1. General Description

A: SPECIFICATION

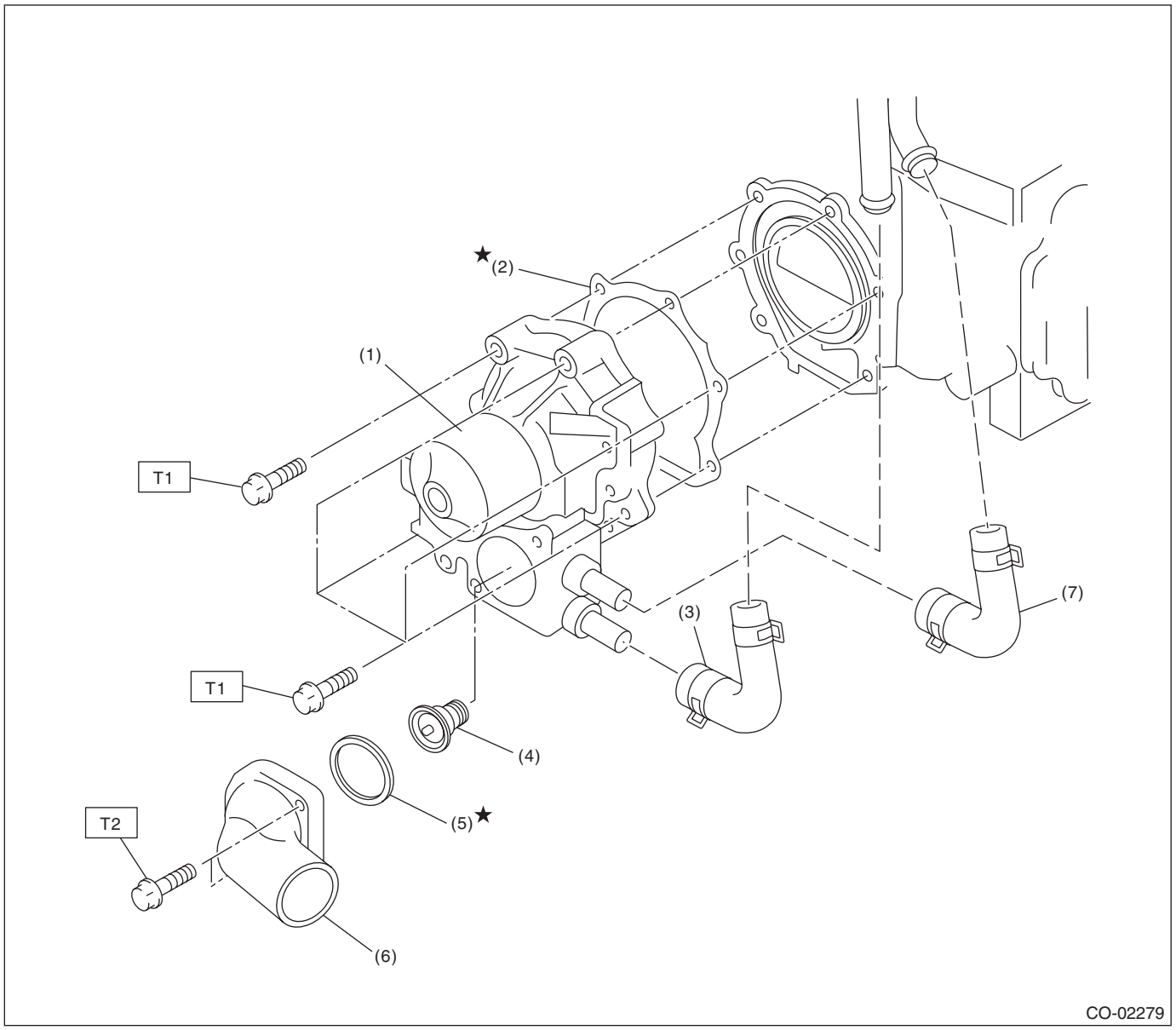
Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity		ℓ (US qt, Imp qt)	MT: approx. 7.3 (7.7, 6.4) AT: approx. 7.2 (7.6, 6.3)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge rate ℓ (US gal, Imp gal) /min	20 (5.3, 4.4)
		Pump 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 to –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)

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

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 — 103 km/h (40 — 64 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: 104 km/h (65 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

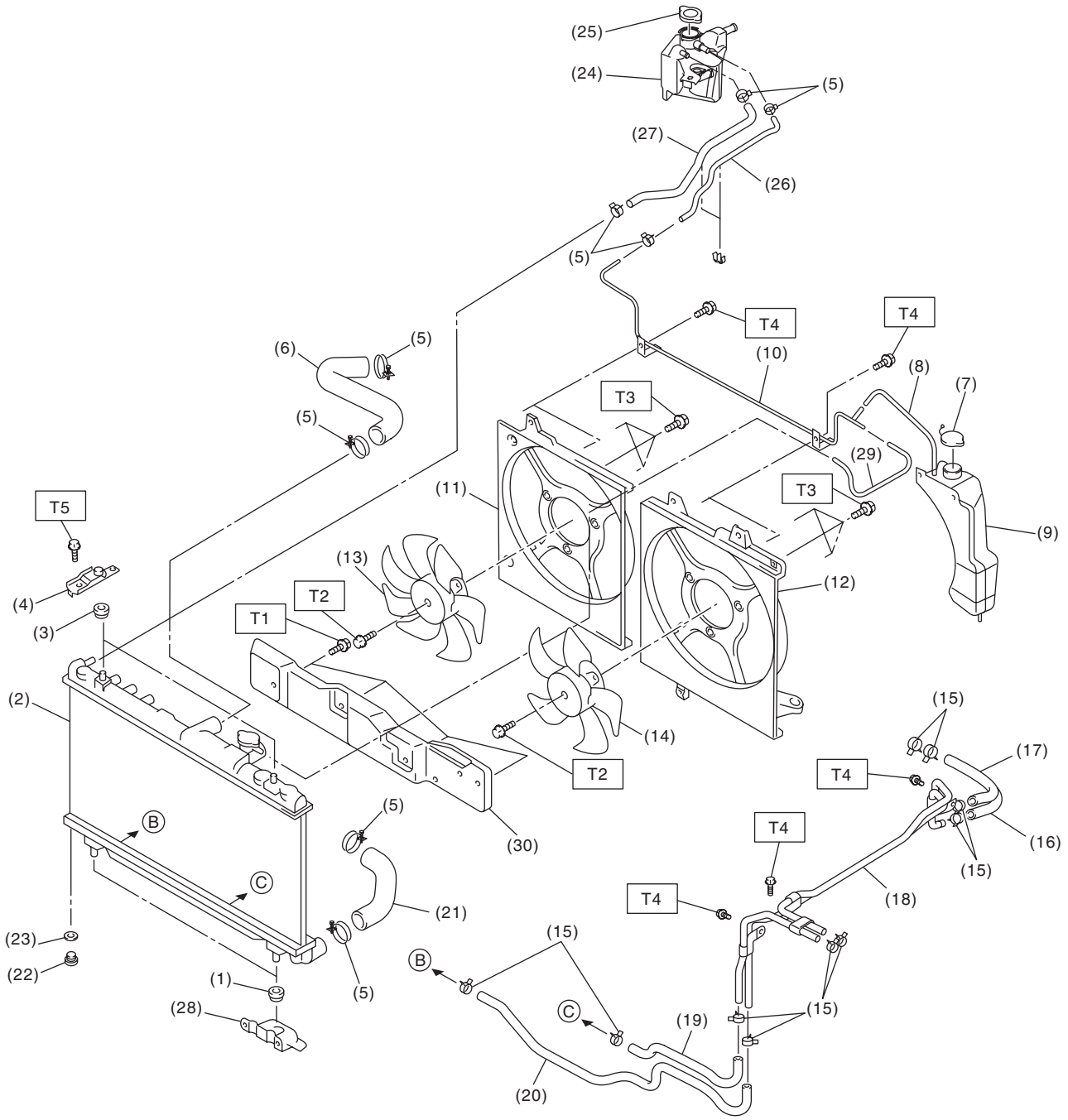
1. WATER PUMP



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

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)

2. RADIATOR AND RADIATOR FAN



CO-02299

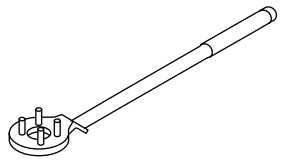
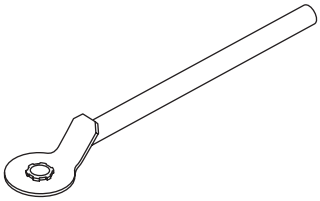
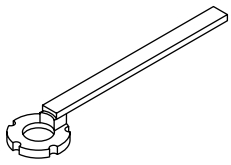
(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator hose A
(7) Engine coolant reservoir tank cap
(8) Over flow hose A
(9) Engine coolant reservoir tank
(10) Over flow pipe
(11) Radiator sub fan shroud
(12) Radiator main fan shroud
(13) 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) Over flow hose B
(30) Heat shield cover (AT model)

Tightening torque:N·m (kgf-m, ft-lb)
T1: 3 (0.3, 2.2)
T2: 3.4 (0.35, 2.5)
T3: 5 (0.5, 3.6)
T4: 7.5 (0.76, 5.5)
T5: 12 (1.2, 8.9)

C: CAUTION

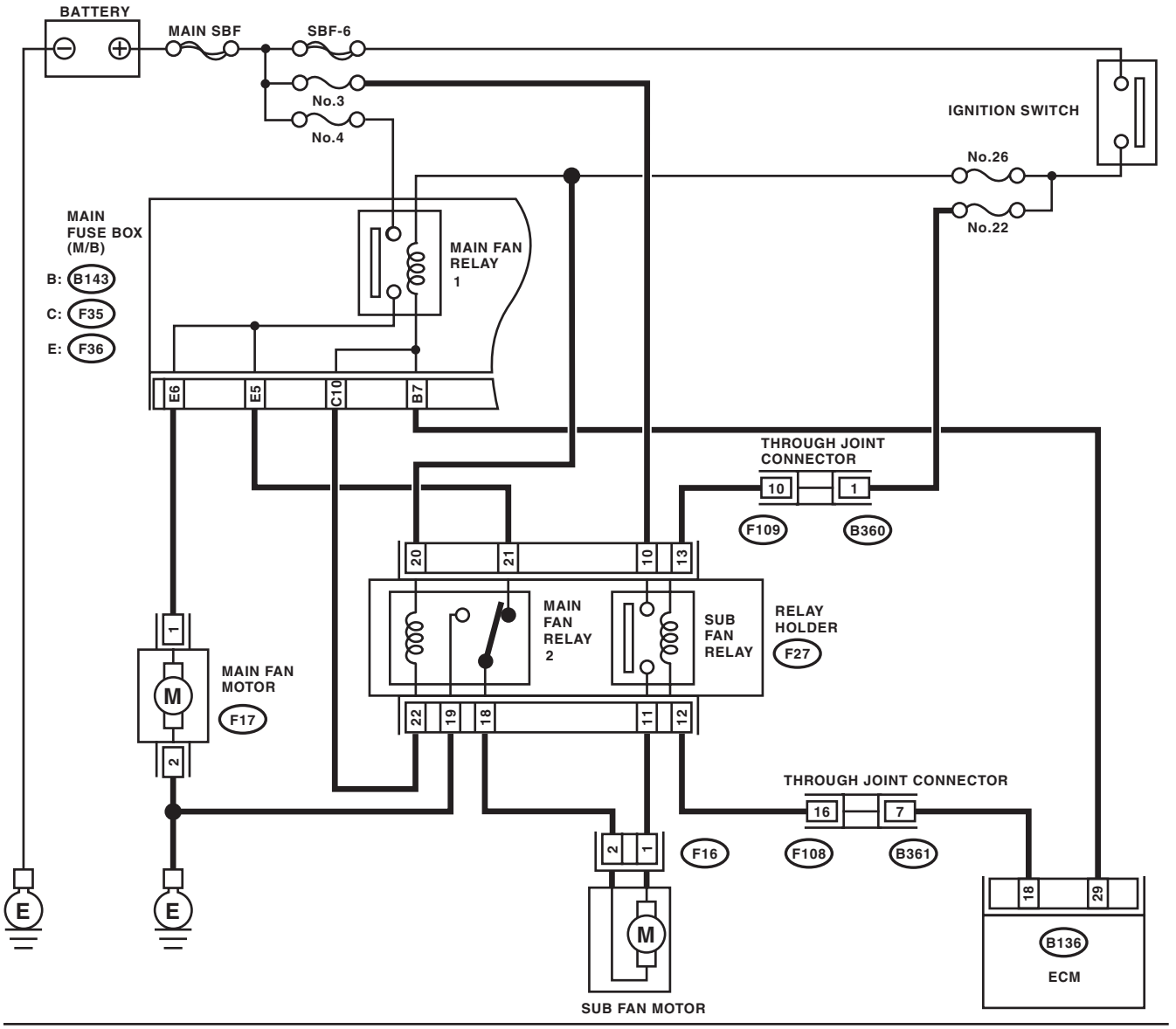
• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal,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

D: PREPARATION TOOL

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



CO-02317

B: INSPECTION

DETECTING CONDITION:

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

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)-57, 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)-57, 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 relay holder. 3) Measure the voltage between the sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 10 (+) — 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. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **7**.	Go to step **6**.

	Step	Check	Yes	No
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.
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. 10 — No. 11:***	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. 12 and No. 13 of the sub fan relay. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 10 — No. 11:***	Is 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. 11:***	Is 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 FAN MOTOR CONNECTOR AND MAIN FAN RELAY 2 CONNECTOR.** 1) Remove the main fan relay 2 from the 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. 18:***	Is 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 for 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 of the sub fan motor, and the ground (–) terminal to terminal No. 2.	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. 21 — No. 18:***	Is resistance less than 1 Ω?	Go to step **14**.	Replace the main fan relay 2.

	Step	Check	Yes	No
14	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 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.
15	**CHECK MAIN FAN MOTOR AND GROUND CIRCUIT.** Measure the resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 2 — Chassis ground:***	Is 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 of the main fan motor, and the ground (–) terminal to terminal No. 2.	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 the ECM. 2) Measure the resistance between the sub fan relay terminal and ECM connector. ***Connector & terminal*** ***(B136) No. 18 — (F27) No. 12:***	Is 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 for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of the ECM connector.	Check the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-44, 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 resistance less than 1 Ω?	Go to step **22**.	Replace the main fan relay 1.
22	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 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 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.

	Step	Check	Yes	No
23	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 AND ECM.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance between main fan relay 1 terminal and ECM connector. ***Connector & terminal*** ***(B136) No. 29 — (B143) No. 7:***	Is resistance less than 1 Ω?	Go to step **24**.	Repair the open circuit of the harness between main fan relay 1 terminal and ECM.
24	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 AND ECM.** Measure the resistance between main fan relay 2 terminal and ECM connector. ***Connector & terminal*** ***(B136) No. 29 — (F27) No. 22:***	Is 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 for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact of the 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 the relay holder. 2) Measure the resistance between main fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 19 — Chassis ground:***	Is 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. 20 (+) — 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. 19 — (F27) No. 18:***	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. 20 and No. 22. 2) Measure the resistance of main fan relay 2. ***Terminals*** ***(F27) No. 19 — (F27) No. 18:***	Is resistance less than 1 Ω?	Go to step **23**.	Replace the main fan relay 2.

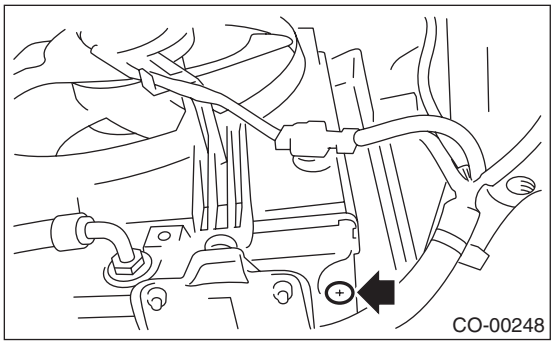
3. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

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

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



5) 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:
Refer to "SPECIFICATION" for the cooling system protective agent. <Ref. to CO(H4DOTC)-2, SPECIFICATION, General Description.>

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

Recommended engine coolant:
Refer to "SPECIFICATION" for the recommended engine coolant. <Ref. to CO(H4DOTC)-2, SPECIFICATION, General Description.>

Coolant level:
Refer to "SPECIFICATION" for the recommended engine coolant. <Ref. to CO(H4DOTC)-2, SPECIFICATION, General Description.>

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.

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.

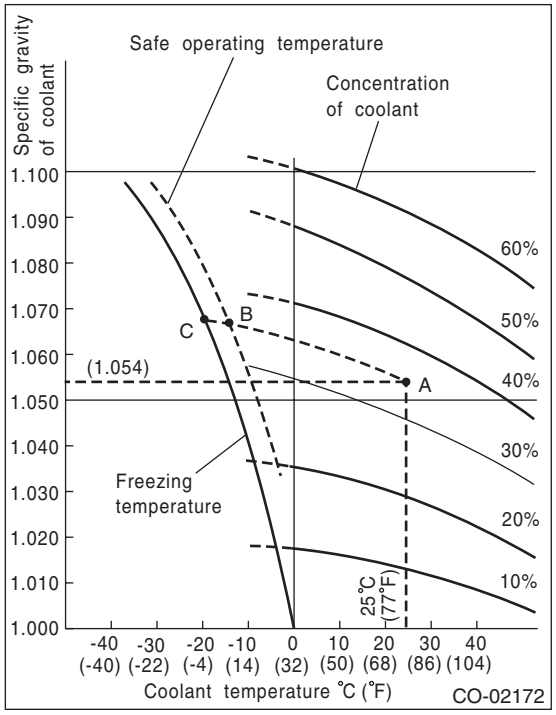
NOTE:
Be careful with the engine coolant temperature gauge to prevent overheating.
11) Stop the engine and wait until the engine coolant temperature lowers to 30°C (86°F) or less.
12) Open the coolant filler tank cap. If the engine coolant level drops, add engine coolant into the coolant filler tank 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 ENGINE COOLANT CONCENTRATION AND FREEZING TEMPERATURE

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

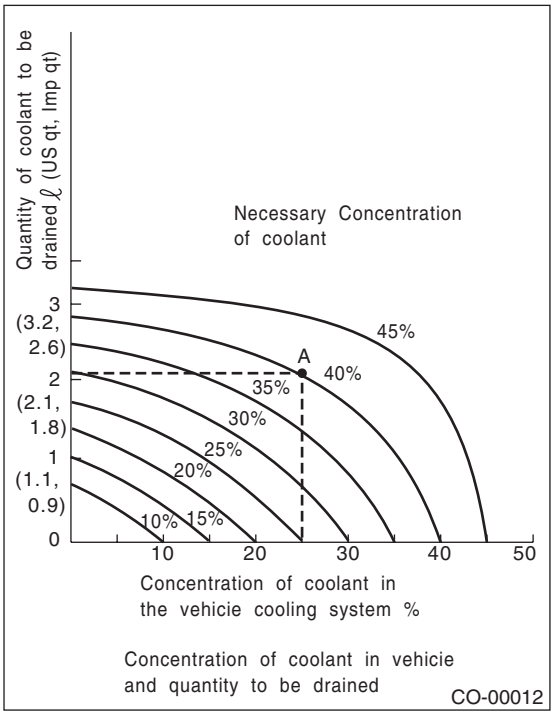
- Diagram 1



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

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

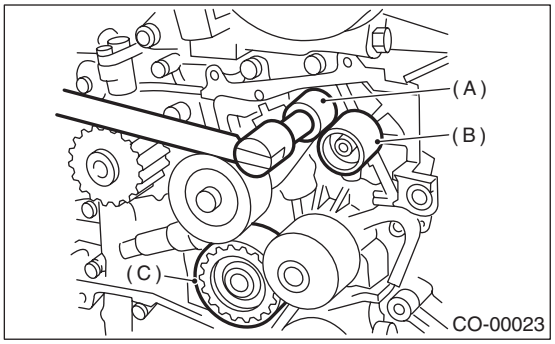
- Diagram 2



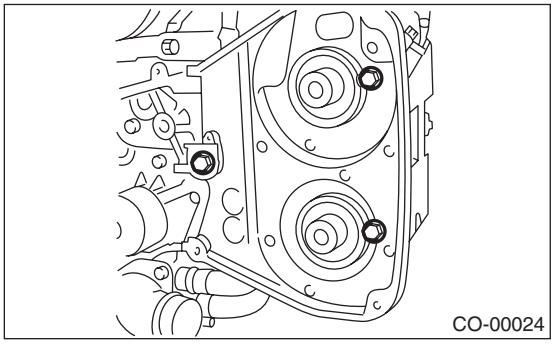
4. Water Pump

A: REMOVAL

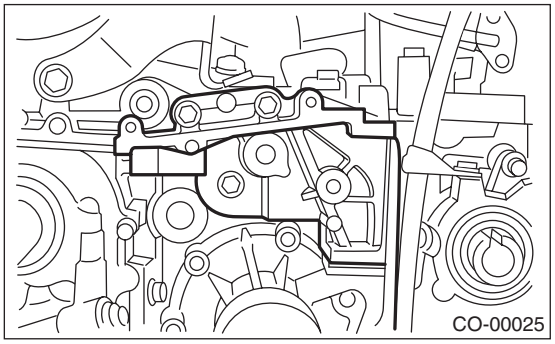
1) Remove the collector cover.
2) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
3) Remove the V-belts. <Ref. to ME(H4DOTC)-37, REMOVAL, V-belt.>
4) Remove the crank pulley. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
5) Remove the timing belt. <Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt.>
6) Remove the automatic belt tension adjuster (A).
7) Remove the belt idler (B).
8) Remove the belt idler No. 2 (C).



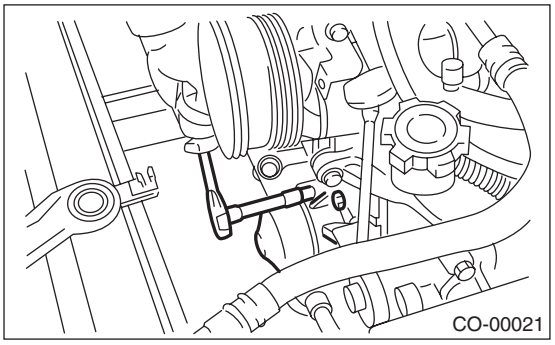
9) Remove the cam sprocket (LH) using ST. <Ref. to ME(H4DOTC)-51, REMOVAL, Cam Sprocket.>
10) Remove the belt cover (LH) No. 2.



11) Remove the tensioner bracket.



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

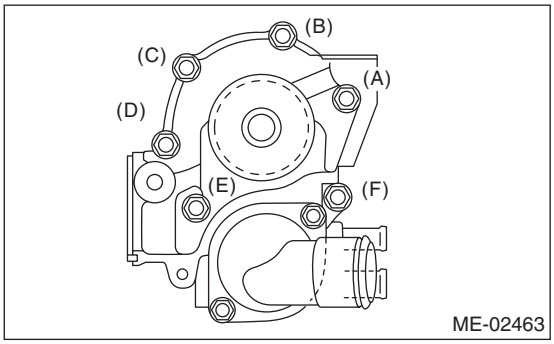


B: INSTALLATION

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

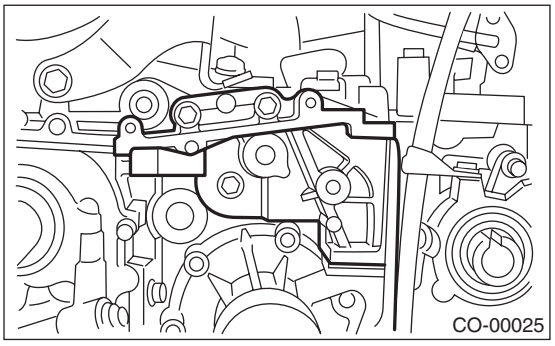
NOTE:
- Use a new gasket.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in figure.

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)



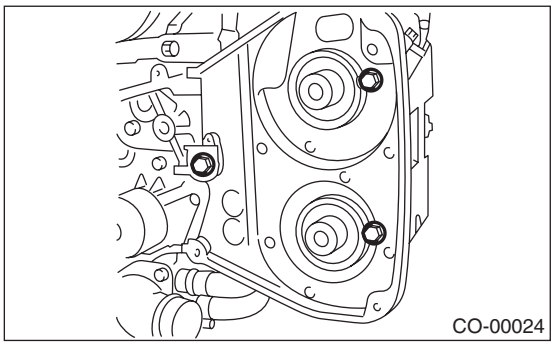
2) Install the hose to water pump.
3) Install the tensioner bracket.

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



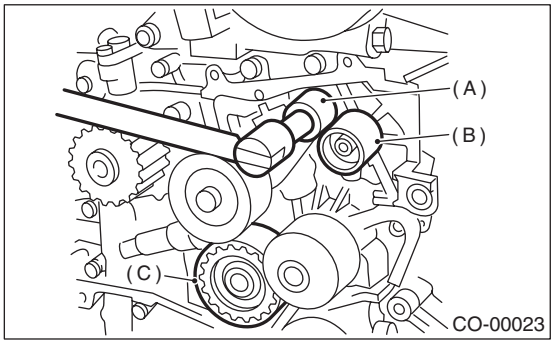
4) Install the belt cover No. 2 (LH).

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



5) Install the cam sprocket (LH) using ST. <Ref. to ME(H4DOTC)-51, INSTALLATION, Cam Sprocket.>
6) Install the belt idler No. 2 (C).
7) Install the belt idler (B).
8) Install the automatic belt tension adjuster (A) which has a tension rod held by a pin. <Ref. to ME(H4DOTC)-45, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

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

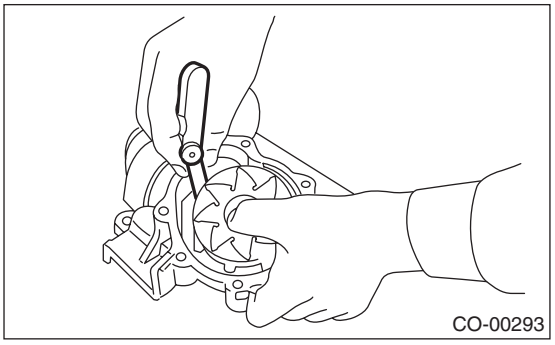


9) Install the timing belt. <Ref. to ME(H4DOTC)-46, TIMING BELT, INSTALLATION, Timing Belt.>
10) Install the crank pulley. <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
11) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>
12) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, 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)

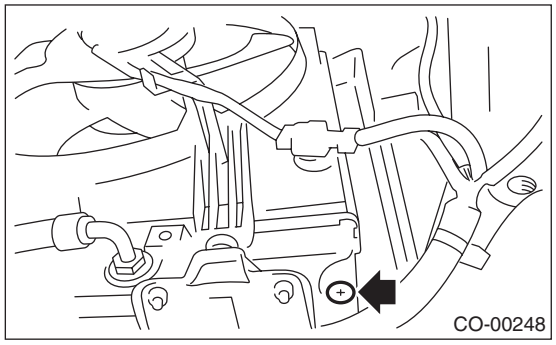


5) After water pump installation, check pulley shaft for engine coolant leaks or noise. If leaks or noise are noted, replace the water pump assembly.

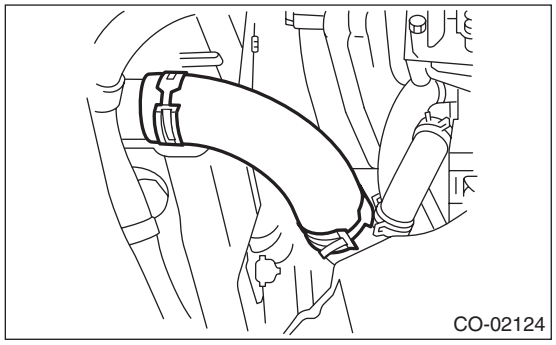
5. Thermostat

A: REMOVAL

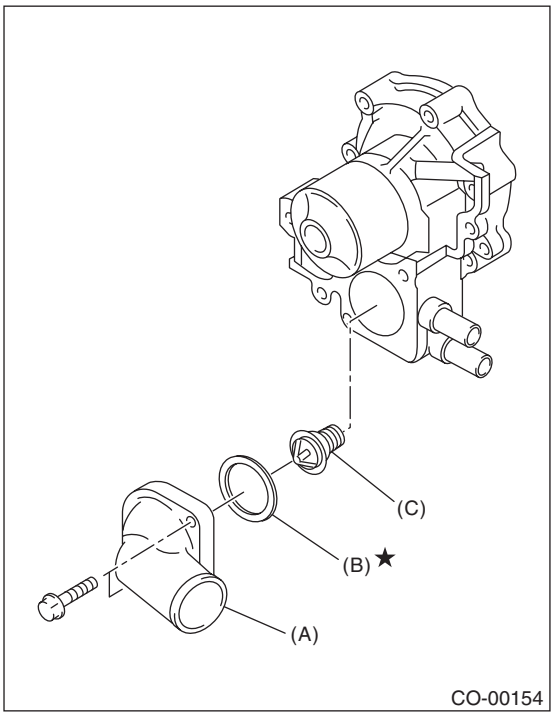
1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Remove the under cover.
4) Drain engine coolant completely.
<Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



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

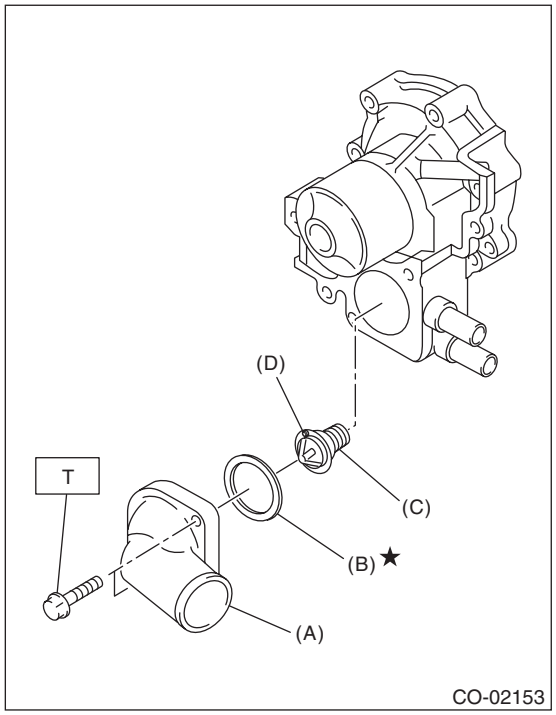
B: INSTALLATION

1) Install a gasket to thermostat.

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

NOTE:
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

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

C: INSPECTION

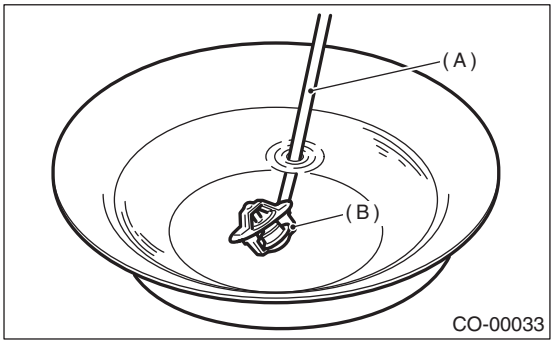
Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
• Inspection method
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the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

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

Fully opens:
91°C (196°F)

Valve lift:
9.0 mm (0.354 in) or more



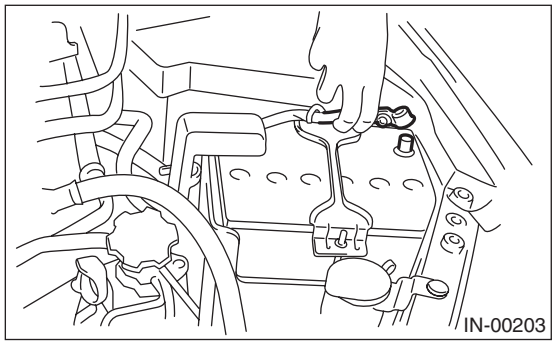
(A) Thermometer
(B) Thermostat

6. Radiator

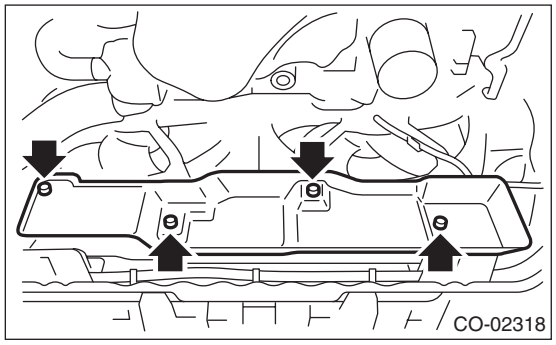
A: REMOVAL

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

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

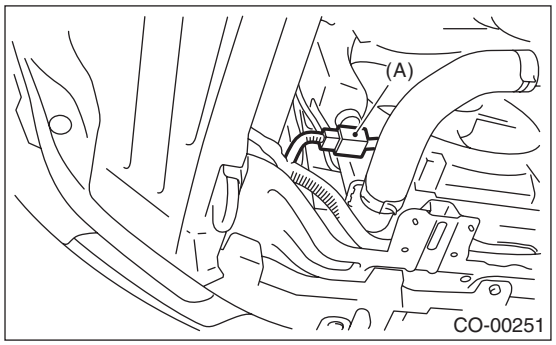


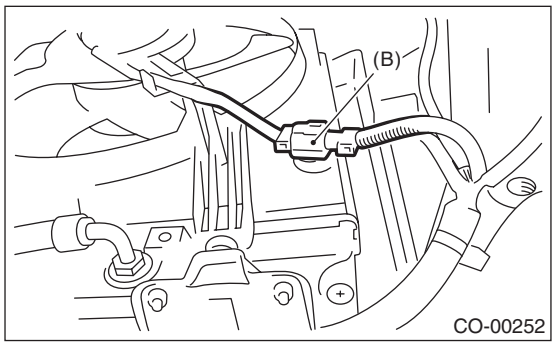
4) Lift up the vehicle.
5) Remove the under cover.
6) Remove the heat shield cover from radiator. (AT model)



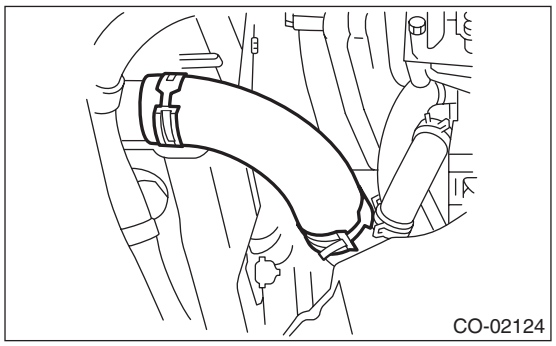
7) Drain engine coolant completely.
<Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

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

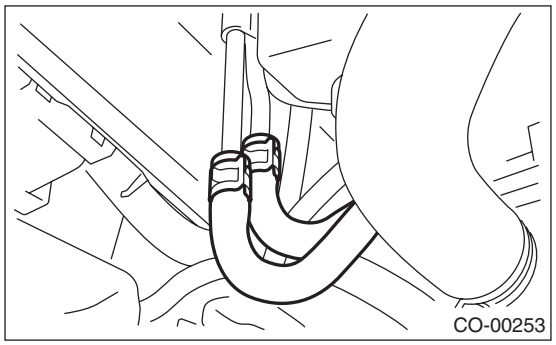




9) Disconnect the radiator outlet hose from thermostat cover.

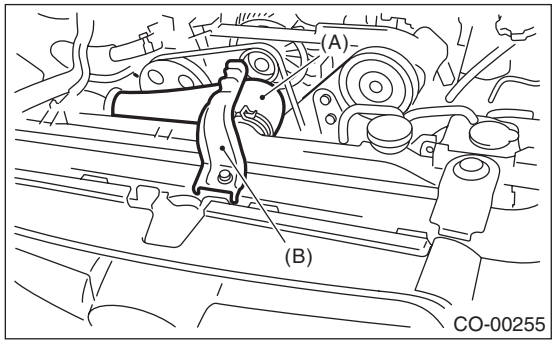


10) Disconnect the ATF cooler hoses from ATF pipes.
Plug the ATF pipe to prevent ATF from leaking. (AT model)

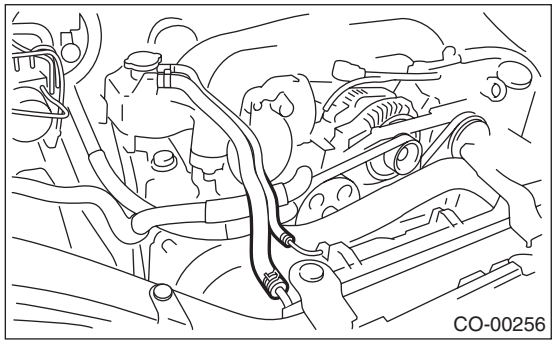


11) Lower the vehicle.
12) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
13) Disconnect the over flow hose.

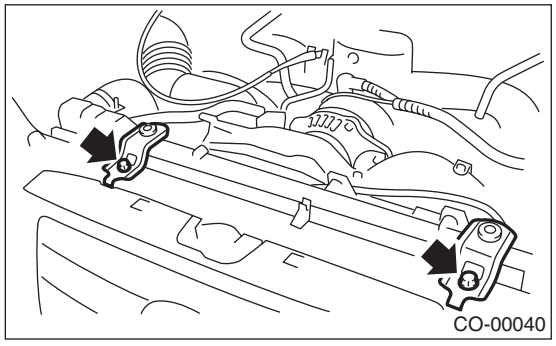
14) Remove the reservoir tank. <Ref. to CO(H4DOTC)-30, REMOVAL, Reservoir Tank.>
15) Disconnect the radiator inlet hose (A) from the radiator.
16) Remove the hood stay holder (B).



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



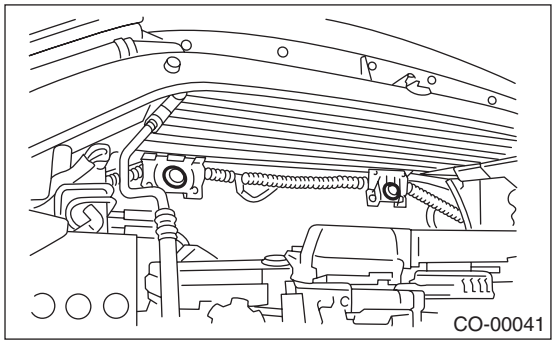
18) Remove the radiator upper brackets.



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

B: INSTALLATION

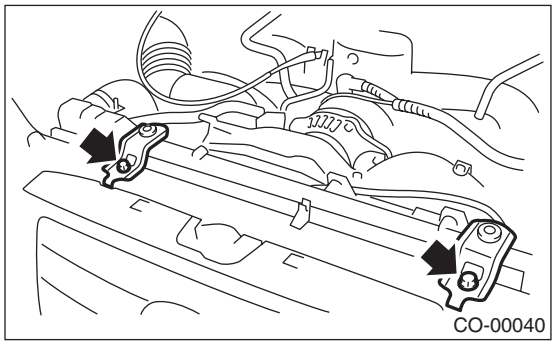
1) Attach the radiator lower cushion to the hole on the radiator lower bracket.



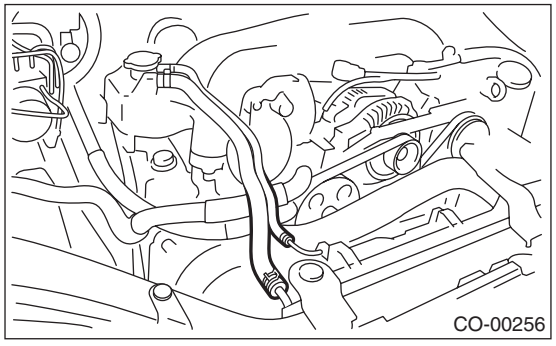
2) Install the radiator to vehicle.

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)

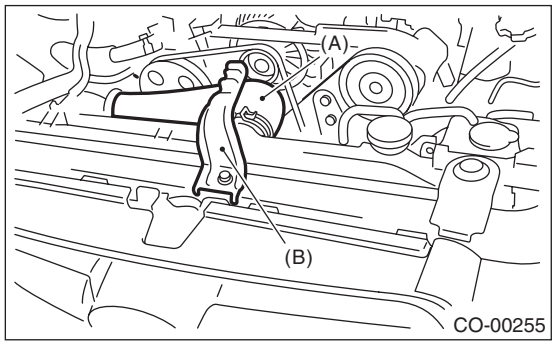


4) Connect the two coolant filler tank hoses to the radiator.

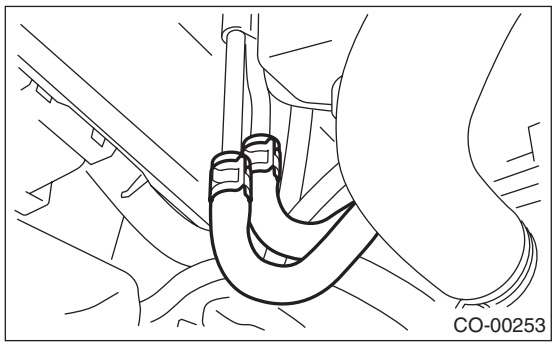


5) Connect the radiator inlet hose (A).
6) Install the hood stay holder (B).

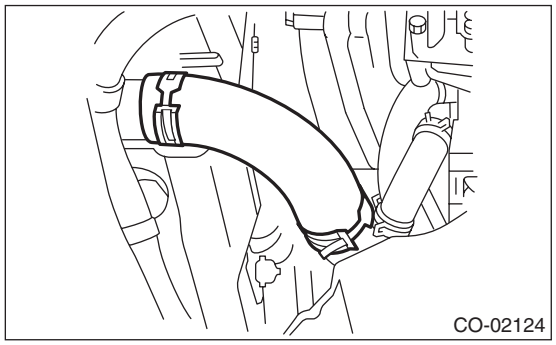
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



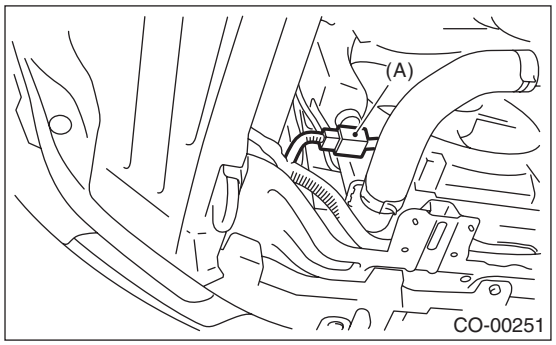
7) Install the reservoir tank. <Ref. to CO(H4DOTC)-30, INSTALLATION, Reservoir Tank.>
8) Connect the over flow hose.
9) Install the air intake duct.
<Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.>
10) Lift up the vehicle.
11) Connect the ATF cooler hoses. (AT model)

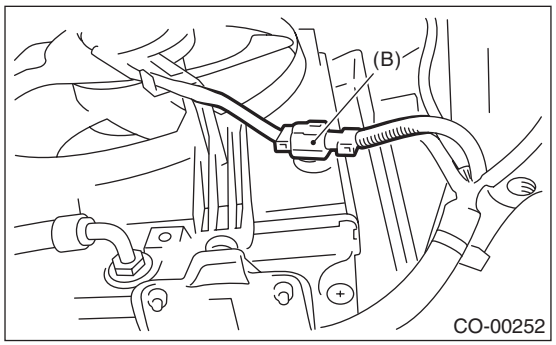


12) Connect the radiator outlet hose.



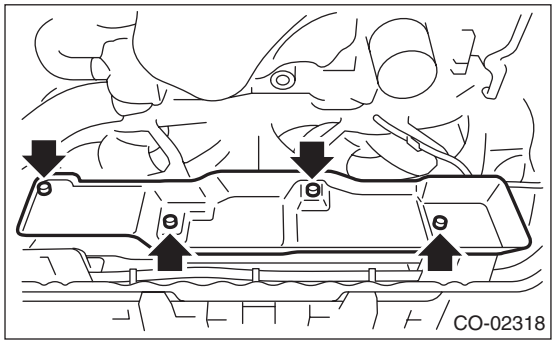
13) Connect the connectors to the radiator main fan motor (A) and sub fan motor (B).



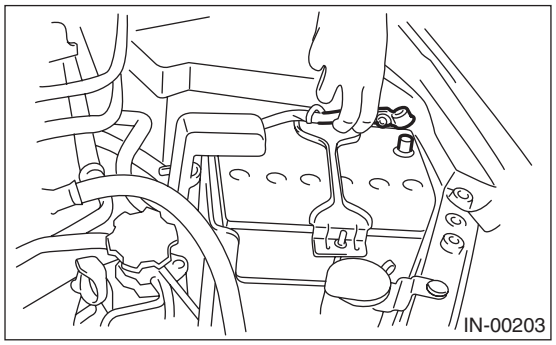


14) Install the heat shield cover to the radiator. (AT model)

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



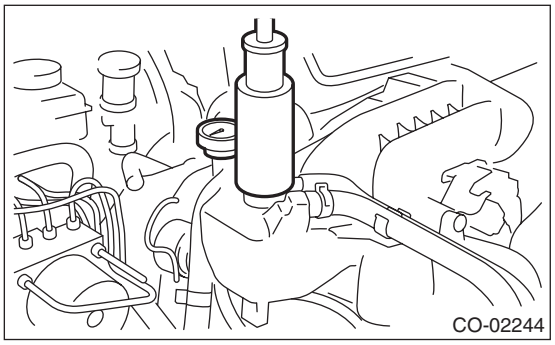
15) Install the under cover.
16) Lower the vehicle.
17) Connect the battery ground cable to battery.



18) Fill engine coolant.
<Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
19) Check the ATF level. <Ref. to 5AT-28, 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.



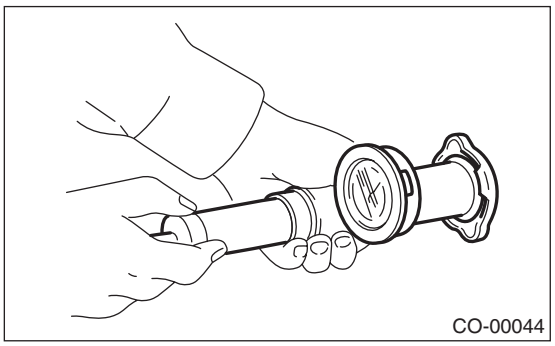
2) Apply a pressure of 122 kPa (1.2 kg/cm^2, 18 psi) to the radiator and check the following points:
- Leakage from the radiator or its vicinity
- Leakage from the hose or its connections

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)

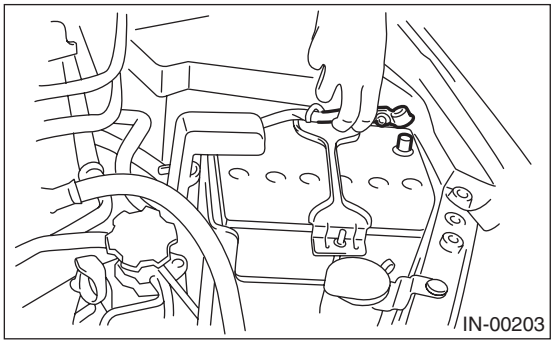
Radiator side
Specified pressure:
122 — 152 kPa
(1.24 — 1.55 kg/cm^2, 18 — 22 psi)
Service limit pressure:
112 kPa (1.14 kg/cm^2, 16 psi)

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.

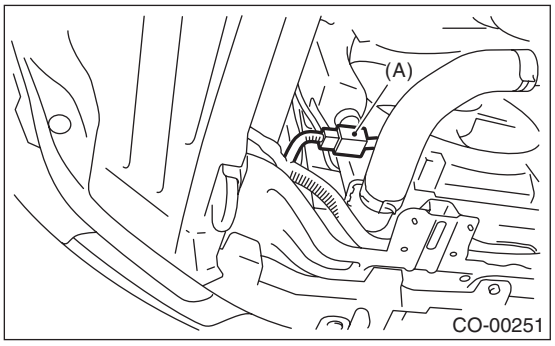
8. Radiator Main Fan and Fan Motor

A: REMOVAL

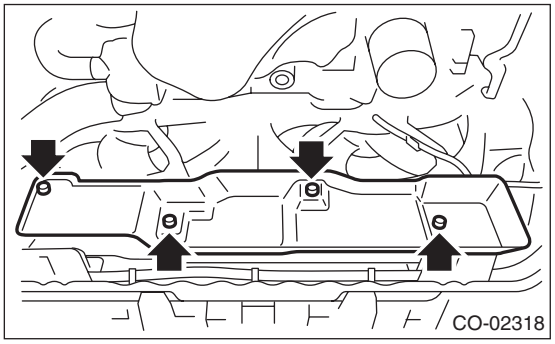
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from the battery.



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

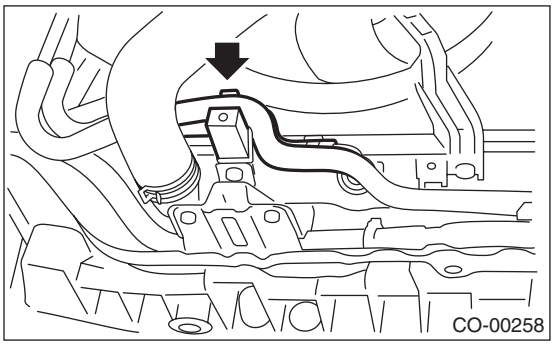


7) Remove the heat shield cover from radiator. (AT model)

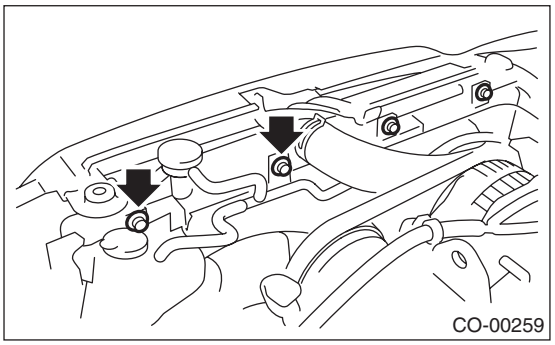


8) Drain the coolant about 1 ℓ (1.06 US qt, 0.88 Imp qt). <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

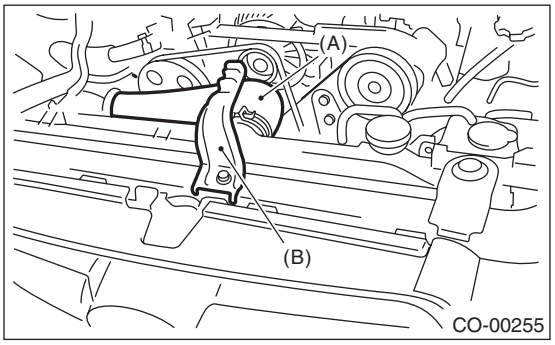
9) Remove the ATF hose from the clip of the radiator main fan motor assembly. (AT model)



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



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

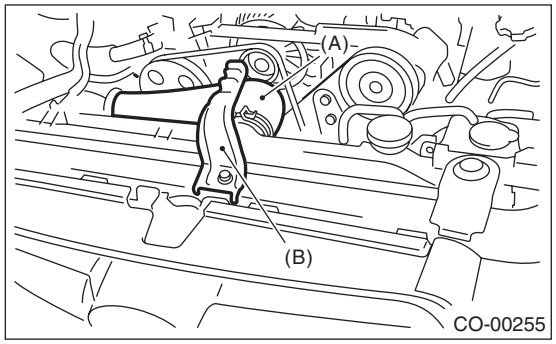


18) Remove the radiator main fan motor assembly from vehicle.

B: INSTALLATION

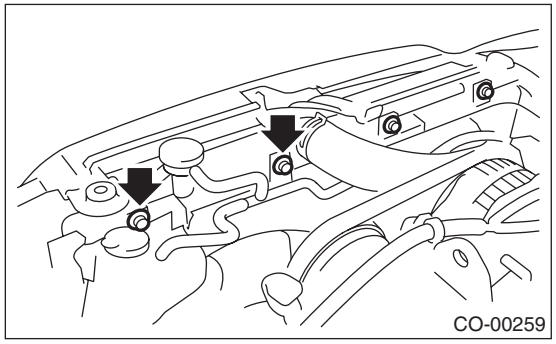
1) Install the radiator main fan motor assembly to the vehicle.
2) Connect the radiator inlet hose (A) to the radiator.
3) Install the hood stay holder (B).

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



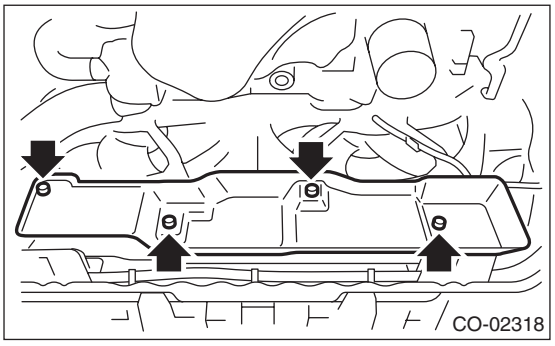
4) Install the mounting bolts to radiator main fan motor assembly.

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

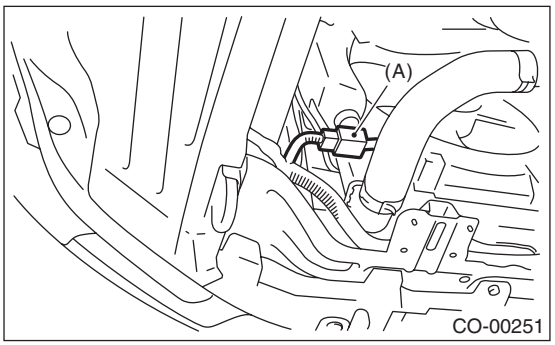


5) Install the reservoir tank. <Ref. to CO(H4DOTC)-30, INSTALLATION, Reservoir Tank.>
6) Install the over flow pipe.
7) Connect the over flow hose.
8) Install the air intake duct.
9) Lift up the vehicle.
10) Connect the ATF hose to the clip of the radiator main fan motor assembly. (AT model)
11) Install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

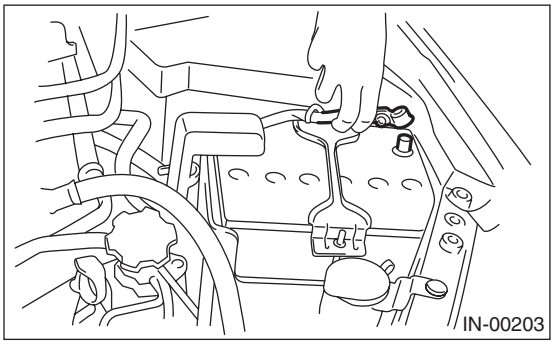
Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



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



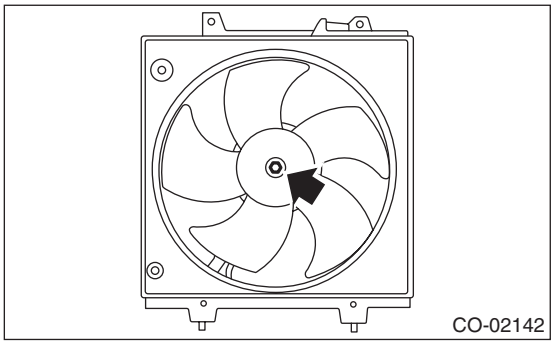
13) Install the under cover.
14) Lower the vehicle.
15) Connect the battery ground cable to battery.



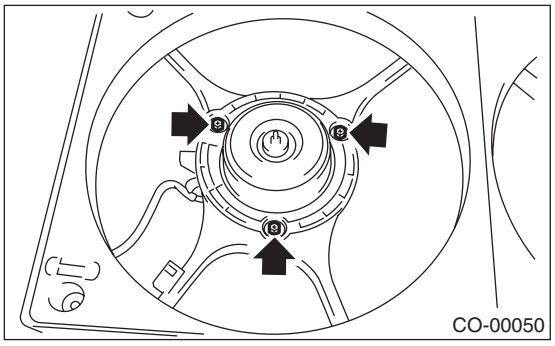
16) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
17) Install the collector cover.

C: DISASSEMBLY

1) Remove the clip which holds the fan motor connector onto the shroud.
2) Remove the nuts which hold the fan to the fan motor.



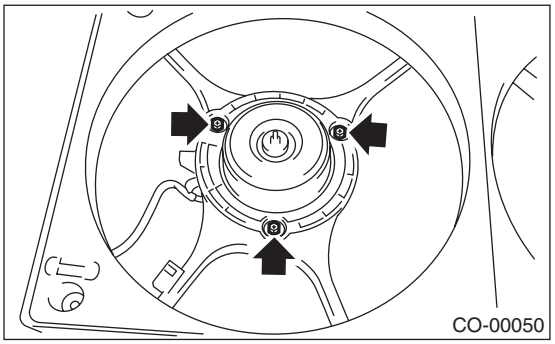
3) Remove the bolts which hold fan motor onto shroud.



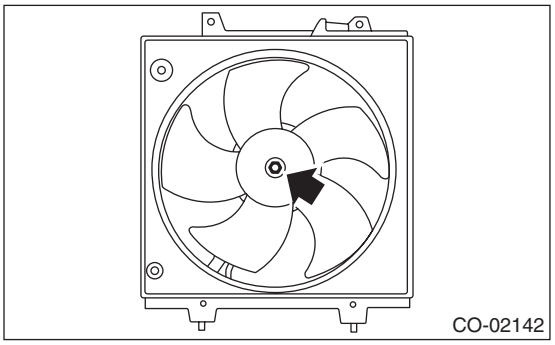
D: ASSEMBLY

Assemble in the reverse order of disassembly.

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



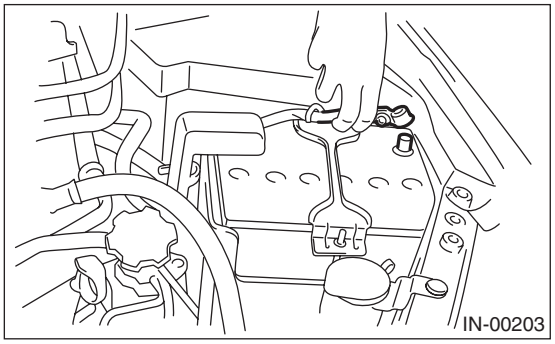
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



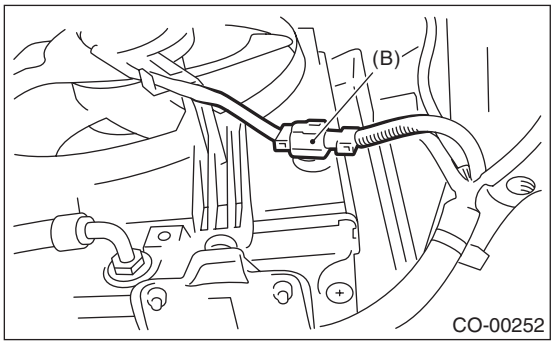
9. Radiator Sub Fan and Fan Motor

A: REMOVAL

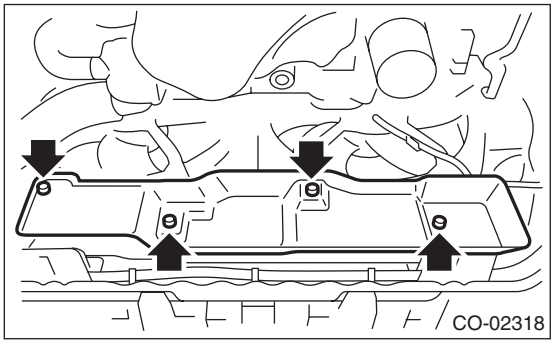
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from the battery.



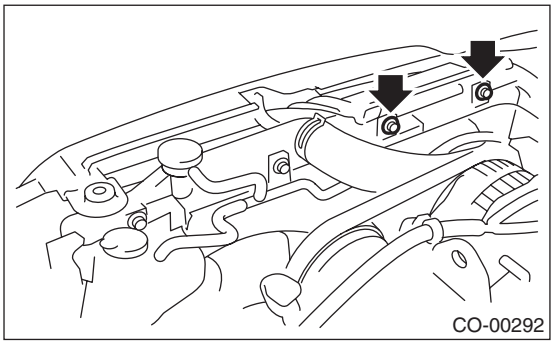
4) Lift up the vehicle.
5) Remove the under cover.
6) Disconnect the sub fan motor connector (B).



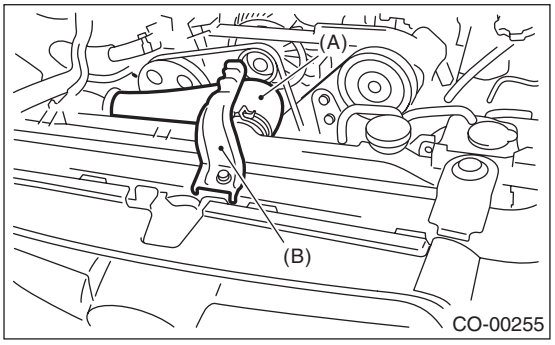
7) Remove the heat shield cover from radiator. (AT model)



8) 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.>
9) Remove the ATF hose from the clip of the radiator sub fan motor assembly. (AT model)
10) Lower the vehicle.
11) Remove the air intake duct.
12) Disconnect the over flow hose.
13) Remove the over flow pipe.
14) Remove the reservoir tank. <Ref. to CO(H4DOTC)-30, REMOVAL, Reservoir Tank.>
15) Remove the mounting bolts from the radiator sub fan motor assembly.



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

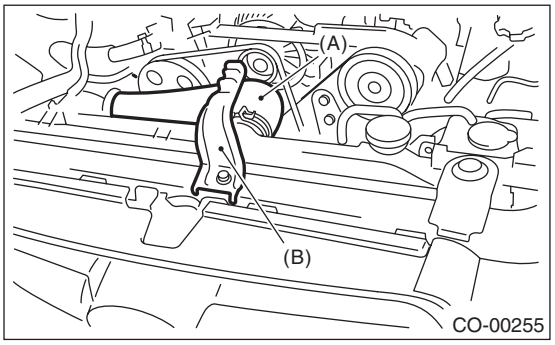


18) Remove the radiator sub fan motor assembly from the vehicle.

B: INSTALLATION

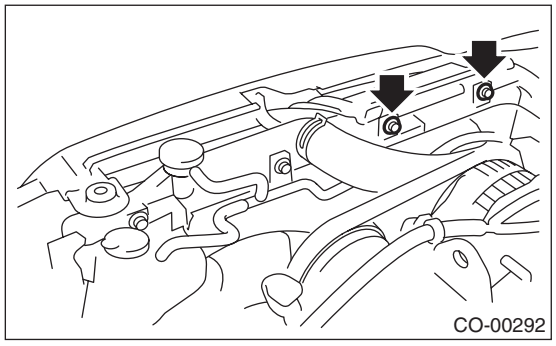
1) Install the radiator sub fan motor assembly to the vehicle.
2) Connect the radiator inlet hose (A) to the radiator.
3) Install the hood stay holder (B).

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



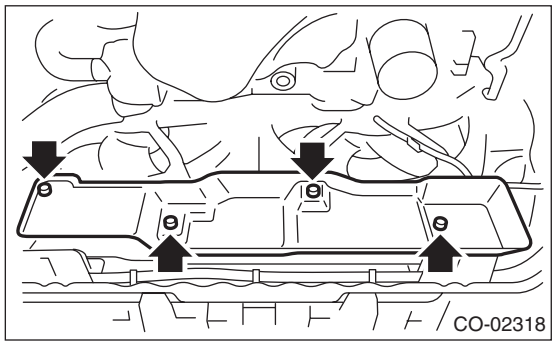
4) Install the mounting bolts to the radiator sub fan motor assembly.

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

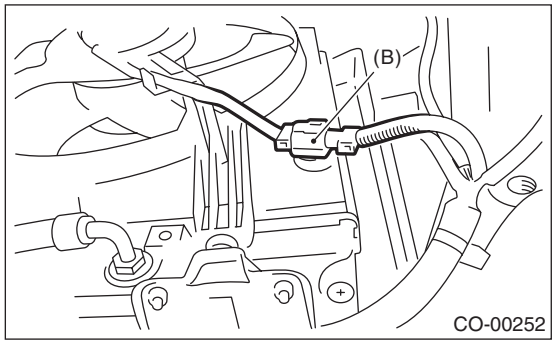


5) Install the reservoir tank. <Ref. to CO(H4DOTC)-30, INSTALLATION, Reservoir Tank.>
6) Install the over flow pipe.
7) Connect the over flow hose.
8) Install the air intake duct.
9) Lift up the vehicle.
10) Connect the ATF hose to the clip of the radiator sub fan motor assembly. (AT model)
11) Install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

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)

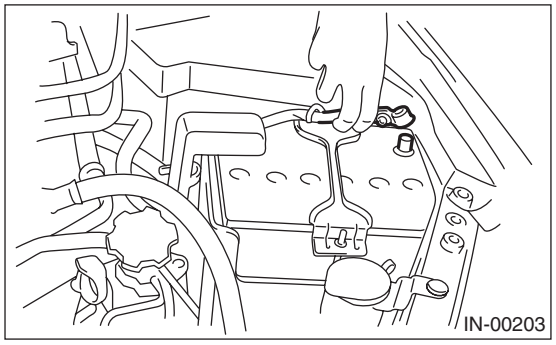


12) Connect the sub fan motor connector (B).



13) Install the under cover.
14) Lower the vehicle.

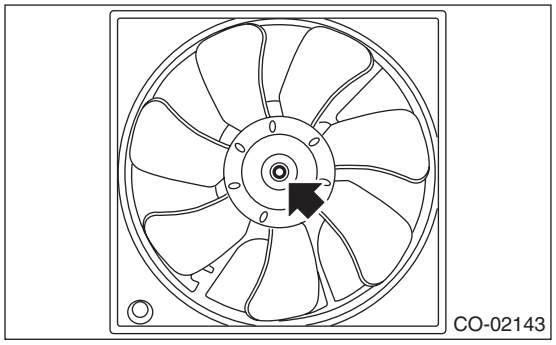
15) Connect the battery ground cable to battery.



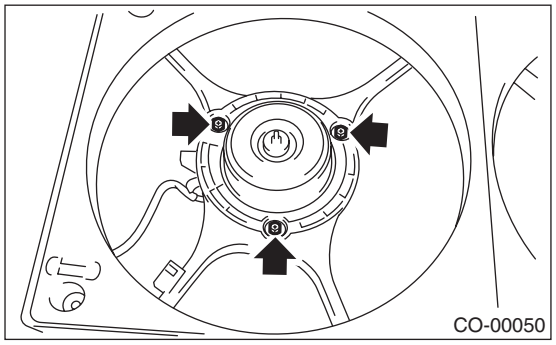
16) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
17) Install the collector cover.

C: DISASSEMBLY

1) Remove the clip which holds the fan motor connector onto the shroud.
2) Remove the nuts which hold the fan to the fan motor.



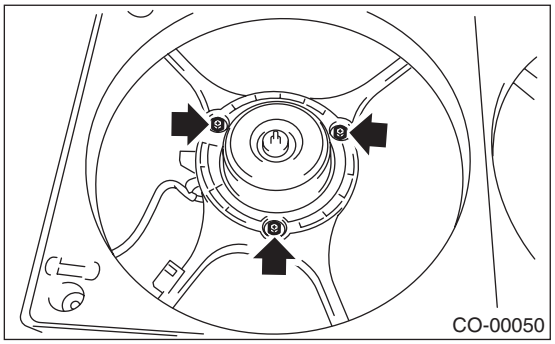
3) Remove the bolts which hold fan motor onto shroud.



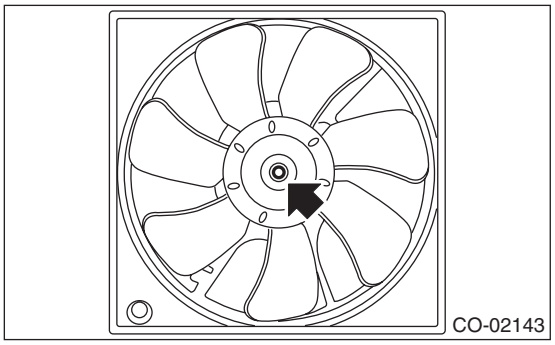
D: ASSEMBLY

Assemble in the reverse order of disassembly.

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



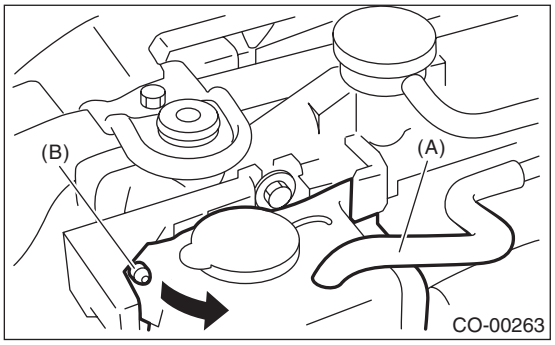
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



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

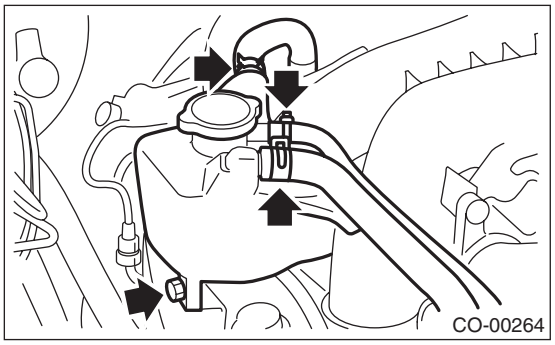
Make sure the engine coolant level is between “FULL” and “LOW”.

11.Coolant Filler Tank

A: REMOVAL

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

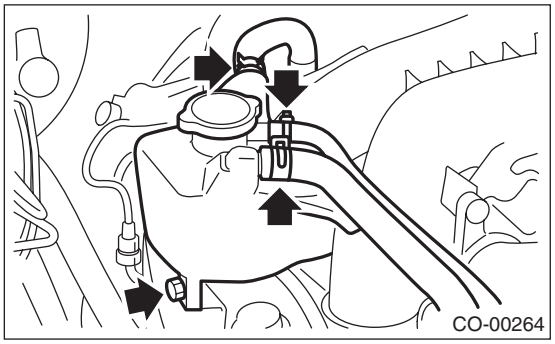
1) Remove the collector cover.
2) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt). <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
3) Disconnect the engine coolant hoses from coolant filler tank.
4) Remove the bolts which install the coolant filler tank.
5) Disconnect 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 the engine coolant. If it is ineffective, inspect and repair the engine side.
	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. Timing belt problem	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

LUBRICATION

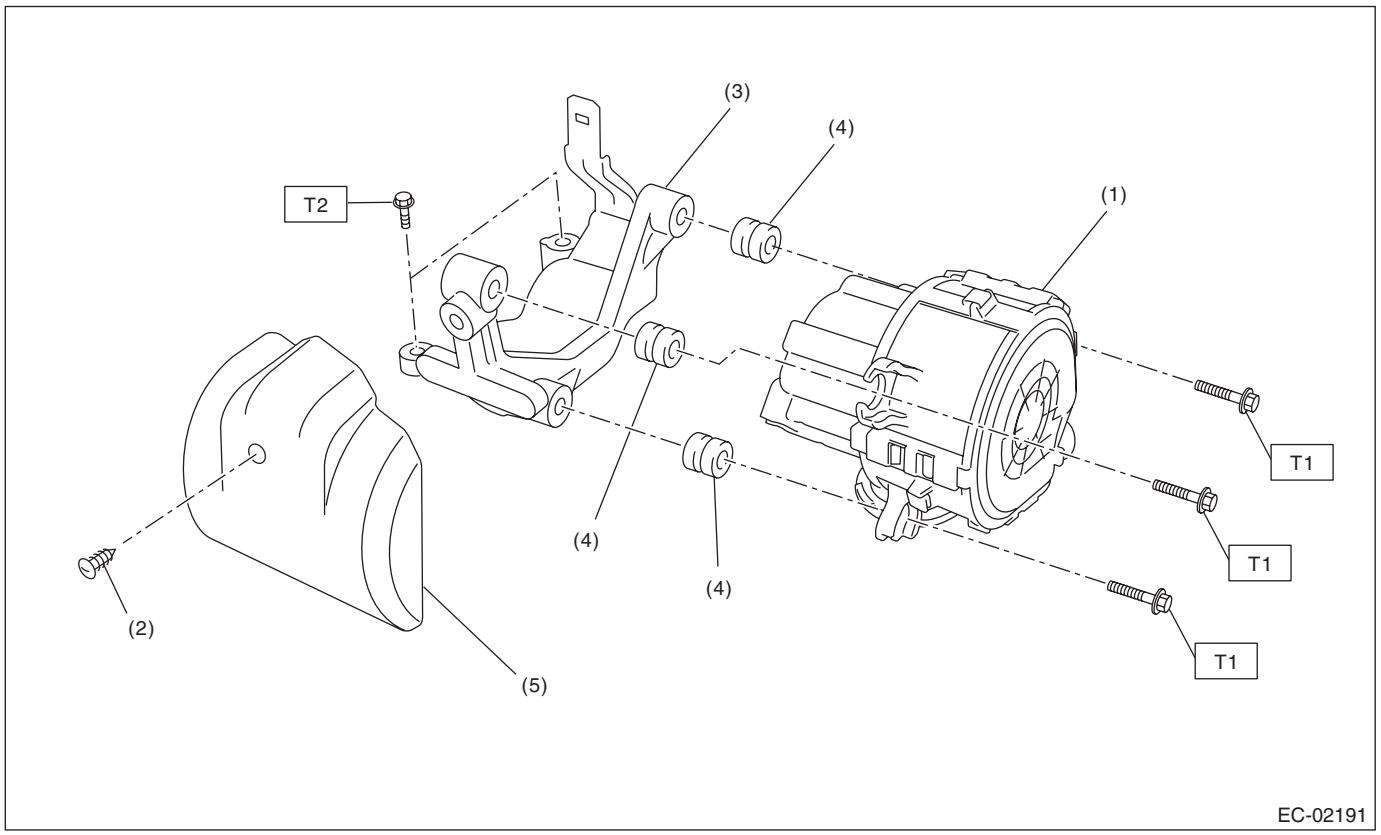
LU(H4DOTC)

		Page
1.	General Description	2
2.	Oil Pressure System	7
3.	Engine Oil	9
4.	Oil Pump	11
5.	Oil Pan and Strainer	16
6.	Oil Pressure Switch	20
7.	Oil Pipe	21
8.	Engine Oil Cooler	25
9.	Engine Oil Filter	26
10.	Engine Lubrication System Trouble in General	27

1. General Description

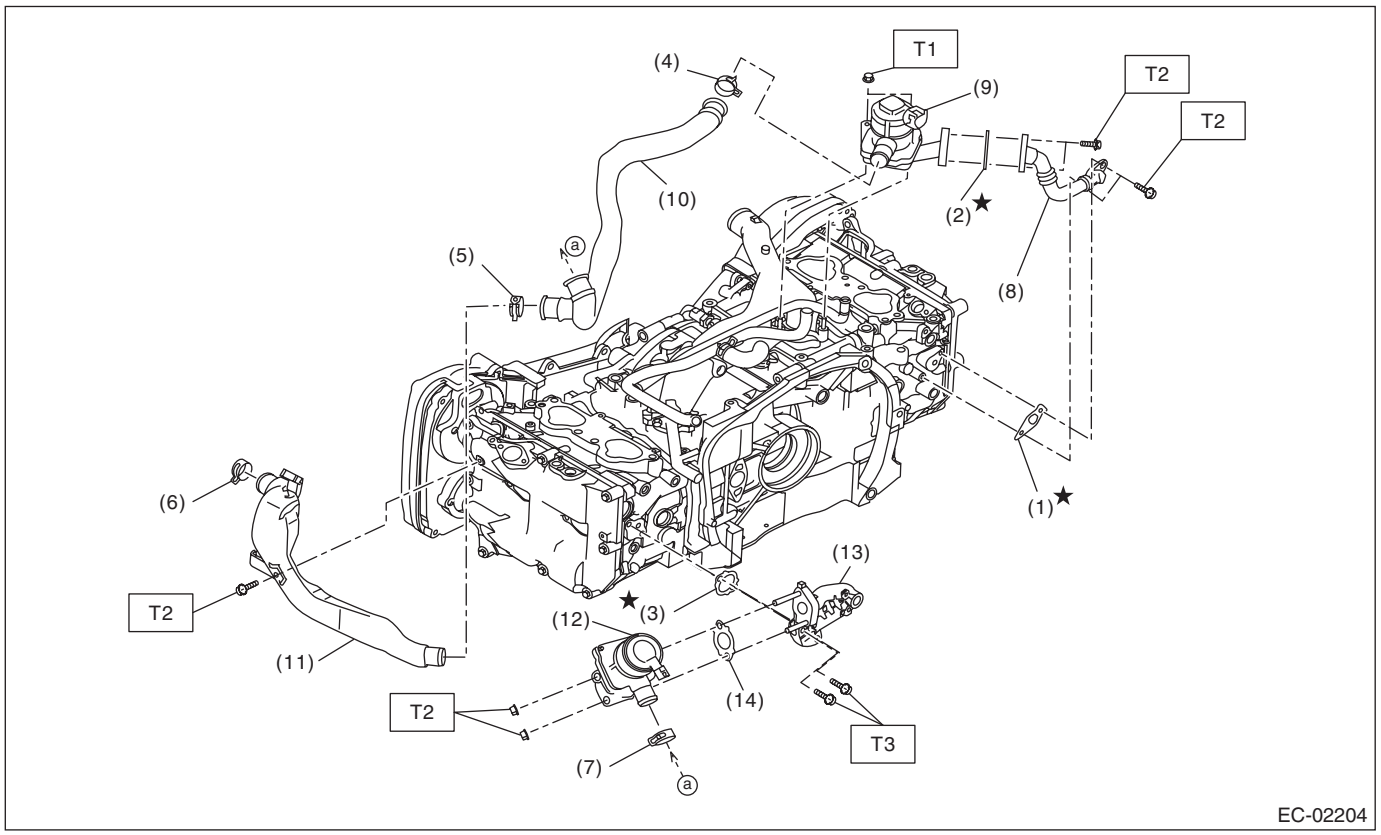
A: COMPONENT

1. SECONDARY AIR PUMP



(1)	Secondary air pump	(4)	Bushing	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Clip	(5)	Secondary air pump cover	***T1: 6.4 (0.65, 4.7)***
(3)	Secondary air pump bracket			***T2: 19 (1.9, 14)***

2. SECONDARY AIR COMBINATION VALVE



(1)	Gasket	(9)	Secondary air combination valve RH
(2)	Gasket		
(3)	Gasket	(10)	Air duct A
(4)	Clamp	(11)	Air duct B
(5)	Clamp	(12)	Secondary air combination valve LH
(6)	Clamp		
(7)	Clamp	(13)	Secondary air pipe LH
(8)	Secondary air pipe RH	(14)	Gasket

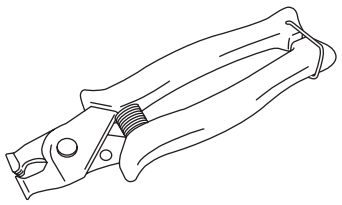
Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 9 (0.9, 6.6)
T3: 19 (1.9, 14)

B: CAUTION

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

C: PREPARATION TOOL

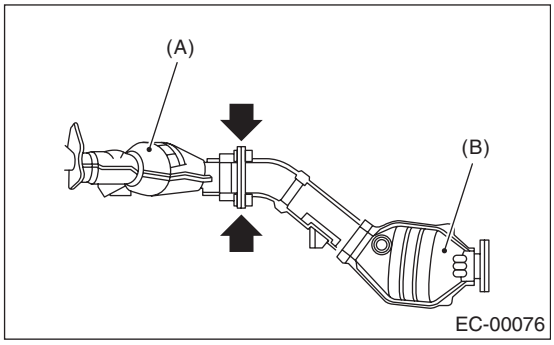
1. SPECIAL TOOL

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.

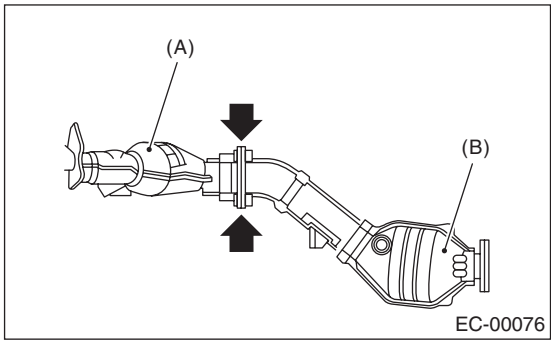
C: INSPECTION

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.

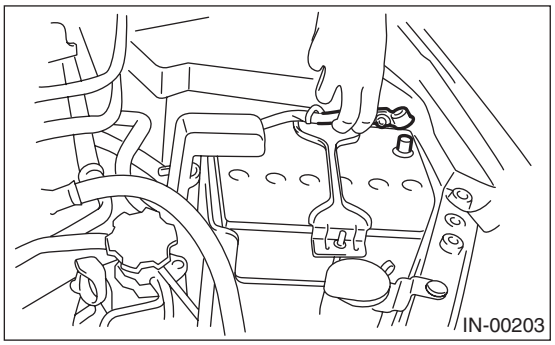
C: INSPECTION

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

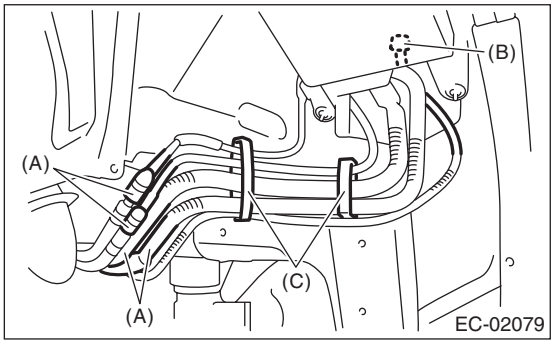
4. Canister

A: REMOVAL

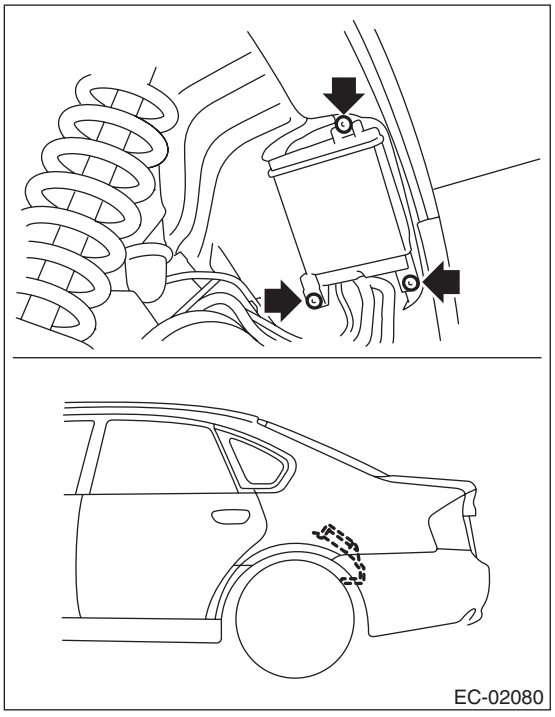
1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.



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



9) Remove the canister from body.

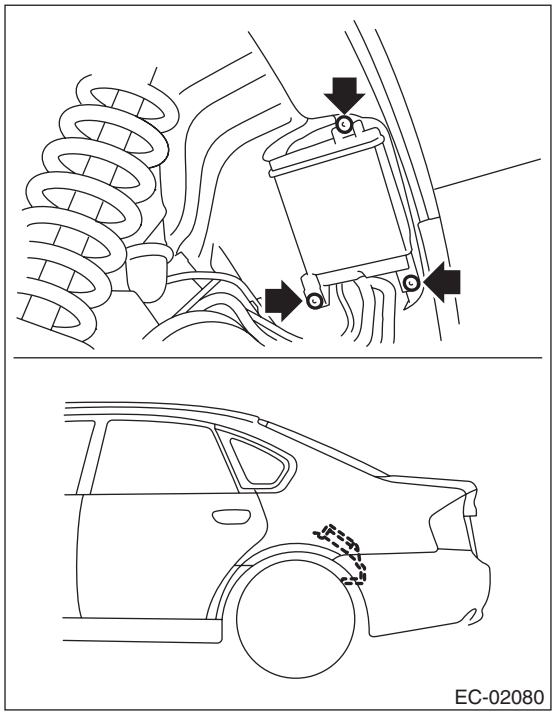


B: INSTALLATION

Install in the reverse order of removal.

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

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



C: INSPECTION

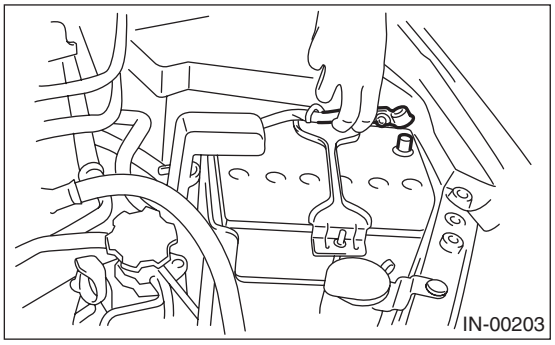
Make sure the canister and canister hoses are not cracked or loose.

5. Purge Control Solenoid Valve

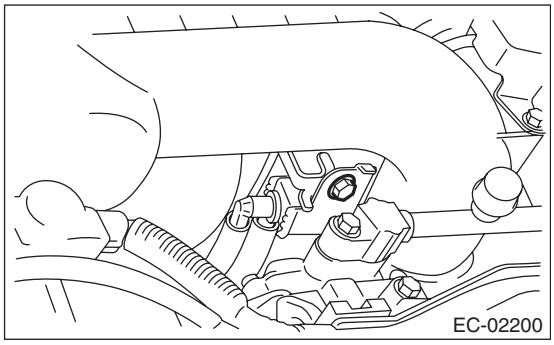
A: REMOVAL

1. PURGE CONTROL SOLENOID VALVE 1

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



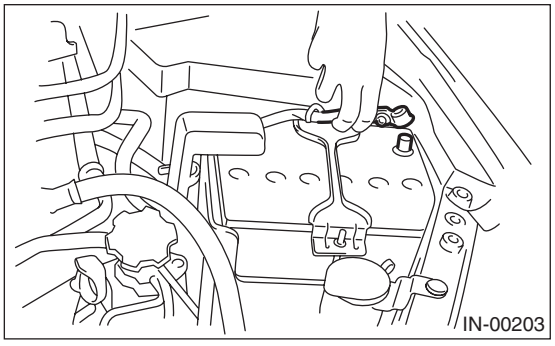
3) Remove the bolts that attach the purge control solenoid valve 1 to the intake manifold. Then disconnect the connector from the purge control solenoid valve 1.



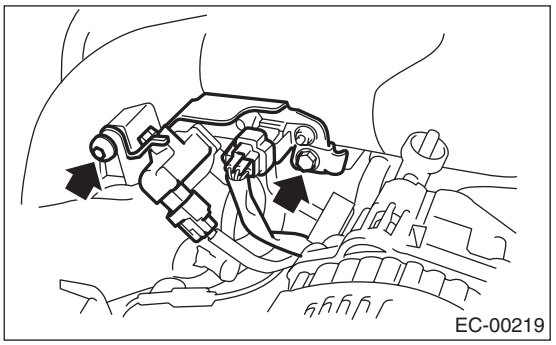
4) Disconnect the evaporation hose from the intake manifold and fuel pipe assembly.

2. PURGE CONTROL SOLENOID VALVE 2

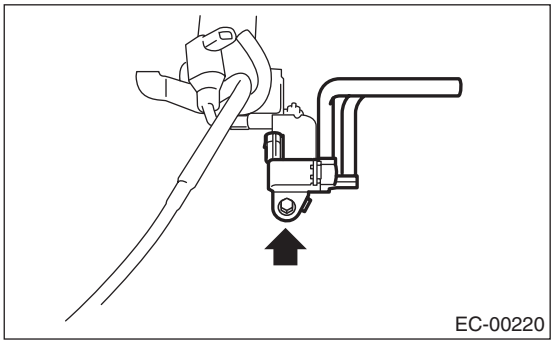
1) Remove the collector cover.
2) Disconnect the ground cable from the battery.



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



4) Disconnect the connector from purge control solenoid valve 2.
5) Disconnect the evaporation hose from the intake duct and fuel pipe assembly.
6) Remove the purge control solenoid valve 2 from the solenoid valve bracket assembly.

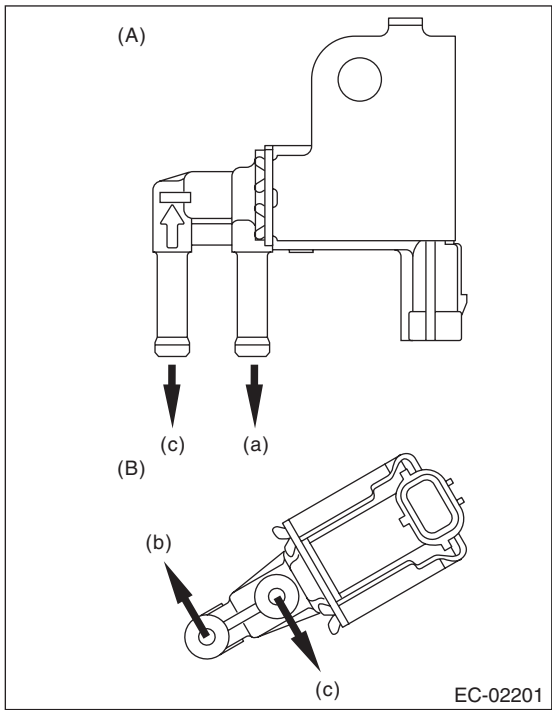


B: INSTALLATION

1. PURGE CONTROL SOLENOID VALVE 1

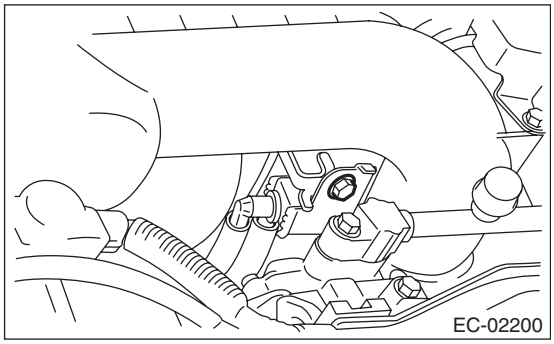
Install in the reverse order of removal.

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



(A) Purge Control Solenoid Valve 1
(B) Purge Control Solenoid Valve 2
(a) To intake manifold
(b) To intake duct
(c) To fuel pipe

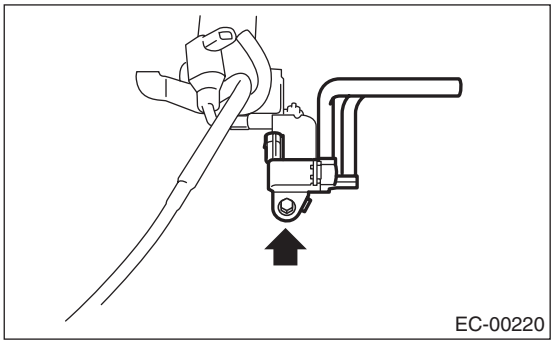
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



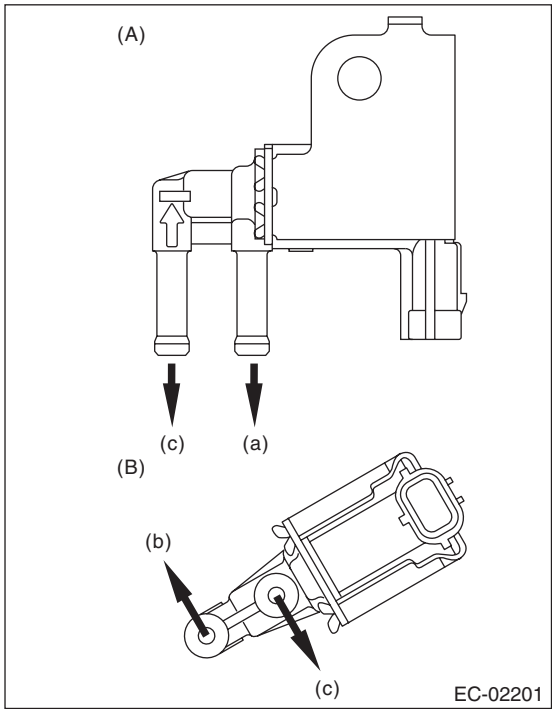
2. PURGE CONTROL SOLENOID VALVE 2

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

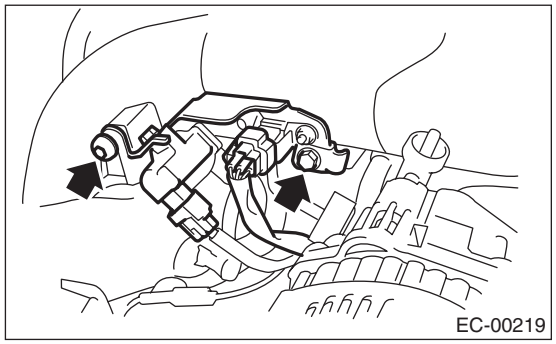


NOTE:
Connect the evaporation hose as shown in the figure.



(A) Purge Control Solenoid Valve 1
(B) Purge Control Solenoid Valve 2
(a) To intake manifold
(b) To intake duct
(c) To fuel pipe

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

6. Fuel Level Sensor

A: REMOVAL

For removal procedure, refer to “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-62, REMOVAL, Fuel Level Sensor.>

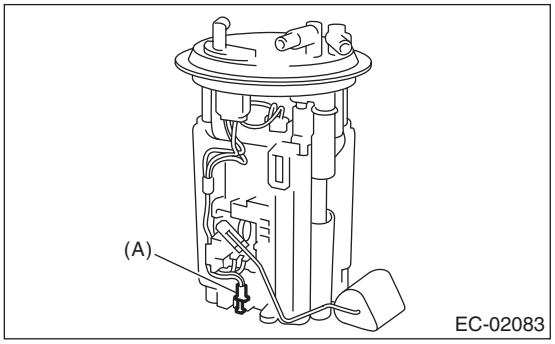
B: INSTALLATION

For installation procedure, refer to “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-62, INSTALLATION, Fuel Level Sensor.>

7. Fuel Temperature Sensor

A: REMOVAL

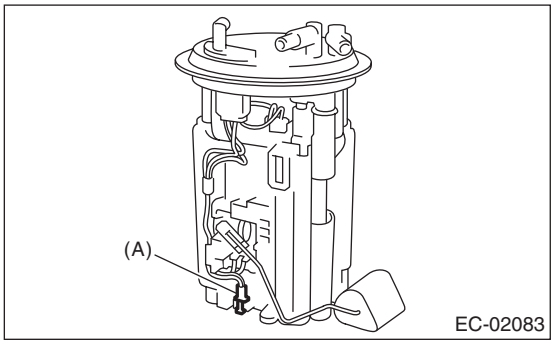
The fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, refer to “Fuel Level Sensor” for removal procedure. <Ref. to FU(H4DOTC)-62, REMOVAL, Fuel Level Sensor.>



(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)-62, INSTALLATION, Fuel Level Sensor.>



(A) Fuel temperature sensor

8. Fuel Sub Level Sensor

A: REMOVAL

For removal procedure, refer to “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-63, REMOVAL, Fuel Sub Level Sensor.>

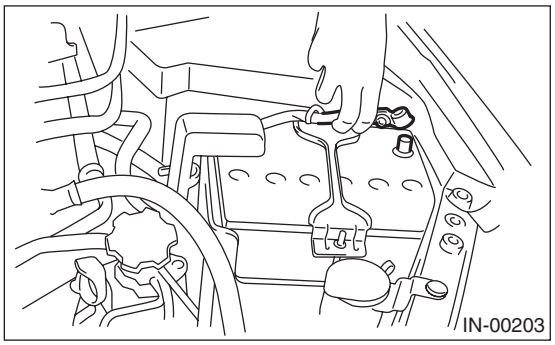
B: INSTALLATION

For installation procedure, refer to “FU(F4DOTC)” section. <Ref. to FU(H4DOTC)-64, INSTALLATION, Fuel Sub Level Sensor.>

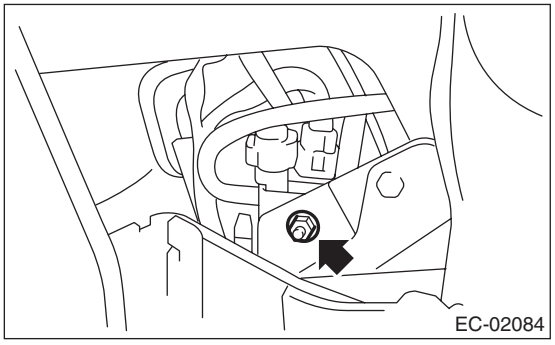
9. Fuel Tank Pressure Sensor

A: REMOVAL

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



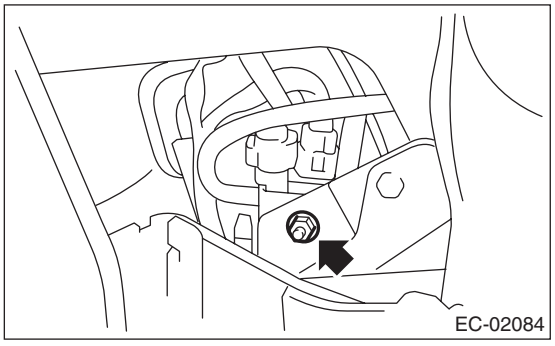
3) Open the fuel flap lid, and remove the fuel filler cap.
4) Lift up the vehicle.
5) Disconnect the connector from the fuel tank pressure sensor.
6) Disconnect the pressure hose from the fuel tank pressure sensor.
7) Remove the fuel tank pressure sensor along with the bracket.



B: INSTALLATION

Install in the reverse order of removal.

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



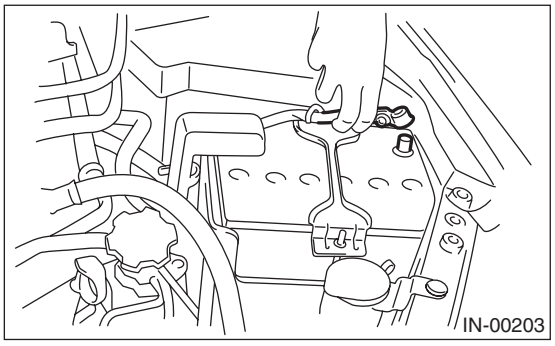
C: INSPECTION

Make sure the hoses are not cracked or loose.

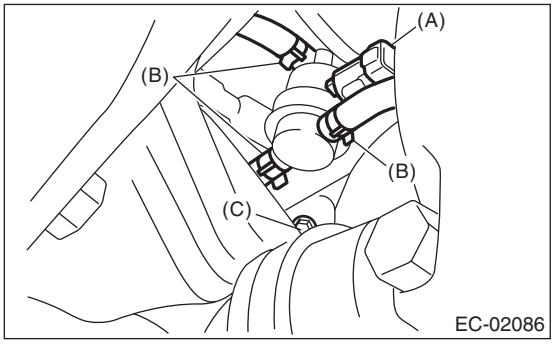
10.Pressure Control Solenoid Valve

A: REMOVAL

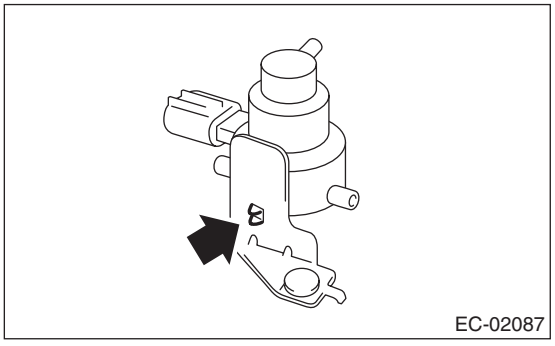
1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.



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.

11.Drain Filter

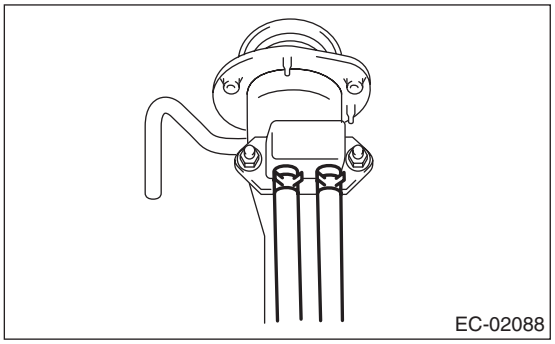
A: SPECIFICATION

Canister is a non-disassembled part, so do not remove the drain filter from canister. Refer to “Canister” for removal and installation procedure. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.> <Ref. to EC(H4DOTC)-7, INSTALLATION, Canister.>

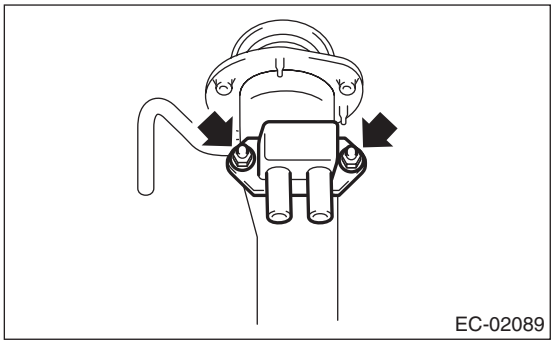
12.Shut Valve

A: REMOVAL

1) Remove the fuel filler pipe.<Ref. to FU(H4DOTC)-57, REMOVAL, Fuel Filler Pipe.>
2) Disconnect the evaporation hose from the shut valve.



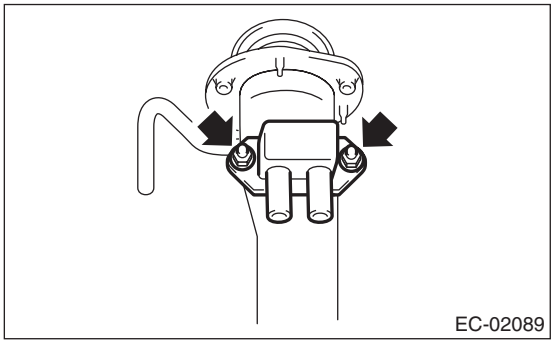
3) Remove the shut valve from the fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

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



C: INSPECTION

Make sure the hoses are not cracked or loose.

13.Drain Valve

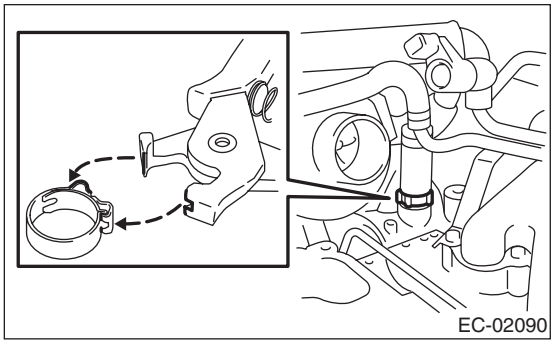
A: SPECIFICATION

Canister is a non-disassembled part, so do not remove the drain valve from canister.
Refer to “Canister” for removal and installation procedure. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.> <Ref. to EC(H4DOTC)-7, INSTALLATION, Canister.>

14.PCV Hose Assembly

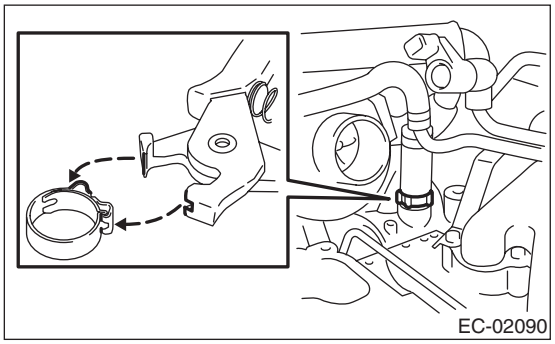
A: REMOVAL

CAUTION:
Do not remove unless the PCV hose, diagnostics connector and PCV valve are damaged.
1) Remove the intake manifold.<Ref. to FU(H4DOTC)-13, 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:
Use a new clamp.
1) Install the PCV hose assembly, then lock by fitting the ST on the clamp protrusion.
ST 18353AA000 CLAMP PLIERS

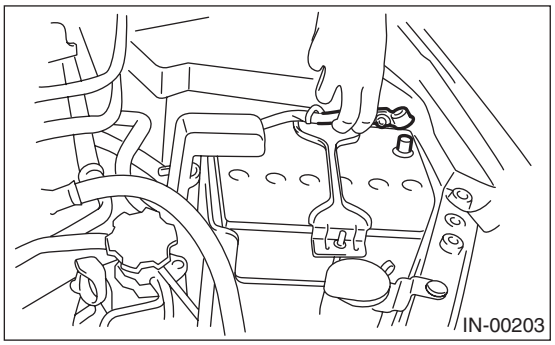


2) Install the intake manifold.<Ref. to FU(H4DOTC)-16, INSTALLATION, Intake Manifold.>

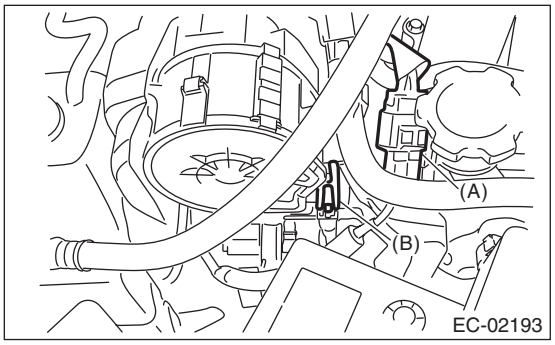
15.Secondary Air Pump

A: REMOVAL

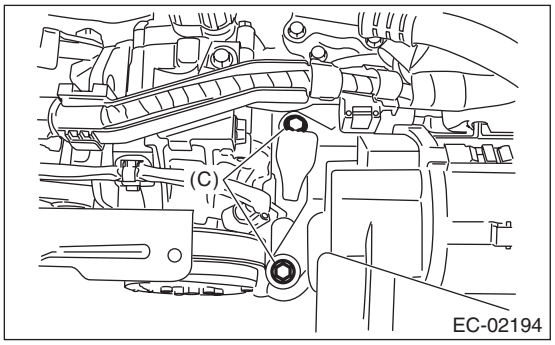
1) Remove the collector cover.
2) Disconnect the ground cable from the battery.



3) Disconnect the connector (A) from secondary air pump, and remove the harness.
4) Disconnect the hose (B) from secondary air pump.



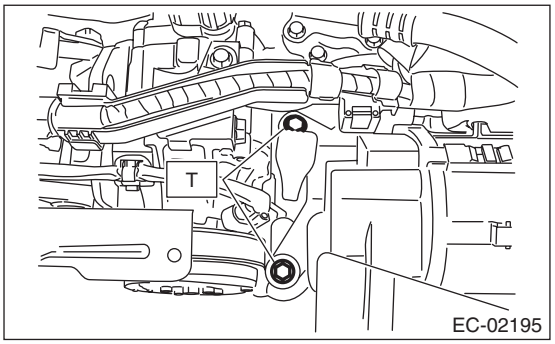
5) Remove the bolt (C) which secures the secondary air pump to the body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



C: INSPECTION

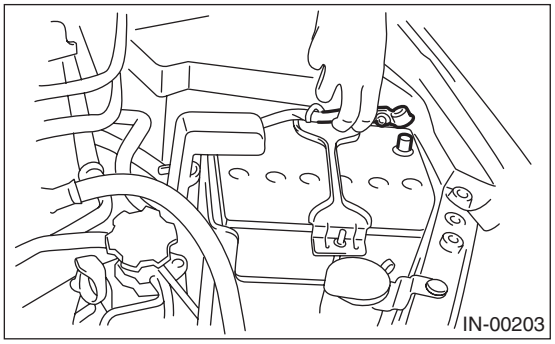
Make sure the hoses are not cracked or loose.

16.Secondary Air Combi Valve

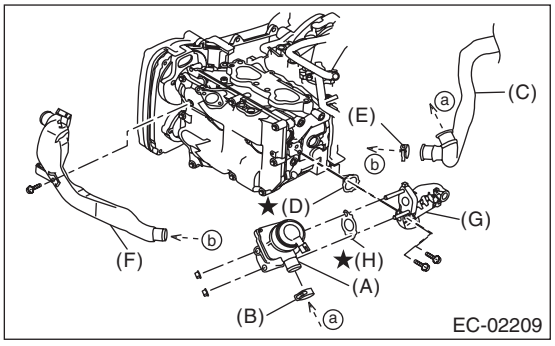
A: REMOVAL

1. SECONDARY AIR COMBINATION VALVE LH

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



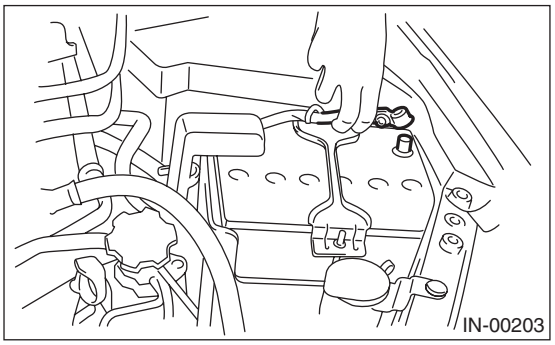
3) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
4) Disconnect the connector from the secondary air combination valve LH.
5) Disconnect the air duct A.
6) Remove the secondary air pipe LH.
7) Remove the secondary air combination valve LH.



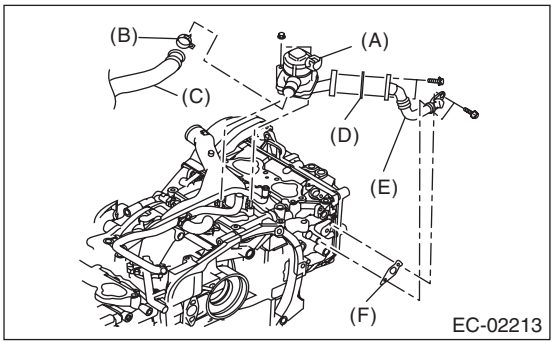
(A) Secondary air combination valve LH
(B) Clamp
(C) Air duct A
(D) Gasket
(E) Clamp
(F) Air duct B
(G) Secondary air pipe LH
(H) Gasket

2. SECONDARY AIR COMBINATION VALVE RH

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



3) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
4) Remove the intake manifold. <Ref. to FU(H4DOTC)-13, REMOVAL, Intake Manifold.>
5) Disconnect the connector from the secondary air combination valve RH.
6) Disconnect the air duct A.
7) Remove the secondary air pipe RH.
8) Remove the secondary air combination valve RH.



(A) Secondary air combination valve RH
(B) Clamp
(C) Air duct A
(D) Gasket
(E) Secondary air pipe RH
(F) Gasket

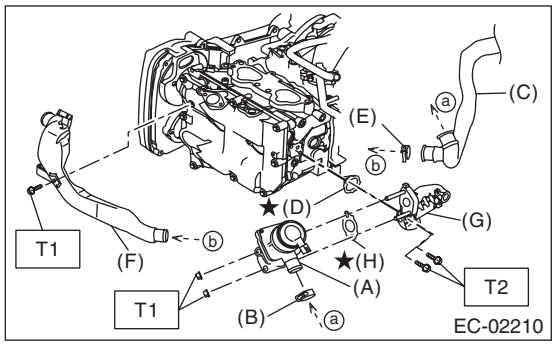
B: INSTALLATION

1. SECONDARY AIR COMBINATION VALVE LH

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
T1: 9 N·m (0.9 kgf-m, 6.6 ft-lb)
T2: 19 N·m (1.9 kgf-m, 14 ft-lb)



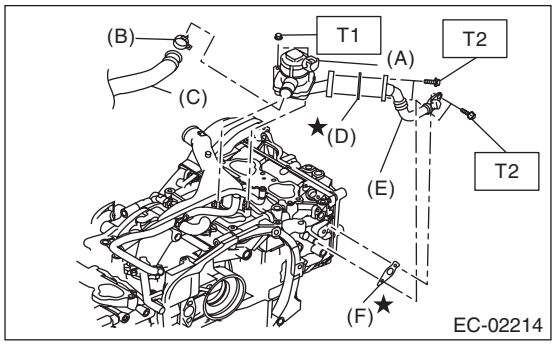
(A) Secondary air combination valve LH
(B) Clamp
(C) Air duct A
(D) Gasket
(E) Clamp
(F) Air duct B
(G) Secondary air pipe LH
(H) Gasket

2. SECONDARY AIR COMBINATION VALVE RH

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
T1: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
T2: 9 N·m (0.9 kgf-m, 6.6 ft-lb)



(A) Secondary air combination valve RH
(B) Clamp
(C) Air duct A
(D) Gasket
(E) Secondary air pipe RH
(F) Gasket

C: INSPECTION

Check the air duct and pipe for looseness.

INTAKE (INDUCTION)

IN(H4DOTC)

Page

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 14
9. Air By-pass Valve 17

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)-69, 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)-380, 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 run the Subaru Select Monitor or general scan tool. 4) Read the DTC on Subaru Select Monitor or general scan tool.	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-81, 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)-60, Malfunction Indicator Light.>
4	**PERFORM DIAGNOSIS.** 1) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to EN(H4DOTC)(diag)-45, 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)-89, 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 illuminates.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators illuminate. ❑ Yes / ❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostic indicator light ❑ ABS warning light ❑ Oil pressure indicator light
b) Fuel level
• Lack of gasoline: ❑ Yes / ❑ No • Indicator position of fuel gauge: • Experienced running out of fuel: ❑ Yes / ❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes / ❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes / ❑ No
• What:
e) Installing of parts other than genuine parts: ❑ Yes / ❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes / ❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes / ❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes / ❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ Does not shift. ❑ Excessive shift shock

3. General Description

A: CAUTION

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

CAUTION:
• All 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. Failure to do so will damage the ECM instantly, and the fuel injector and other parts will also be damaged.

3) Do not disconnect the battery terminals while the engine is running. A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM etc.

4) Before disconnecting the connectors of each sensor and ECM, be sure to turn the ignition switch to OFF. Perform the Clear Memory Mode after connecting the connectors. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.>

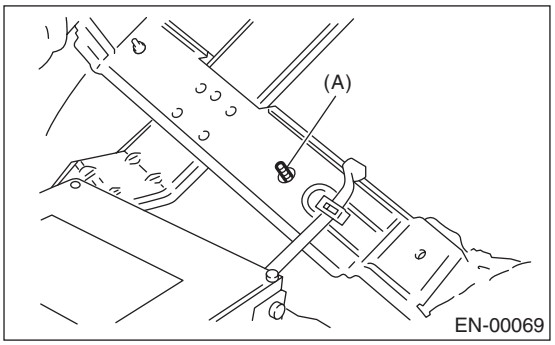
5) Measure the voltage or resistance of individual sensor or all electrical control modules using a tapered pin with a diameter of less than 0.6 mm (0.024 in). Do not insert the pin 4 mm (0.16 in) or more into the part.

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

NOTE:
When replacing the ECM of the models with Immobilizer, immobilizer system must be registered. To do so, all ignition keys and ID cards need to be prepared. Refer to the “IMMOBILIZER TEACHING OPERATION MANUAL”.

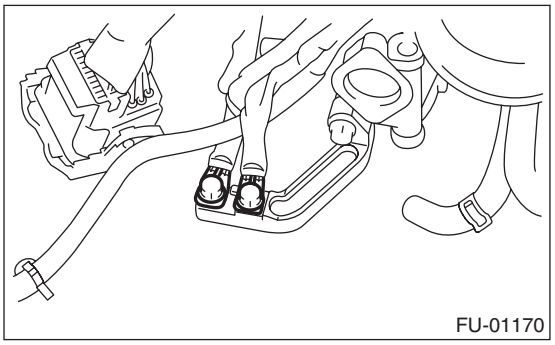
6) Connectors of each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. Even if the connectors are waterproof, take care not to allow water to get into them when washing the vehicle, or when servicing the vehicle in rainy weather.

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



(A) Stud bolt

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



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

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

CAUTION:
• The antenna must be placed as far apart as possible from ECM.
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items mentioned above.
• Incorrect installation of the radio may affect the operation of ECM.

11) Before disconnecting the fuel hoses, disconnect the fuel pump connector and crank the engine for 5 seconds or more to release the pressure of fuel system. If engine starts during this operation, run it until it stops.

12) For the model with ABS, the ABS warning light may illuminate when performing driving test with jacked-up or lifted-up condition, but this is not a system malfunction. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clear procedure of self-diagnosis function.

B: INSPECTION

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

1. BATTERY

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

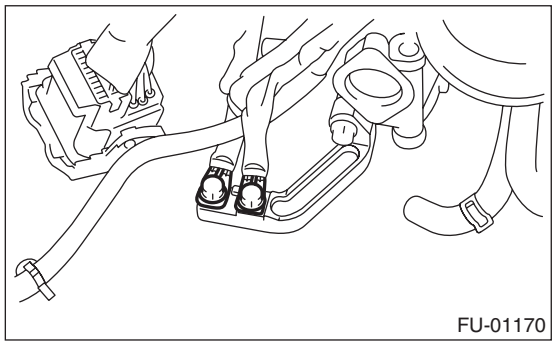
Standard voltage: 12 V

Specific gravity: 1.260 or more

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

2. ENGINE GROUND

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



C: NOTE

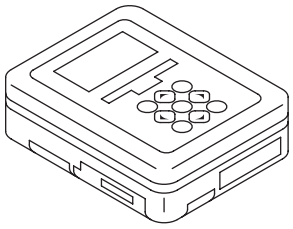
1. GENERAL DESCRIPTION

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

2. ENGINE AND EMISSION CONTROL SYSTEM

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

D: PREPARATION TOOL

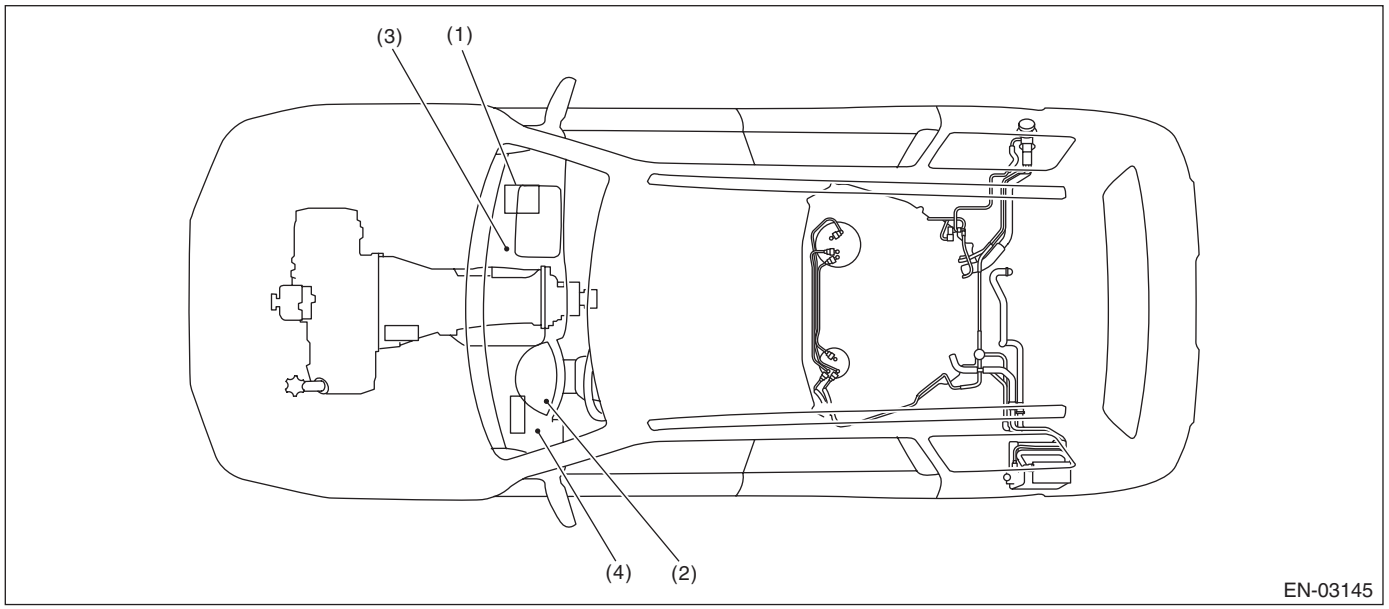
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting the electrical system.

4. Electrical Component Location

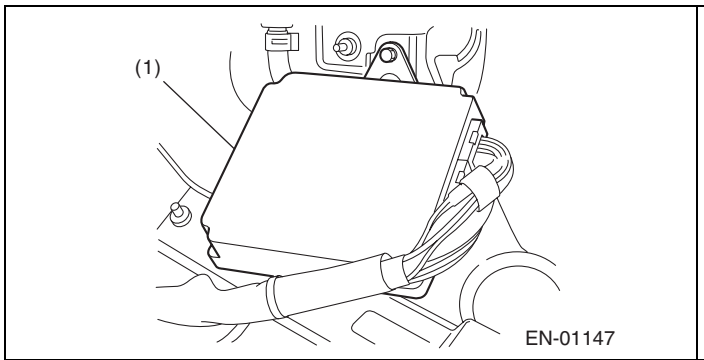
A: LOCATION

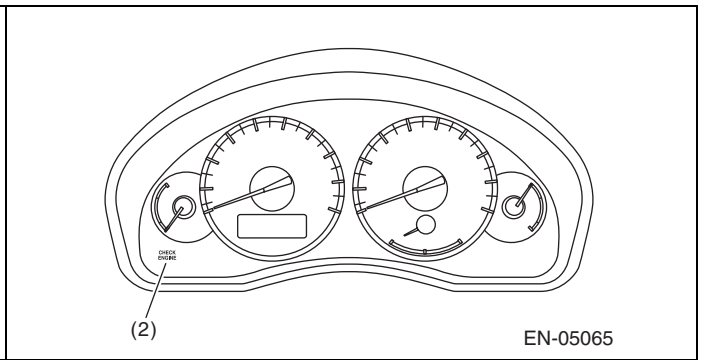
1. ENGINE

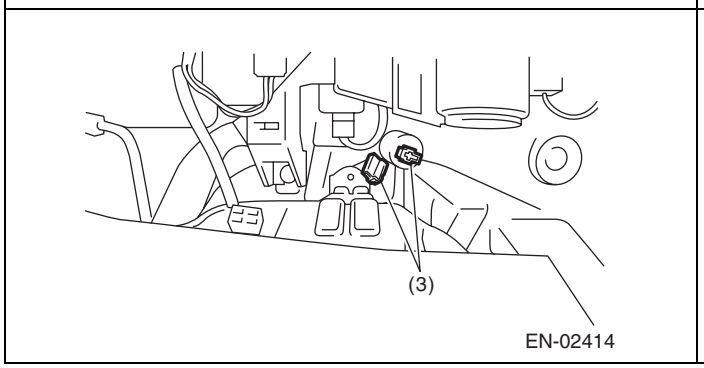
- Control module

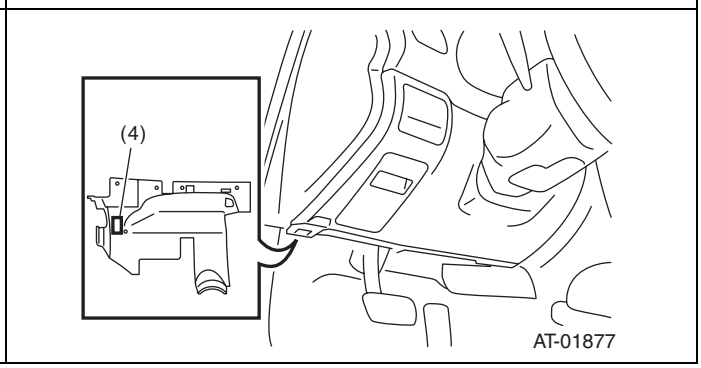


(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Test mode connector
(4) Data link connector

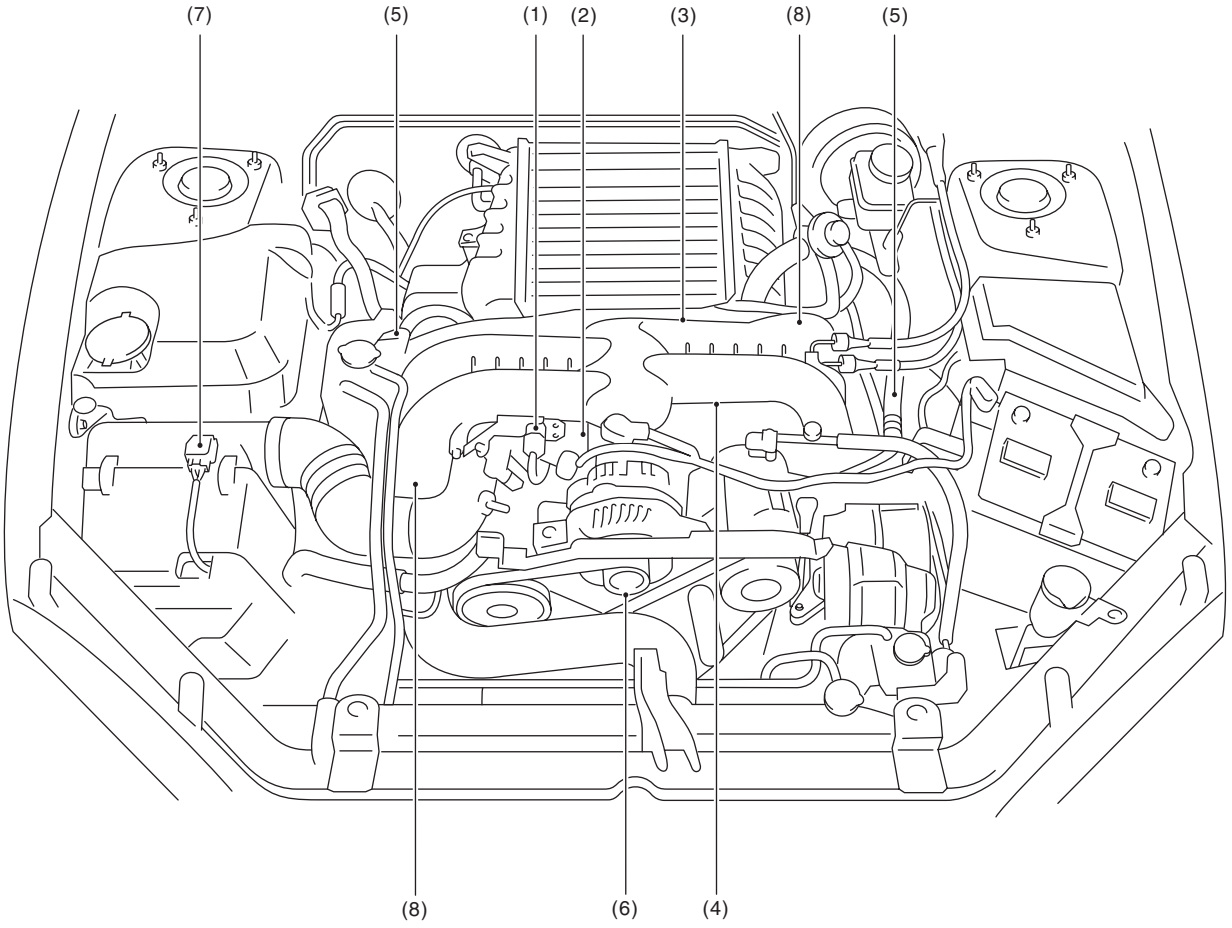




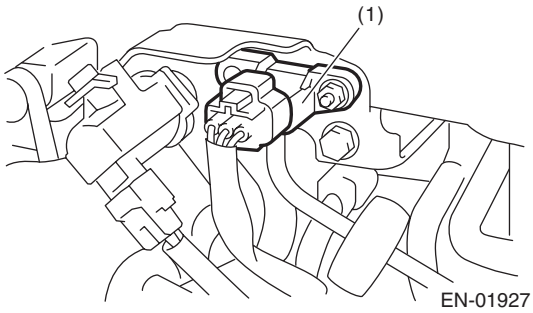


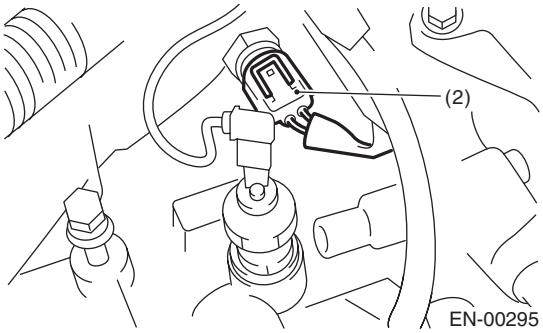


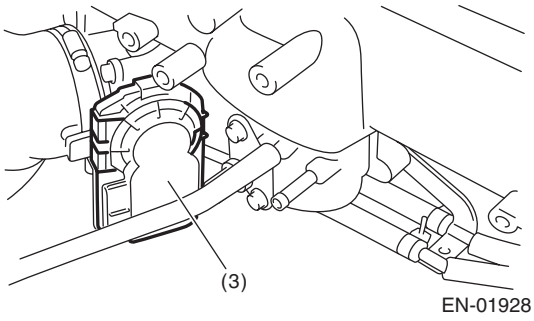
- Sensor

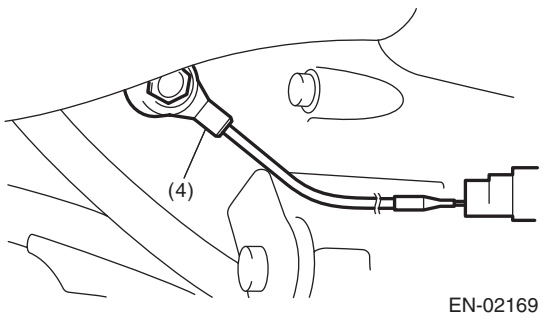


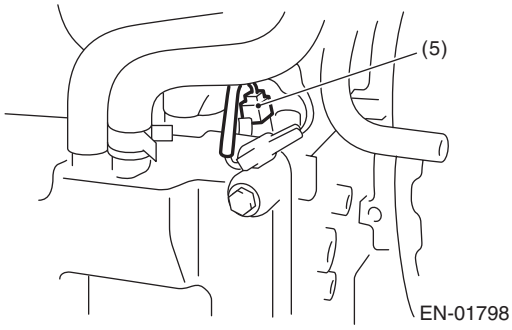
(1) Manifold absolute pressure sensor
(2) Engine coolant temperature sensor
(3) Electronic throttle control
(4) Knock sensor
(5) Intake camshaft position sensor
(6) Crankshaft position sensor
(7) Mass air flow and intake air temperature sensor
(8) Tumble generator valve ASSY

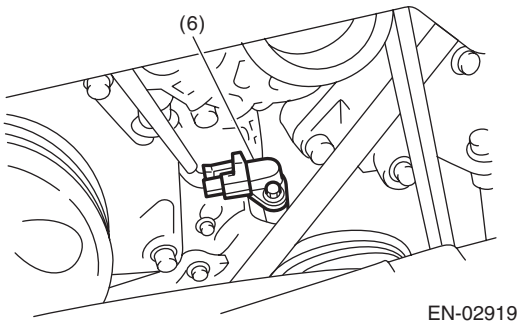

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EN-01927

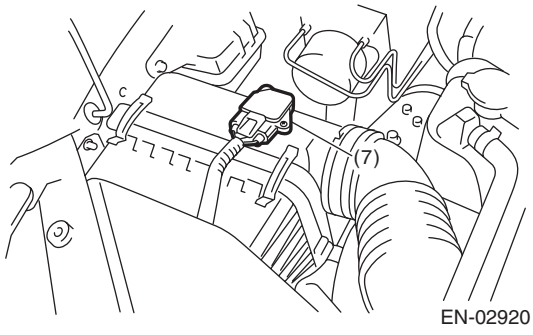

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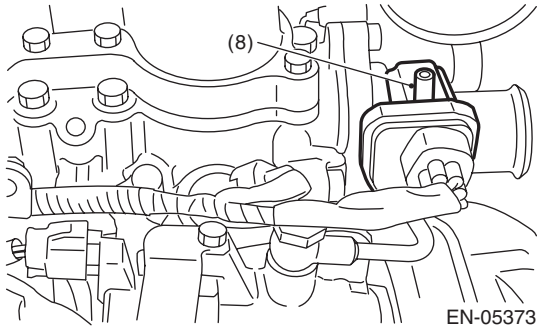

(3)
EN-01928

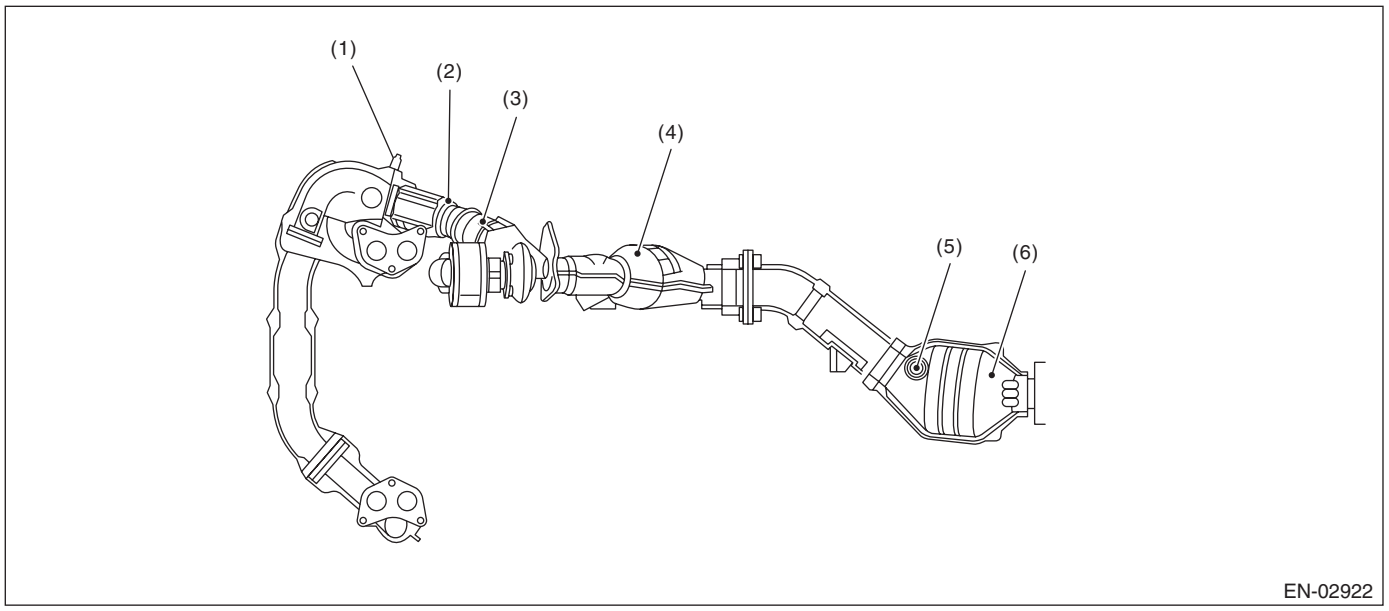

(4)
EN-02169


(5)
EN-01798

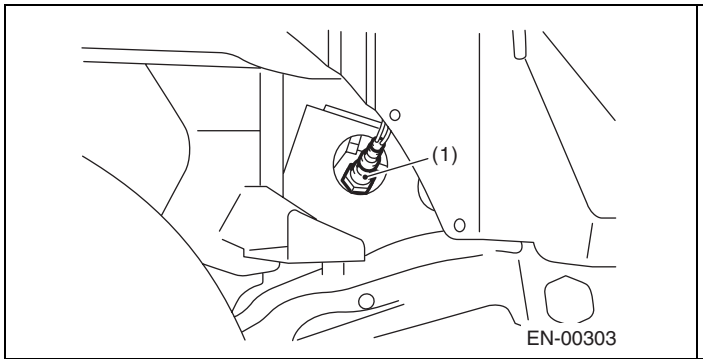

(6)
EN-02919

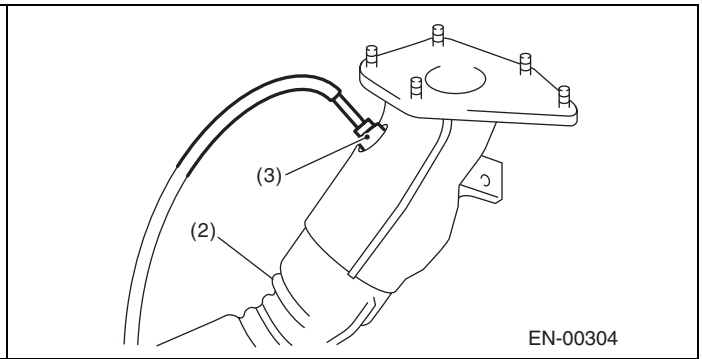

(7)
EN-02920

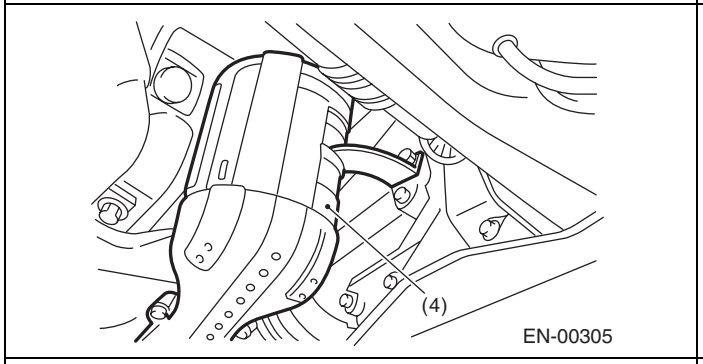

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EN-05373

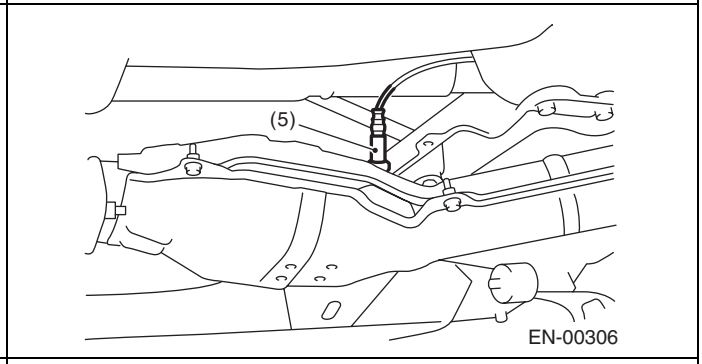


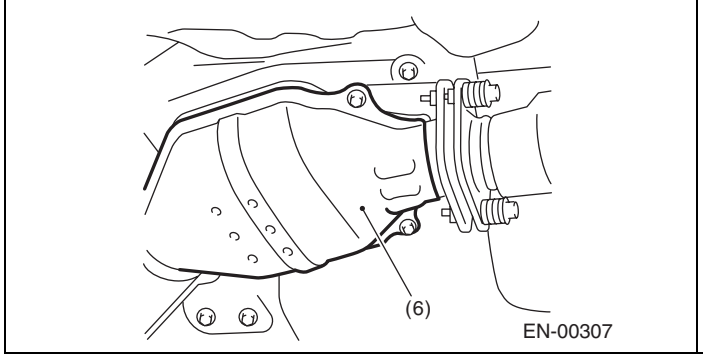
(1) Front oxygen (A/F) sensor
(2) Precatalytic converter
(3) Exhaust temperature sensor
(4) Front catalytic converter
(5) Rear oxygen sensor
(6) Rear catalytic converter

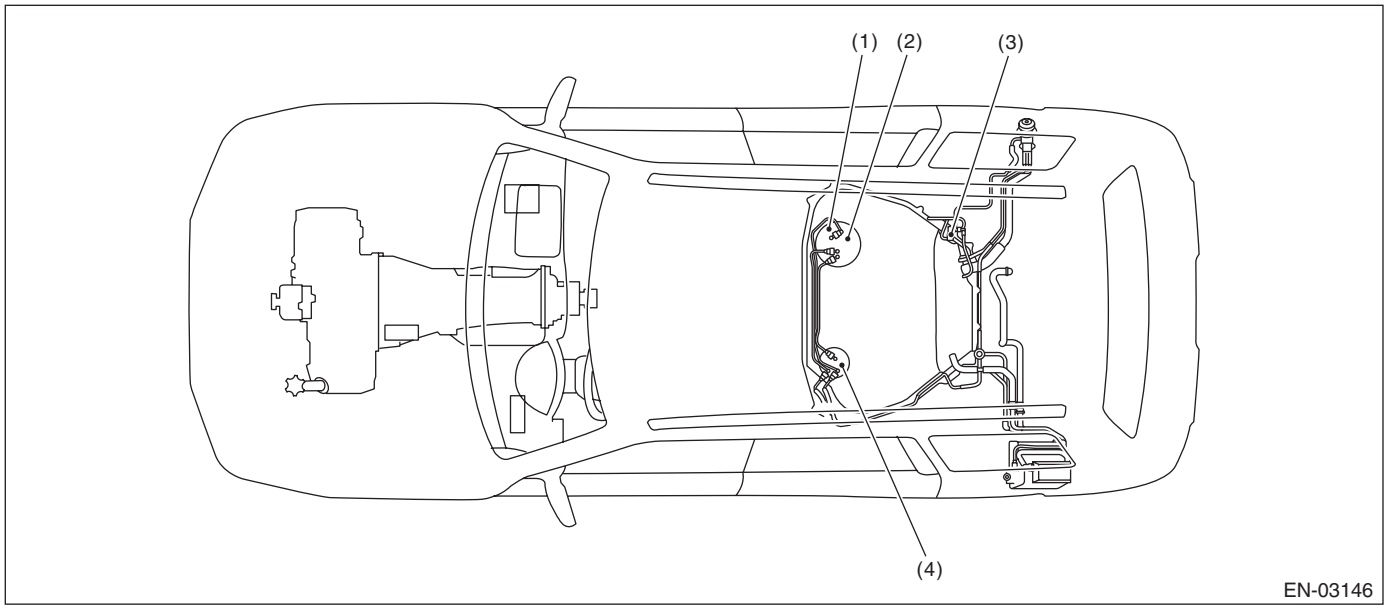




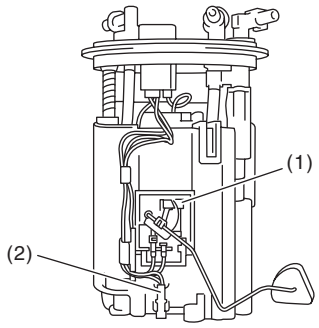


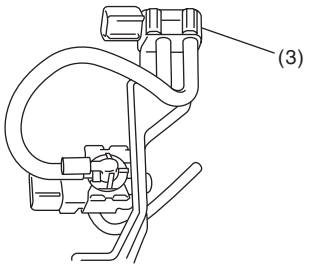


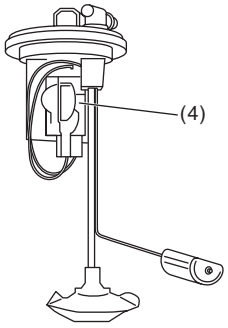




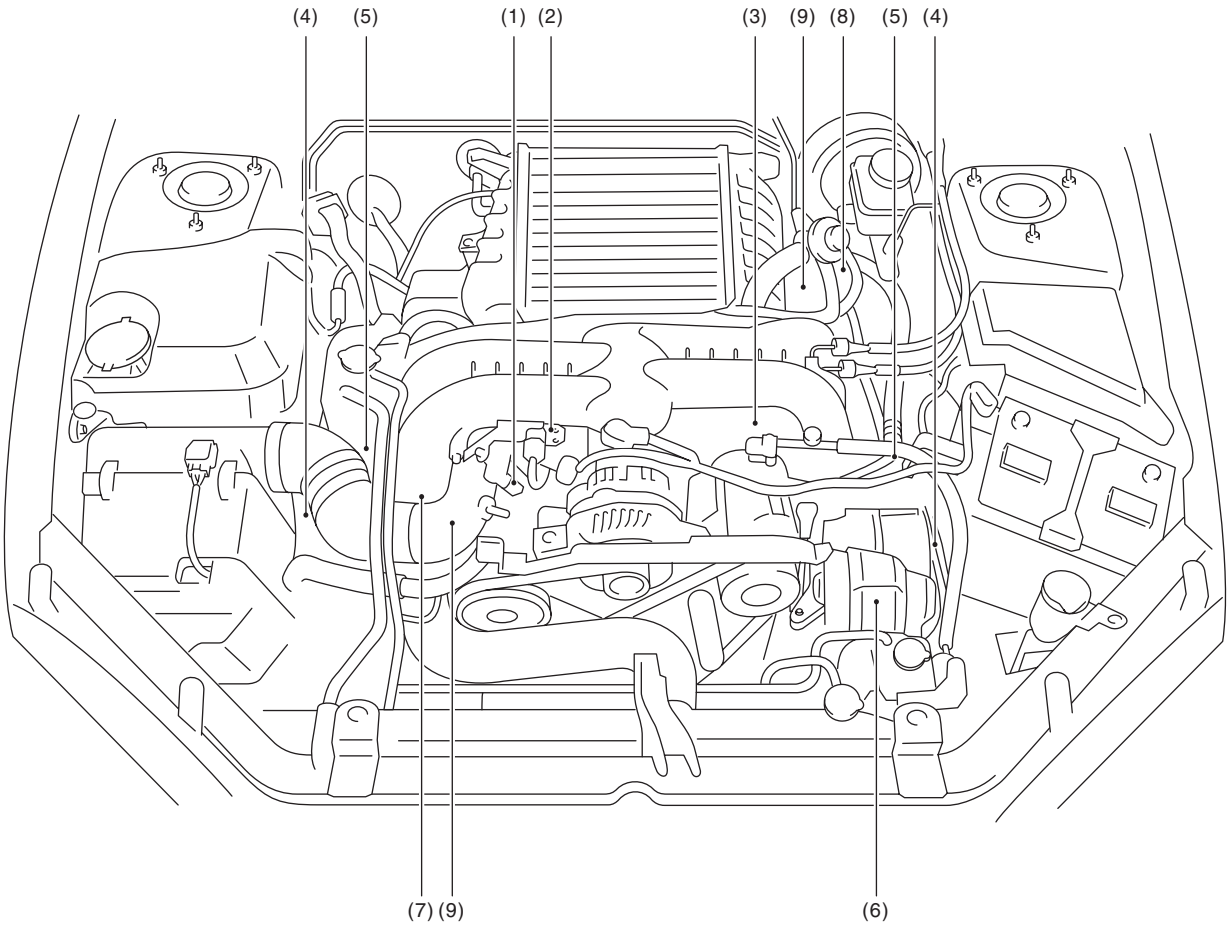
(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor



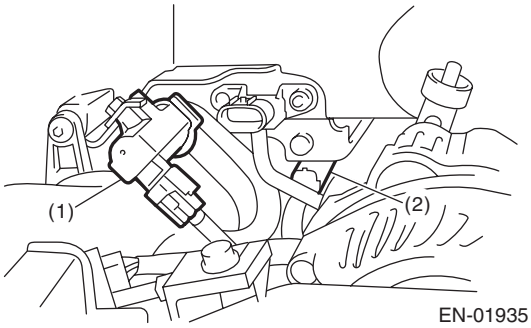




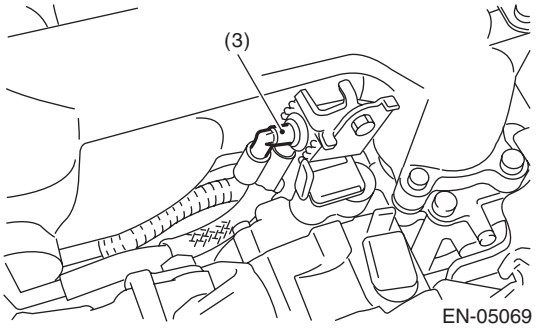
- Solenoid valve, actuator, emission control system parts and ignition system parts



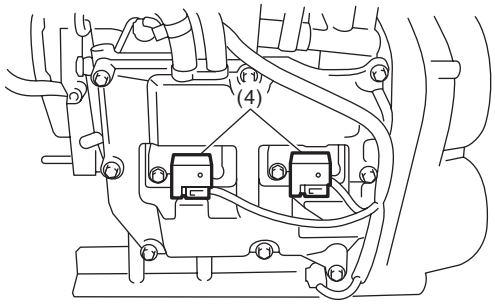
(1) Wastegate control solenoid valve
(2) Purge control solenoid valve 1
(3) Purge control solenoid valve 2
(4) Ignition coil
(5) Intake oil flow control solenoid valve
(6) Secondary air pump
(7) Secondary air combination valve RH
(8) Secondary air combination valve LH
(9) Tumble generator valve ASSY



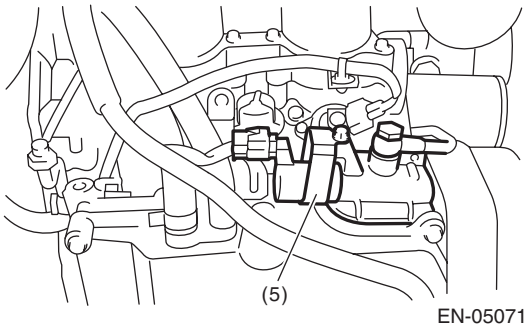
EN-01935



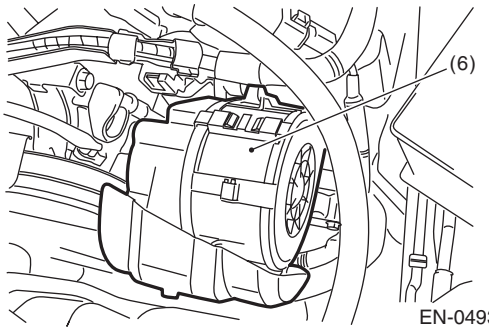
EN-05069



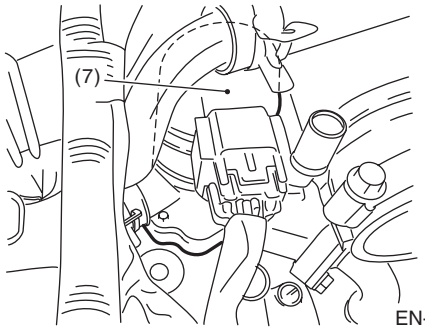
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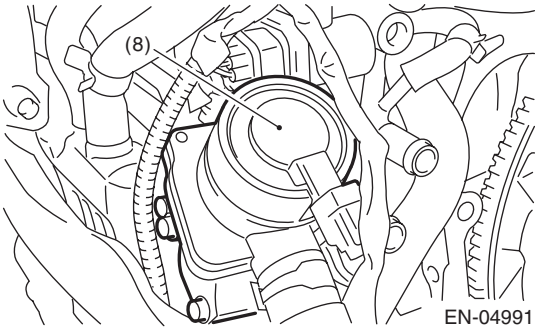
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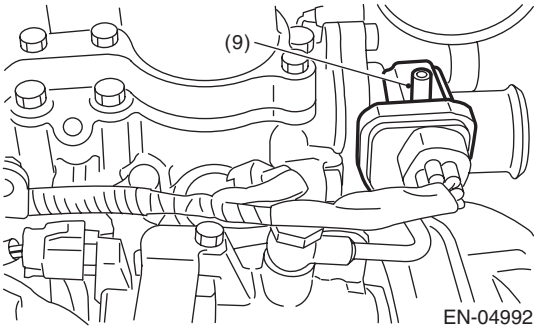
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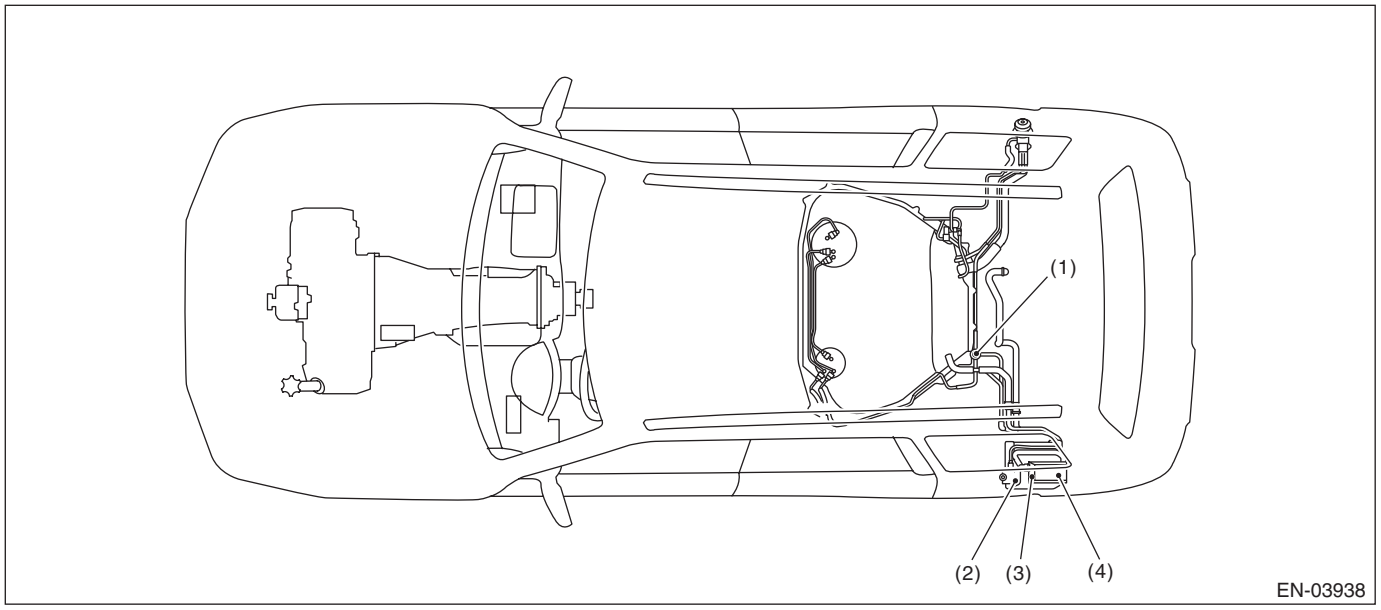
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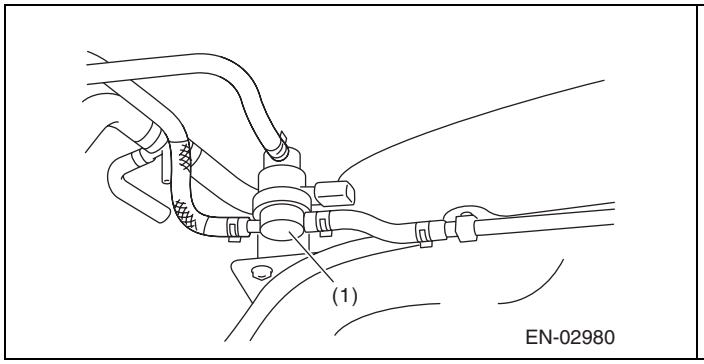
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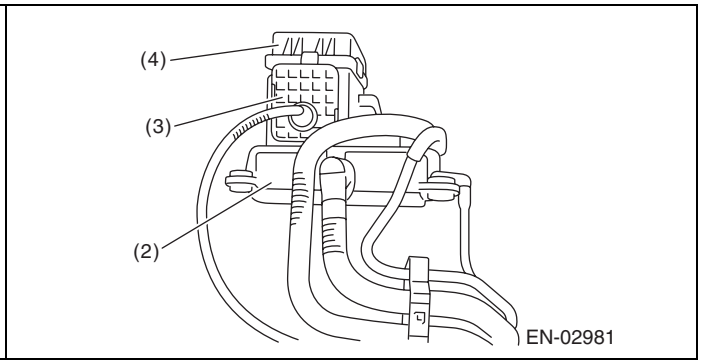


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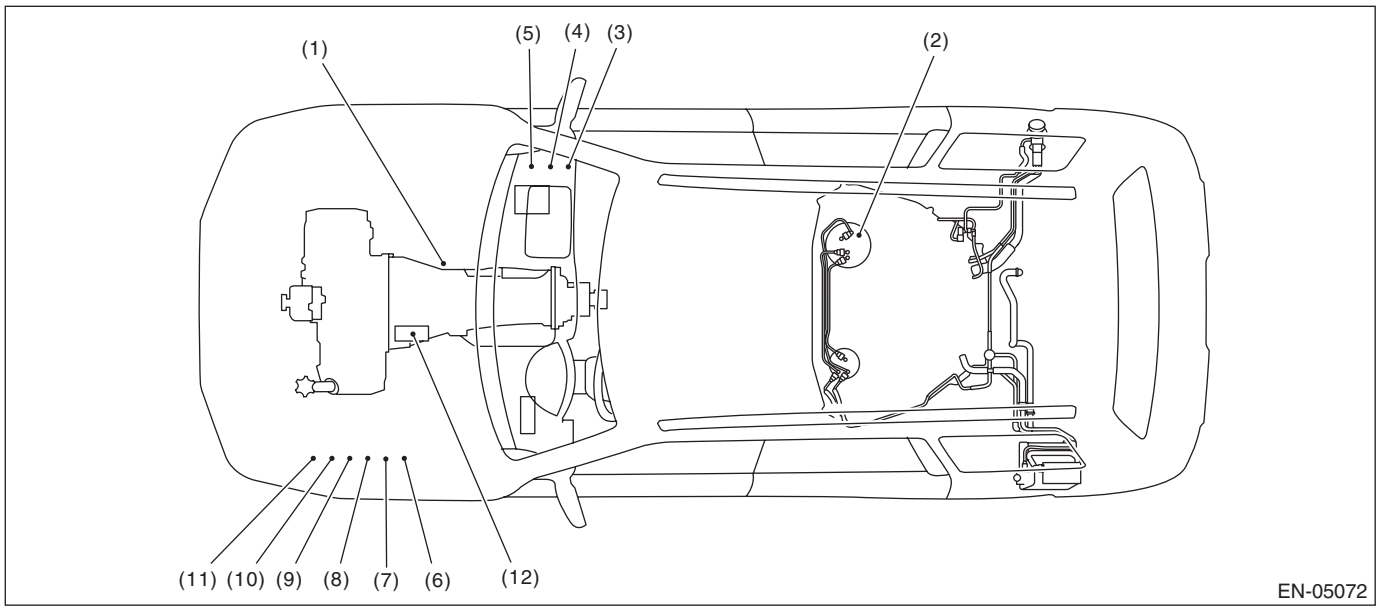


(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter

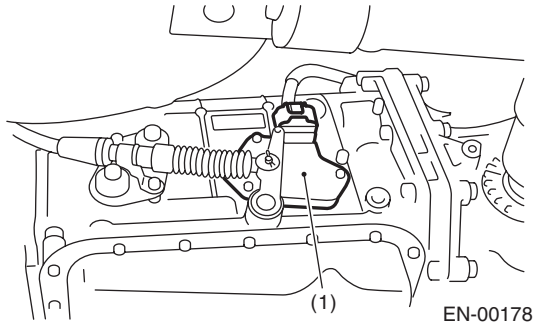




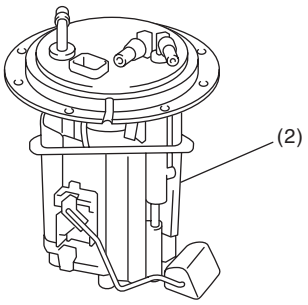
Electrical Component Location



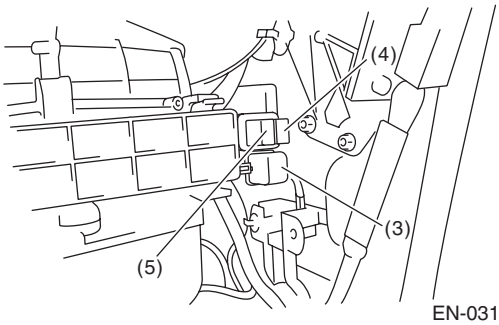
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Electronic throttle control relay
(6) Radiator main fan relay 1
(7) Radiator sub fan relay
(8) Radiator main fan relay 2
(9) Secondary air combination valve relay 1
(10) Secondary air combination valve relay 2
(11) Secondary air pump relay
(12) Starter



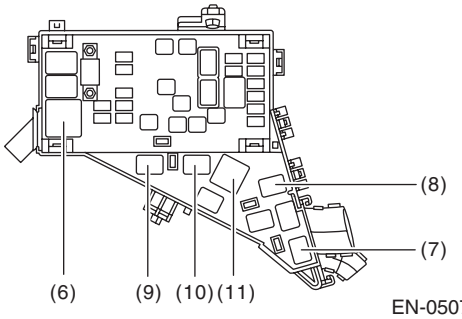
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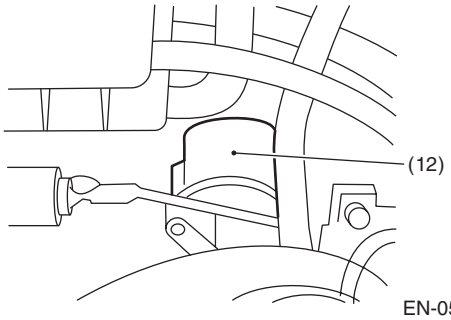
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EN-03150



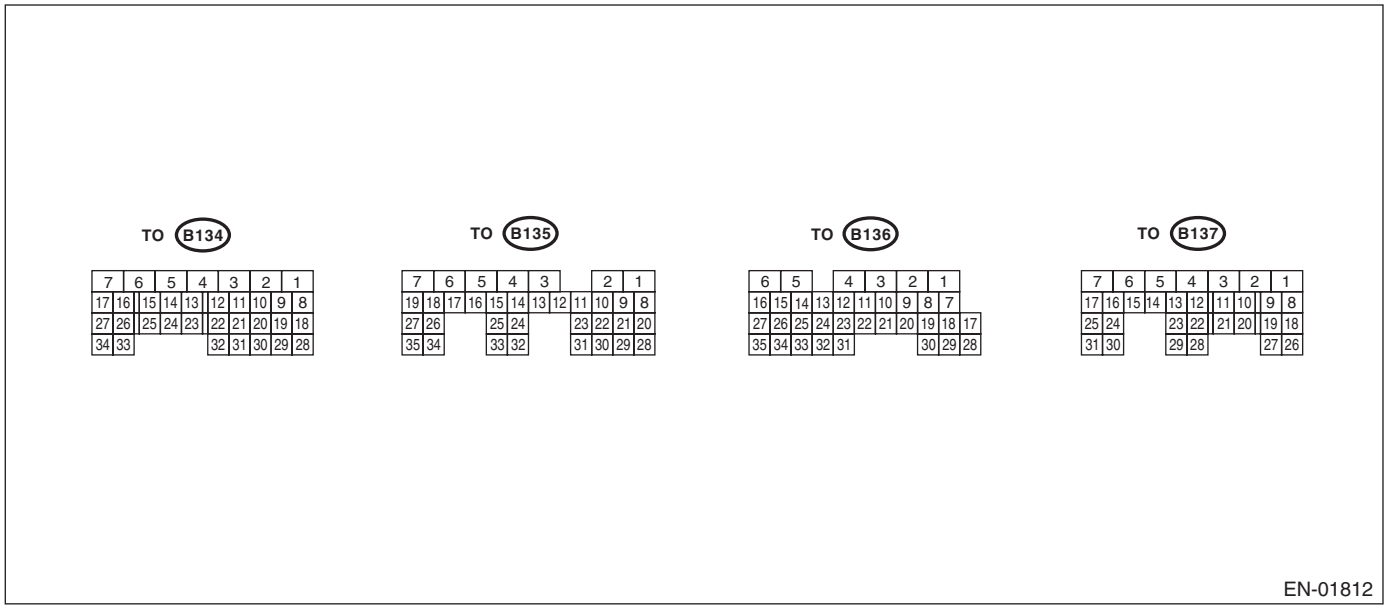
EN-05073



EN-05074

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

A: ELECTRICAL SPECIFICATION



Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B134	13	0	–7 — +7	Waveform
	Signal (–)	B134	14	0	0	—
	Shield	B134	24	0	0	—
Rear oxygen sensor	Signal	B135	4	0	0 — 0.9	—
	Shield	B135	1	0	0	—
	GND(sensor)	B135	30	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B136	3	—	—	Waveform
	Signal 2	B136	2	—	—	Waveform
Rear oxygen sensor heater signal		B136	4	0 — 13	12 — 14	Waveform
Engine coolant temperature sensor	Signal	B134	34	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
	GND (sensor)	B134	29	0	0	After engine is warmed-up.
Air flow sensor	Signal	B135	26	—	0.3 — 4.5	—
	Shield	B135	35	0	0	—
	GND	B135	34	0	0	—
Intake air temperature sensor signal		B135	18	0.3 — 4.6	0.3 — 4.6	—
Wastegate control solenoid valve		B137	27	0 or 10 — 13	0 or 12 — 14	Waveform
Starter switch		B136	32	0	0	Cranking: 8 — 14
A/C switch		B136	24	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Ignition switch		B135	19	10 — 13	12 — 14	—
Neutral position switch (AT / MT)		B136	31	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Test mode connector		B135	27	10 — 13	13 — 14	When connected: 0

Engine Control Module (ECM) I/O Signal

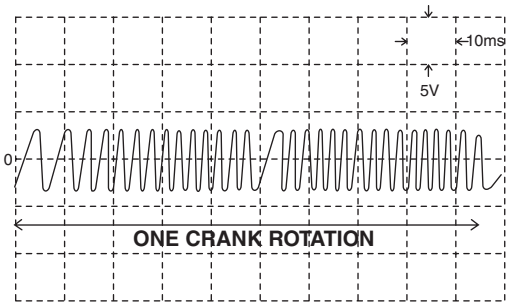
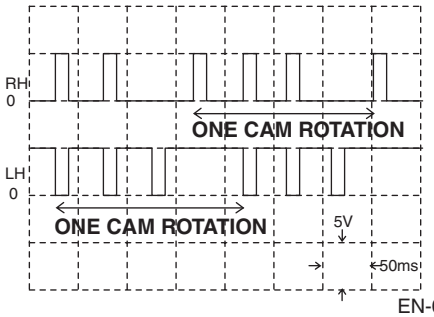
Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Knock sensor	Signal	B134	15	2.8	2.8	—
	Shield	B134	25	0	0	—
Back-up power supply		B135	5	10 — 13	12 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B134	7	10 — 13	12 — 14	—
		B135	2	10 — 13	12 — 14	—
Sensor power supply		B134	19	5	5	—
Ignition control	#1	B137	18	0	12 — 14	Waveform
	#2	B137	19	0	12 — 14	Waveform
	#3	B137	20	0	12 — 14	Waveform
	#4	B137	21	0	12 — 14	Waveform
Fuel injector	#1	B137	8	10 — 13	1 — 14	Waveform
	#2	B137	9	10 — 13	1 — 14	Waveform
	#3	B137	10	10 — 13	1 — 14	Waveform
	#4	B137	11	10 — 13	1 — 14	Waveform
Fuel pump control unit	Signal 1	B135	33	10 — 13	12 — 14	—
	Signal 2	B136	12	0 or 5	0 or 5	Waveform
A/C relay control		B136	9	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 1 control		B136	18	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 2 control		B136	29	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	Model with A/C only
Malfunction indicator light		B136	11	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B136	22	—	0 — 13 or more	Waveform
Purge control solenoid valve 1		B137	29	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Waveform
Purge control solenoid valve 2		B136	7	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Waveform
Manifold absolute pressure sensor	Signal	B134	6	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B134	19	5	5	
	GND (sensor)	B134	29	0	0	
Power steering oil pressure switch		B134	33	10 — 13	ON: 0 OFF: 12 — 14	—
Front oxygen (A/F) sensor signal (+)		B135	9	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (–)		B135	8	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B135	1	0	0	—
SSM communication line		B136	16	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—
Intake camshaft position sensor (LH)		B134	21	0 or 5	0 or 5	Waveform
Intake camshaft position sensor (RH)		B134	11	0 or 5	0 or 5	Waveform
Intake camshaft position sensor ground		B134	22	0	0	—

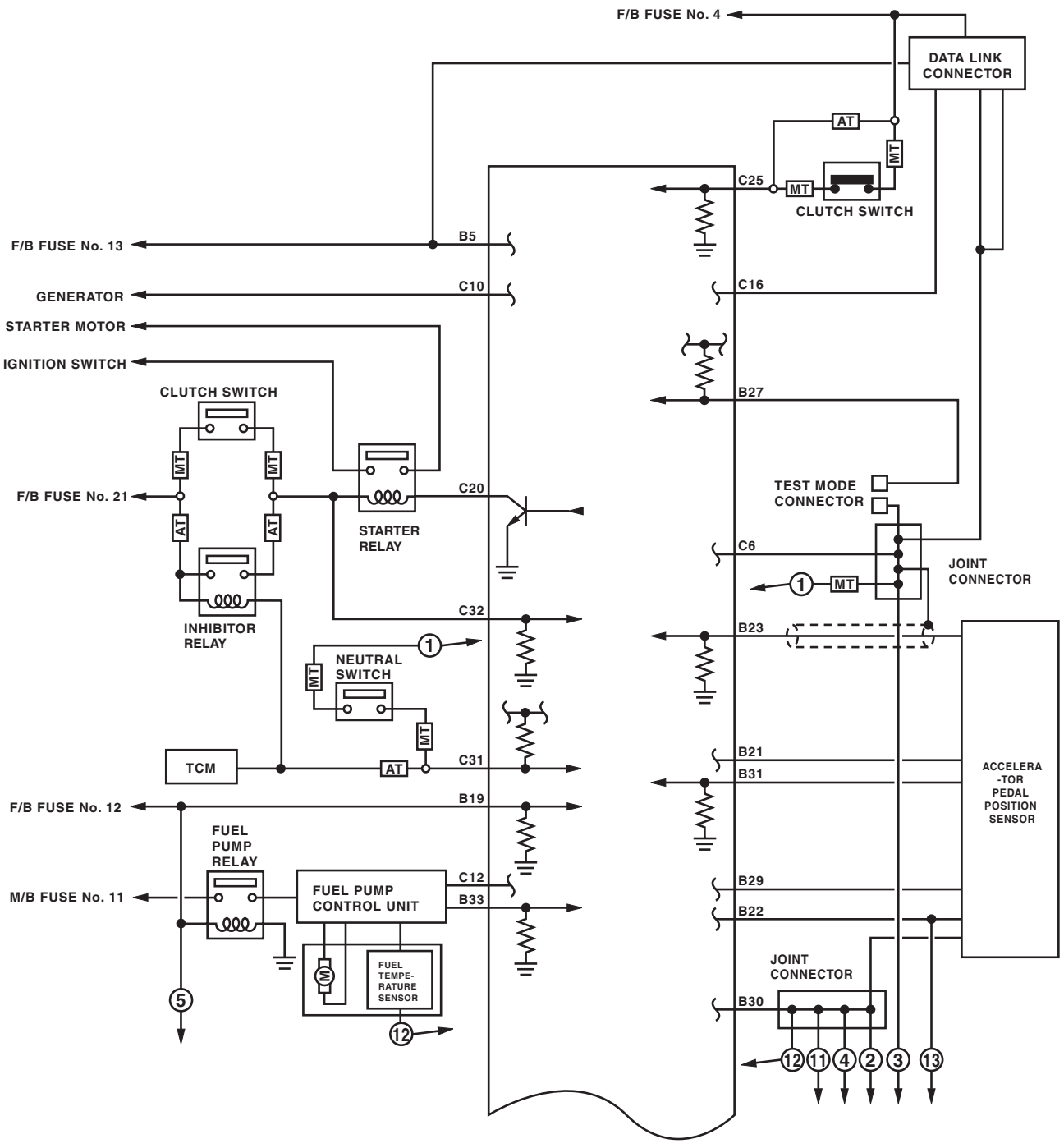
Engine Control Module (ECM) I/O Signal

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Electric throttle control	Main	B134	18	0.64 — 0.72 Fully opened: 3.96	0.64 — 0.72 (After engine is warmed-up.)	Fully closed: 0.6 Fully opened: 3.96
	Sub	B134	28	1.51 — 1.58 Fully opened: 4.17	1.51 — 1.58 (After engine is warmed-up.)	Fully closed: 1.48 Fully opened: 4.17
	Power supply	B134	19	5	5	—
	GND (sensor)	B134	29	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		B136	1	10 — 13	12 — 14	—
Electronic throttle control motor relay		B136	21	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	When ignition switch is turned to ON: ON
Intake AVCS solenoid (LH)	Signal (+)	B137	15	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B137	14	0	0	—
Intake AVCS solenoid (RH)	Signal (+)	B137	17	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B137	16	0	0	—
Accelerator pedal position sensor	Main sensor signal	B135	23	Fully closed: 1 Fully opened: 3.3	Fully closed: 1 Fully opened: 3.3	—
	Main power supply	B135	21	5	5	—
	GND (main sensor)	B135	29	0	0	—
	Shield	B136	6	0	0	—
	Sub sensor signal	B135	31	Fully closed: 1 Fully opened: 3.3	Fully closed: 1 Fully opened: 3.3	—
	Sub power supply	B135	22	5	5	—
	GND (sub sensor)	B135	30	0	0	—
Starter relay		B136	20	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	ON: cranking
A/C middle pressure switch		B136	33	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Clutch switch		B136	25	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		B135	20	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 12 — 14	—
Brake switch 2		B135	28	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 12 — 14 When brake pedal is released: 0	—

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Cruise control command switch		B135	24	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating cancel: 0 — 0.5	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating cancel: 0 — 0.5	—
Cruise control main switch		B135	12	ON: 0 OFF: 5	ON: 0 OFF: 5	—
Fuel tank pressure sensor		B135	32	2.3 — 2.7	2.3 — 2.7	—
Pressure control solenoid valve		B136	28	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Drain valve		B136	17	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Fuel temperature sensor		B135	17	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (77°F)
Immobilizer	Signal 1	B136	26	—	—	—
	Signal 2	B136	34	—	—	—
CAN communication (+)		B136	27	—	—	—
CAN communication (–)		B136	35	—	—	—
AT/MT identification		B136	15	0	0	—
Blow-by leak diagnosis signal		B134	30	0	0	At the time of open circuit (fault): 5
Tumble generator valve position sensor signal (RH)		B134	26	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	—
Tumble generator valve position sensor signal (LH)		B134	16	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	—
Tumble generator valve RH (closed)		B137	23	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve LH (closed)		B137	13	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve RH (open)		B137	22	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve LH (open)		B137	12	0 or 10 — 13	0 or 12 — 14	—
Secondary air pipe pressure sensor	Signal	B134	27	2.2 — 2.8	2.2 — 2.8	When secondary air is inducted: 3.2 — 4.9
	Power supply	B134	19	5.12	5.12	—
	GND (sensor)	B134	29	0	0	—
Secondary air combination valve relay 1		B136	30	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Secondary air combination valve relay 2		B136	19	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Secondary air pump relay		B136	8	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Self-shutoff control		B136	23	10 — 13	12 — 14	—

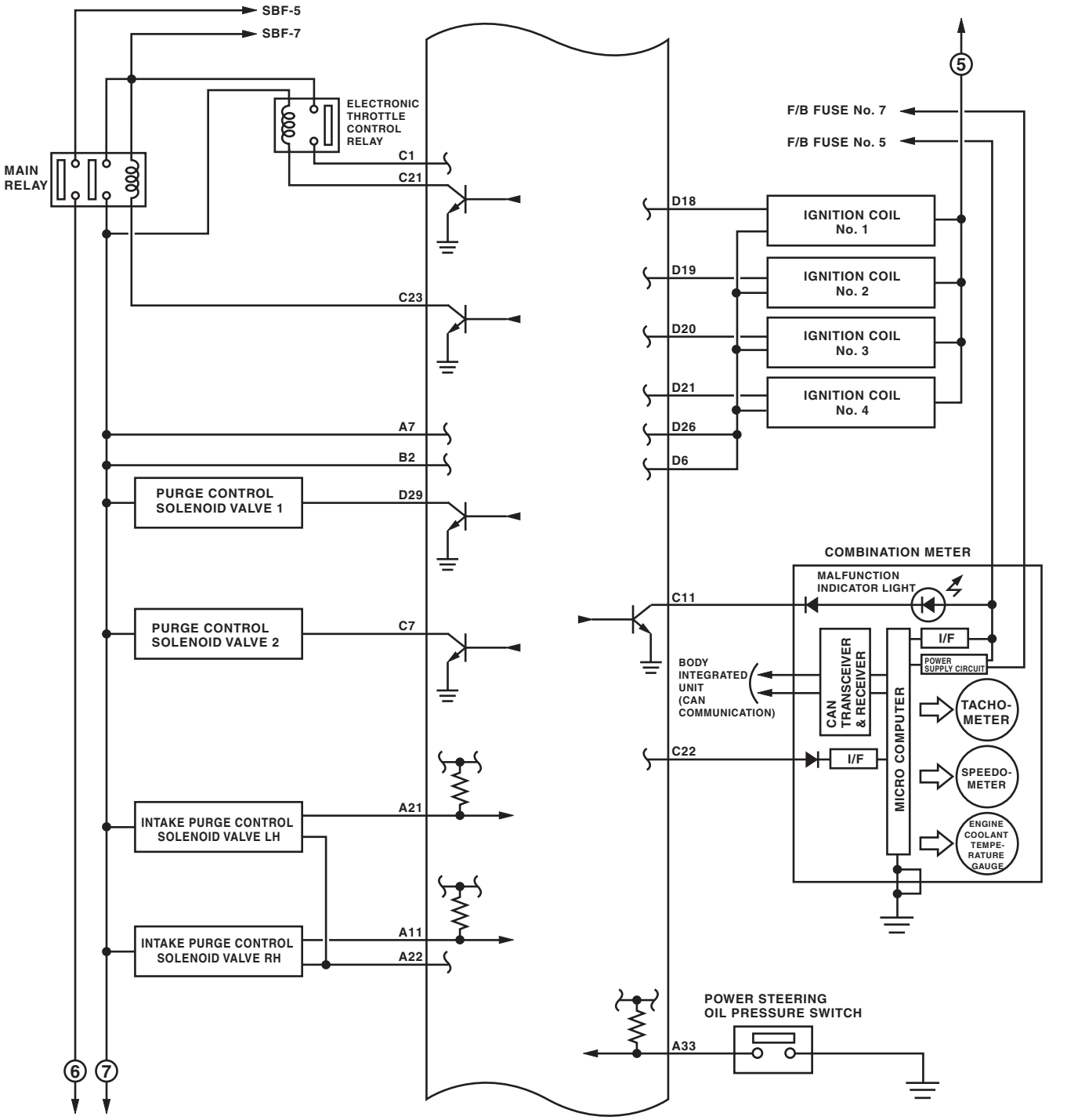
Contents	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (engine OFF)	Engine ON (idling)	
GND (ignition system)	B137	26	0	0	—
	B137	6	0	0	—
Ground (engine 1)	B134	5	0	0	—
Ground (engine 2)	B137	7	0	0	—
Ground (engine 3)	B137	2	0	0	—
Ground (engine 4)	B137	1	0	0	—
Ground (engine 5)	B137	3	0	0	—
Ground (body)	B136	6	0	0	—

Input/output name	Measuring condition	Waveform
1. Crankshaft position sensor	During idling	 EN-05322
2. Camshaft position sensor	During idling	 EN-05359

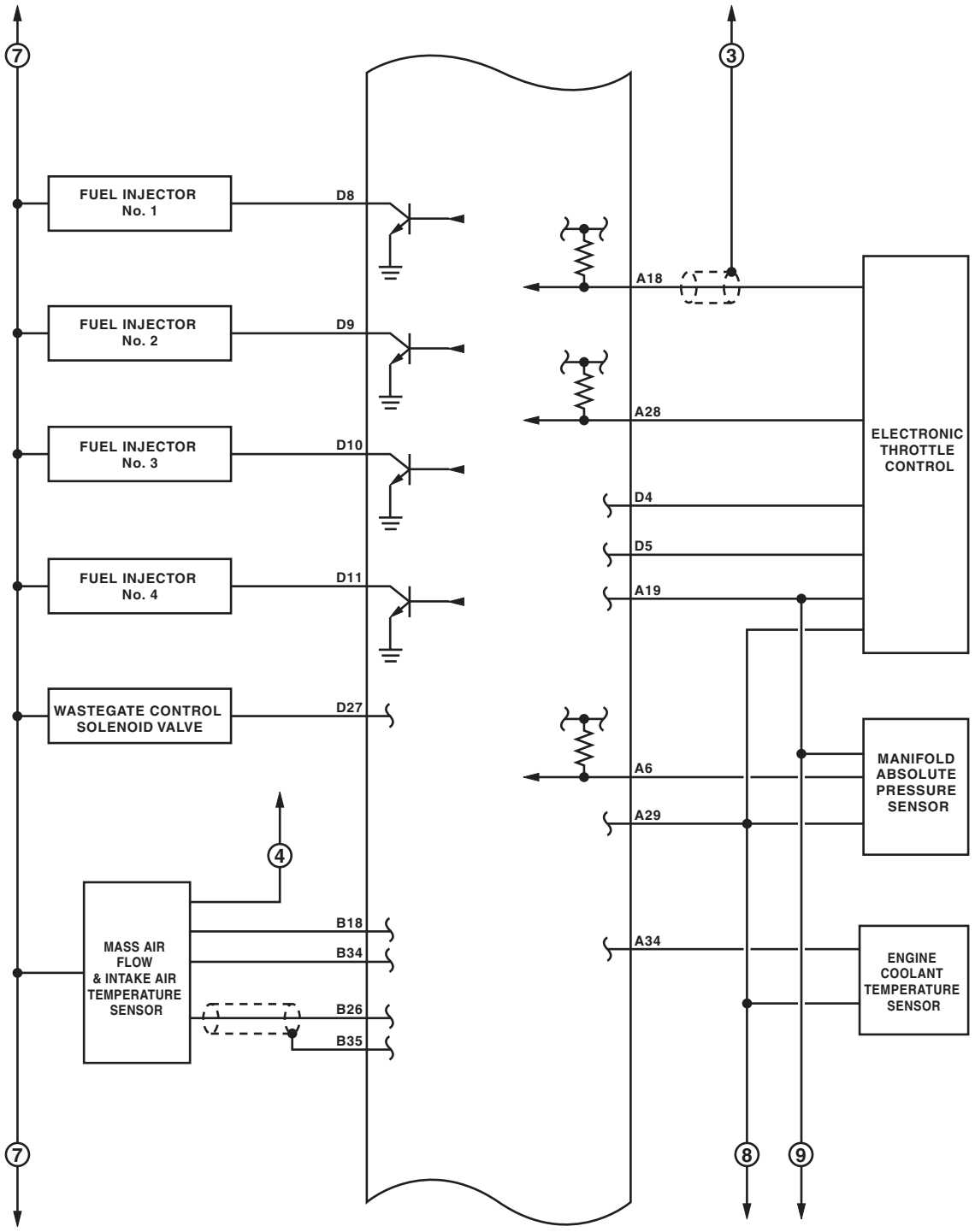

F/B FUSE No. 4
DATA LINK CONNECTOR
AT
MT
C25
MT
CLUTCH SWITCH
F/B FUSE No. 13
B5
GENERATOR
C10
C16
STARTER MOTOR
IGNITION SWITCH
B27
CLUTCH SWITCH
MT
MT
F/B FUSE No. 21
C20
AT
AT
STARTER RELAY
TEST MODE CONNECTOR
C6
JOINT CONNECTOR
1
MT
INHIBITOR RELAY
C32
B23
1
NEUTRAL SWITCH
MT
MT
B21
B31
TCM
AT
C31
ACCELERA -TOR PEDAL POSITION SENSOR
F/B FUSE No. 12
B19
FUEL PUMP RELAY
M/B FUSE No. 11
FUEL PUMP CONTROL UNIT
C12
B33
B29
B22
FUEL TEMPE- RATURE SENSOR
JOINT CONNECTOR
B30
5
12
12
11
4
2
3
13

EN-05075

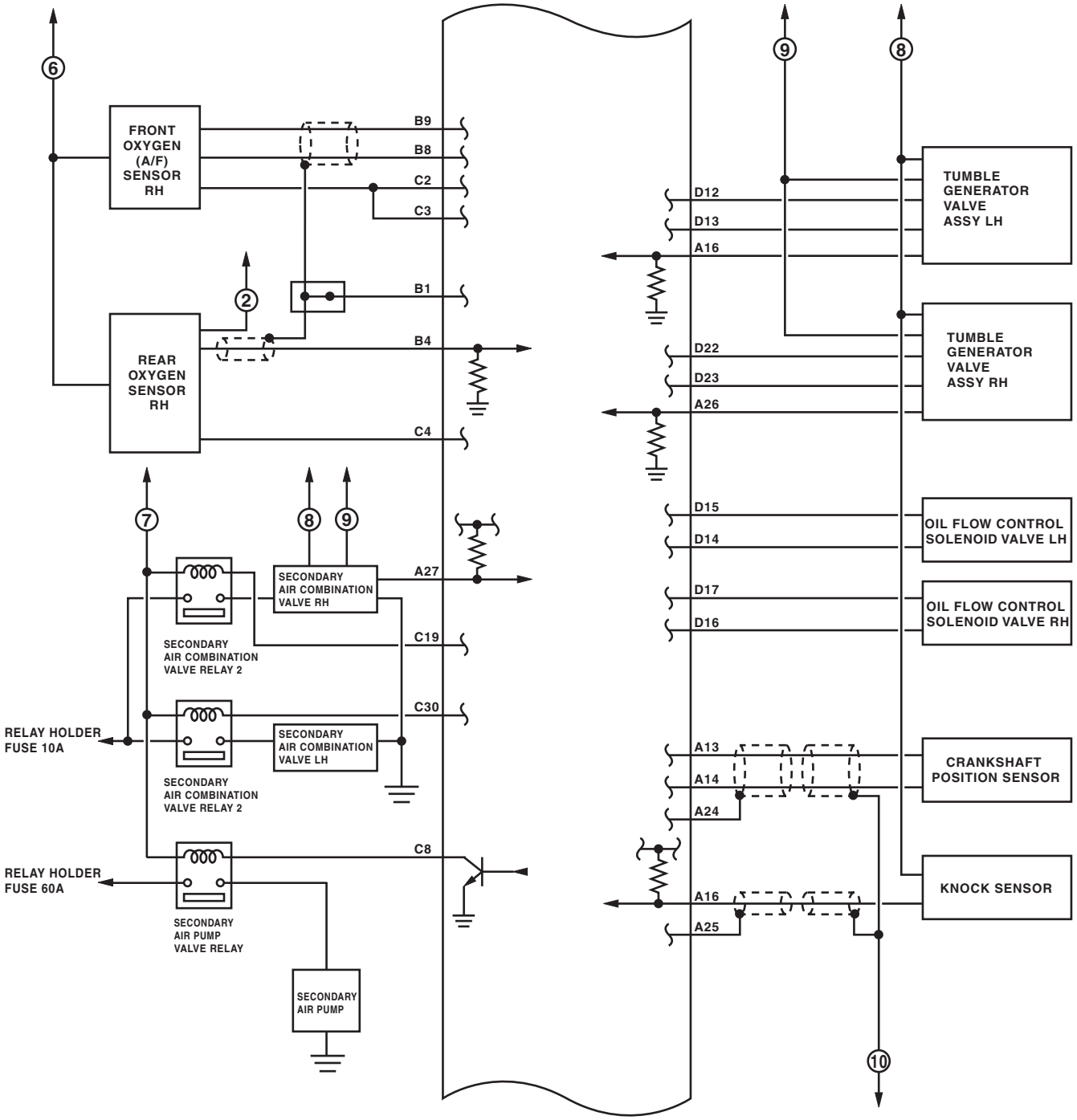
Engine Control Module (ECM) I/O Signal



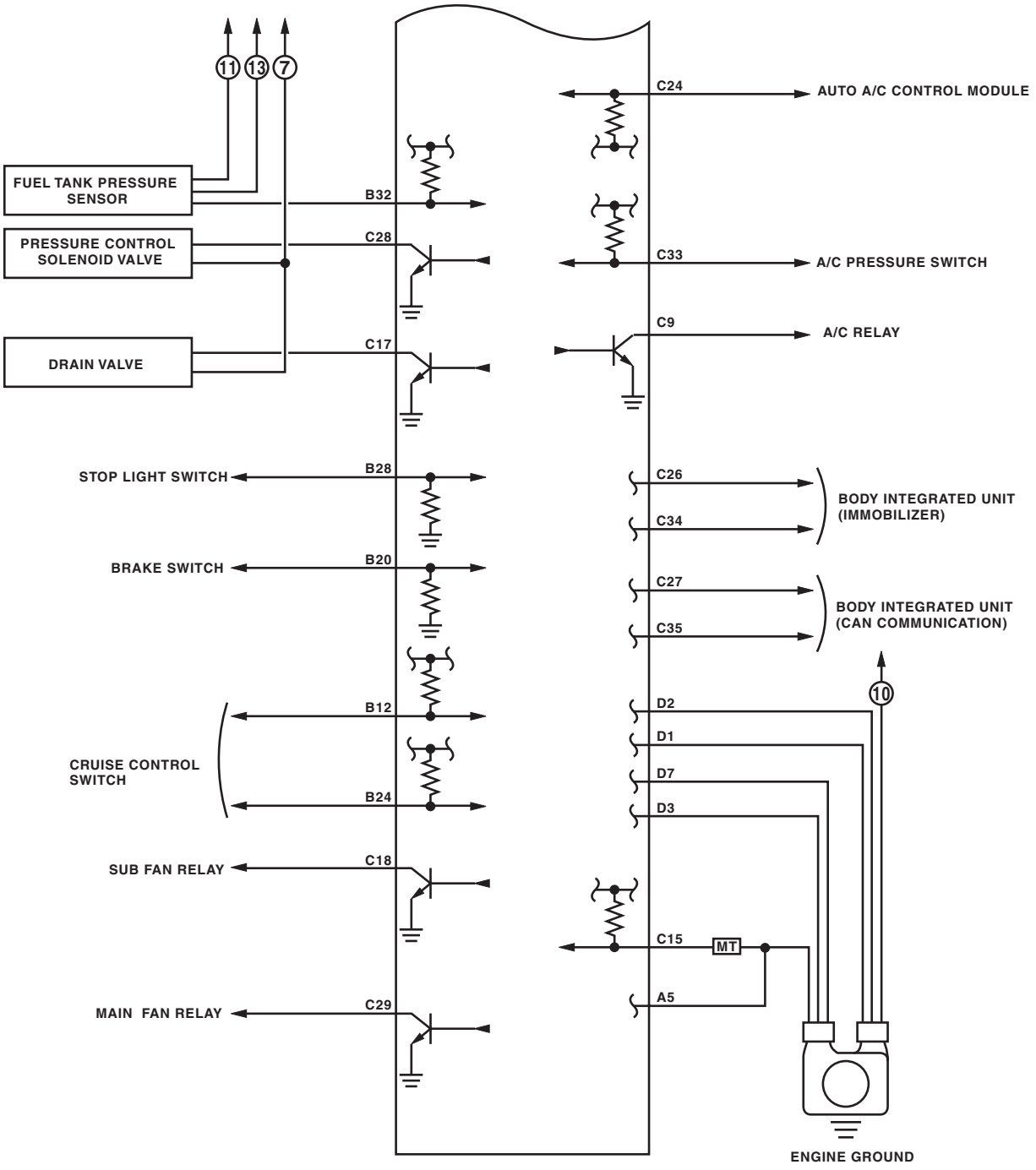
EN-05076


7
3
FUEL INJECTOR No. 1
D8
FUEL INJECTOR No. 2
D9
FUEL INJECTOR No. 3
D10
FUEL INJECTOR No. 4
D11
WASTEGATE CONTROL SOLENOID VALVE
D27
A18
A28
D4
D5
A19
ELECTRONIC THROTTLE CONTROL
A6
A29
MANIFOLD ABSOLUTE PRESSURE SENSOR
4
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR
B18
B34
B26
B35
A34
ENGINE COOLANT TEMPERATURE SENSOR
7
8
9

EN-05009


6
FRONT OXYGEN (A/F) SENSOR RH
B9
B8
C2
C3
2
B1
REAR OXYGEN SENSOR RH
B4
C4
7
8
9
SECONDARY AIR COMBINATION VALVE RH
A27
C19
SECONDARY AIR COMBINATION VALVE RELAY 2
C30
RELAY HOLDER FUSE 10A
SECONDARY AIR COMBINATION VALVE LH
SECONDARY AIR COMBINATION VALVE RELAY 2
C8
RELAY HOLDER FUSE 60A
SECONDARY AIR PUMP VALVE RELAY
SECONDARY AIR PUMP
9
8
D12
D13
A16
TUMBLE GENERATOR VALVE ASSY LH
D22
D23
A26
TUMBLE GENERATOR VALVE ASSY RH
D15
D14
OIL FLOW CONTROL SOLENOID VALVE LH
D17
D16
OIL FLOW CONTROL SOLENOID VALVE RH
A13
A14
A24
CRANKSHAFT POSITION SENSOR
A16
A25
KNOCK SENSOR
10

EN-05077


11
13
7
FUEL TANK PRESSURE SENSOR
PRESSURE CONTROL SOLENOID VALVE
DRAIN VALVE
B32
C28
C17
STOP LIGHT SWITCH
B28
BRAKE SWITCH
B20
CRUISE CONTROL SWITCH
B12
B24
SUB FAN RELAY
C18
MAIN FAN RELAY
C29
C24
AUTO A/C CONTROL MODULE
C33
A/C PRESSURE SWITCH
C9
A/C RELAY
C26
C34
BODY INTEGRATED UNIT (IMMOBILIZER)
C27
C35
BODY INTEGRATED UNIT (CAN COMMUNICATION)
10
D2
D1
D7
D3
C15
MT
A5
ENGINE GROUND

EN-05078

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

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

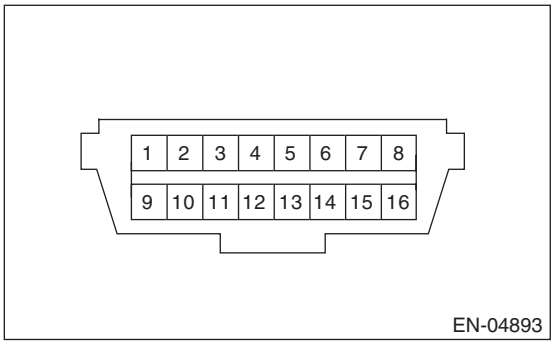
Measuring condition:
- After engine is warmed-up.
- Gear position is in neutral.
- Turn the A/C to OFF.
- Turn all the accessory switches to OFF.

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.



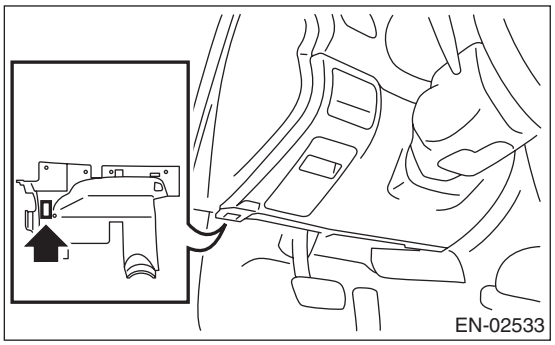
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	Blank
3	Blank	11	Blank
4	Ground	12	Blank
5	Ground	13	Blank
6	CAN communication (+)	14	CAN communication (–)
7	Subaru Select Monitor signal	15	Blank
8	Blank	16	Power supply

8. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

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



3) Using the general scan tool, call up DTC and freeze frame data.
General scan tool functions consist of:

(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain DTC
(4) MODE $04: Clear/Reset emission-related diagnostic information
(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)-81, 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	%
$12	Secondary air control status	—
$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	—
$1F	Elapsed time after starting the engine	sec
$21	Running distance after MIL turns on	miles
$24	A/F value and A/F sensor output voltage	— and V
$2E	Evaporative purge	%
$2F	Fuel level	%
$30	Number of warm ups after DTC clear	—
$31	Travel distance after DTC clear	km
$32	Fuel tank pressure	mmHg
$33	Atmospheric pressure	mmHg
$34	A/F sensor λ value, current	— , A
$3C	Catalyzer temperature	°C
$41	Diagnostic monitor of each drive cycle	—
$42	ECM power voltage	V
$43	Absolute load	%
$44	A/F target lambda	—
$45	Relative throttle opening angle	%
$46	Ambient temperature	°C
$47	Absolute throttle opening angle 2	%
$49	Absolute accelerator opening angle 1	%
$4A	Absolute accelerator opening angle 2	%
$4C	Target throttle opening angle	%
$4D	Engine operation time during MIL on	min
$4E	Elapsed time after DTC clear	min
$51	Fuel used	—
$5A	Relative accelerator opening angle	%

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

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

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

PID	Data	Unit of measure
$02	DTC that caused the freeze frame data storage required by CARB	—
$03	Fuel system control status	—
$04	Calculated engine load value	%
$05	Engine coolant temperature	°C
$06	Short term fuel trim	%
$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	%
$12	Secondary air control status	—
$13	Air fuel ratio sensor	—
$15	Rear oxygen sensor voltage, compensation value	V, —
$1C	Supporting OBD system	—
$1F	Elapsed time after starting the engine	sec
$2E	Evaporative purge	%
$2F	Fuel level	%
$32	Fuel tank pressure	mmHg
$33	Atmospheric pressure	mmHg
$42	ECM power voltage	V
$43	Absolute load	%
$44	A/F target lambda	—
$45	Relative throttle opening angle	%
$46	Ambient temperature	°C
$47	Absolute throttle opening angle 2	%
$49	Absolute accelerator opening angle 1	%
$4A	Absolute accelerator opening angle 2	%
$4C	Target throttle opening angle	%

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

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

Refer to "List of Diagnostic Trouble Code (DTC)" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>

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

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

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

6. MODE $06

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

OBDMID	TID	SID	Diagnostic item
$01	$81	$0A	A/F sensor conduction abnormal (B1S1)
	$82	$8D	
	$83	$14	
	$84	$1E	A/F sensor range abnormal (B1S1)
	$85	$1E	
	$86	$20	A/F sensor response abnormal (B1S1)
$02	$87	$0B	Oxygen sensor circuit abnormal (B1S2)
	$88	$0B	
	$07	$0B	Oxygen sensor drop abnormal (B1S2)
	$08	$0B	
	$A5	$0B	
	$05	$10	Oxygen sensor response abnormal (B1S2)
	$06	$10	
$21	$89	$20	Catalyst degradation diagnosis (B1)
$39	$93	$FE	Evaporative emission control system leak detected (Fuel filler cap off)
$3B	$94	$FE	Evaporative emission control system (0.04 inch leak)
	$95	$FE	
$3C	$96	$FE	Evaporative emission control system (0.02 inch leak)
	$97	$FE	
$3D	$98	$FE	Evaporative emission control system (Purge flow)
$41	$99	$24	A/F sensor heater abnormal (B1S1)
	$9A	$24	
	$9B	$14	A/F sensor heater characteristic abnormal (B1S1)
$42	$9C	$24	Oxygen sensor heater abnormal (B1S2)
	$9D	$24	
$71	$9E	$17	Secondary air system (whole system)
	$9F	$0B	
	$A0	$0B	
	$B0	$17	Secondary air system (relay 2 — combination valve 2)
	$B1	$0B	
	$B1	$17	
	$B2	$0B	
	$B2	$17	
	$B3	$0B	
	$B4	$0B	
	$B5	$0B	
	$B6	$31	
	$B7	$31	
$A1	$0B	$24	Misfire monitoring (All cylinders)
	$0C	$24	
$A2	$0B	$24	Misfire monitoring (#1 cylinder)
	$0C	$24	
$A3	$0B	$24	Misfire monitoring (#2 cylinder)
	$0C	$24	
$A4	$0B	$24	Misfire monitoring (#3 cylinder)
	$0C	$24	

OBDMID	TID	SID	Diagnostic item
$A5	$0B	$24	Misfire monitoring (#4 cylinder)
	$0C	$24	
$E1	$A6	$FE	Purge control solenoid valve 2 close seized

7. MODE $07

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

8. MODE $09

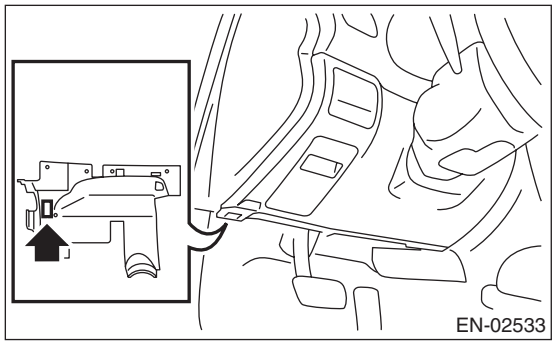
Refer to the data of vehicle specification (V.I.N., calibration ID, etc.).

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) 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.
4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
5) 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)-44, 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)-44, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA FOR ENGINE (NORMAL MODE)

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

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

Contents	Display	Unit of measure	Note (at idling)
Engine 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
Amount of intake air	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 compensation	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
Fuel temperature signal	Fuel Temp.	°C or °F	+28°C or 82°F
Main accelerator sensor voltage	Main-accelerator Sensor	V	1.0 V

Contents	Display	Unit of measure	Note (at idling)
Atmospheric pressure	Atmosphere Pressure	mmHg, kPa, inHg or psig	—
Intake manifold relative pressure	Mani. Relative Pressure	mmHg, kPa, inHg or psig	(Intake manifold absolute pressure — atmosphere 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	0.81 V
Tumble generator valve LH opening signal	TGV Position Sensor L	V	0.81 V
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	—	AT/MT
Test mode terminal	Test Mode Signal	—	U check
Neutral position switch signal	Neutral Position Switch	—	Neutral
Soft idle switch signal	Soft Idle Switch Signal	—	At idle
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	—	Closing 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)
Brake switch signal	Brake Switch	—	OFF (At OFF)
Main switch signal	Main Switch	—	OFF (At OFF)

Contents	Display	Unit of measure	Note (at idling)
Body int. 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}.
2) On the «System Selection Menu» display screen, select {Engine Control System}.
3) Select the [OK] after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System}.
5) On the «OBD Menu» display screen, select the {Current Data Display/Save}.
6) On the «Data Display Menu» screen, select {Data Display}.
7) Using the scroll key, scroll the display screen up or down until the desired data is shown.

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

Contents	Display	Unit of measure	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	—	Supp YES
Monitoring test of misfire	Misfire monitoring	—	Rdy YES/Rdy NO
Monitoring test of fuel system	Fuel system monitoring	—	Supp YES
Monitoring test of fuel system	Fuel system monitoring	—	Rdy YES/Rdy NO
Monitoring test of comprehensive component	Component monitoring	—	Supp YES
Monitoring test of comprehensive component	Component monitoring	—	Rdy YES/Rdy NO
Test of catalyst	Catalyst Diagnosis	—	Supp YES
Test of catalyst	Catalyst Diagnosis	—	Rdy YES/Rdy NO
Test of heating-type catalyst	Heated catalyst	—	Supp NO
Test of heating-type catalyst	Heated catalyst	—	Rdy N/A
Test of evaporative emission purge control system	Evaporative purge system	—	Supp YES
Test of evaporative emission purge control system	Evaporative purge system	—	Rdy YES/Rdy NO
Test of secondary air system	Secondary air system	—	Supp YES
Test of secondary air system	Secondary air system	—	Rdy YES/Rdy NO
Test of air conditioning system	A/C system refrigerant	—	Supp NO
Test of air conditioning system	A/C system refrigerant	—	Rdy N/A
Test of oxygen sensor	Oxygen sensor	—	Supp YES
Test of oxygen sensor	Oxygen sensor	—	Rdy YES/Rdy NO
Test of oxygen sensor heater	O2 Heater Diagnosis	—	Supp YES
Test of oxygen sensor heater	O2 Heater Diagnosis	—	Rdy YES/Rdy NO
Test of EGR system	EGR system	—	Supp NO
Test of EGR system	EGR system	—	Rdy N/A
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—	Normal CLOSE
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
Amount of intake air	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

Contents	Display	Unit of measure	Note (at idling)
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	2.712 V
A/F lambda signal #11	A/F sensor #11	—	0.992
A/F sensor current #11	A/F sensor #11	mA	–0.03 mA
Secondary air control status	Secondary air system	—	—
Time elapsed after engine start	Elapsed Time After Starting Engine	sec	—
Elapsed time after MIL illuminating	Elapsed Time After MIL Illuminates	km or miles	—
Evaporative purge	Evaporative purge	%	—
Fuel level	Fuel level	%	—
Number of warm ups after DTC clear	Number Of Warm Ups After DTC Clear	—	—
Travel distance after DTC clear	Travel distance after DTC clear	km or miles	—
Fuel tank pressure	Fuel Tank Pressure	mmHg, kPa, inHg or psig	—
Atmospheric pressure	Atmospheric Pressure	mmHg, kPa, inHg or psig	—
Catalyst temperature #1	Catalyzer temperature #1	°C or °F	—
Misfire monitoring	Misfire Monitoring	Enable	YES or NO
		Comp	YES or NO
Fuel system diagnosis	Fuel system monitoring	Enable	YES or NO
		Comp	YES or NO
Component monitoring	Component monitoring	Enable	YES or NO
		Comp	YES or NO
Catalyst diagnosis	Catalyst Diagnosis	Enable	YES or NO
		Comp	YES or NO
Heated catalyst diagnosis	Heated catalyst	Enable	N/A
		Comp	N/A
Evaporative purge system diagnosis	Evaporative purge system	Enable	YES or NO
		Comp	YES or NO
Secondary air system	Secondary air system	Enable	YES or NO
		Comp	YES or NO
A/C system refrigerant diagnosis	A/C system refrigerant	Enable	N/A
		Comp	N/A
Oxygen sensor diagnosis	Oxygen sensor	Enable	YES or NO
		Comp	YES or NO
Oxygen heater diagnosis	O2 Heater Diagnosis	Enable	YES or NO
		Comp	YES or NO
EGR diagnosis	EGR system	Enable	N/A
		Comp	N/A
ECM power voltage	ECM power voltage	V	—
Absolute load	Absolute load	%	—
A/F target lambda	A/F target lambda	—	—
Relative throttle opening angle	Relative throttle position	%	—

Contents	Display	Unit of measure	Note (at idling)
Ambient temperature	Ambient temperature	°C or °F	—
Absolute throttle opening angle 2	Absolute throttle opening angle 2	%	—
Absolute accelerator opening angle 1	Absolute accelerator opening angle 1	%	—
Absolute accelerator opening angle 2	Absolute accelerator opening angle 2	%	—
Target throttle opening angle	Target throttle opening angle	%	—
Engine operation time during MIL on	Engine operating time during MIL illuminates	min	—
Elapsed time after DTC clear	Elapsed time after DTC clear	min	—
Fuel used	Fuel used	—	—
Relative accelerator opening angle	Relative accelerator opening angle	%	—

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

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

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

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

Contents	Display	Unit of measure
DTC of freeze frame data	Freeze frame data	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 #1	Ignition timing adv. #1	°
Intake air temperature	Intake Air Temp.	°C
Amount of intake air	Mass Air Flow	g/s
Throttle opening angle	Throttle Opening Angle	%
Secondary air control status	Secondary air system	—
O2 sensor #11	Oxygen sensor #11	—
O2 sensor #12	Oxygen sensor #12	—
A/F correction 12	A/F correction #12	—
OBD system	OBD System	—
Elapsed time after starting the engine	Elapsed Time After Starting Engine	sec
Evaporative purge	Evaporative purge	%
Fuel level	Fuel level	%
Fuel tank pressure	Tank pressure	mmHg, kPa, inHg or psig
Atmospheric pressure	Atmospheric Pressure	mmHg, kPa, inHg or psig
ECM power voltage	ECM power voltage	V
Absolute load	Absolute load	%
A/F target lambda	A/F target lambda	—
Relative throttle opening angle	Relative throttle position	%
Ambient temperature	Ambient temperature	°C or °F
Absolute throttle opening angle 2	Absolute throttle opening angle 2	%
Absolute accelerator opening angle 1	Absolute accelerator opening angle 1	%
Absolute accelerator opening angle 2	Absolute accelerator opening angle 2	%
Target throttle opening angle	Target throttle opening angle	%

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

7. V.I.N. REGISTRATION

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

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

10.Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

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

NOTE:
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

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

NOTE:
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, 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)-50, Drive Cycle.>

DTC	Item	Condition
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	—
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	—
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	—
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Sensor 1 Circuit Low	—
P0113	Intake Air Temperature Sensor 1 Circuit High	—
P0117	Engine Coolant Temperature Circuit Low	—
P0118	Engine Coolant Temperature Circuit High	—
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low	—
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High	—
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0140	O2 Sensor Circuit No Activity Detected (Bank1 Sensor2)	—
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)	—
P0413	Secondary Air Injection System Switching Valve “A” Circuit Open	—
P0416	Secondary Air Injection System Switching Valve “B”Circuit Open	—
P0418	Secondary Air Injection System Control “A” Circuit Open	—
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	—

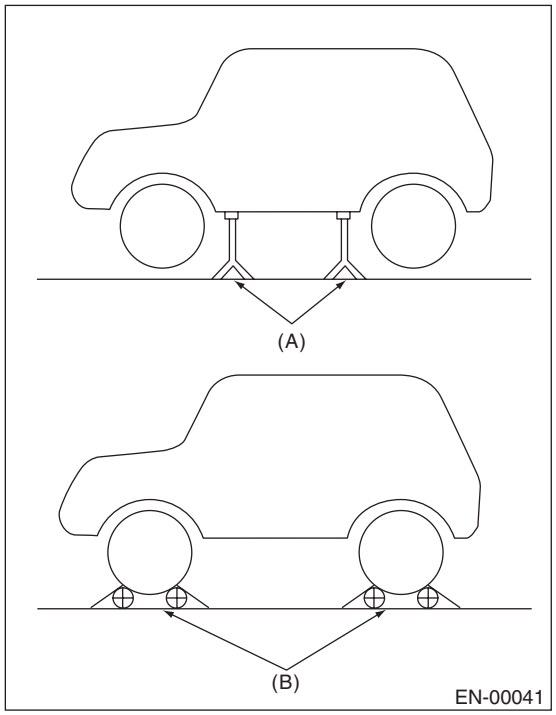
DTC	Item	Condition
P0458	Evaporative Emission System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor “A” Circuit Low	—
P0463	Fuel Level Sensor “A” Circuit High	—
P0500	Vehicle Speed Sensor “A”	—
P0512	Starter Request Circuit	—
P0513	Incorrect Immobilizer Key	—
P0519	Idle Air Control System 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	—
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	Neutral Switch Input Circuit Low	—
P0852	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	—
P1410	Secondary Air Injection System Switching Valve Stuck Open	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
P1560	Back-up Voltage Circuit Malfunction	—
P1570	Antenna	—
P1571	Reference Code Incompatibility	—
P1572	IMM Circuit Failure (Except Antenna Circuit)	—
P1574	Key Communication Failure	—
P1576	EGI Control Module EEPROM	—
P1577	IMM Control Module EEPROM	—
P1578	Meter Failure	—
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	—

DTC	Item	Condition
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance	—
P2419	Evaporative Emission System Switching Valve Control Circuit Low	—
P2420	Evaporative Emission System Switching Valve Control Circuit High	—
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	—
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/ Performance	—
P2432	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low	—
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	—
P2135	Throttle/Pedal Position Sensor/Switch “A”/“B” Voltage Correlation	—
P2138	Throttle/Pedal Position Sensor/Switch “D”/“E” Voltage Correlation	—
P2444	Secondary Air Injection System Pump Stuck On	—

1. PREPARATION FOR THE INSPECTION MODE

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

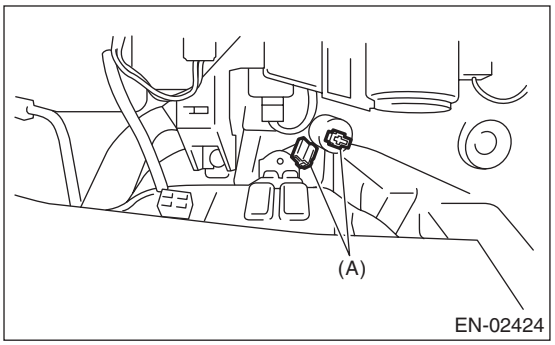
WARNING:
• Before raising the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release clutch pedal or accelerator pedal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

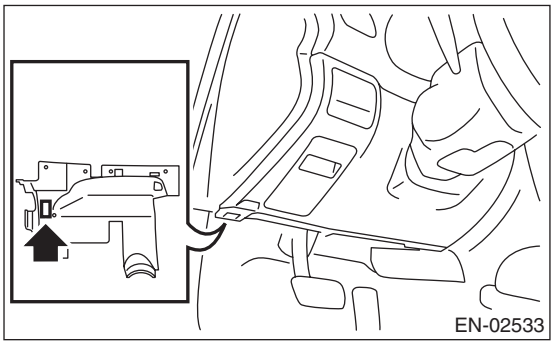
2. SUBARU SELECT MONITOR

1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)(diag)-56, 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) Connect the test mode connector (A) located under the glove box.



(A) Test mode connector

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



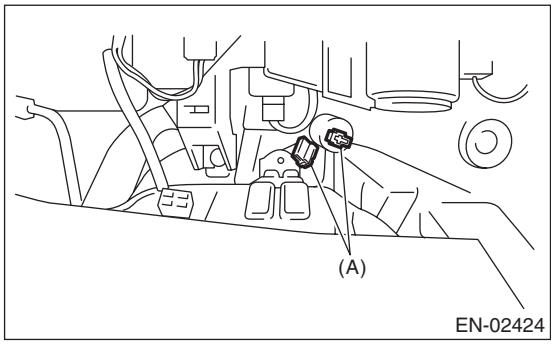
CAUTION:
Do not connect any scan tools except the Subaru Select Monitor or general scan tool.
7) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
8) On the «Main Menu» display screen, select {Each System Check}.
9) On the «System Selection Menu» display screen, select {Engine Control System}.
10) Select the [OK] after the information of engine type has been displayed.
11) On the «Engine Diagnosis» display screen, select {D Check}.
12) When the "Perform Inspection (Dealer Check) Mode" is shown on the screen, select the [OK].

13) Perform subsequent procedures as instructed on the display screen.
• If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
<Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may illuminate the ABS warning light, but this does not indicate a malfunction. When engine control diagnosis is finished, perform the ABS memory clearance procedure of the self-diagnosis system. <Ref. to ABS(diag)-24, Clear Memory Mode.>

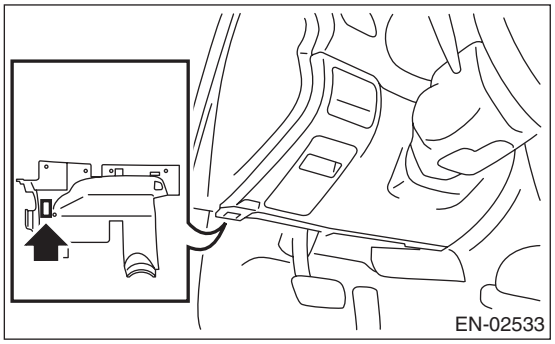
3. GENERAL SCAN TOOL

1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)(diag)-56, 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 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 illuminate 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)-24, Clear Memory Mode.>
10) Using the general scan tool, check DTC and record the result(s).

NOTE:
• For detailed operation procedures, refer to the general scan tool operation manual.
• For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
<Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: PROCEDURE

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

1. PREPARATION FOR DRIVE CYCLE

1) Check that the battery voltage is 12 V or more and fuel remains approx. half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.>
3) Disconnect the test mode connector.

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

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

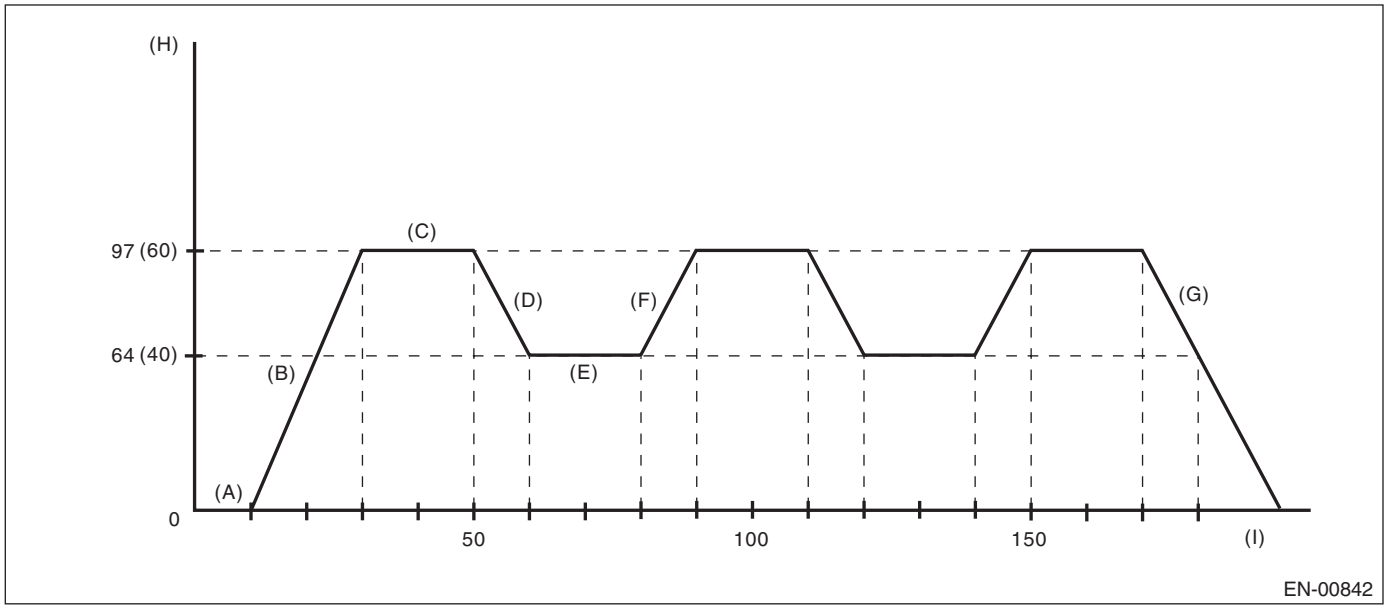
DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature at engine start is less than 20°C (68°F).
*P0126	Insufficient Engine Coolant Temperature for Stable Operation	—
*P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	Engine coolant temperature at engine start is less than 55°C (131°F).
*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)	—
*P0441	Evaporative Emission System Incorrect Purge Flow	—
*P0442	Evaporative Emission Control System Leak Detected (Small Leak)	Engine coolant temperature at engine start is less than 25°C (77°F).
*P0451	Evaporative Emission Control System Pressure Sensor	—
*P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	Engine coolant temperature at engine start is less than 25°C (77°F).
*P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	Engine coolant temperature at engine start is less than 25°C (77°F).
P0459	Evaporative Emission System Purge Control Valve Circuit High	—
P0692	Fan 1 Control Circuit High	—
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 — 10 MINUTES IDLING

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

DTC	Item	Condition
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle A or C as well.
*P0172	System Too Rich (Bank 1)	Diagnosis completes in drive cycle A or C as well.
*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	—
*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 THE VEHICLE WITH FOLLOWING DRIVE PATTERNS



(A) Idle the engine for 10 seconds or more.
(B) Accelerate to 97 km/h (60 MPH) within 20 seconds.
(C) Drive the vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).
(E) Drive the vehicle at 64 km/h (40 MPH) for 20 seconds.
(F) Accelerate 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.
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) Check that the engine coolant temperature at engine start is less than 30°C (86°F).
2) Make sure that fuel remains 9.6 ℓ (2.5 US gal, 2.1 Imp gal) or more and the battery voltage is 10.9 V or more.
3) Start the engine, and check that the engine coolant temperature increases by 10°C (18°F) or more, and reaches 75°C (167°F) or more, when the engine is warmed up.
4) Idle the engine for 120 seconds or more in the condition of step 3.

STUCK DIAGNOSIS

1) Make sure that the battery voltage is 10.9 V or more.
2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, 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 acceptable to drive the vehicle intermittently.
• Do not disconnect the battery terminals while diagnosing. (Data will be cleared by disconnecting the battery terminals.)

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

6. DRIVE CYCLE E

1) Make sure that the battery voltage is 10.9 V or more.
2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, 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 acceptable to drive the vehicle intermittently.
• Do not disconnect the battery terminals while diagnosing. (Data will be cleared by disconnecting the battery terminals.)

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

7. DRIVE CYCLE F

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

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

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

8. DRIVE CYCLE G

1) Remove the battery negative terminal, and reconnect after 10 seconds have passed.
2) Start the engine and warm-up engine until coolant temperature is 80°C (176°F).
3) Start the engine and warm-up engine until coolant temperature is 40°C (104°F) or less.

NOTE:
Do not let engine coolant temperature drop below 5°C (41°F).
4) Start the engine and warm-up engine until coolant temperature is 80°C (176°F).
5) Start the engine and warm-up engine until coolant temperature is 40°C (104°F) or less.

NOTE:
Do not let engine coolant temperature drop below 5°C (41°F).
6) Start and idle the engine.

DTC	Item	Condition
*P0410	Secondary Air Injection System	—
*P0411	Secondary Air Injection System Incorrect Flow Detected	—
P0414	Secondary Air Injection System Switching Valve “A” Circuit Shorted	—
P0417	Secondary Air Injection System Switching Valve B Circuit Shorted	—
P1418	Secondary Air Injection System Control “A” Circuit Shorted	—
*P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank 1)	—
*P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank 1)	—
*P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank 2)	—
*P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank 2)	—

9. DRIVE CYCLE H

1) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.>
2) With the ignition switch ON, read the engine coolant temperature, intake air temperature and fuel temperature. <Ref. to EN(H4DOTC)(diag)-36, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>
3) If the values from step 2) satisfy the following two conditions, start the engine.

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

NOTE:
- If the conditions are not satisfied, turn the ignition switch to OFF and wait until the parameters are satisfied.
- Start AT vehicles in the P range, and MT vehicles in the N position.

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

DTC	Item	Condition
*P1602	Control Module Programming Error	—

13.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

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

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance. Therefore, start the engine 10 seconds or more after have 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}.
2) On the «System Selection Menu» display screen, select {Engine Control System}.
3) Select the [OK] after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System}.
5) On the «OBD Menu» display screen, select {DTC Clear}.
6) When the “Clear Diagnostic Code?” is shown on the screen, select the [OK].
7) Turn the ignition switch to OFF and then close the Subaru Select Monitor.

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

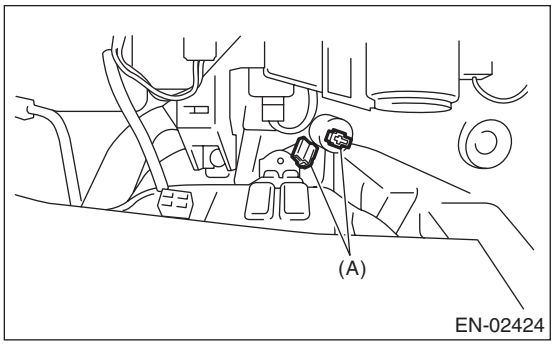
3. GENERAL SCAN TOOL

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

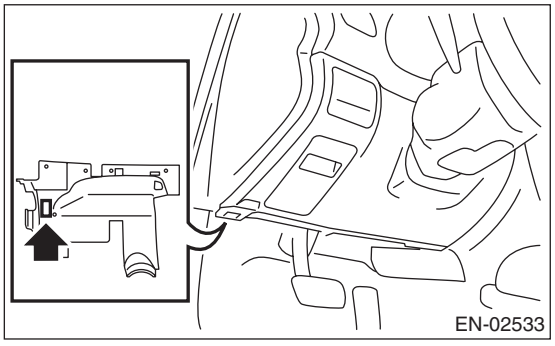
14. Compulsory Valve Operation Check Mode

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



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



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

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

Contents	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.

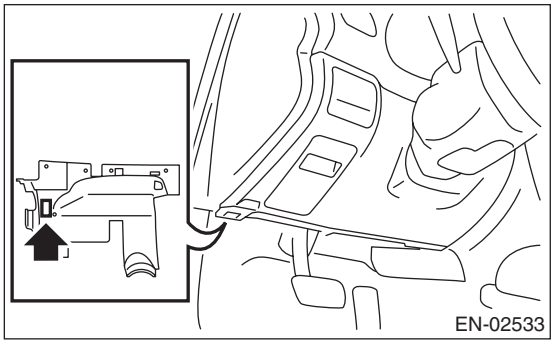
Display
EGR Solenoid
ASV Solenoid
FICD Solenoid
AAI Solenoid
EXH. Bypass Control Permit Flag

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

15. System 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) 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 general scan tool.
4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
5) On the «Main Menu» display screen, select {Each System Check}.
6) On the «System Selection Menu» display screen, select {Engine Control System}.
7) Select the [OK] after the information of engine type has been displayed.
8) On the «Engine Diagnosis» display screen, select {System Operation Check Mode}.
9) The following items will be displayed on screen.

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

1. FUEL PUMP CONTROL (OFF OPERATION)

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>.
1) On the «System Operation Check Mode» display screen, select {Fuel Pump Control}.
2) On the «Fuel Pump Control» display screen, select {OFF Operation}.
3) On the «Start the Engine» display screen, start the engine and select the [OK].
4) Select the [NO] to end the OFF operation. The screen will return to the «Fuel Pump Control» screen.

2. FUEL PUMP CONTROL (ON/OFF OPERATION)

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>.
1) On the «System Operation Check Mode» display screen, select the {Fuel Pump Control}.
2) On the «Fuel Pump Control» display screen, select the {ON/OFF Operation}.
3) On the «Turn Ignition Switch ON with Engine Stalled» display screen, select the [OK].
4) Select the [NO] to end the ON/OFF operation. The screen will return to the «Fuel Pump Control» screen.

3. IDLING IGNITION TIMING FIXED

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>.
1) On the «System Operation Check Mode» display screen, select {Idling Ignition Timing Fixed}.
2) On the «Start the Engine» display screen, start the engine and select the [OK].
3) Select the [NO] to end the idle ignition timing fixed. The screen will return to the «System Operation Check Mode» screen.

4. IDLE SPEED CONTROL

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>.
1) On the «System Operation Check Mode» display screen, select {Idle Speed Control}.
2) On the «Start the Engine» display screen, start the engine and select the [OK].
3) In the «Idle Speed Control» screen, select the [△] or the [▽] to change the setting values, then select the [OK].
Setting is possible in a range between 500 rpm — 2000 rpm, in increments of 50 rpm. However, the engine speed that can actually be controlled will vary depending on the vehicle.

4) Select the [NO] to end the idle engine speed control. The screen will return to the «System Operation Check Mode» screen.

5. INJECTOR CONTROL (INJECTION STOP MODE)

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>.

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

6. INJECTOR CONTROL (INJECTION QUANTITY CONTROL)

CAUTION:
After performing the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>.

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

16.Malfunction Indicator Light

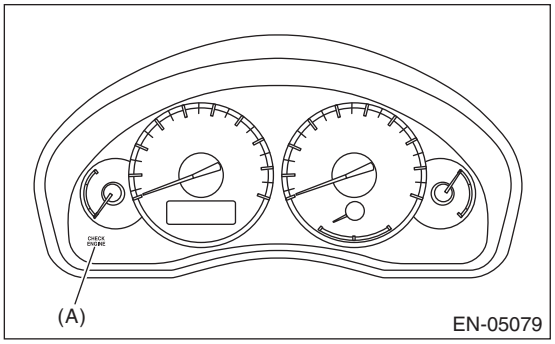
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H4DOTC)(diag)-61, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Malfunction indicator light does not come on. <Ref. to EN(H4DOTC)(diag)-62, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Malfunction indicator light does not go off. <Ref. to EN(H4DOTC)(diag)-64, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>
↓
4. Malfunction indicator light does not blink. <Ref. to EN(H4DOTC)(diag)-65, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK, Malfunction Indicator Light.>
↓
5. Malfunction indicator light keep blinking. <Ref. to EN(H4DOTC)(diag)-67, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING, Malfunction Indicator Light.>

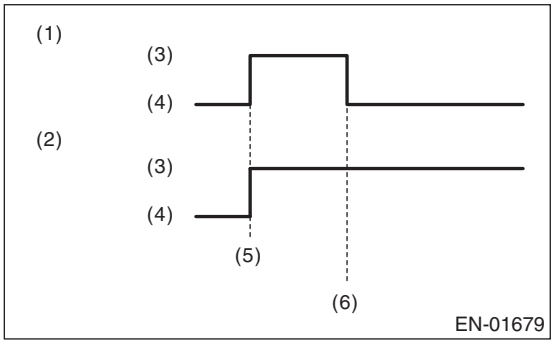
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

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 CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(H4DOTC)(diag)-62, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>

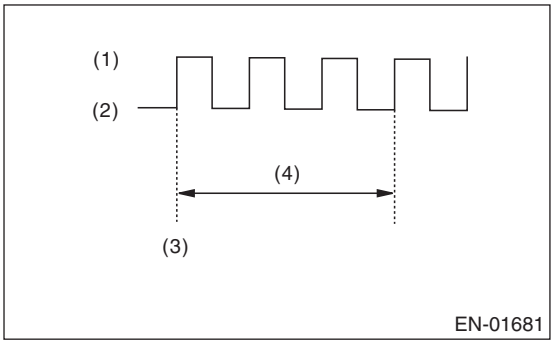


2) After starting the engine, the malfunction indicator light goes out. If it does not go off, either the engine or emission control system has malfunction.



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

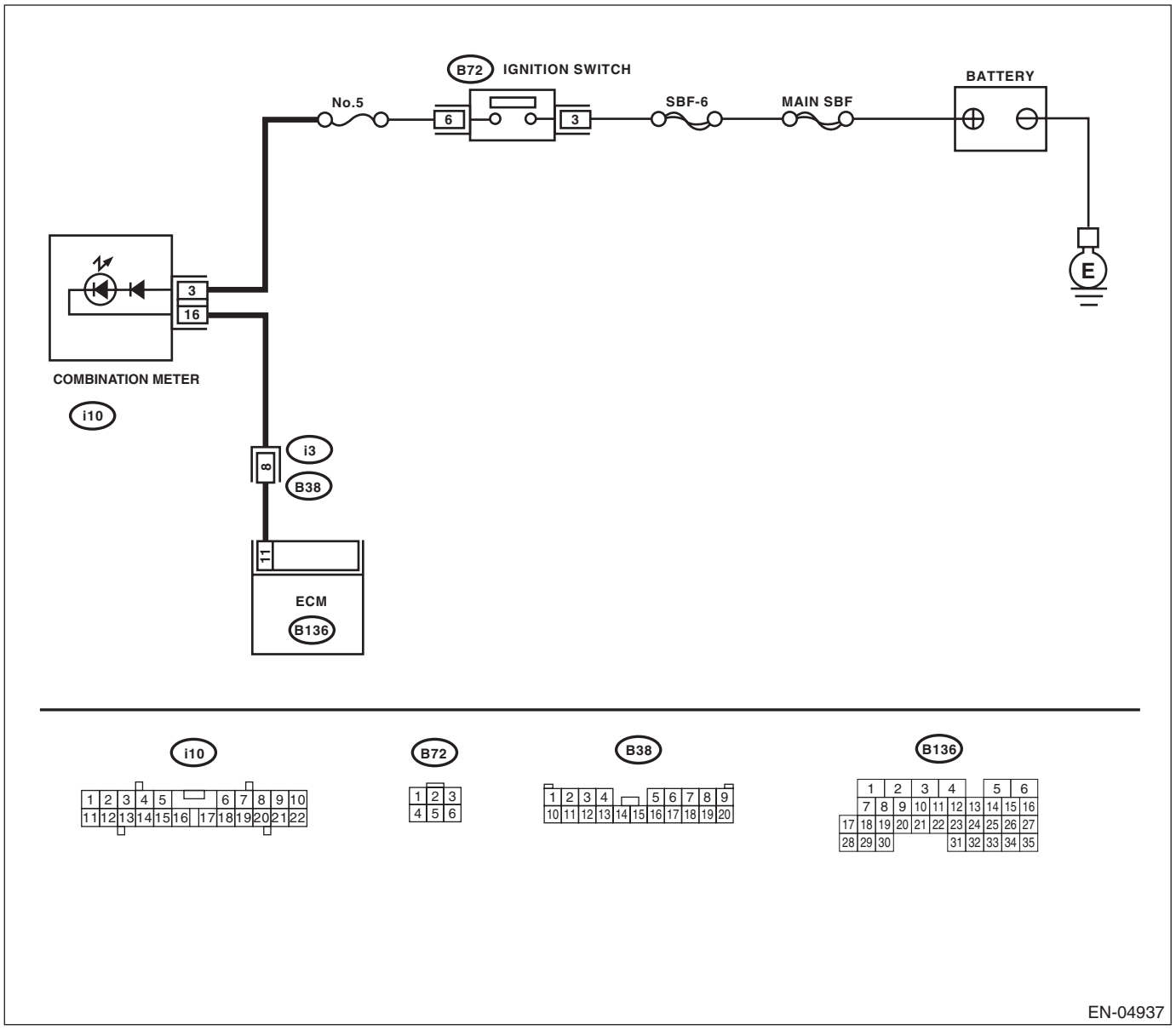
3) Turn the ignition switch to OFF and connect the test mode connector.
(1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light illuminates.
(2) After the engine starts, malfunction indicator light blinks in a cycle of 0.5 Hz. (During diagnosis)
(3) Malfunction indicator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

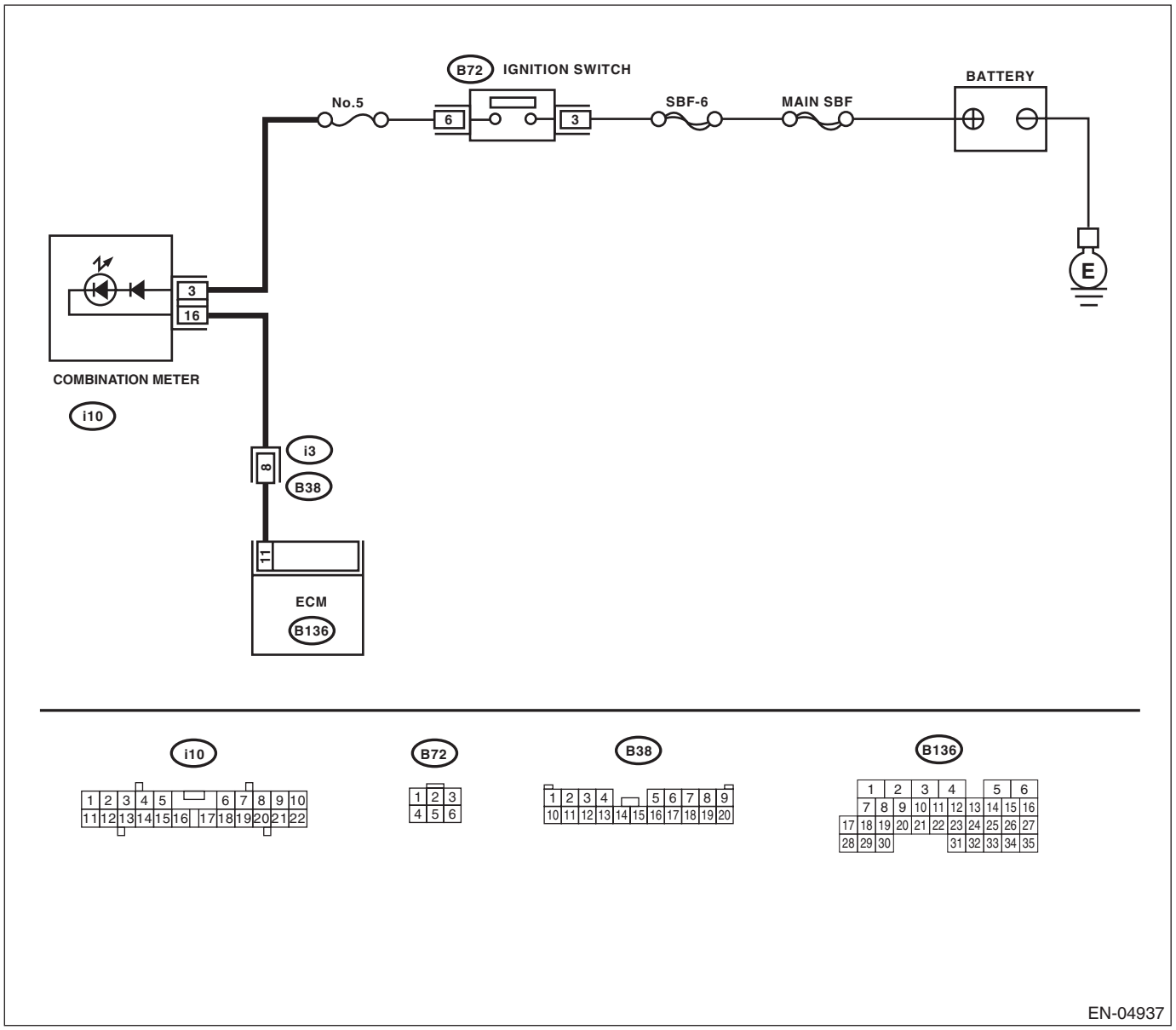
DIAGNOSIS:
The malfunction indicator light circuit is open or shorted.
TROUBLE SYMPTOM:
When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not come on.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Go to step **2**.
2	**CHECK POOR CONTACT.** Check for poor connection by shaking or pulling ECM connector and harness.	Does the malfunction indicator light illuminate?	Repair poor contact of the ECM connector.	Go to step **3**.
3	**CHECK ECM CONNECTOR.** Check the connection of ECM connector.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-19, Combination Meter.> 3) Disconnect the connector from the ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B136) No. 11 — (i10) No. 16:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and combination meter connector • Poor contact of coupling connector
5	**CHECK POOR CONTACT.** Check poor contact of combination meter connector.	Is there poor contact in combination meter connector?	Repair the poor contact of combination meter connector.	Go to step **6**.
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the combination meter circuit board. <Ref. to IDI-19, Combination Meter.>	Check the following item and repair if necessary. NOTE: • Blown out of fuse • Open or short circuit of harness between fuse and battery terminal • Poor contact of ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF

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



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the short circuit of harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK

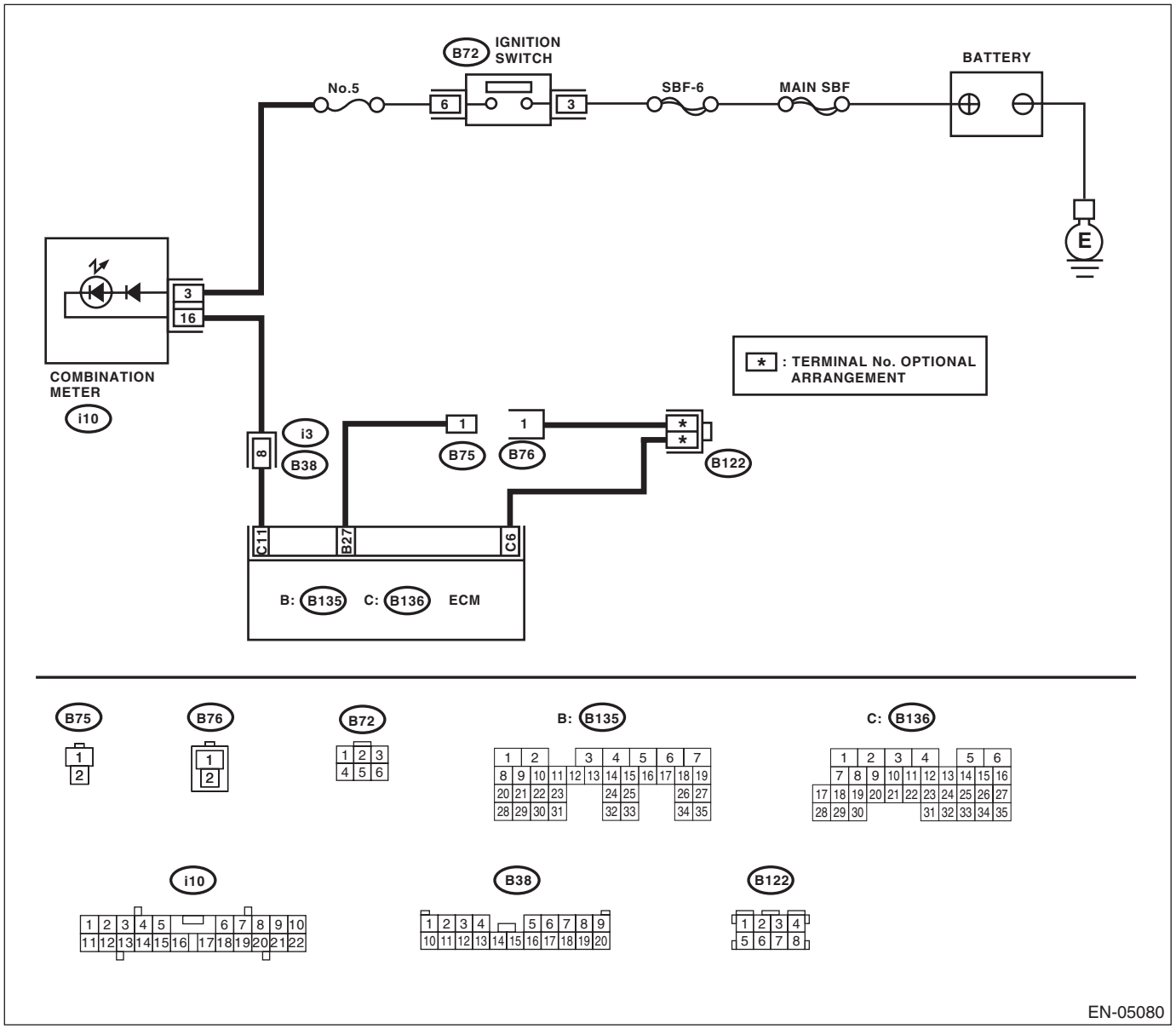
DIAGNOSIS:

- 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.

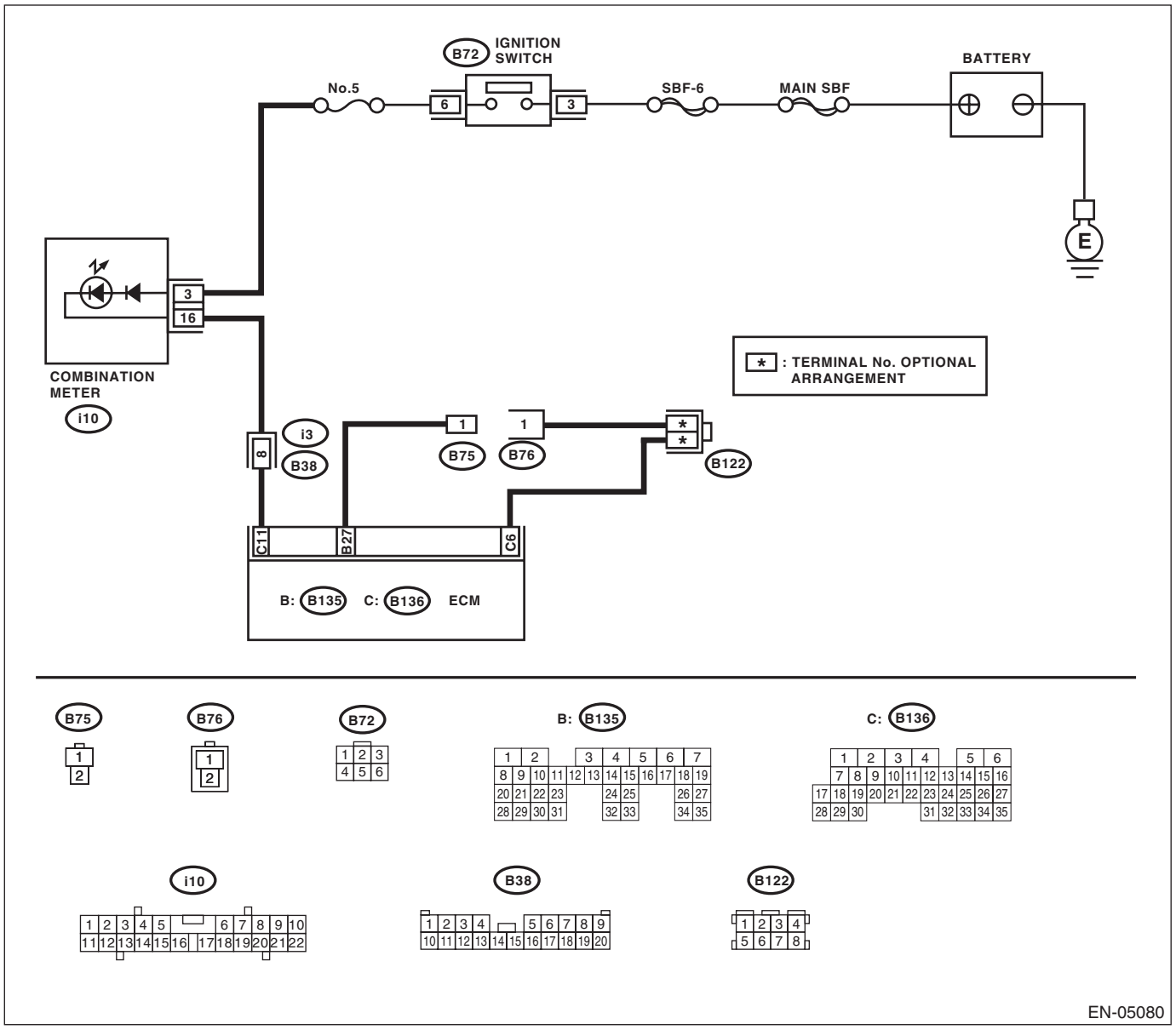
WIRING DIAGRAM:



	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)-62, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the ground short circuit of harness between ECM and combination meter connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of harness between test mode connector and 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 ECM and test mode connector • Poor contact of joint connector
4	**CHECK POOR CONTACT.** Check for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair poor contact of the ECM connector.	Go to step **5**.
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 27 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit of harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair poor contact of the ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, 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 AND CHASSIS GROUND TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 27 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit of harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

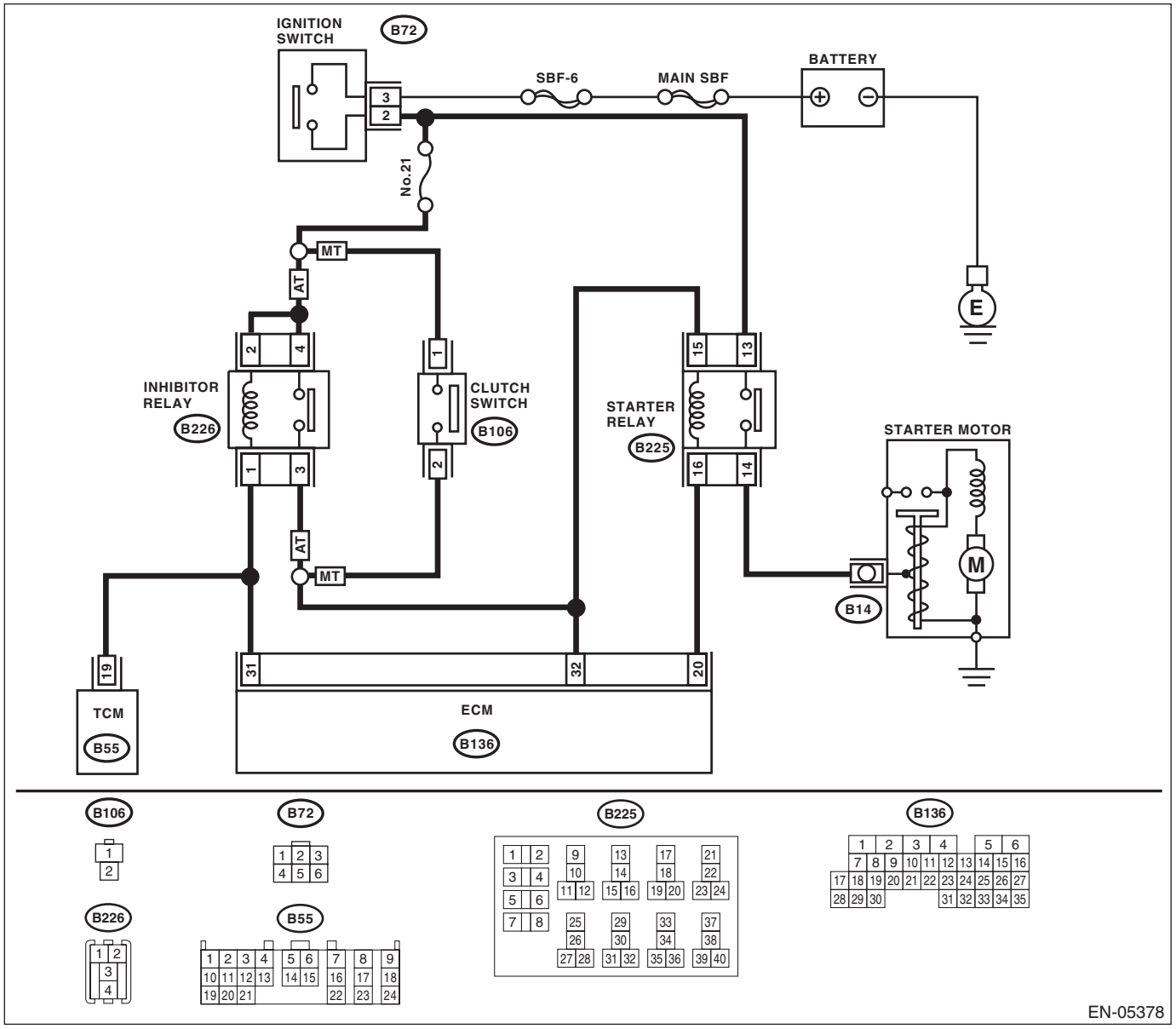
17.Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Check for fuel amount.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)(diag)-70, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-74, 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)-76, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-78, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-79, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



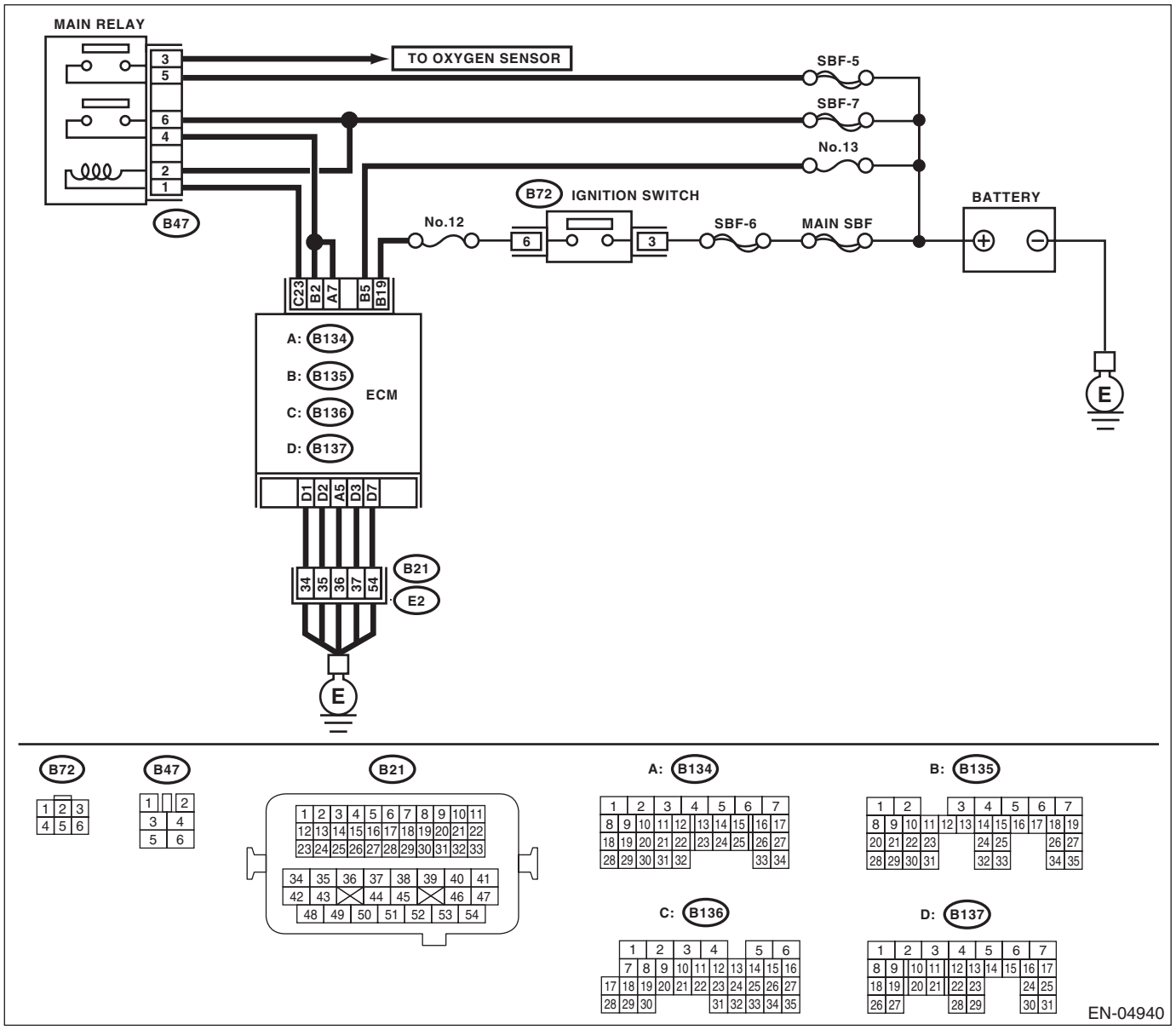
	Step	Check	Yes	No
1	**CHECK BATTERY.** Check the battery voltage.	Is the voltage 12 V or more?	Go to step **2**.	Charge or replace the battery.
2	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **3**.	Go to step **4**.
3	**CHECK DTC.**	Is DTC displayed? <Ref. to EN(H4DOTC)(diag)-44, OPERATION, Read Diagnostic Trouble Code (DTC).>	Check the appropriate DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	The circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
4	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) On AT models, set the select lever to the "P" or "N" range, and on MT models, depress the clutch pedal. 4) Turn the ignition switch to START. 5) Measure the voltage between the starter motor connector and the engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Check the starter motor. <Ref. to SC(H4SO)-6, Starter.>	Go to step **5**.
5	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) On AT models, set the select lever to the "P" or "N" range, and on MT models, depress the clutch pedal. 2) Turn the ignition switch to START. 3) Measure the voltage between starter relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 14 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the open circuit of the harness between starter relay connector and starter motor.	Go to step **6**.
6	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition switch. 3) Measure the voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **7**.	Check the following item and repair if necessary. • Blown out of fuse • Open or ground short circuit of harness between ignition switch connector and battery
7	**CHECK IGNITION SWITCH.** Measure the resistance between ignition switch terminals after turning the ignition switch to START position. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **8**.	Replace the ignition switch. <Ref. to SL-47, REPLACEMENT, Ignition Key Lock.>

	Step	Check	Yes	No
8	**CHECK INPUT VOLTAGE OF STARTER RELAY.** 1) Remove the starter relay. 2) Connect the connector to ignition switch. 3) Turn the ignition switch to START. 4) Measure the voltage between starter relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **9**.	Repair open circuit of harness between starter relay connector and ignition switch connector.
9	**CHECK STARTER RELAY.** 1) Connect the battery to starter relay terminals No. 15 and No. 16. 2) Measure the resistance between starter relay terminals. ***Terminals*** ***No. 13 — No. 14:***	Is the resistance less than 1 Ω?	Go to step **10**.	Replace the starter relay.
10	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of harness between ECM and starter relay connector. ***Connector & terminal*** ***(B136) No. 20 — (B225) No. 16:***	Is the resistance less than 1 Ω?	Go to step **11**.	Repair the open circuit of harness between ECM and starter relay connector.
11	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **16**.	Go to step **12**.
12	**CHECK INPUT VOLTAGE OF STARTER RELAY.** 1) Depress the clutch pedal. 2) Turn the ignition switch to START. 3) Measure the voltage between starter relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 15 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **13**.	Go to step **14**.
13	**CHECK HARNESS BETWEEN ECM AND CLUTCH SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the clutch switch connector. 3) Measure the resistance of harness between ECM and clutch switch connector. ***Connector & terminal*** ***(B136) No. 32 — (B106) No. 2:***	Is the resistance less than 1 Ω?	Check the ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-74, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>	Repair the open circuit of harness between ECM and clutch switch connector.
14	**CHECK INPUT VOLTAGE OF CLUTCH SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the clutch switch connector. 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 10 V or more?	Go to step **15**.	Check the following item and repair if necessary. • Blown out of fuse • Open or ground short circuit of harness between ignition switch connector and clutch switch connector

	Step	Check	Yes	No
15	**CHECK CLUTCH SWITCH.** Measure the resistance between clutch switch terminals while depressing the clutch pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Repair the open circuit of harness between clutch switch connector and starter relay connector.	Replace the clutch switch. <Ref. to CL-35, Clutch Switch.>
16	**CHECK INPUT VOLTAGE OF STARTER RELAY.** 1) Place the select lever in the "P" or "N" range. 2) Turn the ignition switch to START. 3) Measure the voltage between starter relay connector and chassis ground. ***Connector & terminal*** ***(B225) No. 15 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **17**.	Go to step **18**.
17	**CHECK HARNESS BETWEEN ECM AND INHIBITOR RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the inhibitor relay connector. 3) Measure the resistance of harness between ECM and inhibitor relay connector. ***Connector & terminal*** ***(B136) No. 31 — (B226) No. 1:*** ***(B136) No. 32 — (B226) No. 3:***	Is the resistance less than 1 Ω?	Check the ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-74, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>	Repair the open circuit of harness between ECM and inhibitor relay connector.
18	**CHECK INPUT VOLTAGE OF INHIBITOR RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the inhibitor relay connector. 3) Turn the ignition switch to START. 4) Measure the voltage between inhibitor relay connector and chassis ground. ***Connector & terminal*** ***(B226) No. 2 (+) — Chassis ground (–):*** ***(B226) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **19**.	Check the following item and repair if necessary. • Blown out of fuse • Open or ground short circuit of harness between ignition switch connector and inhibitor relay connector
19	**CHECK INHIBITOR RELAY.** 1) Connect the battery to inhibitor relay terminals No. 1 and No. 2. 2) Measure the resistance between inhibitor relay terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **20**.	Replace the inhibitor relay.
20	**CHECK HARNESS BETWEEN INHIBITOR RELAY CONNECTOR AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between inhibitor relay connector and starter relay connector. ***Connector & terminal*** ***(B226) No. 3 — (B225) No. 15:***	Is the resistance less than 1 Ω?	Repair the open circuit of harness between TCM and inhibitor relay connector.	Repair the open circuit of harness between inhibitor relay connector and starter relay connector.

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

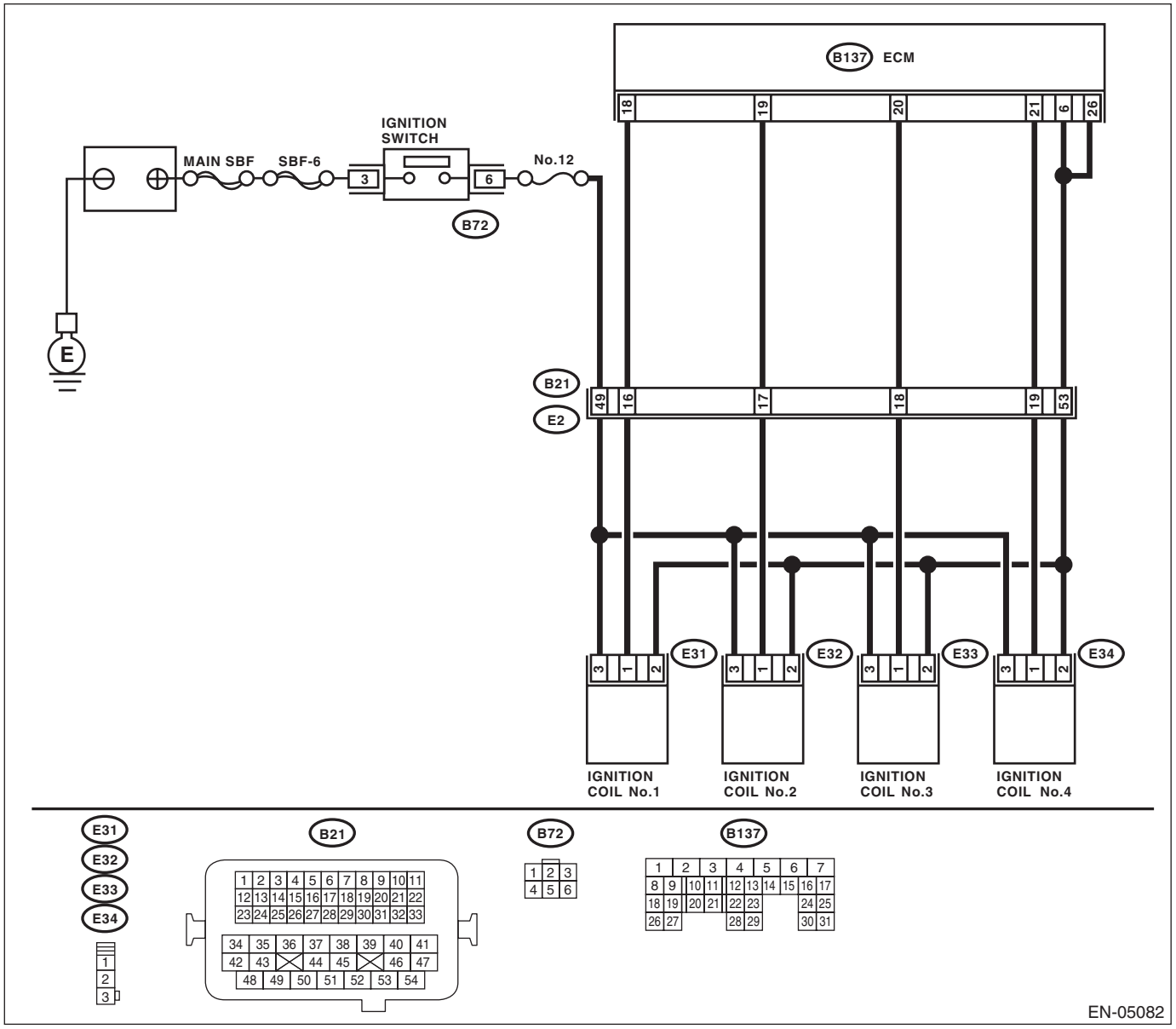
CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2**.	Replace the main relay. <Ref. to EN(H4DOTC)(diag)-8, Electrical Component Location.>
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the open circuit of harness between the ECM and engine ground terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **5**.	Repair the open or ground short circuit of power supply circuit.
5	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (–):*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	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 and chassis ground. ***Connector & terminal*** ***(B134) No. 7 (+) — Chassis ground (–):*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Check ignition control system. <Ref. to EN(H4DOTC)(diag)-76, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit of harness between ECM and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

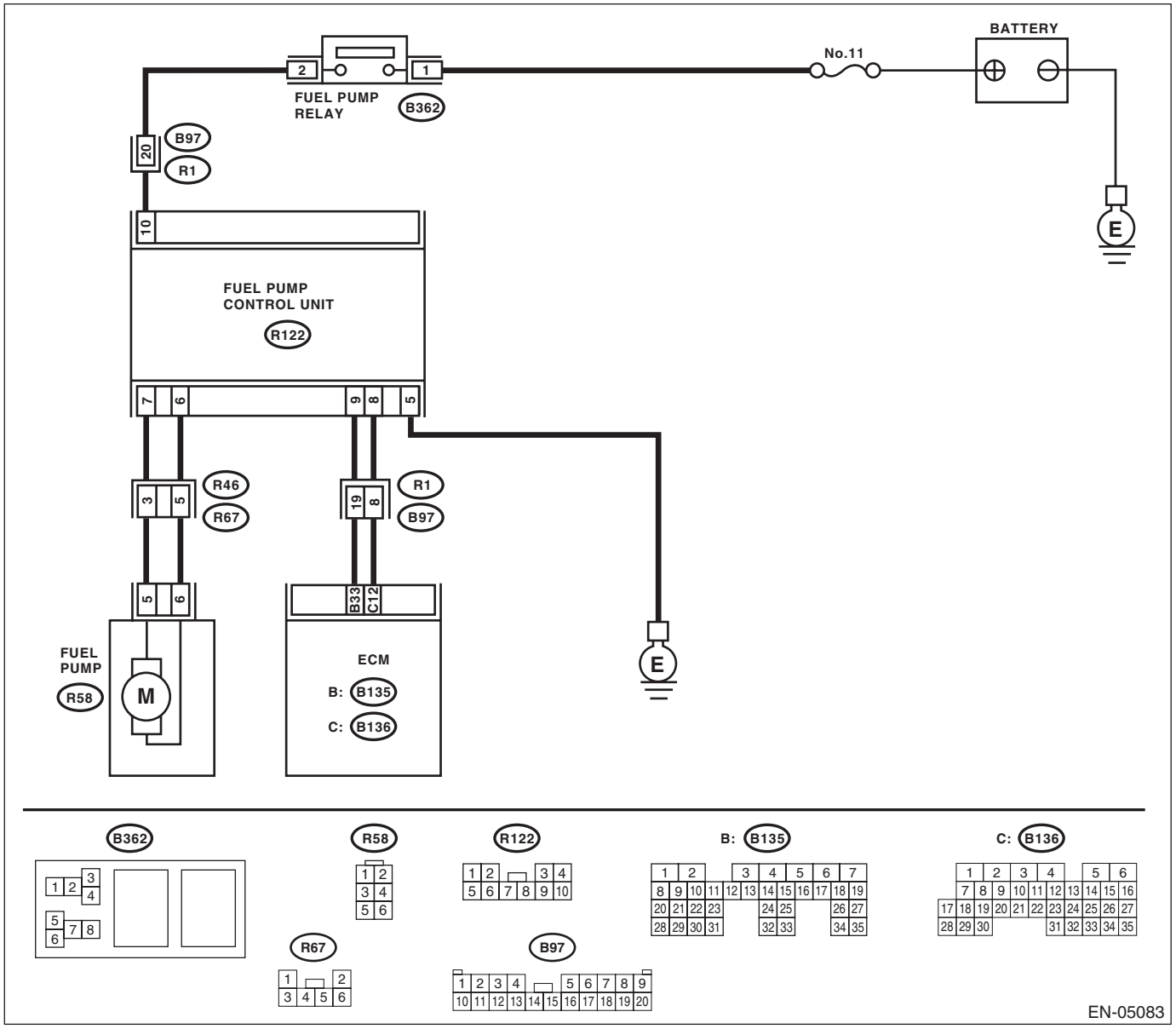


Step		Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DOTC)-5, INSPECTION, Spark Plug.>	Is the spark plug condition normal?	Go to step **2**.	Replace the spark plug. <Ref. to IG(H4DOTC)-4, Spark Plug.>

	Step	Check	Yes	No
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, 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)-78, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3**.
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (–):*** ***(E32) No. 3 (+) — Engine ground (–):*** ***(E33) No. 3 (+) — Engine ground (–):*** ***(E34) No. 3 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ignition coil and ignition switch connector • Poor contact of coupling connector
4	**CHECK HARNESS OF IGNITION COIL GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and ignition coil connector. ***Connector & terminal*** ***(E31) No. 2 — (B137) No. 6:*** ***(E32) No. 2 — (B137) No. 6:*** ***(E33) No. 2 — (B137) No. 6:*** ***(E34) No. 2 — (B137) No. 6:*** ***(E31) No. 2 — (B137) No. 26:*** ***(E32) No. 2 — (B137) No. 26:*** ***(E33) No. 2 — (B137) No. 26:*** ***(E34) No. 2 — (B137) No. 26:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: Open circuit of harness between the ECM and ignition coil connector
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and ignition coil. 3) Measure the resistance of harness between the ECM and ignition coil connector. ***Connector & terminal*** ***(B137) No. 18 — (E31) No. 1:*** ***(B137) No. 19 — (E32) No. 1:*** ***(B137) No. 20 — (E33) No. 1:*** ***(B137) No. 21 — (E34) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and ignition coil connector • Poor contact of coupling connector
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B137) No. 18 — Engine ground:*** ***(B137) No. 19 — Engine ground:*** ***(B137) No. 20 — Engine ground:*** ***(B137) No. 21 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the ground short circuit of harness between the ECM and ignition coil connector.
7	**CHECK POOR CONTACT.** Check for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair poor contact of the ECM connector.	Replace the ignition coil.

E: FUEL PUMP CIRCUIT

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

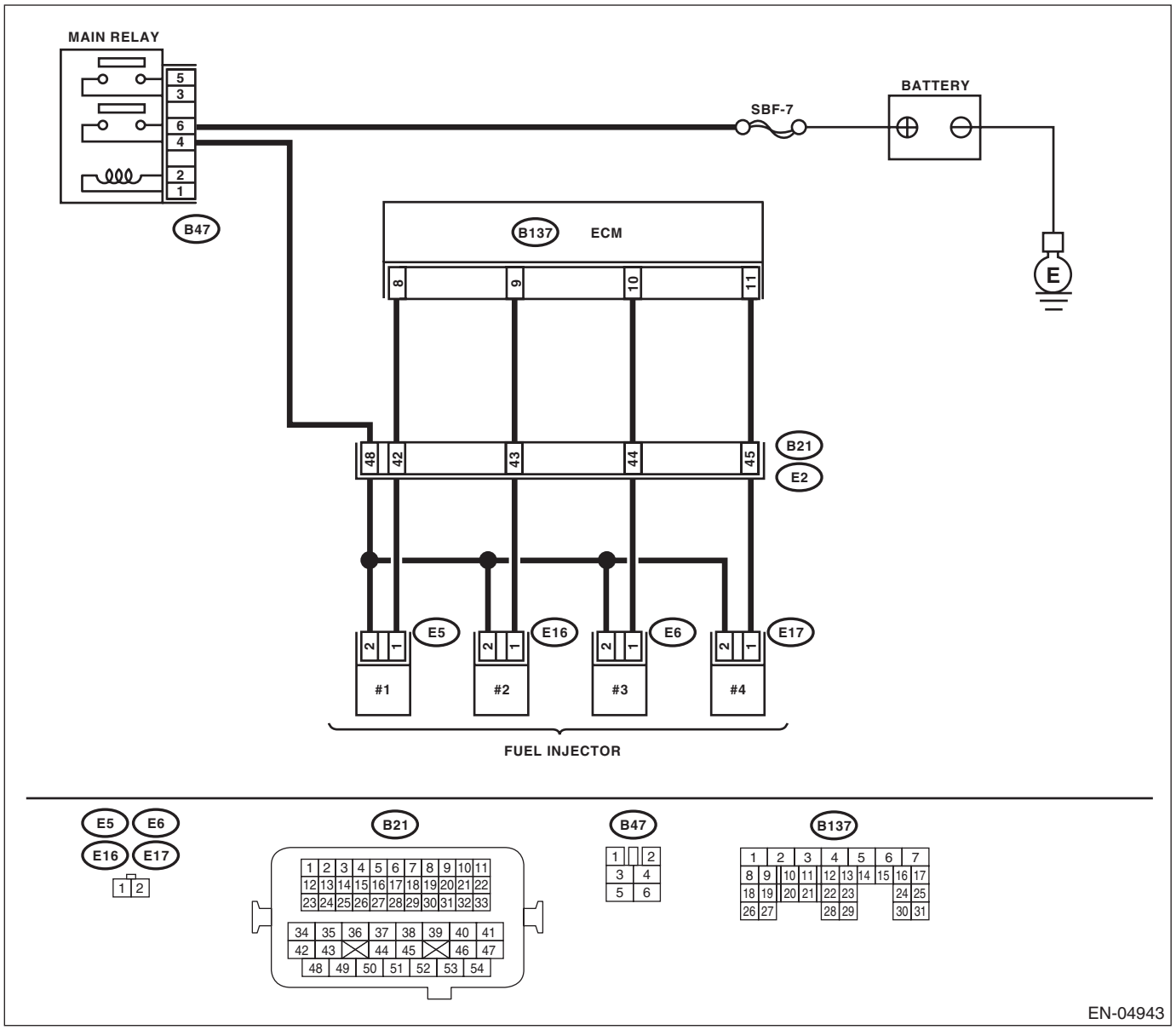


Step		Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump operates for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the fuel pump emit operating sound?	Check the fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-79, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(H4DOTC)(diag)-44, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.**

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check each fuel injector emits operating sound. Use a sound scope or attach a screwdriver to the injector for this check.	Does the fuel injector emit operating sound?	Check the fuel pressure. <Ref. to ME(H4DOTC)-25, 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 10 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and fuel injector connector • Poor contact of main relay connector • Poor contact of coupling connector • Poor contact of fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B137) No. 8 — (E5) No. 1:*** ***(B137) No. 9 — (E16) No. 1:*** ***(B137) No. 10 — (E6) No. 1:*** ***(B137) No. 11 — (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 of harness between ECM and fuel injector connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:*** ***(B137) No. 10 — Chassis ground:*** ***(B137) No. 11 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 5 — 20 Ω?	Go to step **6**.	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check for poor contact of the ECM connector.	Is there poor contact in ECM connector?	Repair poor contact of the ECM connector.	Inspection using “General Diagnostic Table” <Ref. to EN(H4DOTC)(diag)-380, INSPECTION, General Diagnostic Table.>

18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Reference
P0011	Intake Camshaft Position - Timing Over-Advanced Or System Performance (Bank 1)	<Ref. to EN(H4DOTC)(diag)-89, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	<Ref. to EN(H4DOTC)(diag)-90, DTC P0016 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	<Ref. to EN(H4DOTC)(diag)-91, DTC P0018 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(H4DOTC)(diag)-92, 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)-93, 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)-95, 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)-97, 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)-99, 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)-101, 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)-103, 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)-105, 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)-107, 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)-109, 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)-111, 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)-113, 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)-115, 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)-117, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to EN(H4DOTC)(diag)-119, 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)-121, 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)-123, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low	<Ref. to EN(H4DOTC)(diag)-125, 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)-127, 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)-129, 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)-130, 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)-131, 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)-132, 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)-134, 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)-136, 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)-138, 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)-140, 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)-142, 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)-144, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0140	O2 Sensor Circuit No Activity Detected (Bank1 Sensor2)	<Ref. to EN(H4DOTC)(diag)-146, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4DOTC)(diag)-148, 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)-149, 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)-152, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-154, 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)-156, 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)-158, 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)-160, 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)-162, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to EN(H4DOTC)(diag)-165, 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)-167, 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)-169, 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)-170, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-170, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-170, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-171, 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)-177, 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)-179, 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)-181, 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)-183, 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)-185, 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)-187, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0410	Secondary Air Injection System	<Ref. to EN(H4DOTC)(diag)-189, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to EN(H4DOTC)(diag)-193, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0413	Secondary Air Injection System Switching Valve “A” Circuit Open	<Ref. to EN(H4DOTC)(diag)-196, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0414	Secondary Air Injection System Switching Valve “A” Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-199, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0416	Secondary Air Injection System Switching Valve “B”Circuit Open	<Ref. to EN(H4DOTC)(diag)-202, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0417	Secondary Air Injection System Switching Valve “B”Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-205, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0418	Secondary Air Injection System Control “A” Circuit Open	<Ref. to EN(H4DOTC)(diag)-208, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4DOTC)(diag)-211, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0441	Evaporative Emission System Incorrect Purge Flow	<Ref. to EN(H4DOTC)(diag)-215, DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to EN(H4DOTC)(diag)-216, 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)-219, 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)-221, 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)-223, 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)-225, 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)-227, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to EN(H4DOTC)(diag)-229, 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)-232, 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)-235, 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)-237, 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)-238, 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)-238, DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0463	Fuel Level Sensor “A” Circuit High	<Ref. to EN(H4DOTC)(diag)-239, 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)-239, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Fan Rationality Check	<Ref. to EN(H4DOTC)(diag)-240, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle Speed Sensor “A”	<Ref. to EN(H4DOTC)(diag)-240, 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)-241, 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)-243, 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)-245, 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)-247, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial Communication Link	<Ref. to EN(H4DOTC)(diag)-247, 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)-248, 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)-249, 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)-250, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/ Performance (Bank 1)	<Ref. to EN(H4DOTC)(diag)-251, 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)-252, 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)-252, 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)-252, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Park/Neutral Switch Input Circuit Low (AT Model)	<Ref. to 5AT(diag)-2, Basic Diagnostic Procedure.>
P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to EN(H4DOTC)(diag)-253, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Park/Neutral Switch Input Circuit High (AT Model)	<Ref. to 5AT(diag)-2, Basic Diagnostic Procedure.>
P0852	Neutral Switch Input Circuit High (MT Model)	<Ref. to EN(H4DOTC)(diag)-255, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O2 Sensor Circuit Range/ Performance (Low) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-257, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P1153	O2 Sensor Circuit Range/ Performance (High) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-259, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4DOTC)(diag)-260, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-261, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1410	Secondary Air Injection System Switching Valve Stuck Open	<Ref. to EN(H4DOTC)(diag)-263, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1418	Secondary Air Injection System Control “A” Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-266, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to EN(H4DOTC)(diag)-269, 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)-271, 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)-273, 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)-275, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to EN(H4DOTC)(diag)-277, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM(diag)-17, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-19, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM(diag)-20, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM(diag)-22, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-23, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-23, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1578	Meter Failure	<Ref. to IM(diag)-24, DTC P1578 METER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1602	Control Module Programming Error	<Ref. to EN(H4DOTC)(diag)-279, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-288, 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)-288, 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)-289, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to EN(H4DOTC)(diag)-289, 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)-290, 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)-292, 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)-294, 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)-296, 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)-298, 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)-300, 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)-302, 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)-304, 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)-306, 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)-308, 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)-310, 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)-312, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(H4DOTC)(diag)-314, 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)-321, 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)-328, 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)-333, 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)-335, 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)-336, DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-337, 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)-339, 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)-341, 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)-343, 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)-345, 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)-348, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2419	Evaporative Emission System Switching Valve Control Circuit Low	<Ref. to EN(H4DOTC)(diag)-350, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2420	Evaporative Emission System Switching Valve Control Circuit High	<Ref. to EN(H4DOTC)(diag)-352, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-354, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2432	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low	<Ref. to EN(H4DOTC)(diag)-357, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	<Ref. to EN(H4DOTC)(diag)-360, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank1)	<Ref. to EN(H4DOTC)(diag)-363, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank1)	<Ref. to EN(H4DOTC)(diag)-367, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank2)	<Ref. to EN(H4DOTC)(diag)-368, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank2)	<Ref. to EN(H4DOTC)(diag)-372, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to EN(H4DOTC)(diag)-373, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°?	Go to step **2**.	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)
2	**CHECK CURRENT DATA.** 1) Drive (accelerate or decelerate) the vehicle at 80 km/h (50 MPH) or less. NOTE: Drive the vehicle so that duty output of the oil flow control solenoid valve increases. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H4DOTC)-26, Engine Oil Filter.>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°, and oil flow control solenoid valve duty output approx. 10%?	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H4DOTC)-26, Engine Oil Filter.>	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0018 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°, and oil flow control solenoid valve duty output approx. 10%?	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H4DOTC)-26, Engine Oil Filter.>	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°?	Go to step **2**.	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)
2	**CHECK CURRENT DATA.** 1) Drive (accelerate or decelerate) the vehicle at 80 km/h (50 MPH) or less. NOTE: Drive the vehicle so that duty output of the oil flow control solenoid valve increases. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H4DOTC)-26, Engine Oil Filter.>

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

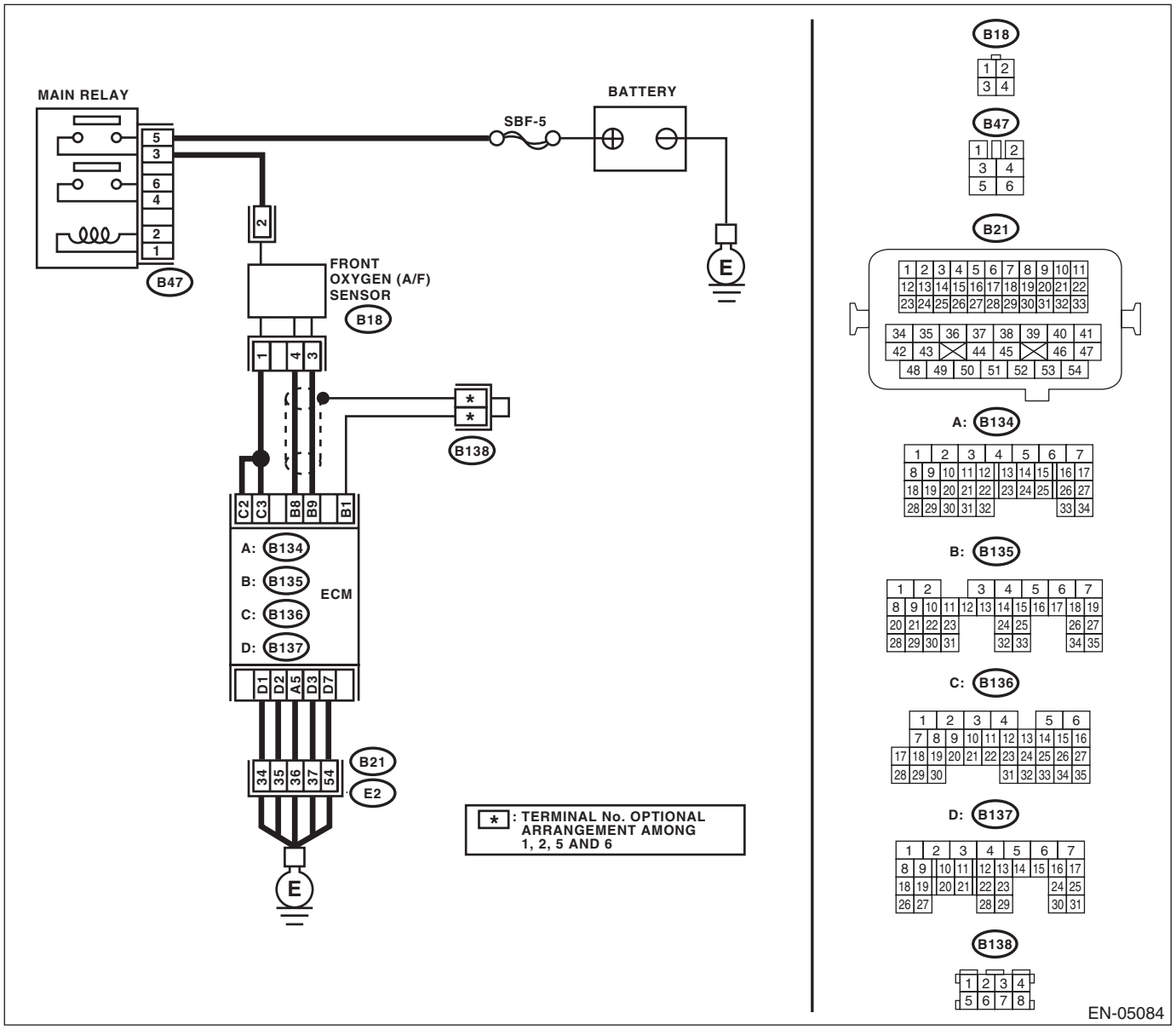
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-13, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 3 — (B18) No. 1:*** ***(B136) No. 2 — (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*** ***(B135) No. 9 — (B18) No. 3:*** ***(B135) No. 8 — (B18) No. 4:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance less than 2 — 3 Ω?	Go to step **4**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.>
4	**CHECK POOR CONTACT.** Check poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.>

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

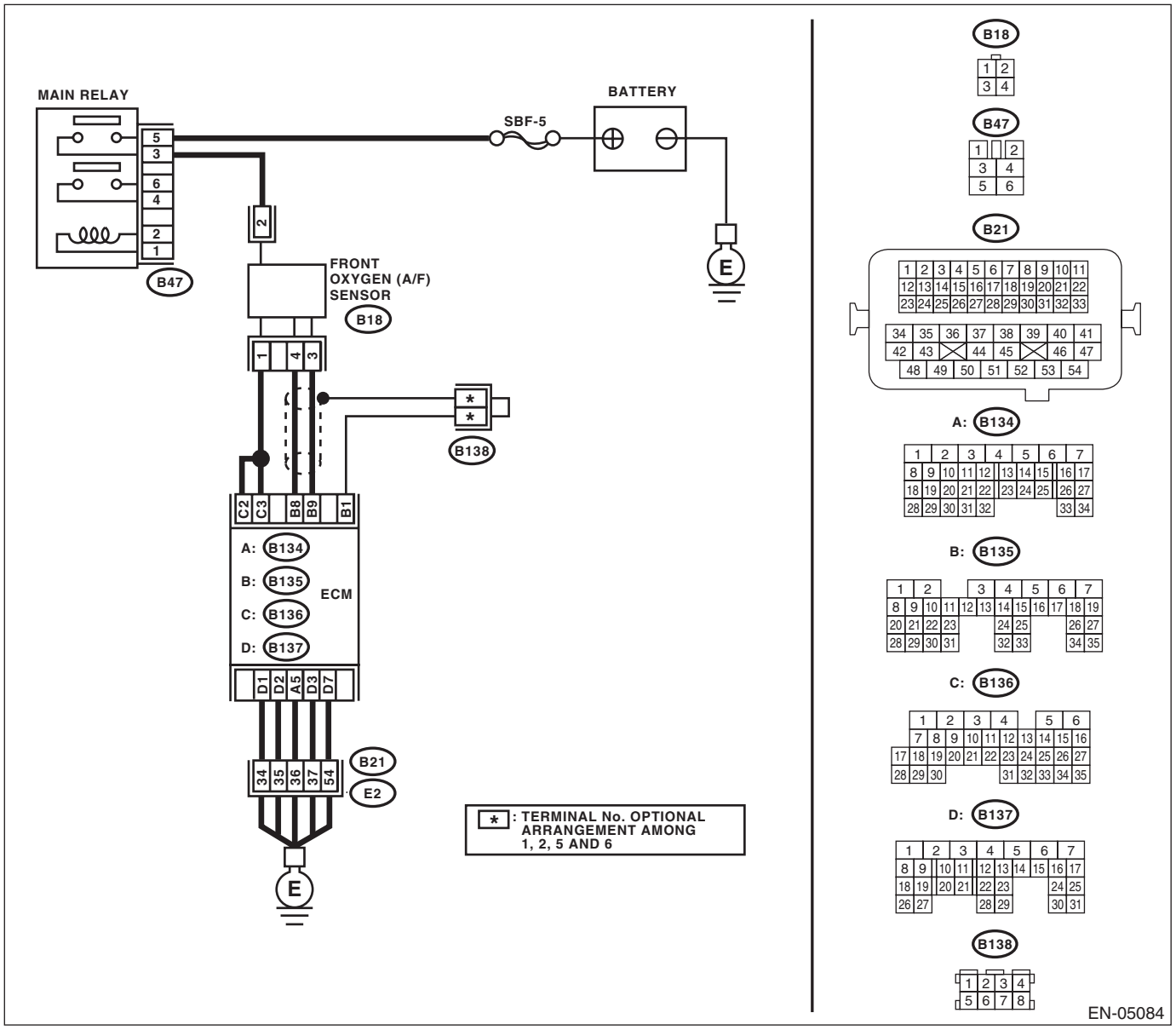
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-15, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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 10 V or more?	Go to step **2**.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and front oxygen (A/F) sensor connector • Poor contact of main relay connector • Malfunction in main relay
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 3 — (B18) No. 1:*** ***(B136) No. 2 — (B18) No. 1:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor.
3	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance between 2 — 3 Ω?	Repair poor contact of the ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.>

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

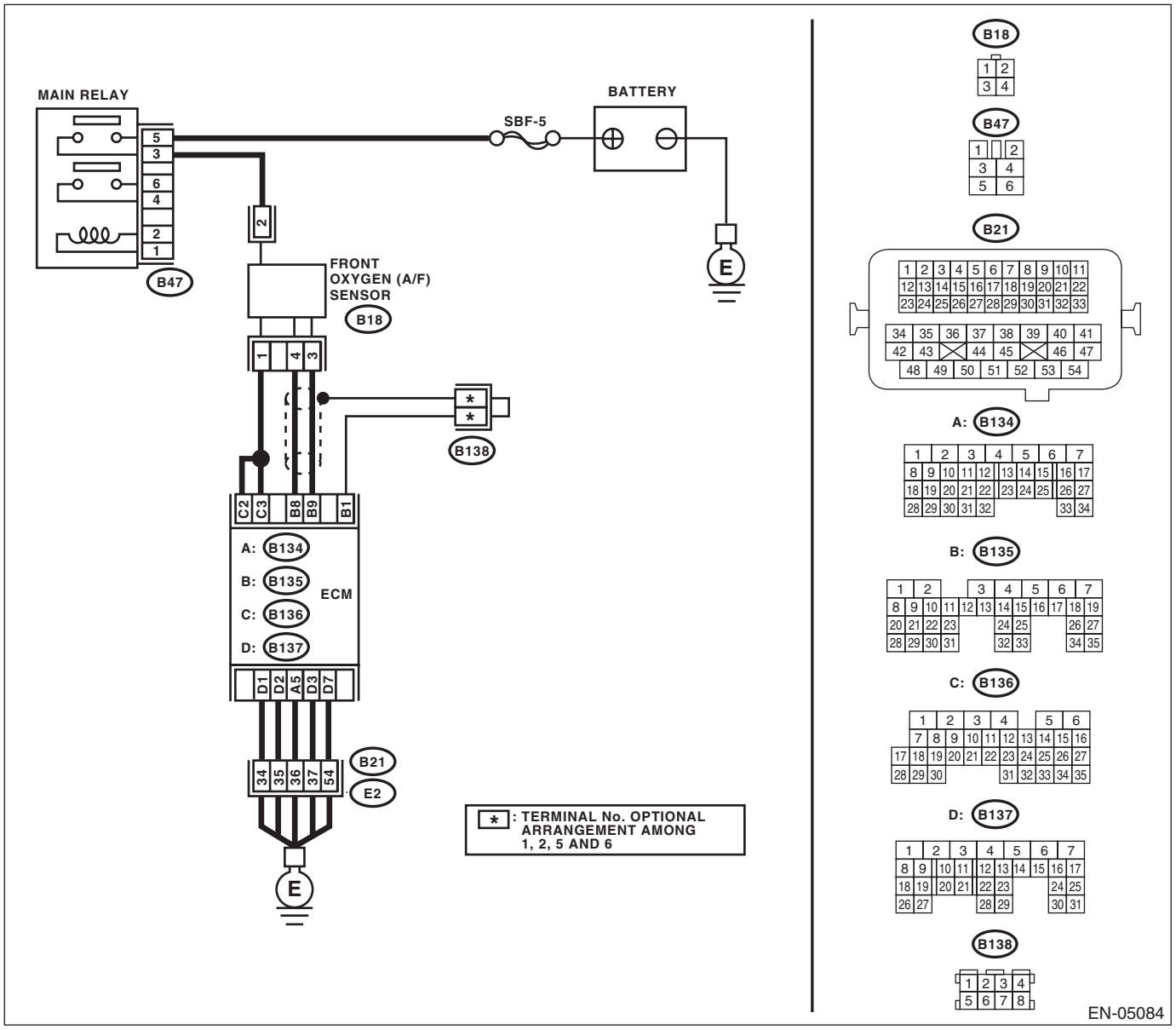
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-17, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 3 (+) — Chassis ground (–):*** ***(B136) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between the ECM and front oxygen (A/F) sensor connector.	Go to step **2**.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

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

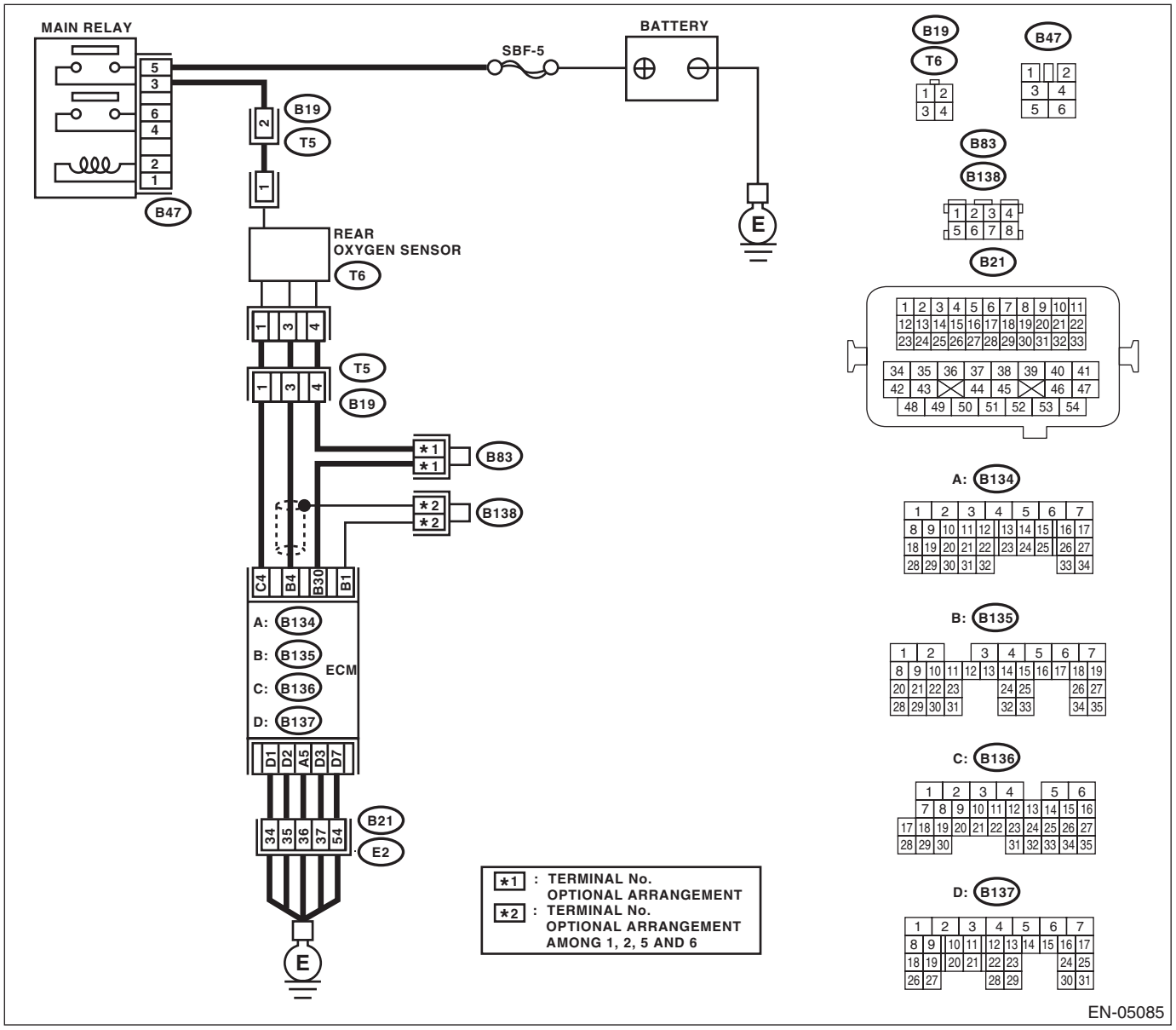
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-19, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground. ***Connector & terminal*** ***(T6) No. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and rear oxygen sensor • Poor contact of main relay connector • Poor contact in coupling connector • Malfunction in main relay
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM and oxygen sensor connector. ***Connector & terminal*** ***(B136) No. 4 — (T6) No. 1:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of the harness between ECM and rear oxygen sensor.
3	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
4	**CHECK REAR OXYGEN SENSOR.** Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 5 — 7 Ω?	Repair poor contact of the ECM connector.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>

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

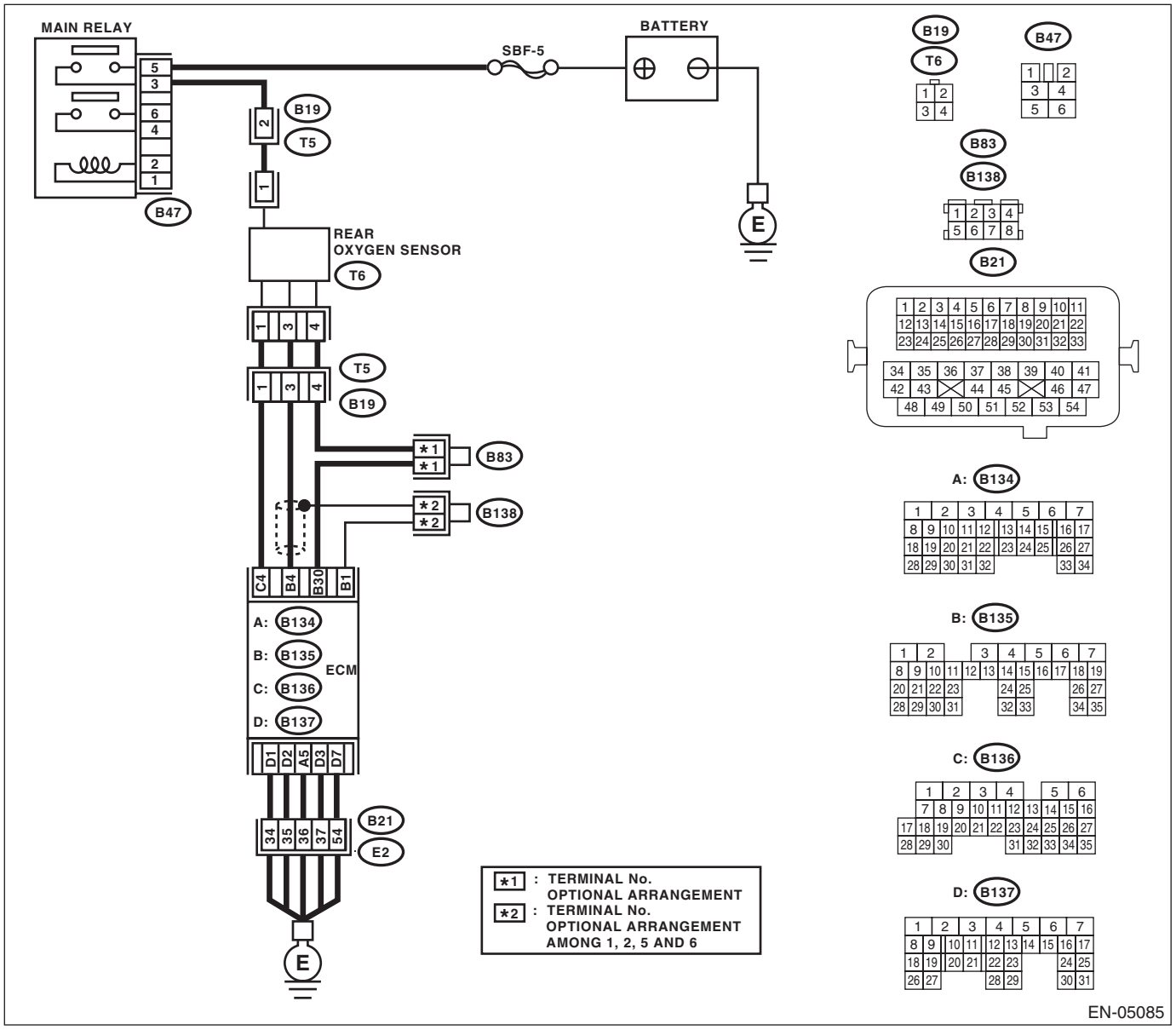
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-21, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



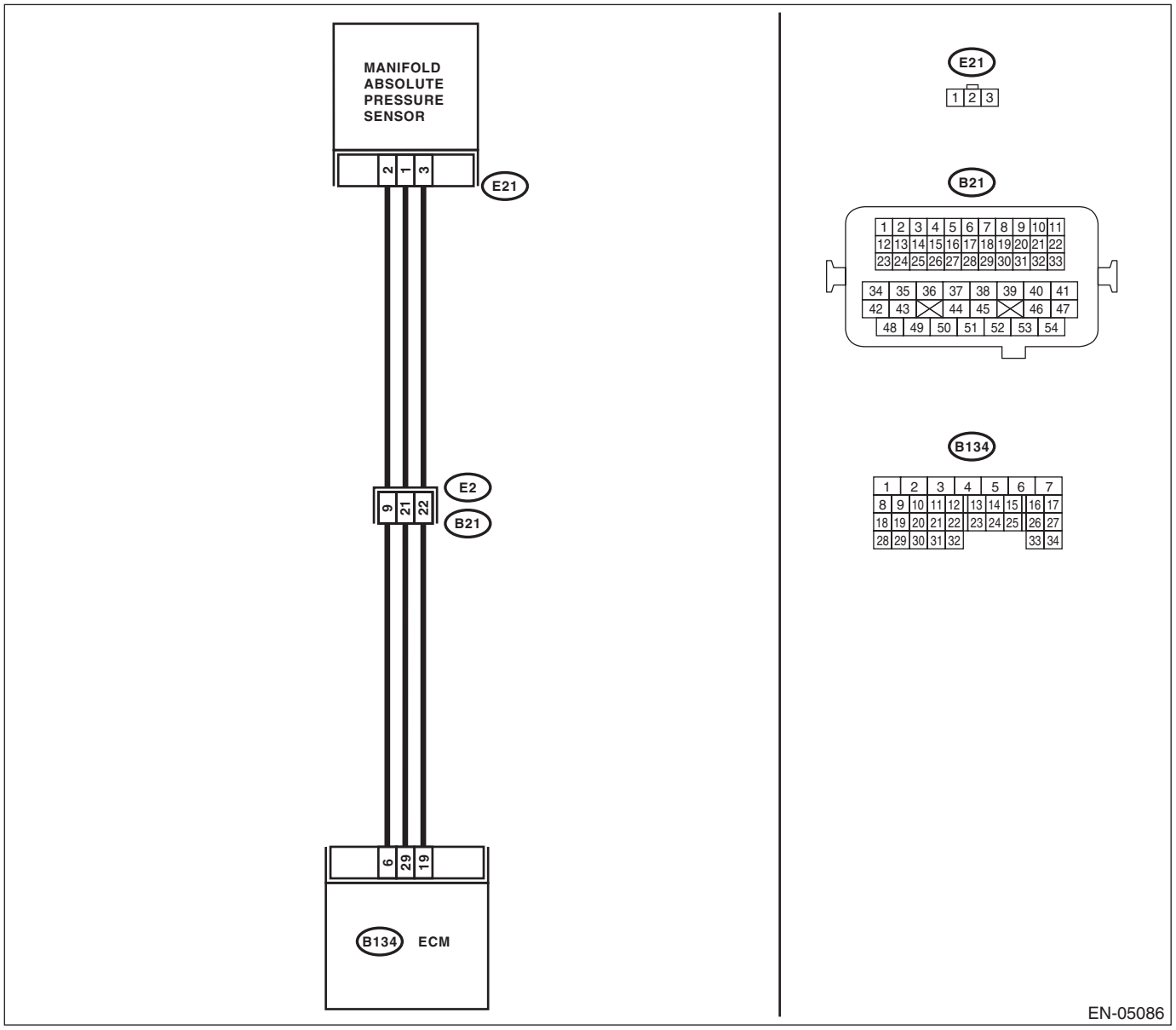
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and rear oxygen sensor connector.	Go to step **2**.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

J: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-23, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **2**.
2	**CHECK MANIFOLD ABSOLUTE PRESSURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is higher than 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the measured value 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) when the ignition is turned ON, and 20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg) during idling?	Go to step **3**.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>
3	**CHECK THROTTLE OPENING ANGLE.** Read the data of throttle position signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the measured value less than 5% when throttle is fully closed?	Go to step **4**.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-12, Throttle Body.>
4	**CHECK THROTTLE OPENING ANGLE.**	Is the measured value 85% or more when throttle is fully open?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-12, Throttle Body.>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-25, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

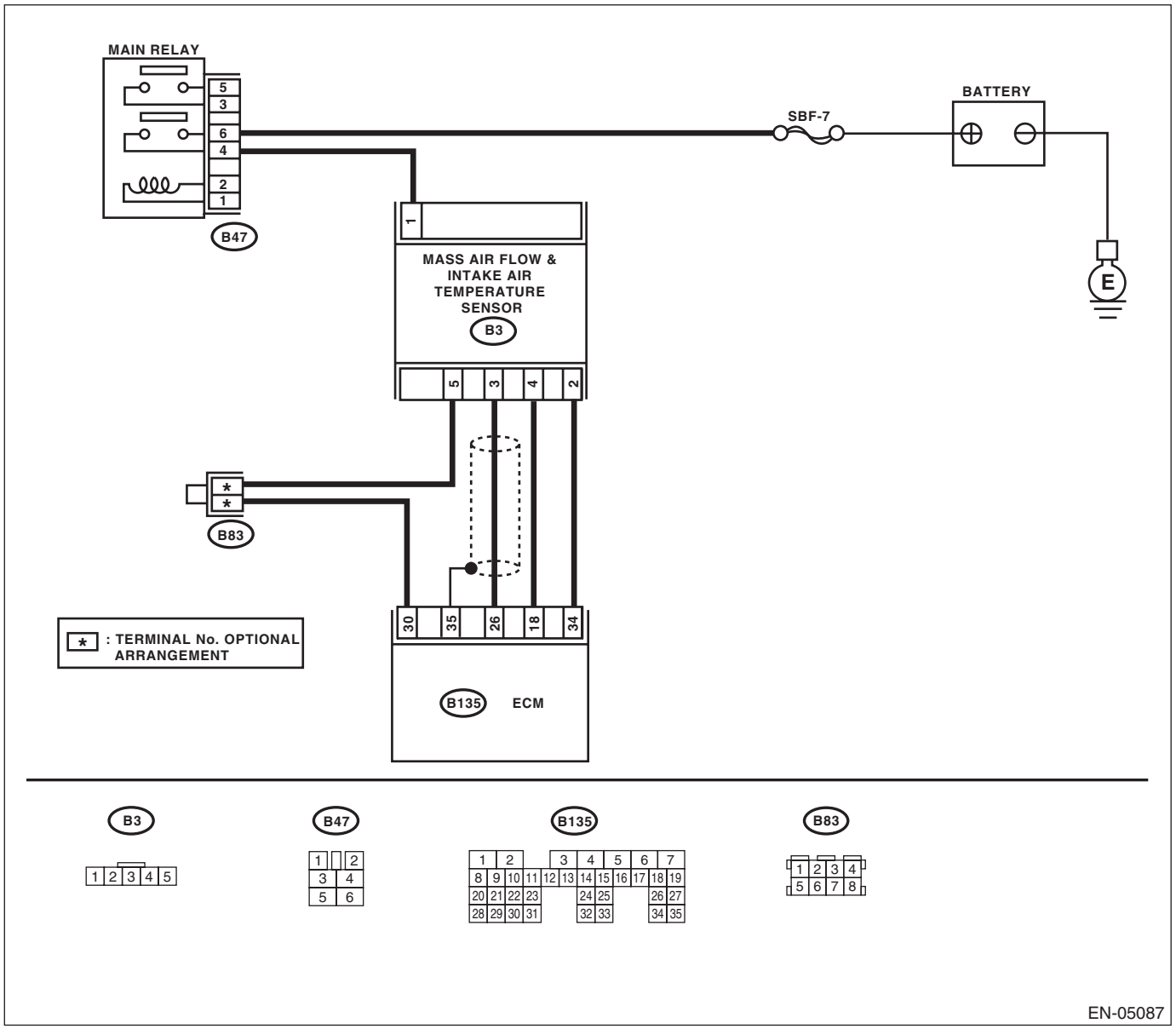
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-28, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

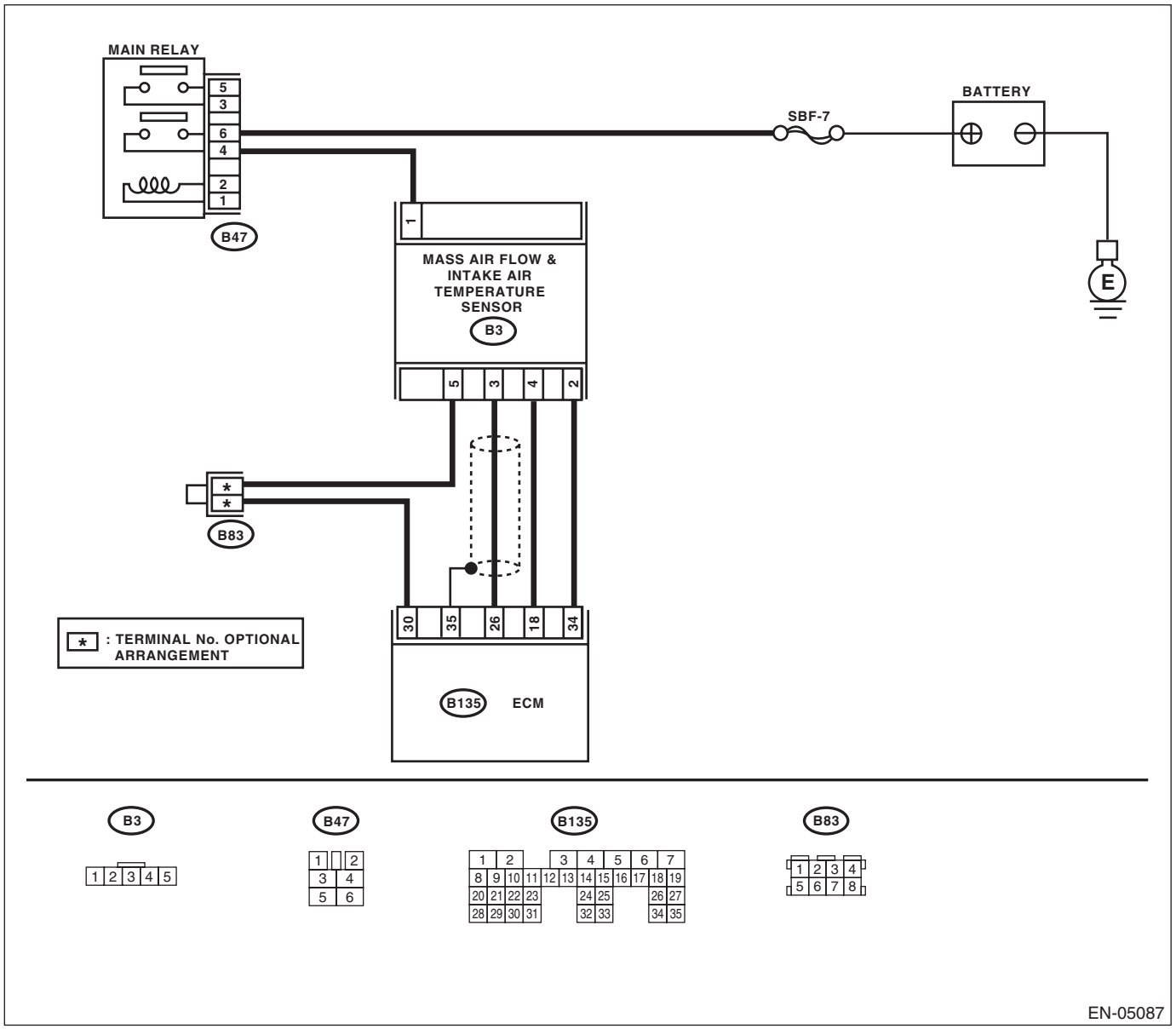
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of air flow sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK POWER SUPPLY OF MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and the mass air flow and intake air temperature sensor connector. • Poor contact in ECM connector
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connector. ***Connector & terminal*** ***(B135) No. 26 — (B3) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and the mass air flow and intake air temperature sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 26 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between the ECM and the mass air flow and intake air temperature sensor connector.
5	**CHECK POOR CONTACT.** Check for any poor contact in the ECM or the mass air flow and intake air temperature sensor connector.	Is there poor contact in the ECM or the mass air flow and intake air temperature sensor connector?	Repair any poor contact in the ECM or the mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-30, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

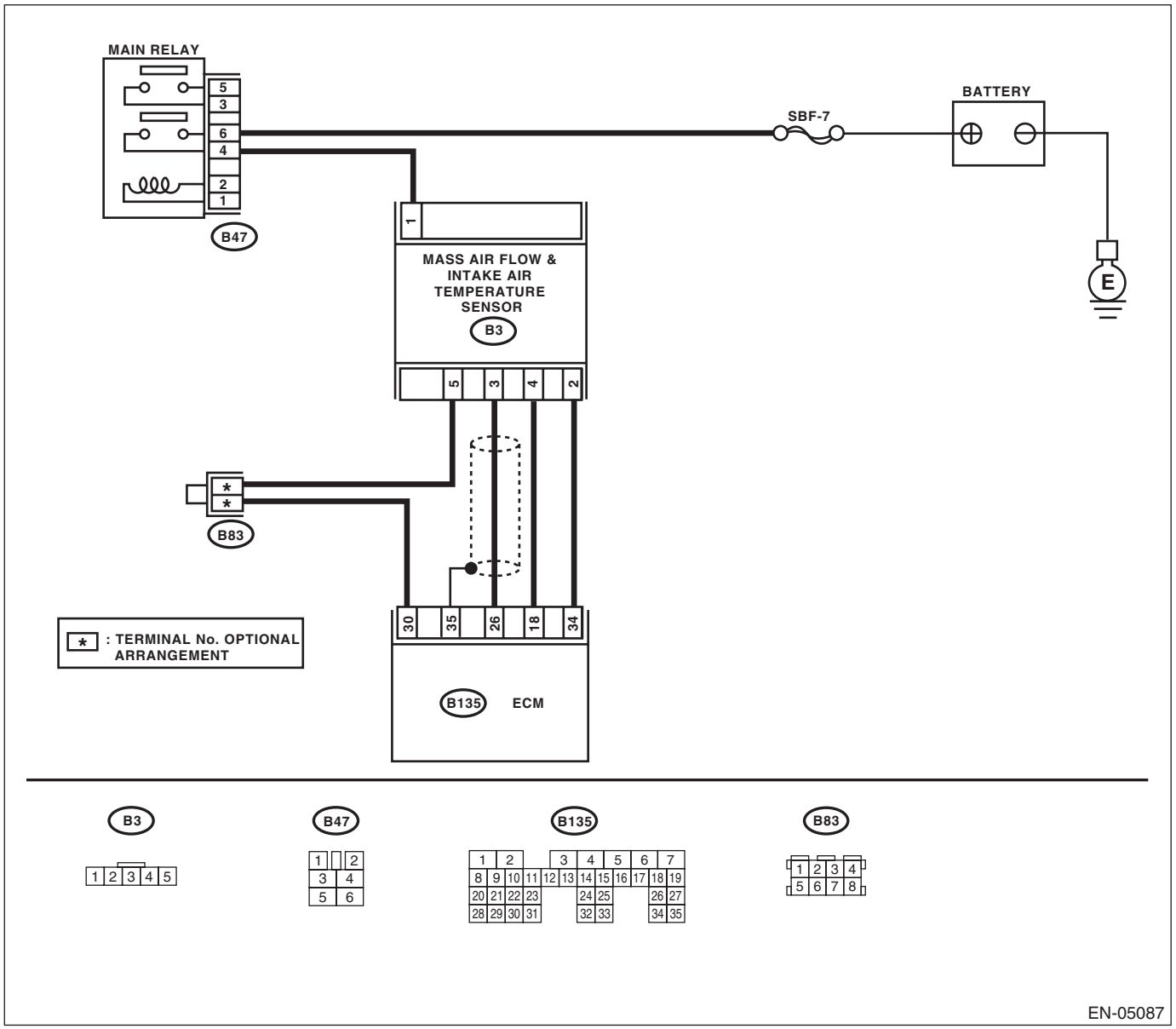
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of air flow sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the mass air flow and intake air temperature sensor. 3) Start the engine. 4) Read the data of air flow sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and the mass air flow and intake air temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between the mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and the mass air flow and intake air temperature sensor connector. • Poor contact in ECM connector
4	**CHECK POOR CONTACT.** Check for any poor contact in the mass air flow and intake air temperature sensor connector.	Is there poor contact in the mass air flow and intake air temperature sensor connector?	Repair any poor contact of the mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

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

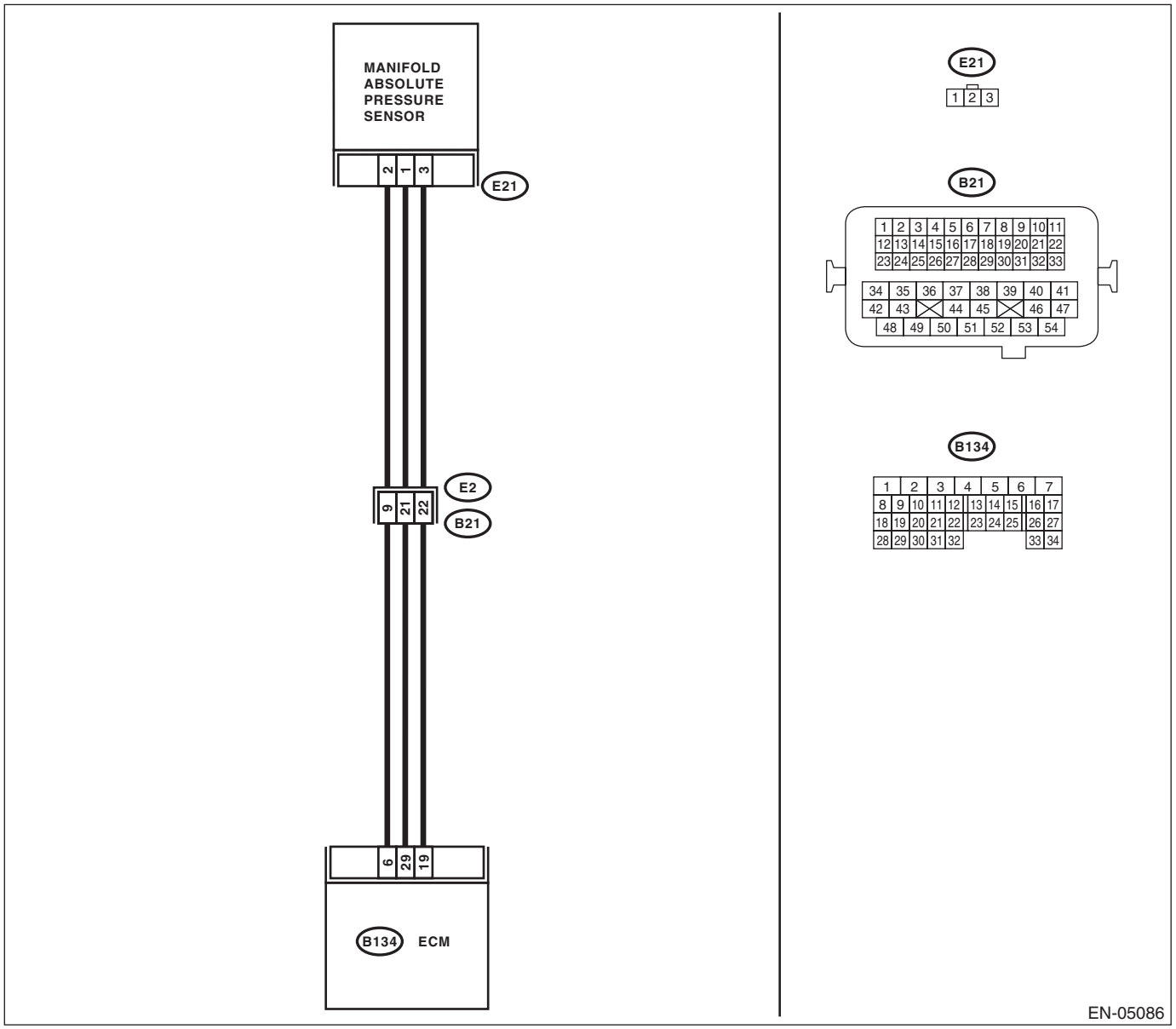
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-32, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than 13.3 kPa (100 mmHg, 3.94 inHg) ?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK POWER SUPPLY OF THE MANIFOLD ABSOLUTE PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):***	Is the voltage 4.5 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B134) No. 6 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair ground short circuit of harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK POOR CONTACT.** Check for poor contact between the ECM and manifold pressure sensor connector.	Is there poor contact in the ECM or manifold absolute pressure sensor connector?	Repair the poor contact in the ECM or manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>

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

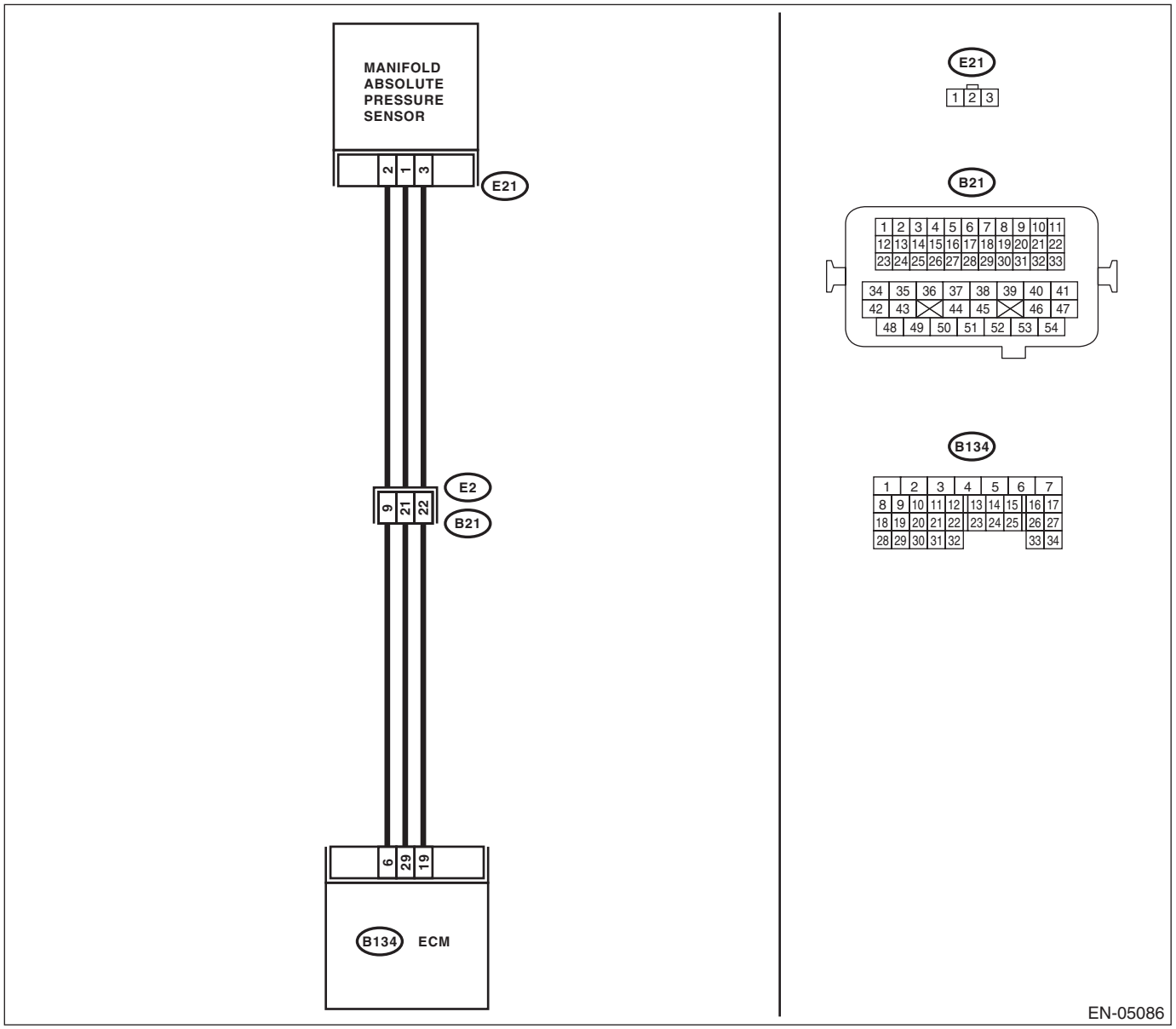
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-34, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 119.5 kPa (896.5 mmHg, 35.29 inHg) or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Start the engine. 4) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 119.5 kPa (896.5 mmHg, 35.29 inHg) or more?	Repair the short circuit to power in the harness between ECM and manifold absolute pressure sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact in ECM connector • Poor contact of coupling connector
4	**CHECK POOR CONTACT.** Check for poor contact of the manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact of manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-36, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

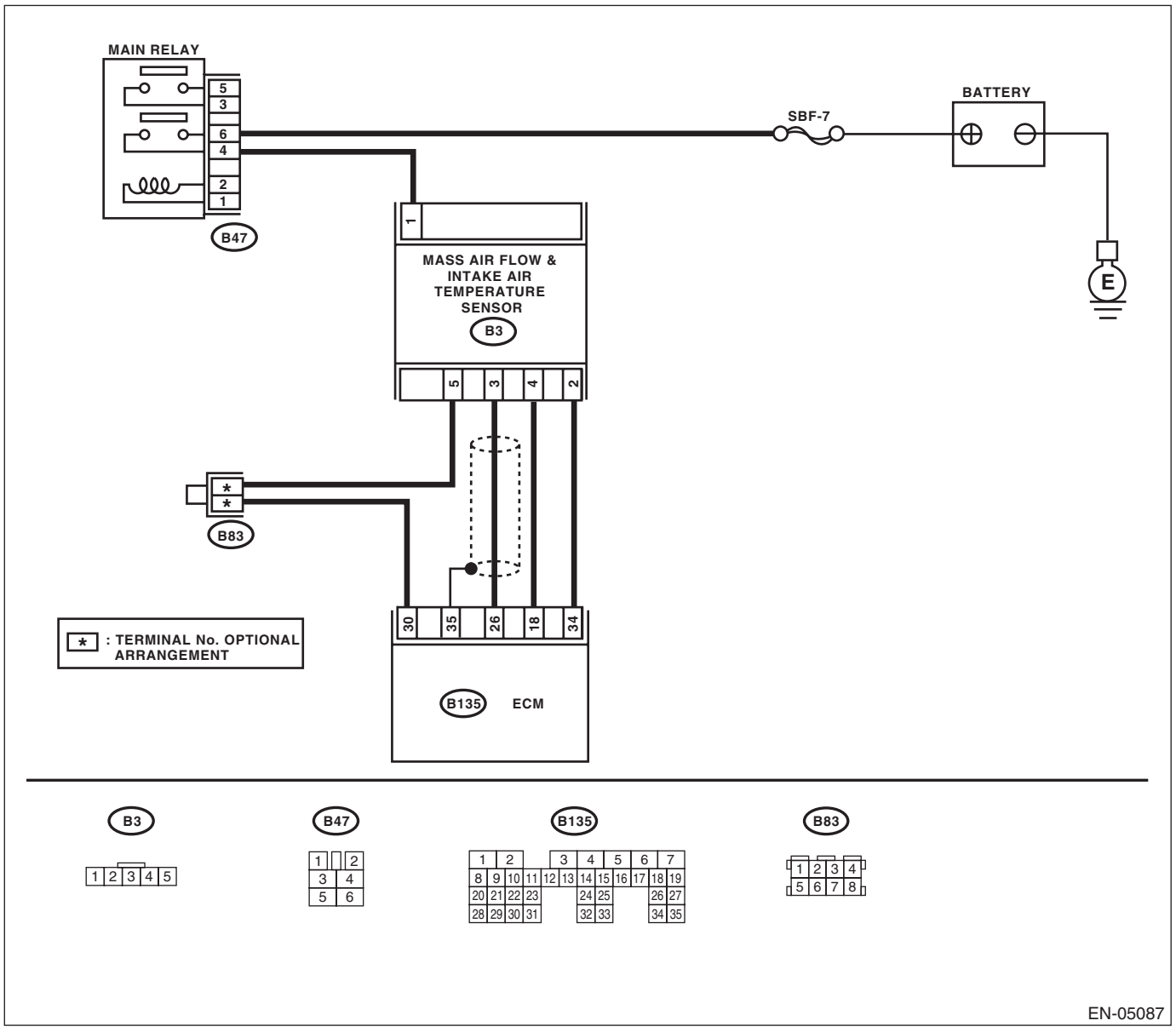
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT TEMPERATURE.** 1) Start the engine and warm-up completely. 2) Measure the engine coolant temperature using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 70°C (158°F) or higher?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Check DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>

Q: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-38, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

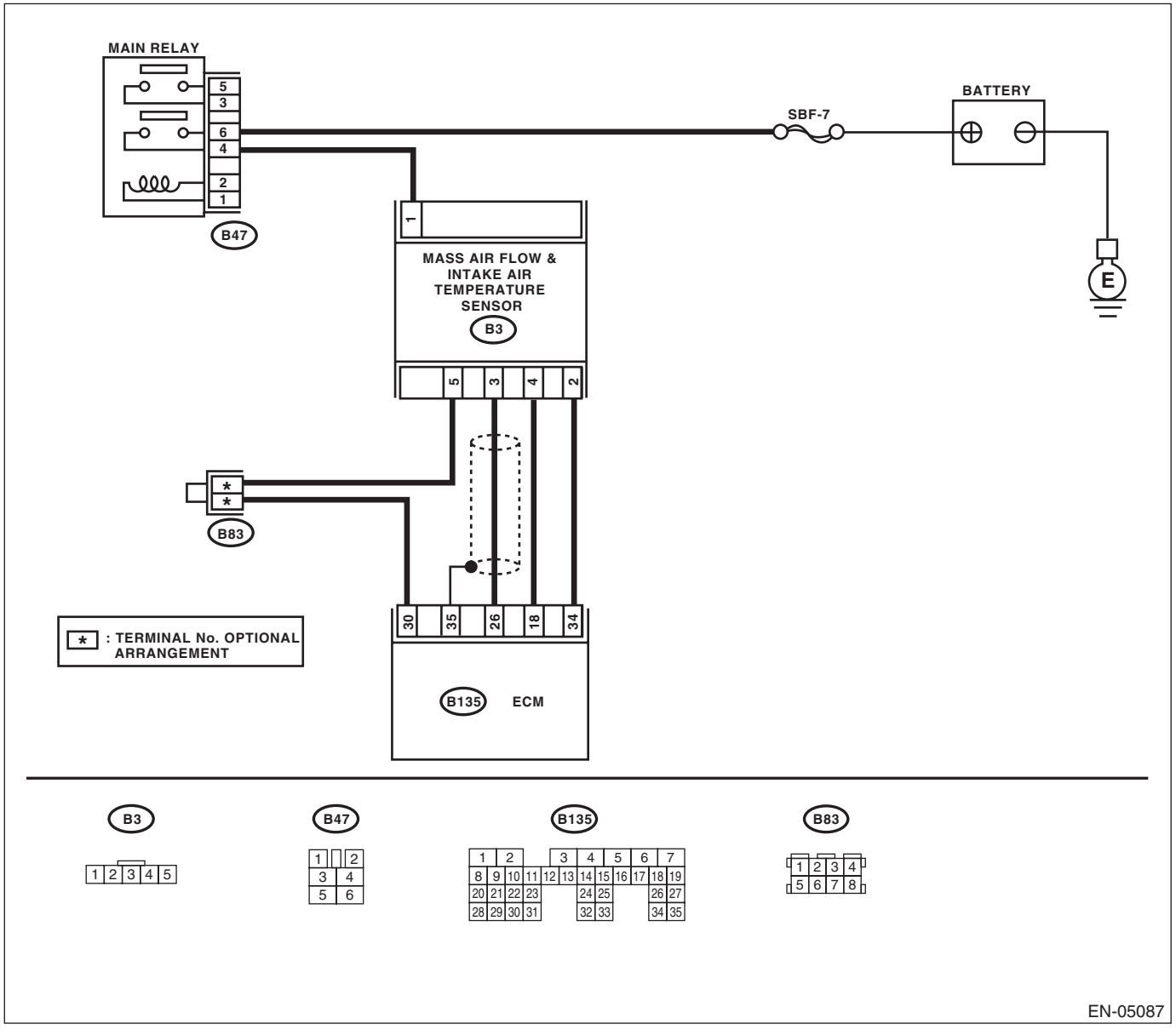
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05087

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the intake air temperature 120°C (248°F) or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and the mass air flow and intake air temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 18 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit of harness between the ECM and the mass air flow and intake air temperature sensor connector.

R: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-40, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

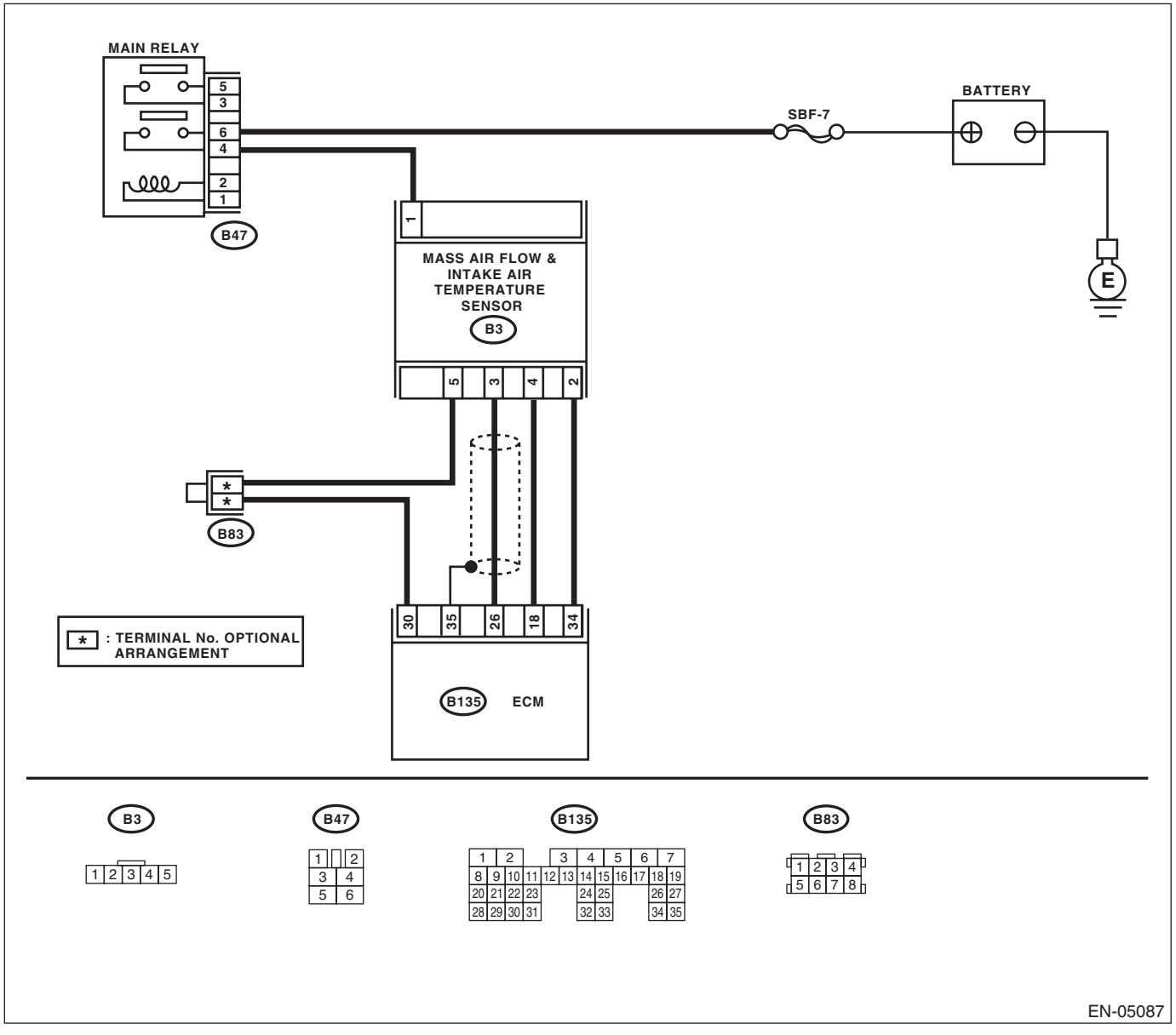
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the intake air temperature less than –40°C (–40°F) ?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK POOR CONTACT.** Check for poor contact in the ECM or the mass air flow and intake air temperature sensor connector.	Is there poor contact in the ECM or the mass air flow and intake air temperature sensor connector?	Repair any poor contact of the ECM or the mass air flow and intake air temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and the mass air flow and intake air temperature sensor. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connector. ***Connector & terminal*** ***(B135) No. 18 — (B3) No. 4:*** ***(B135) No. 34 — (B3) No. 2:*** ***(B135) No. 30 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between the ECM and the mass air flow and intake air temperature sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to OFF. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 18 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and the mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

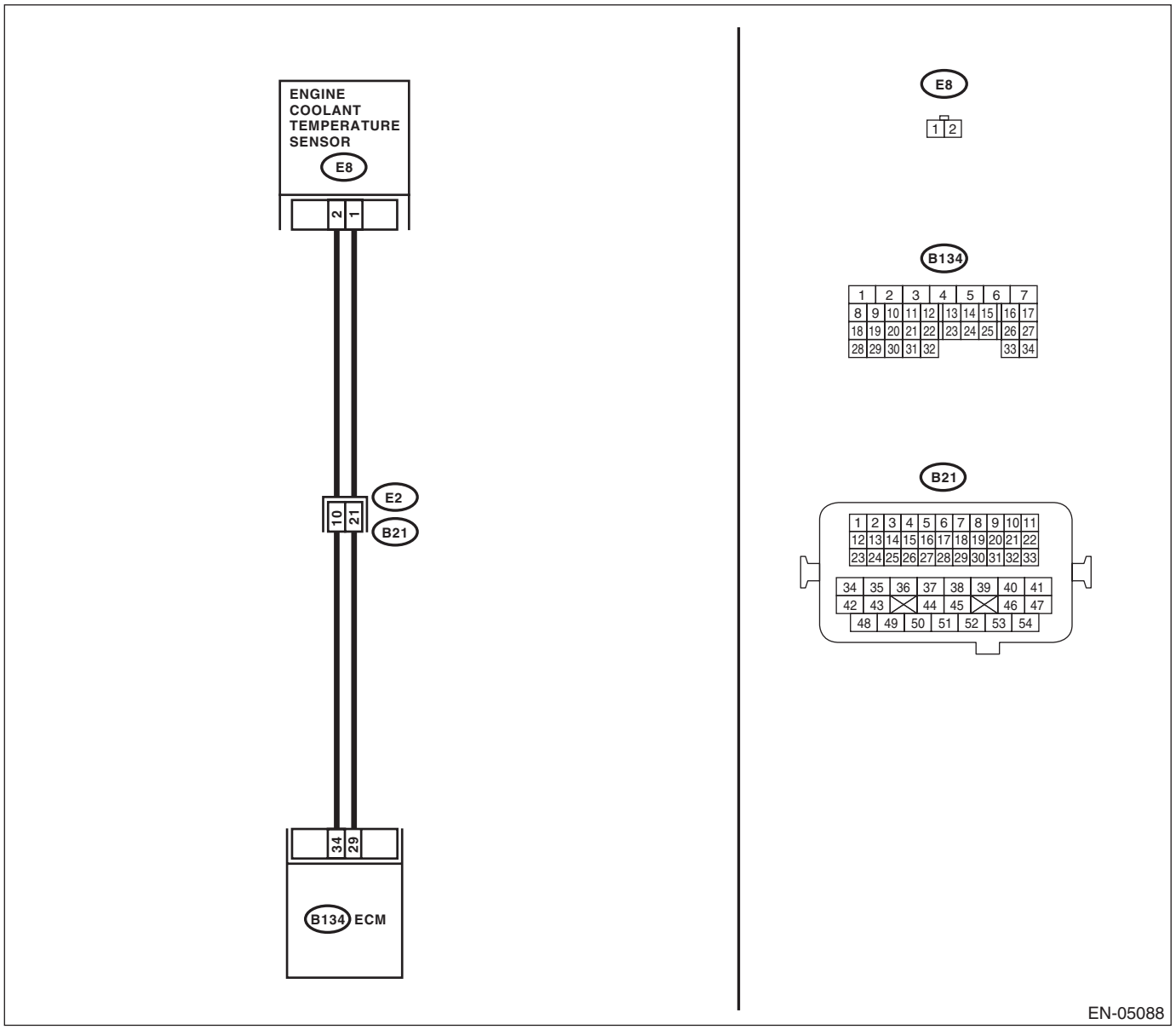
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-42, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 150°C (302°F) or higher?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and engine coolant temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 34 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>	Repair the ground short circuit of the harness between the ECM and engine coolant temperature sensor.

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

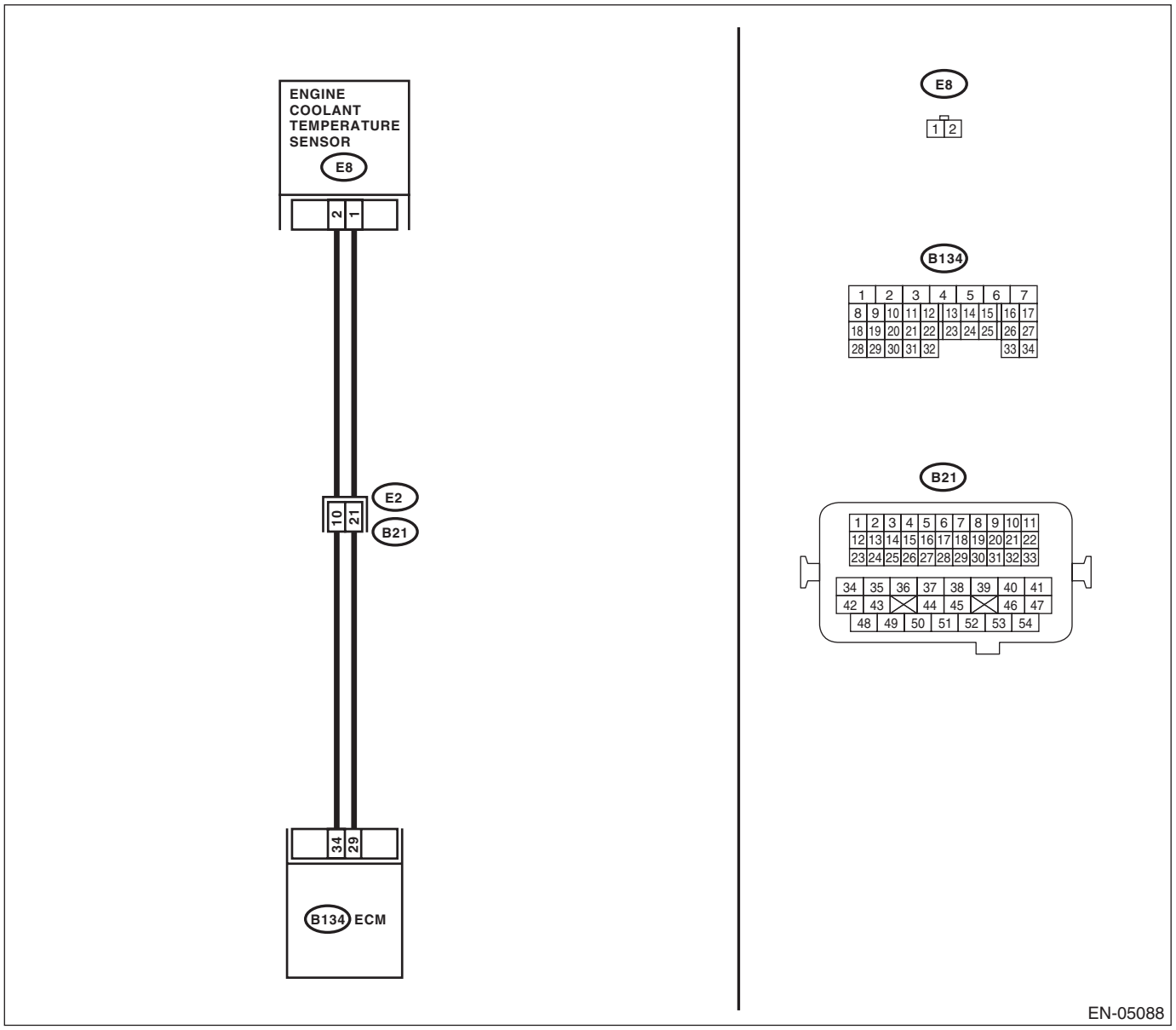
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-44, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature less than –40°C (–40°F) ?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK POOR CONTACT.** Repair any poor contact between the ECM and engine coolant temperature sensor connectors.	Is there poor contact in the ECM or engine coolant temperature sensor connectors?	Repair any poor contact between the ECM and engine coolant temperature sensor connectors.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and engine coolant temperature sensor. 3) Measure the resistance of the harness between the ECM and engine coolant temperature sensor connector. ***Connector & terminal*** ***(B134) No. 34 — (E8) No. 2:*** ***(B134) No. 29 — (E8) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of the harness between the ECM and engine coolant temperature sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 34 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and engine coolant temperature sensor connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-46, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

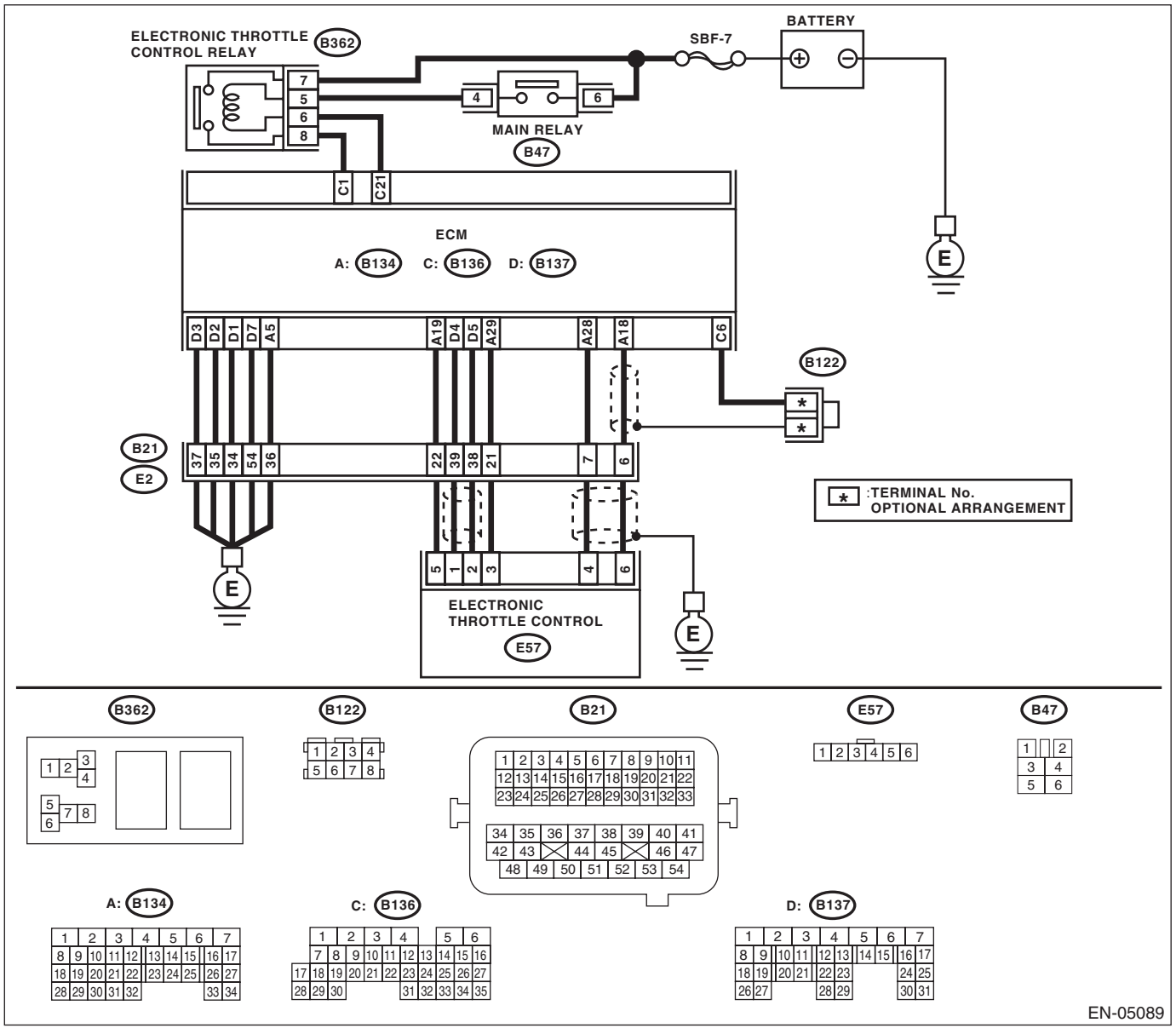
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 6:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the ground short circuit of harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(B134) No. 18 — Engine ground:***	Is the resistance 1 MΩ or more?	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-12, Throttle Body.>	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-48, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

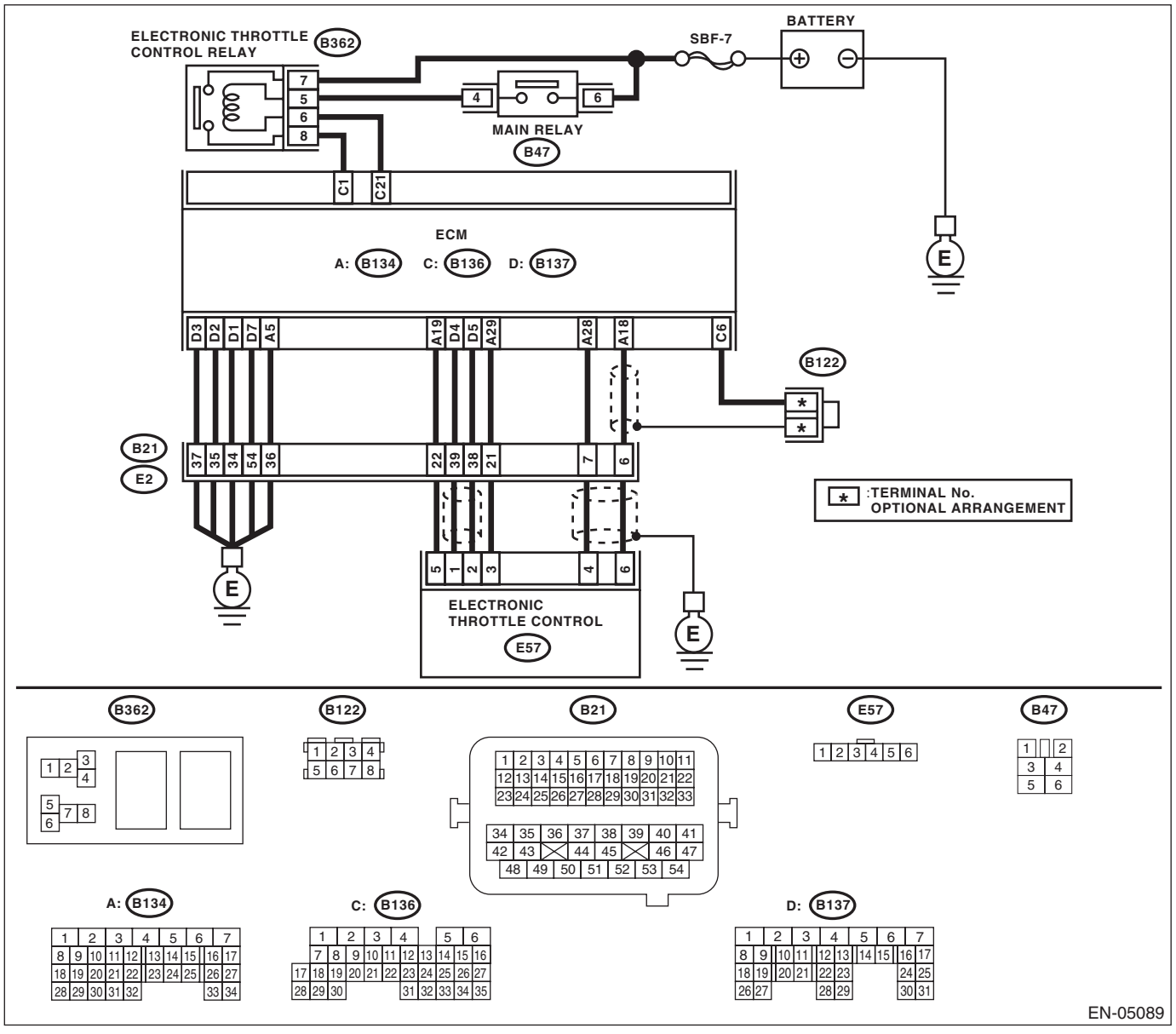
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 18 — (E57) No. 6:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and electronic throttle control connector.
2	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):***	Is the voltage 4.85 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (E57) No. 5:***	Is the resistance 1 MΩ or more?	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-12, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-50, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK TIRE SIZE.**	Is the tire size as specified? and the same size as other three wheels?	Go to step **2**.	Replace the tire.
2	**CHECK ENGINE COOLANT.** Check the following items: • Amount of engine coolant • Engine coolant freeze • Contamination of engine coolant	Is the engine coolant normal?	Go to step **3**.	Fill or replace the engine coolant. <Ref. to CO(H4DOTC)-14, INSPECTION, Engine Coolant.>
3	**CHECK THERMOSTAT.**	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H4DOTC)-17, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

X: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-52, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

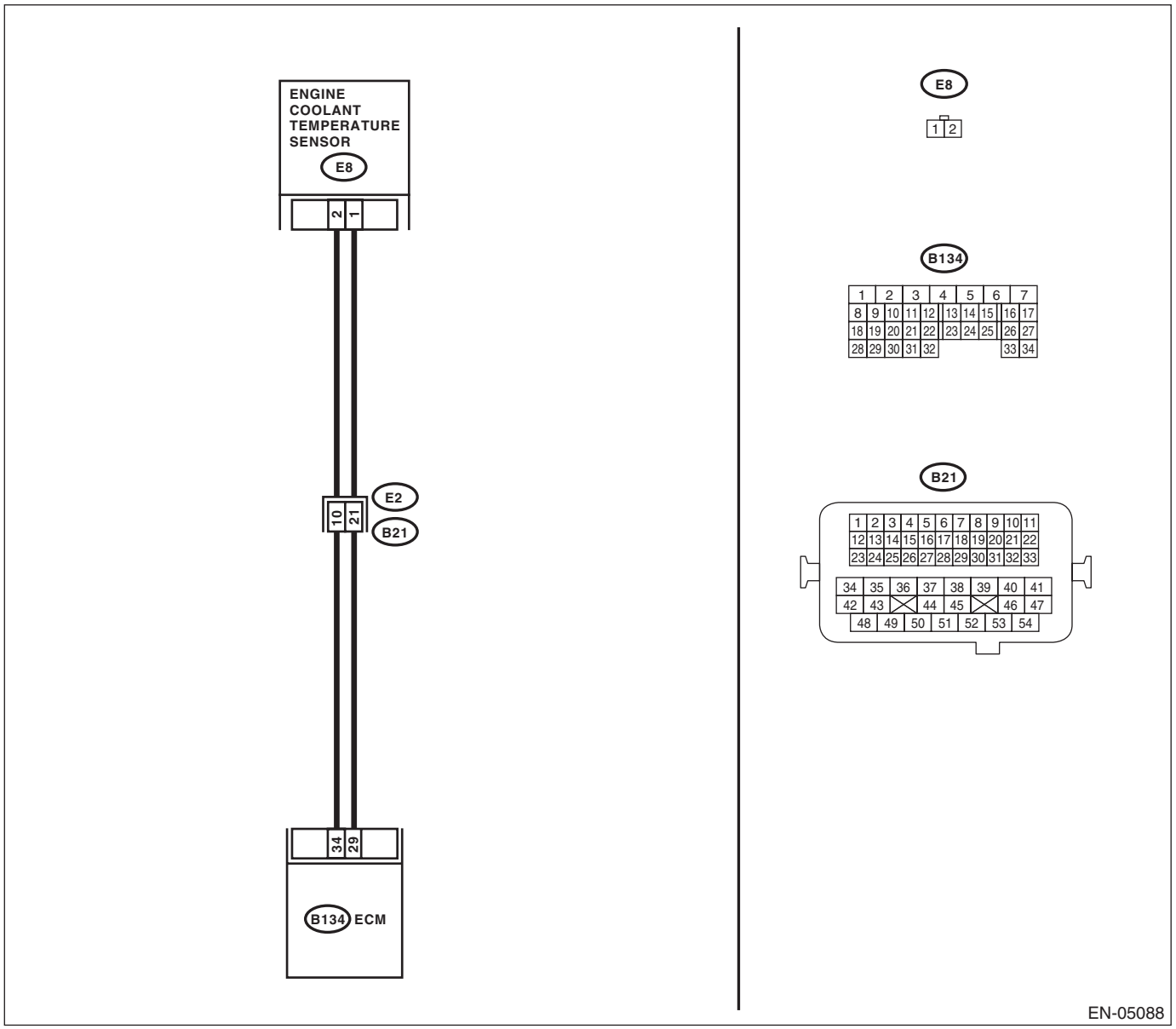
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** Measure the resistance between engine coolant temperature sensor terminals when the engine coolant is cold and after warmed-up. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance of engine coolant temperature sensor different between when engine coolant is cold and after warmed-up?	Repair the poor contact in ECM connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-54, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT.**	Are the coolant level and mixture ratio of engine coolant to anti-freeze solution correct?	Go to step **2**.	Replace the engine coolant. <Ref. to CO(H4DOTC)-13, REPLACEMENT, Engine Coolant.>
2	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check the radiator fan operation.	Does the radiator fan continuously rotate for 3 minutes or more during idling?	Repair radiator fan circuit. <Ref. to CO(H4DOTC)-24, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4DOTC)-27, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO(H4DOTC)-17, Thermostat.>

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

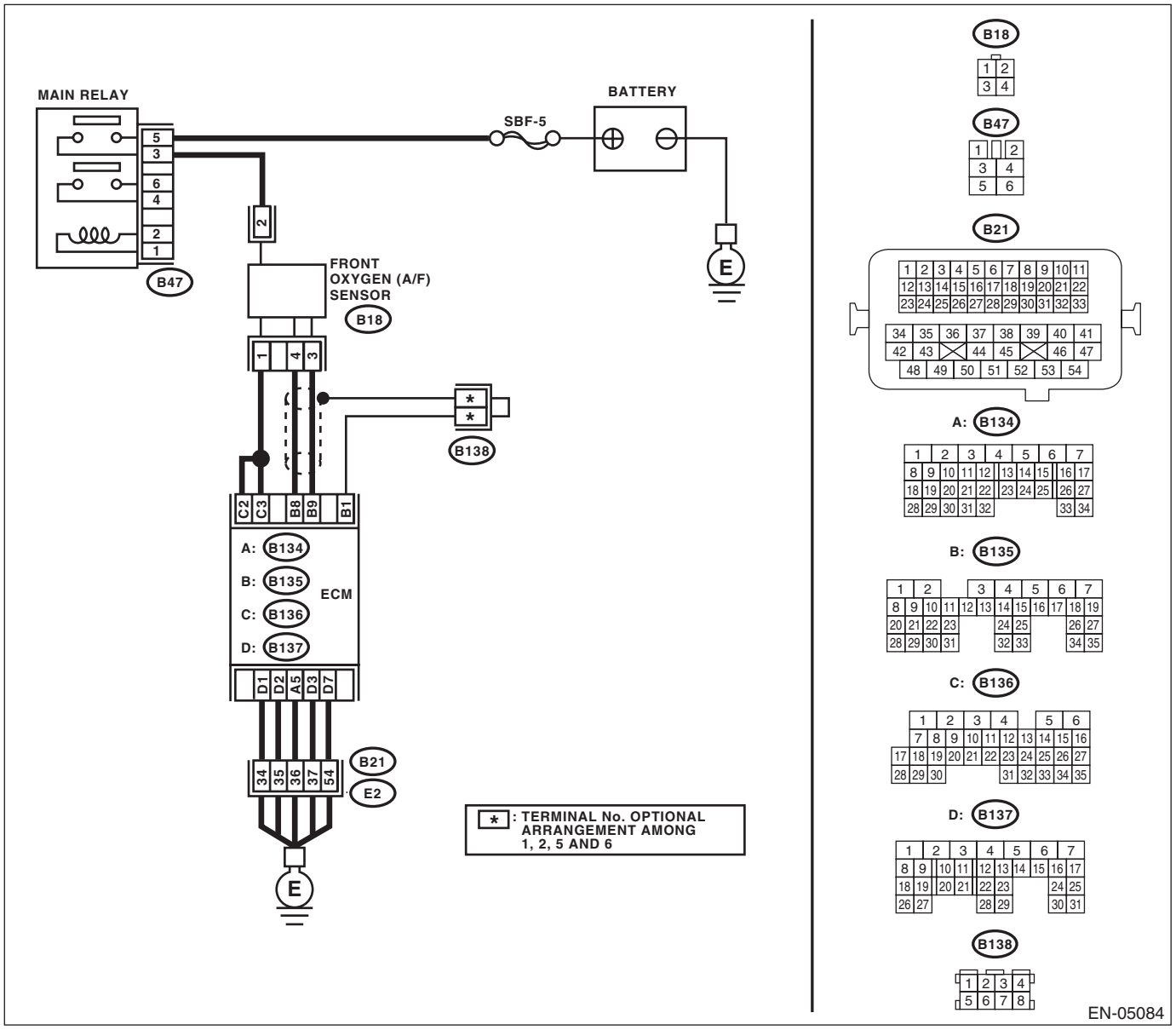
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-56, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — Chassis ground:*** ***(B135) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK POOR CONTACT.** Check poor contact of front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact of the front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.>

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

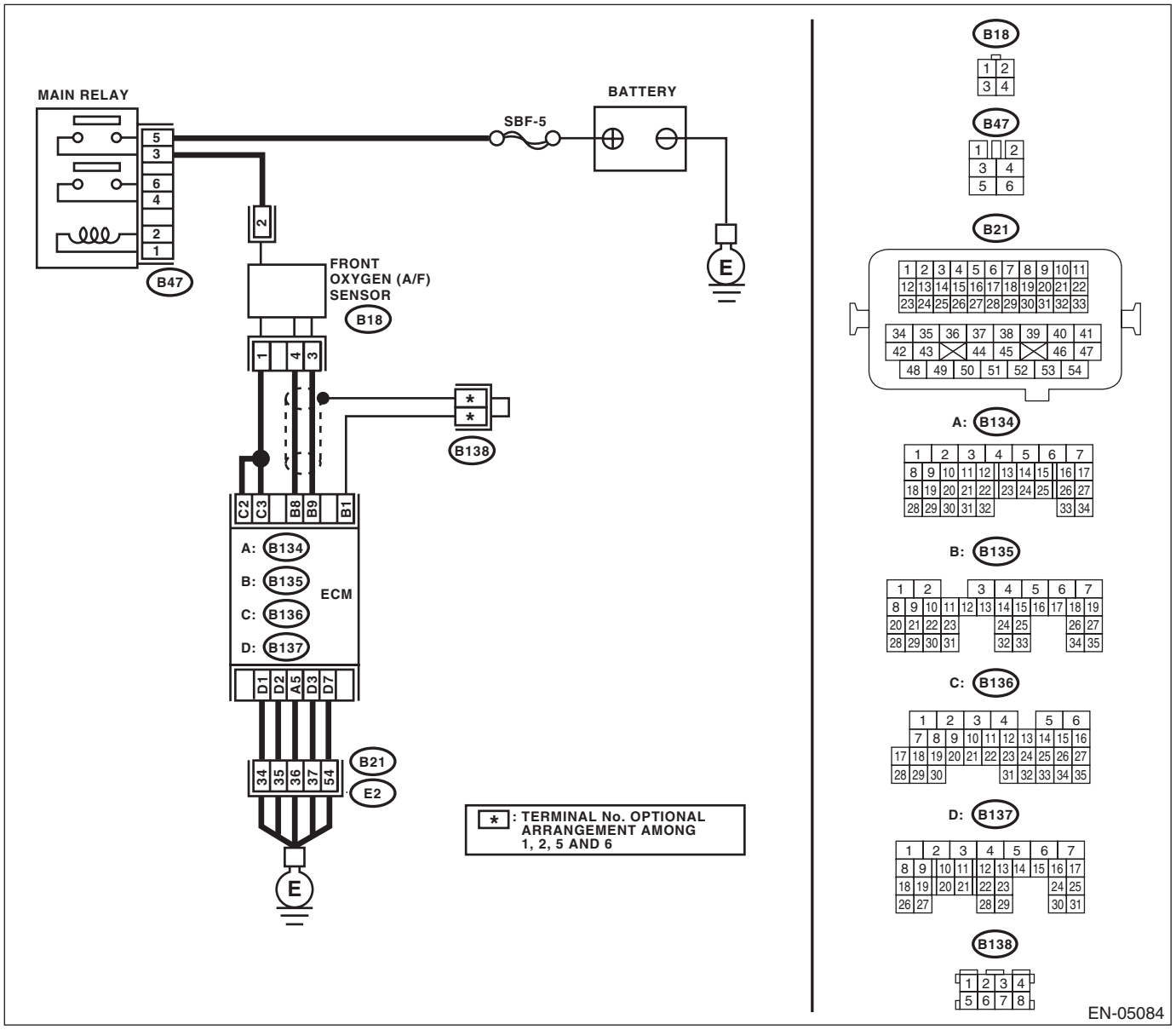
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-58, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between the ECM and front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.>

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

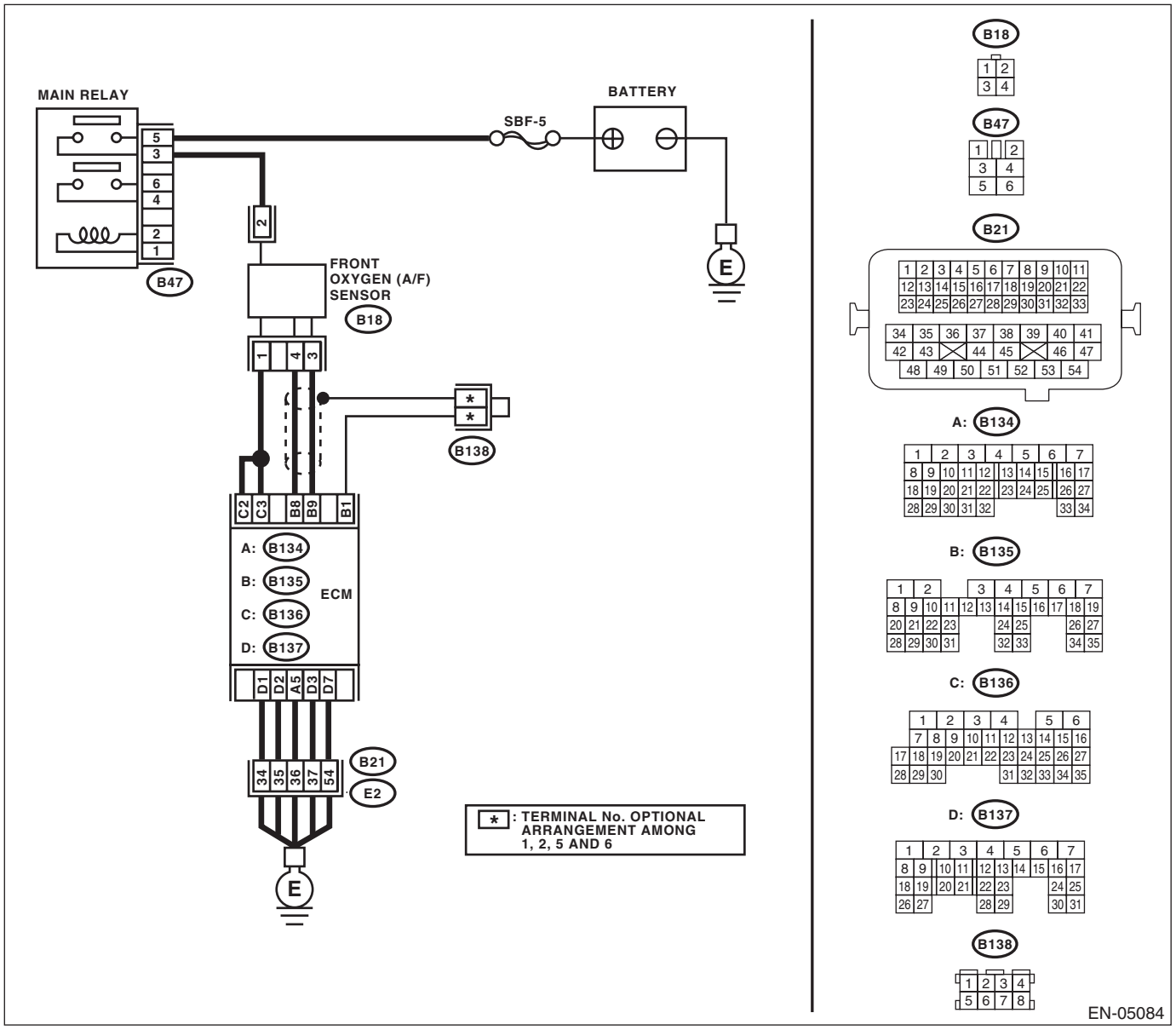
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-60, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there any fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.>

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

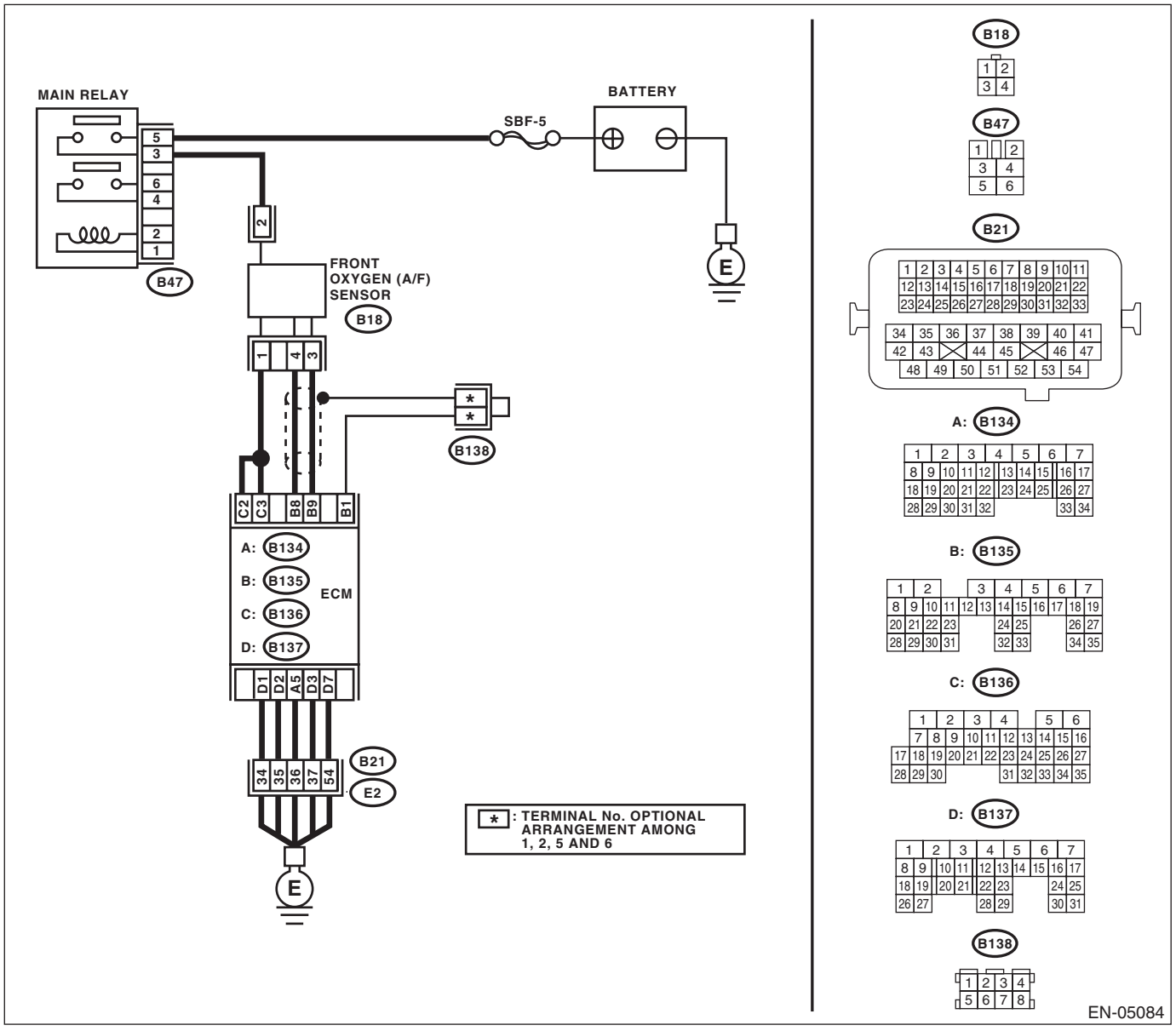
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-63, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 9 — (B18) No. 3:*** ***(B135) No. 8 — (B18) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
2	**CHECK POOR CONTACT.** Check poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.>

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

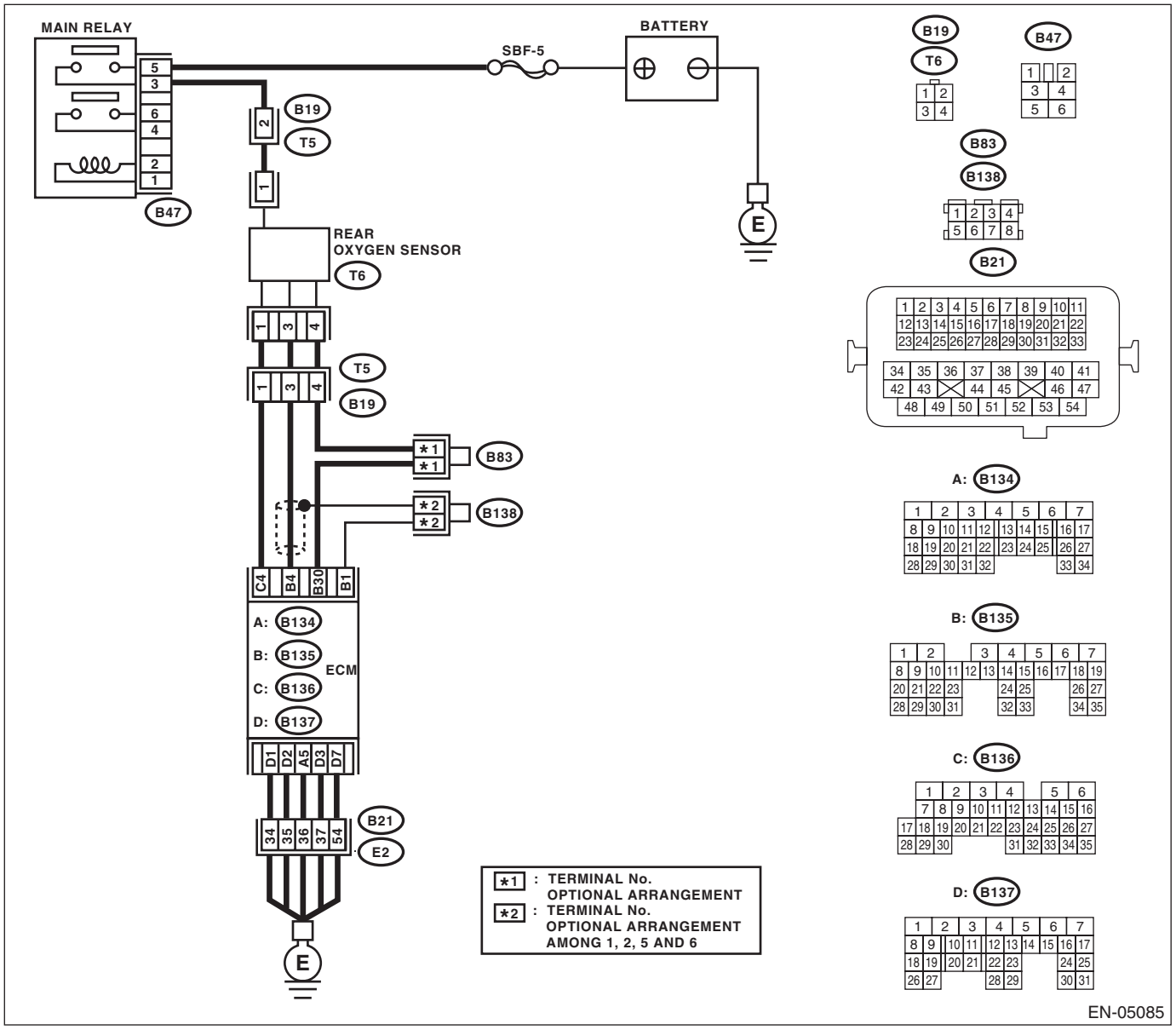
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-65, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **5**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (T6) No. 3:*** ***(B135) No. 30 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between ECM and rear oxygen sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>

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

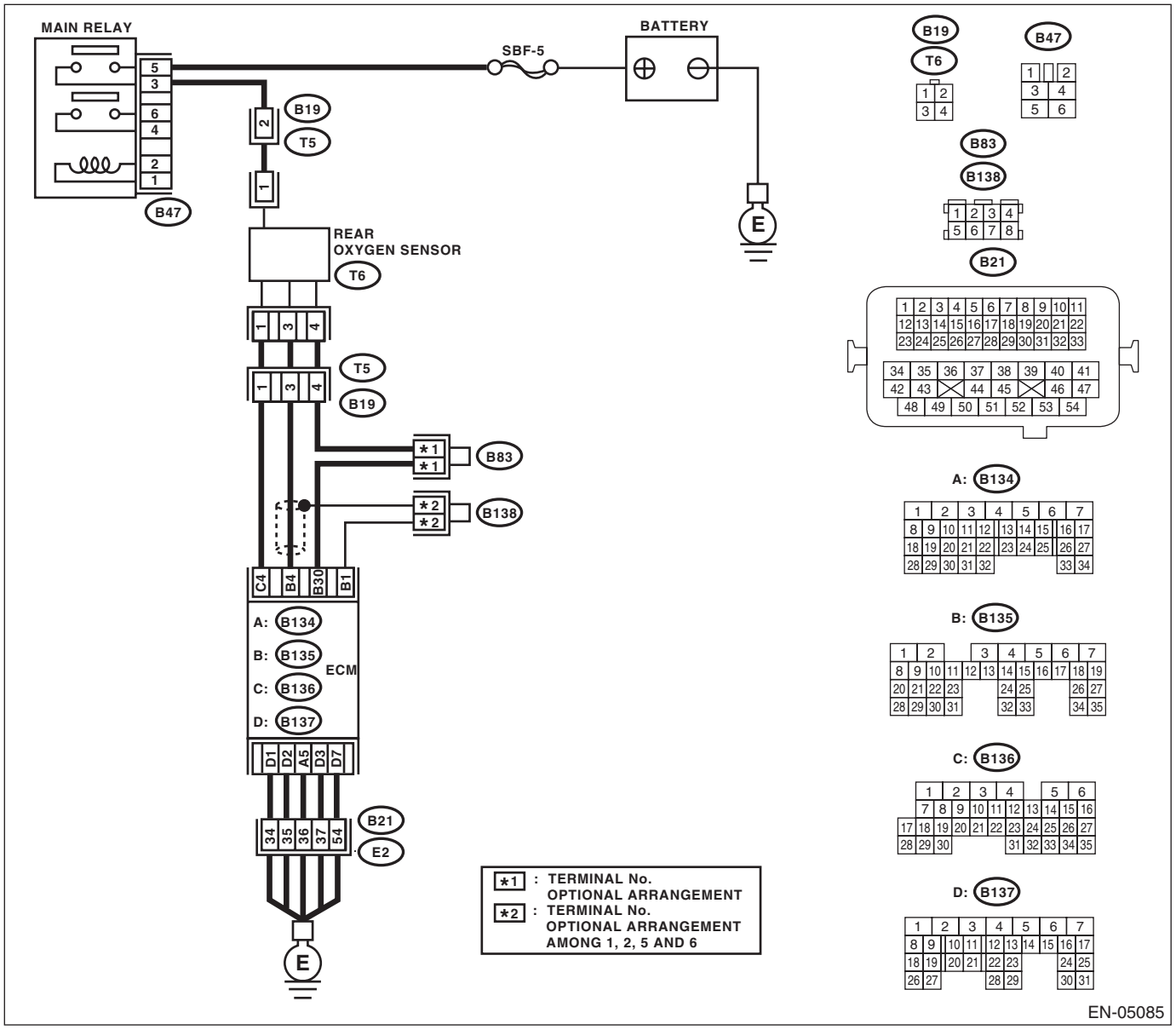
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-67, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **5**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (T6) No. 3:*** ***(B135) No. 30 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between ECM and rear oxygen sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>

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

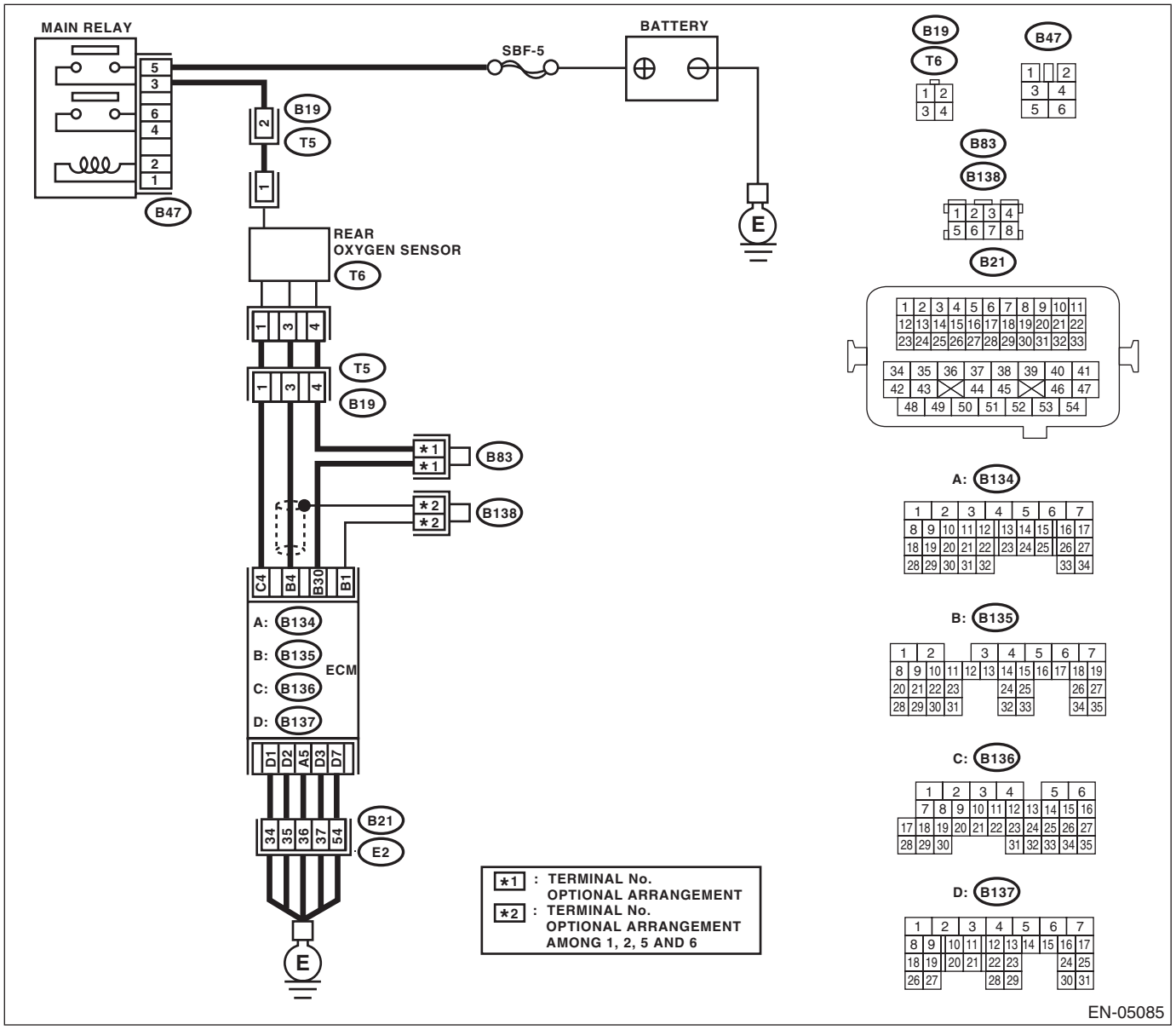
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (T6) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and rear oxygen sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** Measure the resistance between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and rear oxygen sensor connector.
3	**CHECK REAR OXYGEN SENSOR.** Measure the resistance between rear oxygen sensor terminals. ***Terminals*** ***No. 3 — No. 4***	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.

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

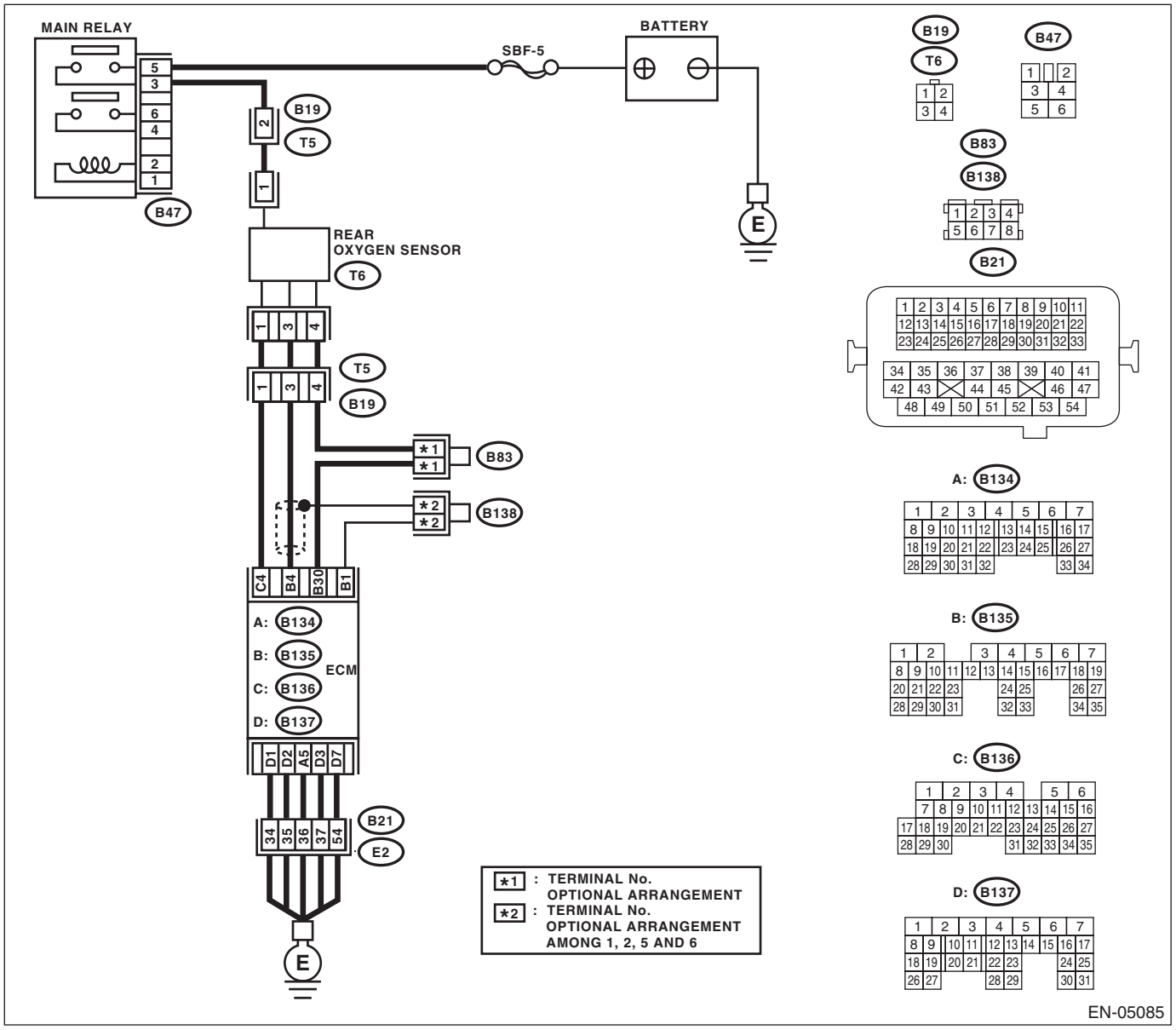
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-74, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **6**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **6**.	Go to step **3**.
3	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (T6) No. 3:*** ***(B135) No. 30 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit of harness between ECM and rear oxygen sensor connector.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Loose part and improper installation between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>

AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H4DOTC)(diag)-149, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-78, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **3**.
3	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 kg/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)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 kg/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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 70°C (158°F) or higher?	Go to step **6**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, 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 higher than 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **7**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is higher than 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Repair the poor contact in ECM connector .	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

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

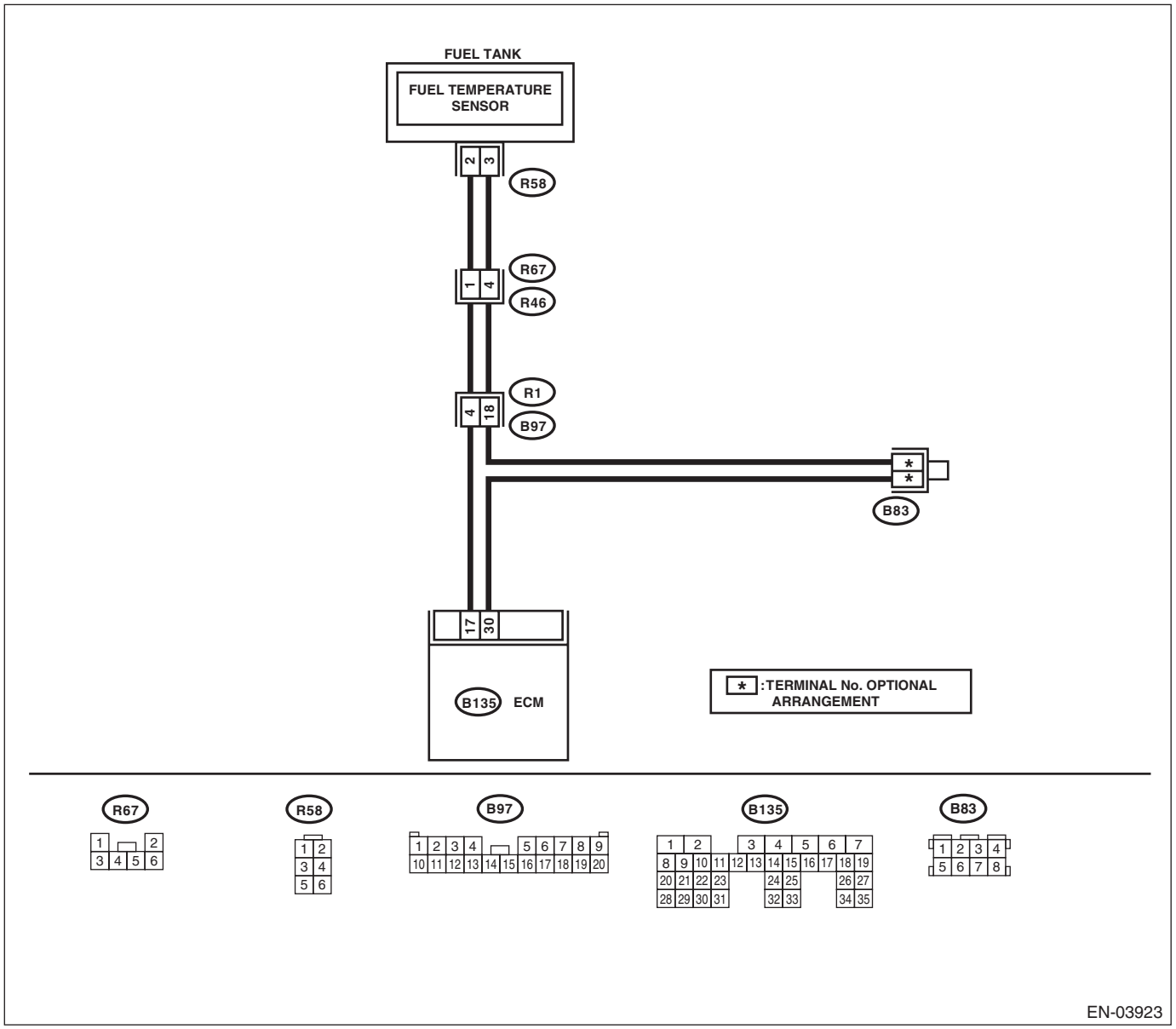
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-80, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



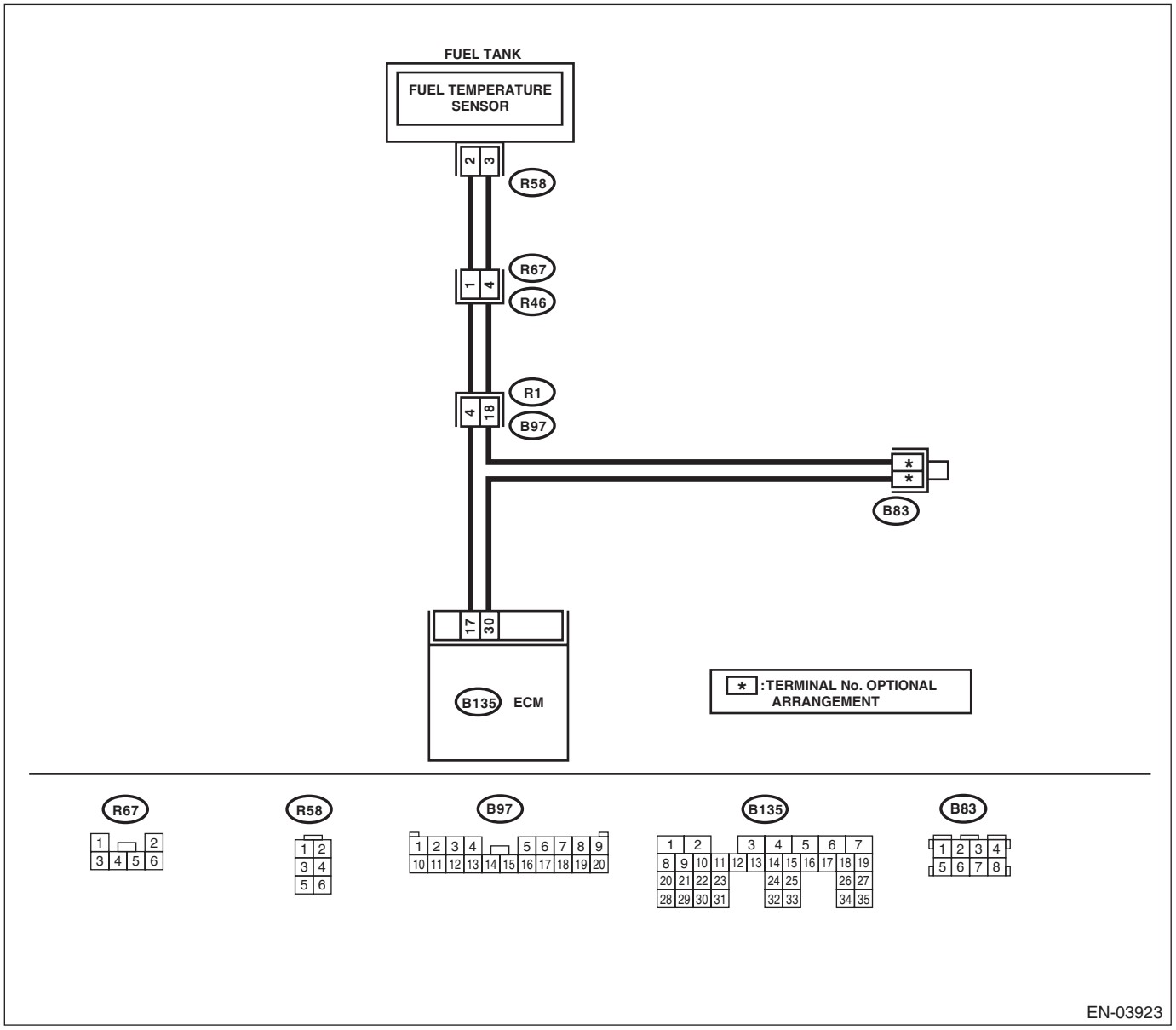
Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-12, Fuel Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-83, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



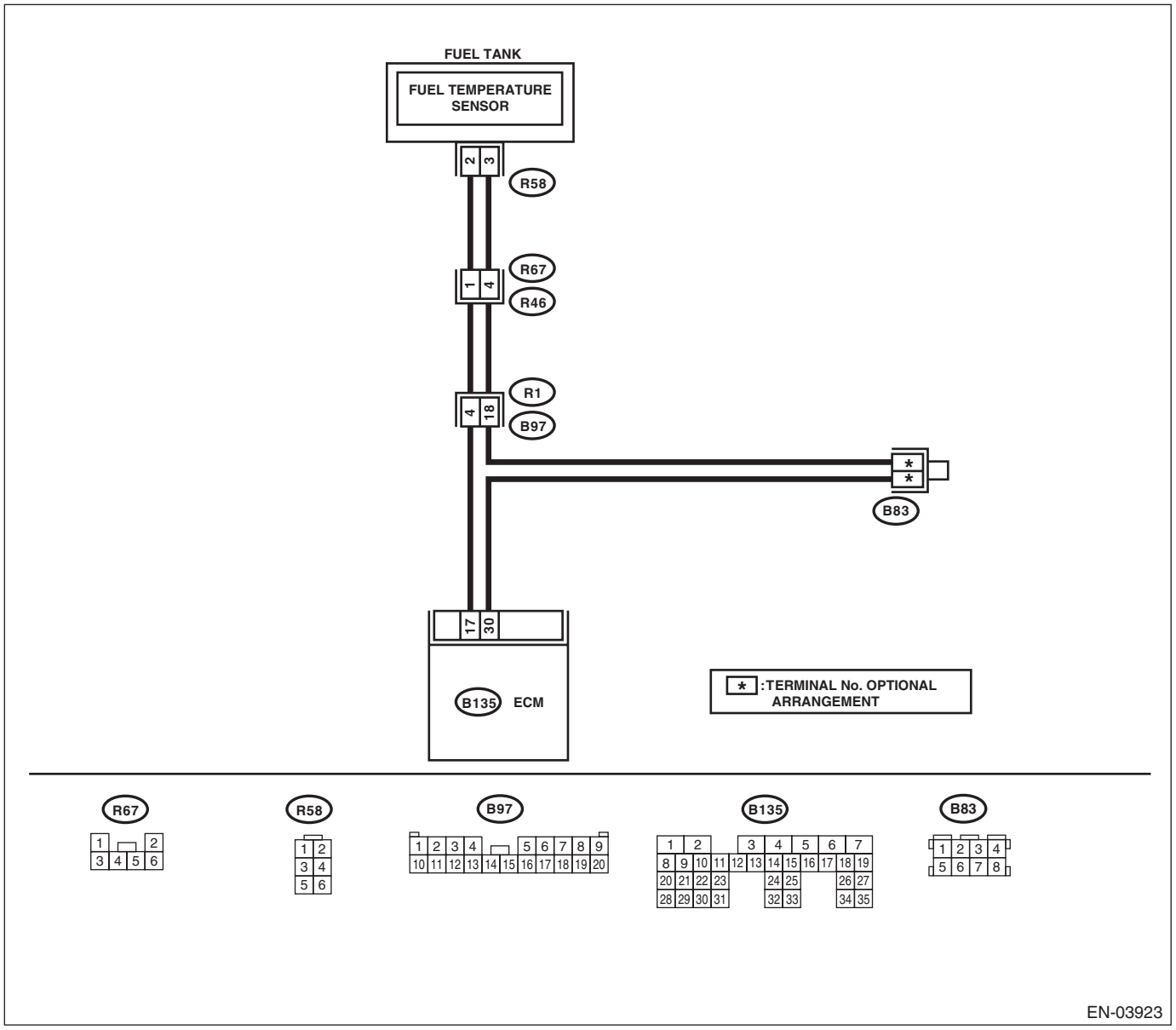
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the temperature 120°C (248°F) or higher?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and fuel temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 17 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-12, Fuel Temperature Sensor.>	Repair the ground short circuit of harness between ECM and fuel pump.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-85, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the temperature less than –40°C (–40°F)?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK POOR CONTACT.** Repair any poor contact between the ECM and fuel temperature sensor connectors.	Is there poor contact in the ECM or fuel temperature sensor connectors?	Repair any poor contact between the ECM and fuel temperature sensor connectors.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and fuel temperature sensor. 3) Measure the resistance of the harness between the ECM and fuel temperature sensor connector. ***Connector & terminal*** ***(B135) No. 17 — (R58) No. 2:*** ***(B135) No. 30 — (R58) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of the harness between the ECM and fuel temperature sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 17 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and fuel temperature sensor connector.	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-12, Fuel Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-87, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

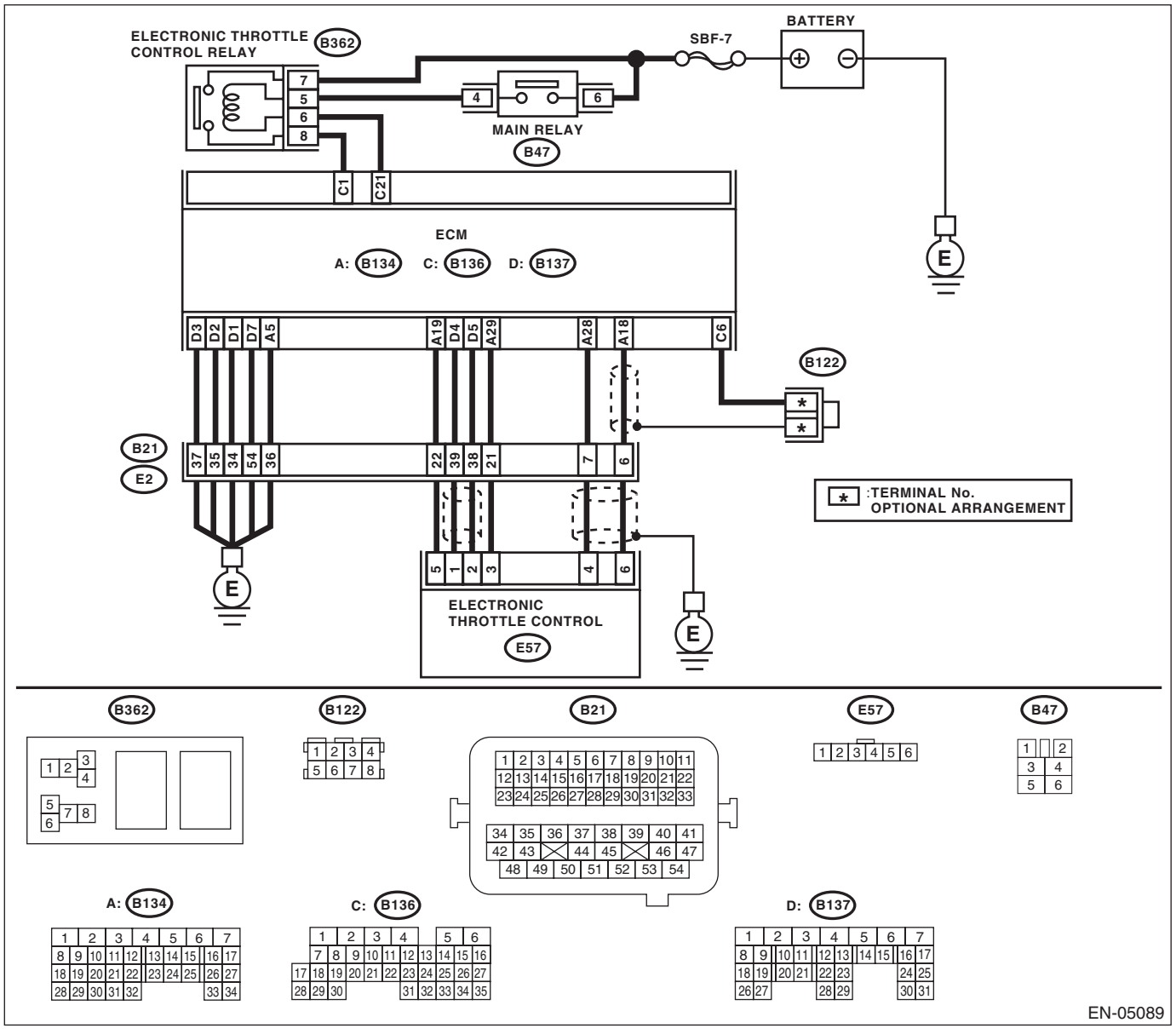
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the ground short circuit of harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(B134) No. 28 — Engine ground:***	Is the resistance 1 MΩ or more?	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-12, Throttle Body.>	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-89, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

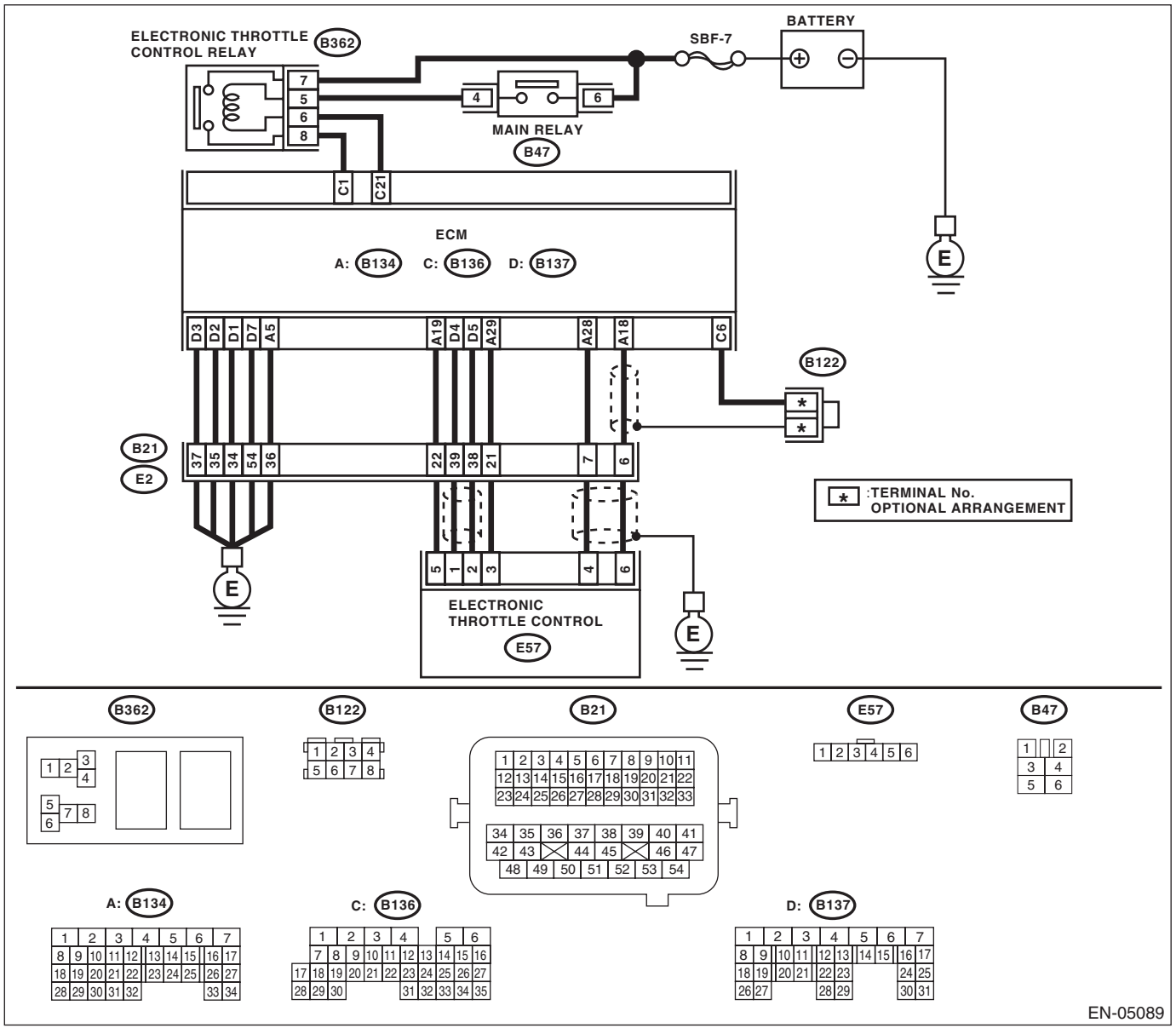
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 28 — (E57) No. 4:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and electronic throttle control connector.
2	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 4.85 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-12, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

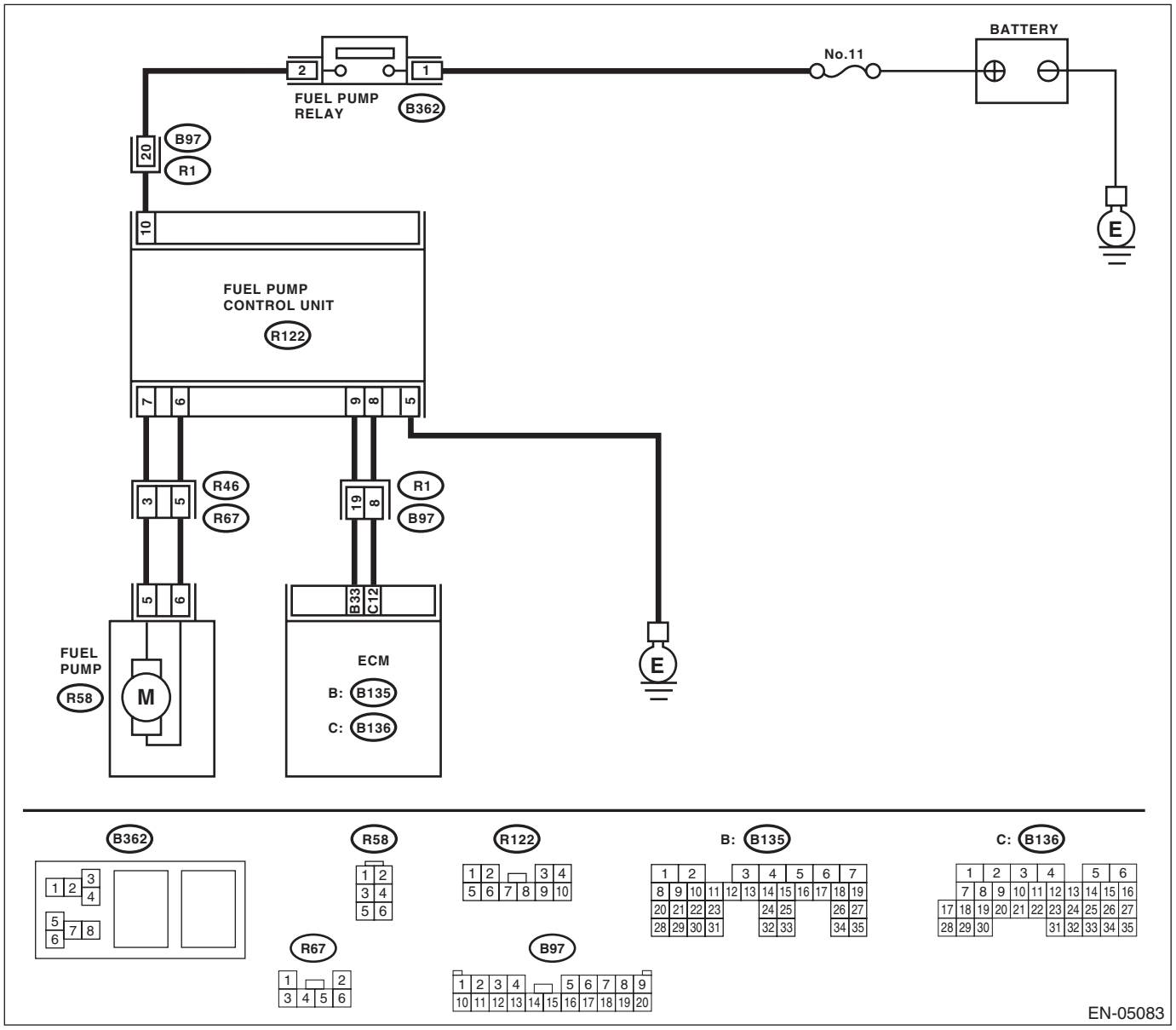
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-91, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply circuit. NOTE: In this case, repair the following item: • Open or ground short circuit of harness between fuel pump relay and fuel pump control unit • Poor contact of fuel pump control unit connector • Poor contact of fuel pump relay connector
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit between fuel pump control unit and chassis ground • Poor contact of fuel pump control unit connector
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** 1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump control unit and fuel pump connector. ***Connector & terminal*** ***(R122) No. 7 — (R58) No. 5:*** ***(R122) No. 6 — (R58) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit between fuel pump control unit and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** Measure the resistance between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between fuel pump control unit and fuel pump.
5	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONTROL UNIT.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance of the harness between the ECM and fuel pump control unit. ***Connector & terminal*** ***(B135) No. 33 — (R122) No. 9:*** ***(B136) No. 12 — (R122) No. 8:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit between the ECM and fuel pump control unit • Poor contact between ECM and fuel pump control unit

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONTROL UNIT.** Measure the resistance between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the ground short circuit of harness between ECM and fuel pump control unit.
7	**CHECK POOR CONTACT.** Check poor contact of ECM and fuel pump control unit connector.	Is there poor contact of ECM and fuel pump control unit connector?	Repair the poor contact of ECM and fuel pump control unit connector.	Go to step **8**.
8	**CHECK EXPERIENCE OF RUNNING OUT OF FUEL.**	Has the vehicle experienced running out of fuel?	Finish the diagnosis. NOTE: DTC may be recorded as a result of fuel pump idling while running out of fuel.	Replace the fuel pump control unit. <Ref. to FU(H4DOTC)-48, Fuel Pump Control Unit.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-93, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

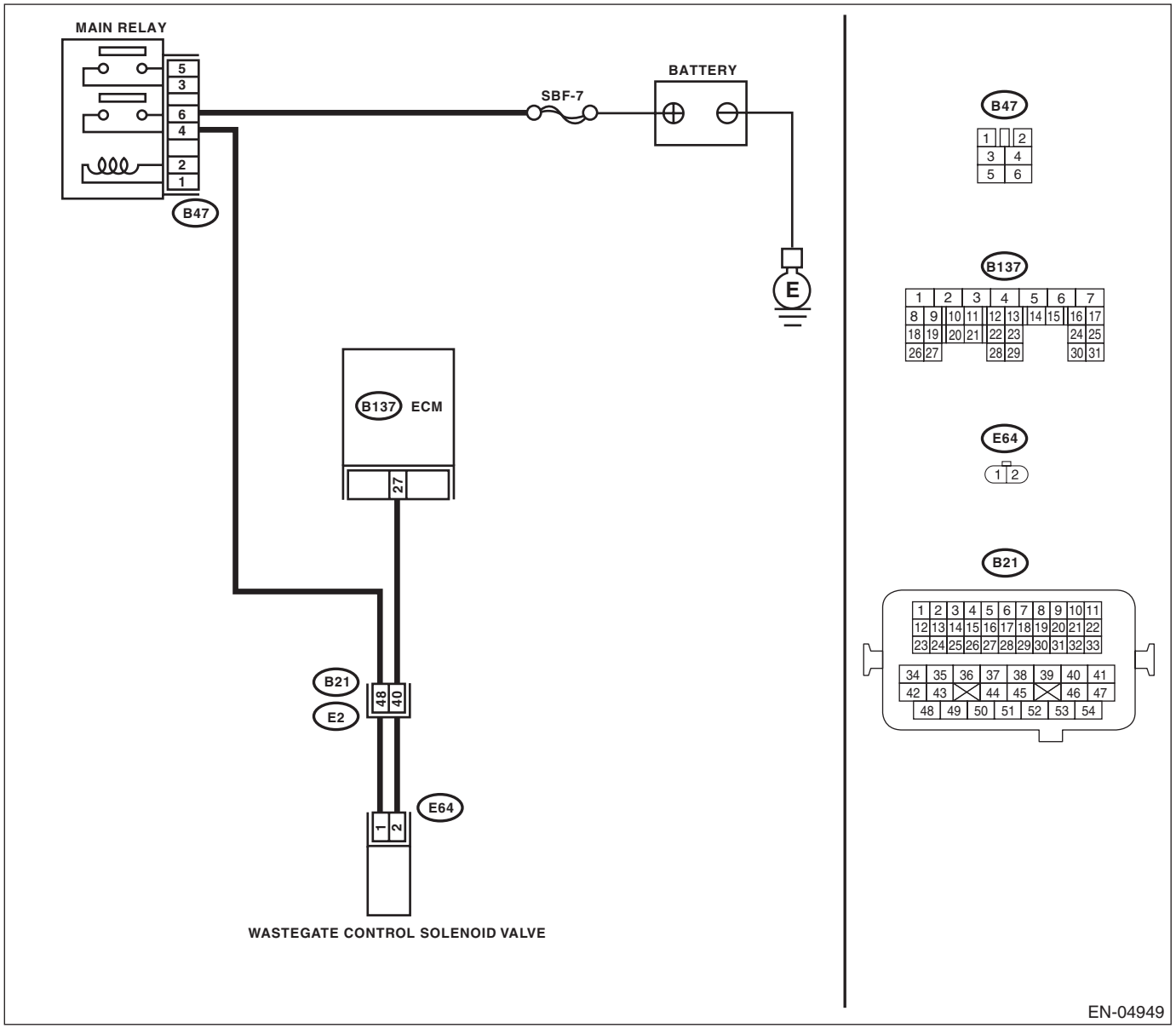
TROUBLE SYMPTOM:

Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-39, Wastegate Control Solenoid Valve.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-95, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

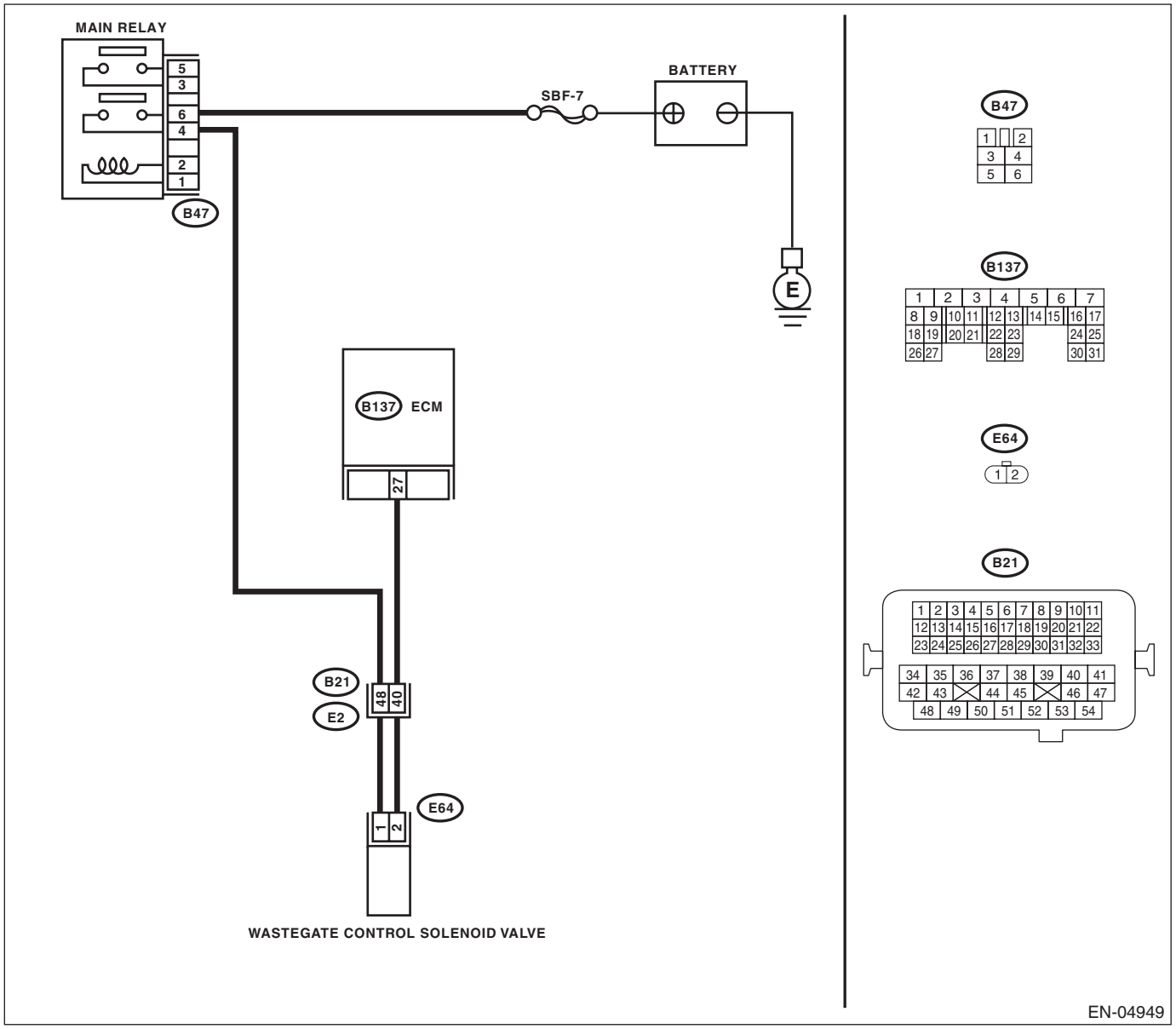
TROUBLE SYMPTOM:

Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 27 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact in ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and wastegate control solenoid valve. 3) Measure the resistance between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(B137) No. 27 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair ground short circuit of harness between ECM and wastegate control solenoid valve connector.
3	**CHECK HARNESS BETWEEN ECM AND WASTEGATE CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and wastegate control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 27 — (E64) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and wastegate control solenoid valve connector • Poor contact of coupling 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 10 — 100 Ω?	Go to step **5**.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-39, 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. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Repair poor contact in wastegate control solenoid valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and wastegate control solenoid valve connector • Poor contact of coupling connector • Poor contact of main relay connector

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-97, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

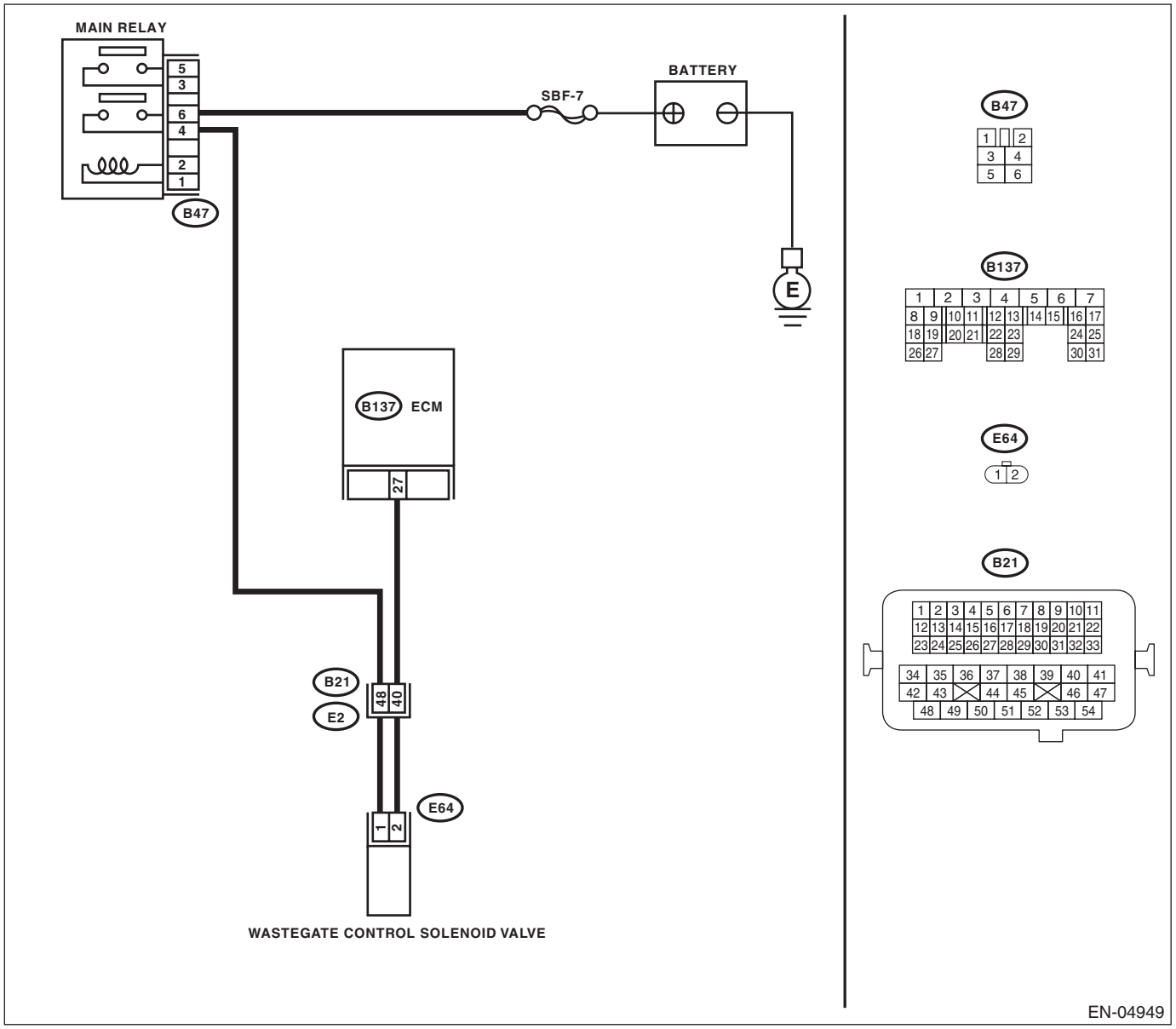
TROUBLE SYMPTOM:

Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 27 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair short circuit to power in the harness between ECM and wastegate control solenoid valve connector.	Go to step **2**.
2	**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. <Ref. to FU(H4DOTC)-39, Wastegate Control Solenoid Valve.>	Repair the poor contact in ECM connector.

AS:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H4DOTC)(diag)-171, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H4DOTC)(diag)-171, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H4DOTC)(diag)-171, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-105, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

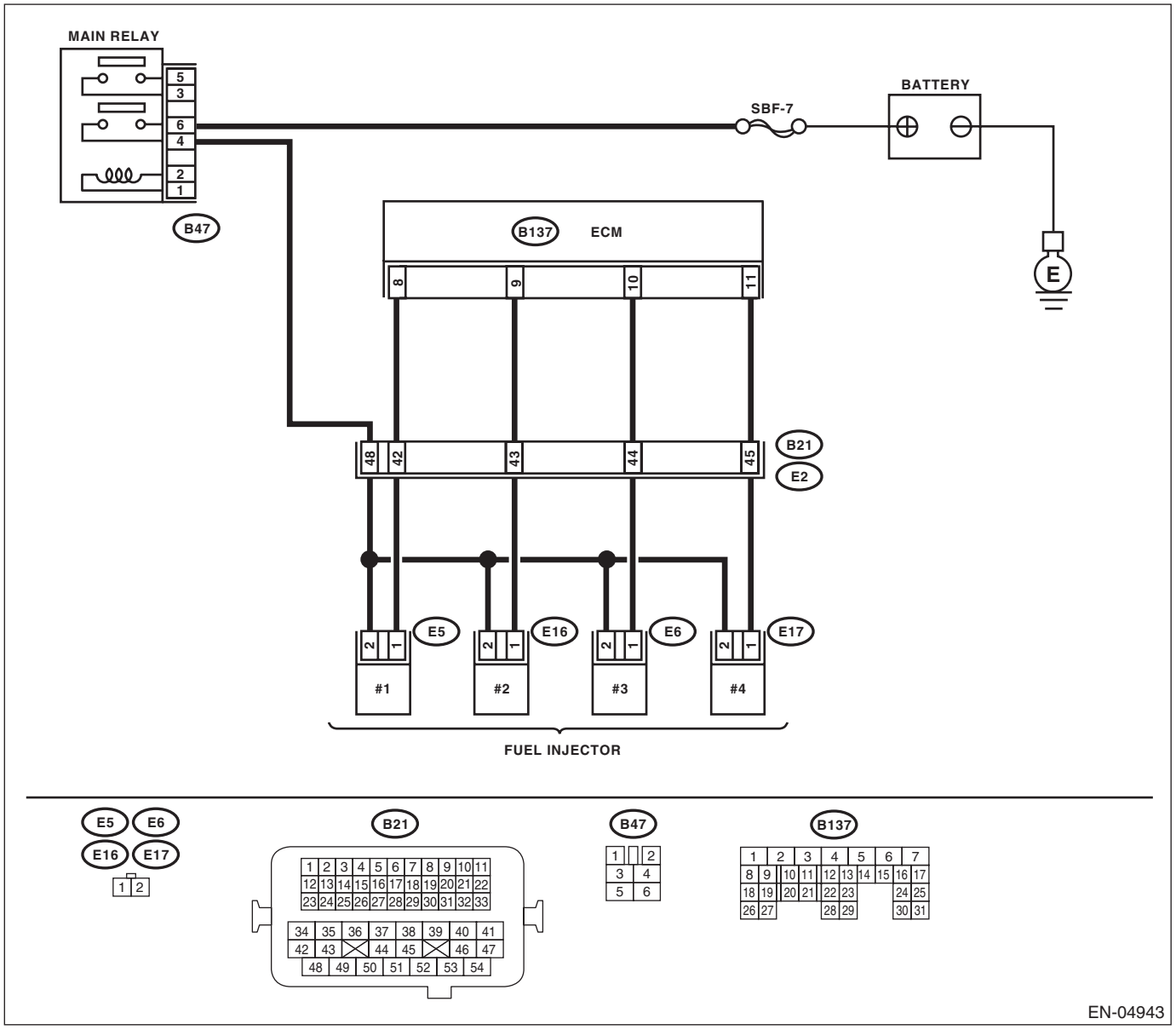
TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the ECM and chassis ground for faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 8 (+) — Chassis ground (–):*** ***#2 (B137) No. 9 (+) — Chassis ground (–):*** ***#3 (B137) No. 10 (+) — Chassis ground (–):*** ***#4 (B137) No. 11 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between the fuel injector connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and fuel injector.
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** Measure the resistance of harness between the ECM and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 8 — (E5) No. 1:*** ***#2 (B137) No. 9 — (E16) No. 1:*** ***#3 (B137) No. 10 — (E6) No. 1:*** ***#4 (B137) No. 11 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel injector connector • Poor contact of coupling connector
4	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 5 — 20 Ω?	Go to step **5**.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>
5	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the 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

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between the ECM and chassis ground for faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 8 (+) — Chassis ground (–):*** ***#2 (B137) No. 9 (+) — Chassis ground (–):*** ***#3 (B137) No. 10 (+) — Chassis ground (–):*** ***#4 (B137) No. 11 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between the ECM and fuel injector.	Go to step **7**.
7	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>	Go to step **8**.
8	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step **9**.
9	**CHECK CRANK SPROCKET.** Remove the timing belt cover.	Is the crank sprocket rusted or does it have damaged teeth?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-52, Crank Sprocket.>	Go to step **10**.
10	**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)-43, Timing Belt.>	Go to step **11**.
11	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **12**.	Replenish fuel so that fuel meter indication is higher than the “Lower” level. After refueling, Go to step **12**.
12	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.> NOTE: • Subaru Select Monitor <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool Refer to operating manuals for the general scan tool. 2) Start the engine, and drive the vehicle 10 minutes or more.	Does the malfunction indicator light illuminate or blink?	Go to step **14**.	Go to step **13**.

Step		Check	Yes	No
13	**CHECK CAUSE OF MISFIRE.**	Was the cause of misfire identified when the engine is running?	Finish diagnostics operation, if the engine has no abnormality.	Repair the poor contact of connector. NOTE: In this case, repair the following item: • Poor contact of ignition coil connector • Poor contact of fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact of coupling connector
14	**CHECK AIR INTAKE SYSTEM.**	Is there any fault in air intake system?	Repair the air intake system. NOTE: Check the following items. • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **15**.
15	**CHECK MISFIRE SYMPTOM.** 1) Turn the ignition switch to ON. 2) Read the DTC. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Does the Subaru Select Monitor or general scan tool indicate only one DTC?	Go to step **20**.	Go to step **16**.
16	**CHECK DTC.**	Are DTCs P0301 and P0302 displayed on the Subaru Select Monitor or general scan tool?	Go to step **21**.	Go to step **17**.
17	**CHECK DTC.**	Are DTCs P0303 and P0304 displayed on the Subaru Select Monitor or general scan tool?	Go to step **22**.	Go to step **18**.
18	**CHECK DTC.**	Are DTCs P0301 and P0303 displayed on the Subaru Select Monitor or general scan tool?	Go to step **23**.	Go to step **19**.
19	**CHECK DTC.**	Are DTCs P0302 and P0304 displayed on the Subaru Select Monitor or general scan tool?	Go to step **24**.	Go to step **25**.

Step		Check	Yes	No
20	ONLY ONE CYLINDER.	Is there any fault in the cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Spark plug cord • Fuel injector • Compression ratio	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-148, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	GROUP OF #1 AND #2 CYLINDERS.	Are there any faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plug • Fuel injector • Ignition coil • Compression ratio • If any fault are not found, check the "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side. <Ref. to EN(H4DOTC)(diag)-76, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-148, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	GROUP OF #3 AND #4 CYLINDERS.	Are there any faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plug • Fuel injector • Ignition coil • Compression ratio • If any fault are not found, check the "IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(H4DOTC)(diag)-76, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-148, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
23	GROUP OF #1 AND #3 CYLINDERS.	Are there any faults in #1 and #3 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-148, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	GROUP OF #2 AND #4 CYLINDERS.	Are there any faults in #2 and #4 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-148, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	CYLINDER AT RANDOM.	Is the engine idle rough?	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-148, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio

AW: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)-106, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

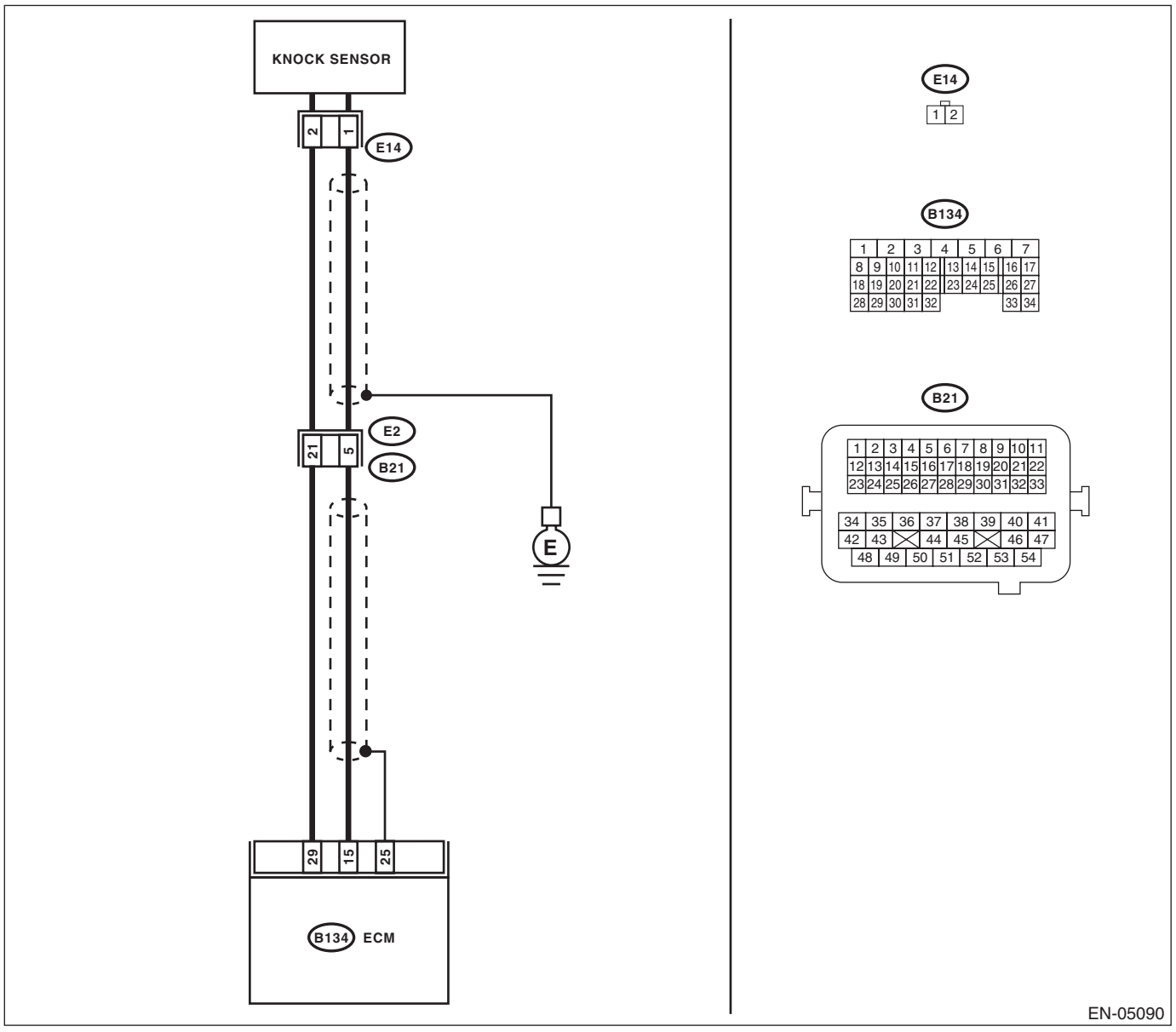
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 15 — (B134) No. 29:***	Is the resistance 600 kΩ or more?	Go to step **2**.	Repair poor contact of the ECM connector.
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 600 kΩ or more?	Replace the knock sensor. <Ref. to FU(H4DOTC)-29, Knock Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and knock sensor • Poor contact of knock sensor connector • Poor contact of coupling connector

AX: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)-108, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

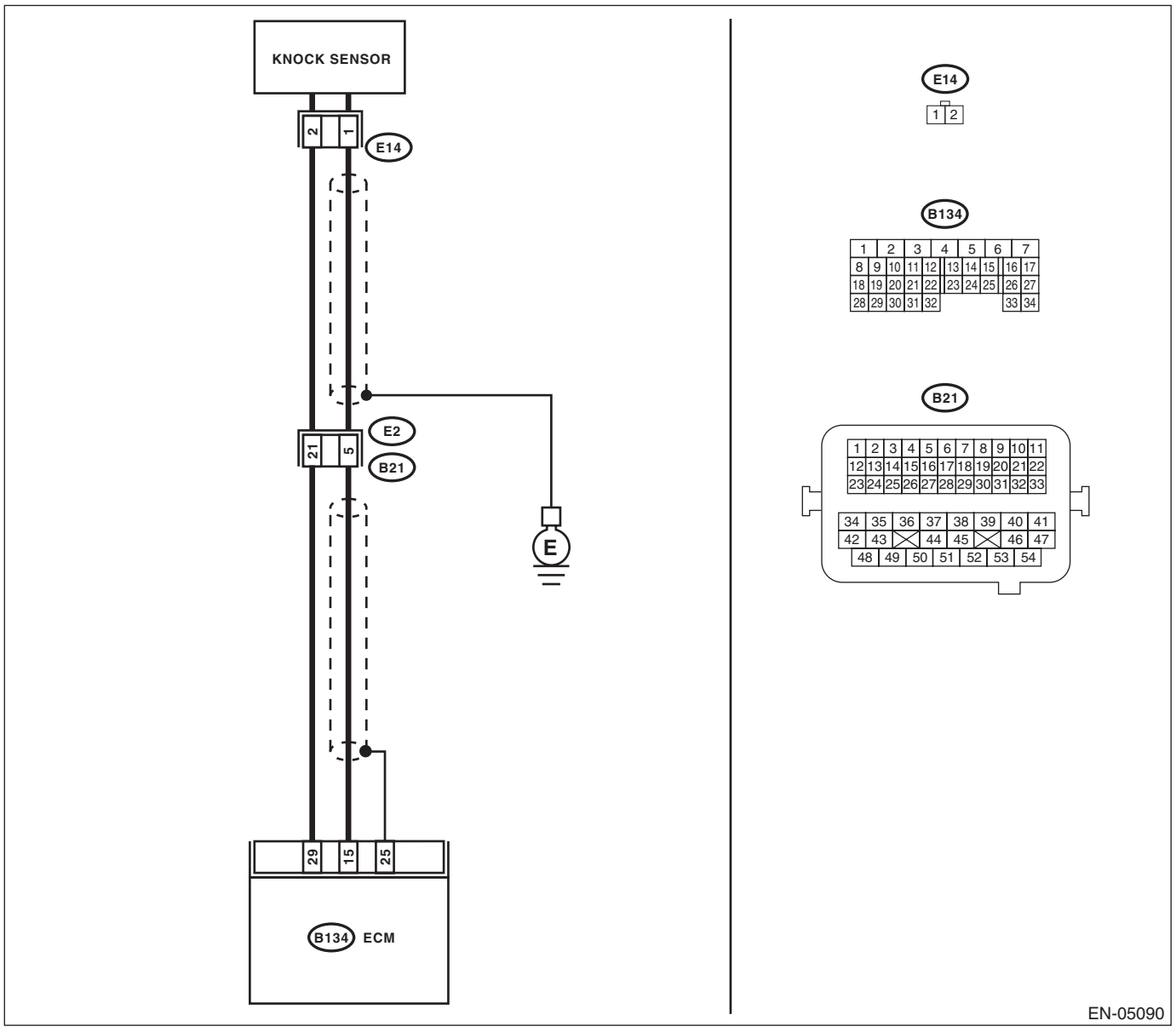
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 15 — (B134) No. 29:***	Is the resistance less than 500 kΩ?	Go to step **2**.	Go to step **3**.
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connectors. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 500 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC)-29, Knock Sensor.>	Repair the ground short circuit of harness between the ECM and knock sensor connector. NOTE: The harness between both connectors are shielded. Remove the shield and repair the short circuit of harness.
3	**CHECK INPUT SIGNAL OF ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 15 (+) — Chassis ground (–):***	Is the voltage 2 V or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.	Repair poor contact of the ECM connector.

AY:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-110, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

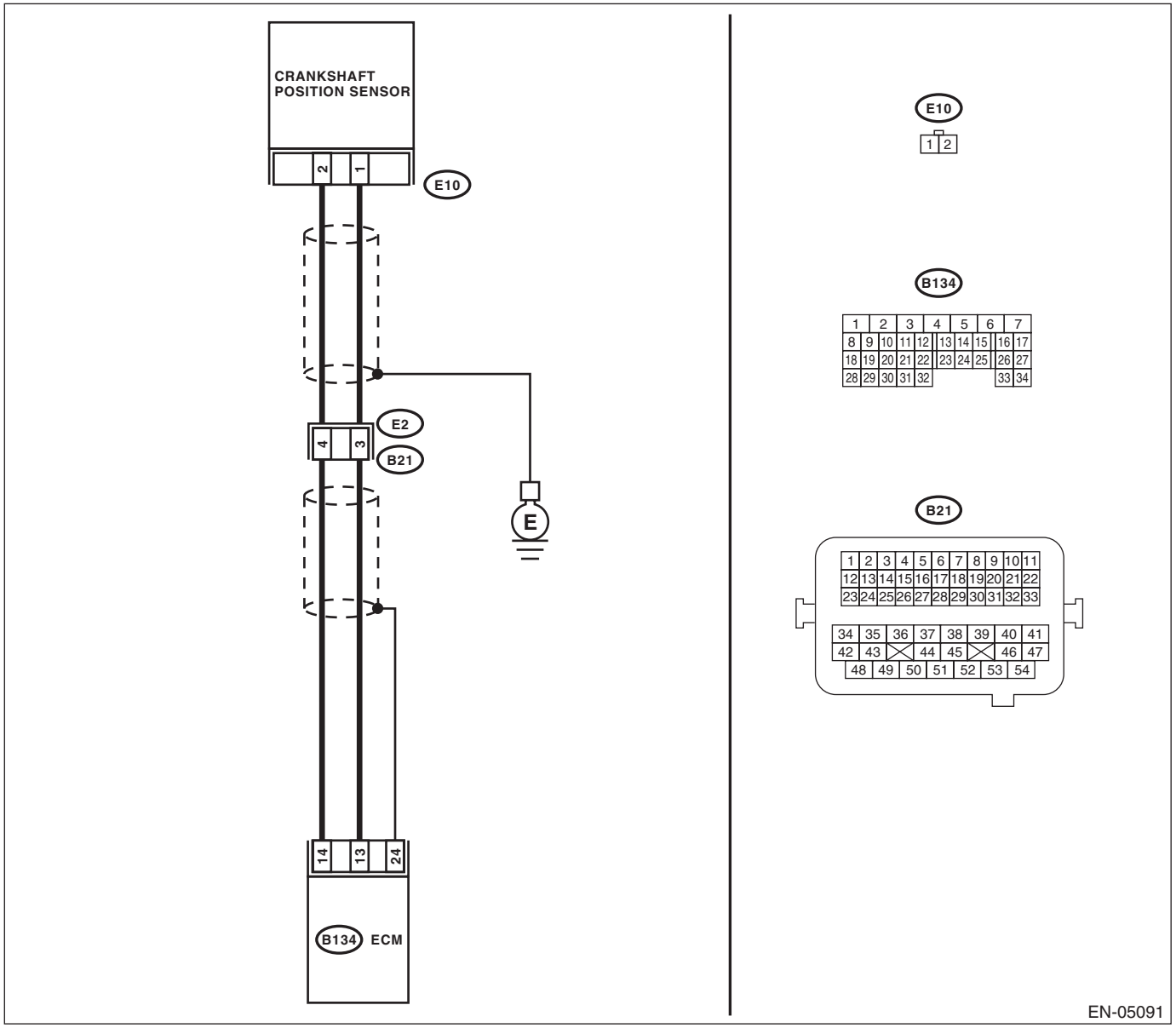
TROUBLE SYMPTOM:

- 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **2**.	Tighten the crankshaft position sensor installation bolt securely.
2	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the crankshaft position sensor. 3) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 1 — 4 kΩ?	Go to step **3**.	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-27, Crankshaft Position Sensor.>
3	**CHECK HARNESS BETWEEN ECM AND CRANK SHAFT POSITION SENSOR.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance of harness between the ECM and crankshaft position sensor connector. ***Connector & terminal*** ***(B134) No. 13 — (E10) No. 1:*** ***(B134) No. 14 — (E10) No. 2:***	Is the resistance less than 1 Ω?	Repair the poor contact of the ECM and crankshaft position sensor connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and crankshaft position sensor connector • Poor contact of coupling connector

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-112, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

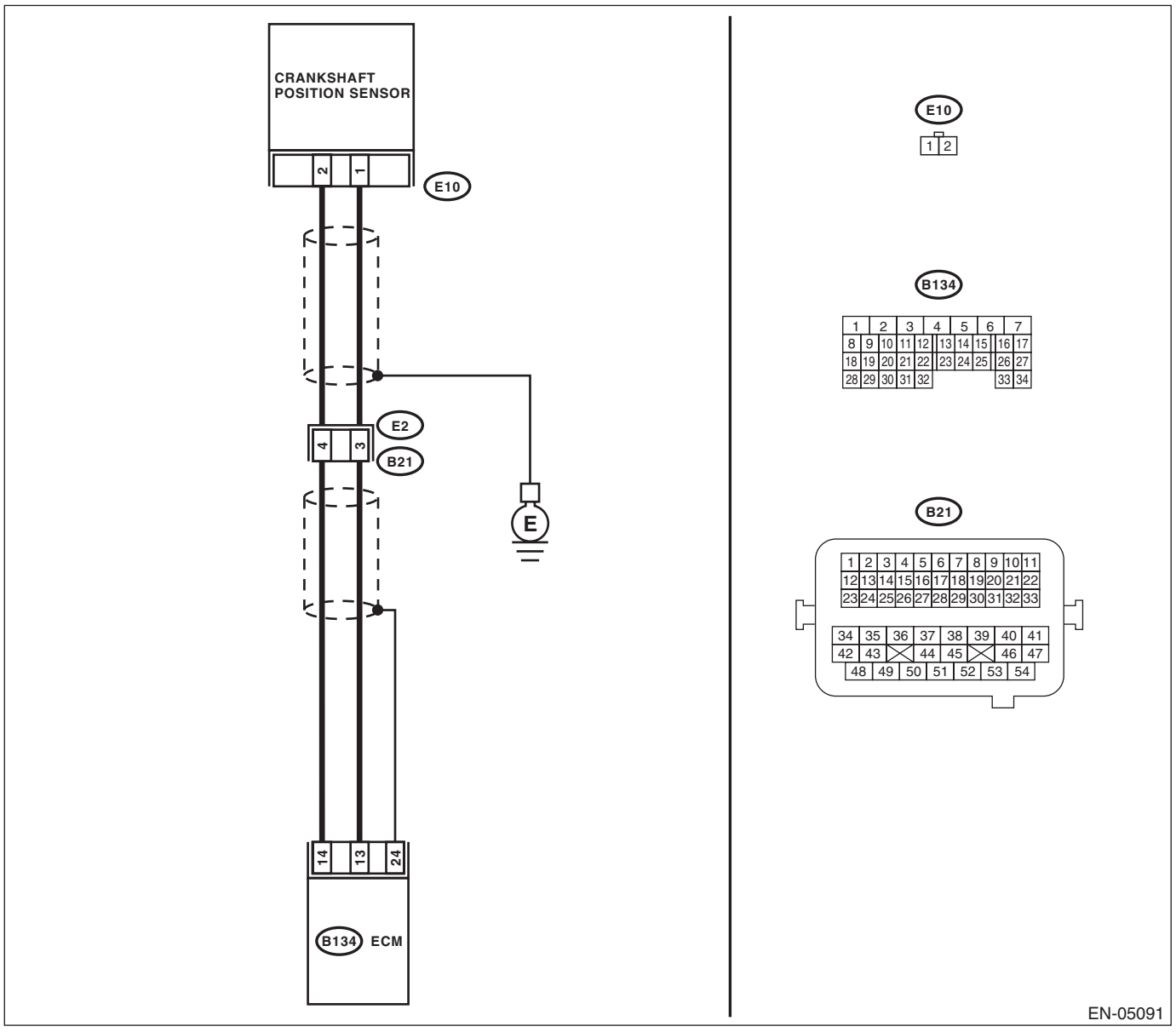
TROUBLE SYMPTOM:

- 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **2**.	Tighten the crankshaft position sensor installation bolt securely.
2	**CHECK CRANK SPROCKET.** Remove the timing belt cover.	Are crank sprocket teeth cracked or damaged?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-52, Crank Sprocket.>	Go to step **3**.
3	**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)-43, Timing Belt.>	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-27, Crankshaft Position Sensor.>

BA: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)-114, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

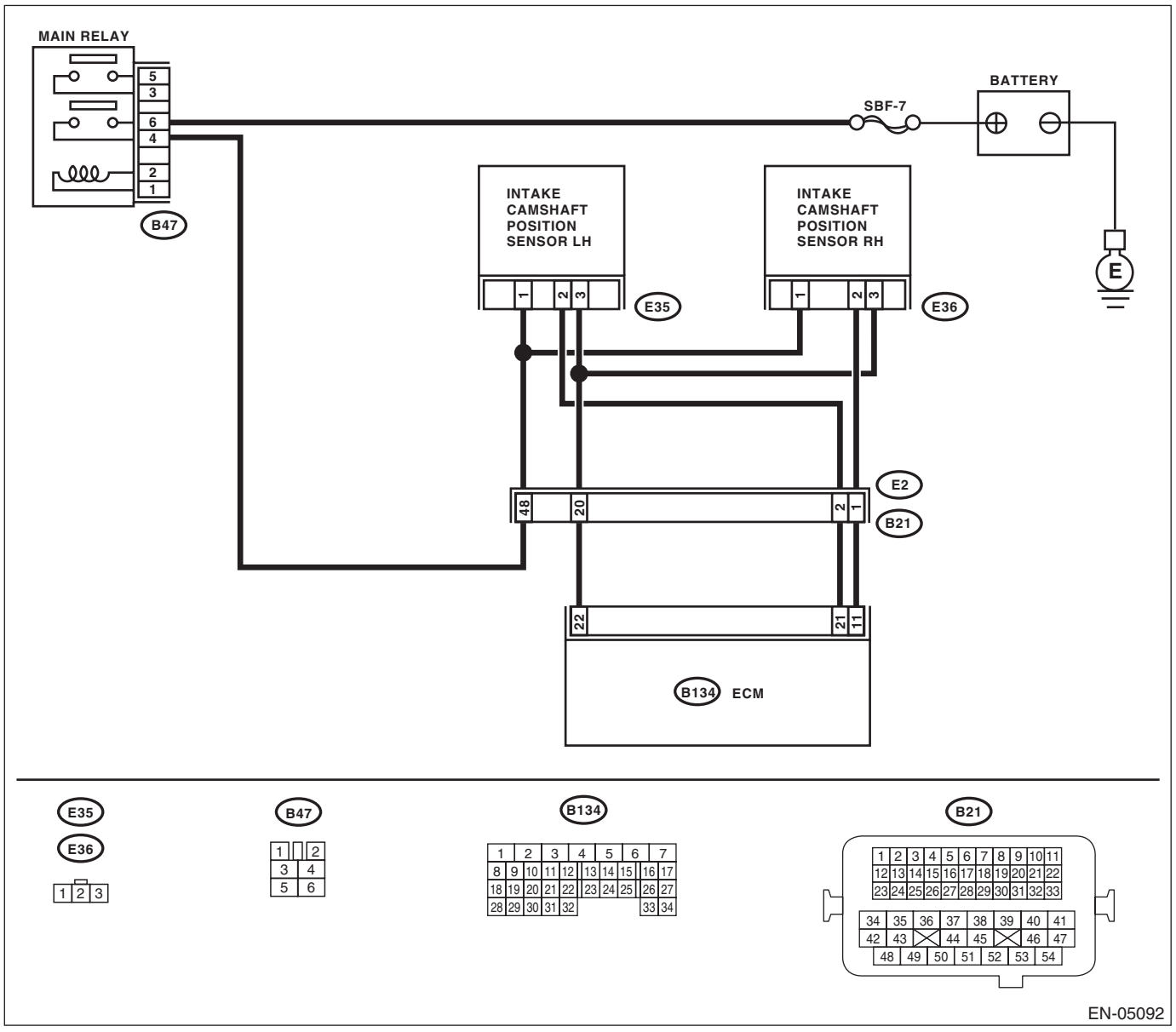
TROUBLE SYMPTOM:

- 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the camshaft position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the open or ground short circuit of harness between main relay connector and camshaft position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between the ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B134) No. 11 — (E36) No. 2:*** ***(B134) No. 22 — (E36) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness between the ECM and camshaft position sensor.
3	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit to ground of harness between the ECM and camshaft position sensor.
4	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 2 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and camshaft position sensor.	Go to step **5**.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6**.	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check waveform of camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-28, Camshaft Position Sensor.>	Repair the following item: • Poor contact in ECM connector • Poor contact in camshaft position sensor connector • Poor contact of coupling connector .

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-116, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

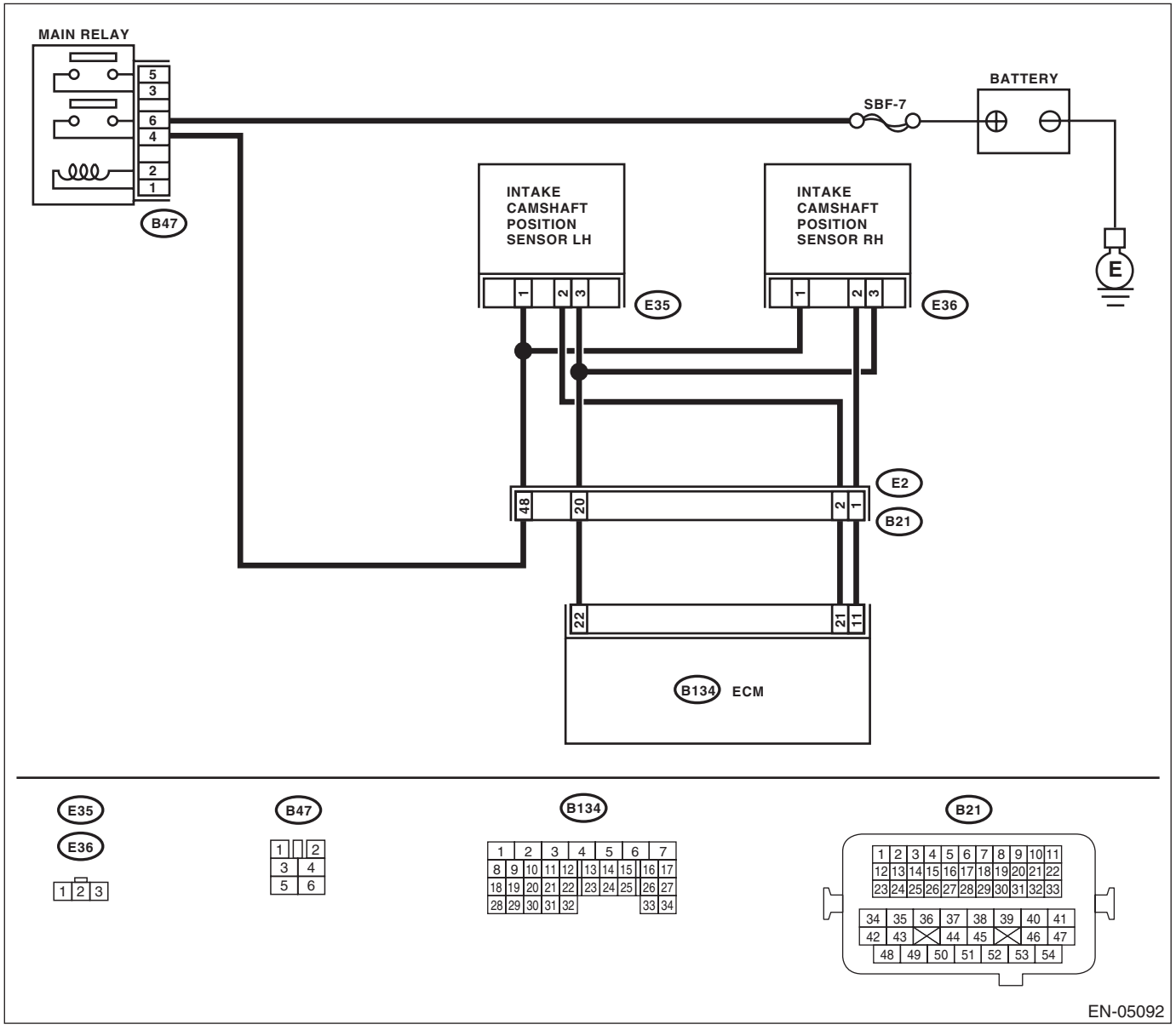
TROUBLE SYMPTOM:

- 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the camshaft position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the open or ground short circuit of harness between main relay connector and camshaft position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between the ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B134) No. 21 — (E35) No. 2:*** ***(B134) No. 22 — (E35) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness between the ECM and camshaft position sensor.
3	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit to ground of harness between the ECM and camshaft position sensor.
4	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 2 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and camshaft position sensor.	Go to step **5**.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6**.	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check waveform of camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-28, Camshaft Position Sensor.>	Repair the following item: • Poor contact in ECM connector • Poor contact in camshaft position sensor connector • Poor contact of coupling connector

BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM

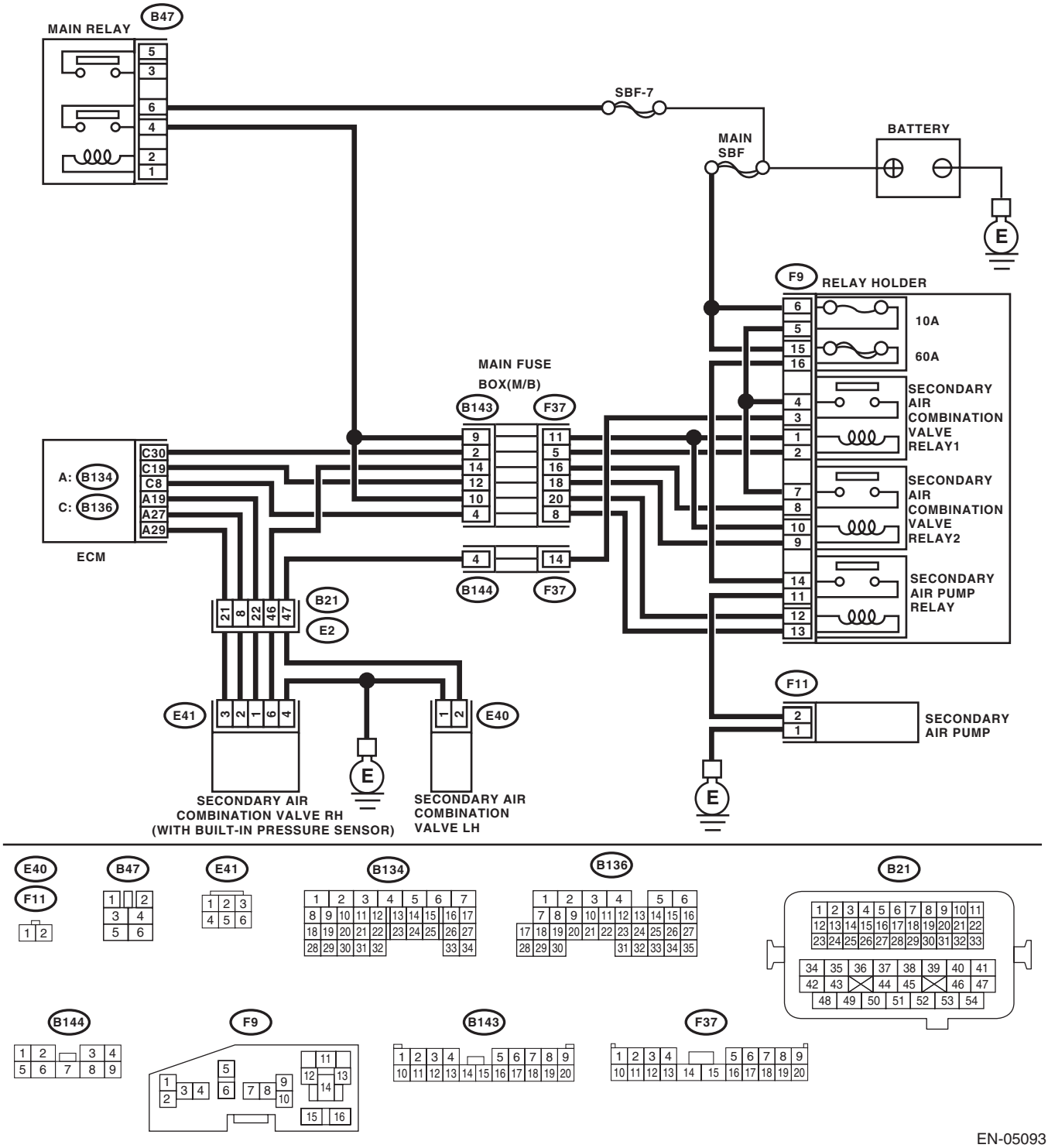
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SECONDARY AIR PUMP FUSE.** Check if the secondary air pump fuse (60 A) is blown out.	Is the fuse blown out?	Go to step **2**.	Go to step **3**.
2	**CHECK HARNESS BETWEEN FUSE BOX AND SECONDARY AIR PUMP.** 1) Remove the secondary air pump fuse from the fuse box. 2) Disconnect the secondary air pump connector. 3) Measure the resistance between the secondary air pump fuse and secondary air pump connector, and chassis ground. ***Connector & terminal*** ***(F9) No. 11 — Chassis ground:*** ***(F11) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the fuse with a new part, and connect the secondary air pump connector. Go to step **3**.	Repair ground short of the harness between the fuse box and the secondary air pump.
3	**CHECK SECONDARY AIR PUMP OPERATION.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform the Clear Memory Mode. 4) Perform operation check for the secondary air pump using the Subaru Select Monitor. NOTE: • Subaru Select Monitor Refer to "Clear Memory Mode" <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.> and "Compulsory Valve Operation Check Mode" <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.> for more operation procedures. • The compulsory operation using the Subaru Select Monitor is performed only for 5 seconds in order to protect the secondary air pump. When operating again, perform the Clear Memory Mode.	Does the secondary air pump operate?	Go to step **4**.	Go to step **5**.
4	**CHECK DUCT BETWEEN SECONDARY AIR PUMP AND COMBINATION VALVE.** Check the duct between the secondary air pump and combination valve.	Is there damage, clog or disconnection of the duct?	Replace, clean or connect the duct.	Replace the secondary air combination valve LH. <Ref. to EC(H4DOTC)-21, Secondary Air Combi Valve.>
5	**CHECK POWER SUPPLY TO SECONDARY AIR PUMP.** 1) Perform the Clear Memory Mode. 2) Turn the ignition switch to OFF. 3) Disconnect the secondary air pump connector. 4) In the condition of step 3, measure the voltage between the secondary air pump connector and the chassis ground. NOTE: For detailed procedures, refer to "Clear Memory Mode". <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.> ***Connector & terminal*** ***(F11) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the secondary air pump. <Ref. to EC(H4DOTC)-20, Secondary Air Pump.>	Go to step **6**.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN SECONDARY AIR PUMP RELAY AND SECONDARY AIR PUMP CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay. 3) Measure the resistance of harness between secondary air pump relay and secondary air pump connector. ***Connector & terminal*** ***(F9) No. 11 — (F11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **7**.	Repair the open circuit of harness between secondary air pump relay and secondary air pump connector.
7	**CHECK HARNESS BETWEEN SECONDARY AIR PUMP CONNECTOR AND CHASSIS GROUND.** Measure the resistance of the harness between secondary air pump connector and chassis ground. ***Connector & terminal*** ***(F11) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **8**.	Repair the open circuit of the harness between secondary air pump connector and chassis ground.
8	**CHECK SECONDARY AIR PUMP RELAY.** 1) Connect the battery to terminals No. 12 and No. 13 of the secondary air pump relay. 2) Measure the resistance between secondary air pump relay terminals. ***Terminals*** ***No. 14 — No. 11:***	Is the resistance less than 1 Ω?	Go to step **9**.	Replace the secondary air pump relay. <Ref. to EN(H4DOTC)(diag)-8, Electrical Component Location.>
9	**CHECK SECONDARY AIR PUMP RELAY POWER SOURCE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air pump relay connector and chassis ground. ***Connector & terminal*** ***(F9) No. 14 (+) — Chassis ground (–):*** ***(F9) No. 12 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **10**.	Repair the open or ground short circuit of power supply circuit.
10	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of harness between ECM and secondary air pump relay connector. ***Connector & terminal*** ***(B136) No. 8 — (F9) No. 13:***	Is the resistance less than 1 Ω?	Repair the poor contact in ECM connector.	Repair the open circuit of harness between ECM and secondary air pump relay connector.

BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

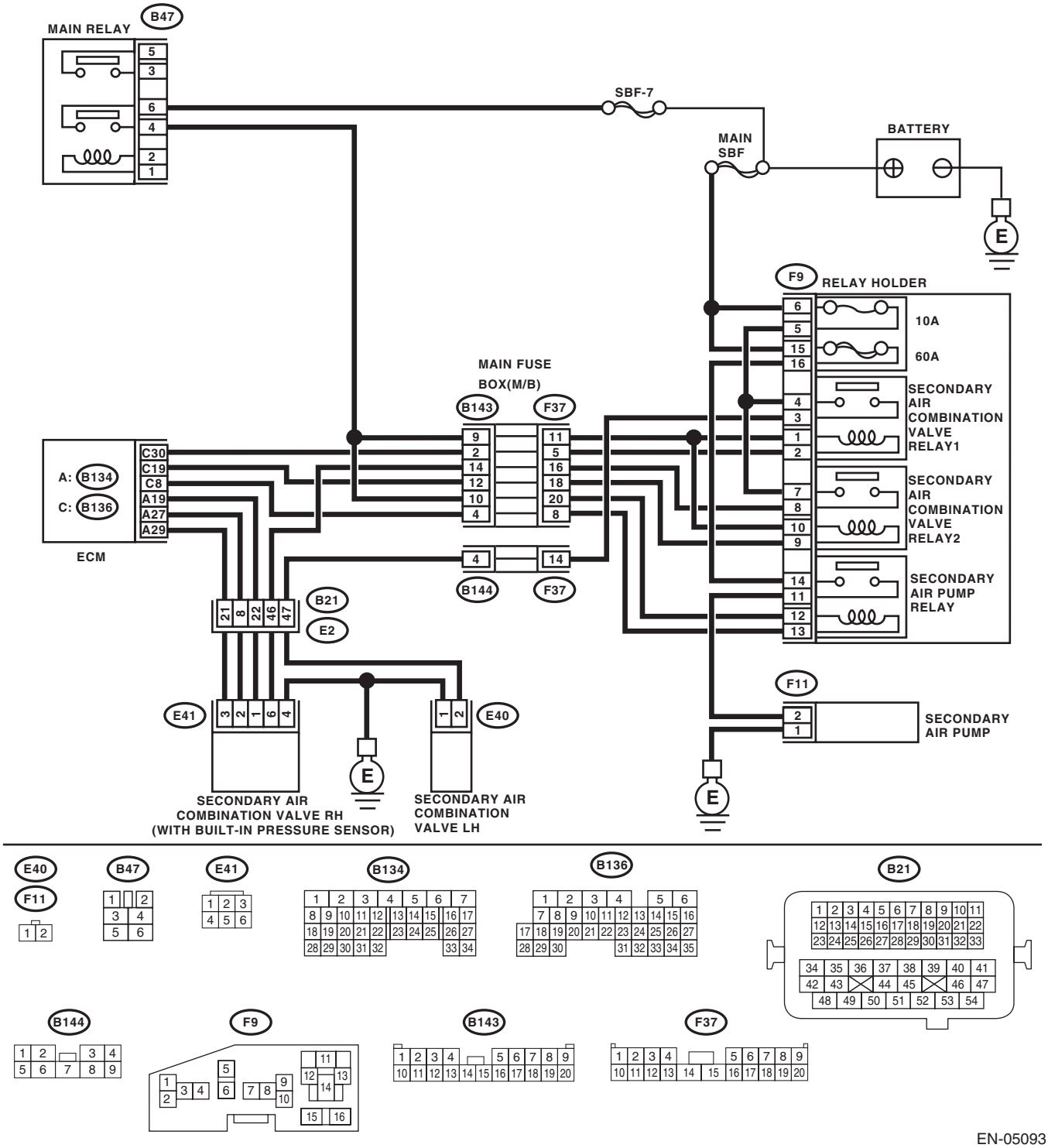
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-124, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SECONDARY AIR COMBINATION VALVE.** Inspection of the pipe between the secondary air combination valve and cylinder head.	Is there damage or disconnection of the pipe?	Replace the pipe between secondary air combination valve and cylinder head.	Go to step **2**.
2	**CHECK SECONDARY AIR COMBINATION VALVE.** Race the engine at 2,000 rpm to check whether or not the exhaust leak is heard.	Is there any exhaust leak?	Replace the pipe between secondary air combination valve and cylinder head.	Repair the poor contact in ECM connector.

BE:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN

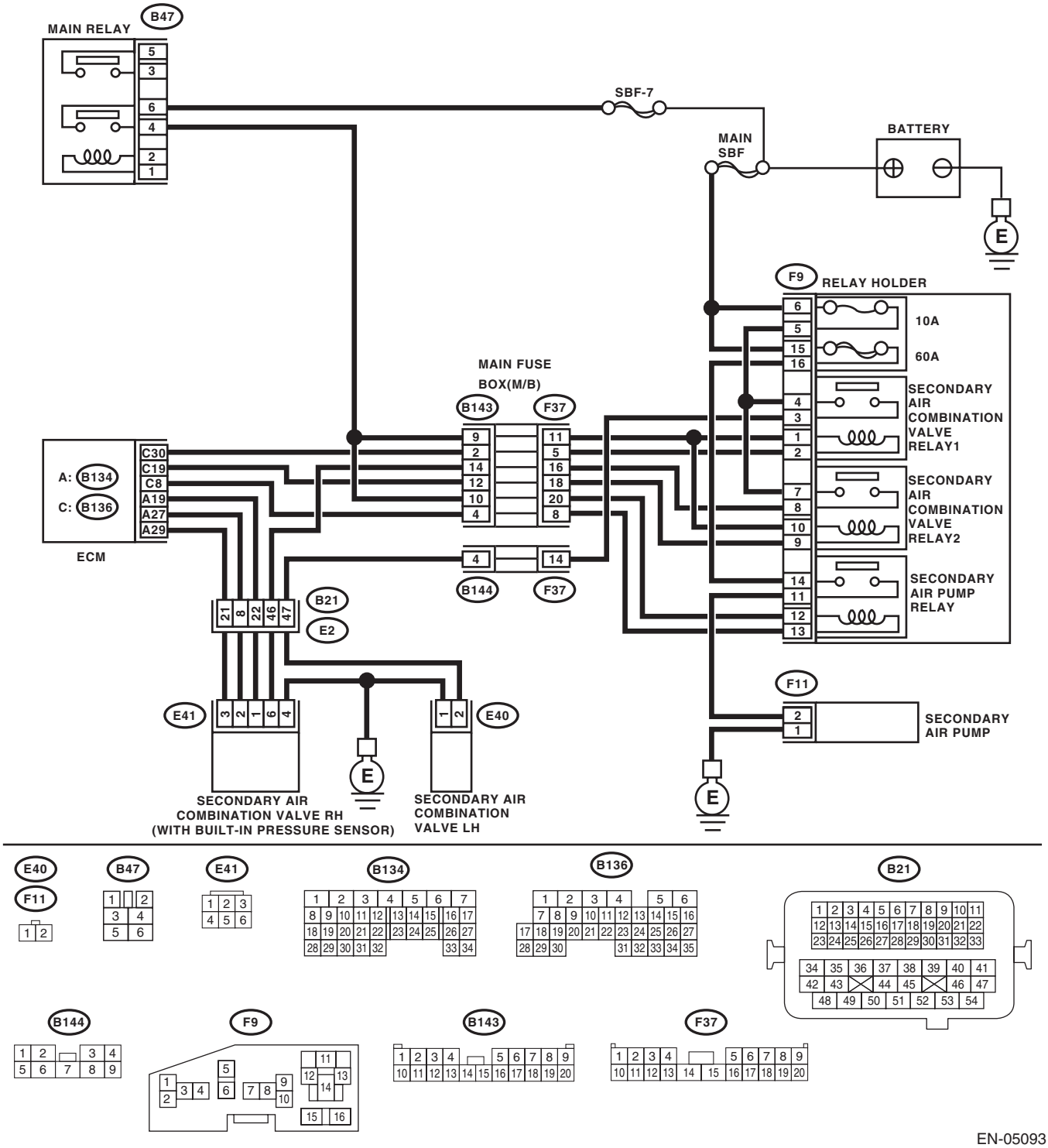
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-125, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combination valve relay 1. 3) Measure the resistance of harness between ECM and secondary air combination valve relay 1. ***Connector & terminal*** ***(B136) No. 30 — (F9) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and secondary air combination valve relay 1.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 30 — Chassis ground:***	Is the resistance 1 MΩ or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.	Repair the ground short circuit of harness between ECM and secondary air combination valve relay 1.

BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED

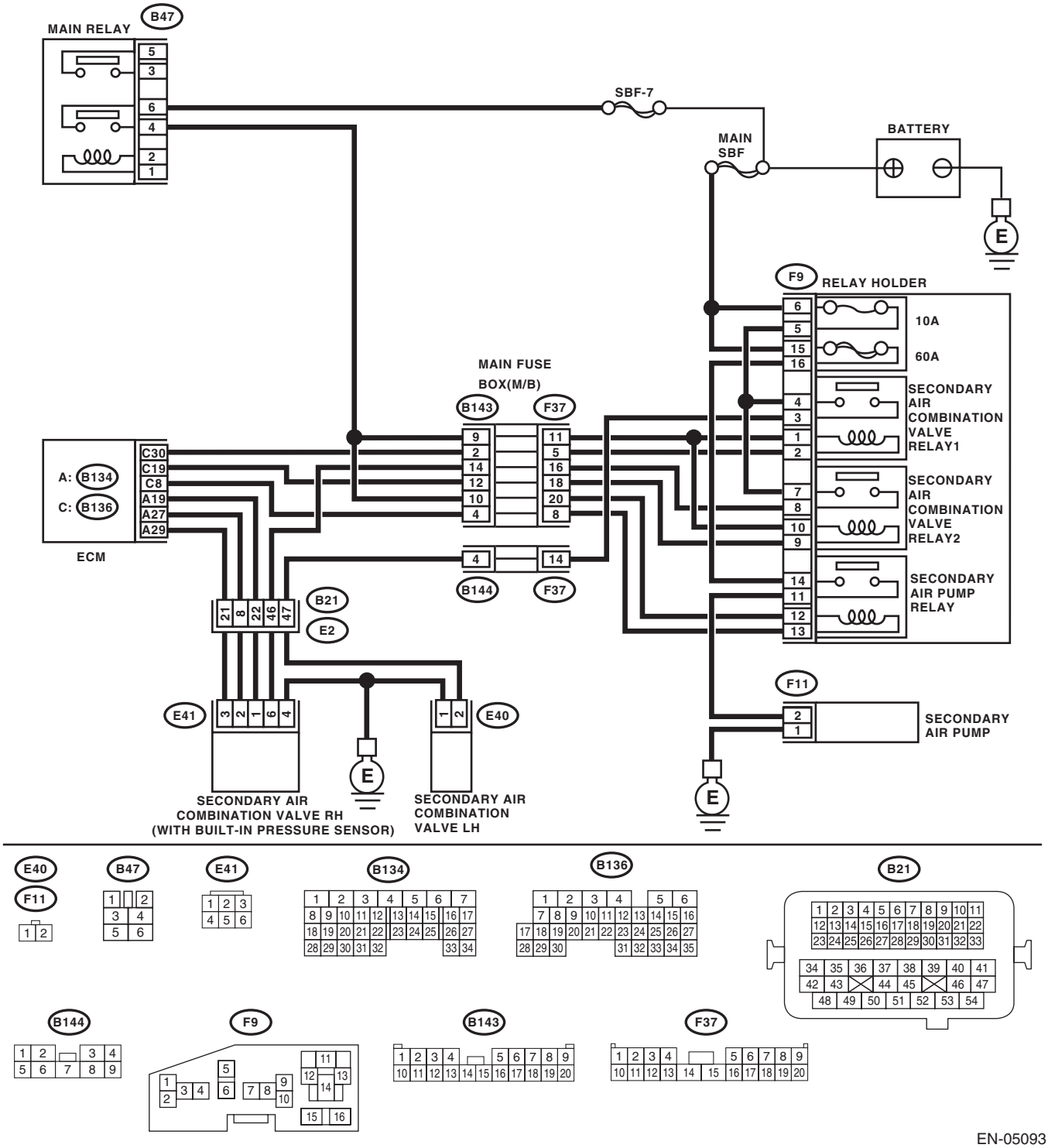
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-126, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05093

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combination valve relay 1. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 30 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and secondary air combination valve relay 1.	Repair the poor contact in ECM connector.

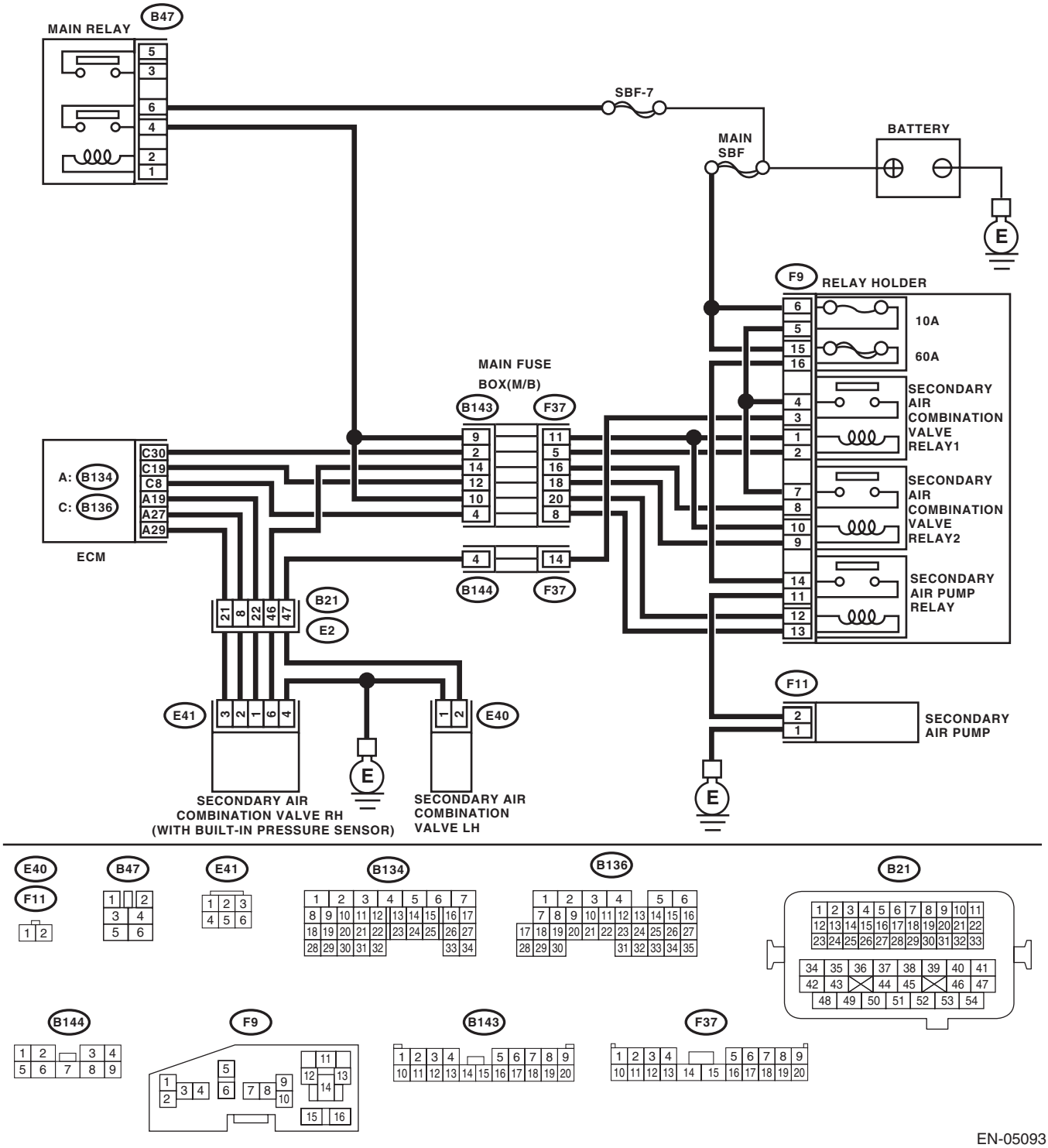
BG:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-127, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combination valve relay 2. 3) Measure the resistance of harness between ECM and secondary air combination valve relay 2. ***Connector & terminal*** ***(B136) No. 19 — (F9) No. 9:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and secondary air combination valve relay 2.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:***	Is the resistance 1 MΩ or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.	Repair the ground short circuit of harness between ECM and secondary air combination valve relay 2.

BH:DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED

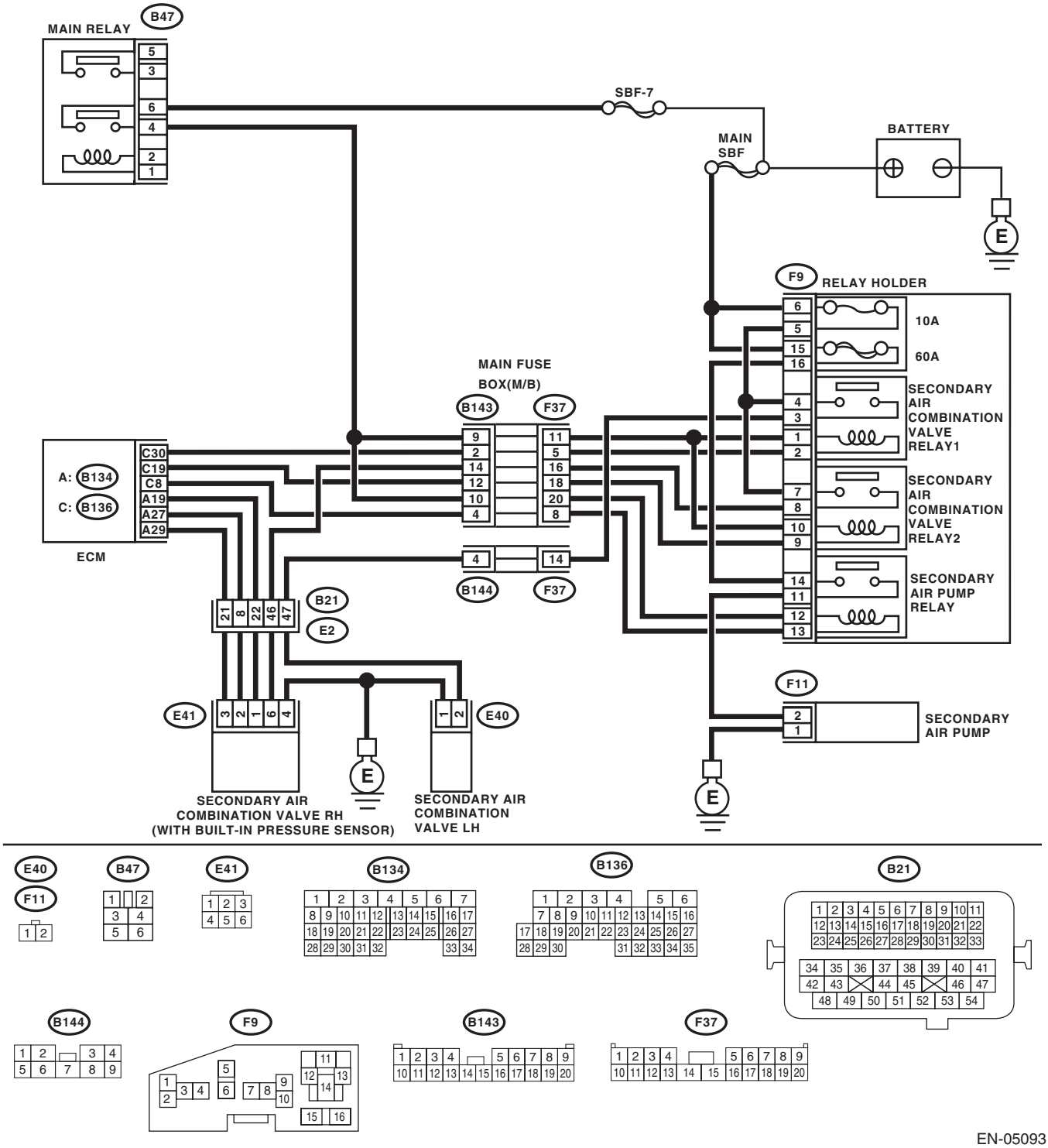
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-127, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combination valve relay 2. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and secondary air combination valve relay 2.	Repair the poor contact in ECM connector.

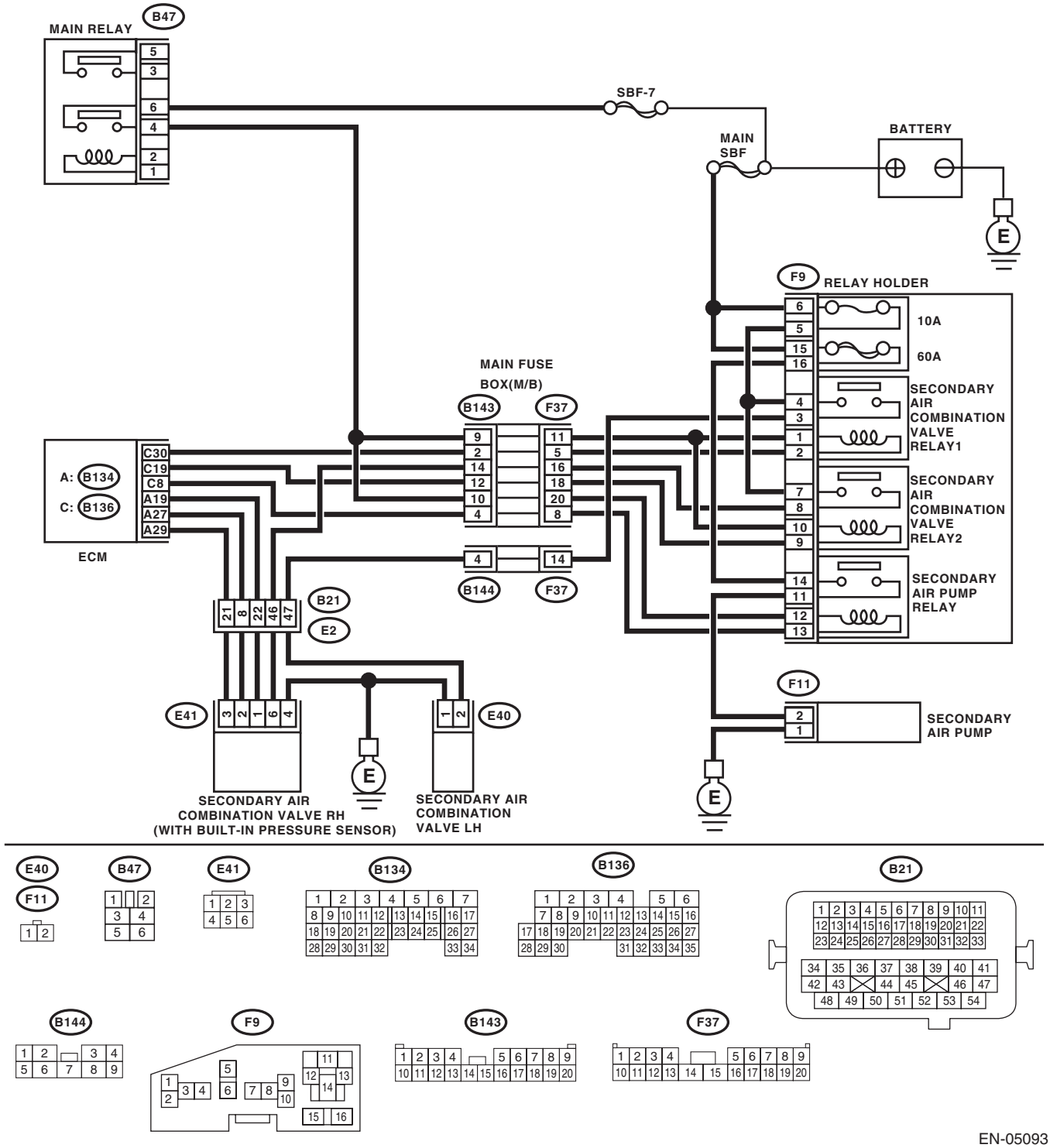
BI: DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-128, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air pump relay. 3) Measure the resistance of harness between ECM and secondary air pump relay. ***Connector & terminal*** ***(B136) No. 8 — (F9) No. 13:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between ECM and secondary air pump relay.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.	Repair the ground short circuit of harness between ECM and secondary air pump relay.

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-129, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

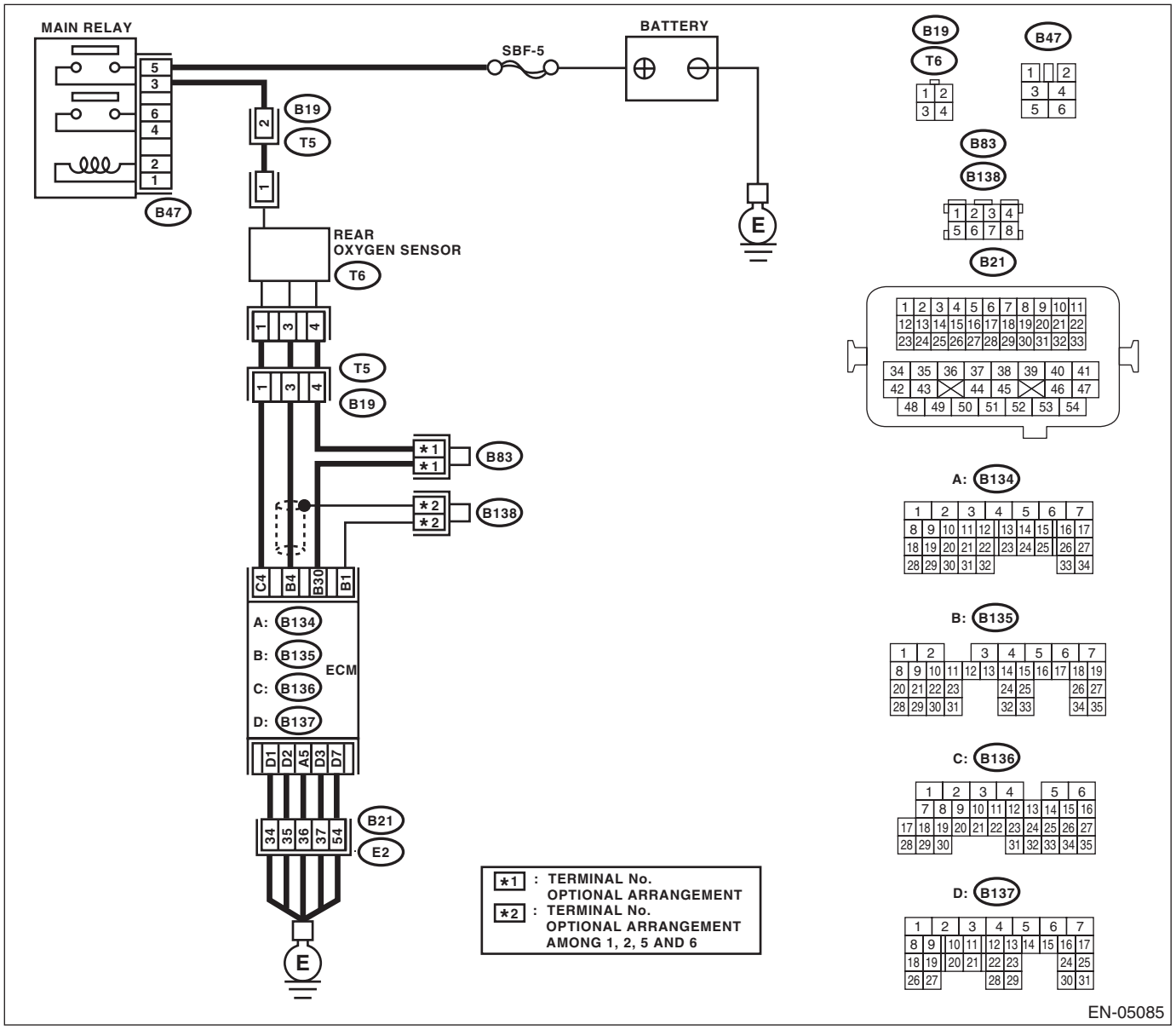
TROUBLE SYMPTOM:

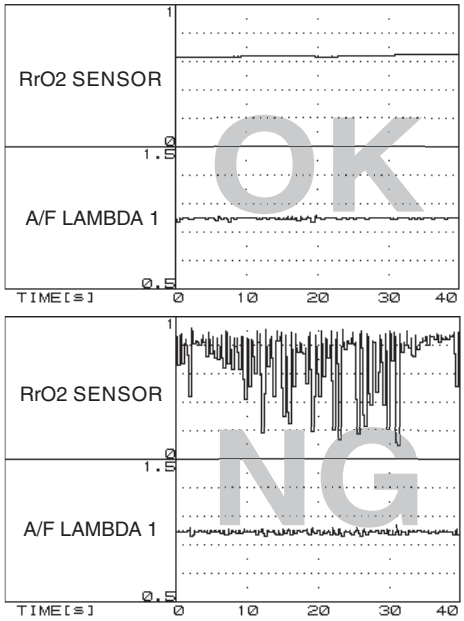
- Engine stalls.
- Idle mixture is out of specifications.

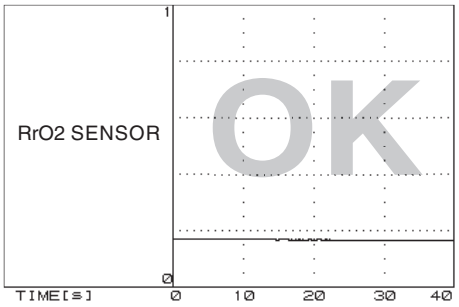
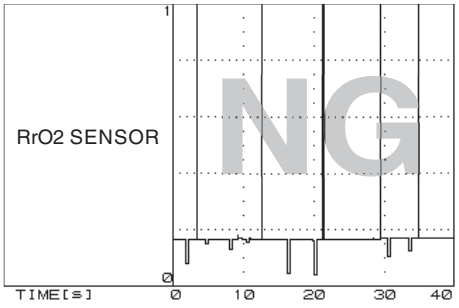
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter • Loose or improperly attached front oxygen (A/F) sensor or rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4DOTC)-2, General Description.>	Go to step **2**.
2	**CHECK WAVEFORM DATA ON THE SUBARU SELECT MONITOR (WHILE DRIVING).** 1) Drive at a constant speed between 80 — 112 km/h (50 — 70 MPH). 2) After 5 minutes have elapsed in the condition of step 1), use the Subaru Select Monitor while still driving to read the waveform data. 	Is a normal waveform displayed?	Even if the mulfunction indicator light illuminates, the circuit has returned to a normal condition at this time.Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK WAVEFORM DATA ON THE SUBARU SELECT MONITOR (WHILE IDLING).** 1) Run the engine at idle. 2) In the condition of step 1), use the Subaru Select Monitor to read the waveform data.   EN-04896	Is a normal waveform displayed?	Go to step **4**.	Go to step **5**.
4	**CHECK CATALYTIC CONVERTER.**	Is the catalytic converter damaged?	Replace the catalytic converter. <Ref. to EC(H4DOTC)-5, Front Catalytic Converter.>	Go to step **5**.
5	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **6**.
6	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (T6) No. 3:*** ***(B135) No. 30 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **7**.	Repair the open circuit of harness between ECM and rear oxygen sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Go to step **8**.	Repair the harness and connector. NOTE: Repair the following locations. • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the ECM and rear oxygen sensor • Poor contact in ECM connector
8	**CHECK REAR OXYGEN SENSOR SHIELD.** 1) Turn the ignition switch to OFF. 2) Expose the rear oxygen sensor connector body side harness sensor shield. 3) Measure the resistance between the sensor shield and chassis ground.	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the open circuit in the rear oxygen sensor harness.

BK:DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-131, DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK PURGE LINE OF THE PURGE CONTROL SOLENOID VALVE 2.**	Is there any clogging, flattened part or bent in the purge line of purge control solenoid valve 2?	Repair or replace the purge line of purge control solenoid valve 2.	Go to step **3**.
3	**CHECK PURGE CONTROL SOLENOID VALVE 2.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the purge control solenoid valve 2 using the Subaru Select Monitor. NOTE: Purge control solenoid valve 2 can be operated using the Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve 2 operate?	Repair the poor contact in ECM connector.	Replace the purge control solenoid valve 2. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

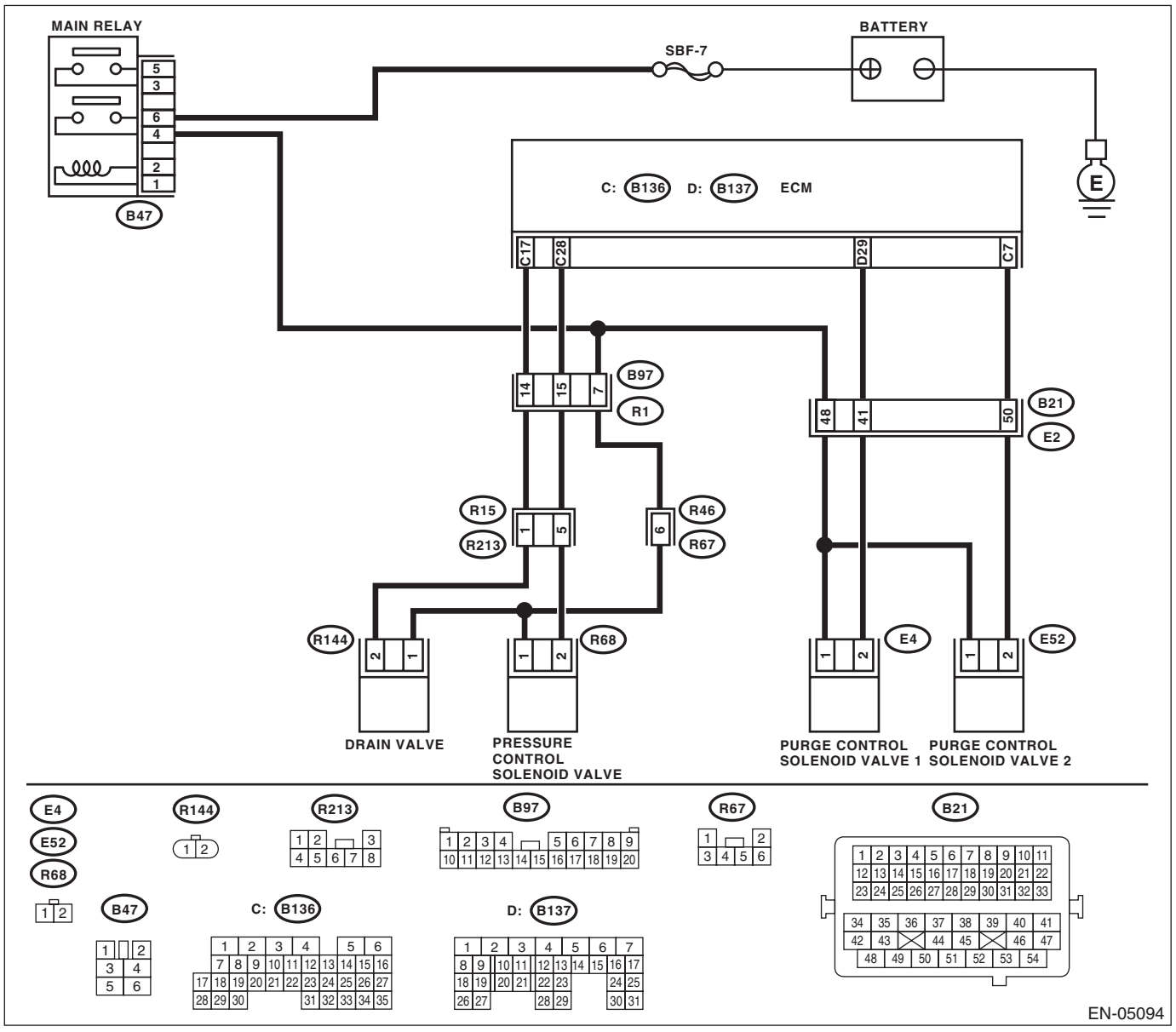
TROUBLE SYMPTOM:

- 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain has caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap genuine?	Go to step **3**.	Replace with a genuine fuel filler cap.
3	**CHECK FUEL FILLER PIPE GASKET.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-57, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: Drain valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H4DOTC)-18, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **6**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **7**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-15, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector.	Is there any hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-67, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8**.

Step		Check	Yes	No
8	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step **9**.
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-51, 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)-51, Fuel Tank.>	Go to step **10**.
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Is there any hole of more than 1.0 mm (0.04 in) dia., crack, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact in ECM connector.

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

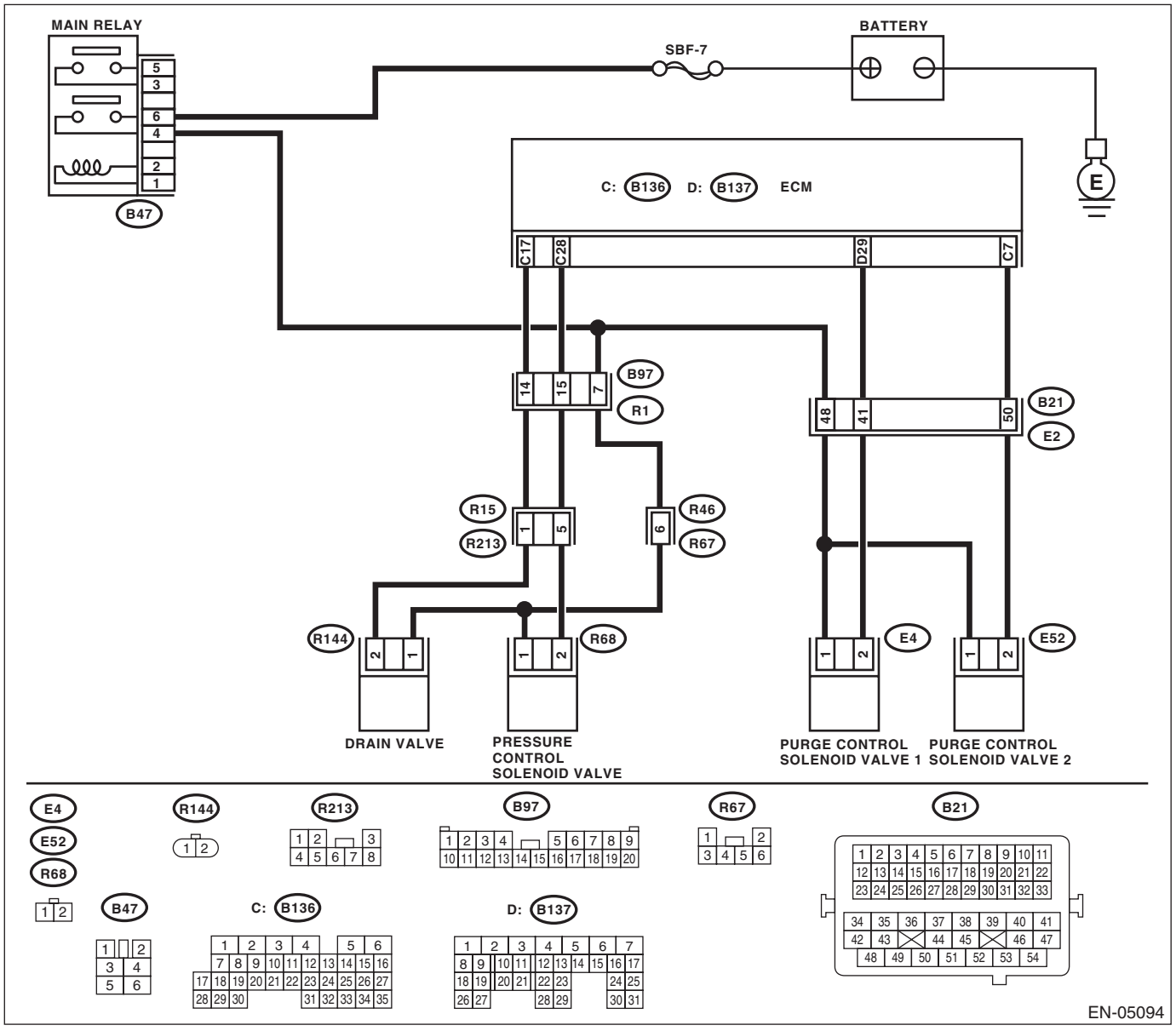
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-147, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact in ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND DRAIN VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and drain valve. 3) Measure the resistance between the drain valve connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and drain valve connector.
3	**CHECK HARNESS BETWEEN ECM AND DRAIN VALVE.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B136) No. 17 — (R144) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and drain valve connector • Poor contact of coupling connector
4	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 — 100 Ω?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H4DOTC)-18, Drain Valve.>
5	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R144) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of drain valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and drain valve • Poor contact of coupling connector • Poor contact of main relay connector

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

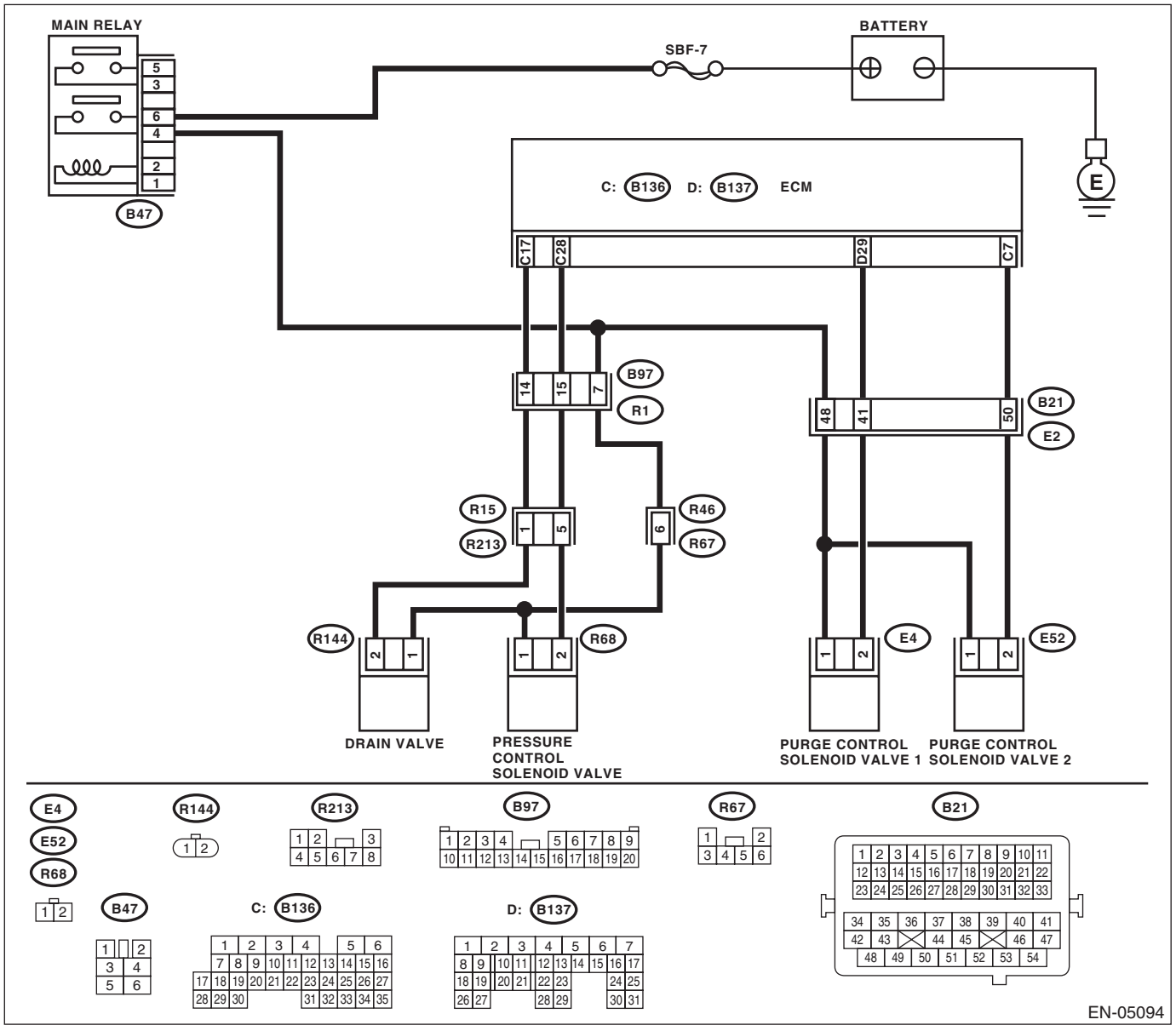
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-149, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND DRAIN VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and drain valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and drain valve connector.	Go to step **2**.
2	**CHECK DRAIN VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the drain valve. <Ref. to EC(H4DOTC)-18, Drain Valve.>	Repair the poor contact in ECM connector.

BO:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

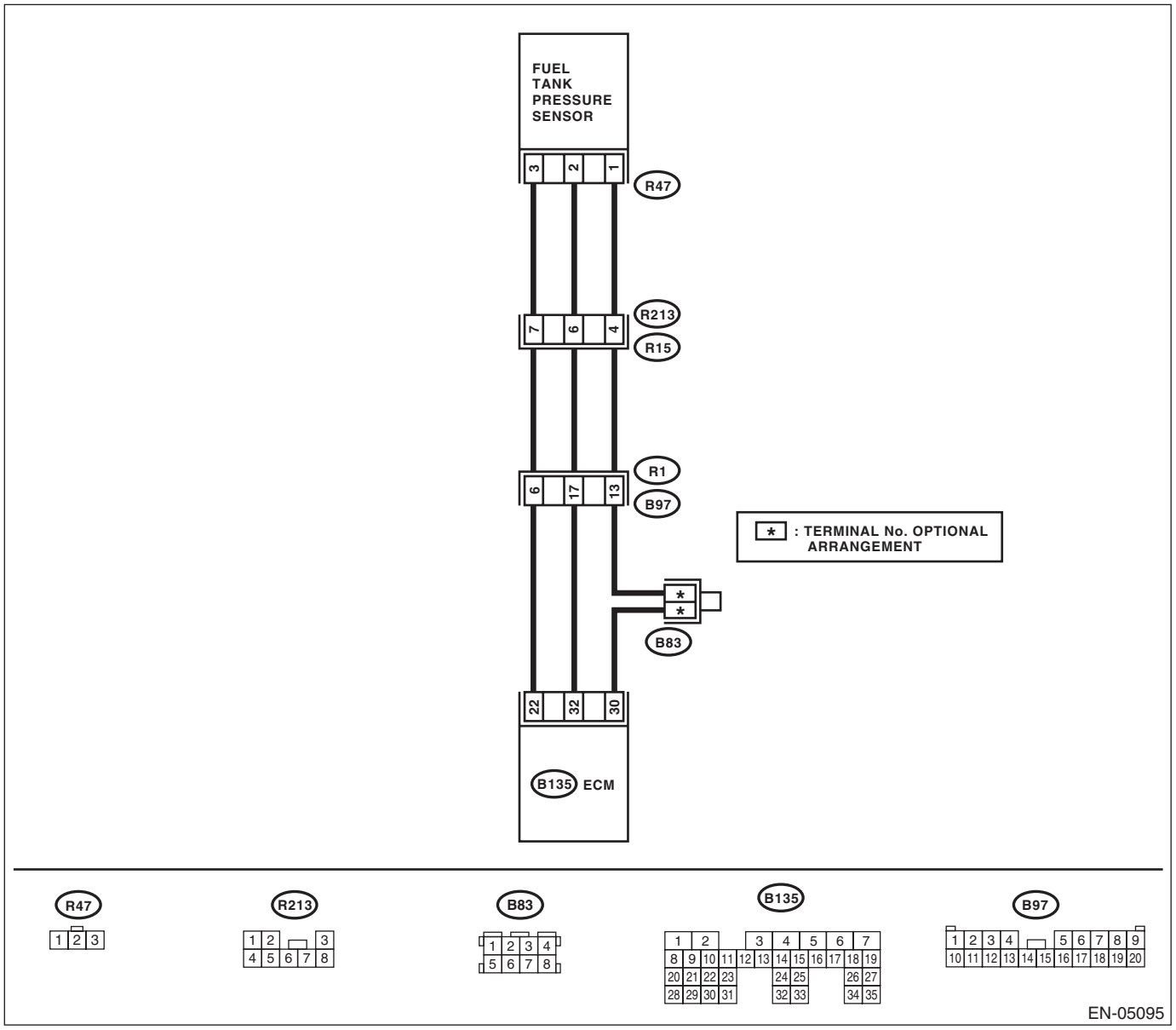
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-151, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK PRESSURE VACUUM LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of 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)-14, Fuel Tank Pressure Sensor.>

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

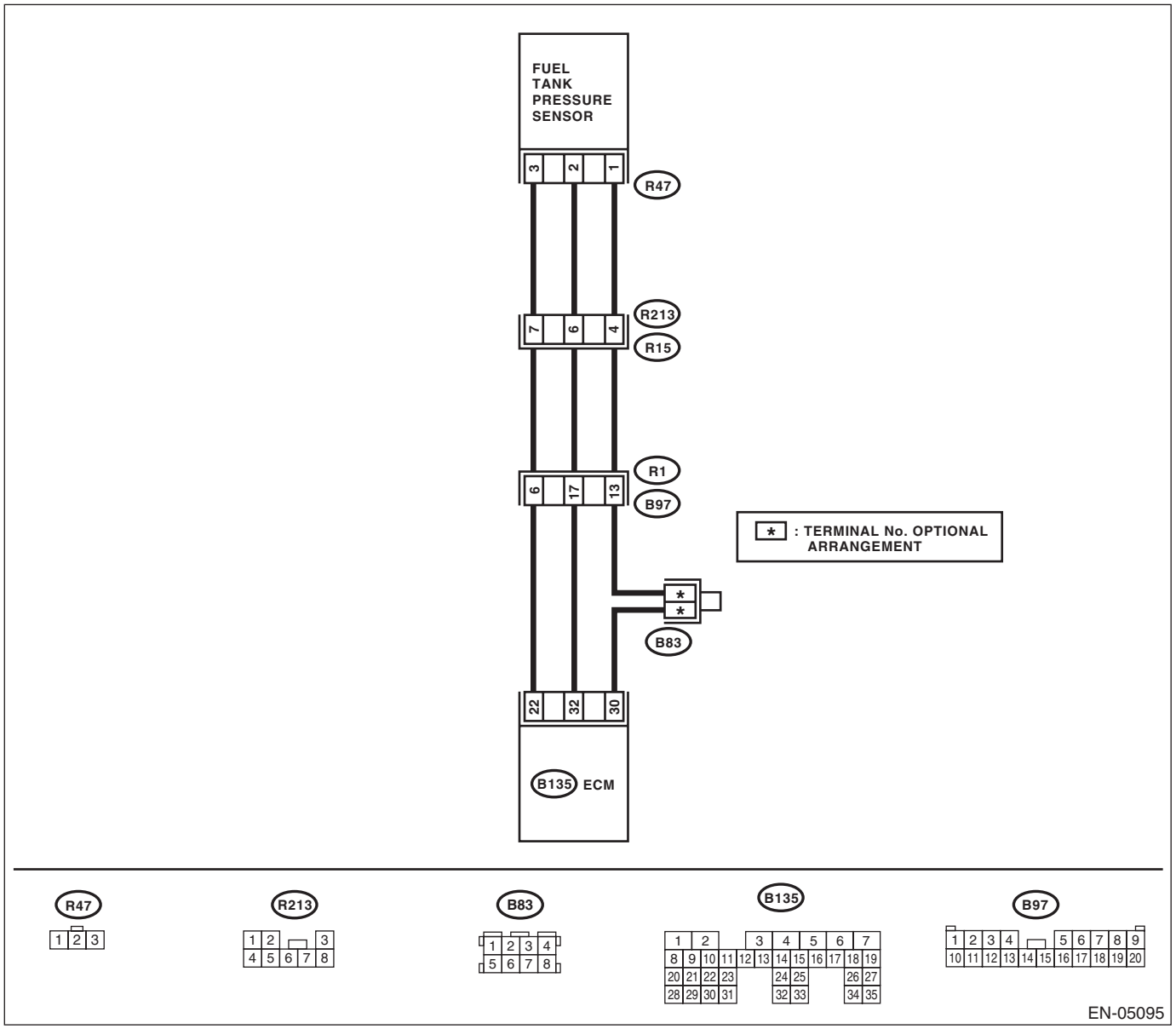
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-153, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of fuel tank pressure sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than –7.45 kPa (–55.85 mmHg, –2.2 inHg)?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK FUEL TANK PRESSURE SENSOR POWER SOURCE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the fuel tank pressure sensor connector and chassis ground. ***Connector & terminal*** ***(R47) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel tank pressure sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of harness between the ECM and fuel tank pressure sensor connector. ***Connector & terminal*** ***(B135) No. 32 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel tank pressure sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and fuel tank pressure sensor connector.
5	**CHECK POOR CONTACT.** Check for poor contact between the ECM and fuel tank pressure sensor connector.	Is there poor contact in the ECM or fuel tank pressure sensor connector?	Repair the poor contact in the ECM or fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-14, Fuel Tank Pressure Sensor.>

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

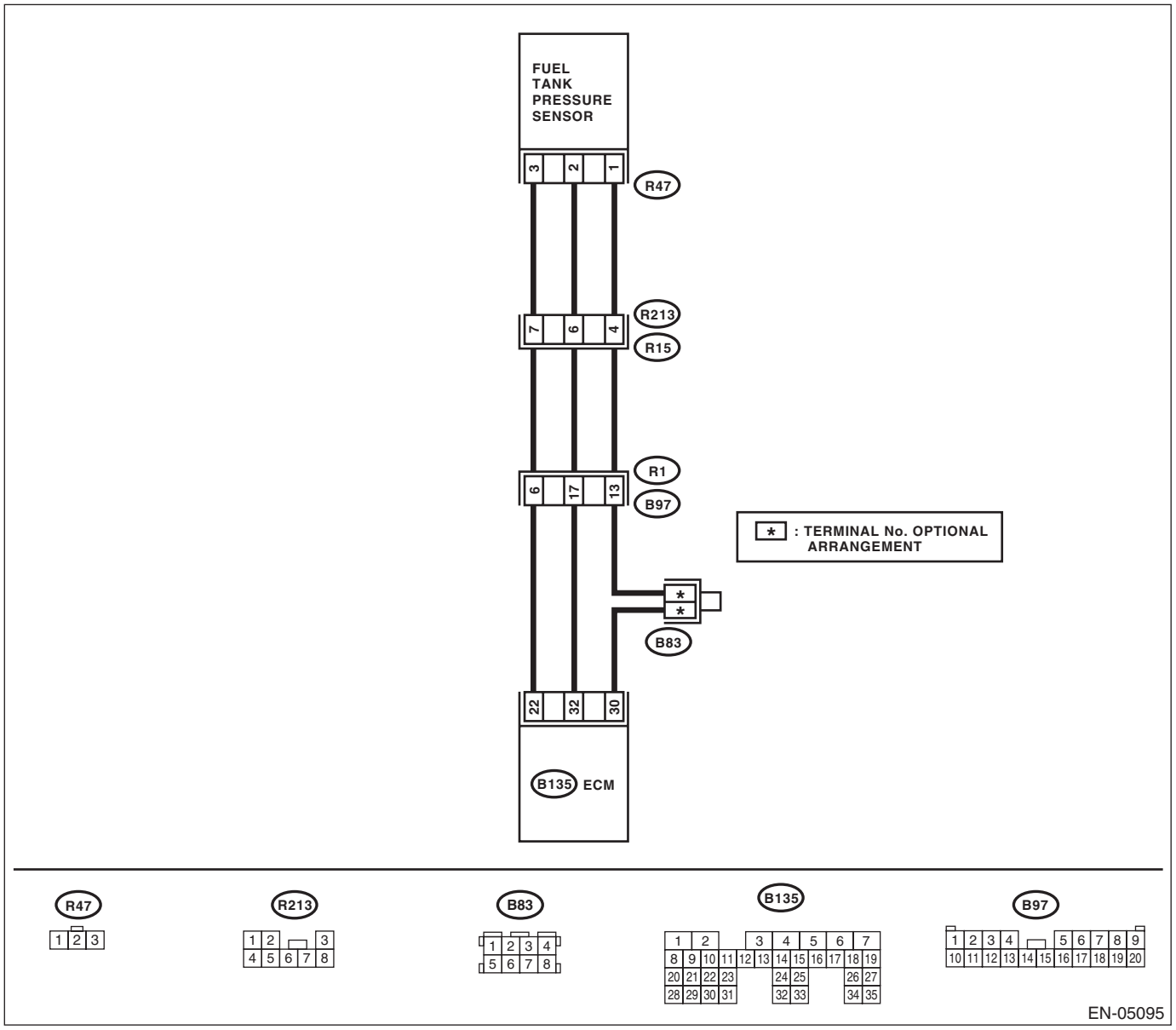
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-155, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of fuel tank pressure sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 7.98 kPa (59.85 mmHg, 2.36 inHg) or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 7.98 kPa (59.85 mmHg, 2.36 inHg) or more?	Repair the short circuit to power in the harness between ECM and fuel tank pressure sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. ***Connector & terminal*** ***(R47) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel tank pressure sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
4	**CHECK POOR CONTACT.** Check for poor contact of the fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair the poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-14, Fuel Tank Pressure Sensor.>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-156, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

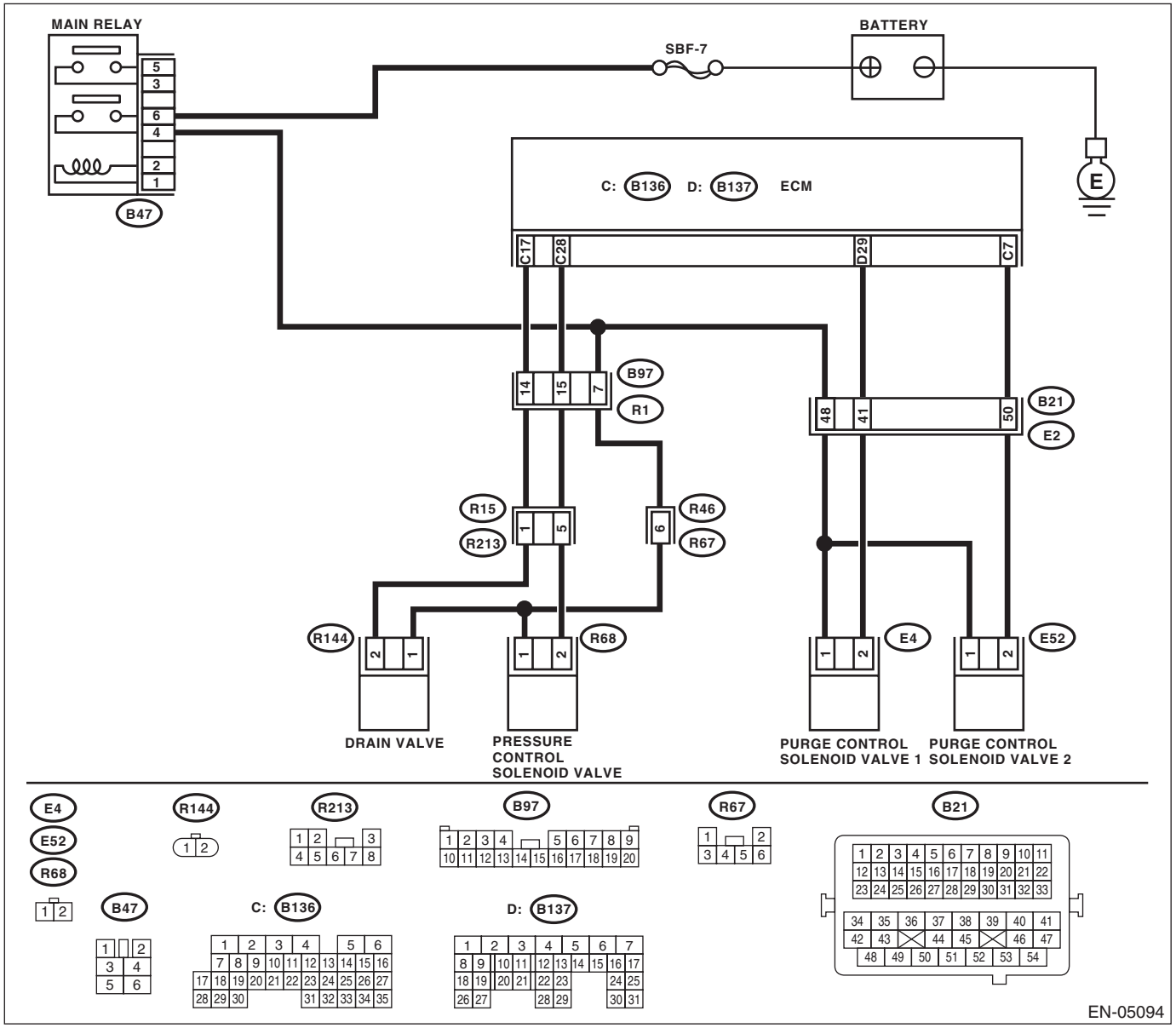
TROUBLE SYMPTOM:

- 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap genuine?	Go to step **3**.	Replace with a genuine fuel filler cap.
3	**CHECK FUEL FILLER PIPE GASKET.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-57, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: Drain valve can be operated using the Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H4DOTC)-18, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **6**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **7**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-15, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector.	Is there any hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-67, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8**.

Step		Check	Yes	No
8	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step **9**.
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-51, 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)-51, Fuel Tank.>	Go to step **10**.
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Is there any hole of more than 0.5 mm (0.020 in) dia., crack, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact in ECM connector.

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-156, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

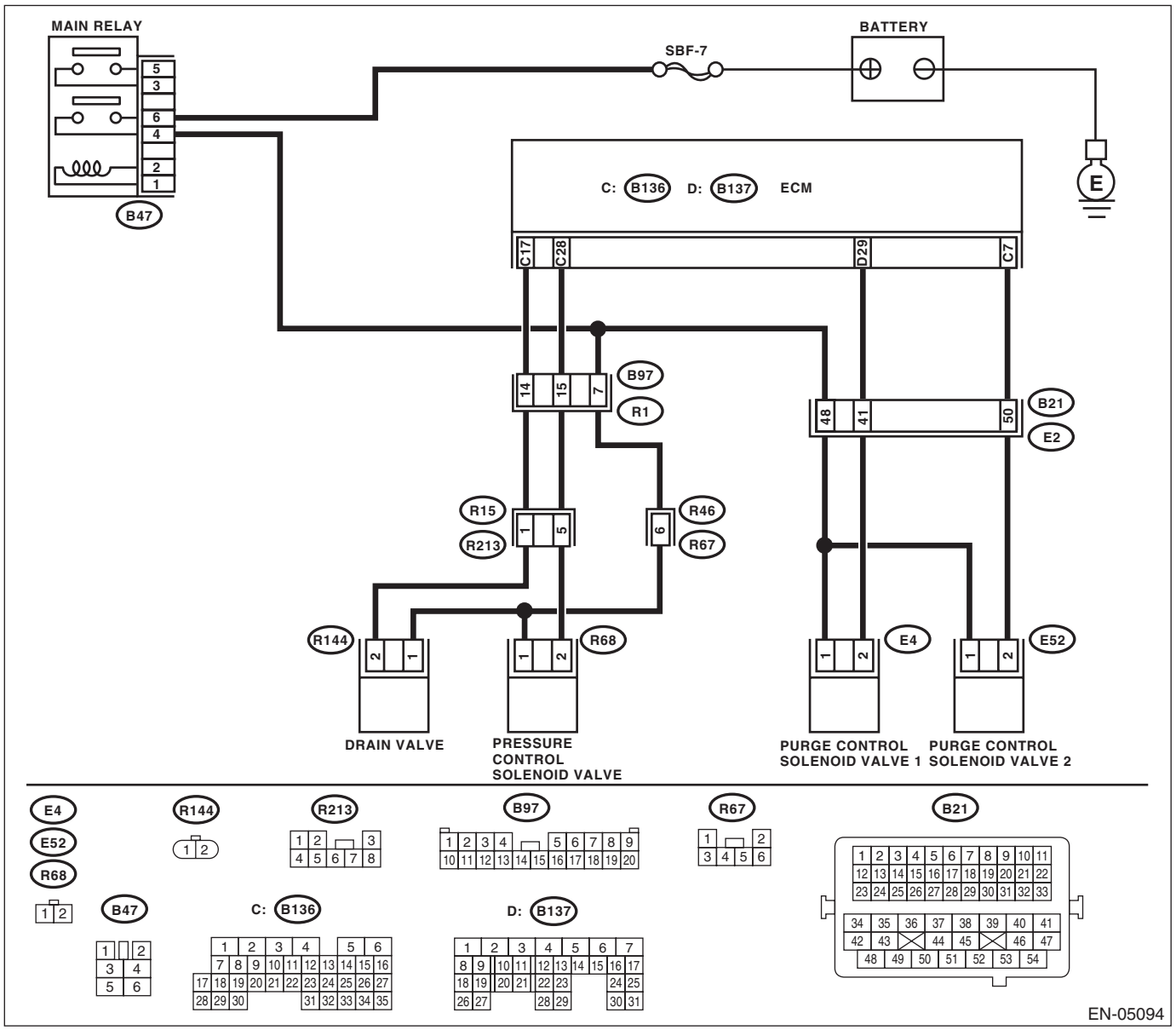
TROUBLE SYMPTOM:

- 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain has caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap genuine?	Go to step **3**.	Replace with a genuine fuel filler cap.
3	**CHECK FUEL FILLER PIPE GASKET.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-57, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: Drain valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H4DOTC)-18, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **6**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **7**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-15, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector.	Is there any disconnection, damage or clogging on the evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-67, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8**.

Step		Check	Yes	No
8	**CHECK CANISTER.**	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step **9**.
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Go to step **10**.
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes, cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact in ECM connector.

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-157, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

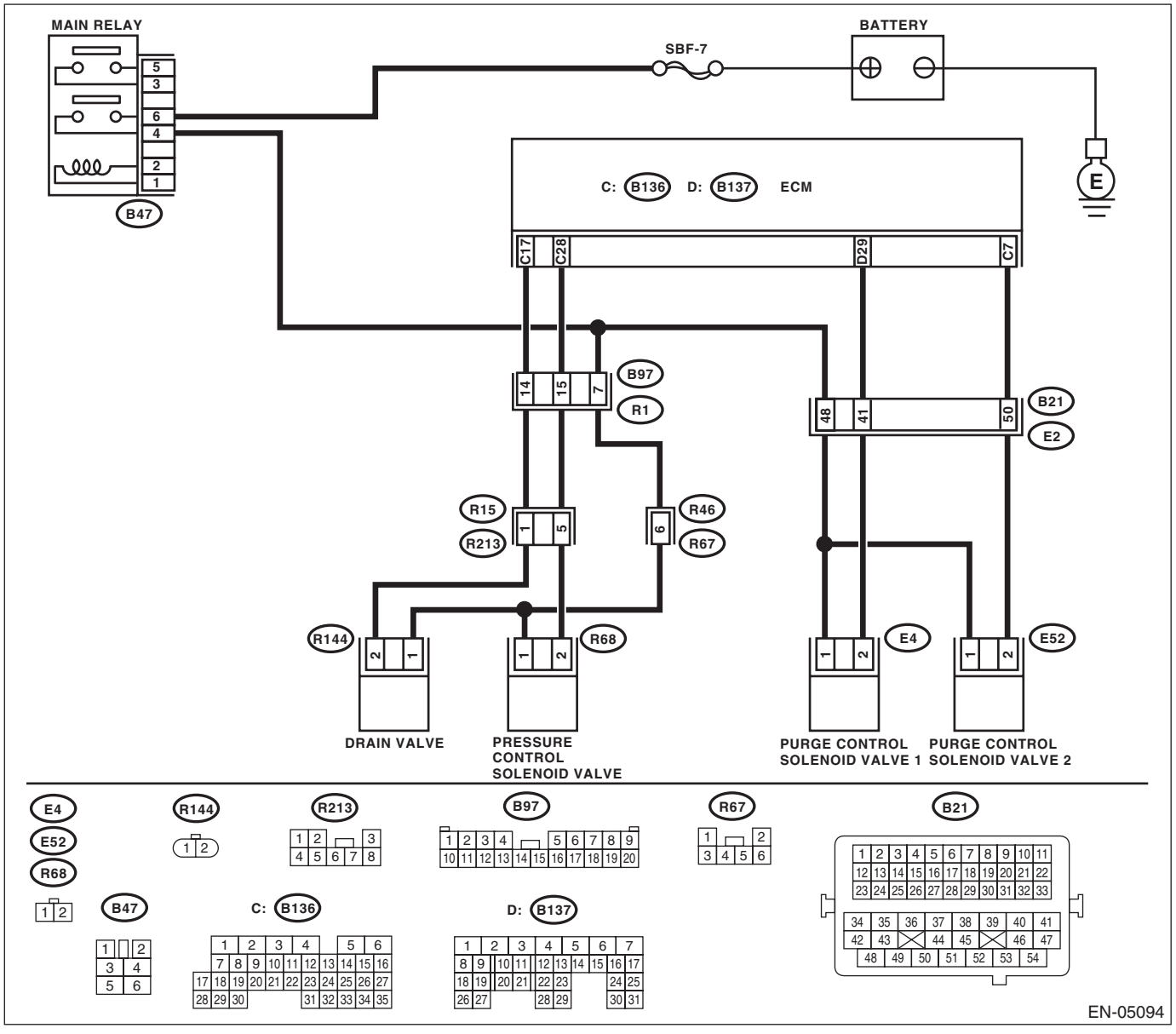
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact in ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve. 3) Measure the resistance between the purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and purge control solenoid valve. ***Connector & terminal*** ***(B137) No. 29 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and purge control solenoid valve connector • Poor contact of coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 — 100 Ω?	Go to step **5**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of purge control solenoid valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the main relay and purge control solenoid valve • Poor contact of coupling connector • Poor contact of main relay connector

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-159, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

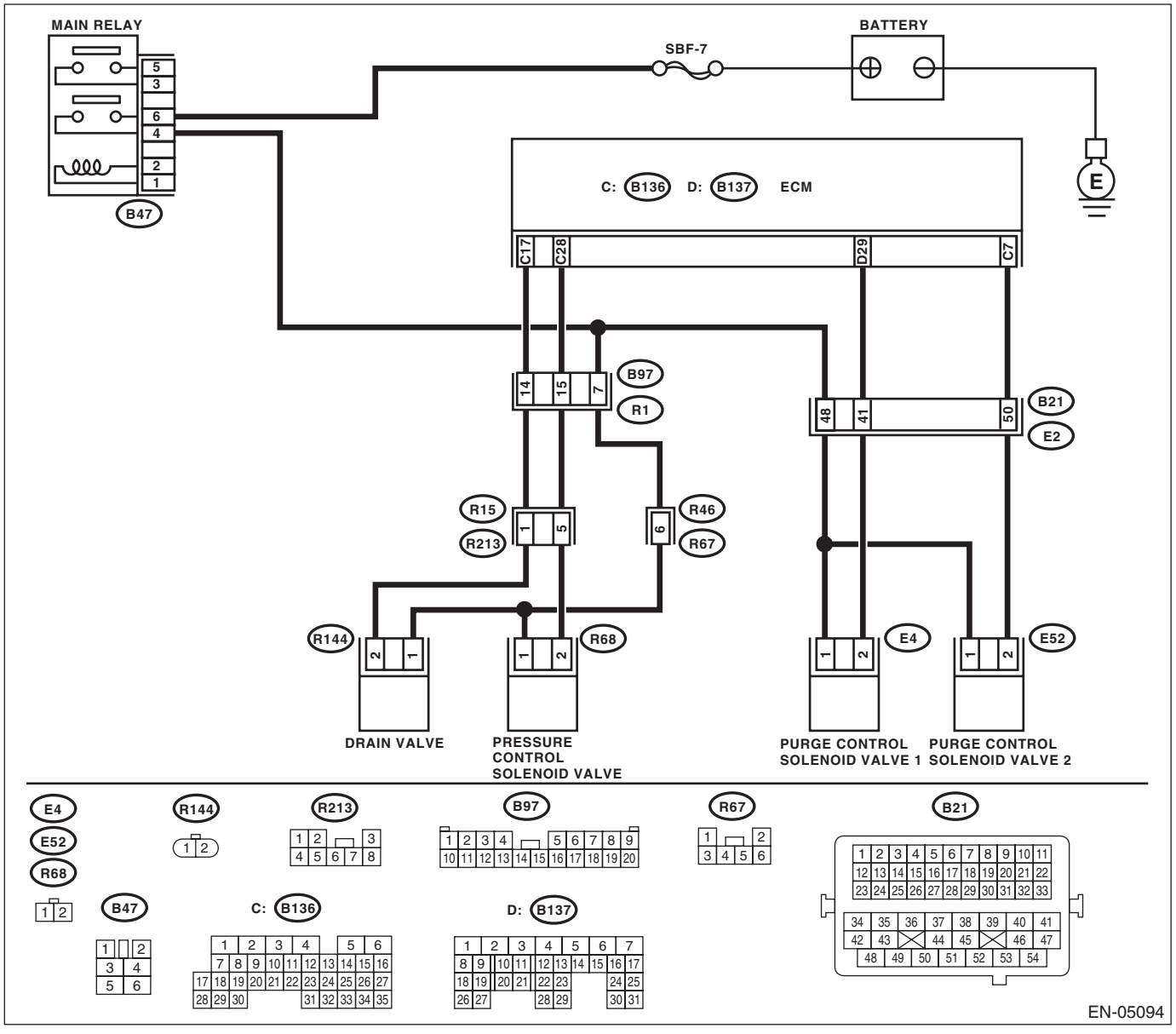
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between the ECM and purge control solenoid valve connector.	Go to step **2**.
2	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>	Repair the poor contact in ECM connector.

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-161, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Replace the fuel level sensor and fuel sub level sensor. <Ref. to FU(H4DOTC)-62, Fuel Level Sensor.> <Ref. to FU(H4DOTC)-63, Fuel Sub Level Sensor.>

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

NOTE:
For the diagnostic procedure, refer to DTC P0463. <Ref. to EN(H4DOTC)(diag)-239, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-165, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is DTC P0462 or P0463 displayed on the Subaru Select Monitor?	Check the combination meter. <Ref. to IDI-13, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.

BY:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-167, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is DTC P0464 displayed on the display?	Check the combination meter. <Ref. to IDI-13, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.

BZ:DTC P0483 FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-170, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

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

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, 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.>

CA:DTC P0500 VEHICLE SPEED SENSOR “A”

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-171, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

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

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-173, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

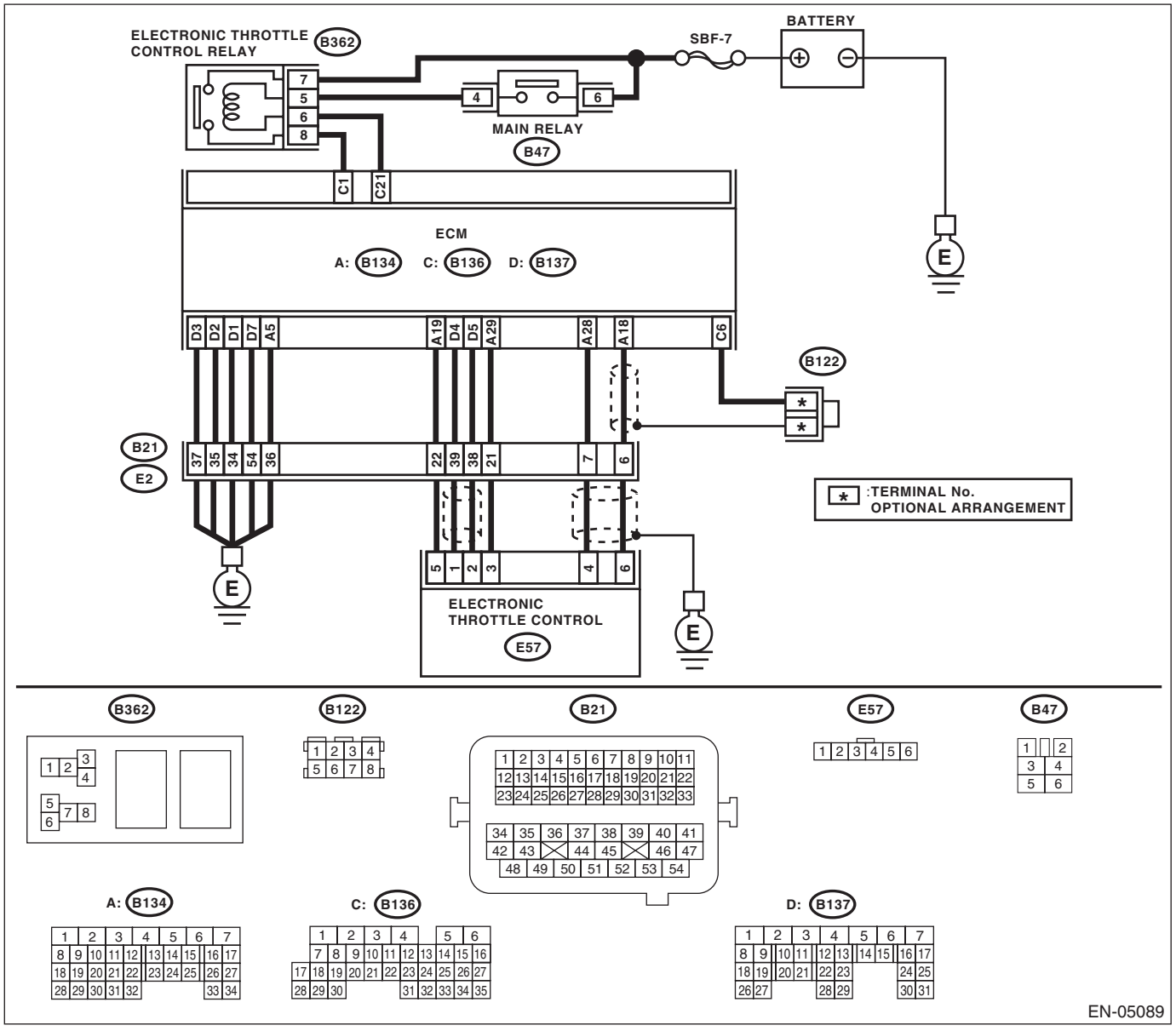
TROUBLE SYMPTOM:

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

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK AIR CLEANER ELEMENT.** 1) Turn the ignition switch to OFF. 2) Check the air cleaner element.	Is there excessive clogging on air cleaner element?	Replace the air cleaner element. <Ref. to IN(H4DOTC)-7, Air Cleaner Element.>	Go to step **3**.
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Remove the electronic throttle control. <Ref. to FU(H4DOTC)-12, REMOVAL, Throttle Body.> 2) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101. <Ref. to EN(H4DOTC)(diag)-328, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-175, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

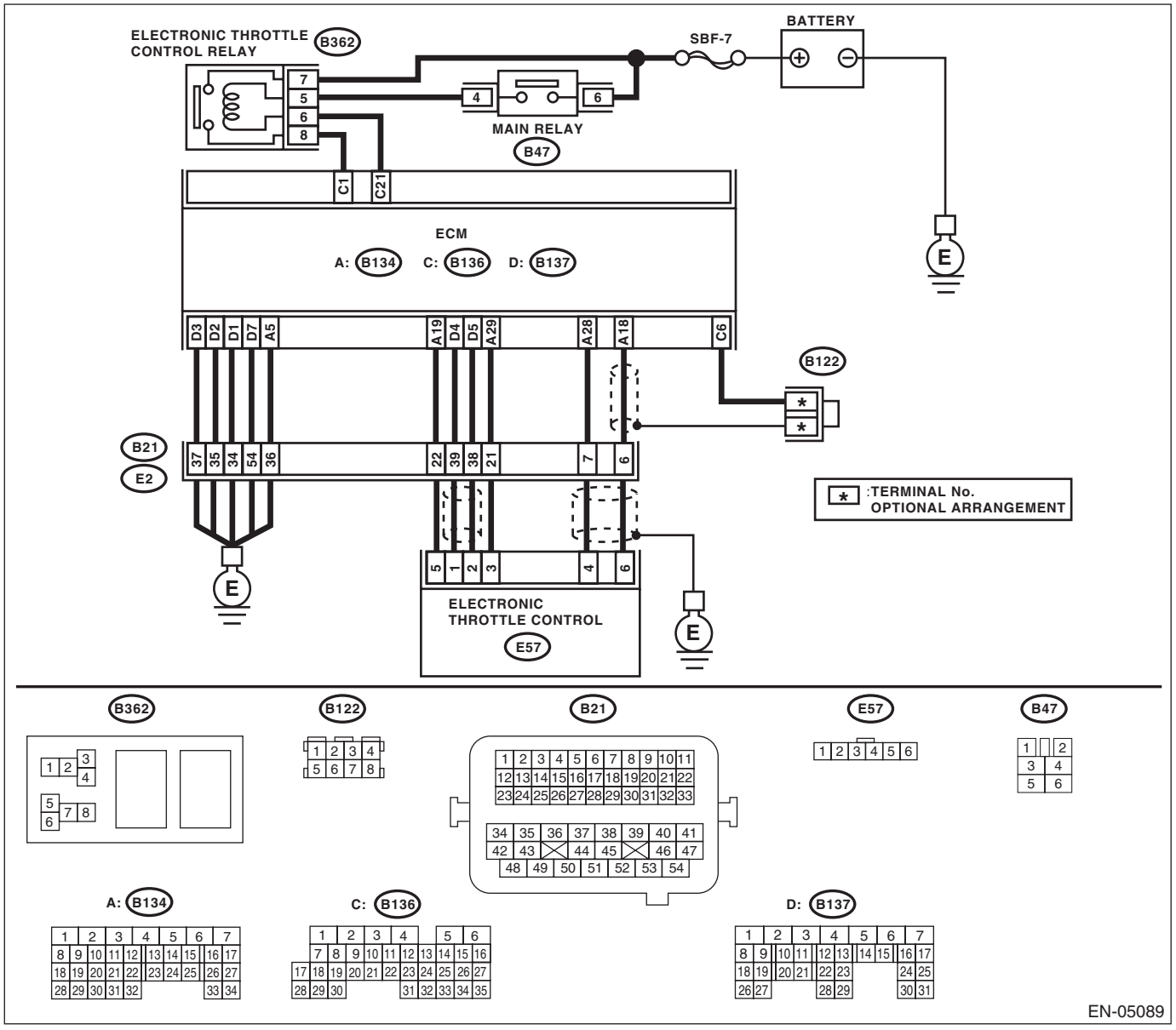
TROUBLE SYMPTOM:

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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.** 1) Start and idle the engine. 2) Check the following items. • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnection of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step **3**.
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. <Ref. to FU(H4DOTC)-12, REMOVAL, Throttle Body.> 3) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101. <Ref. to EN(H4DOTC)(diag)-328, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CD:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-177, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

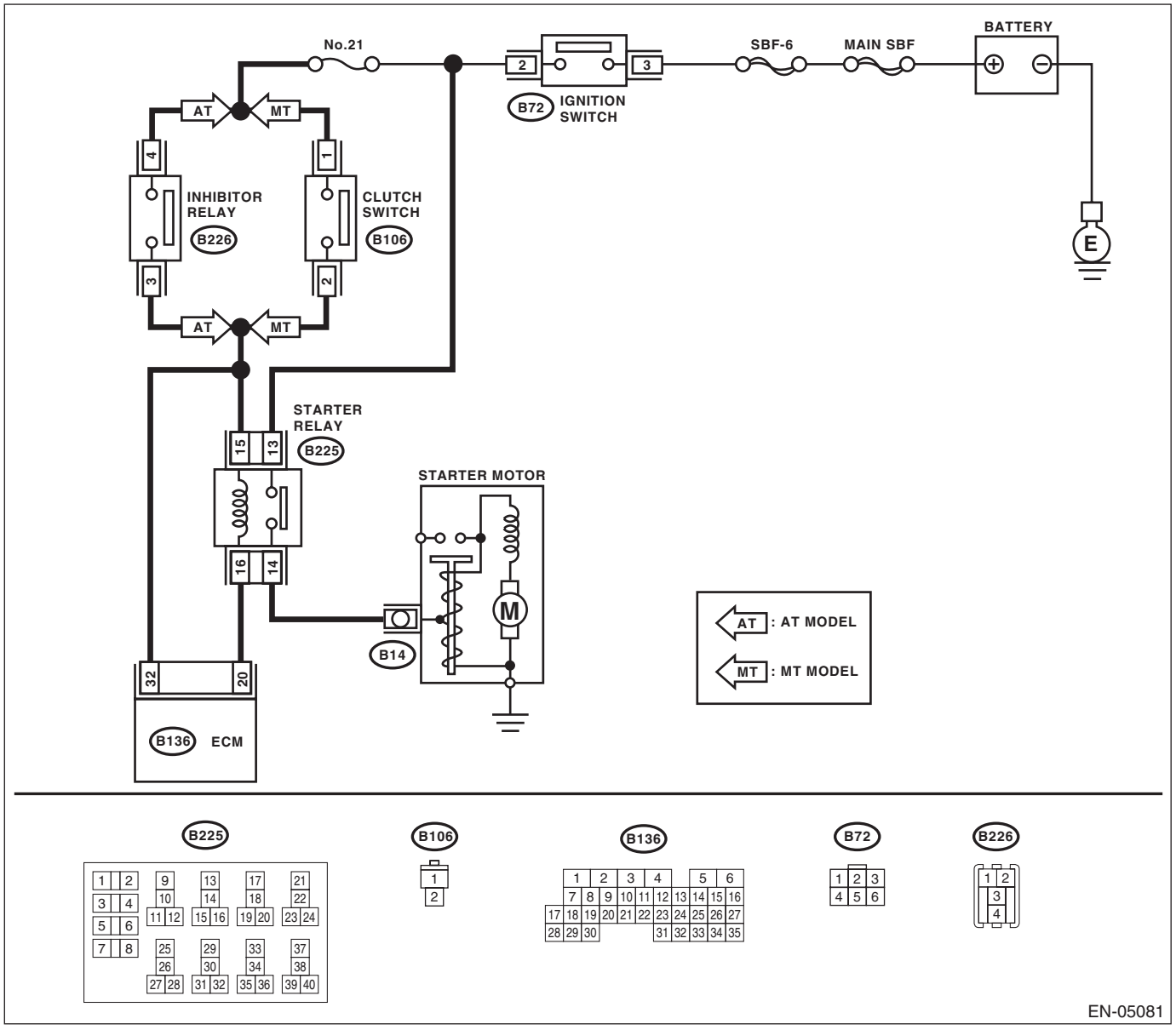
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND IGNITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 32 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and ignition switch.	Repair the poor contact in ECM connector.

CE:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-179, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Engine keeps running at higher speed than specified idle speed.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.** 1) Start and idle the engine. 2) Check the following items. • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnection of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step **3**.
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. <Ref. to FU(H4DOTC)-12, REMOVAL, Throttle Body.> 3) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101. <Ref. to EN(H4DOTC)(diag)-328, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CF:DTC P0600 SERIAL COMMUNICATION LINK

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

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-181, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

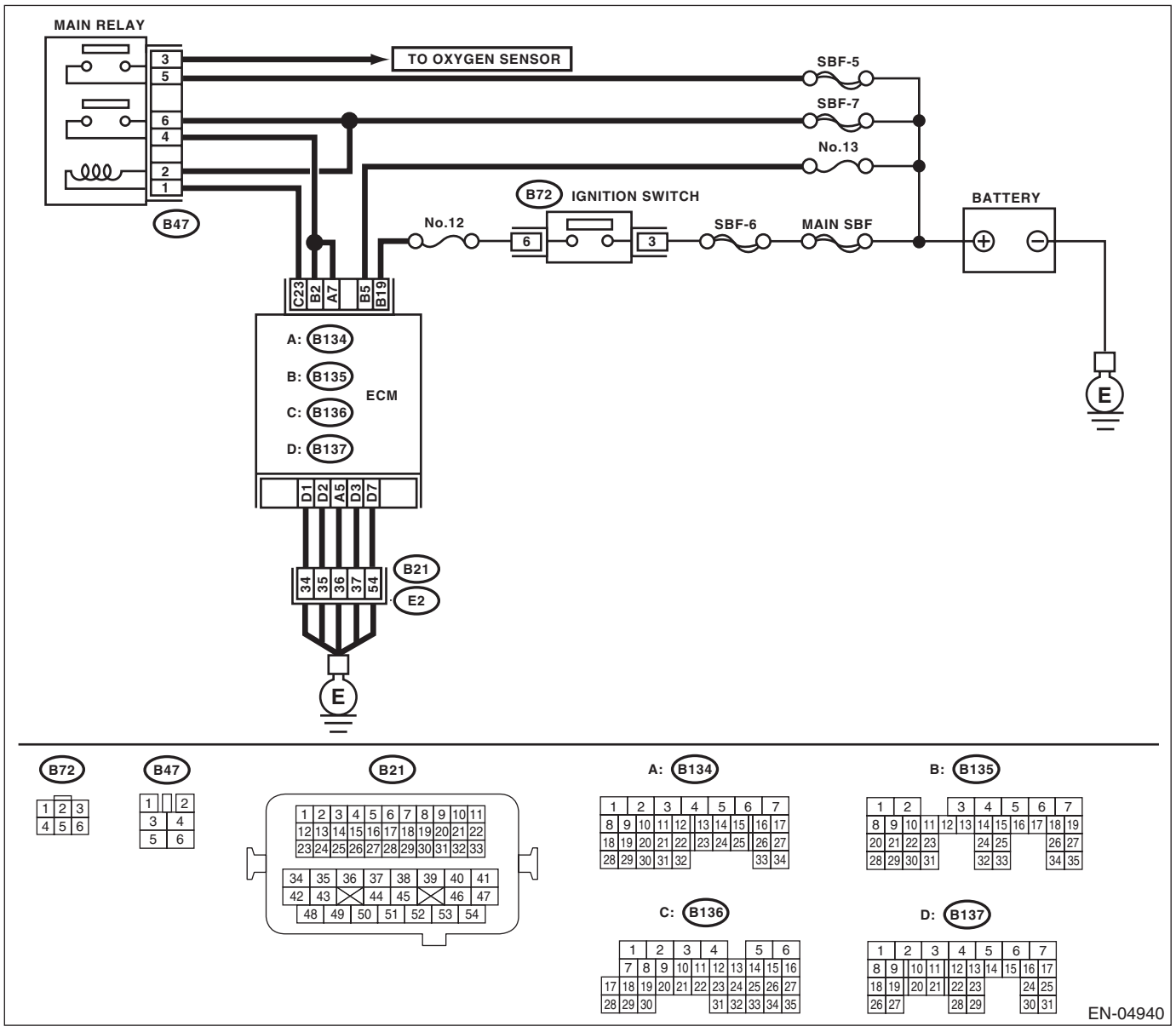
TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.

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

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)(diag)-250, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CI: DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-184, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

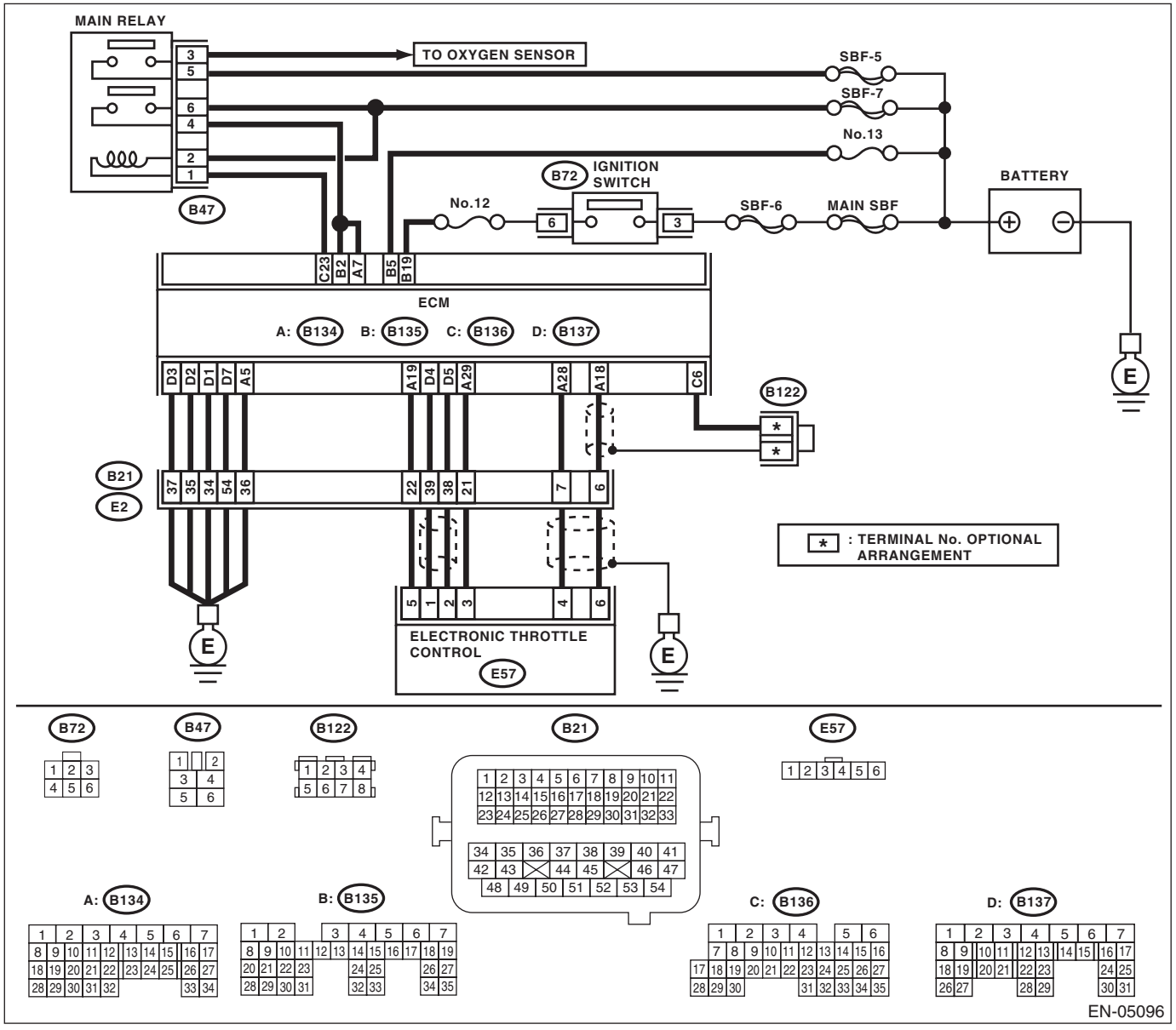
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 (+) — Chassis ground (–):*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **2**.	Repair the open or ground short circuit of power supply circuit.
2	**CHECK INPUT VOLTAGE OF ECM.** 1) Start the engine. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 (+) — Chassis ground (–):*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage 13 — 15 V?	Go to step **3**.	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 19 — (E57) No. 5:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between ECM and electronic throttle control connector.
4	**CHECK ECM GROUND HARNESS.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 (+) — Chassis ground (–):*** ***(B137) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 2 (+) — Chassis ground (–):*** ***(B137) No. 3 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair the poor contact in ECM connector.	Repair the following item. • Further tightening of the engine ground terminal • Poor contact of coupling connector

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

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-328, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CK:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-189, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan system. <Ref. to CO(H4DOTC)-8, Radiator Fan System.>

CL:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-190, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan system. <Ref. to CO(H4DOTC)-8, Radiator Fan System.>

CM:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

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

CN:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

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

CO:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-193, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

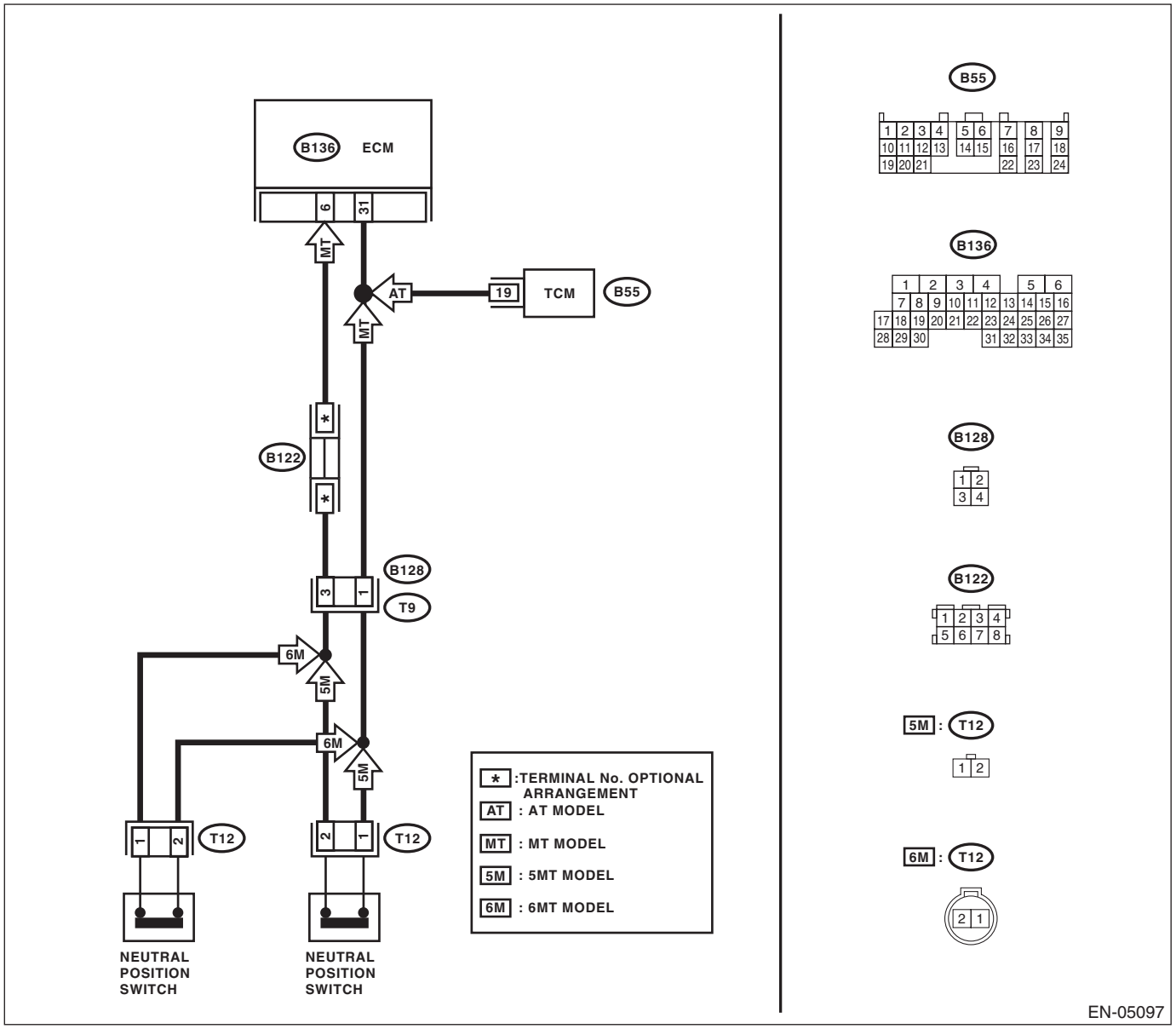
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in a position except for neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact in ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM and transmission harness connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the short circuit of transmission harness, or replace the neutral position switch.	Repair the ground short circuit of harness between ECM and transmission harness connector.

CP:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

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

CQ:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-195, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

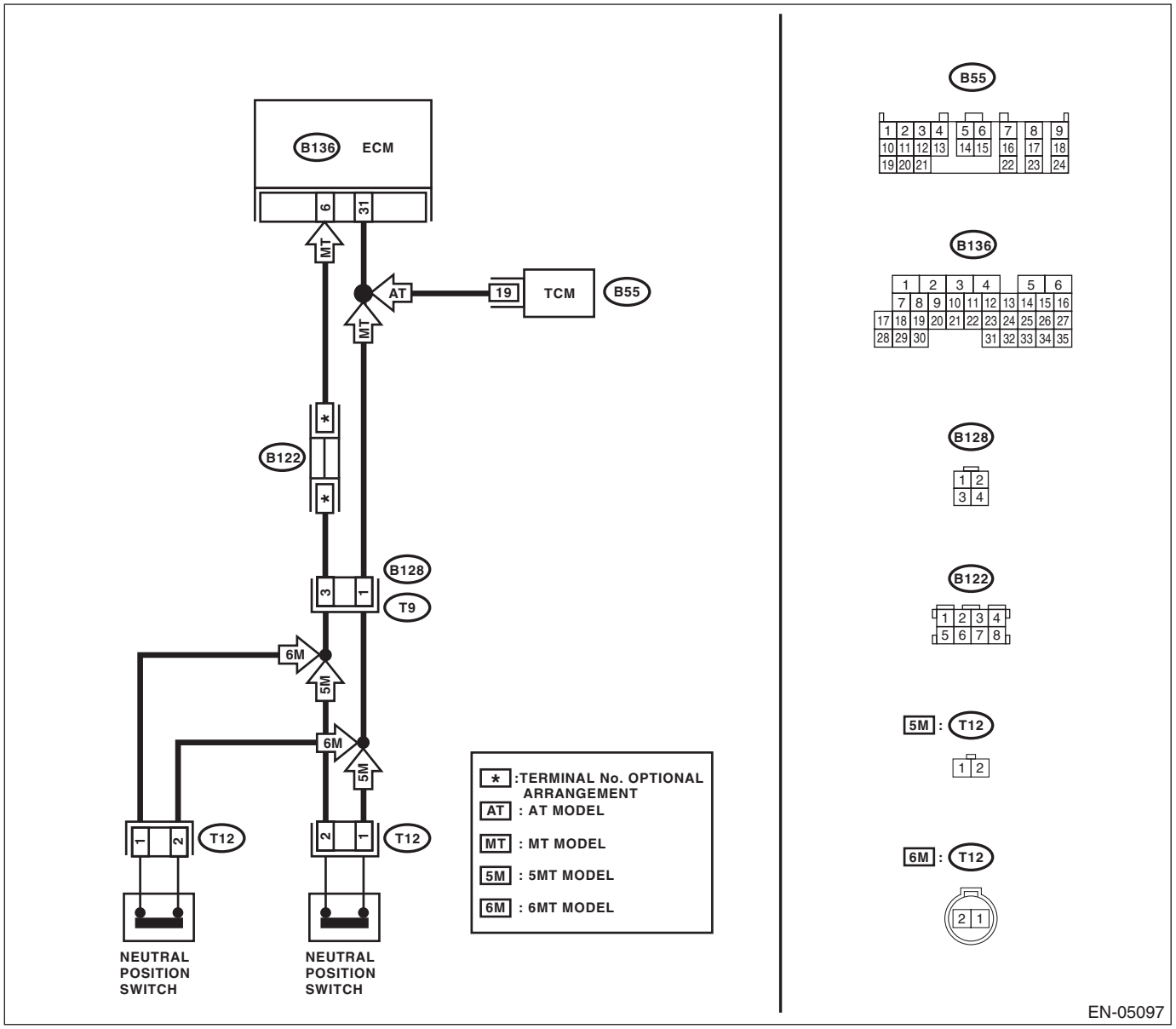
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair the poor contact in ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND NEUTRAL SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM and transmission harness. 3) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***5MT model:*** ***(B136) No. 31 — (T12) No. 1:*** ***6MT model:*** ***(B136) No. 31 — (T12) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness between ECM and transmission harness connector.
3	**CHECK HARNESS BETWEEN ECM AND NEUTRAL SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***5MT model:*** ***(T12) No. 2 — Engine ground:*** ***6MT model:*** ***(T12) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between transmission harness connector and engine ground • Poor contact of coupling connector
4	**CHECK NEUTRAL SWITCH.** 1) Place the shift lever in neutral. 2) Measure the resistance between transmission harness connector terminals. ***Connector & terminal*** ***(T12) No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Repair the poor contact of transmission harness connector.	Repair the open circuit of transmission harness, or replace the neutral switch.

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

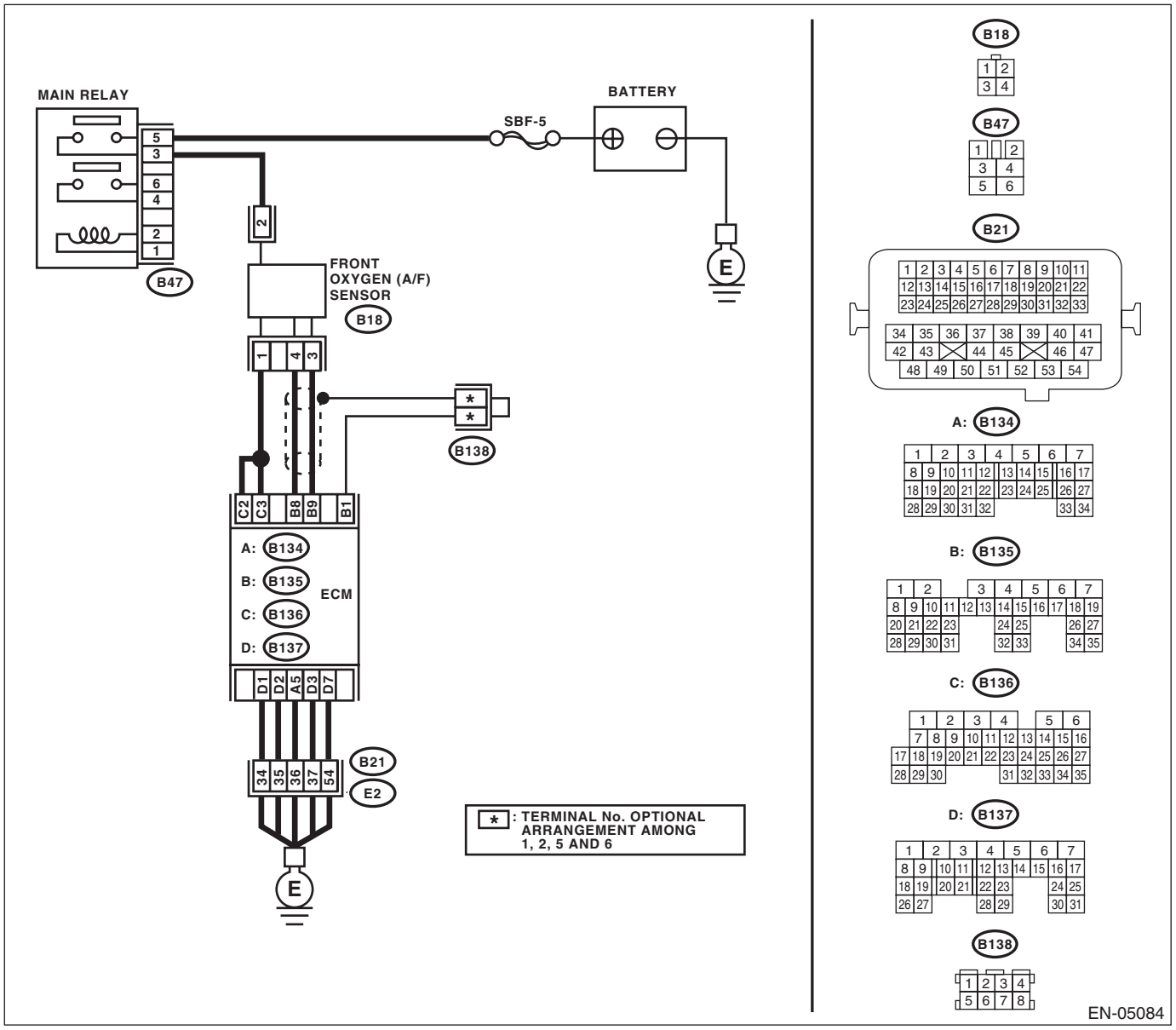
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-196, DTC P1152 O2 SENSOR CIRCUIT RANGE/ PERFORMANCE (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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 9 — (B18) No. 3:*** ***(B135) No. 8 — (B18) No. 4:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3	**CHECK POOR CONTACT.** Check poor contact of front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact of the front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.>

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

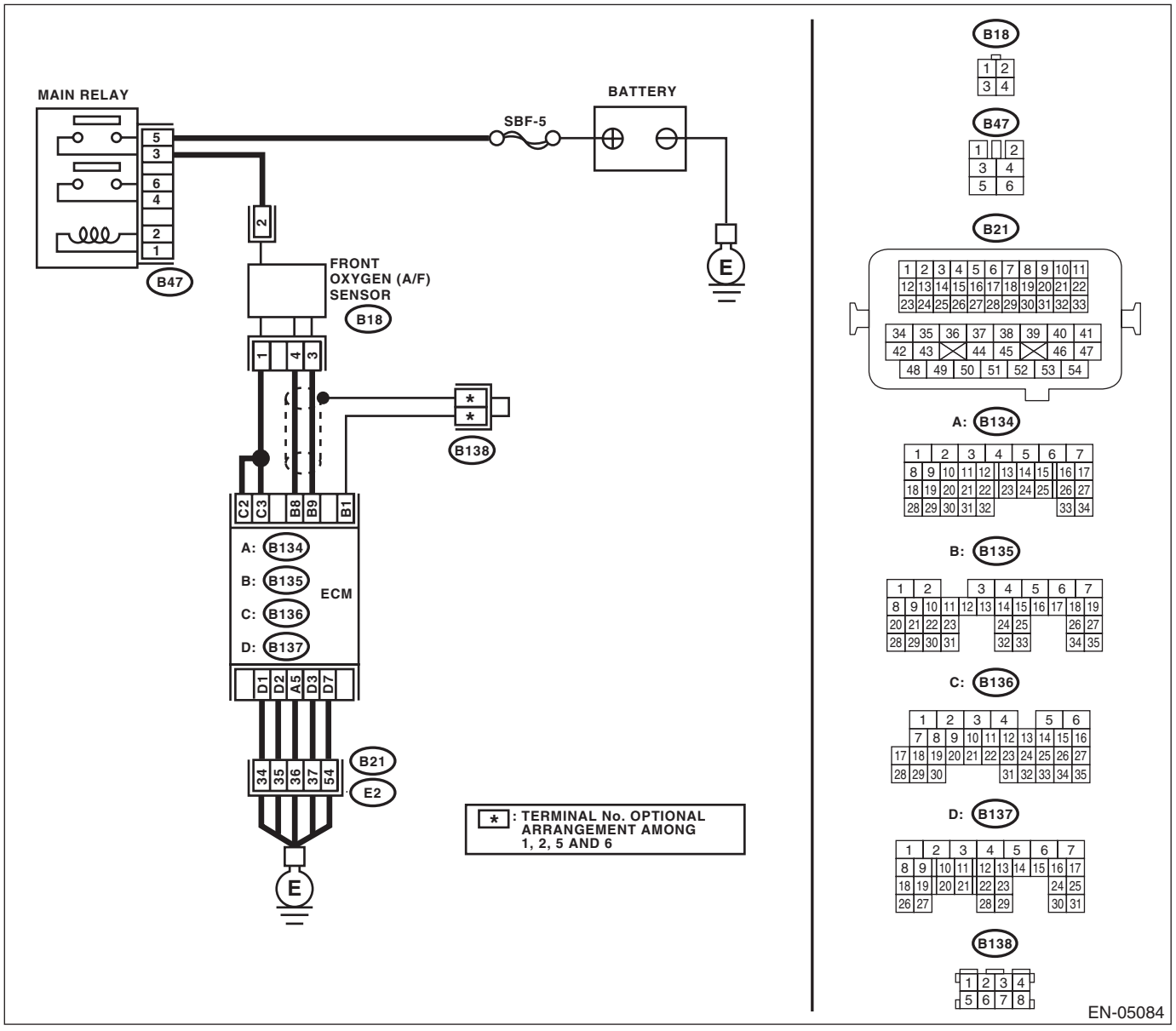
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-198, DTC P1153 O2 SENSOR CIRCUIT RANGE/ PERFORMANCE (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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — Chassis ground:*** ***(B135) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **5**.	Go to step **4**.
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **5**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.>
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between the ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair poor contact of the ECM connector.

CT:DTC P1160 RETURN SPRING FAILURE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-328, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

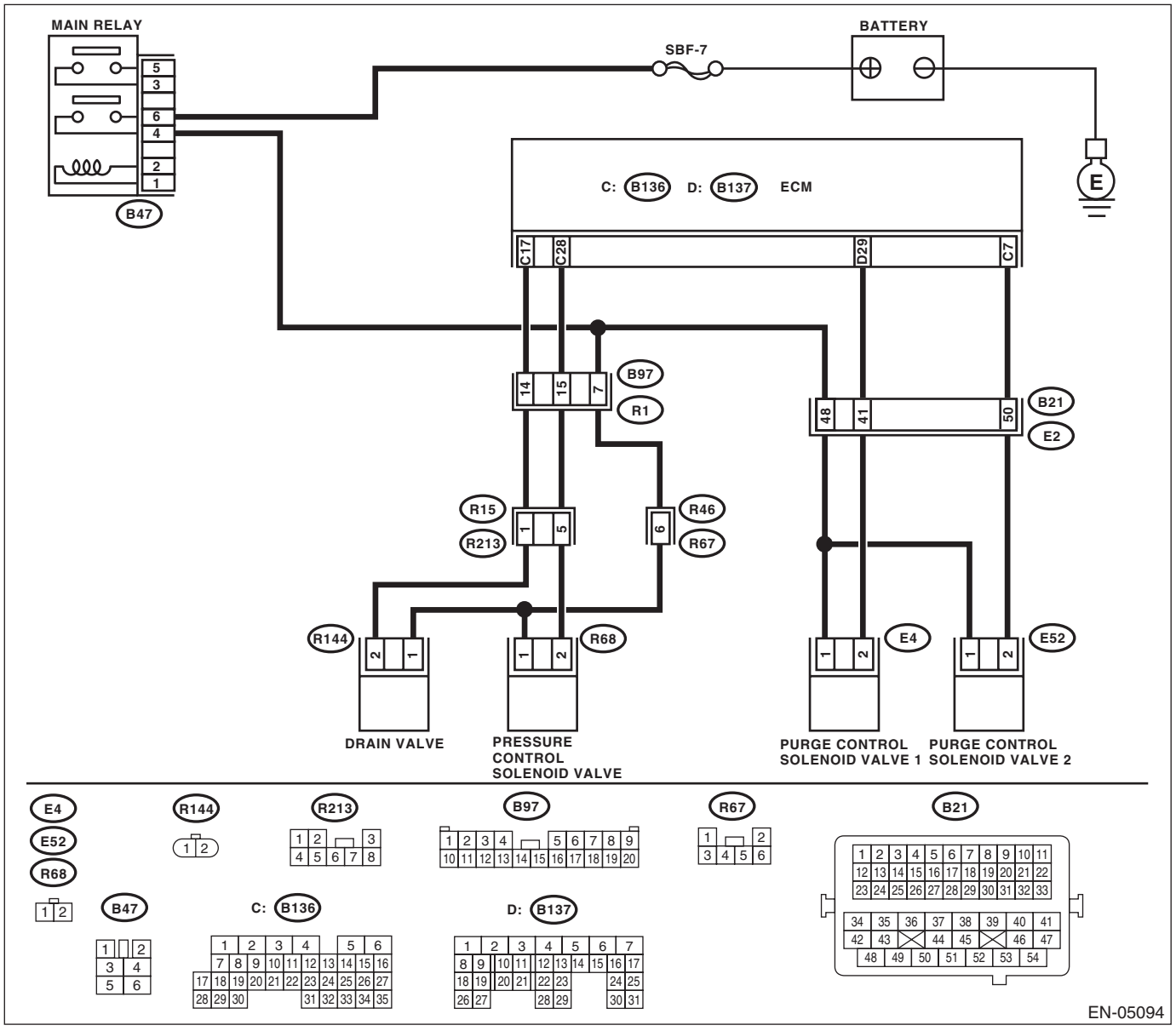
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-202, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact in ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and pressure control solenoid valve. 3) Measure the resistance between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and pressure control solenoid valve connector.
3	**CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and pressure control solenoid valve connector. ***Connector & terminal*** ***(B136) No. 28 — (R68) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact of coupling connector
4	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 — 100 Ω?	Go to step **5**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-15, Pressure Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO THE PRESSURE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of pressure control solenoid valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact of coupling connector • Poor contact of main relay connector

CV:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

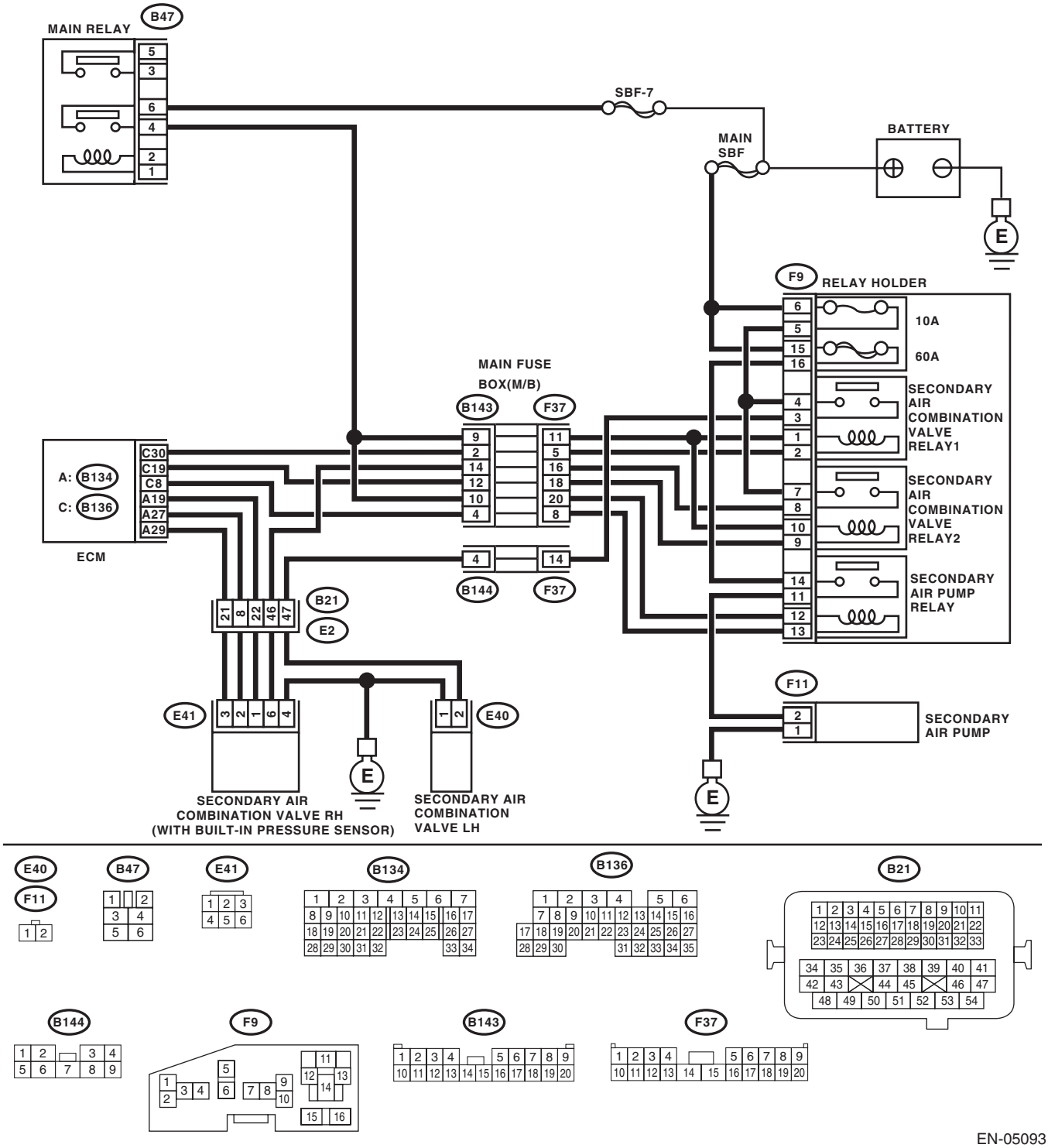
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-204, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK SECONDARY AIR COMBINATION VALVE.** 1) Remove the secondary air combination valve. <Ref. to EC(H4DOTC)-21, Secondary Air Combi Valve.> 2) Blow in air from the secondary air combination valve air inlet, and check whether there are leaks at the pipe connections.	Are there air leaks from the pipe connections?	Replace the secondary air combination valve on the side with the air leak. <Ref. to EC(H4DOTC)-21, Secondary Air Combi Valve.>	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.

CW:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED

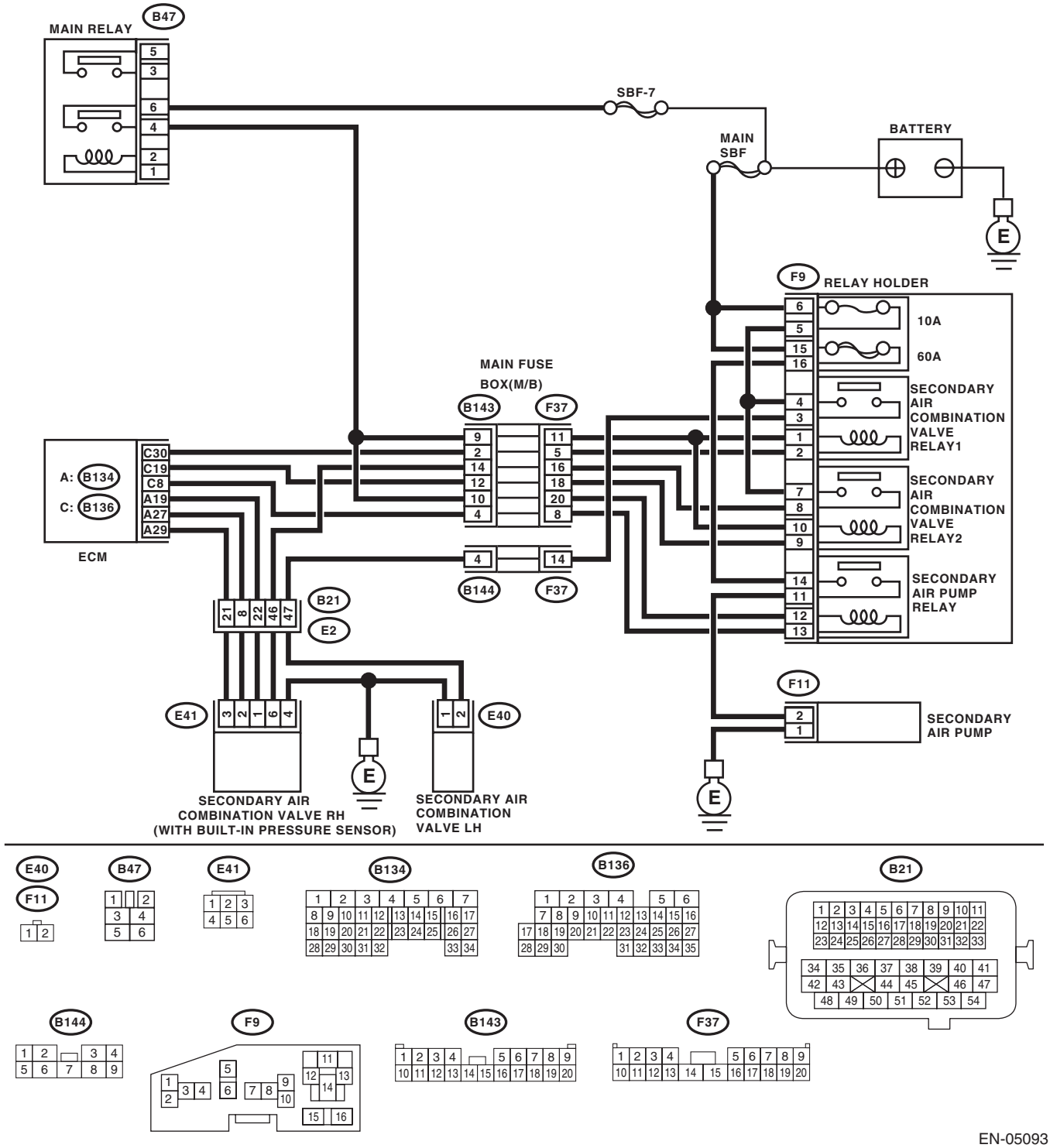
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-206, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air pump relay. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 8 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and secondary air pump relay.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.

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

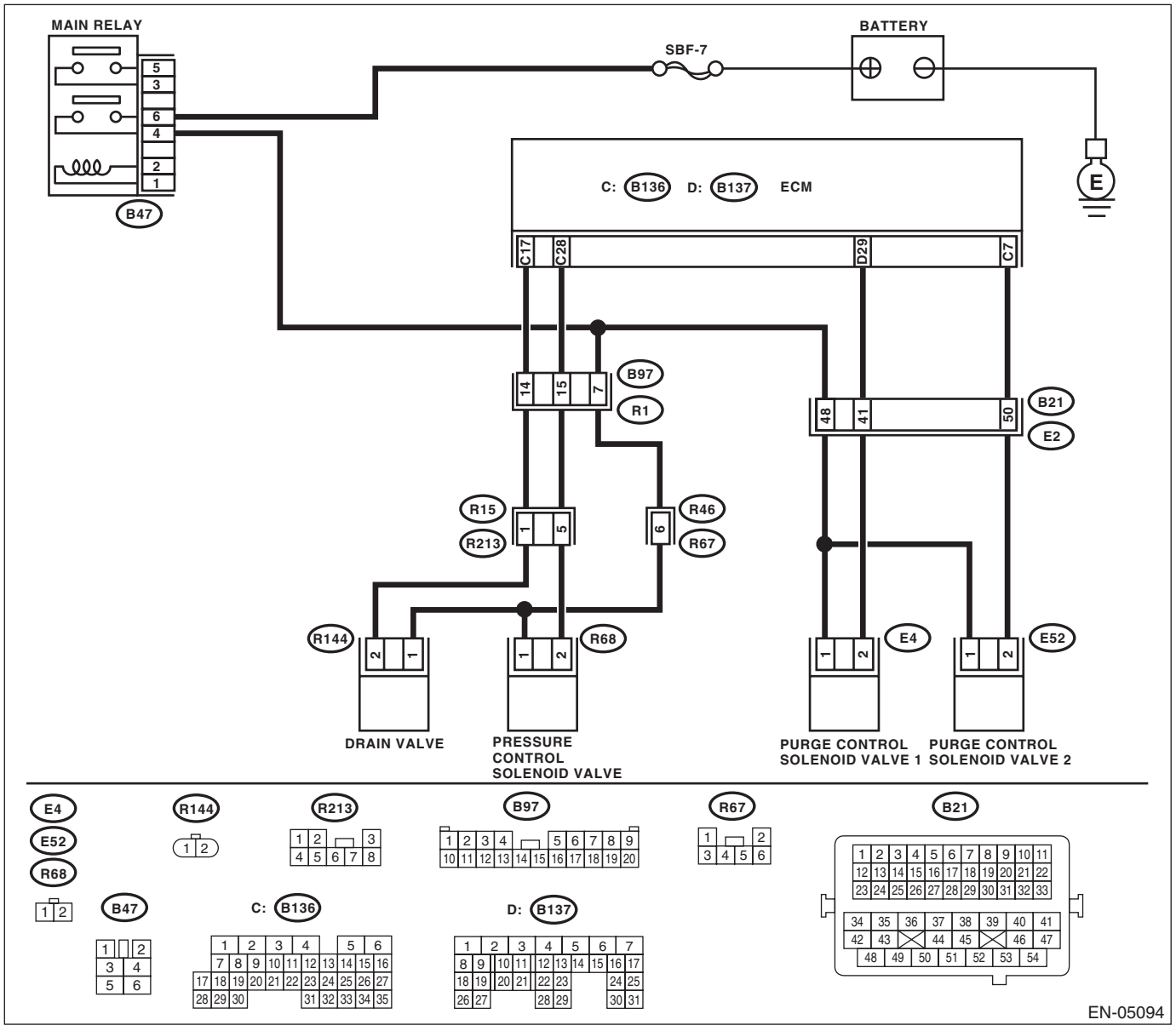
DC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-207, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and pressure control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and pressure control solenoid valve connector.	Go to step **2**.
2	**CHECK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-15, Pressure Control Solenoid Valve.>	Repair the poor contact in ECM connector.

CY:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-209, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

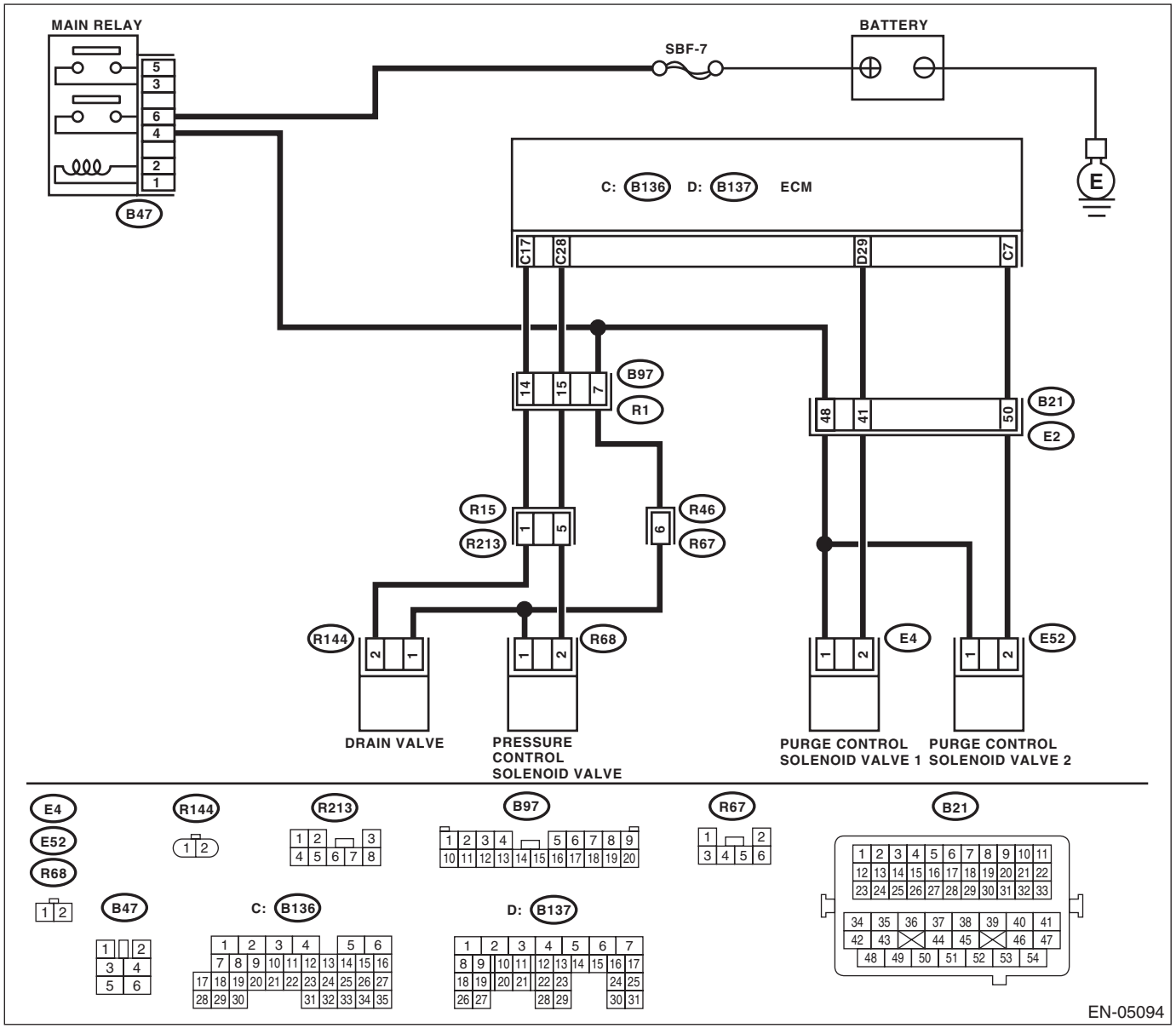
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK DRAIN HOSE.** Check the drain hose for clogging.	Is there clogging in the drain hose?	Replace the drain hose.	Go to step **3**.
3	**CHECK DRAIN VALVE OPERATION.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver’s side). 3) Turn the ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Repair the poor contact in ECM connector.	Replace the drain valve. <Ref. to EC(H4DOTC)-18, Drain Valve.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-211, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

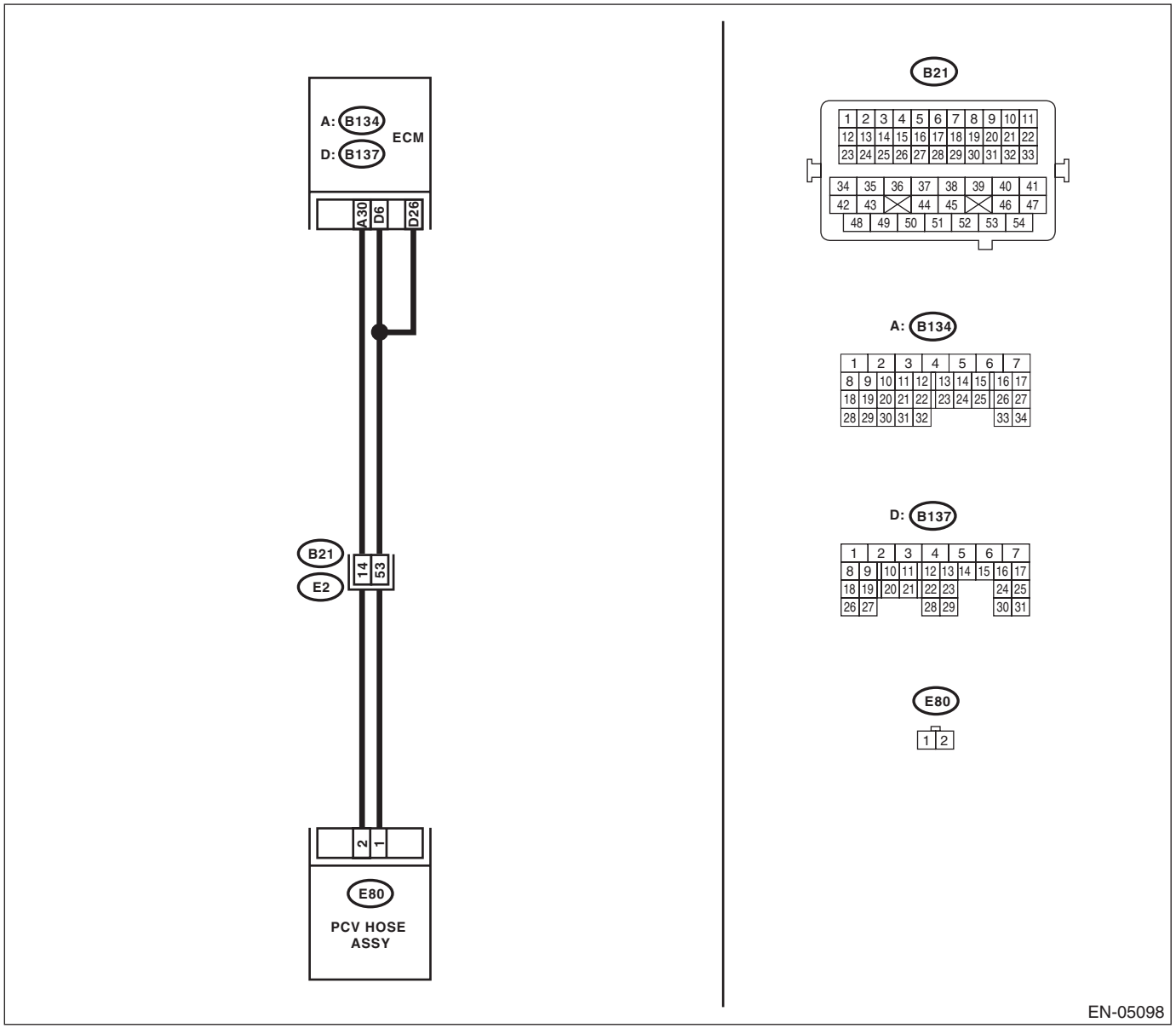
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, 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?	Repair or replace the blow-by hose.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND PCV HOSE ASSEMBLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and PCV hose assembly. 3) Measure the resistance of harness between ECM and PCV hose assembly. ***Connector & terminal*** ***(B134) No. 30 — (E80) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness between ECM and PCV hose assembly.
3	**CHECK HARNESS BETWEEN ECM AND PCV HOSE ASSEMBLY.** Measure the resistance between PCV hose assembly and chassis ground. ***Connector & terminal*** ***(B134) No. 30 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the ground short circuit of harness between ECM and PCV hose assembly.
4	**CHECK GROUND CIRCUIT OF PCV HOSE ASSEMBLY.** Measure the resistance of harness between PCV hose assembly and engine ground. ***Connector & terminal*** ***(E80) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair the open circuit of harness between PCV hose assembly and engine ground.
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 connector.	Replace the PCV hose assembly.

DA:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-213, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

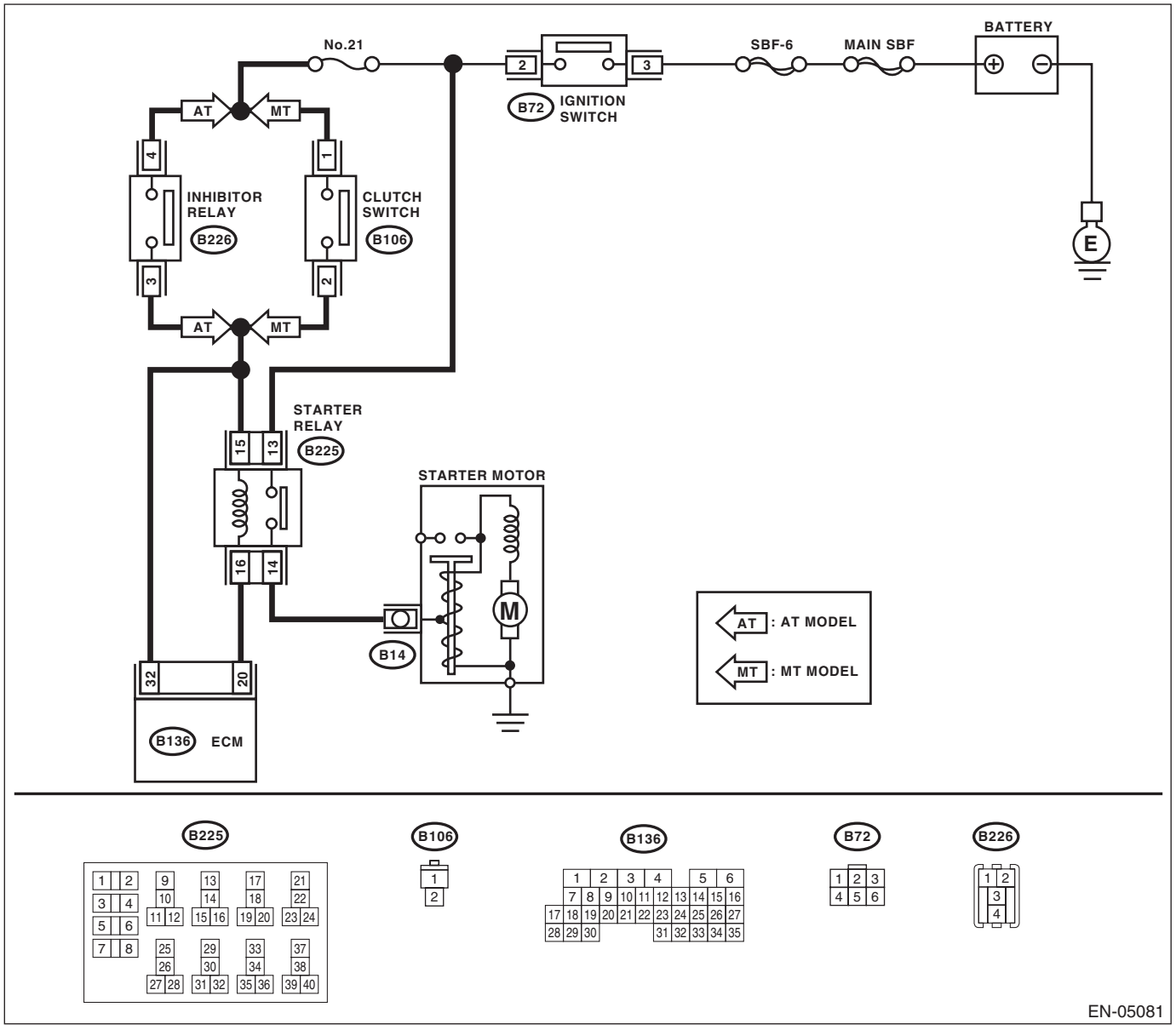
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact in ECM connector.

DB:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

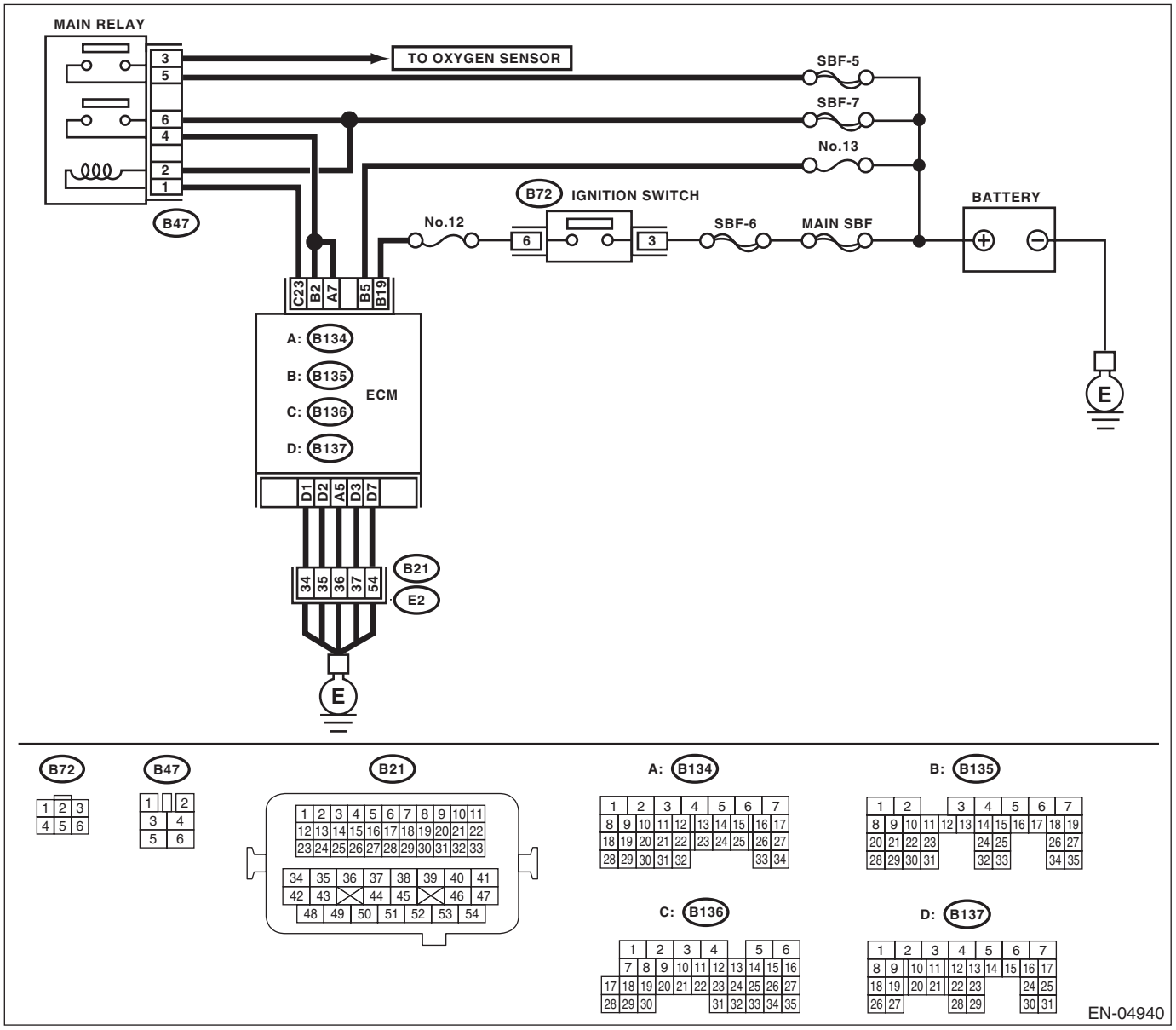
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-214, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair poor contact of the ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 5 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and battery terminal.
3	**CHECK FUSE NO. 13.**	Is the fuse blown out?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and battery • Poor contact in ECM connector • Poor contact of battery terminal

DC:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-216, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

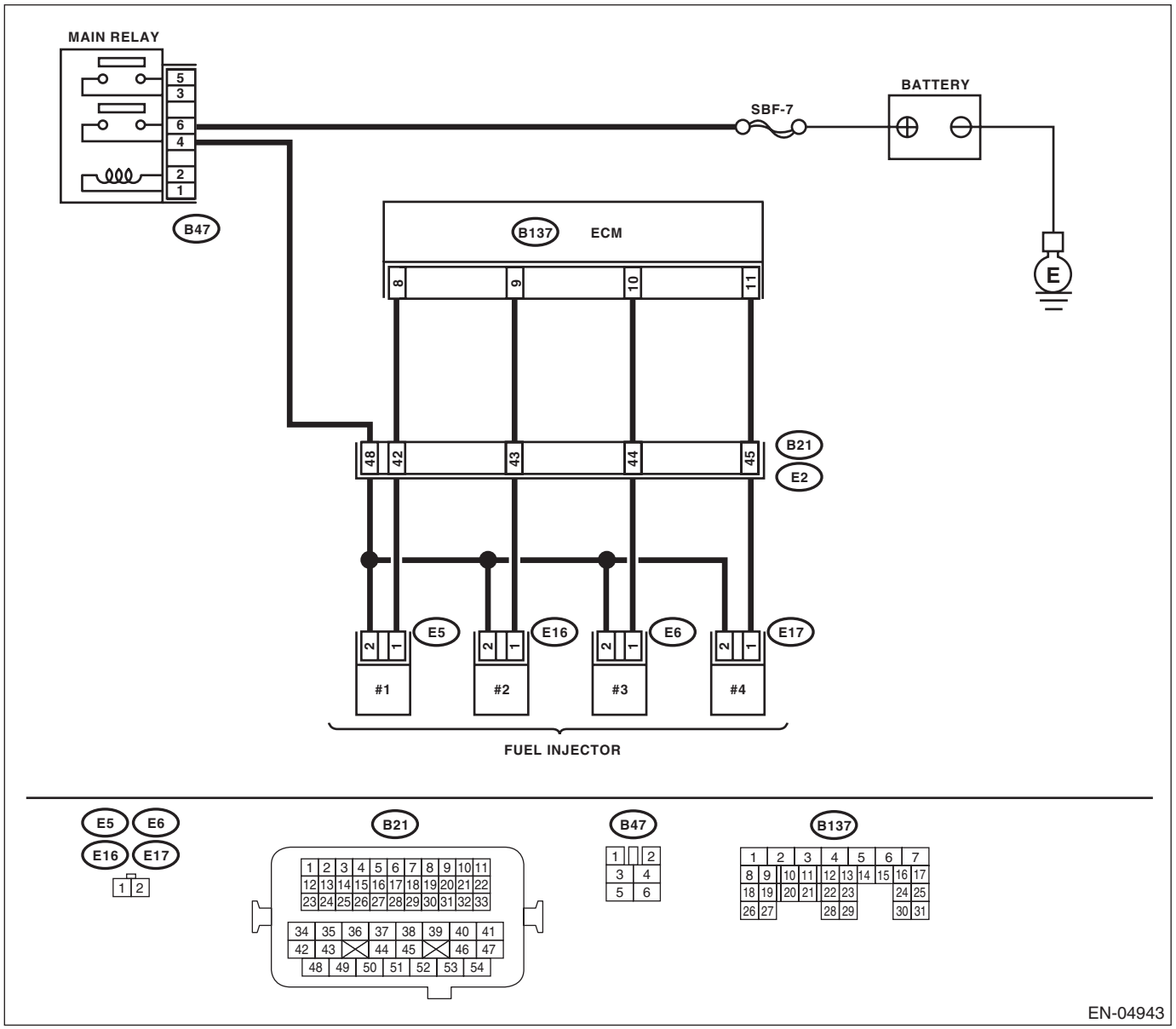
TROUBLE SYMPTOM:

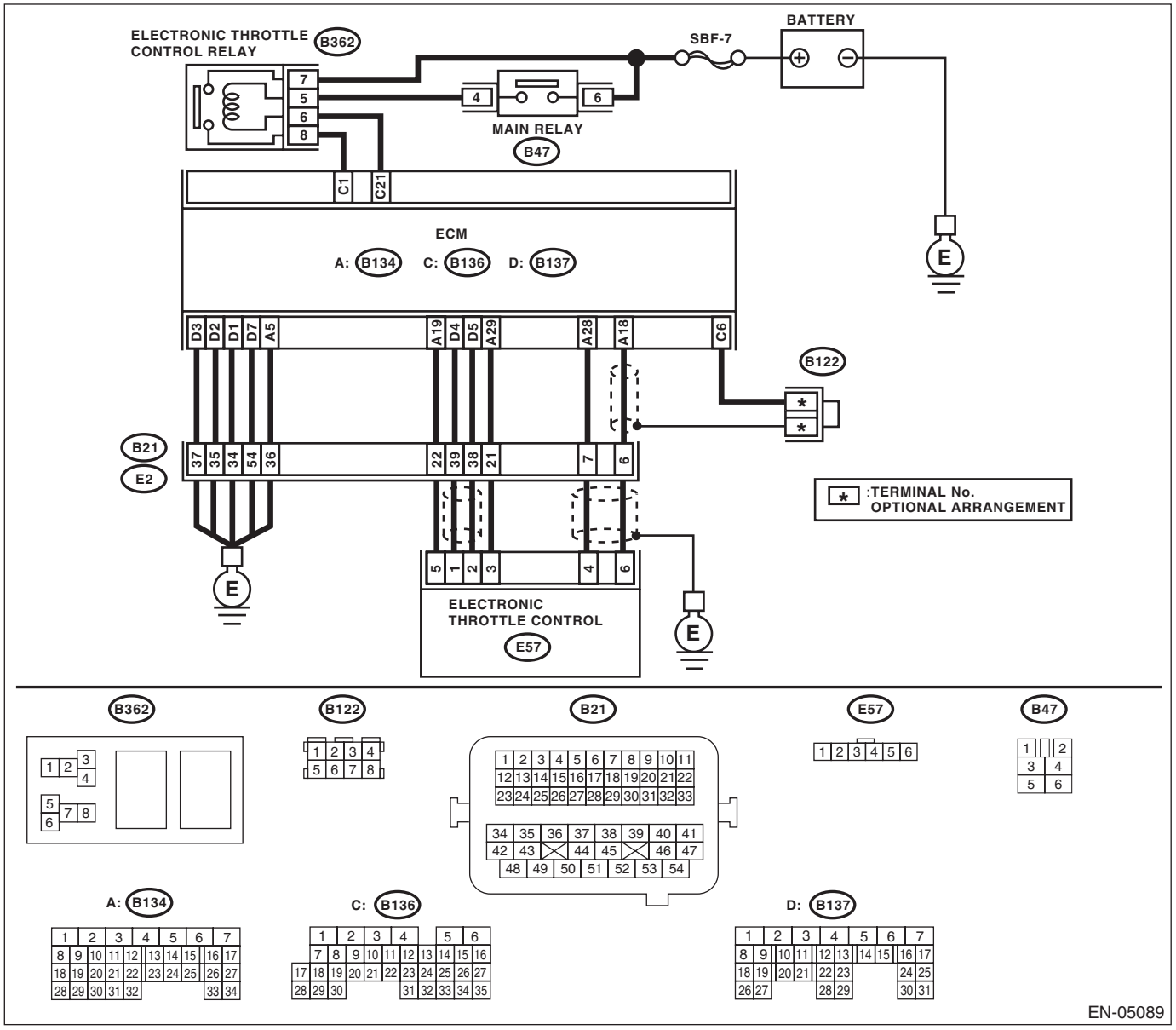
- Engine keeps running at higher speed than specified idle speed.
- Engine keeps running at a lower speed than the specified idle speed.
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ENGINE OIL.**	Is there a proper amount of engine oil?	Go to step **3**.	Replace engine oil. <Ref. to LU(H4SO)-9, REPLACEMENT, Engine Oil.>
3	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **4**.

	Step	Check	Yes	No
4	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **5**.
5	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 kg/cm^2, 41 — 46 psi)?	Go to step **6**.	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
6	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 kg/cm^2, 33 — 38 psi)?	Go to step **7**.	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
7	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 70°C (158°F) or higher ?	Go to step **8**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
8	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is higher than 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **9**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
9	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is higher than 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **10**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
10	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the ECM and chassis ground for faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 8 (+) — Chassis ground (–):*** ***#2 (B137) No. 9 (+) — Chassis ground (–):*** ***#3 (B137) No. 10 (+) — Chassis ground (–):*** ***#4 (B137) No. 11 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **15**.	Go to step **11**.

	Step	Check	Yes	No
11	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between the fuel injector connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **12**.	Repair the ground short circuit of harness between ECM and fuel injector.
12	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** Measure the resistance of harness between the ECM and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 8 — (E5) No. 1:*** ***#2 (B137) No. 9 — (E16) No. 1:*** ***#3 (B137) No. 10 — (E6) No. 1:*** ***#4 (B137) No. 11 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **13**.	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
13	**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 **14**.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>
14	**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 10 V or more?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the 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

	Step	Check	Yes	No
15	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between the ECM and chassis ground for faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 8 (+) — Chassis ground (–):*** ***#2 (B137) No. 9 (+) — Chassis ground (–):*** ***#3 (B137) No. 10 (+) — Chassis ground (–):*** ***#4 (B137) No. 11 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between the ECM and fuel injector.	Go to step **16**.
16	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>	Go to step **17**.
17	**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 **18**.
18	**CHECK CRANK SPROCKET.** Remove the timing belt cover.	Is the crank sprocket rusted or does it have damaged teeth?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-52, Crank Sprocket.>	Go to step **19**.
19	**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)-43, Timing Belt.>	Go to step **20**.
20	**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 **21**.	Replace the electronic throttle control relay. <Ref. to FU(H4DOTC)-47, Electronic Throttle Control Relay.>
21	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(E362) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **22**.	Repair the open or ground short circuit of power supply circuit.
22	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Disconnect the connectors from the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay.	Go to step **23**.

	Step	Check	Yes	No
23	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 — Chassis ground:*** ***(B362) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **24**.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
24	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between the ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B136) No. 21 — (B362) No. 6:*** ***(B136) No. 8 — (B362) No. 1:***	Is the resistance less than 1 Ω?	Go to step **25**.	Repair the open circuit of harness between ECM and electronic throttle control relay.
25	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 6:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **26**.	Repair the ground short circuit of harness between ECM and electronic throttle control connector.
26	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(B57) No. 6 — Engine ground:*** ***(B57) No. 4 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **27**.	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>
27	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 18 — (E57) No. 6:*** ***(B134) No. 28 — (E57) No. 4:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **28**.	Repair the open circuit of harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
28	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **29**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
29	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 4.85 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.	Go to step **30**.
30	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Go to step **31**.	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.
31	**CHECK SENSOR OUTPUT.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **32**.	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-12, Throttle Body.>
32	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **33**.	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-12, Throttle Body.>

	Step	Check	Yes	No
33	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B137) No. 5 — (E57) No. 2:*** ***(B137) No. 4 — (E57) No. 1:***	Is the resistance less than 1 Ω?	Go to step **34**.	Repair the open circuit of harness between ECM and electronic throttle control.
34	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 (+) — Engine ground (–):*** ***(E57) No. 1 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and electronic throttle control.	Go to step **35**.
35	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 — Engine ground:*** ***(E57) No. 1 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **36**.	Repair the ground short circuit of harness between the ECM and electronic throttle control.
36	**CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS CONTROL.** Measure the resistance between the electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance 1 MΩ or more?	Go to step **37**.	Repair the short circuit of harness between ECM and electronic throttle control.
37	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **38**.	Repair the open circuit of the harness between the ECM and engine ground.
38	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 50 Ω or less?	Go to step **39**.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-12, Throttle Body.>
39	**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 in ECM connector.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-12, Throttle Body.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-218, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, 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.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-35, Tumble Generator Valve Assembly.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-219, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, 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.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-35, Tumble Generator Valve Assembly.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-220, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, 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.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-35, Tumble Generator Valve Assembly.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-221, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, 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.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-35, Tumble Generator Valve Assembly.>

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

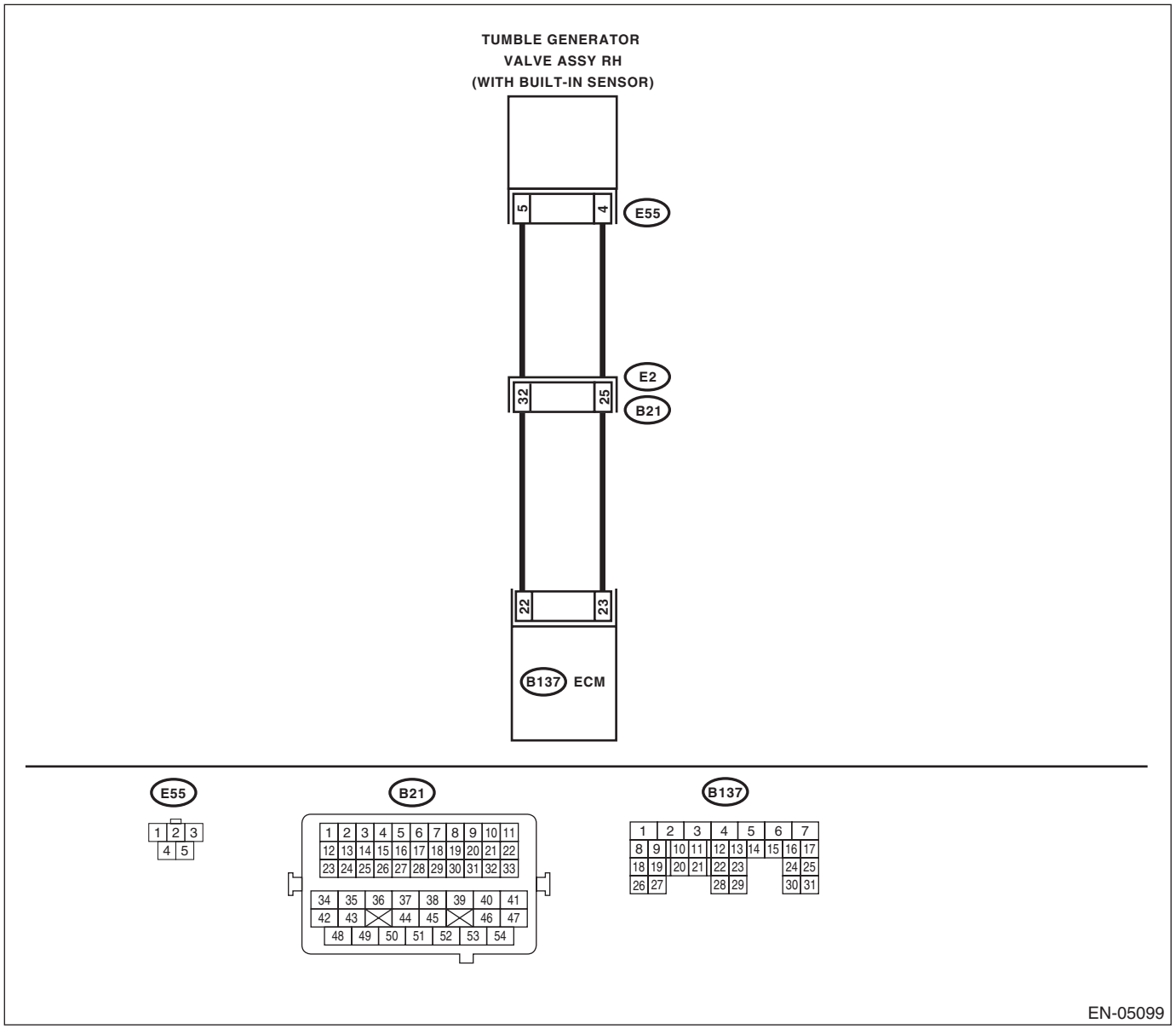
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-222, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



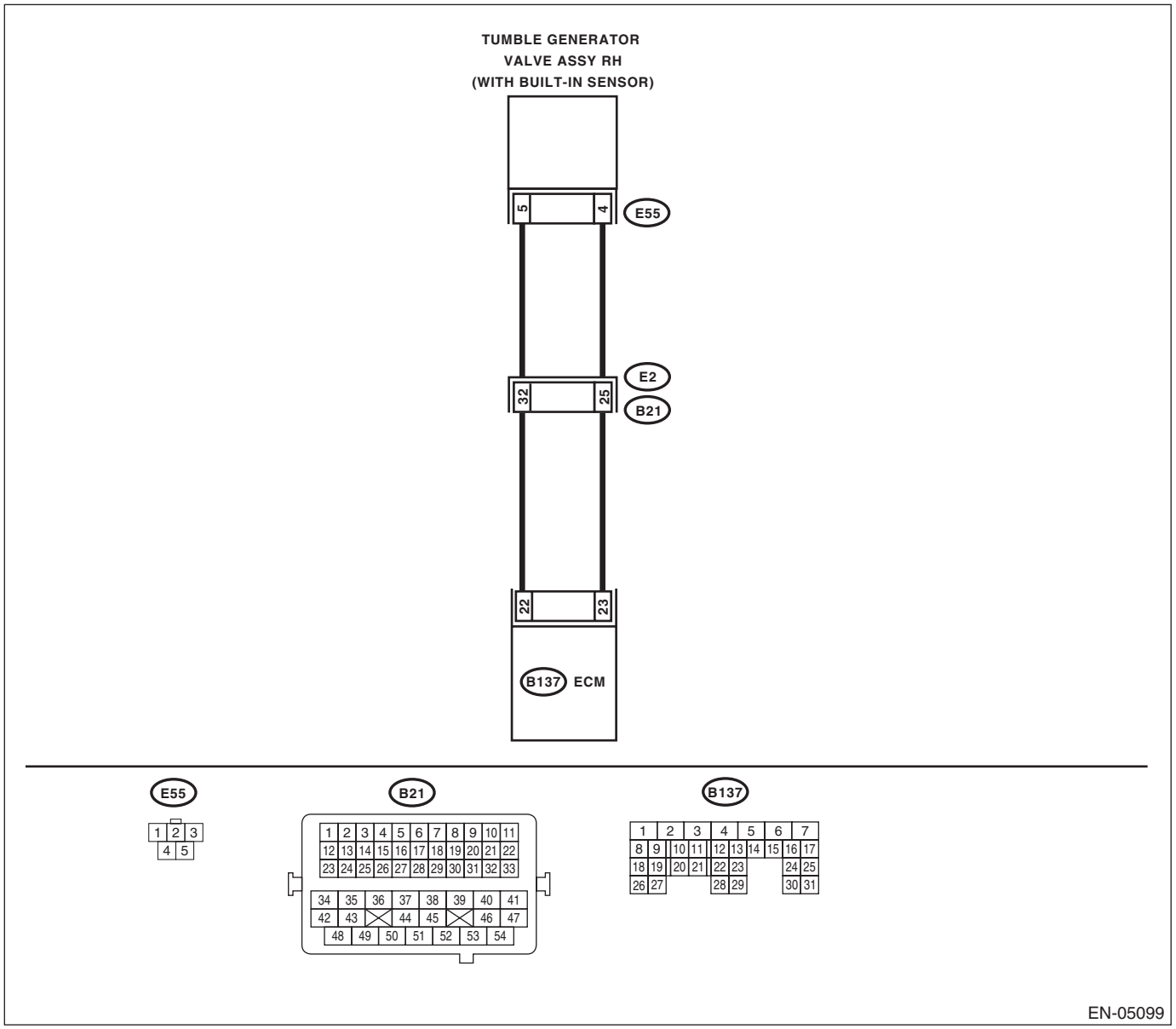
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and tumble generator valve assembly. 3) Measure the resistance of harness between ECM and tumble generator valve assembly. ***Connector & terminal*** ***(B137) No. 22 — (E55) No. 5:*** ***(B137) No. 23 — (E55) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve assembly connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 — Chassis ground:*** ***(B137) No. 23 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and tumble generator valve assembly connector.
3	**CHECK POOR CONTACT.** Check for poor contact of tumble generator valve assembly connector.	Is there poor contact in the tumble generator valve assembly connector?	Repair the poor contact of tumble generator valve assembly connector.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Actuator.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-224, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the tumble generator valve assembly. 3) Measure the voltage between tumble generator valve assembly and chasis ground. ***Connector & terminal*** ***(E55) No. 5 (+) — Chassis ground (–):*** ***(E55) No. 4 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and tumble generator valve assembly.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Actuator.>

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

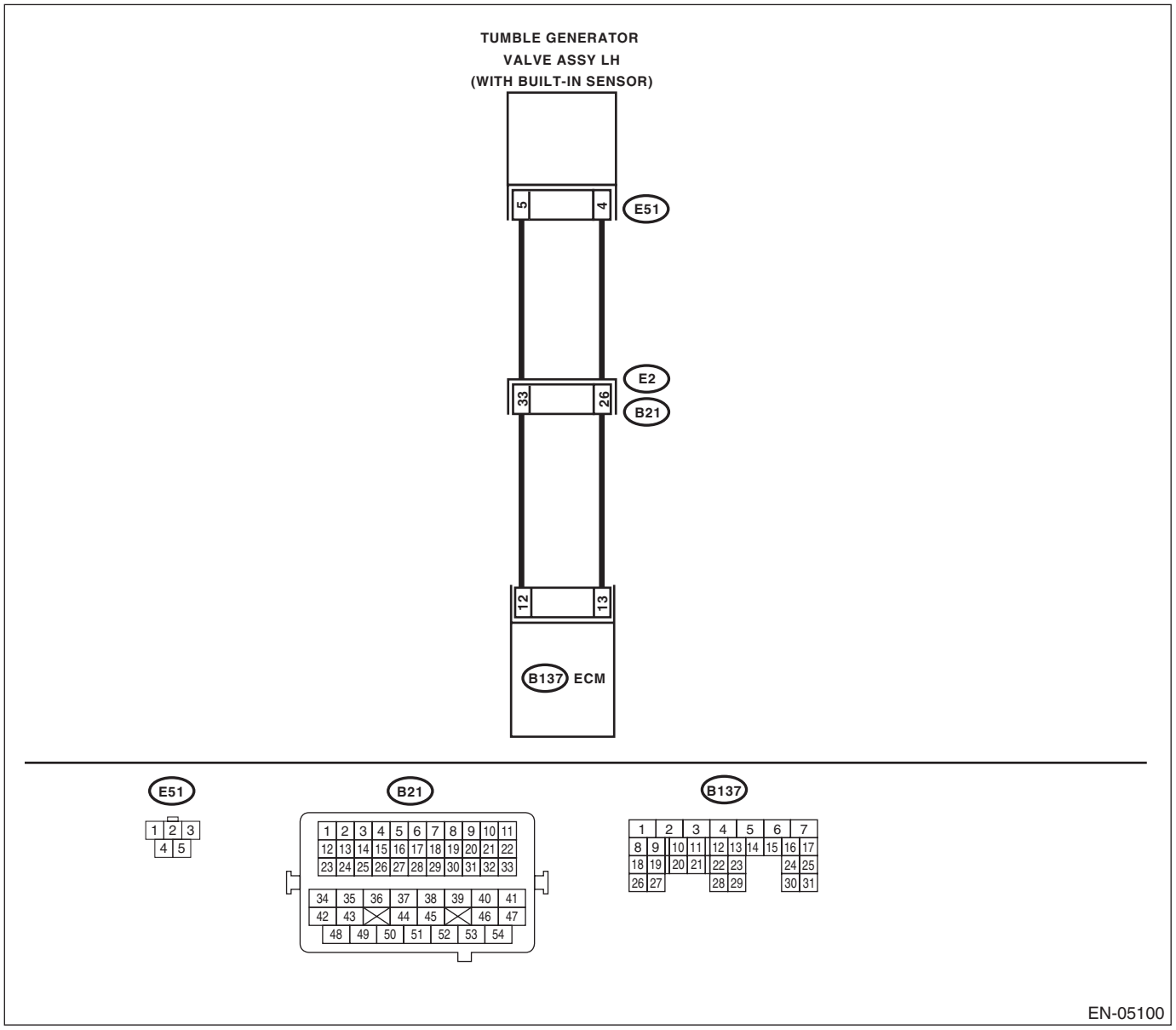
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-226, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and tumble generator valve assembly. 3) Measure the resistance of harness between ECM and tumble generator valve assembly. ***Connector & terminal*** ***(B137) No. 12 — (E51) No. 5:*** ***(B137) No. 13 — (E51) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve assembly connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 12 — Chassis ground:*** ***(B137) No. 13 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and tumble generator valve assembly connector.
3	**CHECK POOR CONTACT.** Check for poor contact of tumble generator valve assembly connector.	Is there poor contact in the tumble generator valve assembly connector?	Repair the poor contact of tumble generator valve assembly connector.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Actuator.>

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

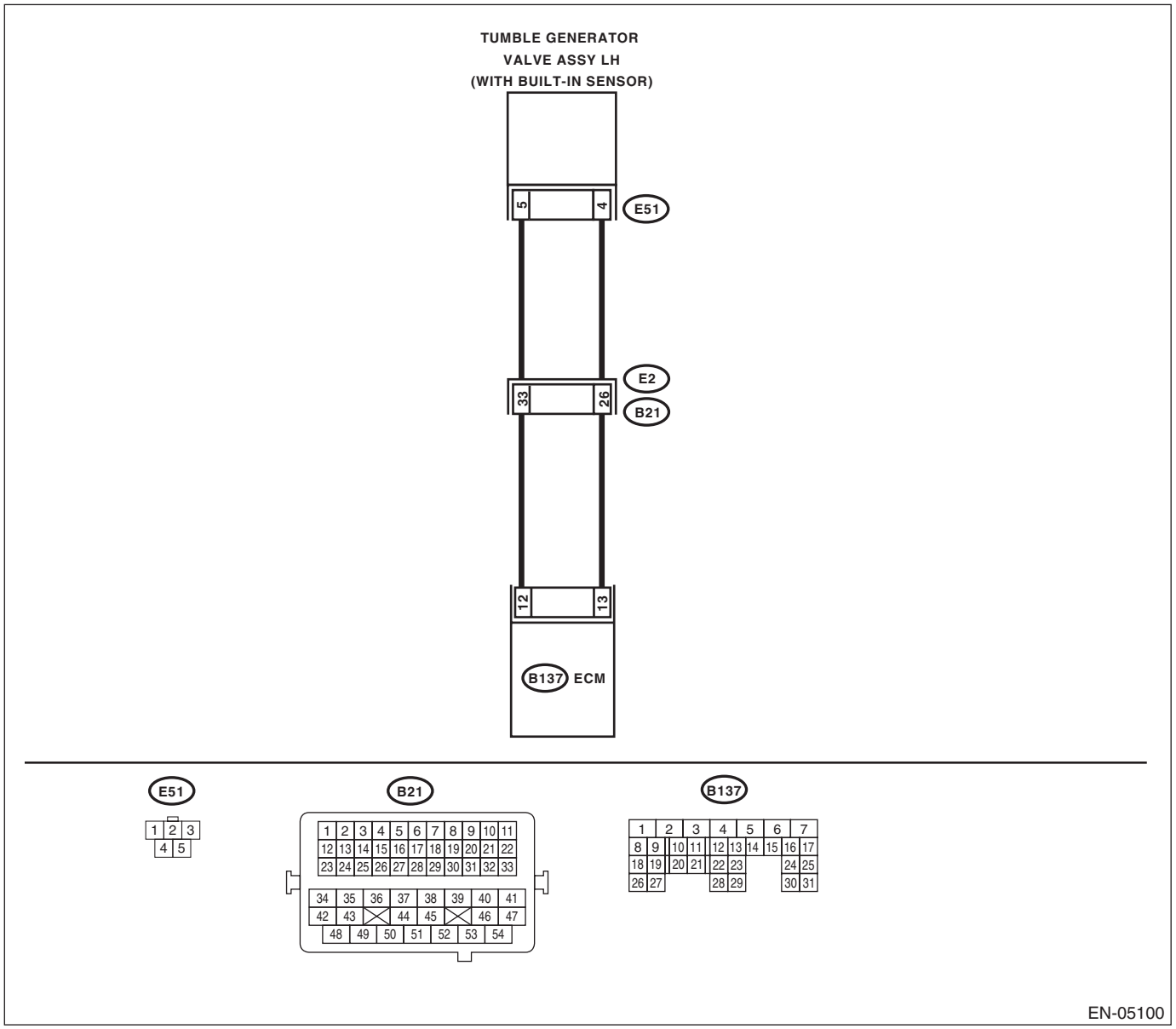
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-228, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the tumble generator valve assembly. 3) Measure the voltage between tumble generator valve assembly and chassis ground. ***Connector & terminal*** ***(E51) No. 5 (+) — Chassis ground (–):*** ***(E51) No. 4 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and tumble generator valve assembly.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Actuator.>

DL: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)-230, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

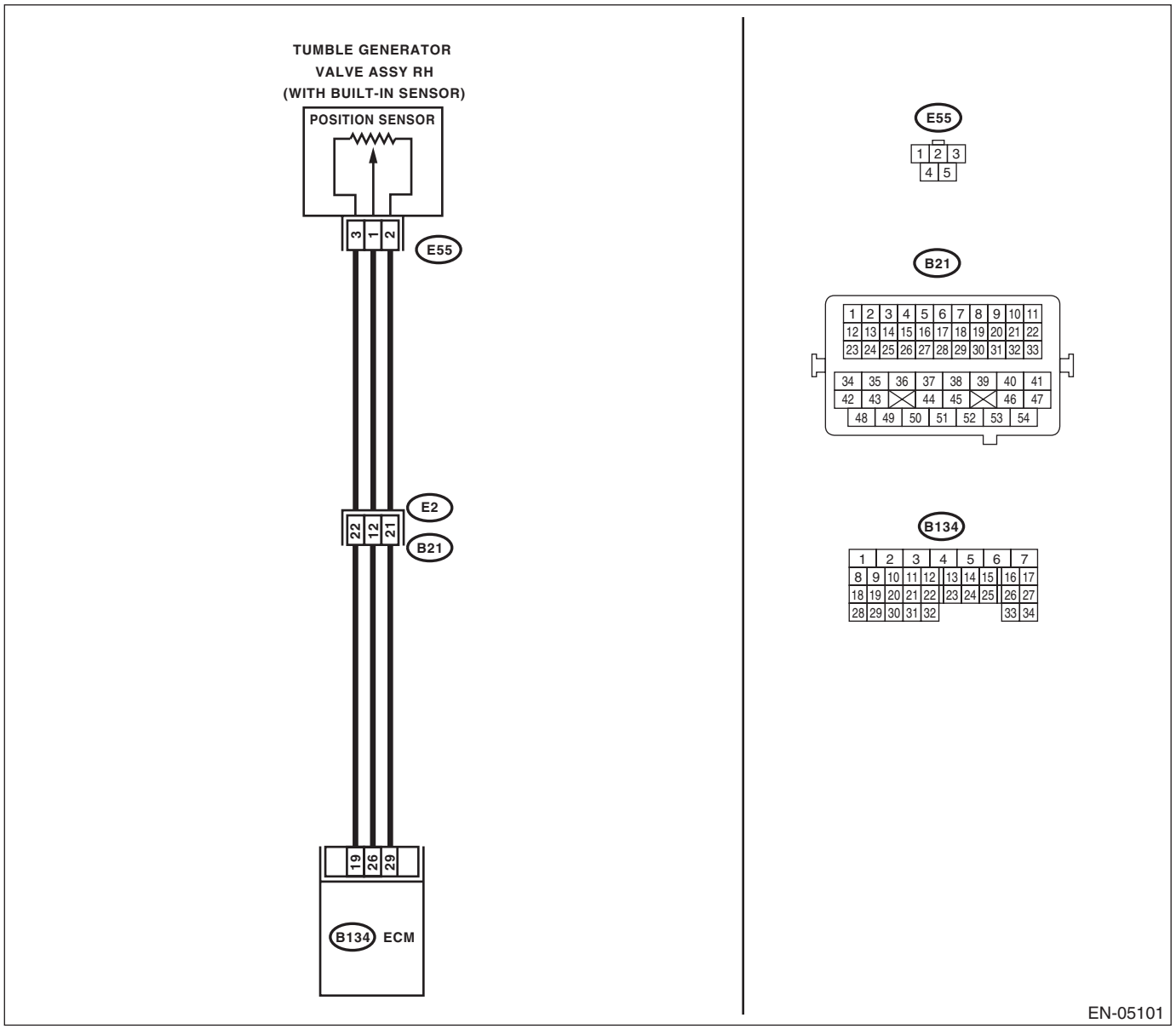
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK POWER SUPPLY OF TUMBLE GENERATOR VALVE POSITION SENSOR.** 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 tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E55) No. 3 (+) — Engine ground (–):***	Is the voltage 4.5 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of harness between ECM and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (E55) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve position sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and tumble generator valve position sensor connector.
5	**CHECK POOR CONTACT.** Check for poor contact in ECM and tumble generator valve position sensor connector.	Is there poor contact in ECM and tumble generator valve position sensor connector?	Repair the poor contact in ECM or tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Position Sensor.>

DM: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)-232, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

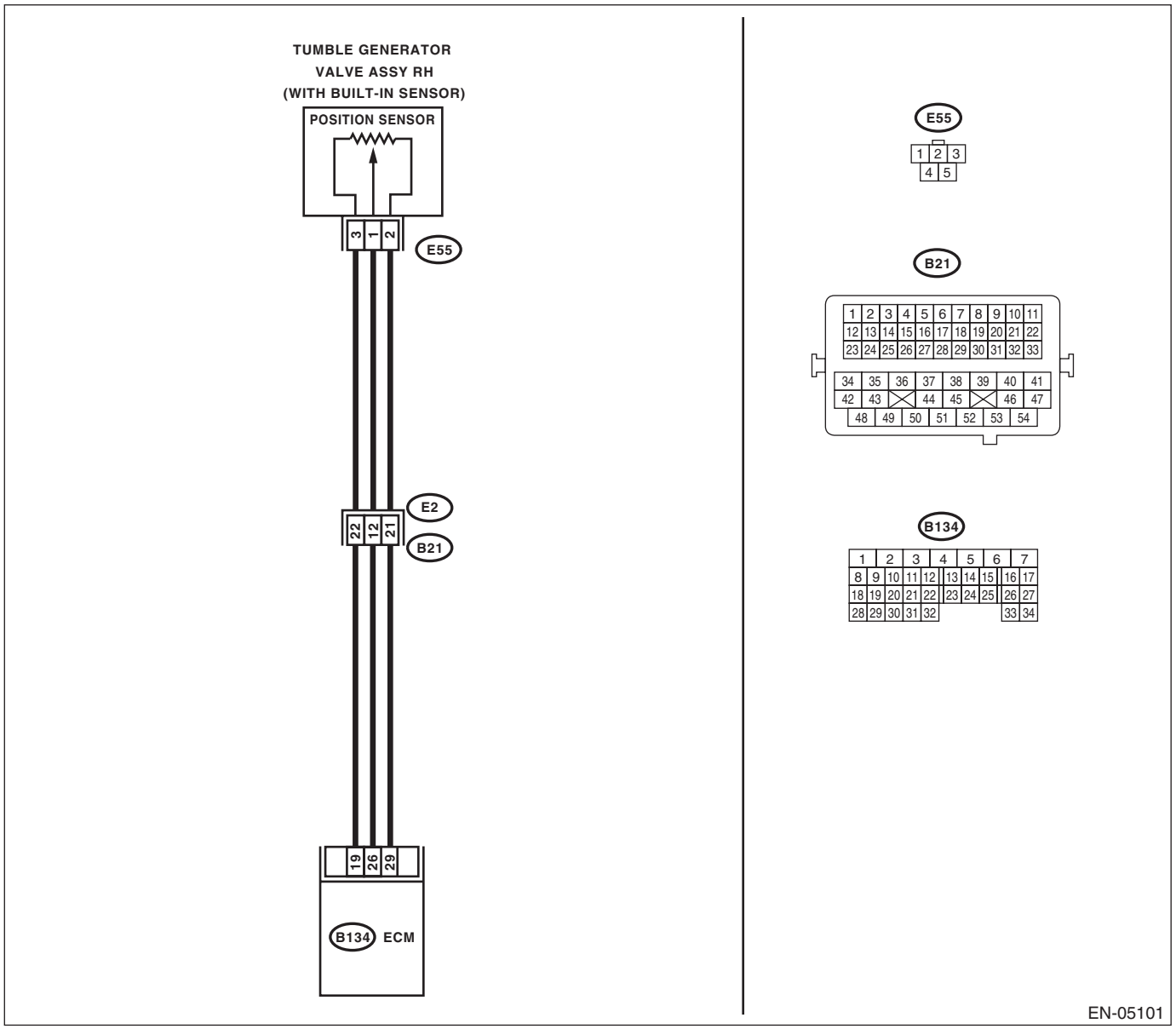
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Start the engine. 4) 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and tumble generator valve position sensor connector.	Go to step **3**.
3	**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 tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E55) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
4	**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 the poor contact of the tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Position Sensor.>

DN: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)-234, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

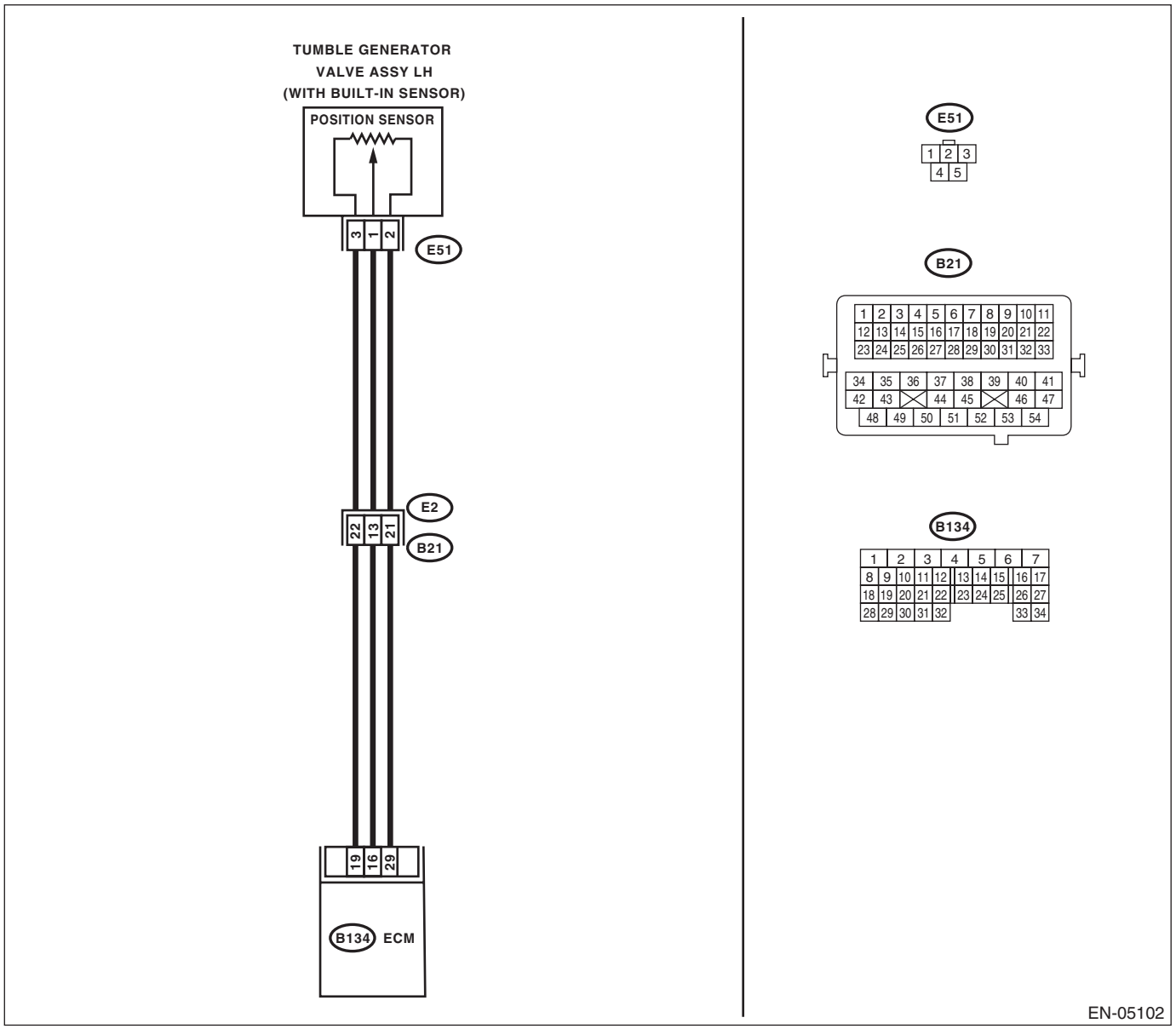
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK POWER SUPPLY OF TUMBLE GENERATOR VALVE POSITION SENSOR.** 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 tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E51) No. 3 (+) — Engine ground (–):***	Is the voltage 4.5 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of harness between ECM and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B134) No. 16 — (E51) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve position sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and tumble generator valve position sensor connector.
5	**CHECK POOR CONTACT.** Check for poor contact in ECM and tumble generator valve position sensor connector.	Is there poor contact in ECM and tumble generator valve position sensor connector?	Repair the poor contact in ECM or tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Position Sensor.>

DO: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)-236, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

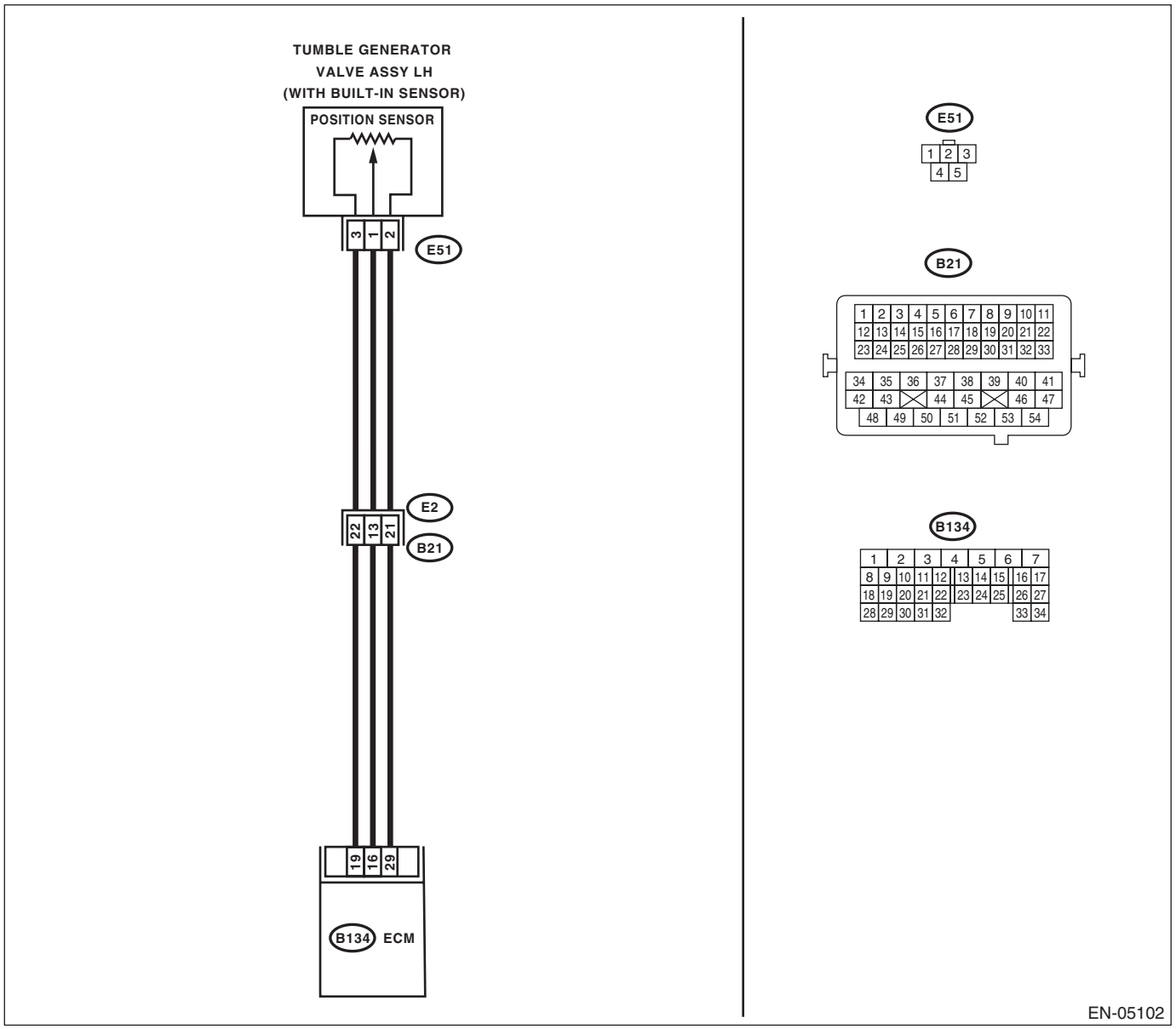
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Start the engine. 4) 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and tumble generator valve position sensor connector.	Go to step **3**.
3	**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 tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E51) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
4	**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 the poor contact of the tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Position Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-238, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

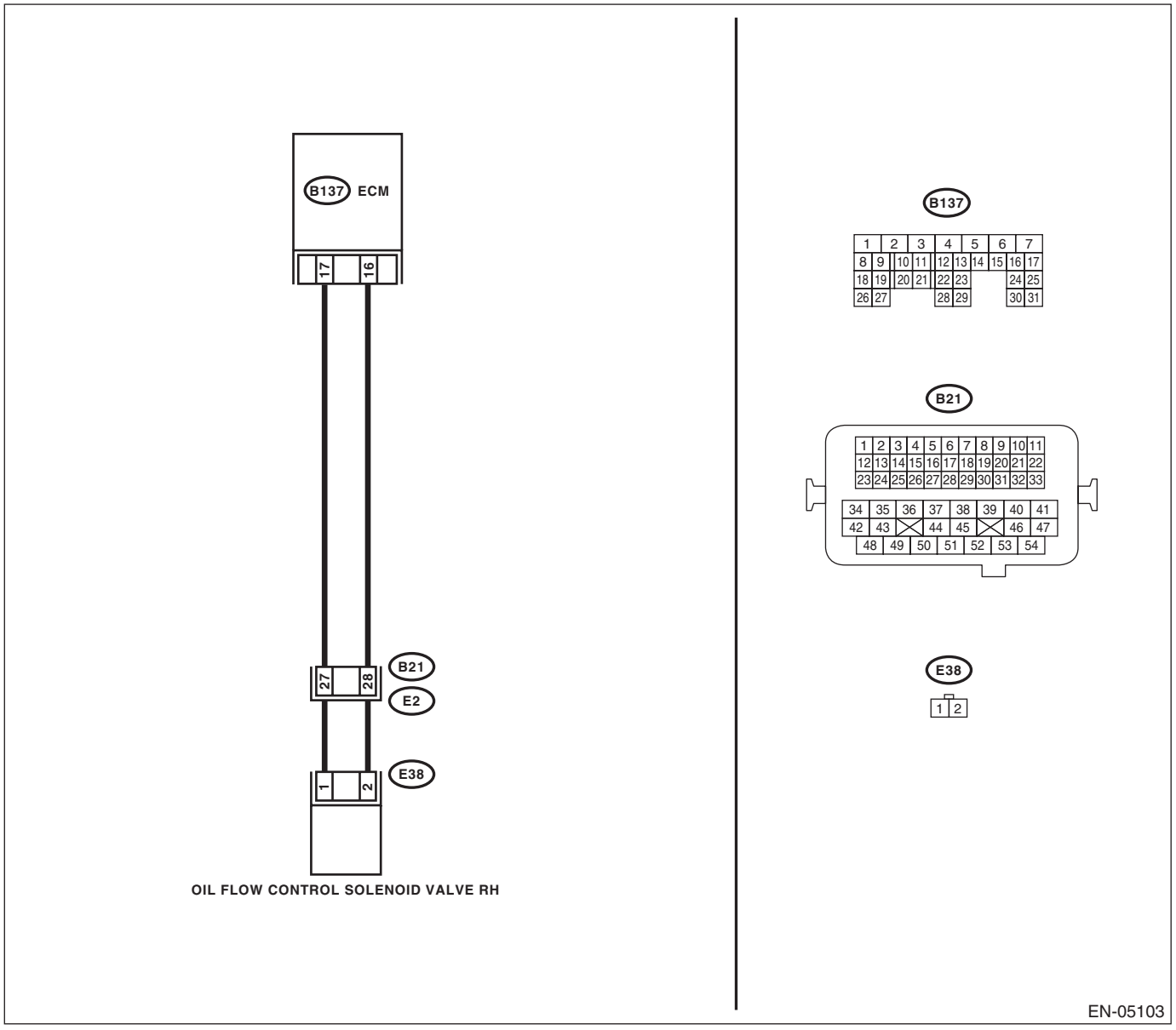
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B137) No. 17 — (E38) No. 1:*** ***(B137) No. 16 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 17 — Chassis ground:*** ***(B137) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-53, Camshaft.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-240, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

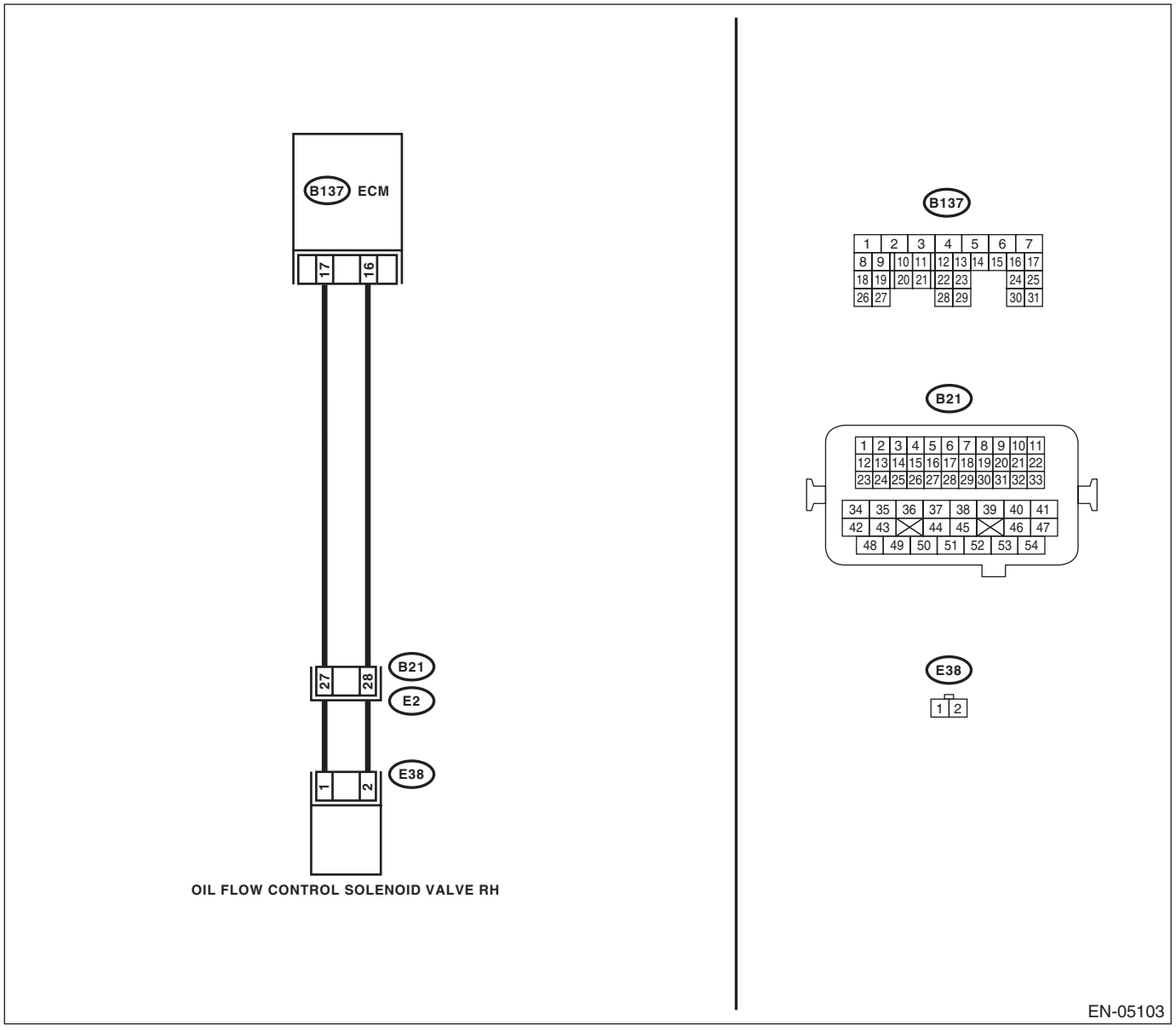
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 17 (+) — Chassis ground (–):*** ***(B137) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power in the harness between the ECM and oil flow control solenoid valve connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and oil flow control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 17 — (E38) No. 1:*** ***(B137) No. 16 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-53, Camshaft.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-241, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

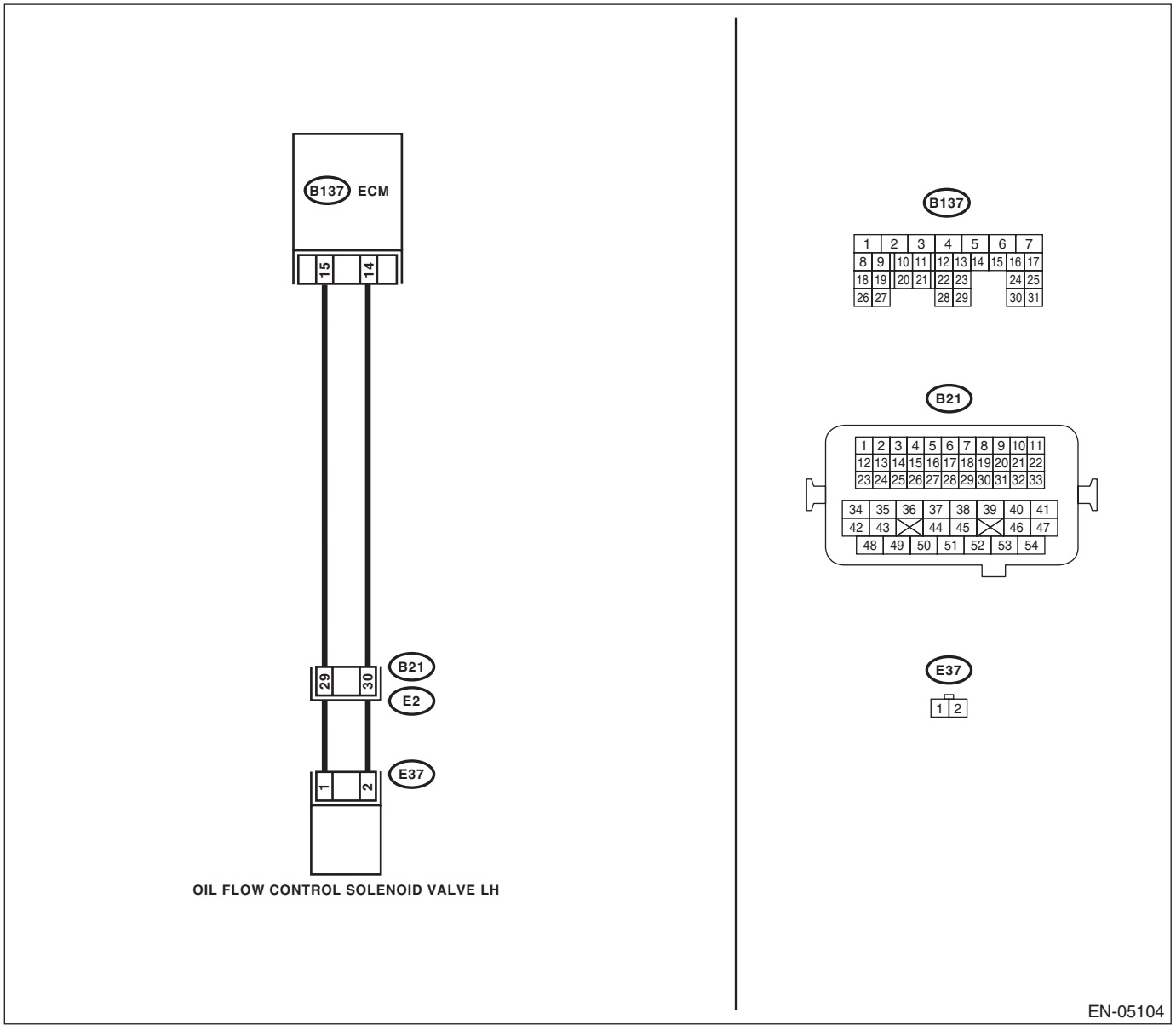
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B137) No. 15 — (E37) No. 1:*** ***(B137) No. 14 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 15 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-53, Camshaft.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-241, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

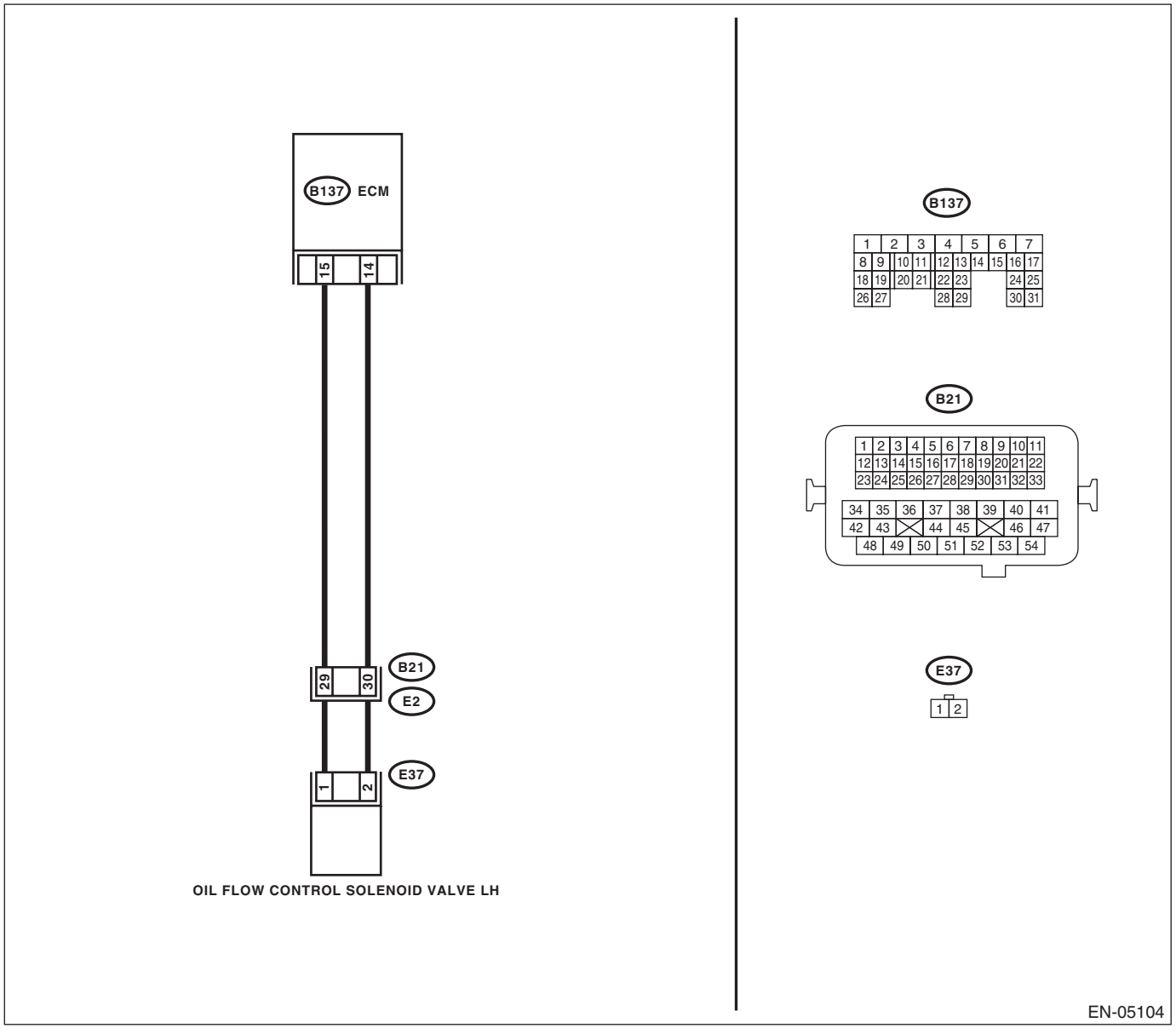
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



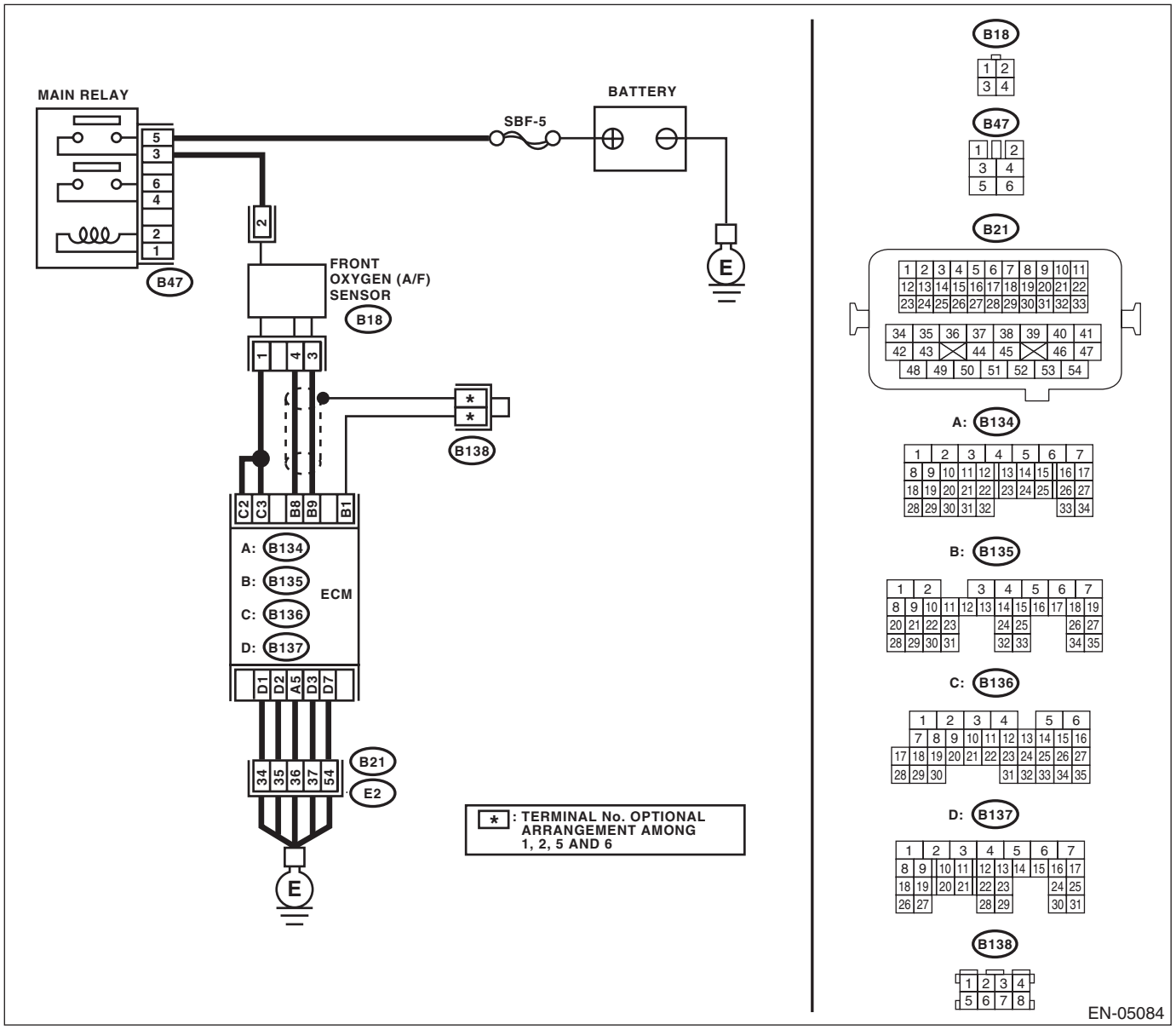
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 15 (+) — Chassis ground (–):*** ***(B137) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power in the harness between the ECM and oil flow control solenoid valve connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and oil flow control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 15 — (E37) No. 1:*** ***(B137) No. 14 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 — 12 Ω?	Repair the poor contact of the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-53, Camshaft.>

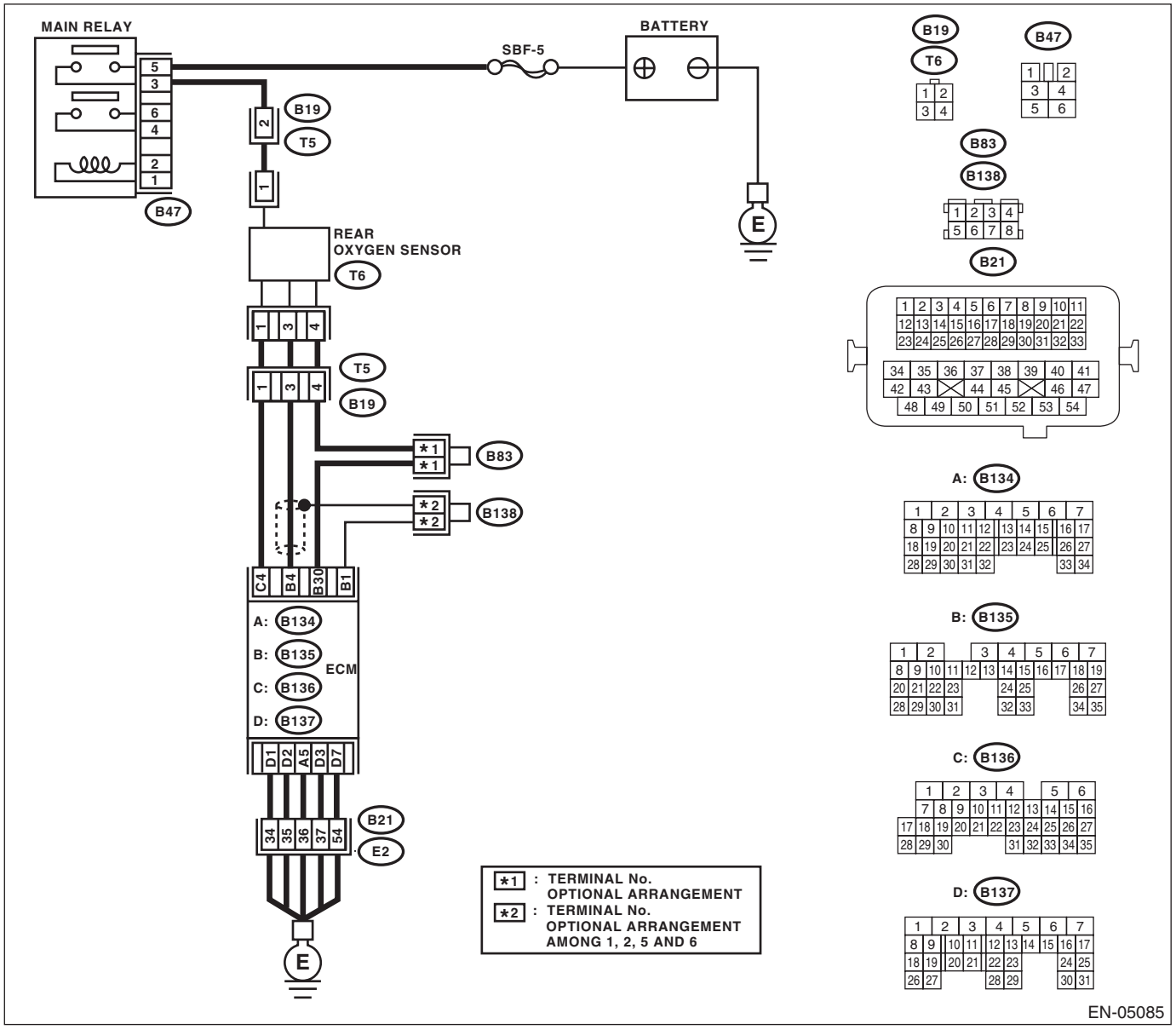
DT:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-242, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:




MAIN RELAY
BATTERY
SBF-5
B19
T5
B47
REAR
OXYGEN SENSOR
T6
B83
B138
B21
A: B134
B: B135
C: B136
D: B137
ECM
E2
E
*1 : TERMINAL No. OPTIONAL ARRANGEMENT
*2 : TERMINAL No. OPTIONAL ARRANGEMENT AMONG 1, 2, 5 AND 6
EN-05085

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 9 — (B18) No. 3:*** ***(B135) No. 8 — (B18) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — Chassis ground:*** ***(B135) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **7**.	Go to step **6**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **7**.	Go to step **8**.
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Chassis ground (–):*** ***(B18) No. 4 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between the ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair poor contact of the ECM connector.

	Step	Check	Yes	No
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10**.
10	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 **11**.	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
11	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 **12**.	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
12	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 70°C (158°F) or higher ?	Go to step **13**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is higher than 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **14**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is higher than 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **15**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Depress the clutch pedal on MT models. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **16**.	Go to step **17**.
16	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Depress the clutch pedal on MT models. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **18**.	Go to step **17**.
17	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **19**.
18	**CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is a voltage of 0.8 V or more maintained for 5 minutes or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.>	Go to step **19**.

	Step	Check	Yes	No
19	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (T6) No. 3:*** ***(B135) No. 30 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **20**.	Repair the open circuit of harness between ECM and rear oxygen sensor connector.
20	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact in ECM connector • Poor contact of coupling connector

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

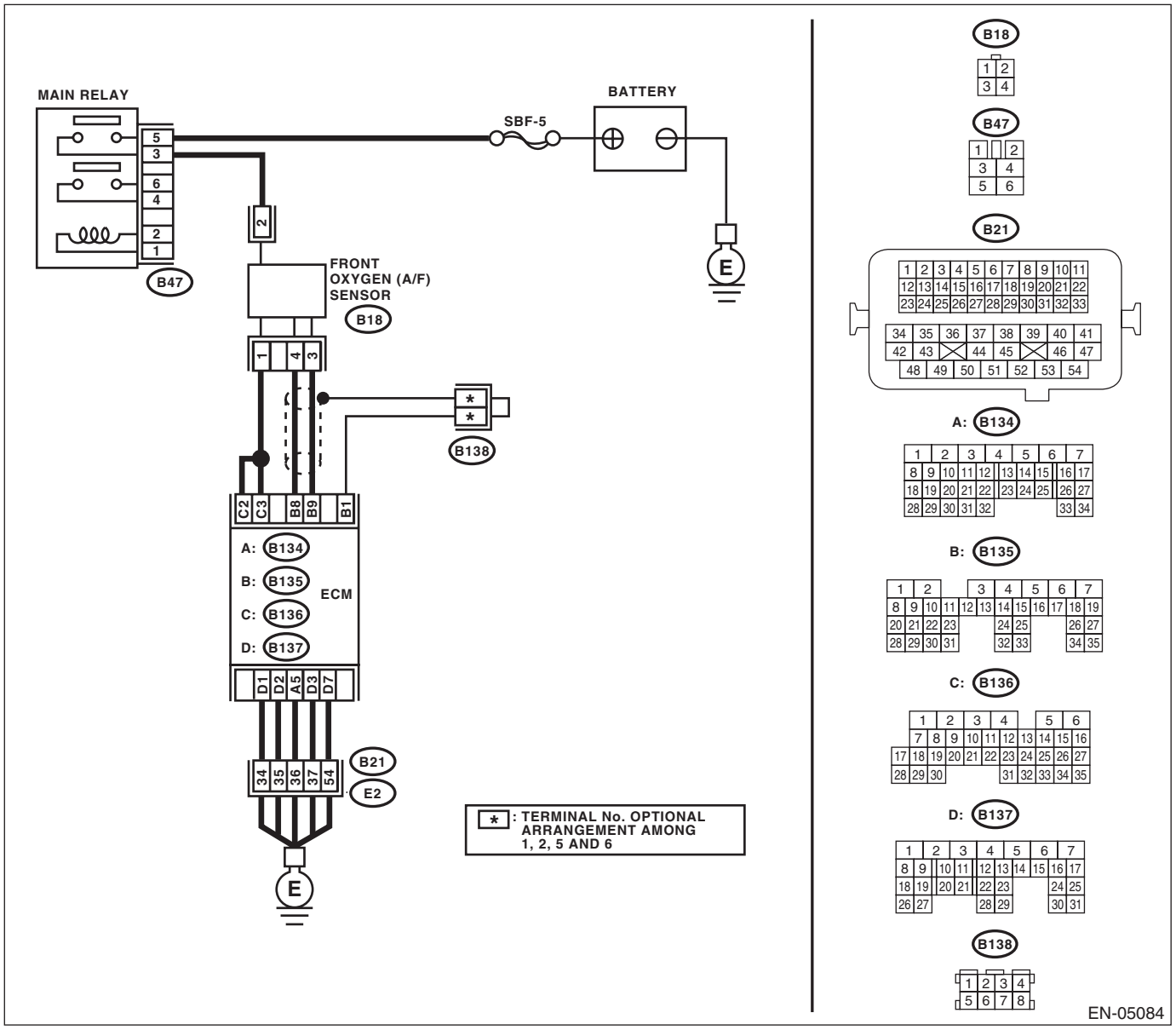
DTC DETECTING CONDITION:

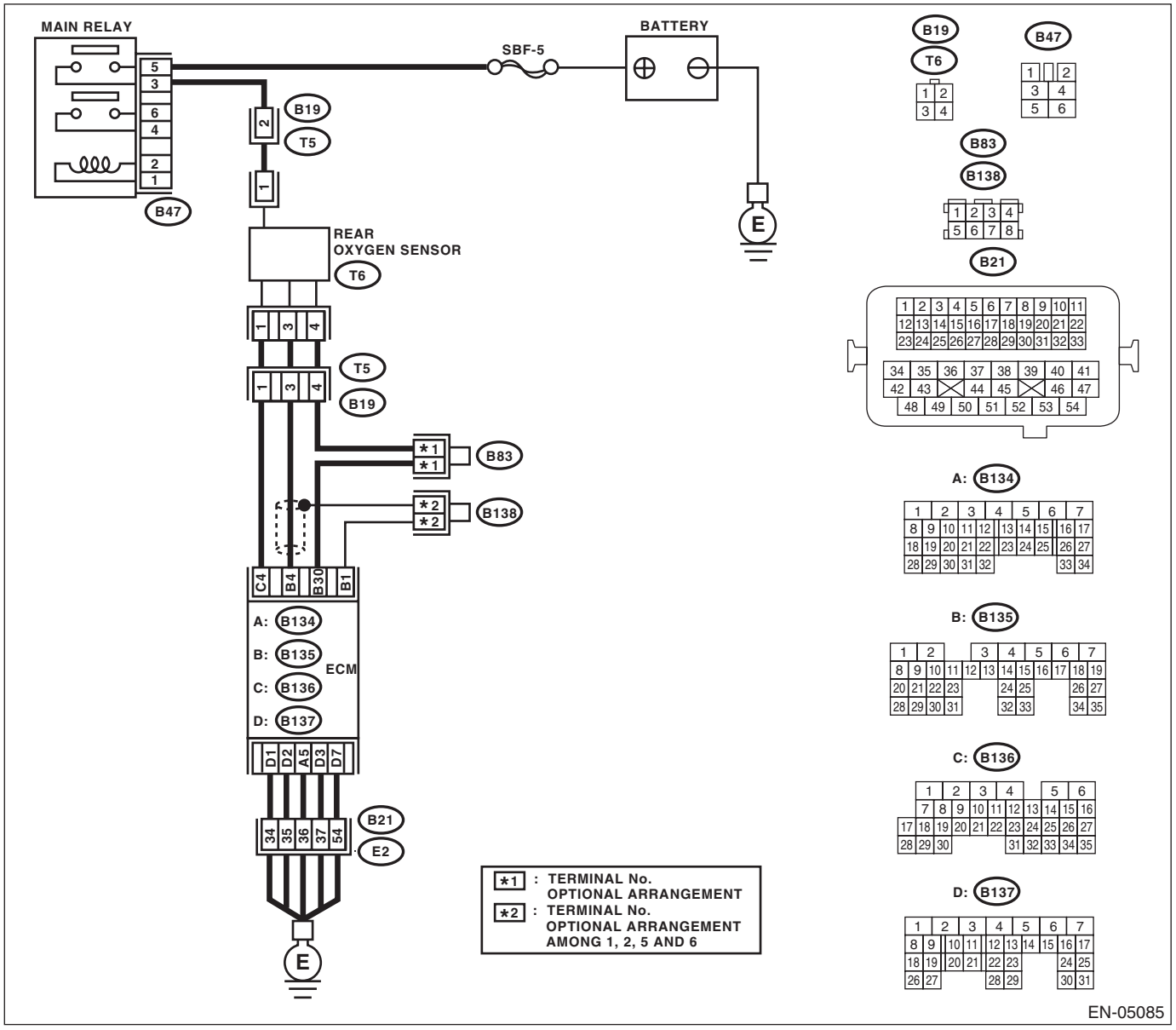
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-244, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:




MAIN RELAY
BATTERY
SBF-5
B19
T5
B47
REAR
OXYGEN SENSOR
T6
B83
B138
B21
E
E2
A: B134
B: B135
C: B136
D: B137
ECM
C4
B4
B30
B1
D1
D2
A5
D3
D7
34
35
36
37
54
*1 : TERMINAL No.
OPTIONAL ARRANGEMENT
*2 : TERMINAL No.
OPTIONAL ARRANGEMENT
AMONG 1, 2, 5 AND 6
EN-05085

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 9 — (B18) No. 3:*** ***(B135) No. 8 — (B18) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — Chassis ground:*** ***(B135) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(B18) No. 9 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **7**.	Go to step **6**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(B18) No. 4 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **7**.	Go to step **8**.
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Chassis ground (–):*** ***(B18) No. 4 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between the ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair poor contact of the ECM connector.

	Step	Check	Yes	No
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10**.
10	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 **11**.	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
11	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 **12**.	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
12	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 70°C (158°F) or higher ?	Go to step **13**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is higher than 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/s) ?	Go to step **14**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is higher than 70°C (158°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **15**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Depress the clutch pedal on MT models. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **16**.	Go to step **17**.
16	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Depress the clutch pedal on MT models. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **18**.	Go to step **17**.
17	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **19**.
18	**CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is higher than 70°C (158°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is a voltage of 0.8 V or more maintained for 5 minutes or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.>	Go to step **19**.

	Step	Check	Yes	No
19	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (T6) No. 3:*** ***(B135) No. 30 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **20**.	Repair the open circuit of harness between ECM and rear oxygen sensor connector.
20	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact in ECM connector • Poor contact of coupling connector

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-246, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

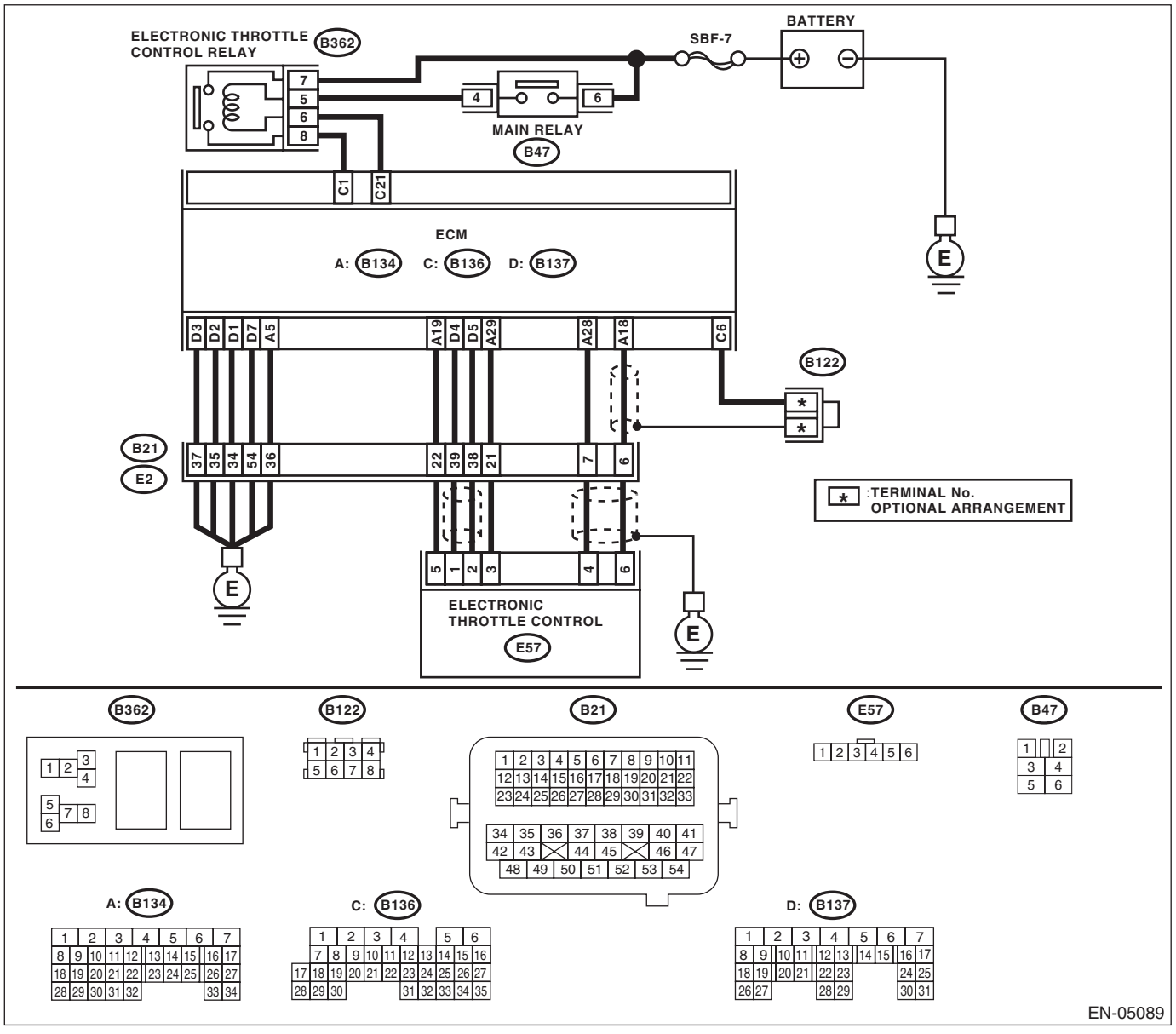
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 5 and No. 6 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to FU(H4DOTC)-47, Electronic Throttle Control Relay.>
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Disconnect the connectors from the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 — Chassis ground:*** ***(B362) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between the ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B136) No. 21 — (B362) No. 6:*** ***(B136) No. 1 — (B362) No. 8:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit of harness between ECM and electronic throttle control relay.
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 6:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the ground short circuit of harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
7	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>
8	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 18 — (E57) No. 6:*** ***(B134) No. 28 — (E57) No. 4:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the open circuit of harness between ECM and electronic throttle control connector.
9	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **10**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
10	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 4.85 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.	Go to step **11**.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Go to step **12**.	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.
12	**CHECK SENSOR OUTPUT.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **13**.	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-12, Throttle Body.>

	Step	Check	Yes	No
13	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **14**.	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-12, Throttle Body.>
14	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B137) No. 5 — (E57) No. 2:*** ***(B137) No. 4 — (E57) No. 1:***	Is the resistance less than 1 Ω?	Go to step **15**.	Repair the open circuit of harness between ECM and electronic throttle control.
15	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 (+) — Engine ground (–):*** ***(E57) No. 1 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and electronic throttle control.	Go to step **16**.
16	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 — Engine ground:*** ***(E57) No. 1 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **17**.	Repair the ground short circuit of harness between the ECM and electronic throttle control.
17	**CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.** Measure the resistance between the electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance 1 MΩ or more?	Go to step **18**.	Repair the short circuit of harness between ECM and electronic throttle control.
18	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **19**.	Repair the open circuit of the harness between the ECM and engine ground.

	Step	Check	Yes	No
19	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 50 Ω or less?	Go to step **20**.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-12, Throttle Body.>
20	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Standard value: 3 mm (0.12 in) from fully closed position	Repair the poor contact in ECM connector.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-12, Throttle Body.>

DW:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-248, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

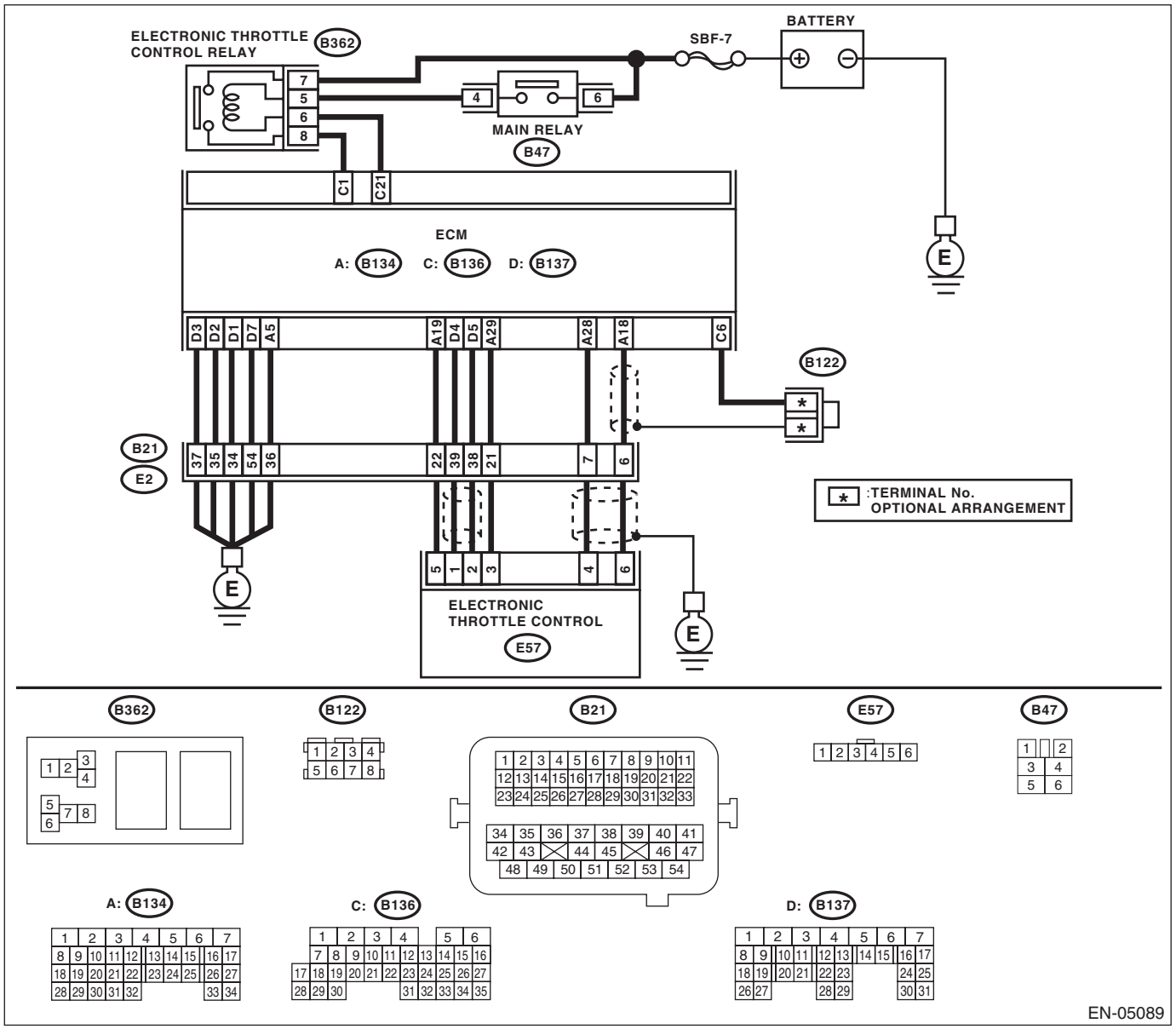
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 5 and No. 6 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to FU(H4DOTC)-47, Electronic Throttle Control Relay.>
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Disconnect the connectors from the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 — Chassis ground:*** ***(B362) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between the ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B136) No. 21 — (B362) No. 6:*** ***(B136) No. 1 — (B362) No. 8:***	Is the resistance less than 1 Ω?	Repair the poor contact in ECM connector.	Repair the open circuit of harness between ECM and electronic throttle control relay.

DX:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

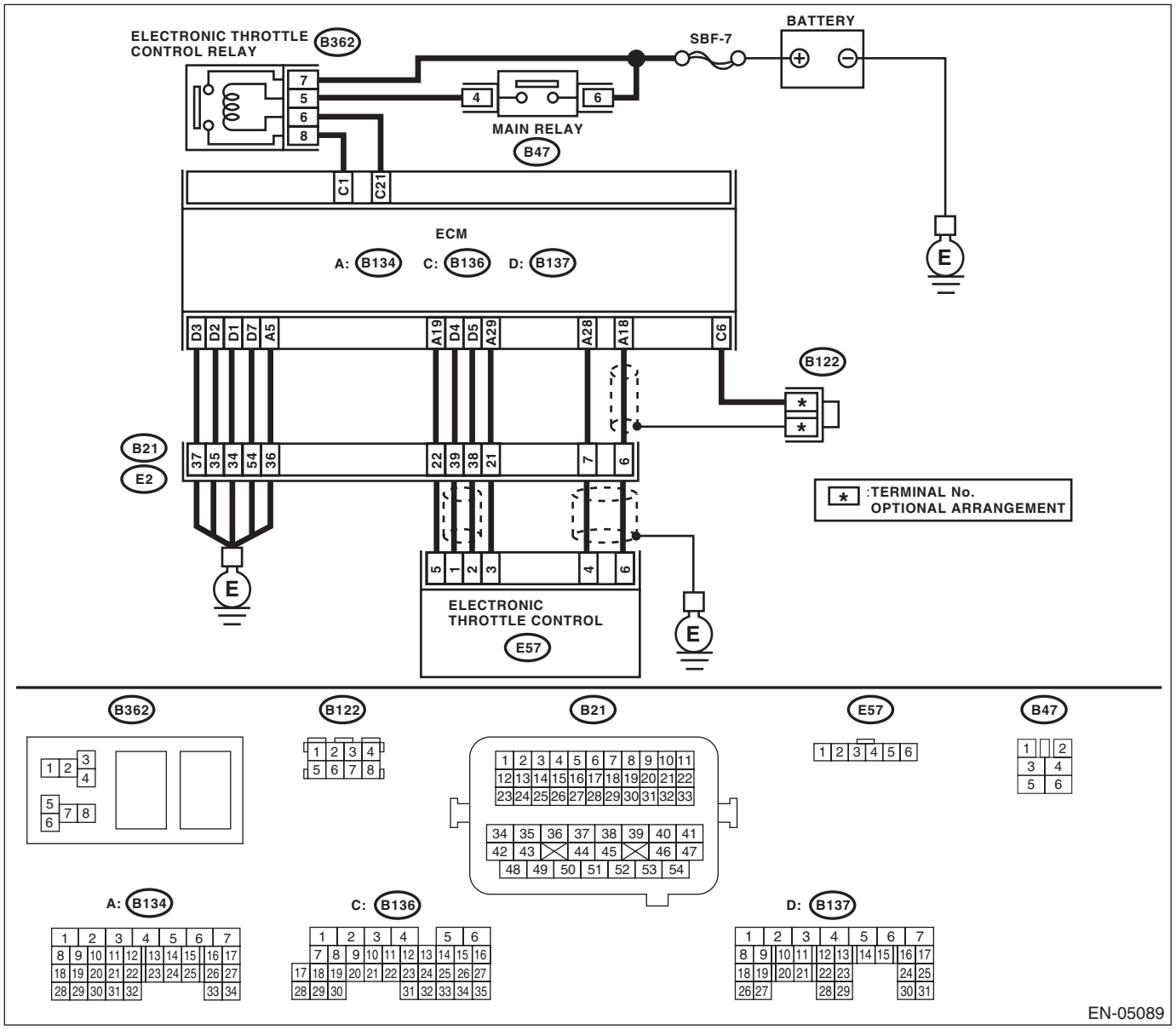
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-250, 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to FU(H4DOTC)-47, Electronic Throttle Control Relay.>
2	**CHECK SHORT CIRCUIT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 8 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B362) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact in ECM connector.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.

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

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-328, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-254, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

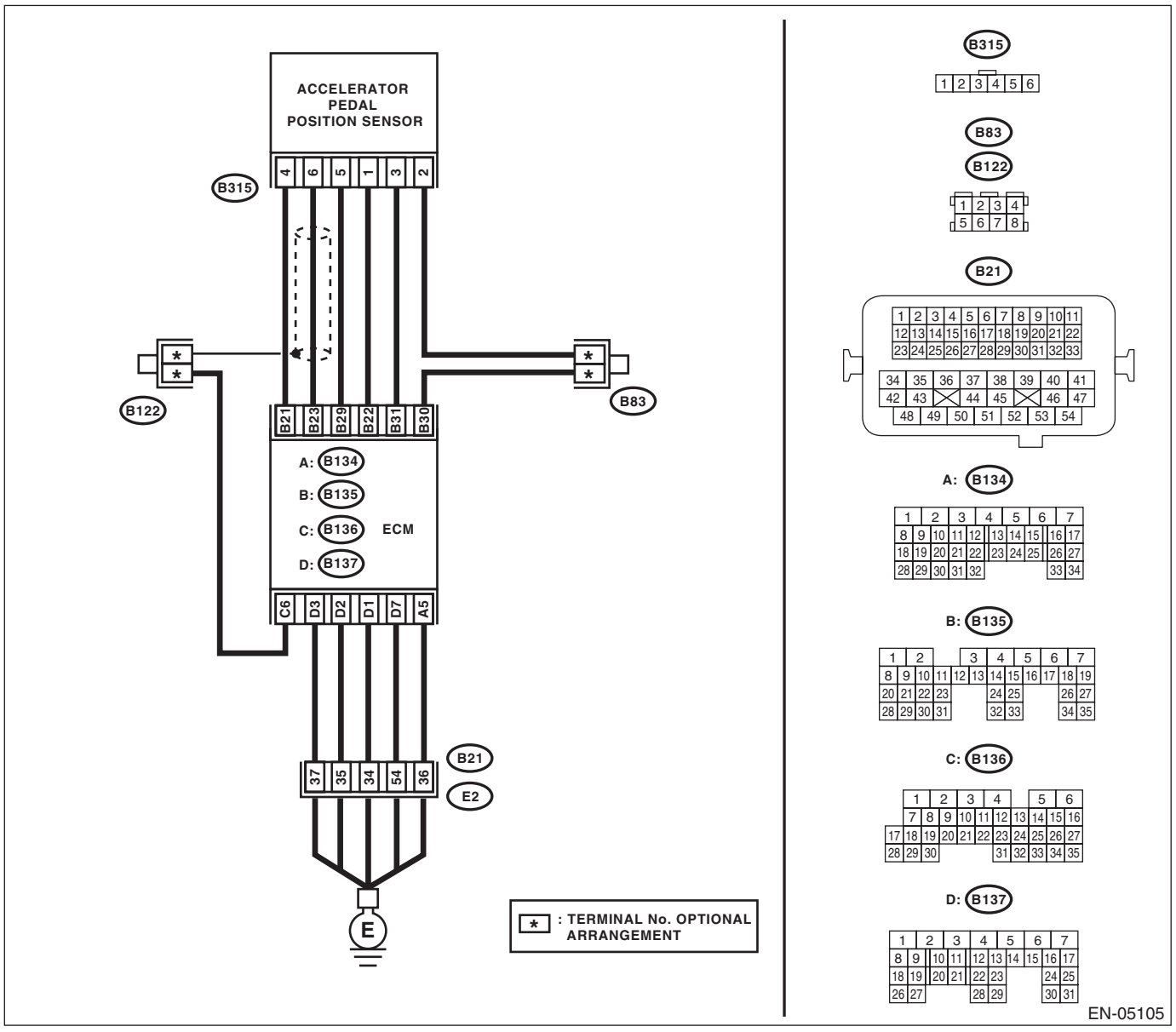
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05105

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and accelerator pedal position sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 21 — Chassis ground:*** ***(B135) No. 23 — Chassis ground:*** ***(B135) No. 23 — (B136) No. 6:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the ground short of the harness between the ECM and accelerator pedal position sensor connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the ground short of the harness between the ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-256, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

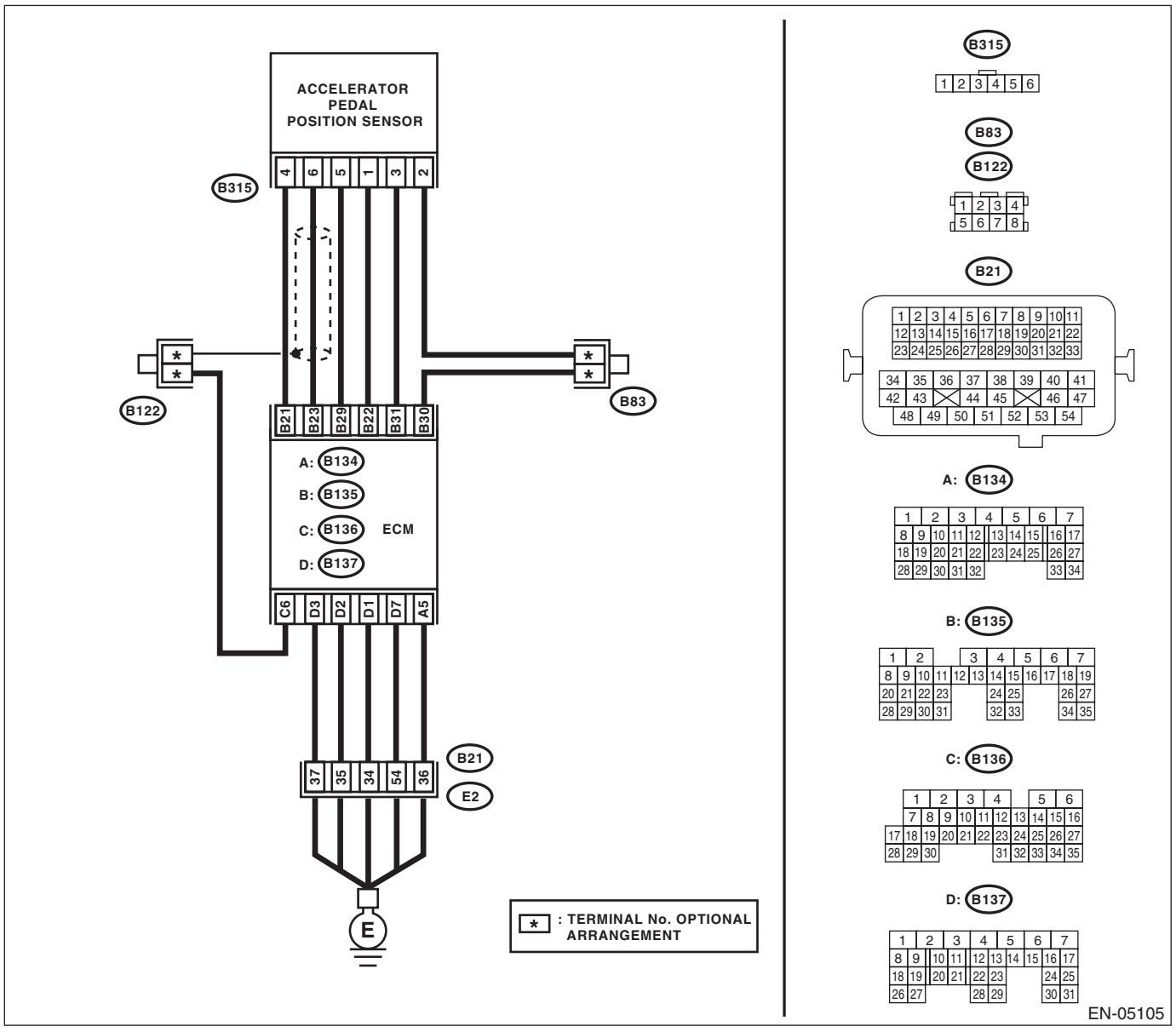
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05105

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and accelerator pedal position sensor. 3) Measure the resistance of harness between ECM and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 23 — (B315) No. 6:*** ***(B135) No. 29 — (B315) No. 5:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of the harness between the ECM and accelerator pedal position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 29 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 (+) — Chassis ground (–):***	Is the voltage 4.85 V or more?	Repair the short circuit to power source in the harness between the ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B135) No. 21 — (B135) No. 23:***	Is the resistance 1 MΩ or more?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal if defective. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the short circuit to power source in the harness between the ECM and accelerator pedal position sensor connector.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-258, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

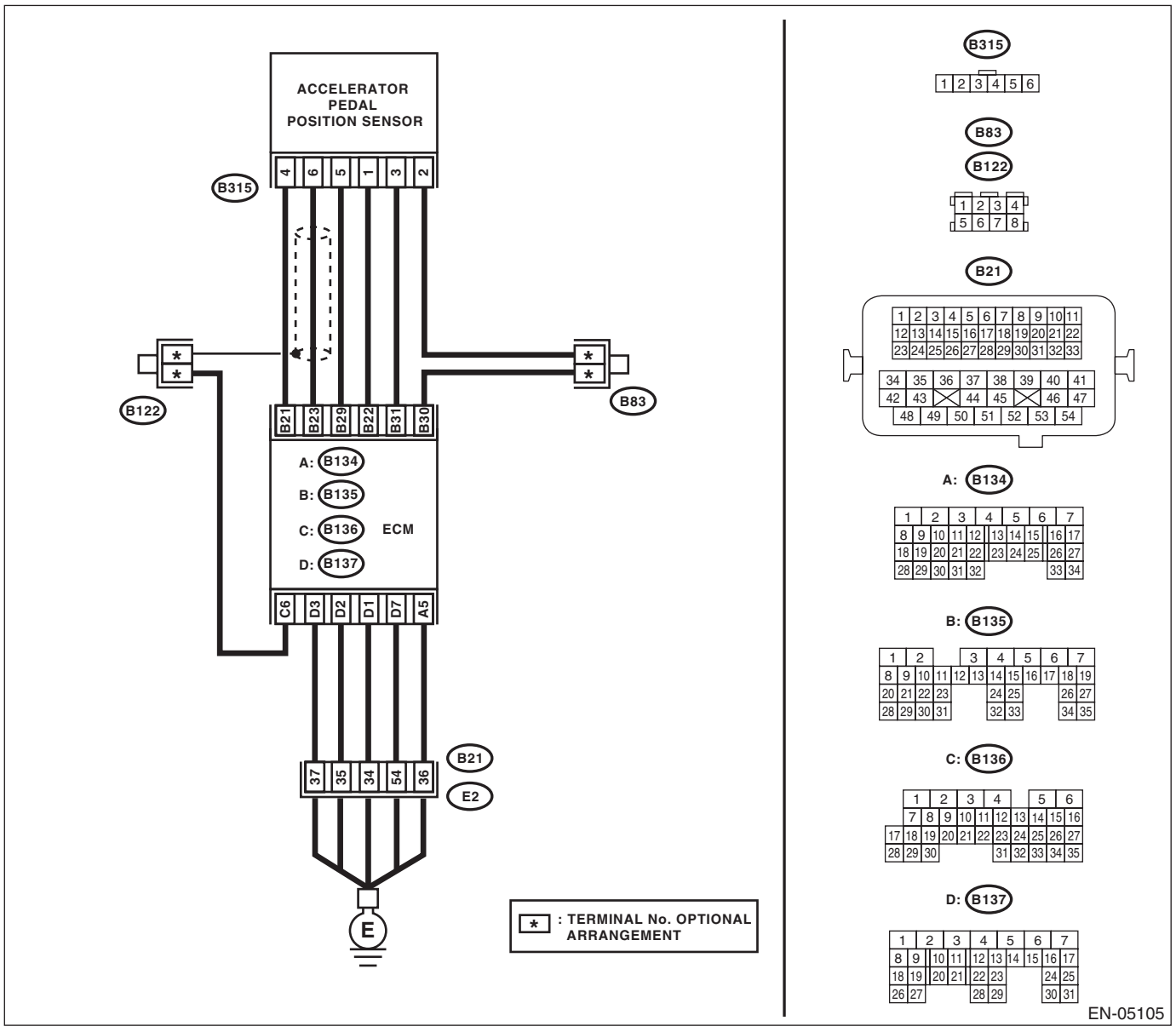
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and accelerator pedal position sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 22 — Chassis ground:*** ***(B135) No. 31 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the ground short of the harness between the ECM and accelerator pedal position sensor connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the ground short of the harness between the ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-260, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

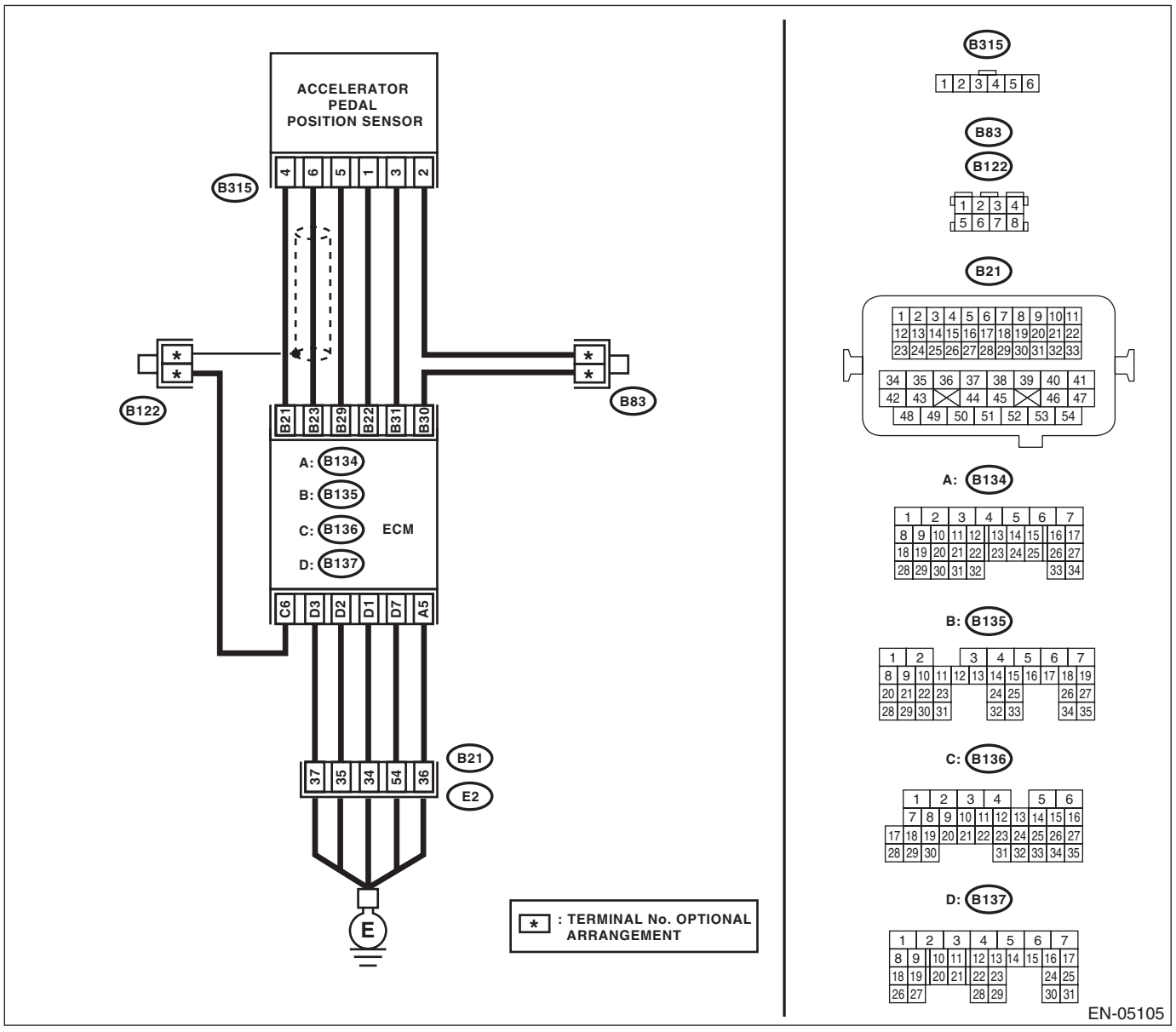
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05105

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and accelerator pedal position sensor. 3) Measure the resistance of harness between ECM and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 31 — (B315) No. 3:*** ***(B135) No. 30 — (B315) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of the harness between the ECM and accelerator pedal position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 2 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.85 V or more?	Repair the short circuit to power source in the harness between the ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B135) No. 22 — (B135) No. 31:***	Is the resistance 1 MΩ or more?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal if defective. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the short circuit to power source in the harness between the ECM and accelerator pedal position sensor connector.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-262, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

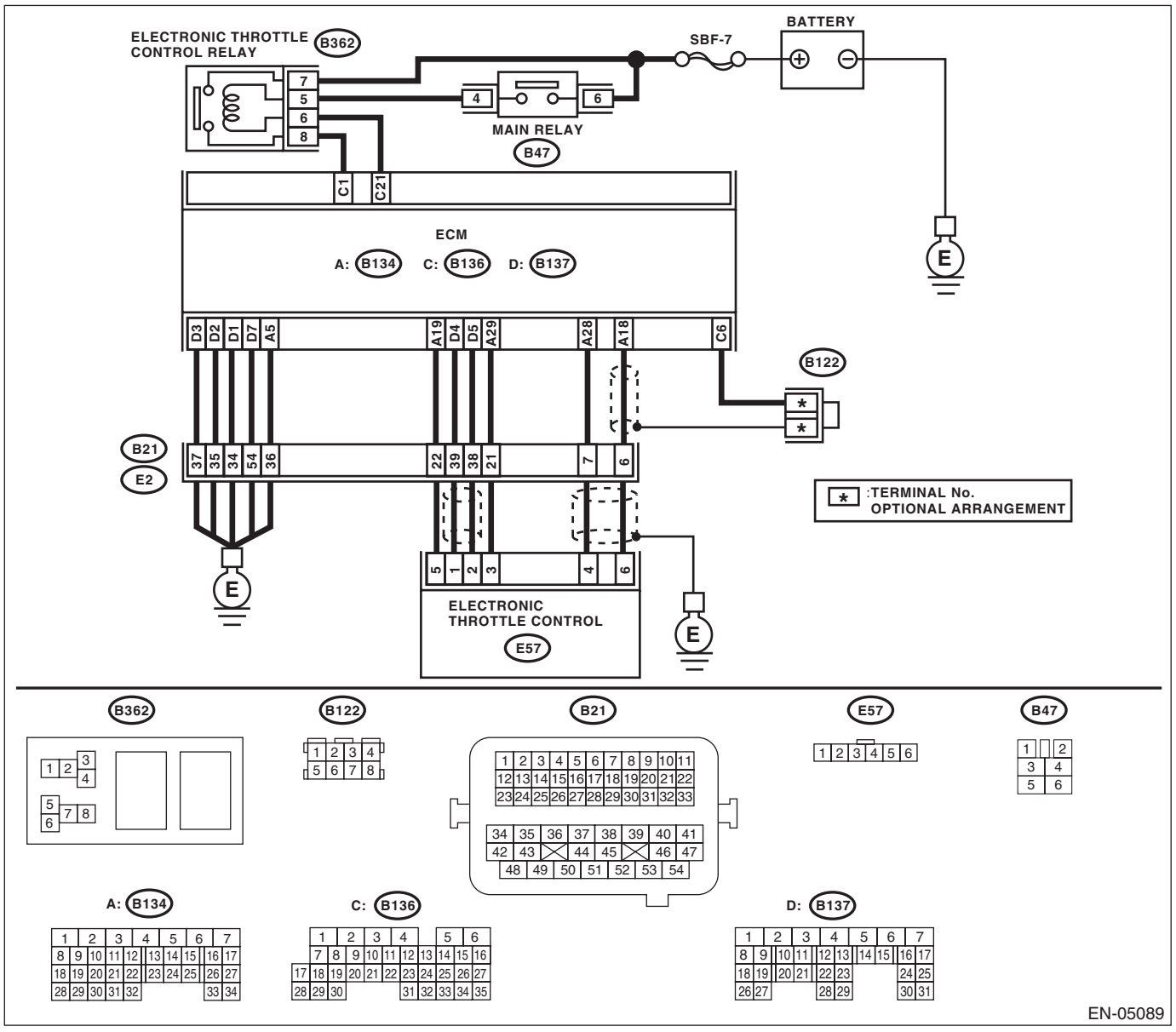
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 6:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the ground short circuit of harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 18 — Engine ground:*** ***(E57) No. 28 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Disconnect the connectors from the ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B135) No. 18 — (E57) No. 6:*** ***(B135) No. 28 — (E57) No. 4:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between ECM and electronic throttle control connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 4.85 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.	Go to step **6**.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Repair poor contact of the electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-12, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-264, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

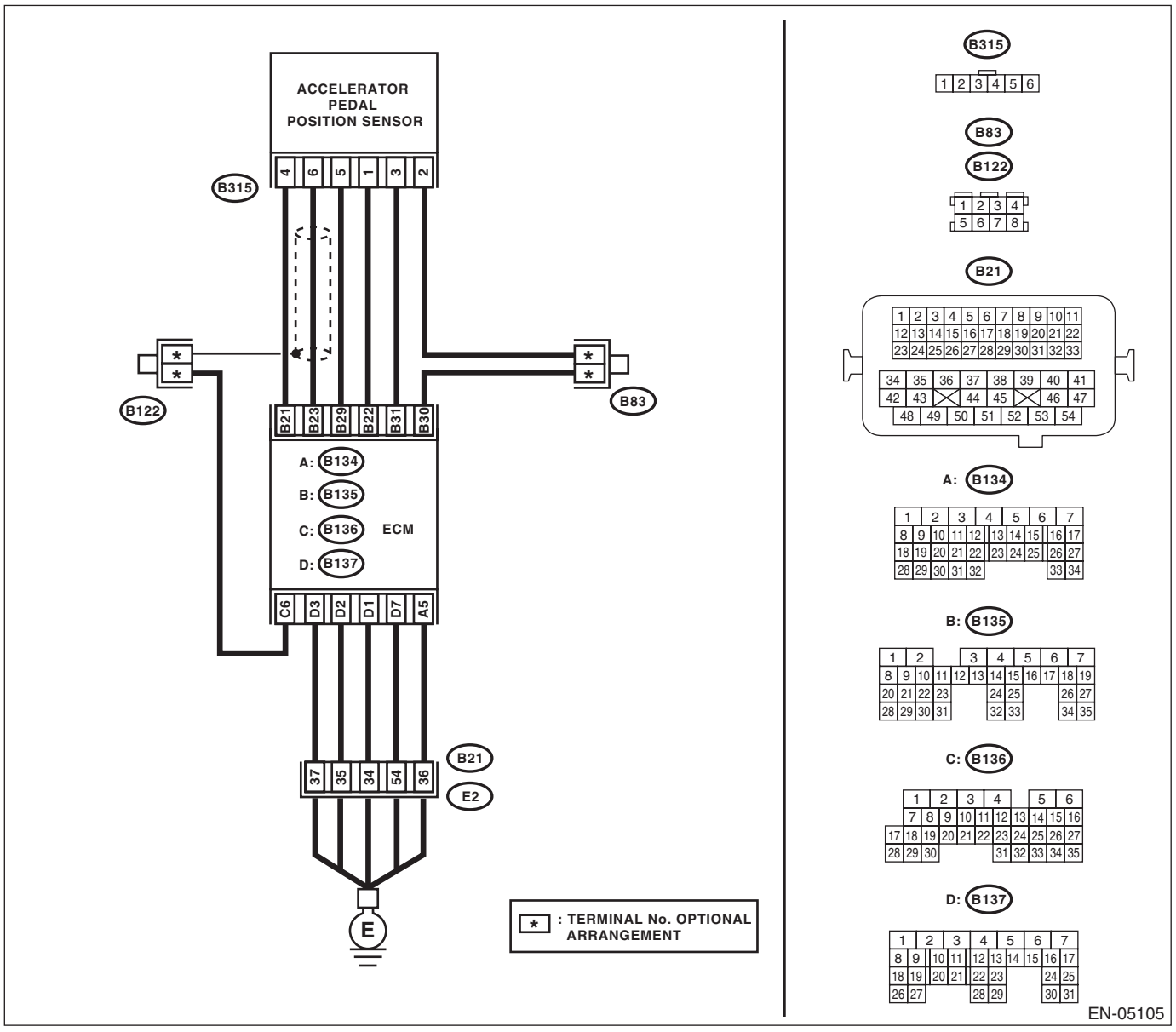
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***Main accelerator pedal position sensor signal*** ***(B135) No. 23 (+) — Chassis ground (–):*** ***Sub accelerator pedal position sensor signal*** ***(B135) No. 31 (+) — Chassis ground (–):***	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelerator pedal position sensor signal 0 V?	Go to step **3**.	Go to step **2**.
2	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 (+) — Chassis ground (–):*** ***(B315) No. 3 (+) — Chassis ground (–):***	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelerator pedal position sensor signal 0 V?	Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and accelerator pedal position sensor connector. • Ground short circuit of harness between the ECM and accelerator pedal position sensor connectors.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** Check the resistance of harness between the accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 — Chassis ground:*** ***(B315) No. 2 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and accelerator pedal position sensor connector. • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

EF:DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-266, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

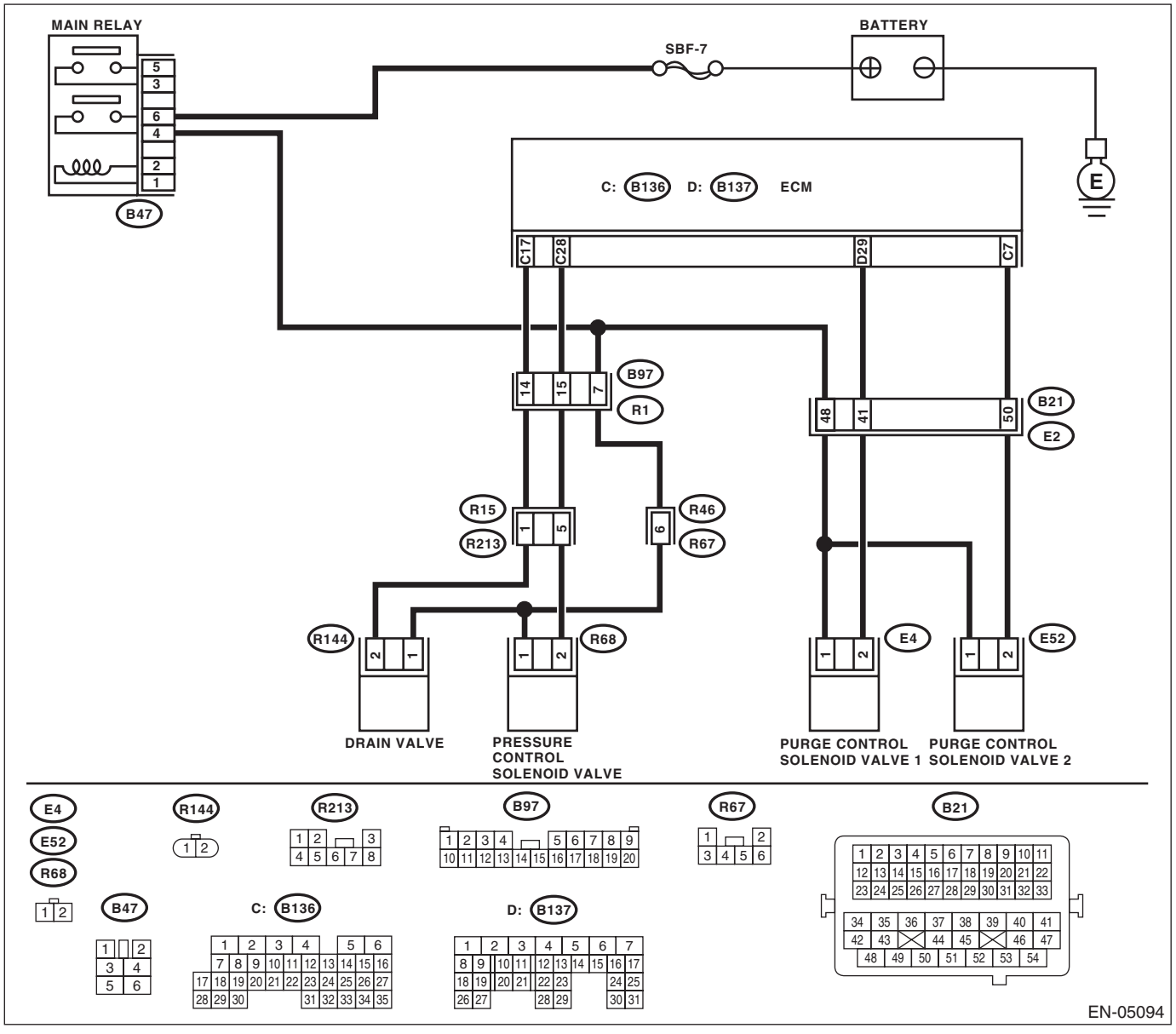
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact in ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE 2.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve 2. 3) Measure the resistance between the purge control solenoid valve 2 connector and engine ground. ***Connector & terminal*** ***(E52) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and purge control solenoid valve 2 connector.
3	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE 2.** Measure the resistance of harness between ECM and purge control solenoid valve 2. ***Connector & terminal*** ***(B136) No. 7 — (E52) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and purge control solenoid valve 2 connector • Poor contact of coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE 2.** 1) Remove the purge control solenoid valve 2. 2) Measure the resistance between purge control solenoid valve 2 terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 — 100 Ω?	Go to step **5**.	Replace the purge control solenoid valve 2. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE 2.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve 2 and engine ground. ***Connector & terminal*** ***(E52) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Repair the poor contact in the purge control solenoid valve 2 connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the main relay and purge control solenoid valve 2 • Poor contact of coupling connector • Poor contact of main relay connector

EG:DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-267, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

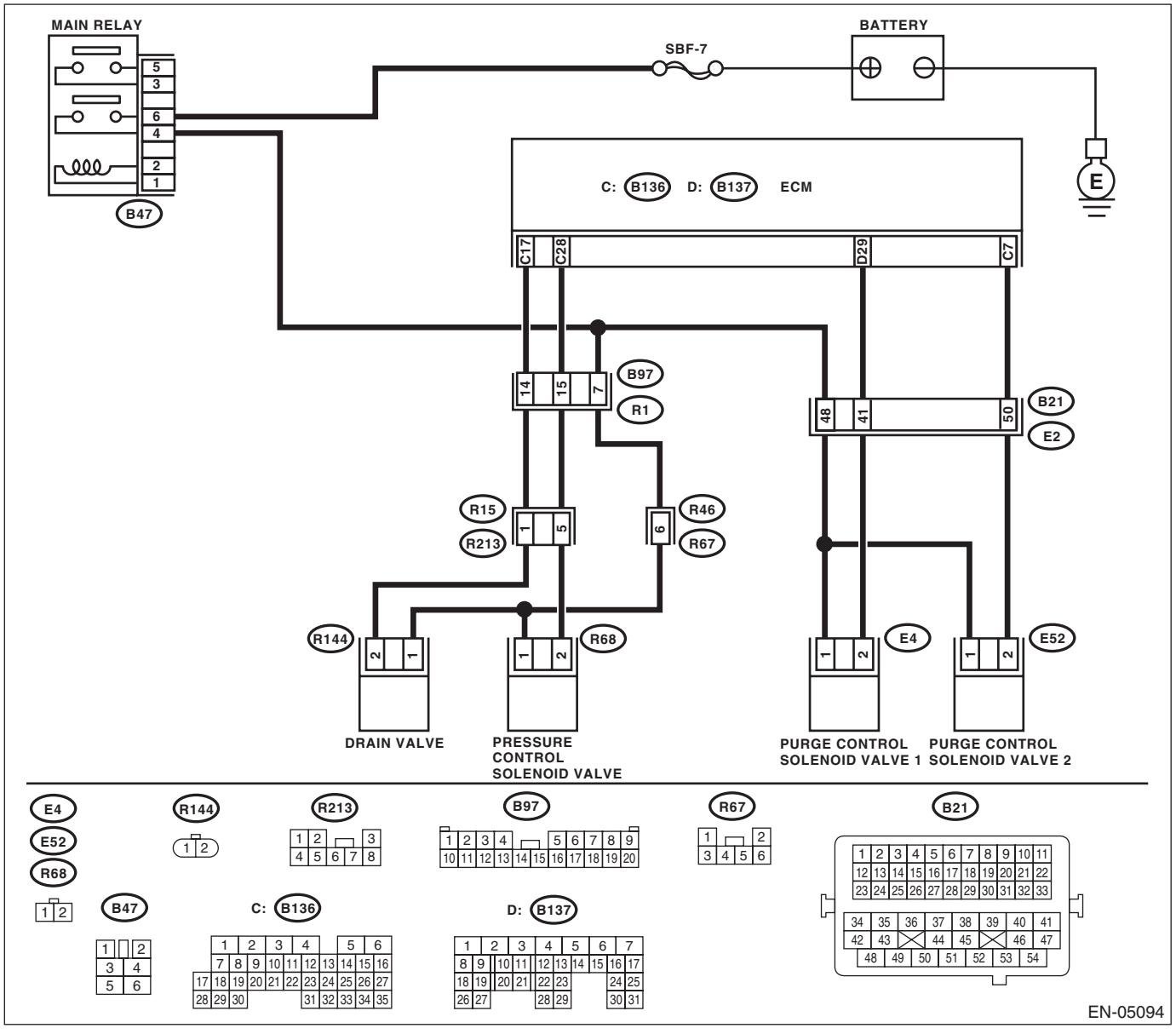
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE 2.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve 2. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short to power in the harness between ECM and purge control solenoid valve 2 connector.	Go to step **2**.
2	**CHECK PURGE CONTROL SOLENOID VALVE 2.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve 2 terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve 2. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>	Repair the poor contact in ECM connector.

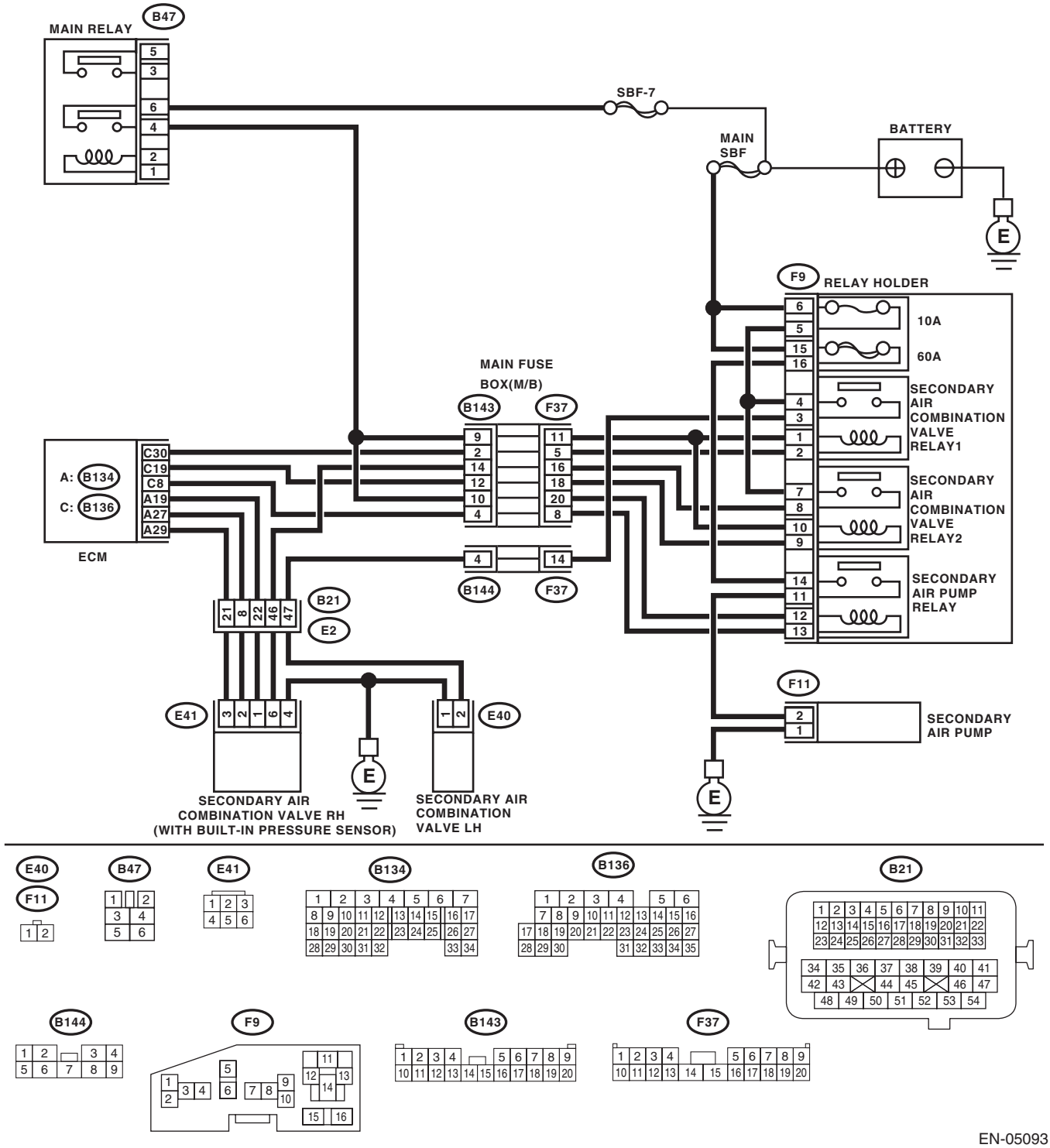
EH:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-268, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON (engine OFF). 2) Using the Subaru Select Monitor, read secondary air piping pressure, intake pipe absolute pressure and atmospheric pressure, and compare with the actual atmospheric pressure. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the actual difference with atmospheric pressure 200 mmHg (27 kPa, 8 inHg, 3.9 psig) or more?	Replace the secondary air combination valve RH. <Ref. to EC(H4DOTC)-21, Secondary Air Combi Valve.>	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.

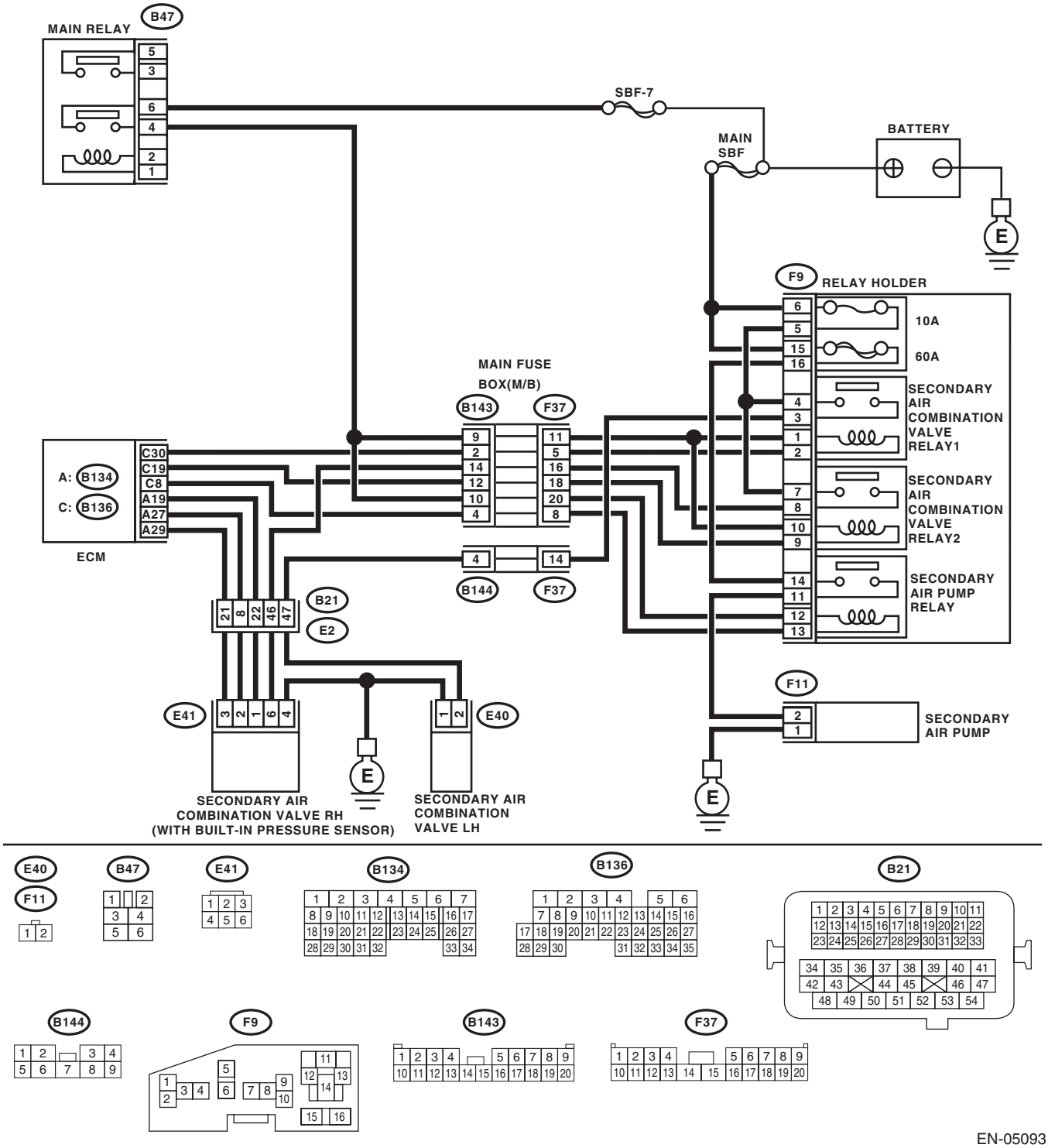
EI: DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-269, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of secondary air pipe pressure signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than 53.3 kPa (400 mmHg, 15.8 inHg) ?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK SECONDARY AIR COMBINATION VALVE RH POWER SOURCE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air combination valve RH. 3) Turn the ignition switch to ON. 4) Measure the voltage between the secondary air combination valve RH connector and chassis ground. ***Connector & terminal*** ***(E41) No. 6 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air combination valve RH connector • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance of the harness between the ECM and secondary air combination valve RH connector. ***Connector & terminal*** ***(B134) No. 27 — (E41) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air combination valve RH connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 27 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and secondary air combination valve RH connector.
5	**CHECK POOR CONTACT.** Check for poor contact in the ECM and secondary air combination valve RH connector.	Is there poor contact in the ECM or secondary air combination valve RH connector?	Repair the poor contact in the ECM or secondary air combination valve RH connector.	Replace the secondary air combination valve RH. <Ref. to EC(H4DOTC)-21, Secondary Air Combi Valve.>

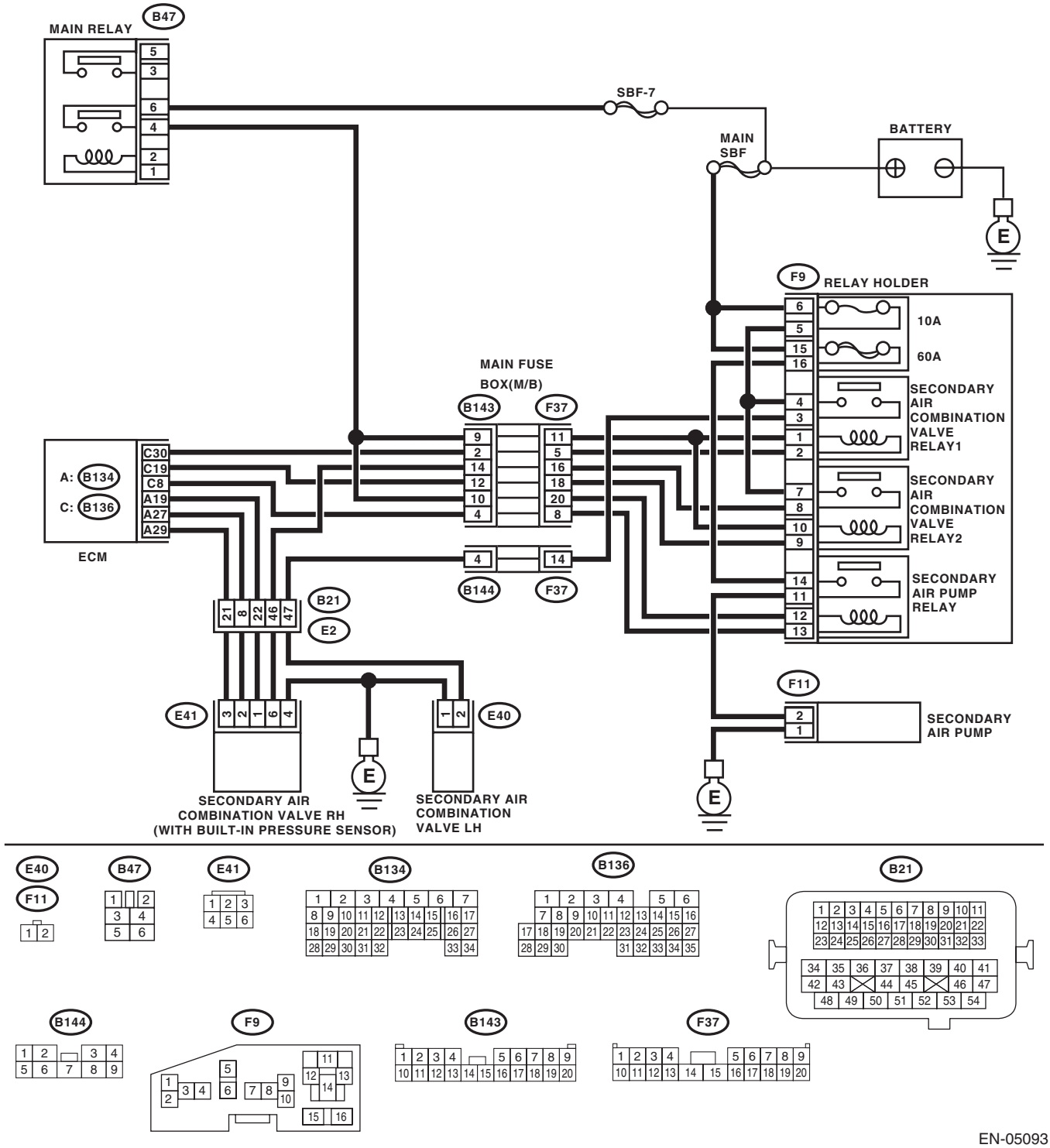
EJ: DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-270, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of secondary air pipe pressure signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 133.3 kPa (1000 mmHg, 39.4 inHg) or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air combination valve RH. 3) Turn the ignition switch to ON. 4) Read the data of secondary air pipe pressure signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 133.3 kPa (1000 mmHg, 39.4 inHg) or more?	Repair the short circuit to power in the harness between ECM and secondary air combination valve RH connectors.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of the harness between the secondary air combination valve RH connector and engine ground. ***Connector & terminal*** ***(E41) No. 4 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air combination valve RH connector • Poor contact in ECM connector • Poor contact of coupling connector
4	**CHECK POOR CONTACT.** Check for poor contact of the secondary air combination valve RH connector.	Is there poor contact of the secondary air combination valve RH connector?	Repair the poor contact of the secondary air combination valve RH connector.	Replace the secondary air combination valve RH. <Ref. to EC(H4DOTC)-21, Secondary Air Combi Valve.>

EK:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1)

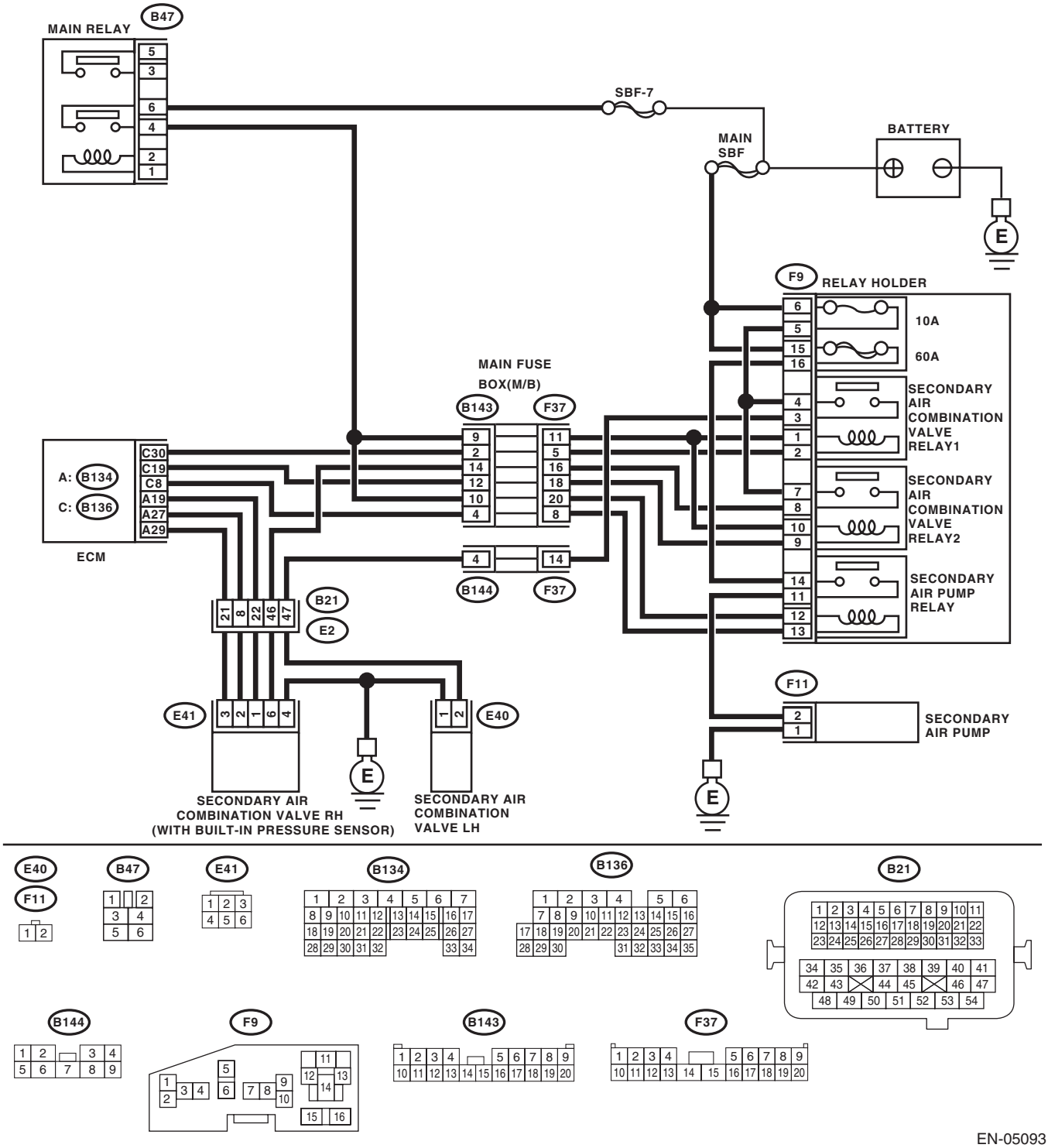
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-271, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SECONDARY AIR COMBINATION VALVE FUSE.** Check if the secondary air combination valve fuse (10 A) is blown out.	Is the fuse blown out?	Go to step **2**.	Go to step **3**.
2	**CHECK HARNESS BETWEEN FUSE BOX AND SECONDARY AIR COMBINATION VALVE LH.** 1) Remove the secondary air combination valve fuse (10 A) from the fuse box. 2) Disconnect the connector from the secondary air combination valve LH. 3) Measure the resistance between the secondary air combination valve fuse and secondary air combination valve LH connector, and chassis ground. ***Connector & terminal*** ***(F9) No. 5 — Chassis ground:*** ***(E40) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the fuse with a new part, and connect the secondary air combination valve LH connector. Go to step **3**.	Repair the ground short circuit of harness between the fuse box and the secondary air combination valve LH.
3	**CHECK SECONDARY AIR COMBINATION VALVE LH OPERATION.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air combination valve LH using the Subaru Select Monitor. NOTE: Refer to “Compulsory Valve Operation Check Mode” for more operation procedures. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the secondary air combination valve LH repeatedly switch to ON and OFF?	Go to step **4**.	Go to step **6**.
4	**CHECK DUCT BETWEEN SECONDARY AIR PUMP AND SECONDARY AIR COMBINATION VALVE LH.** Check the duct between the secondary air pump and secondary air combination valve LH.	Is there damage, clog or disconnection of the duct?	Replace, clean or connect the duct.	Go to step **5**.
5	**CHECK PIPE BETWEEN SECONDARY AIR COMBINATION VALVE LH AND CYLINDER HEAD.** Check the pipe between the secondary air combination valve LH and cylinder head.	Is there damage, clog or disconnection of the pipe?	Replace, clean or connect the pipe.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO SECONDARY AIR COMBINATION VALVE LH.** 1) Disconnect the connector from the secondary air combination valve LH. 2) In the condition of step 3, measure the voltage between the secondary air combination valve LH and the chassis ground. ***Connector & terminal*** ***(E40) No. 2 (+) — Chassis ground (–):***	Does the voltage repeatedly change between 10 V and 0 V?	Replace the secondary air combination valve LH. <Ref. to EC(H4DOTC)-21, Secondary Air Combi Valve.>	Go to step **7**.
7	**CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE LH AND CHASSIS GROUND.** Measure the resistance between the secondary air combination valve LH connector and chassis ground. ***Connector & terminal*** ***(E40) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **8**.	Repair the open circuit of harness between secondary air combination valve LH and chassis ground.
8	**CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RELAY 1 AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air combination valve relay 1 from the relay box. 3) Measure the resistance of the harness between the secondary air combination valve relay 1 and secondary air combination valve RH connector. ***Connector & terminal*** ***(F9) No. 3 — (E40) No. 2:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the open circuit of the harness between the secondary air combination valve relay 1 and secondary air combination valve RH connector.
9	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 1.** 1) Connect the battery to the secondary air combination valve relay 1 terminals No. 1 and No. 2. 2) Measure the resistance between the secondary air combination valve relay 1 terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **10**.	Replace the secondary air combination valve relay 1. <Ref. to EN(H4DOTC)(diag)-8, Electrical Component Location.>
10	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 1.** Measure the resistance between the secondary air combination valve relay 1 terminals with the battery disconnected. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 1 MΩ or more?	Go to step **11**.	Replace the secondary air combination valve relay 1. <Ref. to EN(H4DOTC)(diag)-8, Electrical Component Location.>
11	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 1 POWER SOURCE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air combination valve relay 1 connector and chassis ground. ***Connector & terminal*** ***(F9) No. 4 (+) — Chassis ground (–):*** ***(F9) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **12**.	Repair the open or ground short circuit of power supply circuit.

	Step	Check	Yes	No
12	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of harness between ECM and secondary air combination valve relay 1 connector. ***Connector & terminal*** ***(B136) No. 30 — (F9) No. 2:***	Is the resistance less than 1 Ω?	Go to step **13**.	Repair the open circuit of harness between ECM and secondary air combination valve relay 1 connector.
13	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1 CONNECTOR.** Measure the resistance between the secondary air combination valve relay 1 connector and chassis ground. ***Connector & terminal*** ***(F9) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact in ECM connector.	Repair the ground short circuit of harness between ECM and secondary air combination valve relay 1 connector.

EL:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1)

NOTE:
For the diagnostic procedure, refer to DTC P2440. <Ref. to EN(H4DOTC)(diag)-363, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EM:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2)

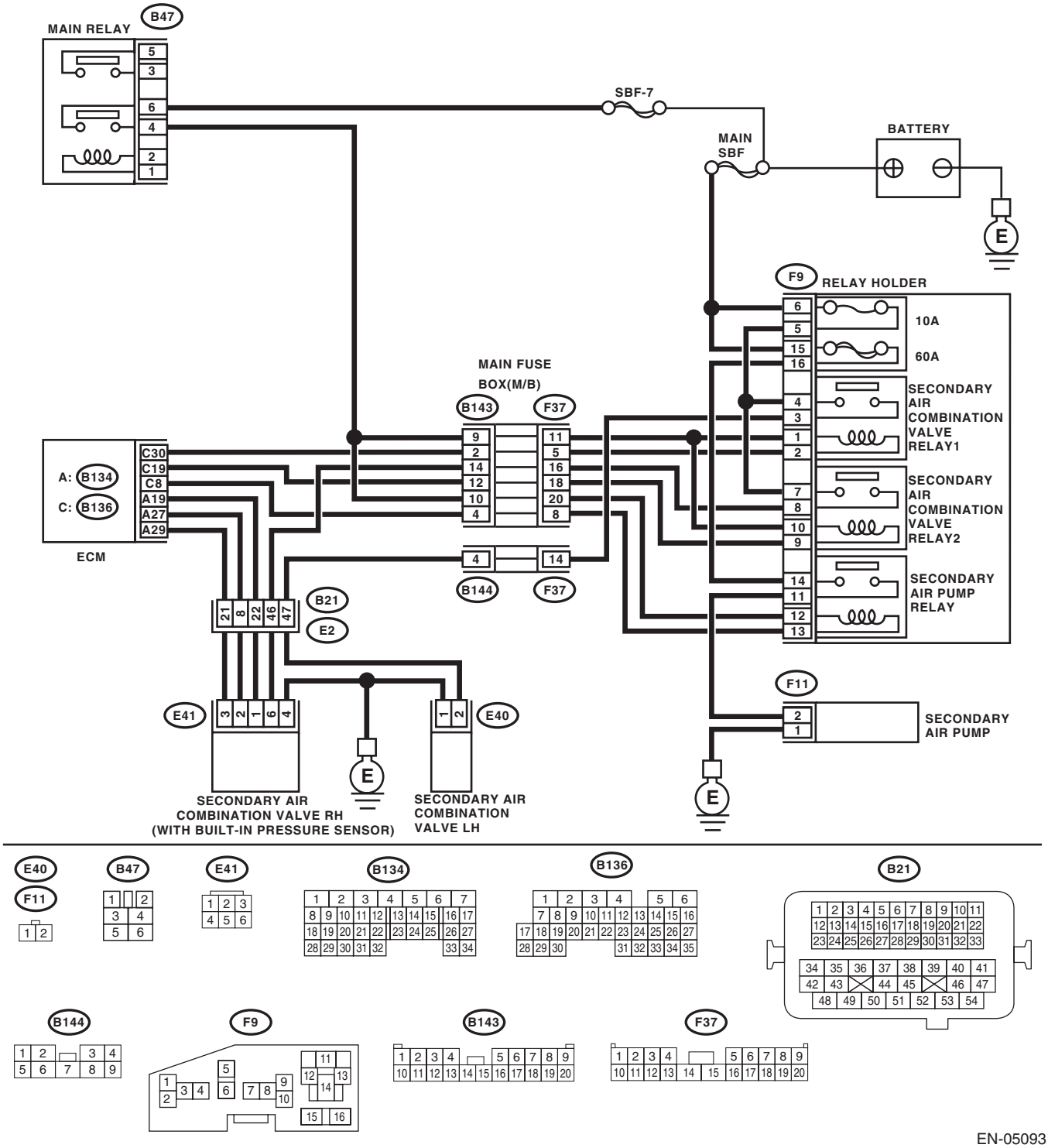
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-271, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SECONDARY AIR COMBINATION VALVE FUSE.** Check if the secondary air combination valve fuse (10 A) is blown out.	Is the fuse blown out?	Go to step **2**.	Go to step **3**.
2	**CHECK HARNESS BETWEEN FUSE BOX AND SECONDARY AIR COMBINATION VALVE RH.** 1) Remove the secondary air combination valve fuse (10 A) from the fuse box. 2) Disconnect the connector from the secondary air combination valve RH. 3) Measure the resistance between the secondary air combination valve fuse and secondary air combination valve RH connector, and chassis ground. ***Connector & terminal*** ***(F9) No. 5 — Chassis ground:*** ***(E41) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the fuse with a new part, and connect the secondary air combination valve RH connector. Go to step **3**.	Repair the ground short circuit of harness between the fuse box and the secondary air combination valve RH.
3	**CHECK SECONDARY AIR COMBINATION VALVE RH OPERATION.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air combination valve RH using the Subaru Select Monitor. NOTE: Refer to “Compulsory Valve Operation Check Mode” for more operation procedures. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the secondary air combination valve RH repeatedly switch to ON and OFF?	Go to step **4**.	Go to step **6**.
4	**CHECK DUCT BETWEEN SECONDARY AIR PUMP AND SECONDARY AIR COMBINATION VALVE RH.** Check the duct between the secondary air pump and secondary air combination valve RH.	Is there damage, clog or disconnection of the duct?	Replace, clean or connect the duct.	Go to step **5**.
5	**CHECK PIPE BETWEEN SECONDARY AIR COMBINATION VALVE RH AND CYLINDER HEAD.** Check the pipe between the secondary air combination valve RH and cylinder head.	Is there damage, clog or disconnection of the pipe?	Replace, clean or connect the pipe.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO SECONDARY AIR COMBINATION VALVE RH.** 1) Disconnect the connector from the secondary air combination valve RH. 2) In the condition of step 3, measure the voltage between the secondary air combination valve RH and the chassis ground. ***Connector & terminal*** ***(E41) No. 6 (+) — Chassis ground (–):***	Does the voltage repeatedly change between 10 V and 0 V?	Replace the secondary air combination valve RH. <Ref. to EC(H4DOTC)-21, Secondary Air Combi Valve.>	Go to step **7**.
7	**CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RH AND CHASSIS GROUND.** Measure the resistance between the secondary air combination valve RH connector and chassis ground. ***Connector & terminal*** ***(E41) No. 4 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **8**.	Repair the open circuit of harness between secondary air combination valve RH and chassis ground.
8	**CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RELAY 2 AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air combination valve relay 2 from the relay box. 3) Measure the resistance of the harness between the secondary air combination valve relay 2 and secondary air combination valve RH connector. ***Connector & terminal*** ***(F9) No. 8 — (E41) No. 6:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the open circuit of the harness between the secondary air combination valve relay 2 and secondary air combination valve RH connector.
9	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 2.** 1) Connect the battery to terminals No. 10 and No. 9 of the secondary air combination valve relay 2. 2) Measure the resistance between the secondary air combination valve relay 2 terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **10**.	Replace the secondary air combination valve relay 2. <Ref. to EN(H4DOTC)(diag)-8, Electrical Component Location.>
10	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 2.** Measure the resistance between the secondary air combination valve relay 2 terminals with the battery disconnected. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance 1 MΩ or more?	Go to step **11**.	Replace the secondary air combination valve relay 2. <Ref. to EN(H4DOTC)(diag)-8, Electrical Component Location.>
11	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 2 POWER SOURCE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air combination valve relay 2 connector and chassis ground. ***Connector & terminal*** ***(F9) No. 7 (+) — Chassis ground (–):*** ***(F9) No. 10 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **12**.	Repair the open or ground short circuit of power supply circuit.

	Step	Check	Yes	No
12	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of harness between ECM and secondary air combination valve relay 2 connector. ***Connector & terminal*** ***(B136) No. 19 — (F9) No. 9:***	Is the resistance less than 1 Ω?	Go to step **13**.	Repair the open circuit of harness between ECM and secondary air combination valve relay 2 connector.
13	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2 CONNECTOR.** Measure the resistance between the secondary air combination valve relay 2 connector and chassis ground. ***Connector & terminal*** ***(F9) No. 9 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact in ECM connector.	Repair the ground short circuit of harness between ECM and secondary air combination valve relay 2 connector.

EN:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2)

NOTE:
For the diagnostic procedure, refer to DTC P2442. <Ref. to EN(H4DOTC)(diag)-368, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EO:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

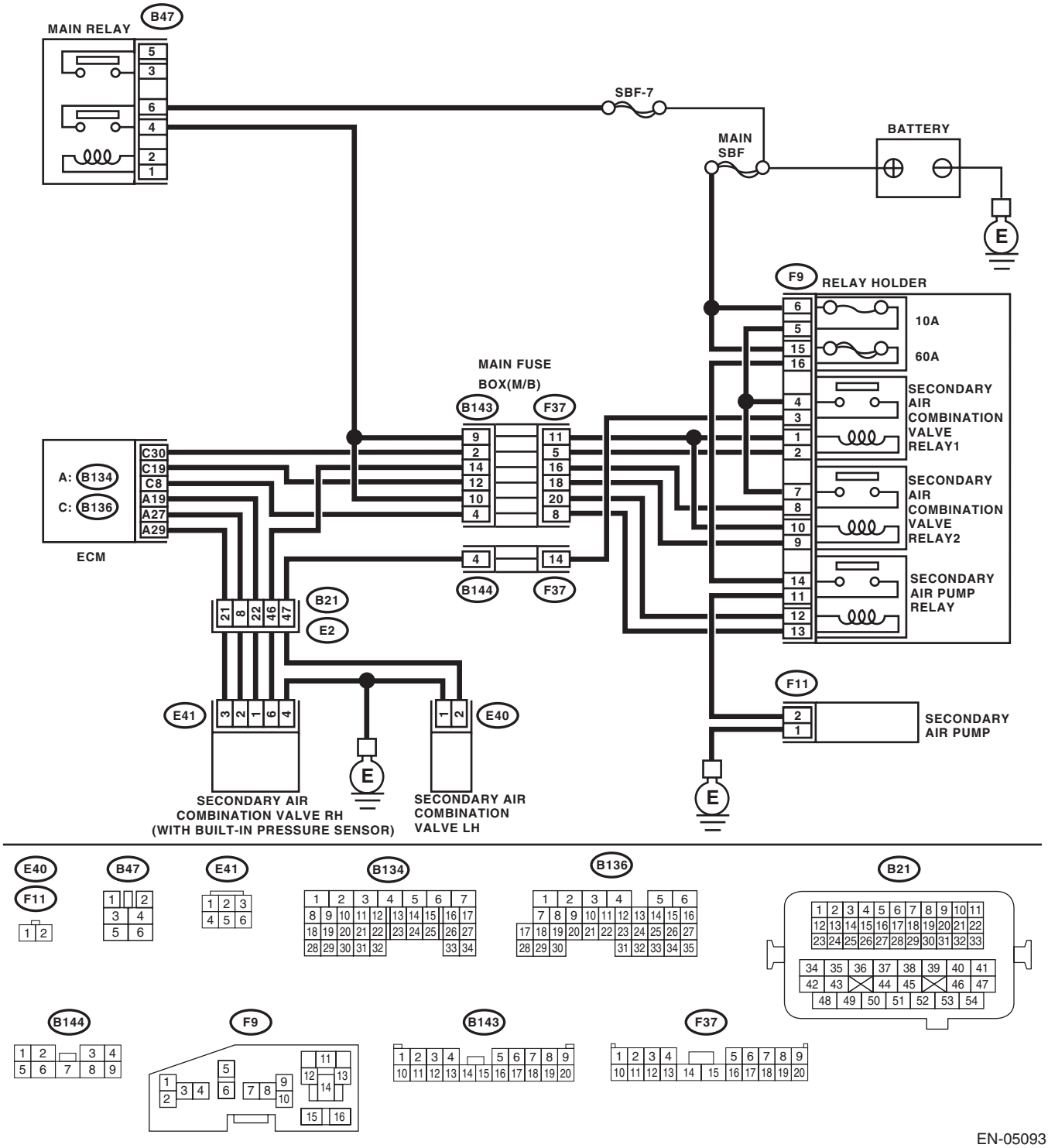
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-272, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SECONDARY AIR PIPING PRESSURE.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, read secondary air piping pressure data, and compare with the actual barometric pressure. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the actual difference with atmospheric pressure 50 mmHg (6.7 kPa, 2.0 inHg, 0.97 psig) or more?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.
2	**CHECK SECONDARY AIR PUMP.** 1) Start the engine and warm-up engine until coolant temperature is higher than 70°C (158°F). 2) Check whether or not the secondary air pump is operating.	Is the secondary air pump operating?	Go to step **3**.	Replace the secondary air combination valve LH. <Ref. to EC(H4DOTC)-21, INSPECTION, Secondary Air Combi Valve.>
3	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from the relay box. 3) Measure the resistance between the secondary air pump relay connector and engine ground terminals. ***Connector & terminal*** ***(F9) No. 13 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the ground short circuit of harness between ECM and secondary air pump relay connector.
4	**CHECK SECONDARY AIR PUMP RELAY.** Measure the resistance between the secondary air pump relay terminals. ***Terminals*** ***No. 14 — No. 11:***	Is the resistance 1 MΩ or more?	Repair the short circuit to power in the harness between secondary air pump relay and secondary air pump connector.	Replace the secondary air pump relay. <Ref. to EN(H4DOTC)(diag)-8, Electrical Component Location.>

20.Diagnostic Procedure without Diagnostic Trouble Code (DTC)

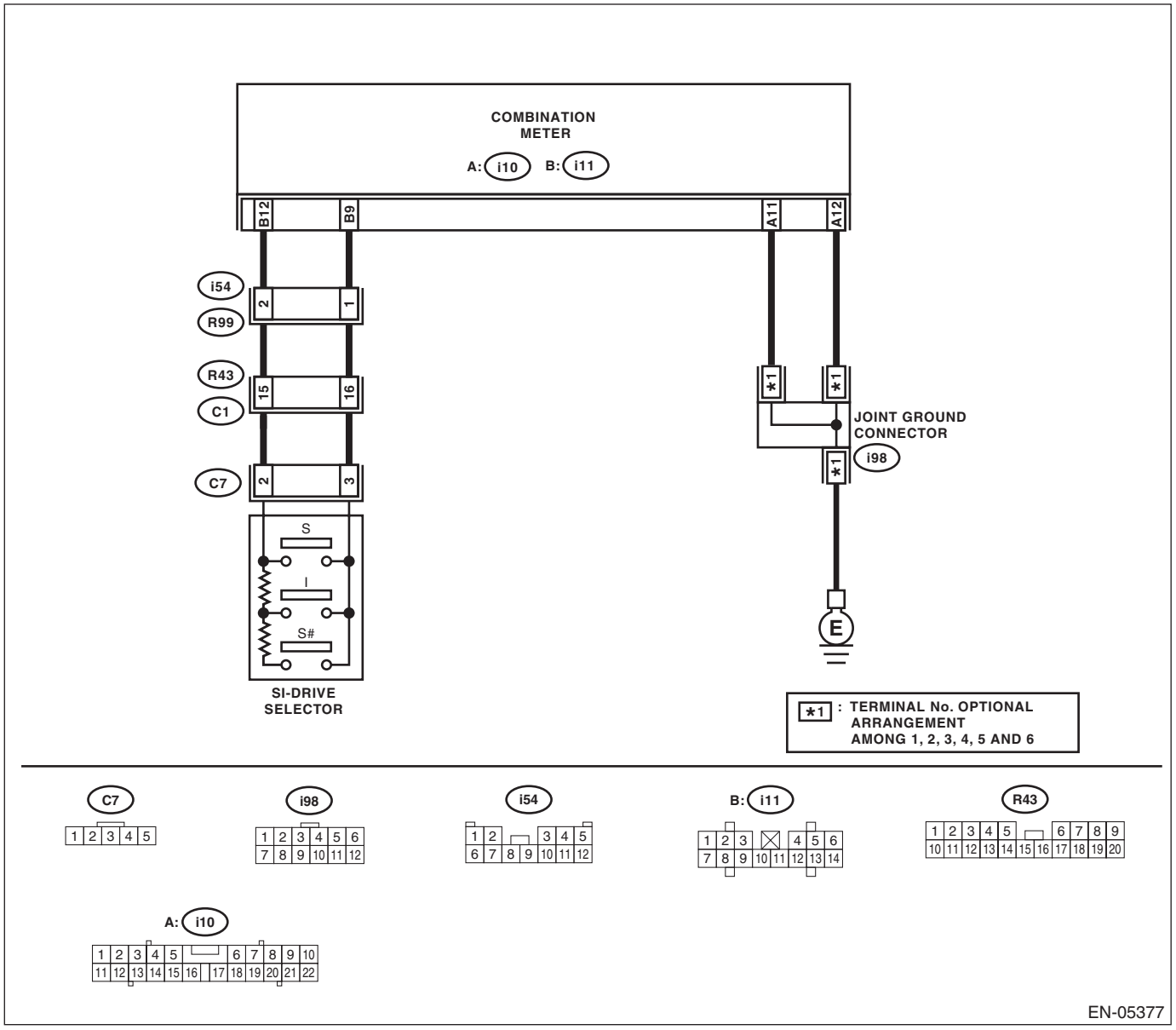
A: CHECK SI-DRIVE SYSTEM

DIAGNOSIS:
SI-DRIVE mode will not change.

CAUTION:
Note that the SI-DRIVE system performs the following control when changing modes.
1. When the engine is cold, the low coolant temperature display will light in the multi-information display meter. In this case, it will not be possible to change to the S# (sports sharp) mode.
2. If the engine is stopped in the S# (sports sharp) mode, it will be in the S (sports) mode when the engine is restarted.
3. If the engine is stopped in the S (sports) or I (intelligent) mode, then restarted, it will enter the mode it was on before stopping the engine.
4. If the malfunction indicator light becomes lit while the engine is running, it will enter the S (sports) mode. In this case, it will not be possible to change to the S# (sports sharp) or I (intelligent) mode.
5. If there is a possible engine coolant temperature overheat condition, it will not be possible to switch to the S# (sports sharp) mode. When driving in the S# (sports sharp) mode, it will enter the S (sports) mode.

1. EVEN WHEN THE SI-DRIVE MODE IS CHANGED, THE MULTI-INFORMATION DISPLAY DOES NOT CHANGE, AND THE MODE DOES NOT SWITCH.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SI-DRIVE SELECTOR.** 1) Disconnect the connector from the multi-information display meter. 2) Measure the resistance between connectors when the SI-DRIVE selector is operated. ***Connector & terminal*** ***(i11) No. 9 — (i11) No. 12:***	Does the resistance change as shown below? S#: 3.48 — 3.85 kΩ I: 0.95 — 1.05 kΩ S: less than 1 Ω	Go to step **2**.	Go to step **4**.
2	**CHECK POOR CONTACT.** Check the following items. • Cracked or improperly connected connector • Broken connector pin • Disconnection of connector terminal	Is there any abnormal condition?	Correct the cause of trouble.	Go to step **3**.
3	**RECHECK FAULT.** 1) Connect all connectors. 2) Change the SI-DRIVE mode.	Is there any abnormal condition?	Replace the multi-information display meter. <Ref. to IDI-19, Combination Meter.>	The circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
4	**CHECK SI-DRIVE SELECTOR HARNESS AND CONNECTOR.** Check the following items. • Short or open circuit in the harness • Improperly connected or loose terminal in the SI-DRIVE selector connector • Improperly connected or loose terminal in coupling connector	Is there any abnormal condition?	Correct the cause of trouble.	Go to step **5**.
5	**RECHECK FAULT.** 1) Connect all connectors. 2) Change the SI-DRIVE mode.	Is there any abnormal condition?	Replace the SI-DRIVE selector. <Ref. to FU(H4DOTC)-43, SI-DRIVE Selector.>	The circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.

2. WHEN THE SI-DRIVE MODE IS CHANGED, "MODE CHANGE ERROR" APPEARS IN THE MULTI-INFORMATION DISPLAY APPROXIMATELY 5 SECONDS LATER.

	Step	Check	Yes	No
1	**CHECK DTC.**	Is DTC displayed?	Check for the corresponding DTC using the "List of Diagnostic Trouble Code (DTC)" for each unit.	Go to step **2**.
2	**CHECK DISPLAY OF MULTI-INFORMATION DISPLAY METER.** Check whether there are other errors displayed other than the "Mode Change Error". Example: • "Err" is displayed in the external temperature or fuel consumption displays. • FUEL gauge, TEMP gauge or ECO gauge does not move.	Is there other errors displayed other than the "Mode Change Error"?	For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Go to step **3**.
3	**CHECK MULTI-INFORMATION DISPLAY METER AND ECM.**	Is the multi-information display meter and ECM part numbers correct?	Replace the multi-information display meter. <Ref. to IDI-19, Combination Meter.>	Replace the multi-information display meter and/or ECM to that of the correct part number. <Ref. to IDI-19, Combination Meter.> or <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

3. WHEN THE SI-DRIVE MODE IS CHANGED, "MODE CHANGE ERROR" IS NOT DISPLAYED IN MULTI-INFORMATION DISPLAY, AND "S#", "I", "S" FLASHES.

NOTE:
In this case, there may be a problem outside the SI-DRIVE system.

	Step	Check	Yes	No
1	**CHECK MALFUNCTION INDICATOR LIGHT.** 1) Start the engine. 2) Check whether the malfunction indicator light is lit or not.	Does the malfunction indicator light illuminate?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-81, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ENGINE COOLANT TEMPERATURE GAUGE.** 1) Turn the ignition switch to ON. 2) Check the engine coolant temperature gauge.	Is the coolant overheating?	Investigate and repair the cause of the overheating.	Go to step **3**.
3	**CHECK DISPLAY OF MULTI-INFORMATION DISPLAY.** 1) Turn the ignition switch to ON. 2) Change the SI-DRIVE mode. 3) Check the display of the multi-information display.	Do the displays "S#", "I", "S" of the multi-information display flash?	Replace the multi-information display meter. <Ref. to IDI-19, Combination Meter.>	Perform test operation, and check the malfunction indicator and the coolant temperature gauge. If they are operating normally, end the diagnosis.

21.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-87, 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)

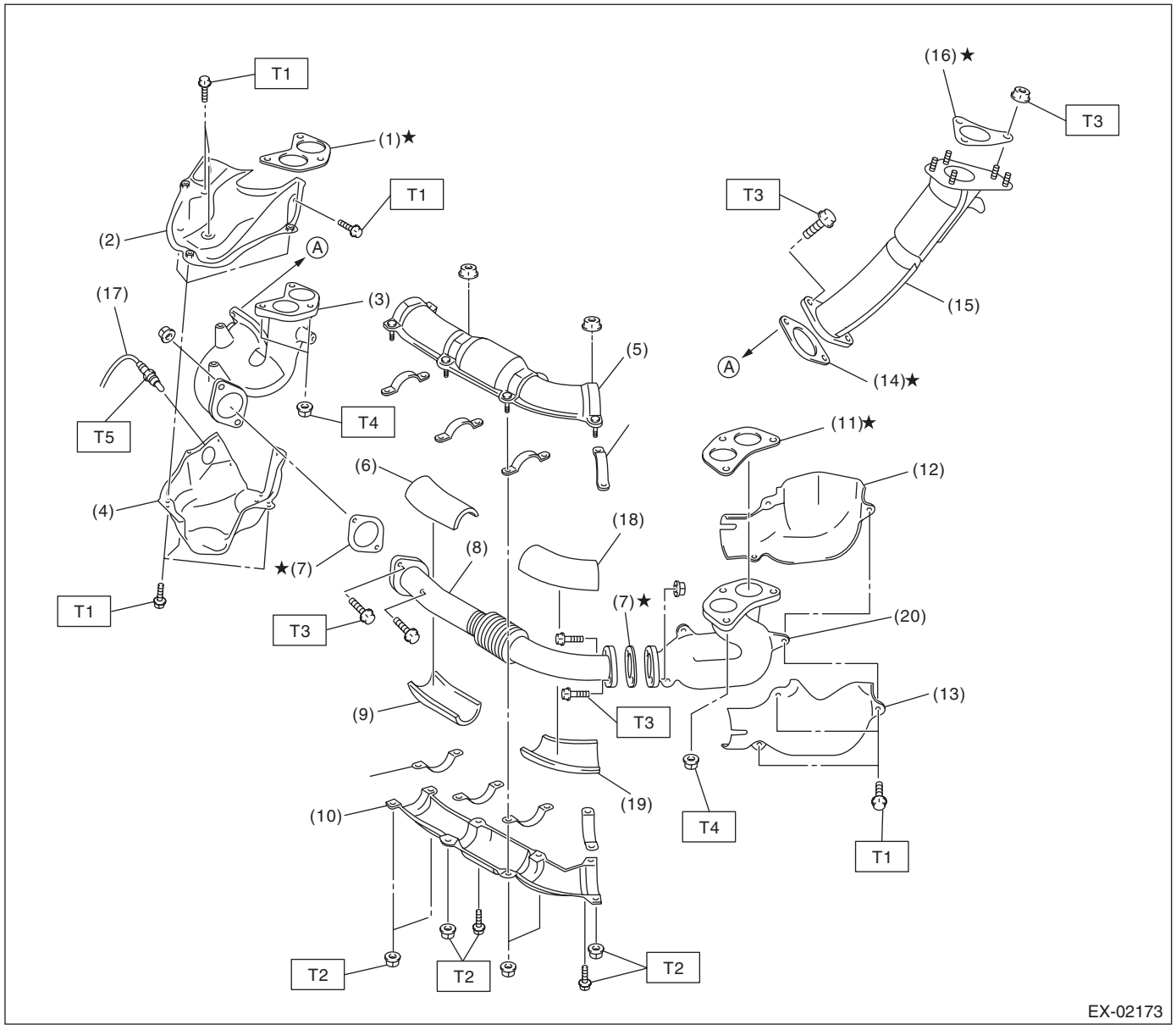
Page

1. List of Diagnostic Trouble Code (DTC) 2
2. Diagnostic Trouble Code (DTC) Detecting Criteria 10

1. General Description

A: COMPONENT

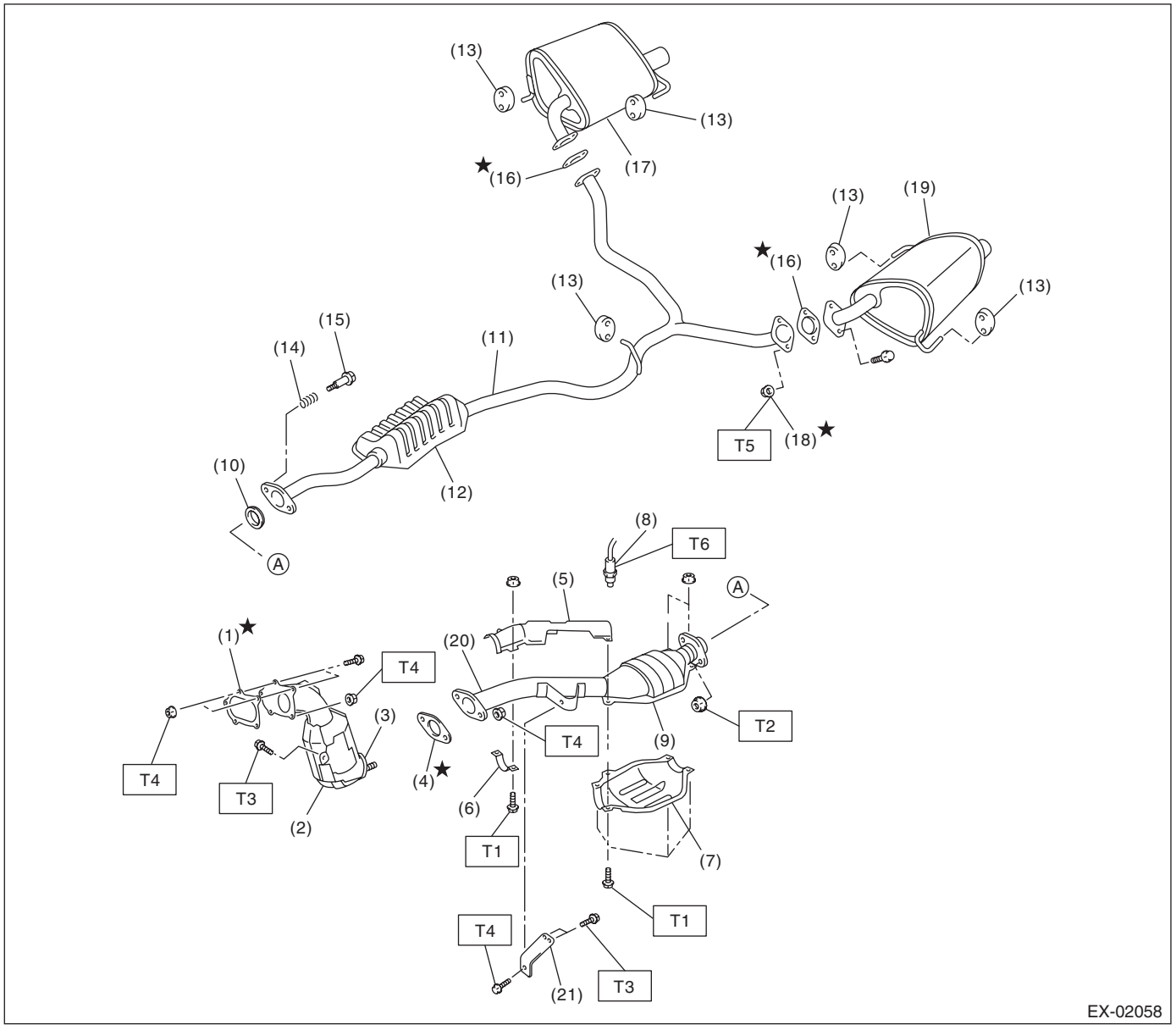
1. FRONT EXHAUST PIPE



(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 outer cover (LH)
(14) Gasket
(15) Turbocharger joint pipe
(16) Gasket
(17) Front oxygen (A/F) sensor
(18) Front exhaust pipe upper insulator (LH)
(19) Front exhaust pipe lower insulator (LH)
(20) Exhaust manifold (LH)

Tightening torque:N·m (kgf-m, ft-lb)
T1: 19 (1.9, 14.0)
T2: 25 (2.5, 18.4)
T3: 35 (3.6, 26.0)
T4: 40 (4, 28.9)
T5: <Ref. to FU(H4DOTC)-41, INSTALLATION, Front Oxygen (A/F) Sensor.>

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



EX-02058

(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)-42, Sen-INSTALLATION, Rear Oxygen sor.>

B: CAUTION

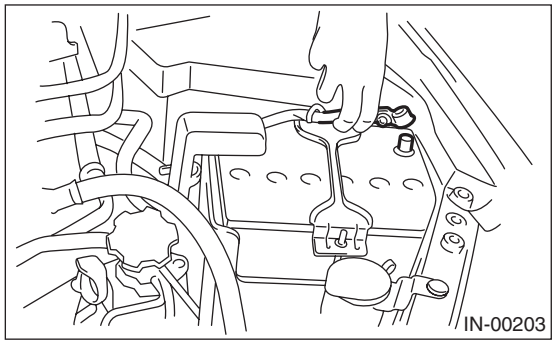
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal,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

2. Front Exhaust Pipe

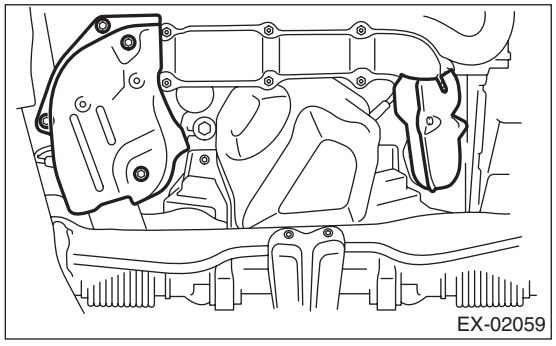
A: REMOVAL

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

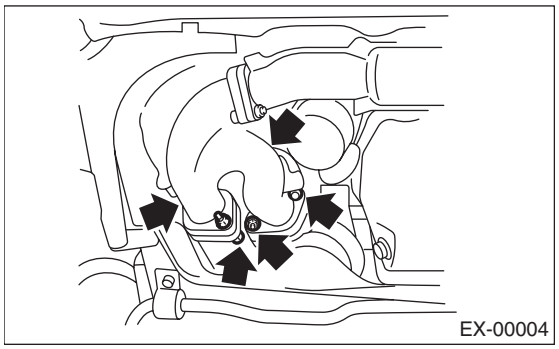
1) Set the vehicle on a lift.
2) Disconnect the ground cable from the battery.

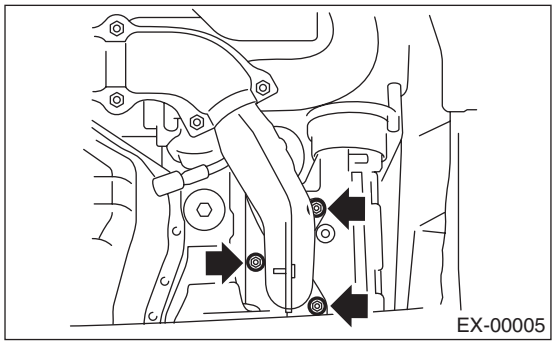


3) Remove the front oxygen (A/F) sensor.<Ref. to FU(H4DOTC)-40, REMOVAL, Front Oxygen (A/F) Sensor.>
4) Remove the under cover.
5) Remove the exhaust manifold lower cover (RH) and the exhaust manifold cover (LH).

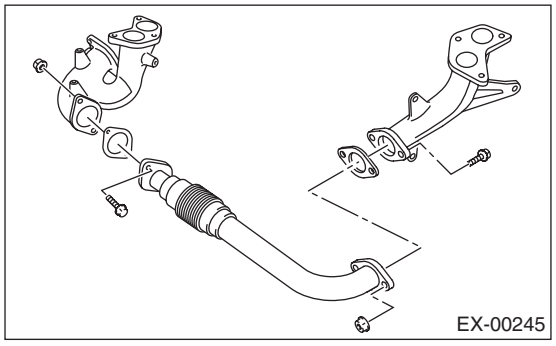


6) Remove the bolts and nuts which hold front exhaust pipe assembly onto turbocharger joint pipe.
7) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold the front exhaust pipe assembly to cylinder head exhaust port.





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

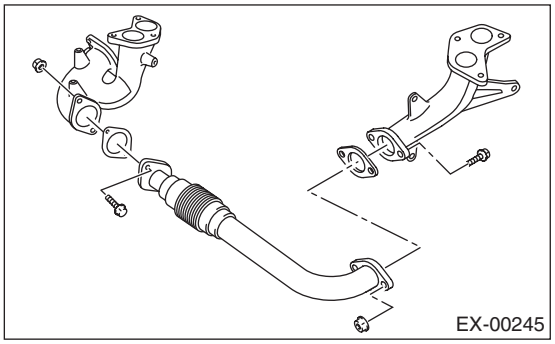


B: INSTALLATION

1) Install the front exhaust pipe and the exhaust manifold.

NOTE:
Use a new gasket.

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



2) Install the front exhaust pipe cover.

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

3) Install the exhaust manifold upper cover (RH).

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

4) Install the front exhaust pipe assembly.

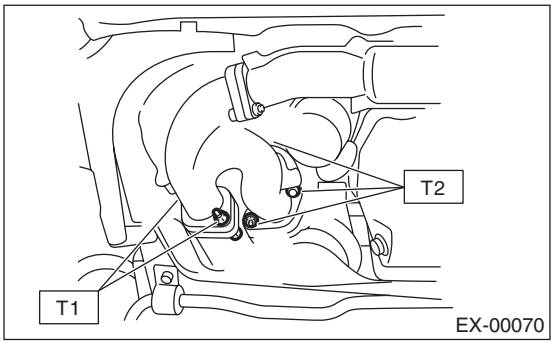
NOTE:
Use a new gasket.

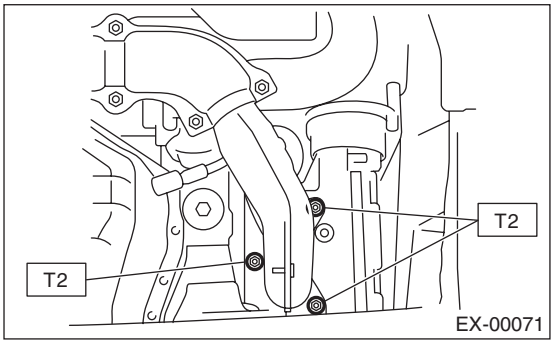
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

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

NOTE:
Use a new gasket.

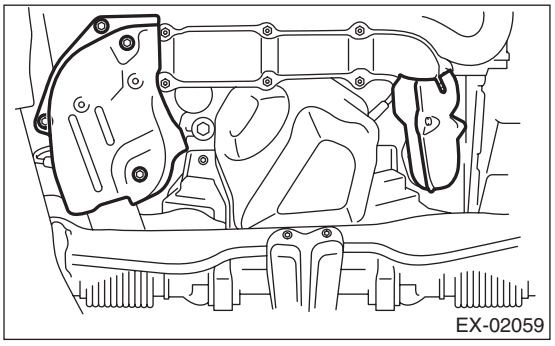
Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26.0 ft-lb)
T2: 40 N·m (4.0 kgf-m, 28.9 ft-lb)



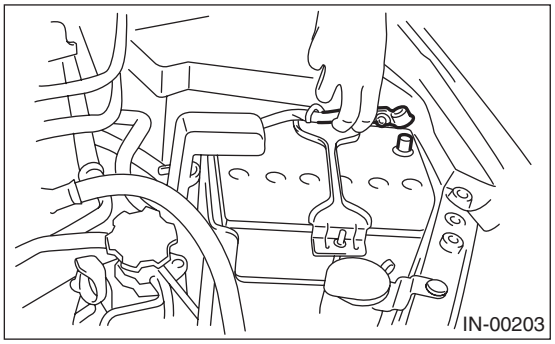


6) Install the exhaust manifold lower cover (RH) and the exhaust manifold cover (LH).

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



7) Install the front oxygen (A/F) sensor.<Ref. to FU(H4DOTC)-41, INSTALLATION, Front Oxygen (A/F) Sensor.>
8) Install the under cover.
9) Lower the vehicle.
10) Connect the battery ground cable to battery.



C: INSPECTION

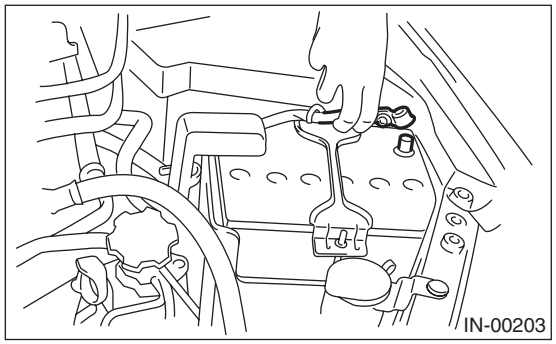
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.

3. Center Exhaust Pipe

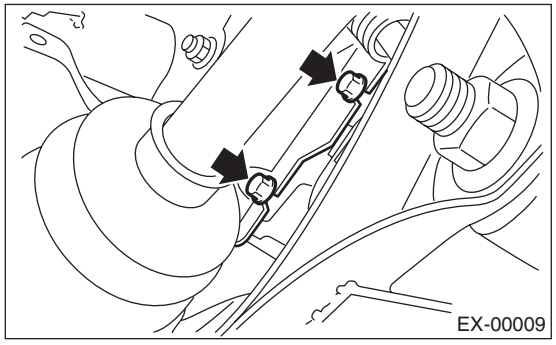
A: REMOVAL

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

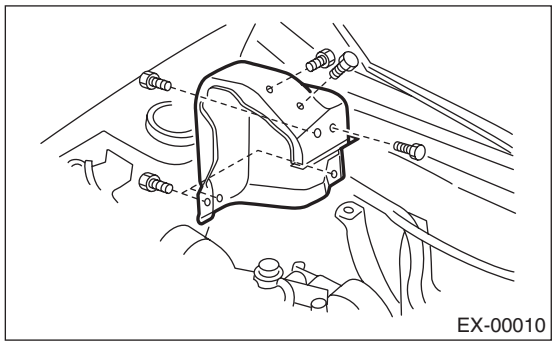
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from the battery.



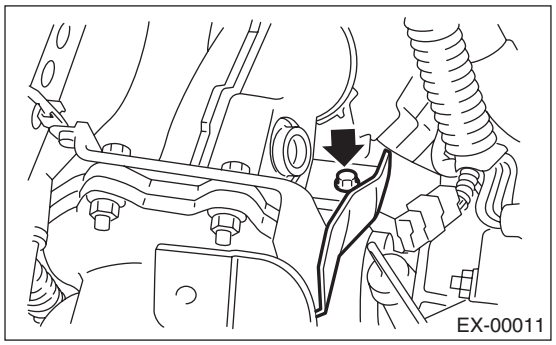
4) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
5) Lift up the vehicle.
6) Remove the under cover.
7) Remove the bolts which install the lower side of turbocharger lower cover.



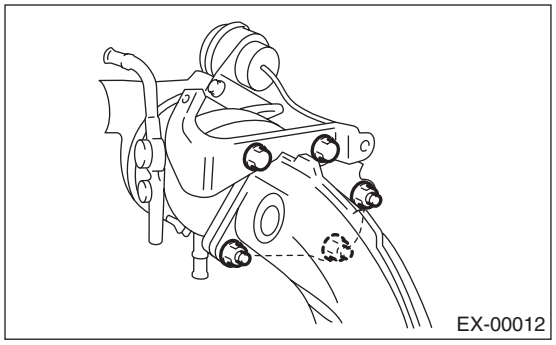
8) Lower the vehicle.
9) Remove the turbocharger upper cover.



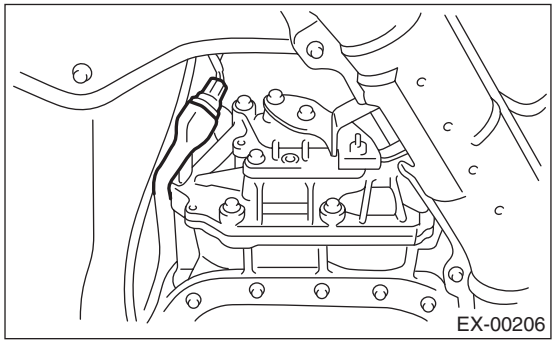
10) Remove the bolts which hold the turbocharger lower cover and center exhaust pipe.



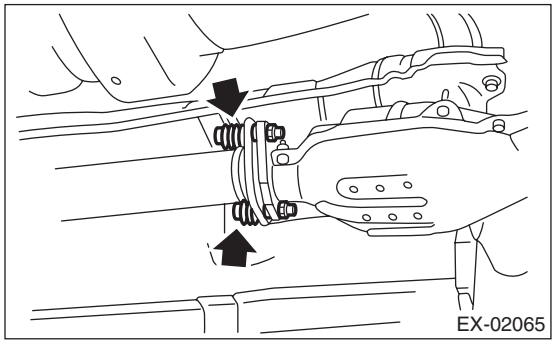
11) Separate the center exhaust pipe from turbocharger.



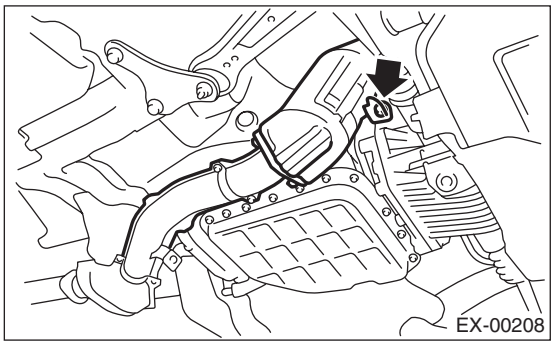
12) Lift up the vehicle.
13) Disconnect the connector from the rear oxygen sensor.



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

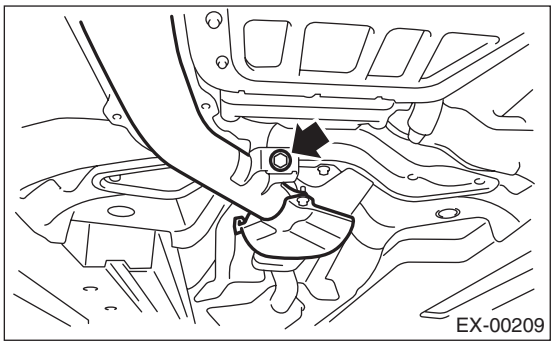


15) Remove the bolt which holds center exhaust pipe bracket to transmission.

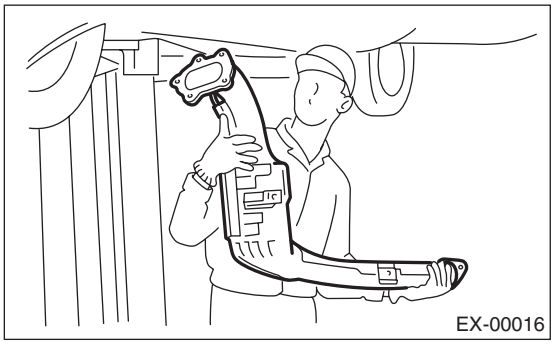


16) Remove the intercooler bracket.
17) Remove the bolt which holds center exhaust pipe to hanger bracket.

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



18) Remove the center exhaust pipe.

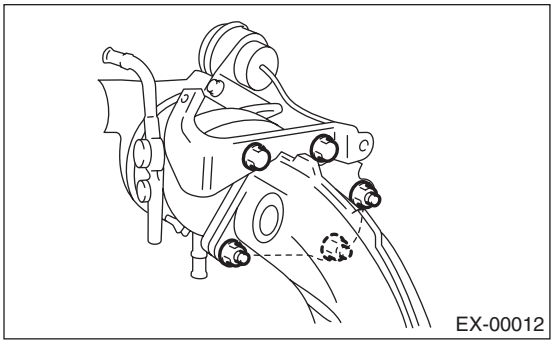


B: INSTALLATION

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.

NOTE:
Use a new gasket.

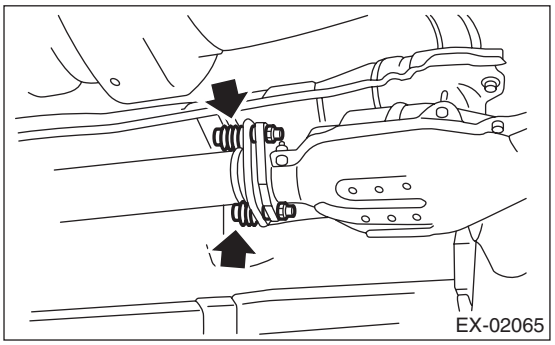
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



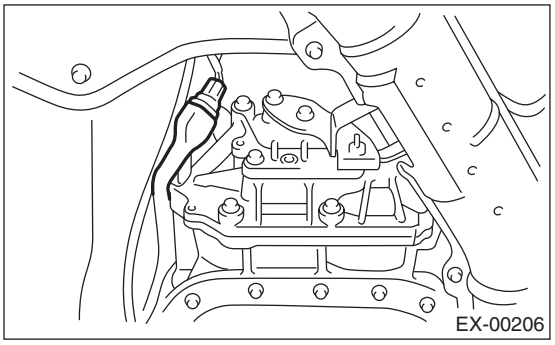
4) Install the center exhaust pipe to rear exhaust pipe.

NOTE:
Use a new gasket.

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

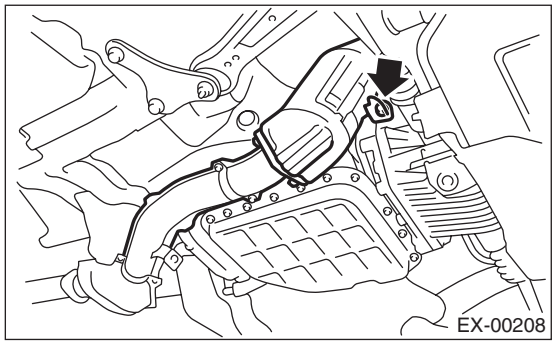


5) Connect the connector to rear oxygen sensor.



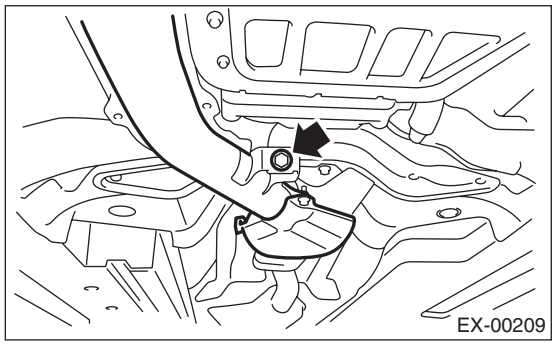
6) Tighten the bolt which holds center exhaust pipe bracket to transmission.

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



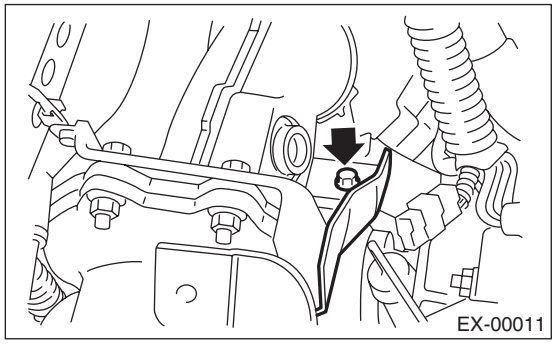
7) Tighten the bolt which holds center exhaust pipe to hanger bracket.

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



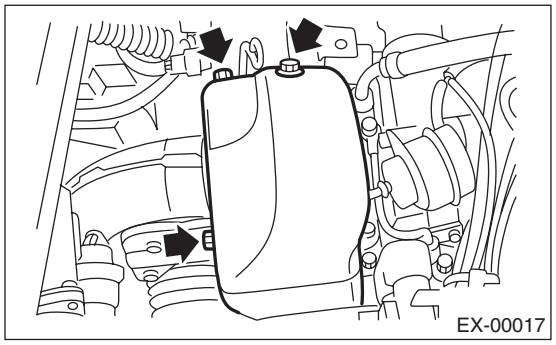
8) Lower the vehicle.
9) Position the turbocharger lower cover, and tighten the bolts which hold the lower cover and center exhaust pipe.

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



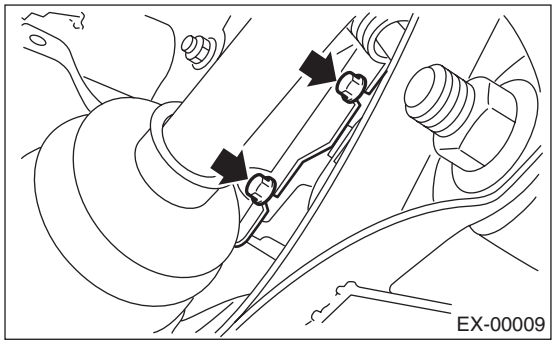
10) Position the turbocharger upper cover, and tighten the bolts which install the upper side of upper cover.

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

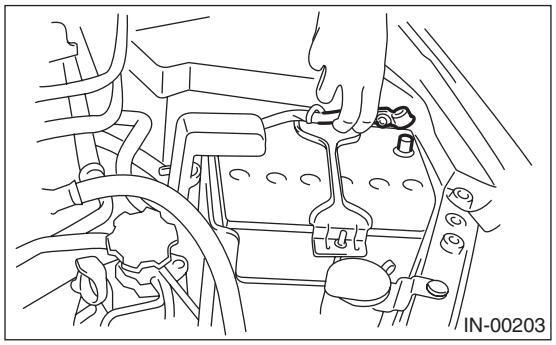


11) Lift up the vehicle.
12) Tighten the bolts which install the under side of turbocharger lower cover.

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



13) Install the under cover.
14) Lower the vehicle.
15) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
16) Install the collector cover.
17) Connect the battery ground cable to battery.



C: INSPECTION

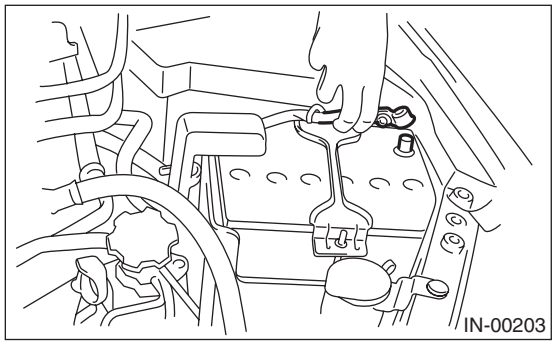
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.

4. Joint Pipe

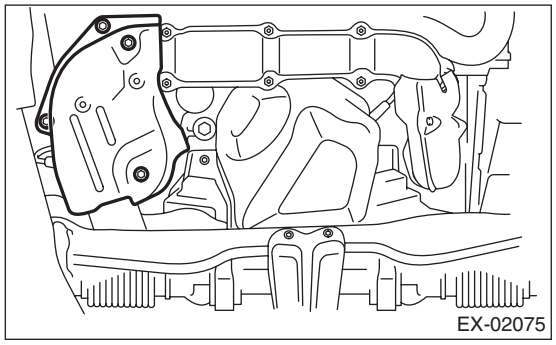
A: REMOVAL

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

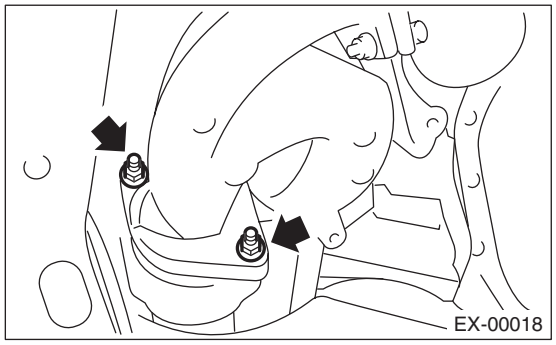
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from the battery.



4) Remove the front oxygen (A/F) sensor.<Ref. to FU(H4DOTC)-40, 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.



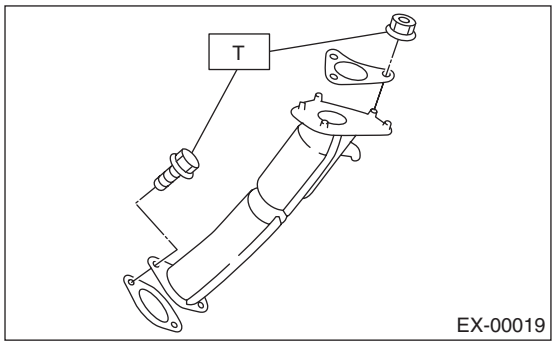
8) Remove the center exhaust pipe.<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
9) Remove the turbocharger. <Ref. to IN(H4DOTC)-14, REMOVAL, Turbocharger.>
10) Take off the joint pipe in the upward direction.

B: INSTALLATION

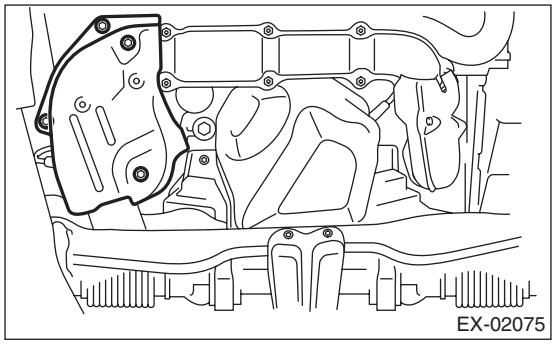
Install in the reverse order of removal.

NOTE:
Use a new gasket.

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



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



C: INSPECTION

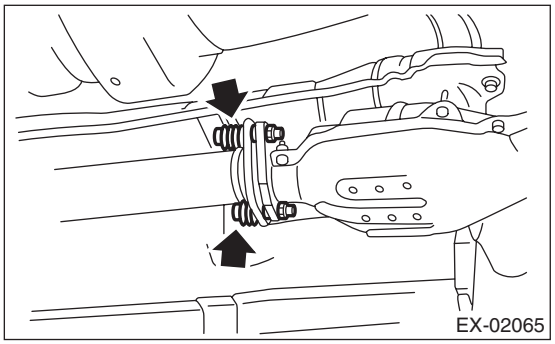
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.

5. Rear Exhaust Pipe

A: REMOVAL

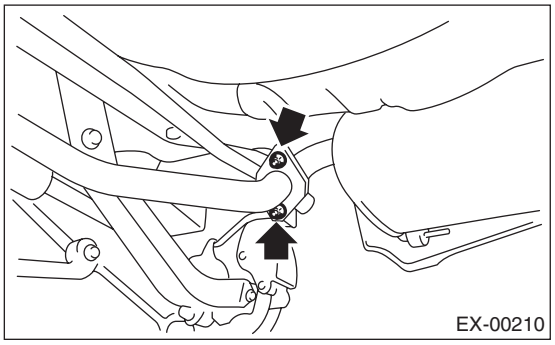
CAUTION:
Be careful not to burn yourself, because the exhaust pipe becomes extremely hot after running.

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

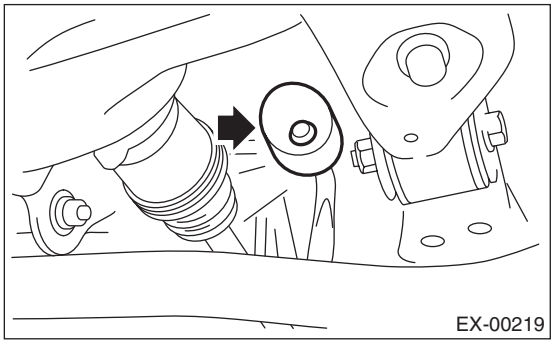


4) Separate the rear exhaust pipe from both mufflers.

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



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

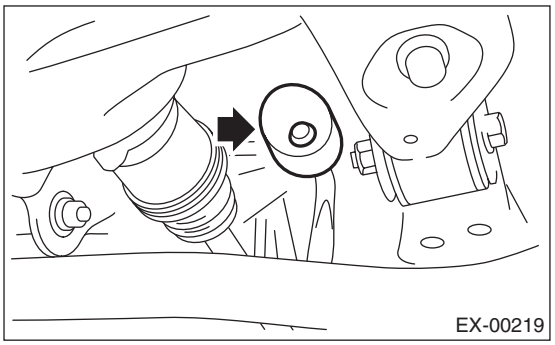


7) Remove the rear exhaust pipe.

B: INSTALLATION

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

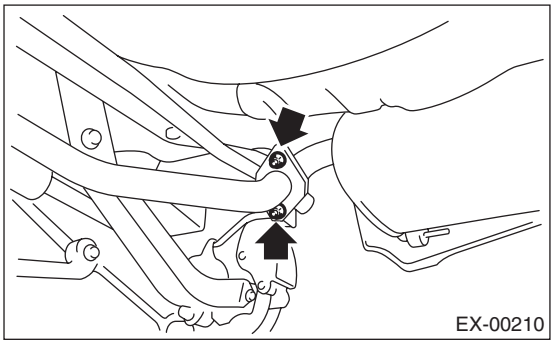
NOTE:
After assembling, degrease the lubricant which was applied to the cushion rubber while removing/installing.



3) Install the rear exhaust pipe to both mufflers.

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

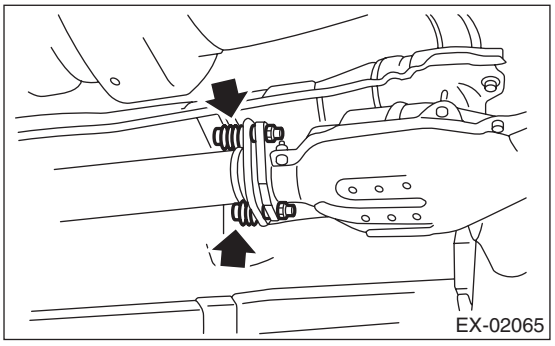
Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



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

NOTE:
Use a new gasket.

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



5) Lower the vehicle.

C: INSPECTION

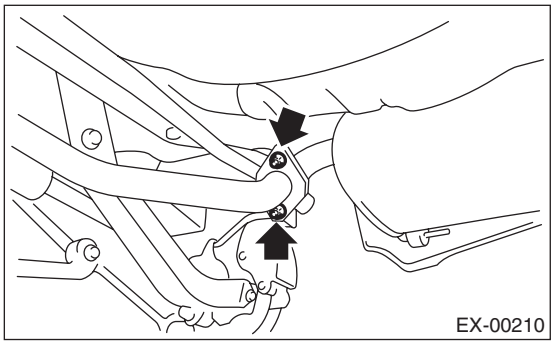
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.
3) Check the cushion rubber for wear or crack.

6. Muffler

A: REMOVAL

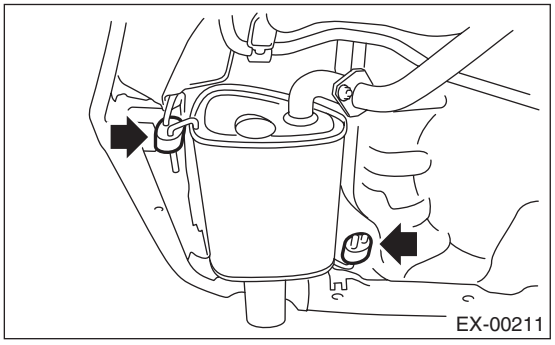
CAUTION:
Be careful not to burn yourself, because the exhaust pipe becomes extremely hot after running.

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



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

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



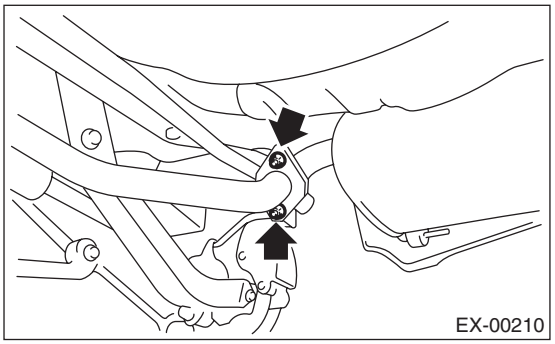
6) Perform the same procedures for the muffler (LH).

B: INSTALLATION

Install in the reverse order of removal.

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

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



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
1.	General Description	2
2.	Radiator Fan System	8
3.	Engine Coolant	13
4.	Water Pump	15
5.	Thermostat	17
6.	Radiator	19
7.	Radiator Cap	23
8.	Radiator Main Fan and Fan Motor	24
9.	Radiator Sub Fan and Fan Motor	27
10.	Reservoir Tank	30
11.	Coolant Filler Tank	31
12.	Engine Cooling System Trouble in General	32

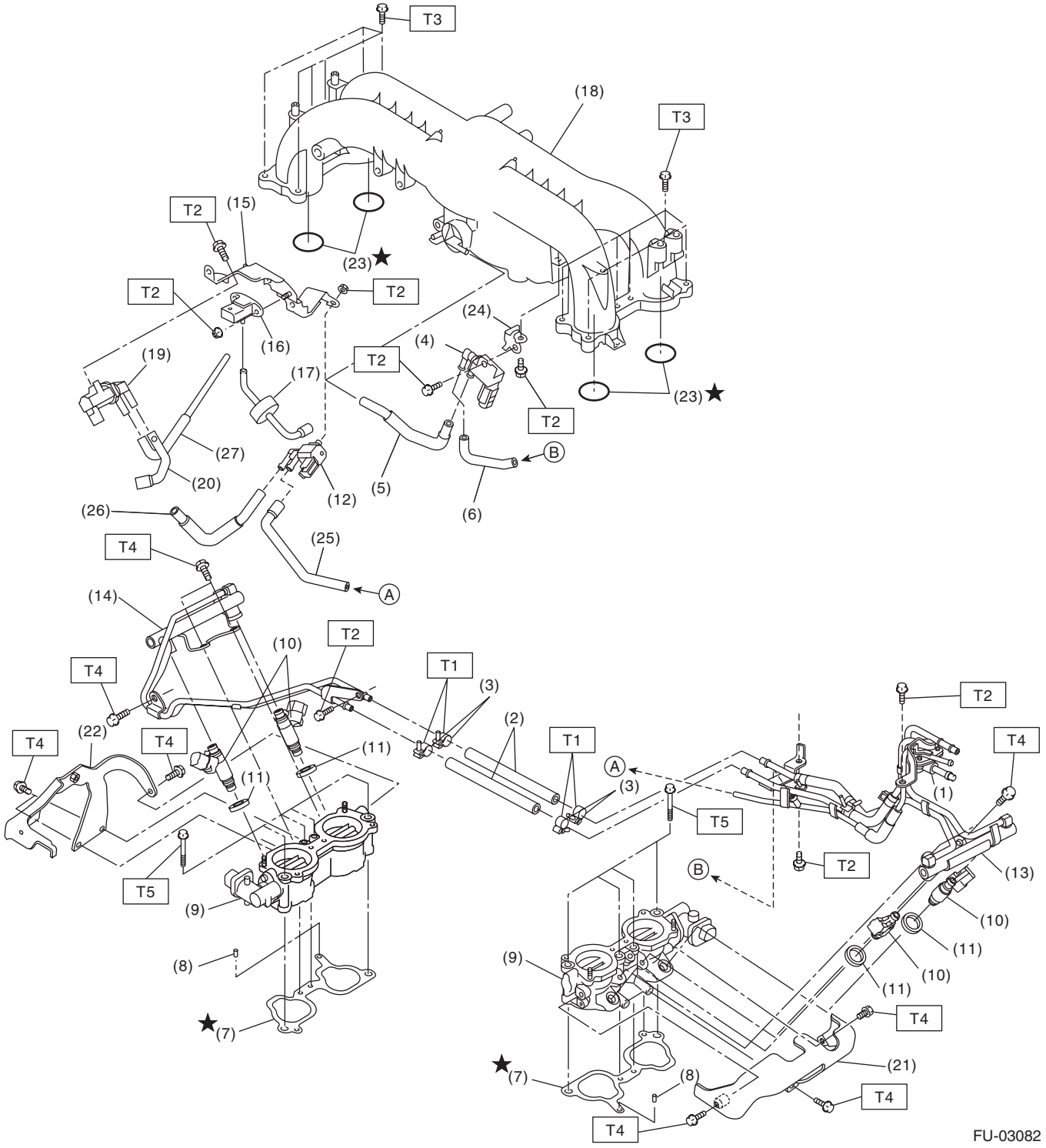
1. General Description

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

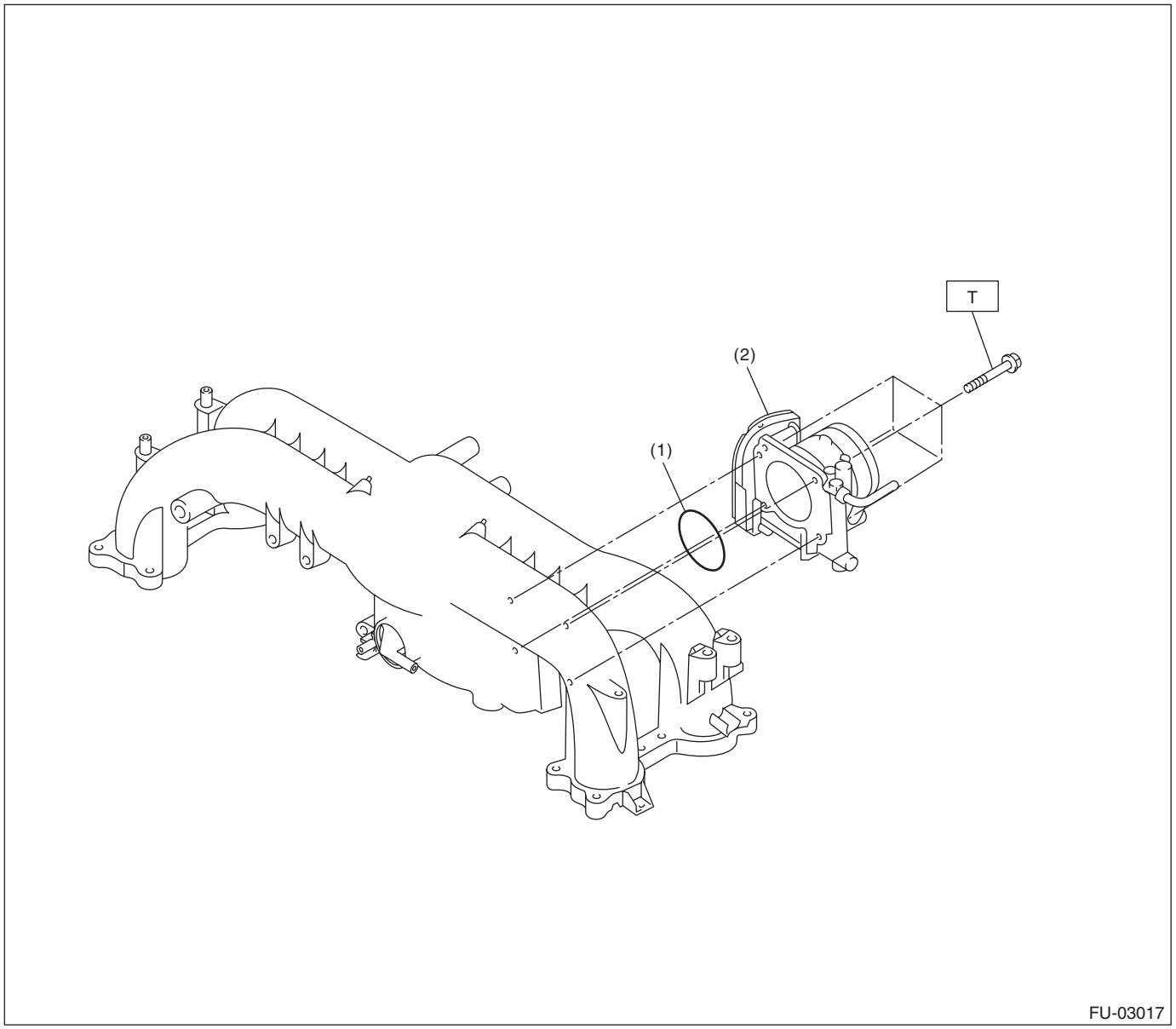
1. INTAKE MANIFOLD



(1) Pressure regulator
(2) Fuel hose
(3) Clamp
(4) Purge control solenoid valve 1
(5) Vacuum hose D
(6) Vacuum hose C
(7) Intake manifold gasket
(8) Guide pin
(9) Intake manifold (lower)
(10) Fuel injector
(11) Seal ring
(12) Purge control solenoid valve 2
(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) Fuel pipe protector LH
(22) Fuel pipe protector RH
(23) O-ring
(24) Solenoid valve bracket
(25) Vacuum hose B
(26) Vacuum hose A
(27) Air control hose

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.25 (0.13, 0.94)
T2: 3.5 (0.36, 2.6)
T3: 6.4 (0.65, 4.7)
T4: 8.3 (0.85, 6.1)
T5: 19 (1.9, 14)
T6: 25 (2.5, 18)

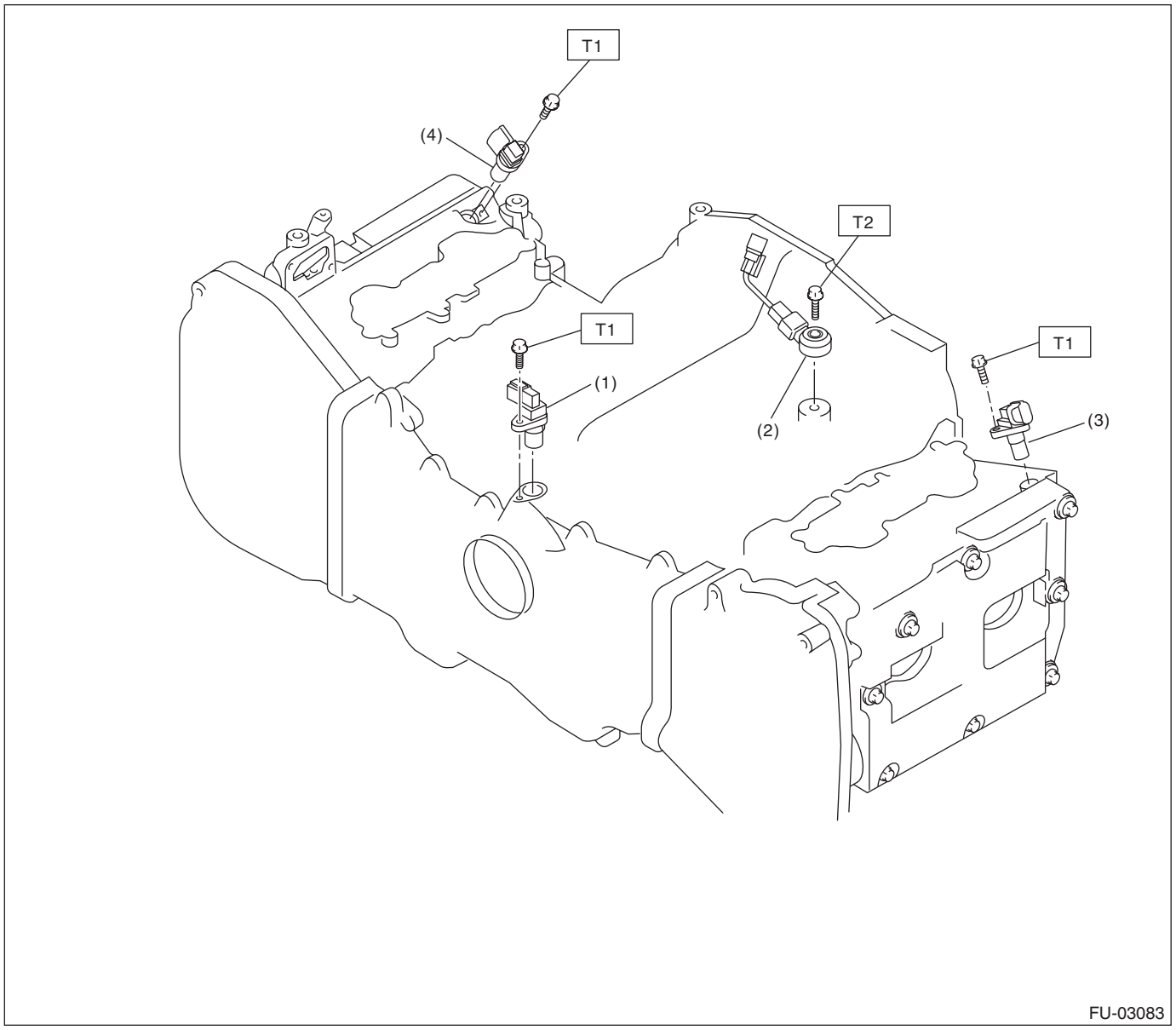
2. AIR INTAKE SYSTEM



(1) O-ring
(2) Throttle body

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

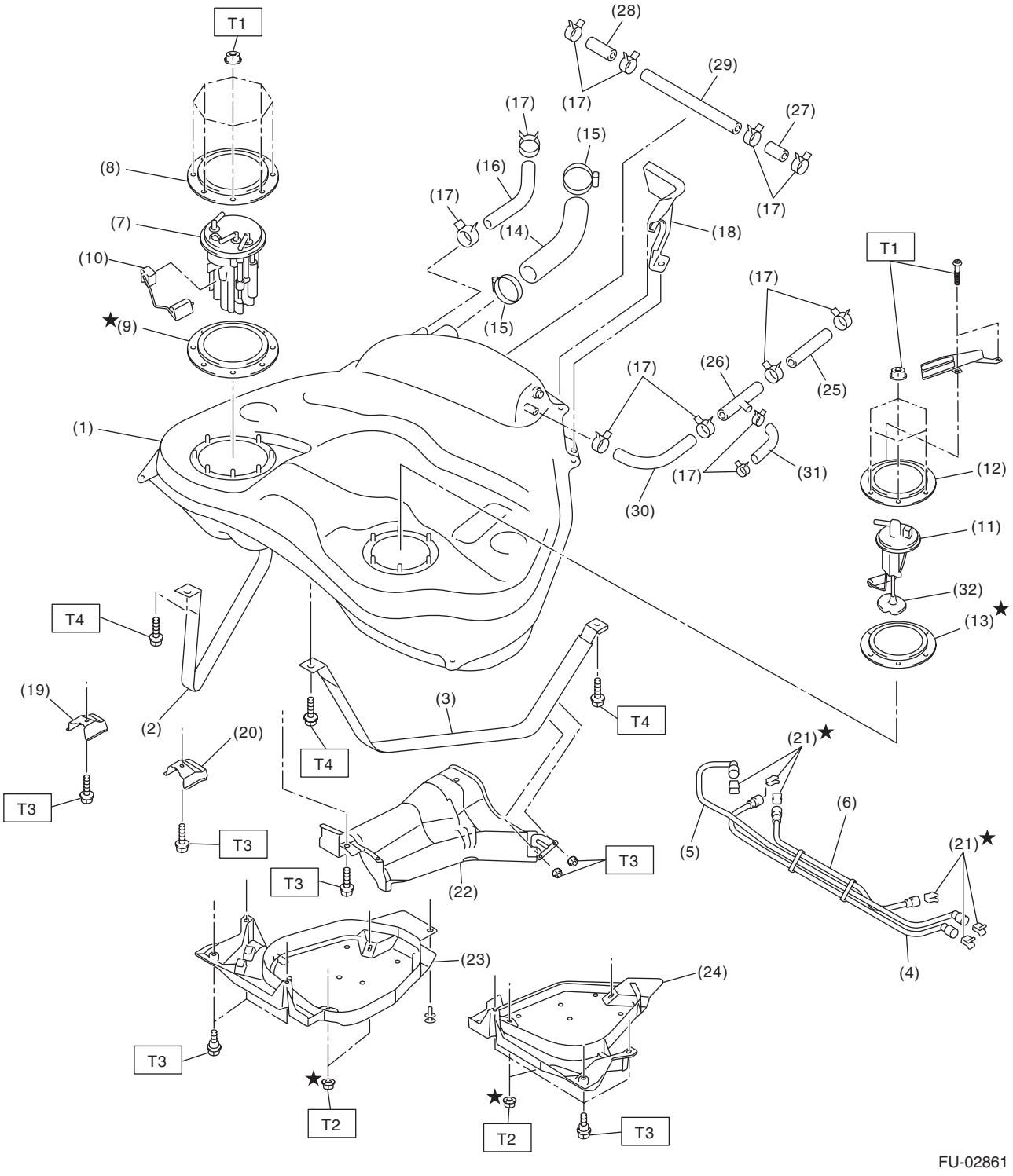
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(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



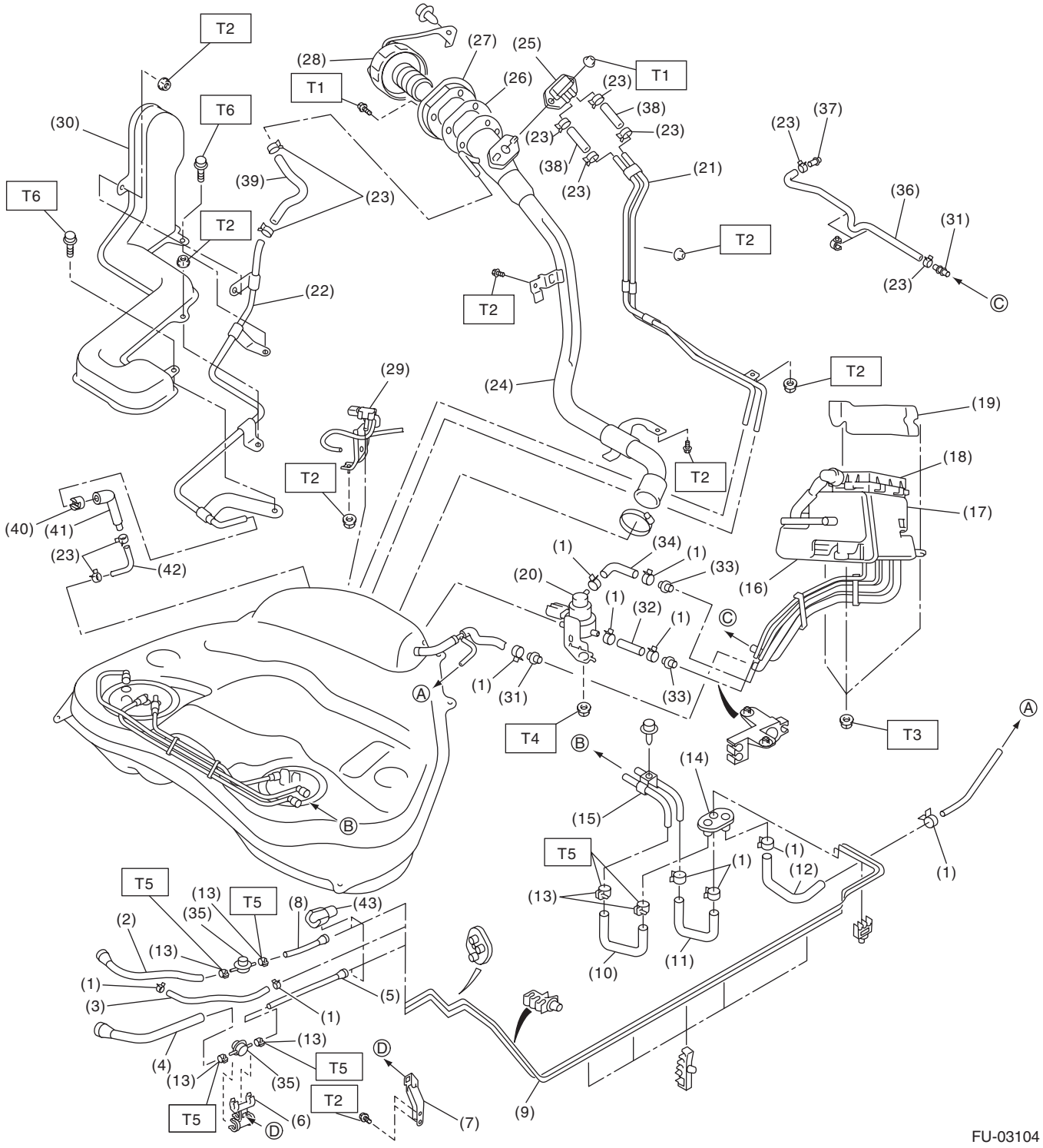
FU-02861

(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



FU-03104

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

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

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
- Place “NO OPEN FLAMES” signs near the working area.
- Prepare a container and cloth to prevent scattering of fuels when performing work where fuels can be spilled. If the fuel spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing fuel.

D: PREPARATION TOOL

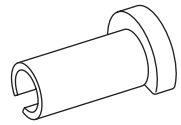
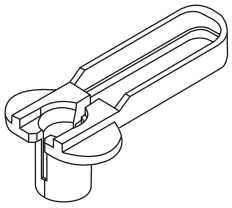
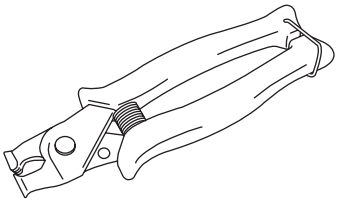
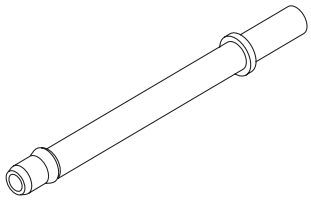
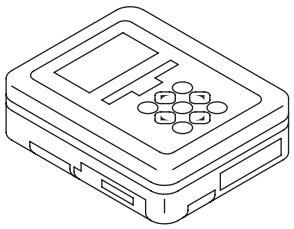
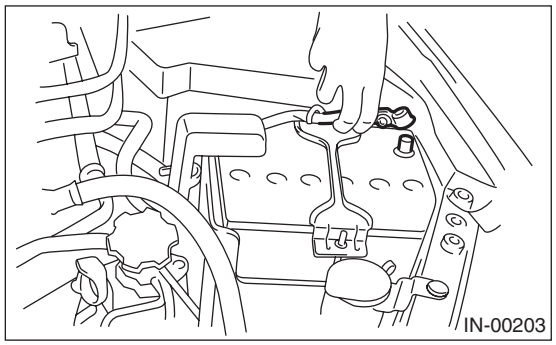
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for disconnecting quick connector on the fuel delivery hose side of the engine compartment.
 ST18371AA000	18371AA000 (Newly adopted tool)	CONNECTOR REMOVER	Used for disconnecting the quick connector on the fuel return hose of the engine compartment.
 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.
 ST18471AA000	18471AA000	FUEL PIPE ADAPTER	Used for draining fuel.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B021XU0	1B021XU0	SUBARU SELECT MONITOR III KIT	Used for draining fuel.

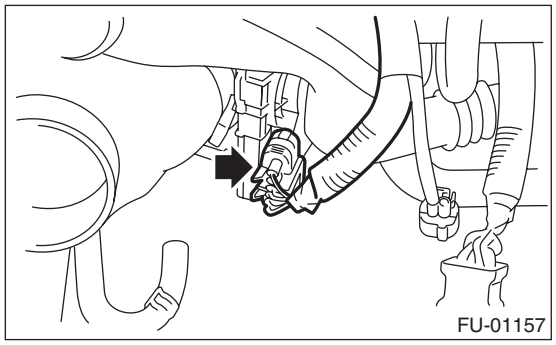
2. Throttle Body

A: REMOVAL

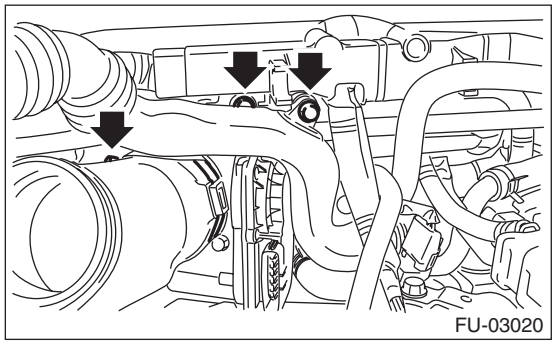
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



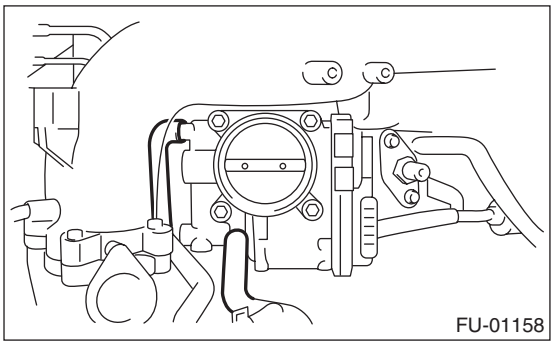
3) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
4) Disconnect the connectors from the throttle position sensor.



5) Remove the bolts which secure the air by-pass pipe and PCV pipe to the intake manifold, and loosen the clamp which connects the throttle body and duct.



6) Remove the duct from the throttle body.
7) Disconnect the engine coolant hoses from the throttle body.



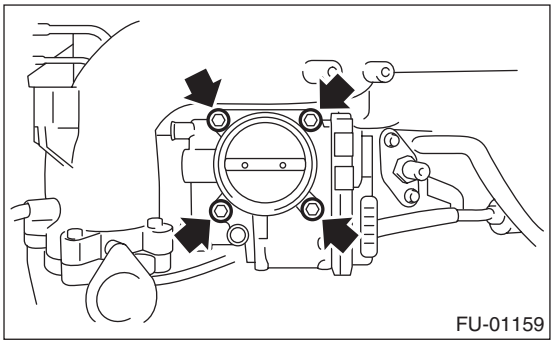
8) Remove the bolts which secure the throttle body to the intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use new O-rings.

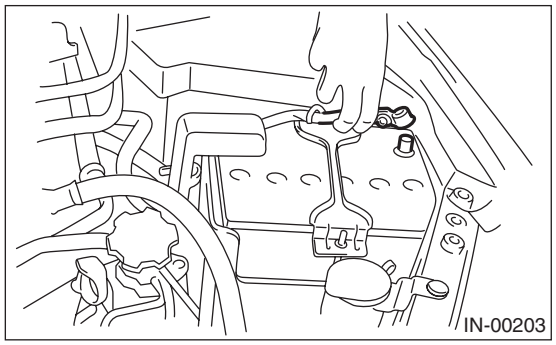
Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



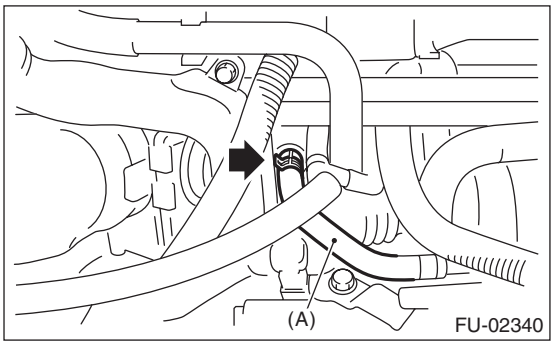
3. Intake Manifold

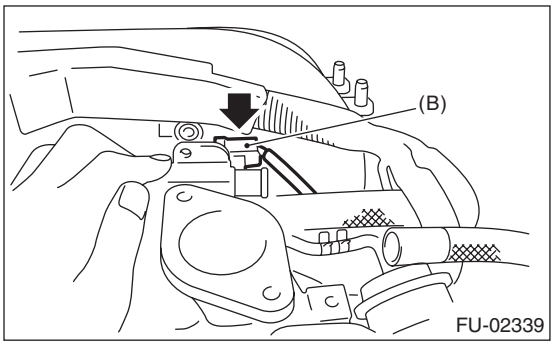
A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure.<Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Remove the collector cover.
4) Disconnect the ground cable from battery.

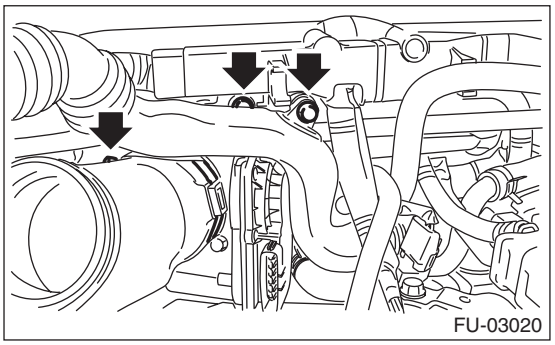


5) Open the fuel filler flap lid, and remove the fuel filler cap.
6) Lift the vehicle.
7) Remove the under cover.
8) Drain approximately 3.0 ℓ (3.2 US qt, 2.6 Imp qt) of coolant.
9) Remove the intake duct from the air cleaner case.
10) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
11) Remove the generator. <Ref. to SC(H4SO)-20, REMOVAL, Generator.>
12) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-31, REMOVAL, Coolant Filler Tank.>
13) Disconnect the emission hose (A) and the connector (B) from the PCV hose assembly.

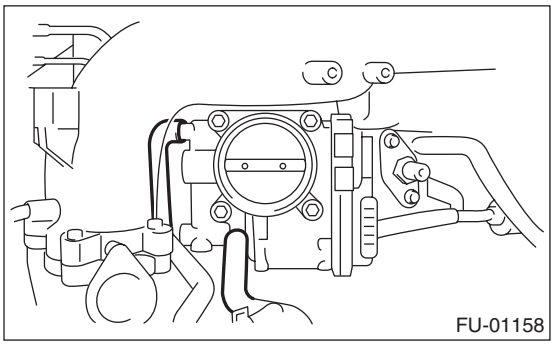




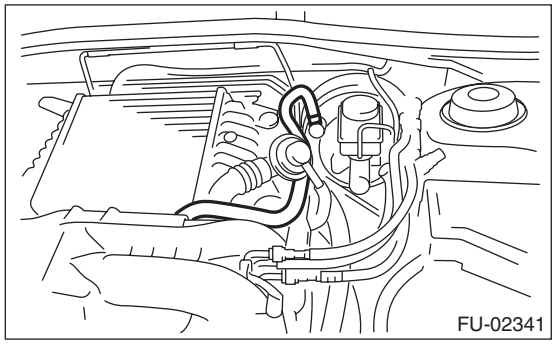
14) Remove the bolts which secure the air by-pass pipe and PCV pipe to the intake manifold, and loosen the clamp which connects the throttle body and duct.



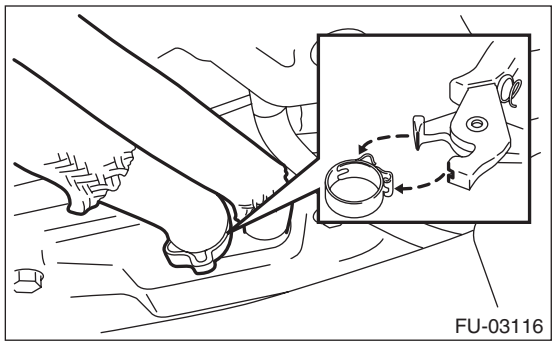
15) Remove the duct from the throttle body.
16) Disconnect the engine coolant hoses from the throttle body.



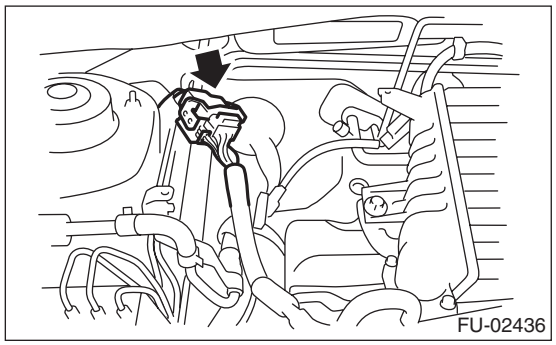
17) Disconnect the brake booster hose.



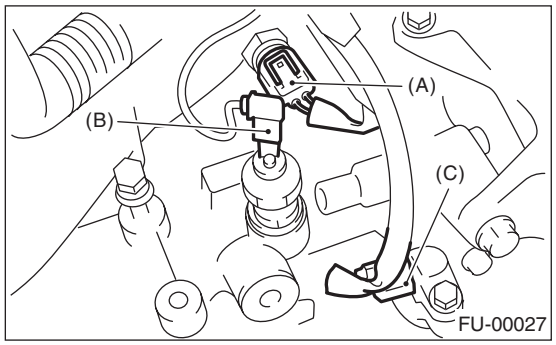
18) Fit the cut out in the ST with the protrusion on the clamp to unlock, and disconnect the PCV hose from the rocker cover.
ST 18353AA000 CLAMP PLIERS



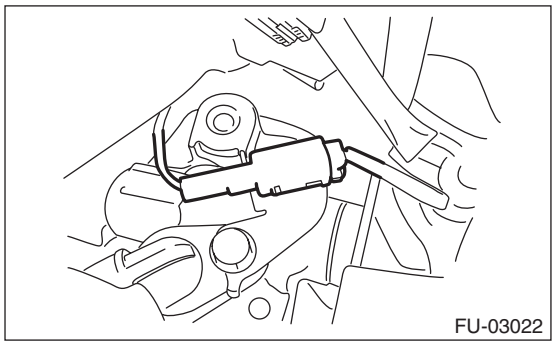
19) Disconnect the engine harness connectors from the bulk head harness connector.



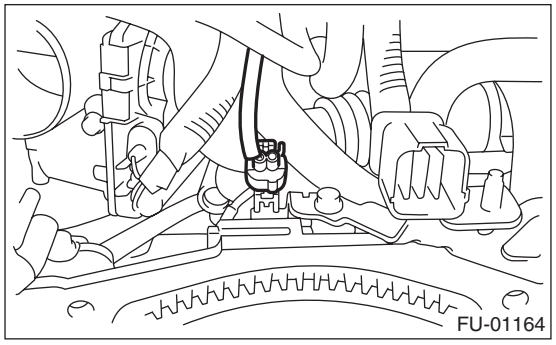
20) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



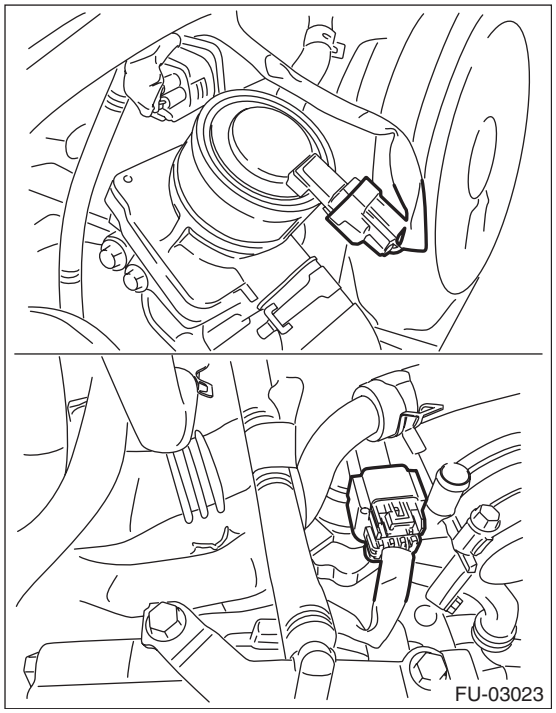
21) Disconnect the connector from power steering pump switch.



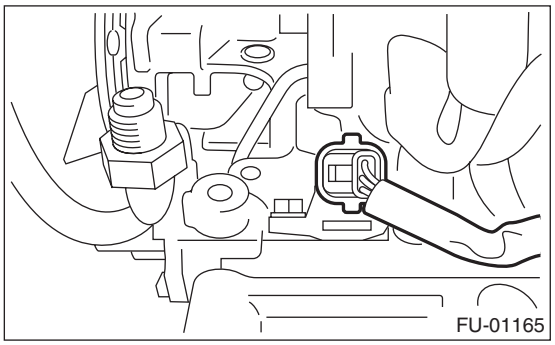
22) Disconnect the knock sensor connector.



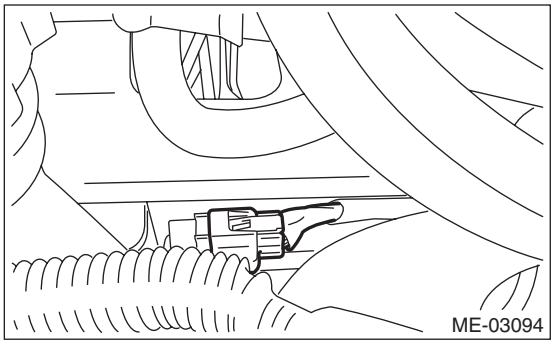
23) Disconnect the connector from the secondary air combination valve.



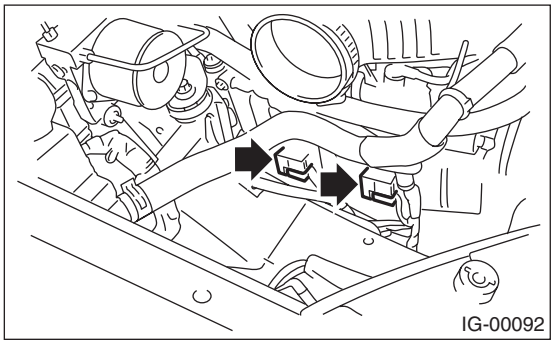
24) Disconnect the connector from the camshaft position sensor.



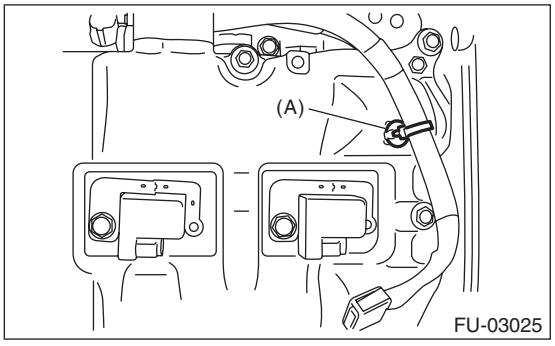
25) Disconnect the connector from the oil flow control solenoid valve.



26) Disconnect the connector from ignition coil.

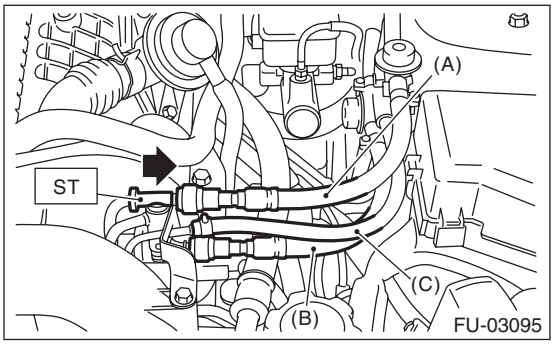


27) Remove the engine harness fixed by clip (A) from the rocker cover.



28) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the fuel delivery hose.
ST 42099AE000 CONNECTOR REMOVER

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

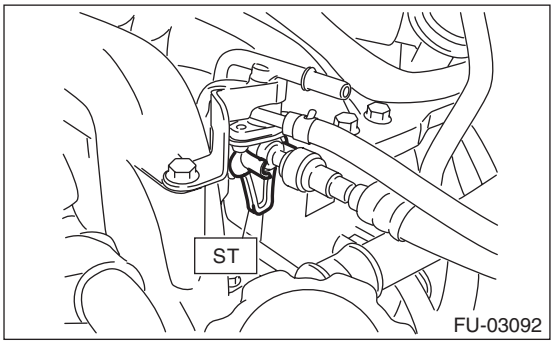


(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

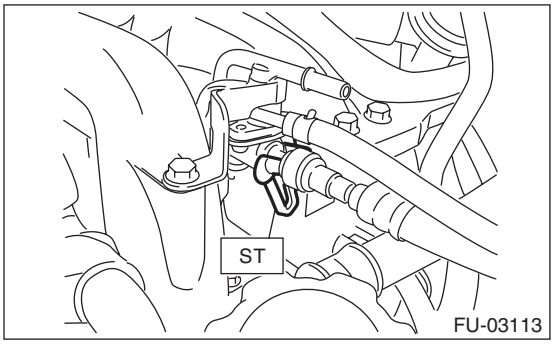
29) Disconnect the fuel return hose using the ST.
ST 18371AA000 CONNECTOR REMOVER

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

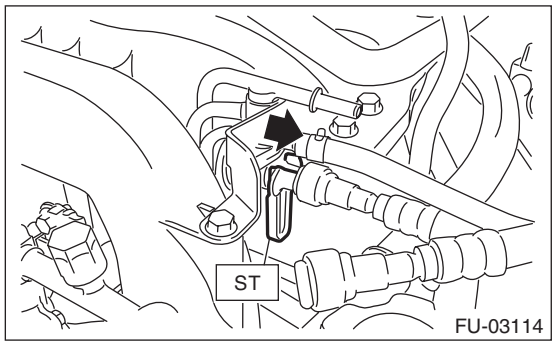
(1) Attach the ST to the fuel return pipe as shown in the figure.



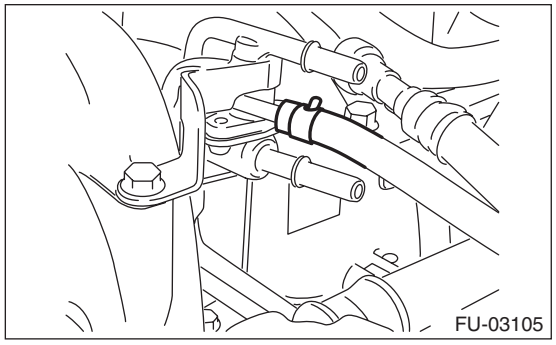
(2) Insert the front side of ST into the quick connector.



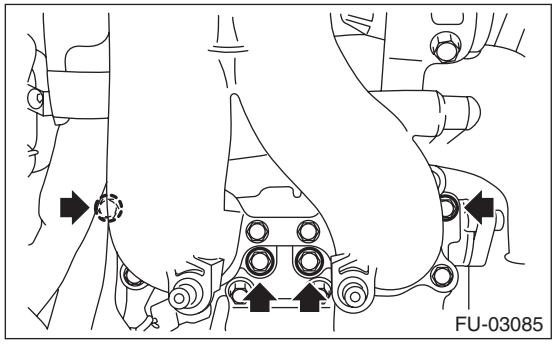
(3) Insert the back side of ST into the quick connector and push ST in the direction of arrow mark to disconnect the fuel return hose.



30) Remove the clip and disconnect the evaporation hose from the fuel pipe.



31) Remove the bolts which hold the tumble generator valve assembly onto the cylinder head.



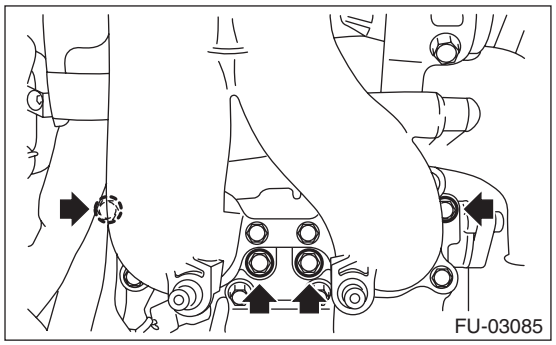
32) Remove the intake manifold.

B: INSTALLATION

1) Install the intake manifold onto cylinder heads.

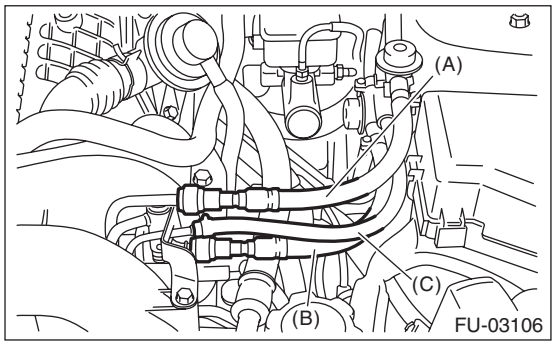
NOTE:
Use a new gasket.

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)-69, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

NOTE:
If fuel hoses or clamps are damaged, replace them with new parts.

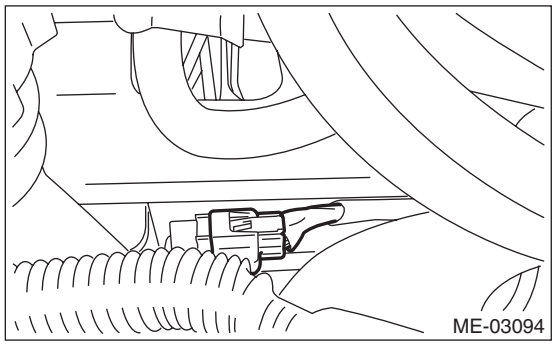


(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

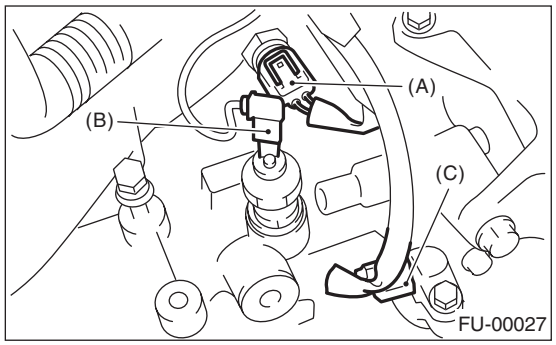
3) Tighten the hose clamp screw.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

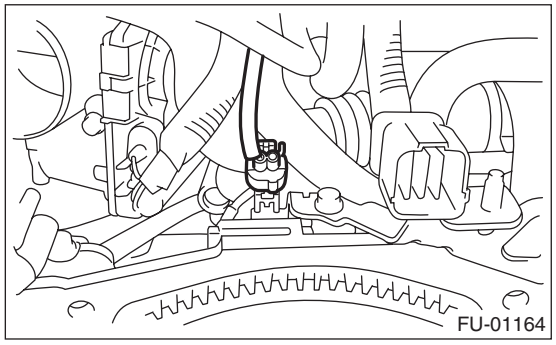
4) Connect the connector to the oil flow control solenoid valve.



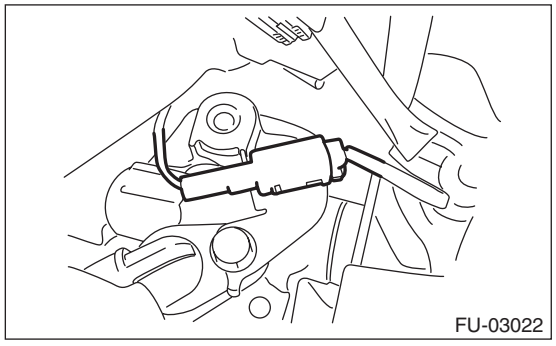
5) Connect the connector to the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



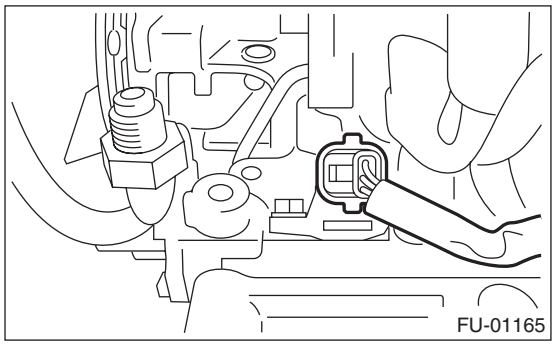
6) Connect the connector to the knock sensor.



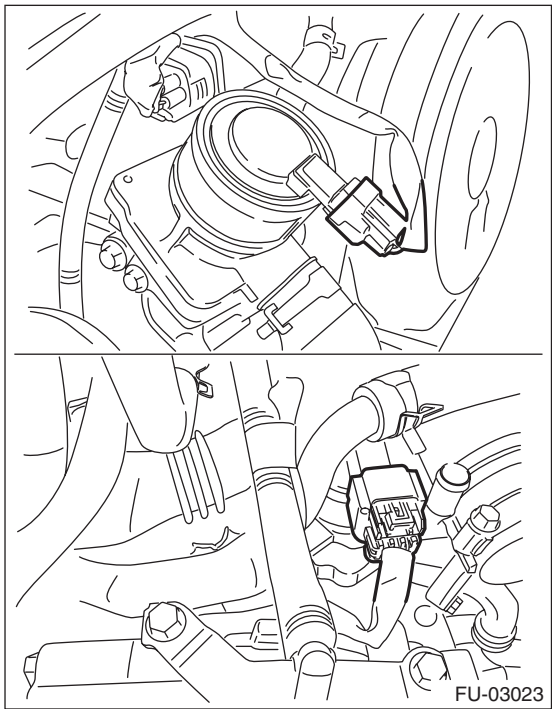
7) Connect the connector to the power steering pump switch.



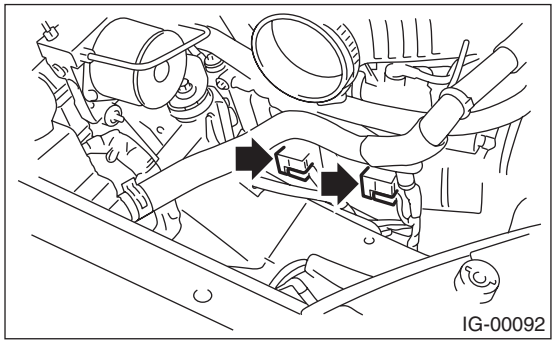
8) Connect the connectors to camshaft position sensor.



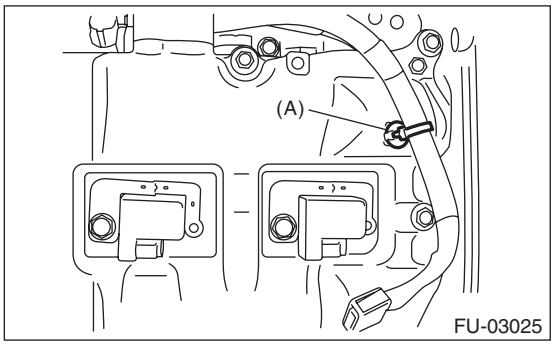
9) Connect the connector to the secondary air combination valve.



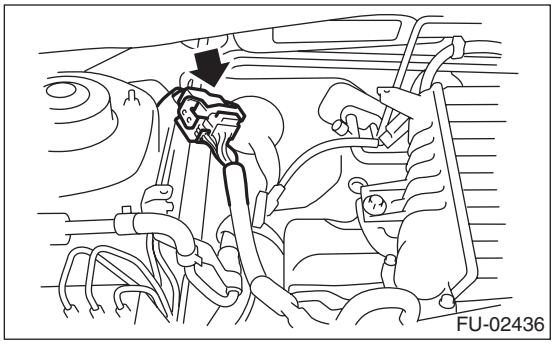
10) Connect the connector to the ignition coil.



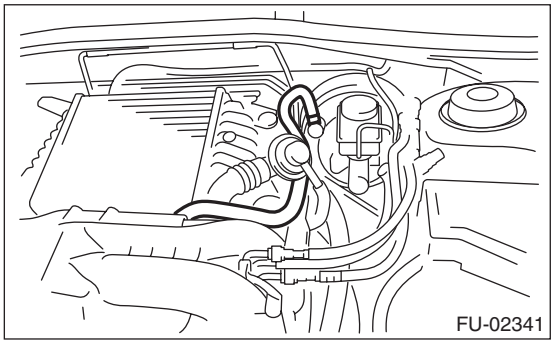
11) Install the engine harness with clip (A) to the rocker cover.



12) Connect the engine harness connectors to the bulkhead harness connectors.

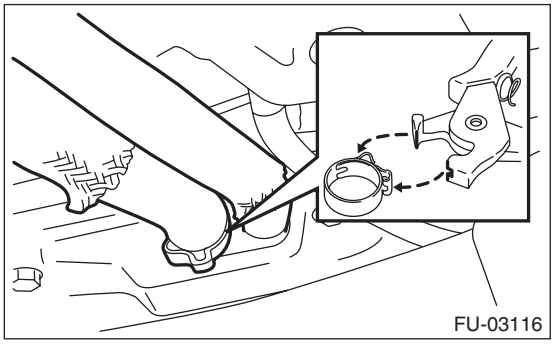


13) Connect the brake booster hose.

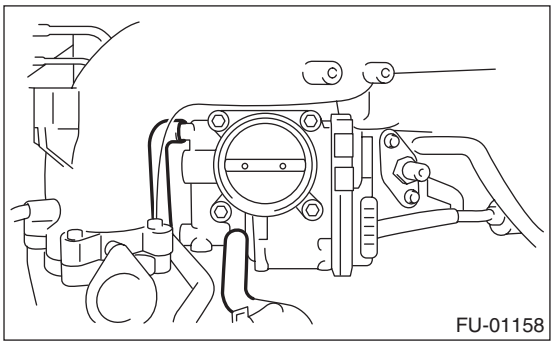


14) Connect the PCV hose to the rocker cover and lock it by fitting the clamp protrusion using ST.
ST 18353AA000 CLAMP PLIERS

NOTE:
Use a new clamp.

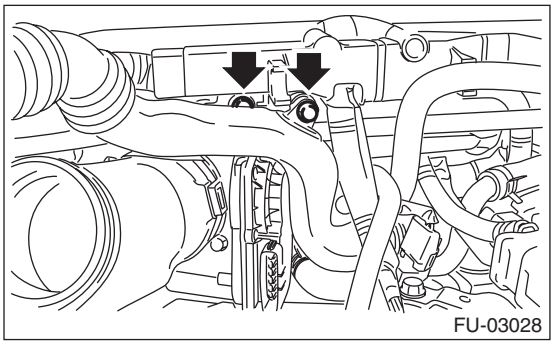


15) Connect the engine coolant hoses to throttle body.

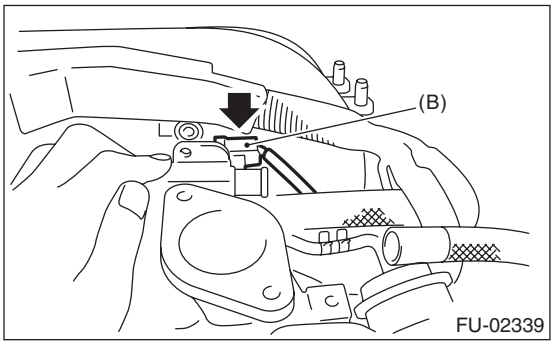


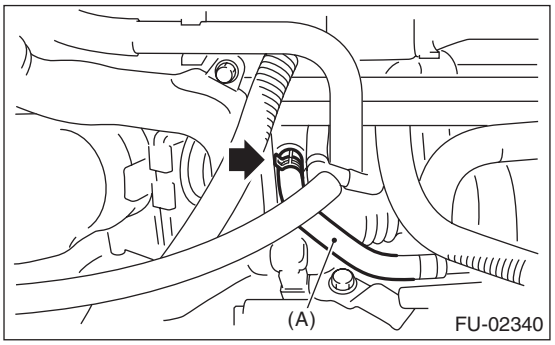
16) Install the duct to the throttle body.
17) Attach the bolts which secure the air by-pass pipe and PCV pipe to the intake manifold.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



18) Connect the emission hose (A) and the connector (B) to the PCV hose assembly.



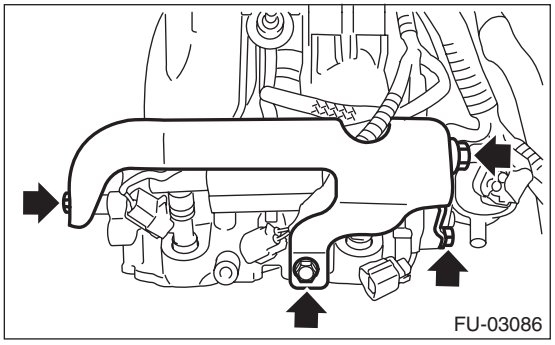


19) Install the coolant filler tank.<Ref. to CO(H4DOTC)-31, INSTALLATION, Coolant Filler Tank.>

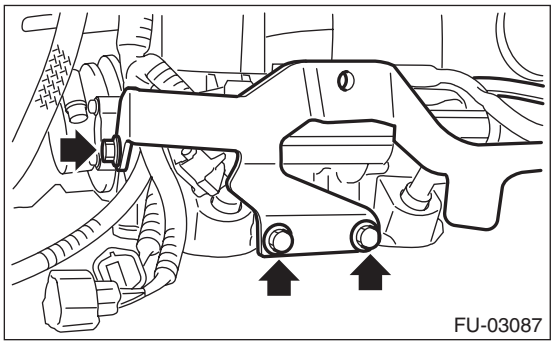
20) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
21) Install the intake duct to the air cleaner case.
22) Install the fuse of fuel pump to the main fuse box.
23) Connect the battery ground cable to the battery.
24) Lift the vehicle.
25) Install the under cover.
26) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
27) Install the collector cover.

C: DISASSEMBLY

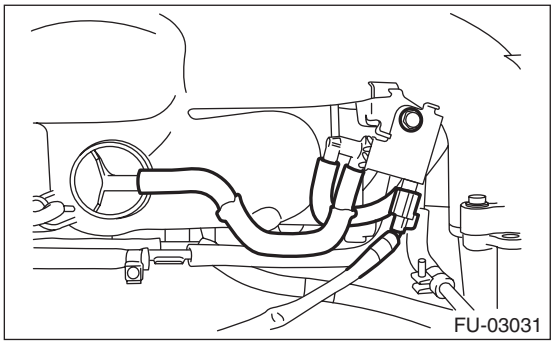
1) Remove the engine ground terminal from the fuel pipe protector LH and remove the fuel pipe protector LH from the intake manifold.


FU-03086

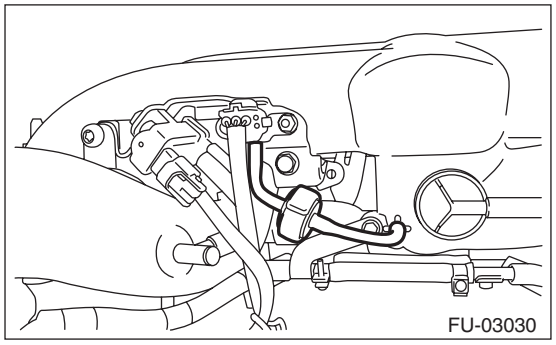
2) Remove the fuel pipe protector RH from the intake manifold.


FU-03087

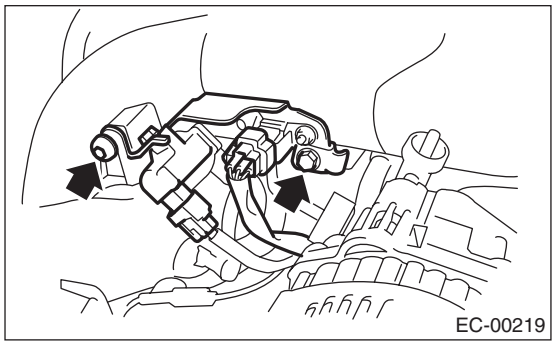
3) Disconnect the evaporation hose and the connector from the purge control solenoid valve 1, and remove the purge control solenoid valve 1 from the intake manifold.


FU-03031

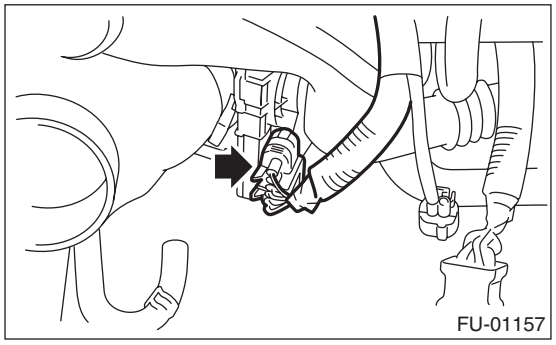
4) Disconnect the filter assembly.


FU-03030

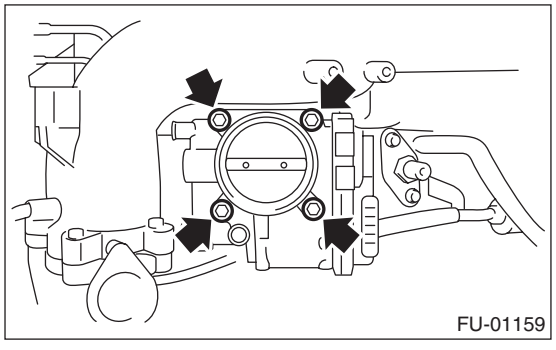
5) Remove the solenoid valve bracket assembly from the intake manifold, and disconnect the connector from the wastegate control solenoid valve, manifold absolute pressure sensor and purge control solenoid valve 2.


EC-00219

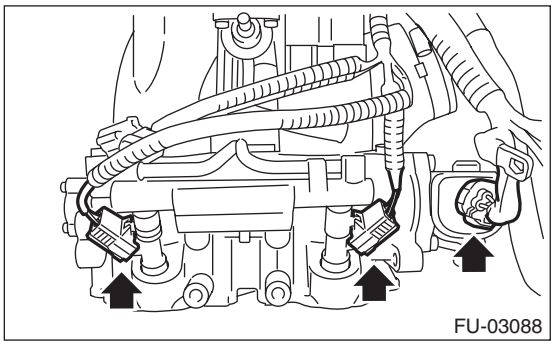
6) Disconnect the evaporation hose of the purge control solenoid valve 2 from the intake duct and fuel pipe assembly.
7) Disconnect the connectors from the throttle position sensor.


FU-01157

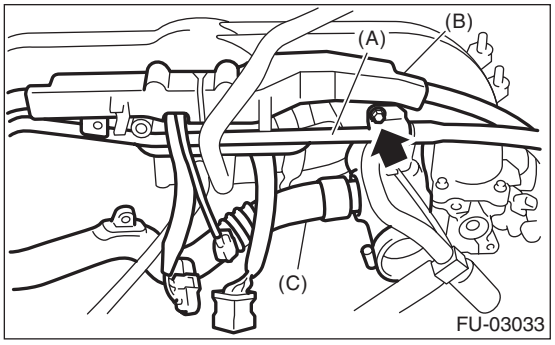
8) Remove the throttle body from the intake manifold.


FU-01159

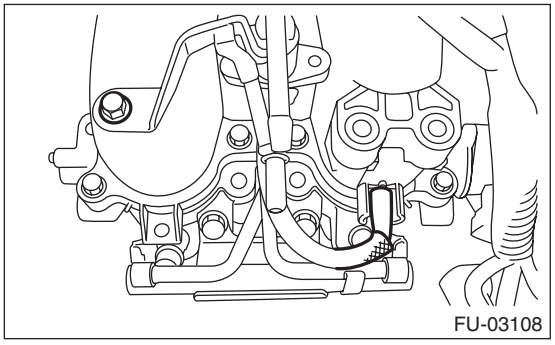
9) Disconnect the connector from the fuel injector and the tumble generator valve assembly.



10) Remove the PCV pipe (A), harness assembly (B) and intake duct (C) from the intake manifold.

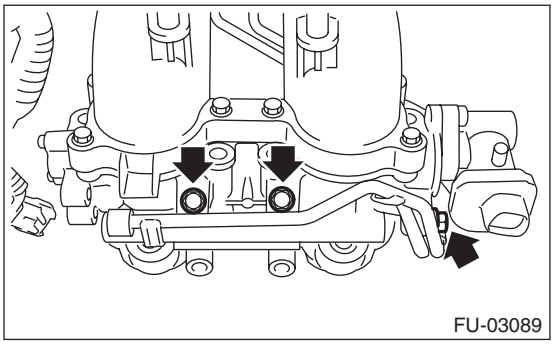


11) Remove the bolt which secures the fuel injector pipe LH onto the front side of intake manifold, and disconnect the pressure regulator vacuum hose from the intake manifold.

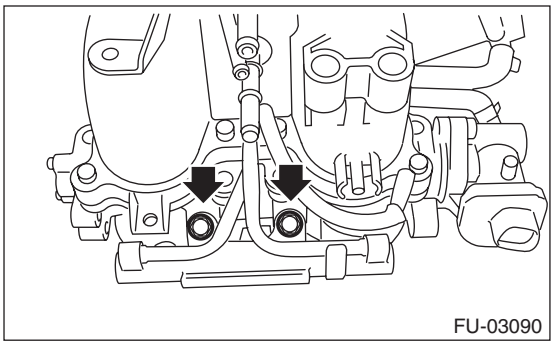


12) Remove the bolt which holds fuel injector pipe onto intake manifold.

- RH side

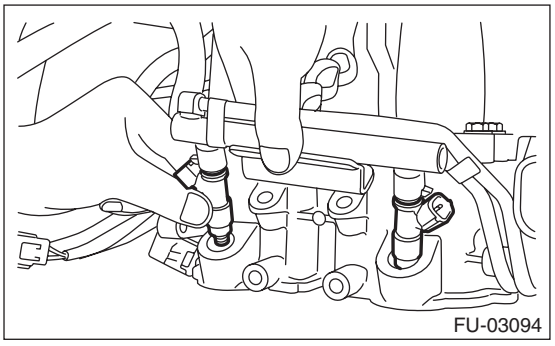


- LH side

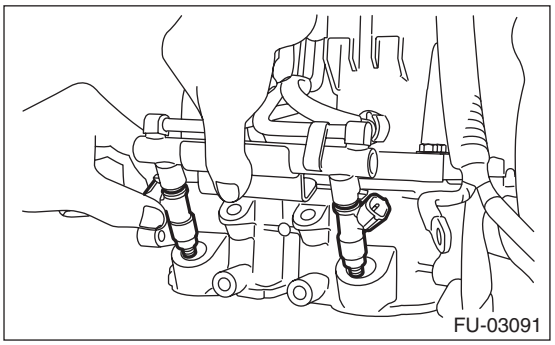


13) Remove the fuel injector.

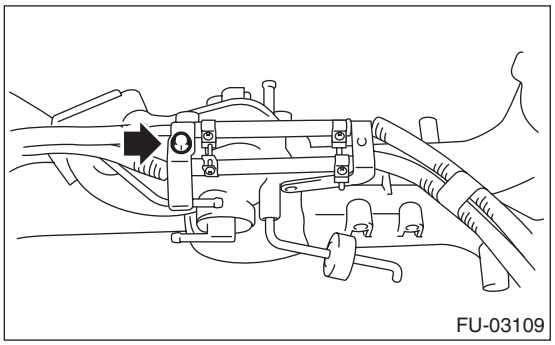
- RH side



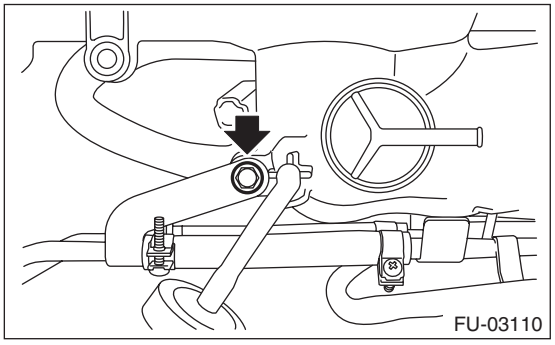
- LH side



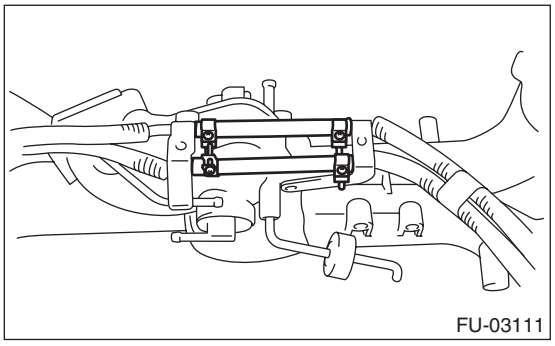
14) Remove the bolt which secures the fuel pipe to the intake manifold.



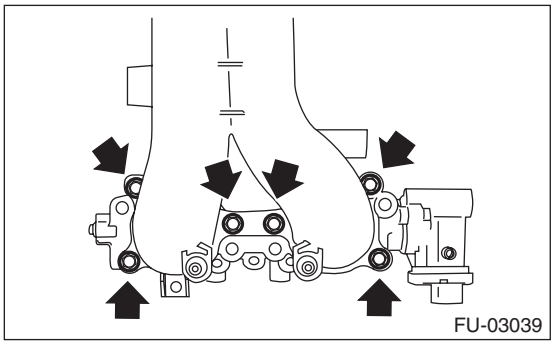
15) Remove the bolt which secures fuel injector pipe RH onto the lower side of the intake manifold.



16) Loosen the clamp which holds the fuel hose to the fuel injector pipe, and then disconnect the fuel hose from pipe.



17) Remove the fuel injector pipe.
18) Remove the tumble generator valve assembly from the intake manifold.

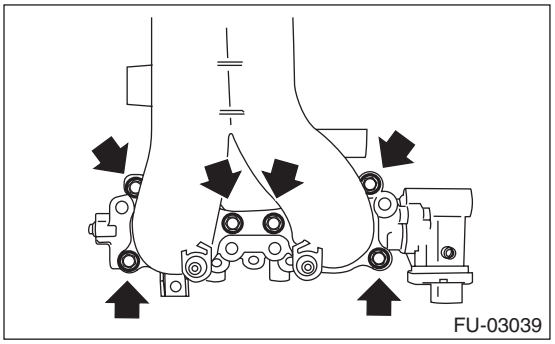


D: ASSEMBLY

1) Install the tumble generator valve assembly onto intake manifold.

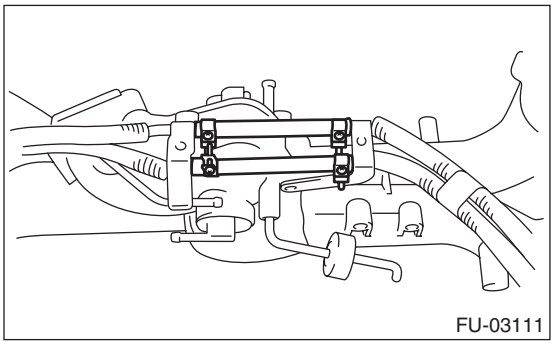
NOTE:
Use new O-rings.

Tightening torque:
8.3 N·m (0.85 kgf-m, 6.1 ft-lb)



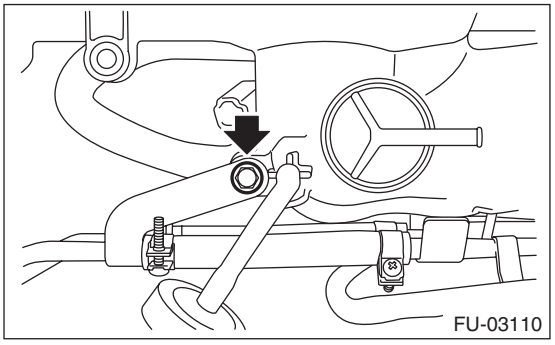
2) Install the fuel injector pipe.
3) Connect fuel hoses to fuel injector pipes on both sides, and secure them with the clamps.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



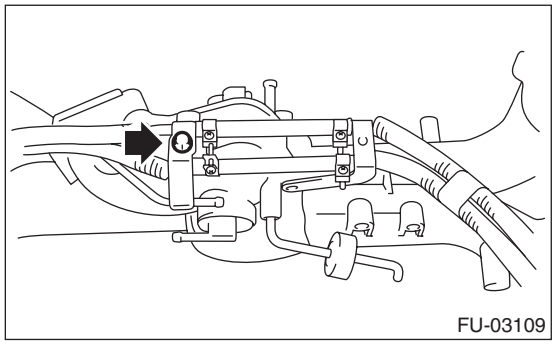
4) Tighten the bolts which secure the fuel injector pipe RH to the lower side of the intake manifold.

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



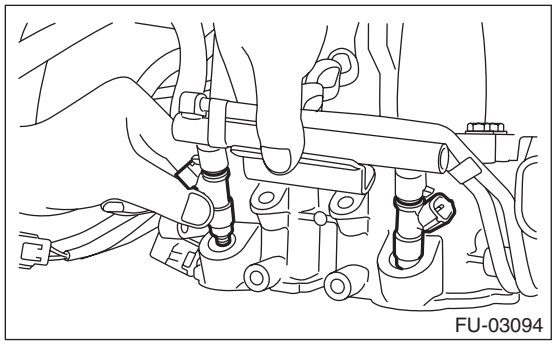
5) Tighten the bolts which secure the fuel pipe to the intake manifold.

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

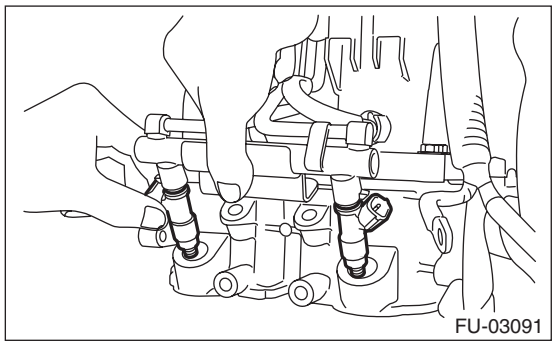

FU-03109

6) Install the fuel injector.

- RH side


FU-03094

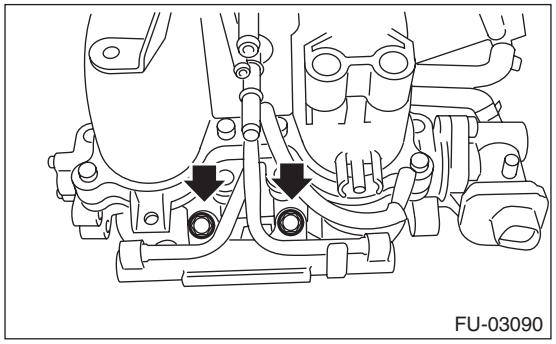
- LH side


FU-03091

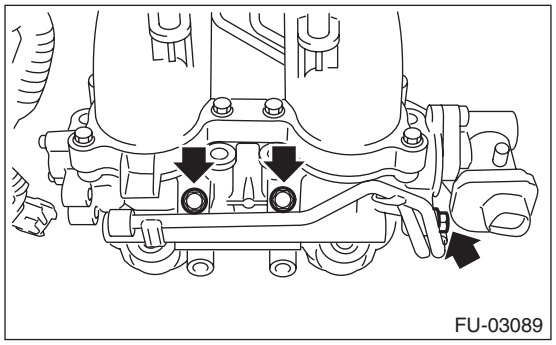
7) Tighten the bolts which secure fuel injector pipe onto intake manifold.

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

- LH side

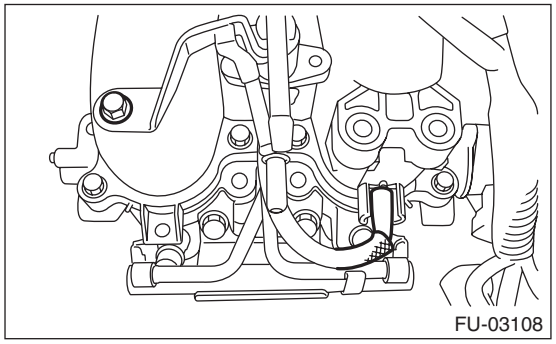

FU-03090

- RH side


FU-03089

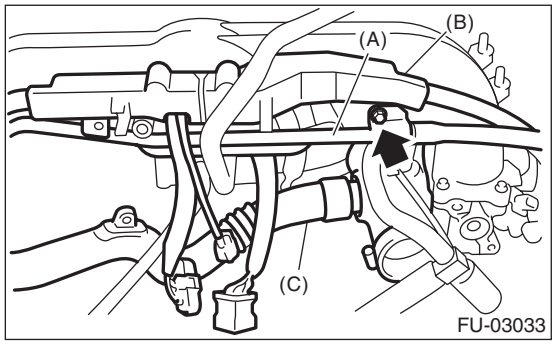
8) Tighten the bolt which holds the fuel injector pipe LH to the front side of the intake manifold, and connect the pressure regulator vacuum hose to the intake manifold.

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

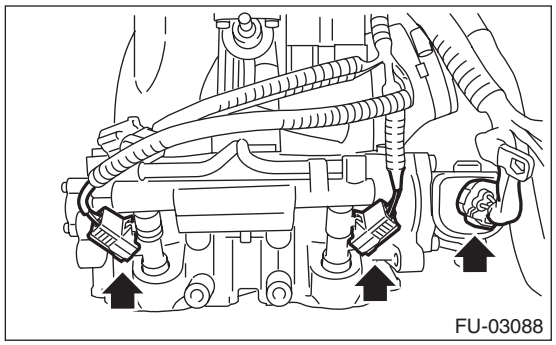

FU-03108

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)



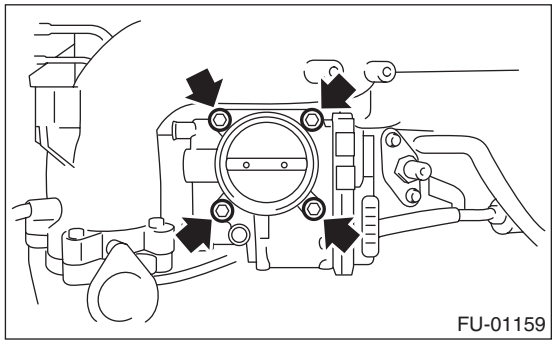
10) Connect the connector to the fuel injector and the tumble generator valve assembly.



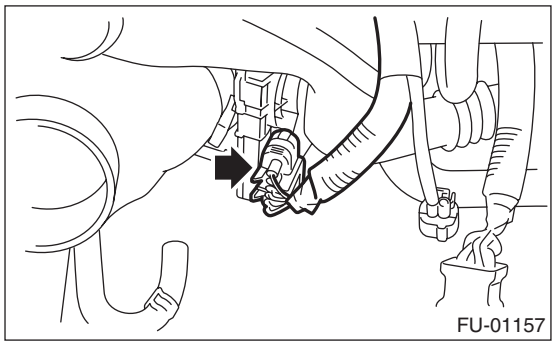
11) Install the throttle body to the intake manifold.

NOTE:
Use new O-rings.

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

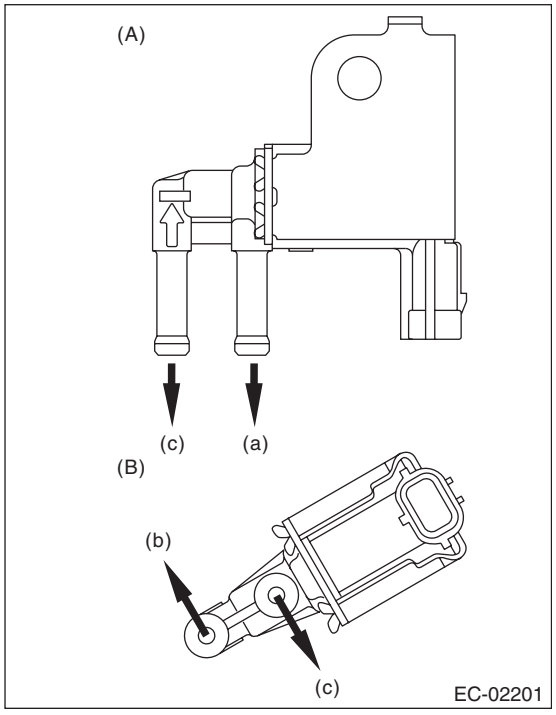


12) Connect the connector to the throttle position sensor.



13) Connect the evaporation hose to the purge control solenoid valve 2.

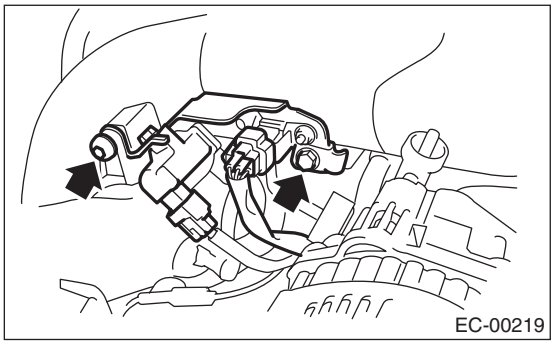
NOTE:
Connect the evaporation hose as shown in the figure.



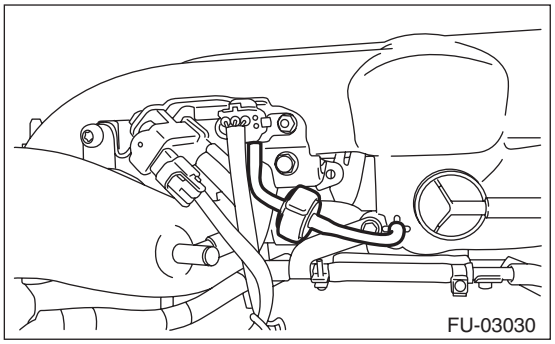
(A) Purge control solenoid valve 1
(B) Purge control solenoid valve 2
(a) To intake manifold
(b) To intake duct
(c) To fuel pipe

14) Connect the connectors to the wastegate control solenoid valve, manifold absolute pressure sensor and purge control solenoid valve 2, and install the solenoid valve bracket assembly to the intake manifold.

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

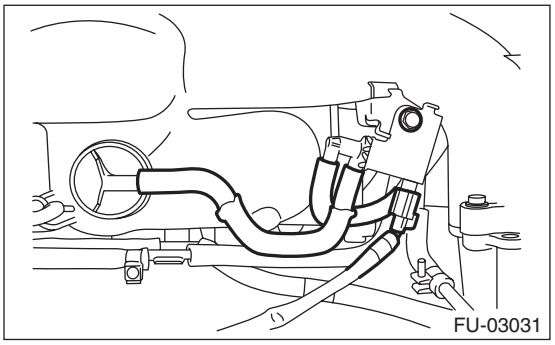


15) Connect the filter assembly.

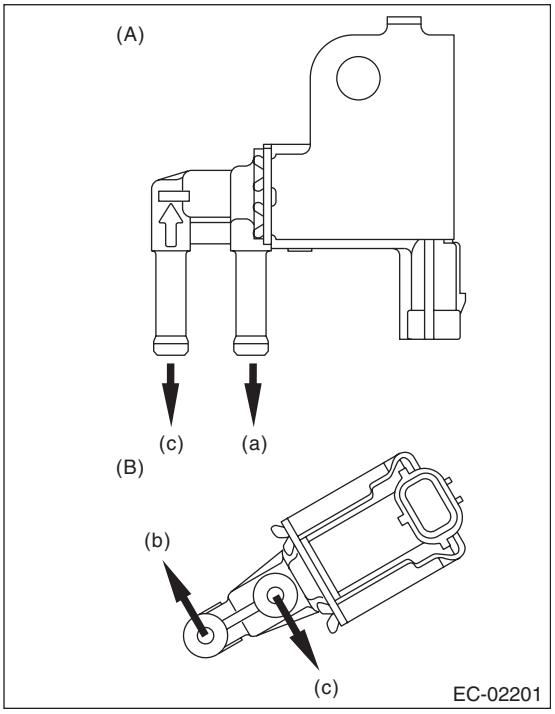


16) Connect the evaporation hose and the connector to the purge control solenoid valve 1, and install the purge control solenoid valve 1 to the intake manifold.

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



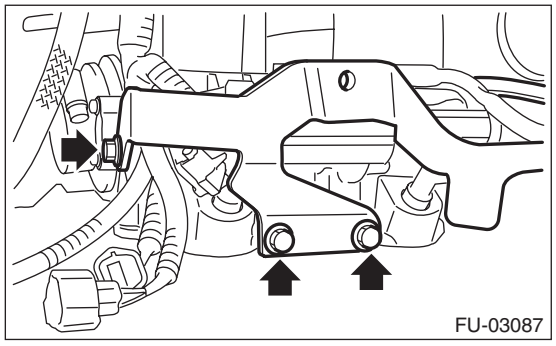
NOTE:
Connect the evaporation hose as shown in the figure.



(A) Purge control solenoid valve 1
(B) Purge control solenoid valve 2
(a) To intake manifold
(b) To intake duct
(c) To fuel pipe

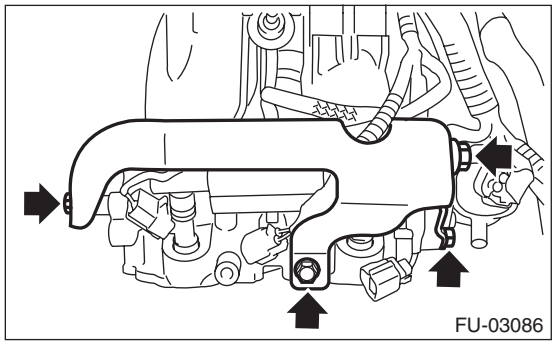
17) Install the fuel pipe protector RH to the intake manifold.

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



18) Install the fuel pipe protector LH to the intake manifold, and install the engine ground terminal to the fuel pipe protector LH.

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



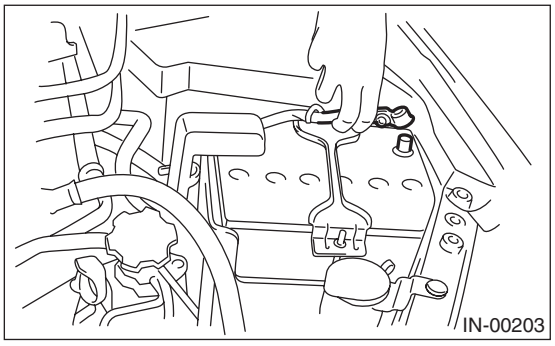
E: INSPECTION

Make sure that the fuel pipe and fuel hose are not cracked and that the connections are tight.

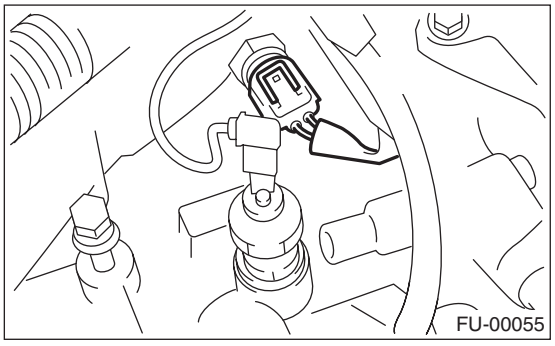
4. Engine Coolant Temperature Sensor

A: REMOVAL

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



3) Remove the generator. <Ref. to SC(H4SO)-20, 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.

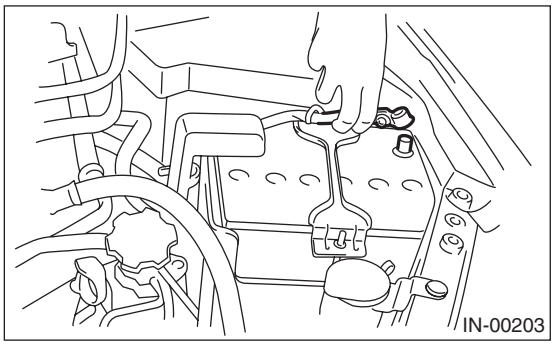
NOTE:
Use a new gasket.

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

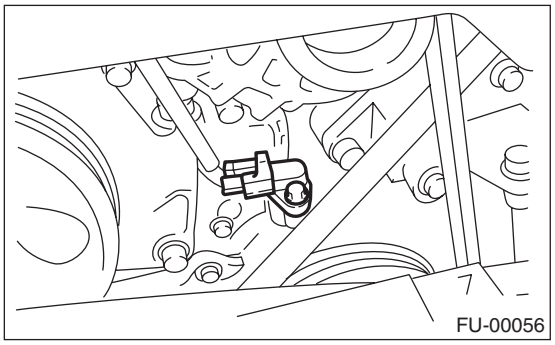
5. Crankshaft Position Sensor

A: REMOVAL

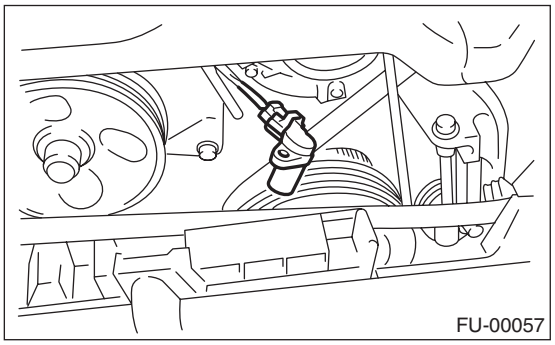
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the generator. <Ref. to SC(H4SO)-20, REMOVAL, Generator.>
4) Remove the bolt which installs crankshaft position sensor to cylinder block.



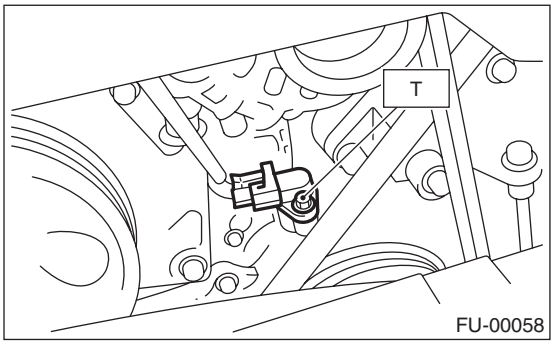
5) Remove the crankshaft position sensor, and then disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

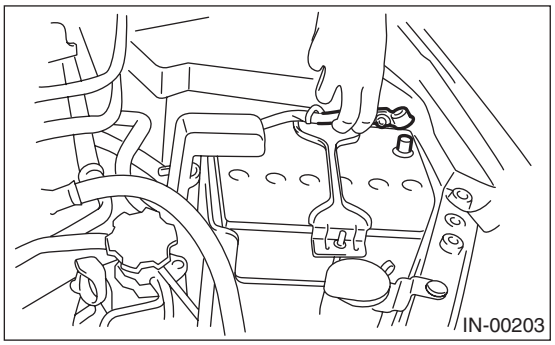
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



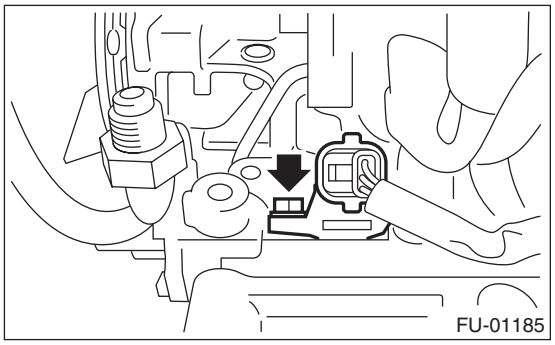
6. Camshaft Position Sensor

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

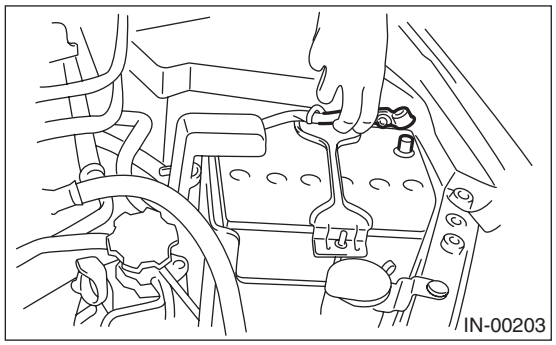
Install in the reverse order of removal.

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

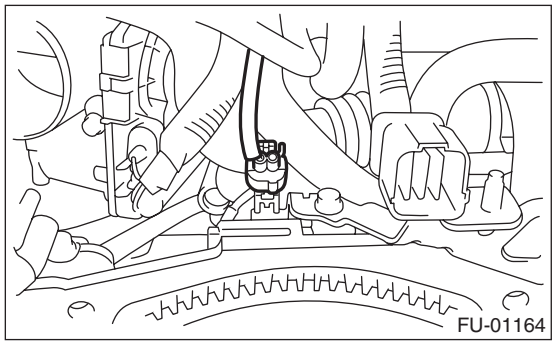
7. Knock Sensor

A: REMOVAL

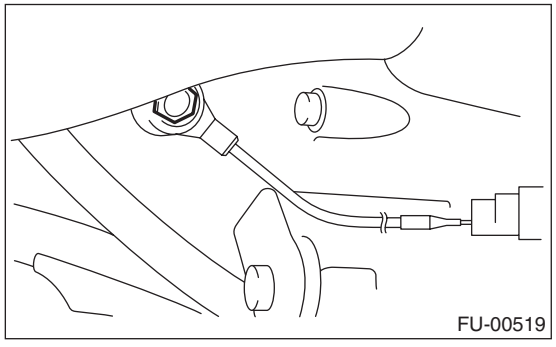
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



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.

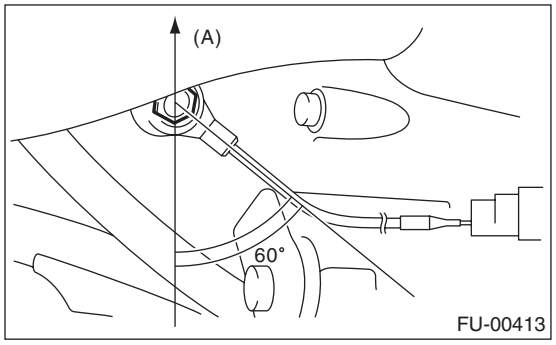


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

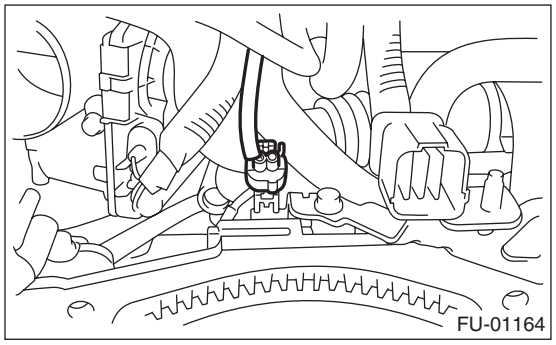
NOTE:
The portion of the knock sensor cord that is pulled out must be positioned at a 60° angle relative to the engine rear.

Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

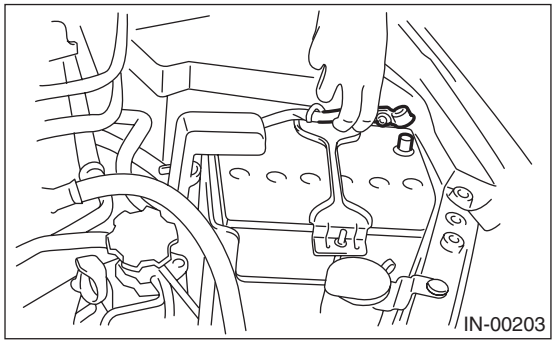


(A) Front side

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

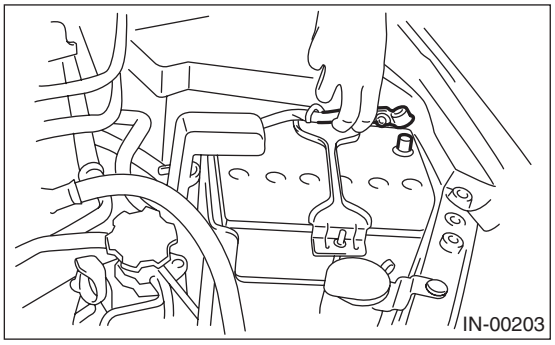
A: SPECIFICATION

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)-12, REMOVAL, Throttle Body.> <Ref. to FU(H4DOTC)-12, INSTALLATION, Throttle Body.>

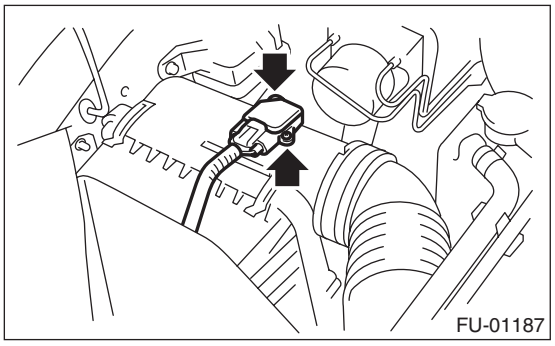
9. Mass Air Flow and Intake Air Temperature Sensor

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

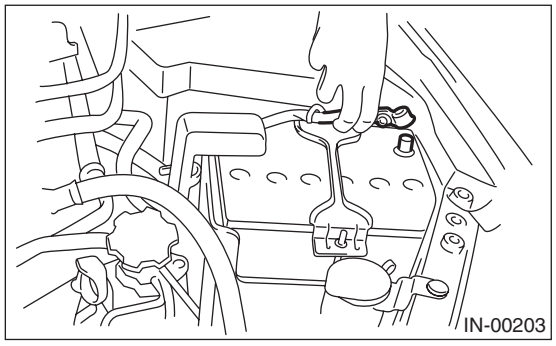
Install in the reverse order of removal.

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

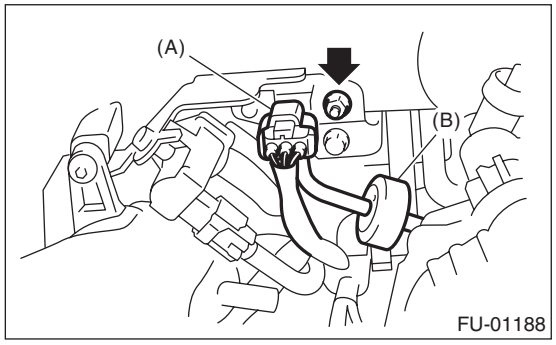
10.Manifold Absolute Pressure Sensor

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.

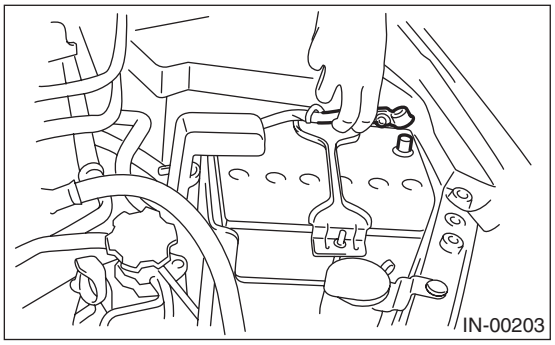
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

11.Fuel Injector

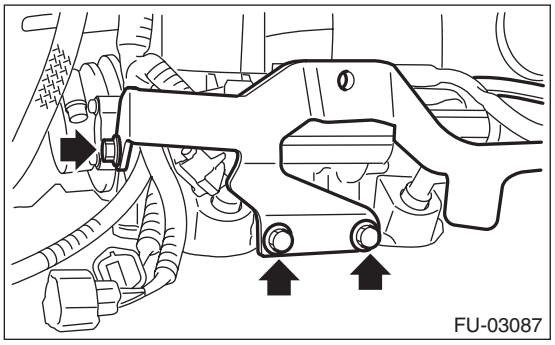
A: REMOVAL

1. RH SIDE

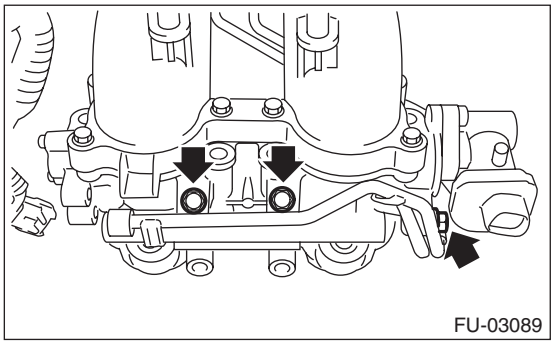
1) Release the fuel pressure.<Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the collector cover.
3) Disconnect the ground cable from battery.



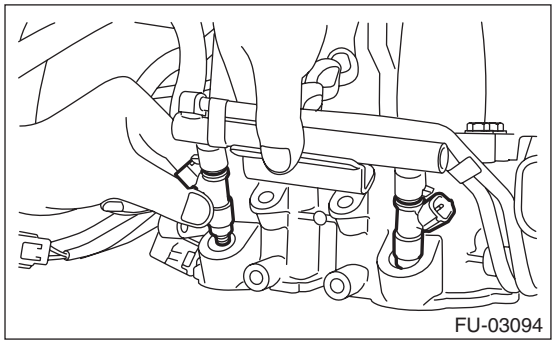
4) Open the fuel filler flap lid, and remove the fuel filler cap.
5) Remove the intake manifold. <Ref. to FU(H4DOTC)-13, REMOVAL, Intake Manifold.>
6) Remove the fuel pipe protector RH from the intake manifold.



7) Disconnect the connector from fuel injector.
8) Remove the bolt which holds fuel injector pipe onto intake manifold.

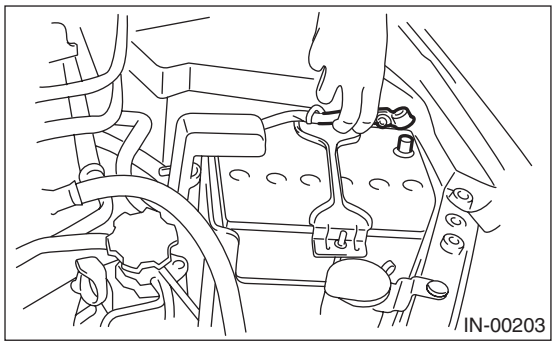


9) Remove the fuel injector.

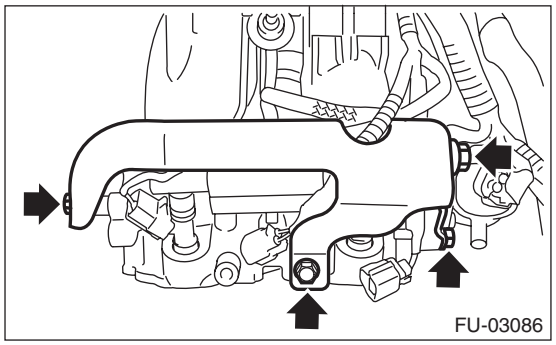


2. LH SIDE

1) Release the fuel pressure.<Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the collector cover.
3) Disconnect the ground cable from battery.

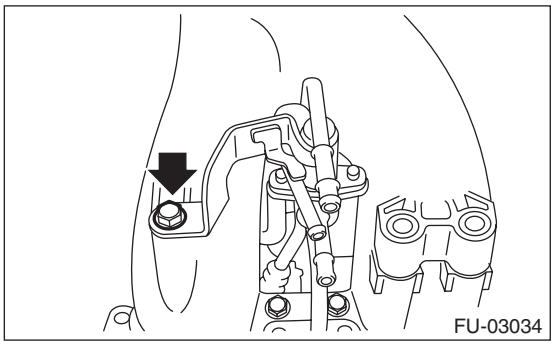


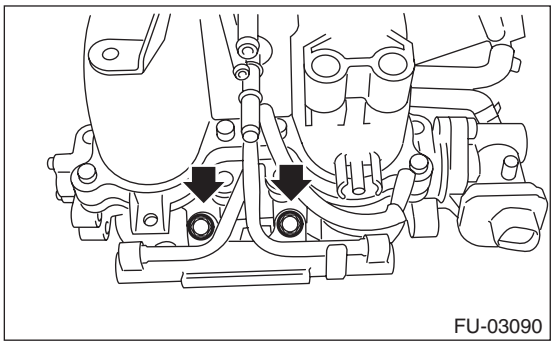
4) Open the fuel filler flap lid, and remove the fuel filler cap.
5) Remove the intake manifold. <Ref. to FU(H4DOTC)-13, REMOVAL, Intake Manifold.>
6) Remove the engine ground terminal from the fuel pipe protector LH and remove the fuel pipe protector LH from the intake manifold.



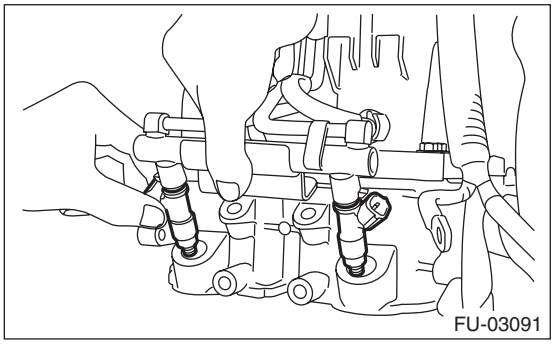
7) Disconnect the connector from fuel injector.

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


FU-03034


FU-03090

9) Remove the fuel injector.


FU-03091

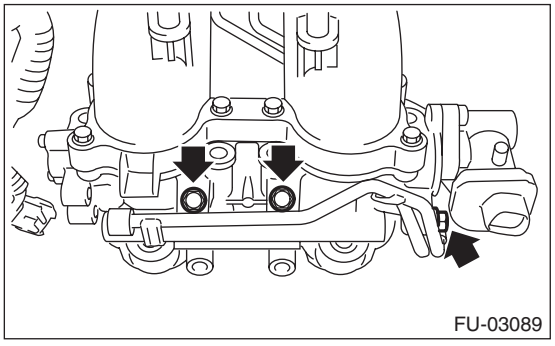
B: INSTALLATION

1. RH SIDE

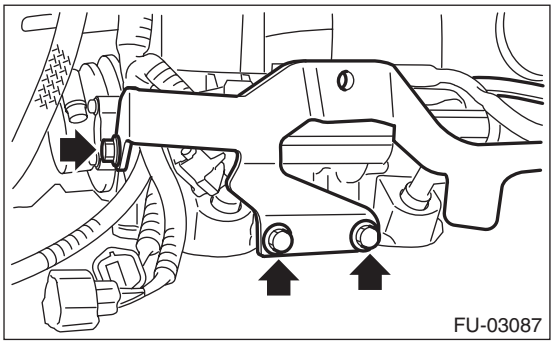
Install in the reverse order of removal.

NOTE:
Use new O-rings.

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


FU-03089

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

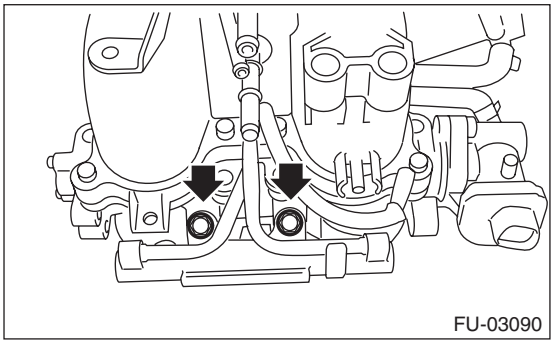

FU-03087

2. LH SIDE

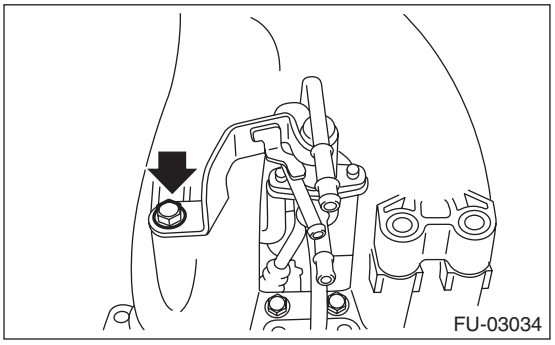
Install in the reverse order of removal.

NOTE:
Use new O-rings.

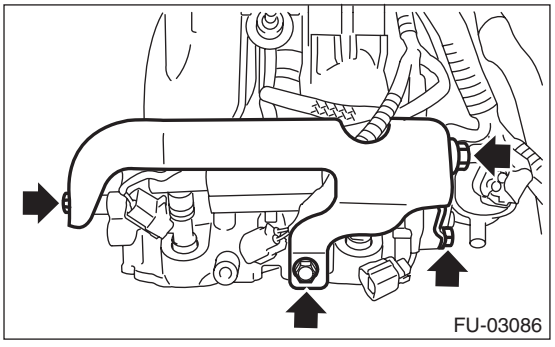
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)


FU-03090

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


FU-03034

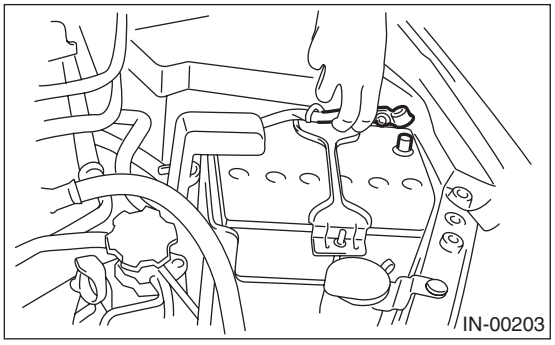
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)


FU-03086

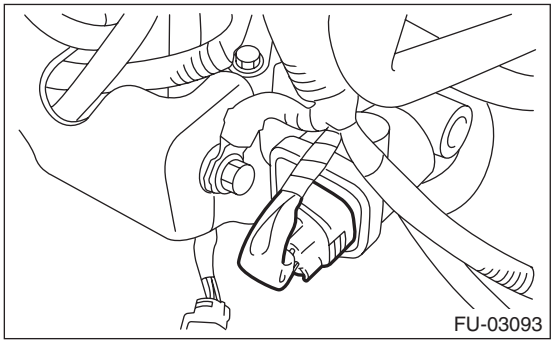
12.Tumble Generator Valve Assembly

A: REMOVAL

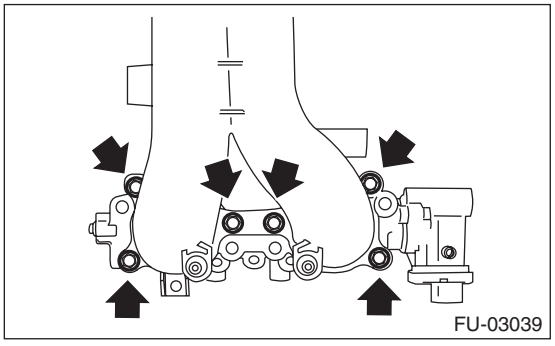
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the collector cover.
3) Disconnect the ground cable from battery.



4) Open the fuel filler flap lid, and remove the fuel filler cap.
5) Remove the intake manifold.<Ref. to FU(H4DOTC)-13, REMOVAL, Intake Manifold.>
6) Disconnect the connector from the tumble generator valve assembly.



7) Remove the fuel injector.<Ref. to FU(H4DOTC)-33, REMOVAL, Fuel Injector.>
8) Remove the tumble generator valve body from intake manifold.

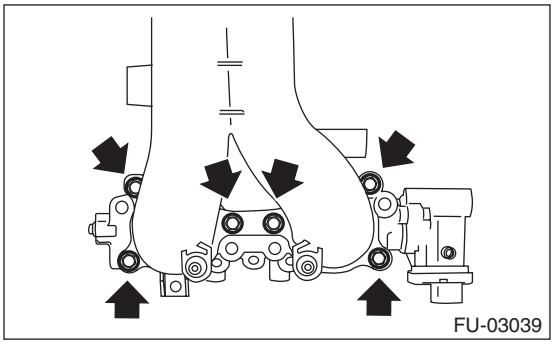


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
8.3 N·m (0.85 kgf-m, 6.1 ft-lb)



13. Tumble Generator Valve Actuator

A: SPECIFICATION

The tumble generator valve assembly cannot be disassembled.
Refer to “Tumble Generator Valve Assembly” for removal and installation procedure. <Ref. to FU(H4DOTC)-35, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(H4DOTC)-35, INSTALLATION, Tumble Generator Valve Assembly.>

14. Tumble Generator Valve Position Sensor

A: SPECIFICATION

The tumble generator valve assembly cannot be disassembled.
Refer to “Tumble Generator Valve Assembly” for removal and installation procedure. <Ref. to FU(H4DOTC)-35, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(H4DOTC)-35, INSTALLATION, Tumble Generator Valve Assembly.>

15.Oil Flow Control Solenoid Valve

A: REMOVAL

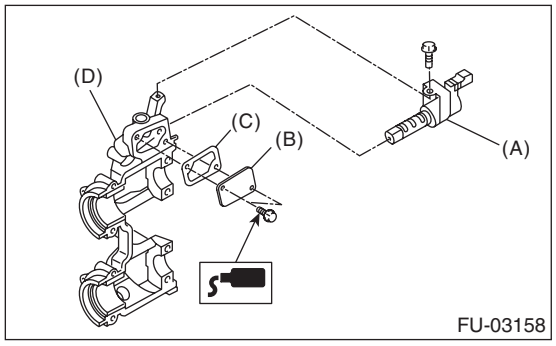
Oil flow control solenoid valve is a unit with camshaft cap.
Refer to “Camshaft” for removal procedure. <Ref. to ME(H4DOTC)-53, REMOVAL, Camshaft.>

B: INSTALLATION

Refer to “Camshaft” for installation procedure. <Ref. to ME(H4DOTC)-54, INSTALLATION, Camshaft.>

C: DISASSEMBLY

1) Remove the 2 mounting bolts and remove the oil return cover and gasket.
2) Remove the mounting bolt and remove the oil flow control solenoid valve.



(A) Oil flow control solenoid valve
(B) Oil return cover
(C) Gasket
(D) Camshaft cap

D: ASSEMBLY

1) Install the oil flow control solenoid valve.

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

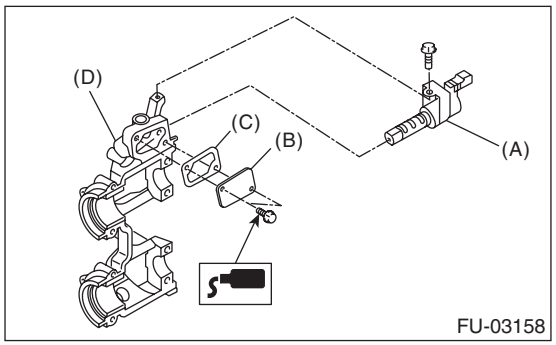
2) Apply liquid gasket to the two bolts which secure the oil return cover.

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

3) Attach the oil return cover and gasket.

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

NOTE:
Use a new gasket.

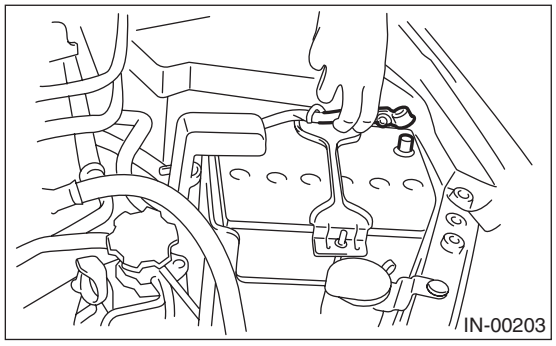


(A) Oil flow control solenoid valve
(B) Oil return cover
(C) Gasket
(D) Camshaft cap

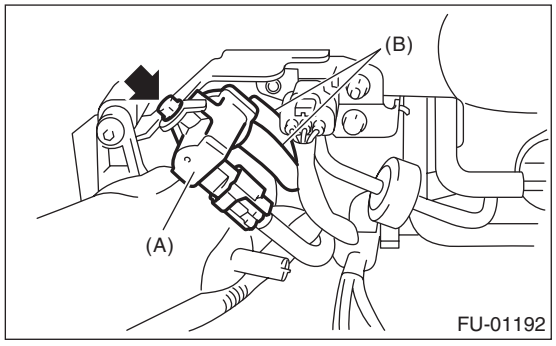
16. Wastegate Control Solenoid Valve

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

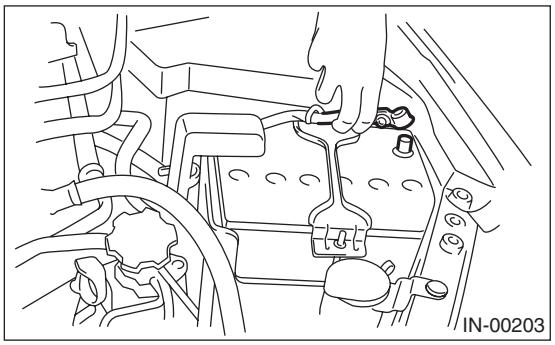
Install in the reverse order of removal.

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

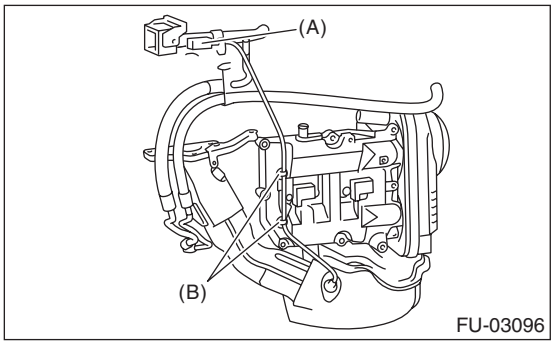
17.Front Oxygen (A/F) Sensor

A: REMOVAL

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

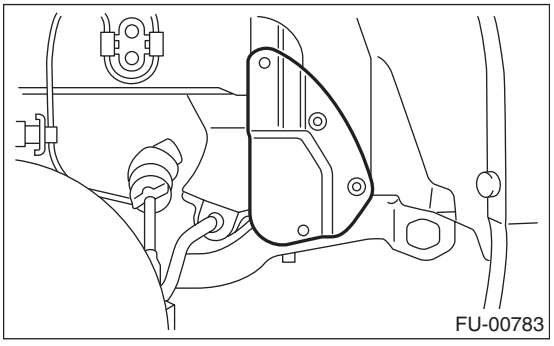


3) Disconnect the connector from front oxygen (A/F) sensor.
4) Disconnect the engine harness fixed by a clip, from the bracket.



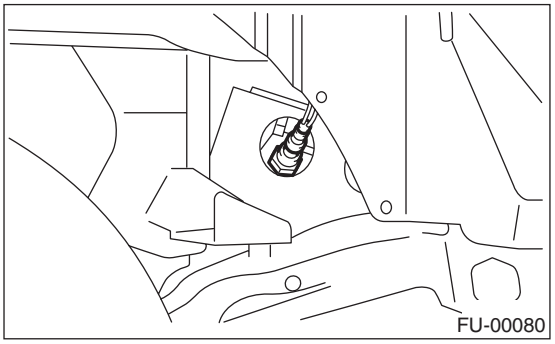
(A) Front oxygen (A/F) sensor connector
(B) Clip

5) Remove the front right side wheel.
6) Lift the vehicle.
7) Remove the service hole cover.



8) Apply spray-type lubricant or equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
9) 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

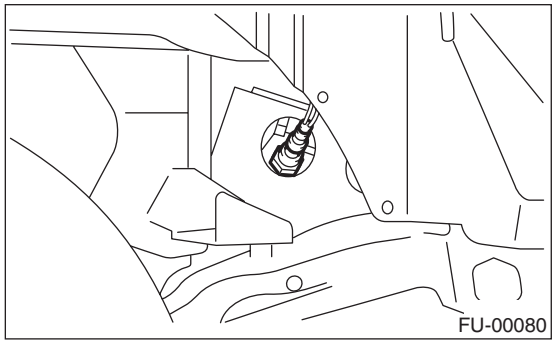
1) Before installing front oxygen (A/F) sensor, apply the anti-seize compound only to the threaded portion of front oxygen (A/F) sensor. This facilitates the next removal.

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

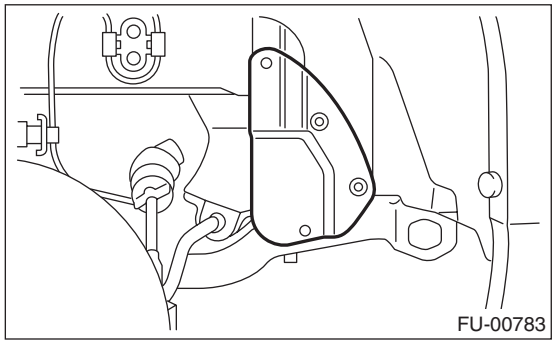
Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30 or equivalent

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

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



3) Install the service hole cover.

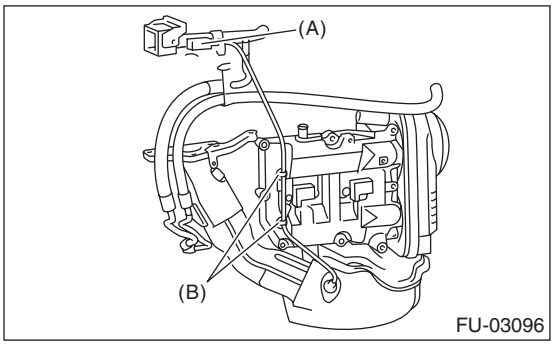


4) Lower the vehicle.
5) Install the front right side wheel.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

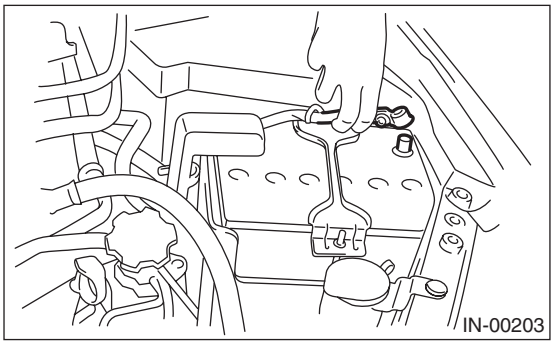
6) Connect the engine harness to the bracket using a clip.

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



(A) Front oxygen (A/F) sensor connector
(B) Clip

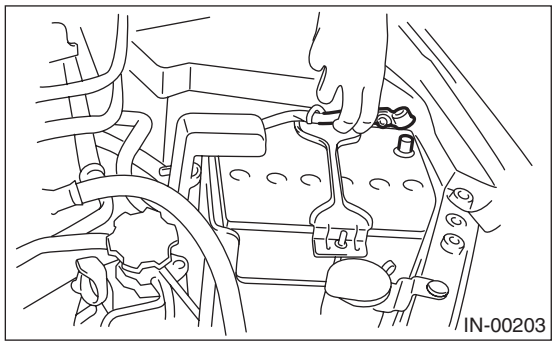
8) Connect the battery ground cable to the battery.



18.Rear Oxygen Sensor

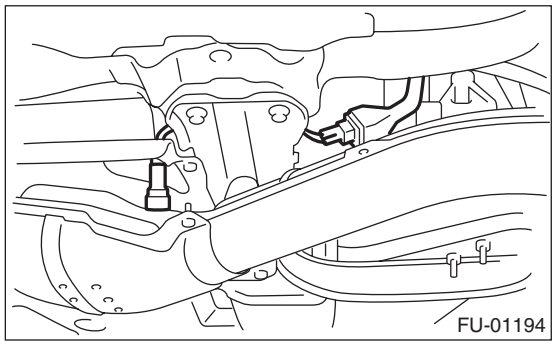
A: REMOVAL

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



3) Lift the vehicle.
4) Disconnect the connector from the rear oxygen sensor.
5) Apply spray-type lubricant or equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
6) 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

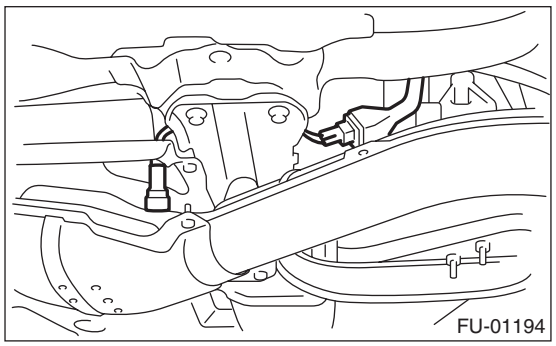
1) Before installing rear oxygen (A/F) sensor, apply the anti-seize compound only to the threaded portion of rear oxygen (A/F) sensor. This facilitates the next removal.

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

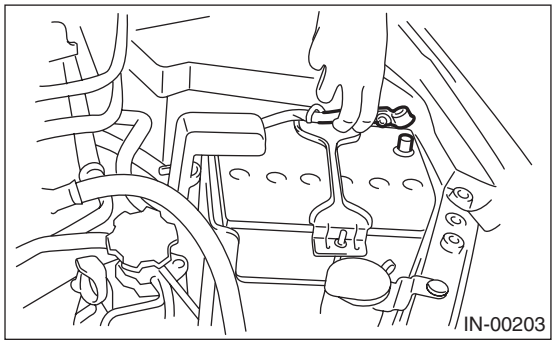
Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30 or equivalent

2) Install the rear oxygen sensor.

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



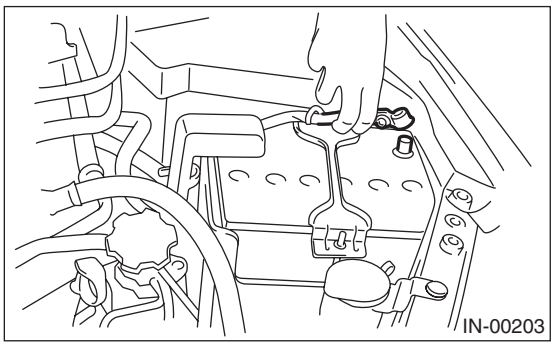
3) Connect the connector to rear oxygen sensor.
4) Lower the vehicle.
5) Connect the battery ground cable to the battery.



19.SI-DRIVE Selector

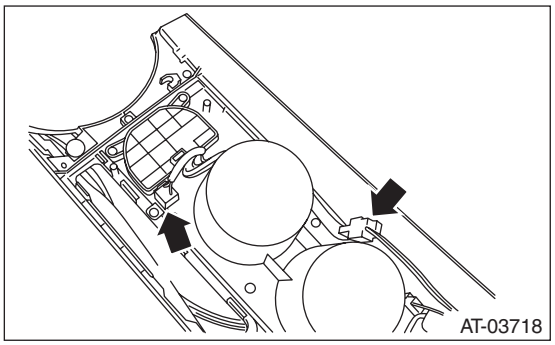
A: REMOVAL

1) Disconnect the ground cable from battery.

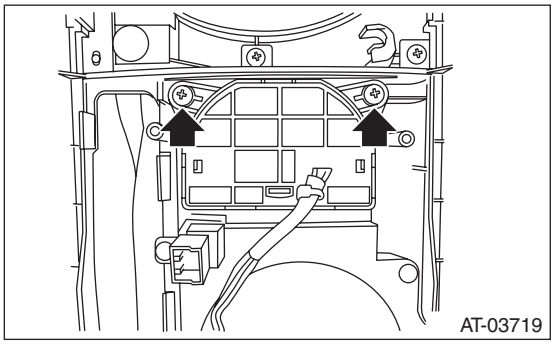


2) Remove the console box. <Ref. to EI-50, REMOVAL, Glove Box.>

3) Disconnect the connectors from the SI-DRIVE selector.



4) Remove the screws securing the upper side of the SI-DRIVE selector to the console box.



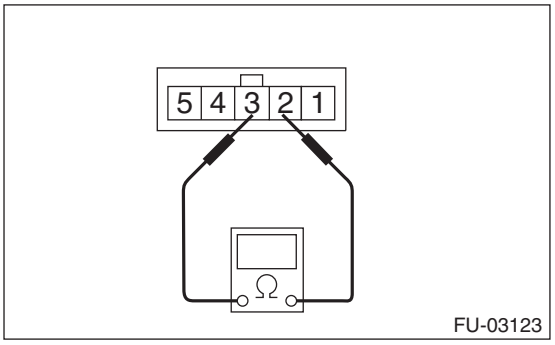
5) Remove the screws which secure the cup holder to the console box, then remove the SI-DRIVE selector.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the resistance between SI-DRIVE selector terminals.

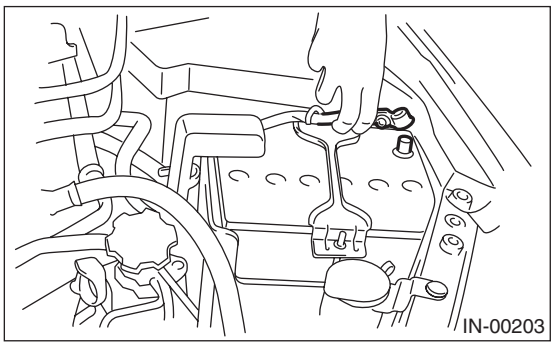


Switch position	Terminal No.	Standard
Sport (when turning the SI-DRIVE selector to the left)	2 and 3	Less than 1 Ω
Intelligent (when pushing the SI-DRIVE selector)		0.95 — 1.05 kΩ
Sport Sharp (when turning the SI-DRIVE selector to the right)		3.48 — 3.85 kΩ

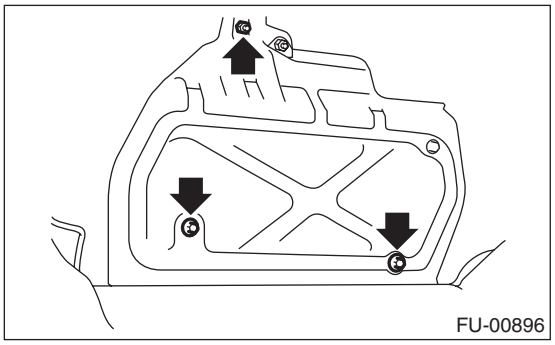
20.Engine Control Module (ECM)

A: REMOVAL

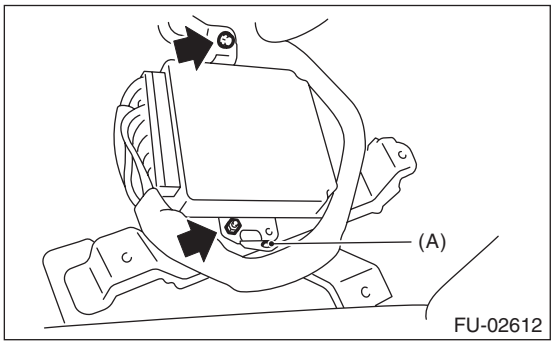
1) Disconnect the ground cable from battery.



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



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



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

B: INSTALLATION

Install in the reverse order of removal.

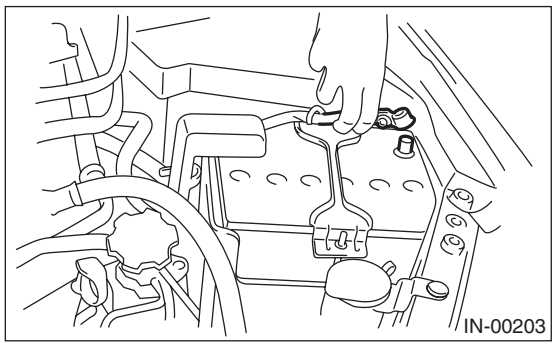
NOTE:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

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

21.Main Relay

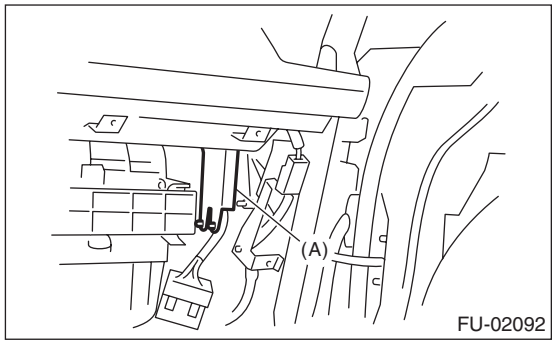
A: REMOVAL

1) Disconnect the ground cable from battery.

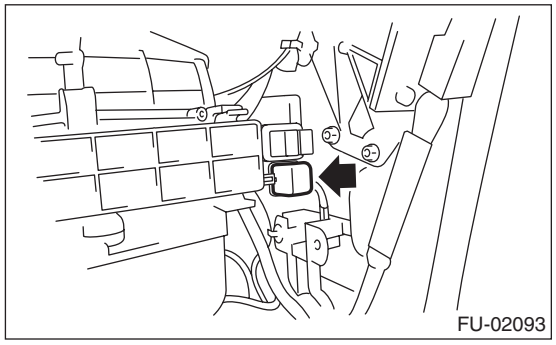


2) Remove the glove box. <Ref. to EI-50, REMOVAL, Glove Box.>

3) Remove the harness cover (A).



4) Disconnect the connectors from main relay.



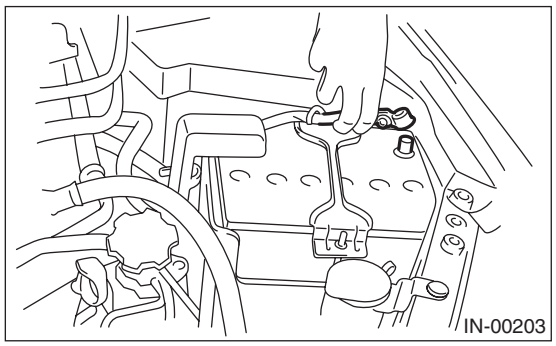
B: INSTALLATION

Install in the reverse order of removal.

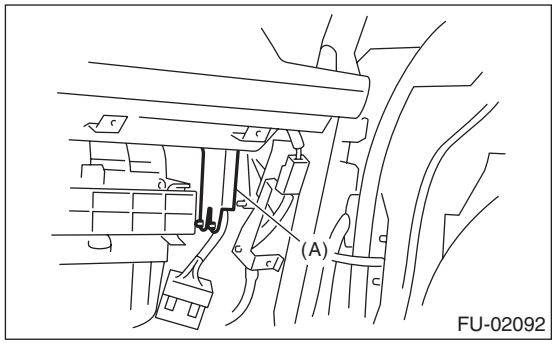
22.Fuel Pump Relay

A: REMOVAL

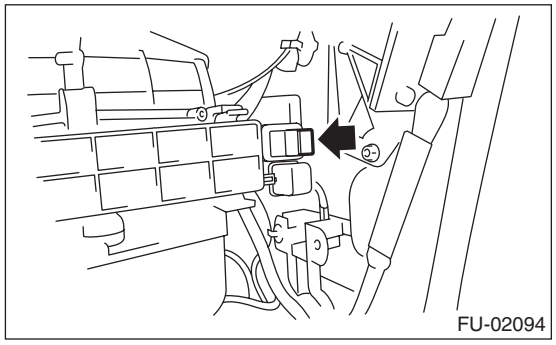
1) Disconnect the ground cable from battery.



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



4) Disconnect the connector from fuel pump relay.



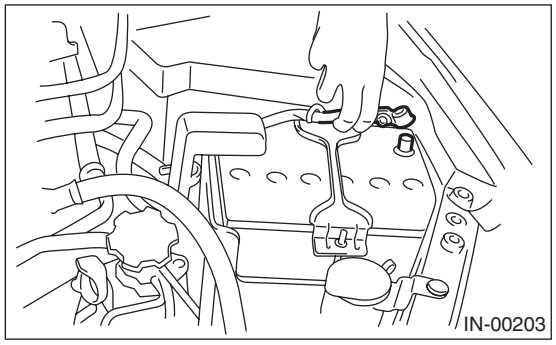
B: INSTALLATION

Install in the reverse order of removal.

23. Electronic Throttle Control Relay

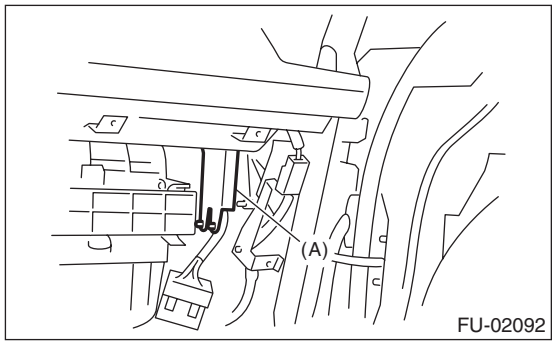
A: REMOVAL

1) Disconnect the ground cable from battery.

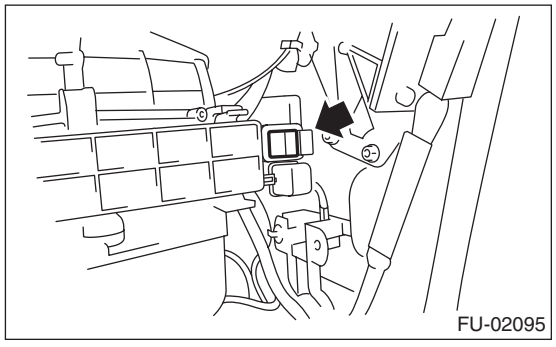


2) Remove the glove box. <Ref. to EI-50, REMOVAL, Glove Box.>

3) Remove the harness cover (A).



4) Disconnect the connector from electric throttle control relay.



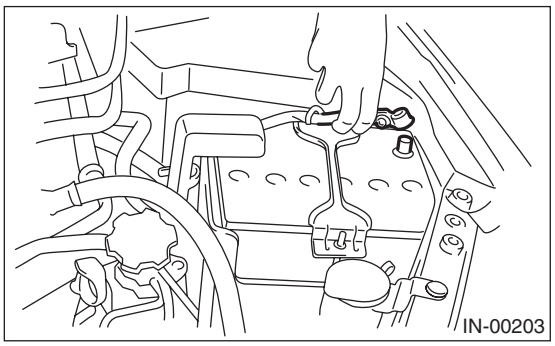
B: INSTALLATION

Install in the reverse order of removal.

24.Fuel Pump Control Unit

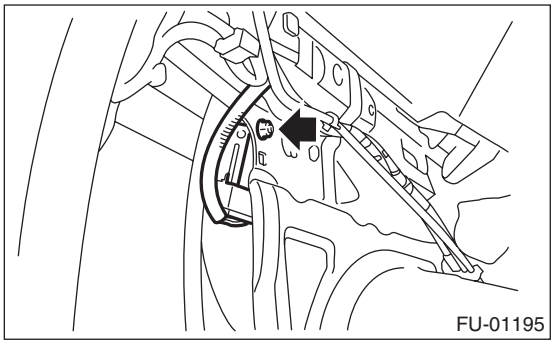
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the rear quarter trim. <Ref. to EI-60, 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 N·m (0.5 kgf-m, 3.7 ft-lb)

25.Fuel

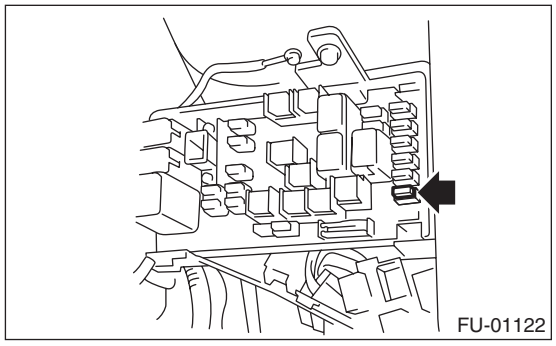
A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

1) Remove the fuse of fuel pump from main fuse box.



2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn the ignition switch to OFF.

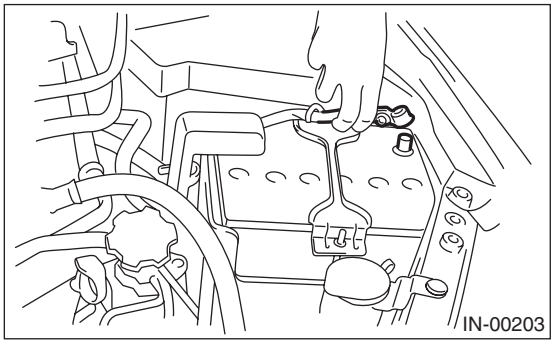
2. DRAINING FUEL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

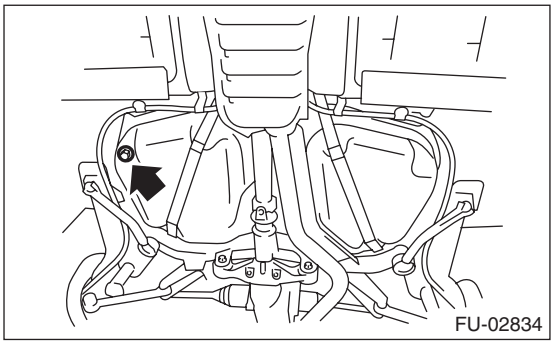
CAUTION:
Be careful not to spill fuel.

NOTE:
For the fuel tank without fuel drain plug, refer to DRAINING FUEL (WITH SUBARU SELECT MONITOR). <Ref. to FU(H4DOTC)-50, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, 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 the vehicle.
5) Remove the fuel tank protector.
6) Set a container under the vehicle and remove the fuel drain plug from fuel tank to drain fuel from fuel tank.



7) Tighten the fuel drain plugs.

NOTE:
Use a new gasket.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

8) Install the fuel tank protector.

NOTE:
Use new nuts.

Tightening torque:
Nut
9 N·m (0.9 kgf-m, 6.6 ft-lb)
Bolt
17.5 N·m (1.78 kgf-m, 12.9 ft-lb)

9) Lower the vehicle.

3. DRAINING FUEL (WITH SUBARU SELECT MONITOR)

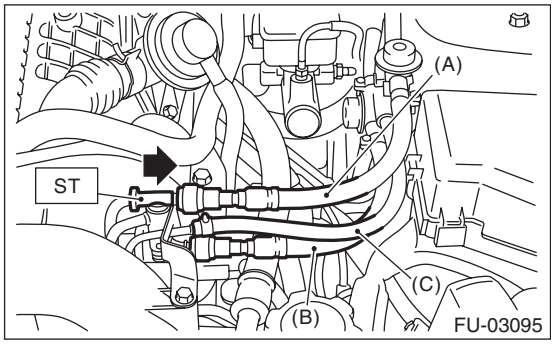
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

NOTE:
• If the fuel pump cannot be actuated, refer to DRAINING FUEL (THROUGH THE FUEL FILLER HOSE) <Ref. to FU(H4DOTC)-50, DRAINING FUEL (THROUGH THE FUEL FILLER HOSE), PROCEDURE, Fuel.>.
• Be careful not to allow the battery to go flat.

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the fuel delivery hose.
ST 42099AE000 CONNECTOR REMOVER

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



3) Connect ST to the fuel delivery hose.
ST 18471AA000 FUEL PIPE ADAPTER
4) Connect the gasoline proof hose to ST, and put the hose end into the container.
5) Actuate the fuel pump and drain the fuel using Subaru Select Monitor <Ref. to EN(H4DOTC)(diag)-58, FUEL PUMP CONTROL (ON/OFF OPERATION), OPERATION, System Operation Check Mode.>.

CAUTION:
Be careful not to spill fuel.

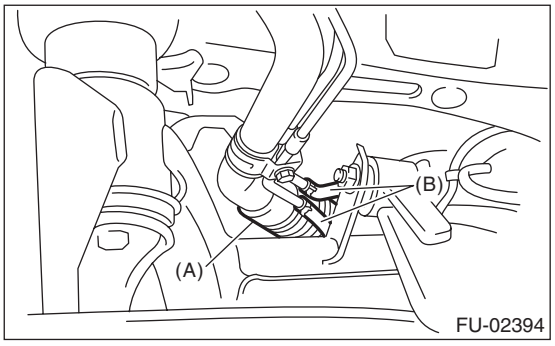
4. DRAINING FUEL (THROUGH THE FUEL FILLER HOSE)

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
• Be careful not to spill fuel.
• Fuel may remain in the fuel filler pipe. Perform the work after draining the fuel from the fuel filler pipe through the fill opening using the gasoline proof pump and the gasoline proof hose (ø10 or less).

1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-12, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
4) Open the fuel filler flap lid, and remove the fuel filler cap.
5) Drain the fuel from the fuel filler pipe through the fill opening using the gasoline proof pump and the gasoline proof hose (ø10 or less).
6) Disconnect the fuel filler hose (A) from the fuel filler pipe.

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



(A) Fuel filler hose
(B) Evaporation hose

7) Set a container under the vehicle and insert the gasoline proof hose (ø10 or less) into the fuel filler hose to drain the fuel.

CAUTION:
Be careful not to spill fuel.

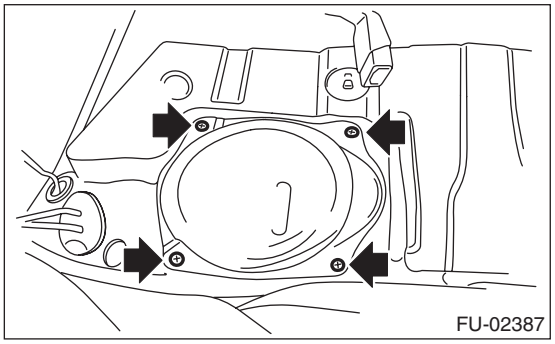
26.Fuel Tank

A: REMOVAL

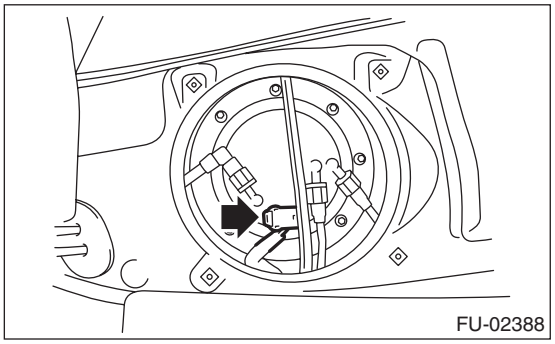
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

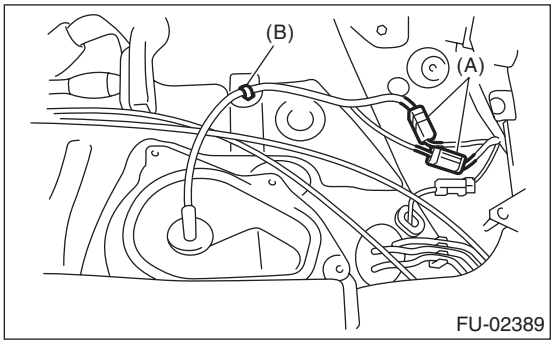
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Drain fuel from fuel tank.<Ref. to FU(H4DOTC)-49, DRAINING FUEL, PROCEDURE, Fuel.>
4) Remove the rear seat.
5) Remove the service hole cover of fuel pump.


FU-02387

6) Disconnect the connector from fuel pump.

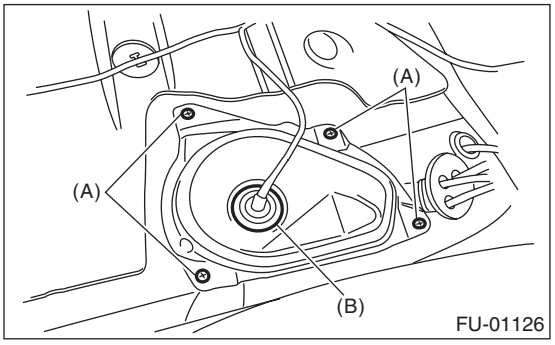

FU-02388

7) Remove the connector (A) and clip (B).



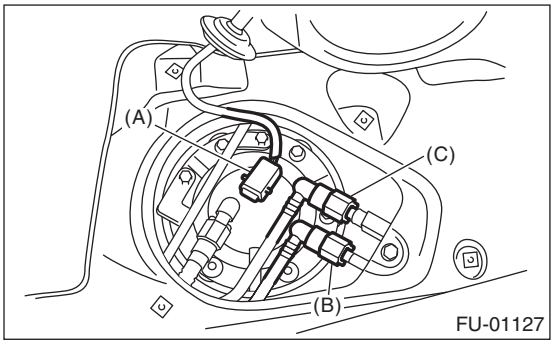
FU-02389

8) Remove the service hole cover of fuel sub level sensor.
(1) Remove the bolt (A).
(2) Push the grommet (B) down and remove the service hole cover.



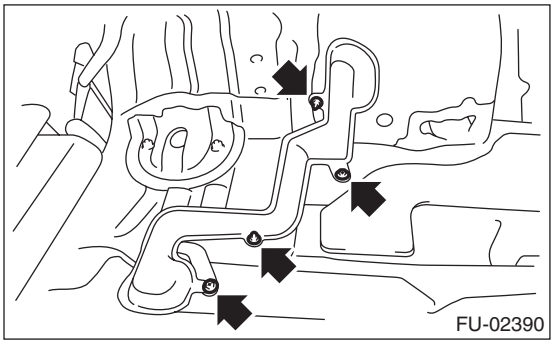
FU-01126

9) Disconnect connector (A) from fuel sub level sensor.
10) Disconnect the quick connector of fuel delivery (B) and return hose (C). <Ref. to FU(H4DOTC)-67, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

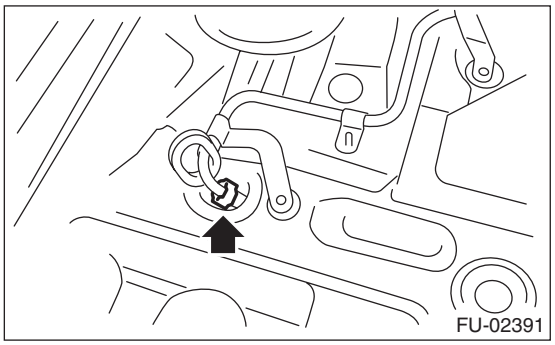


FU-01127

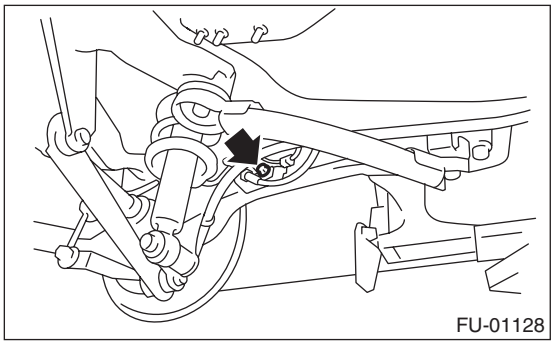
11) Remove the trunk room trim. (Sedan model)<Ref. to EI-67, REMOVAL, Trunk Room Trim.>
12) Remove the rear quarter trim. (Wagon model)<Ref. to EI-60, WAGON MODEL, REMOVAL, Rear Quarter Trim.>
13) Remove the pipe protector.


FU-02390

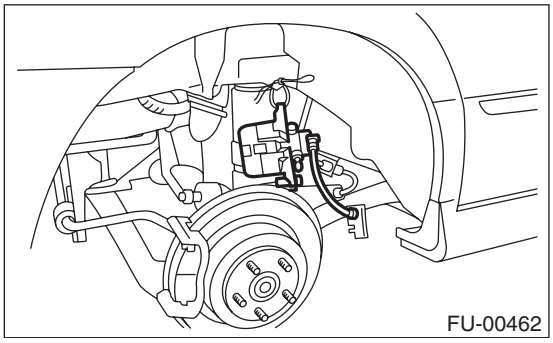
14) Remove the grommet and disconnect the quick connector of the evaporation pipe. <Ref. to FU(H4DOTC)-67, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



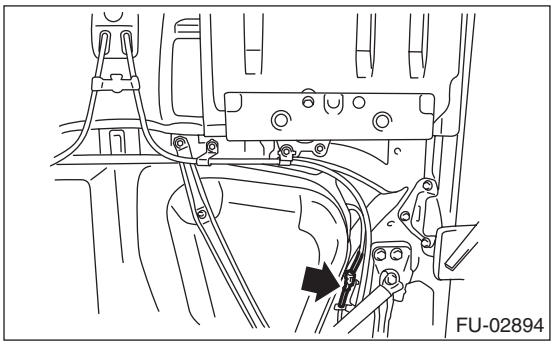
15) Remove the rear wheels.
16) Remove the bolts which secure the rear brake hose mounting bracket.



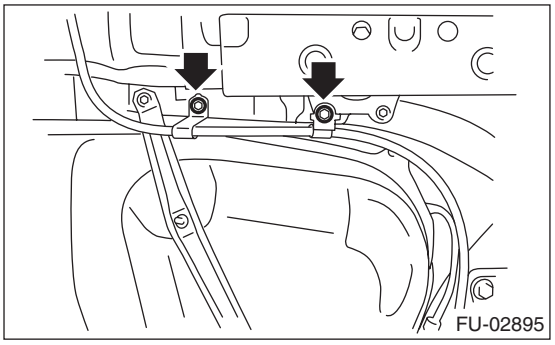
17) Remove the rear brake caliper and tie it to the body side of the vehicle.

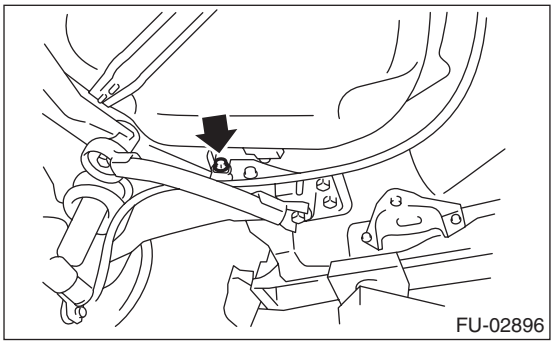


18) Remove the parking brake cable from the parking brake assembly. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
19) Lift the vehicle.
20) Remove the rear exhaust pipe.<Ref. to EX(H4DOTC)-12, REMOVAL, Rear Exhaust Pipe.>
21) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller 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.

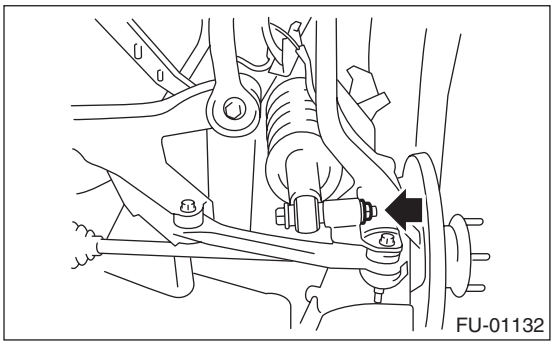




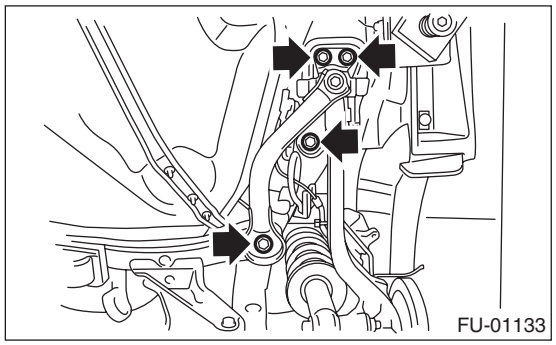
25) Remove the rear suspension assembly.

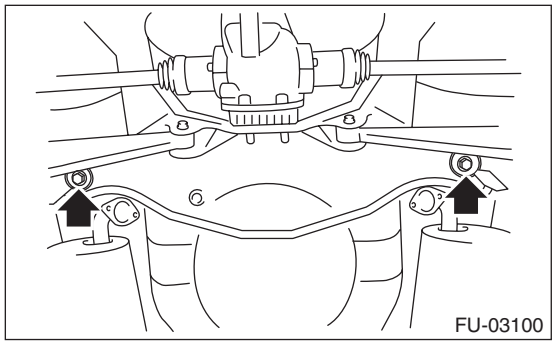
WARNING:
A helper is required to perform this work.

(1) Support the rear differential with the transmission jack.
(2) Remove the bolts which hold the rear shock absorber to the rear suspension arm.



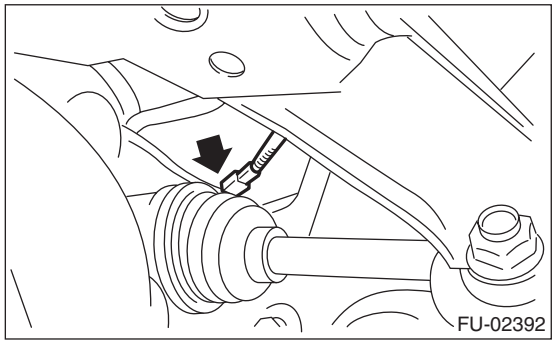
(3) Remove the bolts which secure the rear suspension assembly to the body.



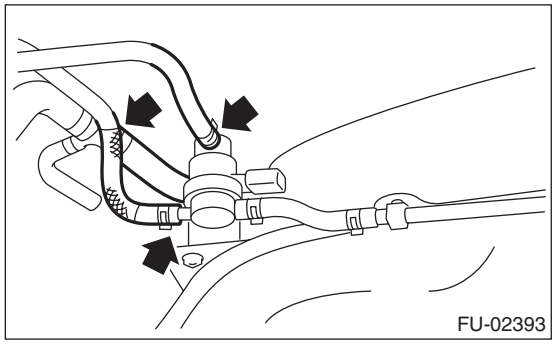


(4) Remove the rear suspension assembly.

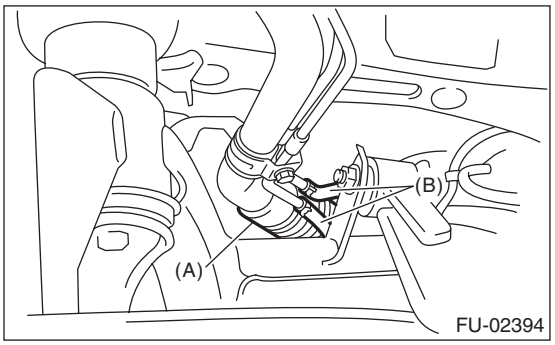
26) Disconnect the connector.



27) Disconnect the evaporation hose.

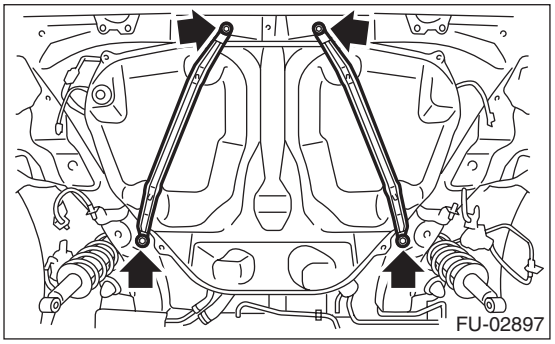


28) Disconnect the fuel filler hose (A) and evaporation hose (B).



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.

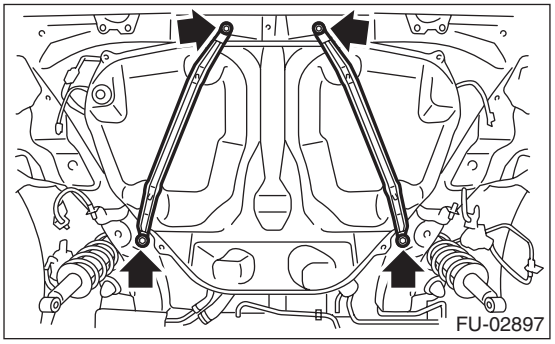
WARNING:
A helper is required to perform this work.



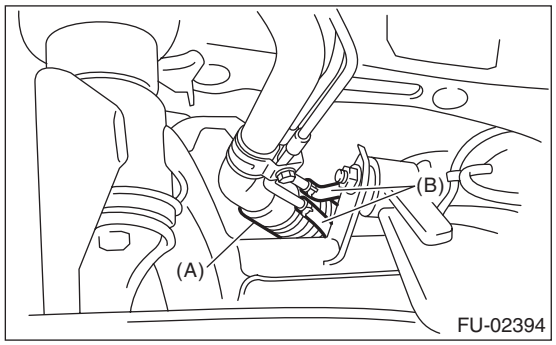
B: INSTALLATION

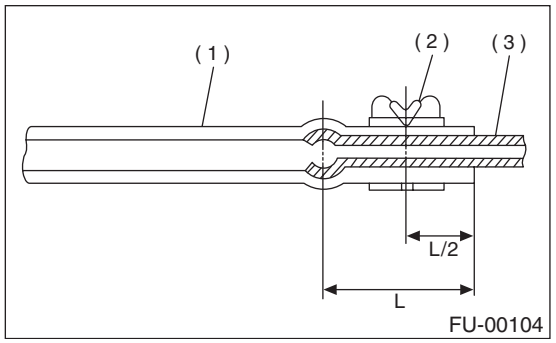
1) Support the fuel tank with a transmission jack, set the fuel tank in place, and temporarily tighten the bolts of the fuel tank band.

WARNING:
A helper is required to perform this work.



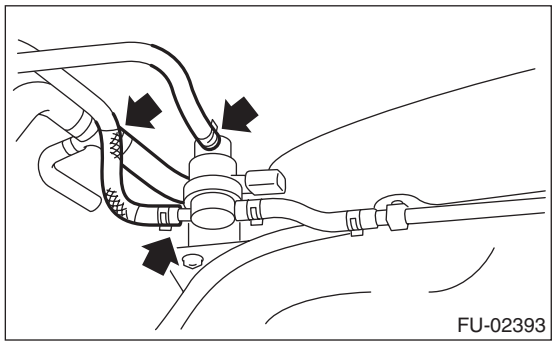
2) Securely insert the fuel filler hose (A) and evaporation hose (B) to the specified position, then tighten the clamp.





(1) Hose
(2) Clip or clamp
(3) Pipe

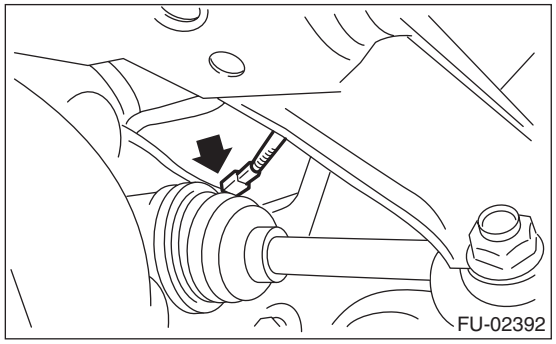
3) Connect the evaporation hose.



4) Tighten the fuel tank band bolts.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

5) Connect the connector.

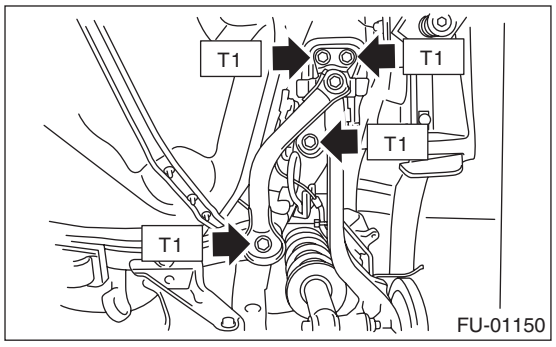


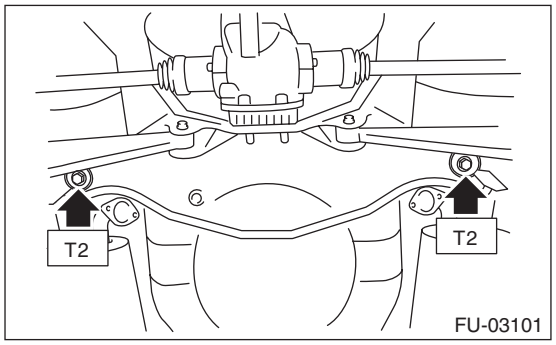
6) Install the rear suspension assembly.

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.

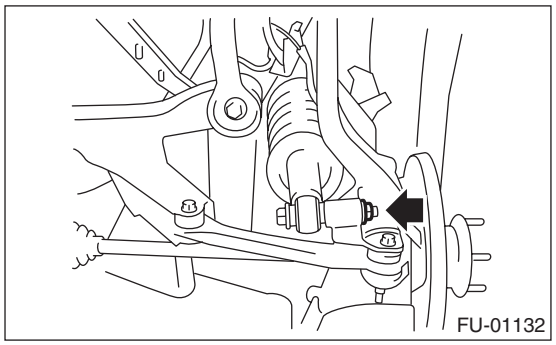
Tightening torque:
T1: 125 N·m (12.7 kgf-m, 92.2 ft-lb)
T2: 175 N·m (17.8 kgf-m, 129 ft-lb)





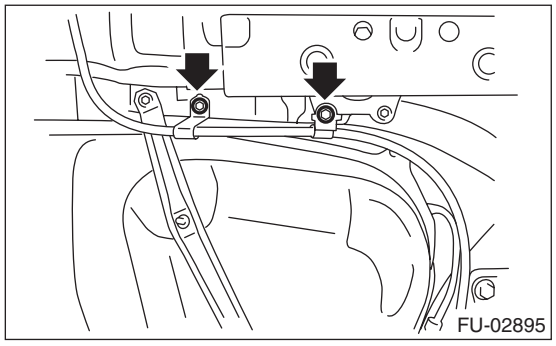
(3) Tighten the bolts which hold the rear shock absorber to the rear suspension arm. <Ref. to RS-10, INSTALLATION, Rear Arm.>

Tightening torque:
62 N·m (6.3 kgf-m, 46 ft-lb)

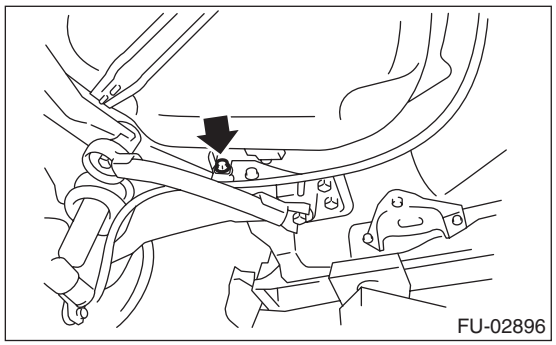


7) Tighten the bolts holding the parking brake cable clamp.

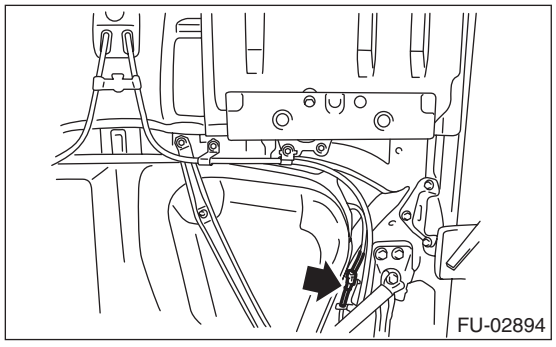
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)

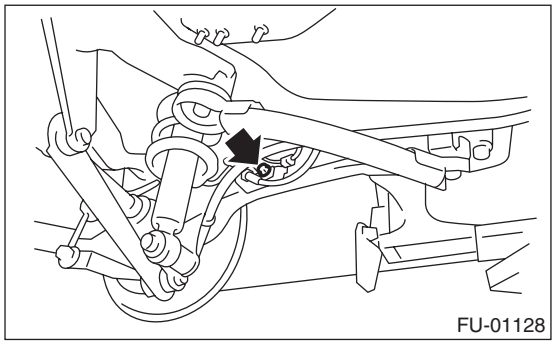


8) Connect the connector to the rear ABS wheel speed sensor.



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.

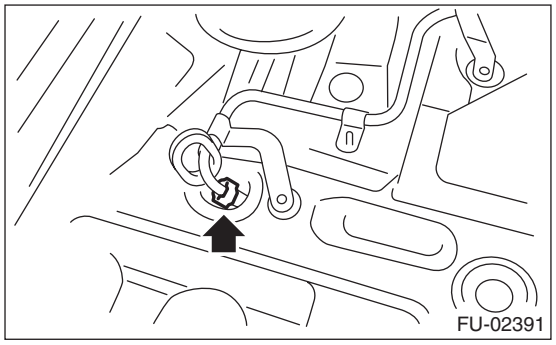
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



16) Install the rear wheels.

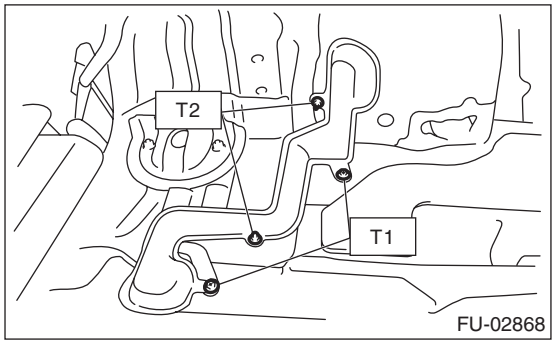
Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

17) Connect the quick connector of the evaporation pipe. <Ref. to FU(H4DOTC)-69, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



18) Install the pipe protector.

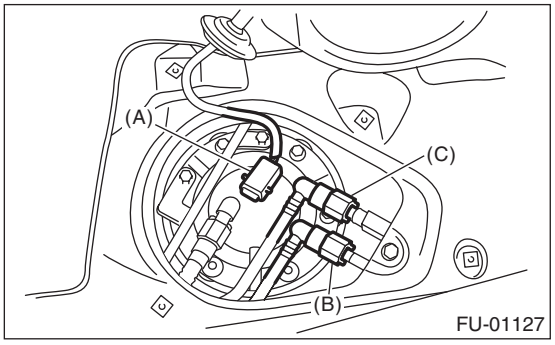
Tightening torque:
T1: 1.0 N·m (0.1 kgf-m, 0.7 ft-lb)
T2: 7.5 N·m (0.7 kgf-m, 5.5 ft-lb)



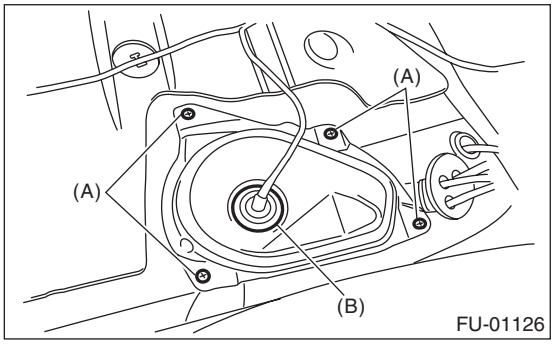
19) Install the trunk room trim. (Sedan model) <Ref. to EI-68, INSTALLATION, Trunk Room Trim.>
20) Install the rear quarter trim. (Wagon model) <Ref. to EI-61, INSTALLATION, Rear Quarter Trim.>
21) Connect connector (A) to the fuel sub level sensor.

22) Connect the quick connector of fuel delivery (B) and return hose (C). <Ref. to FU(H4DOTC)-69, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

NOTE:
When connecting, be careful not to reverse the delivery side and return side.

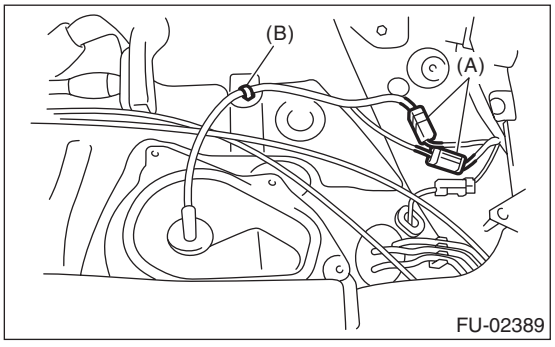


23) Install the service hole cover of fuel sub level sensor.

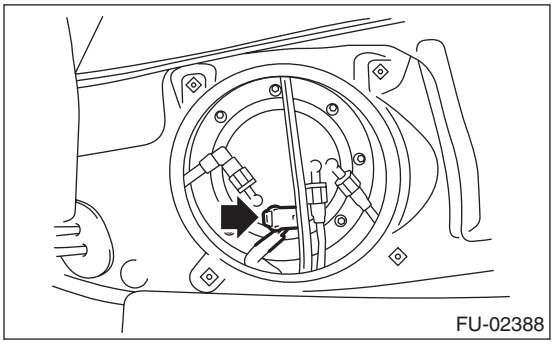


(A) Bolt
(B) Grommet

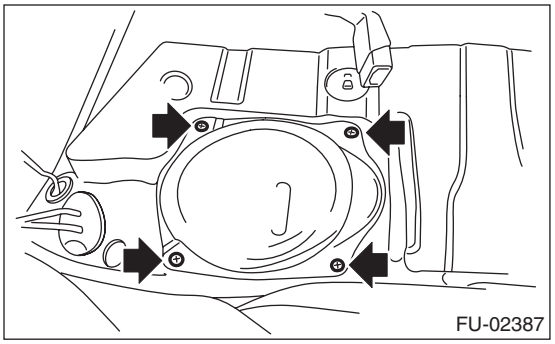
24) Connect connector (A), and install clip (B).



25) Connect the connector to the fuel pump.



26) Install the service hole cover of fuel pump.



27) Install the rear seat.
28) Install the fuse of fuel pump to 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.

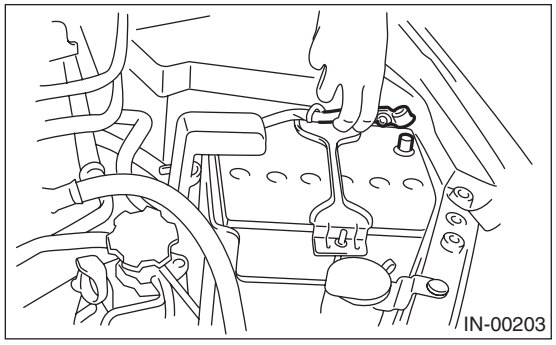
27.Fuel Filler Pipe

A: REMOVAL

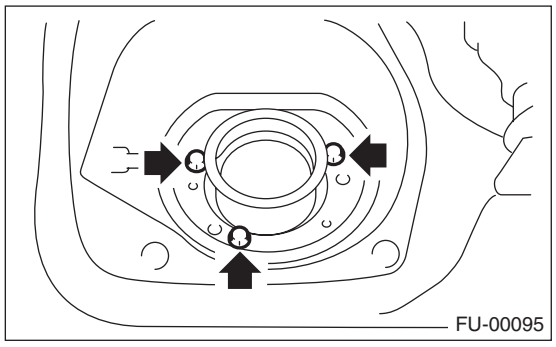
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

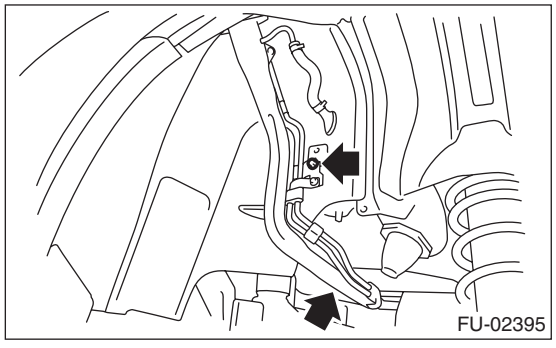
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



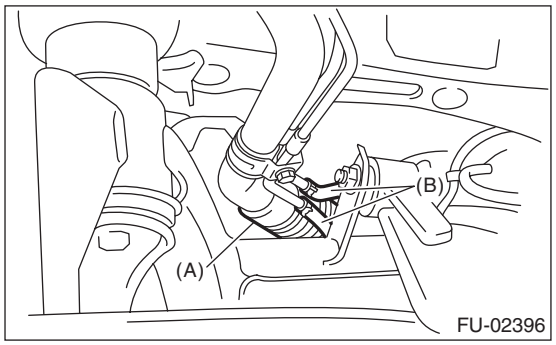
3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the screws which secure gasket.

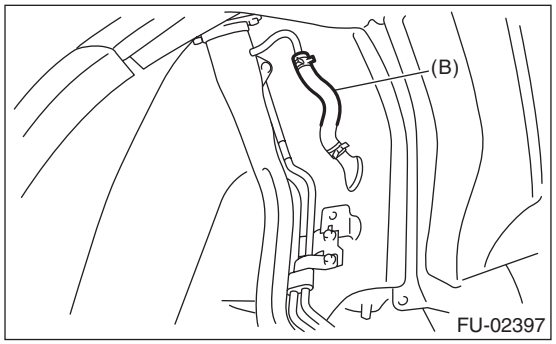


5) Remove the rear wheel RH.
6) Lift the vehicle.
7) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-49, DRAINING FUEL, PROCEDURE, Fuel.>
8) Remove the mud guard. <Ref. to EI-29, REMOVAL, Mud Guard.>
9) Remove the rear sub frame. <Ref. to RS-21, REMOVAL, Rear Sub Frame.>
10) Remove the bolts which hold fuel filler pipe bracket on the body.



11) Loosen the clamp, and disconnect the fuel filler hose (A) and evaporation hose (B).



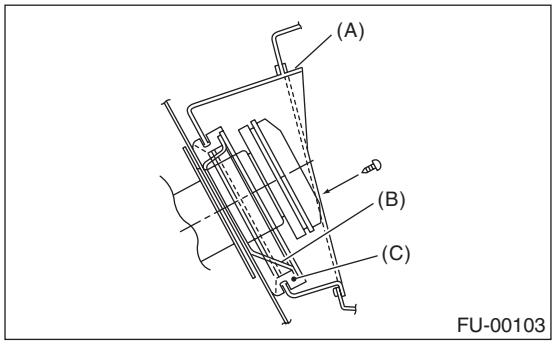


12) Remove the fuel filler pipe to the underside of the vehicle.

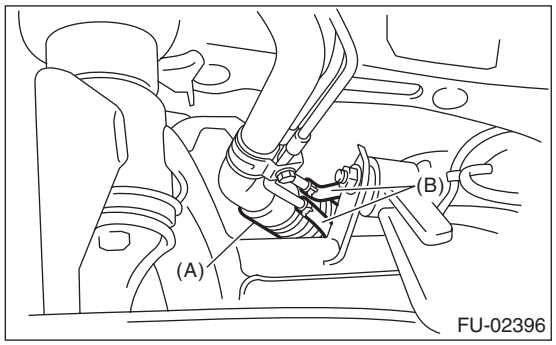
B: INSTALLATION

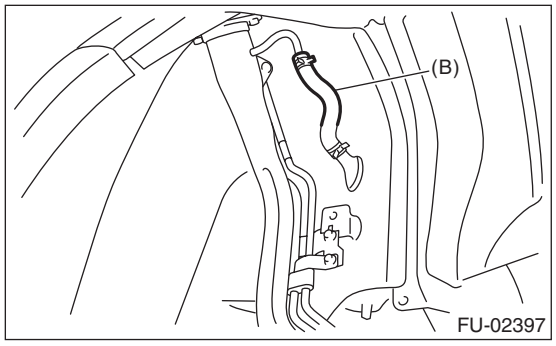
1) Open the fuel filler flap lid.
2) Set the fuel saucer (A) with rubber seal (C), and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

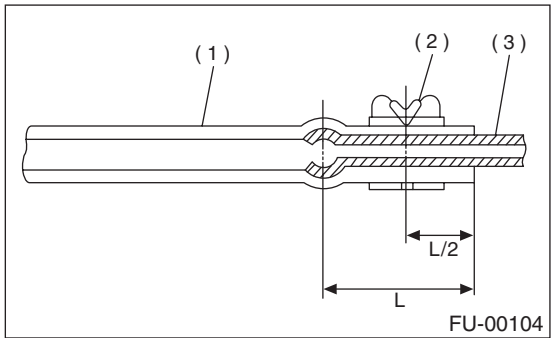
NOTE:
If the edges of rubber seal are folded toward inside, straighten it with a flat tip screwdriver.



4) Securely insert the fuel filler hose (A) and evaporation hose (B) to the specified position, then tighten the clamp.



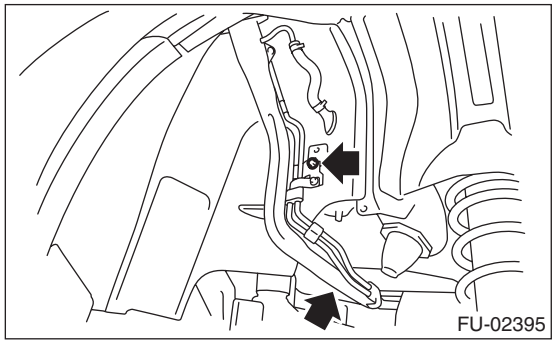




(1) Hose
(2) Clip or clamp
(3) Pipe

5) Tighten the bolts which hold fuel filler pipe bracket on the body.

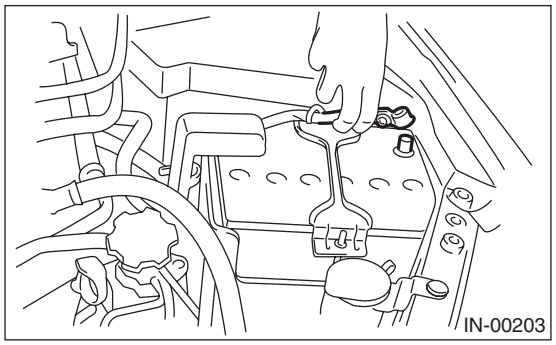
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



6) Install the rear sub frame. <Ref. to RS-21, INSTALLATION, Rear Sub Frame.>
7) Install the mud guard. <Ref. to EI-29, INSTALLATION, Mud Guard.>
8) Lower the vehicle.
9) Install the rear wheel RH.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

10) Connect the battery ground cable to the battery.

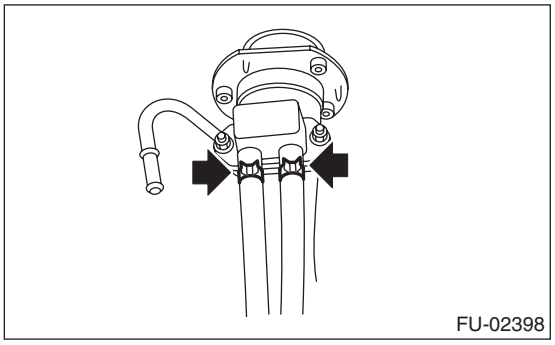


C: INSPECTION

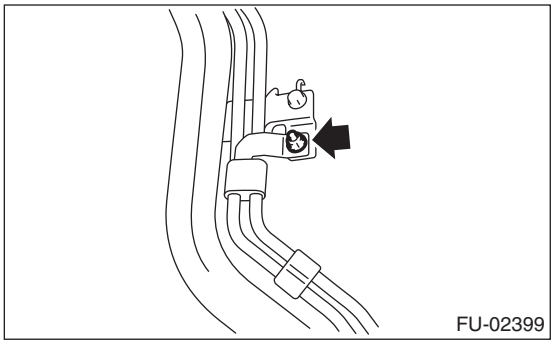
1) Check that the fuel filler pipe does not have holes, cracks or is damaged in any other way.
2) Make sure that the fuel hose is not cracked and that the connections are tight.

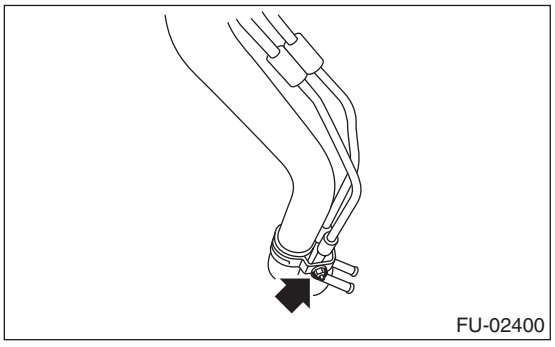
D: DISASSEMBLY

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.

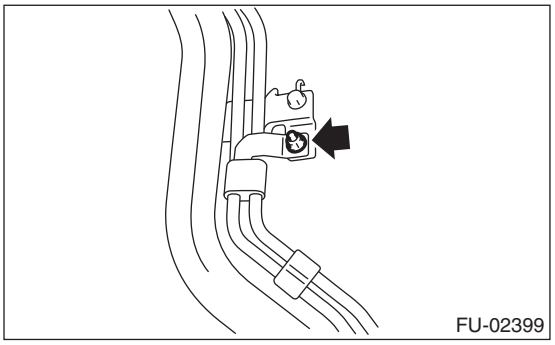


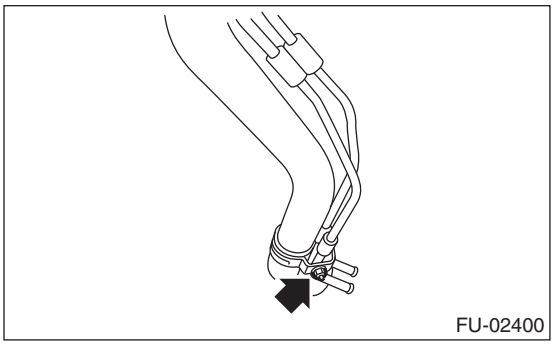


3) Remove the shut valve from the fuel filler pipe. <Ref. to EC(H4DOTC)-17, REMOVAL, Shut Valve.>

E: ASSEMBLY

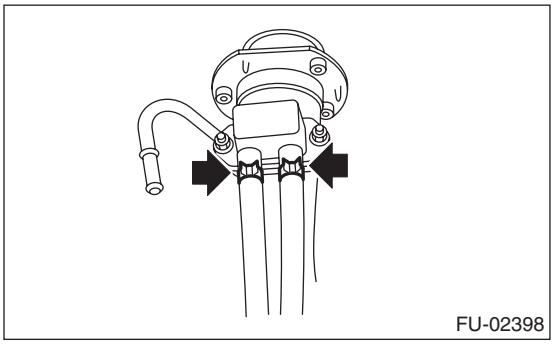
1) Install the shut pipe to the fuel filler pipe. <Ref. to EC(H4DOTC)-17, INSTALLATION, Shut Valve.>
2) Tighten the nuts which secure the evaporation pipe assembly to the fuel filler pipe.





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

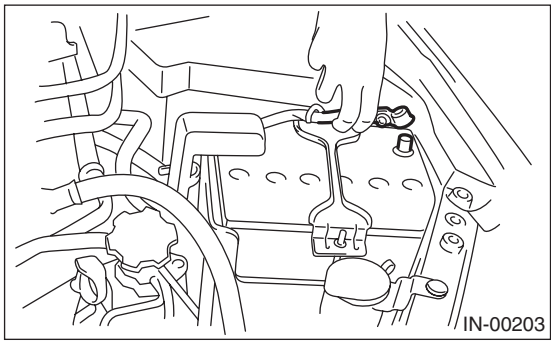
A: REMOVAL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

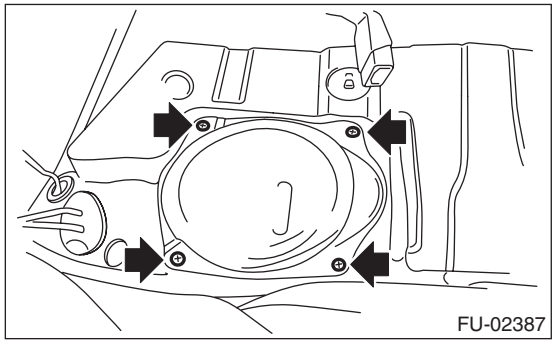
CAUTION:
- **Be careful not to spill fuel.**
- **Before starting work, be sure to reduce fuel in the fuel tank to 3/4 of the tank or less. If there is more fuel in the tank, fuel may spill out.**

NOTE:
Fuel pump assembly consists of fuel pump, fuel filter and fuel level sensor.

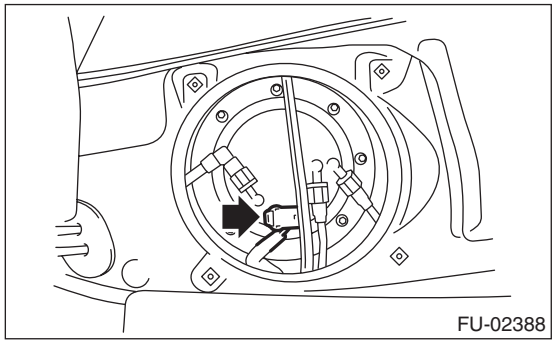
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H4DOTC)-49, DRAINING FUEL, PROCEDURE, Fuel.>
3) Disconnect the ground cable from the battery.


IN-00203

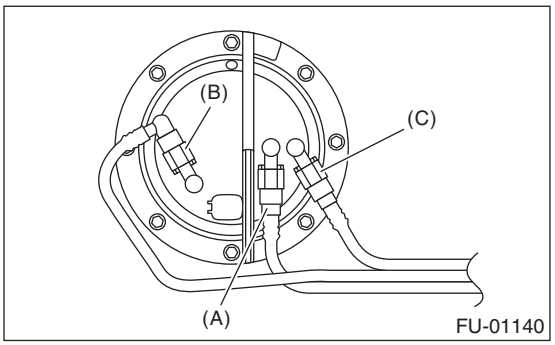
4) Remove the rear seat.
5) Remove the service hole cover.


FU-02387

6) Disconnect the connector from fuel pump.


FU-02388

7) Disconnect the quick connector, then disconnect the fuel delivery hose, return hose and jet pump hose. <Ref. to FU(H4DOTC)-67, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
8) Remove the nuts which install fuel pump assembly onto fuel tank.



FU-01140

(A) Delivery hose
(B) Return hose
(C) Jet pump hose

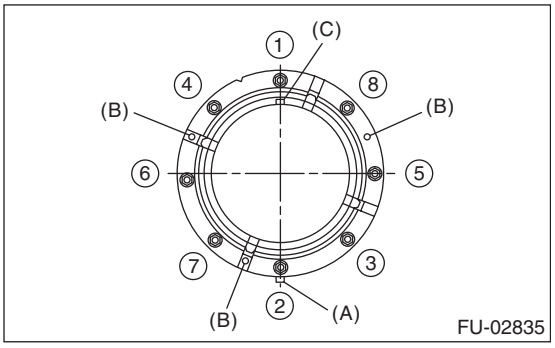
9) Remove the fuel pump assembly from the fuel tank.

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 with the protrusion (A) of gasket aimed at the front side of the vehicle.
- Insert the protrusion (B) of gasket to the upper plate. (3 places)
- Align the protrusion (C) of fuel pump assembly with the cutout 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)

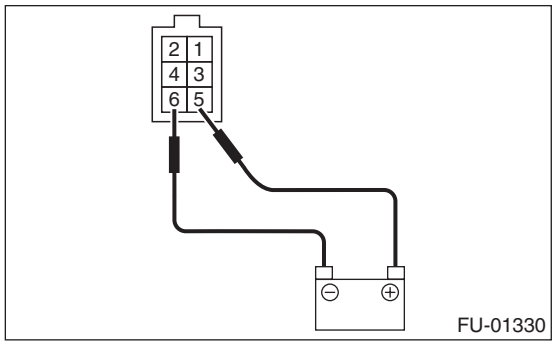


FU-02835

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.**



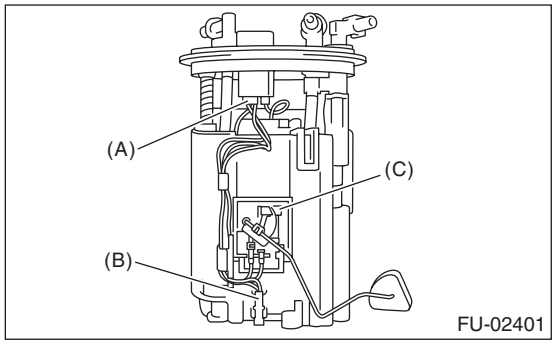
29.Fuel Level Sensor

A: REMOVAL

WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
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)-60, 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.

NOTE:
Use a new gasket.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.2 ft-lb)

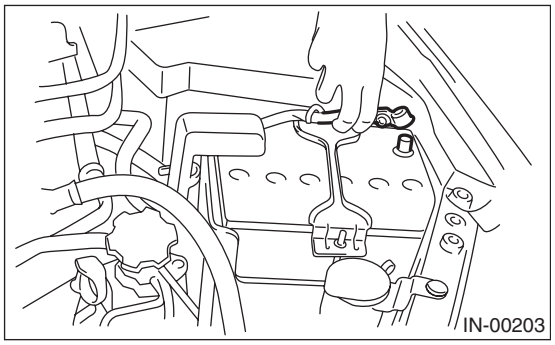
30.Fuel Sub Level Sensor

A: REMOVAL

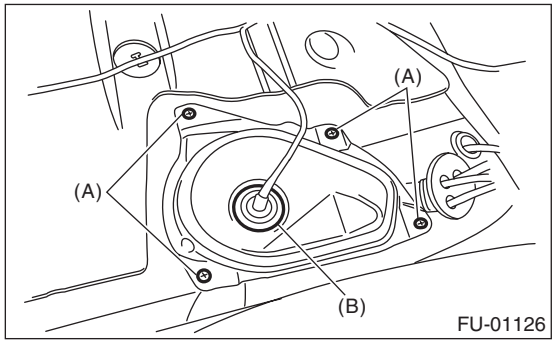
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **Before starting work, be sure to reduce fuel in the fuel tank to 3/4 of the tank or less. If there is more fuel in the tank, fuel may spill out.**

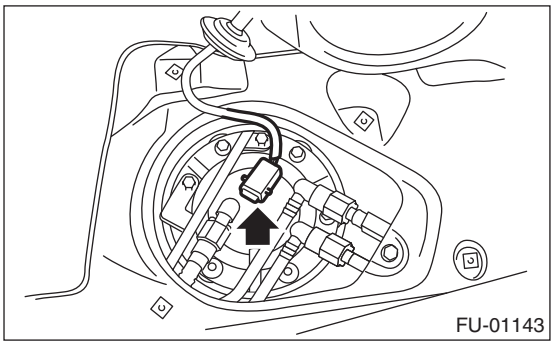
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H4DOTC)-49, DRAINING FUEL, PROCEDURE, Fuel.>
3) Disconnect the ground cable from the battery.



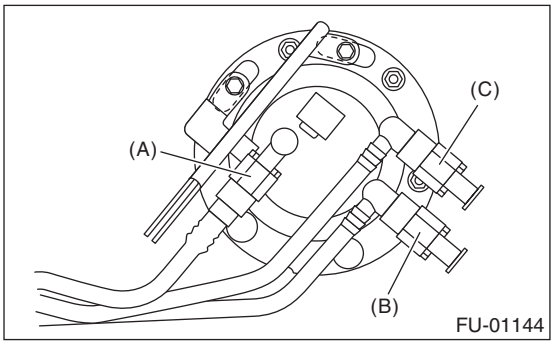
4) Remove the rear seat.
5) Remove the service hole cover.
   (1) Remove bolt (A).
   (2) Push the grommet (B) down and remove the service hole cover.



6) Disconnect the connector from the fuel sub level sensor.



7) Disconnect the quick connector, then disconnect the fuel delivery hose, return hose and jet pump hose. <Ref. to FU(H4DOTC)-67, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
8) Remove the nuts and bolts which install fuel sub level sensor on fuel tank.



(A) Jet pump hose
(B) Delivery hose
(C) Return hose

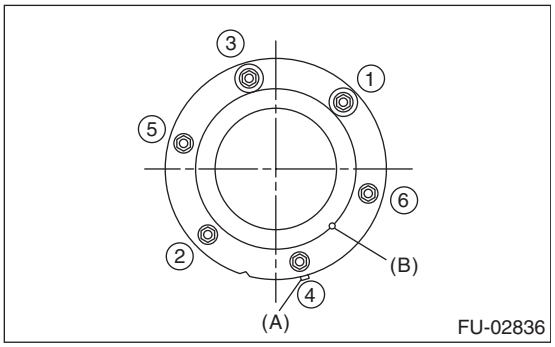
9) Remove the fuel sub level sensor.

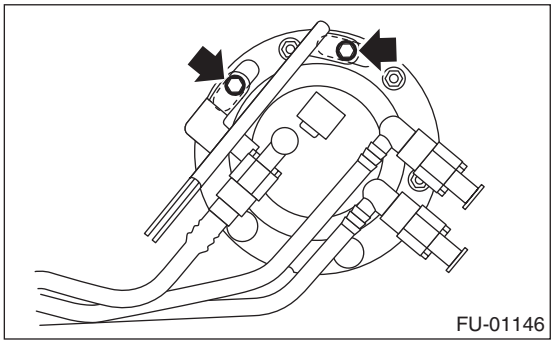
B: INSTALLATION

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 to the position shown in the following figure.
- Align the protrusion (B) of fuel sub level sensor with the cutout portion of fuel sub level sensor upper plate.
- Tighten the nuts and bolts to the specified torque in the order as shown in the figure.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.2 ft-lb)





31.Fuel Filter

A: SPECIFICATION

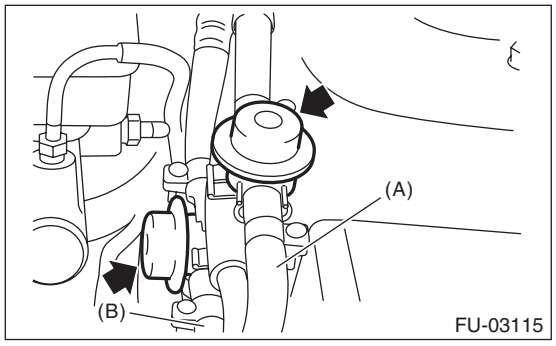
Fuel filter forms a single unit with fuel pump.
Refer to “Fuel Pump” for removal and installation. <Ref. to FU(H4DOTC)-60, REMOVAL, Fuel Pump.> <Ref. to FU(H4DOTC)-60, INSTALLATION, Fuel Pump.>

32.Fuel Damper Valve

A: REMOVAL

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

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the fuel damper valve from the fuel delivery line (A) and the fuel return line (B).



B: INSTALLATION

CAUTION:
If fuel hoses or clamps are damaged, replace them with new parts.
Install in the reverse order of removal.

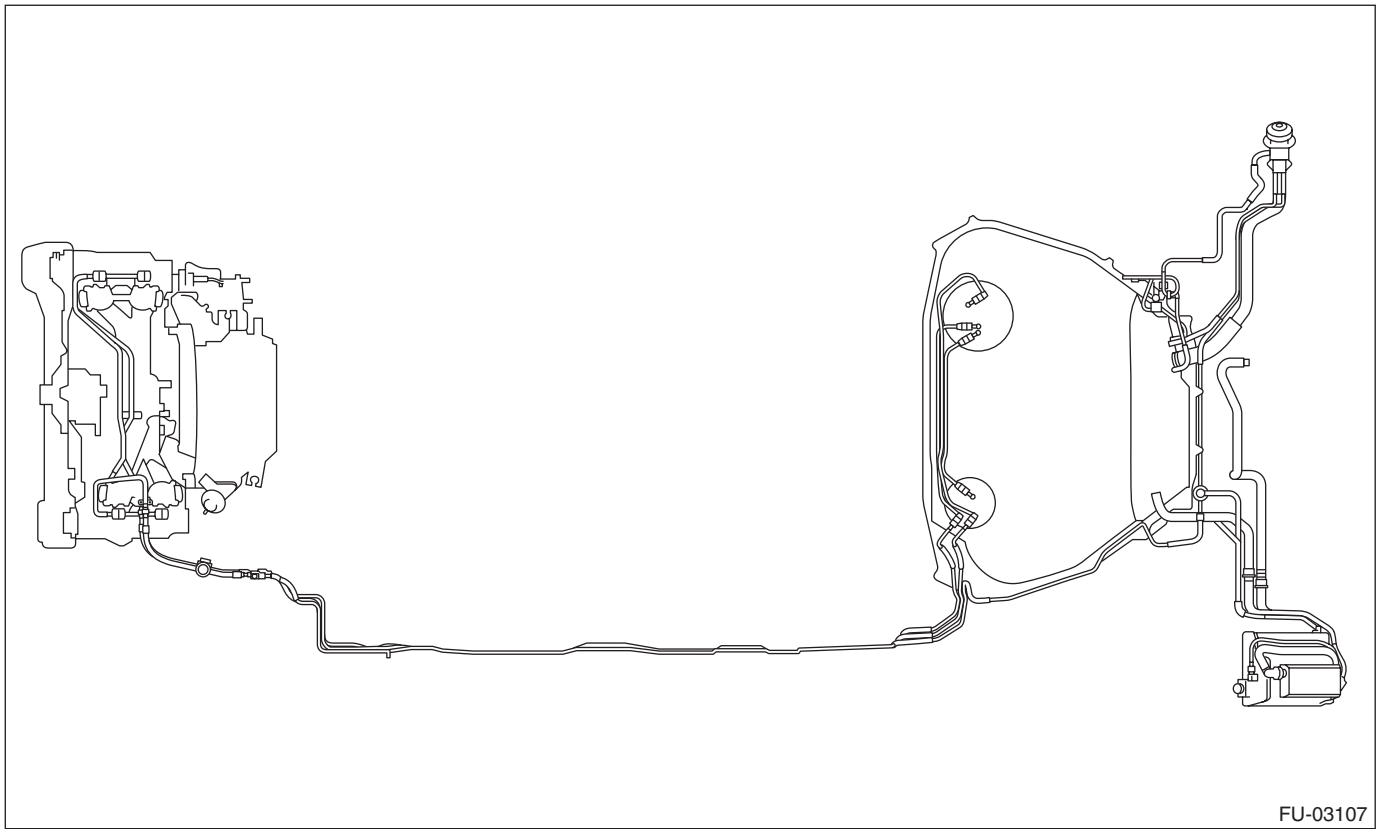
Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

33.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

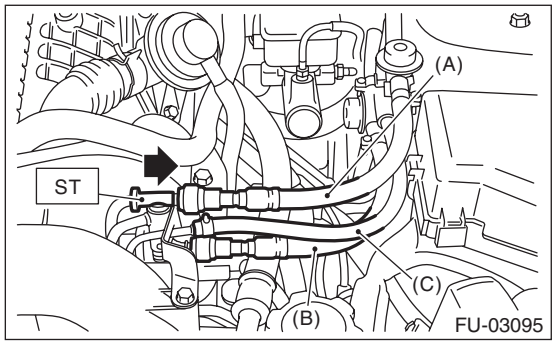
WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
Be careful not to spill fuel.
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the floor mat. <Ref. to EI-69, REMOVAL, Floor Mat.>
5) Disconnect the fuel delivery pipes and hoses, and then disconnect the fuel return pipes and hoses, evaporation pipes and hoses.



6) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the fuel delivery hose.
ST 42099AE000 CONNECTOR REMOVER

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

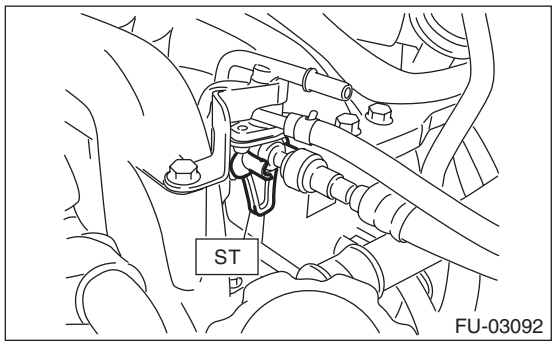


(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

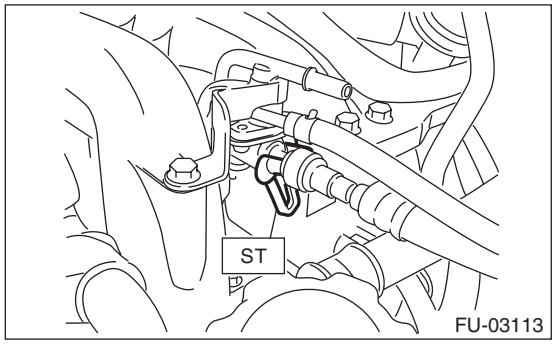
7) Disconnect the fuel return hose using the ST.
ST 18371AA000 CONNECTOR REMOVER

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

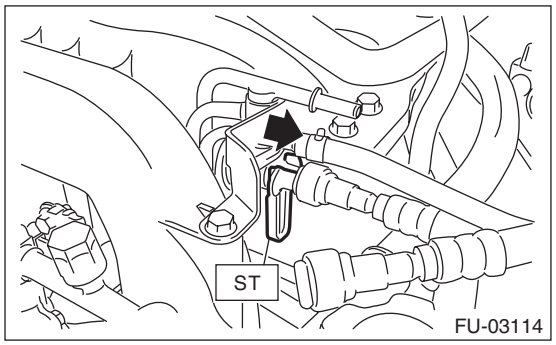
(1) Attach the ST to the fuel return pipe as shown in the figure.



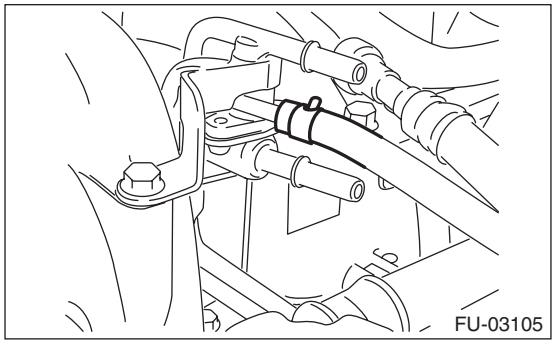
(2) Insert the front side of ST into the quick connector.



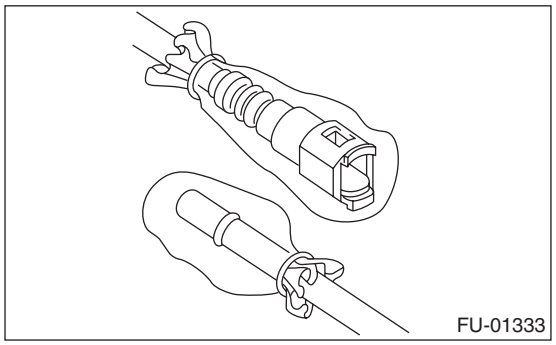
(3) Insert the back side of ST into the quick connector and push ST in the direction of arrow mark to disconnect the fuel return hose.



8) Remove the clip and disconnect the evaporation hose from the fuel pipe.

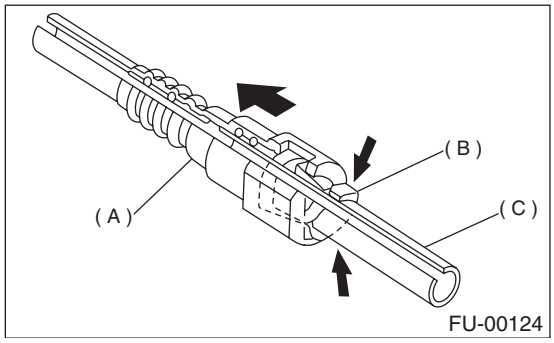


9) Lift the vehicle.
10) Remove the fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
11) Separate the quick connector of fuel line.
(1) Clean the pipe and connector, if they are covered with dust.
(2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag etc.



(3) Hold the connector (A) and push the retainer (B) down.

(4) Pull out the connector (A) from the retainer (B).



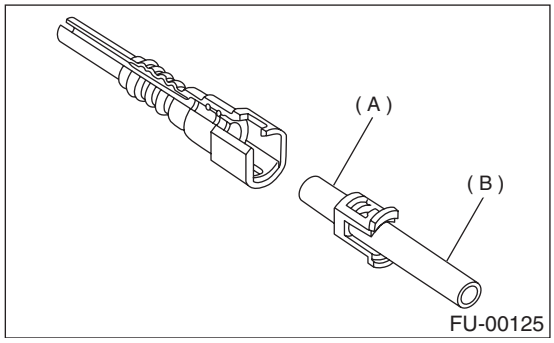
(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel line.

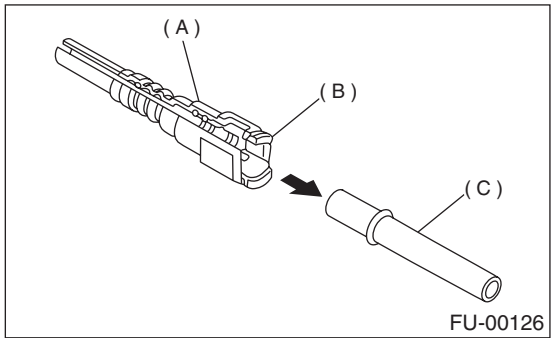
CAUTION:
Make sure there are no damage or dust on connections. If necessary, clean seal surface of pipe.

NOTE:
Use a new retainer.



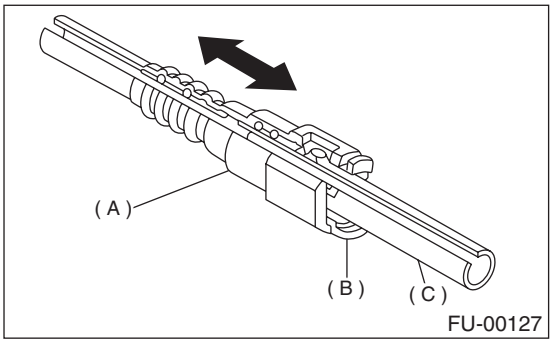
(A) Seal surface
(B) Pipe

(1) Set the new retainer (B) to connector (A).
(2) Push the pipe into the connector completely.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
• Pull the connector to ensure it is connected securely.
• Make sure the two retainer claws are engaged in their mating positions in the connector.
• Be sure to inspect hoses and their connections for any leakage of fuel.



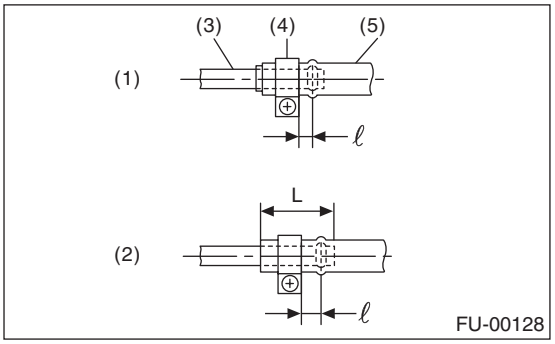
(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose and return hose to the pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the amount to be inserted is specified.
Type B: When the amount to be inserted is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

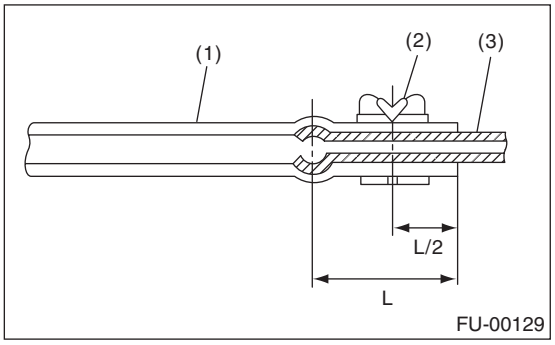
CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



(1) Type A
(2) Type B
(3) Pipe
(4) Clamp
(5) Hose

3) Connect the evaporation hose to the pipe with an overlap of 15 to 20 mm (0.59 to 0.79 in).

Fuel evaporation hose:
L = 17.5±2.5 mm (0.689±0.098 in)



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure the fuel pipe and fuel hose connections are tightened firmly.

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 fuel filter	Replace the fuel pump.
4)	Clogged or bent fuel pipe or hose	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent air breather tube or pipe.	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator	Replace.
2. Leakage or blow out of fuel		
1)	Loose joints of the fuel pipe	Retighten.
2)	Cracked fuel pipe, hose and fuel tank	Replace.
3)	Defective welding part on the fuel tank	Replace.
4)	Defective drain gasket of the fuel tank	Replace.
5)	Clogged or bent air breather tube or air vent tube	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe	Retighten.
2)	Problem in tightness of the fuel saucer gasket air	Correct or replace the gasket.
3)	Inoperative fuel pump modulator or circuit	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor	Replace.
2)	Defective operation of fuel meter	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump	Replace.

NOTE:
• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent the problem.
• In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use a water removing agent in the fuel system to prevent freezing fuel system and accumulating water.
• When water is accumulated in fuel filter, fill the water removing agent in the fuel tank.
• Before using water removing agent, follow the cautions noted on the bottle.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(H4DOTC)

		Page
1.	General Description	2
2.	Front Catalytic Converter	5
3.	Rear Catalytic Converter	6
4.	Canister	7
5.	Purge Control Solenoid Valve	8
6.	Fuel Level Sensor	11
7.	Fuel Temperature Sensor	12
8.	Fuel Sub Level Sensor	13
9.	Fuel Tank Pressure Sensor	14
10.	Pressure Control Solenoid Valve	15
11.	Drain Filter	16
12.	Shut Valve	17
13.	Drain Valve	18
14.	PCV Hose Assembly	19
15.	Secondary Air Pump	20
16.	Secondary Air Combi Valve	21

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)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	<Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to GD(H4DOTC)-12, DTC P0018 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H4DOTC)-12, 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)-13, 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)-15, 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)-17, 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)-19, 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)-21, 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)-23, 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)-25, 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)-28, 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)-30, 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)-32, 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)-34, 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)-36, 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)-38, 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)-40, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to GD(H4DOTC)-42, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(H4DOTC)-44, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low	<Ref. to GD(H4DOTC)-46, 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)-48, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(H4DOTC)-50, 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)-52, 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)-54, 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)-56, 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)-58, 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)-60, 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)-63, 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)-65, 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)-67, 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.>
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-74, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4DOTC)-76, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4DOTC)-78, 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)-80, 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)-83, 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)-85, 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)-87, 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)-89, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H4DOTC)-91, 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)-93, 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)-95, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to GD(H4DOTC)-97, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4DOTC)-99, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4DOTC)-105, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4DOTC)-105, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4DOTC)-105, 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)-106, 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)-108, 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)-110, 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)-112, 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)-114, 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)-116, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0410	Secondary Air Injection System	<Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to GD(H4DOTC)-124, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0413	Secondary Air Injection System Switching Valve “A” Circuit Open	<Ref. to GD(H4DOTC)-125, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0414	Secondary Air Injection System Switching Valve “A” Circuit Shorted	<Ref. to GD(H4DOTC)-126, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0416	Secondary Air Injection System Switching Valve “B” Circuit Open	<Ref. to GD(H4DOTC)-127, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0417	Secondary Air Injection System Switching Valve “B” Circuit Shorted	<Ref. to GD(H4DOTC)-127, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0418	Secondary Air Injection System Control “A” Circuit Open	<Ref. to GD(H4DOTC)-128, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4DOTC)-129, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0441	Evaporative Emission System Incorrect Purge Flow	<Ref. to GD(H4DOTC)-131, DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H4DOTC)-132, 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)-147, 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)-149, 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)-151, 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)-153, 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)-155, 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)-156, 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)-156, 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)-157, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to GD(H4DOTC)-159, 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)-161, 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)-163, 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)-165, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4DOTC)-167, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Fan Rationality Check	<Ref. to GD(H4DOTC)-170, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0500	Vehicle Speed Sensor “A”	<Ref. to GD(H4DOTC)-171, 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)-173, 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)-175, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0512	Starter Request Circuit	<Ref. to GD(H4DOTC)-177, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(H4DOTC)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Air Control System Performance	<Ref. to GD(H4DOTC)-179, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H4DOTC)-180, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4DOTC)-181, 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)-183, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H4DOTC)-184, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4DOTC)-186, 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)-189, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Fan 1 Control Circuit High	<Ref. to GD(H4DOTC)-190, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	Transmission Control System (MIL Request)	<Ref. to GD(H4DOTC)-191, 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)-192, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to GD(H4DOTC)-193, 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)-194, 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)-195, 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)-196, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(H4DOTC)-198, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4DOTC)-200, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4DOTC)-202, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1410	Secondary Air Injection System Switching Valve Stuck Open	<Ref. to GD(H4DOTC)-204, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1418	Secondary Air Injection System Control “A” Circuit Shorted	<Ref. to GD(H4DOTC)-206, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4DOTC)-207, 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)-209, 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)-211, 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)-213, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to GD(H4DOTC)-214, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(H4DOTC)-215, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(H4DOTC)-215, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(H4DOTC)-215, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(H4DOTC)-215, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(H4DOTC)-215, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(H4DOTC)-215, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1578	Meter Failure	<Ref. to GD(H4DOTC)-215, DTC P1578 METER FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1602	Control Module Programming Error	<Ref. to GD(H4DOTC)-216, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to GD(H4DOTC)-218, 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)-219, 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)-220, 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)-221, 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)-222, 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)-224, 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)-226, 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)-228, 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)-230, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	<Ref. to GD(H4DOTC)-232, 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)-234, 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)-236, 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)-238, 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)-240, 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)-241, 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)-241, 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)-242, 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)-244, 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)-246, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(H4DOTC)-248, 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)-250, 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)-252, 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)-254, 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)-256, 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)-258, 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)-260, 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)-262, 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)-264, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P2419	Evaporative Emission System Switching Valve Control Circuit Low	<Ref. to GD(H4DOTC)-266, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2420	Evaporative Emission System Switching Valve Control Circuit High	<Ref. to GD(H4DOTC)-267, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2431	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance	<Ref. to GD(H4DOTC)-268, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2432	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low	<Ref. to GD(H4DOTC)-269, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	<Ref. to GD(H4DOTC)-270, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank1)	<Ref. to GD(H4DOTC)-271, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank1)	<Ref. to GD(H4DOTC)-271, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank2)	<Ref. to GD(H4DOTC)-271, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank2)	<Ref. to GD(H4DOTC)-271, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to GD(H4DOTC)-272, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

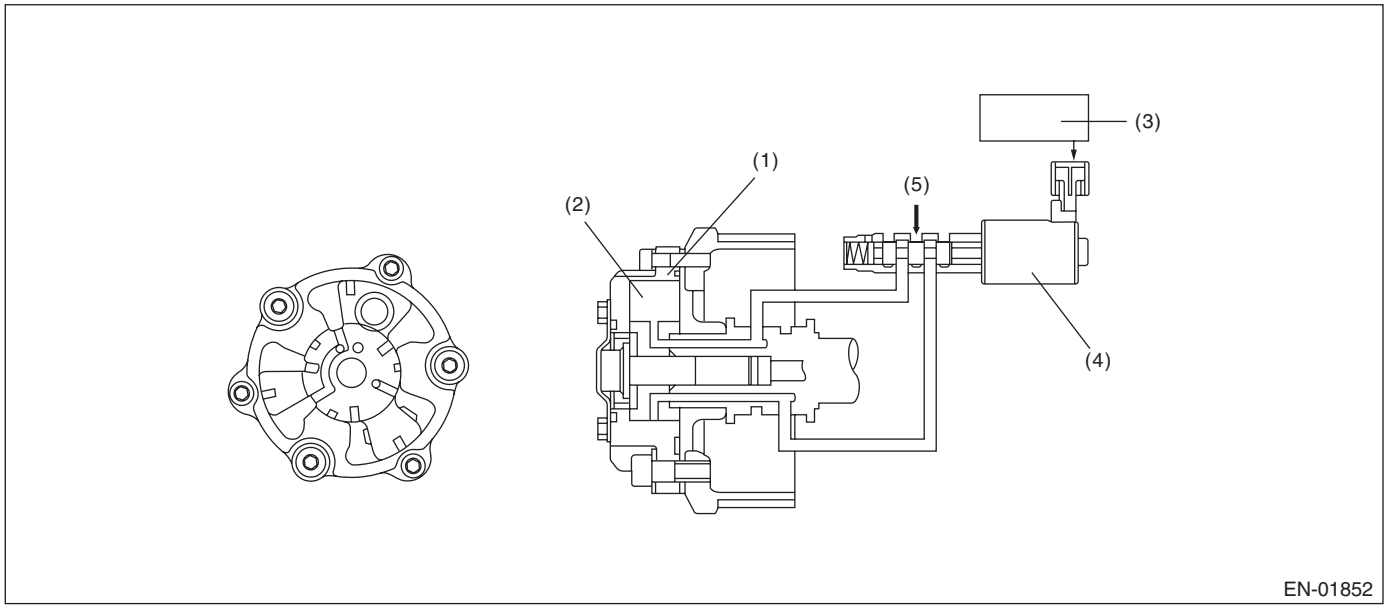
2. Diagnostic Trouble Code (DTC) Detecting Criteria

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

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.
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

Secondary Parameters	Enable Conditions
Abnormality judgment (1)	
Time of establishing all secondary parameter conditions	≥ 3 seconds
Battery voltage	≥ 10.9 V
Engine speed	≥ 1300 rpm
Engine coolant temperature	≥ 60°C (140°F)
Target advance angle	> 0°CA
Target timing advance change amount	< 1.07°CA
Abnormality judgment (2)	
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
Engine coolant temperature	≥ 60°C (140°F)
AVCS control	Not in operation

4. GENERAL DRIVING CYCLE

1) Always perform the diagnosis after warming up when the engine speed is 1300 rpm or more.
2) Always perform the diagnosis after warming up when the engine speed is 500 rpm or more.

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 1 (P0011, P0021)

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 30 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Σ(Target position – actual position) or Σ(Target position – actual position)	> 8000°CA (AT) > 5300°CA (MT) < –8000°CA (AT) < –5300°CA (MT)

Time Needed for Diagnosis: 30 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment 1

Judge as OK and clear the NG when the continuous time of meeting the following criteria is 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Σ(Target position – actual position) and Σ(Target position – actual position)	≤ 8000°CA (AT) ≤ 5300°CA (MT) ≥ –8000°CA (AT) ≥ –5300°CA (MT)

• Abnormality Judgment 2 (P0016, P0018)

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 30 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft input position	< BTDC17°CA or > BTDC55°CA

Time Needed for Diagnosis: 30 seconds

• Normality Judgment 2

Judge as OK and clear the NG when the continuous time of meeting the following criteria is 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft input position	≥ BTDC17°CA and ≤ BTDC55°CA

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- 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 P0016 CRANKSHAFT POSITION — CAMSHAFT POSITION CORRELATION (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

NOTE:
For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

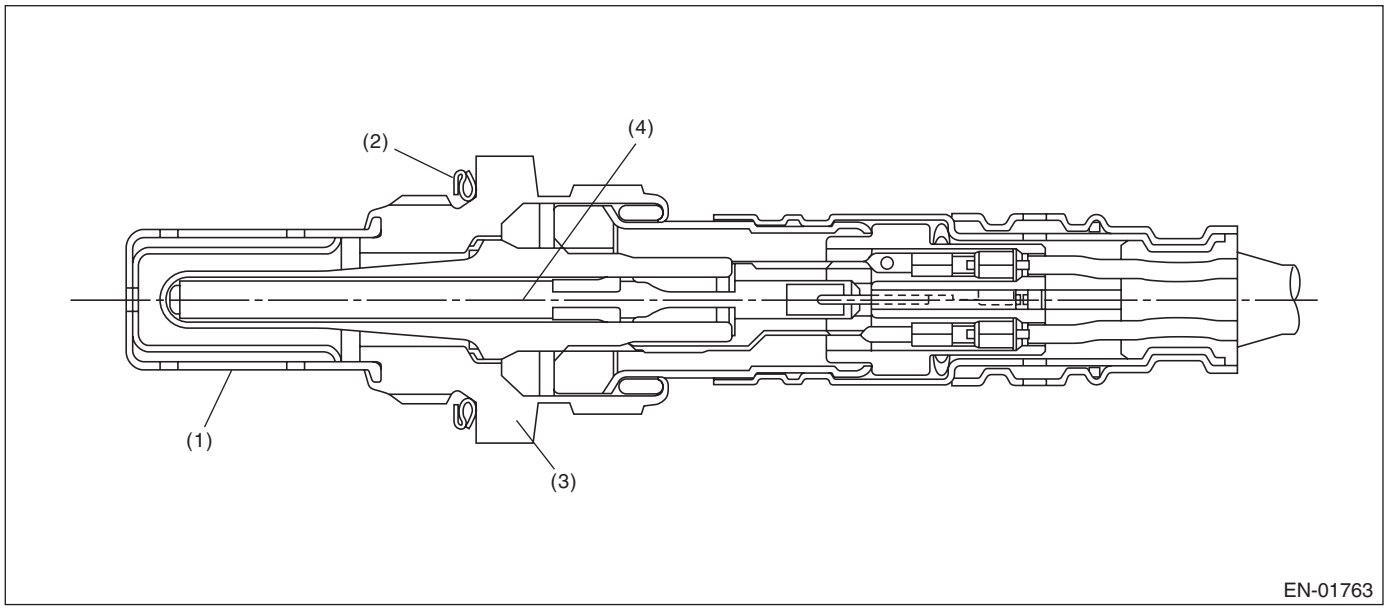
NOTE:
For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

Detect functional errors of the front oxygen (A/F) sensor heater.
Judge as NG when it is determined that the front oxygen (A/F) sensor impedance is large when looking at engine status such as deceleration fuel cut.

2. COMPONENT DESCRIPTION



(1) 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	42 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 the time needed for diagnosis (10 seconds) or more. Judge as OK and clear the NG when the continuous time of not completing the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	> 50 Ω

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- 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

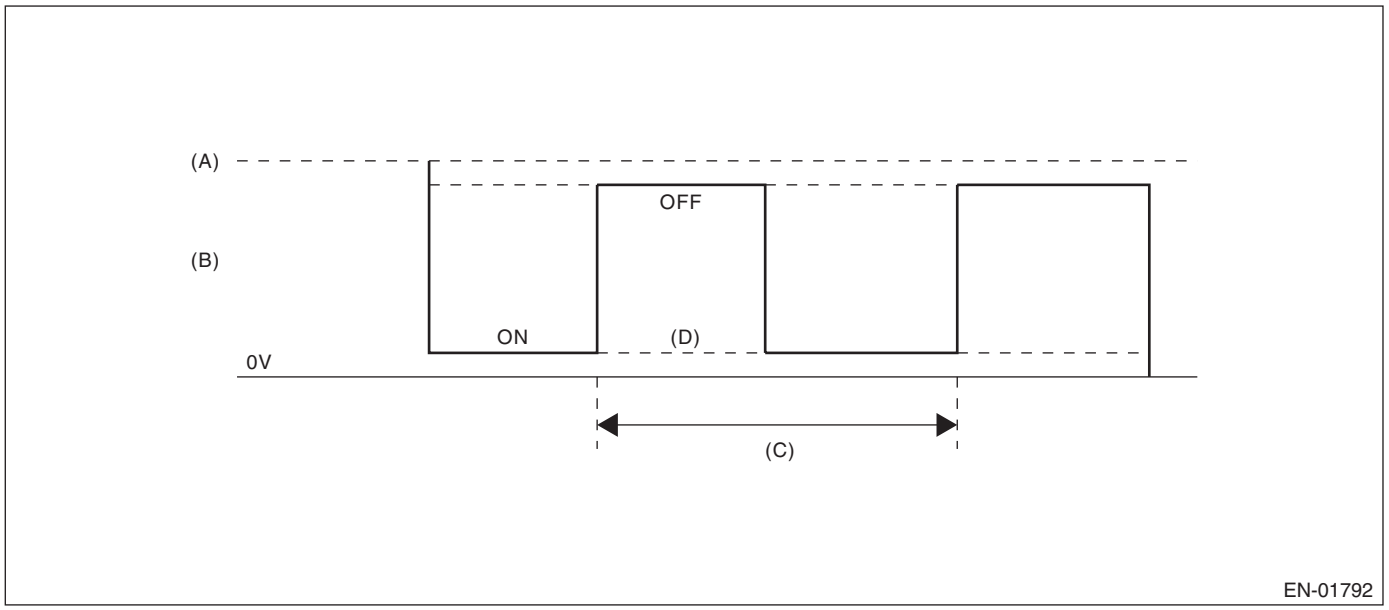
Memorize the freeze frame data. (For test mode $02)

F: 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 meeting the malfunction criteria below becomes 1 second (8 cycles) or more.

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 met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

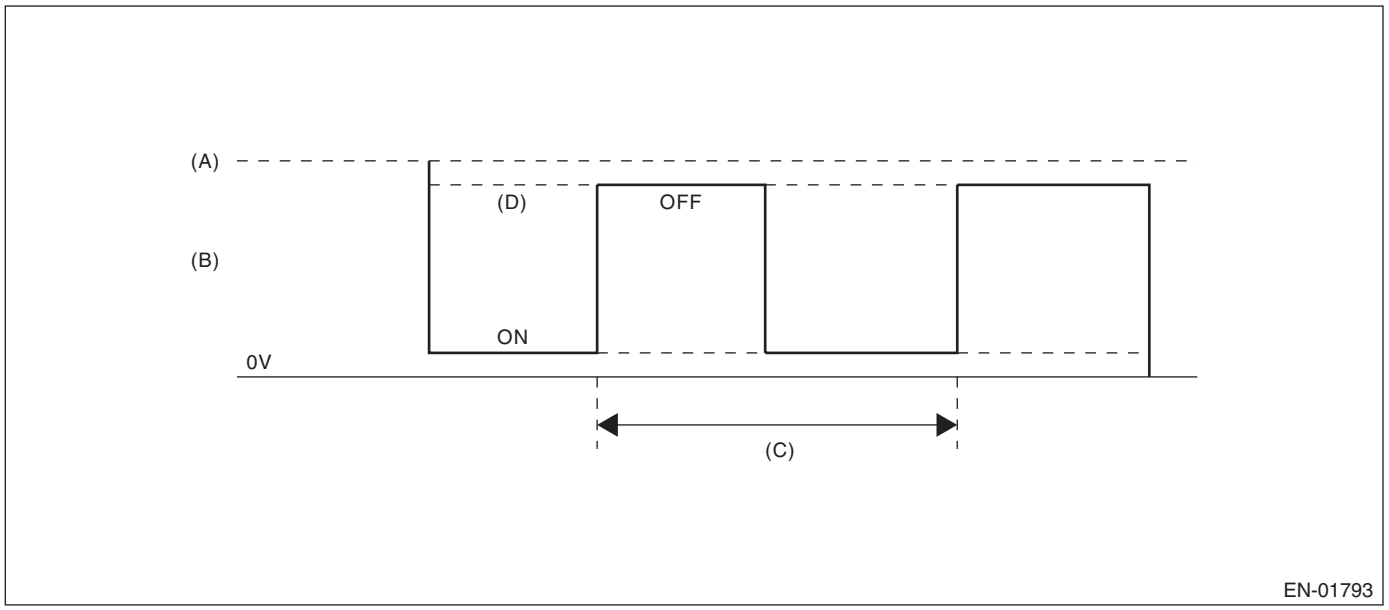
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The heater performs duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge as NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) High error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 second (16 cycles) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	≥ 12.5%

Time Needed for Diagnosis: 2 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 level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

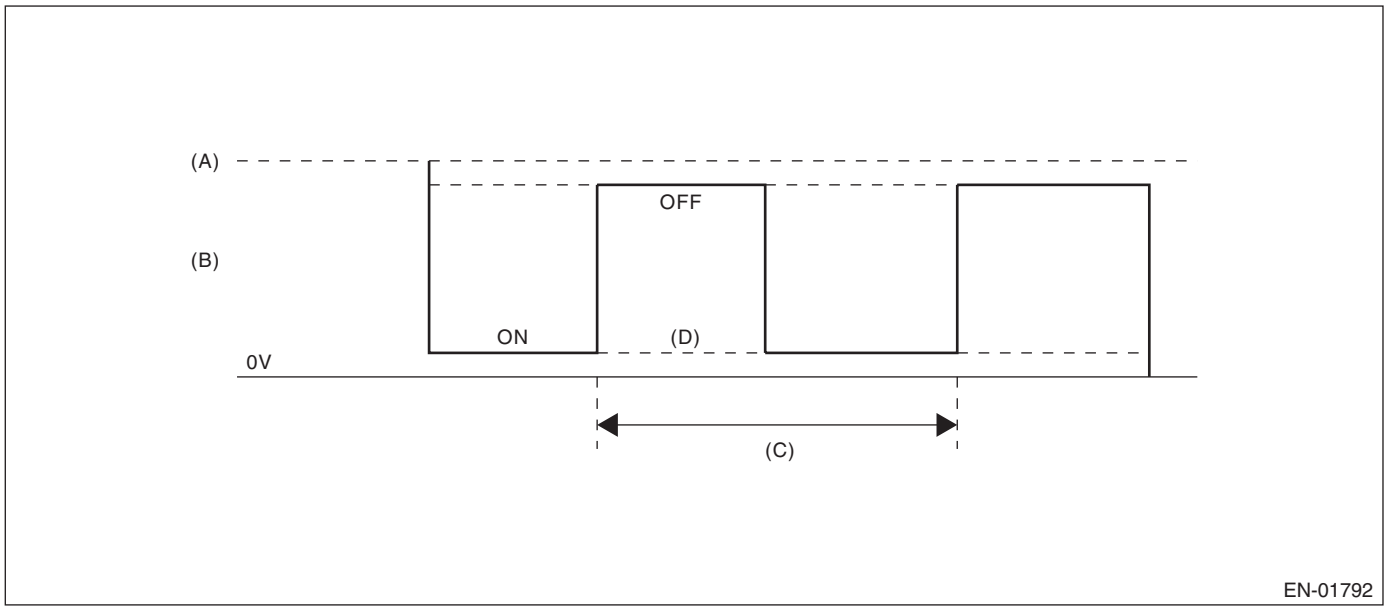
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.
The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.
Judge as NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Output voltage of the rear oxygen sensor heater
(C) 256 milliseconds (cycle)
(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 of meeting all the malfunction criteria below becomes 2560 milliseconds (10 cycles) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75%

Time Needed for Diagnosis: 2.56 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

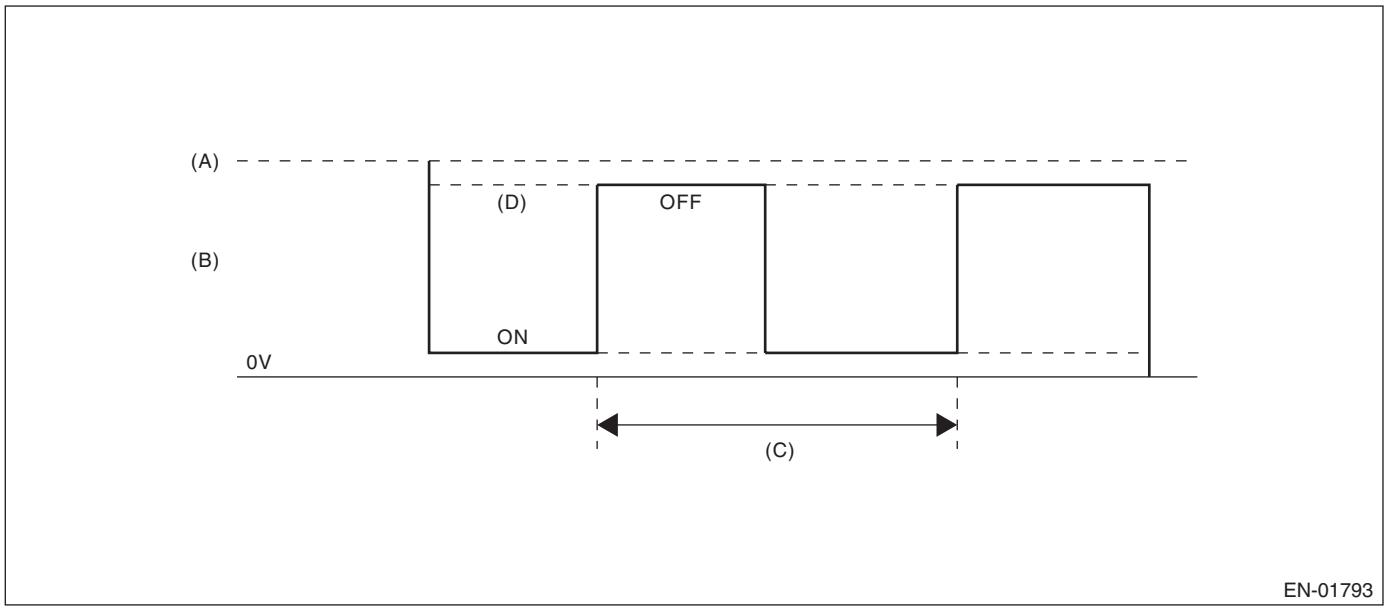
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.
The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.
Judge as NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Output voltage of the rear oxygen sensor heater
(C) 256 milliseconds (cycle)
(D) High 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 of meeting all the malfunction criteria below becomes 2560 milliseconds (10 cycles) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 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 met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

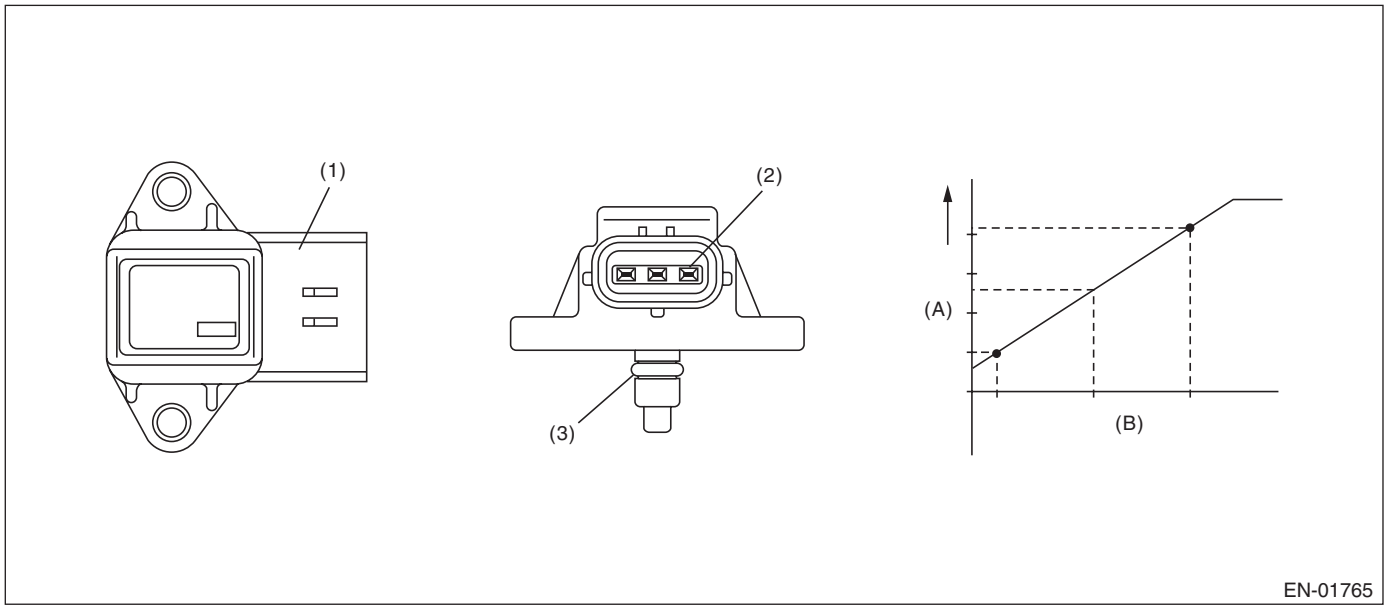
Memorize the freeze frame data. (For test mode $02)

J: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

1. OUTLINE OF DIAGNOSIS

Detect problems in the intake manifold pressure sensor output properties. Judge as NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminals
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°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 meeting 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 criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 10°
Output voltage	≥ 1.0 V
Intake air amount every 0.5 engine revs.	> 1.356 g (0.048 oz) / rev
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 2.75°
Output voltage	< 2.36 V
Intake air amount every 0.5 engine revs.	≤ 0.4 g (0.014 oz)/rev

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from 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

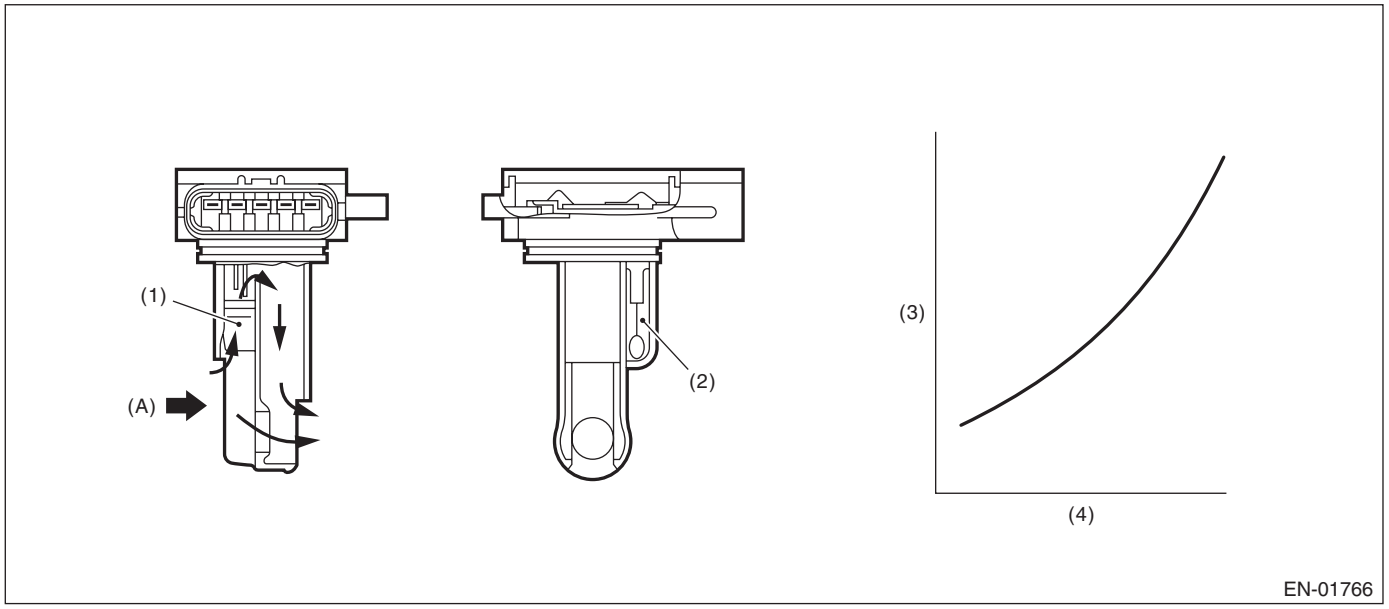
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output properties.
Judge as a low side NG when the air flow voltage indicates a small value regardless of running in a state where the air flow voltage increases. Judge as a high side NG when the air flow voltage indicates a large value regardless of running in a state where the air flow voltage decreases. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (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 if the continuous time while the following criteria are met exceeds the determined 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 if 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

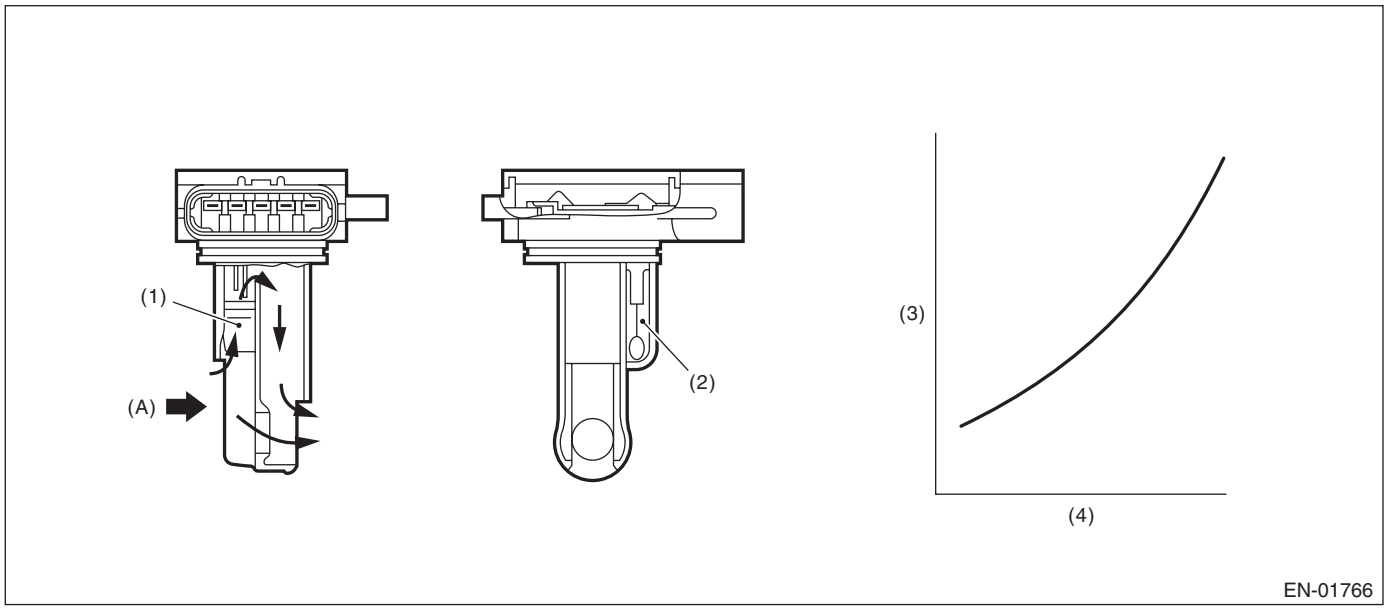
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.2 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
  - When normal: Knock compensation value = Fixed at 0°CA
  - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
  - Whole learning compensation coefficient update not allowed
  - Portional learning zone compensation value calculation not allowed
- ISC control: Open loop compensation is set to (1 g (0.04 oz)/s). Stop calculation of throttle sensor temperature compensation (hold previous value)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

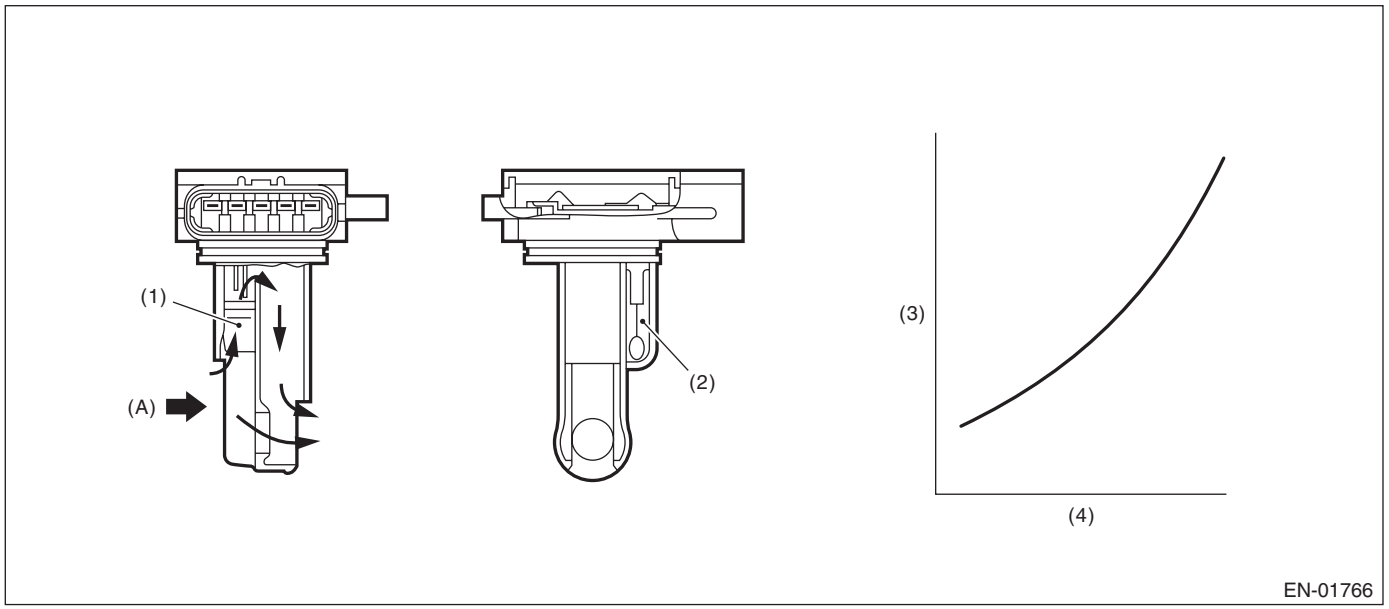
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the criteria below is 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.985 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
  - When normal: Knock compensation value = Fixed at 0°CA
  - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
  - Whole learning compensation coefficient update not allowed
  - Portional learning zone compensation value calculation not allowed
- ISC control: Open loop compensation is set to (1 g (0.04 oz)/s). Stop calculation of throttle sensor temperature compensation (hold previous value)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

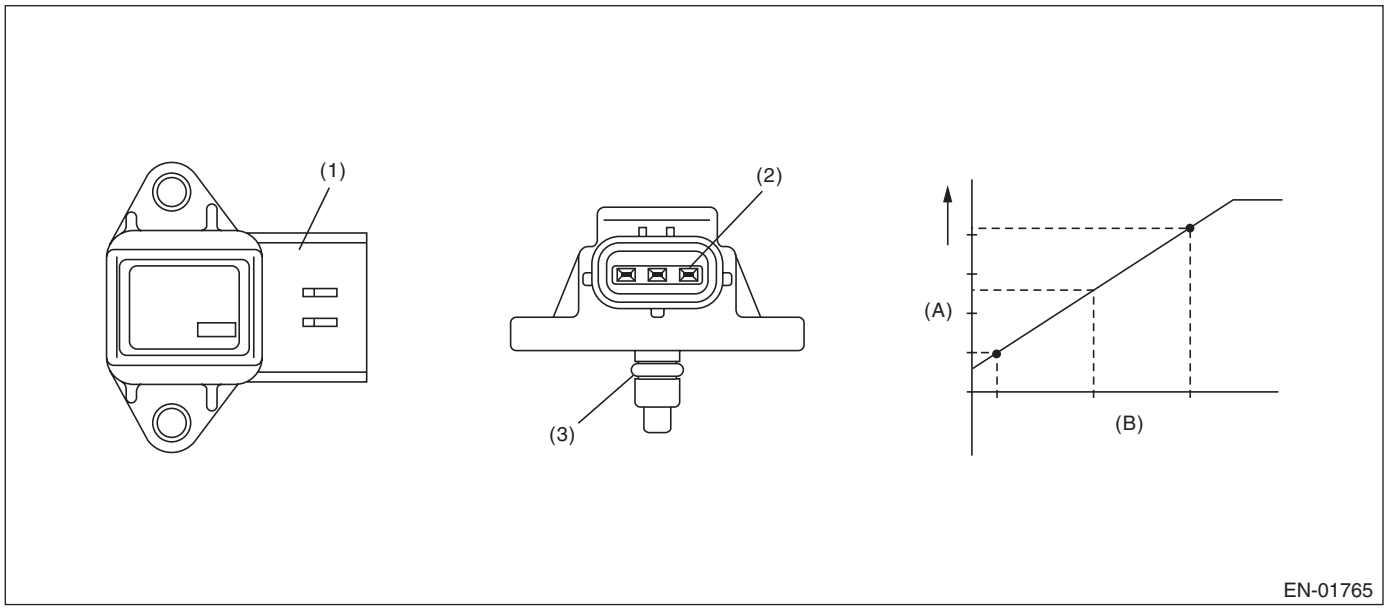
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminals
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from 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

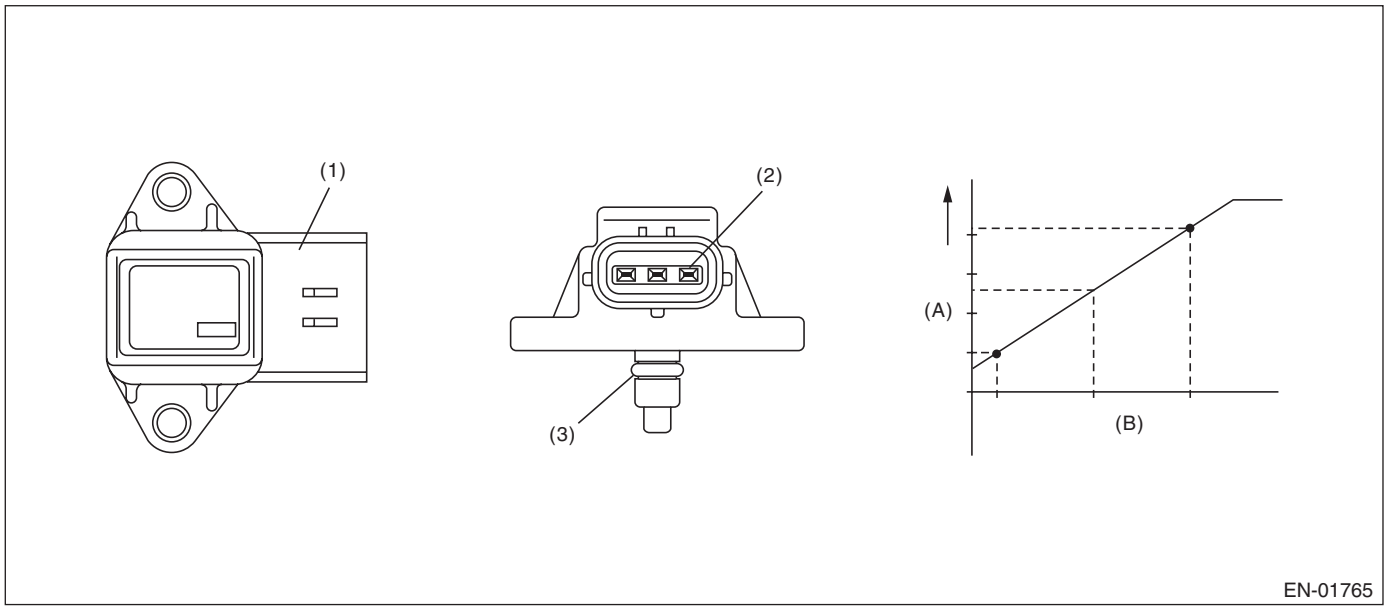
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminals
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from 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

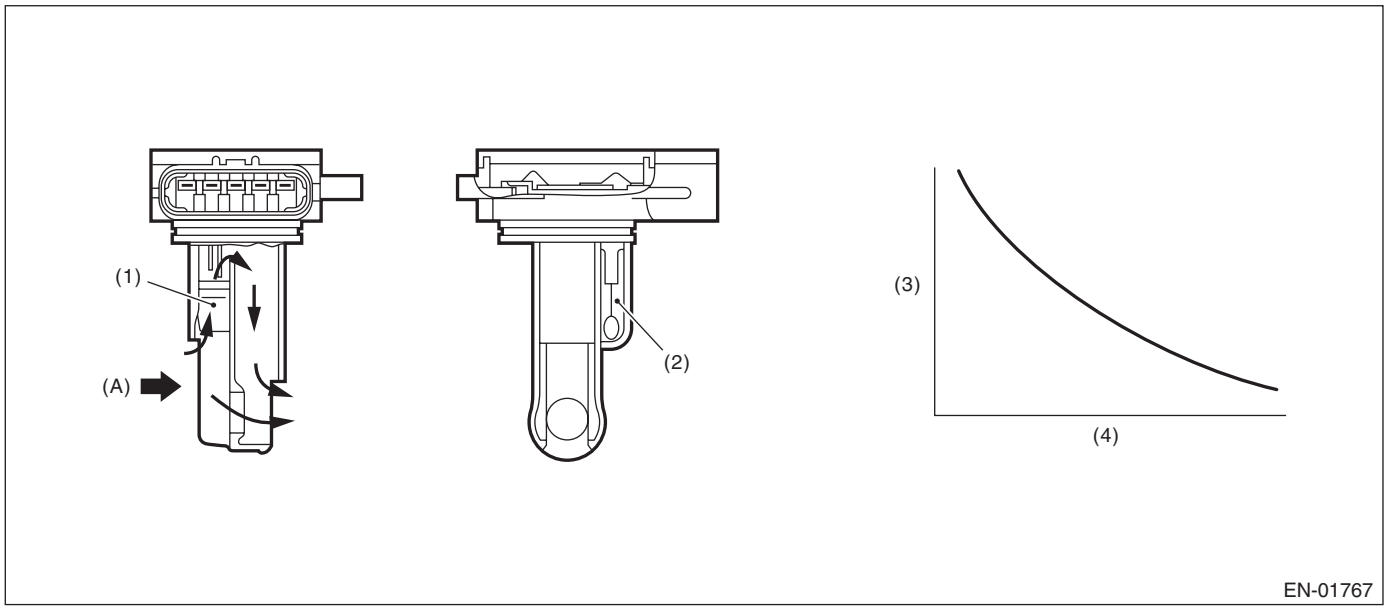
Memorize the freeze frame data. (For test mode $02)

P: 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 met after warming up from a cold condition.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (Equivalent to approximately 0.5°C (33°F) near 25°C)

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

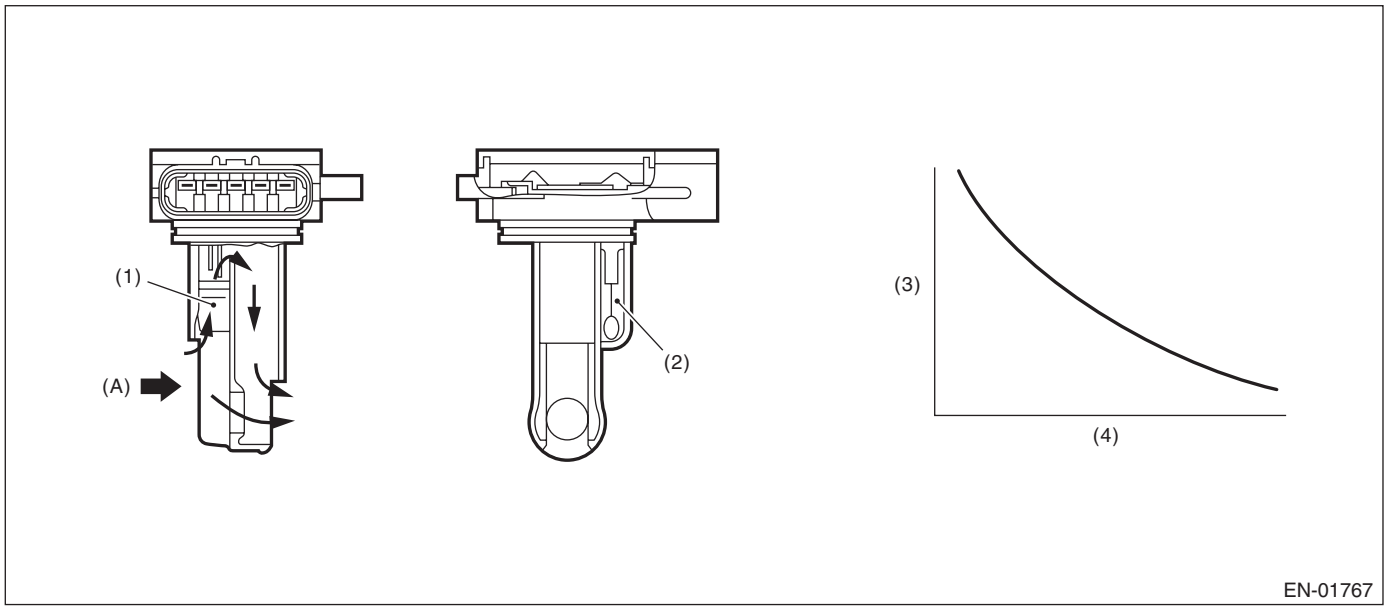
Memorize the freeze frame data. (For test mode $02)

Q: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.166 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.166 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

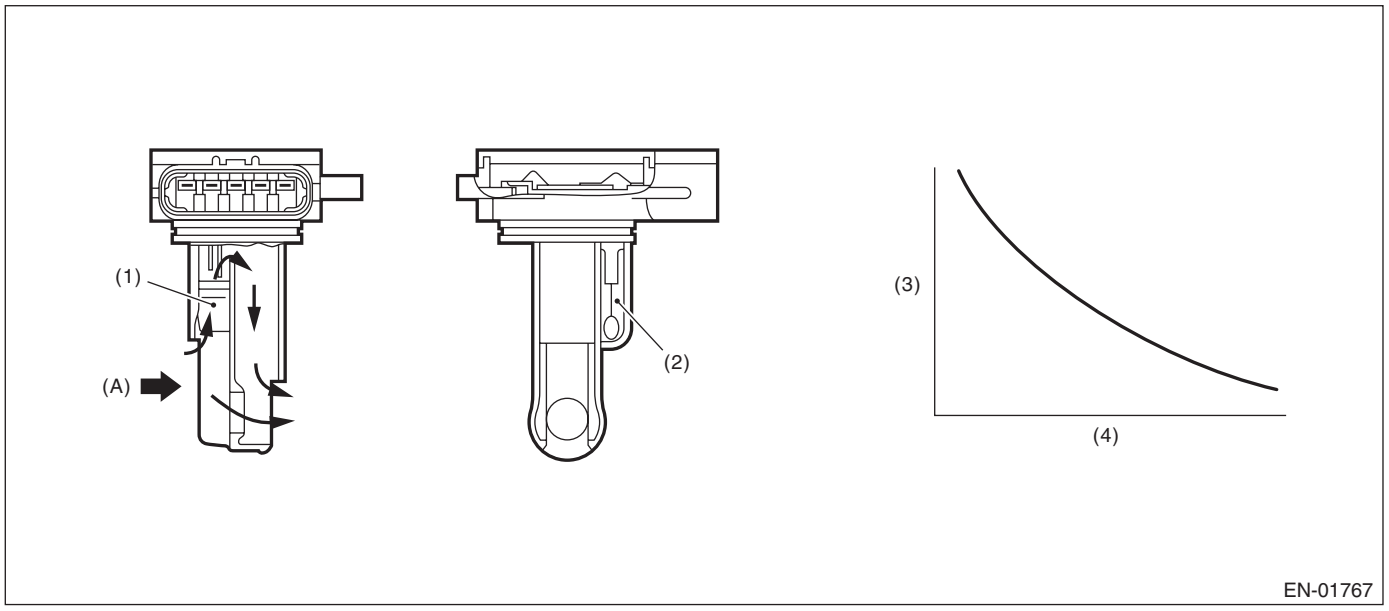
Memorize the freeze frame data. (For test mode $02)

R: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

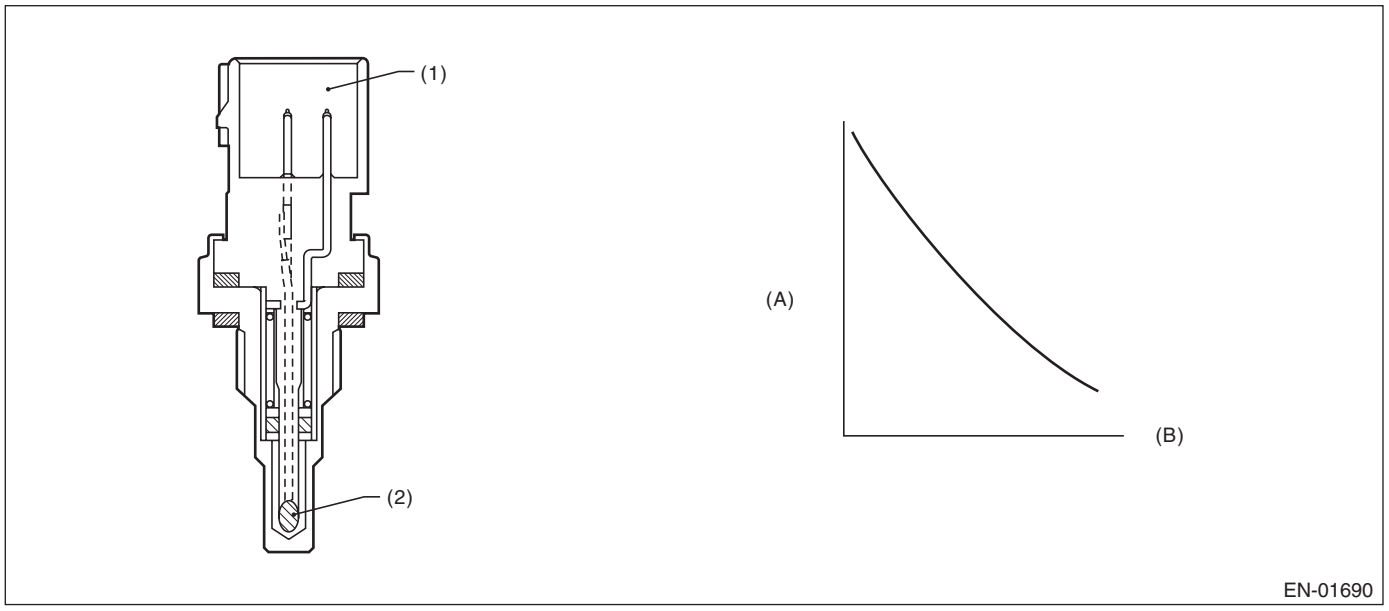
Memorize the freeze frame data. (For test mode $02)

S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.166 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.
- 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

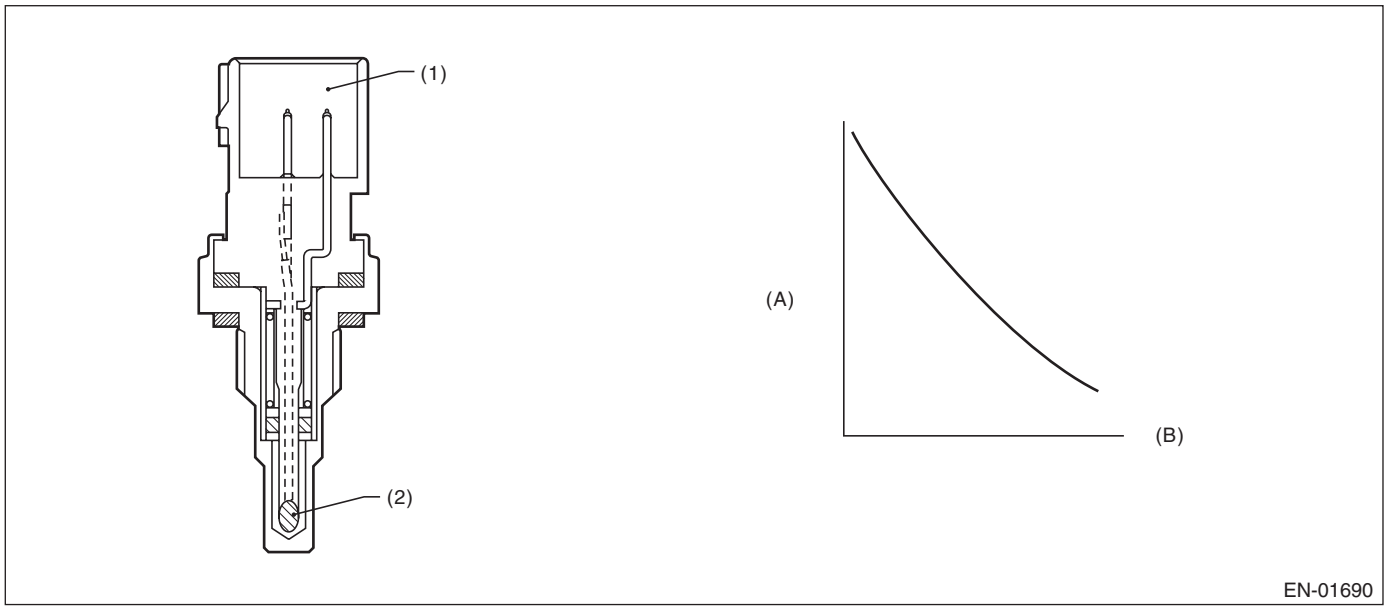
Memorize the freeze frame data. (For test mode $02)

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.
- 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

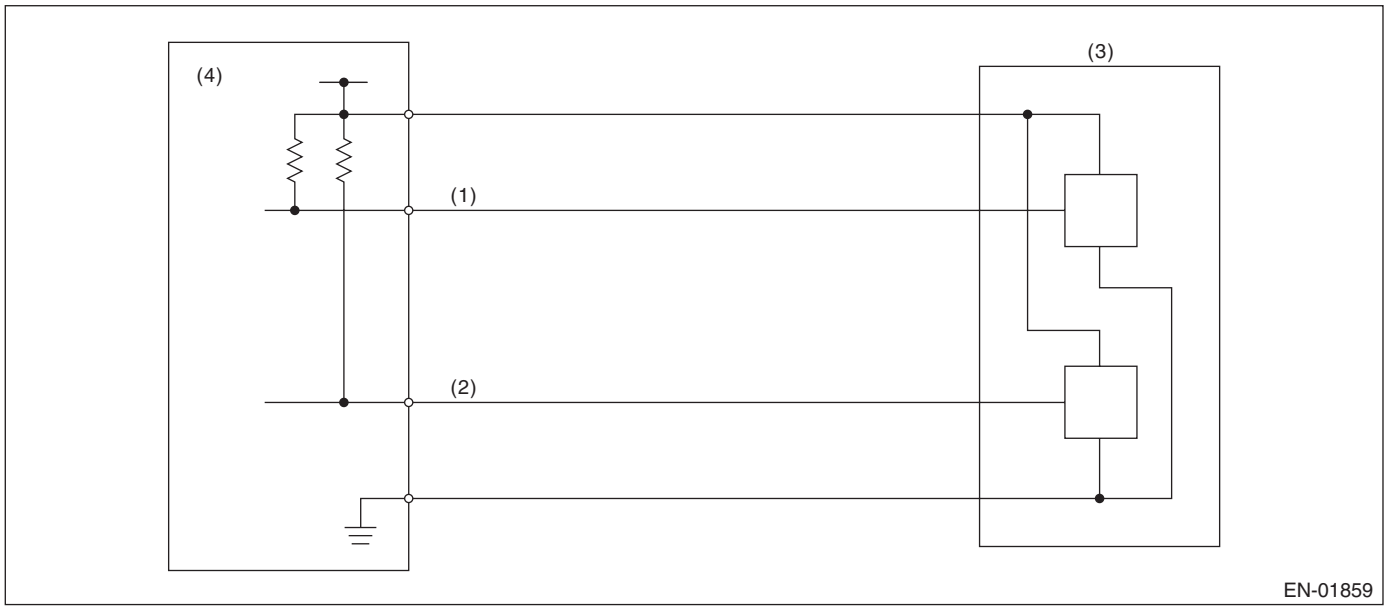
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.224 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

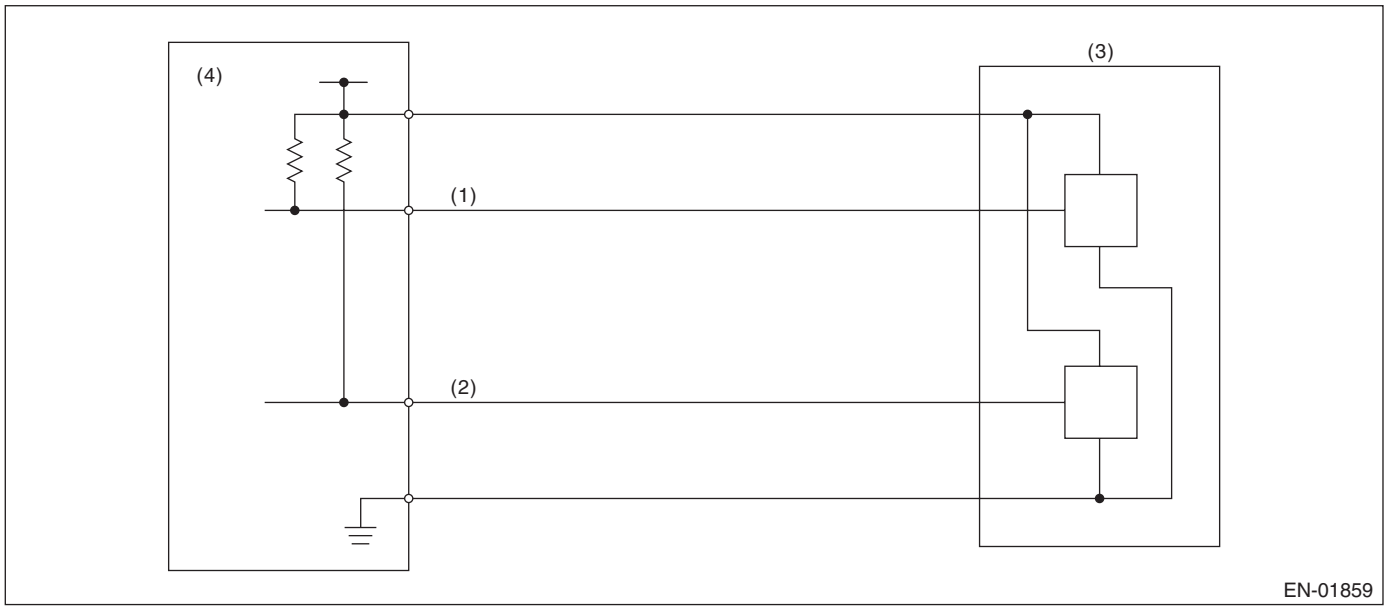
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.851 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

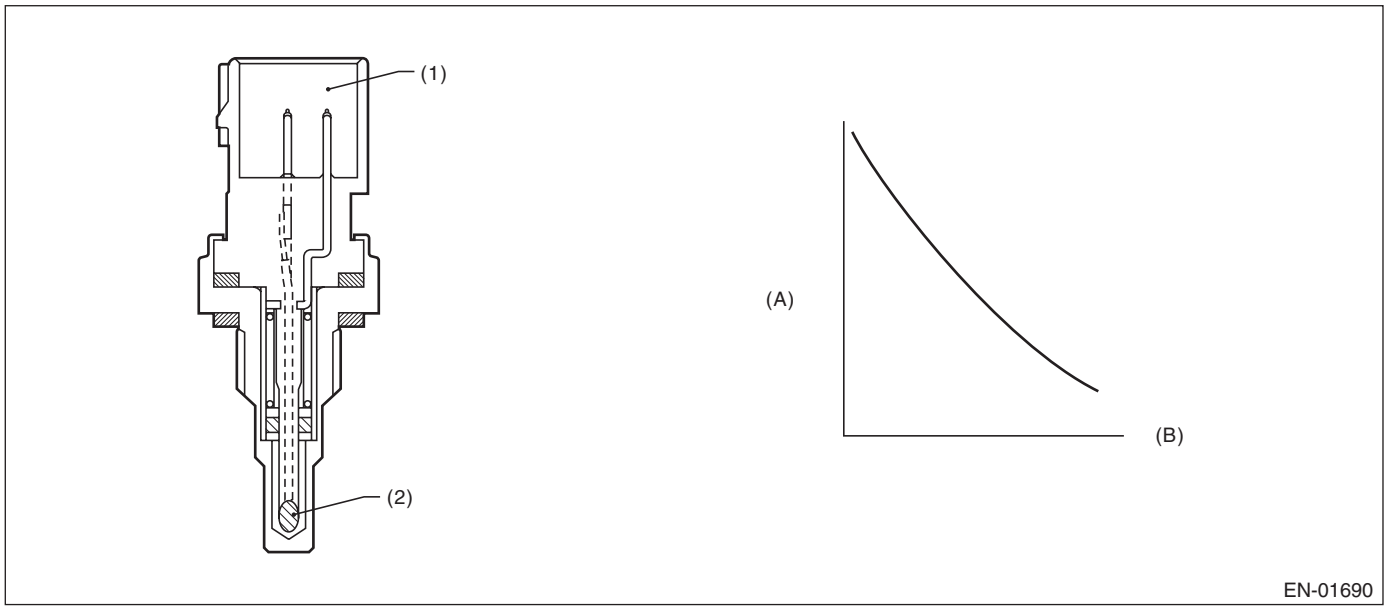
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property.
Judge as NG when the engine coolant temperature does not rise in driving conditions where it should.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine start.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine start	≥ Judgment value of timer after engine start

Timer for diagnosis after engine start
a. Timer stop at fuel cut
b. During the driving conditions except a) above, timer counts up as follows.
64 milliseconds + TWCNT milliseconds (at the time of 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
$t = 451.1 – 25.9 \times Ti$
Ti : The lowest coolant temperature after engine start
Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.
- 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

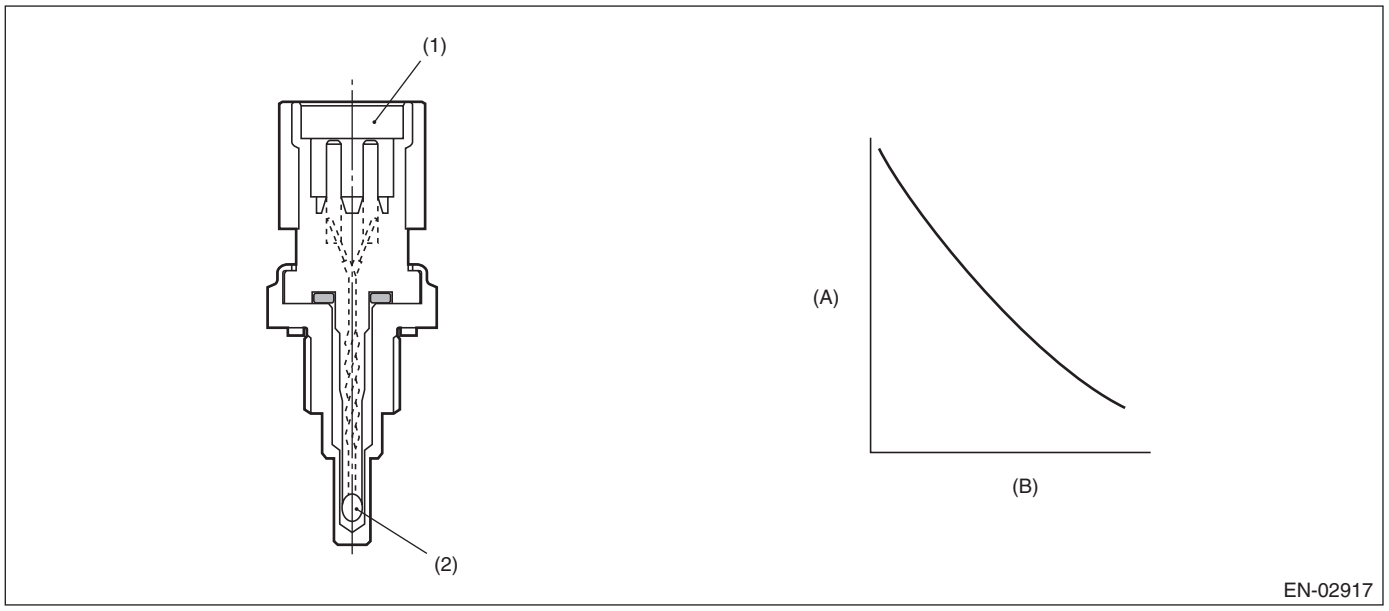
Memorize the freeze frame data. (For test mode $02)

X: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of the engine coolant temperature sensor characteristics.
Memorize the engine coolant temperature and fuel temperature at the last engine stop, and use them to judge as NG when the engine coolant temperature does not decrease when it should.
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
Refueling from the last engine stop till the current engine start	None
Fuel level	≥ 15 ℓ
Engine coolant temperature	≥ 70°C (158°F) and < 95°C (203°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG if the continuous time of meeting the following conditions is 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop – Minimum engine coolant temperature after the engine start	< 2.5°C (4.5°F)
Fuel temperature at the last engine stop – Fuel temperature	> 5°C (9°F)
Intake air temperature – Fuel temperature	< 2.5°C (4.5°F)
Fuel temperature	< 35°C (54°F)

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

When the following conditions are established, judged as OK.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop – Minimum engine coolant temperature after the engine start	≥ 2.5°C (4.5°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

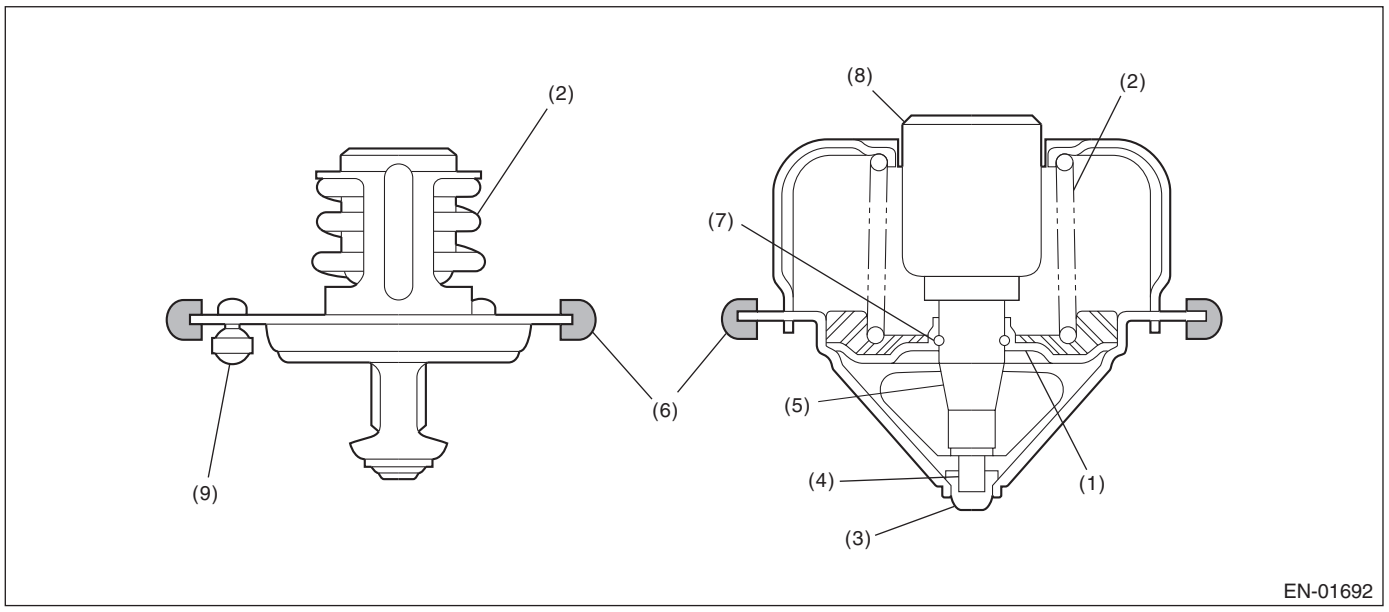
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the thermostat function.
Judge as NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge as OK when the engine coolant temperature becomes to 75°C (167°F), and the difference is small, before judging NG.

2. COMPONENT DESCRIPTION



(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber seal
(7) Stop ring
(8) Wax element
(9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 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	≥ 70°C (158°F)
Engine coolant temperature	< 70°C (158°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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

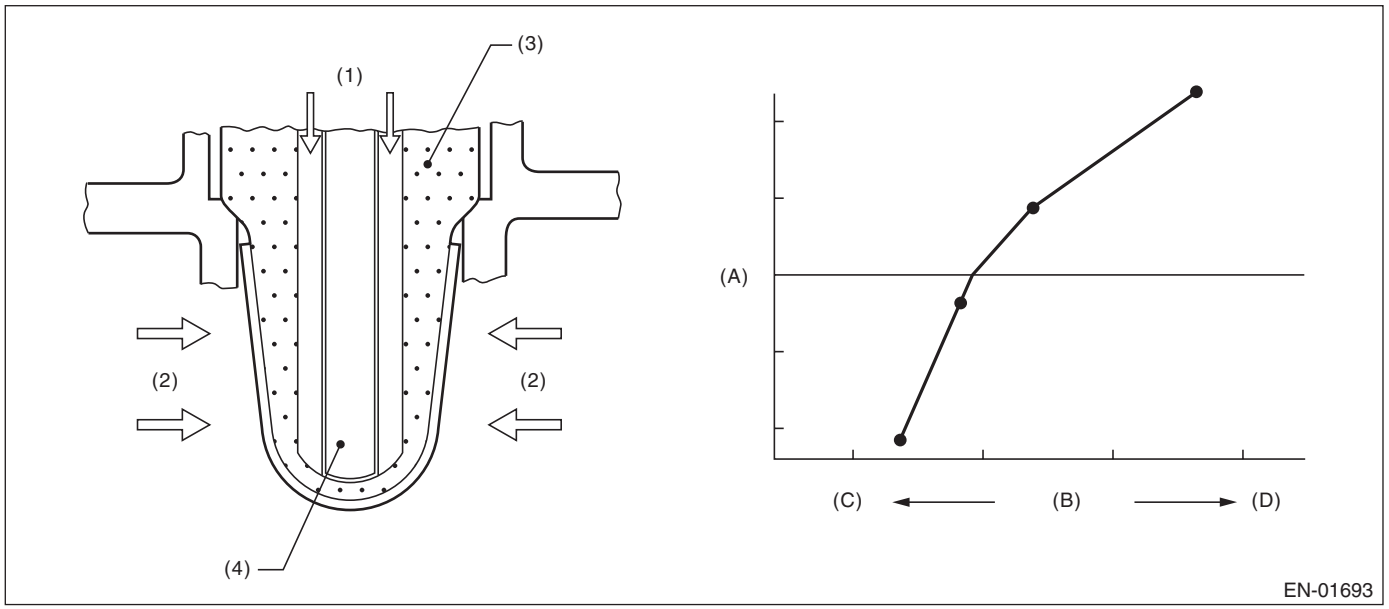
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge as NG when the element applied voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< –0.01 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

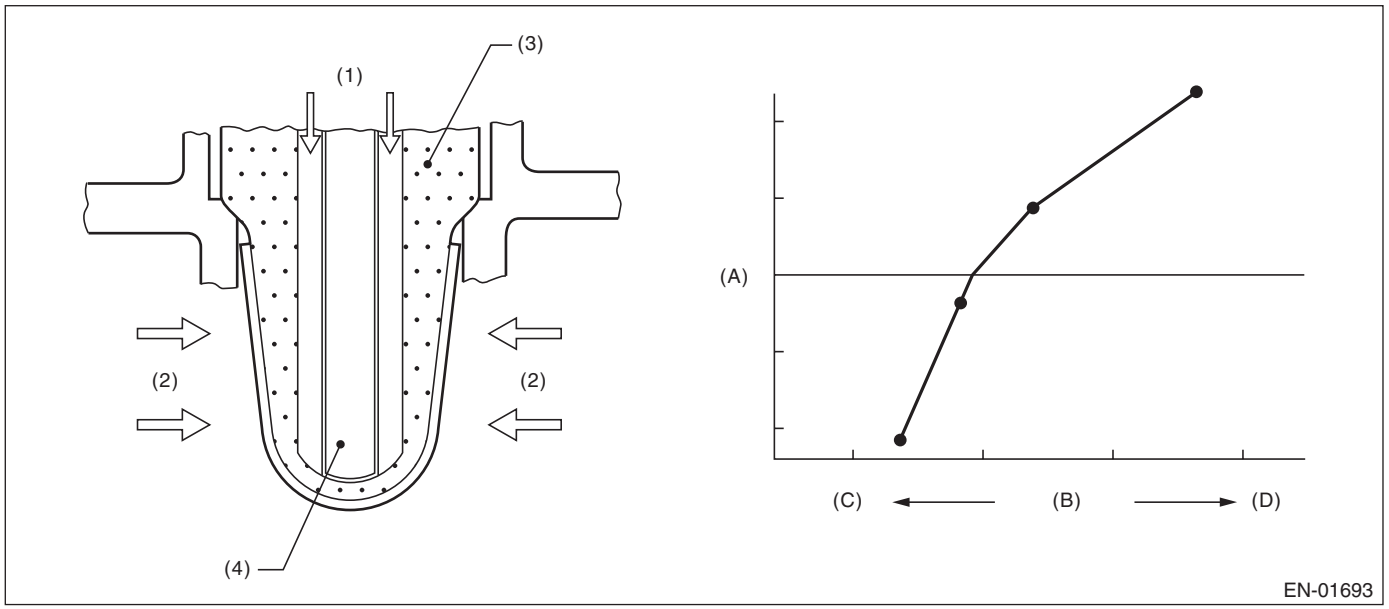
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge as NG when the element applied voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.01 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

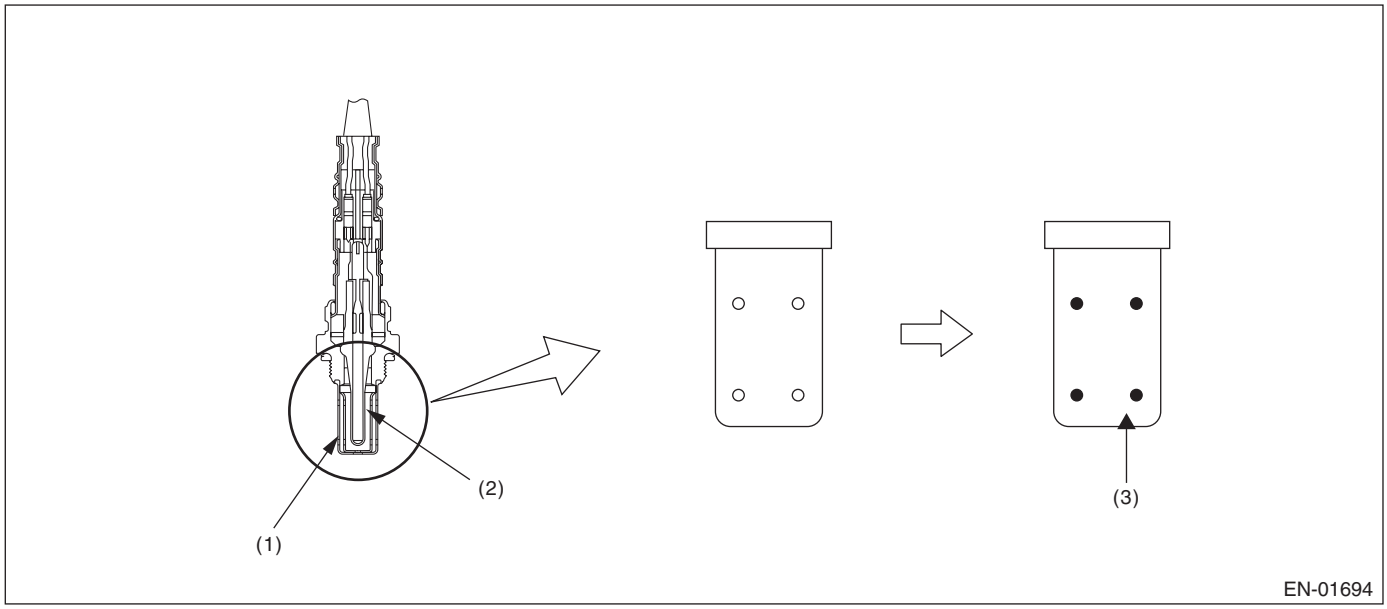
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

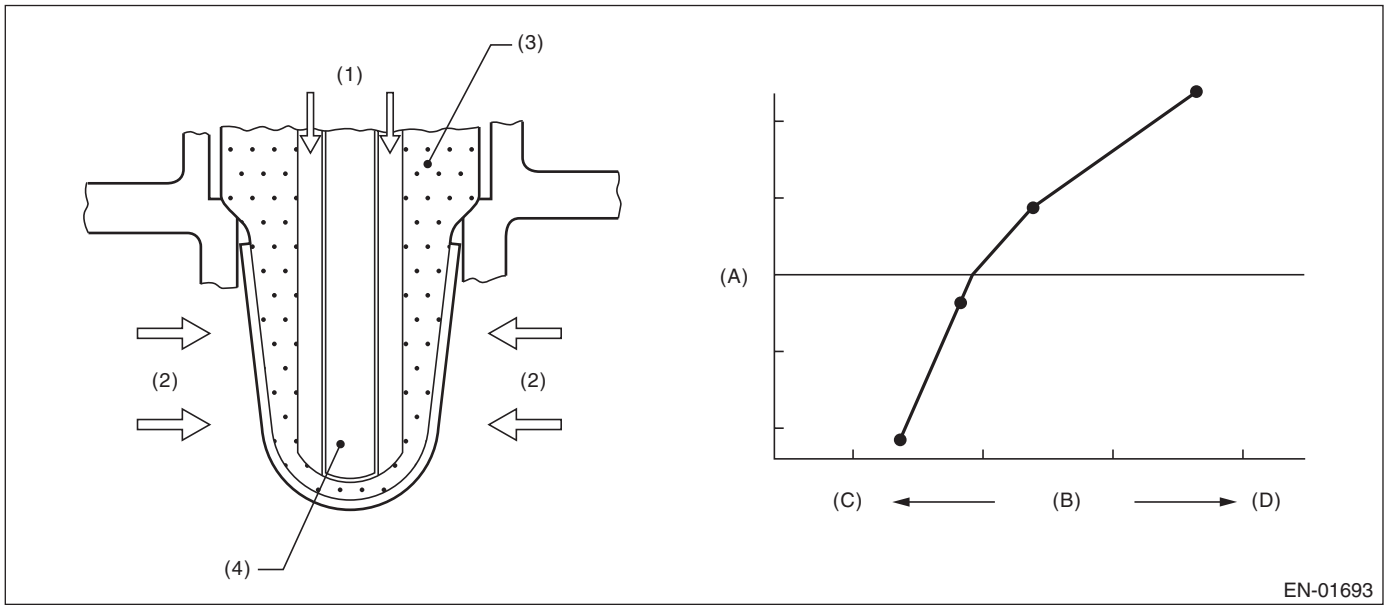
1. OUTLINE OF DIAGNOSIS

Detect the slow response of front oxygen (A/F) sensor.
Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed.
When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the sensor cover holes are clogged, the rich to lean judgment in the ECM is delayed when the actual change from rich to lean occurs.
Judge as NG when the actual movement in comparison to the ECM control amount is slow.



(1) Cover (2) Zirconia (3) Clogging

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	1 second or more
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	0 ←→ 50 Ω
After engine starting	120 seconds or more
Engine coolant temperature	≥ 70°C (158°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) 120 seconds or more after starting the engine.

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 if the criteria below are met. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd	≥ 0.644 (AT) ≥ 0.444 (MT)
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	

Time Needed for Diagnosis: 210 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- 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

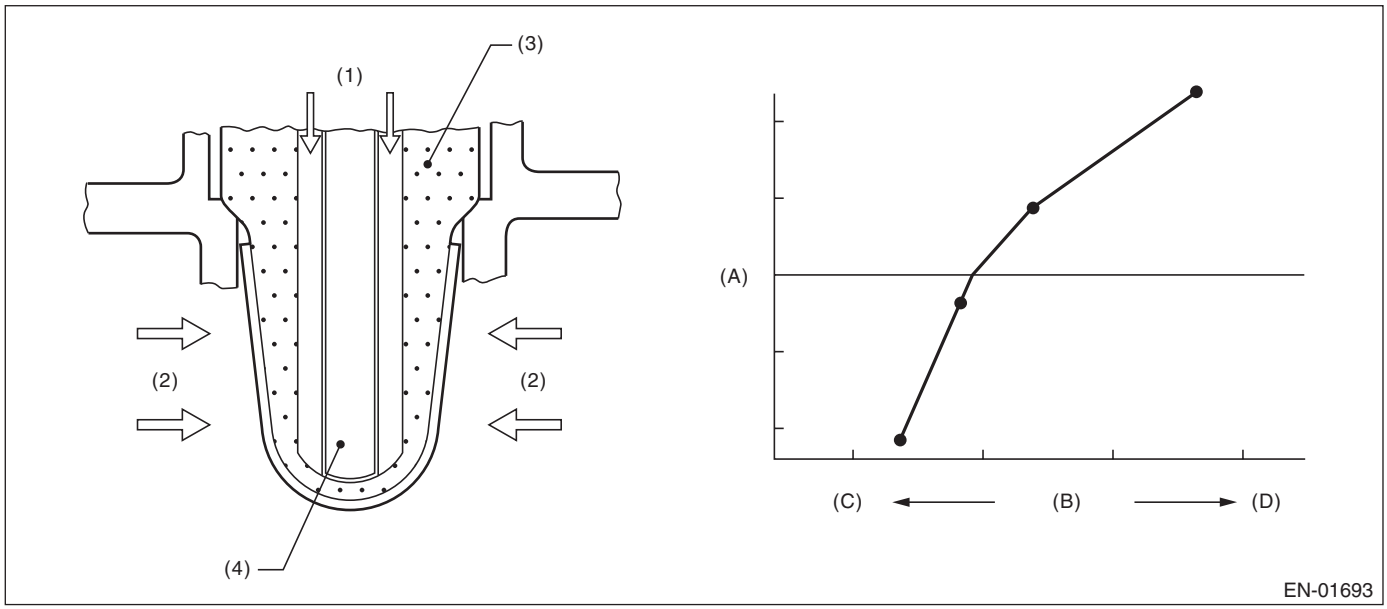
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

1. OUTLINE OF DIAGNOSIS

Detect open circuits of the sensor.
Judge as NG when the impedance of the element is large.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 50 seconds
Time of heater control duty at 70% or more	≥ 36000 milliseconds
Front oxygen (A/F) sensor impedance.	≥ 500 Ω

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor 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

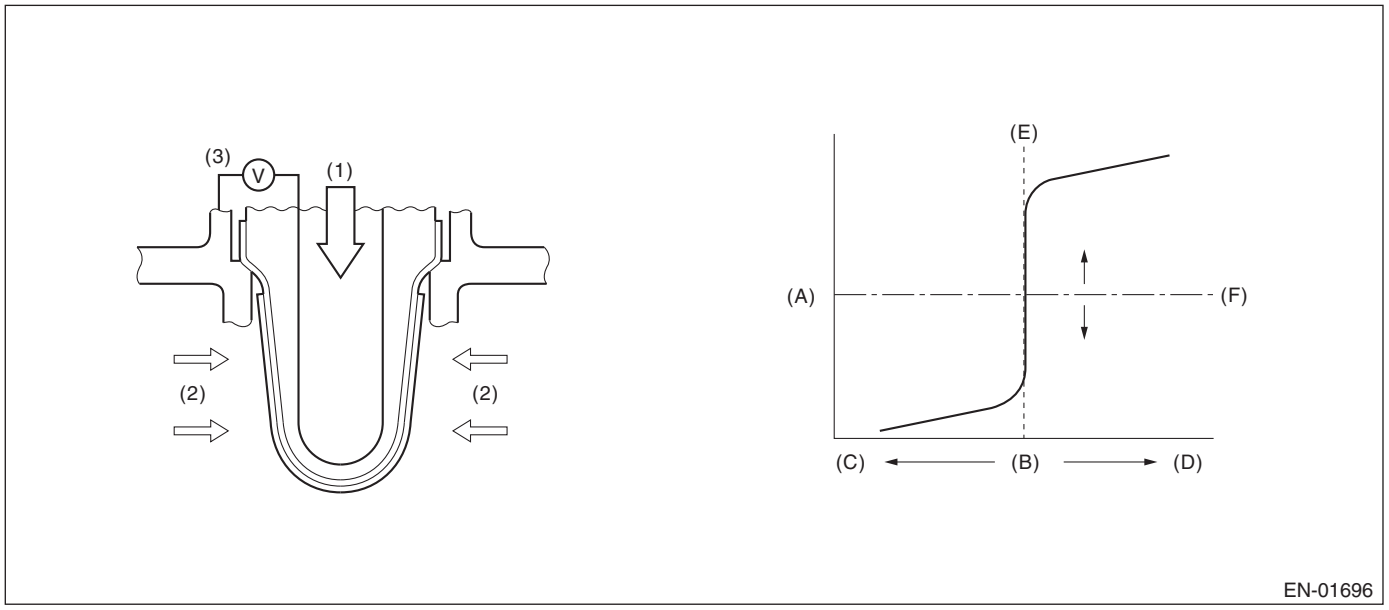
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect continuity NG of the oxygen sensor. If the oxygen sensor voltage reading is not within the probable range considering the operating conditions, judge as NG.

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Used for Abnormality Judgment

Secondary Parameters	Enable Conditions
High side	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Low side 1	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	≥ 10 g/second
Low side 2	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g/second
Current continuation time of the rear oxygen sensor heater	30 seconds or more
Low side 3	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g/second
Current continuation time of the rear oxygen sensor heater	30 seconds or more
Fuel cut	Experienced

Used for normality judgment

Secondary Parameters	Enable Conditions
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

After starting the engine, continuously perform the diagnosis with the same engine condition.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time during which the following conditions are established exceeds the predetermined time, and judge as OK if it does not.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High side Maximum output voltage without continuity	≥ 1200 mV	P0138
Low side Minimum output voltage without continuity	< 30 mV	P0137

Time Needed for Diagnosis

High side: 2.5 seconds
Low side 1: 20 seconds
Low side 2: 150 seconds
Low side 3: Value from Map

Map

Fuel Cut Time (Second)	Time needed for diagnosis (second)
0	150
2	150
10	150

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

NOTE:
For the detection standard, refer to DTC P0137. <Ref. to GD(H4DOTC)-65, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

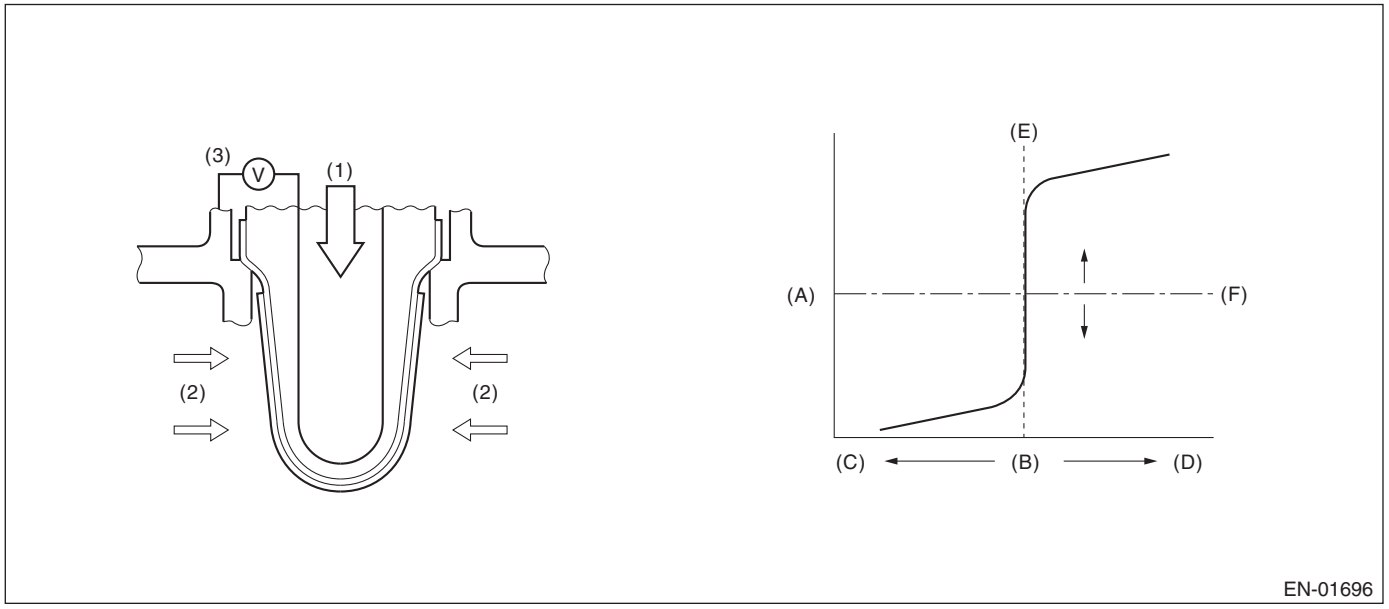
1. OUTLINE OF DIAGNOSIS

Detect the slow response of the oxygen sensor.
Judge as NG if either the rich to lean response diagnosis or lean to rich response diagnosis is NG, and Judge as OK if both are OK.
[Rich → lean diagnosis response]
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to rich to lean. If the measured response time is larger than the threshold value, it is NG. If it is smaller, it is OK.
2. Judge as NG when the oxygen sensor voltage is large (rich) when recovering from a deceleration fuel cut.
[Lean → rich diagnosis response]
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to lean to rich. If the measured response time is larger than the threshold value, it is NG.
2. Judge as NG when the oxygen sensor voltage remains small when recovering from a deceleration fuel cut.

DIAGNOSTIC METHOD

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes to rich to lean. And Judge as NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

- Rich → lean diagnosis response

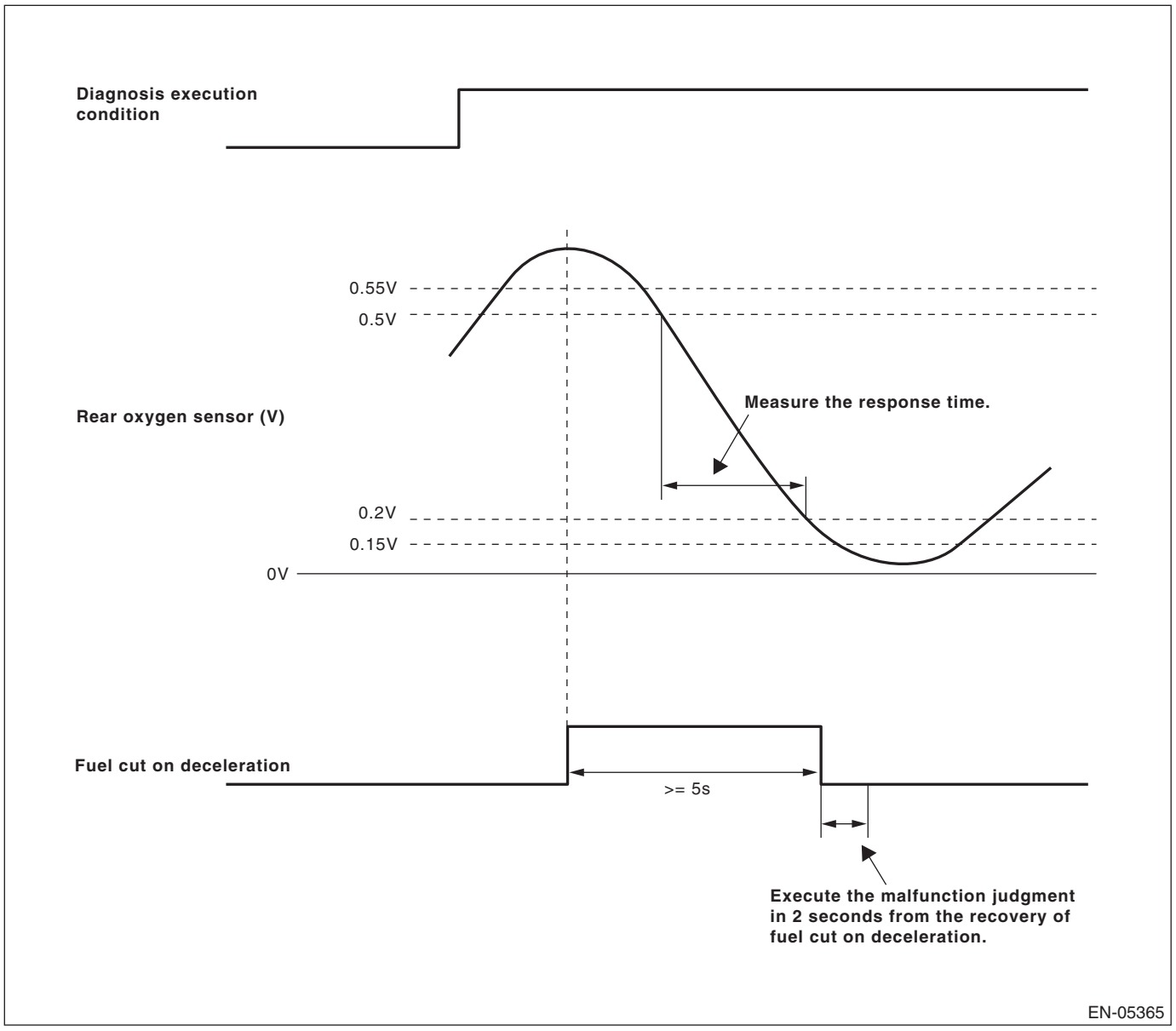
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F sub feedback control condition	Completed
Deceleration fuel cut time is 5 seconds or more.	Experienced
After fuel cut	≥ 2 seconds
Current calculation time of the rear oxygen sensor heater	≥ 60 seconds
Current continuation time of the rear oxygen sensor heater	≥ 30 seconds
Estimated catalyst temperature	≥ 400°C
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 0.15 V (lean), calculate the minimum response time for output change between 0.5 V and 0.2 V for the judgment criteria.



- **Abnormality Judgment**

1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnosis value) > threshold value → abnormal

NOTE:
Variation time of rear oxygen sensor output voltage is short during fuel cut in deceleration. NG judgment should be performed after deceleration fuel cut. Even without deceleration fuel cut, judge as OK if the value is below the threshold.
When the deceleration fuel cut time is 6 seconds or more, judge as NG if the following criteria are met 2 seconds after recovering from the deceleration fuel cut.

2) Judge as NG when the oxygen sensor voltage at recovery from a deceleration fuel cut, is large.
If the fuel cut time in a deceleration fuel cut is long (6 s or more), and even after recovering from a deceleration fuel cut, the oxygen sensor voltage is high (0.55 V or more), judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O_2 output) to lean (200 mV) when voltage reduces from 550 mV to 150 mV	> 837 milliseconds
or	
Longest time over 550 mV	> 2 seconds

Time Needed for Diagnosis: 1 time
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

1) Regardless of a deceleration fuel cut, if the response time (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.
Response time (diagnosis value) ≤ threshold value → normal
2) Do not judge as a normal condition.
Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O_2 output) to lean (200 mV) when voltage reduces from 550 mV to 150 mV	≤ 837 milliseconds

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

10.ENABLE CONDITION

- Lean → rich response diagnosis

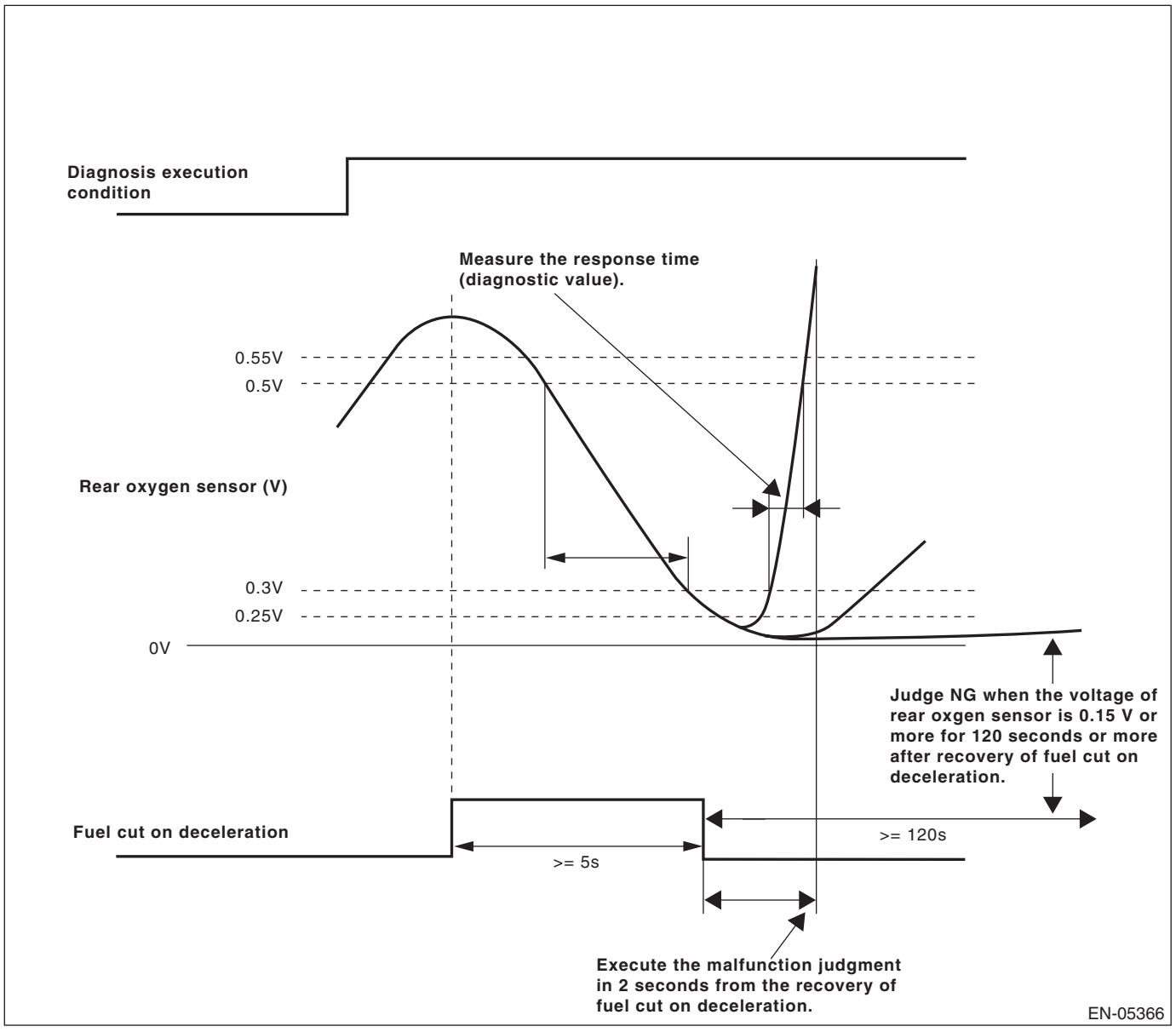
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
5 seconds or more deceleration fuel cut.	Experienced
After fuel cut	≥ 2 seconds
Current calculation time of the rear oxygen sensor heater	≥ 60 seconds
Current continuation time of the rear oxygen sensor heater	≥ 30 seconds
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 oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich).



• **Abnormality Judgment**

1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnosis value) > threshold value → abnormal
2) If the oxygen sensor voltage is small after recovering from a deceleration fuel cut, and remains small, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O_2 output) to rich (500 mV) when voltage changes from 250 mV to 550 mV	> 2 seconds
or	
Longest time to change to 150 mV	> 120 seconds

Time Needed for Diagnosis: 1 time
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• **Normality Judgment**

1) Regardless of a deceleration fuel cut, if the response time (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.
Response time (diagnosis value) ≤ threshold value → normal
2) Do not judge as a normal condition.
Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O_2 output) to rich (500 mV) when voltage changes from 250 mV to 500 mV	≤ 2 seconds

13.DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

15.FAIL SAFE

Sub feedback control: Not allowed

16.ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

1. OUTLINE OF DIAGNOSIS

Detect abnormalities in the rear oxygen sensor output characteristics.
By referring to the intake air amount, engine coolant temperature, main feedback control, deceleration fuel cut and other operating conditions, if the rear oxygen sensor voltage should be moving under thoese conditions but is showing a low voltage, this is judged as a Low side NG. If the voltage is showing a high voltage, it is judged as a High side NG.
When either Low side or High side is NG, judged as rear oxygen sensor property NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)
Target output voltage of rear oxygen sensor	≥ 0.6 V
Air intake amount	10 g (0.35 oz)/seconds or more
Battery voltage	> 10.9 V
Closed loop at the oxygen sensor	In operation
Misfire detection every 200 rotations	5 times or less
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Deceleration fuel cut of 5 seconds or more.	Experienced

3. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine warm-up.

4. DIAGNOSTIC METHOD

Abnormality Judgment

If the following conditions are met, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage	< 550 mV
Minimum output voltage	> 150 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

When the following conditions are established, judged as OK.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage	≥ 550 mV
Minimum output voltage	≤ 150 mV

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AH: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	0.228 (0.008)	0.22 (0.008)	0.22 (0.008)	0.22 (0.008)	0.228 (0.008)	0.23 (0.008)	0.234 (0.008)	0.242 (0.009)	0.25 (0.009)	0.25 (0.009)

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 of meeting the malfunction criteria below continues for 30 seconds or more, 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 met for 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	< 20%

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

7. FAIL SAFE

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)

AI: 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	0.228 (0.008)	0.22 (0.008)	0.22 (0.008)	0.22 (0.008)	0.228 (0.008)	0.23 (0.008)	0.234 (0.008)	0.242 (0.009)	0.25 (0.009)	0.25 (0.009)

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 meeting the malfunction criteria below continues for 30 seconds or more, 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)	2.3 (0.081)	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 CONDITIONS

- 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)

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

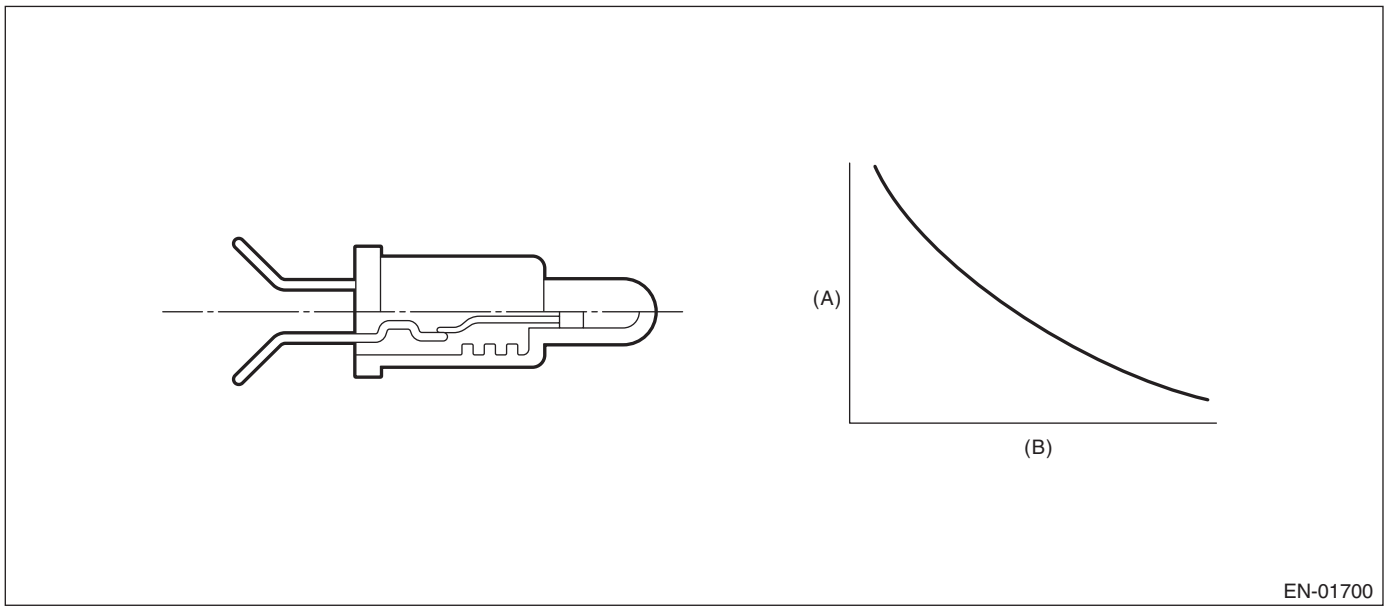
1. OUTLINE OF DIAGNOSIS

Detect faults in the fuel temperature sensor output properties.
Diagnosis is performed in two methods; drift diagnosis and stuck diagnosis. If either is NG, judge as NG. If both are OK, Judge as OK and clear the NG.

- **Drift Diagnosis**

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and judged as NG.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 120 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 9.6 ℓ (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 if 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 if 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)

Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

11.FAIL SAFE

None

12.ECM OPERATION AT DTC SETTING

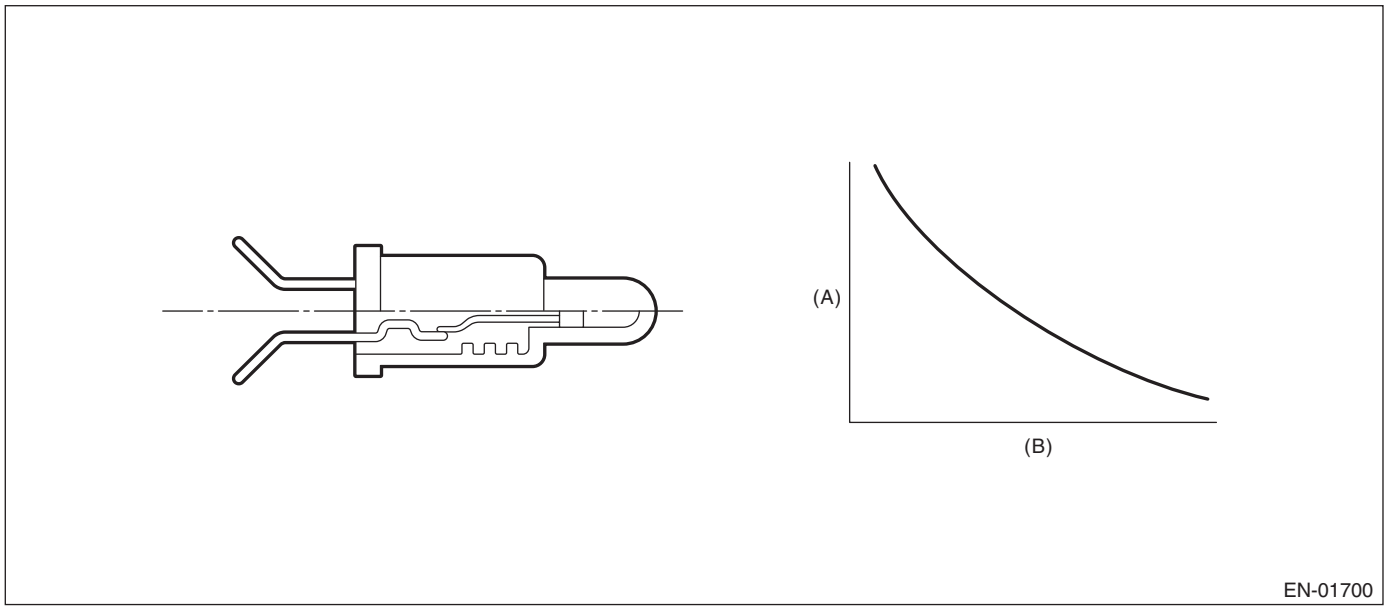
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.1646 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

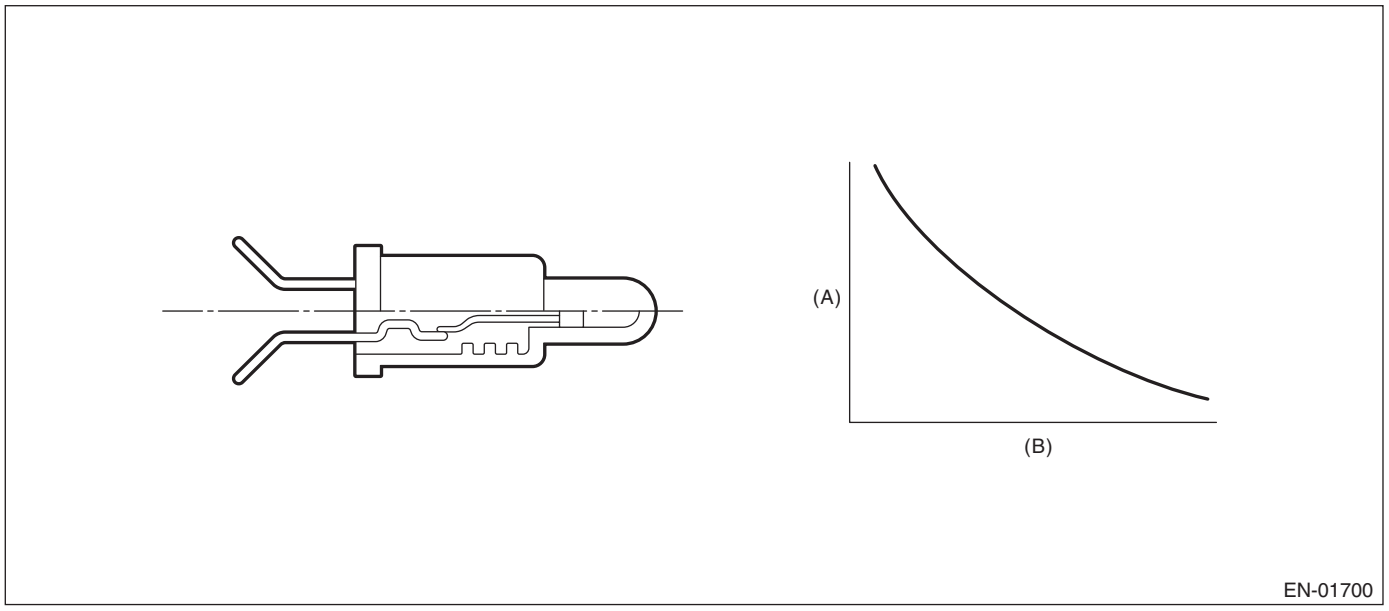
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

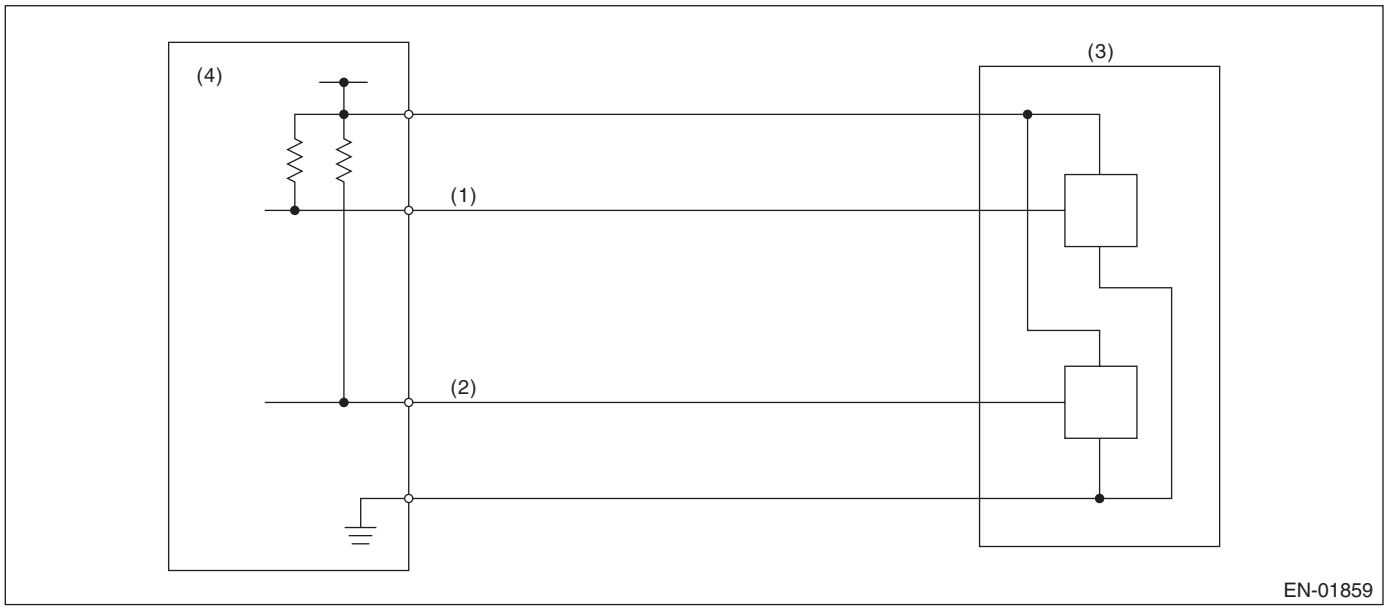
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.224 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

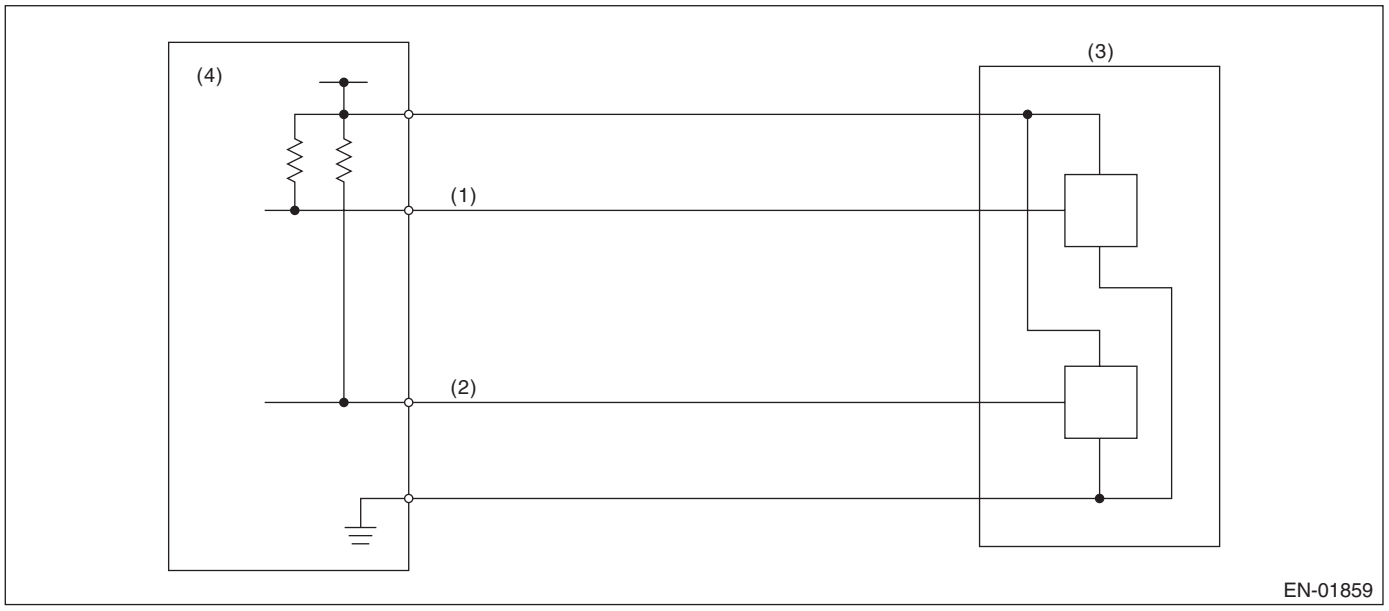
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.851 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

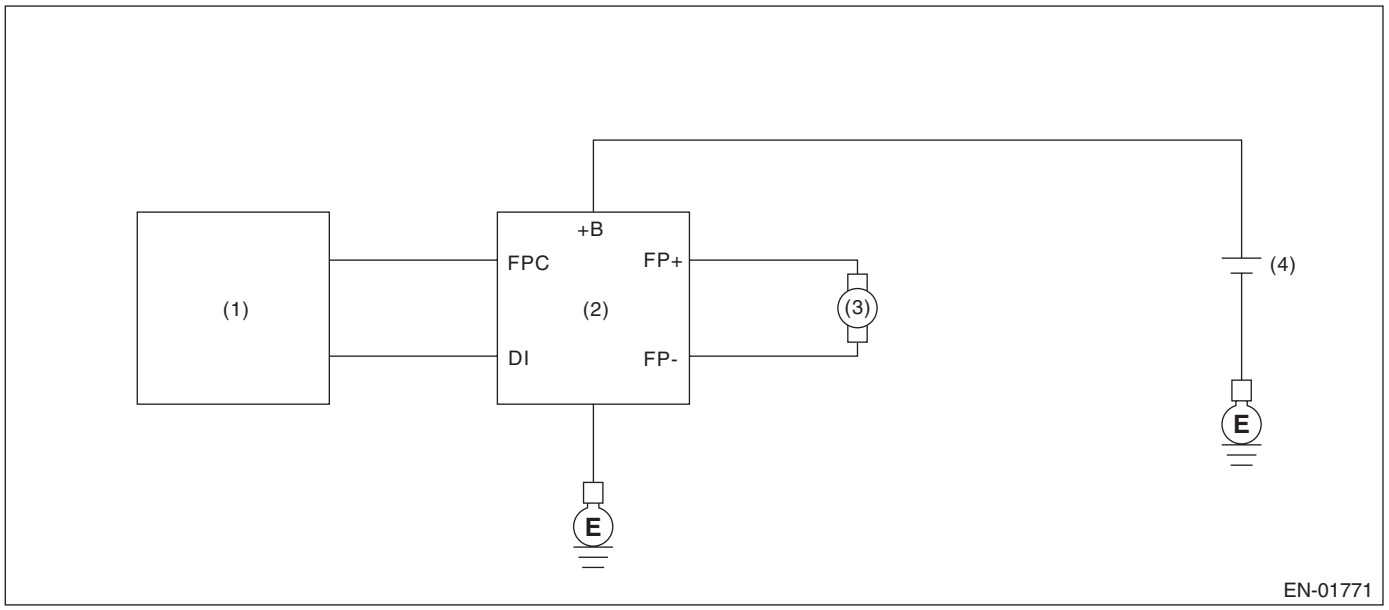
Memorize the freeze frame data. (For test mode $02)

AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit.
Judge as NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit.
Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel pump control unit
(3) Fuel pump
(4) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
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	≥ 180 seconds
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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

9. ECM OPERATION AT DTC SETTING

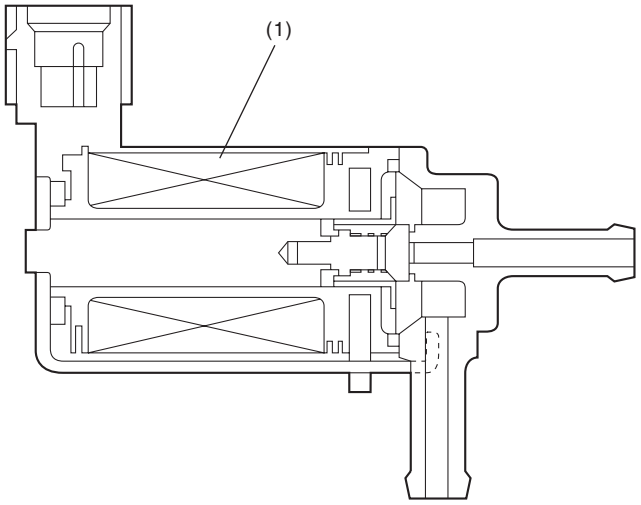
Memorize the freeze frame data. (For test mode $02)

AP: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



EN-01772

(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 meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	≥ Map 10

Map 10

Barometric pressure (kPa (mmHg, inHg))	58.7 (440,17.3)	77.3 (580, 22.8)	89.3 (670, 26.4)	96 (720, 28.4)	98.6 (740, 29.1)	101.3 (760, 29.9)
NG kPa (mmHg, inHg)	143.4 (1076, 42.4)	172.6 (1295, 51)	204.5 (1534, 60.4)	216.2 (1622, 63.9)	211.3 (1660, 65.4)	221.3 (1660, 65.4)
OK kPa (mmHg, inHg)	121 (908, 35.7)	150.2 (1127, 44.4)	182.1 (1366, 53.8)	193.8 (1454, 57.2)	198.9 (1492, 58.7)	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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

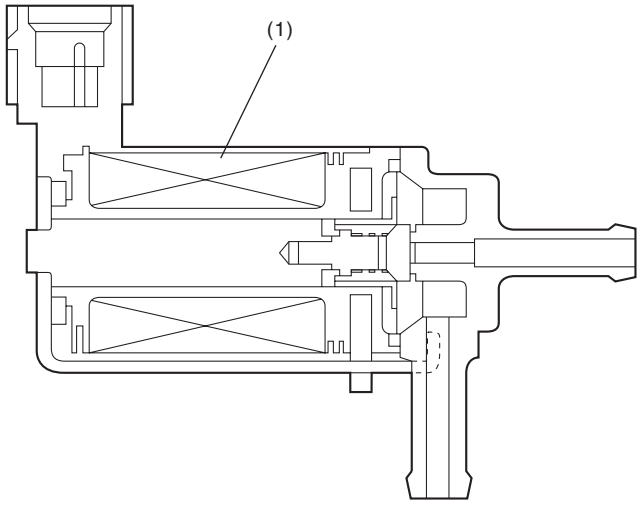
Memorize the freeze frame data. (For test mode $02)

AQ: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 meeting the malfunction criteria below becomes 640 milliseconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage Duty ratio for turbocharged pressure control	Low < 75%

Time Needed for Diagnosis: 640 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

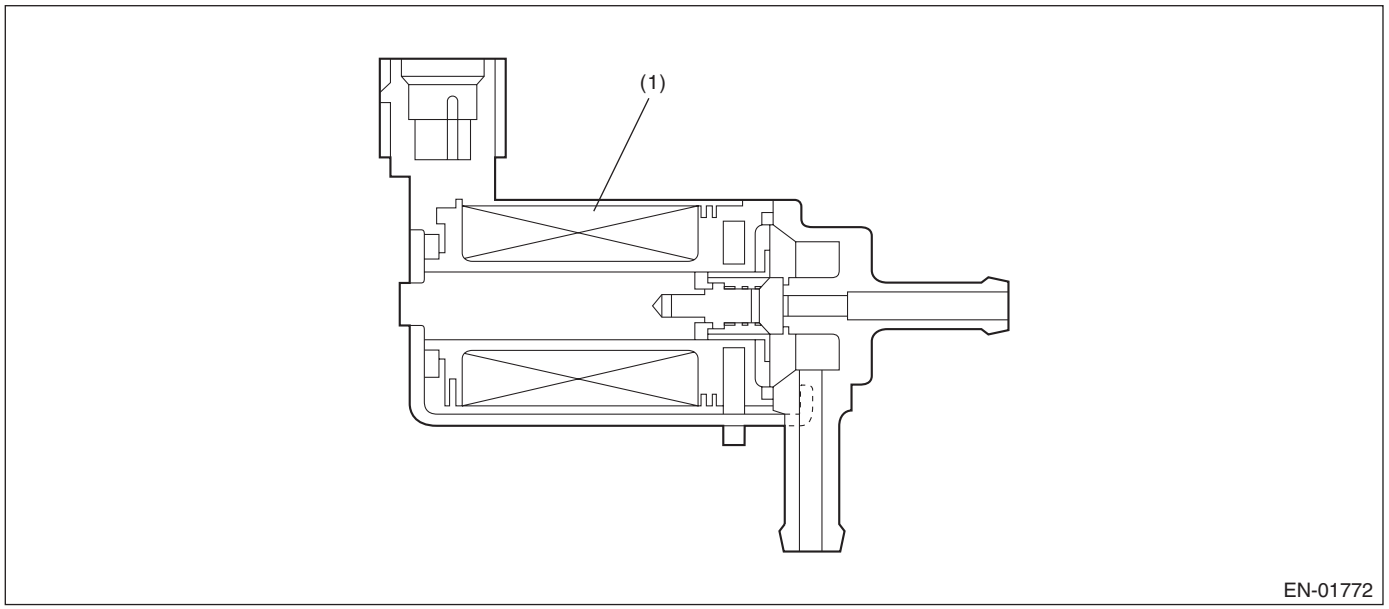
Memorize the freeze frame data. (For test mode $02)

AR: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 meeting the malfunction criteria below becomes 640 milliseconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage Duty ratio for turbocharged pressure control	High > 25%

Time Needed for Diagnosis: 640 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AS: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 second
Intake manifold pressure change during 0.5 engine revs.	< 26.7 kPa (200 mmHg, 7.89 inHg) (MT) < 13.3 kPa (100 mmHg, 3.93 inHg) (AT)
Engine speed change	< 1000 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 14°
Fuel shut-off function	Not in operation
Barometric 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	600 — 6500 rpm
Intake manifold pressure	> Value from 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)	27.3 (205, 8.06)	23.3 (175, 6.88)	23.6 (177, 6.97)	23.3 (175, 6.88)	24.0 (180, 7.09)	24.4 (183, 7.21)	28.8 (216, 8.51)	30.0 (225, 8.86)	31.6 (237, 9.33)	32.5 (244, 9.60)	37.1 (278, 10.96)	41.9 (314, 12.38)	46.9 (352, 13.85)	51.1 (383, 15.09)

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, 7.41)	24.8 (186, 7.32)	25.6 (192, 7.56)	40.0 (300, 11.81)	40.8 (306, 12.05)	42.1 (316, 12.43)	44.0 (330, 13.00)	44.5 (334, 13.14)	47.3 (355, 13.97)	54.7 (410, 16.16)	54.7 (410, 16.16)	54.7 (410, 16.16)	54.7 (410, 16.16)	54.7 (410, 16.16)

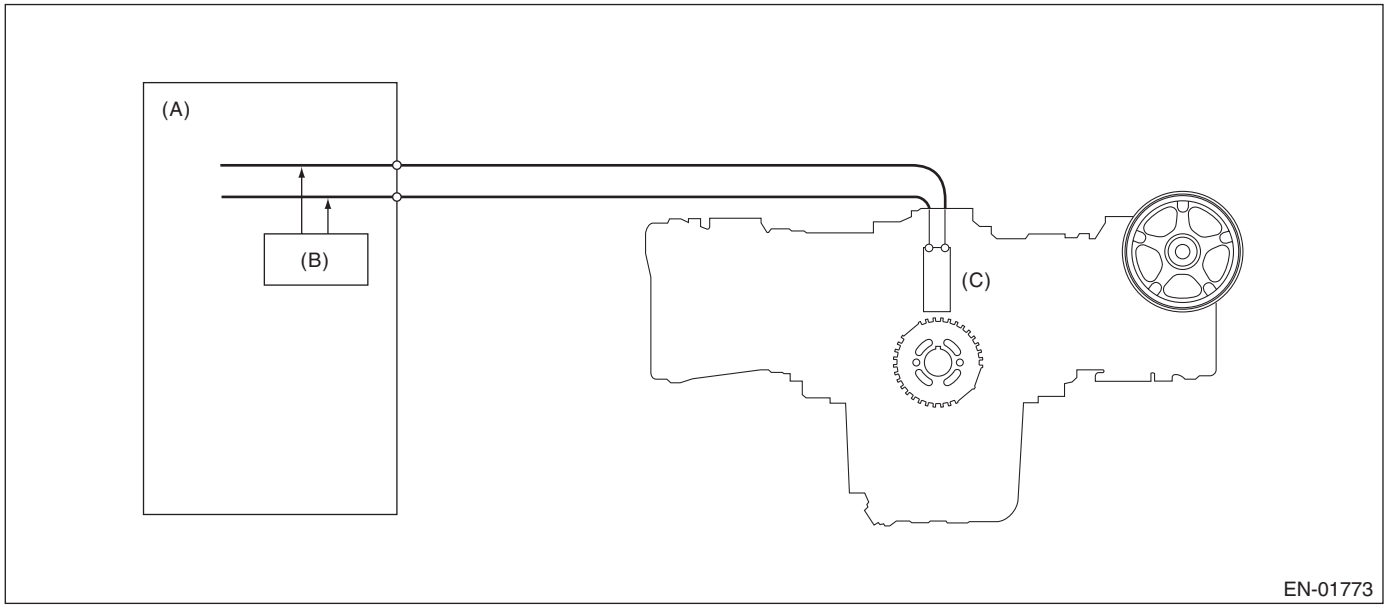
- AT (Tumble generator valve open)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	26.7 (200, 7.89)	26.7 (200, 7.89)	26.7 (200, 7.89)	26.7 (200, 7.89)	27.3 (205, 8.06)	28.0 (210, 8.27)	29.5 (221.5, 8.71)	31.3 (235, 9.24)	32.7 (245.5, 9.66)	34.1 (256, 10.07)	38.2 (286.5, 11.28)	44.0 (330, 13.00)	49.5 (371.5, 14.62)	53.3 (400, 15.74)

3. GENERAL DRIVING CYCLE

- If conditions are met, detect misfire from idling to high rotation.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

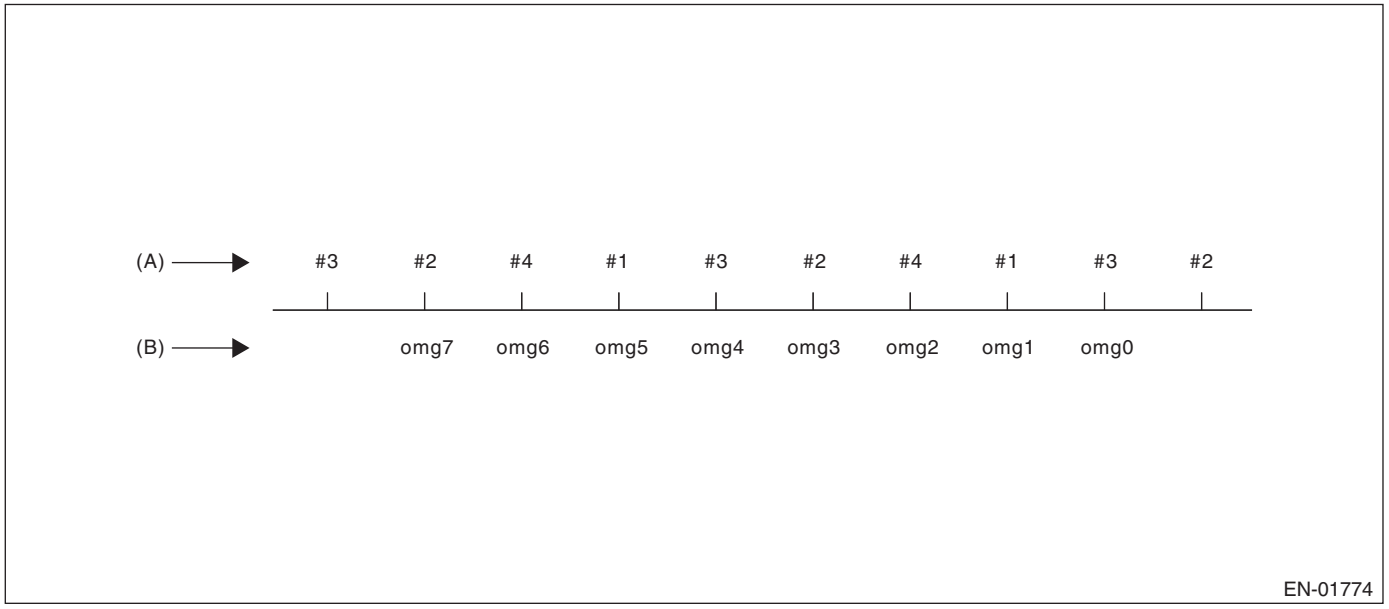


(A) Coil (B) Diagnosis circuit (C) Crankshaft position sensor

When a misfire occurs, the engine speed will decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether a misfire is occurring or not comparing the calculated result with judgment value. Counting the number of misfires. If the misfire ratio is higher during 1000 revs. or 200 revs., Judge corresponding cylinders as NG.

Diagnostic value calculation (Calculate from angle speed) →	Misfire detection every single ignition (Compare diagnostic value with judgment value) →	NG judgment (Misfire occurrence judgment required by the law) (Compare number of misfire with judgment)
	• 180° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method	• FTP 1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

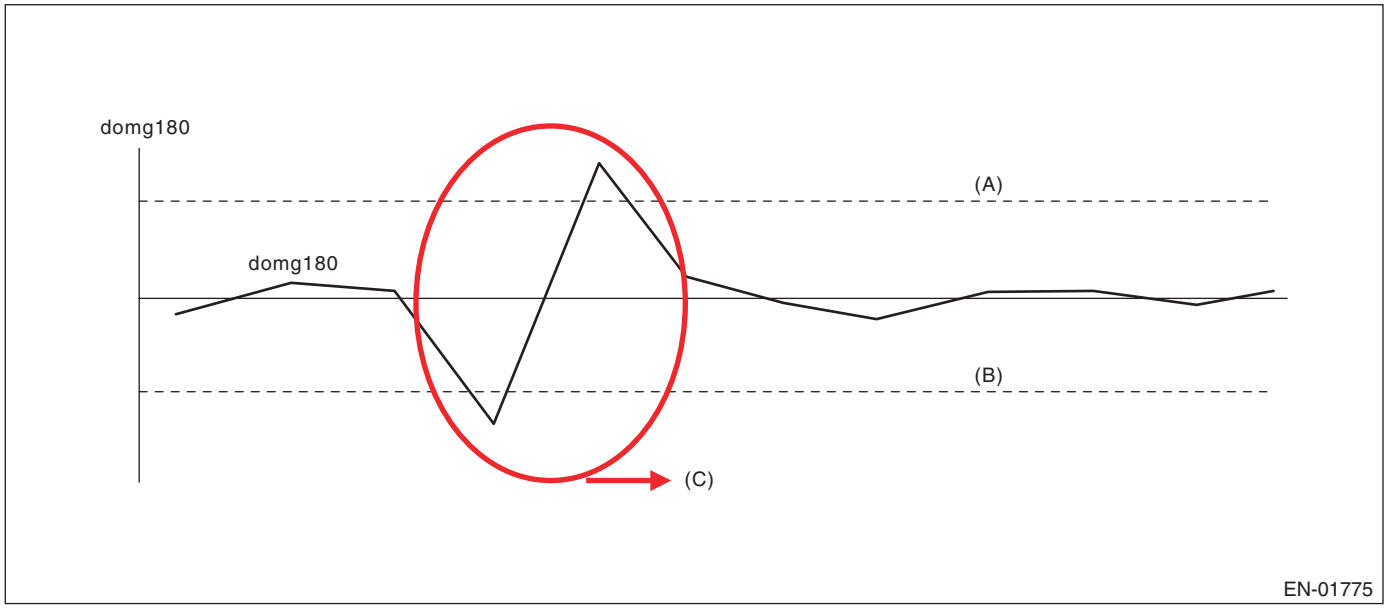
As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.



(A) Ignition order (B) Crankshaft position speed

180° Interval Difference Method

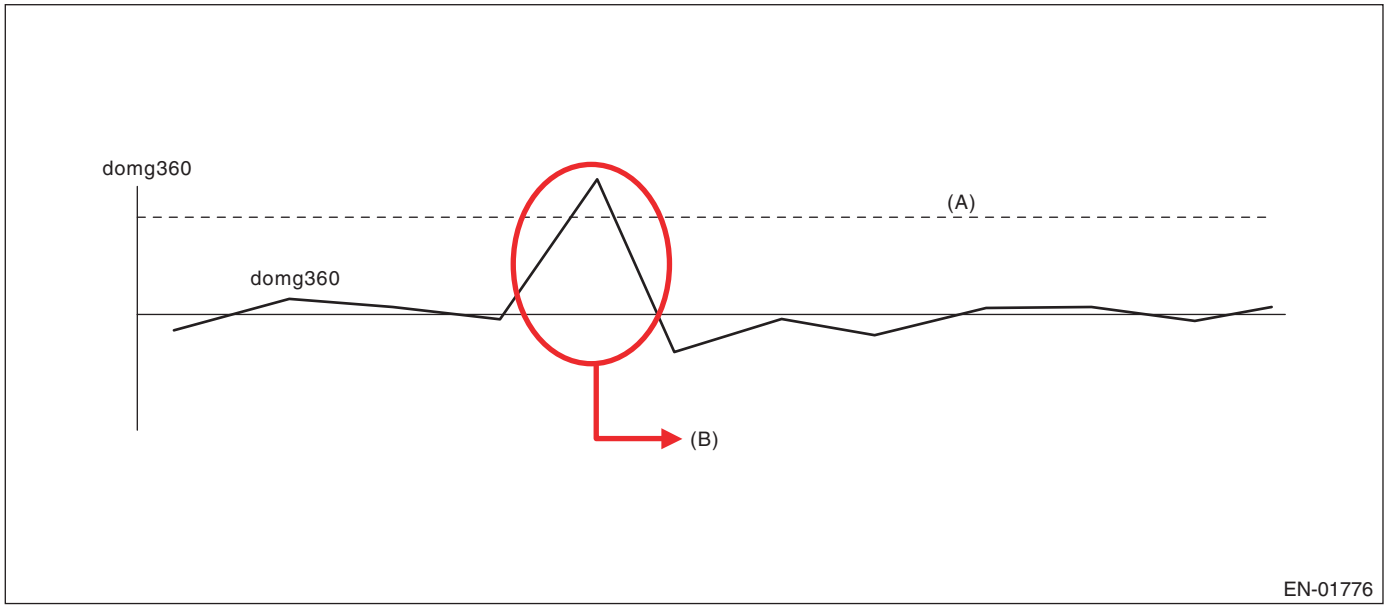
Diagnostic value	domg 180 = (omg 1 – omg 0) – (omg 7 – omg 1)/ 6
Judge as a misfire in the following cases. • domg 180 > judgment value of positive side • domg 180 ≤ judgment value of negative side (Judgment value before 180° CA)	



(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

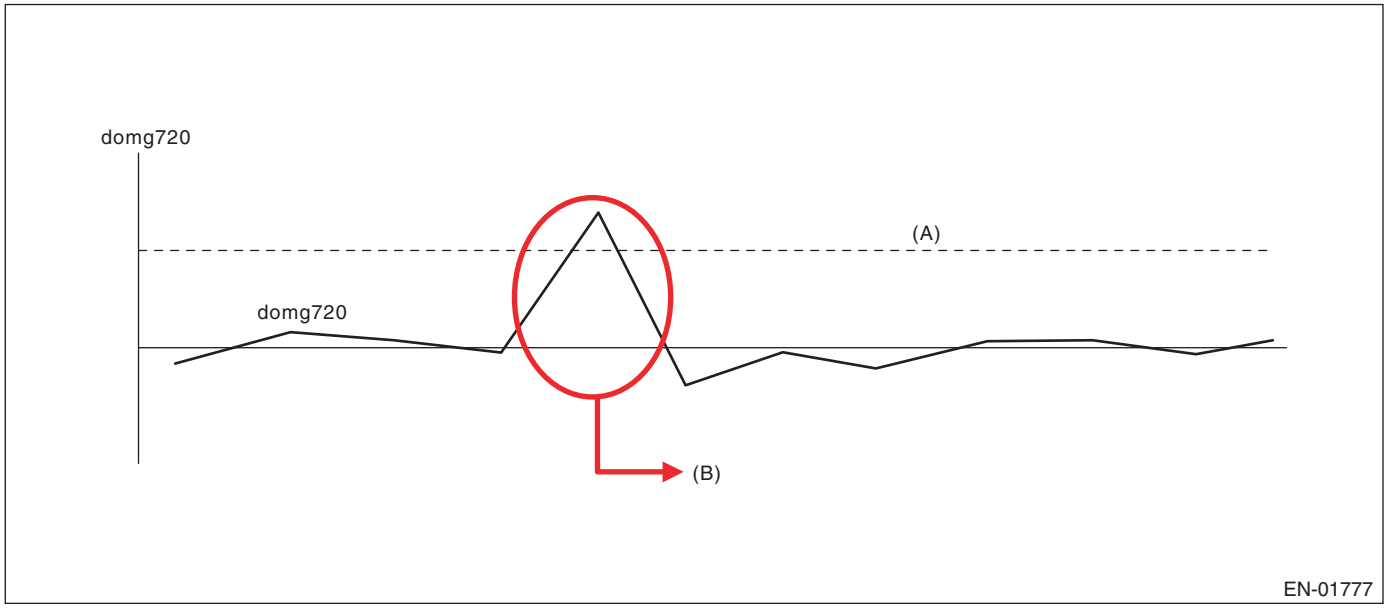
Diagnostic value	domg 360 = (omg 1 – omg 0) – (omg 4 – omg 3)
Misfire judgment	domg 360 > Judgment value → Judge as misfire



(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

Ignition count		Intake air (g(oz)/rev)									
		0.2 (0.007)	0.4 (0.014)	0.6 (0.021)	0.8 (0.028)	1.0 (0.053)	1.2 (0.042)	1.4 (0.049)	1.6 (0.056)	1.8 (0.063)	2.0 (0.071)
Engine speed (rpm)	700	148	128	116	106	100	90	90	90	90	90
	1000	148	128	114	104	92	85	85	85	85	85
	1500	140	118	102	90	85	85	85	72	72	72
	2000	128	90	90	73	58	43	40	36	32	20
	2500	116	87	57	45	39	36	34	32	30	20
	3000	108	87	58	39	36	36	32	30	28	20
	3500	98	74	43	27	23	22	20	20	20	20
	4000	69	61	40	27	22	20	20	20	20	20
	4500	60	55	34	25	20	20	20	20	20	20
	5000	55	55	34	23	20	20	20	20	20	20
	5500	54	54	33	22	20	20	20	20	20	20
	6000	52	52	32	21	20	20	20	20	20	20
	6500	50	50	30	20	20	20	20	20	20	20
	6700	50	50	30	20	20	20	20	20	20	20

Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When 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)

AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0301. <Ref. to GD(H4DOTC)-99, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0301. <Ref. to GD(H4DOTC)-99, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

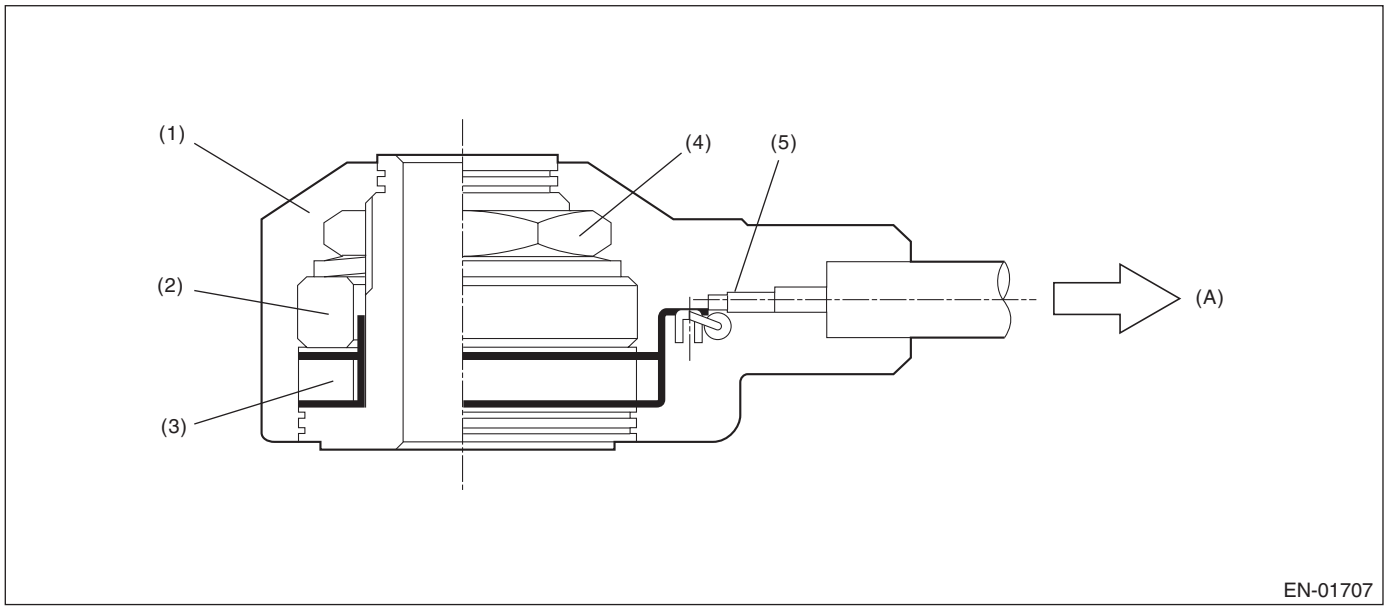
For the detection standard, refer to DTC P0301. <Ref. to GD(H4DOTC)-99, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.238 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.238 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

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

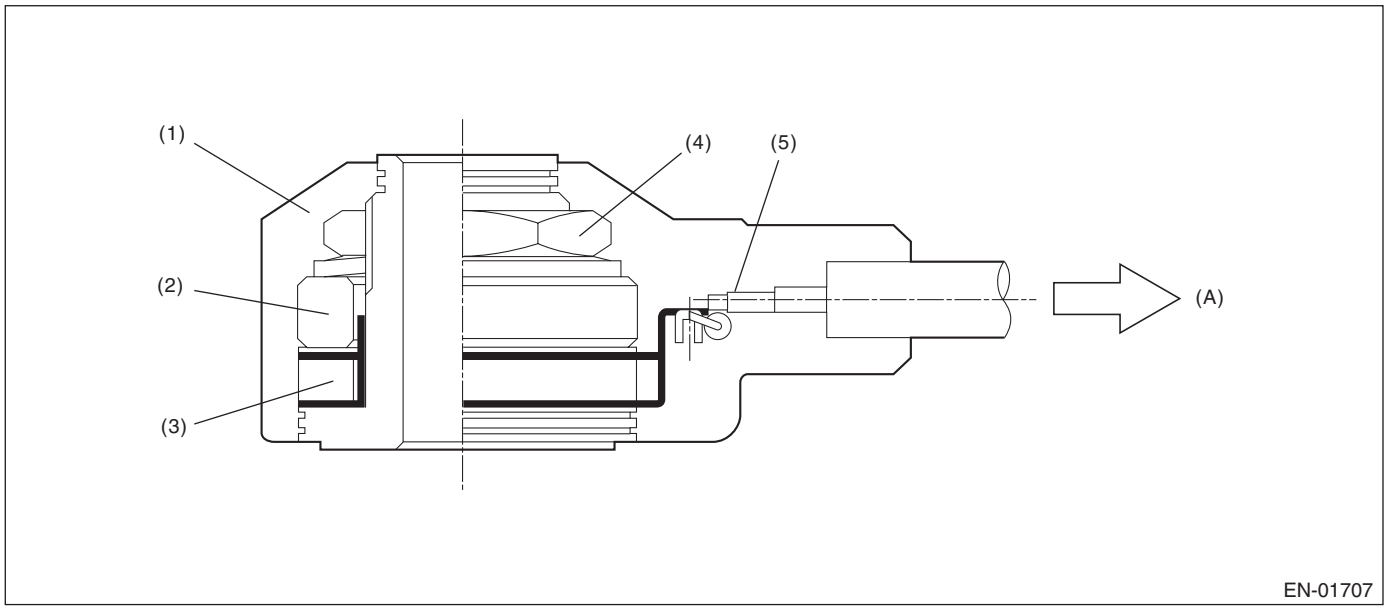
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.714 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.714 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

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

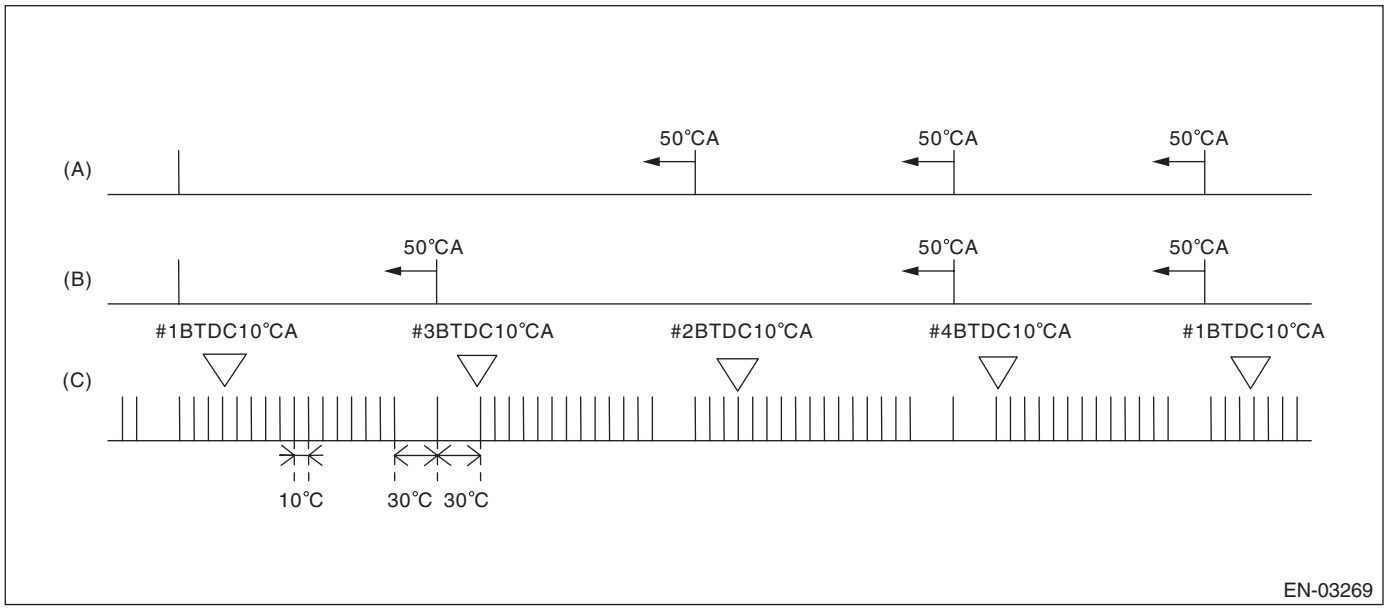
Memorize the freeze frame data. (For test mode $02)

AY:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

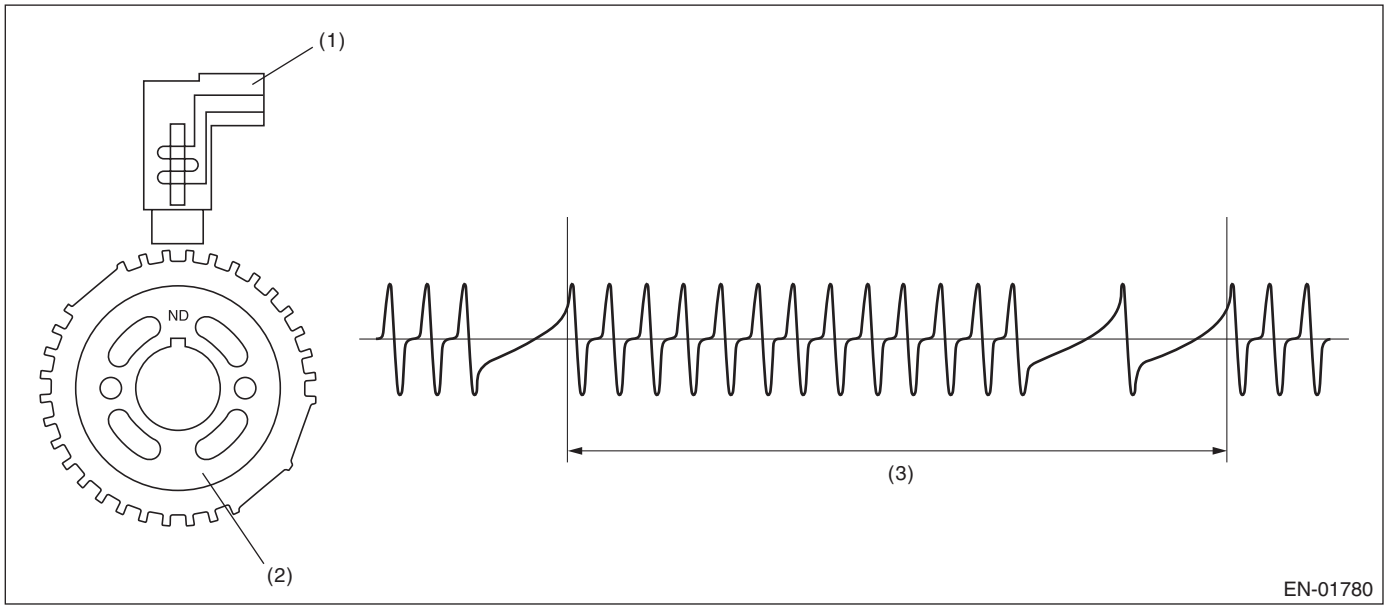
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the crankshaft position sensor.
Judge as NG when the crank signal is not input even though the starter was rotated.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH) (B) Camshaft signal (LH) (C) Crankshaft signal



(1) Crankshaft position sensor (2) Crank sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK when the continuous time of meeting the malfunction criteria below is 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

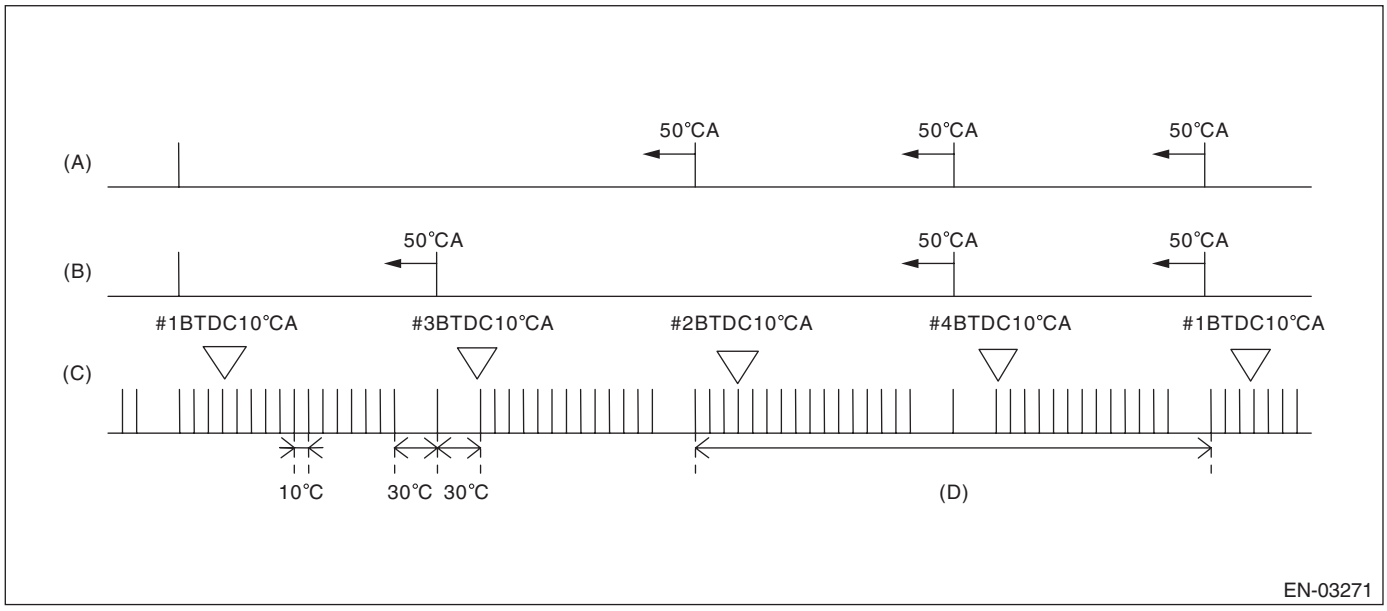
Memorize the freeze frame data. (For test mode $02)

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

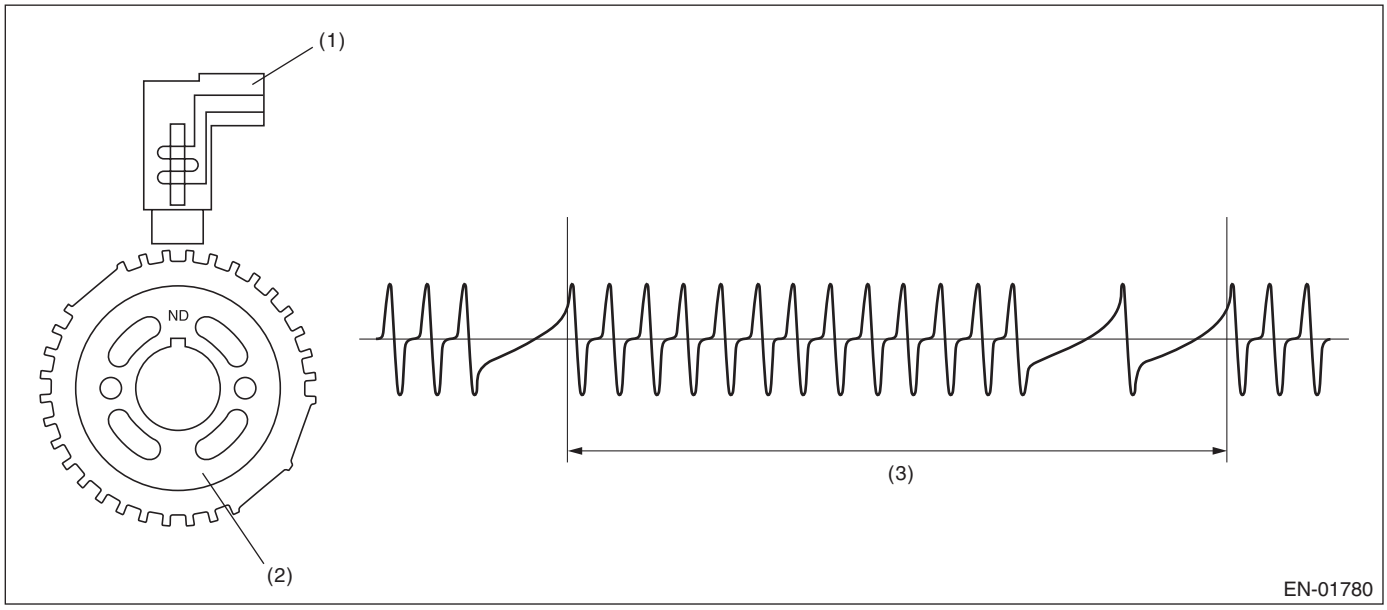
1. OUTLINE OF DIAGNOSIS

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 if the following criteria are met continuously 10 times or more in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

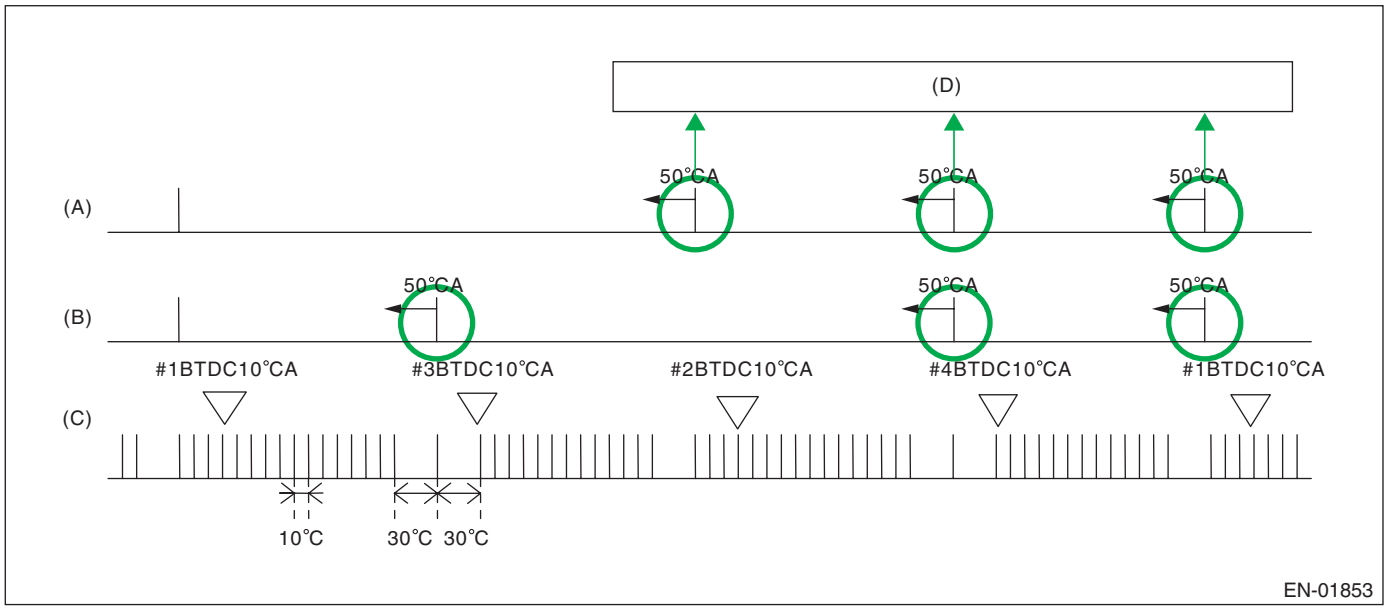
Memorize the freeze frame data. (For test mode $02)

BA: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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment 1**

When normal, there should be 3 cam signals per 2 engine revolutions. If a condition where it is less than 3 signals continues, It is judged as NG.
When the engine speed is 100 rpm or faster, if the following conditions are established it is juged as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft sensor signals during 2 revs.	< 3

Time Needed for Diagnosis: 100 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment 1

Judge as OK and clear the NG when the following criteria are established.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft angle signal	= 3

• Abnormality Judgment 2

Judge as NG if the continuous time of meeting the conditions is 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Starter	ON
Camshaft angle signal	No input

Time Needed for Diagnosis: 3 seconds

• Normality Judgment 2

When the conditions are established, judge as OK.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft angle signal	Input exists

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0° CA) to the compensation value of partial learning zone with IG OFF.
  – Enter the initial value (0° CA) to the compensation value of the partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
  – Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
  – ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0340. <Ref. to GD(H4DOTC)-114, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM

1. OUTLINE OF DIAGNOSIS

Detect NG judging from secondary air delivery pipe pressure, pulse of secondary air delivery pipe pressure and secondary air pipe airflow amount.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Estimated ambient temperature	4.4°C (39.92°F)
Battery voltage	7 V
Barometric pressure	563 mmHg
Engine	In operation
Pump supply pressure diagnosis	
Amount of intake air	≥ 2 g (0.07 oz)/second
Secondary air pump	Operating
Combination valve	One bank open (except with both banks closed)
Combination valve both closed pulse diagnosis	
Engine load	≥ 0.2 g (0.007 oz)/rev
After fuel cut	≥ 100 millisecond
Combination valve change over pressure diagnosis	
Amount of intake air	≥ 2 g (0.07 oz)/second and ≤ 25 seconds
Engine speed	< 4000 rpm
After fuel cut	≥ 1000 millisecond

3. GENERAL DRIVING CYCLE

Perform diagnosis during secondary air pump operation

4. DIAGNOSTIC METHOD

Measure secondary air delivery pipe pressure, pulse of secondary air delivery pipe pressure and secondary air pipe airflow amount.

Pump supply pressure diagnosis

Perform system function diagnosis by comparing the pressure when the secondary air pump is OFF and the pressure increase when it is ON.

Combination valve both closed pulse diagnosis

Perform open stuck diagnosis of both combination valves using delivery pipe pressure pulse when both combination valves are closed. Determine which side of valves is stuck open by comparing secondary air flow amount when RH combination valve is closed with that when LH combination valve is closed.

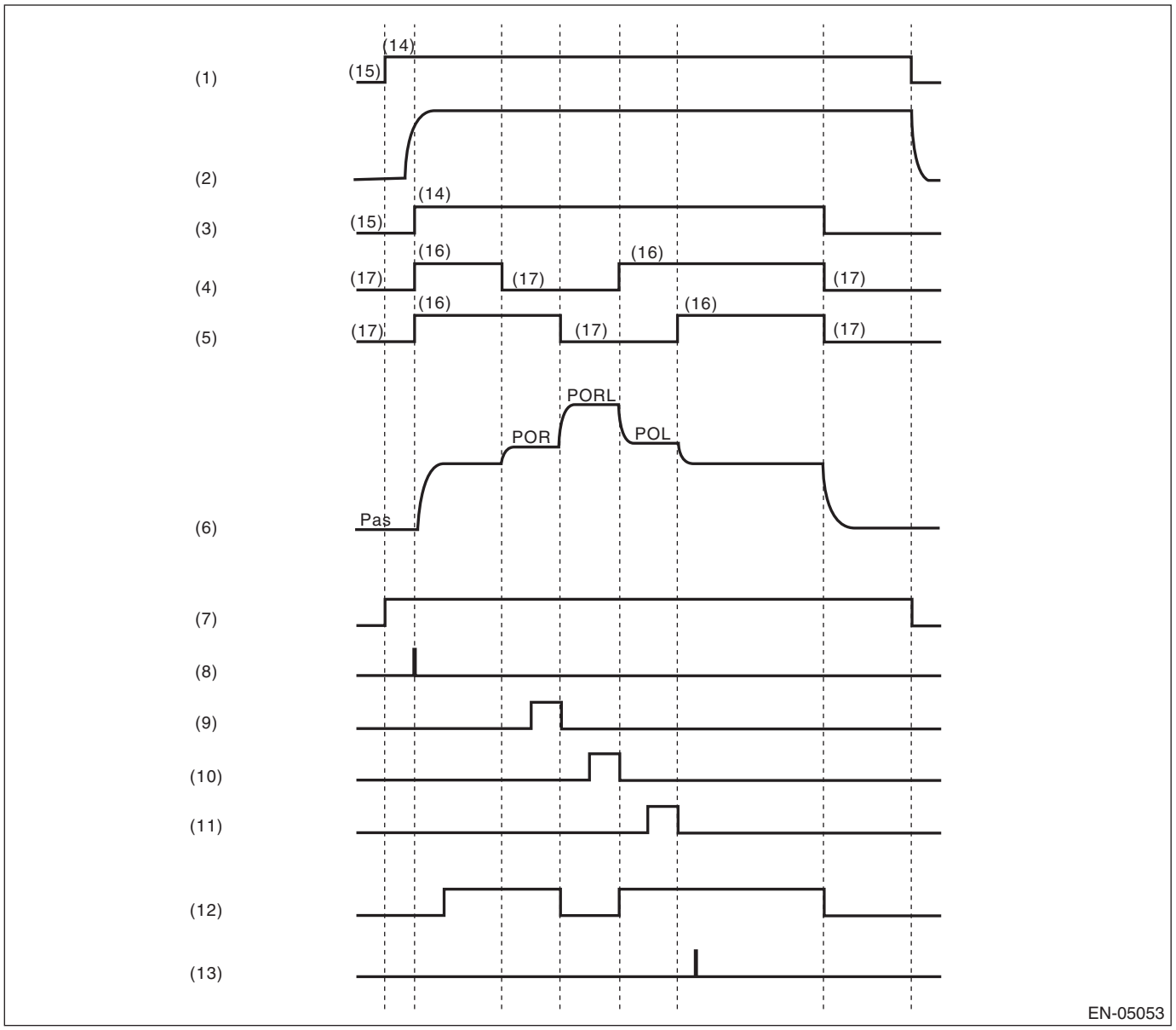
Combination valve change over pressure diagnosis

Perform close stuck diagnosis of right hand combination valve using variation of delivery pipe pressure when the right hand combination valve turns closed → open.

Perform close stuck diagnosis of left hand combination valve using variation of delivery pipe pressure when the left hand combination valve turns open → closed.

Overflow diagnosis

Perform secondary air system flow abnormality diagnosis using both sides of combination valves secondary air amount when both are closed.



(1) IG
(2) Ne
(3) Secondary air pump operating status
(4) E-COMB valve (right hand) status
(5) E-COMB valve (left hand) status
(6) Secondary air delivery pipe pressure (psi)
(7) Diagnosis enable condition
(8) Barometric pressure (Pas) measurement before secondary air control
(9) Right bank all closed pressure (POR) measurement
(10) Both banks all closed pressure (PORL) measurement
(11) Left bank all closed pressure (POL) measurement
(12) Pump supply pressure check (judgment)
(13) Flow amount check (judgment)
(14) ON
(15) OFF
(16) Open
(17) Close

Judgment Value

Pump supply pressure diagnosis

Judge as NG if Delivery pipe pressure does not rise though it should when the secondary air pump turns OFF → ON.

Judge as NG when the following conditions are established. Judge as OK and clear the NG when the following conditions are not established.

Malfunction Criteria	Threshold Value	DTC
Secondary air delivery pipe pressure (after barometric pressure compensation)	< 1 kPa (7 mmHg, 0.3 inHg)	P0410

Combination valve both closed pulse diagnosis

Calculate voltage pulse of the pump supply pipe pressure when both combination valves are closed. The calculation should be small because there is no pulse from supply pipe pressure with both combination valves closed. When the calculation is large, determine that either of the combination valves is stuck open.

Determine which side of valves is stuck open by comparing secondary air flow amount when the RH combination valve is closed with that when the LH combination valve is closed. Air flow amount is larger on the open stuck valve.

Judge as NG when the following conditions are established. Judge as OK and clear the NG when the following conditions are not established.

Malfunction Criteria	Threshold Value	DTC
Pulse calculation value when both combination valves are closed	> Value from Map 3	P2440
Air flow amount when the right bank is closed (value from Map 4)	≥ Air flow amount when the left bank is closed (value from Map 5)	
Pulse calculation value when both combination valves are closed	> Value from Map 3	P2442
Air flow amount when the left bank is closed (value from Map 5)	> Air flow amount when the right bank is closed (value from Map 4)	

Combination valve change over pressure diagnosis

Delilvery pipe pressure should vary when the LH combination valve turns open → closed. When the variation is small, determine that the LH combination valve is stuck closed.

Judge as NG when the following conditions are established. Judge as OK and clear the NG when the following conditions are not established.

Malfunction Criteria	Threshold Value	DTC
Pressure variation value when the LH combination valve is switched	< Value from Map 6	P2443

Delilvery pipe pressure should vary when the RH combination valve turns closed → open. When the variation is small, determine that the RH combination valve is stuck closed.

Judge as NG when the following conditions are established. Judge as OK and clear the NG when the following conditions are not established.

Malfunction Criteria	Threshold Value	DTC
Pressure variation value when the RH combination valve is switched	< Value from Map 7	P2441

Overflow diagnosis

Judge as secondary air system flow abnormality either if there is excessive secondary air flow amount with the RH combination valve closed, or if there is excessive secondary air flow amount with the LH combination valve closed.

Malfunction Criteria	Threshold Value	DTC
Air flow amount when the right bank is closed (value from Map 4) or Air flow amount when the left bank is closed (value from Map 5)	> Value from Map 8 > Value from Map 9	P0411
Voltage at PORL measurement – Voltage at POR measurement	≤ 4 V	
Voltage at PORL measurement – Voltage at POL measurement	≤ 4 V	

PORL: Both banks all closed pressure
PORL: Both banks all closed pressure
POL: Left bank all closed pressure

Map 3

Intake air (g (oz)/rev)	0.1 (0.004)	0.25 (0.009)	0.3 (0.011)	1 (0.04)
Threshold value (V)	12	12	4	4

Map 4

Secondary air pressure in the pipe when both comb. valve is closing kPa (mmHg, inHg) Secondary air pressure in the pipe when LH comb. valve is closing kPa (mmHg, inHg)	69.3 (520, 20.47)	74.7 (560, 22.06)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.7 (680, 26.79)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.7 (800, 31.51)	112.0 (840, 33.08)	117.3 (880, 34.64)	122.7 (920, 36.24)	128.0 (960, 37.80)	133.3 (1000, 39.37)	138.7 (1040, 40.96)	144.0 (1080, 42.53)	149.3 (1120, 44.09)
69.3 (520, 20.47)	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400	2400
74.7 (560, 22.06)	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400
80.0 (600, 23.63)	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400
85.3 (640, 25.19)	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400
90.7 (680, 26.79)	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200
96.0 (720, 28.35)	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000
101.3 (760, 29.92)	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800
106.7 (800, 31.51)	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600
112.0 (840, 33.08)	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400
117.3 (880, 34.64)	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200
122.7 (920, 36.24)	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000
128.0 (960, 37.80)	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800
133.3 (1000, 39.37)	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600
138.7 (1040, 40.96)	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400
144.0 (1080, 42.53)	–2400	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200
149.3 (1120, 44.09)	–2400	–2400	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0
																(L/min)

Map 5

Secondary air pressure in the pipe when both comb. valve is closing kPa (mmHg, inHg) Secondary air pressure in the pipe when RH comb. valve is closing kPa (mmHg, inHg)	69.3 (520, 20.47)	74.7 (560, 22.06)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.7 (680, 26.79)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.7 (800, 31.51)	112.0 (840, 33.08)	117.3 (880, 34.64)	122.7 (920, 36.24)	128.0 (960, 37.80)	133.3 (1000, 39.37)	138.7 (1040, 40.96)	144.0 (1080, 42.53)	149.3 (1120, 44.09)
69.3 (520, 20.47)	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400	2400
74.7 (560, 22.06)	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400
80.0 (600, 23.63)	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400
85.3 (640, 25.19)	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400
90.7 (680, 26.79)	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200
96.0 (720, 28.35)	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000
101.3 (760, 29.92)	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800
106.7 (800, 31.51)	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600
112.0 (840, 33.08)	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400
117.3 (880, 34.64)	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200
122.7 (920, 36.24)	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000
128.0 (960, 37.80)	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800
133.3 (1000, 39.37)	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600
138.7 (1040, 40.96)	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400
144.0 (1080, 42.53)	–2400	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200
149.3 (1120, 44.09)	–2400	–2400	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0
																(L/min)

Map 6

Amount of intake air when LH comb. valve switches (g (oz)/s) Battery voltage when LH comb. valve switches (V)	10 (0.35)	15 (0.53)	20 (0.71)	25 (0.88)	26 (0.92)
11	0.05	0.05	0.05	0.025	0
12	0.05	0.05	0.05	0.025	0
13	0.05	0.05	0.05	0.025	0
14	0.05	0.05	0.05	0.025	0
					(V)

Map 7

Amount of intake air when RH comb. valve switches (g (oz)/s) Battery voltage when RH comb. valve switches (V)	10 (0.35)	15 (0.53)	20 (0.71)	25 (0.88)	26 (0.92)
11	0.05	0.05	0.05	0.025	0
12	0.05	0.05	0.05	0.025	0
13	0.05	0.05	0.05	0.025	0
14	0.05	0.05	0.05	0.025	0
					(V)

Map 8

Amount of intake air when POR is measuring (g (oz)/s) Battery voltage when POR measuring (V)	2 (0.07)	25 (0.88)
11	345	345
12	345	345
13	345	345
14	390	390
15	420	420
		(L/min)

Map 9

Amount of intake air when POL is measuring (g (oz)/s) Battery voltage when POL measuring (V)	2 (0.07)	25 (0.88)
11	345	345
12	345	345
13	345	345
14	390	390
15	420	420
		(L/min)

Map 10

Amount of intake air (g (oz)/s) Engine speed (rpm)	0 (0)	60 (2.12)
500	0	0
5000	0	0

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

NOTE:
For diagnostic procedures, refer to DTC P0410. <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BE:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

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 if the continuous time of meeting the following conditions exceeds 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
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 if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

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 if the continuous time of meeting the following conditions exceeds 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
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 if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BG:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN

NOTE:
For diagnostic procedures, refer to DTC P0413. <Ref. to GD(H4DOTC)-125, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BH:DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED

NOTE:
For diagnostic procedures, refer to DTC P0414. <Ref. to GD(H4DOTC)-126, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BI: DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

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 if the continuous time of meeting the following conditions exceeds 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
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 if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

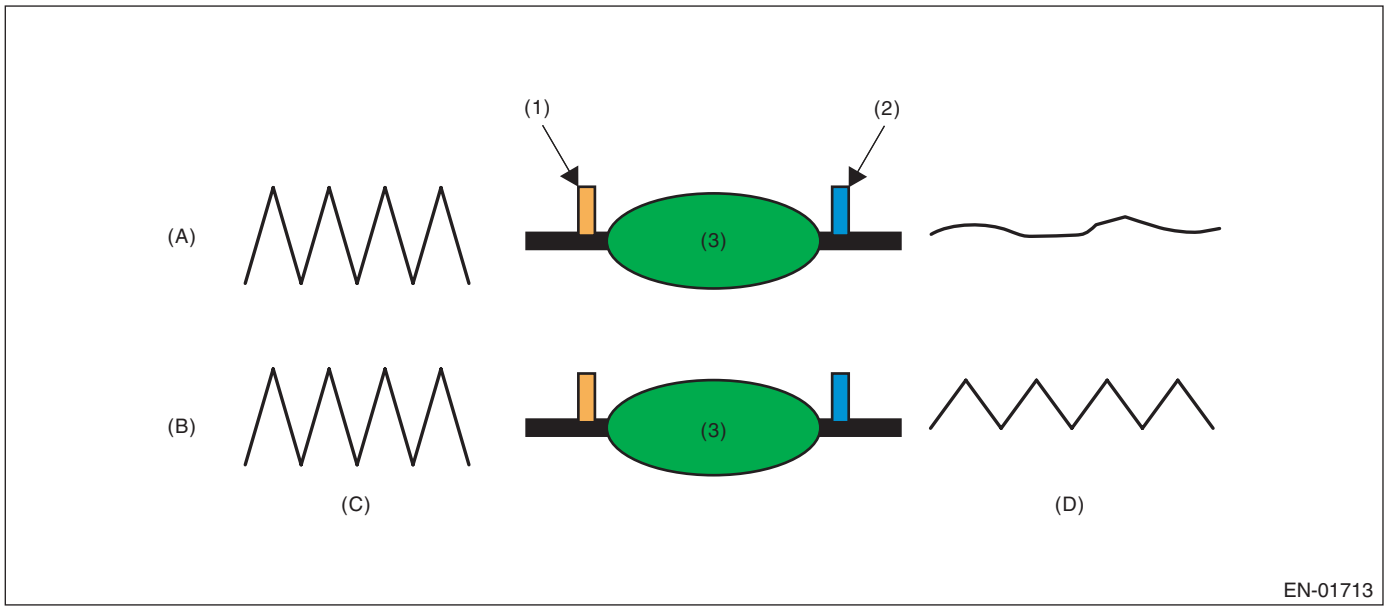
Memorize the freeze frame data. (For test mode $02)

BJ: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	≥ 5 seconds
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70°C (158°F)
Estimated catalyst temperature	≥ 520°C (968°F) (AT) ≥ 530°C (986°F) (MT)
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 600 mV or lower to 600 mV or higher	Experienced after fuel cut
After engine starting	≥ 230 seconds

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 oxygen (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 become the specified value or more. A/F response properties and diagnosis values are parameters for the judgment value.
Judge as NG if the criteria below are met. Judge as OK if the criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of rear oxygen sensor output voltage per 32 milliseconds divided by lambda accumulated variation of the front oxygen (A/F) sensor per 32 milliseconds	≥ 12

Time Needed for Diagnosis: 30 — 55 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

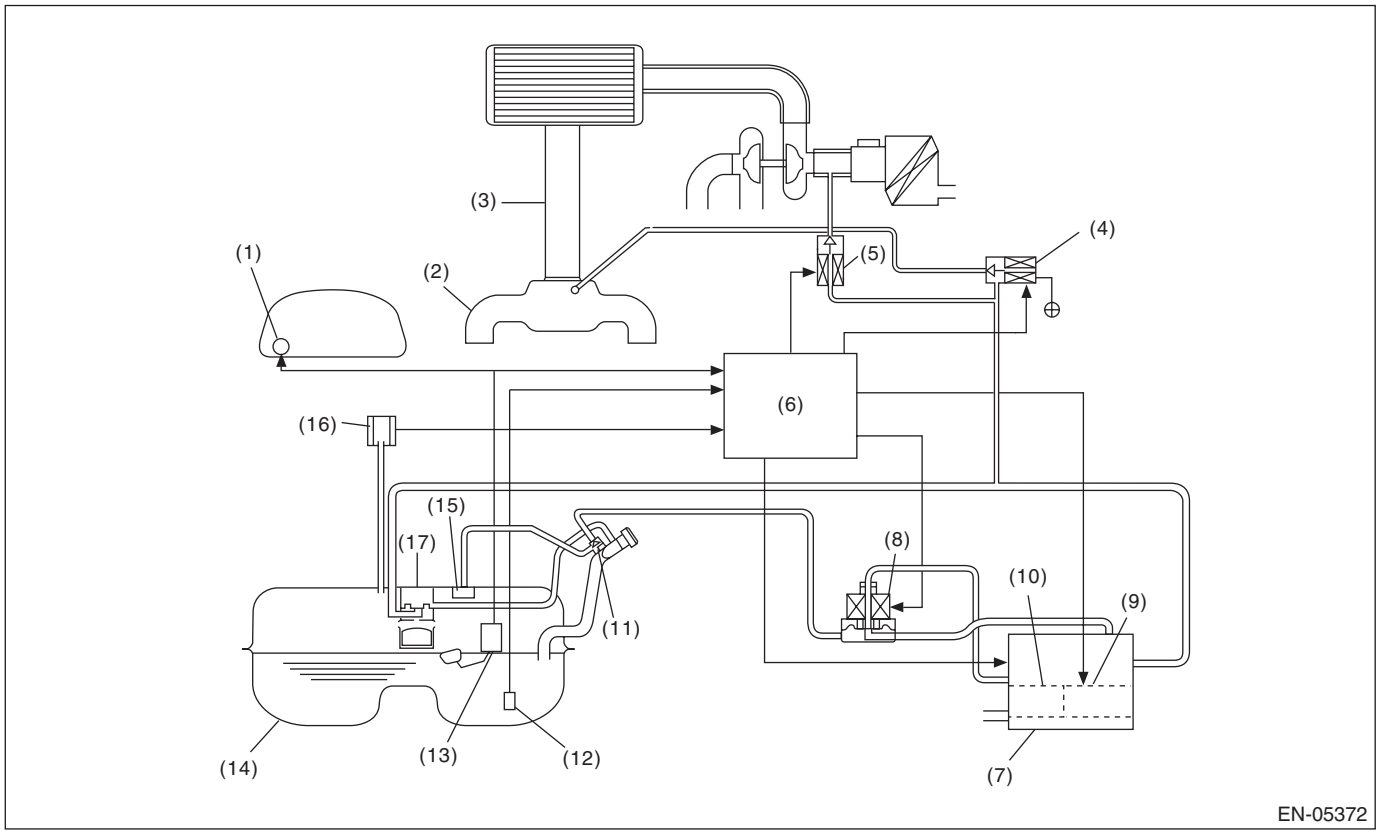
BK:DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW

NOTE:
For diagnostic procedures, refer to DTC P0442. <Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

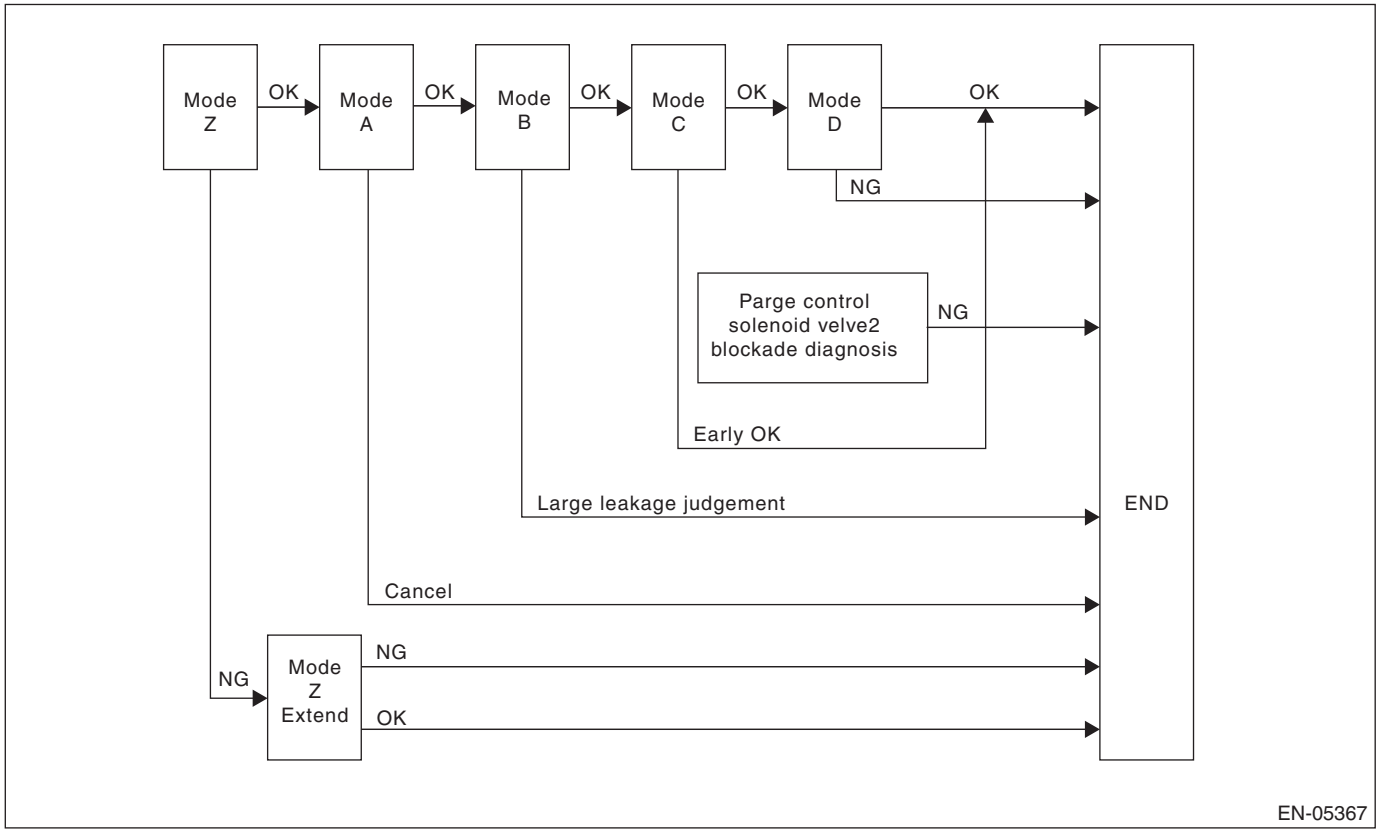
Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.



(1)	Fuel gauge	(7)	Canister	(13)	Fuel level sensor
(2)	Intake manifold	(8)	Pressure control solenoid valve	(14)	Fuel tank
(3)	Throttle body	(9)	Drain valve	(15)	Fuel cut valve
(4)	Purge control solenoid valve	(10)	Drain filter	(16)	Fuel tank pressure sensor
(5)	Purge control solenoid valve 2	(11)	Shut-off valve	(17)	Vent valve
(6)	Engine control module (ECM)	(12)	Fuel temperature 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 → mode D;
When in 0.02 inch diagnosis, perform in the order of mode A → mode B → mode C → mode D → mode E.

0.04-inch Diagnosis

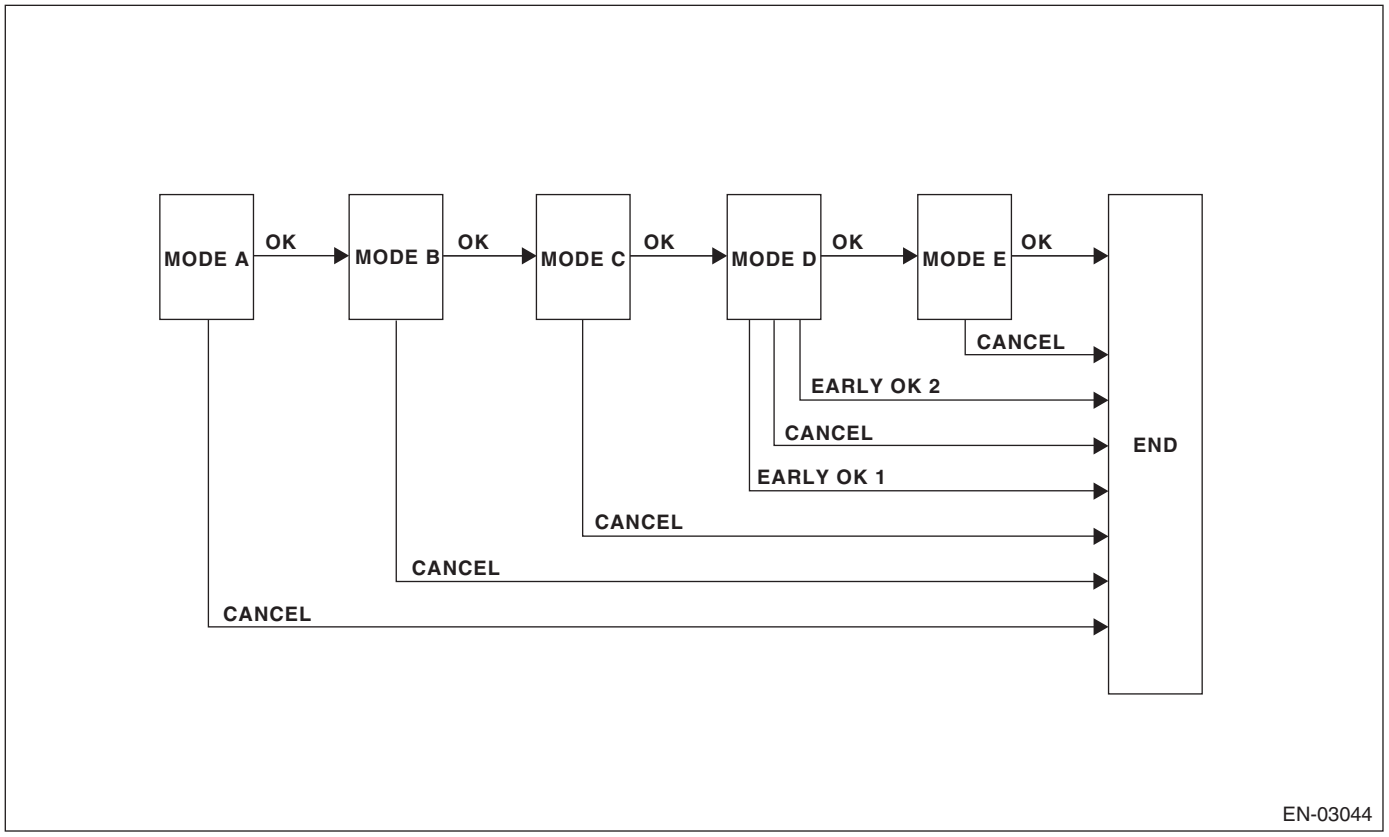


Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve opening failure diagnosis)	Perform purge control solenoid valve opening failure diagnosis from the size of tank pressure variation from diagnosis start.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank 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
Purge control solenoid valve 2 stuck close diagnosis	Perform purge control solenoid valve 2 stuck close diagnosis using the variation gap between the tank pressure at the end of mode C and after mode C.	3 seconds

Mode Table for Evaporative Emission Control System Diagnosis

Mode	When normal	Diagnostic item	DTC
Mode Z	Roughly same as barometric pressure (Same pressure as 0 kPa (0 mmHg, 0 inHg))	Purge control solenoid valve is judged to be open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leak	P0457
Mode C	Reaches target pressure	—	—
Mode D	Pressure change is small.	EVAP system large leak [1.0 mm (0.04 in)]	P0442

0.02-inch Diagnosis

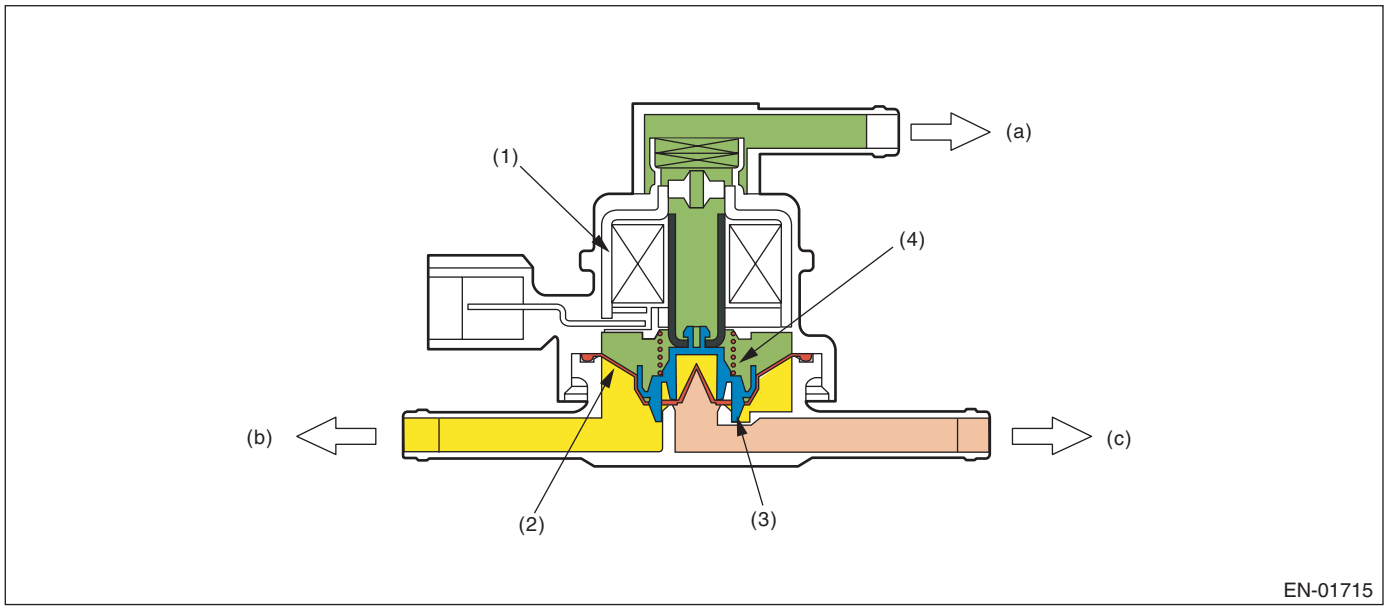


Mode	Mode Description	Diagnosis Period
Mode A (0 point compensation)	When pressure in tank is high, wait for 0 point (Near 0 kPa (0 mmHg, 0 inHg)) to return.	0 — 12 seconds
Mode B (Negative pressure introduced)	Decrease the pressure in the tank to the target value by introducing the intake hose pressure to the fuel tank.	0 — 27 seconds
Mode C (Negative pressure maintained)	Wait until the tank pressure returns to the target (start level of P2 calculation).	0 — 20 seconds
Mode D (Negative pressure change calculated)	Calculate the time it takes for the tank pressure to return to the P2 calculation complete pressure. If the tank pressure does not return to the P2 calculation complete pressure, make advanced OK judgment.	0 — 200 seconds
Mode E (Evaporation generated amount calculation)	Calculate the amount of evaporation (P1).	0 — 280 seconds

2. COMPONENT DESCRIPTION

• Pressure control solenoid valve

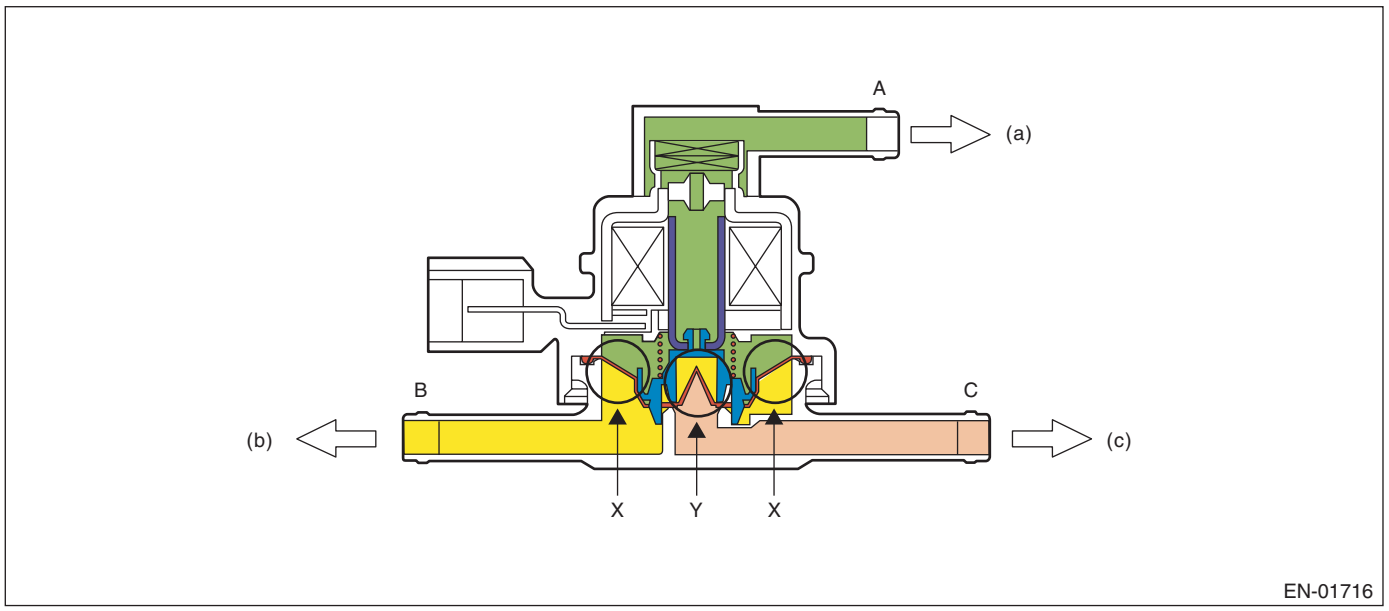
PCV controls the fuel tank pressure to be equal to the atmospheric air pressure. Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



(1) Solenoid
(2) Diaphragm
(3) Valve
(4) Spring
(a) Barometric pressure
(b) Fuel tank
(c) Canister

- **Valve Operation and Air Flow**

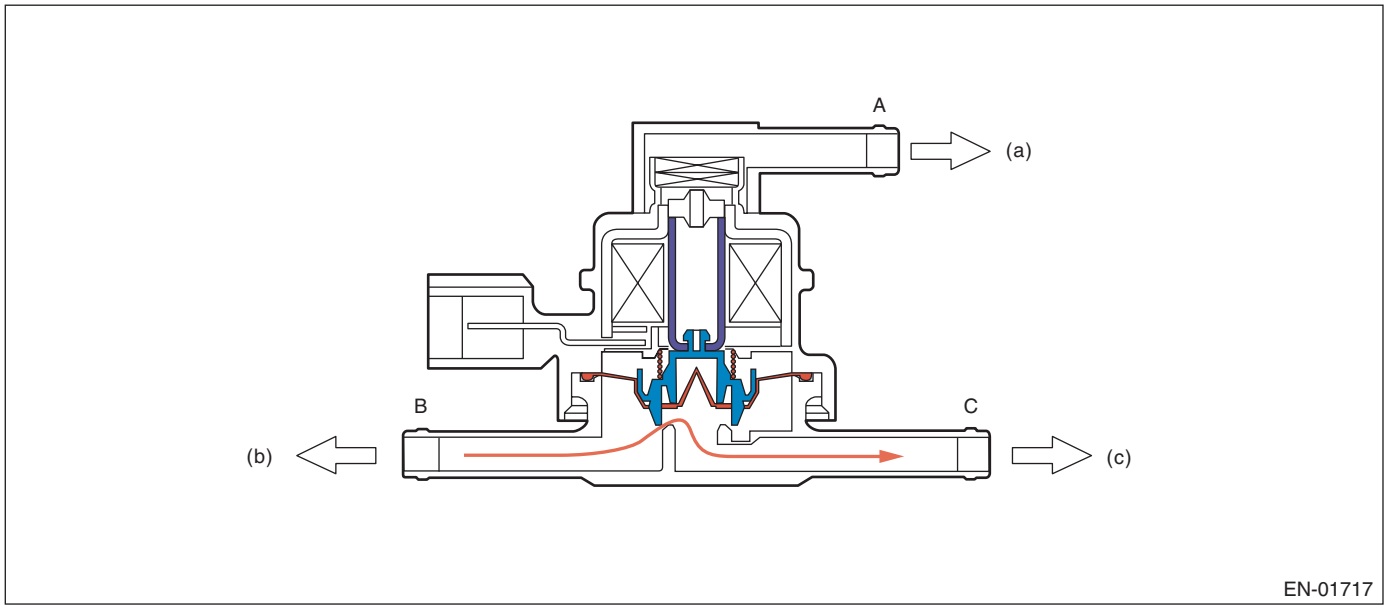
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port 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) Barometric pressure (b) Fuel tank (c) Canister

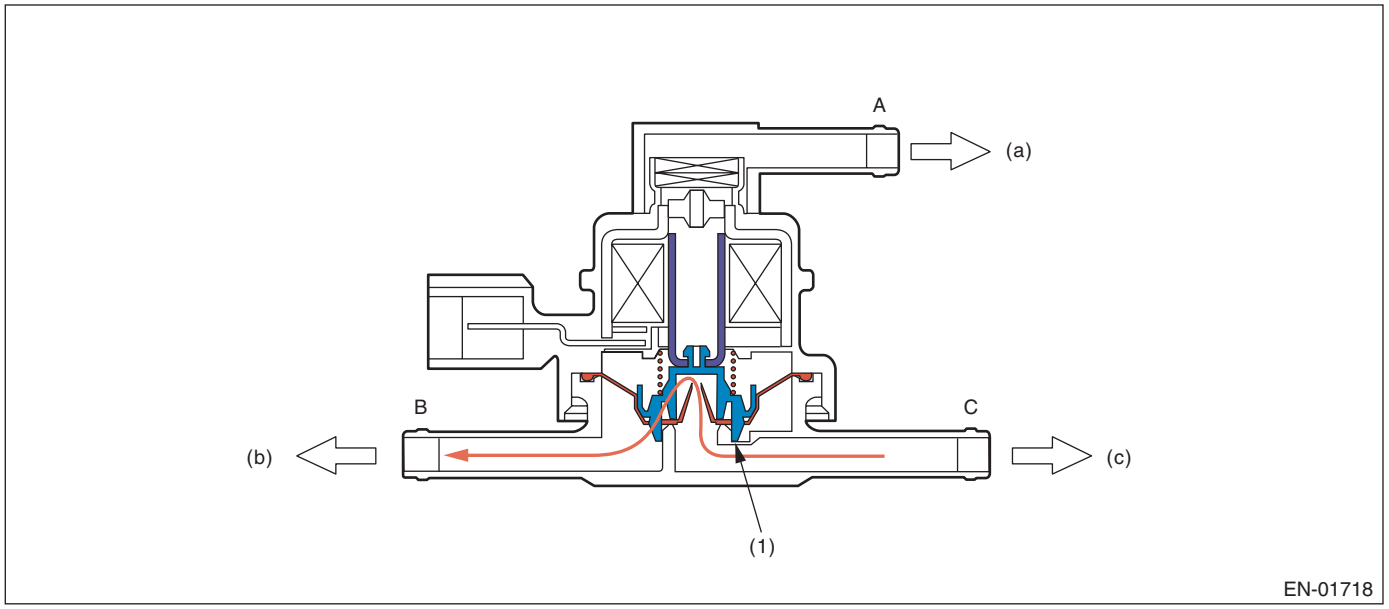
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ←→ C

When A < B (solenoid OFF)



(a) Barometric pressure (b) Fuel tank (c) Canister

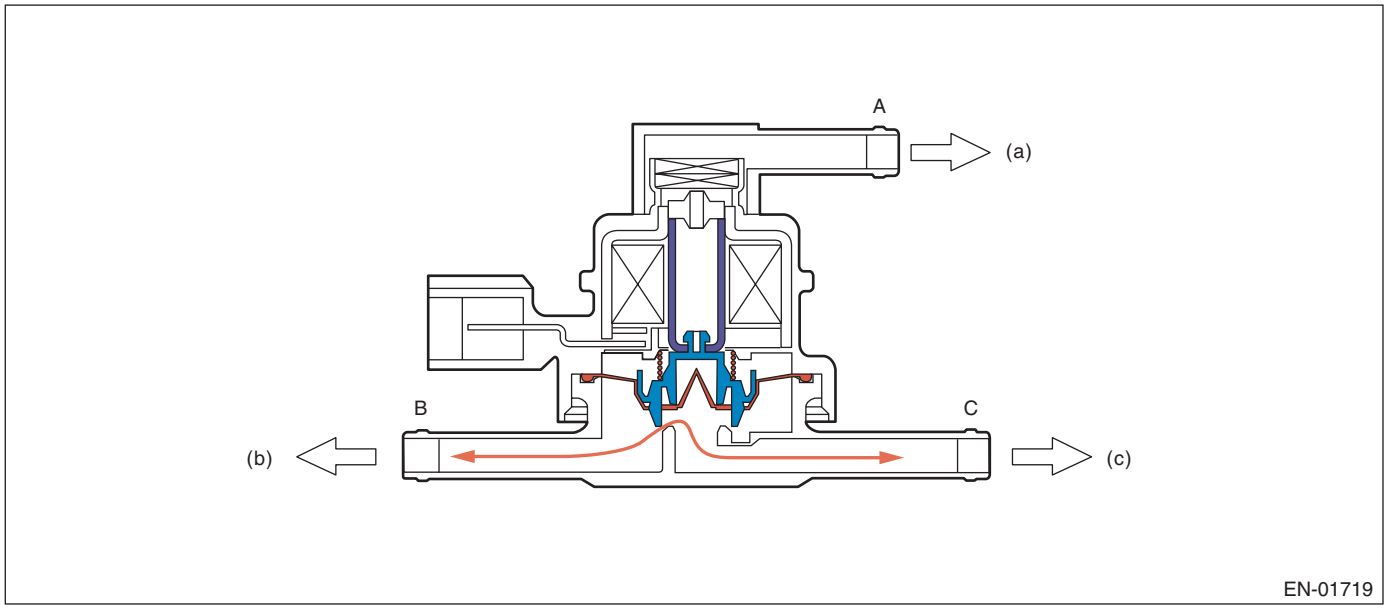
When B < C (solenoid OFF)



(1) Valve

(a) Barometric pressure
(b) Fuel tank
(c) Canister

When Solenoid is ON



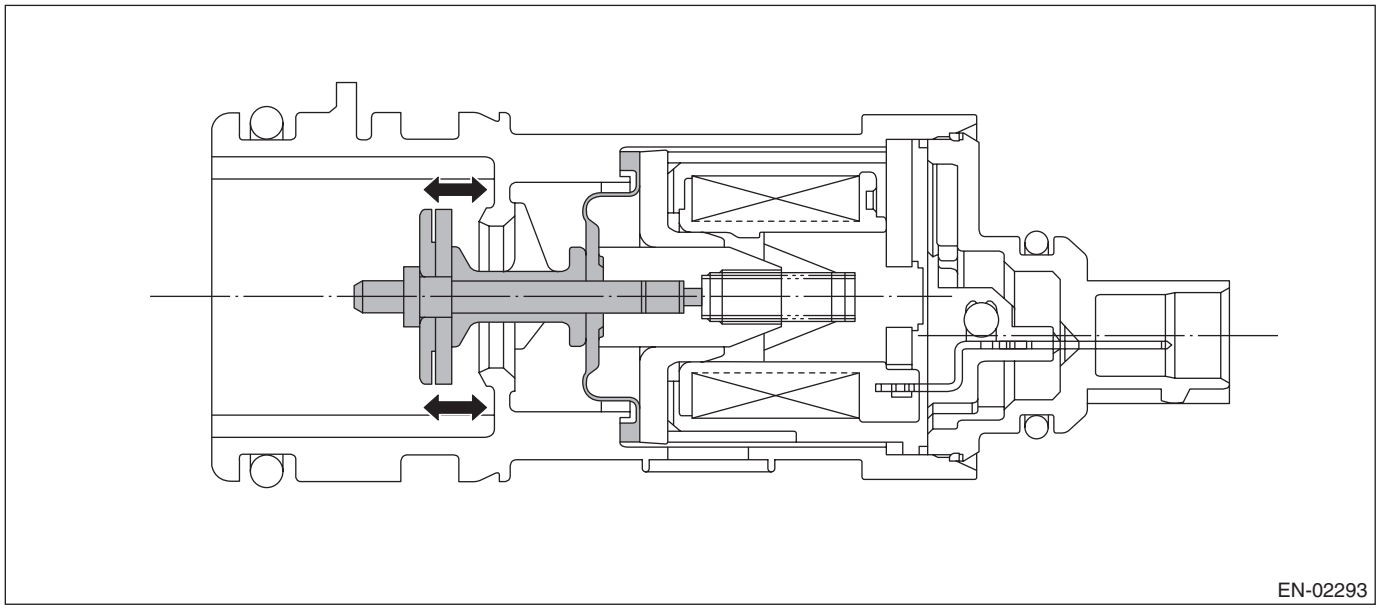
(a) Barometric pressure

(b) Fuel tank

(c) Canister

- **Drain valve**

Drain valve controls the ambient air to be introduced to the canister.



3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	120 seconds or more
After engine starting	335 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	< 0.23 kPa (1.73 mmHg, 0.07 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	< 2 ℓ (2.1 US qt, 1.8 Imp qt)/128 milliseconds
Air fuel ratio	0.76 — 1.25

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
Evap. diagnosis	Incomplete
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Time since last incomplete diagnosis of 0.02-inch leakage	> 120 seconds (Canceled with mode A) > 600 seconds (Canceled with other modes)
Total time of canister purge operation	120 seconds or more
After engine starting	120 seconds or more
Fuel temperature	–10 ←→ 55°C (14 ←→ 131°F)
Fuel level	9.6 ←→ 54.4 ℓ (2.54 ←→ 14.37 US gal, 2.11 ←→ 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	≥ 50 km/h (31 MPH) continues for 125 seconds
Closed air/fuel ratio control	In operation
Engine speed	1050 — 6000 rpm
(During diagnosis)	
Change of fuel level	≤ 5 ℓ (1.3 US gal, 1.1 Imp gal/128 m/s)
Barometric pressure change (Mode D)	–0.47 ←→ 0.32 kPa (–3.5 ←→ 2.4 mmHg, –0.14 ←→ 0.09 inHg)
Barometric pressure change (Mode E)	–0.32 ←→ 0.32 kPa (–2.4 ←→ 2.4 mmHg, –0.09 ←→ 0.09 inHg)
Pressure change every one second	< 0.06 kPa (0.44 mmHg, 0.02 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 0.07 kPa (0.51 mmHg, 0.02 inHg)
|Pressure change in tank every second|	< 0.1 kPa (0.75 mmHg, 0.53 inHg)

4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis
Perform the diagnosis only once 335 seconds or more after starting the engine, at a constant speed of 32 km/h (20 MPH) or more.
Pay attention to the fuel temperature and fuel level.
0.02-inch Diagnosis
Perform the diagnosis 120 seconds or more after starting the engine, at a constant vehicle speed of 50 km/h (31 MPH) or faster, to judge as NG or OK.
If OK/NG judgment is not possible, repeat the diagnosis.
Pay attention to the fuel temperature and fuel level.

5. DIAGNOSTIC METHOD

0.04-inch Diagnosis

Mode Z: (Purge control solenoid valve opening failure diagnosis)

When performing the leakage diagnosis of the EVAP system, the purge control solenoid valve must operate properly. Therefore, mode Z is used to diagnose a stuck open condition of the purge control solenoid valve by monitoring the tank pressure.

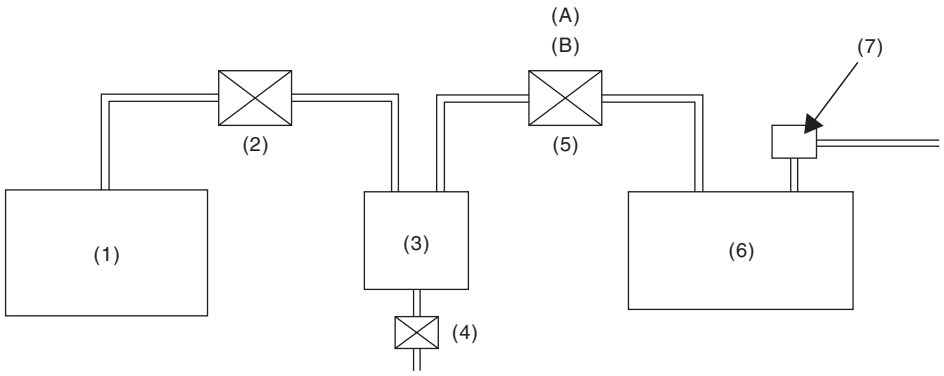
Note that if a purge control solenoid valve stuck open fault is detected, the EVAP system leakage diagnosis is cancelled.

- **Purge Control Solenoid Valve Stuck Open Diagnosis**

DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purge control solenoid valve stuck open diagnosis is performed in mode Z as shown in the figure below.



(1)	Engine	(4)	Drain valve	(6)	Fuel tank
(2)	Purge control solenoid valve	(5)	Pressure control solenoid valve	(7)	Fuel tank pressure sensor
(3)	Canister				
(A)	Normal condition: mechanical control	(B)	During diagnosis: electronic throttle control		

- **Purge Control Solenoid Valve Function Diagnosis**

DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purge control solenoid valve functional diagnosis is performed by monitoring the tank pressure in mode Z.

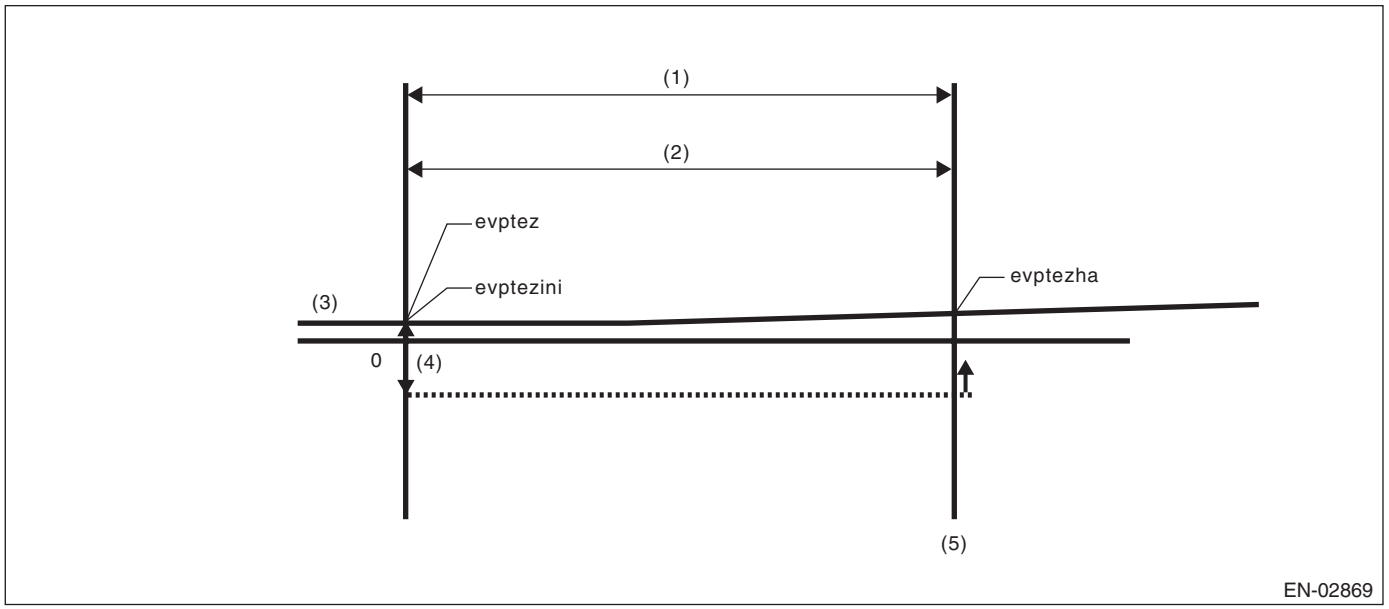
Normality Judgment

Make OK judgment 3 seconds after Mode Z starts, and change to Mode A if OK.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3 mmHg, 0.12 inHg)	P0457

- **Normal**



(1) Mode Z
(2) 3 seconds
(3) Fuel tank pressure
(4) 0.4 kPa (3.0 mmHg, 0.12 inHg)
(5) OK judgment

- evptez – evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)

Normal when above is established

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and Judge as NG when the malfunction criteria below are met.

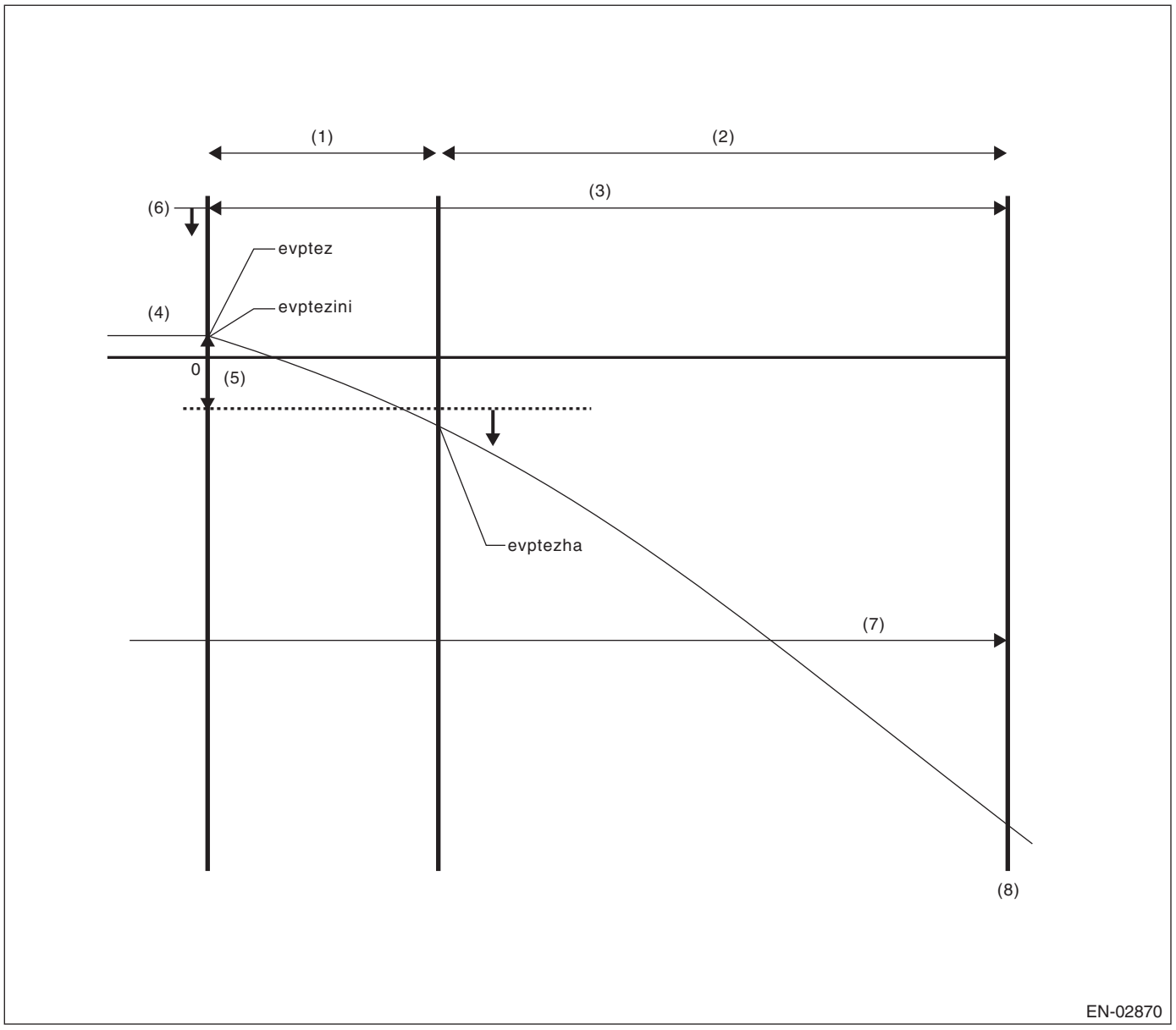
Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)	
Time of 2 ℓ or more fuel no sloshing	≥ 40 seconds	

Time Needed for Diagnosis: 16 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

When judgment for purge control solenoid valve stuck open NG is made, end the evaporative diagnosis. Cancel the evaporative diagnosis when the OK/NG judgment for drain valve stuck closed and purge control solenoid valve stuck open cannot be made in Mode Z.



(1)	Mode Z	(4)	Fuel tank pressure	(7)	40 seconds no fuel sloshing
(2)	Extended mode Z	(5)	0.6 kPa (4.5 mmHg, 0.18 inHg)	(8)	NG judgment
(3)	16 seconds	(6)	1.43 kPa (10.7 mmHg, 0.42 inHg)		

- evptezini, evptez ≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)
- evptez – evptezha ≤ 0.6 kPa (4.5 mmHg, 0.18 inHg)
- No fuel sloshing of over 2 ℓ (0.79 US gal, 0.67 Imp gal) lasts for more than 40 seconds.

Judge as normal when all are established.

- **Leak Diagnosis**

DTC

P0441 Purge control solenoid valve 2 close diagnosis
P0442 Evaporative Emission Control System Leak Detected (Small Leak)
P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

• DIAGNOSTIC METHOD

The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to barometric pressure.

Mode A: (Estimated evaporation gas amount)

Calculate the tank pressure change amount (P1) when using mode A. After calculating P1, switch to mode B.

Mode B: (Negative pressure sealed)

Introduce negative pressure in the intake manifold to the tank.

Approx. 0 → –1.4 (0 → –10.5, 0 → –0.41) kPa (mmHg, inHg)

When the pressure above (desired negative pressure) is reached, enters Mode C.

In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage (10 seconds or 35 seconds) in the system.

Abnormality Judgment

Judge as NG (large leak) when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Time to reach target negative pressure	≥ 35 seconds	P0457
Or mode B time	≥ 10 seconds	
(Min. pressure value in tank when in mode B) – (Tank pressure when mode B started)	< –0.3 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 perform purge control solenoid valve 2 close diagnosis when it does not return after the specified time passed.

Tank pressure when starting calculation of P2	Time for advanced OK judgment
–1.3 kPa (–9.75 mmHg, –0.38 inHg)	17 seconds

Purge control solenoid valve 2 stuck close diagnosis

Perform purge control solenoid valve 2 stuck close diagnosis using the variation gap between the tank pressure at the end of mode C and after mode C.

Malfunction Criteria	Threshold Value	DTC
Tank pressure variation after the end of mode C	= 3 seconds < 0.11 kPa (0.86 mmHg, 0.03 inHg)	P0441

Mode D: (Measure amount of negative pressure change)

Monitor the tank pressure change amount when using mode D. In this case, the tank pressure increases, (nears barometric pressure) because evaporation occurs. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform a small leak diagnosis according to the items below.

When Mode D is ended
Assign tank variations measured in Mode A and Mode D, P1 and P2, to the formula below, judge small leaks in the system. If the measured judgment value exceeds the threshold value, it is judged to be a malfunction. Judge as NG when the criteria below are completed and Judge as OK when not completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Tank pressure that changes every 10 seconds in mode D P1: Tank pressure that changes every 10 seconds in mode A	> Value from Map 7 * Threshold value: Figure (Remaining Fuel vs Tank temperature)	P0442

* 1.5: Evaporation amount compensation value when below negative pressure(Amount of evaporation occurrence increases as a vacuum condition increases.)

Map 7 Failure Diagnosis Reference Limit for 0.04 in Leaks for Evaporation Diagnosis

Fuel temperature & fuel level	25°C (77°F)	30°C (86°F)	35°C (95°F)	40°C (104°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.28 kPa (2.1 mmHg, 0.083 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)	0.31 kPa (2.3 mmHg, 0.090 inHg)	0.31 kPa (2.35 mmHg, 0.092 inHg)	0.32 kPa (2.4 mmHg, 0.094 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.31 kPa (2.3 mmHg, 0.090 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 — 100 seconds
0.02-inch Diagnosis
DTC
P0456 Evaporative Emission Control System Leak Detected (very small leak)

DIAGNOSTIC METHOD

The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to barometric pressure.
Mode A: (0 point compensation)
When pressure in tank is high, wait for 0 point 0 kPa (Near 0 mmHg, 0 inHg) to return. Shift to mode B when 0 point returns.
Cancel the diagnosis when 0 point does not return in the specified time.
Mode B: (Negative pressure introduced)
Introduce negative pressure in the intake manifold to the tank.
Approx. 0 → –2.0 kPa (0 mmHg → –15 mmHg, 0 → –0.59 inHg)
When the pressure above (desired negative pressure) is reached, Mode C is entered.
Cancel the diagnosis when the targeted pressure in the tank is not reached.

Mode C: (Negative pressure maintained)
Stop the introduction of negative pressure and wait until the tank pressure returns to the start level of P2 calculation.
Change to Mode D either when the tank pressure returns to the start level of P2 calculation, or when the predetermined amount of time has passed.
Mode D: (Calculate the amount of negative pressure change)
Monitor the tank pressure in mode D, calculate (P2) the pressure change in the tank, and measure the time (evpdset) for the tank pressure to return when calculation of P2 is completed. Shift to mode E when pressure returns. Make an advance OK judgment using the value of P2, or cancel, when the pressure in the tank does not return after calculation of P2 is completed even when the predetermined amount of time has passed.
When the following conditions are established, judged as OK.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Advanced OK judgment 1		P0456
When in Mode D	≥ 20 seconds	
Fuel tank pressure	≤ –1.80 — –1.85 kPa (–13.5 — –13.9 mmHg, –0.53 — –0.55 inHg)	
Advanced OK judgment 2		
When in Mode D	≥ 200 s	
P2	≥ 0.9 — 1.3 kPa (7 — 9.6 mmHg, 0.28 — 0.38 inHg)	

Mode E: (Evaporation occurrence amount calculation)
Calculate the change of tank pressure with the time evpdset to judge as NG/OK according to the value of P1. (ambiguous determination acceptable).
Abnormality Judgment
If the following conditions are met, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P1	<Value 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 — 516 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

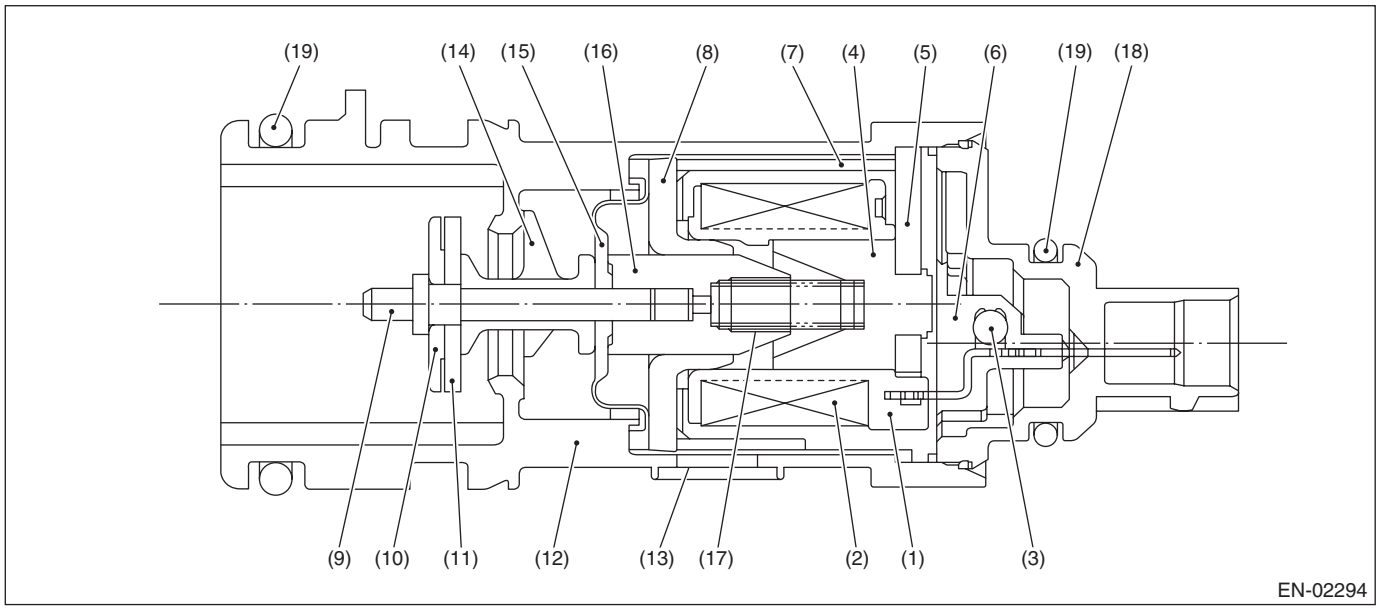
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.
Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 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
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

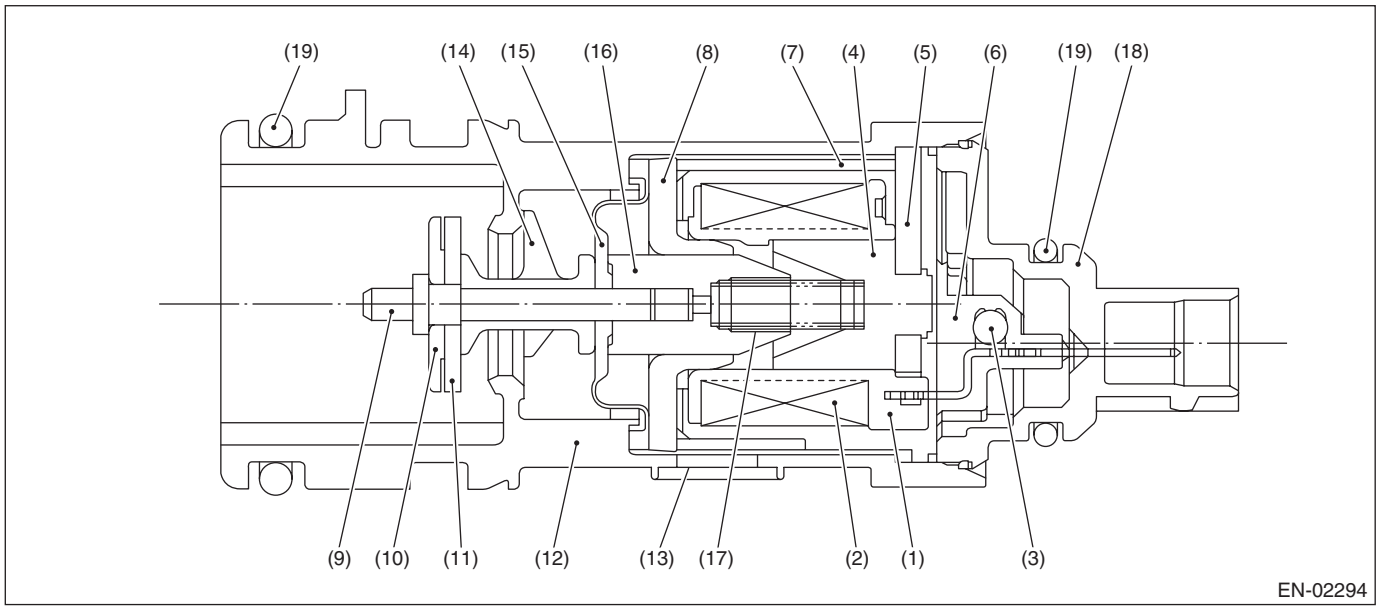
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.
Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

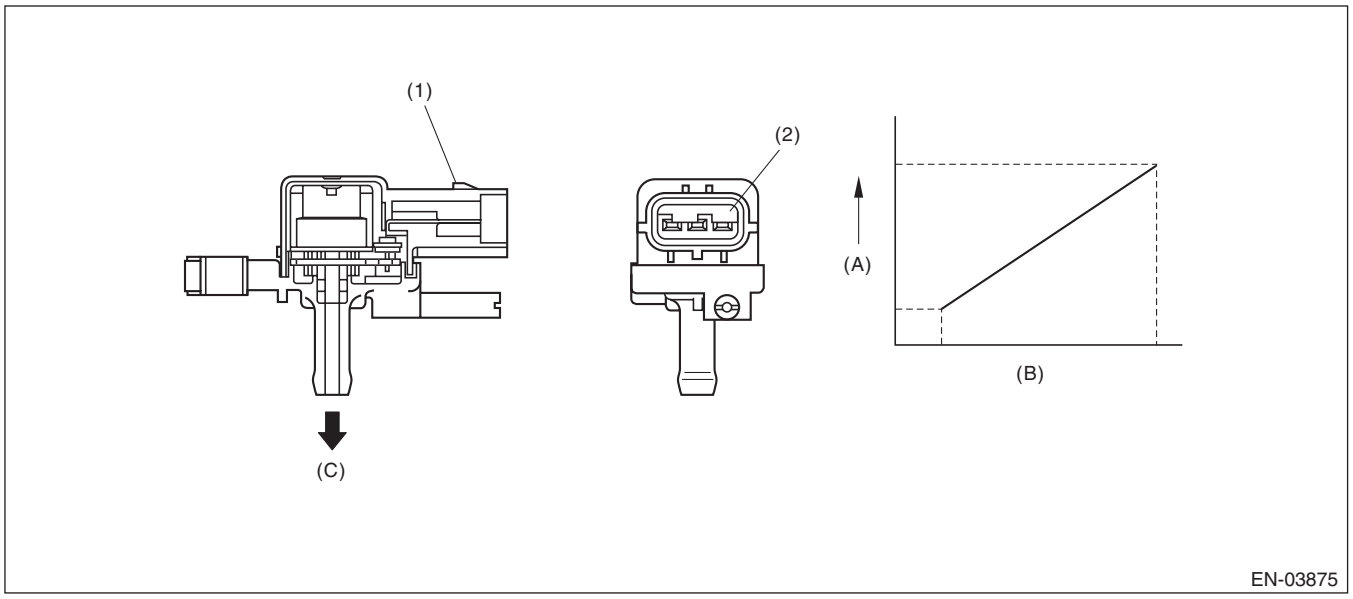
Memorize the freeze frame data. (For test mode $02)

BO:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

1. OUTLINE OF DIAGNOSIS

Detect fuel tank pressure sensor output property abnormality.
Judge as NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminals
(A) Output voltage
(B) Input voltage
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	60 seconds or more
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Fuel temperature	< 35°C (95°F)
Battery voltage	≥ 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
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 if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Number of times the difference between the Max. fuel level and the Min. fuel level every 60 seconds is 2 ℓ (0.53 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 5 ℓ or more, 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixed mode is prohibited.

9. ECM OPERATION AT DTC SETTING

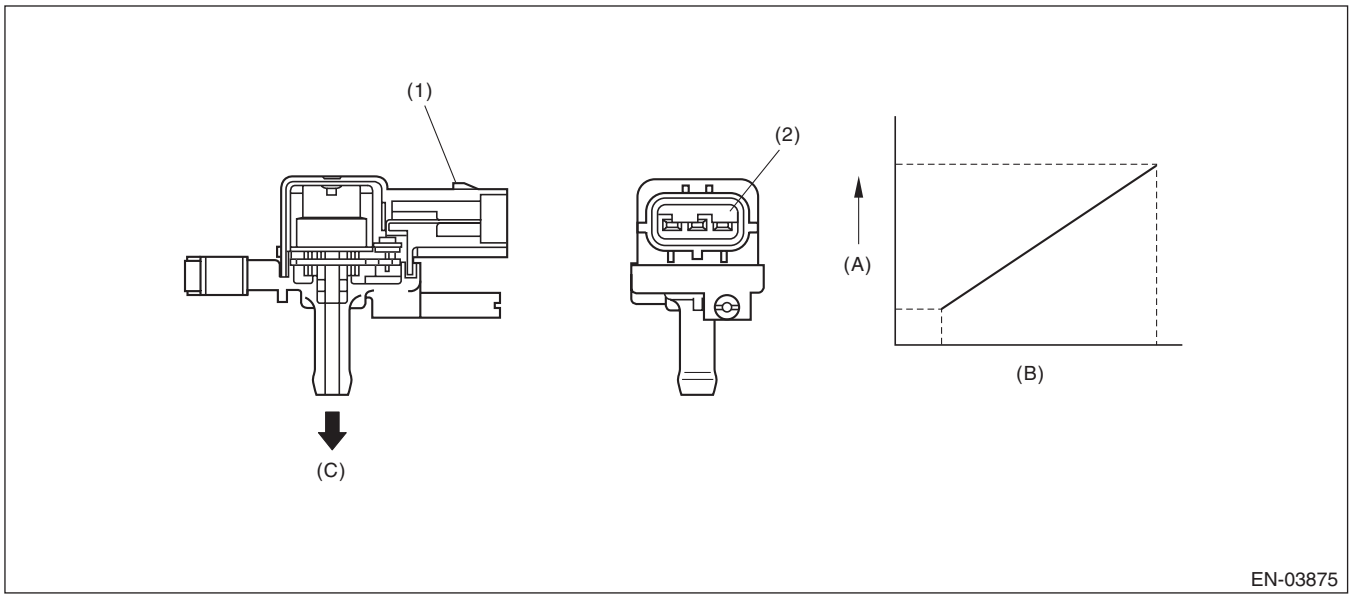
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminals
(A) Output voltage
(B) Input voltage
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
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 meeting 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 if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 7.45 kPa (55.86 mmHg, 2.20 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixed mode is prohibited.

9. ECM OPERATION AT DTC SETTING

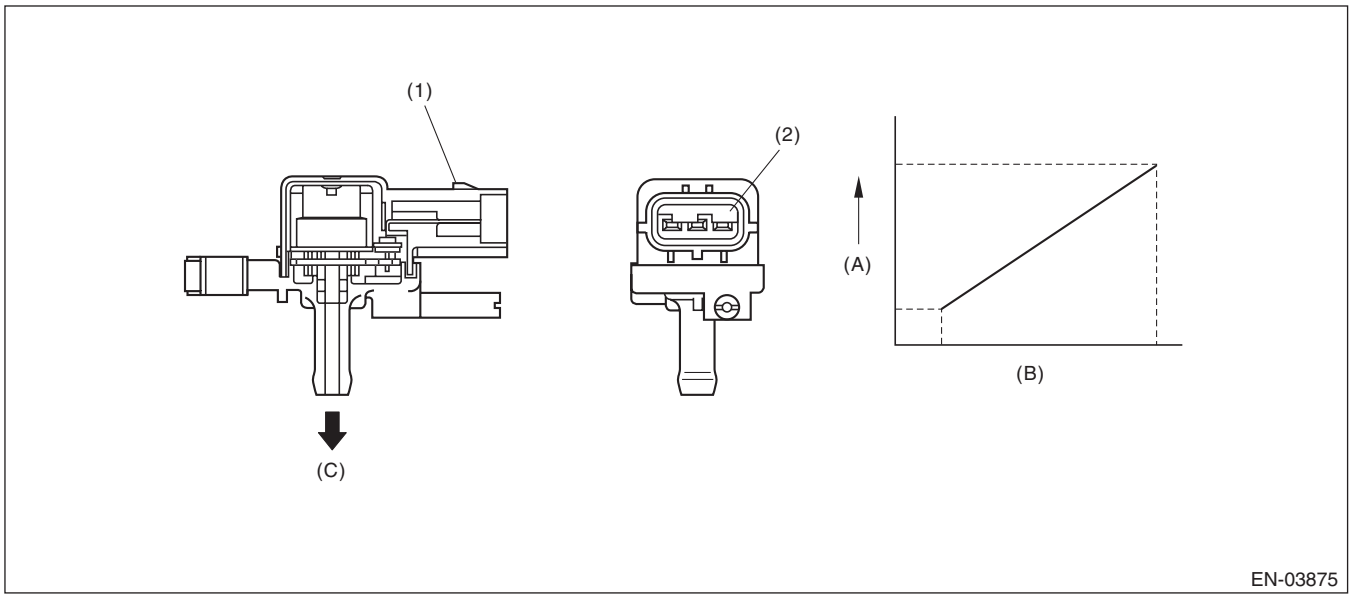
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminals
(A) Output voltage
(B) Input voltage
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Completed
Learning value of evaporation gas 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 meeting the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	< 35°C (95°F)
Barometric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 7.98 kPa (59.85 mmHg, 2.36 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixed mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BR: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)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

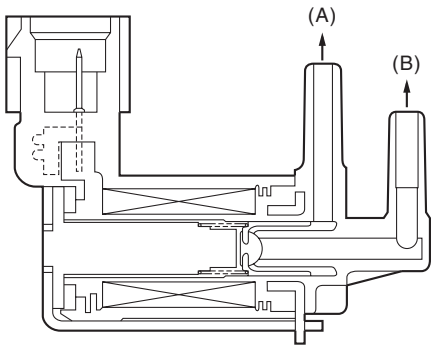
For the detection standard, refer to DTC P0442 Evaporative system (Small leak).
<Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.
Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-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 if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 seconds
Duty ratio of “ON”	< 75%
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

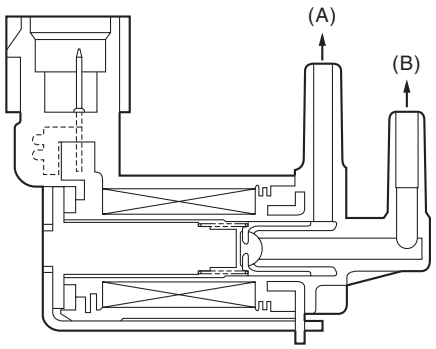
Memorize the freeze frame data. (For test mode $02)

BU: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 if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 seconds
Duty ratio of “ON”	≥ 25%
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

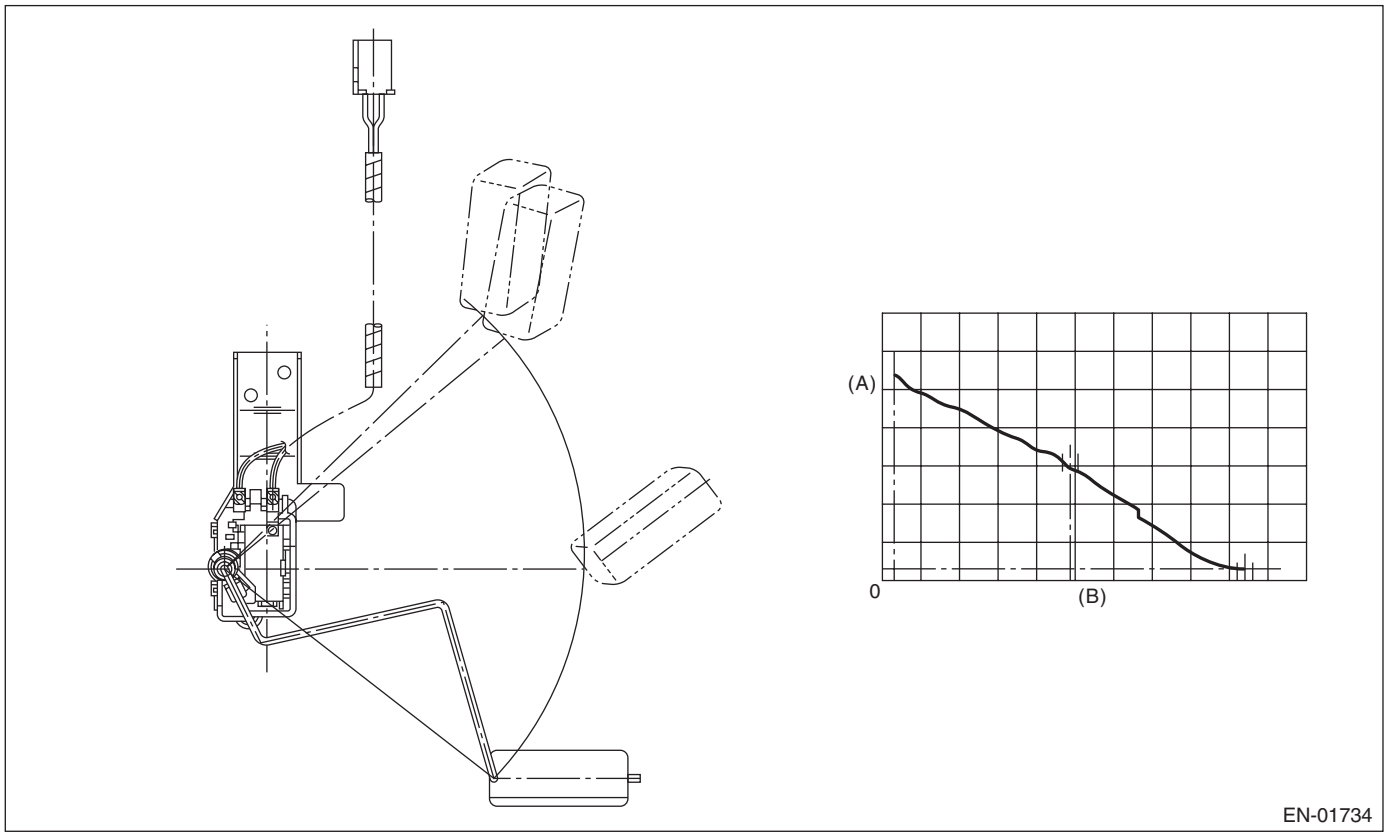
Memorize the freeze frame data. (For test mode $02)

BV: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 if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – min. values of fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	5 seconds or more

Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – min. values of fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	5 seconds or more

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

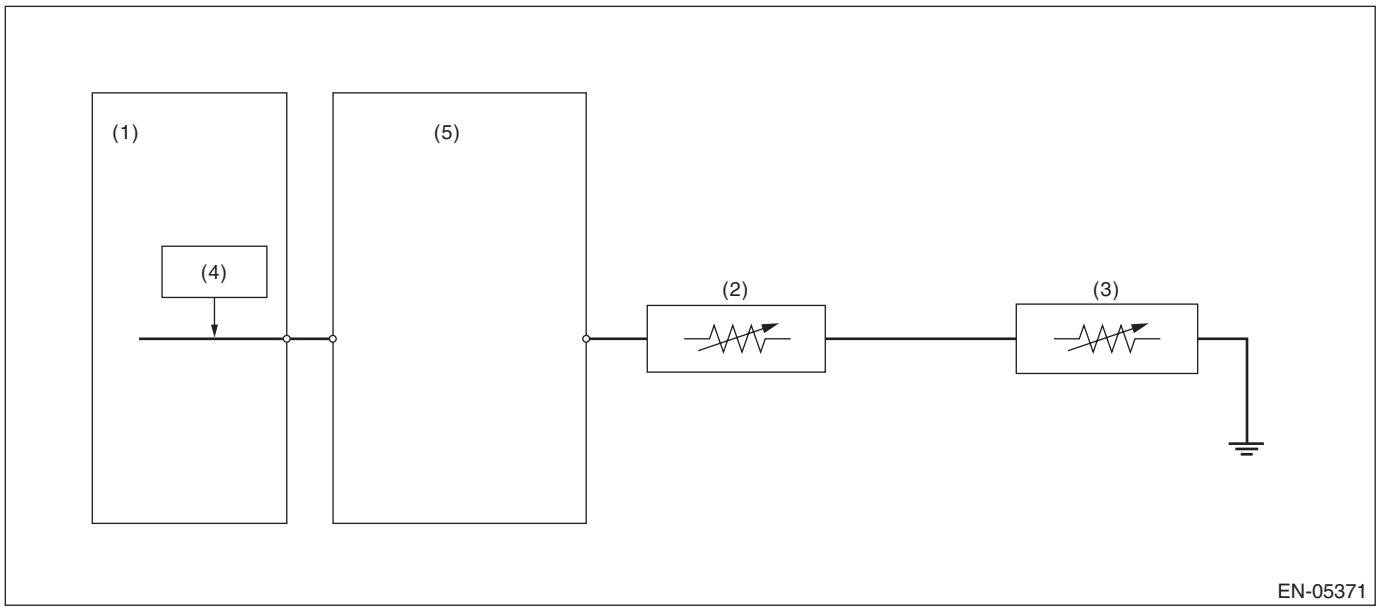
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit
(5) Body integrated unit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below is the time needed for diagnosis (2.5 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 0.173 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 0.173 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

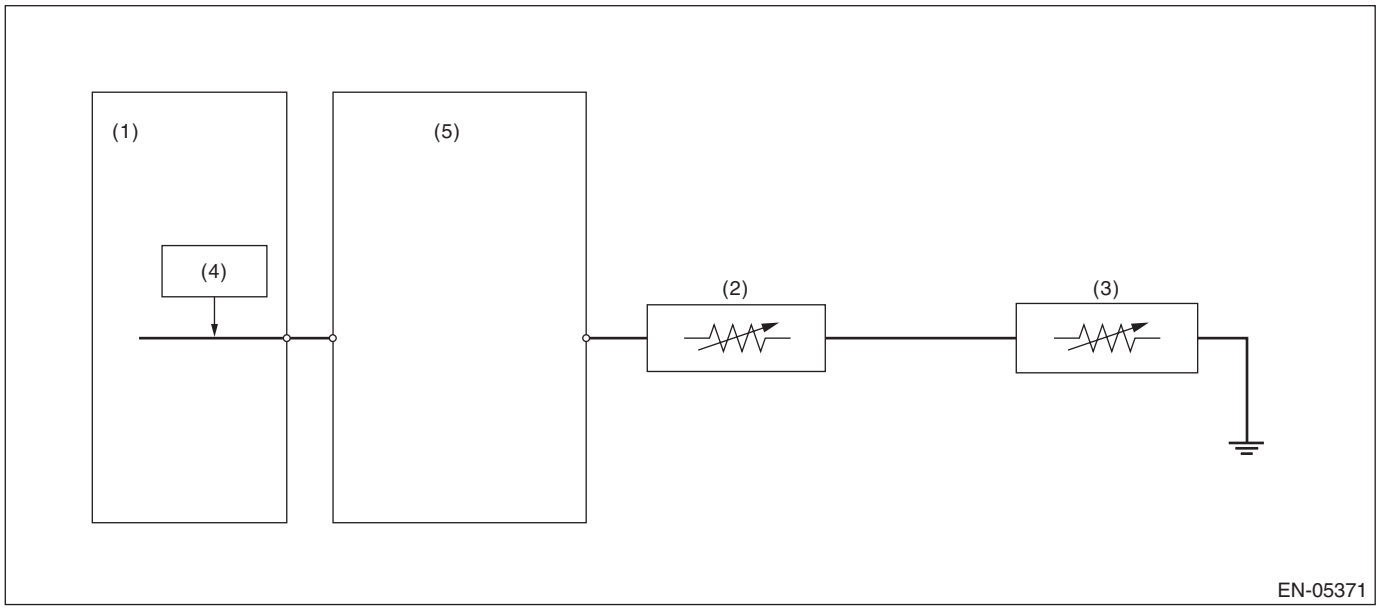
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit
(5) Body integrated unit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BY:DTC 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

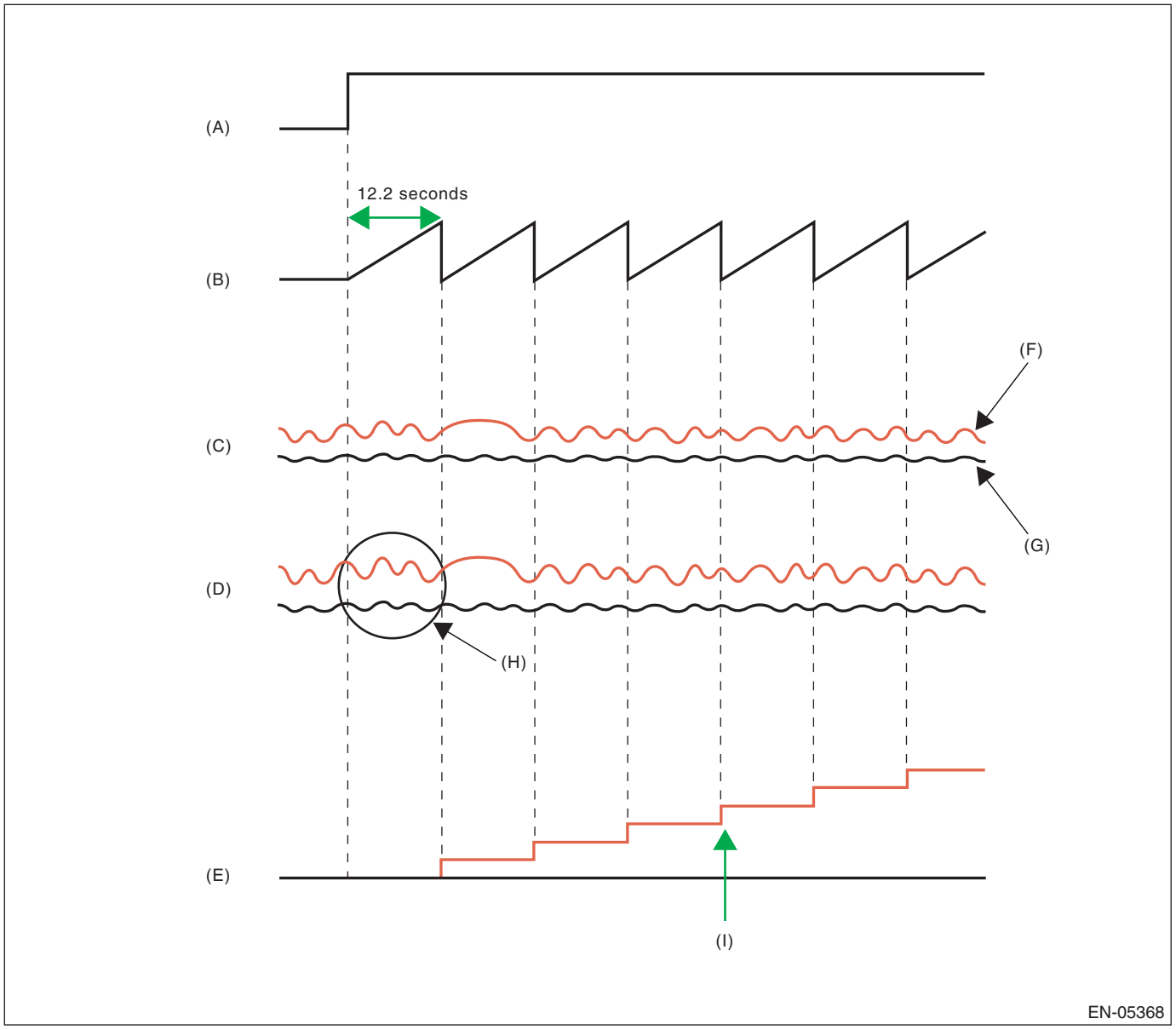
Malfunction Criteria	Threshold Value
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9.6 ←→ 54.4 ℓ (2.54 ←→ 14.37 US gal, 2.11 ←→ 11.97 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

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) Malfunction
(G) Normal
(H) Calculate the Max. value (delvfmx) and the cumulative value (sumvfl)
(I) NG at 4 counts

• **Abnormality Judgment**

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX ≥ 0.27 — 0.894 V or SUMFL ≥ 25.92 V At this time DELFLMAX is Max. deviation of sensor output during 12.2 seconds SUMFL: Integrated value of sensor output deviation in 12.2 seconds	≥ 4 times

The diagnosis counter does not count up when the following conditions are completed within 12.2 seconds.

Maximum value – minimum value of change of tank pressure during 12.2 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Maximum value – minimum value of battery voltage during 12.2 seconds	≥ 0.27 V

Time Needed for Diagnosis: 12.2 seconds × 4 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX	< 0.27 — 0.894 V
SUMFL	< 25.92 V
At this time DELFLMAX is Max. deviation of sensor output during 12.2 seconds SUMFL: Integrated value of sensor output deviation in 12.2 seconds	

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BZ: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	550 — 950 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 meeting the malfunction criteria below becomes 5 minutes or more.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 95°C (203°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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CA: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 unit indicates the erroneous vehicle speed, and when the displayed vehicle speed data is out of the normal range.

2. COMPONENT DESCRIPTION

Vehicle speed signals are taken in to the ABS control module and hydraulic control unit, and normal/erroneous data of the ABS wheel speed sensor is received by CAN communication from the ABS control module and hydraulic control unit.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after engine starting	≥ 2 seconds

4. GENERAL DRIVING CYCLE

Always perform diagnosis more than 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 512 milliseconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Front ABS wheel speed sensor status	Malfunction
Either of the following is established	
Front left wheel speed	≥ 300 km/h (186 MPH)
Front right wheel speed	≥ 300 km/h (186 MPH)

Time Needed for Diagnosis: 512 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when all of the following criteria are established.

Judgment Value

Malfunction Criteria	Threshold Value
Front left wheel speed	> 0 km/h (0 MPH) or < 300 km/h (186 MPH)
Front right wheel speed	> 0 km/h (0 MPH) or < 300 km/h (186 MPH)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Accelerator sensor signal process: Not allowed full closed point learning (hold the previous value)
- ABS wheel speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4400 rpm or more).
- ISC control: Open loop compensation is set to (1 g (0.04 oz) oz/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Both main and sub fan ON drive
- Gear ratio judgment: Gear = Control as fixed in sixth gear
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CB: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	≥ 70°C (158°F)
Battery voltage	≥ 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback of ISC	In operation
Lambda value	0.9 ←→ 1.1
After switching air conditioner to ON/OFF	5 seconds or more
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5 seconds
After neutral switch ON/OFF change	> 5.1 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling after warming up engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criterion below is 10 seconds × 3 times.

Judgment Value

Malfunction Criteria	Threshold Value
Actual - target engine speed	< –100 rpm
Feedback value for ISC	Max.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Actual - target engine speed	≥ –100 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CC: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	≥ 70°C (158°F)
Battery voltage	≥ 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback of ISC	In operation
Lambda value	0.9 ←→ 1.1
After switching air conditioner to ON/OFF	5 seconds or more
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5 seconds
After neutral switch ON/OFF change	> 5 seconds
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 meeting the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CD: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 meeting the malfunction criteria below becomes 3 minutes or more.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter OFF signal	Not detected
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	OFF
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CE: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.

CF:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions that the engine speed continues to rise during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback of ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously if the vehicle speed is at less than 4 km/h (2.49 MPH).

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the all malfunction criteria below becomes the time needed for diagnosis (2 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed - Targeted engine speed	≥ 1500 rpm
Feedback value for ISC	≤ 0
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 meeting all the malfunction criteria below becomes the time needed for diagnosis (5 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed - Targeted engine speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Fuel cut: Cuts off fuel only #1 and #2 cylinders, or for all cylinders according to vehicle speed, engine speed, and throttle position.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CG: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 any one of the following conditions are established, judge as NG.
Judge as OK and clear the NG when the continuous time of not meeting the criteria below reaches to the predetermined time (1 s) or more.

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 CONDITIONS

- 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 kgf-m, 301 ft-lb).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of microcomputer (RAM).
When there is a problem in the main CPU normal RAM, or the sub CPU normal RAM, judge as NG. Judge as OK when both are operating properly.
If it is possible to write data to the whole area of RAM in the initial routine, and is possible to read the same data, it is judged as OK, and if not, NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Diagnosis with the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis as soon as the ignition switch is turned to ON.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormal	
Write 5AA5A55A and then read. (Whole area of RAM)	5AA5A55A cannot be read.
Write A55A5AA5 and then read. (Whole area of RAM)	A55A5AA5 cannot be read.
Sub CPU normal RAM abnormal	
Write 5AA5 and then read. (Whole area of RAM)	5AA5 cannot be read.
Write A55A and then read. (Whole area of RAM)	A55A cannot be read.

Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormal	
Write 5AA5A55A and then read. (Whole area of RAM)	5AA5A55A can be read.
And write A55A5AA5 and then read. (Whole area of RAM)	A55A5AA5 can be read.
Sub CPU normal RAM abnormal	
Write 5AA5 and then read. (Whole area of RAM)	5AA5 can be read.
And write A55A and then read. (Whole area of RAM)	A55A can be read.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Judge as NG when SUM value of ROM is outside the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard

Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

8. ECM OPERATION AT DTC SETTING

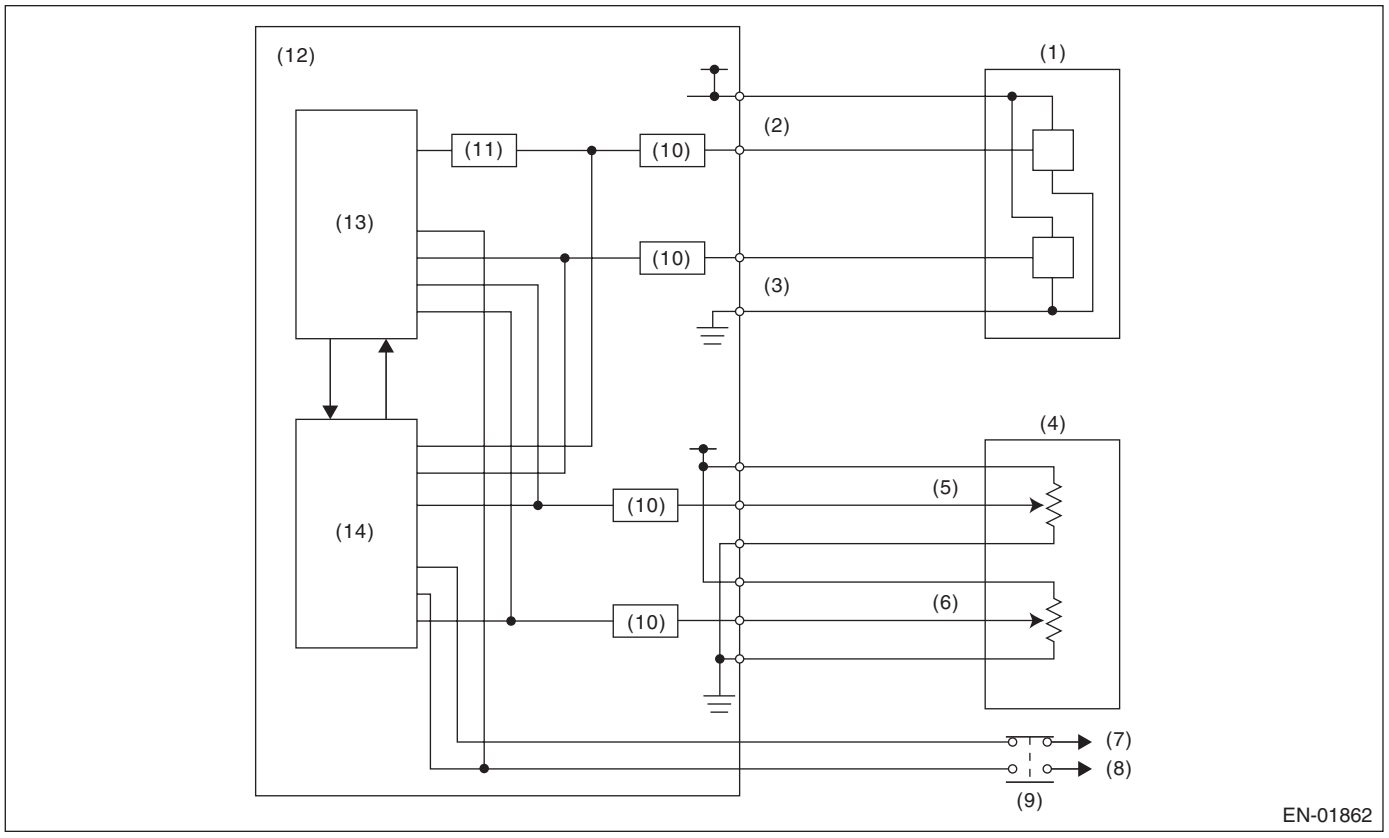
Memorize the freeze frame data. (For test mode $02)

CJ:DTC P0607 CONTROL MODULE PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when any one of the followings is established.
- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU ←→ sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.

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	—

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.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU reading value of the throttle position sensor signal	Within 0.0858 V
(2) Difference of CPU read value of the accelerator pedal position sensor signal	Within 0.035 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Difference of signal on connection of amplifier	1/4 times ±3 deg
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched

Time Needed for Diagnosis:
1. 600 milliseconds
2. 830 milliseconds
3. 200 milliseconds
4. 200 milliseconds
5. 24 milliseconds
6. 250 milliseconds
7. 200 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

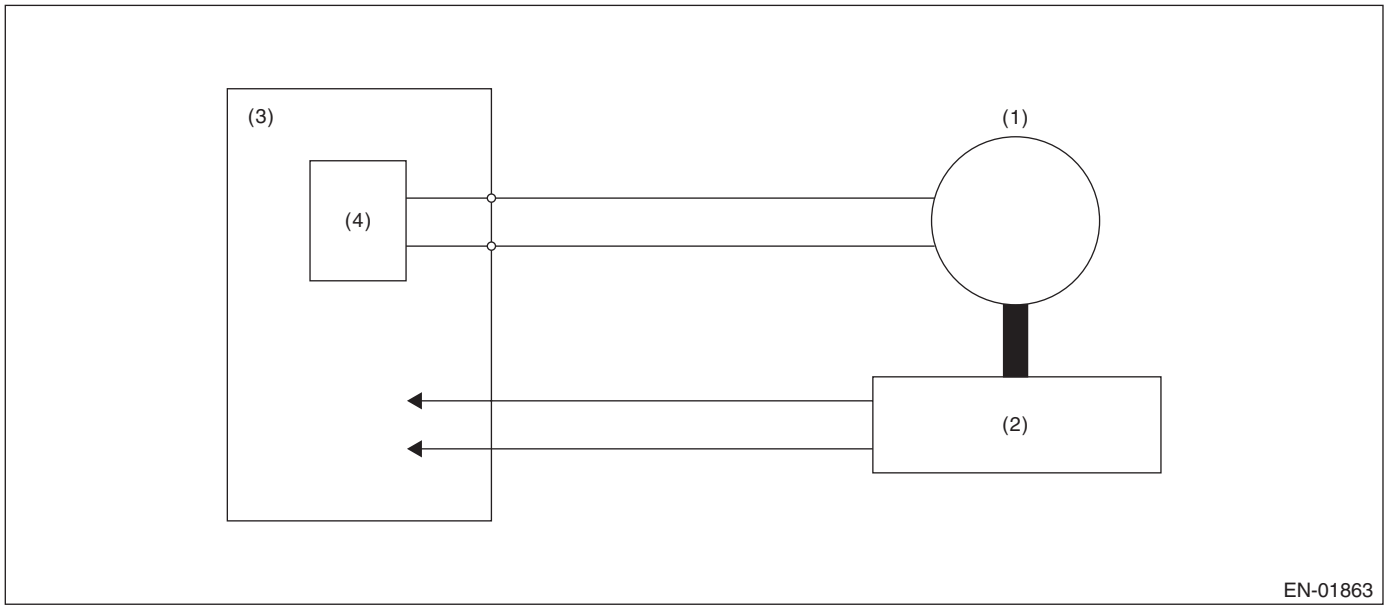
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Judge as NG when the target opening angle and actual opening angle is mismatched or the current to motor is the specified duty or more for specified time continuously.

2. COMPONENT DESCRIPTION



(1) Motor
(2) Throttle position sensor
(3) Engine control module (ECM)
(4) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electronic throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

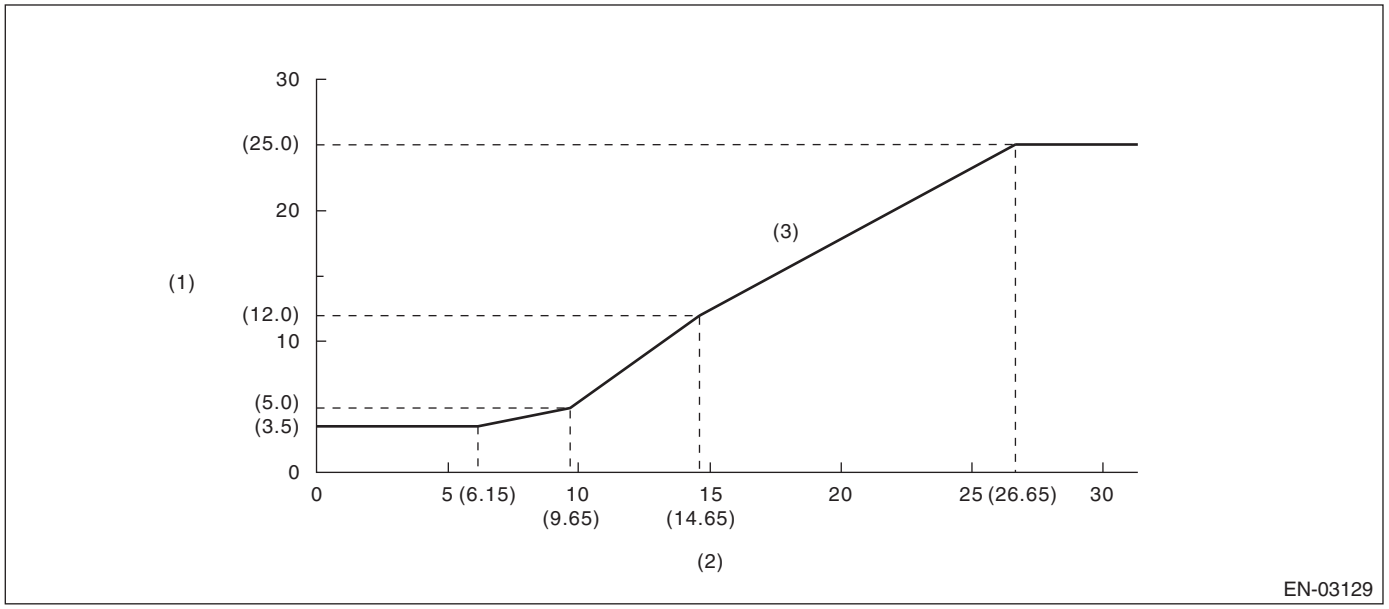
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	3.5° or less
Output duty to drive circuit	95% or less

Time Needed for Diagnosis:

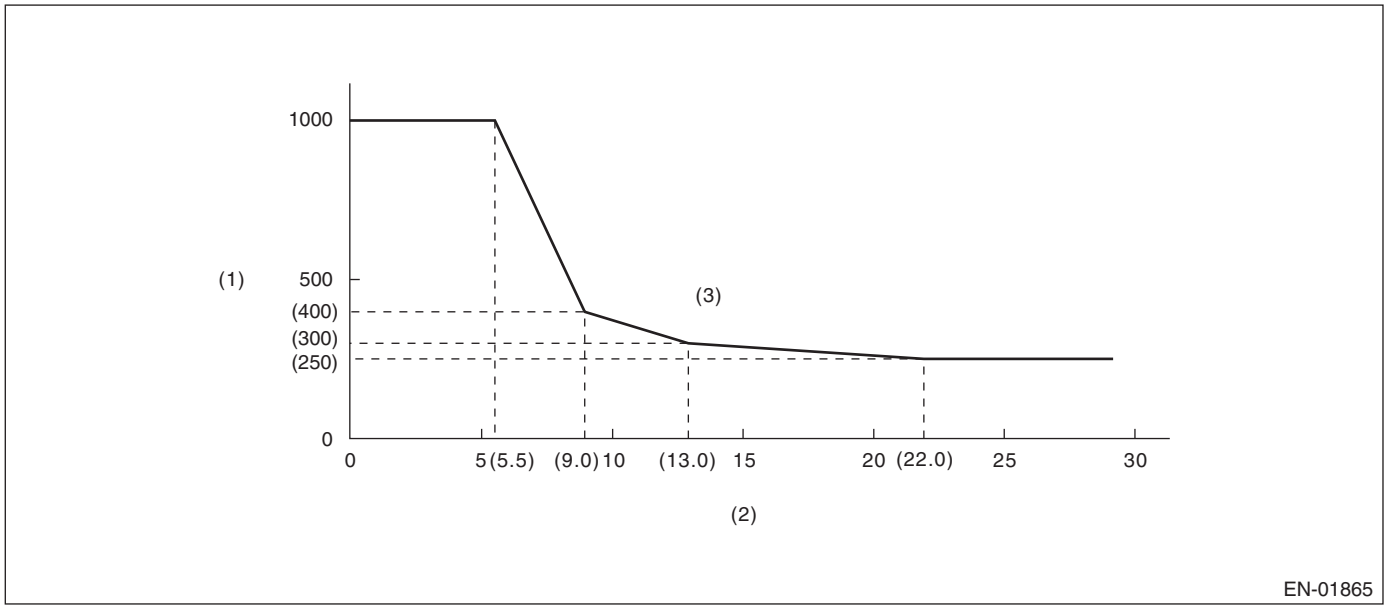
- Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
- Output duty to drive circuit: 2000 milliseconds

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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CL: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 meeting the malfunction criteria below becomes 2.5 seconds or more.

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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CM: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 meeting the malfunction criteria below becomes 2.5 seconds or more.

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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CN:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

1. OUTLINE OF DIAGNOSIS

Judge as NG when there is CAN communication with the AT and there is a MIL lighting request.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the following conditions is the predetermined time (2.5 seconds) or more.
Judge as OK when the following conditions are not established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
MIL lighting request from TCM	set

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CO: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 meeting the malfunction criteria below becomes 6.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CP: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 times 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 monitorings
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CQ: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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CR:DTC 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 times 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 monitorings
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

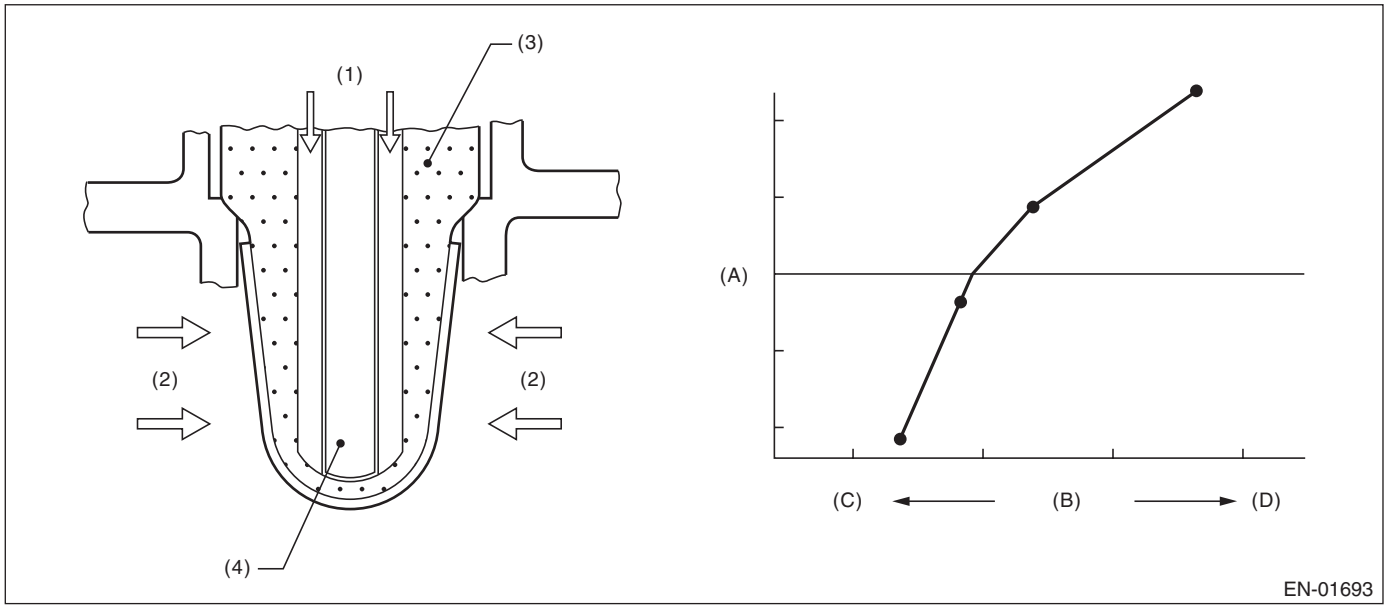
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains low.
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.
λ value = Actual air fuel ratio/Theoretical air fuel ratio
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V ←→ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 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.	≤ 0.02 g (0.0007 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 the time needed for diagnosis (10 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output λ value when rear oxygen sensor sub feedback compensation coefficient is not at maximum limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- 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

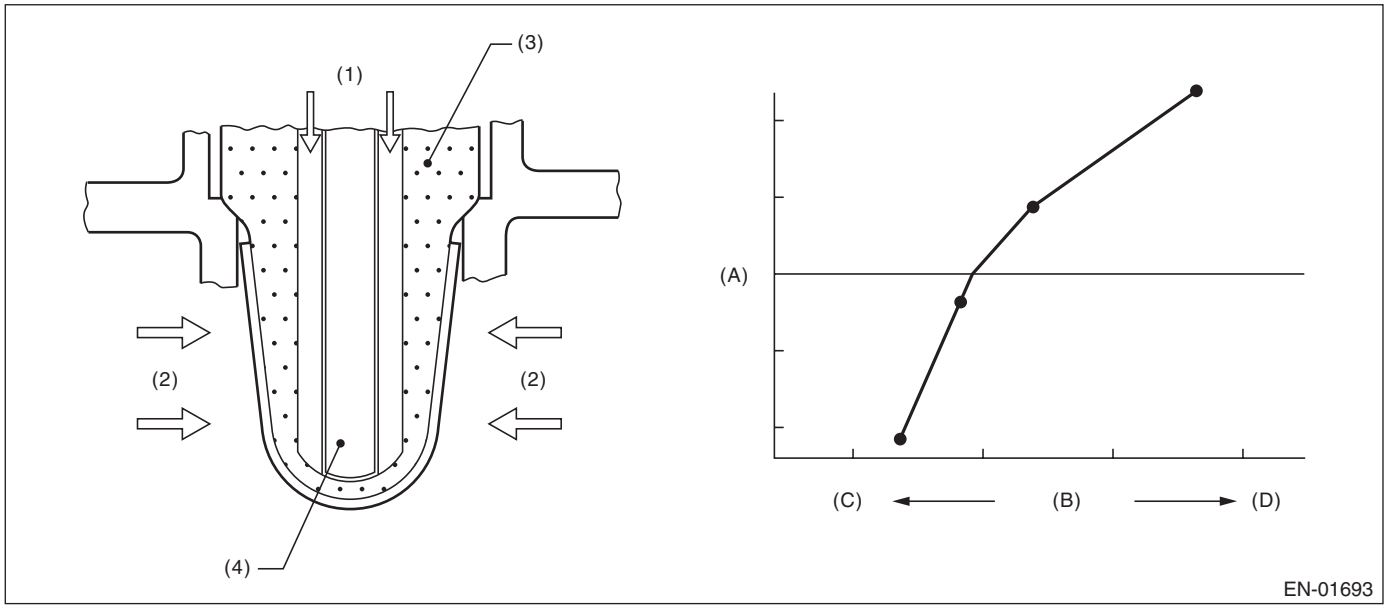
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains high.
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.
λ value = Actual air fuel ratio/Theoretical air fuel ratio
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V ←→ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 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.	≤ 0.02 g (0.0007 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 the time needed for diagnosis (10 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output λ value when rear oxygen sensor sub feedback compensation coefficient cannot be at minimum limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- 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

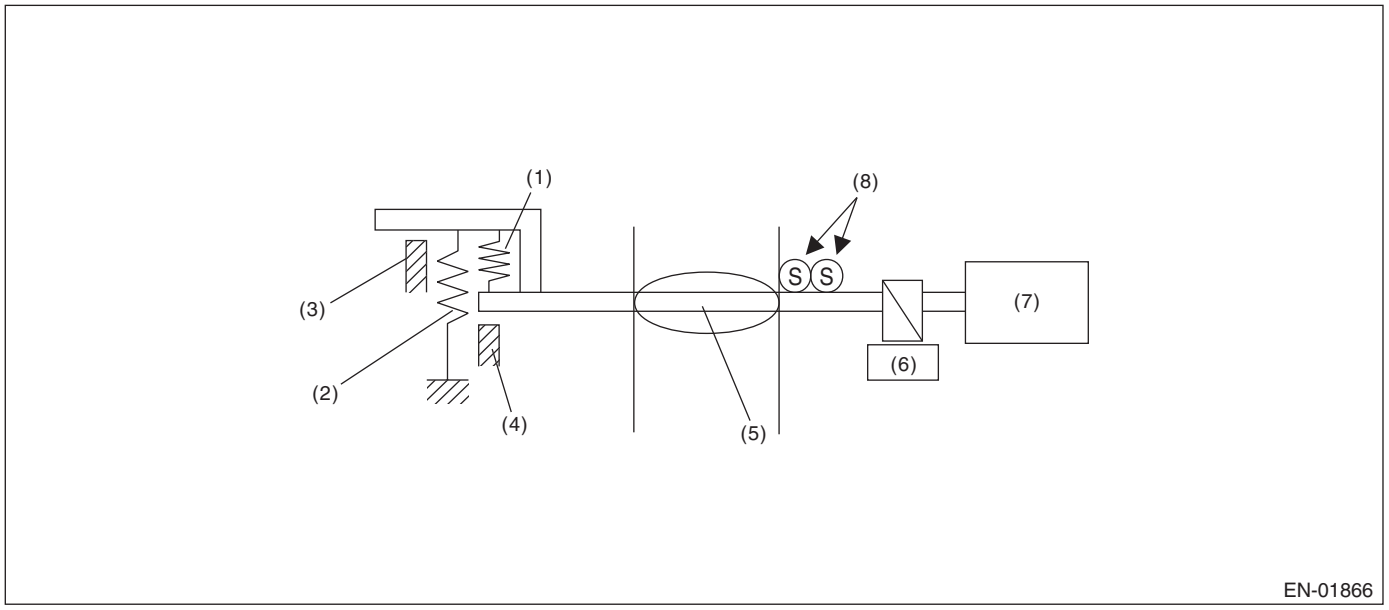
Memorize the freeze frame data. (For test mode $02)

CU:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the valve is opened more than the default opening angle, but does not move to the close direction with the motor power stopped.

2. COMPONENT DESCRIPTION



(1) Opener spring
(2) Return spring
(3) Intermediate stopper
(4) Full closed stopper
(5) Throttle valve
(6) Gear
(7) DC motor
(8) Main and sub throttle sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.6 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

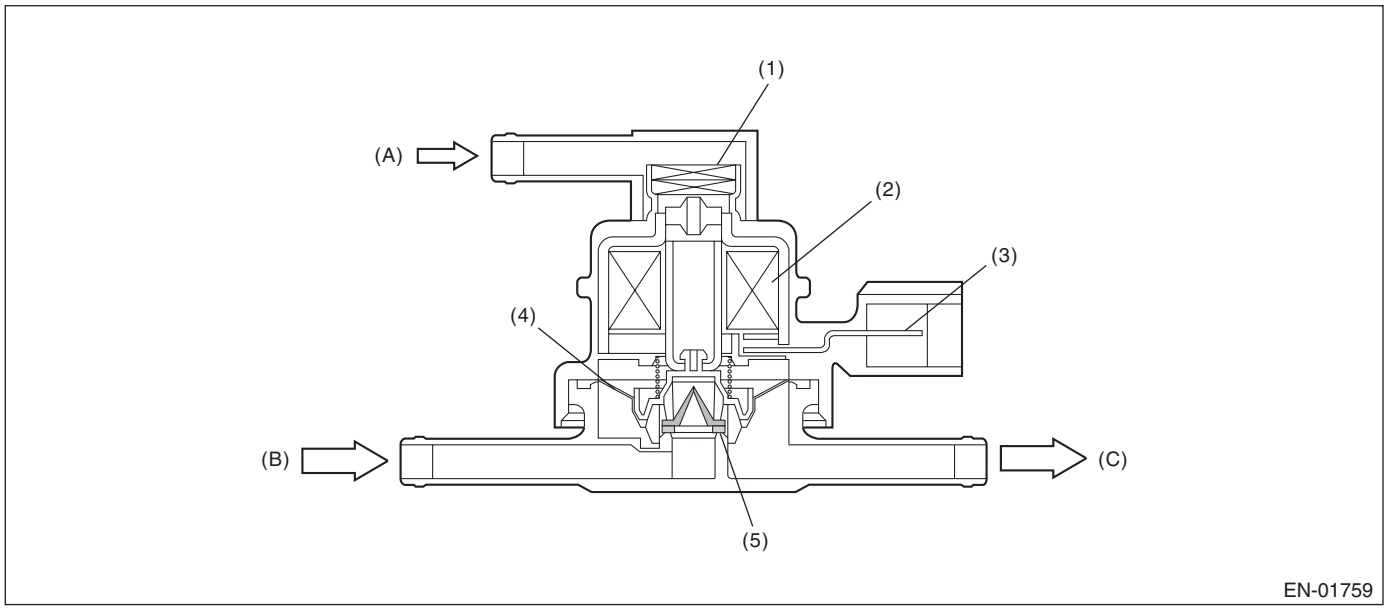
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.
Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Barometric pressure
(B) Shut-off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below is the time needed for diagnosis (2.5 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CW:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

1. OUTLINE OF DIAGNOSIS

Always detect abnormlity that both combination valve electromagnetic valve and the reed valve are open failure.
Calculate the integrated value of Max./Min. value and output voltage deviation of the secondary air delivery pipe pressure sensor output voltage in a given time after engine start. Judge as NG if the integrated value and the difference between Max. and Min. value are large.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 500 rpm
After engine starting	9 seconds or more
After secondary air system stop	9 seconds or more
Amount of intake air	2 g (0.07 oz)/seconds or more and Less than 400 g (14.11 oz)/seconds
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform continuous diagnosis when air flow amount is large during the secondary air pump stop after engine start.

4. DIAGNOSTIC METHOD

When both combination valve electromagnetic valve and the reed valve are open failure, the failure appears as pulses in the secondary air delivery pipe pressure sensor output. Detect abnormality by capturing these pulses using the following method.
Calculate Max./Min. value of the secondary air delivery pipe pressure sensor output voltage and the sum of the output voltage deviation for kCOTIM seconds. Compare the value of the difference between Max. and Min. value with threshold value and also compare the sum value with the threshold value. If the values exceed the threshold value, count up NG counter and then judge as NG if the counter reaches kCOCOT times. Judge as OK if neither exceeds the threshold value, or if either of the two exceeds the threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
Pipe inner pressure difference between Max. and Min.	≥ 0.05 V
Sum of the pipe inner pressure variation value every 4 milliseconds	≥ 5 V
Barometric pressure variation value	< 26.7 kPa (200 mmHg, 7.89 inHg)

Time Needed for Diagnosis: 2 seconds × 20 times
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CX:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

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 if the continuous time of meeting the following conditions exceeds 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
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 if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

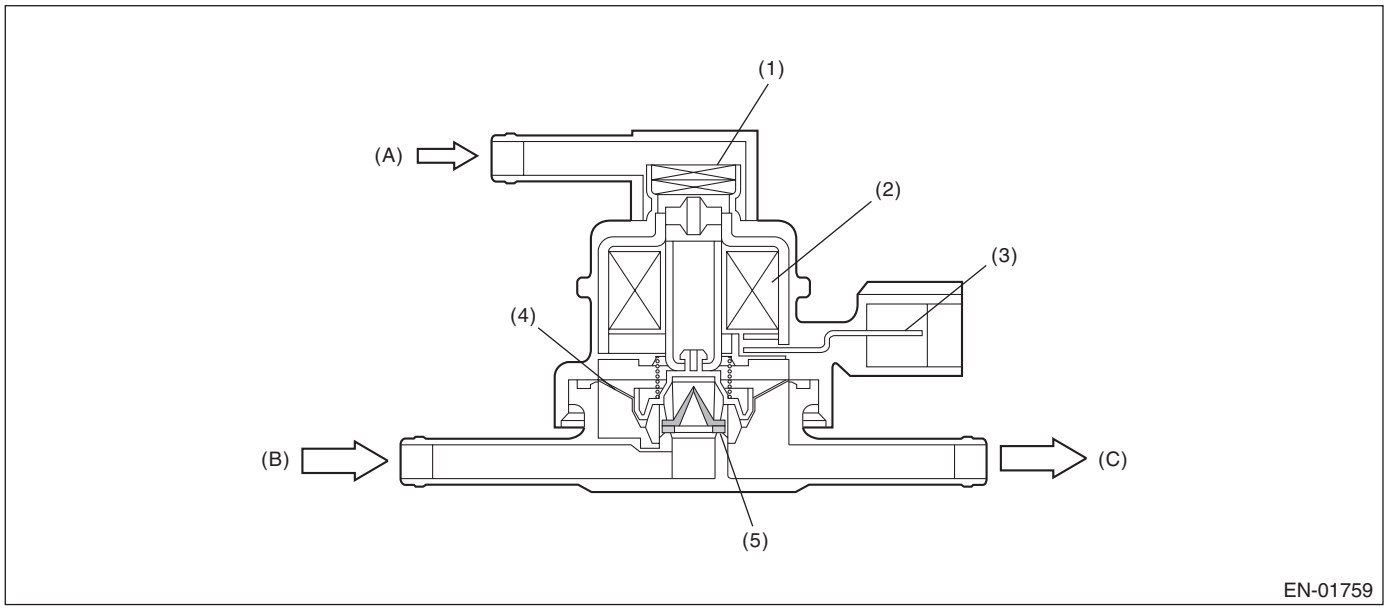
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.
Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Barometric pressure
(B) Shut-off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below is the time needed for diagnosis (2.5 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

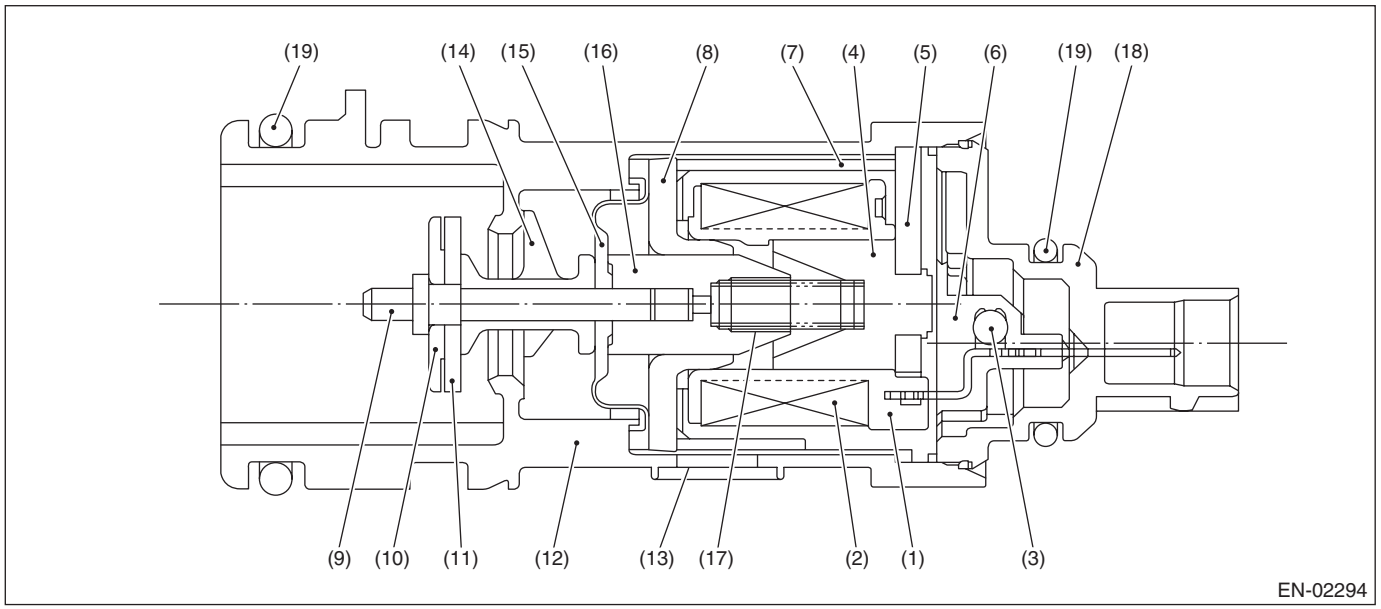
Memorize the freeze frame data. (For test mode $02)

CZ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the abnormal function (stuck closed) of the drain valve.
Judge as NG when fuel tank pressure is low.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Drain valve	Open
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.0 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 meeting the malfunction criteria below becomes 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≤ –4.0 kPa (–30 mmHg, –1.18 inHg)

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	> –4.0 kPa (–30 mmHg, –1.18 inHg)
Cumulative time when all the malfunction criteria below are met.	≥ 30 seconds
Purge control solenoid valve duty ratio	Not = 0
Fuel temperature	–10 ←→ 55°C (14 ←→ 131°F)
Intake manifold relative pressure	≤ –26.7 kPa (–200 mmHg, –7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

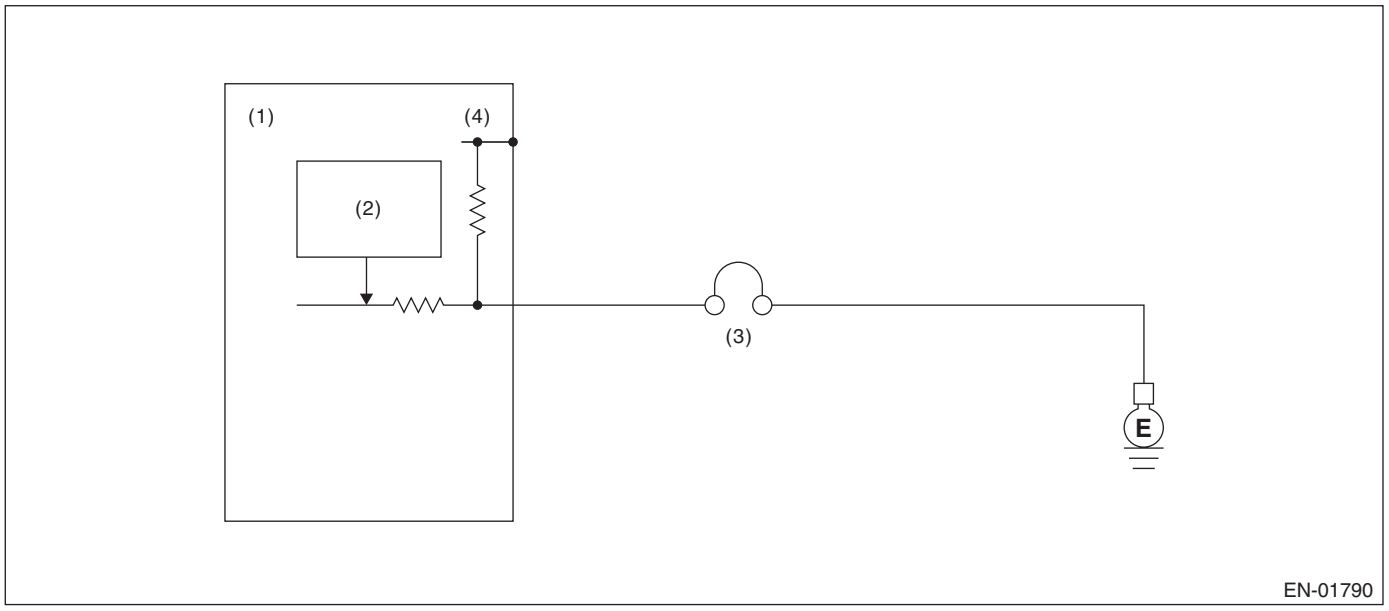
Memorize the freeze frame data. (For test mode $02)

DA: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) (3) PCV diagnosis connector (4) 5 V
(2) 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 meeting the malfunction criteria below becomes 2.5 seconds or more.

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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DB: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 0.8 seconds or more 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

Time Needed for Diagnosis: 800 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OFF OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Not diagnosed
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DC: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 meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	Low
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DD:DTC P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DE:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DF: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)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DG:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DH: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)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DI: 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)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DJ:DTC P1578 METER FAILURE

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DK:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the catalyst advanced idling retard angle control.
Judge as NG when ECM is not controlling the angle properly during catalyst advanced idling retard angle control.
Judge as NG if there is exhaust gas temperature diagnosis and idle speed diagnosis and if either of them is NG.

- Exhaust gas temperature diagnosis

Judge as NG when the estimated exhaust gas temperature in 14 seconds after the cold start is below the specified value.

- Idle speed diagnosis

Judge as NG when actual engine speed is not close to target engine speed after terminating the retard angle control.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Barometric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Cold start diagnosis	Incomplete
Engine	Starting
Vehicle speed	≤ 2 km/h (1 MPH)
Misfire within 200 engine revs.	< 5
Time after starting	14 seconds

3. GENERAL DRIVING CYCLE

Perform the diagnosis at cold start.

4. DIAGNOSTIC METHOD

- Exhaust gas temperature diagnosis

Abnormality Judgment

Calculate the estimated exhaust gas temperature when the diagnostic enable condition is established. Judge as NG when the following conditions are established in 14 seconds after starting the engine.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	< Value from Map 1

Map 1

Engine coolant temperature at engine start	–40°C (–40°F)	–30°C (–22°F)	–20°C (–4°F)	–10°C (14°F)	0°C (32°F)	10°C (50°F)	20°C (68°F)	30°C (86°F)	40°C (104°F)	45°C (113°F)
Threshold Value	200°C (392°F)	200°C (392°F)	200°C (392°F)	200°C (392°F)	97°C (207°F)	97°C (207°F)	96°C (205°F)	92°C (198°F)	89°C (192°F)	88°C (190°F)

Time Needed for Diagnosis: 14 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the following conditions are established after the specified amount of time has passed.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	≥ Value from Map 1

- Idle speed diagnosis

Judge as NG when all of the following conditions are established, and judge as OK when the following conditions are not met.

Malfunction Criteria	Threshold Value
Continuous time of (Target engine speed – Actual engine speed > 100 rpm)	≥ 6 seconds (AT) ≥ 5 seconds (MT)

Time Needed for Diagnosis: 6 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DL: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	≥ –30°C (–22°F)
Ambient air temperature	≥ –30°C (–22°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 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	≥ 64.3°
Tumble generator valve “close” signal output	3.2 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	< 64.3°
Tumble generator valve “close” signal output	3.2 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 CONDITIONS

- 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)

DM: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	≥ –30°C (–22°F)
Ambient air temperature	≥ –30°C (–22°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 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	≥ 64.3°
Tumble generator valve “close” signal output	3.2 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	< 64.3°
Tumble generator valve “close” signal output	3.2 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 CONDITIONS

- 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)

DN: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	≥ –30°C (–22°F)
Ambient air temperature	≥ –30°C (–22°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 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	< 64.3°
Tumble generator valve “open” signal output	4.6 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	≥ 64.3°
Tumble generator valve “open” signal output	4.6 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 CONDITIONS

- 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)

DO: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	≥ –30°C (–22°F)
Ambient air temperature	≥ –30°C (–22°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 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	< 64.3°
Tumble generator valve “open” signal output	4.6 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	≥ 64.3°
Tumble generator valve “open” signal output	4.6 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 CONDITIONS

- 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

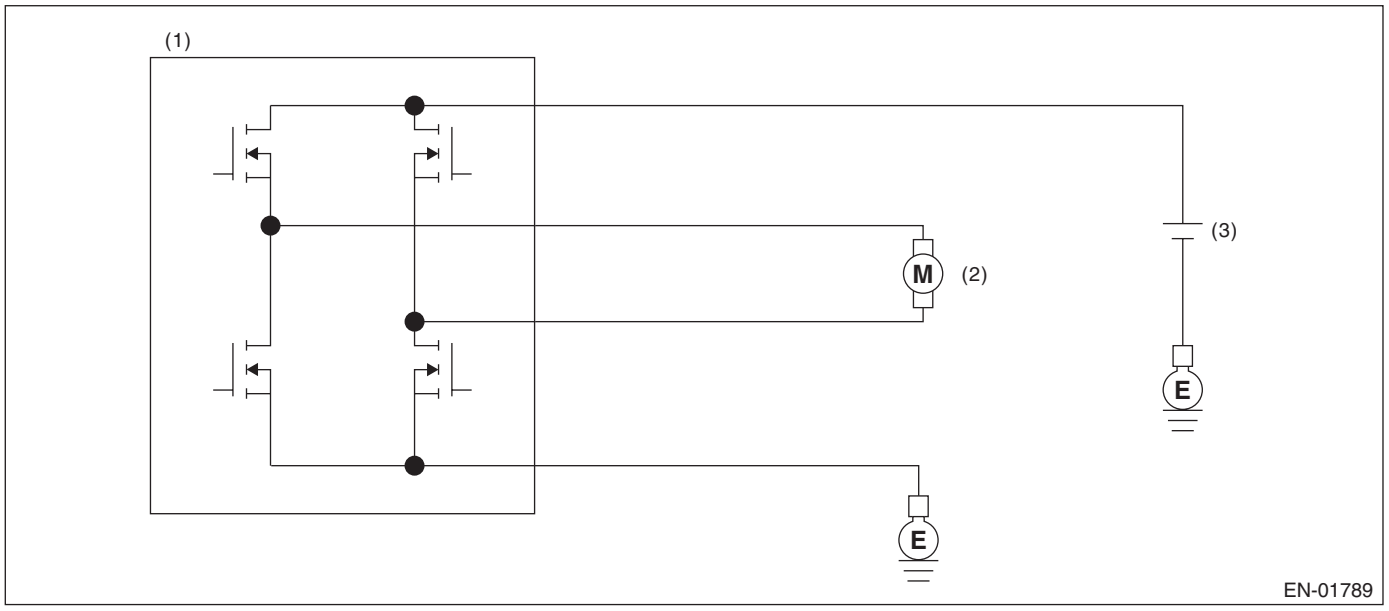
Memorize the freeze frame data. (For test mode $02)

DP: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

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 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	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 CONDITIONS

- 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

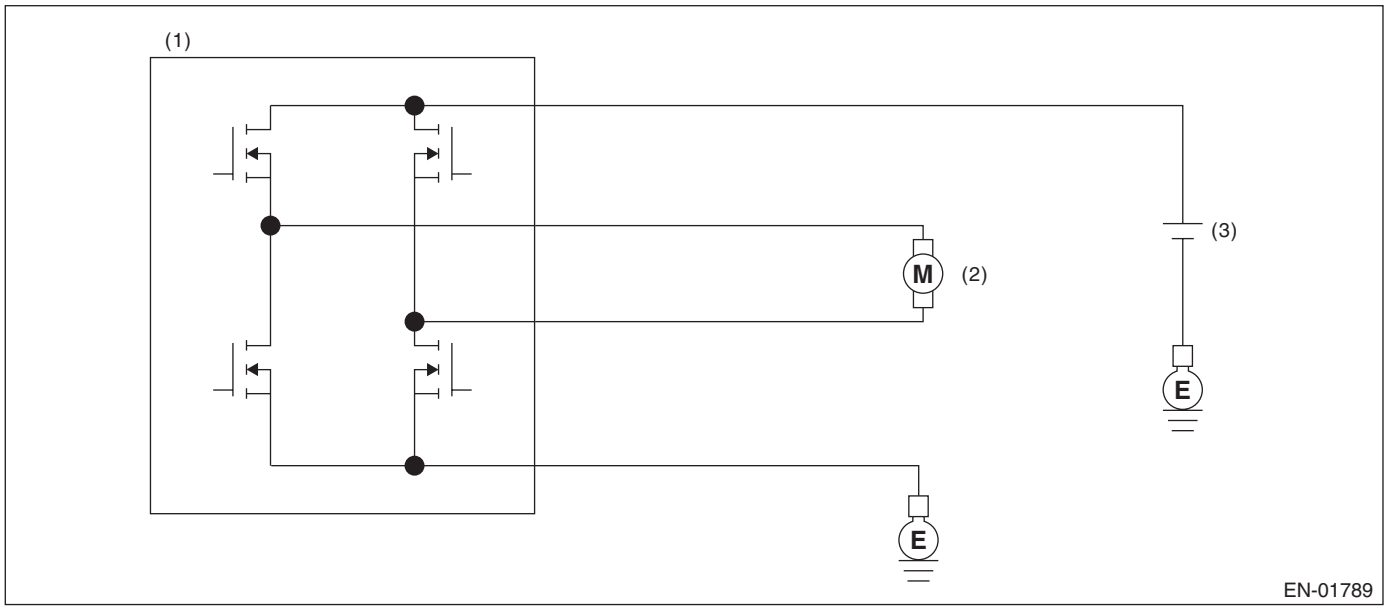
Memorize the freeze frame data. (For test mode $02)

DQ: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

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 CONDITIONS

- 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

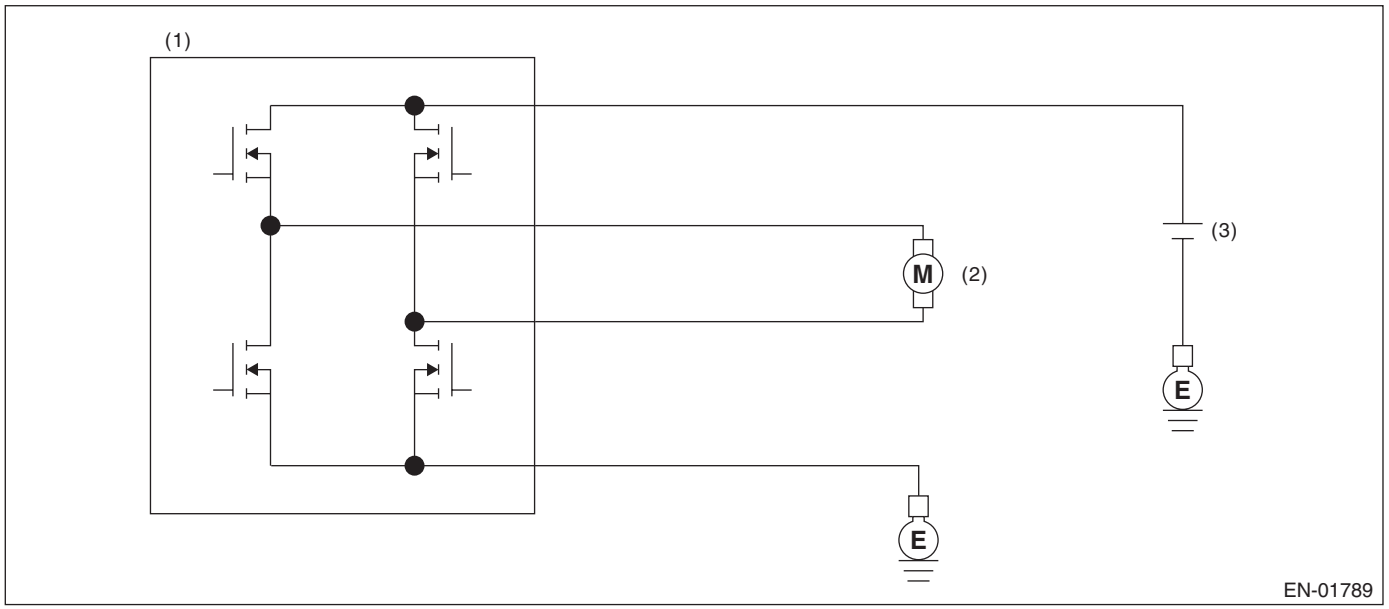
Memorize the freeze frame data. (For test mode $02)

DR: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

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 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	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 CONDITIONS

- 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

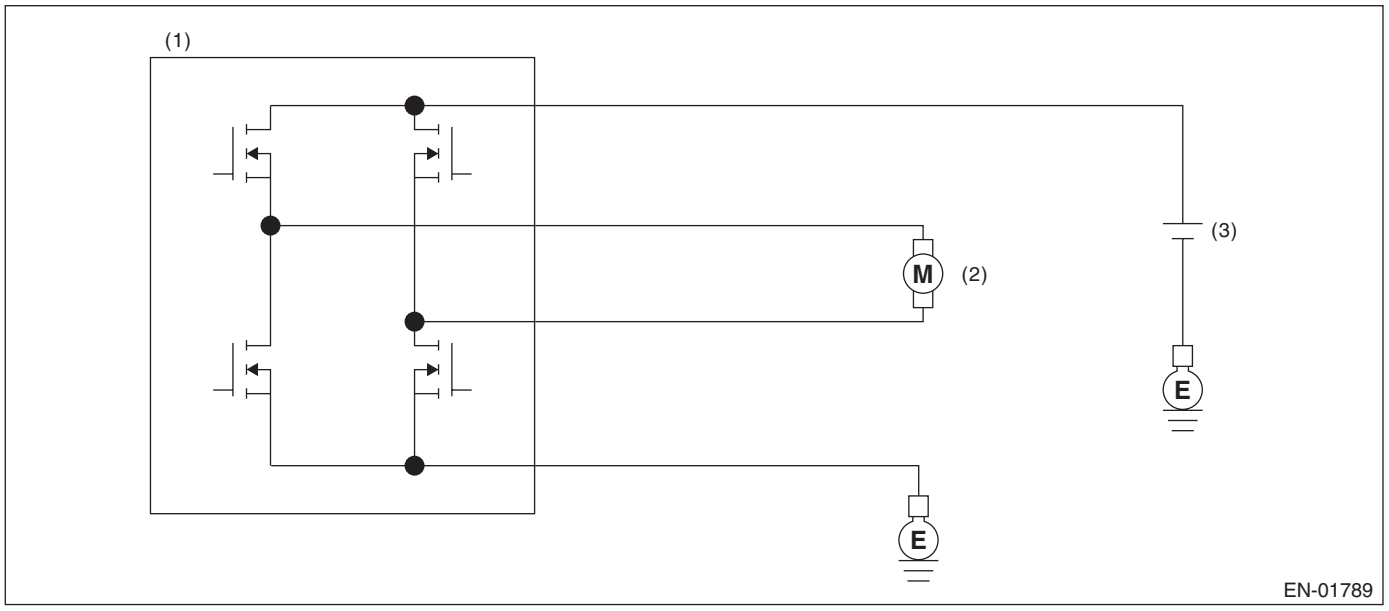
Memorize the freeze frame data. (For test mode $02)

DS: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

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 CONDITIONS

- 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

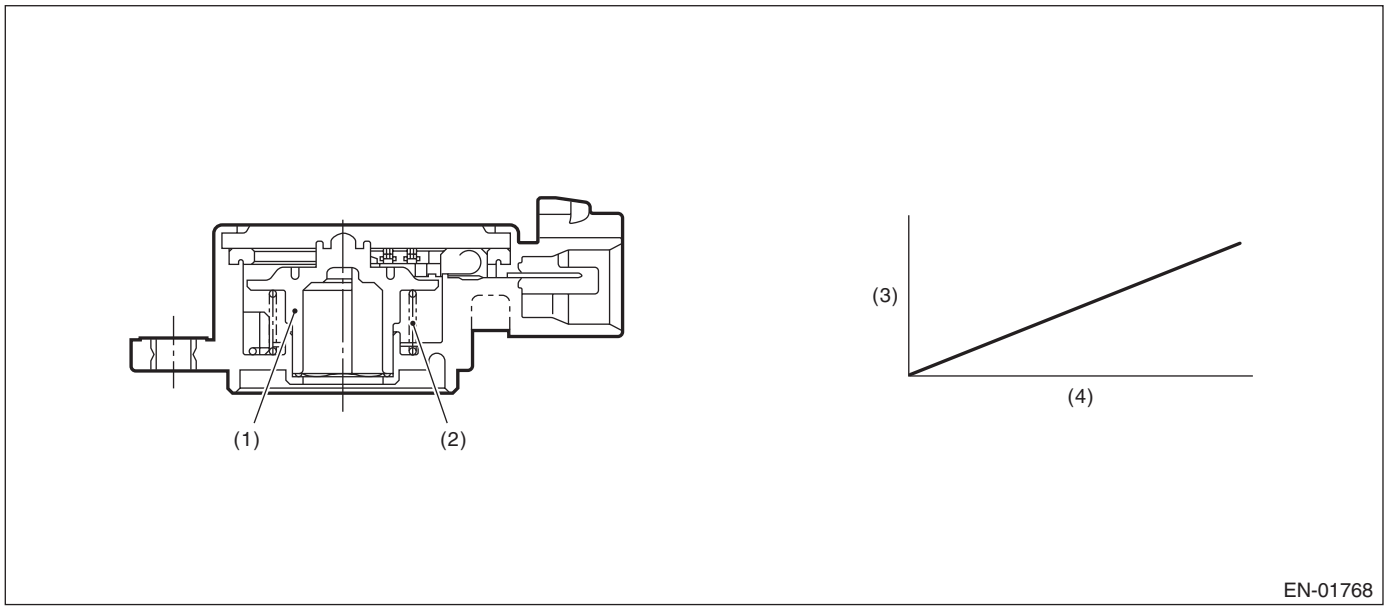
Memorize the freeze frame data. (For test mode $02)

DT: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 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 meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 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 CONDITIONS

- 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

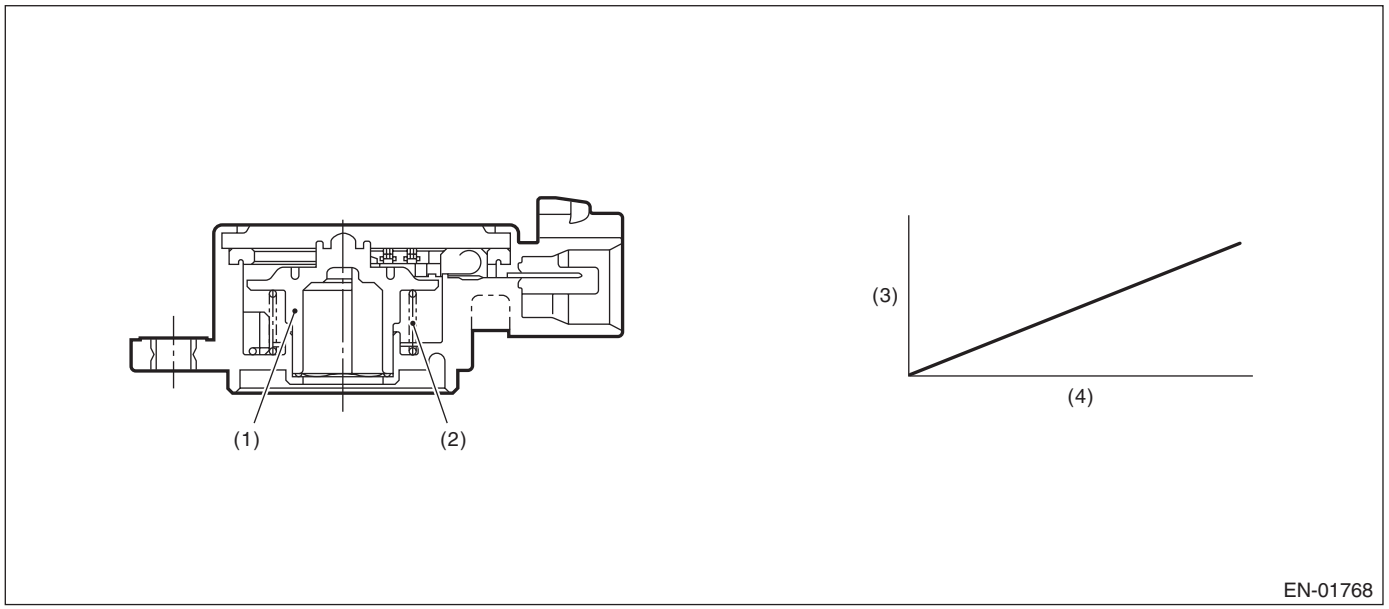
Memorize the freeze frame data. (For test mode $02)

DU: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 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 meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 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 CONDITIONS

- 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

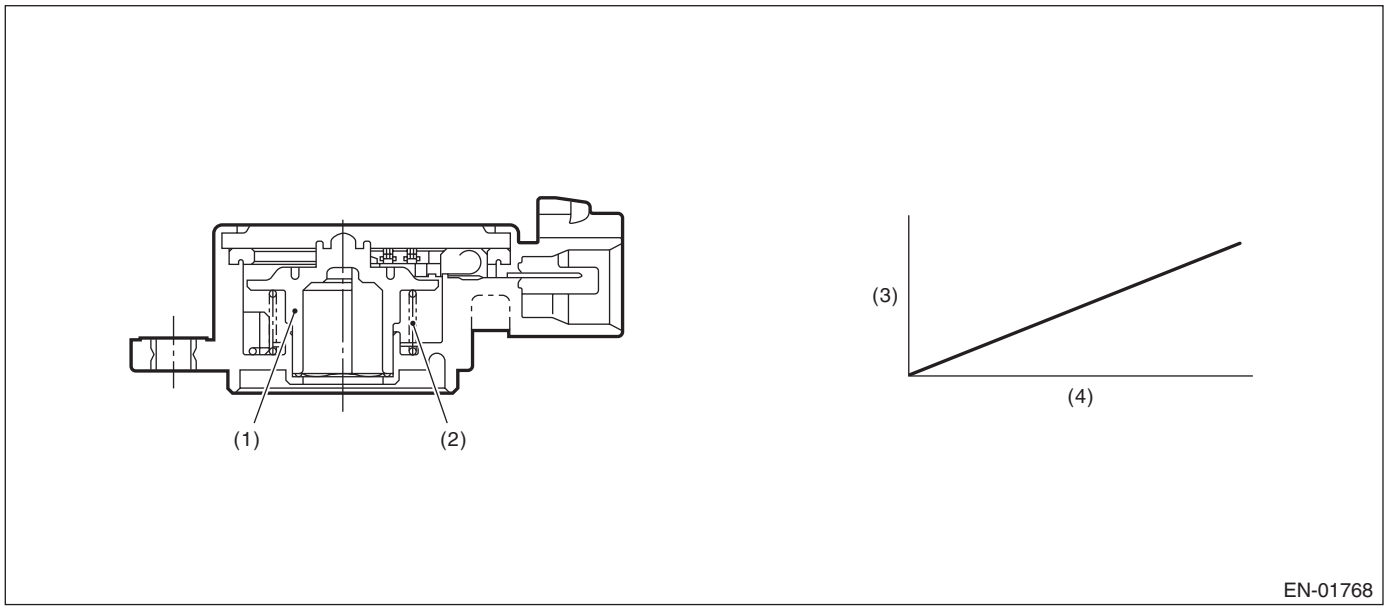
Memorize the freeze frame data. (For test mode $02)

DV: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 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 meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 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 CONDITIONS

- 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

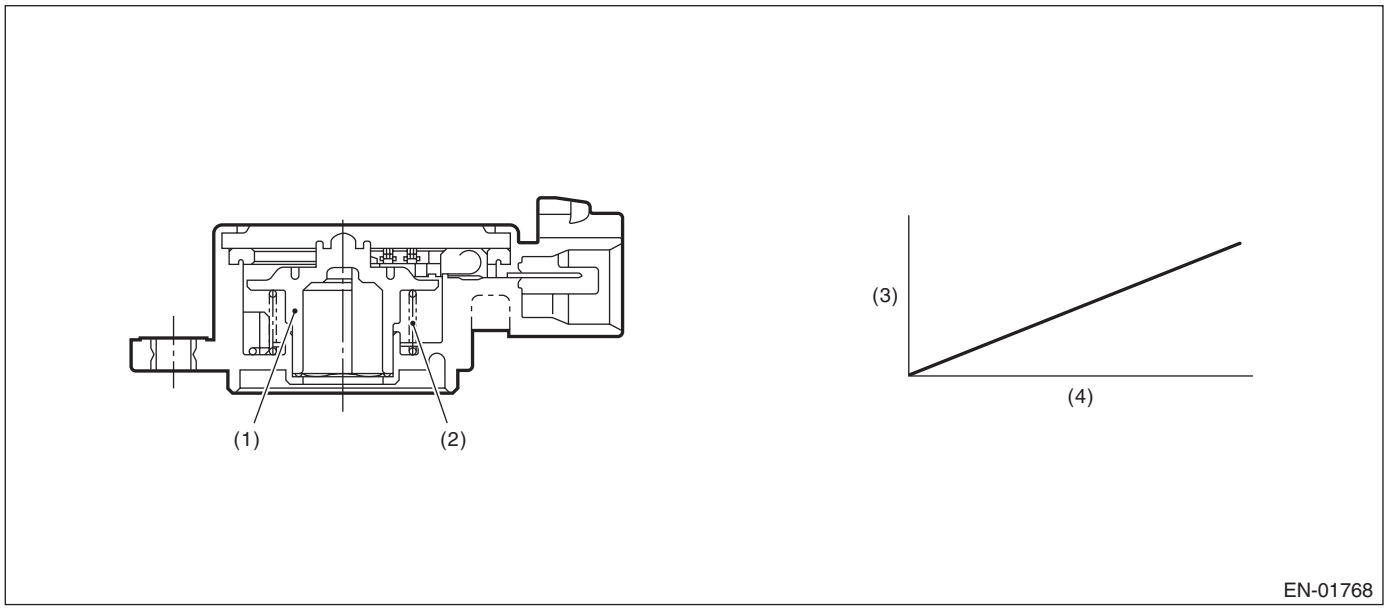
Memorize the freeze frame data. (For test mode $02)

DW: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 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 meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 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 CONDITIONS

- 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)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control 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 meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	≥ 99.61%
Oil control solenoid valve control present current	< 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve	≥ 0.14 A
|Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value |	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0° CA) to the compensation value of partial learning zone with IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
  – Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
  – ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of 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 meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	< 0.39%
Oil control solenoid valve control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
|Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value|	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0° CA) to the compensation value of partial learning zone with IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
  – Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
  – ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P2088. <Ref. to GD(H4DOTC)-238, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

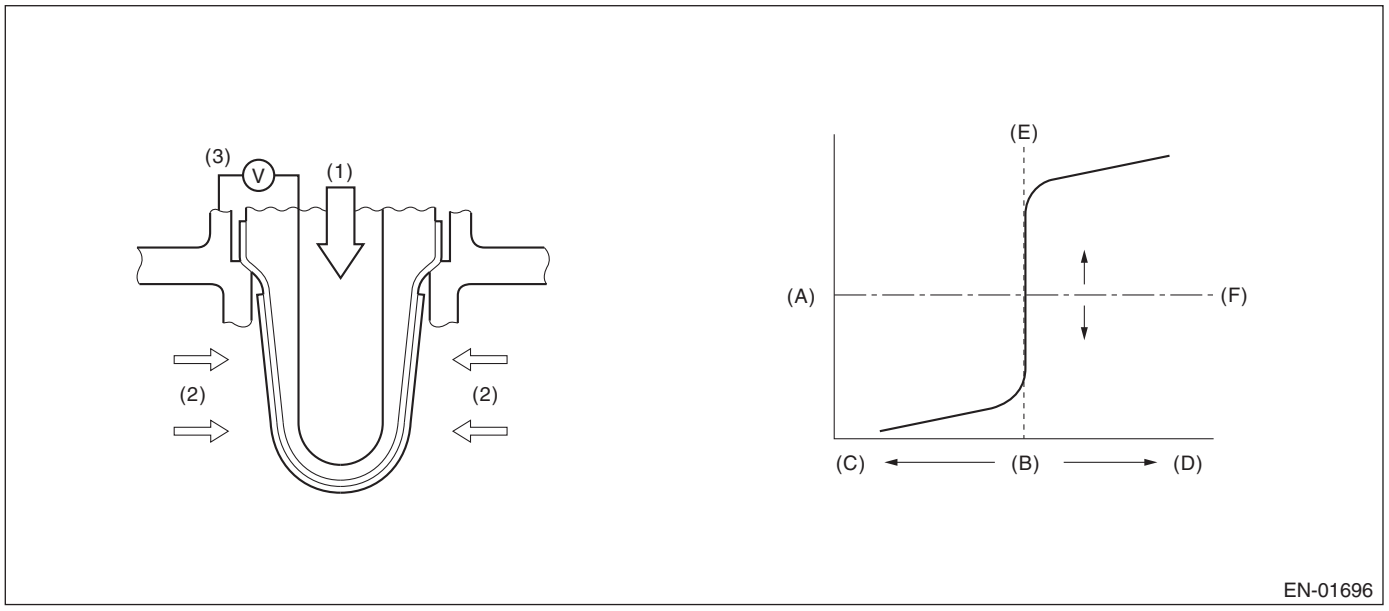
For the detection standard, refer to DTC P2089. <Ref. to GD(H4DOTC)-240, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value.
Control the sub feedback learning and judge as NG when the learning value is in the lean zone.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time of completing all conditions	≥ 1 second
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 5 seconds or more. Judge OK and clear NG when the continuous time of incompleting the malfunction criteria becomes 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	< –0.035 (AT) < –0.04 (MT)

Time Needed for Diagnosis: 5 seconds × 1 time
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

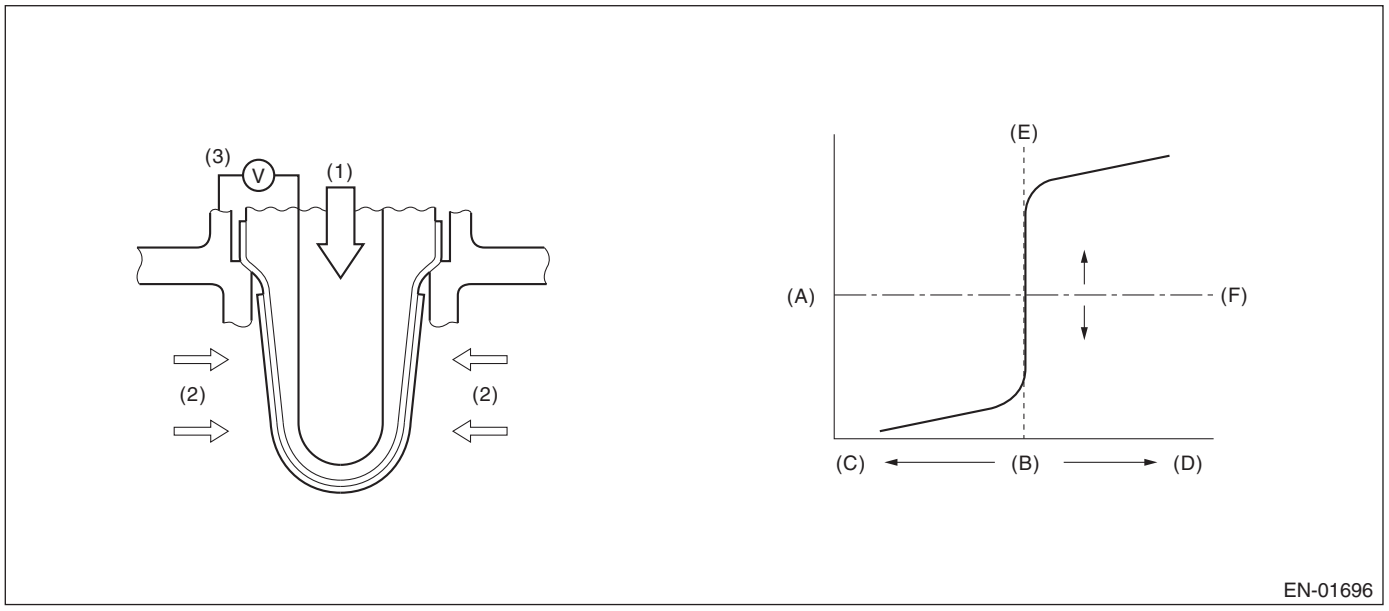
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value.
Sub feedback learning is being performed. When the learning value goes to the rich side, judge as NG.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time of completing all conditions	≥ 1 second
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 5 seconds or more. Judge OK and clear NG when the continuous time of incompleting the malfunction criteria becomes 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	0.009 (AT) 0.03 (MT)

Time Needed for Diagnosis: 5 seconds × 1 time
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

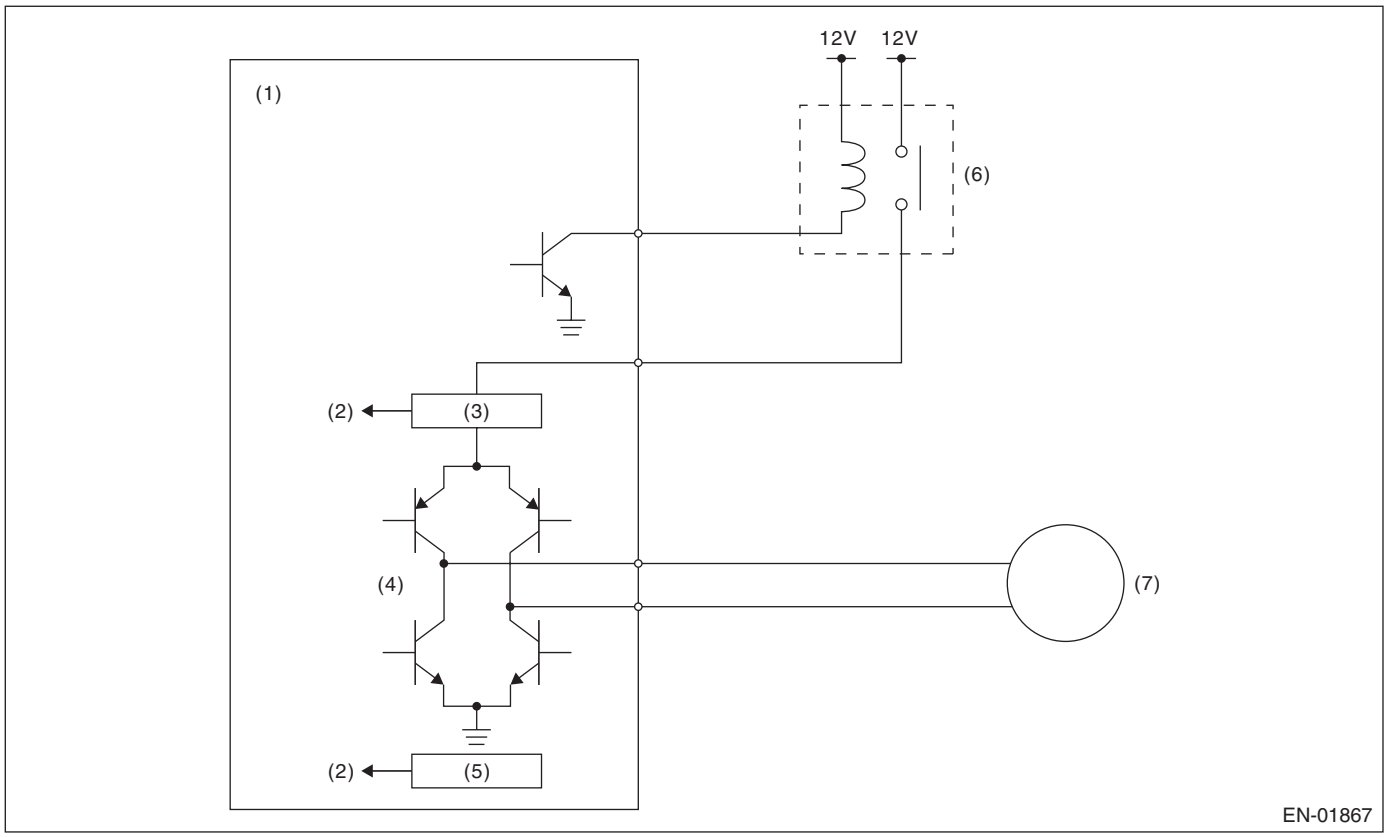
Memorize the freeze frame data. (For test mode $02)

ED:DTC 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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

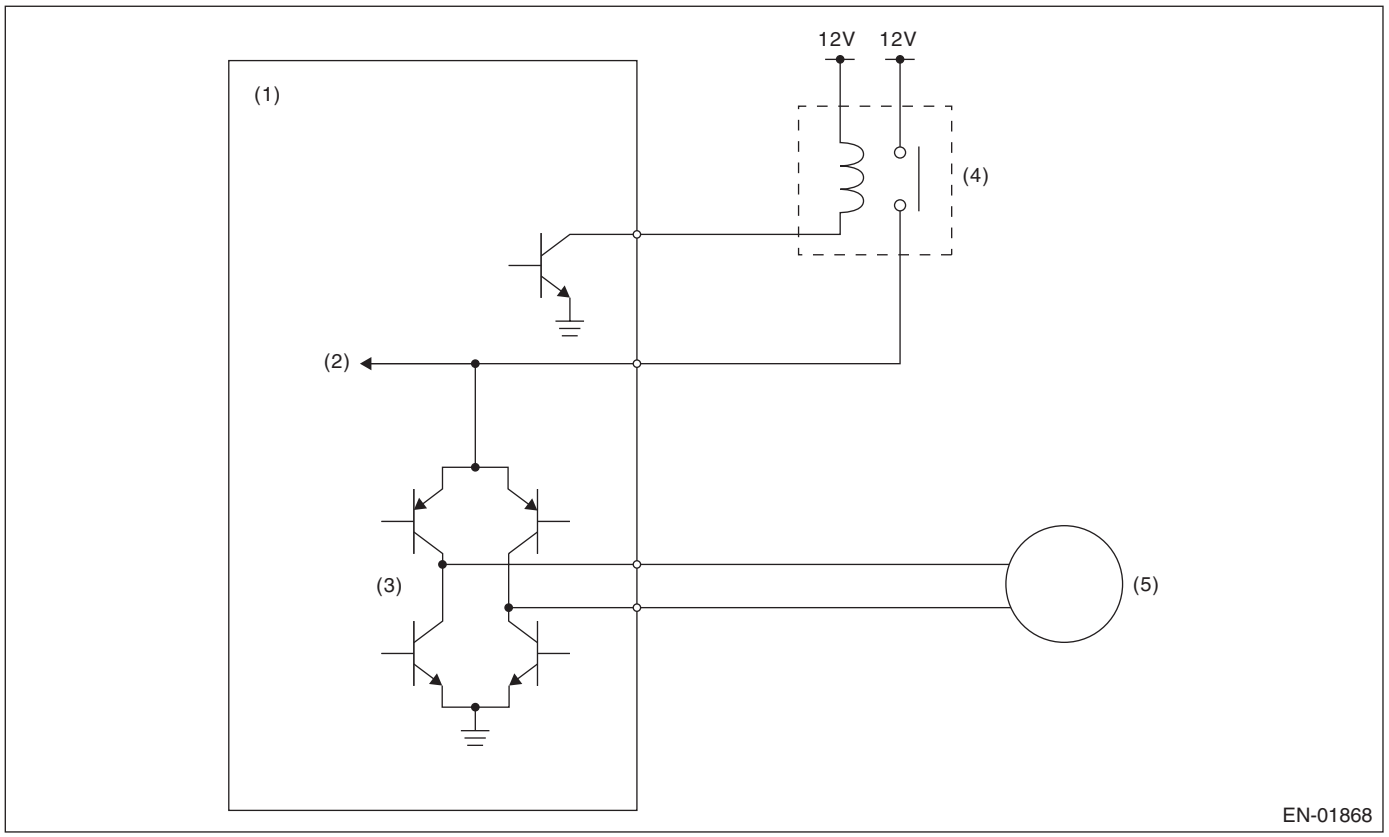
Memorize the freeze frame data. (For test mode $02)

EE:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is not supplied even when ECM sets the electronic throttle control relay to ON.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic throttle control relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic throttle control relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:
- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

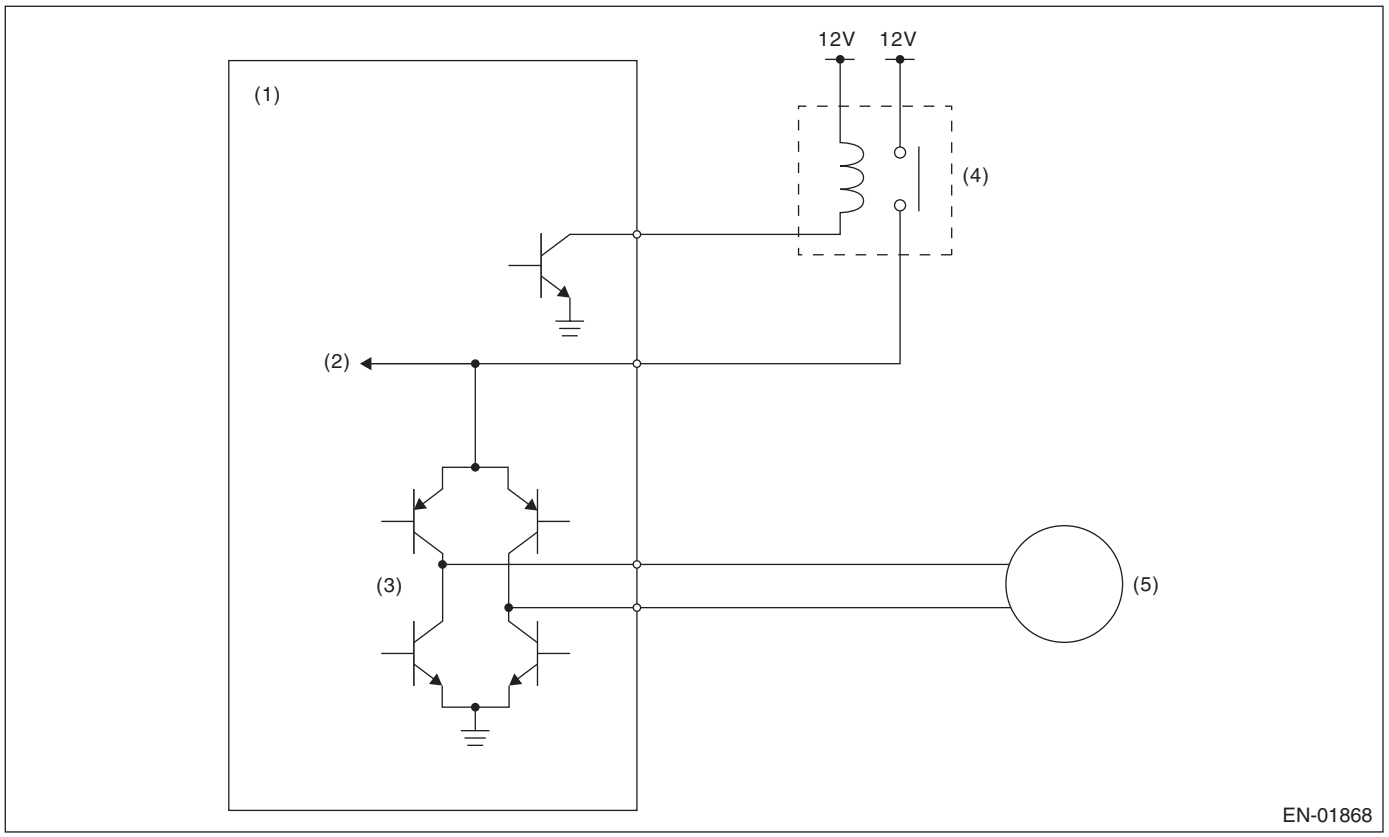
Memorize the freeze frame data. (For test mode $02)

EF:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is supplied even when ECM sets the electronic throttle control relay to OFF.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic throttle control relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic throttle control relay output	OFF

4. GENERAL DRIVING CYCLE

- When ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

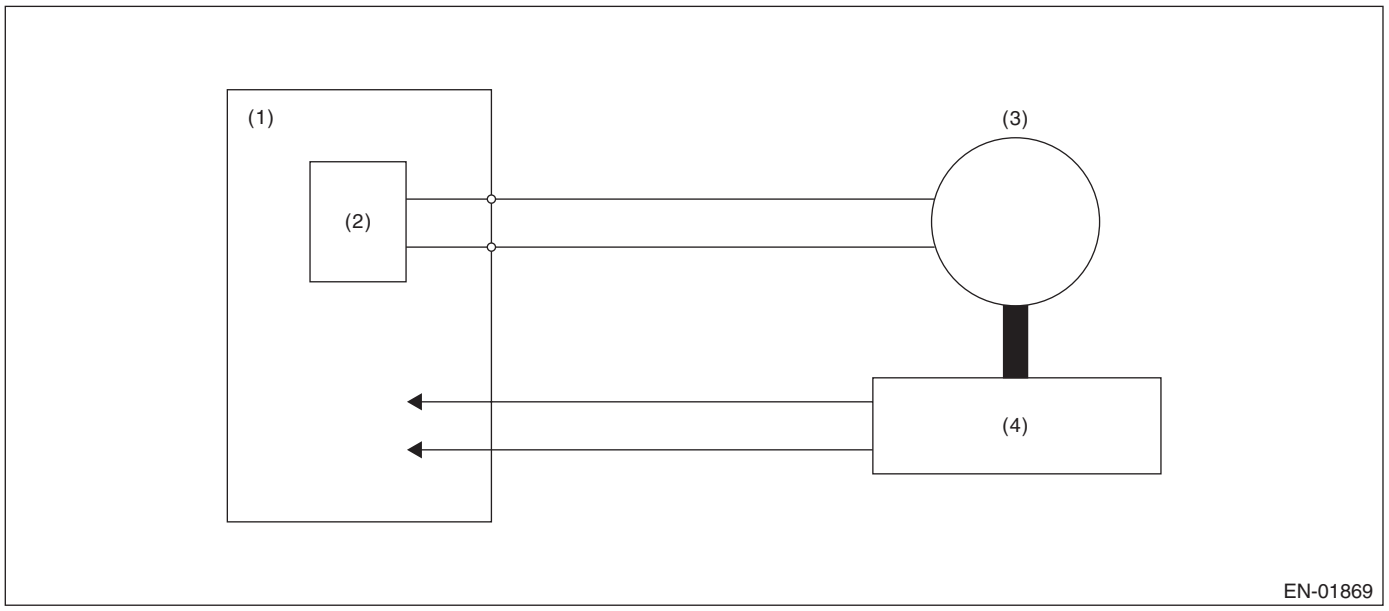
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Judge as NG when full close point learning cannot conducted or abnormal value is detected.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Drive circuit
(3) Motor
(4) Throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (only after clear memory)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at full closed point learning.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor opening angle at full close point learning	10.127 — 19.872 deg
Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	≥ 1.683°

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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

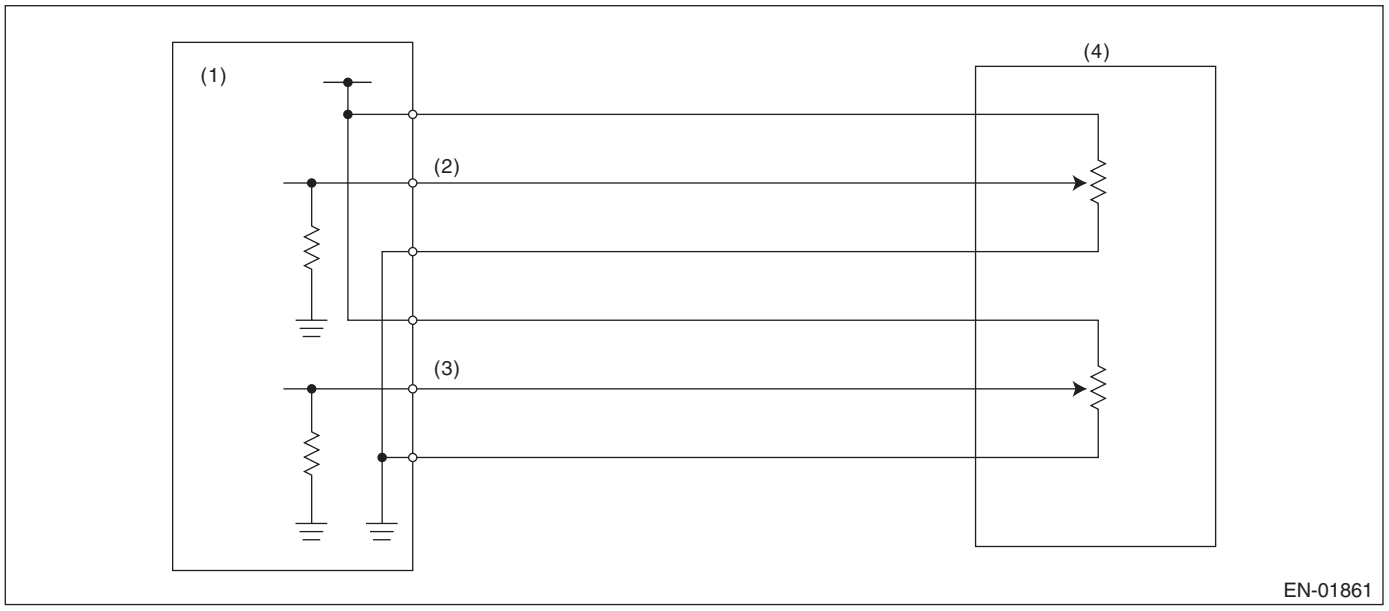
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal
(3) Accelerator pedal position sensor 2 signal
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.219 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

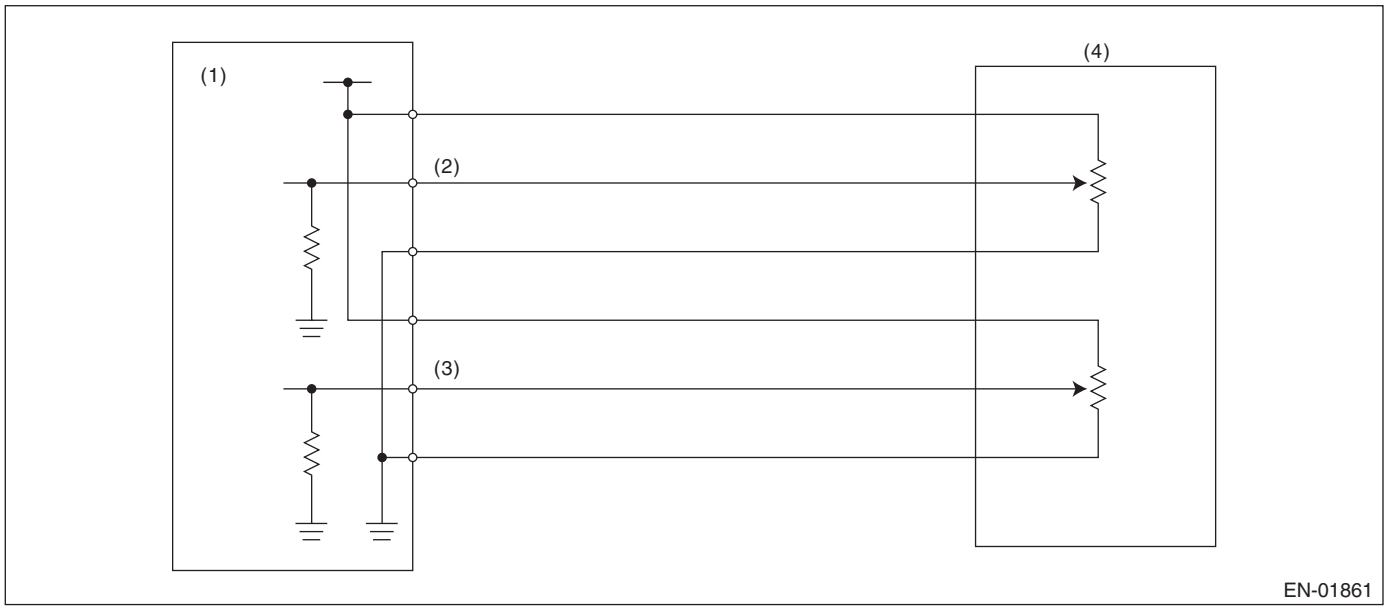
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal
(3) Accelerator pedal position sensor 2 signal
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.781 V

Time Needed for Diagnosis: 32 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

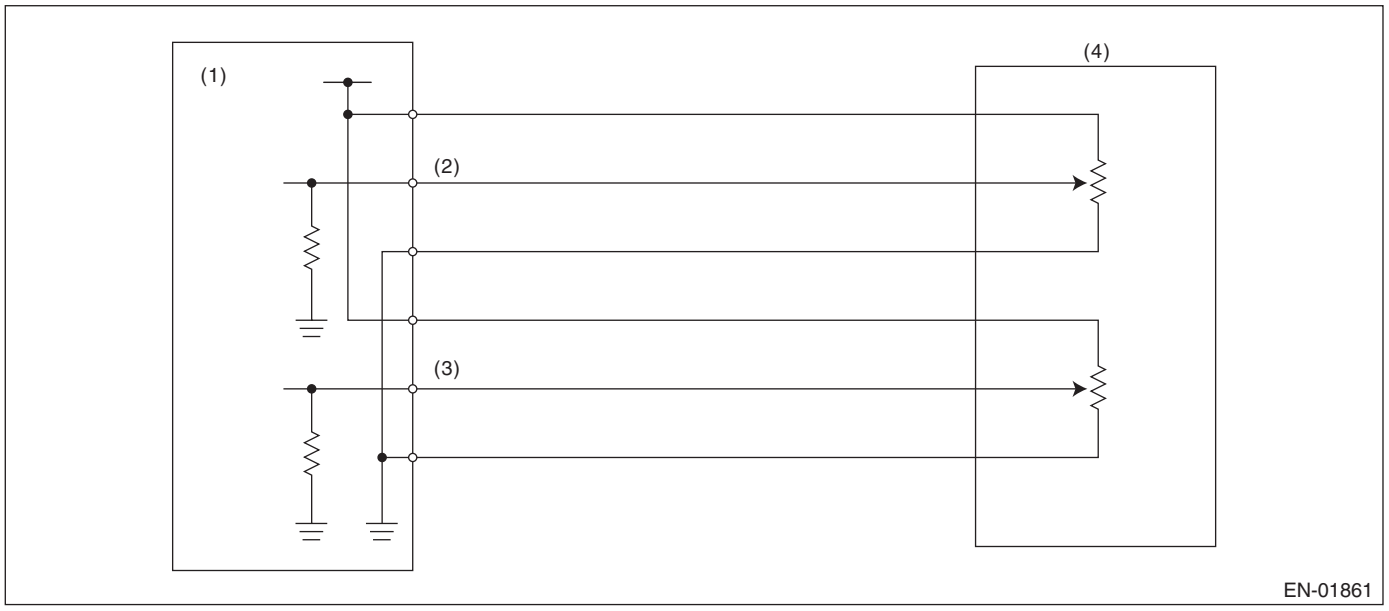
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal
(3) Accelerator pedal position sensor 2 signal
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.219 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

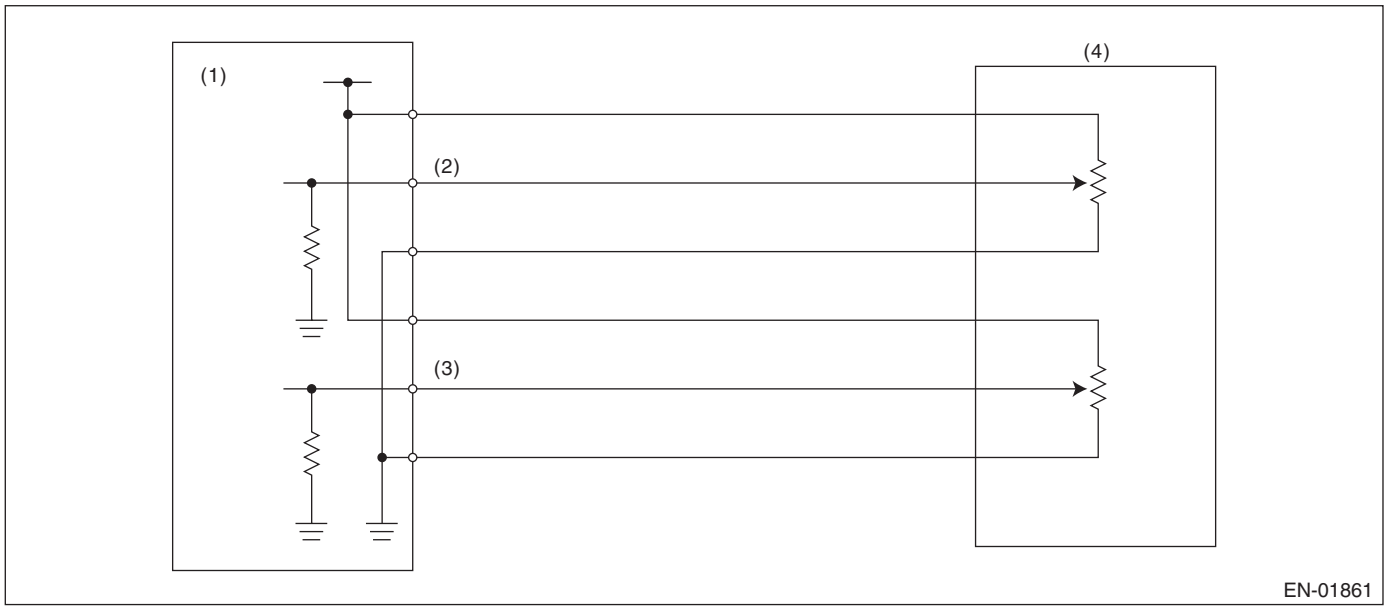
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal
(3) Accelerator pedal position sensor 2 signal
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.781 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

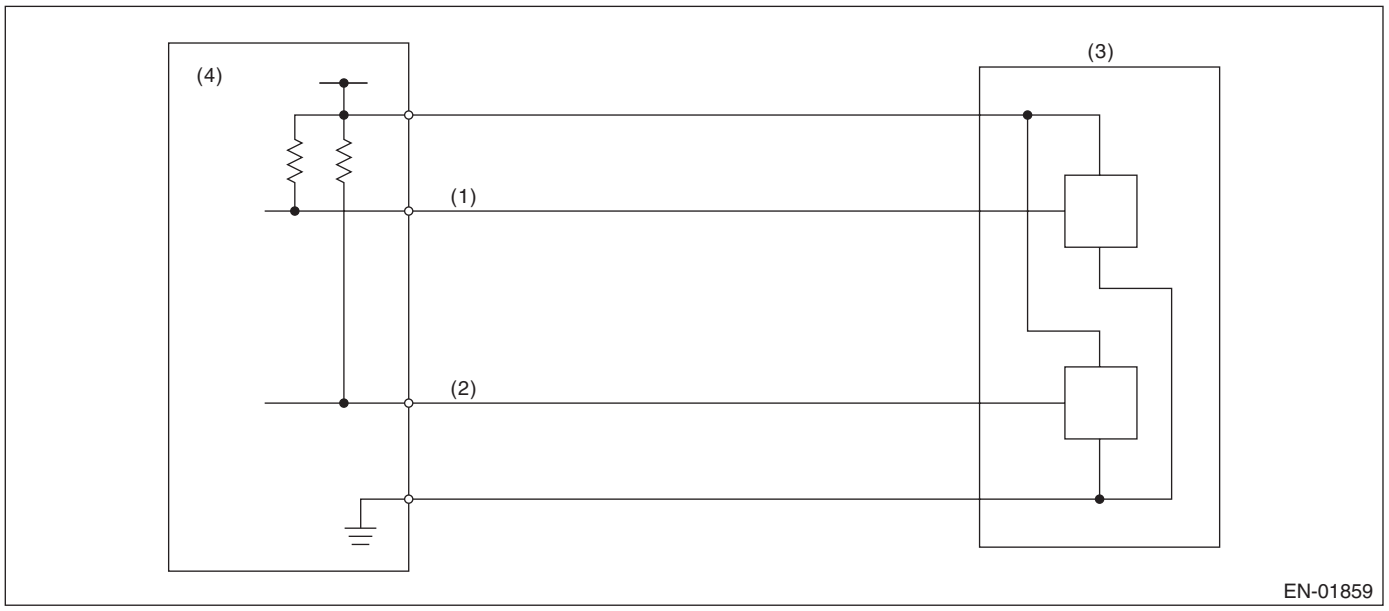
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

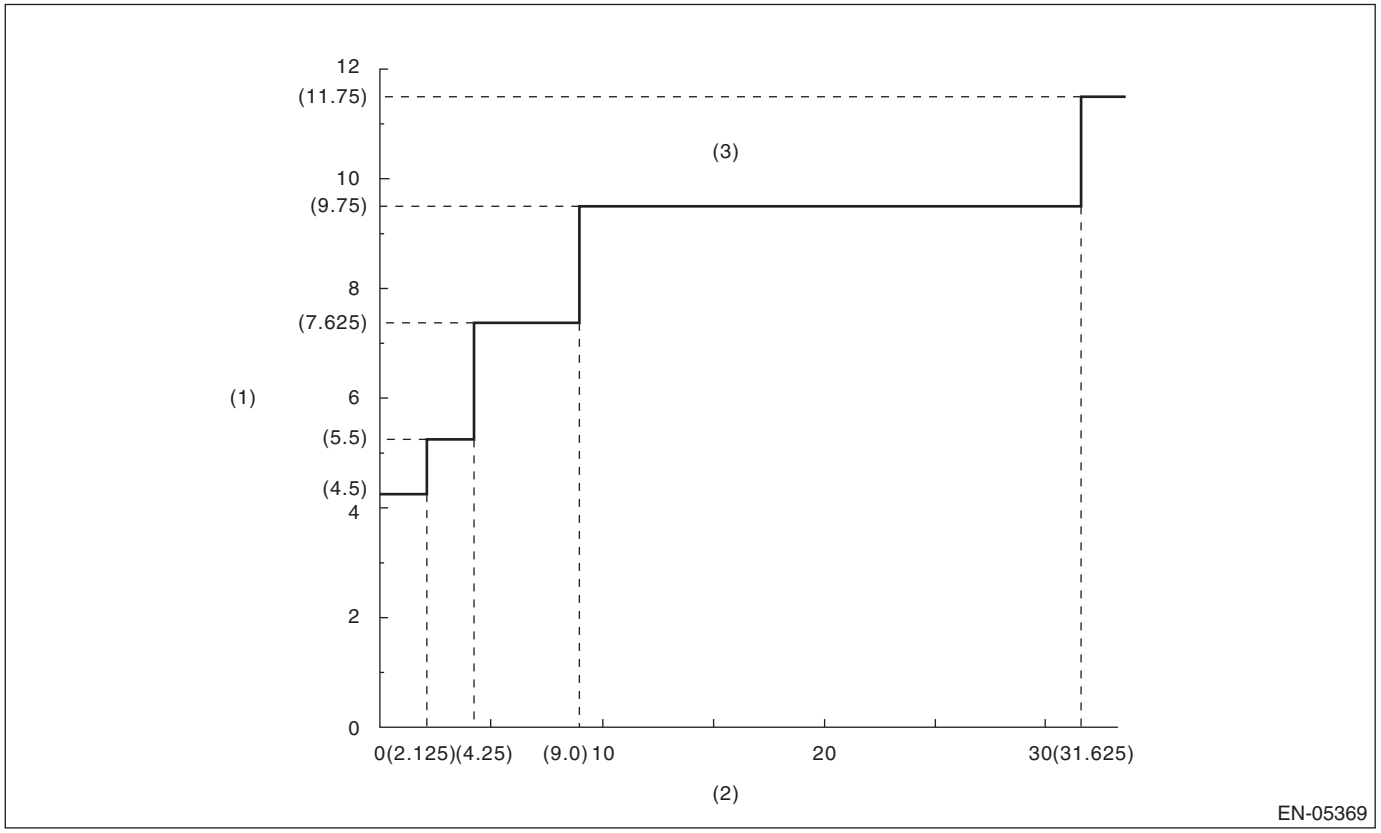
5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 4.5 deg

Details of Judgment Value



(1) Sensor output difference (°)
(2) Throttle position sensor 1 opening angle (°)
(3) NG area

Time Needed for Diagnosis: 212 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to ETC motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

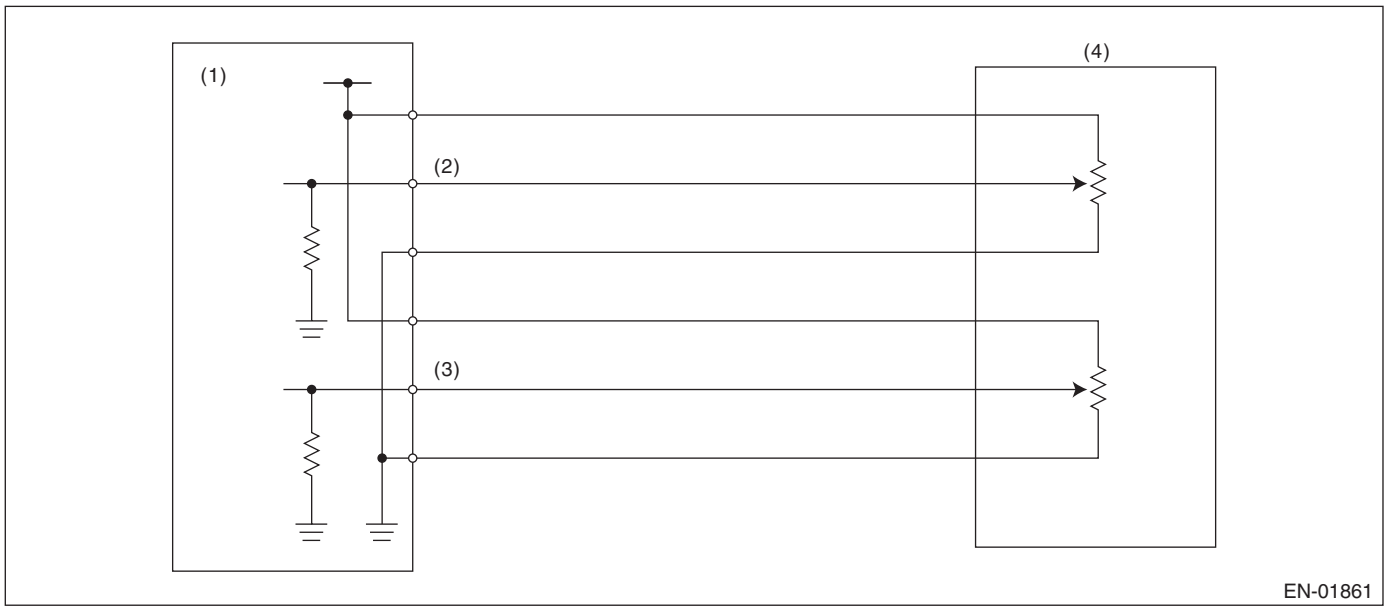
Memorize the freeze frame data. (For test mode $02)

EM: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.

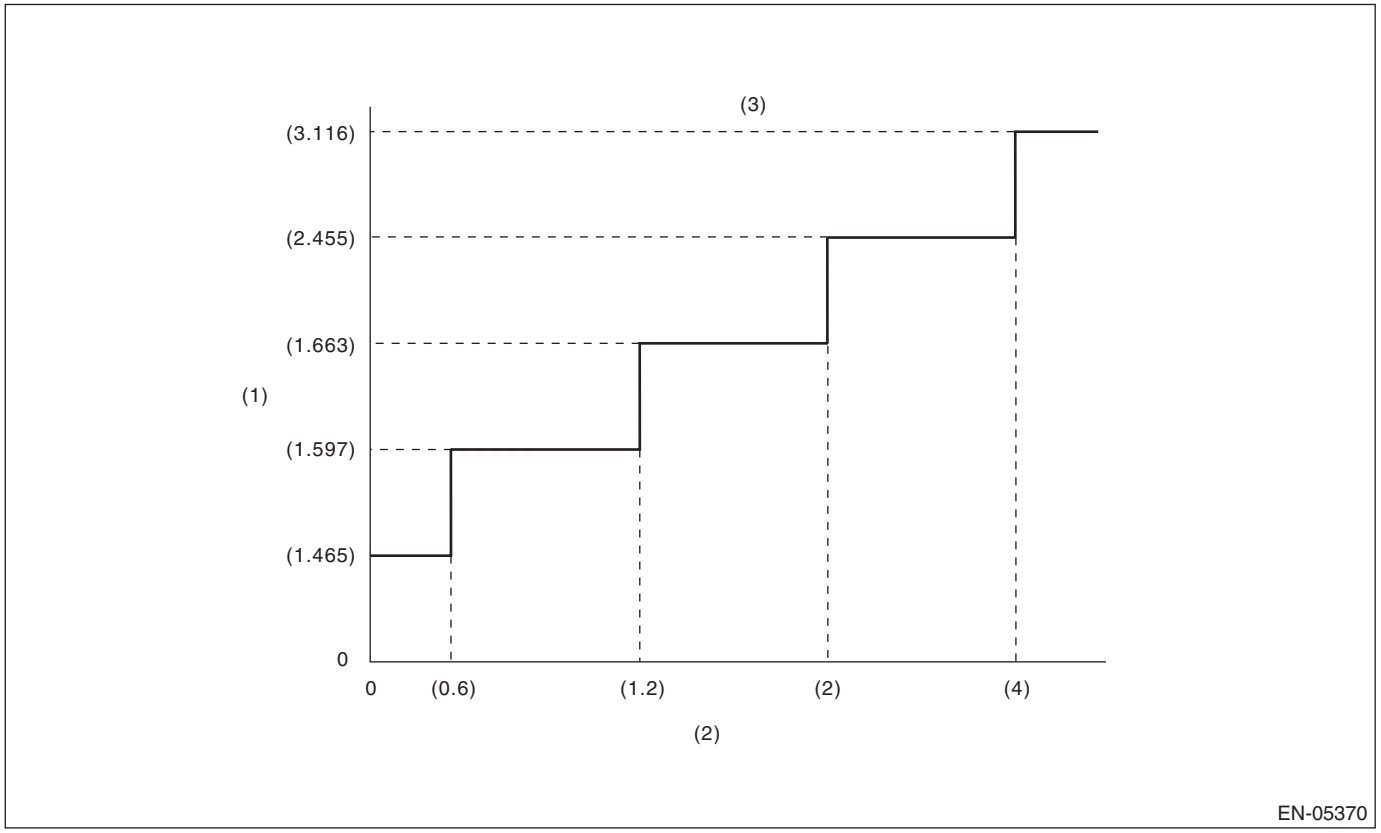
5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≥ 1.465°

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 CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EN:DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve 2.
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 meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EO:DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve 2.
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 meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EP:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of secondary air pressure sensor output property.
Judge as NG when the secondary air pressure sensor output is largely different from the intake manifold pressure at engine start.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at engine start	< 300 rpm
Vehicle speed	< 1 km/h
after secondary air system stop	3 seconds or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis with ignition switch ON.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time of meeting the following conditions is 0.3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
|Secondary air pipe pressure – Intake manifold pressure|	≥ 200 mmHg
|Intake manifold pressure at engine start – Intake manifold pressure|	< 10 mmHg

Time Needed for Diagnosis: 0.3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the following conditions is 0.26 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
|Secondary air pipe pressure – Intake manifold pressure|	< 200 mmHg

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EQ:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG if out of specification.

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 if the continuous time of meeting the following conditions is 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.568 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 if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.568 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

ER:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG if out of specification.

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 if the continuous time of meeting the following conditions is 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.921 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 if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.921 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

ES:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1)

NOTE:
For diagnostic procedures, refer to DTC P0410. <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

ET:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1)

NOTE:
For diagnostic procedures, refer to DTC P0410. <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EU:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2)

NOTE:
For diagnostic procedures, refer to DTC P0410. <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EV:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2)

NOTE:
For diagnostic procedures, refer to DTC P0410. <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EW:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

1. OUTLINE OF DIAGNOSIS

Detect the secondary air pump malfunction (always ON).
Judge as NG if the secondary air pipe pressure is higher than secondary air closing pressure when the secondary air pump is OFF.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	7 V
Engine	In operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Secondary air delivery pipe pressure should be lower than the secondary air closing pressure when the secondary air pump is OFF. Judge as NG if it is higher.

Abnormality Judgment

Judge as NG if the continuous time of meeting all the following conditions is 5 seconds or more.

Malfunction Criteria	Threshold Value
Time since secondary air control completion	≥ 3 seconds or < 8 seconds
Secondary air closing pressure	Detection completed
Secondary air pipe pressure – Secondary air closing pressure	> 6.7 kPa (50 mmHg, 1.98 inHg)

Time Needed for Diagnosis: 8 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting all the following conditions is 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Estimate ambient temperature	≥ 4.4°C (39.92°F)
Battery voltage	≥ 10.9 V
After secondary air system operation	0.6 seconds or more
Battery voltage	≥ 7 V
Barometric pressure	≥ 75.0 kPa (563 mmHg, 22.15 inHg)
Engine	In operation
after secondary air system stop	3 seconds or more
Secondary air pipe pressure (absolute pressure)	≤ Value from Map 22

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

ENGINE 3 SECTION

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)

FUEL INJECTION (FUEL SYSTEMS)

FU(H6DO)

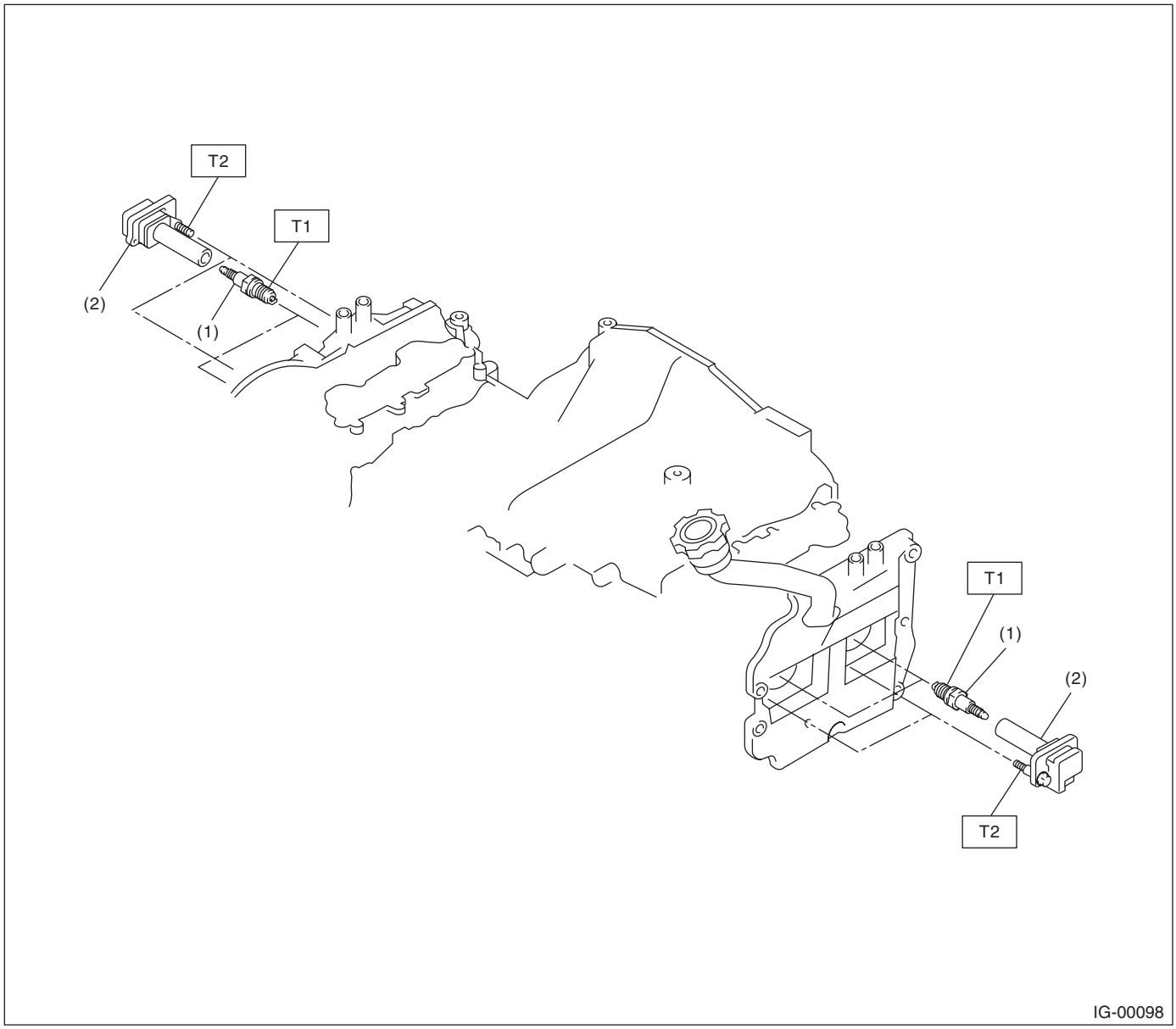
		Page
1.	General Description	2
2.	Throttle Body	12
3.	Intake Manifold	13
4.	Engine Coolant Temperature Sensor	18
5.	Crankshaft Position Sensor	19
6.	Camshaft Position Sensor	20
7.	Knock Sensor	21
8.	Throttle Position Sensor	22
9.	Manifold Absolute Pressure Sensor	23
10.	Mass Air Flow and Intake Air Temperature Sensor	24
11.	Fuel Injector	25
12.	Variable Valve Lift Diagnosis Oil Pressure Switch	27
13.	Oil Temperature Sensor	28
14.	Front Oxygen (A/F) Sensor	29
15.	Rear Oxygen Sensor	31
16.	Engine Control Module (ECM)	33
17.	Main Relay	34
18.	Fuel Pump Relay	35
19.	Electronic Throttle Control Relay	36
20.	Fuel Pump Control Unit	37
21.	Fuel	38
22.	Fuel Tank	40
23.	Fuel Filler Pipe	46
24.	Fuel Pump	49
25.	Fuel Level Sensor	51
26.	Fuel Sub Level Sensor	52
27.	Fuel Filter	53
28.	Fuel Bypass Valve	54
29.	Fuel Delivery, Return and Evaporation Lines	55
30.	Fuel System Trouble in General	58

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: SILFR6A
	Thread size (diameter, pitch, length) mm	14, 1.25, 26.5
	Spark plug gap mm (in)	0.7 — 0.8 (0.028 — 0.031)
	Electrode	Iridium

B: COMPONENT



(1) Spark plug
(2) Ignition coil

Tightening torque:N·m (kgf-m, ft-lb)
T1: 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 the battery.

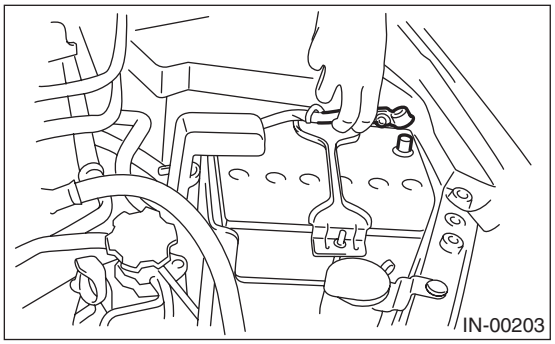
2. Spark Plug

A: REMOVAL

Spark plug:
Refer to "SPECIFICATION" for the spark plug. <Ref. to IG(H4DOTC)-2, SPECIFICATION, General Description.>

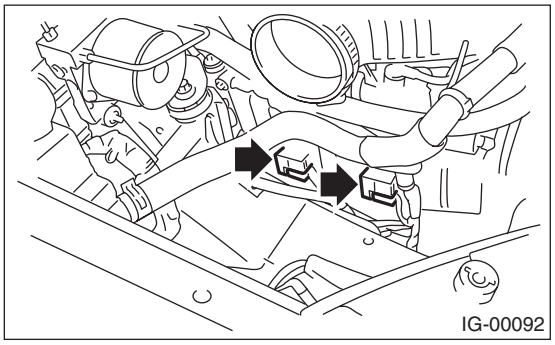
1. RH SIDE

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



3) Remove the air cleaner case.
<Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
4) Disconnect the connector from ignition coil.
5) Remove the ignition coil.

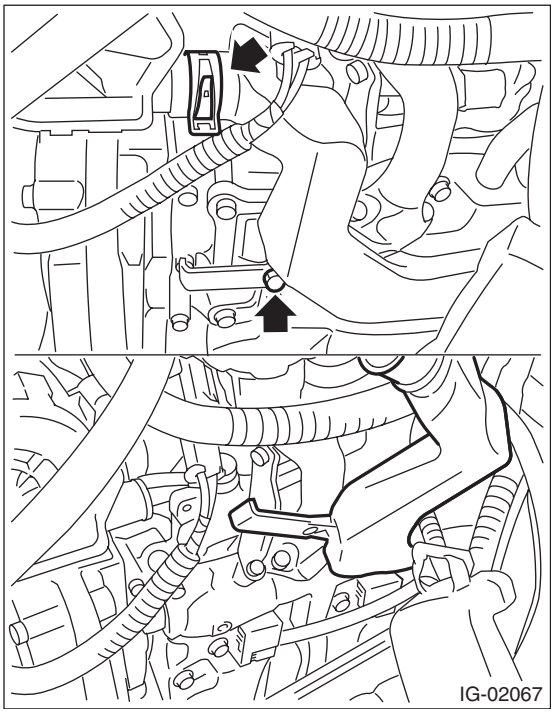
NOTE:
Turn #3 ignition coil by 180 degrees to remove it.



6) Remove the spark plug with a spark plug socket.

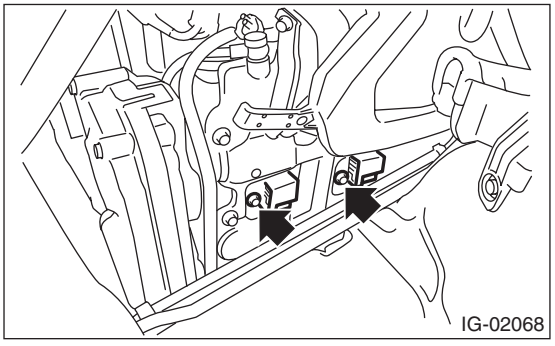
2. LH SIDE

1) Remove the collector cover.
2) Remove the battery and battery carrier.
3) Disconnect the secondary air pump duct from the secondary air pump. <Ref. to EC(H4DOTC)-20, REMOVAL, Secondary Air Pump.>
4) Remove the bolts that attach the secondary air pump duct to the rocker cover (LH), and raise the secondary air pump duct.



5) Disconnect the connector from ignition coil.
6) Remove the ignition coil.

NOTE:
Turn #4 ignition coil by 180 degrees to remove it.



7) 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)

2. LH SIDE

Install in the reverse order of removal.

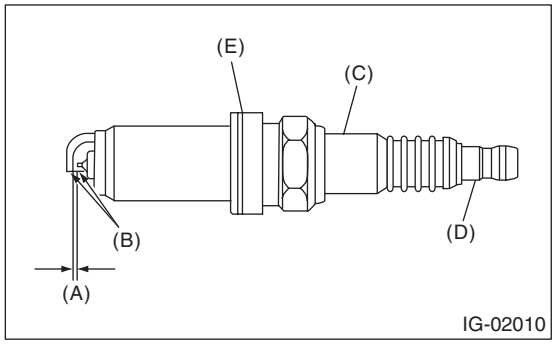
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

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

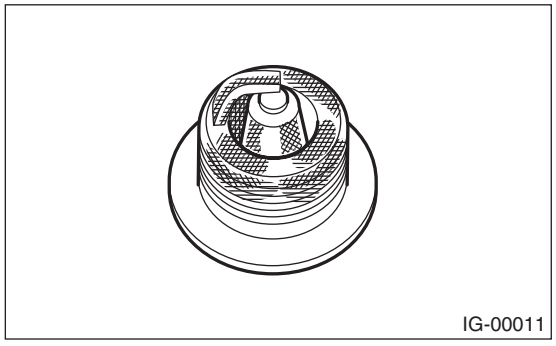
C: INSPECTION

Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.

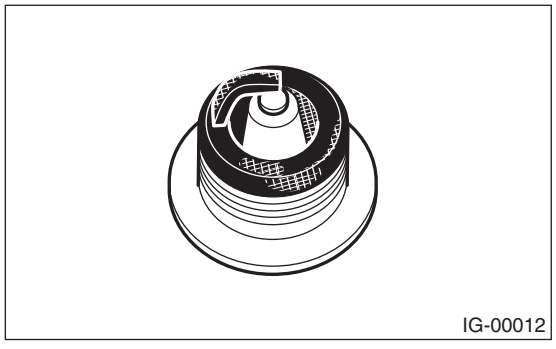


(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Crack
(D) Damage
(E) Damaged gasket

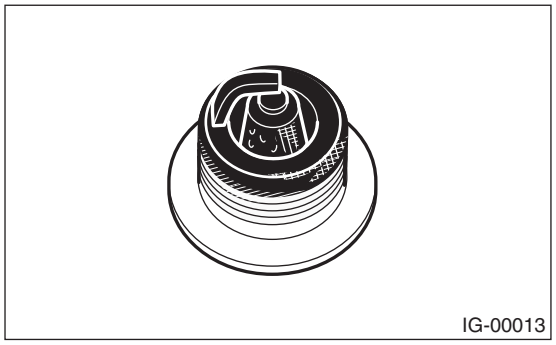
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



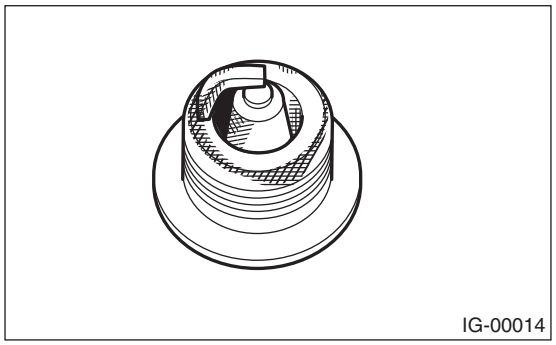
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture and dirty air cleaner.



3) Oil fouled:
Wet black deposits show oil entrance into the combustion chamber through worn rings and excessive clearance between valve guides and stems.



4) Overheating:
White or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating, incorrect ignition timing, wrong selection of fuel, and loose spark plugs.

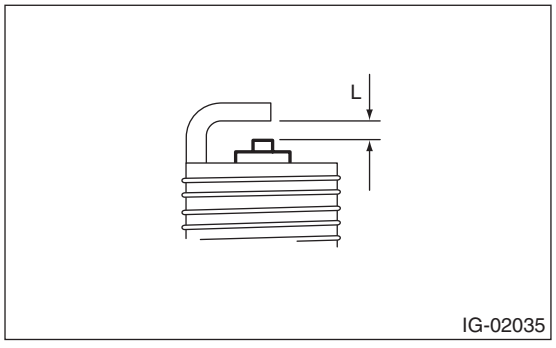


D: ADJUSTMENT

Clean up the spark plug using nylon brush or equivalent. Clean and remove the carbon or oxide deposits. If deposits are too stubborn, replace the spark plugs. After cleaning the spark plugs, measure the spark plug gap using a gap gauge.

NOTE:
- Never use a plug cleaner.
- Never use a metal brush because it makes insulator worn.

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



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)-76, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

STARTING/CHARGING SYSTEMS

SC(H4DOTC)

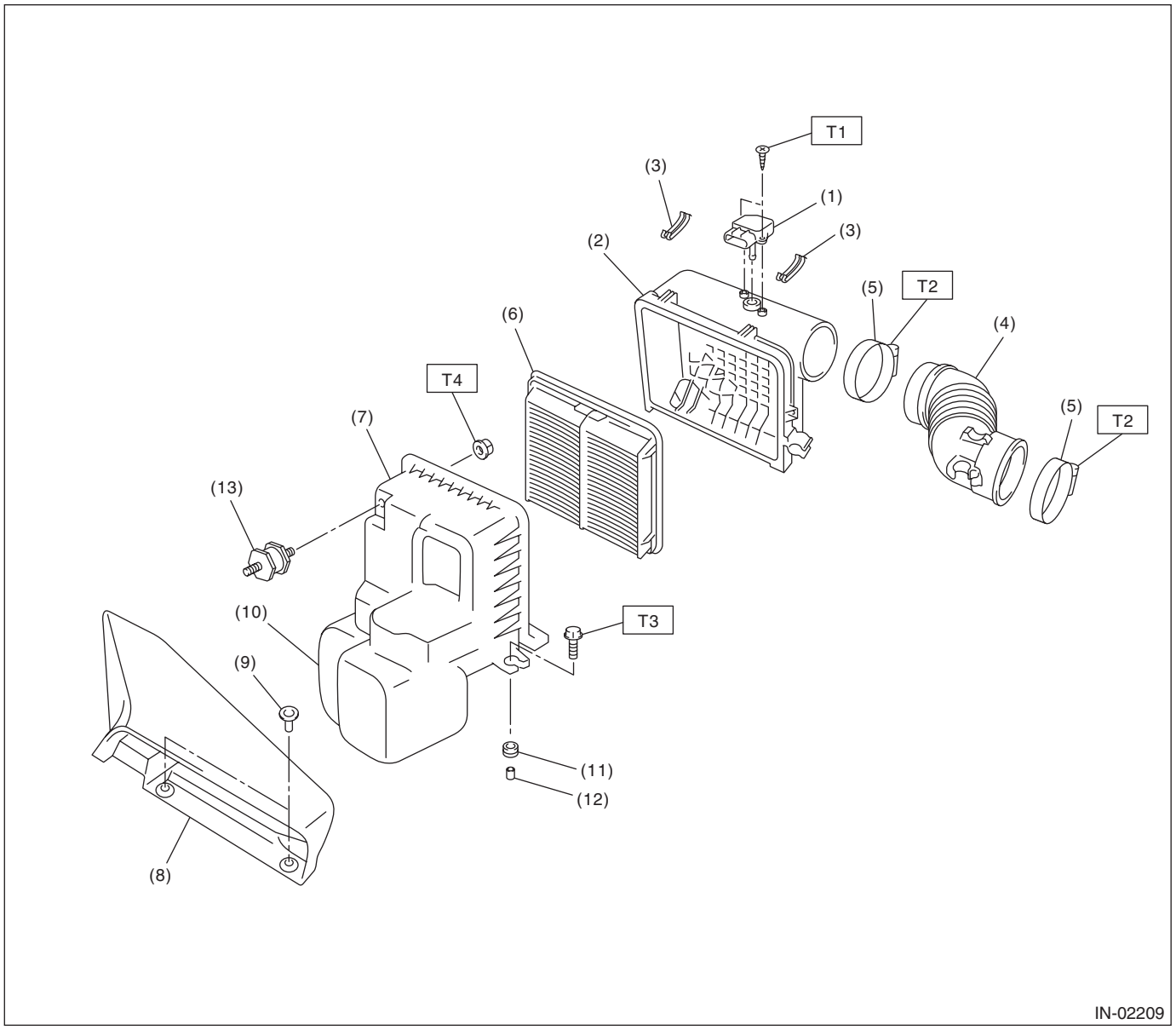
Page

1. General Description 2

1. General Description

A: COMPONENT

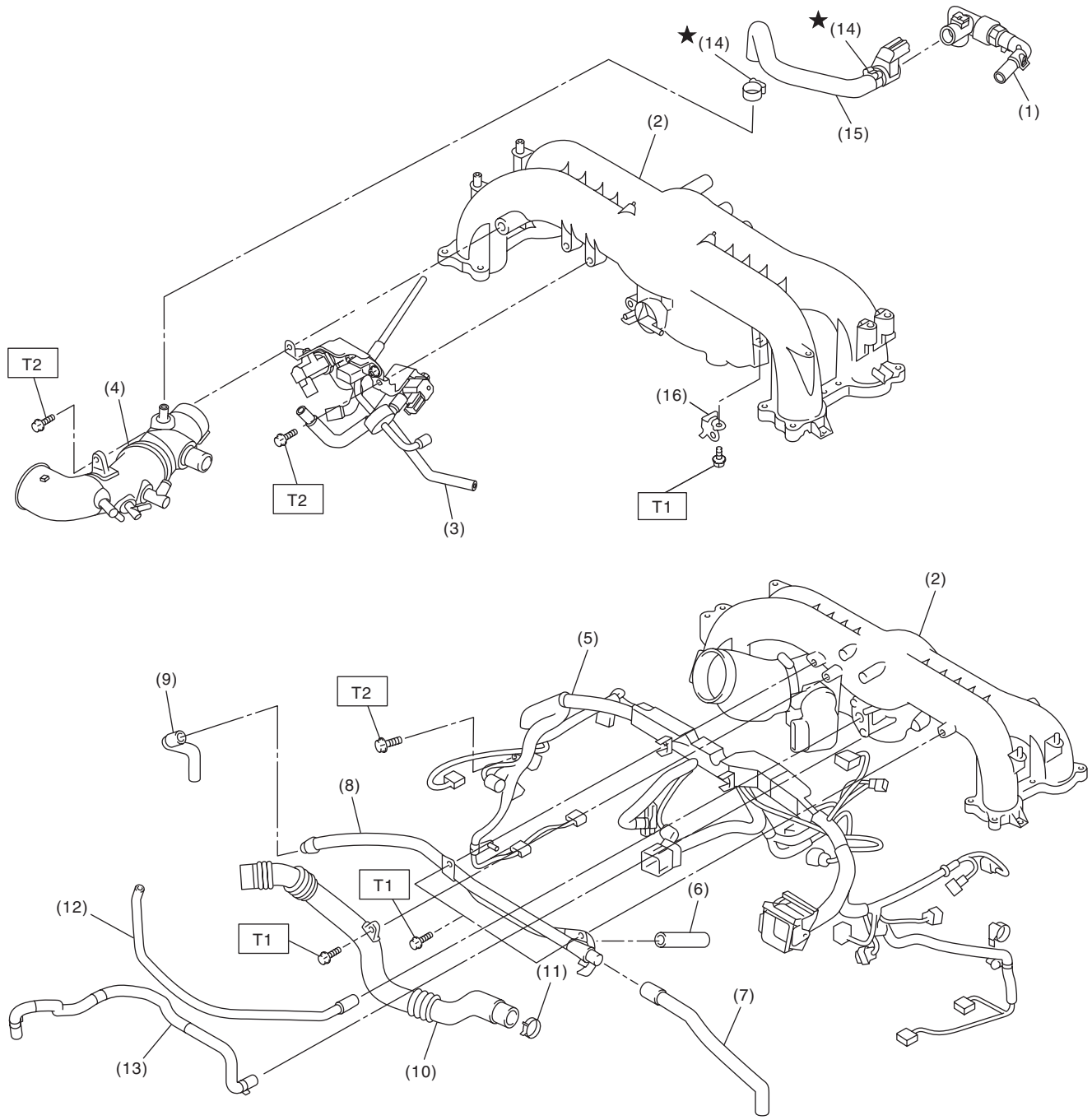
1. AIR CLEANER



(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

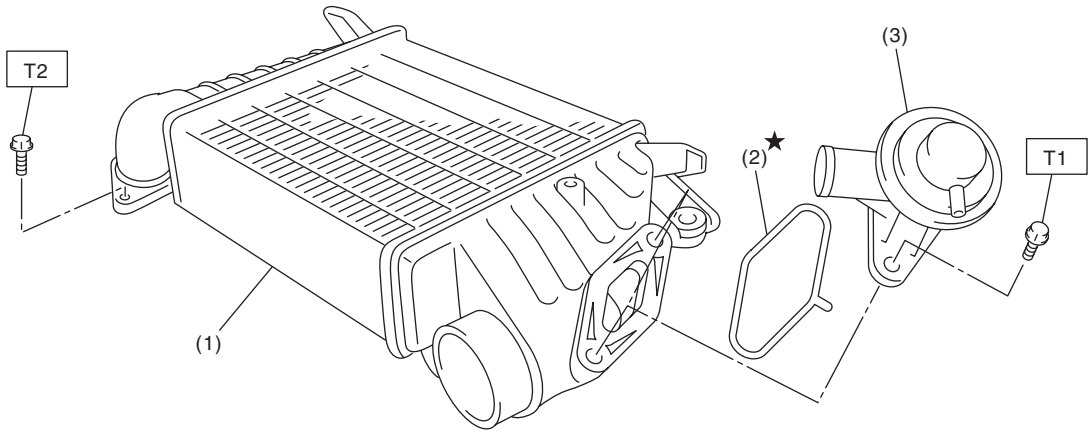


IN-02224

(1) PCV hose ASSY A
(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
(15) PCV hose ASSY B
(16) Solenoid valve bracket

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 19 (1.9, 13.7)

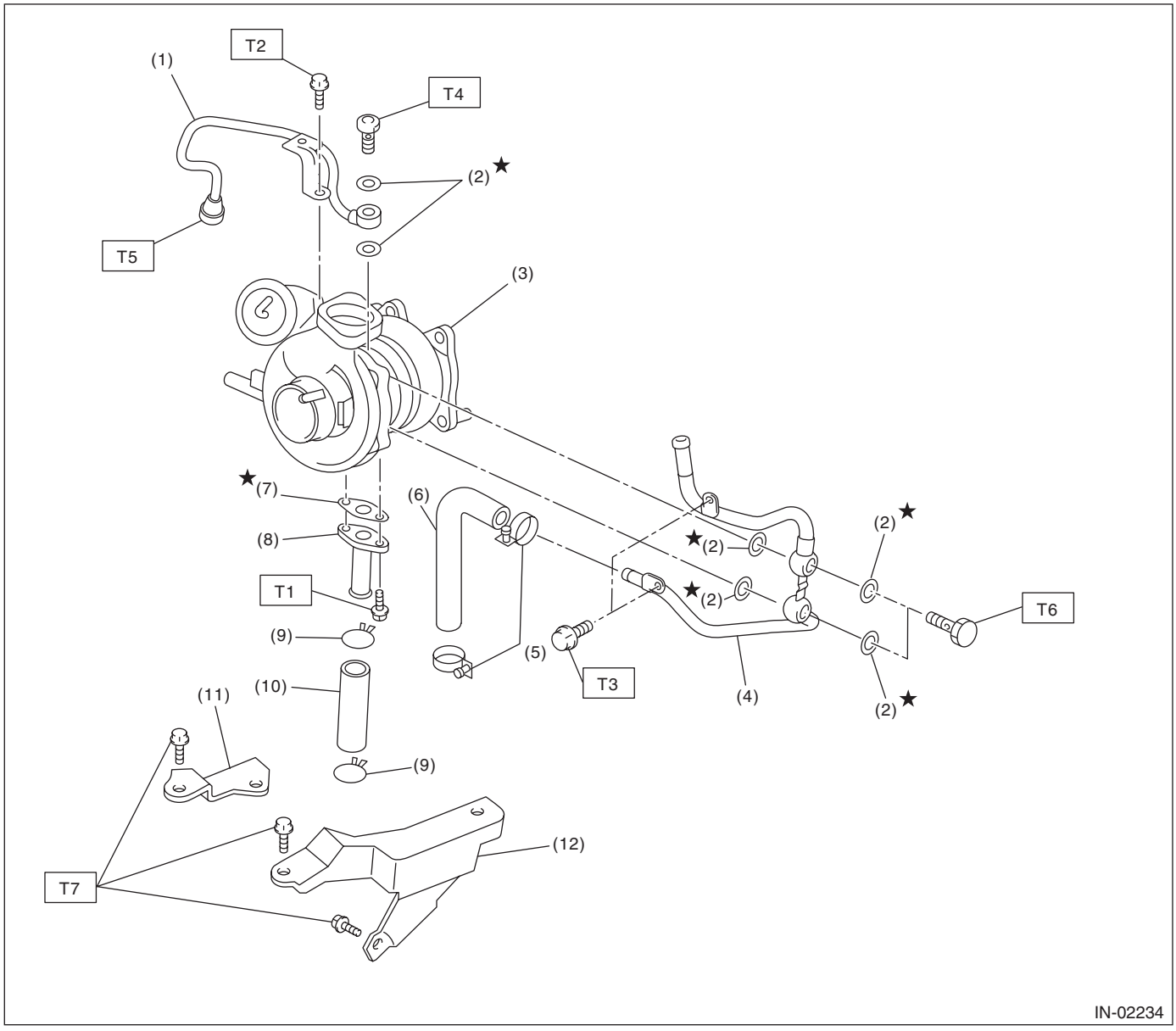
3. INTERCOOLER



(1) Intercooler
(2) O-ring
(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
(2) Metal gasket
(3) Turbocharger
(4) Water pipe
(5) Clamp
(6) Engine coolant hose
(7) Gasket
(8) Oil outlet pipe
(9) Clip
(10) Oil outlet hose
(11) Turbocharger bracket RH
(12) Turbocharger bracket LH

Tightening torque:N·m (kgf-m, ft-lb)
T1: 4.9 (0.5, 3.6)
T2: 5.0 (0.51, 3.7)
T3: 7.8 (0.8, 5.8)
T4: 16 (1.6, 11.6)
T5: 20 (2.0, 14.8)
T6: 23 (2.3, 17.0)
T7: 33 (3.4, 24.6)

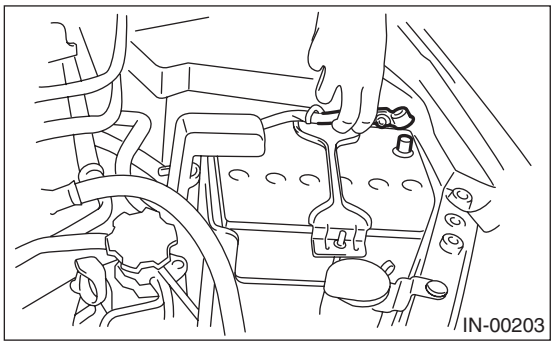
B: CAUTION

- 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 the battery.

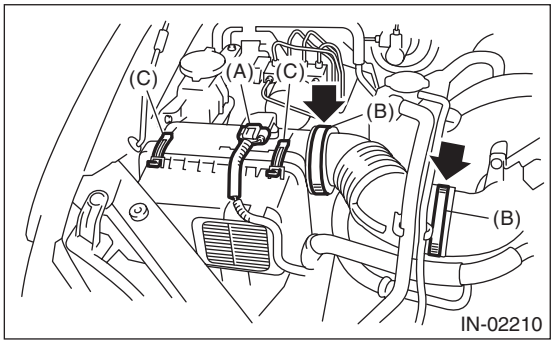
2. Air Cleaner Element

A: REMOVAL

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



3) Disconnect the connector (A) from the mass air flow sensor.
4) Loosen the clamp (B) which connects the air intake boot and intake duct.
5) Remove the clip (C) from the air cleaner case.



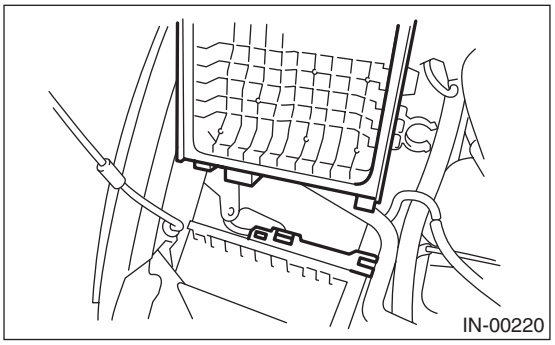
6) Remove the air cleaner case (rear) and air intake boot.
7) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to use SUBARU genuine air cleaner element depending on the engine type when replacing the air cleaner elements. Otherwise engine performance may be damaged.

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.



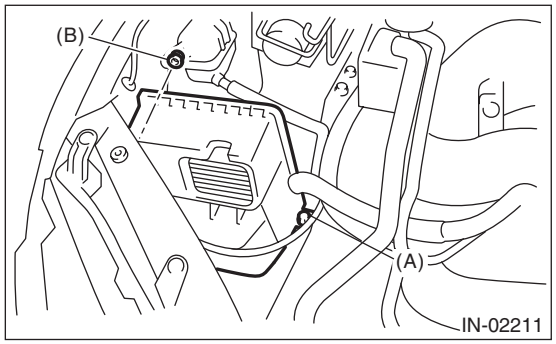
C: INSPECTION

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)

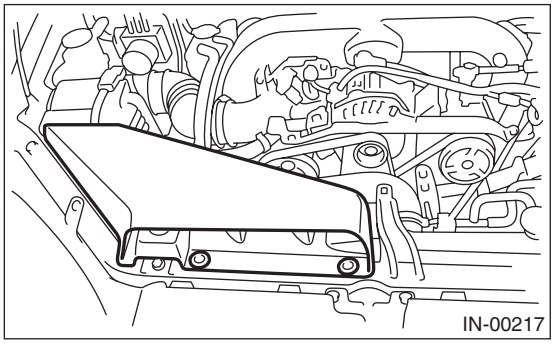
C: INSPECTION

Check for cracks or loose connections.

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 connections.
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.>

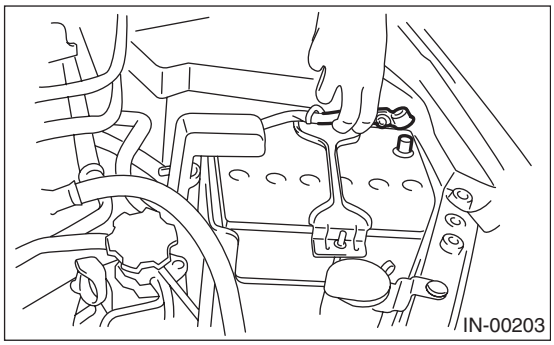
C: INSPECTION

Check for cracks or loose connections.

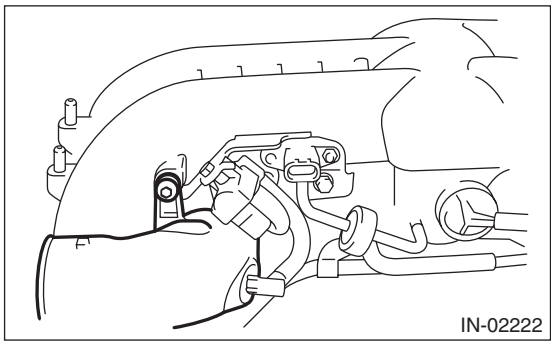
6. Intake Duct

A: REMOVAL

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



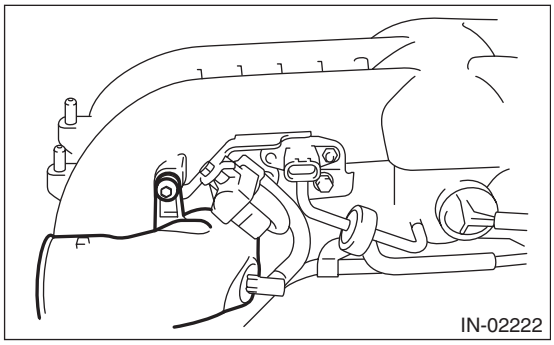
3) Remove the intake manifold. <Ref. to FU(H4DOTC)-13, REMOVAL, Intake Manifold.>
4) Remove the sensor, engine harness and fuel pipe attached to the intake manifold. <Ref. to FU(H4DOTC)-19, DISASSEMBLY, Intake Manifold.>
5) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

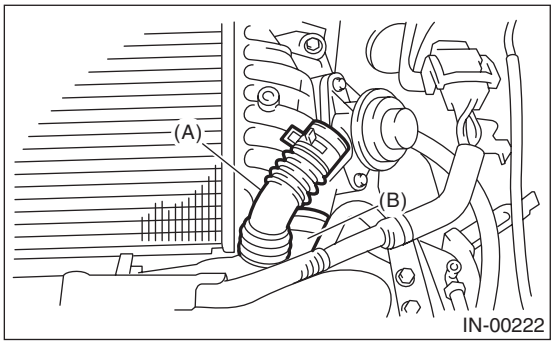
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



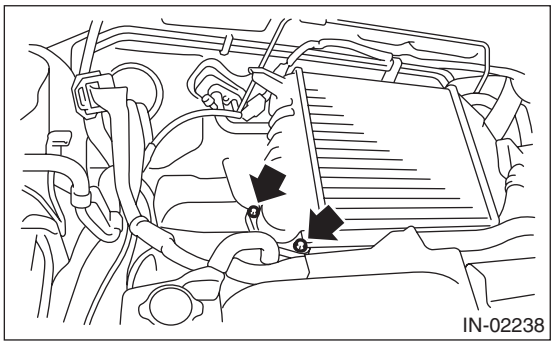
7. Intercooler

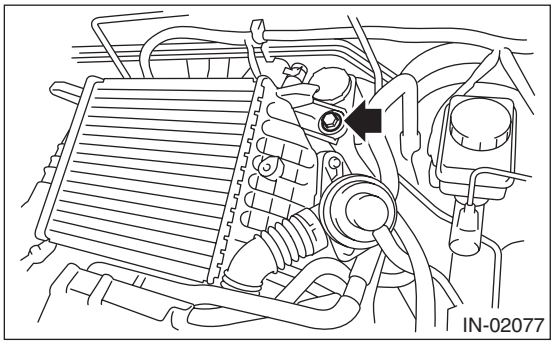
A: REMOVAL

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.

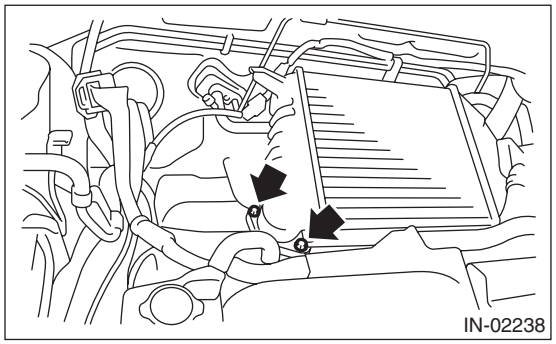


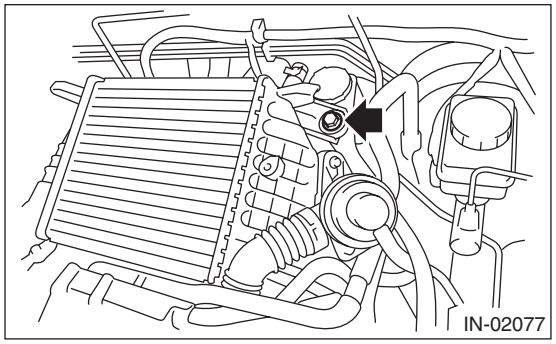


B: INSTALLATION

Install in the reverse order of removal.

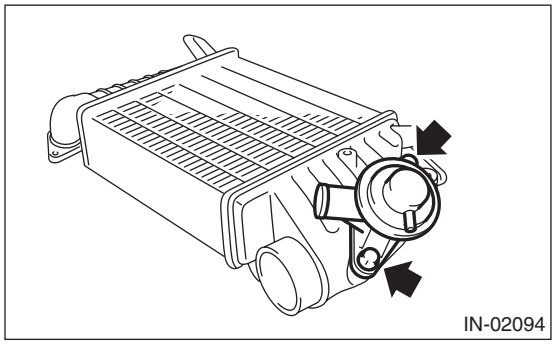
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)





C: DISASSEMBLY

1) Remove the intake duct from the intercooler.
2) Remove the air by-pass valve from intercooler.

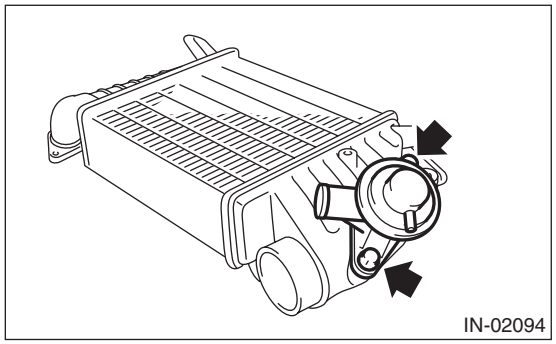


D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
- Use new O-rings.
- Be careful not to pinch the O-ring.

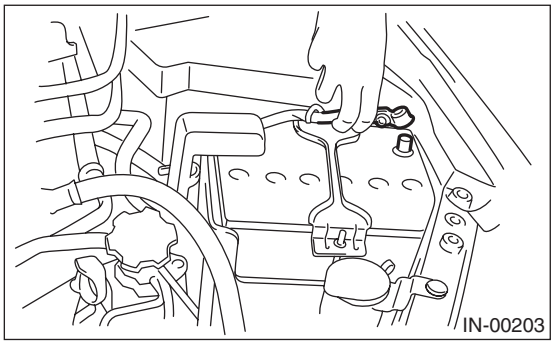
Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



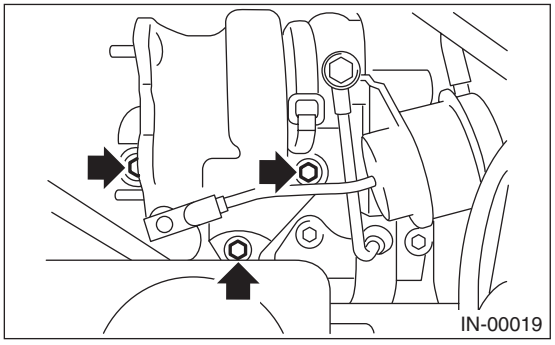
8. Turbocharger

A: REMOVAL

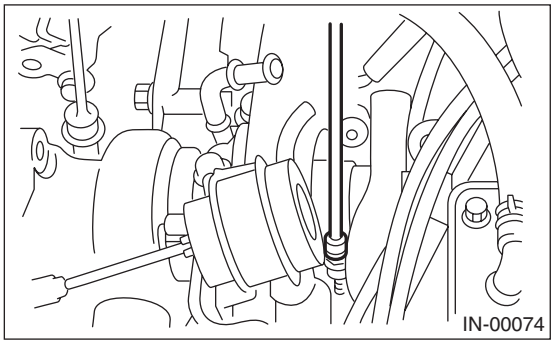
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from the battery.



4) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
5) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
6) Lower the vehicle.
7) Separate the turbocharger joint pipe from turbocharger.

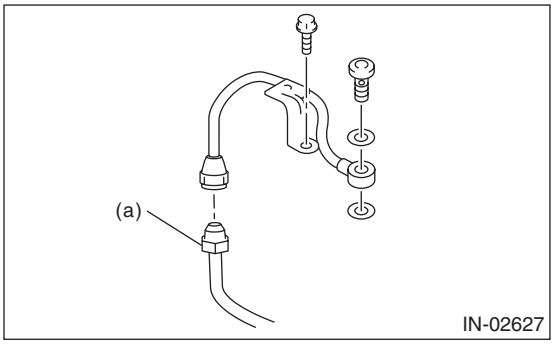


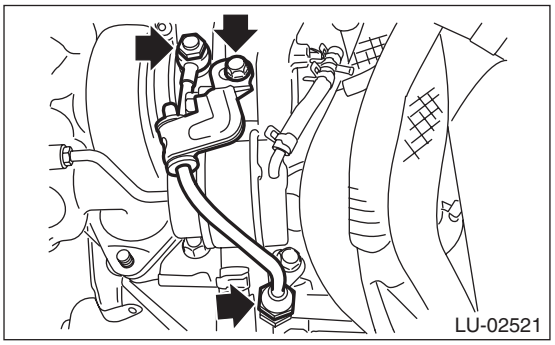
8) Disconnect the engine coolant hose which is connected to coolant filler tank.
9) Loosen the clamp which secures turbocharger to intake duct.



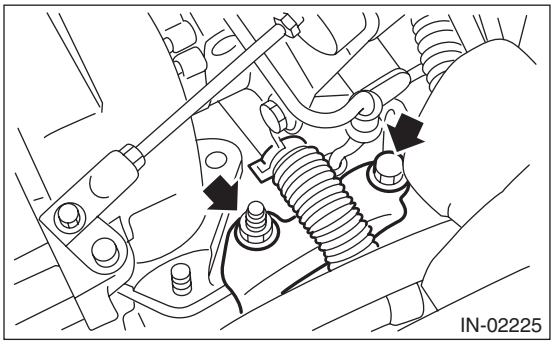
10) Remove the bolts which secure oil pipe bracket to turbocharger.
11) Remove the oil inlet pipe from the turbocharger.

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.

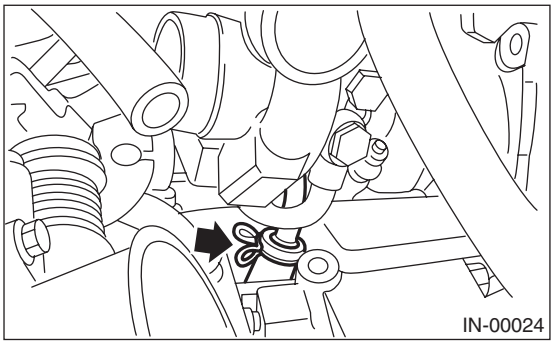




12) Disconnect the engine coolant hose from the pipe, and remove the turbocharger bracket RH.



13) Disconnect the oil outlet hose from pipe.

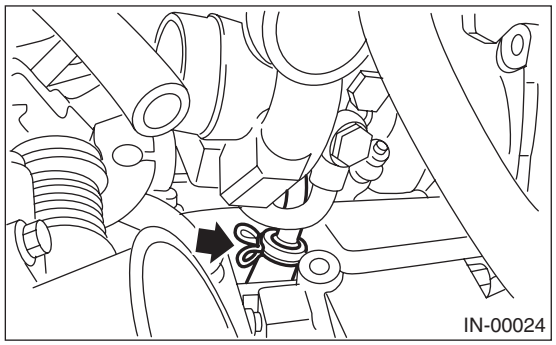


14) Take out the turbocharger from engine compartment.

B: INSTALLATION

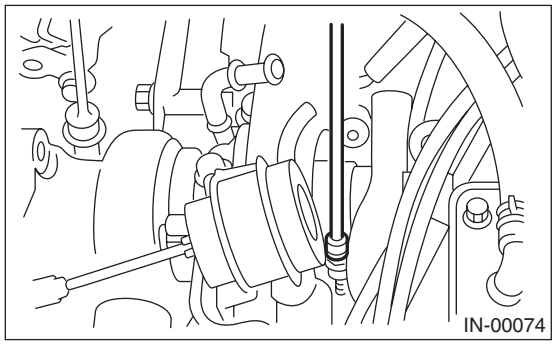
CAUTION:
When replacing the turbocharger, check the filter part of union screw for clogging. <Ref. to LU(H4DOTC)-24, INSPECTING UNION SCREW WITH FILTER, INSPECTION, Oil Pipe.>

1) Connect the oil outlet hose to outlet pipe.



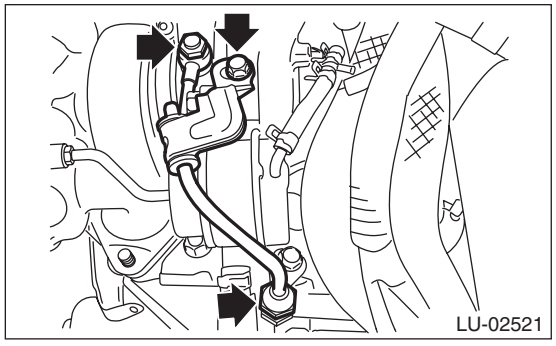
2) Install the turbocharger to intake duct.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



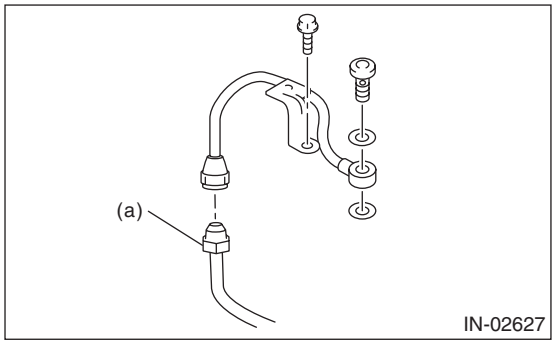
3) Temporarily tighten the bolts and flare nuts which secure the oil inlet pipe to the turbocharger.

NOTE:
Use a new gasket.

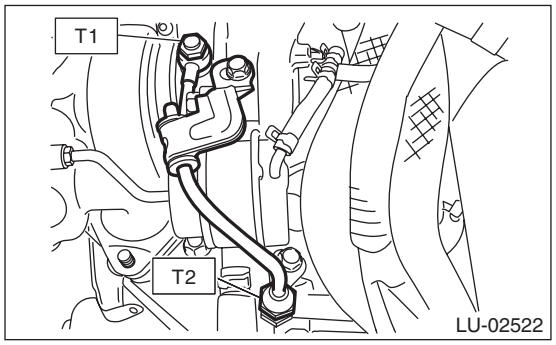


4) Tighten the union screws and flare nuts which secure the oil inlet pipe to the turbocharger.

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.

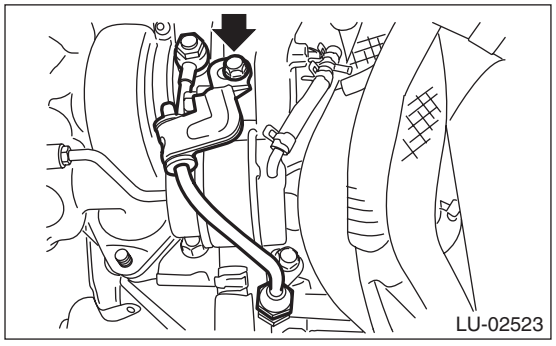


Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



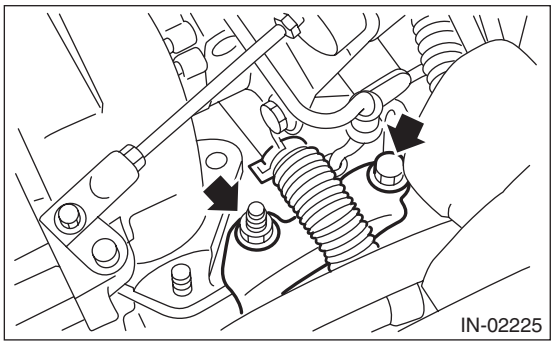
5) Tighten the bolts which hold the oil inlet pipe stay to the turbocharger.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



6) Install the turbocharger bracket RH, and connect the engine coolant hose to the pipe.

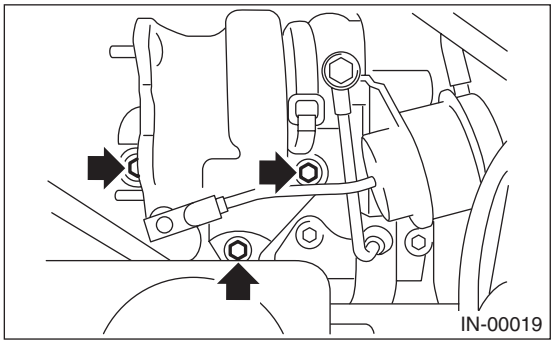
Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



7) Install the joint pipe to turbocharger.

NOTE:
Replace the gasket with a new part.

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

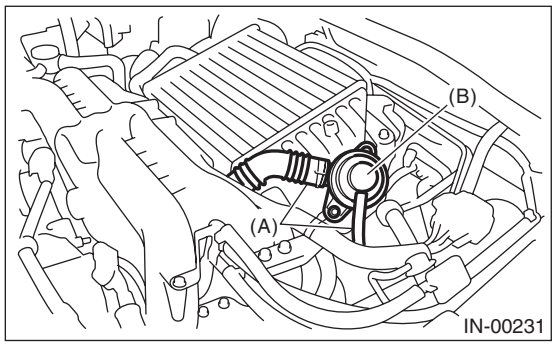


8) Connect the engine coolant hose which is connected to the coolant filler tank.
9) Lift up the vehicle.
10) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
11) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
12) Install the collector cover.

9. Air By-pass Valve

A: REMOVAL

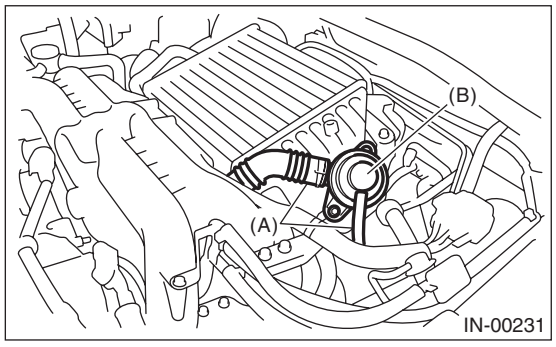
1) Remove the collector cover.
2) Disconnect the air by-pass hose (A) from the air by-pass valve.
3) Remove the air by-pass valve (B) from the inter-cooler.



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)

		Page
1.	General Description	2
2.	Compression	20
3.	Idle Speed	21
4.	Ignition Timing	22
5.	Intake Manifold Vacuum	23
6.	Engine Oil Pressure	24
7.	Fuel Pressure	25
8.	Valve Clearance	26
9.	Engine Assembly	29
10.	Engine Mounting	35
11.	Preparation for Overhaul	36
12.	V-belt	37
13.	Crank Pulley	40
14.	Timing Belt Cover	42
15.	Timing Belt	43
16.	Cam Sprocket	51
17.	Crank Sprocket	52
18.	Camshaft	53
19.	Cylinder Head	58
20.	Cylinder Block	65
21.	Intake and Exhaust Valve	83
22.	Piston	84
23.	Connecting Rod	85
24.	Crankshaft	86
25.	Engine Trouble in General	87
26.	Engine Noise	93

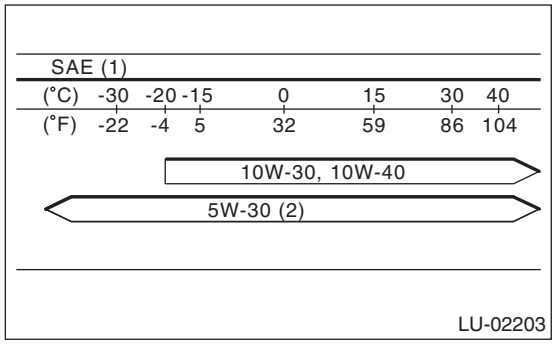
1. General Description

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



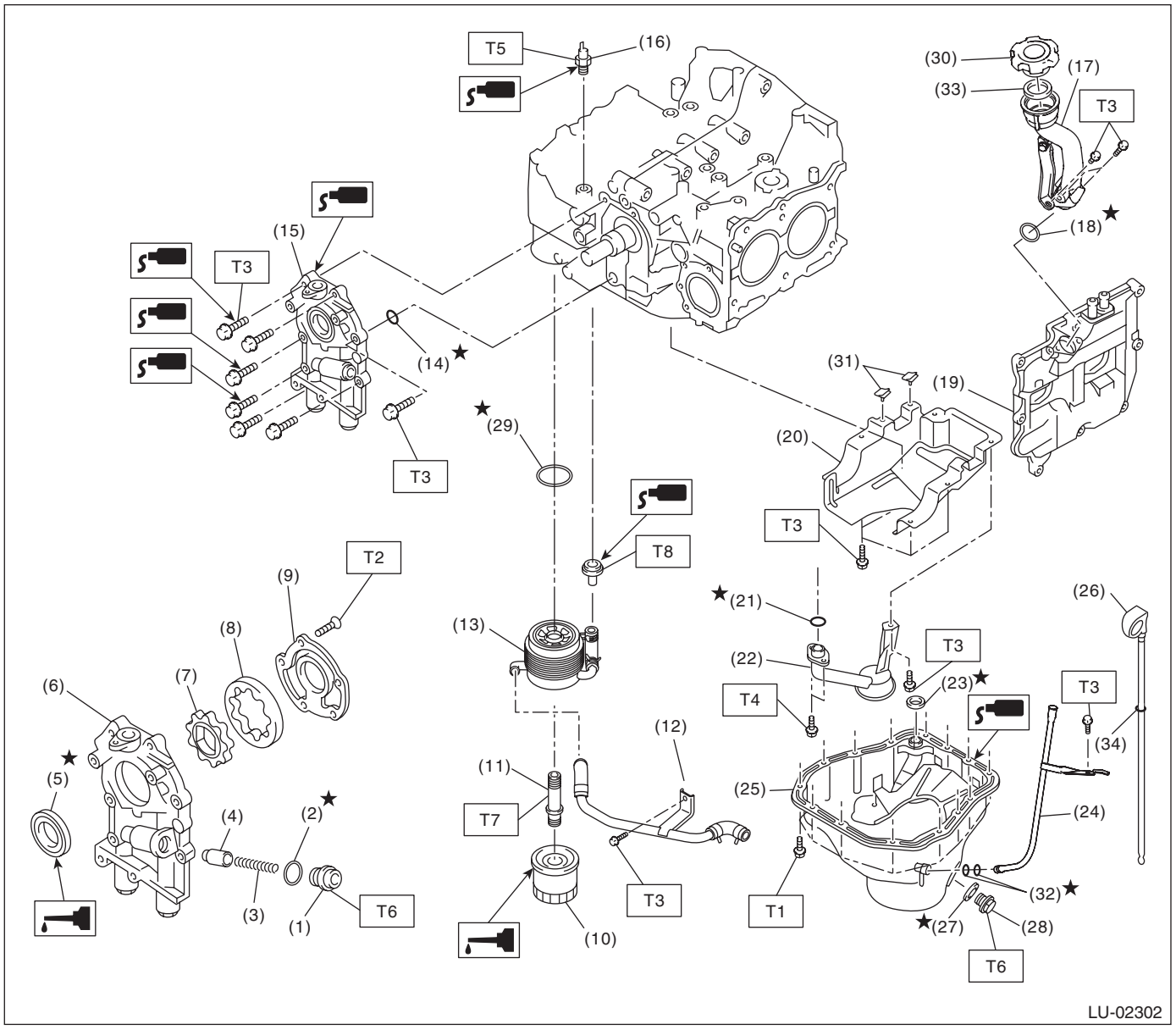
(1) SAE viscosity No. and applicable temperature
(2) Recommended

The proper viscosity oil helps the engine maintain its ideal temperature, and cranking speed increased by reducing viscosity friction in hot condition.

CAUTION:
It is acceptable to fill an engine with oil of another brand when replacing the oil, but make sure to use an oil with an API standard and SAE viscosity number specified by Subaru.

NOTE:
If the vehicle is used in regions with 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) Gasket
(30) Oil filler cap
(31) Seal
(32) O-ring
(33) Gasket
(34) O-ring

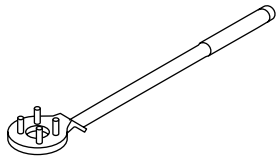
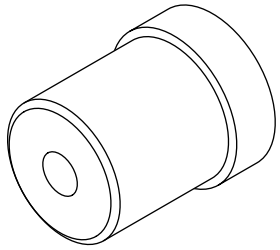
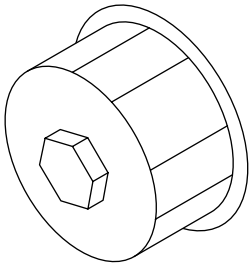
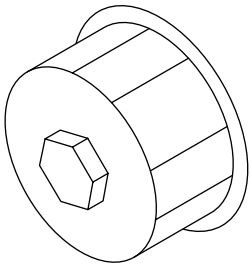
Tightening torque:N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 5.4 (0.55, 4.0)
T3: 6.4 (0.65, 4.7)
T4: 10 (1.0, 7.0)
T5: 25 (2.5, 18.4)
T6: 44 (4.5, 32.5)
T7: 54 (5.5, 40)
T8: 69 (7.0, 50)

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 the battery.

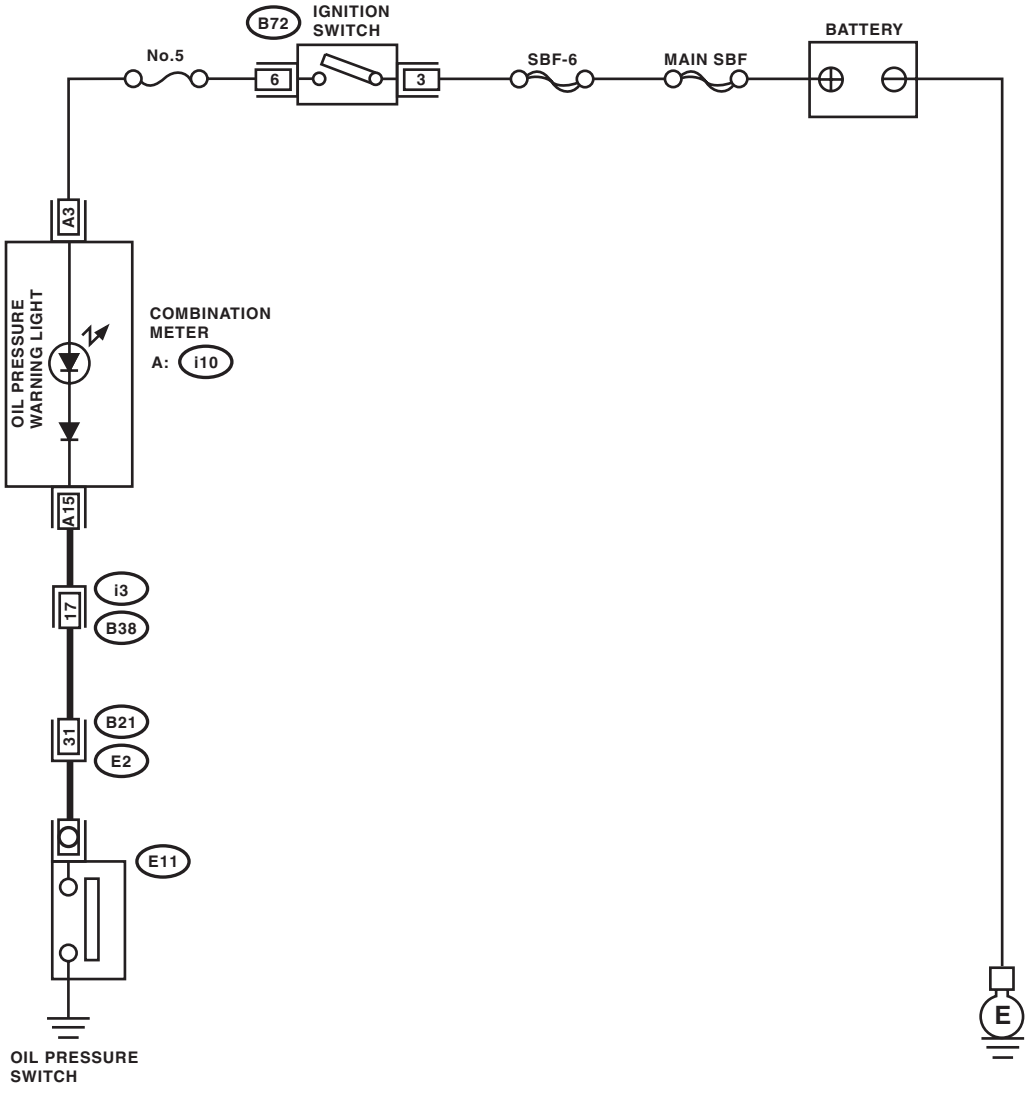
D: PREPARATION TOOL

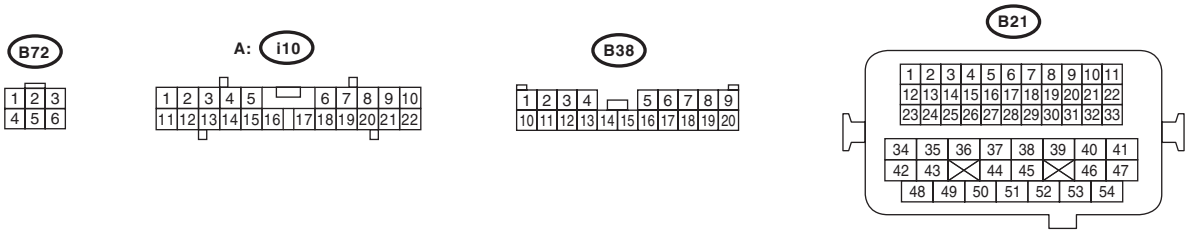
1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when removing and tightening crank pulley bolt.
 ST-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-02327

B: INSPECTION

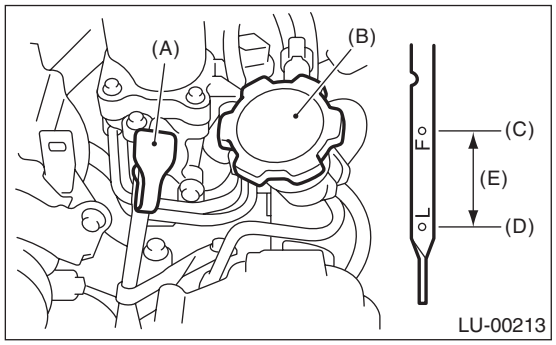
Step		Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (engine OFF) 2) Check the warning light in the combination meter.	Does the warning light illuminate?	Go to step **2**.	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil pressure switch. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between oil pressure switch connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the oil pressure switch.	Go to step **3**.
3	**CHECK COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. ***Terminals*** ***No. 3 — No. 15:***	Is the resistance less than 10 Ω?	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between combination meter and oil pressure switch • Poor contact in combination meter connector • Poor contact in oil pressure switch connector • Poor contact of coupling connector	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>

3. Engine Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe away the oil.
3) Reinsert the 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.

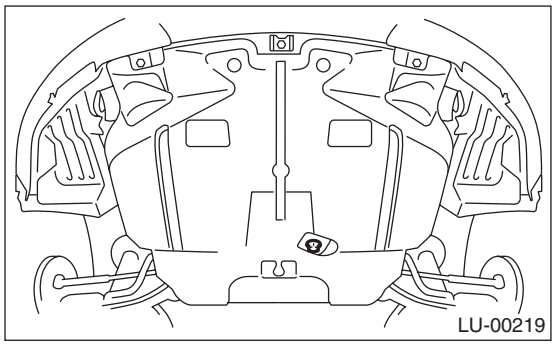


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

1) Set the vehicle on a lift.
2) Open the engine oil filler cap for quick draining of engine oil.
3) Lift up the vehicle.
4) Drain engine oil by loosening the engine oil drain plug.

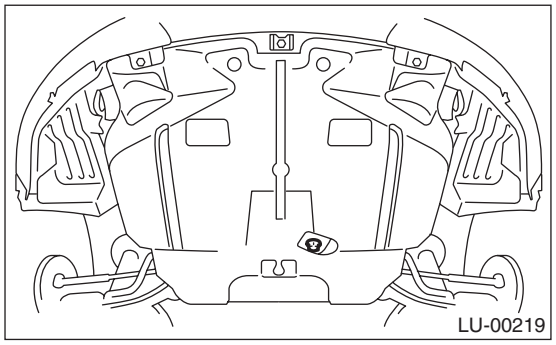
NOTE:
Prepare the container for draining of engine oil.



5) Tighten the engine oil drain plug after draining engine oil.

NOTE:
Use a new metal gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

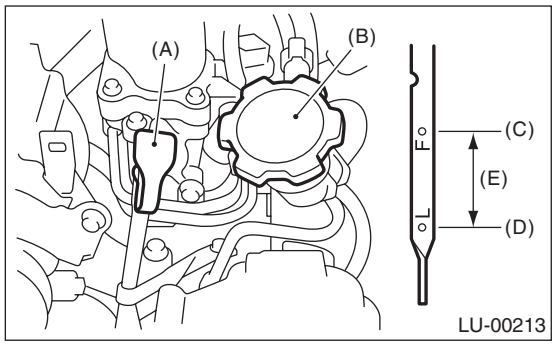


6) Using engine oil of proper quality and viscosity, fill engine oil through the oil filler duct to the upper level on level gauge. Make sure that the vehicle is parked on a level surface when checking oil level.

Recommended oil:
Refer to “SPECIFICATION” for the recommended oil. <Ref. to LU(H4DOTC)-2, SPECIFICATION, General Description.>

Engine oil capacity:
Refer to “SPECIFICATION” for the engine oil capacity. <Ref. to LU(H4DOTC)-2, SPECIFICATION, General Description.>

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

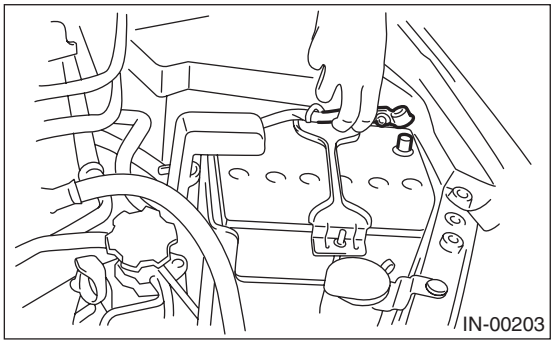


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

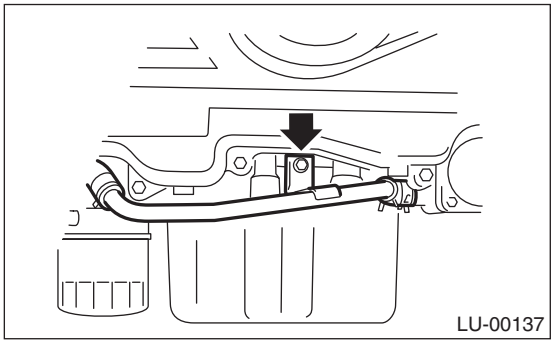
4. Oil Pump

A: REMOVAL

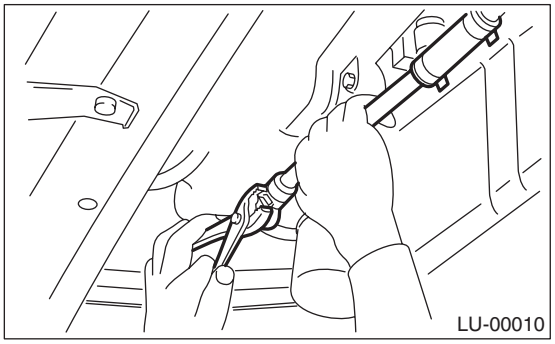
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from the battery.



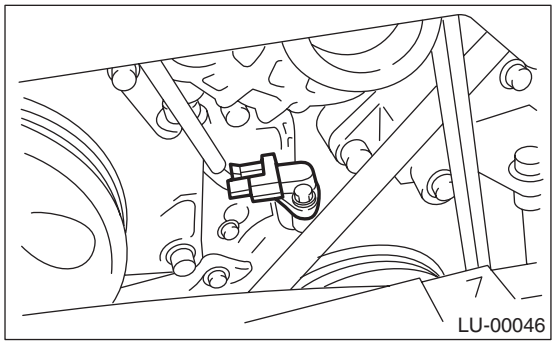
4) Lift up the vehicle.
5) Remove the under cover.
6) Remove the bolts which install water pipe of oil cooler to oil pump.



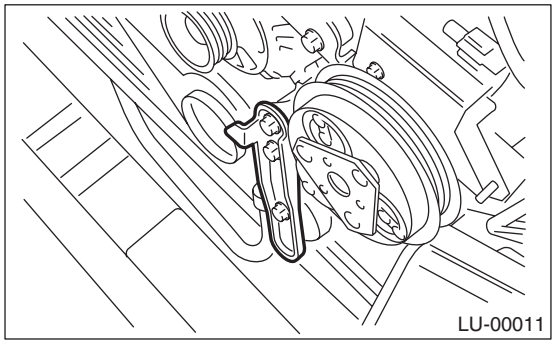
7) Remove the water pipe and hoses between oil cooler and water pump.



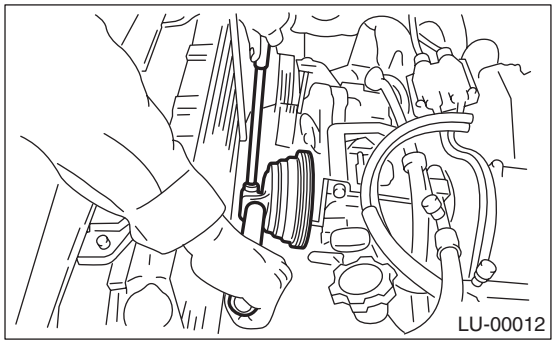
8) Lower the vehicle.
9) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
10) Remove the crankshaft position sensor.



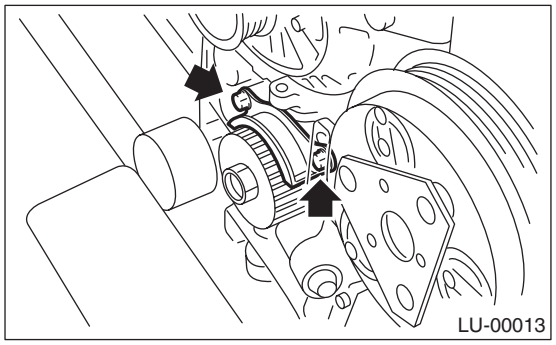
11) Remove the V-belts. <Ref. to ME(H4DOTC)-37, REMOVAL, V-belt.>
12) Remove the belt tensioner.



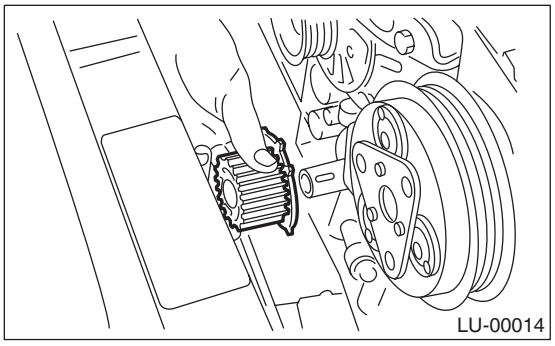
13) Remove the crank pulley using ST. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>



14) Remove the water pump. <Ref. to CO(H4DOTC)-15, REMOVAL, Water Pump.>
15) Remove the timing belt guide. (MT model)

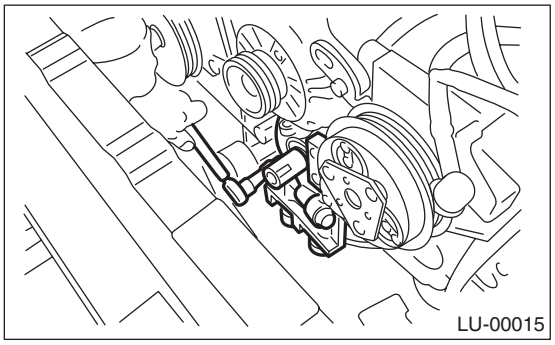


16) Remove the crank sprocket.



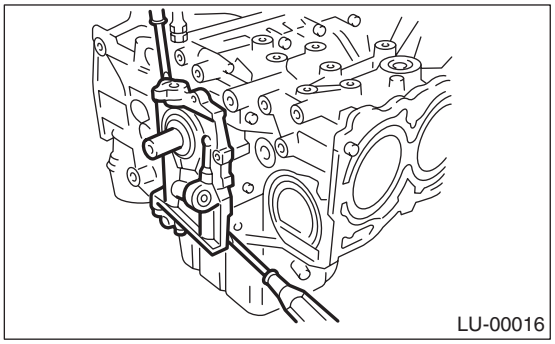
17) Remove the bolts which install oil pump onto cylinder block.

NOTE:
When disassembling and checking the oil pump, loosen the relief valve plug before removing the oil pump.



18) Remove the oil pump by using flat tip screwdriver.

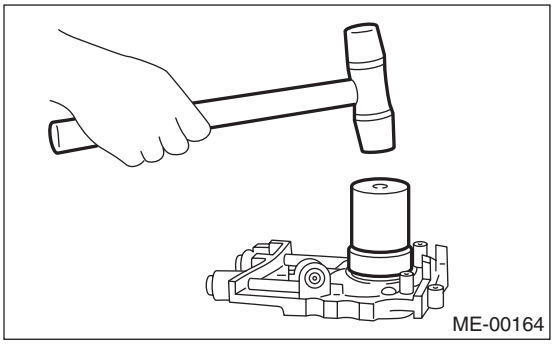
CAUTION:
Be careful not to scratch mating surfaces of cylinder block and oil pump.



B: INSTALLATION

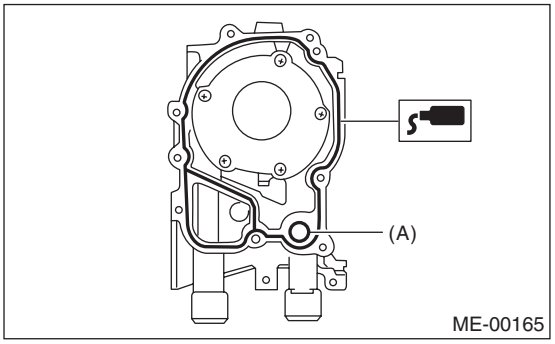
Install in the reverse order of removal.
Perform the following.
1) Using the ST, install the front oil seal.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.



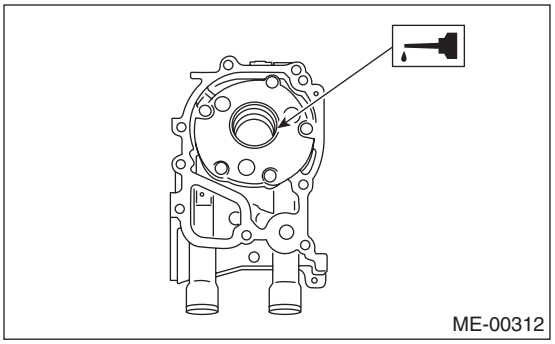
2) Apply liquid gasket to the matching surface of oil pump.

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.



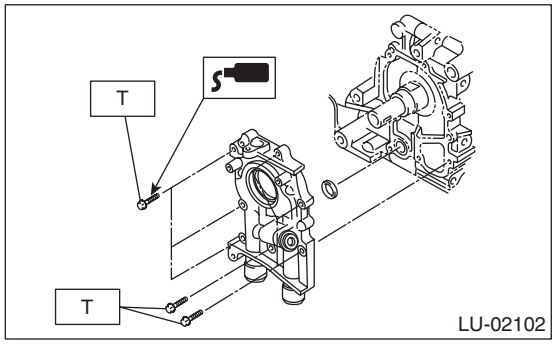
4) Install the oil pump to cylinder block. Be careful not to damage the oil seal during installation.

NOTE:
- Make sure the oil seal lip is not folded.
- Align the flat surface of oil pump's inner rotor with crankshaft before installation.
- Use a new O-ring and oil seal.

5) Apply liquid gasket to the three bolts thread shown in figure. (when reuse the bolts)

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

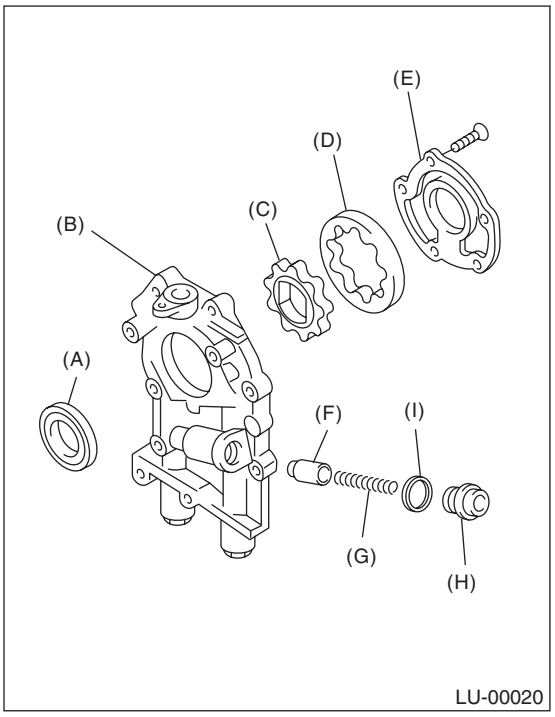
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



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.

NOTE:
Before disassembling the oil pump, remove the relief valve.

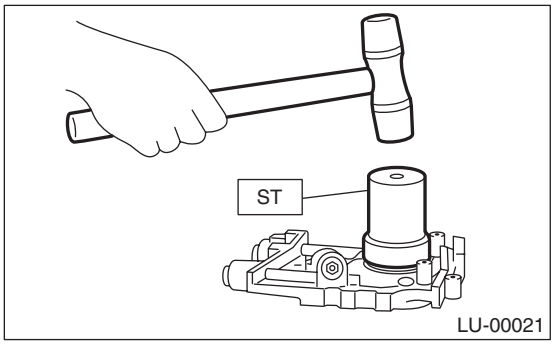


(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

1) Using the ST, install the front oil seal.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.

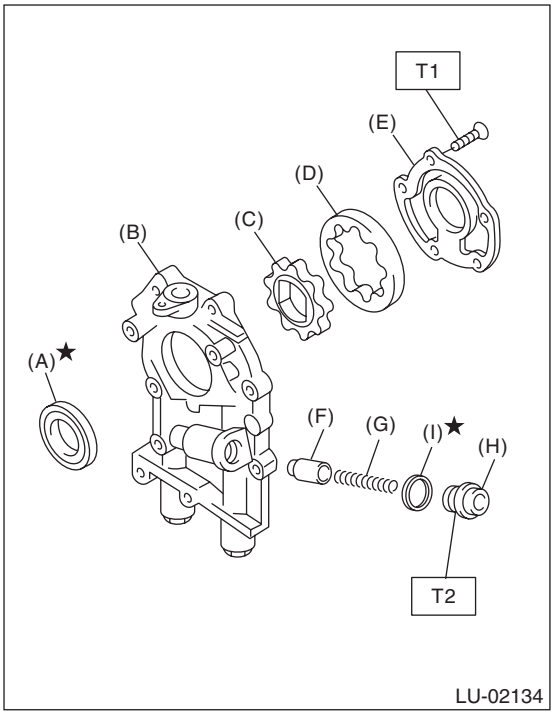


2) Apply a coat of engine oil to inner and outer rotors.
3) Assemble the inner and outer rotors in their original positions.
4) Assemble the oil relief valve and install relief valve spring and plug.

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)



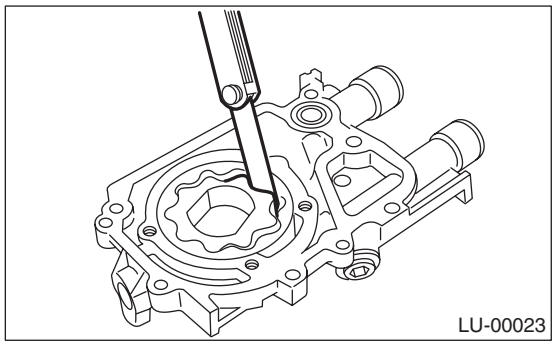
(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance is out of specification, replace the rotors as a set.

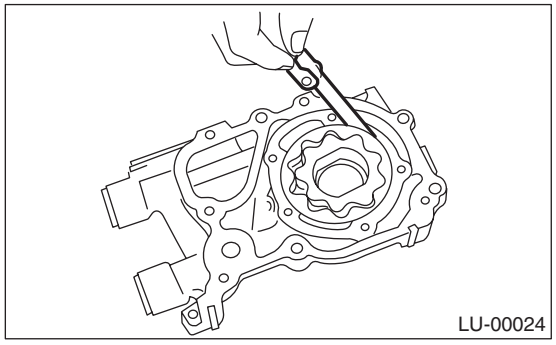
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)



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.

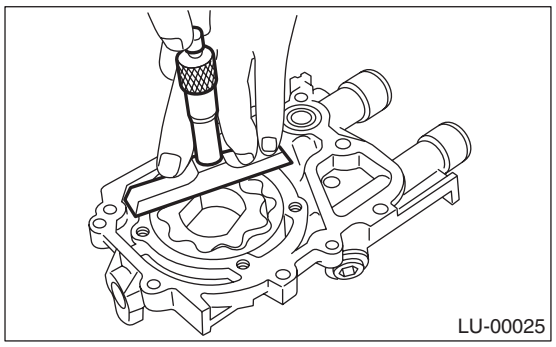
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)



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.

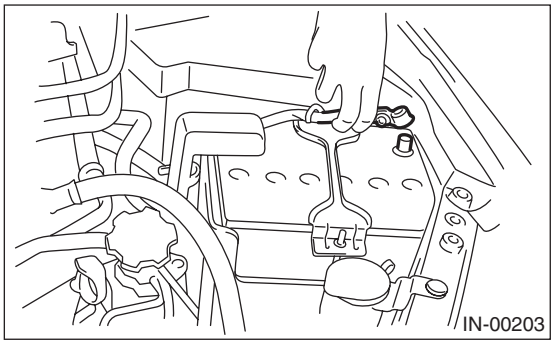
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

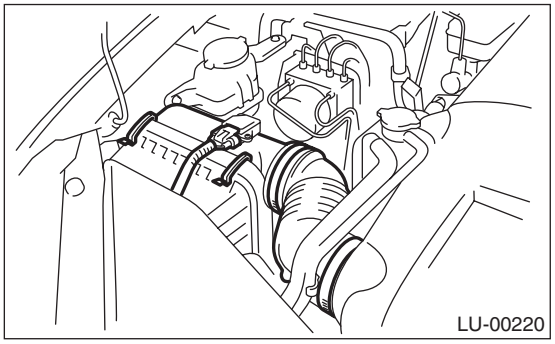
5. Oil Pan and Strainer

A: REMOVAL

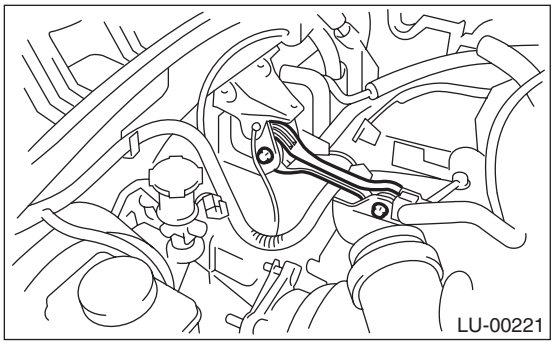
1) Set the vehicle on a lift.
2) Remove the front wheels.
3) Remove the collector cover.
4) Disconnect the ground cable from the battery.



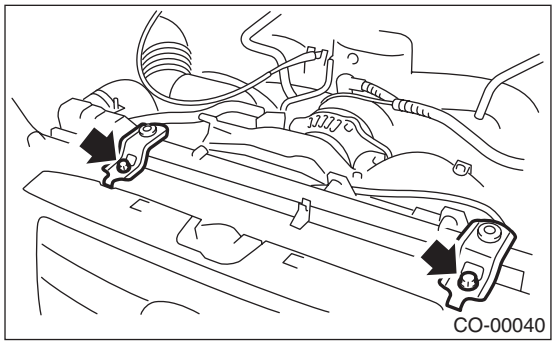
5) Disconnect the connectors from the mass air flow and intake air temperature sensor.
6) Remove the air intake boot and air cleaner upper cover.



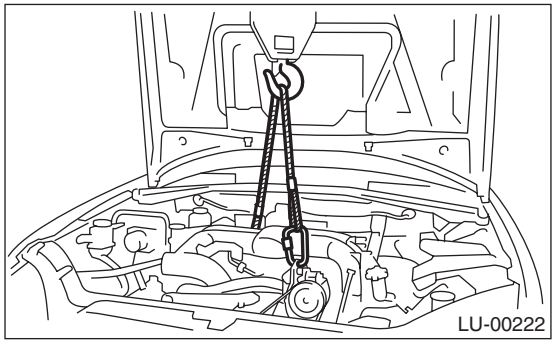
7) Remove the intercooler.
<Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
8) Remove the pitching stopper.



9) Remove the radiator upper brackets.

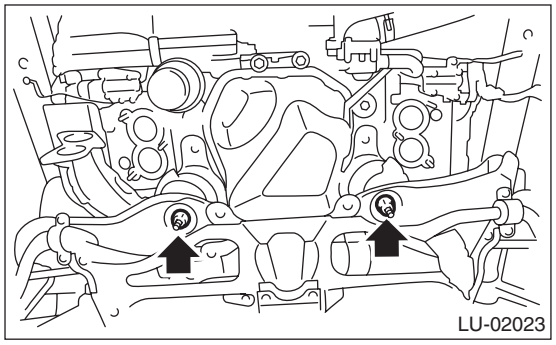


10) Support the engine with a lifting device and wire ropes.



11) Lift up the vehicle.

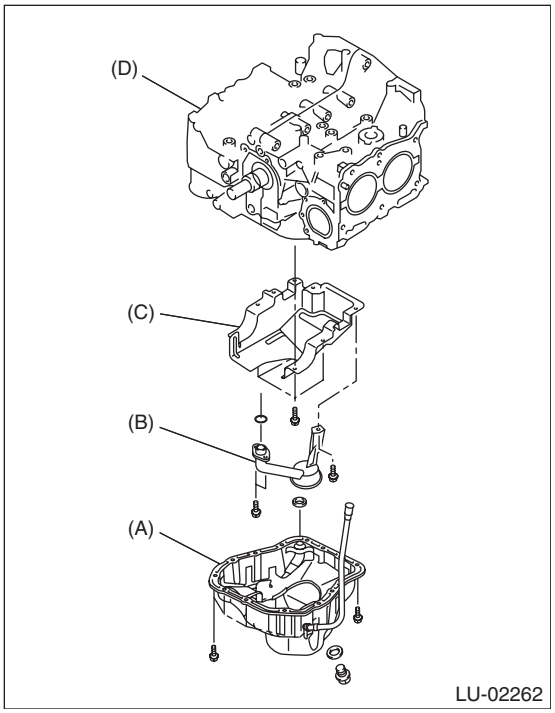
CAUTION:
When lifting up the vehicle, raise up wire ropes at the same time.
12) Remove the under cover.
13) Drain the engine oil.
14) Remove the front exhaust pipe.
<Ref. to EX(H4DOTC)-5, REMOVAL, Front Exhaust Pipe.>
15) Remove the nuts which install front cushion rubber onto front crossmember.



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.

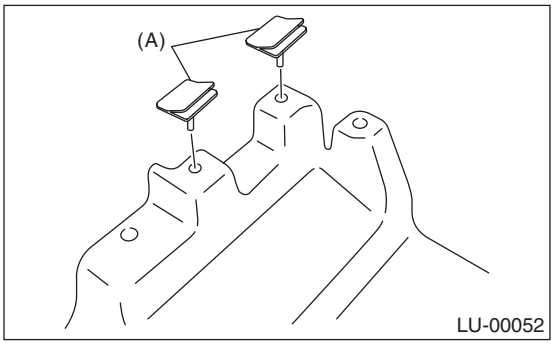


(A) Oil pan
(B) Oil strainer
(C) Baffle plate
(D) Cylinder block

B: INSTALLATION

NOTE:
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 baffle 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 to the cylinder block.

NOTE:
Use new O-rings.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

4) Install the oil strainer stay.

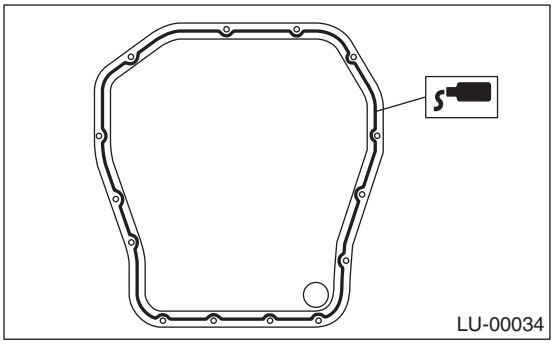
NOTE:
Tighten the oil strainer stay together with the baffle plate.

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

5) Apply liquid gasket to the mating surfaces, and install the oil pan.

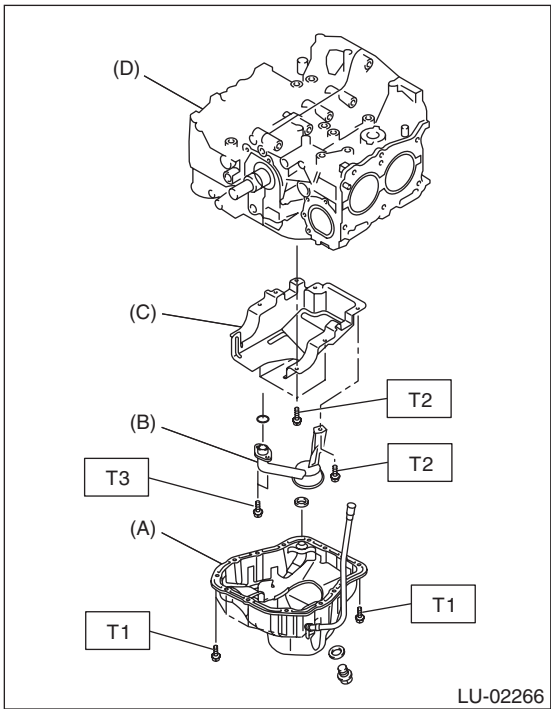
NOTE:
Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent



6) Tighten the bolts which install oil pan to engine block.

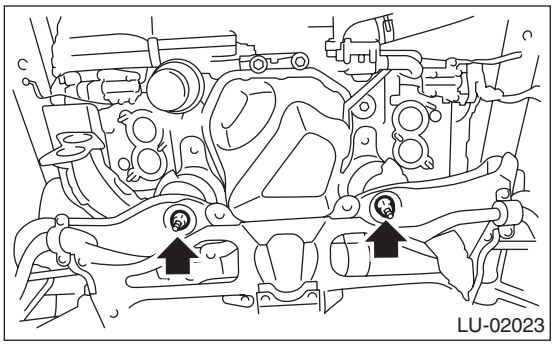
Tightening torque:
T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)
T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
T3: 10 N·m (1.0 kgf-m, 7.2 ft-lb)



(A) Oil pan
(B) Oil strainer
(C) Baffle plate
(D) Cylinder block

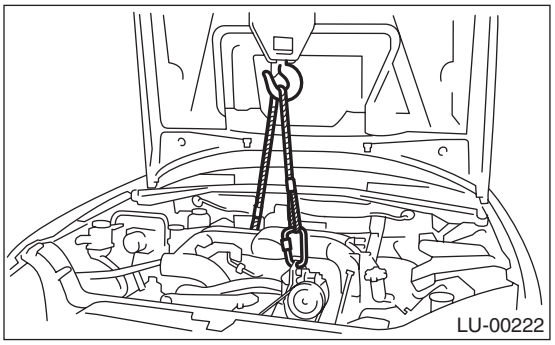
7) Lower the engine onto front crossmember.
8) Tighten the nuts which install front cushion rubber onto front crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 63 ft-lb)



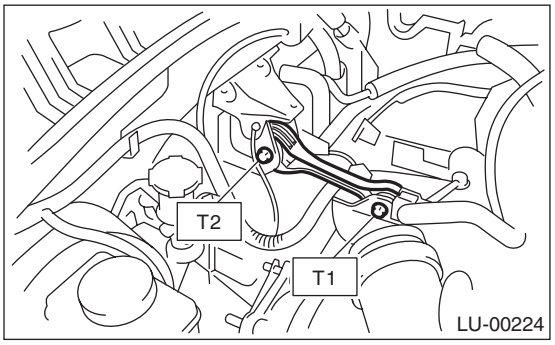
9) Install the front exhaust pipe. <Ref. to EX(H4DOTC)-6, INSTALLATION, Front Exhaust Pipe.>
10) Install the under cover.
11) Lower the vehicle.

CAUTION:
When lowering the vehicle, lower the lift-up device and wire ropes at the same time.
12) Remove the lifting device and wire ropes.

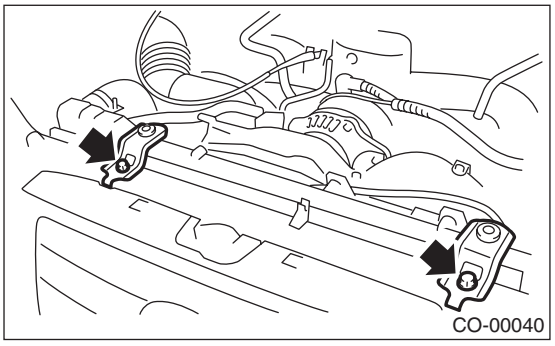


13) Install the pitching stopper.

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)

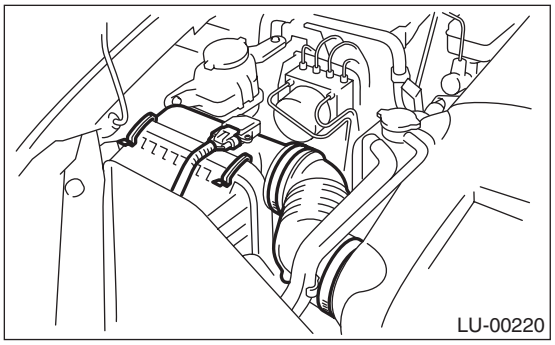


14) Install the radiator upper brackets.



15) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
16) Install the air intake boot and air cleaner upper cover.

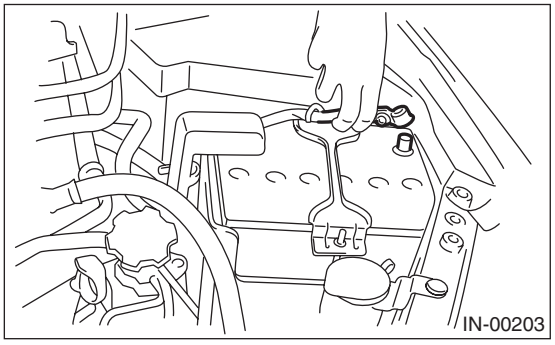
17) Connect the connector to the mass air flow & intake air temperature sensor.



18) Install the front wheels.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

19) Install the collector cover.
20) Connect the battery ground cable to battery.



21) Refill the engine oil. <Ref. to LU(H4DOTC)-9, INSPECTION, Engine Oil.>

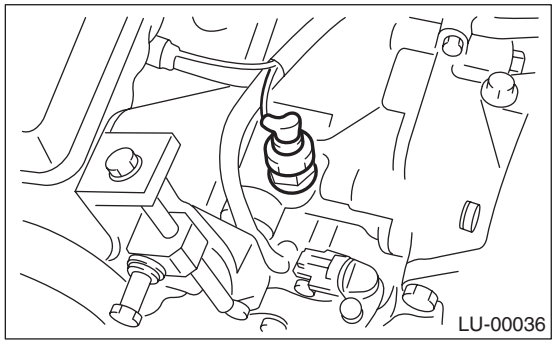
C: INSPECTION

Visually check that the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

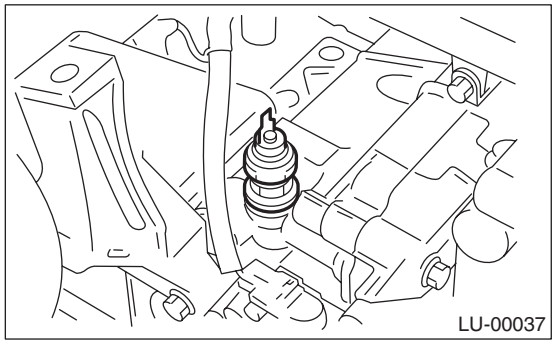
6. Oil Pressure Switch

A: REMOVAL

1) Remove the collector cover.
2) Remove the generator from the bracket. <Ref. to SC(H4SO)-20, REMOVAL, Generator.>
3) Disconnect the terminal from oil pressure switch.



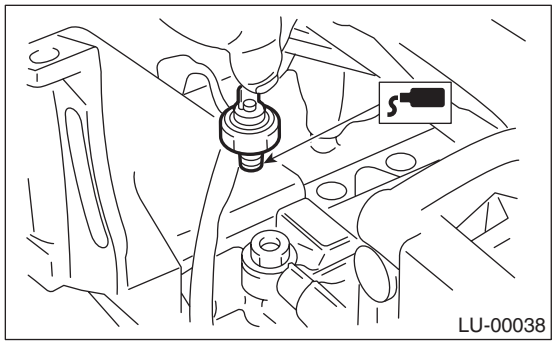
4) Remove the oil pressure switch.



B: INSTALLATION

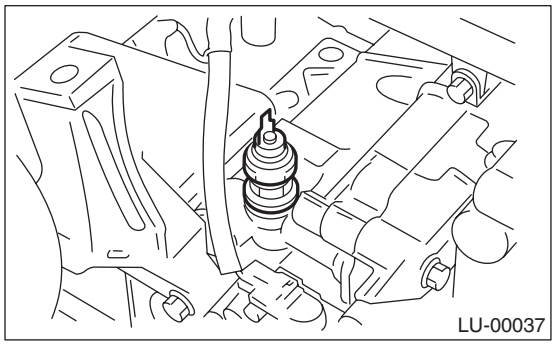
1) Apply liquid gasket to the oil pressure switch threads.

Liquid gasket:
THREE BOND 1324 (Part No. 004403007) or equivalent

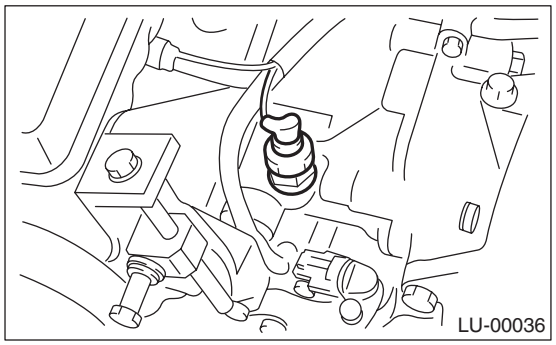


2) Install the oil pressure switch to the cylinder block.

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 the bracket. <Ref. to SC(H4SO)-20, INSTALLATION, Generator.>
5) Install the collector cover.

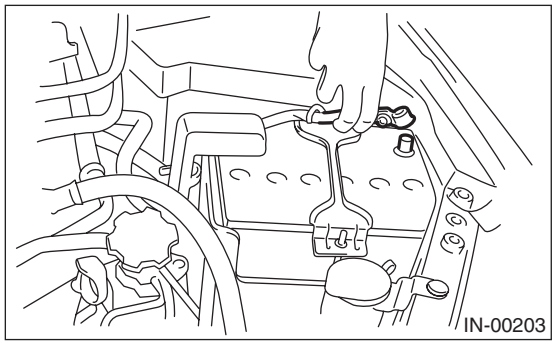
C: INSPECTION

Check the oil pressure switch installation portion for oil leakage and oil seepage.

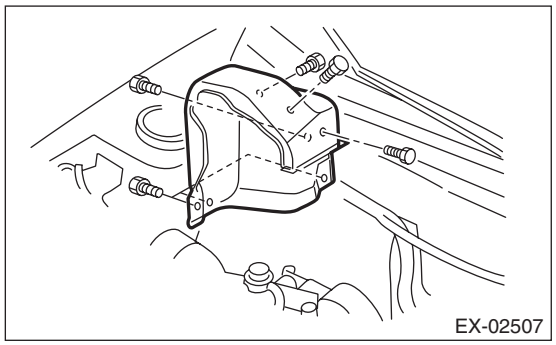
7. Oil Pipe

A: REMOVAL

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

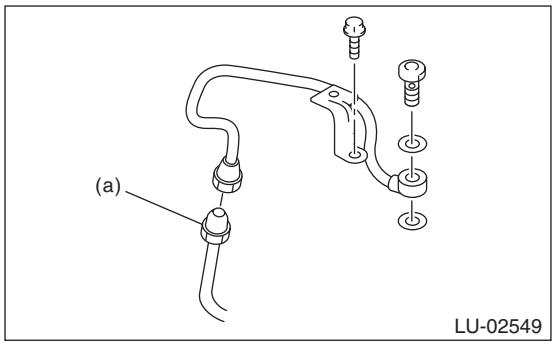


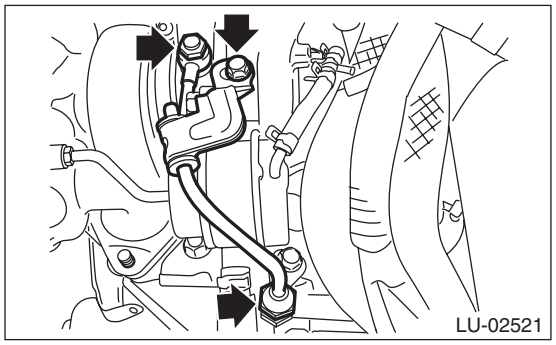
3) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
4) Remove the intercooler bracket RH.
5) Remove the turbocharger upper cover.



6) Remove the oil inlet pipe from the turbocharger.

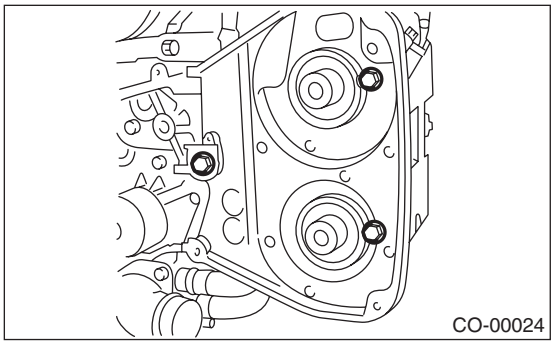
CAUTION:
In order to prevent damaging the oil pipe on the cylinder head side, fix the section (a) shown in the figure when loosing the oil inlet pipe flare nut, and avoid the part from rotating together while loosening the nut.



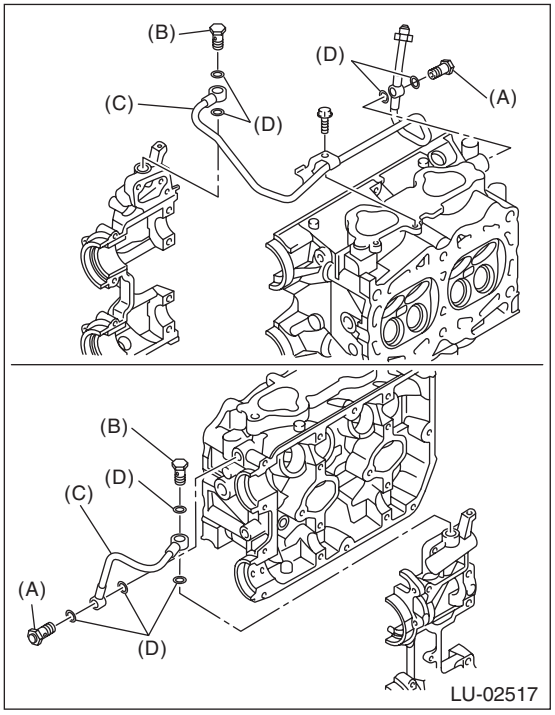


7) Remove the intake manifold. <Ref. to FU(H4DOTC)-13, REMOVAL, Intake Manifold.>
8) Remove the secondary air pump. <Ref. to EC(H4DOTC)-20, REMOVAL, Secondary Air Pump.>
9) Remove the radiator main fan and radiator sub fan. <Ref. to CO(H4DOTC)-24, REMOVAL, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-27, REMOVAL, Radiator Sub Fan and Fan Motor.>
10) Remove the V-belts. <Ref. to ME(H4DOTC)-37, REMOVAL, V-belt.>
11) Remove the crank pulley. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
12) Remove the timing belt cover. <Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>
13) Remove the timing belt. <Ref. to ME(H4DOTC)-43, TIMING BELT, REMOVAL, Timing Belt.>
14) Remove the cam sprocket LH. <Ref. to ME(H4DOTC)-51, REMOVAL, Cam Sprocket.>

15) Remove the belt cover No. 2 LH.



16) Remove the oil pipe.



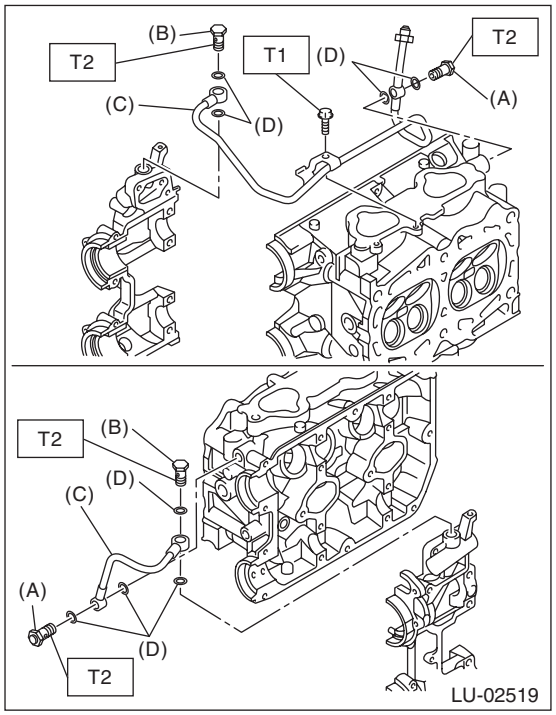
(A) Union screw with filter (with protrusion)
(B) Union screw without filter (without protrusion)
(C) Oil pipe
(D) Gasket

B: INSTALLATION

1) Inspect the union screw with filter. <Ref. to LU(H4DOTC)-24, 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.

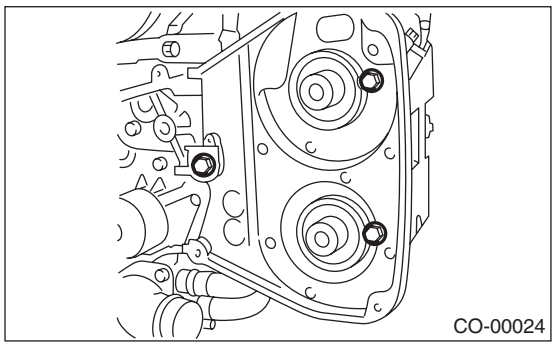
Tightening torque:
T1: 8 N·m (0.8 kgf-m, 5.9 ft-lb)
T2: 29 N·m (3.0 kgf-m, 21.4 ft-lb)



(A) Union screw with filter (with protrusion)
(B) Union screw without filter (without protrusion)
(C) Oil pipe
(D) Gasket

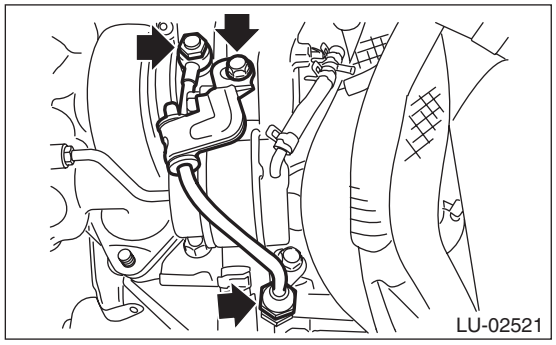
3) Install the belt cover No. 2 LH.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



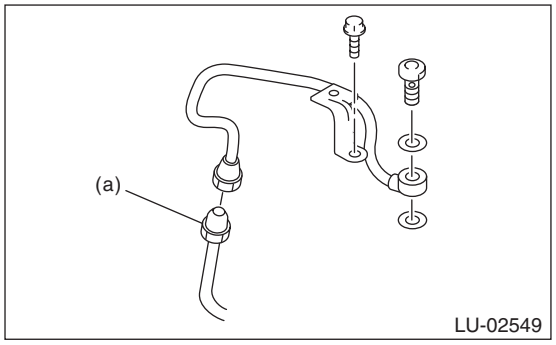
4) Install the cam sprocket LH. <Ref. to ME(H4DOTC)-51, INSTALLATION, Cam Sprocket.>
5) Install the timing belt. <Ref. to ME(H4DOTC)-46, TIMING BELT, INSTALLATION, Timing Belt.>
6) Install the timing belt cover. <Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>
7) Install the crank pulley. <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
8) Install the V-belts. <Ref. to ME(H4DOTC)-38, 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)-27, INSTALLATION, Radiator Sub Fan and Fan Motor.>
10) Install the secondary air pump. <Ref. to EC(H4DOTC)-20, INSTALLATION, Secondary Air Pump.>
11) Install the intake manifold. <Ref. to FU(H4DOTC)-16, INSTALLATION, Intake Manifold.>
12) Temporarily tighten the bolts and flare nuts which secure the oil inlet pipe to the turbocharger.

NOTE:
Use a new gasket.


LU-02521

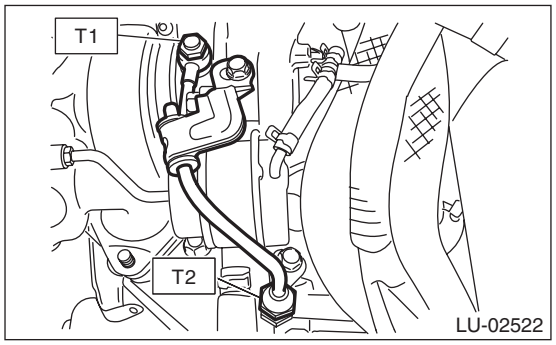
13) Tighten the union screws and flare nuts which secure the oil inlet pipe to the turbocharger.

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.



LU-02549

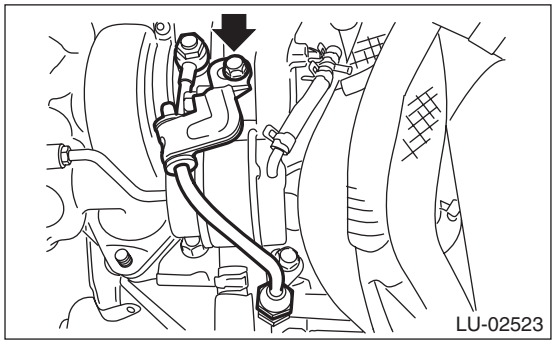
Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



LU-02522

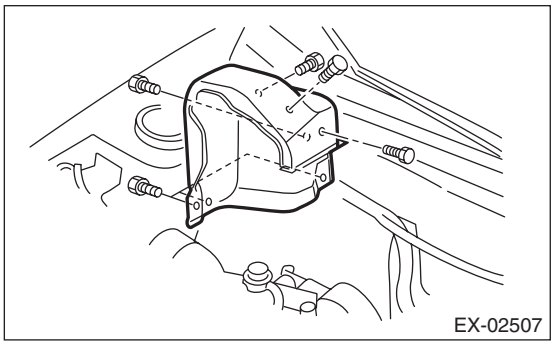
14) Tighten the bolts which hold the oil inlet pipe stay to the turbocharger.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

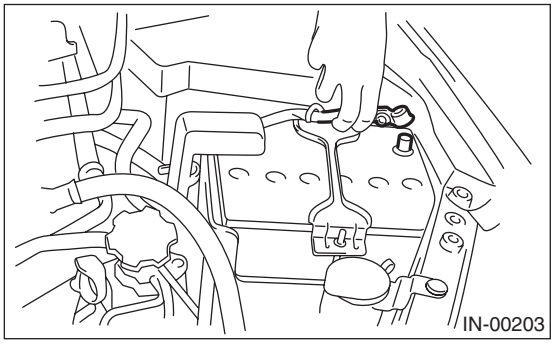

LU-02523

15) Install the turbocharger upper cover.

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



16) Install the intercooler bracket RH.
17) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
18) Connect the ground cable to battery.

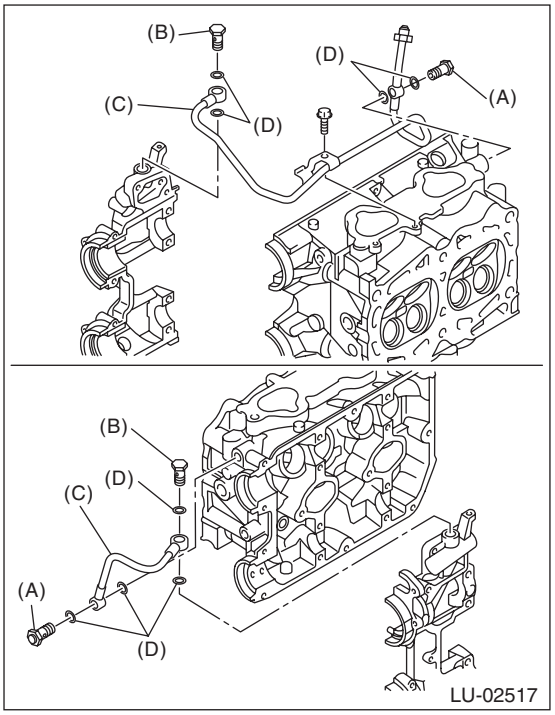


19) Install the collector cover.

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

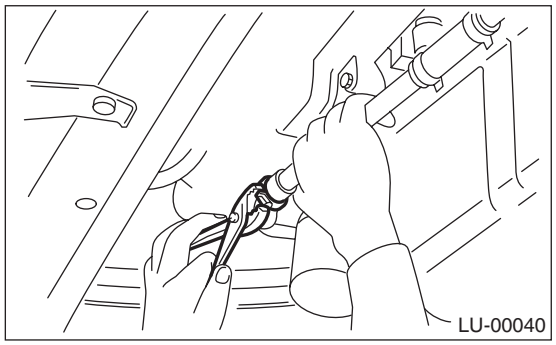
2. OTHER INSPECTIONS

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.

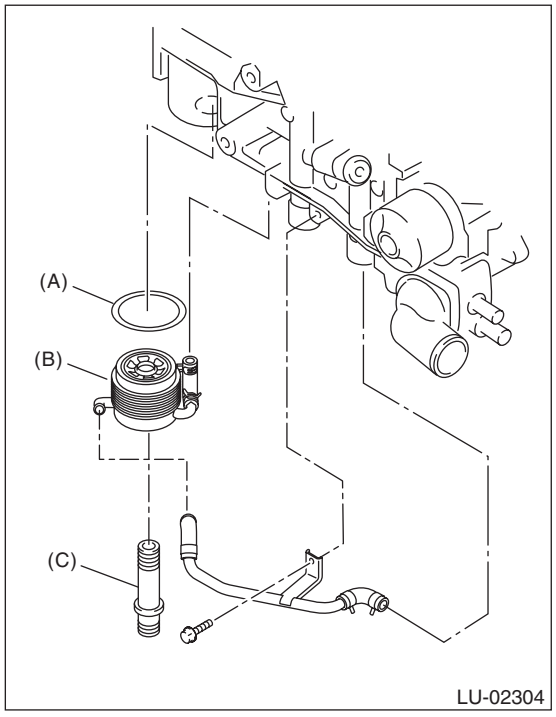
8. Engine Oil Cooler

A: REMOVAL

1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Remove the under cover.
4) Drain the engine oil.
5) Drain engine coolant.
6) Remove the water by-pass pipe between oil cooler and water pump.



7) Remove the engine oil filter. <Ref. to LU(H4DOTC)-26, REMOVAL, Engine Oil Filter.>
8) Remove the oil cooler connector and remove the oil cooler.



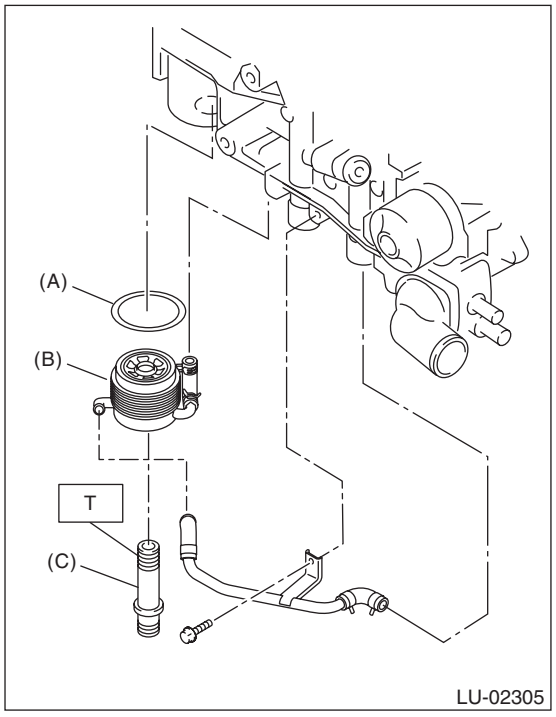
(A) Gasket
(B) Oil cooler
(C) Oil cooler connector

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
T: 54 N·m (5.5 kgf-m, 40 ft-lb)



(A) Gasket
(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, gasket groove and oil filter for damage.

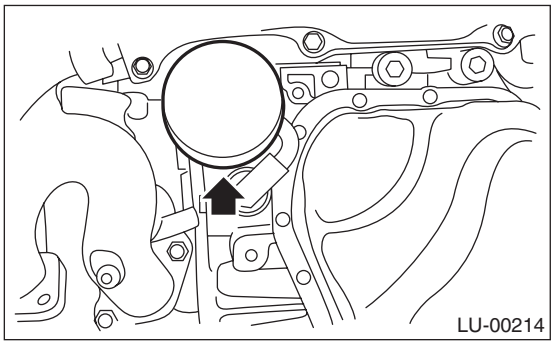
9. Engine Oil Filter

A: REMOVAL

1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Remove the under cover.
4) 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

CAUTION:
Do not tighten excessively, or oil may leak.
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 68 mm (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).
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 (degradation, etc.)	Replace.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not turn on.	1) Malfunction of combination meter		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact of terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed 1) — 2).

SPEED CONTROL SYSTEMS

SP(H4DOTC)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Engine	Model			2.5 L
	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)
	Piston displacement cm^3 (cu in)			2,457 (149.94)
	Compression ratio			8.4
	Compression presure (at 200 —300rpm) 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 35°
		Close	Max. retard	ABDC 65°
			Min. advance	ABDC 25°
	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)
	Idling speed [at neutral position on MT, or “P” or “N” position on AT] rpm		No load	750±100
			A/C ON	800±100 (MT model) 825±100 (AT model)
	Ignition order			1 → 3 → 2 → 4
	Ignition timing BTDC/rpm	MT model		12°±10°/750
		AT model		17°±10°/750

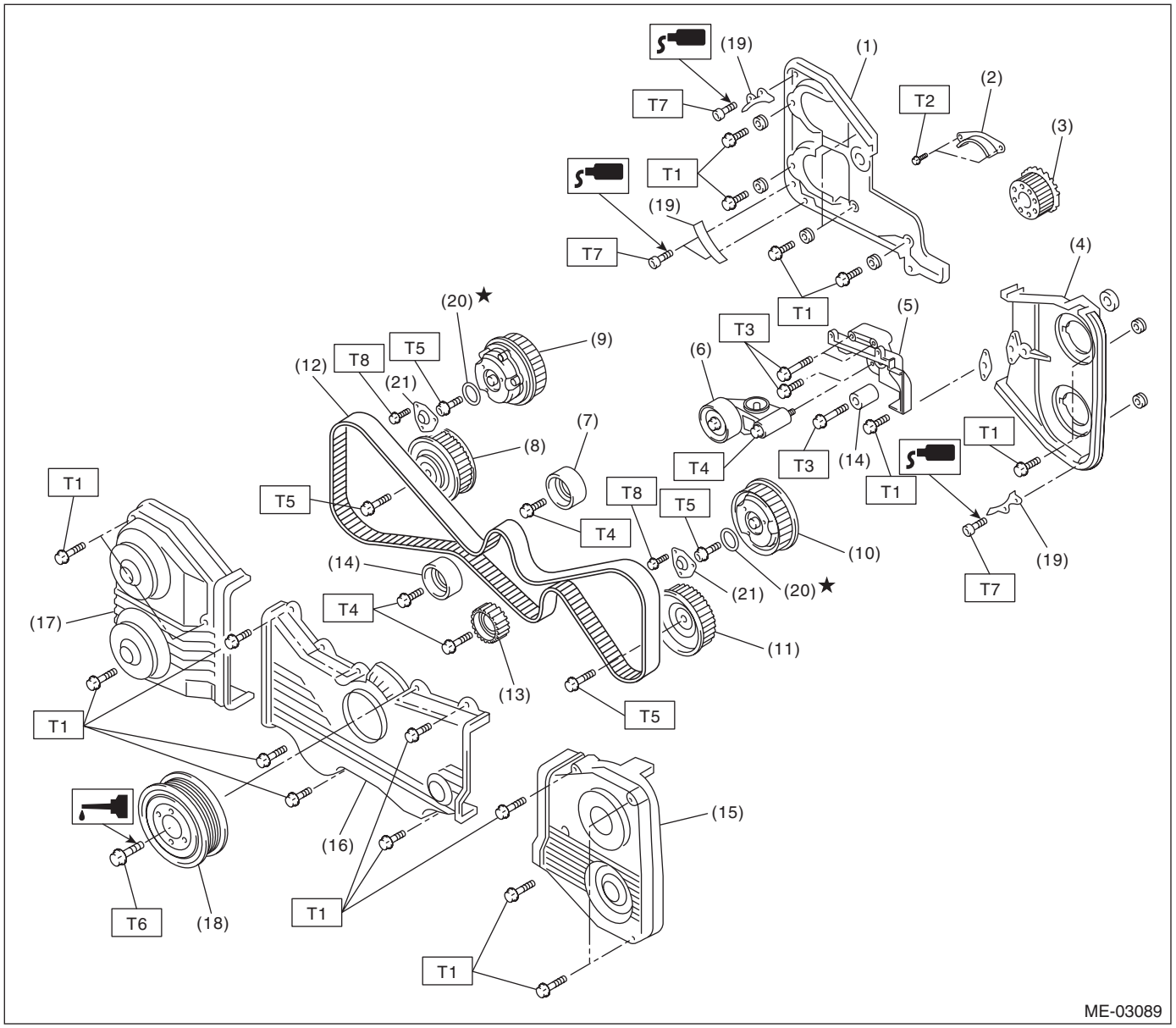
NOTE:
OS: Oversize US: Undersize

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)
	Thrust 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) or less
	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)
Valve lifter	Outer diameter	mm (in)	Standard	34.959 — 34.975 (1.3763 — 1.3770)
	Inner diameter (cylinder head)	mm (in)	Standard	34.990 — 35.016 (1.3777 — 1.3786)
	Valve lifter clearance	mm (in)	Standard	0.019 — 0.057 (0.0007 — 0.0022)
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)
	Cylinder inner diameter boring limit (diameter)		mm (in)	To 100.005 (3.9372)

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)
	Thrust clearance 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 59.758 (2.3527)
	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)
	Thrust 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

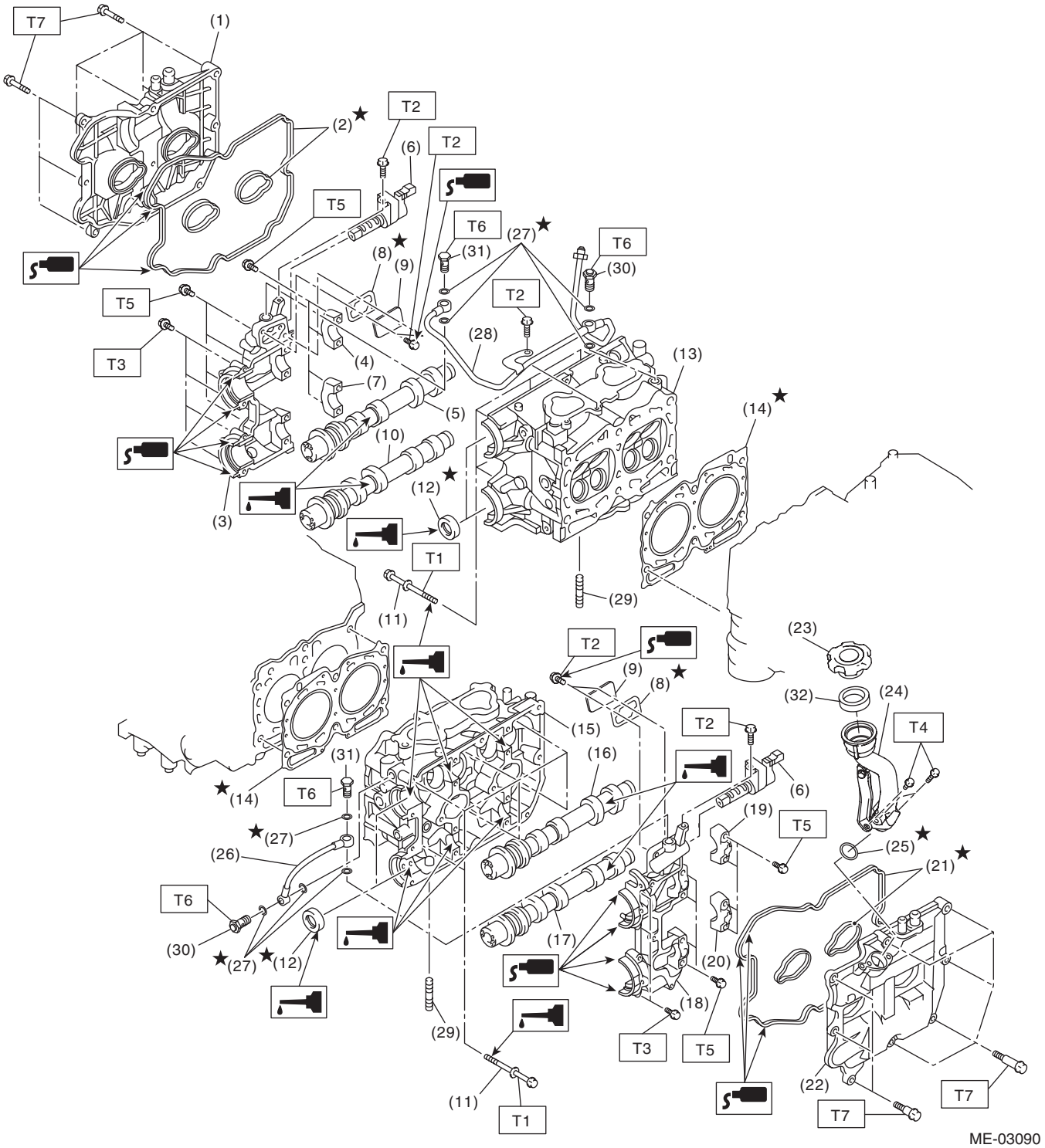


(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide (MT model)
(3) Crank sprocket
(4) Timing belt cover No. 2 (LH)
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Exhaust cam sprocket (RH)
(9) Intake cam sprocket (RH)
(10) Intake cam sprocket (LH)
(11) Exhaust cam 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
(21) Actuator cover

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)-51, INSTALLATION, Cam Sprocket.>
T6: <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
T7: 6.4 (0.65, 4.7)
T8: 3.4 (0.3, 2.5)

2. CYLINDER HEAD AND CAMSHAFT

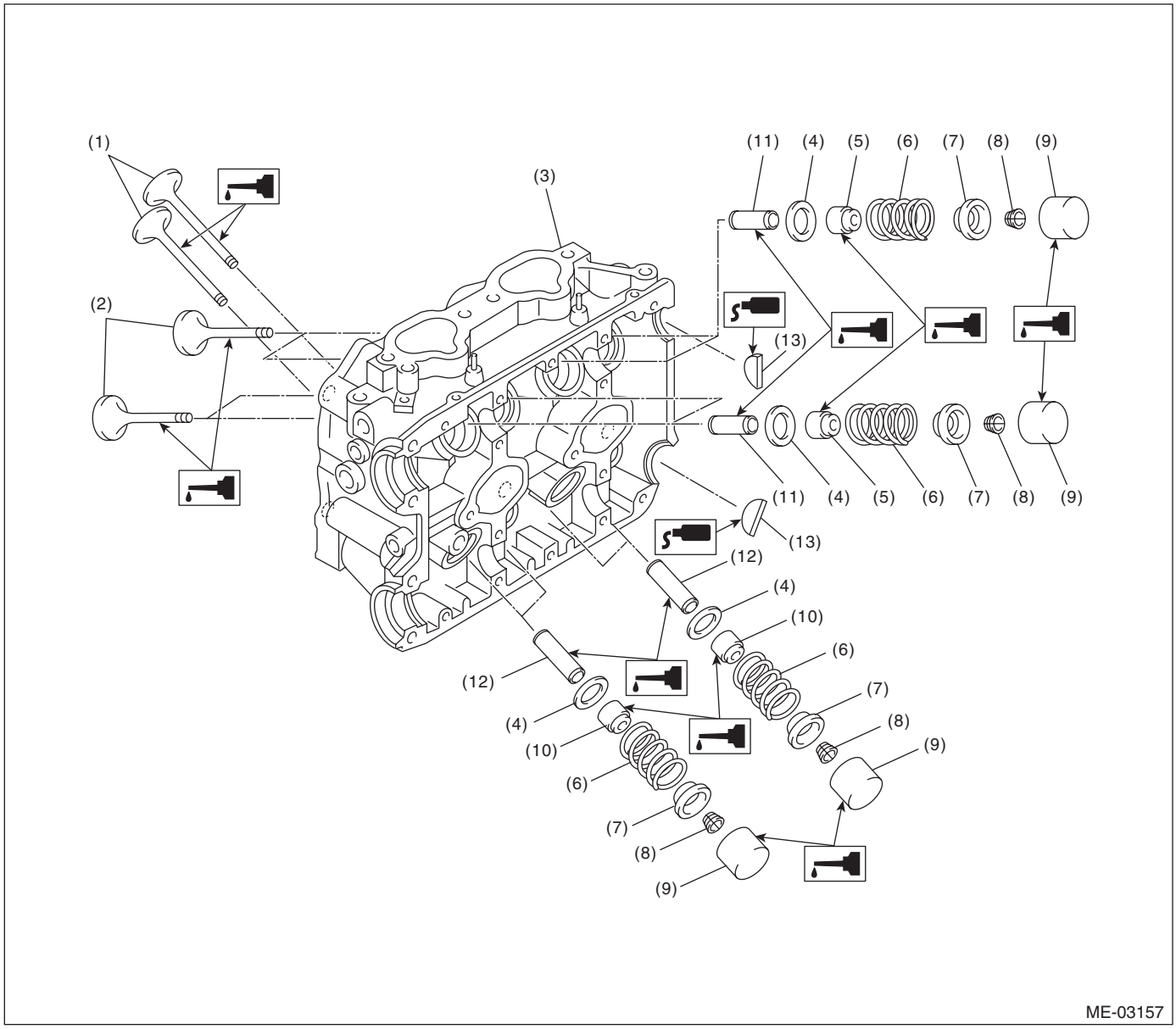


(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Camshaft cap (Front RH)
(4) Intake camshaft cap (Rear RH)
(5) Intake camshaft (RH)
(6) Oil flow control solenoid valve
(7) Exhaust camshaft cap (Rear RH)
(8) Gasket
(9) Oil return cover
(10) Exhaust camshaft (RH)
(11) Cylinder head bolt
(12) Oil 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) Oil filler duct
(25) O-ring
(26) Oil pipe (LH)
(27) Gasket
(28) Oil pipe (RH)
(29) Stud bolt
(30) Union screw with filter (with protrusion)
(31) Union screw without filter (without protrusion)
(32) Gasket

Tightening torque:N·m (kgf-m, ft-lb)

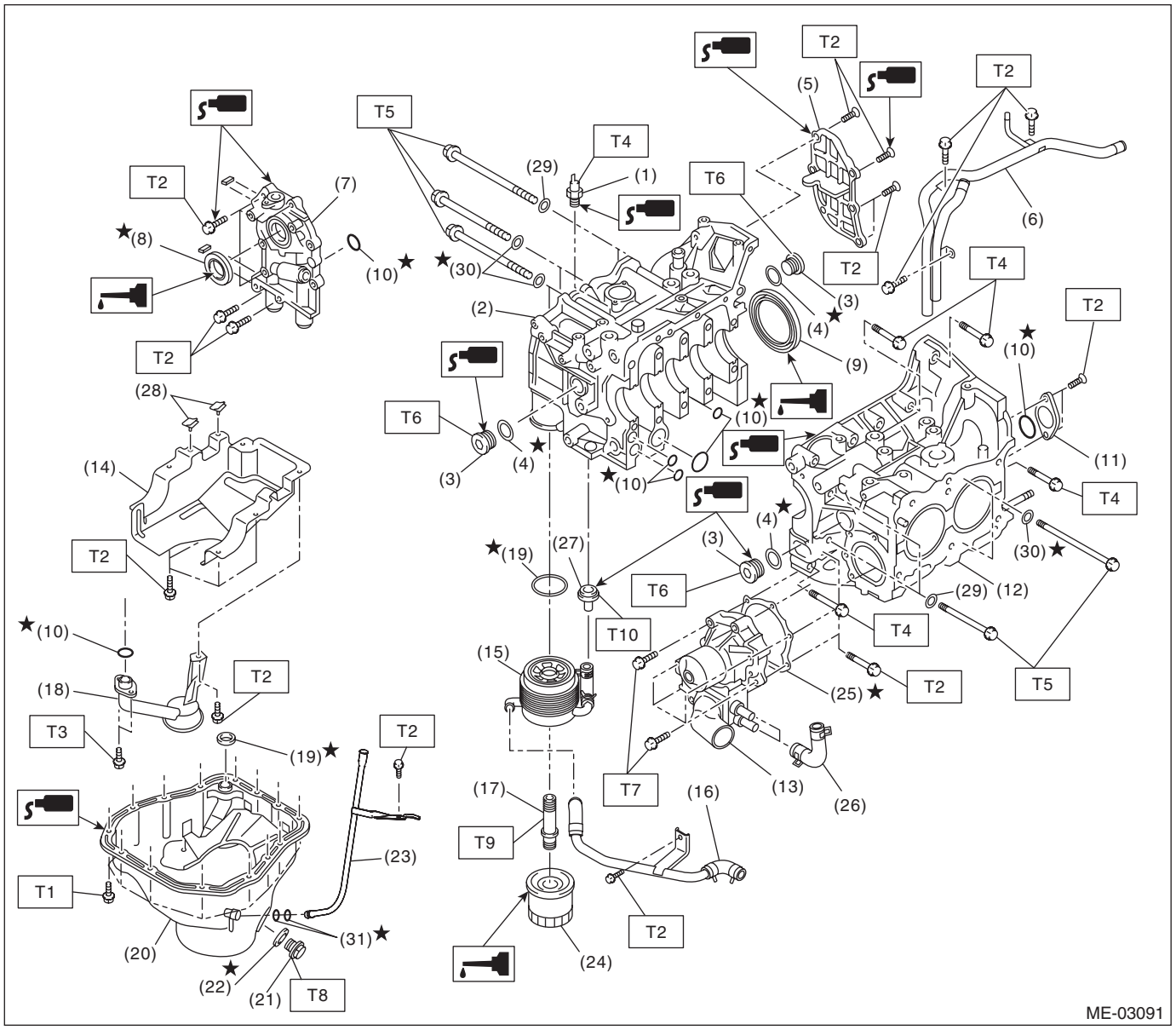
T1: ***<Ref. to ME(H4DOTC)-58, INSTALLATION, Cylinder Head.>***
T2: ***8 (0.8, 5.9)***
T3: ***<Ref. to ME(H4DOTC)-54, INSTALLATION, Camshaft.>***
T4: ***6.4 (0.65, 4.7)***
T5: ***<Ref. to ME(H4DOTC)-54, INSTALLATION, Camshaft.>***
T6: ***29 (3.0, 21.4)***
T7: ***<Ref. to ME(H4DOTC)-54, INSTALLATION, Camshaft.>***

3. CLINDER 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
(13) Plug

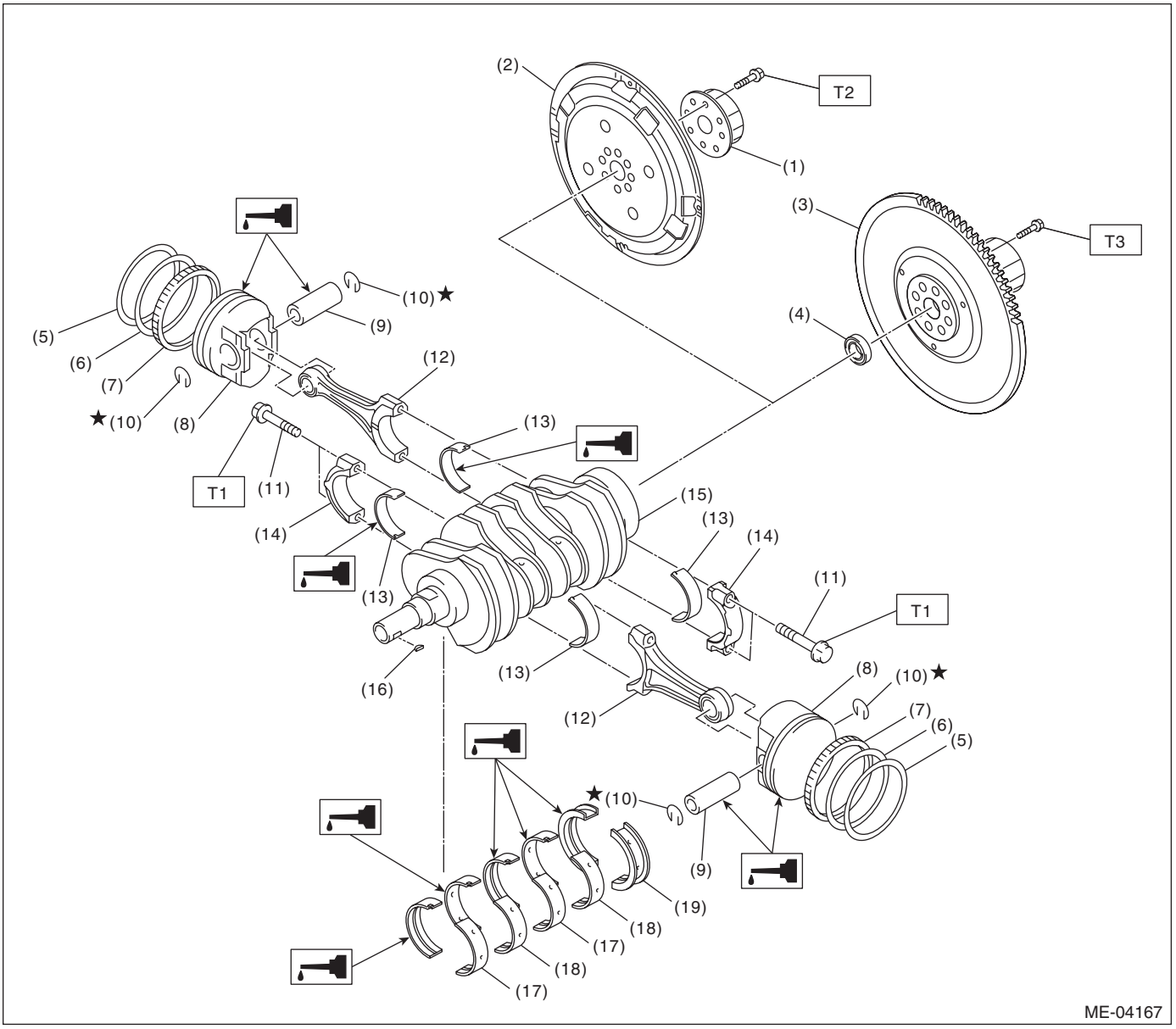
4. CYLINDER BLOCK



(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil cooler
(16) Water by-pass pipe
(17) Connector
(18) Oil strainer
(19) Gasket
(20) Oil pan
(21) Drain plug
(22) Metal gasket
(23) Oil level gauge guide
(24) Oil filter
(25) Gasket
(26) Water pump hose
(27) Plug
(28) Seal
(29) Washer
(30) Seal washer
(31) O-ring

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)-68, 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 PISTION



(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

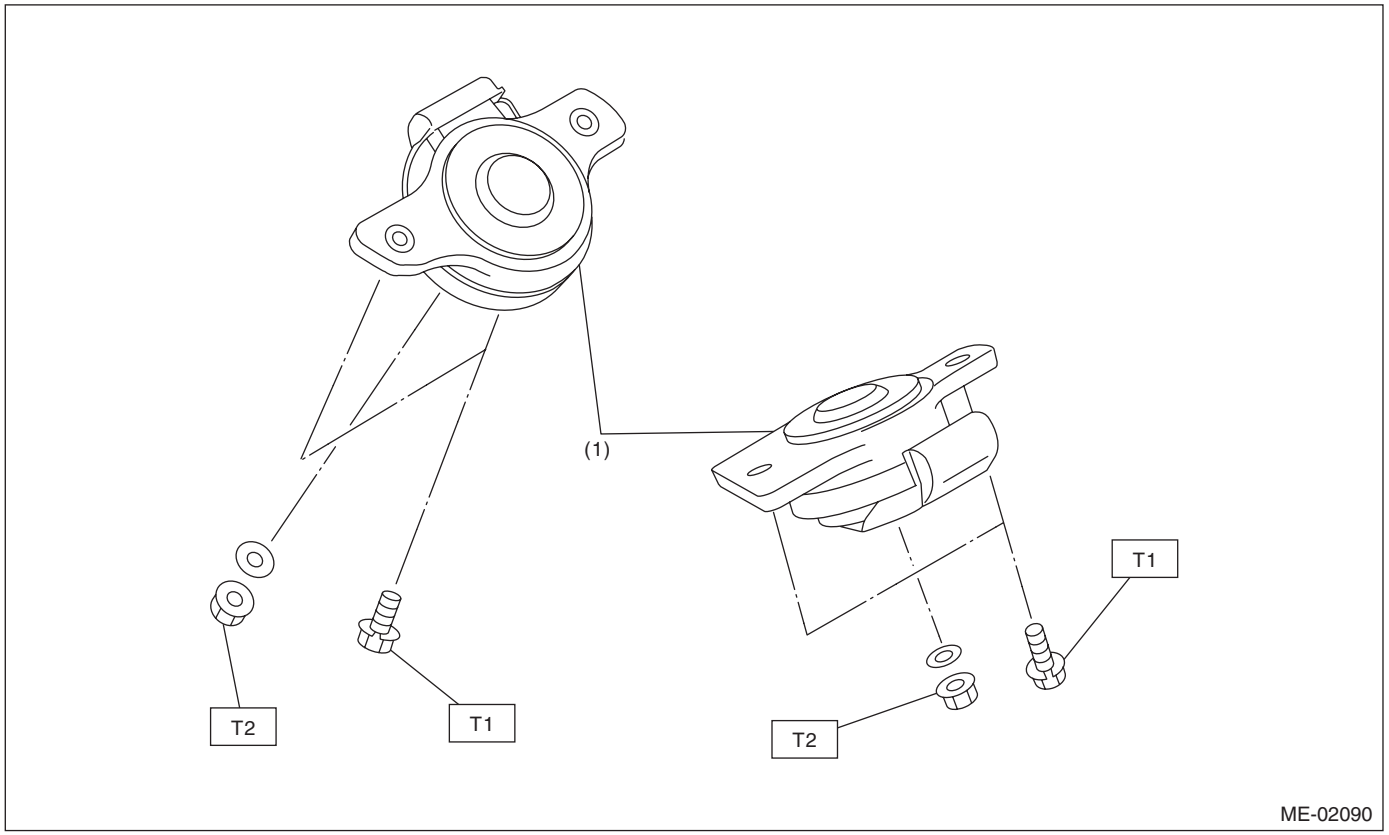
Tightening torque:N·m (kgf-m, ft-lb)

T1: 52 (5.3, 38.4)

T2: <Ref. to 5AT-65, INSTALLATION, Drive Plate.>

T3: <Ref. to CL-16, INSTALLATION, Flywheel.>

6. ENGINE MOUNTING



(1) Front cushion rubber

Tightening torque:N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 85 (8.7, 62.7)

C: CAUTION

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

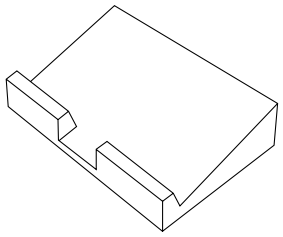
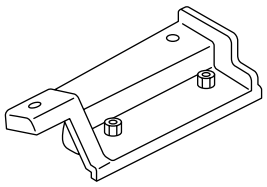
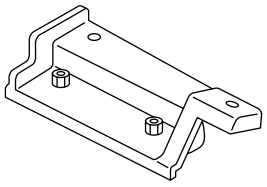
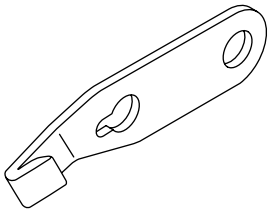
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve spring.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used together with the ENGINE STAND (499817100).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used together with the ENGINE STAND (499817100).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for removing and installing the flywheel and the drive plate.

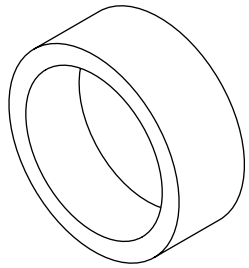
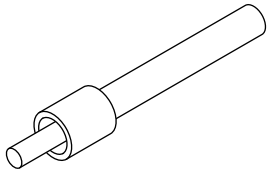
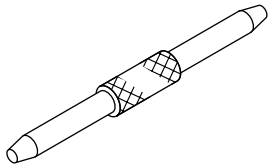
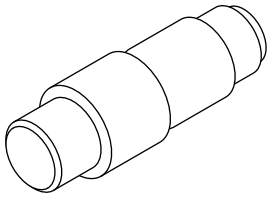
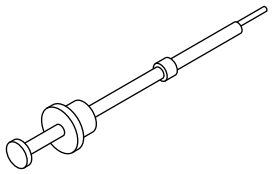
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498747300	498747300	PISTON GUIDE	Used for installing the cup to the wheel cylinder piston. (2.5 L model)
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN 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.

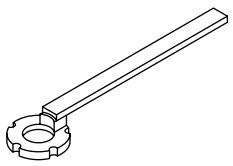
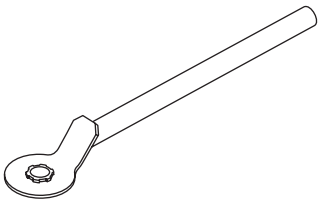
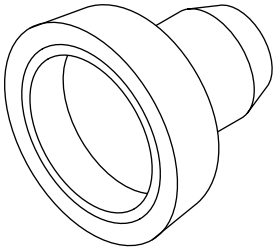
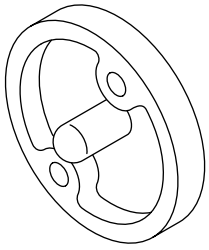
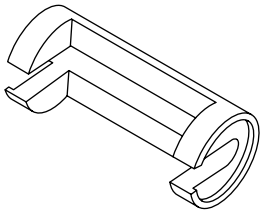
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing exhaust cam sprocket.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used together with the CRANKSHAFT OIL SEAL GUIDE (499597100).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used together with the CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.

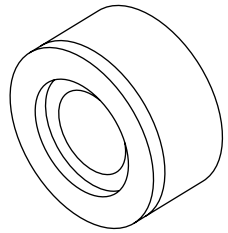
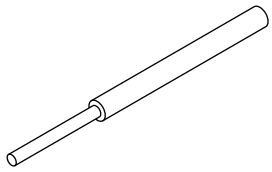
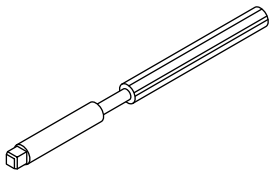
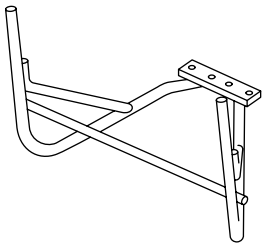
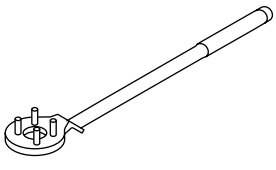
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817100	499817100	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used together with the 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.

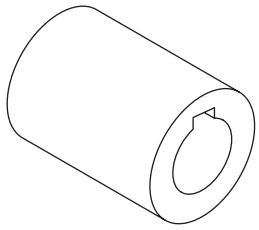
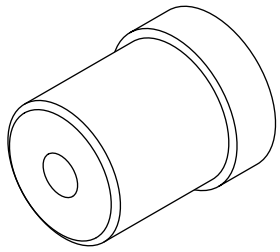
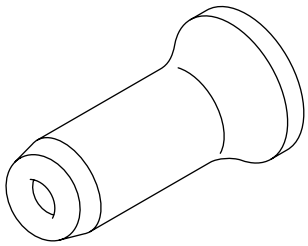
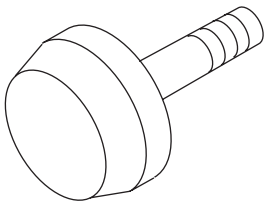
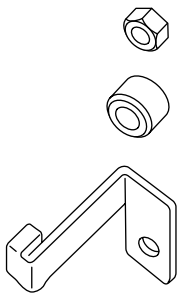
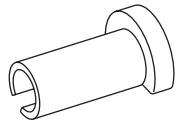
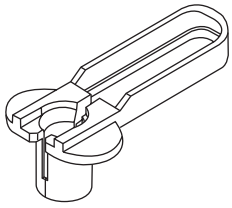
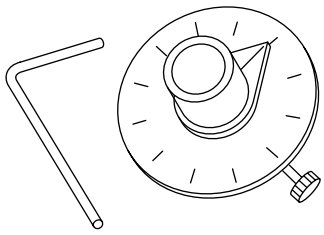
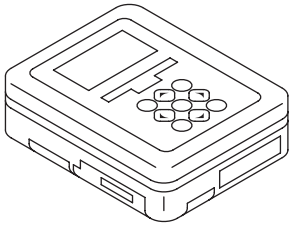
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499587600	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.
 ST-499597200	499597200	OIL SEAL GUIDE	• Used for installing camshaft oil seal for DOHC engine. • Used together with the OIL SEAL INSTALLER (499587600).
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for disconnecting quick connector of the engine compartment.
 ST18371AA000	18371AA000 (Newly adopted tool)	CONNECTOR REMOVER	Used for disconnecting the quick connector on the fuel return hose of the engine compartment.
 ST18854AA000	18854AA000	ANGLE GAUGE	Used for installing the crank pulley.
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.
Timing light	Used for measuring ignition timing.
Vacuum gauge	Used for measuring intake manifold vacuum.
Oil pressure gauge	Used for measuring engine oil pressure.
Fuel pressure gauge	Used for measuring fuel pressure.

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

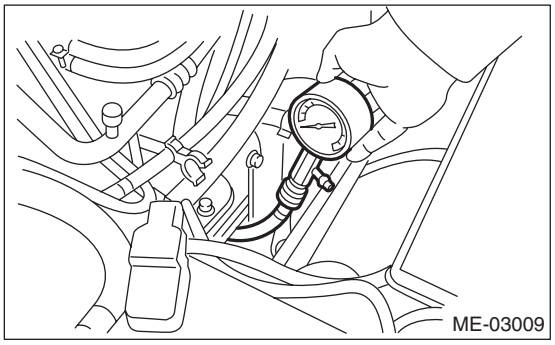
2. Compression

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)-49, 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 should be less than 18 mm (0.71 in) long.
9) Crank the engine by the starter motor, and read the maximum value on the gauge when the needle of gauge is steady.



10) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (200 — 300 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) Connect the Subaru Select Monitor to the data link connector.
5) Turn the ignition switch to ON and run the Subaru Select Monitor.
6) Select {Each System Check} in Main Menu.
7) Select {Engine Control System} in Selection Menu.
8) Select {Current Data Display & Save} in Engine Control System Diagnosis.
9) Select {Data Display} in Data Display Menu.
10) Start the engine, and read the engine idle speed.
11) 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, "P" or "N" range]:
750±100 rpm

12) Check the idle speed when loaded. (Turn the A/C switch to ON and operate the compressor for at least one minute before measurement.)

Idle speed [A/C ON and gears in neutral, "P" or "N" range]:
800±100 rpm (MT model)
825±100 rpm (MT model)

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

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself at measurement.

1. METHOD WITH SUBARU SELECT MONITOR

1) Before checking the ignition timing, check the following item:
   (1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.
   (2) Check the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn the ignition switch to OFF.
4) Connect the Subaru Select Monitor to the data link connector.
5) Turn the ignition switch to ON and run the Subaru Select Monitor.
6) Select {Each System Check} in Main Menu.
7) Select {Engine Control System} in Selection Menu.
8) Select {Current Data Display & Save} in Engine Control System Diagnosis.
9) Select {Data Display} in Data Display Menu.
10) Start the engine and check the ignition timing at idle speed.

Ignition timing [BTDC/rpm]:
12°±10°/750 (MT Model)
17°±10°/750 (AT Model)

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.>

2. METHOD WITH TIMING LIGHT

1) Before checking the ignition timing, check the following item:
   (1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.
   (2) Check the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn the ignition switch to OFF.
4) Remove the air intake duct.
5) Disconnect the mass air flow and intake air temperature sensor connector.
6) Remove the air cleaner cover and element.
7) Connect the timing light to the power wire of #1 ignition coil.
8) Install the air cleaner cover, element and mass air flow and intake air temperature sensor.
9) Start the engine, turn the timing light to the crank pully, and check the ignition timing by means of crank pully indicator.

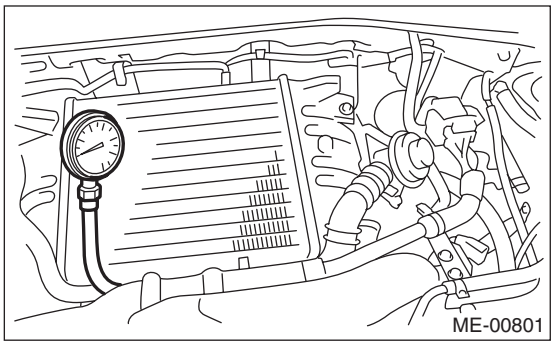
Ignition timing [BTDC/rpm]:
12°±10°/750 (MT Model)
17°±10°/750 (AT Model)

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, the internal condition of the engine can be diagnosed as described below.



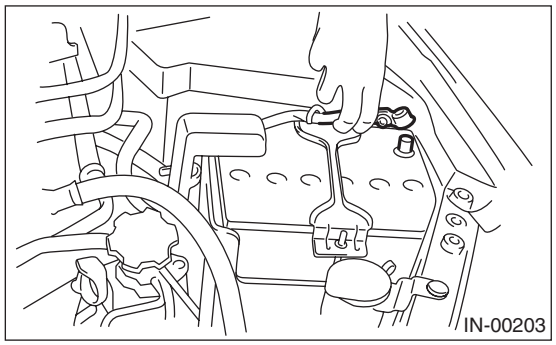
Vacuum pressure (at idling, A/C OFF):
Less than –70.6 kPa (–530 mmHg, –20.85 inHg) (MT model)
Less than –68.0 kPa (–510 mmHg, –20.08 inHg) (AT model)

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

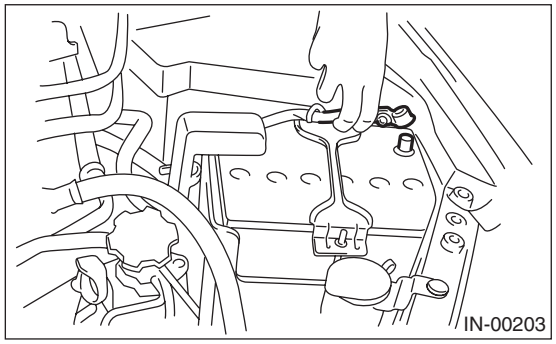
6. Engine Oil Pressure

A: INSPECTION

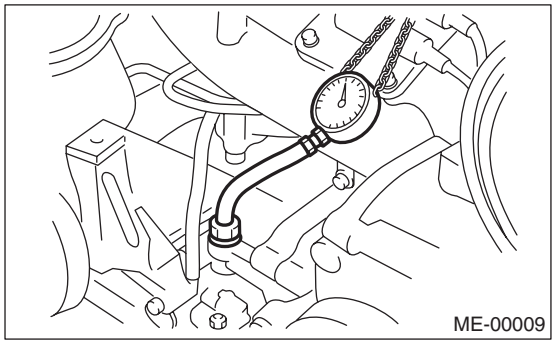
1) Remove the collector cover.
2) Disconnect the ground cable from the battery.



3) Remove the oil pressure switch. <Ref. to LU(H4DOTC)-20, REMOVAL, Oil Pressure Switch.>
4) Connect the oil pressure gauge hose to cylinder block.
5) Connect the battery ground cable to the battery.



6) Start the engine, and measure the oil pressure.



Oil pressure:

Standard:
98 kPa (1.0 kgf/cm^2, 14 psi) or more (at 600 rpm)
294 kPa (3.0 kgf/cm^2, 43 psi) or more (at 5,000 rpm)

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4DOTC)-27, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is ON and oil pressure is within specification, check the oil pressure switch. <Ref. to LU(H4DOTC)-27, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:
Standard value is based on an engine oil temperature of 80°C (176°F).

7) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4DOTC)-20, INSTALLATION, Oil Pressure Switch.>

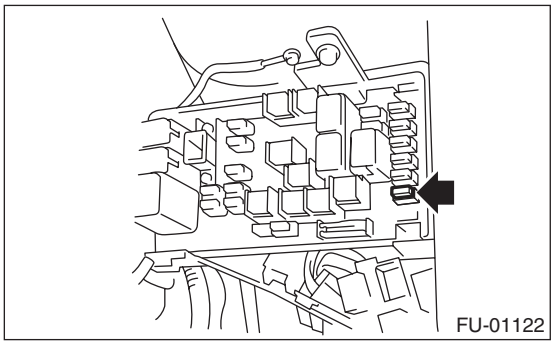
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

7. Fuel Pressure

A: INSPECTION

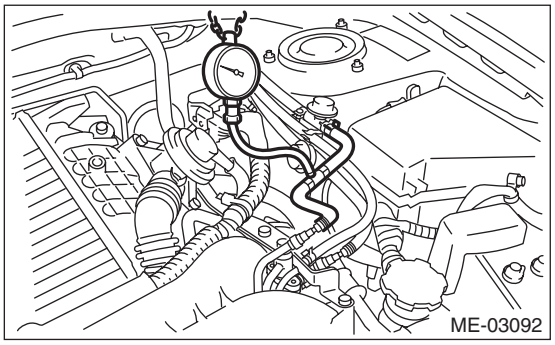
CAUTION:
• Before removing the fuel pressure gauge, release the fuel pressure.
• Be careful not to spill fuel.
• Catch the fuel from hoses using a container or cloth.

NOTE:
If the fuel pressure is out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.
1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, 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 from fuel damper valve, and connect fuel pressure gauge.
5) Install the fuse of fuel pump to the main fuse box.



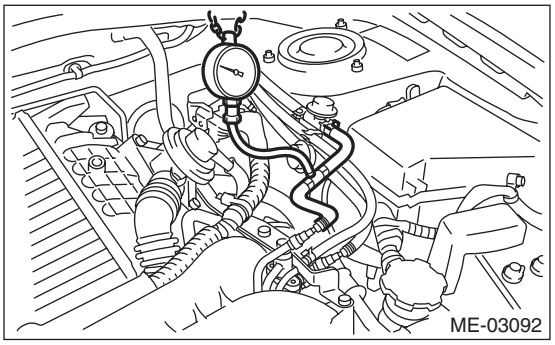
6) Start the engine.
7) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard: 284 — 314 kPa
(2.9 — 3.2 kgf/cm^2, 41 — 46 psi)



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)

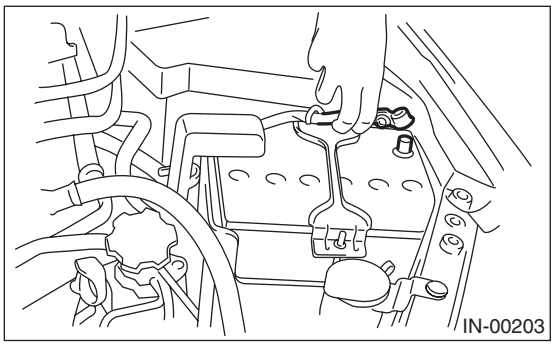


NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

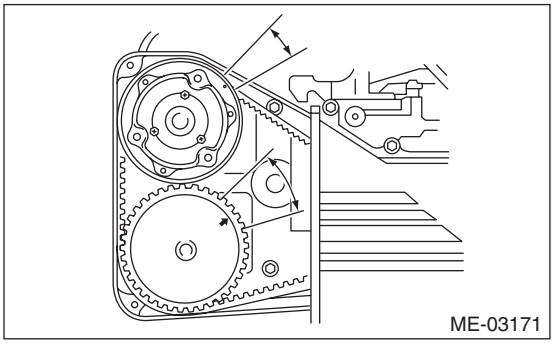
A: INSPECTION

NOTE:
Inspection and adjustment of valve clearance should be performed while engine is cold.
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from the battery.



4) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
5) Remove a bolt which secures timing belt cover (RH).
6) Lift the vehicle.
7) Remove the under cover.
8) Loosen the remaining bolts which secure timing belt cover (RH), then remove the timing belt cover.
9) Lower the vehicle.
10) 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 the rocker cover (RH).
(6) Remove the bolts, then remove the rocker cover (RH).
11) When inspecting #2 and #4 cylinders
(1) Disconnect the battery cable, and then remove the battery and battery carrier.
(2) Remove the secondary air pump. <Ref. to EC(H4DOTC)-20, REMOVAL, Secondary Air Pump.>
(3) Disconnect the connector of ignition coil.
(4) Remove the ignition coil.
(5) Place a suitable container under the vehicle.
(6) Disconnect the PCV hose from the rocker cover (LH).
(7) Remove the bolts, then remove the rocker cover (LH).
12) Turn the crank pulley clockwise until the round mark and arrow mark on the camshaft sprocket are set to position shown in the figure.

NOTE:
Turn the crankshaft using socket wrench.

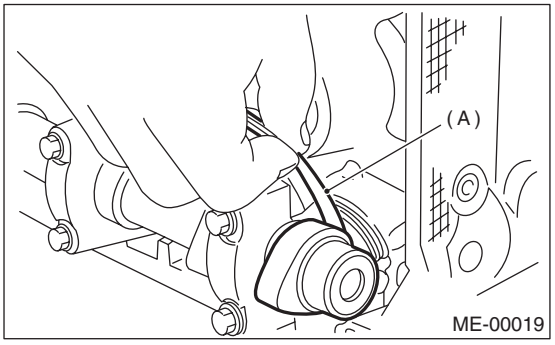


13) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

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.

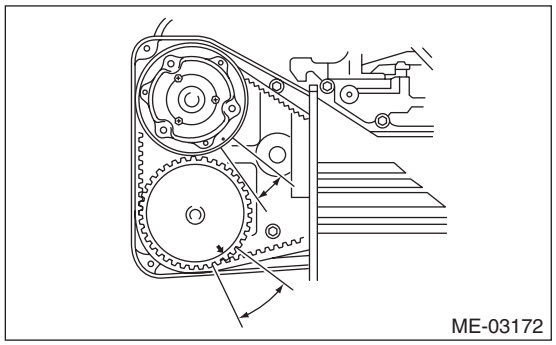
Valve clearance
Intake:
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust:
0.35±0.02 mm (0.0138±0.0008 in)

• If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.

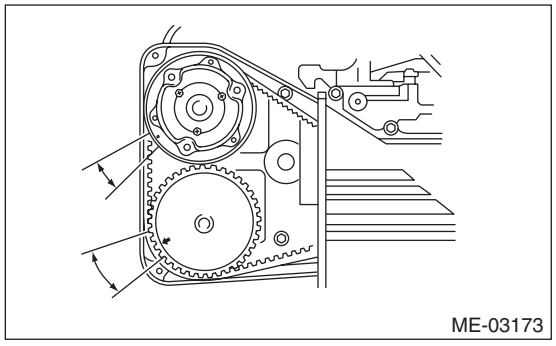


14) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-27, ADJUSTMENT, Valve Clearance.>
15) Further turn the crank pulley clockwise and then measure the valve clearances again.

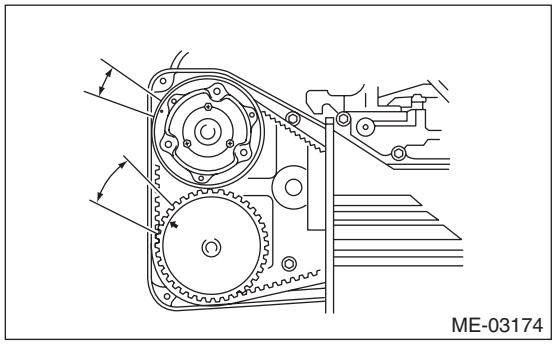
(1) Set the round mark and arrow mark on cam sprocket to the position shown in the figure, and measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set the round mark and 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 round mark and 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.



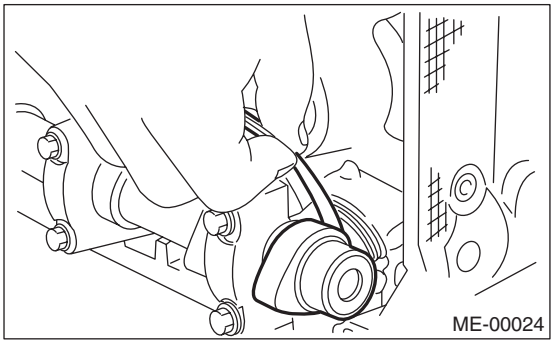
16) After inspection, install the related parts in the reverse order of removal.

B: ADJUSTMENT

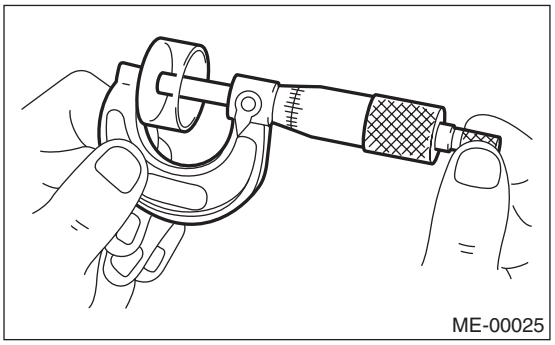
NOTE:
Adjustment of valve clearance should be performed while engine is cold.

1) Measure all the valve clearances. <Ref. to ME(H4DOTC)-26, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after measurement.



2) Remove the camshaft. <Ref. to ME(H4DOTC)-53, 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)

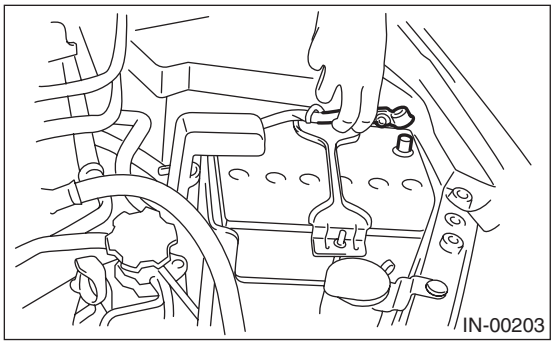
Part No.	Thickness mm (in)
13228 AB602	5.18 (0.2039)
13228 AB612	5.19 (0.2043)
13228 AB622	5.20 (0.2047)
13228 AB632	5.21 (0.2051)
13228 AB642	5.22 (0.2055)
13228 AB652	5.23 (0.2059)
13228 AB662	5.24 (0.2063)
13228 AB672	5.25 (0.2067)
13228 AB682	5.26 (0.2071)
13228 AB692	5.27 (0.2075)
13228 AB702	4.38 (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.

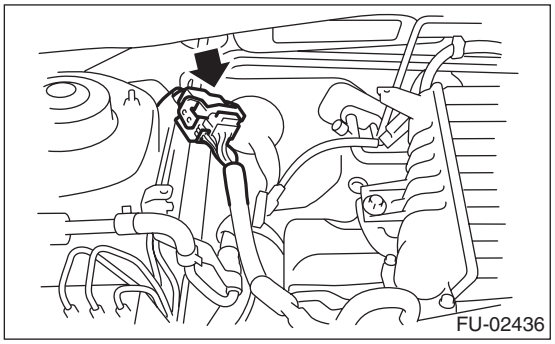
9. Engine Assembly

A: REMOVAL

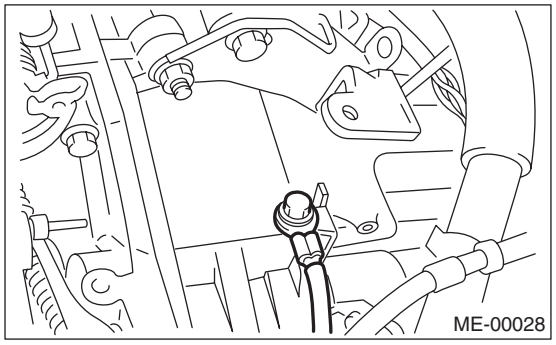
1) Set the vehicle on a lift.
2) Open the front hood fully and support with the front food stay.
3) Remove the collector cover.
4) Collect the refrigerant from A/C system. <Ref. to AC-19, Refrigerant Recovery Procedure.>
5) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
6) Disconnect the ground cable from the battery.


IN-00203

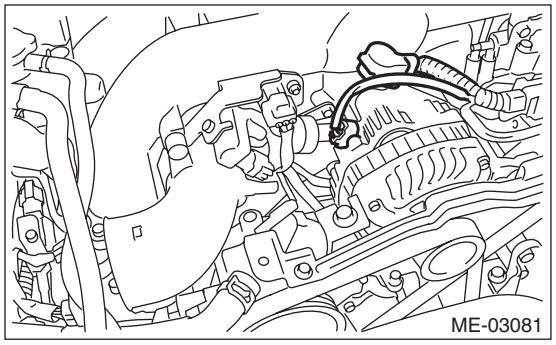
7) Open the fuel filler flap lid, and remove the fuel filler cap.
8) Remove the air intake duct and air cleaner case. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.> <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
9) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
10) Remove the radiator from vehicle. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
11) Remove the coolant filler tank.<Ref. to CO(H4DOTC)-31, REMOVAL, Coolant Filler Tank.>
12) Disconnect the A/C pressure hoses from A/C compressor. <Ref. to AC-37, REMOVAL, Hose and Tube.>
13) Disconnect the following connectors and cables.
(1) Engine harness connectors


FU-02436

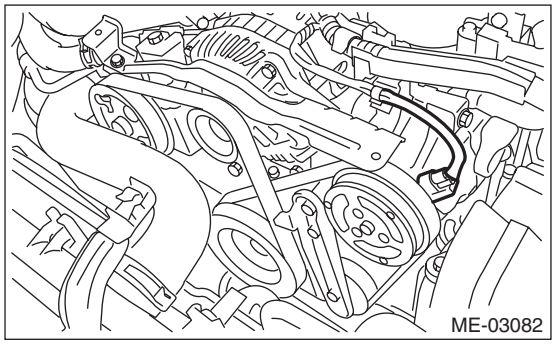
(2) Engine ground terminal


ME-00028

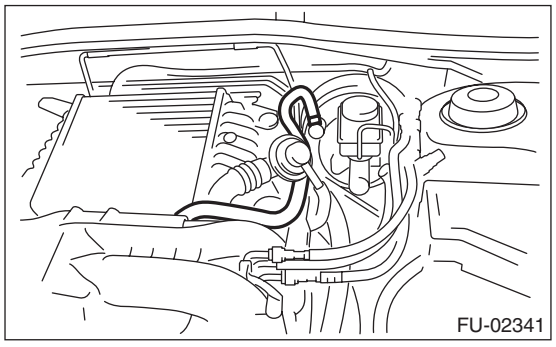
(3) Generator connector and terminal


ME-03081

(4) A/C compressor connector

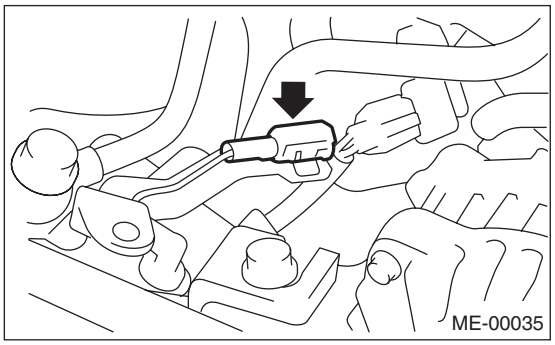

ME-03082

14) Disconnect the following hoses.
(1) Brake booster vacuum hose

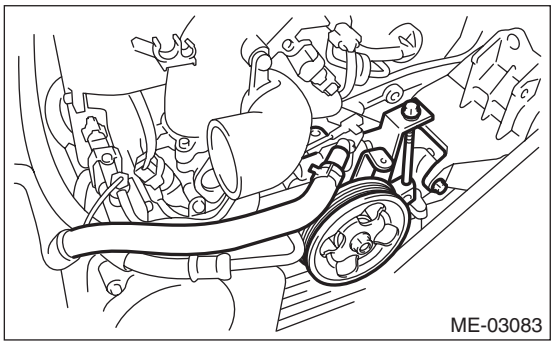

FU-02341

(2) Heater inlet and outlet hoses

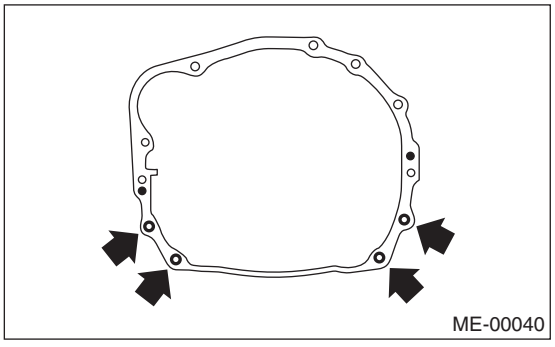
15) Remove the power steering pump from the bracket.
(1) Loosen the lock bolt and slider bolt, and remove the front side belt. <Ref. to ME(H4DOTC)-37, FRONT SIDE BELT, REMOVAL, V-belt.>
(2) Disconnect the power steering pump switch connector.



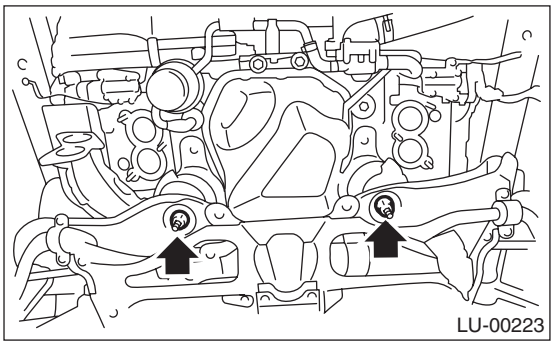
(3) Remove the power steering pump from the engine. <Ref. to PS-45, REMOVAL, Oil Pump.>



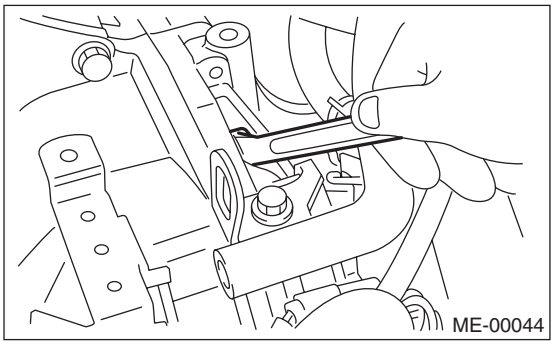
(4) Place the power steering pump on the right side wheel apron.
16) Lift the vehicle.
17) Remove the center exhaust pipe.<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
18) Remove the bolts and nuts which hold the lower side of transmission to the engine.



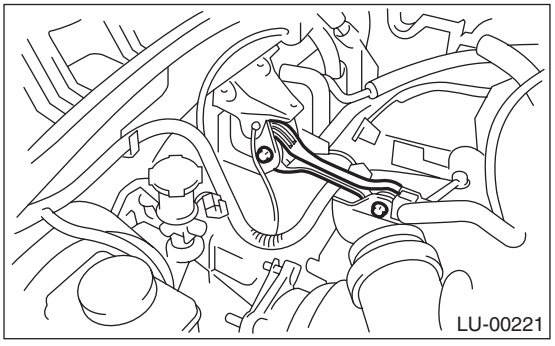
19) Remove the nuts which install front cushion rubber onto front crossmember.



20) 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 crankshaft using socket wrench.

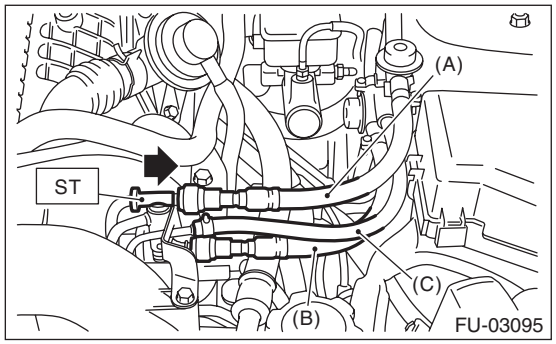


21) Remove the pitching stopper.



22) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the fuel delivery hose.
ST 42099AE000 CONNECTOR REMOVER

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

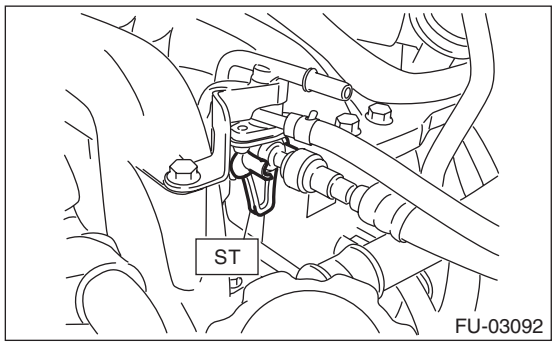


(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

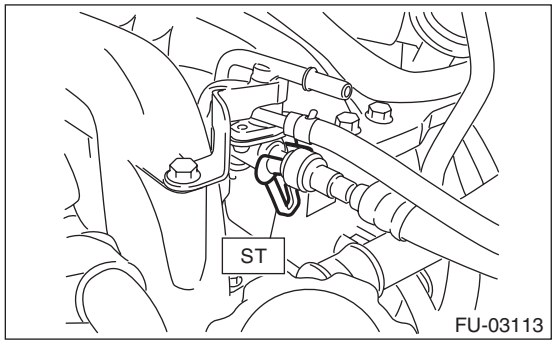
23) Disconnect the fuel return hose using the ST.
ST 18371AA000 CONNECTOR REMOVER

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

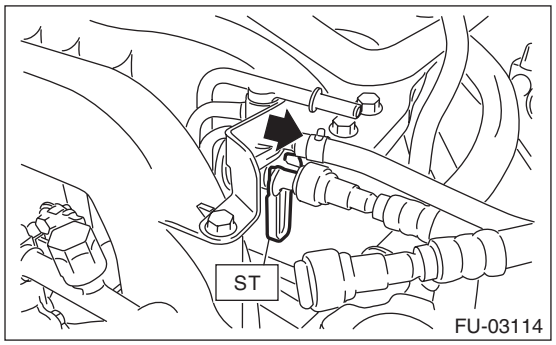
(1) Attach the ST to the fuel return pipe as shown in the figure.



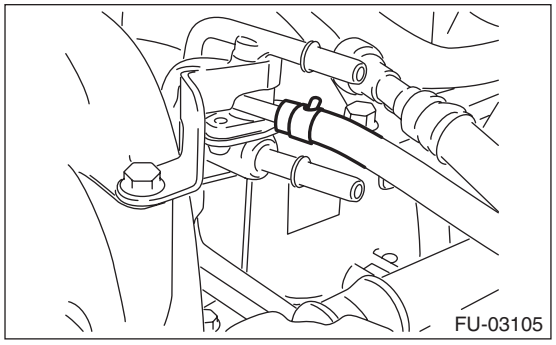
(2) Insert the front side of ST into the quick connector.



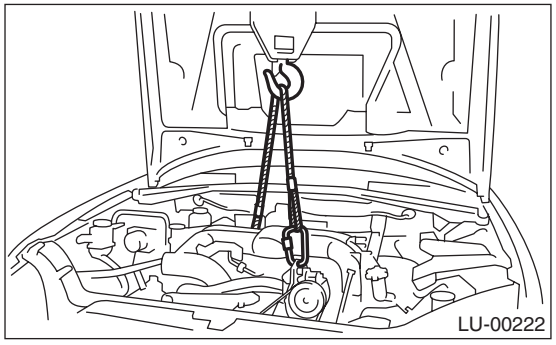
(3) Insert the back side of ST into the quick connector and push ST in the direction of arrow mark to disconnect the fuel return hose.



24) Remove the clip and disconnect the evaporation hose from the fuel pipe.

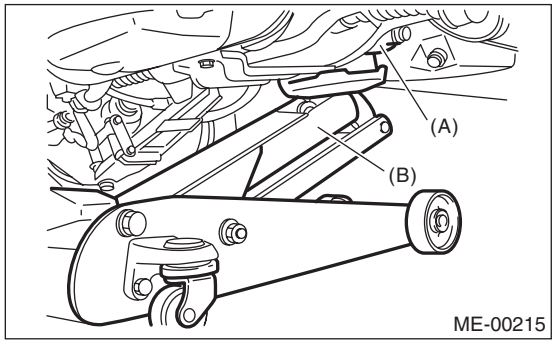


25) Support the engine with a lifting device and wire ropes.



26) Support the transmission with a garage jack.

CAUTION:
Doing this is very important to prevent the transmission from lowering due to its own weight.

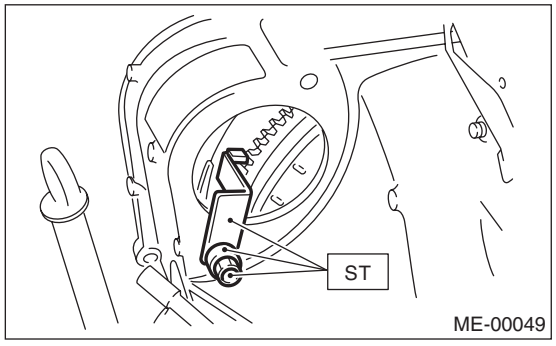


(A) Transmission
(B) Garage jack

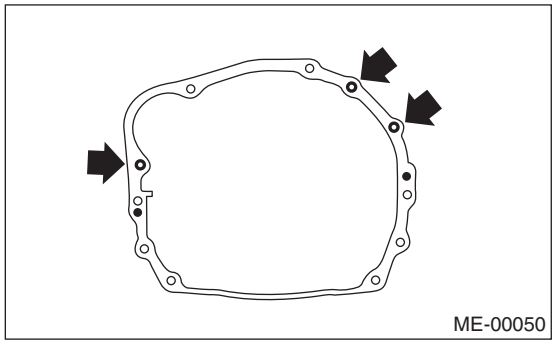
CAUTION:
Before removing the engine away from transmission, check to be sure no work has been overlooked.

27) Separation of engine and transmission.
(1) Remove the starter. <Ref. to SC(H4SO)-6, REMOVAL, Starter.>
(2) Set the ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



(3) Remove the bolts which hold the upper side of the transmission to the engine.



28) 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.

29) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the front cushion rubbers to engine.

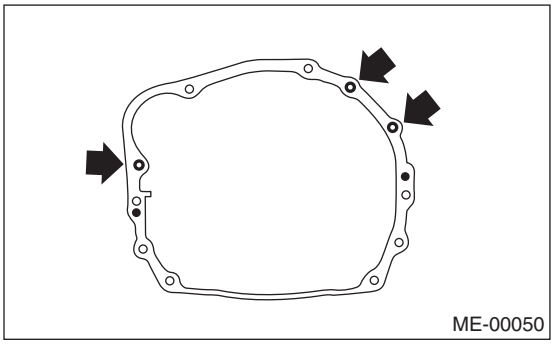
Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

2) Apply a small amount of grease to splines of main shaft. (MT model)
3) Position the engine in engine compartment and align it with transmission.

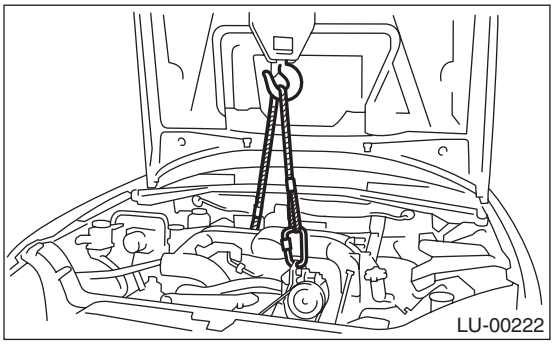
NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

4) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



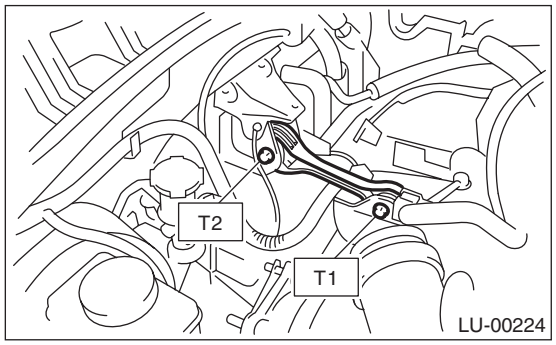
5) Remove the lifting device and wire ropes.



6) Remove the garage jack.

7) Install the 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)



8) Remove the ST from the torque converter clutch case. (AT model)

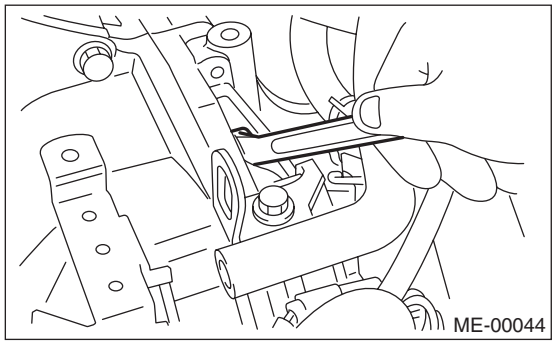
NOTE:
Be careful not to drop the ST into the torque converter clutch case when removing the ST.
ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC(H4SO)-6, INSTALLATION, Starter.>

10) 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 crankshaft using socket wrench.

NOTE:
Be careful not to drop bolts into the torque converter clutch housing.

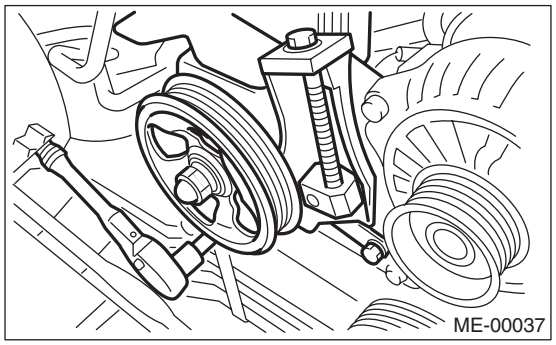
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



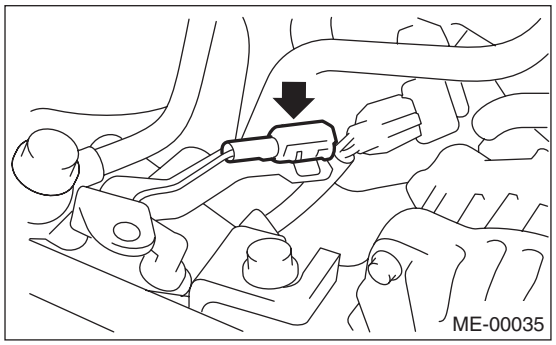
11) Fit the plug to service hole.

12) Install the power steering pump.
(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 pump switch connector.

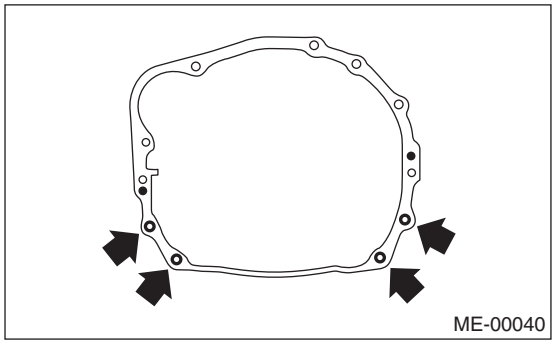


(3) Install and adjust the front side belt. <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, INSTALLATION, V-belt.>

13) Lift the vehicle.

14) Tighten the bolts and nuts which hold lower side of the transmission to engine.

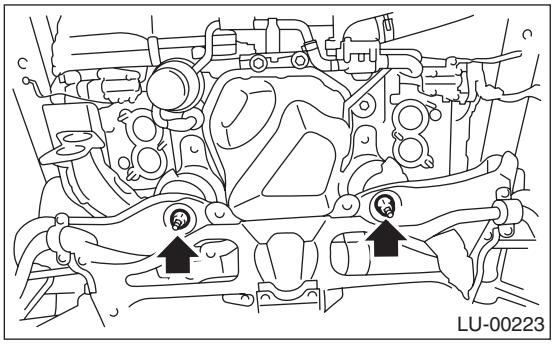
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



15) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)

NOTE:
Make sure that the front cushion rubber mounting bolts and locator are securely installed.



16) Install the center exhaust pipe.<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
17) Lower the vehicle.
18) 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
19) Connect the following connectors and terminals.
(1) Engine ground terminal
(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connector
20) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
21) Install the air cleaner case and air intake duct. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.>
22) Install the A/C pressure hoses. <Ref. to AC-37, INSTALLATION, Hose and Tube.>
23) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, Radiator.>
24) Install the coolant filler tank. <Ref. to CO(H4DOTC)-31, INSTALLATION, Coolant Filler Tank.>
25) Install the battery to the vehicle, and connect the battery ground terminal.
26) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
27) Charge the A/C system with refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Charging Procedure.>
28) Check the ATF level and replenish it if necessary. <Ref. to 5AT-28, INSPECTION, Automatic Transmission Fluid.>
29) Install the collector cover.
30) Remove the front hood stay, and close the front hood.
31) Lower the vehicle from the lift.

C: INSPECTION

1) Check 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)-29, 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

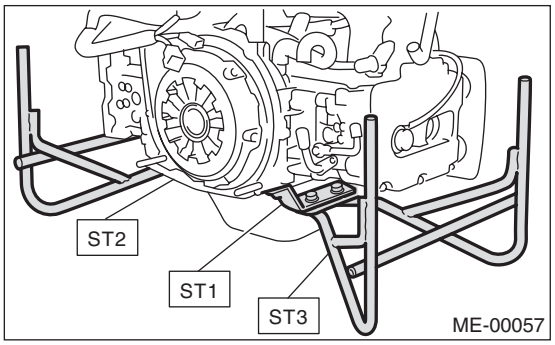
Make sure that no crack or other damages do not exist.

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	499817100	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.

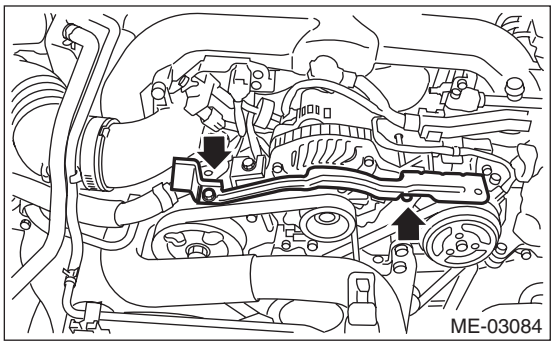
12.V-belt

A: REMOVAL

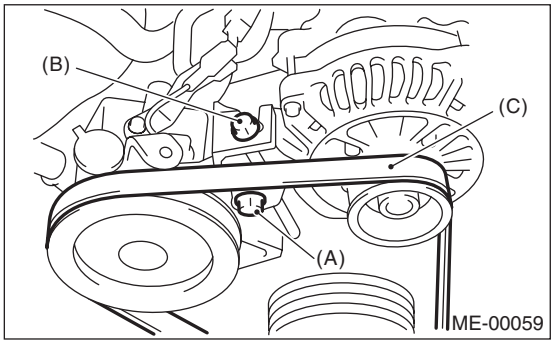
NOTE:
Perform the work with the engine installed to body when replacing a single part.

1. FRONT SIDE BELT

1) Remove the collector cover.
2) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>.
3) Remove the collector cover bracket.

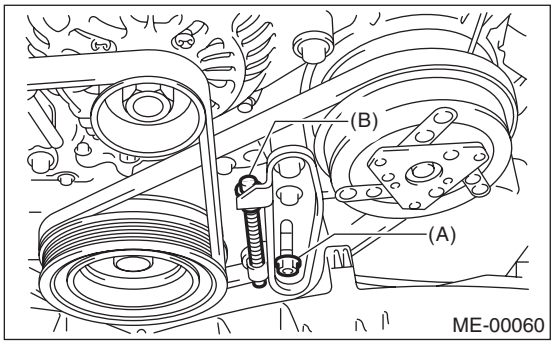


4) Loosen the lock bolt (A).
5) Loosen the slider bolt (B).
6) Remove the front side belt (C).

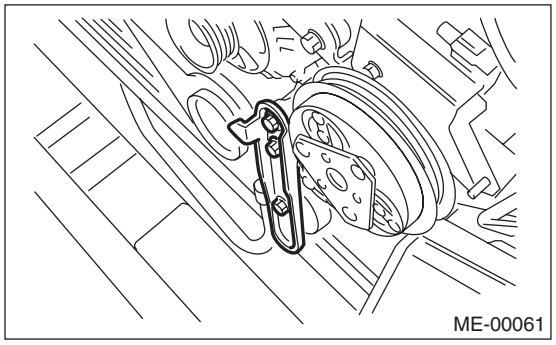


2. REAR SIDE BELT

1) Remove the front side belts. <Ref. to ME(H4DOTC)-37, FRONT SIDE BELT, REMOVAL, V-belt.>
2) Loosen the lock nut (A).
3) Loosen the slider bolt (B).



4) Remove the rear side belt.
5) Remove the belt tensioner.



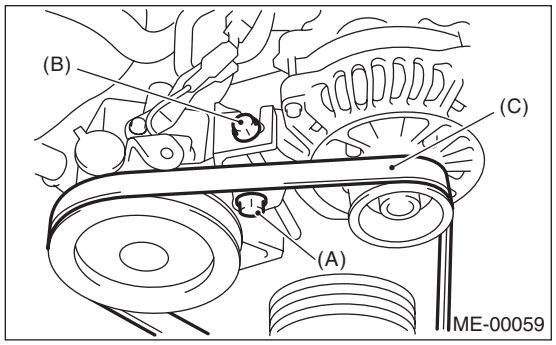
B: INSTALLATION

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

1. FRONT SIDE BELT

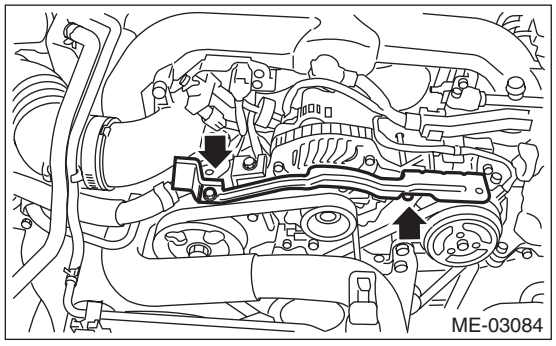
1) Install the front side belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-39, INSPECTION, V-belt.>
2) Tighten the lock bolt (A).
3) Tighten the slider bolt (B).

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)



4) Install the collector cover bracket.

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

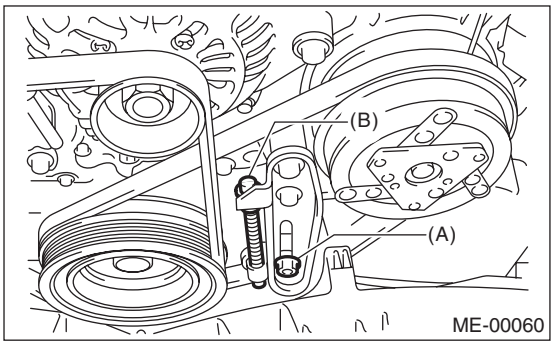


5) Install the air intake duct. <Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.>
6) Install the collector cover.

2. REAR SIDE BELT

1) Install the belt tensioner.
2) Install the rear side belt, and tighten the slider bolt (B) so as to obtain the specified belt tension.<Ref. to ME(H4DOTC)-39, 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)



4) Install the front side belt. <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, INSTALLATION, V-belt.>

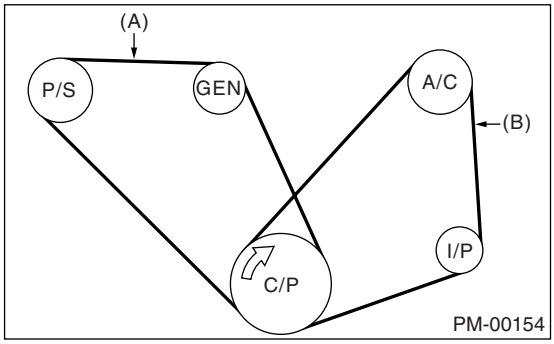
C: INSPECTION

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:
640 — 780 N (65 — 80 kgf, 144 — 175 lb)
At inspection:
490 — 640 N (50 — 65 kgf, 110 — 144 lb)

(B)
When installing new parts:
650 — 750 N (66 — 76 kgf, 146 — 169 lb)
At inspection:
350 — 450 N (36 — 46 kgf, 78 — 101 lb)

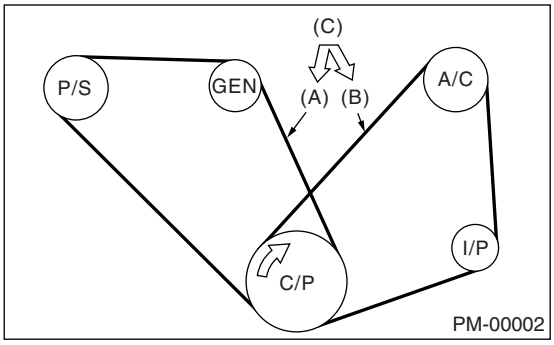


(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C A/C compressor pulley
I/P Idler pulley

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)

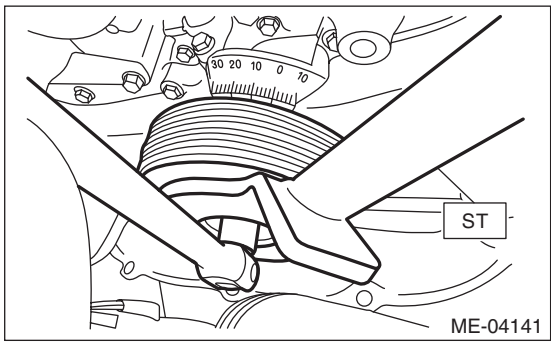


(A) Front side belt
(B) Rear side belt
(C) 98 N (10 kgf, 22 lbf)
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

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)-37, REMOVAL, V-belt.>
2) Use the ST to lock the crank pulley, and remove the crank pulley bolt.
ST 499977100 CRANK PULLEY WRENCH



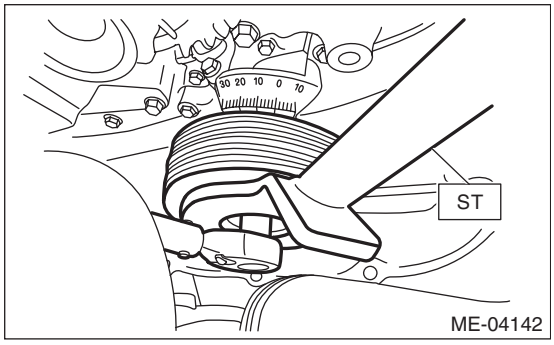
3) Remove the crank pulley.

B: INSTALLATION

1. METHOD WITHOUT ANGLE GAUGE

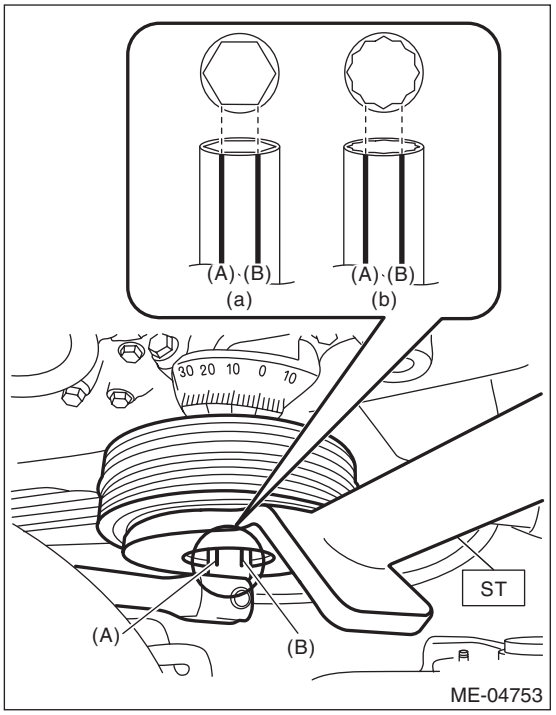
1) Clean the crankshaft thread using compressed air.
2) Install the crank pulley.
3) Apply engine oil to the crank pulley bolt seat and thread.
4) Tighten the crank pulley bolts.
(1) Use the ST to lock the crank pulley, and temporarily tighten the crank pulley bolt.
ST 499977100 CRANK PULLEY WRENCH

Tightening torque:
47 N·m (4.8 kgf-m, 34.7 ft-lb)



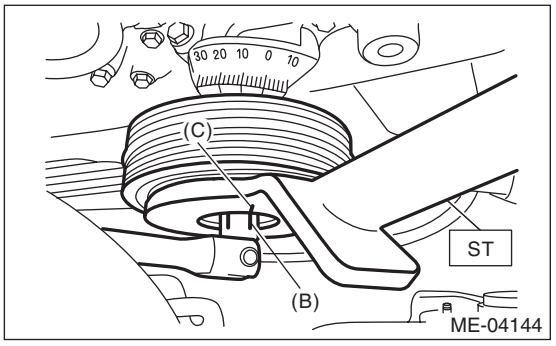
(2) Draw reference lines (A) and (B) using a marker to set the socket to the crank pulley bolt as shown in the figure.
ST 499977100 CRANK PULLEY WRENCH

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

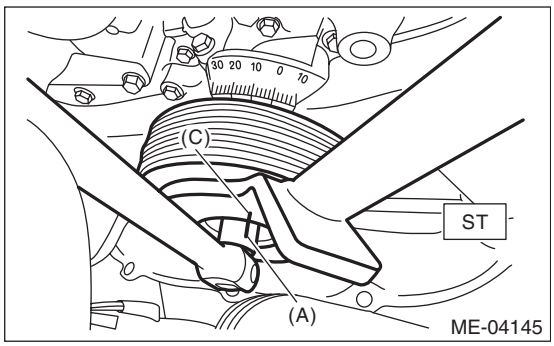
(3) Draw end line (C) on ST using a marker at the same position as reference line (B) was drawn on the socket in step (2).
ST 499977100 CRANK PULLEY WRENCH



(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°



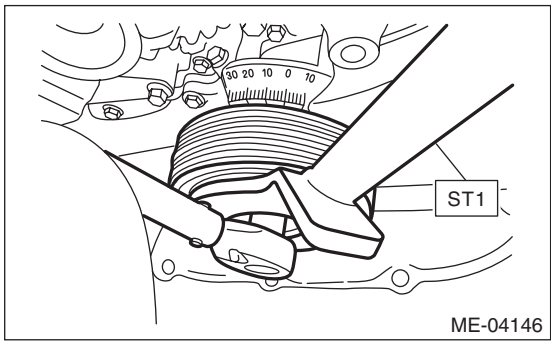
5) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

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)

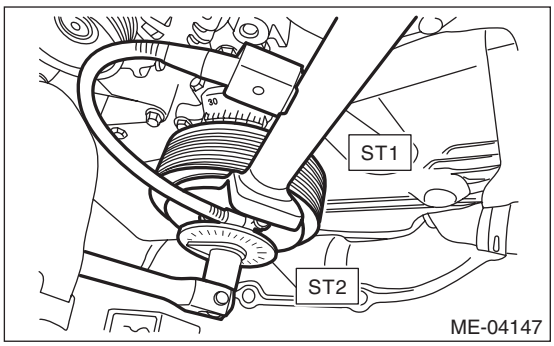


(3) Set the ST2, use the ST1 to lock the crank pulley, and tighten the crank pulley bolt to the specified angle.

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)-27, INSTALLATION, Radiator Sub Fan and Fan Motor.>

5) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

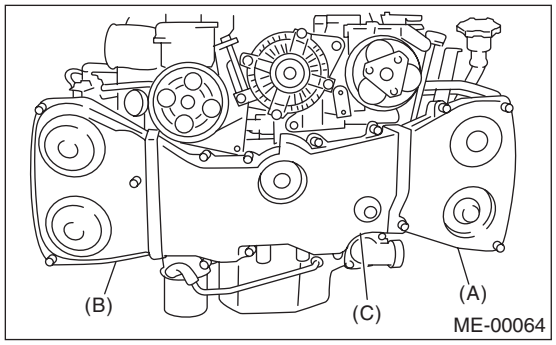
C: INSPECTION

1) Make sure the V-belt is not worn or damaged.
2) Check the tension of the front side belt. <Ref. to ME(H4DOTC)-39, INSPECTION, V-belt.>

14.Timing Belt Cover

A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part.
1) Remove the secondary air pump. <Ref. to EC(H4DOTC)-20, REMOVAL, Secondary Air Pump.>
2) Remove the V-belts. <Ref. to ME(H4DOTC)-37, REMOVAL, V-belt.>
3) Remove the crank pulley.<Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
4) Remove the timing belt cover (LH) (A).
5) Remove the timing belt cover (RH) (B).
6) Remove the front timing belt cover (C).



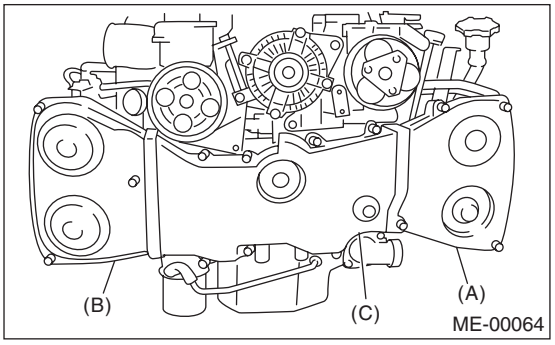
B: INSTALLATION

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)-40, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>
6) Install the secondary air pump. <Ref. to EC(H4DOTC)-20, INSTALLATION, Secondary Air Pump.>

C: INSPECTION

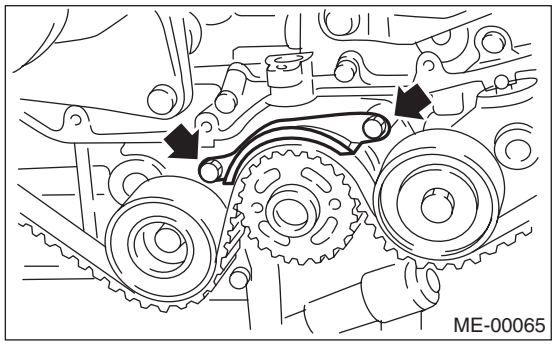
Check the cover for damage.

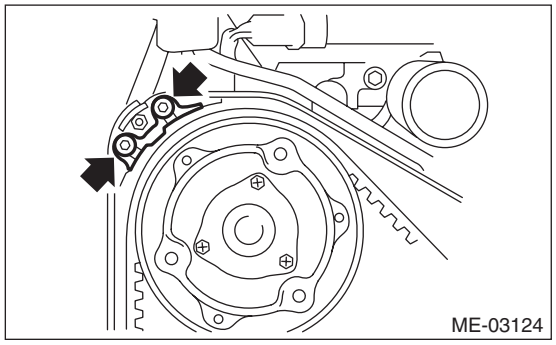
15.Timing Belt

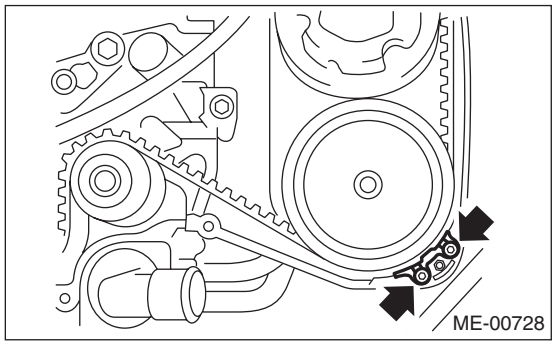
A: REMOVAL

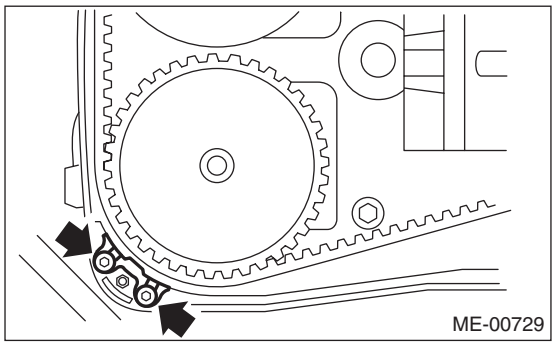
1. TIMING BELT

NOTE:
Perform the work with the engine installed to body when replacing a single part. For operation procedures, refer to “Timing Belt” in the PM section. <Ref. to PM-16, Timing Belt.>
1) Remove the V-belts. <Ref. to ME(H4DOTC)-37, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt guide. (MT model)


ME-00065

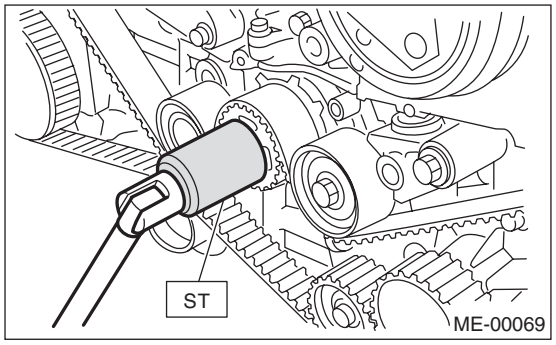

ME-03124


ME-00728


ME-00729

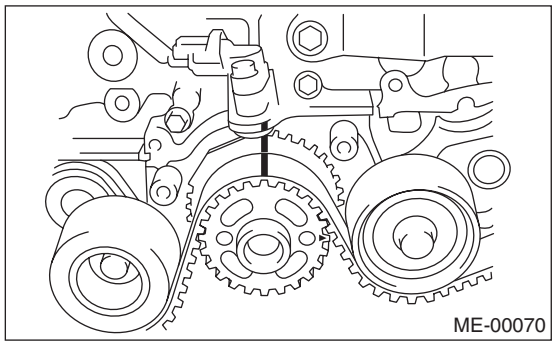
5) If the alignment mark or arrow mark (which indicates the direction of rotation) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.
(1) Turn the crankshaft using ST, and align the alignment marks on crank sprocket, intake cam sprocket (LH), exhaust cam sprocket (LH), intake cam sprocket (RH) and exhaust cam sprocket (RH) with notches of timing belt cover and cylinder block.

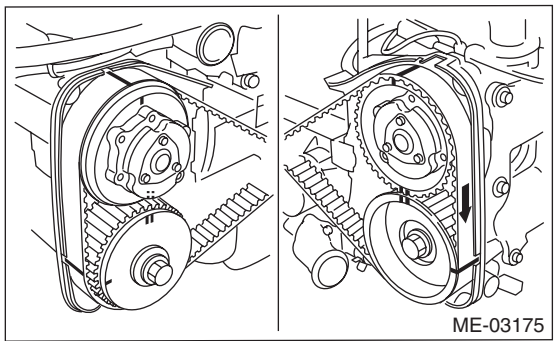
ST 499987500 CRANKSHAFT SOCKET



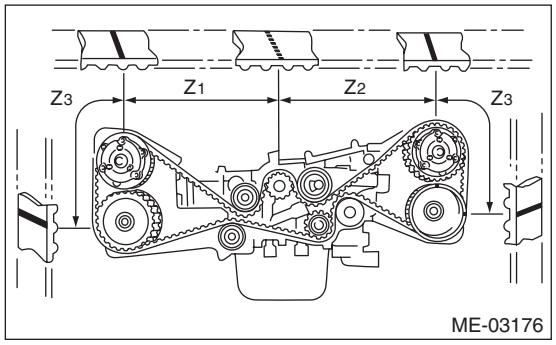
ME-00069

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


ME-00070

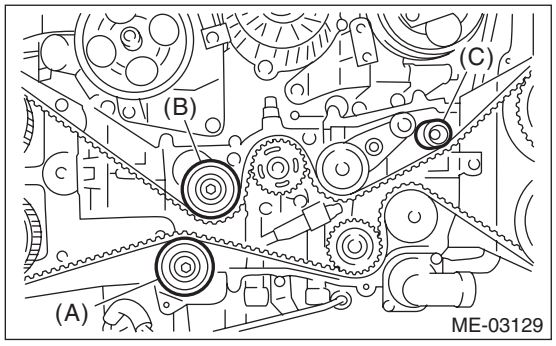

ME-03175

Z_1: 54.5 teeth
Z_2: 51 teeth
Z_3: 28 teeth



ME-03176

6) Remove the belt idler (A).



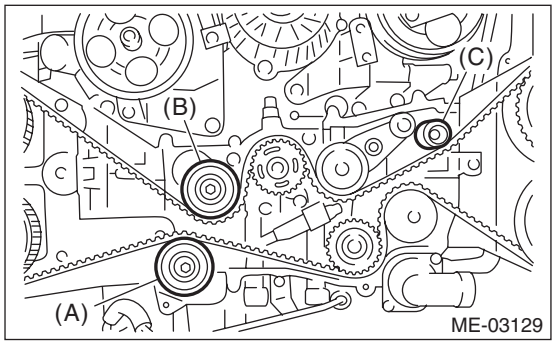
ME-03129

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.

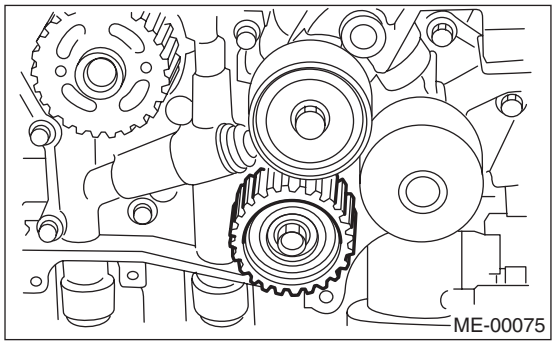
2. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

1) Remove the belt idler (B) and (C).

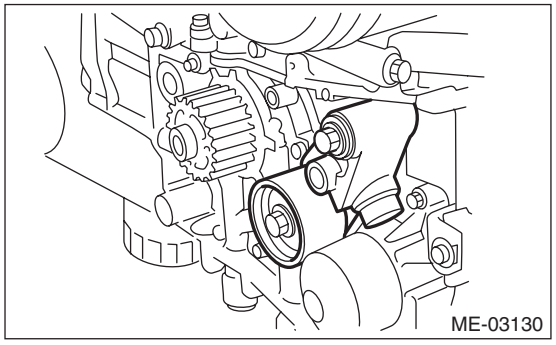


ME-03129

2) Remove the belt idler No. 2.


ME-00075

3) Remove the automatic belt tension adjuster assembly.


ME-03130

B: INSTALLATION

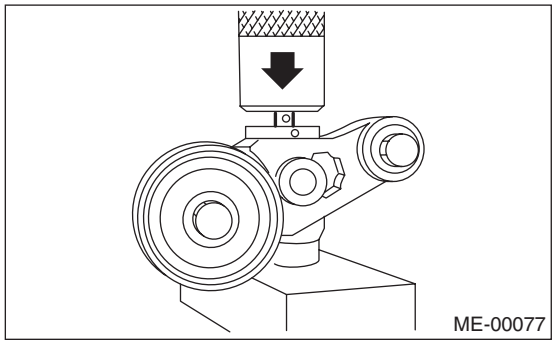
1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

1) Prepare for installation of automatic belt tension adjuster assembly.

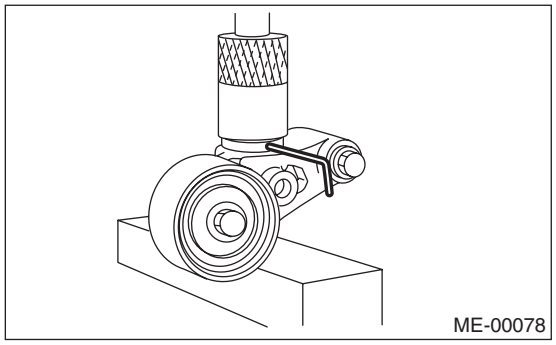
CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking three minutes or more.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press 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.

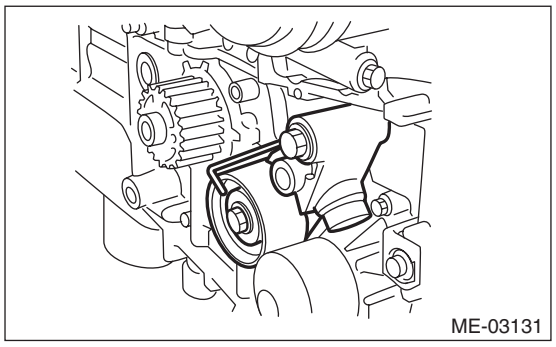

ME-00077

(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

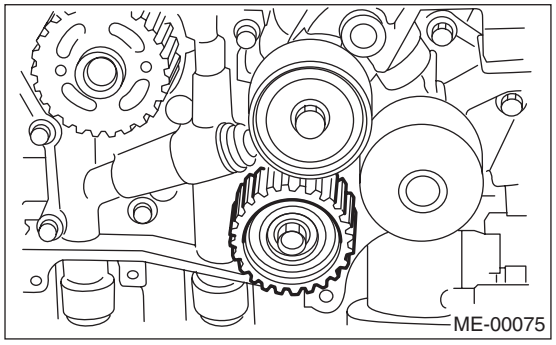
2) Install the automatic belt tension adjuster assembly.

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


ME-03131

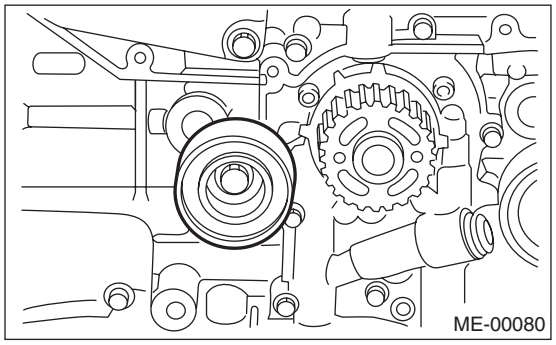
3) Install the belt idler No. 2.

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


ME-00075

4) Install the belt idlers.

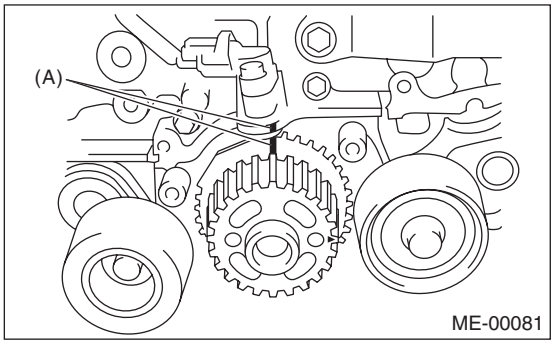
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00080

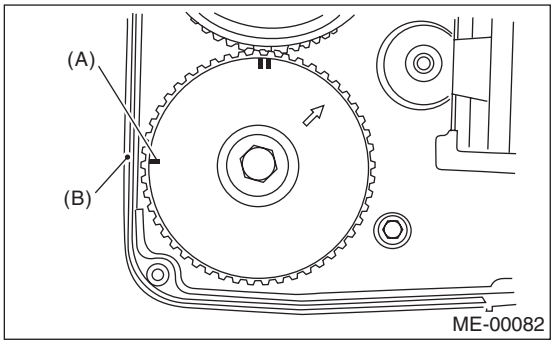
2. TIMING BELT

1) Prepare for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4DOTC)-45, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

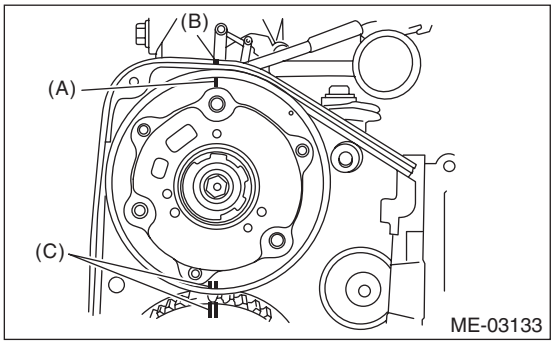
2) Align the mark (A) on crank sprocket with the mark on oil pump cover at cylinder block.



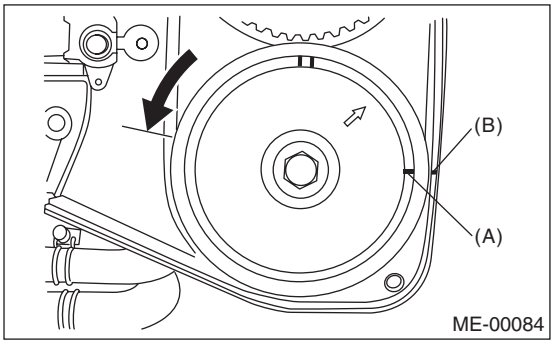
3) Align single line mark (A) on the exhaust cam sprocket (RH) with notch (B) on timing belt cover.



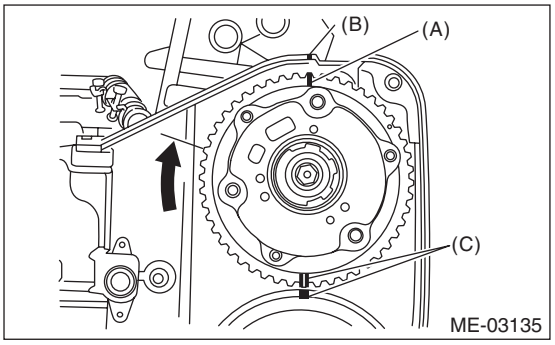
4) Align single line mark (A) on the intake cam sprocket (RH) with notch (B) on timing belt cover. (Make sure that the double lines (C) on intake and exhaust camshaft sprockets are aligned.)



5) 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).

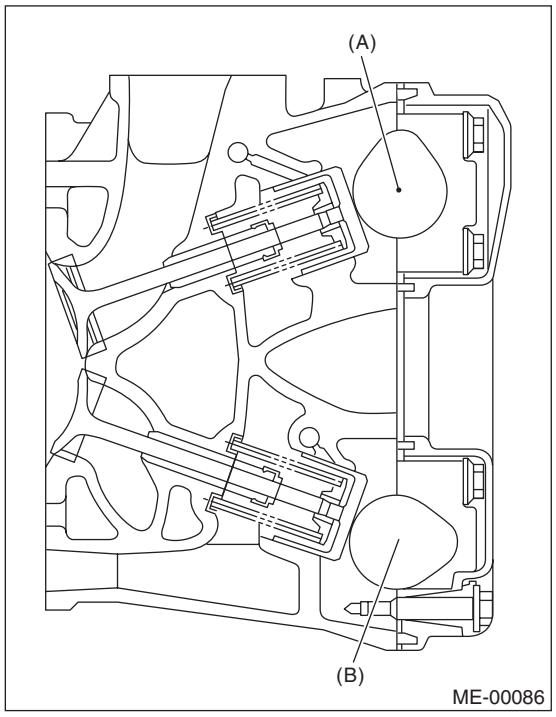


6) Align the single line mark (A) on intake cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine). Make sure the double line marks (C) on the intake and exhaust cam sprockets are aligned.



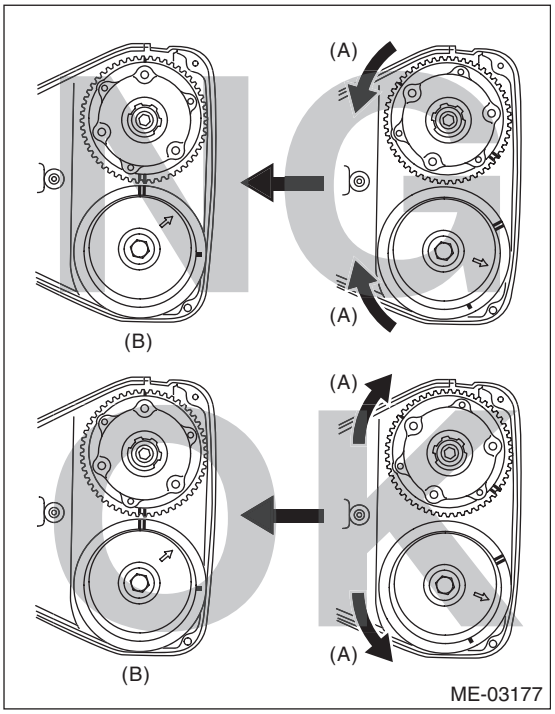
7) Make sure that the cam and crank sprockets are positioned properly.

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 upper figure. Doing this may cause both the intake and exhaust valves to lift simultaneously, resulting in mutual interference of heads.

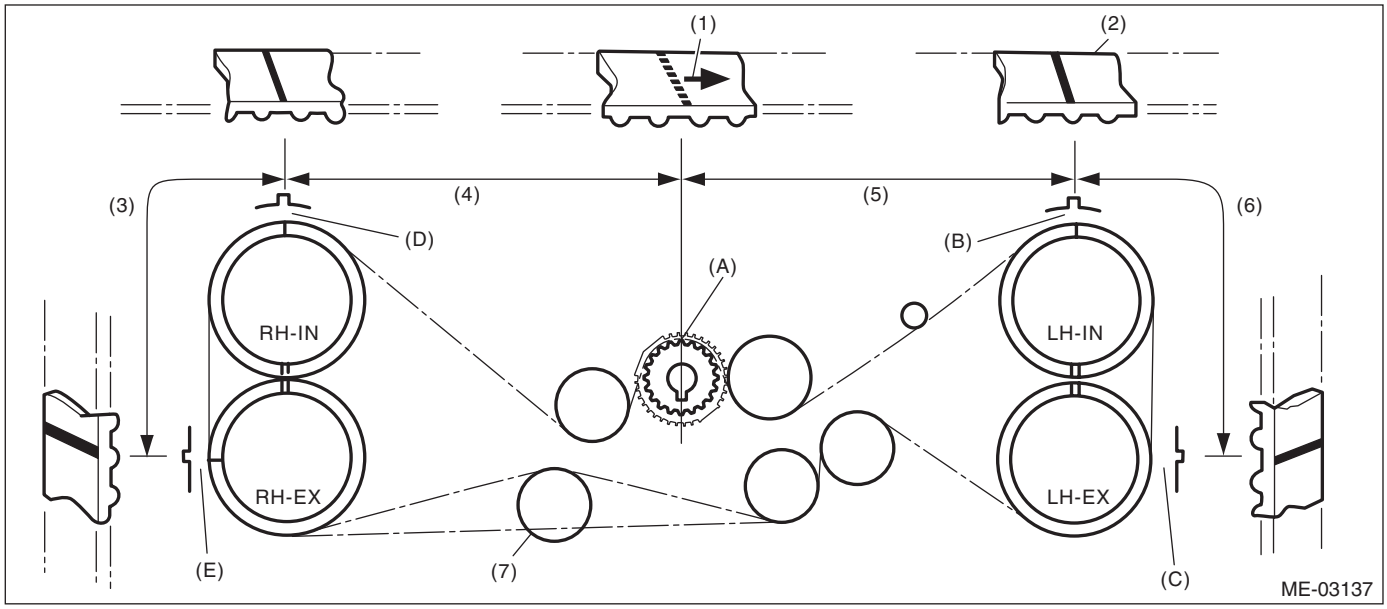


(A) Direction of rotation
(B) Timing belt installation position

8) Install the 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.**

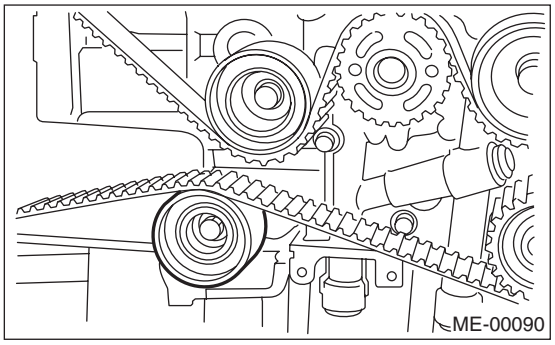


(1) Arrow mark
(2) Timing belt
(3) 28 tooth length
(4) 54.5 tooth length
(5) 51 tooth length
(6) 28 tooth length
(7) Install it in the end

9) 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.



10) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.
11) Install the timing belt guide. (MT model)

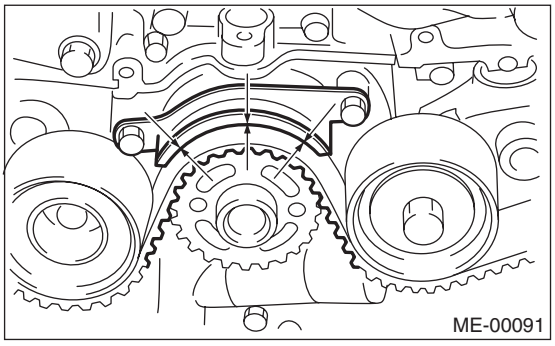
NOTE:
• Clean the threaded portion of timing belt cover before attaching bolts.
• Apply liquid gasket to the threaded portion of cam sprocket. (when reusing bolts)

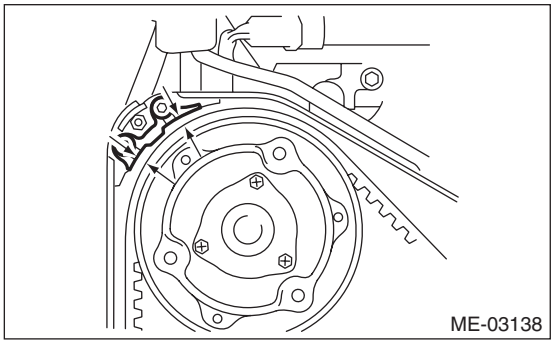
Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

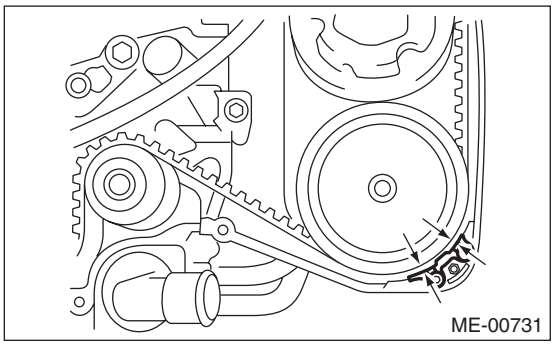
(1) Temporarily tighten the bolts mounting the timing belt guide.

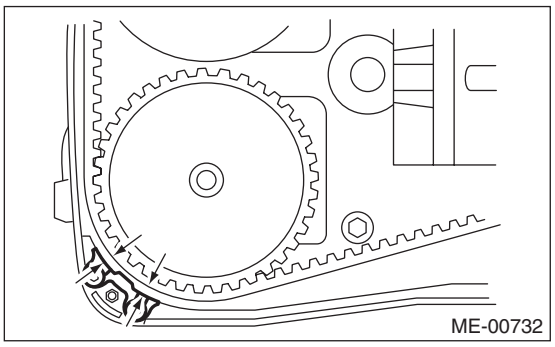
(2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:
1.0±0.5 mm (0.039±0.020 in)


ME-00091

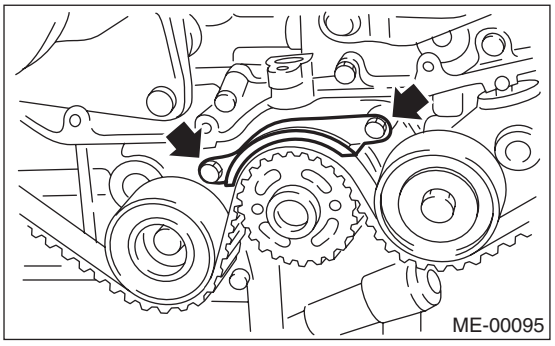

ME-03138


ME-00731

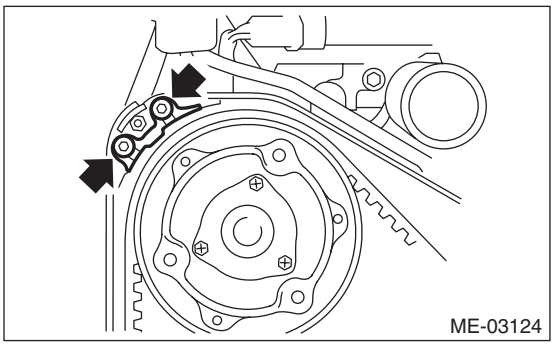

ME-00732

(3) Tighten the bolts mounting the timing belt guide.

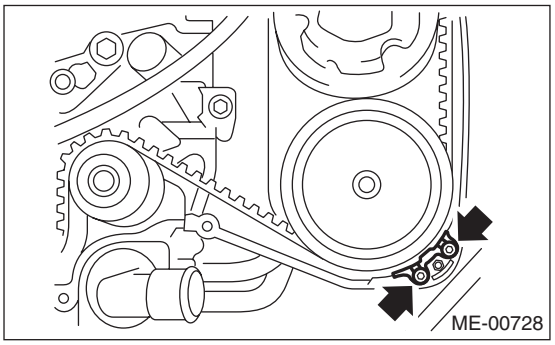
Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)


ME-00095

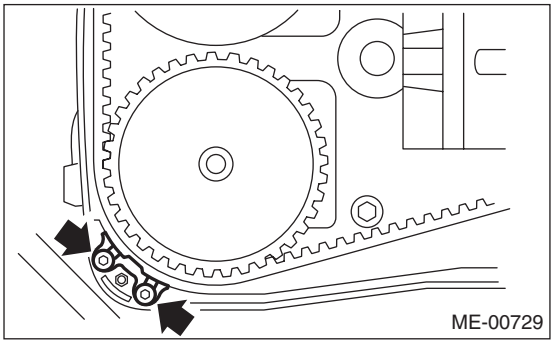
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


ME-03124

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

12) Install the timing belt cover.<Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>
13) Install the crank pulley.<Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
14) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

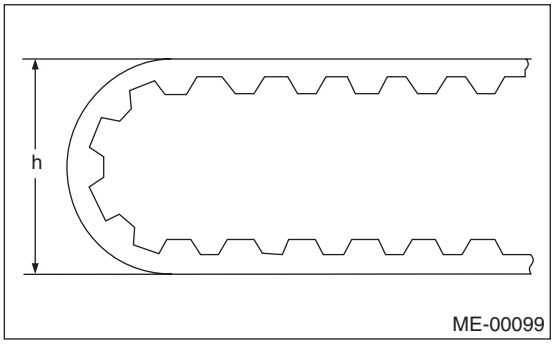
C: INSPECTION

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 back surface of the timing belt. If cracks are found, replace the timing belt.

CAUTION:
• Be careful not to let oil, grease or coolant contact the timing 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



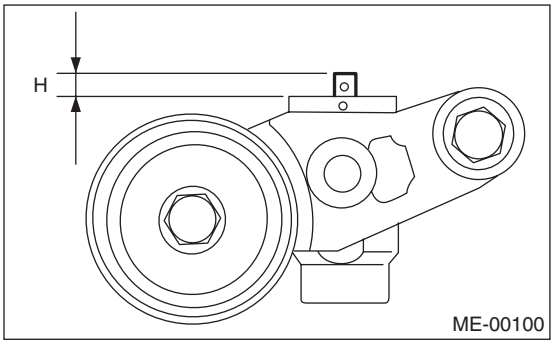
2. AUTOMATIC BELT TENSION ADJUSTER

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 three minutes or more.
• 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 “H” beyond the body. If it is not within specified range, replace with new part.

Amount of rod protrusion H:
5.2 — 6.2 mm (0.205 — 0.244 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.

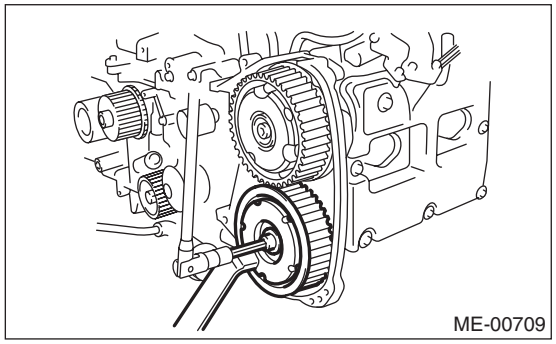
4. BELT IDLER

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.

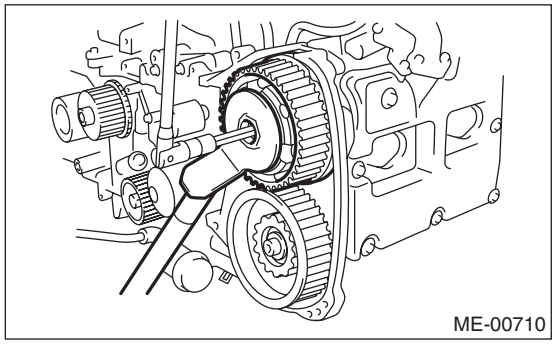
16.Cam Sprocket

A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part.
1) Remove the V-belts. <Ref. to ME(H4DOTC)-37, REMOVAL, V-belt.>
2) Remove the crank pulley.<Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt.<Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt.>
5) Remove the actuator cover of the intake cam sprocket.
6) Fasten the cam sprocket and remove from the cam shaft using ST.
ST 499207400 CAM SPROCKET WRENCH



ST 499977500 CAM SPROCKET WRENCH

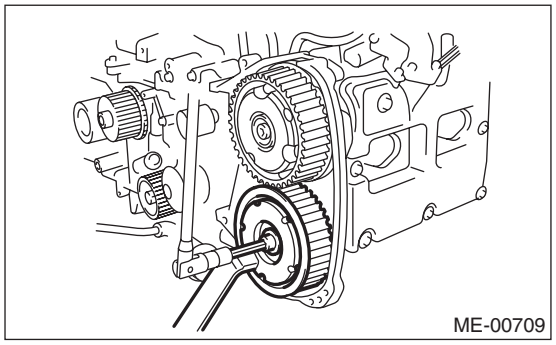


B: INSTALLATION

1) Fasten the cam sprocket and install to the cam shaft using ST.

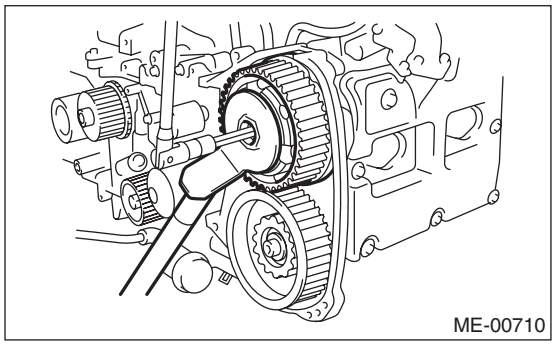
NOTE:
Do not confuse the cam sprockets (LH) and (RH) during installation.
ST 499207400 CAM SPROCKET WRENCH

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) Attach the actuator cover of the intake cam sprocket.

NOTE:
Use new O-rings.

Tightening torque:
3.4 N·m (0.3 kgf-m, 2.5 ft-lb)
3) Install the timing belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt.>
4) Install the timing belt cover. <Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>
5) Install the crank pulley. <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
6) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

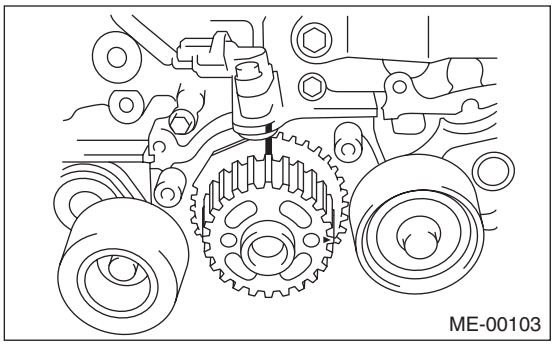
C: INSPECTION

1) Check the cam sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between cam sprocket and key.

17.Crank Sprocket

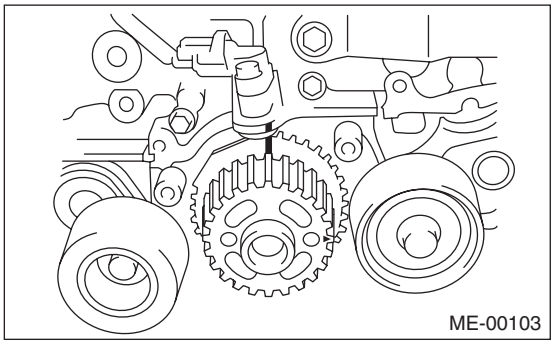
A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part.
1) Remove the V-belts. <Ref. to ME(H4DOTC)-37, REMOVAL, V-belt.>
2) Remove the crank pulley.<Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt.<Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt.>
5) Remove the crank sprocket.



B: INSTALLATION

1) Install the crank sprocket.



2) Install the timing belt.<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt.>
3) Install the timing belt cover. <Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>
4) Install the crank pulley. <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

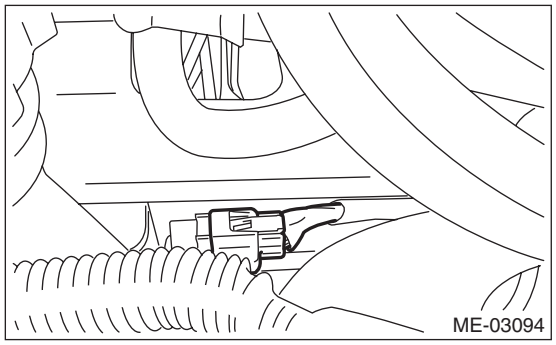
C: INSPECTION

1) Check the crank sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between crank sprocket and key.
3) Check the crank sprocket protrusion used for sensor for damage and contamination of foreign matter.

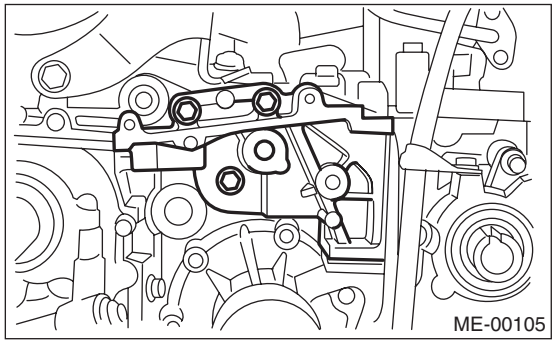
18.Camshaft

A: REMOVAL

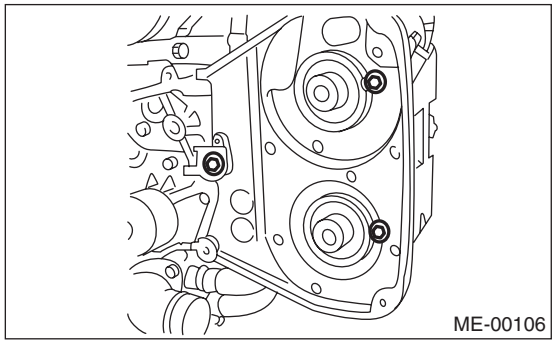
NOTE:
Perform the work with the engine installed to body when replacing a single part. Refer to “Valve Clearance” for preparation. <Ref. to ME(H4DOTC)-26, INSPECTION, Valve Clearance.>
1) Remove the V-belts. <Ref. to ME(H4DOTC)-37, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt. <Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt.>
5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-51, REMOVAL, Cam Sprocket.>
6) Disconnect the oil flow control solenoid valve assembly connector.


ME-03094

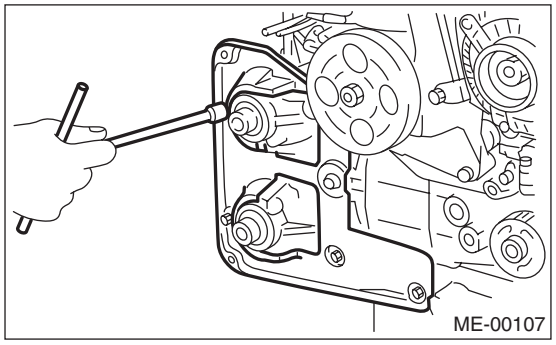
7) Remove the tensioner bracket.


ME-00105

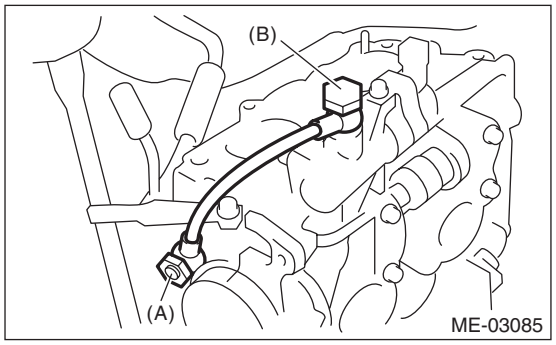
8) Remove the timing belt cover No. 2 (LH).


ME-00106

9) Remove the timing belt cover No. 2 (RH).


ME-00107

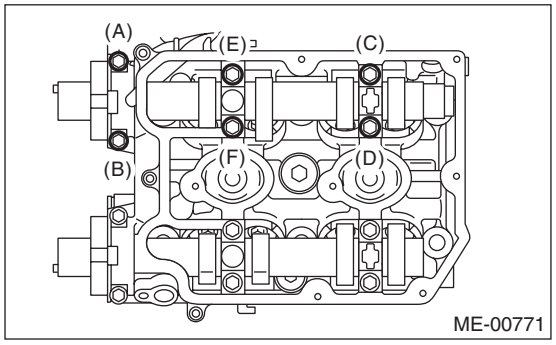
10) Remove the ignition coil.
11) Disconnect the PCV hose from the rocker cover.
12) Remove the oil level gauge guide. (LH side)
13) Remove the rocker cover and gasket.
14) Remove the oil pipe.



ME-03085

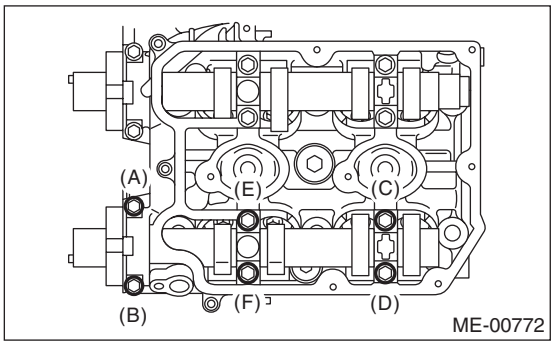
(A) Union screw with filter (with protrusion)
(B) Union screw without filter (without protrusion)

15) Loosen the oil flow control solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical order shown in the figure.



ME-00771

16) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical order shown in the figure.



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.

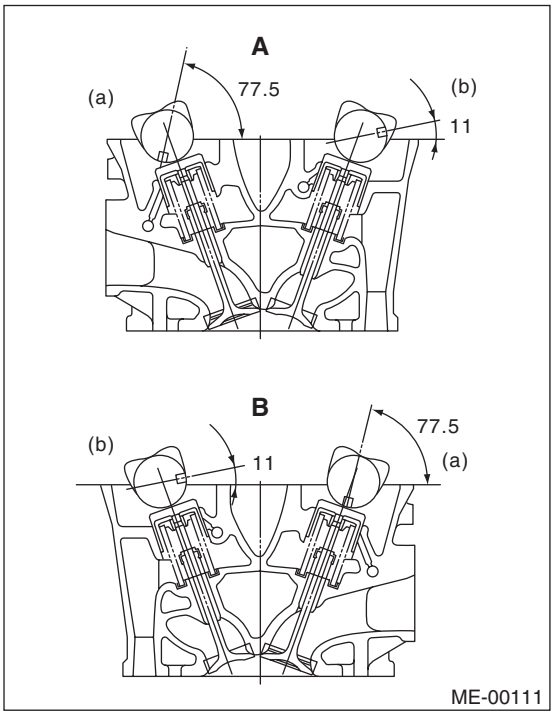
B: INSTALLATION

1) Install the camshaft.
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.

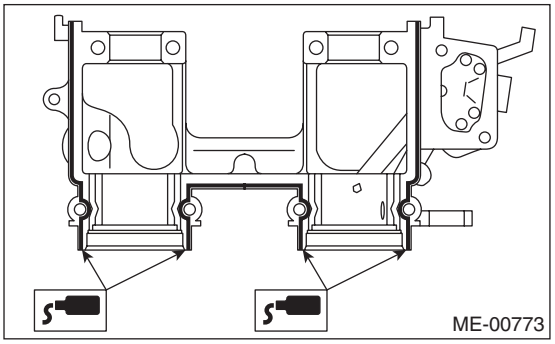


A Cylinder head (LH)
B Cylinder head (RH)
(a) Intake camshaft
(b) Exhaust camshaft

2) Install the camshaft cap and oil flow control solenoid valve assembly.
(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.

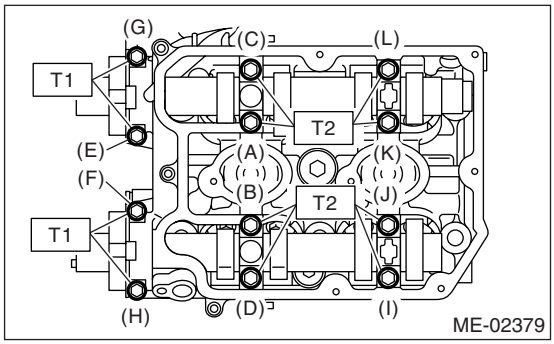
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(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 order shown in the figure, and then tighten to specified torque.

Tightening torque:
T1: 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)

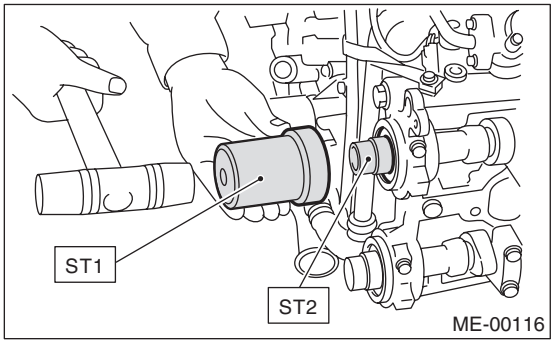


(4) After tightening the camshaft cap, ensure the camshaft rotates only slightly while holding it at base circle.

3) Apply a coat of engine oil to the camshaft oil seal periphery and oil seal lips, then install the oil seal on the camshaft using ST1 and ST2.

NOTE:
Use a new oil seal.

ST1	499587600	OIL SEAL INSTALLER
ST2	499597200	OIL SEAL GUIDE



4) Install the rocker cover.

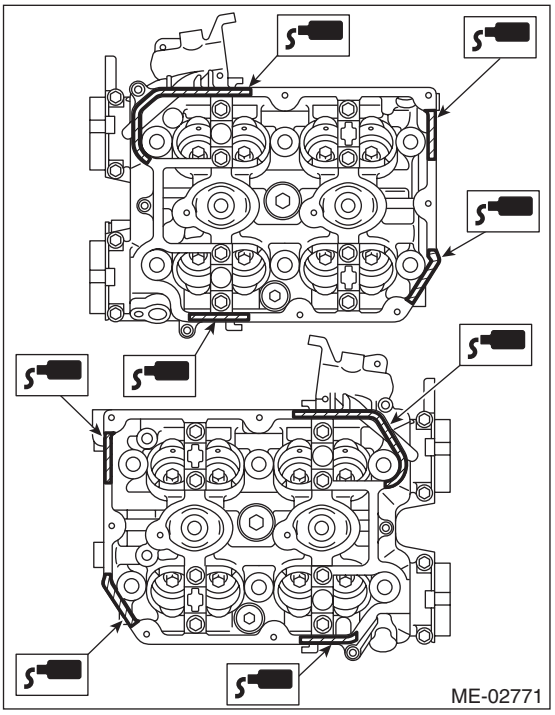
(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil gasket.

NOTE:
Use a new 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.

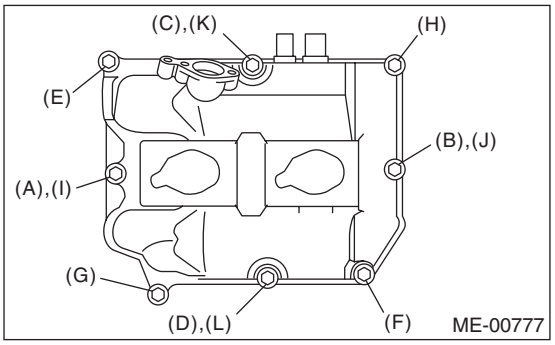
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(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 in alphabetical order.

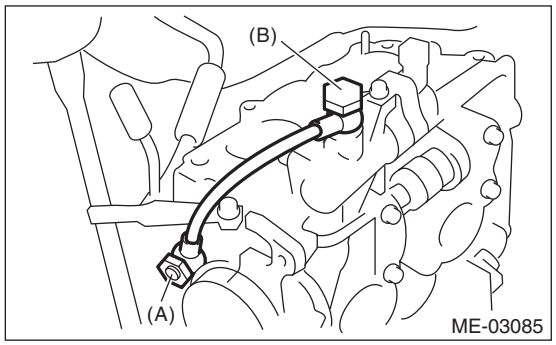
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



5) Install the oil pipe.

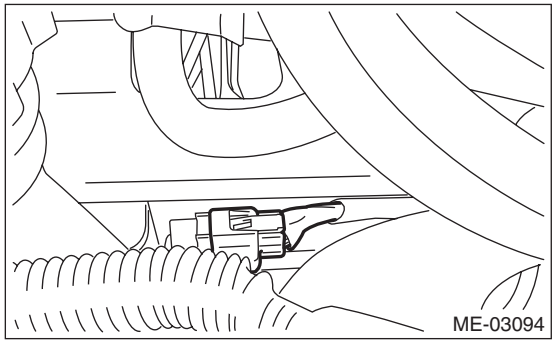
CAUTION:
Install to the position shown in the figure as the head side and oil flow control solenoid valve side of union screw are of different specification.

Tightening torque:
29 N·m (3.0 kgf-m, 21.4 ft-lb)



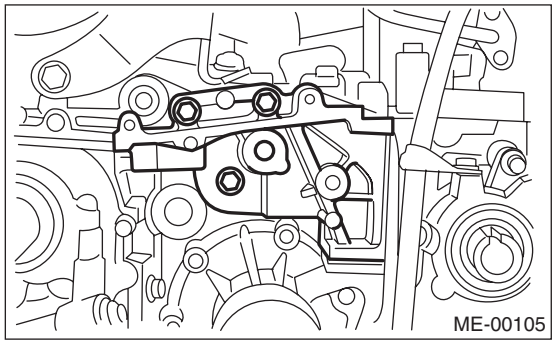
(A) Union screw with filter (with protrusion)
(B) Union screw without filter (without protrusion)

6) Connect the oil flow control solenoid valve connector.



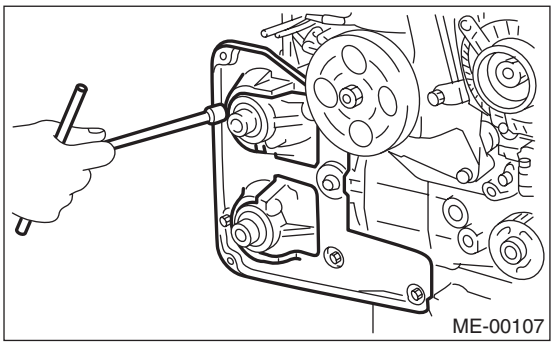
7) Connect the PCV hose to the rocker cover.
8) Tighten the ignition coil.
9) Similarly, install the parts on right-hand side.
10) Install the tensioner bracket.

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



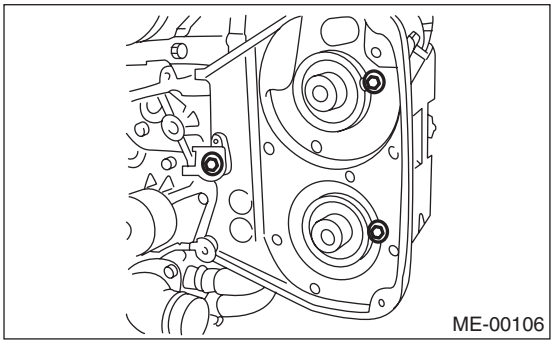
11) Install the timing belt cover No. 2 (RH).

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



12) Install the timing belt cover No. 2 (LH).

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

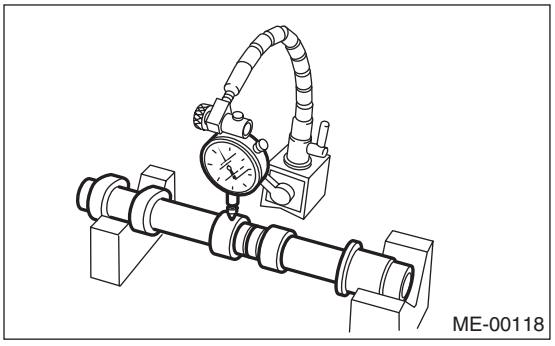


13) Install the cam sprocket.<Ref. to ME(H4DOTC)-51, INSTALLATION, Cam Sprocket.>
14) Install the timing belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt.>
15) Install the timing belt cover.<Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>
16) Install the crank pulley.<Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
17) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Service limit:
0.020 mm (0.00079 in)

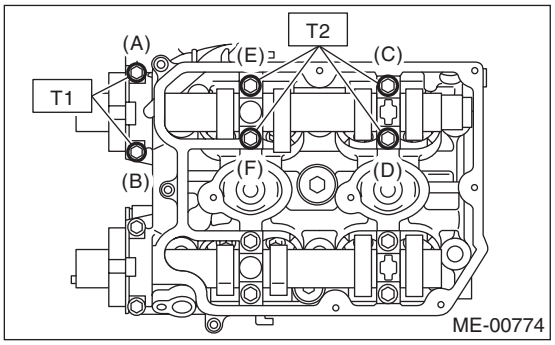


2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal. If the journal diameter is not within the standard value, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard mm (in)	37.946 — 37.963 (1.4939 — 1.4946)	29.946 — 29.963 (1.1790 — 1.1796)

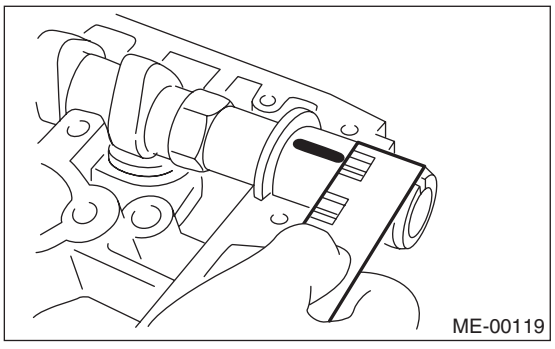
4) Measurement of the camshaft journal oil clearance
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on cylinder head. (Without installing the valve lifter)
(3) Place a plastigauge across each camshaft journals.
(4) Gradually tighten the cap in at least two stages in alphabetical order shown in the figure, and then tighten to specified torque. Do not turn the camshaft.

Tightening torque:
T1: 9.75 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)

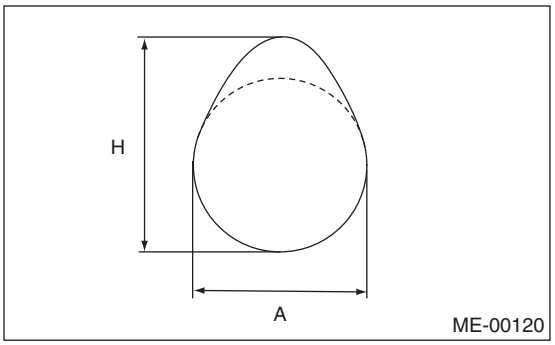


(7) Completely remove the plastigauge.
5) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H. If it exceeds the standard or offset wear occurs, replace it.

Cam height H:

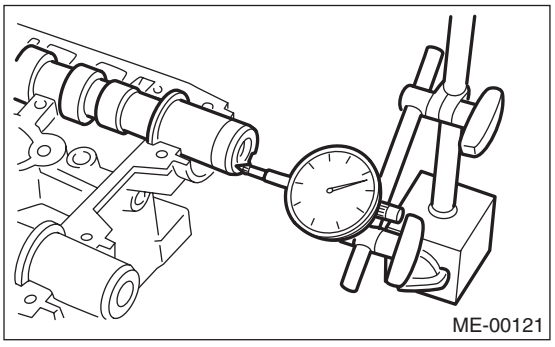
Standard
Intake
46.55 — 46.65 mm (1.833 — 1.837 in)
Exhaust
46.75 — 46.85 mm (1.841 — 1.844 in)

Cam base circle diameter A:
37.0 mm (1.457 in)



6) Measure the thrust clearance of camshaft with setting the dial gauge at end of camshaft. If the thrust clearance exceeds the standard or there is offset wear, replace the caps and cylinder head as a set. If necessary replace the camshaft.

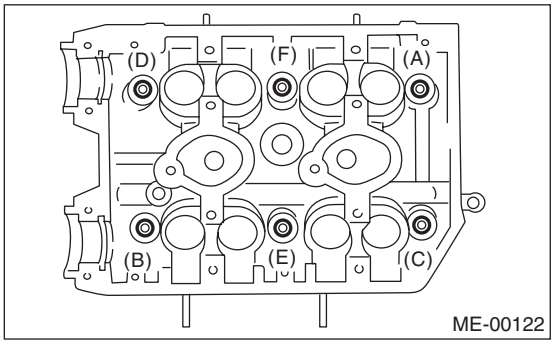
Standard:
0.068 — 0.116 mm (0.0027 — 0.0047 in)



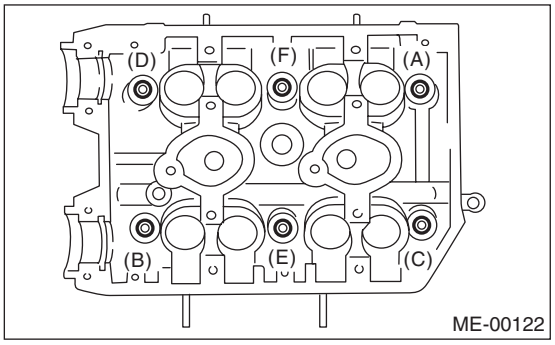
19.Cylinder Head

A: REMOVAL

NOTE:
Perform the work with the engine installed to body when replacing a single part. Refer to “Valve Clearance” for preparation. <Ref. to ME(H4DOTC)-26, INSPECTION, Valve Clearance.>
1) Remove the V-belts. <Ref. to ME(H4DOTC)-37, REMOVAL, V-belt.>
2) Remove the crank pulley.<Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt.<Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt.>
5) Remove the cam sprocket.<Ref. to ME(H4DOTC)-51, REMOVAL, Cam Sprocket.>
6) Remove the intake manifold.<Ref. to FU(H4DOTC)-13, REMOVAL, Intake Manifold.>
7) Remove the secondary air combination valve. <Ref. to EC(H4DOTC)-21, REMOVAL, Secondary Air Combi Valve.>
8) Remove the bolt which installs the A/C compressor bracket on cylinder head.
9) Remove the camshaft. <Ref. to ME(H4DOTC)-53, REMOVAL, Camshaft.>
10) Remove the cylinder head bolts in alphabetical order shown in the figure. Leave the bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



12) Remove the cylinder head gasket.

CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.
13) Similarly, remove the cylinder head (RH).

B: INSTALLATION

1) Install the cylinder head 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.

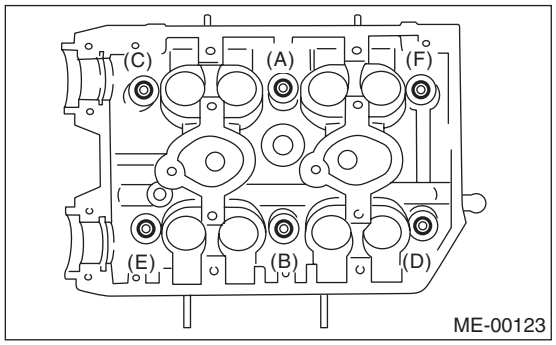
CAUTION:
To avoid erroneous tightening of the bolts, clean out the bolt holes sufficiently by blowing with compressed air to eliminate engine coolant etc.
(2) Apply a sufficient coat of engine oil to the washer and bolt thread.
(3) Tighten all bolts to 40 N·m (4.1 kgf-m, 29.5 ft-lb) in alphabetical order.
(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°.



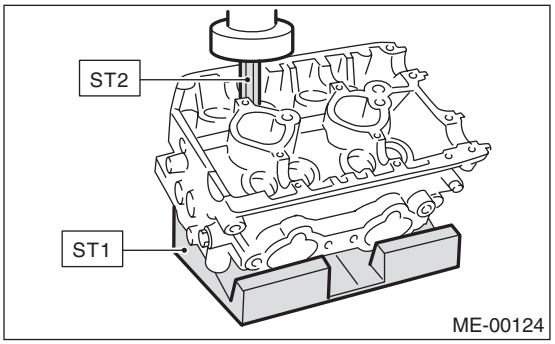
2) Install the camshaft. <Ref. to ME(H4DOTC)-54, INSTALLATION, Camshaft.>
3) Install the A/C compressor bracket on cylinder head.
4) Install the secondary air combination valve. <Ref. to EC(H4DOTC)-22, INSTALLATION, Secondary Air Combi Valve.>
5) Install the intake manifold.<Ref. to FU(H4DOTC)-16, INSTALLATION, Intake Manifold.>
6) Install the cam sprocket.<Ref. to ME(H4DOTC)-51, INSTALLATION, Cam Sprocket.>
7) Install the timing belt.<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt.>
8) Install the timing belt cover.<Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>
9) Install the crank pulley.<Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
10) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

C: DISASSEMBLY

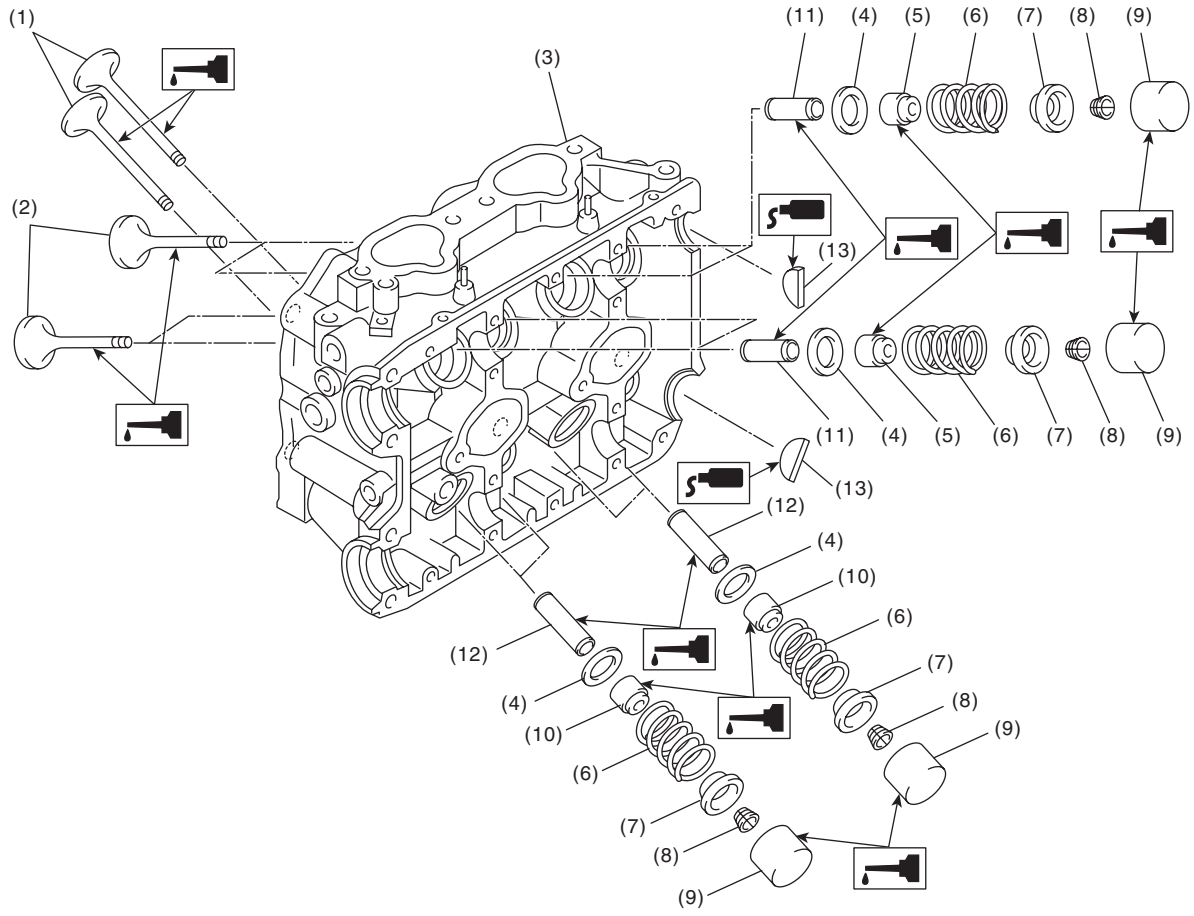
1) Remove the valve lifter.
2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1	498267600	CYLINDER HEAD TABLE
ST2	499718000	VALVE SPRING REMOVER

NOTE:
- Mark each valve to prevent confusion.
- Pay careful attention not to damage the lips of intake valve oil seals and exhaust valve oil seals.
- Keep all the removed parts in order for re-installing in their original positions.



D: ASSEMBLY



(1) 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
(13) Plug

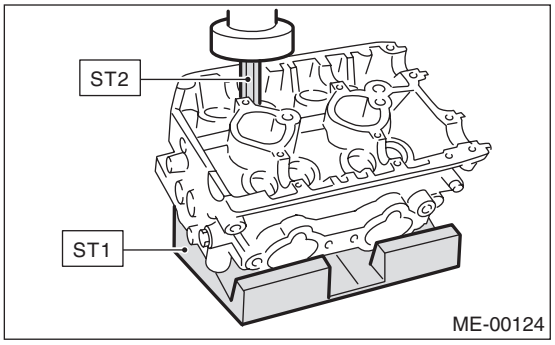
1) Install the valve spring and valve.
(1) Coat the stem of each valve with engine oil and insert the valve into the valve guide.

NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

(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

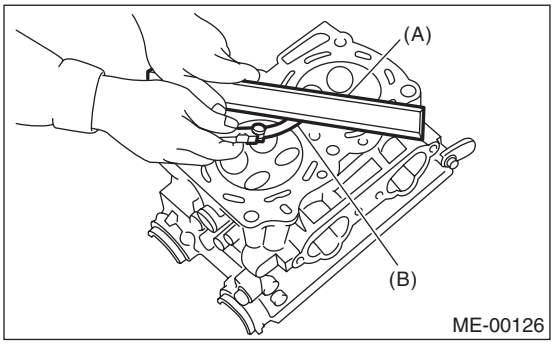
1) Check for cracks or damage. Use liquid penetrant tester on the important sections to check for fissures. Check that there are no marks of gas leaking or water leaking on gasket installing surface.
2) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge (A) and thickness gauge (B).
If the warping exceeds the limit, correct the surface by grinding it with a surface grinder.

Warping 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 bolts can cause warping. When reinstalling, pay special attention to the torque so as to tighten evenly.



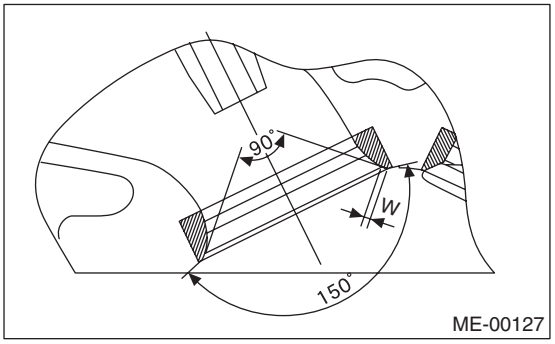
2. VALVE SEAT

Inspect the intake and exhaust valve seats, and correct the contact surfaces with a valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width W:

Intake
Standard
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 valve stem. The clearance can be checked by measuring respectively the outer diameter of valve stem with a micrometer and the inner diameter of valve guide with a caliper gauge.

Clearance between the valve guide and valve stem:

Standard
Intake
0.030 — 0.057 mm (0.0012 — 0.0022 in)
Exhaust
0.040 — 0.067 mm (0.0016 — 0.0026 in)

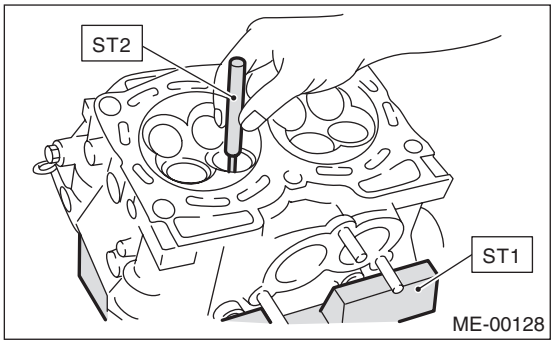
2) If the clearance between valve guide and valve stem exceeds the standard, replace the valve guide or valve itself whichever shows greater amount of wear or damaged and etc. See the following procedure for valve guide replacement.

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)

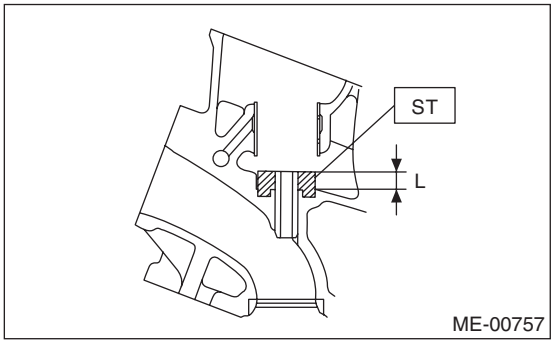
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



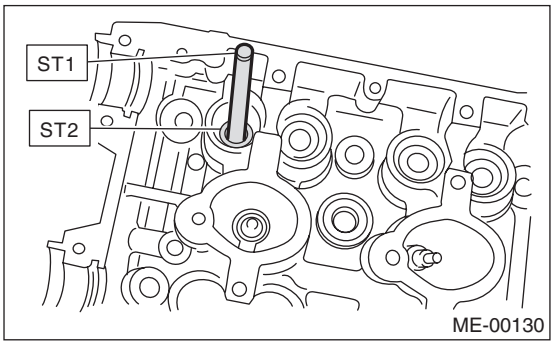
(3) Turn the cylinder head upside down and place the ST as shown in the figure.

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.

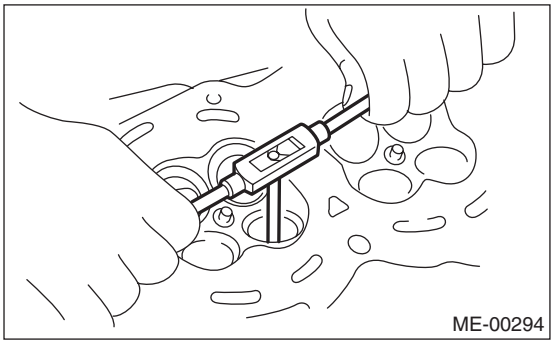
Valve guide protrusion L:
15.8 — 16.2 mm (0.622 — 0.638 in)

(7) Ream the inside of valve guide using ST. Put the ST in valve guide, and rotate the ST slowly clockwise while pushing it lightly. Bring the ST back while rotating it clockwise.

NOTE:
• Apply engine oil to the ST when reaming.
• If the inner surface of valve guide is damaged, the edge of ST should be slightly ground with oil stone.
• If the inner surface of valve guide becomes lustrous and the ST does not chip, use a new ST or remedy the ST.

(8) After reaming, clean the valve guide to remove chips.
(9) Recheck the contact condition between valve and valve seat after replacing the valve guide.

ST 499767400 VALVE GUIDE REAMER

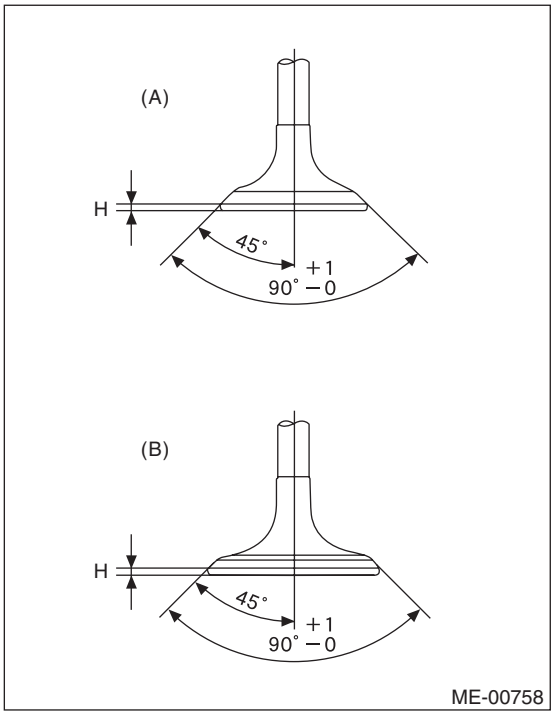


4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace the valve with a new part if damaged, worn, deformed, or if "H" is outside of the specified limit.

Head edge thickness H:

Standard
Intake (A)
1.0 — 1.4 mm (0.039 — 0.055 in)
Exhaust (B)
1.3 — 1.7 mm (0.051 — 0.067 in)



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.

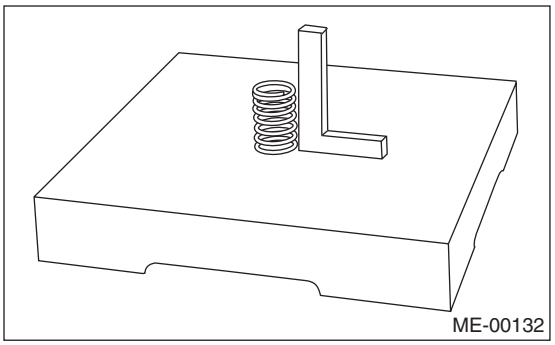
NOTE:
It is possible to differentiate between the intake valve and the exhaust valve by their overall length.

Valve overall length:
Intake
104.4 mm (4.110 in)
Exhaust
104.65 mm (4.1201 in)

5. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within the standard value presented in the table.
2) To measure the squareness of the valve spring, stand the 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) or less



6. INTAKE AND EXHAUST VALVE OIL SEAL

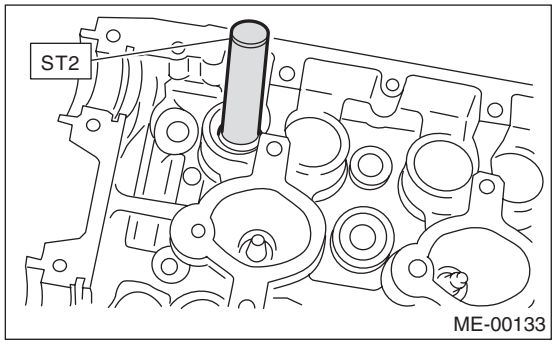
1) For the following, replace the oil seal with a new part. See the procedure 2) and subsequent for replacement procedures.
- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of valve and valve seat.
- When replacing the valve guide.

2) Place the cylinder head on ST1.
3) Using the ST2, press in the oil seal.

ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

NOTE:
- Apply engine oil to oil seal before press-fitting.
- When press-fitting the oil seal, do not use a hammer or strike in.
- The intake valve oil seal and exhaust valve oil seal can be distinguished by colors.

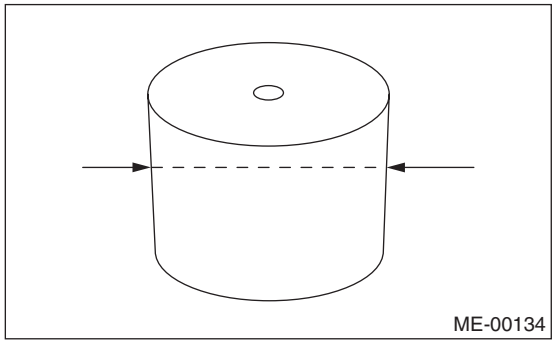
Color of rubber part:
Intake [Gray]
Exhaust [Green]



7. VALVE LIFTER

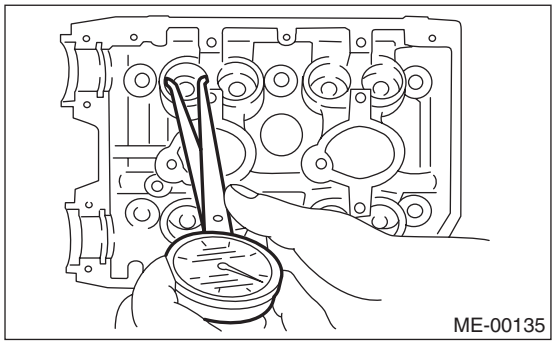
1) Check the valve lifter visually.
2) Measure the outer diameter of valve lifter.

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.

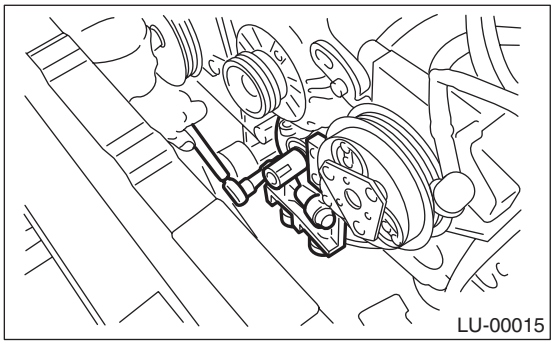
Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

20.Cylinder Block

A: REMOVAL

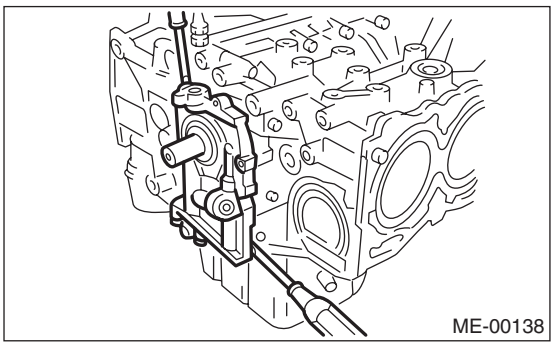
NOTE:
Before conducting this procedure, drain the engine oil completely.
1) Remove the intake manifold.<Ref. to FU(H4DOTC)-13, REMOVAL, Intake Manifold.>
2) Remove the V-belts. <Ref. to ME(H4DOTC)-37, REMOVAL, V-belt.>
3) Remove the crank pulley.<Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
4) Remove the timing belt cover.<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>
5) Remove the timing belt.<Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt.>
6) Remove the cam sprocket.<Ref. to ME(H4DOTC)-51, REMOVAL, Cam Sprocket.>
7) Remove the crank sprocket.<Ref. to ME(H4DOTC)-52, REMOVAL, Crank Sprocket.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the cylinder head.<Ref. to ME(H4DOTC)-58, REMOVAL, Cylinder Head.>
10) Remove the clutch disc and cover. <Ref. to CL-13, REMOVAL, Clutch Disc and Cover.>
11) Remove the flywheel. (MT model)<Ref. to CL-16, REMOVAL, Flywheel.>
12) Remove the drive plate. (AT model) <Ref. to 5AT-65, REMOVAL, Drive Plate.>
13) Remove the oil separator cover.
14) Remove the water by-pass pipe for heater.
15) Remove the oil filter. <Ref. to LU(H4DOTC)-26, REMOVAL, Engine Oil Filter.>
16) Remove the oil cooler. <Ref. to LU(H4DOTC)-26, REMOVAL, Engine Oil Filter.>
17) Remove the water pump. <Ref. to CO(H4DOTC)-15, REMOVAL, Water Pump.>
18) 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.


LU-00015

19) Remove the oil pump from cylinder block using a flat tip screwdriver.

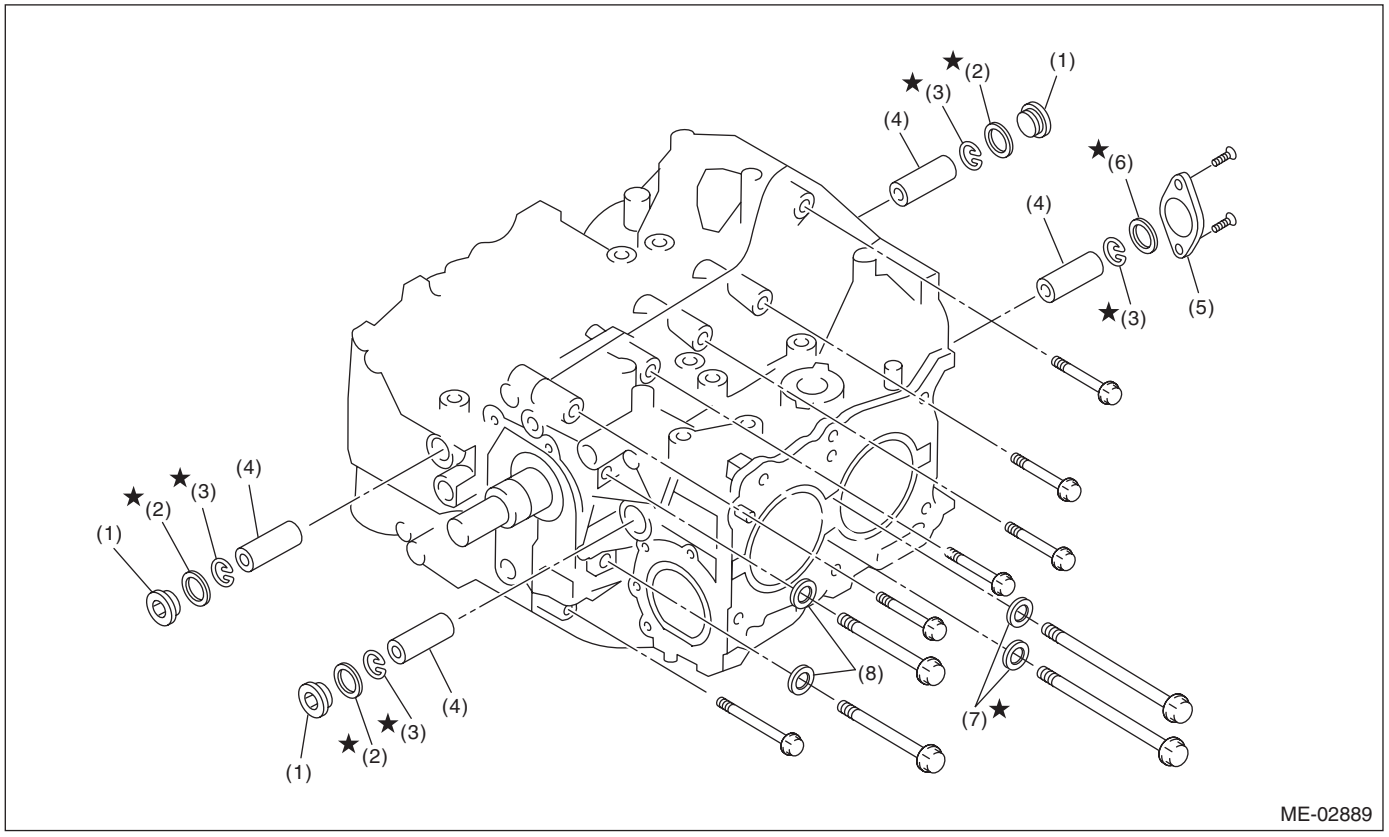
CAUTION:
Be careful not to scratch the mating surface of cylinder block and oil pump.


ME-00138

20) Remove the oil pan.
(1) Set the part so that the cylinder block (LH) is on the upper side.
(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.

CAUTION:
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.

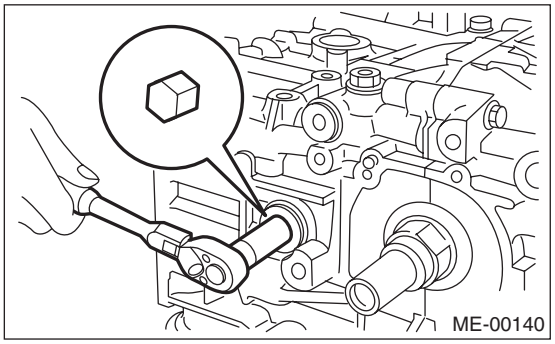
24) Remove the water pipe.



ME-02889

(1) Service hole plug
(2) Gasket
(3) Snap ring
(4) Piston pin
(5) Service hole cover
(6) O-ring
(7) Seal washer
(8) Washer

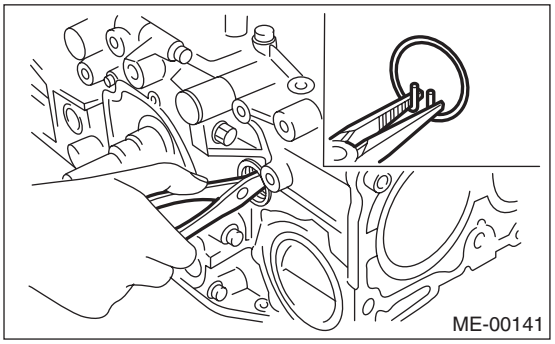
25) Remove the service hole plugs using a hexagon wrench [14 mm].



ME-00140

26) Remove the service hole cover.

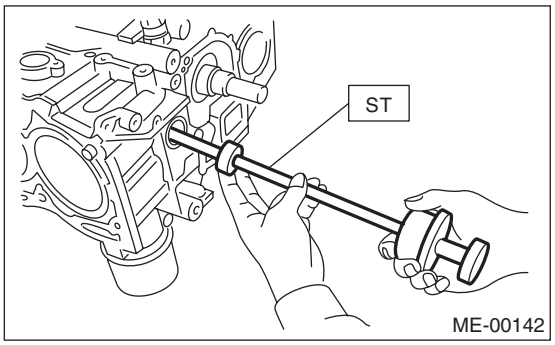
27) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove the piston snap ring through service hole of #1 and #2 cylinders.



ME-00141

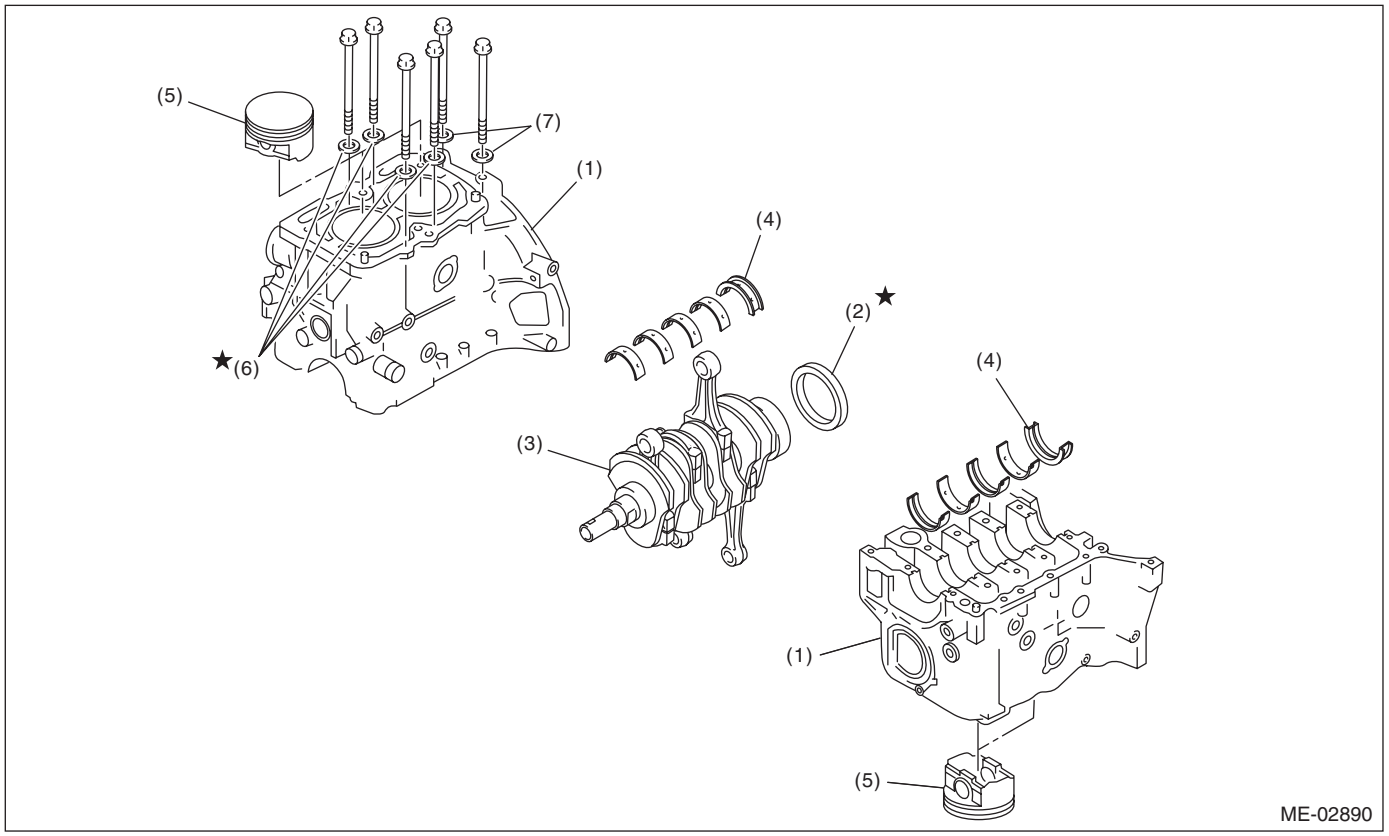
28) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



29) Similarly remove the piston pins from #3 and #4 pistons.
30) Remove the cylinder block connecting bolt on the RH side.
31) Loosen the cylinder block connecting bolt on the LH side by 2-3 turns.
32) Set the part so that the cylinder block (LH) is on the upper side, and remove the cylinder block connecting bolt.
33) 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
(6) Seal washer
(7) Washer

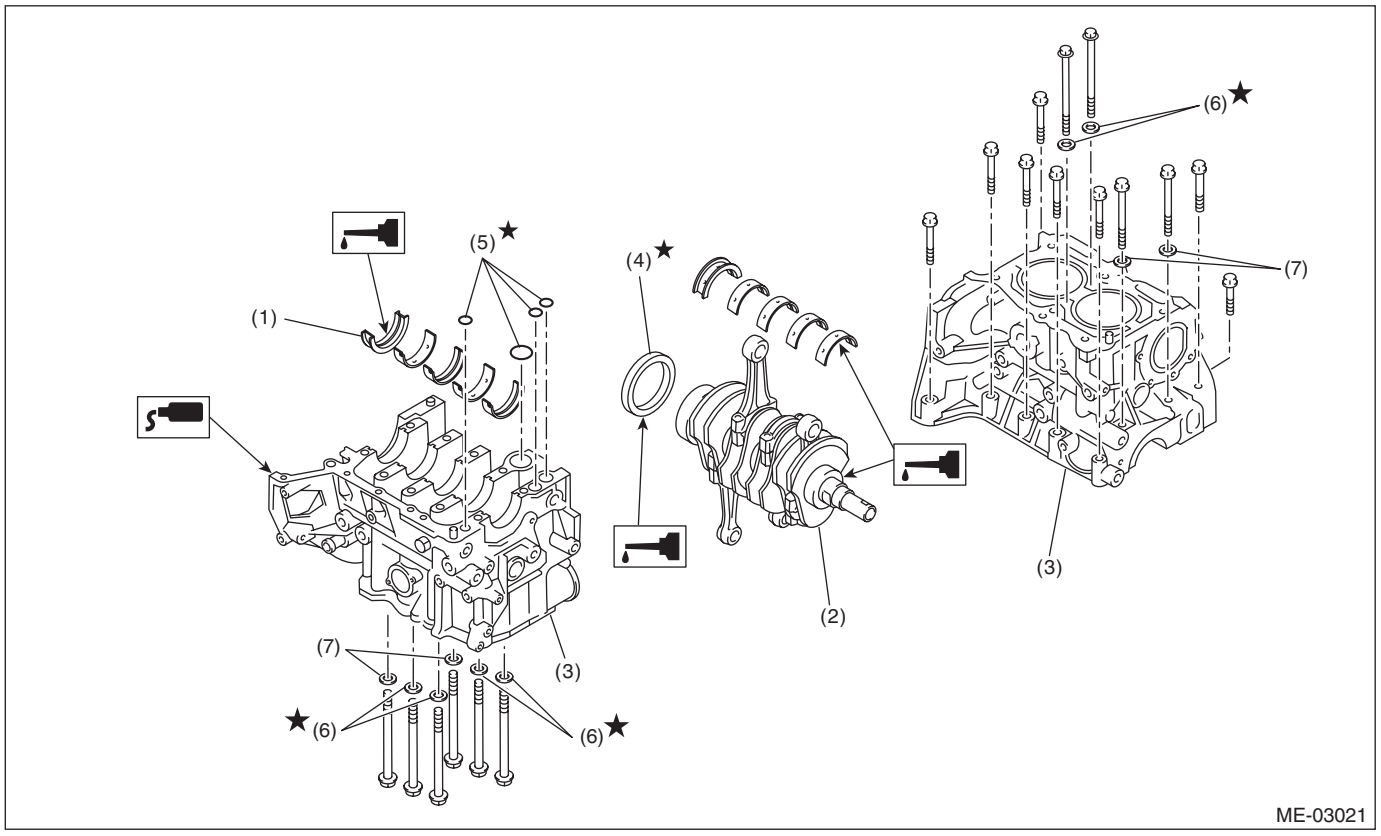
34) Remove the rear oil seal.
35) Remove the crankshaft together with connecting rod.
36) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:
Be careful not to confuse the crankshaft bearing combination. Press the bearing at the end opposite to locking lip.

37) 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

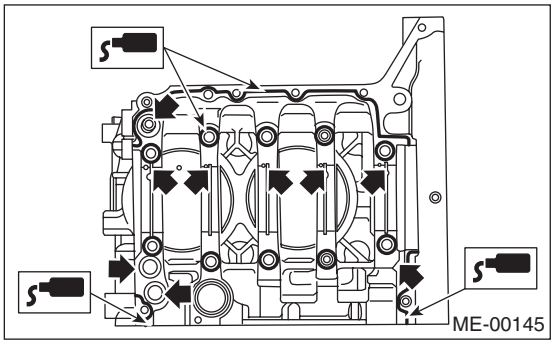


(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal
(5) O-ring
(6) Seal washer
(7) Washer

1) Remove oil on the mating surface of cylinder block before installation. Apply a coat of engine oil to the bearing and crankshaft journal.
2) Position the crankshaft and O-ring on the cylinder block (RH).
3) Apply liquid gasket to the mating surfaces of cylinder block (RH), and position the cylinder block (LH).

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

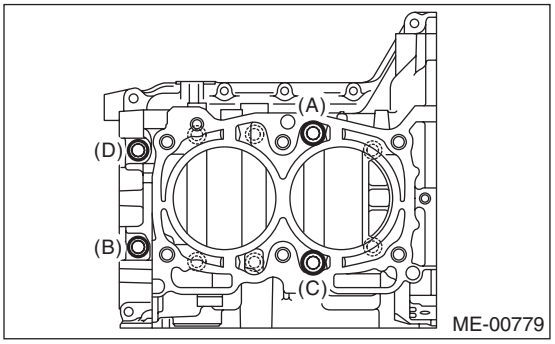
NOTE:
Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.



4) Apply a coat of engine oil to the washer and bolt thread.

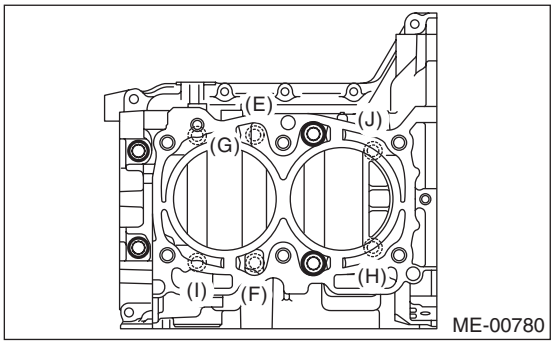
NOTE:
Use a new seal washer.
5) Tighten the 10 mm cylinder block connecting bolts on LH side (A — D) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



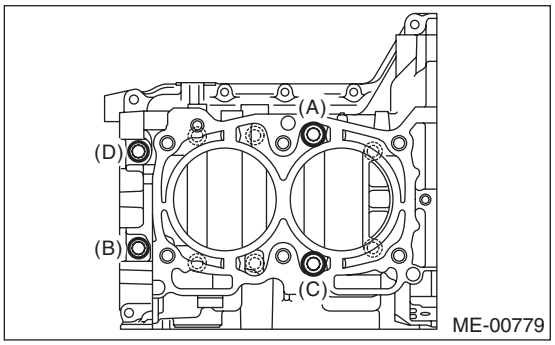
6) Tighten the 10 mm cylinder block connecting bolts on RH side (E — J) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



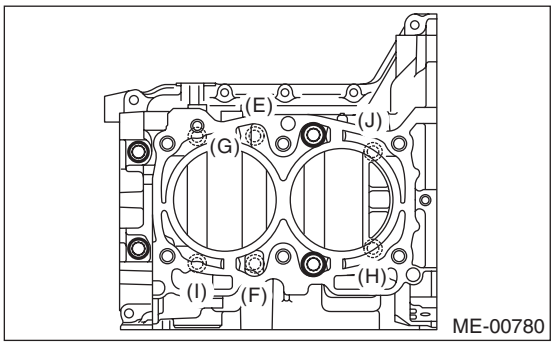
7) Tighten the LH side cylinder block connecting bolts (A — D) further in alphabetical order.

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



8) Tighten the RH side cylinder block connecting bolts (E — J) further in alphabetical order.

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



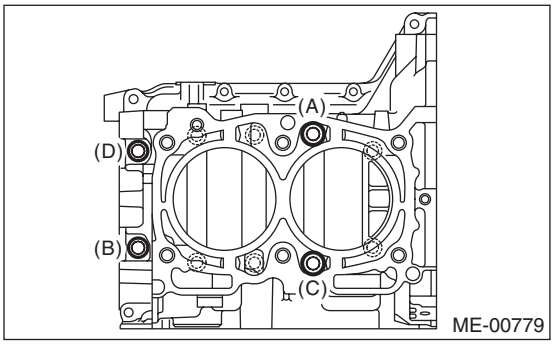
9) Tighten the LH side cylinder block connecting bolts (A — D) further in alphabetical order.

- (A), (C): Angle tightening

Tightening angle:
90°

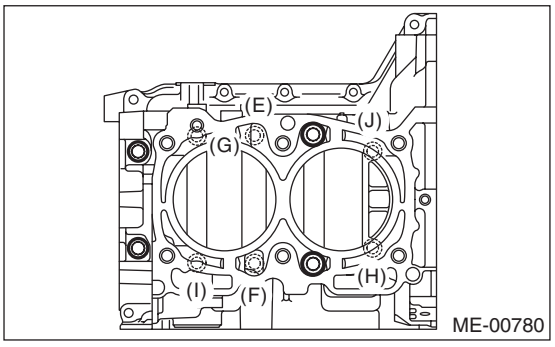
- (B), (D): Torque tightening

Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)



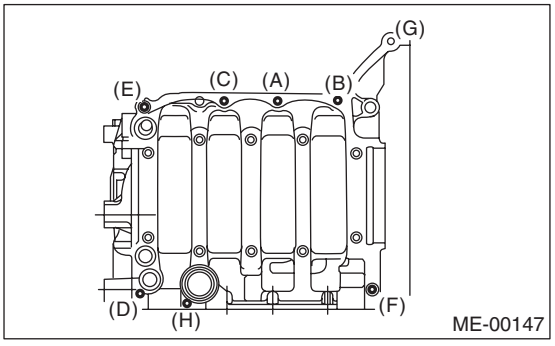
10) Tighten the RH side cylinder block connecting bolts (E — J) further in alphabetical order.

Tightening angle:
90°



11) Tighten the 8 mm and 6 mm cylinder block connecting bolts on the LH side (A — H) in alphabetical order.

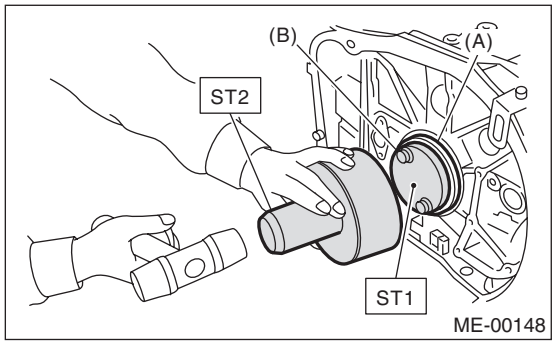
Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



12) Apply a coat of engine oil to the oil seal periphery, then install the rear oil seal using ST1 and ST2.

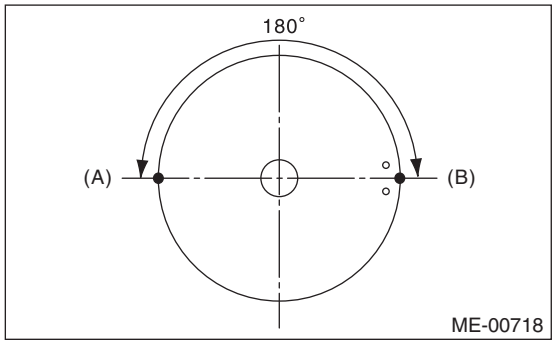
NOTE:
Use a new oil seal.

ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER

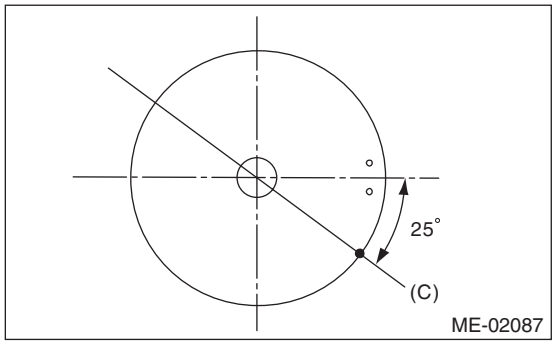


(A) Rear oil seal
(B) Flywheel attaching bolt

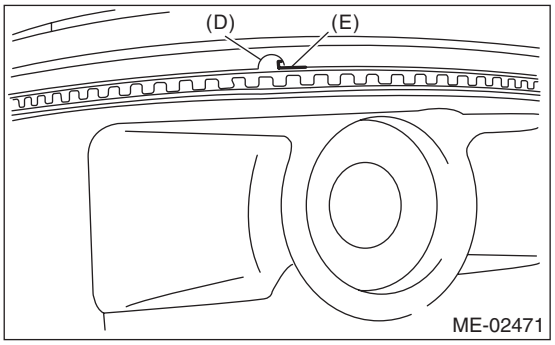
13) Position the top ring gap at (A) or (B) in the figure.
14) Position the second ring gap at 180° on the reverse side the top ring gap.



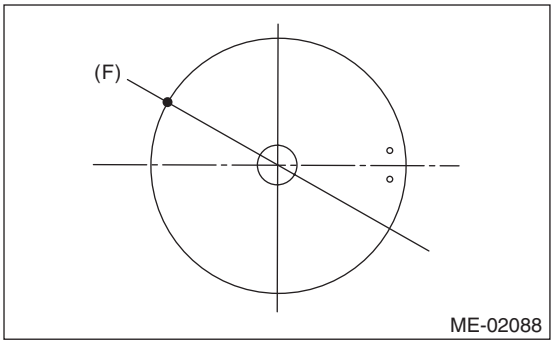
15) Position the upper rail gap at (C) in the figure.



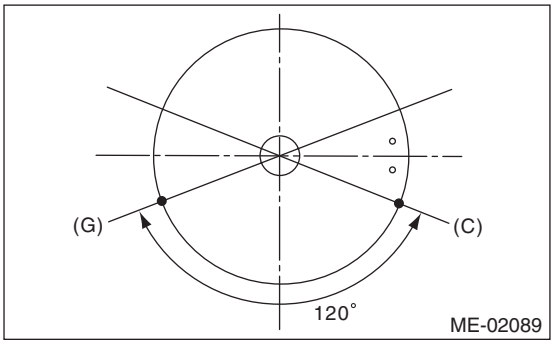
16) Align the upper rail spin stopper (E) to the side hole (D) on the piston.



17) Position the expander gap at (F) in the figure on the 180° opposite direction of (C).



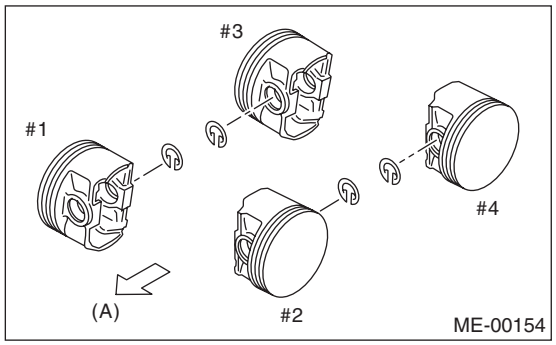
18) Set the lower rail gap at position (G), located 120° clockwise from (C).



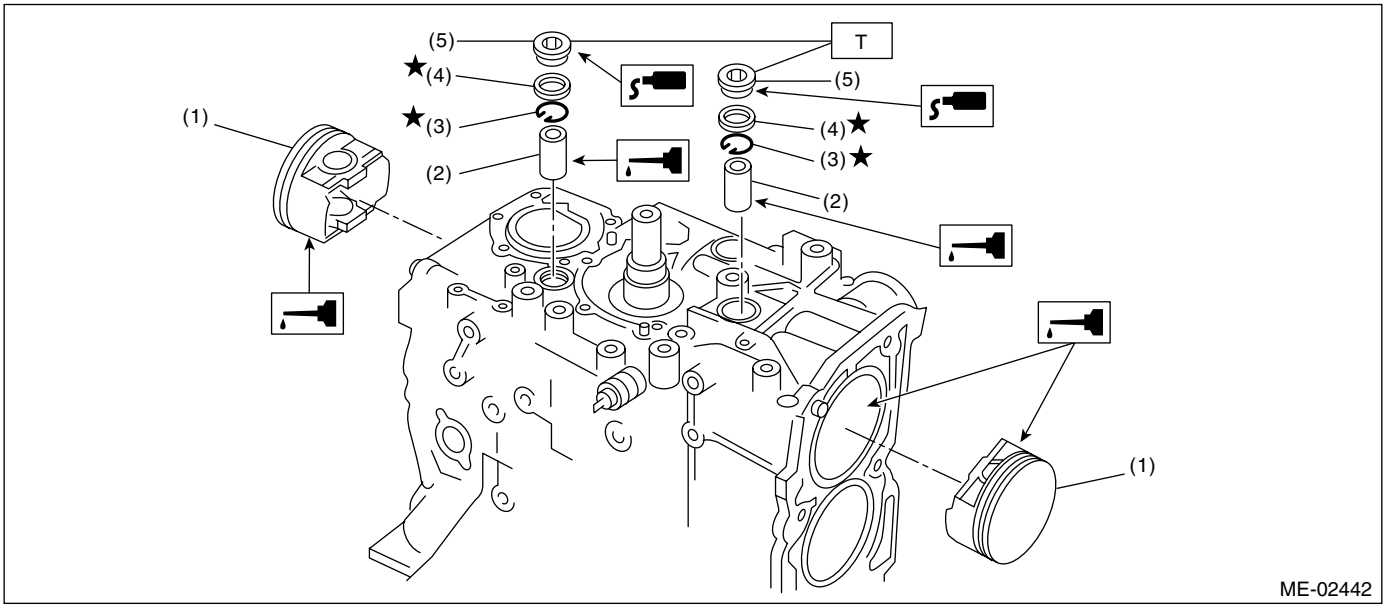
NOTE:
• Make sure ring gaps do not face the same direction.
• Make sure ring gaps are not within the piston skirt area.

19) Install the snap ring.
Install the snap rings in the piston holes located opposite to the service holes in cylinder block before positioning pistons in cylinders.

NOTE:
Use new snap rings.



(A) Front side



(1) Piston
(2) Piston pin
(3) Snap ring
(4) Gasket
(5) Service hole plug

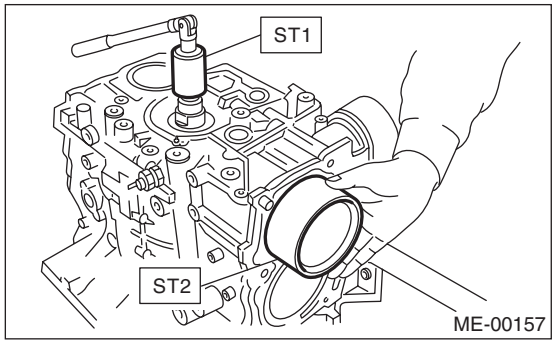
Tightening torque:N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.6)

20) Install pistion.
(1) Set the parts so that the #1 and #2 cylinders are on the upper side.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

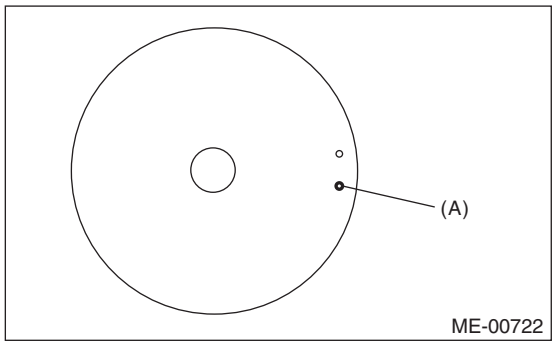
ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



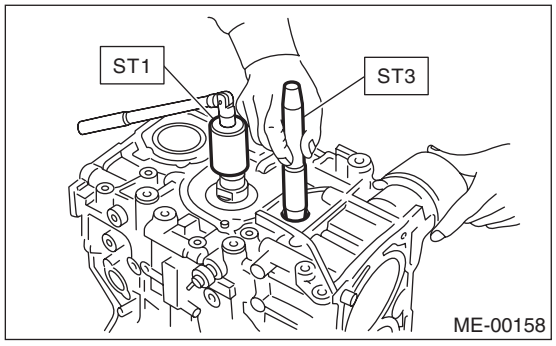
NOTE:
Face the piston front mark towards the front of the engine.



(A) Front mark

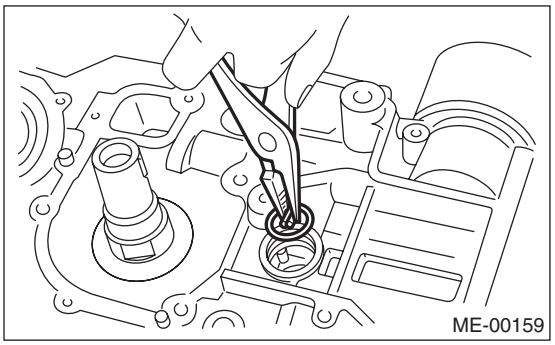
21) Install pistion pin.
(1) Apply a coat of engine oil to ST3 before insertion, and then insert it into the service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



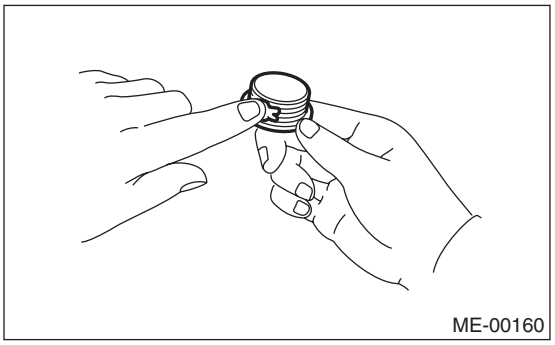
(2) Apply a coat of engine oil to piston pin, and insert the piston pin into piston and connecting rod through service hole.
(3) Install the snap ring.

NOTE:
Use new snap rings.



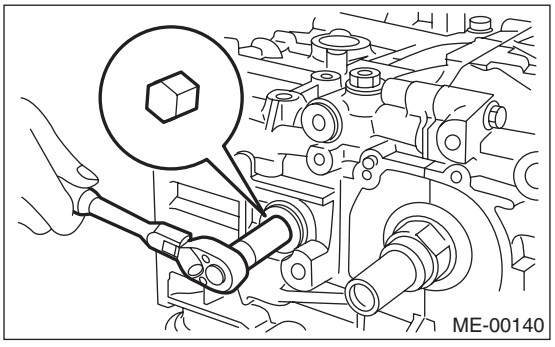
(4) Apply liquid gasket around the service hole plug.

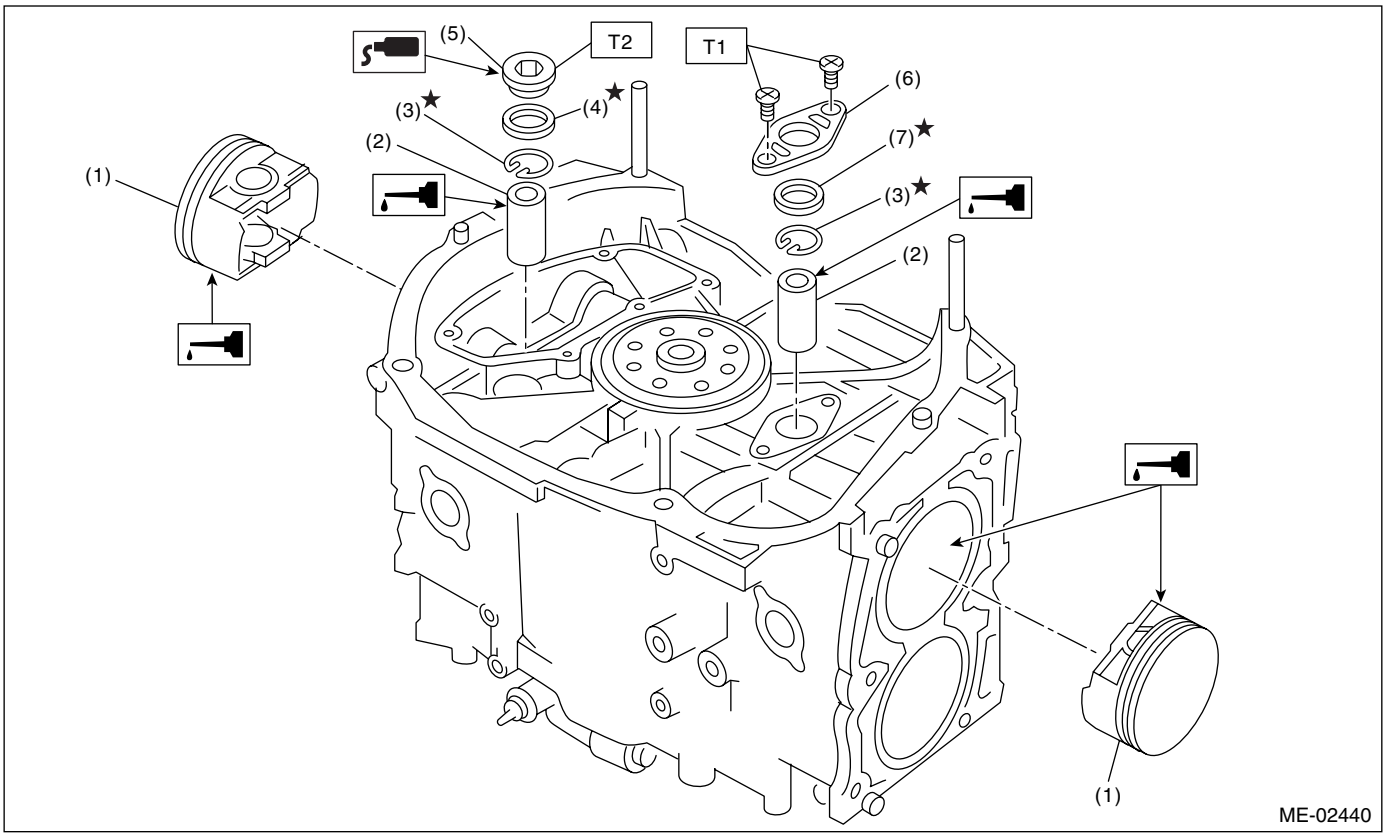
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent



(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) Set the parts so that the #3 and #4 cylinders are on the upper side. 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 to the cylinder block.

NOTE:
Use new O-rings.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

25) Install the oil strainer stay.

NOTE:
Tighten the oil strainer stay together with baffle plate.

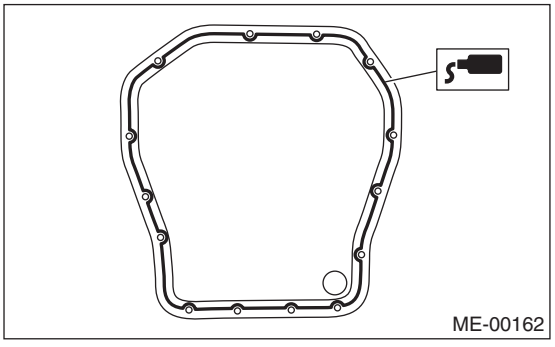
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

26) Apply liquid gasket to the mating surfaces, and install the oil pan.

NOTE:
Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent

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

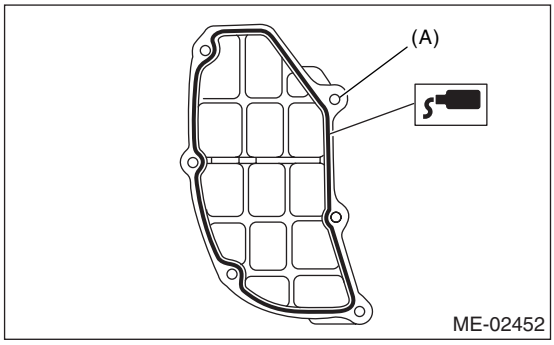


27) Apply liquid gasket to the mating surfaces and the threaded portion of bolt (A) shown in the figure (when reusing the bolt), and then install the oil separator cover.

NOTE:
Install within 5 min. after applying liquid gasket.

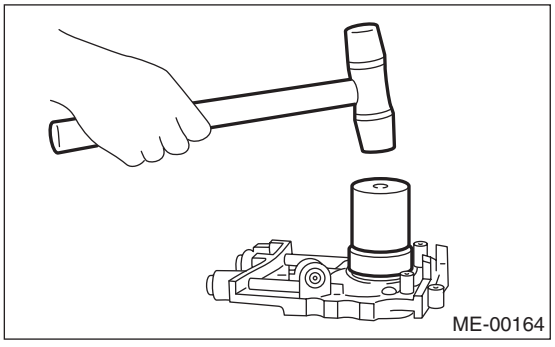
Liquid gasket:
Mating surface
THREE BOND 1217G or equivalent
Bolt thread (A) (when reusing the bolt)
THREE BOND 1324 (Part No. 004403042) or equivalent

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



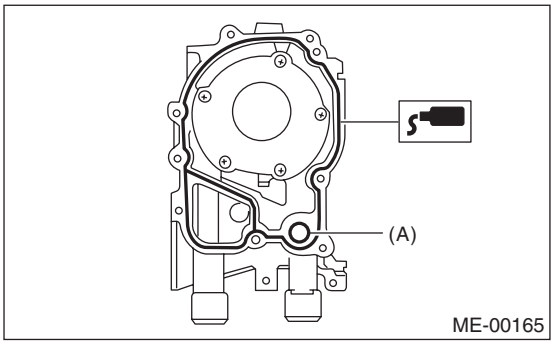
28) Install the flywheel. (MT model) <Ref. to CL-16, INSTALLATION, Flywheel.>
29) Install the clutch disc and cover. (MT model) <Ref. to CL-13, INSTALLATION, Clutch Disc and Cover.>
30) Install the drive plate. (AT model) <Ref. to 5AT-65, INSTALLATION, Drive Plate.>
31) Install the oil pump.
(1) Using the ST, install the front oil seal.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.



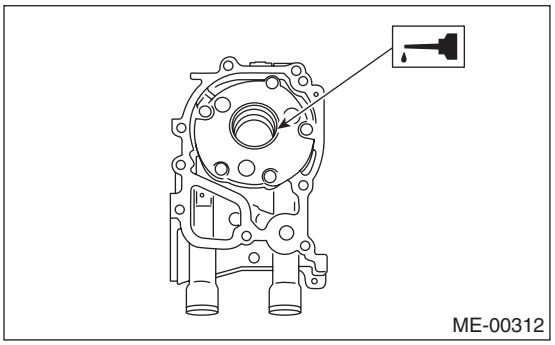
(2) Apply liquid gasket to the matching surface of oil pump.

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.



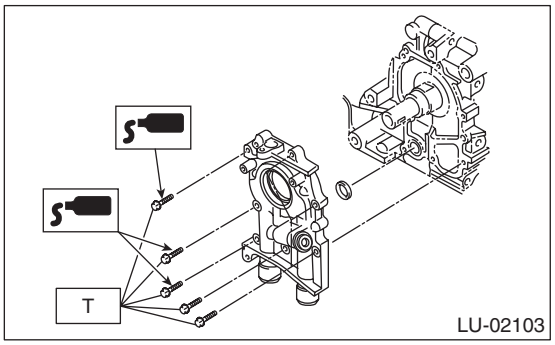
(4) Install the oil pump to cylinder block. Be careful not to damage the oil seal during installation.

NOTE:
- Make sure the oil seal lip is not folded.
- Align the flat surface of oil pump's inner rotor with crankshaft before installation.
- Use new O-rings and oil seals.

(5) Apply liquid gasket to the three bolts thread shown in figure. (when reusing bolts)

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

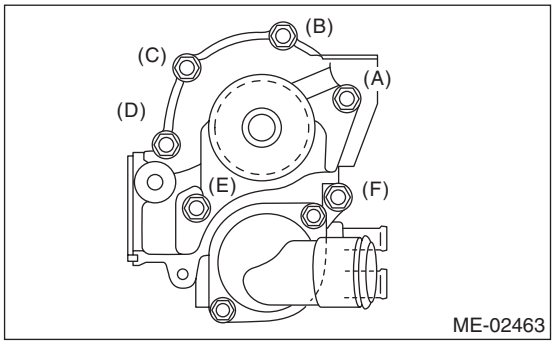
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



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)

NOTE:
• When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.
• Use a new gasket.



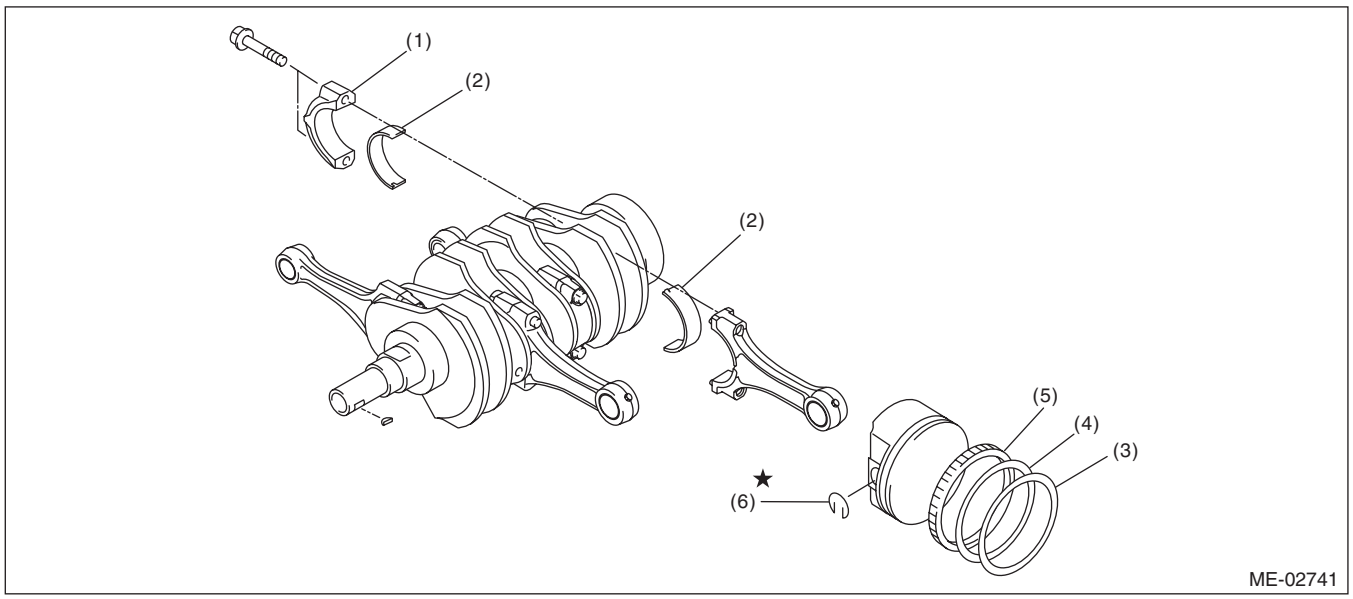
33) Install the water by-pass pipe for heater.
34) Install the oil cooler. <Ref. to LU(H4DOTC)-25, INSTALLATION, Engine Oil Cooler.>
35) Install the oil filter. <Ref. to LU(H4DOTC)-26, INSTALLATION, Engine Oil Filter.>
36) Install the water by-pass pipe between oil cooler and water pump.
37) Install the water pipe.

NOTE:
Use new O-rings.
38) Install the cylinder head.<Ref. to ME(H4DOTC)-58, INSTALLATION, Cylinder Head.>
39) Install the oil level gauge guide and tighten the attachment bolts. (LH side)

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
40) Install the rocker cover and rocker cover gasket.

NOTE:
Use a new gasket.
41) Install the crank sprocket. <Ref. to ME(H4DOTC)-52, INSTALLATION, Crank Sprocket.>
42) Install the cam sprocket.<Ref. to ME(H4DOTC)-51, INSTALLATION, Cam Sprocket.>
43) Install the timing belt.<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt.>
44) Install the timing belt cover.<Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>
45) Install the crank pulley.<Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
46) Install the generator and A/C compressor brackets on cylinder head.
47) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>
48) Install the intake manifold.<Ref. to FU(H4DOTC)-16, 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

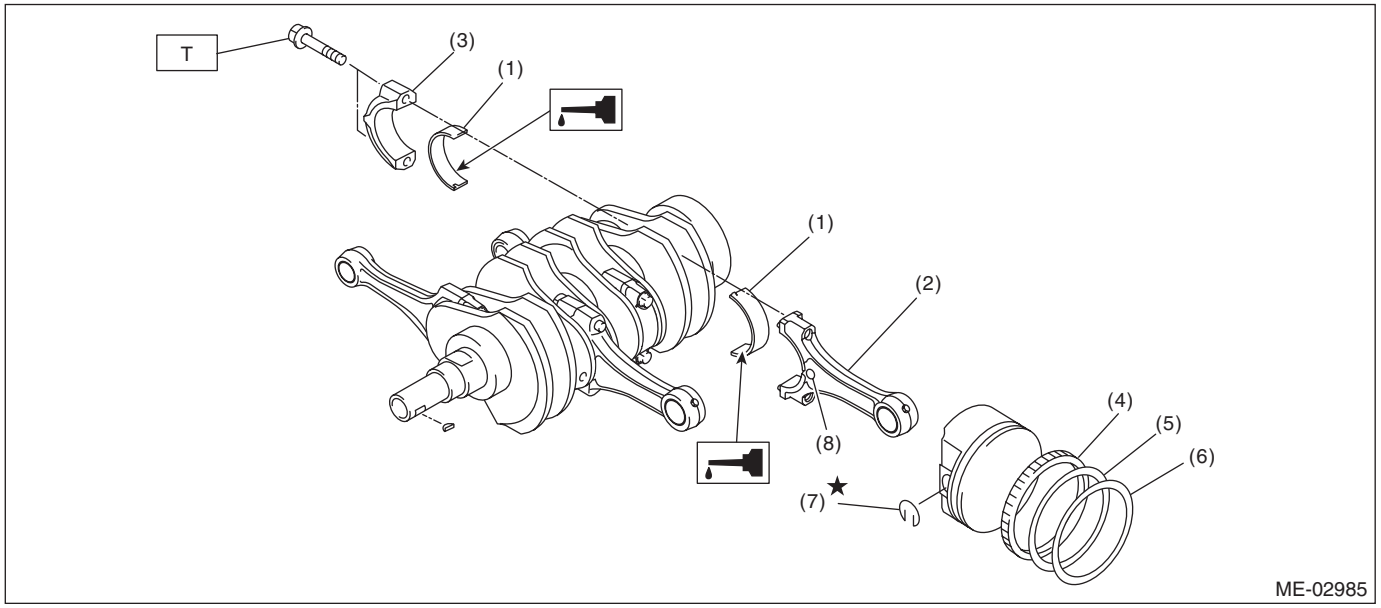
1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

NOTE:
Keep the removed connecting rods, connecting rod caps and bearings in order so that they are kept in their original combinations/groups, and not mixed together.

3) Remove the piston rings using piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in proper order, to prevent confusion.
5) Remove the snap ring.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Snap ring
(8) Side mark

Tightening torque:N·m (kgf-m, ft-lb)
T: 52 (5.3, 38.4)

1) Apply oil to the surface of the connecting rod bearings, and install the connecting rod bearings on connecting rods and connecting rod caps.
2) Position each connecting rod with the marking side facing forward.
3) Tighten the connecting rod cap with connecting rod bolt. Make sure the arrow mark on connecting rod cap facing front during installation.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

Tightening torque:
52 N·m (5.3 kgf-m, 38.4 ft-lb)

4) Install the oil ring upper rail, expander and lower rail by hand.
5) Install the second ring and top ring using piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Check for cracks or damage. Use liquid penetrant tester on the important sections to check for fissures. Check that there are no marks of gas leaking or water leaking on gasket installing surface.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.025 mm (0.00098 in)

Grinding limit:
0.1 mm (0.004 in)

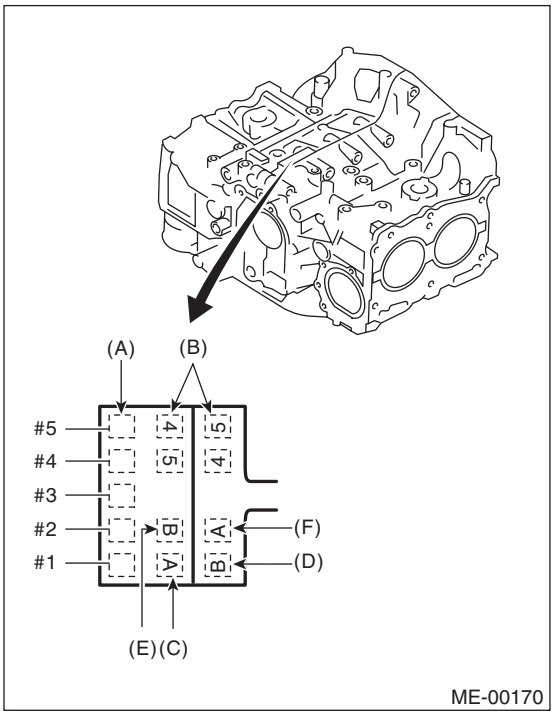
Standard height of cylinder block:
201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the front upper face of the cylinder block.

NOTE:
• Measurement should be performed at a temperature of 20°C (68°F).
• Standard sized pistons are classified into two grades, “A” and “B”. These grades should be used as guide lines in selecting a standard piston.

Standard diameter:
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



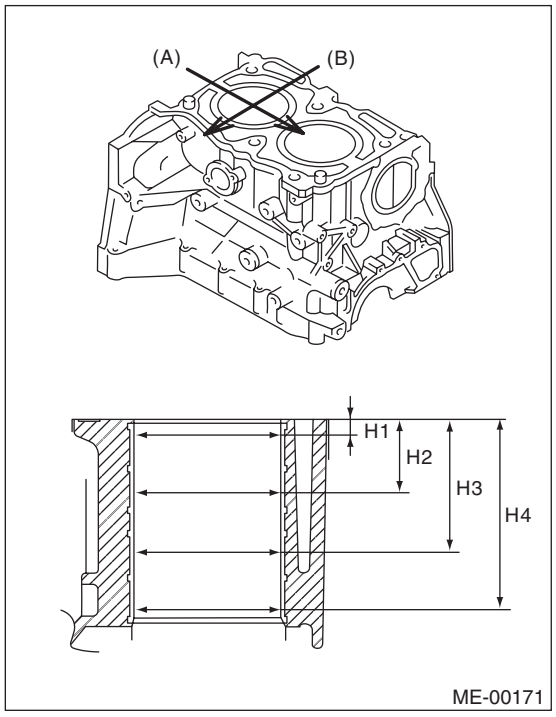
(A) Main journal size mark
(B) Cylinder block (RH) – (LH) combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) Cylinder inner diameter measurement
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.

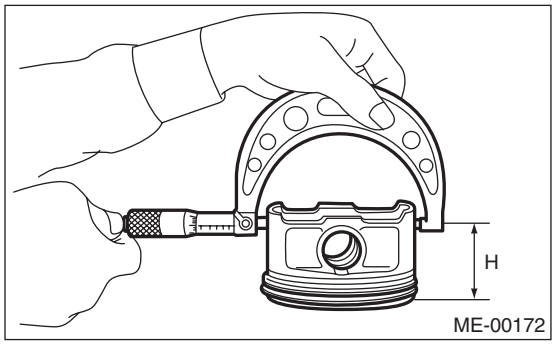
4) Cylinder outer diameter measurement
Measure the outer diameter of each piston at the height as shown in the figure. (Thrust direction)

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 any of the measured value of taper, out-of-roundness or cylinder-to-piston clearance is out of standard or if there is any damage on the cylinder wall, rebore it to replace with an oversize piston.

CAUTION:
• When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and replaced with oversize pistons.
• Do not perform boring on one cylinder only. Do not replace only a single cylinder for an oversize piston.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the cylinder block.

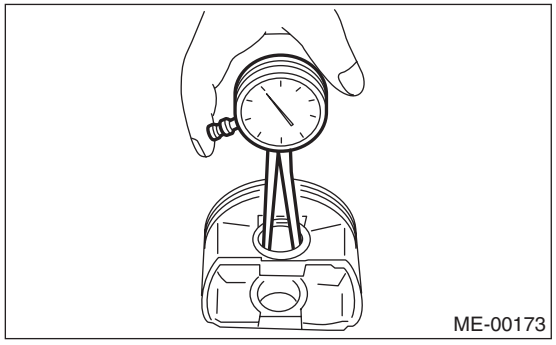
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, when measuring the cylinder diameter, wait until it has cooled to room temperature.

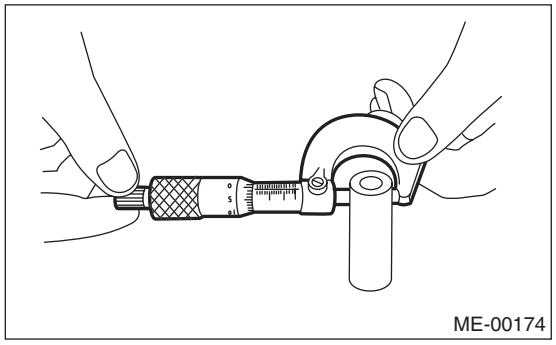
Cylinder inner diameter boring limit (diameter):
100.015 mm (3.9376 in)

3. PISTON AND PISTON PIN

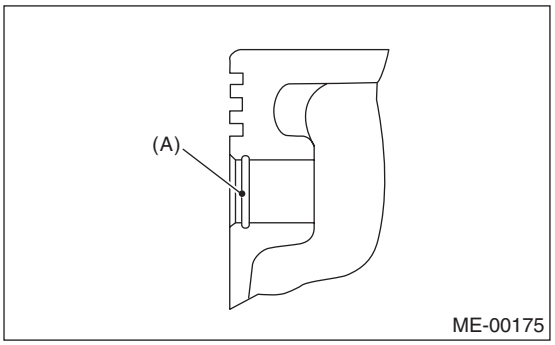
1) Check the piston and piston pin for breaks, cracks or wear. Replace if faulty.
2) Check the piston ring groove for wear and damage. Replace if faulty.
3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if faulty.

Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)


ME-00173


ME-00174

4) Check the snap ring installation groove (A) on the piston for burr. If necessary, remove burr from the groove so that the piston pin can lightly move.



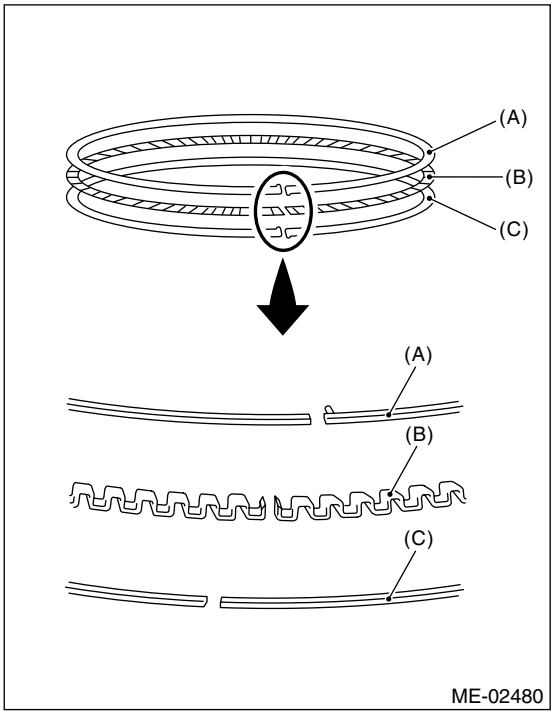
ME-00175

5) Check the piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new part of the same size as piston.

NOTE:
• The top ring and second ring have the mark to determine the direction to install on them. When installing the ring to piston, face this mark to the top side.
• Oil ring consists of the upper rail, expander and lower rail. When installing oil ring on piston, be careful of the direction of each rail.



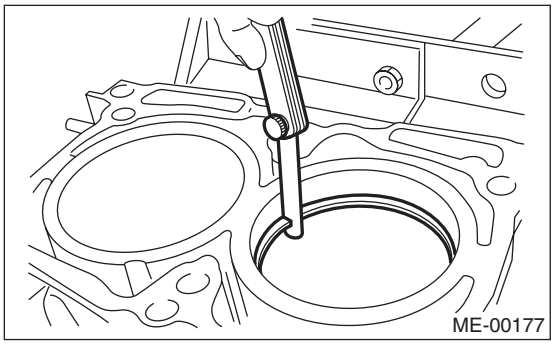
ME-02480

(A) Upper rail
(B) Expander
(C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder using the piston, 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)

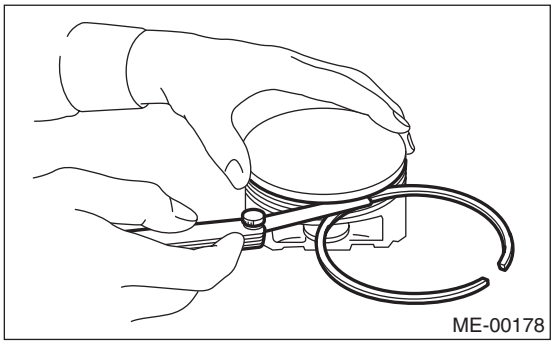
NOTE:
Difference between outer and inner circumference of top ring is within 0.05 mm (0.0020 in).



3) Fit the piston ring straight into the piston ring groove, then measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

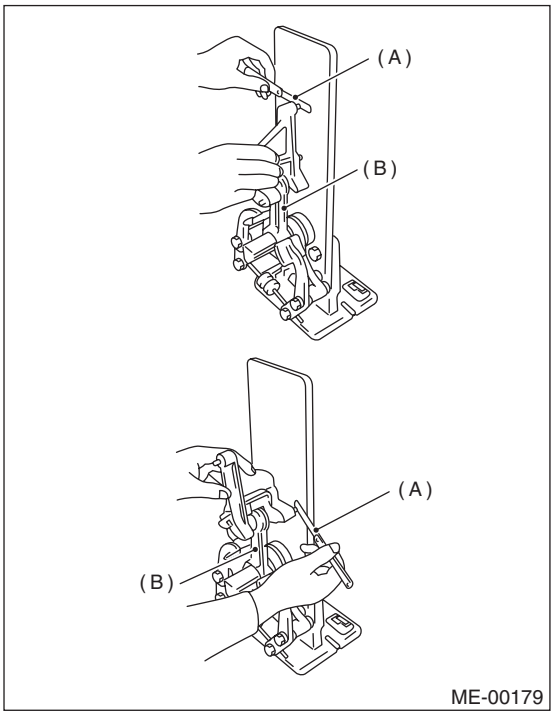
		Standard mm (in)
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)



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.

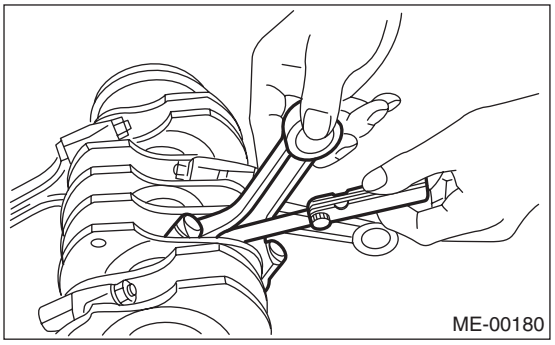
Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to the crankshaft, and measure the thrust clearance using a thickness gauge. If the thrust clearance exceeds the standard or uneven wear is found, replace the connecting rod.

Connecting rod thrust clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)



4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

5) Measure the oil clearance on each connecting rod bearing using plastigauge. If any oil clearance is not within the standard, replace the defective bearing with a new part of standard size or undersize as necessary. (See the table below.)

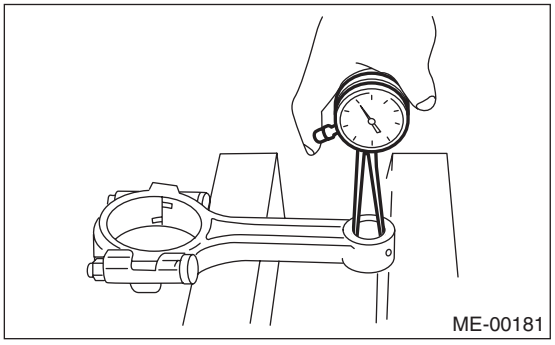
Connecting rod oil clearance:
Standard
0.017 — 0.045 mm (0.0007 — 0.0018 in)

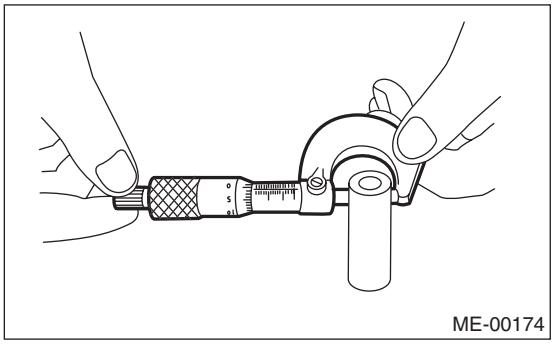
Unit: mm (in)

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 with a new part if worn or damaged.
7) Measure the piston pin clearance at connecting rod small end. If the measured value is not within the standard, replace it with a new part.

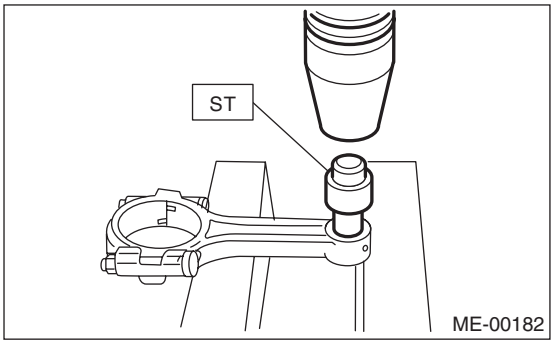
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)


ME-00181


ME-00174

8) The replacement procedure for the connecting rod small end bushing is as follows.
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with the ST after applying oil on the periphery of new bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00182

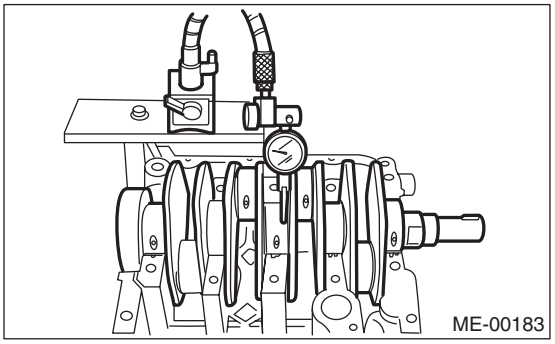
(3) Make two 3 mm (0.12 in) holes in the pressed bushing by aligning with the pre-manufactured holes on the connecting rod, and ream the inside of the bushing.
(4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely, and check it for cracks through liquid penetrant testing, etc. If defective, replace the crankshaft.
2) Measure warping of the crankshaft. If it exceeds the limit, correct or replace it.

NOTE:
If a suitable V-block is not available, using just the #1 and #5 crankshaft bearings on cylinder block, position the crankshaft on cylinder block. Then, measure the crankshaft bend using a dial gauge.

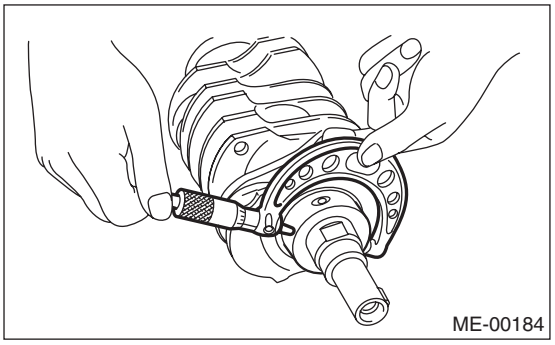
Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00183

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 grind to correct the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

Crank pin:
Out-of-roundness
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 59.758 mm (2.3527 in)

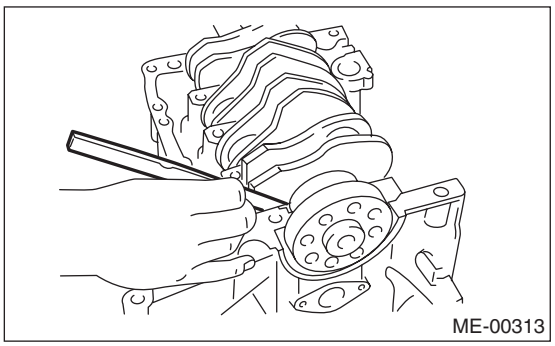

ME-00184

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 by using thickness gauge. If clearance exceeds the standard, replace the bearing.

Crankshaft thrust 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 grind to correct 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)-58, REMOVAL, Cylinder Head.> <Ref. to ME(H4DOTC)-58, 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)-68, 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)-68, 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)-68, INSTALLATION, Cylinder Block.>

25.Engine Trouble in General

A: INSPECTION

NOTE:
The “RANK” shown in the chart shows the possibilities of the cause of trouble in order from “Very often” to “Rarely”.
A — Very often
B — Sometimes
C — Rarely

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
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Degradation, etc.	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
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
	Timing belt	Degradation, etc.	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(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
	Timing belt	Degradation, etc.	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
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
	Timing 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	Overheating	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
	Timing 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	Overheating	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
	Timing 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	Overheating	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	Overheating	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
	Timing 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
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Overheating	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
	Timing 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 crankshaft 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 crankshaft main bearing • Worn connecting rod bearing (large end)
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam 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 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)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(H4DOTC)

Page

1. General Description 2
2. Front Exhaust Pipe 5
3. Center Exhaust Pipe 8
4. Joint Pipe 11
5. Rear Exhaust Pipe 12
6. Muffler 14

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)

Page

1. General Description 2
2. Spark Plug 4
3. Ignition Coil 6

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)

		Page
1.	Basic Diagnostic Procedure	2
2.	Check List for Interview	3
3.	General Description	5
4.	Electrical Component Location	8
5.	Engine Control Module (ECM) I/O Signal	18
6.	Engine Condition Data	28
7.	Data Link Connector	29
8.	General Scan Tool	30
9.	Subaru Select Monitor	35
10.	Read Diagnostic Trouble Code (DTC)	44
11.	Inspection Mode	45
12.	Drive Cycle	50
13.	Clear Memory Mode	56
14.	Compulsory Valve Operation Check Mode	57
15.	System Operation Check Mode	58
16.	Malfunction Indicator Light	60
17.	Diagnostics for Engine Starting Failure	69
18.	List of Diagnostic Trouble Code (DTC)	81
19.	Diagnostic Procedure with Diagnostic Trouble Code (DTC)	89
20.	Diagnostic Procedure without Diagnostic Trouble Code (DTC)	376
21.	General Diagnostic Table	380