FTP1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

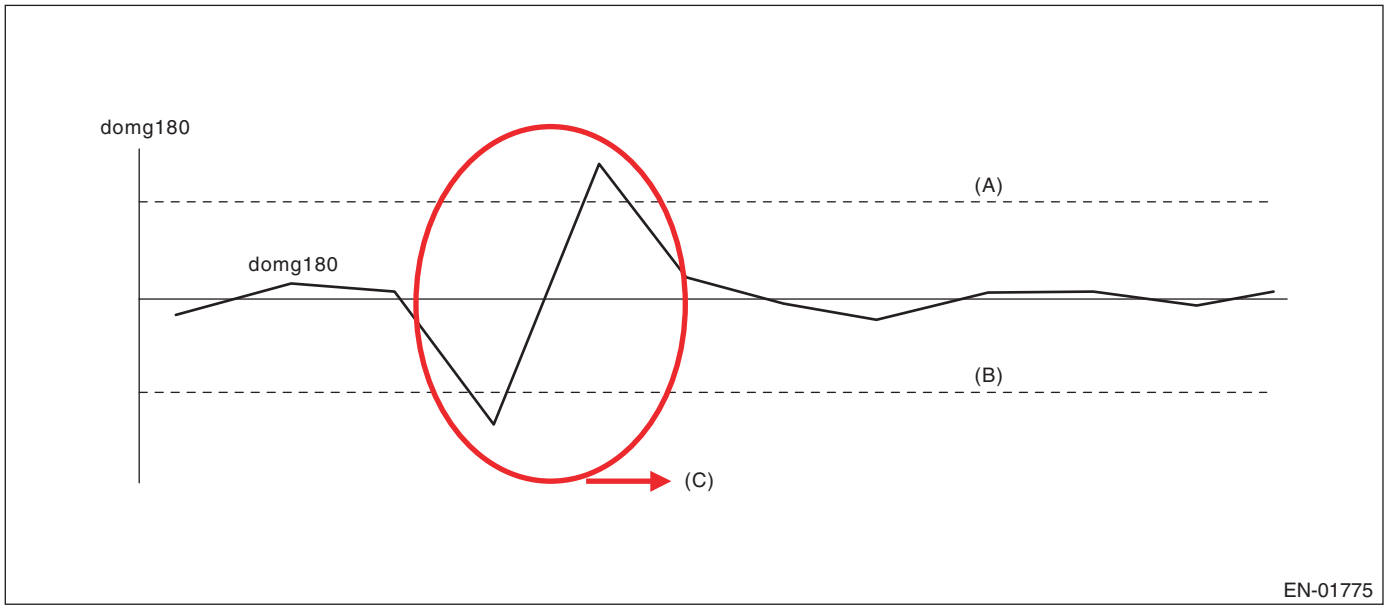
As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.



(A) Ignition order (B) Crankshaft position speed

180° Interval Difference Method

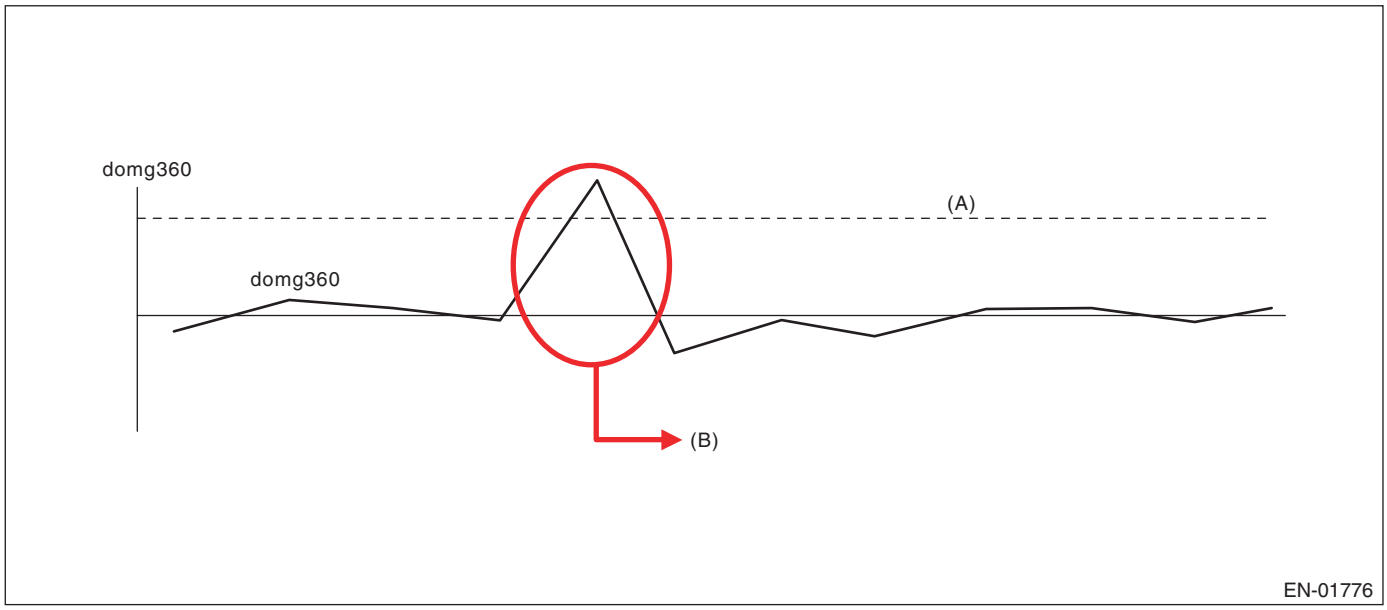
Diagnostic value	domg 180 = (omg 1 – omg 0) – (omg 7 – omg 1)/6
Judge as a misfire in the following cases. • domg 180 > judgment value of positive side • domg 180 ≤ judgment value of negative side (Judgment value before 180°CA)	



(A) Threshold value (judgment value of the positive side)
(B) Threshold value (judgment value of the negative side)
(C) Judged as a misfire

360° Interval Difference Method

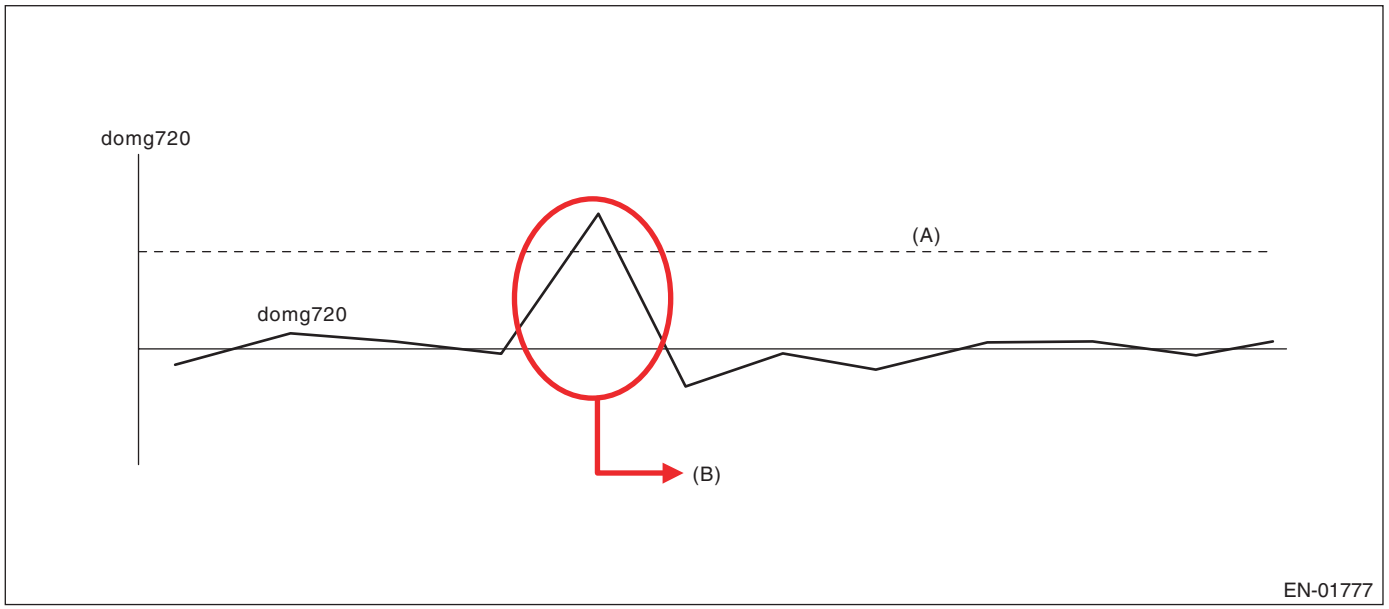
Diagnostic value	domg 360 = (omg 1 – omg 0) – (omg 4 – omg 3)
Misfire judgment	domg 360 > Judgment value → Judge as misfire



(A) Threshold Value
(B) Judged as a 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



(A) Threshold Value (B) Judged as a 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 (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

Percentage		Intake air (g(oz)/rev)									
		0.16 (0.006)	0.28 (0.010)	0.4 (0.014)	0.52 (0.018)	0.64 (0.023)	0.76 (0.027)	0.92 (0.032)	1.1 (0.039)	1.2 (0.042)	1.4 (0.046)
Engine speed (rpm)	1000	37.0	32.0	28.5	26.0	23.0	21.3	21.3	—	—	—
	1500	35.0	29.5	25.5	22.5	21.3	21.3	21.3	18.0	—	—
	2000	32.0	22.5	22.5	18.3	14.5	10.8	10.0	9.0	8.0	5.0
	2500	29.0	21.8	14.3	11.3	9.8	9.0	8.5	8.0	7.5	5.0
	3000	27.0	21.8	14.5	9.8	9.0	9.0	8.0	7.5	7.0	5.0
	3500	24.5	18.5	10.8	6.8	5.8	5.5	5.0	5.0	5.0	5.0
	4000	—	15.3	10.0	6.8	5.5	5.0	5.0	5.0	5.0	5.0
	4500	—	13.8	8.5	6.3	5.0	5.0	5.0	5.0	5.0	—
	5000	—	13.8	8.5	5.8	5.0	5.0	5.0	5.0	5.0	—
	5500	—	13.5	8.3	5.5	5.0	5.0	5.0	5.0	5.0	—
	6000	—	13.0	8.0	5.3	5.0	5.0	5.0	5.0	5.0	—
	6500	—	12.5	7.5	5.0	5.0	5.0	5.0	5.0	—	—
	6700	—	12.3	7.3	5.0	5.0	5.0	5.0	5.0	—	—

These figures indicate the misfire rate (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) misfires. This value or more is judged as a misfire.
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 CONDITION

- 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)

AQ:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AR:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AS:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

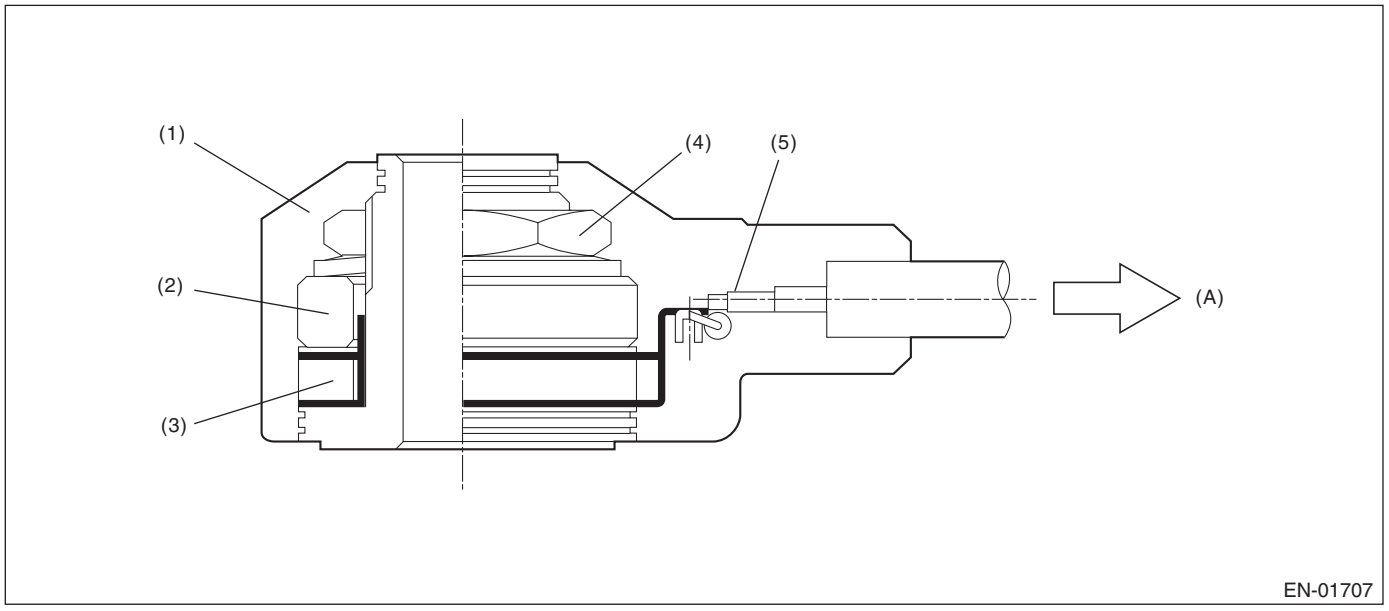
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AT: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 it is 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 completing 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

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 = –5°CA (5°CA retard)
- Whole learning compensation coefficient update not allowed
- Portional learning zone compensation value calculation not allowed

9. ECM OPERATION AT DTC SETTING

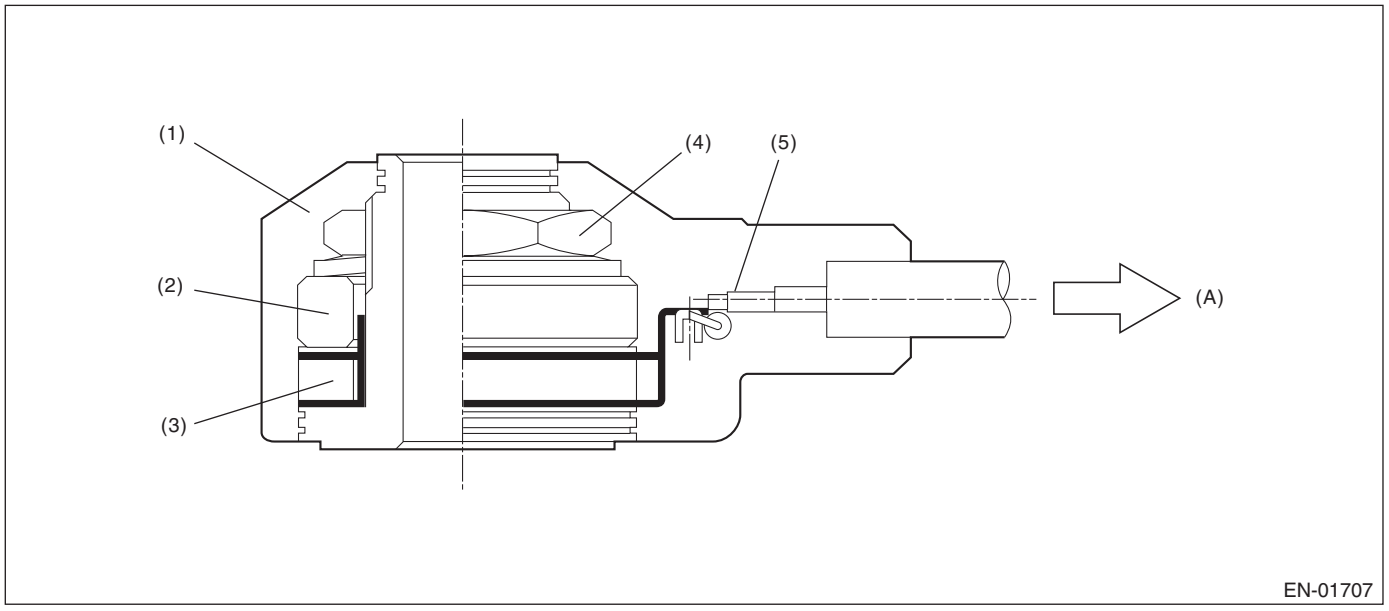
Memorize the freeze frame data. (For test mode $02)

AU: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 it is 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 completing 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

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 = –5°CA (5°CA retard)
- Whole learning compensation coefficient update not allowed
- Portional learning zone compensation value calculation not allowed

9. ECM OPERATION AT DTC SETTING

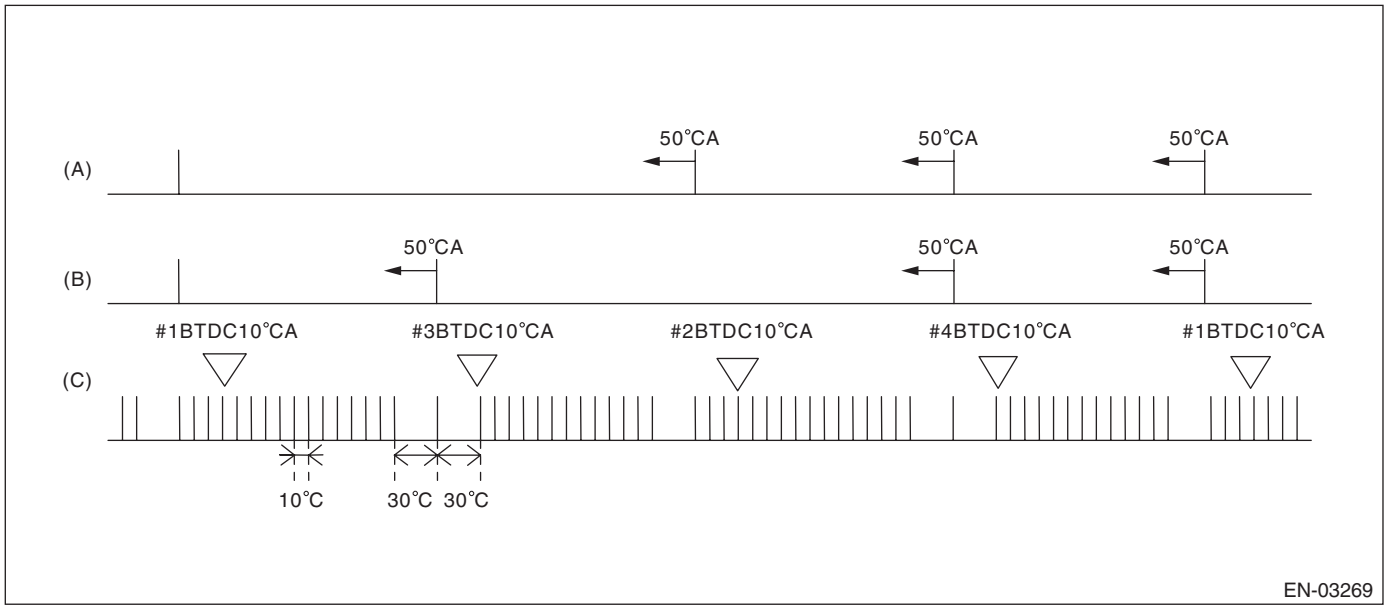
Memorize the freeze frame data. (For test mode $02)

AV:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

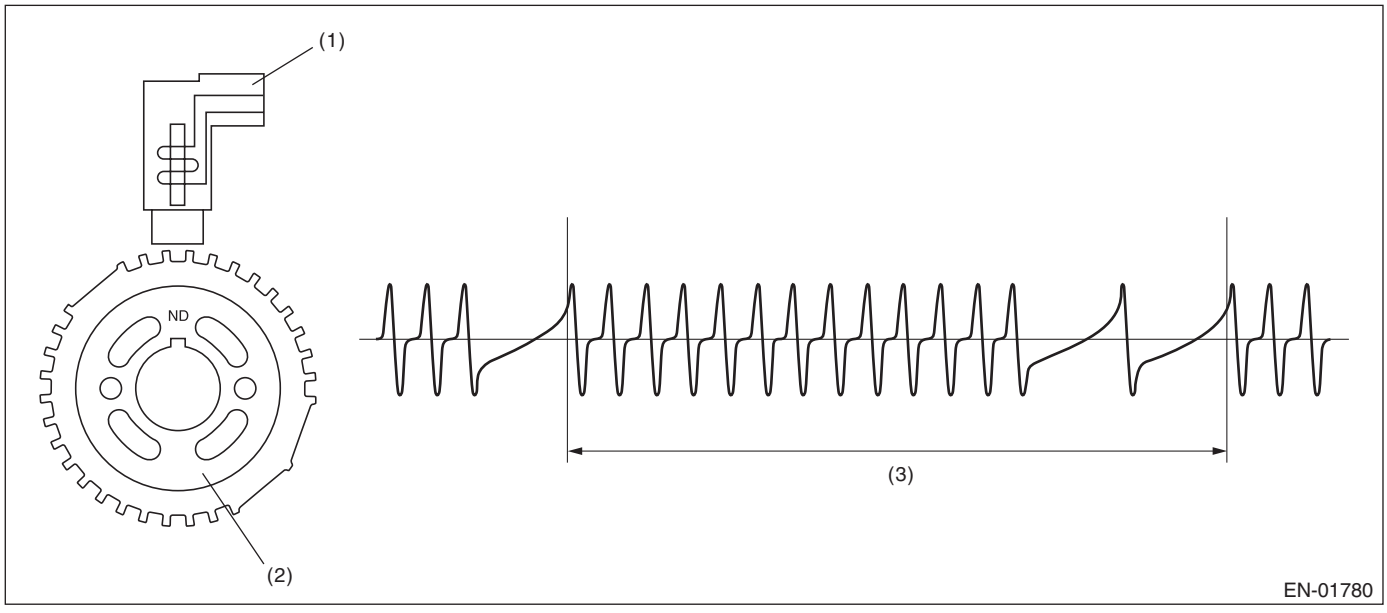
1. OUTLINE OF DIAGNOSIS

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 completing the malfunction criteria below becomes more than 3 seconds.

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 while 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 CONDITION

- 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

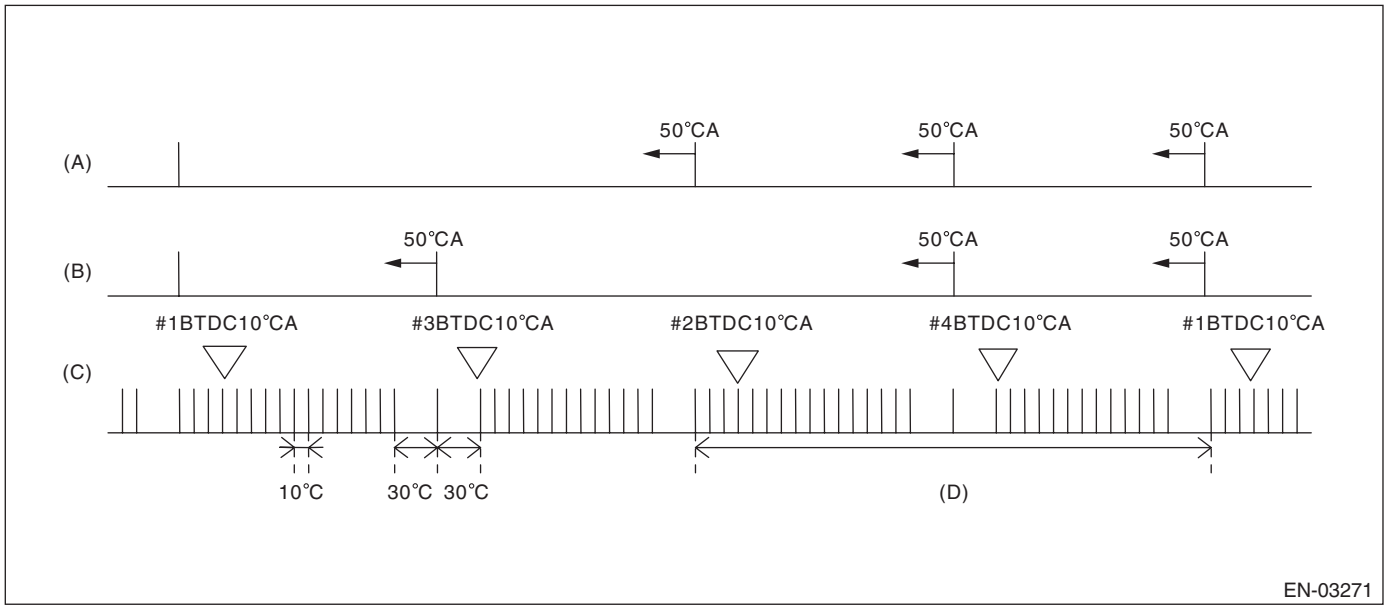
Memorize the freeze frame data. (For test mode $02)

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

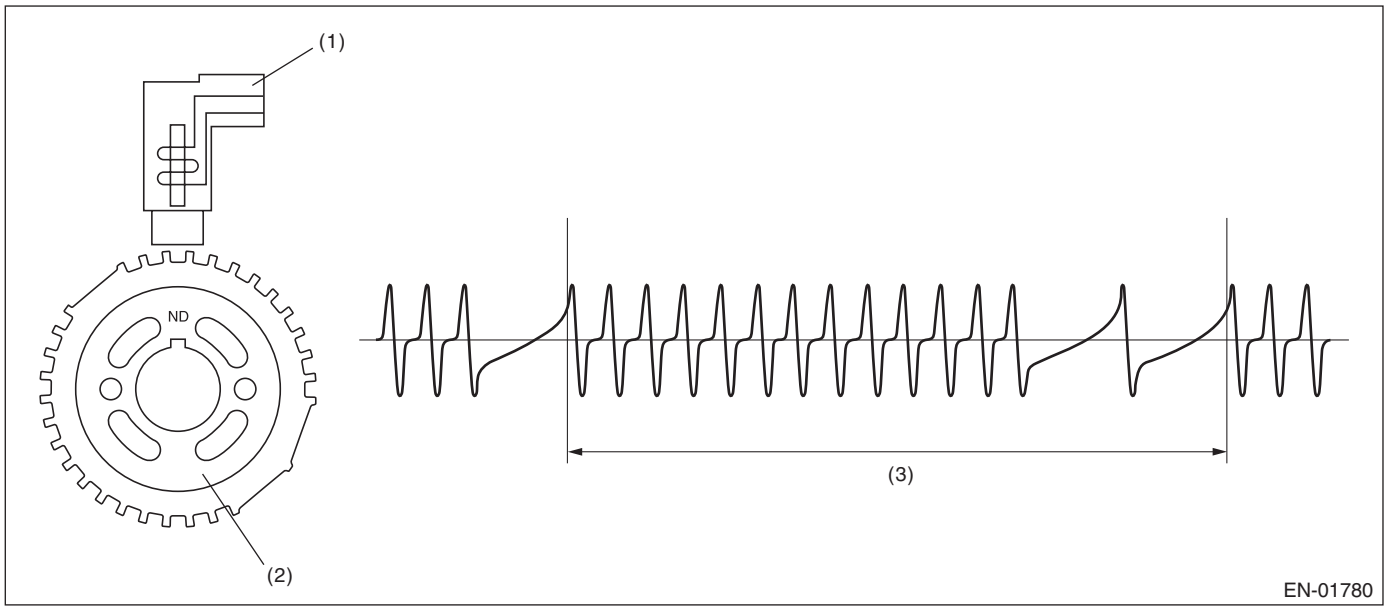
1. OUTLINE OF DIAGNOSIS

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
(D) Number of crankshaft signal = 30 is normal.



(1) Crankshaft position sensor
(2) Crank sprocket
(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Engine speed	< 3000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when all the malfunction criteria below are completed more than 10 times 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 rotations
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 CONDITION

- 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

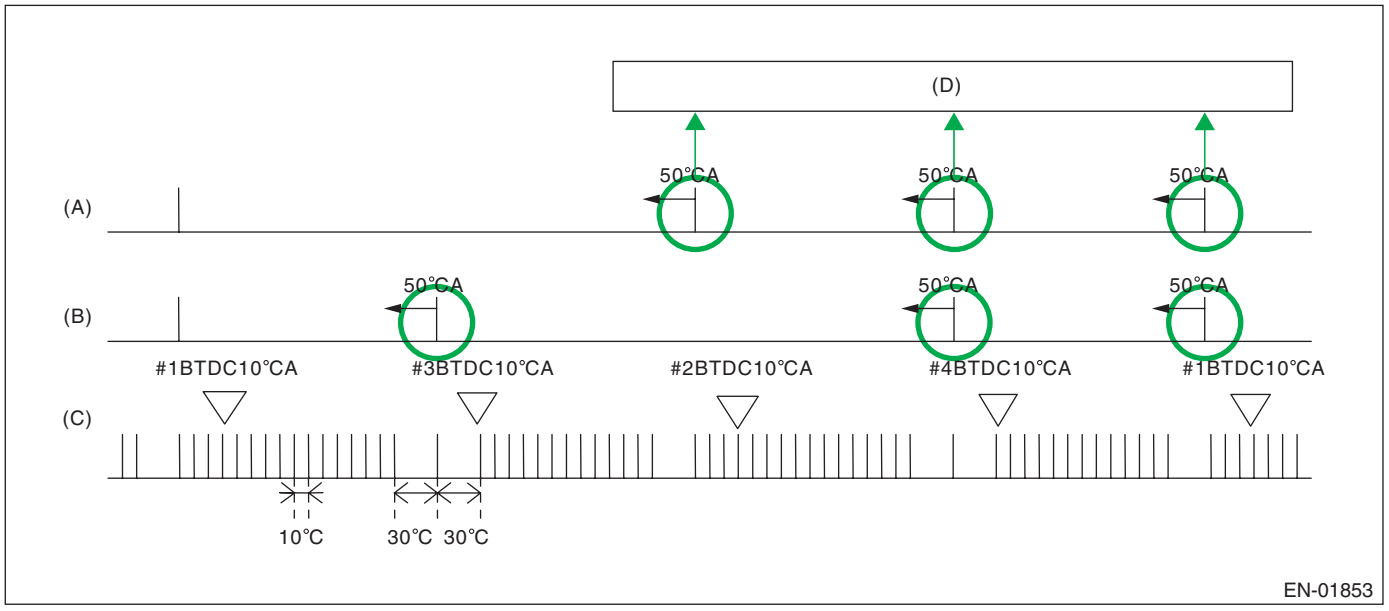
Memorize the freeze frame data. (For test mode $02)

AX: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
(D) Number of camshaft position signals = When normal, there will be 3 cam signals for every 2 engine revolutions.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 8 V
Engine speed	≥ 600 rpm

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

When normal, there should be 3 cam signals per 2 engine revolutions. If a condition where it is not 3 times continues, It is judged as NG.
When the engine speed is over 100 rpm, if the following conditions are established it is juged as NG. Judge as OK and clear the NG when the following criteria are not established.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft sensor signals during 2 revs.	Not = 3
Engine speed	≥ 600 rpm

Time Needed for Diagnosis: 100 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the following criteria are established.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft angle signal	Exsists

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 CONDITION

- 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)

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

1. OUTLINE OF DIAGNOSIS

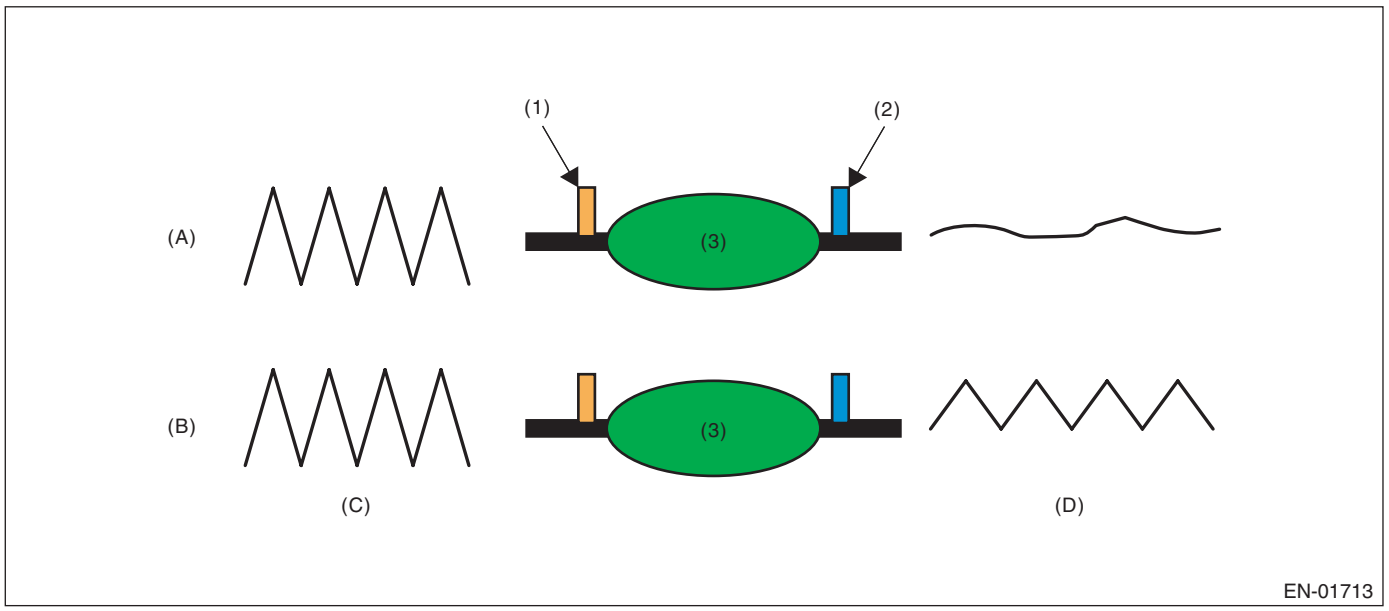
For the diagnostic procedure, refer to DTC P0340. <Ref. to GD(H4DOTC)-111, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AZ: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
Accumulated time of canister purge operation after engine starting	≥ 19.9 sec.
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70°C (158°F)
Catalyst warm-up counter (Map 2)	≥ 8000
Misfire detection every 200 rotations	< 5 times
Learning value of evaporation gas density	< 0.20
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	≥ 70.4 km/h (44 MPH)
Amount of intake air	12 — 40 g (0.35 — 1.41 oz)/s
Engine load change every 0.5 engine revs.	< 0.02 g (0.0007 oz)/rev
Rear oxygen output change from lower than to higher than 600 mV	Experienced after fuel cut
After engine starting	≥ 235 sec.

Map 2

Add the following value every 512 milliseconds.

Catalyst warm-up counter≤ 9000

Intake amount of air (g(oz)/s)	0 (0)	5 (0.18)	7.5 (0.265)	10 (0.35)	15 (0.53)	20 (0.71)	25 (0.88)	30 (1.06)	35 (1.23)	40 (1.41)	45 (1.59)	50 (1.76)
Total value for warm-up counter	–36	–10	1	11	25	40	57	72	87	100	100	100

Catalyst warm-up counter> 9000

Intake amount of air (g(oz)/s)	0 (0)	5 (0.18)	7.5 (0.265)	10 (0.35)	15 (0.53)	20 (0.71)	25 (0.88)	30 (1.06)	35 (1.23)	40 (1.41)	45 (1.59)	50 (1.76)
Total value for warm-up counter	–16	–8	–1	3	6	8	9	11	13	14	14	14

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at a constant 7.5 km/h (46.6 MPH) or higher after warming-up.

5. DIAGNOSTIC METHOD

After the execution criterias are established, calculate the output fluctuation value of front xygen (A/F) sensor and output fluctuation value of rear oxygen sensor. Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value is more than specified value. A/F response properties and diagnosis values are parameters for the judgment value.
Judge as NG when the malfunction criteria below are met. Judge as OK if the criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of rear oxygen sensor output voltage per 32 milliseconds divided by lambda accumulated variation of the front oxygen (A/F) sensor per 32 milliseconds	≥ 9.5

Time Needed for Diagnosis: 30 to 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

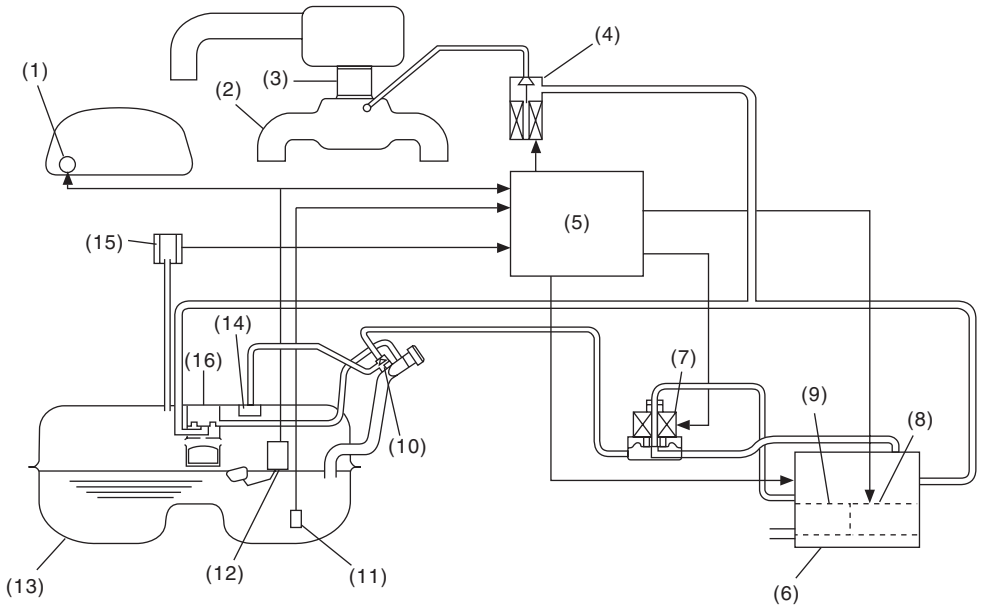
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

1. OUTLINE OF DIAGNOSIS

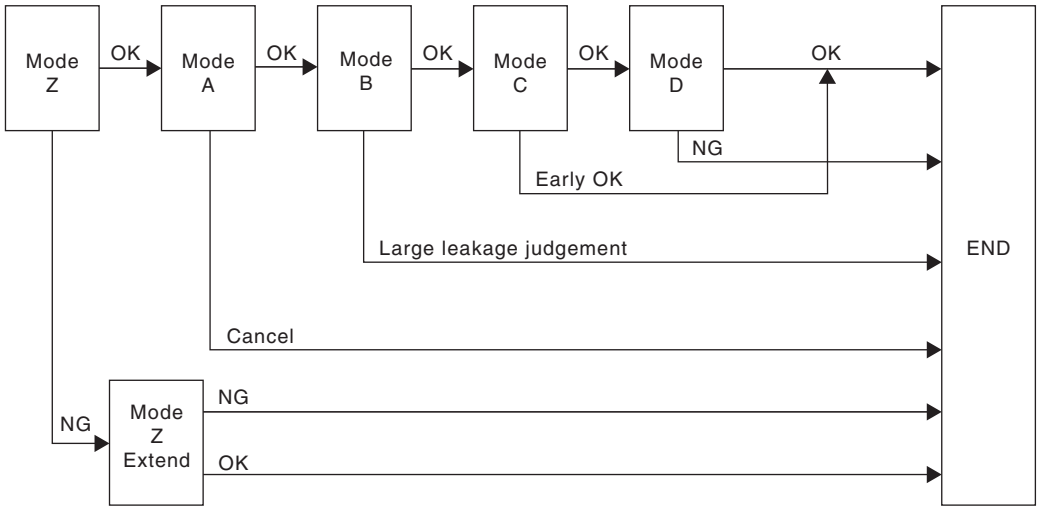
Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.



(1)	Fuel gauge	(7)	Pressure control solenoid valve	(13)	Fuel tank
(2)	Intake manifold	(8)	Drain valve	(14)	Fuel cut valve
(3)	Throttle body	(9)	Drain filter	(15)	Fuel tank pressure sensor
(4)	Purge control solenoid valve	(10)	Shut-off valve	(16)	Vent valve
(5)	Engine control module (ECM)	(11)	Fuel temperature sensor	(17)	Fuel tank sensor control valve
(6)	Canister	(12)	Fuel level sensor		

In this system diagnosis, check for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor.
When in 0.04 inch diagnosis, perform in the order of mode Z → mode A → mode B → mode C and mode D;
When in 0.02 inch diagnosis, perform in the order of mode A → mode B → mode C → mode D and mode E.

0.04-inch Diagnosis



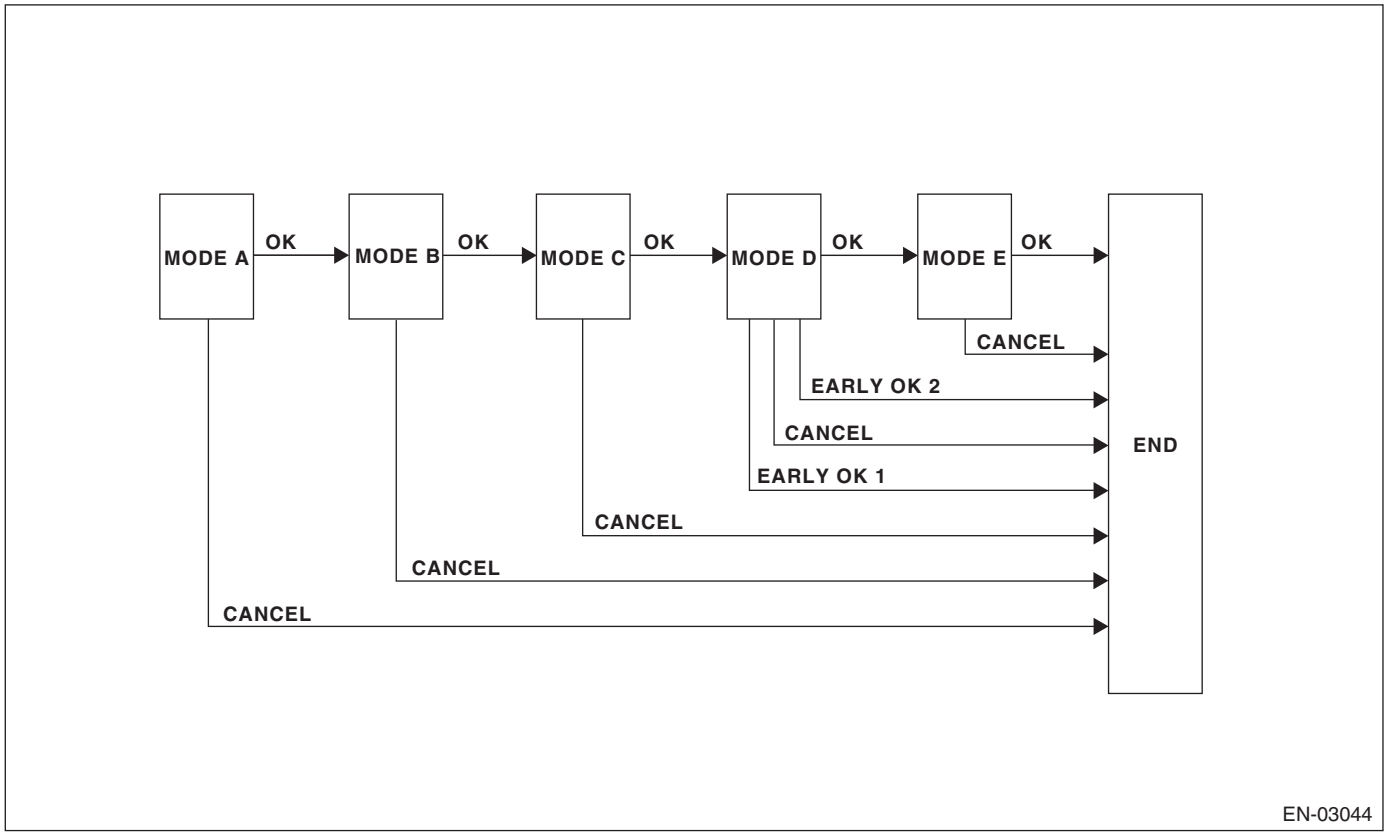
EN-02872

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 atmospheric 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

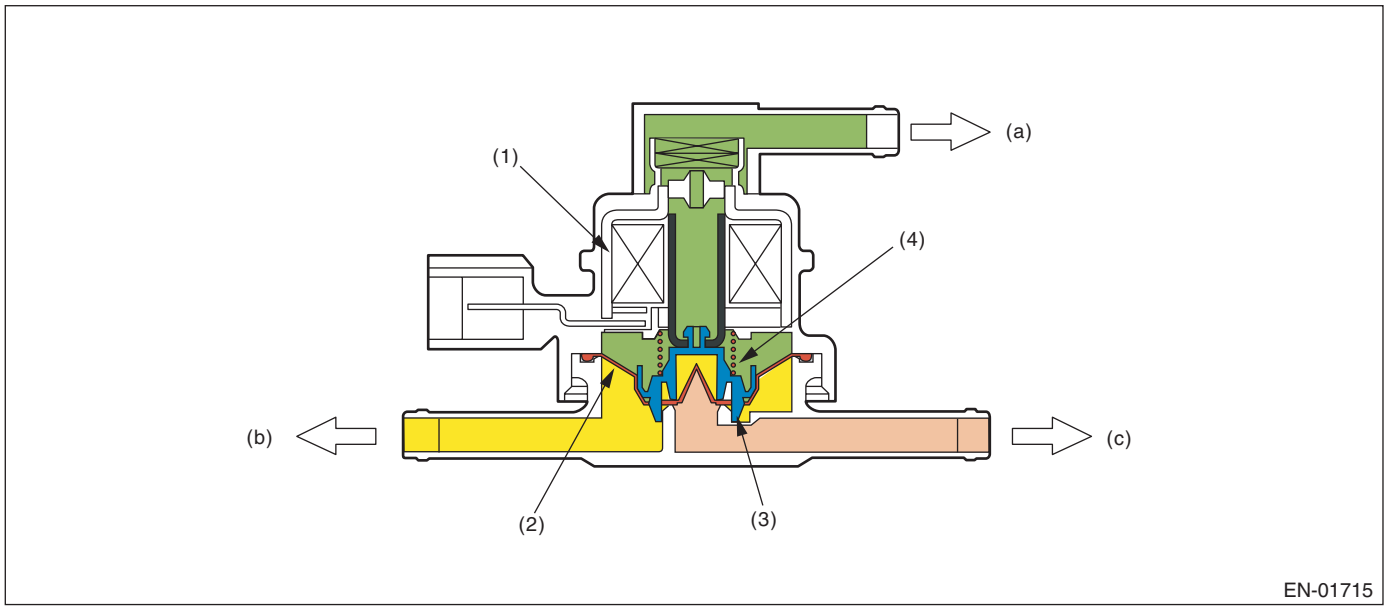


Mode	Mode Description	Diagnosis Period
Mode A (0 point compensation)	When pressure in tank is high, wait for 0 point (Near 0 kPa (0 mmHg, 0 inHg)) to return.	0 — 12 seconds
Mode B (Negative pressure introduced)	Decrease the pressure in the tank to the target value by introducing the intake hose pressure 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

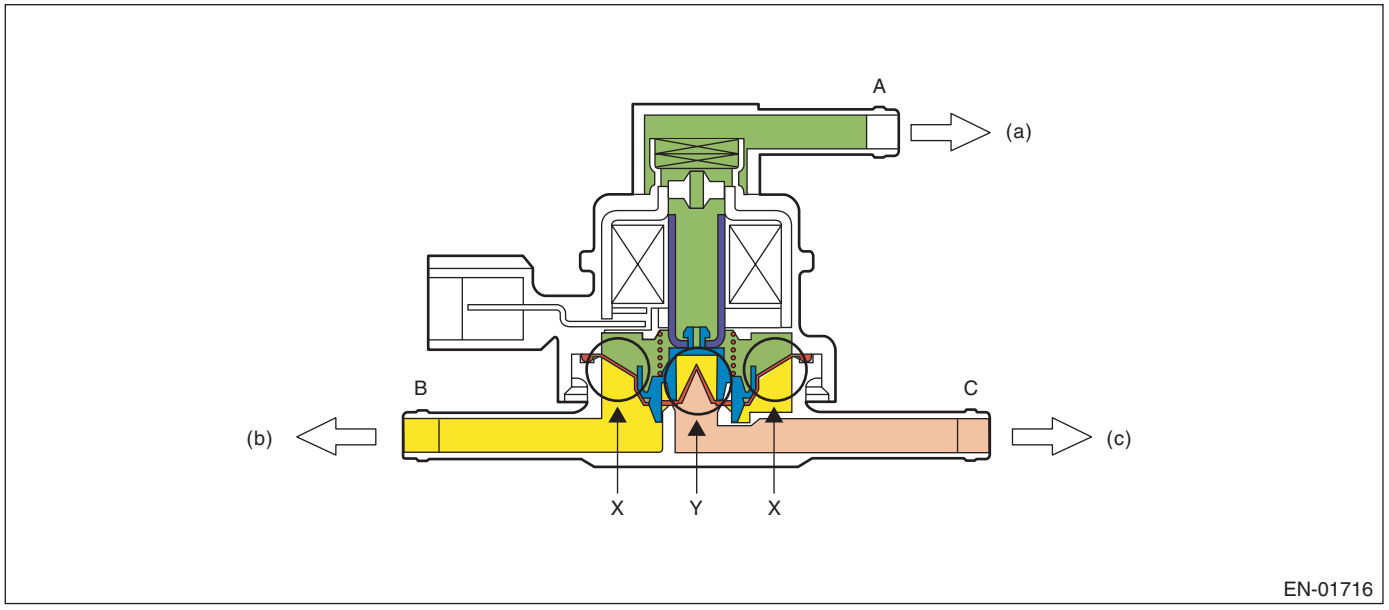
PCV controls the fuel tank pressure to be equal to the atmospheric air pressure. Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



(1) Solenoid
(2) Diaphragm
(3) Valve
(4) Spring
(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

- **Valve Operation and Air Flow**

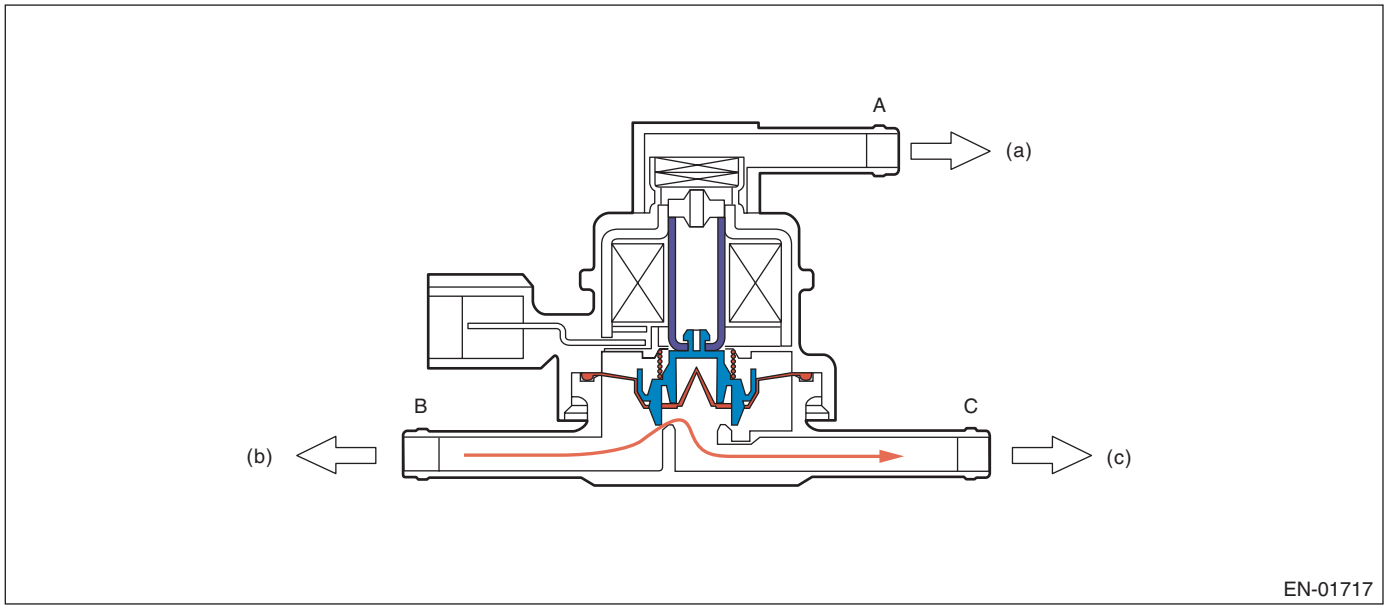
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port 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) Atmospheric pressure (b) Fuel tank (c) Canister

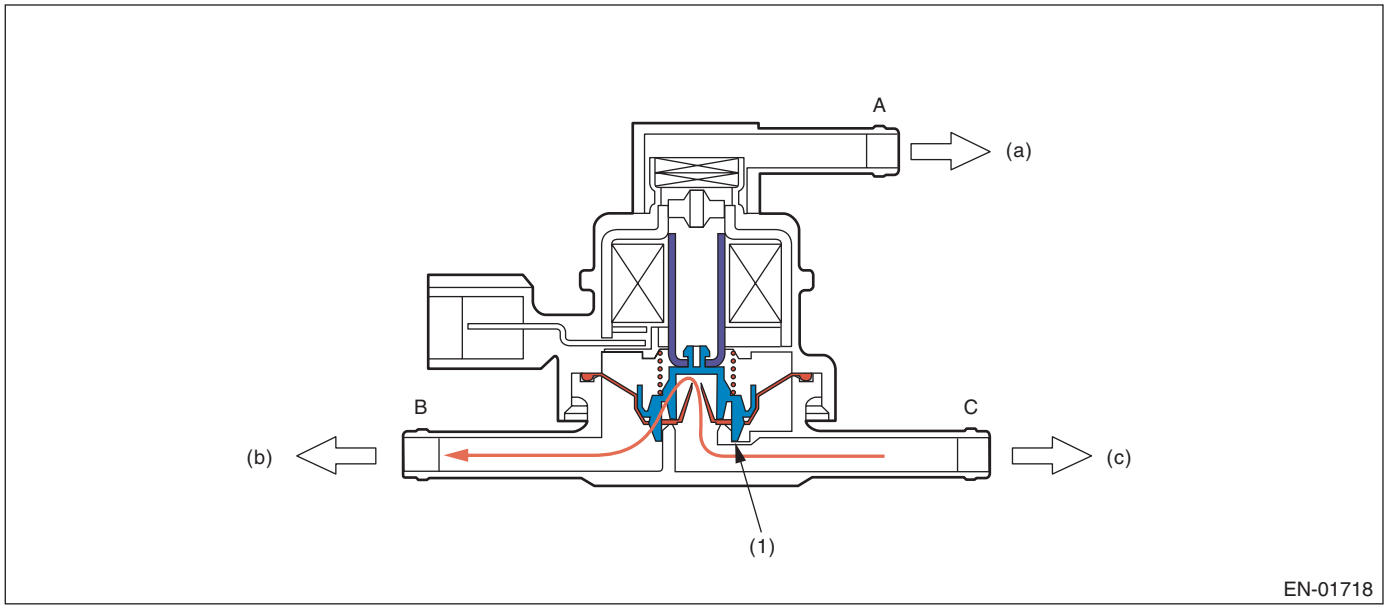
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ←→ C

When A < B (solenoid OFF)



(a) Atmospheric pressure (b) Fuel tank (c) Canister

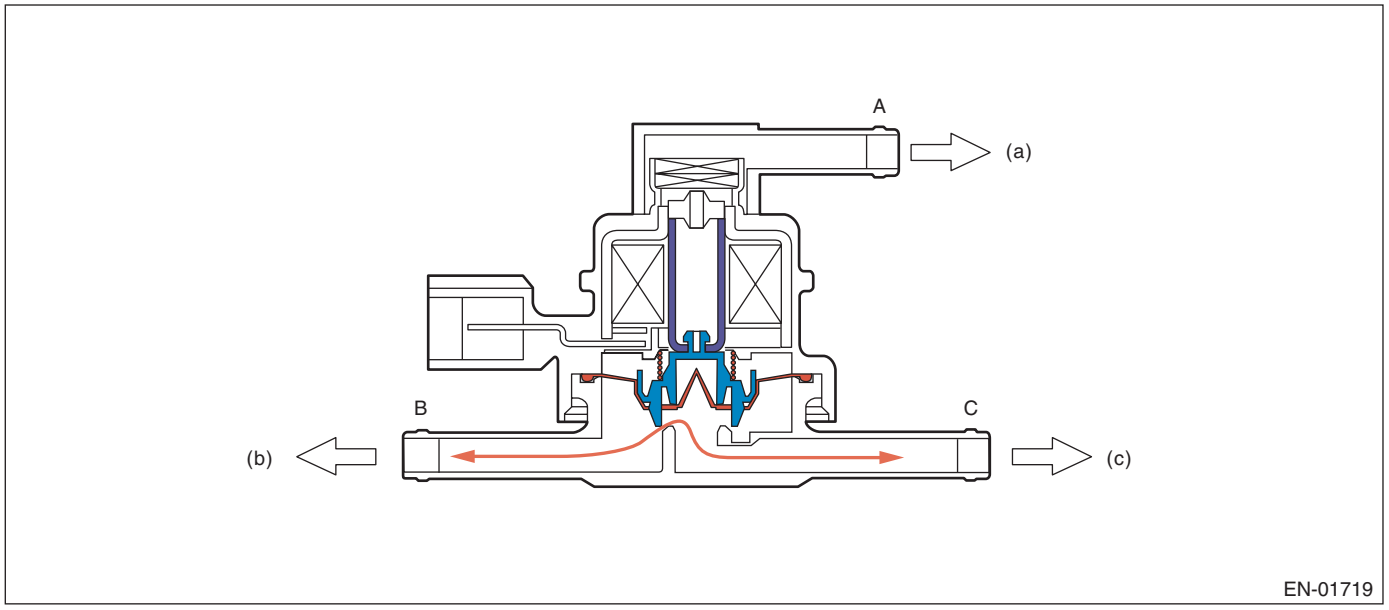
When B < C (solenoid OFF)



(a) Atmospheric pressure (b) Fuel tank (c) Canister

(1) Valve

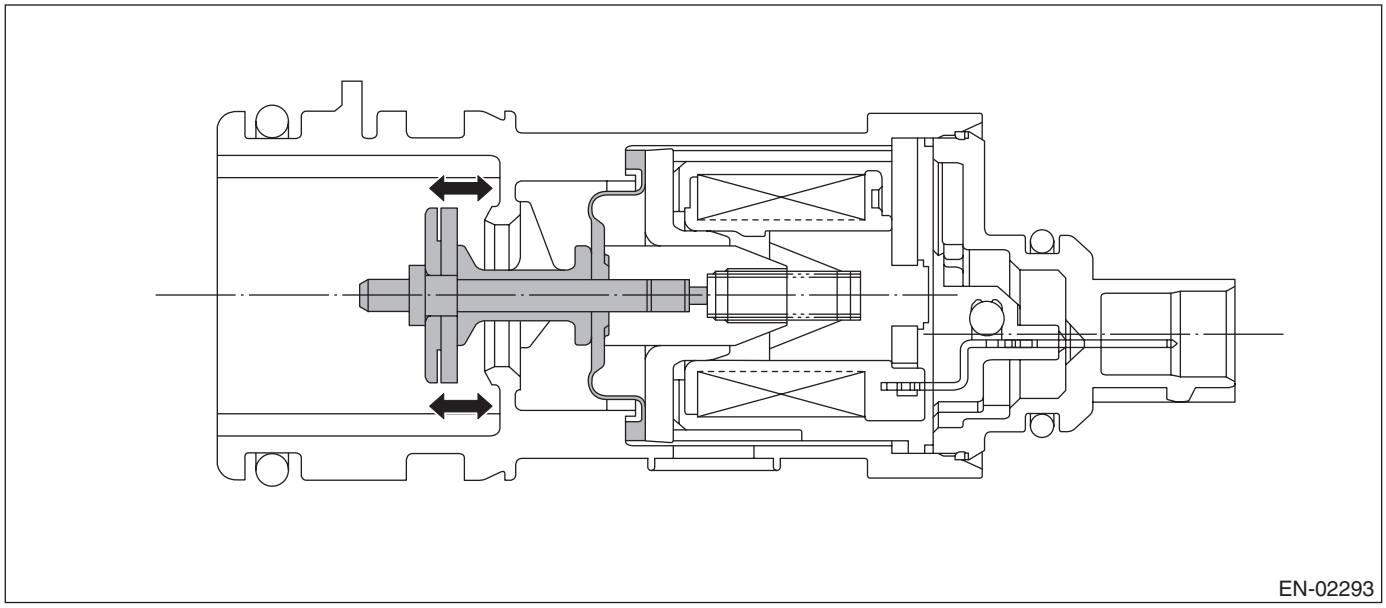
When Solenoid is ON



(a) Atmospheric 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	< 1.42 kPa (10.7 mmHg, 0.42 inHg)
Intake manifold relative vacuum (relative pressure)	< –13.33 kPa (–100 mmHg, –3.94 inHg)
Vehicle speed	≥ 32 km/h (20 MPH)
Fuel level	9.6 ←→ 54.4 ℓ (2.54 ←→ 14.37 US gal, 2.11 ←→ 11.97 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 per second	< 0.12 kPa (0.95 mmHg, 0.04 inHg)
Minimum pressure change value every one second – Maximum pressure change value	< 0.23 kPa (1.75 mmHg, 0.07 inHg)
Change of fuel level	< 3 ℓ (3.2 US qt, 2.6 Imp qt)/131 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
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Time since last incomplete diagnosis event of 0.02-inch leakage	> 600 sec.
Total time of canister purge operation	120 seconds or more
After engine starting	770 seconds or more
Fuel temperature	–10 ←→ 70°C (14 ←→ 158°F)
Fuel level	9.6 ←→ 54.4 ℓ (2.54 ←→ 14.37 US gal, 2.11 ←→ 11.97 Imp gal)
Intake manifold relative vacuum (relative pressure)	< –13.3 kPa (–100 mmHg, –3.94 inHg)
Fuel tank pressure	–0.43 — 1.43 kPa (–3.2 — 10.7 mmHg, –0.13 — 0.42 inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	550 — 6000 rpm
(During diagnosis)	
Change of fuel level	≤ 5 ℓ (1.3 US gal, 1.1 Imp gal/128 m/s)
Atmospheric pressure change (Mode D)	–0.47 ←→ 0.32 kPa (–3.5 ←→ 2.4 mmHg, –0.14 ←→ 0.09 inHg)
Atmospheric 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 in 856 seconds or more after starting the engine, at a constant speed of 32 km/h (20 MPH) or more.
Pay attention to the fuel temperature and fuel level.
0.02-inch Diagnosis
Perform the diagnosis after 770 seconds or more after starting the engine, at a constant engine speed of 68 km/h (42 MPH) or higher, 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.

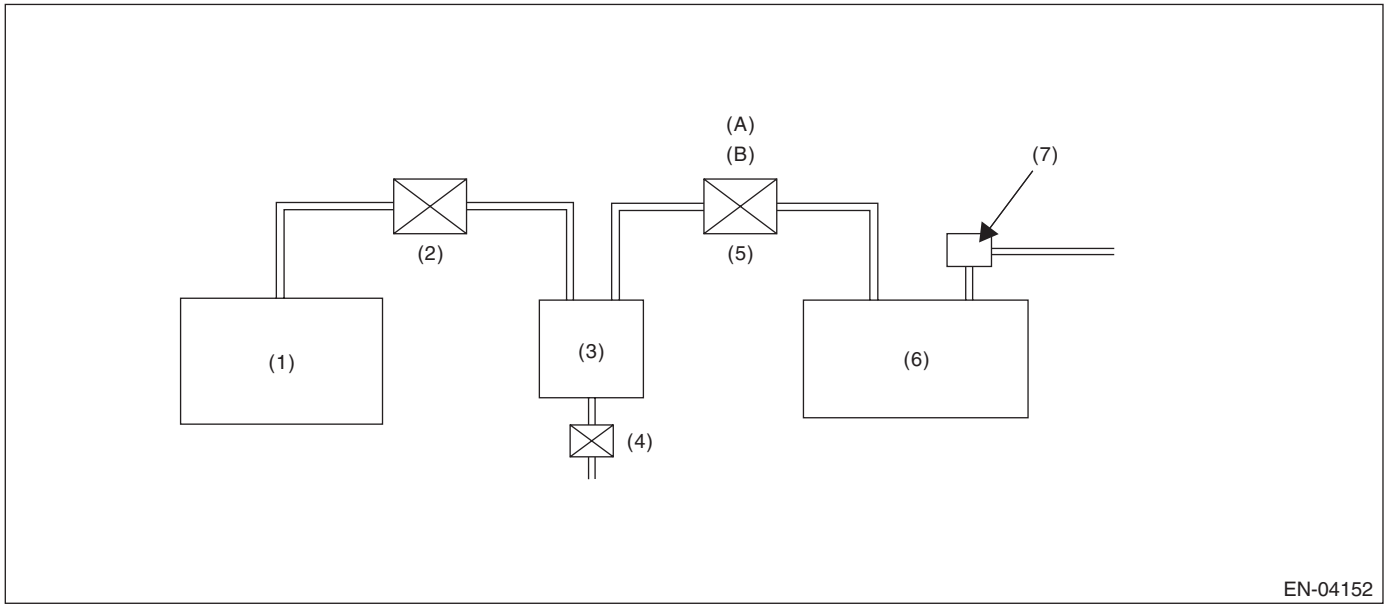
Note that if a purge control solenoid valve stuck open fault is detected, the EVAP system leakage diagnosis is cancelled.

- **PURGE CONTROL SOLENOID VALVE STUCK OPEN DIAGNOSIS**

DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purge control solenoid valve stuck open diagnosis is performed in mode Z as shown in the figure below.



(1)	Engine	(4)	Drain valve	(7)	Fuel tank pressure sensor
(2)	Purge control solenoid valve	(5)	Pressure control solenoid valve		
(3)	Canister	(6)	Fuel tank		
(A)	Normal condition: mechanical control	(B)	During diagnosis: electronic control		

- **Diagnosis of purge control solenoid valve function**

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.

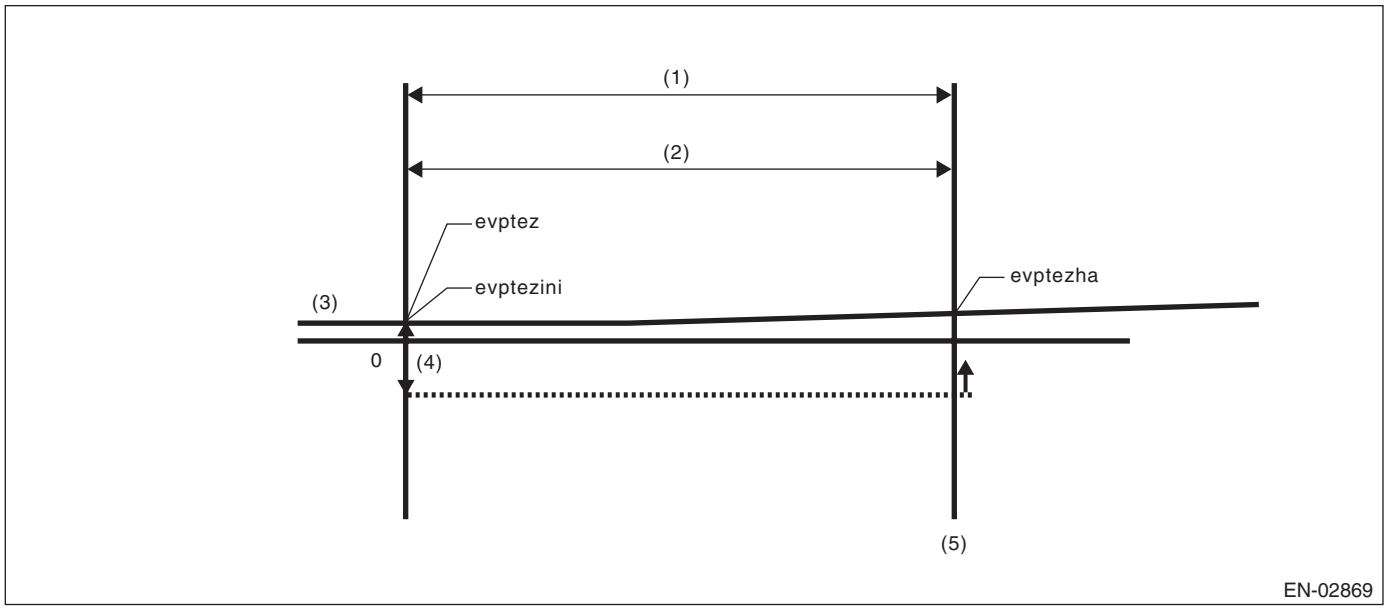
Normality Judgment

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)
- evptezini – evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)

Judge normal when these calculations are completed.

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and Judge as NG when all the criteria below are completed in 16 seconds.

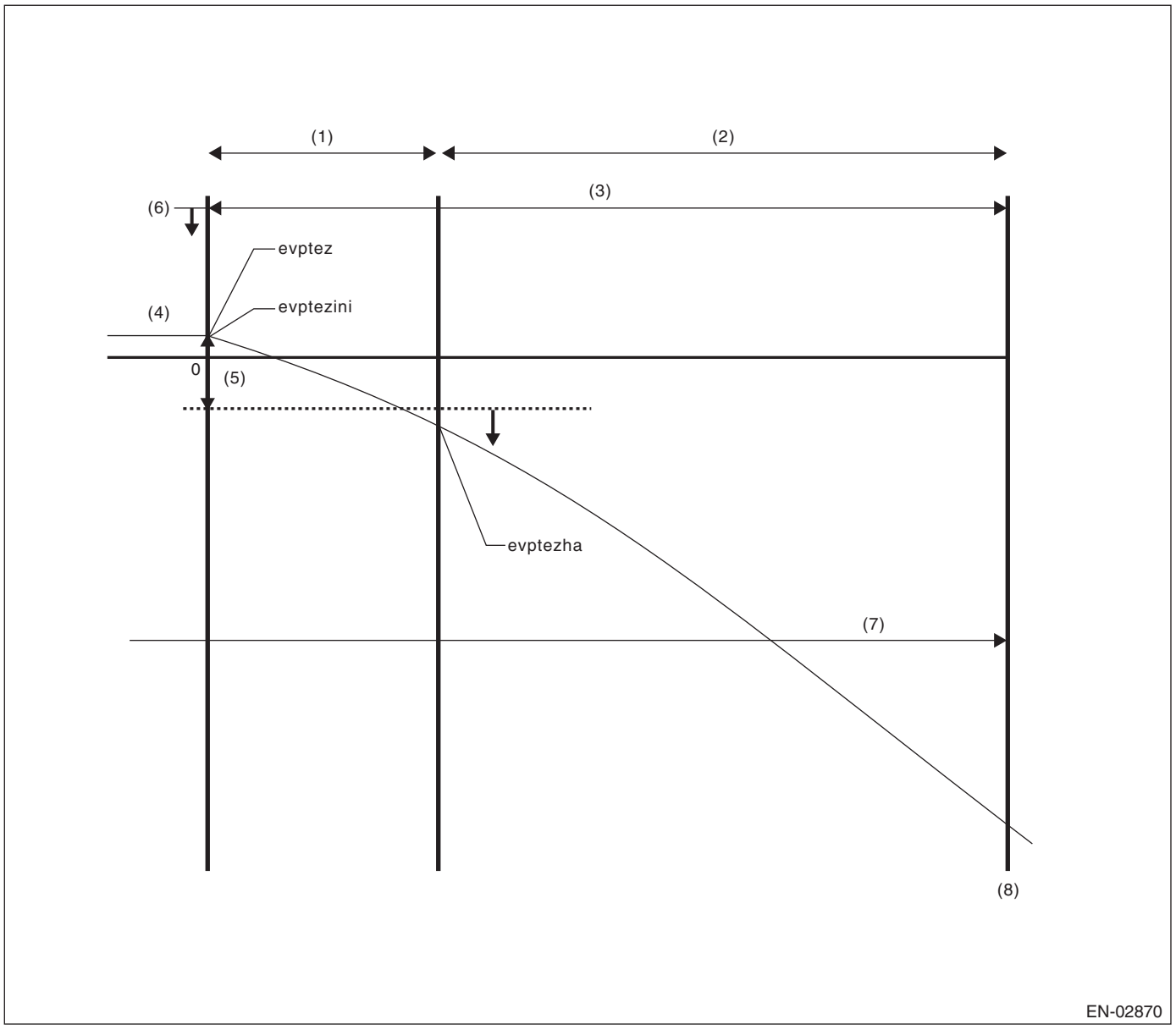
Judgment Value

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)	
2 ℓ or more fuel no sloshing	≥ 40 sec.	

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
(2) Extended mode Z
(3) 16 seconds
(4) Fuel tank pressure
(5) 0.87 kPa (6.5 mmHg, 0.26 inHg)
(6) 1.43 kPa (10.7 mmHg, 0.42 inHg)
(7) 40 seconds no fuel sloshing
(8) NG judgment

- evptezini, evptez ≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)
- evptez – evptezha ≤ 0.87 kPa (6.5 mmHg, 0.26 inHg)
- evptezini – evptezha ≤ 0.87 kPa (6.5 mmHg, 0.26 inHg)
- No fuel sloshing of over 2 ℓ (0.79 US gal, 0.67 Imp gal) 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 atmospheric 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 25 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	≥ 25 sec.	P0457
Or mode B time	≥ 10 sec.	
(Min. pressure value in tank when in mode B) – (Tank pressure when mode B started)	< –0.3 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 atmospheric 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	> Value from Map 7	P0442
P2: Tank pressure that changes every 10 seconds in mode D	* Threshold value: Figure (Remaining Fuel vs Tank temperature)	
P1: Tank pressure that changes every 10 seconds in mode A		

* 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, 0.090 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 to 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 atmospheric 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	
Tank pressure	≤ –1.8 kPa (–13.5 mmHg, –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
When the following conditions are established, judged as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P1	<Value of Map 7 * Threshold value: Figure (Residual Fuel Amount vs evpdset)	P0456

Map7 Failure diagnosis reference limit for 0.02 in leaks for evaporative emission control system 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 of Map 8 * Threshold value: Figure (Residual Fuel Amount vs evpdset)	P0456

Map8

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 to 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 CONDITION

- 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

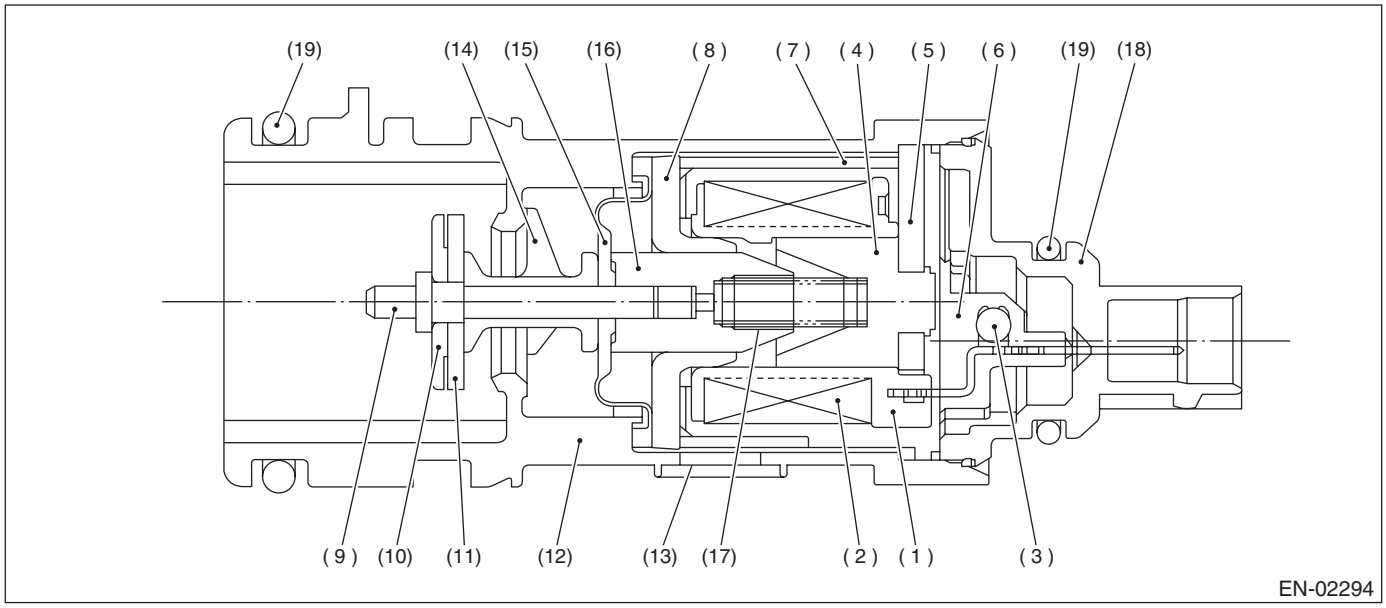
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BB: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 completing the malfunction criteria below becomes more than 2.5 seconds.

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 CONDITION

- 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

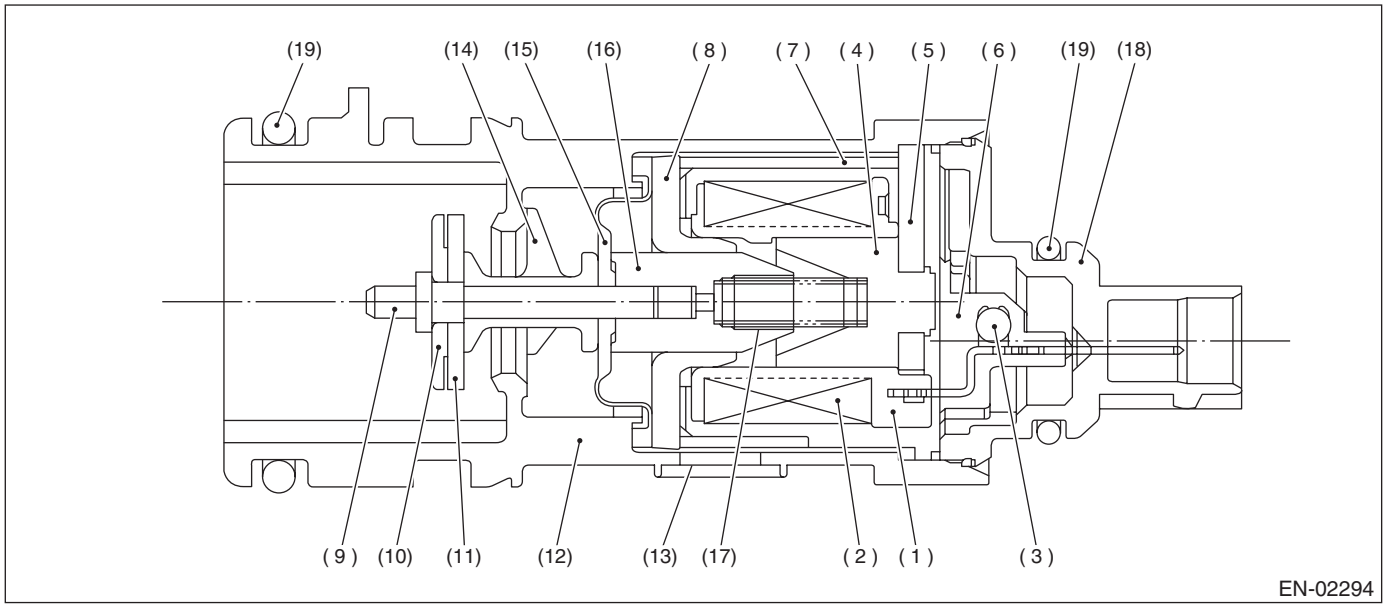
Memorize the freeze frame data. (For test mode $02)

BC: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 completing the malfunction criteria below becomes more than 2.5 seconds.

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 CONDITION

- 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

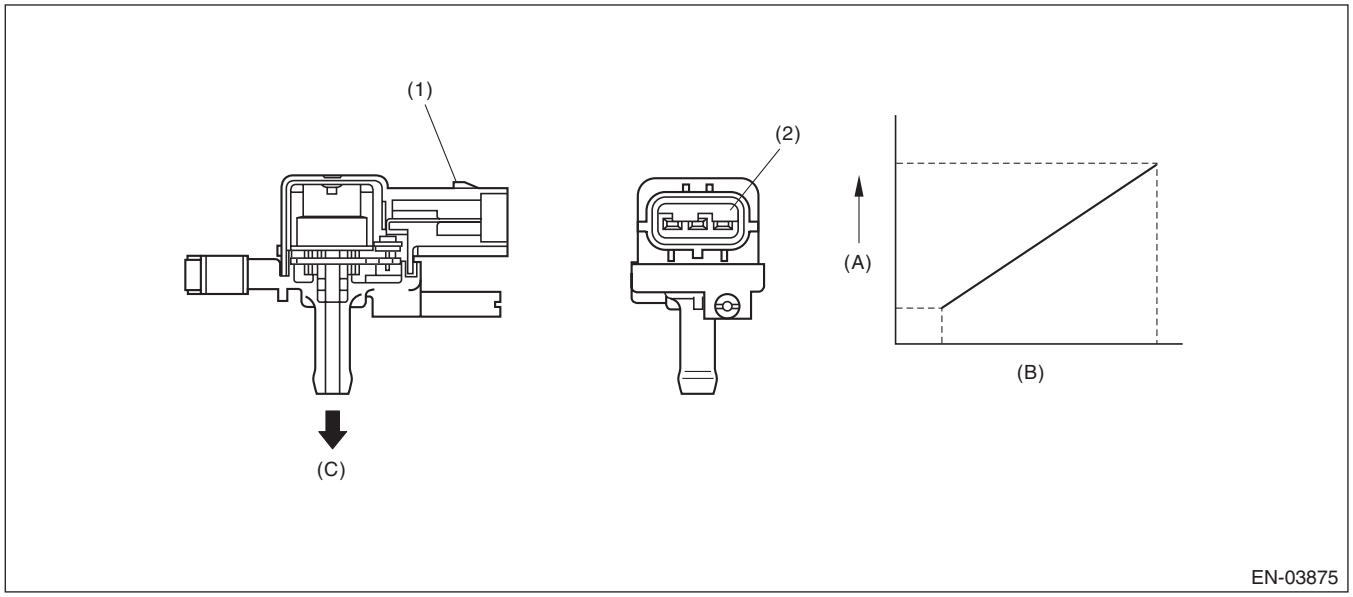
Memorize the freeze frame data. (For test mode $02)

BD: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) Terminal
(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 (2.54 US gal, 2.11 Imp gal)
Fuel temperature	< 35°C (95°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine speed	< 6500 rpm
Purge control solenoid valve ON/OFF	Experienced

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 when the malfunction 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 (0.53 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 every seconds is less than 5 liters, extend 60 seconds 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 more than 5 ℓ, the diagnosis counter counts up.
Time Needed for Diagnosis: 1 minute × 16 times or more
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
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 CONDITION

- 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

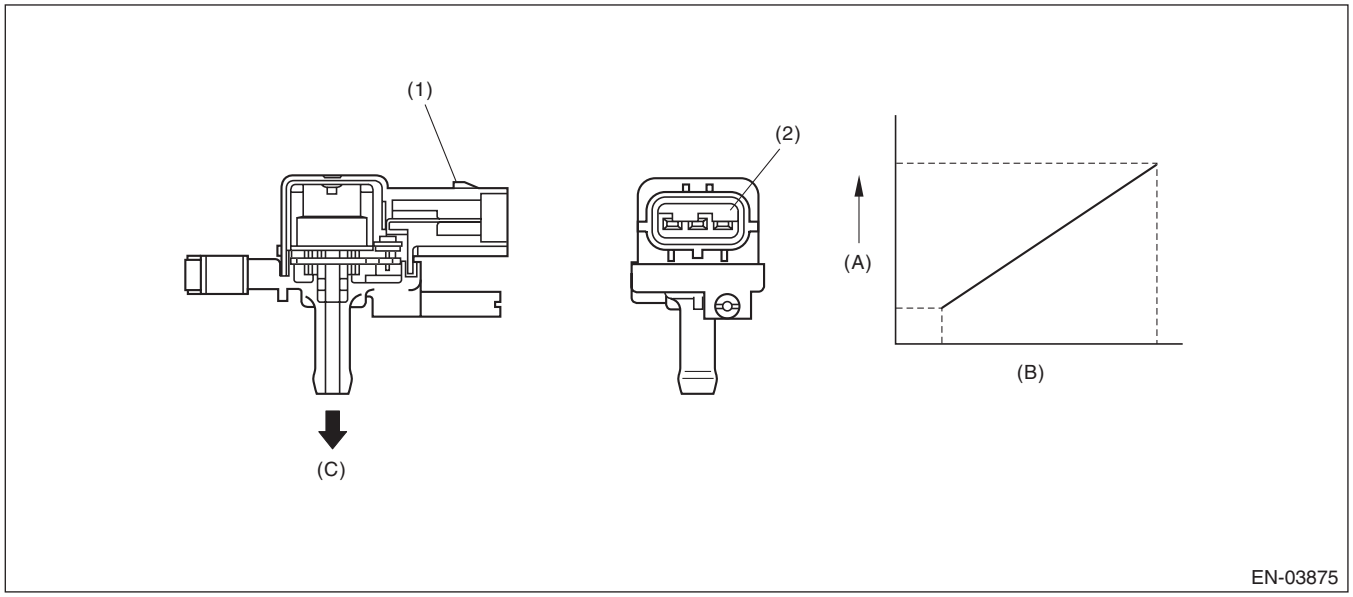
Memorize the freeze frame data. (For test mode $02)

BE: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 it is out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank

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 when the continuous time of completing the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< –7.45 kPa (–55.86 mmHg, –2.20 inHg)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ –7.33 kPa (–55 mmHg, –2.17 inHg)
Feedback lambda coefficient	≥ 0.9

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 CONDITION

- 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

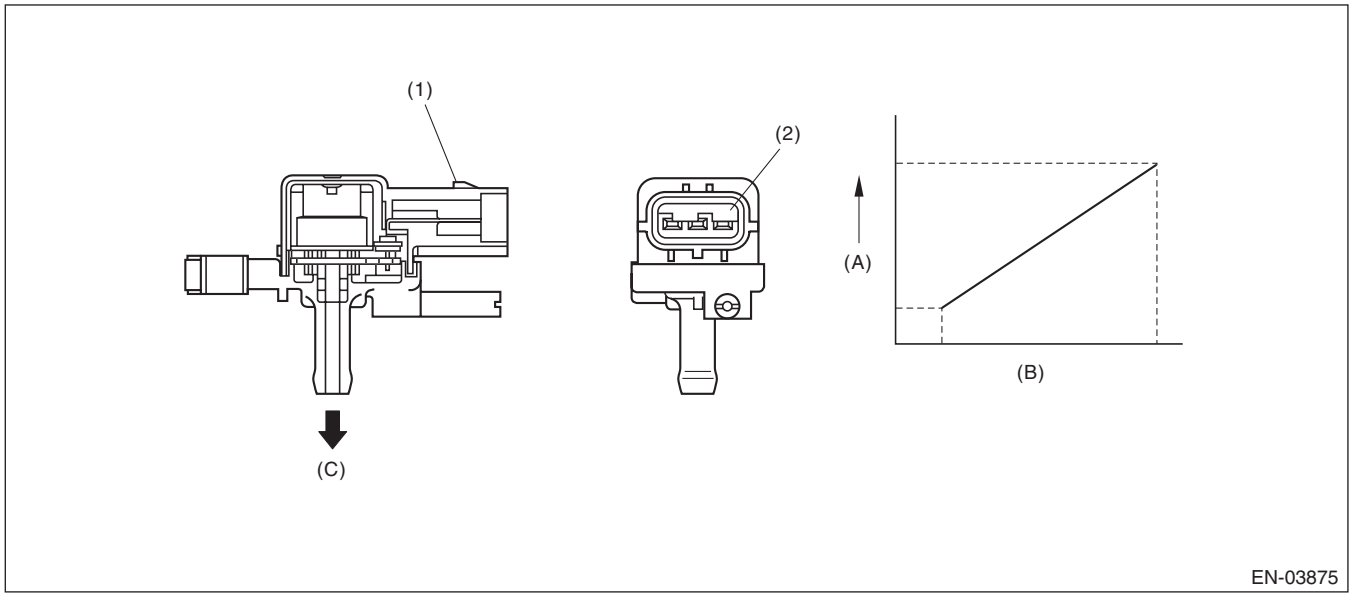
Memorize the freeze frame data. (For test mode $02)

BF: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 it is out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(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 density	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continually when purging.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of completing 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)
Atmospheric 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 when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 7.33 kPa (55 mmHg, 2.17 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 CONDITION

- 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)

BG: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(H4DOTC)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

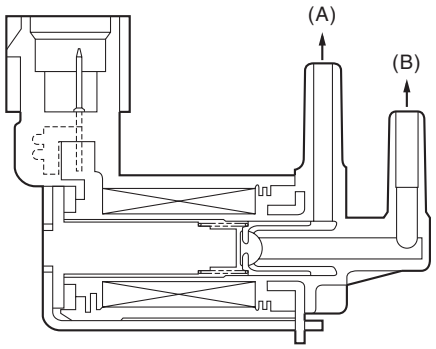
For the detection standard, refer to DTC P0442 Evaporative system (Small leak).
<Ref. to GD(H4DOTC)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BI: 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



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(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 malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 sec.
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 CONDITION

- 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

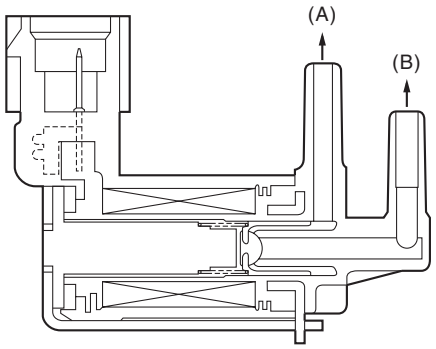
Memorize the freeze frame data. (For test mode $02)

BJ: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-01733

(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 malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 sec.
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 CONDITION

- 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

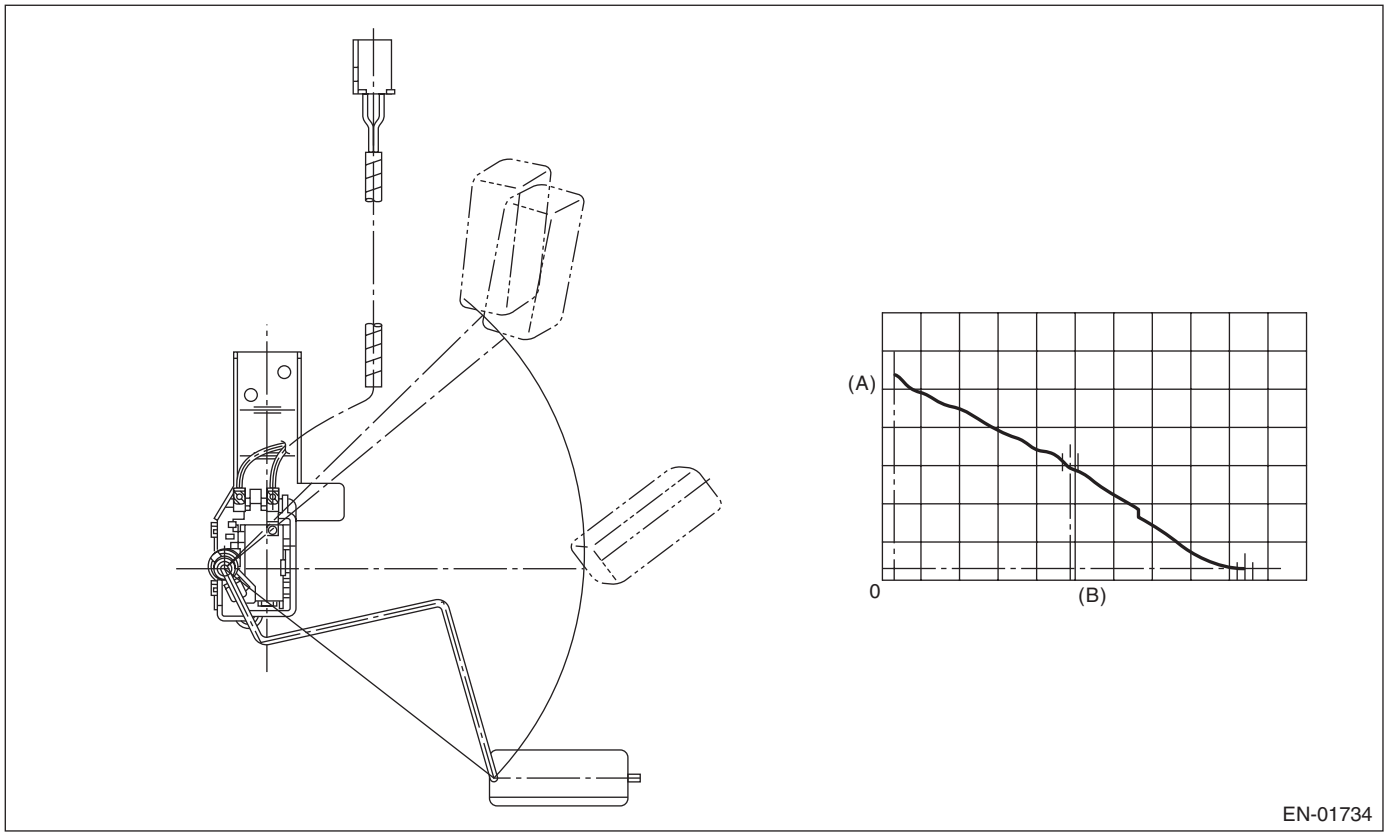
Memorize the freeze frame data. (For test mode $02)

BK: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 (L) (B) Resistance (Ω)

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 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
Engine speed	< 6500 rpm
After engine starting	10 seconds or more

Time Needed for Diagnosis: Undecided
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	10 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 CONDITION

- 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

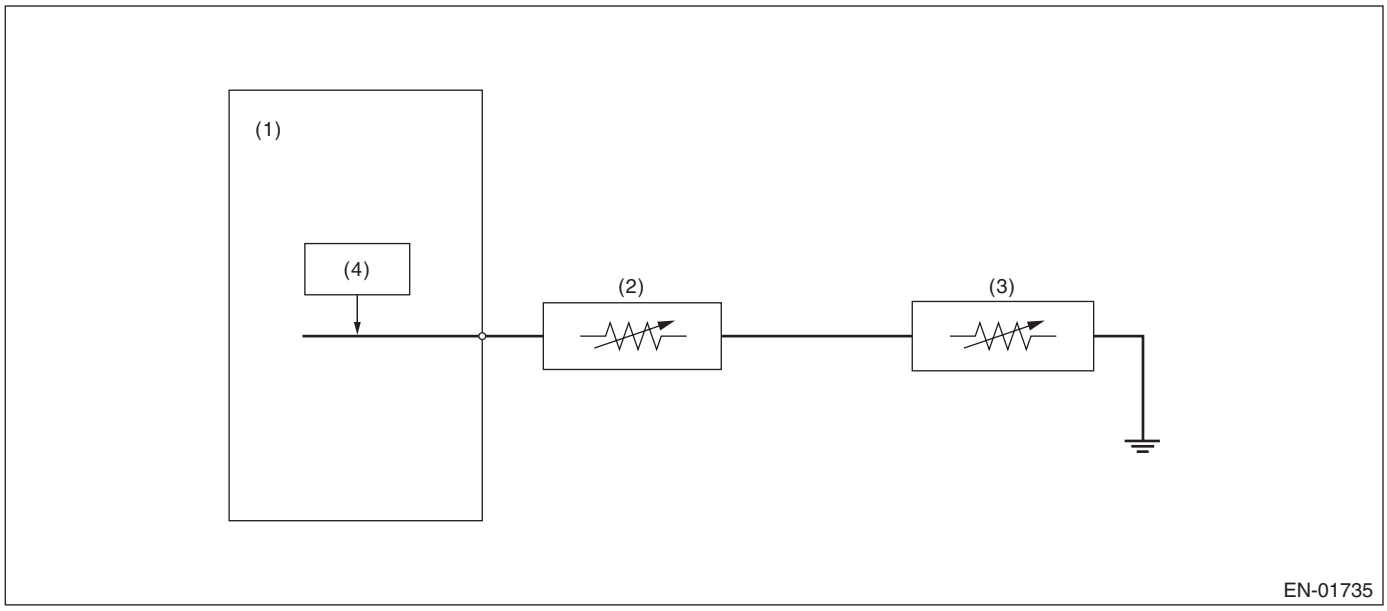
Memorize the freeze frame data. (For test mode $02)

BL: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 it is out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

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 completing the malfunction criteria below becomes more than time needed 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	< 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 CONDITION

- 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

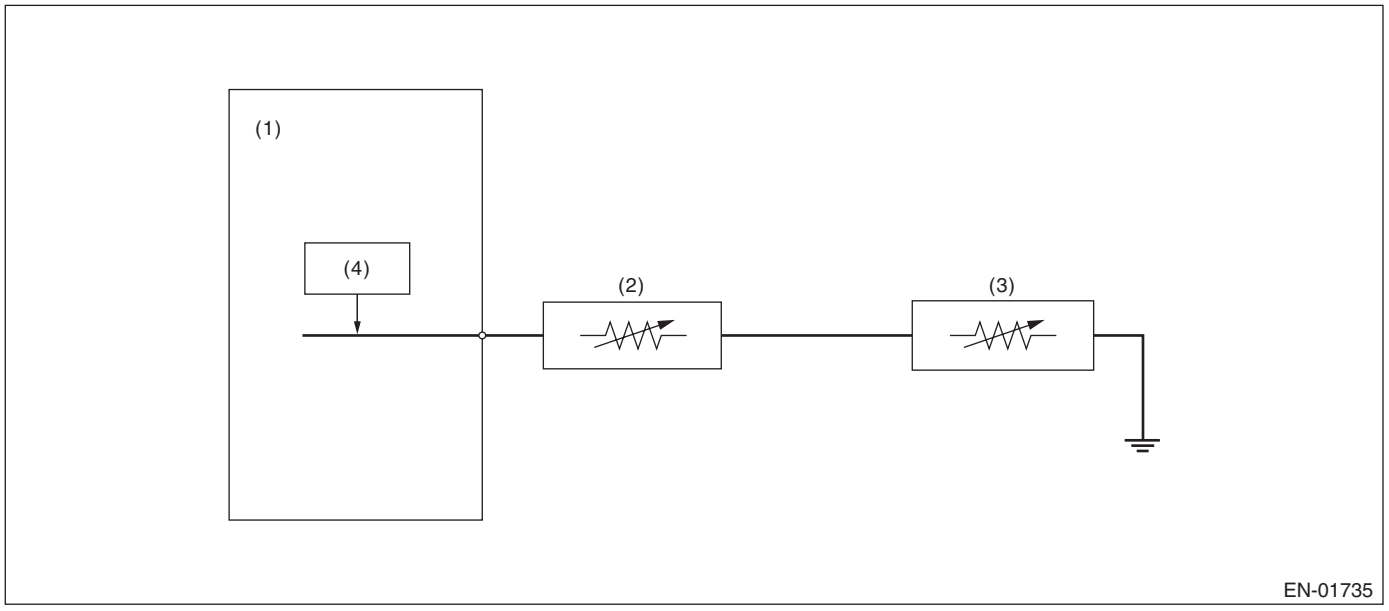
Memorize the freeze frame data. (For test mode $02)

BM: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 it is out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

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 completing the malfunction criteria below exceeds the time required for diagnosis (1 second).

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 CONDITION

- 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)

BN: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

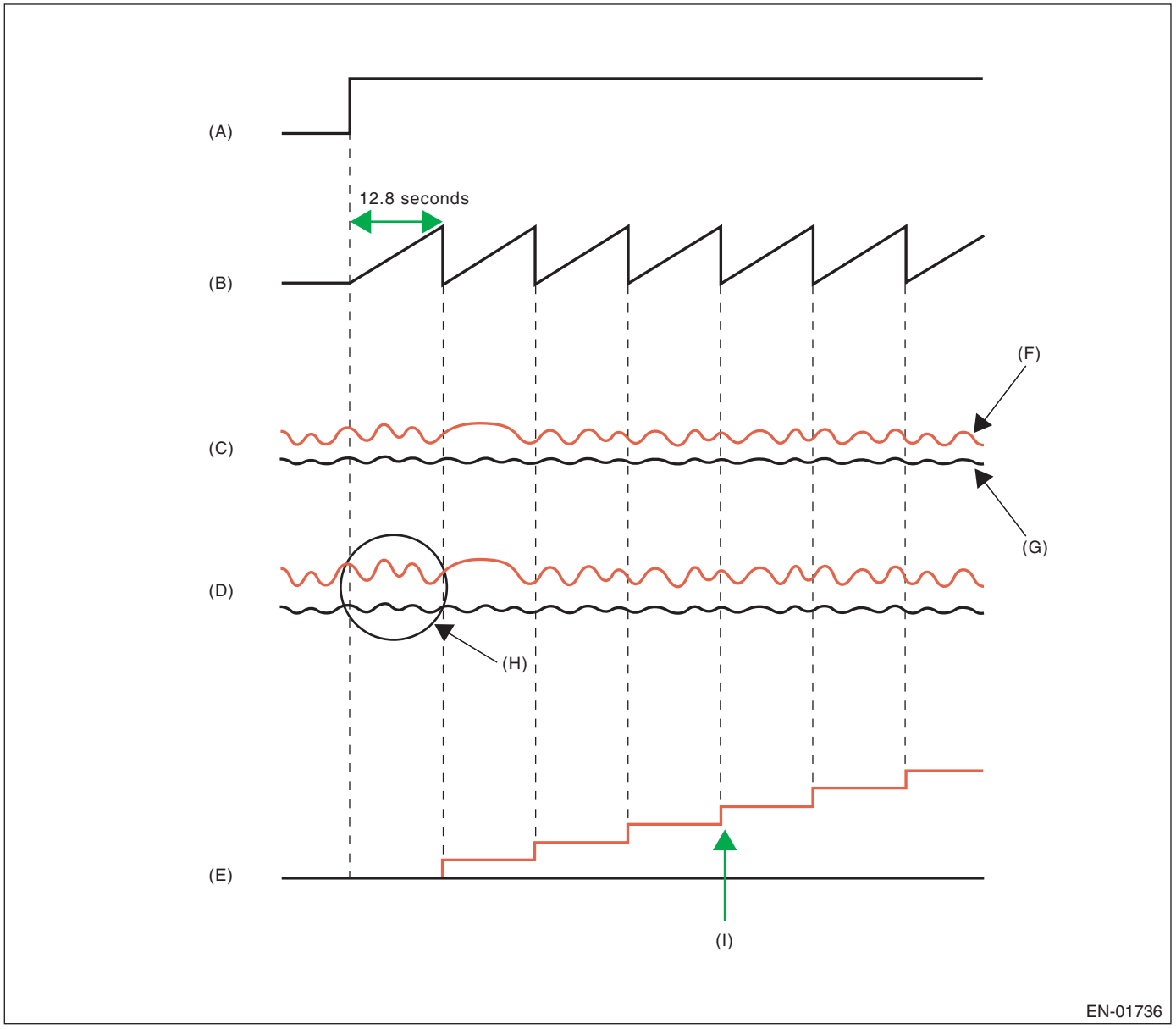
Malfunction Criteria	Threshold Value
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9.6 ←→ 54.4 ℓ (2.54 ←→ 14.37 US gal, 2.11 ←→ 11.97 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

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 12.8 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 6 counts.



(A) Diagnosis condition
(B) Diagnosis period
(C) Fuel level sensor at idle
(D) Amount of fuel level output voltage variation
(E) Diagnosis counter
(F) Abnormal
(G) Normal
(H) Calculate the Max. value (delvfmx) and the cumulative value (sumvfl)
(I) NG at 4 counts

• **Abnormality Judgment**

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX ≥ 0.609 V or SUMFL ≥ 25.92 V At this time DELFLMAX is Max. deviation of sensor output during 12.8 seconds SUMFL: Integrated value of sensor output deviation in 12.8 seconds	≥ 4 times

The diagnosis counter does not count up when the following conditions are completed within 12.8 seconds.

Maximum value – minimum value of change of tank pressure during 12.8 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Maximum value – minimum value of battery voltage during 12.8 seconds	≥ 0.4 V

Time Needed for Diagnosis: 12.8 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	< 0.609 V
SUMFL	< 25.92 V
At this time DELFLMAX is Max. deviation of sensor output during 12.8 seconds SUMFL: Integrated value of sensor output deviation in 12.8 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 CONDITION

- 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 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	0 km/h (0 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when idling.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 98°C (208°F)
Radiator fan	OFF → ON
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
Radiator fan	OFF → ON
Engine coolant temperature	Decreased

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 CONDITION

- 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)

BP:DTC P0500 VEHICLE SPEED SENSOR “A”

1. OUTLINE OF DIAGNOSIS

Judge as NG when outside of the possible range.
Judge as NG when the data received from the ABS control module and hydraulic control module are at erroneous vehicle speeds, and if the vehicle speed of the data is impossible.

2. COMPONENT DESCRIPTION

Vehicle speed signals are taken in to the ABS control module and hydraulic control unit, and normal/erroneous data of the ABS wheel speed sensor is received by CAN communication from the ABS control module and hydraulic control unit.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after engine starting	≥ 2 sec.

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 completing the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Front ABS wheel speed sensor status	Abnormal
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 CONDITION

- 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
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BQ: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	≥ 10.9V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda value	0.9 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After intake manifold pressure changes more than 4kPa (30 mmHg, 1.2 inHg).	> 5 sec.
After neutral switch ON/OFF change	> 5.1 sec.
Vehicle speed	0 km/h (0 MPH)
Throttle opening angle	< 0.25°

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 completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

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 CONDITION

- 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)

BR: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	≥ 10.9V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda value	0.9 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After intake manifold pressure changes more than 4kPa (30 mmHg, 1.2 inHg).	> 5 sec.
After neutral switch ON/OFF change	> 5 sec.
Vehicle speed	0 km/h (0 MPH)
Throttle opening angle	< 0.25°

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 completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

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 CONDITION

- 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)

BS: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.
Judge as OFF NG when the engine starts without starter 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 ON NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

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 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 CONDITION

- 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)

BT: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 of the diagnosis outline above are established.

BU:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in 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

• Abnormality Judgment

Judge as NG when the continuous time of completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – Targeted engine speed	≥ 1000 rpm
Feedback value for ISC	≤ 0
Engine speed change every 180 degree engine rev.	≥ –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 completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

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 CONDITION

- 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

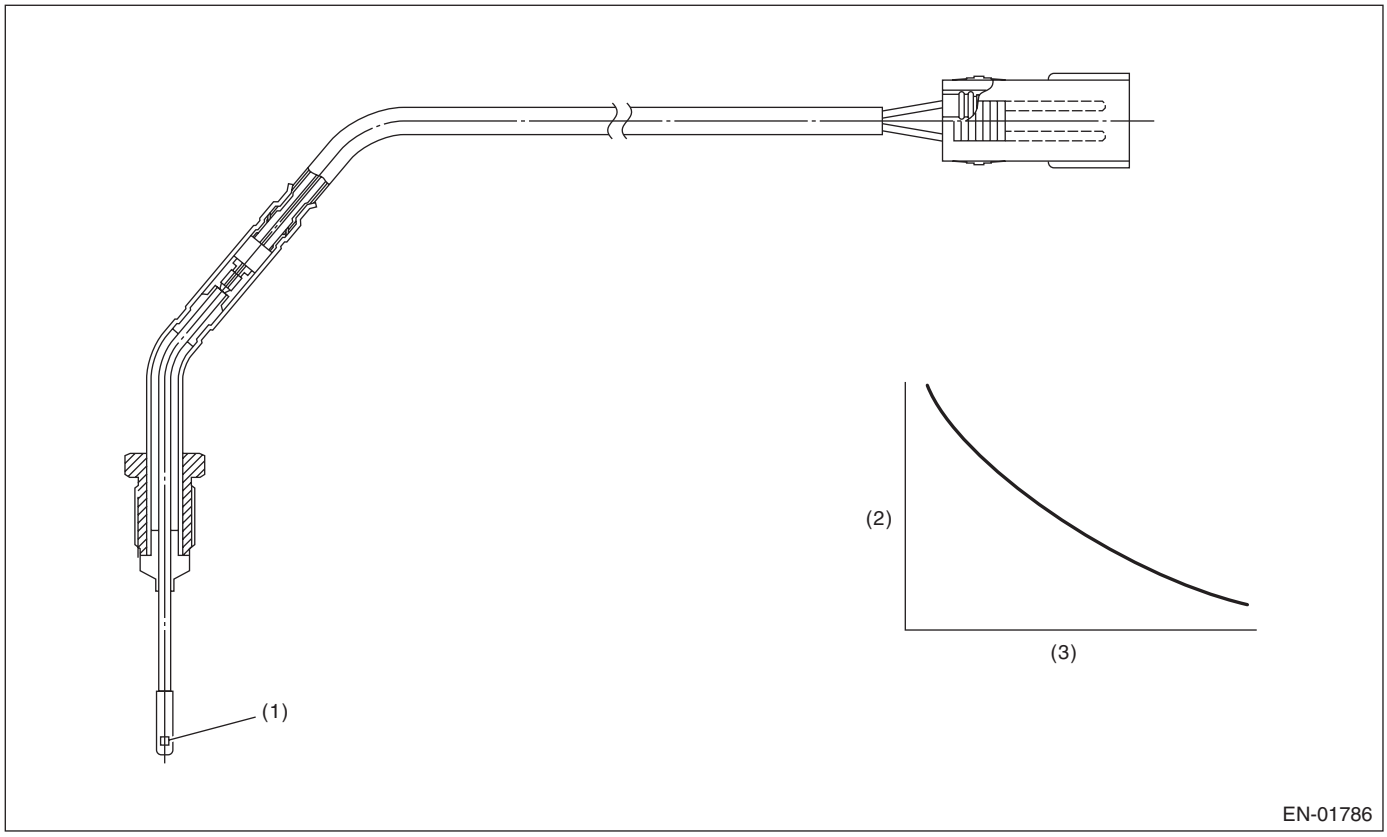
Memorize the freeze frame data. (For test mode $02)

BV:DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the exhaust temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Thermistor (2) Resistance value (kΩ) (3) Exhaust 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 completing the malfunction criteria below becomes more than time needed for diagnosis (5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Sensor output voltage	< 0.15 V
Amount of intake air	< 100 g (3.53 oz)/s

Time Needed for Diagnosis: 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
Sensor output voltage	≥ 0.15 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 CONDITION

- 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

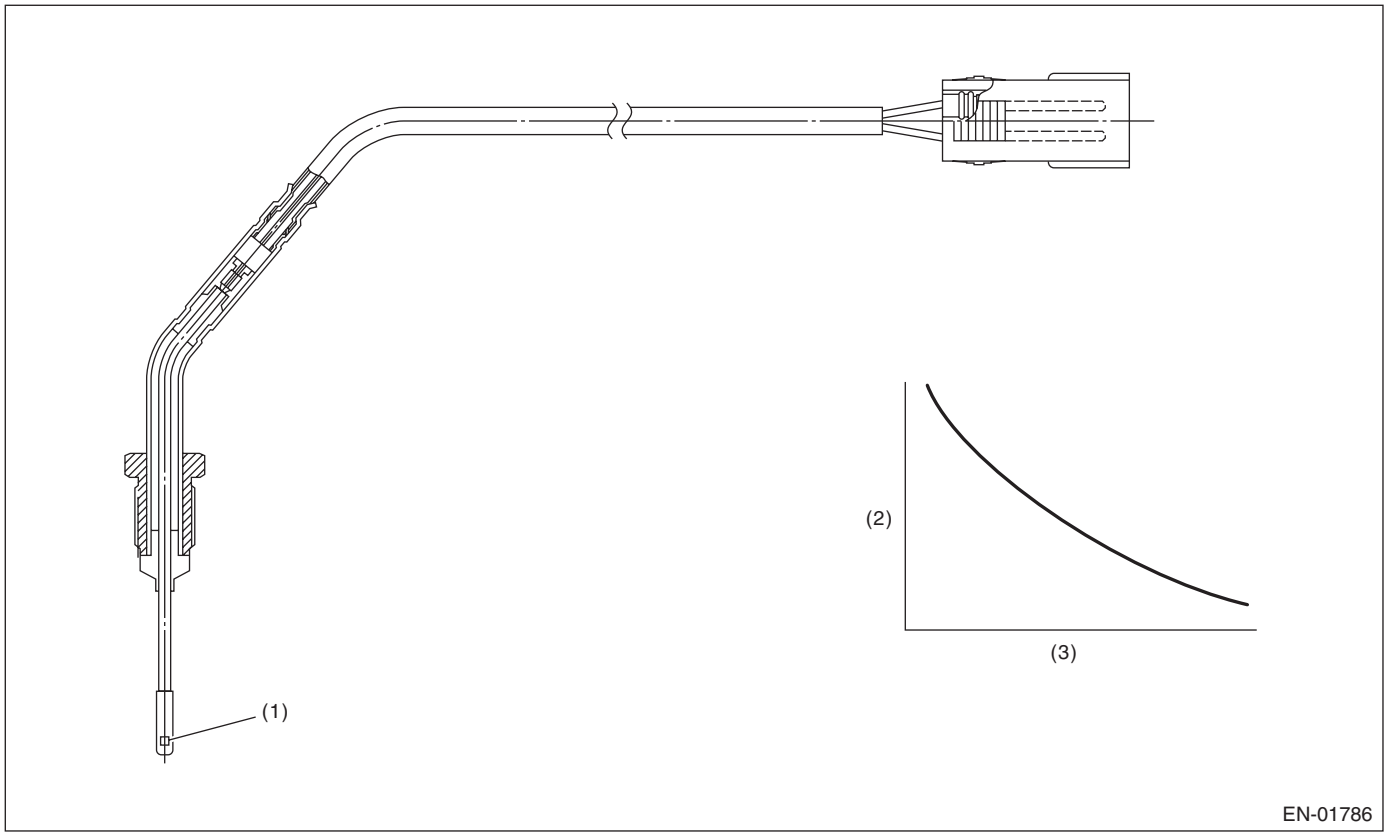
Memorize the freeze frame data. (For test mode $02)

BW:DTC P0546 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the exhaust temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Thermistor (2) Resistance value (kΩ) (3) Exhaust 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 accumulative time of completing the malfunction criteria below exceeds the time required for diagnosis (30 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	240 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 65 km/h (40.4 MPH)
Engine speed	≥ 1800 rpm
Engine load (gn)	≥ 0.6 g (0.021 oz)/rev
Fuel cut	Not in operation
After the recovery from fuel cut event	30 seconds or more
Sensor output voltage	≥ 4.72 V

Time Needed for Diagnosis: 30 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
Sensor output voltage	< 4.72 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 CONDITION

- 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)

BX:DTC P0600 SERIAL COMMUNICATION LINK

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.
When CAN communications is not possible, and CAN communications with body integrated unit is not possible, judge as NG if data from the body integrated unit is not normal.

2. COMPONENT DESCRIPTION

ECM and body integrated unit are connected by high speed CAN.
(Common Specifications)
CAN Protocol 2.0 B (Active)
Frame Format: 11 Bit ID Frame (Standard Frame)
(High speed CAN)
Conforms to ISO11898
Communication Speed: 500 kbps

3. ENABLE 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 either of the following conditions are established, it is judged NG.
Judge as OK and clear the NG when the continuous time when all of the following criteria are established is more than the predetermined time (1 s).

Judgment Value

Malfunction Criteria	Threshold Value
bus off flag or 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 time
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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Accelerator pedal position sensor request target throttle opening calculation: AT protection torque guard is normally obtained from CAN communication. Preset value is 408 N·m (42 kg-fm, 301 ft-lb).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BY: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 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 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: 100 milliseconds
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 CONDITION

- 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)

BZ: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 when the continuous time of completing the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Specification

Time Needed for Diagnosis: Undecided
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 CONDITION

- 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 control throttle motor. (Throttle opening is fixed to 6°.)

8. ECM OPERATION AT DTC SETTING

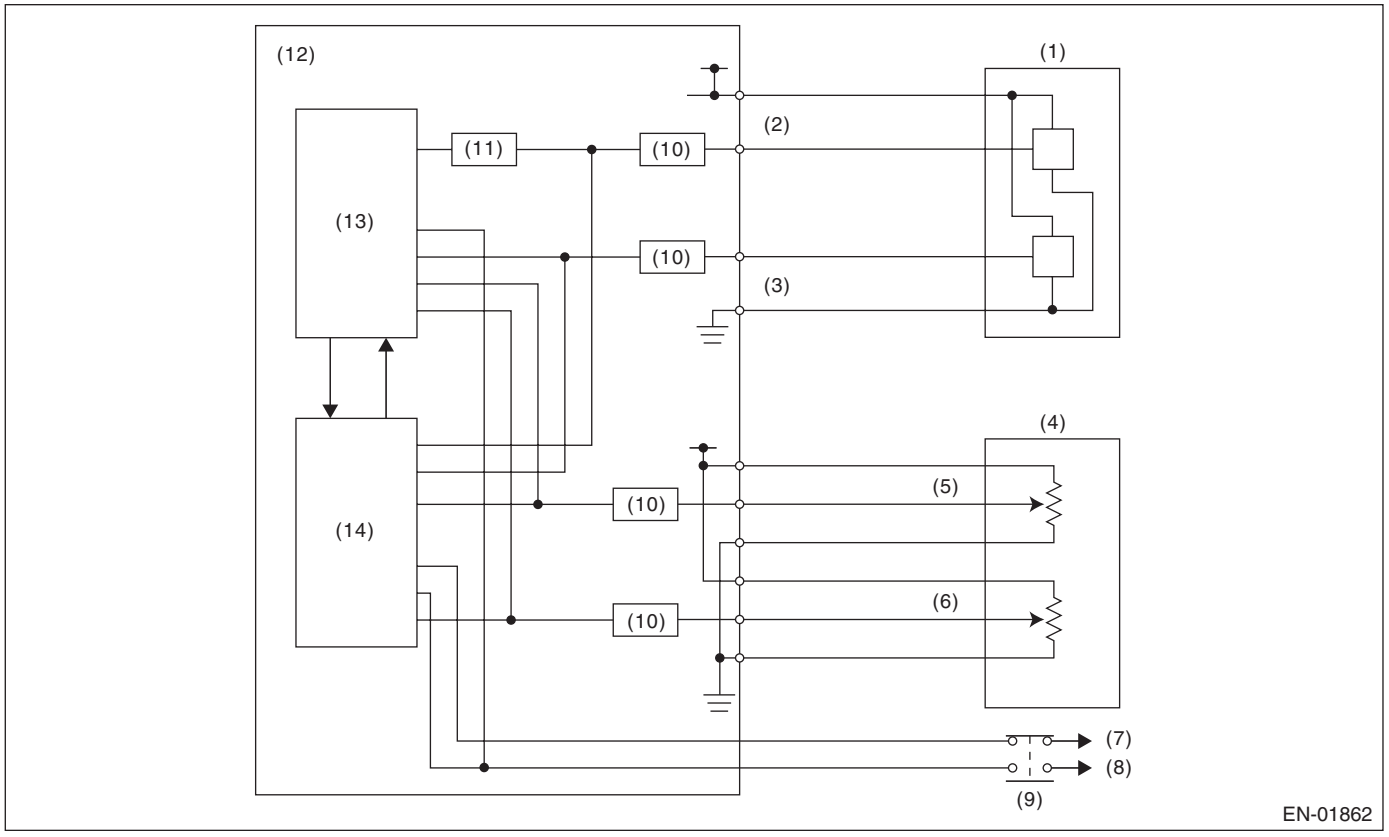
Memorize the freeze frame data. (For test mode $02)

CA:DTC P0607 CONTROL MODULE PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when either the following is completed.
- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU ←→ sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from the main CPU is abnormal.

2. COMPONENT DESCRIPTION



(1)	Throttle position sensor	(6)	Accelerator pedal position sensor 2	(11)	Amplifier circuit
(2)	Throttle position sensor 1	(7)	Battery	(12)	Engine control module (ECM)
(3)	Throttle position sensor 2	(8)	Stop light	(13)	Sub CPU
(4)	Accelerator pedal position sensor	(9)	Brake switch	(14)	Main CPU
(5)	Accelerator pedal position sensor 1	(10)	I/F circuit		

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Ignition switch	ON
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	
(6) Brake switch (only with cruise control)	ON
(7) None	—
(8) Cruise control	OFF

4. GENERAL DRIVING CYCLE

(1) — (4): Always perform the diagnosis continuously.
(5): Always perform the diagnosis continuously when idling.
(6): Perform the diagnosis when the brake pedal is depressed.
(7): Always perform the diagnosis continuously.
(8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU reading value of the throttle position sensor signal	Within 0.116 V
(2) Difference of CPU read value of the accelerator position sensor signal	Within 0.615 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	Within X 4 ±0.56 V
(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
(8) Throttle opening angle directing value	Within the opening angle +3.4° which calculated from accelerator opening angle coefficient

Time Needed for Diagnosis:
1. 200 milliseconds
2. 250 milliseconds
3. 200 milliseconds
4. 200 milliseconds
5. 24 milliseconds
6. 250 milliseconds
7. 200 milliseconds
8. 250 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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- 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 control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

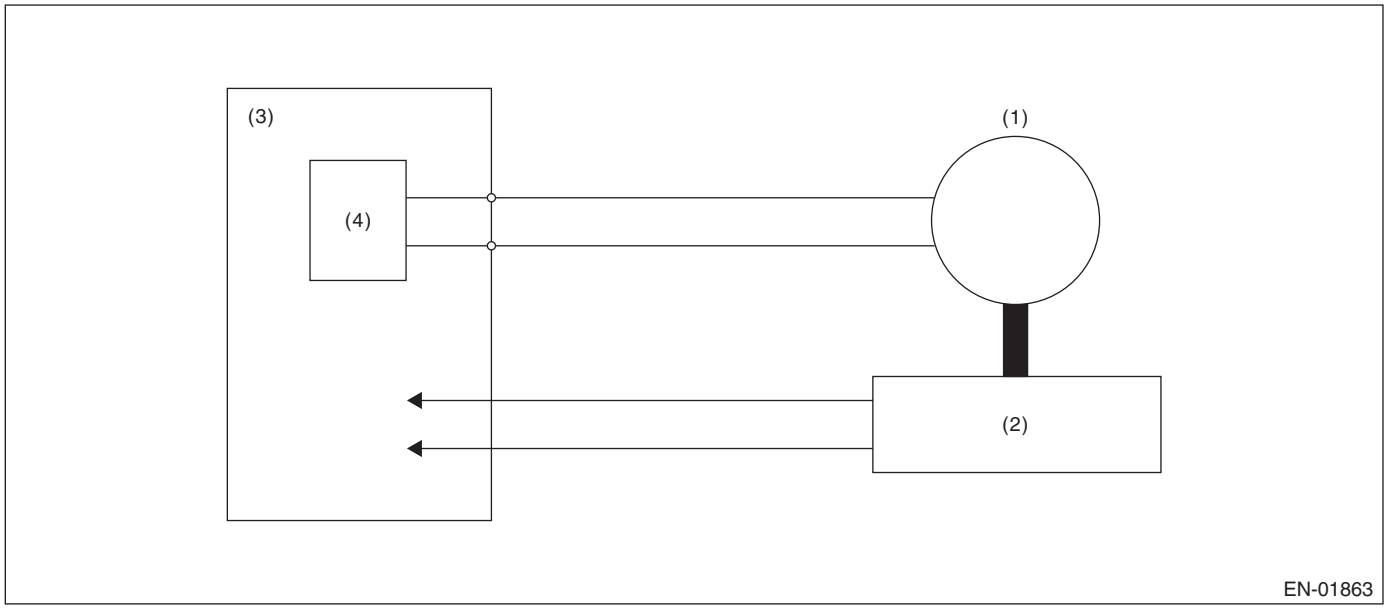
Memorize the freeze frame data. (For test mode $02)

CB: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 more than specified duty 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 electric throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electric throttle control is operating.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

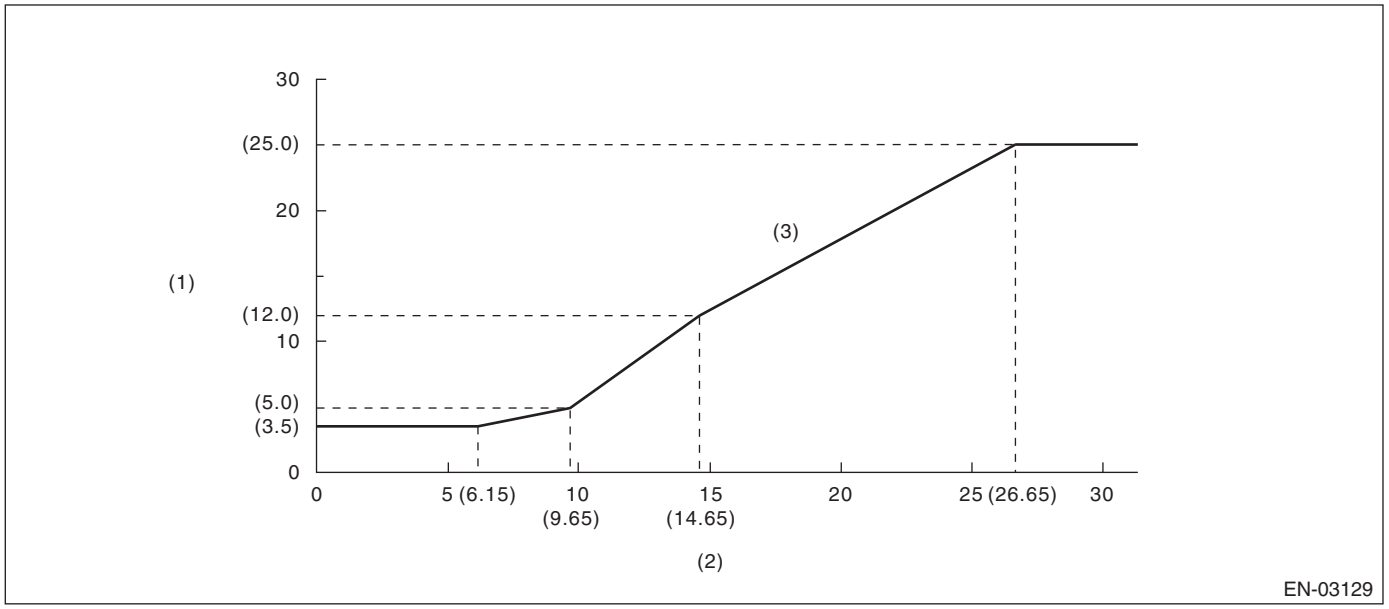
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	3.5° or less
Output duty to drive circuit	95% or less

Time Needed for Diagnosis:

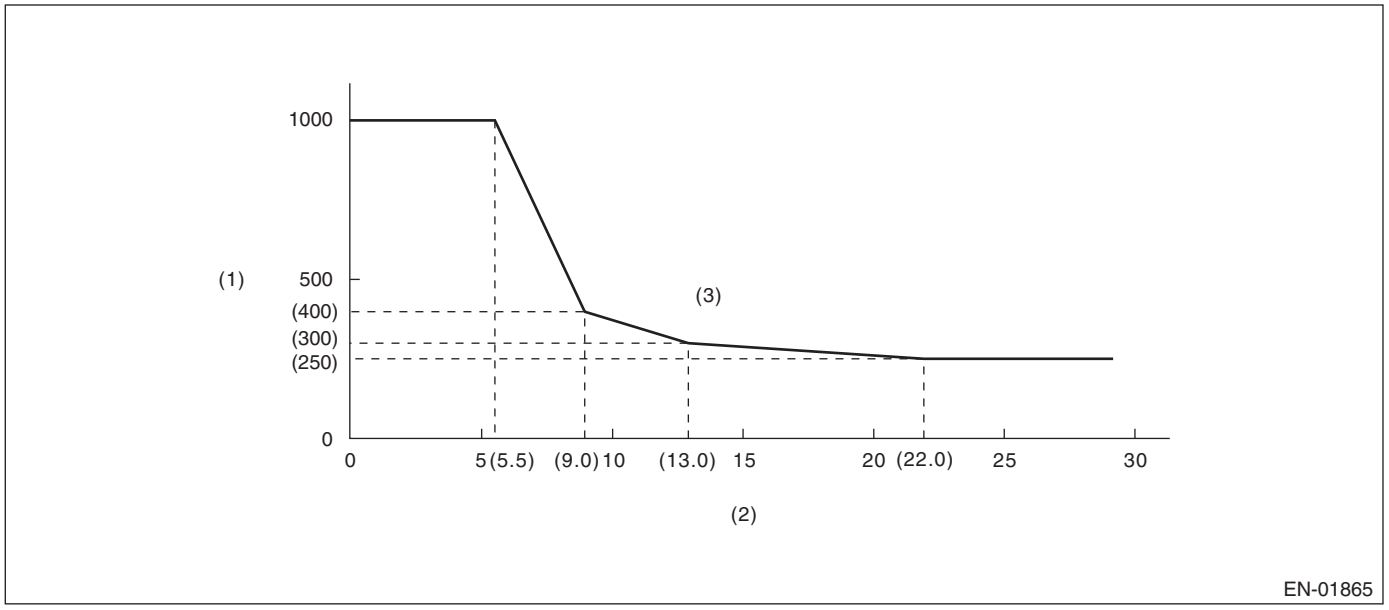
- Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
- Output duty to drive circuit: 2000 milliseconds

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 (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 CONDITION

- 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 control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CC: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
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs OFF signal	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
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs OFF signal	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 CONDITION

- 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)

CD: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
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs ON signal	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
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs ON signal	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 CONDITION

- 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)

CE: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 when the following conditions are established is longer than the predetermined amount of time (2.5 seconds).
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 CONDITION

- 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)

CF:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge as NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 6.5 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “OFF” and any other switches = “ON” on AT	LOW (ON)

Time Needed for Diagnosis: 6.5 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 CONDITION

- 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)

CG:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge as NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	Low (OFF) continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (40 MPH) & engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring
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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CH:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge as NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time until meeting the malfunction criteria below becomes more than 6.5 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “ON” and any other switches = “OFF” on AT	HIGH (OFF)

Time Needed for Diagnosis: 6.5 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 CONDITION

- 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)

CI: DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge as NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	HIGH (ON) continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (40 MPH) & engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring
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 CONDITION

- 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

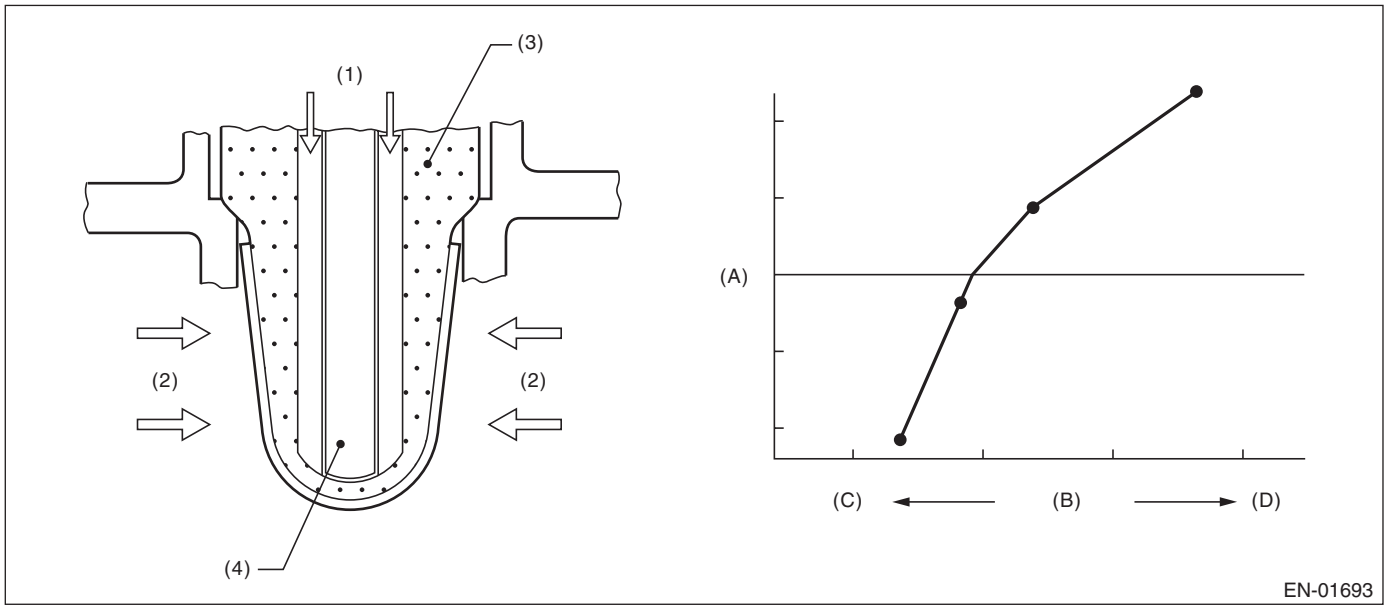
Memorize the freeze frame data. (For test mode $02)

CJ:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains low.
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.
λ value = Actual air fuel ratio/Theoretical air fuel ratio
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(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
Atmospheric 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	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine revs.	≤ 0.01 g (0.0003 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

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more, from 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen sensor (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

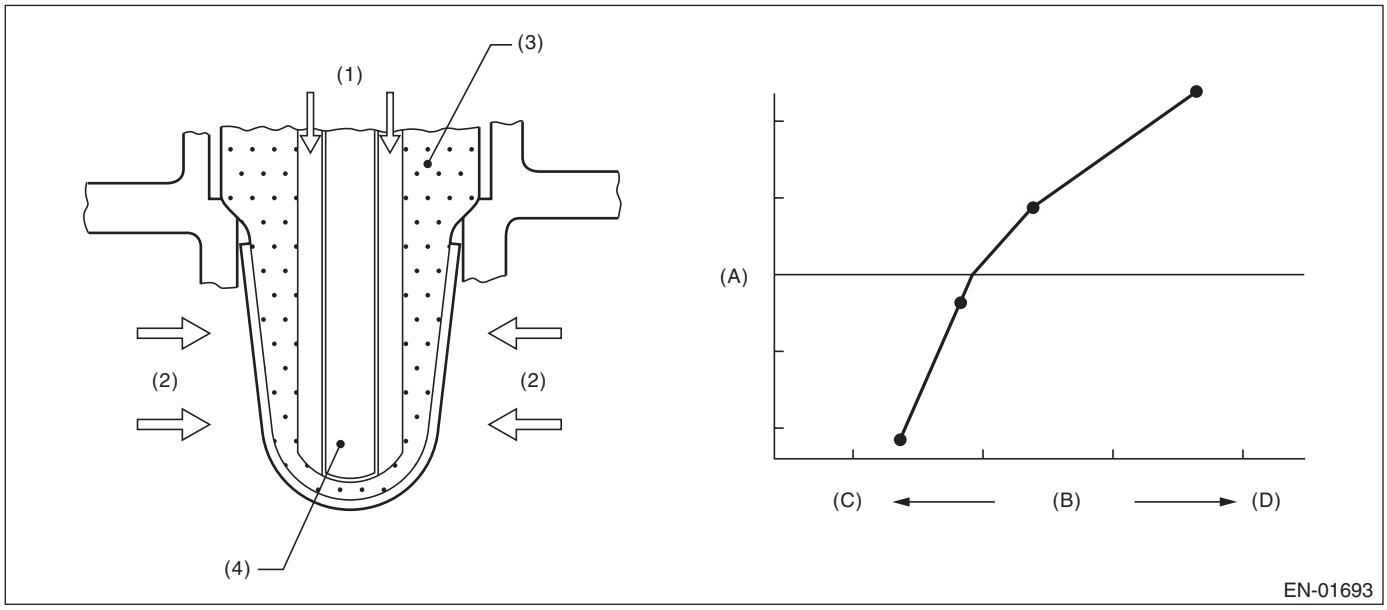
Memorize the freeze frame data. (For test mode $02)

CK:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains high.
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.
λ value = Actual air fuel ratio/Theoretical air fuel ratio
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(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
Atmospheric 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	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine revs.	≤ 0.01 g (0.0003 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

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant vehicle speed of 20 km/h (12 MPH) or more, from 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen sensor (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

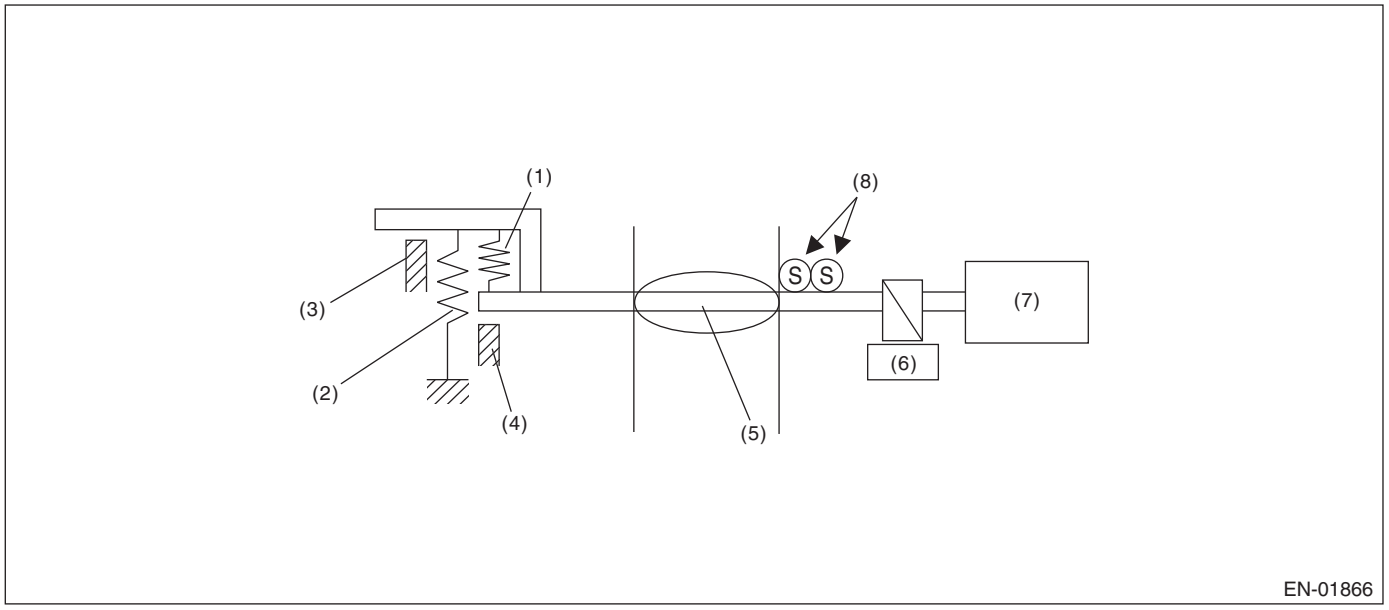
Memorize the freeze frame data. (For test mode $02)

CL: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 completing the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	< 2°

Time Needed for Diagnosis: 600 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 CONDITION

- 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)

CM:DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS)

1. OUTLINE OF DIAGNOSIS

Detect the presence of misfire occurrence. (Exhaust temperature method)
Judge as NG when the exhaust temperature is high.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time for keep completing all secondary parameters	1 second or more
Intake manifold pressure change during 0.5 engine revs.	< 16.0 kPa (120 mmHg, 4.72 inHg) (MT) < 14.7 kPa (110 mmHg, 4.33 inHg) (AT)
Engine speed change	< 1000 rpm/32 milli-seconds
Throttle position change during 16 milli-seconds	< 14°
Fuel shut-off function	Not in operation
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Evaporative system leak check	Not in operation
Engine speed	450 — 6700 rpm
Intake manifold pressure	> Value of map 3 or more
Battery voltage	≥ 8 V

Map 3

- MT

Vehicle speed < 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.1 (188, 7.40)	24.8 (186, 7.32)	25.6 (192, 7.56)	23.3 (175, 6.89)	26.3 (197, 7.76)	25.9 (194, 7.64)	28.9 (216.5, 8.52)	30.0 (225, 8.86)	31.7 (237.5, 9.35)	33.0 (248, 9.76)	37.1 (278.5, 11.0)	41.9 (314, 12.4)	47.0 (352.5, 13.9)	51.1 (383, 15.1)

Vehicle speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.5 (191, 7.52)	25.1 (188, 7.40)	30.4 (227.7, 8.96)	35.6 (267.4, 10.5)	38.5 (288.9, 11.4)	40.4 (302.9, 11.9)	41.1 (308.6, 12.1)	40.8 (306, 12.0)	44.8 (335.8, 13.2)	47.3 (354.5, 14.0)	49.1 (368.2, 14.5)	50.9 (381.9, 15.0)	52.8 (396, 15.6)	52.8 (396, 15.6)

- AT

Vehicle speed < 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	26.3 (197, 7.76)	24.8 (186, 7.32)	23.6 (177, 6.97)	25.5 (191, 7.52)	27.3 (205, 8.07)	26.1 (196, 7.72)	29.5 (221.5, 8.72)	31.3 (235, 9.25)	32.7 (245.5, 9.67)	34.1 (256, 10.08)	38.2 (286.5, 11.3)	33.6 (252.3, 9.93)	49.5 (371.5, 14.62)	51.5 (386, 15.20)

3. GENERAL DRIVING CYCLE

- If conditions are met, detect misfire from idling to high rotation.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge as NG when the following malfunction criteria continues for 200 engine revolutions (400 ignitions) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Exhaust temperature	> 1050°C (1922°F)

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 CONDITION

- 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)

CN:DTC P1312 EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of exhaust temperature sensor.
Judge NG when the exhaust temperature remains high or low whereas it seemed to vary from the viewpoint of driving condition.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	240 seconds or more
Coolant temp. at engine start	≤ 40°C (104°F)
Engine coolant temperature	≥ 75°C (167°F)
Intake ait temperature at engine start	≥ 0°C (32°F)
Estimate ambient temperature	≥ 0°C (32°F)
Vehicle speed	65 km/h (40 MPH)
Engine speed	≥ 2400 rpm
Engine load (gn)	≥ 0.85 g (0.030 oz)/rev
Lambda value	0.75 ←→ 1.25

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at more than 2400 rpm of engine speed in 240 seconds and more after starting the engine in cool condition.
Pay attention to the engine coolant temperature at engine starting.

4. DIAGNOSTIC METHOD

Judge as NG when one of the malfunction criteria below is completed. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Min. exhaust temperature from engine starting	≥ 700°C (1292°F)
Max. exhaust temperature from engine starting	< 500°C (932°F)

Time Needed for Diagnosis: 0 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 CONDITION

- 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

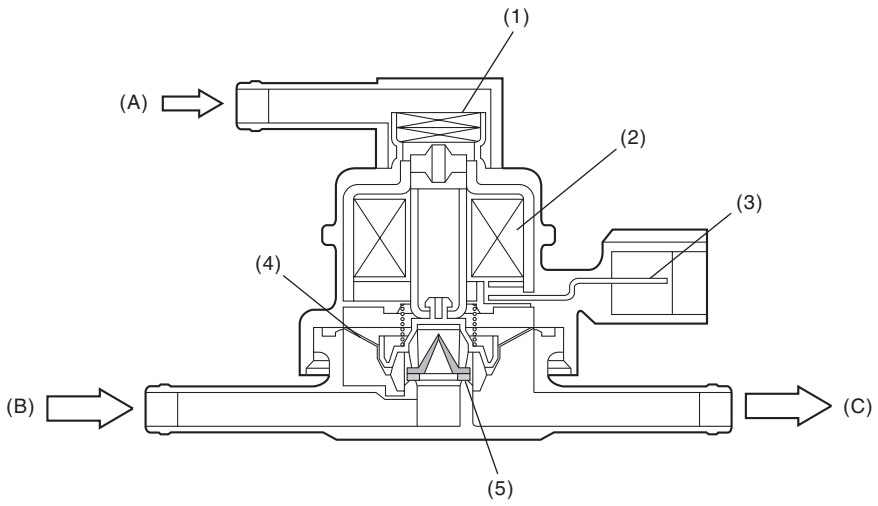
Memorize the freeze frame data. (For test mode $02)

CO: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) Atmospheric 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 completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). 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 CONDITION

- 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

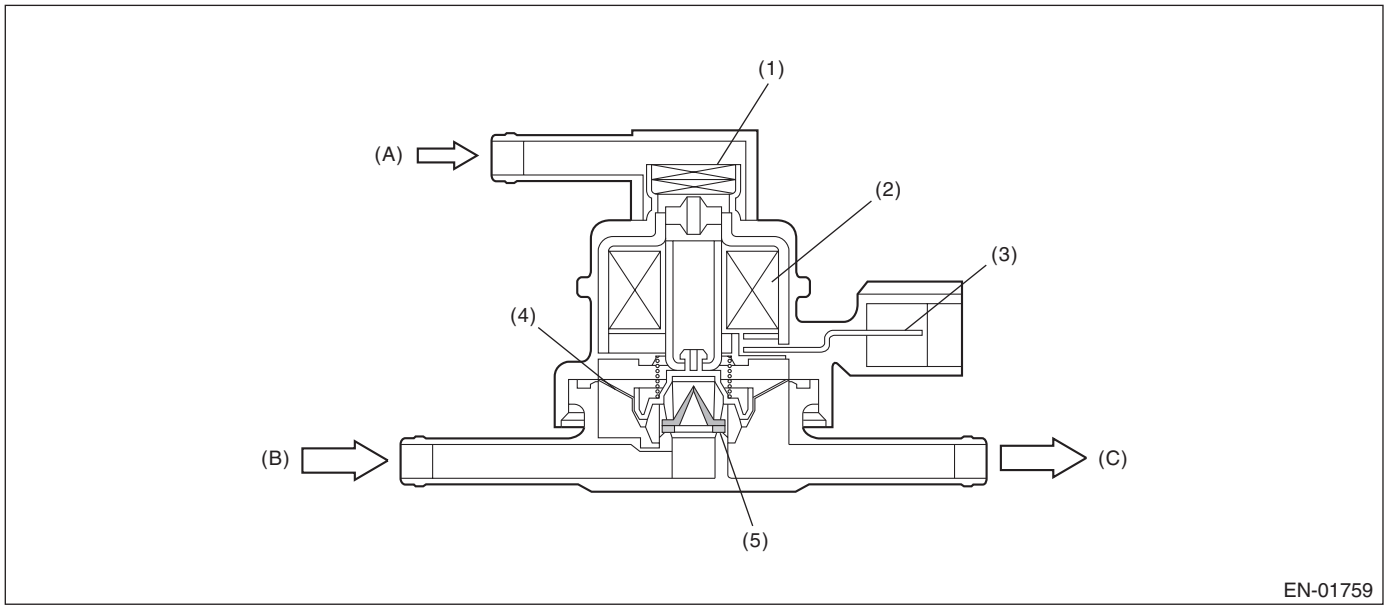
Memorize the freeze frame data. (For test mode $02)

CP:DTC 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) Atmospheric 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 completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). 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 CONDITION

- 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

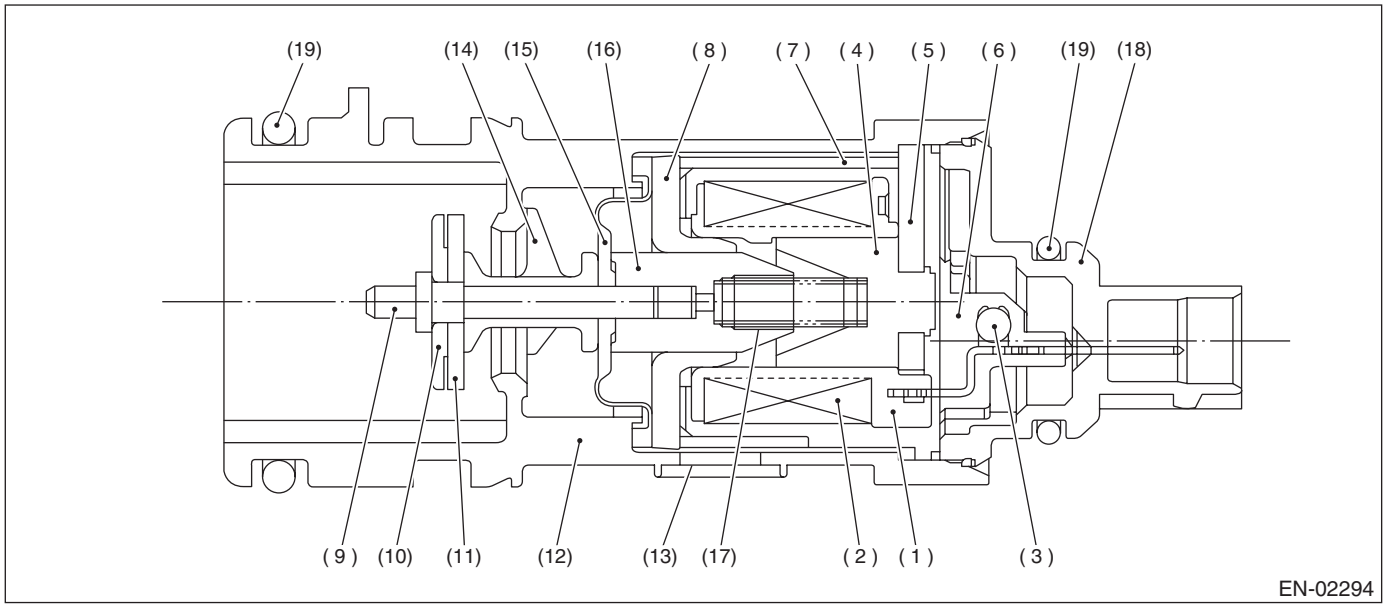
Memorize the freeze frame data. (For test mode $02)

CQ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the abnormal function (stuck closed) of the drain valve.
Judge as NG when fuel tank pressure is low.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Drain valve	Open
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.17 inHg)
Tank pressure when starter is OFF → ON	–0.43 ←→ 1.43 kPa (–3.2 ←→ 10.7 mmHg, –0.13 ←→ 0.42 inHg)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
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
Tank pressure	> –4.0 kPa (–30 mmHg, –1.18 inHg)
Cumulative time when all of the malfunction criteria below is completed.	≥ 30 sec.
Purge control solenoid valve duty ratio	Not = 0
Fuel temperature	–10 ←→ 45°C (14 ←→ 113°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 CONDITION

- 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

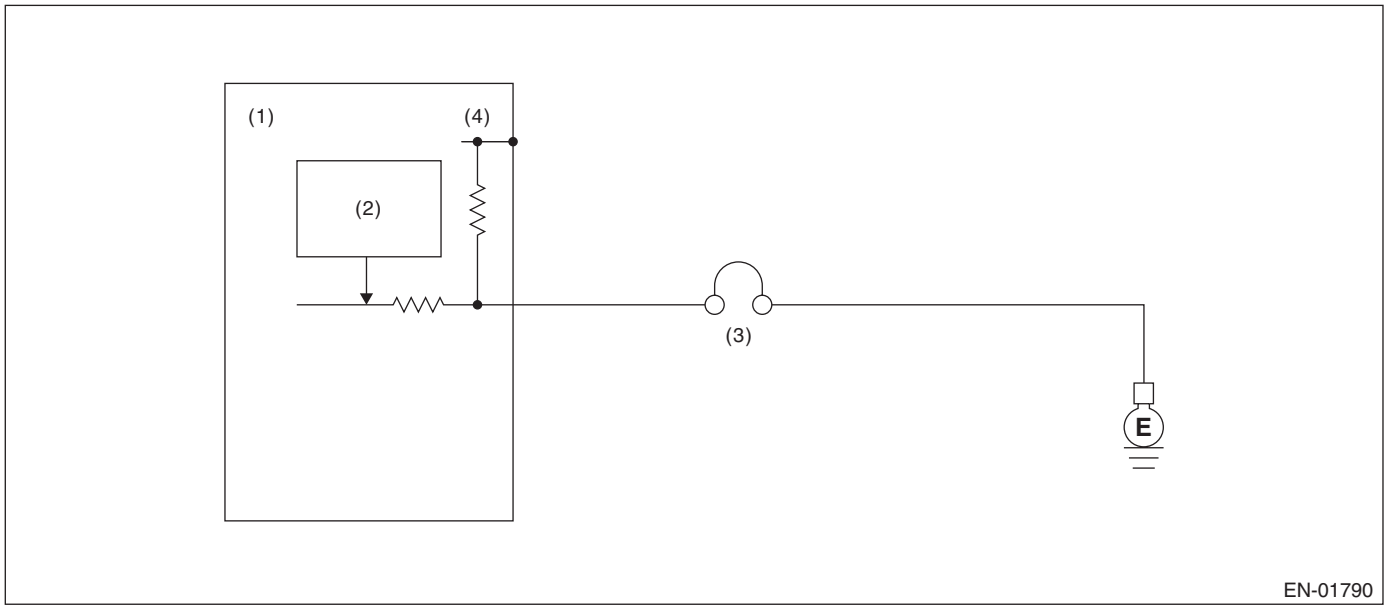
Memorize the freeze frame data. (For test mode $02)

CR:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.
Judge as NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) PCV diagnosis connector
(4) 5 V

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 completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Engine speed	≥ 500 rpm
Positive crankcase ventilation diagnosis voltage	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
Battery voltage	> 10.9 V
Engine speed	≥ 500 rpm
Positive crankcase ventilation diagnosis 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 CONDITION

- 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)

CS: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 following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
It took more than 0.8 seconds at engine starting, and then it turned after engine starting.	
Starter ON signal	Not detected
Engine speed in 0.8 seconds or more for which the condition that engine speed is less than 500 rpm continues	≥ 500 rpm
Battery voltage	> 8 V

Time Needed for Diagnosis: 1 second
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 CONDITION

- 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)

CT:DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of high exhaust gas temperature
Judge as NG when the exhaust temperature is high.

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 completing the malfunction criteria below becomes 8.2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel cut	Not in operation
After fuel cut	≥ 1 millisecond
Exhaust temperature	≥ 1050°C (1922°F)

Time Needed for Diagnosis: 8.2 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 with the following criteria established is more than 8.2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Exhaust temperature	< 550°C (1022°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 CONDITION

- 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)

CU: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 voltage becomes smaller than the battery voltage.

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 completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	<Battery voltage × 0.7
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	≥Battery voltage × 0.7
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 CONDITION

- 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 P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-162, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CW:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-162, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CX: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(H4DOTC)-162, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CY:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-162, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CZ:DTC P1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-162, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DA:DTC P1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-162, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DB:DTC P1578 METER FAILURE

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-162, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DC:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient air temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	≥ 67.4°
Tumble generator valve “close” signal output	2.2 seconds or more

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
Tumble generator valve opening	< 67.4°
Tumble generator valve “close” signal output	2.2 seconds or more

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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Tumble generator valve opening
- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DD:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient air temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	≥ 67.4°
Tumble generator valve “close” signal output	2.2 seconds or more

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
Tumble generator valve opening	< 67.4°
Tumble generator valve “close” signal output	2.2 seconds or more

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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Tumble generator valve opening
- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DE:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient air temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	< 67.4°
Tumble generator valve “open” signal output	2.4 seconds or more

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
Tumble generator valve opening	≥ 67.4°
Tumble generator valve “open” signal output	2.4 seconds or more

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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Tumble generator valve opening
- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DF:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient air temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	< 67.4°
Tumble generator valve “open” signal output	2.4 seconds or more

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
Tumble generator valve opening	≥ 67.4°
Tumble generator valve “open” signal output	2.4 seconds or more

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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Tumble generator valve opening
- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

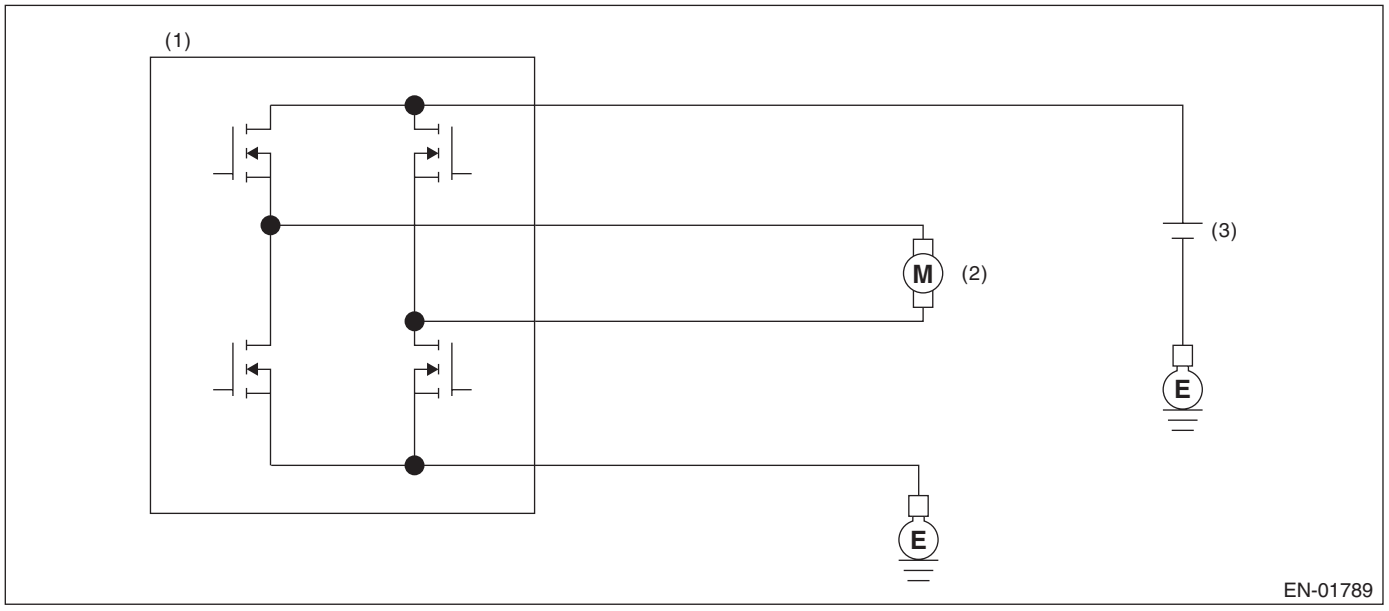
Memorize the freeze frame data. (For test mode $02)

DG:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.
Judge as NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generator valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before signal change from ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge open NG when the open NG signal is sent 2 seconds in a row.
Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 2 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

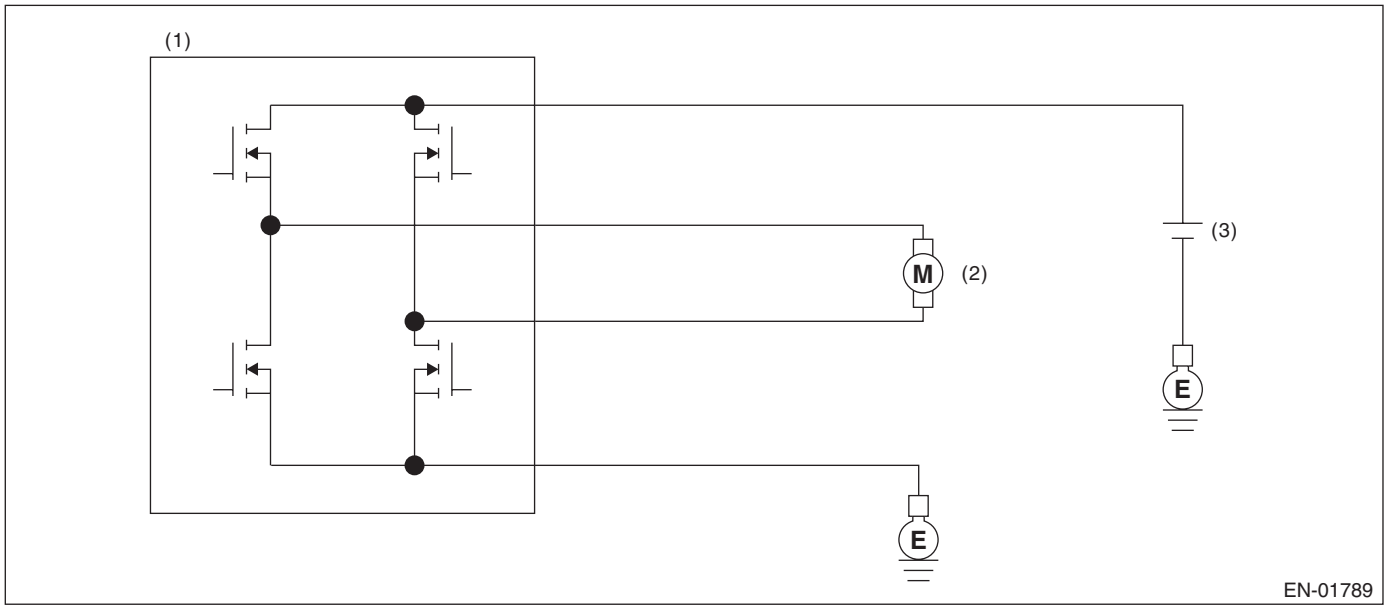
Memorize the freeze frame data. (For test mode $02)

DH:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.
Judge as NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generator valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before signal change from ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge overcurrent NG when the overcurrent NG signal is sent 1 second in a row. Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

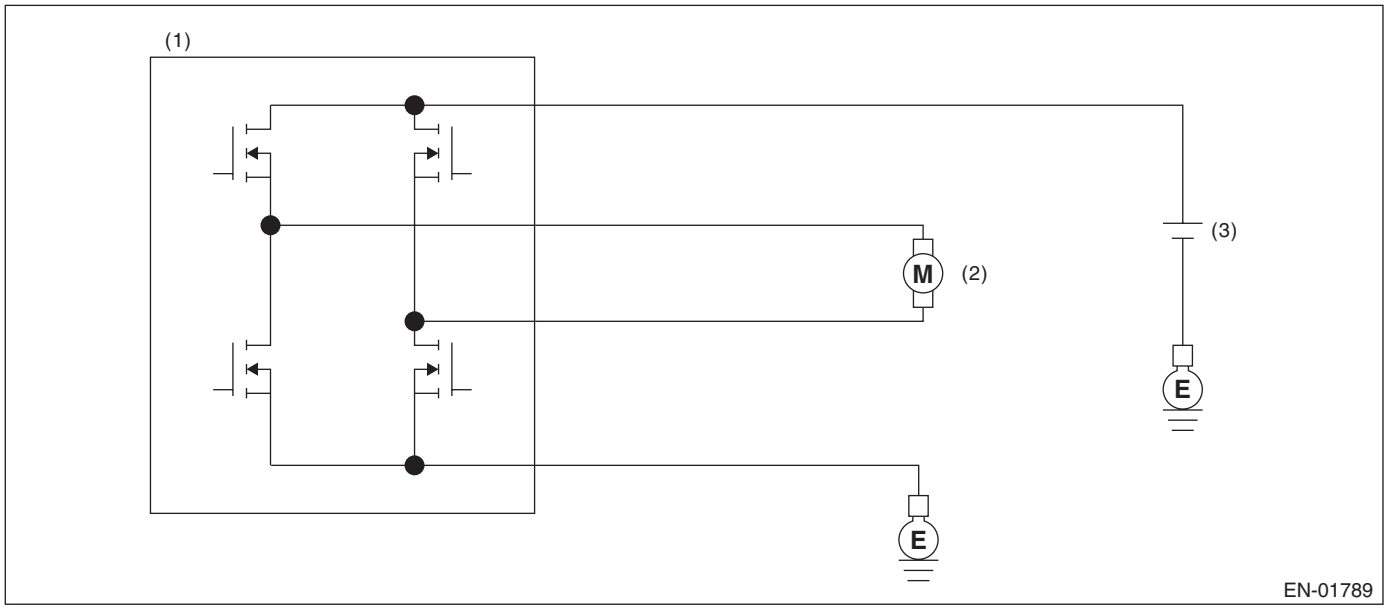
Memorize the freeze frame data. (For test mode $02)

DI: DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.
Judge as NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generator valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before signal change from ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge open NG when the open NG signal is sent 2 seconds in a row. Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 2 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

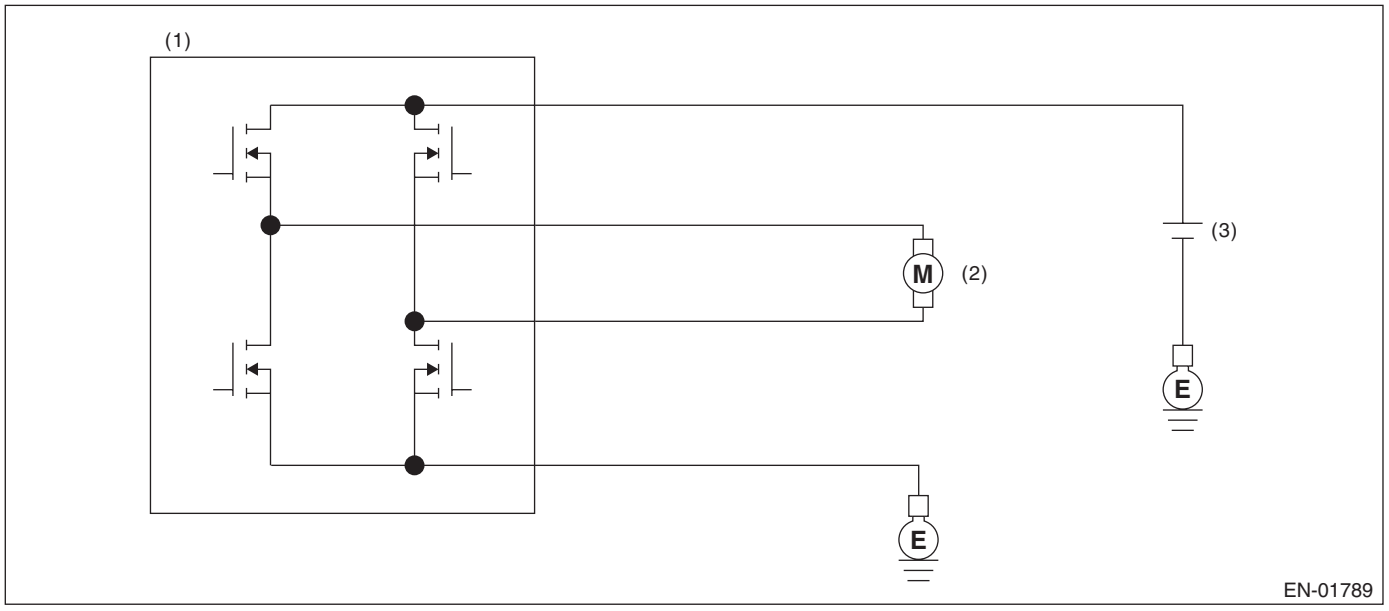
Memorize the freeze frame data. (For test mode $02)

DJ:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.
Judge as NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generator valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before signal change from ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge overcurrent NG when the overcurrent NG signal is sent 1 second in a row. Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

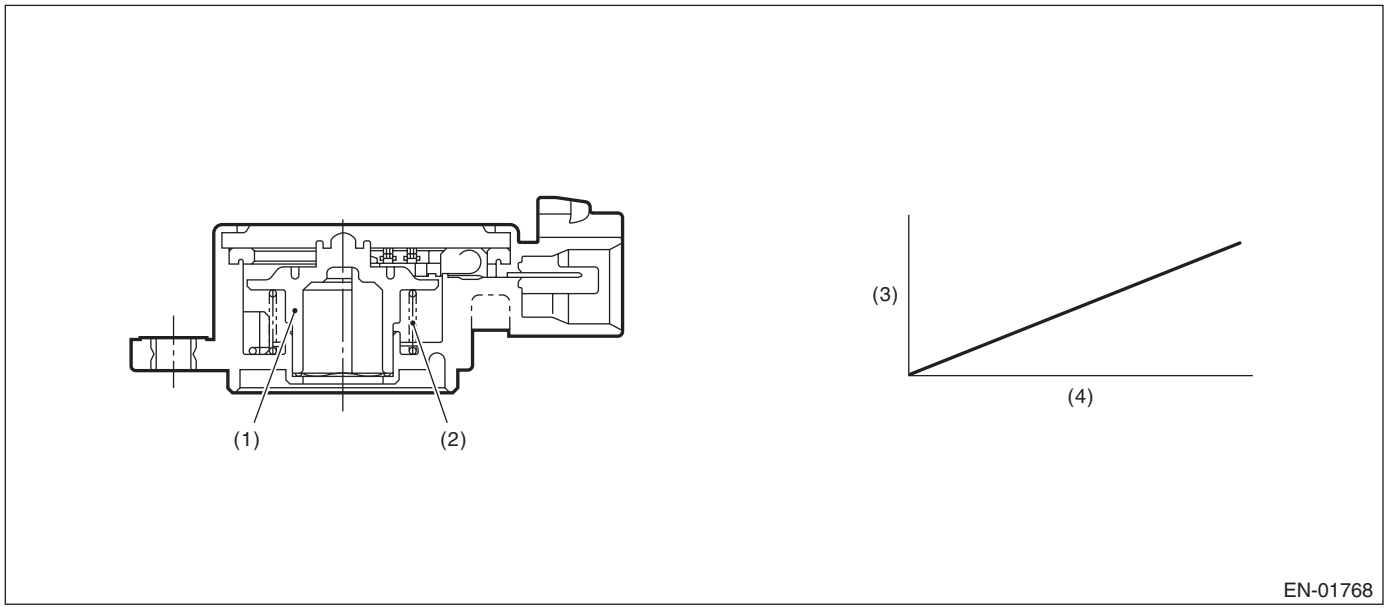
Memorize the freeze frame data. (For test mode $02)

DK:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generator valve opening (°)

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 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	< 0.167 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve opening
- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

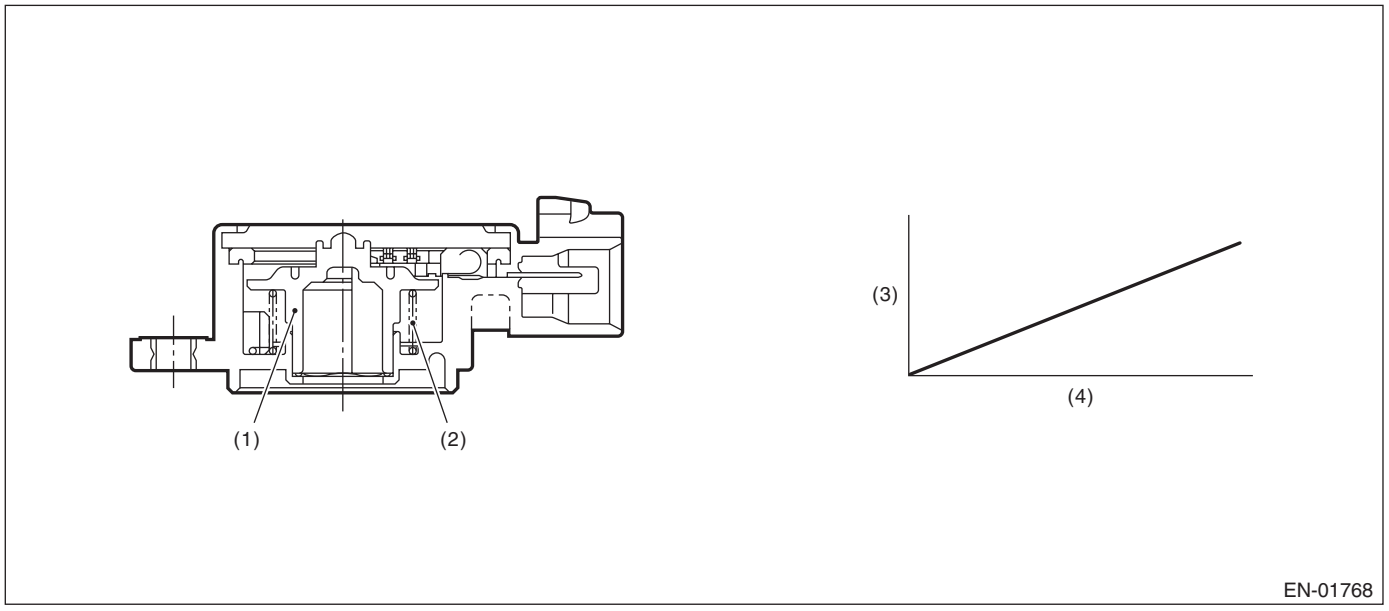
Memorize the freeze frame data. (For test mode $02)

DL:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Throttle valve opening angle (°)

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 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	≥ 4.843 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve opening
- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

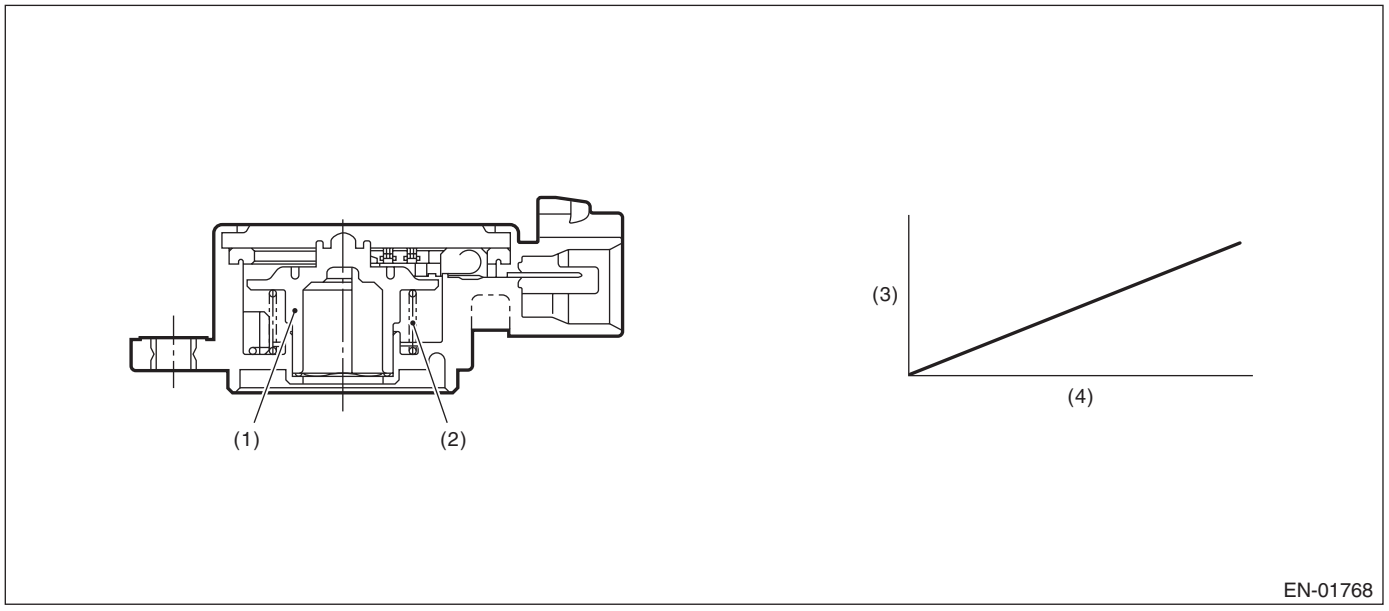
Memorize the freeze frame data. (For test mode $02)

DM:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generator valve opening (°)

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 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	< 0.167 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve opening
- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

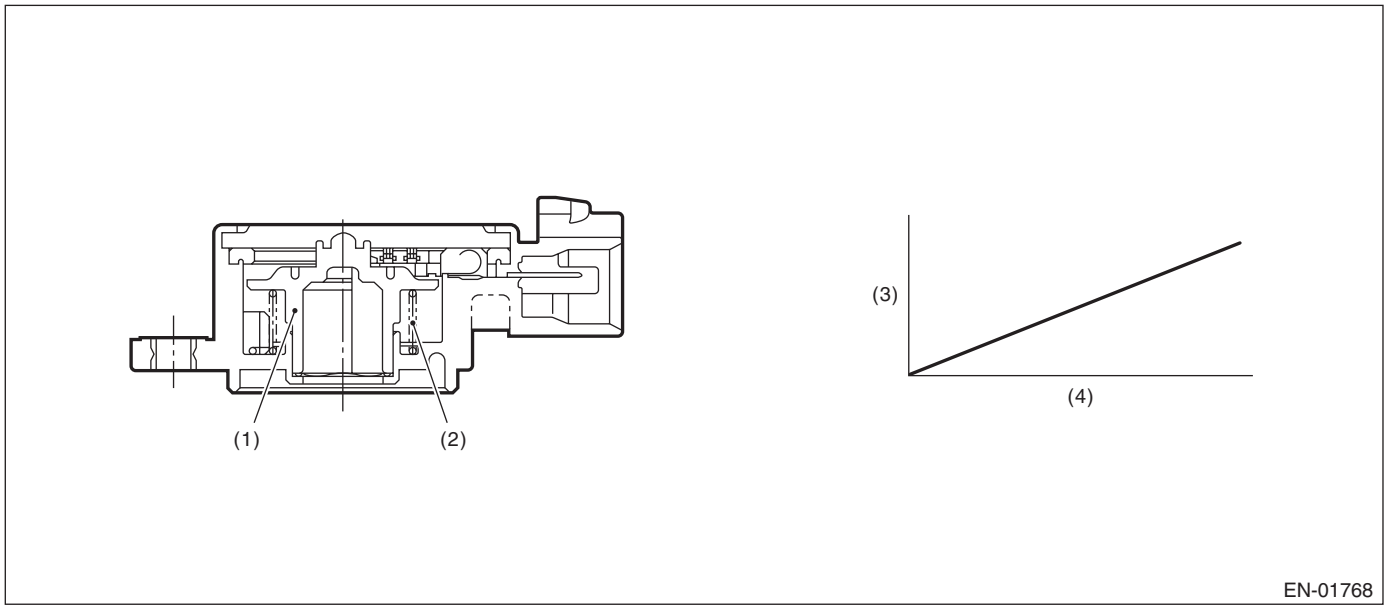
Memorize the freeze frame data. (For test mode $02)

DN:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generator valve opening (°)

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 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	≥ 4.843 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve opening
- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DO: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 valve solenoid.
Judge as open NG when the current flow is small whereas duty signal is large, and judge as short NG when the current flow is large whereas 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 completing 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 flow 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 completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve	≥ 0.14%
|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 CONDITION

- 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)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control valve solenoid.
Judge as open NG when the current flow is small whereas duty signal is large, and judge as short NG when the current flow is large whereas 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 completing 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 flow 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 completing the malfunction criteria below becomes more than 2 seconds.

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 CONDITION

- 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)

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

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P2088. <Ref. to GD(H4DOTC)-225, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

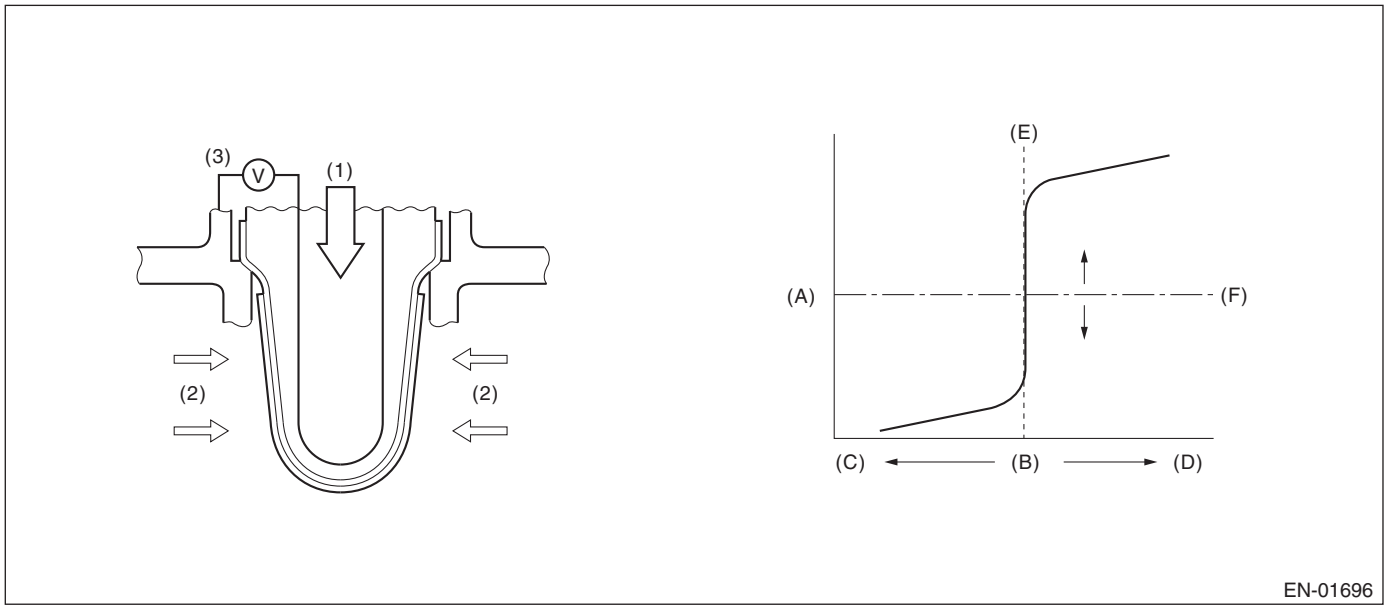
For the diagnostic procedure, refer to DTC P2089. <Ref. to GD(H4DOTC)-227, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DS: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 of completing all conditions	≥ 1 sec.
Conditions for carrying out the sub feedback learning	Completed

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at an idling or a constant 80 km/h (50 MPH).

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria becomes more than 5 seconds.
Judge OK and clear NG when the continuous time of incompleting the malfunction criteria becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	–0.015

Time Needed for Diagnosis: 5 seconds × 1 times
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 CONDITION

- 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

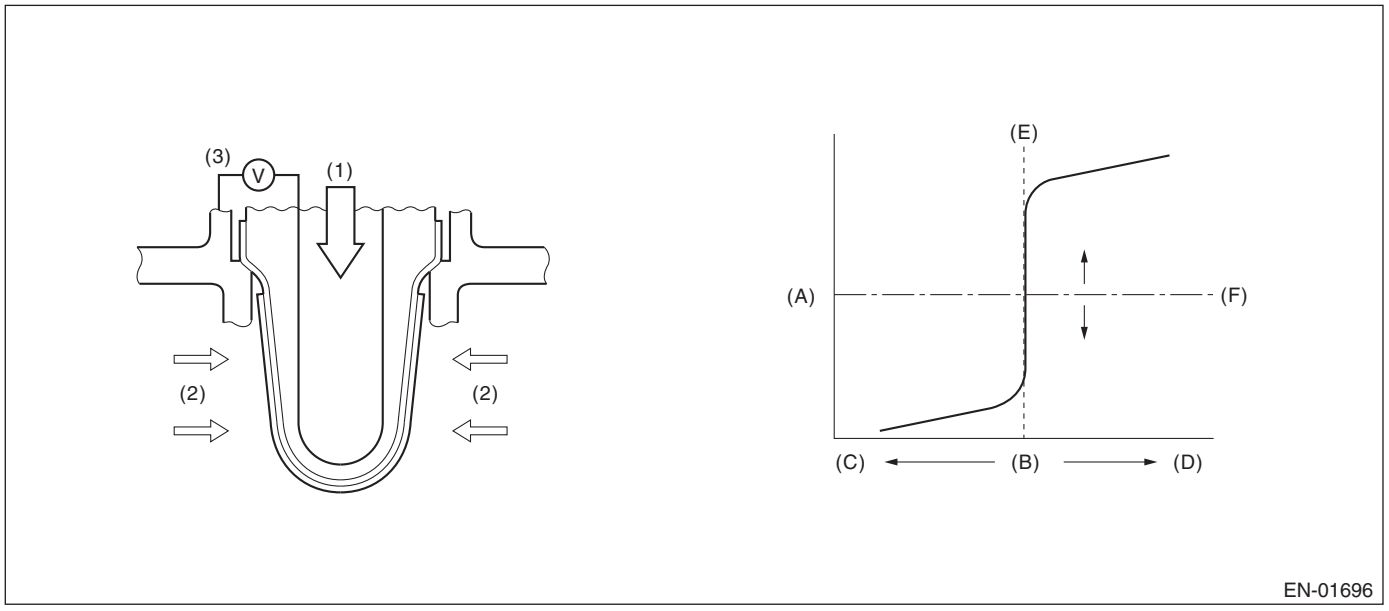
Memorize the freeze frame data. (For test mode $02)

DT: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 of completing all conditions	≥ 1 sec.
Conditions for carrying out the sub feedback learning	Completed

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at an idling or a constant 80 km/h (50 MPH).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria becomes more than 5 seconds.
Judge OK and clear NG when the continuous time of incompleting the malfunction criteria becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ 0.015

Time Needed for Diagnosis: 5 seconds × 1 times
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 CONDITION

- 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

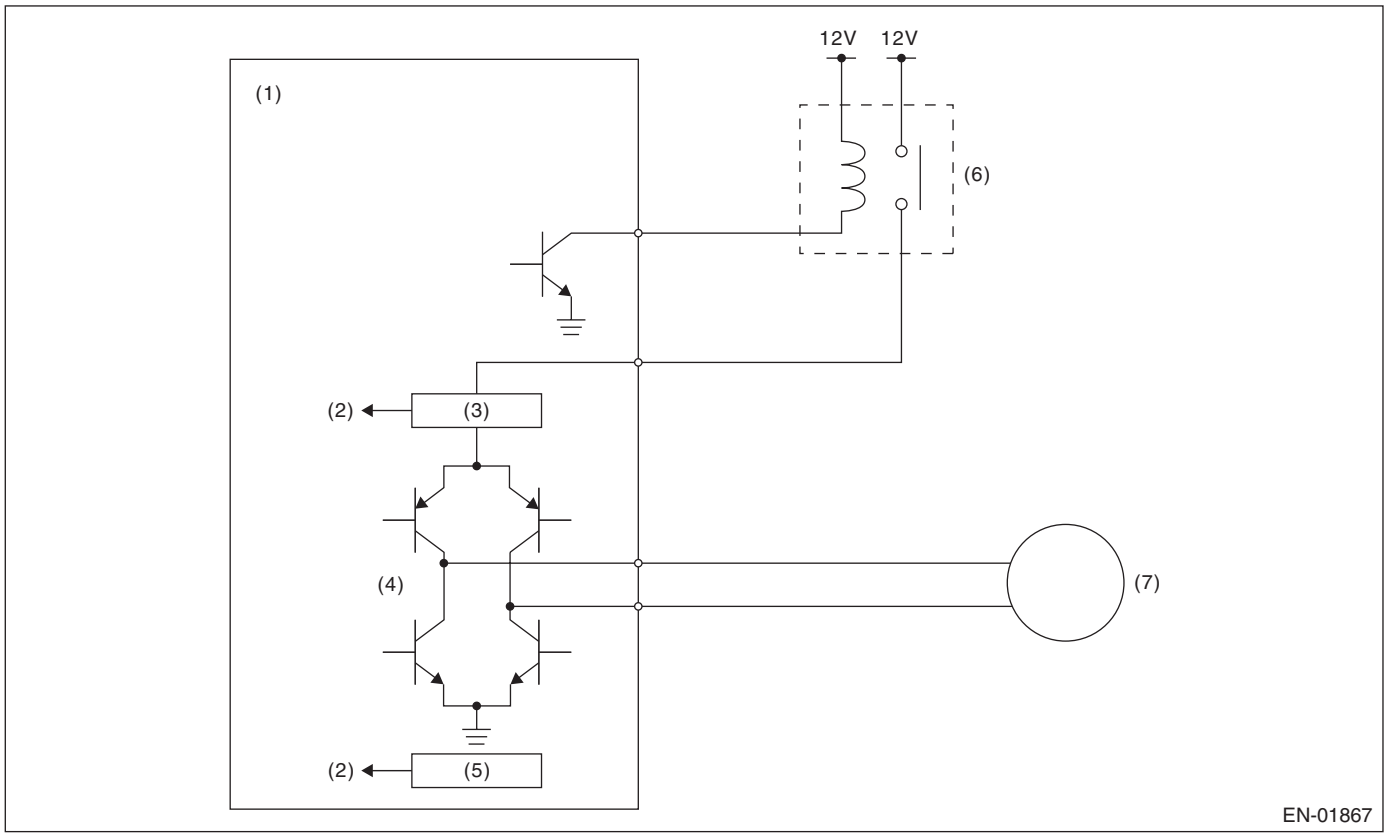
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Judge as NG when the motor current becomes large or drive circuit is heated.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Overcurrent detection circuit
(4) Drive circuit
(5) Temperature detection circuit
(6) Electronic throttle control relay
(7) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

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 CONDITION

- 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 control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

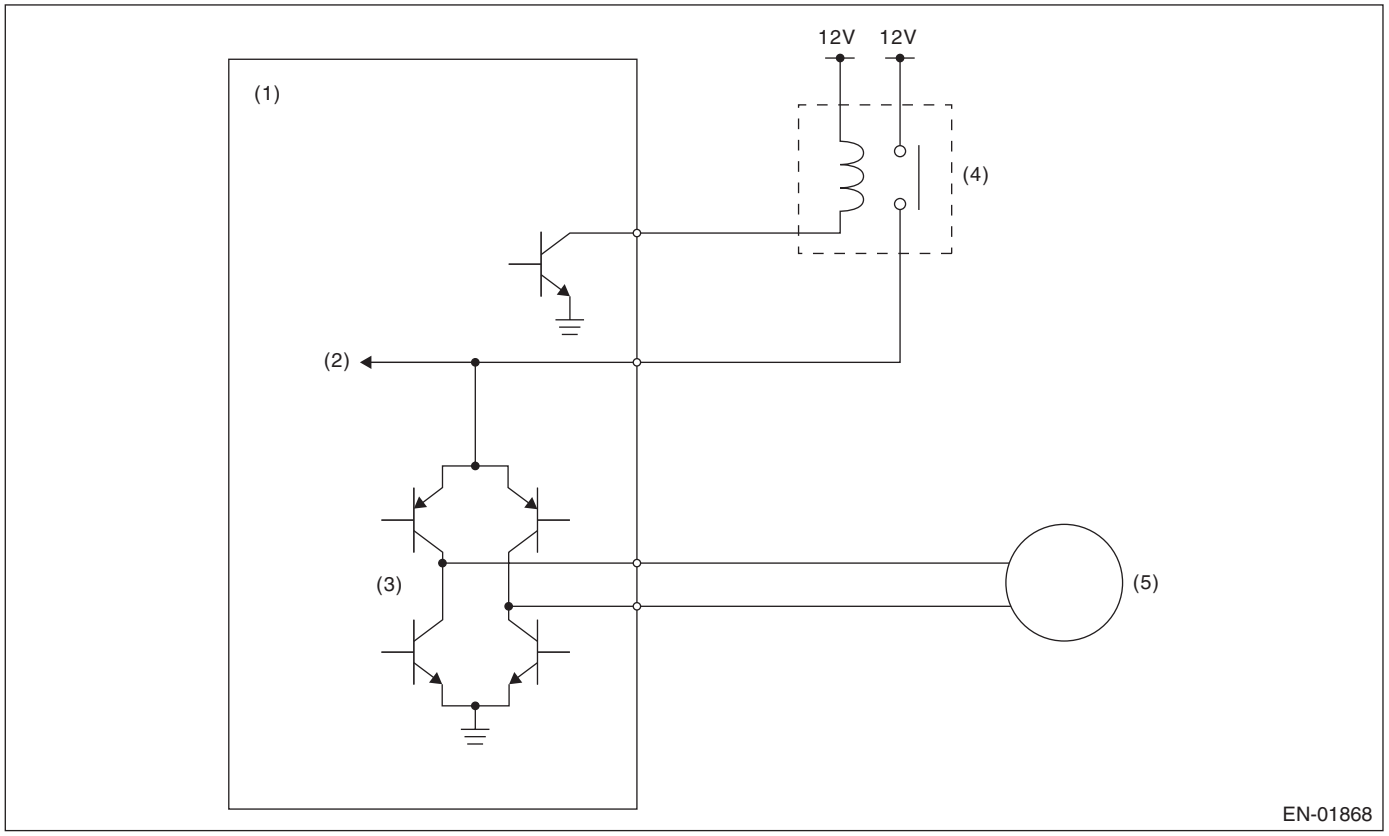
Memorize the freeze frame data. (For test mode $02)

DV: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 electric control throttle 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 control throttle relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.5 seconds or more.

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 CONDITION

- 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 control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

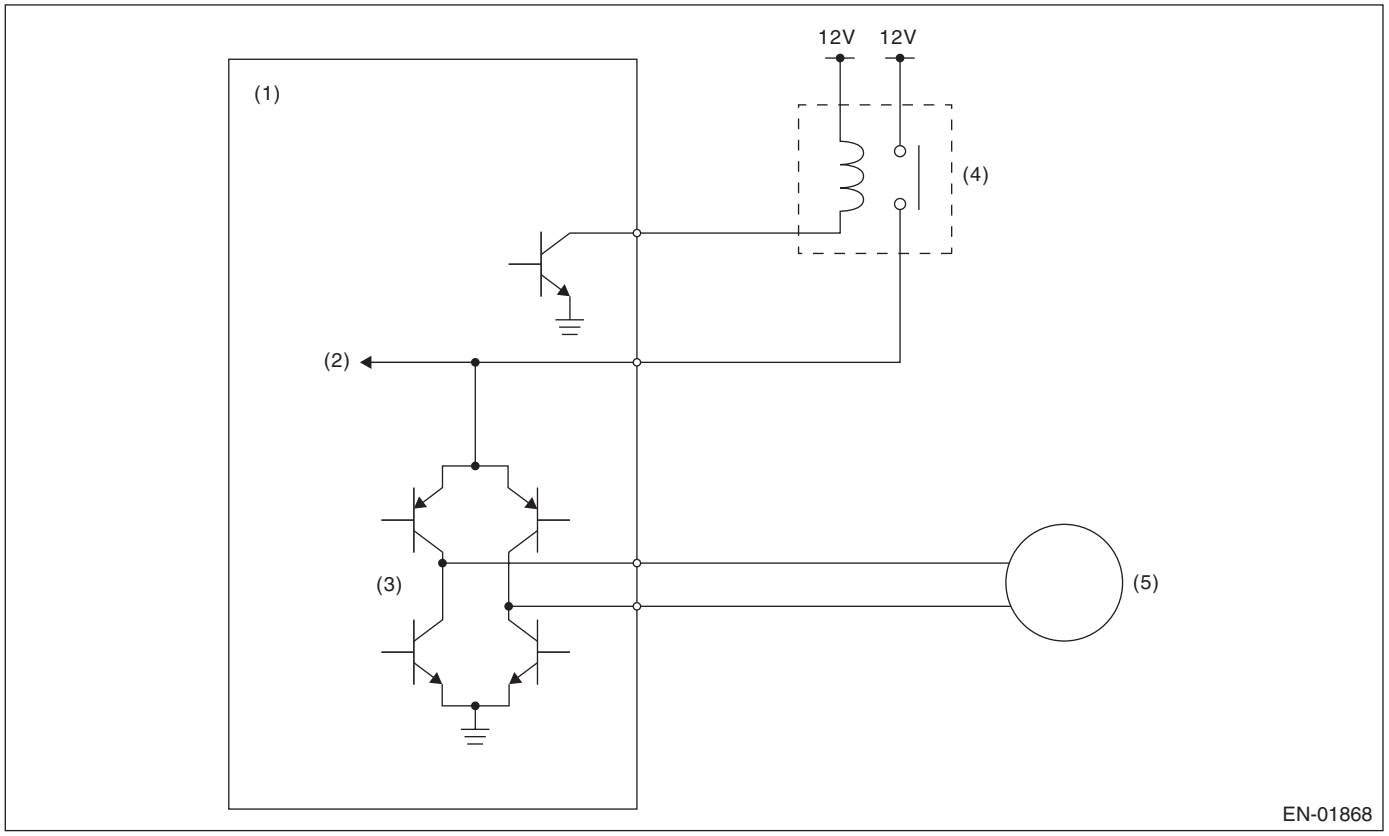
Memorize the freeze frame data. (For test mode $02)

DW: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 electric 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 control throttle 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 CONDITION

- 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 control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

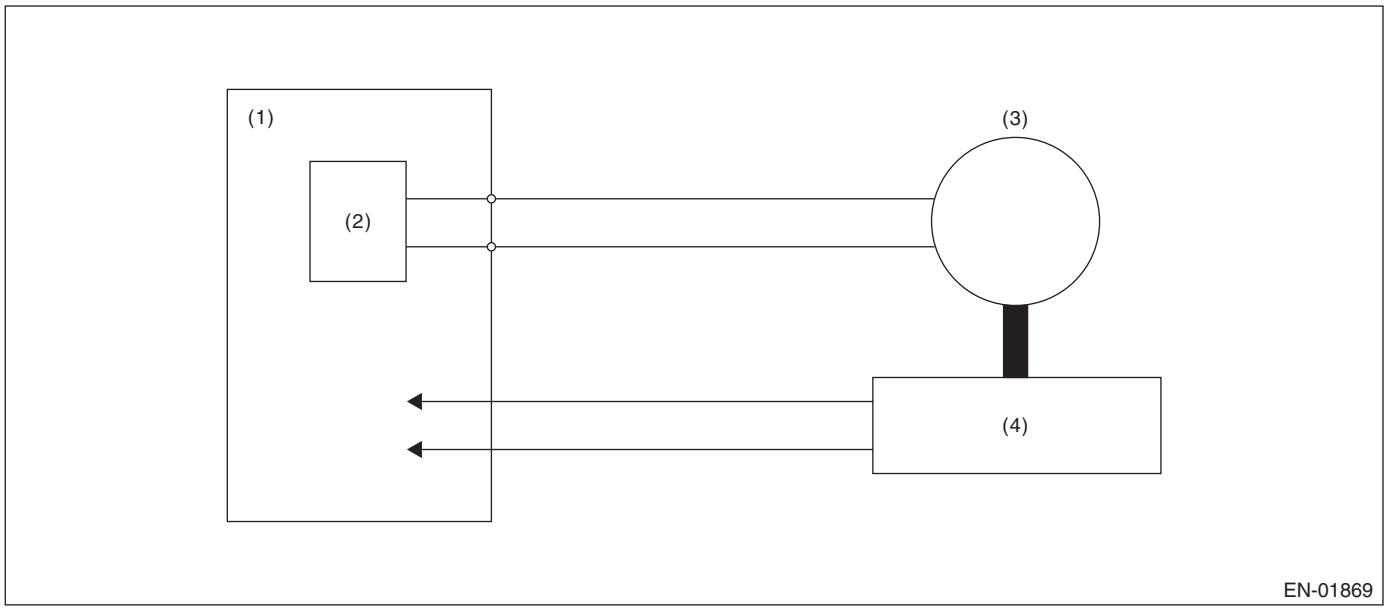
Memorize the freeze frame data. (For test mode $02)

DX: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 clearing the 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 voltage at full close point learning	0.41 — 0.79 V
Time for full close point learning completion	Within 80 milliseconds

Time Needed for Diagnosis: None
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 CONDITION

- 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 control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

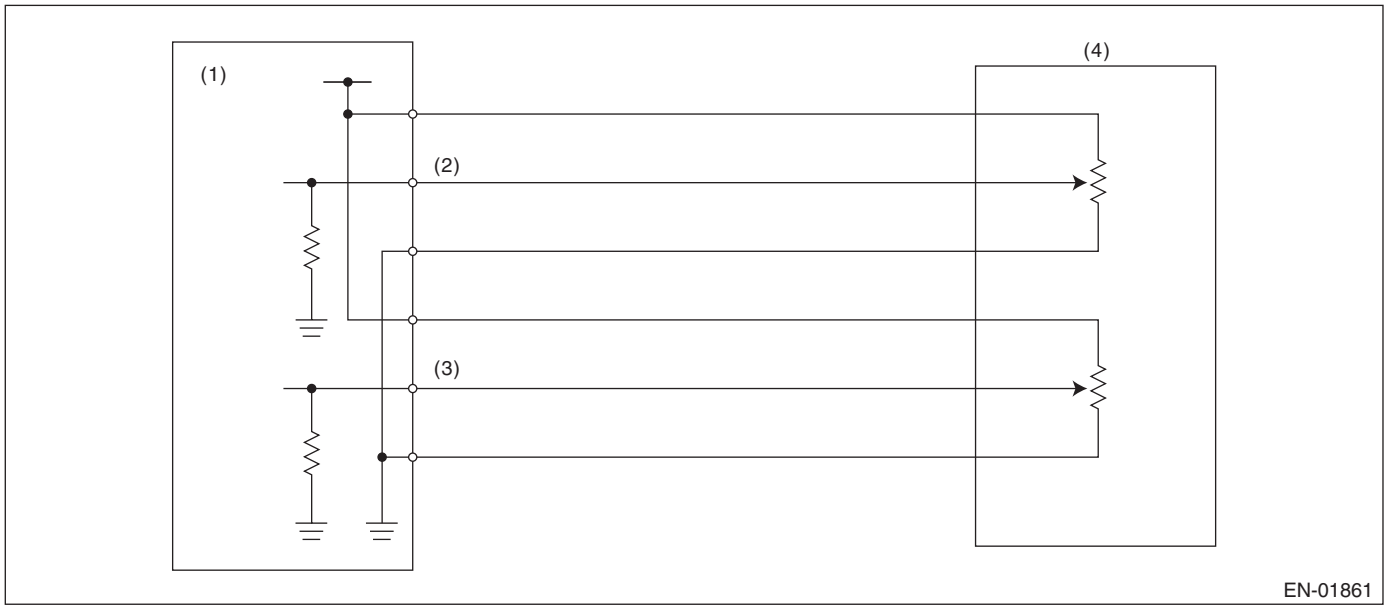
Memorize the freeze frame data. (For test mode $02)

DY: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 it is 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 CONDITION

- 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

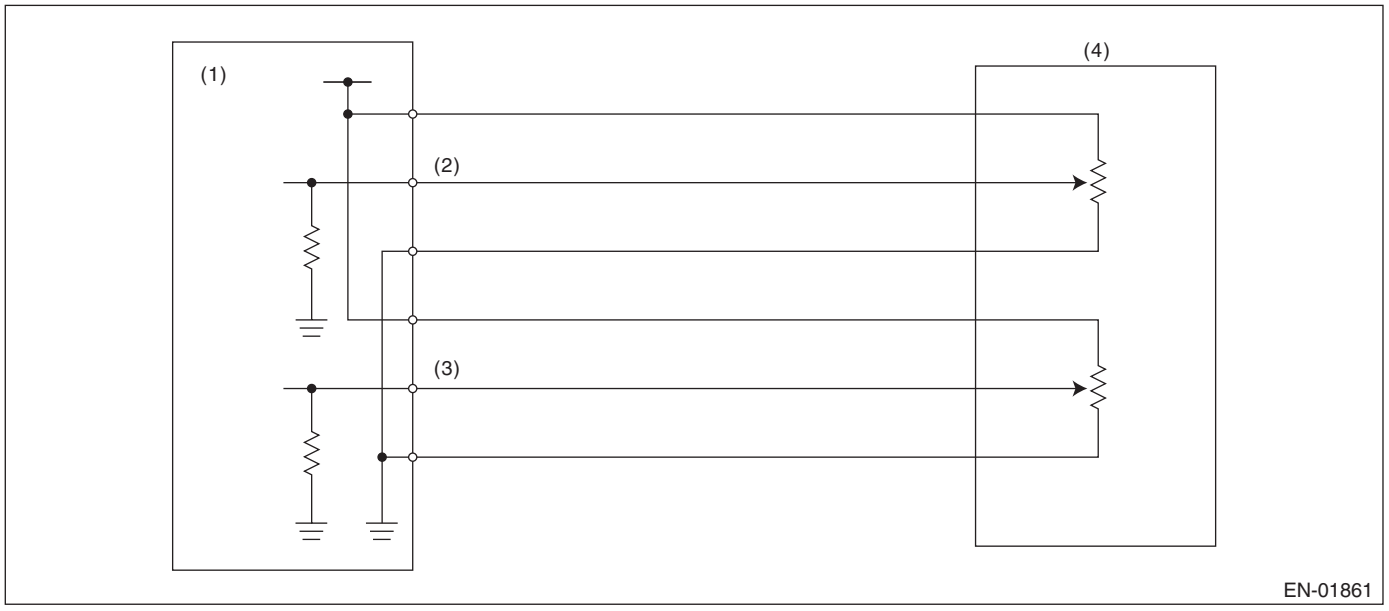
Memorize the freeze frame data. (For test mode $02)

DZ: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 it is 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: 80 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 CONDITION

- 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

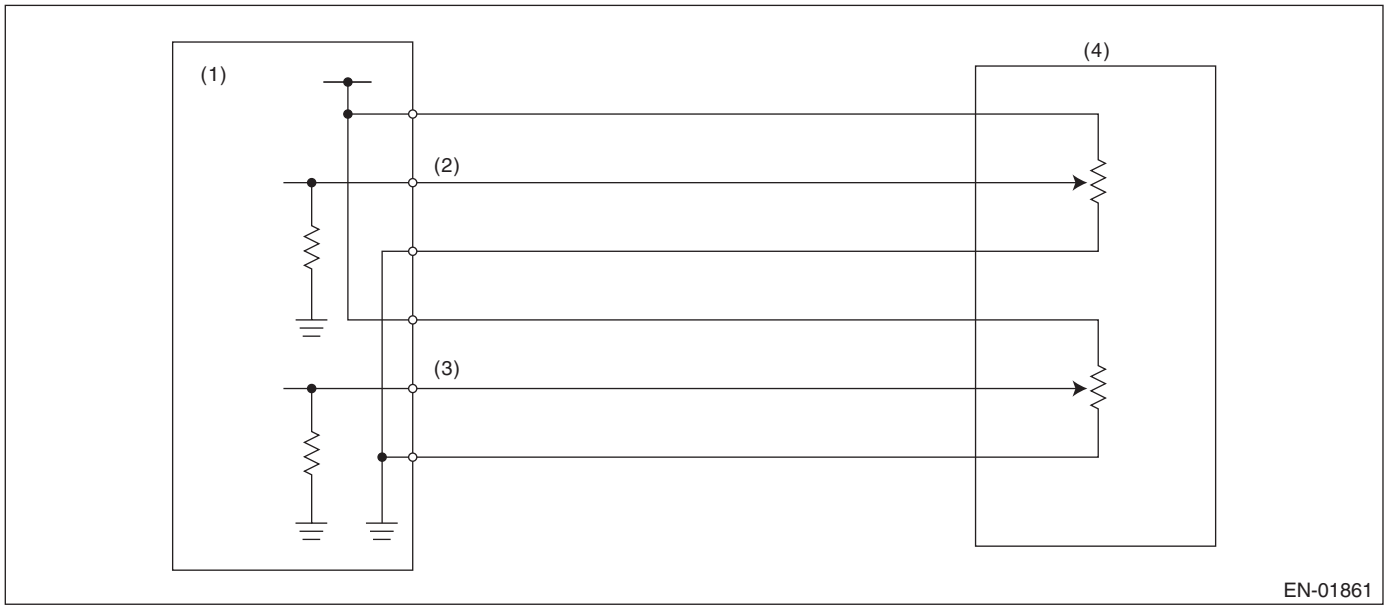
Memorize the freeze frame data. (For test mode $02)

EA: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 it is 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 CONDITION

- 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

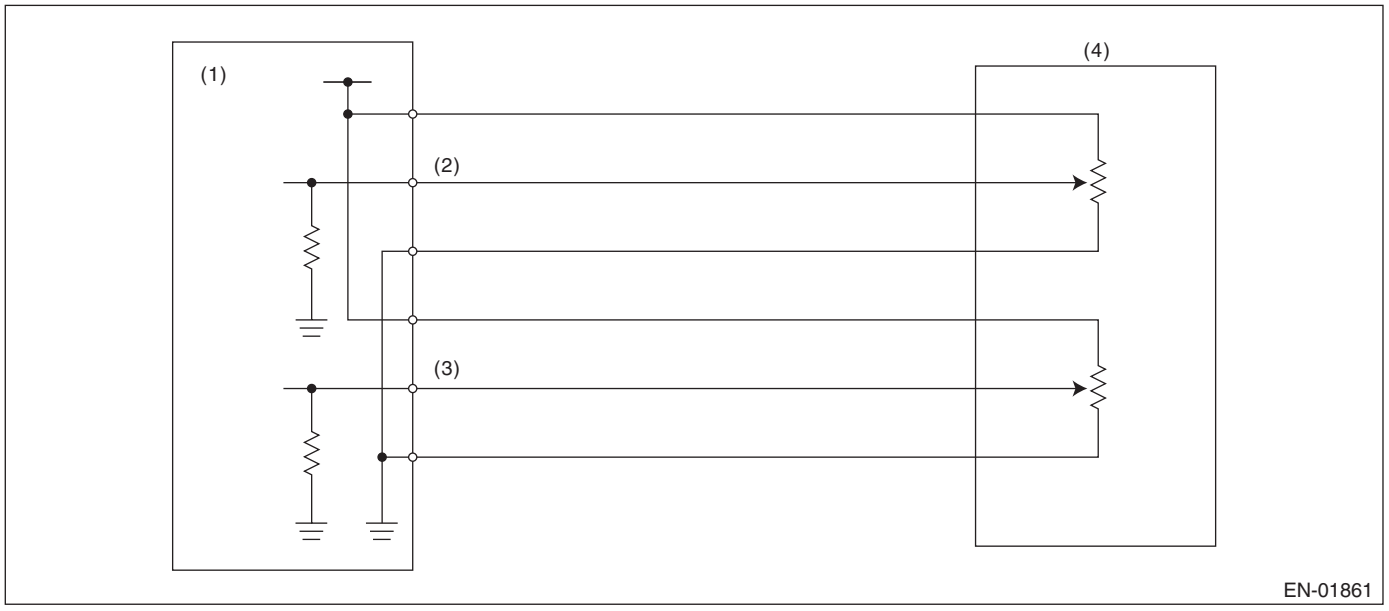
Memorize the freeze frame data. (For test mode $02)

EB: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 it is 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	< 4.865 V

Time Needed for Diagnosis: 80 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 CONDITION

- 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

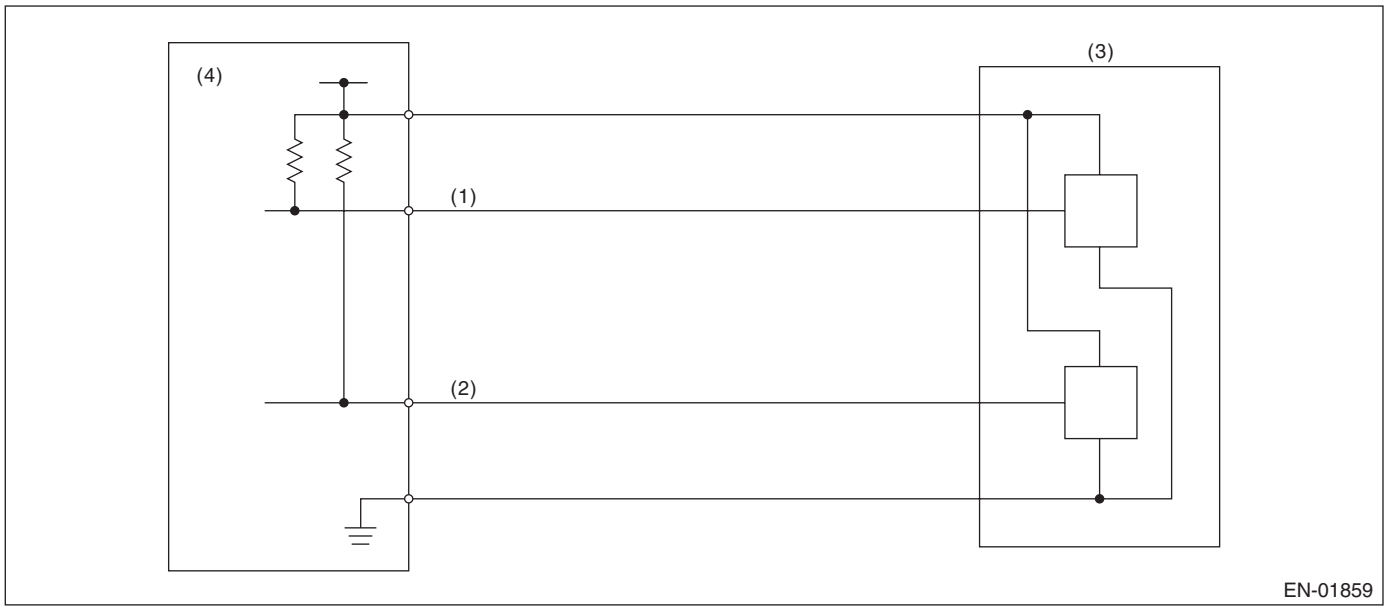
Memorize the freeze frame data. (For test mode $02)

EC: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.

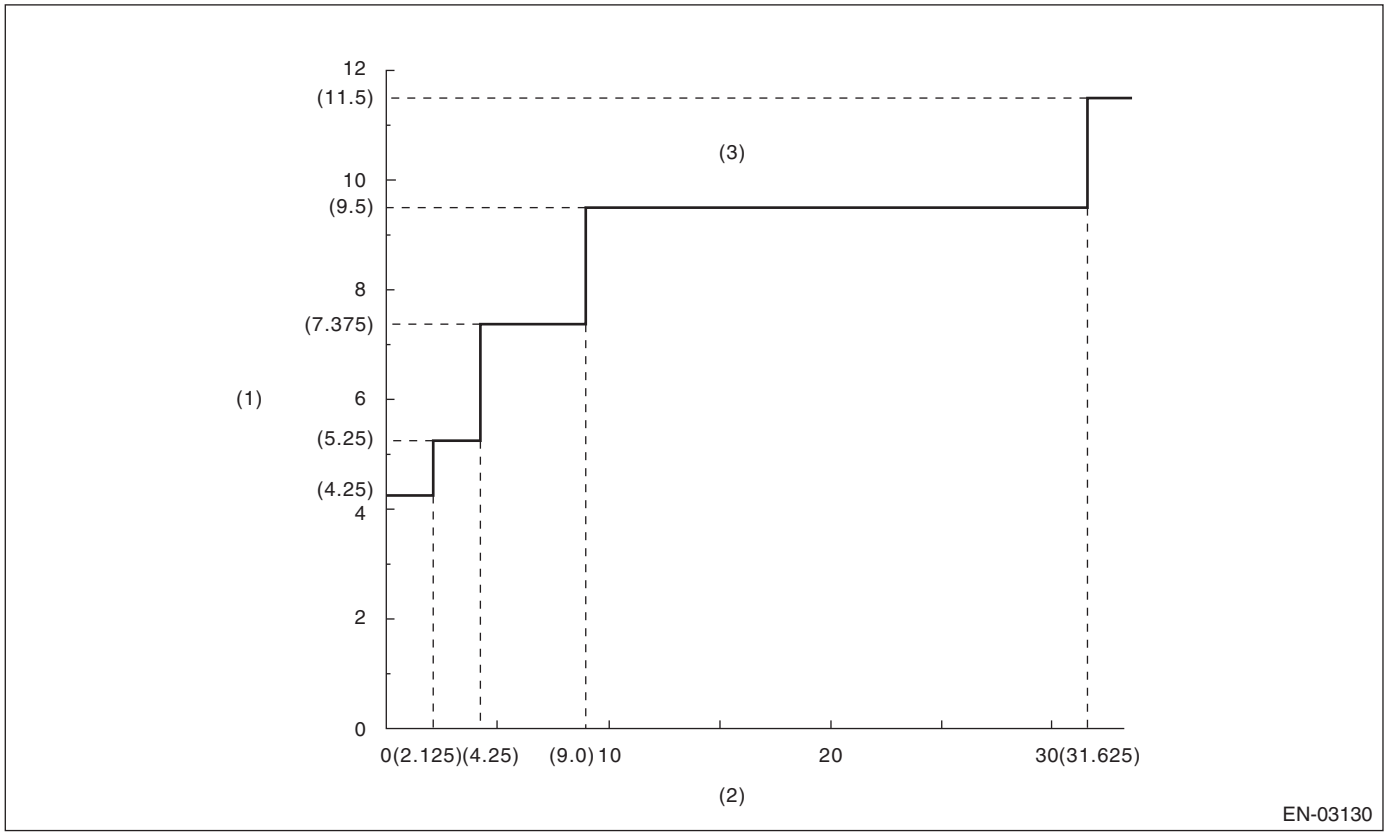
5. DIAGNOSTIC METHOD

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	≤ 4.25

Details of Judgment Value



(1) Sensor output difference (°)
(2) Throttle position sensor 1 opening angle (°)
(3) NG area

Time Needed for Diagnosis: 212 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 CONDITION

- 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 ETC motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

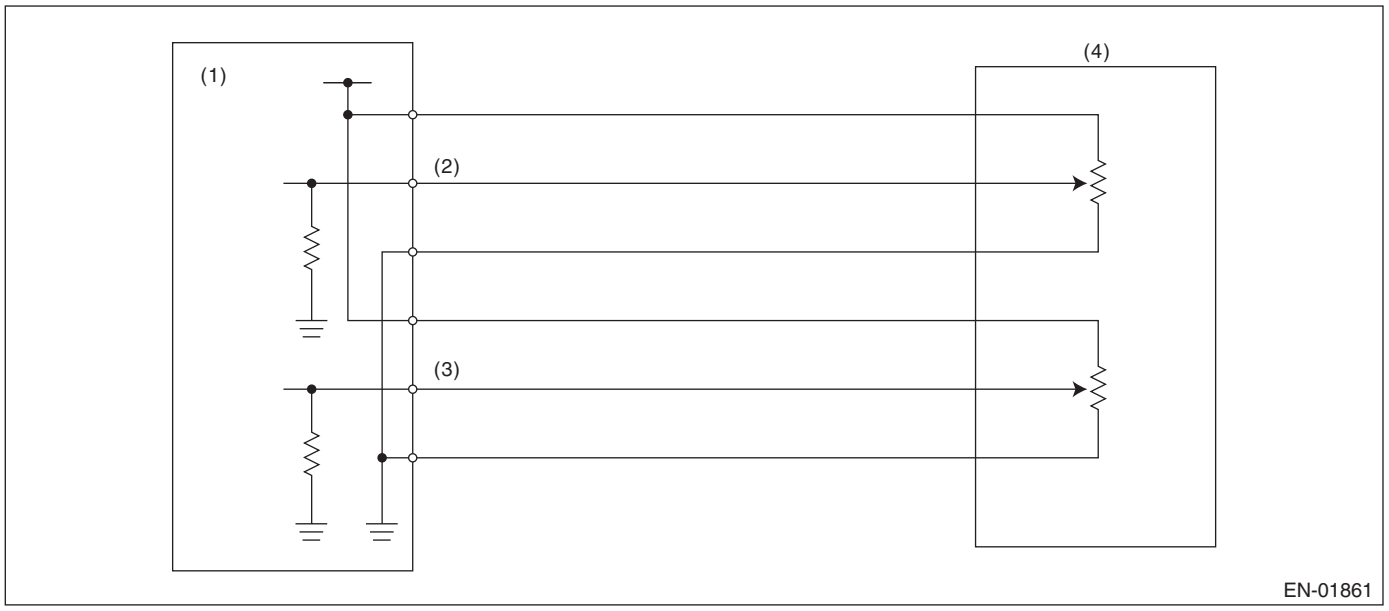
Memorize the freeze frame data. (For test mode $02)

ED: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.

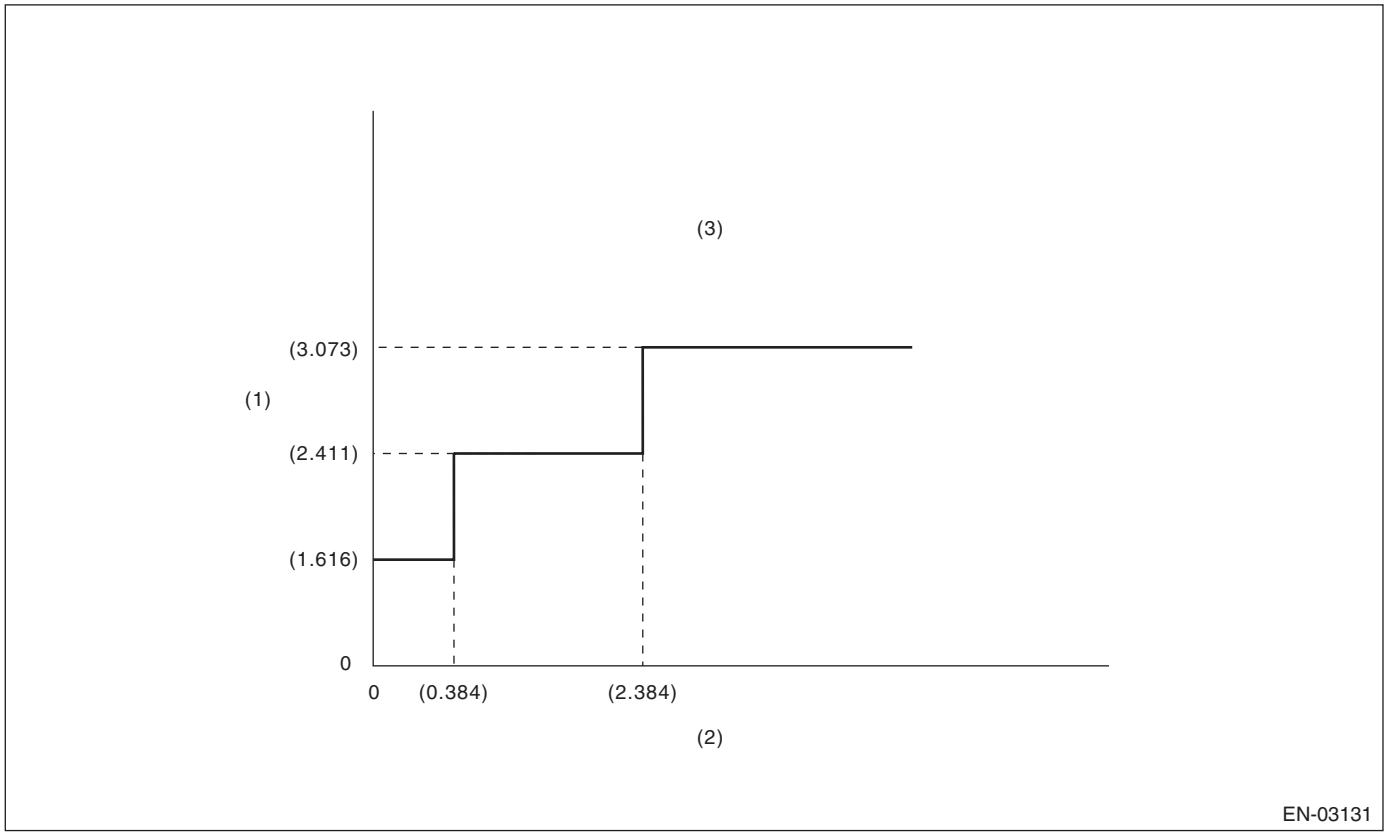
5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≥ 1.616°

Details of Judgment Value



(1) Sensor output difference
(2) Accelerator pedal position sensor 2 opening angle (°)
(3) NG area

Time Needed for Diagnosis:
- 116 milliseconds (For NG)
- 1000 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 CONDITION

- 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)

EE:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property.
Judge as NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. COMPONENT DESCRIPTION

The atmospheric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis once before engine start with the ignition switch ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
|Atmospheric – manifold absolute pressure|	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
|Intake manifold pressure at engine startup 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 completing the malfunction criteria below becomes more than 0.26 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – manifold absolute 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EF:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the atmospheric pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

The atmospheric 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 completing 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric 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)

EG:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the atmospheric pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

The atmospheric 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 completing 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: 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 CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric 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)

ENGINE SECTION 4

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.

FUEL INJECTION (FUEL SYSTEMS)	FU(H6DO)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H6DO)
INTAKE (INDUCTION)	IN(H6DO)
MECHANICAL	ME(H6DO)
EXHAUST	EX(H6DO)
COOLING	CO(H6DO)
LUBRICATION	LU(H6DO)
SPEED CONTROL SYSTEMS	SP(H6DO)
IGNITION	IG(H6DO)
STARTING/CHARGING SYSTEMS	SC(H6DO)
ENGINE (DIAGNOSTICS)	EN(H6DO) (diag)
GENERAL DESCRIPTION	GD(H6DO)

FUJI HEAVY INDUSTRIES LTD.

FUEL INJECTION (FUEL SYSTEMS)

FU(H6DO)

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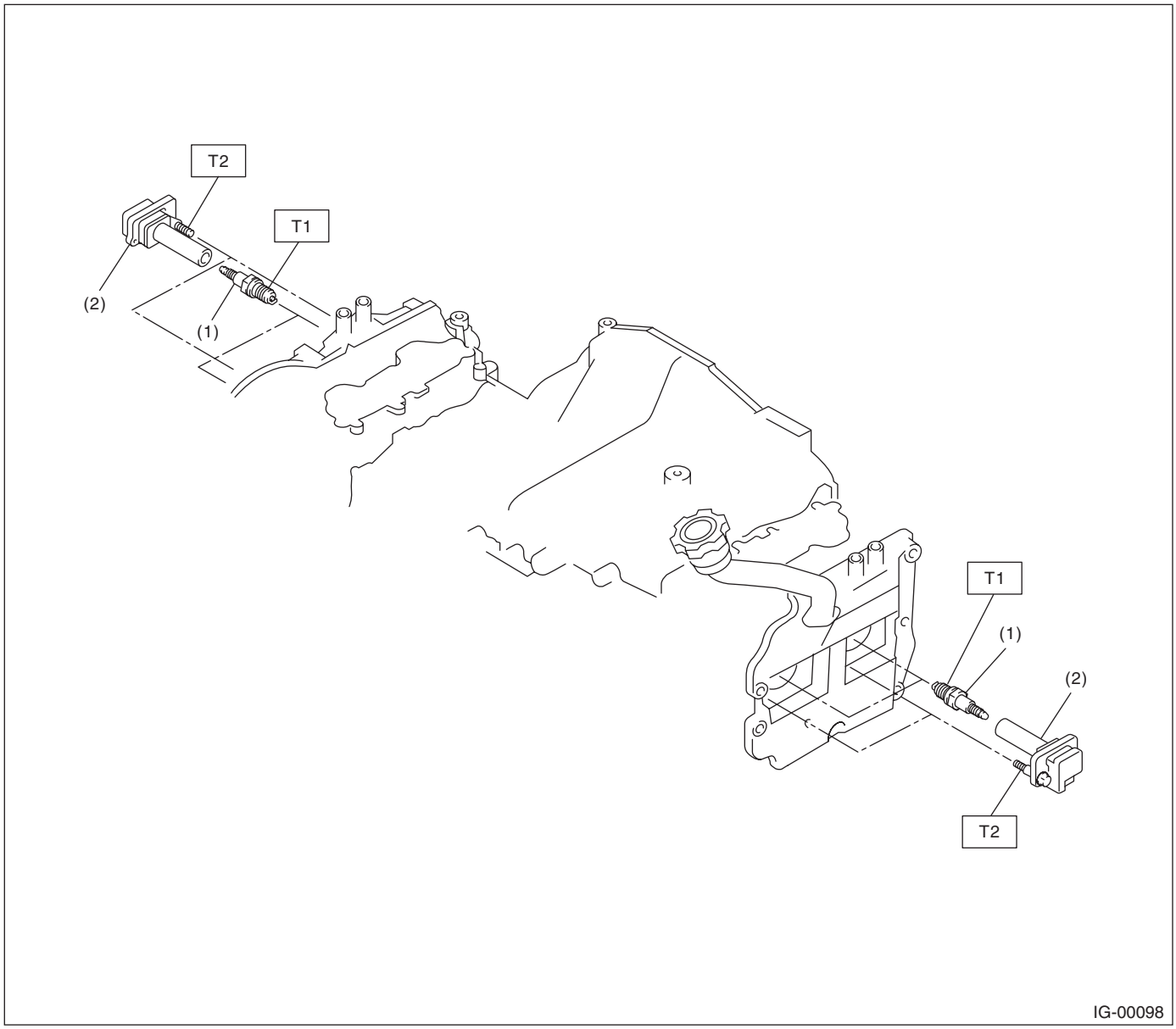
1. General Description

A: SPECIFICATION

Item		Specification
Ignition coil	Type	FK0186
	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 and ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 16 (1.6, 11.7)

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 battery.

2. Spark Plug

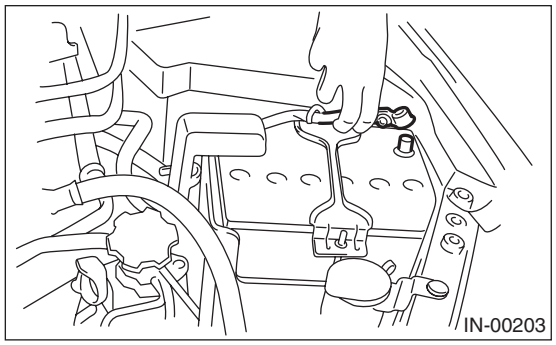
A: REMOVAL

CAUTION:
All spark plugs installed on an engine must be of the same heat range.

Spark plug:
<Ref. to IG(H4DOTC)-2, SPECIFICATION, General Description.>

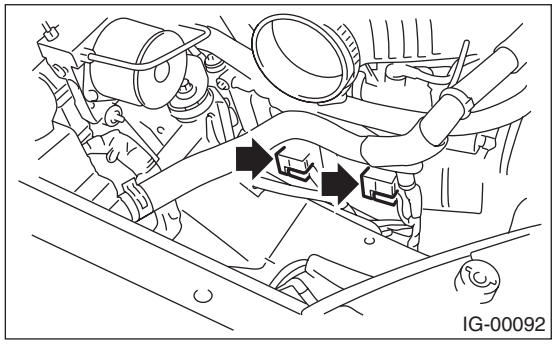
1. RH SIDE

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



3) Remove the air cleaner case.
<Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
4) Disconnect the connector from ignition coil.
5) Remove the ignition coil.

NOTE:
Turn #3 ignition coil by 180 degrees to remove it.

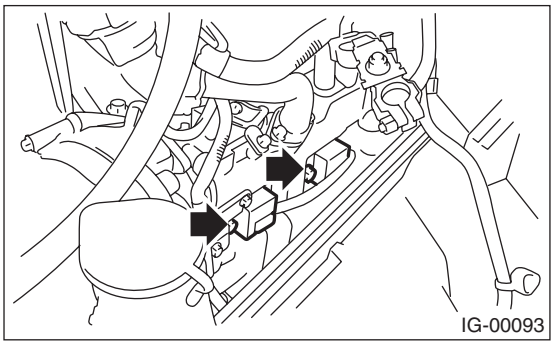


6) Remove the spark plug with a spark plug socket.

2. LH SIDE

1) Remove the collector cover.
2) Remove the battery and battery carrier.
3) Disconnect the connector from ignition coil.
4) Remove the ignition coil.

NOTE:
Turn #4 ignition coil by 180 degrees to remove it.



5) Remove the spark plug with a 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)

NOTE:
The tightening torque described above should be applied to only new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

Install in the reverse order of removal.

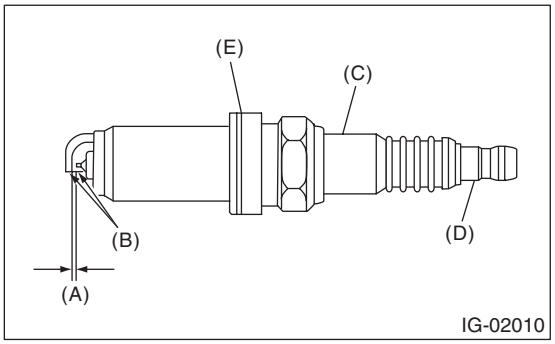
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

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

NOTE:
The tightening torque described above should be applied to only new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

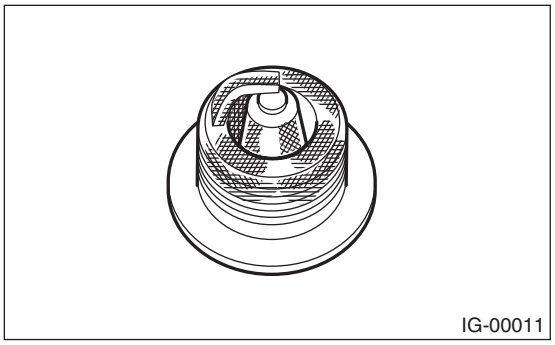
C: INSPECTION

Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.

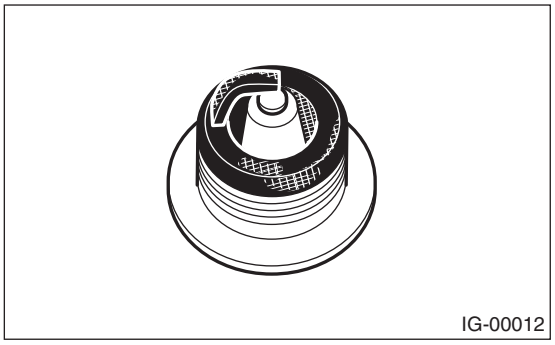


(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Crack
(D) Damage
(E) Damaged gasket

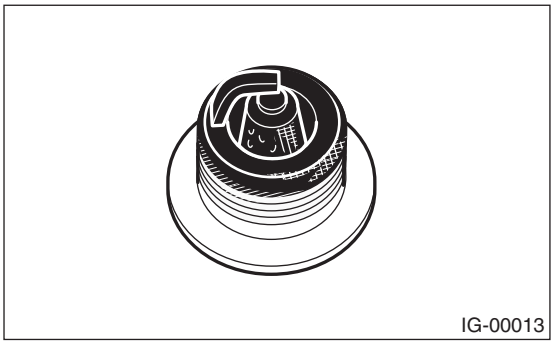
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



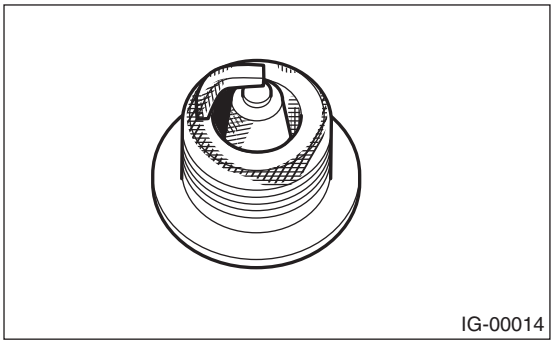
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture and dirty air cleaner.



3) Oil fouled:
Wet black deposits show oil entrance into the combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems.



4) Overheating:
White or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc.

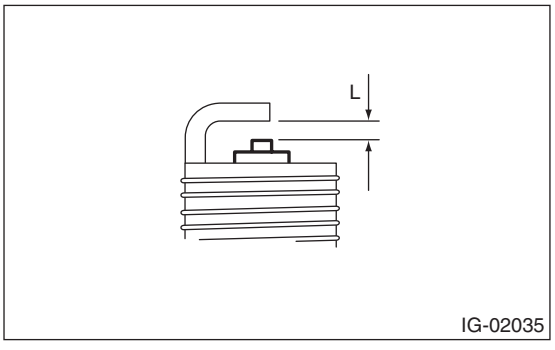


D: ADJUSTMENT

Clean the spark plugs using a wire brush.
Clean and remove the carbon or oxide deposits. But do not wear away ceramic insulator at this time. If deposits are too stubborn, replace the spark plugs.

NOTE:
Do not use a plug cleaner because the spark plugs are applied with iridium tip.

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



3. Ignition Coil

A: REMOVAL

Direct ignition type has been adopted. Refer to “Spark Plug” for removal procedure. <Ref. to IG(H4DOTC)-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(H4DOTC)(diag)-61, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

STARTING/CHARGING SYSTEMS

SC(H4DOTC)

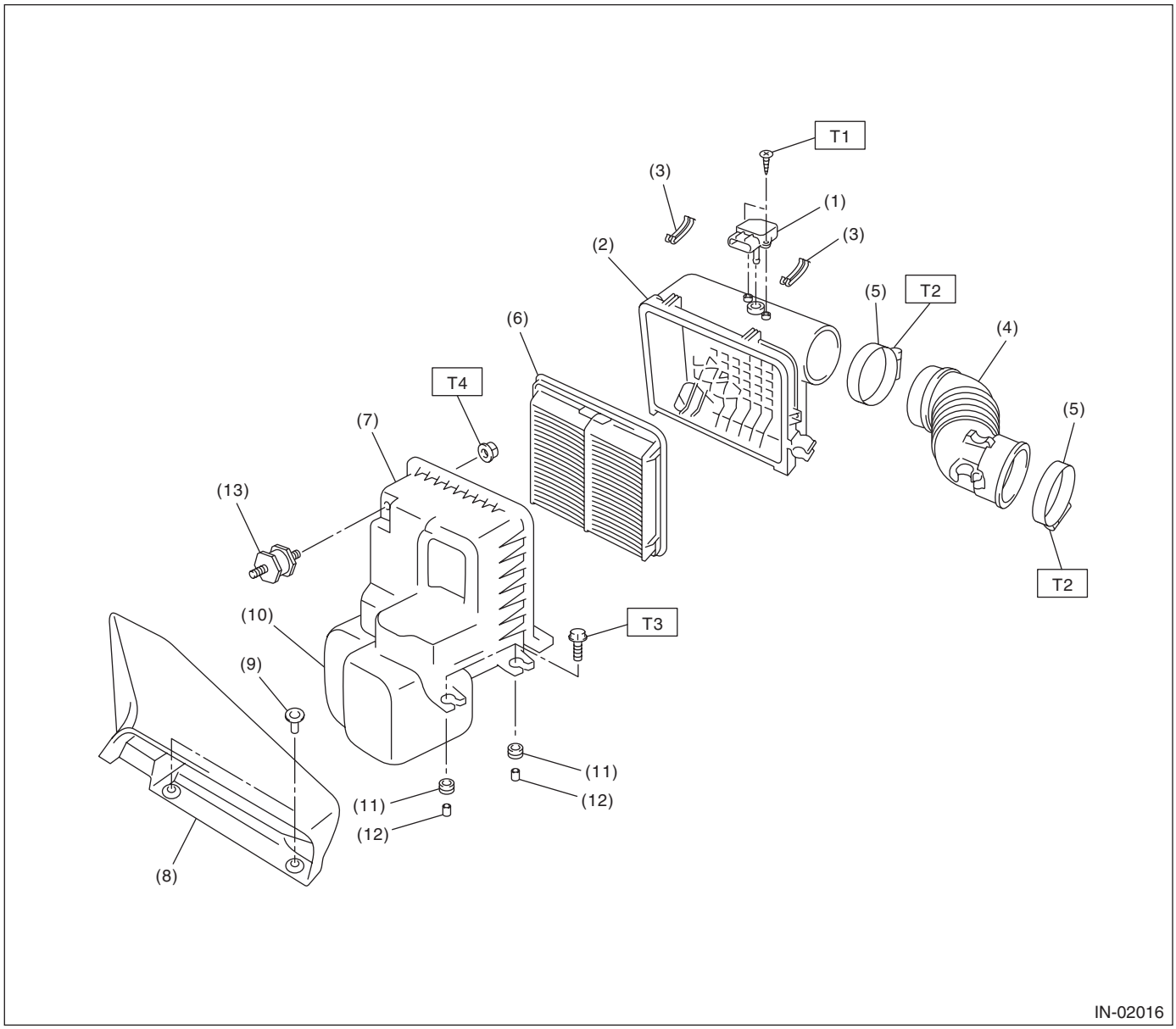
Page

1. General Description 2

1. General Description

A: COMPONENT

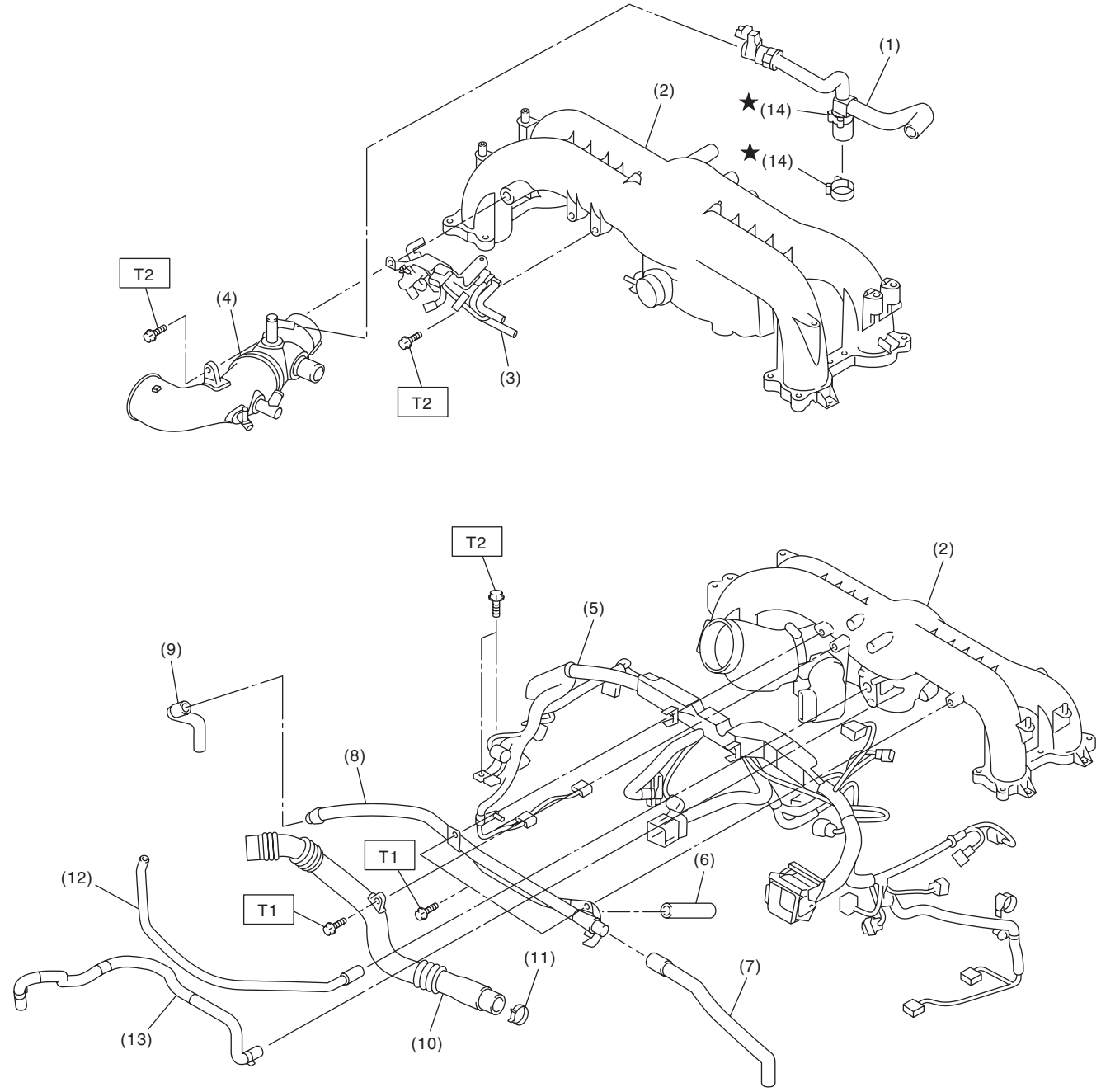
1. AIR CLEANER



(1)	Mass air flow and intake air temperature sensor	(7)	Air cleaner case (front)
(2)	Air cleaner case (rear)	(8)	Air intake duct
(3)	Clip	(9)	Clip
(4)	Air intake boot	(10)	Resonator chamber
(5)	Clamp	(11)	Cushion
(6)	Air cleaner element	(12)	Spacer
		(13)	Cushion

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.0 (0.10, 0.74)
T2: 2.5 (0.25, 1.8)
T3: 6.0 (0.61, 4.4)
T4: 7.5 (0.76, 5.5)

2. INTAKE DUCT

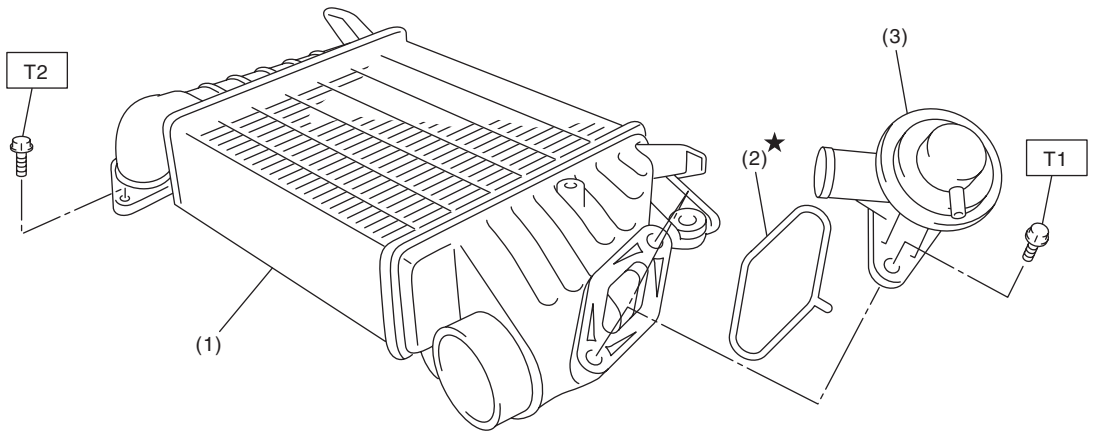


IN-02092

(1) PCV hose ASSY
(2) Intake manifold
(3) Solenoid valve bracket ASSY
(4) Intake duct
(5) Engine harness ASSY
(6) Vacuum hose
(7) Vacuum hose
(8) PCV pipe
(9) Vacuum hose
(10) Air by-pass pipe
(11) Clamp
(12) Vacuum hose
(13) Brake booster hose
(14) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.5 (0.66, 4.8)
T2: 19 (1.9, 13.7)

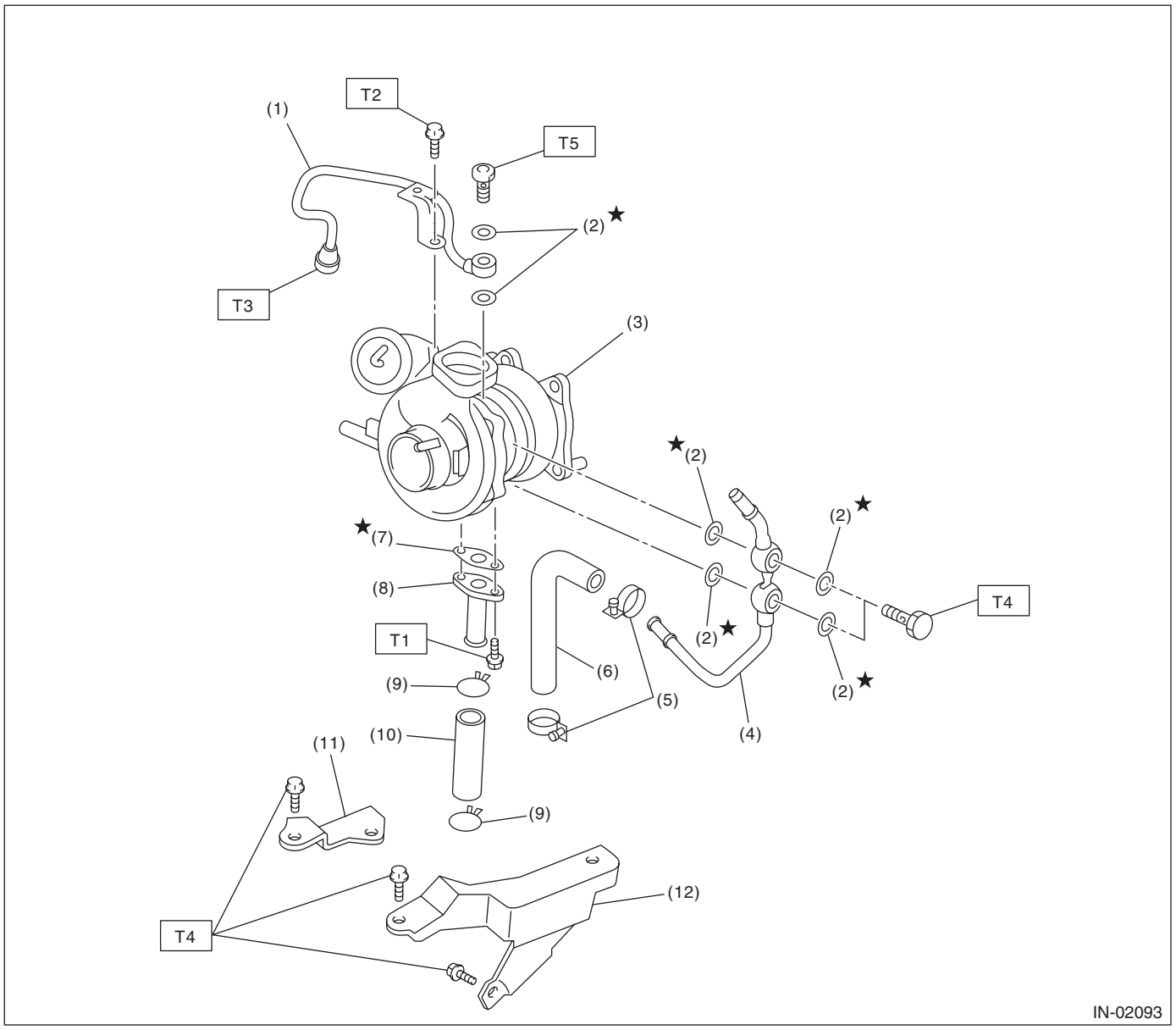
3. INTERCOOLER



(1) Intercooler
(2) Gasket
(3) Air by-pass valve

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.5 (0.66, 4.8)
T2: 16 (1.6, 11.6)

4. TURBOCHARGER



(1)	Oil inlet pipe	(7)	Gasket
(2)	Metal gasket	(8)	Oil outlet pipe
(3)	Turbocharger	(9)	Clip
(4)	Water pipe	(10)	Oil outlet hose
(5)	Clamp	(11)	Turbocharger bracket RH
(6)	Engine coolant hose	(12)	Turbocharger bracket LH

Tightening torque: N·m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)
T2: 4.9 (0.50, 3.6)
T3: 20 (2.0, 14.8)
T4: 33 (3.4, 24.6)
T5: 16 (1.6, 11.6)

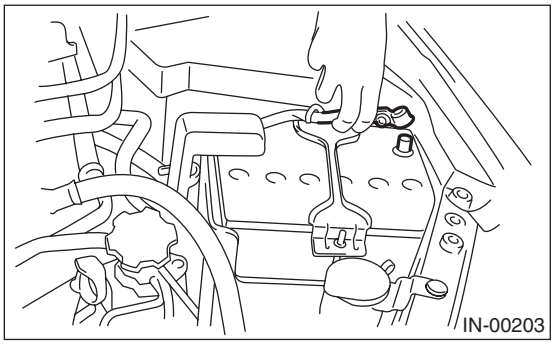
B: CAUTION

- 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 battery.

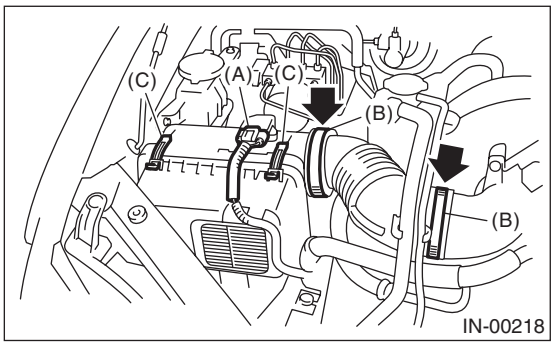
2. Air Cleaner Element

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector (A) from the mass air flow sensor.
3) Loosen the clamp (B) which connects the air intake boot and intake duct.
4) Remove the clip (C) from the air cleaner case.

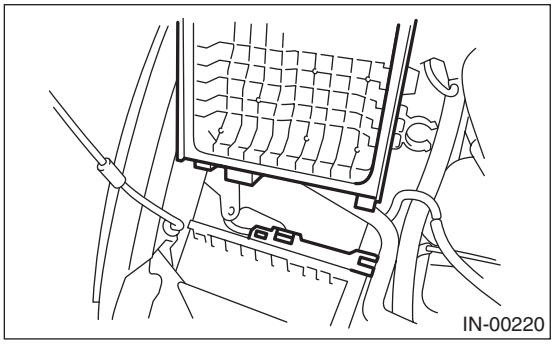


5) Remove the air cleaner case (rear) and air intake boot.
6) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
When installing the air cleaner case (rear), align the protrusion of the air cleaner case (rear) to the hole on the air cleaner case (front) to install.



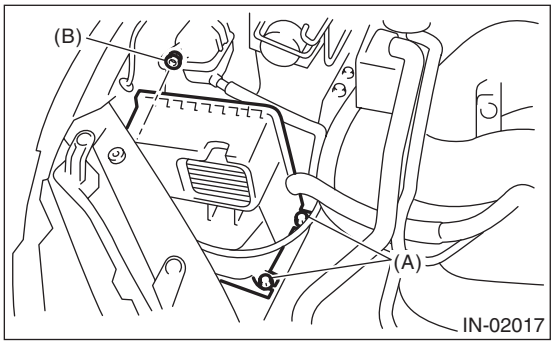
C: INSPECTION

Replace if excessively damaged or dirty.

3. Air Cleaner Case

A: REMOVAL

1) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
2) Remove the air cleaner element.
<Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner Element.>
3) Remove the bolts (A) and nuts (B) which secure the air cleaner case (front) to the body.



4) Remove the air cleaner case (front).

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Bolt: 6.0 N·m (0.61 kgf-m, 4.4 ft-lb)
Nut: 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

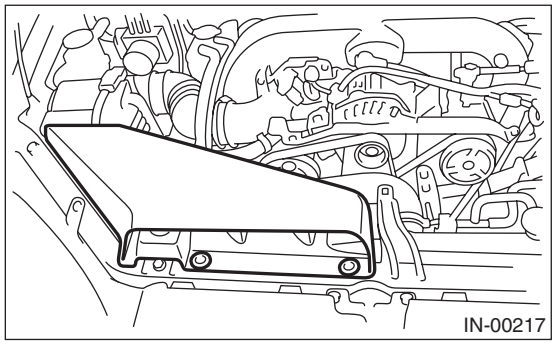
C: INSPECTION

Check for cracks or loose connection.

4. Air Intake Duct

A: REMOVAL

Remove the clip which installs the air intake duct on the front side of body.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Check for cracks or loose connection.
2) Inspect that no foreign objects in the air intake duct.

5. 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(H4DOTC)-8, 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(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>

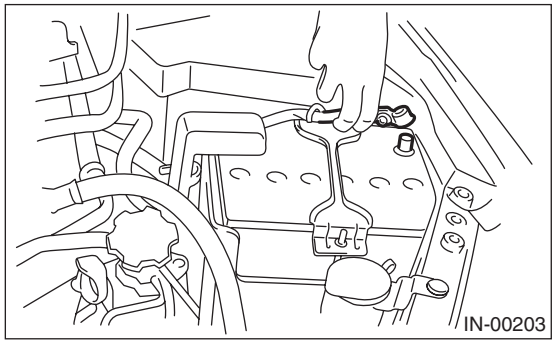
C: INSPECTION

Check for cracks or loose connection.

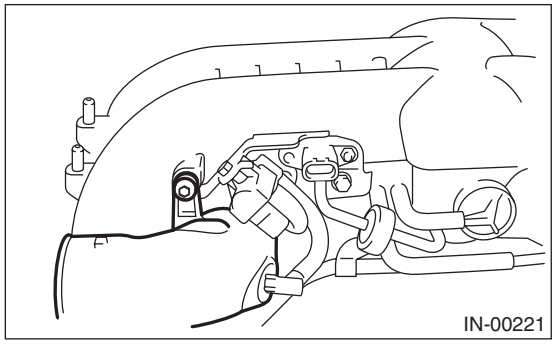
6. Intake Duct

A: REMOVAL

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



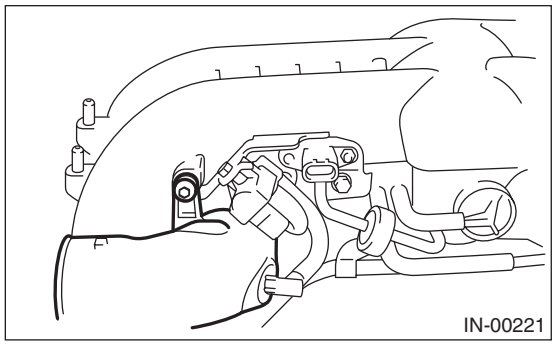
3) Remove the intake manifold. <Ref. to FU(H4DOTC)-11, REMOVAL, Intake Manifold.>
4) Remove the sensor, engine harness and fuel pipe attached to the intake manifold. <Ref. to FU(H4DOTC)-15, DISASSEMBLY, Intake Manifold.>
5) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

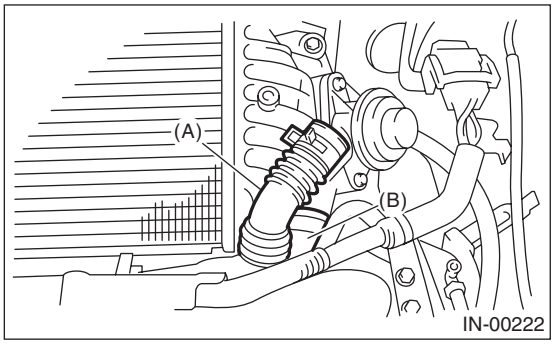
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



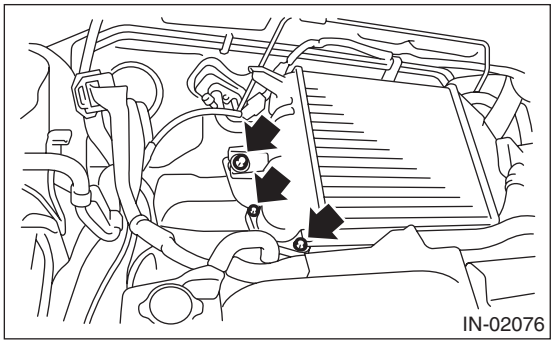
7. Intercooler

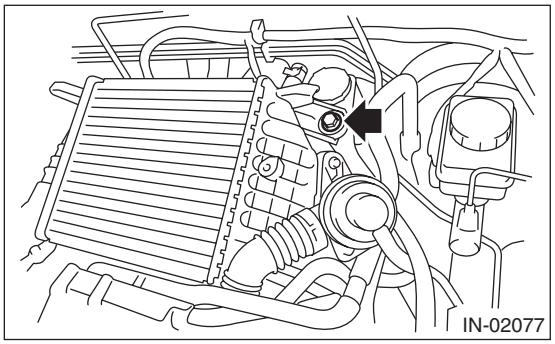
A: REMOVAL

1) Remove the collector cover.
2) Loosen the clamp and remove the air by-pass pipe (A) from the air by-pass valve.
3) Loosen the clamp, and then remove the intake duct (B) from the intercooler.



4) Remove the bolts which secure the intake duct to the turbocharger.
5) Remove the bolts which secure the intercooler to the bracket, and remove the intercooler.

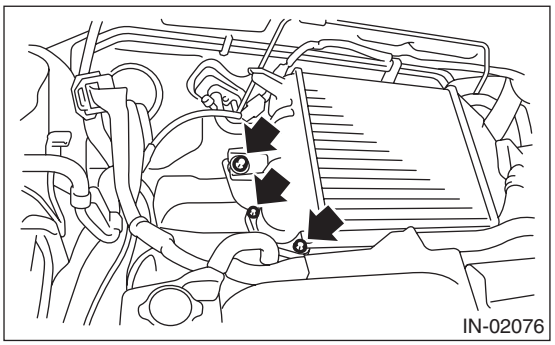


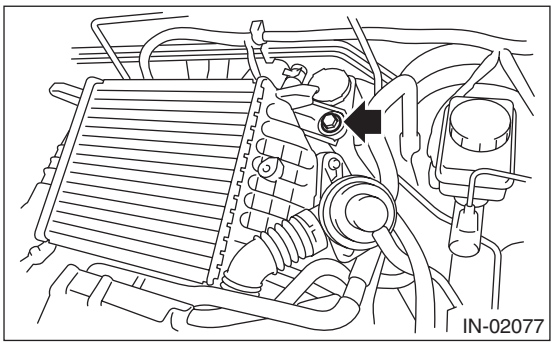


B: INSTALLATION

Install in the reverse order of removal.

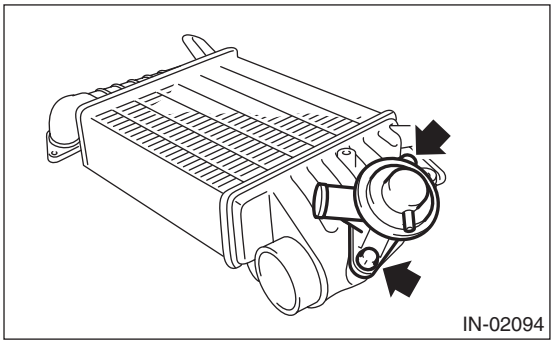
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)





C: DISASSEMBLY

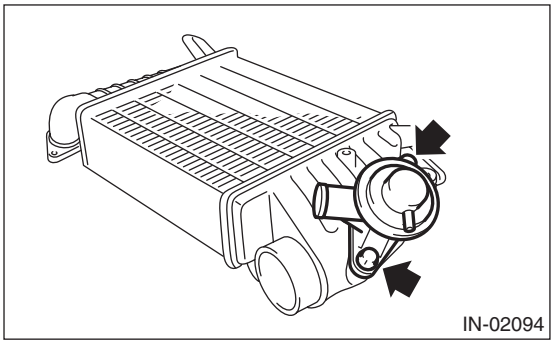
1) Remove the intake duct from the intercooler.
2) Remove the air by-pass valve from intercooler.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

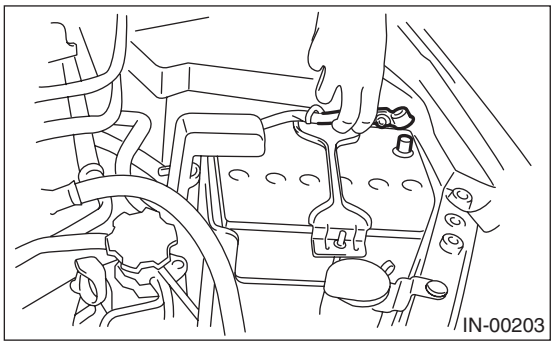
Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



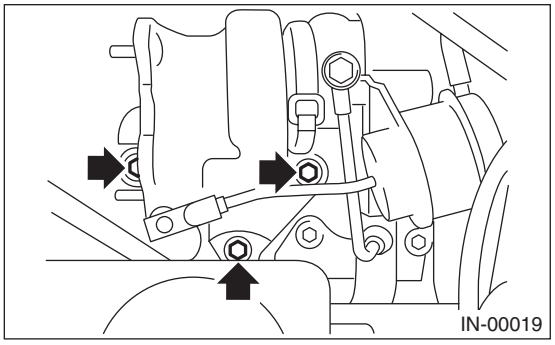
8. Turbocharger

A: REMOVAL

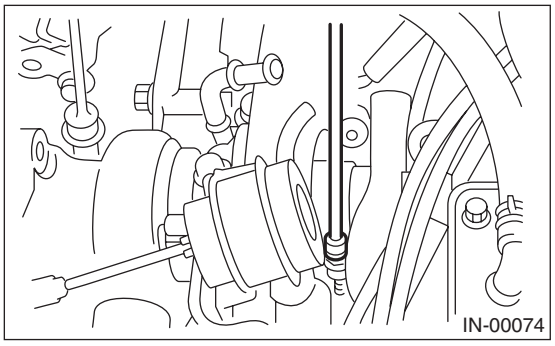
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.



4) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
5) Remove the intercooler bracket RH.
6) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
7) Lower the vehicle.
8) Separate the turbocharger joint pipe from turbocharger.

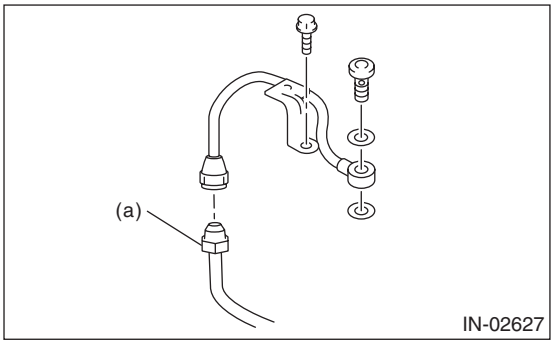


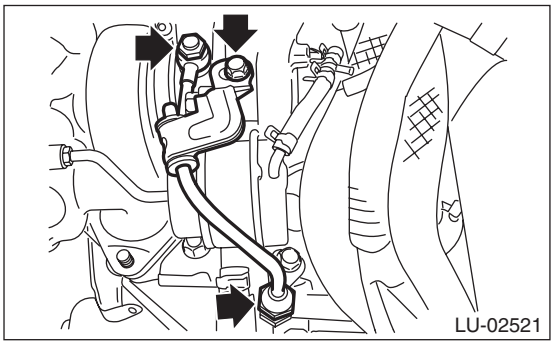
9) Disconnect the engine coolant hose which is connected to coolant filler tank.
10) Loosen the clamp which secures turbocharger to intake duct.



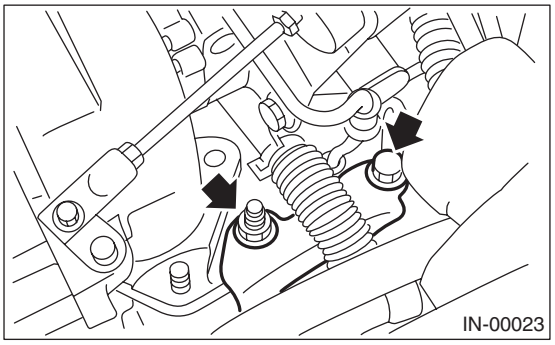
11) Remove the bolts which secure oil pipe bracket to turbocharger.
12) Remove the oil inlet pipe from the turbocharger.

CAUTION:
In order to prevent damaging the oil pipe on the cylinder head side, fix the section (a) shown in the figure when loosing the oil inlet pipe flare nut, and avoid the part from rotating together while loosening the nut.

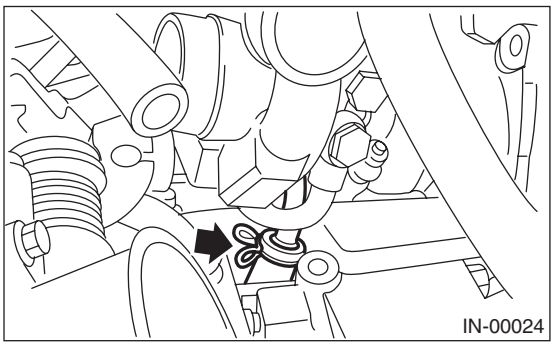




13) Remove the turbocharger bracket.



14) Disconnect the oil outlet hose from pipe.

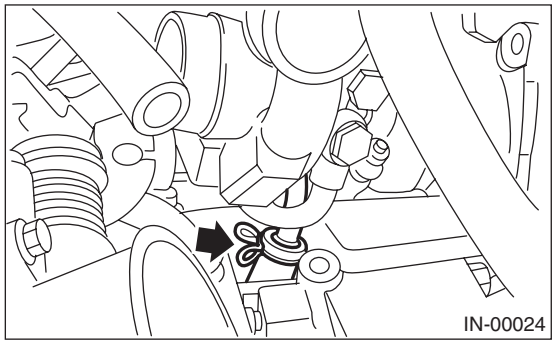


15) Take out the turbocharger from engine compartment.

B: INSTALLATION

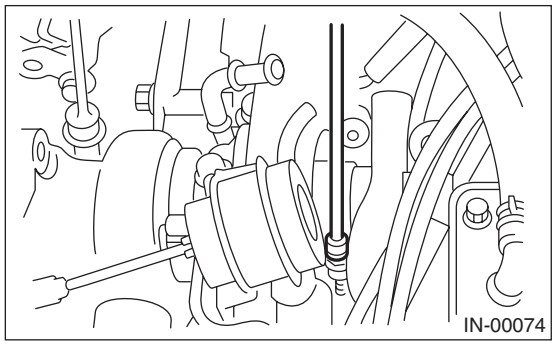
CAUTION:
When replacing the turbocharger, check the filter part of union screw for clogging. <Ref. to LU(H4DOTC)-22, INSPECTING UNION SCREW WITH FILTER, INSPECTION, Oil Pipe.>

1) Connect the oil outlet hose to outlet pipe.



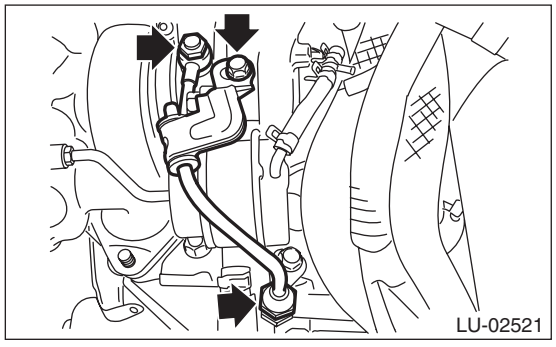
2) Install the turbocharger to intake duct.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



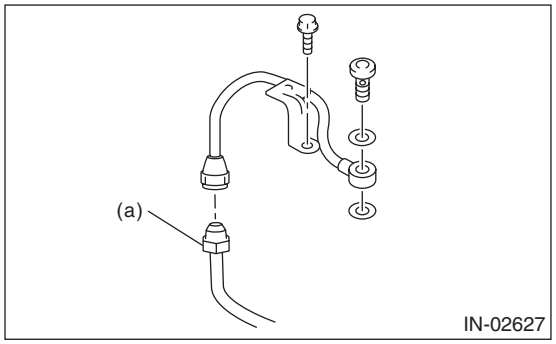
3) Temporarily tighten the bolts and flare nuts which secure the oil inlet pipe to the turbocharger.

NOTE:
Use a new gasket.

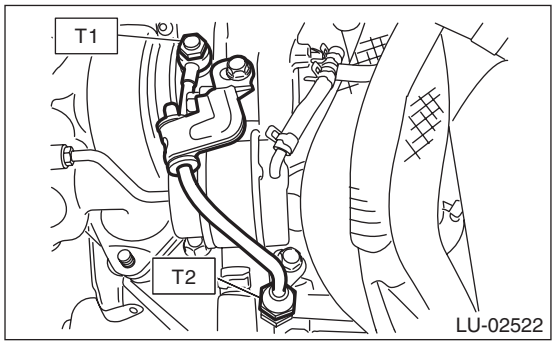


4) Tighten the union screws and flare nuts which secure the oil inlet pipe to the turbocharger.

CAUTION:
In order to prevent damaging the oil pipe on the cylinder head side, fix the section (a) shown in the figure when tightening the oil inlet pipe flare nut, and avoid the part from rotating together while tightening the nut.

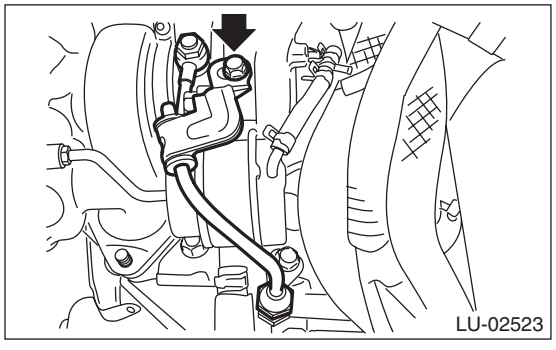


Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



5) Tighten the bolts which hold the oil inlet pipe stay to the turbocharger.

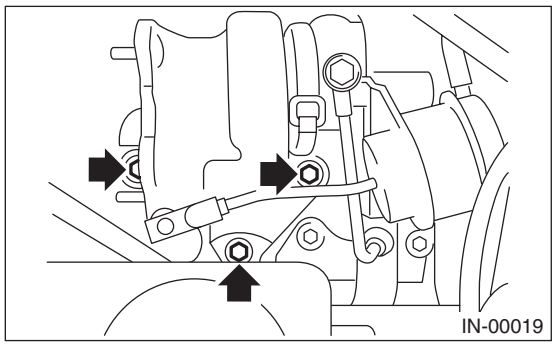
Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



6) Install the joint pipe to turbocharger.

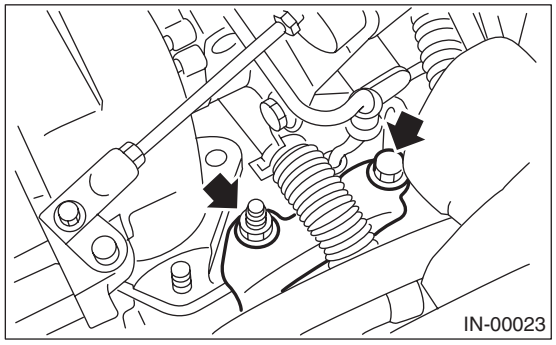
NOTE:
Replace the gasket with a new part.

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



7) Install the turbocharger bracket.

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

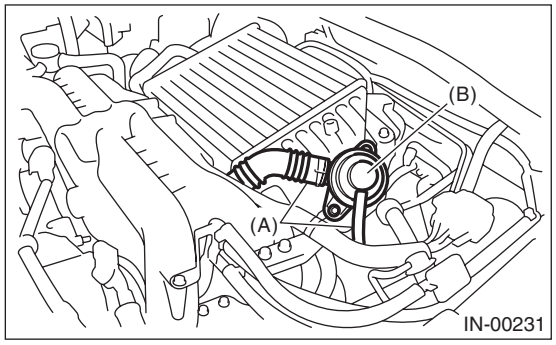


8) Connect the engine coolant hose which is connected to the coolant filler tank.
9) Lift-up the vehicle.
10) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
11) Install the intercooler bracket RH.
12) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
13) Install the collector cover.

9. Air By-pass Valve

A: REMOVAL

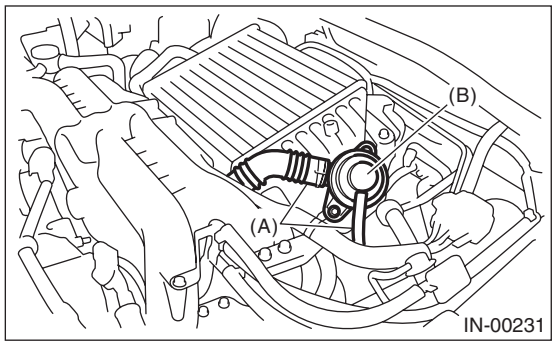
1) Remove the collector cover.
2) Disconnect the air by-pass hose (A) from the air by-pass valve.
3) Remove the air by-pass valve (B) from the inter-cooler.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



(A) Air by-pass hose
(B) Air by-pass valve

MECHANICAL

ME(H4DOTC)

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1. General Description

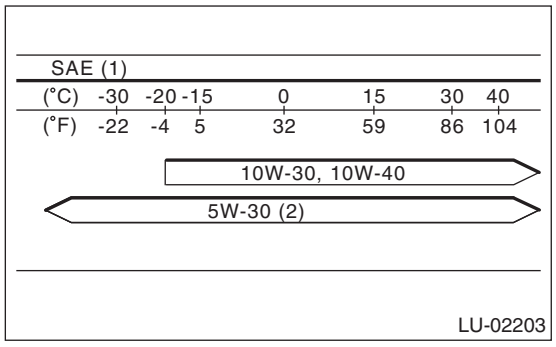
A: SPECIFICATION

Lubrication method					Forced lubrication
Oil pump	Pump type				Trochoid type
	Number of teeth	Inner rotor			9
		Outer rotor			10
	Outer rotor diameter × thickness			mm (in)	78 × 10 (3.07 × 0.47)
	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)	0.02 — 0.07 (0.0008 — 0.0028)
	Case clearance between outer rotor and pump case		Standard	mm (in)	0.10 — 0.175 (0.0039 — 0.0069)
	Performance (Oil temperature 80°C (176°F)	600 rpm	Discharge pressure	kPa (kg/cm^2, psi)	98 (1.0, 14)
			Discharge rate	ℓ (US qt, Imp qt)/min.	4.6 (4.9, 4.0) or more
		5,000 rpm	Discharge pressure	kPa (kg/cm^2, psi)	294 (3.0, 43)
			Discharge rate	ℓ (US qt, Imp qt)/min.	47.0 (49.7, 41.4) or more
	Relief valve working pressure			kPa (kg/cm^2, psi)	588 (6.0, 85)
Oil filter	Filter type				Full-flow filter type
	Filtration area		cm^2 (sq in)	Outer diameter: 68 mm (2.68 in)	800 (124)
				Outer diameter: 65 mm (2.56 in)	470 (72.9)
	By-pass valve opening pressure			kPa (kg/cm^2, psi)	160 (1.63, 23.2)
	Outer diameter × width		mm (in)	Outer diameter: 68 mm (2.68 in)	68 × 65 (2.68 × 2.56)
				Outer diameter: 65 mm (2.56 in)	65 × 74.4 (2.56 × 2.93)
	Installation screw specifications				M 20 × 1.5
Oil pressure switch	Type				Immersed contact point type
	Operating voltage — power consumption				12 V — 3.4 W or less
	Warning light operating pressure			kPa (kg/cm^2, psi)	14.7 (0.15, 2.1)
	Proof pressure			kPa (kg/cm^2, psi)	981 (10, 142) or more
Engine oil	Total capacity (Overhaul)			ℓ (US qt, Imp qt)	5.0 (5.3, 4.4)
	When replacing engine oil and oil filter			ℓ (US qt, Imp qt)	4.3 (4.5, 3.8)
	When replacing engine oil only			ℓ (US qt, Imp qt)	4.0 (4.2, 3.5)

Recommended oil:

Those with an 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

The proper viscosity oil helps the engine maintain its ideal temperature, and cranking speed increased by reducing viscosity friction in hot condition.

CAUTION:

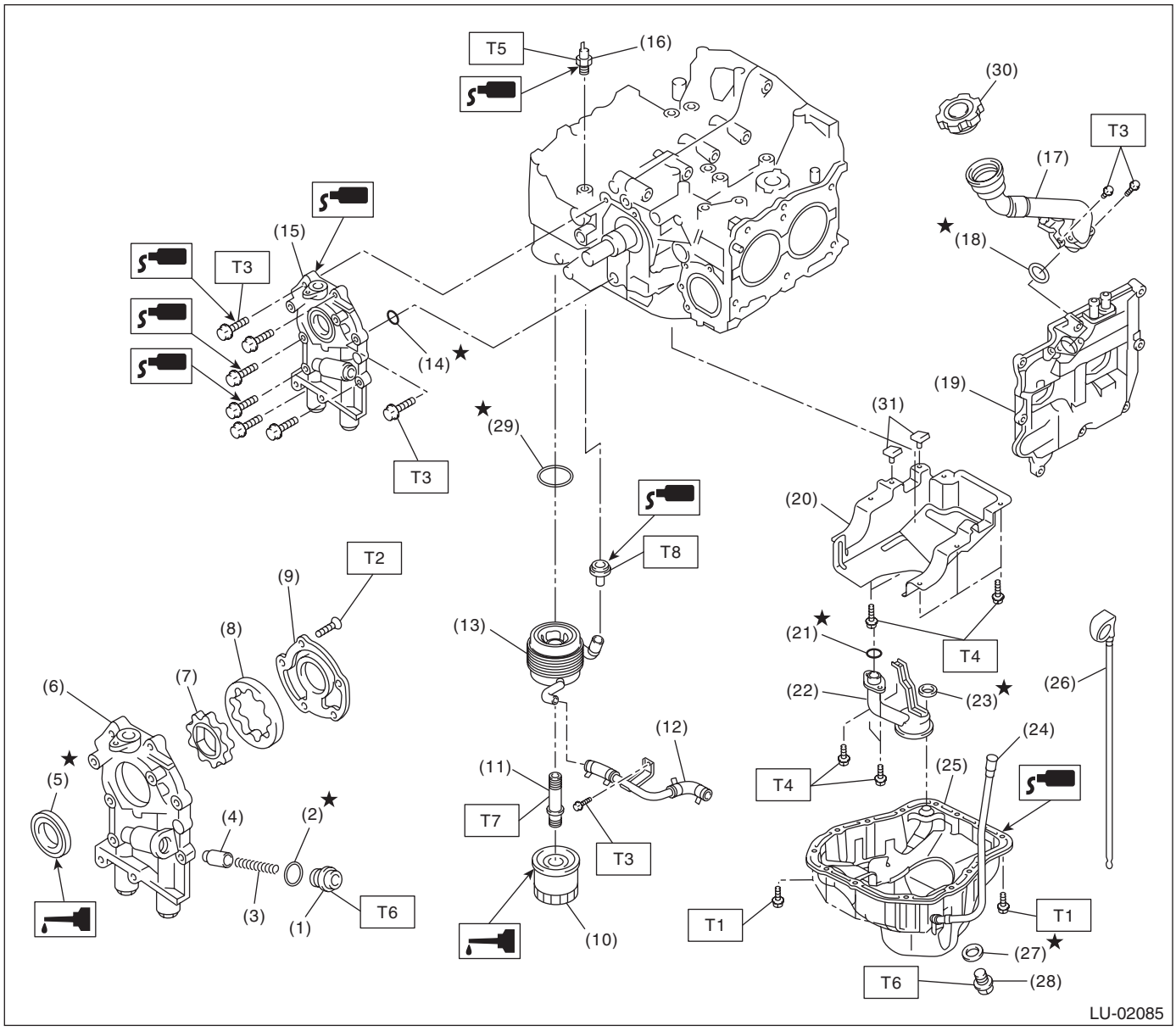
When replacing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil with SUBARU designated API standard and SAE viscosity numbers.

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) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) Oil cooler connector
(12) Water by-pass pipe
(13) Oil cooler
(14) O-ring
(15) Oil pump ASSY
(16) Oil pressure switch
(17) Oil filler duct
(18) O-ring
(19) Rocker cover
(20) Baffle plate
(21) O-ring
(22) Oil strainer
(23) Gasket
(24) Oil level gauge guide
(25) Oil pan
(26) Oil level gauge
(27) Metal gasket
(28) Drain plug
(29) O-ring
(30) Oil filler cap
(31) Seal

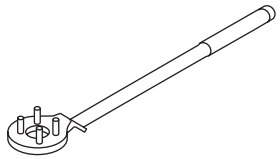
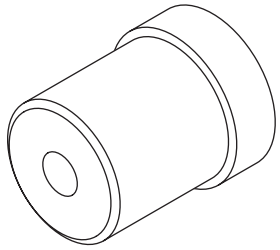
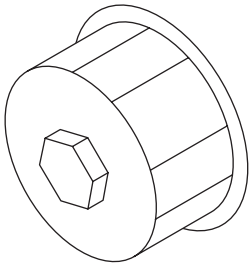
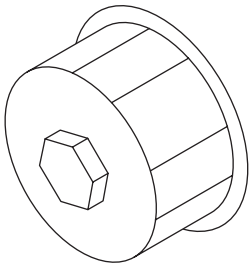
Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 5.4 (0.55, 4.0)
T3: 6.4 (0.65, 4.7)
T4: 10 (1.0, 7.0)
T5: 25 (2.5, 18.4)
T6: 44 (4.5, 32.5)
T7: 54 (5.5, 40)
T8: 69 (7.0, 50)

C: CAUTION

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

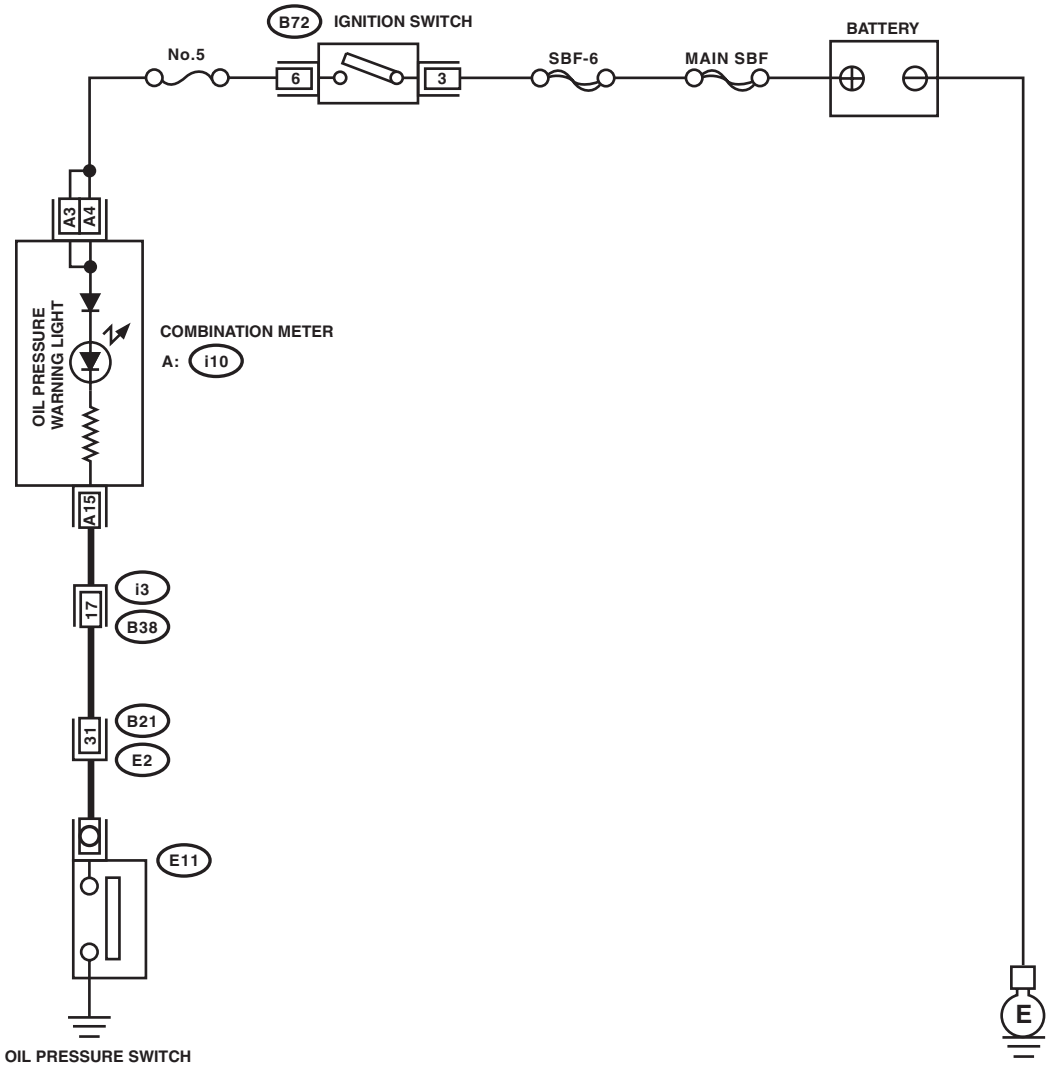
D: PREPARATION TOOL

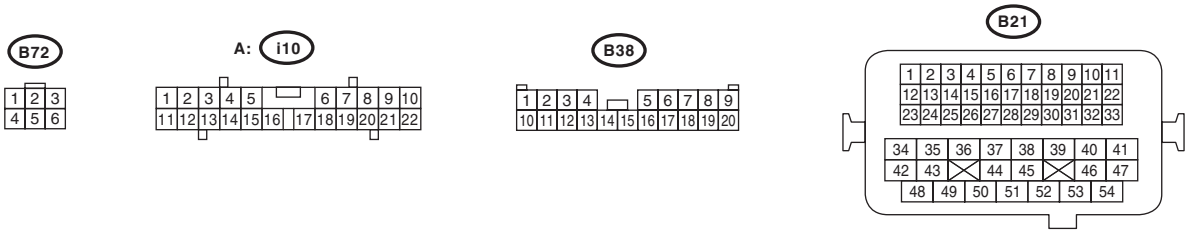
1. SPECIAL TOOL

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-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil seal into oil pump.
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))

2. Oil Pressure System

A: WIRING DIAGRAM





LU-02113

B: INSPECTION

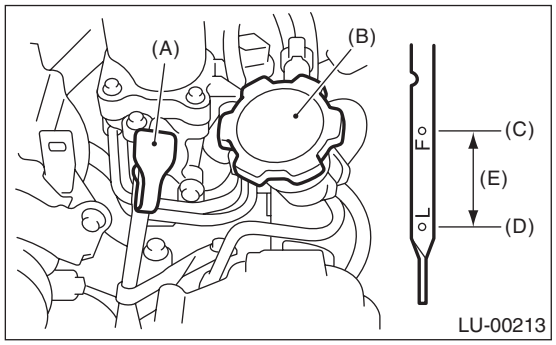
Step		Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (engine OFF) 2) Check the warning light of combination meter.	Does the warning light illuminate?	Go to step **2**.	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil pressure switch. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between oil pressure switch connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Replace the oil pressure switch.	Go to step **3**.
3	**CHECK COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. ***Terminal*** ***(i10) No. 4 — (i10) No. 15:*** ***(i10) No. 3 — (i10) No. 15:***	Is the resistance less than 10 Ω?	Replace the harness connector between the combination meter and the oil pressure switch.	Repair or replace the combination meter. <Ref. to IDI-3, 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 level gauge all the way. Be sure that the 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 level.
6) Just after driving or while the engine is warm, engine oil level shows in the range between “F” line and cutout portion. This is caused by thermal expansion of engine oil.

NOTE:
To prevent overfilling of engine oil, do not add oil above “F” line when the engine is cold.

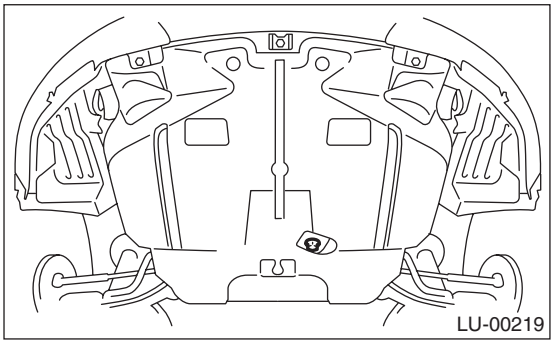


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

1) Open the engine oil filler cap for quick draining of engine oil.
2) Lift up the vehicle.
3) Drain engine oil by loosening the engine oil drain plug.

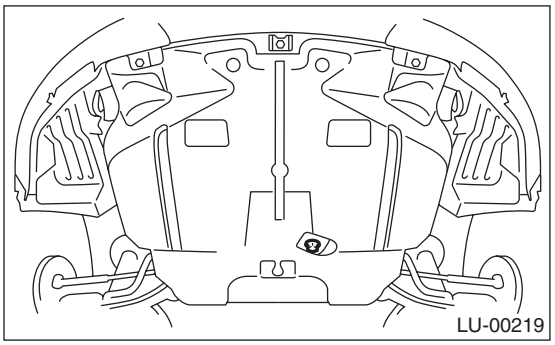
NOTE:
Prepare the container for draining of engine oil.



4) Tighten the engine oil drain plug after draining engine oil.

NOTE:
Use a new metal gasket.

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

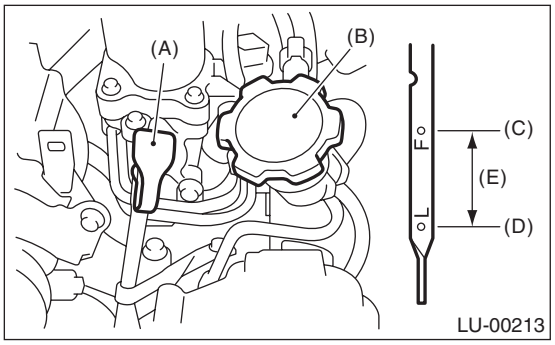


5) Using engine oil of proper quality and viscosity, fill engine oil through the oil filler duct to the upper level on level gauge. Make sure that the vehicle is parked on a level surface when checking oil level.

Recommended oil:
<Ref. to LU(H4DOTC)-2, SPECIFICATION, General Description.>

Engine oil capacity:
Engine oil capacity <Ref. to LU(H4DOTC)-2, SPECIFICATION, General Description.>
6) Close the engine oil filler cap.
7) Start the engine and warm it up for a time.

8) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

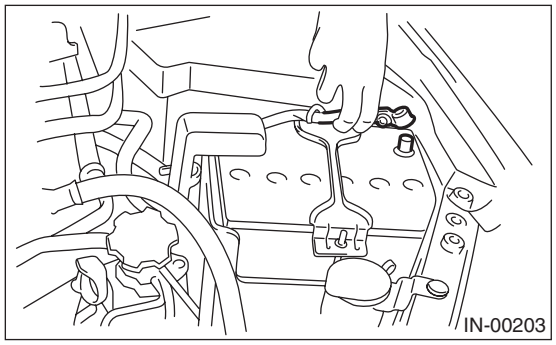


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

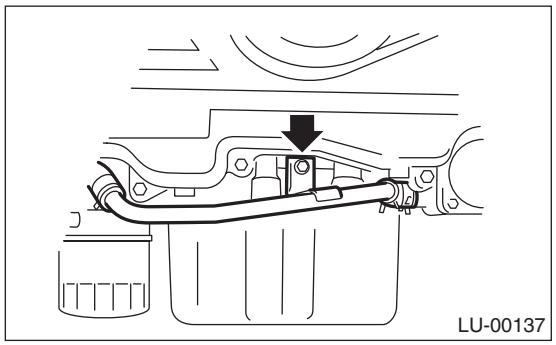
4. Oil Pump

A: REMOVAL

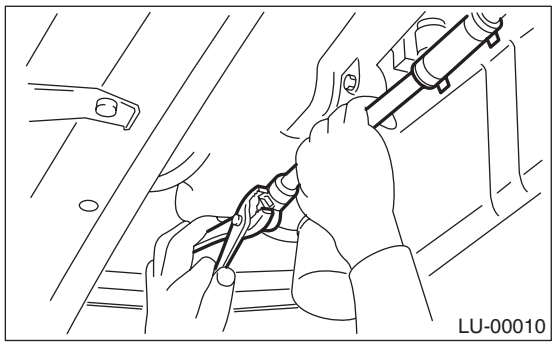
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



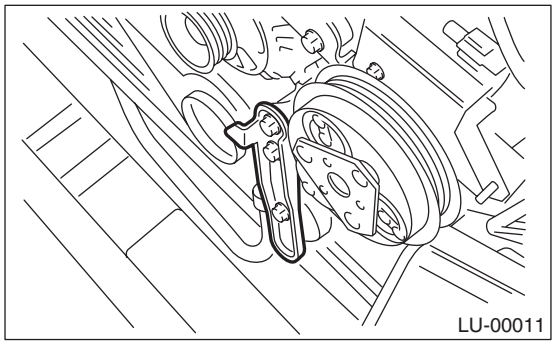
3) Lift up the vehicle.
4) Remove the under cover.
5) Remove the bolts which install water pipe of oil cooler to oil pump.



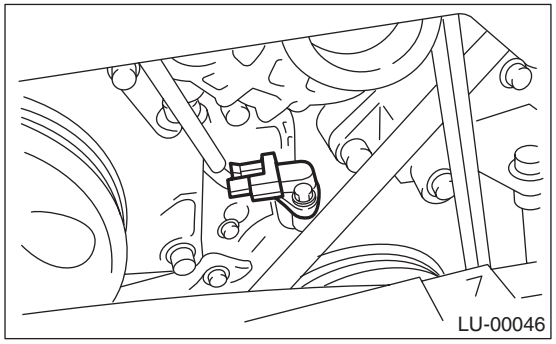
6) Remove the water pipe and hoses between oil cooler and water pump.



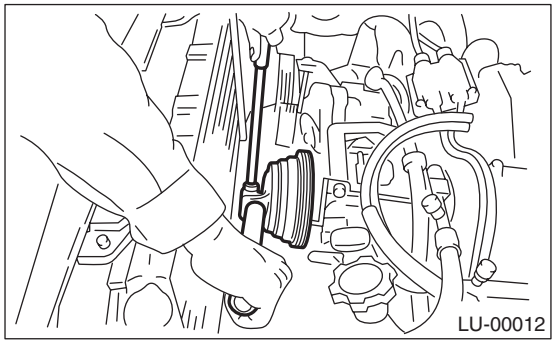
7) Lower the vehicle.
8) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
9) Remove the V-belts. <Ref. to ME(H4DOTC)-36, REMOVAL, V-belt.>
10) Remove the rear side V-belt tensioner.



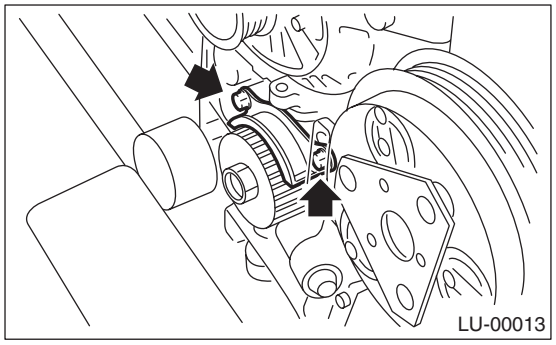
11) Remove the crankshaft position sensor.



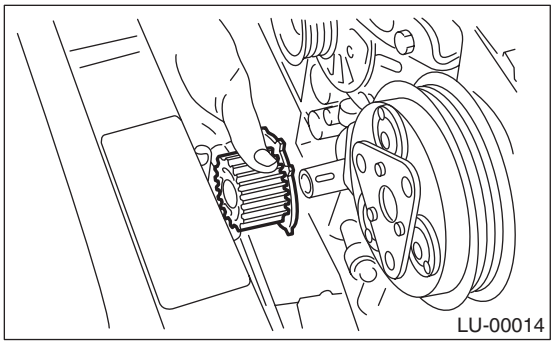
12) Remove the crank pulley using ST. <Ref. to ME(H4DOTC)-39, REMOVAL, Crank Pulley.>



13) Remove the water pump. <Ref. to CO(H4DOTC)-15, REMOVAL, Water Pump.>
14) Remove the timing belt guide.

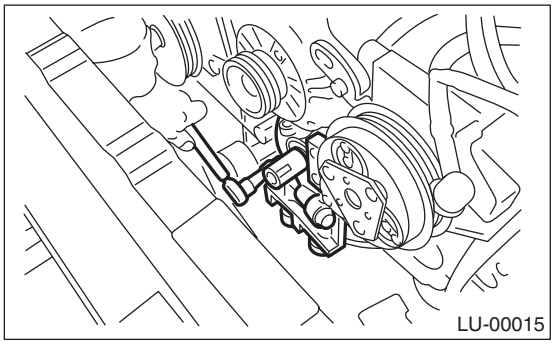


15) Remove the crank sprocket.



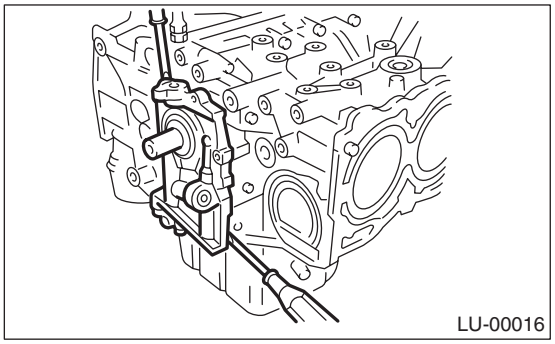
16) Remove the bolts which install oil pump onto cylinder block.

NOTE:
When disassembling and checking the oil pump, loosen the relief valve plug before removing the oil pump.



17) Remove the oil pump by using flat tip screwdriver.

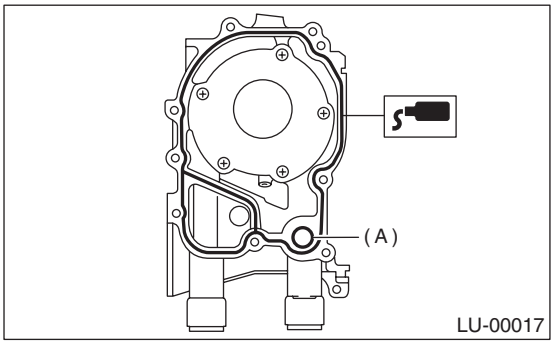
CAUTION:
Be careful not to scratch mating surfaces of cylinder block and oil pump.



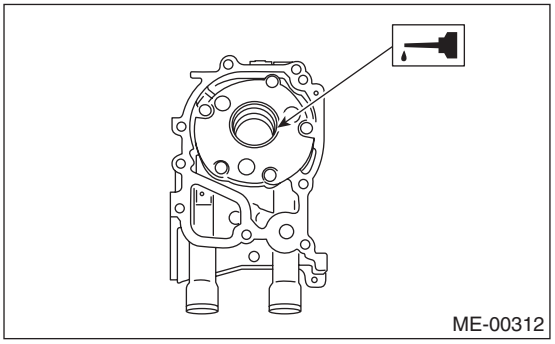
B: INSTALLATION

Install in the reverse order of removal.
Perform the following.
1) Apply liquid gasket to the mating surfaces of oil pump.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



2) Replace O-ring (A) with a new part.
3) Apply a coat of engine oil to the inside of oil seal.



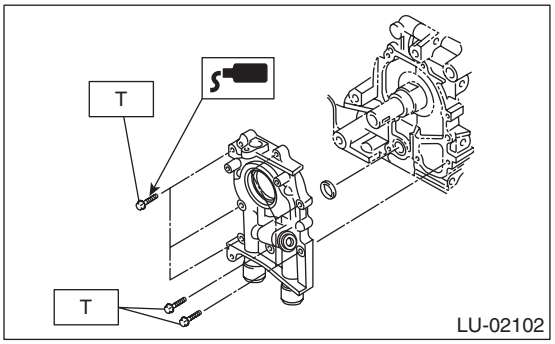
4) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:
- **Make sure the oil seal lip is not folded.**
- **Be careful not to scratch the oil seal when installing oil pump on cylinder block.**

5) Install the oil pump.
6) Apply liquid gasket to the three bolts thread.

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

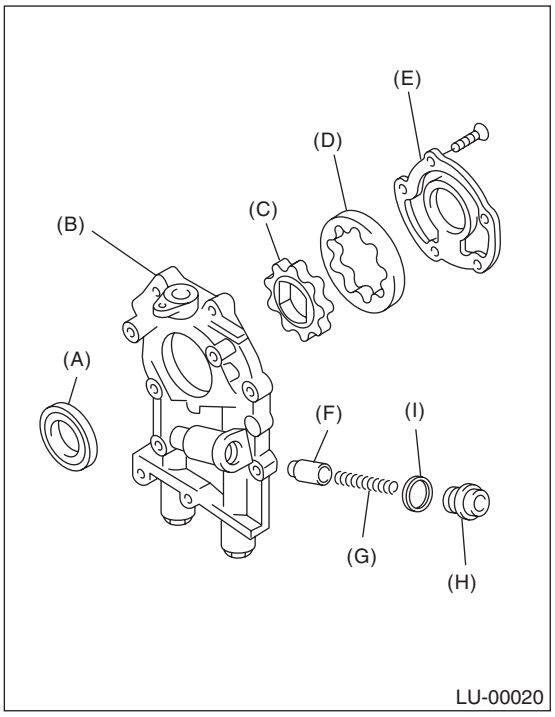
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



C: DISASSEMBLY

Remove the screw which secures oil pump cover and then disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:
Before disassembling the oil pump, remove the relief valve.

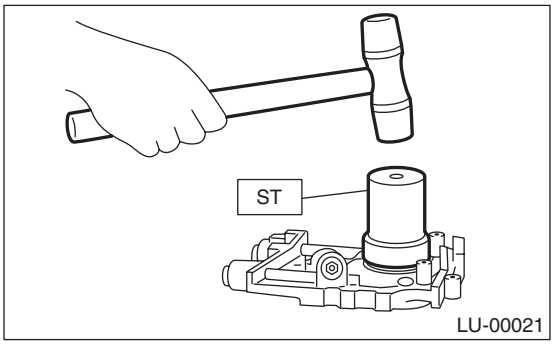


(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

1) Using the ST, install the front oil seal.
ST 499587100 OIL SEAL INSTALLER

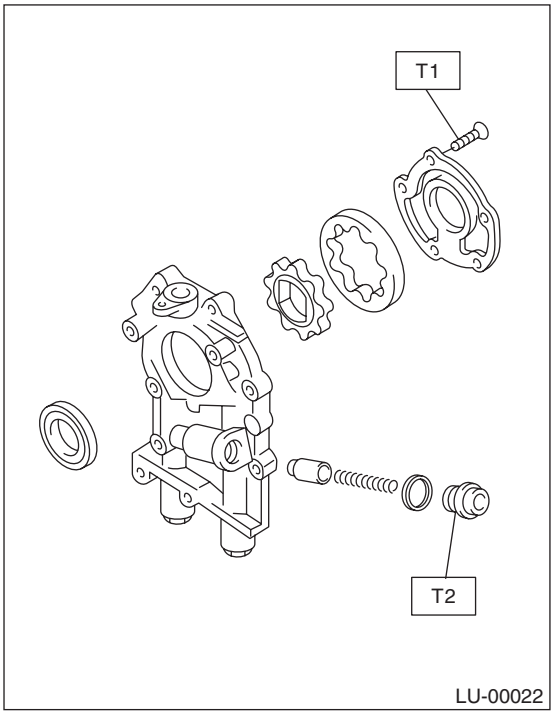
NOTE:
Use a new oil seal.



2) Apply a coat of engine oil to inner and outer rotors.
3) Assemble the inner and outer rotors in their original positions.
4) Assemble the oil relief valve and install relief valve spring and plug.

NOTE:
Use a new gasket.
5) Install the oil pump cover.

Tightening torque:
T1: 5.4 N·m (0.55 kgf-m, 4.0 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

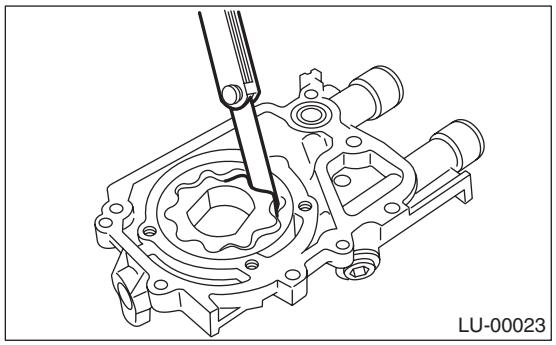


E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance is out of specification, replace the rotors as a set.

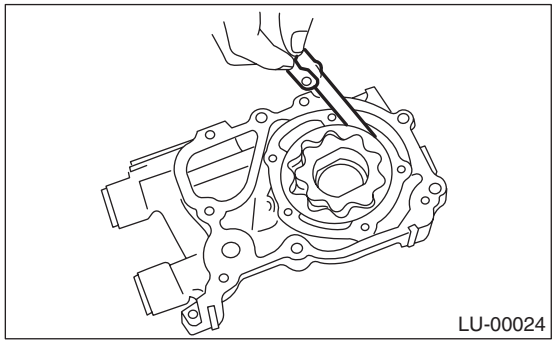
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and the oil pump rotor housing. If clearance is out of standard, replace the oil pump case.

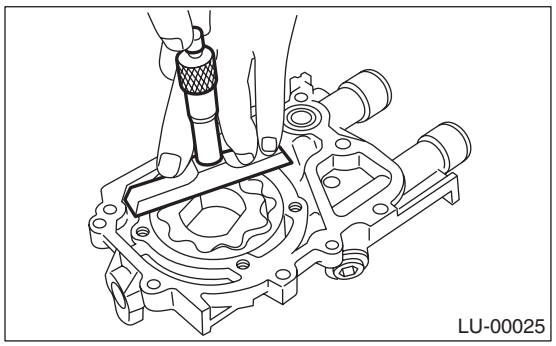
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)



3. SIDE CLEARANCE

Measure the clearance between oil pump inner rotor and pump cover. If the clearance is out of specification, replace the rotors and the pump body.

Side clearance:
Standard
0.02 — 0.07 mm (0.0008 — 0.0028 in)



4. OIL RELIEF VALVE

Check the valve for assembly condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:
Free length
73.7 mm (2.902 in)
Installed length
54.7 mm (2.154 in)
Load when installed
93.1 N (9.49 kgf, 20.88 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks and other faults.

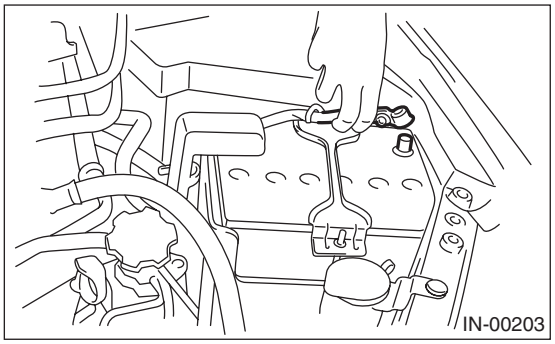
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

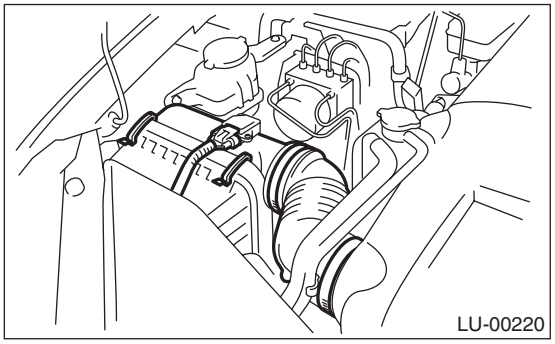
5. Oil Pan and Strainer

A: REMOVAL

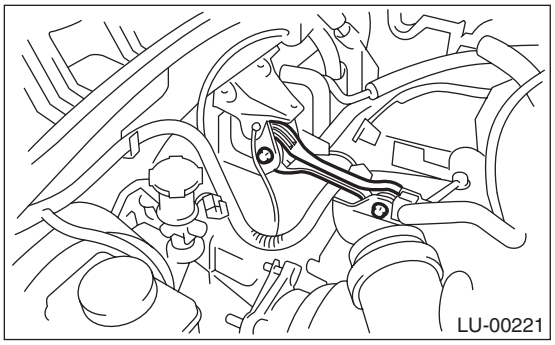
1) Set the vehicle on a lift.
2) Remove the front wheels.
3) Remove the collector cover.
4) Disconnect the ground cable from battery.



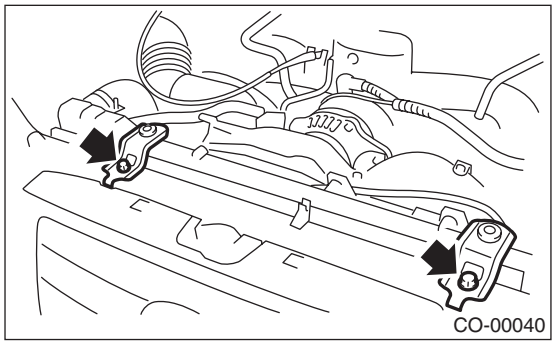
5) Disconnect the connector from mass airflow sensor.
6) Remove the air intake boot and air cleaner upper cover.



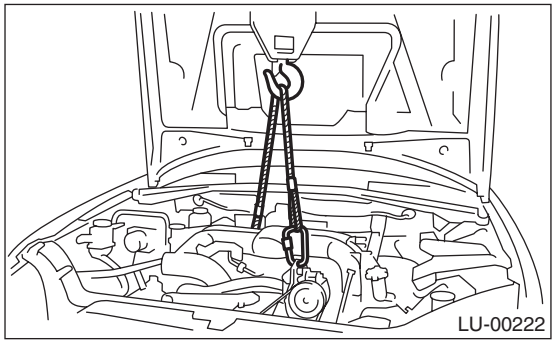
7) Remove the intercooler.
<Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
8) Remove the pitching stopper.



9) Remove the radiator upper brackets.

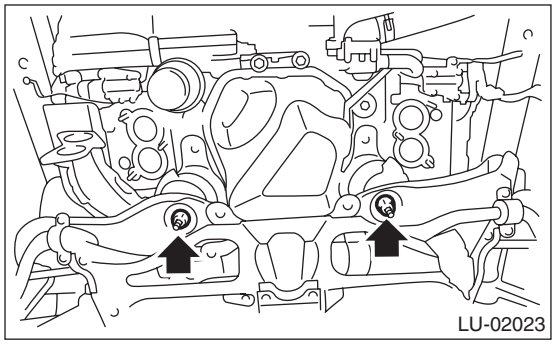


10) Support the engine with a lifting device and wire ropes.



11) Lift up the vehicle.

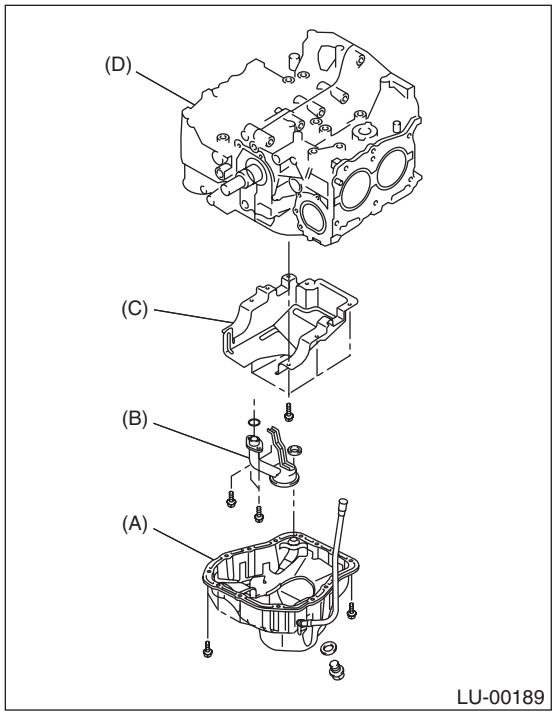
CAUTION:
When lifting up the vehicle, raise up wire ropes at the same time.
12) Remove the under cover.
13) Drain the engine oil.
14) Remove the front exhaust pipe.
<Ref. to EX(H4DOTC)-6, REMOVAL, Front Exhaust Pipe.>
15) Remove the nuts which install front cushion rubber onto front crossmember.



16) Remove the bolts which install oil pan on cylinder block with the engine raised up.
17) Insert the oil pan cutter blade into the gap between cylinder block and oil pan.

CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.
18) Remove the oil strainer.

19) Remove the baffle plate.

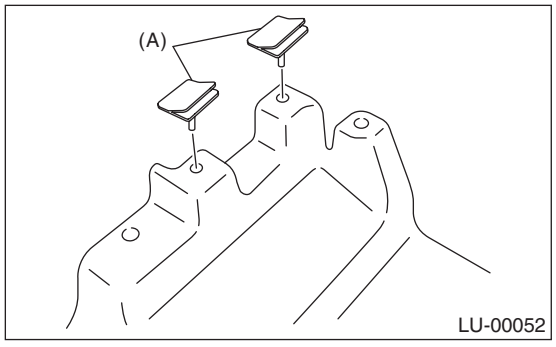


(A) Oil pan
(B) Oil strainer
(C) Baffle plate
(D) Cylinder block

B: INSTALLATION

CAUTION:
Before installing the oil pan, clean the mating surface of oil pan and engine block.

1) Make sure that the seals (A) are installed securely on the buffle plate in a direction as shown in the figure below.



2) Install the baffle plate.

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

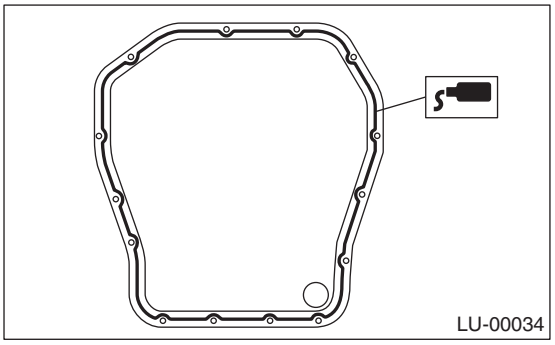
3) Install the oil strainer onto baffle plate.

NOTE:
Use new O-rings.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

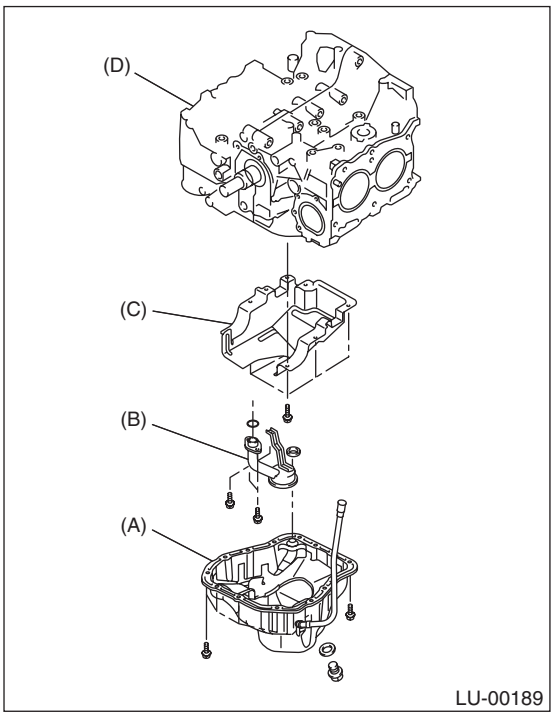
4) Apply liquid gasket to the mating surfaces, and install the oil pan.

Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent



5) Tighten the bolts which install oil pan to engine block.

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

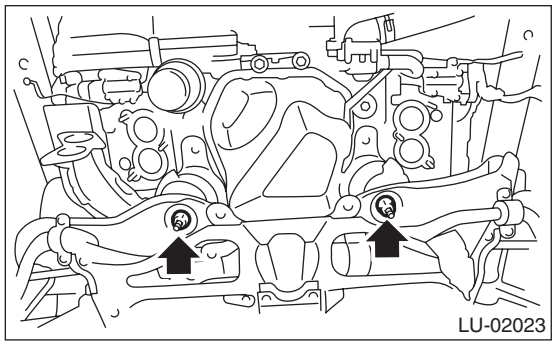


(A) Oil pan
(B) Oil strainer
(C) Baffle plate
(D) Cylinder block

6) Lower the engine onto front crossmember.

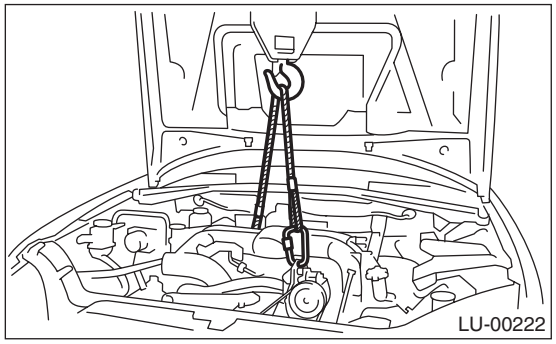
7) Tighten the nuts which install front cushion rubber onto front crossmember.

Tightening torque:
83 N·m (8.5 kgf-m, 61 ft-lb)



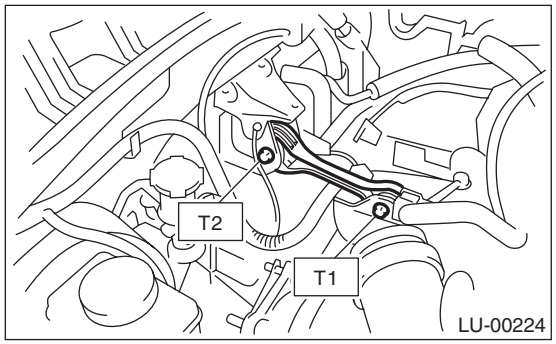
8) Install the front exhaust pipe. <Ref. to EX(H4DOTC)-6, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
9) Install the under cover.
10) Lower the vehicle.

CAUTION:
When lowering the vehicle, lower the lift-up device and wire ropes at the same time.
11) Remove the lifting device and wire ropes.

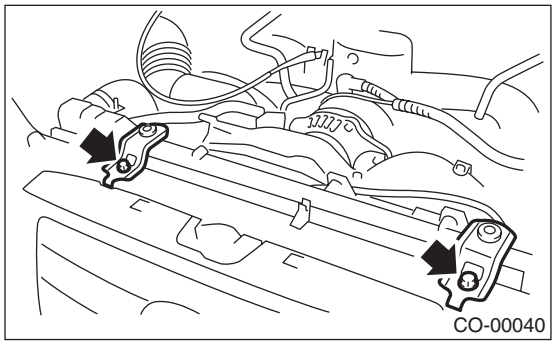


12) Install the pitching stopper.

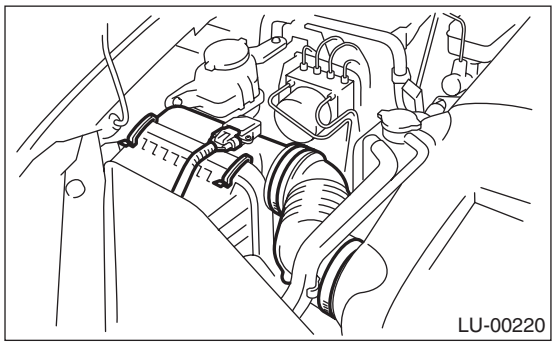
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



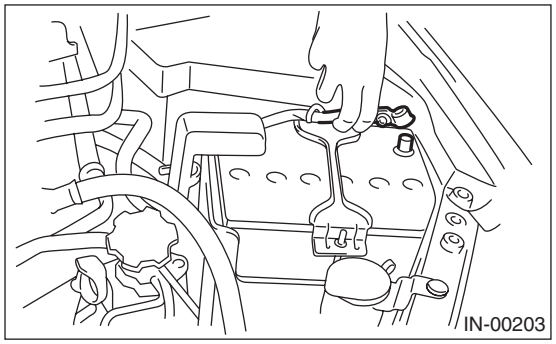
13) Install the radiator upper brackets.



14) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
15) Install the air intake boot and air cleaner upper cover.
16) Connect the connector to the mass air flow sensor.



17) Install the front wheels.
18) Install the collector cover.
19) Connect the ground cable to battery.



20) Refill the engine oil. <Ref. to LU(H4DOTC)-9, INSPECTION, Engine Oil.>

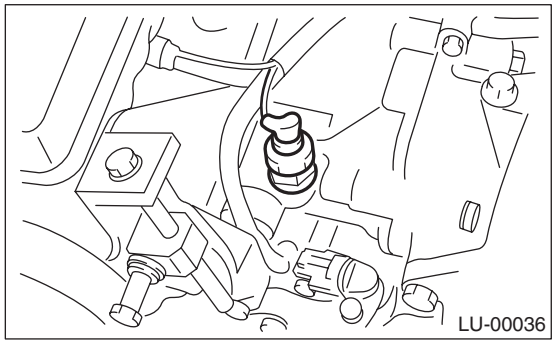
C: INSPECTION

Visually check that the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

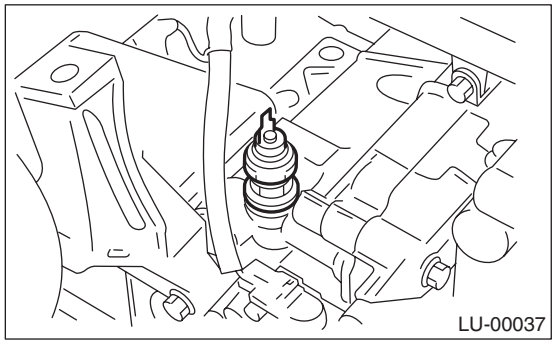
6. Oil Pressure Switch

A: REMOVAL

1) Remove the collector cover.
2) Remove the generator from bracket. <Ref. to SC(H4SO)-21, REMOVAL, Generator.>
3) Disconnect the terminal from oil pressure switch.



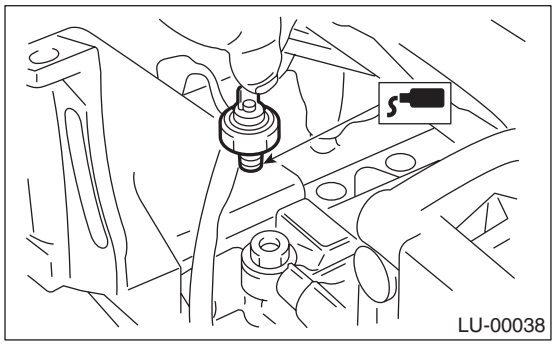
4) Remove the oil pressure switch.



B: INSTALLATION

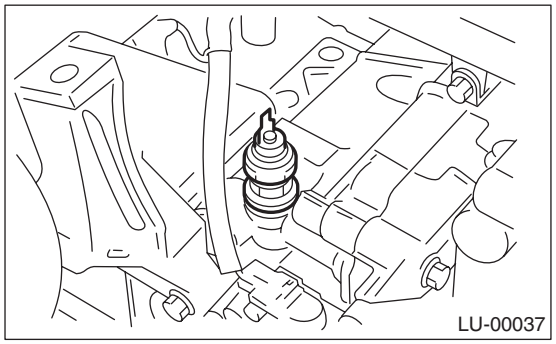
1) Apply liquid gasket to the oil pressure switch threads.

Liquid gasket:
THREE BOND 1324 (Part No. 004403007) or equivalent

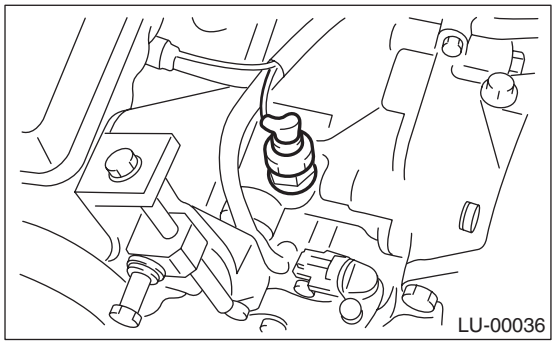


2) Install the oil pressure switch onto engine block.

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



3) Connect the terminal to the oil pressure switch.



4) Install the generator to bracket. <Ref. to SC(H4SO)-21, INSTALLATION, Generator.>
5) Install the collector cover.

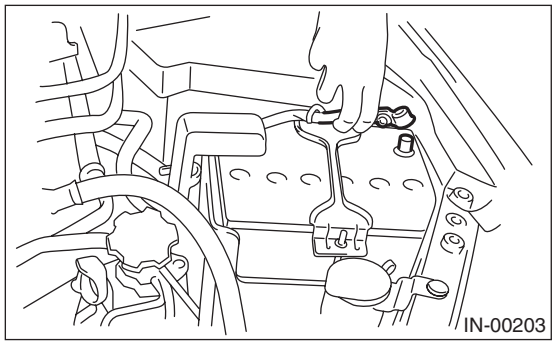
C: INSPECTION

Check the oil pressure switch installation portion for oil leakage and oil seepage.

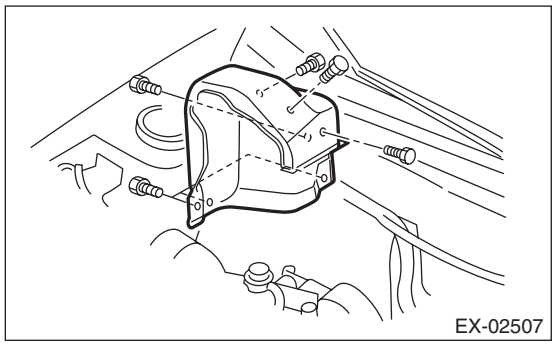
7. Oil Pipe

A: REMOVAL

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

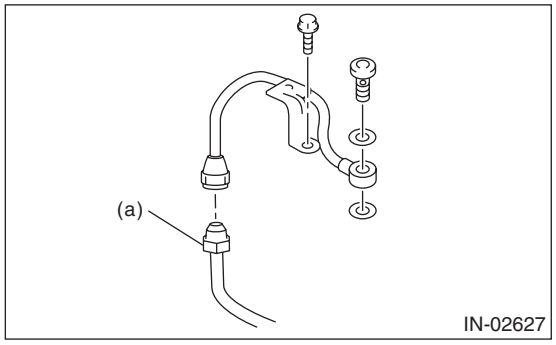


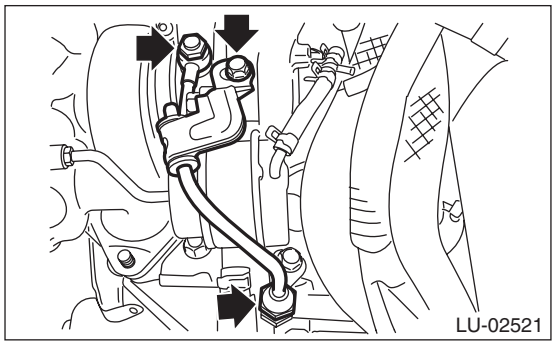
3) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
4) Remove the intercooler bracket RH.
5) Remove the turbocharger upper cover.



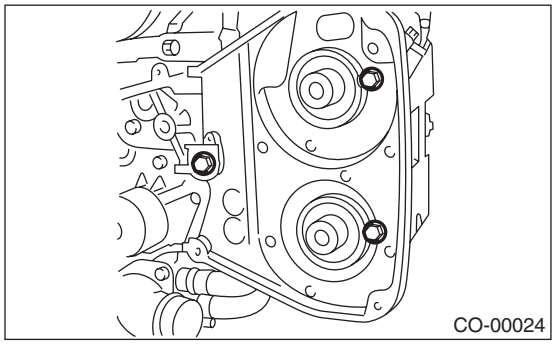
6) Remove the oil inlet pipe from the turbocharger.

CAUTION:
In order to prevent damaging the oil pipe on the cylinder head side, fix the section (a) shown in the figure when loosing the oil inlet pipe flare nut, and avoid the part from rotating together while loosening the nut.

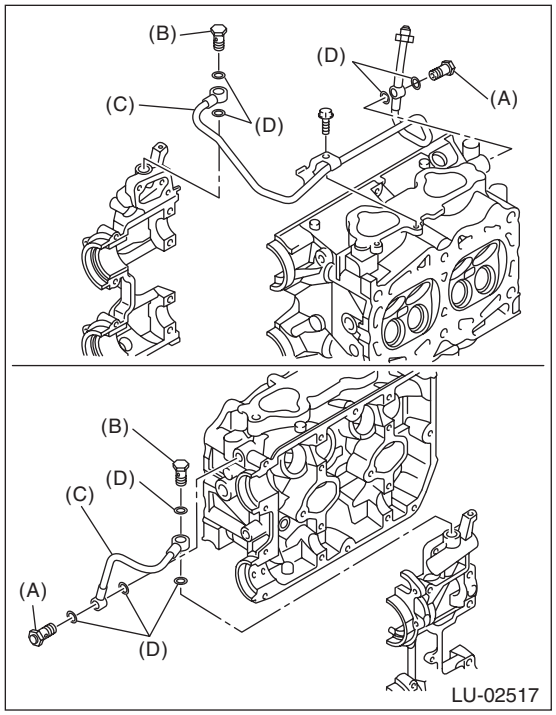




7) Remove the intake manifold. <Ref. to FU(H4DOTC)-11, REMOVAL, Intake Manifold.>
8) Remove the radiator main fan and radiator sub fan. <Ref. to CO(H4DOTC)-24, REMOVAL, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-27, REMOVAL, Radiator Sub Fan and Fan Motor.>
9) Remove the V-belts. <Ref. to ME(H4DOTC)-36, REMOVAL, V-belt.>
10) Remove the crank pulley. <Ref. to ME(H4DOTC)-39, REMOVAL, Crank Pulley.>
11) Remove the timing belt cover. <Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
12) Remove the timing belt. <Ref. to ME(H4DOTC)-42, TIMING BELT, REMOVAL, Timing Belt.>
13) Remove the cam sprocket LH. <Ref. to ME(H4DOTC)-50, REMOVAL, Cam Sprocket.>
14) Remove the belt cover No. 2 LH.



15) Remove the oil pipe.



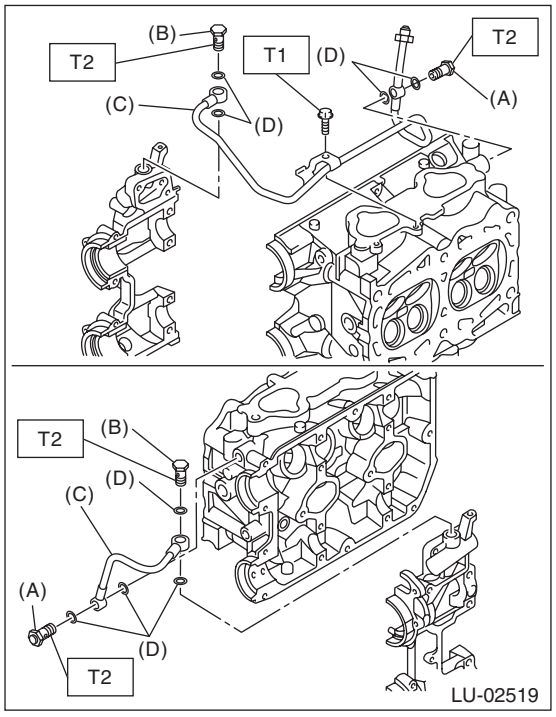
(A) Union screw with filter (with protrusion)
(B) Union screw without filter (without protrusion)
(C) Oil pipe
(D) Gasket

B: INSTALLATION

1) Inspect the union screw with filter. <Ref. to LU(H4DOTC)-22, INSPECTING UNION SCREW WITH FILTER, INSPECTION, Oil Pipe.>
2) Install the oil pipe.

NOTE:
- Make sure not to mix up the union screws with filter and without filter as their installation positions are different.
- Use a new gasket.

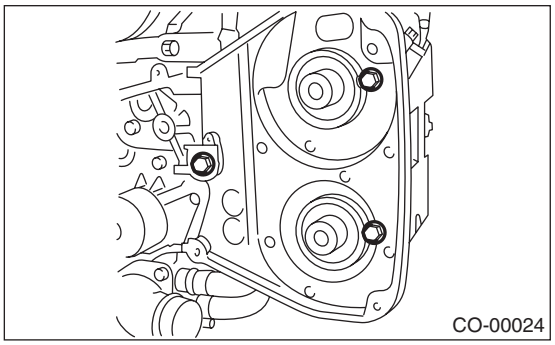
Tightening torque:
T1: 8 N·m (0.8 kgf-m, 5.9 ft-lb)
T2: 29 N·m (3.0 kgf-m, 21.4 ft-lb)



(A) Union screw with filter (with protrusion)
(B) Union screw without filter (without protrusion)
(C) Oil pipe
(D) Gasket

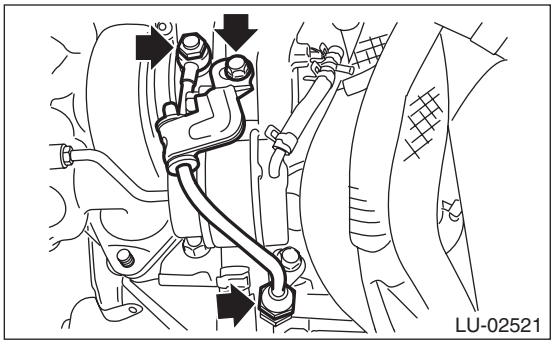
3) Install the belt cover No. 2 LH.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



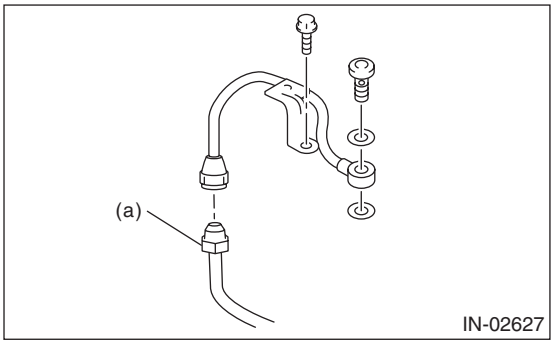
4) Install the cam sprocket LH. <Ref. to ME(H4DOTC)-50, INSTALLATION, Cam Sprocket.>
5) Install the timing belt. <Ref. to ME(H4DOTC)-45, TIMING BELT, INSTALLATION, Timing Belt.>
6) Install the timing belt cover. <Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
7) Install the crank pulley. <Ref. to ME(H4DOTC)-39, INSTALLATION, Crank Pulley.>
8) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>
9) Install the radiator main fan and the radiator sub fan. <Ref. to CO(H4DOTC)-25, INSTALLATION, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-28, INSTALLATION, Radiator Sub Fan and Fan Motor.>
10) Install the intake manifold. <Ref. to FU(H4DOTC)-13, INSTALLATION, Intake Manifold.>
11) Temporarily tighten the bolts and flare nuts which secure the oil inlet pipe to the turbocharger.

NOTE:
Use a new gasket.

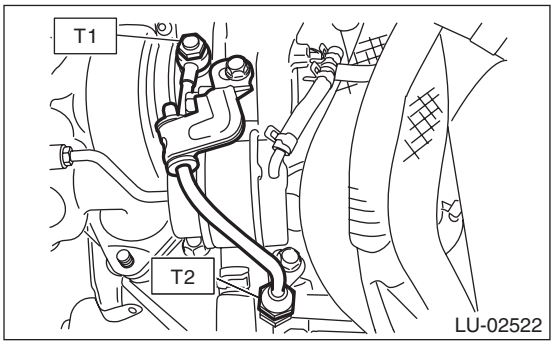


12) Tighten the union screws and flare nuts which secure the oil inlet pipe to the turbocharger.

CAUTION:
In order to prevent damaging the oil pipe on the cylinder head side, fix the section (a) shown in the figure when tightening the oil inlet pipe flare nut, and avoid the part from rotating together while tightening the nut.

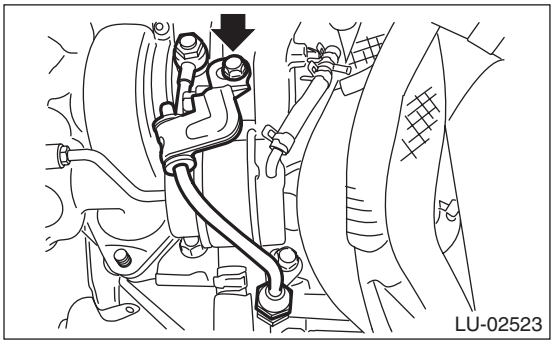


Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



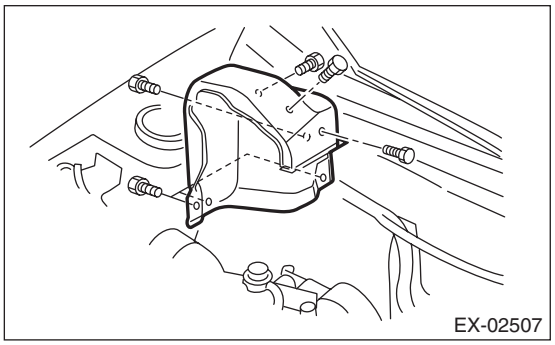
13) Tighten the bolts which hold the oil inlet pipe stay to the turbocharger.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

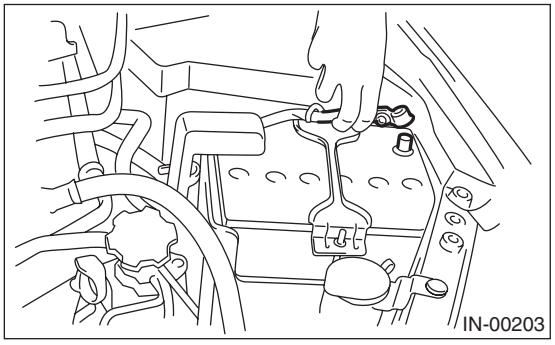


14) Install the turbocharger upper cover.

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



15) Install the intercooler bracket RH.
16) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
17) Connect the ground cable to battery.

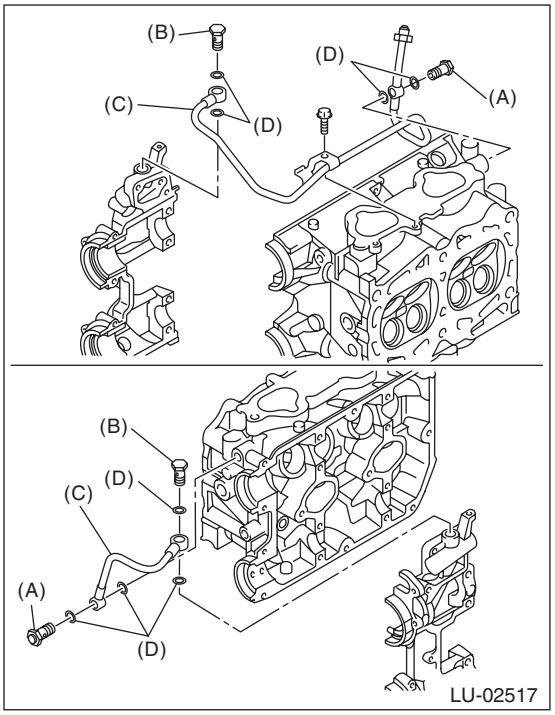


18) Install the collector cover.

C: INSPECTION

1. INSPECTING UNION SCREW WITH FILTER

Check the filter part of union screw for clogging or damage, and if defective, replace the union screw with filter with a new part.



(A) Union screw with filter (with protrusion)
(B) Union screw without filter (without protrusion)
(C) Oil pipe
(D) Gasket

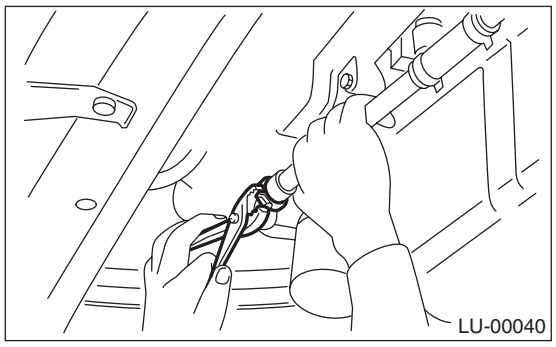
2. OTHER INSPECTIONS

1) Check that the oil pipe and union screw have no deformation, cracks and other damages.
2) Check that there are no oil leaks or oil oozing from the oil pipe attachment section.

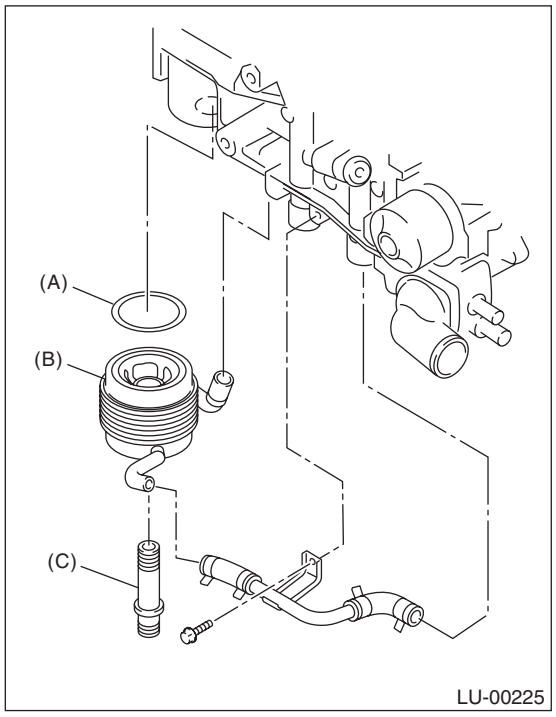
8. Engine Oil Cooler

A: REMOVAL

1) Lift up the vehicle.
2) Remove the under cover.
3) Drain the engine oil.
4) Drain engine coolant.
5) Remove the water by-pass pipe between oil cooler and water pump.



6) Remove the engine oil filter. <Ref. to LU(H4DOTC)-24, REMOVAL, Engine Oil Filter.>
7) Remove the oil cooler connector and remove the oil cooler.



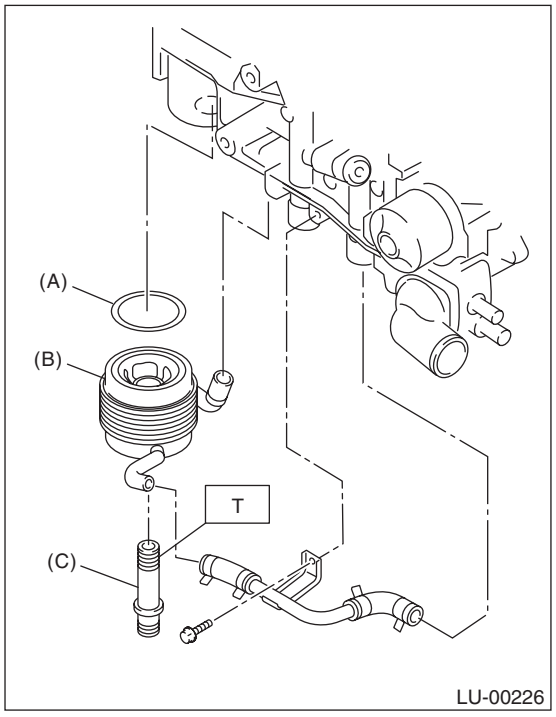
(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use new O-rings.

Tightening torque:
T: 54 N·m (5.5 kgf-m, 40 ft-lb)



(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

C: INSPECTION

1) Check the coolant paths for clogs while spraying compressed air.
2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

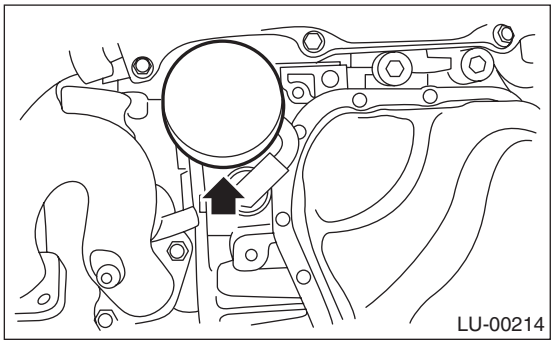
9. Engine Oil Filter

A: REMOVAL

1) Lift up the vehicle.
2) Remove the under cover.
3) Remove the oil filter using ST.

ST	18332AA000	OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST	18332AA010	OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

NOTE:
Standard oil filter outer diameter is 68 mm (2.68 in), however Subaru oil filter with outer diameter of 65 mm (2.56 in) is also available.



B: INSTALLATION

1) Clean the oil filter installation surface on cylinder block or 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 further after the seal rubber contacts the oil cooler.

NOTE:
• In case of the filter of outer diameter 68mm (2.68 in), tighten by about one turn. When using a torque wrench, tighten to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
• In case of the filter of outer diameter 65 mm (2.56 in), tighten by about 2/3 to 3/4 turns. When using a torque wrench, tighten to 12 N·m (1.2 kgf-m, 8.9 ft-lb).
• Do not tighten excessively, or oil may leak.
5) Install the under cover.
6) Lower the vehicle.

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(H4DOTC)-9, INSPECTION, Engine Oil.>

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.

Symptoms	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	Replenish.
		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(H4DOTC)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Engine	Cylinder arrangement			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine
	Valve system mechanism			Belt driven, double overhead camshaft, 4-valve/cylinder
	Bore × Stroke mm (in)			99.5 × 79.0 (3.92 × 3.11)
	Displacement cm^3 (cu in)			2,457 (149.94)
	Compression ratio			8.2
	Compression pressure (at 400 rpm) kPa (kg/cm^2, psi)			981 — 1,177 (10 — 12, 142 — 171)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Open	Max.retard	ATDC 5°
			Min. advance	BTDC 15°
		Close	Max.retard	ABDC 65°
			Min. advance	ABDC 45°
	Exhaust valve timing	Open		BBDC 55°
		Close		ATDC 5°
	Valve clearance mm (in)	Intake		0.20±0.02 (0.0079±0.0008)
		Exhaust		0.35±0.02 (0.0138±0.0008)
	Idle rpm [“P” or “N” range] rpm		No load	750±100
			A/C ON	875±100
	Ignition order			1 → 3 → 2 → 4
	Ignition timing BTDC/rpm	MT model		12°±10°/750
		AT model		17°±10°/750

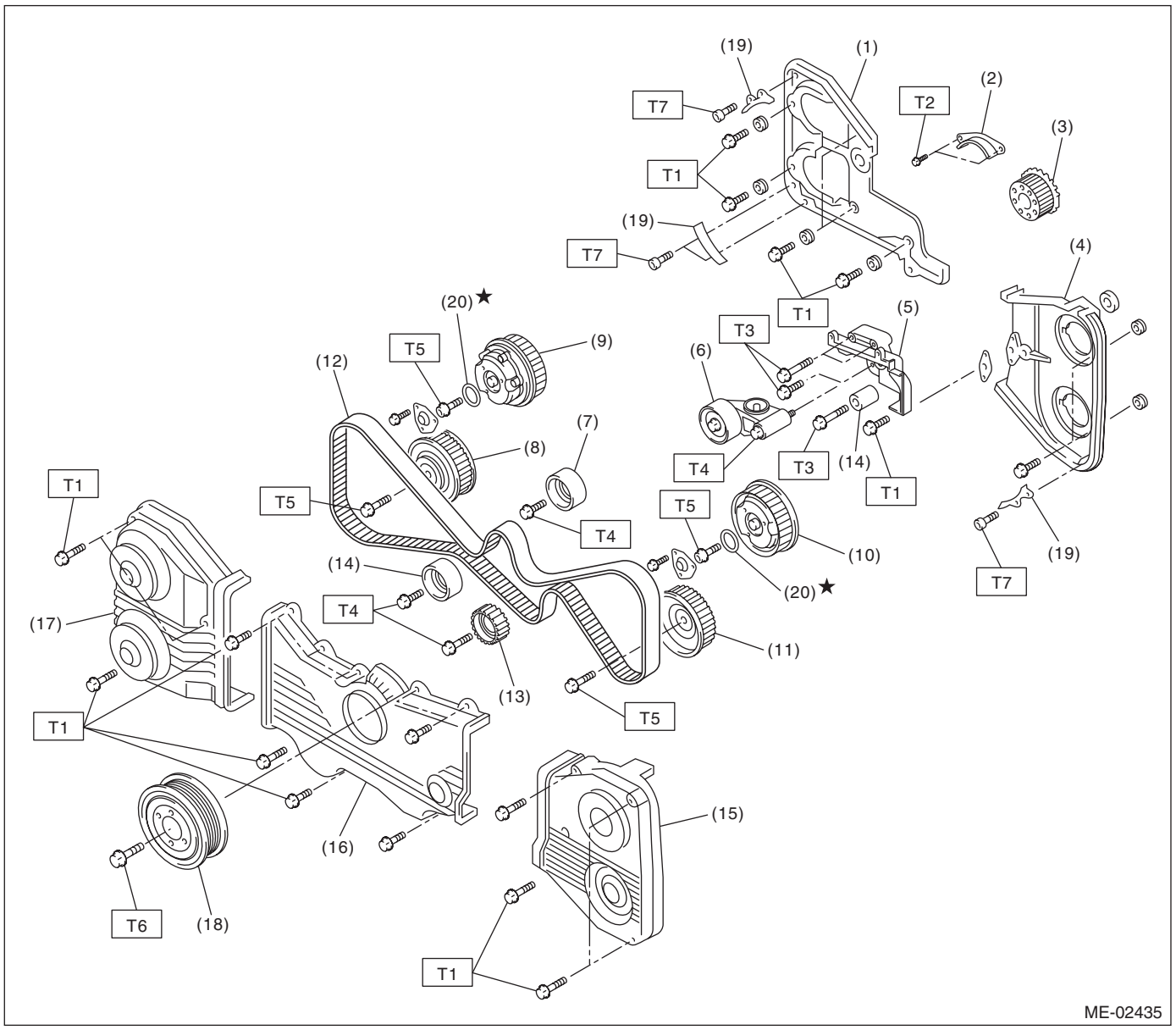
NOTE:
OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod		mm (in)	5.2 — 6.2 (0.205 — 0.244)
Belt tensioner	Spacer O.D.		mm (in)	17.955 — 17.975 (0.7069 — 0.7077)
	Tensioner bushing I.D.		mm (in)	18.0 — 18.08 (0.7087 — 0.7118)
	Clearance between spacer and bushing	mm (in)	Standard	0.025 — 0.125 (0.0010 — 0.0049)
	Side clearance of spacer	mm (in)	Standard	0.2 — 0.55 (0.0079 — 0.0217)
Camshaft	Bending limit		mm (in)	0.020 (0.00079)
	Side clearance	mm (in)	Standard	0.068 — 0.116 (0.0027 — 0.0047)
	Cam lobe height mm (in)	Intake	Standard	46.55 — 46.65 (1.833 — 1.837)
		Exhaust	Standard	46.75 — 46.85 (1.841 — 1.844)
	Journal O.D. mm (in)	Standard	Front	37.946 — 37.963 (1.4939 — 1.4946)
			Center rear	29.946 — 29.963 (1.1790 — 1.1796)
	Journal clearance	mm (in)	Standard	0.037 — 0.072 (0.0015 — 0.0028)
Cylinder head	Surface warpage limit		mm (in)	0.035 (0.0014)
	Grinding limit		mm (in)	0.3 (0.012)
	Standard height		mm (in)	127.5 (5.02)
Valve seat	Seating angle			90°
	Contacting width mm (in)	Intake	Standard	0.6 — 1.4 (0.024 — 0.055)
		Exhaust	Standard	1.2 — 1.8 (0.047 — 0.071)
Valve guide	Inside diameter		mm (in)	6.000 — 6.012 (0.2362 — 0.2367)
	Protrusion above head		mm (in)	15.8 — 16.2 (0.622 — 0.638)
Valve	Head edge thickness mm (in)	Intake	Standard	1.0 — 1.4 (0.039 — 0.055)
		Exhaust	Standard	1.3 — 1.7 (0.051 — 0.067)
	Stem outer diameter mm (in)	Intake		5.955 — 5.970 (0.2344 — 0.2350)
		Exhaust		5.945 — 5.960 (0.2341 — 0.2346)
	Valve stem gap mm (in)	Standard	Intake	0.030 — 0.057 (0.0012 — 0.0022)
			Exhaust	0.040 — 0.067 (0.0016 — 0.0026)
	Overall length mm (in)	Intake		104.4 (4.110)
		Exhaust		104.65 (4.1201)
Valve spring	Free length		mm (in)	47.32 (1.863)
	Squareness			2.5°, 2.1 mm (0.083 in)
	Tension/spring height	N (kgf, lb)/mm (in)	Set	205 — 235 (20.9 — 24.0, 46.1 — 52.8)/36.0 (1.417)
			Lift	426 — 490 (43.4 — 50.0, 95.8 — 110)/26.50 (1.043)
Cylinder block	Surface warpage limit (Mating surface with cylinder head)		mm (in)	0.025 (0.0098)
	Grinding limit		mm (in)	0.1 (0.004)
	Standard height		mm (in)	201.0 (7.91)
	Cylinder inner diameter mm (in)	Standard	A	99.505 — 99.515 (3.9175 — 3.9179)
			B	99.495 — 99.505 (3.9171 — 3.9175)
	Taper	mm (in)	Standard	0.015 (0.0006)
	Out-of-roundness	mm (in)	Standard	0.010 (0.0004)
	Piston clearance	mm (in)	Standard	–0.010 — 0.010 (–0.00039 — 0.00039)
Piston	Outer diameter mm (in)	Standard	A	99.505 — 99.515 (3.9175 — 3.9179)
			B	99.495 — 99.505 (3.9171 — 3.9175)
		0.25 (0.0098) OS		99.745 — 99.765 (3.9270 — 3.9278)
		0.50 (0.0197) OS		99.995 — 100.015 (3.9368 — 3.9376)
Piston pin	Standard clearance between piston and piston pin	mm (in)	Standard	0.004 — 0.008 (0.0002 — 0.0003)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).

Piston ring	Ring closed gap mm (in)		Top ring	Standard	0.20 — 0.25 (0.0079 — 0.0098)
			Second ring	Standard	0.37 — 0.52 (0.015 — 0.0203)
			Oil ring	Standard	0.20 — 0.50 (0.0079 — 0.0197)
	Ring groove gap mm (in)		Top ring	Standard	0.040 — 0.080 (0.0016 — 0.0031)
			Second ring	Standard	0.030 — 0.070 (0.0012 — 0.0028)
Connecting rod	Bend or twist per 100 mm (3.94 in) in length mm (in)			Limit	0.10 (0.0039)
	Side clearance of large end mm (in)			Standard	0.070 — 0.330 (0.0028 — 0.0130)
Bearing of large end	Oil clearance mm (in)			Standard	0.017 — 0.045 (0.0007 — 0.0018)
	Bearing size (Thickness at center) mm (in)		Standard		1.490 — 1.502 (0.0587 — 0.0591)
			0.03 (0.0012) US		1.504 — 1.512 (0.0592 — 0.0595)
			0.05 (0.0020) US		1.514 — 1.522 (0.0596 — 0.0599)
			0.25 (0.0098) US		1.614 — 1.622 (0.0635 — 0.0639)
Bushing of small end	Clearance between piston pin and bushing mm (in)			Standard	0 — 0.022 (0 — 0.0009)
Crankshaft	Bending limit mm (in)				0.035 (0.0014)
	Crank pin	Out-of-roundness mm (in)			0.003 (0.0001)
		Cylindricality mm (in)			0.004 (0.0002)
		Grinding limit (dia.) mm (in)			To 51.750 (2.0374)
	Crank journal	Out-of-roundness mm (in)			0.005 (0.0002)
		Cylindricality mm (in)			0.006 (0.0002)
		Grinding limit (dia.) mm (in)			To 59.750 (2.3524)
	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 (2.0447 — 2.0453)
			0.25 (0.0098) US		51.734 — 51.750 (2.0368 — 2.0374)
	Crank journal outer diameter mm (in)		Standard		59.992 — 60.008 (2.3619 — 2.3625)
			0.03 (0.0012) US		59.962 — 59.978 (2.3607 — 2.3613)
			0.05 (0.0020) US		59.942 — 59.958 (2.3599 — 2.3605)
			0.25 (0.0098) US		59.742 — 59.758 (2.3520 — 2.3527)
	Side clearance mm (in)			Standard	0.030 — 0.115 (0.0012 — 0.0045)
	Oil clearance mm (in)				0.010 — 0.030 (0.0004 — 0.0012)
Main bearing	Bearing size (Thickness at center) mm (in)	#1, #3	Standard		1.998 — 2.011 (0.0787 — 0.0792)
			0.03 (0.0012) US		2.017 — 2.020 (0.0794 — 0.0795)
			0.05 (0.0020) US		2.027 — 2.030 (0.0798 — 0.0799)
			0.25 (0.0098) US		2.127 — 2.130 (0.0837 — 0.0839)
		#2, #4, #5	Standard		2.000 — 2.013 (0.0787 — 0.0793)
			0.03 (0.0012) US		2.019 — 2.022 (0.0795 — 0.0796)
			0.05 (0.0020) US		2.029 — 2.032 (0.0799 — 0.0800)
			0.25 (0.0098) US		2.129 — 2.132 (0.0838 — 0.0839)

B: COMPONENT

1. TIMING BELT

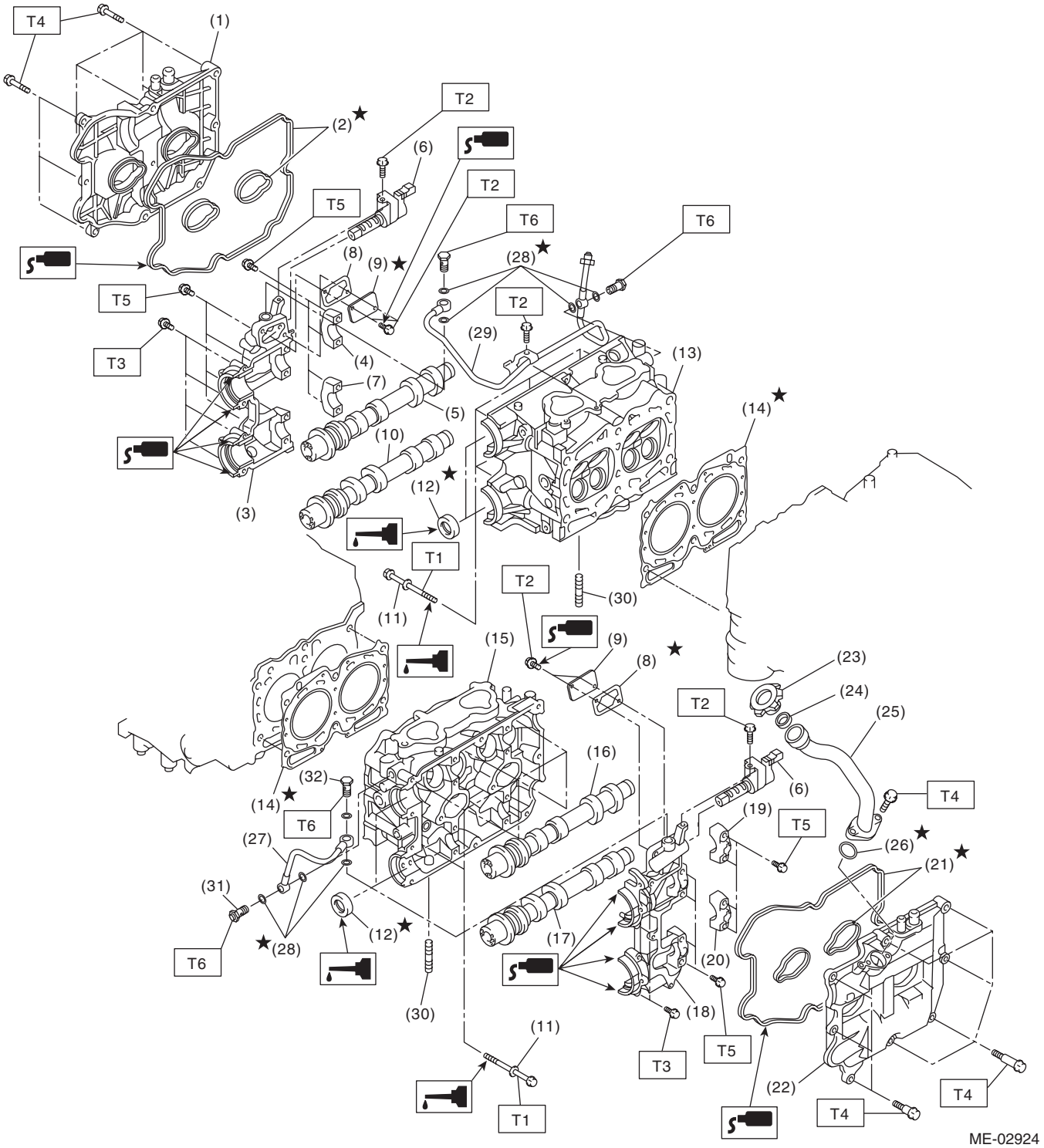


(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide
(3) Crank sprocket
(4) Timing belt cover No. 2 (LH)
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Exhaust cam sprocket (RH)
(9) Intake cam sprocket (RH)
(10) Intake cam sprocket (LH)
(11) Exhaust cam sprocket (LH)
(12) Timing belt
(13) Belt idler No. 2
(14) Belt idler
(15) Timing belt cover (LH)
(16) Front belt cover
(17) Timing belt cover (RH)
(18) Crank pulley
(19) Timing belt guide (MT model)
(20) O-ring

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 9.75 (1.0, 7.2)
T3: 24.5 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: <Ref. to ME(H4DOTC)-50, INSTALLATION, Cam Sprocket.>
T6: <Ref. to ME(H4DOTC)-39, INSTALLATION, Crank Pulley.>
T7: 6.4 (0.65, 4.7)

2. CYLINDER HEAD AND CAMSHAFT

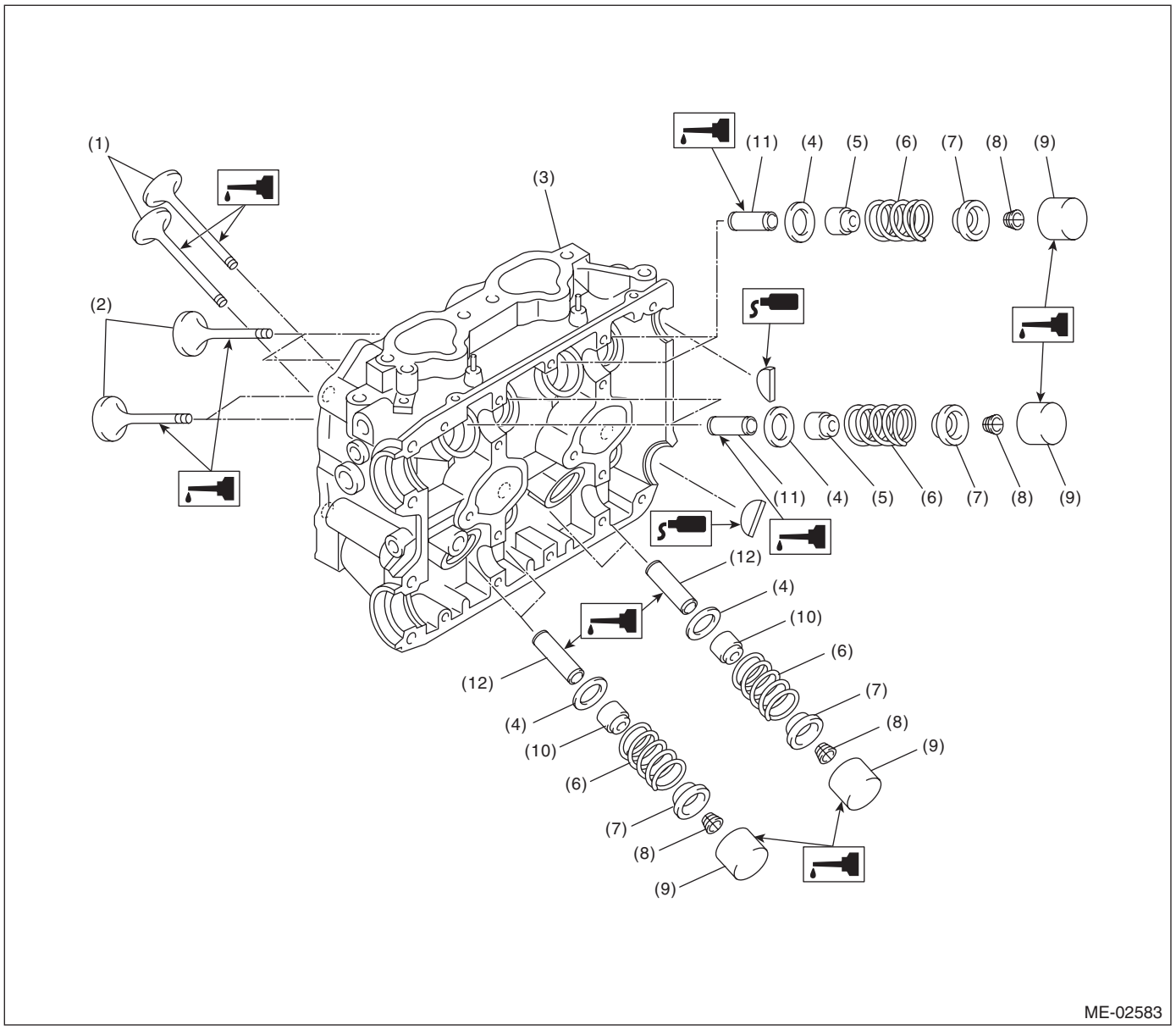


(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Camshaft cap (Front RH)
(4) Intake camshaft cap (Rear RH)
(5) Intake camshaft (RH)
(6) Oil flow control solenoid valve
(7) Exhaust camshaft cap (Rear RH)
(8) Gasket
(9) Oil return cover
(10) Exhaust camshaft (RH)
(11) Cylinder head bolt
(12) Oil seal
(13) Cylinder head (RH)
(14) Cylinder head gasket
(15) Cylinder head (LH)
(16) Intake camshaft (LH)
(17) Exhaust camshaft (LH)
(18) Camshaft cap (Front LH)
(19) Intake camshaft cap (Rear LH)
(20) Exhaust camshaft cap (Rear LH)
(21) Rocker cover gasket (LH)
(22) Rocker cover (LH)
(23) Oil filler cap
(24) Gasket
(25) Oil filler duct
(26) O-ring
(27) Oil pipe (LH)
(28) Gasket
(29) Oil pipe (RH)
(30) Stud bolt
(31) Union screw (With protrusion)
(32) Union screw (Without protrusion)

Tightening torque: N·m (kgf-m, ft-lb)

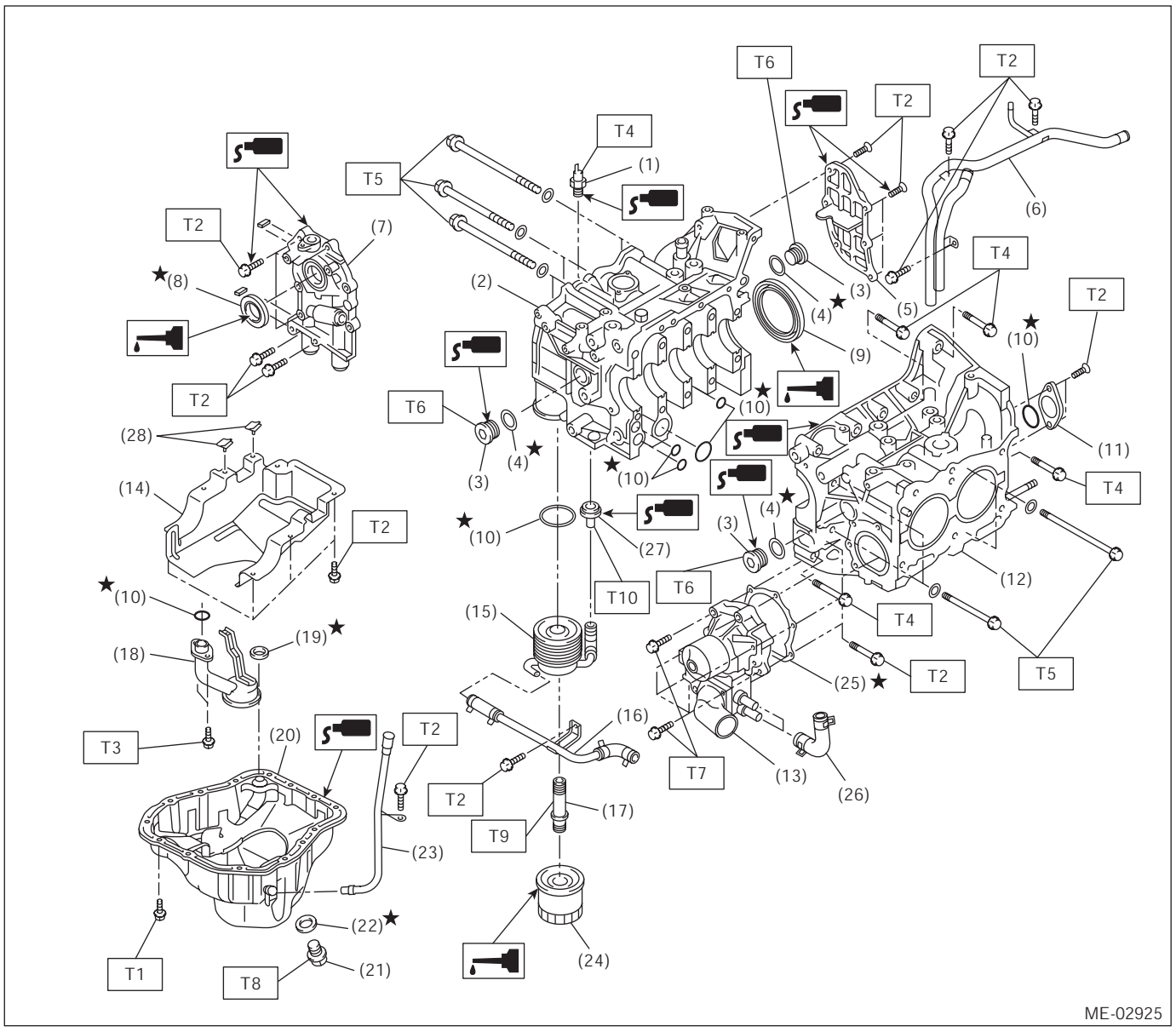
T1: <Ref. to ME(H4DOTC)-57, INSTALLATION, Cylinder Head.>
T2: 8 (0.8, 5.9)
T3: <Ref. to ME(H4DOTC)-53, INSTALLATION, Camshaft.>
T4: 6.4 (0.65, 4.7)
T5: <Ref. to ME(H4DOTC)-53, INSTALLATION, Camshaft.>
T6: 29 (3.0, 21.4)

3. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

4. CYLINDER BLOCK

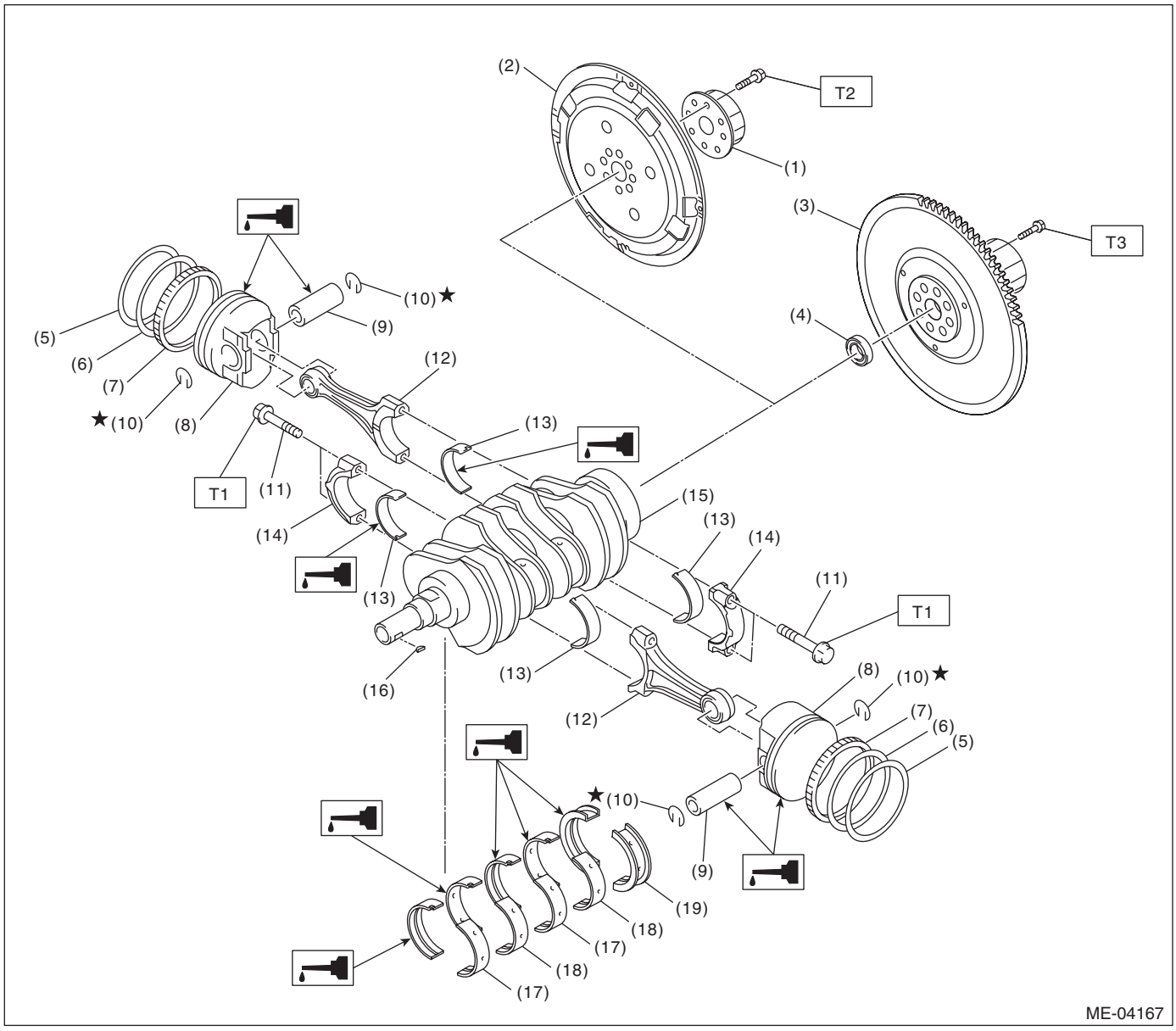


(1)	Oil pressure switch	(15)	Oil cooler
(2)	Cylinder block (RH)	(16)	Water by-pass pipe
(3)	Service hole plug	(17)	Connector
(4)	Gasket	(18)	Oil strainer
(5)	Oil separator cover	(19)	Gasket
(6)	Water by-pass pipe	(20)	Oil pan
(7)	Oil pump	(21)	Drain plug
(8)	Front oil seal	(22)	Metal gasket
(9)	Rear oil seal	(23)	Oil level gauge guide
(10)	O-ring	(24)	Oil filter
(11)	Service hole cover	(25)	Gasket
(12)	Cylinder block (LH)	(26)	Water pump hose
(13)	Water pump	(27)	Plug
(14)	Baffle plate	(28)	Seal

Tightening torque: N·m (kgf-m, ft-lb)

- ***T1: 5 (0.5, 3.6)***
- ***T2: 6.4 (0.65, 4.7)***
- ***T3: 10 (1.0, 7.2)***
- ***T4: 25 (2.5, 18.1)***
- ***T5: <Ref. to ME(H4DOTC)-69, INSTALLATION, Cylinder Block.>***
- ***T6: 70 (7.1, 51.6)***
- ***T7: First 12 (1.2, 8.9)***
  Second 12 (1.2, 8.9)
- ***T8: 44 (4.5, 33)***
- ***T9: 54 (5.5, 40)***
- ***T10: 69 (7.0, 50.9)***

5. CRANKSHAFT AND PISTON



(1) Reinforcement (AT model)
(2) Drive plate (AT model)
(3) Flywheel (MT model)
(4) Ball bearing (MT model)
(5) Top ring
(6) Second ring
(7) Oil ring
(8) Piston
(9) Piston pin
(10) Snap ring
(11) Connecting rod bolt
(12) Connecting rod
(13) Connecting rod bearing
(14) Connecting rod cap
(15) Crankshaft
(16) Woodruff key
(17) Crankshaft bearing #1, #3
(18) Crankshaft bearing #2, #4
(19) Crankshaft bearing #5

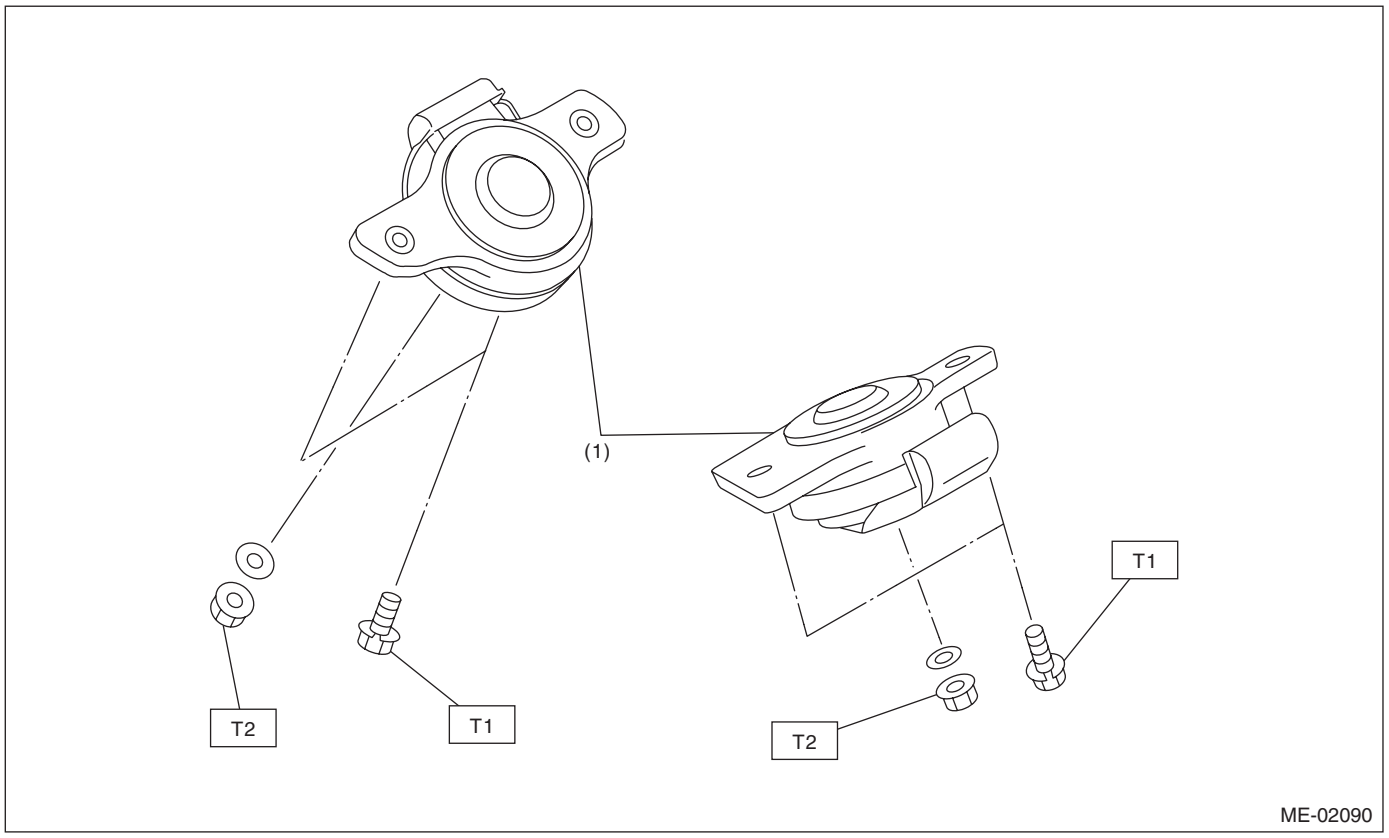
Tightening torque: N·m (kgf-m, ft-lb)

T1: 52 (5.3, 38.4)

T2: <Ref. to 5AT-64, INSTALLATION, Drive Plate.>

T3: <Ref. to CL-13, INSTALLATION, Flywheel.>

6. ENGINE MOUNTING



(1) Front cushion rubber

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 75 (7.6, 55.3)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from 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.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- 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

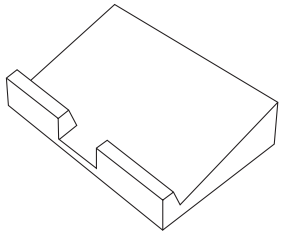
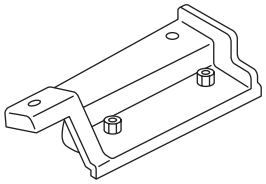
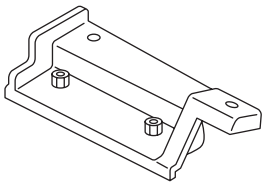
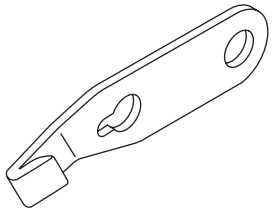
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve spring.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of the drive plate when loosening/tightening the crank pulley bolt.

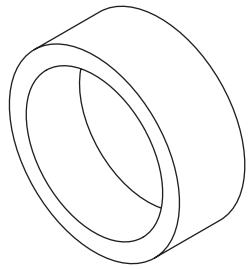
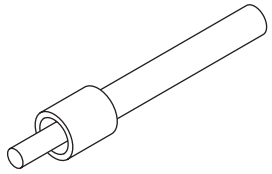
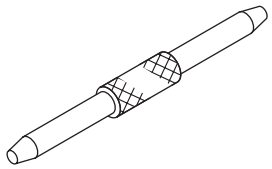
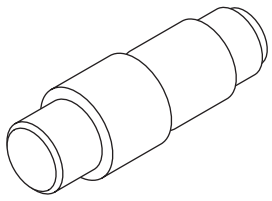
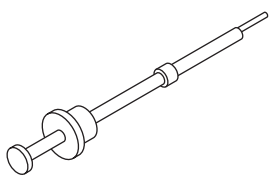
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498747300	498747300	PISTON GUIDE	Used for installing the cup to the wheel cylinder piston. (2.5 L model)
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	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.

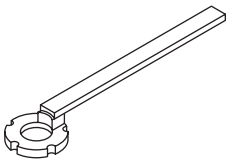
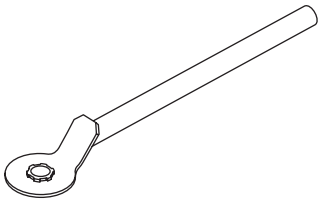
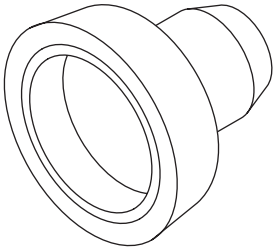
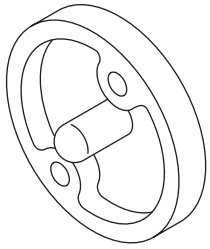
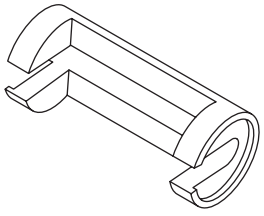
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing exhaust cam sprocket.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.

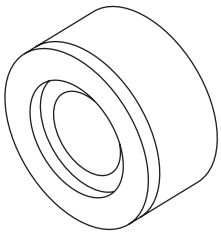
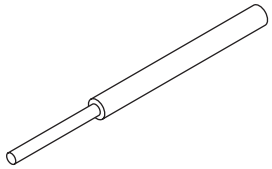
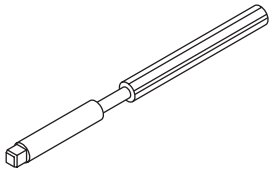
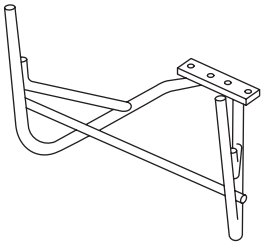
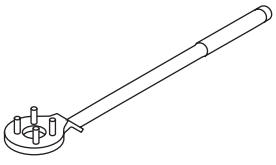
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817000	499817000	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening/tightening crank pulley bolt.

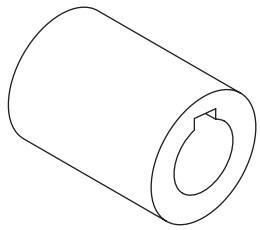
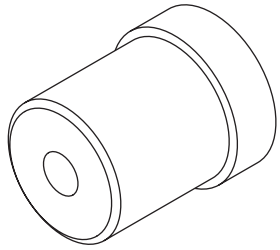
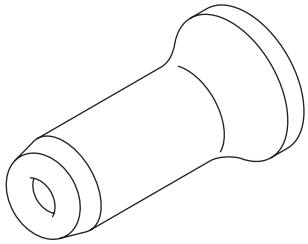
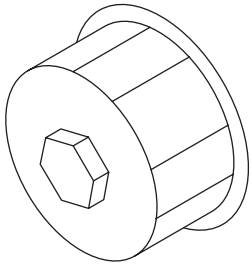
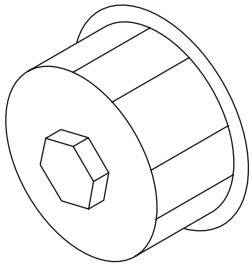
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499587600	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))

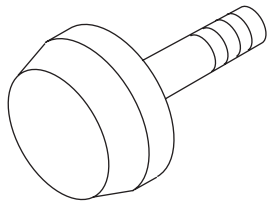
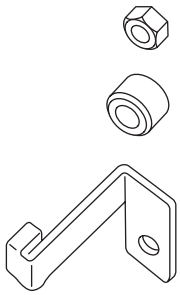
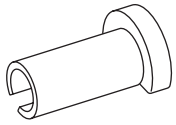
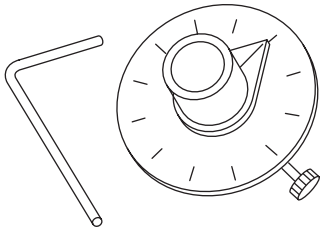
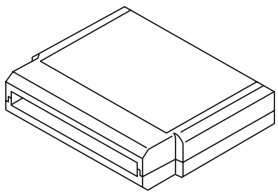
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597200	499597200	OIL SEAL GUIDE	• Used for installing camshaft oil seal for DOHC engine. • Used with OIL SEAL INSTALLER (499587600).
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for disconnecting quick connector of the engine compartment.
 ST18854AA000	18854AA000	ANGLE GAUGE	Used for installing the crank pulley.
 ST18482AA010	18482AA010	CARTRIDGE	Troubleshooting for electrical system.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.

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 belt
- Camshaft
- Cylinder head

2. Compression

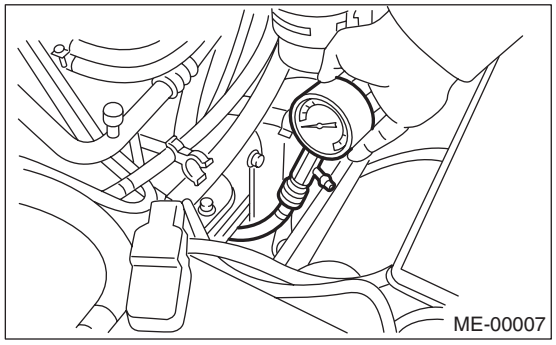
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) Remove the collector cover.
2) After warming-up the engine, turn the ignition switch to OFF.
3) Make sure that the battery is fully charged.
4) Release the fuel pressure. <Ref. to FU(H4DOTC)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
5) Remove all the spark plugs.
<Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>
6) Fully open the throttle valve.
7) Check the starter motor for satisfactory performance and operation.
8) Hold the compression gauge tightly against the spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

9) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.



10) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard:
981 — 1,177 kPa (10 — 12 kgf/cm^2, 142 — 171 psi)
Difference between cylinders:
49 kPa (0.5 kgf/cm^2, 7 psi), or less

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) Insert the cartridge to the Subaru Select Monitor.
5) Connect the Subaru Select Monitor to the data link connector.
6) Turn the ignition switch to ON and Subaru Select Monitor switch to ON.
7) Select {Each System Check} in Main Menu.
8) Select {Engine Control System} in Selection Menu.
9) Select {Current Data Display & Save} in Engine Control System Diagnosis.
10) Select {Data Display} in Data Display Menu.
11) Start the engine, and read the engine idle speed.
12) Check the idle speed when no-loaded. (Headlight, heater fan, rear defroster, radiator fan, A/C, etc. are OFF.)

Idle speed [No load and gears in neutral]:
750±100 rpm

13) 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 neutral]:
875±100 rpm

NOTE:
Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted.If the prescribed idle speed cannot be maintained, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

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) Insert the cartridge to the Subaru Select Monitor.
5) Connect the Subaru Select Monitor to the data link connector.
6) Turn the ignition switch to ON and Subaru Select Monitor switch to ON.
7) Select {Each System Check} in Main Menu.
8) Select {Engine Control System} in Selection Menu.
9) Select {Current Data Display & Save} in Engine Control System Diagnosis.
10) Select {Data Display} in Data Display Menu.
11) Start the engine and check the ignition timing at idle speed.

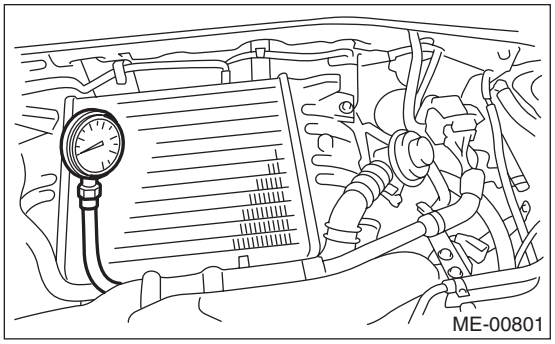
Ignition timing [BTDC/rpm]:
MT model
12°±10°/750
AT model
17°±10°/750

If the timing is not correct, check the ignition control system. Refer to “Engine Control System”. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Remove the collector cover.
2) Warm-up the engine.
3) Disconnect the brake vacuum hose from intake manifold, and then install the vacuum gauge.
4) Keep the engine at idle speed and read the vacuum gauge indication.
By observing the gauge needle movement, internal condition of the engine can be diagnosed as described below.



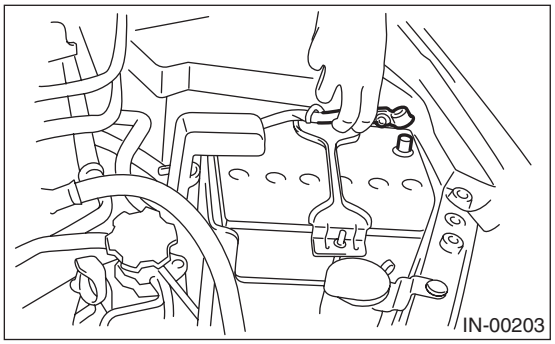
Vacuum pressure (at idling, A/C "OFF"):
Less than –60.0 kPa (–450 mmHg, –17.72 in-Hg)

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.	Leakage around intake manifold gasket, or disconnected or damaged 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

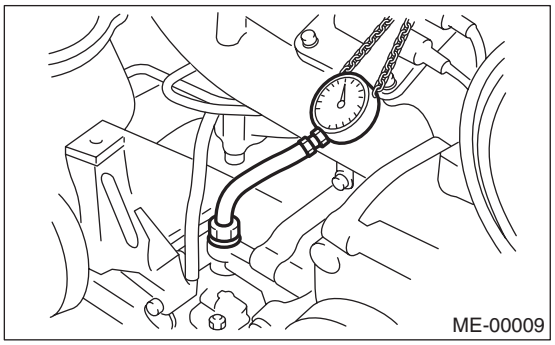
6. Engine Oil Pressure

A: INSPECTION

1) Remove the collector cover.
2) Remove the oil pressure switch from the engine cylinder block. <Ref. to LU(H4DOTC)-18, REMOVAL, Oil Pressure Switch.>
3) Connect the oil pressure gauge hose to cylinder block.
4) Connect the battery ground cable to the battery.



5) Start the engine, and measure the oil pressure.



Oil pressure (Standard):
At 600 rpm
98 kPa (1.0 kgf/cm^2, 14 psi) or more
At 5,000 rpm
294 kPa (3.0 kgf/cm^2, 43 psi) or more

CAUTION:
• If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4DOTC)-25, INSPECTION, Engine Lubrication System Trouble in General.>
• If the oil pressure warning light illuminates but the oil pressure is within specification, check the oil pressure switch. <Ref. to LU(H4DOTC)-25, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:
Standard value is based on an engine oil temperature of 80°C (176°F).

6) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4DOTC)-18, INSTALLATION, Oil Pressure Switch.>

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

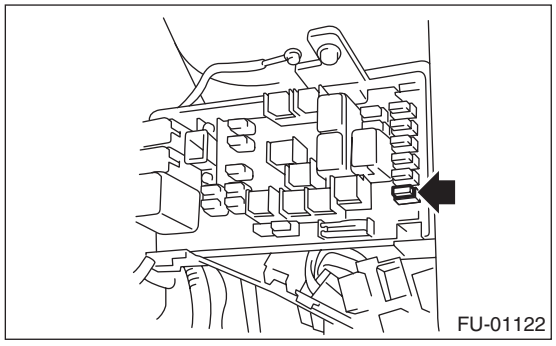
7. Fuel Pressure

A: INSPECTION

WARNING:
Before removing the fuel pressure gauge, release the fuel pressure.

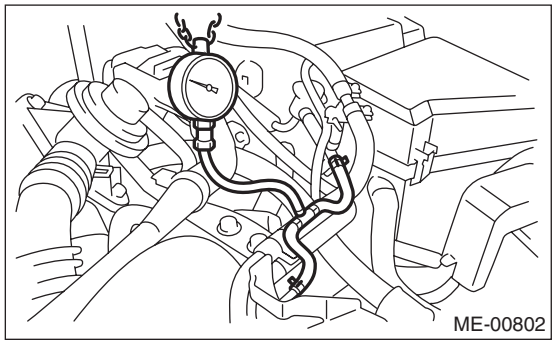
NOTE:
If the fuel pressure is out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-43, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Disconnect the fuel delivery hose and connect fuel pressure gauge.
5) Remove the fuse of fuel pump from main fuse box.


FU-01122

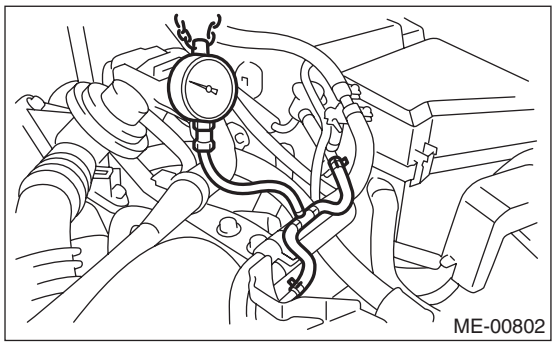
6) Start the engine.
7) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard: 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)


ME-00802

8) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard: 230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)


ME-00802

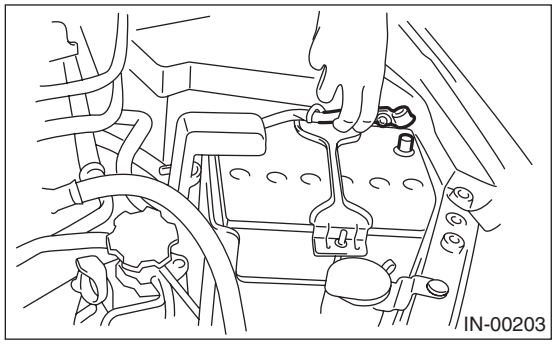
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

A: INSPECTION

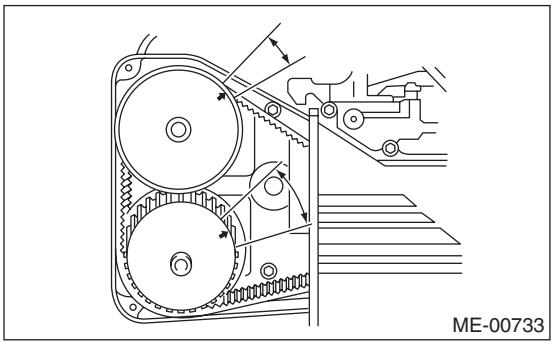
Inspection and adjustment of valve clearance should be performed while engine is cold.

1) Lift-up the vehicle.
2) Remove the under cover.
3) Lower the vehicle.
4) Remove the collector cover.
5) Disconnect the ground cable from battery.



6) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
7) Remove a bolt which secures timing belt cover (RH).
8) Loosen the remaining bolts which secure timing belt cover (RH), then remove the timing belt cover.
9) When inspecting #1 and #3 cylinders:
   (1) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
   (2) Disconnect the connector of ignition coil.
   (3) Remove the ignition coil.
   (4) Place a suitable container under the vehicle.
   (5) Disconnect the PCV hose from rocker cover (RH).
   (6) Remove the bolts, then remove the rocker cover (RH).
10) When inspecting #2 and #4 cylinders:
   (1) Disconnect the battery cable, and then remove the battery and battery carrier.
   (2) Disconnect the connector of ignition coil.
   (3) Remove the ignition coil.
   (4) Place a suitable container under the vehicle.
   (5) Disconnect the PCV hose from rocker cover (LH).
   (6) Remove the bolts, then remove the rocker cover (LH).
11) Turn the crank pulley clockwise until arrow mark on the camshaft sprocket is set to position shown in the figure.

NOTE:
Turn the crankshaft using socket wrench.

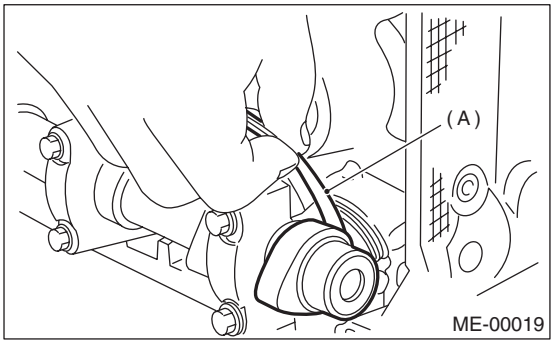


12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:
- Insert a thickness gauge in a direction as horizontal as possible with respect to the valve lifter.
- Measure the exhaust valve clearances while lifting-up the vehicle.

Valve clearance
Intake:
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust:
0.35±0.02 mm (0.0138±0.0008 in)

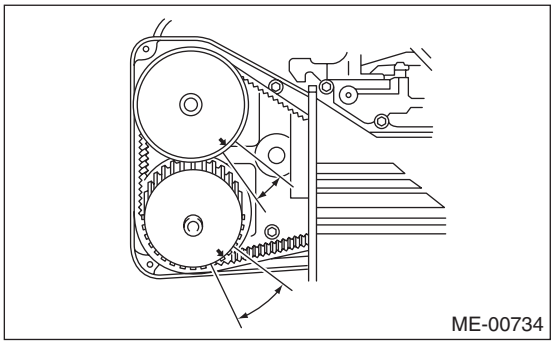
- If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



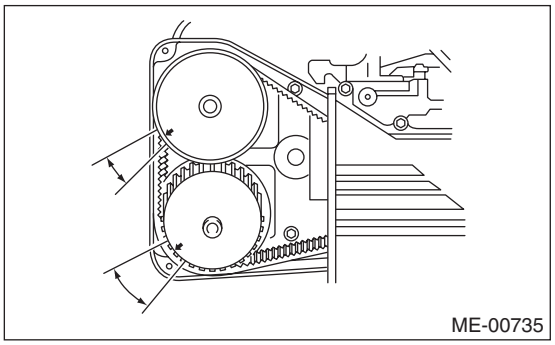
13) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-26, ADJUSTMENT, Valve Clearance.>

14) Further turn the crank pulley clockwise and then measure the valve clearances again.

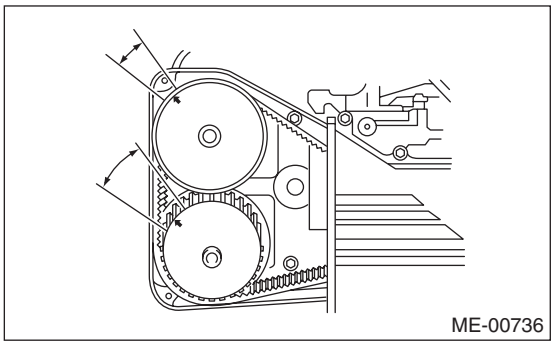
(1) Set the arrow mark on cam sprocket to the position shown in the figure, and measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set the arrow mark on cam sprocket to the position shown in the figure, and measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.



(3) Set the arrow mark on cam sprocket to the position shown in the figure, and measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



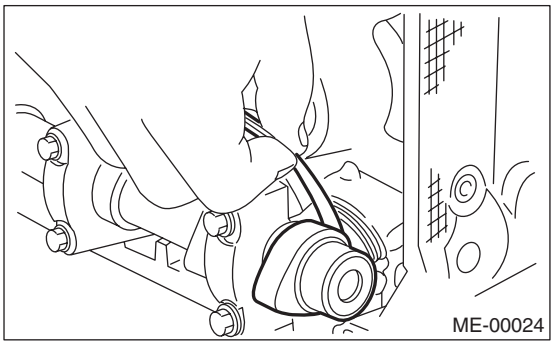
15) After inspection, install the related parts in the reverse order of removal.

B: ADJUSTMENT

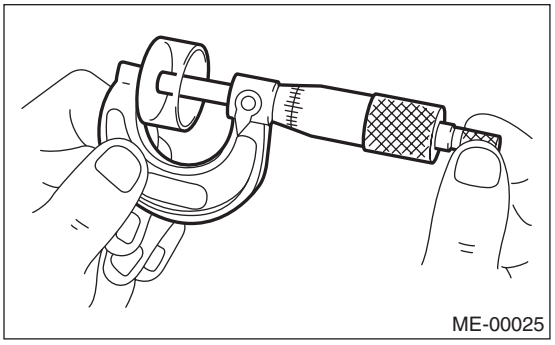
CAUTION:
Adjustment of valve clearance should be performed while engine is cold.

1) Measure all the valve clearances. <Ref. to ME(H4DOTC)-25, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after measurement.



2) Remove the camshaft. <Ref. to ME(H4DOTC)-52, REMOVAL, Camshaft.>
3) Remove the valve lifter.
4) Measure the thickness of valve lifter using micrometer.



5) Select a valve lifter of suitable thickness from the following table using the measured valve clearance and valve lifter thickness.

Unit: (mm)
Intake valve: S = (V + T) – 0.20 Exhaust valve: 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)
13228 AB102	4.68 (0.1843)
13228 AB112	4.69 (0.1846)
13228 AB122	4.70 (0.1850)
13228 AB132	4.71 (0.1854)
13228 AB142	4.72 (0.1858)
13228 AB152	4.73 (0.1862)
13228 AB162	4.74 (0.1866)
13228 AB172	4.75 (0.1870)
13228 AB182	4.76 (0.1874)
13228 AB192	4.77 (0.1878)
13228 AB202	4.78 (0.1882)
13228 AB212	4.79 (0.1886)
13228 AB222	4.80 (0.1890)
13228 AB232	4.81 (0.1894)
13228 AB242	4.82 (0.1898)
13228 AB252	4.83 (0.1902)
13228 AB262	4.84 (0.1906)
13228 AB272	4.85 (0.1909)
13228 AB282	4.86 (0.1913)
13228 AB292	4.87 (0.1917)
13228 AB302	4.88 (0.1921)
13228 AB312	4.89 (0.1925)
13228 AB322	4.90 (0.1929)
13228 AB332	4.91 (0.1933)
13228 AB342	4.92 (0.1937)
13228 AB352	4.93 (0.1941)
13228 AB362	4.94 (0.1945)
13228 AB372	4.95 (0.1949)
13228 AB382	4.96 (0.1953)
13228 AB392	4.97 (0.1957)
13228 AB402	4.98 (0.1961)
13228 AB412	4.99 (0.1965)
13228 AB422	5.00 (0.1969)
13228 AB432	5.01 (0.1972)
13228 AB442	5.02 (0.1976)
13228 AB452	5.03 (0.1980)
13228 AB462	5.04 (0.1984)
13228 AB472	5.05 (0.1988)
13228 AB482	5.06 (0.1992)
13228 AB492	5.07 (0.1996)
13228 AB502	5.08 (0.2000)
13228 AB512	5.09 (0.2004)
13228 AB522	5.10 (0.2008)
13228 AB532	5.11 (0.2012)
13228 AB542	5.12 (0.2016)
13228 AB552	5.13 (0.2020)
13228 AB562	5.14 (0.2024)
13228 AB572	5.15 (0.2028)
13228 AB582	5.16 (0.2031)
13228 AB592	5.17 (0.2035)
13228 AB602	5.18 (0.2039)
13228 AB612	5.19 (0.2043)

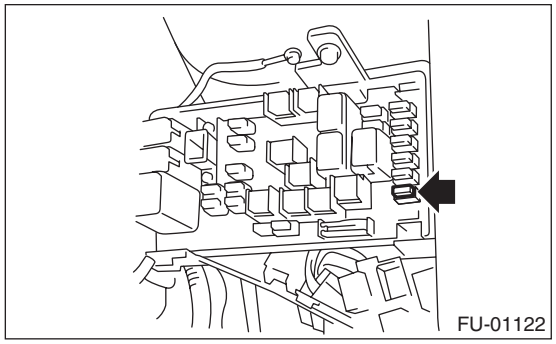
Part No.	Thickness mm (in)
13228 AB622	5.20 (0.2047)
13228 AB632	5.21 (0.2051)
13228 AB642	5.22 (0.2055)
13228 AB652	5.23 (0.2059)
13228 AB662	5.24 (0.2063)
13228 AB672	5.25 (0.2067)
13228 AB682	5.26 (0.2071)
13228 AB692	5.27 (0.2075)
13228 AB702	4.38 (0.1724)
13228 AB712	4.40 (0.1732)
13228 AB722	4.42 (0.1740)
13228 AB732	4.44 (0.1748)
13228 AB742	4.46 (0.1756)
13228 AB752	4.48 (0.1764)
13228 AB762	4.50 (0.1771)
13228 AB772	4.52 (0.1780)
13228 AB782	4.54 (0.1787)
13228 AB792	4.56 (0.1795)
13228 AB802	4.58 (0.1803)
13228 AB812	4.60 (0.1811)
13228 AB822	4.62 (0.1819)
13228 AB832	4.64 (0.1827)
13228 AB842	4.66 (0.1835)
13228 AB852	5.29 (0.2083)
13228 AB862	5.31 (0.2091)
13228 AB872	5.33 (0.2098)
13228 AB882	5.35 (0.2106)
13228 AB892	5.37 (0.2114)
13228 AB902	5.39 (0.2122)
13228 AB912	5.41 (0.2123)
13228 AB922	5.43 (0.2138)
13228 AB932	5.45 (0.2146)
13228 AB942	5.47 (0.2154)
13228 AB952	5.49 (0.2161)
13228 AB962	5.51 (0.2169)
13228 AB972	5.53 (0.2177)
13228 AB982	5.55 (0.2185)
13228 AB992	5.57 (0.2193)
13228 AC002	5.59 (0.2201)
13228 AC012	5.61 (0.2209)
13228 AC022	5.63 (0.2217)
13228 AC032	5.65 (0.2224)

6) Inspect all valves for valve clearance again at this time. If the valve clearance is not correct, repeat the procedure over again from the first step.
7) After inspection, install the related parts in the reverse order of removal.

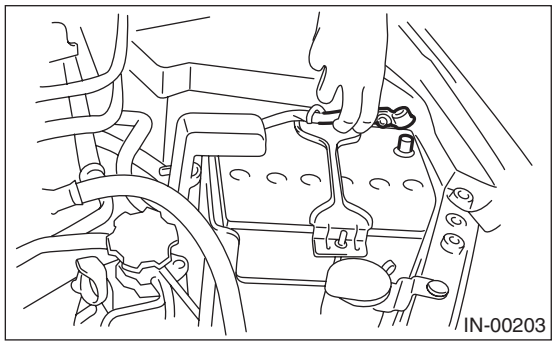
9. Engine Assembly

A: REMOVAL

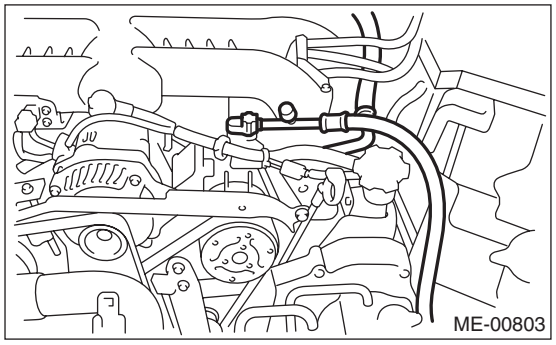
1) Set the vehicle on a lift.
2) Open the front hood fully and support with the front food stay.
3) Collect the refrigerant from A/C system. <Ref. to AC-19, Refrigerant Recovery Procedure.>
4) Release the fuel pressure.
   (1) Remove the fuse of fuel pump from main fuse box.



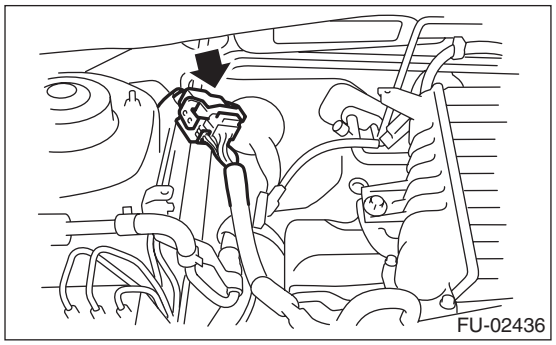
   (2) Start the engine and run it until it stalls.
   (3) After the engine stalls, crank it for five more seconds.
   (4) Turn the ignition switch to OFF.
5) Remove the fuel filler cap.
6) Remove the collector cover.
7) Disconnect the ground cable from battery.

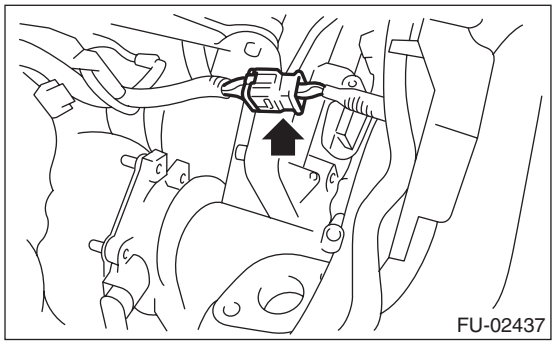


8) Remove the radiator from vehicle. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
9) Remove the coolant filler tank.
<Ref. to CO(H4DOTC)-31, REMOVAL, Coolant Filler Tank.>
10) Disconnect the A/C pressure hoses from A/C compressor.

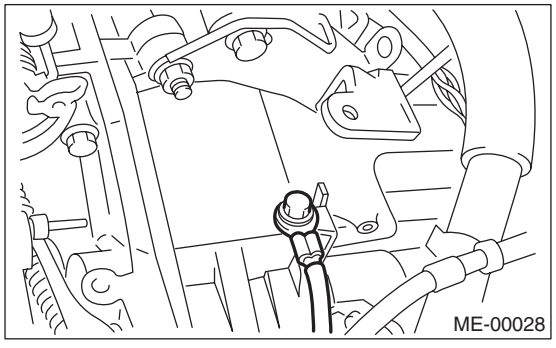


11) Remove the air intake system.
   (1) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
   (2) Remove the air cleaner element and air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
12) Disconnect the following connectors and cables.
   (1) Engine harness connectors

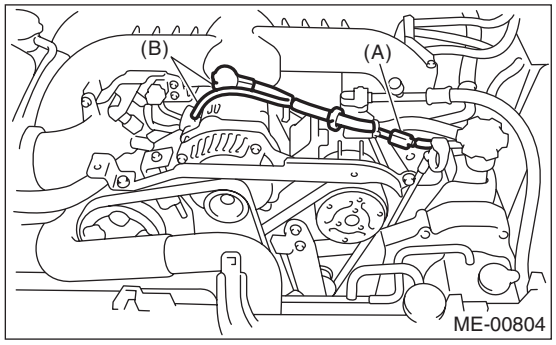




   (2) Engine ground terminal

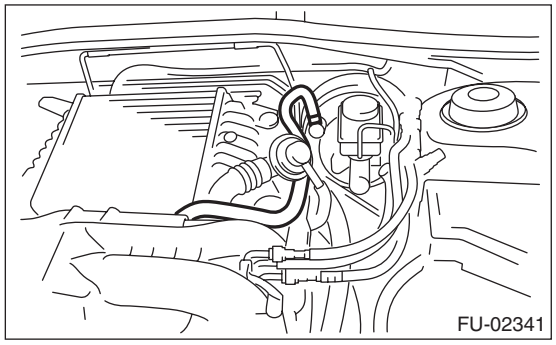


(3) Generator connector, terminal and A/C compressor connector

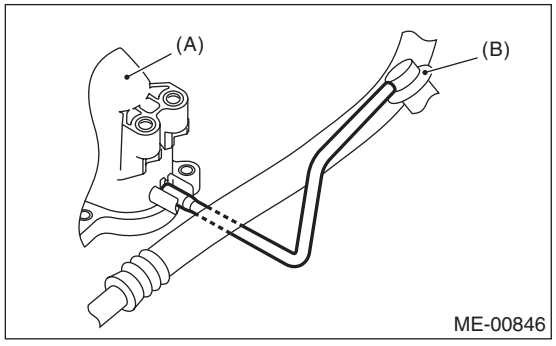


(A) A/C compressor connector
(B) Generator connector and terminal

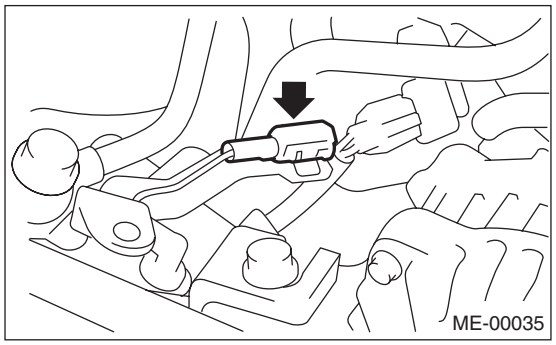
13) Disconnect the following hoses.
(1) Brake booster vacuum hose



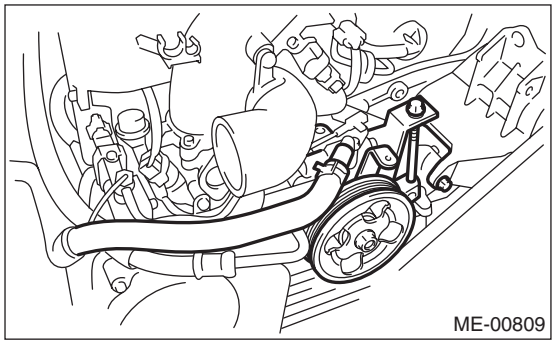
(2) Heater inlet and outlet hoses
(3) Remove the hose between intake manifold (A) and pressure regulator (B).



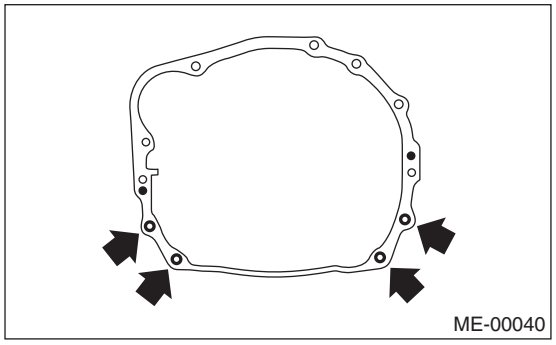
14) Remove the power steering pump from the bracket.
(1) Loosen the lock bolt and slider bolt, and remove the front side belt. <Ref. to ME(H4DOTC)-36, FRONT SIDE BELT, REMOVAL, V-belt.>
(2) Disconnect the power steering pressure switch connector.



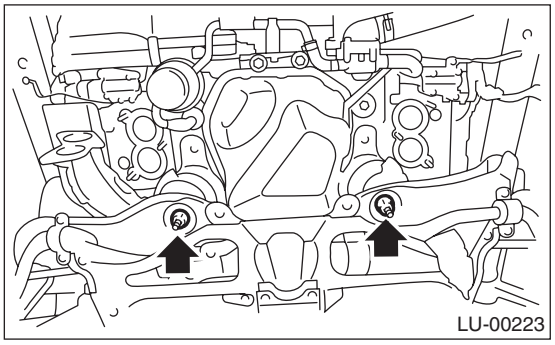
(3) Remove the power steering pump from the engine. <Ref. to PS-45, REMOVAL, Oil Pump.>



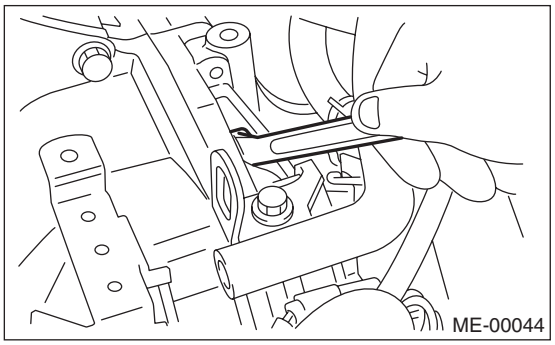
(4) Place the power steering pump on the right side wheel apron.
15) Lift-up the vehicle.
16) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
17) Remove the nuts which hold lower side of the transmission to the engine.



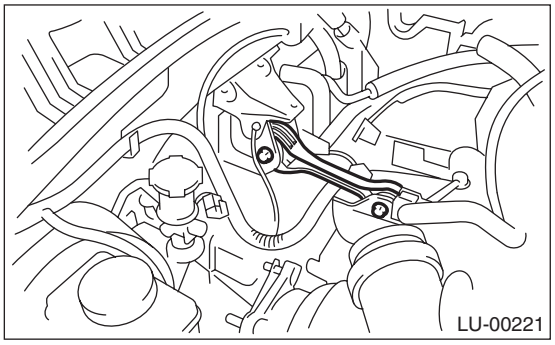
18) Remove the nuts which install front cushion rubber onto front crossmember.



19) Separate the torque converter clutch from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove the service hole plug.
(3) Remove the bolts which hold torque converter clutch to drive plate.
(4) Remove other bolts while rotating the engine using socket wrench.

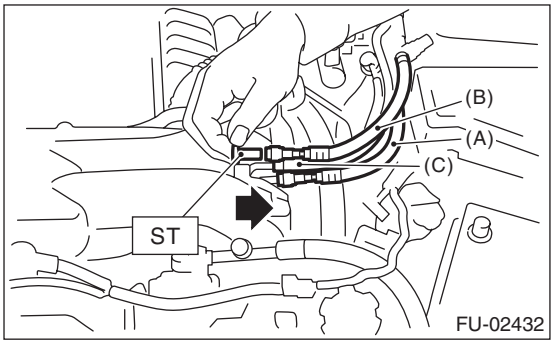


20) Remove the pitching stopper.



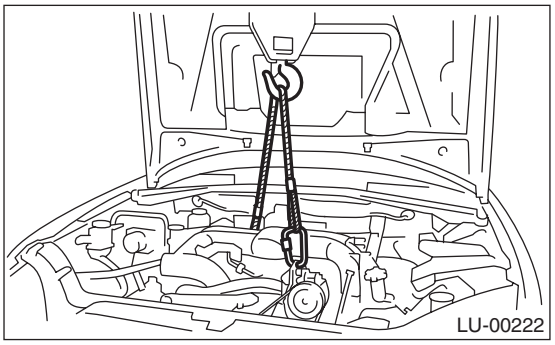
21) Disconnect the fuel hoses from fuel pipe.
(1) Disconnect the connector of fuel pipe by pushing the ST in the direction of arrow.
ST 42099AE000 CONNECTOR REMOVER
(2) Remove the clip and disconnect the evaporation hose from the pipe.

CAUTION:
• Collect fuel from the hose into container.
• Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.



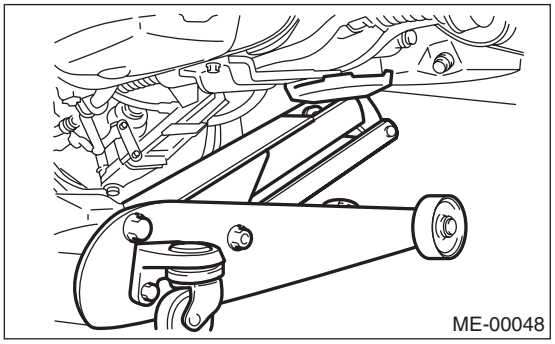
(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

22) Support the engine with a lifting device and wire ropes.



23) Support the transmission with a garage jack.

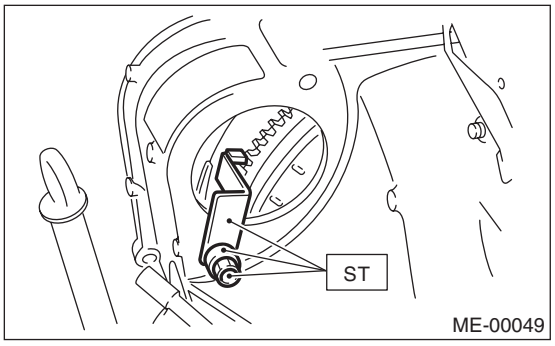
CAUTION:
Doing this is very important because the transmission lowers for its own weight. This work is also of great importance for facilitating reinstallation.


ME-00048

CAUTION:
Before removing the engine away from transmission, check to be sure no work has been overlooked.

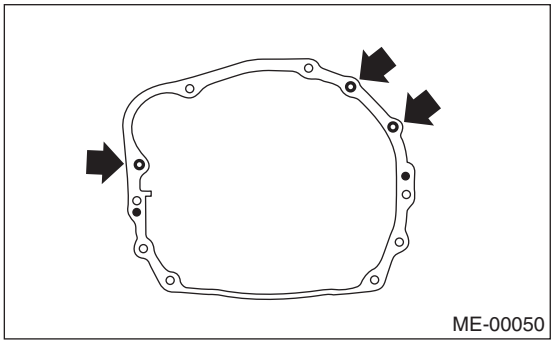
24) Separation of engine and transmission.
(1) Remove the starter. <Ref. to SC(H4SO)-6, REMOVAL, Starter.>
(2) Attach the ST to converter case. (AT model)

ST 498277200 STOPPER SET



ME-00049

(3) Remove the bolts which hold the upper side of the transmission to the engine.


ME-00050

25) 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.

26) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the front cushion rubbers to engine.

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

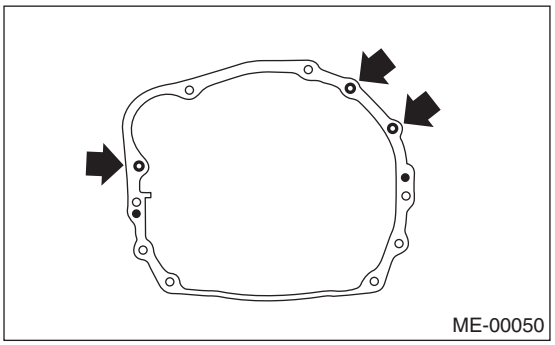
2) Install the transmission onto the engine.
(1) Position the engine in engine compartment and align it with transmission.

NOTE:
Be careful not to damage adjacent parts or body panels with the crank pulley, oil pressure gauge, etc.

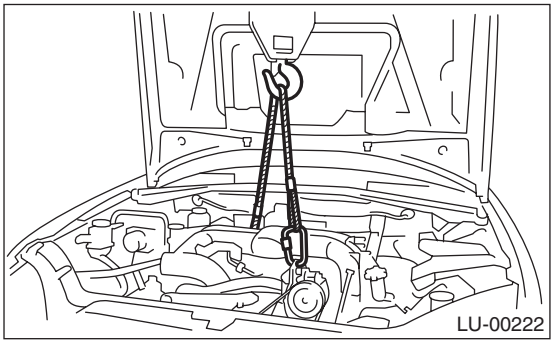
(2) Apply a small amount of grease to splines of main shaft. (MT model)

3) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)


ME-00050

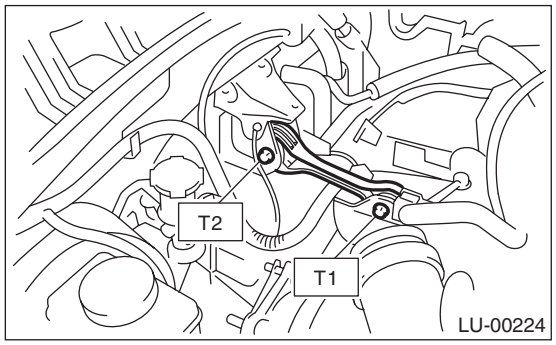
4) Remove the lifting device and wire ropes.


LU-00222

5) Remove the garage jack.

6) Attach the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



7) Remove the ST from converter case. (AT model)

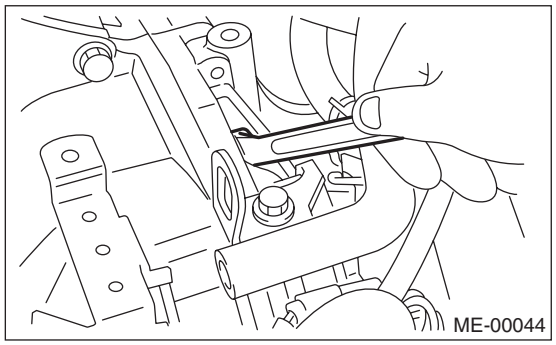
NOTE:
Be careful not to drop the ST into the converter case when removing the ST.
ST 498277200 STOPPER SET

8) Install the starter. <Ref. to SC(H4SO)-6, INSTALLATION, Starter.>

9) Install the torque converter clutch to drive plate. (AT model)
(1) Tighten the bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the engine using the ST.

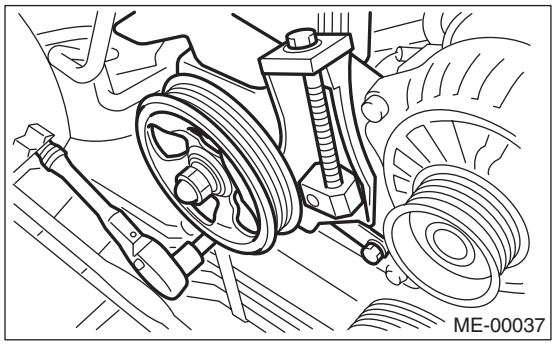
CAUTION:
Be careful not to drop bolts into the torque converter clutch housing.
ST 499977400 CRANK PULLEY WRENCH

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

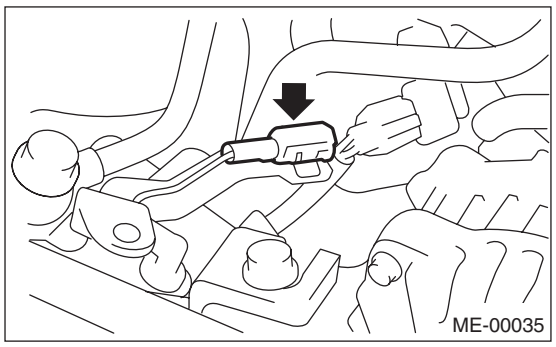


10) Install the power steering pump to the bracket.
(1) Install the power steering pump.

Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(2) Connect the power steering pressure switch connector.

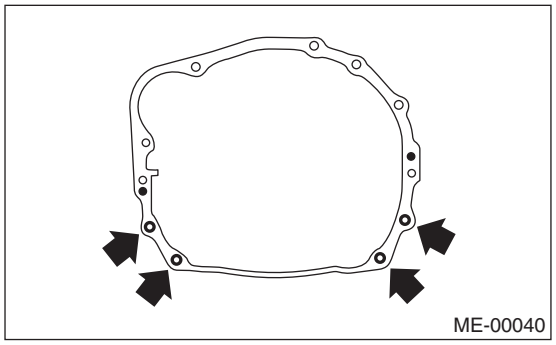


(3) Install and adjust the front side belt. <Ref. to ME(H4DOTC)-37, FRONT SIDE BELT, INSTALLATION, V-belt.>

11) Lift-up the vehicle.

12) Tighten the nuts which hold the lower side of transmission to the engine.

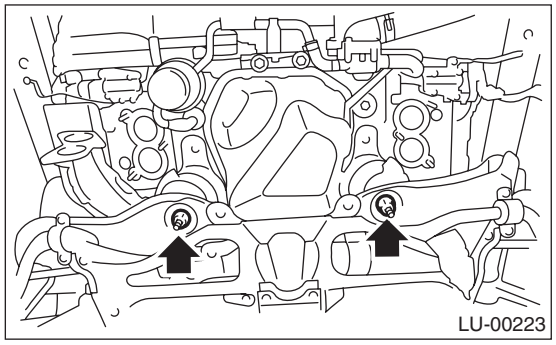
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



13) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
75 N·m (7.6 kgf-m, 55.3 ft-lb)

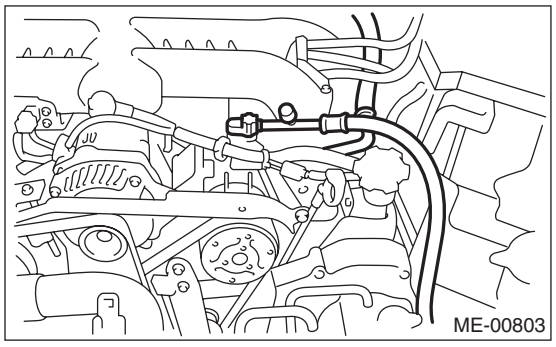
NOTE:
Make sure that the front cushion rubber mounting bolts and locator are securely installed.



14) Install the center exhaust pipe.
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
15) Lower the vehicle.
16) Connect the following hoses.
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
(4) Pressure regulator hose
17) Connect the following connectors and terminals.
(1) Engine ground terminal
(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connector
18) Install the air intake system.
(1) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
(2) Install the air cleaner element and air cleaner case. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>
19) Install the A/C pressure hoses.

NOTE:
Use new O-rings.

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



20) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, Radiator.>
21) Install the coolant filler tank. <Ref. to CO(H4DOTC)-31, INSTALLATION, Coolant Filler Tank.>
22) Install the window washer tank.
23) Install the battery to the vehicle, and connect the battery ground terminal.
24) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
25) Charge the A/C system with refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Charging Procedure.>
26) Install the collector cover.
27) Remove the front hood stay, and close the front hood.
28) Take off the vehicle from lift.

C: INSPECTION

1) Check that the pipes and hoses are connected securely.
2) Check the engine coolant and ATF are at specified levels.

10.Engine Mounting

A: REMOVAL

1) Remove the engine unit. <Ref. to ME(H4DOTC)-28, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the engine mounting cover of the RH side is securely installed.

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

C: INSPECTION

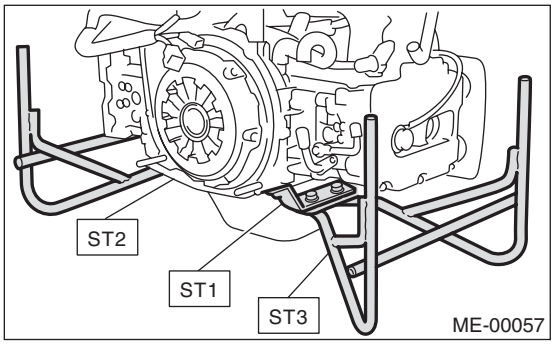
Make sure that no crack or other damages do not exist.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it to ST in the following procedure.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817000	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. The procedure for overhauling of the engine will be completed when you go through all steps in the process.

Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

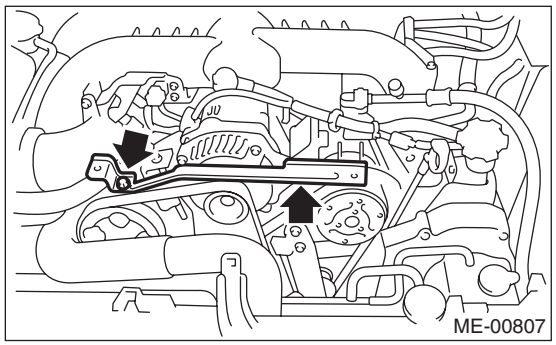
12.V-belt

A: REMOVAL

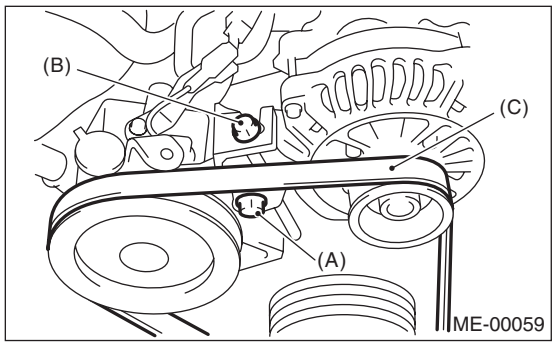
NOTE:
Perform the following procedures with the engine installed to body.

1. FRONT SIDE BELT

1) Remove the collector cover.
2) Remove the V-belt covers.

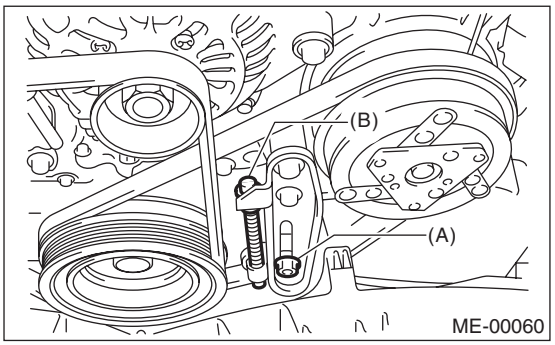


3) Loosen the lock bolt (A).
4) Loosen the slider bolt (B).
5) Remove the front side belt (C).

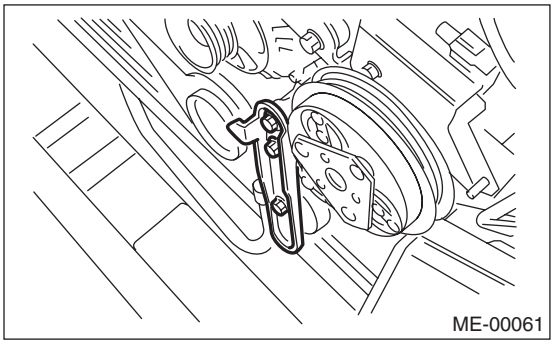


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the A/C belt.
4) Remove the A/C belt tensioner.



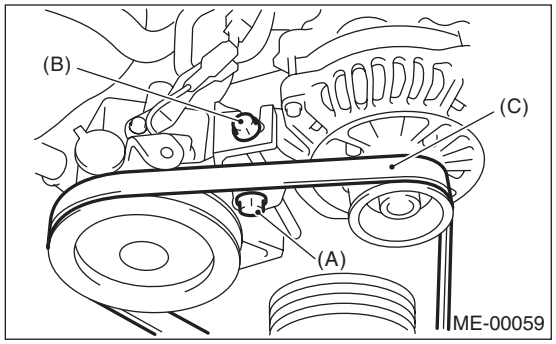
B: INSTALLATION

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

1. FRONT SIDE BELT

1) Install a V-belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-38, INSPECTION, V-belt.>
2) Tighten the lock bolt (A).
3) Tighten the slider bolt (B).

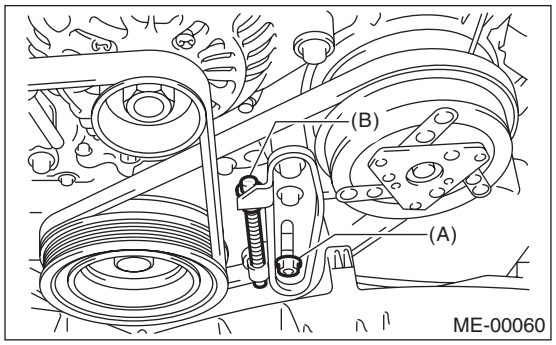
Tightening torque:
Lock bolt (A):
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt (B):
8 N·m (0.8 kgf-m, 5.9 ft-lb)



2. REAR SIDE BELT

1) Remove the A/C belt tensioner.
2) Install the V belt, and tighten the slider bolt (B) to obtain the specified belt tension.
<Ref. to ME(H4DOTC)-38, INSPECTION, V-belt.>
3) Tighten the lock nut (A).

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



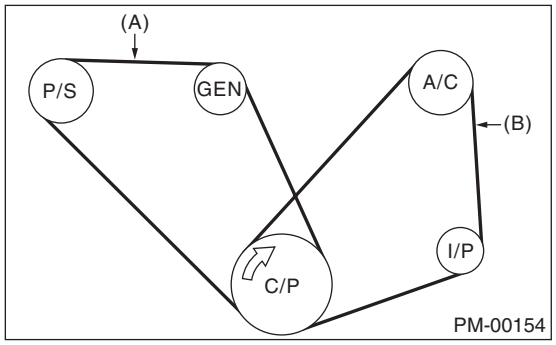
C: INSPECTION

1) Replace the belts, if crack, fraying or wear is found.
2) Check the V-belt tension and adjust it if necessary by changing the generator installing position or idler pulley installing position.

Belt tension (with belt tension gauge):

(A)
When installing new parts:
618 — 755 N (63 — 77 kgf, 139 — 170 lb)
At inspection:
490 — 640 N (50 — 65 kgf, 110 — 144 lb)

(B)
When installing new parts:
740— 880 N (75 — 90 kgf, 166 — 198 kg)
At inspection:
350 — 450 N (36 — 46 kgf, 78 — 101 lb)

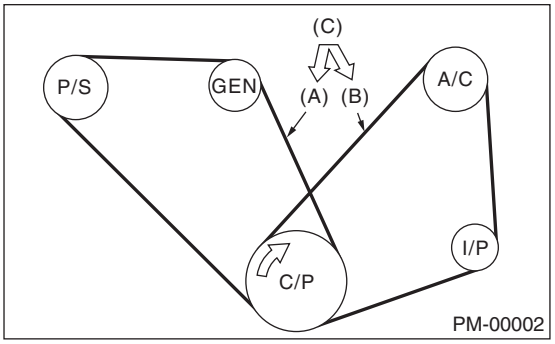


(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C A/C compressor pulley
I/P Idler pulley

Belt tension (when not using a belt tension gauge)

(A)
When installing new parts:
7 — 9 mm (0.276 — 0.354 in)
At inspection:
9 — 11 mm (0.354 — 0.433 in)

(B)
When installing new parts:
7.5 — 8.5 mm (0.295 — 0.335 in)
At inspection:
9.0 — 10.0 mm (0.354 — 0.394 in)

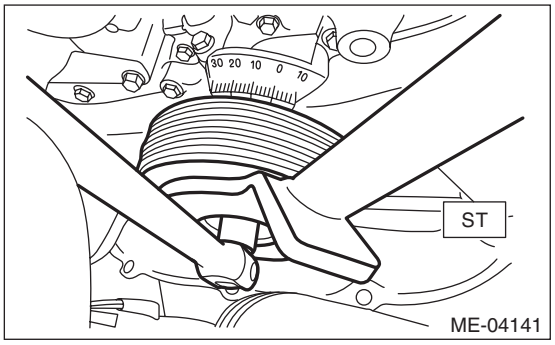


(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

13.Crank Pulley

A: REMOVAL

NOTE:
When replacing the single part, perform the work with the engine installed to vehicle body.
1) Remove the V-belts. <Ref. to ME(H4DOTC)-36, REMOVAL, V-belt.>
2) Use the ST to lock the crank pulley, and remove the crank pulley bolt.
ST 499977100 CRANK PULLEY WRENCH



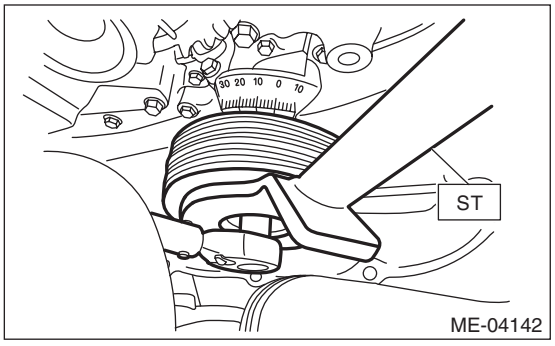
3) Remove the crank pulley.

B: INSTALLATION

1. METHOD WITHOUT ANGLE GAUGE

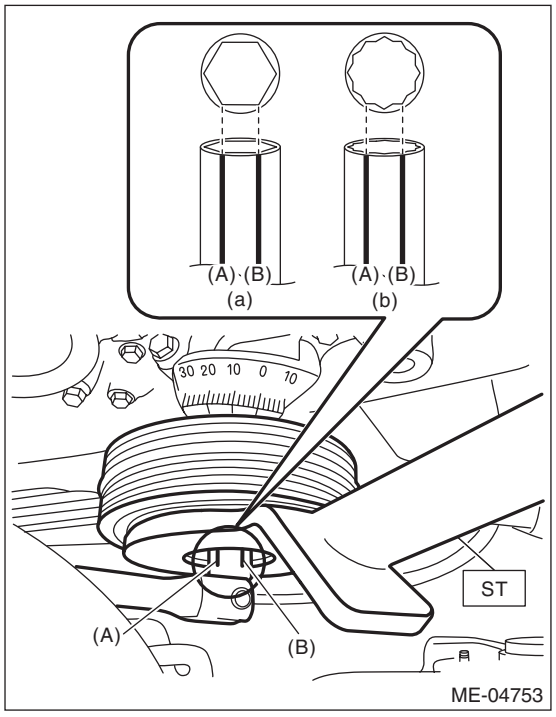
1) Clean the crankshaft thread using compressed air.
2) Install the crank pulley.
3) Apply engine oil to the crank pulley bolt seat and thread.
4) Tighten the crank pulley bolts.
(1) Use the ST to lock the crank pulley, and temporarily tighten the crank pulley bolt.
ST 499977100 CRANK PULLEY WRENCH

Tightening torque:
47 N·m (4.8 kgf-m, 34.7 ft-lb)



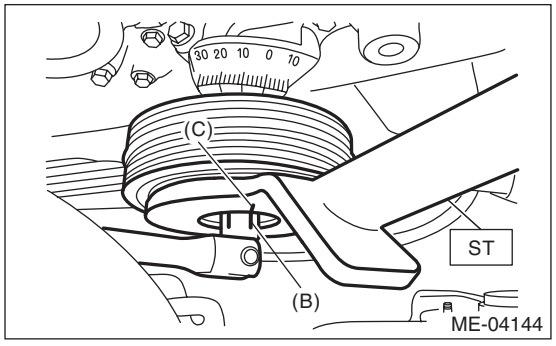
(2) Draw reference lines (A) and (B) using a marker to set the socket to the crank pulley bolt as shown in the figure.
ST 499977100 CRANK PULLEY WRENCH

NOTE:
Set the socket onto the crank pulley bolt so that reference lines (A) and (B) is visible.



(a) When using 6-point socket
(b) When using 12-point socket

(3) Draw end line (C) on ST using a marker at the same position as reference line (B) was drawn on the socket in step (2).
ST 499977100 CRANK PULLEY WRENCH

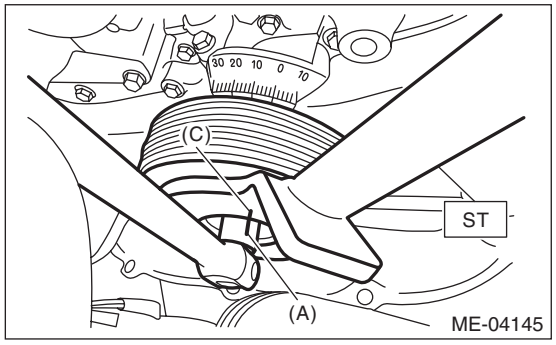


(4) Use the ST to lock the crank pulley, and tighten the crank pulley bolt to the angle where reference line (A) and end line (C) are aligned.

ST 499977100 CRANK PULLEY WRENCH

NOTE:
It should be approx. 60° when reference line (A) and end line (C) are aligned.

Tightening angle:
60°±5°



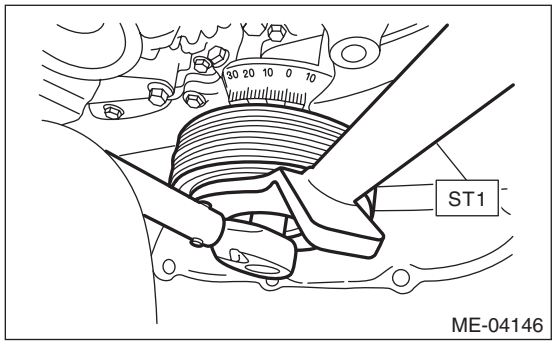
5) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>

2. METHOD WITH ANGLE GAUGE

1) Clean the crankshaft thread using compressed air.
2) Install the crank pulley.
3) Apply engine oil to the crank pulley bolt seat and thread.
4) Tighten the crank pulley bolts.
(1) Remove the radiator main fan motor assembly and radiator sub motor assembly. <Ref. to CO(H4DOTC)-24, REMOVAL, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-27, REMOVAL, Radiator Sub Fan and Fan Motor.>
(2) Use the ST1 to lock the crank pulley, and temporarily tighten the crank pulley bolt.

ST1 499977100 CRANK PULLEY WRENCH

Tightening torque:
47 N·m (4.8 kgf-m, 34.7 ft-lb)

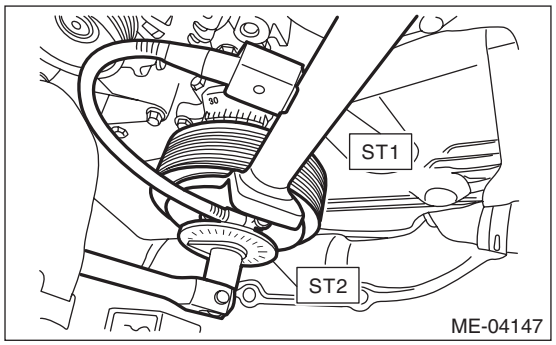


(3) Set the ST2, use the ST1 to lock the crank pulley, and tighten the crank pulley bolt to the specified angle.

ST1 499977100 CRANK PULLEY WRENCH
ST2 18854AA000 ANGLE GAUGE

NOTE:
Attach the magnet used for securing the ST2 (ANGLE GAUGE) to ST1.

Tightening angle:
60°±5°



(4) Install the radiator main fan motor assembly and radiator sub motor assembly. <Ref. to CO(H4DOTC)-25, INSTALLATION, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-28, INSTALLATION, Radiator Sub Fan and Fan Motor.>

5) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>

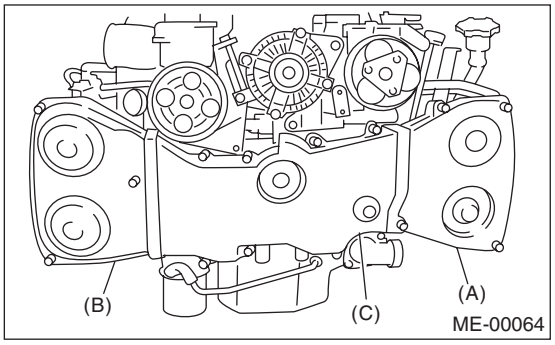
C: INSPECTION

1) Make sure the V-belt is not worn or damaged.
2) Check the tension of the front side belt. <Ref. to ME(H4DOTC)-38, INSPECTION, V-belt.>

14.Timing Belt Cover

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-36, REMOVAL, V-belt.>
2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-39, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover (LH) (A).
4) Remove the timing belt cover (RH) (B).
5) Remove the front timing belt cover (C).



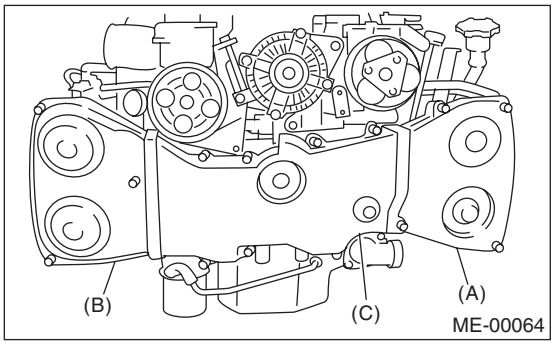
B: INSTALLATION

1) Install the front timing belt cover (C).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)
2) Install the timing belt cover (RH) (B).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)
3) Install the timing belt cover (LH) (A).

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



4) Install the crank pulley. <Ref. to ME(H4DOTC)-39, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>

C: INSPECTION

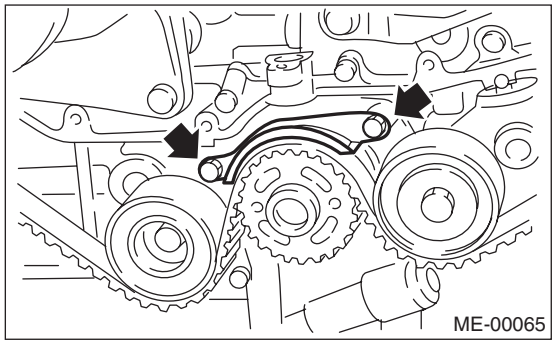
Check the cover for damage.

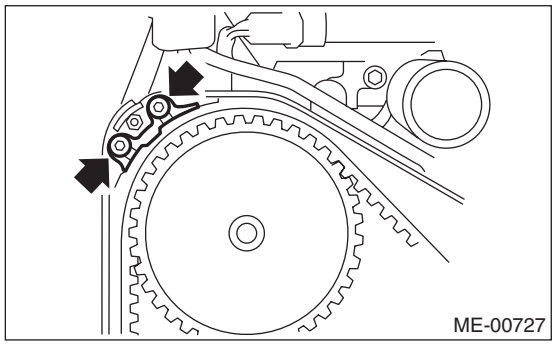
15.Timing Belt

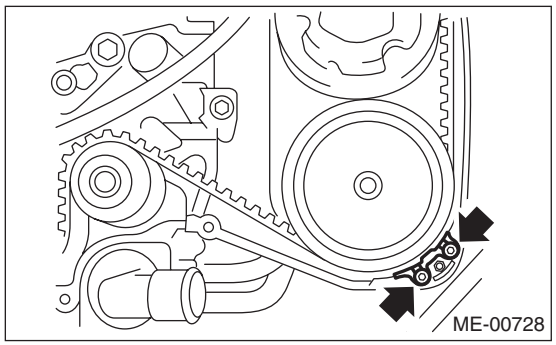
A: REMOVAL

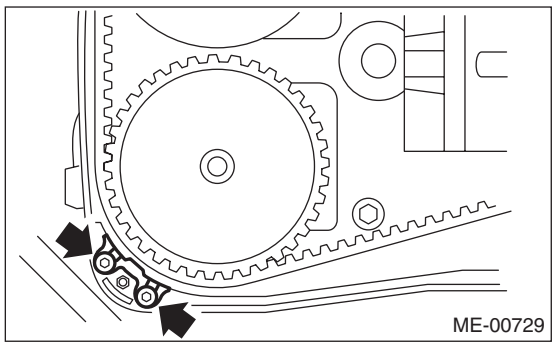
1. TIMING BELT

1) Remove the V-belts. <Ref. to ME(H4DOTC)-36, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-39, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt guide. (Model with timing belt guide)


ME-00065

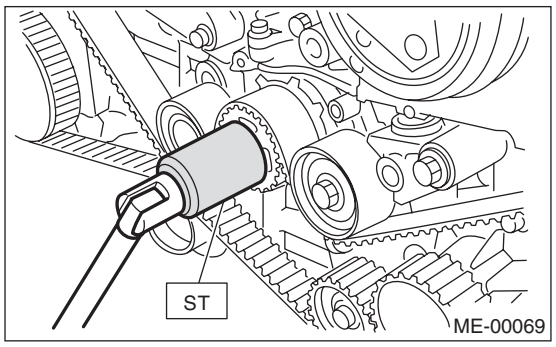

ME-00727


ME-00728


ME-00729

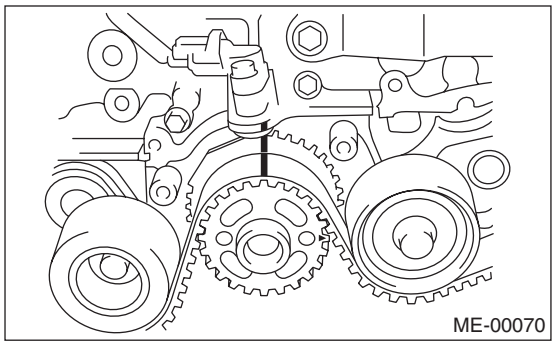
5) If the alignment mark or arrow mark (which indicates the direction of rotation) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.
(1) Turn the crankshaft using ST, and align the alignment marks on crank sprocket, intake cam sprocket (LH), exhaust cam sprocket (LH), intake cam sprocket (RH) and exhaust cam sprocket (RH) with notches of timing belt cover and cylinder block.

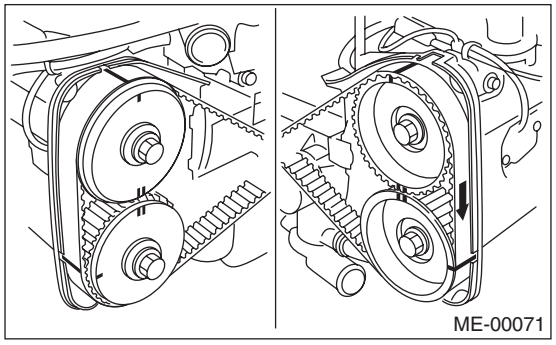
ST 499987500 CRANKSHAFT SOCKET



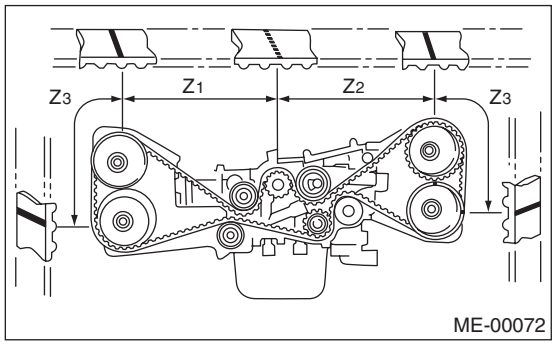
ME-00069

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

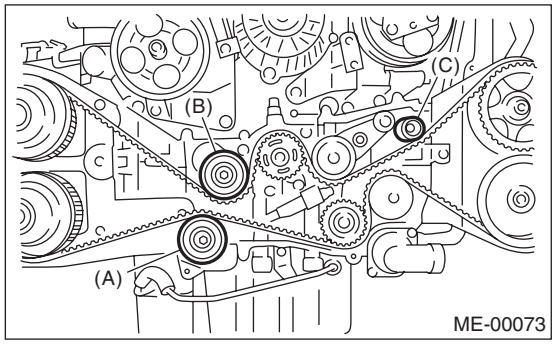

ME-00070


ME-00071

Z_1: 54.5-tooth length
Z_2: 51-tooth length
Z_3: 28-tooth length



6) Remove the belt idler (A).

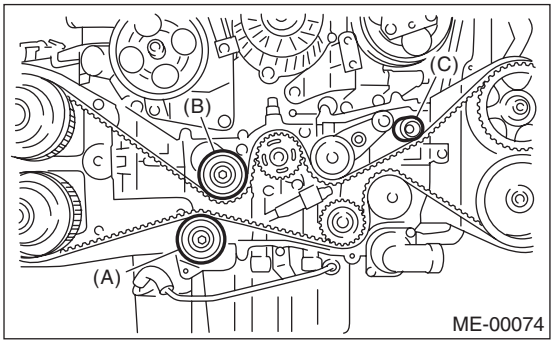


7) Remove the timing belt.

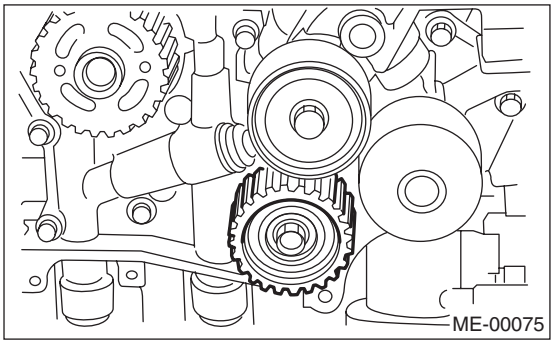
CAUTION:
After the timing belt has been removed, never rotate the intake and exhaust sprocket. If the cam sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

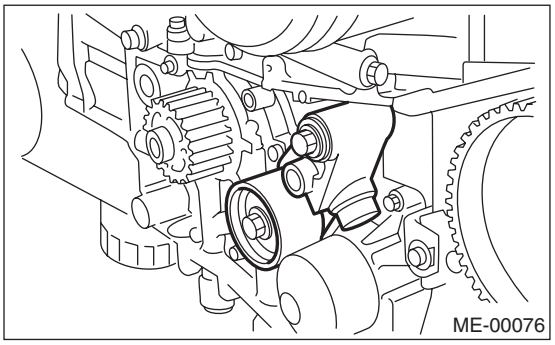
1) Remove the belt idler (B) and (C).



2) Remove the belt idler No. 2.



3) Remove the automatic belt tension adjuster assembly.



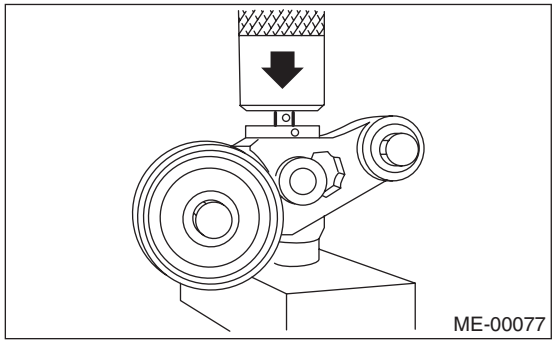
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

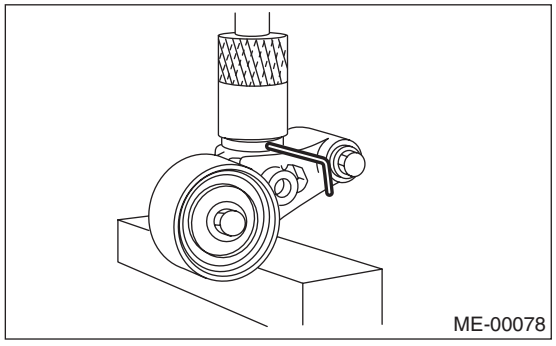
1) Preparation for installation of automatic belt tension adjuster assembly.

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than three minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
• Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to vertical pressing tool.
(2) Slowly move the adjuster rod down with a pressure of 165 N (16.8 kgf, 37.1 lb) or more until the adjuster rod is aligned with the stopper pin hole in the cylinder.

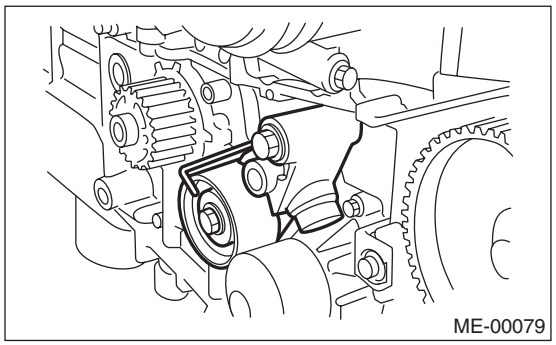

ME-00077

(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.


ME-00078

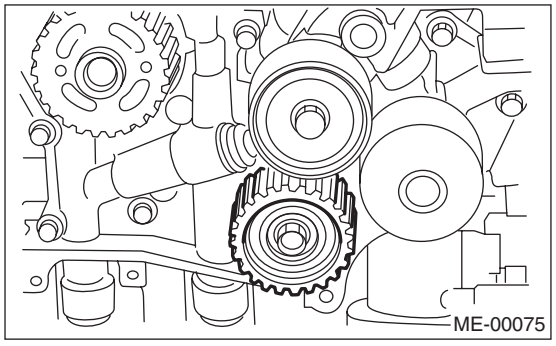
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00079

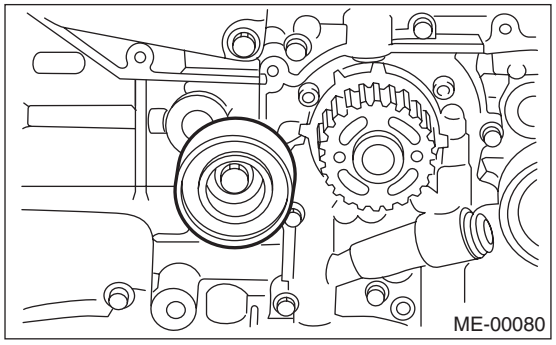
3) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00075

4) Install the belt idlers.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

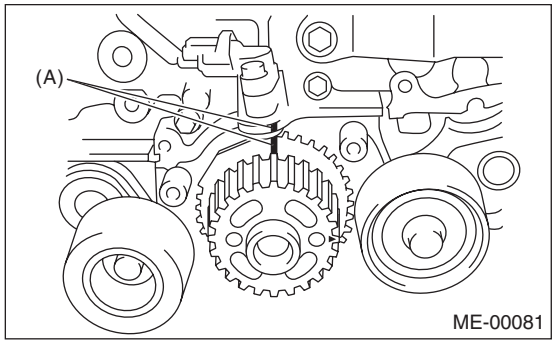

ME-00080

2. TIMING BELT

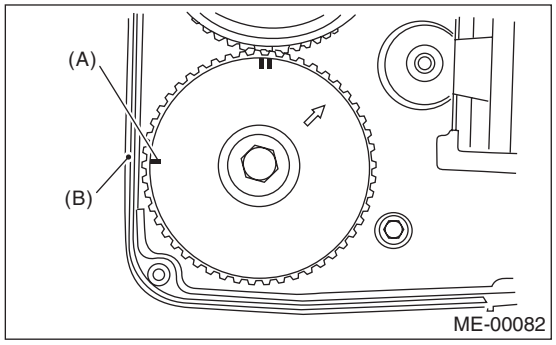
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4DOTC)-44, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

2) Crankshaft and camshaft sprocket alignment

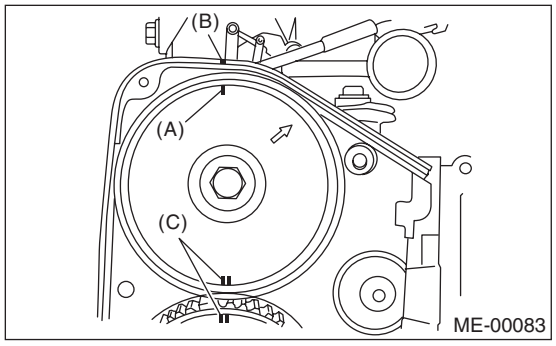
(1) Align the mark (A) on crank sprocket with the mark on oil pump cover at cylinder block.



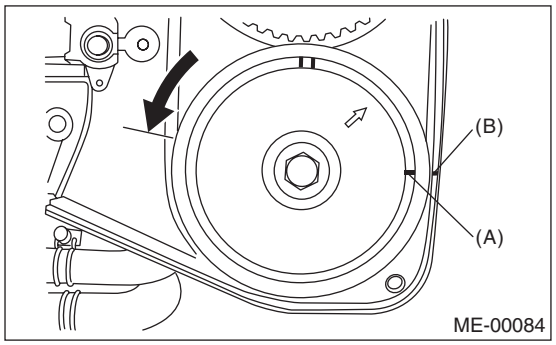
(2) Align single line mark (A) on the exhaust cam sprocket (RH) with notch (B) on timing belt cover.



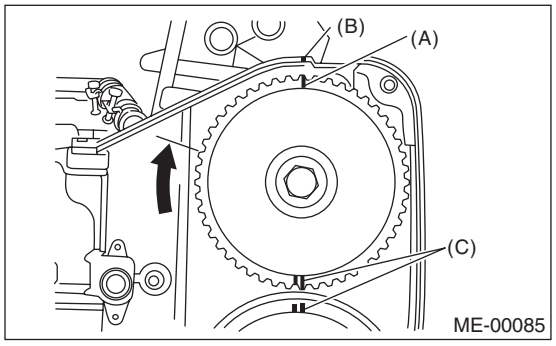
(3) Align single line mark (A) on the intake cam sprocket (RH) with notch (B) on timing belt cover. (Ensure double lines (C) on intake and exhaust camshaft sprockets are aligned.)



(4) Align the single line mark (A) on exhaust cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).

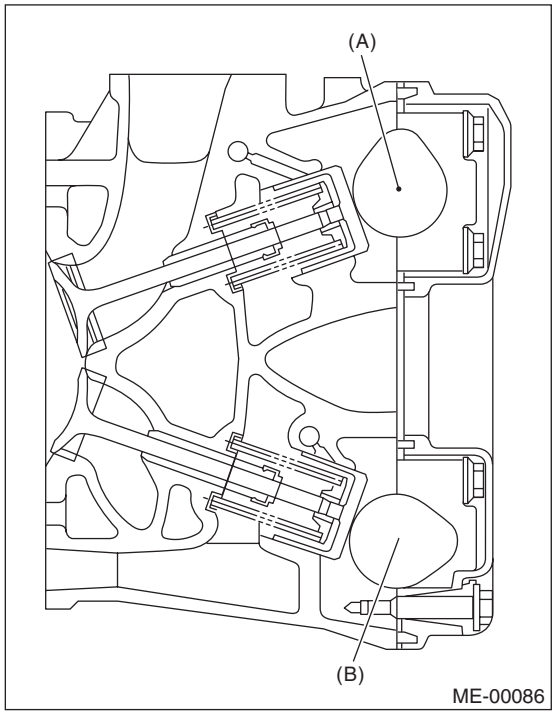


(5) Align the single line mark (A) on intake cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine). Make sure the double line marks (C) on the intake and exhaust cam sprockets are aligned.



(6) Make sure that the cam and crank sprockets are positioned properly.

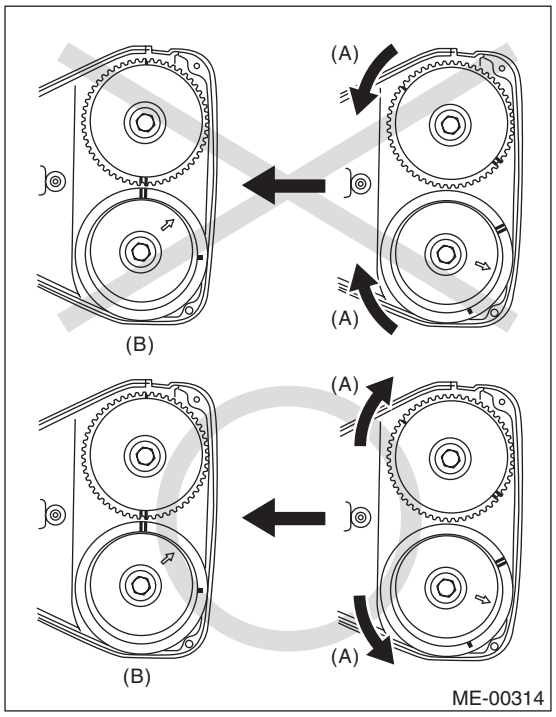
CAUTION:
• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, the valve heads will interfere with each other, resulting in bent valves.



(A) Intake camshaft
(B) Exhaust camshaft

• When the timing belts are not installed, four camshafts are held at the "zero-lift" position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
• When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Right-side camshafts are held so that their cams do not push valves down.
• Camshafts (LH) must be rotated from the "zero-lift" position to the position where the timing belt is to be installed with the smallest possible angle, in order to prevent mutual interference of intake and exhaust valve heads.

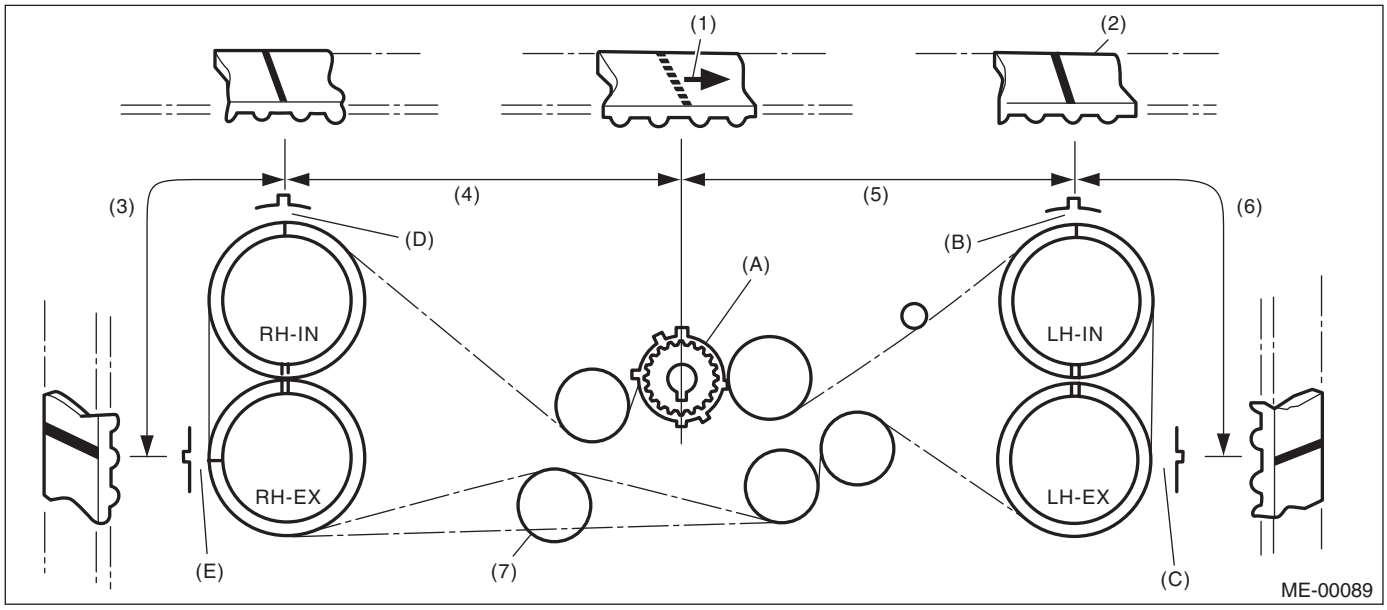
• Do not allow the camshafts to rotate in the direction shown in the figure because both intake and exhaust valves may lift simultaneously, and the valve heads may interfere with each other.



(A) Direction of rotation
(B) Timing belt installation position

3) Installation of timing belt:
Align the alignment mark on the timing belt with marks on the sprockets in the alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:
- **If the timing belt slips by 3 or more teeth, the valve and piston may hit each other.**
- **Make sure that the direction of belt rotation is correct.**

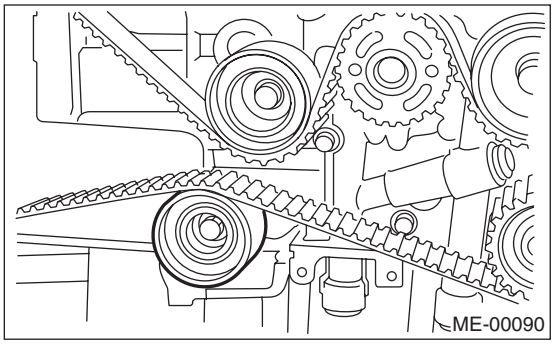


(1) Arrow mark
(2) Timing belt
(3) 28 tooth length
(4) 54.5 tooth length
(5) 51 tooth length
(6) 28 tooth length
(7) Install it in the end

4) Install the belt idlers.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

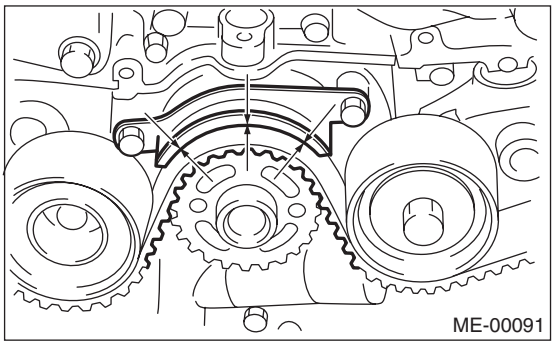
NOTE:
Make sure that the marks on the timing belt and sprockets are aligned.

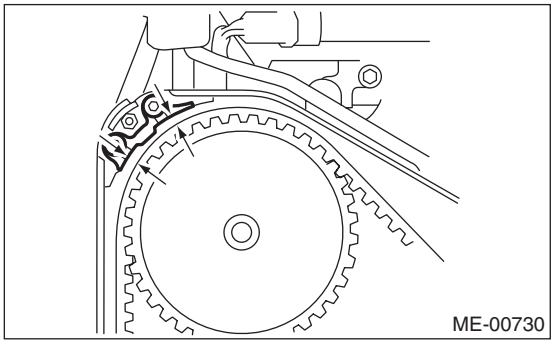


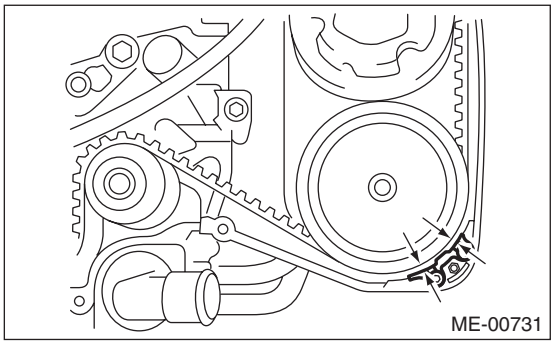
5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.

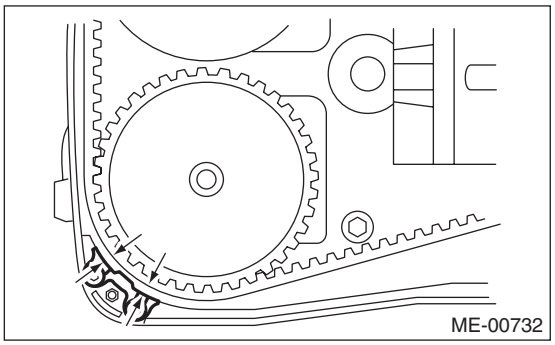
6) Install the timing belt guide. (Model with timing belt guide)
(1) Temporarily tighten the bolts.
(2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:
1.0±0.5 mm (0.039±0.020 in)


ME-00091

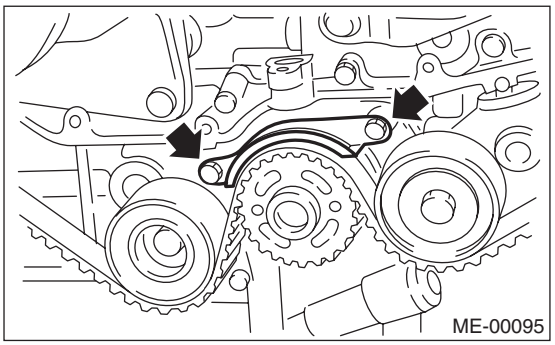

ME-00730


ME-00731

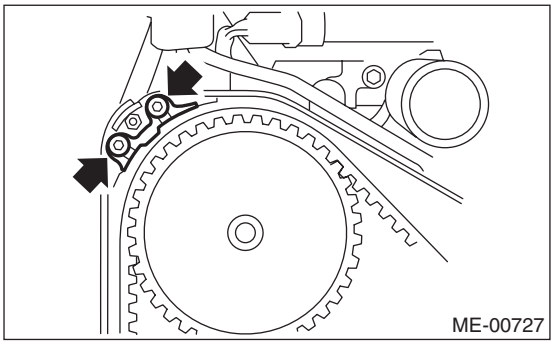

ME-00732

(3) Tighten the bolt.

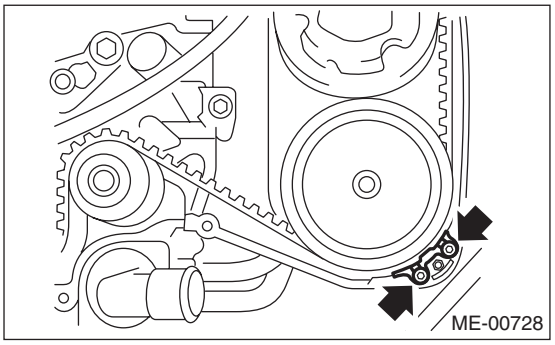
Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)


ME-00095

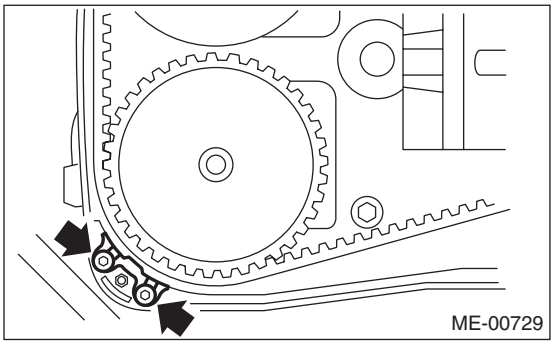
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


ME-00727

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


ME-00728

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


ME-00729

7) Install the timing belt cover.
<Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
8) Install the crank pulley.
<Ref. to ME(H4DOTC)-39, INSTALLATION, Crank Pulley.>
9) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>

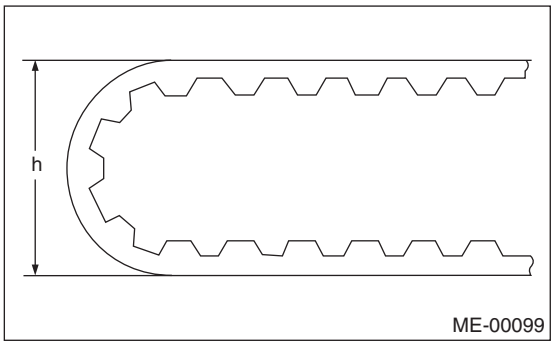
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks or wear. If any fault is found, replace the timing belt.
2) Check the condition on the backside of the timing belt. If cracks are found, replace the timing belt.

CAUTION:
• Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the timing belt sharply.

In radial diameter h:
60 mm (2.36 in) or more



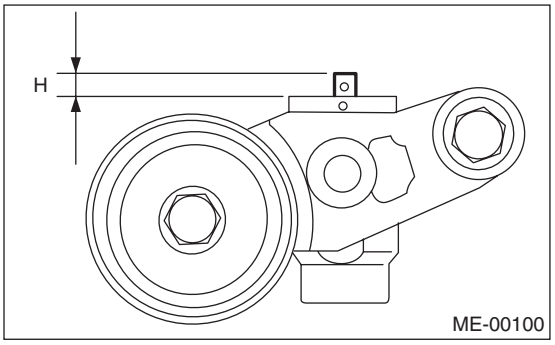
2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear and scratches. If necessary, replace the automatic belt tension adjuster assembly.

NOTE:
Slight traces of oil on the oil seal of the rod does not indicate a problem.
2) Check that the adjuster rod does not move when a pressure of 165 N (16.8 kgf, 37.1 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 165 N (16.8 kgf, 37.1 lb), check it using the following procedures:
(1) Slowly press the adjuster rod down to the end surface of cylinder. Repeat this operation two to three times.
(2) With the adjuster rod moved all the way up, apply a pressure of 165 N (16.8 kgf, 37.1 lb) to it. Check the adjuster rod stiffness.
(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new part.

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than three minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into cylinder. Doing so may damage the cylinder.
4) Measure the amount of rod protrusion beyond the body. If it is not within specified range, replace with new part.

Amount of rod protrusion H:
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. If defective, replace the belt tension pulley.
2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play occurs.
3) Check the belt tension pulley for grease leakage.

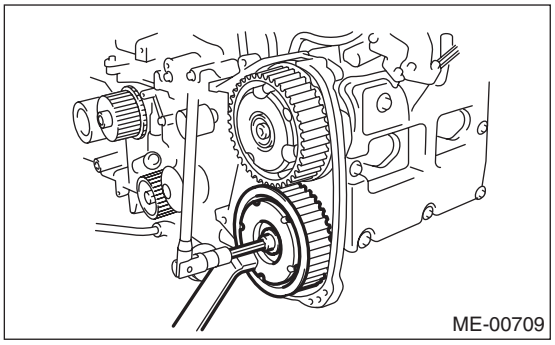
4. BELT IDLER

1) Check the belt idler for smooth rotation. Replace if noise or excessive play occurs.
2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check the belt idler for grease leakage.

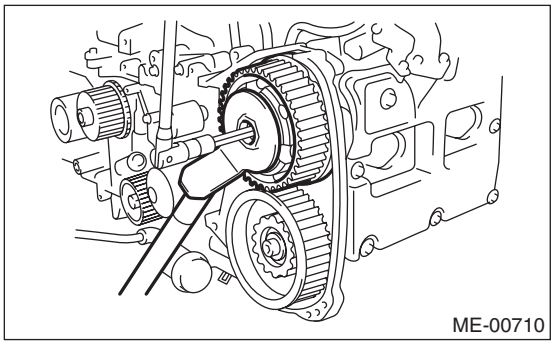
16.Cam Sprocket

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-36, REMOVAL, V-belt.>
2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-39, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt.
<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt.>
5) Remove the cam sprocket. To lock the camshaft, use the ST.
ST 499207400 CAM SPROCKET WRENCH



ST 499977500 CAM SPROCKET WRENCH

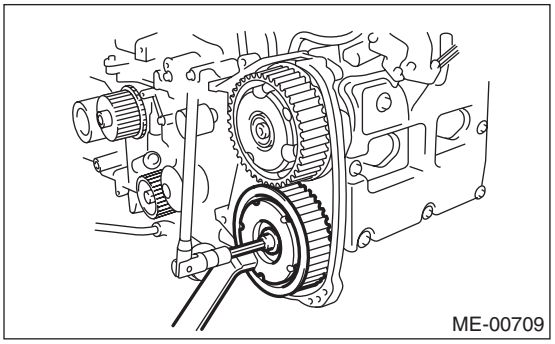


B: INSTALLATION

1) Install the cam sprocket. To lock the camshaft, use the ST.

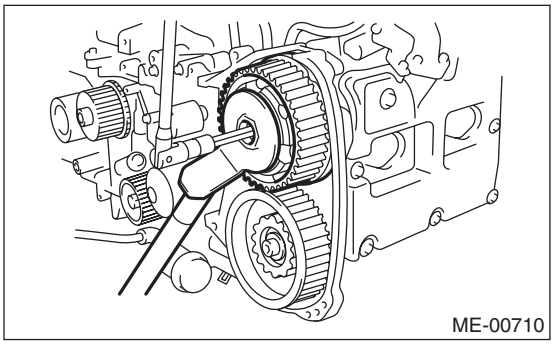
NOTE:
Do not confuse the cam sprockets (LH) and (RH) during installation.
ST 499207400 CAM SPROCKET WRENCH

Tightening torque:
Tighten to 30 N·m (3.1 kgf-m, 22.1 ft-lb) of torque, and then tighten further by 45°.



ST 499977500 CAM SPROCKET WRENCH

Tightening torque:
Tighten to 30 N·m (3.1 kgf-m, 22.1 ft-lb) of torque, and then tighten further by 45°.



2) Install the timing belt. <Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt.>
3) Install the timing belt cover. <Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
4) Install the crank pulley. <Ref. to ME(H4DOTC)-39, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>

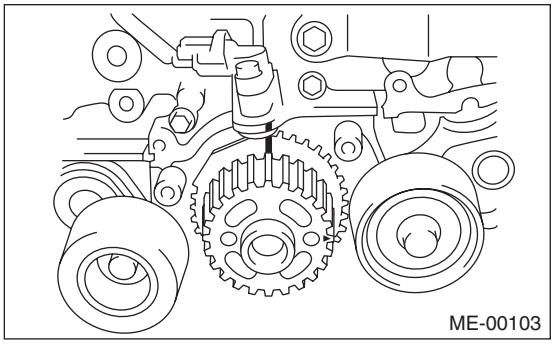
C: INSPECTION

1) Check the cam sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between cam sprocket and key.
3) Check the cam sprocket protrusion used for sensor for damage and contamination of foreign matter.

17.Crank Sprocket

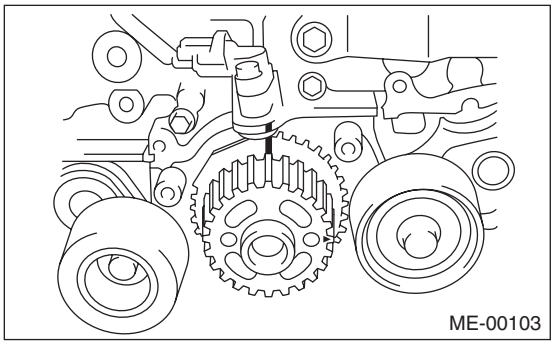
A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-36, REMOVAL, V-belt.>
2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-39, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt.
<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt.>
5) Remove the crank sprocket.



B: INSTALLATION

1) Install the crank sprocket.



2) Install the timing belt.
<Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt.>
3) Install the timing belt cover. <Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
4) Install the crank pulley. <Ref. to ME(H4DOTC)-39, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>

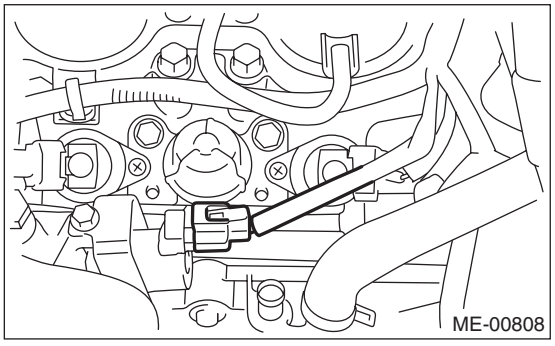
C: INSPECTION

1) Check the crank sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between crank sprocket and key.
3) Check the crank sprocket protrusion used for sensor for damage and contamination of foreign matter.

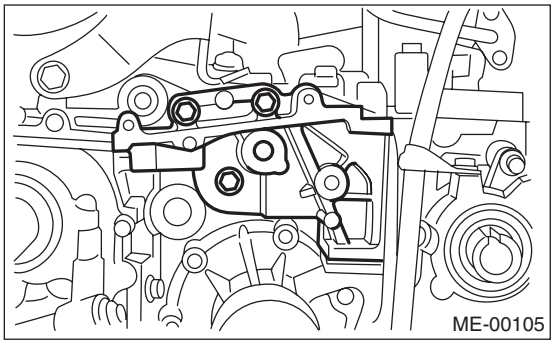
18.Camshaft

A: REMOVAL

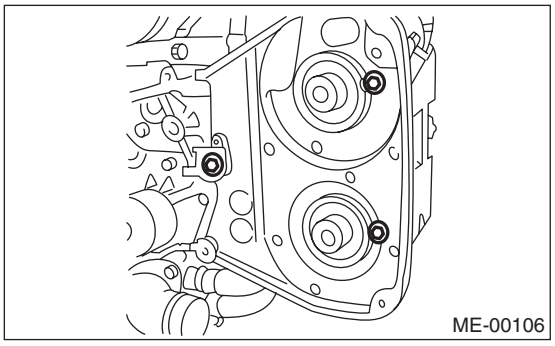
1) Remove the V-belts. <Ref. to ME(H4DOTC)-36, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-39, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt. <Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt.>
5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-50, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H4DOTC)-51, REMOVAL, Crank Sprocket.>
7) Disconnect the oil flow control solenoid valve assembly connector.


ME-00808

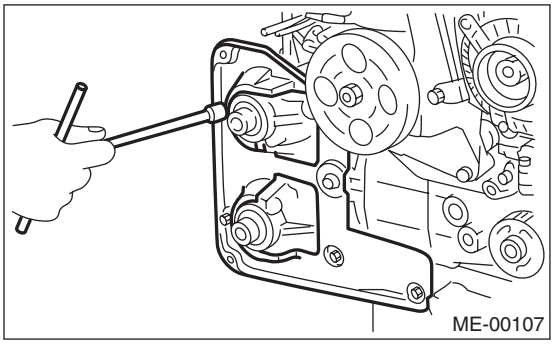
8) Remove the tensioner bracket.


ME-00105

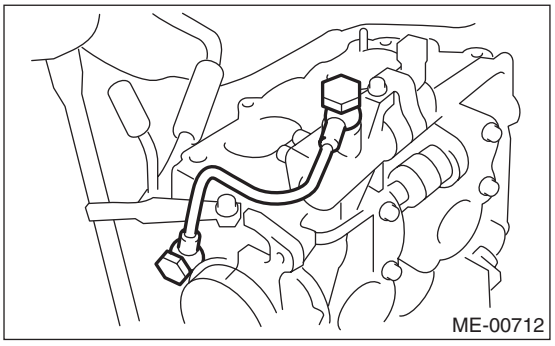
9) Remove the timing belt cover No. 2 (LH).


ME-00106

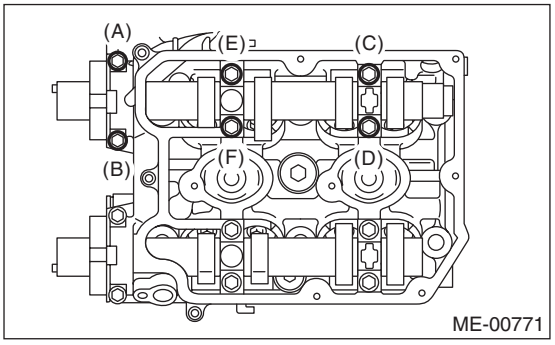
10) Remove the timing belt cover No. 2 (RH).


ME-00107

11) Remove the spark plug cords.
12) Remove the oil level gauge guide. (LH side)
13) Remove the rocker cover and gasket.
14) Remove the oil pipe.

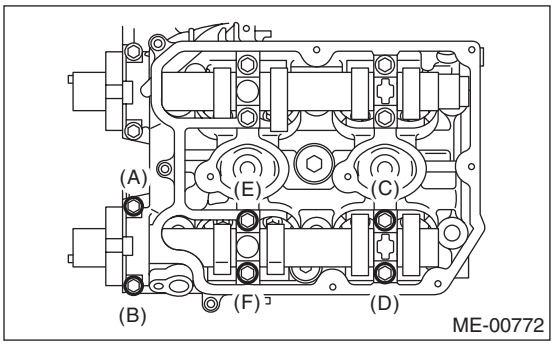

ME-00712

15) Loosen the oil flow control solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00771

16) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00772

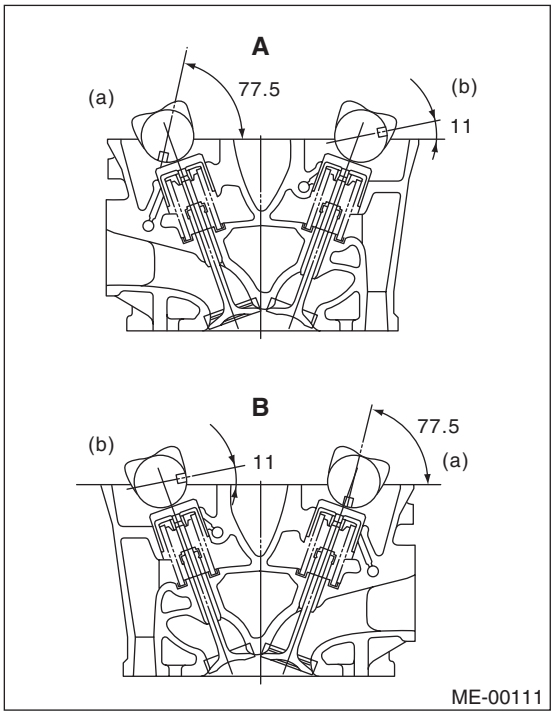
17) Remove the oil flow control solenoid valve assembly, intake camshaft cap and camshaft.
18) Remove the exhaust camshaft caps and camshaft.

NOTE:
Arrange camshaft caps in order so that they can be installed in their original positions.
19) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1) Camshaft installation:
Apply engine oil to the cylinder head at camshaft bearing installation location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with base circle of the cam lobe.

NOTE:
• Set the camshaft to the position shown in the figure. It is necessary to rotate the camshaft (LH) slightly when installing the timing belt.
• Camshaft (RH) need not be rotated when set at the position shown in the figure.
Intake camshaft (LH):
Rotate 80° clockwise.
Exhaust camshaft (LH):
Rotate 45° counterclockwise.

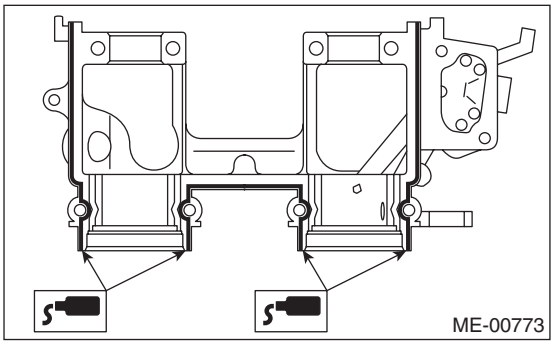


A Cylinder head (LH)
B Cylinder head (RH)
(a) Intake camshaft
(b) Exhaust camshaft

2) Camshaft cap and oil flow control solenoid valve assembly installation:
(1) Apply small amount of liquid gasket to the mating surface of cap.

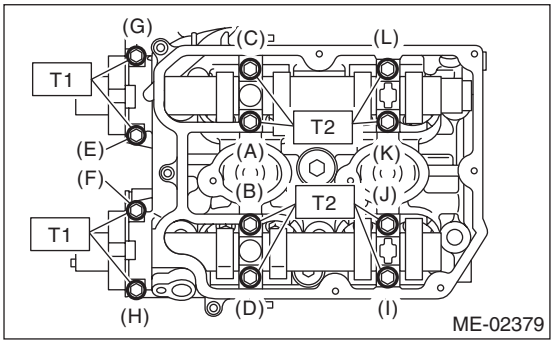
NOTE:
Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to come out and flow toward oil seal, resulting in oil leak.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(2) Apply a thin coat of engine oil to the cap bearing surface, and install the cap to the camshaft according to the identification mark.
(3) Gradually tighten the camshaft cap and oil control valve assembly in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

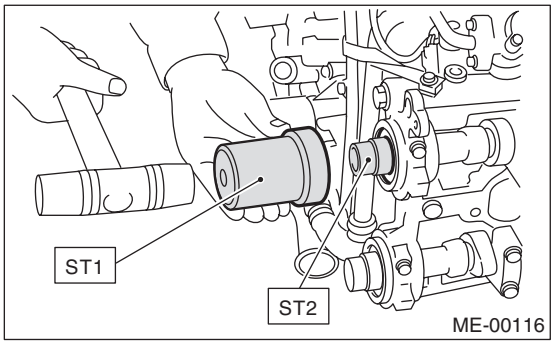
Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(4) After tightening the camshaft cap, ensure the camshaft rotates only slightly while holding it at base circle.

3) Apply engine oil to the oil seal periphery and oil seal lip, and install the oil seal to the camshaft using ST1 and ST2.

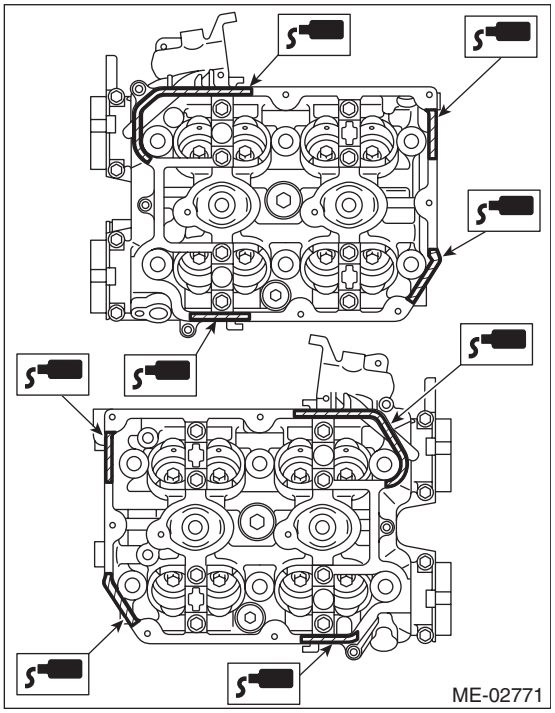
NOTE:
Use a new oil seal.
ST1 499587600 OIL SEAL INSTALLER
ST2 499597200 OIL SEAL GUIDE



4) Rocker cover installation:
(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil gasket.
(2) Apply liquid gasket to the specified point of the cylinder head.

NOTE:
Apply extra amount of liquid gasket around semicircular plugs 5 mm or more.

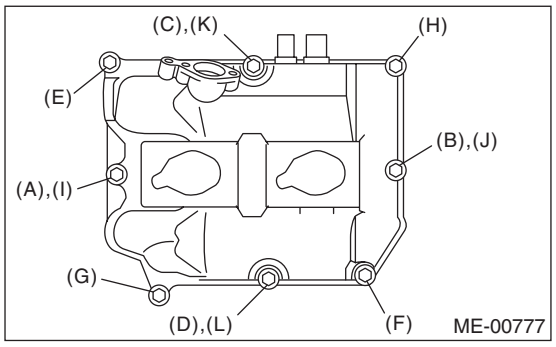
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

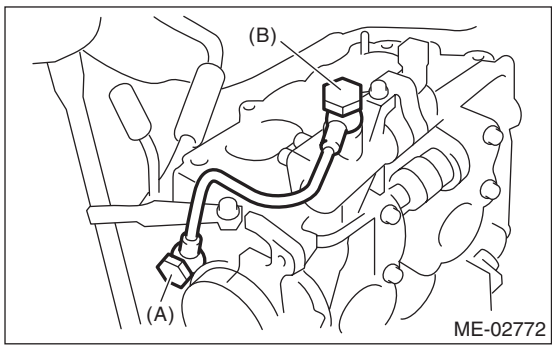
(4) Temporarily tighten the rocker cover tightening bolt in alphabetical sequence shown in the figure, and then tighten to specified torque.

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



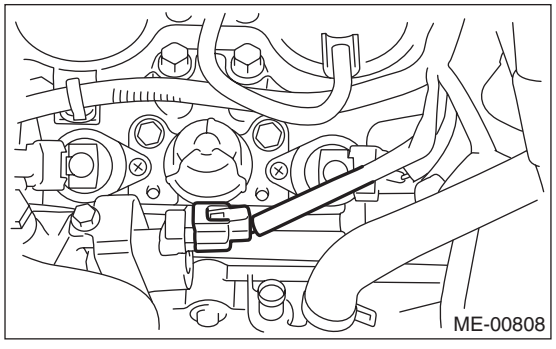
5) Install the oil pipe.

Tightening torque:
29 N·m (3.0 kgf-m, 21.4 ft-lb)



(A) Union screw (With protrusion)
(B) Union screw (Without protrusion)

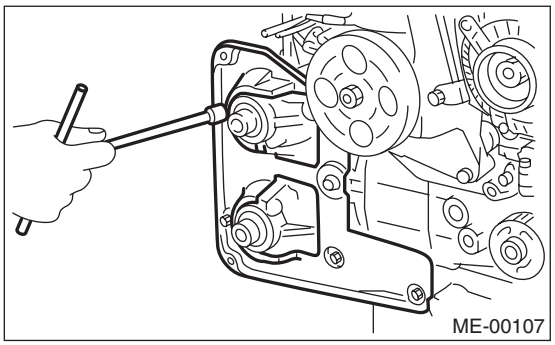
6) Connect the oil flow control solenoid valve connector.



7) Install the spark plug cord.
8) Similarly, install the parts on right-hand side.

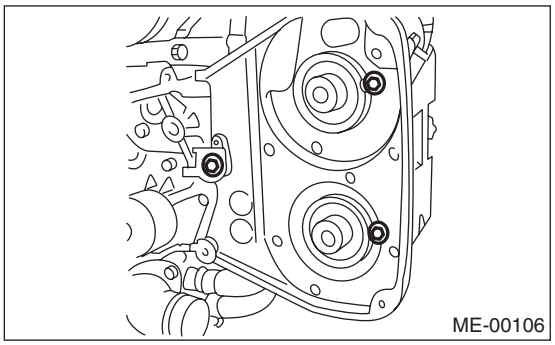
9) Install the timing belt cover No. 2 (RH).

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



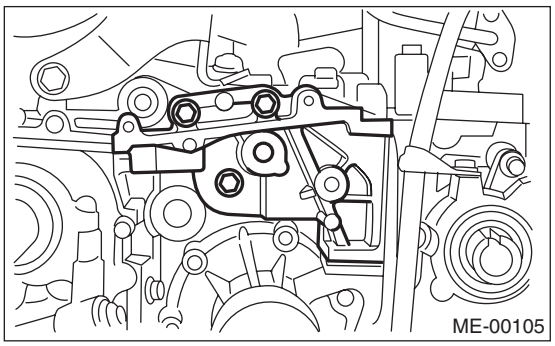
10) Install the timing belt cover No. 2 (LH).

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



11) Install the tensioner bracket.

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

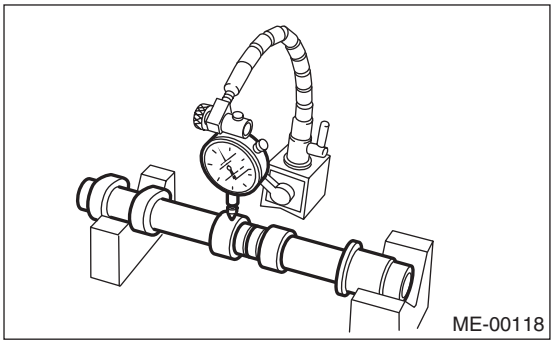


12) Install the crank sprocket.
<Ref. to ME(H4DOTC)-51, INSTALLATION, Crank Sprocket.>
13) Install the cam sprocket.
<Ref. to ME(H4DOTC)-50, INSTALLATION, Cam Sprocket.>
14) Install the timing belt. <Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt.>
15) Install the timing belt cover.
<Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
16) Install the crank pulley.
<Ref. to ME(H4DOTC)-39, INSTALLATION, Crank Pulley.>
17) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Limit:
0.020 mm (0.00079 in)



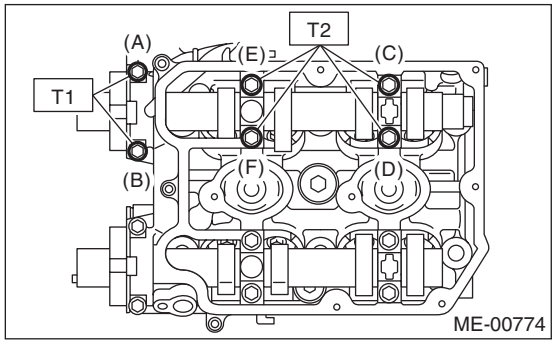
2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal. If the journal diameter is not within specification, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard mm (in)	37.946 — 37.963 (1.4939 — 1.4946)	29.946 — 29.963 (1.1790 — 1.1796)

4) Measurement of the camshaft journal oil clearance:
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on cylinder head.
(3) Place a plastigauge across each camshaft journals.

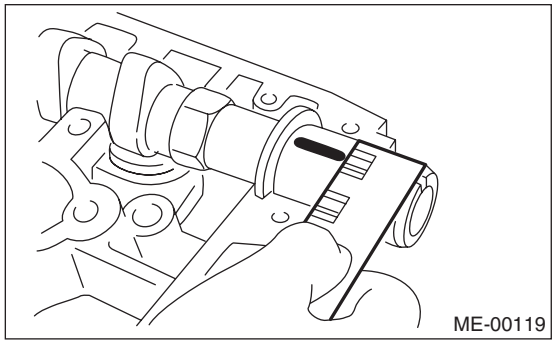
(4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque. Do not turn the camshaft.

Tightening torque:
T1: 9.5 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(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)



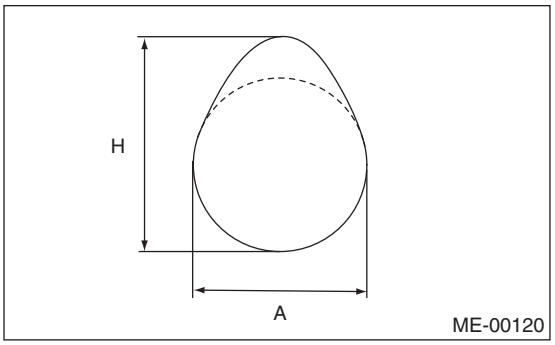
(7) Completely remove the plastigauge.

5) 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:

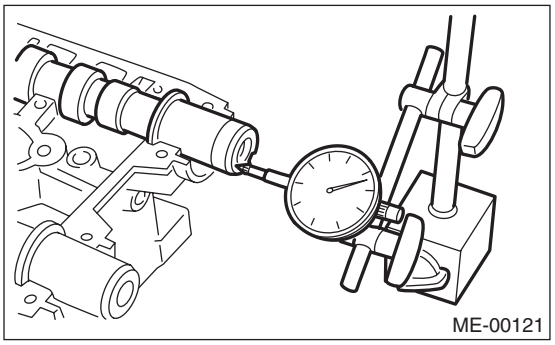
Standard
Intake
46.55 — 46.65 mm (1.833 — 1.837 in)
Exhaust
46.75 — 46.85 mm (1.841 — 1.844 in)

Cam base circle diameter A:
37.0 mm (1.457 in)



6) 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.

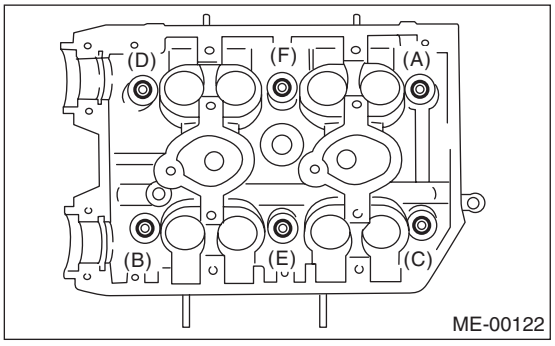
Standard:
0.068 — 0.116 mm (0.0027 — 0.0047 in)



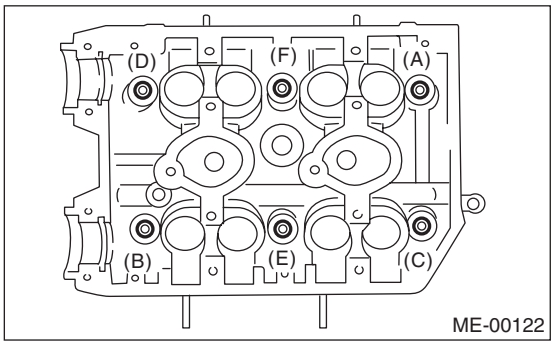
19.Cylinder Head

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-36, REMOVAL, V-belt.>
2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-39, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt.
<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt.>
5) Remove the cam sprocket.
<Ref. to ME(H4DOTC)-50, REMOVAL, Cam Sprocket.>
6) Remove the intake manifold.
<Ref. to FU(H4DOTC)-11, REMOVAL, Intake Manifold.>
7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
8) Remove the camshaft. <Ref. to ME(H4DOTC)-52, REMOVAL, Camshaft.>
9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
Leave the bolts (A) and (D) 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.
Remove the bolts (A) and (D) to remove cylinder head.



11) Remove the cylinder head gasket.

CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.

12) Similarly, remove the cylinder head (RH).

B: INSTALLATION

1) Install the cylinder head to the cylinder block.

CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.

NOTE:
Use a new cylinder head gasket.

(1) Clean the bolt threads and the bolt holes in the cylinder block.

CAUTION:
To avoid erroneous tightening of the bolts, clean out the bolt holes sufficiently by blowing with compressed air to eliminate engine coolant etc.

(2) Apply a sufficient coat of engine oil to the washer and bolt thread.
(3) Tighten all bolts to 40 N·m (4.1 kgf-m, 29.5 ft-lb) in alphabetical order.
(4) Retighten all bolts to 95 N·m (9.7 kgf-m, 70.1 ft-lb) in alphabetical order.

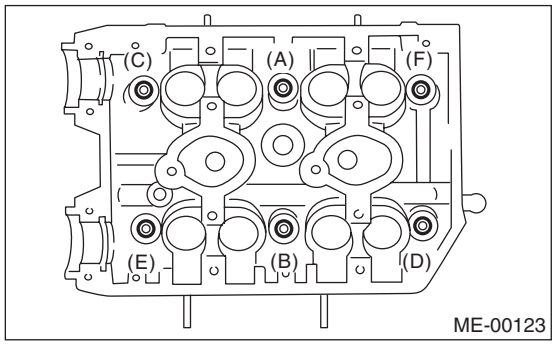
CAUTION:
If the bolt makes stick-slip sound during tightening, repeat the procedure from step (1). In this case, the cylinder head gasket can be reused.

(5) Loosen all the bolts by 180° in the reverse order of installing, and loosen them further by 180°.
(6) Tighten all bolts to 10 N·m (1.0 kgf-m, 7.4 ft-lb) in alphabetical order.
(7) Retighten all bolts to 30 N·m (3.1 kgf-m, 22.1 ft-lb) in alphabetical order.
(8) Retighten all bolts to 70 N·m (7.1 kgf-m, 51.6 ft-lb) in alphabetical order.
(9) Retighten all bolts by 80 — 90° in alphabetical order.
(10) Retighten all bolts by 40 — 45° in alphabetical order.

CAUTION:
The tightening angle of the bolt should not exceed 45°.

(11) Retighten bolts (A) and (B) by 40 — 45°.

CAUTION:
Make sure the total "tightening angle" of steps (10) and (11) does not exceed 90°.



2) Install the camshaft. <Ref. to ME(H4DOTC)-53, INSTALLATION, Camshaft.>
3) Install the A/C compressor bracket on cylinder head.
4) Install the intake manifold.
<Ref. to FU(H4DOTC)-13, INSTALLATION, Intake Manifold.>
5) Install the cam sprocket.
<Ref. to ME(H4DOTC)-50, INSTALLATION, Cam Sprocket.>
6) Install the timing belt.
<Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt.>
7) Install the timing belt cover.
<Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
8) Install the crank pulley.
<Ref. to ME(H4DOTC)-39, INSTALLATION, Crank Pulley.>
9) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>

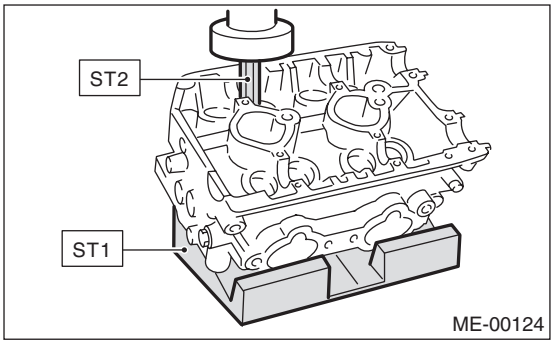
C: DISASSEMBLY

1) Remove the valve lifter.
2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

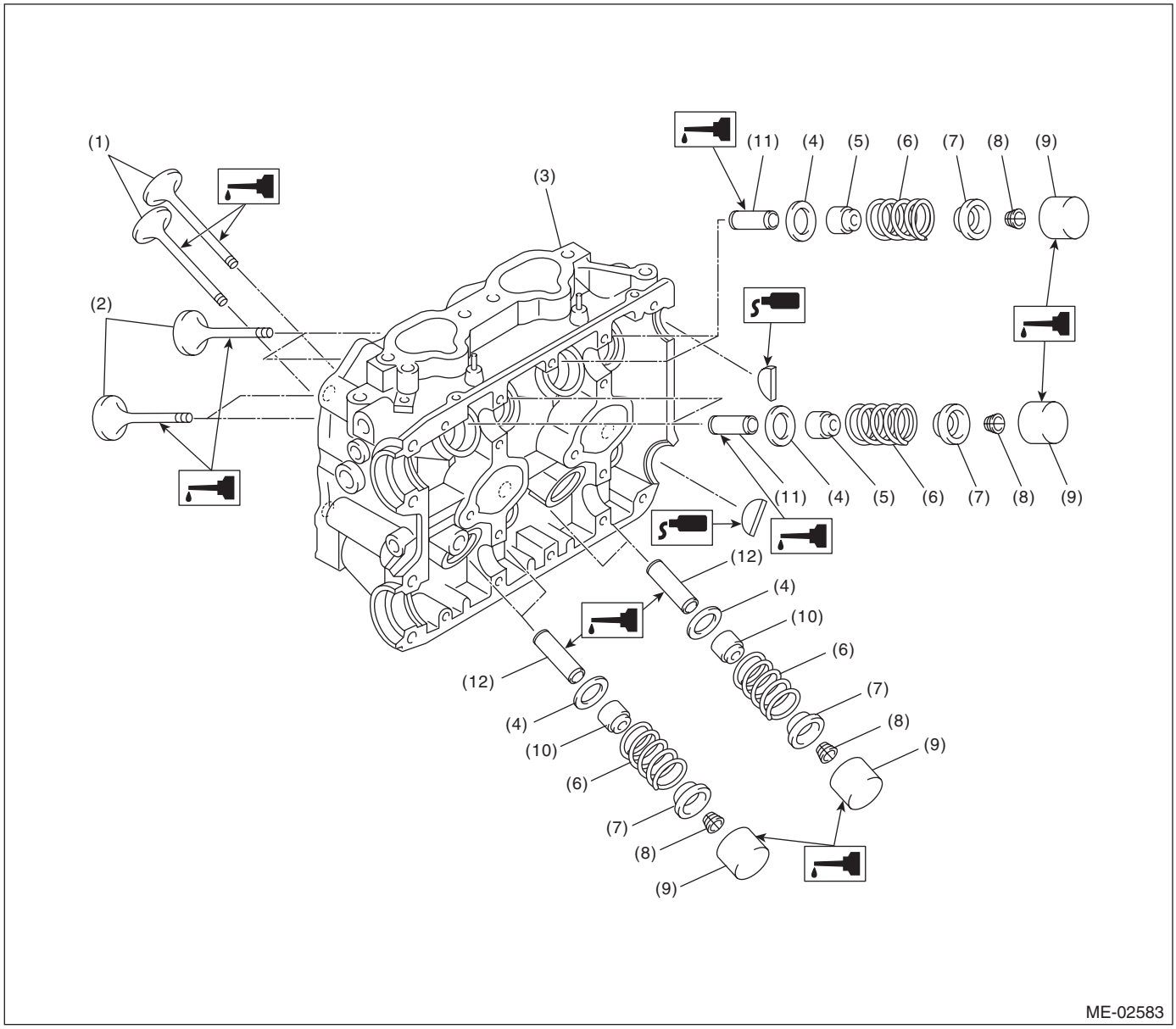
ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
Keep all the removed parts in order for re-installing in their original positions.

CAUTION:
- **Mark each valve to prevent confusion.**
- **Pay careful attention not to damage the lips of intake valve oil seals and exhaust valve oil seals.**



D: ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

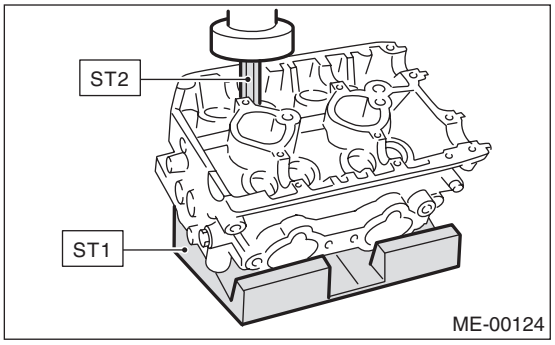
1) Installation of valve spring and valve:
(1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

(2) Set the cylinder head on ST1.
(3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
Be sure to install the valve spring with its close-coiled end facing the seat on cylinder head.



(4) Compress the valve spring and fit the valve spring retainer key.
(5) After installing, tap the valve spring retainers lightly with a wooden hammer for better seating.

2) Apply oil to the surfaces of the valve lifter.
3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

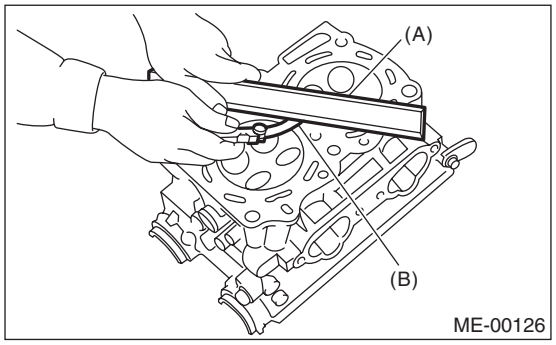
1) Make sure that no crack or other damages do not exist. In addition to visual inspection, inspect important areas using liquid penetrant tester.
2) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge (A) and thickness gauge (B).
If the warping exceeds the limit, regrind the surface with a surface grinder.

Warp limit:
0.035 mm (0.0014 in)

Grinding limit:
0.3 mm (0.012 in)

Standard height of cylinder head:
127.5 mm (5.02 in)

NOTE:
Uneven torque for the cylinder head nuts can cause warping. When reinstalling, pay special attention to the torque so as to tighten evenly.



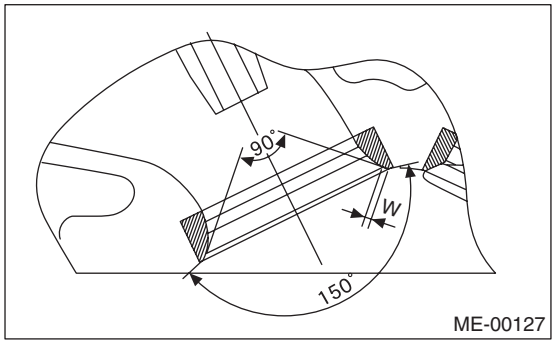
2. VALVE SEAT

Inspect the intake and exhaust valve seats, and correct the contact surfaces with a valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width W:

Intake
Standard
0.6 — 1.4 mm (0.024 — 0.055 in)

Exhaust
Standard
1.2 — 1.8 mm (0.047 — 0.071 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring respectively the outer diameter of valve stem and inner diameter of valve guide with a micrometer.

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 damage. See the following procedure for valve guide replacement.

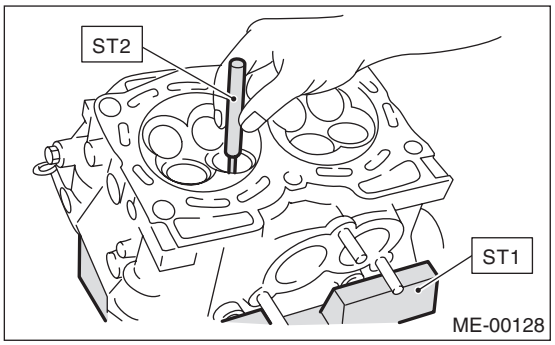
Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
Intake
5.955 — 5.970 mm (0.2344 — 0.2350 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.

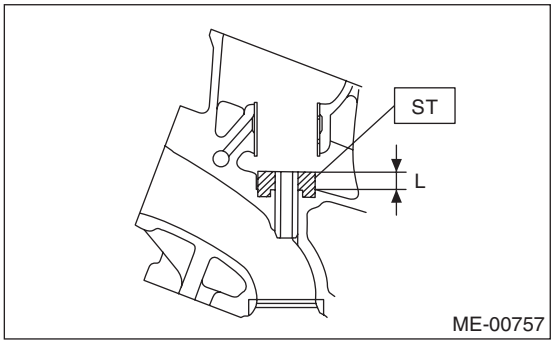
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place the ST as shown in the figure.

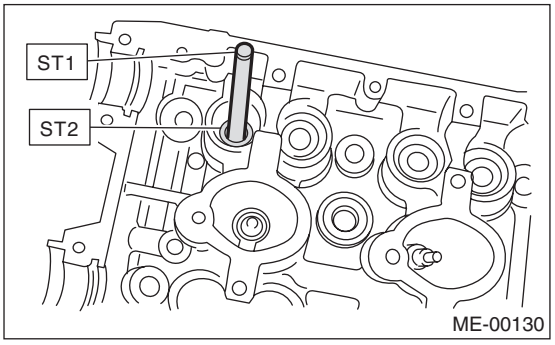
ST 18251AA020 VALVE GUIDE ADJUSTER



(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 cylinder, and insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion L:
15.8 — 16.2 mm (0.622 — 0.638 in)

(7) Ream the inside of valve guide using ST. Put the reamer in valve guide, and rotate the reamer slowly clockwise while pushing it lightly. Bring the reamer back while rotating it clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

NOTE:
• Apply engine oil to the reamer when reaming.
• If the inner surface of valve guide is damaged, the edge of reamer should be slightly ground with oil stone.
• If the inner surface of valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

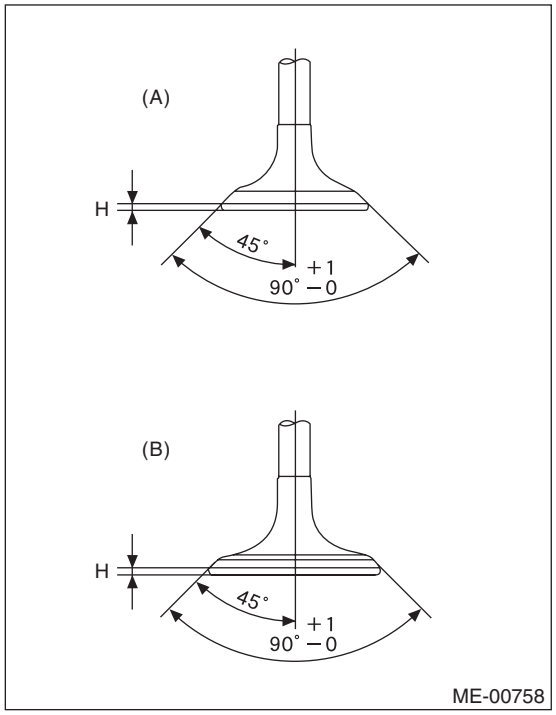
(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of the valve, and replace if damaged, worn or deformed, or if H exceeds the standard or there is uneven wear.

H:
Standard (Intake)
1.0 — 1.4 mm (0.039 — 0.055 in)
Standard (Exhaust)
1.3 — 1.7 mm (0.051 — 0.067 in)

Valve overall length:
Intake
104.4 mm (4.110 in)
Exhaust
104.65 mm (4.1201 in)



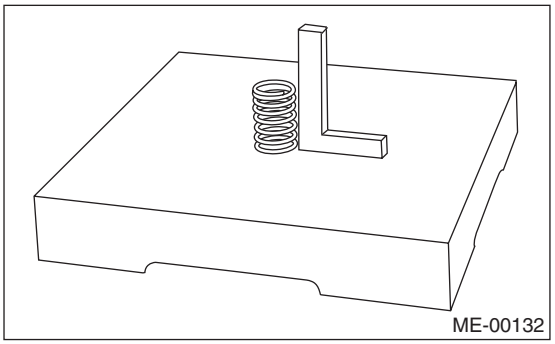
(A) Intake
(B) Exhaust

2) Put a small amount of grinding compound on the seat surface, and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

5. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within the standard value presented in the table.
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.

Free length mm (in)		47.32 (1.863)
Tension/spring height N (kgf, lb)/mm (in)	Set	205 — 235 (20.9 — 24.0, 46.1 — 52.8)/36.0 (1.417)
	Lift	426 — 490 (43.4 — 50.0, 95.8 — 110)/26.50 (1.041)
Squareness		2.5°, 2.1 mm (0.083 in)



6. INTAKE AND EXHAUST VALVE OIL SEAL

In the following case, pinch and remove the oil seal from valve using pliers, and then replace it with a new part.
- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of intake valve and valve sheet.
- When replacing the intake valve guide.

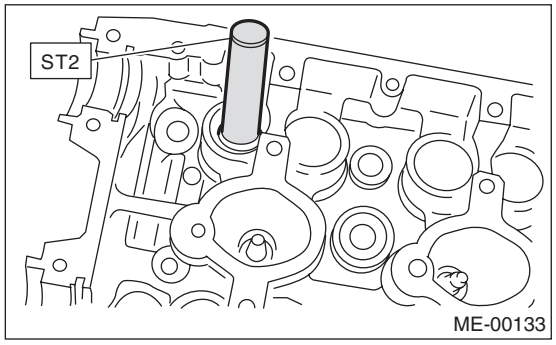
1) Place the cylinder head on ST1.
2) Using the ST2, press-fit the oil seal.

NOTE:
- Apply engine oil to oil seal before press-fit-ting.
- When press-fitting the oil seal, do not use a hammer or strike in.

ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

CAUTION:
Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

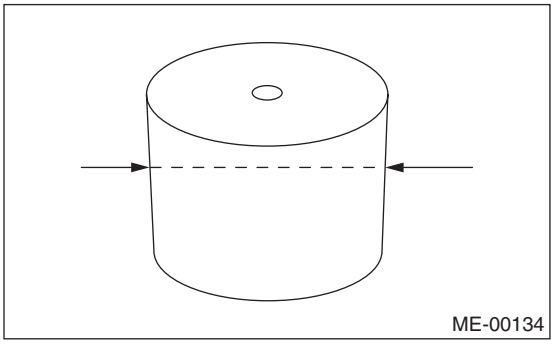
Color of rubber part:
Intake [Gray]
Exhaust [Green]



7. VALVE LIFTER

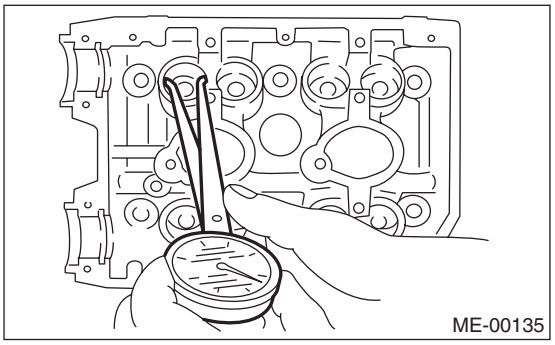
1) Check the valve lifter visually.
2) Measure the outer diameter of valve lifter.

Outer diameter:
34.959 — 34.975 mm (1.3763 — 1.3770 in)



3) Measure the inner diameter of valve lifter mating surface on cylinder head.

Inner diameter:
34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:
If difference between outer diameter of valve lifter and inner diameter of its mating surface is not within the standard or there is uneven wear, replace the cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

F: DISPOSAL

CAUTION:
• Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.
• Since metallic sodium may cause blindness if contacted with eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.

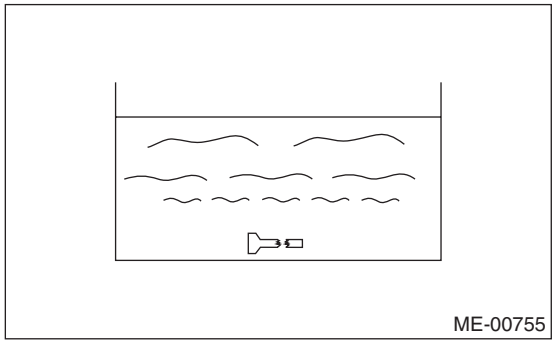
1) If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.

(1) Wearing rubber gloves, remove the damaged valve from the cylinder head.
(2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water. (at least 10 liters)
(3) Immerse the damaged valve in the receptacle.

CAUTION:
A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.

(4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.
(5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

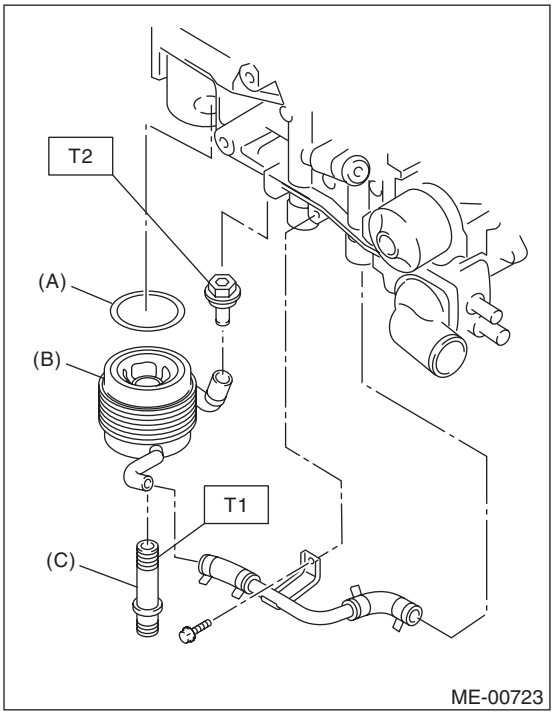
CAUTION:
Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.



20.Cylinder Block

A: REMOVAL

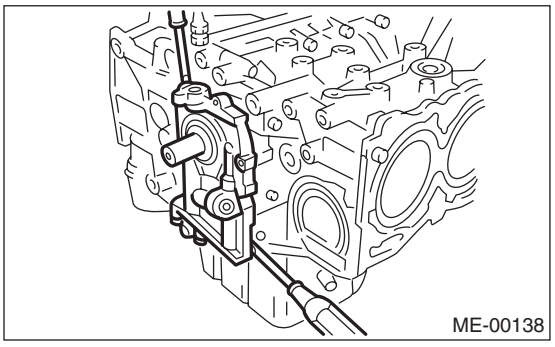
NOTE:
Before conducting this procedure, drain the engine oil completely.
1) Remove the intake manifold.
<Ref. to FU(H4DOTC)-11, REMOVAL, Intake Manifold.>
2) Remove the V-belts. <Ref. to ME(H4DOTC)-36, REMOVAL, V-belt.>
3) Remove the crank pulley.
<Ref. to ME(H4DOTC)-39, REMOVAL, Crank Pulley.>
4) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
5) Remove the timing belt.
<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt.>
6) Remove the cam sprocket.
<Ref. to ME(H4DOTC)-50, REMOVAL, Cam Sprocket.>
7) Remove the crank sprocket.
<Ref. to ME(H4DOTC)-51, REMOVAL, Crank Sprocket.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the cylinder head.
<Ref. to ME(H4DOTC)-57, REMOVAL, Cylinder Head.>
10) Remove the clutch disc and cover. <Ref. to CL-10, REMOVAL, Clutch Disc and Cover.>
11) Remove the flywheel. (MT model)
<Ref. to CL-13, REMOVAL, Flywheel.>
12) Remove the drive plate. (AT model) <Ref. to 5AT-64, REMOVAL, Drive Plate.>
13) Remove the oil separator cover.
14) Remove the water by-pass pipe for heater.
15) Remove the water pump.
16) Remove the oil filter. <Ref. to LU(H4DOTC)-24, REMOVAL, Engine Oil Filter.>
17) Remove the oil cooler.



(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

18) Remove the bolts which install oil pump onto cylinder block.
19) Remove the oil pump from cylinder block using a flat tip screwdriver.

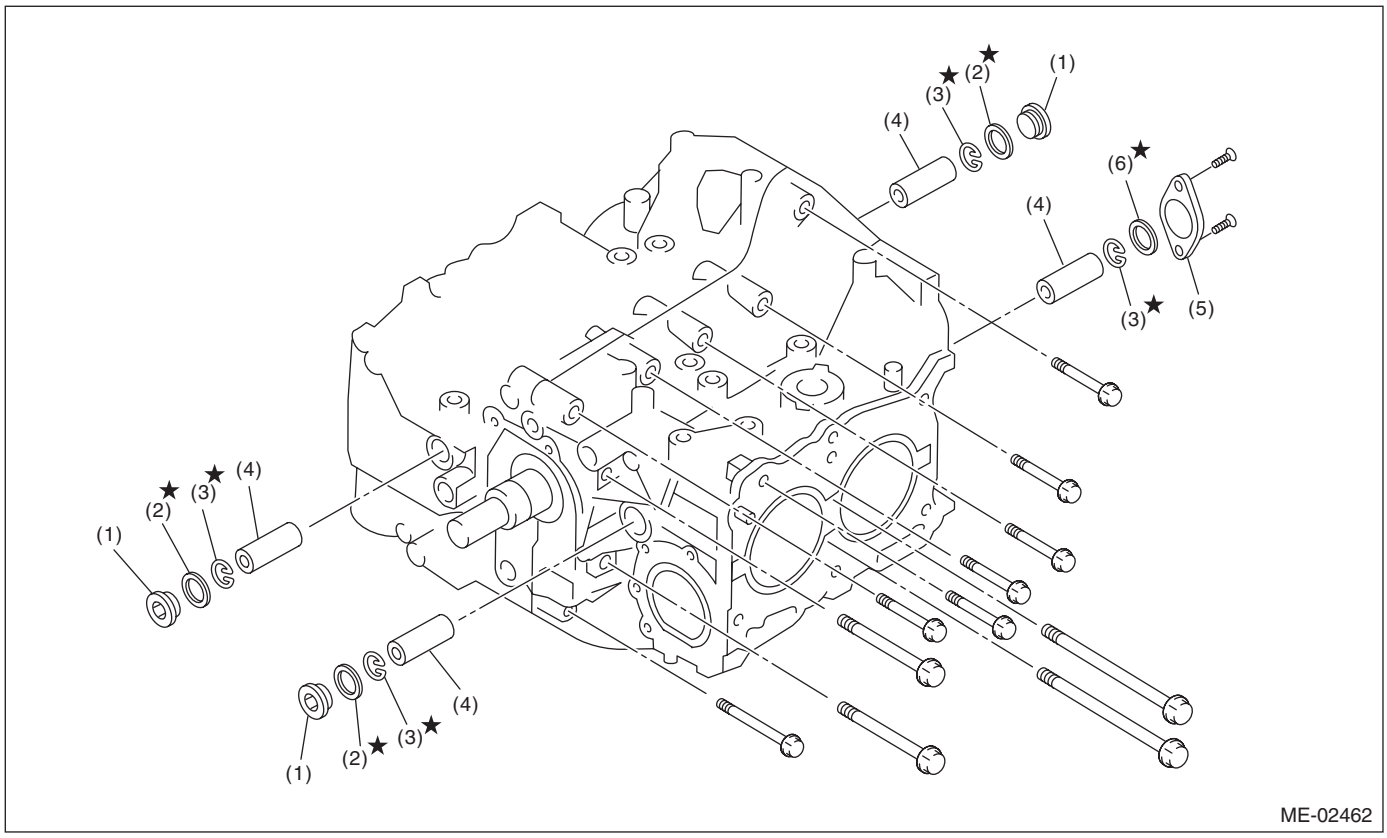
CAUTION:
Be careful not to scratch the mating surface of cylinder block and oil pump.



20) Removal of oil pan:
(1) Face the #2 and #4 cylinder side upward.
(2) Remove the bolts which secure oil pan to cylinder block.

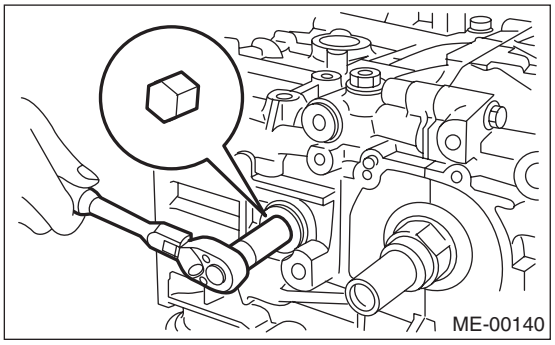
(3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove the oil pan. Do not use a screwdriver or similar tools in place of oil pan cutter.

21) Remove the oil strainer stay.
22) Remove the oil strainer.
23) Remove the baffle plate.
24) Remove the water pipe.

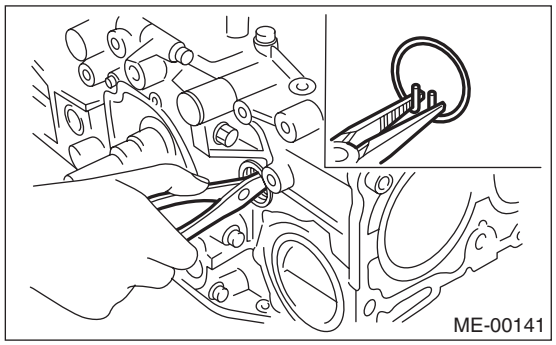


(1) Service hole plug
(2) Gasket
(3) Snap ring
(4) Piston pin
(5) Service hole cover
(6) O-ring

25) Remove the service hole cover and service hole plugs using a hexagon wrench [14 mm].

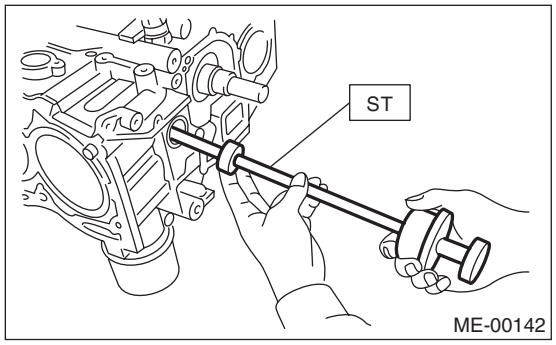


26) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove the piston snap ring through service hole of #1 and #2 cylinders.



27) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

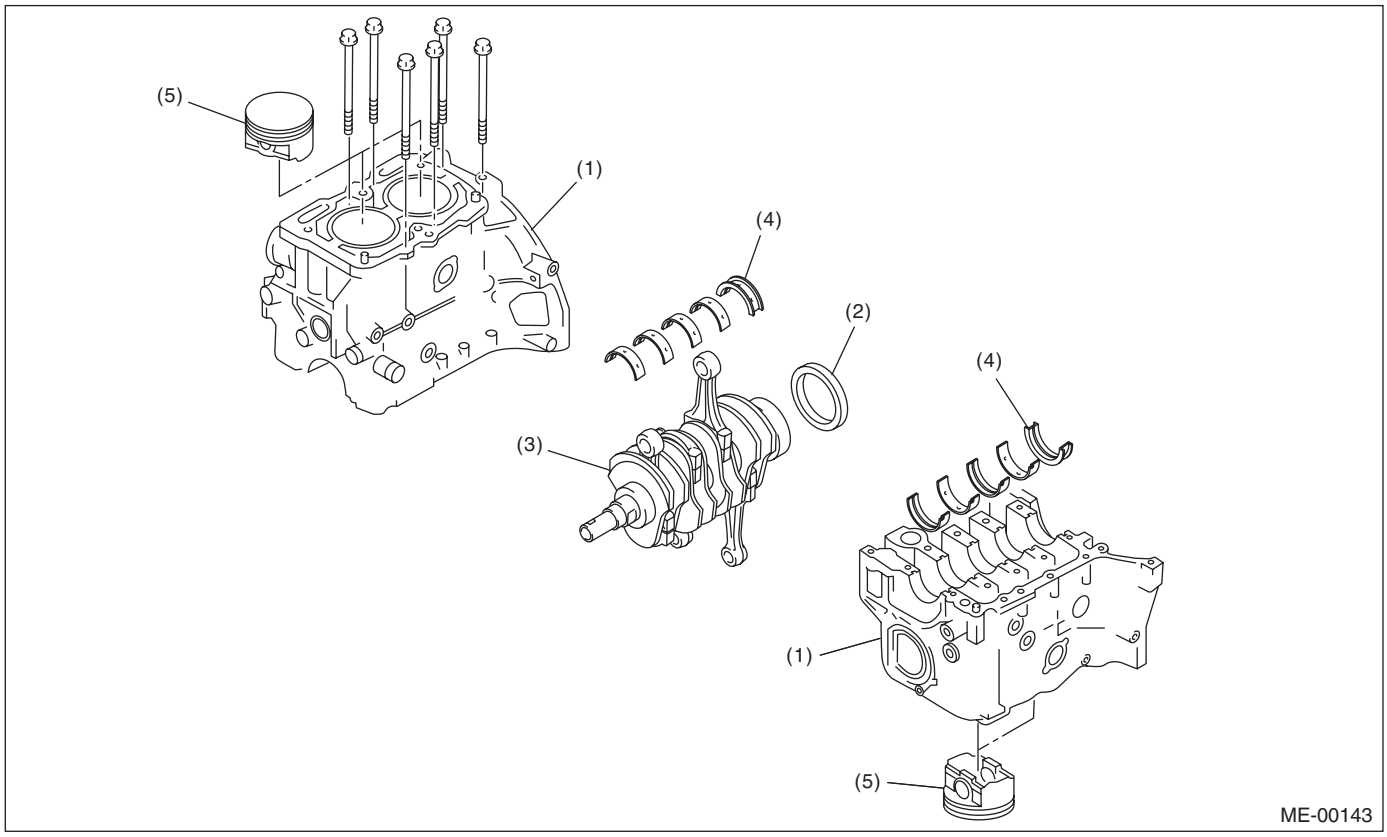
NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



28) Similarly remove the piston pins from #3 and #4 pistons.
29) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.
30) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.
31) With cylinder #1 and #3 facing upward, remove the cylinder block connecting bolts.

32) 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.



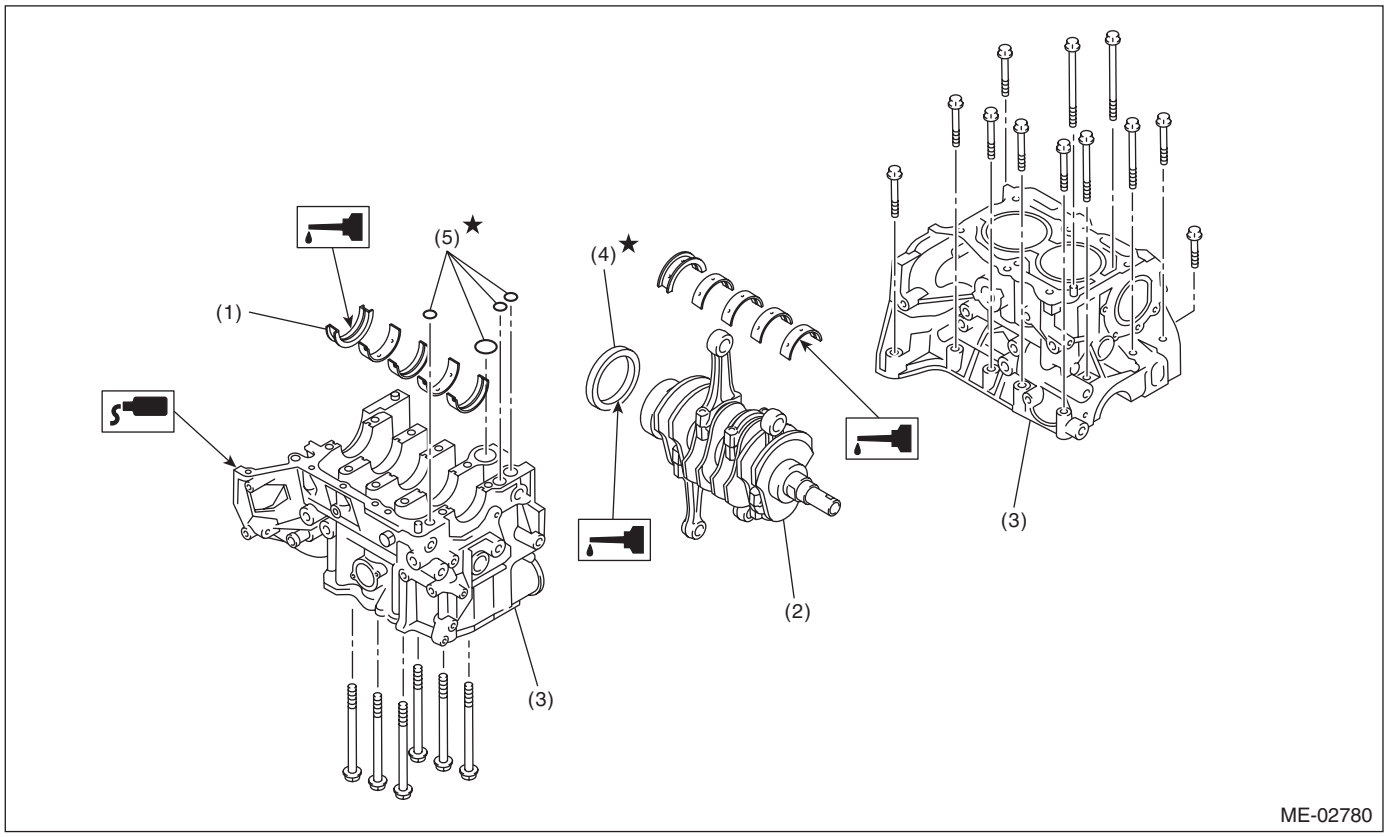
(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

33) Remove the rear oil seal.
34) Remove the crankshaft together with connecting rod.
35) 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.
36) 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

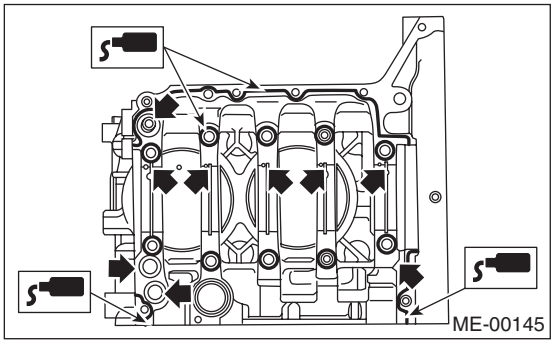


(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal
(5) O-ring

1) Remove oil on the mating surface of bearing and cylinder block before installation. Apply engine oil to crankshaft pins.
2) Position the crankshaft and O-rings on the #1 and #3 cylinder block.
3) Apply liquid gasket to the mating surface of #1 and #3 cylinder blocks, and position cylinder block #2 and #4.

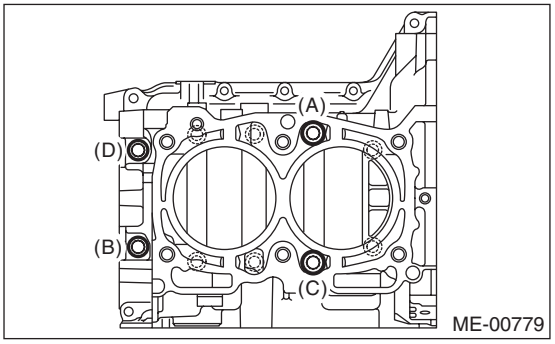
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

NOTE:
Do not allow liquid gasket to run over to O-ring grooves, oil passages, bearing grooves, etc.



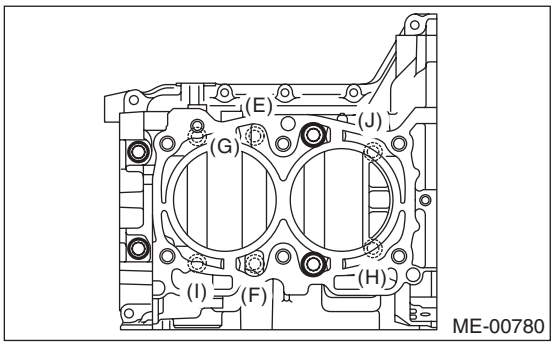
4) Apply a coat of engine oil to the washer and bolt thread.
5) Tighten the 10 mm cylinder block connecting bolts on LH side (A — D) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



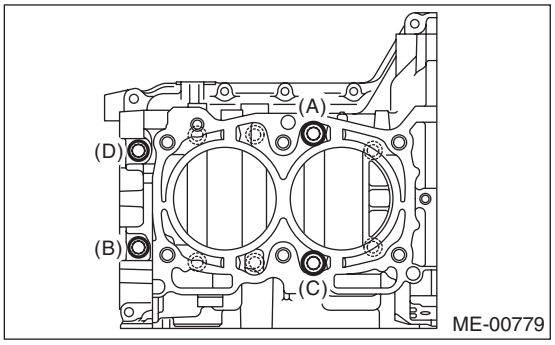
6) Tighten the 10 mm cylinder block connecting bolts on RH side (E — J) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



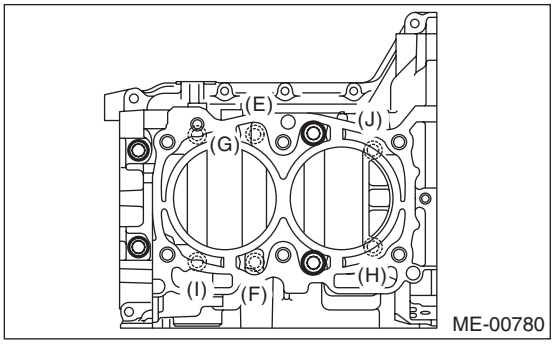
7) Further tighten the LH side bolts (A — D) in alphabetical sequence.

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



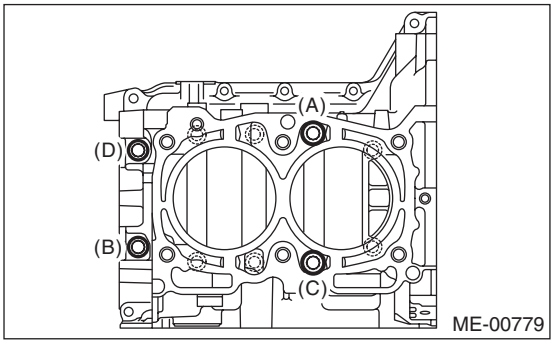
8) Further tighten the RH side bolts (E — J) in alphabetical sequence.

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

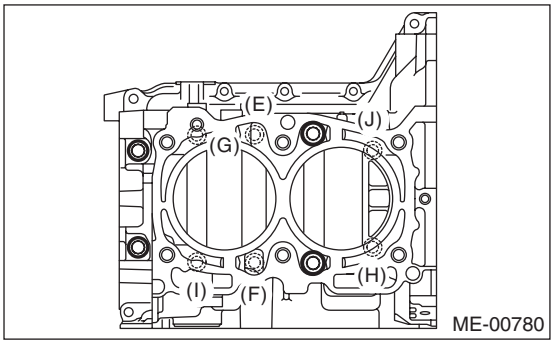


9) Further tighten the LH side bolts (A — D) in alphabetical sequence.

(A), (C): 90°
(B), (D): 40 N·m (4.1 kgf-m, 29.5 ft-lb)

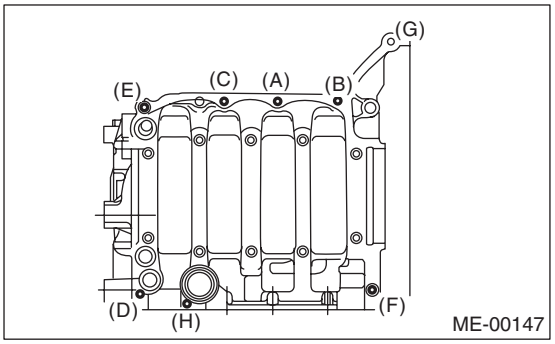


10) Tighten the RH side bolts (E — J) 90° further in alphabetical sequence.



11) Tighten the 8 mm and 6 mm cylinder block connecting bolts on LH side (A — H) in alphabetical sequence.

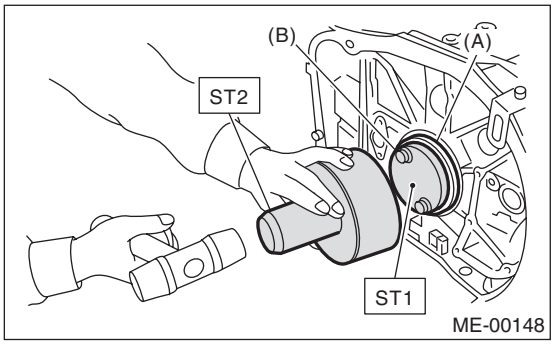
Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



12) Apply engine oil to the oil seal periphery, and install the rear oil seal using ST1 and ST2.

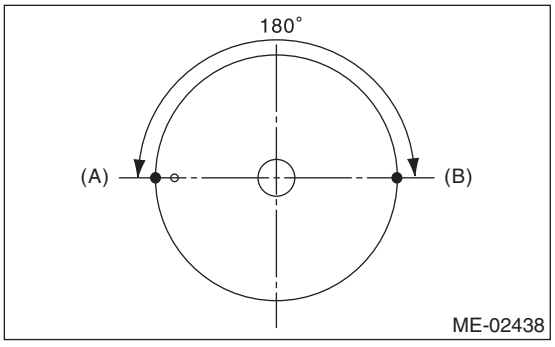
NOTE:
Use a new rear oil seal.

ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER

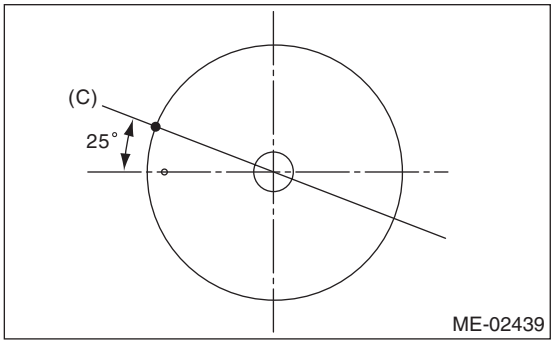


(A) Rear oil seal
(B) Flywheel attaching bolt

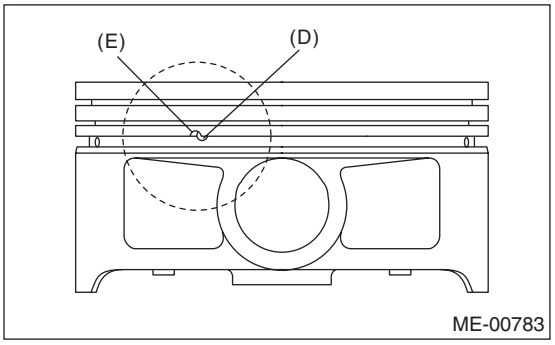
13) Position the top ring gap at (A) or (B) in the figure.
14) Position the second ring gap at 180° on the reverse side the top ring gap.



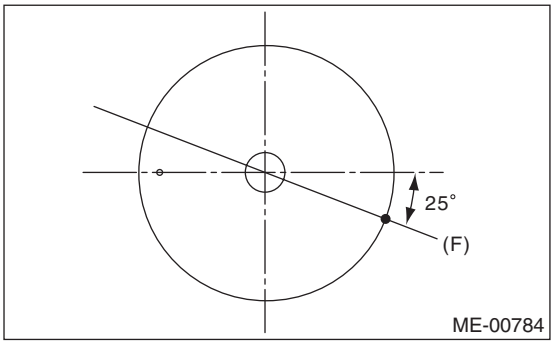
15) Position the upper rail gap at (C) in the figure.



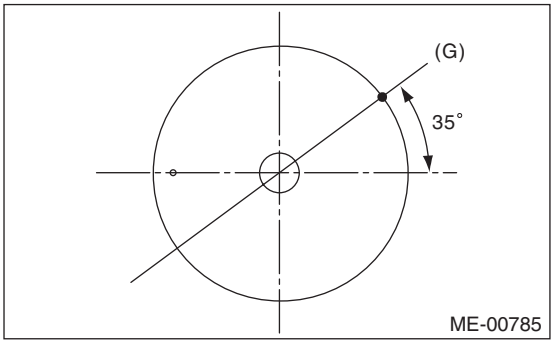
16) Align the upper rail spin stopper (D) to the side hole (E) on the piston.



17) Position the expander gap at (F) in the figure on the 180° opposite direction of (C).

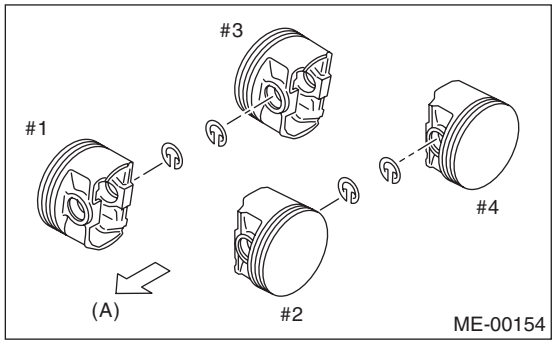


18) Position the lower rail gap at (G) in the figure.

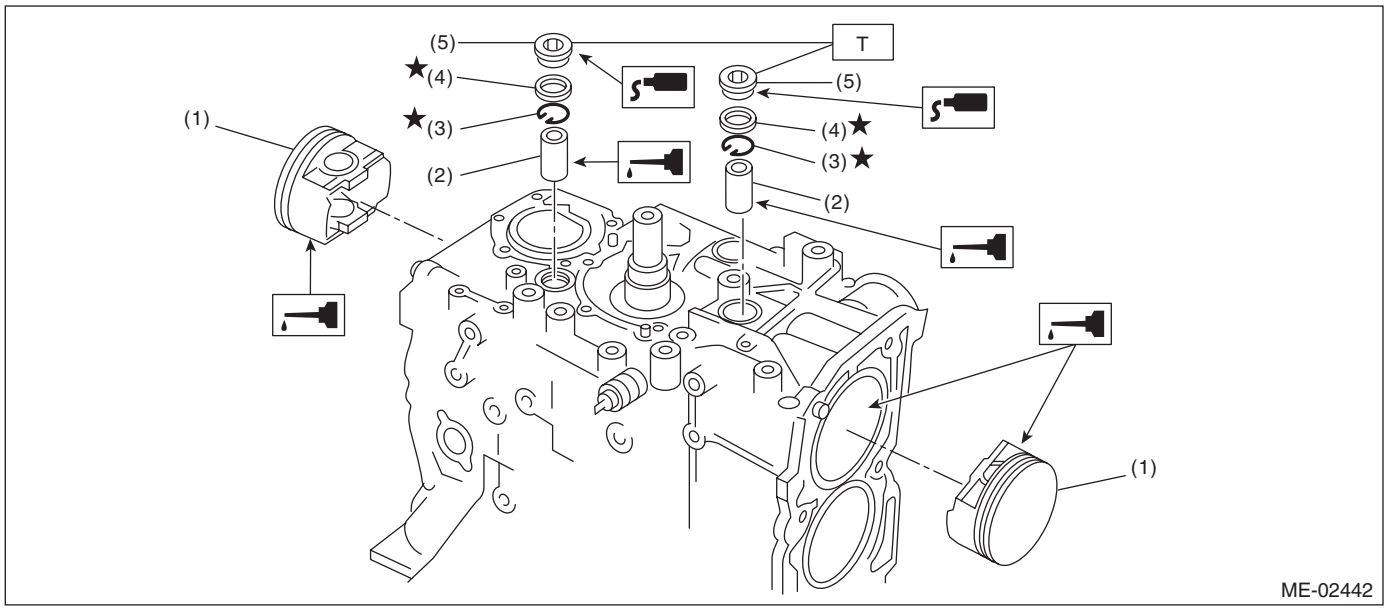


19) Install the snap ring.
Install the snap rings in the piston holes located opposite to the service holes in cylinder block when positioning all pistons in corresponding cylinders.

NOTE:
Use new snap rings.



(A) Front side



(1) Piston
(2) Piston pin
(3) Snap ring
(4) Gasket
(5) Service hole plug

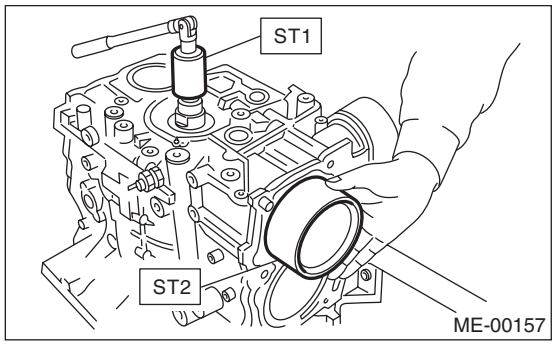
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.6)

20) Installing piston:
(1) Face the #1 and #2 cylinder side upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

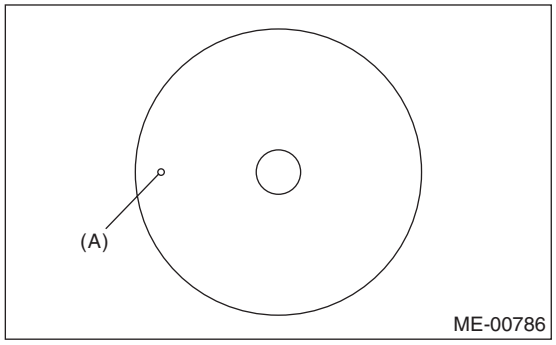
ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



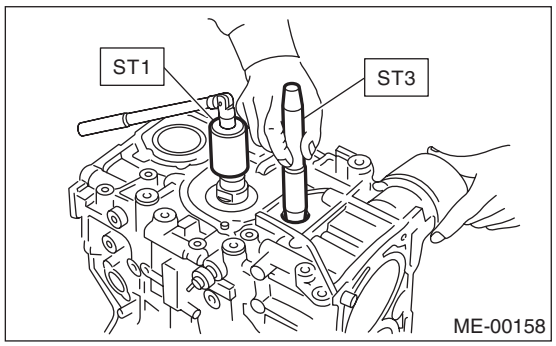
NOTE:
Face the piston front mark towards the front of the engine.



(A) Front mark

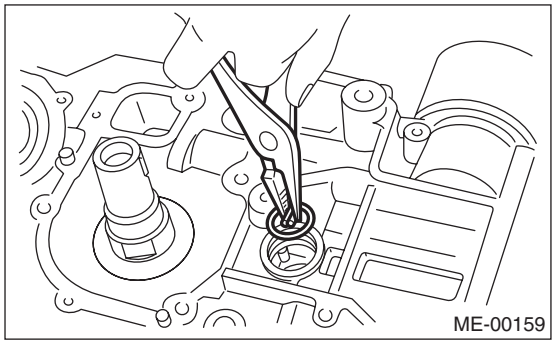
21) Installing piston pin:
(1) Apply a coat of engine oil to ST3 before insertion, and then insert it into the service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



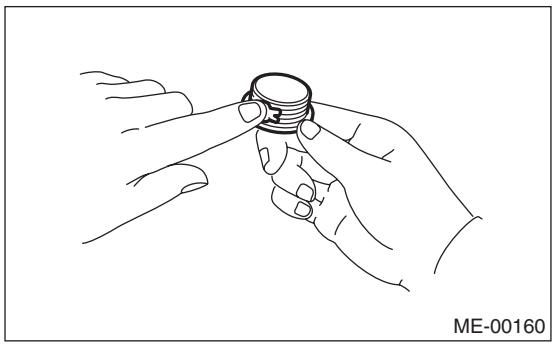
(2) Apply a coat of engine oil to piston pin, and insert the piston pin into piston and connecting rod through service hole.
(3) Install the snap ring.

NOTE:
Use new snap rings.



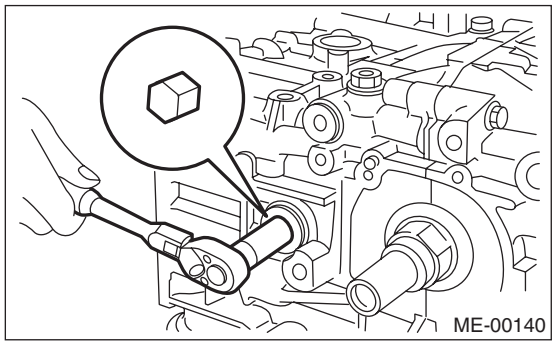
(4) Apply liquid gasket around the service hole plug.

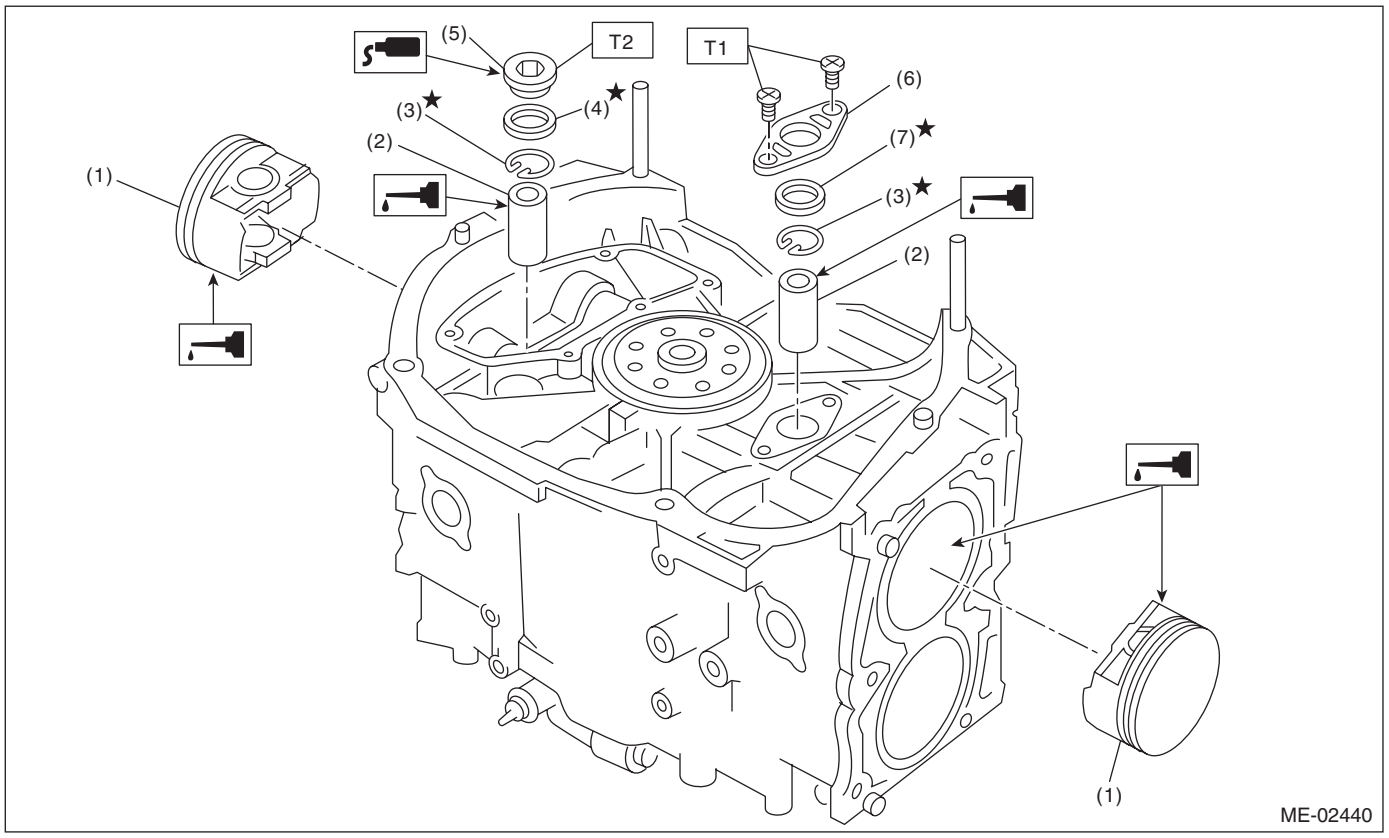
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent



(5) Install the service hole plug and gasket.

NOTE:
Use a new gasket.





(1) Piston
(2) Piston pin
(3) Snap ring
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 50.6)

(6) Face the #3 and #4 cylinder side upward. Following the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

22) Install the water pipe.
23) Install the baffle plate.

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

24) Install the oil strainer and O-ring.

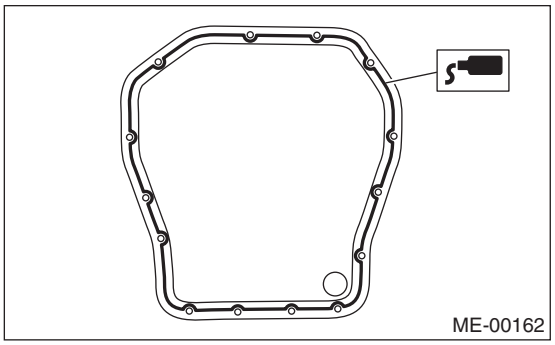
Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

25) Install the oil strainer stay.

26) Apply liquid gasket to the mating surfaces, and install the oil pan.

Liquid gasket:
THREE BOND 1207C (Part No.004403012) or equivalent

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

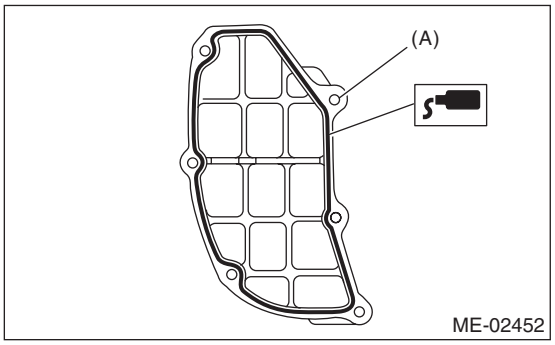


27) Apply liquid gasket to the mating surfaces and the threaded portion of bolt (A) shown in the figure, and then install the oil separator cover.

NOTE:
Install within 20 min. after applying liquid gasket.

Liquid gasket:
Mating surface
THREE BOND 1207C (Part No.004403012) or equivalent
Bolt thread (A)
THREE BOND 1324 (Part No.004403042) or equivalent

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



28) Install the flywheel. (MT model)<Ref. to CL-13, INSTALLATION, Flywheel.>

29) Install the clutch disc and cover. (MT model)<Ref. to CL-10, INSTALLATION, Clutch Disc and Cover.>

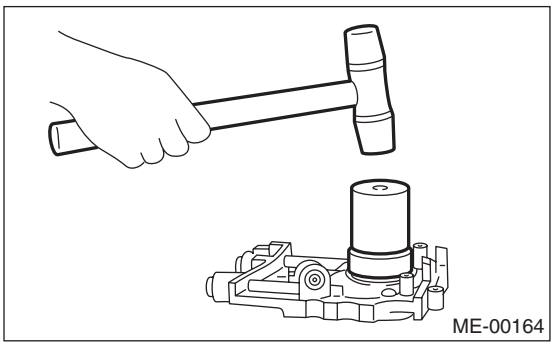
30) Install the drive plate. (AT model) <Ref. to 5AT-64, INSTALLATION, Drive Plate.>

31) Installation of oil pump:

(1) Using the ST, install the front oil seal.

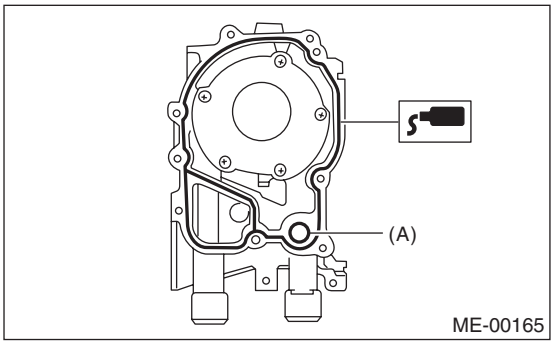
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new front oil seal.



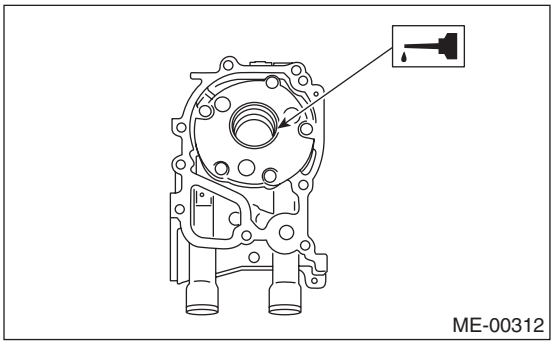
(2) Apply liquid gasket to the matching surface of oil pump.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(A) O-ring

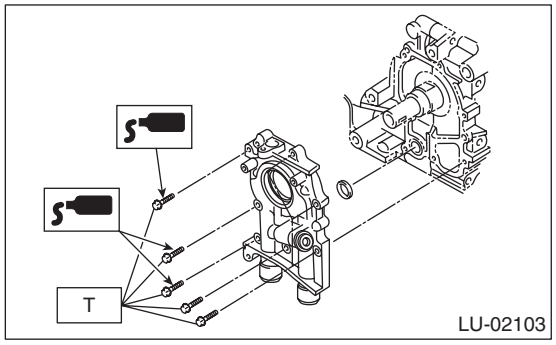
(3) Apply a coat of engine oil to the inside of oil seal.



(4) Install the oil pump to cylinder block. Be careful not to damage the oil seal during installation.
(5) Apply liquid gasket to the three bolts thread.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

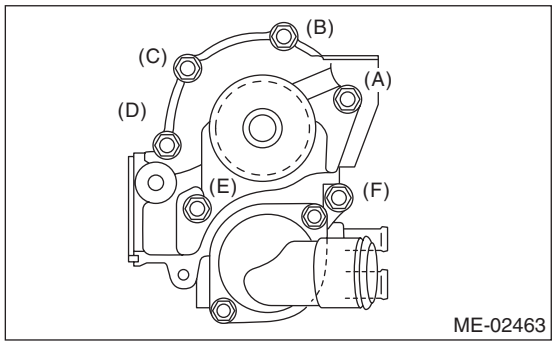
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



CAUTION:
• Do not forget to install the O-ring and seal when installing the oil pump.
• Align the flat surface of oil pump's inner rotor with crankshaft before installation.
32) Install the water pump and gasket.

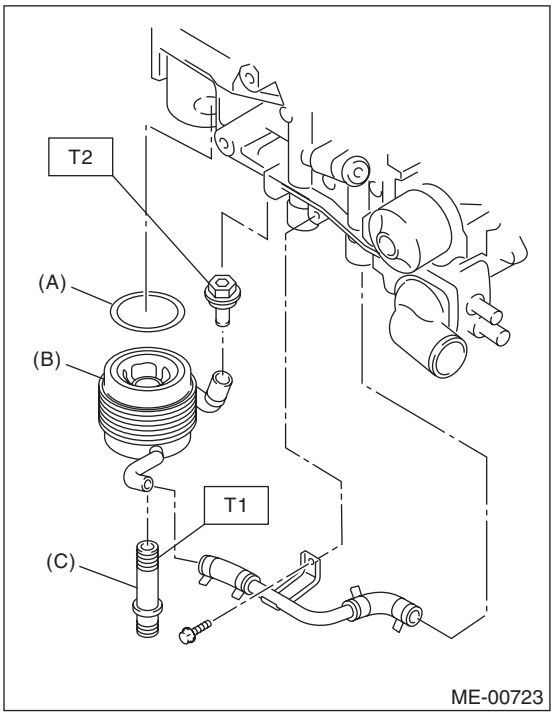
Tightening torque:
First: 12 N·m (1.2 kgf-m, 8.9 ft-lb)
Second: 12 N·m (1.2 kgf-m, 8.9 ft-lb)

CAUTION:
• Be sure to use a new gasket.
• When installing the water pump, tighten bolts in two stages in alphabetical sequence, as shown in the figure.



33) Install the water by-pass pipe for heater.
34) Install the oil cooler.

Tightening torque:
T1: 54 N·m (5.5 kgf-m, 40 ft-lb)
T2: 70 N·m (7.1 kgf-m, 50.6 ft-lb)



(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

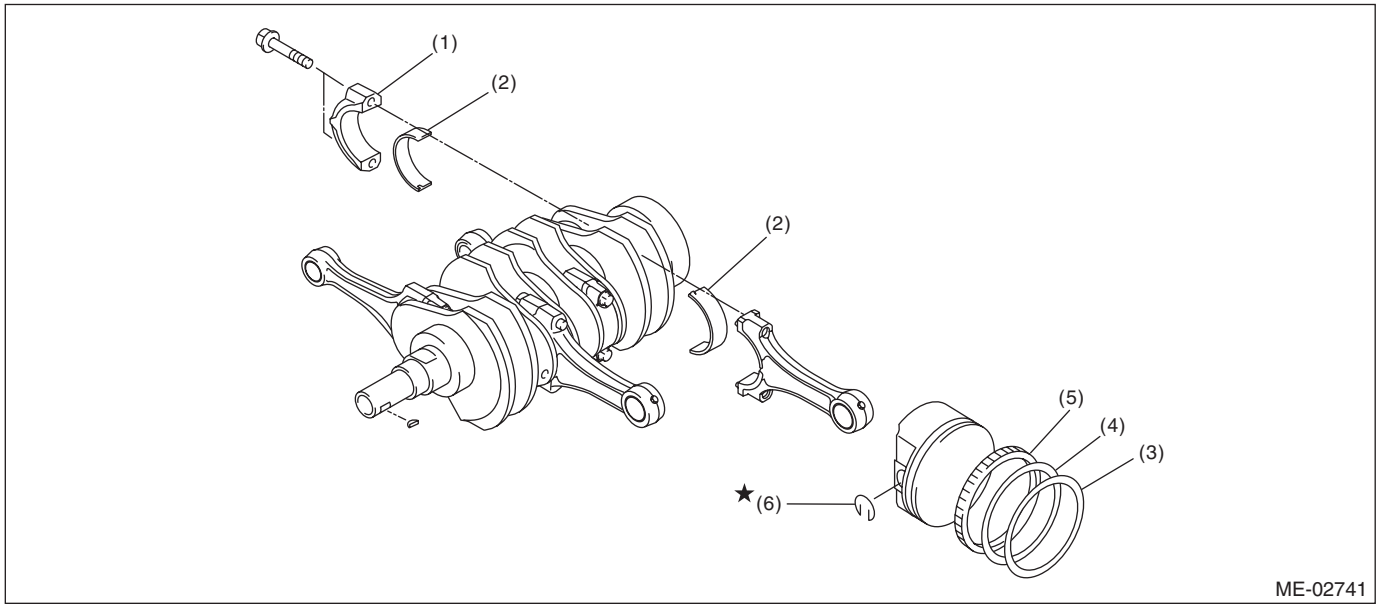
35) Install the oil filter. <Ref. to LU(H4DOTC)-24, INSTALLATION, Engine Oil Filter.>
36) Install the water by-pass pipe between oil cooler and water pump.
37) Install the water pipe.

NOTE:
Always use new O-rings.
38) Install the cylinder head.
<Ref. to ME(H4DOTC)-57, INSTALLATION, Cylinder Head.>
39) Install the oil level gauge guide. (LH side)
40) Install the rocker cover and rocker cover gasket.

NOTE:
Use a new rocker cover gasket.
41) Install the crank sprocket. <Ref. to ME(H4DOTC)-51, INSTALLATION, Crank Sprocket.>

42) Install the cam sprocket.
<Ref. to ME(H4DOTC)-50, INSTALLATION, Cam Sprocket.>
43) Install the timing belt.
<Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt.>
44) Install the timing belt cover.
<Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
45) Install the crank pulley.
<Ref. to ME(H4DOTC)-39, INSTALLATION, Crank Pulley.>
46) Install the generator and A/C compressor brackets on cylinder head.
47) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>
48) Install the intake manifold.
<Ref. to FU(H4DOTC)-13, INSTALLATION, Intake Manifold.>

C: DISASSEMBLY



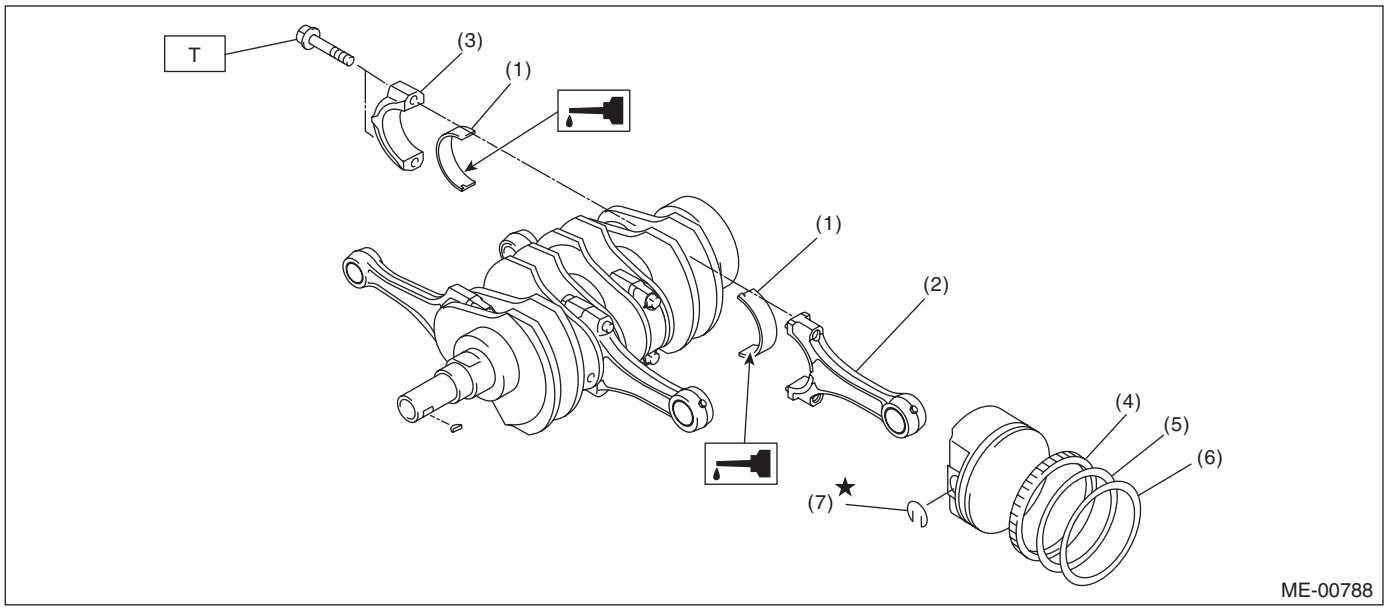
(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Snap ring

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 good order to prevent confusion.
5) Remove the snap ring.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Snap ring

Tightening torque: N·m (kgf-m, ft-lb)
T: 52 (5.3, 38.4)

1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
2) Install the connecting rod on crankshaft.

NOTE:
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.

CAUTION:
• 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 nuts, apply oil on the threads.
4) Install the oil ring spacer, upper rail and lower rail in this order by hand. Install the second ring and top ring using piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts using liquid penetrant tester.
2) Check the oil passages for clogging.
3) Inspect the cylinder block surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warp limit:
0.025 mm (0.00098 in)

Grinding limit:
0.1 mm (0.004 in)

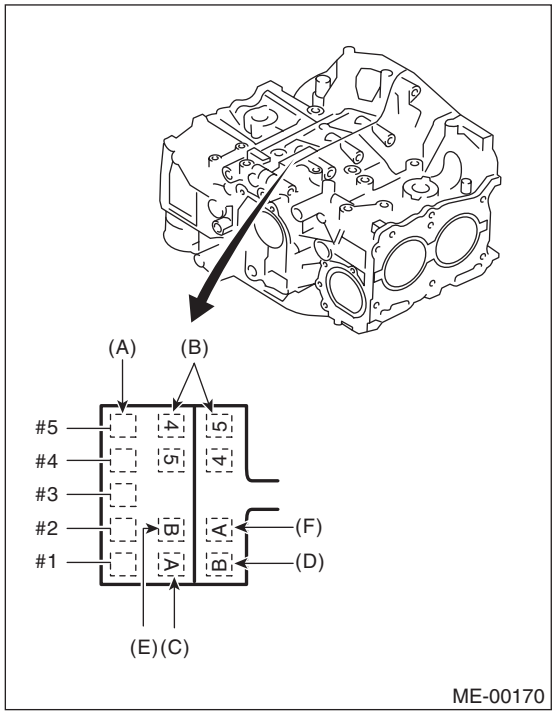
Standard height of cylinder block:
201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block front upper surface.

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: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



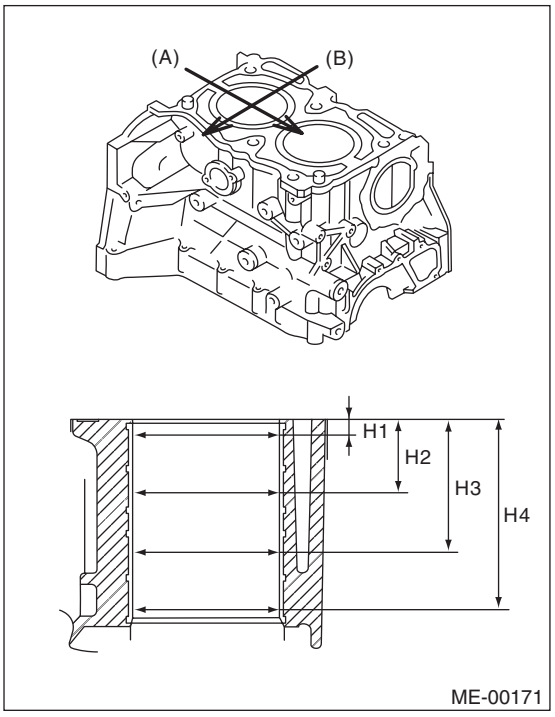
(A) Main journal size mark
(B) Cylinder block (RH) – (LH) combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

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).

Taper:
Standard
0.015 mm (0.0006 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)
H4: 115 mm (4.53 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.

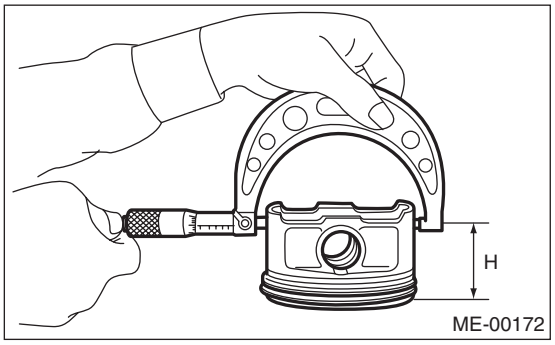
4) How to measure the outer diameter of each piston:
Measure the outer diameter of each piston at the height as shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
38.2 mm (1.50 in)

Piston outer diameter:

Standard
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)
0.25 mm (0.0098 in) oversize
99.745 — 99.765 mm (3.9270 — 3.9278 in)
0.50 mm (0.0197 in) oversize
99.995 — 100.015 mm (3.9368 — 3.9376 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 (–0.00039 — 0.00039 in)

6) Boring and honing:
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured is out of standard or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only. Nor use an oversize piston for one cylinder only.

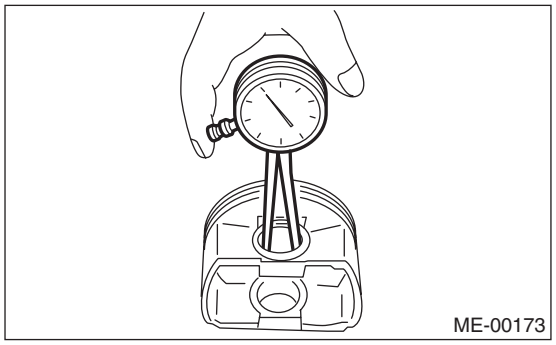
(2) If the cylinder inner diameter exceeds 100.015 mm (3.9376 in) after boring and honing, replace the crankcase.

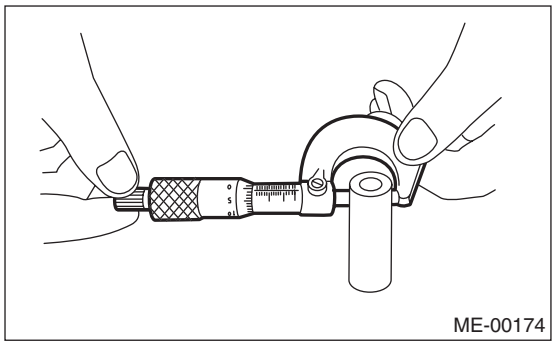
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

3. PISTON AND PISTON PIN

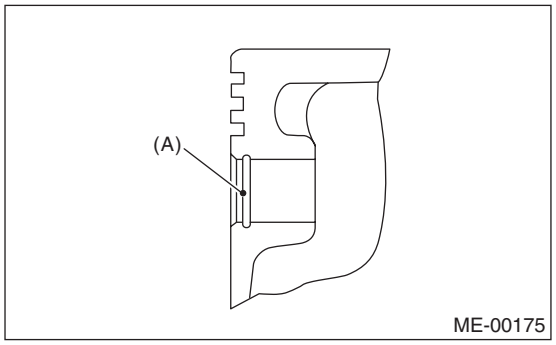
1) Check the pistons and piston pins for damage, cracks and wear, and the piston ring grooves for wear and damage. Replace if faulty.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4DOTC)-79, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within standard, replace the piston or bore the cylinder to use an oversize piston.
3) 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 burrs. If necessary, remove burr from the groove so that the piston pin can lightly move.

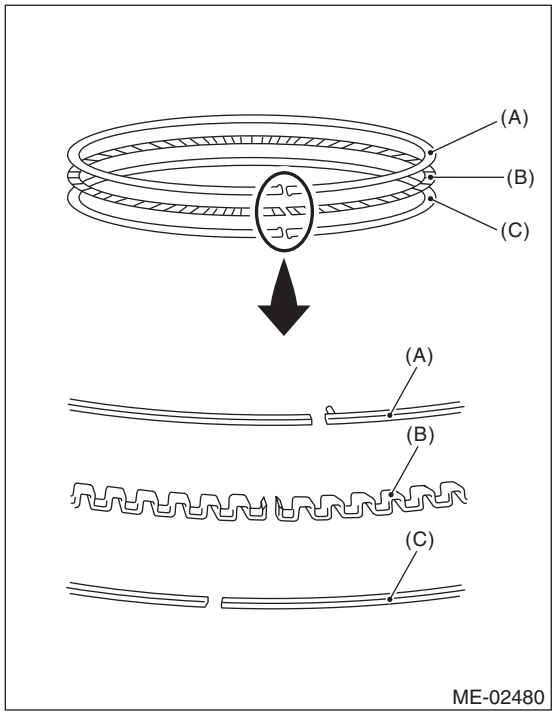


5) Check the piston pin snap ring for distortion, cracks and wear.

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.

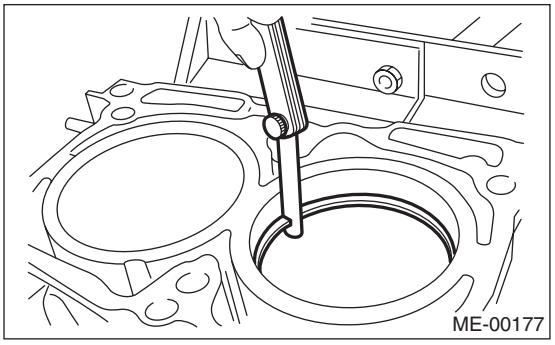
CAUTION:
• Marks are displayed on the end of top and second rings. When installing the ring to piston, face this mark upward.
• Oil ring consists of the upper rail, expander and lower rail. When installing on the piston, be careful of the direction of each rail



(A) Upper rail
(B) Expander
(C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

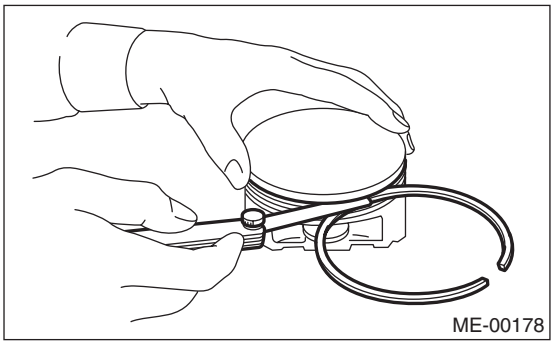
		Standard mm (in)
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)
	Second ring	0.37 — 0.52 (0.015 — 0.020)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)



3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

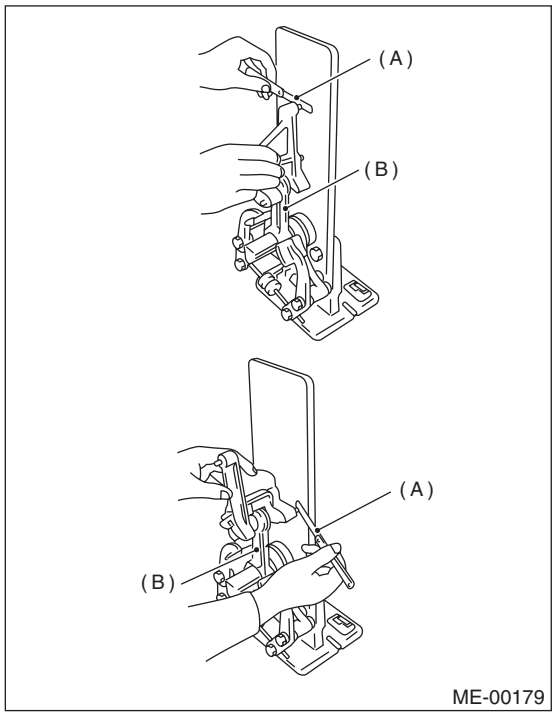
		Standard mm (in)
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)



5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

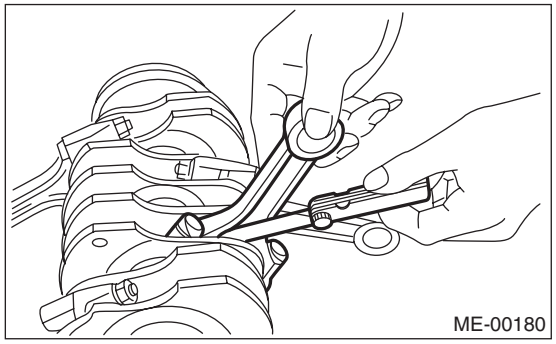
Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft and measure the side clearance (thrust clearance). If the clearance exceeds the standard or uneven wear is found, replace the connecting rod.

Connecting rod side 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.)

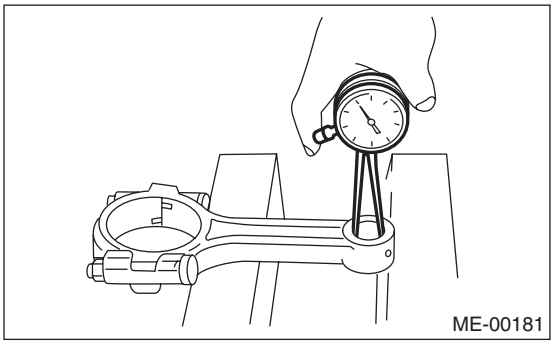
Connecting rod oil clearance:
Standard
0.017 — 0.045 mm (0.0007 — 0.0018 in)

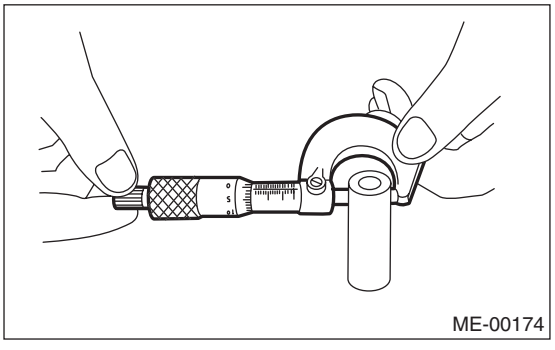
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 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. Also measure the piston pin clearance at connecting rod small end.

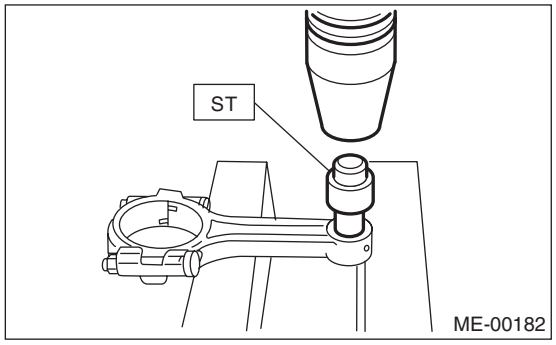
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)





7) Replacement procedure is as follows.
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



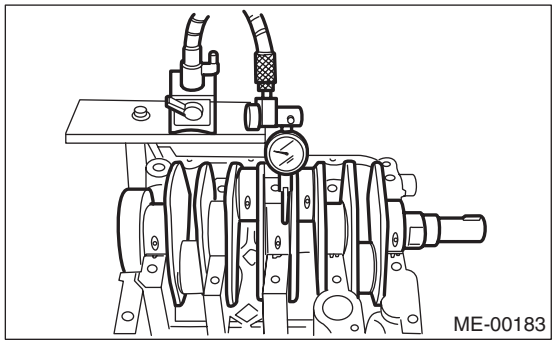
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely, and check it for cracks using liquid penetrant tester. Replace if defective.
2) Measure warping of the crankshaft. If it exceeds the limit, repair or replace it.

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 measure the crankshaft bend using a dial gauge.

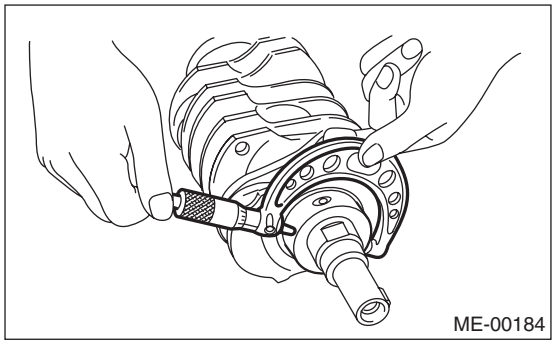
Crankshaft bend limit:
0.035 mm (0.0014 in)



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:
Out-of-roundness
0.003 mm (0.0001 in)
Cylindricality
0.004 mm (0.0002 in)
Grinding limit (dia.)
To 51.750 mm (2.0374 in)

Crank journal:
Out-of-roundness
0.005 mm (0.0002 in)
Cylindricality
0.006 mm (0.0002 in)
Grinding limit (dia.)
To 59.750 mm (2.3524 in)

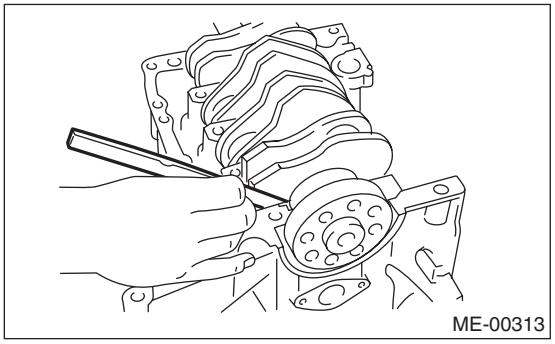


Unit: mm (in)

		Crank journal diameter		Crank pin outer diameter
		#1, #3	#2, #4, #5	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.486 — 1.498 (0.0585 — 0.0590)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

4) Measure the thrust clearance of crankshaft at center bearing. If clearance exceeds the standard, replace the bearing.

Crankshaft side clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)


ME-00313

5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting and wear.
6) Measure the oil clearance on each crankshaft bearing using plastigauge. If the measured value is out of standard, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

Crankshaft oil clearance:
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)

21.Intake and Exhaust Valve

A: SPECIFICATION

Refer to “Cylinder Head” for removal and installation procedures of intake and exhaust valves. <Ref. to ME(H4DOTC)-57, REMOVAL, Cylinder Head.> <Ref. to ME(H4DOTC)-57, INSTALLATION, Cylinder Head.>

22.Piston

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of pistons. <Ref. to ME(H4DOTC)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-69, INSTALLATION, Cylinder Block.>

23.Connecting Rod

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of connecting rod.
<Ref. to ME(H4DOTC)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-69, INSTALLATION, Cylinder Block.>

24.Crankshaft

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of crankshaft. <Ref. to ME(H4DOTC)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-69, INSTALLATION, Cylinder Block.>

25.Engine Trouble in General

A: INSPECTION

NOTE:
“RANK” shown in the chart refers to the possibility of the cause of trouble in order “Very often” to “Rarely”
A — Very often
B — Sometimes
C — Rarely

Symptom	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(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Lack of or insufficient fuel	B
	Belt	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
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4DOTC)(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
	Belt	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

Symptom	Problem parts etc.	Possible cause	RANK
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(H4DOTC)(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
	Belt	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
2. Rough idle and engine stall	Engine control system <Ref. to EN(H4DOTC)(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
	Belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Over-heating	C
	Others	Evaporative emission control system malfunction	A
		Stuck or damaged throttle valve	B

Symptom	Problem parts etc.	Possible cause	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H4DOTC)(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
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Over-heating	C
		Over-cooling	C
	Others	Evaporative emission control system malfunction	A
4. Surging	Engine control system <Ref. to EN(H4DOTC)(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
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Cooling system	Over-heating	B
	Others	Evaporative emission control system malfunction	C

Symptom	Problem parts etc.	Possible cause	RANK
5. Engine does not return to idle.	Engine control system <Ref. to EN(H4DOTC)(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(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Over-heating	B
	Others	Evaporative emission control system malfunction	B
7. After burning in exhaust system	Engine control system <Ref. to EN(H4DOTC)(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
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over-cooling	C
	Others	Evaporative emission control system malfunction	C
8. Knocking	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Over-heating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter O-ring	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan fitting bolts or defective oil pan	B

Symptom	Problem parts etc.	Possible cause	RANK
10. Excessive fuel consumption	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over-cooling	C

26.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
Heavy and dull clank	Oil pressure is low.	• Worn camshaft main bearing • Worn connecting rod bearing (large end)
	Oil pressure is normal.	• Loosened flywheel mounting bolt • 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 camshaft main bearing • Worn bearing at crankshaft end of connecting rod
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 sprocket • 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 belt noise	—	• Loose timing belt • Belt contacting with case/adjacent part
Valve tappet noise	—	Incorrect valve clearance

NOTE*)
When disconnecting the fuel injector connector, the malfunction indicator light illuminates and DTC is stored in ECM memory. Therefore, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-33, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(H4DOTC)

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4. Joint Pipe 11
5. Rear Exhaust Pipe 12
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1. General Description

A: SPECIFICATION

Specifications for the turbo model are the same as the SOHC model. <Ref. to SP(H4SO)-2, General Description.>

IGNITION

IG(H4DOTC)

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1. General Description

A: SPECIFICATION

Specifications for the turbo model are included in the SC(H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(H4DOTC)(diag)

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