

# GENERAL DESCRIPTION

Fuel Injection (Fuel Systems)

## 1. General Description S145001

### A: SPECIFICATIONS S145001E49

Model		
Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm <sup>2</sup> , 53.6 — 98 psi)
	Discharge flow	More than 85 ℓ (22.5 US gal, 18.7 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm <sup>2</sup> , 43.5 psi)]
Fuel filter		Cartridge type

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Fuel Injection (Fuel Systems)

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**MEMO:**

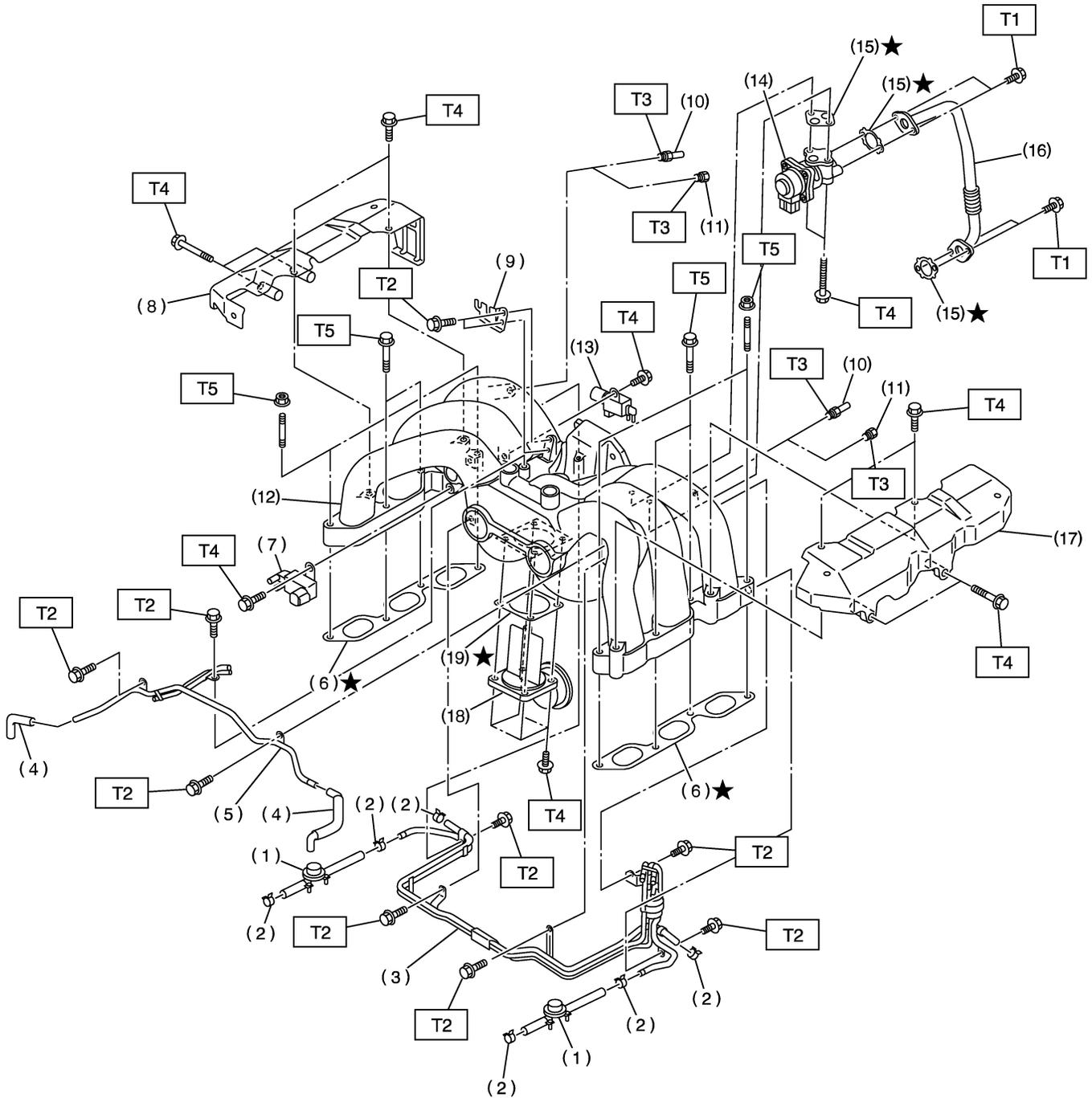
**FU(H6)-3**

# GENERAL DESCRIPTION

Fuel Injection (Fuel Systems)

## B: COMPONENT S145001A05

### 1. INTAKE MANIFOLD S145001A0501



B2M4476A

FU(H6)-4

# GENERAL DESCRIPTION

Fuel Injection (Fuel Systems)

- (1) Fuel damper valve
- (2) Clamp
- (3) Fuel pipe ASSY
- (4) Air assist hose
- (5) Air assist and purge pipe ASSY
- (6) Gasket
- (7) Purge control solenoid valve
- (8) Fuel pipe protector RH
- (9) Accelerator cable bracket

- (10) Nipple
- (11) Plug
- (12) Intake manifold
- (13) Induction valve control solenoid
- (14) EGR valve
- (15) Gasket
- (16) EGR pipe
- (17) Fuel pipe protector LH
- (18) Induction valve

- (19) Gasket

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***Tightening torque: N·m (kgf-m, ft-lb)***

***T1: 6.4 (0.65, 4.7)***

***T2: 5.0 (0.51, 3.7)***

***T3: 17 (1.7, 12)***

***T4: 19 (1.9, 14)***

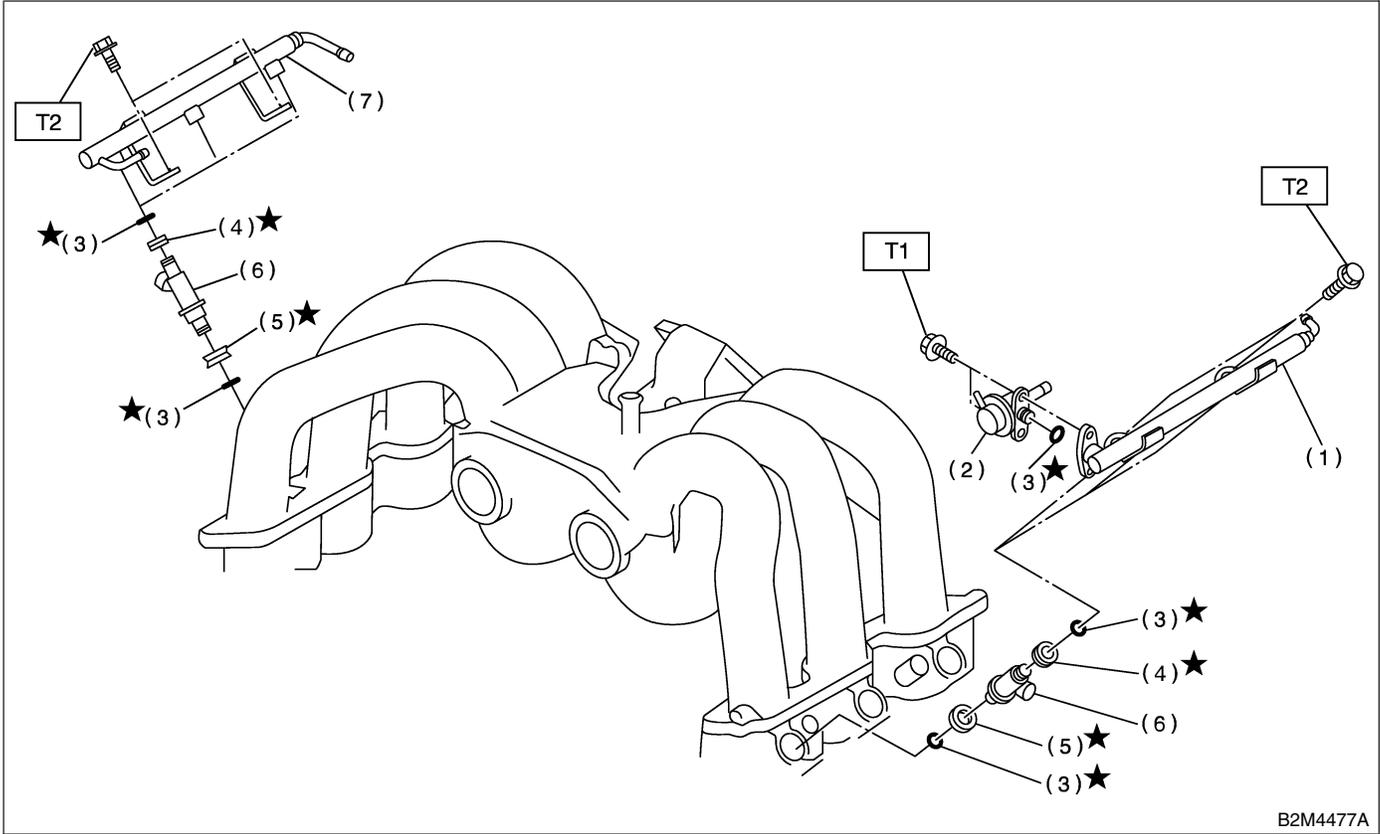
***T5: 25 (2.5, 18)***

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# GENERAL DESCRIPTION

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## 2. FUEL INJECTOR S145001A0502



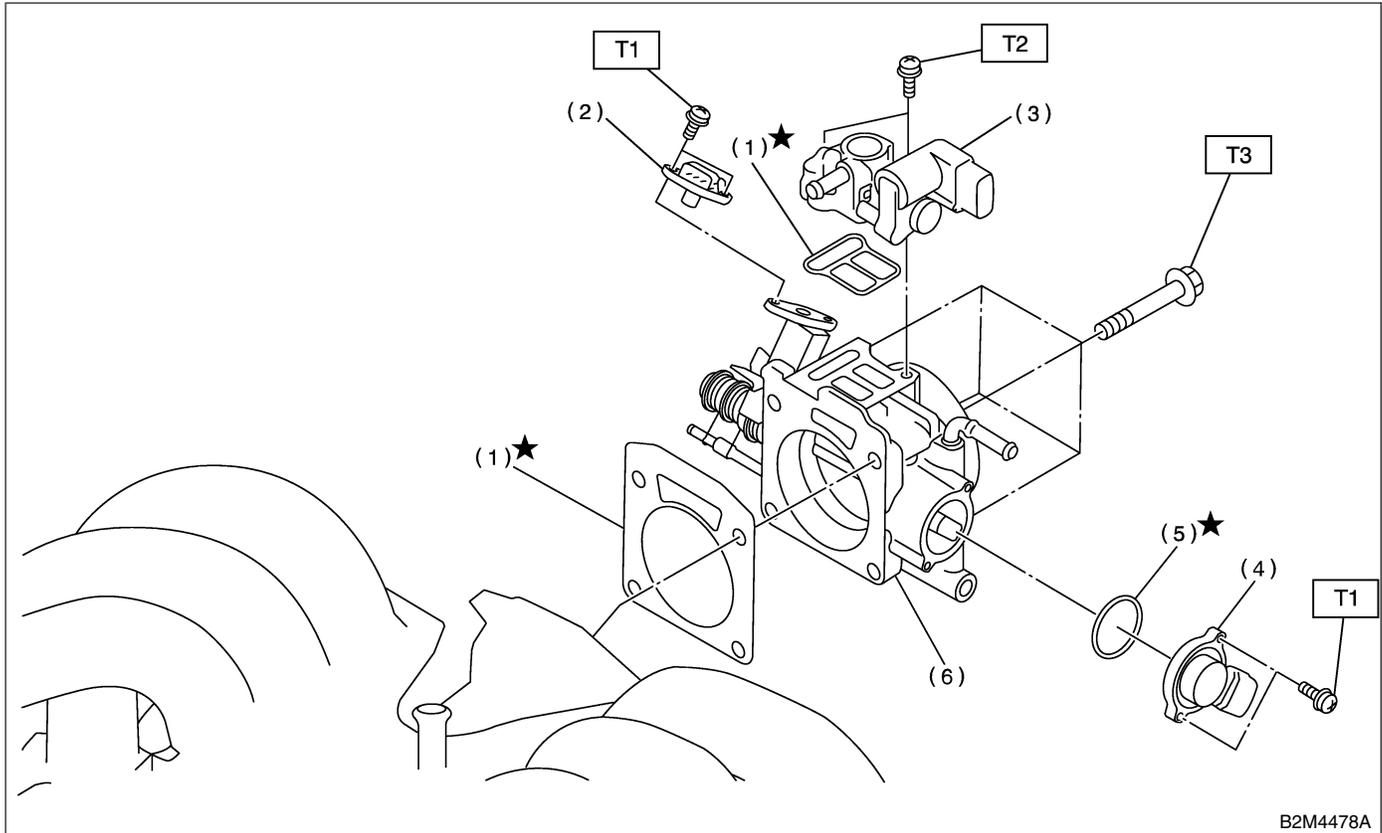
- (1) Fuel injector pipe LH
- (2) Pressure regulator
- (3) O-ring
- (4) Injection rubber
- (5) Insulator
- (6) Fuel injector
- (7) Fuel injector pipe RH

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 19 (1.9, 14)**

## 3. AIR INTAKE SYSTEM S145001A0503



- (1) Gasket
- (2) Intake manifold pressure sensor
- (3) Idle air control solenoid valve
- (4) Throttle position sensor

- (5) O-ring
- (6) Throttle body

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 1.6 (0.16, 1.2)**

**T2: 2.8 (0.29, 2.1)**

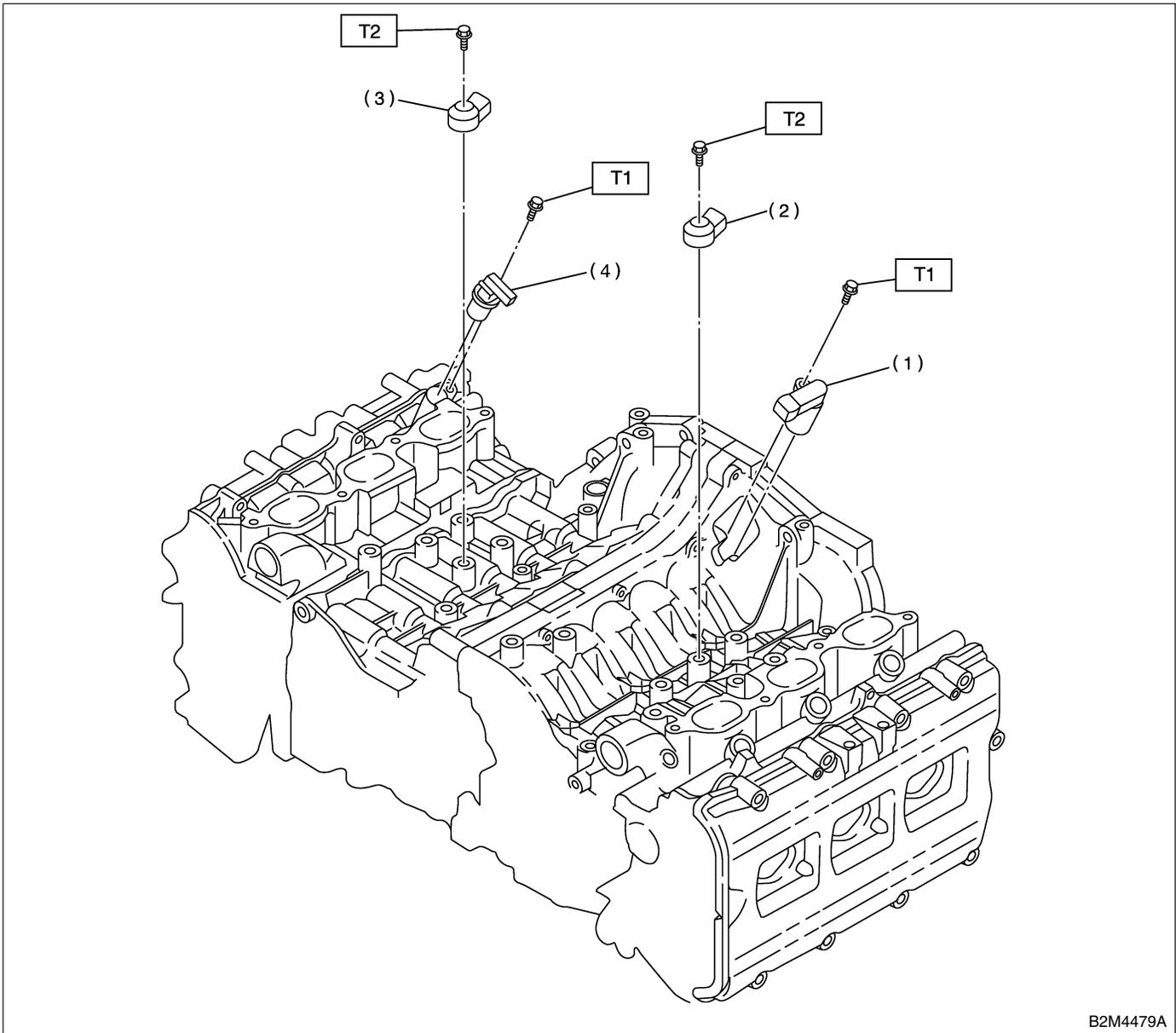
**T3: 22 (2.2, 15.9)**

# GENERAL DESCRIPTION

Fuel Injection (Fuel Systems)

## 4. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS

S145001A0504



B2M4479A

- (1) Crankshaft position sensor
- (2) Knock sensor LH

- (3) Knock sensor RH
- (4) Camshaft position sensor

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 25 (2.5, 18)**

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Fuel Injection (Fuel Systems)

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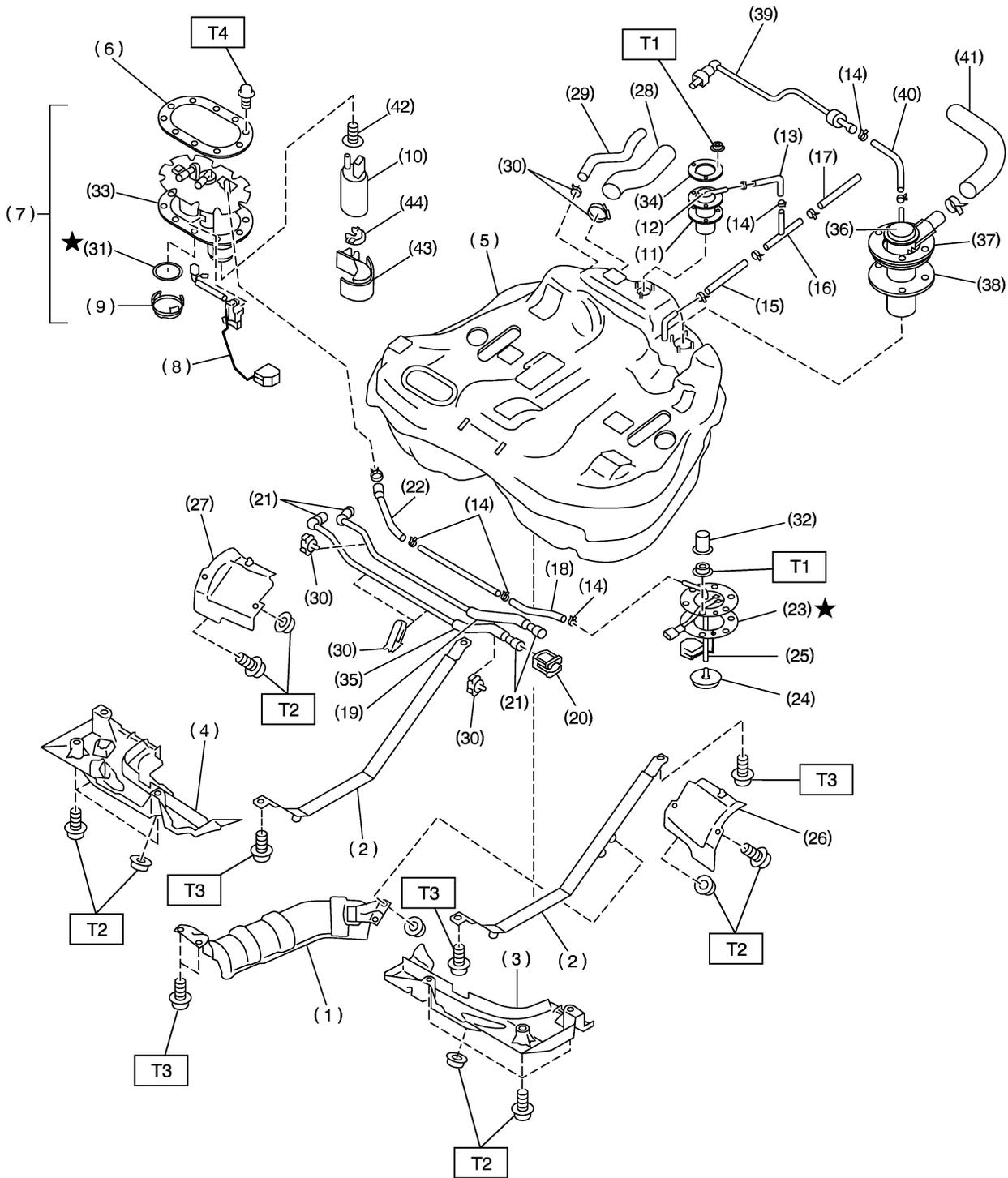
**MEMO:**

**FU(H6)-9**

# GENERAL DESCRIPTION

Fuel Injection (Fuel Systems)

## 5. FUEL TANK S145001A0505



B2M3662A

# GENERAL DESCRIPTION

Fuel Injection (Fuel Systems)

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(1) Heat sealed cover	(18) Jet pump hose A	(35) Fuel delivery tube
(2) Fuel tank band	(19) Fuel return tube	(36) Vent valve
(3) Protector LH (Front)	(20) Retainer	(37) Vent valve plate
(4) Protector RH (Front)	(21) Quick connector	(38) Vent valve gasket
(5) Fuel tank	(22) Jet pump hose B	(39) Evaporation tube
(6) Fuel pump plate	(23) Fuel sub level sensor gasket	(40) Evaporation hose D
(7) Fuel pump ASSY	(24) Jet pump filter	(41) Air vent hose
(8) Fuel level sensor	(25) Fuel sub level sensor	(42) Seal
(9) Cap	(26) Protector LH (Rear)	(43) Fuel pump holder
(10) Fuel pump	(27) Protector RH (Rear)	(44) Grommet
(11) Fuel cut valve gasket	(28) Fuel filler hose	
(12) Fuel cut valve	(29) Fuel tank pressure sensor hose	
(13) Evaporation hose A	(30) Clamp	
(14) Clip	(31) Gasket	
(15) Evaporation hose C	(32) Cap	
(16) Joint pipe	(33) Gasket	
(17) Evaporation hose B	(34) Fuel cut valve plate	

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***Tightening torque: N·m (kgf-m, ft-lb)***

***T1: 4.4 (0.45, 3.3)***

***T2: 18 (1.8, 13.0)***

***T3: 33 (3.4, 25)***

***T4: 5.9 (0.6, 4.3)***

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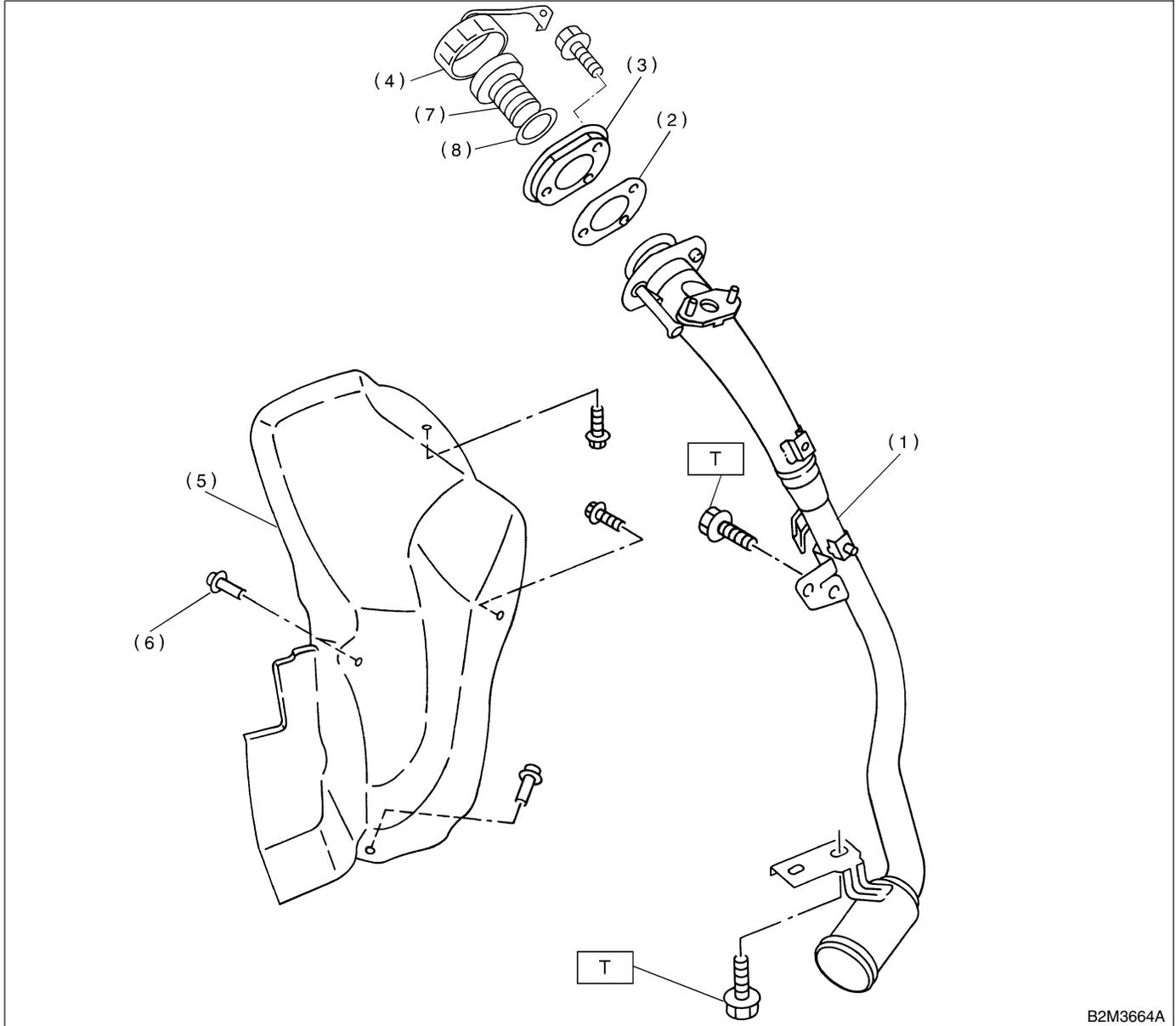
(1) Clamp	(22) Air vent pipe	(43) Drain filter
(2) Fuel delivery hose A	(23) Evaporation hose J	(44) Drain filter hose A
(3) Fuel filter bracket	(24) Evaporation hose K	(45) Drain valve hose
(4) Fuel filter holder	(25) Evaporation hose L	(46) Drain filter hose B
(5) Fuel filter cup	(26) Fuel tank pressure sensor hose	(47) Pressure control solenoid valve
(6) Fuel filter	(27) Fuel filler hose	(48) Evaporation hose O
(7) Evaporation hose F	(28) Evaporation pipe B	(49) Evaporation pipe C
(8) Clip	(29) Fuel tank pressure sensor	(50) Pipe protector
(9) Fuel delivery hose B	(30) Fuel filler pipe	(51) Evaporation hose P
(10) Fuel return hose	(31) Ring A	(52) Pressure control solenoid valve hose
(11) Fuel pipe ASSY	(32) Fuel filler cap	(53) Canister front bracket
(12) Fuel delivery hose C	(33) Ring B	
(13) Fuel return hose C	(34) Packing	
(14) Evaporation hose G	(35) Shut valve	<b><i>Tightening torque: N·m (kgf-m, ft-lb)</i></b>
(15) Clamp	(36) Evaporation hose M	<b><i>T1: 4.5 (0.46, 3.3)</i></b>
(16) Grommet	(37) Evaporation hose N	<b><i>T2: 7.5 (0.76, 5.5)</i></b>
(17) Fuel pipe ASSY	(38) Canister	<b><i>T3: 18 (1.8, 13.0)</i></b>
(18) Air vent hose A	(39) Canister lower bracket	<b><i>T4: 23 (2.3, 16.6)</i></b>
(19) Evaporation hose H	(40) Cushion rubber	<b><i>T5: 33 (3.4, 25)</i></b>
(20) Evaporation hose I	(41) Canister upper bracket	
(21) Air vent hose B	(42) Drain valve	

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# GENERAL DESCRIPTION

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## 7. FUEL FILLER PIPE S145001A0507



- (1) Fuel filler pipe ASSY
- (2) Filler pipe packing
- (3) Filler ring
- (4) Filler cap
- (5) Filler pipe protector
- (6) Clip
- (7) Ring A
- (8) Ring B

**Tightening torque: N·m (kgf·m, ft·lb)**

**T: 7.5 (0.75, 5.4)**

# GENERAL DESCRIPTION

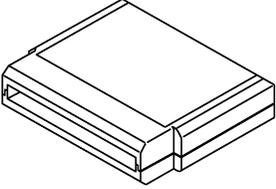
Fuel Injection (Fuel Systems)

## C: CAUTION S145001A03

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

## D: PREPARATION TOOL S145001A17

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B2M3876</p>	<p style="text-align: center;">24082AA190 (Newly adopted tool)</p>	<p style="text-align: center;">CARTRIDGE</p>	<p style="text-align: center;">Troubleshooting for electrical systems.</p>
 <p style="text-align: center;">B2M3877</p>	<p style="text-align: center;">22771AA030</p>	<p style="text-align: center;">SELECT MONITOR KIT</p>	<p style="text-align: center;">Troubleshooting for electrical systems.</p> <ul style="list-style-type: none"> <li>● English: 22771AA030 (Without printer)</li> <li>● German: 22771AA070 (Without printer)</li> <li>● French: 22771AA080 (Without printer)</li> <li>● Spanish: 22771AA090 (Without printer)</li> </ul>

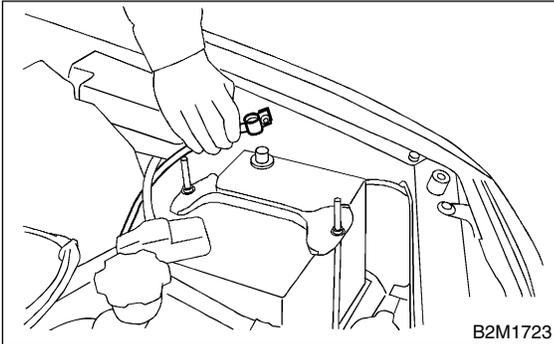
# THROTTLE BODY

Fuel Injection (Fuel Systems)

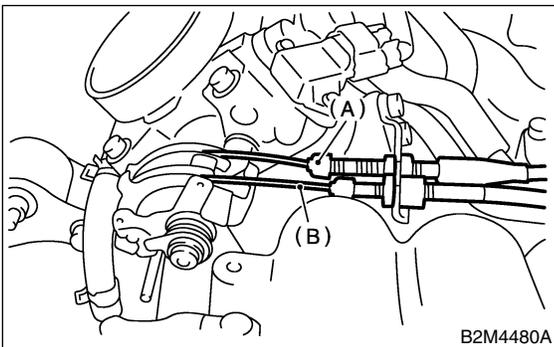
## 2. Throttle Body S145010

### A: REMOVAL S145010A18

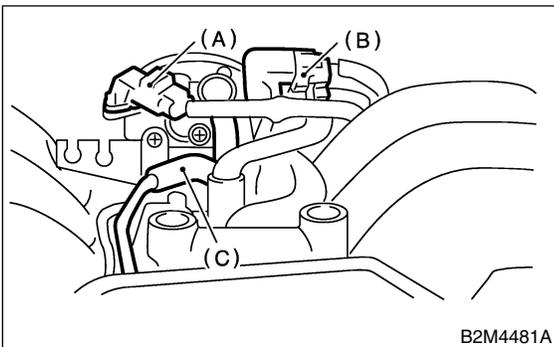
- 1) Disconnect battery ground cable.



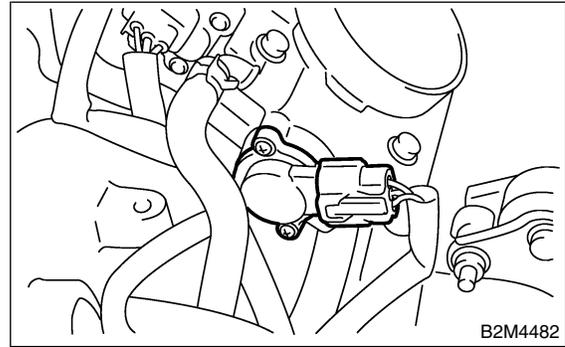
- 2) Remove air intake chamber. <Ref. to IN(H6)-6, REMOVAL, Air Intake Chamber.>
- 3) Disconnect accelerator cable (A).
- 4) Disconnect cruise control cable (B). (With cruise control model)



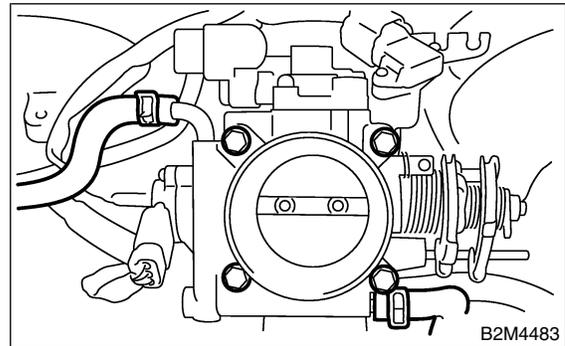
- 5) Disconnect connectors from intake manifold pressure sensor (A) and idle air control solenoid valve (B).
- 6) Disconnect air by-pass hose (C) from idle air control solenoid valve.



- 7) Disconnect throttle position sensor connector.



- 8) Disconnect engine coolant hoses from throttle body.
- 9) Remove bolts which secure throttle body to intake manifold.



### B: INSTALLATION S145010A11

Install in the reverse order of removal.

#### NOTE:

Always use a new gasket.

#### **Tightening torque:**

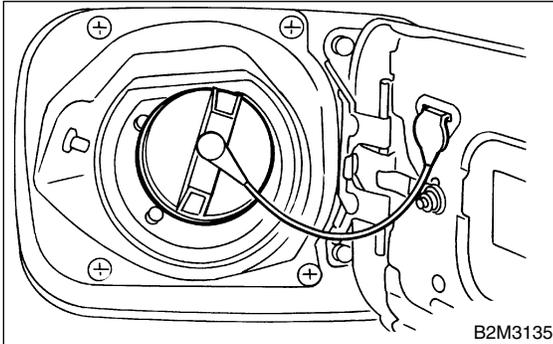
**Throttle body;**

**22 N·m (2.2 kgf-m, 15.9 ft-lb)**

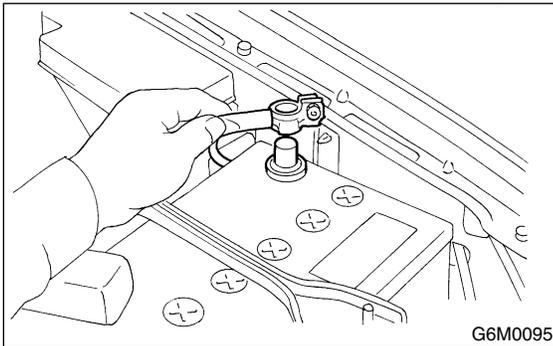
## 3. Intake Manifold S145034

### A: REMOVAL S145034A18

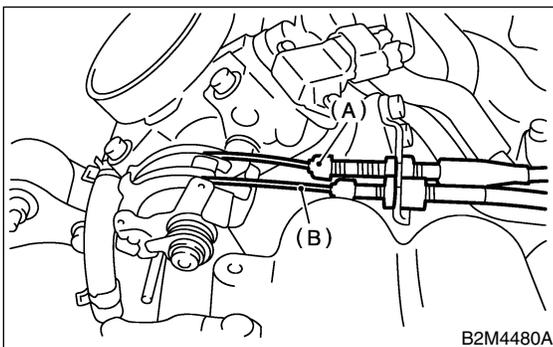
- 1) Release fuel pressure. <Ref. to FU(H6)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel flap lid, and remove fuel filler cap.



- 3) Disconnect battery ground cable.



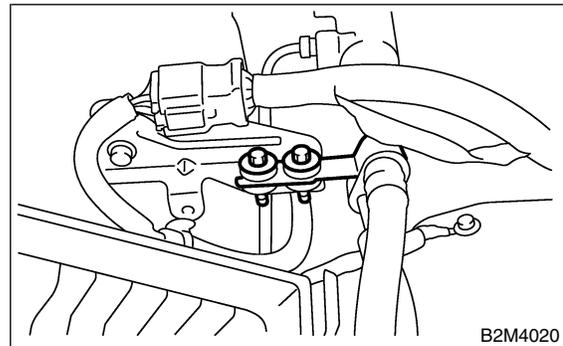
- 4) Remove air intake duct, air cleaner assembly and air intake chamber. <Ref. to IN(H6)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H6)-5, REMOVAL, Air Cleaner.> and <Ref. to IN(H6)-6, REMOVAL, Air Intake Chamber.>
- 5) Disconnect accelerator cable (A).
- 6) Disconnect cruise control cable (B). (With cruise control model)



- 7) Remove power steering pump and tank from brackets.

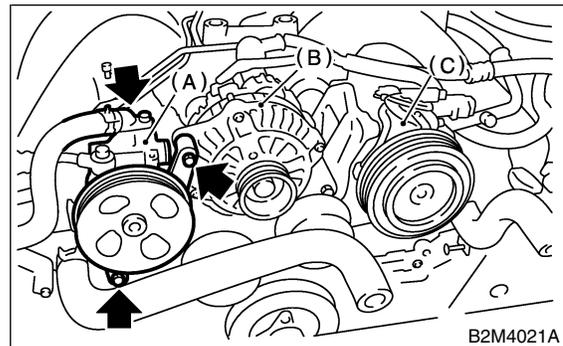
- (1) Remove V-belt.  
<Ref. to ME(H6)-29, REMOVAL, V-belt.>

- (2) Remove power steering oil pipe with bracket.



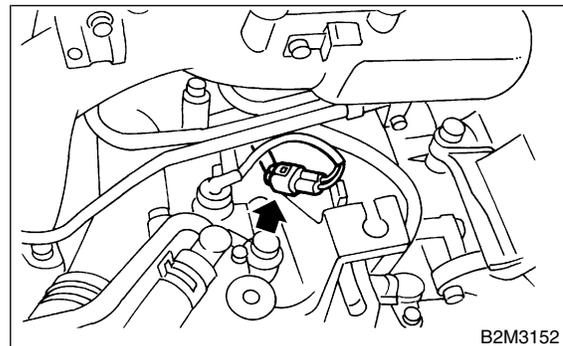
- (3) Remove bolts which install power steering pump bracket.

**NOTE:**  
Do not separate hose and pipe from the main pump.



- (A) Power steering pump
- (B) Generator
- (C) A/C compressor

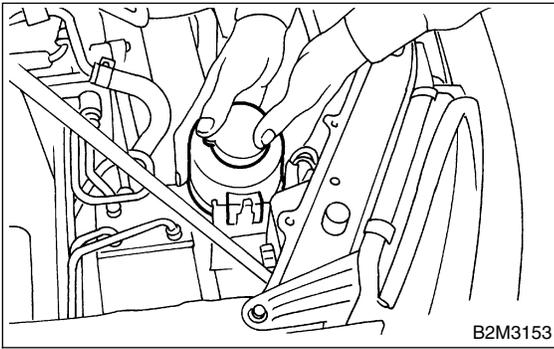
- (4) Disconnect power steering pump switch connector.



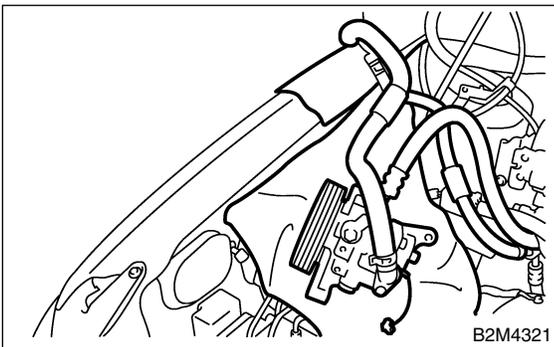
# INTAKE MANIFOLD

## Fuel Injection (Fuel Systems)

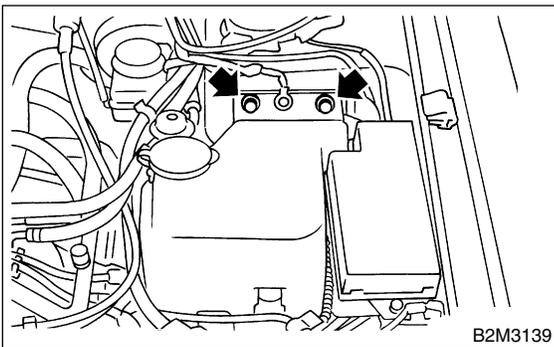
(5) Remove power steering tank from the bracket by pulling it upward.



(6) Place power steering pump on the right side wheel apron.

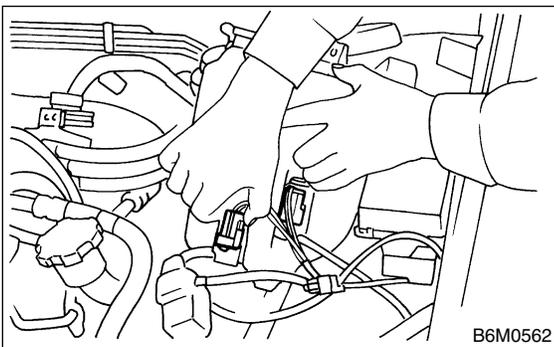


8) Remove two bolts which install washer tank on body.



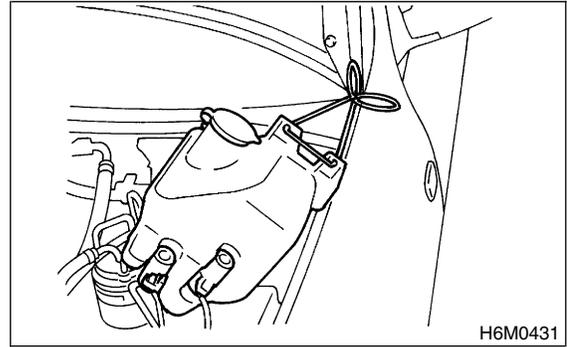
9) Disconnect connector from front window washer motor.

10) Disconnect connector from rear gate glass washer motor.

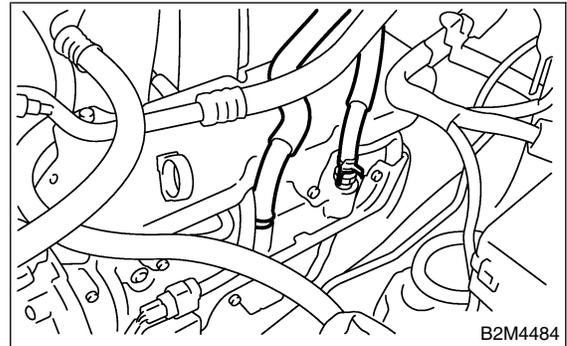


11) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

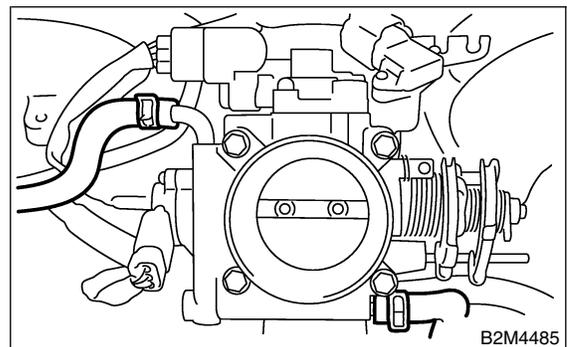
12) Move washer tank upward.



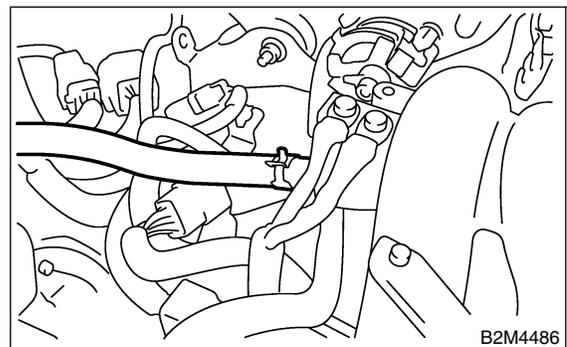
13) Disconnect PCV hoses from cylinder head cover.



14) Disconnect engine coolant hose from throttle body.



15) Disconnect brake booster hose.



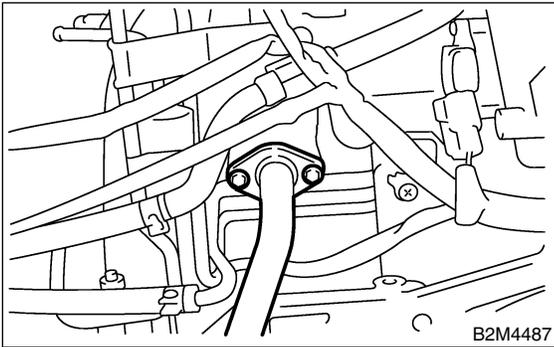
# INTAKE MANIFOLD

Fuel Injection (Fuel Systems)

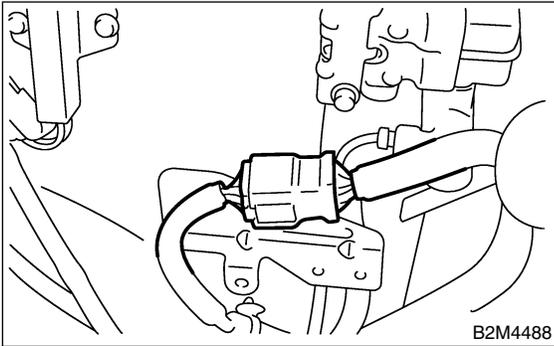
16) Remove EGR pipe from EGR valve.

**NOTE:**

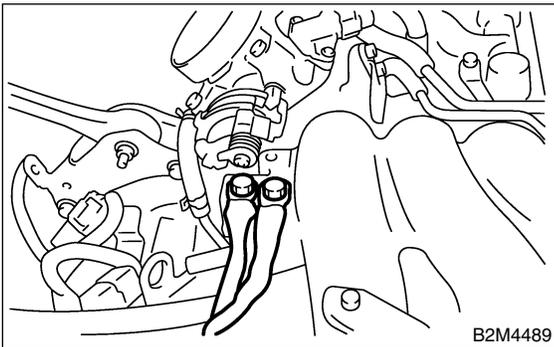
Be careful not to drop gaskets.



17) Disconnect engine harness connectors from bulkhead harness connectors.



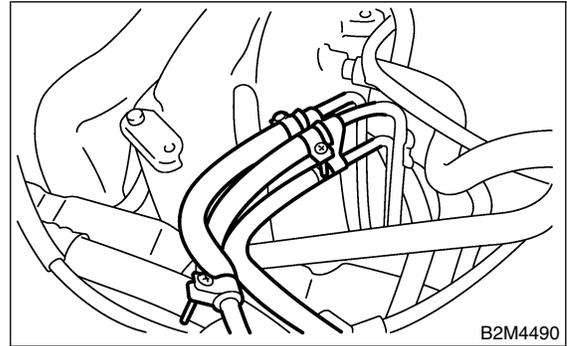
18) Disconnect engine ground cable from intake manifold.



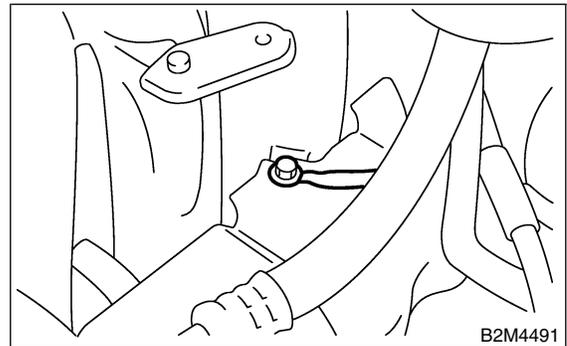
19) Disconnect fuel hoses from fuel pipes.

**WARNING:**

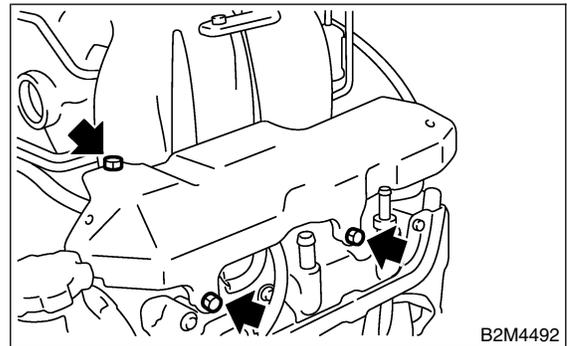
- Do not spill fuel.
- Catch fuel from hoses in a container or cloth.



20) Remove ground cable from fuel pipe protector LH.



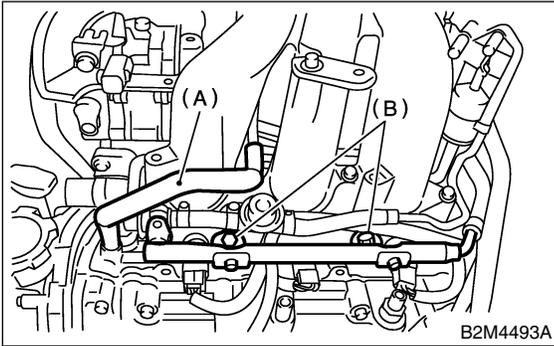
21) Remove fuel pipe protector LH.



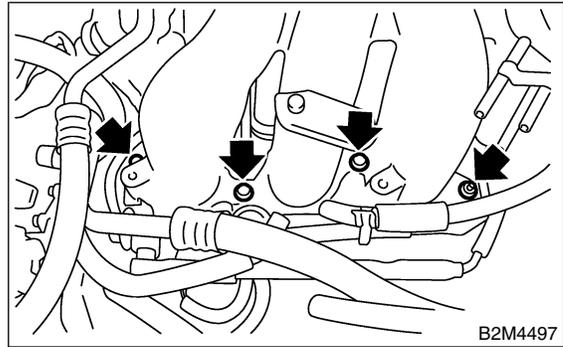
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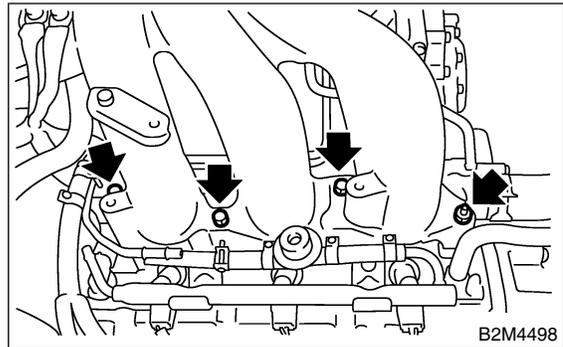
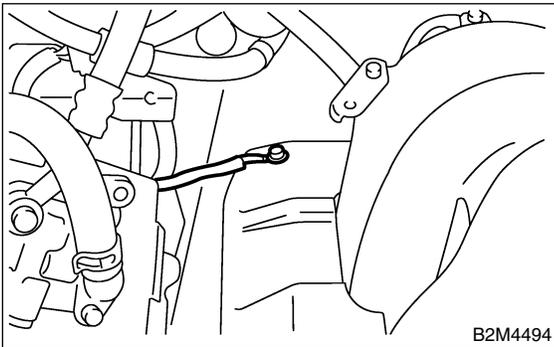
- 22) Disconnect air assist hose (A).
- 23) Remove the bolt (B), which holds fuel injector pipe LH onto cylinder head.



- 27) Remove bolts which hold intake manifold onto cylinder heads.

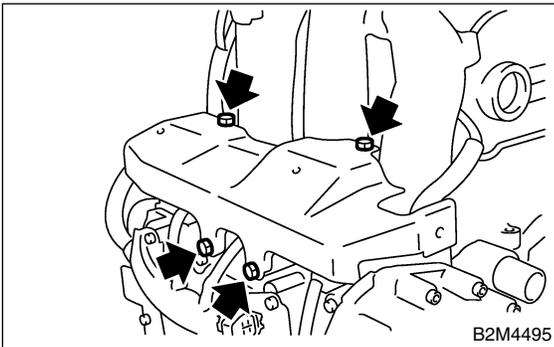


- 24) Remove ground cable from fuel pipe protector RH.

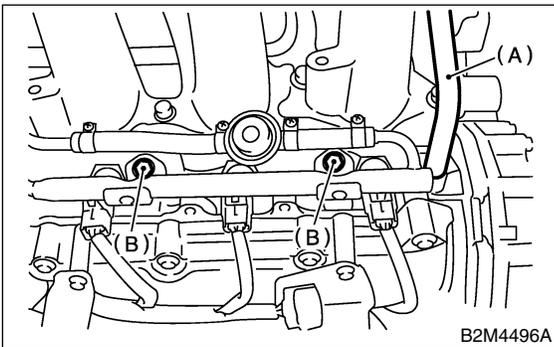


- 28) Remove intake manifold.

- 25) Remove fuel pipe protector RH.



- 26) Disconnect air assist hose (A).
- Remove the bolt (B), which holds fuel injector pipe RH onto cylinder head.



## B: INSTALLATION S145034A11

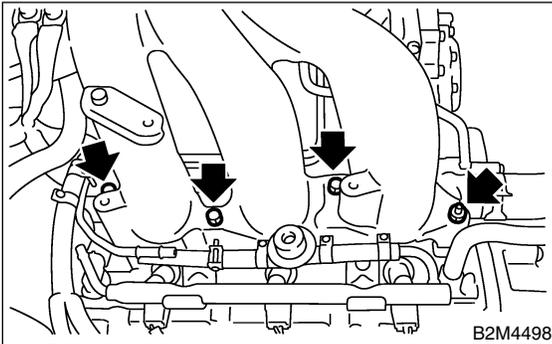
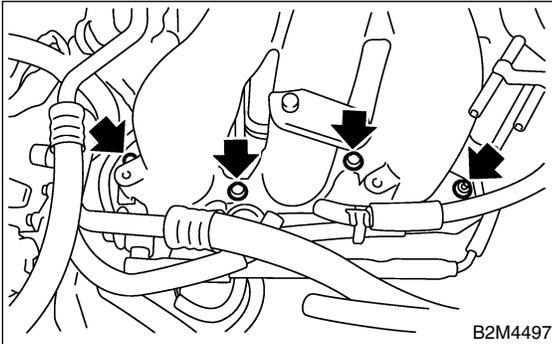
1) Install intake manifold onto cylinder heads.

### CAUTION:

Always use new gaskets.

**Tightening torque:**

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

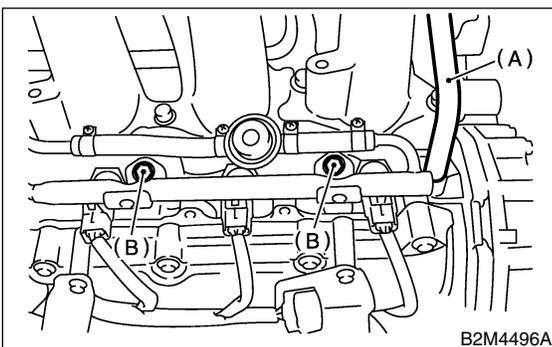


2) Install the bolt (B), which holds fuel injector pipe RH onto cylinder head.

**Tightening torque:**

**19 N·m (1.9 kgf-m, 14 ft-lb)**

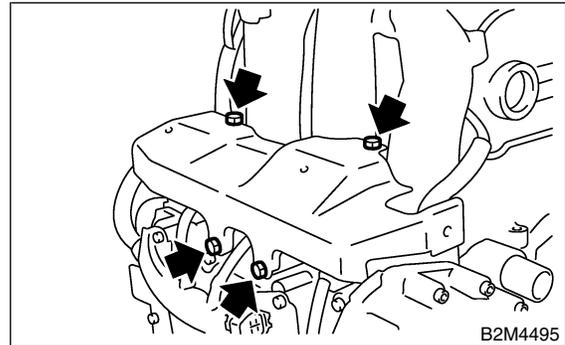
3) Connect air assist hose (A).



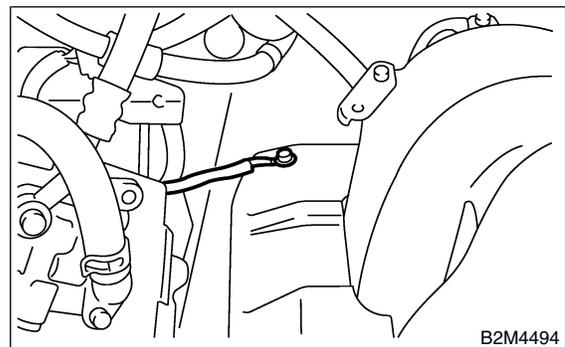
4) Install fuel pipe protector RH.

**Tightening torque:**

**19 N·m (1.9 kgf-m, 14 ft-lb)**



5) Install ground cable to fuel pipe protector RH.

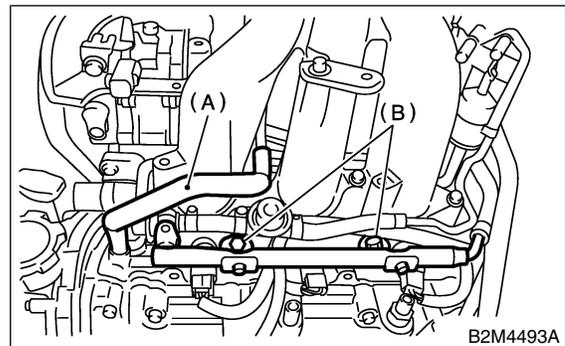


6) Install the bolt (B) which holds fuel injector pipe RH onto cylinder head.

**Tightening torque:**

**19 N·m (1.9 kgf-m, 14 ft-lb)**

7) Connect air assist hose (A).



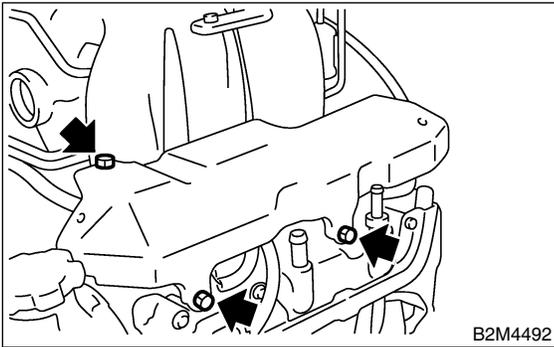
# INTAKE MANIFOLD

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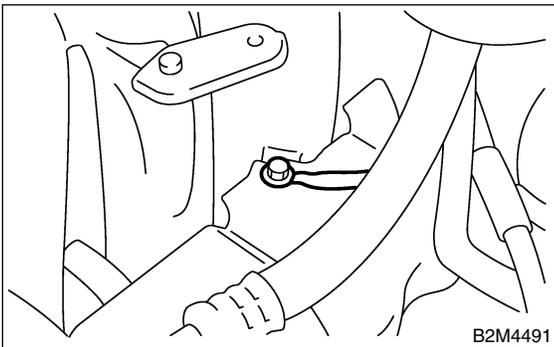
8) Install fuel pipe protector LH.

**Tightening torque:**

**19 N·m (1.9 kgf·m, 14 ft·lb)**



9) Install ground cable to fuel pipe protector LH.

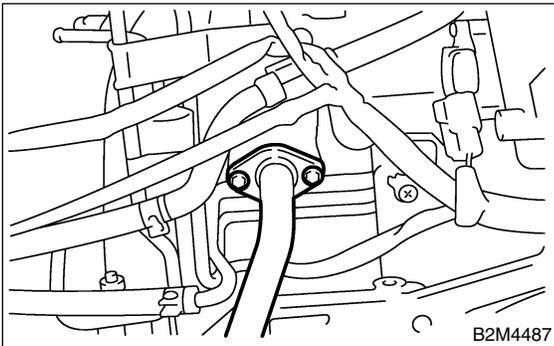


10) Install EGR pipe to EGR valve.

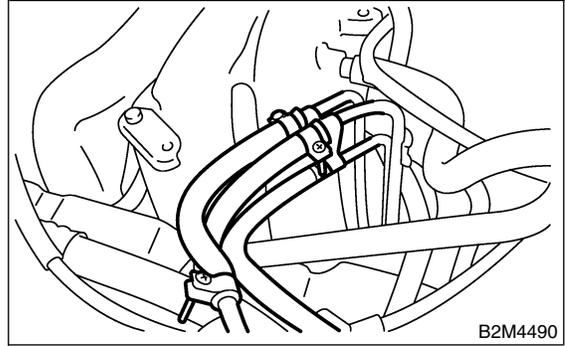
**CAUTION:**  
Always use new gasket.

**Tightening torque:**

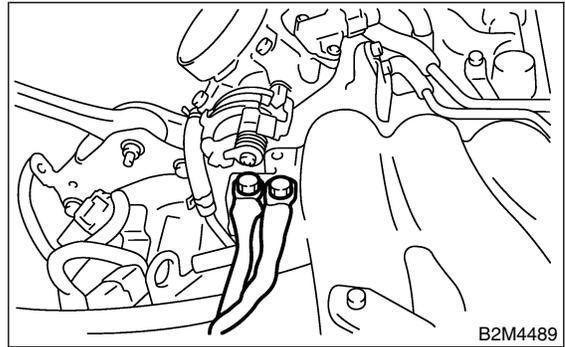
**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**



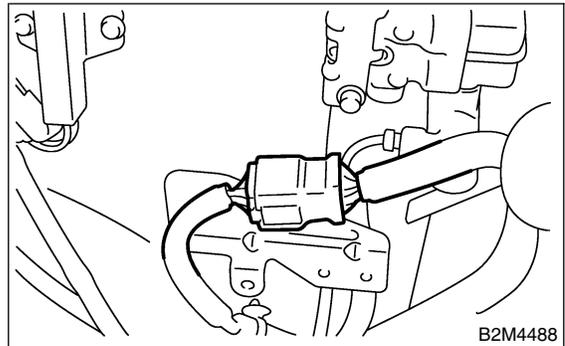
11) Connect fuel hoses.



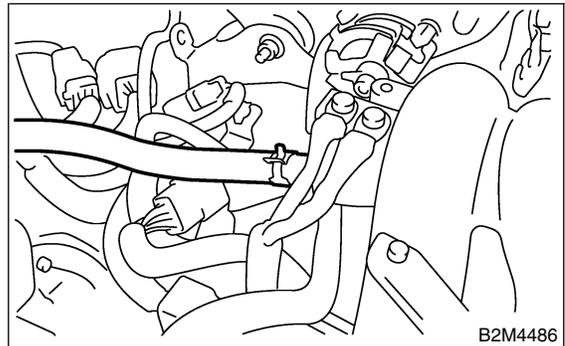
12) Connect engine ground cable to intake manifold.



13) Connect engine harness connectors to bulk-head connectors.



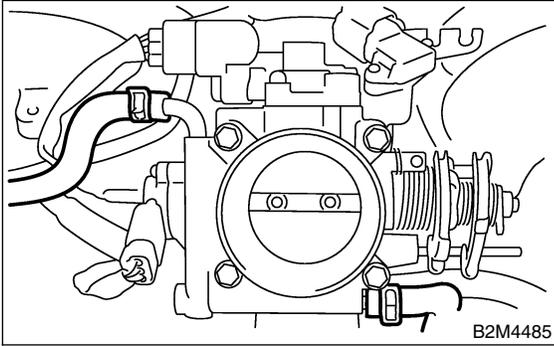
14) Connect brake booster hose.



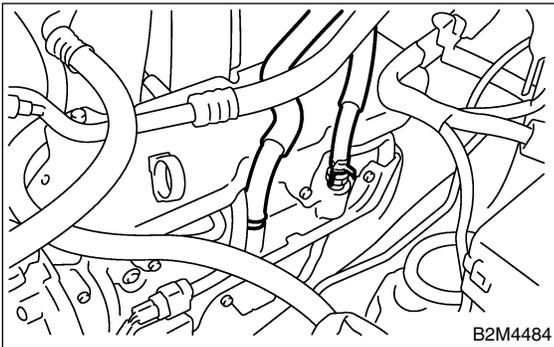
# INTAKE MANIFOLD

Fuel Injection (Fuel Systems)

- 15) Connect engine coolant hose to throttle body.

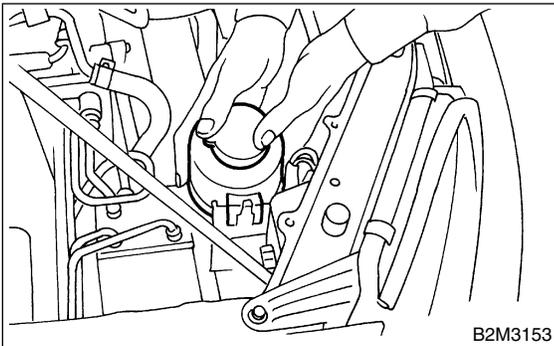


- 16) Connect PCV hose to cylinder head cover.

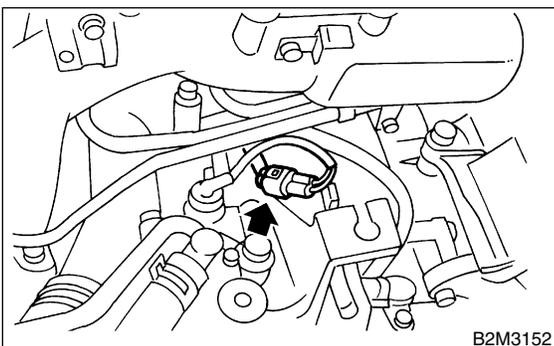


- 17) Install power steering pump and tank on brackets.

- (1) Install power steering tank on bracket.



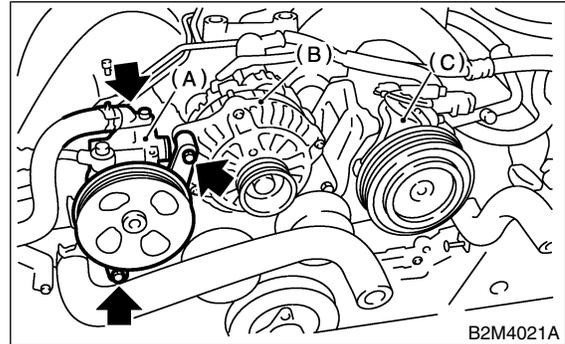
- (2) Connect connector to power steering pump switch.



- (3) Tighten bolts which install power steering pump on bracket.

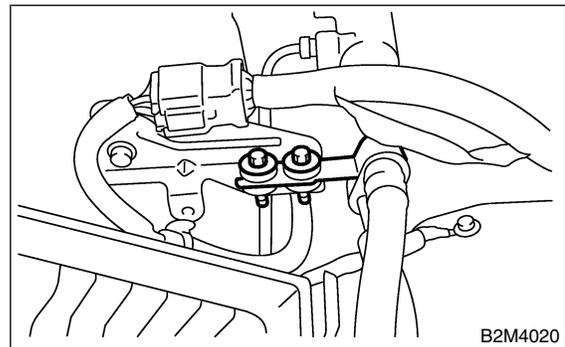
**Tightening torque:**

**20 N·m (2.0 kgf·m, 14 ft·lb)**



- (A) Power steering pump  
(B) Generator  
(C) A/C compressor

- (4) Install power steering pipes with bracket.

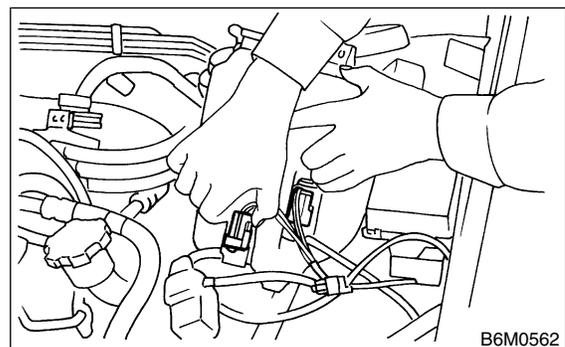


- (5) Install V-belt. <Ref. to ME(H6)-29, INSTALLATION, V-belt.>

- 18) Connect rear window washer hose to washer motor.

- 19) Connect front window washer motor connector.

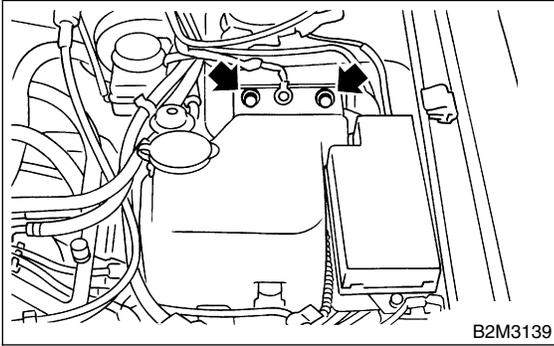
- 20) Connect rear window washer motor connector.



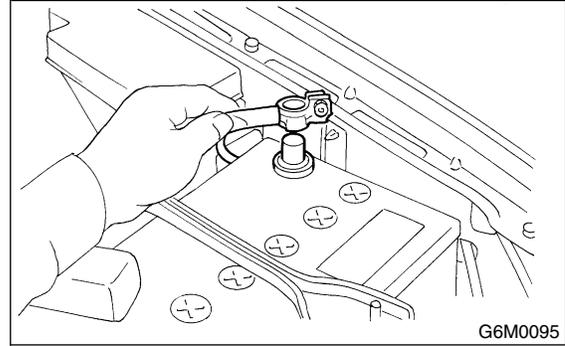
# INTAKE MANIFOLD

## Fuel Injection (Fuel Systems)

21) Install washer tank on body.

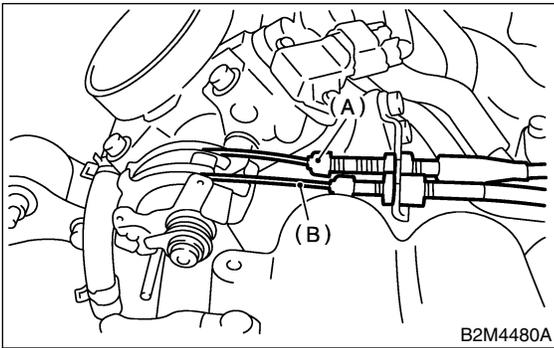


26) Connect battery ground cable.



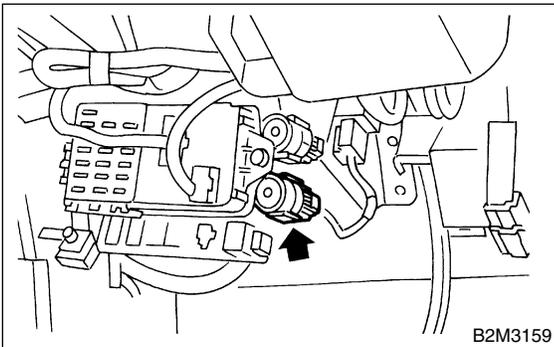
22) Connect accelerator cable (A).

23) Connect cruise control cable (B). (With cruise control models)



24) Install air intake duct, air cleaner and air intake chamber. <Ref. to IN(H6)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H6)-5, INSTALLATION, Air Cleaner.> and <Ref. to IN(H6)-6, INSTALLATION, Air Intake Chamber.>

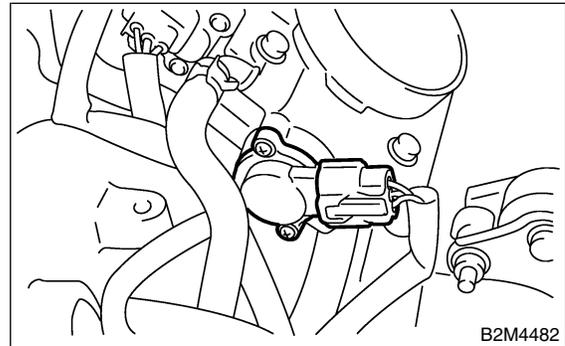
25) Connect connector to fuel pump relay.



## C: DISASSEMBLY

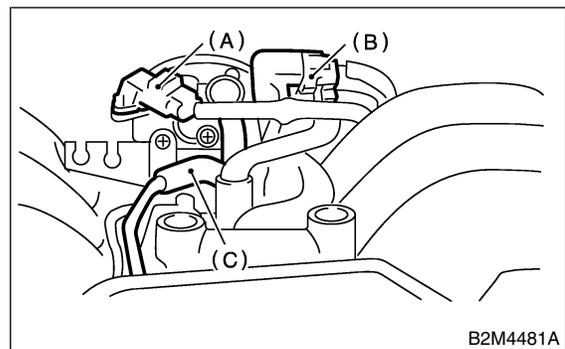
S145034A06

1) Disconnect connectors from throttle position sensor.



2) Disconnect connectors from intake manifold pressure sensor (B) and idle air control solenoid valve (A).

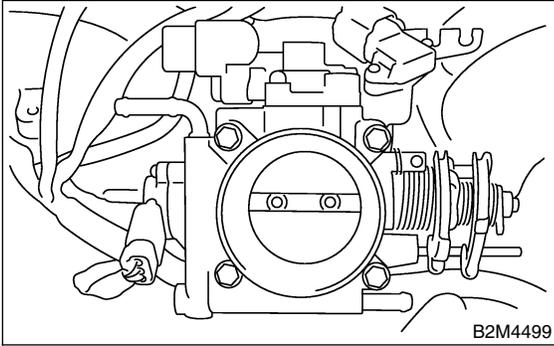
3) Disconnect air by-pass hose (C) from idle air control solenoid valve.



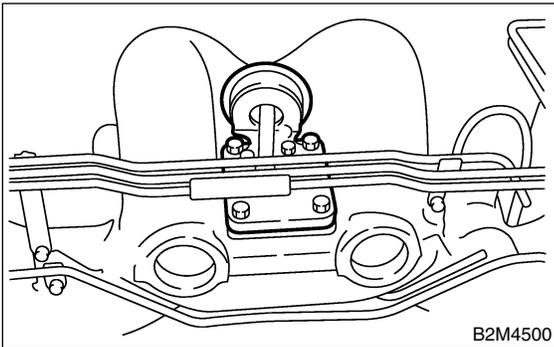
# INTAKE MANIFOLD

Fuel Injection (Fuel Systems)

4) Remove throttle body.

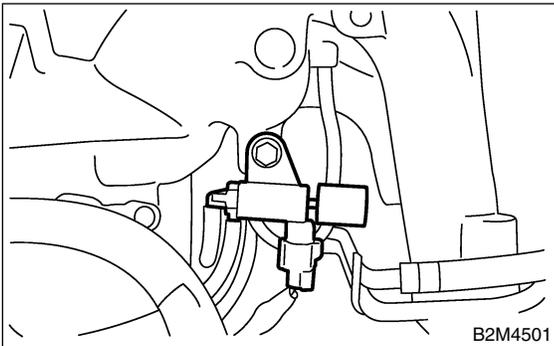


5) Remove induction valve.



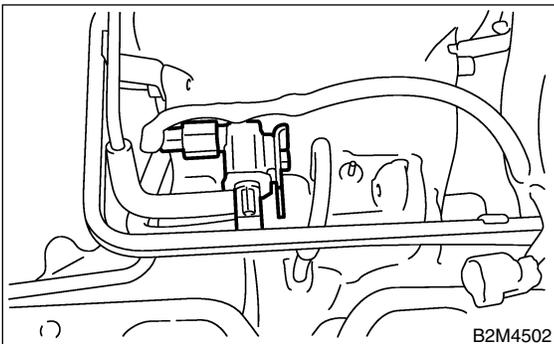
6) Disconnect connector from induction valve control solenoid.

7) Remove induction valve control solenoid.



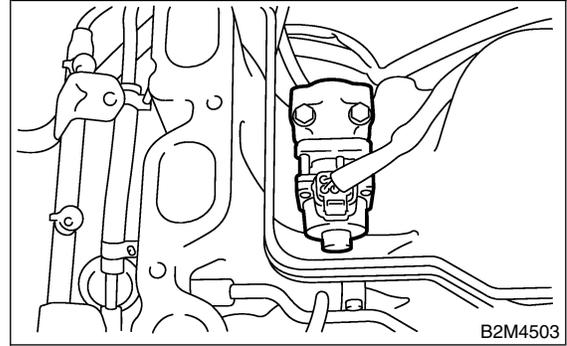
8) Disconnect connector from purge control solenoid valve.

9) Remove purge control solenoid valve.

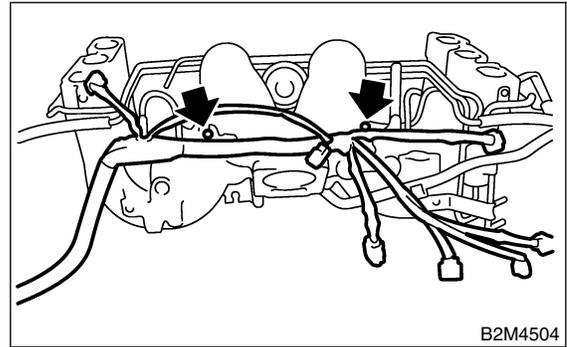


10) Disconnect connector from EGR valve.

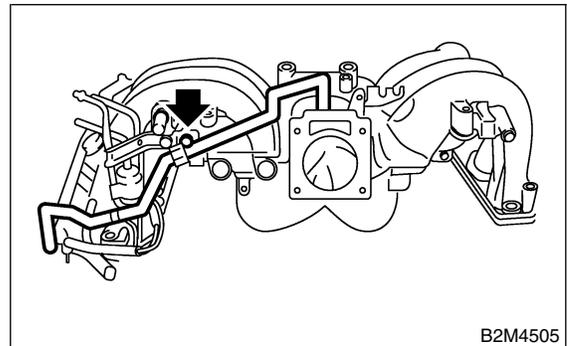
11) Remove EGR valve.



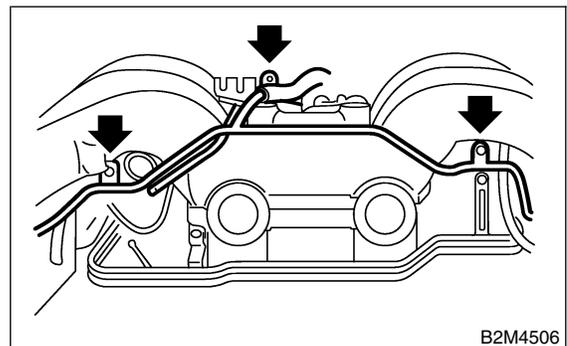
12) Remove engine harness assembly from intake manifold.



13) Remove PCV pipe from intake manifold.



14) Remove air assist and purge pipe assembly.

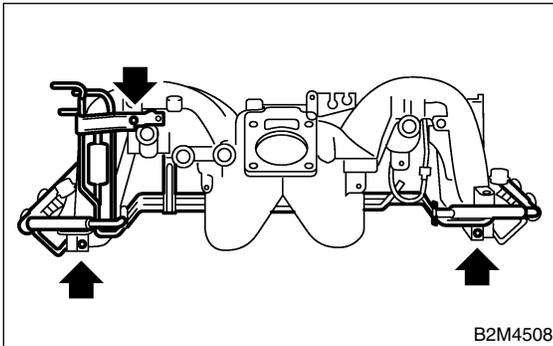
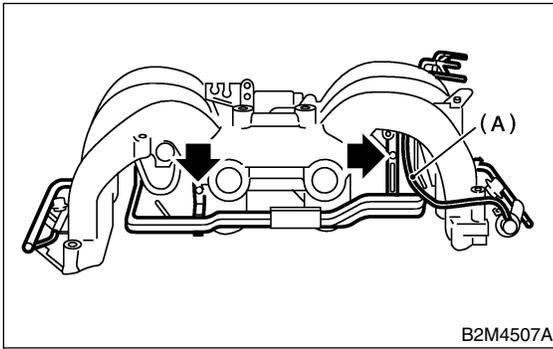


15) Disconnect pressure regulator vacuum hose (A) from intake manifold.

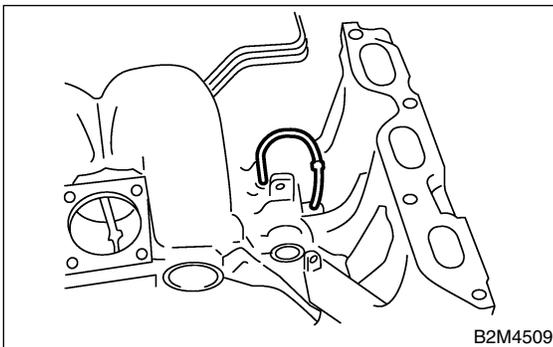
# INTAKE MANIFOLD

## Fuel Injection (Fuel Systems)

16) Remove fuel pipe and injector pipe assembly.

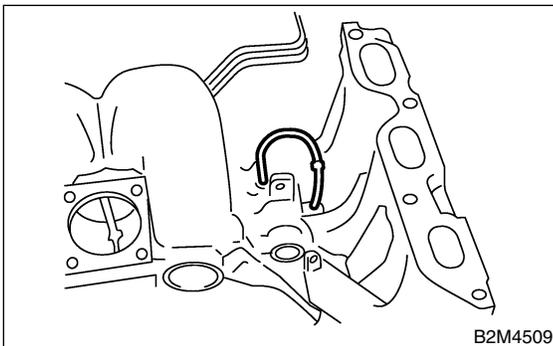


17) Remove induction valve vacuum hose from intake manifold.



## D: ASSEMBLY S145034A02

1) Intake induction valve vacuum hose to intake manifold.

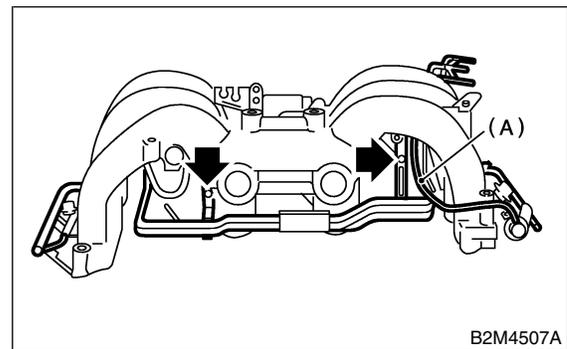
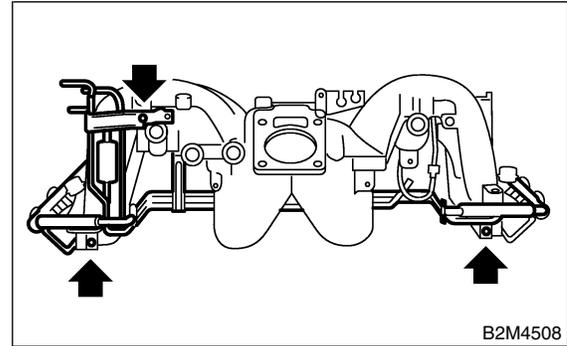


2) Install fuel pipe and injector pipe assembly.

**Tightening torque:**

**5.0 N·m (0.51 kgf-m, 3.7 ft-lb)**

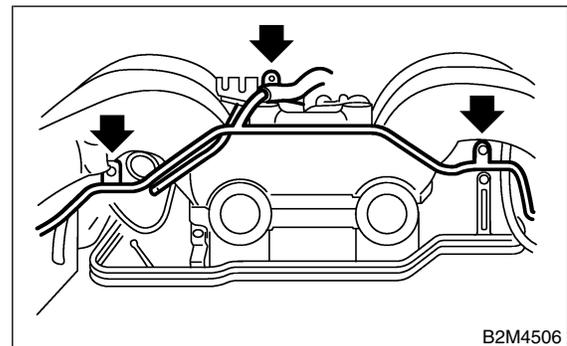
3) Connect pressure regulator vacuum hose (A) to intake manifold.



4) Install air assist and purge pipe assembly.

**Tightening torque:**

**5.0 N·m (0.51 kgf-m, 3.7 ft-lb)**



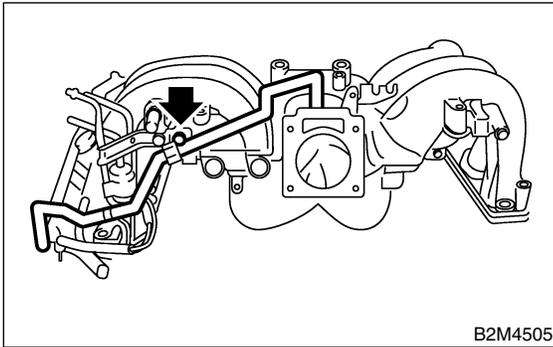
# INTAKE MANIFOLD

Fuel Injection (Fuel Systems)

5) Install PCV pipe to intake manifold.

**Tightening torque:**

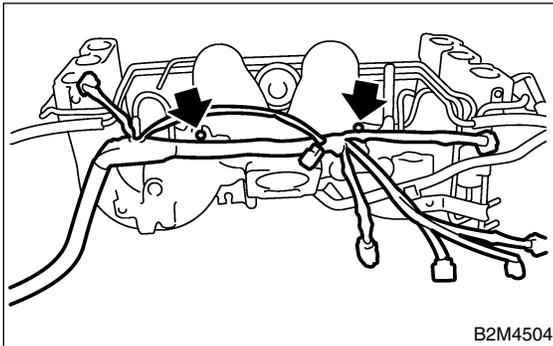
**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**



6) Install engine harness assembly to intake manifold.

**Tightening torque:**

**5.0 N·m (0.51 kgf·m, 3.7 ft·lb)**

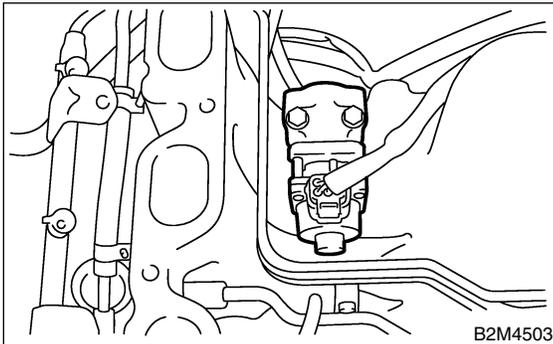


7) Install EGR valve.

**Tightening torque:**

**19 N·m (1.9 kgf·m, 14 ft·lb)**

8) Connect connector to EGR valve.

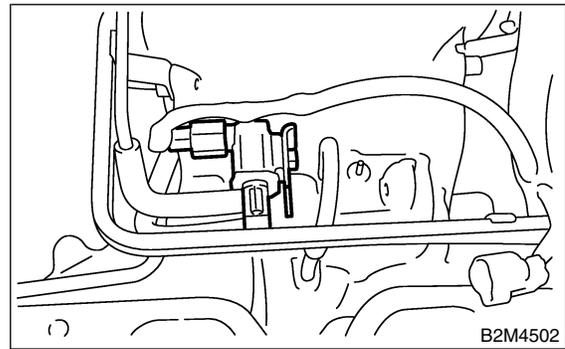


9) Install purge control solenoid valve.

**Tightening torque:**

**19 N·m (1.9 kgf·m, 14 ft·lb)**

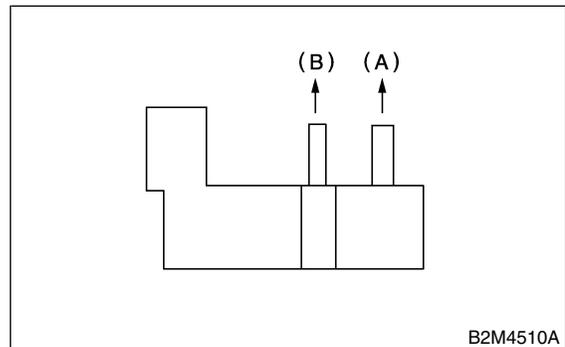
10) Connect connector to purge control solenoid valve.



11) Connect hoses to purge control solenoid valve.

**CAUTION:**

**Carefully connect the evaporation hoses.**



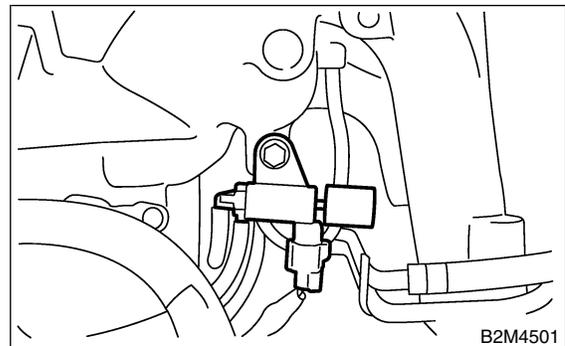
(A) To purge pipe  
(B) To fuel pipe

12) Install induction valve control solenoid.

**Tightening torque:**

**19 N·m (1.9 kgf·m, 14 ft·lb)**

13) Connect connector to induction valve control solenoid.



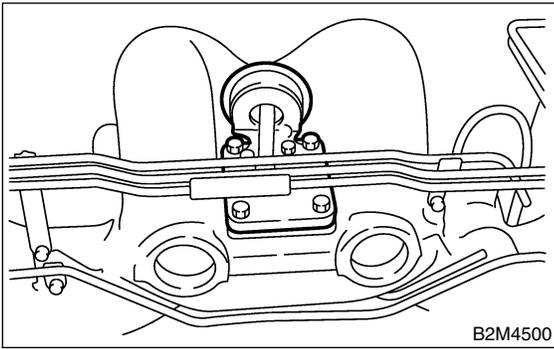
14) Install induction valve.

**Tightening torque:**

**19 N·m (1.9 kgf·m, 14 ft·lb)**

# INTAKE MANIFOLD

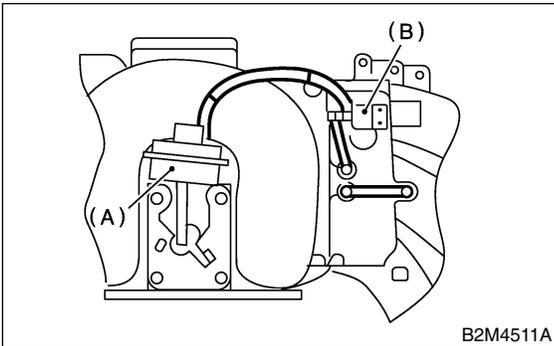
Fuel Injection (Fuel Systems)



15) Connect hoses to induction valve control solenoid.

**CAUTION:**

**Carefully connect the vacuum hoses.**



- (A) Induction valve
- (B) Induction valve control solenoid

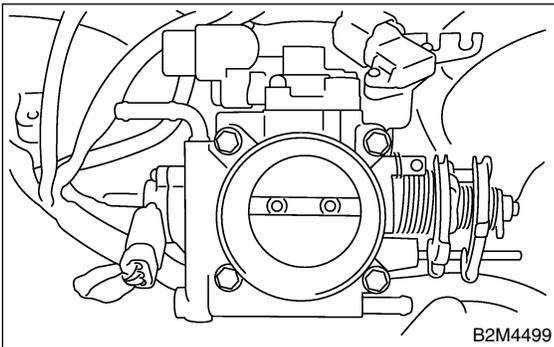
16) Install throttle body to intake manifold.

**NOTE:**

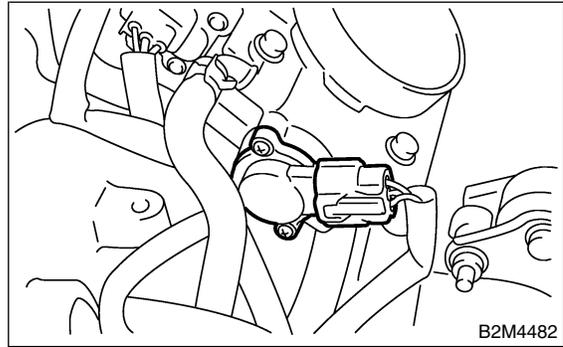
Replace gasket with a new one.

**Tightening torque:**

**22 N·m (2.2 kgf·m, 15.9 ft·lb)**

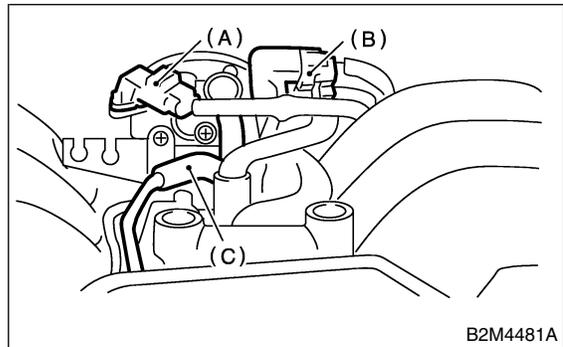


17) Connect connectors to throttle position sensor.



18) Connect connectors to intake manifold pressure sensor (A) and idle air control solenoid valve (B).

19) Connect air by-pass hose (C) to idle air control solenoid valve.



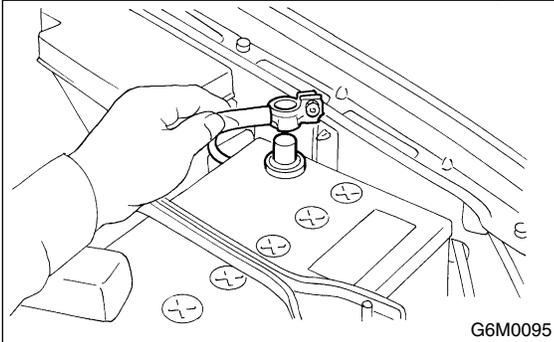
## 4. Engine Coolant Temperature Sensor

S145047

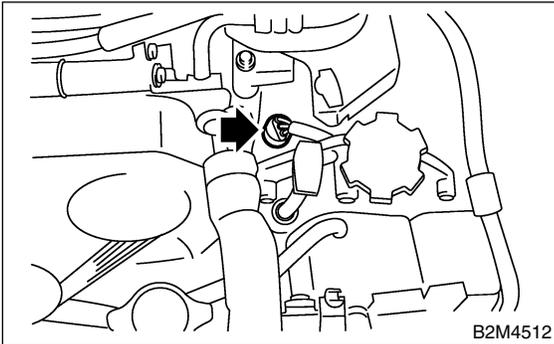
### A: REMOVAL

S145047A18

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from engine coolant temperature sensor.
- 3) Remove engine coolant temperature sensor.



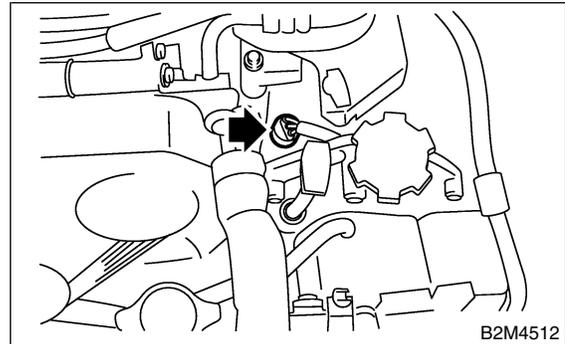
### B: INSTALLATION

S145047A11

Install in the reverse order of removal.

**Tightening torque:**

**16 N·m (0.16 kgf-m, 1.2 ft-lb)**



# CRANKSHAFT POSITION SENSOR

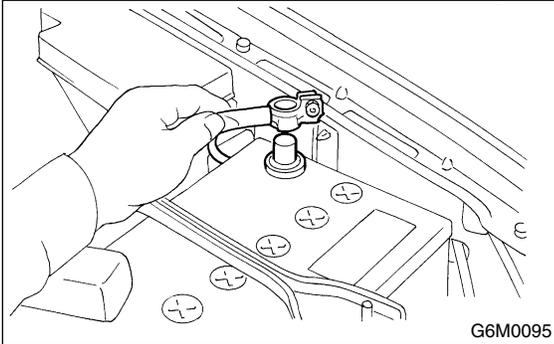
Fuel Injection (Fuel Systems)

## 5. Crankshaft Position Sensor

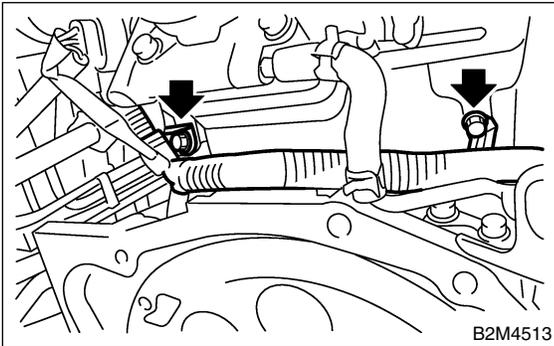
S145043

### A: REMOVAL S145043A18

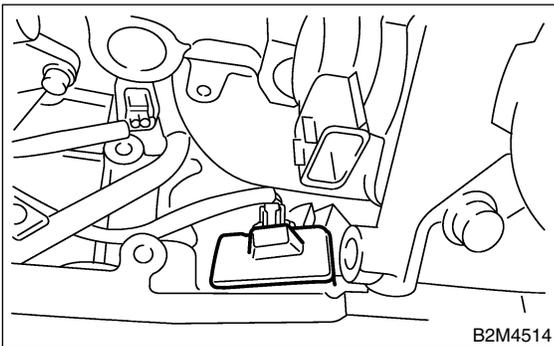
- 1) Disconnect battery ground cable.



- 2) Remove air intake chamber.  
<Ref. to IN(H6)-6, REMOVAL, Air Intake Chamber.>
- 3) Remove engine harness bracket from intake manifold.

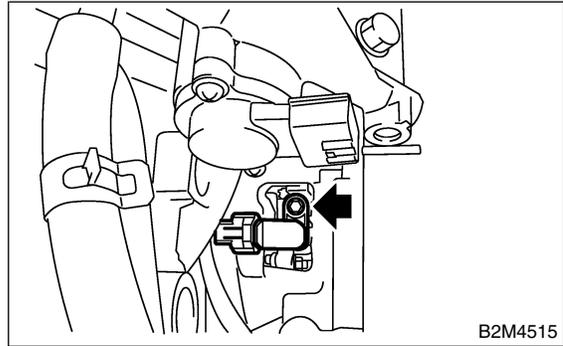


- 4) Remove service hole cover.



- 5) Remove bolt which install crankshaft position sensor to cylinder block.

- 6) Remove crankshaft position sensor, and disconnect connector from it.

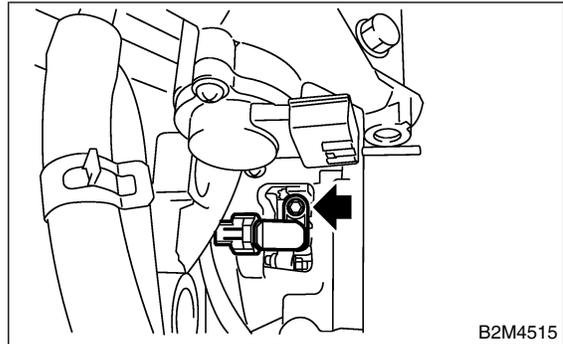


### B: INSTALLATION S145043A11

Install in the reverse order of removal.

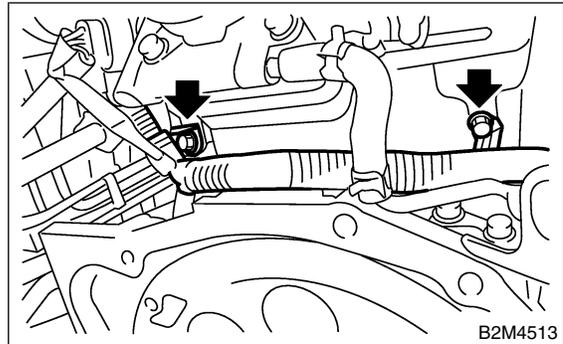
**Tightening torque:**

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



**Tightening torque:**

**T: 5.0 N·m (0.51 kgf-m, 3.7 ft-lb)**

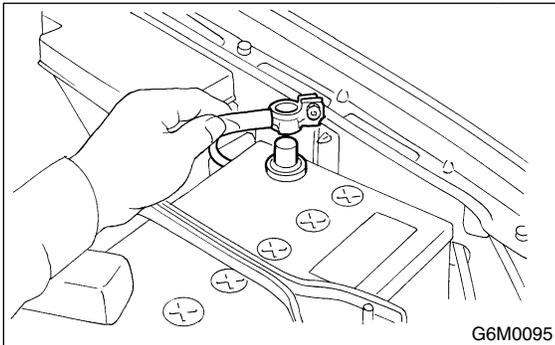


## 6. Camshaft Position Sensor

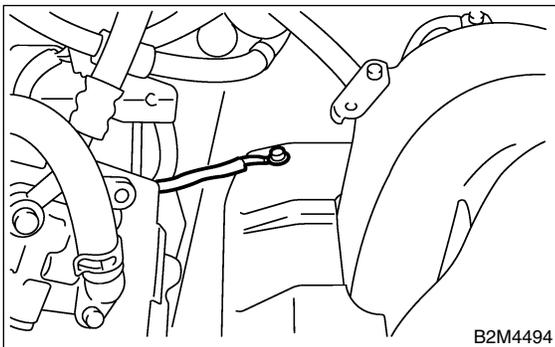
S145041

### A: REMOVAL S145041A18

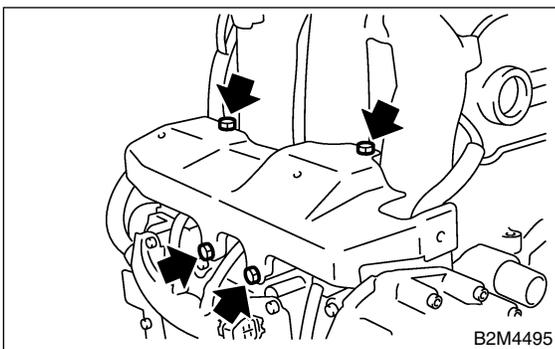
- 1) Disconnect battery ground cable.



- 2) Remove air cleaner.  
<Ref. to IN(H6)-5, REMOVAL, Air Cleaner.>
- 3) Remove ground cable from fuel pipe protector RH.

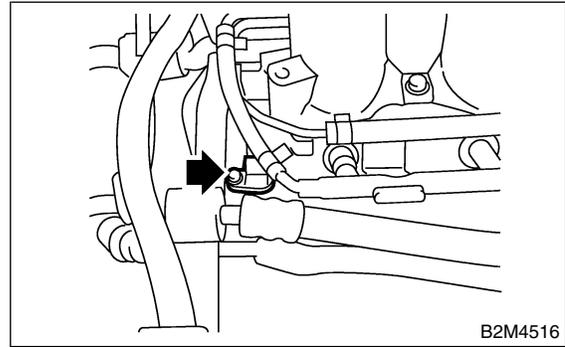


- 4) Remove fuel pipe protector RH.



- 5) Disconnect connector from camshaft position sensor.

- 6) Remove camshaft position sensor.



### B: INSTALLATION S145041A11

Install in the reverse order of removal.

#### **Tightening torque:**

- **Camshaft position sensor;**  
**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**
- **Fuel pipe protector RH;**  
**19 N·m (1.9 kgf-m, 14 ft-lb)**

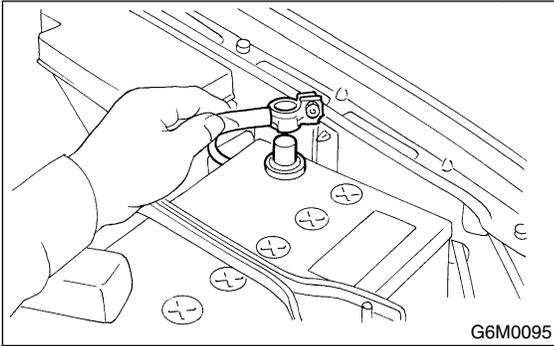
# KNOCK SENSOR

Fuel Injection (Fuel Systems)

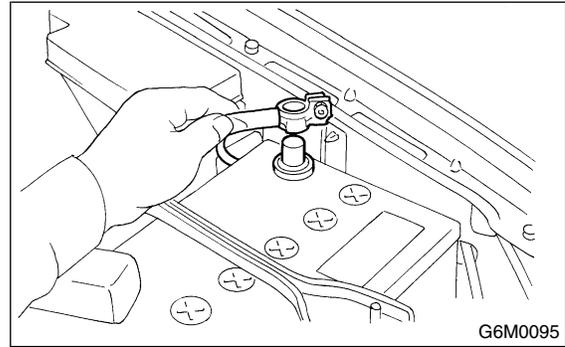
## 7. Knock Sensor S145042

### A: REMOVAL S145042A18

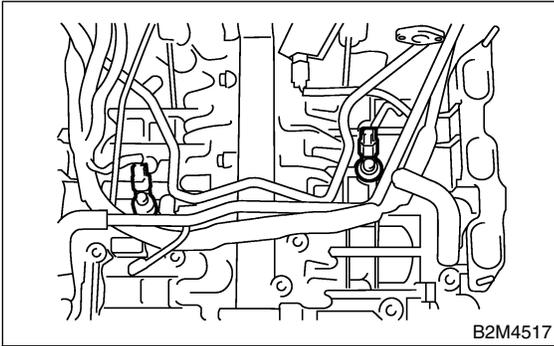
- 1) Disconnect battery ground cable from battery.



- 4) Connect battery ground cable.



- 2) Remove intake manifold.  
<Ref. to FU(H6)-17, REMOVAL, Intake Manifold.>
- 3) Disconnect knock sensor connector.
- 4) Remove knock sensor from cylinder block.



### B: INSTALLATION S145042A11

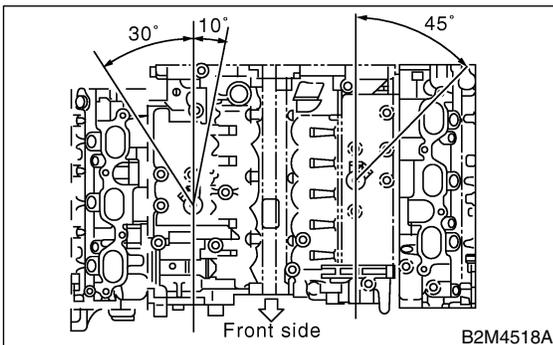
- 1) Install knock sensor to cylinder block.

#### **Tightening torque:**

**25 N·m (2.5 kgf·m, 18 ft·lb)**

#### **NOTE:**

For the knock sensor's installation angle, refer to the figure below.

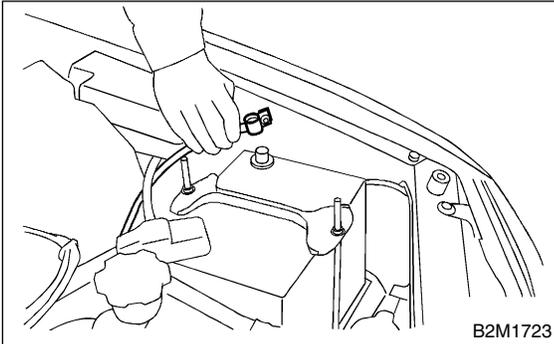


- 2) Connect knock sensor connector.
- 3) Install intake manifold. <Ref. to FU(H6)-21, INSTALLATION, Intake Manifold.>

## 8. Throttle Position Sensor S145039

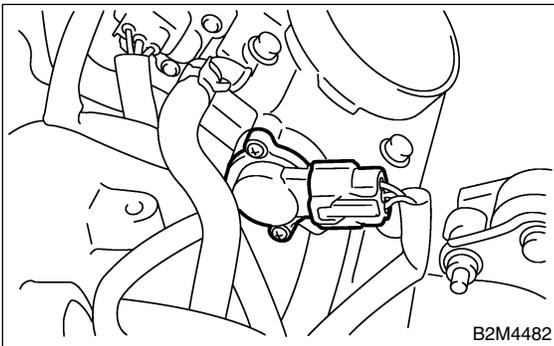
### A: REMOVAL S145039A18

- 1) Disconnect battery ground cable.



Remove air intake chamber. <Ref. to IN(H6)-6, REMOVAL, Air Intake Chamber.>

- 2) Disconnect connector from throttle position sensor.
- 3) Remove throttle position sensor holding screws, and remove throttle position sensor itself.

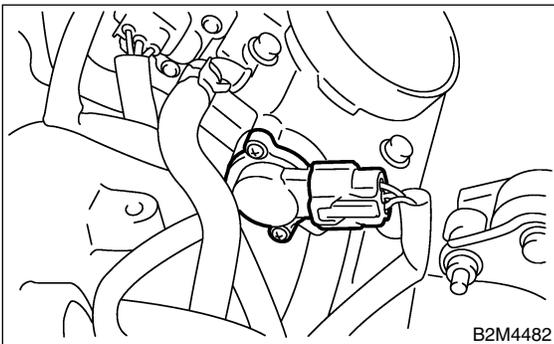


### B: INSTALLATION S145039A11

Install in the reverse order of removal.

**Tightening torque:**

**1.6 N·m (0.16 kgf-m, 1.2 ft-lb)**



# INTAKE MANIFOLD PRESSURE SENSOR

Fuel Injection (Fuel Systems)

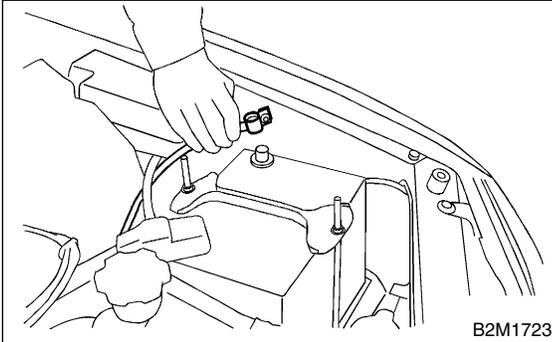
## 9. Intake Manifold Pressure Sensor

S145568

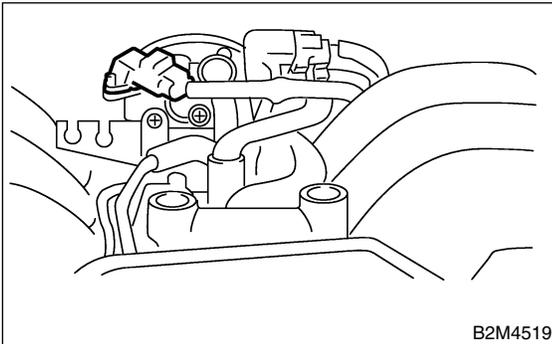
### A: REMOVAL

S145568A18

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from intake manifold pressure sensor.
- 3) Remove intake manifold pressure sensor from throttle body.



### B: INSTALLATION

S145568A11

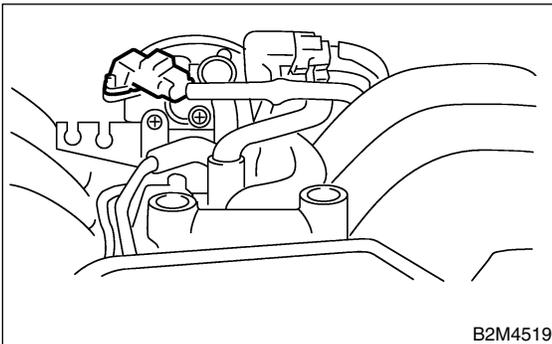
Install in the reverse order of removal.

NOTE:

Replace gasket with new one.

**Tightening torque:**

**1.6 N·m (0.16 kgf·m, 1.2 ft·lb)**



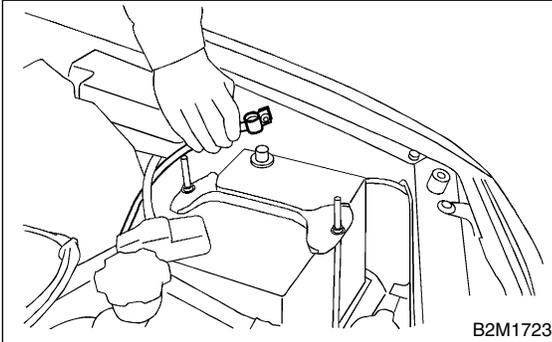
## 10. Intake Air Temperature Sensor

S145569

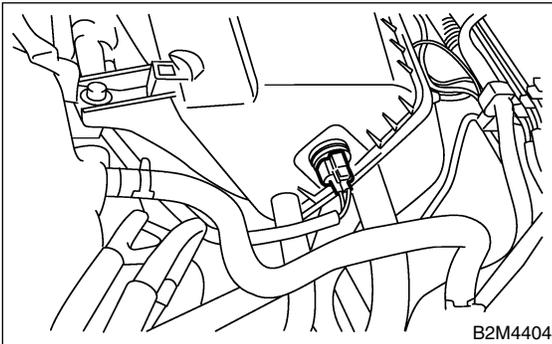
### A: REMOVAL

S145569A18

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from intake air temperature sensor.
- 3) Remove intake air temperature sensor from air intake chamber.



### B: INSTALLATION

S145569A11

Install in the reverse order of removal.

# IDLE AIR CONTROL SOLENOID VALVE

Fuel Injection (Fuel Systems)

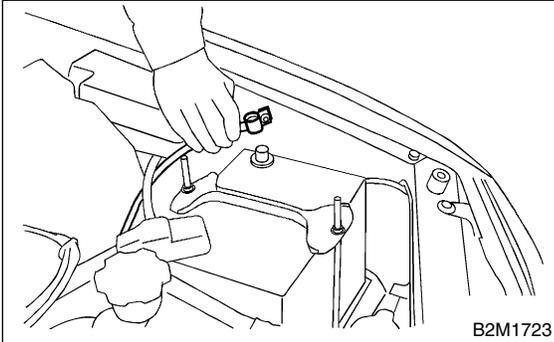
## 11. Idle Air Control Solenoid Valve

S145056

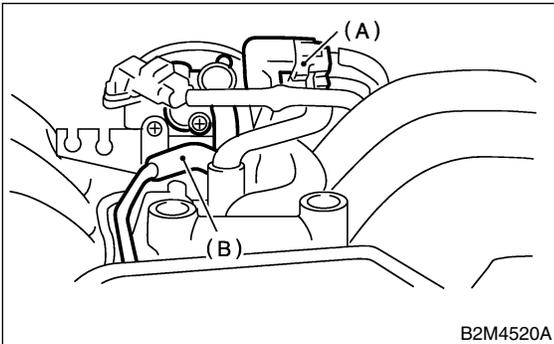
### A: REMOVAL

S145056A18

- 1) Disconnect battery ground cable.



- 2) Disconnect connector (A) from idle air control solenoid valve.
- 3) Disconnect air by-pass hose (B) from idle air control solenoid valve.
- 4) Remove idle air control solenoid valve from throttle body.



### B: INSTALLATION

S145056A11

Install in the reverse order of removal.

NOTE:

Replace gasket with a new one.

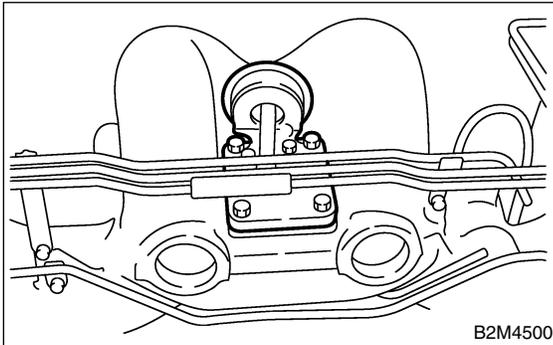
**Tightening torque:**

**2.8 N·m (0.29 kgf-m, 2.1 ft-lb)**

## 12. Induction Valve S145742

### A: REMOVAL S145742A18

- 1) Disconnect battery ground cable.
- 2) Remove intake manifold.  
<Ref. to FU(H6)-17, REMOVAL, Intake Manifold.>
- 3) Remove induction valve from intake manifold.



### B: INSTALLATION S145742A11

Install in the reverse order of removal.

**NOTE:**

Always use a new gasket.

**Tightening torque:**

**19 N·m (1.9 kgf-m, 14 ft-lb)**

# INDUCTION VALVE CONTROL SOLENOID

Fuel Injection (Fuel Systems)

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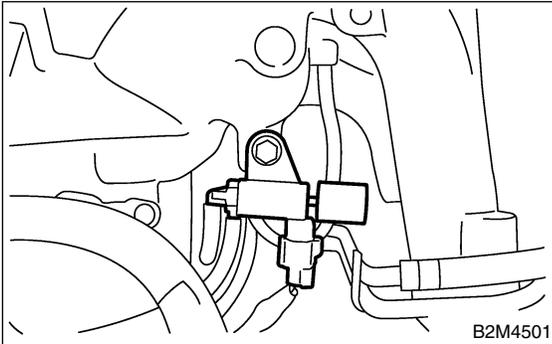
## 13. Induction Valve Control Solenoid

S145743

### A: REMOVAL

S145743A18

- 1) Disconnect battery ground cable.
- 2) Remove intake manifold.  
<Ref. to FU(H6)-17, REMOVAL, Intake Manifold.>
- 3) Disconnect connector from induction valve control solenoid.
- 4) Remove induction valve control solenoid from intake manifold.



### B: INSTALLATION

S145743A11

Install in the reverse order of removal.

NOTE:

Always use a new gasket.

**Tightening torque:**

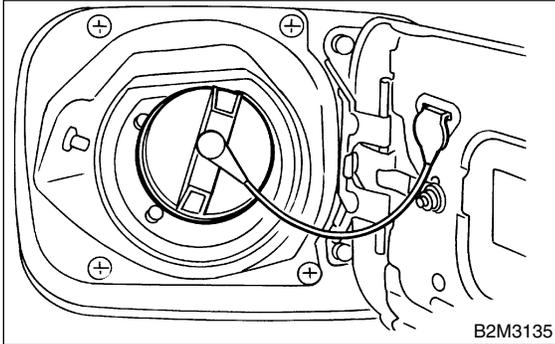
**19 N·m (1.9 kgf-m, 14 ft-lb)**

## 14. Fuel Injector S145051

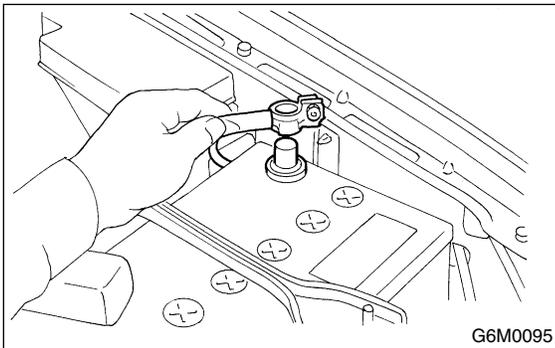
### A: REMOVAL S145051A18

#### 1. RH SIDE S145051A1801

- 1) Release fuel pressure.  
<Ref. to FU(H6)-50, RELEASING OF FUEL PRESSURE, Fuel.>
- 2) Open fuel flap lid, and remove fuel filler cap.

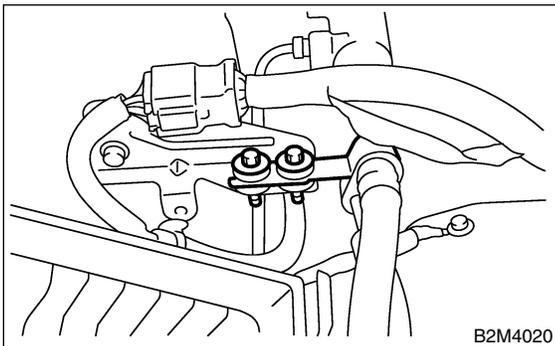


- 3) Disconnect battery ground cable.



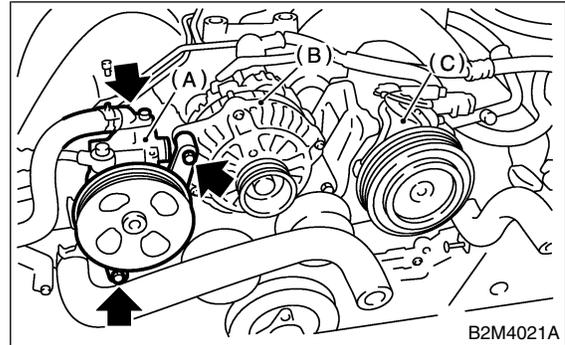
- 4) Remove air cleaner lower case. <Ref. to IN(H6)-5, REMOVAL, Air Cleaner.>
- 5) Remove power steering pump and tank from brackets.

- (1) Remove V-belt.  
<Ref. to ME(H6)-29, REMOVAL V-belt.>
- (2) Remove power steering oil pipe with bracket.



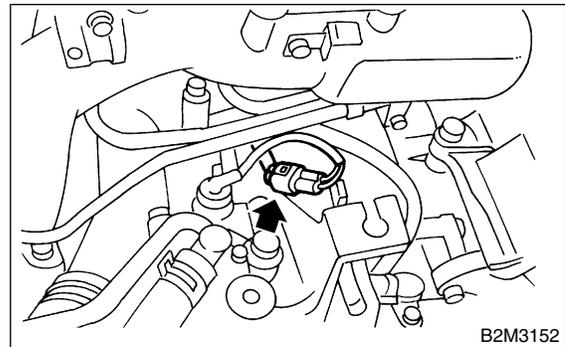
- (3) Remove bolts which install power steering pump bracket.

**CAUTION:**  
Do not separate hose and pipe from the main pump.

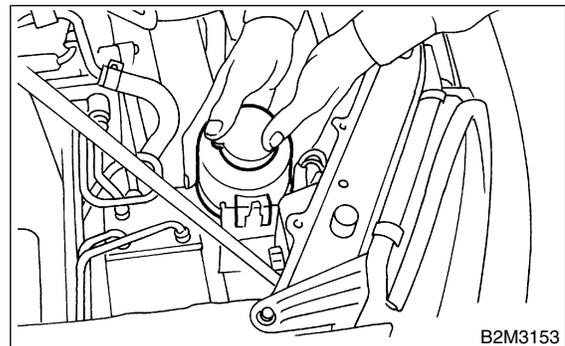


- (A) Power steering pump
- (B) Generator
- (C) A/C compressor

- (4) Disconnect power steering pump switch connector.



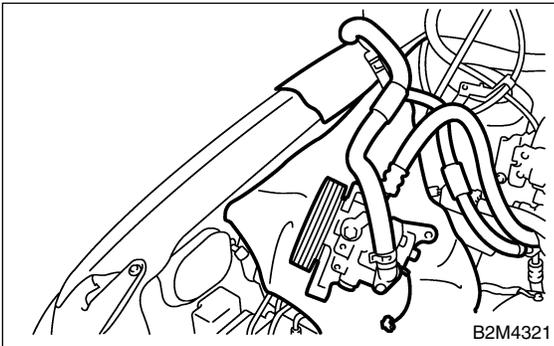
- (5) Remove power steering tank from the bracket by pulling it upward.



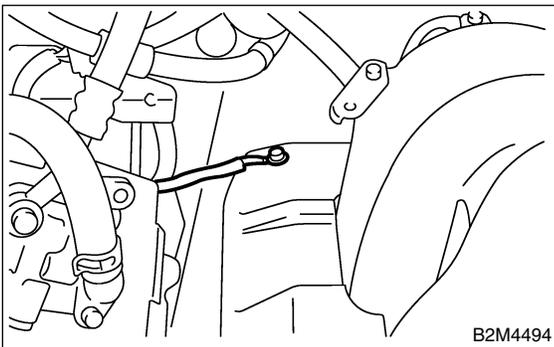
# FUEL INJECTOR

## Fuel Injection (Fuel Systems)

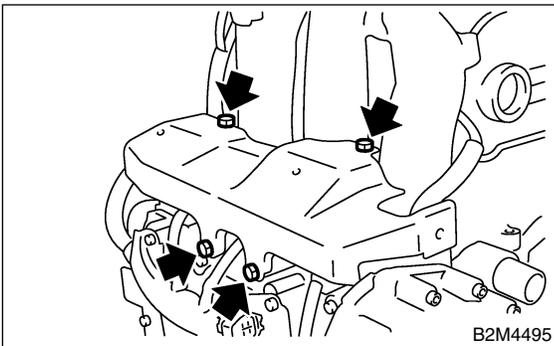
(6) Place power steering pump on the right side wheel apron.



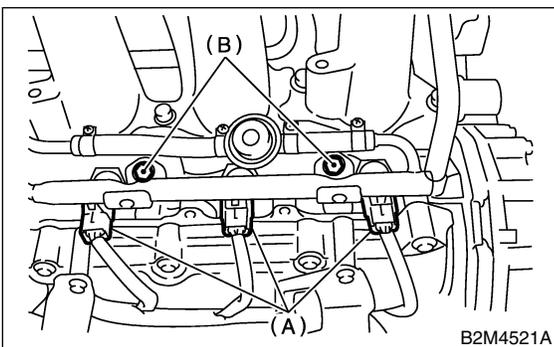
6) Remove ground cable from fuel pipe protector RH.



7) Remove fuel pipe protector RH.



8) Disconnect connector (A) from fuel injector.  
9) Remove bolt (B) which holds injector pipe onto cylinder head.

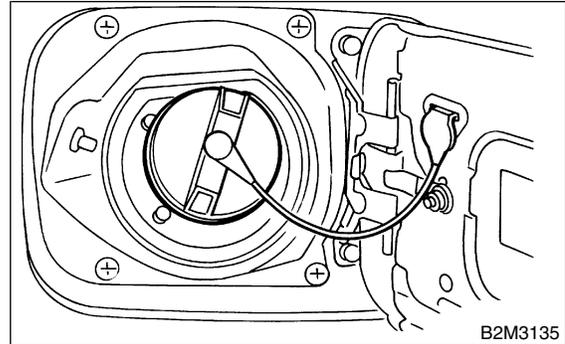


10) Remove fuel injector while lifting up fuel injector pipe.

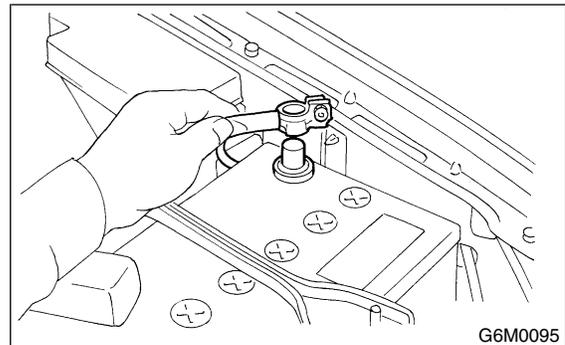
## 2. LH SIDE S145051A1802

1) Release fuel pressure. <Ref. to FU(H6)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

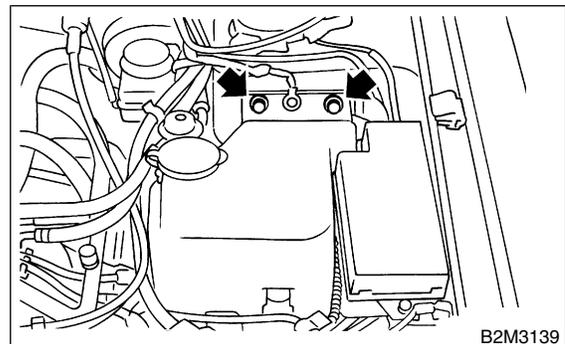
2) Open fuel flap lid, and remove fuel filler cap.



3) Disconnect battery ground cable.



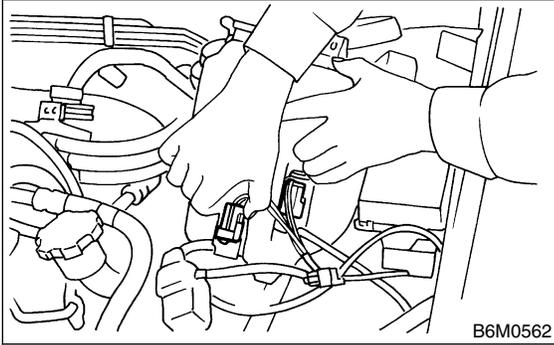
4) Remove two bolts which install washer tank on body.



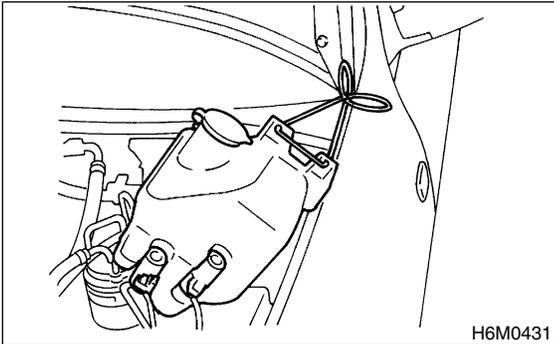
# FUEL INJECTOR

Fuel Injection (Fuel Systems)

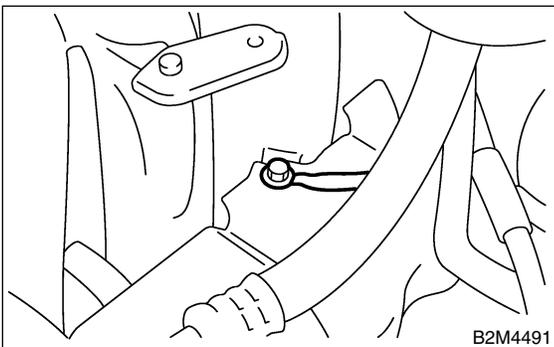
- 5) Disconnect connector from front window washer motor.
- 6) Disconnect connector from rear gate glass washer motor.



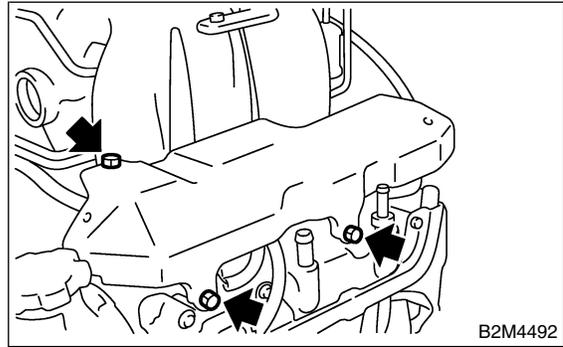
- 7) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.
- 8) Move washer tank upward.



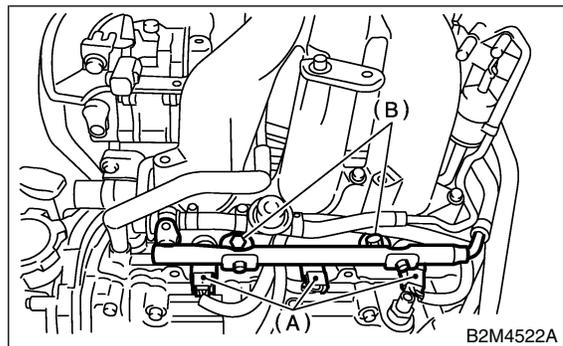
- 9) Remove ground cable from fuel pipe protector LH.



- 10) Remove fuel pipe protector LH.



- 11) Disconnect connector (A) from fuel injector.
- 12) Remove bolt (B) which holds injector pipe onto cylinder head.



- 13) Remove fuel injector while lifting up fuel injector pipe.

# FUEL INJECTOR

Fuel Injection (Fuel Systems)

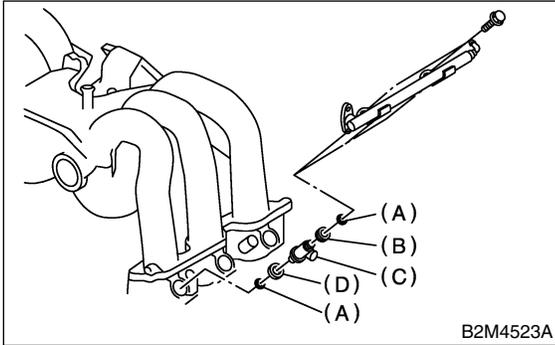
## B: INSTALLATION S145051A11

### 1. RH SIDE S145051A1101

Install in the reverse order of removal.

NOTE:

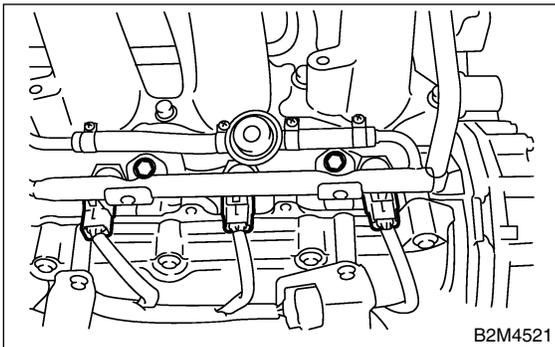
Replace O-rings and insulators with new ones.



- (A) O-ring
- (B) Injection rubber
- (C) Fuel injector
- (D) Insulator

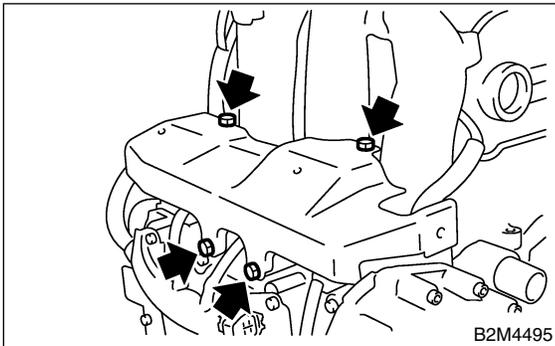
**Tightening torque:**

**19 N·m (1.9 kgf-m, 14 ft-lb)**



**Tightening torque:**

**19 N·m (1.9 kgf-m, 14 ft-lb)**

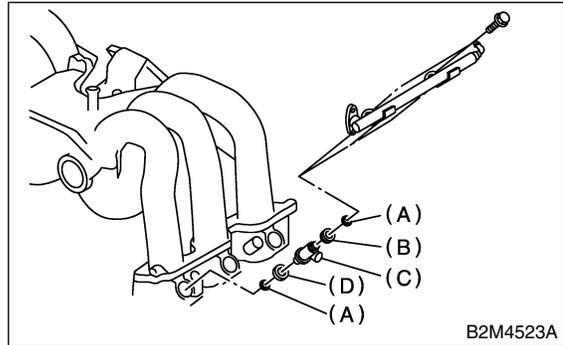


### 2. LH SIDE S145051A1102

Install in the reverse order of removal.

NOTE:

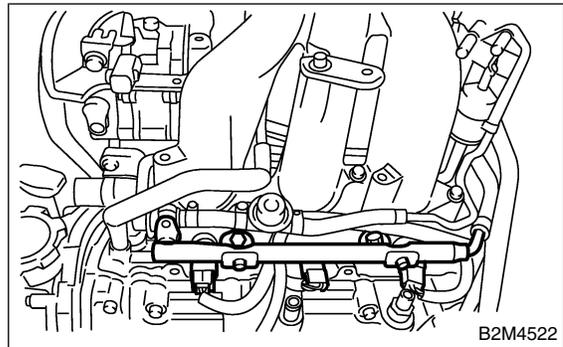
Replace O-rings and insulators with new ones.



- (A) O-ring
- (B) Injection rubber
- (C) Fuel injector
- (D) Insulator

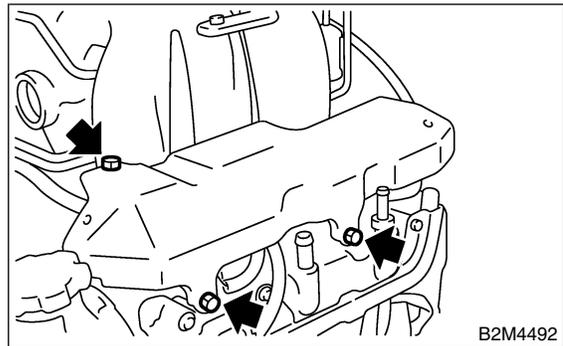
**Tightening torque:**

**19 N·m (1.9 kgf-m, 14 ft-lb)**



**Tightening torque:**

**19 N·m (1.9 kgf-m, 14 ft-lb)**

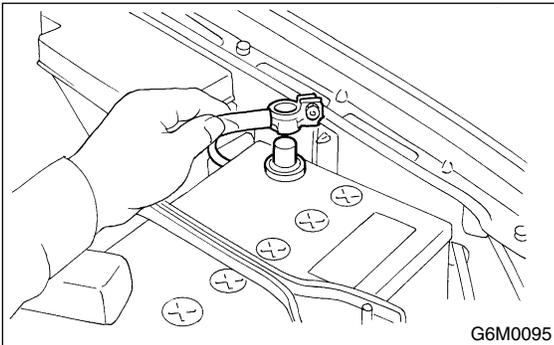


## 15. Front Oxygen (A/F) Sensor

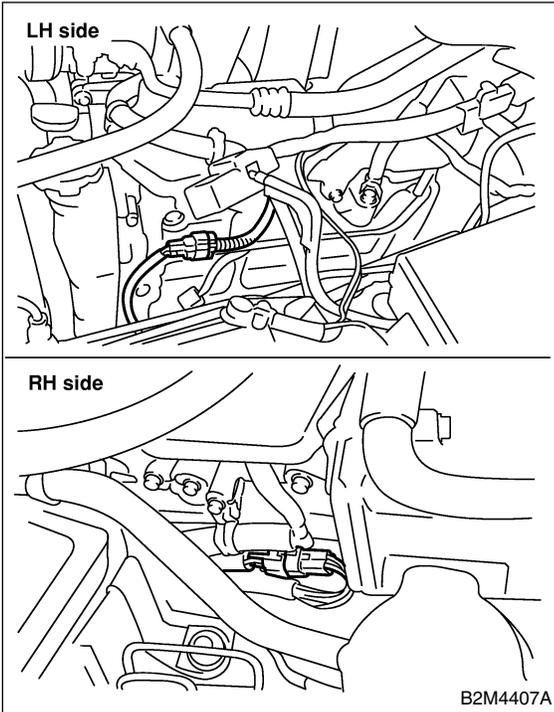
S145642

### A: REMOVAL S145642A18

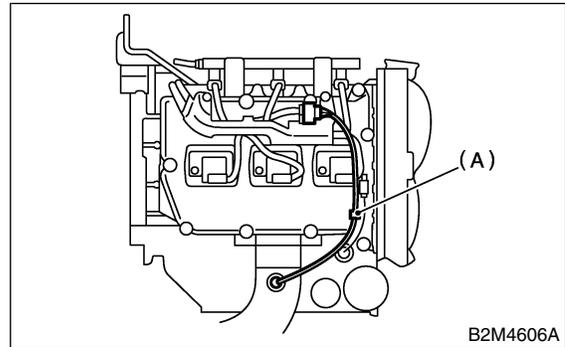
- 1) Disconnect battery ground cable.



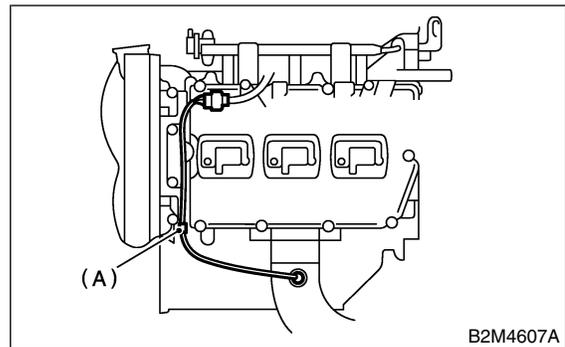
- 2) Disconnect connector from front oxygen (A/F) sensor.



- RH side



- LH side



- 6) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

***SUBARU CRC (Part No. 004301003)***

- 3) Lift-up the vehicle.
- 4) Remove under cover.
- 5) Separate harness from clip (A).

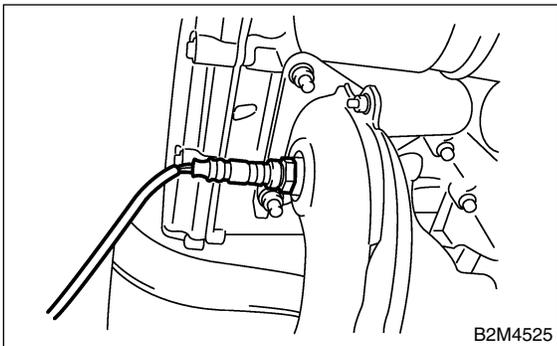
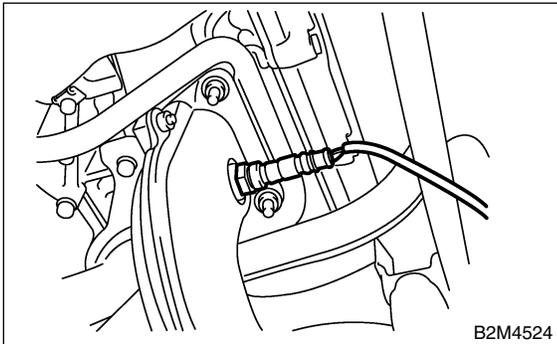
# FRONT OXYGEN (A/F) SENSOR

Fuel Injection (Fuel Systems)

7) Remove front oxygen (A/F) sensor.

## CAUTION:

When removing front oxygen (A/F) sensor, do not force front oxygen (A/F) sensor especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.



## B: INSTALLATION S145642A11

1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to threaded portion of front oxygen (A/F) sensor to make the next removal easier.

**Anti-seize compound:**

**SS-30 by JET LUBE**

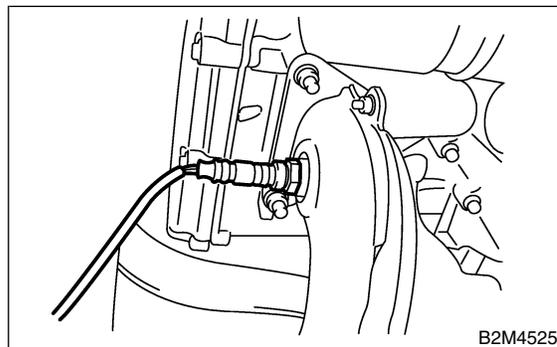
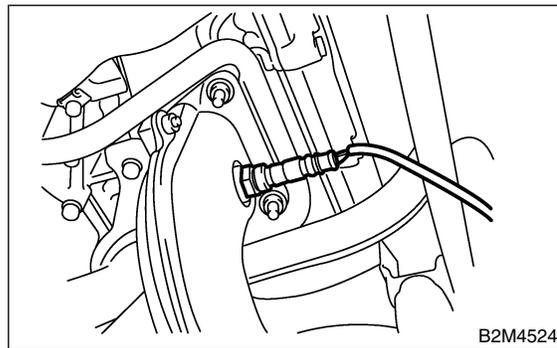
## CAUTION:

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

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

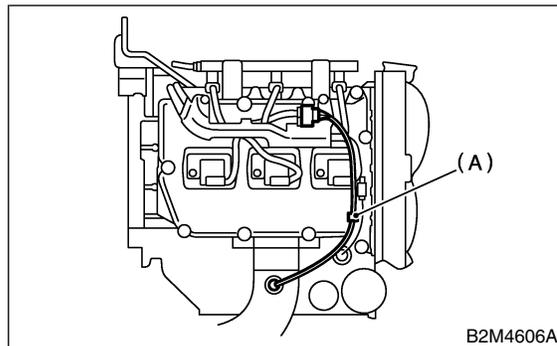
**Tightening torque:**

**21 N·m (2.1 kgf·m, 15.2 ft·lb)**



3) Secure harness on clip (A).

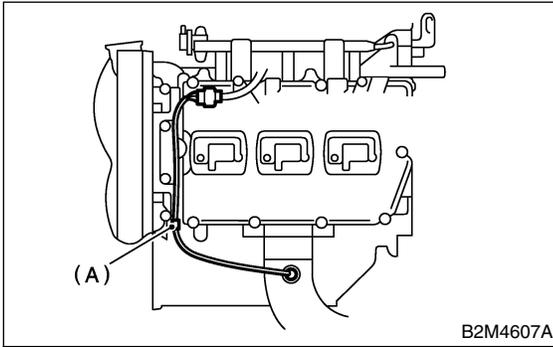
- RH side



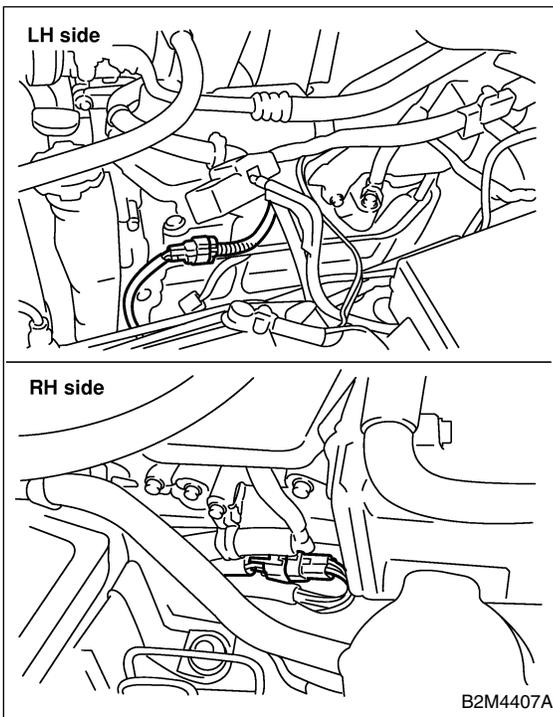
# FRONT OXYGEN (A/F) SENSOR

Fuel Injection (Fuel Systems)

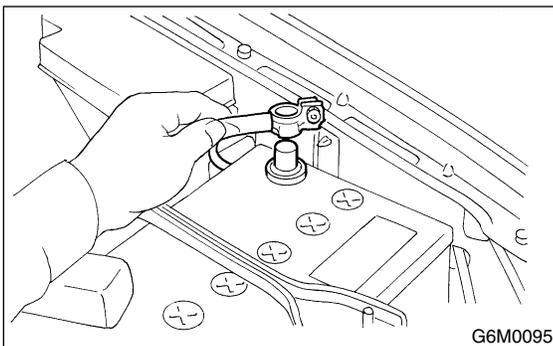
- LH side



- 4) Install under cover.
- 5) Lower the vehicle.
- 6) Connect connector of front oxygen (A/F) sensor.



- 7) Connect battery ground cable.



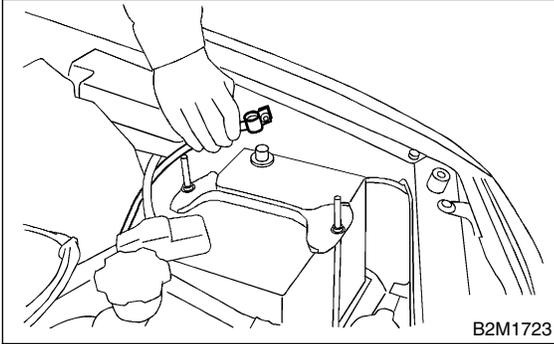
# REAR OXYGEN SENSOR

Fuel Injection (Fuel Systems)

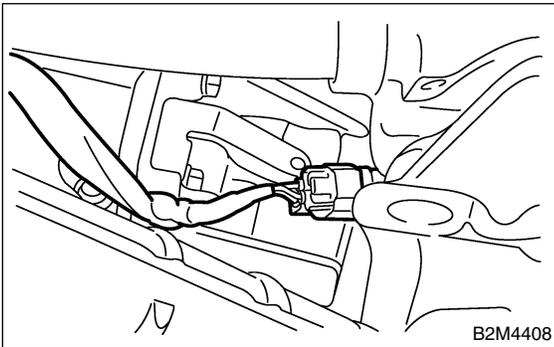
## 16. Rear Oxygen Sensor S145657

### A: REMOVAL S145657A18

- 1) Disconnect battery ground cable.



- 2) Disconnect connector from rear oxygen sensor.



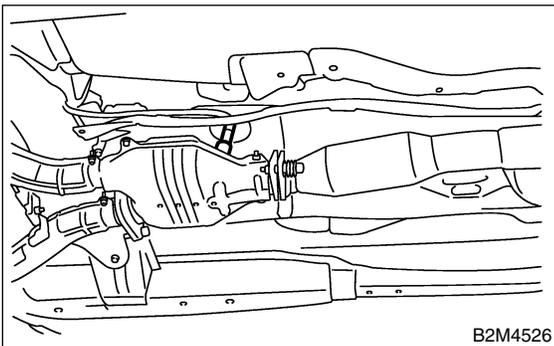
- 3) Lift-up the vehicle.
- 4) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

**SUBARU CRC (Part No. 004301003)**

- 5) Remove rear oxygen sensor.

#### CAUTION:

**When removing, do not force rear oxygen sensor in an unnatural way especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.**



### B: INSTALLATION S145657A11

- 1) Before installing rear oxygen sensor, apply anti-seize compound only to threaded portion of rear oxygen sensor to make the next removal easier.

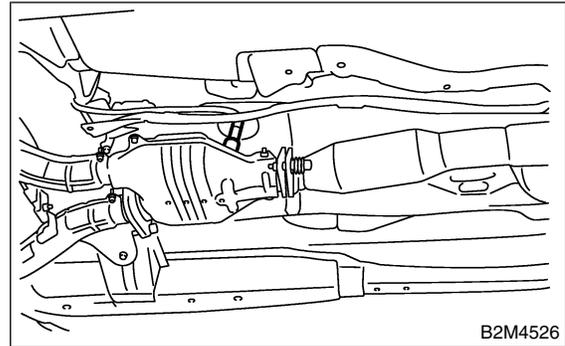
#### CAUTION:

**Never apply anti-seize compound to protector of rear oxygen sensor.**

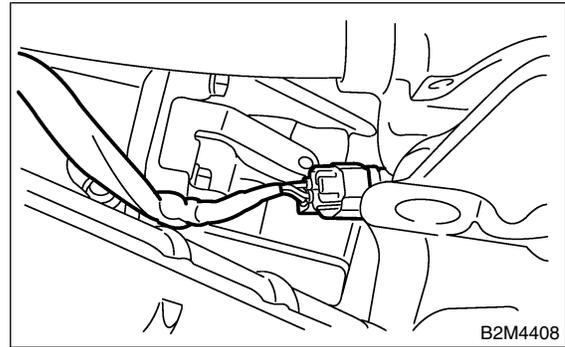
**Anti-seize compound:  
SS-30 by JET LUBE**

- 2) Install rear oxygen sensor.

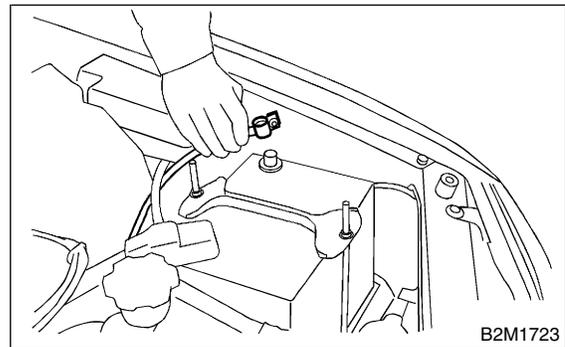
**Tightening torque:  
21 N·m (2.1 kgf-m, 15.2 ft-lb)**



- 3) Connect connector to rear oxygen sensor.



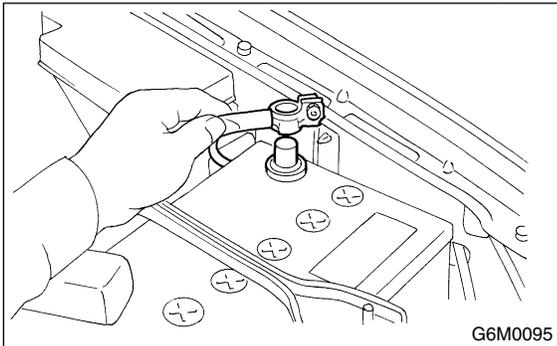
- 4) Lower the vehicle.
- 5) Connect battery ground cable.



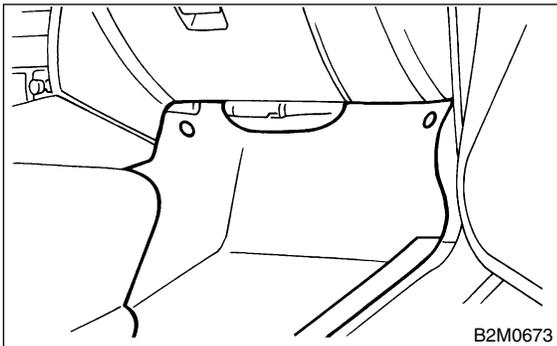
## 17. Engine Control Module S145049

### A: REMOVAL S145049A18

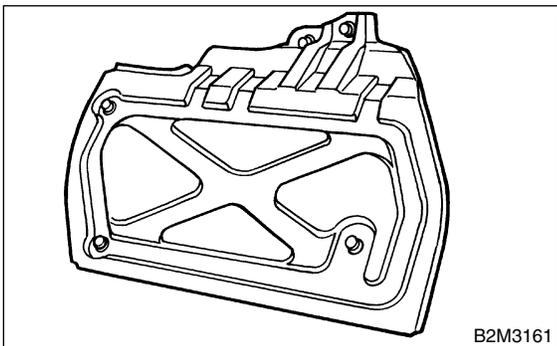
- 1) Disconnect battery ground cable.



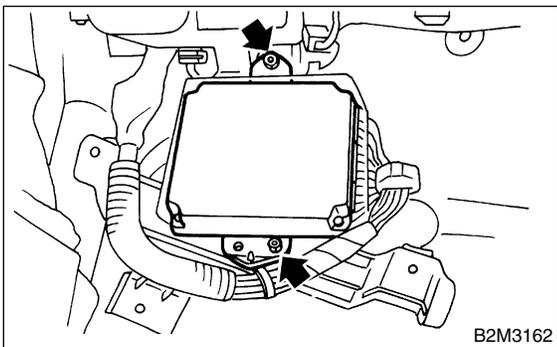
- 2) Remove lower inner trim of passenger side.  
<Ref. to EI-43, REMOVAL, Lower Inner Trim.>  
3) Detach floor mat of front passenger seat.



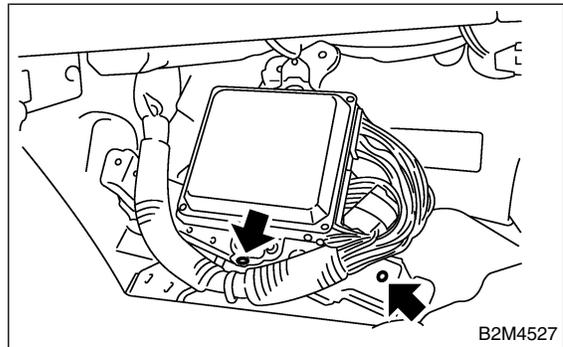
- 4) Remove protect cover.



- 5) Remove nuts which hold ECM to bracket.



- 6) Remove clip from bracket.



- 7) Disconnect ECM connectors and take out ECM.

### B: INSTALLATION S145049A11

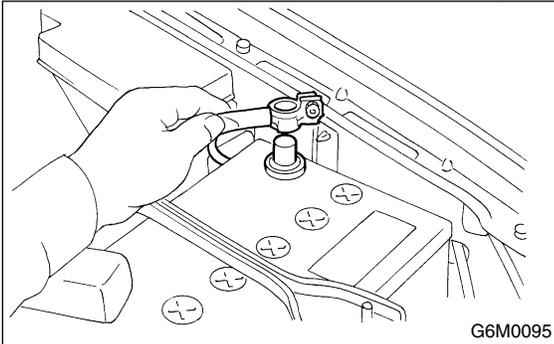
Install in the reverse order of removal.

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

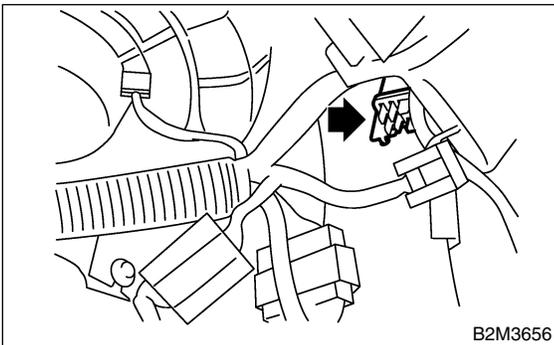
## 18. Main Relay S145050

### A: REMOVAL S145050A18

- 1) Disconnect battery ground cable.



- 2) Remove lower inner trim of passenger side.  
<Ref. to EI-43, REMOVAL, Lower Inner Trim.>
- 3) Disconnect connectors from main relay.
- 4) Remove bolt which holds main relay bracket on body.



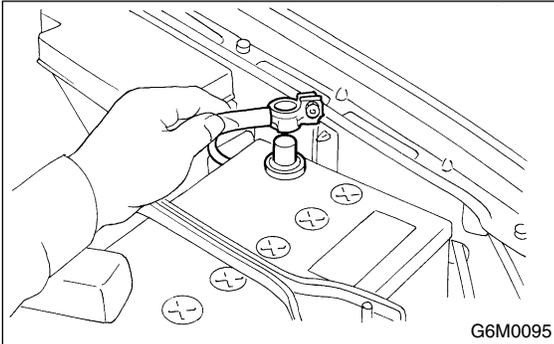
### B: INSTALLATION S145050A11

Install in the reverse order of removal.

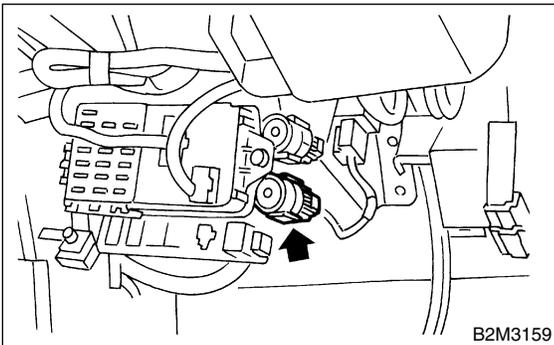
## 19. Fuel Pump Relay S145048

### A: REMOVAL S145048A18

- 1) Disconnect battery ground cable.



- 2) Remove lower cover. <Ref. to EI-37, REMOVAL, Instrument Panel Assembly.>
- 3) Disconnect connector from fuel pump relay.



- 4) Remove fuel pump relay from mounting bracket.

### B: INSTALLATION S145048A11

Install in the reverse order of removal.

## 20. Fuel S145052

### A: OPERATION S145052A16

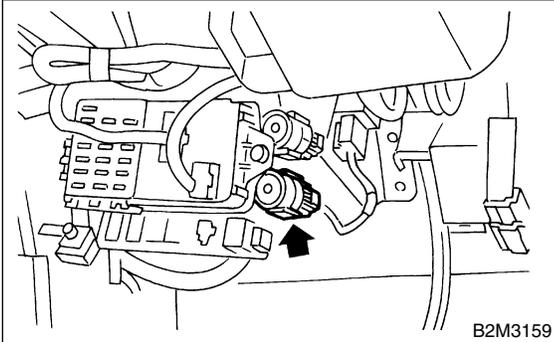
#### 1. RELEASING OF FUEL PRESSURE

S145052A1601

##### WARNING:

- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Disconnect connector from fuel pump relay.



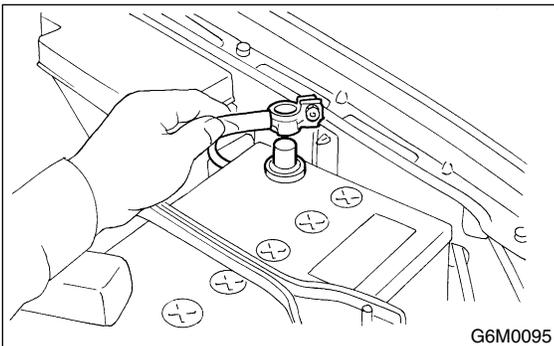
- 2) Start the engine and run it until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn ignition switch to OFF.

#### 2. DRAINING FUEL S145052A1602

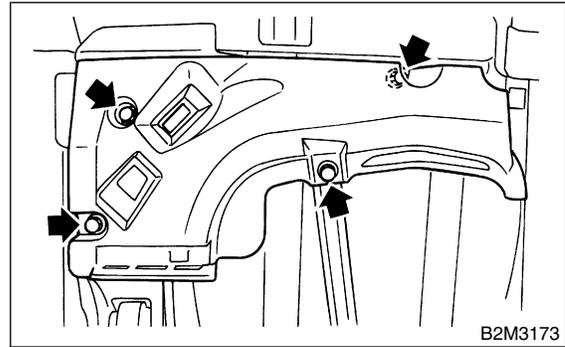
##### WARNING:

- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

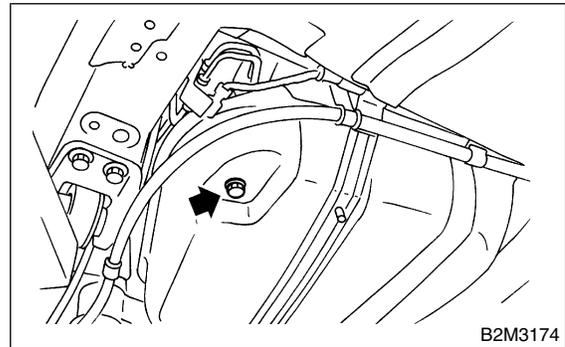
- 1) Set vehicle on the lift.
- 2) Disconnect battery ground cable.



- 3) Lift-up the vehicle.
- 4) Remove front right side fuel tank cover.



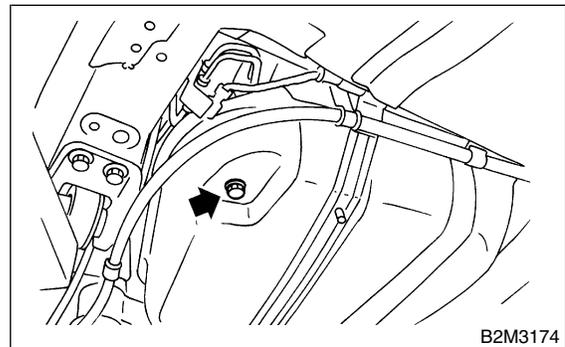
- 5) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



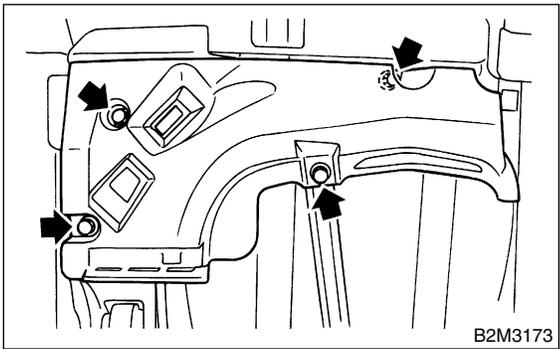
- 6) Tighten fuel drain plug and install front right side tank cover.

##### Tightening torque:

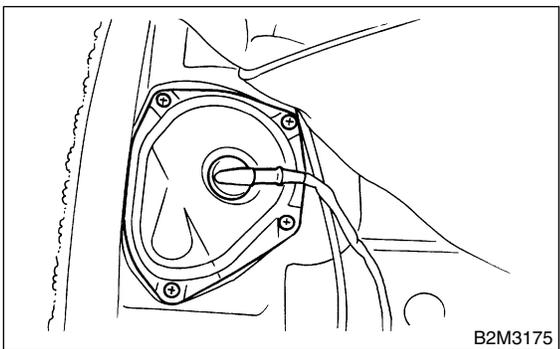
**26 N·m (2.65 kgf·m, 19.2 ft·lb)**



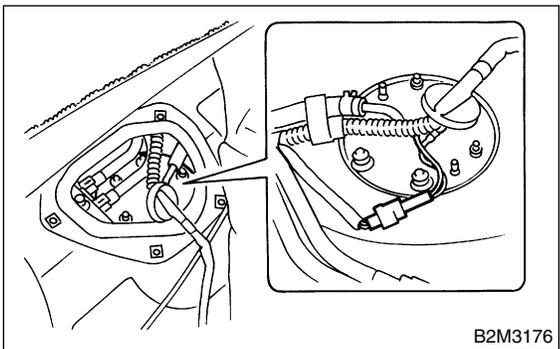
**Tightening torque:**  
**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



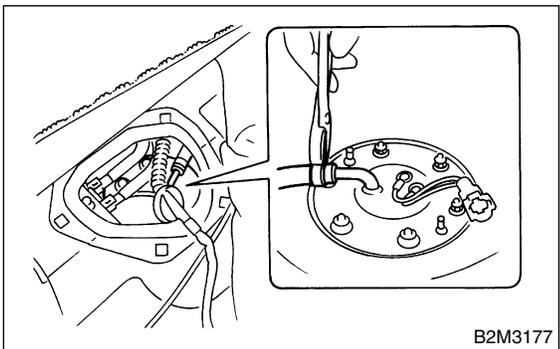
- 7) Lower the vehicle.
- 8) Remove sub service hole cover.



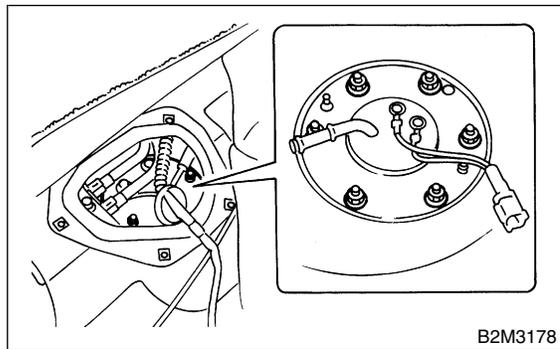
- 9) Disconnect connector from fuel sub level sensor.



- 10) Disconnect fuel jet pump hose.



- 11) Remove fuel sub level sensor.

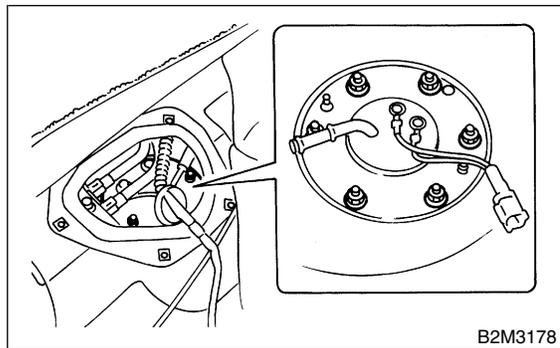


- 12) Drain fuel from fuel tank by using hand pump.

**WARNING:**  
**Do not use a motor pump when draining fuel.**

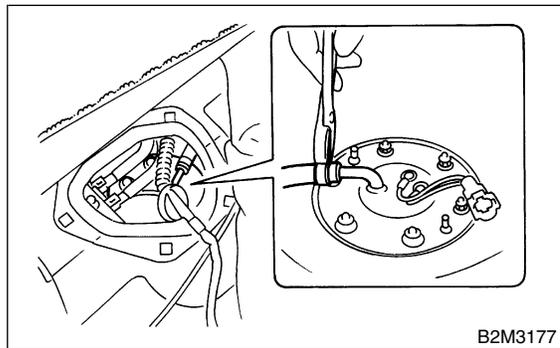
- 13) After draining fuel, reinstall fuel sub level sensor.

**Tightening torque:**  
**T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**

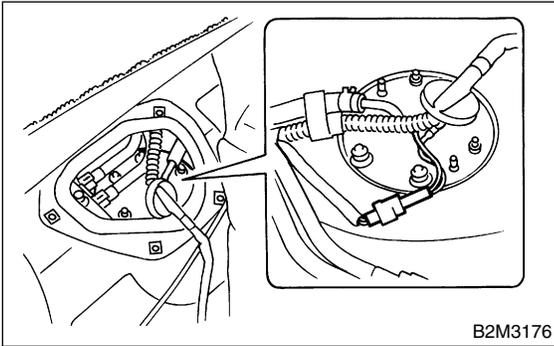


**NOTE:**  
 If you have not removed fuel tank yet, proceed with the procedure below for installation.

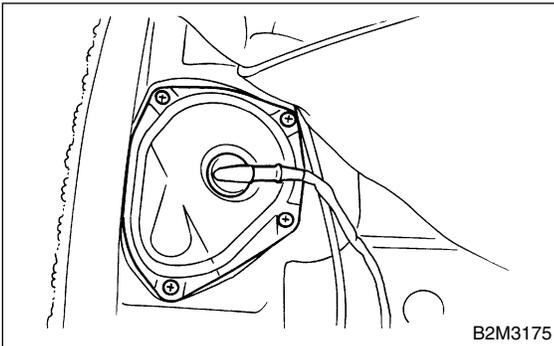
- (1) Connect fuel jet pump hose.



- (2) Connect connector from fuel sub level sensor.



- (3) Install sub service hole cover.

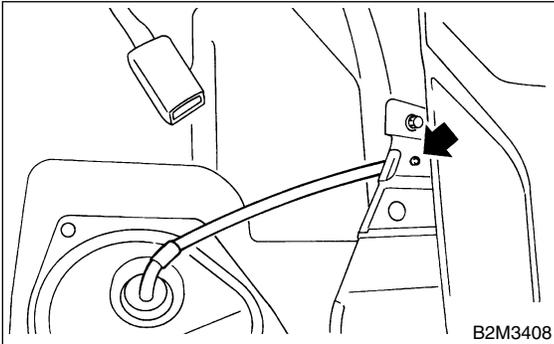


- (4) Set rear seat and floor mat.

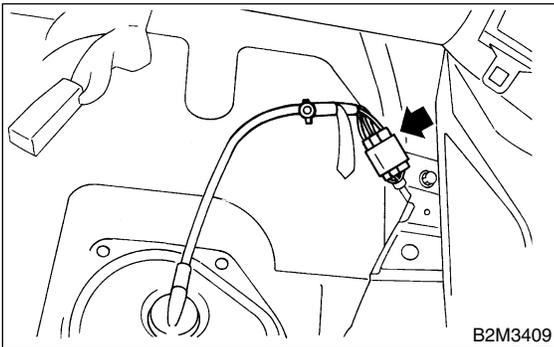
## 21. Fuel Tank S145053

### A: REMOVAL S145053A18

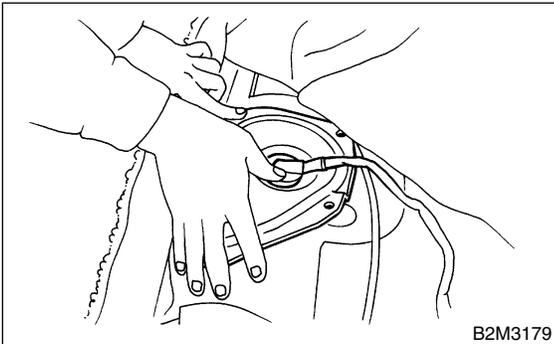
- 1) Set vehicle on the lift.
- 2) Release fuel pressure. <Ref. to FU(H6)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Drain fuel from fuel tank. <Ref. to FU(H6)-50, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove holder clip which secures fuel tank cord on bracket.



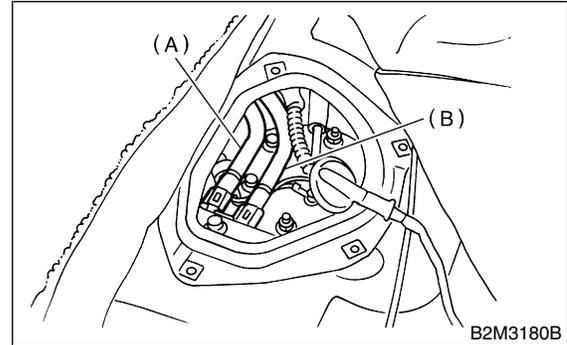
- 5) Disconnect connector of fuel tank cord to rear harness.



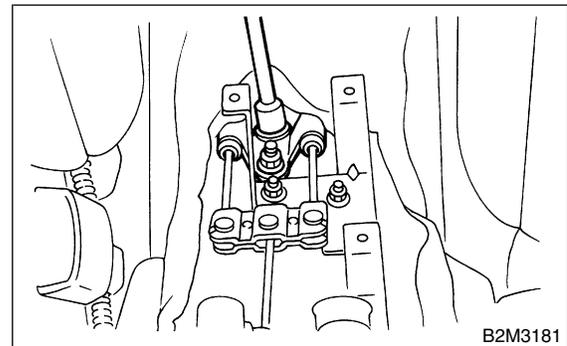
- 6) Push grommet which holds fuel tank cord on service hole cover into body side.



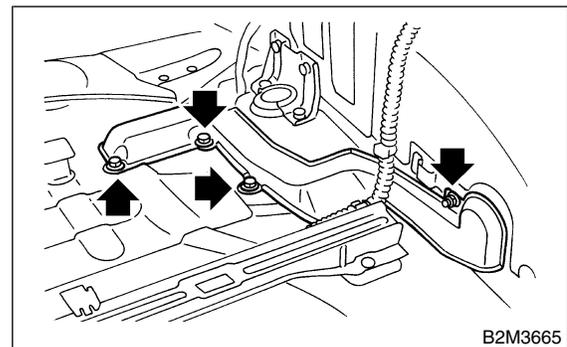
- 7) Separate quick connector of fuel delivery (A) and return hose (B). <Ref. to FU(H6)-78, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



- 8) Remove parking brake cable.
  - (1) Remove console box console. <Ref. to EI-36, REMOVAL, Console Box.>
  - (2) Remove parking brake bracket and disconnect parking brake cable from equalizer. <Ref. to PB-5, REMOVAL, Parking Brake Cable.>



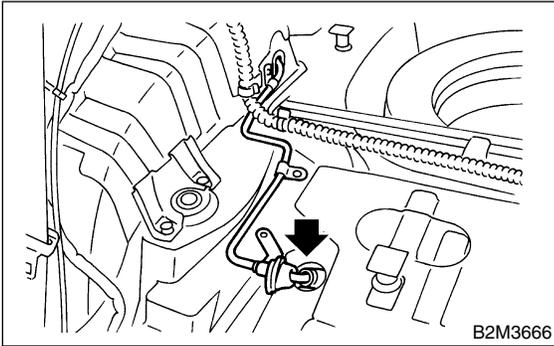
- 9) Remove trunk trim. (Sedan model) <Ref. to EI-51, REMOVAL, Trunk Trim.>
- 10) Remove rear quarter lower trim. (Wagon model) <Ref. to EI-44, WAGON, REMOVAL, Rear Quarter Trim.>
- 11) Remove pipe protector.



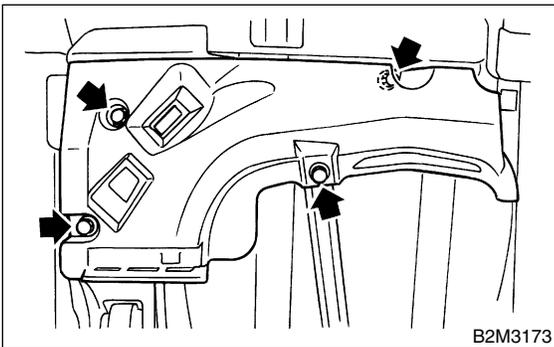
# FUEL TANK

## Fuel Injection (Fuel Systems)

- 12) Separate quick connector of evaporation pipe  
(A). <Ref. to FU(H6)-78, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



- 13) Remove wheel nuts from rear wheels.  
14) Lift-up the vehicle.  
15) Remove rear wheel.  
16) Remove front side fuel tank cover.



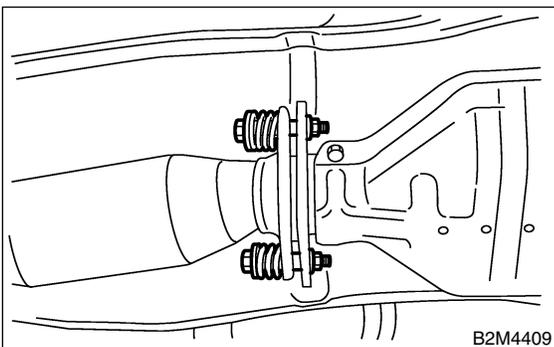
- 17) Remove rear exhaust pipe and muffler.

### NOTE:

To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

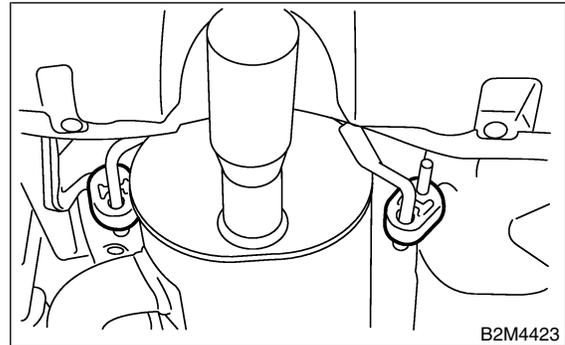
### **SUBARU CRC (Part No. 004301003)**

- (1) Separate rear exhaust pipe from front exhaust pipe.

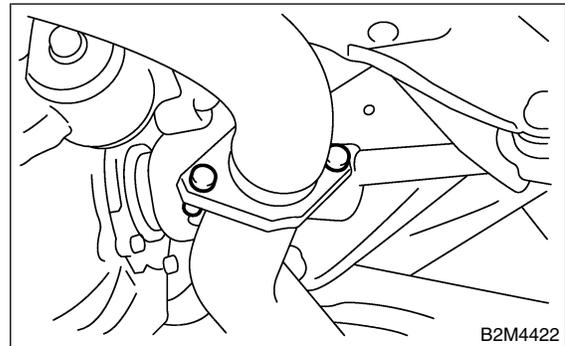


- (2) Remove left and right rubber cushions.

**CAUTION:**  
Be careful not to pull down muffler.

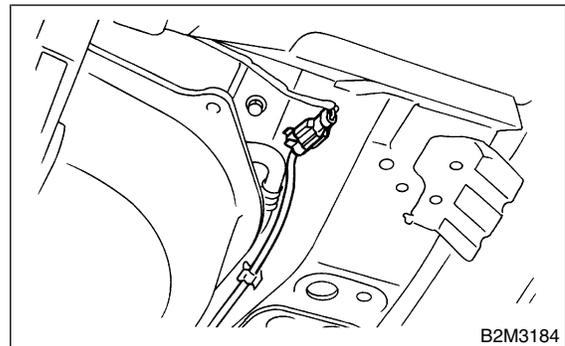


- (3) Remove front rubber cushion and detach muffler assembly.



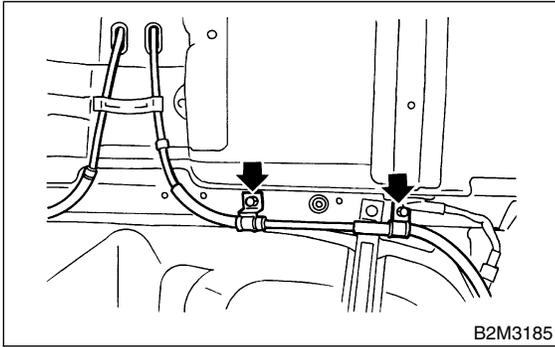
- 18) Remove propeller shaft. <Ref. to DS-13, REMOVAL, Propeller Shaft.>

- 19) Disconnect connector from ABS sensor.

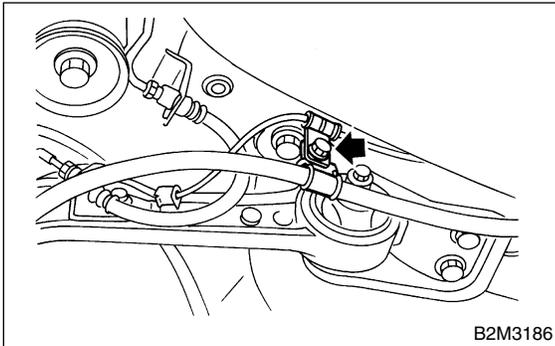


20) Remove bolts which hold parking brake cable holding bracket.

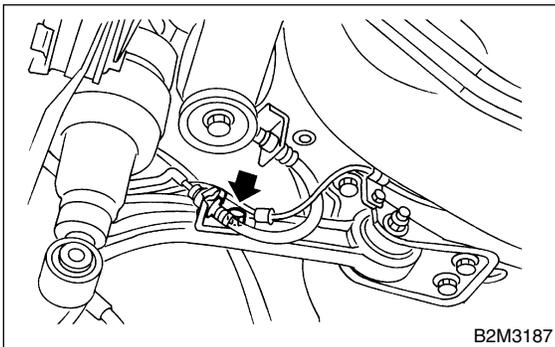
21) Remove parking brake cable from cabin by forcibly pulling it backward.



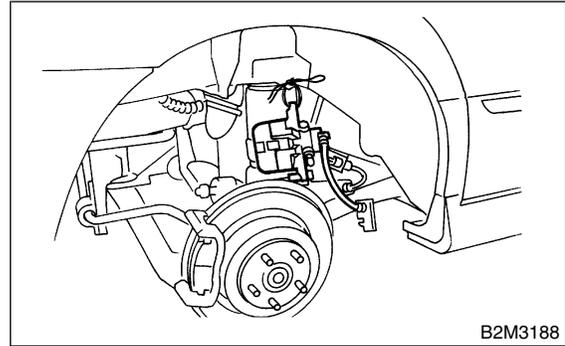
22) Remove bolts which hold parking brake cable holding bracket.



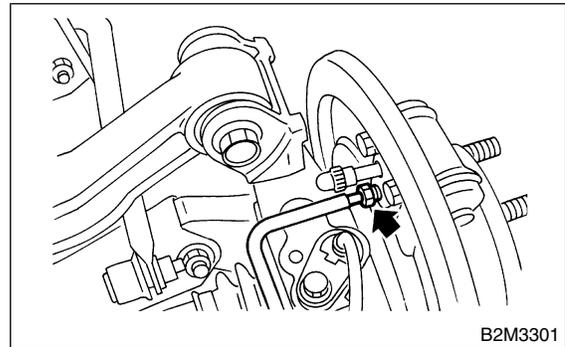
23) Remove bolts which hold rear brake hoses holding bracket.



24) Remove rear brake caliper, then tie it up to the body side of the vehicle as shown in figure. (Rear disc brake model)



25) Disconnect brake pipes from wheel cylinder. (Rear drum brake model)



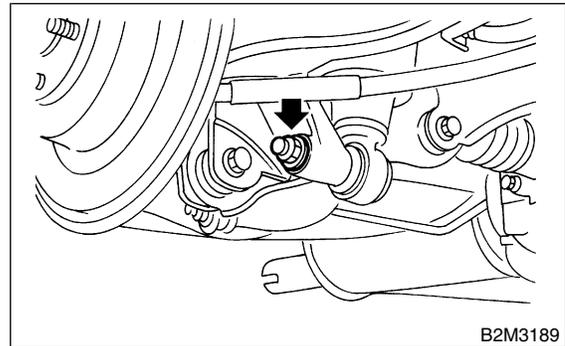
26) Remove rear suspension assembly.

**WARNING:**

**A helper is required to perform this work.**

(1) Support rear differential with transmission jack.

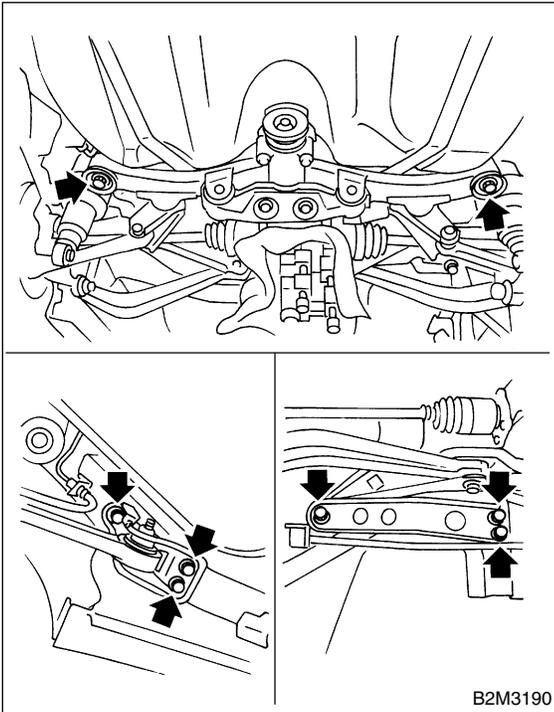
(2) Remove bolt which holds rear shock absorber to rear suspension arm.



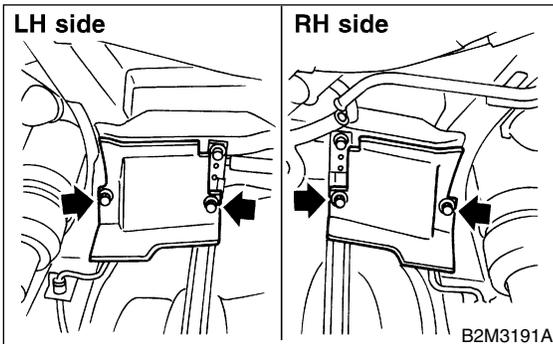
# FUEL TANK

## Fuel Injection (Fuel Systems)

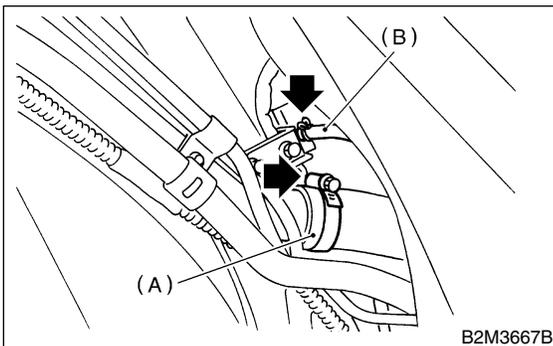
(3) Remove bolts which secure rear suspension assembly to body.



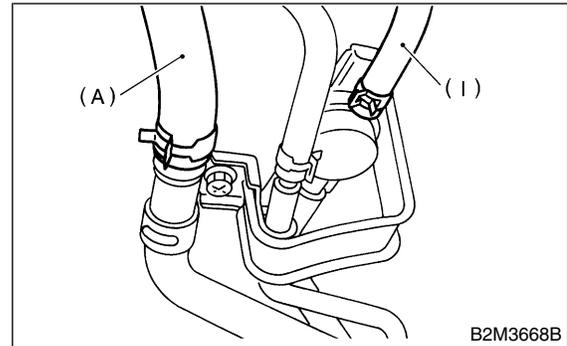
(4) Remove rear suspension assembly.  
27) Remove rear side fuel tank cover.



28) Disconnect fuel filler hose (A) and fuel tank pressure sensor (B) hose.

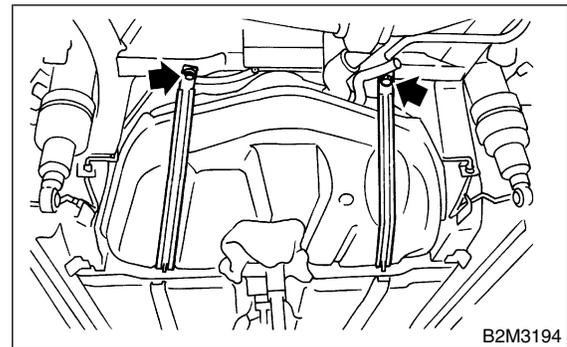


29) Disconnect air vent hose (A) from evaporation pipe assembly and disconnect evaporation hose (I) from pressure control solenoid valve.



30) Support fuel tank with transmission jack, remove bolts from bands and dismount fuel tank from the vehicle.

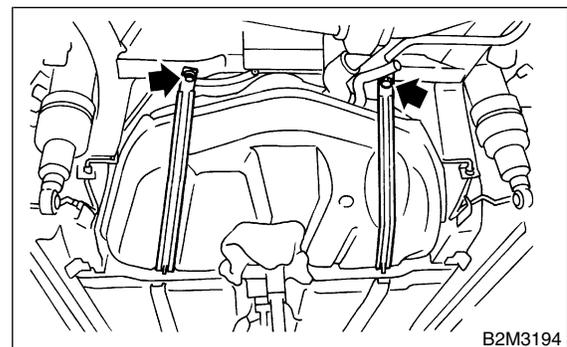
**WARNING:**  
A helper is required to perform this work.



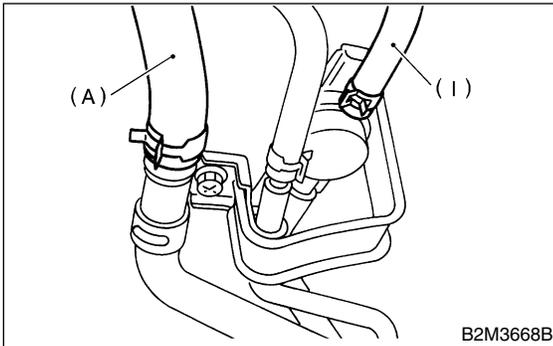
## B: INSTALLATION S145053A11

1) Support fuel tank with transmission jack and push fuel tank harness into access hole with grommet.  
2) Set fuel tank and temporarily tighten bolts of fuel tank bands.

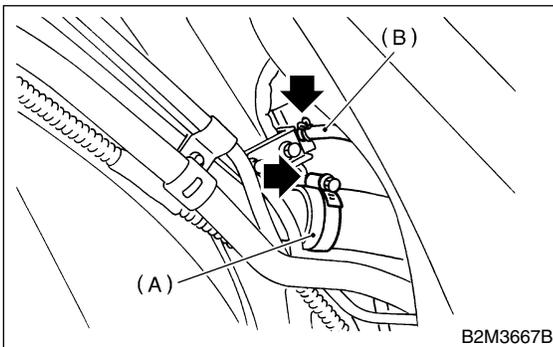
**WARNING:**  
A helper is required to perform this work.



3) Connect air vent hose (A) to evaporation pipe assembly and connect evaporation hose (I) to pressure control solenoid valve.

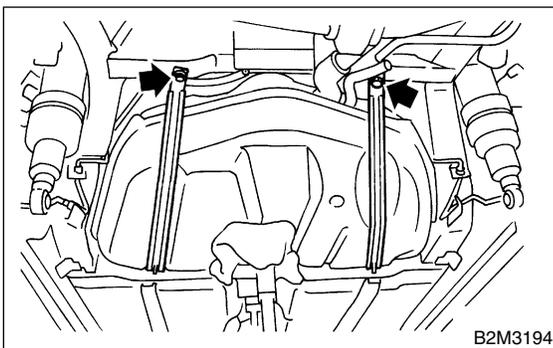


4) Connect fuel filler hose (A) and fuel tank pressure sensor hose (B).



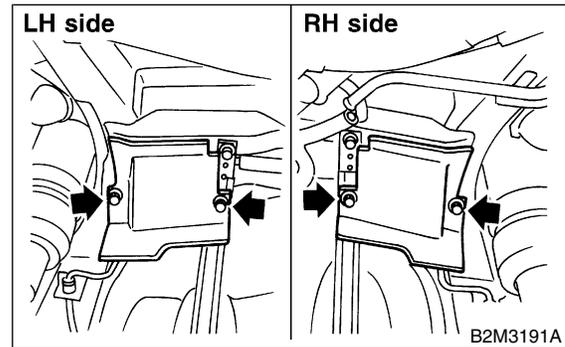
5) Tighten band mounting bolts.

**Tightening torque:**  
**33 N·m (3.4 kgf·m, 25 ft·lb)**



6) Install rear side fuel tank cover.

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

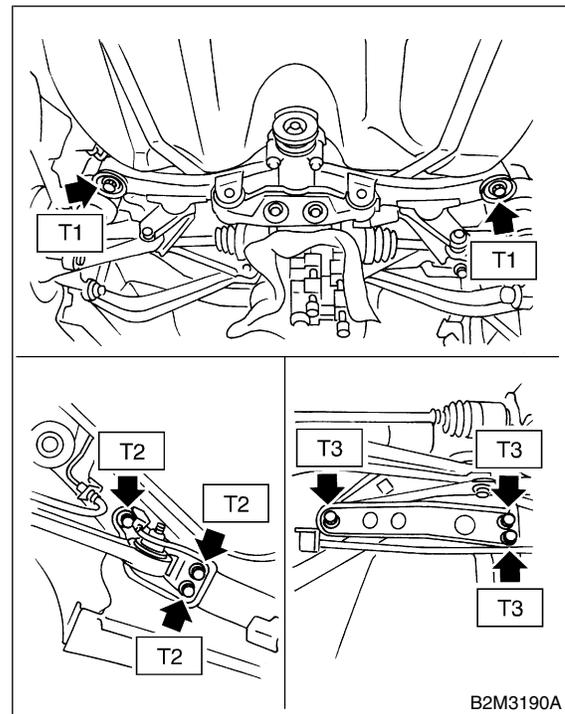


7) Install rear suspension assembly.

**WARNING:**  
**A helper is required to perform this work.**

(1) Support rear suspension assembly and then tighten bolts which secure rear suspension assembly.

**Tightening torque:**  
**T1: 172 N·m (17.5 kgf·m, 127 ft·lb)**  
**T2: 108 N·m (11.0 kgf·m, 80 ft·lb)**  
**T3: 66 N·m (6.7 kgf·m, 48 ft·lb)**

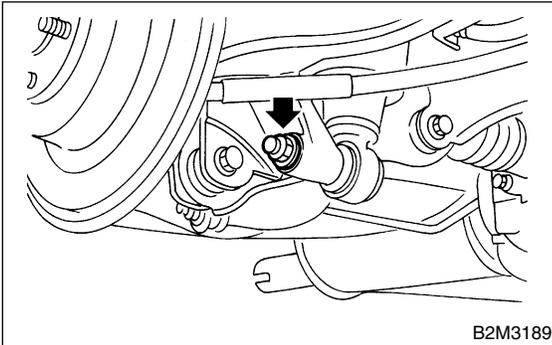


# FUEL TANK

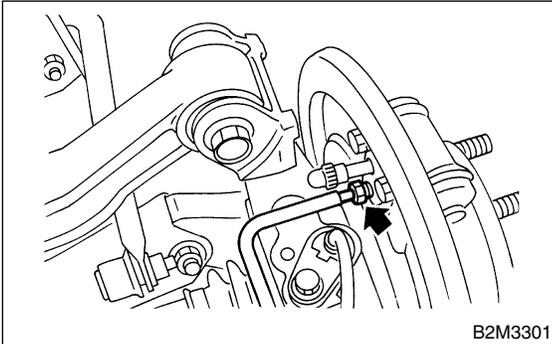
## Fuel Injection (Fuel Systems)

(2) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-14, INSTALLATION, Link Upper.>

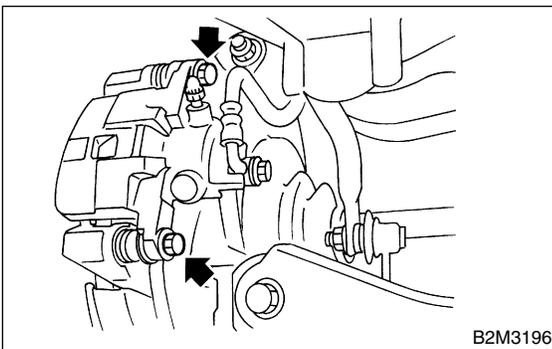
**Tightening torque:**  
**157 N·m (16 kgf·m, 116 ft·lb)**



8) Connect brake pipes to wheel cylinder. (Rear drum brake model)

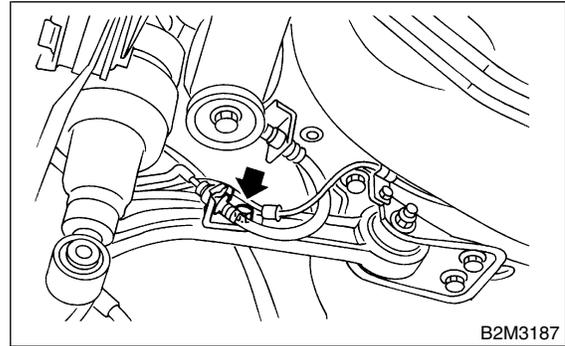


9) Install rear brake caliper. (Rear disk brake model) <Ref. to BR-22, INSTALLATION, Rear Disc Brake Assembly.>



10) Tighten bolt which holds rear brake hoses holding bracket.

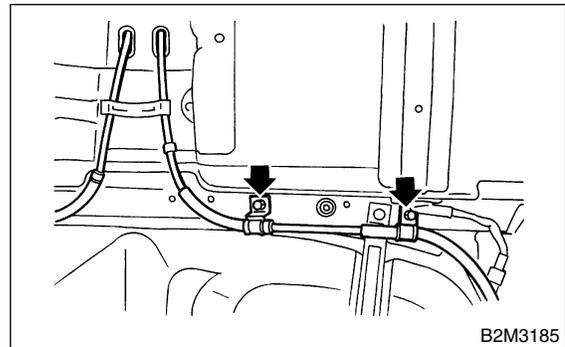
**Tightening torque:**  
**33 N·m (3.4 kgf·m, 25 ft·lb)**



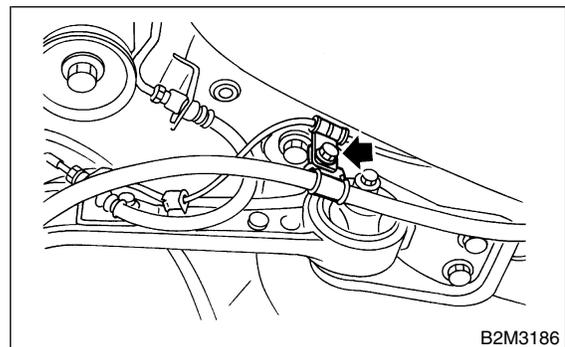
11) Install parking brake cable to cabin by forcibly pushing it forward.

12) Tighten bolts which hold parking brake cable holding bracket.

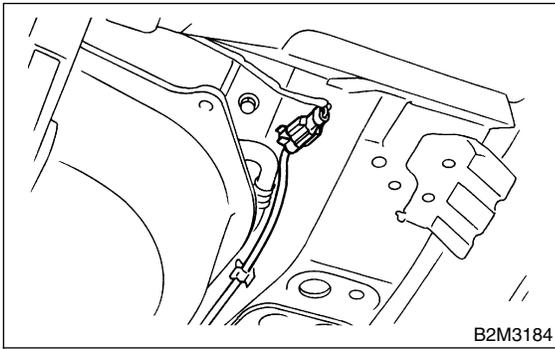
**Tightening torque:**  
**18 N·m (1.8 kgf·m, 13.0 ft·lb)**



**Tightening torque:**  
**32 N·m (3.3 kgf·m, 23.9 ft·lb)**



13) Connect connector to ABS sensor.



B2M3184

14) Install propeller shaft. <Ref. to DS-14, INSTALLATION, Propeller Shaft.>

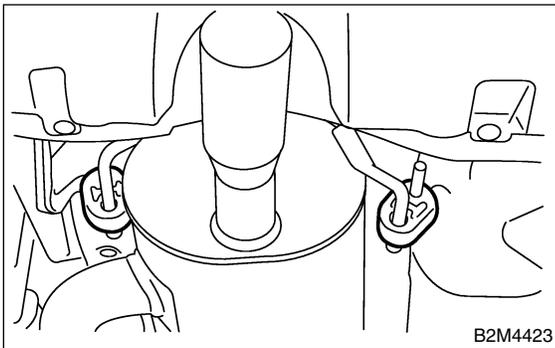
15) Install rear exhaust pipe and muffler.

**NOTE:**

To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

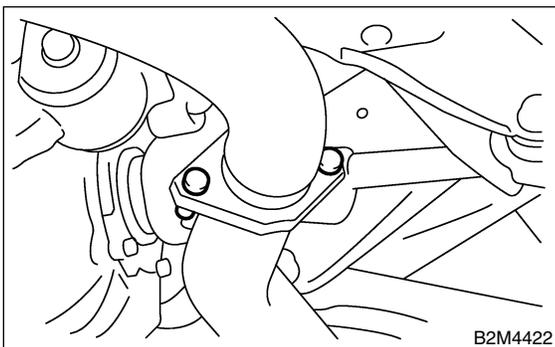
**SUBARU CRC (Part No. 004301003)**

(1) Install left and right rubber cushions.



B2M4423

(2) Install front rubber cushion and attach muffler assembly.

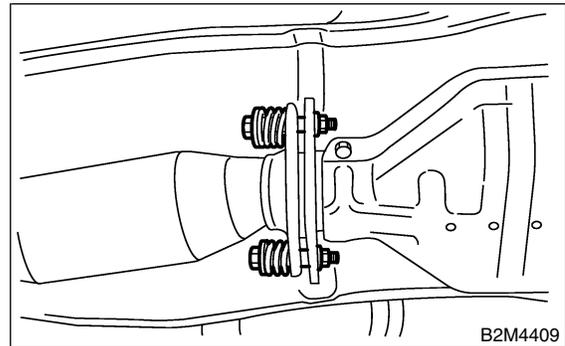


B2M4422

(3) Install rear exhaust pipe to center exhaust pipe.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**

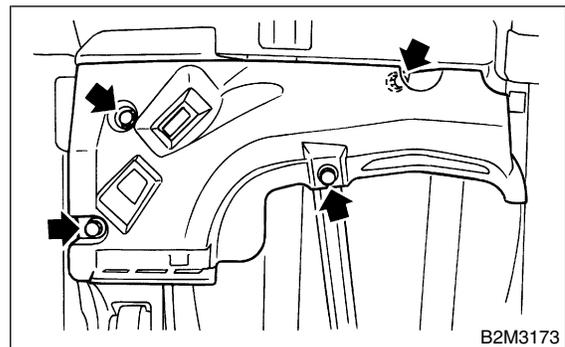


B2M4409

16) Install front side fuel tank cover.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



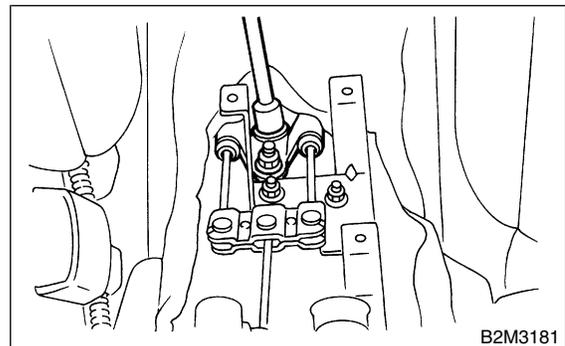
B2M3173

17) Install rear wheel.

18) Lower the vehicle.

19) Tighten wheel nuts to rear wheel.

20) Install parking brake cable. <Ref. to PB-4, INSTALLATION, Parking Brake Lever.>



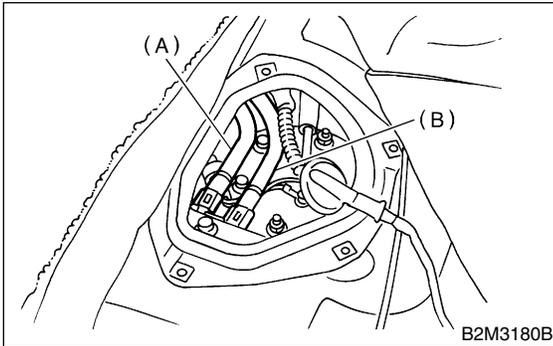
B2M3181

# FUEL TANK

## Fuel Injection (Fuel Systems)

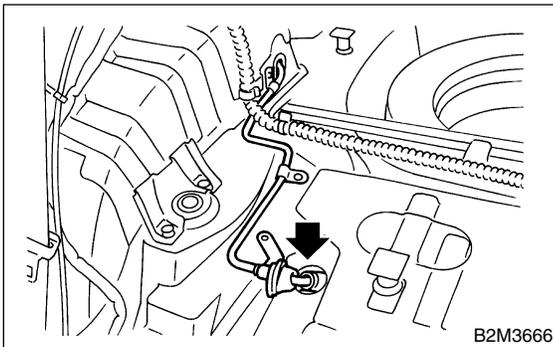
21) Install console box. <Ref. to EI-36, INSTALLATION, Console Box.>

22) Connect fuel hoses and hold them with quick connector. <Ref. to FU(H6)-79, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

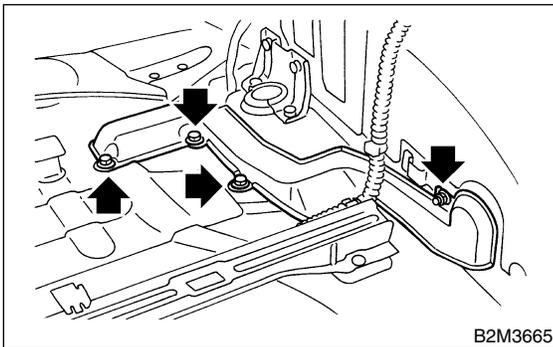


- (A) Delivery hose
- (B) Return hose

23) Connect evaporation pipe (A) and hold it with quick connector. <Ref. to FU(H6)-79, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



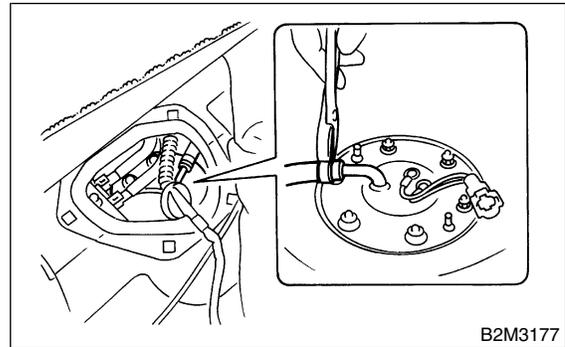
24) Install pipe protector.



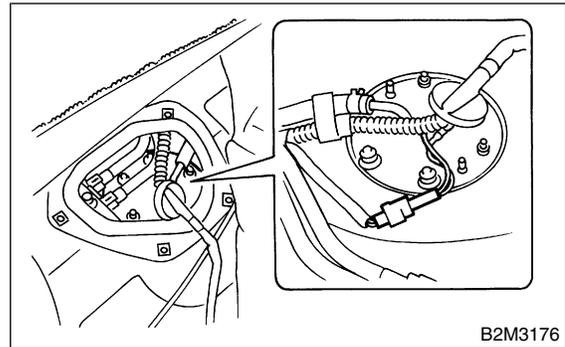
25) Install trunk room trim. (Sedan model)

26) Install luggage room trim. (Wagon model)

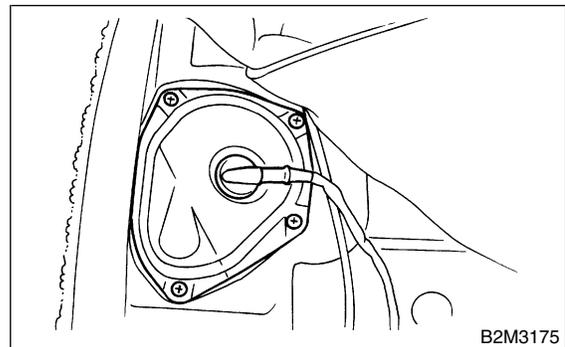
27) Connect fuel jet pump hose.



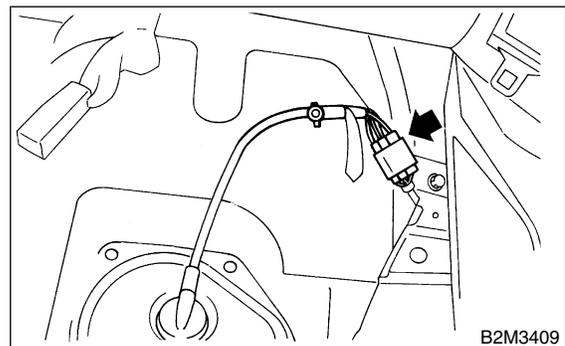
28) Connect connector to fuel sub level sensor.



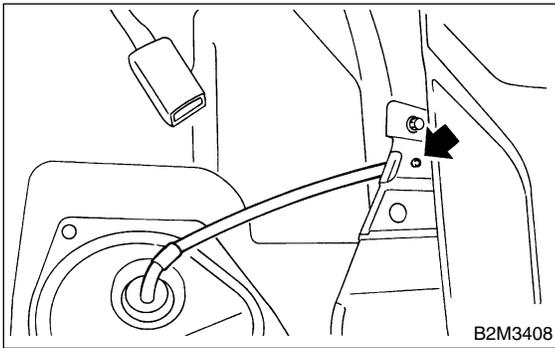
29) Install sub service hole cover.



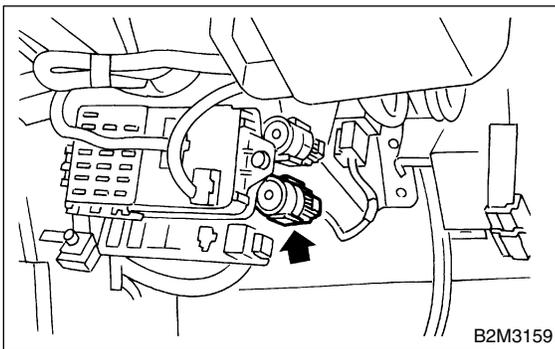
30) Connect connectors to fuel tank cord and plug service hole with grommet.



- 31) Install holder clip which secures fuel tank cord on bracket.



- 32) Set rear seat and floor mat.
- 33) Connect connector to fuel pump relay.



- 34) Bleed air from brake system. (Rear drum brake model only) <Ref. to BR-36, BRAKE LINE, PROCEDURE, Air Bleeding.>
- 35) Adjust parking brake lever stroke. <Ref. to PB-9, ADJUSTMENT, Parking Brake Assembly.>
- 36) Check wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

## C: INSPECTION S145053A10

- 1) Make sure there are no cracks, holes, or other damage on the fuel tank.
- 2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

# FUEL FILLER PIPE

Fuel Injection (Fuel Systems)

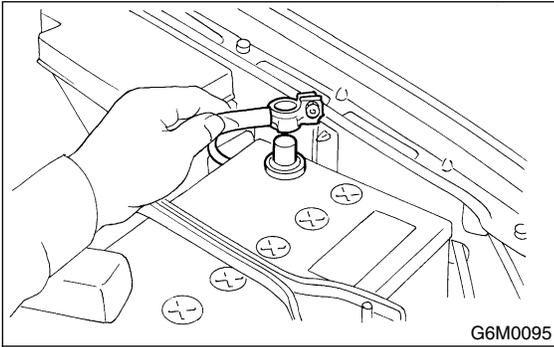
## 22. Fuel Filler Pipe S145022

### A: REMOVAL S145022A18

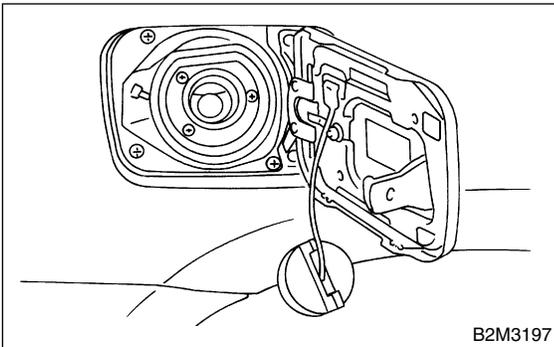
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

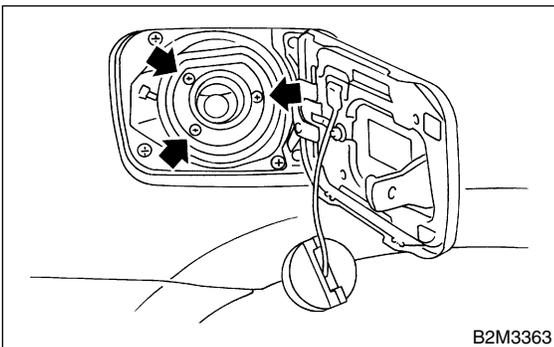
- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.



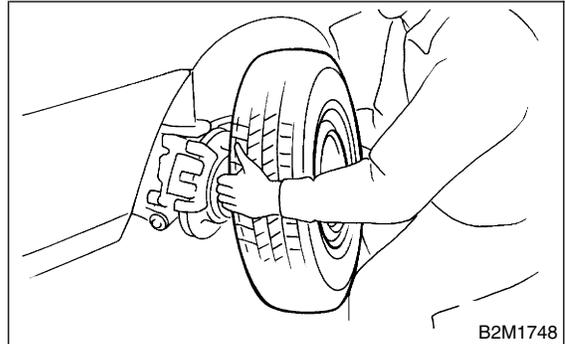
- 3) Open fuel filler flap lid and remove filler cap.



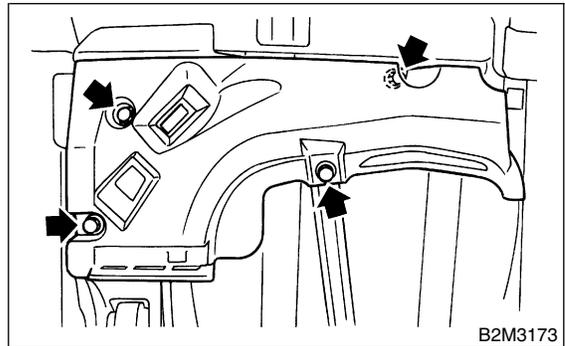
- 4) Remove screws holding packing in place.



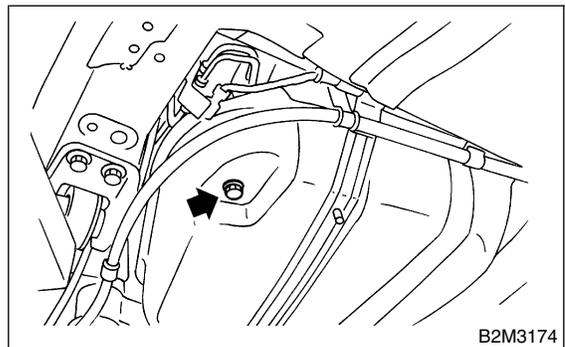
- 5) Lift-up the vehicle.
- 6) Remove rear wheel nuts.
- 7) Remove rear wheel.



- 8) Remove front right side fuel tank cover.



- 9) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



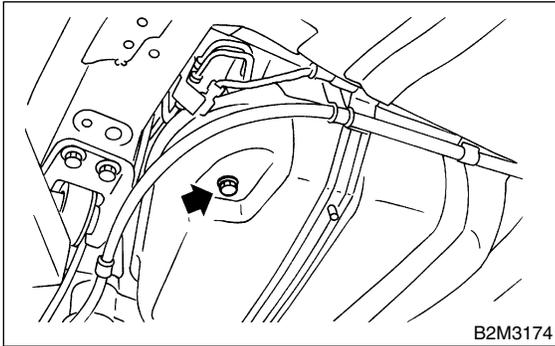
# FUEL FILLER PIPE

Fuel Injection (Fuel Systems)

10) Tighten fuel drain plug and then install front right side tank cover.

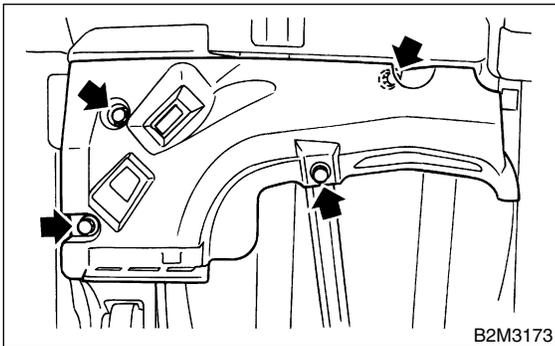
**Tightening torque:**

**26 N·m (2.65 kgf-m, 19.2 ft-lb)**



**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



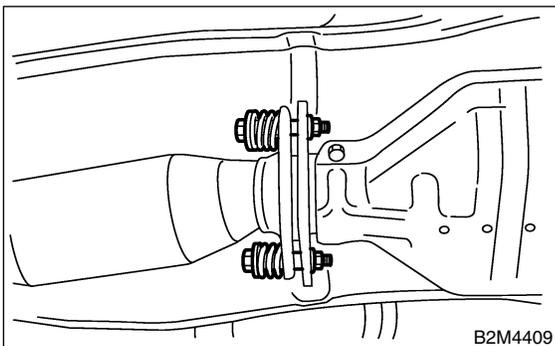
11) Remove rear exhaust pipe and muffler.

**NOTE:**

To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

**SUBARU CRC (Part No. 004301003)**

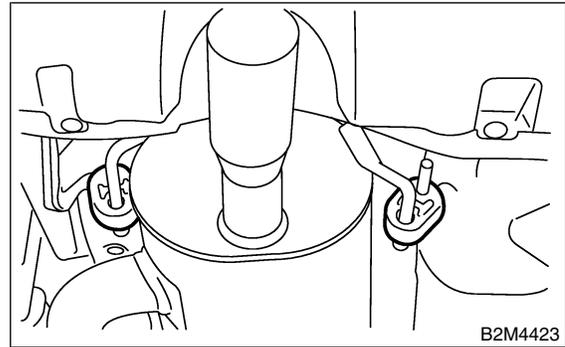
(1) Separate rear exhaust pipe from center exhaust pipe.



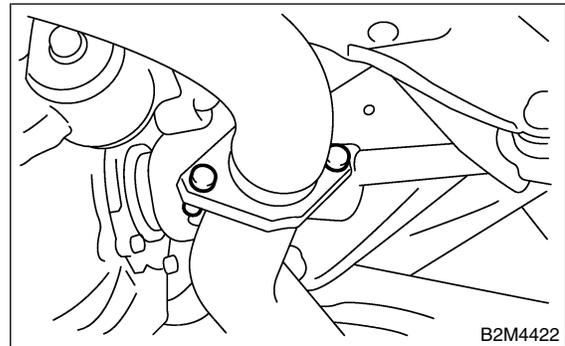
(2) Remove left and right rubber cushions.

**CAUTION:**

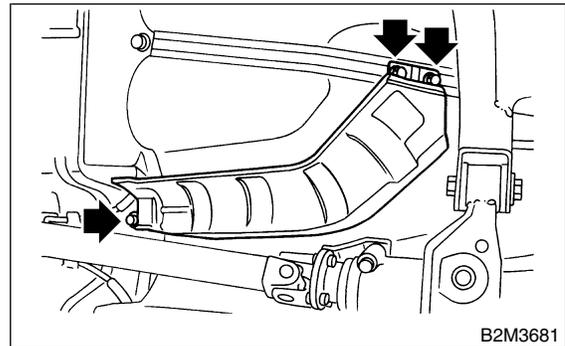
**Be careful not to pull down muffler.**



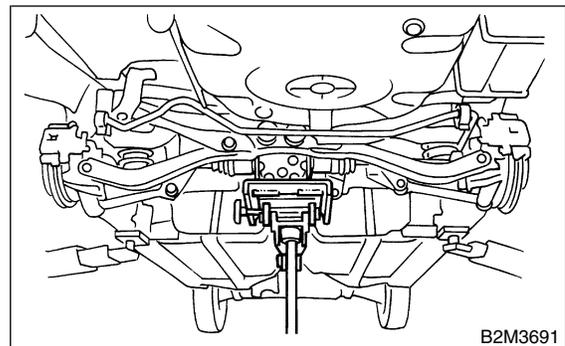
(3) Remove front rubber cushion and detach muffler assembly.



12) Remove heat sealed cover.



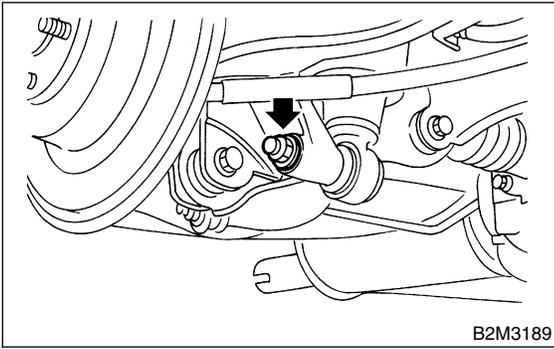
13) Place transmission jack under sub frame.



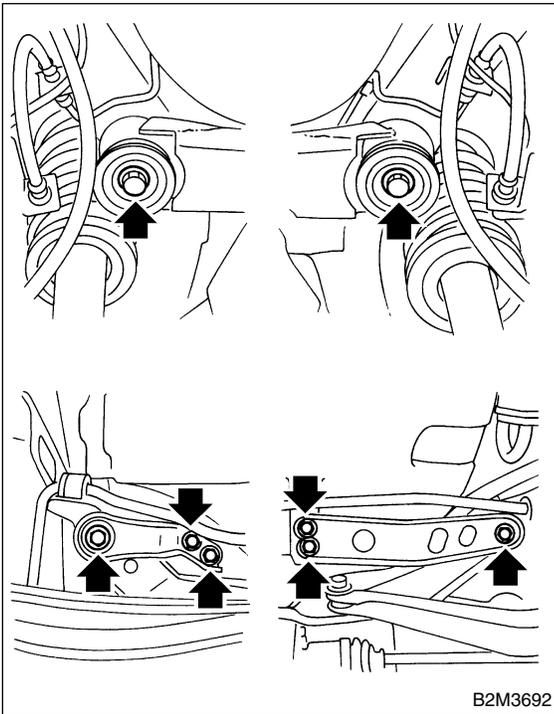
# FUEL FILLER PIPE

## Fuel Injection (Fuel Systems)

14) Remove bolt which holds rear shock absorber to rear suspension arm.



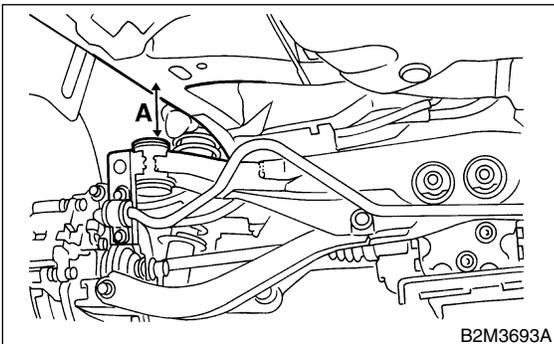
15) Remove bolts which hold rear sub frame on body.



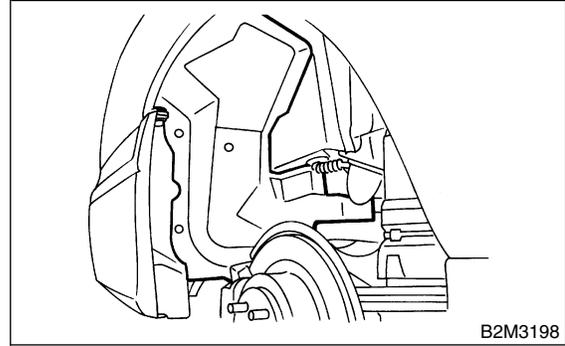
16) Lower the rear sub frame.

**CAUTION:**  
Be sure to lower sub frame slowly.

**A = 150 mm (5.91 in)**

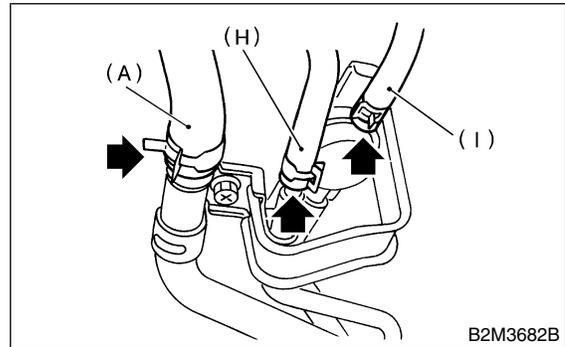


17) Remove fuel filler pipe protector.

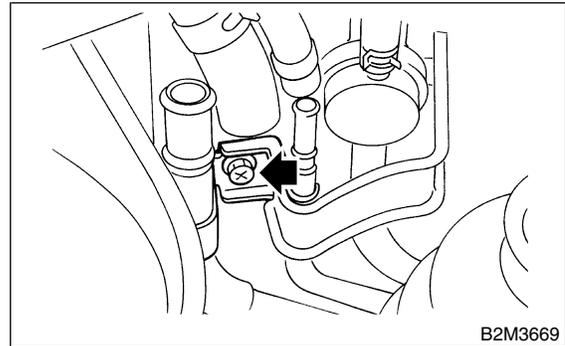


18) Disconnect air vent hose (A) and evaporation hose (H) from evaporation pipe assembly.

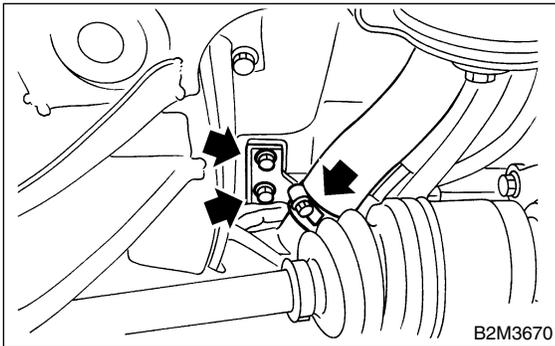
19) Disconnect evaporation hose (I) from pressure control solenoid valve.



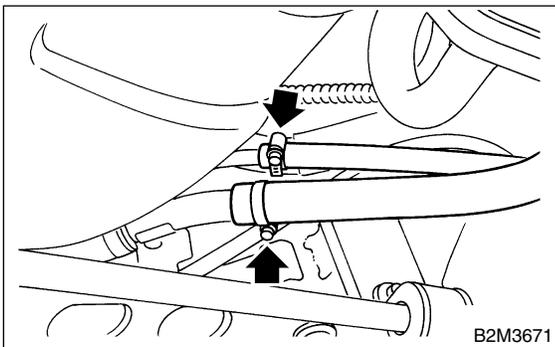
20) Remove bolt which holds evaporation pipe assembly on body.



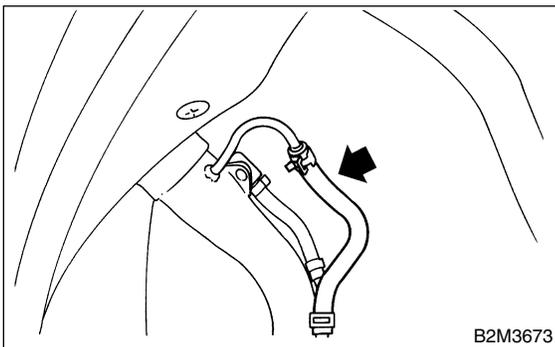
- 21) Disconnect fuel filler hose.
- 22) Remove bolt which holds fuel pressure sensor on fuel filler pipe and remove bolt which holds fuel filler pipe on body.



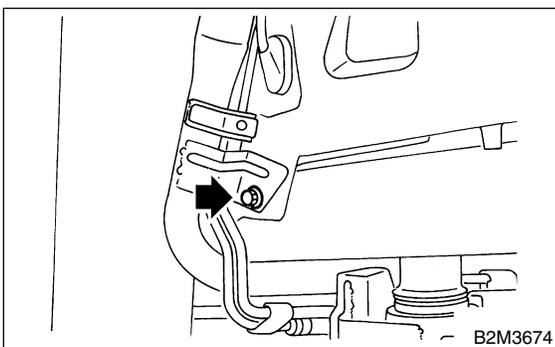
- 23) Disconnect canister hose from evaporation pipe assembly.



- 24) Disconnect evaporation hose (O) from fuel filler pipe.



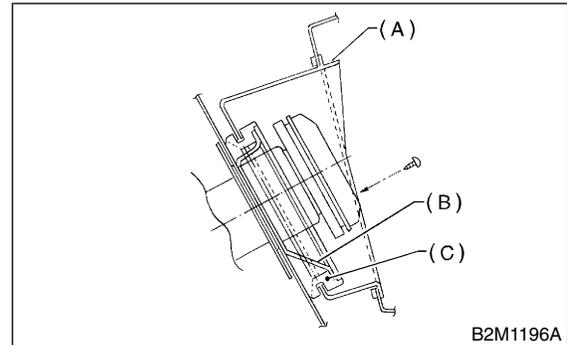
- 25) Remove bolt which holds fuel filler pipe to body.



- 26) Remove fuel filler pipe to under side of the vehicle.

## B: INSTALLATION S145022A11

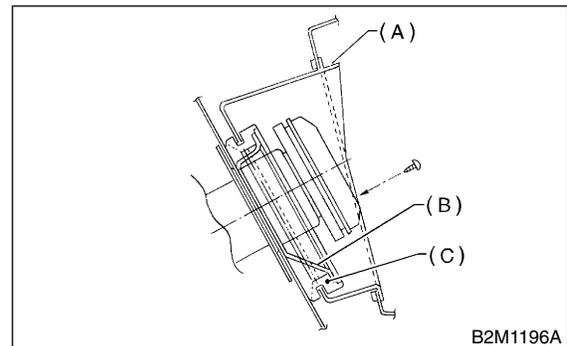
- 1) Hold fuel filler flap open.
- 2) Set fuel saucer (A) with rubber packing (C) and insert fuel filler pipe into hole from the inner side of apron.



- 3) Align holes in fuel filler pipe neck and set cup (B), and tighten screws.

### NOTE:

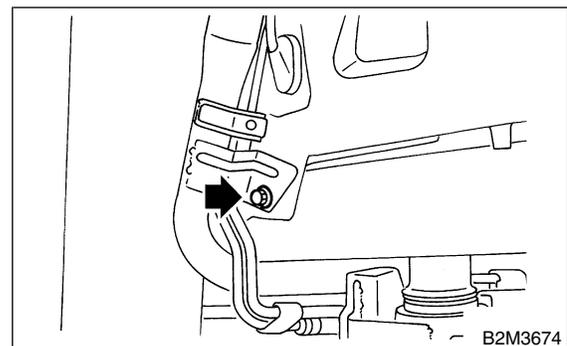
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



- 4) Tighten bolt which holds fuel filler pipe on body.

### Tightening torque:

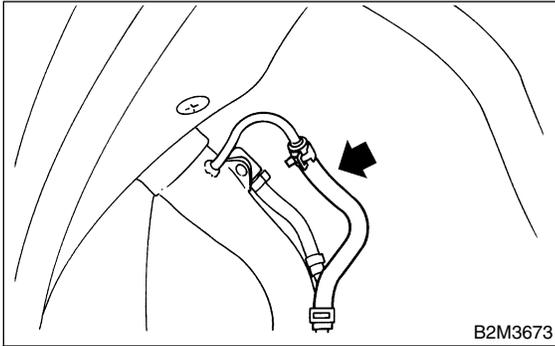
**7.5 N·m (0.75 kgf·m, 5.4 ft·lb)**



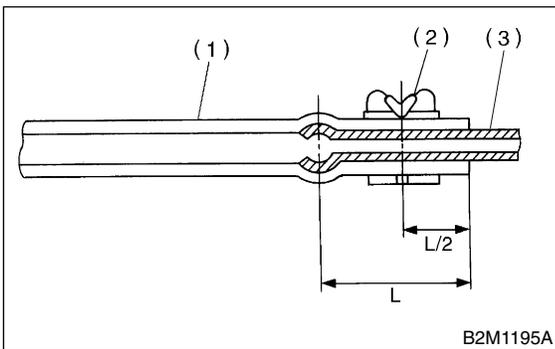
# FUEL FILLER PIPE

## Fuel Injection (Fuel Systems)

5) Insert evaporation hose approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and hold clip.

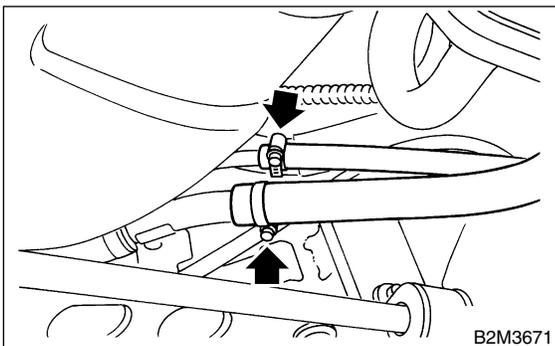


$L = 27.5 \pm 2.5 \text{ mm (1.083 \pm 0.098 in)}$

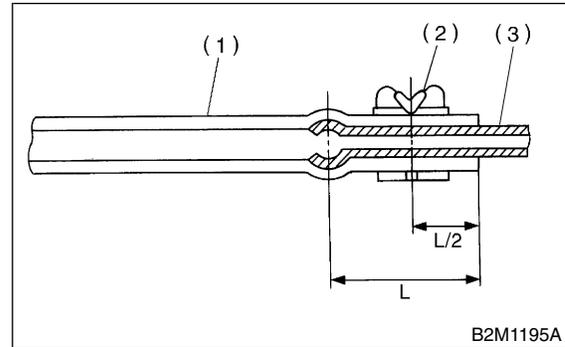


- (1) Hose
- (2) Clip
- (3) Pipe

6) Insert canister hoses approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and tighten clamp.



$L = 27.5 \pm 2.5 \text{ mm (1.083 \pm 0.098 in)}$

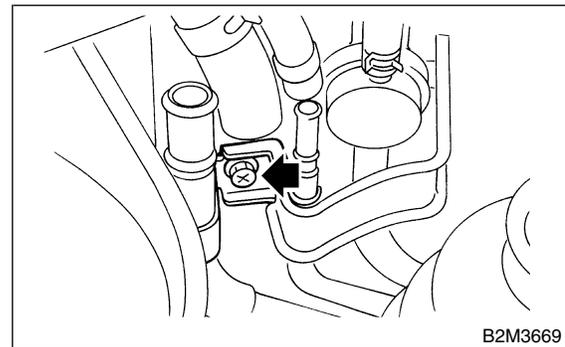


- (1) Hose
- (2) Clip
- (3) Pipe

7) Tighten bolt which holds evaporation pipe assembly on body.

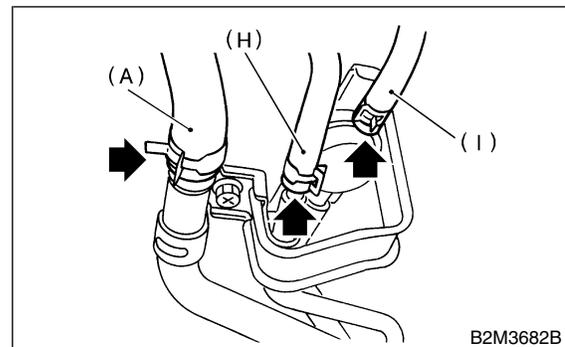
**Tightening torque:**

**7.5 N-m (0.75 kgf-m, 5.4 ft-lb)**



8) Insert air vent hose (A), evaporation hose (H) approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and hold clip.

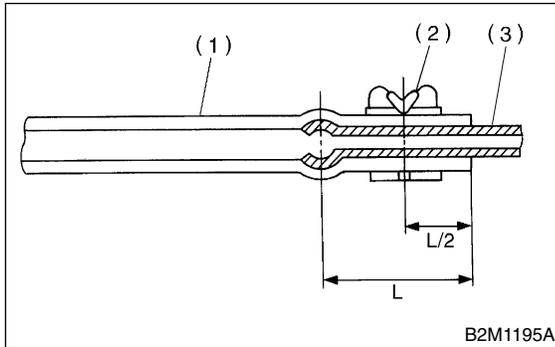
9) Insert evaporation hose (I) to pressure control solenoid valve and hold clip.



# FUEL FILLER PIPE

Fuel Injection (Fuel Systems)

$L = 27.5 \pm 2.5 \text{ mm (1.083 \pm 0.098 in)}$



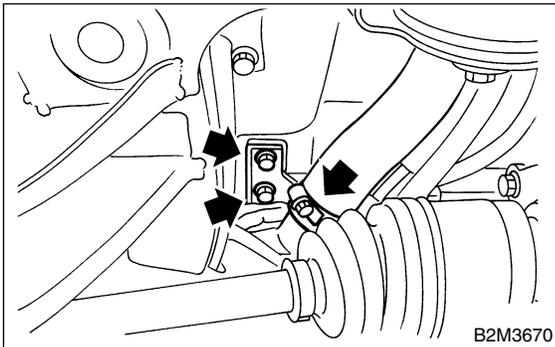
- (1) Hose
- (2) Clip
- (3) Pipe

10) Tighten bolt which holds fuel filler pipe on body and tighten bolt which holds fuel pressure sensor on fuel filler pipe.

**Tightening torque:**

**7.5 N·m (0.75 kgf·m, 5.4 ft·lb)**

11) Insert fuel filler hose approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten clamp.

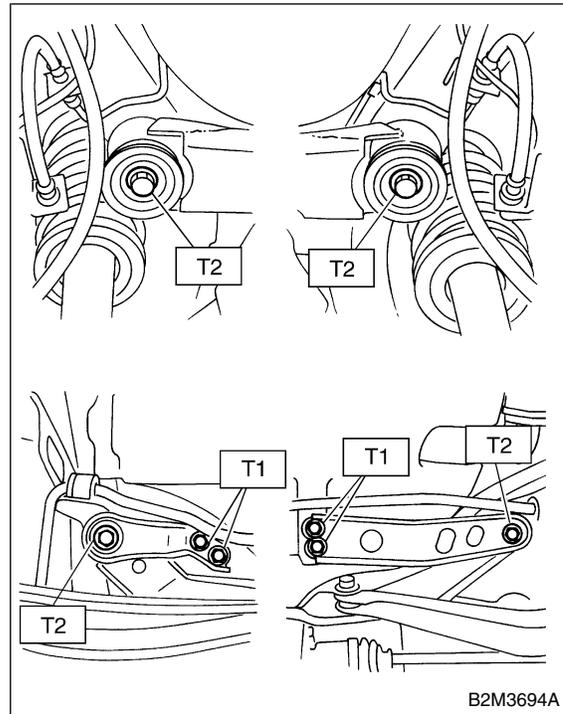


12) Jack-up the rear sub frame and tighten bolts which hold rear sub frame on body.

**Tightening torque:**

**T1: 66 N·m (6.7 kgf·m, 48.5 ft·lb)**

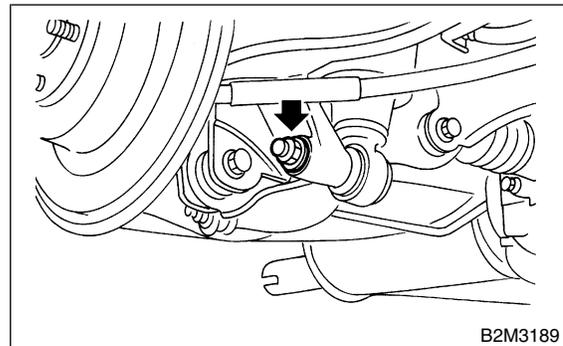
**T2: 172 N·m (17.5 kgf·m, 127 ft·lb)**



13) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-17, INSTALLATION, Rear Shock Absorber.>

**Tightening torque:**

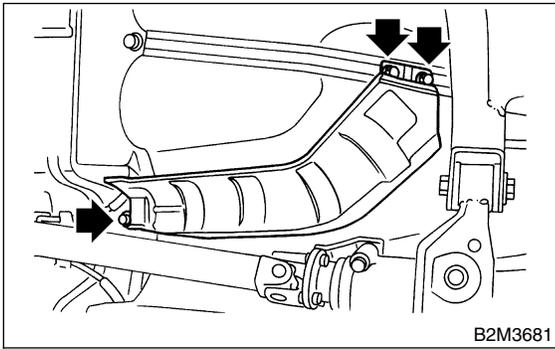
**157 N·m (16 kgf·m, 116 ft·lb)**



# FUEL FILLER PIPE

Fuel Injection (Fuel Systems)

14) Install heat shield cover.



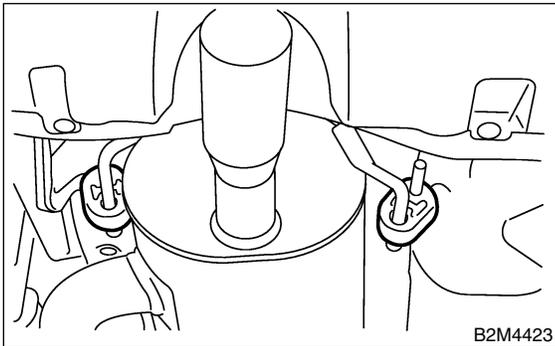
15) Install rear exhaust pipe and muffler.

**NOTE:**

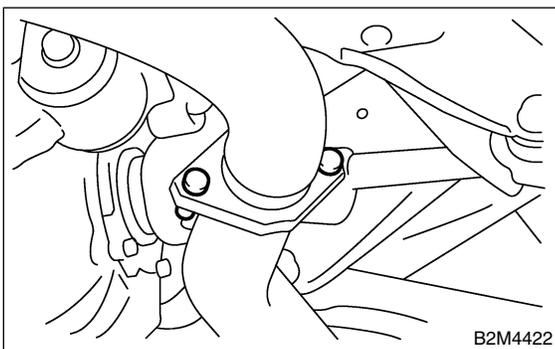
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

**SUBARU CRC (Part No. 004301003)**

(1) Install left and right rubber cushions.



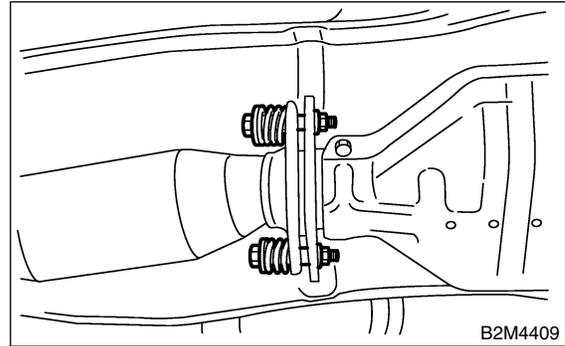
(2) Install front rubber cushion and attach muffler assembly.



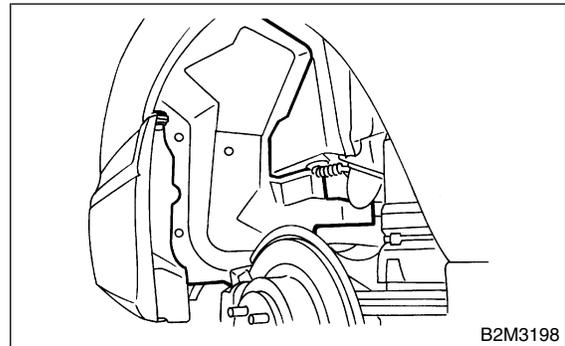
(3) Install rear exhaust pipe to center exhaust pipe.

**Tightening torque:**

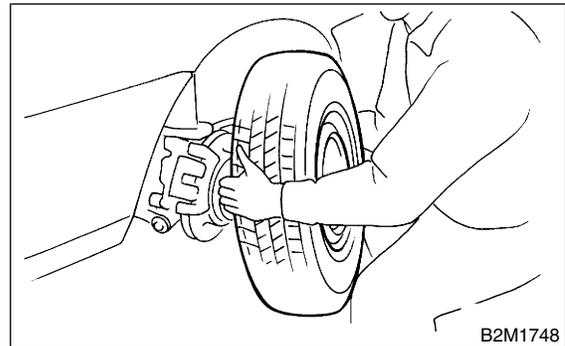
**18 N·m (1.8 kgf·m, 13.0 ft·lb)**



16) Install fuel filler pipe protector.



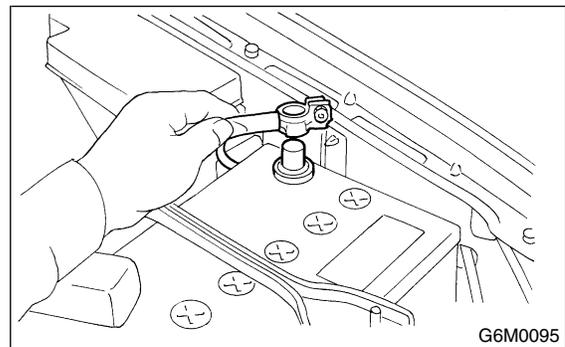
17) Install rear right wheel.



18) Lower the vehicle.

19) Tighten wheel nuts.

20) Connect battery ground cable.



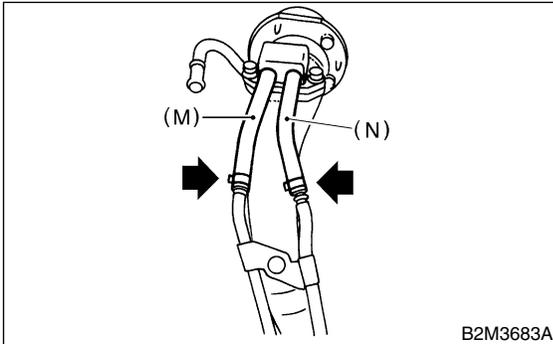
21) Remove fuel filler pipe to under side of the vehicle.

## D: ASSEMBLY S145022A02

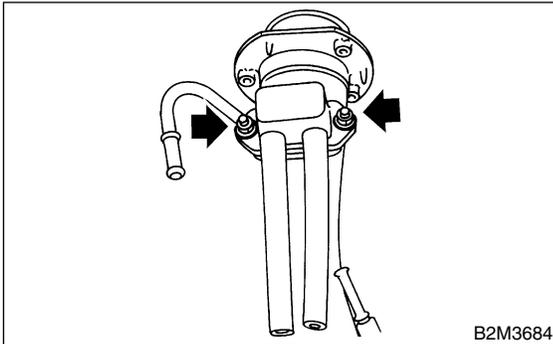
Assemble in the reverse order of disassembly.

## C: DISASSEMBLY S145022A06

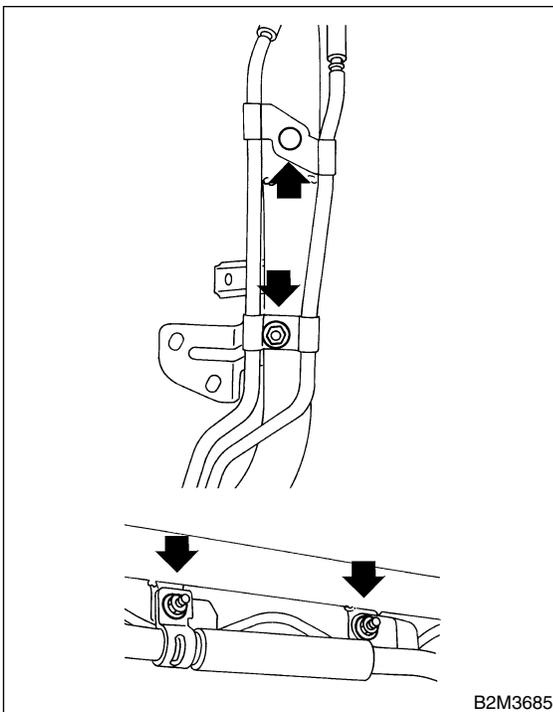
1) Disconnect evaporation hose (M) and (N) from evaporation pipe assembly.



2) Remove shut valve from fuel filler pipe.



3) Remove nut which holds evaporation pipe assembly on fuel filler pipe.



# FUEL PUMP

Fuel Injection (Fuel Systems)

## 23. Fuel Pump S145025

### A: REMOVAL S145025A18

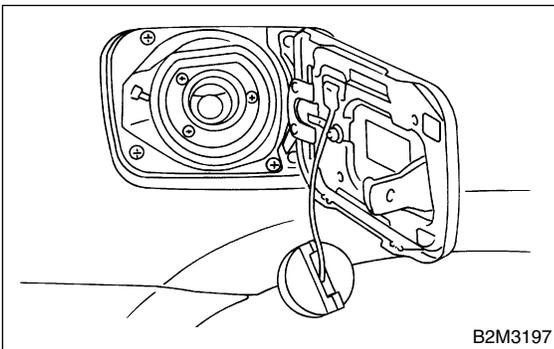
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

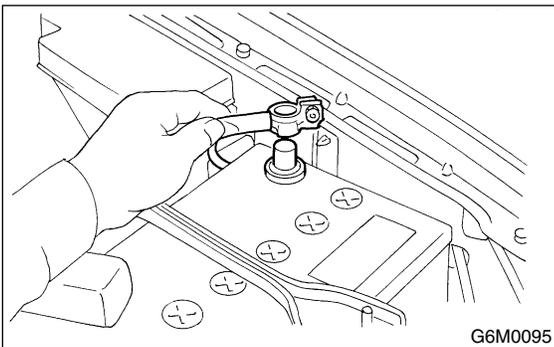
#### NOTE:

Fuel pump assembly consists of fuel pump and fuel level sensor.

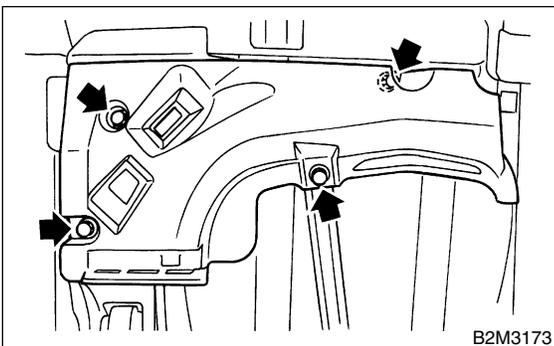
- 1) Release fuel pressure. <Ref. to FU(H6)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open fuel filler flap lid and remove fuel filler cap.



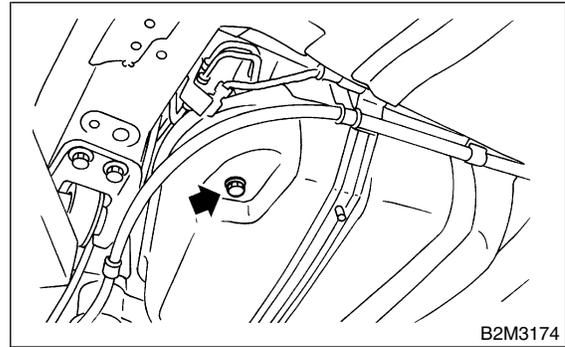
- 3) Disconnect battery ground cable.



- 4) Lift-up the vehicle.
- 5) Remove front side fuel tank cover.



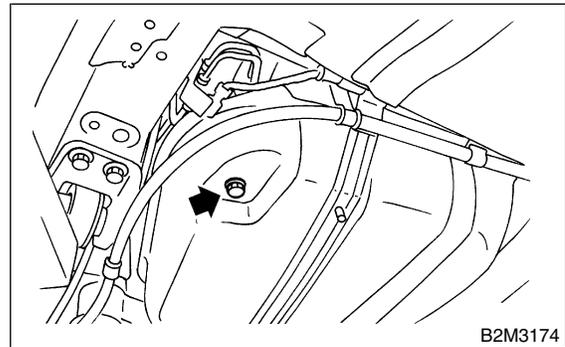
- 6) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



- 7) Tighten fuel drain plug and install front right side fuel tank cover.

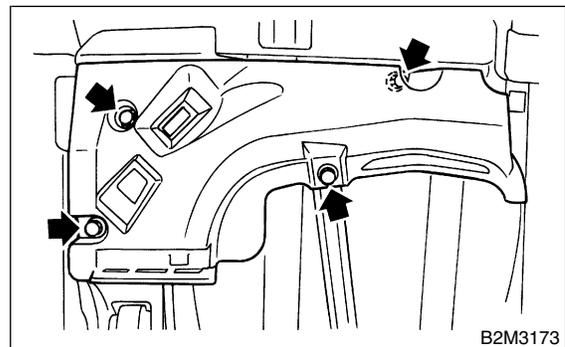
#### Tightening torque:

**26 N·m (2.65 kgf·m, 19.2 ft·lb)**



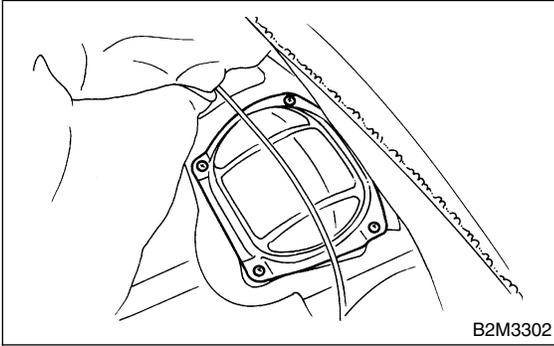
#### Tightening torque:

**18 N·m (1.8 kgf·m, 13.0 ft·lb)**

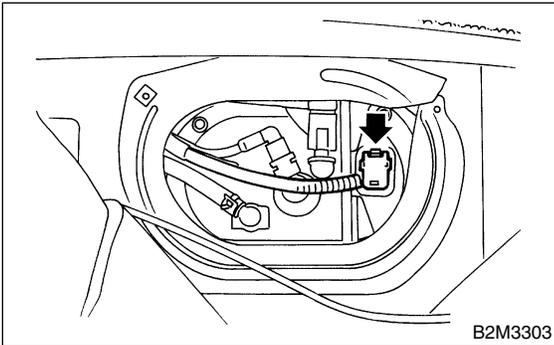


- 8) Raise rear seat and turn floor mat up.

9) Remove access hole lid.

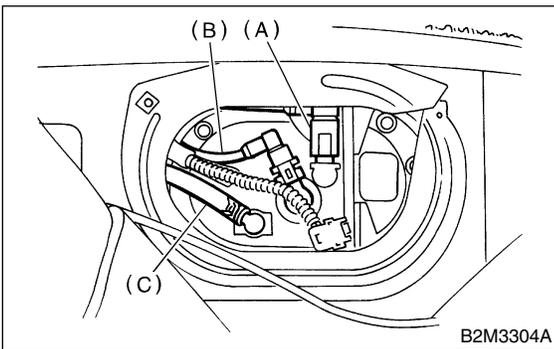


10) Disconnect connector from fuel pump.

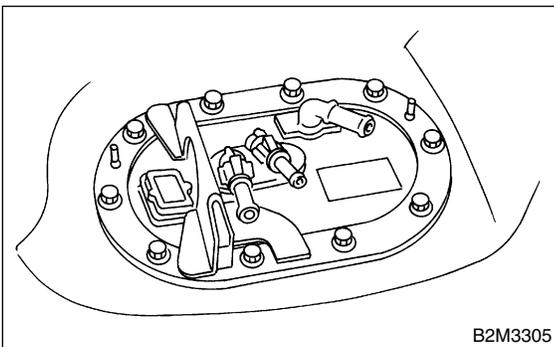


11) Move clips and then disconnect jet pump hose (C).

12) Disconnect quick connector and then disconnect fuel delivery hose (A) and return hose (B). <Ref. to FU(H6)-78, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



13) Remove nuts which install fuel pump assembly onto fuel tank.



14) Take off fuel pump assembly from fuel tank.

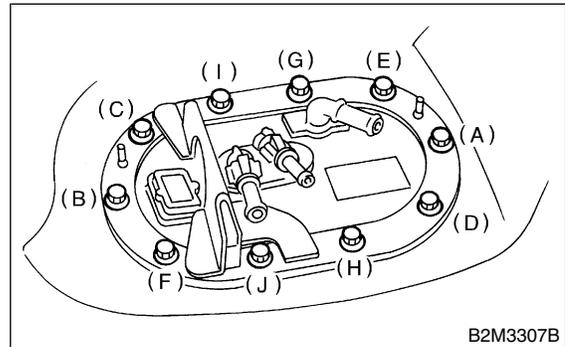
## B: INSTALLATION S145025A11

Install in the reverse order of removal. Do the following:

- (1) Always use new gaskets.
- (2) Ensure sealing portion is free from fuel or foreign particles before installation.
- (3) Tighten nuts in alphabetical sequence shown in figure to specified torque.

**Tightening torque:**

**5.9 N·m (0.6 kgf·m, 4.3 ft·lb)**

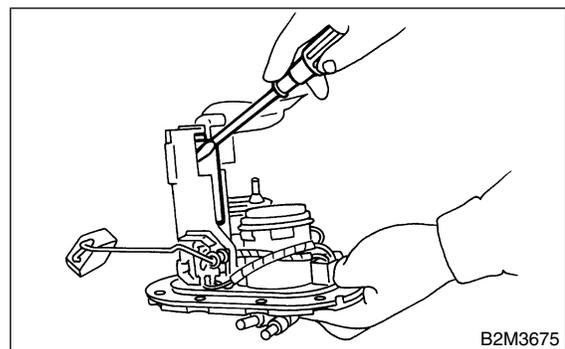


## C: DISASSEMBLY S145025A06

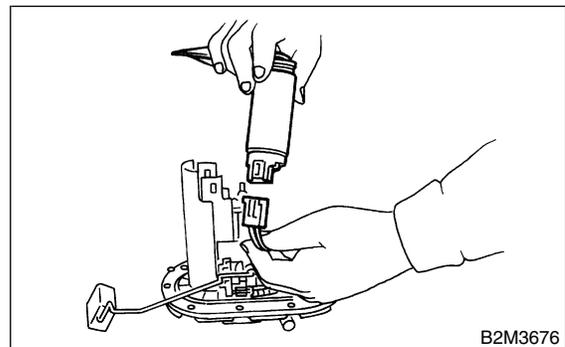
1) Remove fuel pump and pump holder.

**NOTE:**

When disassembling pump holder, be careful as it is installed with two pawls.



2) Disconnect connector from fuel pump.



# FUEL PUMP

Fuel Injection (Fuel Systems)

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## D: ASSEMBLY S145025A02

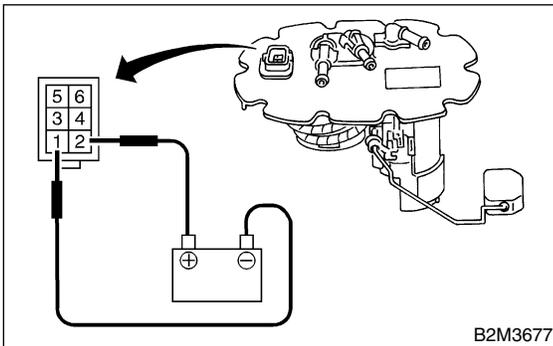
Assemble in the reverse order of disassembly.

## E: INSPECTION S145025A10

Connect lead harness to connector terminal of fuel pump and apply battery power supply to check whether the pump operate.

### WARNING:

- Wipe off the fuel completely.
- Keep battery as far apart from fuel pump as possible.
- Be sure to turn the battery supply ON and OFF on the battery side.
- Do not run fuel pump for a long time under no-load condition.



## 24. Fuel Level Sensor S145026

### A: REMOVAL S145026A18

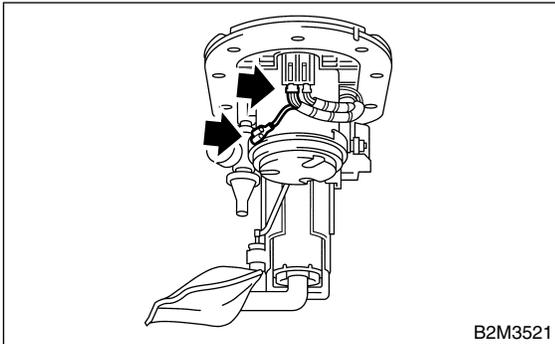
**WARNING:**

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

**NOTE:**

Fuel level sensor is built in fuel pump assembly.

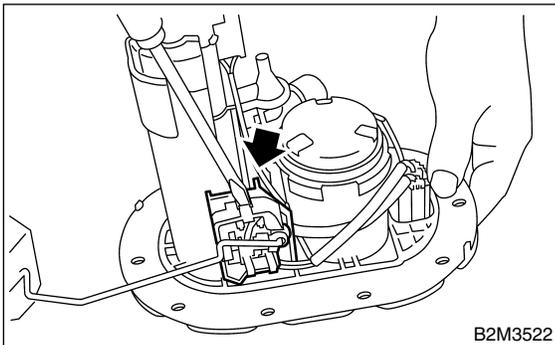
- 1) Remove fuel pump assembly. <Ref. to FU(H6)-70, REMOVAL, Fuel Pump.>
- 2) Disconnect connector from fuel pump bracket.



- 3) Pushing the pawls with a screwdriver, remove fuel meter unit by pulling it downwards.

**NOTE:**

Replace fuel filter pawls with new ones as they might break when removed.

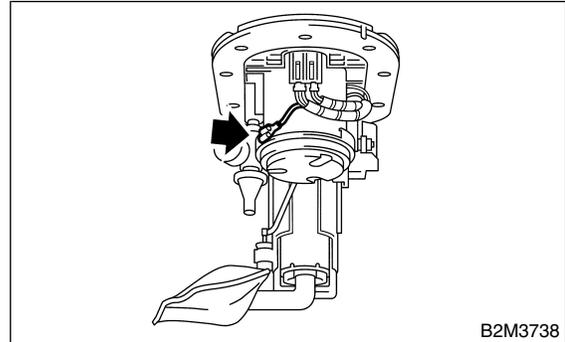


### B: INSTALLATION S145026A11

Install in the reverse order of removal.

**WARNING:**

- Ground cable must be connected.
- Spark may occur and ignite if fuel is nearby.



# FUEL SUB LEVEL SENSOR

Fuel Injection (Fuel Systems)

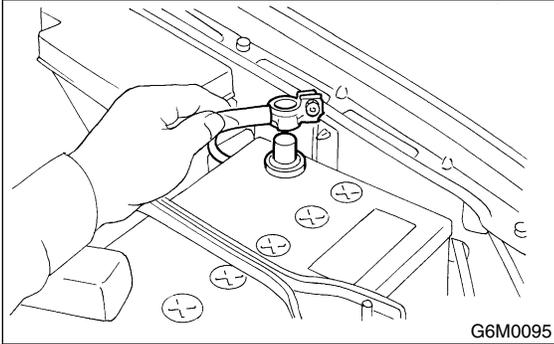
## 25. Fuel Sub Level Sensor S145023

### A: REMOVAL S145023A18

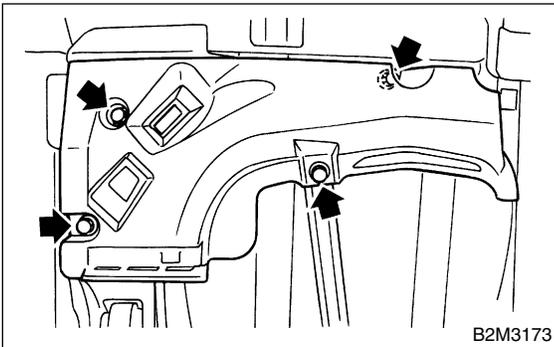
#### WARNING:

- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

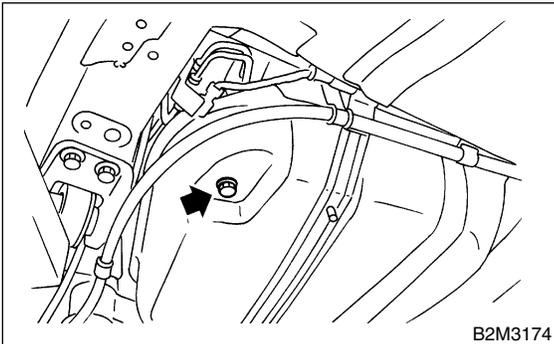
- 1) Disconnect battery ground cable.



- 2) Lift-up the vehicle.
- 3) Remove front side fuel tank cover.



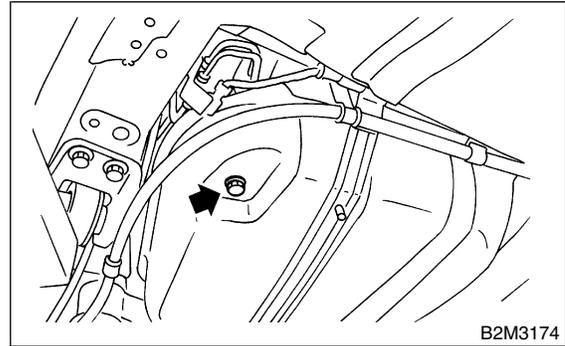
- 4) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



- 5) Tighten fuel drain plug and install front right side fuel tank cover.

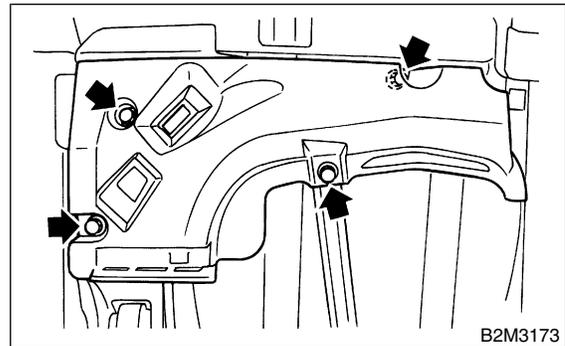
#### Tightening torque:

**26 N-m (2.65 kgf-m, 19.2 ft-lb)**

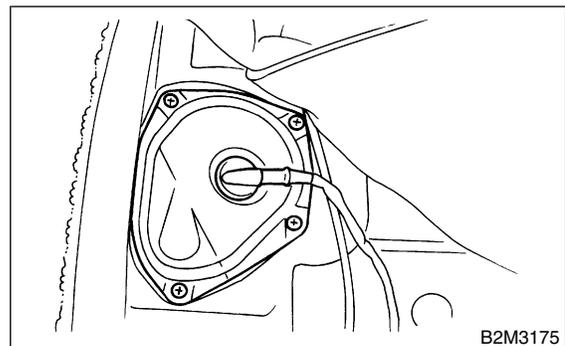


#### Tightening torque:

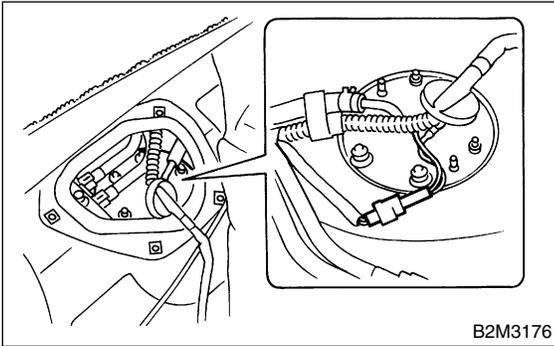
**18 N-m (1.8 kgf-m, 13.0 ft-lb)**



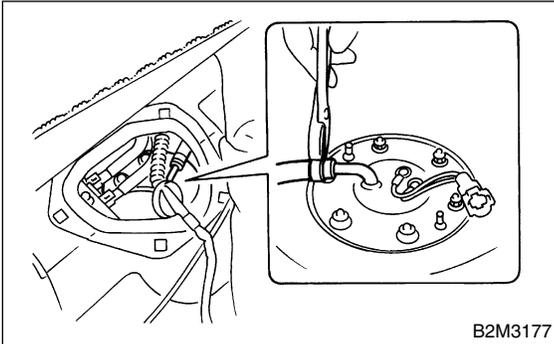
- 6) Raise rear seat and turn floor mat up. (Wagon model)
- 7) Remove rear seat. (Sedan model)
- 8) Remove service hole cover.



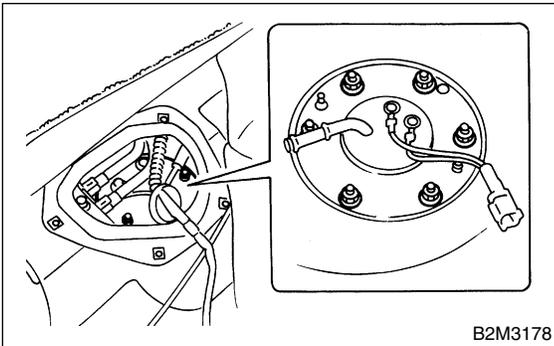
- 9) Disconnect connector from fuel sub level sensor.



- 10) Disconnect fuel jet pump hose.



- 11) Remove bolts which install fuel sub level sensor on fuel tank.



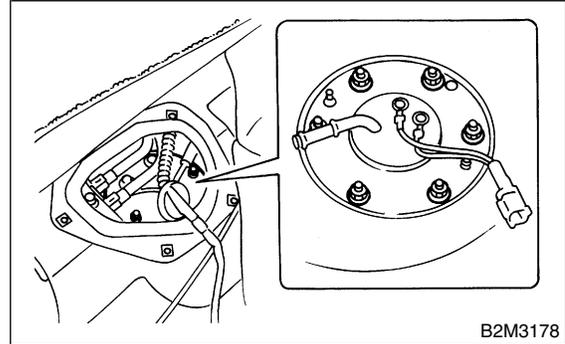
- 12) Remove fuel sub level sensor.

## B: INSTALLATION S145023A11

Install in the reverse order of removal.

**Tightening torque:**

**4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



## 26. Fuel Filter S145027

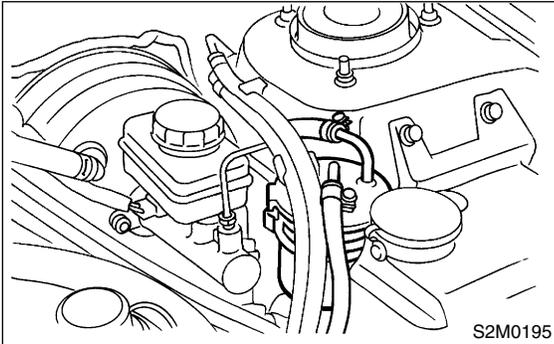
### A: REMOVAL S145027A18

#### WARNING:

- Place “NO FIRE” signs near the working area.

- Be careful not to spill fuel on the floor.

- 1) Release fuel pressure. <Ref. to FU(H6)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Disconnect fuel delivery hoses from fuel filter.



- 3) Remove filter from holder.

### B: INSTALLATION S145027A11

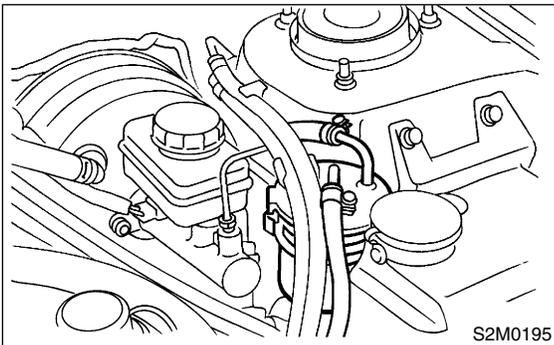
#### CAUTION:

- If fuel hoses are damaged at the connecting portion, replace it with a new one.
- If clamps are badly damaged, replace with new ones.

- 1) Install in the reverse order of removal.
- 2) Tighten hose clamp screws.

#### **Tightening torque:**

**1.0 N·m (0.1 kgf-m, 0.7 ft-lb)**



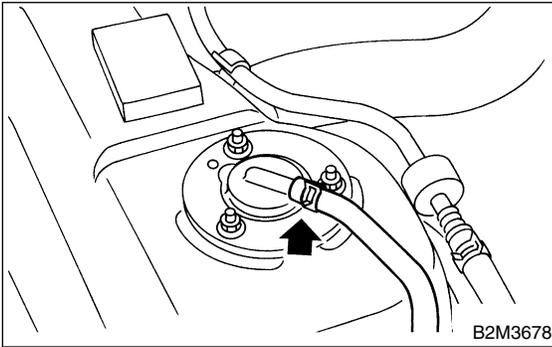
### C: INSPECTION S145027A10

- 1) Check the inside of fuel filter for dirt and water sediment.
- 2) If it is clogged, or if replacement interval has been reached, replace it.
- 3) If water is found in it, shake and expel the water from inlet port.

## 27. Fuel Cut Valve S145021

### A: REMOVAL S145021A18

- 1) Remove fuel tank. <Ref. to FU(H6)-53, REMOVAL, Fuel Tank.>
- 2) Move clip and disconnect evaporation hose from fuel cut valve.



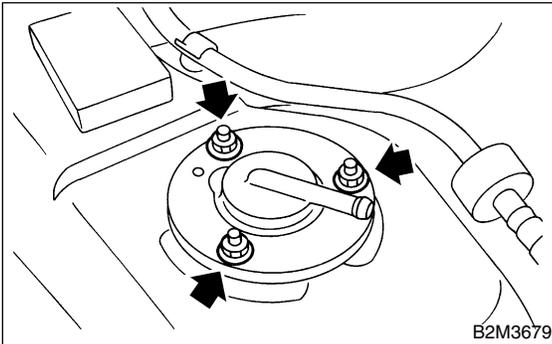
- 3) Remove bolts which install fuel cut valve.

### B: INSTALLATION S145021A11

Install in the reverse order of removal.

#### **Tightening torque:**

**4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



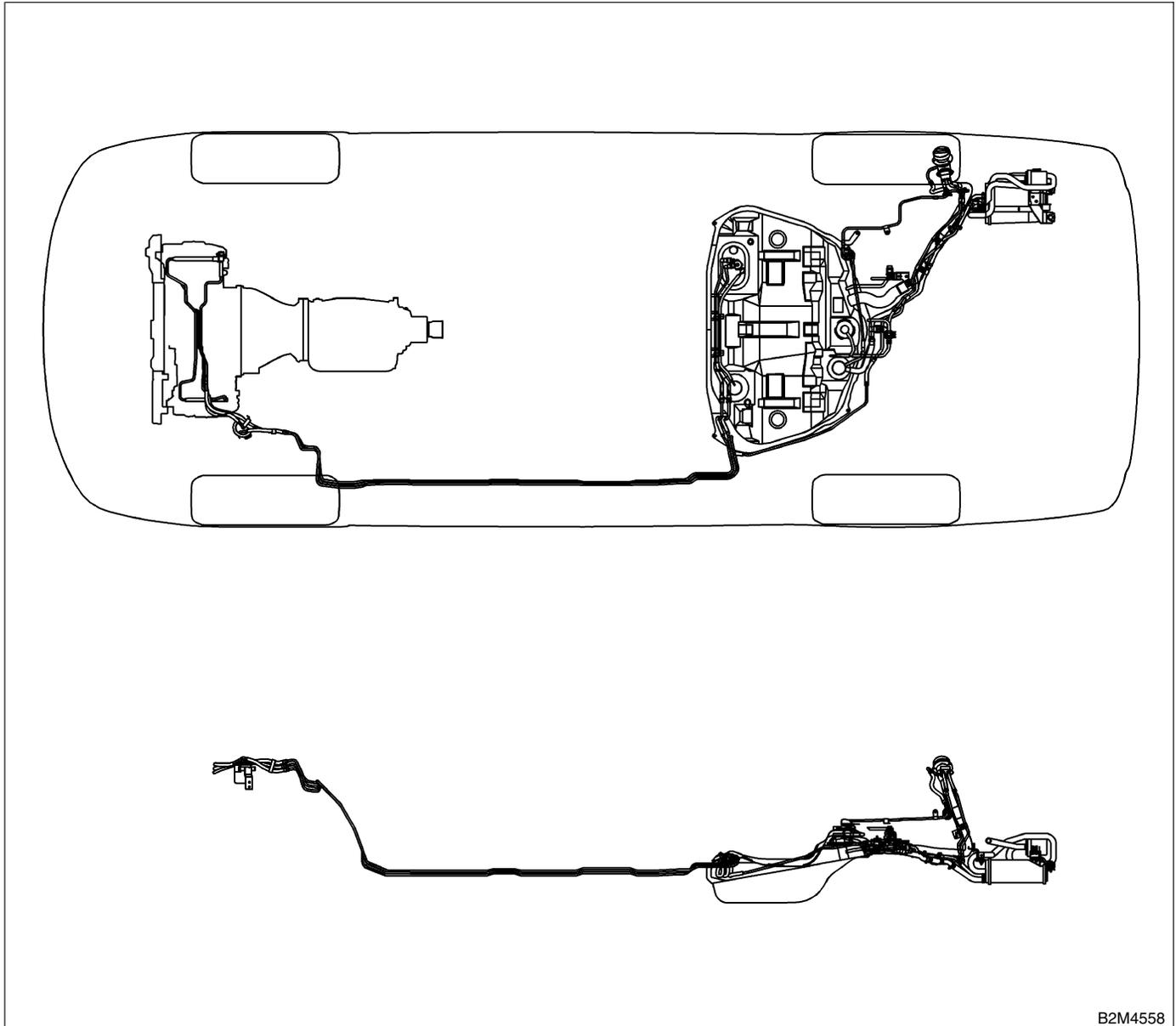
# FUEL DELIVERY, RETURN AND EVAPORATION LINES

Fuel Injection (Fuel Systems)

## 28. Fuel Delivery, Return and Evaporation Lines S145019

### A: REMOVAL S145019A18

- 1) Set vehicle on the lift.
- 2) Release fuel pressure. <Ref. to FU(H6)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Open fuel filler flap lid and remove fuel filler cap.
- 4) Remove fuel tank. <Ref. to FU(H6)-53, REMOVAL, Fuel Tank.>
- 5) Remove fuel filler pipe. <Ref. to FU(H6)-62, REMOVAL, Fuel Filler Pipe.>
- 6) Remove floor mat. <Ref. to EI-52, REMOVAL, Floor Mat.>
- 7) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

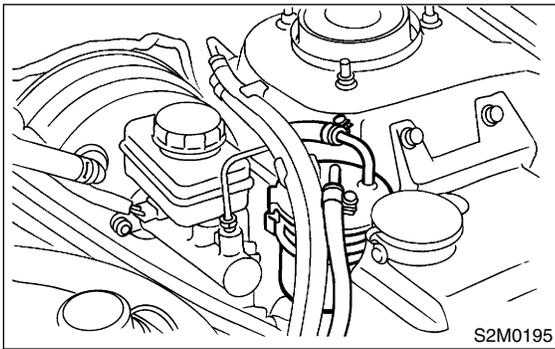


B2M4558

# FUEL DELIVERY, RETURN AND EVAPORATION LINES

Fuel Injection (Fuel Systems)

8) In engine compartment, detach fuel delivery hoses, return hoses and evaporation hose.

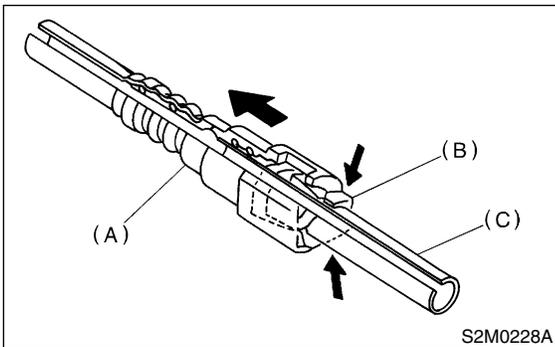


9) Separate quick connector on fuel delivery, return line and evaporation line.

- (1) Clean pipe and connector, if they are covered with dust.
- (2) Hold connector (A) and push retainer (B) down.
- (3) Pull out connector (A) from retainer (B).

### CAUTION:

Replace retainer with new ones.



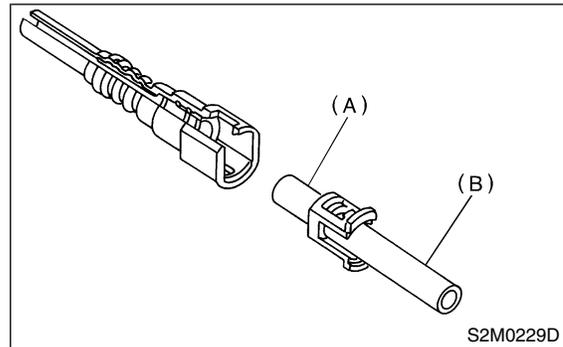
- (A) Connector
- (B) Retainer
- (C) Pipe

## B: INSTALLATION S145019A11

1) Connect quick connector on fuel delivery and return line.

### CAUTION:

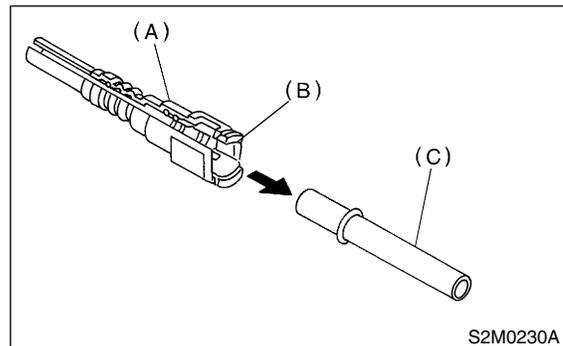
- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface (A) of pipe (B).



- (1) Set new retainer (B) to connector (A).
- (2) Push pipe into connector completely.

### NOTE:

At this time, clicking sound can be heard two times.



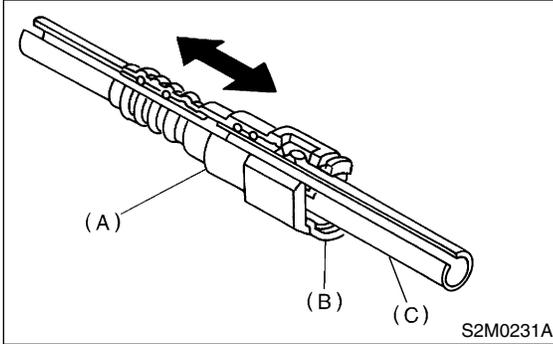
- (A) Connector
- (B) Retainer
- (C) Pipe

# FUEL DELIVERY, RETURN AND EVAPORATION LINES

Fuel Injection (Fuel Systems)

## CAUTION:

- Pull the connector to ensure it is connected securely.
- Ensure the two retainer pawls are engaged in their mating positions in the connector.
- Be sure to inspect hoses and their connections for any leakage of fuel.



- (A) Connector
- (B) Retainer
- (C) Pipe

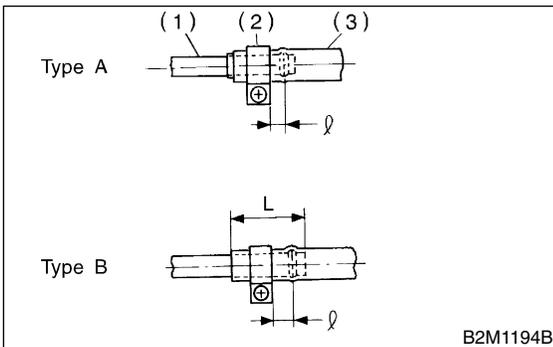
2) Connect fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When fitting length is specified.

Type B: When fitting length is not specified.

$\ell : 2.5 \pm 1.5 \text{ mm } (0.098 \pm 0.059 \text{ in})$

$L : 22.5 \pm 2.5 \text{ mm } (0.886 \pm 0.098 \text{ in})$



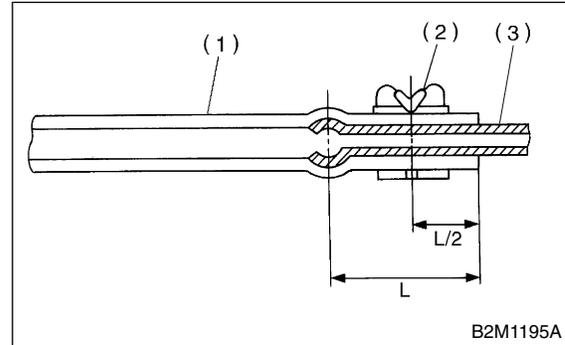
- (1) Fitting
- (2) Clamp
- (3) Hose

3) Connect evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

$L = 17.5 \pm 2.5 \text{ mm } (0.689 \pm 0.098 \text{ in})$

## CAUTION:

Be sure to inspect hoses and their connections for any leakage of fuel.



- (1) Hose
- (2) Clip
- (3) Pipe

## C: INSPECTION S145019A10

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.

2) Make sure that the fuel pipe and fuel hose connections are tight.

## 29. Fuel System Trouble in General

S145571

### A: INSPECTION

S145571A10

Trouble and possible cause	Corrective action
<b>1. Insufficient fuel supply to the injector</b>	
1) Fuel pump will not operate.	
○ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
○ Trouble in electromagnetic or electronic circuit parts.	Replace fuel pump.
2) Lowering of fuel pump function.	Replace fuel pump.
3) Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4) Clogged or bent fuel pipe or hose.	Clean, correct or replace fuel pipe or hose.
5) Air is mixed in the fuel system.	Inspect or retighten each connection part.
6) Clogged or bent breather tube or pipe.	Clean, correct or replace air breather tube or pipe.
7) Damaged diaphragm of pressure regulator.	Replace.
<b>2. Leakage or blow out fuel</b>	
1) Loosened joints of the fuel pipe.	Retightening.
2) Cracked fuel pipe, hose and fuel tank.	Replace.
3) Defective welding part on the fuel tank.	Replace.
4) Defective drain packing of the fuel tank.	Replace.
5) Clogged or bent air breather tube or air vent tube.	Clean, correct or replace air breather tube or air vent tube.
<b>3. Gasoline smell inside of compartment</b>	
1) Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2) Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3) Cracked fuel separator.	Replace separator.
4) Inoperative fuel pump modulator or circuit.	Replace.
<b>4. Defective fuel meter indicator</b>	
1) Defective operation of fuel meter unit.	Replace.
2) Defective operation of fuel meter.	Replace.
<b>5. Noise</b>	
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.

To prevent water condensation:

(1) Top off the fuel tank or drain the fuel completely.

(2) Drain water condensation from the fuel filter.

- Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

- Protecting the fuel system against freezing and water condensation.

(1) Cold areas

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the cool-

ing system. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under Affected areas below.

(2) Affected areas

When water condensation is noticed in the fuel filter, drain water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

- Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

# FUEL SYSTEM TROUBLE IN GENERAL

Fuel Injection (Fuel Systems)

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**MEMO:**

# GENERAL DESCRIPTION

Emission Control (Aux. Emission Control Devices)

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## 1. General Description S140001

### A: CAUTION S140001A03

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

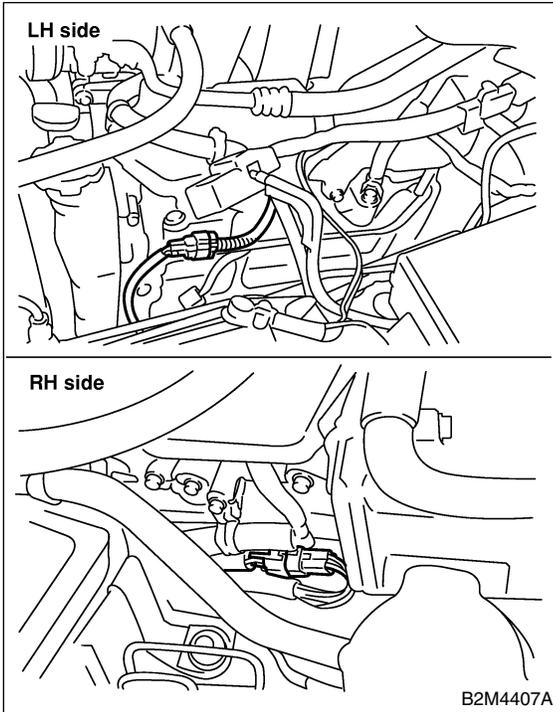
# FRONT CATALYTIC CONVERTER

Emission Control (Aux. Emission Control Devices)

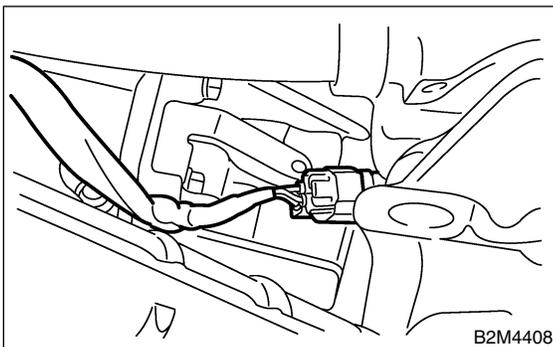
## 2. Front Catalytic Converter S140017

### A: REMOVAL S140017A18

- 1) Set the vehicle on the lift.
- 2) Remove battery.
- 3) Remove air cleaner case and air intake duct.  
<Ref. to IN(H6)-5, REMOVAL, Air Cleaner.> and  
<Ref. to IN(H6)-7, REMOVAL, Air Intake Duct.>
- 4) Disconnect front oxygen (A/F) sensor connectors.



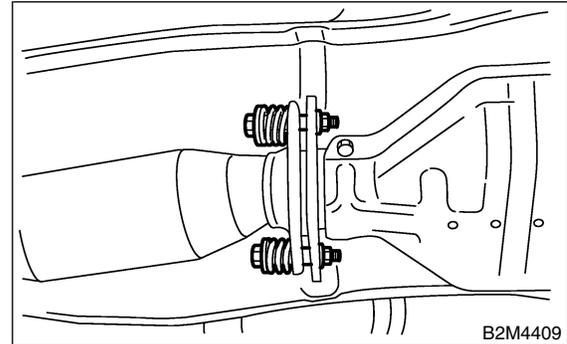
- 5) Lift-up the vehicle.
- 6) Remove under cover.
- 7) Remove front oxygen A/F sensor harness from the clips attached to both right and left cylinder head covers.
- 8) Disconnect connector from rear oxygen sensor connector.



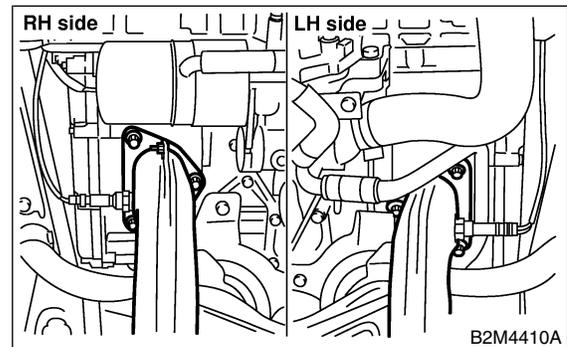
- 9) Separate front exhaust pipe from rear exhaust pipe.

#### CAUTION:

**Be careful, exhaust pipe is hot.**



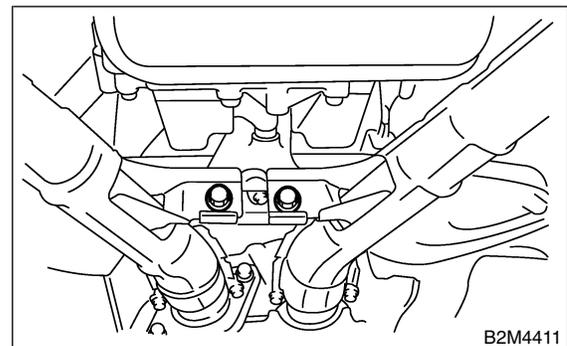
- 10) Remove bolts which hold front exhaust pipe onto cylinder heads.



- 11) Remove front exhaust pipe from hanger bracket.

#### CAUTION:

**Be careful not to pull down front exhaust pipe.**



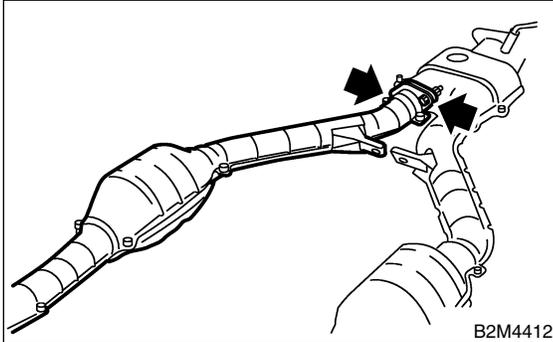
# FRONT CATALYTIC CONVERTER

Emission Control (Aux. Emission Control Devices)

12) Separate front catalytic converter (RH) from front exhaust pipe.

## NOTE:

The rear catalytic converter is integrated with front catalytic converter. Therefore, the procedure for removing rear catalytic converter is the same as the description above.



## B: INSTALLATION

S140017A11

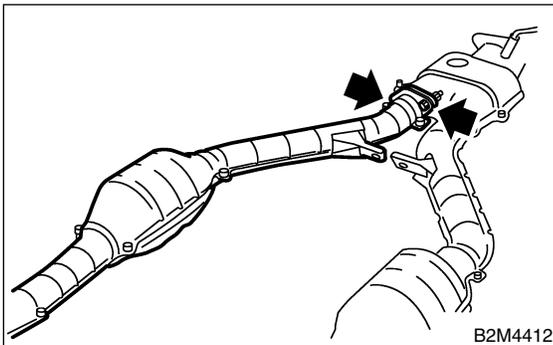
## NOTE:

Replace gaskets with new ones.

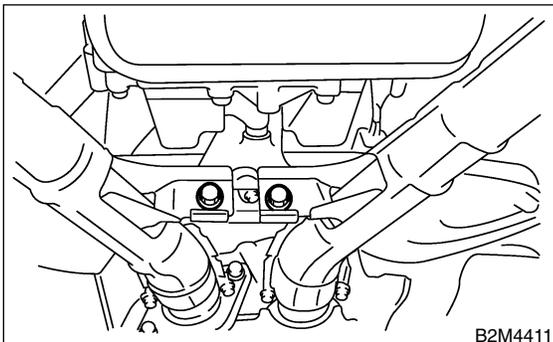
1) Install front catalytic converter (RH) to front exhaust pipe.

## Tightening torque:

**30 N·m (3.1 kgf-m, 22.4 ft-lb)**



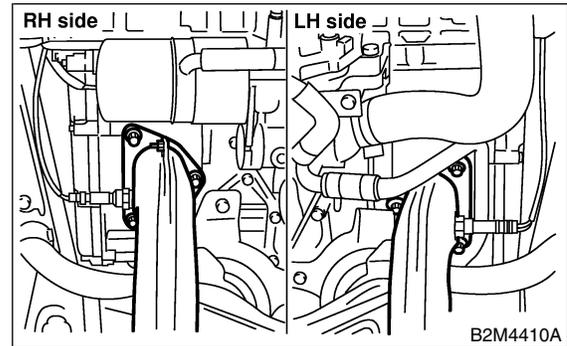
2) Install front exhaust pipe. And temporarily tighten bolt which installs front exhaust pipe to hanger bracket.



3) Tighten bolts which hold front exhaust pipe onto cylinder heads.

## Tightening torque:

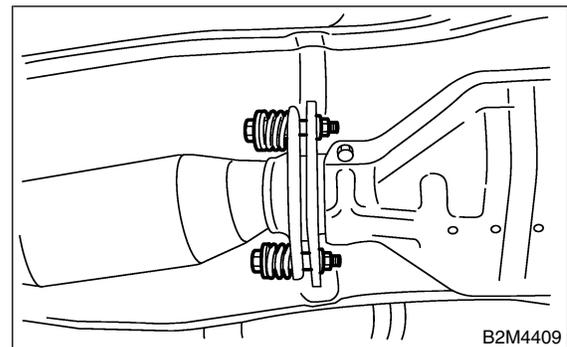
**30 N·m (3.1 kgf-m, 22.4 ft-lb)**



4) Install front exhaust pipe to rear exhaust pipe.

## Tightening torque:

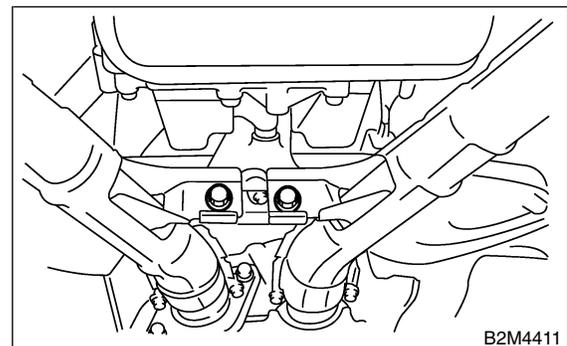
**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



5) Tighten bolt which holds front exhaust pipes to hanger bracket.

## Tightening torque:

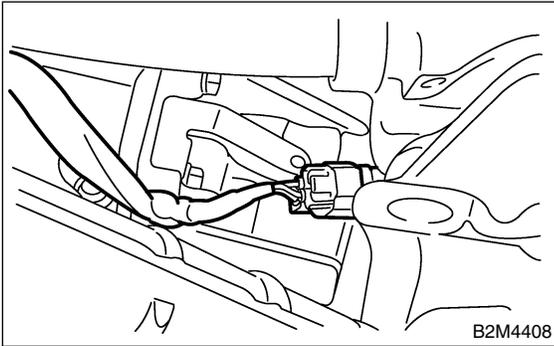
**35 N·m (3.6 kgf-m, 26.0 ft-lb)**



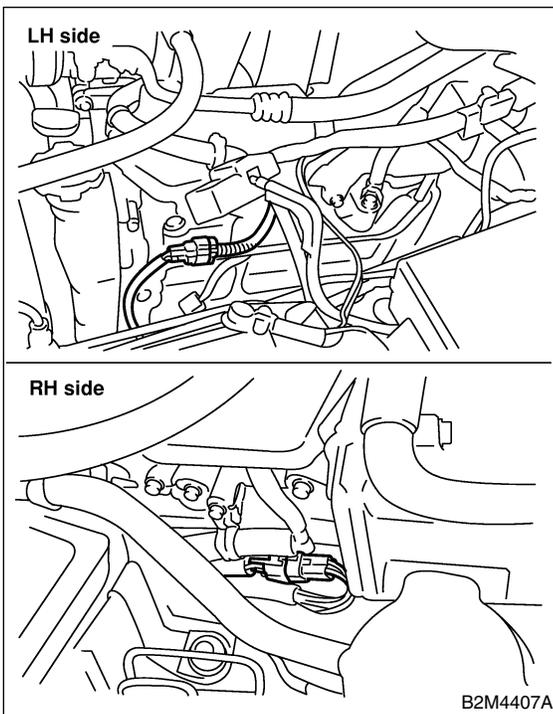
# FRONT CATALYTIC CONVERTER

Emission Control (Aux. Emission Control Devices)

- 6) Connect connector to rear oxygen sensor connector.



- 7) Install front oxygen A/F sensor harness to the clips attached to the cylinder head covers.
- 8) Install under cover.
- 9) Lower the vehicle.
- 10) Connect front oxygen (A/F) sensor connector.



- 11) Install air cleaner case and air intake duct.  
<Ref. to IN(H6)-5, INSTALLATION, Air Cleaner.>  
and <Ref. to IN(H6)-7, INSTALLATION, Air Intake Duct.>
- 12) Install battery.

## C: INSPECTION S140017A10

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

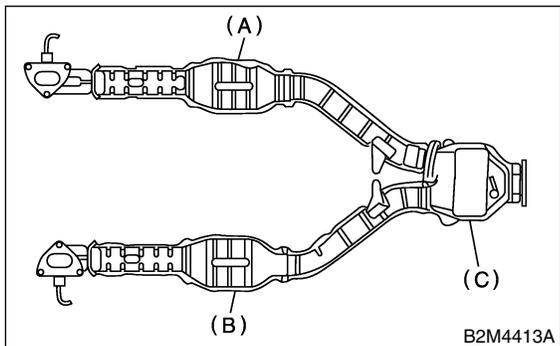
# REAR CATALYTIC CONVERTER

Emission Control (Aux. Emission Control Devices)

## 3. Rear Catalytic Converter S140036

### A: REMOVAL S140036A18

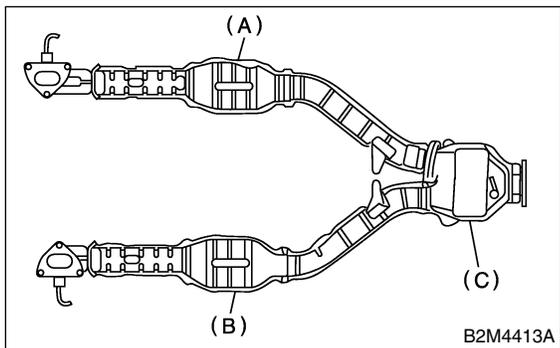
The front and rear catalytic converter are integrated into one unit. Therefore, the removal and installation procedures are the same as the those for the front catalytic converter. <Ref. to EC(H6)-3, REMOVAL, Front Catalytic Converter.>



- (A) Front catalytic converter RH
- (B) Front catalytic converter LH
- (C) Rear catalytic converter

### B: INSTALLATION S140036A11

The front and rear catalytic converter are integrated into one unit. Therefore, the removal and installation procedures are the same as the ones described under front catalytic converter. <Ref. to EC(H6)-4, INSTALLATION, Front Catalytic Converter.>



- (A) Front catalytic converter RH
- (B) Front catalytic converter LH
- (C) Rear catalytic converter

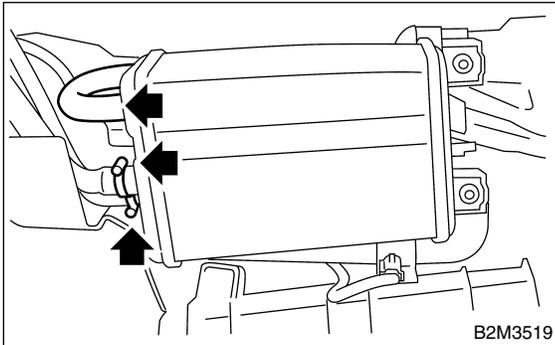
### C: INSPECTION S140036A10

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

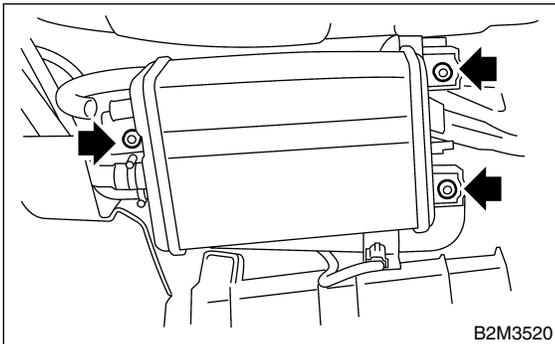
## 4. Canister S140037

### A: REMOVAL S140037A18

- 1) Lift-up the vehicle.
- 2) Loosen two clamps which hold two canister hoses, and disconnect evaporation three hoses from canister.



- 3) Remove canister from body.

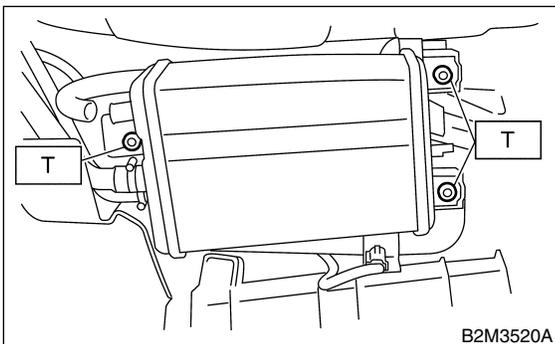


### B: INSTALLATION S140037A11

Install in the reverse order of removal.

#### **Tightening torque:**

**23 N·m (2.3 kgf-m, 17 ft-lb)**



### C: INSPECTION S140037A10

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

# PURGE CONTROL SOLENOID VALVE

Emission Control (Aux. Emission Control Devices)

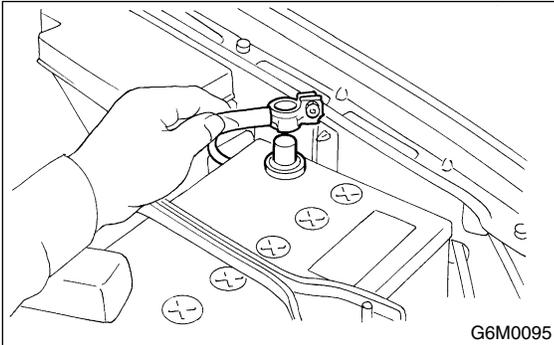
## 5. Purge Control Solenoid Valve

S140035

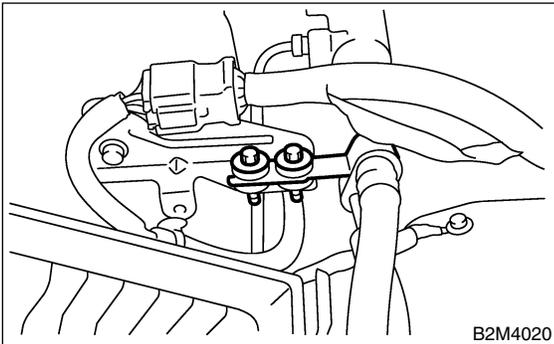
### A: REMOVAL

S140035A18

- 1) Disconnect battery ground cable.



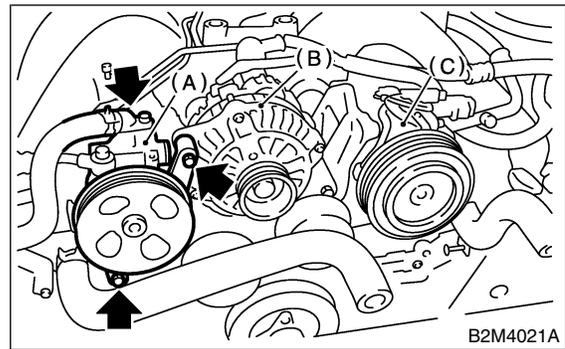
- 2) Remove power steering pump from bracket.
  - (1) Remove air intake duct and air cleaner case. <Ref. to IN(H6)-5, REMOVAL, Air Cleaner.> and <Ref. to IN(H6)-7, REMOVAL, Air Intake Duct.>
  - (2) Remove V-belt. <Ref. to ME(H6)-29, REMOVAL, V-belt.>
  - (3) Remove power steering oil pipe with bracket.



- (4) Remove bolts which install power steering pump bracket.

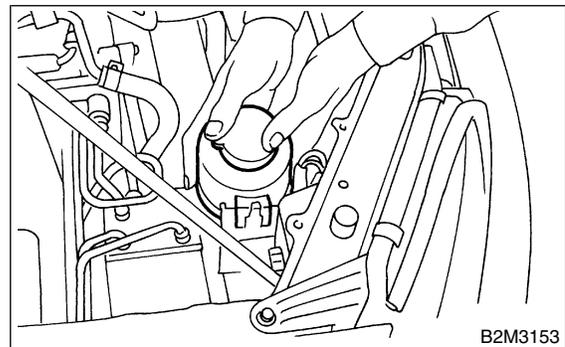
#### CAUTION:

Do not separate hose and pipe from the pump main unit.

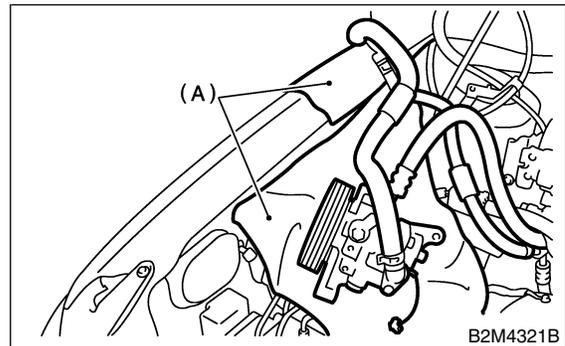


- (A) Power steering pump
- (B) Generator
- (C) A/C compressor

- (5) Remove power steering tank from the bracket by pulling it upward.



- (6) Place power steering pump on the right side wheel apron.

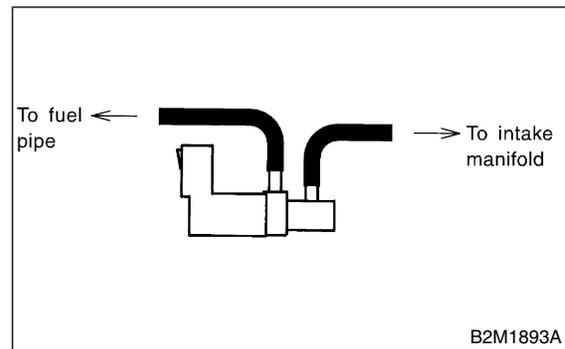
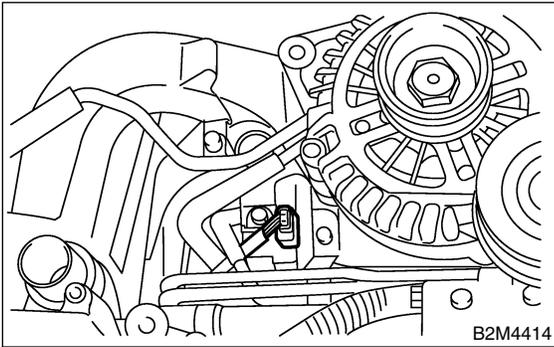


- (A) Cloth

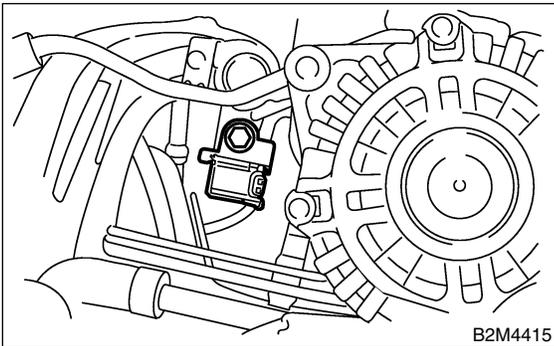
# PURGE CONTROL SOLENOID VALVE

Emission Control (Aux. Emission Control Devices)

3) Disconnect connector and hoses from purge control solenoid valve.



4) Remove bolt which installs purge control solenoid valve onto intake manifold.



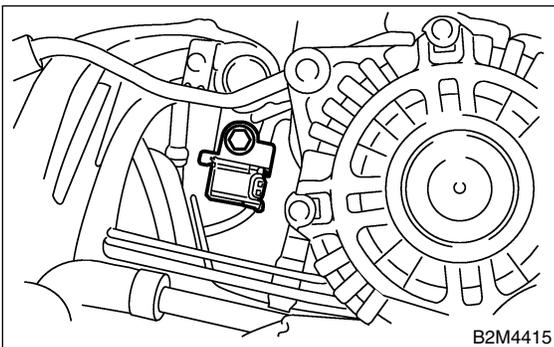
5) Take out purge control solenoid valve through the bottom of the intake manifold.

## B: INSTALLATION S140035A11

Install in the reverse order of removal.

### **Tightening torque:**

**19 N·m (1.9 kgf·m, 14 ft·lb)**



**CAUTION:**  
Carefully connect the evaporation hoses.

## C: INSPECTION S140035A10

Make sure hoses are not cracked or loose.

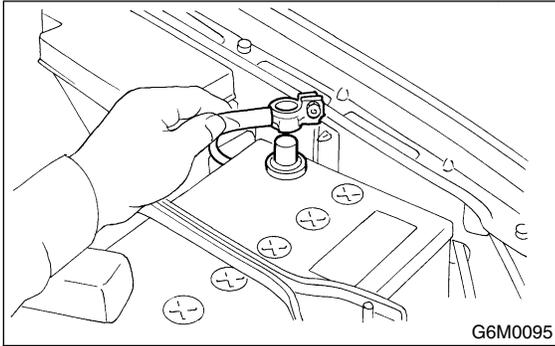
# EGR VALVE

Emission Control (Aux. Emission Control Devices)

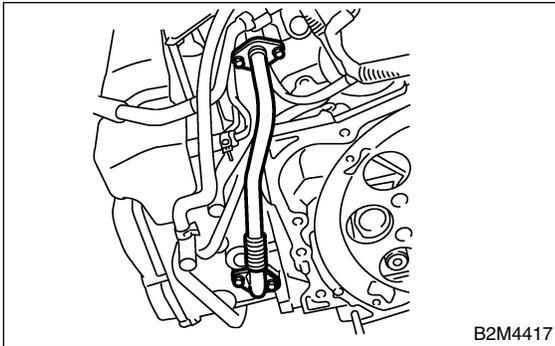
## 6. EGR Valve S140738

### A: REMOVAL S140738A18

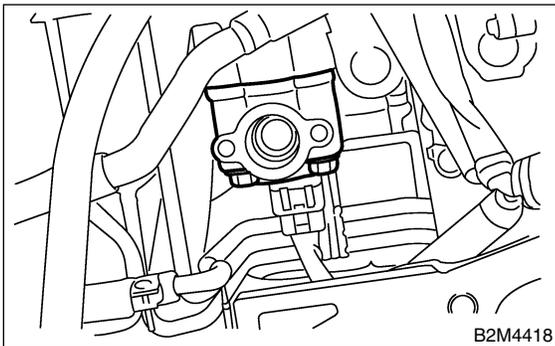
- 1) Disconnect battery ground cable.



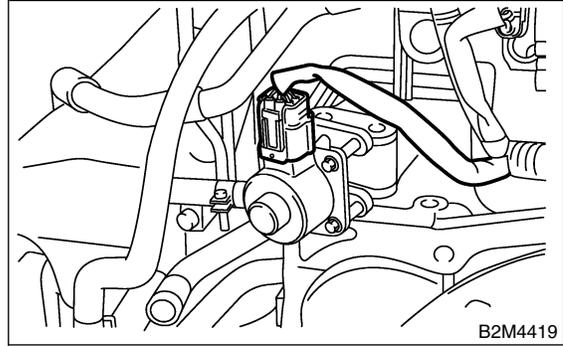
- 2) Remove air intake chamber. <Ref. to IN(H6)-6, REMOVAL, Air Intake Chamber.>
- 3) Remove starter. <Ref. to SC(H6)-6, REMOVAL, Starter.>
- 4) Remove EGR pipe from EGR valve and cylinder head.



- 5) Remove EGR valve from intake manifold.



- 6) Disconnect connector from EGR valve.

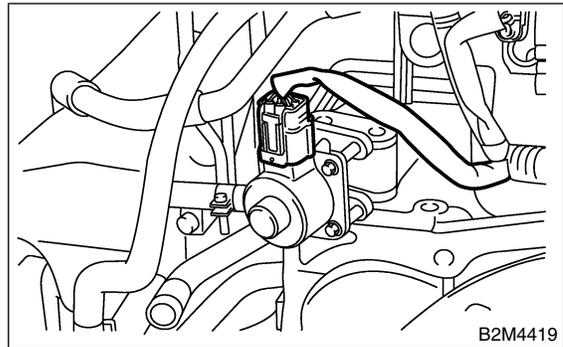


### B: INSTALLATION S140738A11

NOTE:

Replace old gaskets with new one.

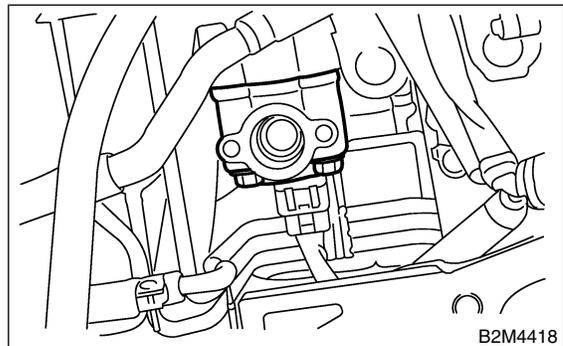
- 1) Connect connector EGR valve.



- 2) Install EGR valve to intake manifold.

**Tightening torque:**

**19 N·m (1.9 kgf·m, 14 ft·lb)**



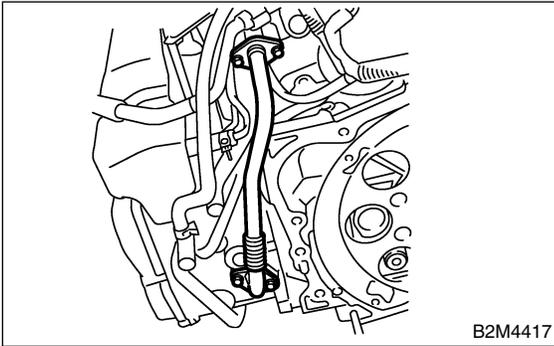
- 3) Install EGR pipe to EGR valve and cylinder head.

# EGR VALVE

Emission Control (Aux. Emission Control Devices)

## **Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



- 4) Install starter. <Ref. to SC(H6)-6, INSTALLATION, Starter.>
- 5) Install air intake chamber. <Ref. to IN(H6)-6, INSTALLATION, Air Intake Chamber.>
- 6) Connect battery ground cable.

## **C: INSPECTION** S140738A10

- 1) Check the EGR valve for proper valve movement.
- 2) Check the EGR pipe, etc., for blockages or cracks.

# MAIN FUEL LEVEL SENSOR

Emission Control (Aux. Emission Control Devices)

---

## 7. Main Fuel Level Sensor S140038

### A: REMOVAL S140038A18

For work procedures, refer to “FU(H6)” section.  
<Ref. to FU(H6)-73, REMOVAL, Fuel Lever Sensor.>

### B: INSTALLATION S140038A11

For work procedures, refer to “FU(H6)” section.  
<Ref. to FU(H6)-73, INSTALLATION, Fuel Lever Sensor.>

# FUEL TEMPERATURE SENSOR

Emission Control (Aux. Emission Control Devices)

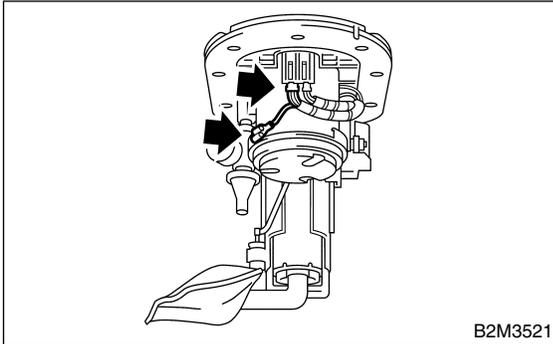
## 8. Fuel Temperature Sensor S140032

### A: REMOVAL S140032A18

#### NOTE:

Fuel temperature sensor is built in fuel pump assembly.

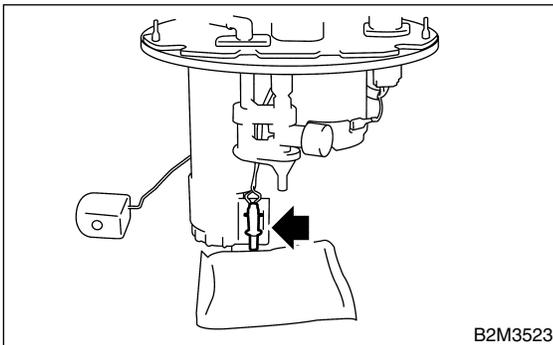
- 1) Remove fuel pump assembly. <Ref. to FU(H6)-70, REMOVAL, Fuel Pump.>
- 2) Disconnect connector from fuel pump bracket.



- 3) Remove fuel temperature sensor.

#### NOTE:

When replacing fuel temperature sensor, also replace fuel level sensor. <Ref. to FU(H6)-73, REMOVAL, Fuel Level Sensor.>

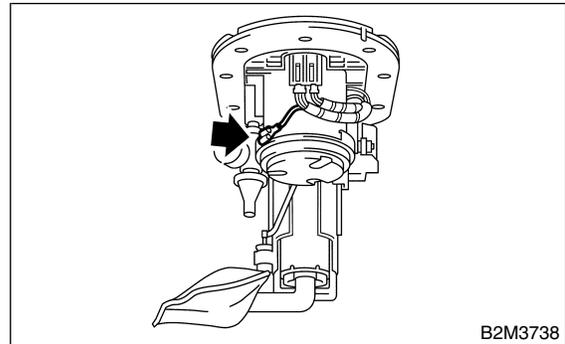


### B: INSTALLATION S140032A11

Install in the reverse order of removal.

#### WARNING:

- Ground cable must be connected.
- Spark may occur and ignite if fuel is nearby.



# SUB FUEL LEVEL SENSOR

Emission Control (Aux. Emission Control Devices)

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## 9. Sub Fuel Level Sensor S140029

### A: REMOVAL S140029A18

For work procedures, refer to “FU(H6)” section.  
<Ref. to FU(H6)-74, REMOVAL, Fuel Sub Level Sensor.>

### B: INSTALLATION S140029A11

For work procedures, refer to “FU(H6)” section.  
<Ref. to FU(H6)-75, INSTALLATION, Fuel Sub Level Sensor.>

# FUEL TANK PRESSURE SENSOR

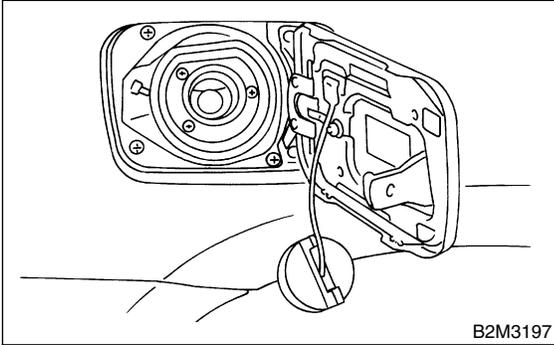
Emission Control (Aux. Emission Control Devices)

## 10. Fuel Tank Pressure Sensor

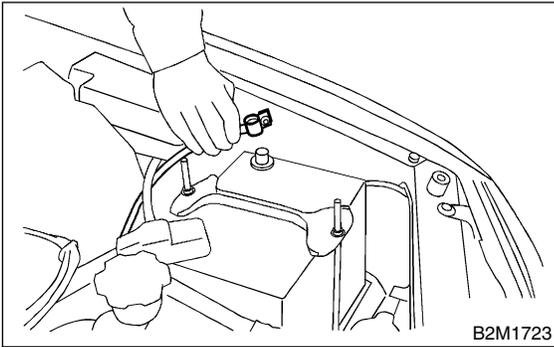
S140030

### A: REMOVAL S140030A18

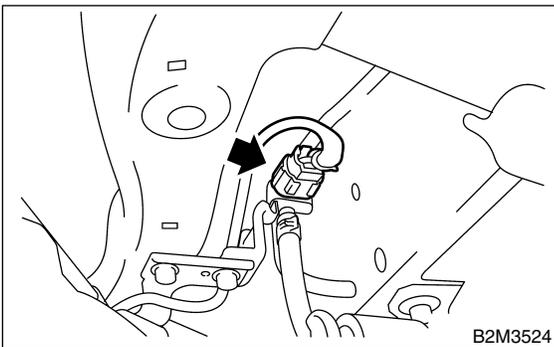
- 1) Set the vehicle on the lift.
- 2) Open fuel flap lid, and remove fuel filler cap.



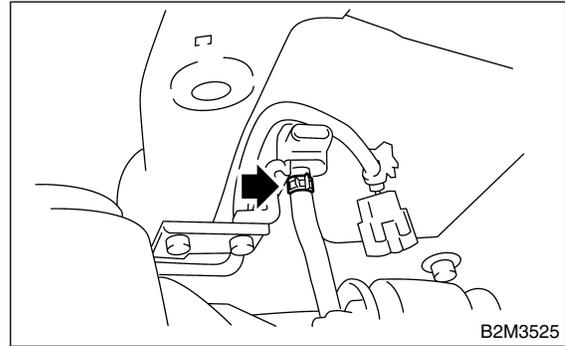
- 3) Disconnect battery ground cable.



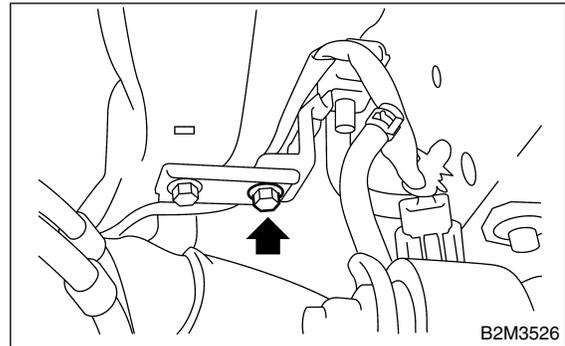
- 4) Lift-up the vehicle.
- 5) Disconnect connector from fuel tank pressure sensor.



- 6) Disconnect pressure hose from fuel tank pressure sensor.



- 7) Remove fuel tank pressure sensor.

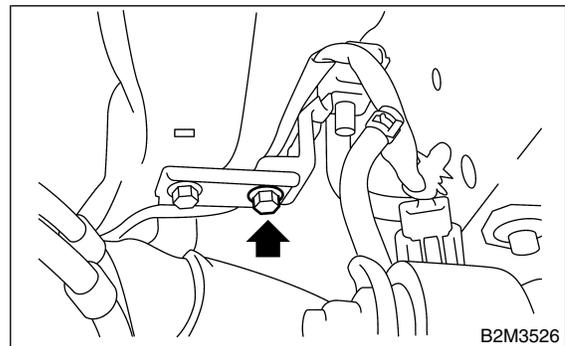


### B: INSTALLATION S140030A11

Install in the reverse order of removal.

**Tightening torque:**

**7.4 N·m (0.75 kgf·m, 5.4 ft·lb)**



### C: INSPECTION S140030A10

Make sure that hoses are not cracked or loose.

# PRESSURE CONTROL SOLENOID VALVE

Emission Control (Aux. Emission Control Devices)

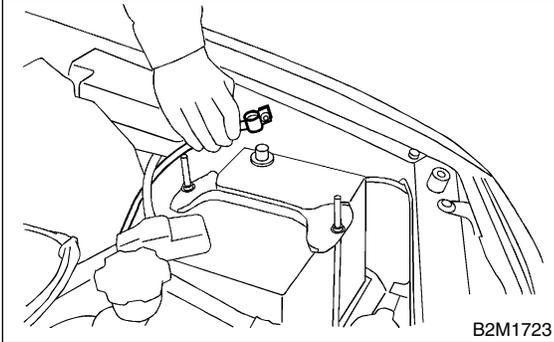
## 11. Pressure Control Solenoid Valve

S140031

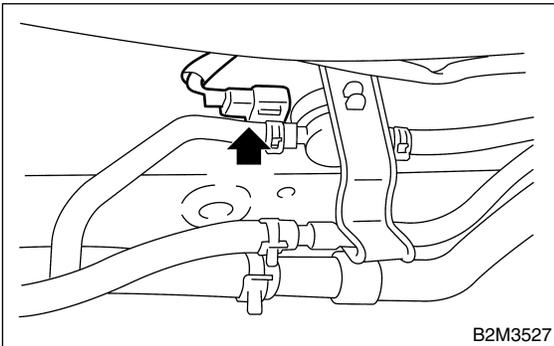
### A: REMOVAL

S140031A18

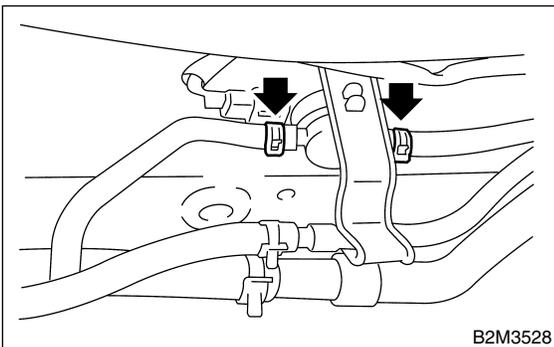
- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.



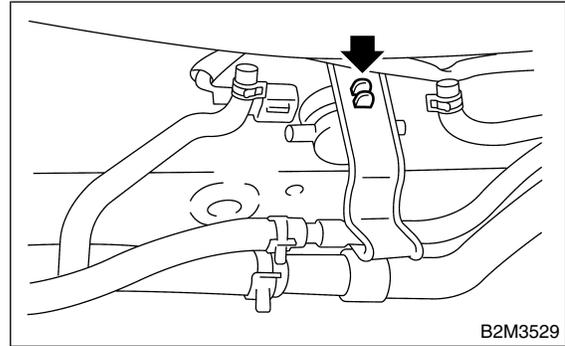
- 3) Lift-up the vehicle.
- 4) Disconnect connector from pressure control solenoid valve.



- 5) Disconnect two evaporation hoses from pressure control solenoid valve.



- 6) Remove pressure control solenoid valve from bracket.



### B: INSTALLATION

S140031A11

Install in the reverse order of removal.

### C: INSPECTION

S140031A10

Make sure that hoses are not cracked or loose.

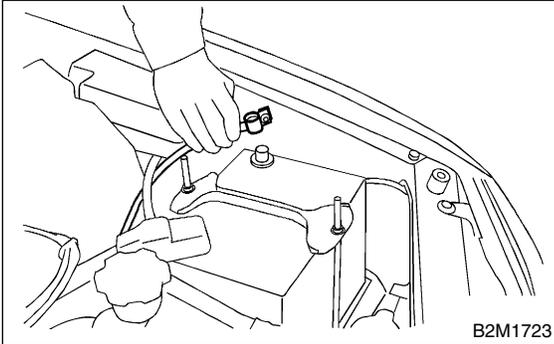
# DRAIN FILTER

Emission Control (Aux. Emission Control Devices)

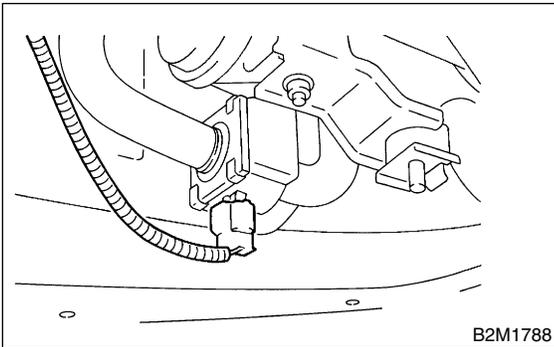
## 12. Drain Filter S140567

### A: REMOVAL S140567A18

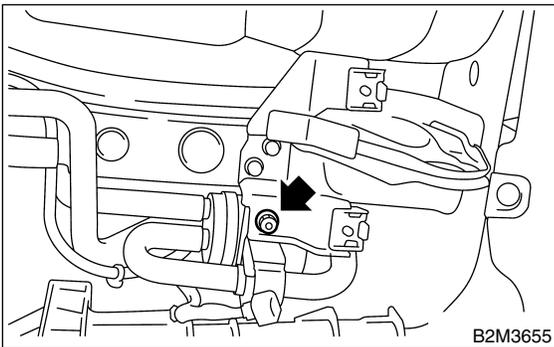
- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.



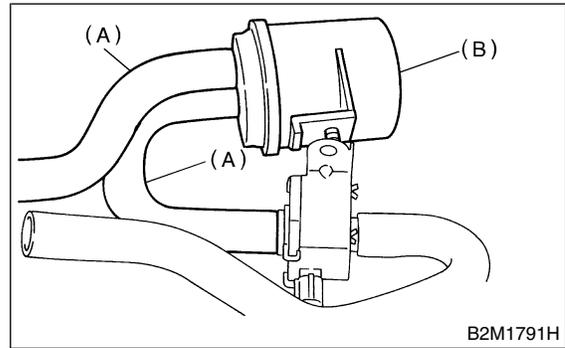
- 3) Lift-up the vehicle.
- 4) Remove canister. <Ref. to EC(H6)-7, REMOVAL, Canister.>
- 5) Disconnect connector from drain valve.



- 6) Remove nut which installs drain filter and drain valve brackets on body, and remove them as a unit.



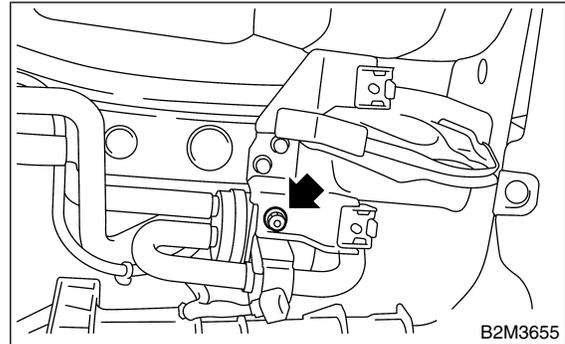
- 7) Disconnect evaporation hoses (A) and remove drain filter (B).



### B: INSTALLATION S140567A11

Install in the reverse order of removal.

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



### C: INSPECTION S140567A10

- 1) Make sure that all hoses are installed correctly.
- 2) Make sure that hoses are not cracked or loose.

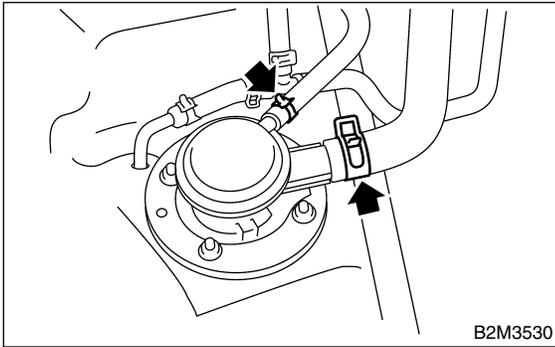
# VENT VALVE

Emission Control (Aux. Emission Control Devices)

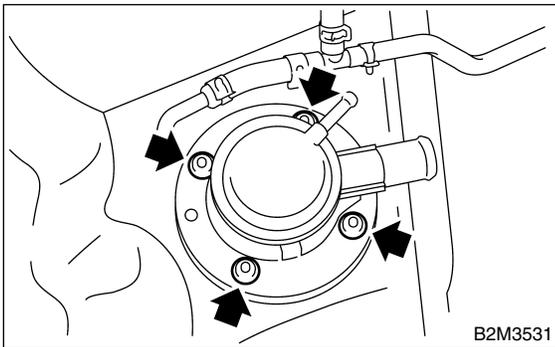
## 13. Vent Valve S140033

### A: REMOVAL S140033A18

- 1) Remove fuel tank. <Ref. to FU(H6)-53, REMOVAL, Fuel Tank.>
- 2) Move clips, and disconnect hoses from vent valve.



- 3) Remove nuts which install vent valve on fuel tank.



### B: INSTALLATION S140033A11

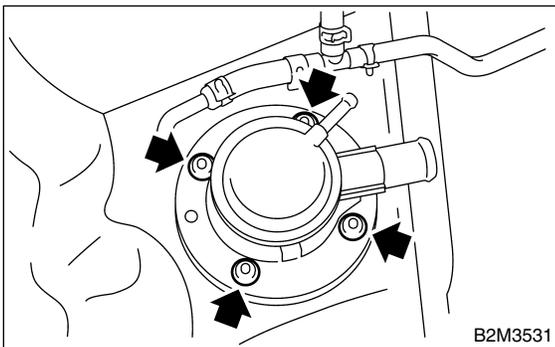
Install in the reverse order of removal.

NOTE:

Replace rubber seat with a new one.

**Tightening torque:**

**4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



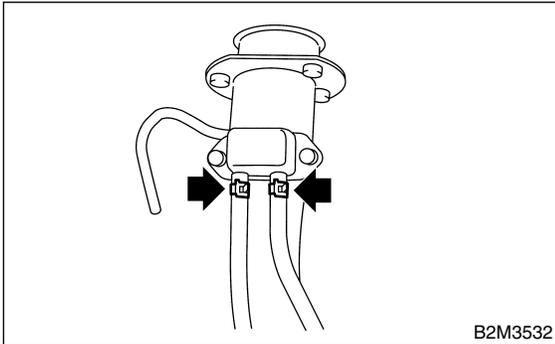
### C: INSPECTION S140033A10

Make sure that hoses are not cracked or loose.

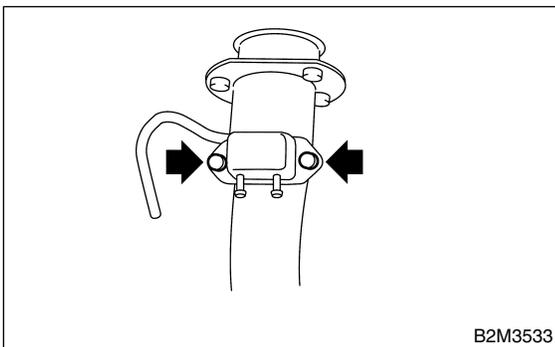
## 14. Shut Valve S140024

### A: REMOVAL S140024A18

- 1) Drain fuel from fuel tank. <Ref. to FU(H6)-50, DRAINING FUEL, OPERATION, Fuel.>
- 2) Remove fuel filler pipe. <Ref. to FU(H6)-62, REMOVAL, Fuel Filler Pipe.>
- 3) Disconnect evaporation hoses from shut valve.



- 4) Remove shut valve from fuel filler pipe.

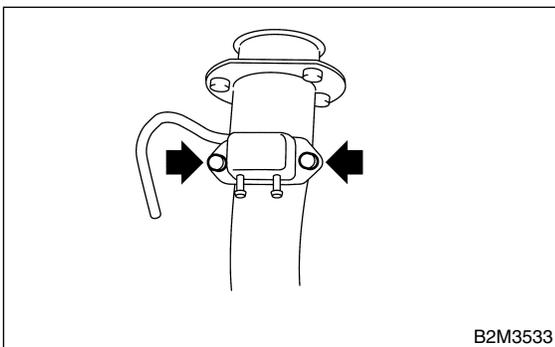


### B: INSTALLATION S140024A11

Install in the reverse order of removal.

#### **Tightening torque:**

**4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



### C: INSPECTION S140024A10

Make sure that hoses are not cracked or loose.

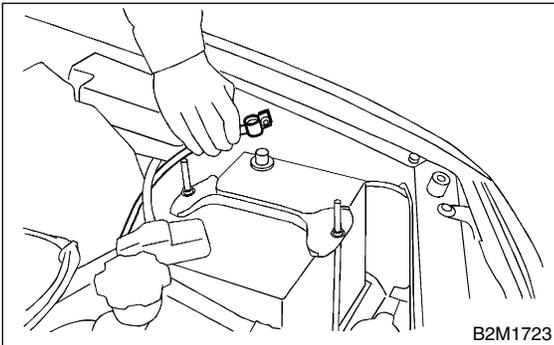
# DRAIN VALVE

Emission Control (Aux. Emission Control Devices)

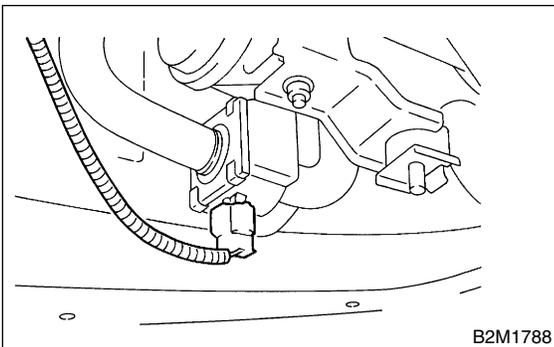
## 15. Drain Valve S140088

### A: REMOVAL S140088A18

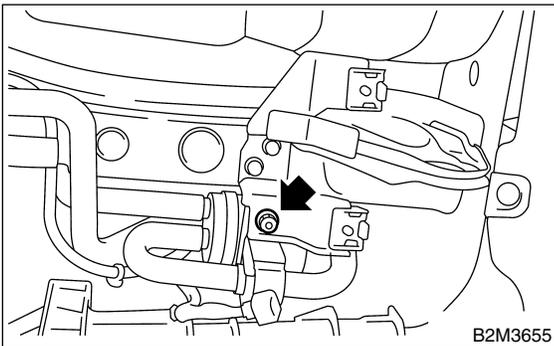
- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.



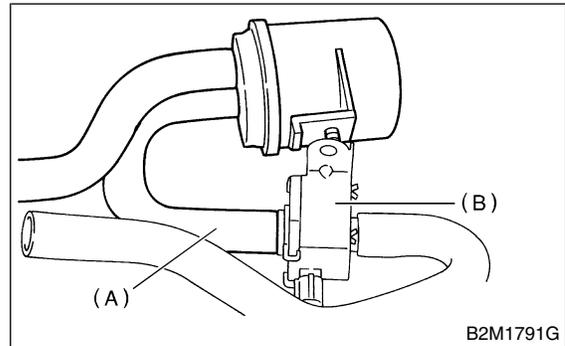
- 3) Lift-up the vehicle.
- 4) Remove canister. <Ref. to EC(H6)-7, REMOVAL, Canister.>
- 5) Disconnect connector from drain valve.



- 6) Remove bolt which installs air filter and drain valve brackets on body.



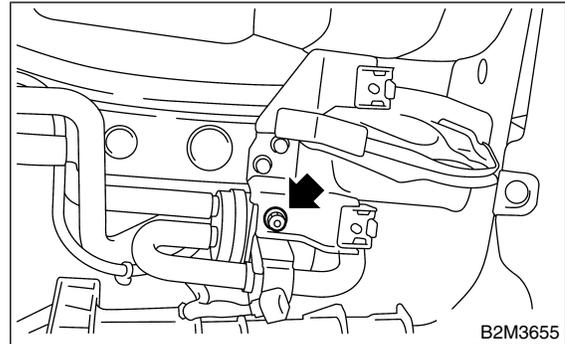
- 7) Disconnect evaporation hose (A) and remove drain valve (B).



### B: INSTALLATION S140088A11

Install in the reverse order of removal.

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



### C: INSPECTION S140088A10

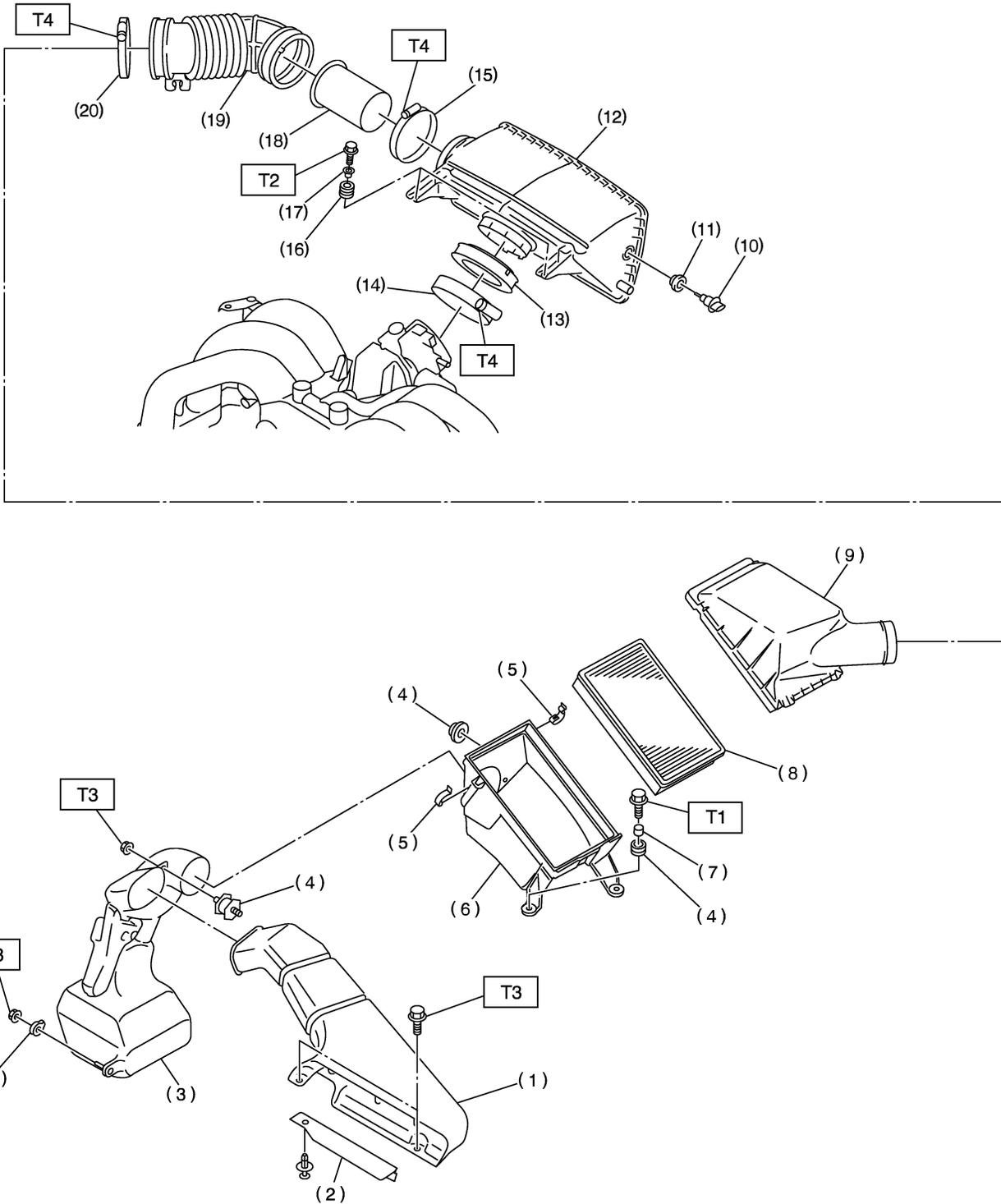
- 1) Make sure that all hoses are installed correctly.
- 2) Make sure that hoses are not cracked or loose.

# GENERAL DESCRIPTION

Intake (Induction)

## 1. General Description S144001

### A: COMPONENT S144001A05



B2M4400A

# GENERAL DESCRIPTION

Intake (Induction)

- (1) Air intake duct
- (2) Plate
- (3) Resonator chamber
- (4) Cushion
- (5) Clip
- (6) Air cleaner lower case
- (7) Spacer
- (8) Air cleaner element
- (9) Air cleaner upper cover

- (10) Intake air temperature sensor
- (11) Grommet
- (12) Air intake chamber
- (13) Grommet
- (14) Clamp
- (15) Clamp
- (16) Cushion
- (17) Spacer
- (18) Intake duct

- (19) Air intake boot
- (20) Clamp

---

***Tightening torque: N·m (kgf-m, ft-lb)***

***T1: 32 (3.3, 24)***

***T2: 6.4 (0.65 4.7)***

***T3: 7.5 (0.76, 5.5)***

***T4: 3 (0.3, 2.2)***

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## GENERAL DESCRIPTION

Intake (Induction)

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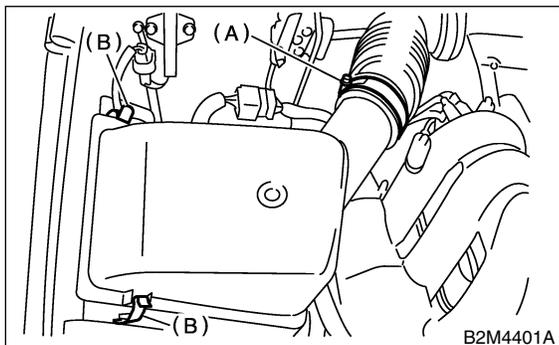
### **B: CAUTION** S144001A03

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect ground cable from battery.

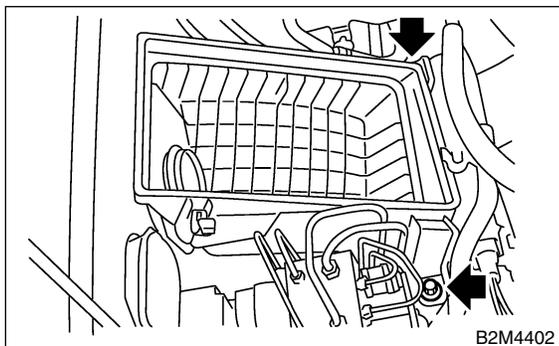
## 2. Air Cleaner S144087

### A: REMOVAL S144087A18

- 1) Loosen clamp (A), and separate air cleaner upper cover and air intake boot.
- 2) Remove the clip (B) above the air cleaner upper cover.



- 3) Remove air cleaner upper cover and air cleaner element.
- 4) Remove air cleaner lower case.

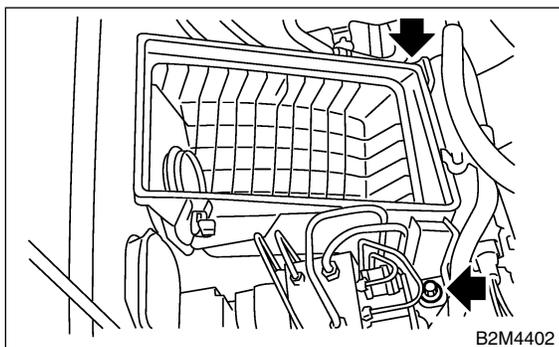


### B: INSTALLATION S144087A11

- 1) Install the air cleaner lower case element.

**Tightening torque:**

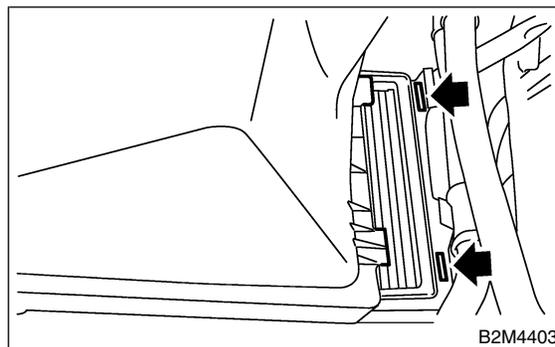
**32 N·m (3.3 kgf·m, 24 ft-lb)**



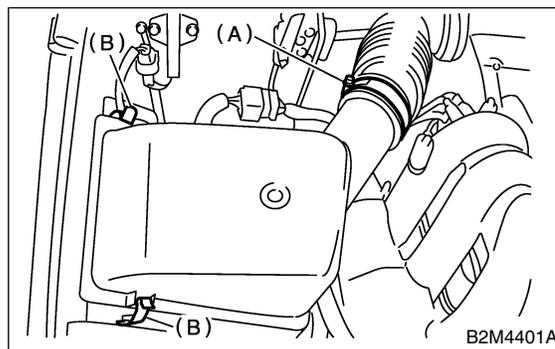
- 2) Set the air cleaner element.
- 3) Install the air cleaner upper cover.

**NOTE:**

Before installing air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure upper cover to lower case.



- 4) Install the clip (B) above the air cleaner upper cover.
- 5) Tighten clamp (A), and connect air intake boot and air cleaner upper cover.



### C: INSPECTION S144087A10

Replace if excessively damaged or dirty.

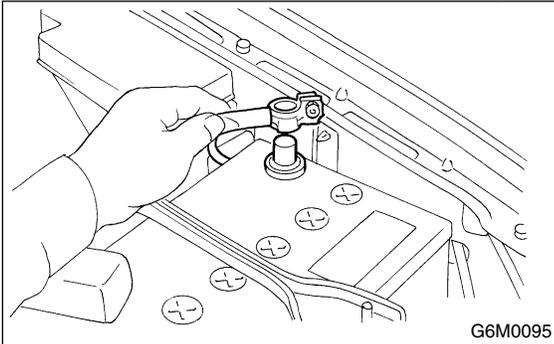
# AIR INTAKE CHAMBER

Intake (Induction)

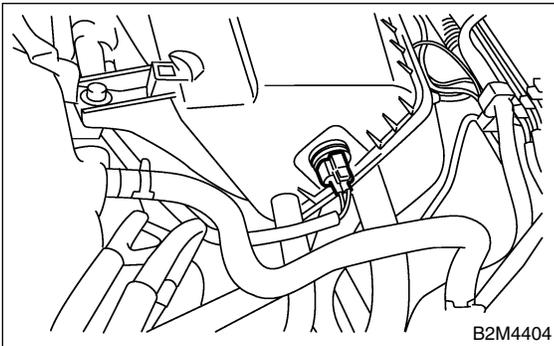
## 3. Air Intake Chamber S144757

### A: REMOVAL S144757A18

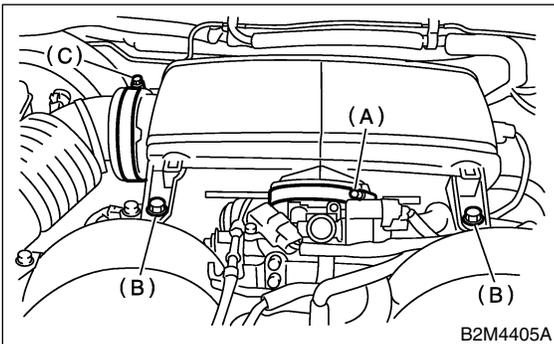
- 1) Disconnect battery ground cable.



- 2) Disconnect connector from intake air temperature sensor.



- 3) Loosen clamp (A) which connects air intake chamber to throttle body.
- 4) Remove bolts (B) which install air intake chamber to stays.
- 5) Loosen clamp (C) which connects air intake chamber to air intake boot.



- 6) Disconnect hoses from air intake chamber.
- 7) Remove air intake chamber.

### B: INSTALLATION S144757A11

Install in the reverse order of removal.

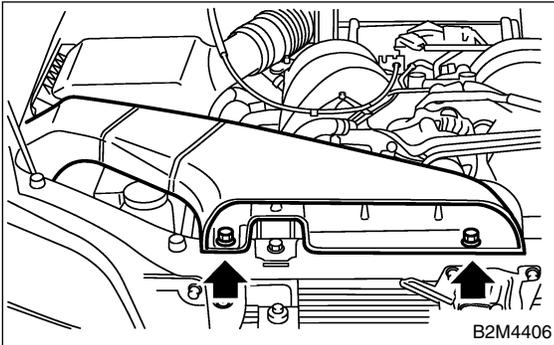
### C: INSPECTION S144757A10

Inspect for cracks and loose connections.

## 4. Air Intake Duct S144566

### A: REMOVAL S144566A18

1) Remove bolts which install air intake duct on the front side of body.



### B: INSTALLATION S144566A11

Install in the reverse order of removal.

#### **Tightening torque:**

**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**

### C: INSPECTION S144566A10

Inspect for cracks and loose connections. Check that no foreign objects are mixed in the air intake duct.

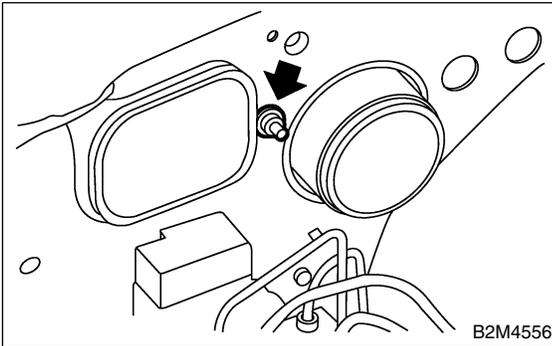
# RESONATOR CHAMBER

Intake (Induction)

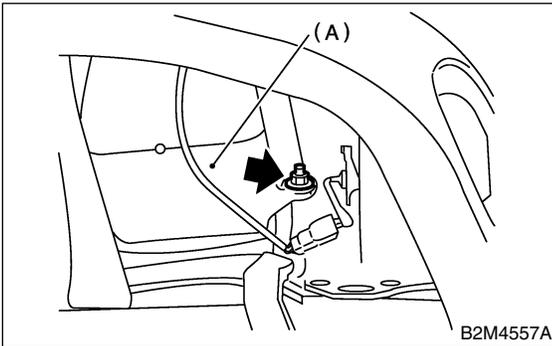
## 5. Resonator Chamber S144639

### A: REMOVAL S144639A18

- 1) Set vehicle on a lift.
- 2) Remove air intake duct. <Ref. to IN(H6)-7, REMOVAL, Air Intake Duct.>
- 3) Remove air cleaner lower case. <Ref. to IN(H6)-5, REMOVAL, Air Cleaner.>
- 4) Remove the resonator chamber mounting bolt on the right of engine compartment.



- 5) Remove the front right tire, and lift the vehicle.
- 6) Remove front mudguard RH.
- 7) Remove the resonator chamber (A) from the inside front fender.



### B: INSTALLATION S144639A11

Install in the reverse order of removal.

#### **Tightening torque:**

**7.5 N·m (0.76 kgf·m, 5.5 ft·lb)**

### C: INSPECTION S144639A10

Inspect for cracks and loose connections. Check that no foreign objects and mixed in the resonator chamber.

# GENERAL DESCRIPTION

Mechanical

## 1. General Description S143001

### A: SPECIFICATIONS S143001E49

Engine	Type		Horizontally opposed, liquid cooled, 6-cylinder, 4-stroke gasoline engine
	Valve arrangement		Chain driven, double over-head camshaft, 4-valve/cylinder
	Bore x Stroke		mm (in) 89.2 x 80 (3.51 x 3.150)
	Displacement		cm <sup>3</sup> (cu in) 3,000 (183.1)
	Compression ratio		10.7
	Compression pressure (350 rpm and fully open throttle)		kPa (kg/cm <sup>2</sup> , psi) 1,275 — 1,471 (13.0 — 15.0, 185 — 213)
	Number of piston rings		Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening	5° BTDC
		Closing	55° ABDC
	Exhaust valve timing	Opening	52° BBDC
		Closing	0° ATDC
	Valve clearance	Intake	mm (in) 0.20 <sup>+0.04</sup> / <sub>-0.06</sub> (0.0079 <sup>+0.0016</sup> / <sub>-0.0024</sub> )
		Exhaust	mm (in) 0.25±0.05 (0.0098±0.0020)
	Idle speed [At "P" or "N" position]		rpm 600±50 (No load) 700±50 (A/C switch ON)
Firing order		1 → 6 → 3 → 2 → 5 → 4	
Ignition timing		BTDC/rpm 10°±8°/600	

**NOTE:**

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter US: Undersize OS: Oversize

Camshaft	Bend limit		0.020 mm (0.0008 in)	
	Thrust clearance	Intake	STD	0.075 — 0.135 mm (0.0030 — 0.0053 in)
			Limit	0.155 mm (0.0061 in)
		Exhaust	STD	0.048 — 0.108 mm (0.0019 — 0.0043 in)
			Limit	0.130 mm (0.0051 in)
	Cam lobe height	Intake	STD	46.05 — 46.15 mm (1.8130 — 1.8169 in)
			Limit	45.95 mm (1.8091 in)
		Exhaust	STD	45.55 — 45.65 mm (1.7933 — 1.7972 in)
			Limit	45.45 mm (1.7894 in)
	Camshaft journal O.D.	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)	
		Center & Rear	27.946 — 27.963 mm (1.1002 — 1.1009 in)	
	Camshaft journal hole I.D.	Front	38.000 — 38.018 mm (1.4961 — 1.4968 in)	
		Center & Rear	28.000 — 28.018 mm (1.1024 — 1.1031 in)	
	Oil clearance	STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)	
Limit		0.10 mm (0.0039 in)		
Cylinder head	Surface warpage limit		0.05 mm (0.0020 in)	
	Surface grinding limit		0.1 mm (0.004 in)	
	Standard height		124 mm (4.88 in)	
Valve seat	Refacing angle		90°	
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter		5.500 — 5.512 mm (0.2165 — 0.2170 in)	
	Protrusion above head		12.3 — 12.7 mm (0.484 — 0.500 in)	

# GENERAL DESCRIPTION

Mechanical

Valve	Head edge thickness	Intake	STD	1.0 mm (0.039 in)
			Limit	0.8 mm (0.315 in)
		Exhaust	STD	1.2 mm (0.047 in)
			Limit	0.8 mm (0.315 in)
	Stem diameter		Intake	5.455 — 5.470 mm (0.2148 — 0.2154 in)
			Exhaust	5.455 — 5.460 mm (0.2148 — 0.2150 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
Overall length		Intake	103.5 mm (4.07 in)	
		Exhaust	103.2 mm (4.06 in)	
Valve spring	Free length		46.79 mm (1.8421 in)	
	Squareness		2.5°, 2.0 mm (0.079 in)	
	Tension/spring height	Set	186.2 — 205.8 N (18.99 — 20.99 kgf, 41.9 — 46.3 lb)/37.4 mm (1.472 in)	
Lift		446.5 — 493.5 N (45.54 — 50.34 kgf, 100.3 — 110.9 lb)/27.5 mm (1.083 in)		
Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Cylinder bore	STD	A	89.205 — 89.215 mm (3.5120 — 3.5124 in)
			B	89.195 — 89.205 mm (3.5116 — 3.5120 in)
	Taper		Limit	0.050 mm (0.0020 in)
	Out-of-roundness		Limit	0.050 mm (0.0020 in)
	Piston clearance		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit			0.050 mm (0.0020 in)	
Enlarging (boring) limit			0.5 mm (0.020 in)	
Piston	Outer diameter	STD	A	89.185 — 89.195 mm (3.5112 — 3.5116 in)
			B	89.175 — 89.185 mm (3.5108 — 3.5112 in)
		0.25 mm (0.0098 in) OS		89.425 — 89.435 mm (3.5207 — 3.5211 in)
		0.50 mm (0.0197 in) OS		89.675 — 89.685 mm (3.5305 — 3.5309 in)
Standard inner diameter of piston pin hole			22.000 — 22.006 mm (0.8661 — 0.8664 in)	
Piston pin	Outer diameter		21.994 — 22.000 mm (0.8659 — 0.8661 in)	
	Standard clearance between piston pin and hole in piston		0.004 — 0.008 mm (0.0002 — 0.0003 in)	
	Degree of fit		Piston pin must be fitted into position with thumb at 20°C (68°F).	
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.35 mm (0.0079 — 0.0138 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.35 — 0.50 mm (0.0138 — 0.0197 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.60 mm (0.0079 — 0.0236 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
Second ring		STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)	
		Limit	0.15 mm (0.0059 in)	
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance	STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)	
		Limit	0.4 mm (0.016 in)	

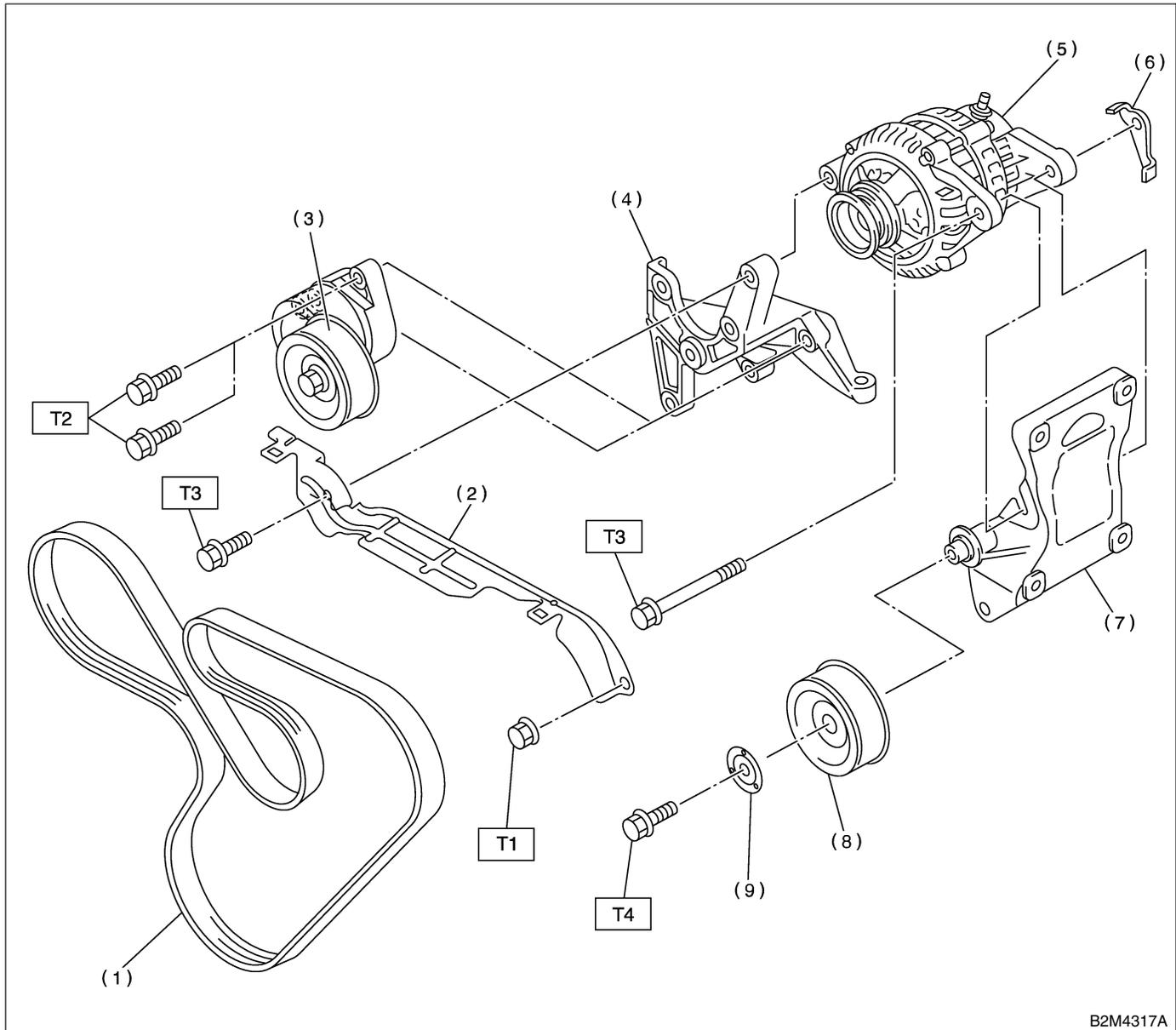
# GENERAL DESCRIPTION

Mechanical

Connecting rod bearing	Oil clearance		STD	0.022 — 0.052 mm (0.0009 — 0.0020 in)
			Limit	0.065 mm (0.0026 in)
	Thickness at center portion		STD	1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US	1.510 — 1.513 mm (0.0594 — 0.0596 in)
			0.05 mm (0.0020 in) US	1.520 — 1.523 mm (0.0598 — 0.0600 in)
		0.25 mm (0.0098 in) US	1.620 — 1.623 mm (0.0638 — 0.0639 in)	
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)
Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.250 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0446 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #3, #5, #7	STD	63.992 — 64.008 mm (2.5194 — 2.5200 in)
			0.03 mm (0.0012 in) US	63.962 — 63.978 mm (2.5182 — 2.5188 in)
			0.05 mm (0.0020 in) US	63.942 — 63.958 mm (2.5174 — 2.5180 in)
			0.25 mm (0.0098 in) US	63.742 — 63.758 mm (2.5095 — 2.5102 in)
		#2, #4, #6	STD	63.992 — 64.008 mm (2.5194 — 2.5200 in)
			0.03 mm (0.0012 in) US	63.962 — 63.978 mm (2.5182 — 2.5188 in)
			0.05 mm (0.0020 in) US	63.942 — 63.958 mm (2.5174 — 2.5180 in)
			0.25 mm (0.0098 in) US	63.742 — 63.758 mm (2.5095 — 2.5102 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
Oil clearance		STD	0.015 — 0.030 mm (0.0006 — 0.0012 in)	
		Limit	0.050 mm (0.0020 in)	
Crankshaft bearing	#1, #3, #5, #7	STD	1.992 — 2.005 mm (0.0784 — 0.0789 in)	
		0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)	
		0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)	
		0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)	
	#2, #4, #5	STD	1.996 — 2.000 mm (0.0786 — 0.0787 in)	
		0.03 mm (0.0012 in) US	2.019 — 2.020 mm (0.0795 — 0.0795 in)	
		0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)	
		0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)	

## B: COMPONENT S143001A05

### 1. V-BELT S143001A0508



- |                                 |                         |
|---------------------------------|-------------------------|
| (1) V-belt                      | (7) A/C compressor stay |
| (2) Belt cover                  | (8) Idler pulley        |
| (3) Belt tensioner              | (9) Idler pulley cover  |
| (4) Power steering pump bracket |                         |
| (5) Generator                   |                         |
| (6) Generator plate             |                         |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 20 (2.0, 14)**

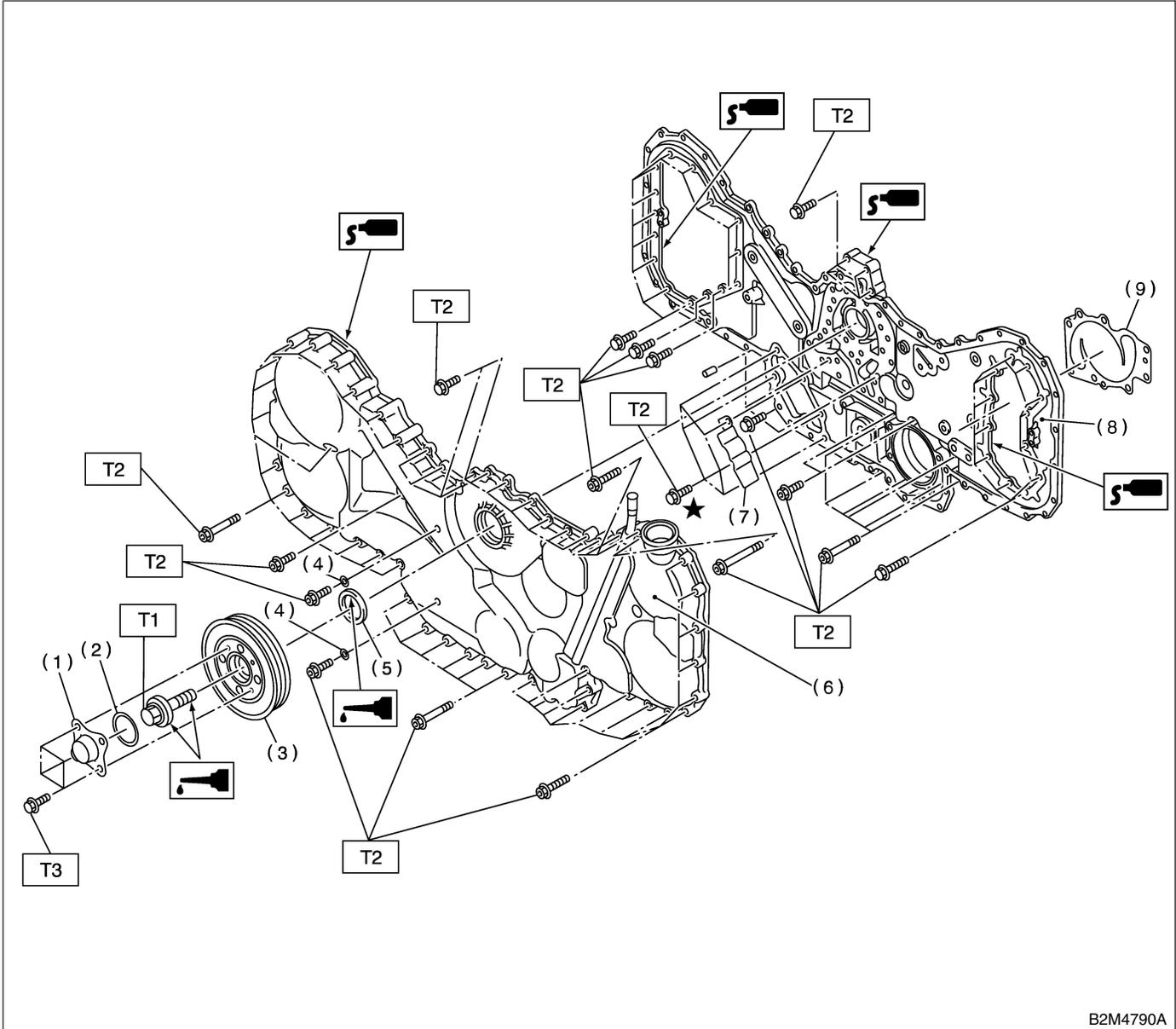
**T3: 25 (2.5, 18)**

**T4: 33 (3.4, 25)**

# GENERAL DESCRIPTION

Mechanical

## 2. TIMING CHAIN COVER S143001A0509



- |                        |                       |
|------------------------|-----------------------|
| (1) Crank pulley cover | (7) Baffle            |
| (2) O-ring             | (8) Rear chain cover  |
| (3) Crank pulley       | (9) Water pump gasket |
| (4) Sealing washer     |                       |
| (5) Oil seal           |                       |
| (6) Front chain cover  |                       |

**Tightening torque: N·m (kgf·m, ft·lb)**

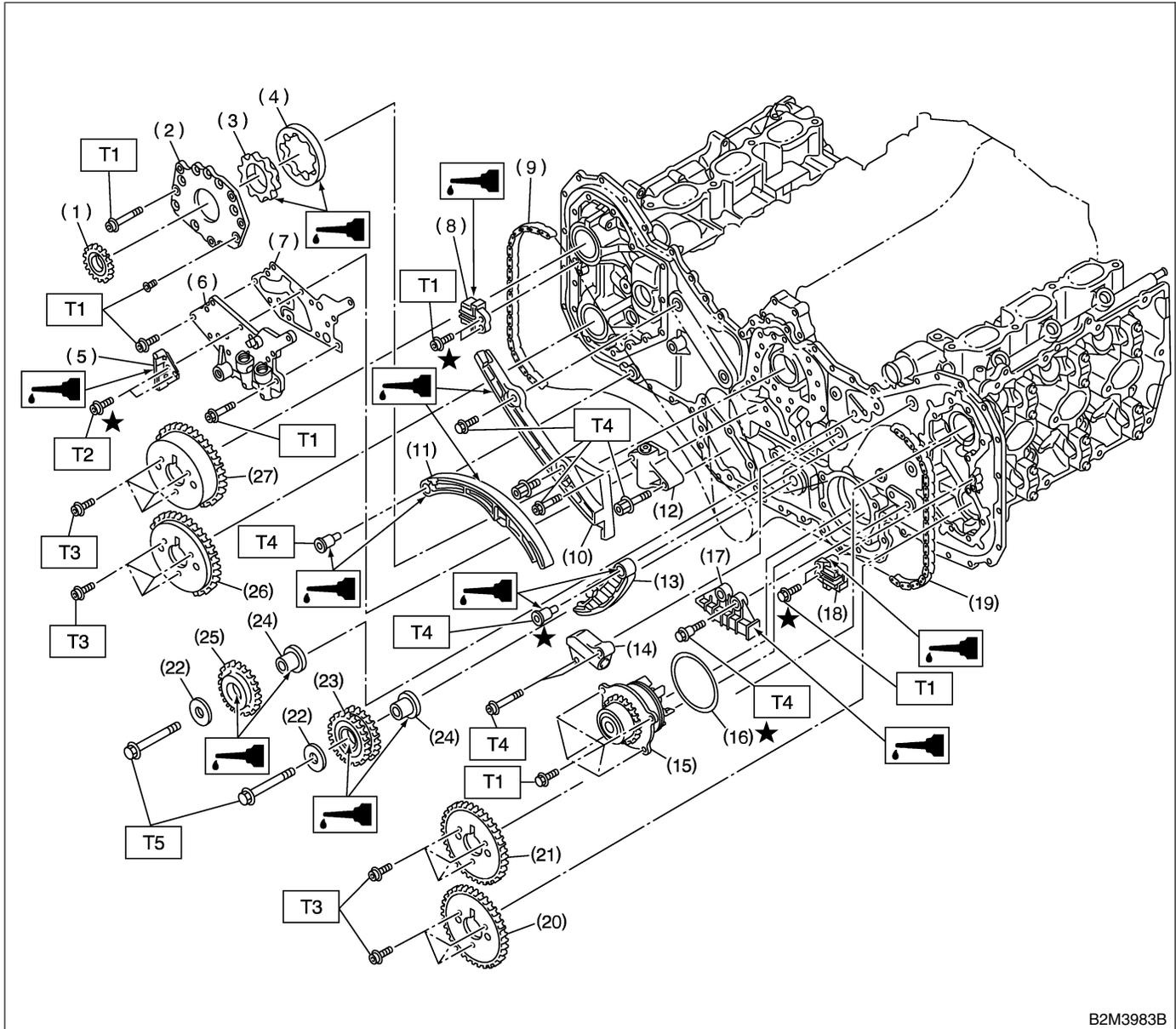
**T1: Refer to ME(H6)-39, Crankshaft Pulley.**

**T2: Refer to ME(H6)-40, Front Chain Cover and ME(H6)-49, Rear Chain Cover.**

**T3: 6.4 (0.65, 4.7)**

**ME(H6)-6**

## 3. TIMING BELT S143001A0501



B2M3983B

- |                                              |                                              |                                |
|----------------------------------------------|----------------------------------------------|--------------------------------|
| (1) Crank sprocket                           | (13) Chain tensioner lever (LH)              | (25) Idler sprocket (Upper)    |
| (2) Oil pump cover                           | (14) Chain tensioner (LH)                    | (26) Exhaust cam sprocket (RH) |
| (3) Inner rotor                              | (15) Water pump                              | (27) Intake cam sprocket (RH)  |
| (4) Outer rotor                              | (16) O-ring                                  |                                |
| (5) Chain guide (Center)                     | (17) Chain guide (LH)                        |                                |
| (6) Relief valve case                        | (18) Chain guide (Left-hand between<br>cams) |                                |
| (7) Relief valve case gasket                 | (19) Timing chain (LH)                       |                                |
| (8) Chain guide (Right-hand<br>between cams) | (20) Exhaust cam sprocket (LH)               |                                |
| (9) Timing chain (RH)                        | (21) Intake cam sprocket (LH)                |                                |
| (10) Chain guide (RH)                        | (22) Idler sprocket plate                    |                                |
| (11) Chain tensioner lever (RH)              | (23) Idler sprocket (Lower)                  |                                |
| (12) Chain tensioner (RH)                    | (24) Idler sprocket color                    |                                |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.4 (0.64, 4.7)**

**T2: 7.8 (0.80, 5.8)**

**T3: 13 (1.3, 9.4)**

**T4: 16 (1.6, 11.6)**

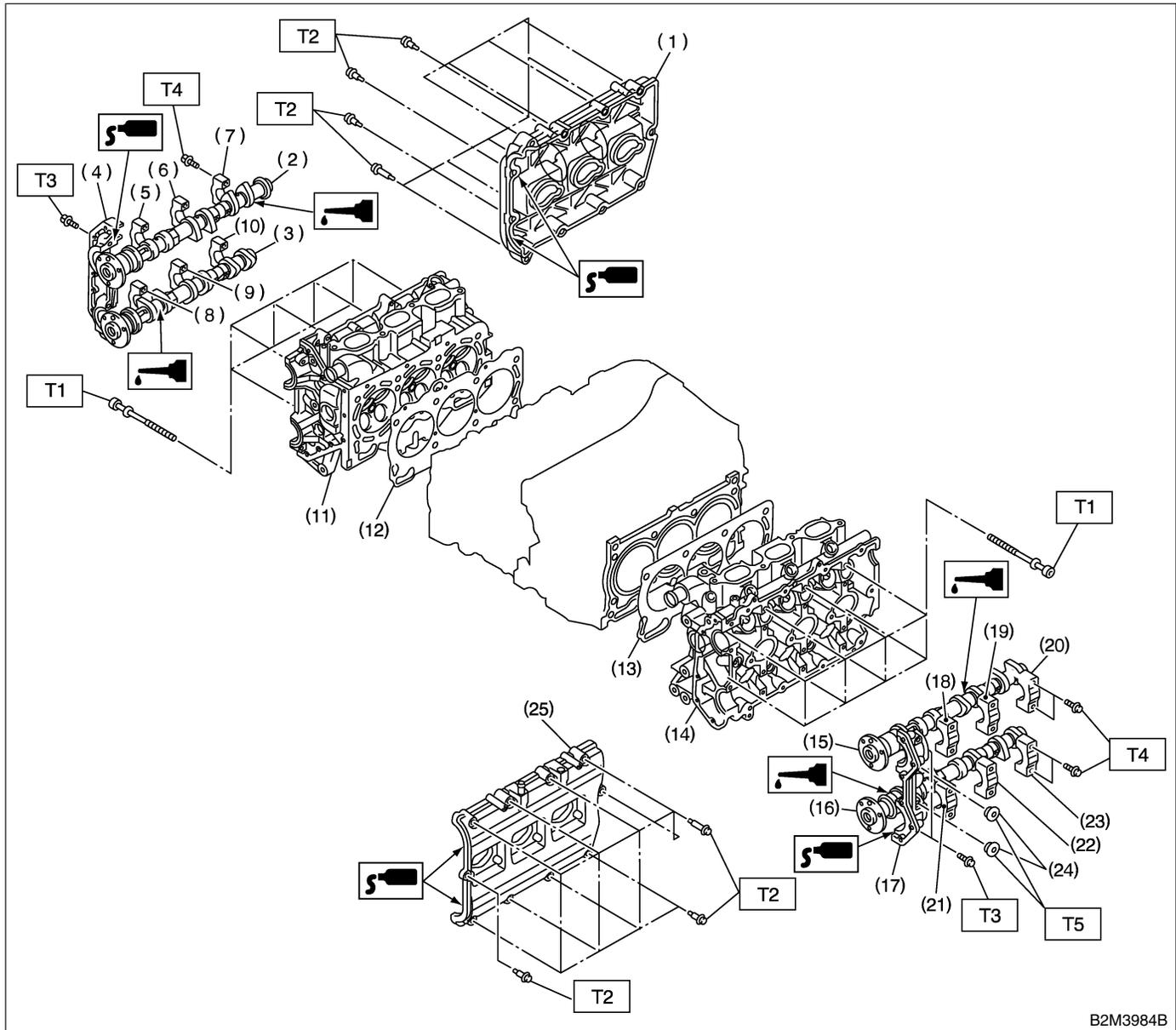
**T5: 69 (7.0, 50.6)**

# GENERAL DESCRIPTION

Mechanical

## 4. CYLINDER HEAD AND CAMSHAFT

S143001A0502



B2M3984B

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| (1) Rocker cover (RH)                | (12) Cylinder head gasket (RH)        |
| (2) Intake camshaft (RH)             | (13) Cylinder head gasket (LH)        |
| (3) Exhaust camshaft (RH)            | (14) Cylinder head (LH)               |
| (4) Front camshaft cap (RH)          | (15) Intake camshaft (LH)             |
| (5) Intake camshaft cap (Front RH)   | (16) Exhaust camshaft (LH)            |
| (6) Intake camshaft cap (Center RH)  | (17) Front camshaft cap (LH)          |
| (7) Intake camshaft cap (Rear RH)    | (18) Intake camshaft cap (Front LH)   |
| (8) Exhaust camshaft cap (Front RH)  | (19) Intake camshaft cap (Center LH)  |
| (9) Exhaust camshaft cap (Center RH) | (20) Intake camshaft cap (Rear LH)    |
| (10) Exhaust camshaft cap (Rear RH)  | (21) Exhaust camshaft cap (Front LH)  |
| (11) Cylinder head (RH)              | (22) Exhaust camshaft cap (Center LH) |
|                                      | (23) Exhaust camshaft cap (Rear LH)   |

- |                        |
|------------------------|
| (24) Plug              |
| (25) Rocker cover (LH) |

### **Tightening torque: N·m (kgf·m, ft·lb)**

**T1: Ref. to ME(H6)-55, Cylinder Head Assembly.**

**T2: Ref. to ME(H6)-51, Camshaft.**

**T3: 9.8 (1.0, 7.2)**

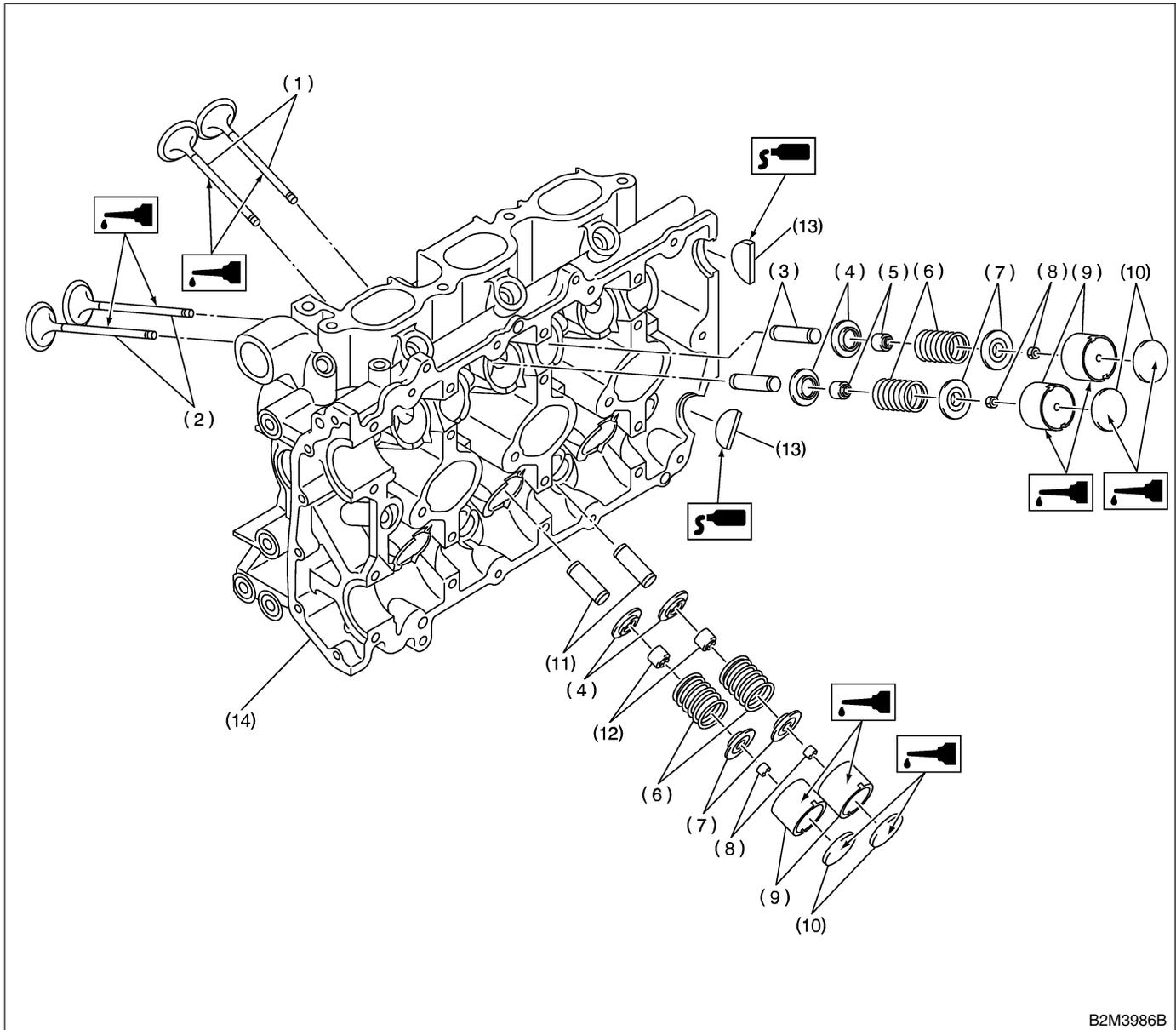
**T4: 16 (1.6, 12)**

**T5: 59 (6.0, 43)**

**ME(H6)-8**

## 5. CYLINDER HEAD AND VALVE ASSEMBLY

S143001A0504



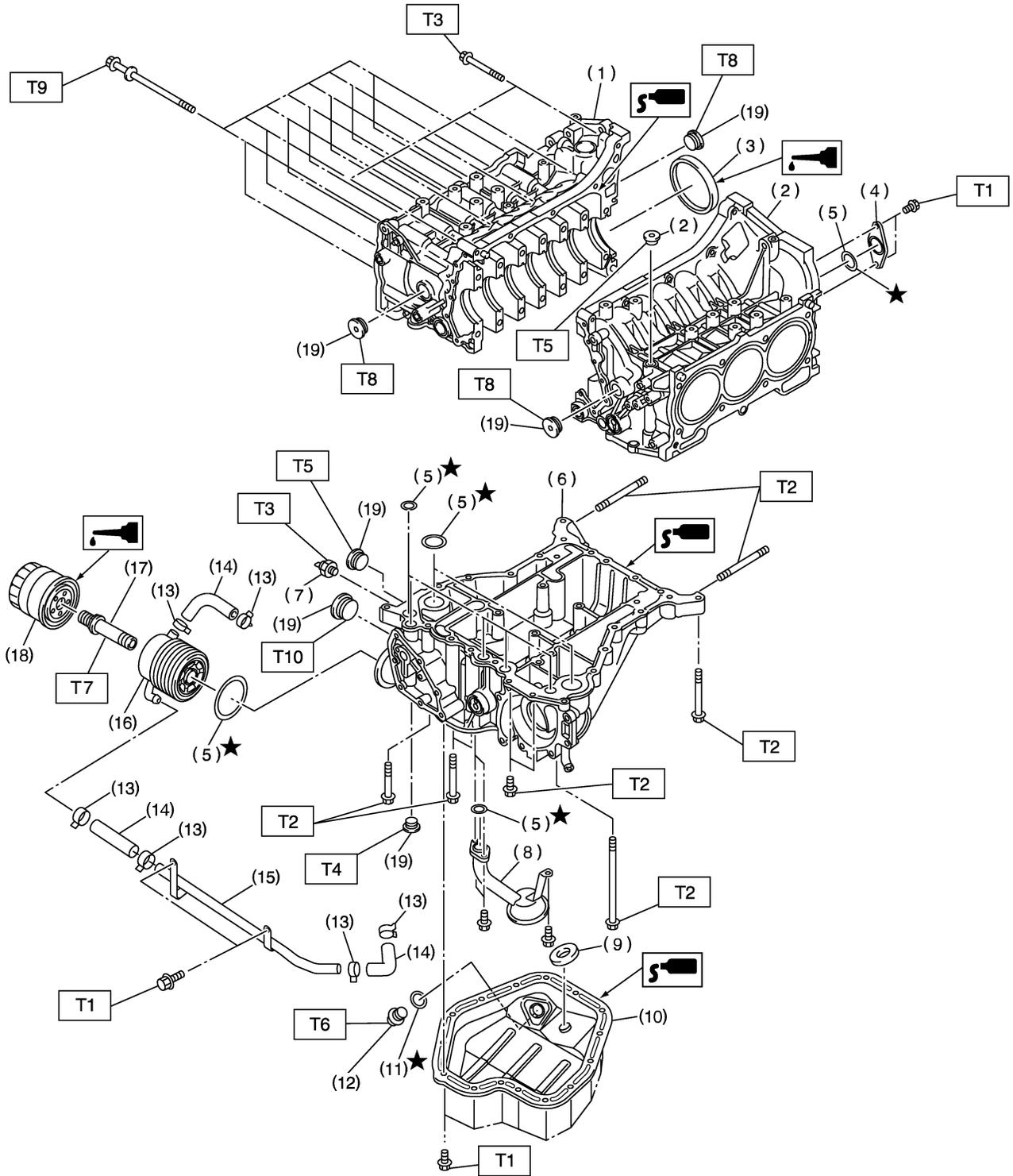
B2M3986B

- |                           |                       |                             |
|---------------------------|-----------------------|-----------------------------|
| (1) Exhaust valve         | (6) Valve spring      | (11) Exhaust valve guide    |
| (2) Intake valve          | (7) Retainer          | (12) Exhaust valve oil seal |
| (3) Intake valve guide    | (8) Retainer key      | (13) Cylinder head plug     |
| (4) Valve spring seat     | (9) Valve lifter seat | (14) Cylinder head          |
| (5) Intake valve oil seal | (10) Shim             |                             |

# GENERAL DESCRIPTION

Mechanical

## 6. CYLINDER BLOCK S143001A0505



B2M3987B

ME(H6)-10

# GENERAL DESCRIPTION

Mechanical

- (1) Cylinder block (RH)
- (2) Cylinder block (LH)
- (3) Rear oil seal
- (4) Service hole cover
- (5) O-ring
- (6) Oil pan upper
- (7) Oil pressure switch
- (8) Oil strainer
- (9) Magnet
- (10) Oil pan
- (11) Metal gasket

- (12) Drain plug
- (13) Clamp
- (14) Hose
- (15) Oil cooler pipe
- (16) Oil cooler
- (17) Connector
- (18) Oil filter
- (19) Plug

---

***Tightening torque: N·m (kgf·m, ft·lb)***

***T1: 6.4 (0.65, 4.7)***

***T2: 18 (1.8, 13.0)***

***T3: 25 (2.5, 18)***

***T4: 34 (3.5, 25)***

***T5: 37 (3.8, 27)***

***T6: 44 (4.5, 33)***

***T7: 54 (5.5, 40)***

***T8: 69 (7.0, 51)***

***T9: Ref. to ME(H6)-61, Cylinder Block.***

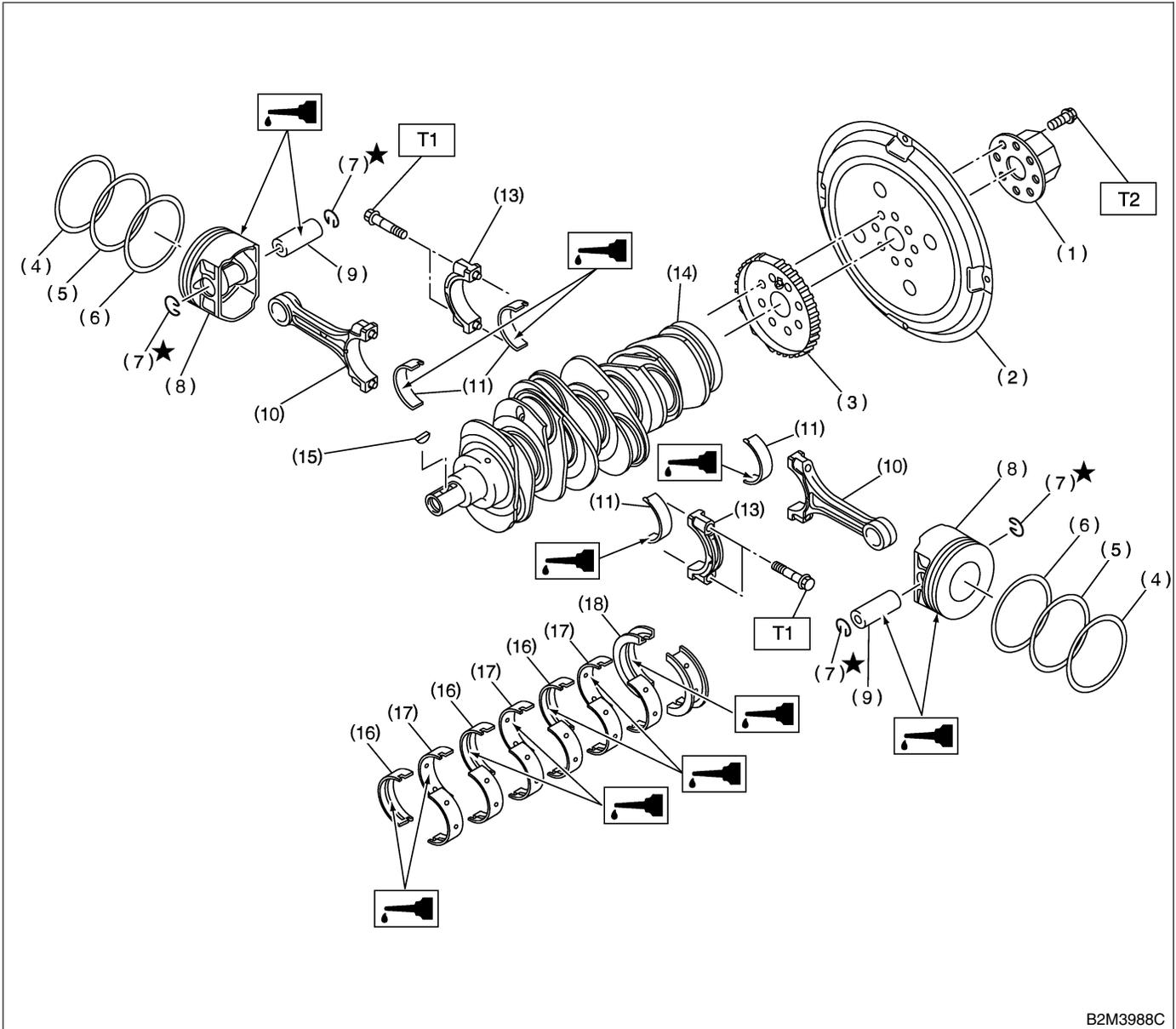
***T10: 90 (9.2, 67)***

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# GENERAL DESCRIPTION

Mechanical

## 7. CRANKSHAFT AND PISTON S143001A0506



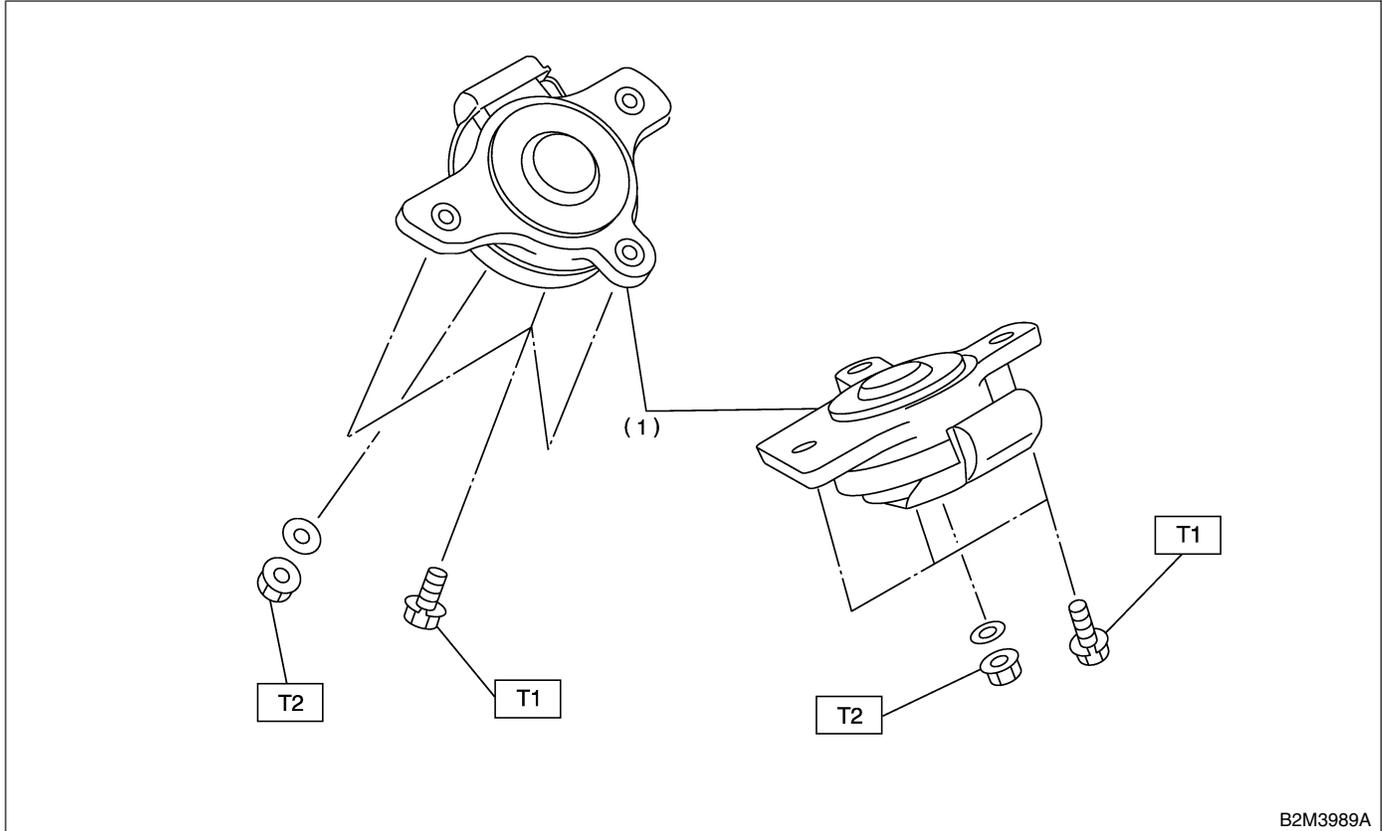
- |                                      |                                    |                                    |
|--------------------------------------|------------------------------------|------------------------------------|
| (1) Reinforcement                    | (9) Piston pin                     | (17) Crankshaft bearing #2, #4, #6 |
| (2) Drive plate                      | (10) Connecting rod                | (18) Crankshaft bearing #7         |
| (3) Crankshaft position sensor plate | (11) Connecting rod bearing        |                                    |
| (4) Top ring                         | (12) Connecting rod bolt           |                                    |
| (5) Second ring                      | (13) Connecting rod cap            |                                    |
| (6) Oil ring                         | (14) Crankshaft                    |                                    |
| (7) Circlip                          | (15) Woodruff key                  |                                    |
| (8) Piston                           | (16) Crankshaft bearing #1, #3, #5 |                                    |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 53 (5.4, 39)**

**T2: 81 (8.3, 60)**

## 8. ENGINE MOUNTING S143001A0507



(1) Front cushion rubber

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 34 (3.5, 25.3)**

**T2: 74 (7.5, 54)**

### C: CAUTION S143001A03

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

- All parts should be thoroughly cleaned, paying special attention to the 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 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 ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install 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 stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following:

# GENERAL DESCRIPTION

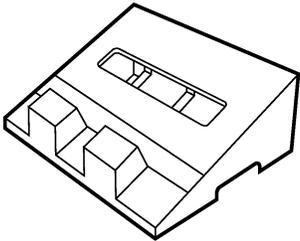
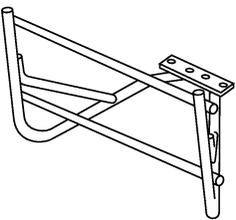
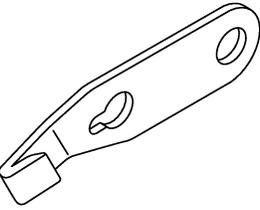
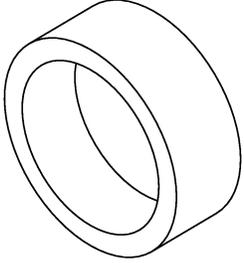
Mechanical

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.

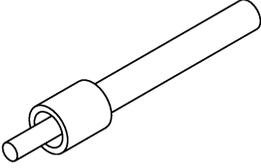
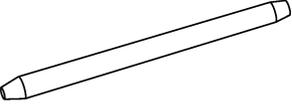
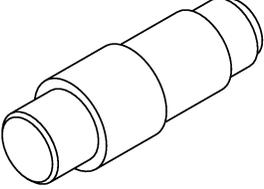
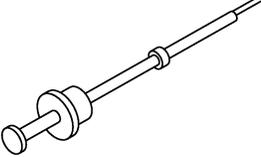
## D: PREPARATION TOOL S143001A17

### 1. SPECIAL TOOLS S143001A1701

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B2M3990</p>	18250AA000	CYLINDER HEAD TABLE	<ul style="list-style-type: none"> <li>● Used for replacing valve guides.</li> <li>● Used for removing and installing valve springs.</li> </ul>
 <p style="text-align: center;">B2M3991</p>	18232AA000	ENGINE STAND	Used for engine disassembly and assembly.
 <p style="text-align: center;">B2M3853</p>	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 <p style="text-align: center;">B2M3854</p>	18254AA000	PISTON GUIDE	Used for installing piston in cylinder.

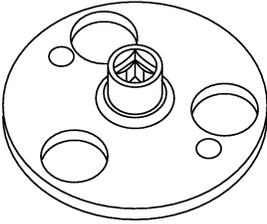
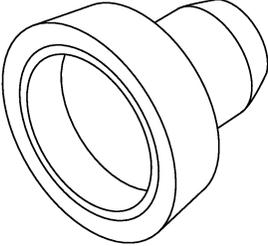
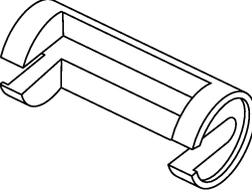
# GENERAL DESCRIPTION

Mechanical

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B2M3855</p>	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 <p style="text-align: center;">B2M3993</p>	18253AA000	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 <p style="text-align: center;">B2M3857</p>	18350AA000	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 <p style="text-align: center;">B2M3858</p>	499097500	PISTON PIN REMOVER ASSY	Used for removing piston pin.

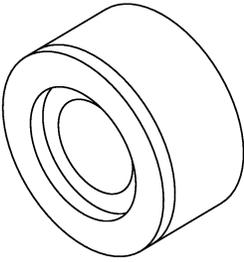
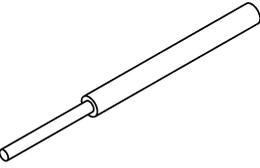
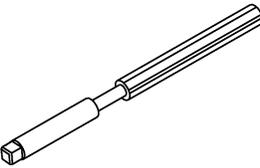
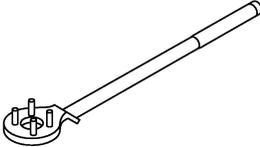
# GENERAL DESCRIPTION

Mechanical

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B2M3995</p>	18231AA000	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.
 <p style="text-align: center;">B2M3861</p>	499587200	CRANKSHAFT OIL SEAL INSTALLER	<ul style="list-style-type: none"> <li>● Used for installing crankshaft oil seal.</li> <li>● Used with CRANKSHAFT OIL SEAL GUIDE (499597100).</li> </ul>
 <p style="text-align: center;">B2M3863</p>	499597100	CRANKSHAFT OIL SEAL GUIDE	<ul style="list-style-type: none"> <li>● Used for installing crankshaft oil seal.</li> <li>● Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).</li> </ul>
 <p style="text-align: center;">B2M3864</p>	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.

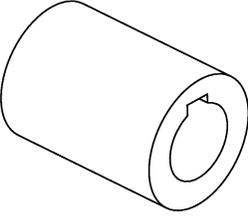
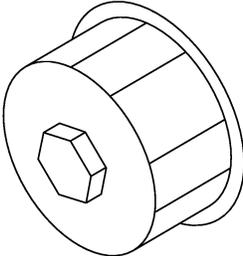
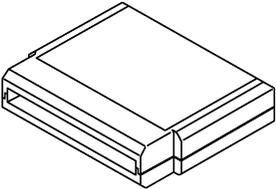
# GENERAL DESCRIPTION

Mechanical

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3865</p>	18251AA000	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 <p style="text-align: right;">B2M3867</p>	499765700	VALVE GUIDE REMOVER	Used for removing valve guides.
 <p style="text-align: right;">B2M3868</p>	499765900	VALVE GUIDE REAMER	Used for reaming valve guides.
 <p style="text-align: right;">B2M3870</p>	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.

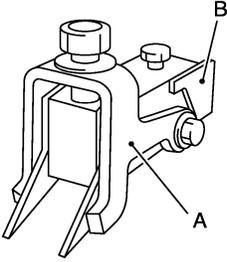
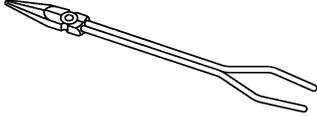
# GENERAL DESCRIPTION

Mechanical

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B2M3871</p>	18252AA000	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 <p style="text-align: center;">B2M3872</p>	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 <p style="text-align: center;">B2M3876</p>	24082AA190 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 <p style="text-align: center;">B2M3877</p>	22771AA020	SELECT MONITOR KIT	Troubleshooting for electrical systems. ● English: 22771AA020 (With printer) 22771AA030 (Without printer)

# GENERAL DESCRIPTION

Mechanical

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>B2M3992A</p>	18329AA000	SHIM REPLACER ASSY	Used for correct valve clearance.
	A: 18330AA010	LIFTER	If 498187200 SHIM REPLACER ASSY (H4) tool is available, it is commonly used for H6 by partially replacing the following parts: ● LIFTER (H4) → LIFTER (H6) A: 18330AA010 ● SLIDER (H4) → SLIDER (H6) B: 18351AA000
	B: 18351AA000	SLIDER	
 <p>B2M3994</p>	18233AA000	PISTON PIN CIR-CLIP PLIERS	Used for removing piston pin circlip.

## 2. GENERAL PURPOSE TOOLS S143001A1702

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.

## E: PROCEDURE S143001E45

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- Camshaft
- Cylinder Head

## 2. Compression S143081

### A: INSPECTION S143081A10

**CAUTION:**

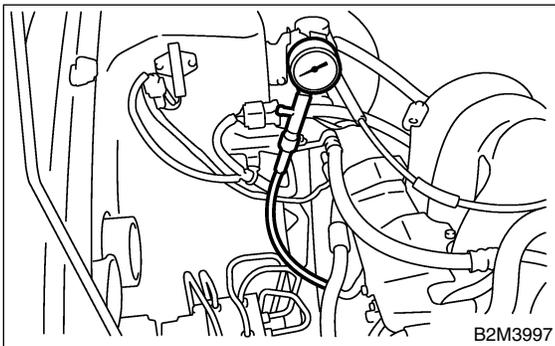
**After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.**

- 1) After warming-up the engine, turn ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release fuel pressure. <Ref. to FU(H6)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(H6)-4, REMOVAL, Spark Plug.>
- 5) Fully open throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Hold the compression gauge tight against the spark plug hole.

**CAUTION:**

**When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.**

- 8) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

**Compression (350 rpm and fully open throttle):**

**Standard;**

**1,275 — 1,471 kPa (13.0 — 15.0 kg/cm<sup>2</sup>,  
185 — 213 psi)**

**Limit;**

**1,128 kPa (11.5 kg/cm<sup>2</sup>, 164 psi)**

### 3. Idle Speed S143082

#### A: INSPECTION S143082A10

1) Before checking idle speed, check the following:

(1) Ensure that air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that hoses are connected properly.

(2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.

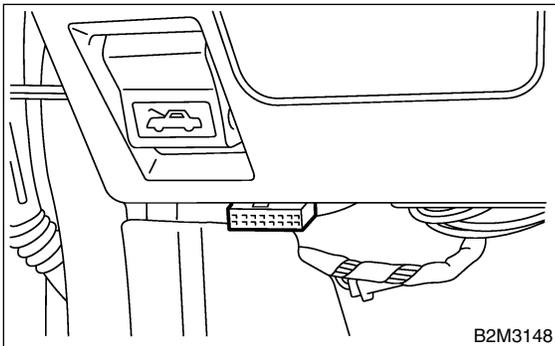
2) Warm-up the engine.

3) Stop the engine, and turn ignition switch to OFF.

4) When using SUBARU SELECT MONITOR <Ref. to ME(H6)-14, SPECIAL TOOLS, PREPARATION TOOL, General Description.>

(1) Insert the cartridge to SUBARU SELECT MONITOR.

(2) Connect SUBARU SELECT MONITOR to the data link connector.



(3) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.

(4) Select {2. Each System Check} in Main Menu.

(5) Select {Engine Control System} in Selection Menu.

(6) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.

(7) Select {1.12 Data Display} in Data Display Menu.

(8) Start the engine, and read engine idle speed.

#### NOTE:

- When using the OBD-II general scan tool, carefully read its operation manual.
- This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

5) Check idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

*Idle speed (No load and gears in N or P position):*

**600±50 rpm**

6) Check idle speed when loaded. (Turn air conditioning switch to “ON” and operate compressor for at least one minute before measurement.)

*Idle speed [A/C “ON”, no load and gears in N or P position]:*

**700±50 rpm**

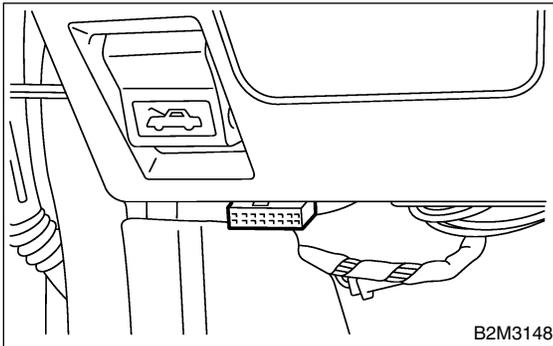
#### CAUTION:

**Idling speed cannot be adjusted manually because of automatic adjusting system. If idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(H6)-2, Basic Diagnostic Procedure.>**

## 4. Ignition Timing S143086

### A: INSPECTION S143086A10

- 1) Before checking ignition timing, check the following:
  - (1) Ensure that air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
  - (2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.
- 2) Warm-up the engine.
- 3) Stop the engine, and turn ignition switch to OFF.
- 4) When using SUBARU SELECT MONITOR <Ref. to ME(H6)-14, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
  - (1) Insert the cartridge to SUBARU SELECT MONITOR.
  - (2) Connect SUBARU SELECT MONITOR to the data link connector.



- (3) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
- (4) Select {2. Each System Check} in Main Menu.
- (5) Select {Engine Control System} in Selection Menu.
- (6) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.
- (7) Select {1.12 Data Display} in Data Display Menu.
- (8) Start engine at idle speed and check the ignition timing.

#### **Ignition timing [BTDC/rpm]:** **$10^{\circ} \pm 8^{\circ} / 600$**

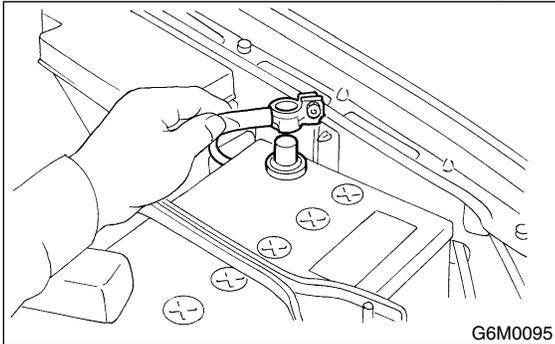
If the timing is not correct, check the ignition control system.  
Refer to EN(H6) Engine Control System. <Ref. to EN(H6)-2, Basic Diagnostic Procedure.>

## 5. Valve Clearance S143083

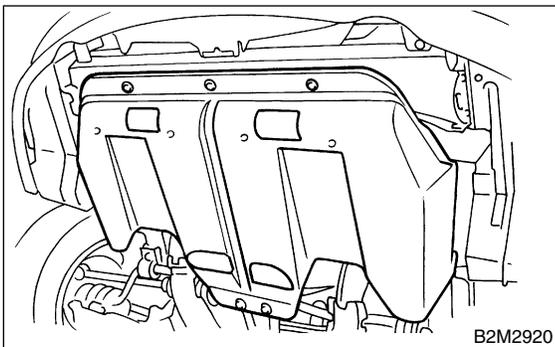
### A: INSPECTION S143083A10

**CAUTION:**  
 Inspection and adjustment of valve clearance should be performed while engine is cold.

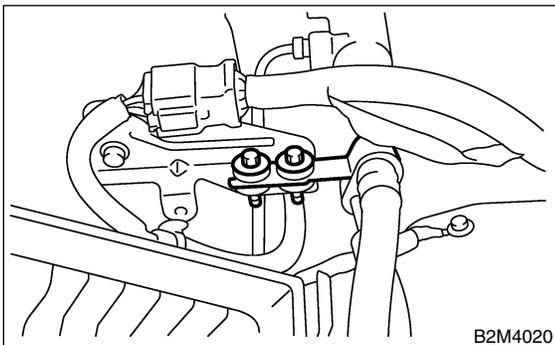
- 1) Set the vehicle on the lift.
- 2) Disconnect battery ground cable.



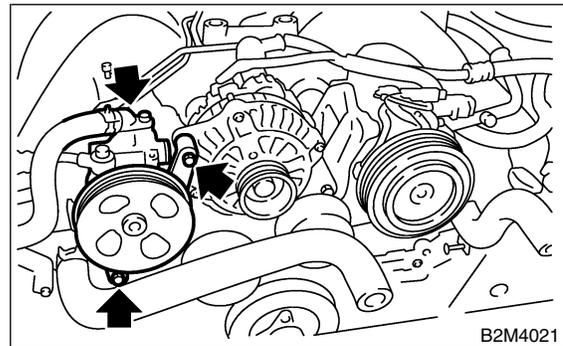
- 3) Lift up the vehicle.
- 4) Remove under cover.



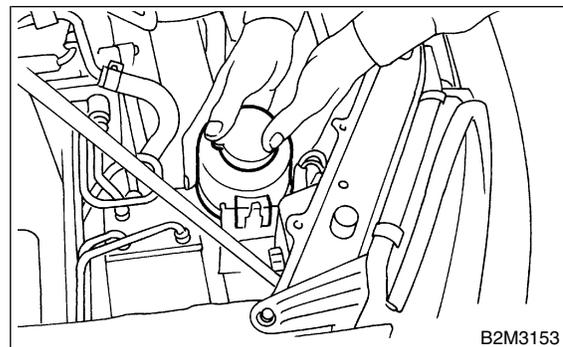
- 5) Lower the vehicle.
- 6) Place suitable container under the vehicle.
- 7) When inspecting RH side cylinder.
  - (1) Remove air intake duct and air cleaner case. <Ref. to IN(H6)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H6)-5, REMOVAL, Air Cleaner.>
  - (2) Remove V-belt. <Ref. to ME(H6)-29, REMOVAL, V-belt.>
  - (3) Remove power steering hose from bracket.



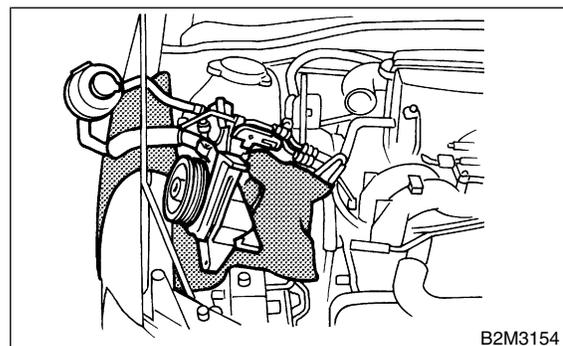
- (4) Remove bolts which install power steering pump bracket.



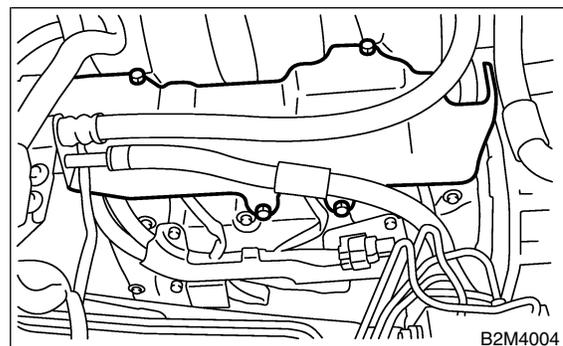
- (5) Remove power steering tank from the bracket by pulling it upward.



- (6) Place power steering pump on the right side wheel apron.



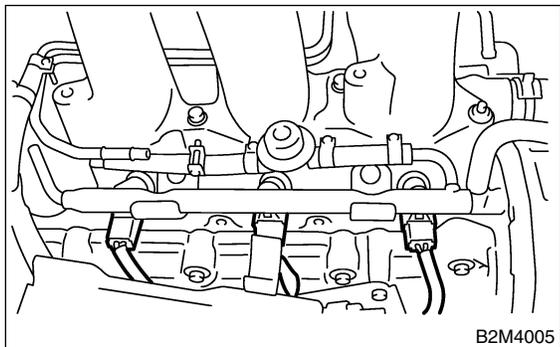
- (7) Remove fuel pipe protector RH.



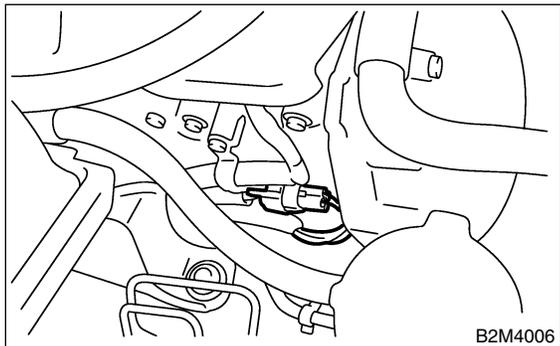
# VALVE CLEARANCE

Mechanical

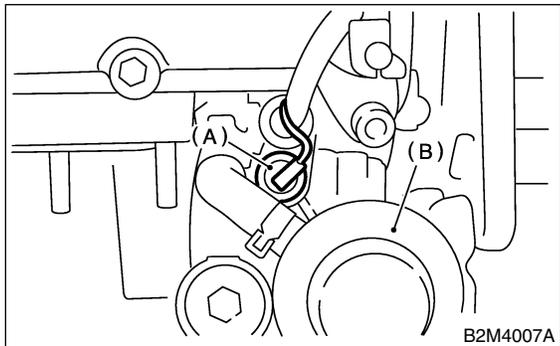
(8) Disconnect fuel injector connectors.



(9) Disconnect front oxygen (A/F) sensor connector.



(10) Disconnect oil pressure switch connector.



(A) Oil pressure switch

(B) Oil filter

(11) Remove ignition coils. <Ref. to IG(H6)-7, REMOVAL, Ignition Coil and Ignitor Assembly.>

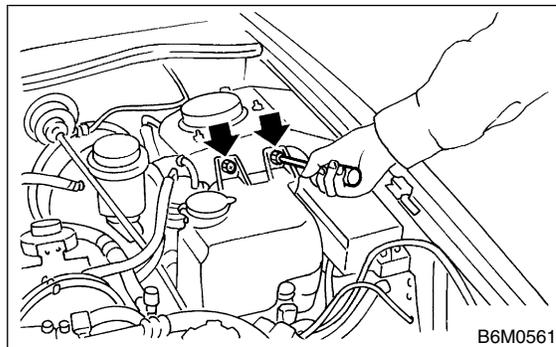
(12) Remove rocker cover RH. <Ref. to ME(H6)-51, REMOVAL, Camshaft.>

8) When inspecting LH side cylinder.

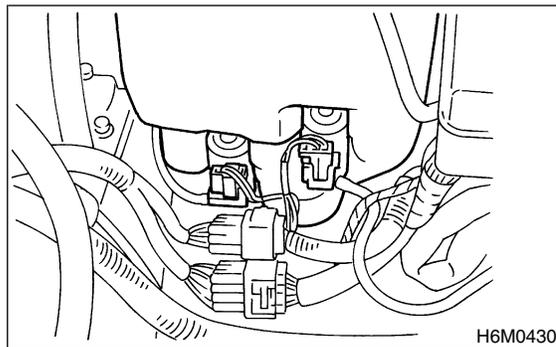
(1) Set the vehicle on the lift.

(2) Remove battery.

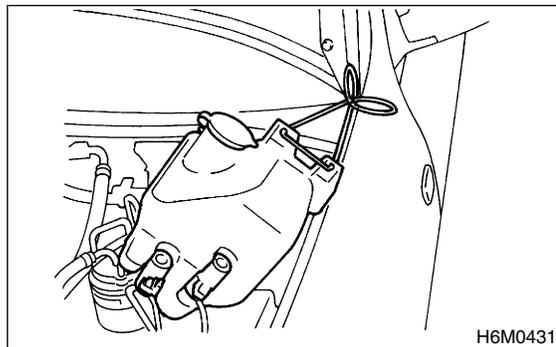
(3) Remove washer tank mounting bolts.



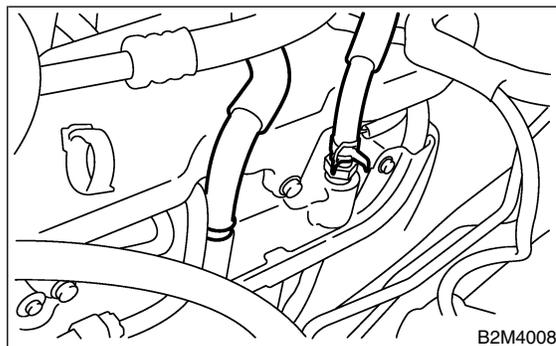
(4) Disconnect washer motor connectors.



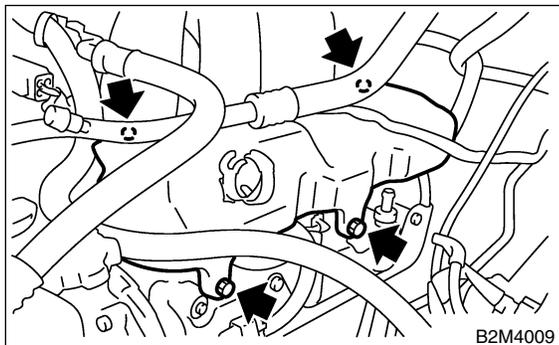
(5) Move washer tank upward.



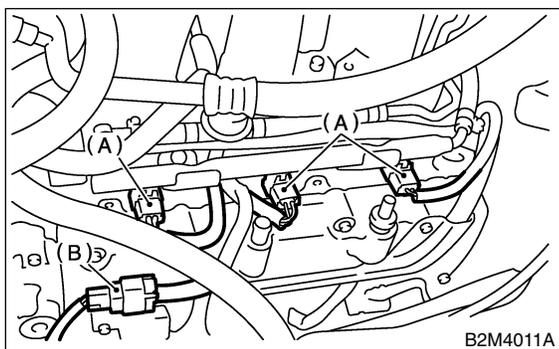
(6) Disconnect PCV and blow-by hose from rocker cover LH.



(7) Remove fuel pipe protector LH.



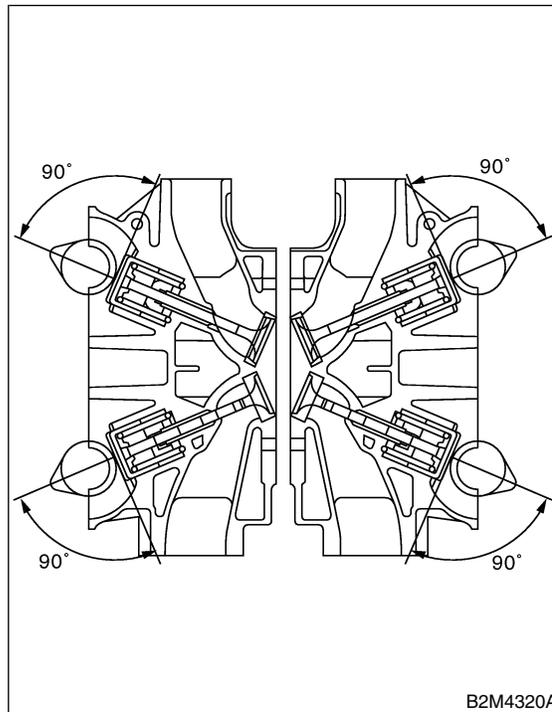
(8) Disconnect fuel injector connectors. (A)  
 (9) Disconnect front oxygen (A/F) sensor connector. (B)



(10) Remove ignition coils. <Ref. to IG(H6)-7, REMOVAL, Ignition Coil and Ignitor Assembly.>  
 (11) Remove rocker cover LH. <Ref. to ME(H6)-51, REMOVAL, Camshaft.>

9) Using the ST, turn the crankshaft clockwise. Adjust the camshaft position so that the cam lobe is perpendicular to the shim as shown in the figure.

ST 18252AA000 CRANKSHAFT SOCKET

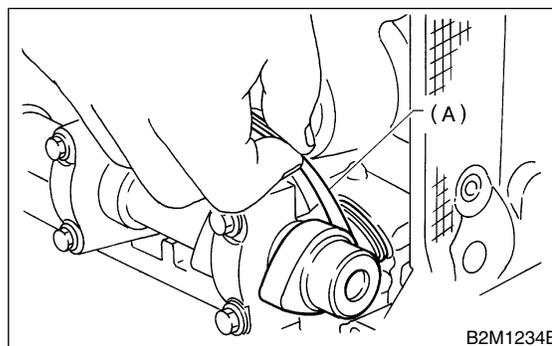


10) Measure intake valve and exhaust valve clearances by using thickness gauge (A).

**CAUTION:**  
 Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.

**Valve clearance:**  
 Intake:  $0.20^{+0.04}/_{-0.06}$  mm ( $0.0079^{+0.0016}/_{-0.0024}$  in)  
 Exhaust:  $0.25 \pm 0.05$  mm ( $0.0098 \pm 0.0020$  in)

**NOTE:**  
 If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



11) If necessary, adjust the valve clearance. <Ref. to ME(H6)-26, ADJUSTMENT, Valve Clearance.>  
 12) Further turn crankshaft pulley clockwise. Using the same procedure described previously, then measure valve clearances again.  
 13) After inspection, install the related parts in the reverse order of removal.

# VALVE CLEARANCE

Mechanical

## B: ADJUSTMENT S143083A01

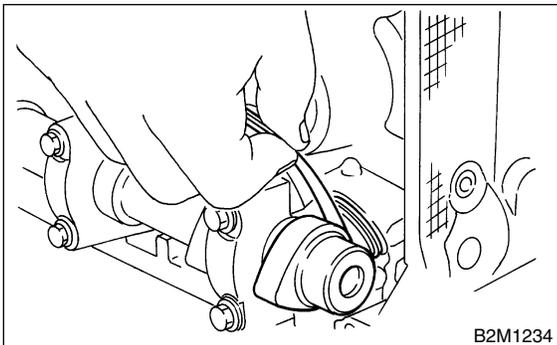
### CAUTION:

Adjustment of valve clearance should be performed while engine is cold.

1) Measure all valve clearances. <Ref. to ME(H6)-23, INSPECTION, Valve Clearance.>

### NOTE:

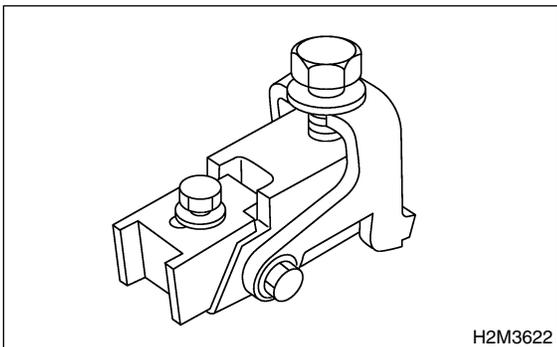
Record each valve clearance after it has been measured.



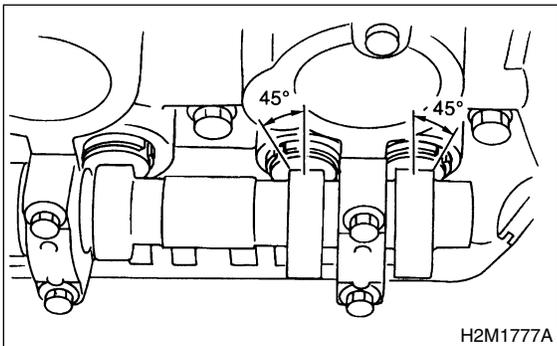
2) Remove shim from valve lifter.

(1) Prepare the ST.

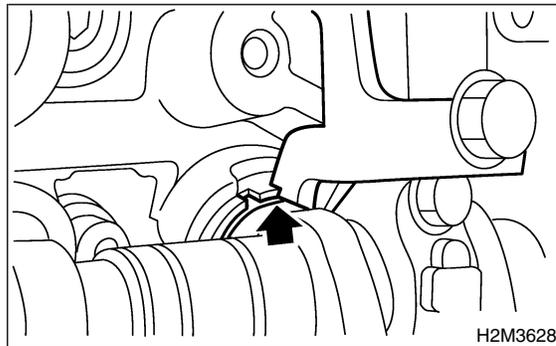
ST 18329AA000 SHIM REPLACER



(2) Rotate the notch of the valve lifter outward by 45°.



(3) Adjust SHIM REPLACER notch to valve lifter and set it.

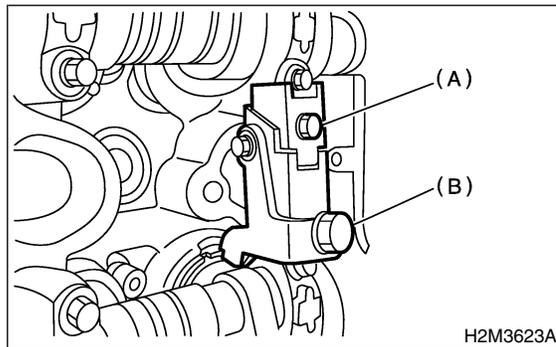


### NOTE:

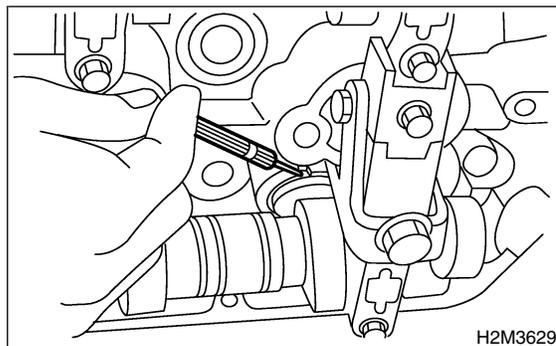
When setting, be careful SHIM REPLACER edge does not touch shim.

(4) Tighten bolt (A) and install it to the cylinder head.

(5) Tighten bolt (B) and insert the valve lifter.



(6) Insert tweezers into the notch of the valve lifter, and take the shim out.

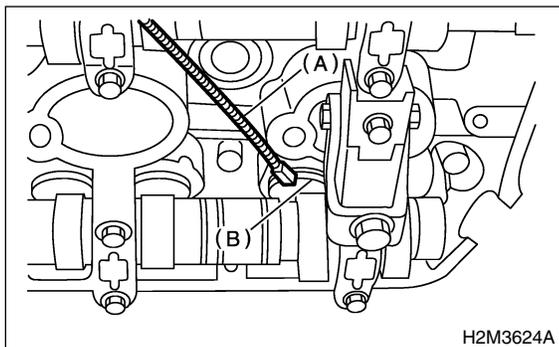


# VALVE CLEARANCE

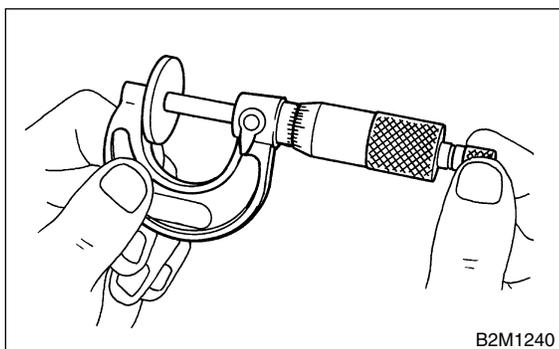
Mechanical

**NOTE:**

By using a magnet (A), the shim (B) can be taken out without dropping it.



3) Measure thickness of shim with micrometer.



4) Select a shim of suitable thickness using measured valve clearance and shim thickness, by referring to the following table.

5) Set suitable shim selected in step 4) to valve lifter.

Unit: mm
Intake valve: $S = (V + T) - 0.20$
Exhaust valve: $S = (V + T) - 0.25$
S: Shim thickness to be used
V: Measured valve clearance
T: Shim thickness required

Part No.	Thickness mm (in)
13218 AK010	2.00 (0.0787)
13218 AK020	2.02 (0.0795)
13218 AK030	2.04 (0.0803)
13218 AK040	2.06 (0.0811)
13218 AK050	2.08 (0.0819)
13218 AK060	2.10 (0.0827)
13218 AK070	2.12 (0.0835)
13218 AK080	2.14 (0.0843)
13218 AK090	2.16 (0.0850)
13218 AK100	2.18 (0.0858)
13218 AK110	2.20 (0.0866)
13218 AE710	2.22 (0.0874)
13218 AE720	2.23 (0.0878)
13218 AE730	2.24 (0.0882)

Part No.	Thickness mm (in)
13218 AE740	2.25 (0.0886)
13218 AE750	2.26 (0.0890)
13218 AE760	2.27 (0.0894)
13218 AE770	2.28 (0.0898)
13218 AE780	2.29 (0.0902)
13218 AE790	2.30 (0.0906)
13218 AE800	2.31 (0.0909)
13218 AE810	2.32 (0.0913)
13218 AE820	2.33 (0.0917)
13218 AE830	2.34 (0.0921)
13218 AE840	2.35 (0.0925)
13218 AE850	2.36 (0.0929)
13218 AE860	2.37 (0.0933)
13218 AE870	2.38 (0.0937)
13218 AE880	2.39 (0.0941)
13218 AE890	2.40 (0.0945)
13218 AE900	2.41 (0.0949)
13218 AE910	2.42 (0.0953)
13218 AE920	2.43 (0.0957)
13218 AE930	2.44 (0.0961)
13218 AE940	2.45 (0.0965)
13218 AE950	2.46 (0.0969)
13218 AE960	2.47 (0.0972)
13218 AE970	2.48 (0.0976)
13218 AE980	2.49 (0.0980)
13218 AE990	2.50 (0.0984)
13218 AF000	2.51 (0.0988)
13218 AF010	2.52 (0.0992)
13218 AF020	2.53 (0.0996)
13218 AF030	2.54 (0.1000)
13218 AF040	2.55 (0.1004)
13218 AF050	2.56 (0.1008)
13218 AF060	2.57 (0.1012)
13218 AF070	2.58 (0.1016)
13218 AF090	2.60 (0.1024)
13218 AF100	2.61 (0.1028)
13218 AF110	2.62 (0.1031)
13218 AF120	2.63 (0.1035)
13218 AF130	2.64 (0.1039)
13218 AF140	2.65 (0.1043)
13218 AF150	2.66 (0.1047)
13218 AF160	2.67 (0.1051)
13218 AF170	2.68 (0.1055)
13218 AF180	2.69 (0.1059)
13218 AF190	2.70 (0.1063)
13218 AF200	2.71 (0.1067)
13218 AF210	2.72 (0.1071)
13218 AF220	2.73 (0.1075)
13218 AF230	2.74 (0.1079)
13218 AF240	2.75 (0.1083)
13218 AF250	2.76 (0.1087)
13218 AF260	2.77 (0.1091)

## VALVE CLEARANCE

Mechanical

---

Part No.	Thickness mm (in)
13218 AF270	2.78 (0.1094)
13218 AF280	2.79 (0.1098)
13218 AF290	2.80 (0.1102)
13218 AF300	2.81 (0.1106)

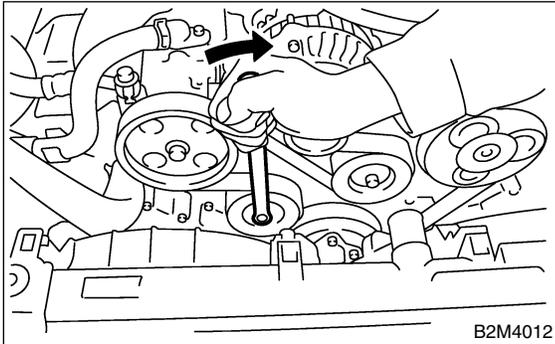
6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.

7) After inspection, install the related parts in the reverse order of removal.

**6. V-belt** S143080

**A: REMOVAL** S143080A18

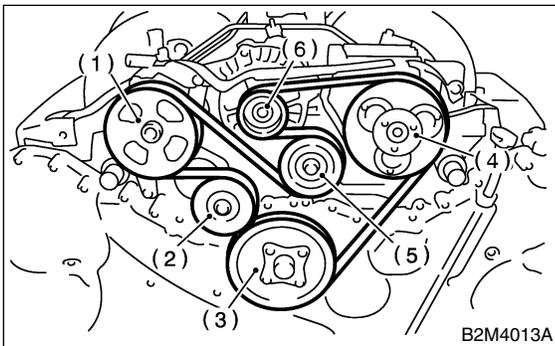
- 1) Fit the tool to the belt tensioner mounting bolt.
- 2) Turn the tool clockwise, and loosen the V-belt to remove.



- 3) Remove the V-belt cover.

**B: INSTALLATION** S143080A11

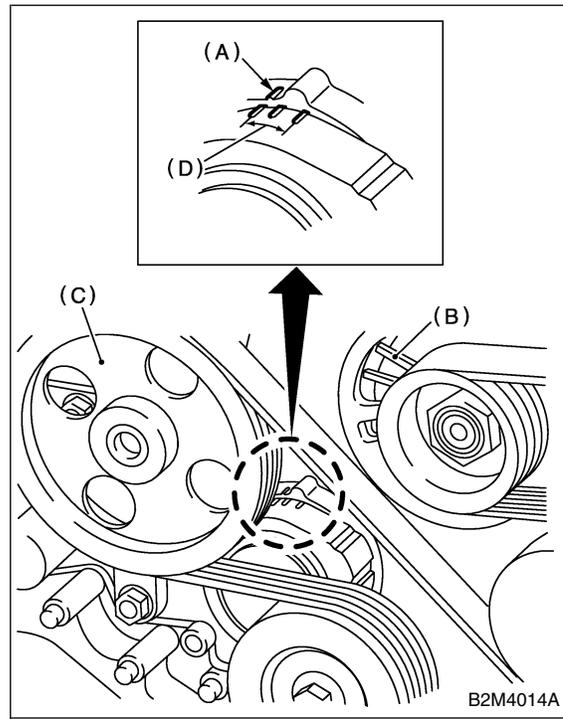
- 1) Install in the reverse order of removal.



- (1) Power steering oil pump
- (2) Belt tension adjuster
- (3) Crankshaft pulley
- (4) A/C compressor
- (5) Belt idler
- (6) Generator

**C: INSPECTION** S143080A10

- 1) Replace belts, if cracks, fraying or wear is found.
- 2) Check that the V-belt automatic tensioner indicator is within the range (D).

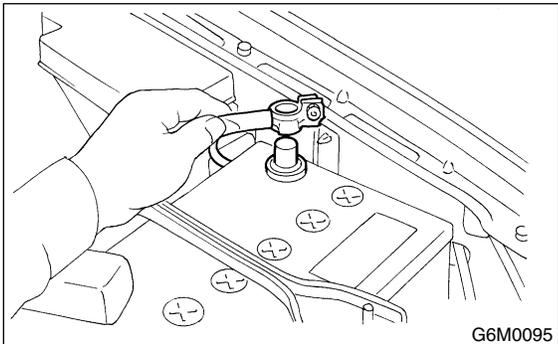


- (A) Indicator
- (B) Generator
- (C) Power steering oil pump
- (D) Service limit

## 7. Engine Assembly S143079

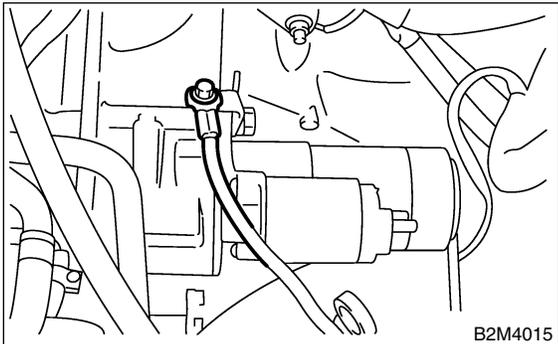
### A: REMOVAL S143079A18

- 1) Set the vehicle on lift arms.
- 2) Open front hood fully and support with stay.
- 3) Raise rear seat, and turn floor mat up.
- 4) Release fuel pressure. <Ref. to FU(H6)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 5) Remove filler cap.
- 6) Disconnect battery ground cable.

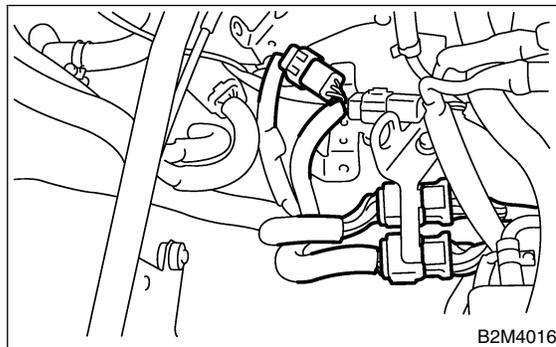


- 7) Remove air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H6)-7, REMOVAL, Air Intake Duct.>, <Ref. to IN(H6)-6, REMOVAL, Air Intake Chamber.> and <Ref. to IN(H6)-5, REMOVAL, Air Cleaner.>
- 8) Lift up the vehicle.
- 9) Remove under cover.
- 10) Remove radiator from vehicle. <Ref. to CO(H6)-23, REMOVAL, Radiator.>
- 11) Remove V-belt. <Ref. to ME(H6)-29, REMOVAL, V-belt.>
- 12) Disconnect A/C pressure hoses from A/C compressor. <Ref. to AC-38, REMOVAL, Flexible Hose.>
- 13) Disconnect the following connectors and cables.

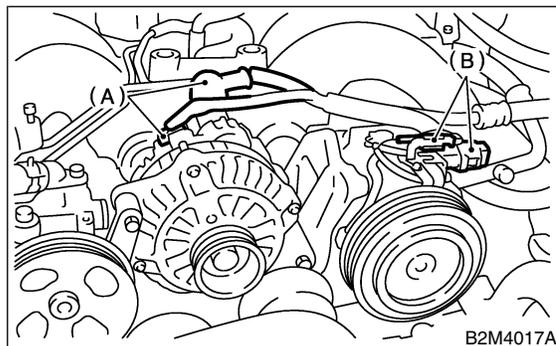
#### (1) Engine ground terminal



#### (2) Engine harness connectors

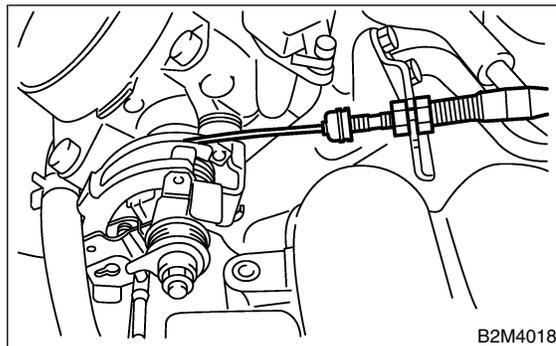


#### (3) Generator connector, terminal and A/C compressor connector



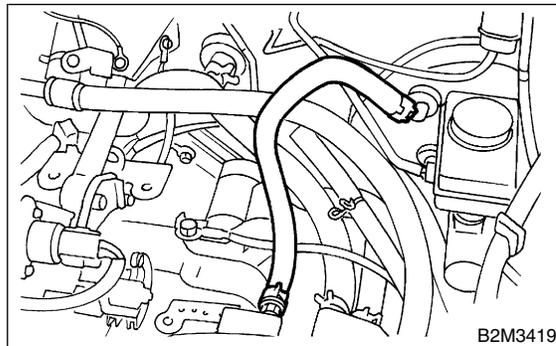
- (A) A/C compressor connector
- (B) Generator connector and terminal

#### (4) Accelerator cable

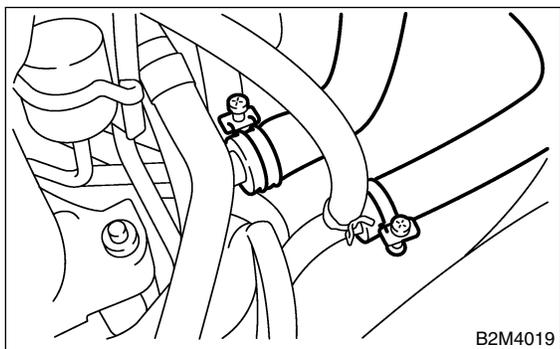


#### 14) Disconnect the following hoses.

##### (1) Brake booster vacuum hose

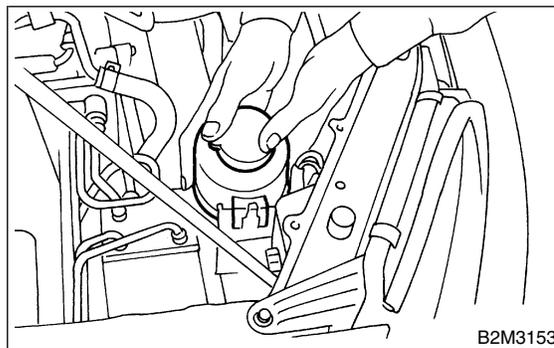


(2) Heater inlet outlet hose



B2M4019

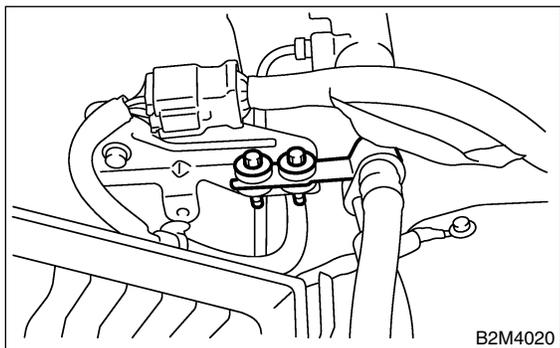
(3) Remove power steering tank from the bracket by pulling it upward.



B2M3153

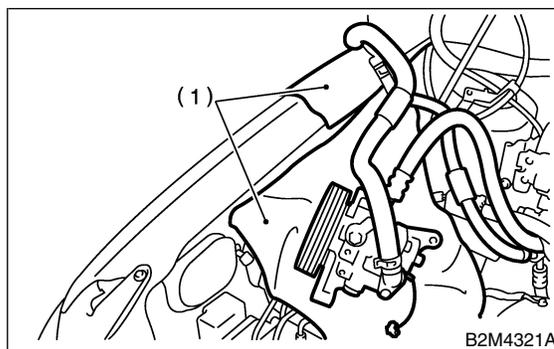
15) Remove power steering pump from bracket.

(1) Remove pipe with bracket.



B2M4020

(4) Place power steering pump on the right side wheel apron.



B2M4321A

(2) Remove bolts which install power steering pump bracket.

(1) Cloth

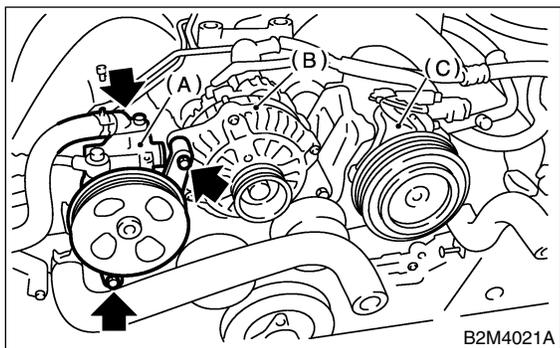
**CAUTION:**

**Do not separate the hose and the pipe from the pump body.**

16) Remove front exhaust pipe.

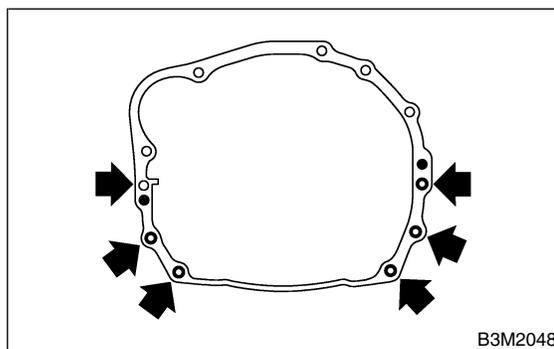
<Ref. to EX(H6)-5, REMOVAL, Front Exhaust Pipe.>

17) Remove nuts which hold lower side of transmission to engine.



B2M4021A

- (A) Power steering pump
- (B) Generator
- (C) A/C compressor

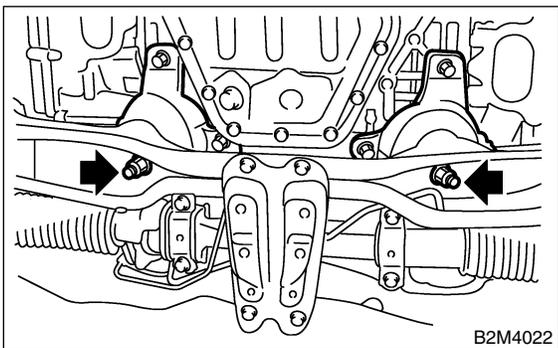


B3M2048

# ENGINE ASSEMBLY

Mechanical

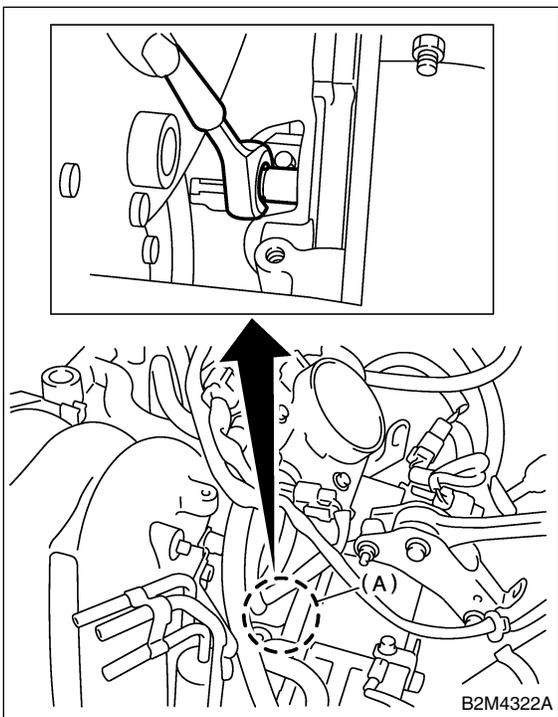
18) Remove nuts which install front cushion rubber onto front crossmember.



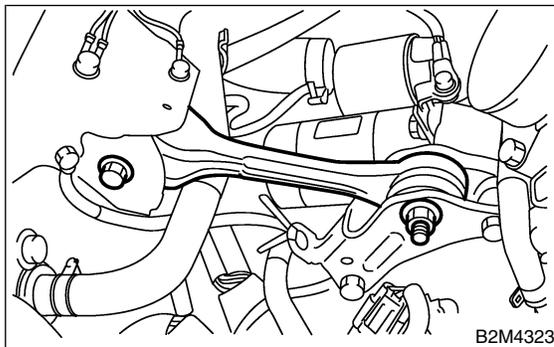
19) Separate torque converter clutch from drive plate.

- (1) Lower the vehicle.
- (2) Remove service hole plug (A).
- (3) Remove bolts which hold torque converter clutch to drive plate.
- (4) Remove other bolts while rotating the crank pulley using ST.

ST 499977100 CRANK PULLEY WRENCH



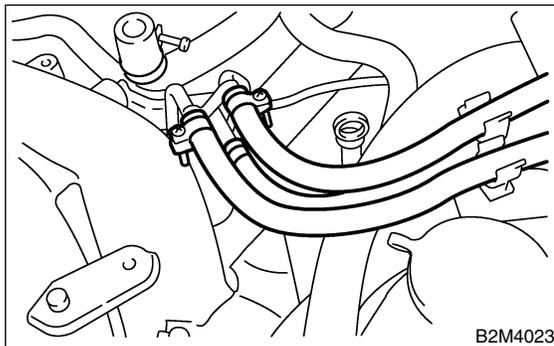
20) Remove pitching stopper.



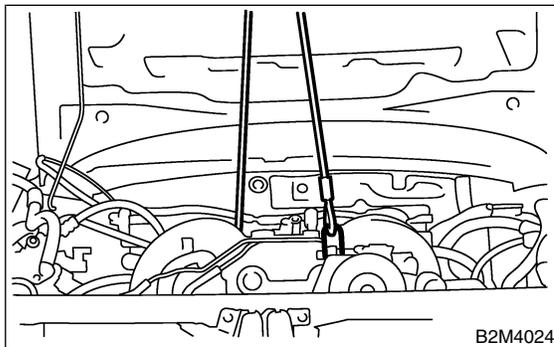
21) Disconnect fuel delivery hose, return hose and evaporation hose.

### CAUTION:

- Disconnect hose with its end wrapped with cloth to prevent fuel from splashing.
- Catch fuel from hose into container.



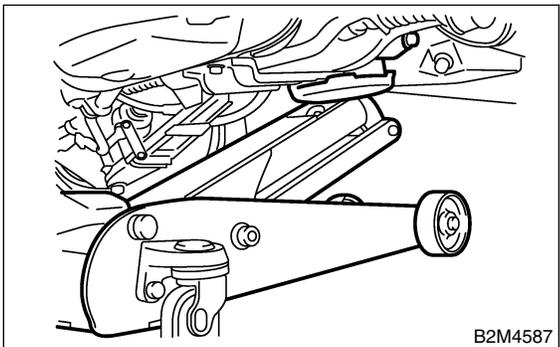
22) Support engine with a lifting device and wire ropes.



23) Support transmission with a garage jack.

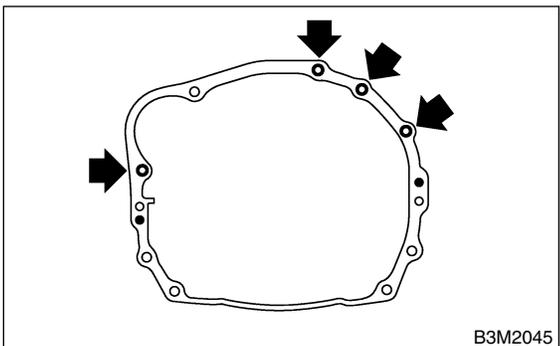
**CAUTION:**

Before moving engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.



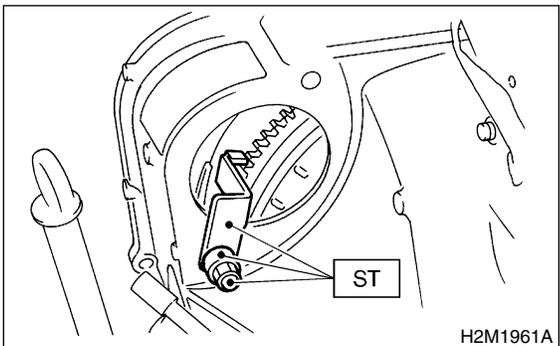
24) Separation of engine and transmission.

- (1) Remove starter. <Ref. to SC(H6)-6, REMOVAL, Starter.>
- (2) Remove bolts which hold upper side of transmission to engine.



25) Install ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



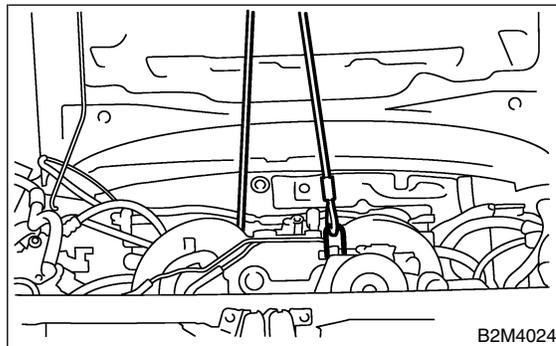
26) Remove engine from vehicle.

- (1) Slightly raise engine.
- (2) Raise transmission with garage jack.
- (3) Move engine horizontally until main shaft is withdrawn from clutch cover.

(4) Slowly move engine away from engine compartment.

**CAUTION:**

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



27) Remove front cushion rubbers.

**B: INSTALLATION**

S143079A11

1) Install front cushion rubbers.

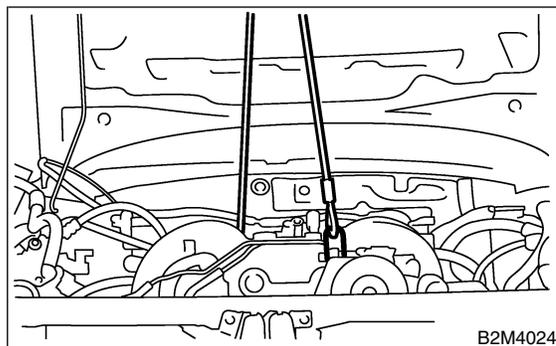
**Tightening torque:**

**34 N·m (3.5 kgf·m, 25.3 ft·lb)**

2) Position engine in engine compartment and align it with transmission.

**CAUTION:**

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

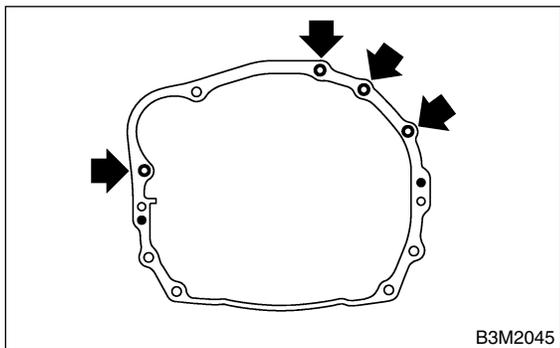


3) Tighten bolts which hold upper side of transmission to engine.

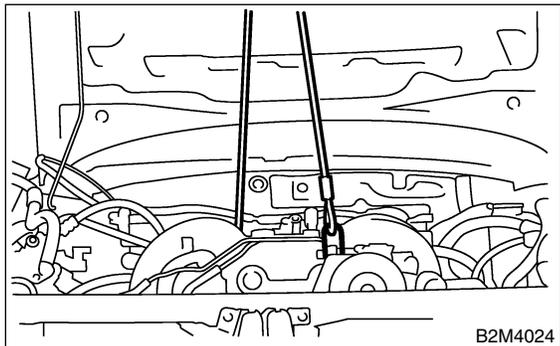
# ENGINE ASSEMBLY

Mechanical

**Tightening torque:**  
**50 N·m (5.1 kgf-m, 36.9 ft-lb)**

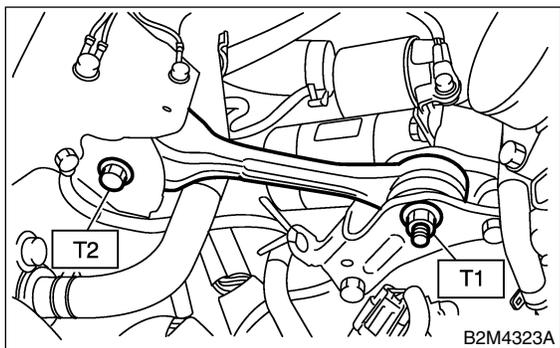


4) Remove lifting device and wire ropes.



5) Remove garage jack.  
6) Install pitching stopper.

**Tightening torque:**  
**T1: 49 N·m (5.0 kgf-m, 36.2 ft-lb)**  
**T2: 57 N·m (5.8 kgf-m, 42 ft-lb)**



7) Remove ST from torque converter clutch case.

**NOTE:**

Be careful not to drop the ST into the torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

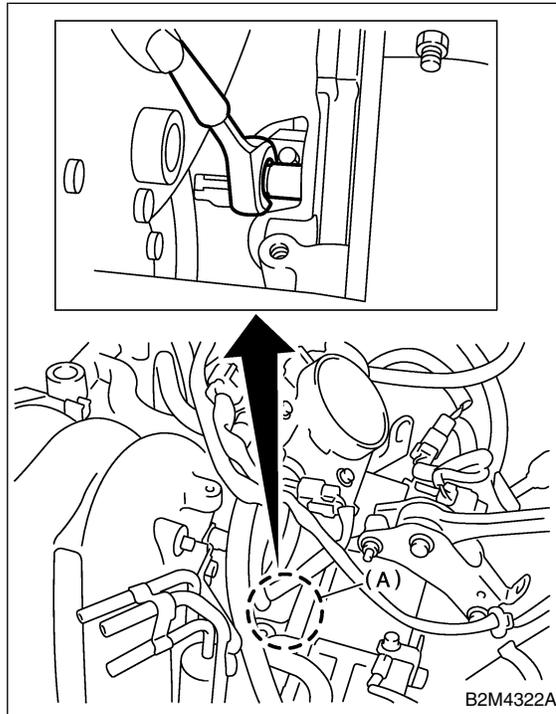
8) Install starter. <Ref. to SC(H6)-6, INSTALLATION, Starter.>

9) Install torque converter clutch onto drive plate.  
(1) Tighten bolts which hold torque converter clutch to drive plate.  
(2) Tighten other bolts while rotating the crank pulley by using ST.

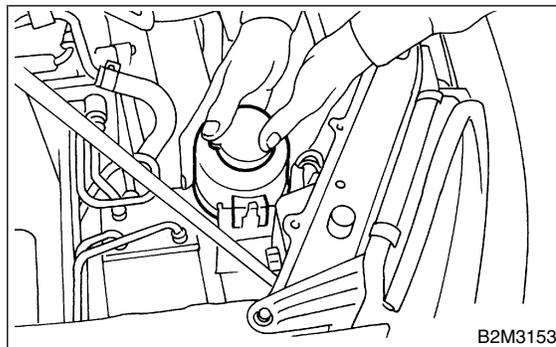
**CAUTION:**  
Be careful not to drop bolts into torque converter clutch housing.

ST 499977100 CRANK PULLEY WRENCH

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



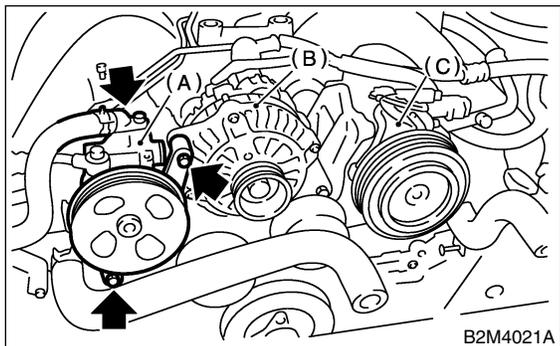
(3) Clog plug (A) onto service hole.  
10) Install power steering pump on bracket.  
(1) Install power steering tank on bracket.



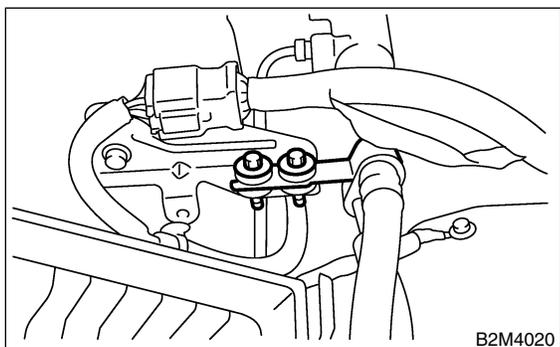
(2) Install power steering pump on bracket, and tighten bolts.

**Tightening torque:**

**20.1 N-m (2.05 kgf-m, 14.8 ft-lb)**



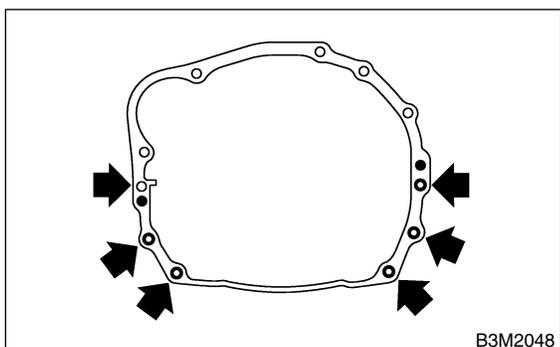
(3) Tighten bolt which installs power steering pipe bracket.



11) Tighten nuts which hold lower side of transmission to engine.

**Tightening torque:**

**50 N-m (5.1 kgf-m, 36.9 ft-lb)**



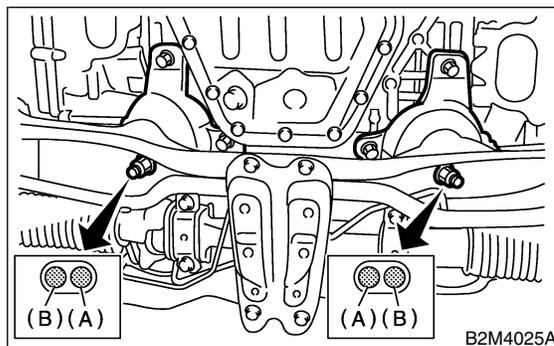
12) Tighten nuts which install front cushion rubber onto crossmember.

**Tightening torque:**

**74 N-m (7.5 kgf-m, 54 ft-lb)**

**CAUTION:**

**Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.**

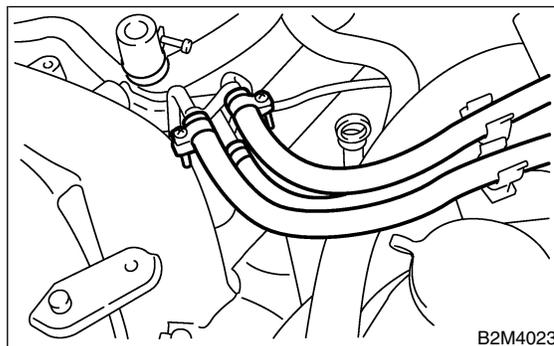


13) Install front exhaust pipe.

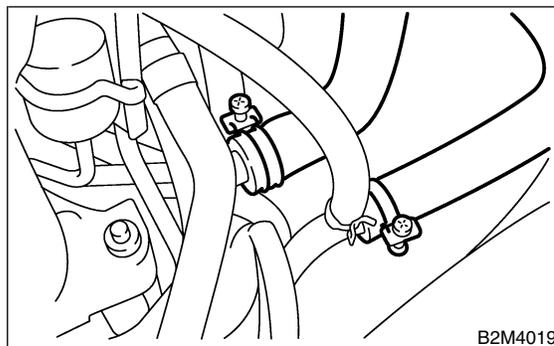
<Ref. to EX(H6)-6, INSTALLATION, Front Exhaust Pipe.>

14) Connect the following hoses.

(1) Fuel delivery hose, return hose and evaporation hose



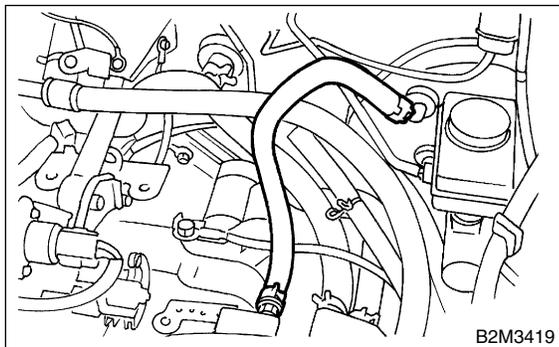
(2) Heater inlet and outlet hoses



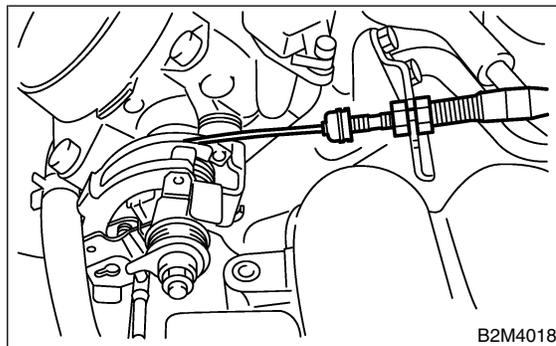
# ENGINE ASSEMBLY

Mechanical

## (3) Brake booster vacuum hose



## (1) Accelerator cable

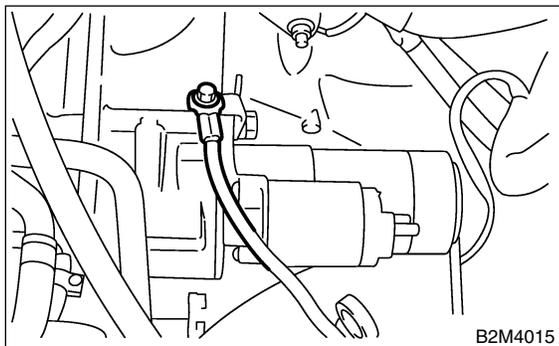


## 15) Connect the following connectors.

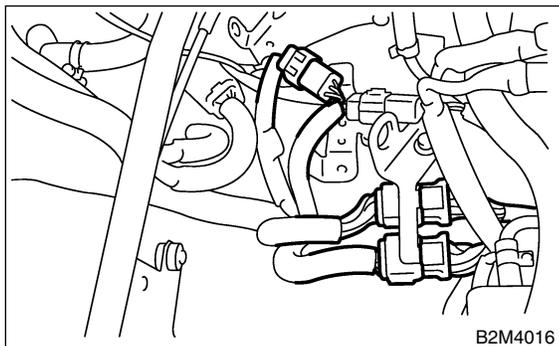
### (1) Engine ground terminals

#### Tightening torque:

**14 N·m (1.4 kgf-m, 10.1 ft-lb)**

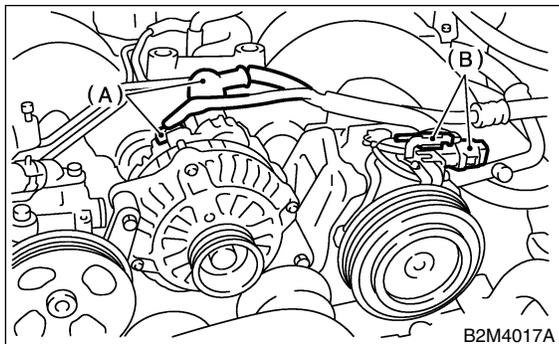


### (2) Engine harness connectors



### (3) Alternator connector and terminal (A)

### (4) A/C compressor connectors (B)



## 16) Connect the following cables.

#### CAUTION:

**After connecting each cable, adjust them.**

### 17) Install A/C pressure hoses.

<Ref. to AC-38, INSTALLATION, Flexible Hose.>

### 18) Install V-belt.

19) Install radiator to vehicle. <Ref. to CO(H6)-24, INSTALLATION, Radiator.>

20) Install air intake duct, cleaner case and air intake chamber.

<Ref. to IN(H6)-2, General Description.>

21) Install under cover.

22) Install battery in the vehicle, and connect cables.

23) Fill coolant.

<Ref. to CO(H6)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

24) Check ATF level and correct if necessary.

<Ref. to AT-9, Automatic Transmission Fluid.>

25) Charge A/C system with refrigerant.

<Ref. to AC-19, OPERATION, Refrigerant Charging Procedure.>

26) Remove front hood stay, and close front hood.

27) Take off the vehicle from lift arms.

#### C: INSPECTION

S143079A10

1) Make sure pipes and hoses are installed correctly.

2) Make sure the engine coolant and ATF are at specified levels.

## 8. Engine Mounting S143085

### A: REMOVAL S143085A18

- 1) Remove engine assembly. <Ref. to ME(H6)-30, REMOVAL, Engine Assembly.>
- 2) Remove engine mounting from engine assembly.

### B: INSTALLATION S143085A11

Install in the reverse order of removal.

#### *Tightening torque:*

#### *Engine mounting;*

**34 N·m (3.5 kgf·m, 25.3 ft-lb)**

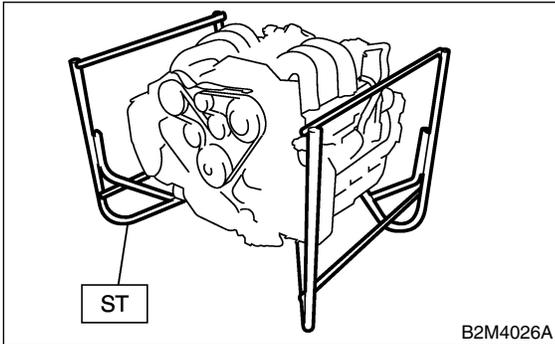
### C: INSPECTION S143085A10

Make sure there are no cracks or other damage.

## 9. Preparation for Overhaul S143091

### A: REMOVAL S143091A18

- 1) Remove engine from body. <Ref. to ME(H6)-30, REMOVAL, Engine Assembly.>
- 2) After removing engine from body, install ST onto engine.  
ST 18232AA000 ENGINE STAND

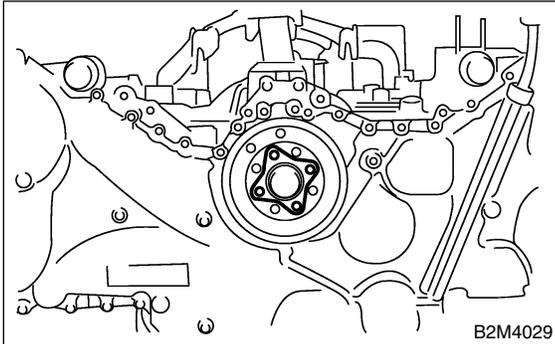


- 3) Remove sensors, pipes, and hoses installed on engine before starting overhaul.
  - (1) Remove intake manifold. <Ref. to FU(H6)-17, REMOVAL, Intake Manifold.>
  - (2) Remove generator. <Ref. to SC(H6)-11, REMOVAL, Generator.>
  - (3) Remove A/C compressor. <Ref. to AC-31, REMOVAL, Compressor.>
  - (4) Remove EGR pipe. <Ref. to EC(H6)-10, REMOVAL, EGR Valve.>
  - (5) Remove water pipe and hoses.
  - (6) Remove engine harness.
  - (7) Remove spark plugs. <Ref. to IG(H6)-4, REMOVAL, Spark Plug.>
  - (8) Remove camshaft position sensor. <Ref. to FU(H6)-31, REMOVAL, Camshaft Position Sensor.>
  - (9) Remove crankshaft position sensor. <Ref. to FU(H6)-30, REMOVAL, Crankshaft Position Sensor.>
  - (10) Remove knock sensor. <Ref. to FU(H6)-32, REMOVAL, Knock Sensor.>
  - (11) Remove engine temperature sensor. <Ref. to FU(H6)-29, REMOVAL, Engine Coolant Temperature Sensor.>
  - (12) Remove oil pressure switch. <Ref. to LU(H6)-17, REMOVAL, Oil Pressure Switch.>
  - (13) Remove oil filter. <Ref. to LU(H6)-18, REMOVAL, Engine Oil Filter.>
  - (14) Remove oil cooler. <Ref. to LU(H6)-19, REMOVAL, Oil Cooler.>

## 10. Crankshaft Pulley S143098

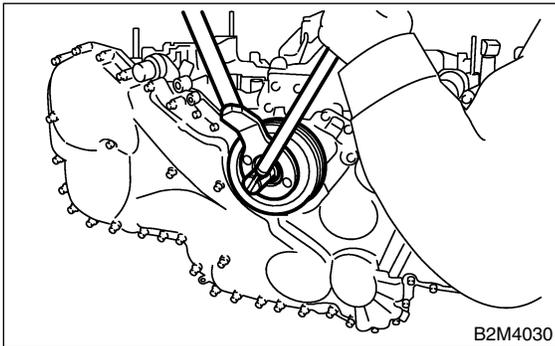
### A: REMOVAL S143098A18

- 1) Remove crankshaft pulley cover.



- 2) Remove crankshaft pulley bolt. To lock crankshaft, use ST.

ST 49997100 CRANKSHAFT PULLEY WRENCH



- 3) Remove crankshaft pulley.

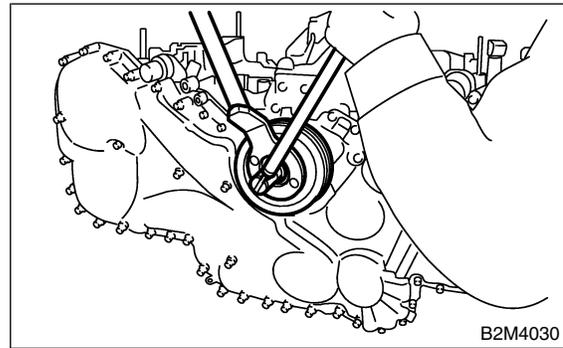
### B: INSTALLATION S143098A11

- 1) Install crankshaft pulley.
- 2) Install crankshaft pulley bolt. To lock crankshaft, use ST.

ST 49997100 CRANKSHAFT PULLEY WRENCH

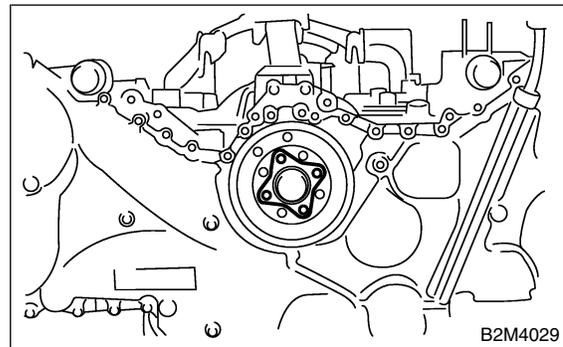
- (1) Clean the crankshaft pulley thread using an air gun.
- (2) Apply engine oil to the crankshaft pulley bolt seat and thread.
- (3) Tighten the crankshaft pulley bolts.

**Tightening torque:**  
**178 N·m (18.1 kgf·m, 131 ft·lb)**



- 3) Install the crankshaft pulley cover.

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



### C: INSPECTION S143098A10

- 1) Check crankshaft pulley cover for oil leaks and bleeding.
- 2) Check crankshaft pulley for looseness.

# FRONT CHAIN COVER

Mechanical

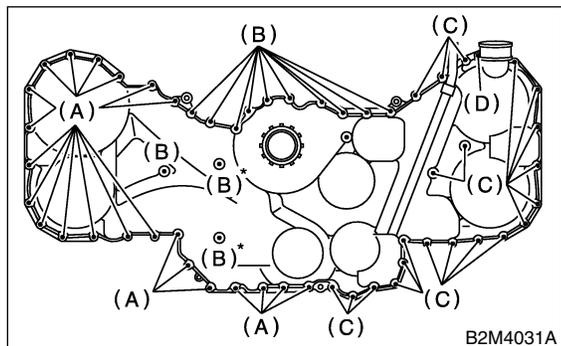
## 11. Front Chain Cover S143739

### A: REMOVAL S143739A18

- 1) Remove crankshaft pulley. <Ref. to ME(H6)-39, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover.

#### NOTE:

There are four different types of chain cover mounting bolts. Sort them into separate containers to avoid confusion at installation.



#### Bolt dimension:

- (A) 6 × 45
- (B) 6 × 16
- (C) 6 × 30
- (D) 6 × 50

\*: Sealing washer

### B: INSTALLATION S143739A11

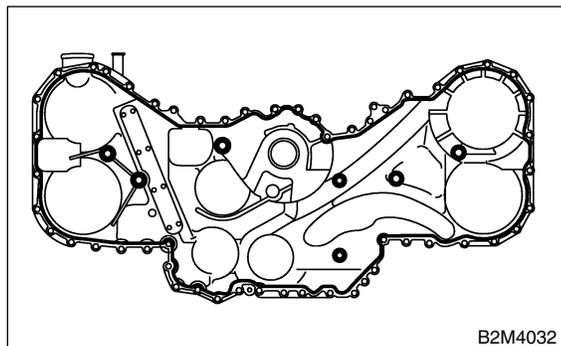
- 1) Remove old fluid packing on the matching surface, and degrease it.
- 2) Apply fluid packing to the mating surface of front chain cover.

#### Fluid packing:

**THREE BOND 1280B**

#### Fluid packing application diameter:

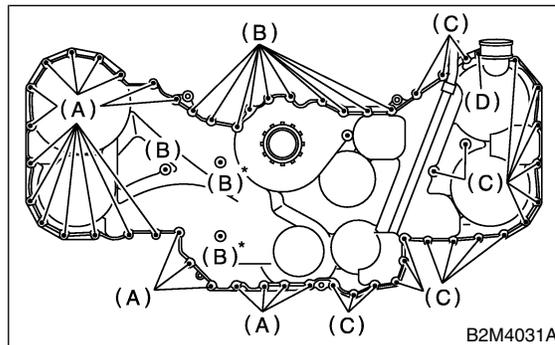
**2.5±0.5 mm (0.098±0.0197 in)**



- 3) Install front chain cover. Temporarily tighten the bolts.

#### NOTE:

Do not confuse the mounting positions of the bolts.



#### Bolt dimension:

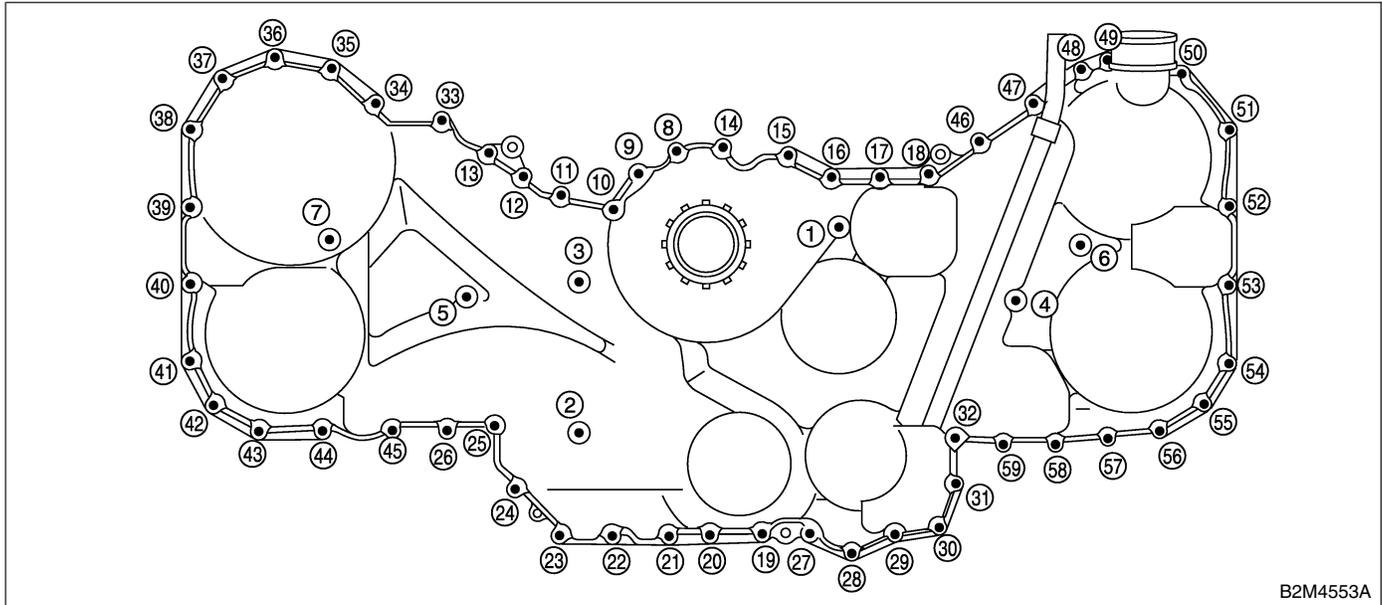
- (A) 6 × 45
- (B) 6 × 16
- (C) 6 × 30
- (D) 6 × 50

\*: Sealing washer

4) Tighten the bolts in the numerical sequence shown in figure.

**Tightening torque:**

**6.6 N·m (0.67 kgf·m, 4.8 ft·lb)**



5) Install crankshaft pulley. <Ref. to ME(H6)-39, INSTALLATION, Crankshaft Pulley.>

**C: INSPECTION** S143739A10

Check the cover surface for flaws and dents.  
Check the cover mating surface and the mounting point of crankshaft pulley for oil leaks.

# TIMING CHAIN ASSEMBLY

Mechanical

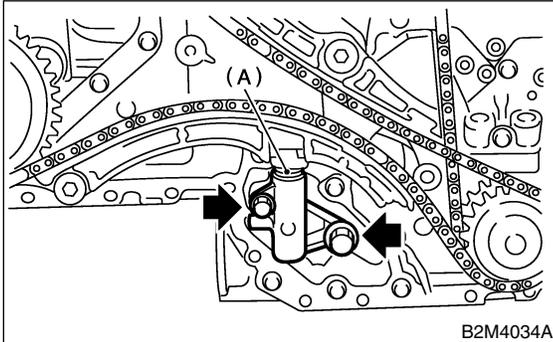
## 12. Timing Chain Assembly S143740

### A: REMOVAL S143740A18

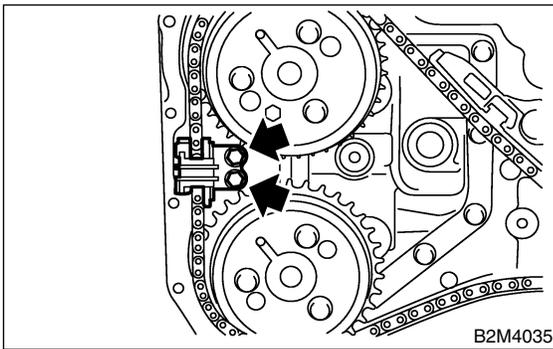
- 1) Remove crankshaft pulley. <Ref. to ME(H6)-39, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6)-40, REMOVAL, Front Chain Cover.>
- 3) Remove chain tensioner (RH).

NOTE:

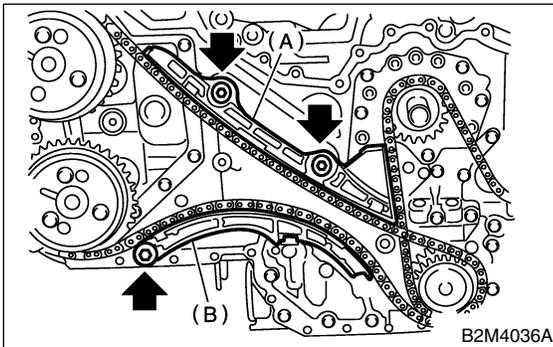
Make sure plunger (A) does not come out.



- 4) Remove chain guide. (Right-hand between cams)



- 5) Remove chain guide (RH).
- 6) Remove chain tensioner lever (RH).



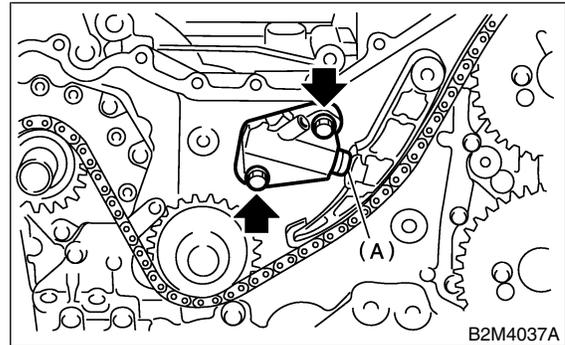
- (A) Chain guide (RH)
- (B) Chain tensioner lever (RH)

- 7) Remove timing chain (RH).

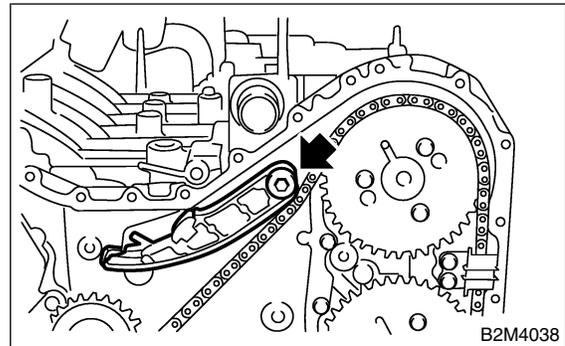
- 8) Remove chain tensioner (LH).

NOTE:

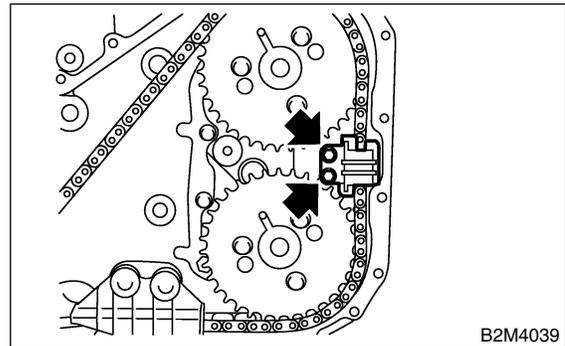
Make sure plunger (A) does not come out.



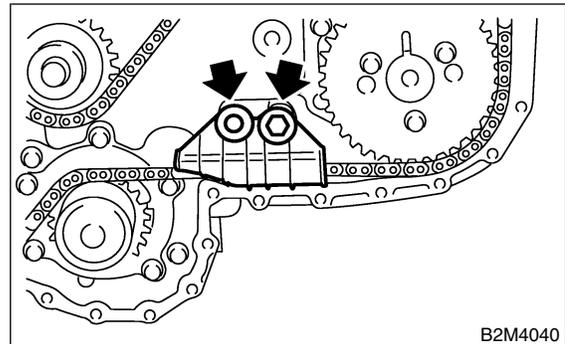
- 9) Remove chain tensioner lever (LH).



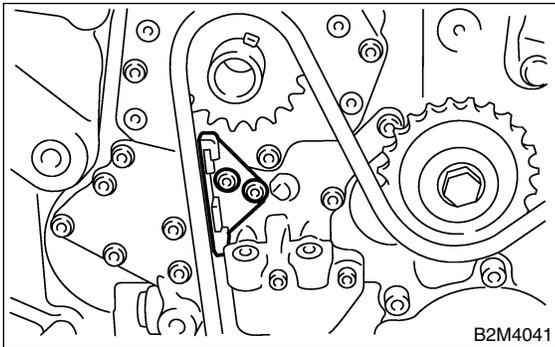
- Remove chain guide. (Left-hand between cams)



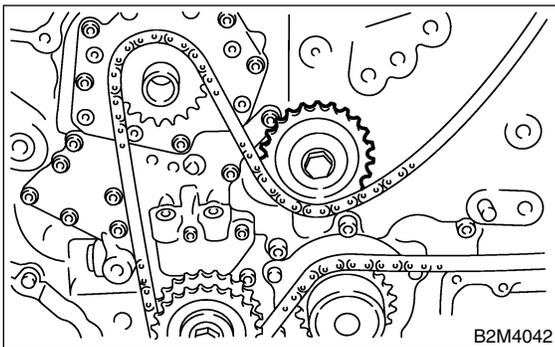
- 10) Remove chain guide (LH).



11) Remove chain guide. (Center)

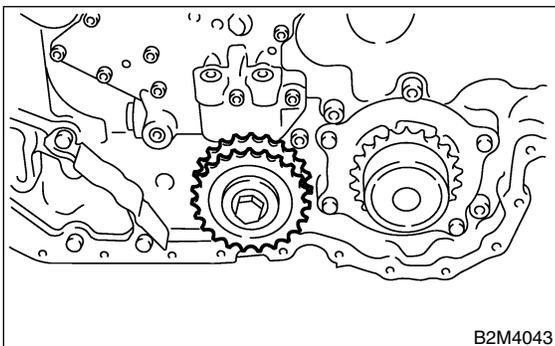


12) Remove idler sprocket. (Upper)



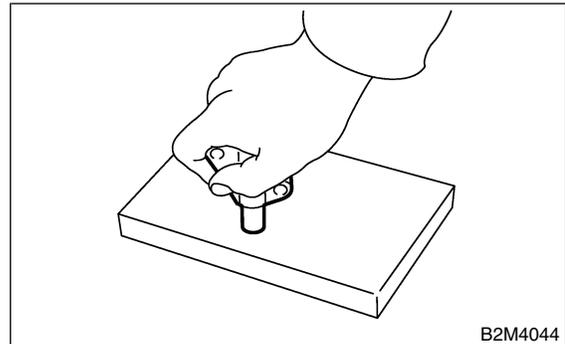
13) Remove timing chain (LH).

14) Remove idler sprocket. (Lower)



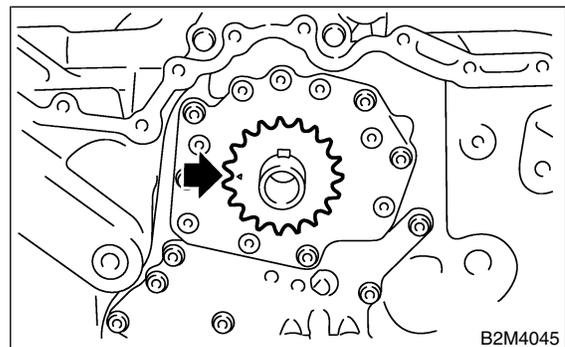
NOTE:

Carry out the work on rubber mat or other nonslip material.



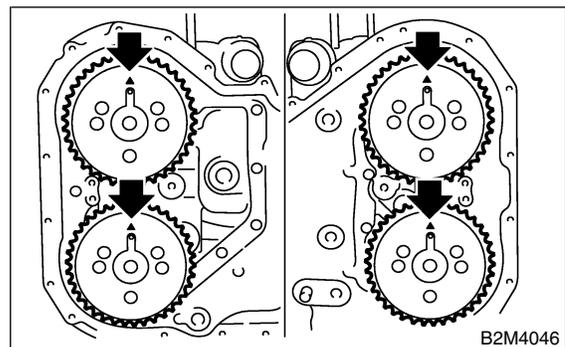
2) Using ST, align "top mark" on crankshaft sprocket at 9 o'clock position as shown in the figure.

ST 18252AA000 CRANKSHAFT SOCKET



3) Using ST, align four key grooves on camshaft sprocket at 12 o'clock position as shown in the figure.

ST 18231AA000 CAMSHAFT SPROCKET WRENCH



## B: INSTALLATION

S143740A11

### CAUTION:

- During installation, be careful to prevent foreign objects from attaching to or mixing with assembled components.
- Apply engine oil to chain guide, chain tensioner lever, and idler sprocket during installation.

- 1) Preparation for installation of chain tensioner.
  - (1) Put the screw, spring, pin and tension rod into the tensioner body.
  - (2) While pressing tensioner onto rubber mat, twist it left and right to shorten tension rod. Then set a thin pin into the holes between tension rod and tensioner body to hold it.

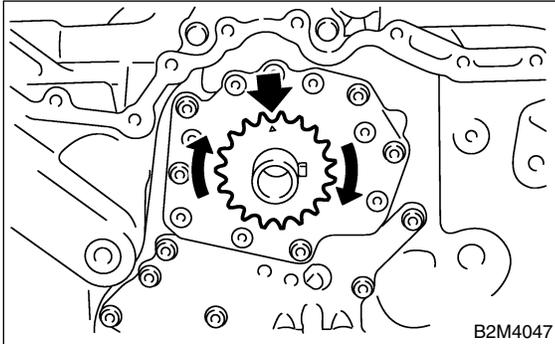
# TIMING CHAIN ASSEMBLY

Mechanical

4) Rotate crankshaft sprocket clockwise to align "top mark" at 12 o'clock position as shown in the figure. (Piston # 1 is at TDC.)

**CAUTION:**

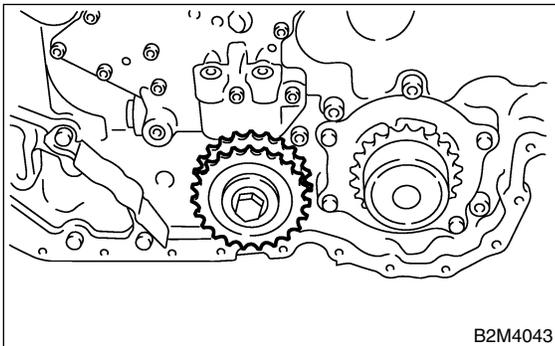
**Do not rotate crankshaft and camshaft sprockets until timing chain is completely routed.**



5) Install the idler sprocket. (Lower)

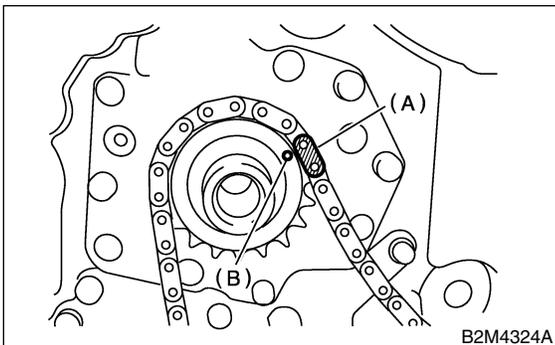
**Tightening torque:**

**69 N·m (7.0 kgf-m, 50.6 ft-lb)**



6) Install timing chain LH.

(1) Align the timing mark (B) on crankshaft sprocket with the matching mark (A) on timing chain LH.

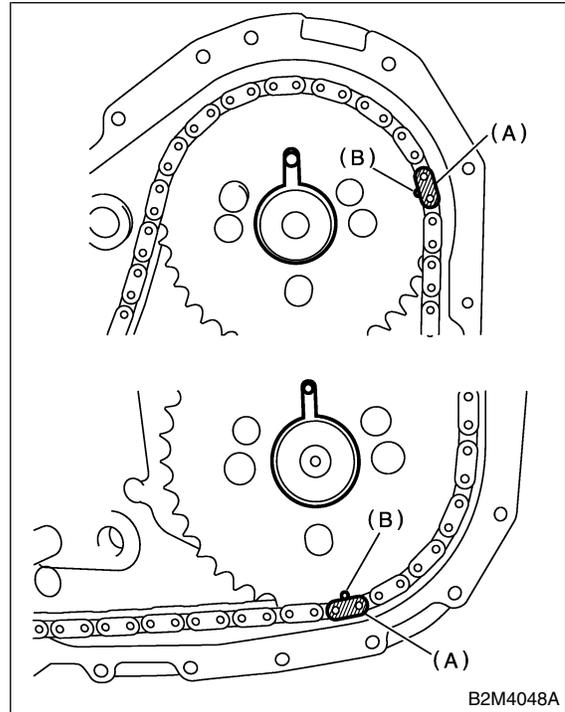


(A) Gold

(2) Route timing chain LH on idler sprocket (Lower), water pump, exhaust cam sprocket, and intake cam sprocket in order.

**CAUTION:**

**Make sure that matching marks on the timing chain (A) and camshaft sprocket (B) are aligned the same way as the one on crankshaft sprocket.**

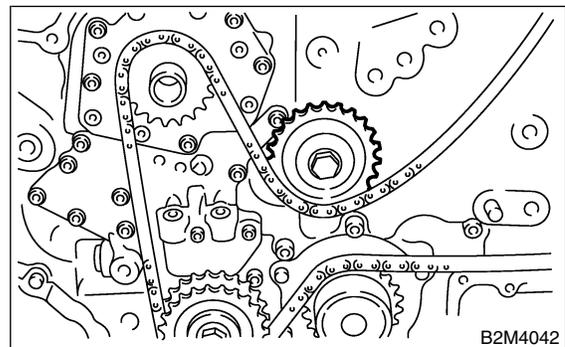


(A) Dark blue

(3) Install chain idler. (Upper)

**Tightening torque:**

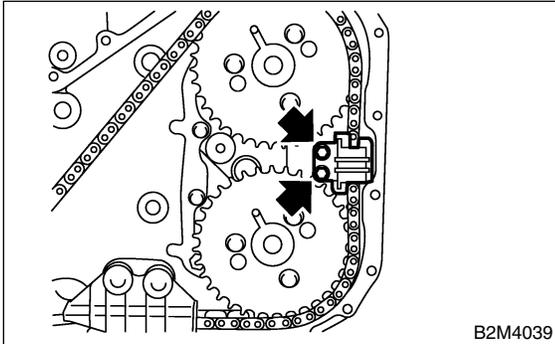
**69 N·m (7.0 kgf-m, 50.6 ft-lb)**



(4) Install chain guide. (Left-hand between cams)

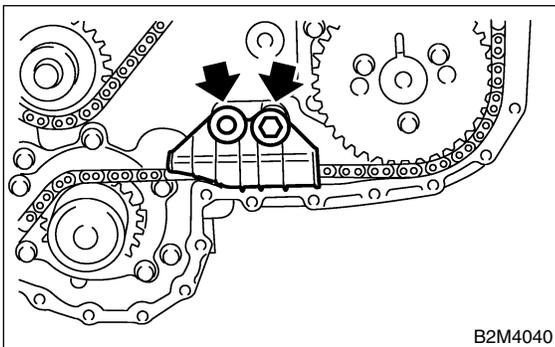
**Tightening torque:**  
**6.3N·m (0.64 kgf-m, 4.6 ft-lb)**

**NOTE:**  
 Replace mounting bolt with a new one.



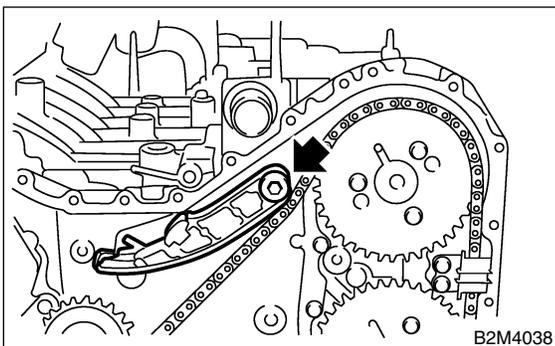
(5) Install chain guide (LH).

**Tightening torque:**  
**16 N·m (1.6 kgf-m, 11.6 ft-lb)**



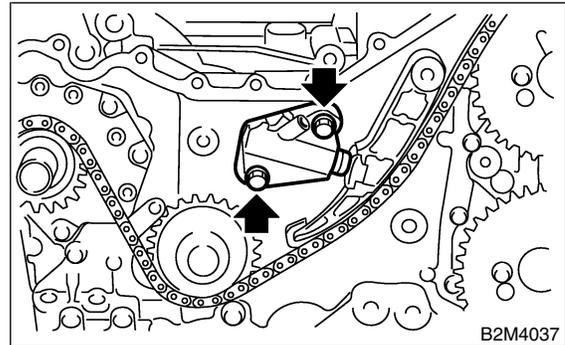
(6) Install chain tensioner lever LH.

**Tightening torque:**  
**16 N·m (1.6 kgf-m, 11.6 ft-lb)**



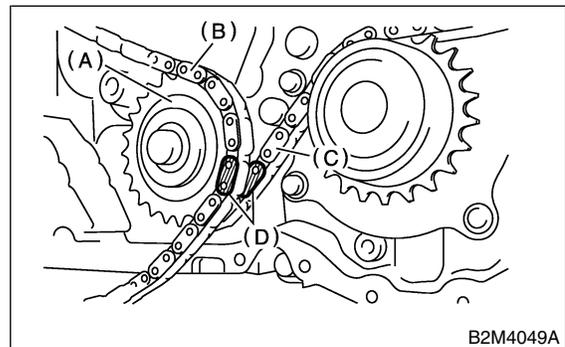
(7) Install chain tensioner LH.

**Tightening torque:**  
**16 N·m (1.6 kgf-m, 11.6 ft-lb)**



7) Install timing chain RH.

(1) On idler sprocket (Lower), align matching marks on timing chains LH and RH.



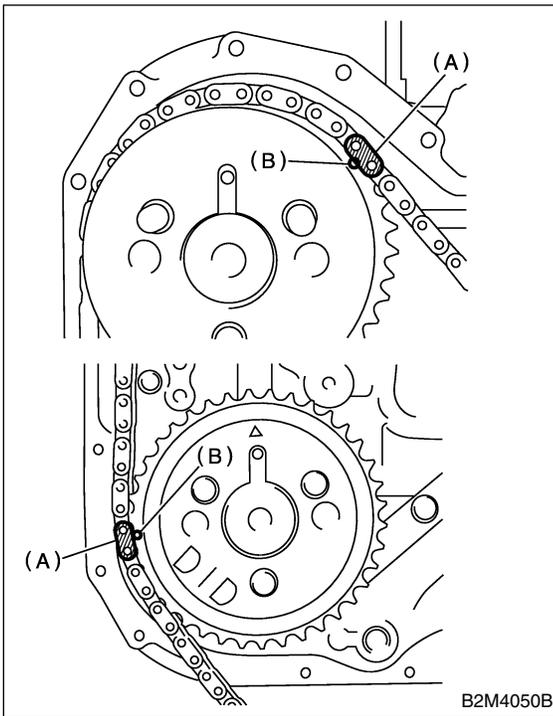
- (A) Lower idler sprocket
- (B) Timing chain RH
- (C) Timing chain LH
- (D) Dark blue

(2) Route timing chain RH on intake cam sprocket and then exhaust cam sprocket.

**CAUTION:**  
 Make sure that matching marks on the timing chain (A) and camshaft sprocket (B) are aligned the same way as the one on crankshaft sprocket.

# TIMING CHAIN ASSEMBLY

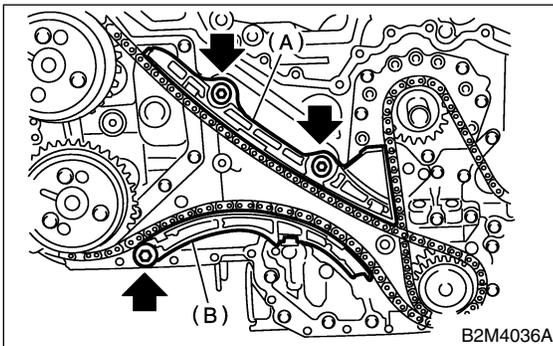
Mechanical



(A) Gold

- (3) Install chain guide (RH).
- (4) Install chain tensioner lever (RH).

**Tightening torque:**  
**16 N·m (1.6 kgf-m, 11.6 ft-lb)**

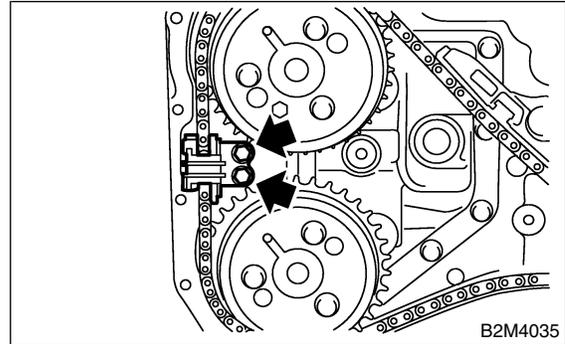


- (A) Chain guide (RH)
- (B) Chain tensioner lever (RH)

- (5) Install timing chain guide RH No. 1.

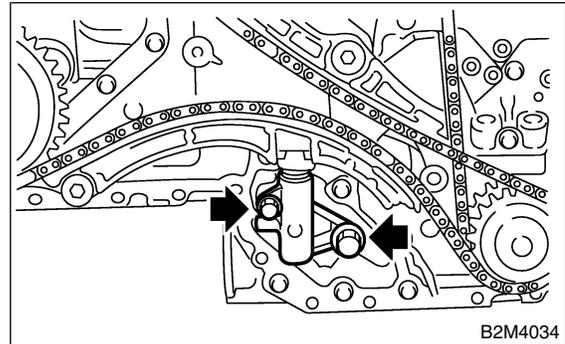
**Tightening torque:**  
**6.3 N·m (0.64 kgf-m, 4.6 ft-lb)**

**NOTE:**  
Replace mounting bolt with a new one.



- (6) Install the chain tensioner (RH).

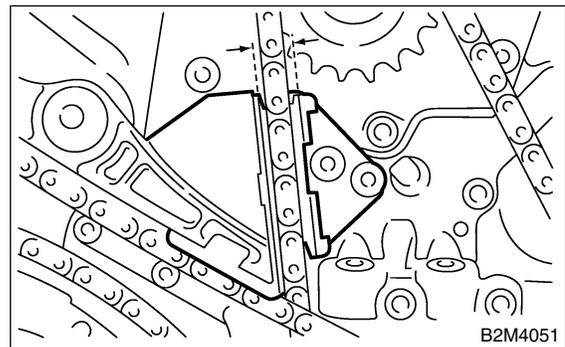
**Tightening torque:**  
**16 N·m (1.6 kgf-m, 11.6 ft-lb)**



- (7) Adjust the clearance between chain guide (RH) and chain guide (Center) to the range between 8.4 mm (0.331 in) to 8.6 mm (0.339 in). And install chain guide (Center).

**Tightening torque:**  
**7.8 N·m (0.8 kgf-m, 5.8 ft-lb)**

**NOTE:**  
Replace mounting bolt with a new one.



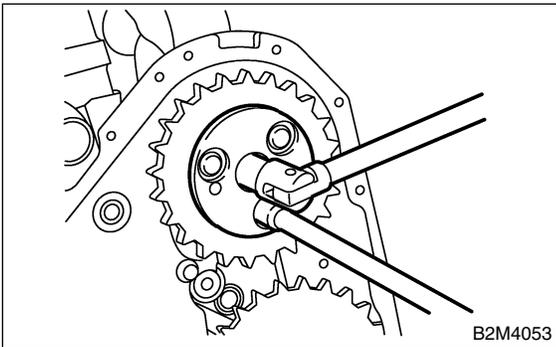
- (8) After checking the matching marks on each sprocket and corresponding timing chain are aligned, pull stopper pin out of chain tensioner.

## 13. Camshaft Sprocket S143097

### A: REMOVAL S143097A18

- 1) Remove crankshaft pulley. <Ref. to ME(H6)-39, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6)-40, REMOVAL, Front Chain Cover.>
- 3) Remove timing chain assembly. <Ref. to ME(H6)-42, REMOVAL, Timing Chain Assembly.>
- 4) Remove camshaft sprocket. To lock camshaft, use ST.

ST 18231AA000 CAMSHAFT SPROCKET  
WRENCH



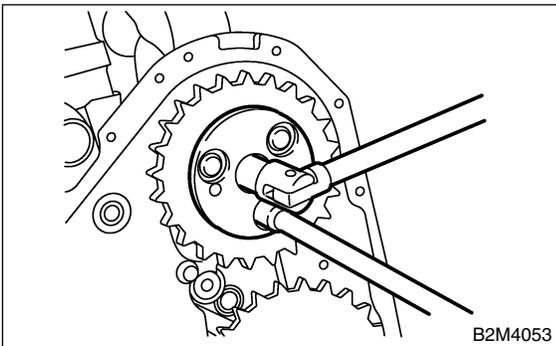
### B: INSTALLATION S143097A11

- 1) Install camshaft sprocket. To lock camshaft, use ST.

ST 18231AA000 CAMSHAFT SPROCKET  
WRENCH

#### **Tightening torque:**

**13 N·m (1.3 kgf·m, 9.4 ft·lb)**



- 2) Install timing chain assembly. <Ref. to ME(H6)-43, INSTALLATION, Timing Chain Assembly.>
- 3) Install front chain cover. <Ref. to ME(H6)-40, INSTALLATION, Front Chain Cover.>
- 4) Install crankshaft pulley. <Ref. to ME(H6)-39, INSTALLATION, Crankshaft Pulley.>

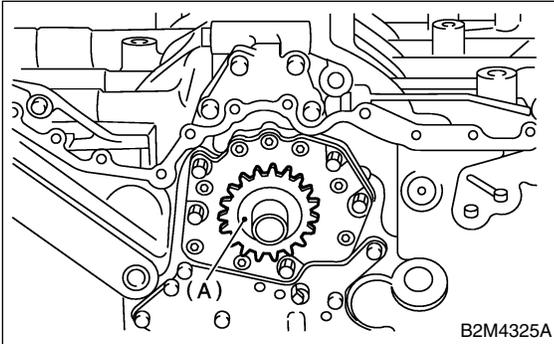
### C: INSPECTION S143097A10

- 1) Check sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.

## 14. Crankshaft Sprocket S143101

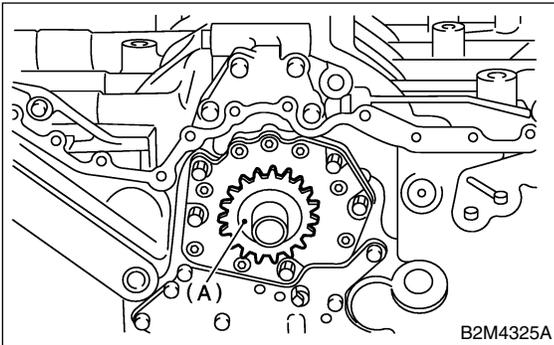
### A: REMOVAL S143101A18

- 1) Remove crankshaft pulley. <Ref. to ME(H6)-39, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6)-40, REMOVAL, Front Chain Cover.>
- 3) Remove timing chain assembly. <Ref. to ME(H6)-42, REMOVAL, Timing Chain Assembly.>
- 4) Remove camshaft sprocket. <Ref. to ME(H6)-47, REMOVAL, Camshaft Sprocket.>
- 5) Remove crankshaft sprocket (A).



### B: INSTALLATION S143101A11

- 1) Install crankshaft sprocket (A).



- 2) Install camshaft sprocket. <Ref. to ME(H6)-47, INSTALLATION, Camshaft Sprocket.>
- 3) Install timing chain assembly. <Ref. to ME(H6)-43, INSTALLATION, Timing Chain Assembly.>
- 4) Install front chain cover. <Ref. to ME(H6)-40, INSTALLATION, Front Chain Cover.>
- 5) Install crankshaft pulley. <Ref. to ME(H6)-39, INSTALLATION, Crankshaft Pulley.>

### C: INSPECTION S143101A10

- 1) Check sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

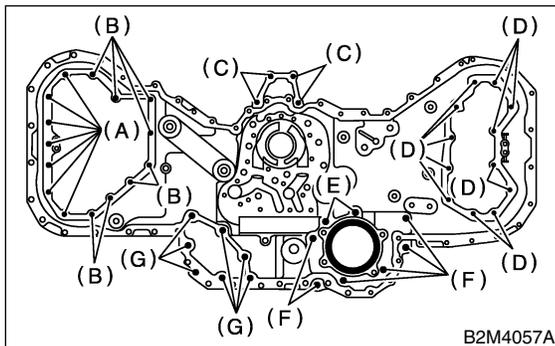
## 15. Rear Chain Cover S143741

### A: REMOVAL S143741A18

- 1) Remove crankshaft pulley. <Ref. to ME(H6)-39, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6)-40, REMOVAL, Front Chain Cover.>
- 3) Remove timing chain. <Ref. to ME(H6)-42, REMOVAL, Timing Chain Assembly.>
- 4) Remove camshaft sprocket. <Ref. to ME(H6)-47, REMOVAL, Camshaft Sprocket.>
- 5) Remove crankshaft sprocket.
- 6) Remove oil pump. (B)  
<Ref. to LU(H6)-12, REMOVAL, Oil Pump.>
- 7) Remove oil pump relief valve case.  
<Ref. to LU(H6)-14, REMOVAL, Oil Pump Relief Valve.>
- 8) Remove water pump.  
<Ref. to CO(H6)-20, REMOVAL, Water Pump.>
- 9) Remove rear chain cover.

**NOTE:**

There are seven different types of mounting bolts. Sort them into separate containers to avoid confusion at installation.



**Bolt dimension:**

- (A) 6 × 14
- (B) 6 × 18 (Silver)
- (C) 6 × 30
- (D) 6 × 18
- (E) 6 × 40
- (F) 6 × 30
- (G) 6 × 22

### B: INSTALLATION S143741A11

- 1) Remove old fluid packing on the matching surface, and degrease it.

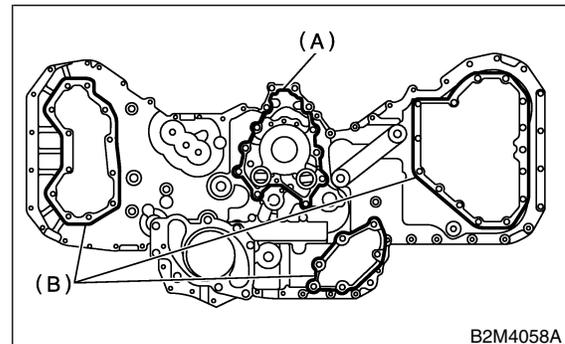
- 2) Apply fluid packing to the mating surface of rear chain cover.

**Fluid packing:**

**THREE BOND 1280B**

**Fluid packing application diameter:**

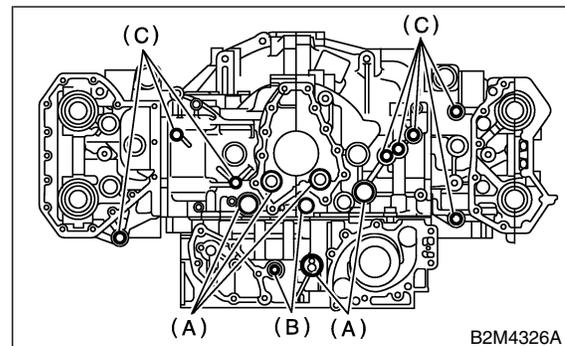
- (A) 1.0±0.5 mm (0.039±0.020 in)
- (B) 3.0±1.0 mm (0.118±0.039 in)



- 3) Install O-ring.

**NOTE:**

Do not reuse the O-ring.



- (A) O-ring (Large)
- (B) O-ring (Medium)
- (C) O-ring (Small)

# REAR CHAIN COVER

Mechanical

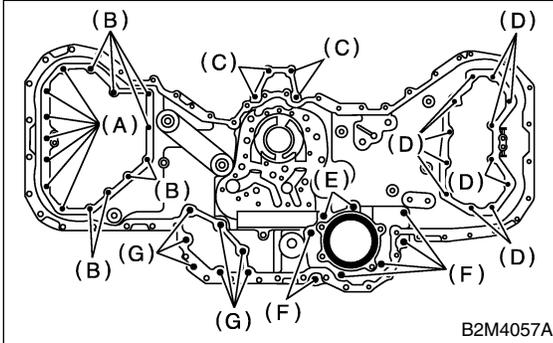
4) Temporarily tighten rear chain cover.

**CAUTION:**

**Do not confuse the mounting positions of the bolts.**

**NOTE:**

Replace mounting bolts (G) with new ones.



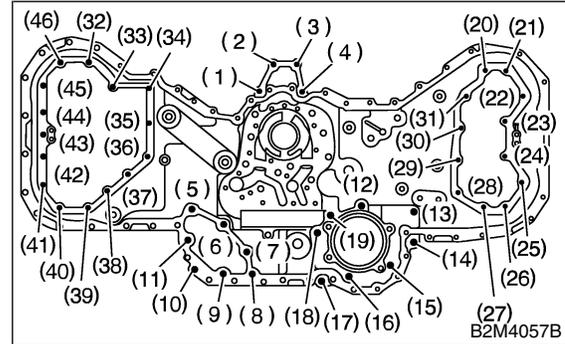
**Bolt dimension:**

- (A) 6 × 14
- (B) 6 × 18 (Silver)
- (C) 6 × 30
- (D) 6 × 18
- (E) 8 × 40
- (F) 8 × 30
- (G) 6 × 22

5) Tighten the bolts in the numerical sequence shown in figure.

**Tightening torque:**

(1) to (11)	9 N·m (0.9 kgf-m, 6.5 ft-lb)
(12) to (19)	20 N·m (2.0 kgf-m, 14 ft-lb)
(20) to (31)	9 N·m (0.9 kgf-m, 6.5 ft-lb)
(32) to (39)	12 N·m (1.2 kgf-m, 8.7 ft-lb)
(40) to (46)	9 N·m (0.9 kgf-m, 6.5 ft-lb)

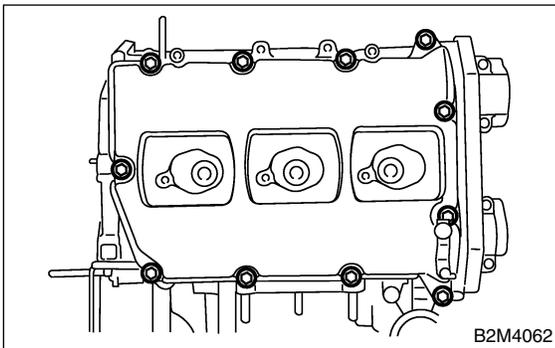


- 6) Install water pump.  
<Ref. to CO(H6)-20, INSTALLATION, Water Pump.>
- 7) Install oil pump relief valve.  
<Ref. to LU(H6)-14, INSTALLATION, Oil Pump Relief Valve.>
- 8) Install oil pump.  
<Ref. to LU(H6)-12, INSTALLATION, Oil Pump.>
- 9) Install crankshaft sprocket.
- 10) Install camshaft sprocket. <Ref. to ME(H6)-47, INSTALLATION, Camshaft Sprocket.>
- 11) Install timing chain. <Ref. to ME(H6)-43, INSTALLATION, Timing Chain Assembly.>
- 12) Install front chain cover. <Ref. to ME(H6)-40, INSTALLATION, Front Chain Cover.>
- 13) Install crankshaft pulley. <Ref. to ME(H6)-39, INSTALLATION, Crankshaft Pulley.>

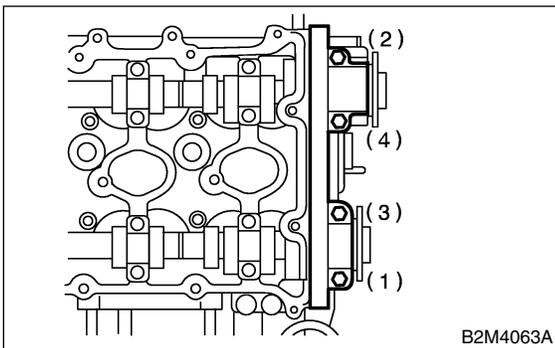
## 16. Camshaft S143092

### A: REMOVAL S143092A18

- 1) Remove crankshaft pulley. <Ref. to ME(H6)-39, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6)-40, REMOVAL, Front Chain Cover.>
- 3) Remove timing chain assembly. <Ref. to ME(H6)-42, REMOVAL, Timing Chain Assembly.>
- 4) Remove camshaft sprockets. <Ref. to ME(H6)-47, REMOVAL, Camshaft Sprocket.>
- 5) Remove crankshaft sprocket. <Ref. to ME(H6)-48, REMOVAL, Crankshaft Sprocket.>
- 6) Remove rear chain cover. <Ref. to ME(H6)-49, REMOVAL, Rear Chain Cover.>
- 7) Remove rocker cover (RH).

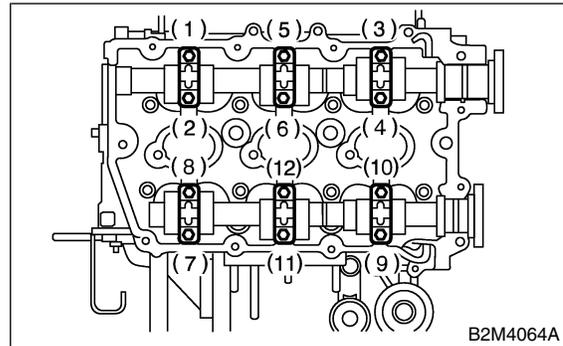


- 8) Loosen front camshaft cap bolts equally, a little at a time in numerical sequence shown in the figure (RH).



- 9) Remove camshaft cap and intake camshaft (RH).

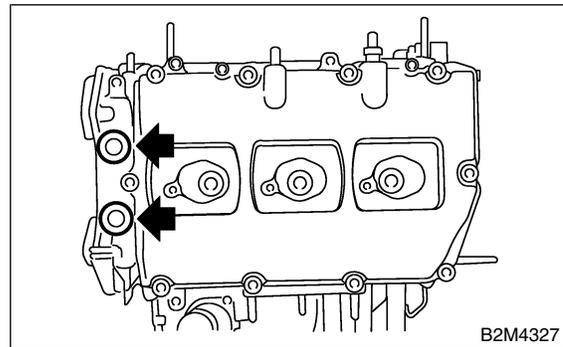
- 10) Loosen camshaft cap bolts equally, a little at a time in the numerical sequence shown in the figure.



- 11) Remove camshaft cap and exhaust camshaft (RH).

**CAUTION:**  
Arrange camshaft caps in order so that they can be installed in their original position.

- 12) Remove plug (LH).

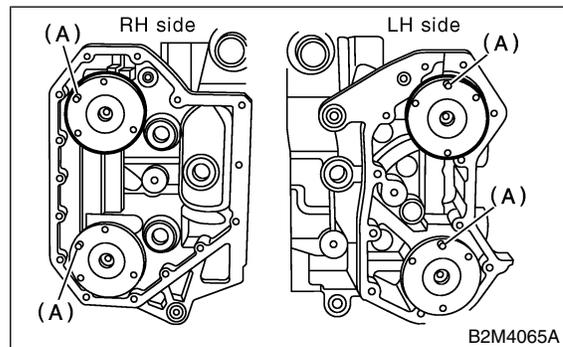


- 13) Similarly, remove left-hand camshafts and related parts.

### B: INSTALLATION S143092A11

- 1) Apply a coat of engine oil to camshaft journals and install camshaft.

**CAUTION:**  
When installing camshaft, adjust camshaft front flange knock pin (A) position as follows:  
LH side: 12 o'clock  
RH side: 10 o'clock



# CAMSHAFT

Mechanical

2) Install camshaft cap.

(1) Apply fluid packing sparingly to back of front camshaft cap shown in the figure.

**CAUTION:**

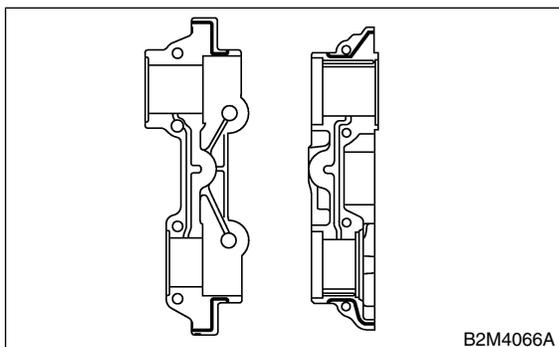
Do not apply fluid packing excessively. Failure to do so may cause excess packing to come out and flow toward oil seal, resulting in oil leaks.

**Fluid packing:**

**THREE BOND 1280B**

**Fluid packing application diameter:**

**2.0±0.5 mm (0.079±0.020 in)**

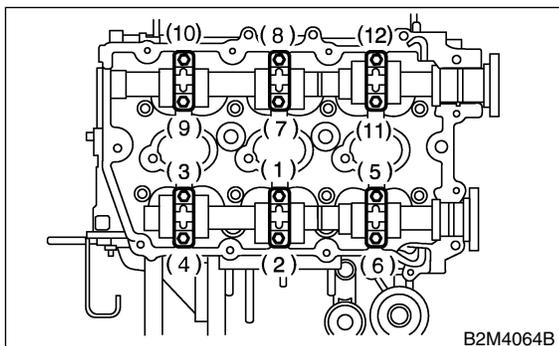


(2) Apply engine oil to cap bearing surface and install cap on camshaft.

(3) Tighten the camshaft cap bolts in the numerical sequence shown in the figure.

**Tightening torque:**

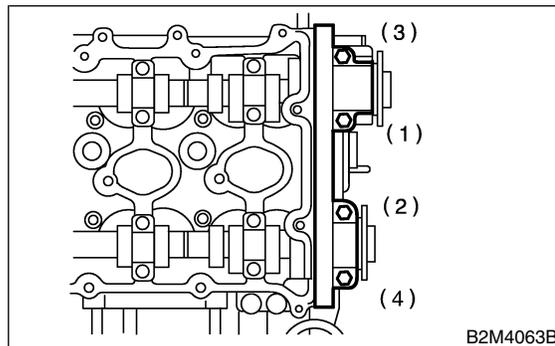
**16 N·m (1.6 kgf·m, 11.6 ft·lb)**



(4) Tighten the front camshaft cap bolts in the numerical sequence shown in the figure.

**Tightening torque:**

**9.8 N·m (1.0 kgf·m, 7.2 ft·lb)**



3) Install rocker cover.

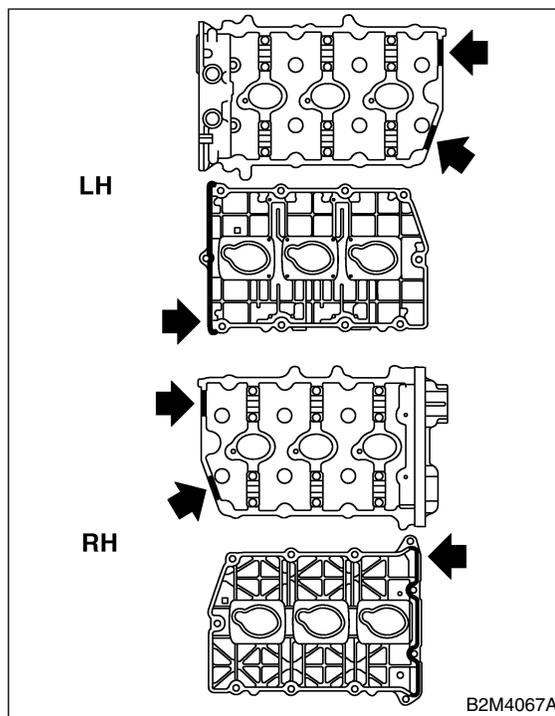
(1) Apply fluid packing sparingly to matching surface of cylinder heads and rocker covers shown in the figure.

**CAUTION:**

Do not apply fluid packing excessively. Doing so may cause excess packing to come out and flow toward oil seal, resulting in oil leaks.

**Fluid packing:**

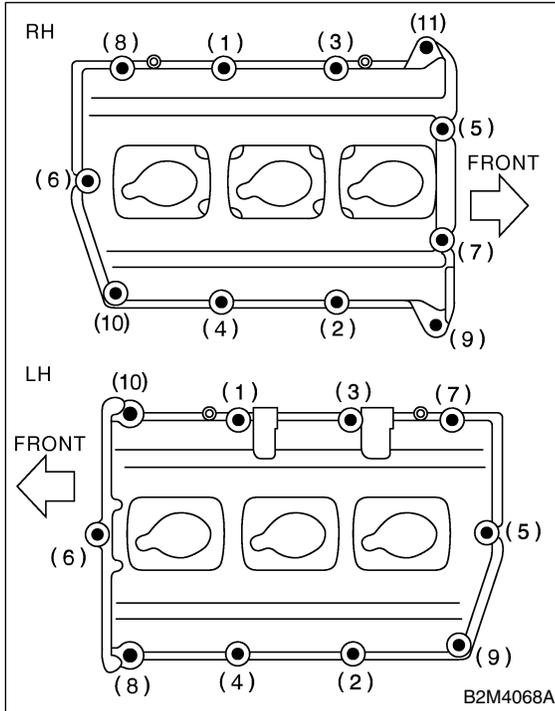
**THREE BOND 1280B**



(2) Tighten the rocker cover bolts in the numerical order shown in the figure.

**Tightening torque:**

**6.4 N·m (0.64 kgf·m, 4.6 ft·lb)**



- 4) Install rear chain cover. <Ref. to ME(H6)-49, INSTALLATION, Rear Chain Cover.>
- 5) Install crankshaft sprocket. <Ref. to ME(H6)-48, INSTALLATION, Crankshaft Sprocket.>
- 6) Install camshaft sprockets. <Ref. to ME(H6)-47, INSTALLATION, Camshaft Sprocket.>
- 7) Install timing chain assembly. <Ref. to ME(H6)-43, INSTALLATION, Timing Chain Assembly.>
- 8) Install front chain cover. <Ref. to ME(H6)-40, INSTALLATION, Front Chain Cover.>
- 9) Install crankshaft pulley. <Ref. to ME(H6)-39, INSTALLATION, Crankshaft Pulley.>

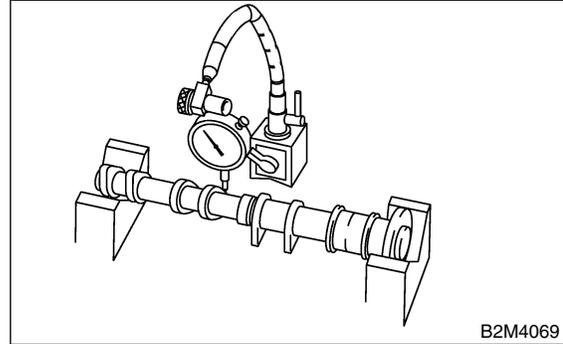
## C: INSPECTION S143092A10

### 1. CAMSHAFT S143092A1001

1) Measure the bend, and repair or replace if necessary.

**Limit:**

**0.020 mm (0.0008 in)**



- 2) Check journal for damage and wear. Replace if faulty.
- 3) Measure outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	27.946 — 27.963 mm (1.1002 — 1.1009 in)

- 4) Measurement of the camshaft journal oil clearance
  - (1) Clean the bearing caps and camshaft journals.
  - (2) Place the camshafts on the cylinder head. (Without installing valve rocker.)
  - (3) Place plastigauge across each of the camshaft journals.
  - (4) Install the bearing caps.

**CAUTION:**

**Do not turn the camshaft.**

- (5) Remove the bearing caps.

# CAMSHAFT

Mechanical

(6) Measure the widest point of the plastigauge on each journal.

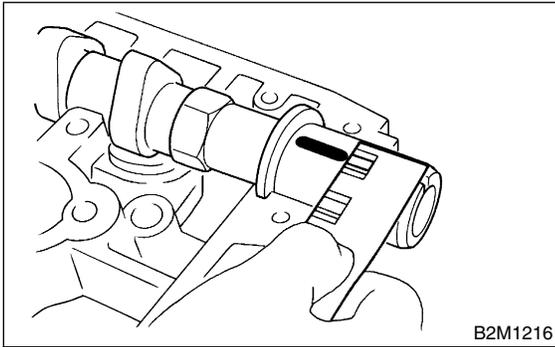
If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

**Standard oil clearance:**

**0.037 — 0.072 mm (0.0015 — 0.0028 in)**

**Limit:**

**0.10 mm (0.0039 in)**



(7) Completely remove the plastigauge.

5) Check cam face condition; remove minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

**Cam height: H**

**Standard:**

**Intake:**

**46.05 — 46.15 mm (1.8130 — 1.8169 in)**

**Exhaust:**

**45.55 — 45.65 mm (1.7933 — 1.7972 in)**

**Limit:**

**Intake:**

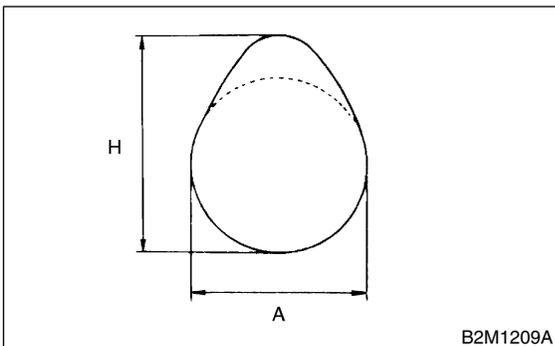
**45.95 mm (1.8091 in)**

**Exhaust:**

**45.45 mm (1.7894 in)**

**Cam base circle diameter A:**

**36.0 mm (1.4173 in)**



6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace caps and cylinder head as a set. If necessary replace camshaft.

**Standard:**

**Intake:**

**0.075 — 0.135 mm (0.0030 — 0.0053 in)**

**Exhaust:**

**0.048 — 0.108 mm (0.0019 — 0.0043 in)**

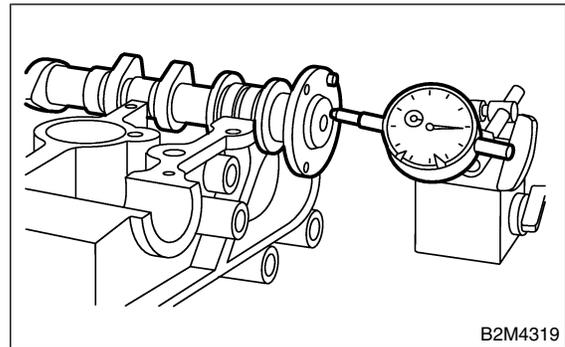
**Limit:**

**Intake:**

**0.155 mm (0.0061 in )**

**Exhaust:**

**0.130 mm (0.0051 in)**



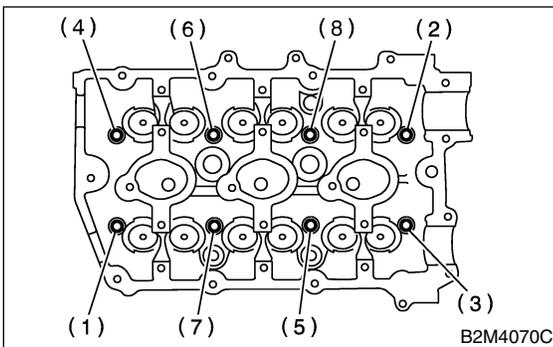
## 17. Cylinder Head Assembly S143093

### A: REMOVAL S143093A18

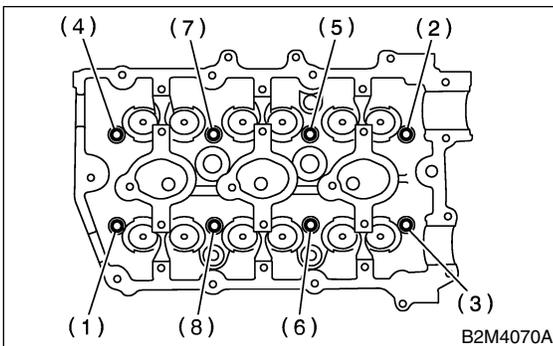
- 1) Remove crankshaft pulley. <Ref. to ME(H6)-39, REMOVAL, Crankshaft Pulley.>
- 2) Remove front chain cover. <Ref. to ME(H6)-40, REMOVAL, Front Chain Cover.>
- 3) Remove timing chain assembly. <Ref. to ME(H6)-42, REMOVAL, Timing Chain Assembly.>
- 4) Remove camshaft sprockets. <Ref. to ME(H6)-47, REMOVAL, Camshaft Sprocket.>
- 5) Remove crankshaft sprocket. <Ref. to ME(H6)-48, REMOVAL, Crankshaft Sprocket.>
- 6) Remove rear chain cover. <Ref. to ME(H6)-49, REMOVAL, Rear Chain Cover.>
- 7) Remove camshafts. <Ref. to ME(H6)-51, REMOVAL, Camshaft.>
- 8) Remove cylinder head bolts in numerical sequence shown in figure.

#### CAUTION:

**Leave bolts (2) and (4) engaged by three or four threads to prevent cylinder head from falling.**



- 9) Tap cylinder head with a plastic hammer to separate it from cylinder block.
- 10) Remove bolts (2) and (4) to remove cylinder head.



- 11) Remove cylinder head gasket.

#### CAUTION:

**Do not scratch the mating surface of cylinder head and cylinder block.**

- 12) Similarly, remove right side cylinder head.

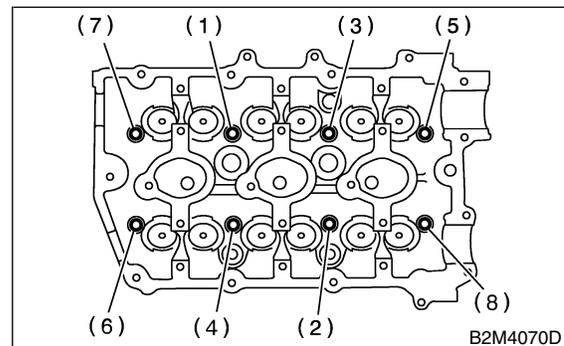
### B: INSTALLATION S143093A11

- 1) Install cylinder head and gaskets on cylinder block.

#### CAUTION:

- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder block and oil pump.

- 2) Tighten cylinder head bolts.
  - (1) Coat the washers and threaded parts of the cylinder head bolts with engine oil.
  - (2) Install the cylinder head on the cylinder block and tighten the bolts in the numerical order shown in the figure to a tightening torque of 20 N·m (2.0 kgf·m, 14 ft·lb).
  - (3) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 50 N·m (5.1 kgf·m, 37 ft·lb).
  - (4) Loosen all the bolts in 2 stages, 180° at a time, in the reverse order of tightening.
  - (5) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 25 N·m (2.5 kgf·m, 18 ft·lb).
  - (6) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 25 N·m (2.5 kgf·m, 18 ft·lb).
  - (7) Tighten all the bolts 90° in the numerical order shown in the figure.
  - (8) Tighten the (1) to (4) bolts 90° again in the numerical order shown in the figure.
  - (9) Tighten the (5) to (8) bolts 45° again in the numerical order shown in the figure.



- 3) Install camshafts. <Ref. to ME(H6)-51, INSTALLATION, Camshaft.>
- 4) Install rear chain cover. <Ref. to ME(H6)-49, INSTALLATION, Rear Chain Cover.>
- 5) Install crankshaft sprocket. <Ref. to ME(H6)-48, INSTALLATION, Crankshaft Sprocket.>
- 6) Install camshaft sprockets. <Ref. to ME(H6)-47, INSTALLATION, Camshaft Sprocket.>
- 7) Install timing chain assembly. <Ref. to ME(H6)-43, INSTALLATION, Timing Chain Assembly.>
- 8) Install front chain cover. <Ref. to ME(H6)-40, INSTALLATION, Front Chain Cover.>

# CYLINDER HEAD ASSEMBLY

Mechanical

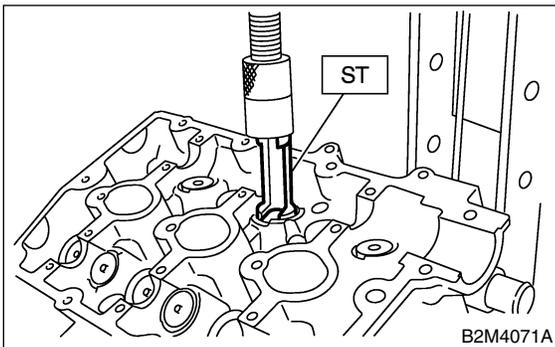
9) Install crankshaft pulley. <Ref. to ME(H6)-39, INSTALLATION, Crankshaft Pulley.>

## C: DISASSEMBLY S143093A06

- 1) Place cylinder head on ST.  
ST 18250AA000 CYLINDER HEAD TABLE
- 2) Remove valve shims and valve lifters.
- 3) Set ST on valve spring. Compress valve spring and remove the valve spring retainer key. Remove each valve and valve spring.  
ST 499718000 VALVE SPRING REMOVER

### CAUTION:

- For correct re-installation, keep removed parts in order in their original positions.
- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



## D: ASSEMBLY S143093A02

- 1) Installation of valve spring and valve  
(1) Place cylinder head on ST.  
ST 18250AA000 CYLINDER HEAD TABLE  
(2) Coat stem of each valve with engine oil and insert valve into valve guide.

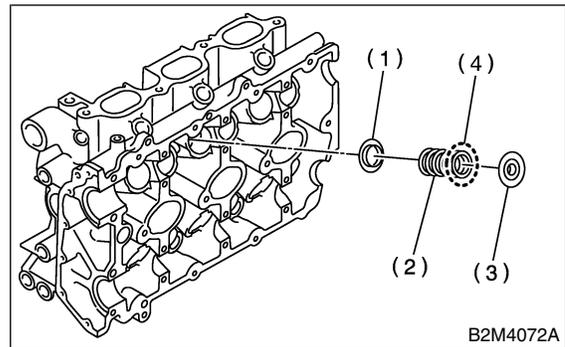
### CAUTION:

When inserting valve into valve guide, use special care not to damage the oil seal lip.

- (3) Install valve spring and retainer.

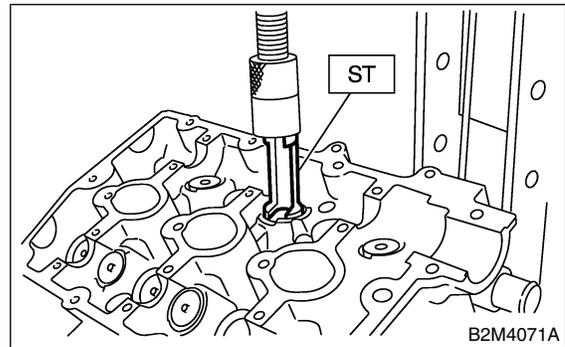
### CAUTION:

- Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.
- Install valve spring with the painted surface facing the retainer side.



- (1) Seat
- (2) Valve spring
- (3) Retainer
- (4) Painted face

- (4) Set ST on valve spring.  
ST 499718000 VALVE SPRING REMOVER



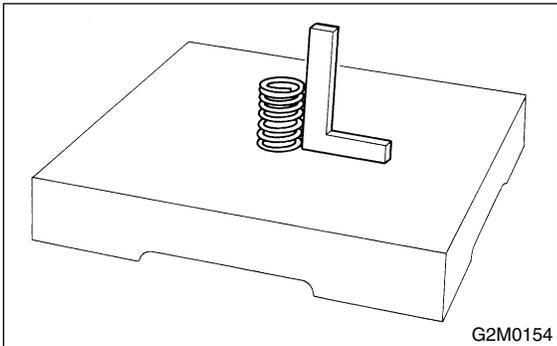
- (5) Compress valve spring and fit valve spring retainer key.
- (6) After installing, tap valve spring retainers lightly with wooden hammer for better seating.
- 2) Apply oil to the surface of the valve lifter and valve shim.
- 3) Install valve lifter and valve shim.

## E: INSPECTION S143093A10

### 1. VALVE SPRING S143093A1002

- 1) Check valve springs for damage, free length, and tension. Replace valve spring if it is not to the specifications presented below.
- 2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Free length		46.79 mm (1.8421 in)
Squareness		2.5°/2.0 mm (0.079 in)
Tension/spring height	Set	186.2 — 205.8 N (18.79 — 20.99 kgf, 41.9 — 46.3 lb)/37.4 mm (1.472 in)
	Lift	446.5 — 493.5 N (45.54 — 50.34 kgf, 100.3 — 110.9 lb)/27.5 mm (1.083 in)



### 2. INTAKE AND EXHAUST VALVE OIL SEAL S143093A1003

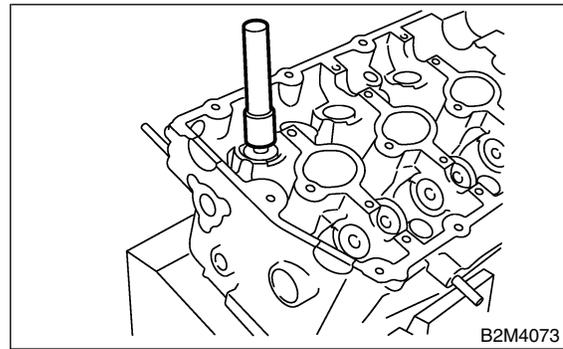
Replace oil seal with new one, if lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced. Use pliers to pinch and remove oil seal from valve.

- 1) Place cylinder head on ST1.
- 2) Press-fit oil seal to the specified dimension indicated in the figure using ST2.

#### CAUTION:

- Apply engine oil to oil seal before press-fitting.
- When press-fitting oil seal, do not use hammer or strike in.

- ST1 18250AA000 CYLINDER HEAD TABLE  
ST2 498857100 VALVE OIL SEAL GUIDE

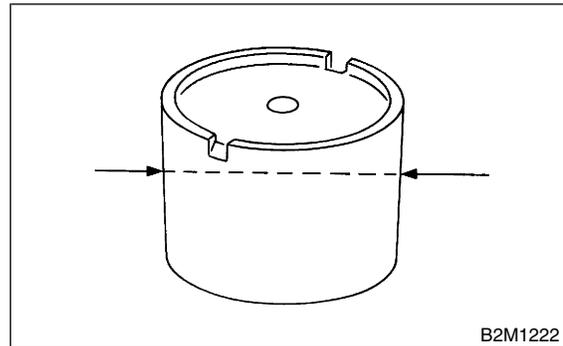


### 3. VALVE LIFTER S143093A1001

- 1) Check valve lifter visually.
- 2) Measure outer diameter of valve lifter.

#### Outer diameter:

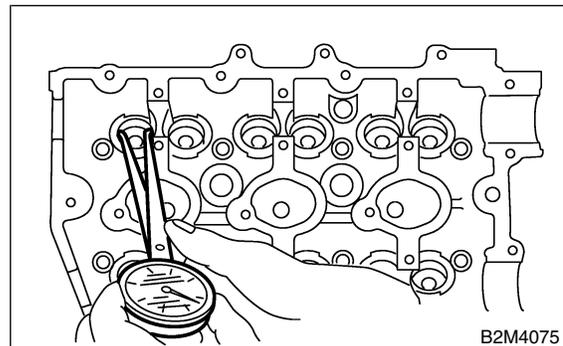
**33.959 — 33.975 mm (1.3370 — 1.3376 in)**



- 3) Measure inner diameter of valve lifter mating part on cylinder head.

#### Inner diameter:

**34.006 — 34.016 mm (1.3388 — 1.3392 in)**



#### CAUTION:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace cylinder head.

# CYLINDER HEAD ASSEMBLY

Mechanical

## Standard:

0.019 — 0.057 mm (0.0007 — 0.0022 in)

## Limit:

0.100 mm (0.0039 in)

## F: ADJUSTMENT

S143093A01

### 1. CYLINDER HEAD

S143093A0101

1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.

Also make sure that gasket installing surface shows no trace of gas and water leaks.

2) Place cylinder head on ST.

ST 18250AA000 CYLINDER HEAD TABLE

3) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge and thickness gauge.

If the warping exceeds 0.05 mm (0.0020 in), grind the surface with a surface grinder.

#### Warping limit:

0.05 mm (0.0020 in)

#### Grinding limit:

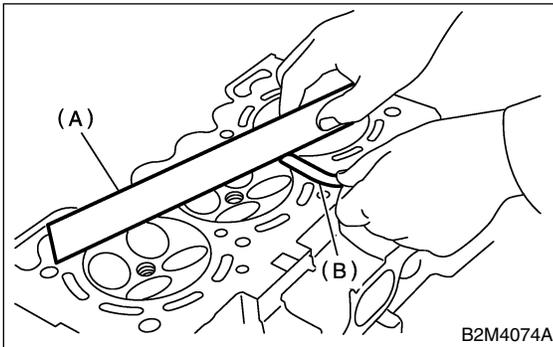
0.1 mm (0.004 in)

#### Standard height of cylinder head:

124 mm (4.88 in)

#### CAUTION:

Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



(A) Straight edge

(B) Thickness gauge

### 2. VALVE SEAT

S143093A0102

Inspect intake and exhaust valve seats, and correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

#### Valve seat width: *W*

##### Intake

###### Standard

1.0 mm (0.039 in)

###### Limit

1.7 mm (0.067 in)

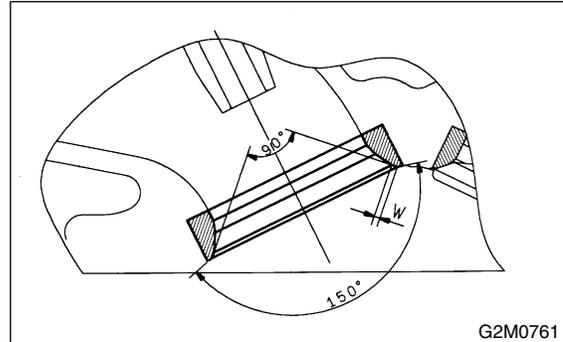
##### Exhaust

###### Standard

1.5 mm (0.059 in)

###### Limit

2.2 mm (0.087 in)



### 3. VALVE GUIDE

S143093A0103

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

#### Clearance between the valve guide and valve stem:

##### Standard

###### Intake

0.030 — 0.057 mm (0.0012 — 0.0022 in)

###### Exhaust

0.040 — 0.067 mm (0.0016 — 0.0026 in)

##### Limit

0.15 mm (0.0059 in)

2) If the clearance between valve guide and stem exceeds the limit, replace valve guide or valve itself whichever shows greater amount of wear. See following procedure for valve guide replacement.

#### Valve guide inner diameter:

5.500 — 5.512 mm (0.2165 — 0.2170 in)

#### Valve stem outer diameter:

###### Intake

5.455 — 5.470 mm (0.2148 — 0.2154 in)

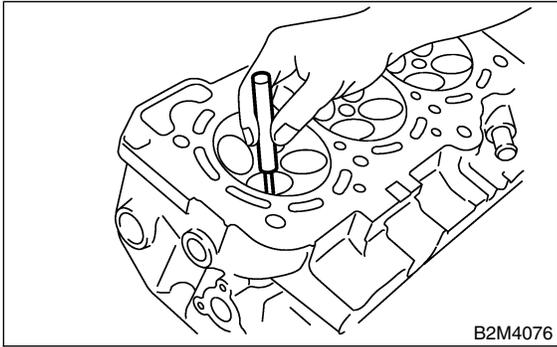
###### Exhaust

5.455 — 5.460 mm (0.2148 — 0.2150 in)

(1) Place cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

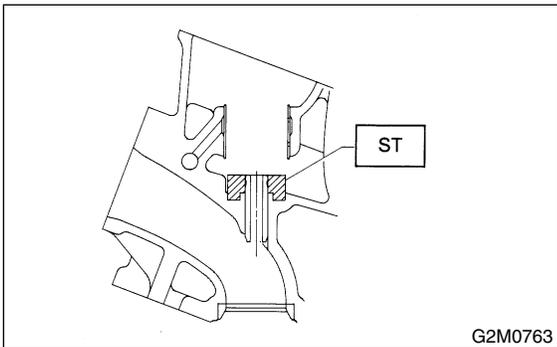
(2) Insert ST2 into valve guide and press it down to remove valve guide.

ST1 18250AA000 CYLINDER HEAD TABLE  
ST2 499765700 VALVE GUIDE REMOVER



(3) Turn cylinder head upside down and place ST as shown in the figure.

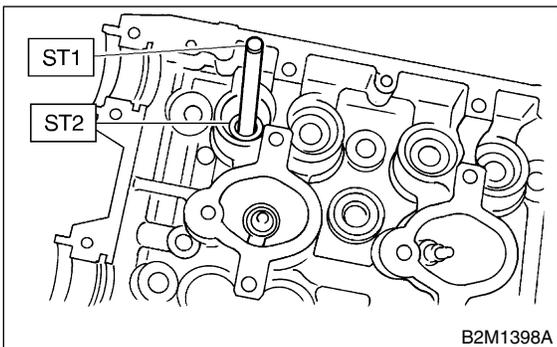
ST 18251AA000 VALVE GUIDE ADJUSTER



(4) Before installing new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

(5) Put new valve guide in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499765700 VALVE GUIDE REMOVER  
ST2 18251AA000 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

**Valve guide protrusion: L**  
**12.3 — 12.7 mm (0.484 — 0.500 in)**

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming, clean valve guide to remove chips.

ST 499765900 VALVE GUIDE REAMER

**CAUTION:**

- Apply engine oil to the reamer when reaming.
- If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
- If the inner surface of the valve guide becomes lustrous and the reamer does not chips, use a new reamer or remedy the reamer.

(8) Recheck the contact condition between valve and valve seat after replacing valve guide.

**4. INTAKE AND EXHAUST VALVE** S143093A0104

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" is less than the specified limit.

# CYLINDER HEAD ASSEMBLY

Mechanical

**H:**

**Intake**

**Standard**

**1.0 mm (0.039 in)**

**Limit**

**0.8 mm (0.031 in)**

**Exhaust**

**Standard**

**1.2 mm (0.047 in)**

**Limit**

**0.8 mm (0.031 in)**

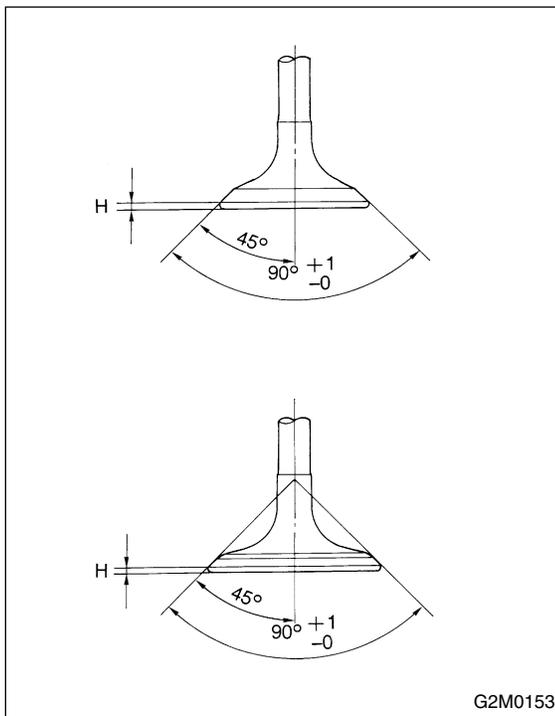
**Valve overall length:**

**Intake**

**103.5 mm (4.075 in)**

**Exhaust**

**103.2 mm (4.063 in)**



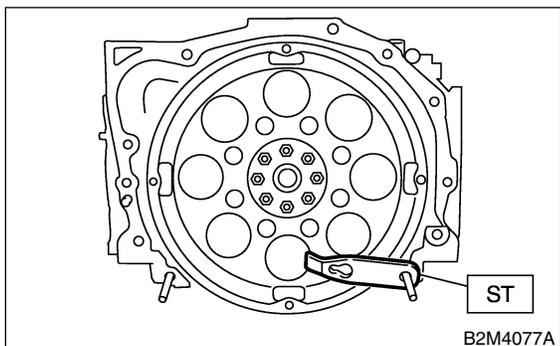
2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

## 18. Cylinder Block S143090

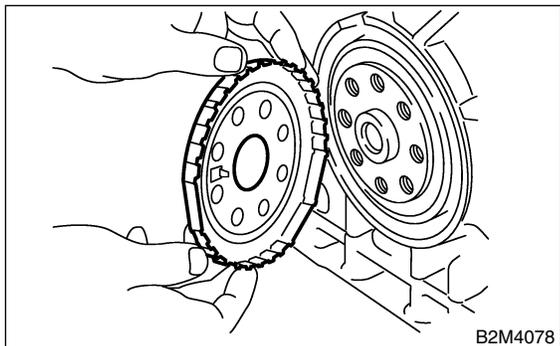
### A: REMOVAL S143090A18

- 1) Remove crankshaft pulley. <Ref. to ME(H6)-39, REMOVAL, Crankshaft Pulley.>
  - 2) Remove front chain cover. <Ref. to ME(H6)-40, REMOVAL, Front Chain Cover.>
  - 3) Remove timing chain assembly. <Ref. to ME(H6)-42, REMOVAL, Timing Chain Assembly.>
  - 4) Remove camshaft sprockets. <Ref. to ME(H6)-47, REMOVAL, Camshaft Sprocket.>
  - 5) Remove crankshaft sprocket. <Ref. to ME(H6)-48, REMOVAL, Crankshaft Sprocket.>
  - 6) Remove rear chain cover. <Ref. to ME(H6)-49, REMOVAL, Rear Chain Cover.>
  - 7) Remove camshafts. <Ref. to ME(H6)-51, REMOVAL, Camshaft.>
  - 8) Remove cylinder head assembly. <Ref. to ME(H6)-55, REMOVAL, Cylinder Head Assembly.>
  - 9) Remove drive plate.
- Using ST, lock crankshaft.

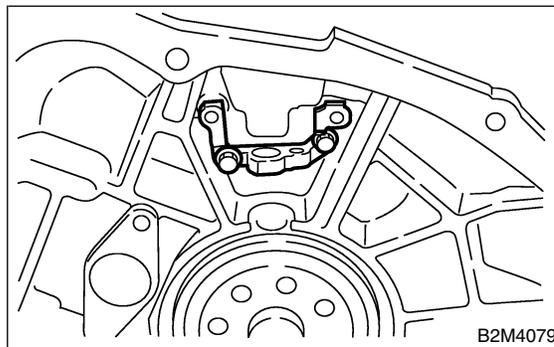
ST 498497100 CRANKSHAFT STOPPER



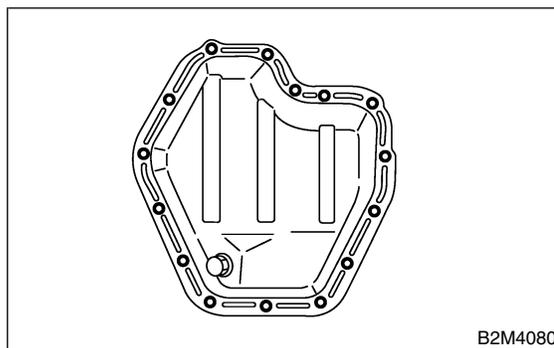
- 10) Remove crankshaft position sensor plate.



- 11) Remove crankshaft position sensor bracket.



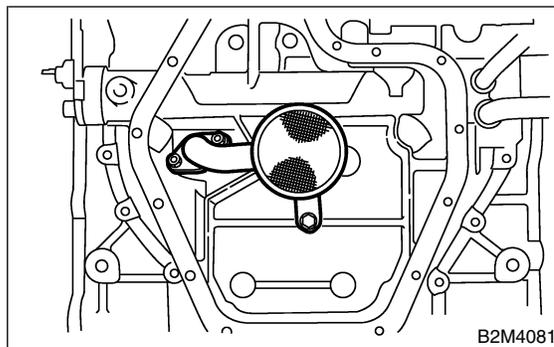
- 12) Rotate engine until oil pan comes to the top.
- 13) Remove bolts which secure lower oil pan to upper oil pan.



- 14) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove oil pan.

**CAUTION:**  
Do not use a screwdriver or similar tool in place of oil pan cutter.

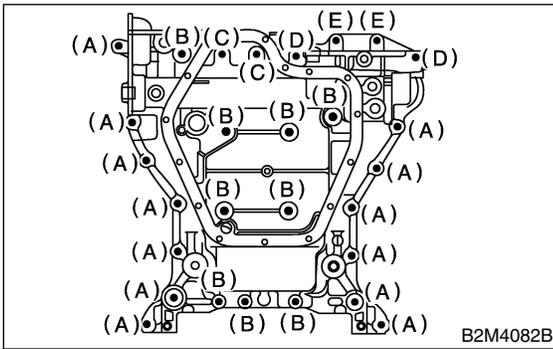
- 15) Remove oil strainer.



# CYLINDER BLOCK

Mechanical

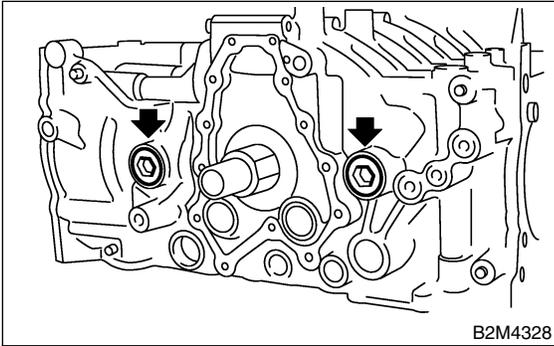
16) Remove bolts which secure upper oil pan to cylinder block.



**Bolt dimension:**

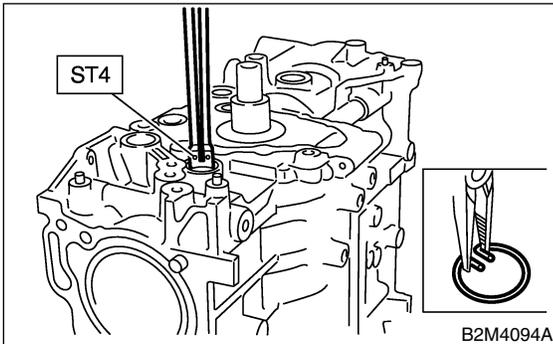
- (A) 8 × 40
- (B) 8 × 65
- (C) 8 × 85
- (D) 8 × 130
- (E) 8 × 24

17) Remove service hole cover and service hole plugs using hexagon wrench.



18) Rotate crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove piston circlip through service hole of #1 and #2 cylinders by using ST.

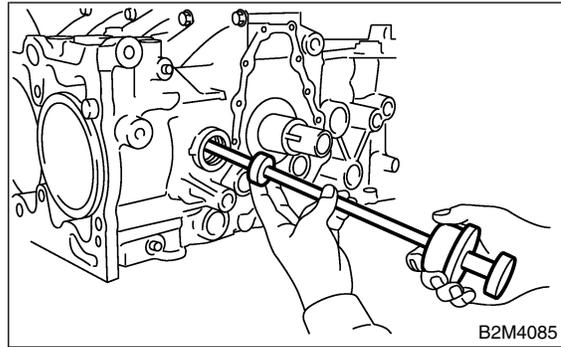
ST 18233AA000 PISTON PIN CIRCLIP PLIER



19) Draw out piston pin from #1 and #2 pistons by using ST.

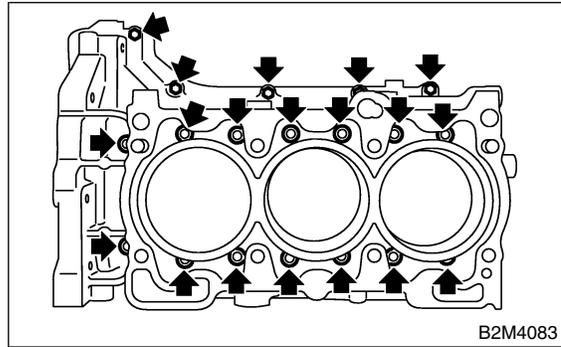
ST 49997500 PISTON PIN REMOVER

**CAUTION:**  
Be careful not to confuse original combination of piston, piston pin and cylinder.



20) Similarly remove piston pins from #3, #4, #5 and #6 pistons.

21) Remove bolts which connect cylinder block.



22) Separate left-hand and right-hand cylinder blocks.

**CAUTION:**  
When separating cylinder block, do not allow the connecting rod to fall and damage the cylinder block.

23) Remove rear oil seal.

24) Remove crankshaft together with connecting rod.

25) Remove crankshaft bearings from cylinder block.

**CAUTION:**  
Do not confuse combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

26) Draw out each piston from cylinder block using wooden bar or hammer handle.

**CAUTION:**  
Do not confuse combination of piston, piston pin and cylinder.

## B: INSTALLATION S143090A11

1) Install ST to cylinder block, then install crankshaft bearing.

ST 18232AA000 ENGINE STAND

### CAUTION:

**Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.**

2) Position crankshaft and connecting rod on the #2, #4 and #6 cylinder.

3) Apply fluid packing to the mating surface of #1, #3 and #5 cylinder block.

### Fluid packing:

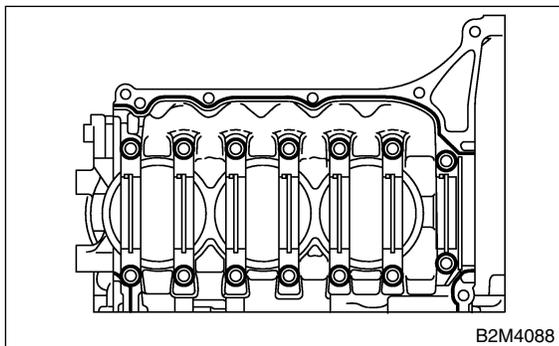
**THREE BOND 1215B or equivalent**

### CAUTION:

**Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.**

### Fluid packing application diameter:

**1.0±0.2 mm (0.039±0.008 in)**

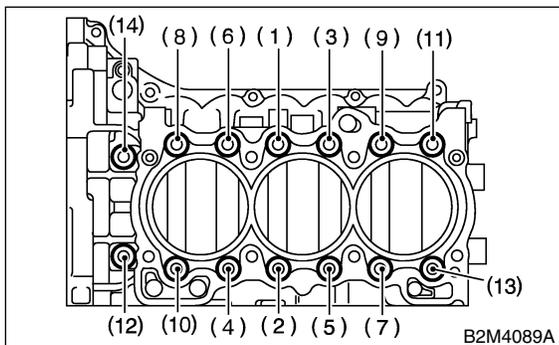


4) Apply engine oil to washers and threads of cylinder block connecting bolts. Tighten the bolts following the steps below.

(1) Tighten all the bolts in the numerical order shown in the figure.

### Tightening torque:

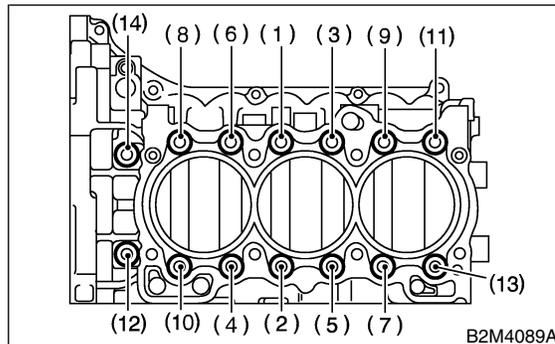
(1) to (11)	25 N·m (2.5 kgf-m, 18 ft-lb)
(12)	20 N·m (2.0 kgf-m, 14 ft-lb)
(13)	25 N·m (2.5 kgf-m, 18 ft-lb)
(14)	20 N·m (2.0 kgf-m, 14 ft-lb)



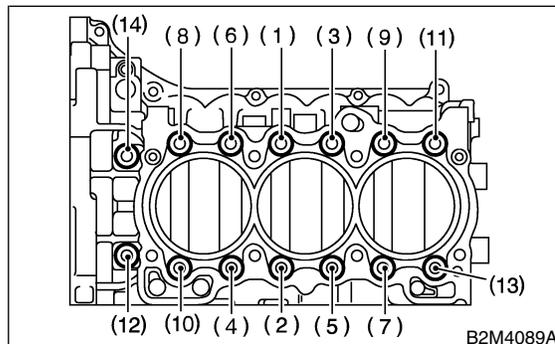
(2) Tighten all the bolts again in the order shown in the figure.

### Tightening torque:

(1) to (11)	25 N·m (2.5 kgf-m, 18 ft-lb)
(12)	20 N·m (2.0 kgf-m, 14 ft-lb)
(13)	25 N·m (2.5 kgf-m, 18 ft-lb)
(14)	20 N·m (2.0 kgf-m, 14 ft-lb)



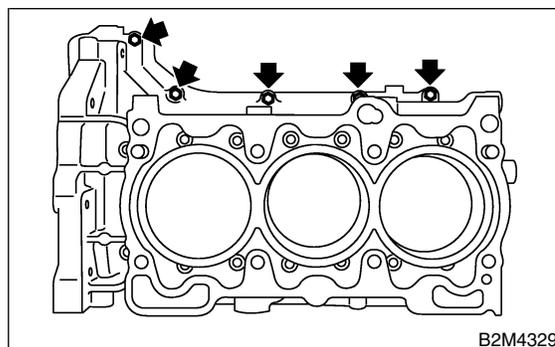
5) Tighten all the bolts by 90° in the order shown in the figure.



6) Install upper bolts on cylinder block.

### Tightening torque:

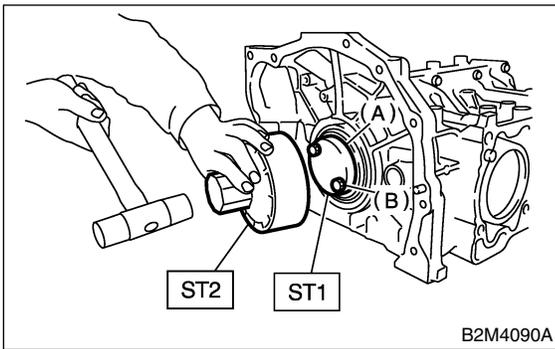
**25 N·m (2.5 kgf-m, 18 ft-lb)**



7) Install rear oil seal using ST1 and ST2.

# CYLINDER BLOCK

Mechanical

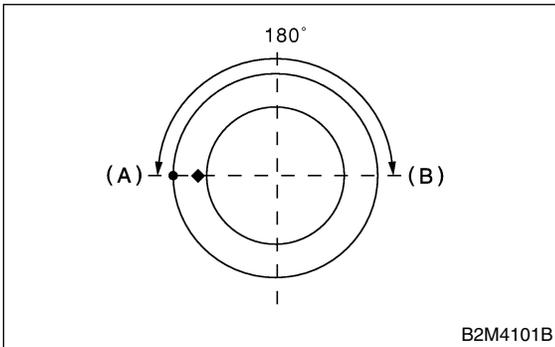


- (A) Rear oil seal  
(B) Drive plate attaching bolt

B2M4090A

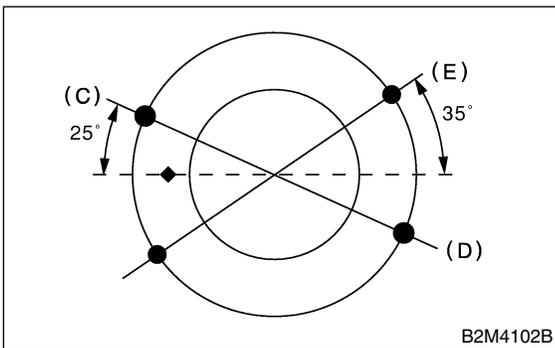
## 8) Align piston ring gap.

- (1) Position the top ring gap at (A) in the figure.
- (2) Position the second ring gap at (B) in the figure.



B2M4101B

- (3) Position the upper rail gap at (C) in the figure.
- (4) Position the expander gap at (D) in the figure.
- (5) Position the lower rail gap at (E) in the figure.



B2M4102B

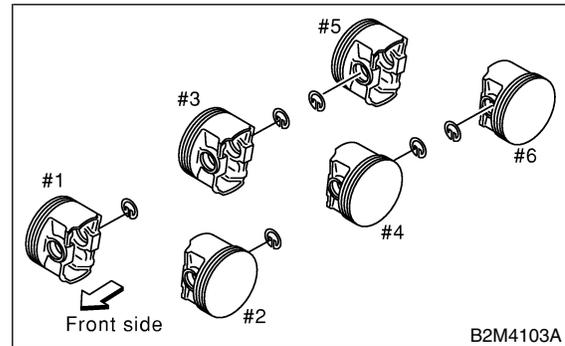
## CAUTION:

- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

## (6) Install circlip.

Install circlips in piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

**CAUTION:**  
Use new circlips.



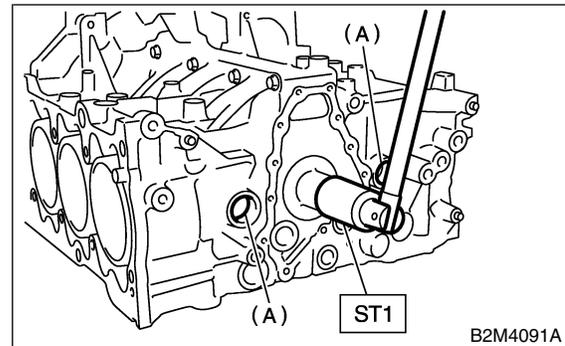
B2M4103A

## 9) Installing piston.

**CAUTION:**  
Install piston and piston pin to the same cylinder they were installed before overhaul.

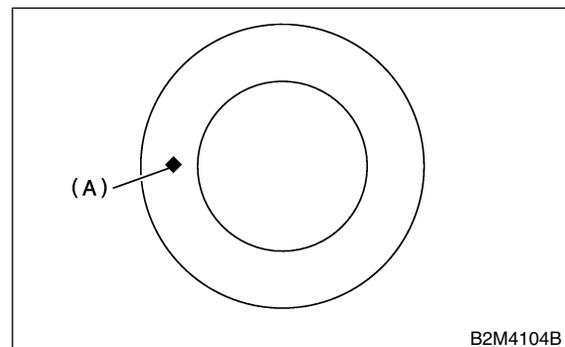
- (1) Using ST1, rotate crankshaft until each small end of connecting rods #3 and #4 is aligned over service hole (A).

ST1 18252AA000 CRANKSHAFT SOCKET



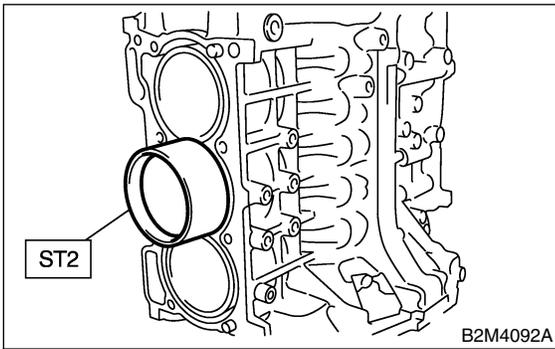
B2M4091A

- (2) Apply a coat of engine oil to piston and cylinders.
- (3) Install pistons with their front marks (A) facing the front of engine.



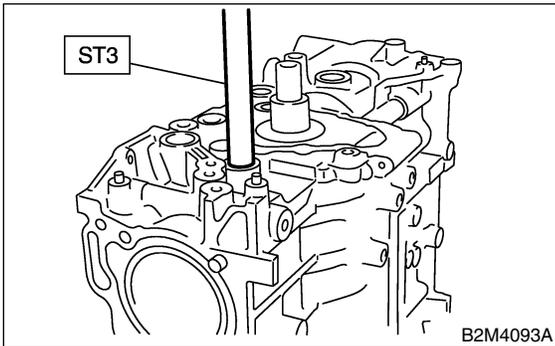
B2M4104B

- (4) Insert pistons in their cylinders using ST2.  
 ST2 18254AA000 PISTON GUIDE



- 10) Installing piston pin.

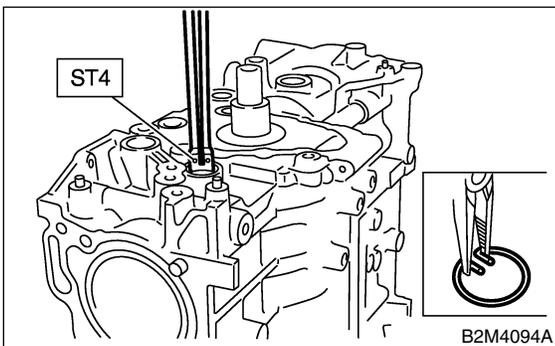
- (1) Apply a coat of engine oil to ST3.  
 ST3 18253AA000 PISTON PIN GUIDE  
 (2) Insert ST3 into service hole to align piston pin hole with connecting rod small end.



- (3) Apply a coat of engine oil to piston pin and insert piston pin into piston and connecting rod small end through service hole.  
 (4) Using ST4, install circlip.

- ST4 18233AA000 PISTON PIN CIRCLIP PLIER

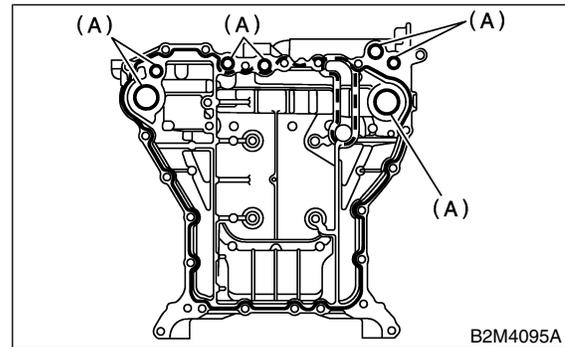
**CAUTION:**  
 Use a new circlip.



- 11) Repeat the same steps for pistons #1 and #2, #5 and #6.  
 12) Install service hole plug and cover.  
 13) Apply fluid packing to mating surface of upper oil pan.

- 14) Install O-ring.

**Fluid packing:**  
**THREE BOND 1280B**

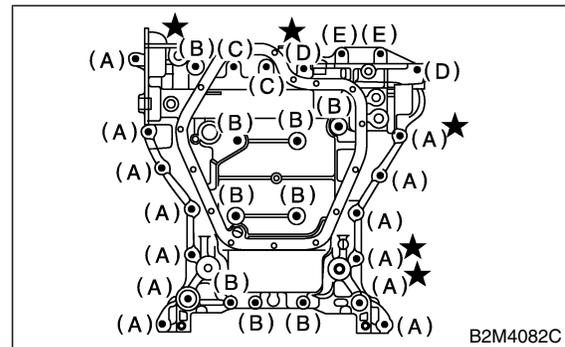


- (A) O-ring

- 15) Temporarily tighten the upper oil pan.

**CAUTION:**  
 Do not confuse the mounting positions of the bolts.

**NOTE:**  
 Replace mounting bolts (marked with ★) with new ones.



**Bolt dimension:**

- (A) 8 × 40
- (B) 8 × 65
- (C) 8 × 85
- (D) 8 × 130
- (E) 8 × 20

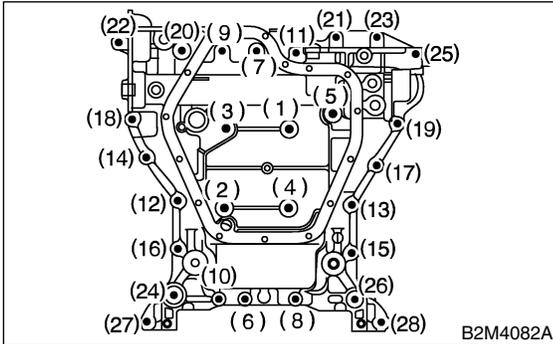
# CYLINDER BLOCK

Mechanical

16) Tighten the upper oil pan mounting bolts in the numerical sequence shown in the figure.

**Tightening torque:**

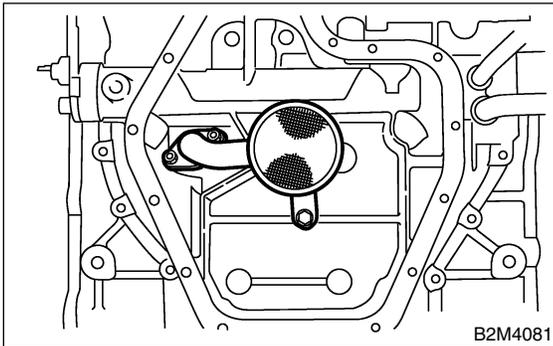
**18 N-m (1.8 kgf-m, 13.0 ft-lb)**



17) Install oil strainer.

**NOTE:**

Use a new O-ring.



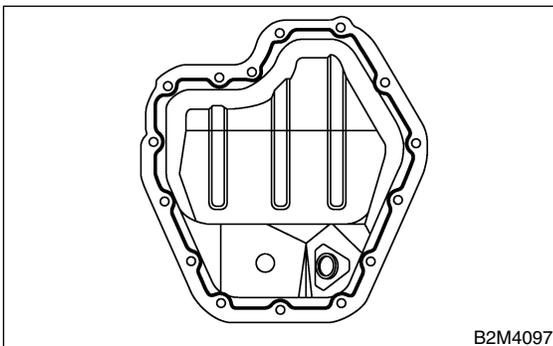
18) Apply fluid packing to mating surface of lower oil pan.

**Fluid packing:**

**THREE BOND 1280B**

**Fluid packing application diameter:**

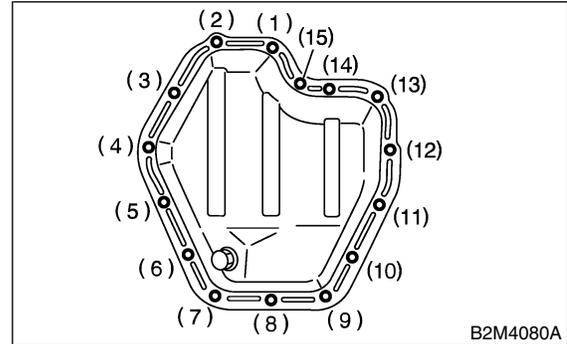
**5.0±1.0 mm (0.197±0.039 in)**



19) Tighten the lower oil pan mounting bolts in the numerical sequence shown in the figure.

**Tightening torque:**

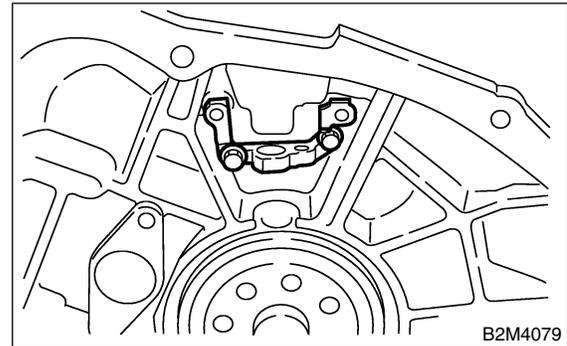
**6.4 N-m (0.65 kgf-m, 4.7 ft-lb)**



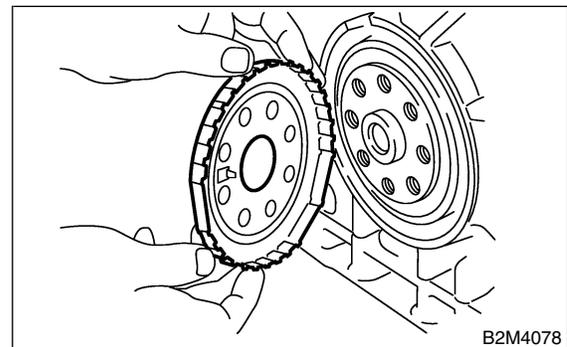
20) Install crankshaft position sensor bracket.

**Tightening torque:**

**6.4 N-m (0.65 kgf-m, 4.7 ft-lb)**



21) Install crankshaft position sensor plate.



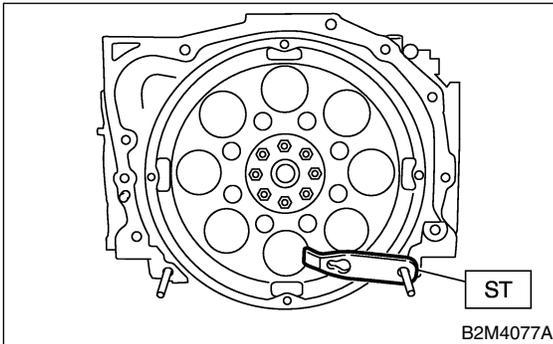
# CYLINDER BLOCK

Mechanical

22) Install drive plate.  
Using ST, lock crankshaft.  
ST 498497100 CRANKSHAFT STOPPER

**Tightening torque:**

**81 N·m (8.3 kgf·m, 60 ft·lb)**



23) Install cylinder head assembly. <Ref. to ME(H6)-55, INSTALLATION, Cylinder Head Assembly.>

24) Install camshafts. <Ref. to ME(H6)-51, INSTALLATION, Camshaft.>

25) Install rear chain cover. <Ref. to ME(H6)-49, INSTALLATION, Rear Chain Cover.>

26) Install crankshaft sprocket. <Ref. to ME(H6)-48, INSTALLATION, Crankshaft Sprocket.>

27) Install camshaft sprockets. <Ref. to ME(H6)-47, INSTALLATION, Camshaft Sprocket.>

28) Install timing chain assembly. <Ref. to ME(H6)-43, INSTALLATION, Timing Chain Assembly.>

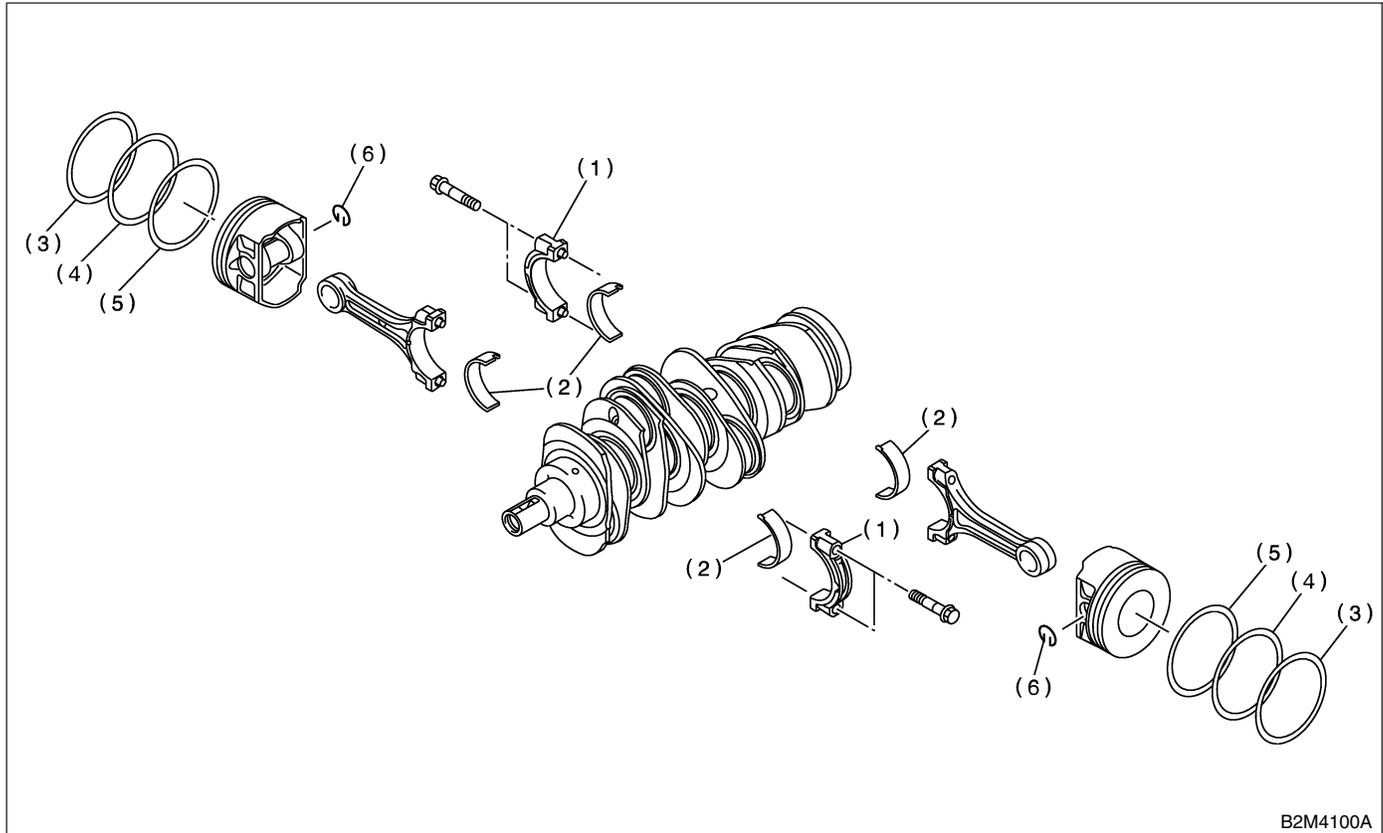
29) Install front chain cover. <Ref. to ME(H6)-40, INSTALLATION, Front Chain Cover.>

30) Install crankshaft pulley. <Ref. to ME(H6)-39, INSTALLATION, Crankshaft Pulley.>

# CYLINDER BLOCK

Mechanical

## C: DISASSEMBLY S143090A06



B2M4100A

- |                            |                 |              |
|----------------------------|-----------------|--------------|
| (1) Connecting rod cap     | (3) Top ring    | (5) Oil ring |
| (2) Connecting rod bearing | (4) Second ring | (6) Circlip  |

- 1) Remove connecting rod cap.
- 2) Remove connecting rod bearing.

### CAUTION:

**Arrange removed connecting rod, connecting rod cap and bearing in order to prevent confusion.**

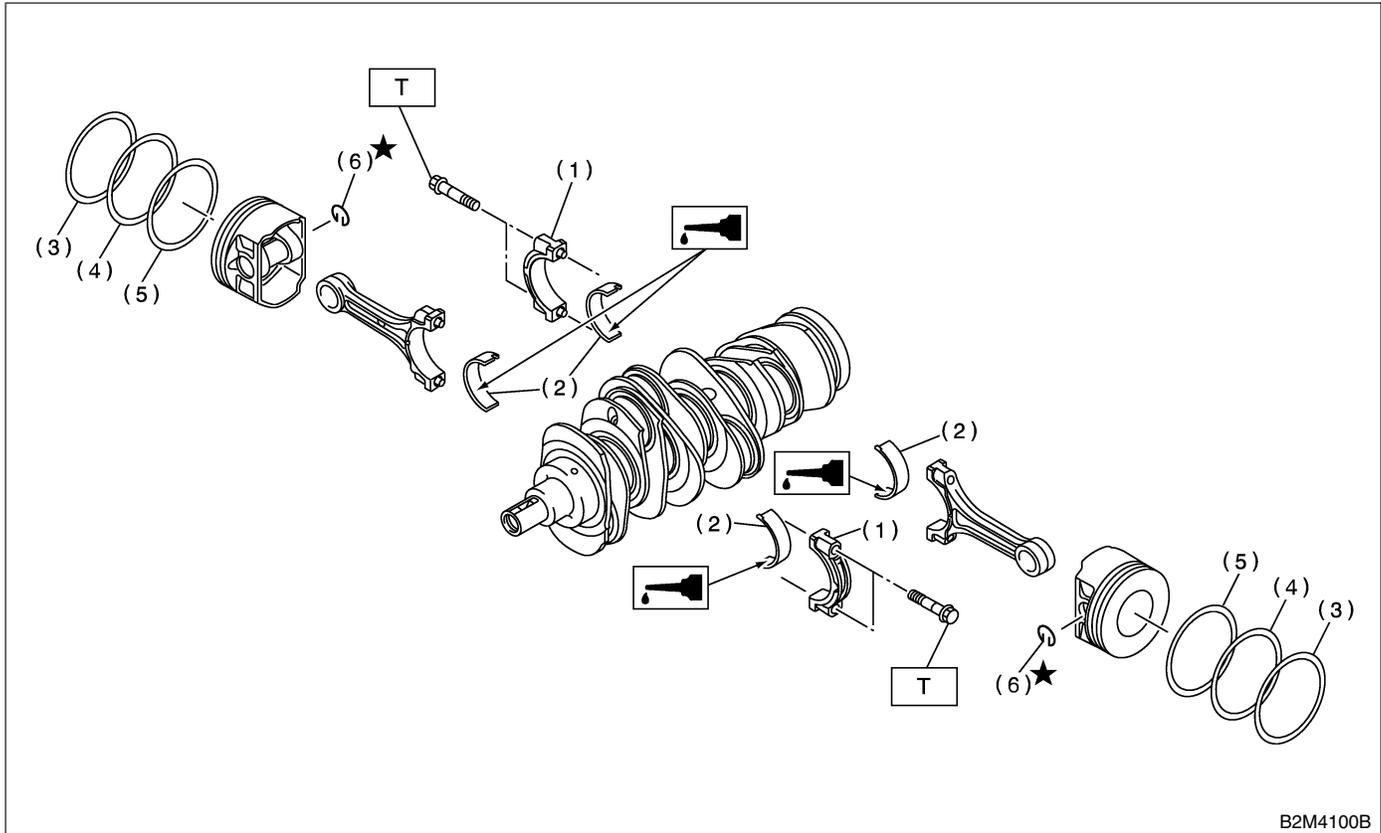
- 3) Remove piston rings using the piston ring expander.
- 4) Remove the oil ring by hand.

### CAUTION:

**Arrange the removed piston rings in good order to prevent confusion.**

- 5) Remove circlip.

## D: ASSEMBLY S143090A02



- |                            |                 |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod         | (6) Top ring    |
| (3) Connecting rod cap     | (7) Circlip     |
| (4) Oil ring               |                 |

**Tightening torque: N-m (kgf-m, ft-lb)**  
**T: 53 (5.4, 39)**

1) Install connecting rod bearings on connecting rods and connecting rod caps.

### CAUTION:

**Apply oil to the surfaces of the connecting rod bearings.**

2) Install connecting rod on crankshaft.

### CAUTION:

**Position each connecting rod with the side marked facing forward.**

3) Install connecting rod cap with connecting rod nut.

Ensure the arrow on connecting rod cap faces the front during installation.

### CAUTION:

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.

- When tightening the connecting rod nuts, apply oil on the threads.

4) Install piston rings and oil ring.

## E: INSPECTION S143090A10

### 1. CYLINDER BLOCK S143090A1002

1) Visually check for cracks and damage. Especially, inspect important parts by means of red lead check.

2) Check the oil passages for clogging.

3) Inspect crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

#### Warping limit:

**0.05 mm (0.0020 in)**

#### Grinding limit:

**0.1 mm (0.004 in)**

#### Standard height of cylinder block:

**202 mm (7.95 in)**

### 2. CYLINDER AND PISTON S143090A1003

1) The cylinder bore size is stamped on the cylinder block's front upper surface.

# CYLINDER BLOCK

Mechanical

## CAUTION:

Measurement should be performed at a temperature 20°C (68°F).

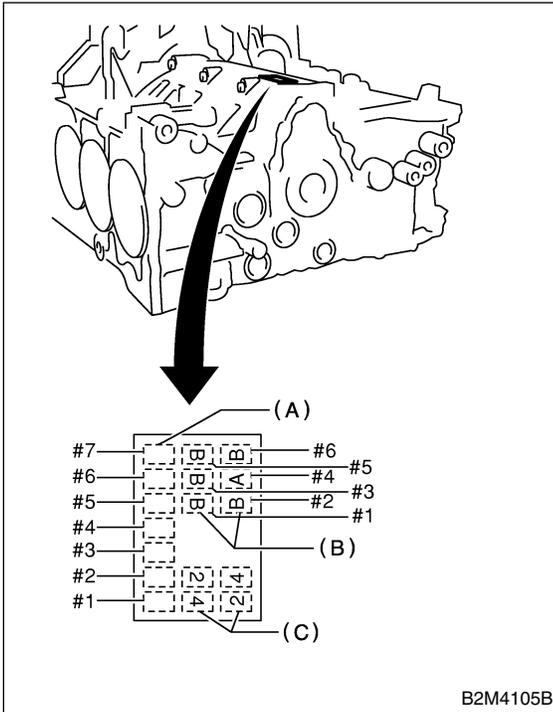
## NOTE:

Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

### Standard diameter:

**A: 89.205 — 89.215 mm (3.5120 — 3.5124 in)**

**B: 89.195 — 89.205 mm (3.5116 — 3.5120 in)**



- (A) Main journal size mark
- (B) Cylinder bore size mark
- (C) Cylinder block RH, LH combination mark

## 2) How to measure the inner diameter of each cylinder

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

## CAUTION:

Measurement should be performed at a temperature 20°C (68°F).

## Taper:

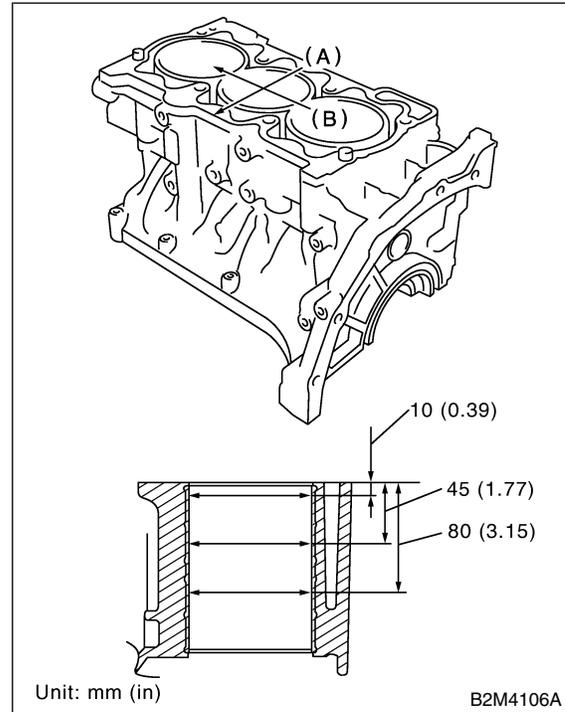
### Limit

0.050 mm (0.0020 in)

## Out-of-roundness:

### Limit

0.050 mm (0.0020 in)



- (A) Thrust direction
- (B) Piston pin direction

3) When piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston

Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

**CAUTION:**

Measurement should be performed at a temperature of 20°C (68°F).

**Piston grade point H:**  
39.0 mm (1.535 in)

**Piston outer diameter:**  
**Standard**

**A: 89.185 — 89.195 mm**  
(3.5112 — 3.5116 in)

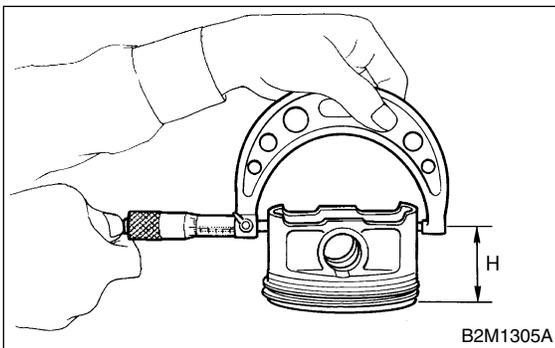
**B: 89.175 — 89.185 mm**  
(3.5108 — 3.5112 in)

**0.25 mm (0.0098 in) oversize**

**89.425 — 89.435 mm**  
(3.5207 — 3.5211 in)

**0.50 mm (0.0197 in) oversize**

**89.675 — 89.685 mm**  
(3.5305 — 3.5309 in)



5) Calculate the clearance between cylinder and piston.

**CAUTION:**

Measurement should be performed at a temperature of 20°C (68°F).

**Cylinder to piston clearance at 20°C (68°F):**

**Standard**

**0.010 — 0.030 mm (0.0004 — 0.0012 in)**

**Limit**

**0.050 mm (0.0020 in)**

6) Boring and honing

(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebores it to use an oversize piston.

**CAUTION:**

When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

**CAUTION:**

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

**Limit of cylinder enlarging (boring):**  
**0.5 mm (0.020 in)**

**3. PISTON AND PISTON PIN** S143090A1004

1) Check pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.

2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H6)-69, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.

3) Make sure that piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

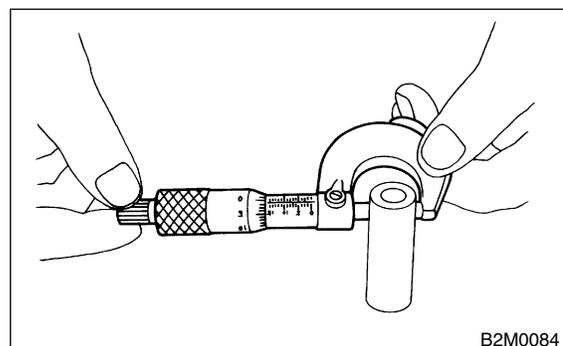
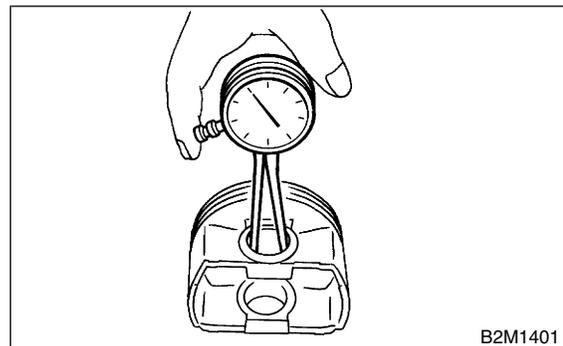
**Standard clearance between piston pin and hole in piston:**

**Standard**

**0.004 — 0.008 mm (0.0002 — 0.0003 in)**

**Limit**

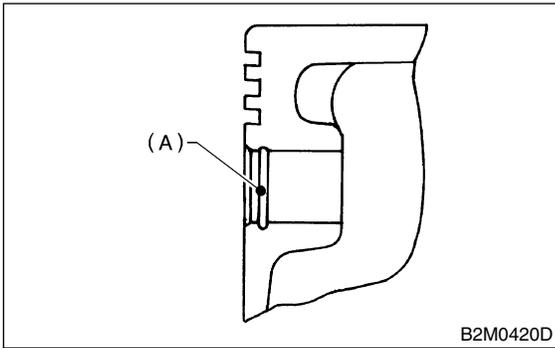
**0.020 mm (0.0008 in)**



# CYLINDER BLOCK

Mechanical

4) Check circlip installation groove on the piston for burr. If necessary, remove burr (A) from the groove so that piston pin can lightly move.



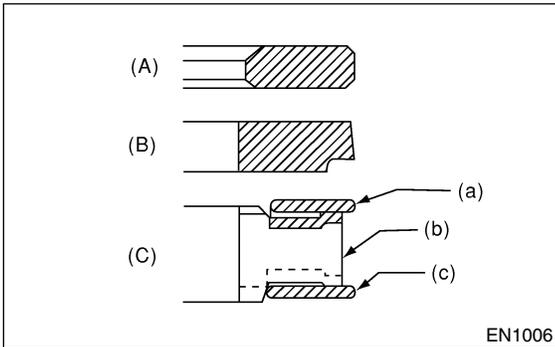
5) Check piston pin circlip for distortion, cracks and wear.

## 4. PISTON RING S143090A1005

1) If piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace piston ring with a new one of the same size as the piston.

### CAUTION:

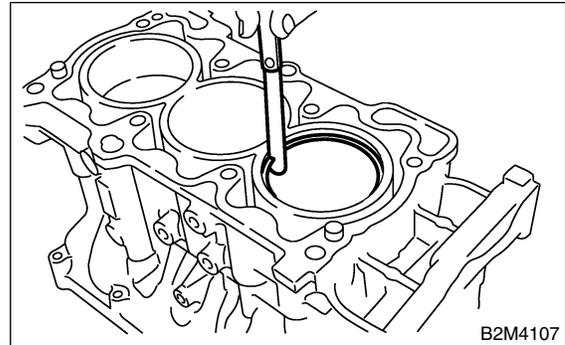
- Marks are shown on the end of the top and second rings. When installing the rings to the piston, face this mark upward.
- The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful to assemble correctly.



- (A) Top ring
- (B) Second ring
- (C) Oil ring
- (a) Upper rail
- (b) Expander
- (c) Lower rail

2) Squarely place piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

		Unit: mm (in)	
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.60 (0.0079 — 0.024)	1.5 (0.059)

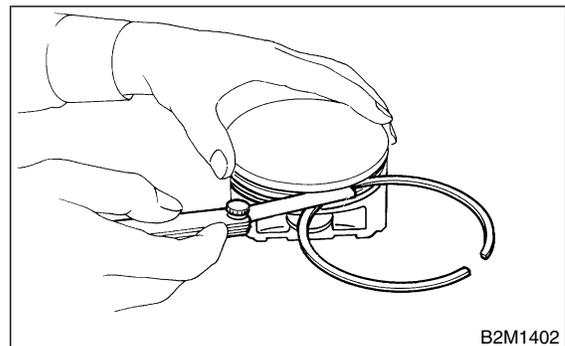


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

### CAUTION:

Before measuring the clearance, clean the piston ring groove and piston ring.

		Unit: mm (in)	
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)
Clearance between oil ring and oil ring groove		0.065 — 0.155 (0.0026 — 0.0061)	—

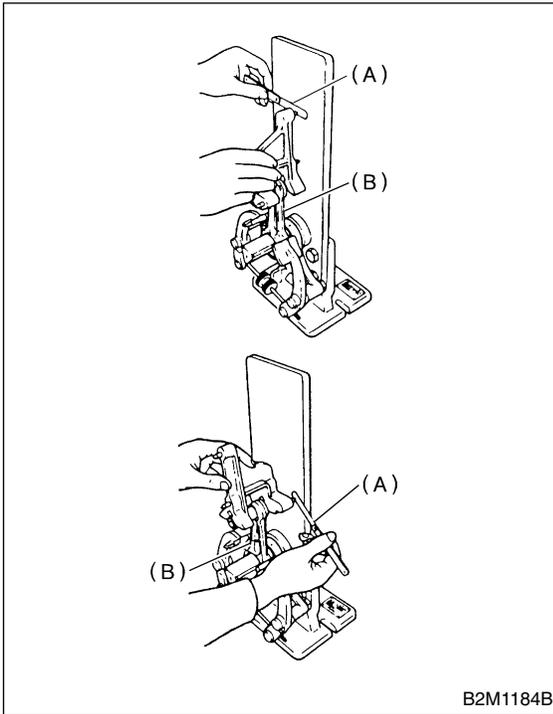


## 5. CONNECTING ROD S143090A1006

- 1) Replace connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace 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)**



B2M1184B

- (A) Thickness gauge  
(B) Connecting rod

- 3) Install connecting rod fitted with bearing to crankshaft and measure the side clearance (thrust clearance). Replace connecting rod if the side clearance exceeds the specified limit.

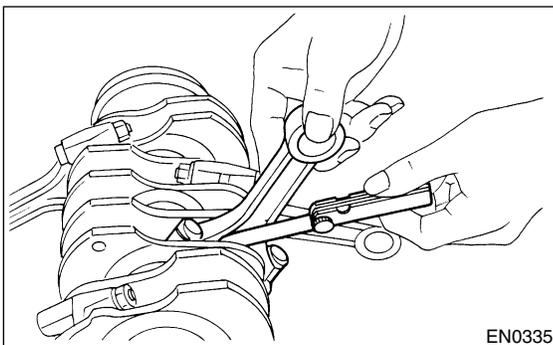
**Connecting rod side clearance:**

**Standard**

**0.070 — 0.330 mm (0.0028 — 0.0130 in)**

**Limit**

**0.4 mm (0.016 in)**



EN0335

- 4) Inspect connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
- 5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

**Connecting rod oil clearance:**

**Standard**

**0.020 — 0.046 mm (0.0008 — 0.0018 in)**

**Limit**

**0.050 mm (0.0020 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	1.510 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

- 6) Inspect bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at the connecting rod small end.

# CYLINDER BLOCK

Mechanical

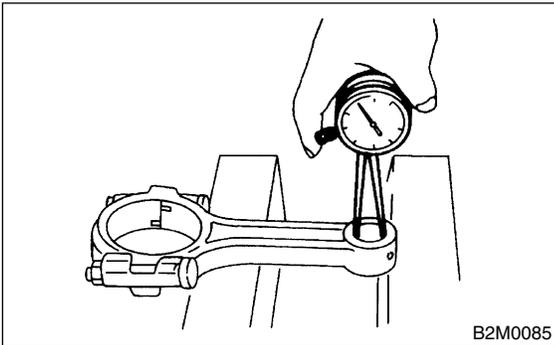
## Clearance between piston pin and bushing:

### Standard

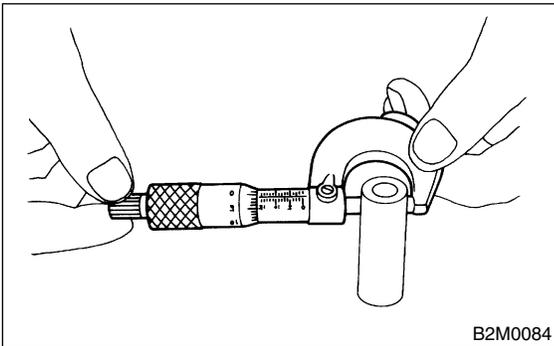
0 — 0.022 mm (0 — 0.0009 in)

### Limit

0.030 mm (0.0012 in)



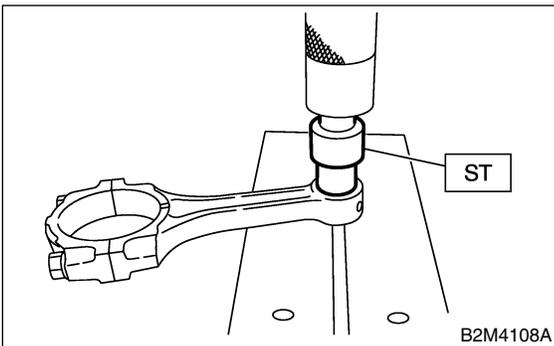
B2M0085



B2M0084

- 7) Replacement procedure is as follows.
- (1) Remove bushing from connecting rod with ST and press.
  - (2) Press bushing with ST after applying oil on the periphery of bushing.

ST 18350AA000 CONNECTING ROD BUSHING REMOVER AND INSTALLER



B2M4108A

- (3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
- (4) After completion of reaming, clean bushing to remove chips.

## 6. CRANKSHAFT AND CRANKSHAFT BEARING

S143090A1007

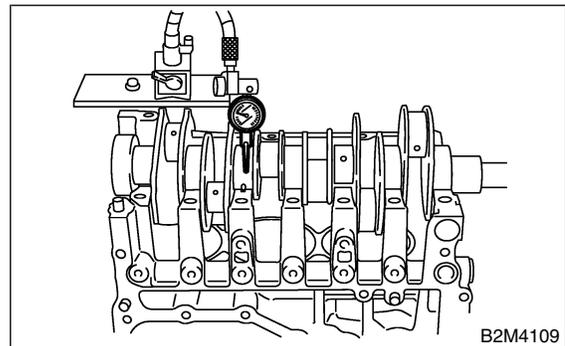
- 1) Clean crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
- 2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

### CAUTION:

If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position crankshaft on these bearings and measure crankshaft bend using a dial gauge.

### Crankshaft bend limit:

0.035 mm (0.0014 in)



B2M4109

- 3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace bearing with a suitable (undersize) one, and replace or recondition crankshaft as necessary. When grinding crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

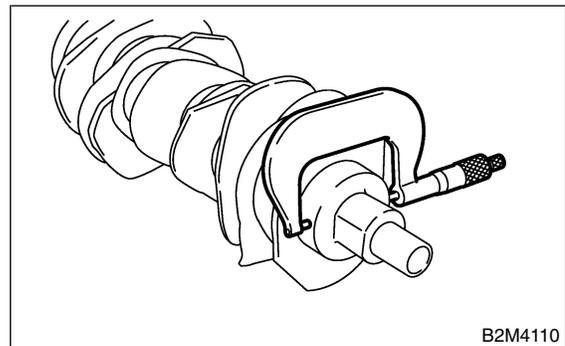
### Crank pin and crank journal:

#### Out-of-roundness

0.020 mm (0.0008 in) or less

#### Grinding limit

0.250 mm (0.0098 in)



B2M4110

# CYLINDER BLOCK

Mechanical

		Crank journal diameter		Unit: mm (in)
		#1, #3, #5, #7	#2, #4, #6	Crank pin diameter
Standard	Journal O.D.	63.992 — 64.008 (2.5194 — 2.5200)		51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.992 — 2.005 (0.0784 — 0.0789)	1.996 — 2.000 (0.0786 — 0.0787)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	63.962 — 63.978 (2.5182 — 2.5188)		51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.020 (0.0795 — 0.0795)	1.510 — 1.513 (0.0594 — 0.0596)
0.05 (0.0020) undersize	Journal O.D.	63.942 — 63.958 (2.5174 — 2.5180)		51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.520 — 1.523 (0.0598 — 0.0600)
0.25 (0.0098) undersize	Journal O.D.	63.742 — 63.758 (2.5095 — 2.5102)		51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.620 — 1.623 (0.0638 — 0.0639)

O.D. ... Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace bearing.

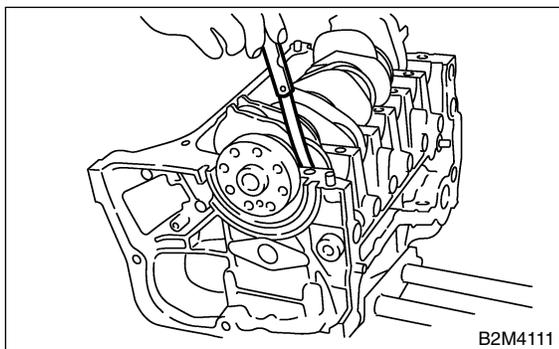
**Crankshaft thrust clearance:**

**Standard**

**0.030 — 0.115 mm (0.0012 — 0.0045 in)**

**Limit**

**0.25 mm (0.0098 in)**



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace defective bearing with an undersize one, and replace or recondition crankshaft as necessary.

Unit: mm (in)	
Crankshaft oil clearance	
Standard	0.010 — 0.030 (0.0004 — 0.0012)
Limit	0.05 (0.0020)

# ENGINE TROUBLE IN GENERAL

Mechanical

## 19. Engine Trouble in General

S143095

### A: INSPECTION S143095A10

NOTE:

“RANK” shown in the chart refer to the possibility of reason for the trouble in order (“Very often” to “Rarely”)

A — Very often

B — Sometimes

C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will 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	● Poor terminal connection	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(H6)-2, Basic Diagnostic Procedure.>		A
	● Fuel line	● Defective fuel pump and relay	A
		● Lack of or insufficient fuel	B
	● Chain	● Defective	B
		● Defective timing	B
	● Compression	● Incorrect valve clearance	C
		● Loosened spark plugs or defective gasket	C
		● Loosened cylinder head bolts or defective gasket	C
		● Improper valve seating	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		

# ENGINE TROUBLE IN GENERAL

Mechanical

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3) Initial combustion occur.	● Engine control system <Ref. to EN(H6)-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
	● Chain	● Defective	B
		● Defective timing	B
	● Compression	● Incorrect valve clearance	C
		● Loosened spark plugs or defective gasket	C
		● Loosened cylinder head bolts or defective gasket	C
		● Improper valve seating	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(H6)-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
	● Chain	● Defective	B
		● Defective timing	B
	● Compression	● Incorrect valve clearance	C
		● Loosened spark plugs or defective gasket	C
		● Loosened cylinder head bolts or defective gasket	C
● Improper valve seating		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		

# ENGINE TROUBLE IN GENERAL

Mechanical

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
2. Rough idle and engine stall	● Engine control system <Ref. to EN(H6)-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
	● Chain	● Defective timing	C
	● Compression	● Incorrect valve clearance	B
		● Loosened spark plugs or defective gasket	B
		● Loosened cylinder head bolts or defective gasket	B
		● Improper valve seating	B
		● Defective valve stem	C
		● Worn or broken valve spring	B
		● Worn or stuck piston rings, cylinder and piston	B
		● Incorrect valve timing	A
	● Lubrication system	● Improper engine oil (low viscosity)	B
		● Defective rocker cover gasket	C
● Cooling system	● Overheating	C	
● Others	● Malfunction of evaporative emission control system	A	
	● Stuck or damaged throttle valve	B	
	● Accelerator cable out of adjustment	C	

# ENGINE TROUBLE IN GENERAL

Mechanical

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	● Engine control system <Ref. to EN(H6)-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
	● Chain	● Defective timing	B
	● Compression	● Incorrect valve clearance	B
		● Loosened spark plugs or defective gasket	B
		● Loosened cylinder head bolts or defective gasket	B
		● Improper valve seating	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	● Malfunction of evaporative emission control system	A	
4. Surging	● Engine control system <Ref. to EN(H6)-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
	● Chain	● Defective timing	B
	● Compression	● Incorrect valve clearance	B
		● Loosened spark plugs or defective gasket	C
		● Loosened cylinder head bolts or defective gasket	C
		● Improper valve seating	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	● Malfunction of evaporative emission control system	C	

# ENGINE TROUBLE IN GENERAL

Mechanical

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	● Engine control system <Ref. to EN(H6)-2, Basic Diagnostic Procedure.>		A
	● Intake system	● Loosened or cracked vacuum hose	A
	● Others	● Stuck or damaged throttle valve	A
		● Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	● Engine control system <Ref. to EN(H6)-2, Basic Diagnostic Procedure.>		A
	● Cooling system	● Overheating	B
	● Others	● Malfunction of evaporative emission control system	B
7. After burning in exhaust system	● Engine control system <Ref. to EN(H6)-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
	● Chain	● Defective timing	B
	● Compression	● Incorrect valve clearance	B
		● Loosened spark plugs or defective gasket	C
		● Loosened cylinder head bolts or defective gasket	C
		● Improper valve seating	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	● Malfunction of evaporative emission control system	C	
8. Knocking	● Engine control system <Ref. to EN(H6)-2, Basic Diagnostic Procedure.>		A
	● Intake system	● Loosened oil filler cap	B
	● Chain	● 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 seal	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	

# ENGINE TROUBLE IN GENERAL

Mechanical

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK	
10. Excessive fuel consumption	● Engine control system <Ref. to EN(H6)-2, Basic Diagnostic Procedure.>		A	
	● Intake system	● Dirty air cleaner element	A	
	● Chain	● Defective timing	B	
	● Compression	● Incorrect valve clearance		B
		● Loosened spark plugs or defective gasket		C
		● Loosened cylinder head bolts or defective gasket		C
		● Improper valve seating		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
● Others	● Accelerator cable out of adjustment		B	

# ENGINE NOISE

Mechanical

## 20. Engine Noise S143096

### A: INSPECTION S143096A10

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	<ul style="list-style-type: none"> <li>● Valve mechanism is defective.</li> <li>● Incorrect valve clearance</li> <li>● Worn valve rocker</li> <li>● Worn camshaft</li> <li>● Broken valve spring</li> </ul>
Heavy and dull clank	Oil pressure is low.	<ul style="list-style-type: none"> <li>● Worn crankshaft main bearing</li> <li>● Worn connecting rod bearing (big end)</li> </ul>
	Oil pressure is normal.	<ul style="list-style-type: none"> <li>● Loose flywheel mounting bolts</li> <li>● Damaged engine mounting</li> </ul>
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	<ul style="list-style-type: none"> <li>● Ignition timing advanced</li> <li>● Accumulation of carbon inside combustion chamber</li> <li>● Wrong spark plug</li> <li>● Improper gasoline</li> </ul>
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> <li>● Worn crankshaft main bearing</li> <li>● Worn bearing at crankshaft end of connecting rod</li> </ul>
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*)	<ul style="list-style-type: none"> <li>● Worn cylinder liner and piston ring</li> <li>● Broken or stuck piston ring</li> <li>● Worn piston pin and hole at piston end of connecting rod</li> </ul>
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	<ul style="list-style-type: none"> <li>● Unusually worn valve lifter</li> <li>● Worn cam gear</li> <li>● Worn camshaft journal bore in crankcase</li> </ul>
Squeaky sound	—	<ul style="list-style-type: none"> <li>● Insufficient generator lubrication</li> </ul>
Rubbing sound	—	<ul style="list-style-type: none"> <li>● Defective generator brush and rotor contact</li> </ul>
Gear scream when starting engine	—	<ul style="list-style-type: none"> <li>● Defective ignition starter switch</li> <li>● Worn gear and starter pinion</li> </ul>
Sound like polishing glass with a dry cloth	—	<ul style="list-style-type: none"> <li>● Loose drive belt</li> <li>● Defective water pump shaft</li> </ul>
Hissing sound	—	<ul style="list-style-type: none"> <li>● Loss of compression</li> <li>● Air leakage in air intake system, hoses, connections or manifolds</li> </ul>
Timing chain noise	—	<ul style="list-style-type: none"> <li>● Loose timing chain</li> <li>● Chain contacting case/adjacent part</li> </ul>
Valve tappet noise	—	<ul style="list-style-type: none"> <li>● Incorrect valve clearance</li> </ul>

**NOTE\*:**

When disconnecting fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.

Therefore, carry out the Clear Memory Mode <Ref. to EN(H6)-58, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, Inspection Mode.> after connecting fuel injector connector.



# GENERAL DESCRIPTION

Exhaust

- (1) Front oxygen (A/F) sensor (RH)
- (2) Gasket (RH)
- (3) Upper front catalytic converter cover (RH)
- (4) Lower front catalytic converter cover (RH)
- (5) Front catalytic converter (RH)
- (6) Front exhaust pipe (RH)
- (7) Gasket (RH)
- (8) Front oxygen (A/F) sensor (LH)
- (9) Gasket (LH)
- (10) Upper front catalytic converter cover (LH)

- (11) Lower front catalytic converter cover (LH)
- (12) Front catalytic converter (LH)
- (13) Front exhaust pipe (LH)
- (14) Lower rear catalytic converter cover
- (15) Clamp
- (16) Rear oxygen sensor
- (17) Rear catalytic converter
- (18) Bracket
- (19) Gasket
- (20) Spring
- (21) Rear exhaust pipe

- (22) Gasket
- (23) Muffler
- (24) Cushion rubber
- (25) Self-locking nut

---

**Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 13 (1.3, 9.4)**

**T2: 18 (1.8, 13.0)**

**T3: 21 (2.1, 15)**

**T4: 30 (3.1, 22.4)**

**T5: 35 (3.6, 26.0)**

**T6: 48 (4.9, 35.4)**

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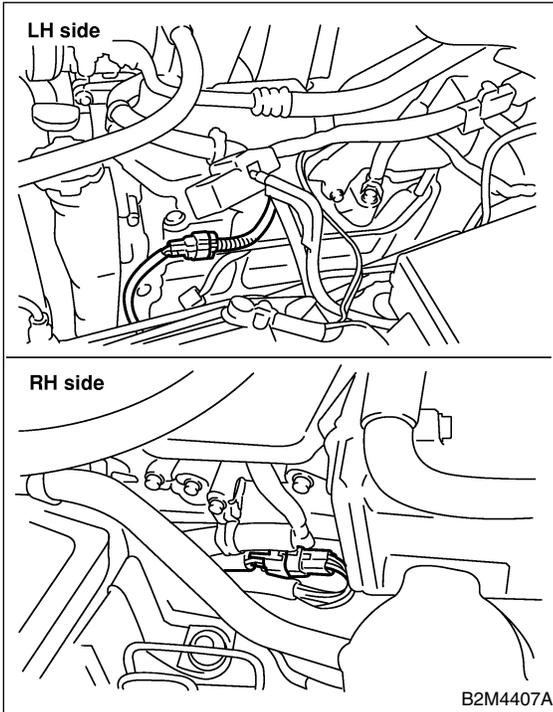
### **B: CAUTION** S142001A03

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

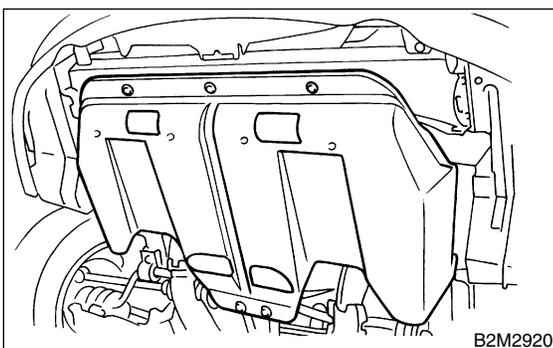
## 2. Front Exhaust Pipe S142065

### A: REMOVAL S142065A18

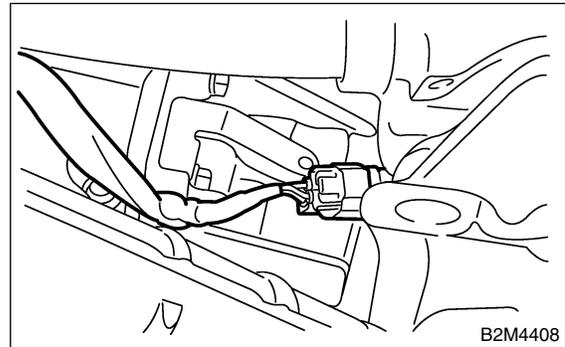
- 1) Remove battery.
- 2) Remove air cleaner case and air intake duct.  
<Ref. to IN(H6)-5, REMOVAL, Air Cleaner.> and  
<Ref. to IN(H6)-7, REMOVAL, Air Intake Duct.>
- 3) Disconnect front oxygen (A/F) sensor connector.



- 4) Lift-up the vehicle.
- 5) Remove under cover.

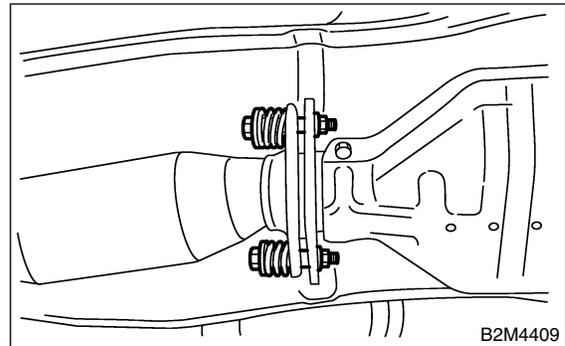


- 6) Disconnect rear oxygen sensor connector.



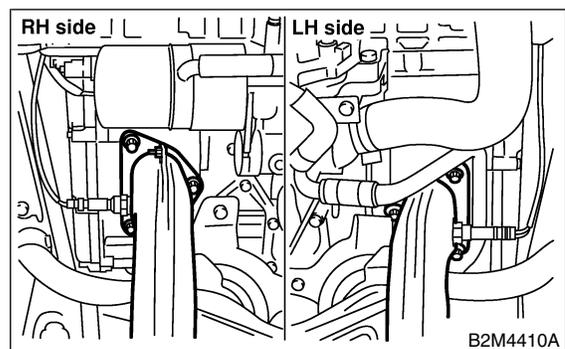
- 7) Separate front exhaust pipe assembly from rear exhaust pipe.

**WARNING:**  
Be careful, exhaust pipe is hot.



- 8) Remove bolts which hold front exhaust pipe onto cylinder heads.

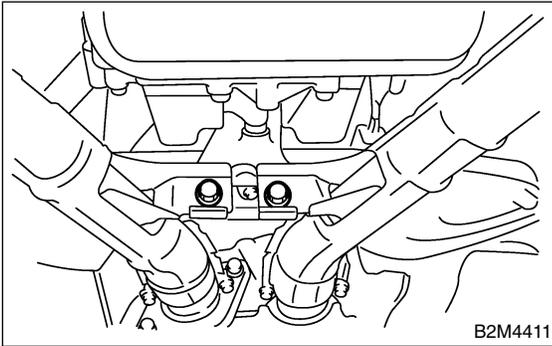
**CAUTION:**  
Be careful not to pull down front and center exhaust pipe assembly.



# FRONT EXHAUST PIPE

## Exhaust

- 9) Remove bolt which secures front exhaust pipe assembly to hanger bracket.

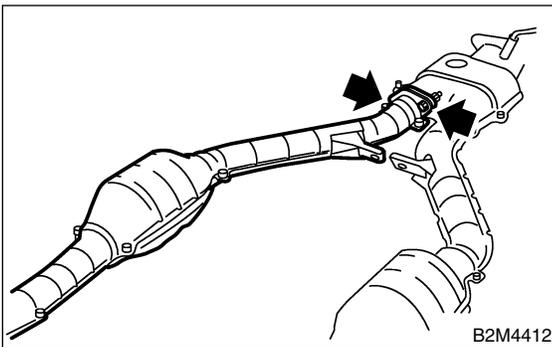


- 10) Remove front exhaust pipe from the vehicle.

### CAUTION:

- Be careful not to let front exhaust pipe assembly fall off when removing as it is quite heavy.
- After removing front exhaust assembly, do not apply excessive pulling force on rear exhaust pipe.

- 11) Separate front exhaust pipe (RH) from front exhaust pipe assembly.



## B: INSTALLATION S142065A11

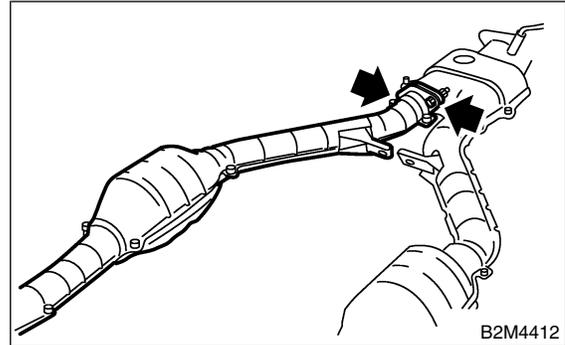
- 1) Install front exhaust pipe (RH) to front exhaust pipe assembly.

### NOTE:

Replace gaskets with new ones.

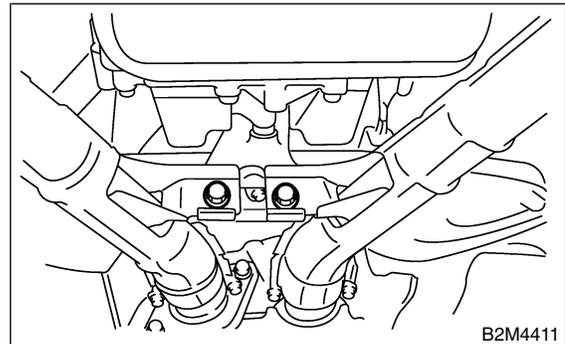
### Tightening torque:

**30 N·m (3.1 kgf-m, 22.4 ft-lb)**



- 2) Install front and rear exhaust pipe assembly to the vehicle.

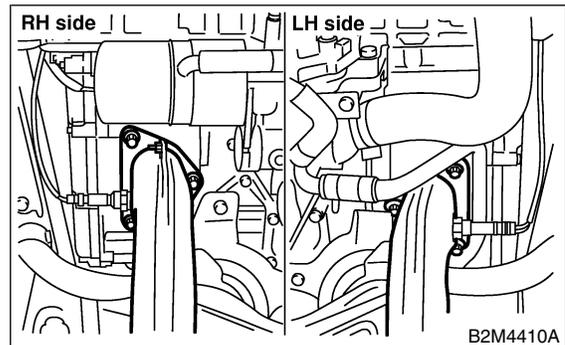
- 3) Temporarily tighten bolt which installs front exhaust pipe assembly to hanger bracket.



- 4) Tighten bolts which hold front exhaust pipe onto cylinder heads.

### Tightening torque:

**30 N·m (3.1 kgf-m, 22.4 ft-lb)**

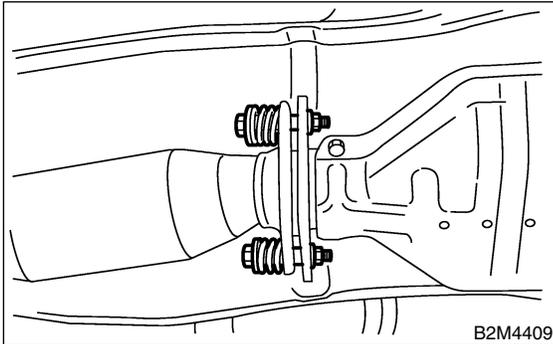


- 5) Install under cover.

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

**Tightening torque:**

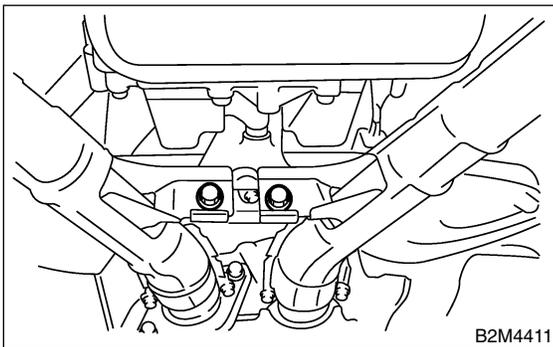
**18 N·m (1.8 kgf·m, 13.0 ft·lb)**



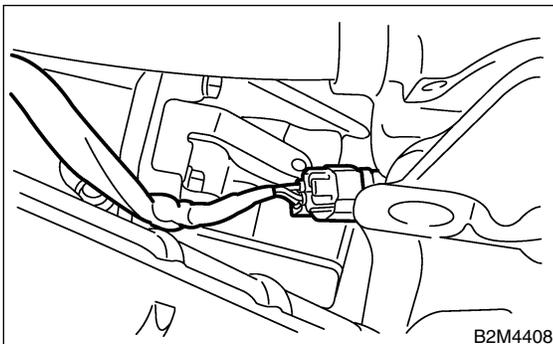
7) Tighten bolt which holds front exhaust pipe assembly to hanger bracket.

**Tightening torque:**

**35 N·m (3.6 kgf·m, 26.0 ft·lb)**

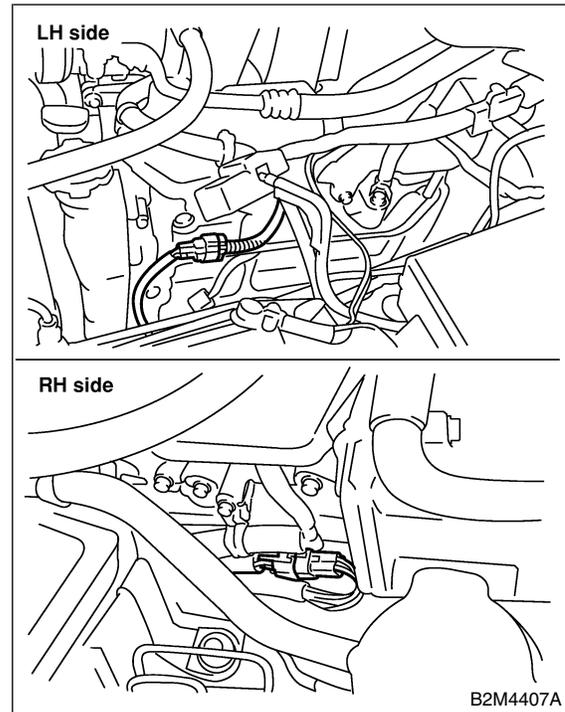


8) Connect rear oxygen sensor connector.



9) Lower the vehicle.

10) Connect front oxygen (A/F) sensor connectors.



11) Install air cleaner case and air intake duct. <Ref. to IN(H6)-5, INSTALLATION, Air Cleaner.> and <Ref. to IN(H6)-7, INSTALLATION, Air Intake Duct.>

12) Install battery.

**C: INSPECTION** S142065A10

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

# REAR EXHAUST PIPE

Exhaust

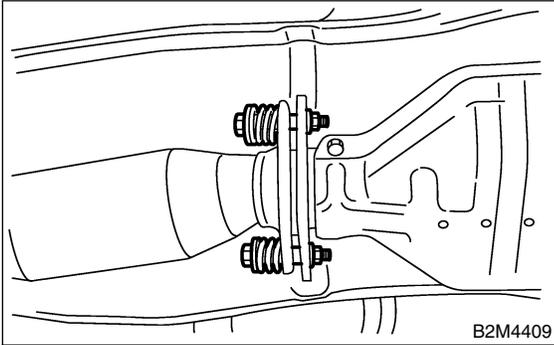
## 3. Rear Exhaust Pipe S142068

### A: REMOVAL S142068A18

1) Separate rear exhaust pipe from front exhaust pipe.

#### CAUTION:

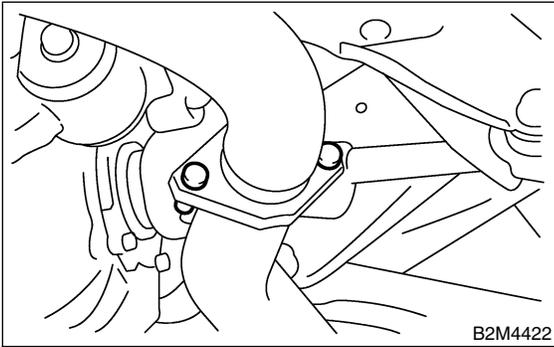
Be careful, exhaust pipe is hot.



2) Separate rear exhaust pipe from muffler.

#### CAUTION:

Be careful not to pull down rear exhaust pipe.



3) Remove rear exhaust pipe.

### B: INSTALLATION S142068A11

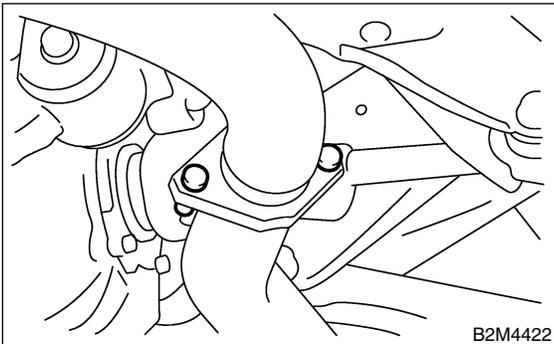
#### NOTE:

Replace gaskets with new ones.

1) Install rear exhaust pipe to muffler.

#### Tightening torque:

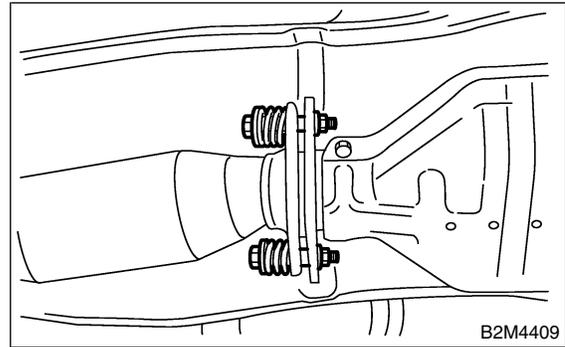
**48 N·m (4.9 kgf·m, 35.4 ft·lb)**



2) Install rear exhaust pipe to front exhaust pipe.

#### Tightening torque:

**18 N·m (1.8 kgf·m, 13.0 ft·lb)**



### C: INSPECTION S142068A10

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.
- 3) Make sure the cushion rubber is not worn or cracked.

## 4. Muffler S142066

### A: REMOVAL S142066A18

1) Separate muffler from rear exhaust pipe.

**CAUTION:**

Be careful, exhaust pipe is hot.



2) Remove left and right rubber cushions.

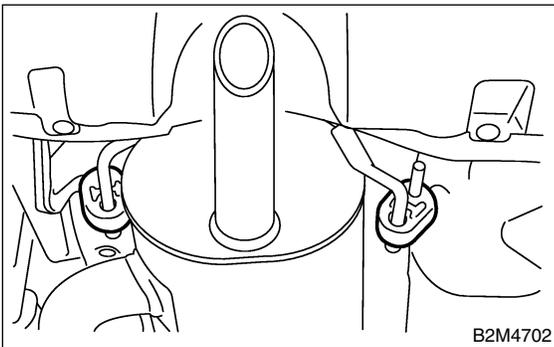
**CAUTION:**

Be careful not to drop the muffler during removal.

**NOTE:**

To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushions in advance.

**SUBARU CRC (Part No. 004301003)**

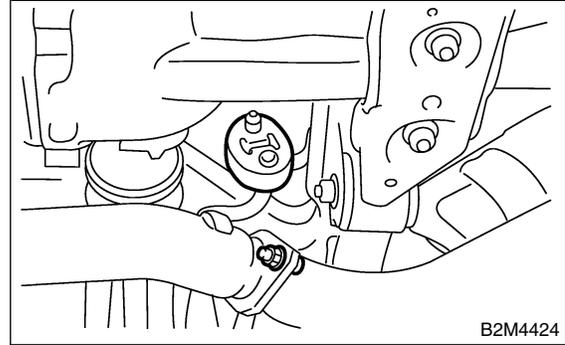


3) Remove front rubber cushion, and detach muffler assembly.

**NOTE:**

To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushion in advance.

**SUBARU CRC (Part No. 004301003)**



### B: INSTALLATION S142066A11

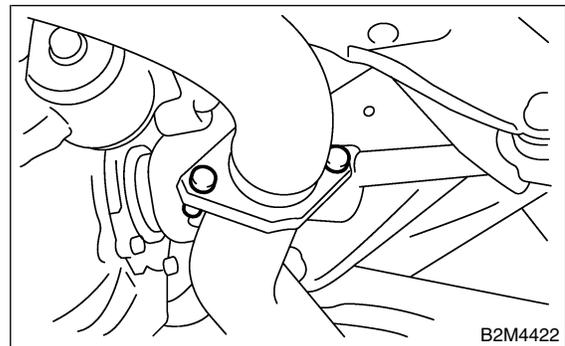
Install in the reverse order of removal.

**NOTE:**

Replace gasket with a new one.

**Tightening torque:**

**48 N·m (4.9 kgf-m, 35.4 ft-lb)**



### C: INSPECTION S142066A10

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

3) Make sure the cushion rubber is not worn or cracked.

# MUFFLER

Exhaust

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**MEMO:**

# GENERAL DESCRIPTION

Cooling

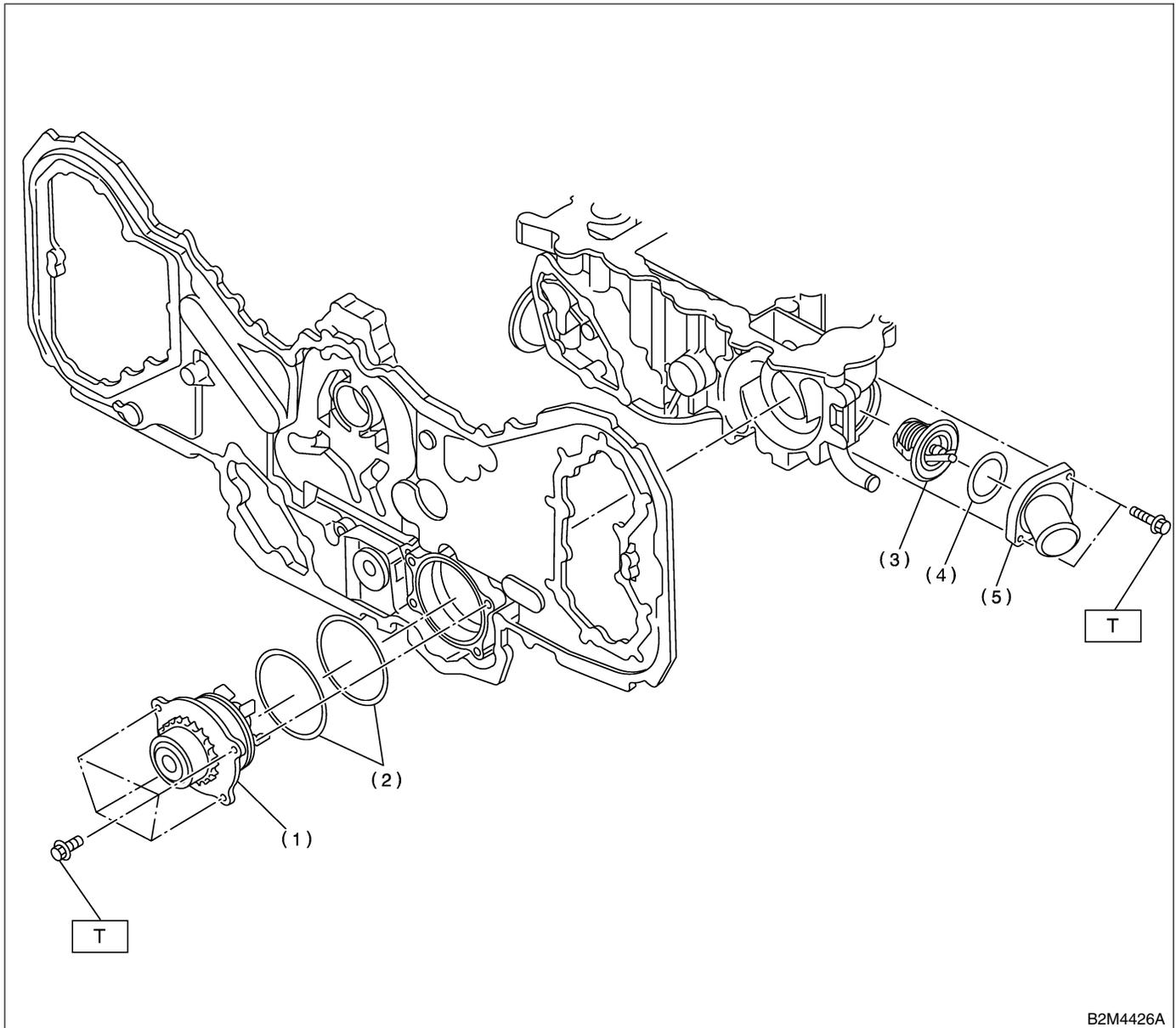
## 1. General Description S146001

### A: SPECIFICATIONS S146001E49

Cooling system		Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity		ℓ (US qt, Imp qt)	
Water pump	Type	Centrifugal impeller type	
	Discharge performance	Discharge	320 ℓ (84.5 US gal, 70.4 Imp gal)/min.
		Pump speed—total engine coolant head	5,500 rpm — 18 mAq (59 ftAq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter	73.2 mm (2.882 in)	
	Number of impeller vanes	6	
	Tooth number of pump sprocket	22 t	
Thermostat	Type	Wax pellet type	
	Start to open	76 — 80°C (169 — 176°F)	
	Fully open	91°C (196°F)	
	Valve lift	9.0 mm (0.354 in) or more	
	Valve bore	35 mm (1.38 in)	
Radiator fan	Motor	120 W (main fan) 120 W (sub fan)	
	Fan diameter × Blade	320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)	
Radiator	Type	Down flow, pressure type	
	Core dimensions	699 × 349 × 27 mm (27.52 × 13.74 × 1.06 in)	
	Pressure range in which cap valve is open	Above: 108±15 kPa (1.1±0.15 kg/cm <sup>2</sup> , 16±2 psi) Below: -1.0 to -4.9 kPa (-0.01 to -0.05 kg/cm <sup>2</sup> , -0.1 to -0.7 psi)	
	Fins	Corrugated fin type	
Reservoir tank	Capacity	0.5 ℓ (0.5 US qt, 0.4 Imp qt)	

## B: COMPONENT S146001A05

### 1. WATER PUMP S146001A0501



B2M4426A

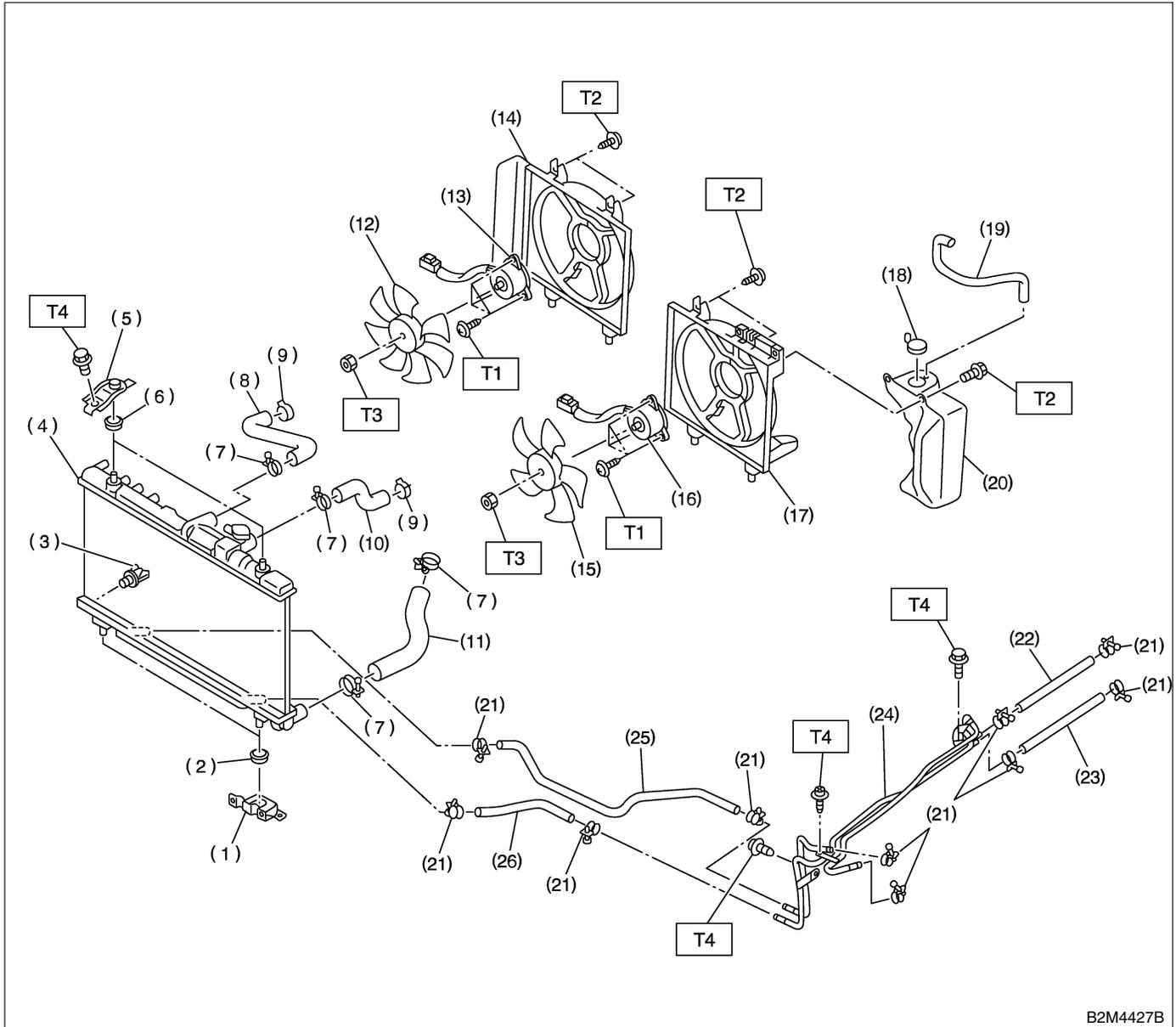
- |                     |                      |
|---------------------|----------------------|
| (1) Water pump ASSY | (4) Gasket           |
| (2) O-ring          | (5) Thermostat cover |
| (3) Thermostat      |                      |

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

# GENERAL DESCRIPTION

Cooling

## 2. RADIATOR AND RADIATOR FAN S146001A0502



B2M4427B

- |                            |                                        |                        |
|----------------------------|----------------------------------------|------------------------|
| (1) Radiator lower bracket | (13) Radiator sub fan motor            | (24) ATF pipe          |
| (2) Radiator lower cushion | (14) Sub fan shroud                    | (25) ATF inlet hose B  |
| (3) Drain cock             | (15) Radiator main fan                 | (26) ATF outlet hose B |
| (4) Radiator               | (16) Radiator main fan motor           |                        |
| (5) Radiator upper bracket | (17) Main fan shroud                   |                        |
| (6) Radiator upper cushion | (18) Engine coolant reservoir tank cap |                        |
| (7) Clamp                  | (19) Over flow hose                    |                        |
| (8) Radiator inlet hose A  | (20) Engine coolant reservoir tank     |                        |
| (9) Clamp                  | (21) ATF hose clamp                    |                        |
| (10) Radiator inlet hose B | (22) ATF inlet hose A                  |                        |
| (11) Radiator outlet hose  | (23) ATF outlet hose A                 |                        |
| (12) Radiator sub fan      |                                        |                        |

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**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 4.4 (0.45, 3.3)**

**T2: 4.9 (0.50, 3.6)**

**T3: 7.5 (0.76, 5.5)**

**T4: 12 (1.2, 8.7)**

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# GENERAL DESCRIPTION

Cooling

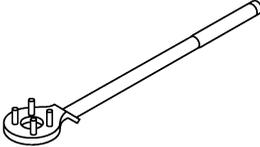
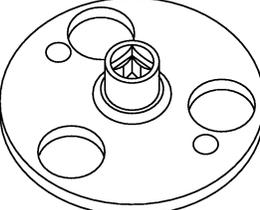
## C: CAUTION S146001A03

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

## D: PREPARATION TOOL S146001A17

### 1. SPECIAL TOOLS S146001A1701

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>B2M3870</p>	499977100	CRANKSHAFT PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 <p>B2M3995</p>	18231AA000	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

### 2. GENERAL PURPOSE TOOLS S146001A1702

TOOL NAME	REMARKS
Radiator cap tester	Used for measuring pressure.

# RADIATOR MAIN FAN SYSTEM

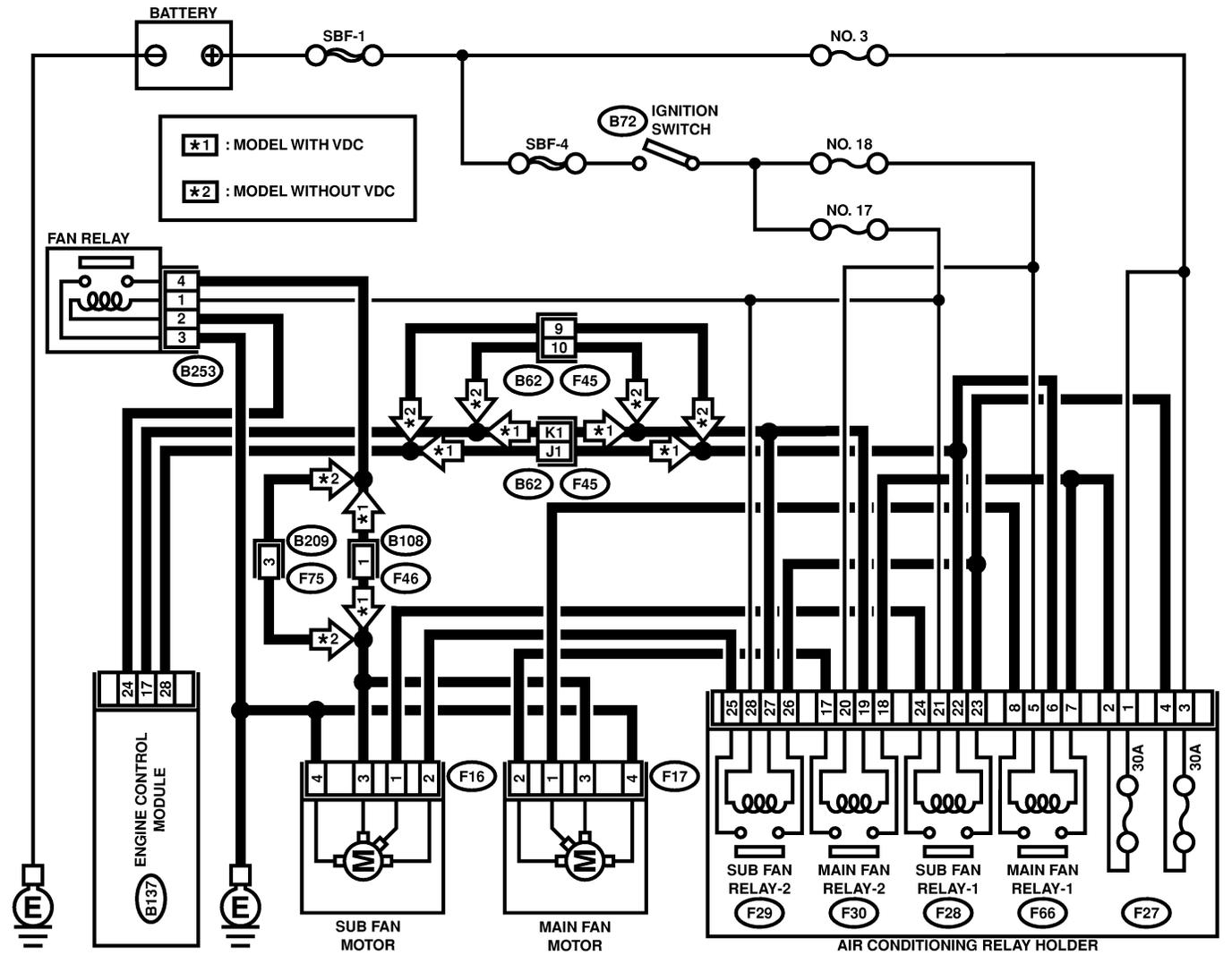
Cooling

## 2. Radiator Main Fan System

S146732

### A: SCHEMATIC

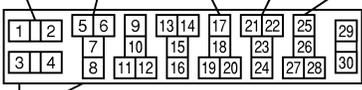
S146732A21



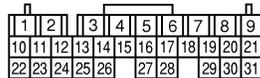
(B72) (BLUE)



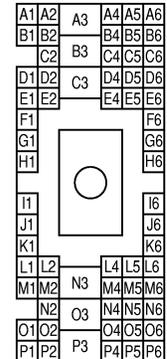
(F27) (F66) (F30) (F28) (F29)



(B137)



(B62) : \*1



(F16)



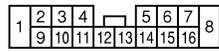
(B253)



(F75) : \*2



(B62) : \*2



(F46) : \*1



B2M4755

# RADIATOR MAIN FAN SYSTEM

Cooling

## B: INSPECTION

S146732A10

### TROUBLE SYMPTOM:

- Radiator main fan does not rotate in low speed under the following conditions:
  - (1) Coolant temperature 95°C (203°F) or more.
  - (2) A/C switch set to OFF.
- Radiator main fan does not rotate in middle speed under the following conditions:

- (1) Coolant temperature 94°C (201°F) or less.
  - (2) A/C switch set to ON and A/C temperature at the lowest position.
- Radiator main fan does not rotate in high speed under the following conditions:
    - (1) Coolant temperature 95°C (203°F) or more.
    - (2) A/C switch set to ON and A/C temperature at the lowest position.

No.	Step	Check	Yes	No
1	<b>CHECK OPERATION OF RADIATOR FAN.</b> 1) Run the engine at idle (Vehicle stationary) 2) Turn the A/C switch to ON, set temperature at the lowest position. 3) Inspect while coolant temperature is 94°C (201°F) or less.	When A/C compressor is operating, does the radiator main fan rotate in middle speed?	Go to step 2.	Go to step 4.
2	<b>CHECK OPERATION OF RADIATOR FAN.</b> 1) Turn the A/C switch to OFF. 2) Warm the engine until coolant temperature is over 95°C (203°F).	When A/C compressor is operating, does the radiator main fan rotate in low speed?	Go to step 3.	Go to step 18.
3	<b>CHECK OPERATION OF RADIATOR FAN.</b> Turn the A/C switch to ON, set temperature at the lowest position.	When A/C compressor is operating, does the radiator main fan rotate in high speed?	Radiator main fan system is okay.	Go to step 31.
4	<b>CHECK POWER SUPPLY TO MAIN FAN MOTOR.</b> <b>CAUTION:</b> <b>Be careful not to overheat engine during repair.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from main fan motor. 3) Start the engine, keep coolant temperature below 94°C (201°F). 4) Turn the A/C switch to ON, set temperature at the lowest position. 5) Measure voltage while A/C compressor is rotating. 6) Measure voltage between main fan motor connector and chassis ground. <b>Connector &amp; terminal</b> <b>(F17) No. 2 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 5.	Go to step 8.
5	<b>CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.</b> 1) Turn ignition switch to OFF. 2) Measure resistance between main fan motor connector and chassis ground. <b>Connector &amp; terminal</b> <b>(F17) No. 4 — Chassis ground:</b>	Is the resistance less than 5 Ω?	Go to step 6.	Repair open circuit in harness between main fan motor connector and chassis ground.
6	<b>CHECK POOR CONTACT.</b> Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step 7.
7	<b>CHECK MAIN FAN MOTOR.</b> Connect battery positive (+) terminal to terminal No. 2 and negative (-) terminal to terminal No. 4 of main fan motor connector.	Does the main fan rotate?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.

# RADIATOR MAIN FAN SYSTEM

Cooling

No.	Step	Check	Yes	No
8	<b>CHECK POWER SUPPLY TO MAIN FAN RELAY 2.</b> 1) Turn ignition switch to OFF. 2) Remove main fan relay 2 from A/C relay holder. 3) Measure voltage between main fan relay 2 terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F30) No. 18 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 9.	Go to step 10.
9	<b>CHECK POWER SUPPLY TO MAIN FAN RELAY 2.</b> 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay 2 terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F30) No. 20 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 13.	Go to step 12.
10	<b>CHECK 30 A FUSE.</b> 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 11.
11	<b>CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.</b> Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F27) No. 1 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Repair open circuit in harness between 30 A fuse and main fan relay 2 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
12	<b>CHECK FUSE.</b> 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Repair open circuit in harness between main fan relay 2 and ignition switch.
13	<b>CHECK MAIN FAN RELAY 2.</b> 1) Turn ignition switch to OFF. 2) Remove main fan relay 2. 3) Measure resistance of main fan relay 2. <b>Terminal</b> <b>No. 17 — No. 18:</b>	Is the resistance more than 1 M $\Omega$ ?	Go to step 14.	Replace main fan relay 2.
14	<b>CHECK MAIN FAN RELAY 2.</b> 1) Connect battery to terminals No. 19 and No. 20 of main fan relay 2. 2) Measure resistance of main fan relay 2. <b>Terminal</b> <b>No. 17 — No. 18:</b>	Is the resistance less than 1 $\Omega$ ?	Go to step 15.	Replace main fan relay 2.
15	<b>CHECK HARNESS BETWEEN MAIN FAN RELAY 2 TERMINAL AND MAIN FAN MOTOR CONNECTOR.</b> Measure resistance of harness between main fan motor connector and main fan relay 2 terminal. <b>Connector &amp; terminal</b> <b>(F17) No. 2 — (F30) No. 17:</b>	Is the resistance less than 1 $\Omega$ ?	Go to step 16.	Repair open circuit in harness between main fan motor connector and main fan relay 2 terminal.

# RADIATOR MAIN FAN SYSTEM

Cooling

No.	Step	Check	Yes	No
16	<b>CHECK HARNESS BETWEEN MAIN FAN RELAY 2 AND ECM.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay 2 connector and ECM connector. <b>Connector &amp; terminal</b> <b>(F30) No. 19 — (B137) No. 17:</b>	Is the resistance less than 1 Ω?	Go to step 17.	Repair open circuit in harness between main fan relay 2 and ECM.
17	<b>CHECK POOR CONTACT.</b> Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM.	Repair poor contact connector.	Contact with SOA (distributor) service.
18	<b>CHECK POWER SUPPLY TO MAIN FAN MOTOR.</b> <b>CAUTION:</b> <b>Be careful not to overheat engine during repair.</b> 1) Turn ignition switch to OFF. 2) Turn A/C switch to OFF. 3) Disconnect main fan motor connector. 4) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 5) Measure voltage between main fan motor connector and chassis ground. <b>Connector &amp; terminal</b> <b>(F17) No. 1 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 19.	Go to step 21.
19	<b>CHECK POOR CONTACT.</b> Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step 20.
20	<b>CHECK MAIN FAN MOTOR.</b> Connect battery positive (+) terminal to terminal No. 1, and negative (-) terminal to terminal No. 4 of main fan motor connector.	Does the main fan rotate?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
21	<b>CHECK POWER SUPPLY TO MAIN FAN RELAY 1.</b> 1) Turn ignition switch to OFF. 2) Remove main fan relay 1 from A/C relay holder. 3) Measure voltage between main fan relay 1 terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F66) No. 7 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 22.	Go to step 23.
22	<b>CHECK POWER SUPPLY TO MAIN FAN RELAY 1.</b> 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay 1 terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F66) No. 5 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 26.	Go to step 25.
23	<b>CHECK 30 A FUSE.</b> 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 24.

# RADIATOR MAIN FAN SYSTEM

Cooling

No.	Step	Check	Yes	No
24	<p><b>CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.</b> Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(F27) No. 1 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair open circuit in harness between 30 A fuse and main fan relay terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
25	<p><b>CHECK FUSE.</b> 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.</p>	Is the fuse blown-out?	Replace fuse.	Repair open circuit in harness between main fan relay 1 and ignition switch.
26	<p><b>CHECK MAIN FAN RELAY 1.</b> 1) Turn ignition switch to OFF. 2) Remove main fan relay 1. 3) Measure resistance of main fan relay 1.</p> <p><b>Terminal</b> <b>No. 7 — No. 8:</b></p>	Is the resistance more than 1 MΩ?	Go to step 27.	Replace main fan relay 1.
27	<p><b>CHECK MAIN FAN RELAY.</b> 1) Connect battery to terminals No. 5 and No. 6 of main fan relay 1. 2) Measure resistance of main fan relay 1.</p> <p><b>Terminal</b> <b>No. 7 — No. 8:</b></p>	Is the resistance less than 1 Ω?	Go to step 28.	Replace main fan relay 1.
28	<p><b>CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.</b> Measure resistance of harness between main fan motor connector and main fan relay 1 terminal.</p> <p><b>Connector &amp; terminal</b> <b>(F17) No. 1 — (F66) No. 8:</b></p>	Is the resistance less than 1 Ω?	Go to step 29.	Replace open circuit in harness between main fan motor connector and main fan relay 1 terminal.
29	<p><b>CHECK HARNESS BETWEEN MAIN FAN RELAY 1 AND ECM.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay 1 connector and ECM connector.</p> <p><b>Connector &amp; terminal</b> <b>(F66) No. 6 — (B137) No. 28:</b></p>	Is the resistance less than 1 Ω?	Go to step 30.	Repair open circuit in harness between main fan relay 1 and ECM.
30	<p><b>CHECK POOR CONTACT.</b> Check poor contact in connector between main fan and ECM.</p>	Is there poor contact in connector between main fan motor and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.
31	<p><b>CHECK HARNESS BETWEEN MAIN FAN MOTOR CONNECTOR AND CHASSIS GROUND.</b> 1) Turn ignition switch to OFF. 2) Disconnect main fan motor connector. 3) Measure resistance of harness between main fan motor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(F17) No. 3 — Chassis ground:</b></p>	Is the resistance less than 5 Ω?	Go to step 32.	Go to step 33.
32	<p><b>CHECK POOR CONTACT.</b> Check poor contact in main fan motor connector.</p>	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.

# RADIATOR MAIN FAN SYSTEM

Cooling

No.	Step	Check	Yes	No
33	<b>CHECK HARNESS BETWEEN MAIN FAN AND FAN RELAY.</b> 1) Disconnect fan relay connector. 2) Measure resistance of between main fan motor connector and fan relay connector. <i>Connector &amp; terminal</i> <i>(F17) No. 3 — (B253) No. 4:</i>	Is the resistance less than 1 $\Omega$ ?	Go to step 34.	Repair open circuit between main fan motor connector and fan relay connector.
34	<b>CHECK POWER SUPPLY TO FAN RELAY.</b> 1) Turn ignition switch to ON. 2) Measure voltage between fan relay terminal and chassis ground. <i>Connector &amp; terminal</i> <i>(B253) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10V?	Go to step 36.	Go to step 35.
35	<b>CHECK FUSE.</b> 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Repair open circuit in harness between main fan relay and ignition switch.
36	<b>CHECK FAN RELAY.</b> 1) Turn ignition switch to OFF. 2) Remove fan relay. 3) Measure resistance of fan relay. <i>Terminal</i> <i>No. 4 — No. 5:</i>	Is resistance more than 1 $M\Omega$ ?	Go to step 37.	Replace fan relay.
37	<b>CHECK FAN RELAY.</b> 1) Connect battery to terminals No. 1 and No. 3 of fan relay. 2) Measure resistance of fan relay. <i>Terminal</i> <i>No. 4 — No. 5:</i>	Is resistance less than 1 $\Omega$ ?	Go to step 38.	Replace fan relay.
38	<b>CHECK HARNESS BETWEEN FAN RELAY TERMINAL AND CHASSIS GROUND.</b> Measure resistance of harness between fan relay connector and chassis ground. <i>Connector &amp; terminal</i> <i>(B253) No. 3 — Chassis ground:</i>	Is resistance less than 1 $\Omega$ ?	Go to step 39.	Repair open circuit in harness between fan relay connector and chassis ground.
39	<b>CHECK HARNESS BETWEEN FAN RELAY AND ECM.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fan relay and ECM connector. <i>Connector &amp; terminal</i> <i>(B253) No. 2 — (B137) No. 24:</i>	Is resistance less than 1 $\Omega$ ?	Go to step 40.	Repair open circuit in harness between fan relay connector and ECM.
40	<b>CHECK POOR CONTACT.</b> Check poor contact in connector between fan relay and ECM.	Is there poor contact in connector between fan relay and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.

**NOTE:**

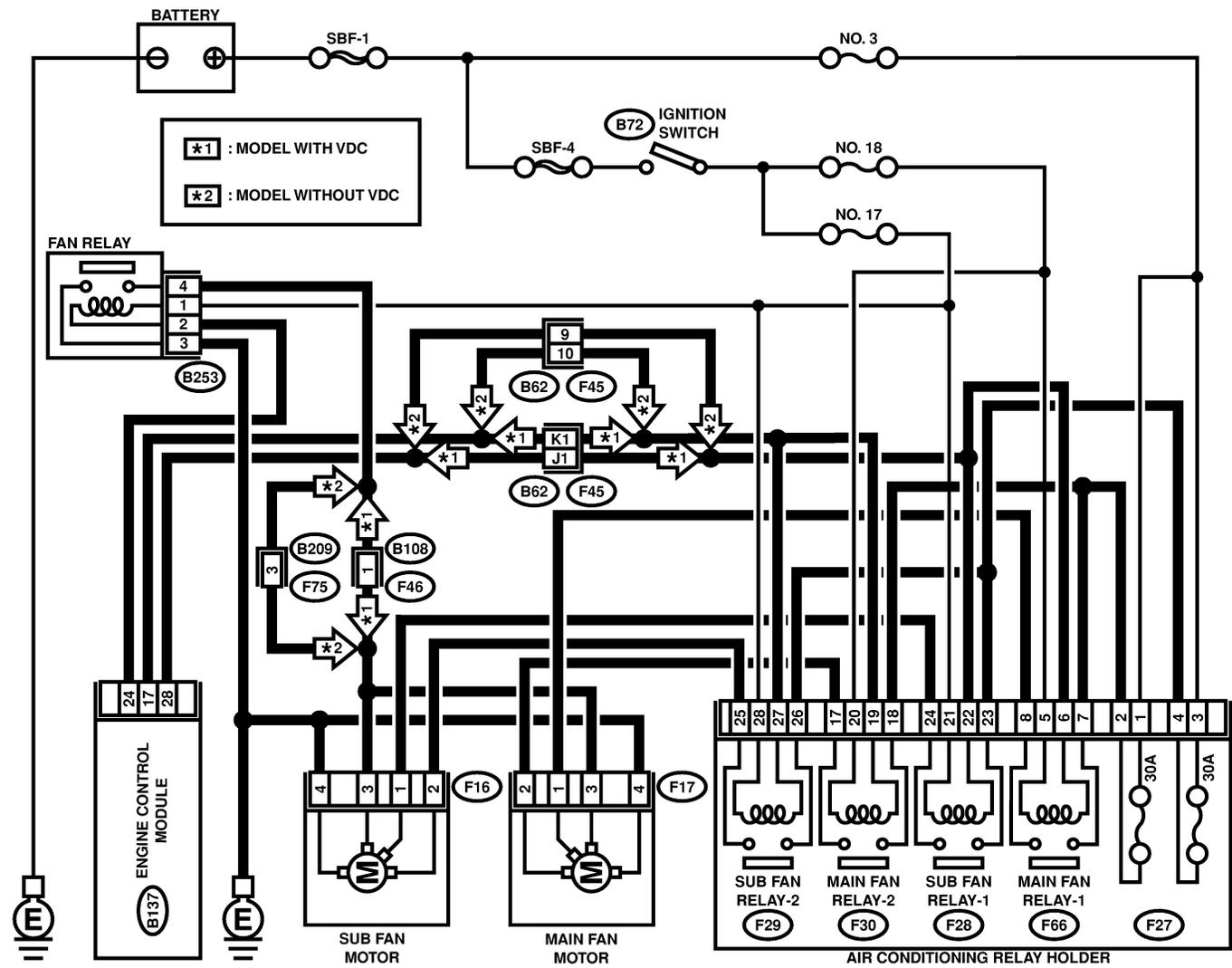
Inspection by SOA (distributor) service is required, because probable cause is deterioration of multiple parts.

# RADIATOR SUB FAN SYSTEM

Cooling

## 3. Radiator Sub Fan System S146733

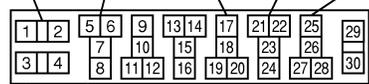
### A: SCHEMATIC S146733A21



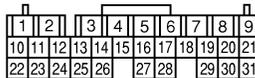
(B72) (BLUE)



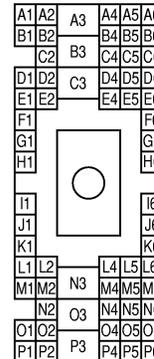
(F27) (F66) (F30) (F28) (F29)



(B137)



(B62) : \*1



(F16)

(F17)

(F46) : \*1



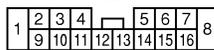
(B253)



(F75) : \*2



(B62) : \*2



B2M4755

# RADIATOR SUB FAN SYSTEM

Cooling

## B: INSPECTION

S146733A10

### TROUBLE SYMPTOM:

- Radiator sub fan does not rotate in low speed under the following conditions:
  - (1) Coolant temperature 95°C (203°F) or more.
  - (2) A/C switch set to OFF.
- Radiator sub fan does not rotate in middle speed under the following conditions:

- (1) Coolant temperature 94°C (201°F) or less.
  - (2) A/C switch set to ON and A/C temperature at the lowest position.
- Radiator sub fan does not rotate in high speed under the following conditions:
    - (1) Coolant temperature 95°C (203°F) or more.
    - (2) A/C switch set to ON and A/C temperature at the lowest position.

No.	Step	Check	Yes	No
1	<b>CHECK OPERATION OF RADIATOR FAN.</b> 1) Run the engine at idle (Vehicle stationary) 2) Turn the A/C switch to ON, set temperature at the lowest position. 3) Inspect while coolant temperature is 94°C (201°F) or less.	When A/C compressor is operating, does the radiator sub fan rotate in middle speed?	Go to step 2.	Go to step 4.
2	<b>CHECK OPERATION OF RADIATOR FAN.</b> 1) Turn the A/C switch to OFF. 2) Warm the engine until coolant temperature is over 95°C (203°F).	When A/C compressor is operating, does the radiator sub fan rotate in low speed?	Go to step 3.	Go to step 18.
3	<b>CHECK OPERATION OF RADIATOR FAN.</b> 1) Turn the A/C switch to ON, set temperature at the lowest position.	When A/C compressor is operating, does the radiator sub fan rotate in high speed?	Radiator sub fan system is okay.	Go to step 31.
4	<b>CHECK POWER SUPPLY TO SUB FAN MOTOR.</b> <b>CAUTION:</b> <b>Be careful not to overheat engine during repair.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from sub fan motor. 3) Start the engine, keep coolant temperature below 94°C (201°F). 4) Turn the A/C switch to ON, set temperature at the lowest position. 5) Measure voltage while A/C compressor is rotating. 6) Measure voltage between sub fan motor connector and chassis ground. <b>Connector &amp; terminal</b> <b>(F16) No. 2 (+) — Chassis ground (-):</b>	Is the voltage more than 10V?	Go to step 5.	Go to step 8.
5	<b>CHECK GROUND CIRCUIT OF SUB FAN MOTOR.</b> 1) Turn ignition switch to OFF. 2) Measure resistance between sub fan motor connector and chassis ground. <b>Connector &amp; terminal</b> <b>(F16) No. 4 — Chassis ground:</b>	Is the resistance less than 5 Ω?	Go to step 6.	Repair open circuit in harness between sub fan motor connector and chassis ground.
6	<b>CHECK POOR CONTACT.</b> Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step 7.
7	<b>CHECK SUB FAN MOTOR.</b> Connect battery positive (+) terminal to terminal No. 2 and negative (-) terminal to terminal No. 4 of sub fan motor connector.	Does the sub fan rotate?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.

# RADIATOR SUB FAN SYSTEM

Cooling

No.	Step	Check	Yes	No
8	<b>CHECK POWER SUPPLY TO SUB FAN RELAY 2.</b> 1) Turn ignition switch to OFF. 2) Remove sub fan relay 2 from A/C relay holder. 3) Measure voltage between sub fan relay 2 terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F29) No. 26 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 9.	Go to step 10.
9	<b>CHECK POWER SUPPLY TO SUB FAN RELAY 2.</b> 1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay 2 terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F29) No. 28 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 13.	Go to step 12.
10	<b>CHECK 30 A FUSE.</b> 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 11.
11	<b>CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.</b> Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F27) No. 3 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Repair open circuit in harness between 30 A fuse and sub fan relay 2 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
12	<b>CHECK FUSE.</b> 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Repair open circuit in harness between sub fan relay 2 and ignition switch.
13	<b>CHECK SUB FAN RELAY 2.</b> 1) Turn ignition switch to OFF. 2) Remove sub fan relay 2. 3) Measure resistance of sub fan relay 2. <b>Terminal</b> <b>No. 25 — No. 26:</b>	Is the resistance more than 1 M $\Omega$ ?	Go to step 14.	Replace sub fan relay 2.
14	<b>CHECK SUB FAN RELAY 2.</b> 1) Connect battery to terminals No. 27 and No. 28 of sub fan relay 2. 2) Measure resistance of sub fan relay 2. <b>Terminal</b> <b>No. 25 — No. 26:</b>	Is the resistance less than 1 $\Omega$ ?	Go to step 15.	Replace sub fan relay 2.
15	<b>CHECK HARNESS BETWEEN SUB FAN RELAY 2 TERMINAL AND SUB FAN MOTOR CONNECTOR.</b> Measure resistance of harness between sub fan motor connector and sub fan relay 2 terminal. <b>Connector &amp; terminal</b> <b>(F16) No. 2 — (F29) No. 25:</b>	Is the resistance less than 1 $\Omega$ ?	Go to step 16.	Repair open circuit in harness between sub fan motor connector and sub fan relay 2 terminal.

# RADIATOR SUB FAN SYSTEM

Cooling

No.	Step	Check	Yes	No
16	<b>CHECK HARNESS BETWEEN SUB FAN RELAY 2 AND ECM.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay 2 connector and ECM connector. <b>Connector &amp; terminal</b> <b>(F29) No. 27 — (B137) No. 17:</b>	Is the resistance less than 1 Ω?	Go to step 17.	Repair open circuit in harness between sub fan relay 2 and ECM.
17	<b>CHECK POOR CONTACT.</b> Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM.	Repair poor contact connector.	Contact with SOA (distributor) service.
18	<b>CHECK POWER SUPPLY TO SUB FAN MOTOR.</b> <b>CAUTION:</b> <b>Be careful not to overheat engine during repair.</b> 1) Turn ignition switch to OFF. 2) Turn A/C switch to OFF. 3) Disconnect sub fan motor connector. 4) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 5) Measure voltage between sub fan motor connector and chassis ground. <b>Connector &amp; terminal</b> <b>(F16) No. 1 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 19.	Go to step 21.
19	<b>CHECK POOR CONTACT.</b> Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step 20.
20	<b>CHECK SUB FAN MOTOR.</b> Connect battery positive (+) terminal to terminal No. 1, and negative (-) terminal to terminal No. 4 of sub fan motor connector.	Does the sub fan rotate?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
21	<b>CHECK POWER SUPPLY TO SUB FAN RELAY 1.</b> 1) Turn ignition switch to OFF. 2) Remove sub fan relay 1 from A/C relay holder. 3) Measure voltage between sub fan relay 1 terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F28) No. 23 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 22.	Go to step 23.
22	<b>CHECK POWER SUPPLY TO SUB FAN RELAY 1.</b> 1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay 1 terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F28) No. 21 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 26.	Go to step 25.
23	<b>CHECK 30 A FUSE.</b> 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 24.

# RADIATOR SUB FAN SYSTEM

Cooling

No.	Step	Check	Yes	No
24	<p><b>CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.</b> Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(F27) No. 3 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair open circuit in harness between 30 A fuse and sub fan relay 1 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
25	<p><b>CHECK FUSE.</b> 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.</p>	Is the fuse blown-out?	Replace fuse.	Repair open circuit in harness between sub fan relay 1 and ignition switch.
26	<p><b>CHECK SUB FAN RELAY 1.</b> 1) Turn ignition switch to OFF. 2) Remove sub fan relay 1. 3) Measure resistance of sub fan relay 1.</p> <p><b>Terminal</b> <b>No. 23 — No. 24:</b></p>	Is the resistance more than 1 M $\Omega$ ?	Go to step 27.	Replace sub fan relay 1.
27	<p><b>CHECK SUB FAN RELAY.</b> 1) Connect battery to terminals No. 21 and No. 22 of sub fan relay 1. 2) Measure resistance of sub fan relay 1.</p> <p><b>Terminal</b> <b>No. 23 — No. 24:</b></p>	Is the resistance less than 1 $\Omega$ ?	Go to step 28.	Replace sub fan relay 1.
28	<p><b>CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.</b> Measure resistance of harness between sub fan motor connector and sub fan relay 1 terminal.</p> <p><b>Connector &amp; terminal</b> <b>(F16) No. 1 — (F28) No. 24:</b></p>	Is the resistance less than 1 $\Omega$ ?	Go to step 29.	Replace open circuit in harness between sub fan motor connector and sub fan relay 1 terminal.
29	<p><b>CHECK HARNESS BETWEEN SUB FAN RELAY 1 AND ECM.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay 1 connector and ECM connector.</p> <p><b>Connector &amp; terminal</b> <b>(F28) No. 22 — (B137) No. 28:</b></p>	Is the resistance less than 1 $\Omega$ ?	Go to step 30.	Repair open circuit in harness between sub fan relay and ECM.
30	<p><b>CHECK POOR CONTACT.</b> Check poor contact in connector between sub fan and ECM.</p>	Is there poor contact in connector between sub fan motor and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.
31	<p><b>CHECK HARNESS BETWEEN SUB FAN MOTOR CONNECTOR AND CHASSIS GROUND.</b> 1) Turn ignition switch to OFF. 2) Disconnect sub fan motor connector. 3) Measure resistance of harness between sub fan motor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(F16) No. 3 — Chassis ground:</b></p>	Is the resistance less than 5 $\Omega$ ?	Go to step 32.	Go to step 33.
32	<p><b>CHECK POOR CONTACT.</b> Check poor contact in sub fan motor connector.</p>	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.

# RADIATOR SUB FAN SYSTEM

Cooling

No.	Step	Check	Yes	No
33	<b>CHECK HARNESS BETWEEN SUB FAN AND FAN RELAY.</b> 1) Disconnect fan relay connector. 2) Measure resistance between sub fan motor connector and fan relay connector. <i>Connector &amp; terminal (F16) No. 3 — (B253) No. 4:</i>	Is the resistance less than 1 $\Omega$ ?	Go to step 34.	Repair open circuit between sub fan motor connector and fan relay connector.
34	<b>CHECK POWER SUPPLY TO FAN RELAY.</b> 1) Turn ignition switch to ON. 2) Measure voltage between fan relay terminal and chassis ground. <i>Connector &amp; terminal (B253) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10V?	Go to step 36.	Go to step 35.
35	<b>CHECK FUSE.</b> 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Repair open circuit in harness between fan relay and ignition switch.
36	<b>CHECK FAN RELAY.</b> 1) Turn ignition switch to OFF. 2) Remove fan relay. 3) Measure resistance of fan relay. <i>Terminal No. 4 — No. 5:</i>	Is resistance more than 1 $M\Omega$ ?	Go to step 37.	Replace fan relay.
37	<b>CHECK FAN RELAY.</b> 1) Connect battery to terminals No. 1 and No. 3 of fan relay. 2) Measure resistance of fan relay. <i>Terminal No. 4 — No. 5:</i>	Is resistance less than 1 $\Omega$ ?	Go to step 38.	Replace fan relay.
38	<b>CHECK HARNESS BETWEEN FAN RELAY TERMINAL AND CHASSIS GROUND.</b> Measure resistance of harness between fan relay connector and chassis ground. <i>Connector &amp; terminal (B253) No. 3 — Chassis ground:</i>	Is resistance less than 1 $\Omega$ ?	Go to step 39.	Repair open circuit in harness between fan relay connector and chassis ground.
39	<b>CHECK HARNESS BETWEEN FAN RELAY AND ECM.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fan relay connector and ECM connector. <i>Connector &amp; terminal (B253) No. 2 — (B137) No. 24:</i>	Is resistance less than 1 $\Omega$ ?	Go to step 40.	Repair open circuit in harness between fan relay connector and ECM.
40	<b>CHECK POOR CONTACT.</b> Check poor contact in connector between fan relay and ECM.	Is there poor contact in connector between fan relay and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.

**NOTE:**

Inspection by SOA (distributor) service is required, because probable cause is deterioration of multiple parts.

# ENGINE COOLANT

Cooling

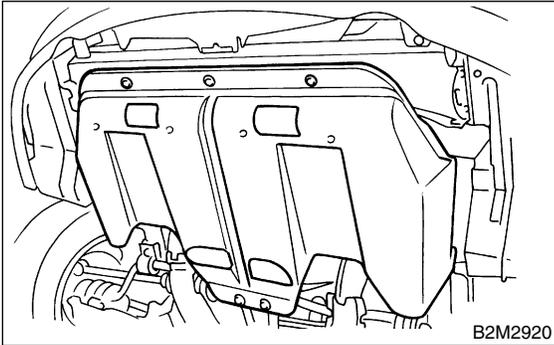
## 4. Engine Coolant S146060

### A: REPLACEMENT S146060A20

#### 1. DRAINING OF ENGINE COOLANT

S146060A2001

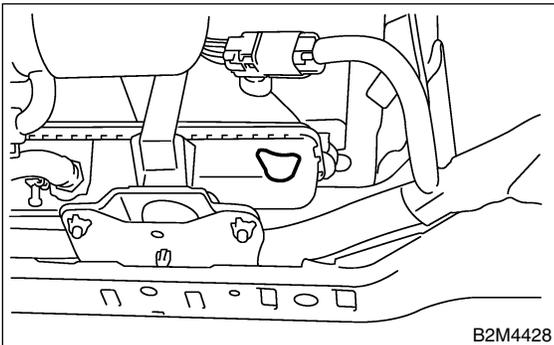
- 1) Lift-up the vehicle.
- 2) Remove under cover.



- 3) Remove drain cock to drain engine coolant into container.

#### NOTE:

Remove radiator cap so that engine coolant will drain faster.



#### 2. FILLING OF ENGINE COOLANT S146060A2002

- 1) Fill engine coolant into radiator up to filler neck position.

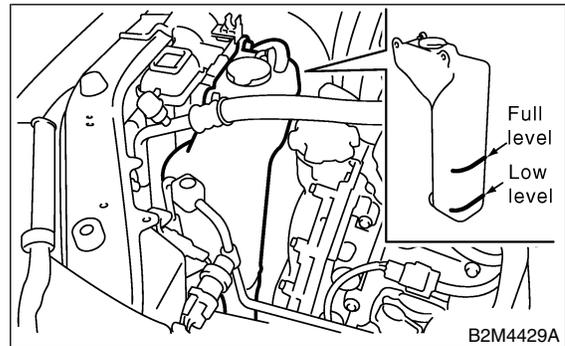
#### **Engine oil amount for refill:**

**Approx. 7.9 l (8.4 US qt, 7.0 Imp qt)**

#### CAUTION:

The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

- 2) Fill engine coolant into reservoir tank up to upper level.



- 3) Attach radiator cap and reservoir tank cap properly.
- 4) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.
- 5) If engine coolant level drops in radiator, add engine coolant to filler neck position.
- 6) If engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
- 7) Attach radiator cap and reservoir tank cap properly.

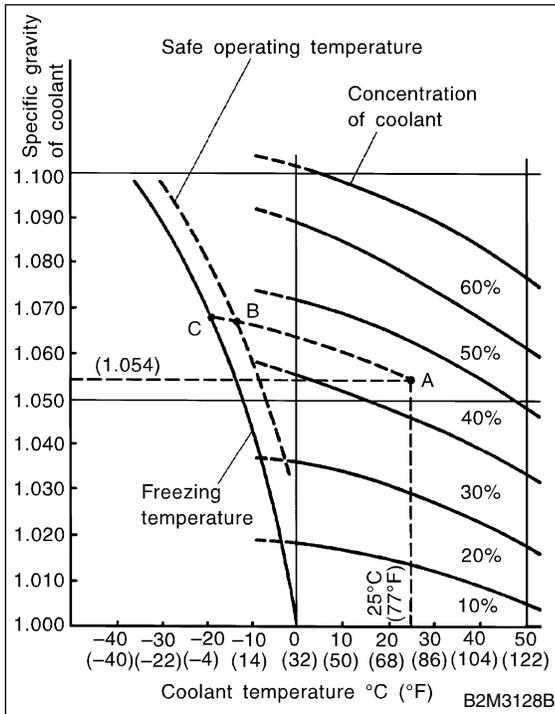
### B: INSPECTION S146060A10

#### 1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE S146060A1001

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

[Example]

If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



## 2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

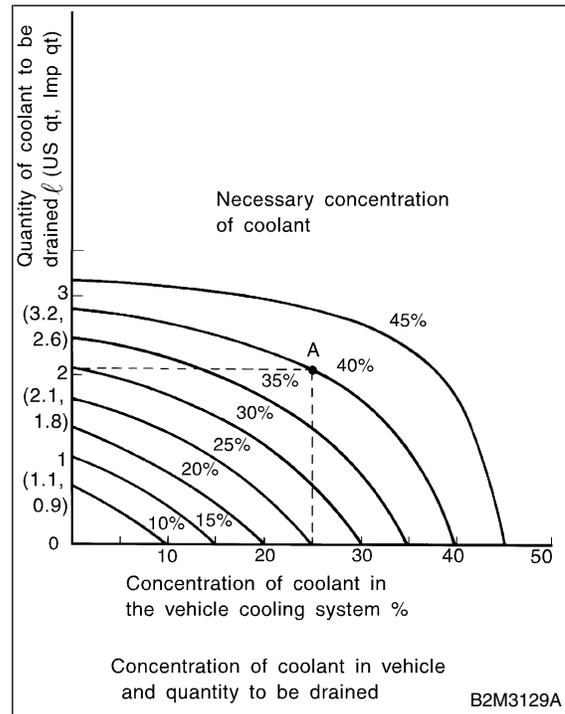
S146060A1002

To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50). The amount of coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary 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 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



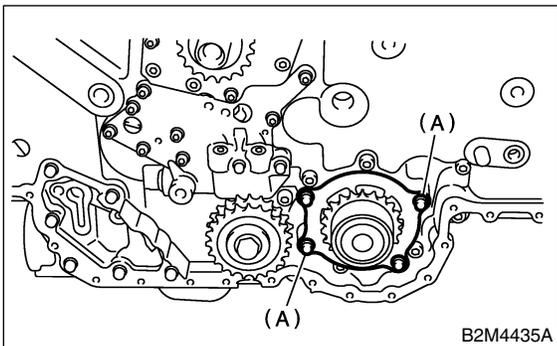
## 5. Water Pump S146061

### A: REMOVAL S146061A18

- 1) Remove radiator. <Ref. to CO(H6)-23, REMOVAL, Radiator.>
- 2) Remove V-belt.  
<Ref. to ME(H6)-29, REMOVAL, V-belt.>
- 3) Remove front chain cover.  
<Ref. to ME(H6)-40, REMOVAL, Front Chain Cover.>
- 4) Remove timing chain.  
<Ref. to ME(H6)-42, REMOVAL, Timing Chain Assembly.>
- 5) Remove water pump.

**NOTE:**

When water pump cannot be easily removed, install M8 bolt in opposing bolt holes ("A" in figure). Alternately tightening each bolt should be enough to gradually free water pump from rear chain cover.



### B: INSTALLATION S146061A11

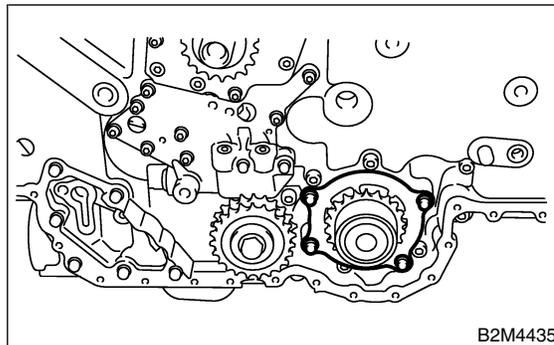
- 1) Install water pump onto rear chain cover.

**Tightening torque:**

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**

**NOTE:**

- Replace O-rings with a new one.
- Applying engine coolant to O-ring makes water pump installation easier.



- 2) Install timing chain assembly. <Ref. to ME(H6)-43, INSTALLATION, Timing Chain Assembly.>
- 3) Install front chain cover.  
<Ref. to ME(H6)-40, INSTALLATION, Front Chain Cover.>
- 4) Install V-belt. <Ref. to ME(H6)-29, INSTALLATION, V-belt.>
- 5) Install radiator. <Ref. to CO(H6)-24, INSTALLATION, Radiator.>
- 6) Fill coolant. <Ref. to CO(H6)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

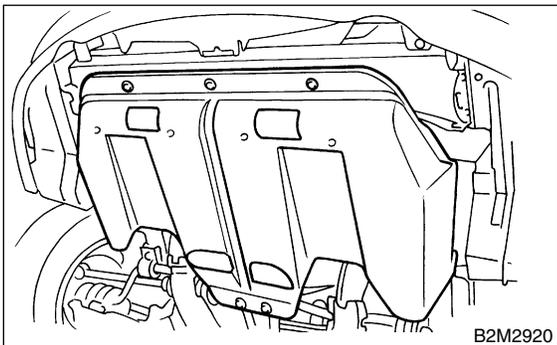
### C: INSPECTION S146061A10

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

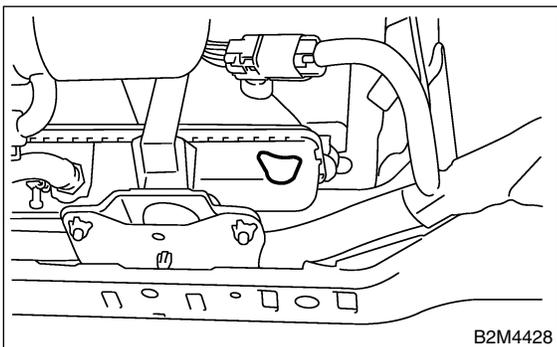
## 6. Thermostat S146062

### A: REMOVAL S146062A18

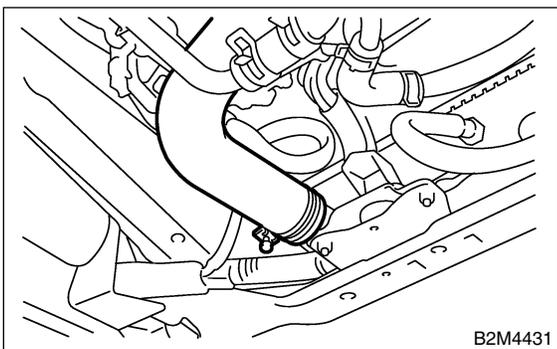
- 1) Lift-up the vehicle.
- 2) Remove under cover.



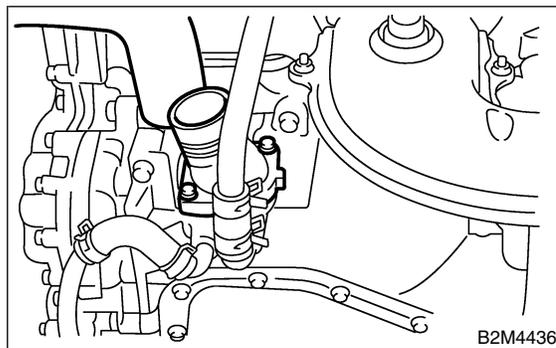
- 3) Drain engine coolant completely. <Ref. to CO(H6)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



- 4) Disconnect radiator outlet hose from thermostat cover.



- 5) Remove thermostat cover and gasket, and pull out the thermostat.



### B: INSTALLATION S146062A11

- 1) Install the thermostat to oil pan upper, and install the thermostat cover together with a new gasket.

#### NOTE:

When reinstalling the thermostat, use a new gasket.

#### **Tightening torque:**

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**

- 2) Connect radiator outlet hose to thermostat cover.
- 3) Fill coolant. <Ref. to CO(H6)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

## C: INSPECTION S146062A10

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

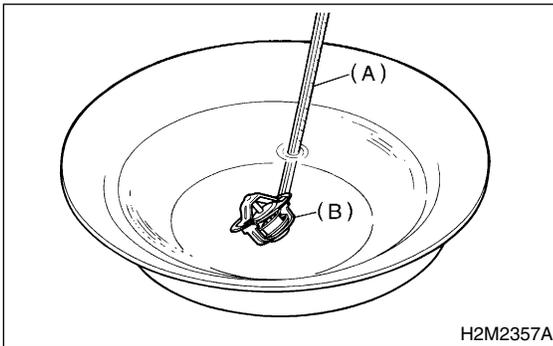
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

**Starts to open:**

**76.0 — 80.0°C (169 — 176°F)**

**Fully opens:**

**91°C (196°F)**

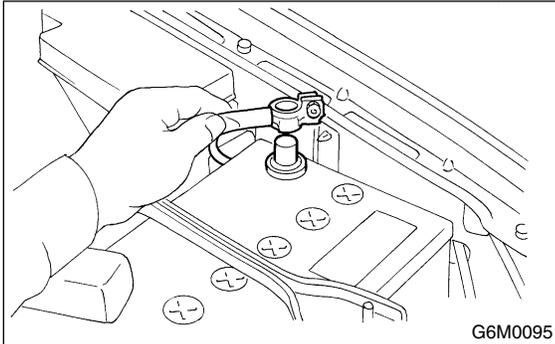


- (A) Thermometer
- (B) Thermostat

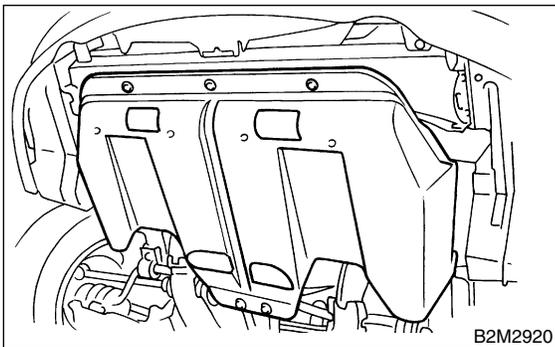
## 7. Radiator S146058

### A: REMOVAL S146058A18

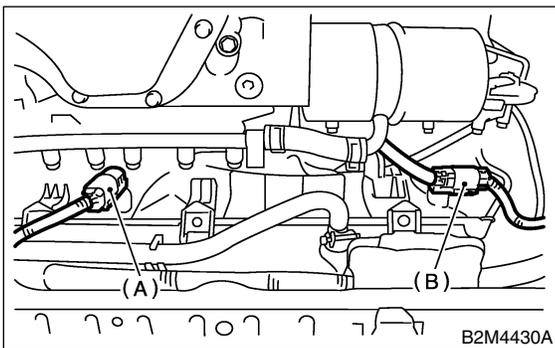
- 1) Disconnect battery ground cable.



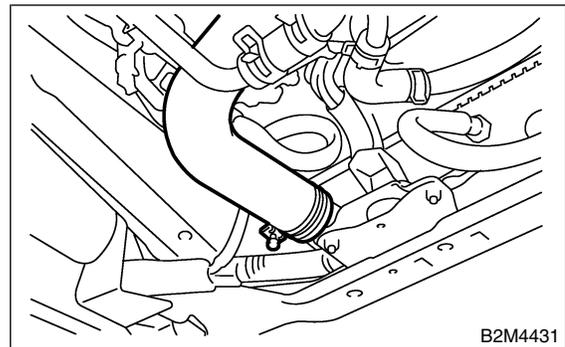
- 2) Lift-up the vehicle.
- 3) Remove under cover.



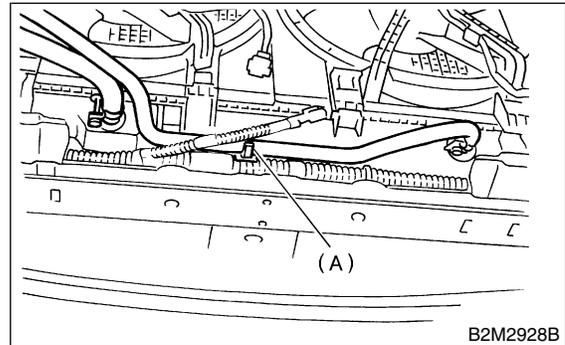
- 4) Drain engine coolant completely. <Ref. to CO(H6)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 5) Disconnect connectors of radiator main fan (A) and sub fan (B) motor.



- 6) Disconnect radiator outlet hose from radiator.

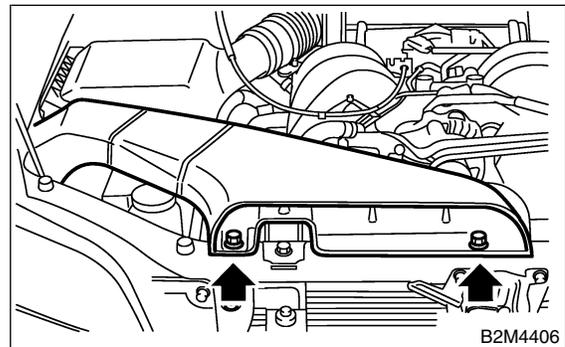


- 7) Disconnect ATF cooler hoses from radiator.

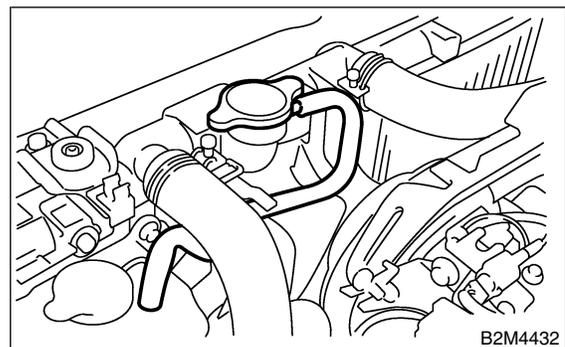


(A) Clip

- 8) Lower the vehicle.
- 9) Remove air intake duct.



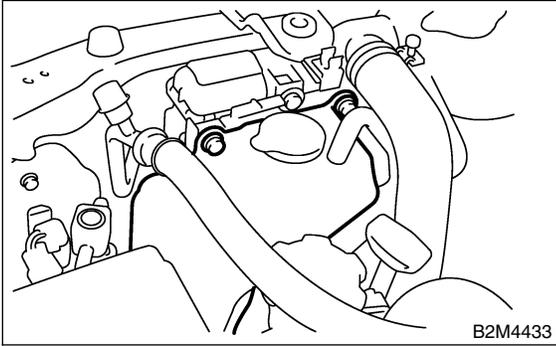
- 10) Disconnect over flow hose.



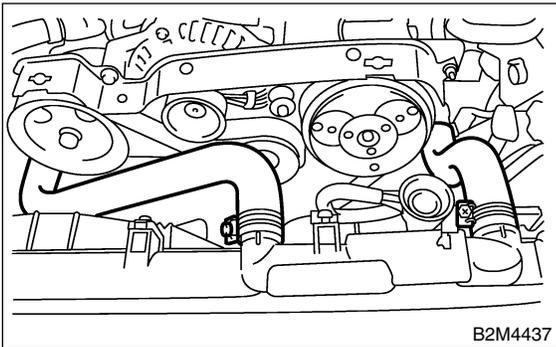
# RADIATOR

## Cooling

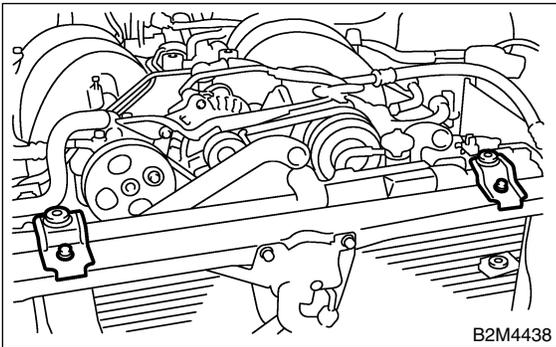
11) Remove reservoir tank.



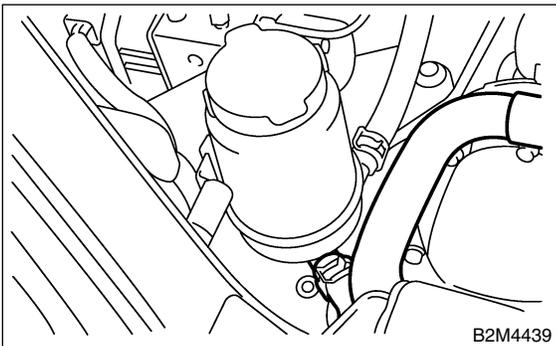
12) Disconnect radiator inlet hoses from radiator.



13) Remove radiator upper brackets.

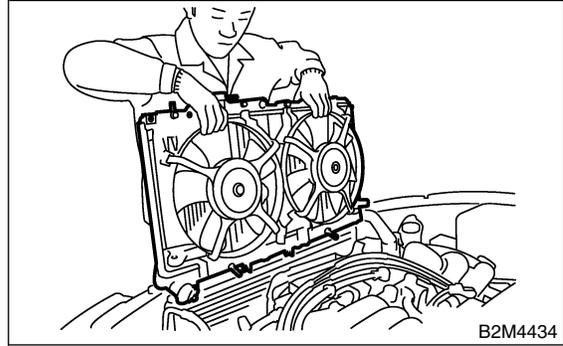


14) Detach power steering hose from the clip on the radiator.



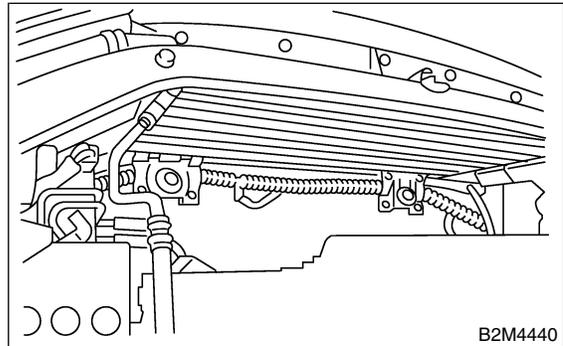
15) While slightly lifting radiator, slide it to left.

16) Lift radiator up and away from vehicle.



## B: INSTALLATION S146058A11

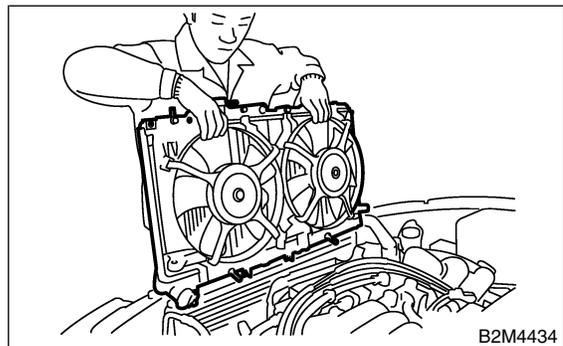
1) Attach radiator mounting cushions to holes on the vehicle.



2) Install radiator while fitting radiator pins to cushions.

### NOTE:

Fit pins on lower side of radiator into cushions on body side.



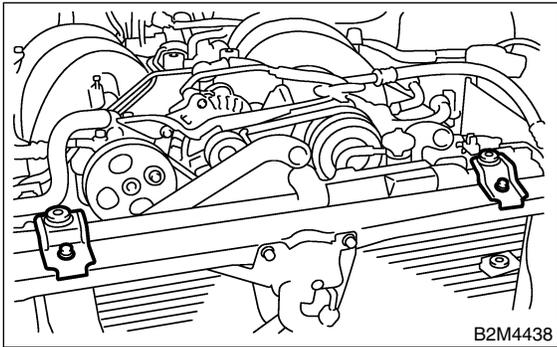
# RADIATOR

Cooling

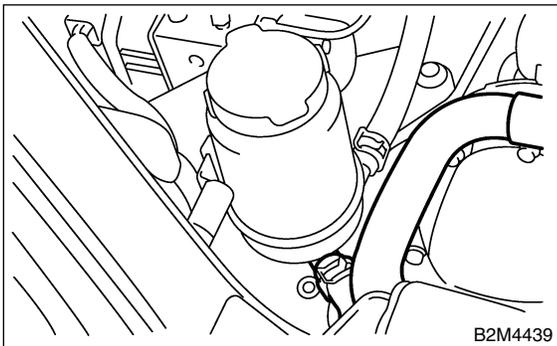
3) Install radiator brackets and tighten bolts.

**Tightening torque:**

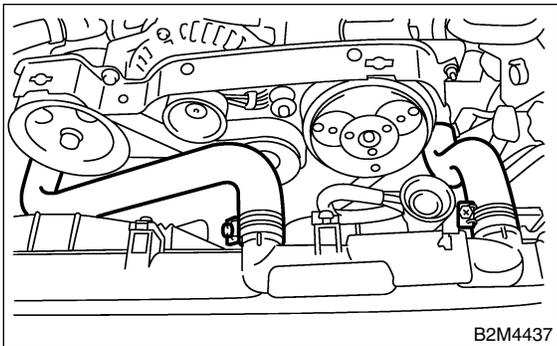
**12 N·m (1.2 kgf-m, 8.7 ft-lb)**



4) Attach power steering hose to the radiator.



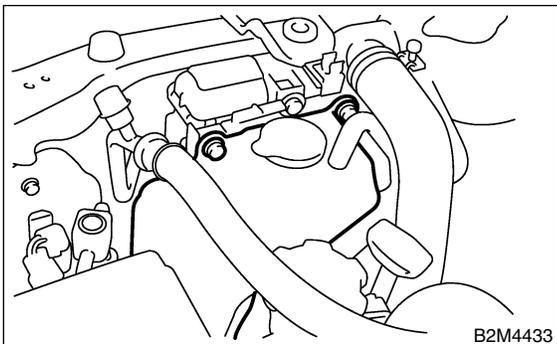
5) Connect radiator inlet hoses.



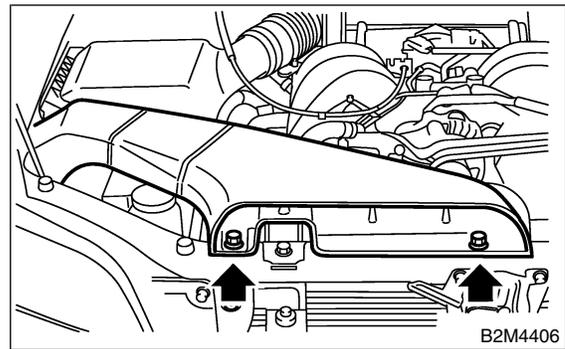
6) Install reservoir tank.

**Tightening torque:**

**4.9 N·m (0.50 kgf-m, 3.6 ft-lb)**

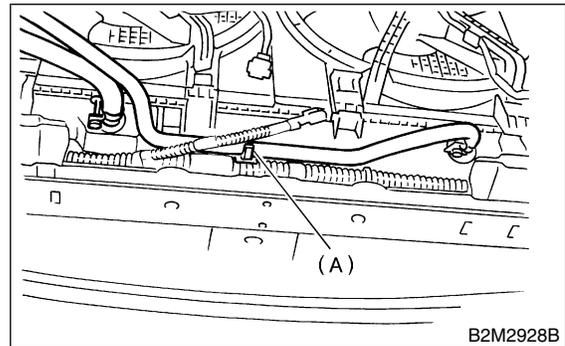


7) Install air intake duct.



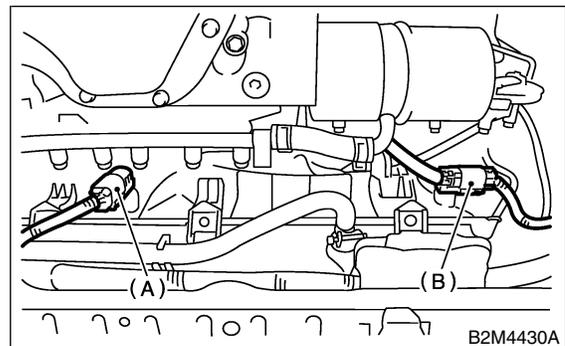
8) Lift-up the vehicle.

9) Connect ATF cooler hoses.

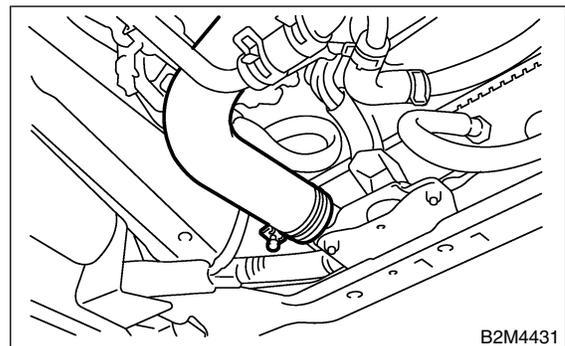


(A) Clip

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



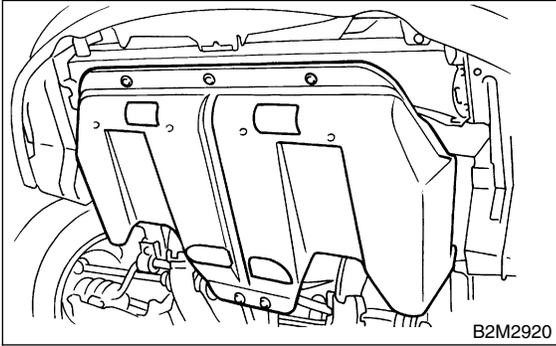
11) Connect radiator outlet hose.



# RADIATOR

## Cooling

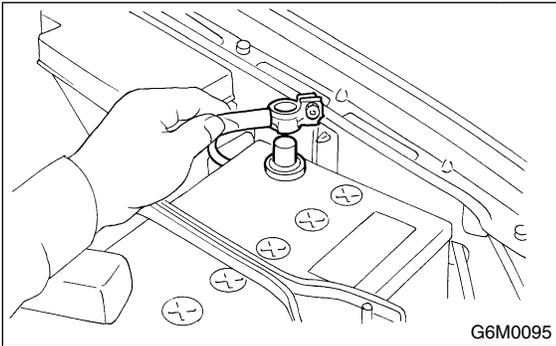
12) Install under cover.



- Be careful to prevent engine coolant from spurting out when removing tester.
- Be careful also not to deform filler neck of radiator when installing or removing tester.

13) Lower the vehicle.

14) Connect battery ground cable.

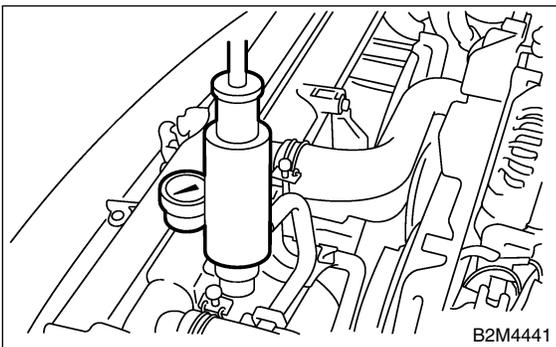


15) Fill coolant. <Ref. to CO(H6)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

16) Check ATF level. <Ref. to AT-9, REPLACEMENT, Automatic Transmission Fluid.>

## C: INSPECTION S146058A10

1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.



2) Apply a pressure of 157 kPa (1.6 kg/cm<sup>2</sup>, 23 psi) to radiator to check if:

- (1) Engine coolant leaks at/around radiator.
- (2) Engine coolant leaks at/around hoses or connections.

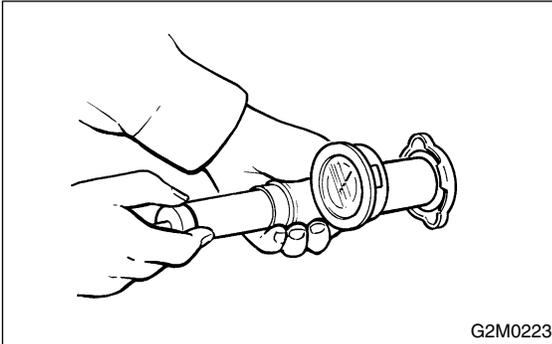
### CAUTION:

- Engine should be off.
- Wipe engine coolant from check points in advance.

## 8. Radiator Cap S146064

### A: INSPECTION S146064A10

- 1) Attach radiator cap to tester.



- 2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

**Standard pressure:**

**93 — 123 kPa (0.95 — 1.25 kg/cm<sup>2</sup>, 14 — 18 psi)**

**Service limit pressure:**

**83 kPa (0.85 kg/cm<sup>2</sup>, 12 psi)**

**CAUTION:**

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

# RADIATOR MAIN FAN AND FAN MOTOR

Cooling

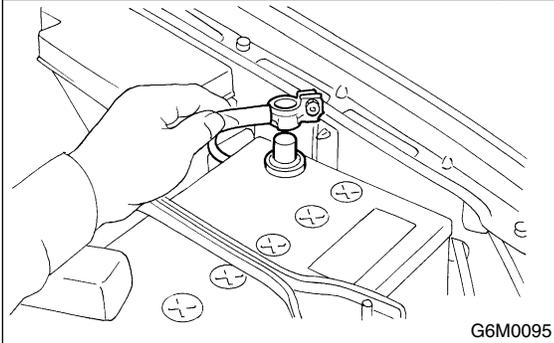
## 9. Radiator Main Fan and Fan Motor

S146059

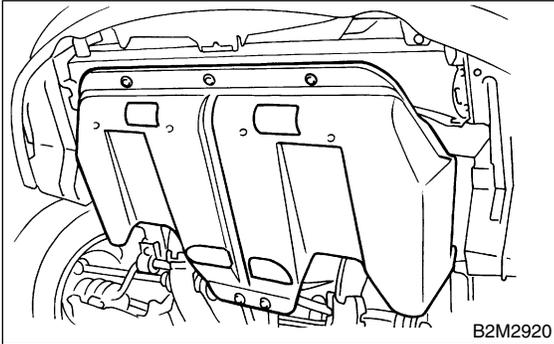
### A: REMOVAL

S146059A18

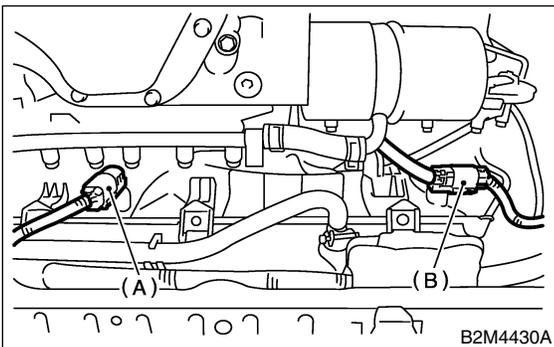
- 1) Disconnect battery ground cable.



- 2) Lift-up the vehicle.
- 3) Remove under cover.

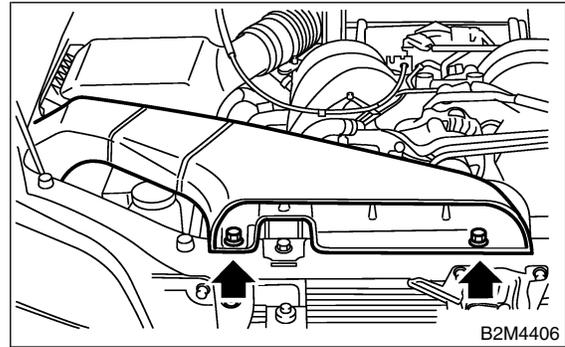


- 4) Drain engine coolant completely.  
<Ref. to CO(H6)-18, Engine Coolant.>
- 5) Disconnect connectors of main and sub fan motor.

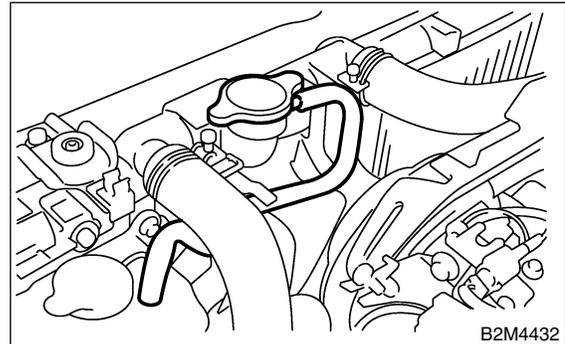


- (A) Main fan motor connector
- (B) Sub fan motor connector

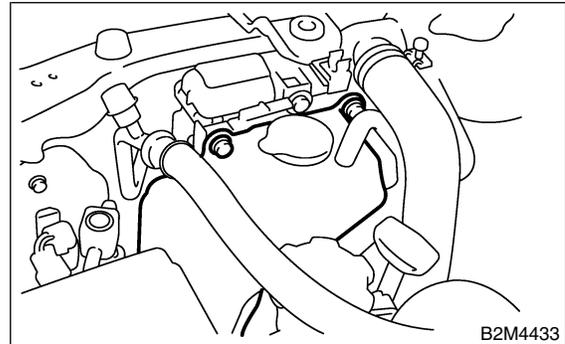
- 6) Lower the vehicle.
- 7) Remove air intake duct.



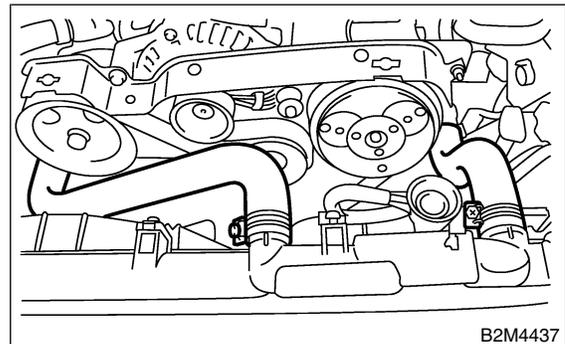
- 8) Disconnect over flow hose.



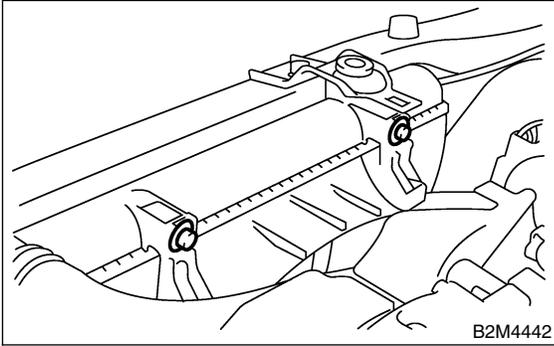
- 9) Remove reservoir tank.



- 10) Disconnect radiator inlet hoses from radiator.

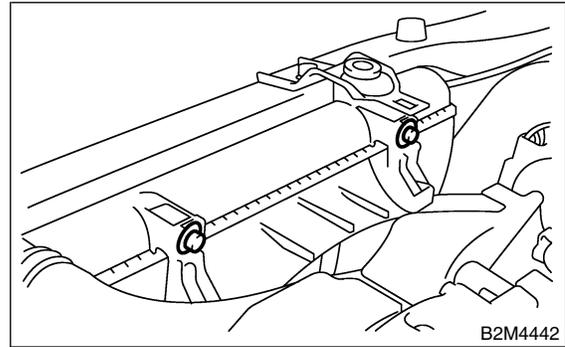


11) Remove radiator sub fan motor assembly.



**Tightening torque:**

**4.9 N·m (0.50 kgf·m, 3.6 ft·lb)**



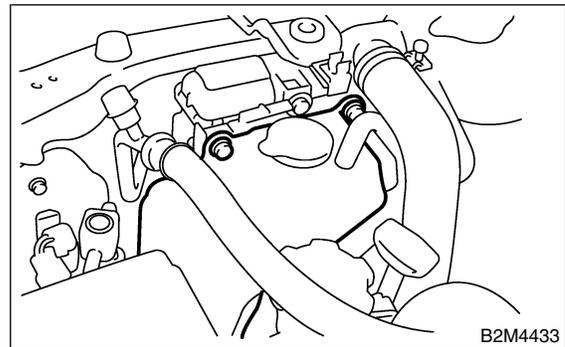
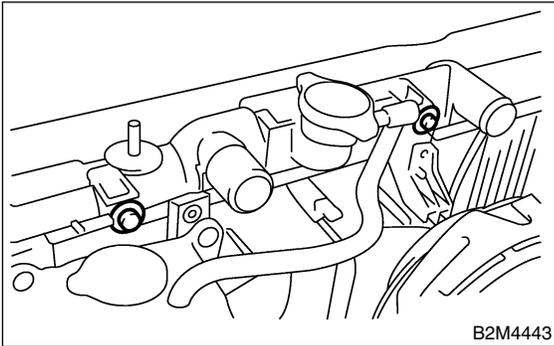
12) Remove radiator main fan motor assembly.

**NOTE:**

When removing main fan assembly by lifting it upward, main fan shroud will cause interference with coolant suction area. In order to avoid this, shift the main fan assembly over to sub fan side before removing it.

**Tightening torque:**

**4.9 N·m (0.50 kgf·m, 3.6 ft·lb)**



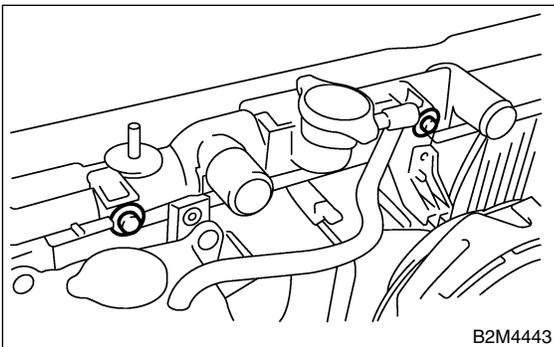
## B: INSTALLATION

S146059A11

Install in the reverse order of removal.

**Tightening torque:**

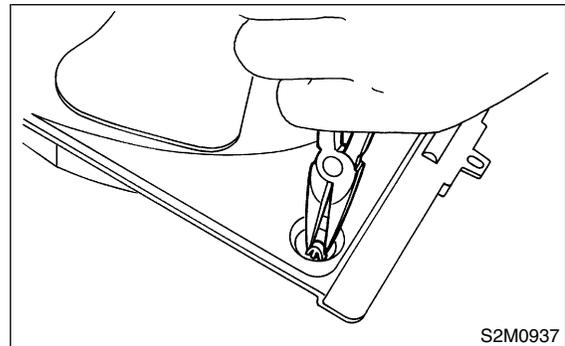
**4.9 N·m (0.50 kgf·m, 3.6 ft·lb)**



## C: DISASSEMBLY

S146059A06

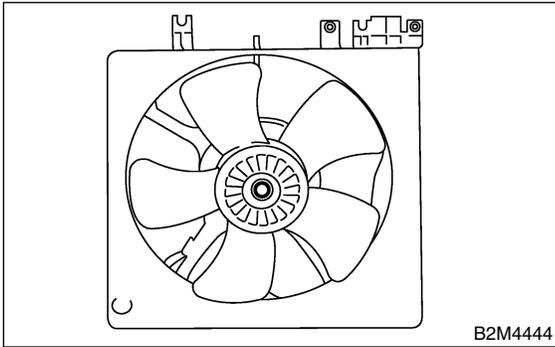
1) Remove clip which holds motor connector onto shroud.



# RADIATOR MAIN FAN AND FAN MOTOR

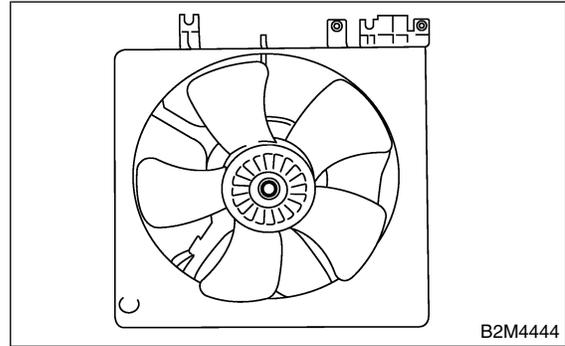
Cooling

2) Remove nut which holds fan itself onto fan motor and shroud assembly.

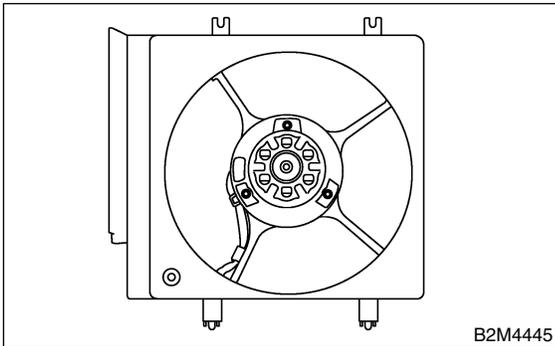


**Tightening torque:**

**7.5 N·m (0.76 kgf·m, 5.5 ft·lb)**



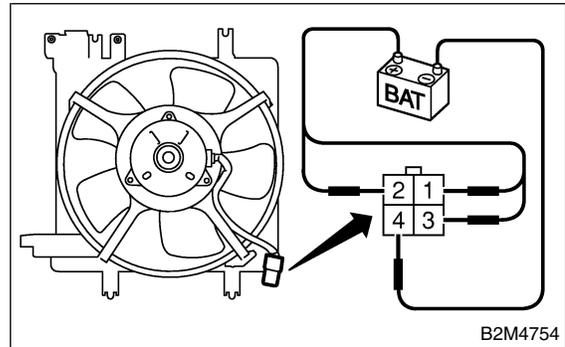
3) Remove screws which install fan motor onto shroud.



## E: INSPECTION

S146059A10

1) Connect battery to main fan motor connector.



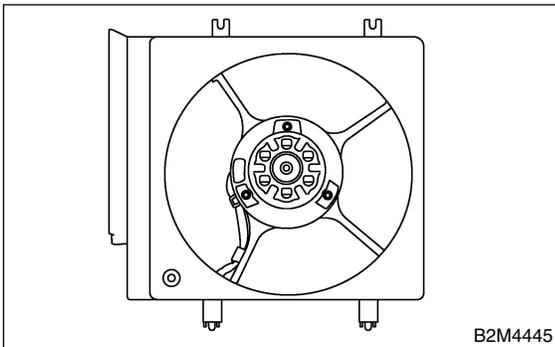
## D: ASSEMBLY

S146059A02

Assemble in the reverse order of disassembly.

**Tightening torque:**

**4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



**Terminal:**

**No. 1 (+) — No. 4 (–): Low speed**

**No. 2 (+) — No. 4 (–): Middle speed**

**No. 3 (+) — No. 4 (–): High speed**

2) Make sure the main fan motor operates properly. Replace it if it doesn't.

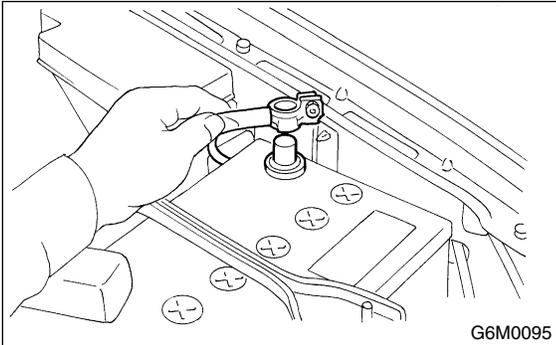
## 10. Radiator Sub Fan and Fan Motor

S146074

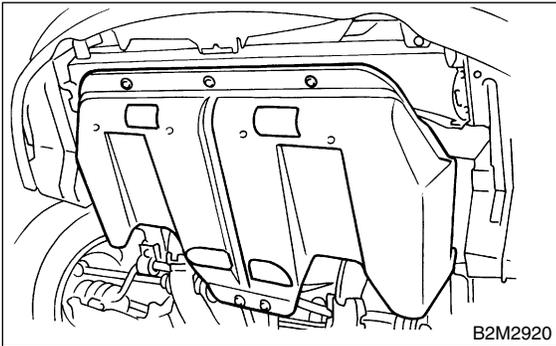
### A: REMOVAL

S146074A18

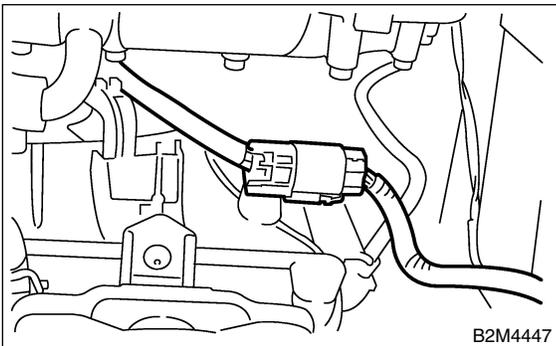
- 1) Disconnect battery ground cable.



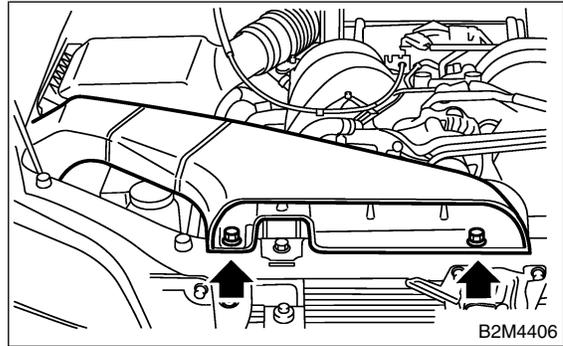
- 2) Lift-up the vehicle.
- 3) Remove under cover.



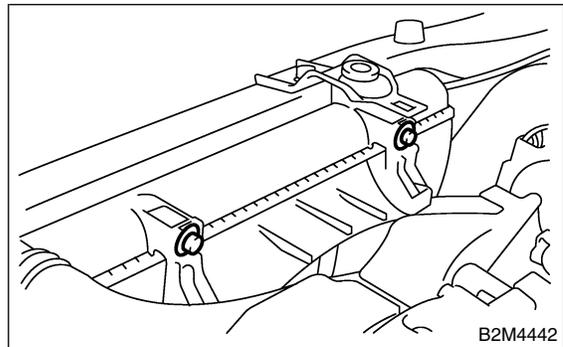
- 4) Disconnect connector of sub fan motor.



- 5) Lower the vehicle.
- 6) Remove air intake duct.



- 7) Remove bolts which hold sub fan shroud to radiator.
- 8) Remove radiator sub fan shroud through the under side of vehicle.



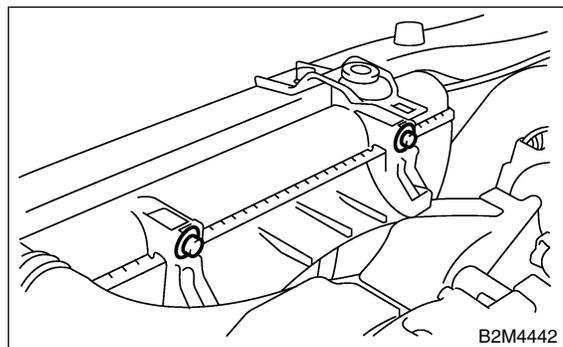
### B: INSTALLATION

S146074A11

Install in the reverse order of removal.

**Tightening torque:**

**4.9 N·m (0.50 kgf·m, 3.6 ft·lb)**

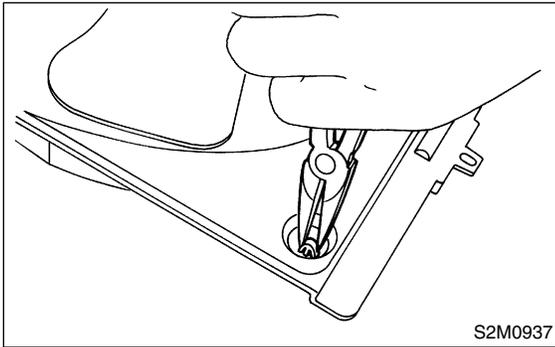


# RADIATOR SUB FAN AND FAN MOTOR

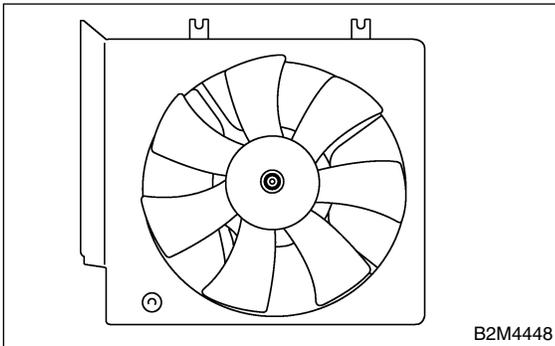
Cooling

## C: DISASSEMBLY S146074A06

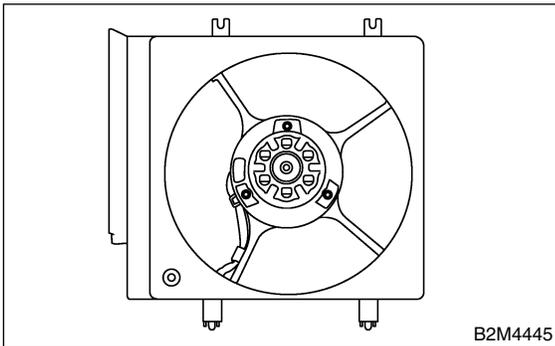
- 1) Remove clip which holds motor harness onto shroud.



- 2) Remove nut which holds fan itself onto fan motor and shroud assembly.



- 3) Remove screws which install fan motor onto shroud.

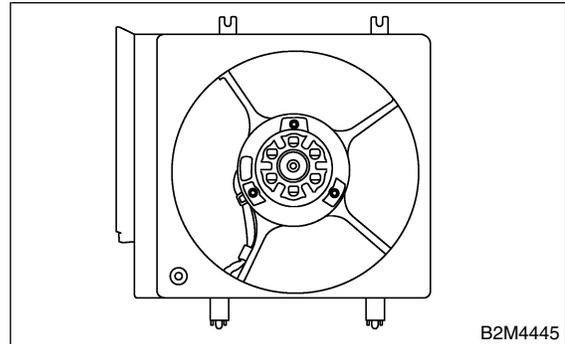


## D: ASSEMBLY S146074A02

Assemble in the reverse order of disassembly.

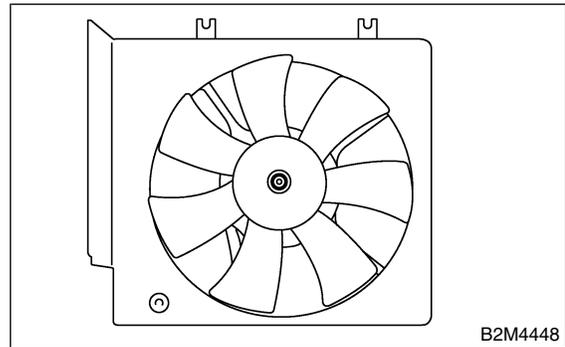
**Tightening torque:**

**4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



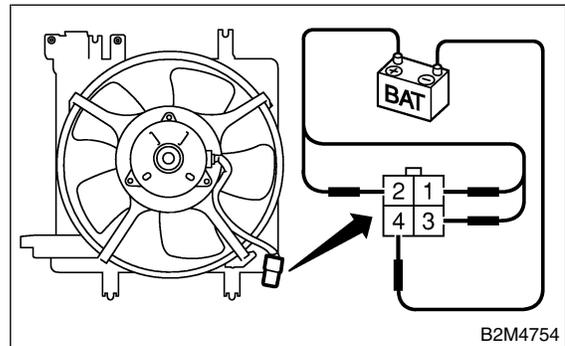
**Tightening torque:**

**7.5 N·m (0.76 kgf·m, 5.5 ft·lb)**



## E: INSPECTION S146074A10

- 1) Connect battery to sub fan motor connector.



**Terminal:**

**No. 1 (+) — No. 4 (-): Low speed**

**No. 2 (+) — No. 4 (-): Middle speed**

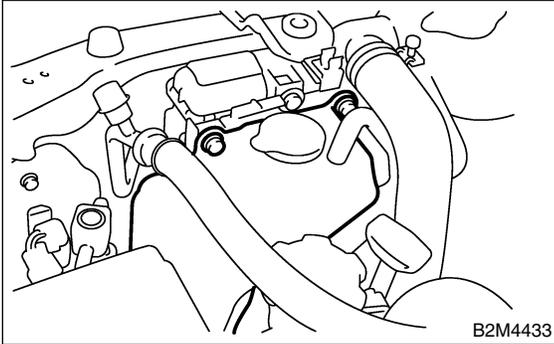
**No. 3 (+) — No. 4 (-): High speed**

- 2) Make sure the sub-fan motor operates properly. Replace it if it doesn't.

## 11. Reservoir Tank S146075

### A: REMOVAL S146075A18

- 1) Disconnect over flow hose from radiator filler neck position.
- 2) Remove bolts which install reservoir tank onto radiator main fan shroud.
- 3) Remove reservoir tank.

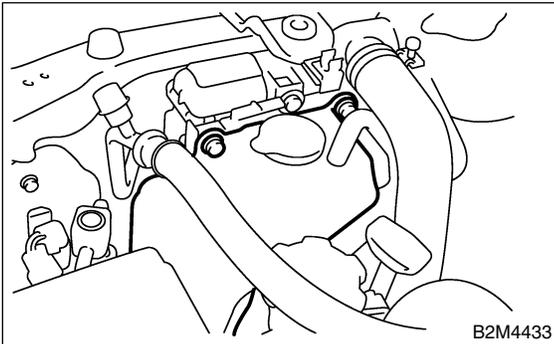


### B: INSTALLATION S146075A11

Install in the reverse order of removal.

#### **Tightening torque:**

**4.9N·m (0.50 kgf·m, 3.6 ft·lb)**



### C: INSPECTION S146075A10

Make sure the engine coolant level is between full and low.

# ENGINE COOLING SYSTEM TROUBLE IN GENERAL

Cooling

## 12. Engine Cooling System Trouble in General S146078

### A: INSPECTION S146078A10

Trouble	Symptom	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Loose timing chain	Repair or replace timing belt tensioner.
	c. Oil on drive chain	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(H6)-2, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Engine oil in engine coolant	Replace engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system. <Ref. to EN(H6)-2, 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	Repair or replace.
	n. Dragging brake	Adjust.
	o. Improper transmission oil	Replace.
p. Defective thermostat	Replace.	
q. Malfunction of electric fan	Inspect radiator fan relay, engine coolant temperature sensor or radiator motor and replace if necessary.	
Over-cooling	a. Atmospheric temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks.	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crank-case	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

# GENERAL DESCRIPTION

Lubrication

## 1. General Description S148001

### A: SPECIFICATIONS S148001E49

Lubrication method		Forced lubrication	
Oil pump	Pump type	Trochoid type	
	Number of teeth	Inner rotor	9
		Outer rotor	10
	Outer rotor diameter × thickness		78 × 11 mm (3.07 × 0.43 in)
	Tip clearance between inner and outer rotors	STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
		LIMIT	0.20 mm (0.0079 in)
	Side clearance between inner rotor and pump case	STANDARD	0.02 — 0.08 mm (0.0008 — 0.0031 in)
		LIMIT	0.15 mm (0.0059 in)
Case clearance between outer rotor and pump case	STANDARD	0.11 — 0.18 mm (0.0043 — 0.0071 in)	
	LIMIT	0.25 mm (0.0098 in)	
Oil filter	Type	Full-flow filter type	
	Filtration area	1,300 cm <sup>2</sup> (201.5 sq in)	
	By-pass valve opening pressure	160 kPa (1.63 kg/cm <sup>2</sup> , 23 psi)	
	Outer diameter × width	80 × 75 mm (3.15 × 2.95 in)	
	Oil filter to engine thread size	M 20 × 1.5	
Relief valve operation pressure		588 kPa (6 kg/cm <sup>2</sup> , 185 psi)	
Oil pressure switch	Type	Immersed contact point type	
	Working voltage — wattage	12 V — 3.4 W or less	
	Warning light activation pressure	15 kPa (0.153 kg/cm <sup>2</sup> , 2.2 psi)	
	Proof pressure	More than 980 kPa (9.993 kg/cm <sup>2</sup> , 142 psi)	
Oil capacity	Total capacity	6.8 ℓ (7.2 US qt, 6.0 Imp qt)	
	Engine oil amount for refill	5.8 ℓ (6.1 US qt, 5.1 Imp qt)	

# GENERAL DESCRIPTION

Lubrication

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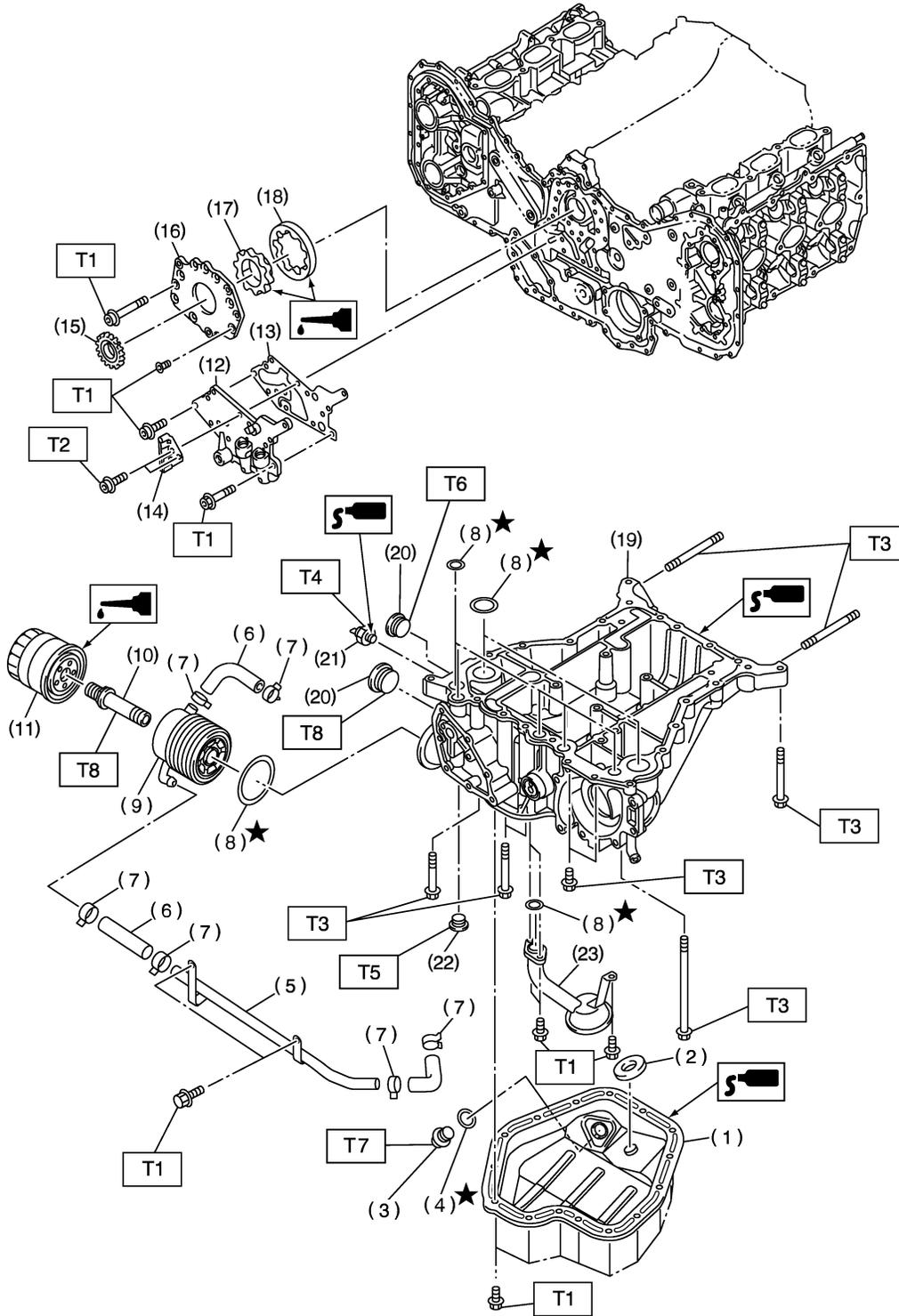
**MEMO:**

**LU(H6)-3**

# GENERAL DESCRIPTION

Lubrication

## B: COMPONENT S148001A05



B2M4533B

LU(H6)-4

# GENERAL DESCRIPTION

Lubrication

- (1) Oil pan lower
- (2) Magnet
- (3) Drain plug
- (4) Gasket
- (5) Oil cooler pipe
- (6) Hose
- (7) Clamp
- (8) O-ring
- (9) Oil cooler
- (10) Connector
- (11) Oil filter
- (12) Relief valve case

- (13) Relief valve case gasket
- (14) Chain guide (center)
- (15) Crank sprocket
- (16) Oil pump cover
- (17) Inner rotor
- (18) Outer rotor
- (19) Oil pan upper
- (20) Plug
- (21) Oil pressure switch
- (22) Plug
- (23) Oil strainer

---

***Tightening torque: N·m (kgf-m, ft-lb)***

***T1: 6.4 (0.65, 4.7)***

***T2: 7.8 (0.80, 5.8)***

***T3: 18 (1.8, 13)***

***T4: 25 (2.5, 18)***

***T5: 34 (3.5, 25)***

***T6: 37 (3.8, 27)***

***T7: 44 (4.5, 33)***

***T8: 54 (5.5, 40)***

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# GENERAL DESCRIPTION

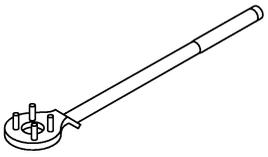
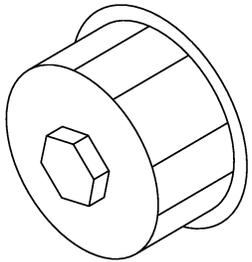
Lubrication

## C: CAUTION S148001A03

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

## D: PREPARATION TOOL S148001A17

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3870</p>	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 <p style="text-align: right;">B2M3872</p>	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.

# GENERAL DESCRIPTION

Lubrication

---

**MEMO:**

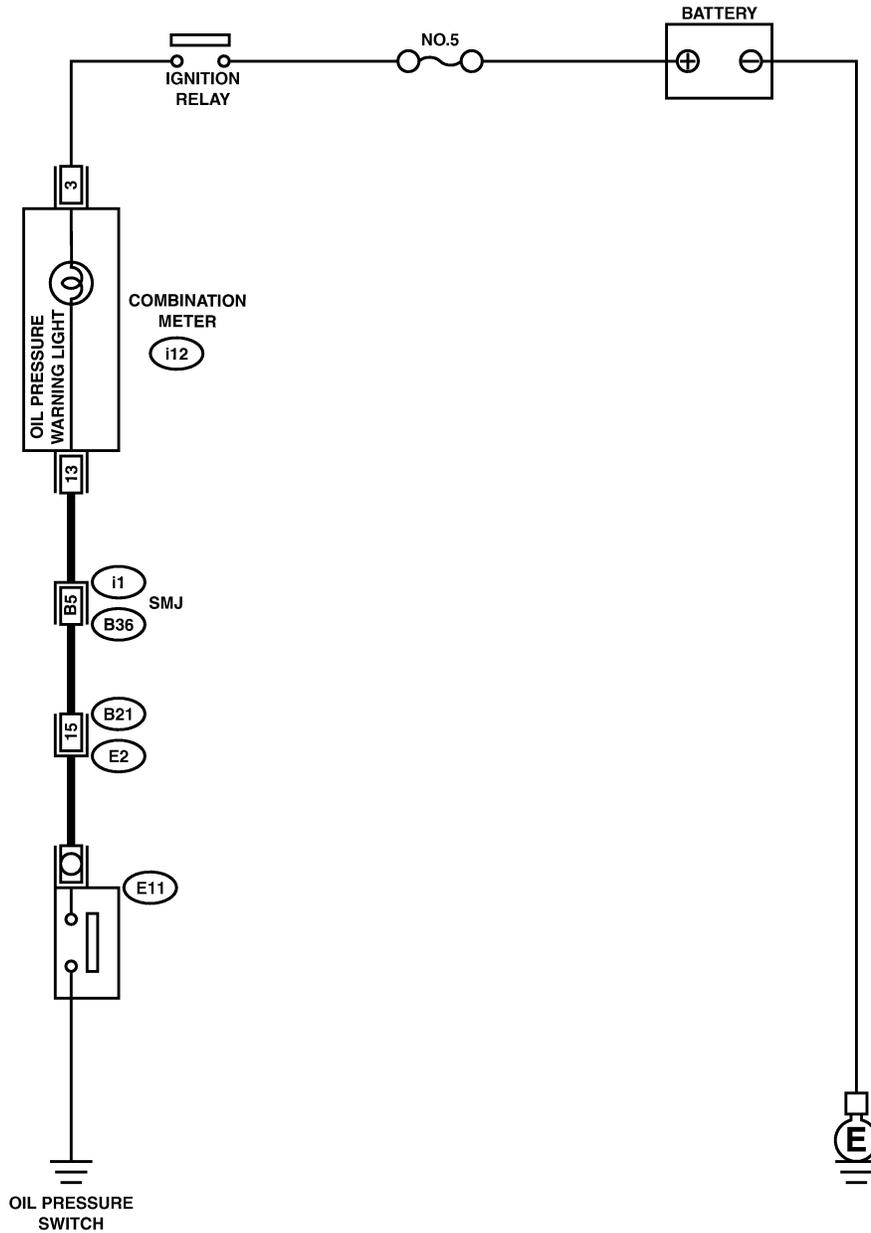
**LU(H6)-7**

# OIL PRESSURE SYSTEM

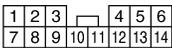
Lubrication

## 2. Oil Pressure System S148076

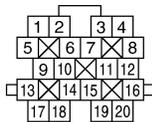
## A: SCHEMATIC S148076A21



C: i12 (GREEN)



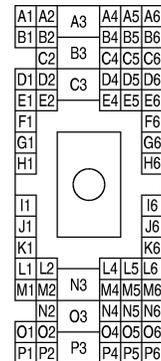
B21 (GRAY)



A: i10 (GREEN)



B36



B2M4532

LU(H6)-8

# OIL PRESSURE SYSTEM

Lubrication

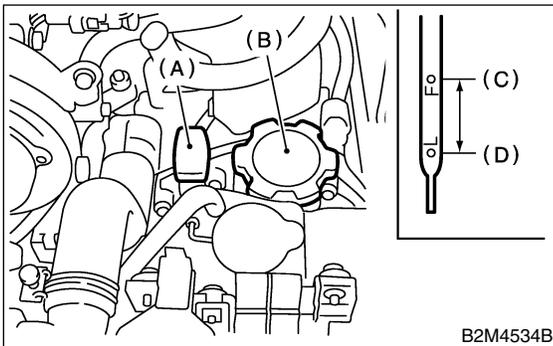
## B: INSPECTION S148076A10

No.	Step	Check	Yes	No
1	<b>CHECK COMBINATION METER.</b> 1) Turn ignition switch to ON. (engine OFF) 2) Check other warning lights.	Do the warning lights go on?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2	<b>CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from the oil pressure switch. 3) Turn ignition switch ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. <i>Connector &amp; terminal (E11) No. 1 — Chassis ground:</i>	Is the voltage more than 10 V?	Replace oil pressure switch.	Go to step 3.
3	<b>CHECK COMBINATION METER.</b> 1) Turn ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of the combination meter. <i>Terminal No. 13 — No. 3:</i>	Is the resistance less than 10 $\Omega$ ?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter and the oil pressure switch warning light bulb.

## 3. Engine Oil S148077

### A: INSPECTION S148077A10

- 1) Park vehicle on a level surface.
- 2) Remove oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and note the reading. If the engine oil level is below the "L" line, add oil to bring the level up to the "F" line.
- 5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
- 6) To prevent overfilling the engine oil, do not add oil above the "F" line when the engine is cold.

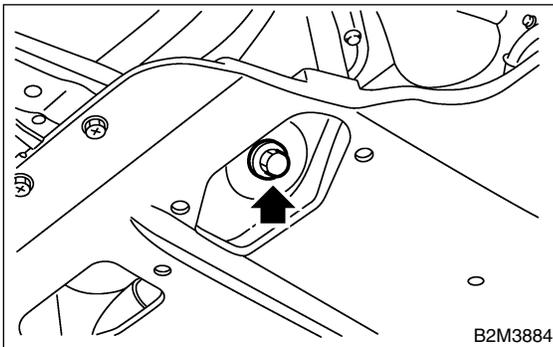


- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level

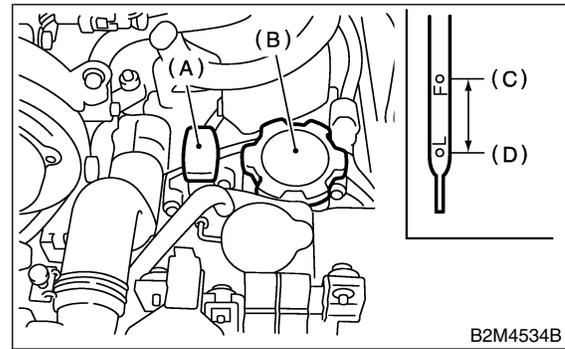
### B: REPLACEMENT S148077A20

When refilling engine oil, replace oil filter at the same time.

- 1) Drain engine oil by loosening engine oil drain plug.



- 2) Open engine oil filler cap for quick draining of the engine oil.

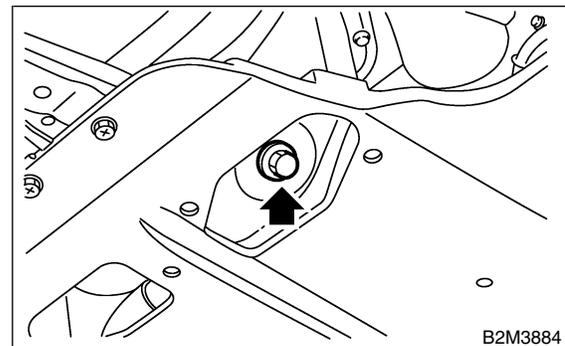


- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level

- 3) Replace drain plug gasket.
- 4) Tighten engine oil drain plug after draining engine oil.

#### Tightening torque:

**44 N·m (4.5 kgf·m, 33 ft·lb)**



- 5) Fill engine oil through filler pipe up to upper point on level gauge. Make sure that vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

#### Recommended oil

##### API classification

**SL or SJ with the words "Energy Conserving or Energy conserving II", CCMC specification G4 or G5, ACEA specification A1, A2 or A3, or New API mark displayed on the container (If it is impossible to get SL or SJ, grade, you may use SG grade.)**

**Engine oil amount for refill:  
5.8 l (6.1 US qt, 5.1 Imp qt)**

SAE Viscosity No. and Applicable Temperature							
(°C)	-30	-20	-15	0	15	30	40
(°F)	-22	-4	5	32	59	86	104
B2M3885A							

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

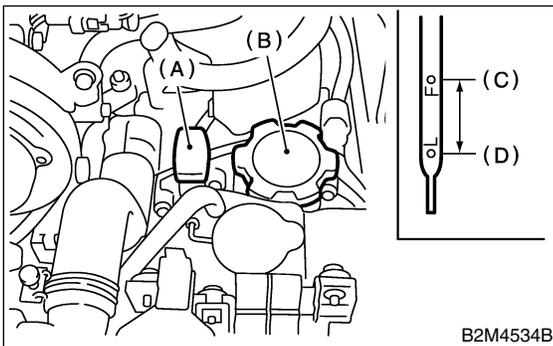
**CAUTION:**

**When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API classification and SAE viscosity No. designated by SUBARU.**

**NOTE:**

If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API classification: SL or SJ  
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

- 6) Close engine oil filler cap.
- 7) Start engine and warm it up for a time.
- 8) After engine stops, recheck the oil level. If necessary, add engine oil up to upper level on level gauge.



- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level

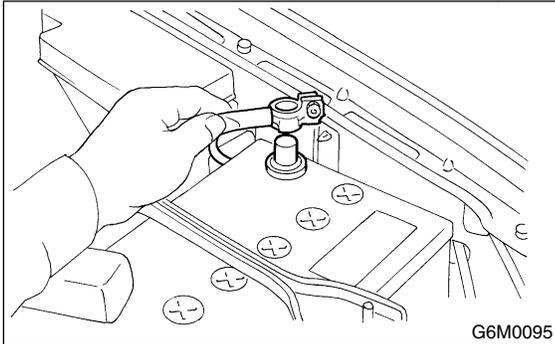
# OIL PUMP

Lubrication

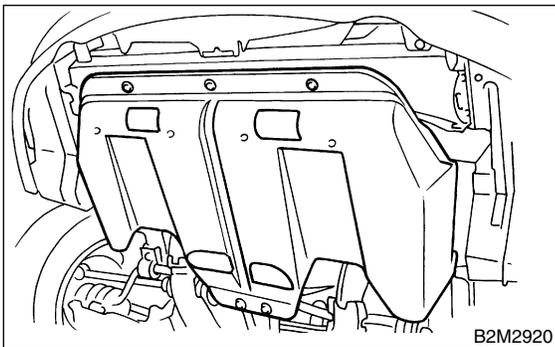
## 4. Oil Pump S148070

### A: REMOVAL S148070A18

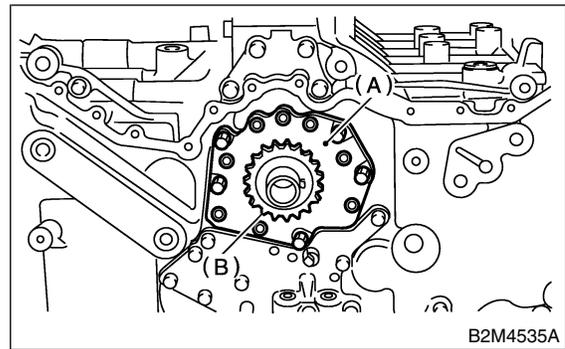
- 1) Disconnect battery ground cable.



- 2) Lift-up the vehicle.
- 3) Remove under cover.



- 4) Drain coolant. <Ref. to CO(H6)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 5) Lower the vehicle.
- 6) Remove radiator. <Ref. to CO(H6)-23, REMOVAL, Radiator.>
- 7) Remove V-belt. <Ref. to ME(H6)-29, REMOVAL, V-belt.>
- 8) Remove front chain cover. <Ref. to ME(H6)-40, REMOVAL, Front Chain Cover.>
- 9) Remove timing chain. <Ref. to ME(H6)-42, REMOVAL, Timing Chain Assembly.>
- 10) Remove oil pump cover and crankshaft sprocket.

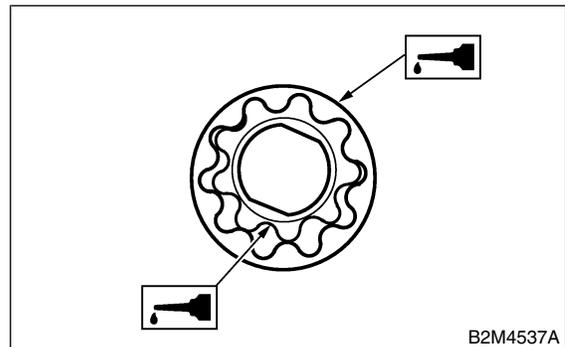


- (A) Oil pump cover
- (B) Crankshaft sprocket

- 11) Remove inner rotor and outer rotor.

### B: INSTALLATION S148070A11

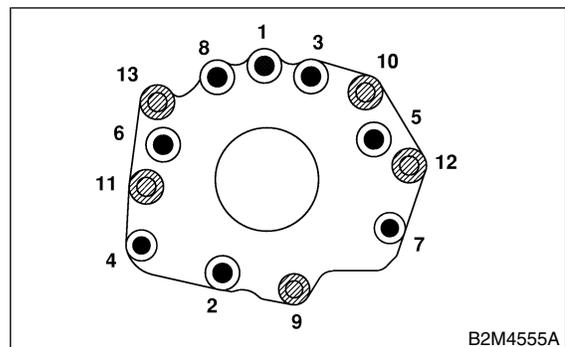
- 1) Apply engine oil to the entire surface area of both inner and outer rotors.



- 2) Install the inner rotor by fitting it into the groove on the crankshaft, and then assemble the outer rotor.
- 3) Install oil pump cover.
- 4) Tighten the bolts in the numerical sequence shown in the figure.

**CAUTION:**  
Make sure that bolt mounting position is correct.

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



- 5) Install crank sprocket.

- 6) Install timing chain. <Ref. to ME(H6)-43, INSTALLATION, Timing Chain Assembly.>
- 7) Install front chain cover. <Ref. to ME(H6)-40, INSTALLATION, Front Chain Cover.>
- 8) Install V-belt. <Ref. to ME(H6)-29, INSTALLATION, V-belt.>
- 9) Install radiator. <Ref. to CO(H6)-24, INSTALLATION, Radiator.>
- 10) Fill coolant. <Ref. to CO(H6)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

## C: INSPECTION S148070A10

### 1. TIP CLEARANCE S148070A1001

Measure the tip clearance of rotors. If the clearance exceeds the limit, replace rotors as a matched set.

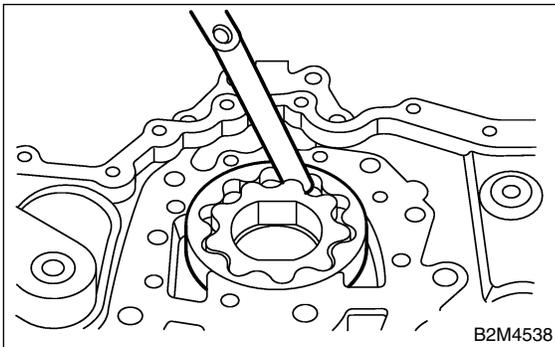
**Tip clearance:**

**Standard**

**0.04 — 0.14 mm (0.0016 — 0.0055 in)**

**Limit**

**0.20 mm (0.0079 in)**



### 2. CASE CLEARANCE S148070A1002

Measure the clearance between the outer rotor and the rear chain cover rotor housing. If the clearance exceeds the limit, replace the rotor.

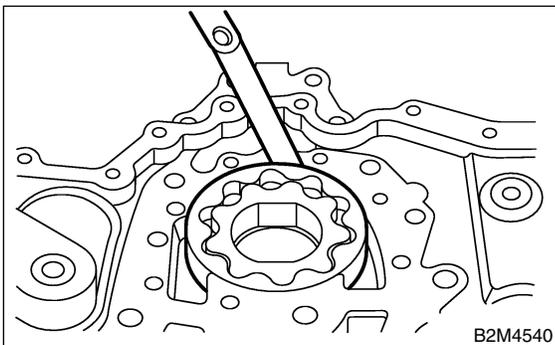
**Case clearance:**

**Standard**

**0.11 — 0.18 mm (0.0043 — 0.0071 in)**

**Limit**

**0.25 mm (0.0098 in)**



### 3. SIDE CLEARANCE S148070A1003

Measure clearance between oil pump inner rotor and rear chain cover. If the clearance exceeds the limit, replace rotor or pump body.

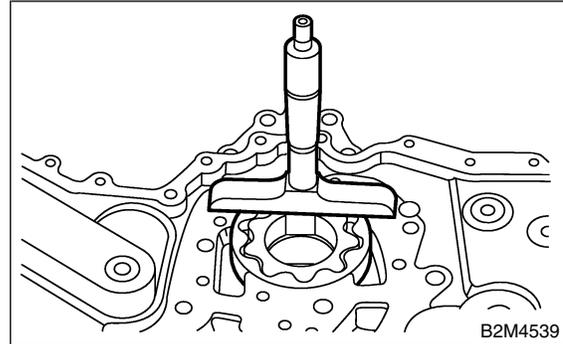
**Side clearance:**

**Standard**

**0.02 — 0.08 mm (0.0008 — 0.0031 in)**

**Limit**

**0.15 mm (0.0059 in)**



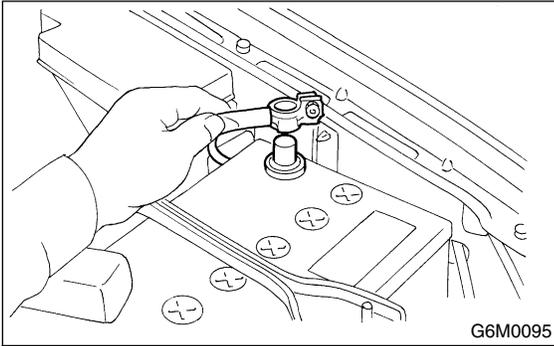
### 4. OIL PUMP CASE S148070A1004

Check the oil pump case for worn shaft hole, clogged oil passage, cracks and other faults.

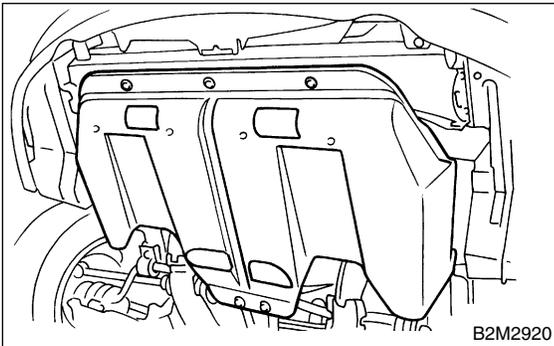
## 5. Oil Pump Relief Valve S148744

### A: REMOVAL S148744A18

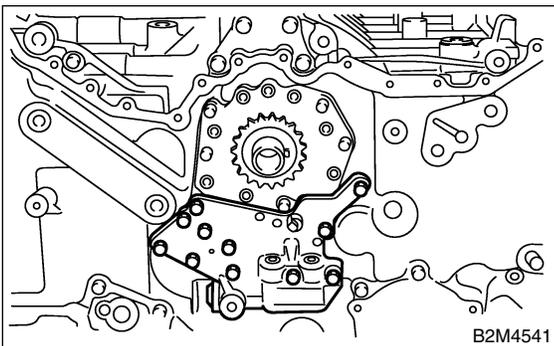
- 1) Disconnect battery ground cable.



- 2) Lift-up the vehicle.
- 3) Remove under cover.



- 4) Drain coolant. <Ref. to CO(H6)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 5) Lower the vehicle.
- 6) Remove radiator. <Ref. to CO(H6)-23, REMOVAL, Radiator.>
- 7) Remove V-belt. <Ref. to ME(H6)-29, REMOVAL, V-belt.>
- 8) Remove front chain cover. <Ref. to ME(H6)-40, REMOVAL, Front Chain Cover.>
- 9) Remove timing chain assembly. <Ref. to ME(H6)-42, REMOVAL, Timing Chain Assembly.>
- 10) Remove oil pump relief valve.

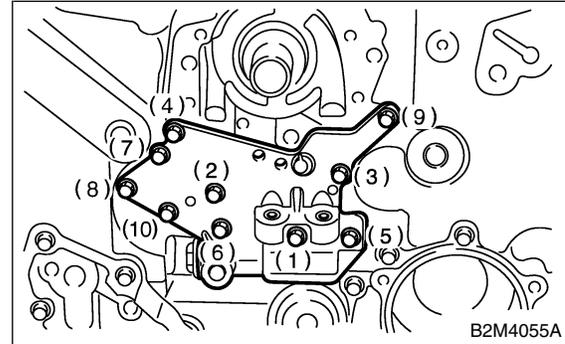


### B: INSTALLATION S148744A11

- 1) Install oil pump relief valve case and gasket.
- 2) Tighten the bolts in the numerical sequence shown in the figure.

**Tightening torque:**

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**



Bolt installation position	Bolt dimension
(1) and (5)	6 x 26
(2), (3), (4) and (9)	6 x 35
(6), (7), (8) and (10)	6 x 16

- 3) Install timing chain assembly. <Ref. to ME(H6)-43, INSTALLATION, Timing Chain Assembly.>
- 4) Install front chain cover. <Ref. to ME(H6)-40, INSTALLATION, Front Chain Cover.>
- 5) Install V-belt. <Ref. to ME(H6)-29, INSTALLATION, V-belt.>
- 6) Install radiator. <Ref. to CO(H6)-24, INSTALLATION, Radiator.>
- 7) Fill coolant. <Ref. to CO(H6)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

### C: INSPECTION S148744A10

Check the oil pump relief valve case for worn shaft hole, clogged oil passage, cracks and other faults.

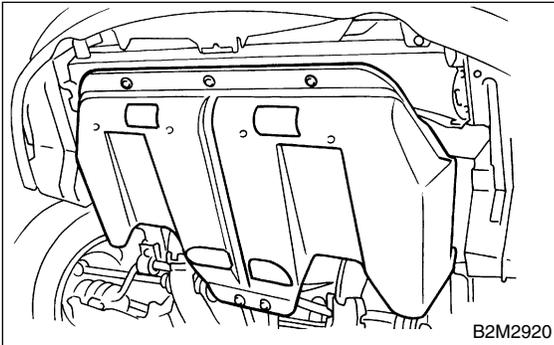
## 6. Oil Pan and Strainer S148071

### A: REMOVAL S148071A18

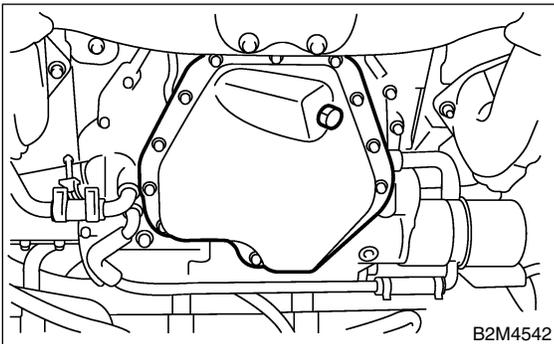
**NOTE:**

Oil pan upper cannot be removed from the normal vehicle position. The engine must be separated from the body prior to removal. <Ref. to ME(H6)-30, REMOVAL, Engine Assembly.>

- 1) Set the vehicle on lift arms.
- 2) Lift-up the vehicle.
- 3) Remove under cover.



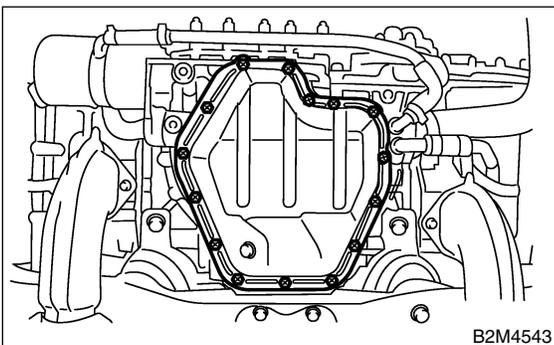
- 4) Drain engine oil.  
Set container under the vehicle, and remove drain plug from oil pan.



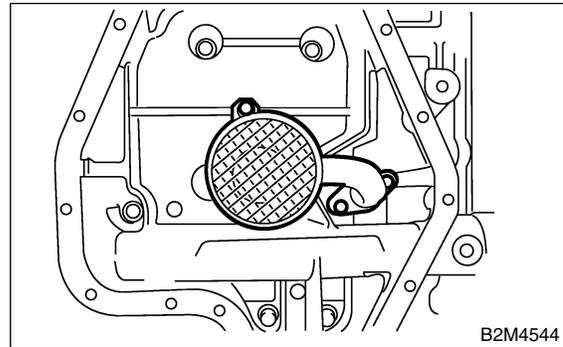
- 5) Insert oil pan cutter blade between upper and lower oil pans.

**CAUTION:**  
Do not use a screwdriver or similar tool in place of oil pan cutter.

- 6) Remove oil pan.



- 7) Remove oil strainer.



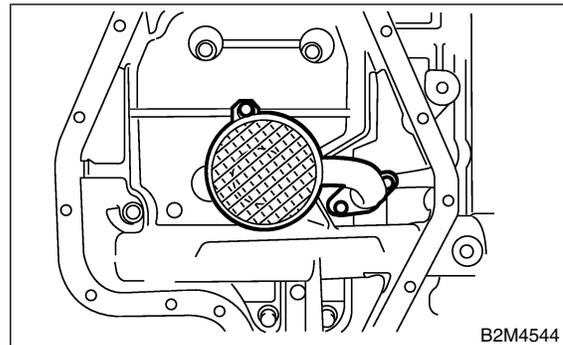
### B: INSTALLATION S148071A11

**CAUTION:**  
Before installing oil pan, clean sealant from lower oil pan and upper oil pan.

- 1) Install oil strainer onto baffle plate.

**CAUTION:**  
Replace O-ring with a new one.

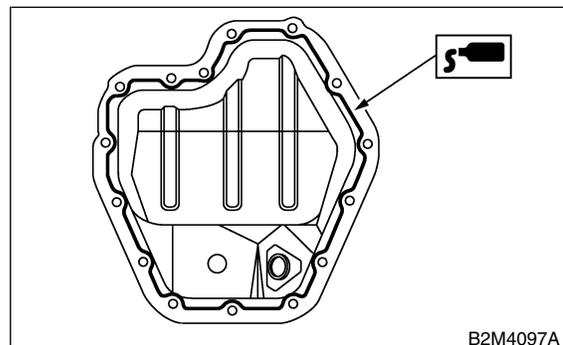
**Tightening torque:**  
**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**



- 2) Apply fluid packing to mating surfaces and install oil pan.

**Fluid packing:**  
**THREE BOND 1280B**

**Fluid packing application diameter:**  
**5.0±1.0 mm (0.197±0.039 in)**



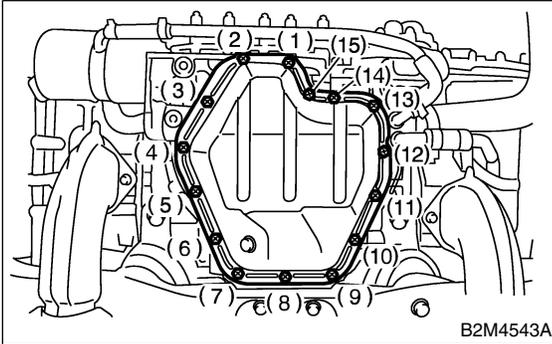
# OIL PAN AND STRAINER

## Lubrication

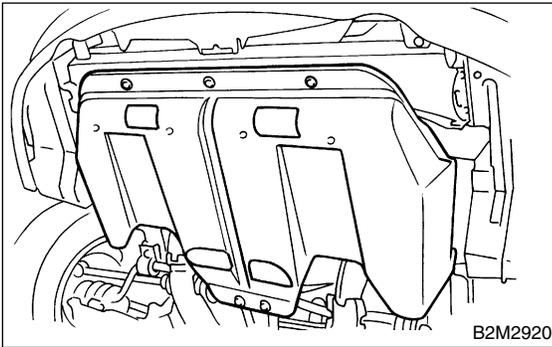
3) Tighten the lower oil pan mounting bolts in the numerical sequence shown in the figure.

### **Tightening torque:**

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**



4) Install under cover.



5) Fill engine oil. <Ref. to LU(H6)-10, INSPECTION, Engine Oil.>

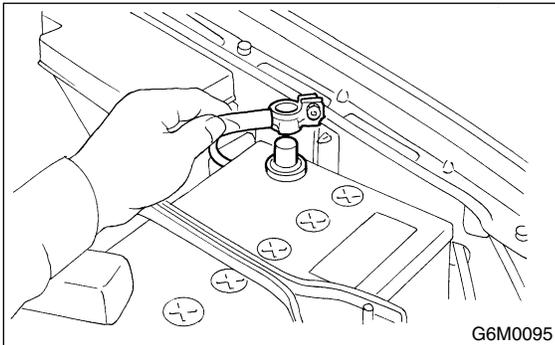
## **C: INSPECTION** S148071A10

By visual check make sure oil pan, oil strainer and oil strainer stay are not damaged.

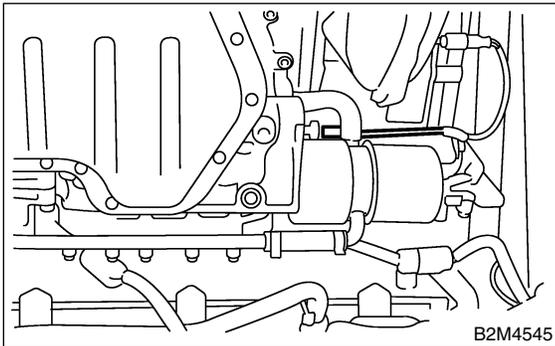
## 7. Oil Pressure Switch S148069

### A: REMOVAL S148069A18

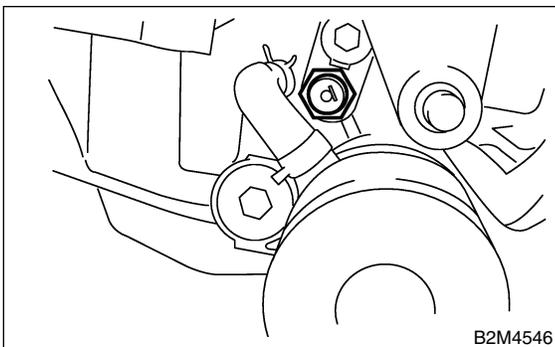
- 1) Set vehicle on the lift.
- 2) Disconnect battery ground cable.



- 3) Lift-up the vehicle.
- 4) Remove under cover.
- 5) Disconnect terminal from oil pressure switch.



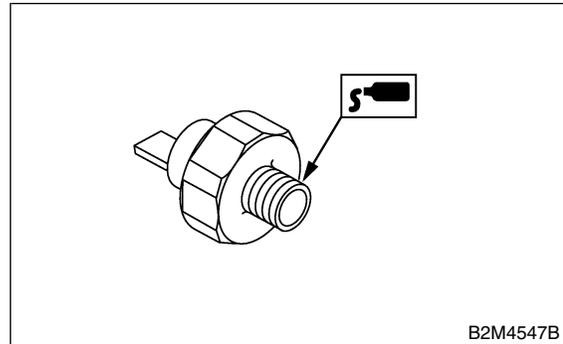
- 6) Remove oil pressure switch.



### B: INSTALLATION S148069A11

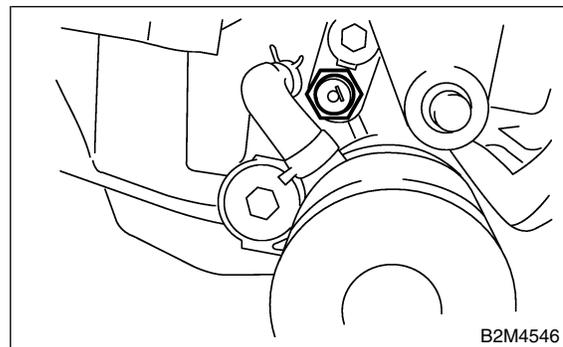
- 1) Apply fluid packing to oil pressure switch threads.

**Fluid packing:**  
**THREE BOND 1324 or equivalent**

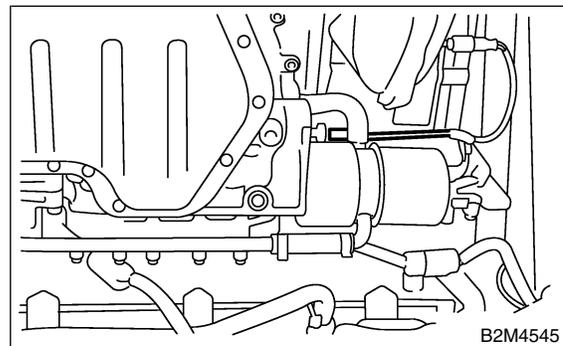


- 2) Install oil pressure switch.

**Tightening torque:**  
**25 N-m (2.5 kgf-m, 18.1 ft-lb)**



- 3) Connect terminal of oil pressure switch.



- 4) Install under cover.

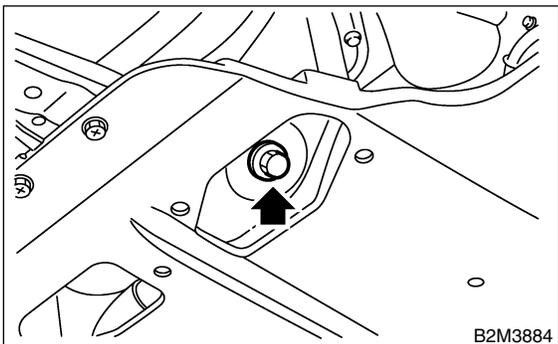
### C: INSPECTION S148069A10

Make sure oil does not leak or seep from where the oil pressure switch is installed.

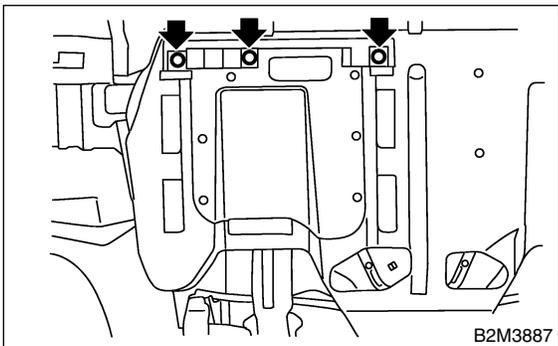
## 8. Engine Oil Filter S148585

### A: REMOVAL S148585A18

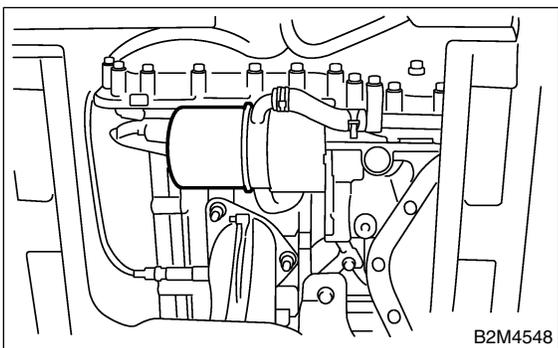
- 1) Drain engine oil by loosening engine oil drain plug.



- 2) Remove access lid.



- 3) Remove oil filter with ST.  
ST 498547000 OIL FILTER WRENCH



### B: INSTALLATION S148585A11

- 1) Get a new oil filter and apply a thin coat of engine oil to the rubber seal.
- 2) Install oil filter by turning it by hand, being careful not to damage rubber seal.
- 3) Tighten more (approximately 3/4 turn) after the rubber seal contacts the oil cooler. Do not tighten excessively, or oil may leak.
- 4) Fill engine oil. <Ref. to LU(H6)-10, Engine Oil.>

### C: INSPECTION S148585A10

- 1) After installing oil filter, run engine and make sure that no oil is leaking around rubber seal.

#### NOTE:

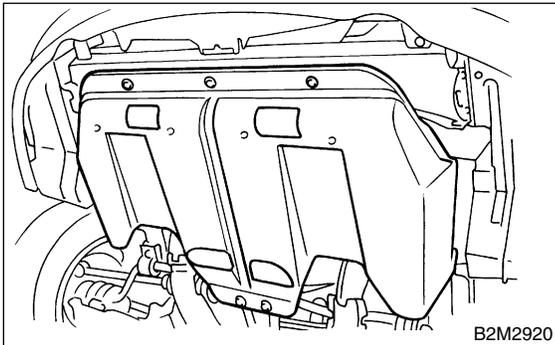
The filter element and filter case are permanently jointed; therefore, interior cleaning is not necessary.

- 2) Check the engine oil level. <Ref. to LU(H6)-10, INSPECTION, Engine Oil.>

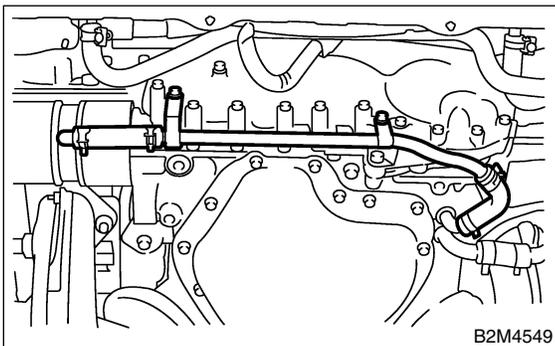
## 9. Oil Cooler S148073

### A: REMOVAL S148073A18

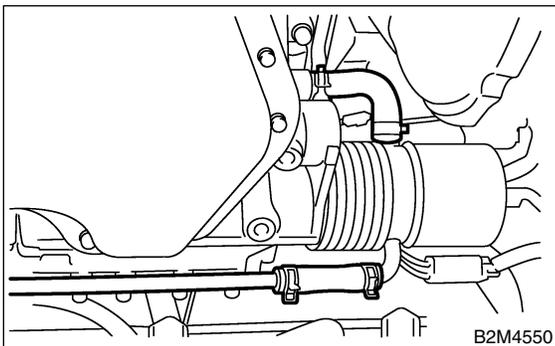
- 1) Lift-up the vehicle.
- 2) Remove under cover.



- 3) Drain engine coolant completely. <Ref. to CO(H6)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 4) Drain engine oil. <Ref. to LU(H6)-10, REPLACEMENT, Engine Oil.>
- 5) Remove bolts which install water pipe to engine.

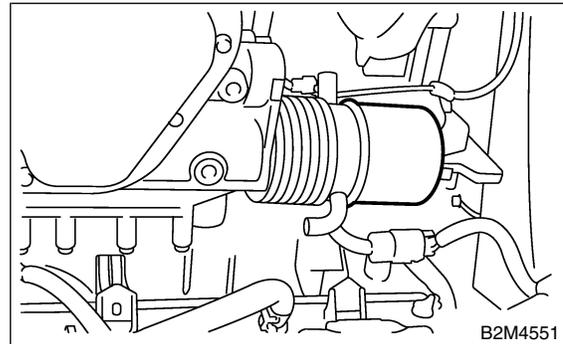


- 6) Disconnect water hoses from oil cooler.

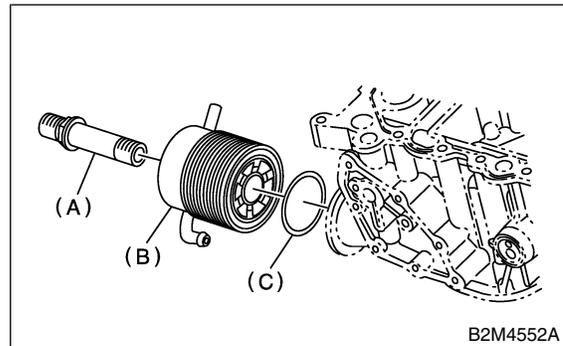


- 7) Remove oil filter using ST. <Ref. to LU(H6)-18, REMOVAL, Engine Oil Filter.>  
ST 49854700 OIL FILTER WRENCH

NOTE:  
Set container under the vehicle.



- 8) Remove connector and remove oil cooler.



- (A) Connector
- (B) Oil cooler
- (C) O-ring

### B: INSPECTION S148073A10

- 1) Check that coolant passages are not clogged using air blow method.
- 2) Check mating surfaces of gasket, upper oil pan groove and oil filter for damage.

# OIL COOLER

Lubrication

## C: INSTALLATION S148073A11

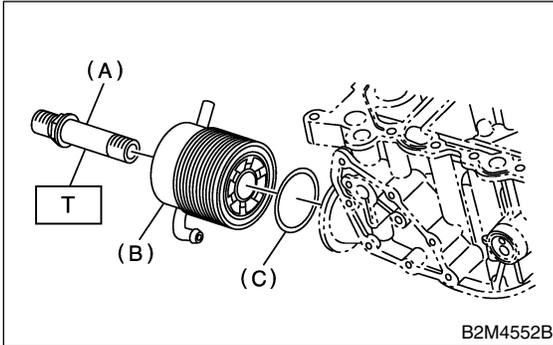
1) Install oil cooler on upper oil pan with connector pipe.

**Tightening torque:**

**T: 54 N·m (5.5 kgf·m, 40 ft·lb)**

**NOTE:**

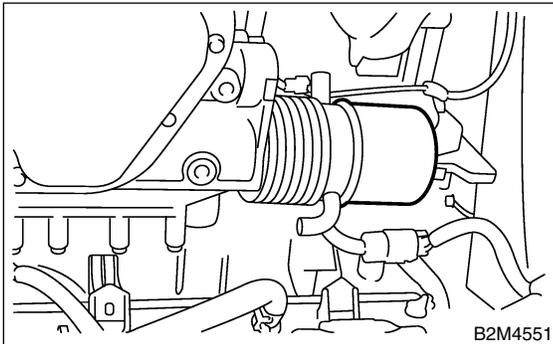
Always use a new O-ring.



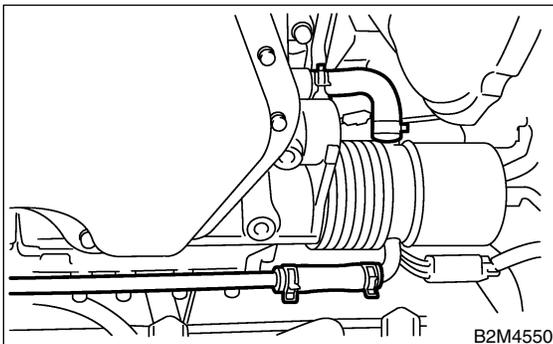
- (A) Connector
- (B) Oil cooler
- (C) O-ring

2) Install oil filter using ST. <Ref. to LU(H6)-18, INSTALLATION, Engine Oil Filter.>

ST 49854700 OIL FILTER WRENCH



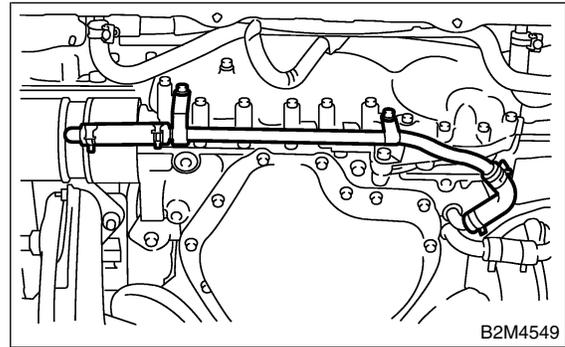
3) Install water hose.



4) Install water pipe to engine.

**Tightening torque:**

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**



5) Fill engine oil. <Ref. to LU(H6)-10, REPLACEMENT, Engine Oil.>

6) Fill engine coolant. <Ref. to CO(H6)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

7) Check the engine oil level. <Ref. to LU(H6)-10, INSPECTION, Engine Oil.>

## 10. Engine Lubrication System Trouble in General S148100

### A: INSPECTION S148100A10

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	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	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
Stuck oil pump rotor		Replace.	
2. Warning light does not go on.	1) Burn-out bulb		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1.—2).

# ENGINE LUBRICATION SYSTEM TROUBLE IN GENERAL

Lubrication

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**MEMO:**

# GENERAL DESCRIPTION

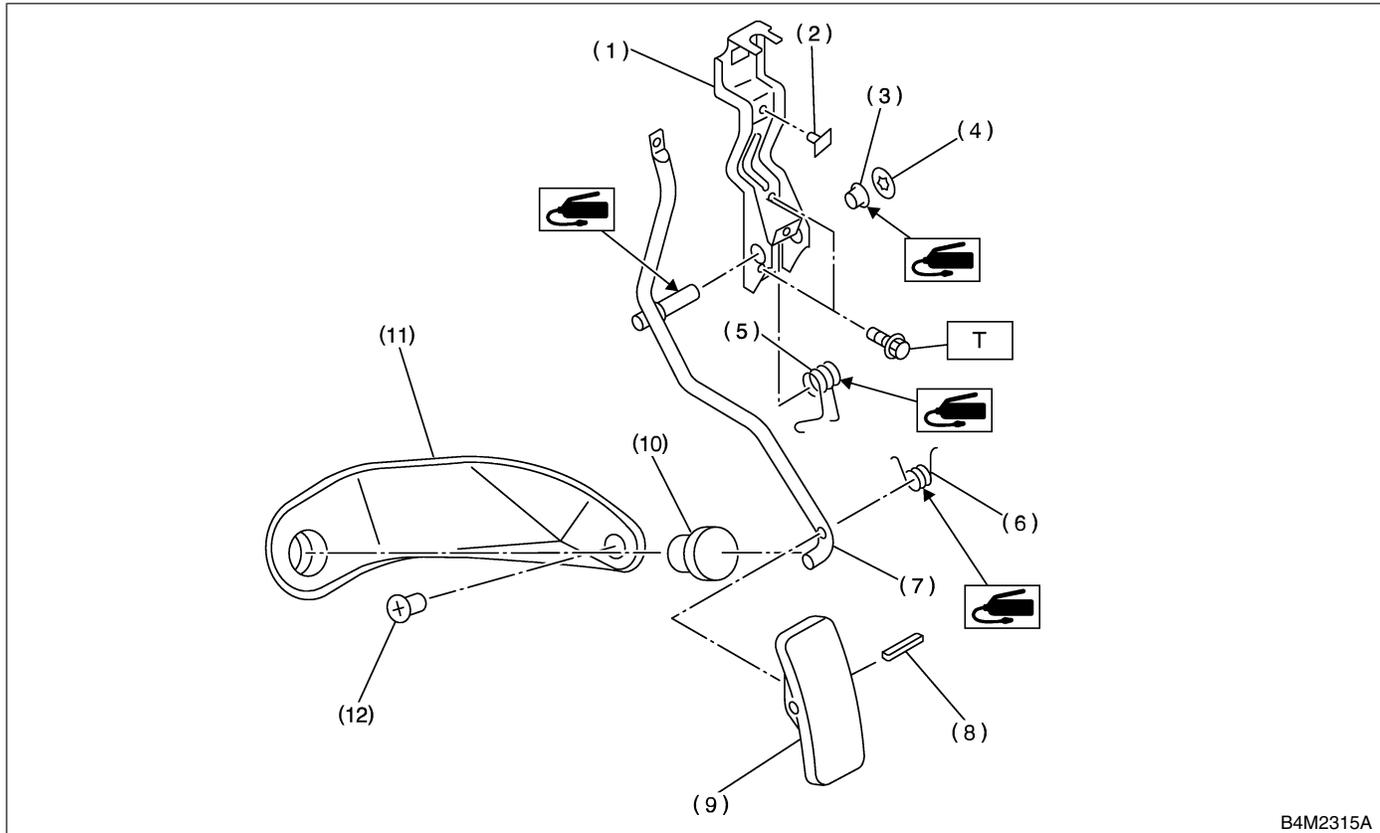
Speed Control Systems

## 1. General Description S147001

### A: SPECIFICATION S147001A22

Accelerator pedal	Free play	At pedal pad	1 — 4 mm (0.04 — 0.16 in)
	Stroke	At pedal pad	50 — 55 mm (1.97 — 2.17 in)

### B: COMPONENT S147001A05



- (1) Accelerator bracket
- (2) Stopper
- (3) Bushing
- (4) Clip
- (5) Accelerator spring

- (6) Accelerator pedal spring
- (7) Accelerator pedal lever
- (8) Spring pin
- (9) Accelerator pedal
- (10) Accelerator stopper

- (11) Accelerator plate
- (12) Clip

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

### C: CAUTION S147001A03

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- 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.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

# GENERAL DESCRIPTION

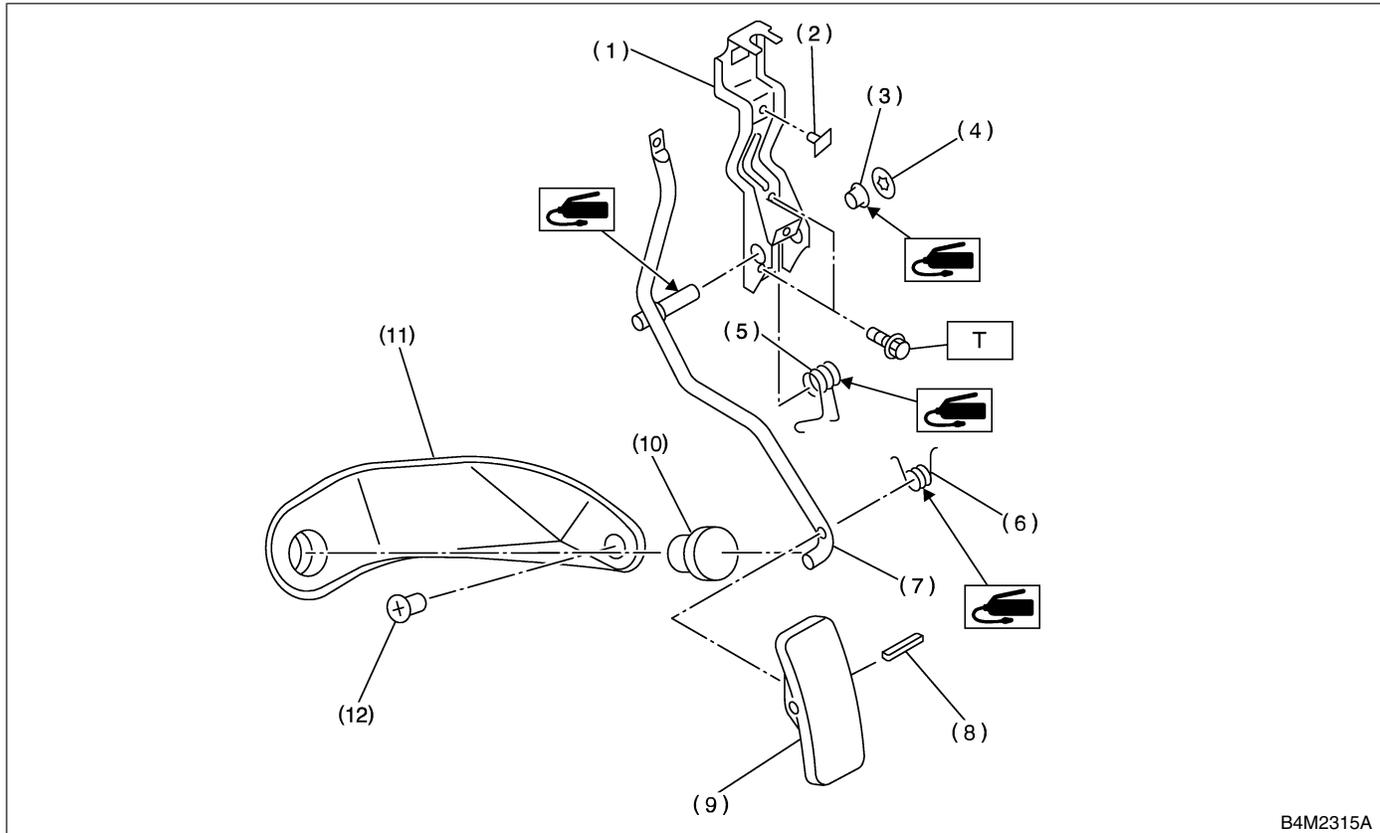
Speed Control Systems

## 1. General Description S147001

### A: SPECIFICATION S147001A22

Accelerator pedal	Free play	At pedal pad	1 — 4 mm (0.04 — 0.16 in)
	Stroke	At pedal pad	50 — 55 mm (1.97 — 2.17 in)

### B: COMPONENT S147001A05



- (1) Accelerator bracket
- (2) Stopper
- (3) Bushing
- (4) Clip
- (5) Accelerator spring

- (6) Accelerator pedal spring
- (7) Accelerator pedal lever
- (8) Spring pin
- (9) Accelerator pedal
- (10) Accelerator stopper

- (11) Accelerator plate
- (12) Clip

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

### C: CAUTION S147001A03

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- 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.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

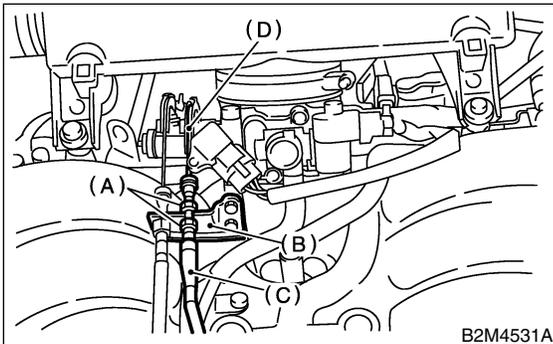
## 2. Accelerator Pedal S147005

### A: REMOVAL S147005A18

- 1) Disconnect ground cable from battery.
- 2) Remove lock nut from accelerator cable bracket.
- 3) Separate accelerator cable from bracket.
- 4) Remove accelerator cable end from throttle cam.
- 5) Disconnect accelerator cable from throttle body.

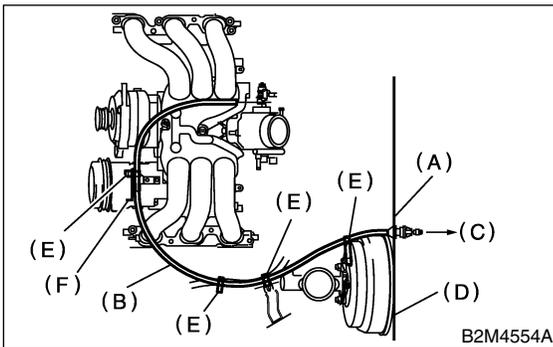
#### CAUTION:

**Be careful not to kink accelerator cable.**



- (A) Lock nut
- (B) Accelerator cable bracket
- (C) Accelerator cable
- (D) Throttle cam

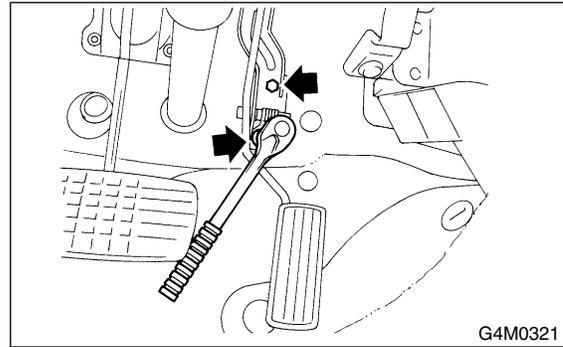
- 6) Remove clip inside engine compartment.



- (A) Toe board
- (B) Accelerator cable
- (C) To accelerator pedal
- (D) Brake booster
- (E) Clip
- (F) Bracket

- 7) Remove instrument panel lower cover from instrument panel, and connector.
- 8) Remove brake and clutch pedal bracket. (MT model) <Ref. to BR-41, REMOVAL, Brake Pedal.>

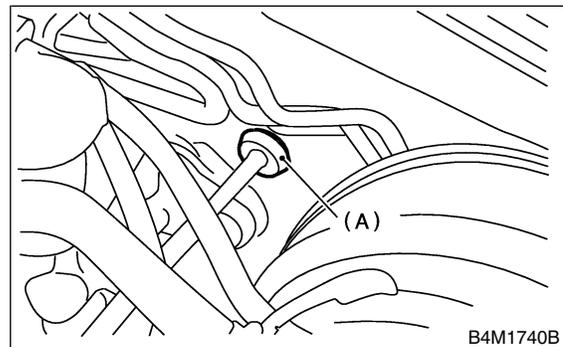
- 9) Remove accelerator pedal connecting bolt from accelerator pedal bracket.



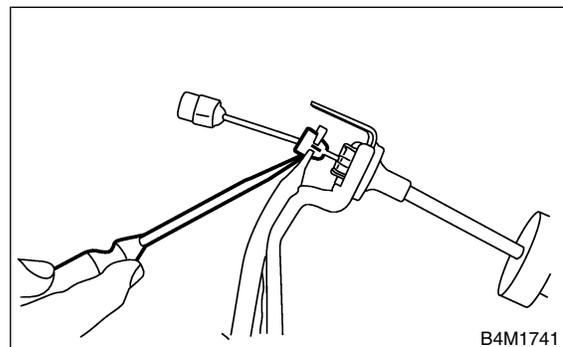
- 10) Disconnect grommet (A) from toe board.

#### NOTE:

From inside compartment, push grommet into hole.



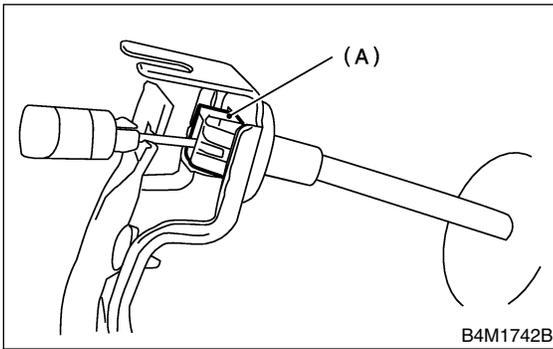
- 11) Pull out the cable from the toe board hole.
- 12) Disconnect accelerator cable bushing from accelerator pedal lever.



# ACCELERATOR PEDAL

## Speed Control Systems

13) Disconnect accelerator cable stopper (A) from bracket.



14) Separate accelerator cable and bracket.

## B: INSTALLATION S147005A11

Install in the reverse order of removal.

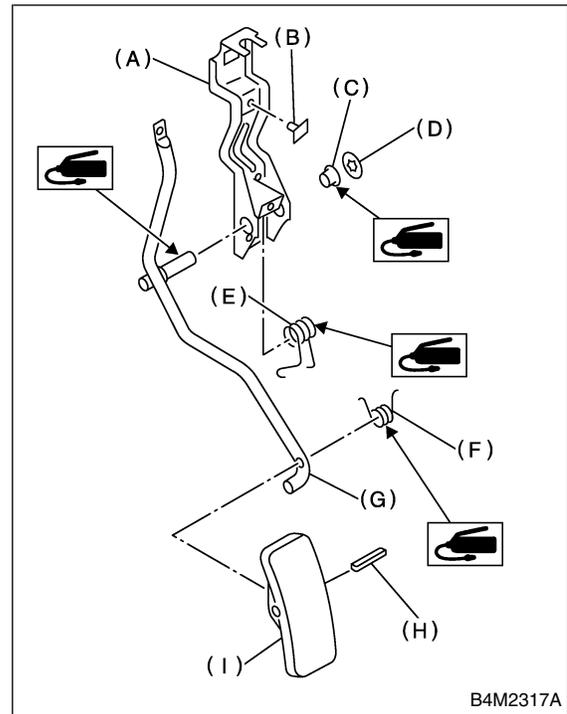
### CAUTION:

- If cable clamp is damaged, replace it with a new one.
- Never fail to cover outer cable end with boot.
- Be careful not to kink accelerator cable.
- Always use new clevis pins.

**Accelerator cable lock nut tightening torque:**  
**12 N·m (1.2 kgf-m, 9 ft-lb)**

## C: DISASSEMBLY S147005A06

- 1) Remove the clip, and then remove the accelerator pedal from the bracket.
- 2) Pull out the spring pin, and then remove the accelerator pedal from the accelerator pedal lever.



- (A) Bracket
- (B) Stopper
- (C) Bushing
- (D) Clip
- (E) Accelerator spring
- (F) Accelerator pedal spring
- (G) Accelerator pedal lever
- (H) Spring pin
- (I) Accelerator pedal

## D: ASSEMBLY S147005A02

Assemble in the reverse order of disassembly.

### CAUTION:

Clean and apply grease to spacer and inside bore of a accelerator pedal.

## E: INSPECTION S147005A10

Lightly move pedal pad in the lateral direction to ensure pedal deflection is in specified range.

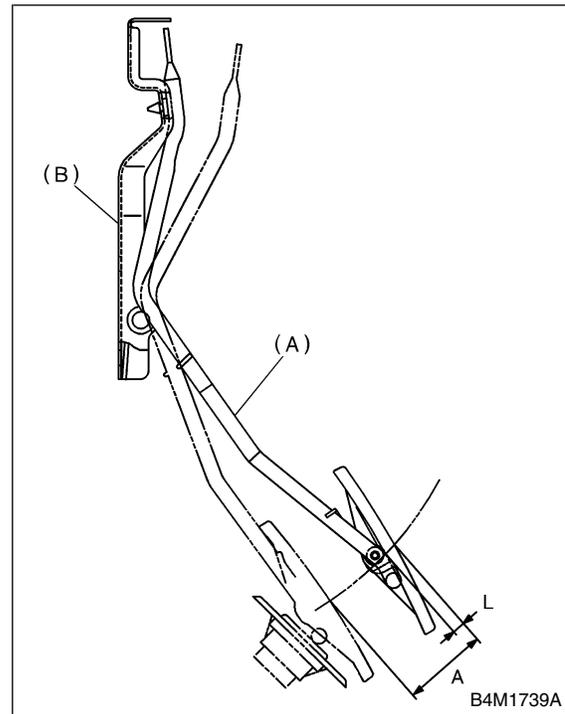
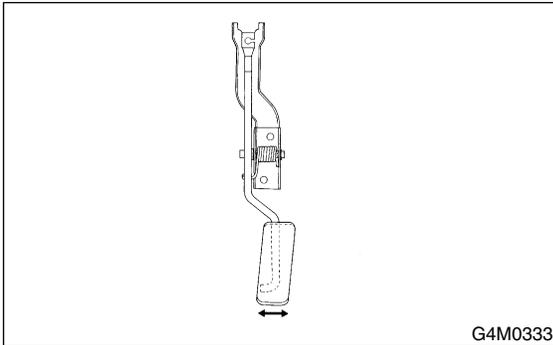
### CAUTION:

If excessive deflection is noted, replace bushing and clip with new ones.

**Deflection of accelerator pedal:**

**Service limit**

**5.0 mm (0.197 in) or less**



- (A) Accelerator pedal
- (B) Accelerator pedal bracket

## F: ADJUSTMENT S147005A01

Check pedal stroke and free play by operating accelerator pedal by hand.

If it is not within specified value, adjust it by turning nut connecting accelerator cable to throttle body.

**Free play at pedal pad: L**

**1 — 4 mm (0.04 — 0.16 in)**

**Stroke at pedal pad: A**

**50 — 55 mm (1.97 — 2.17 in)**

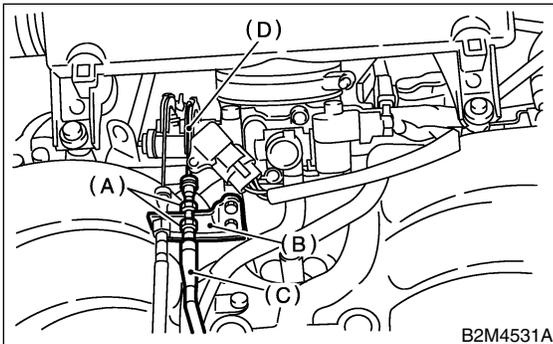
## 2. Accelerator Pedal S147005

### A: REMOVAL S147005A18

- 1) Disconnect ground cable from battery.
- 2) Remove lock nut from accelerator cable bracket.
- 3) Separate accelerator cable from bracket.
- 4) Remove accelerator cable end from throttle cam.
- 5) Disconnect accelerator cable from throttle body.

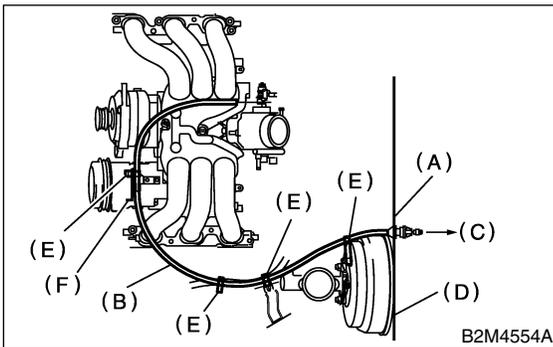
#### CAUTION:

**Be careful not to kink accelerator cable.**



- (A) Lock nut
- (B) Accelerator cable bracket
- (C) Accelerator cable
- (D) Throttle cam

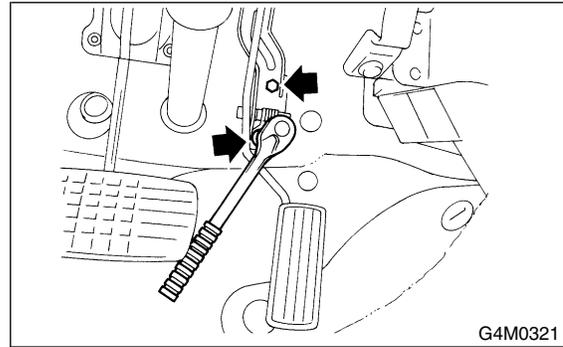
- 6) Remove clip inside engine compartment.



- (A) Toe board
- (B) Accelerator cable
- (C) To accelerator pedal
- (D) Brake booster
- (E) Clip
- (F) Bracket

- 7) Remove instrument panel lower cover from instrument panel, and connector.
- 8) Remove brake and clutch pedal bracket. (MT model) <Ref. to BR-41, REMOVAL, Brake Pedal.>

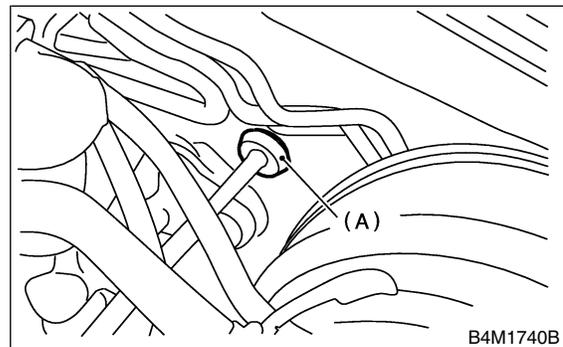
- 9) Remove accelerator pedal connecting bolt from accelerator pedal bracket.



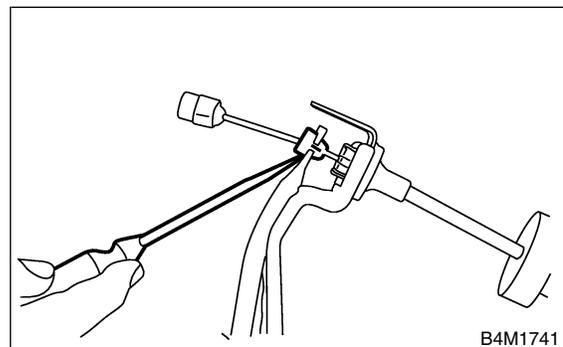
- 10) Disconnect grommet (A) from toe board.

#### NOTE:

From inside compartment, push grommet into hole.



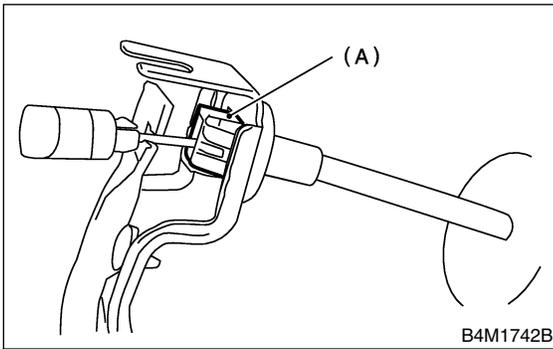
- 11) Pull out the cable from the toe board hole.
- 12) Disconnect accelerator cable bushing from accelerator pedal lever.



# ACCELERATOR PEDAL

## Speed Control Systems

13) Disconnect accelerator cable stopper (A) from bracket.



14) Separate accelerator cable and bracket.

## B: INSTALLATION S147005A11

Install in the reverse order of removal.

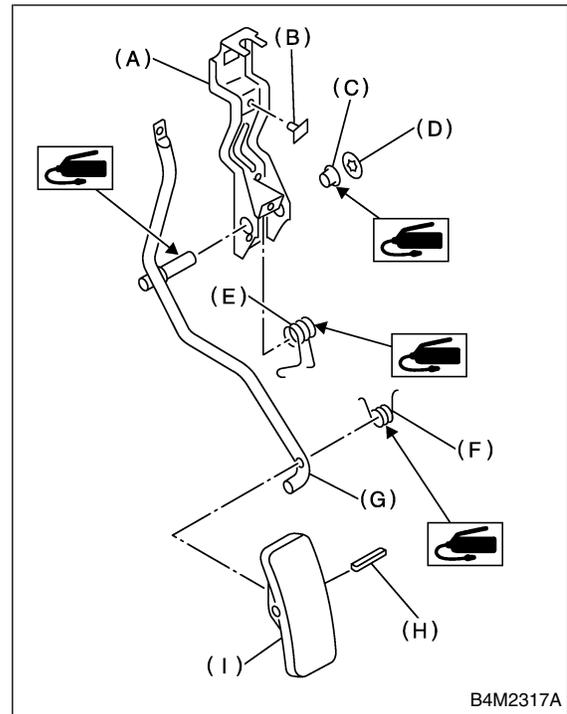
### CAUTION:

- If cable clamp is damaged, replace it with a new one.
- Never fail to cover outer cable end with boot.
- Be careful not to kink accelerator cable.
- Always use new clevis pins.

**Accelerator cable lock nut tightening torque:**  
**12 N·m (1.2 kgf-m, 9 ft-lb)**

## C: DISASSEMBLY S147005A06

- 1) Remove the clip, and then remove the accelerator pedal from the bracket.
- 2) Pull out the spring pin, and then remove the accelerator pedal from the accelerator pedal lever.



- (A) Bracket
- (B) Stopper
- (C) Bushing
- (D) Clip
- (E) Accelerator spring
- (F) Accelerator pedal spring
- (G) Accelerator pedal lever
- (H) Spring pin
- (I) Accelerator pedal

## D: ASSEMBLY S147005A02

Assemble in the reverse order of disassembly.

### CAUTION:

Clean and apply grease to spacer and inside bore of a accelerator pedal.

## E: INSPECTION S147005A10

Lightly move pedal pad in the lateral direction to ensure pedal deflection is in specified range.

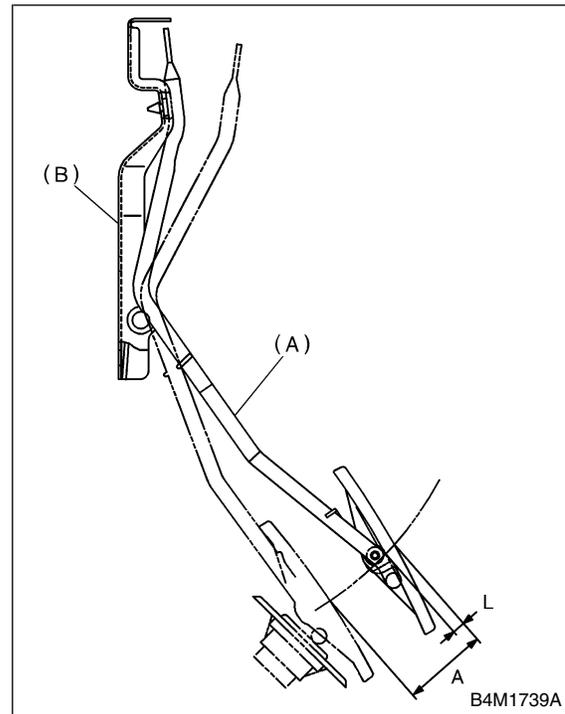
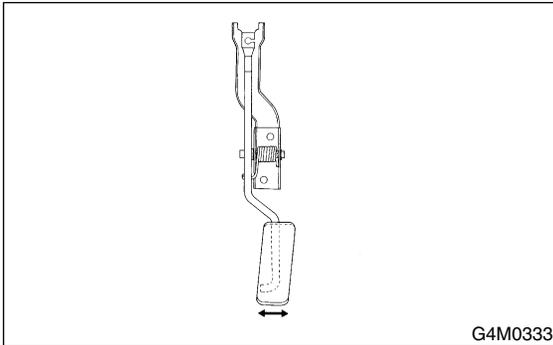
### CAUTION:

If excessive deflection is noted, replace bushing and clip with new ones.

**Deflection of accelerator pedal:**

**Service limit**

**5.0 mm (0.197 in) or less**



- (A) Accelerator pedal
- (B) Accelerator pedal bracket

## F: ADJUSTMENT S147005A01

Check pedal stroke and free play by operating accelerator pedal by hand.

If it is not within specified value, adjust it by turning nut connecting accelerator cable to throttle body.

**Free play at pedal pad: L**

**1 — 4 mm (0.04 — 0.16 in)**

**Stroke at pedal pad: A**

**50 — 55 mm (1.97 — 2.17 in)**

## 3. Accelerator Control Cable S147007

### A: REMOVAL S147007A18

- 1) Remove accelerator pedal. <Ref. to SP(H6)-3, REMOVAL, Accelerator Pedal.>
- 2) Separate accelerator cable and accelerator pedal.

### B: INSTALLATION S147007A11

- 1) Install in the reverse order of removal.

#### CAUTION:

- If cable clamp is damaged, replace it with a new one.
- Never fail to cover outer cable end with boot.
- Be careful not to kink accelerator cable.
- Do not apply grease to the throttle cable on the engine side.

- 2) Adjustment after pedal installation <Ref. to SP(H6)-4, INSTALLATION, Accelerator Pedal.>

### C: INSPECTION S147007A10

- 1) Make sure the inner cable is not twisted or frayed.
- 2) Make sure the outer cable is not cracked.

## 3. Accelerator Control Cable S147007

### A: REMOVAL S147007A18

- 1) Remove accelerator pedal. <Ref. to SP(H6)-3, REMOVAL, Accelerator Pedal.>
- 2) Separate accelerator cable and accelerator pedal.

### B: INSTALLATION S147007A11

- 1) Install in the reverse order of removal.

#### CAUTION:

- If cable clamp is damaged, replace it with a new one.
- Never fail to cover outer cable end with boot.
- Be careful not to kink accelerator cable.
- Do not apply grease to the throttle cable on the engine side.

- 2) Adjustment after pedal installation <Ref. to SP(H6)-4, INSTALLATION, Accelerator Pedal.>

### C: INSPECTION S147007A10

- 1) Make sure the inner cable is not twisted or frayed.
- 2) Make sure the outer cable is not cracked.

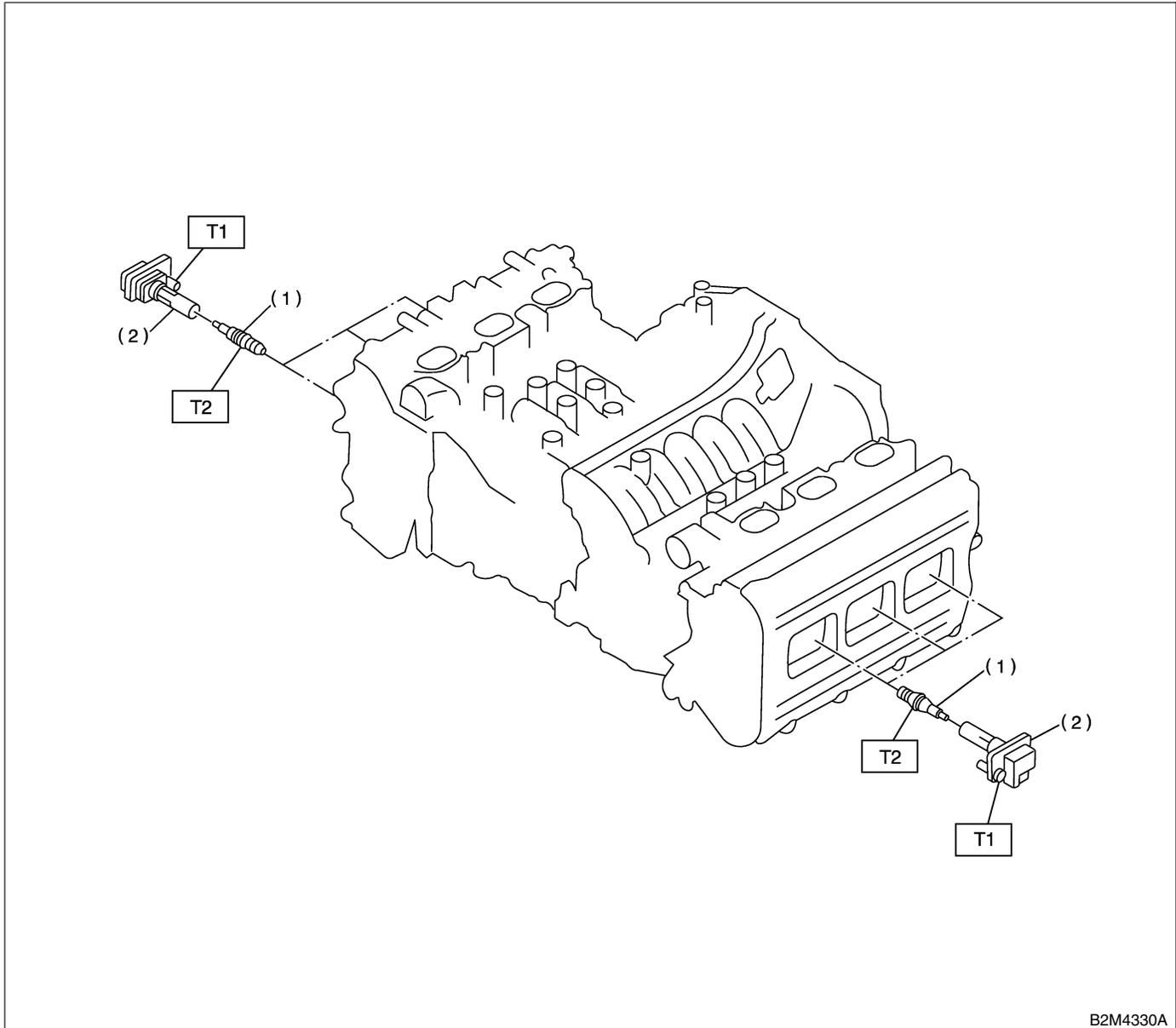
# GENERAL DESCRIPTION

Ignition

## 1. General Description S141001

### A: SPECIFICATIONS S141001E49

Item		Designation
Ignition coil and ignitor assembly	Model	FK0140
	Manufacturer	DIAMOND
Spark plug	Type and manufacturer	PLFR6A-11 ..... NGK
	Thread size	mm 14, P = 1.25
	Spark gap	mm (in) 1.0 — 1.1 (0.039 — 0.043)

**B: COMPONENT** S141001A05

B2M4330A

- (1) Spark plug  
 (2) Ignition coil and ignitor ASSY

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**Tightening torque: N·m (kgf·m, ft·lb)**
**T1: 16 (1.6, 12)**
**T2: 21 (2.1, 15)**


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**C: CAUTION** S141001A03

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary

removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

# SPARK PLUG

Ignition

## 2. Spark Plug S141003

### A: REMOVAL S141003A18

#### CAUTION:

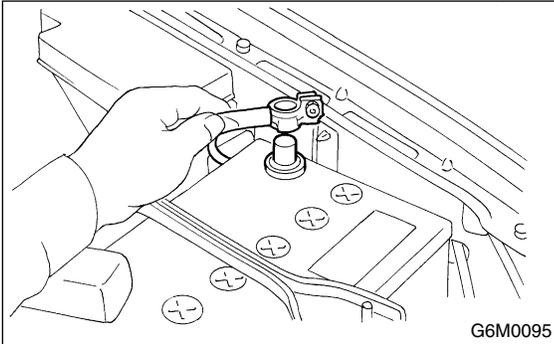
All spark plugs installed on an engine, must be of the same heat range.

Spark plug:

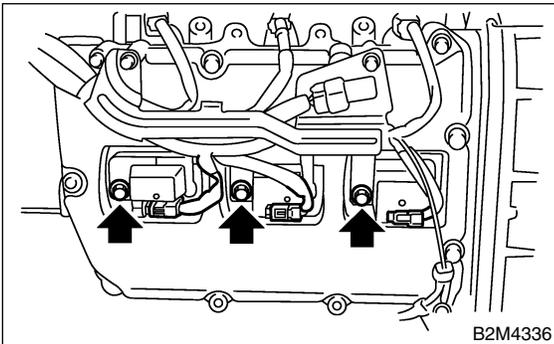
**NGK: PLFR6A-11**

#### 1. RH SIDE S141003A1805

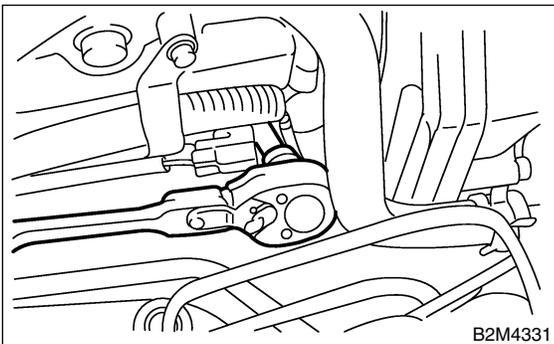
- 1) Disconnect battery ground cable.



- 2) Remove air cleaner lower case. <Ref. to IN(H6)-5, REMOVAL, Air Cleaner.>
- 3) Disconnect connector from ignition coil.
- 4) Remove ignition coil.

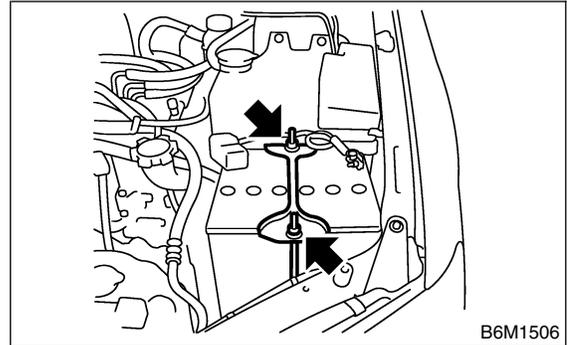


- 5) Remove spark plugs with the spark plug socket.

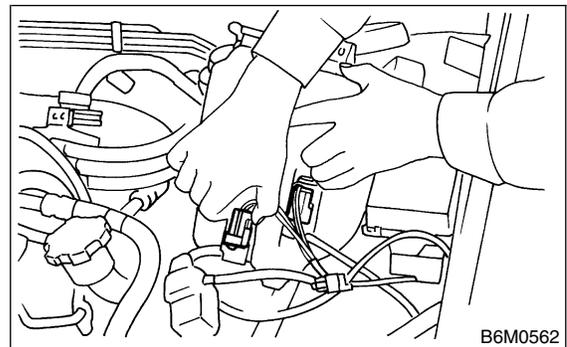


#### 2. LH SIDE S141003A1806

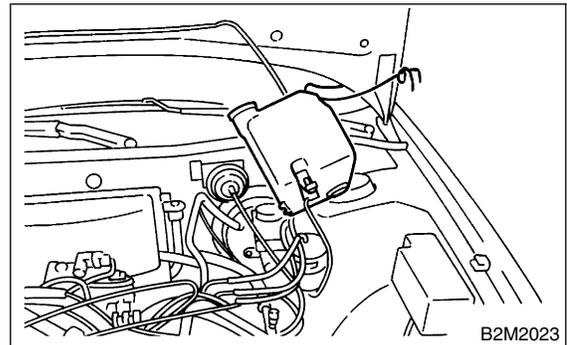
- 1) Disconnect battery cables and then remove battery and battery carrier.



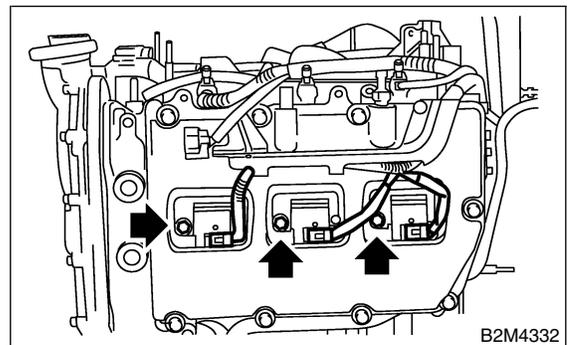
- 2) Disconnect washer motor connector.



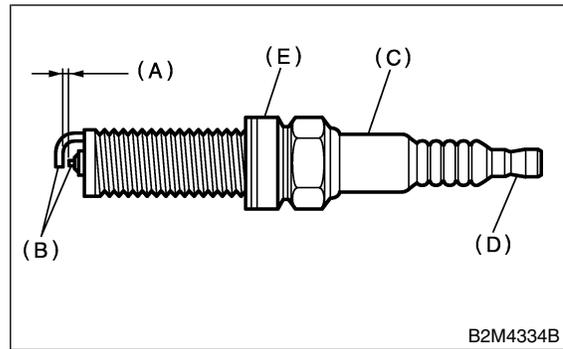
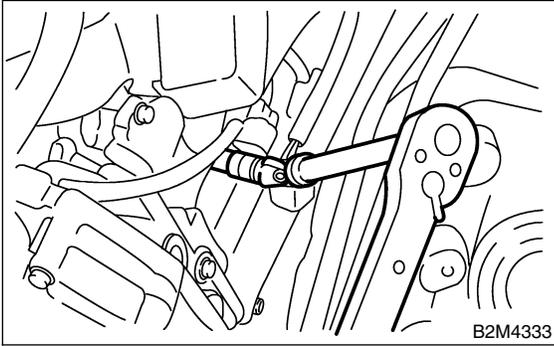
- 3) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



- 4) Disconnect connector from ignition coil.
- 5) Remove ignition coil.



6) Remove spark plug with the spark plugs socket.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

## B: INSTALLATION S141003A11

### 1. RH SIDE S141003A1105

1) Install in the reverse order of removal.

**Tightening torque (Spark plug):**  
**21 N·m (2.1 kgf-m, 15 ft-lb)**

#### CAUTION:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

**Tightening torque (Ignition coil):**  
**16 N·m (1.6 kgf-m, 12 ft-lb)**

### 2. LH SIDE S141003A1106

1) Install in the reverse order of removal.

**Tightening torque (Spark plug):**  
**21 N·m (2.1 kgf-m, 15 ft-lb)**

#### CAUTION:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

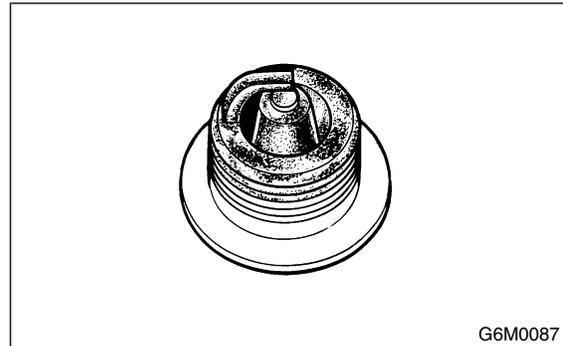
**Tightening torque (Ignition coil):**  
**16 N·m (1.6 kgf-m, 12 ft-lb)**

## C: INSPECTION S141003A10

Check electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.

1) Normal

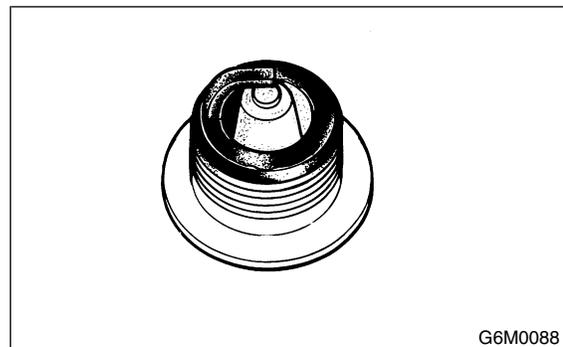
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



2) Carbon fouled

Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.

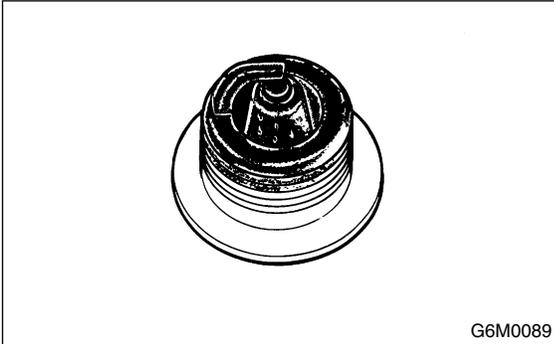


# SPARK PLUG

## Ignition

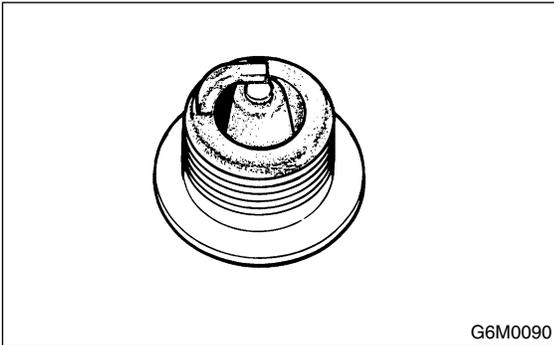
### 3) Oil fouled

Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If same condition remains after repair, use a hotter plug.



### 4) Overheating

White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.



## D: CLEANING S141003E56

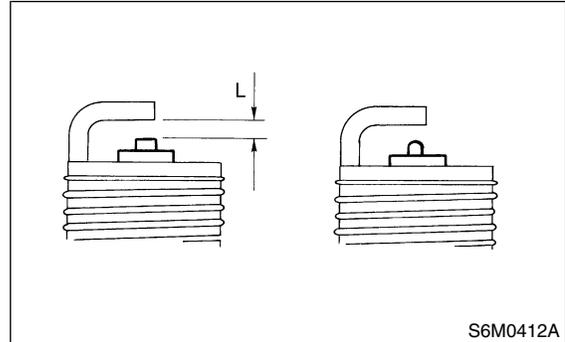
Clean spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain. If deposits are too stubborn, replace plugs.

## E: ADJUSTMENT S141003A01

Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

**Spark plug gap: L**

**1.0 — 1.1 mm (0.039 — 0.043 in)**



### NOTE:

Replace with new spark plug if this area is worn to "ball" shape.

### 3. Ignition Coil and Ignitor Assembly S141015

#### A: REMOVAL S141015A18

Direct ignition type is adopted.  
For the order of removal, refer to the removal of spark plugs.

#### B: INSTALLATION S141015A11

Install in the reverse order of removal.

#### *Tightening torque:*

**16 N·m (1.6 kgf-m, 12 ft-lb)**

#### C: INSPECTION S141015A10

Because ignition coil is a direct ignition type, the resistance cannot be measured in a single unit. For inspection procedure of ignition system, refer to the following. <Ref. to EN(H6)-86, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

# IGNITION COIL AND IGNITOR ASSEMBLY

Ignition

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**MEMO:**

# GENERAL DESCRIPTION

Starting/Charging Systems

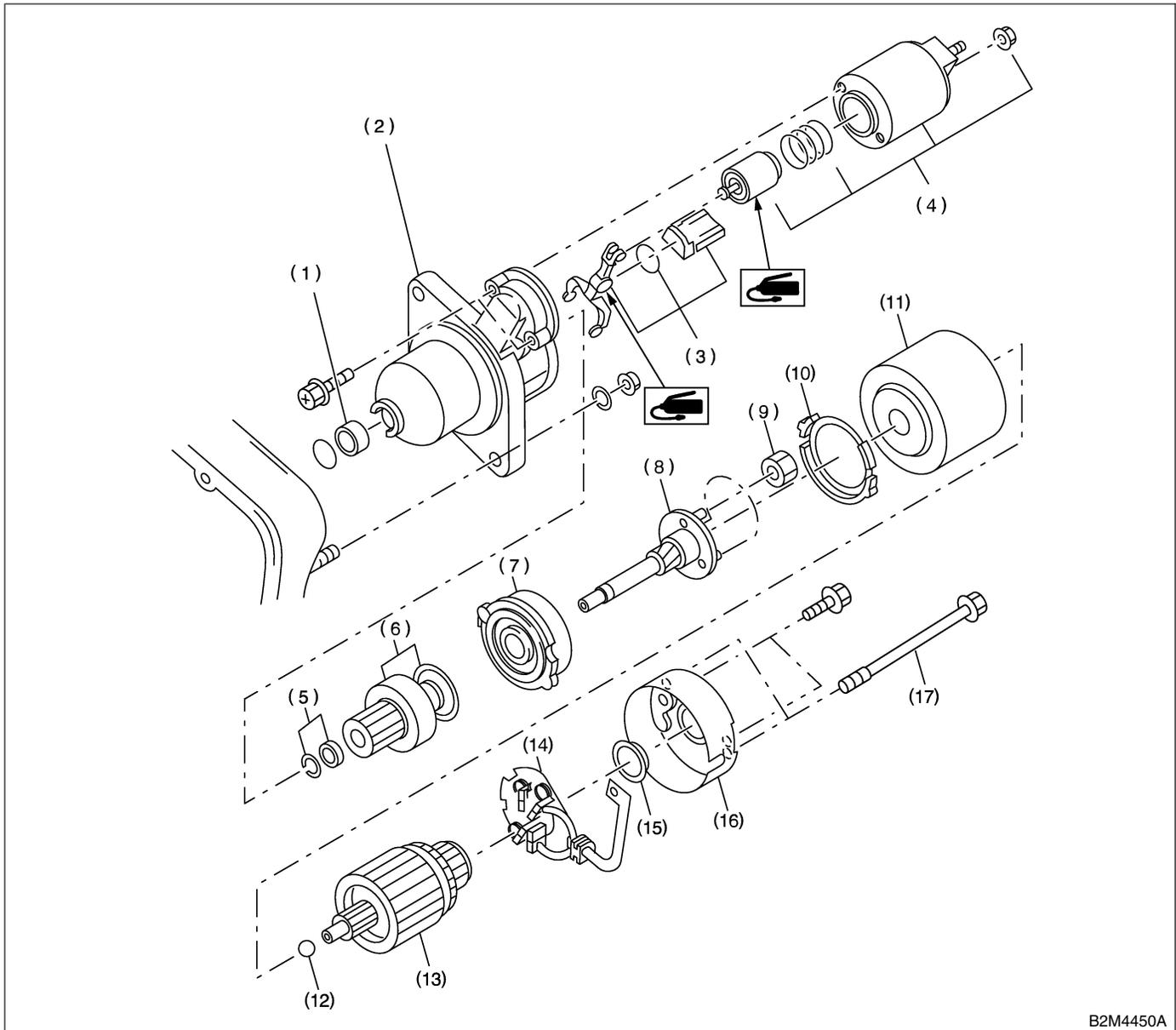
## 1. General Description S149001

### A: SPECIFICATIONS S149001E49

Item		Designation	
Starter	Type	Reduction type	
	Model	TN128000-8321	
	Manufacturer	NIPPONDENSO TENNESSEE	
	Voltage and output	12 V — 1.4 kW	
	Direction of rotation	Counterclockwise (when observed from pinion)	
	Number of pinion teeth	9	
	No-load characteristics	Voltage	11 V
		Current	90 A or less
		Rotating speed	2,900 rpm or more
	Load characteristics	Voltage	8 V
		Current	370 A or less
		Torque	13.7 N·m (1.4 kgf-m, 10.1 ft-lb)
		Rotating speed	880 rpm or more
	Lock characteristics	Voltage	5 V
Current		1,050 A or less	
Torque		27.5 N·m (2.8 kgf-m, 20.3 ft-lb) or more	
Generator	Type	Rotating-field three-phase type	
	Model	LR190-742	
	Manufacturer	MITUBISHI ELECTRIC	
	Voltage and output	12 V — 100 A	
	Polarity on ground side	Negative	
	Rotating direction	Clockwise (when observed from pulley side.)	
	Armature connection	3-phase Y-type	
	Output current	1,500 rpm — 43 A or more	
		2,500 rpm — 76 A or more	
5,000 rpm — 100 A or more			
Regulated voltage	14.5 <sup>+0.3</sup> / <sub>-0.4</sub> V [20°C (68°F)]		
Battery	Reserve capacity	110 min	
	Cold cranking amps	490 amp.	

## B: COMPONENT S149001A05

### 1. STARTER S149001A0501



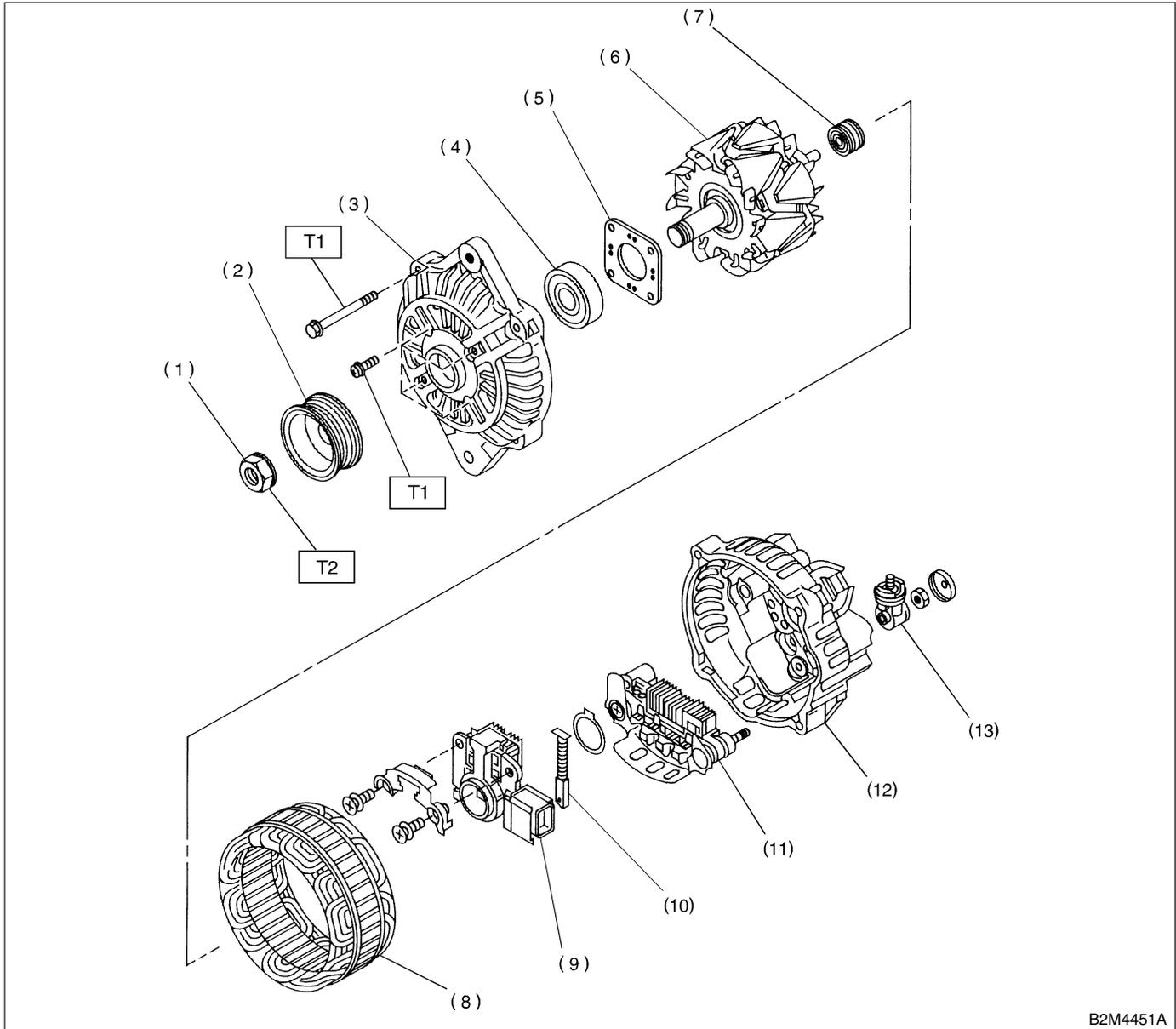
B2M4450A

- |                        |                        |                   |
|------------------------|------------------------|-------------------|
| (1) Sleeve bearing     | (7) Internal gear ASSY | (13) Armature     |
| (2) Front bracket      | (8) Shaft ASSY         | (14) Brush holder |
| (3) Lever set          | (9) Gear ASSY          | (15) Bearing      |
| (4) Magnet switch ASSY | (10) Packing           | (16) Rear bracket |
| (5) Stopper set        | (11) Yoke              | (17) Through bolt |
| (6) Overrunning clutch | (12) Ball              |                   |

# GENERAL DESCRIPTION

Starting/Charging Systems

## 2. GENERATOR S149001A0502



B2M4451A

- (1) Pulley nut
- (2) Pulley
- (3) Front cover
- (4) Ball bearing
- (5) Bearing retainer
- (6) Rotor
- (7) Bearing
- (8) Stator coil
- (9) IC regulator with brush
- (10) Brush
- (11) Rectifier
- (12) Rear cover

- (13) Terminal

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 3.1 (0.32, 2.3)**

**T2: 63.7 (6.5, 47.0)**

## **C: CAUTION** S149001A03

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground battery cable.

# GENERAL DESCRIPTION

Starting/Charging Systems

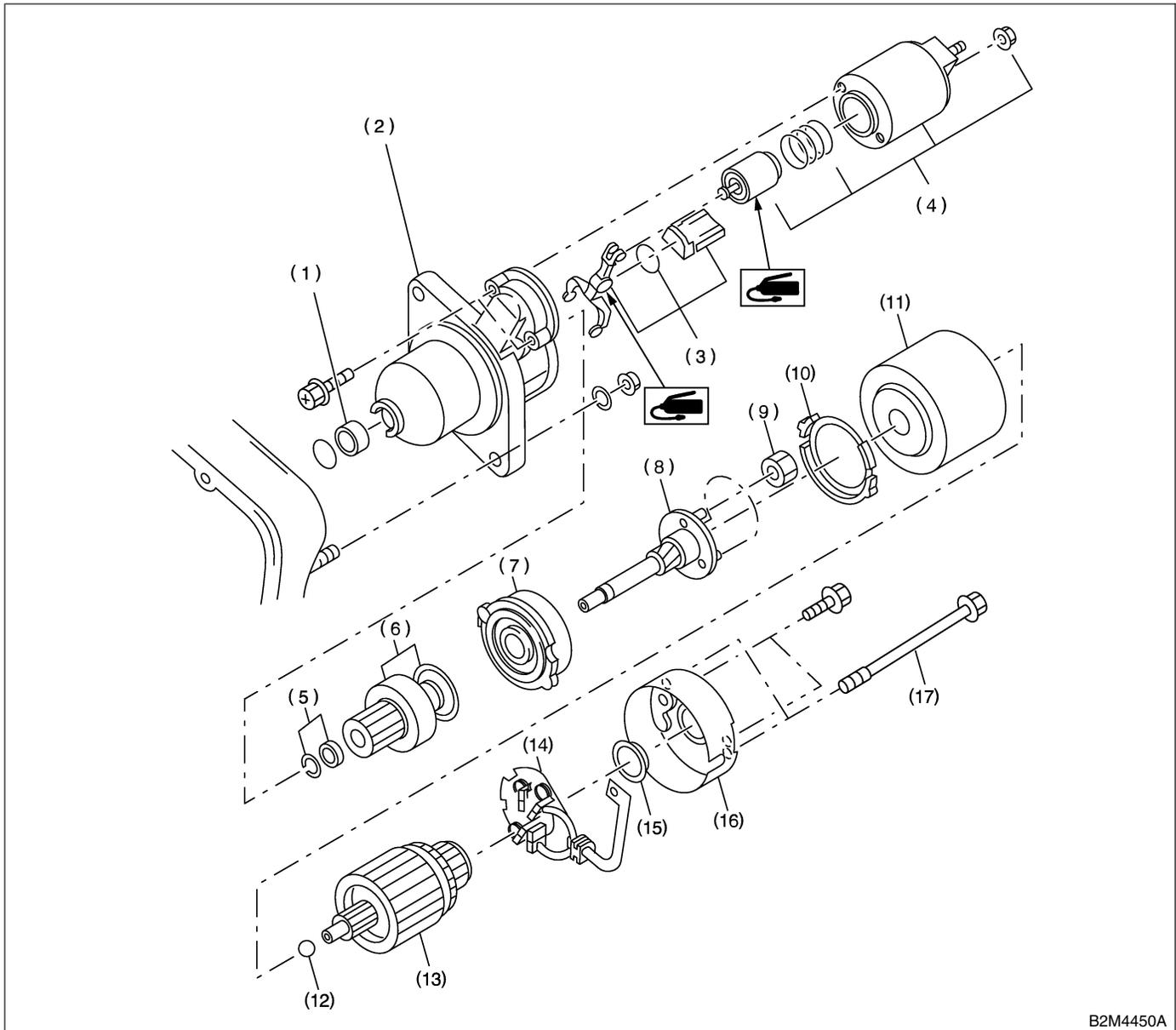
## 1. General Description S149001

### A: SPECIFICATIONS S149001E49

Item		Designation	
Starter	Type	Reduction type	
	Model	TN128000-8321	
	Manufacturer	NIPPONDENSO TENNESSEE	
	Voltage and output	12 V — 1.4 kW	
	Direction of rotation	Counterclockwise (when observed from pinion)	
	Number of pinion teeth	9	
	No-load characteristics	Voltage	11 V
		Current	90 A or less
		Rotating speed	2,900 rpm or more
	Load characteristics	Voltage	8 V
		Current	370 A or less
		Torque	13.7 N·m (1.4 kgf-m, 10.1 ft-lb)
		Rotating speed	880 rpm or more
	Lock characteristics	Voltage	5 V
		Current	1,050 A or less
Torque		27.5 N·m (2.8 kgf-m, 20.3 ft-lb) or more	
Generator	Type	Rotating-field three-phase type	
	Model	LR190-742	
	Manufacturer	MITUBISHI ELECTRIC	
	Voltage and output	12 V — 100 A	
	Polarity on ground side	Negative	
	Rotating direction	Clockwise (when observed from pulley side.)	
	Armature connection	3-phase Y-type	
	Output current	1,500 rpm — 43 A or more	
		2,500 rpm — 76 A or more	
5,000 rpm — 100 A or more			
Regulated voltage	14.5 <sup>+0.3</sup> / <sub>-0.4</sub> V [20°C (68°F)]		
Battery	Reserve capacity	110 min	
	Cold cranking amps	490 amp.	

## B: COMPONENT S149001A05

### 1. STARTER S149001A0501



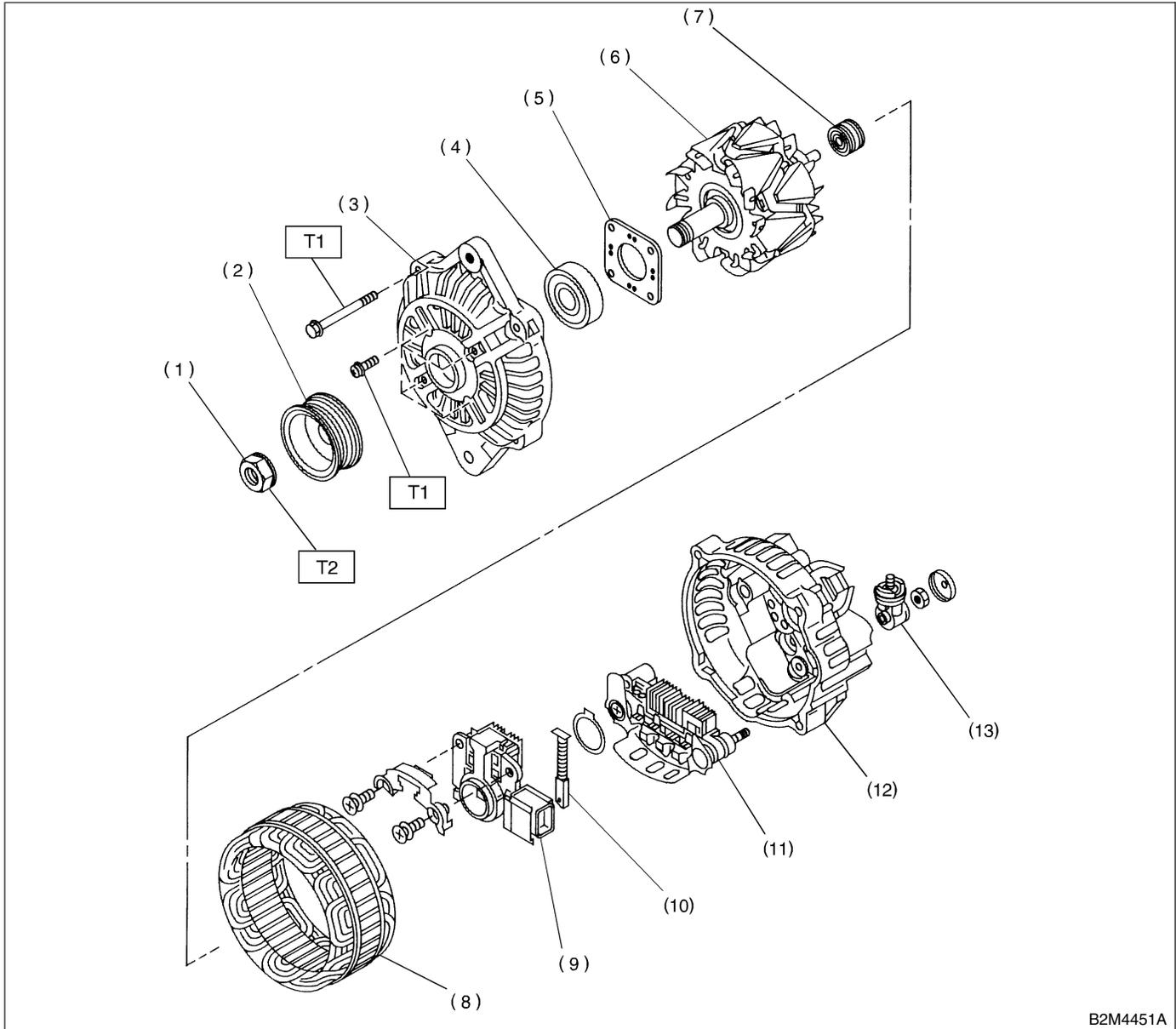
B2M4450A

- |                        |                        |                   |
|------------------------|------------------------|-------------------|
| (1) Sleeve bearing     | (7) Internal gear ASSY | (13) Armature     |
| (2) Front bracket      | (8) Shaft ASSY         | (14) Brush holder |
| (3) Lever set          | (9) Gear ASSY          | (15) Bearing      |
| (4) Magnet switch ASSY | (10) Packing           | (16) Rear bracket |
| (5) Stopper set        | (11) Yoke              | (17) Through bolt |
| (6) Overrunning clutch | (12) Ball              |                   |

# GENERAL DESCRIPTION

Starting/Charging Systems

## 2. GENERATOR S149001A0502



B2M4451A

- (1) Pulley nut
- (2) Pulley
- (3) Front cover
- (4) Ball bearing
- (5) Bearing retainer
- (6) Rotor
- (7) Bearing
- (8) Stator coil
- (9) IC regulator with brush
- (10) Brush
- (11) Rectifier
- (12) Rear cover

- (13) Terminal

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 3.1 (0.32, 2.3)**

**T2: 63.7 (6.5, 47.0)**

**SC(H6)-4**

## **C: CAUTION** S149001A03

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground battery cable.

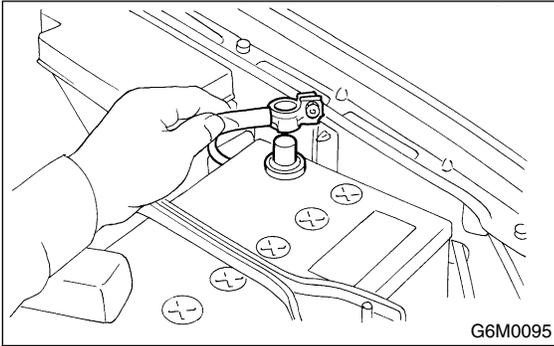
# STARTER

Starting/Charging Systems

## 2. Starter S149012

### A: REMOVAL S149012A18

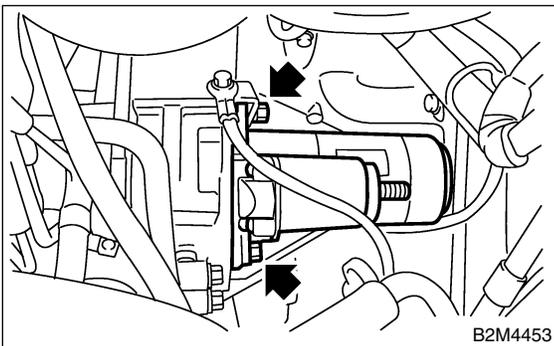
- 1) Disconnect battery ground cable.



- 2) Remove air intake chamber. <Ref. to IN(H6)-6, REMOVAL, Air Intake Chamber.>
- 3) Disconnect connector and terminal from starter.



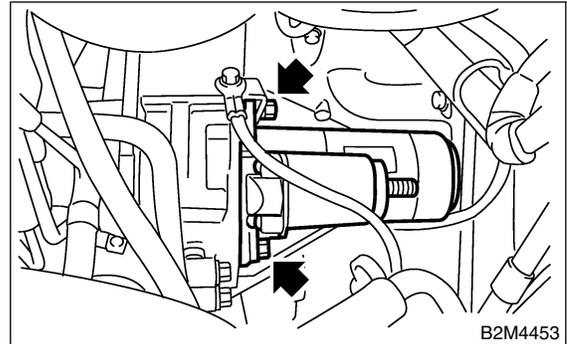
- 4) Remove starter from transmission.



### B: INSTALLATION S149012A11

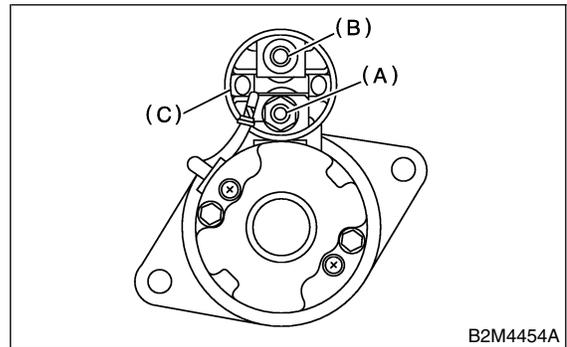
Install in the reverse order of removal.

**Tightening torque:**  
**50 N·m (5.1 kgf-m, 37 ft-lb)**



### C: DISASSEMBLY S149012A06

- 1) Loosen nut which holds terminal M of switch assembly, and disconnect connector.



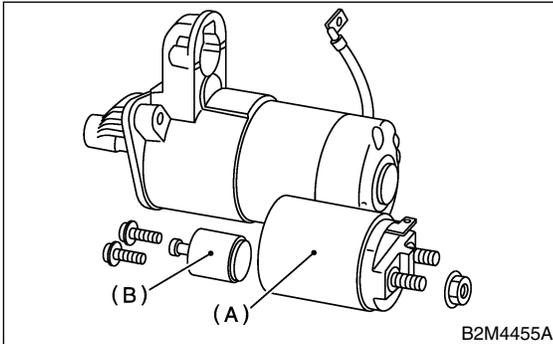
- (A) Terminal M
- (B) Terminal B
- (C) Terminal S

# STARTER

2) Remove bolts which hold switch assembly, and remove switch assembly, plunger and plunger spring from starter as a unit.

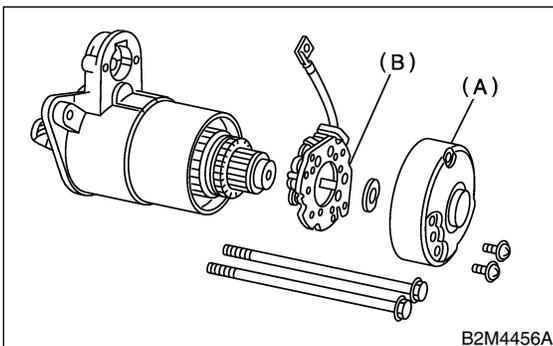
**CAUTION:**

Be careful because pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.



- (A) Switch ASSY
- (B) Plunger

3) Remove both through-bolts and brush holder screws, and detach rear bracket and brush holder.

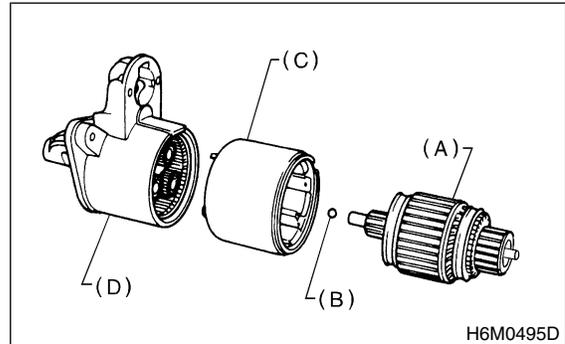


- (A) Rear bracket
- (B) Brush holder

4) Remove armature and yoke. Ball used as a bearing will then be removed from the end of armature.

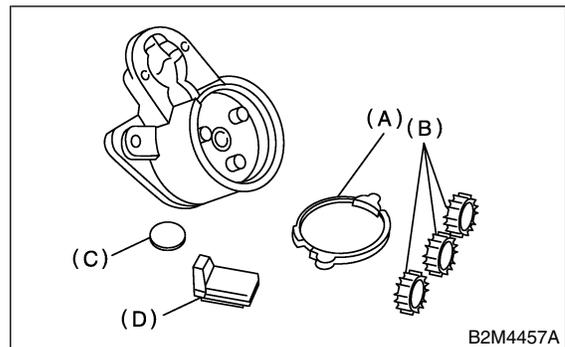
**CAUTION:**

Be sure to mark an alignment mark on yoke and front bracket before removing yoke.



- (A) Armature
- (B) Ball
- (C) Yoke
- (D) Front bracket

5) Remove packing A, three planetary gears, packing B and plate.



- (A) Packing A
- (B) Planetary gear
- (C) Plate
- (D) Packing B

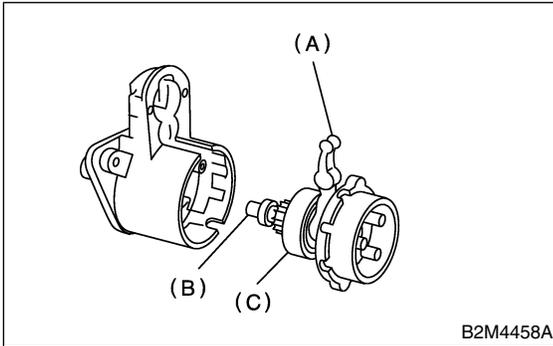
# STARTER

## Starting/Charging Systems

6) Remove shaft assembly and overrunning clutch as a unit.

### CAUTION:

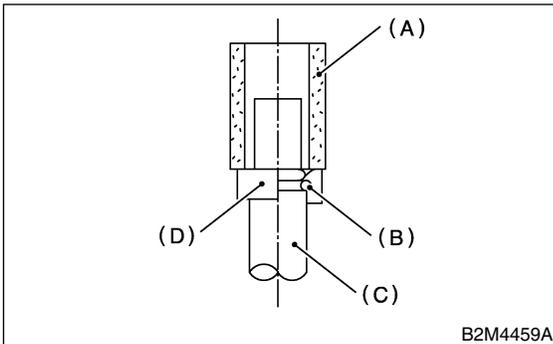
Record the direction of lever before removing.



- (A) Lever
- (B) Shaft ASSY
- (C) Overrunning clutch

7) Remove overrunning clutch from shaft assembly as follows:

- (1) Remove stopper from ring by lightly tapping a fit tool placed on stopper.
- (2) Remove ring, stopper and clutch from shaft.



- (A) Tool
- (B) Ring
- (C) Shaft
- (D) Stopper

## D: ASSEMBLY S149012A02

Assemble in the reverse order of disassembly. Do the following:

- 1) Carefully assemble all parts in the order of assembly and occasionally inspect nothing has been overlooked.
- 2) Apply grease to the following parts during assembly.

### Grease:

**ESSO BEACON 325**  
**SHELL ALVANIA GREASE RA**  
or equivalent

- Front and rear bracket sleeve bearing
  - Armature shaft gear
  - Outer periphery of plunger
  - Mating surface of plunger and lever
  - Gear shaft splines
  - Mating surface of lever and clutch
  - Ball at the armature shaft end
  - Internal and planetary gears
- 3) After assembling parts correctly, make sure starter operates properly.

## E: INSPECTION S149012A10

### 1. ARMATURE S149012A1001

1) Check commutator for any sign of burns or rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.

2) Run-out test

Check the commutator run-out and replace if it exceeds the limit.

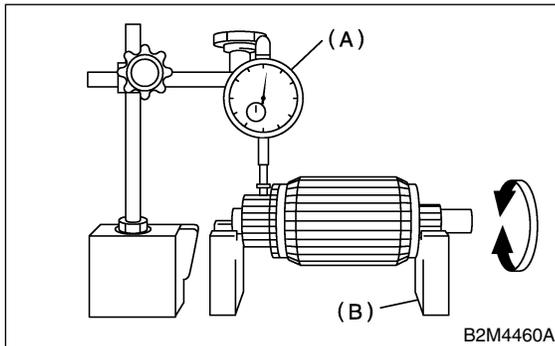
#### Commutator run-out:

##### Standard

**0.05 mm (0.0020 in), or less**

##### Service limit

**Less than 0.10 mm (0.0039 in)**



(A) Dial gauge  
(B) Block

3) Depth of segment mold

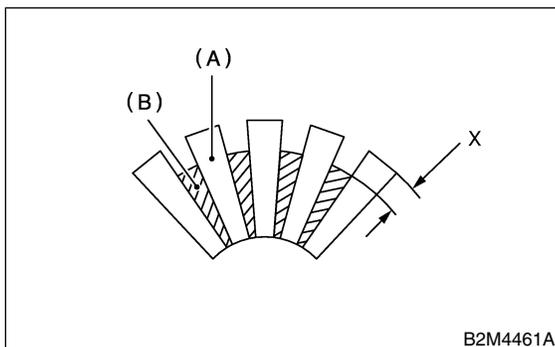
Check the depth of segment mold.

#### Depth of segment mold X:

**0.6 mm (0.024 in)**

##### Limit

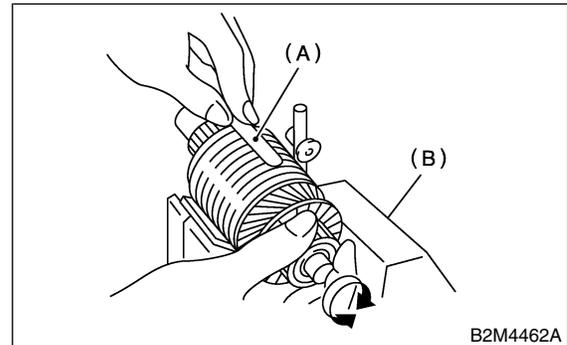
**0.2 mm (0.008 in)**



(A) Segment  
(B) Mold

4) Armature short-circuit test

Check armature for short-circuit by placing it on growler tester. Hold a hacksaw blade against armature core while slowly rotating armature. A short-circuited armature will cause the blade to vibrate and to be attracted to core. If the hacksaw blade is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.

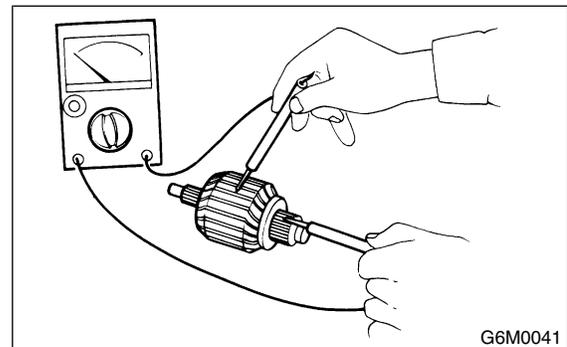


(A) Iron sheet  
(B) Growler tester

5) Armature ground test

Using circuit tester, touch one probe to the commutator segment and the other to shaft. There should be resistance of 1 MΩ or more. If resistance is 1 Ω or less, armature is grounded.

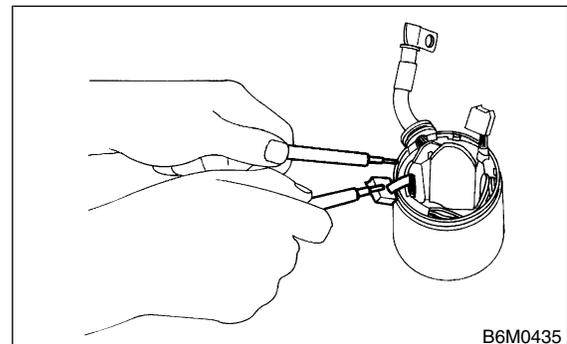
Replace armature if it is grounded.



G6M0041

### 2. YOKE S149012A1002

Make sure pole is set in position.



B6M0435

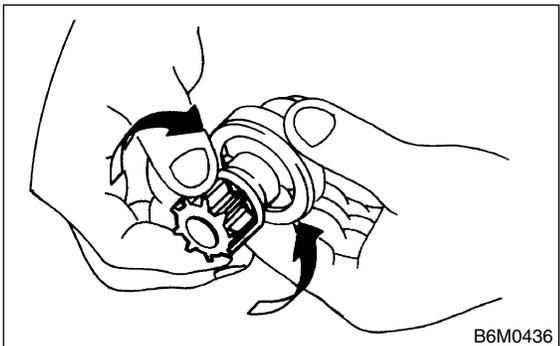
# STARTER

## 3. OVERRUNNING CLUTCH S149012A1003

Inspect teeth of pinion for wear and damage. Replace if it is damaged. Rotate pinion in direction of rotation (clockwise). It should rotate smoothly. But in opposite direction, it should be locked.

### CAUTION:

Do not clean overrunning clutch with oil to prevent grease from flowing out.



## 4. BRUSH AND BRUSH HOLDER S149012A1004

### 1) Brush length

Measure the brush length and replace if it exceeds the service limit.

Replace if abnormal wear or cracks are noticed.

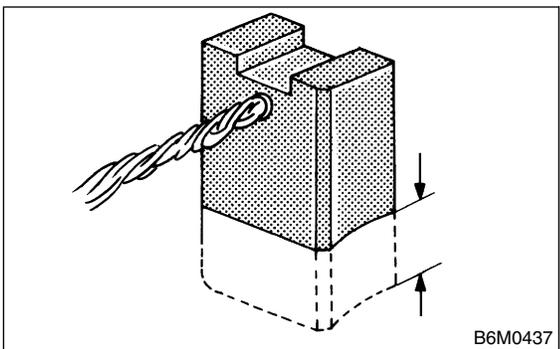
### Brush length:

#### Standard

17.0 mm (0.669 in)

#### Service limit

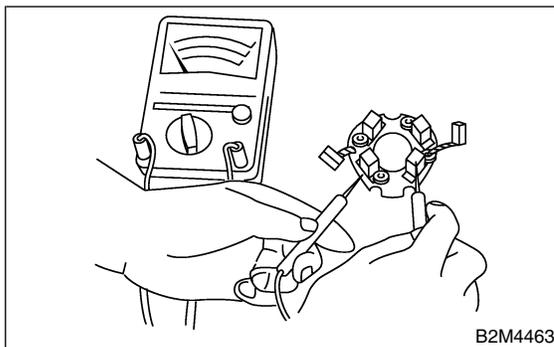
11.5 mm (0.453 in)



### 2) Brush movement

Be sure brush moves smoothly inside brush holder.

3) Insulation resistance of brush holder  
Be sure there is resistance of 1 MΩ or more between brush holder and its plate.



## 5. MAGNETIC SWITCH S149012A1005

### CAUTION:

- The following magnetic switch tests should be performed with specified voltage applied.
- Each test should be conducted within 3 to 5 seconds. Power to be furnished should be one-half the rated voltage.

## 6. SWITCH ASSEMBLY S149012A1006

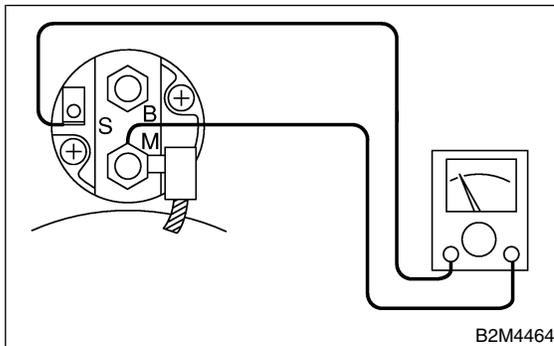
Be sure there is resistance of 1 Ω or less between terminals S and M, and between terminal S and ground. Use a circuit tester (set in "ohm"). Also check to be sure resistance is 1 MΩ or more between terminal M and B.

### Terminal / Specified resistance:

S — M / 1Ω or less

S — Ground / 1Ω or less

M — B / 1 MΩ or more



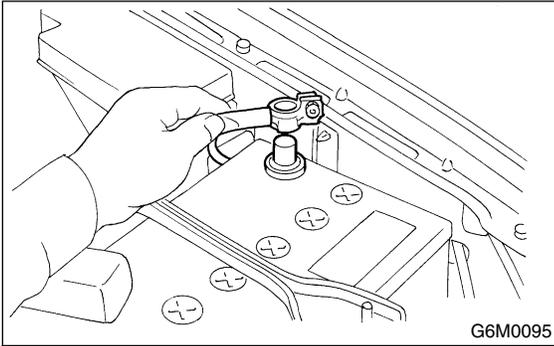
# STARTER

Starting/Charging Systems

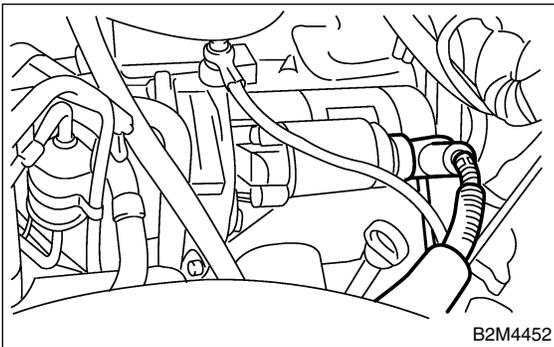
## 2. Starter S149012

### A: REMOVAL S149012A18

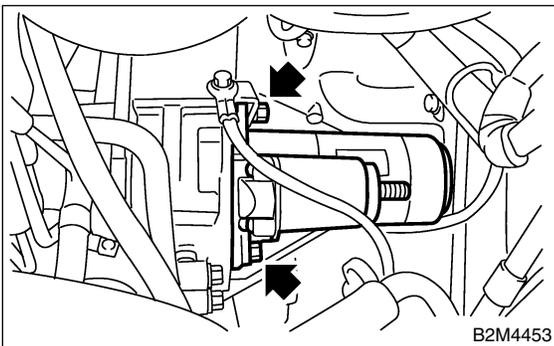
- 1) Disconnect battery ground cable.



- 2) Remove air intake chamber. <Ref. to IN(H6)-6, REMOVAL, Air Intake Chamber.>
- 3) Disconnect connector and terminal from starter.



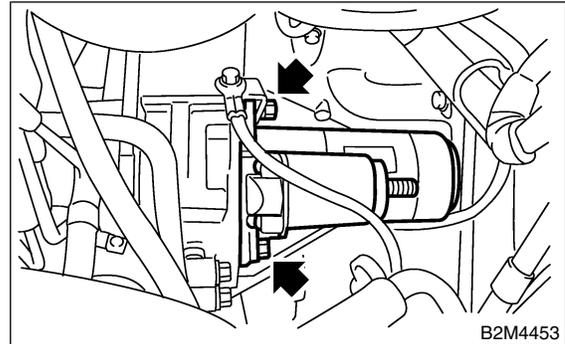
- 4) Remove starter from transmission.



### B: INSTALLATION S149012A11

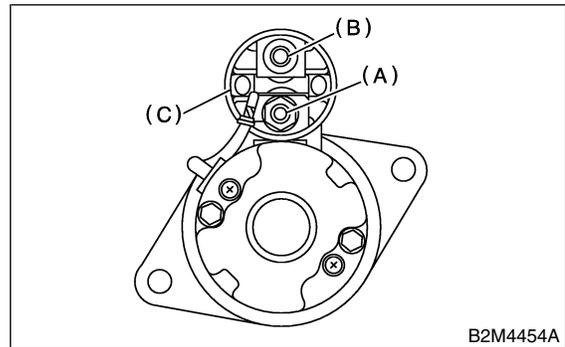
Install in the reverse order of removal.

**Tightening torque:**  
**50 N·m (5.1 kgf-m, 37 ft-lb)**



### C: DISASSEMBLY S149012A06

- 1) Loosen nut which holds terminal M of switch assembly, and disconnect connector.



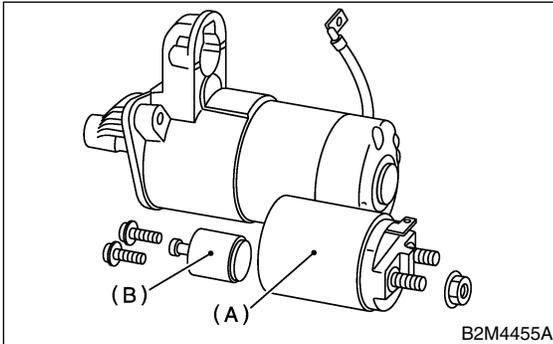
- (A) Terminal M
- (B) Terminal B
- (C) Terminal S

# STARTER

2) Remove bolts which hold switch assembly, and remove switch assembly, plunger and plunger spring from starter as a unit.

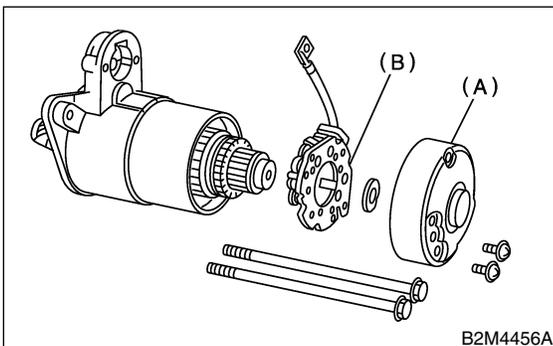
**CAUTION:**

Be careful because pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.



- (A) Switch ASSY
- (B) Plunger

3) Remove both through-bolts and brush holder screws, and detach rear bracket and brush holder.

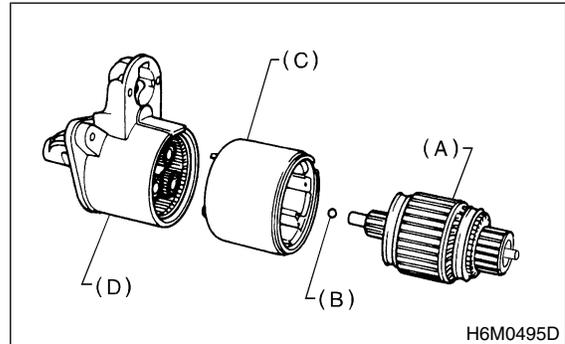


- (A) Rear bracket
- (B) Brush holder

4) Remove armature and yoke. Ball used as a bearing will then be removed from the end of armature.

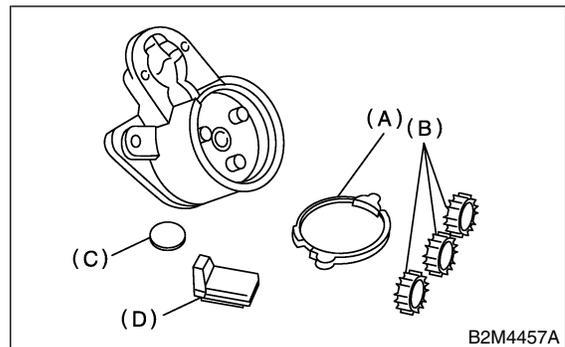
**CAUTION:**

Be sure to mark an alignment mark on yoke and front bracket before removing yoke.



- (A) Armature
- (B) Ball
- (C) Yoke
- (D) Front bracket

5) Remove packing A, three planetary gears, packing B and plate.



- (A) Packing A
- (B) Planetary gear
- (C) Plate
- (D) Packing B

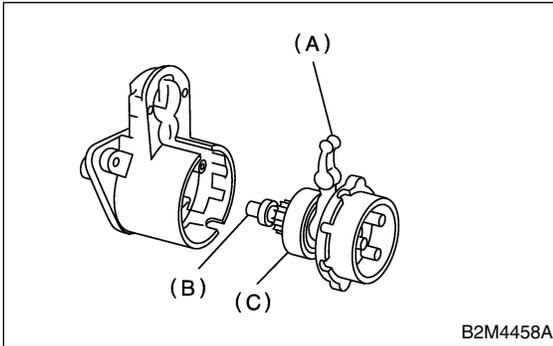
# STARTER

## Starting/Charging Systems

6) Remove shaft assembly and overrunning clutch as a unit.

### CAUTION:

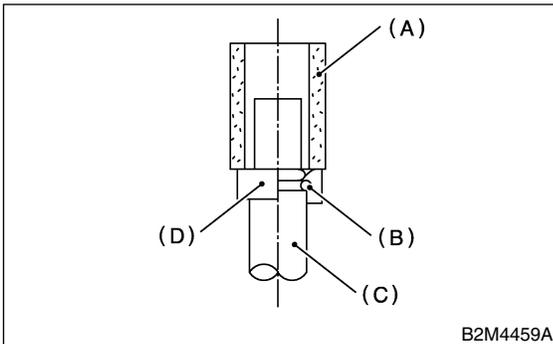
Record the direction of lever before removing.



- (A) Lever
- (B) Shaft ASSY
- (C) Overrunning clutch

7) Remove overrunning clutch from shaft assembly as follows:

- (1) Remove stopper from ring by lightly tapping a fit tool placed on stopper.
- (2) Remove ring, stopper and clutch from shaft.



- (A) Tool
- (B) Ring
- (C) Shaft
- (D) Stopper

## D: ASSEMBLY S149012A02

Assemble in the reverse order of disassembly. Do the following:

- 1) Carefully assemble all parts in the order of assembly and occasionally inspect nothing has been overlooked.
- 2) Apply grease to the following parts during assembly.

### Grease:

**ESSO BEACON 325**  
**SHELL ALVANIA GREASE RA**  
or equivalent

- Front and rear bracket sleeve bearing
  - Armature shaft gear
  - Outer periphery of plunger
  - Mating surface of plunger and lever
  - Gear shaft splines
  - Mating surface of lever and clutch
  - Ball at the armature shaft end
  - Internal and planetary gears
- 3) After assembling parts correctly, make sure starter operates properly.

## E: INSPECTION S149012A10

### 1. ARMATURE S149012A1001

1) Check commutator for any sign of burns or rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.

2) Run-out test

Check the commutator run-out and replace if it exceeds the limit.

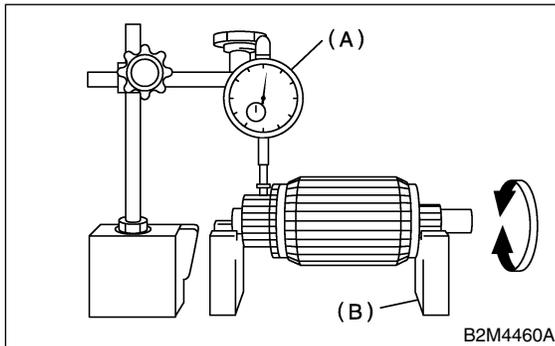
#### Commutator run-out:

##### Standard

**0.05 mm (0.0020 in), or less**

##### Service limit

**Less than 0.10 mm (0.0039 in)**



(A) Dial gauge  
(B) Block

3) Depth of segment mold

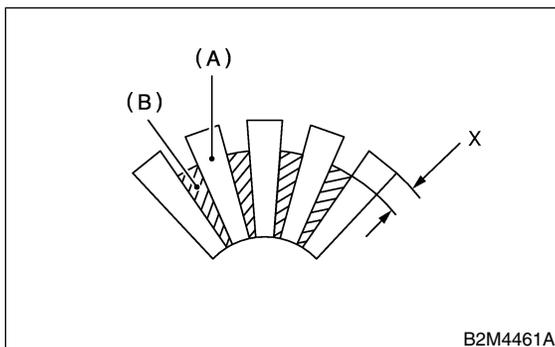
Check the depth of segment mold.

#### Depth of segment mold X:

**0.6 mm (0.024 in)**

#### Limit

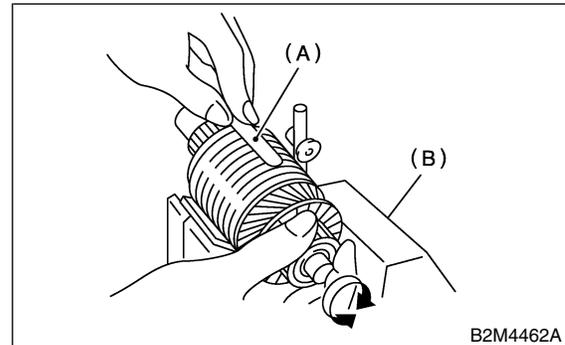
**0.2 mm (0.008 in)**



(A) Segment  
(B) Mold

4) Armature short-circuit test

Check armature for short-circuit by placing it on growler tester. Hold a hacksaw blade against armature core while slowly rotating armature. A short-circuited armature will cause the blade to vibrate and to be attracted to core. If the hacksaw blade is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.

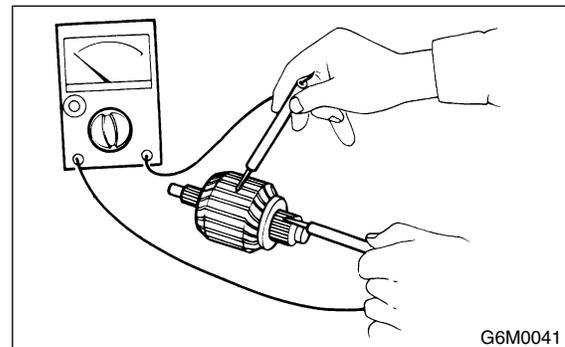


(A) Iron sheet  
(B) Growler tester

5) Armature ground test

Using circuit tester, touch one probe to the commutator segment and the other to shaft. There should be resistance of 1 MΩ or more. If resistance is 1 Ω or less, armature is grounded.

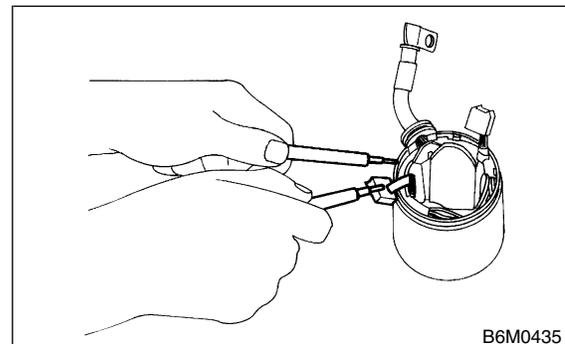
Replace armature if it is grounded.



G6M0041

### 2. YOKE S149012A1002

Make sure pole is set in position.



B6M0435

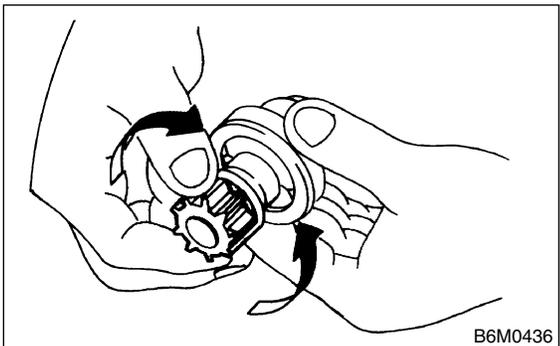
# STARTER

## 3. OVERRUNNING CLUTCH S149012A1003

Inspect teeth of pinion for wear and damage. Replace if it is damaged. Rotate pinion in direction of rotation (clockwise). It should rotate smoothly. But in opposite direction, it should be locked.

### CAUTION:

Do not clean overrunning clutch with oil to prevent grease from flowing out.



## 4. BRUSH AND BRUSH HOLDER S149012A1004

### 1) Brush length

Measure the brush length and replace if it exceeds the service limit.

Replace if abnormal wear or cracks are noticed.

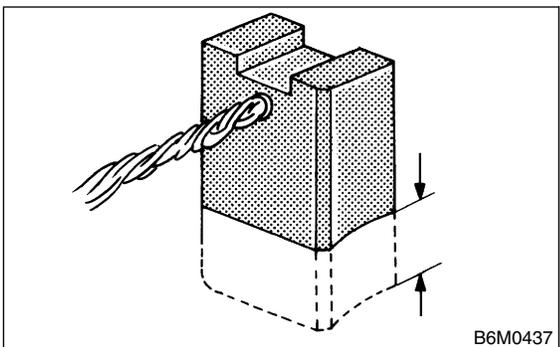
### Brush length:

#### Standard

17.0 mm (0.669 in)

#### Service limit

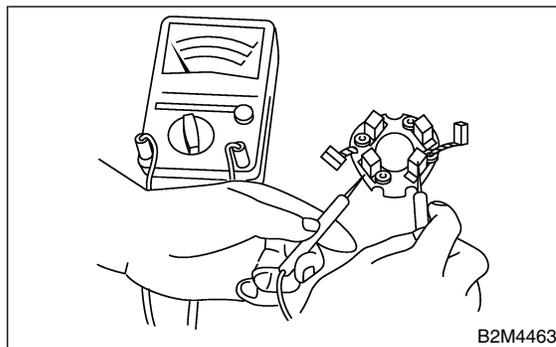
11.5 mm (0.453 in)



### 2) Brush movement

Be sure brush moves smoothly inside brush holder.

3) Insulation resistance of brush holder  
Be sure there is resistance of 1 MΩ or more between brush holder and its plate.



## 5. MAGNETIC SWITCH S149012A1005

### CAUTION:

- The following magnetic switch tests should be performed with specified voltage applied.
- Each test should be conducted within 3 to 5 seconds. Power to be furnished should be one-half the rated voltage.

## 6. SWITCH ASSEMBLY S149012A1006

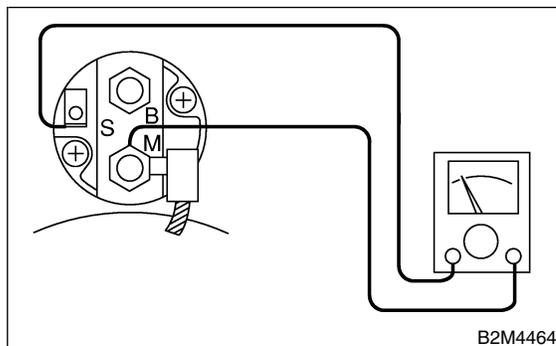
Be sure there is resistance of 1 Ω or less between terminals S and M, and between terminal S and ground. Use a circuit tester (set in "ohm"). Also check to be sure resistance is 1 MΩ or more between terminal M and B.

### Terminal / Specified resistance:

S — M / 1Ω or less

S — Ground / 1Ω or less

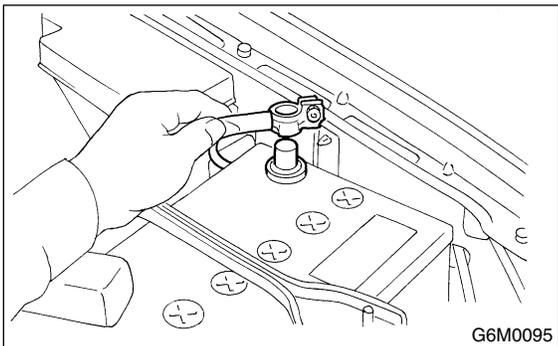
M — B / 1 MΩ or more



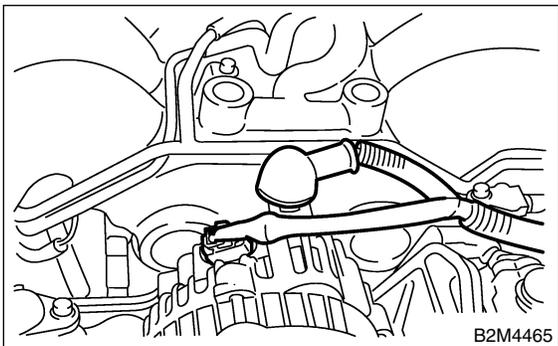
## 3. Generator S149008

### A: REMOVAL S149008A18

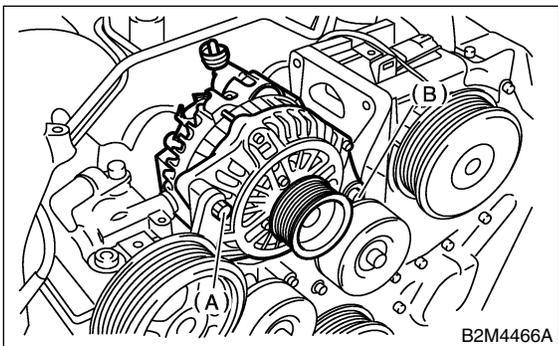
- 1) Disconnect battery ground cable.



- 2) Disconnect connector and terminal from generator.

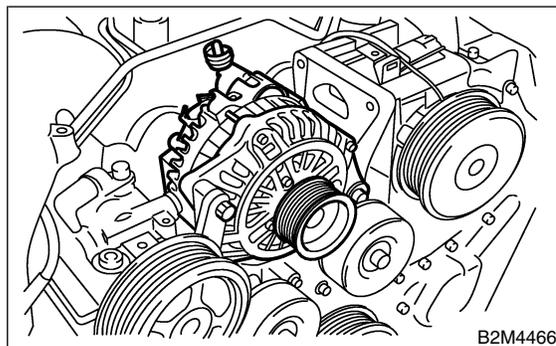


- 3) Remove V-belt. <Ref. to ME(H6)-29, REMOVE, V-belt.>
- 4) Remove bolt (A), and loosen bolt (B). Then, remove generator from bracket.



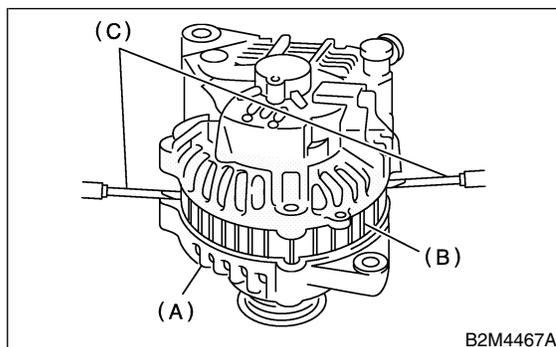
### B: INSTALLATION S149008A11

Install in the reverse order of removal.



### C: DISASSEMBLY S149008A06

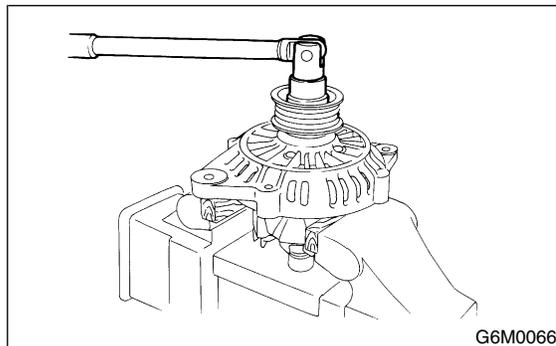
- 1) Remove the four through-bolts. Then insert the tip of a flat-head screwdriver into the gap between the stator and front bracket. Pry them apart to disassemble.



- (A) Front cover
- (B) Stator
- (C) Screwdriver

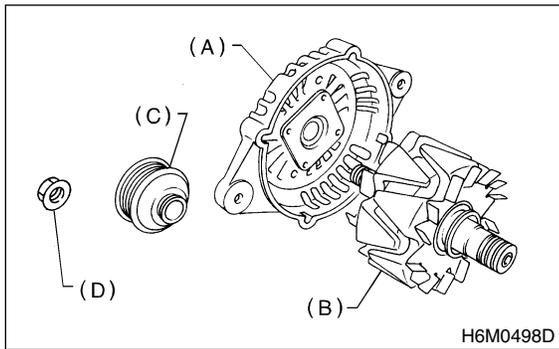
- 2) Hold rotor with a vise and remove pulley nut.

**CAUTION:**  
When holding rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of the vise to prevent rotor from damage.



# GENERATOR

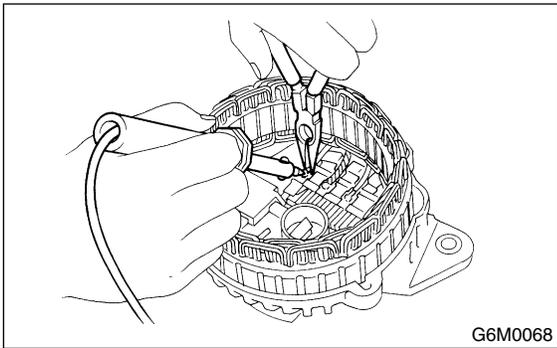
## Starting/Charging Systems



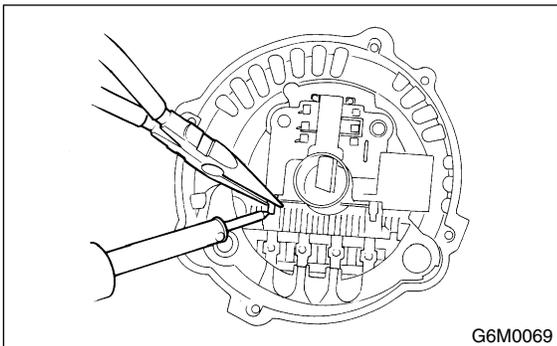
- (A) Front bracket
- (B) Rotor
- (C) Pulley
- (D) Nut

3) Unsolder connection between rectifier and stator coil to remove stator coil.

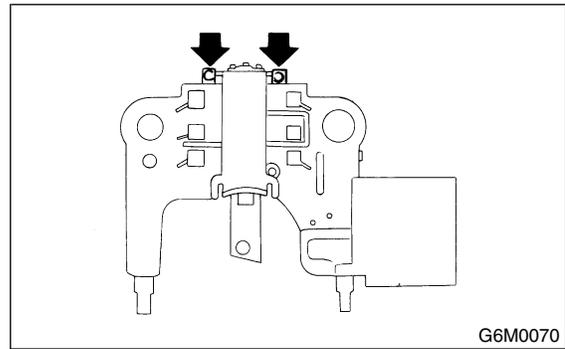
**CAUTION:**  
Finish the work rapidly (less than three seconds) because the rectifier cannot withstand heat very well.



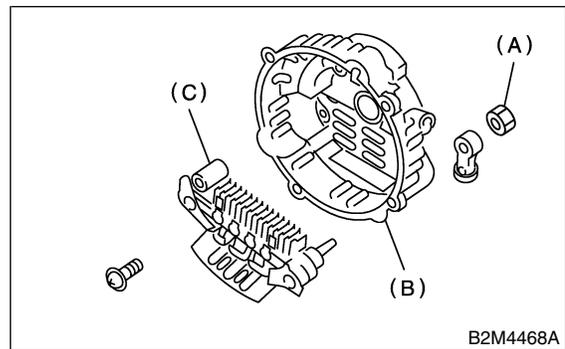
4) Remove screws which secure IC regulator to rear cover, and unsolder connection between IC regulator and rectifier to remove IC regulator.



5) Remove the brushes by unsoldering at the pig-tails.



6) Remove the nut and insulating bushing at terminal B, and remove rectifier.



- (A) Nut
- (B) Rear cover
- (C) Rectifier

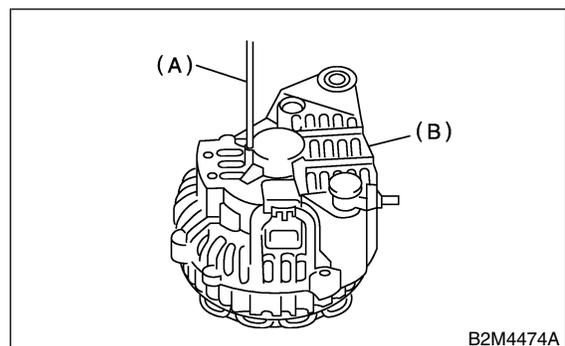
## D: ASSEMBLY S149008A02

Assemble in the reverse order of disassembly.

1) Pulling up brush

Before assembling, press the brush down into the brush holder with your finger and secure in that position by passing a [2 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire (A) through the hole shown in the figure.

**CAUTION:**  
Be sure to remove the wire after reassembly.



- (A) Wire
- (B) Rear cover

2) Heat the bearing box in the rear bracket [50 to 60°C (122 to 140°F)] and press the rear bearing into the rear bracket.

**CAUTION:**

**Grease should not be applied for the rear bearing. Remove oil completely if it is found on the bearing box.**

3) After reassembly, turn the pulley by hand to check that the rotor turns smoothly.

**E: INSPECTION** S149008A10

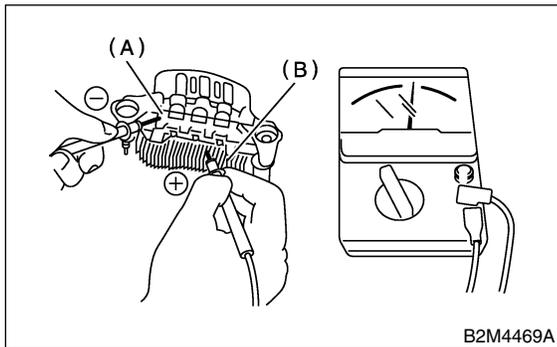
**1. DIODE** S149008A1001

**CAUTION:**

**Never use a megatester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.**

1) Checking positive diode

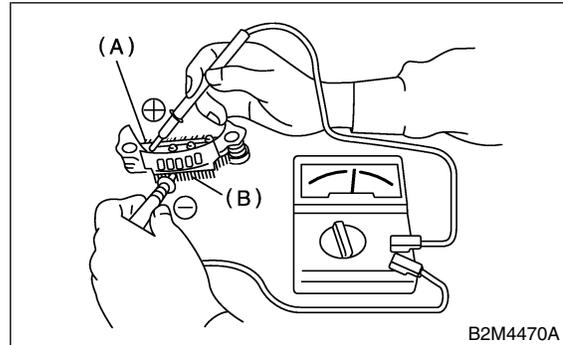
Check for resistance of 1 Ω or less between the diode lead and the positive side heat sink. The positive diode is in good condition if resistance is 1 Ω or less only in the direction from the diode lead to the heat sink.



(A) Diode lead  
(B) Heat sink (Positive side)

2) Checking negative diode

Check for resistance of 1 Ω or less between the negative side heat sink and diode lead. The negative diode is in good condition if resistance is 1 Ω or less only in the direction from the heat sink to the diode lead.



(A) Diode lead  
(B) Heat sink (Negative side)

**2. ROTOR** S149008A1002

1) Slip ring surface

Inspect slip rings for contamination or any roughness of the sliding surface. Repair slip ring surface using a lathe or sand paper.

2) Slip ring outer diameter

Measure slip ring outer diameter. If slip ring is worn, replace rotor assembly.

**Slip ring outer diameter:**

**Standard**

**22.7 mm (0.894 in)**

**Limit**

**22.1 mm (0.870 in)**

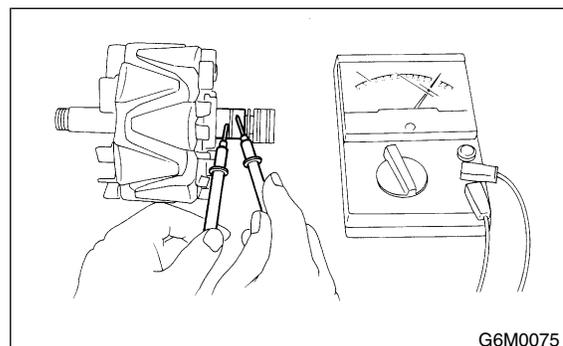
3) Continuity test

Check resistance between slip rings using circuit tester.

If the resistance is not within specification, replace rotor assembly.

**Specified resistance:**

**Approx. 2.7 — 3.2 Ω**

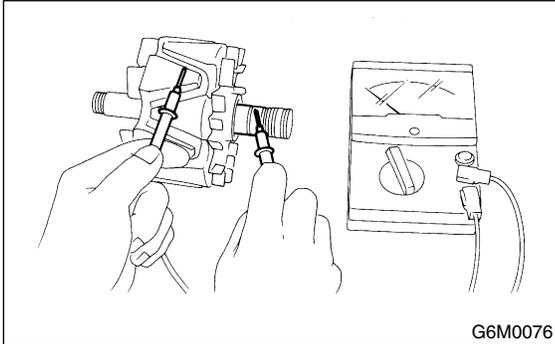


# GENERATOR

## Starting/Charging Systems

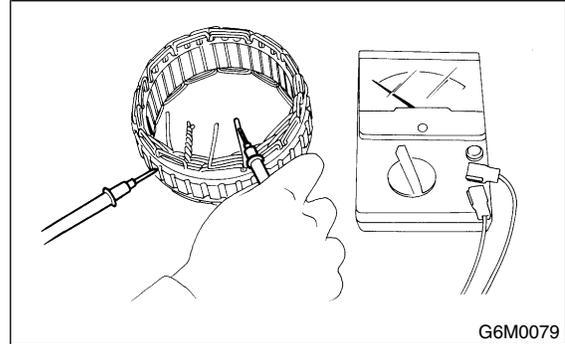
### 4) Insulation test

Check resistance is  $1\ \Omega$  or less between slip ring and rotor core or shaft. If resistance is  $1\ \Omega$  or less, the rotor coil is grounded, and so replace rotor assembly.



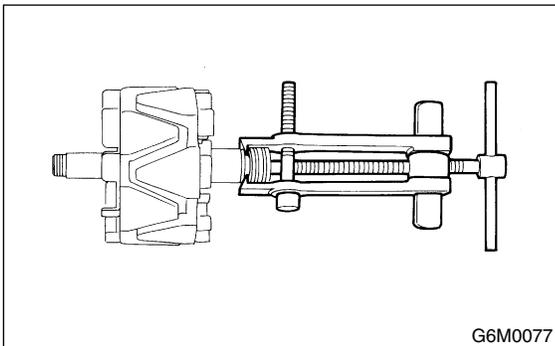
### 2) Insulation test

Inspect stator coil resistance is  $1\ \Omega$  or less between stator core and each end of the lead wire. If resistance is  $1\ \Omega$  or less, the stator coil is grounded, and so replace stator assembly.



### 5) Ball bearing (rear side)

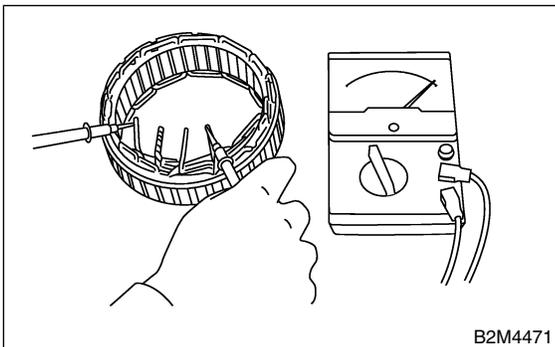
- (1) Check rear ball bearing. Replace if it is noisy or if rotor does not turn smoothly.
- (2) The rear bearing can be removed by using common bearing puller.



## 3. STATOR S149008A1003

### 1) Continuity test

Inspect stator coil resistance is  $1\ \Omega$  or less between each end of the lead wires. If resistance is  $1\ M\Omega$  or more between individual lead wires, the lead wire is broken, and so replace stator assembly.



## 4. BRUSH S149008A1004

- 1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

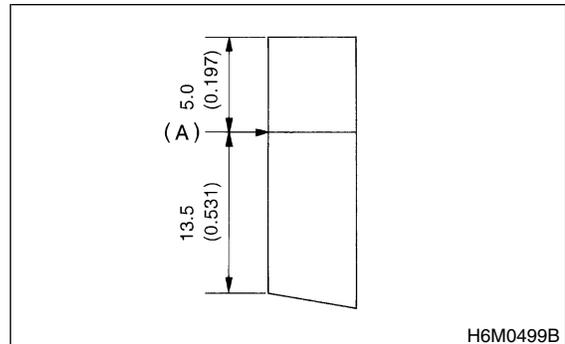
### Brush length:

#### Standard

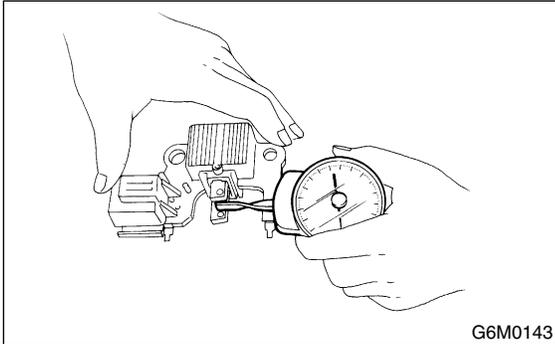
18.5 mm (0.728 in)

#### Service limit

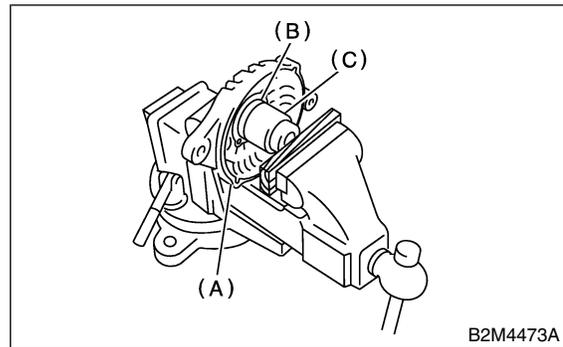
5.0 mm (0.197 in)



2) Checking brush spring for proper pressure  
Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of the brush spring. If the pressure is less than 2.648 N (270 g, 9.52 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.609 to 5.786 N (470 to 590 g, 16.58 to 20.81 oz).



(3) Set a new bearing and closely install a fit tool on the bearing outer race. Press the bearing down into place with a hand press or vise. A socket wrench can serve as the tool.  
(4) Install front bearing retainer.



- (A) Front bracket
- (B) Bearing
- (C) Socket wrench

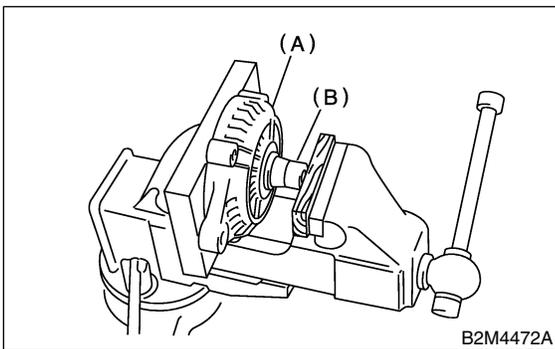
## 5. BEARING (FRONT SIDE) S149008A1005

1) Check front ball bearing. If resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

2) Replacing front bearing

(1) Remove front bearing retainer.

(2) Closely install a fit tool on the bearing inner race. Press the bearing down out of front bracket with a hand press or vise. A socket wrench can serve as the tool.

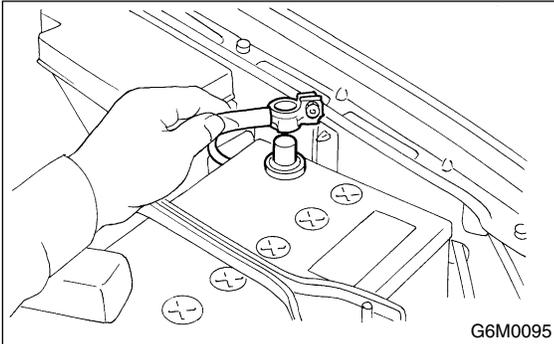


- (A) Front bracket
- (B) Socket wrench

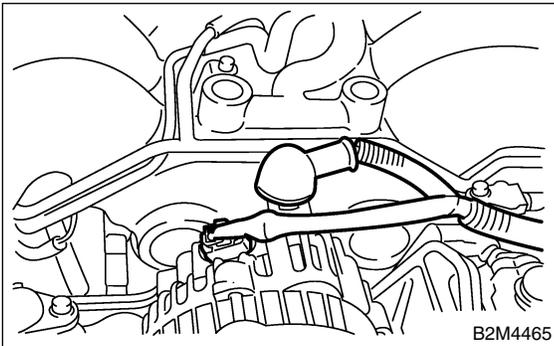
## 3. Generator S149008

### A: REMOVAL S149008A18

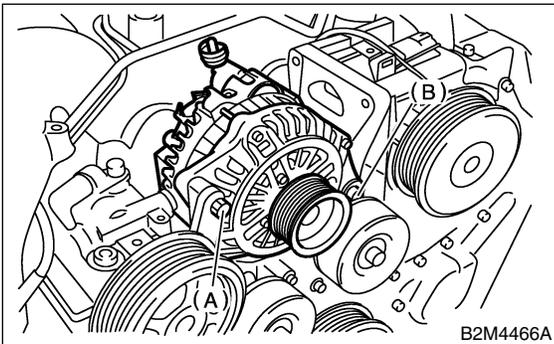
- 1) Disconnect battery ground cable.



- 2) Disconnect connector and terminal from generator.

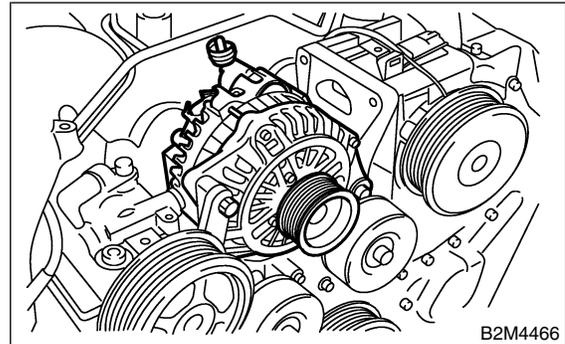


- 3) Remove V-belt. <Ref. to ME(H6)-29, REMOVE, V-belt.>
- 4) Remove bolt (A), and loosen bolt (B). Then, remove generator from bracket.



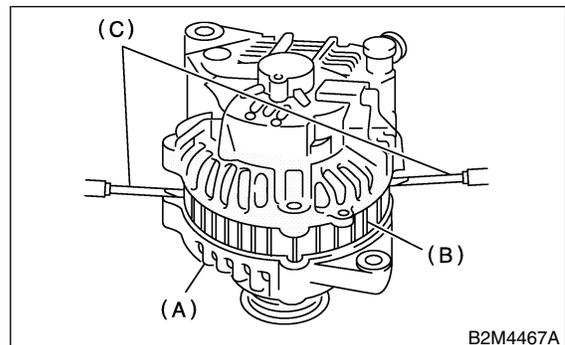
### B: INSTALLATION S149008A11

Install in the reverse order of removal.



### C: DISASSEMBLY S149008A06

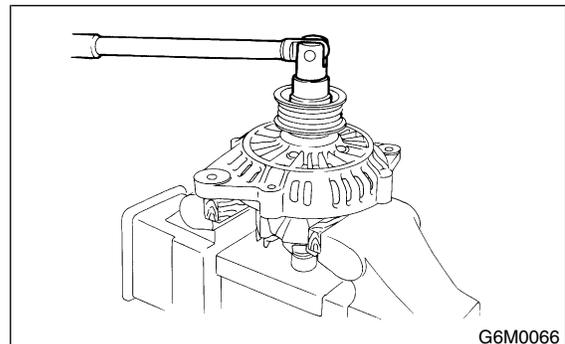
- 1) Remove the four through-bolts. Then insert the tip of a flat-head screwdriver into the gap between the stator and front bracket. Pry them apart to disassemble.



- (A) Front cover
- (B) Stator
- (C) Screwdriver

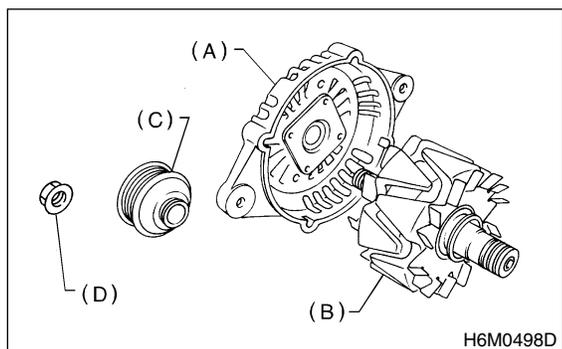
- 2) Hold rotor with a vise and remove pulley nut.

**CAUTION:**  
When holding rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of the vise to prevent rotor from damage.



# GENERATOR

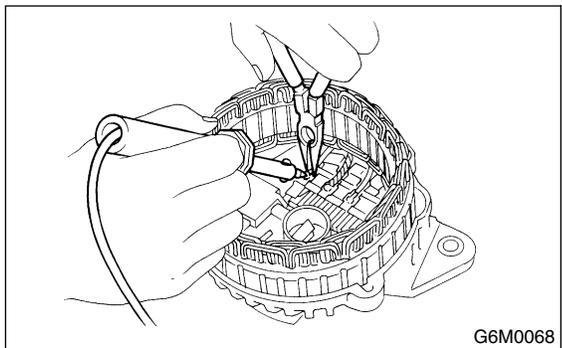
## Starting/Charging Systems



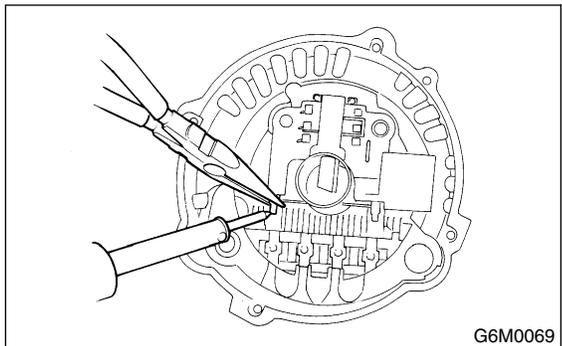
- (A) Front bracket
- (B) Rotor
- (C) Pulley
- (D) Nut

3) Unsolder connection between rectifier and stator coil to remove stator coil.

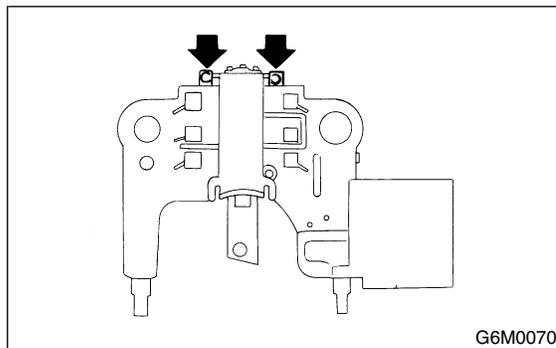
**CAUTION:**  
Finish the work rapidly (less than three seconds) because the rectifier cannot withstand heat very well.



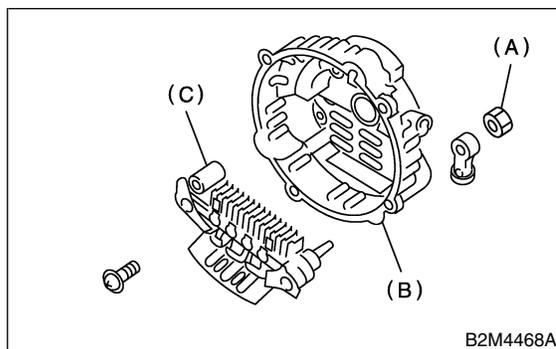
4) Remove screws which secure IC regulator to rear cover, and unsolder connection between IC regulator and rectifier to remove IC regulator.



5) Remove the brushes by unsoldering at the pig-tails.



6) Remove the nut and insulating bushing at terminal B, and remove rectifier.



- (A) Nut
- (B) Rear cover
- (C) Rectifier

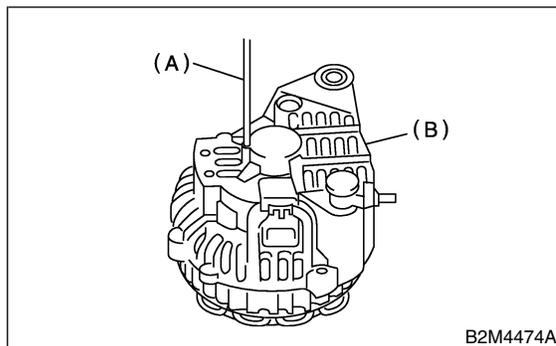
## D: ASSEMBLY S149008A02

Assemble in the reverse order of disassembly.

1) Pulling up brush

Before assembling, press the brush down into the brush holder with your finger and secure in that position by passing a [2 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire (A) through the hole shown in the figure.

**CAUTION:**  
Be sure to remove the wire after reassembly.



- (A) Wire
- (B) Rear cover

2) Heat the bearing box in the rear bracket [50 to 60°C (122 to 140°F)] and press the rear bearing into the rear bracket.

**CAUTION:**

**Grease should not be applied for the rear bearing. Remove oil completely if it is found on the bearing box.**

3) After reassembly, turn the pulley by hand to check that the rotor turns smoothly.

**E: INSPECTION** S149008A10

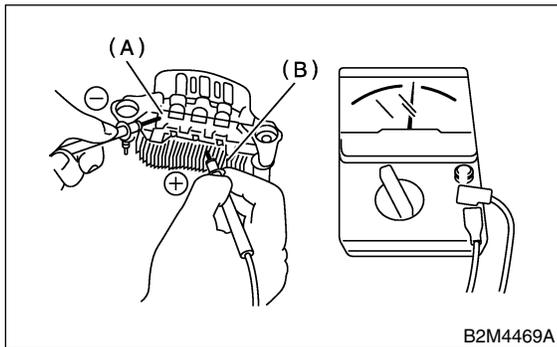
**1. DIODE** S149008A1001

**CAUTION:**

**Never use a megatester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.**

1) Checking positive diode

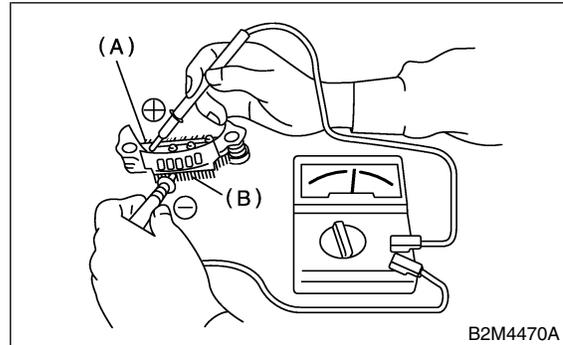
Check for resistance of 1 Ω or less between the diode lead and the positive side heat sink. The positive diode is in good condition if resistance is 1 Ω or less only in the direction from the diode lead to the heat sink.



(A) Diode lead  
(B) Heat sink (Positive side)

2) Checking negative diode

Check for resistance of 1 Ω or less between the negative side heat sink and diode lead. The negative diode is in good condition if resistance is 1 Ω or less only in the direction from the heat sink to the diode lead.



(A) Diode lead  
(B) Heat sink (Negative side)

**2. ROTOR** S149008A1002

1) Slip ring surface

Inspect slip rings for contamination or any roughness of the sliding surface. Repair slip ring surface using a lathe or sand paper.

2) Slip ring outer diameter

Measure slip ring outer diameter. If slip ring is worn, replace rotor assembly.

**Slip ring outer diameter:**

**Standard**

**22.7 mm (0.894 in)**

**Limit**

**22.1 mm (0.870 in)**

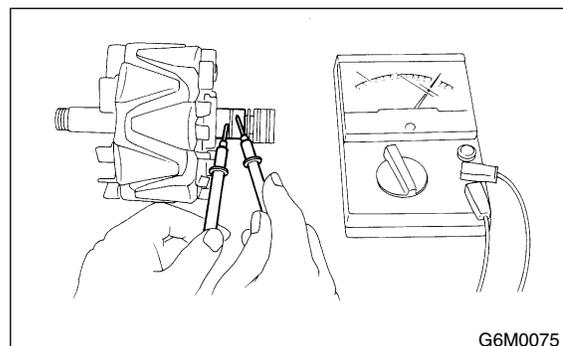
3) Continuity test

Check resistance between slip rings using circuit tester.

If the resistance is not within specification, replace rotor assembly.

**Specified resistance:**

**Approx. 2.7 — 3.2 Ω**

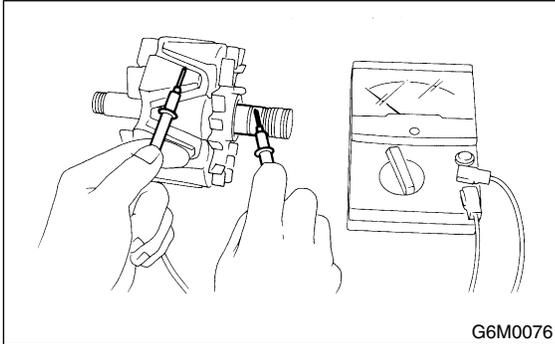


# GENERATOR

## Starting/Charging Systems

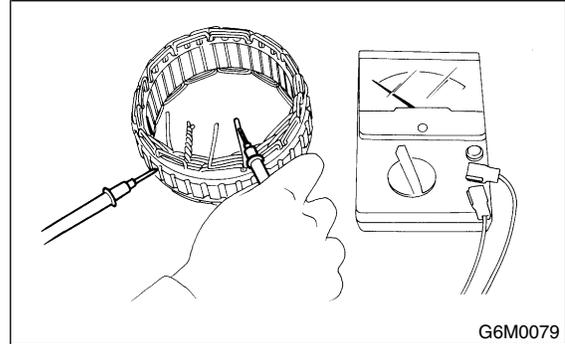
### 4) Insulation test

Check resistance is  $1\ \Omega$  or less between slip ring and rotor core or shaft. If resistance is  $1\ \Omega$  or less, the rotor coil is grounded, and so replace rotor assembly.



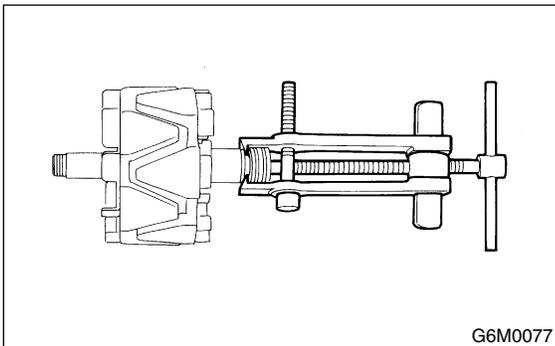
### 2) Insulation test

Inspect stator coil resistance is  $1\ \Omega$  or less between stator core and each end of the lead wire. If resistance is  $1\ \Omega$  or less, the stator coil is grounded, and so replace stator assembly.



### 5) Ball bearing (rear side)

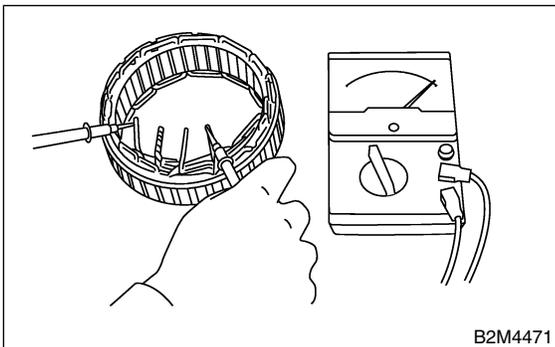
- (1) Check rear ball bearing. Replace if it is noisy or if rotor does not turn smoothly.
- (2) The rear bearing can be removed by using common bearing puller.



## 3. STATOR S149008A1003

### 1) Continuity test

Inspect stator coil resistance is  $1\ \Omega$  or less between each end of the lead wires. If resistance is  $1\ M\Omega$  or more between individual lead wires, the lead wire is broken, and so replace stator assembly.



## 4. BRUSH S149008A1004

- 1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

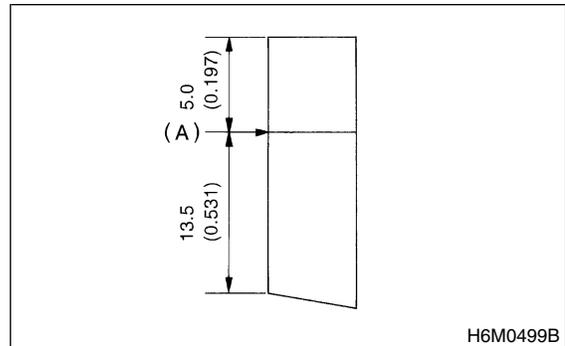
### Brush length:

#### Standard

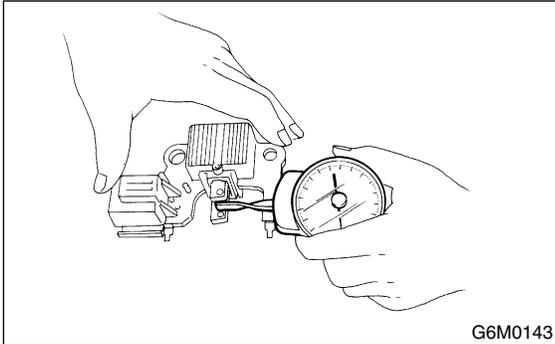
18.5 mm (0.728 in)

#### Service limit

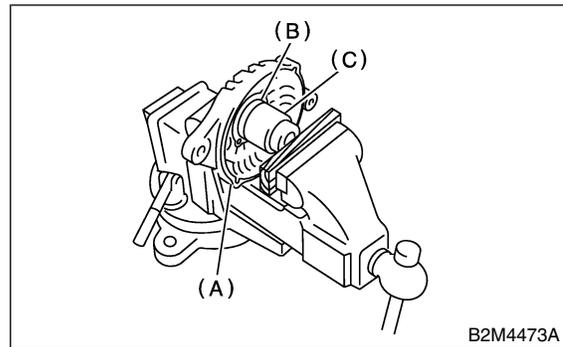
5.0 mm (0.197 in)



2) Checking brush spring for proper pressure  
Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of the brush spring. If the pressure is less than 2.648 N (270 g, 9.52 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.609 to 5.786 N (470 to 590 g, 16.58 to 20.81 oz).



(3) Set a new bearing and closely install a fit tool on the bearing outer race. Press the bearing down into place with a hand press or vise. A socket wrench can serve as the tool.  
(4) Install front bearing retainer.



- (A) Front bracket
- (B) Bearing
- (C) Socket wrench

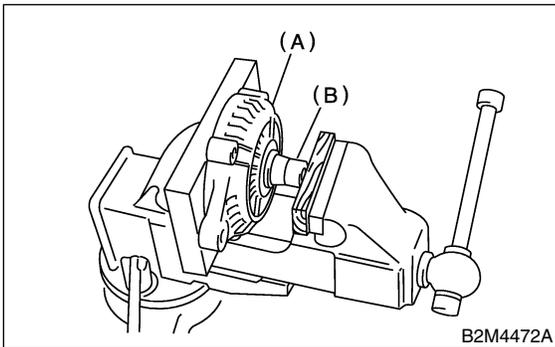
## 5. BEARING (FRONT SIDE) S149008A1005

1) Check front ball bearing. If resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

2) Replacing front bearing

(1) Remove front bearing retainer.

(2) Closely install a fit tool on the bearing inner race. Press the bearing down out of front bracket with a hand press or vise. A socket wrench can serve as the tool.



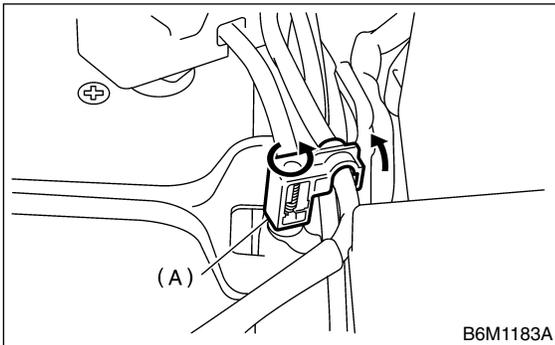
- (A) Front bracket
- (B) Socket wrench

# BATTERY

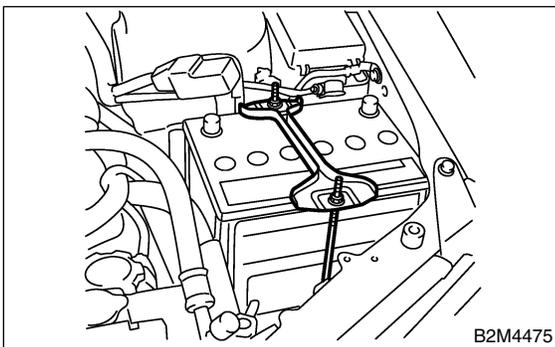
## 4. Battery S149011

### A: REMOVAL S149011A18

- 1) Remove battery cable holder (A) from battery rod.



- 2) Disconnect the positive (+) terminal after disconnecting the negative (-) terminal of battery.
- 3) Remove flange nuts from battery rods and take off battery holder.



- 4) Remove battery.

### B: INSTALLATION S149011A11

Install in the reverse order of removal.

#### **Tightening torque:**

**3.4 N·m (0.35 kgf·m, 2.5 ft·lb)**

#### **NOTE:**

- Clean battery cable terminals and apply grease to retard the formation of corrosion.
- Connect the positive (+) terminal of battery and then the negative (-) terminal of the battery.

### C: INSPECTION S149011A10

#### **WARNING:**

- Electrolyte has toxicity; be careful handling the fluid.
- Avoid contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.
- Batteries produce explosive gasses. Keep sparks, flame, cigarettes away.
- Ventilate when charging or using in enclosed space.
- For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.
- Do not let battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.
- To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.

#### **1. EXTERNAL PARTS: S149011A1001**

Check for the existence of dirt or cracks on the battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.

Apply a thin coat of grease on the terminal posts to prevent corrosion.

#### **2. ELECTROLYTE LEVEL: S149011A1002**

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

#### **3. SPECIFIC GRAVITY OF ELECTROLYTE: S149011A1003**

1) Measure specific gravity of electrolyte using a hydrometer and a thermometer.

Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

$$S_{20} = St + 0.0007 \times (t - 20)$$

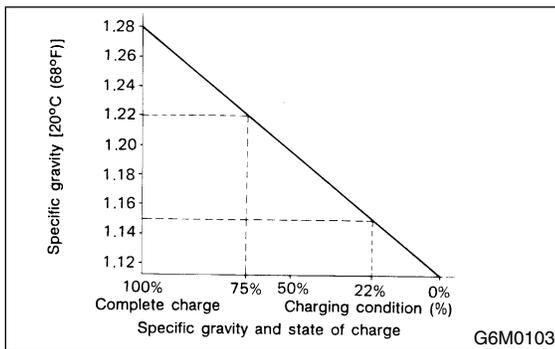
$S_{20}$ : Specific gravity corrected at electrolyte temperature of 20°C

$St$ : Measured specific gravity

$t$ : Measured temperature (°C)

Determine whether or not battery must be charged, according to corrected specific gravity.

Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



2) Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between the specific gravity and the state of charge is as shown in figure.

## D: MEASUREMENT S149011A14

### WARNING:

- Do not bring an open flame close to the battery at this time.

### CAUTION:

- Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
- Be careful since battery electrolyte overflows while charging the battery.
- Observe instructions when handling battery charger.
- Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

## 1. JUDGMENT OF BATTERY IN CHARGED CONDITION S149011A1401

1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.

2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

## 2. CHECK HYDROMETER FOR STATE OF CHARGE S149011A1402

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)

\*: Check electrical system before replacement.

## 3. NORMAL CHARGING S149011A1403

Charge the battery at current value specified by manufacturer or at approximately 1/10 of battery's ampere-hour rating.

## 4. QUICK CHARGING S149011A1404

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.

Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).

It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

### CAUTION:

- Observe the items in 1. NORMAL CHARGING.
- Never use more than 10 amperes when charging the battery because that will shorten battery life.

# BATTERY

Starting/Charging Systems

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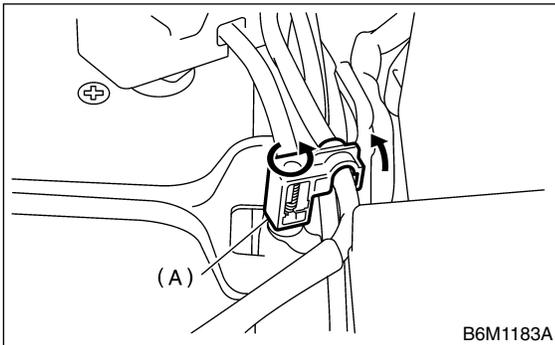
**MEMO:**

# BATTERY

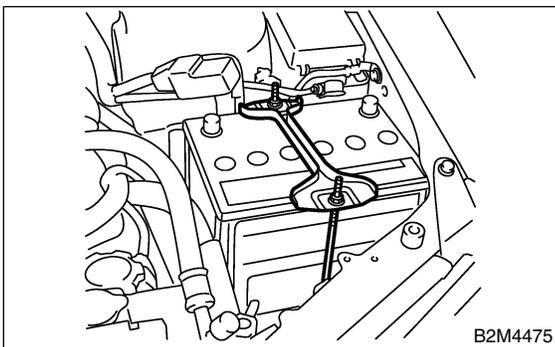
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- 4) Remove battery.

### B: INSTALLATION S149011A11

Install in the reverse order of removal.

#### **Tightening torque:**

**3.4 N·m (0.35 kgf·m, 2.5 ft·lb)**

#### **NOTE:**

- Clean battery cable terminals and apply grease to retard the formation of corrosion.
- Connect the positive (+) terminal of battery and then the negative (-) terminal of the battery.

### C: INSPECTION S149011A10

#### **WARNING:**

- Electrolyte has toxicity; be careful handling the fluid.
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- Batteries produce explosive gasses. Keep sparks, flame, cigarettes away.
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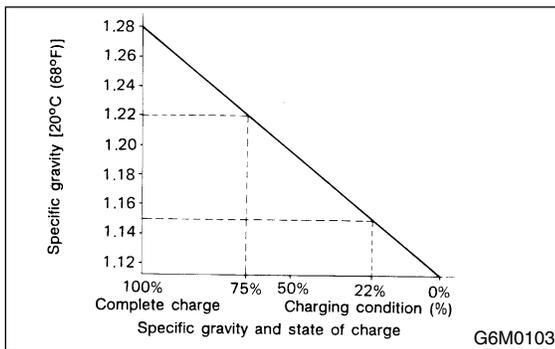
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## D: MEASUREMENT S149011A14

### WARNING:

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### CAUTION:

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- Be careful since battery electrolyte overflows while charging the battery.
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- Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

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### CAUTION:

- Observe the items in 1. NORMAL CHARGING.
- Never use more than 10 amperes when charging the battery because that will shorten battery life.

# BATTERY

Starting/Charging Systems

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**MEMO:**

# BASIC DIAGNOSTIC PROCEDURE

Engine (DIAGNOSTICS)

## 1. Basic Diagnostic Procedure

S048501

### A: PROCEDURE S048501E45

#### 1. ENGINE S048501E4501

No.	Step	Check	Yes	No
1	<b>CHECK ENGINE START FAILURE.</b> 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H6)-4, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step 2.	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H6)-77, Diagnostics for Engine Starting Failure.>
2	<b>CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).</b>	Does CHECK ENGINE malfunction indicator lamp illuminate?	Go to step 3.	Inspection using "General Diagnostics Table". <Ref. to EN(H6)-366, INSPECTION, General Diagnostic Table.>
3	<b>CHECK INDICATION OF DTC ON DISPLAY.</b> 1) Turn ignition switch to OFF. 2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read DTC on the Subaru Select Monitor or OBD-II general scan tool.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Go to step 4.	Repair the related parts. NOTE: If DTC is not shown on display although the MIL illuminates, perform diagnostics of MIL (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(H6)-62, Engine Malfunction Indicator Lamp (MIL).>
4	<b>PERFORM THE DIAGNOSIS.</b> 1) Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H6)-104, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: Carry out the basic check, only when DTC about automatic transmission is shown on display. <Ref. to EN(H6)-49, Read Diagnostic Trouble Code.> 2) Repair the trouble cause. 3) Perform the clear memory mode. <Ref. to EN(H6)-58, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to EN(H6)-50, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H6)-104, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

**2. AUTOMATIC TRANSMISSION** S048501E4502

When trouble code about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

- 1) ATF level check <Ref. to AT-9, Automatic Transmission Fluid.>
- 2) Differential gear oil level check <Ref. to AT-11, Differential Gear Oil.>
- 3) ATF leak check <Ref. to AT-9, Automatic Transmission Fluid.>
- 4) Differential gear oil leak check <Ref. to AT-11, Differential Gear Oil.>
- 5) Stall test <Ref. to AT-13, Stall Test.>
- 6) Line pressure test <Ref. to AT-16, Line Pressure Test.>
- 7) Transfer clutch pressure test <Ref. to AT-18, Transfer Clutch Pressure Test.>
- 8) Time lag test <Ref. to AT-15, Time Lag Test.>
- 9) Road test <Ref. to AT-12, Road Test.>
- 10) Shift characteristics <Ref. to AT-18, Transfer Clutch Pressure Test.>

# CHECK LIST FOR INTERVIEW

Engine (DIAGNOSTICS)

## 2. Check List for Interview S048502

Check the following items when problem has occurred.

### A: CHECK S048502A04

NOTE:

#### 1. CHECK LIST NO. 1 S048502A0401

Use copies of this page for interviewing customers.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others:		
Outdoor temperature	°F (°C)		
	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold		
Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:		
Engine temperature	<input type="checkbox"/> Cold <input type="checkbox"/> Warming-up <input type="checkbox"/> After warming-up <input type="checkbox"/> Any temperature <input type="checkbox"/> Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH)		
Headlight	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Rear defogger	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Blower	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Radio	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
A/C compressor	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CD/Cassette	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Cooling fan	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Car phone	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Front wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CB	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Rear wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF		

# CHECK LIST FOR INTERVIEW

Engine (DIAGNOSTICS)

## 2. CHECK LIST NO. 2 S048502A0402

NOTE:  
Use copies of this page for interviewing customers.

Check the following items about the vehicle's state when MIL turns on.

a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<input type="checkbox"/> Low fuel warning light <input type="checkbox"/> Charge indicator light <input type="checkbox"/> AT diagnostics indicator light <input type="checkbox"/> ABS warning light <input type="checkbox"/> VDC warning light <input type="checkbox"/> Engine oil pressure warning light
b) Fuel level
● Lack of gasoline: <input type="checkbox"/> Yes/ <input type="checkbox"/> No ● Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
● What:
d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
● What:
e) Installing of parts other than genuine parts: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
● What: ● Where:
f) Occurrence of noise: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
● From where: ● What kind:
g) Occurrence of smell: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
● From where: ● What kind:
h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
i) Troubles occurred
<input type="checkbox"/> Engine does not start. <input type="checkbox"/> Engine stalls during idling. <input type="checkbox"/> Engine stalls while driving. <input type="checkbox"/> Engine speed decreases. <input type="checkbox"/> Engine speed does not decrease. <input type="checkbox"/> Rough idling <input type="checkbox"/> Poor acceleration <input type="checkbox"/> Back fire <input type="checkbox"/> After fire <input type="checkbox"/> No shift <input type="checkbox"/> Excessive shift shock

# GENERAL DESCRIPTION

Engine (DIAGNOSTICS)

## 3. General Description SO48001

### A: CAUTION SO48001A03

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

#### CAUTION:

- All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.

- Be careful not to damage Airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery terminals while the engine is running.

- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing ECM from the located position, disconnect two cables on battery.

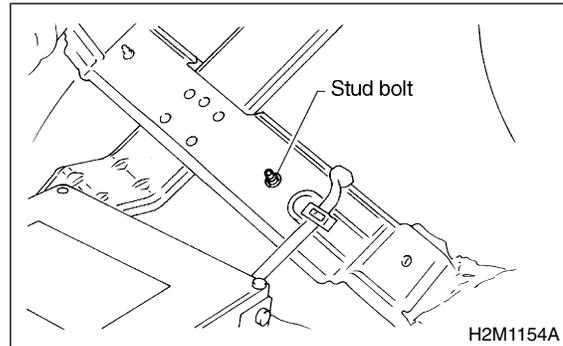
- Otherwise, the ECM may be damaged.

#### CAUTION:

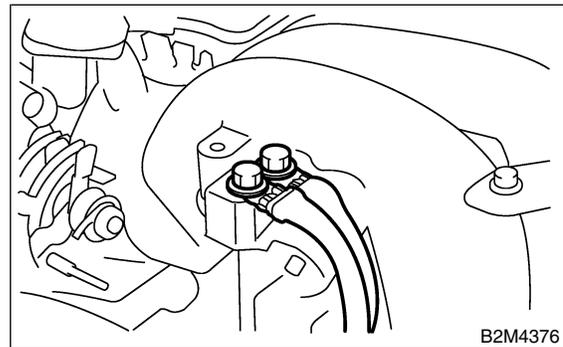
**When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.**

7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

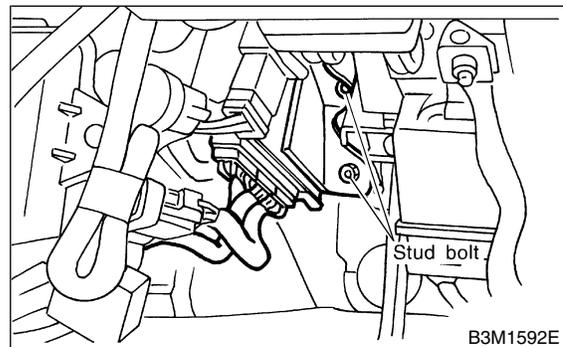
8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



9) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



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



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

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

#### CAUTION:

- The antenna must be kept as far apart as possible from the control unit.

(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)

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

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.

14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.

15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.

16) In AT vehicles, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).

17) On ABS vehicle, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

## B: INSPECTION S048001A10

Before performing diagnostics, check the following items which might affect engine problems:

### 1. BATTERY S048001A1001

1) Measure battery voltage and specific gravity of electrolyte.

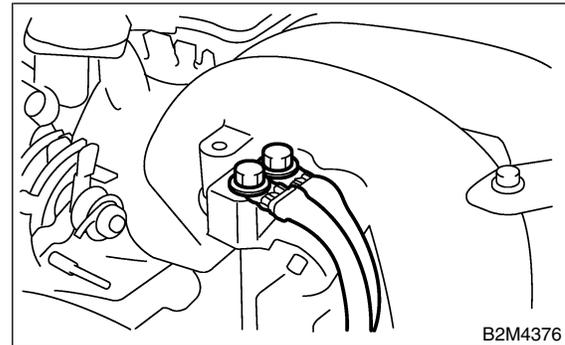
**Standard voltage: 12 V**

**Specific gravity: Above 1.260**

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

## 2. ENGINE GROUNDING S048001A1002

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



## C: NOTE S048001A15

### 1. DESCRIPTION S048001A1501

● The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (MIL) 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 engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). 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, MIL illuminates. At the same time of the MIL illumination or blinking, a diagnostic trouble code (DTC) and a freeze frame engine conditions are stored into on-board computer.

● The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.

● If the OBD system detects the various malfunctions including 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, MIL is turned off, but DTC remains at on-board computer.

● The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.

● The OBD-II diagnostics procedure is different from the usual diagnostics procedure. When troubleshooting OBD-II vehicles, connect Subaru

# GENERAL DESCRIPTION

Engine (DIAGNOSTICS)

Select Monitor or the OBD-II general scan tool to the vehicle.

## 2. ENGINE AND EMISSION CONTROL SYSTEM

S048001A1502

● 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.

● Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.

The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduced 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.

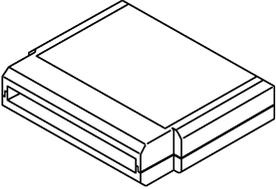
## 3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

S048001A1503

The electronic-hydraulic control system consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

## D: PREPARATION TOOL

S048001A17

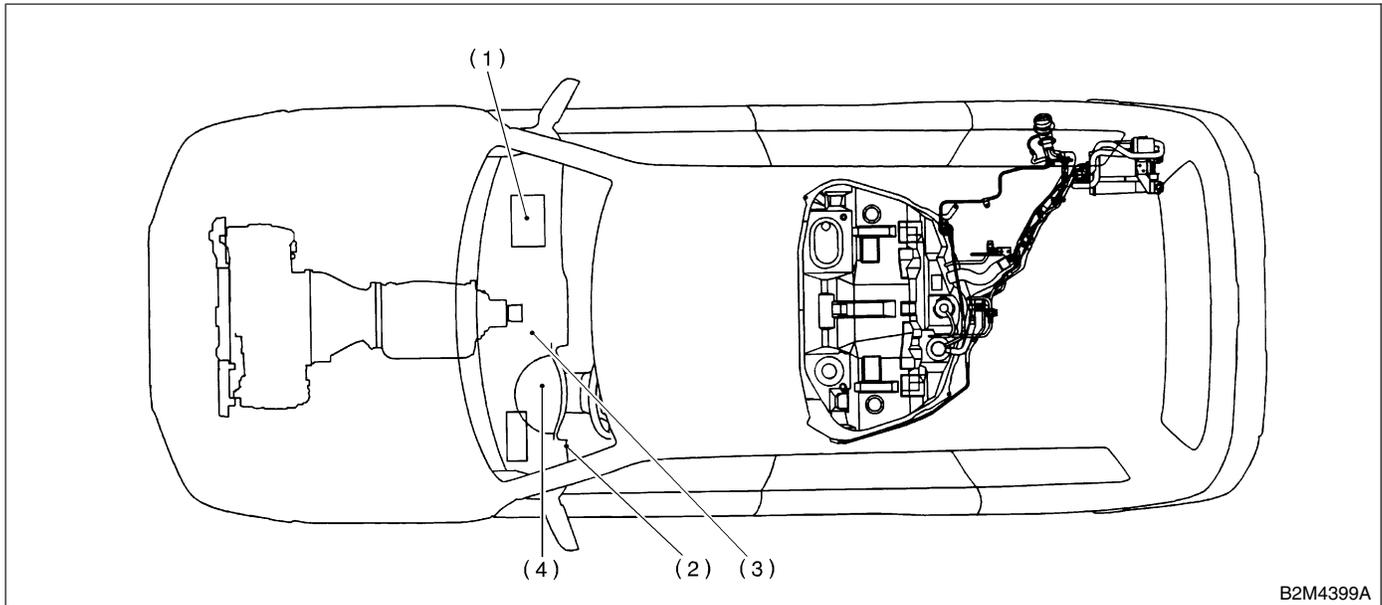
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B2M3876</p>	24082AA190 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 <p style="text-align: center;">B2M3877</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> <li>● English: 22771AA030 (Without printer)</li> <li>● German: 22771AA070 (Without printer)</li> <li>● French: 22771AA080 (Without printer)</li> <li>● Spanish: 22771AA090 (Without printer)</li> </ul>

## 4. Electrical Components Location S048507

### A: LOCATION S048507A13

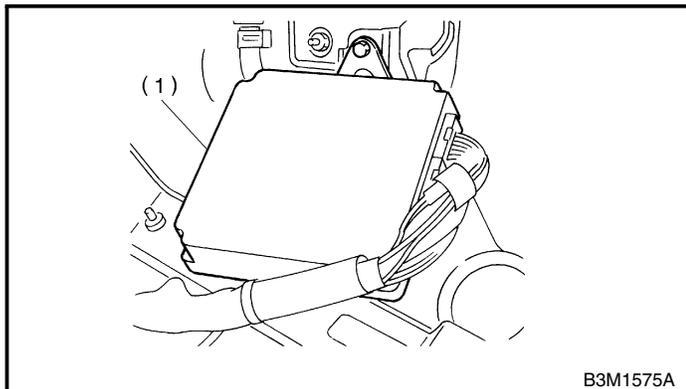
#### 1. ENGINE S048507A1301

#### ● MODULE S048507A130101

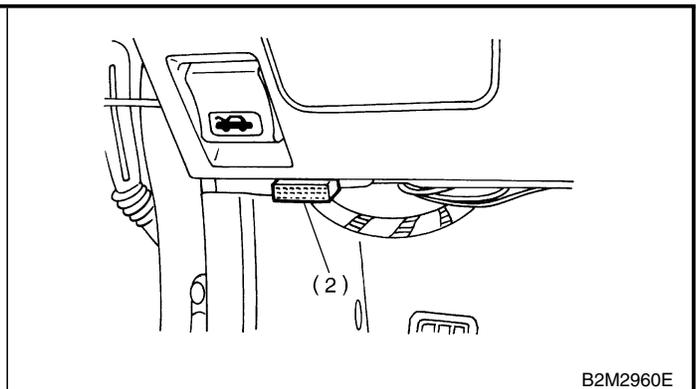


B2M4399A

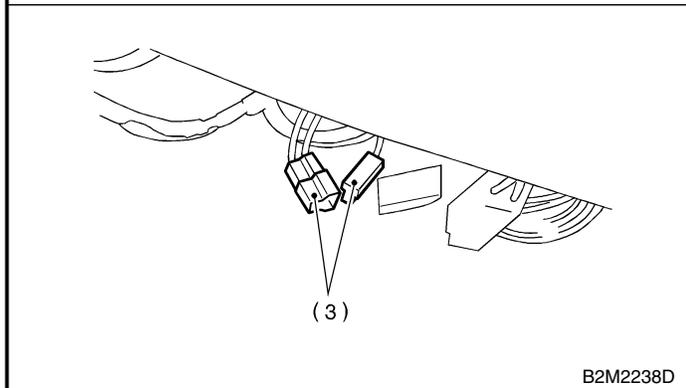
- |                                                                                  |                                                   |
|----------------------------------------------------------------------------------|---------------------------------------------------|
| (1) Engine control module (ECM)                                                  | (3) Test mode connector                           |
| (2) Data link connector (for Subaru Select Monitor and OBD-II general scan tool) | (4) CHECK ENGINE malfunction indicator lamp (MIL) |



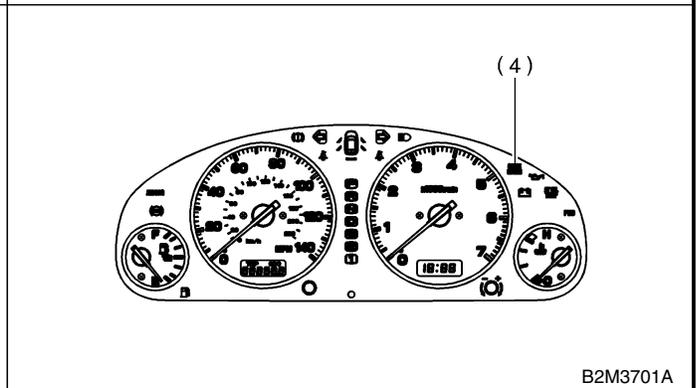
B3M1575A



B2M2960E



B2M2238D

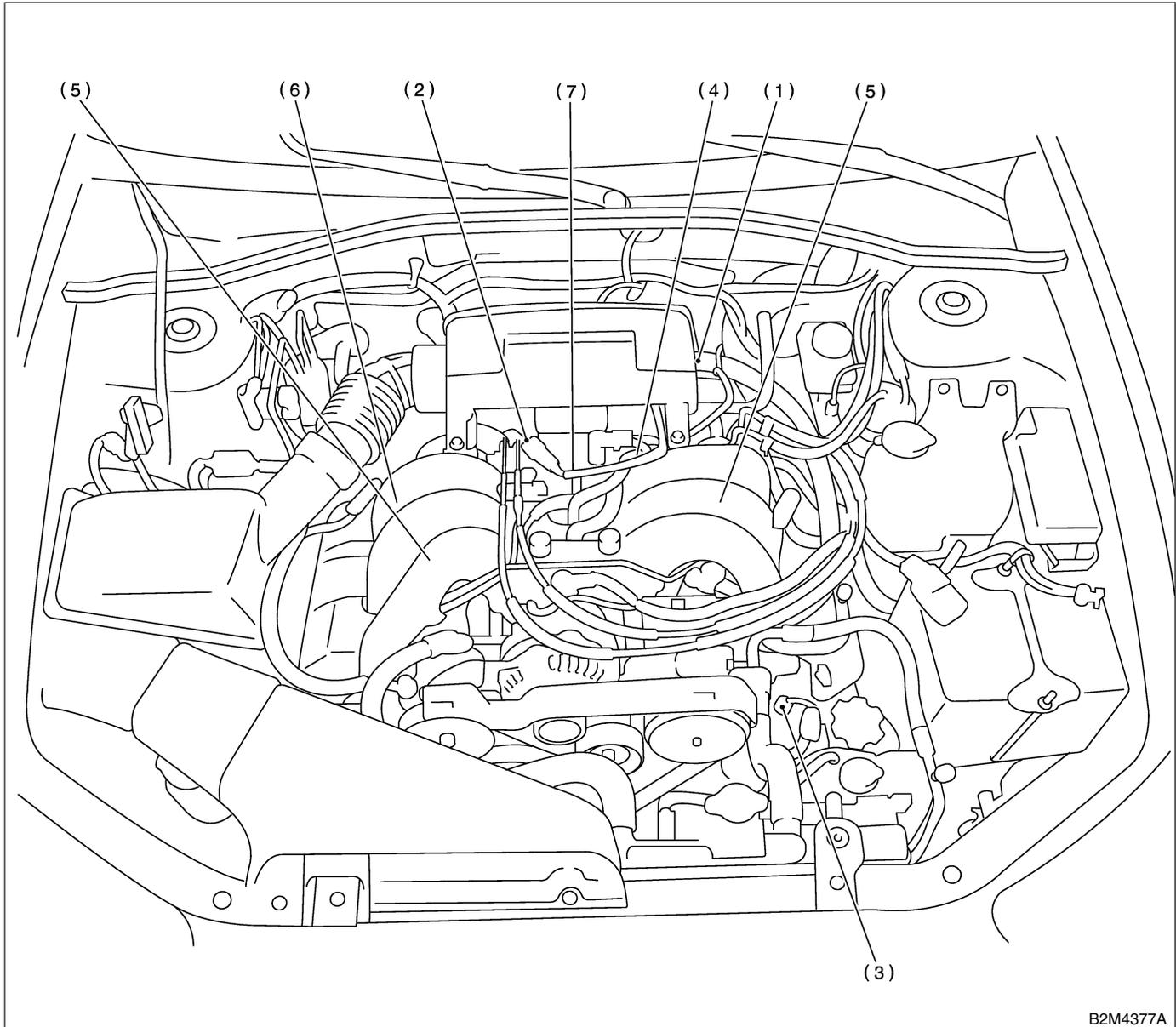


B2M3701A

# ELECTRICAL COMPONENTS LOCATION

Engine (DIAGNOSTICS)

## ● SENSOR S048507A130102

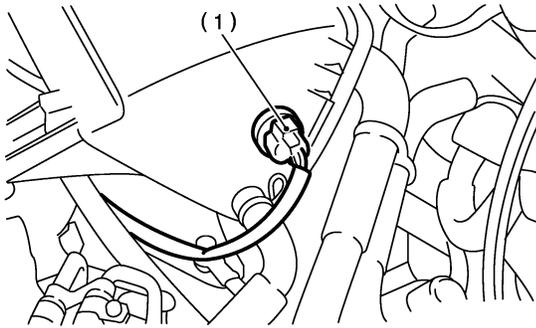


B2M4377A

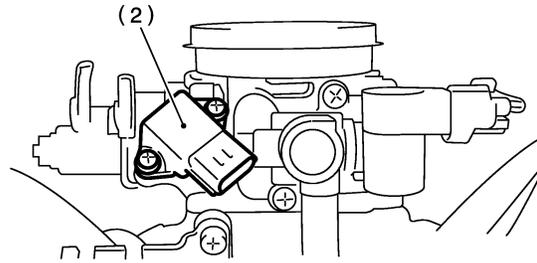
- |                                       |                                |
|---------------------------------------|--------------------------------|
| (1) Intake air temperature sensor     | (4) Throttle position sensor   |
| (2) Intake manifold pressure sensor   | (5) Knock sensor               |
| (3) Engine coolant temperature sensor | (6) Camshaft position sensor   |
|                                       | (7) Crankshaft position sensor |

# ELECTRICAL COMPONENTS LOCATION

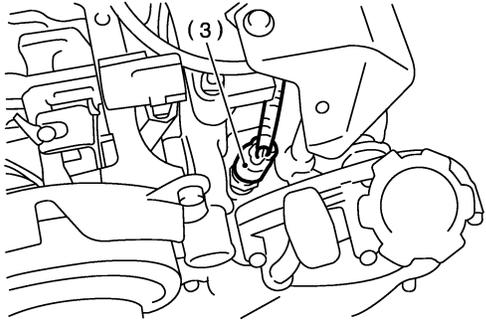
Engine (DIAGNOSTICS)



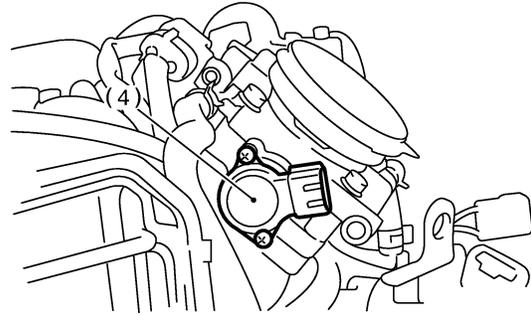
B2M4378A



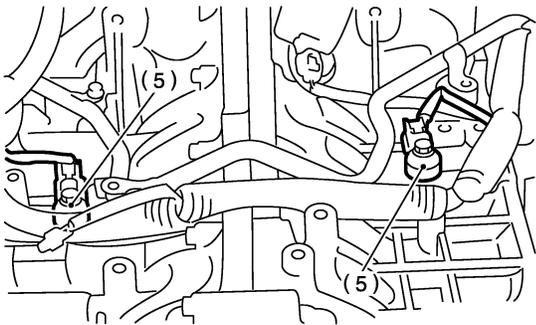
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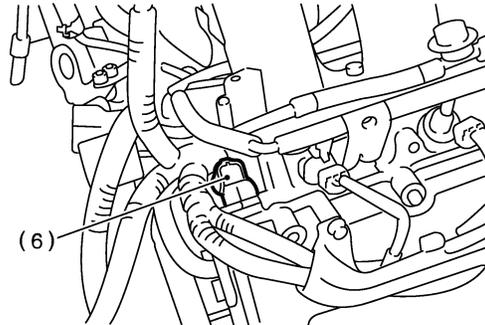
B2M4379A



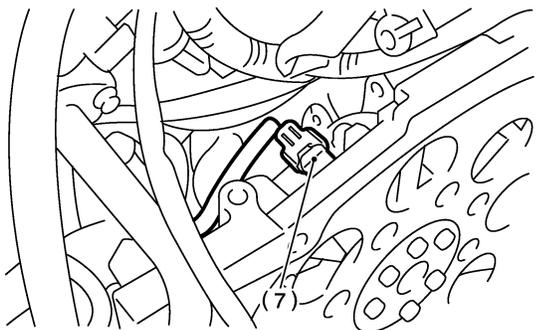
B2M4383A



B2M4380A



B2M4381A

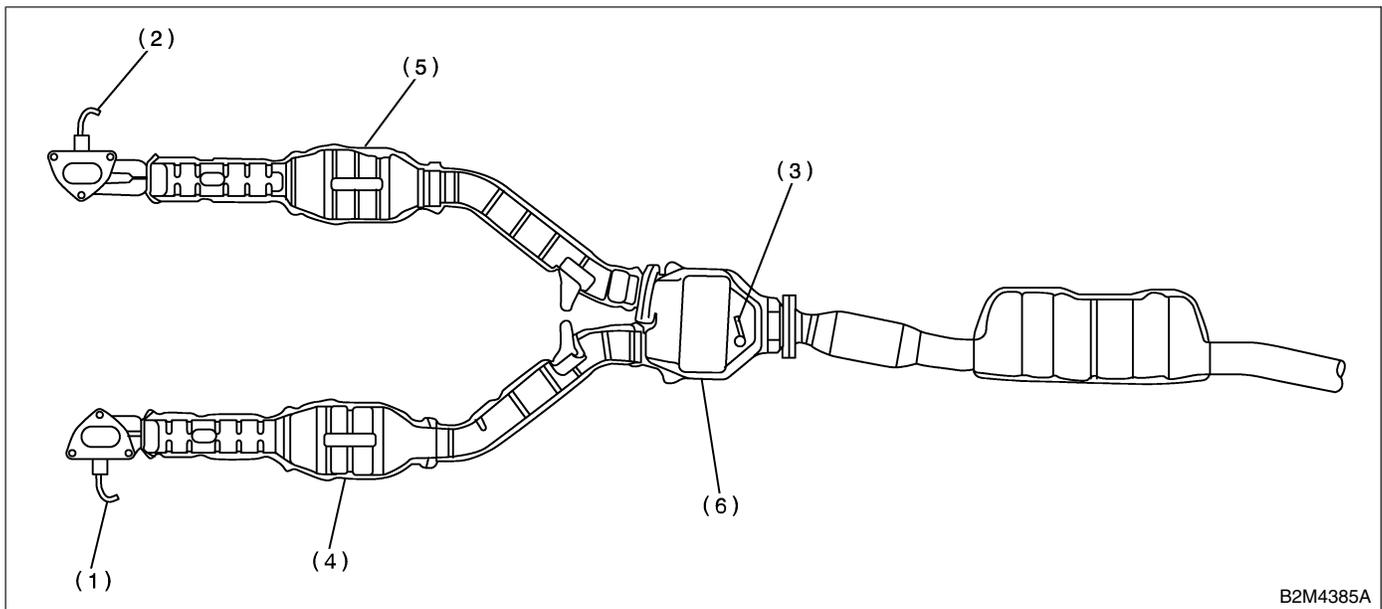


B2M4384A

**SUBARU.**

# ELECTRICAL COMPONENTS LOCATION

Engine (DIAGNOSTICS)



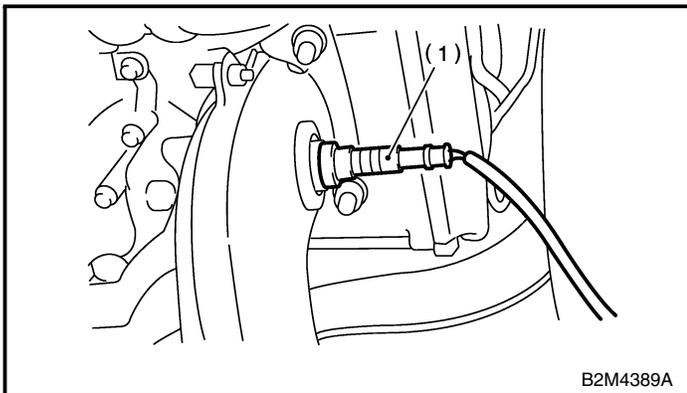
- (1) Front oxygen (A/F) sensor (LH)
- (2) Front oxygen (A/F) sensor (RH)

- (3) Rear oxygen sensor
- (4) Front catalytic converter (LH)

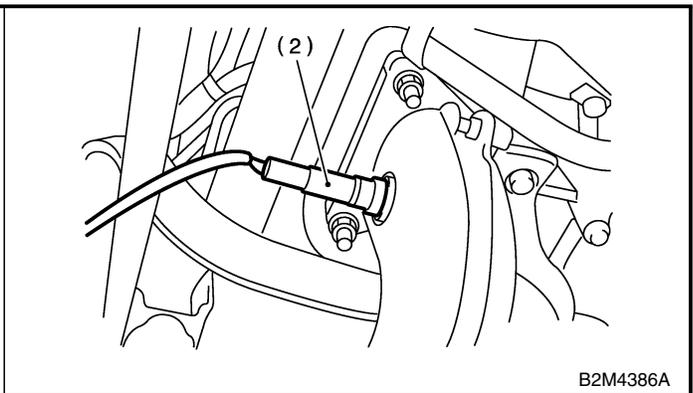
- (5) Front catalytic converter (RH)
- (6) Rear catalytic converter

# ELECTRICAL COMPONENTS LOCATION

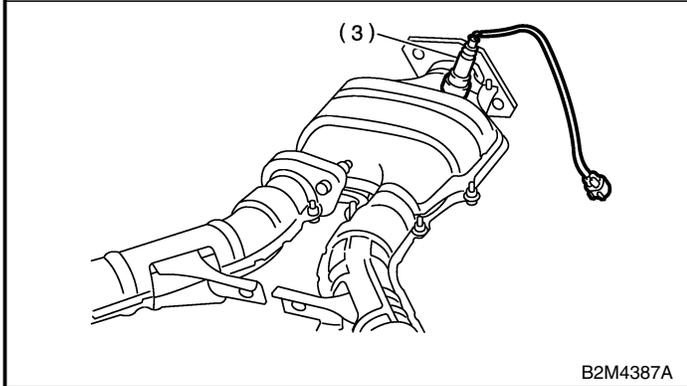
Engine (DIAGNOSTICS)



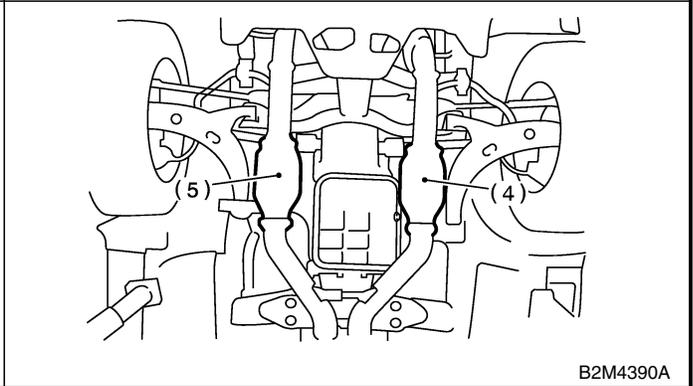
B2M4389A



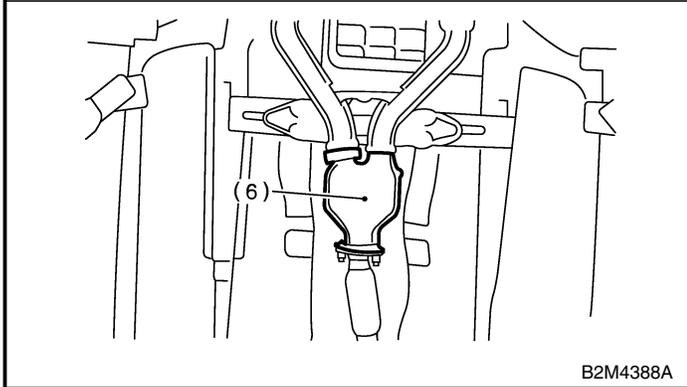
B2M4386A



B2M4387A



B2M4390A

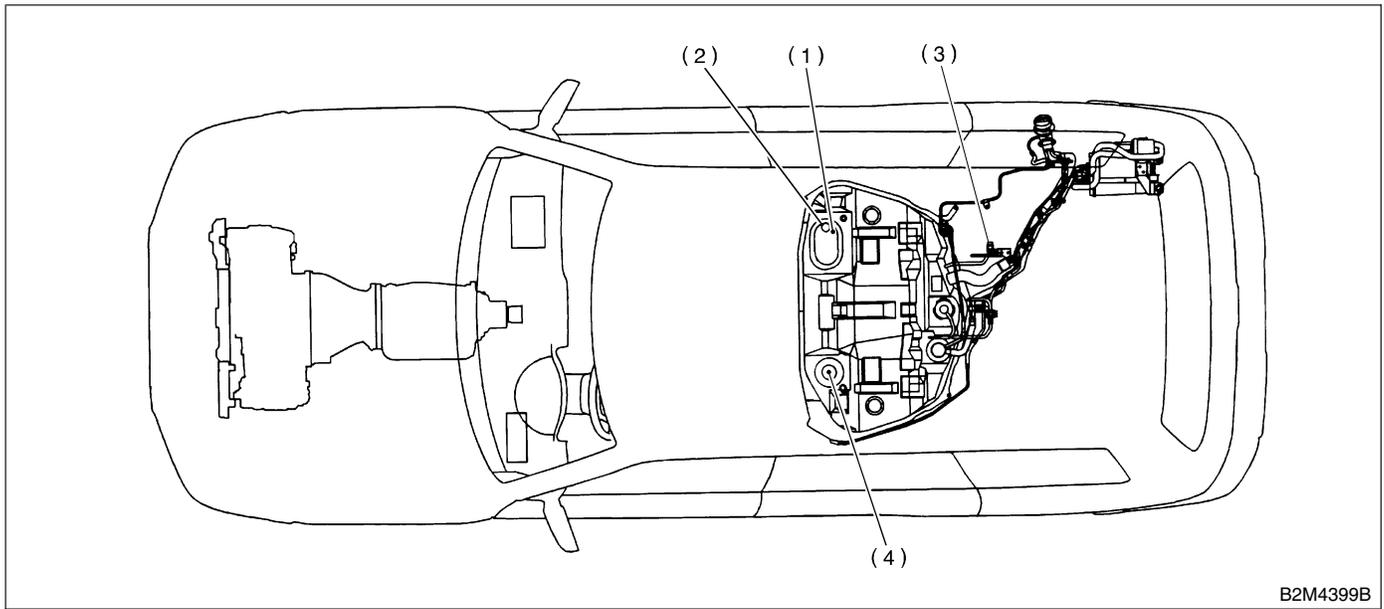


B2M4388A

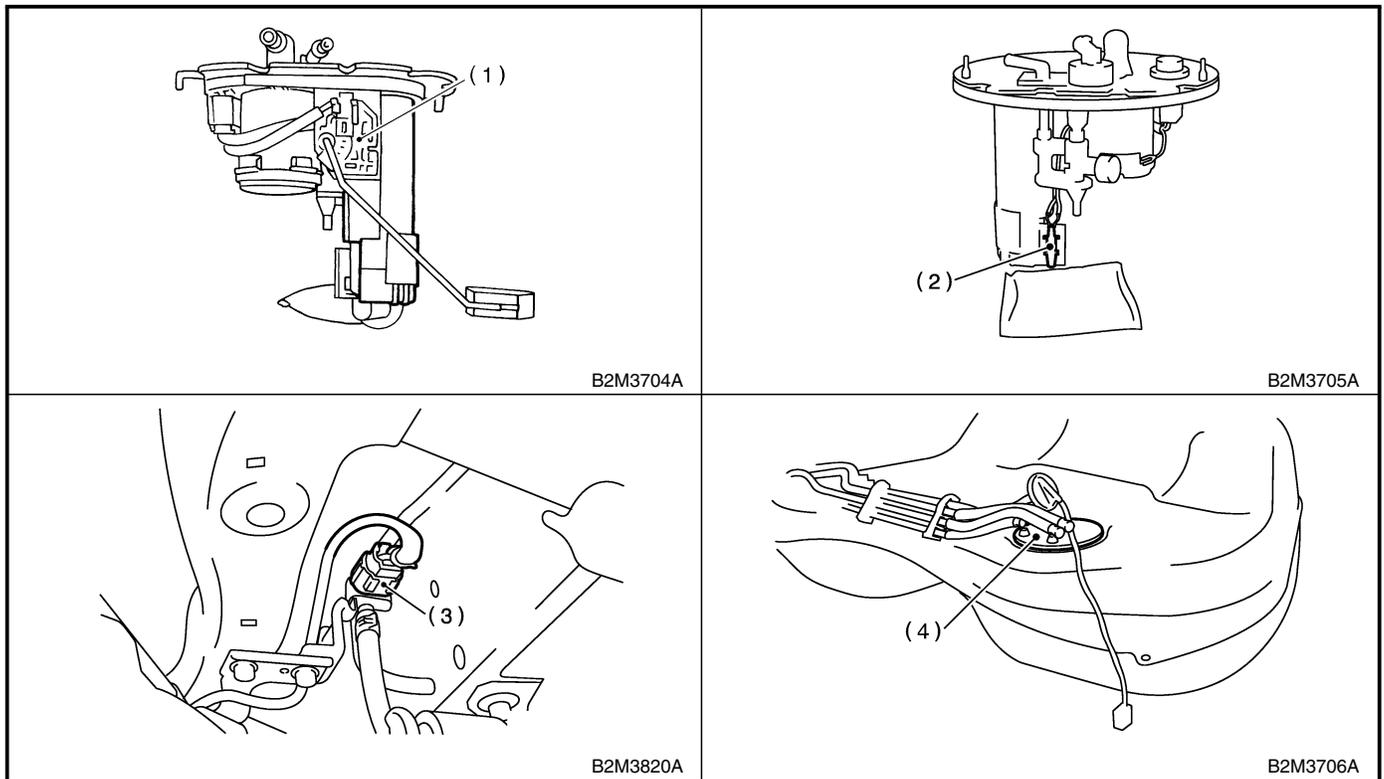
**SUBARU.**

# ELECTRICAL COMPONENTS LOCATION

Engine (DIAGNOSTICS)



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



# ELECTRICAL COMPONENTS LOCATION

Engine (DIAGNOSTICS)

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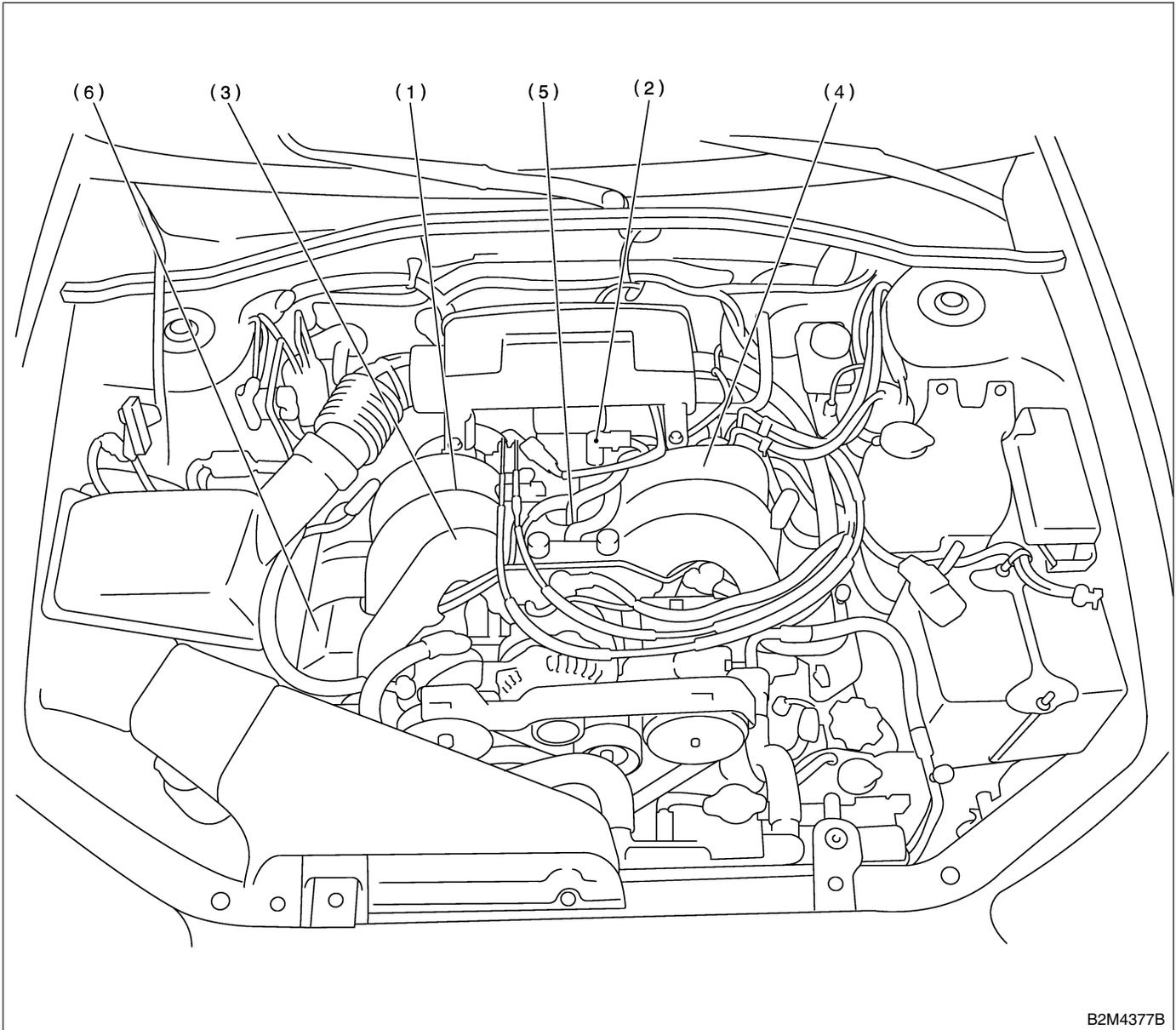
**MEMO:**

# ELECTRICAL COMPONENTS LOCATION

Engine (DIAGNOSTICS)

## ● SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS

S048507A130103



B2M4377B

(1) Induction control solenoid valve

(3) Purge control solenoid valve

(5) Induction control valve

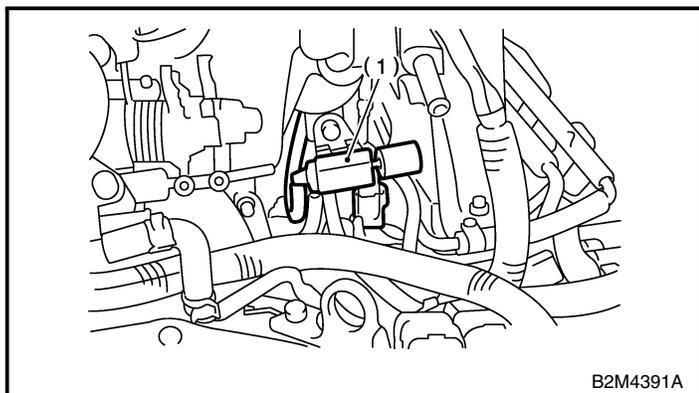
(2) Idle air control solenoid valve

(4) EGR solenoid valve

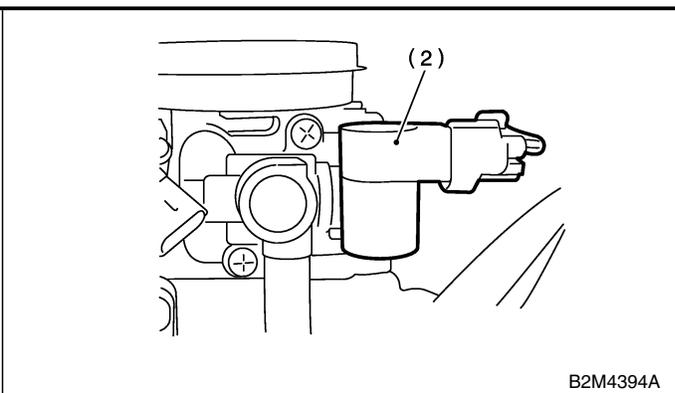
(6) Ignition coil & ignitor ASSY

# ELECTRICAL COMPONENTS LOCATION

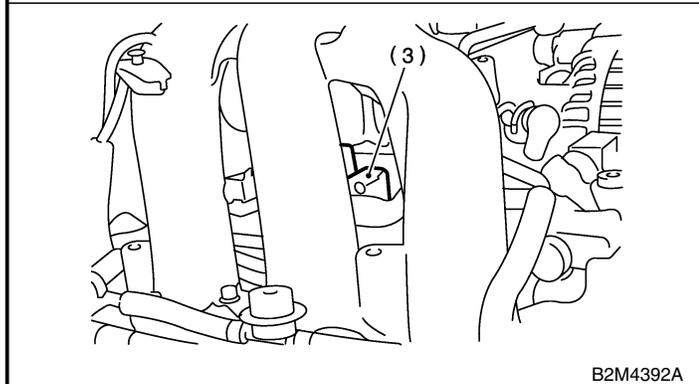
Engine (DIAGNOSTICS)



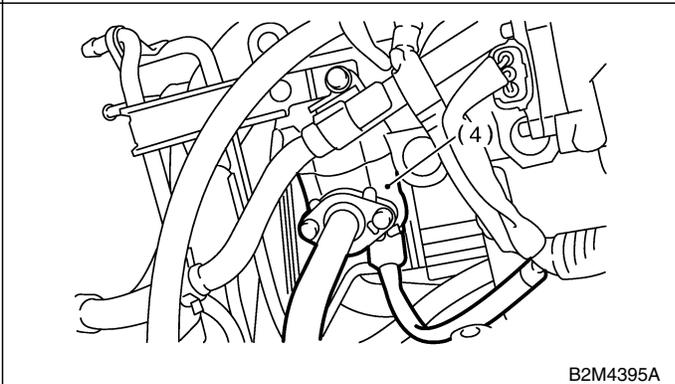
B2M4391A



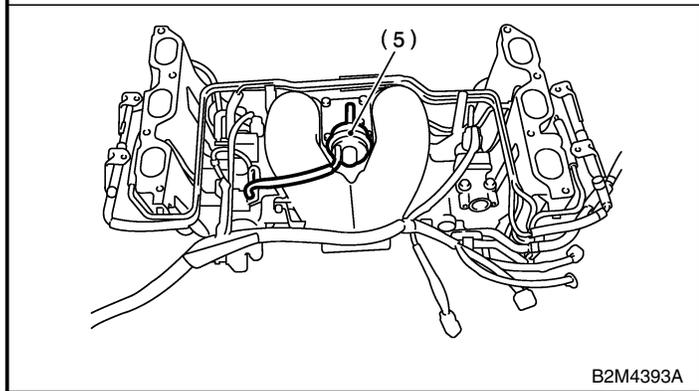
B2M4394A



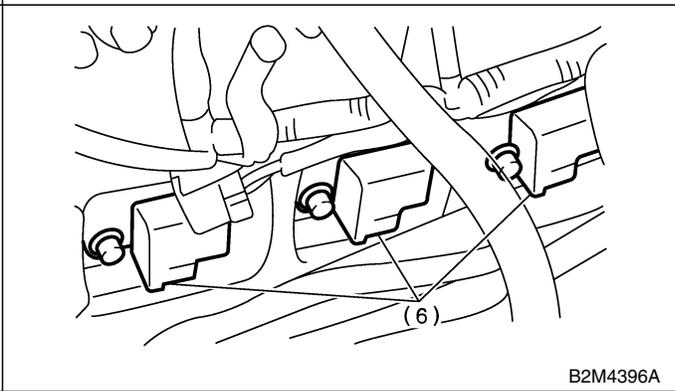
B2M4392A



B2M4395A



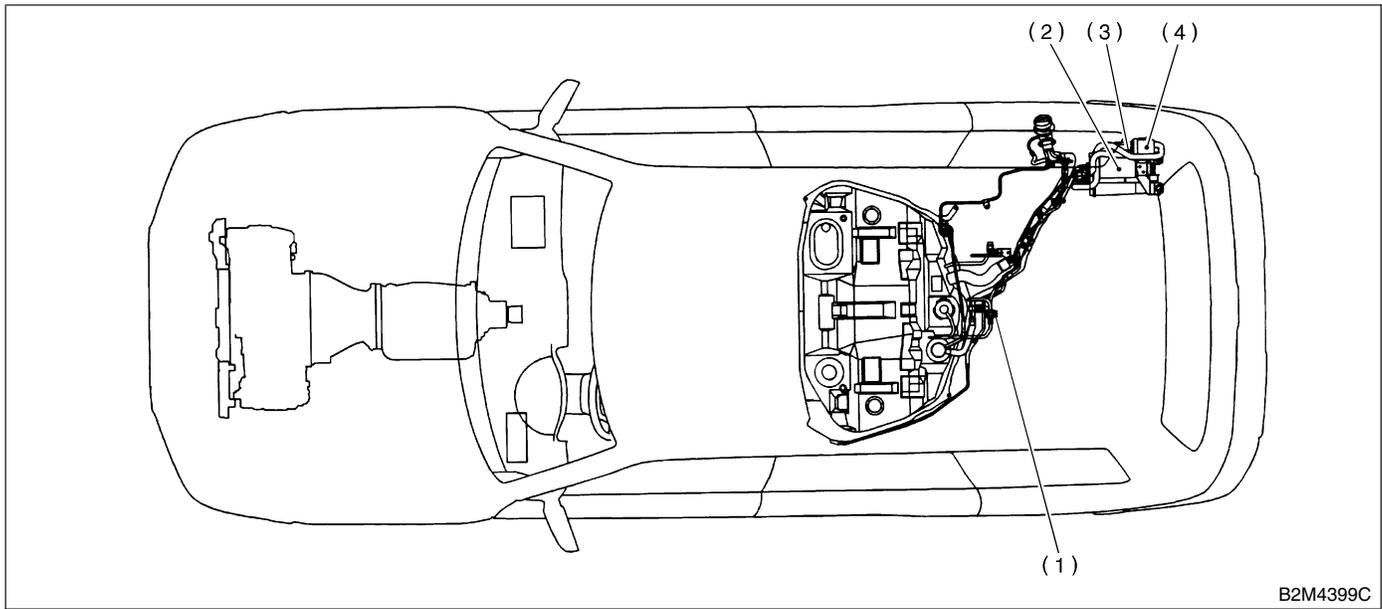
B2M4393A



B2M4396A

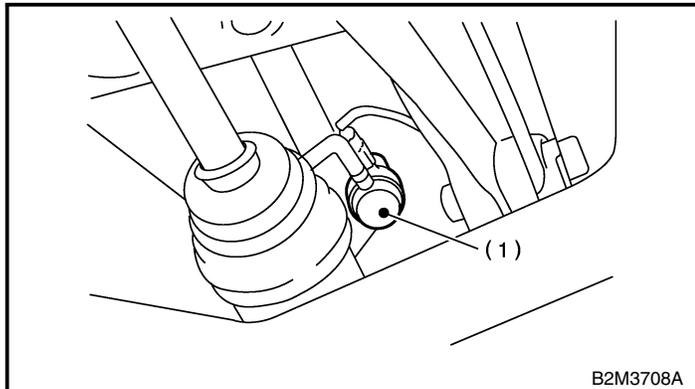
# ELECTRICAL COMPONENTS LOCATION

Engine (DIAGNOSTICS)

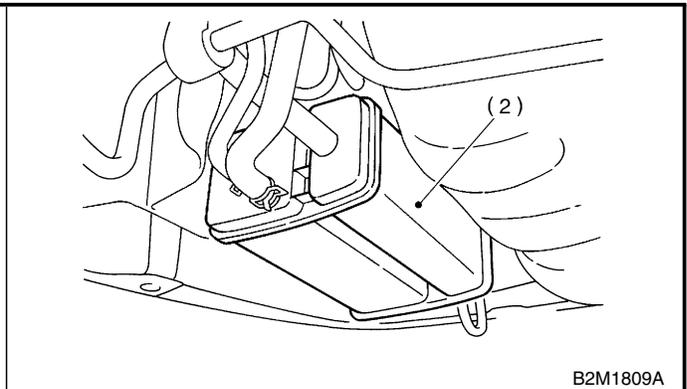


B2M4399C

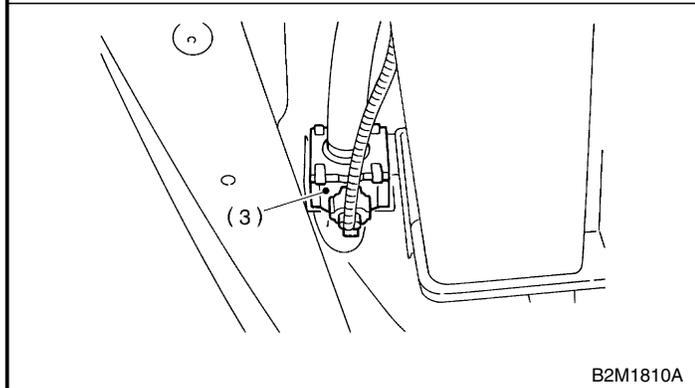
- (1) Pressure control solenoid valve
- (2) Canister
- (3) Drain valve
- (4) Drain filter



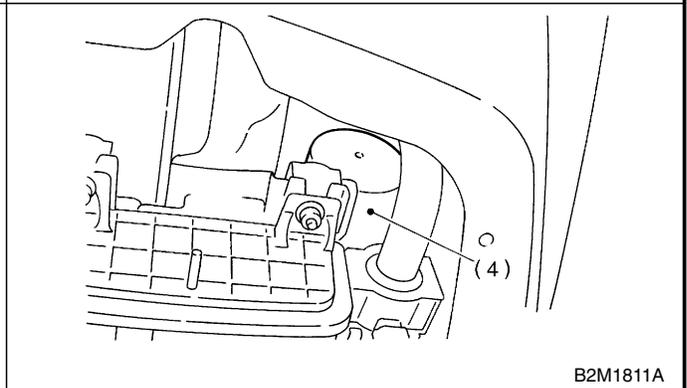
B2M3708A



B2M1809A



B2M1810A



B2M1811A

# ELECTRICAL COMPONENTS LOCATION

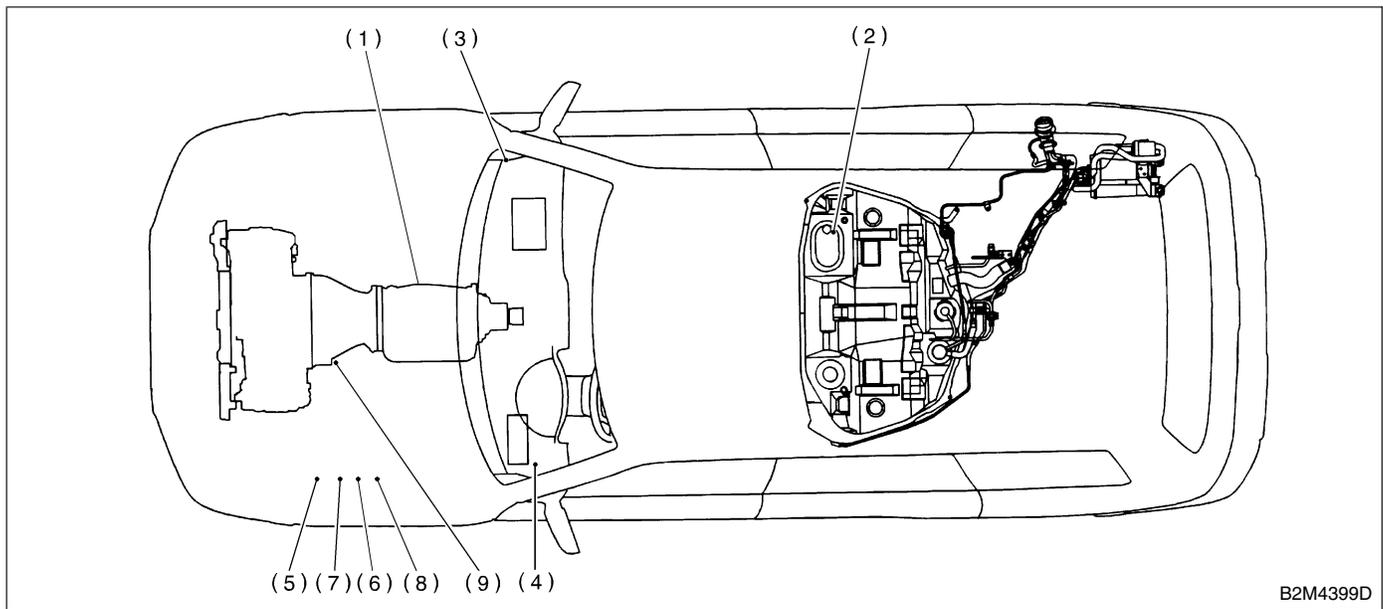
Engine (DIAGNOSTICS)

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**MEMO:**

# ELECTRICAL COMPONENTS LOCATION

Engine (DIAGNOSTICS)

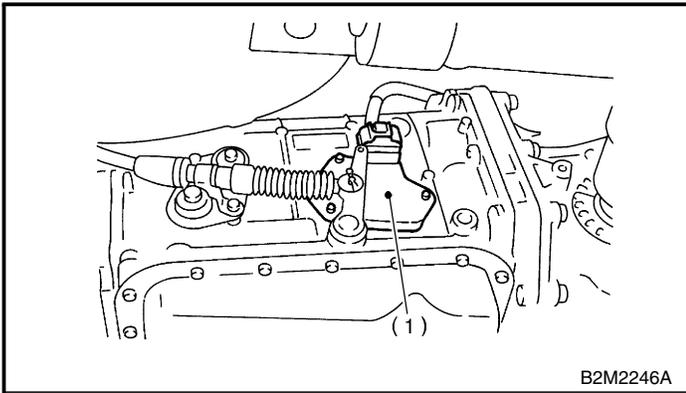


B2M4399D

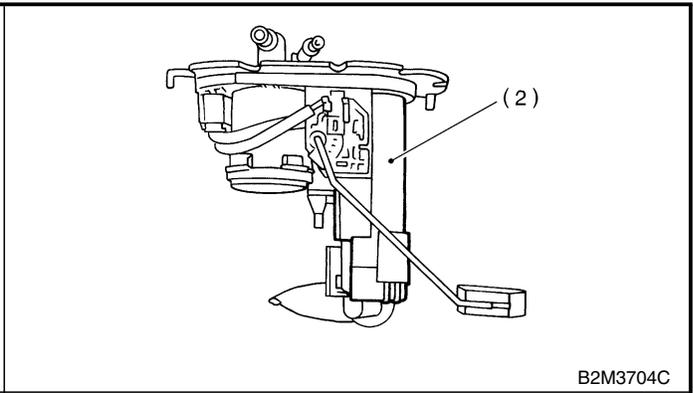
- |                      |                               |                               |
|----------------------|-------------------------------|-------------------------------|
| (1) Inhibitor switch | (4) Fuel pump relay           | (7) Radiator main fan relay-2 |
| (2) Fuel pump        | (5) Radiator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

# ELECTRICAL COMPONENTS LOCATION

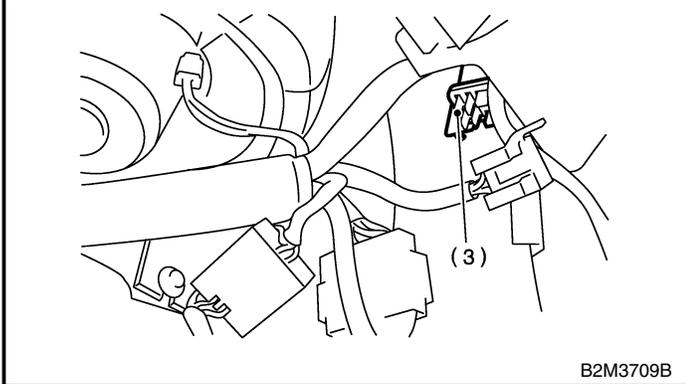
Engine (DIAGNOSTICS)



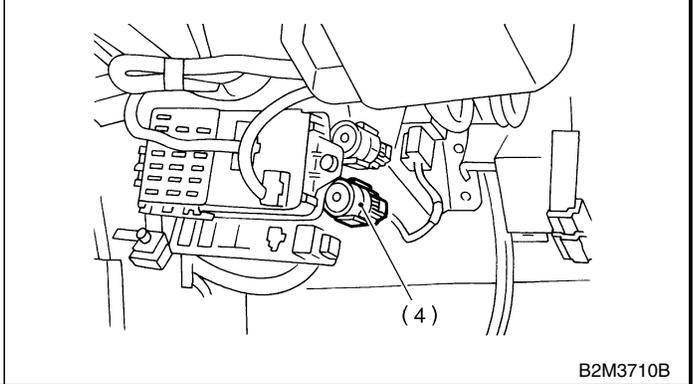
B2M2246A



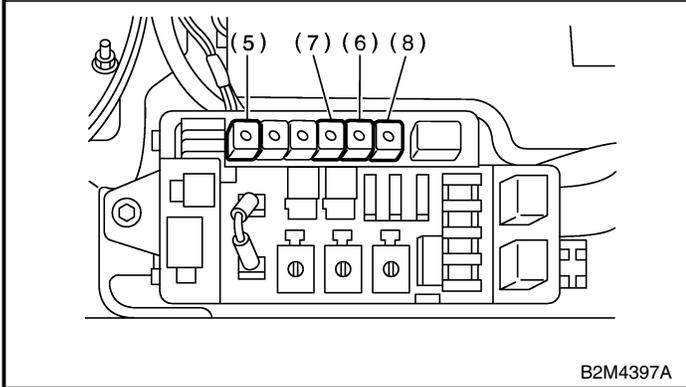
B2M3704C



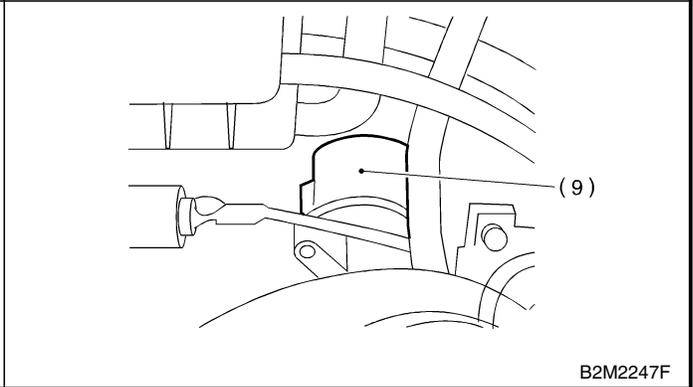
B2M3709B



B2M3710B



B2M4397A



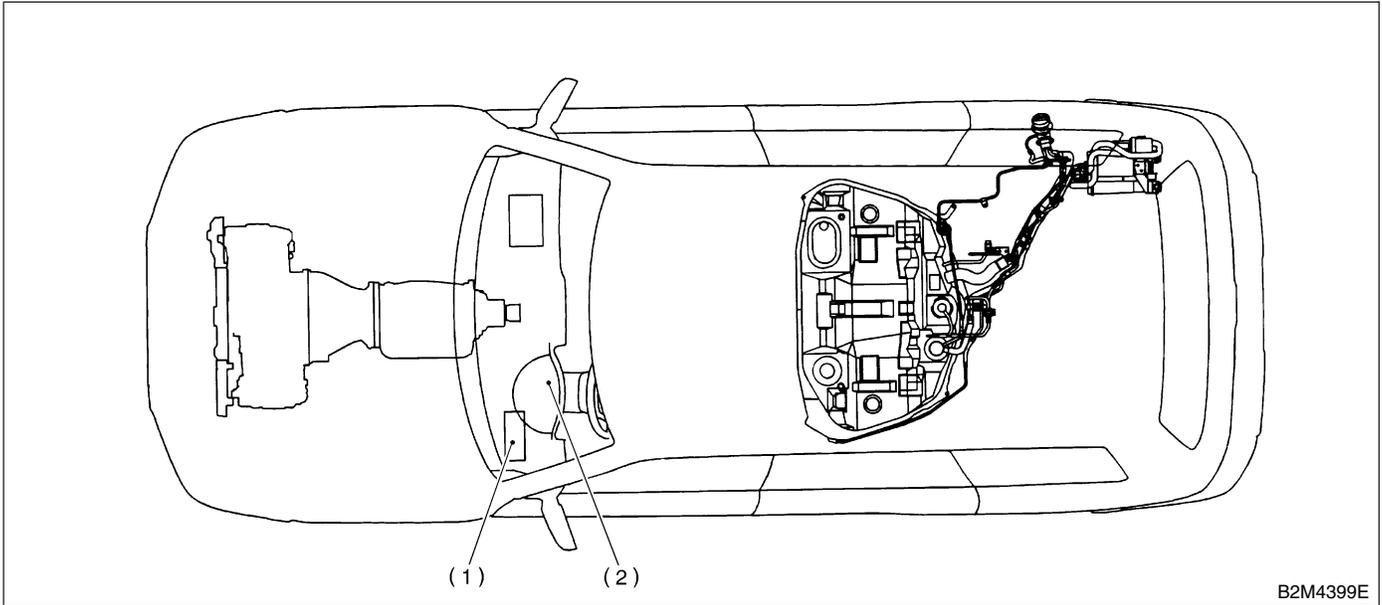
B2M2247F

# ELECTRICAL COMPONENTS LOCATION

Engine (DIAGNOSTICS)

## 2. TRANSMISSION S048507A1302

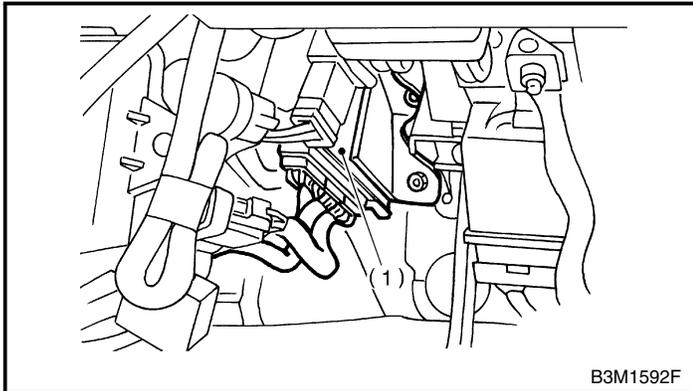
### ● MODULE S048507A130201



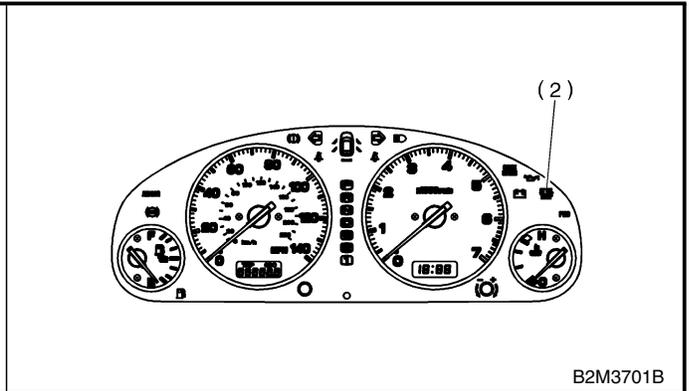
B2M4399E

(1) Transmission Control Module (TCM)

(2) AT diagnostic indicator light



B3M1592F

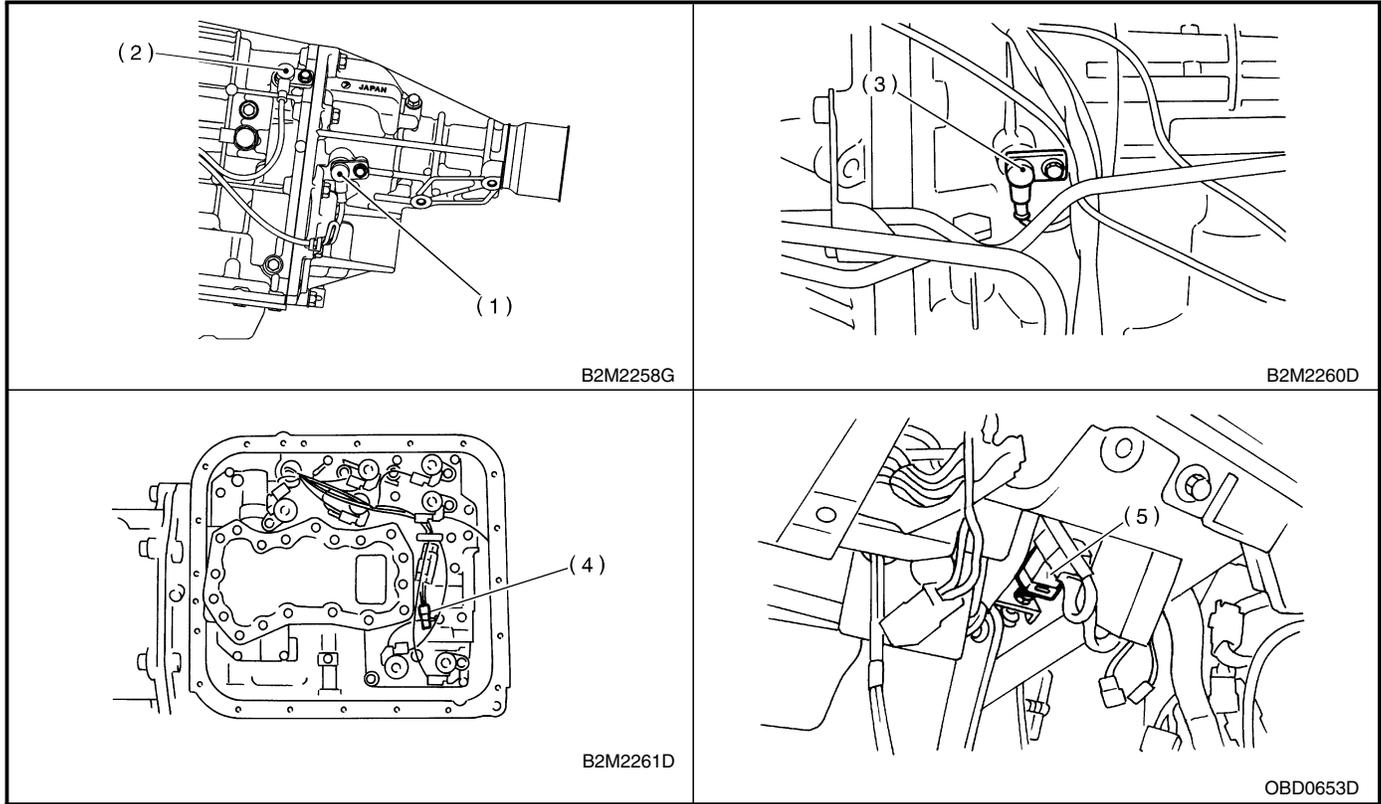


B2M3701B

# ELECTRICAL COMPONENTS LOCATION

Engine (DIAGNOSTICS)

## ● SENSOR S048507A130202

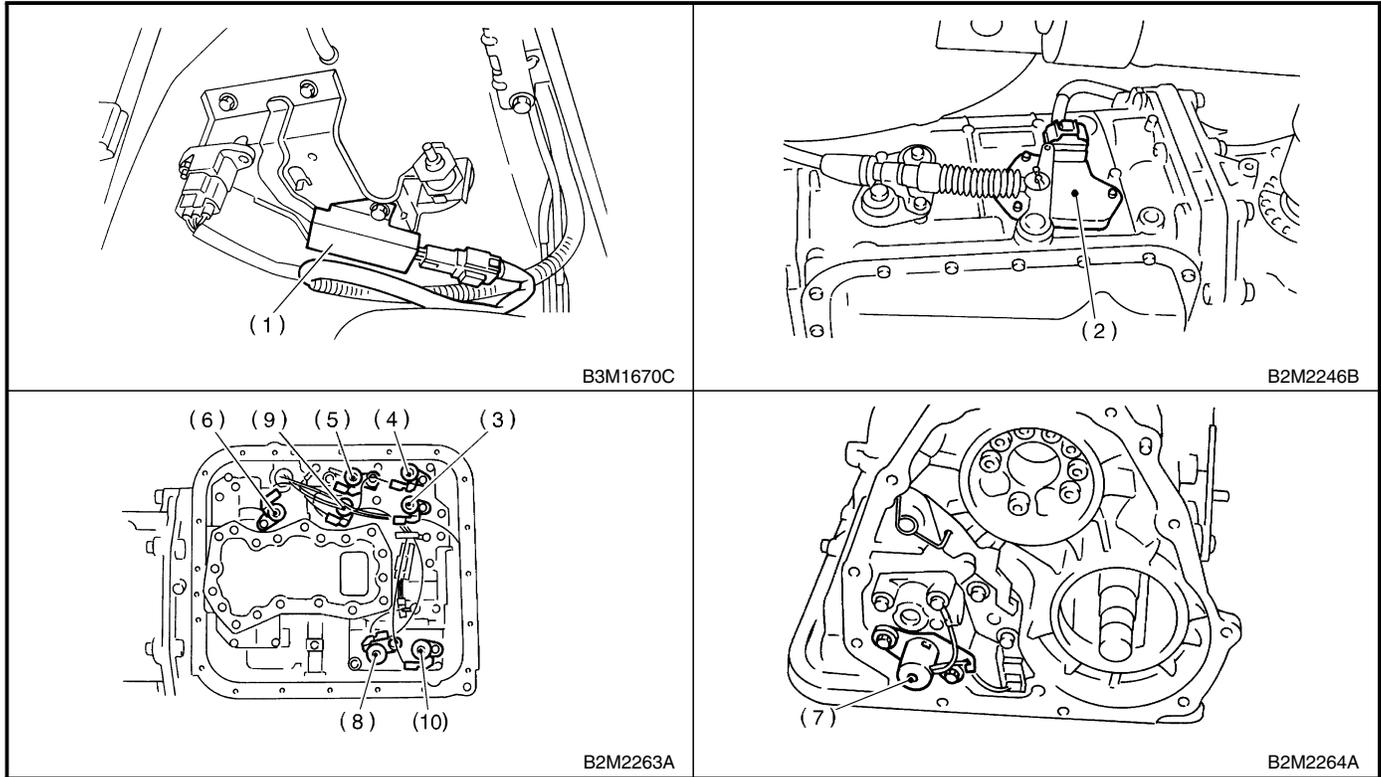


- (1) Rear vehicle speed sensor
- (2) Front vehicle speed sensor
- (3) Torque converter turbine speed sensor
- (4) ATF temperature sensor
- (5) Brake light switch

# ELECTRICAL COMPONENTS LOCATION

Engine (DIAGNOSTICS)

## ● SOLENOID VALVE AND SWITCH S048507A130203



- (1) Dropping resistor
- (2) Inhibitor switch
- (3) Shift solenoid valve 1
- (4) Shift solenoid valve 2
- (5) Line pressure duty solenoid
- (6) Lock-up duty solenoid
- (7) Transfer duty solenoid
- (8) 2-4 brake duty solenoid
- (9) Low clutch timing solenoid valve
- (10) 2-4 brake timing solenoid valve

# ELECTRICAL COMPONENTS LOCATION

Engine (DIAGNOSTICS)

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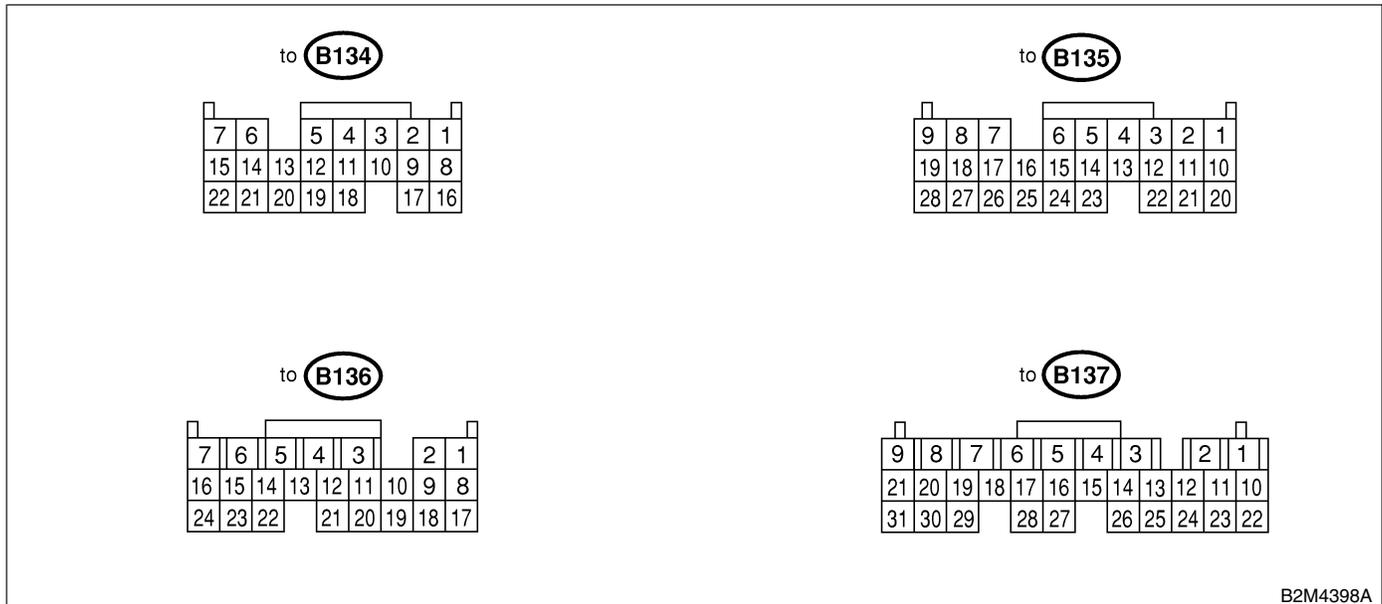
**MEMO:**

# ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Engine (DIAGNOSTICS)

## 5. Engine Control Module (ECM) I/O Signal S048526

### A: ELECTRICAL SPECIFICATION S048526A08



B2M4398A

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	2	0	—	Sensor output waveform <Ref. to EN(H6)-29, WAVEFORM, MEASUREMENT, Engine Control Module (ECM) I/O Signal.>
	Signal (-)	B135	11	0	0	
	Shield	B135	21	0	0	
Camshaft position sensor	Signal (+)	B135	1	0	—	Sensor output waveform <Ref. to EN(H6)-29, WAVEFORM, MEASUREMENT, Engine Control Module (ECM) I/O Signal.>
	Signal (-)	B135	10	0	0	
Throttle position sensor	Signal	B135	7	Fully closed: 0.3 — 0.8 Fully open: 4.2 — 4.7	0.3 — 0.8	—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Rear oxygen sensor	Signal	B135	17	0 — 0.5	0 — 0.9	—
	Shield	B135	26	0	0	—
Front oxygen (A/F) sensor heater	Signal	LH1	B137	7	—	—
		LH2	B137	6	—	—
		RH1	B137	5	—	—
		RH2	B137	4	—	—
Rear oxygen sensor heater signal		B136	13	—	—	—
Vehicle speed signal		B134	1	0 or 5	0 or 5	"5" and "0" are repeatedly displayed when vehicle is driven.

# ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Engine (DIAGNOSTICS)

Content		Connector No.	Terminal No.	Signal (V)		Note	
				Ignition SW ON (Engine OFF)	Engine ON (Idling)		
Engine coolant temperature sensor	Signal	B135	18	—	—	After warm-up the engine.	
	GND (sensor)	B134	7	0	0	After warm-up the engine.	
	15						
Generator signal		B137	12	4 — 5	4 — 5		
Starter switch		B134	16	0	0	Cranking: 9 — 12	
A/C switch		B134	2	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—	
Ignition switch		B134	5	10 — 13	13 — 14	—	
Neutral position switch		B134	8	ON: 0 OFF: 5		Switch is ON when shift is in "N" or "P" position.	
Test mode connector		B134	14	5	5	When connected: 0	
Knock sensor	Signal	B135	1	4	2.5	2.5	—
			2	13	2.5	2.5	—
	Shield	B135	22	0	0	—	
Back-up power supply		B137	10	10 — 13	13 — 14	Ignition switch "OFF": 10 — 13	
Control unit power supply		B137	2	10 — 13	13 — 14	—	
			3	10 — 13	13 — 14	—	
Sensor power supply		B135	9	5	5	—	
Line end check 1		B134	10	0	0	—	
Ignition control	#1	B136	24	0	—	Waveform	
	#2	B136	23	0	—	Waveform	
	#3	B136	22	0	—	Waveform	
	#4	B136	21	0	—	Waveform	
	#5	B136	20	0	—	Waveform	
	#6	B136	19	0	—	Waveform	
Fuel injector	#1	B137	1	10 — 13	1 — 14	Waveform	
	#2	B136	6	10 — 13	1 — 14	Waveform	
	#3	B136	5	10 — 13	1 — 14	Waveform	
	#4	B136	4	10 — 13	1 — 14	Waveform	
	#5	B136	3	10 — 13	1 — 14	Waveform	
	#6	B136	1	10 — 13	1 — 14	Waveform	
Idle air control solenoid valve	Signal	B136	10	10 — 13	—	Waveform	
Fuel pump relay control		B136	15	ON: 0.5, or less OFF: 10 — 13	0.5, or less	—	
A/C relay control		B137	27	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—	
Radiator fan relay 1 control		B137	17	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—	
Radiator fan relay 2 control		B137	28	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only	
Radiator fan relay 3 control		B137	24	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—	
Self-shutoff control		B134	6	10 — 13	13 — 14	—	
Malfunction indicator lamp		B137	15	—	—	Light "ON": 1, or less Light "OFF": 10 — 14	
Engine speed output		B136	9	—	0 — 13, or more	Waveform	
Torque control 1 signal		B134	19	5	5	—	

# ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Engine (DIAGNOSTICS)

Content	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Torque control 2 signal	B134	18	5	5	—
Torque control cut signal	B136	14	8	8	—
EGR solenoid valve (A-)	B137	26	10 — 13	13 — 14	—
EGR solenoid valve (B-)	B137	25	10 — 13	13 — 14	—
EGR solenoid valve (A+)	B137	14	10 — 13	13 — 14	—
EGR solenoid valve (B+)	B137	13	10 — 13	13 — 14	—
Induction control solenoid valve	B137	23	0	ON: 0 OFF: 13 — 14	—
Purge control solenoid valve	B137	16	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Fuel temperature sensor	B135	6	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (75°F)
Fuel level sensor	B135	25	0.12 — 4.75	0.12 — 4.75	—
Fuel tank pressure sensor	Signal	B135	2.3 — 2.7	2.3 — 2.7	The value obtained after the fuel filler cap was removed once and recapped.
	GND (sensor)	B134	15	0	—
Fuel tank pressure control solenoid valve	B137	22	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Drain valve	B137	11	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
A/C compressor switch	B134	13	—	—	—
A/C pressure switch	B135	23	—	—	—
AT diagnosis input signal	B135	20	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	Waveform
AT load signal	B135	28	4.3 — 4.4	0.9 — 1.4	—
Small light switch	B134	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch	B134	9	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch	B134	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal RH (+)	B137	29	3.7 — 3.9	3.7 — 3.9	—
Front oxygen (A/F) sensor signal RH (-)	B137	19	2.6 — 4.4	3.4 — 3.6	—
Front oxygen (A/F) sensor signal LH (+)	B137	30	3.7 — 3.9	3.7 — 3.9	—
Front oxygen (A/F) sensor signal LH (-)	B137	20	2.6 — 4.4	3.4 — 3.6	—
Front oxygen (A/F) sensor shield	B137	18	0	0	—
Pressure sensor	B135	8	3.0 — 4.2	1.0 — 2.6	—
Intake air temperature sensor	B135	27	—	—	—
Power steering switch	B137	24	ON: 0 OFF: 5	ON: 0 OFF: 5	—
SSM/GST communication line	B134	21	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	—
GND (sensors)	B134	15	0	0	—
GND (injectors)	B136	8	0	0	—
GND (ignition system)	B136	18	0	0	—

# ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Engine (DIAGNOSTICS)

Content	Con- nector No.	Termi- nal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
GND (power supply)	B134	22	0	0	—
	B136	17	0	0	—
GND (control systems)	B134	7	0	0	—
		15	0	0	—
GND (oxygen sensor heater LH)	1	B137	0	0	—
	2	B137			
GND (oxygen sensor heater RH)	1	B137	0	0	—
	2	B137			

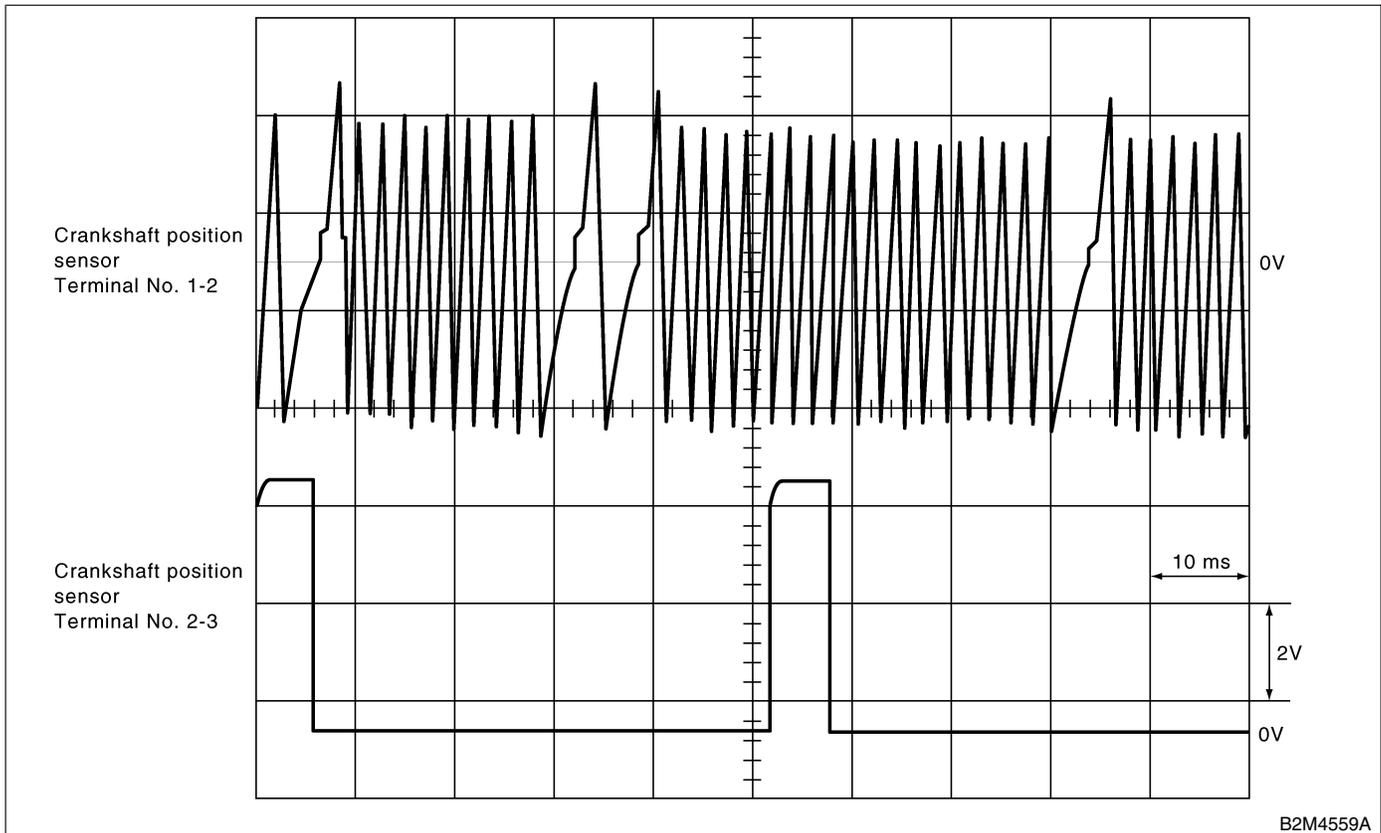
## B: MEASUREMENT

S048526A14

Measure input/output signal voltage.

### 1. WAVEFORM

S048526A1401



# ENGINE CONDITION DATA

Engine (DIAGNOSTICS)

## 6. Engine Condition Data S048530

### A: ELECTRICAL SPECIFICATION

S048530A08

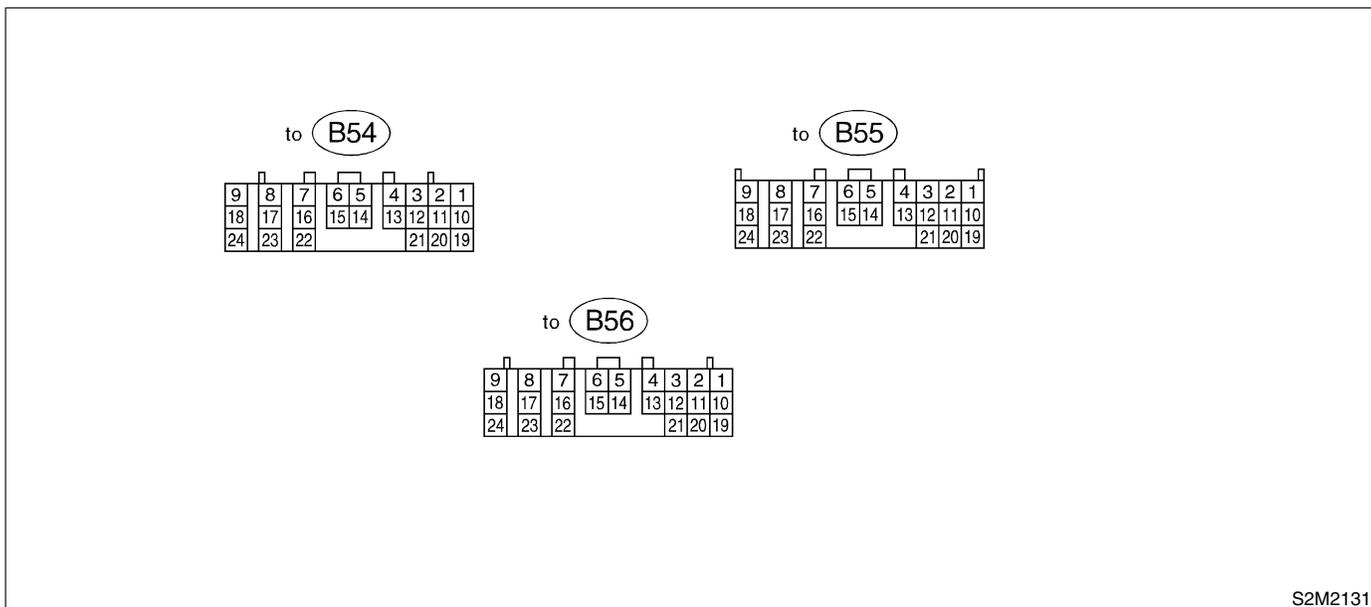
Content	Specified data
Engine load	1.6 — 4.0 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:

- After warm-up the engine.
- Gear position is in “N” or “P” position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

## 7. Transmission Control Module (TCM) I/O Signal S048506

### A: ELECTRICAL SPECIFICATION S048506A08



S2M2131

Check with ignition switch ON.						
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)	
Back-up power supply	B56	1	Ignition switch OFF	10 — 16	—	
Ignition power supply	B54	23	Ignition switch ON (with engine OFF)	10 — 16	—	
	B54	24				
Inhibitor switch	"P" range switch	B55	1	Select lever in "P" range	Less than 1	—
				Select lever in any other than "P" range (except "N" range)	More than 8	
	"N" range switch	B55	14	Select lever in "N" range	Less than 1	—
				Select lever in any other than "N" range (except "P" range)	More than 8	
	"R" range switch	B55	3	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	4	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B55	5	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	
	"2" range switch	B55	6	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B55	7	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	
Brake switch	B55	12	Brake pedal depressed.	More than 10.5	—	
			Brake pedal released.	Less than 1		

# TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

Engine (DIAGNOSTICS)

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
VDC communication signal +	B56	9	Ignition ON	(+) — (-) Plus signal	—
VDC communication signal -	B56	18		(+) — (-) Plus signal	—
Kick-down switch	B55	11	Throttle fully opened.	Less than 1	—
			Throttle fully closed.	More than 6.5	
AT OIL TEMP warning light	B56	10	Light ON	Less than 1	—
			Light OFF	More than 9	
Throttle position sensor	B54	3	Throttle fully closed.	0.3 — 0.7	—
			Throttle fully open.	4.3 — 4.9	
Throttle position sensor power supply	B54	2	Ignition switch ON (With engine OFF)	4.8 — 5.3	—
ATF temperature sensor	B54	11	ATF temperature 20°C (68°F)	2.9 — 4.0	2.1 — 2.9 k
			ATF temperature 80°C (176°F)	0.5 — 0.8	275 — 375
Rear vehicle speed sensor	B55	24	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	18	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range) 4	
Torque converter turbine speed sensor	B55	8	Engine idling after warm-up. (D range)	0	450 — 650
			Engine idling after warm-up. (N range)	More than 1 (AC range)	
Vehicle speed output signal	B56	17	Vehicle speed at most 10 km/h (6 MPH)	Less than 1 ← → More than 4	—
Engine speed signal	B55	17	Ignition switch ON (with engine OFF)	More than 10.5	—
			Ignition switch ON (with engine ON)	8 — 11	
Cruise set signal	B55	22	When cruise control is set (SET lamp ON)	Less than 1	—
			When cruise control is not set (SET lamp OFF)	More than 6.5	
Torque control signal 1	B56	5	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control signal 2	B56	14	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control cut signal	B55	10	Ignition switch ON	8	—
Intake manifold pressure signal	B54	10	Engine idling after warm-up.	1.2 — 1.8	—
Shift solenoid 1	B54	22	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	5	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	

# TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

Engine (DIAGNOSTICS)

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Dropping resistor	B54	8	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
Lock-up duty solenoid	B54	7	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid	B54	6	Fuse on FWD switch	More than 8.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
2-4 brake duty solenoid	B54	18	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake dropping resistor	B54	17	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	16	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	15	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
Sensor ground line 1	B54	19	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
System ground line	B56	19	—	0	Less than 1
	B54	20	—		
AT diagnosis signal	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—
		6	—	—	

# DATA LINK CONNECTOR

Engine (DIAGNOSTICS)

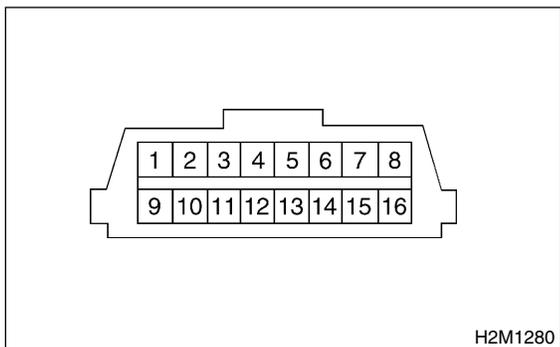
## 8. Data Link Connector S048505

### A: NOTE S048505A15

- 1) This connector is used both for OBD-II general scan tools and the Subaru Select Monitor.
- 2) Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

### CAUTION:

**Do not connect any scan tools other than the OBD-II general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.**



Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	K line of ISO 9141 CARB
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Line end check signal 1	14	Blank
7	Blank	15	Blank
8	—	16	Blank

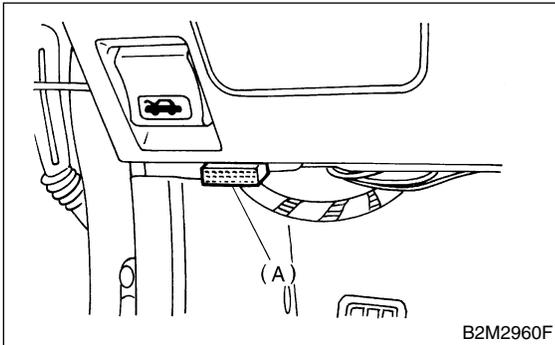
\*: Circuit only for Subaru Select Monitor

**9. OBD-II General Scan Tool** S048527

**A: OPERATION** S048527A16

**1. HOW TO USE OBD-II GENERAL SCAN TOOL** S048527A1601

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



- 3) Using the OBD-II general scan tool, call up diagnostic trouble code(s) and freeze frame data. OBD-II 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 diagnostic trouble codes
  - (4) MODE \$04: Clear/Reset emission-related diagnostic information

Read out data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

**NOTE:**

For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>

**2. MODE \$01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)** S048527A1602

Refers to data denoting the current operating condition of analog input/output, digital input/output and/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 trouble codes and MIL status	ON/OFF and number
03	Fuel system control status	%
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim (Bank 1)	%
07	Long term fuel trim (Bank 1)	%
08	Short term fuel trim (Bank 2)	%
09	Long term fuel trim (Bank 2)	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
10	Air flow rate from pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
24	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 1	V and %
28	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
1C	On-board diagnosis system	—

**NOTE:**

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

# OBD-II GENERAL SCAN TOOL

Engine (DIAGNOSTICS)

## 3. MODE \$02 (POWERTRAIN FREEZE FRAME DATA) S048527A1603

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

PID	Data	Unit of measure
02	Trouble code that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim (Bank 1)	%
07	Long term fuel trim (Bank 1)	%
08	Short term fuel trim (Bank 2)	%
09	Long term fuel trim (Bank 2)	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE \$02).

## 4. MODE \$03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE) S048527A1604

Refer to Read Diagnostic Trouble Code for information about data denoting emission-related powertrain diagnostic trouble codes. <Ref. to EN(H6)-49, Read Diagnostic Trouble Code.>

## 5. MODE \$04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION) S048527A1605

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

NOTE:

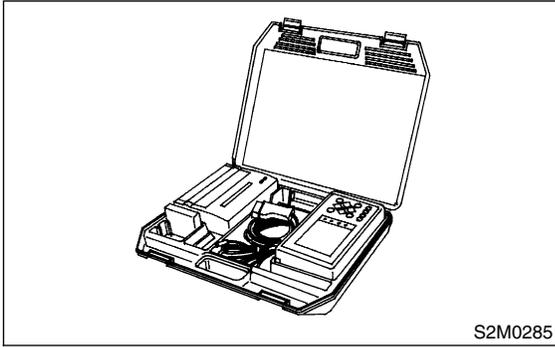
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE \$04).

**10. Subaru Select Monitor** S048503

**A: OPERATION** S048503A16

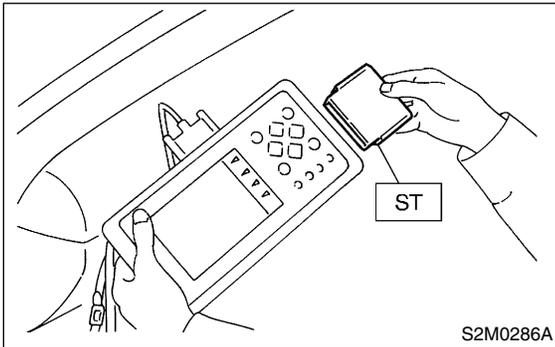
**1. HOW TO USE SUBARU SELECT MONITOR** S048503A1601

1) Prepare Subaru Select Monitor kit. <Ref. to EN(H6)-8, PREPARATION TOOL, General Description.>



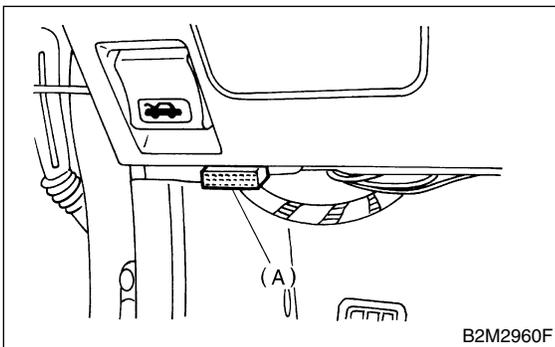
2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6)-8, PREPARATION TOOL, General Description.>



4) Connect Subaru Select Monitor to data link connector.

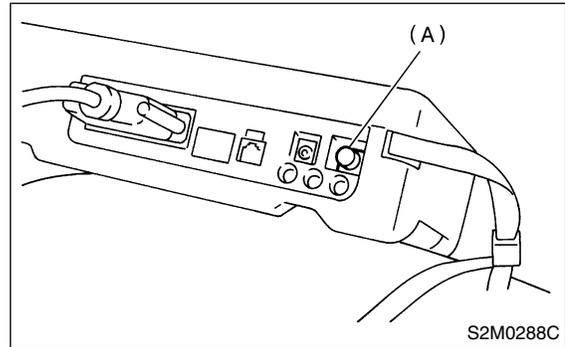
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect diagnosis cable to data link connector.

**CAUTION:**  
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

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



(A) Power switch

6) Using Subaru Select Monitor, call up diagnostic trouble code(s) and various data, then record them.

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

S048503A1610

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H6)-49, Read Diagnostic Trouble Code.>

**3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)** S048503A1611

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H6)-49, Read Diagnostic Trouble Code.>

# SUBARU SELECT MONITOR

Engine (DIAGNOSTICS)

## 4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE) S048503A1604

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
  - 3) Press the [YES] key after displayed the information of engine type.
  - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
  - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
  - 6) Using the scroll key, move 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
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width 1	Fuel Injection #1 Pulse	ms
Injection pulse width 2	Fuel Injection #2 Pulse	ms
Idle air control signal	ISC Valve Duty Ratio	%
Engine load data	Engine Load	%
Front oxygen (A/F) sensor output signal 1	A/F Sensor #1	—
Front oxygen (A/F) sensor output signal 2	A/F Sensor #2	—
Front oxygen (A/F) sensor resistance 1	A/F Sensor #1 Resistance	Ω
Front oxygen (A/F) sensor resistance 2	A/F Sensor #2 Resistance	Ω
Rear oxygen sensor output signal	Rear O2 Sensor	V
Short term fuel trim 1	A/F Correction #1	%
Short term fuel trim 2	A/F Correction #2	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psig
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psig
EGR control signal	No. of EGR Steps	STEP
Generator signal	ALT Duty	%
Front oxygen (A/F) sensor 1 current	A/F Sensor #1 Current	mA
Front oxygen (A/F) sensor 2 current	A/F Sensor #2 Current	mA
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim 1	A/F Learning #1	%
Long term whole fuel trim 2	A/F Learning #2	%
Long term whole fuel trim 3	A/F Learning #3	%
Front oxygen (A/F) sensor heater current 1	A/F Heater Current 1	A
Front oxygen (A/F) sensor heater current 2	A/F Heater Current 2	A
Rear oxygen sensor heater voltage	Rear O2 Heater Voltage	V
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Fuel tank pressure signal	Fuel Tank Pressure	mmHg or kPa or inHg or psig
Fuel temperature signal	Fuel Temp.	°C or °F
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F

Contents	Display	Unit of measure
Ignition switch signal	Ignition Switch	ON or OFF
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioner switch signal	A/C Switch	ON or OFF
Radiator fan relay signal 1	Radiator Fan Relay #1	ON or OFF
Fuel pump relay signal	Fuel Pump Relay	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator fan relay signal 2	Radiator Fan Relay #2	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Control Permission Signal	ON or OFF
Pressure control solenoid valve	PCV Solenoid Valve	ON or OFF
Drain valve	Vent. Solenoid Valve	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch Signal	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Air conditioner lock switch signal	A/C Lock Signal	ON or OFF
Air conditioner mid pressure switch signal	A/C Mid Pressure Switch	ON or OFF
Air conditioner compressor signal	A/C Compressor Signal	ON or OFF
Radiator fan relay signal 3	Radiator Fan Relay #3	ON or OFF
Induction control solenoid signal	Variable Intake Air Sol.	ON or OFF
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF

**NOTE:**

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For select monitor display details, refer to the following.

**Engine Load**

**Display: 0 — 100%**

The engine load is displayed. The ECM calculates the engine load via the engine speed and signals from the pressure sensor. The engine load increases when the engine speed and absolute pressure of the intake manifold increase.

**Coolant Temp.**

**Display: -40 to 215°C (-40 to 419°F)**

The coolant temperature transmitted from the engine coolant temperature sensor is displayed.

**ATF Correction #1, #2 and #3**

**Display: -100 to 99%**

Using the signal from the front oxygen (A/F) sensor, the correction value of the fuel supply amount regulated by the ECM is indicated. When the A/F is lean and when displayed value becomes 0 % or more, ECM increases the fuel. When the A/F is rich and when displayed value becomes 0 % or less, ECM decreases the fuel.

**A/F Learning #1, #2 and #3**

**Display: -100 to 99.2%**

The ECM calculates the long-term fuel trim value from the short-term fuel trim value. The long-term fuel trim value means the correction value of long-term fuel supply amount. If the displayed value is less than 0 %, the fuel system is in rich status and the ECM restricts the fuel supply (by shortening the injector pulse). If the displayed value is more than 0 %, the fuel system is in lean status and the ECM increases the fuel supply (by extending the injector pulse).

**Mani Absolute Pressure**

**Display: 0 — 254.9 kPa (0 — 1,912.5 mmHg, 0 — 75.3 inHg)**

The pressure in the intake manifold is displayed. The ECM detects the pressure in the intake tube via the signal from the pressure sensor. The ECM calculates the air mass required for the engine.

# SUBARU SELECT MONITOR

Engine (DIAGNOSTICS)

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## **Engine Speed**

**Display: 0 — 16,383 rpm**

The engine speed transmitted from the crankshaft position sensor is detected.

## **Vehicle Speed**

**Display: 0 — 255 km/h (0 — 158 MPH)**

The vehicle speed transmitted from the vehicle speed sensor is displayed.

## **Ignition Timing**

**Display: -64 to 63.5 deg.**

The advanced ignition timing value is displayed. The ECM calculates the advanced ignition timing value using engine coolant temperature, engine speed, and engine load.

## **Intake Air Temp.**

**Display: 40 — 215°C (104 — 419°F)**

The intake air temperature is displayed. The ECM detects the intake air temperature via the signal from the intake air temperature sensor, and corrects the ignition timing and fuel supply amount.

## **Rear O2 Sensor**

**Display: 0 — 327.7 Volt**

The ECM corrects air-fuel ratio by the signal sent from O2 sensor. Also, the signal is used for catalyst degradation diagnosis.

## **Battery Voltage**

**Display: 0 — 20.4 V**

The battery voltage is displayed.

## **Throttle Sensor Voltage**

**Display: 0 — 5 V**

The throttle angle is displayed in voltage. When the throttle is fully-closed, the displayed voltage value is approx. 0.5 V. When it is fully-open, the voltage is approx. 4 V or more.

## **Fuel Injection #1 and #2 Pulse**

**Display: 0 — 65.3 m/sec (0 — 214.2 ft/sec)**

The injector valve opening time is displayed. The longer the injector valve opening time, the more the fuel is supplied. The higher the engine load, the longer the injector valve opening time becomes.

## **Knocking Correction**

**Display: -64 to 63.5 deg.**

The ECM controls the ignition timing via the signal from the knock sensor.

## **Atmosphere Pressure**

**Display: 0 — 254.9 kPa (0 — 1,912.5 mmHg, 0 — 75.3 inHg)**

The atmospheric pressure is displayed. The ECM detects the atmospheric pressure via the signal from the atmosphere sensor.

## **Mani. Relative Pressure**

**Display: 0 — 126.9 kPa (0 — 952 mmHg, 0 — 37.5 inHg)**

A value calculated by subtracting the absolute pressure in the intake tube from the atmospheric pressure is displayed. A larger load leads to a larger value.

## **Fuel Tank Pressure**

**Display: 0 — 3.2 kPa (0 — 24 mmHg, 0 — 0.94 inHg)**

**The pressure in the fuel tank is displayed.**

## **Fuel Temp.**

**Display: -40 to 215°C**

The fuel temperature is displayed. The ECM detects the fuel temperature via the signal from the fuel temperature sensor. This signal is used for the evaporation diagnosis.

## **Front O2 Heater Current**

**Display: 0 — 10 A**

The heater current of the A/F sensor is displayed. A larger current value leads to increased heat generation.

## **Rear O2 Heater Current**

**Display: 0 — 10 A**

The heater current of the rear O2 sensor is displayed. A larger current value leads to increased heat generation.

## **Fuel Level**

**Display: 0 — 5 V**

The float inside the fuel tank is a variable resistor which varies the resistance based on fuel level. The ECM then averages this voltage and the signal voltage from the fuel tank in order to determine fuel level. The scan tool displays close to 0.7 volts for an empty tank, and close to 5 volts for a full tank.

## **CPC Valve Duty Ratio**

**Display: 0 — 100%**

The purge control solenoid valve is regulated by the ECM. The displayed value of 0 % indicates that the purge amount is 0, and 100 % indicates that the purge amount becomes the maximum.

**A/F sensor #1, #2**  
**Display: 0 — 2**

The air surplus ratio output from the front oxygen (A/F) sensor is displayed. Air overflow ratio = 1.0 is regarded as a stoichiometric A/F ratio. A value above 1.0 indicates A/F lean range, and below 1.0 indicates A/F rich range.

**A/F Correction #3**  
**Display:**

The correction value of fuel supply amount regulated by the ECM via the signal from the rear oxygen sensor is displayed.

**ALT Duty**  
**Display: 0 — 100%**

The output from the generator is displayed. The displayed value of 0 % indicates that no regulation is done, and 100 % indicates that the generator output is controlled at lower level.

**A/F Sensor #1, #2 Current**  
**Display: -16 — 15.9 mA**

A value of 0 mA is regarded as a stoichiometric A/F ratio. A negative value indicates A/F rich range, and positive value indicates A/F lean range.

**A/F Sensor #1, #2 Resistance**  
**Display: 0 — 255  $\Omega$**

The resistance value of the front oxygen (A/F) sensor is displayed. At idle after warm-up, the resistance value shows 27 to 32 ohm.

**ISC Valve Duty Ratio**  
**Display: 0 — 127.5%**

The duty value of the idle air control solenoid valve is displayed. This value is regulated by the ECM. The displayed value of 0 % indicates that the air bypass circuit is closed, and 100 % indicates that it is fully-open.

**No of EGR Steps**  
**Display: 0 — 255 step**

The number of the EGR valve steps is displayed. The EGR valve is driven by the stepping motor, and the number of steps is regulated by the ECM. A value of 0 steps indicates that the EGR ratio is 0 %.

**Rear O2 Heater Voltage**  
**Display: 0 — 5.1 V**

The heater voltage value of the rear oxygen sensor is displayed. The heater current duty-controlled by driving range regulates heater temperature.

**A/F Heater Current 1, 2**  
**Display: 0 — 25.5 A**

The heater voltage value of the front oxygen (A/F) sensor is displayed. To stabilize the output, the heater current is regulated to keep heater temperature to the specified value.

**AT Vehicle ID Signal**  
**Display: ON or OFF**

AT and MT vehicles are identified. For AT vehicles, ON is displayed, and for MT ones, OFF is displayed.

**Neutral Position Switch**  
**Display: ON or OFF**

When the shift lever stays in the neutral position, ON is displayed. When in other positions, OFF is displayed.

**Idle Switch Signal**  
**Display: ON or OFF**

When the accelerator pedal is released fully, ON is displayed. When depressed fully, OFF is displayed.

**P/S Switch**  
**Display: ON or OFF**

When the steering wheel is turned fully, ON is displayed. When returned, OFF is displayed. This signal is used for idle control or other controls.

**A/C Switch**  
**Display: ON or OFF**

When the A/C switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

**Starter Switch**  
**Display: ON or OFF**

When the vehicle is cranking, ON is displayed. When not cranking, OFF is displayed.

**Rear O2 Rich Signal**  
**Display: ON or OFF**

When the A/F ratio is rich, ON is displayed. When lean, OFF is displayed.

**Knocking Signal**  
**Display: ON or OFF**

When knocking occurs and the ignition timing is retarded, ON is displayed. At any other time, OFF is displayed.

**Crankshaft Position Sig.**  
**Display: ON or OFF**

When a crankshaft signal exists, ON is displayed. At any other time (at engine stall), OFF is displayed.

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## **Camshaft Position Sig.**

**Display: ON or OFF**

When a camshaft signal exists, ON is displayed. At any other time (at engine stall), OFF is displayed.

## **Rear Defogger SW**

**Display: ON or OFF**

When the rear defogger switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

## **Blower Fan SW**

**Display: ON or OFF**

When the blower fan switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

## **Light Switch**

**Display: ON or OFF**

When the light switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

## **A/C Lock Signal**

**Display: ON or OFF**

Whether or not the A/C compressor is active is detected. When it is active, ON is displayed. When inactive, OFF is displayed.

## **A/C Mid Pressure Switch**

**Display: ON or OFF**

The status of the A/C compressor is detected. When the A/C compressor voltage is high, ON is displayed. When low, OFF is displayed.

## **A/C Compressor Signal**

**Display: ON or OFF**

When the A/C clutch is engaged, ON is displayed. When disengaged, OFF is displayed.

## **Radiator Fan Relay #1, #2, #3**

**Display: ON or OFF**

When the radiator fan relay is ON (radiator operates), ON is displayed. When OFF (radiator stops), OFF is displayed.

## **Fuel Pump Relay**

**Display: ON or OFF**

When the radiator fan relay is ON (fuel pump operates), ON is displayed. When OFF (fuel pump stops), OFF is displayed.

## **PCV Solenoid Valve**

**Display: ON or OFF**

The status of the pressure control solenoid valve is displayed. When the pressure control solenoid valve is closed, OFF is displayed. When open, ON is displayed. During an evaporation leak diagnosis, the pressure control solenoid valve is only open when vacuum in the intake tube is taken into the fuel tank.

## **Vent Solenoid Valve**

**Display: ON or OFF**

The status of the drain valve is displayed. When the drain valve is closed, ON is displayed. When open, OFF is displayed. Except during an evaporation leak diagnosis, the drain valve is always open.

## **Torque Control Signal #1, #2**

**Display: ON or OFF**

When a torque down signal exists, ON is displayed. When it doesn't, OFF is displayed.

## **Torque Permission Signal**

**Display: ON or OFF**

The signal which notifies whether or not torque down is possible is displayed. This signal is transmitted from the ECU in response to a torque down signal from the TCU. When torque down is prohibited, ON is displayed. When permitted, OFF is displayed.

## **Variable Intake Air Sol.**

**Display: ON or OFF**

The status of the induction control valve is displayed. When the valve is closed for the control to improve low- and mid-speed range, ON is displayed. When open, OFF is displayed.

## 5. READ CURRENT DATA FOR ENGINE. (OBD MODE) S048503A1605

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
  - 3) Press the [YES] key after displayed the information of engine type.
  - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
  - 5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
  - 6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
  - 7) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of diagnosis code	Number of Diag Code:	—
Malfunction indicator lamp status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor (Bank 1, Bank 2, Rear)	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater (Bank 1, Bank 2, Rear)	O2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR steps	
Air fuel ratio control system for bank 1	Fuel System for Bank 1	C1 normal
Air fuel ratio control system for bank 2	Fuel System for Bank 2	C1 normal
Engine load data	Calculated load valve	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor bank 1	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor bank 1	Long term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor bank 2	Short term fuel trim B2	%
Long term fuel trim by front oxygen (A/F) sensor bank 2	Long term fuel trim B2	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Throttle position signal	Throttle Opening Angle	%
Oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—
Oxygen sensor equipment	Oxygen Sensor #11	Supported
Oxygen sensor equipment	Oxygen Sensor #12	Supported
Oxygen sensor equipment	Oxygen Sensor #21	Supported
A/F sensor equipment	A/F Sensor #11	—
A/F sensor output signal	A/F Sensor #11	V
A/F sensor equipment	A/F Sensor #21	—
A/F sensor output signal	A/F Sensor #21	V

**NOTE:**

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

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## 6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE) S048503A1606

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

Contents	Display	Unit of measure
Diagnostic trouble code (DTC) for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Air fuel ratio control system for bank 2	Fuel System for Bank 2	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor bank 1	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor bank 1	Long term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor bank 2	Short term fuel trim B2	%
Long term fuel trim by front oxygen (A/F) sensor bank 2	Long term fuel trim B2	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH

### NOTE:

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

## 7. LED OPERATION MODE FOR ENGINE S048503A1608

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
  - 3) Press the [YES] key after displayed the information of engine type.
  - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
  - 5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
  - 6) Using the scroll key, move 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	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Relay	ON or OFF	When air conditioning relay is functioning.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is functioning.
Fuel pump relay signal	Fuel Pump Relay	ON or OFF	When fuel pump relay is functioning.
Knocking signal	Knocking Signal (#1 or #2)	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is functioning.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permit	ON or OFF	When engine torque control permission signal is entered.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Pressure control solenoid valve	PCV Solenoid Valve	ON or OFF	When pressure control solenoid valve is functioning.
Drain valve	Vent. Solenoid Valve	ON or OFF	When drain valve is functioning.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.
Radiator sub fan relay 2 signal	Radiator Fan Relay 3	ON or OFF	When radiator sub fan relay is functioning.
Air conditioner mid pressure switch signal	A/C Mid Pressure Switch	ON or OFF	When air conditioner mid pressure switch is entered.
Air conditioner lock switch signal	A/C Lock Signal	ON or OFF	When air conditioner lock switch is entered.

**NOTE:**

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

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## 8. READ CURRENT DATA FOR AT. S048503A1612

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
  - 3) Press the [YES] key after displayed the information of transmission type.
  - 4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
  - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
  - 6) Using the scroll key, move 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
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Vehicle Speed #1	km/h or MPH
Front vehicle speed sensor signal	Vehicle Speed #2	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	AT Turbine Speed	rpm
2-4 brake timing pressure control duty ratio	2-4B Duty Ratio	%
Intake manifold pressure sensor voltage	Mani. Pressure Voltage	V
2 wheel drive switch signal	2WD Switch	ON or OFF
Stop lamp switch signal	Stop Lamp Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	AT Diagnosis Lamp	ON or OFF

### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For select monitor display details, refer to the following.

#### **Front Wheel Speed**

**Display: 0 — 255 km/h (0 — 158 MPH)**

The front wheel speed is displayed. This signal is used for the shift control, lock-up control, line pressure control, and transfer control.

#### **ATF Temp.**

**Display: -40 to 215°C (-40 to 419°F)**

The ATF temperature via the signal from the ATF temperature sensor is displayed.

**Gear Position****Display:**

The present gear position is displayed. The gear position is calculated from the engine speed and torque converter turbine speed.

**Line Pressure Duty Ratio****Display: 0 — 123%**

The duty value of the line pressure duty solenoid is displayed. The line pressure duty solenoid is regulated by the TCM, adjusting the line pressure to the optimum value depending on driving conditions.

**Lock Up Duty Ratio****Display: 0 — 123%**

The duty value of the lock-up duty solenoid is displayed. The lock-up duty solenoid is regulated by the TCM. Because the lock-up duty solenoid controls the lock-up control valve, the lock-up clutch engages and disengages smoothly.

**Transfer Duty Ratio****Display: 0 — 123%**

The duty value of the transfer duty solenoid is displayed. The transfer duty solenoid is regulated by the TCM, adjusting the transfer clutch oil pressure and controlling the driving force of the rear wheels.

**Turbine Revolution Speed****Display: 0 — 8,160 rpm**

The input shaft speed detected by the torque converter speed sensor is displayed. This signal is used to control the line pressure and 2 - 4 brake pressure control timing during shifting.

**Throttle Sensor Power****Display: 0 — 256 V**

The supply voltage to the throttle sensor is displayed. This signal is used for the throttle sensor output correction.

**Brake Clutch Duty Ratio****Display: 0 — 123%**

The duty value of the 2 - 4 brake duty solenoid. The 2 - 4 brake duty solenoid is regulated by the TCM, adjusting the 2 - 4 brake pressure during shifting and relieving from harsh shifting.

**Rear Wheel Speed****Display: 0 — 255 km/h (0 — 158 MPH)**

The rear wheel speed is displayed. This signal is used to control the transfer. If the front vehicle speed sensor is malfunctioning, this signal is used as a substitute.

**Cruise Control Signal****Display: ON or OFF**

When the cruise control switch is ON, ON is displayed. When OFF, OFF is displayed.

**ABS Signal****Display: ON or OFF**

When the ABS function is active, ON is displayed. When inactive, OFF is displayed.

**Stop Light Signal****Display: ON or OFF**

When the brake pedal is depressed, ON is displayed. When released, OFF is displayed.

**1st, 2nd, 3rd, D, R, Range Signal****Display: ON or OFF**

When the switch for each range is ON, ON is displayed.

**2-4 Brake Timing Sol.****Display: ON or OFF**

When the 2-4 brake timing solenoid is ON, ON is displayed. When OFF, OFF is displayed. The 2-4 brake timing solenoid is regulated by the TCM, controlling the release timing of the 2-4 brake.

**Low Clutch Timing Sol.****Display: ON or OFF**

When the low clutch timing solenoid is ON, ON is displayed. When OFF, OFF is displayed. The low clutch timing solenoid is regulated by the TCM, controlling the release timing of the low clutch.

**Shift Solenoid #1, #2****Display: ON or OFF**

When the solenoid valve is ON, ON is displayed. When OFF, OFF is displayed. By combining No. 1 and No. 2 solenoids, the shifting mechanism is controlled.

**P Range****Display: ON or OFF**

When the shift lever stays in P range, ON is displayed. When not in P range, OFF is displayed.

**N Range****Display: ON or OFF**

When the shift lever stays in N range, ON is displayed. When not in N range, OFF is displayed.

**Torque Control Signal #1, #2****Display: ON or OFF**

When the torque down signal exists, ON is displayed. When it does not exist, OFF is displayed.

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## ***Torque Permission Signal***

***Display: ON or OFF***

The signal which notifies whether or not torque down is possible is displayed. This signal is transmitted from the ECU in response to a torque down signal from the TCU. When torque down is prohibited, ON is displayed. When permitted, OFF is displayed.

## 11. Read Diagnostic Trouble Code S048508

### A: OPERATION S048508A16

#### 1. SUBARU SELECT MONITOR (NORMAL MODE) S048508A1601

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

**NOTE:**

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>

#### 2. SUBARU SELECT MONITOR (OBD MODE) S048508A1602

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press the [YES] key.
- 6) Make sure that a diagnostic trouble code (DTC) is shown on the display screen.

**NOTE:**

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>

### 3. OBD-II GENERAL SCAN TOOL S048508A1603

Refers to data denoting emission-related powertrain diagnostic trouble codes.

For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>

**NOTE:**

Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain diagnostic trouble codes (MODE \$03).

# INSPECTION MODE

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## 12. Inspection Mode S048510

When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle. <Ref. to EN(H6)-55, Drive Cycle.>

### A: OPERATION S048510A16

Carry out trouble diagnosis shown in the following DTC table.

DTC No.	Item
P0031	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) heater circuit low input
P0032	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) heater circuit high input
P0037	Bank #1 and sensor #2 oxygen sensor (rear) heater circuit low input
P0038	Bank #1 and sensor #2 oxygen sensor (rear) heater circuit high input
P0051	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) heater circuit low input
P0052	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) heater circuit high input
P0106	Intake manifold pressure sensor circuit range/performance problem
P0107	Intake manifold pressure sensor circuit low input
P0108	Intake manifold pressure sensor circuit high input
P0112	Intake air temperature sensor circuit low input
P0113	Intake air temperature sensor circuit high input
P0117	Engine coolant temperature sensor circuit low input
P0118	Engine coolant temperature sensor circuit high input
P0122	Throttle position sensor circuit low input
P0123	Throttle position sensor circuit high input
P0131	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) circuit malfunction (open circuit)
P0132	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) circuit malfunction (short circuit)
P0137	Bank #1 and sensor #2 oxygen sensor (rear) circuit low input
P0138	Bank #1 and sensor #2 oxygen sensor (rear) circuit high input
P0151	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) circuit malfunction (open circuit)
P0152	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) circuit malfunction (short circuit)
P0182	Fuel temperature sensor A circuit low input
P0183	Fuel temperature sensor A circuit high input
P0327	Knock sensor 1 circuit low input
P0328	Knock sensor 1 circuit high input
P0332	Knock sensor 2 circuit low input
P0333	Knock sensor 2 circuit high input
P0335	Crankshaft position sensor circuit malfunction
P0336	Crankshaft position sensor circuit range/performance problem
P0340	Camshaft position sensor circuit malfunction
P0341	Camshaft position sensor circuit range/performance problem
P0447	Evaporative emission control system vent control low input
P0448	Evaporative emission control system vent control high input
P0452	Evaporative emission control system pressure sensor low input
P0458	Evaporative emission control system purge control valve circuit low input
P0462	Fuel level sensor circuit low input
P0463	Fuel level sensor circuit high input
P0500	Vehicle speed sensor malfunction
P0508	Idle control system circuit low input
P0509	Idle control system circuit high input
P0512	Starter switch circuit high input
P0604	Internal control module memory check sum error
P0661	Induction valve control solenoid circuit low input
P0662	Induction valve control solenoid circuit high input
P0691	Cooling fan relay 1 circuit low input

# INSPECTION MODE

Engine (DIAGNOSTICS)

DTC No.	Item
P0692	Cooling fan relay 1 circuit high input
P0703	Brake switch input malfunction
P0705	Transmission range sensor circuit malfunction
P0710	Transmission fluid temperature sensor circuit malfunction
P0715	Torque converter turbine speed sensor circuit malfunction
P0720	Output speed sensor (vehicle speed sensor 2) circuit malfunction
P0725	Engine speed input circuit malfunction
P0731	Gear 1 incorrect ratio
P0732	Gear 2 incorrect ratio
P0733	Gear 3 incorrect ratio
P0734	Gear 4 incorrect ratio
P0741	Torque converter clutch system malfunction
P0743	Torque converter clutch system (Lock-up duty solenoid) electrical
P0748	Pressure control solenoid (Line pressure duty solenoid) electrical
P0753	Shift solenoid A (Shift solenoid 1) electrical
P0758	Shift solenoid B (Shift solenoid 2) electrical
P0778	2-4 brake pressure control solenoid valve circuit malfunction
P0785	2-4 brake timing control solenoid valve circuit malfunction
P0851	Neutral position switch circuit low input
P0852	Neutral position switch circuit high input
P0864	Automatic transmission diagnosis input signal circuit malfunction
P0865	Automatic transmission diagnosis input signal circuit low input
P0866	Automatic transmission diagnosis input signal circuit high input
P1110	Atmospheric pressure sensor low input
P1111	Atmospheric pressure sensor high input
P1112	Atmospheric pressure sensor range/performance problem
P1134	Front oxygen (A/F) sensor micro-computer problem
P1139	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) heater circuit range/performance problem
P1140	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) heater circuit range/performance problem
P1146	Pressure sensor circuit range/performance problem (high input)
P1152	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) circuit range/performance problem (low input)
P1153	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) circuit range/performance problem (high input)
P1154	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) circuit range/performance problem (low input)
P1155	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) circuit range/performance problem (high input)
P1400	Fuel tank pressure control solenoid valve circuit low input
P1420	Fuel tank pressure control solenoid valve circuit high input
P1443	Evaporative emission control system vent control function problem
P1507	Idle control system malfunction (fail-safe)
P1518	Starter switch circuit low input
P1560	Back-up voltage circuit malfunction
P1698	Engine torque control cut signal circuit low input
P1699	Engine torque control cut signal circuit high input
P1700	Throttle position sensor circuit malfunction for automatic transmission
P1701	Cruise control set signal circuit malfunction for automatic transmission
P1703	Low clutch timing control solenoid valve circuit malfunction
P1711	Engine torque control signal 1 circuit malfunction
P1712	Engine torque control signal 2 circuit malfunction

# INSPECTION MODE

Engine (DIAGNOSTICS)

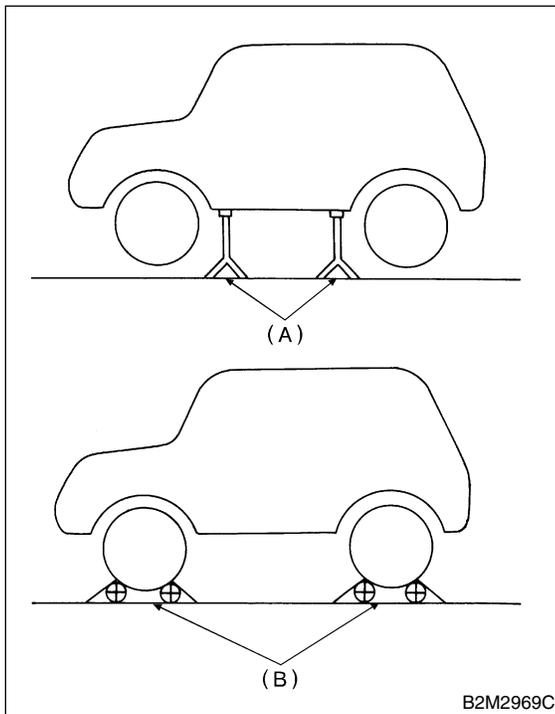
## 1. PREPARATION FOR THE INSPECTION MODE S048510A1601

1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.

2) Raise the vehicle using a garage jack and place on safety stands 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 safety stand.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator pedal during works even when 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 safety stands and the 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.



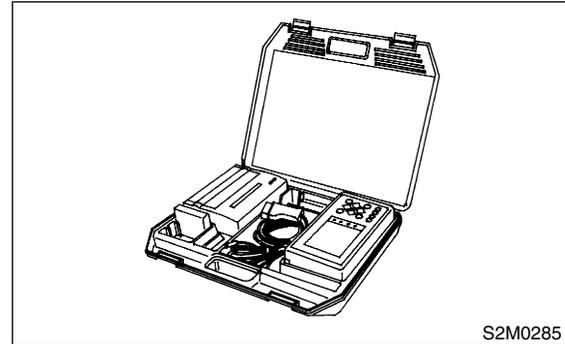
- (A) Safety stand  
(B) Free rollers

## 2. SUBARU SELECT MONITOR S048510A1602

1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6)-58, Clear Memory Mode.>

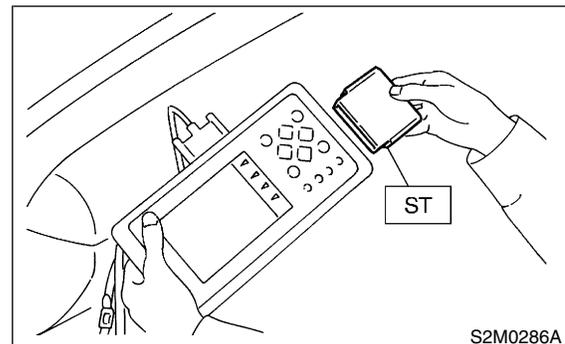
2) Warm up engine.

3) Prepare Subaru Select Monitor kit. <Ref. to EN(H6)-8, PREPARATION TOOL, General Description.>

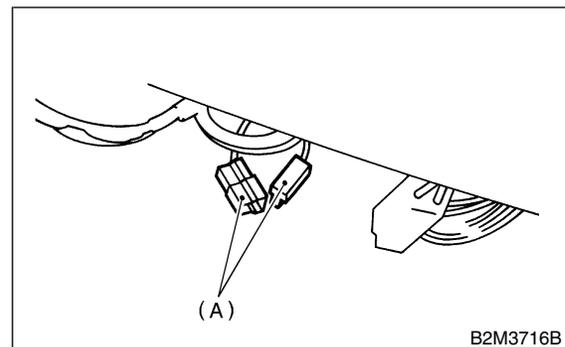


4) Connect diagnosis cable to Subaru Select Monitor.

5) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6)-8, PREPARATION TOOL, General Description.>

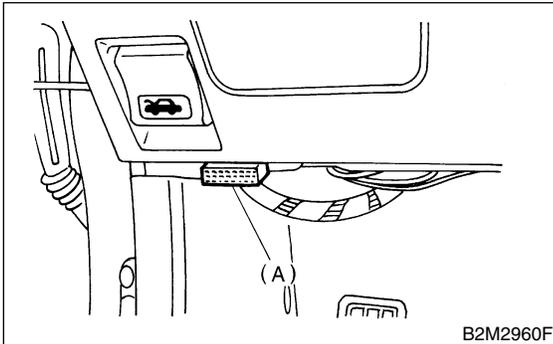


6) Connect test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



7) Connect Subaru Select Monitor to data link connector.

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

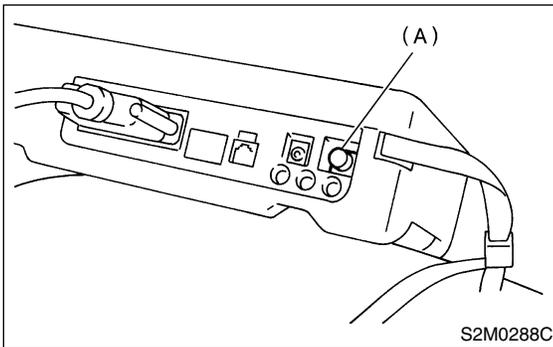


(2) Connect diagnosis cable to data link connector.

**CAUTION:**

**Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.**

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



(A) Power switch

9) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

10) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

11) Press the [YES] key after displayed the information of engine type.

12) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.

13) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press the [YES] key.

14) Perform subsequent procedures as instructed on the display screen.

● If trouble still remains in the memory, the corresponding diagnostic trouble code (DTC) appears on the display screen.

**NOTE:**

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

● For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>

● Release the parking brake.

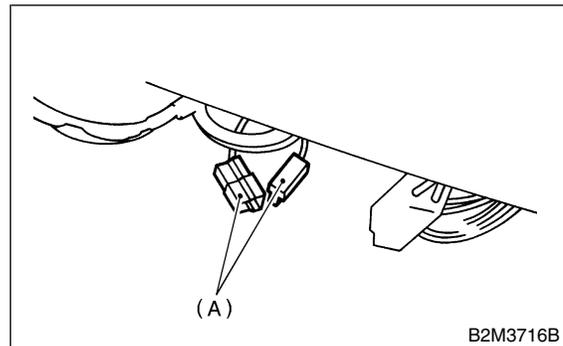
● The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

**3. OBD-II GENERAL SCAN TOOL** S048510A1603

1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data: <Ref. to EN(H6)-58, Clear Memory Mode.>

2) Warm up engine.

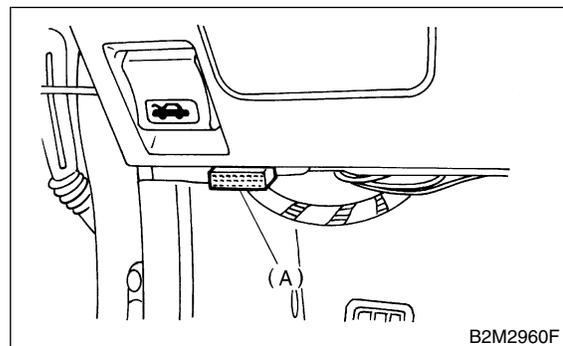
3) Connect test mode connector (A) at the lower side of the instrument panel (on the driver's side), to the side of the center console box.



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

**CAUTION:**

**Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.**



5) Start the engine.

# INSPECTION MODE

## Engine (DIAGNOSTICS)

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### NOTE:

Ensure the selector lever is placed in the “P” position before starting.

6) Using the selector lever or shift lever, turn the “P” position switch and the “N” position switch to ON.

7) Depress the brake pedal to turn the brake switch ON.

8) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.

9) Place the selector lever or shift lever in the “D” position and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

### NOTE:

- On AWD vehicles, release the parking brake.
- The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

10) Using the OBD-II general scan tool, check for diagnostic trouble code(s) and record the result(s).

### NOTE:

- For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>

**13. Drive Cycle** S048812

**A: OPERATION** S048812A16

There are 3 drive patterns for trouble diagnosis. Driving in the specified pattern allows to diagnose the malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

**1. PREPARATION FOR THE DRIVE CYCLE.** S048812A1601

- 1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
- 2) After performing diagnostics and cleaning the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6)-58, Clear Memory Mode.>
- 3) Separate test mode connector.

NOTE:

- Except for water temperature specified items at starting, diagnosis is carried out after engine warm up.
- Carry out diagnosis which is marked \* on DTC twice, Then, after finishing 1st diagnosis, stop engine and do the second time at the same condition.

**2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.**

S048812A1602

DTC No.	Item	Condition
*P0111	Intake air temperature sensor circuit range/performance problem	Coolant temperature at start is less than 30°C (86°F).
*P0125	Insufficient coolant temperature for closed loop fuel control	Coolant temperature at start is less than 20°C (68°F).
*P0128	Thermostat malfunction	Coolant temperature at start is less than 55°C (131°F).
*P0133	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) circuit slow response	—
*P0153	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) circuit slow response	—
*P0181	Fuel temperature sensor A circuit range/performance problem	—
*P0420	Catalyst system efficiency below threshold	—
*P0442	Evaporative emission control system malfunction	—
*P0451	Evaporative emission control system pressure sensor range/performance problem	—
P0453	Evaporative emission control system pressure sensor high input	—
*P0457	Evaporative system malfunction	—
P0459	Evaporative emission control system purge control valve circuit high input	—
P0461	Fuel level sensor circuit range/performance problem	—
*P0464	Fuel level sensor intermittent input	—

# DRIVE CYCLE

Engine (DIAGNOSTICS)

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## 3. IDLE FOR 10 MINUTES S048812A1603

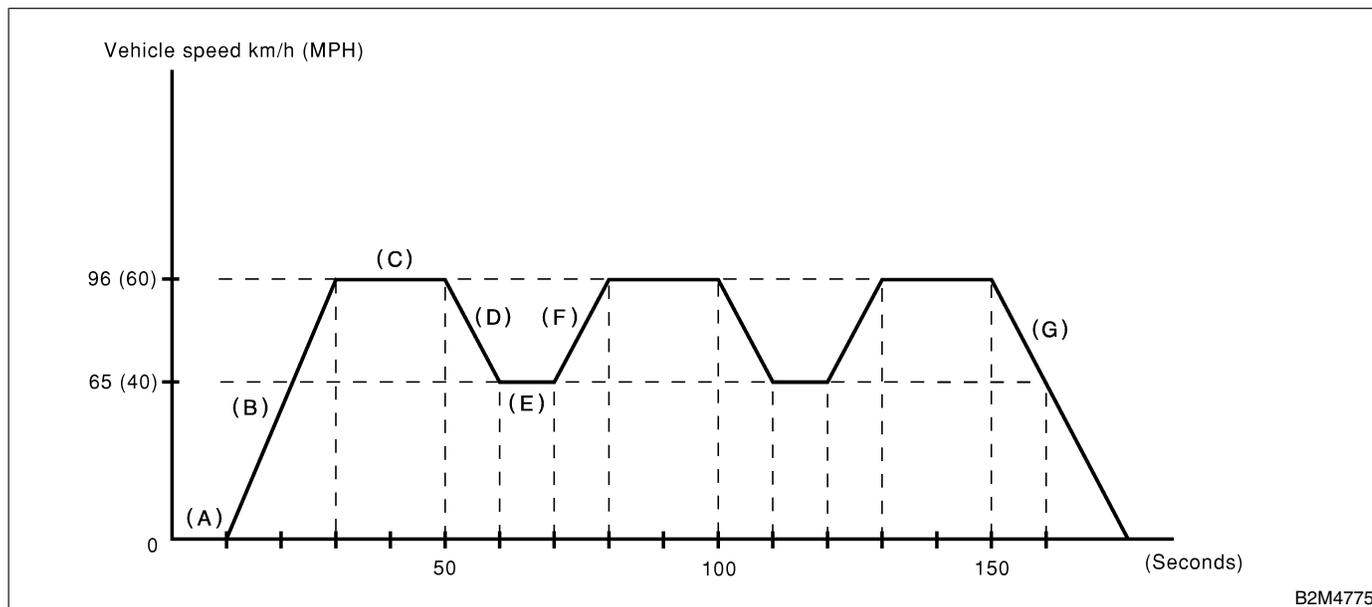
NOTE:

Before diagnosis, drive vehicle at 4 km/h (6 MPH) or more.

DTC No.	Item	Condition
*P0483	Cooling fan function problem	—
*P0506	Idle control system RPM lower than expected	—
*P0507	Idle control system RPM higher than expected	—
*P1139	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) heater circuit range/performance problem	—
*P1140	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) heater circuit range/performance problem	—

## 4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN

S048812A1604



- |                                                       |                                                                |                                                       |
|-------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------|
| (A) Idle engine for 1 minute.                         | (D) Decelerate with fully closed throttle to 64 km/h (40 MPH). | (F) Accelerate to 97 km/h (60 MPH) within 10 seconds. |
| (B) Accelerate to 97 km/h (60 MPH) within 20 seconds. | (E) Drive vehicle at 64 km/h (40 MPH) for 10 seconds.          | (G) Stop vehicle with throttle fully closed.          |
| (C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds. |                                                                |                                                       |

DTC No.	Item	Condition
*P0121	Throttle position sensor circuit range/performance problem (high input)	Coolant temperature at start is more than 80°C (176°F).
*P0139	Rear oxygen sensor circuit slow response	—
*P0171	Fuel trim #1 (RH) malfunction (A/F too lean)	—
*P0172	Fuel trim #1 (RH) malfunction (A/F too rich)	—
*P0174	Fuel trim #2 (LH) malfunction (A/F too lean)	—
*P0175	Fuel trim #2 (LH) malfunction (A/F too rich)	—
*P0301	Cylinder 1 misfire detected	—
*P0302	Cylinder 2 misfire detected	—
*P0303	Cylinder 3 misfire detected	—
*P0304	Cylinder 4 misfire detected	—
*P0305	Cylinder 5 misfire detected	—
*P0306	Cylinder 6 misfire detected	—
*P0400	EGR system malfunction	—
*P1142	Throttle position sensor circuit range/performance problem (low input)	—

## 14. Clear Memory Mode S048513

### A: OPERATION S048513A16

#### 1. SUBARU SELECT MONITOR (NORMAL MODE) S048513A1601

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

#### NOTE:

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

#### 2. SUBARU SELECT MONITOR (OBD MODE) S048513A1602

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

#### NOTE:

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

### 3. OBD-II GENERAL SCAN TOOL S048513A1603

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

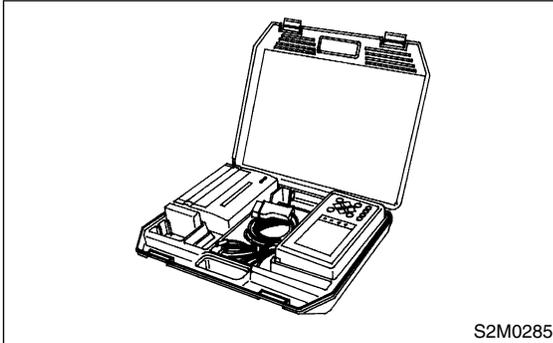
## 15. Compulsory Valve Operation Check Mode

S048528

### A: OPERATION

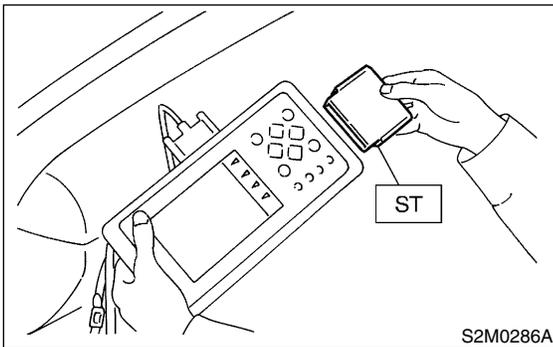
S048528A16

1) Prepare Subaru Select Monitor kit. <Ref. to EN(H6)-8, PREPARATION TOOL, General Description.>

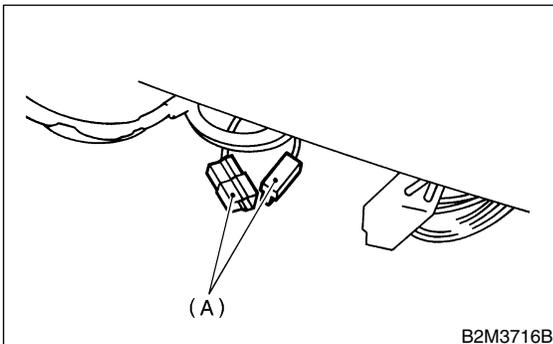


2) Connect diagnosis cable to Subaru Select Monitor.

3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6)-8, PREPARATION TOOL, General Description.>

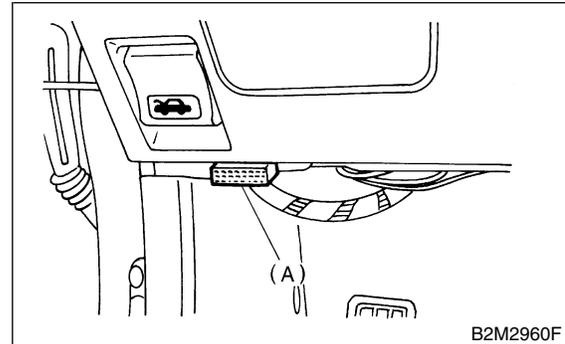


4) Connect test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



5) Connect Subaru Select Monitor to data link connector.

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

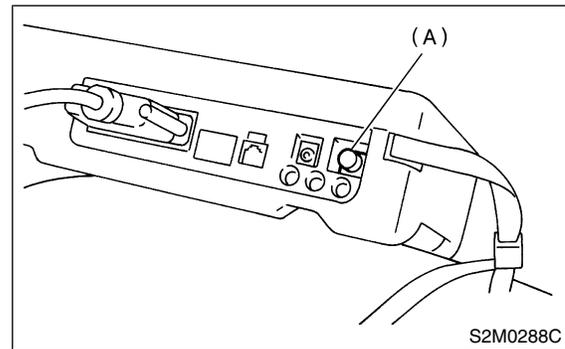


(2) Connect diagnosis cable to data link connector.

### CAUTION:

**Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.**

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



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

9) Press the [YES] key after displayed the information of engine type.

10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.

11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.

12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

# COMPULSORY VALVE OPERATION CHECK MODE

Engine (DIAGNOSTICS)

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13) Pressing the [NO] key completes the compulsory 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 Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory air assist injector solenoid valve operation check	AAI Solenoid Valve
Compulsory fuel tank pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory drain valve operation check	Vent Control Solenoid Valve

NOTE:

- The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
Fuel Tank Sensor Control Valve
AAI Solenoid Valve

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

# COMPULSORY VALVE OPERATION CHECK MODE

Engine (DIAGNOSTICS)

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MEMO:

# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

## 16. Engine Malfunction Indicator Lamp (MIL) S048653

### A: PROCEDURE S048653E45

1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(H6)-63, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
↓
2. Check engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN(H6)-64, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
↓
3. Check engine malfunction indicator lamp (MIL) does not go off. <Ref. to EN(H6)-68, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MIL).>
↓
4. Check engine malfunction indicator lamp (MIL) does not blink at a cycle of 3 Hz. <Ref. to EN(H6)-70, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>
↓
5. Check engine malfunction indicator lamp (MIL) remains blinking at a cycle of 3 Hz. <Ref. to EN(H6)-74, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>

# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

## B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

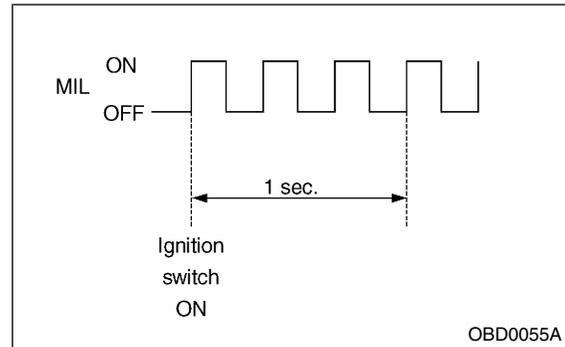
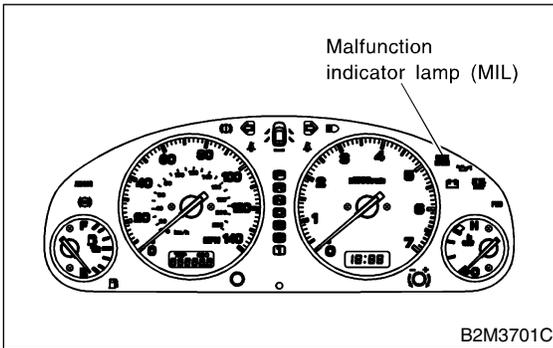
S048653E89

1) When ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

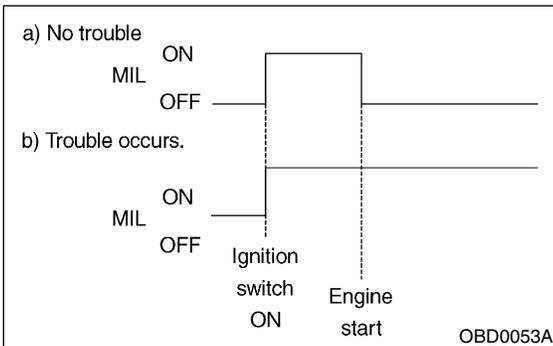
### NOTE:

If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(H6)-64, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL) Illumination Pattern.>

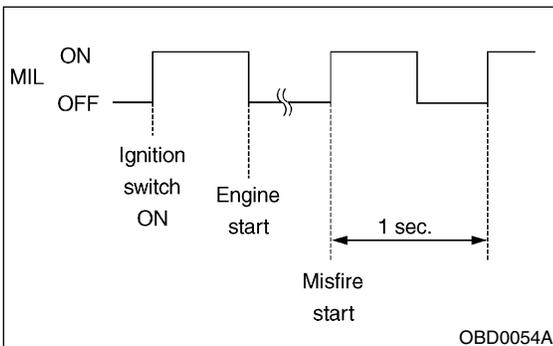
4) When ignition switch is turned to ON (engine off) or to "START" with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.



2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MIL will blink at a cycle of 1 Hz.





# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. <i><b>Connector &amp; terminal</b></i> <i><b>(B137) No. 15 (+) — Chassis ground (-):</b></i>	Is the voltage less than 1 V?	Go to step 4.	Go to step 2.
2	<b>CHECK POOR CONTACT.</b>	Does the MIL come on when shaking or pulling ECM connector and harness?	Repair poor contact in ECM connector.	Go to step 3.
3	<b>CHECK ECM CONNECTOR.</b>	Is ECM connector correctly connected?	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Repair connection of ECM connector.
4	<b>CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Remove combination meter. <Ref. to IDI-11, Combination Meter Assembly.> 3) Disconnect connector from ECM and combination meter. 4) Measure resistance of harness between ECM and combination meter connector. <i><b>Connector &amp; terminal</b></i> <i><b>(B137) No. 15 — (i12) No. 12:</b></i>	Is resistance less than 1 $\Omega$ ?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and combination meter connector</li> <li>● Poor contact in coupling connector</li> </ul>
5	<b>CHECK POOR CONTACT.</b> Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair poor contact in combination meter connector.	Go to step 6.

# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<p><b>CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.</b>                      Measure voltage between combination meter connector and chassis ground.  <b>Connector &amp; terminal</b>  <i>(i12) No. 3 (+) — Chassis ground (-):</i></p>	Is voltage more than 10 V?	Go to step 7.	Check the following and repair if necessary. NOTE: <ul style="list-style-type: none"> <li>● Broken down ignition relay.</li> <li>● Blown out fuse (No. 5).</li> <li>● If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector.</li> <li>● Open or short circuit in harness between fuse (No. 5) and battery terminal</li> <li>● Open circuit in harness between fuse (No. 5) and ignition relay connector</li> <li>● Poor contact in ignition relay connector</li> <li>● Poor contact in ignition switch connector</li> </ul>
7	<p><b>CHECK LAMP BULB.</b>                      Remove engine malfunction indicator lamp bulb.</p>	Is lamp bulb condition OK?	Repair combination meter connector.	Replace lamp bulb.

# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

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MEMO:

## ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

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### **D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.** S048653E91

- **DIAGNOSIS:**

- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.

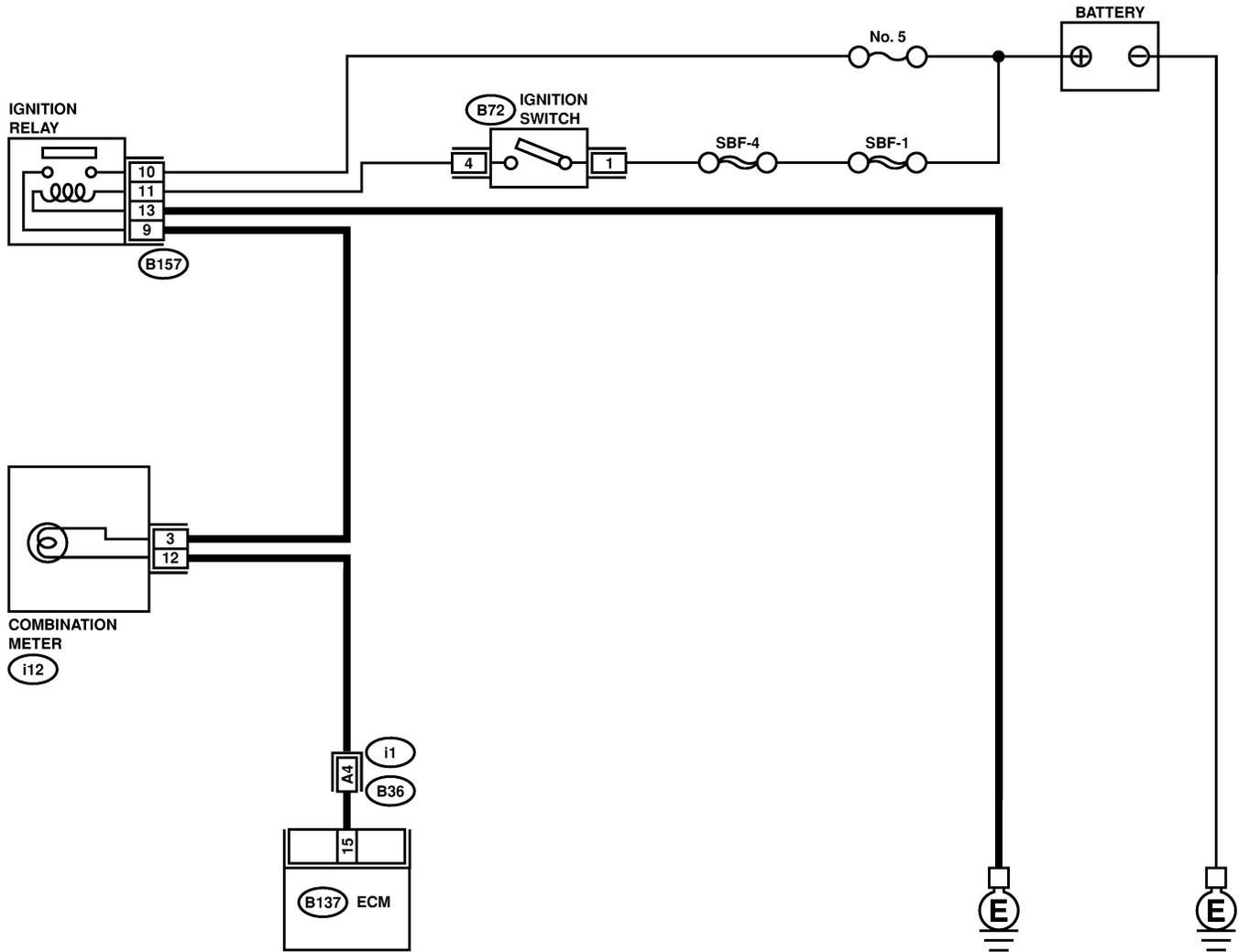
- **TROUBLE SYMPTOM:**

- Although MIL comes on when engine runs, trouble code is not shown on Subaru select monitor or OBD-II general scan tool display.

# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

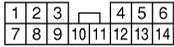
## ● WIRING DIAGRAM:



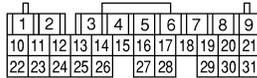
(B72)



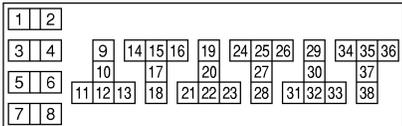
(i12)



(B137)



(B157)



## ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

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### **E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 Hz.** S048653E92

- **DIAGNOSIS:**

- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- Test mode connector circuit is open.

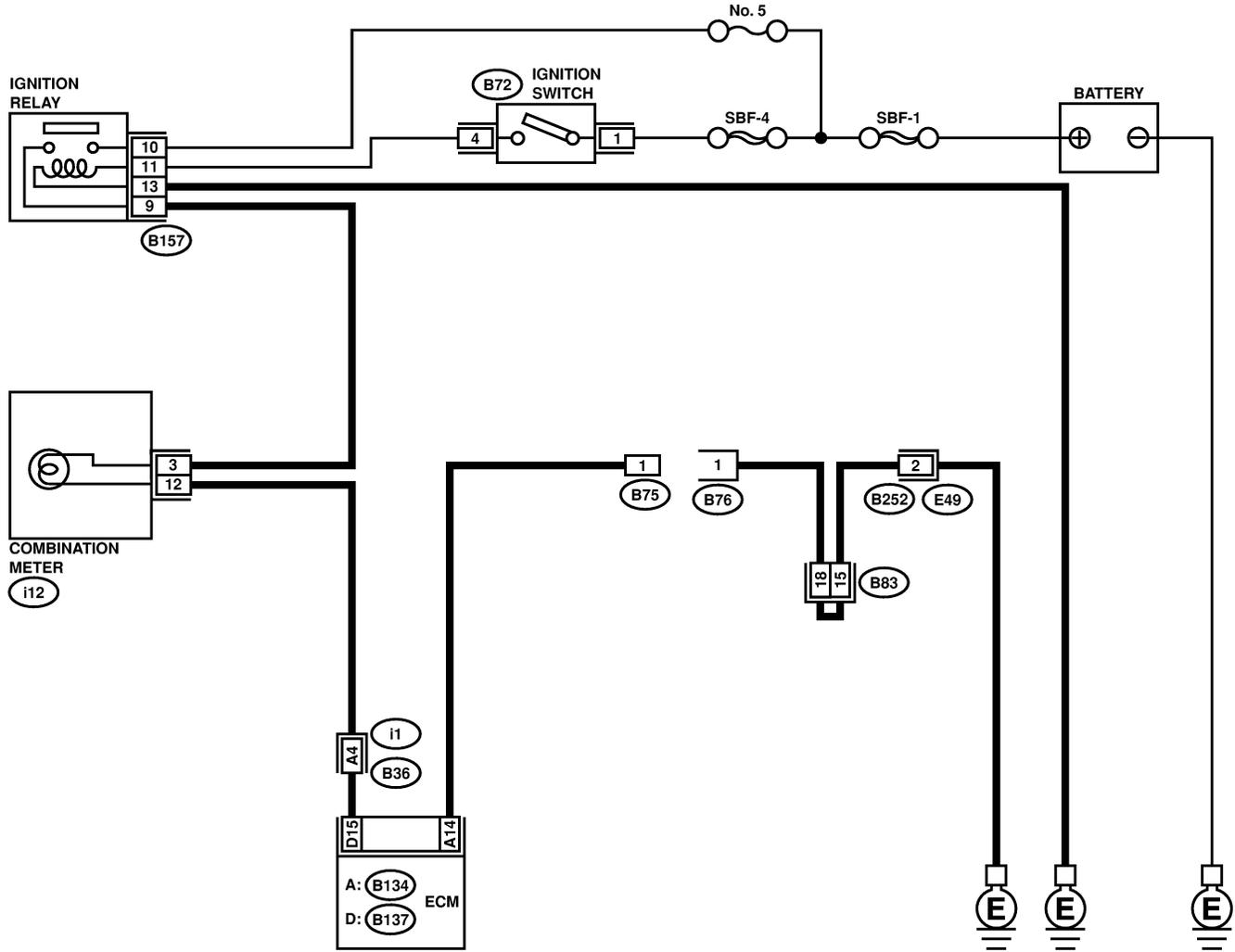
- **TROUBLE SYMPTOM:**

- When inspection mode, MIL does not blink at a cycle of 3 Hz.

# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

## ● WIRING DIAGRAM:



B75



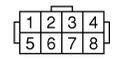
B76



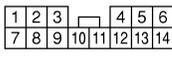
B72



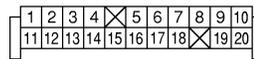
B252



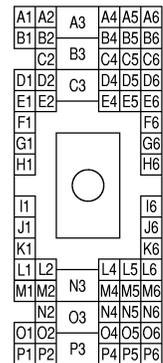
i12



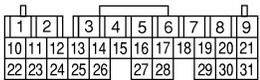
B83



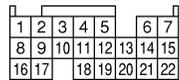
B36



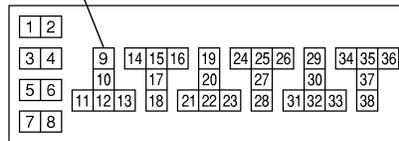
B137



B134



B157



B2M4653

# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).</b> 1) Turn ignition switch to OFF. 2) Disconnect test mode connector. 3) Turn ignition switch to ON. (engine OFF)	Does the MIL come on?	Go to step 2.	Repair the MIL circuit. <Ref. to EN(H6)-64, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
2	<b>CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON.	Does the MIL come on?	Repair ground short circuit in harness between combination meter and ECM connector.	Go to step 3.
3	<b>CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between test mode connector and chassis ground. <i><b>Connector &amp; terminal (B76) No. 1 — Chassis ground:</b></i>	Is resistance less than 1 $\Omega$ ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between test mode connector and chassis ground</li> </ul>
4	<b>CHECK POOR CONTACT.</b> Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Go to step 5.
5	<b>CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.</b> 1) Connect test mode connector. 2) Measure resistance of harness between ECM and chassis ground. <i><b>Connector &amp; terminal (B134) No. 14 — Chassis ground:</b></i>	Is resistance less than 1 $\Omega$ ?	Go to step 6.	Repair open circuit in harness between ECM and test mode connector.
6	<b>CHECK POOR CONTACT.</b> Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>

# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

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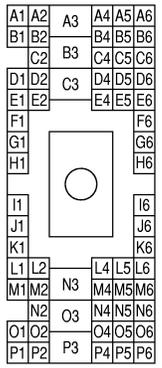
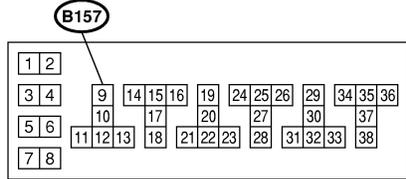
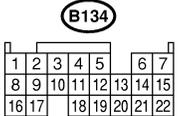
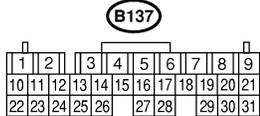
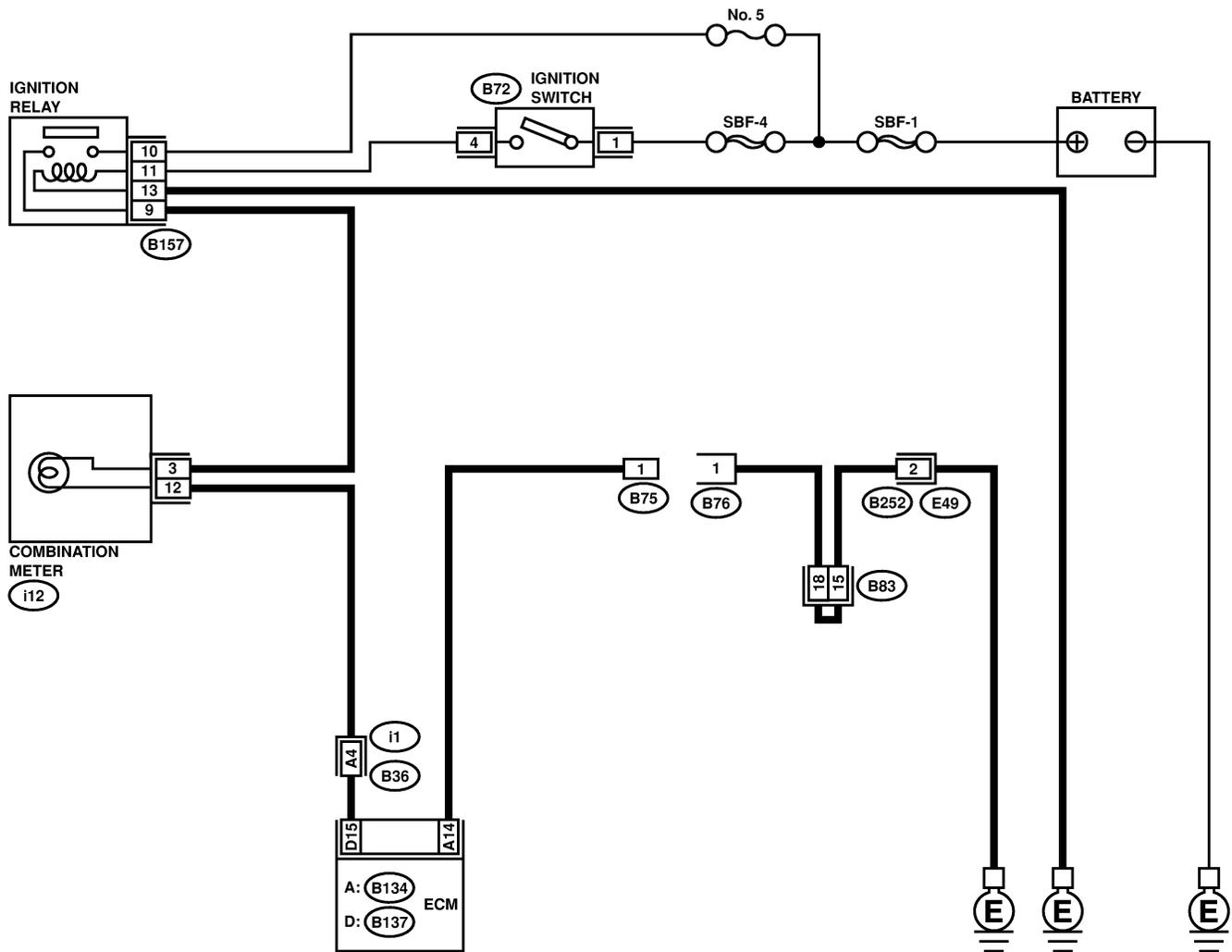
MEMO:

# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

## F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 Hz. S048653E93

- **DIAGNOSIS:**
  - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
  - MIL blinks at a cycle of 3 Hz when ignition switch is turned to ON.
- **WIRING DIAGRAM:**



B2M4653

# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK TEST MODE CONNECTOR.</b> 1) Disconnect test mode connector. 2) Turn ignition switch to ON.	Does MIL flash on and off?	Go to step 2.	System is in good order. NOTE: MIL blinks at a cycle of 3 Hz when test mode connector is connected.
2	<b>CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B134) No. 14 — Chassis ground:</b>	Is resistance less than 5 $\Omega$ ?	Repair short circuit in harness between ECM and test mode connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>

# ENGINE MALFUNCTION INDICATOR LAMP (MIL)

Engine (DIAGNOSTICS)

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**MEMO:**

## 17. Diagnostics for Engine Starting Failure

S048533

### A: PROCEDURE

S048533E45

1. Inspection of starter motor circuit. <Ref. to EN(H6)-78, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H6)-82, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H6)-86, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H6)-90, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H6)-94, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection using Subaru Select Monitor or OBD-II general scan tool <Ref. to EN(H6)-104, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or inspection using "General Diagnostics Table". <Ref. to EN(H6)-366, General Diagnostic Table.>

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

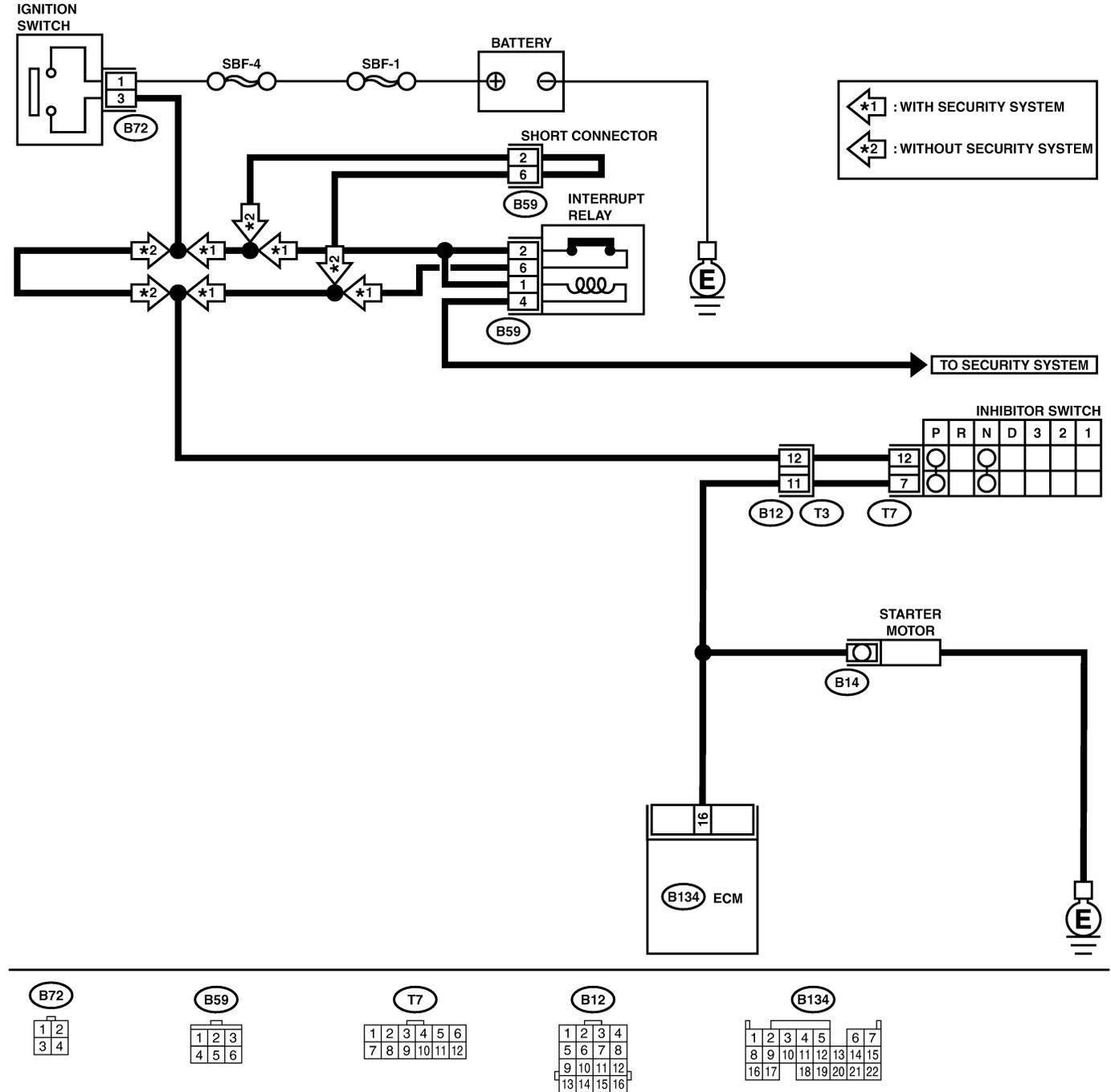
## B: STARTER MOTOR CIRCUIT

S048533E94

### CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6)-58, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6)-50, Inspection Mode.>

### ● WIRING DIAGRAM:



B2M4339

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK OPERATION OF STARTER MOTOR.</b>	Does starter motor operate when the switch starts?	Go to step 2.	Go to step 3.
2	<b>CHECK DTC.</b> <Ref. to EN(H6)-49, OPERATION, Read Diagnostic Trouble Code.>	Is the trouble code stored in memory? <Ref. to EN(H6)-96, LIST, List of Diagnostic Trouble Code (DTC).>	Record DTC. Repair the trouble case. <Ref. to EN(H6)-26, Engine Control Module (ECM) I/O Signal.>	Go to step 3.
3	<b>CHECK INPUT SIGNAL FOR STARTER MOTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from starter motor. 3) Turn ignition switch to ST. 4) Measure power supply voltage between starter motor connector terminal and engine ground. <b>Connector &amp; terminal</b> <b>(B14) No. 1 (+) — Engine ground (-):</b> NOTE: Place the selector lever in the "P" or "N" position.	Is the voltage more than 10 V?	Go to step 4.	Go to step 5.
4	<b>CHECK GROUND CIRCUIT OF STARTER MOTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect terminal from starter motor. 3) Measure resistance of ground cable between ground cable terminal and engine ground.	Is resistance less than 5 $\Omega$ ?	Check starter motor. <Ref. to SC-7, Starter.>	Repair open circuit of ground cable.
5	<b>CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT.</b> 1) Turn ignition switch to OFF. 2) Measure resistance between starter motor and ECM. <b>Connector &amp; terminal</b> <b>(B14) No. 1 — Engine ground:</b>	Is resistance less than 1 $\Omega$ ?	Repair ground short circuit.	Go to step 6.
6	<b>CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT.</b> 1) Turn ignition switch to START. 2) Measure resistance of fuse. <b>Connector &amp; terminal</b> <b>(B14) No. 1 — Engine ground:</b>	Is resistance less than 1 $\Omega$ ?	Go to step 7.	Repair ground short circuit.
7	<b>CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.</b> 1) Ignition switch to OFF. 2) Disconnect connector from ignition switch. 3) Measure power supply voltage between ignition switch connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B72) No. 1 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 8.	Repair open circuit in harness between ignition switch and battery.
8	<b>CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.</b> 1) Connect connector to ignition switch. 2) Turn ignition switch to START. 3) Measure voltage between ignition switch and chassis ground. <b>Connector &amp; terminal</b> <b>(B72) No. 3 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 9.	Replace ignition switch.

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
9	<b>CHECK INHIBITOR SWITCH CIRCUIT.</b> 1) Turn ignition switch to OFF. 2) Place the selector lever in the "P" or "N" position. 3) Separate transmission harness connector. 4) Measure resistance between transmission harness connector receptacle's terminals. <b>Connector &amp; terminal</b> <b>(T3) No. 11 — No. 12:</b>	Is the resistance less than 1 $\Omega$ ?	Repair open circuit in harness between starter motor and ignition switch connector.	Go to step 10.
10	<b>CHECK TRANSMISSION HARNESS.</b> 1) Disconnect connector from inhibitor switch. 2) Measure resistance of harness between transmission harness and inhibitor switch connector. <b>Connector &amp; terminal</b> <b>(T3) No. 11 — (T7) No. 7:</b>	Is the resistance less than 1 $\Omega$ ?	Go to step 11.	Repair open circuit in harness between transmission harness and inhibitor switch connector.
11	<b>CHECK POOR CONTACT.</b> Check poor contact in inhibitor switch connector.	Is there poor contact in inhibitor switch connector?	Repair poor contact in inhibitor switch connector.	Replace inhibitor switch.

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

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MEMO:

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

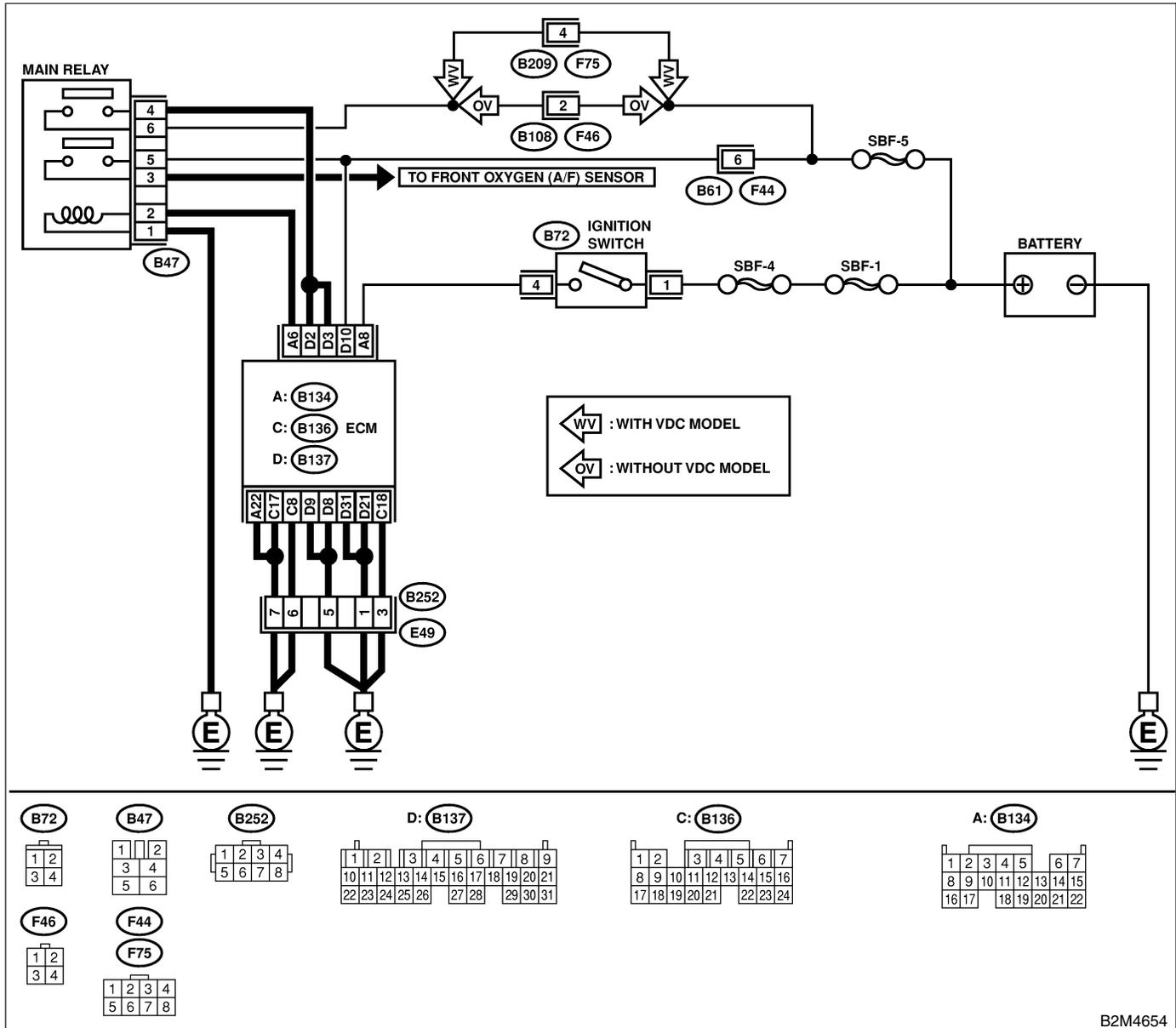
## C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

S048533E37

### CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6)-58, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(H6)-50, Inspection Mode.>

### ● WIRING DIAGRAM:



B2M4654

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

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<b>CHECK GROUND CIRCUIT OF ECM.</b> 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground. <b>Connector &amp; terminal</b> <i>(B134) No. 22 — Chassis ground:</i> <i>(B136) No. 8 — Chassis ground:</i> <i>(B136) No. 17 — Chassis ground:</i> <i>(B136) No. 18 — Chassis ground:</i> <i>(B137) No. 8 — Chassis ground:</i> <i>(B137) No. 9 — Chassis ground:</i> <i>(B137) No. 21 — Chassis ground:</i> <i>(B137) No. 31 — Chassis ground:</i>	Is the resistance less than 5 $\Omega$ ?	Go to step 3.	Repair open circuit in harness between ECM connector and engine grounding terminal.
3	<b>CHECK INPUT VOLTAGE OF ECM.</b> Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <i>(B137) No. 10 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 4.	Repair open or ground short circuit of power supply circuit.
4	<b>CHECK INPUT VOLTAGE OF ECM.</b> 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <i>(B134) No. 8 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 5.	Repair open or ground short circuit of power supply circuit.
5	<b>CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Measure resistance between ECM and chassis ground. <b>Connector &amp; terminal</b> <i>(B134) No. 6 — Chassis ground:</i>	Is the resistance more than 1 M $\Omega$ ?	Go to step 6.	Repair ground short circuit in harness between ECM connector and main relay connector, then replace ECM.
6	<b>CHECK OUTPUT VOLTAGE FROM ECM.</b> 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <i>(B134) No. 6 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 7.	Replace ECM.
7	<b>CHECK INPUT VOLTAGE OF MAIN RELAY.</b> Check voltage between main relay connector and chassis ground. <b>Connector &amp; terminal</b> <i>(B47) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 8.	Repair open circuit in harness between ECM connector and main relay connector.
8	<b>CHECK GROUND CIRCUIT OF MAIN RELAY.</b> 1) Turn ignition switch to OFF. 2) Measure resistance between main relay connector and chassis ground. <b>Connector &amp; terminal</b> <i>(B47) No. 1 — Chassis ground:</i>	Is the resistance less than 5 $\Omega$ ?	Go to step 9.	Repair open circuit between main relay and chassis ground.
9	<b>CHECK INPUT VOLTAGE OF MAIN RELAY.</b> Measure voltage between main relay connector and chassis ground. <b>Connector &amp; terminal</b> <i>(B47) No. 5 (+) — Chassis ground (-):</i> <i>(B47) No. 6 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 10.	Repair open or ground short circuit in harness of power supply circuit.

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
10	<b>CHECK INPUT VOLTAGE OF ECM.</b> 1) Connect main relay connector. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 2 (+) — Chassis ground (-):</b> <b>(B137) No. 3 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(H6)-86, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

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MEMO:

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

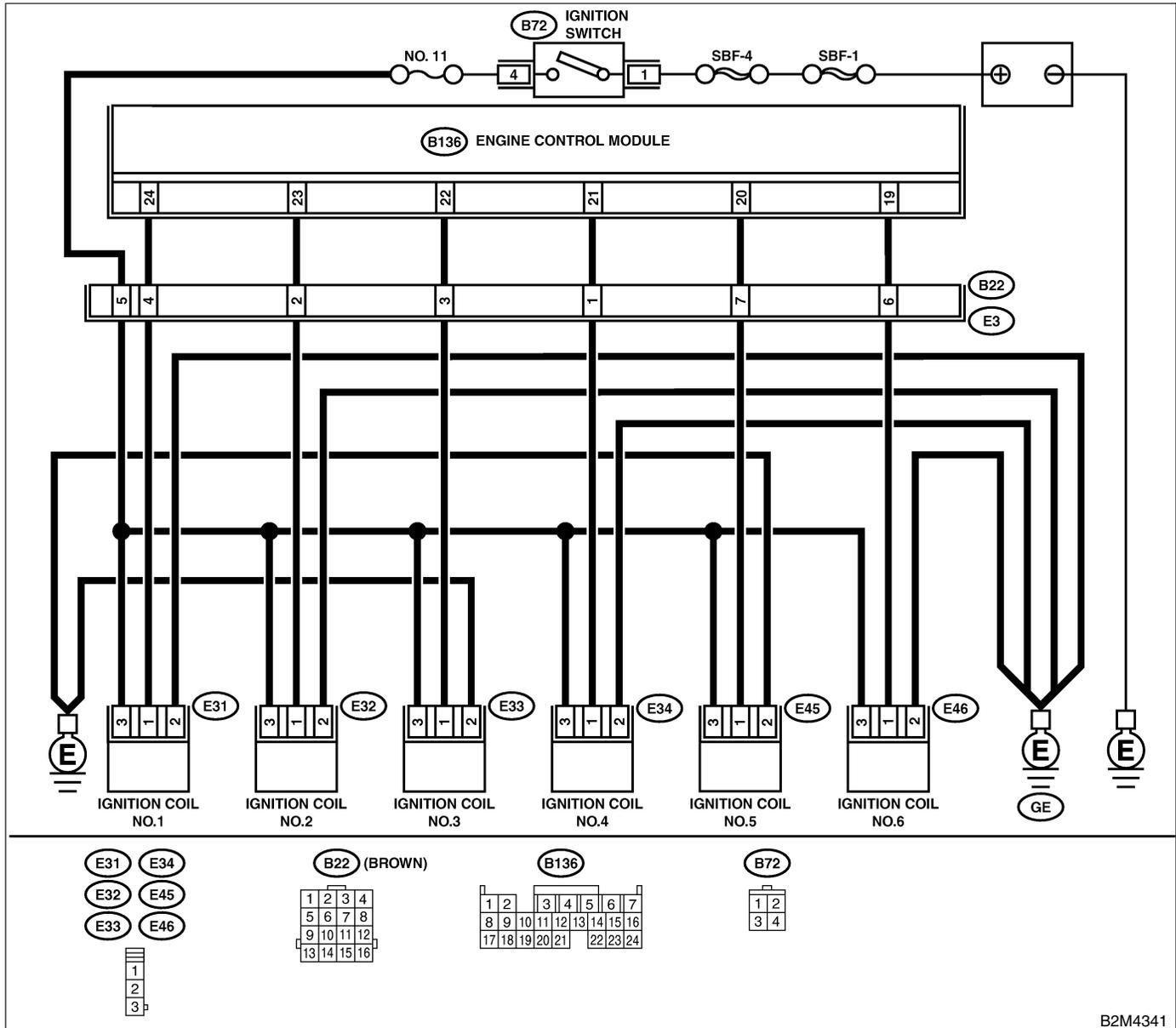
## D: IGNITION CONTROL SYSTEM

S048533E95

### CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6)-58, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6)-50, Inspection Mode.>

### ● WIRING DIAGRAM:



B2M4341

No.	Step	Check	Yes	No
1	<b>CHECK SPARK PLUG CONDITION.</b> 1) Remove the spark plug. <Ref. to IG(H6)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H6)-5, INSPECTION, Spark Plug.>	Is the spark plug OK?	Go to step 2.	Replace the spark plug.

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<p><b>CHECK IGNITION SYSTEM FOR SPARKS.</b></p> <p>1) Remove plug cord cap from each spark plug.</p> <p>2) Install new spark plug on plug cord cap.</p> <p><b>CAUTION:</b> <b>Do not remove spark plug from engine.</b></p> <p>3) Contact spark plug's thread portion on engine.</p> <p>4) While opening throttle valve fully, crank engine to check that spark occurs at each cylinder.</p>	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H6)-90, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 3.
3	<p><b>CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL &amp; IGNITOR ASSEMBLY.</b></p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from ignition coil &amp; ignitor assembly.</p> <p>3) Turn ignition switch to ON.</p> <p>4) Measure power supply voltage between ignition coil &amp; ignitor assembly connector and engine ground.</p> <p><b>Connector &amp; terminal</b></p> <p><b>(E31) No. 3 (+) — Engine ground (-):</b></p> <p><b>(E32) No. 3 (+) — Engine ground (-):</b></p> <p><b>(E33) No. 3 (+) — Engine ground (-):</b></p> <p><b>(E34) No. 3 (+) — Engine ground (-):</b></p> <p><b>(E45) No. 3 (+) — Engine ground (-):</b></p> <p><b>(E46) No. 3 (+) — Engine ground (-):</b></p>	Is the voltage more than 10 V?	Go to step 4.	<p>Repair harness and connector.</p> <p><b>NOTE:</b></p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between ignition coil &amp; ignitor assembly, and ignition switch connector</li> <li>● Poor contact in coupling connectors</li> </ul>
4	<p><b>CHECK HARNESS OF IGNITION COIL &amp; IGNITOR ASSEMBLY GROUND CIRCUIT.</b></p> <p>1) Turn ignition switch to OFF.</p> <p>2) Measure resistance between ignition coil &amp; ignitor assembly connector and engine ground.</p> <p><b>Connector &amp; terminal</b></p> <p><b>(E31) No. 2 — Engine ground:</b></p> <p><b>(E32) No. 2 — Engine ground:</b></p> <p><b>(E33) No. 2 — Engine ground:</b></p> <p><b>(E34) No. 2 — Engine ground:</b></p> <p><b>(E45) No. 2 — Engine ground:</b></p> <p><b>(E46) No. 2 — Engine ground:</b></p>	Is the resistance between less than 5 Ω?	Go to step 5.	<p>Repair harness and connector.</p> <p><b>NOTE:</b></p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between ignition coil &amp; ignitor assembly connector and engine grounding terminal</li> </ul>
5	<p><b>CHECK HARNESS BETWEEN ECM AND IGNITION COIL &amp; IGNITOR ASSEMBLY CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from ECM.</p> <p>3) Disconnect connector from ignition coil &amp; ignitor assembly.</p> <p>4) Measure resistance of harness between ECM and ignition coil &amp; ignitor assembly connector.</p> <p><b>Connector &amp; terminal</b></p> <p><b>(B136) No. 24 — (E31) No. 1:</b></p> <p><b>(B136) No. 23 — (E32) No. 1:</b></p> <p><b>(B136) No. 22 — (E33) No. 1:</b></p> <p><b>(B136) No. 21 — (E34) No. 1:</b></p> <p><b>(B136) No. 20 — (E45) No. 1:</b></p> <p><b>(B136) No. 19 — (E46) No. 1:</b></p>	Is the resistance less than 1 Ω?	Go to step 6.	<p>Repair harness and connector.</p> <p><b>NOTE:</b></p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and ignition coil &amp; ignitor assembly connector</li> <li>● Poor contact in coupling connector</li> </ul>

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<p><b>CHECK HARNESS BETWEEN ECM AND IGNITION COIL &amp; IGNITOR ASSEMBLY CONNECTOR.</b>                      Measure resistance of harness between ECM and engine ground.  <b>Connector &amp; terminal:</b>                      (B136) No. 24 — Engine ground:                      (B136) No. 23 — Engine ground:                      (B136) No. 22 — Engine ground:                      (B136) No. 21 — Engine ground:                      (B136) No. 20 — Engine ground:                      (B136) No. 19 — Engine ground:</p>	Is the resistance more than 1 MΩ?	Go to step 7.	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
7	<p><b>CHECK INPUT SIGNAL FOR IGNITION COIL &amp; IGNITOR ASSEMBLY.</b>                      1) Connect connector to ignition coil &amp; ignitor assembly.                      2) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil &amp; ignitor assembly connector and engine ground.  <b>Connector &amp; terminal</b>                      (E31) No. 1 (+) — Engine ground (-):                      (E32) No. 1 (+) — Engine ground (-):                      (E33) No. 1 (+) — Engine ground (-):                      (E34) No. 1 (+) — Engine ground (-):                      (E45) No. 1 (+) — Engine ground (-):                      (E46) No. 1 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 8.	Replace ignition coil & ignitor assembly. <Ref. to IG(H6)-7, Ignition Coil and Ignitor Assembly.>
8	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H6)-90, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

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MEMO:

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

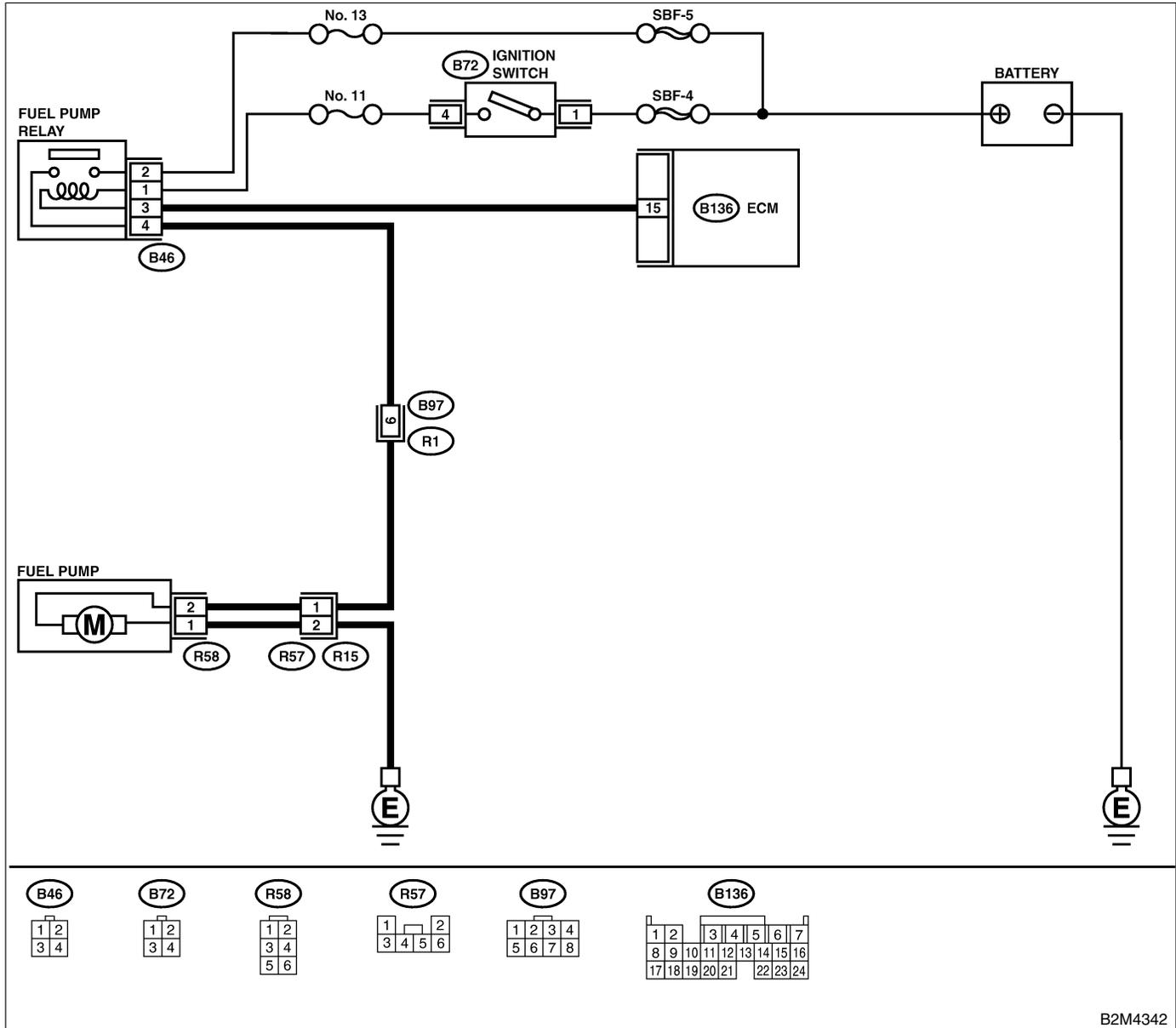
## E: FUEL PUMP CIRCUIT

S048533E96

### CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY MODE** <Ref. to EN(H6)-58, Clear Memory Mode.> and **INSPECTION MODE** <Ref. to EN(H6)-50, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4342

No.	Step	Check	Yes	No
1	<p><b>CHECK OPERATING SOUND OF FUEL PUMP.</b></p> <p>Make sure that fuel pump is in operation for two seconds when turning ignition switch to ON.</p> <p>NOTE: Fuel pump operation can also be executed using Subaru Select Monitor (Function mode: FD01).</p> <p>For the procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.&gt;</p>	Does fuel pump produce operating sound?	Check fuel injector circuit. <Ref. to EN(H6)-94, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<p><b>CHECK GROUND CIRCUIT OF FUEL PUMP.</b>                      1) Turn ignition switch to OFF.                      2) Remove fuel pump access hole lid located on the right rear of luggage compartment floor (Wagon).                      3) Disconnect connector from fuel pump.                      4) Measure resistance of harness connector between fuel pump and chassis ground.</p> <p><b>Connector &amp; terminal</b>  <b>(R58) No. 1 — Chassis ground:</b></p>	Is the resistance less than 5 Ω?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between fuel pump connector and chassis grounding terminal ● Poor contact in coupling connector
3	<p><b>CHECK POWER SUPPLY TO FUEL PUMP.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage of power supply circuit between fuel pump connector and chassis ground.</p> <p><b>Connector &amp; terminal</b>  <b>(R58) No. 2 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Replace fuel pump. <Ref. to FU(H6)-70, Fuel Pump.>	Go to step 4.
4	<p><b>CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Measure resistance of harness connector between fuel pump and fuel pump relay.</p> <p><b>Connector &amp; terminal</b>  <b>(R58) No. 2 — (B46) No. 4:</b></p>	Is the resistance less than 1 Ω?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between fuel pump connector and chassis grounding terminal ● Poor contact in coupling connectors
5	<p><b>CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.</b>                      Measure resistance of harness between fuel pump and fuel pump relay connector.</p> <p><b>Connector &amp; terminal</b>  <b>(R58) No. 2 — Chassis ground:</b></p>	Is the resistance more than 1 MΩ?	Go to step 6.	Repair short circuit in harness between fuel pump and fuel pump relay connector.
6	<p><b>CHECK FUEL PUMP RELAY.</b>                      1) Disconnect connectors from fuel pump relay and main relay.                      2) Remove fuel pump relay and main relay with bracket.                      3) Connect battery to fuel pump relay connector terminals No. 1 and No. 3.                      4) Measure resistance between connector terminals of fuel pump relay.</p> <p><b>Terminals</b>  <b>No. 2 — No. 4:</b></p>	Is the resistance less than 10 Ω?	Go to step 7.	Replace fuel pump relay. <Ref. to FU(H6)-49, Fuel Pump Relay.>

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
7	<b>CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR.</b> 1) Disconnect connectors from ECM. 2) Measure resistance of harness between ECM and fuel pump relay connector. <b>Connector &amp; terminal</b> <b>(B136) No. 15 — (B46) No. 3:</b>	Is the resistance less than 1 $\Omega$ ?	Go to step 8.	Repair open circuit in harness between ECM and fuel pump relay connector.
8	<b>CHECK POOR CONTACT.</b> Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel injector circuit. <Ref. to EN(H6)-94, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

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MEMO:

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

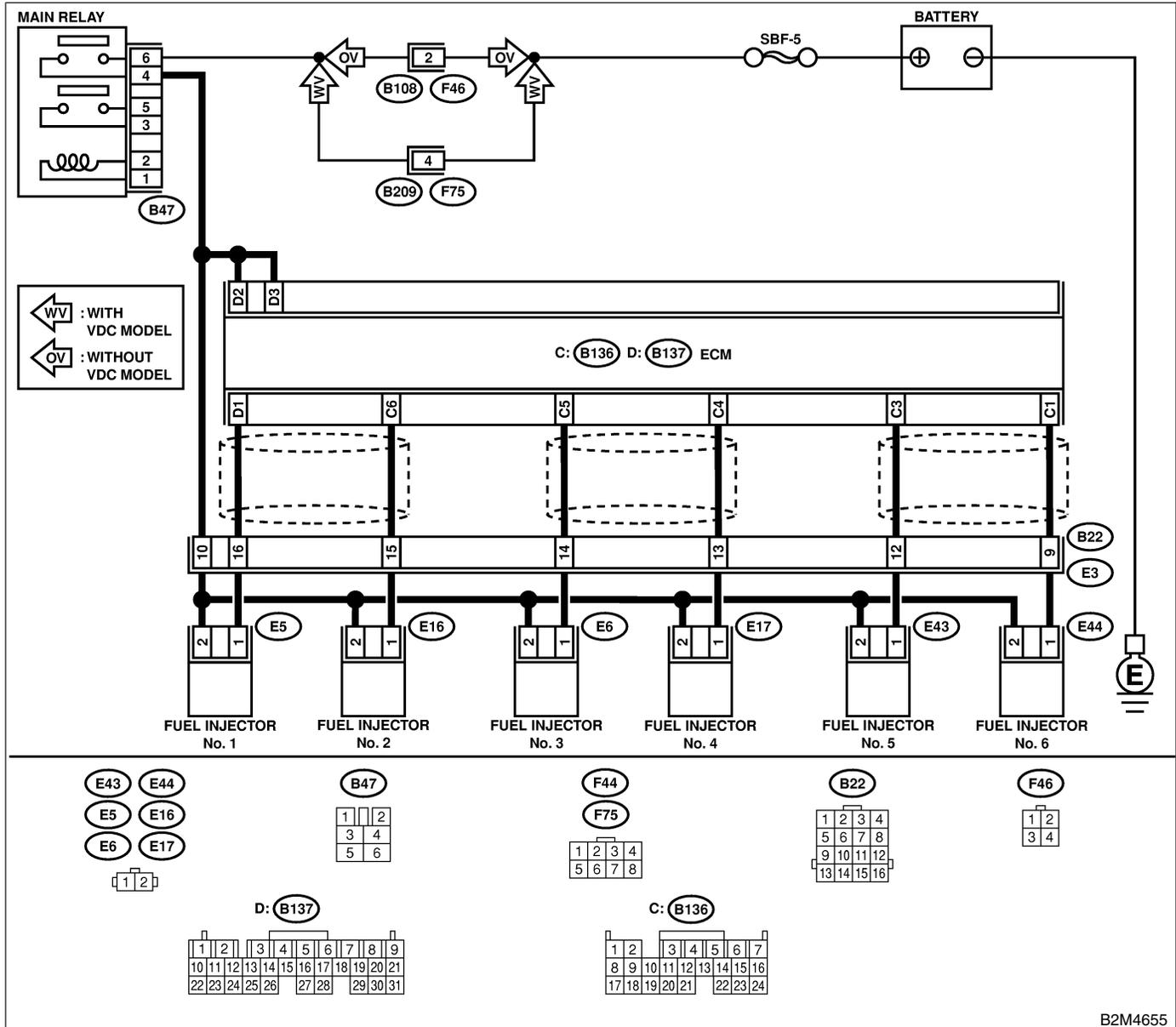
## F: FUEL INJECTOR CIRCUIT

S048533E97

### CAUTION:

- Check or repair only faulty parts.
- After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6)-58, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(H6)-50, Inspection Mode.>

### • WIRING DIAGRAM:



No.	Step	Check	Yes	No
1	<b>CHECK OPERATION OF EACH FUEL INJECTOR.</b> While cranking the engine, check that each fuel injector emits "operating" sound. Use a sound scope or attach a screwdriver to injector for this check.	Does the fuel injector emit "operating" sound?	Check fuel pressure. <Ref. to FU(H6)-50, Fuel.>	Go to step 2.

# DIAGNOSTICS FOR ENGINE STARTING FAILURE

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<p><b>CHECK POWER SUPPLY TO EACH FUEL INJECTOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Disconnect connector from fuel injector.                      3) Turn ignition switch to ON.                      4) Measure power supply voltage between the fuel injector terminal and engine ground.</p> <p><b>Connector &amp; terminal</b></p> <p><b>#1 (E5) No. 2 (+) — Engine ground (-):</b>  <b>#2 (E16) No. 2 (+) — Engine ground (-):</b>  <b>#3 (E6) No. 2 (+) — Engine ground (-):</b>  <b>#4 (E17) No. 2 (+) — Engine ground (-):</b>  <b>#5 (E43) No. 2 (+) — Engine ground (-):</b>  <b>#6 (E43) No. 2 (+) — Engine ground (-):</b></p>	Is the voltage more than 10 V?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between main relay and fuel injector connector ● Poor contact in main relay connector ● Poor contact in coupling connector ● Poor contact in fuel injector connector
3	<p><b>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</b></p> <p>1) Disconnect connector from ECM and fuel injector.                      2) Measure resistance of harness between ECM and fuel injector connector.</p> <p><b>Connector &amp; terminal</b></p> <p><b>(B137) No. 1 — (E5) No. 1:</b>  <b>(B136) No. 6 — (E16) No. 1:</b>  <b>(B136) No. 5 — (E6) No. 1:</b>  <b>(B136) No. 4 — (E17) No. 1:</b>  <b>(B136) No. 3 — (E43) No. 1:</b>  <b>(B136) No. 1 — (E44) No. 1:</b></p>	Is the resistance less than 1 Ω?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between ECM and fuel injector connector ● Poor contact in coupling connector
4	<p><b>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</b></p> <p>Measure resistance of harness between ECM and fuel injector connector.</p> <p><b>Connector &amp; terminal</b></p> <p><b>(B137) No. 1 — Chassis ground:</b>  <b>(B136) No. 6 — Chassis ground:</b>  <b>(B136) No. 5 — Chassis ground:</b>  <b>(B136) No. 4 — Chassis ground:</b>  <b>(B136) No. 3 — Chassis ground:</b>  <b>(B136) No. 1 — Chassis ground:</b></p>	Is the resistance more than 1 MΩ?	Go to step 5.	Repair ground short circuit in harness between ECM and fuel injector connector.
5	<p><b>CHECK EACH FUEL INJECTOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Measure resistance between each fuel injector terminals.</p> <p><b>Terminals</b></p> <p><b>No. 1 — No. 2:</b></p>	Is the resistance between 5 and 20 Ω?	Go to step 6.	Replace faulty fuel injector.
6	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(H6)-366, INSPECTION, General Diagnostic Table.>

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## 18. List of Diagnostic Trouble Code (DTC)

S048525

### A: LIST

S048525A12

DTC No.	Item	Index
P0031	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) heater circuit low input	<Ref. to EN(H6)-104, DTC P0031 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) HEATER CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) heater circuit high input	<Ref. to EN(H6)-108, DTC P0032 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) HEATER CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	Bank #1 and sensor #2 oxygen sensor (rear) heater circuit low input	<Ref. to EN(H6)-110, DTC P0037 — BANK #1 AND SENSOR #2 OXYGEN SENSOR (REAR) HEATER CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	Bank #1 and sensor #2 oxygen sensor (rear) heater circuit high input	<Ref. to EN(H6)-114, DTC P0038 — BANK #1 AND SENSOR #2 OXYGEN SENSOR (REAR) HEATER CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0051	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) heater circuit low input	<Ref. to EN(H6)-116, DTC P0051 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) HEATER CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0052	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) heater circuit high input	<Ref. to EN(H6)-120, DTC P0052 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) HEATER CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0106	Intake manifold pressure sensor circuit range/performance problem	<Ref. to EN(H6)-122, DTC P0106 — INTAKE MANIFOLD PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Intake manifold pressure sensor circuit low input	<Ref. to EN(H6)-124, DTC P0107 — INTAKE MANIFOLD PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Intake manifold pressure sensor circuit high input	<Ref. to EN(H6)-128, DTC P0108 — INTAKE MANIFOLD PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake air temperature sensor circuit range/performance problem	<Ref. to EN(H6)-132, DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake air temperature sensor circuit low input	<Ref. to EN(H6)-134, DTC P0112 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake air temperature sensor circuit high input	<Ref. to EN(H6)-136, DTC P0113 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine coolant temperature sensor circuit low input	<Ref. to EN(H6)-140, DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine coolant temperature sensor circuit high input	<Ref. to EN(H6)-142, DTC P0118 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

DTC No.	Item	Index
P0121	Throttle position sensor circuit range/performance problem (high input)	<Ref. to EN(H6)-146, DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle position sensor circuit low input	<Ref. to EN(H6)-148, DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle position sensor circuit high input	<Ref. to EN(H6)-152, DTC P0123 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient coolant temperature for closed loop fuel control	<Ref. to EN(H6)-154, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Thermostat malfunction	<Ref. to EN(H6)-156, DTC P0128 — THERMOSTAT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) circuit malfunction (open circuit)	<Ref. to EN(H6)-158, DTC P0131 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) CIRCUIT MALFUNCTION (OPEN CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) circuit malfunction (short circuit)	<Ref. to EN(H6)-160, DTC P0132 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) CIRCUIT MALFUNCTION (SHORT CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) circuit slow response	<Ref. to EN(H6)-162, DTC P0133 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	Bank #1 and sensor #2 oxygen sensor (rear) circuit low input	<Ref. to EN(H6)-164, DTC P0137 — BANK #1 AND SENSOR #2 OXYGEN SENSOR (REAR) LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	Bank #1 and sensor #2 oxygen sensor (rear) circuit high input	<Ref. to EN(H6)-168, DTC P0138 — BANK #1 AND SENSOR #2 OXYGEN SENSOR (REAR) CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	Bank #1 and sensor #2 oxygen sensor (rear) circuit slow response	<Ref. to EN(H6)-172, DTC P0139 — BANK #1 AND SENSOR #2 OXYGEN SENSOR (REAR) CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0151	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) circuit malfunction (open circuit)	<Ref. to EN(H6)-174, DTC P0151 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) CIRCUIT MALFUNCTION (OPEN CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0152	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) circuit malfunction (short circuit)	<Ref. to EN(H6)-176, DTC P0152 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) CIRCUIT MALFUNCTION (SHORT CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0153	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) circuit slow response	<Ref. to EN(H6)-178, DTC P0153 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	Fuel trim #1 (RH) malfunction (A/F too lean)	<Ref. to EN(H6)-180, DTC P0171 — FUEL TRIM #1 (RH) MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	Fuel trim #1 (RH) malfunction (A/F too rich)	<Ref. to EN(H6)-180, DTC P0172 — FUEL TRIM #1 (RH) MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

## Engine (DIAGNOSTICS)

DTC No.	Item	Index
P0174	Fuel trim #2 (LH) malfunction (A/F too lean)	<Ref. to EN(H6)-184, DTC P0174 — FUEL TRIM #2 (LH) MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0175	Fuel trim #2 (LH) malfunction (A/F too rich)	<Ref. to EN(H6)-184, DTC P0175 — FUEL TRIM #2 (LH) MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel temperature sensor A circuit range/performance problem	<Ref. to EN(H6)-188, DTC P0181 — FUEL TEMPERATURE SENSOR A CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel temperature sensor A circuit low input	<Ref. to EN(H6)-190, 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(H6)-192, DTC P0183 — FUEL TEMPERATURE SENSOR A CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(H6)-195, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(H6)-195, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(H6)-195, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(H6)-196, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0305	Cylinder 5 misfire detected	<Ref. to EN(H6)-196, DTC P0305 — CYLINDER 5 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0306	Cylinder 6 misfire detected	<Ref. to EN(H6)-196, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock sensor 1 circuit low input	<Ref. to EN(H6)-204, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor 1 circuit high input	<Ref. to EN(H6)-206, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0332	Knock sensor 2 circuit low input	<Ref. to EN(H6)-208, DTC P0332 — KNOCK SENSOR 2 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0333	Knock sensor 2 circuit high input	<Ref. to EN(H6)-210, DTC P0333 — KNOCK SENSOR 2 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft position sensor circuit malfunction	<Ref. to EN(H6)-212, DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft position sensor circuit range/performance problem	<Ref. to EN(H6)-214, DTC P0336 — CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft position sensor circuit malfunction	<Ref. to EN(H6)-216, DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

DTC No.	Item	Index
P0341	Camshaft position sensor circuit range/performance problem	<Ref. to EN(H6)-218, DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	EGR system malfunction	<Ref. to EN(H6)-220, DTC P0400 — EGR SYSTEM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst system efficiency below threshold	<Ref. to EN(H6)-224, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative emission control system malfunction	<Ref. to EN(H6)-226, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative emission control system vent control low input	<Ref. to EN(H6)-230, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative emission control system vent control high input	<Ref. to EN(H6)-234, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative emission control system pressure sensor range/performance problem	<Ref. to EN(H6)-236, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative emission control system pressure sensor low input	<Ref. to EN(H6)-238, 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(H6)-242, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative emission control system malfunction	<Ref. to EN(H6)-246, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative emission control system purge control valve circuit low input	<Ref. to EN(H6)-250, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative emission control system purge control valve circuit high input	<Ref. to EN(H6)-254, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel level sensor circuit range/performance problem	<Ref. to EN(H6)-256, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel level sensor circuit low input	<Ref. to EN(H6)-258, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel level sensor circuit high input	<Ref. to EN(H6)-262, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel level sensor intermittent input	<Ref. to EN(H6)-266, DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan function problem	<Ref. to EN(H6)-268, DTC P0483 — COOLING FAN FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

DTC No.	Item	Index
P0500	Vehicle speed sensor malfunction	<Ref. to EN(H6)-272, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle control system RPM lower than expected	<Ref. to EN(H6)-274, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle control system RPM higher than expected	<Ref. to EN(H6)-276, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0508	Idle control system circuit low input	<Ref. to EN(H6)-278, DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0509	Idle control system circuit high input	<Ref. to EN(H6)-280, DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter switch circuit high input	<Ref. to EN(H6)-282, DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal control module memory check sum error	<Ref. to EN(H6)-286, DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0661	Induction valve control solenoid circuit low input	<Ref. to EN(H6)-288, DTC P0661 — INDUCTION VALVE CONTROL SOLENOID CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0662	Induction valve control solenoid circuit high input	<Ref. to EN(H6)-292, DTC P0662 — INDUCTION VALVE CONTROL SOLENOID CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling fan relay 1 circuit low input	<Ref. to EN(H6)-294, DTC P0691 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling fan relay 1 circuit high input	<Ref. to EN(H6)-298, DTC P0692 — COOLING FAN RELAY 1 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Brake switch input malfunction	<Ref. to EN(H6)-302, DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission range sensor circuit malfunction	<Ref. to AT-122, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-trouble Code (DTC).>
P0710	Transmission fluid temperature sensor circuit malfunction	<Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0715	Torque converter turbine speed sensor circuit malfunction	<Ref. to AT-66, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output speed sensor (vehicle speed sensor 2) circuit malfunction	<Ref. to AT-60, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0725	Engine speed input circuit malfunction	<Ref. to AT-44, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 incorrect ratio	<Ref. to EN(H6)-304, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN(H6)-304, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN(H6)-304, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

DTC No.	Item	Index
P0734	Gear 4 incorrect ratio	<Ref. to EN(H6)-305, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque converter clutch system malfunction	<Ref. to EN(H6)-306, DTC P0741 — TORQUE CONVERTER CLUTCH SYSTEM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque converter clutch system (Lock-up duty solenoid) electrical	<Ref. to AT-100, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure control solenoid (Line pressure duty solenoid) electrical	<Ref. to AT-90, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift solenoid A (Shift solenoid 1) electrical	<Ref. to AT-74, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift solenoid B (Shift solenoid 2) electrical	<Ref. to AT-78, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	2-4 brake pressure control solenoid valve circuit malfunction	<Ref. to AT-94, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	2-4 brake timing control solenoid valve circuit malfunction	<Ref. to AT-86, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral position switch circuit low input	<Ref. to EN(H6)-308, DTC P0851 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral position switch circuit high input	<Ref. to EN(H6)-310, DTC P0852 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	Automatic transmission diagnosis input signal circuit malfunction	<Ref. to EN(H6)-314, DTC P0864 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	Automatic transmission diagnosis input signal circuit low input	<Ref. to EN(H6)-316, DTC P0865 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	Automatic transmission diagnosis input signal circuit high input	<Ref. to EN(H6)-318, DTC P0866 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric pressure sensor low input	<Ref. to EN(H6)-320, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor high input	<Ref. to EN(H6)-320, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1112	Atmospheric pressure sensor range/performance problem	<Ref. to EN(H6)-321, DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	Front oxygen (A/F) sensor micro-computer problem	<Ref. to EN(H6)-322, DTC P1134 — FRONT OXYGEN (A/F) SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1139	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) heater circuit range/performance problem	<Ref. to EN(H6)-324, DTC P1139 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) HEATER CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1140	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) heater circuit range/performance problem	<Ref. to EN(H6)-326, DTC P1140 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) HEATER CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

DTC No.	Item	Index
P1142	Throttle position sensor circuit range/performance problem (low input)	<Ref. to EN(H6)-328, DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1146	Pressure sensor circuit range/performance problem (high input)	<Ref. to EN(H6)-330, DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) circuit range/performance problem (low input)	<Ref. to EN(H6)-333, DTC P1152 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	Bank #1 and sensor #1 oxygen (A/F) sensor (front RH) circuit range/performance problem (high input)	<Ref. to EN(H6)-334, DTC P1153 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1154	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) circuit range/performance problem (low input)	<Ref. to EN(H6)-336, DTC P1154 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1155	Bank #2 and sensor #1 oxygen (A/F) sensor (front LH) circuit range/performance problem (high input)	<Ref. to EN(H6)-338, DTC P1155 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel tank pressure control solenoid valve circuit low input	<Ref. to EN(H6)-340, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel tank pressure control solenoid valve circuit high input	<Ref. to EN(H6)-344, DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Evaporative emission control system vent control function problem	<Ref. to EN(H6)-346, DTC P1443 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1507	Idle control system malfunction (fail-safe)	<Ref. to EN(H6)-348, DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter switch circuit low input	<Ref. to EN(H6)-350, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN(H6)-354, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1698	Engine torque control cut signal circuit low input	<Ref. to EN(H6)-356, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine torque control cut signal circuit high input	<Ref. to EN(H6)-358, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle position sensor circuit malfunction for automatic transmission	<Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1701	Cruise control set signal circuit malfunction for automatic transmission	<Ref. to EN(H6)-360, DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1703	Low clutch timing control solenoid valve circuit malfunction	<Ref. to AT-82, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

DTC No.	Item	Index
P1711	Engine torque control signal 1 circuit malfunction	<Ref. to EN(H6)-362, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine torque control signal 2 circuit malfunction	<Ref. to EN(H6)-364, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031, 0051 and P0037 at the same time?	Go to step 2.	Go to step 3.
2	<b>CHECK GROUND CIRCUIT OF ECM.</b> Measure resistance of harness between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 31 — Chassis ground:</b> <b>(B137) No. 21 — Chassis ground:</b> <b>(B137) No. 8 — Chassis ground:</b> <b>(B137) No. 9 — Chassis ground:</b>	Is the resistance less than 5 Ω?	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between ECM and engine ground terminal ● Poor contact in ECM connector ● Poor contact in coupling connector
3	<b>CHECK CURRENT DATA.</b> 1) Start engine 2) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6)-37, Subaru Select Monitor.> ● OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 0.2 A?	Repair poor contact in connector. NOTE: In this case, repair the following: ● Poor contact in front oxygen (A/F) sensor connector ● Poor contact in ECM connector	Go to step 4.
4	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 4 (+) — Chassis ground (-):</b>	Is the voltage less than 1.0 V?	Go to step 6.	Go to step 5.
5	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 4 (+) — Chassis ground (-):</b>	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step 6.
6	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 5 (+) — Chassis ground (-):</b>	Is the voltage less than 1.0 V?	Go to step 8.	Go to step 7.
7	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 5 (+) — Chassis ground (-):</b>	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step 8.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
8	<p><b>CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Disconnect connector from front oxygen (A/F) sensor.                      3) Turn ignition switch to ON.                      4) Measure voltage between front oxygen (A/F) sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b>  <b>(E47) No. 2 (+) — Engine ground (-):</b></p>	Is the voltage more than 10 V?	Go to step 9.	<p>Repair power supply line.</p> <p><b>NOTE:</b>                      In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between main relay and front oxygen (A/F) sensor connector</li> <li>● Poor contact in front oxygen (A/F) sensor connector</li> <li>● Poor contact in main relay connector</li> </ul>
9	<p><b>CHECK FRONT OXYGEN (A/F) SENSOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Measure resistance between front oxygen (A/F) sensor connector terminals.</p> <p><b>Terminals</b>  <b>No. 2 — No. 1:</b></p>	Is the resistance less than 10 Ω?	<p>Repair harness and connector.</p> <p><b>NOTE:</b>                      In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector</li> <li>● Poor contact in front oxygen (A/F) sensor connector</li> <li>● Poor contact in ECM connector</li> </ul>	<p>Replace front oxygen (A/F) sensor.</p> <p>&lt;Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.&gt;</p>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

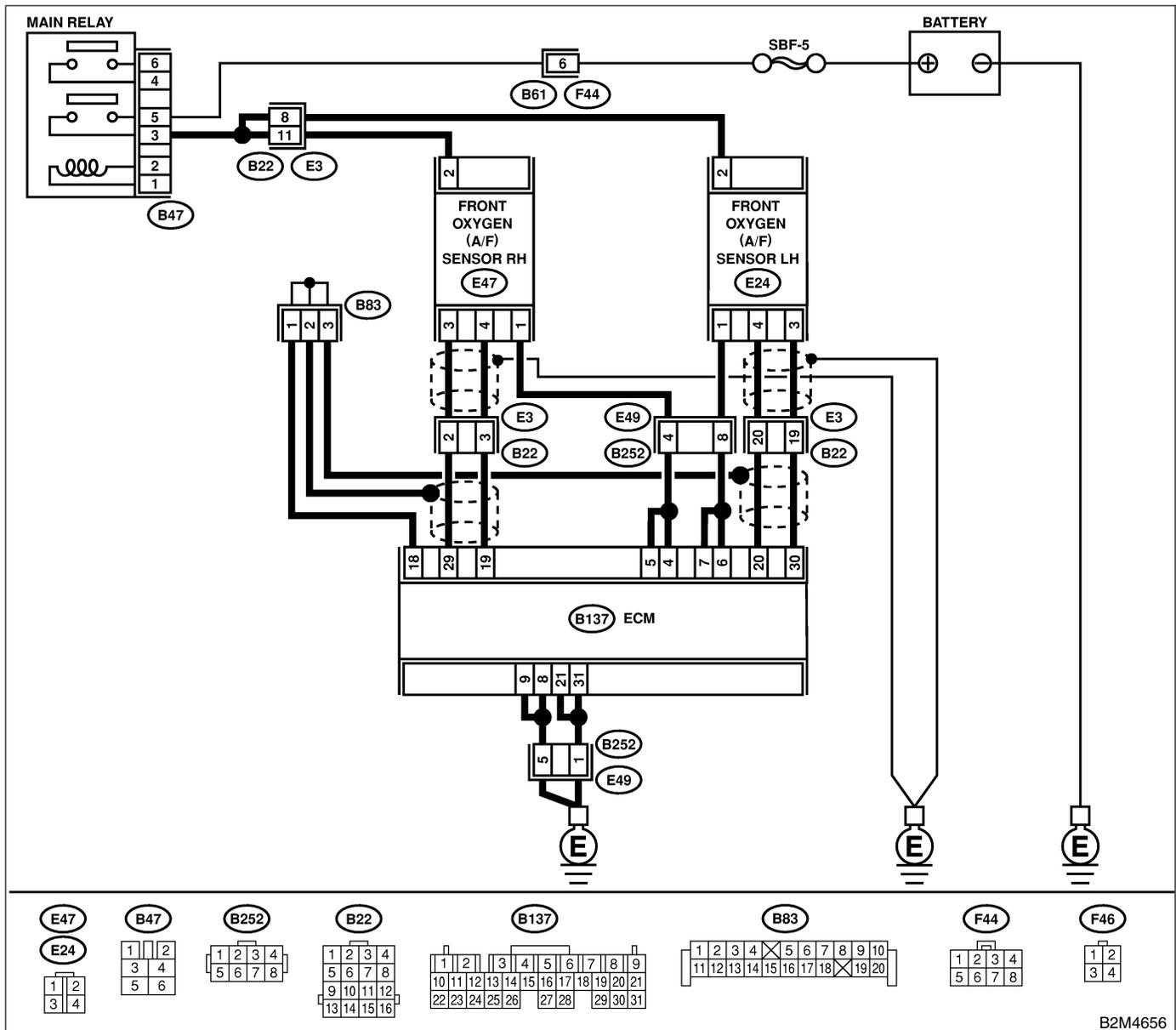
## B: DTC P0032 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) HEATER CIRCUIT HIGH INPUT — S048521H22

- DTC DETECTING CONDITION:
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. <i>Connector &amp; terminal</i> <i>(B137) No. 4 (+) — Chassis ground (-):</i>	Is the voltage more than 8 V?	Go to step 3.	Go to step 2.
2	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <i>Connector &amp; terminal</i> <i>(B137) No. 5 (+) — Chassis ground (-):</i>	Is the voltage more than 8 V?	Go to step 3.	Go to step 4.
3	<b>CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.</b> 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn ignition switch to ON. 4) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6)-37, Subaru Select Monitor.> ● OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 2.3 A?	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	END
4	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <i>Connector &amp; terminal</i> <i>(B137) No. 4 (+) — Chassis ground (-):</i>	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step 5.
5	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <i>Connector &amp; terminal</i> <i>(B137) No. 5 (+) — Chassis ground (-):</i>	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## C: DTC P0037 — BANK #1 AND SENSOR #2 OXYGEN SENSOR (REAR) HEATER CIRCUIT LOW INPUT —

S048521H23

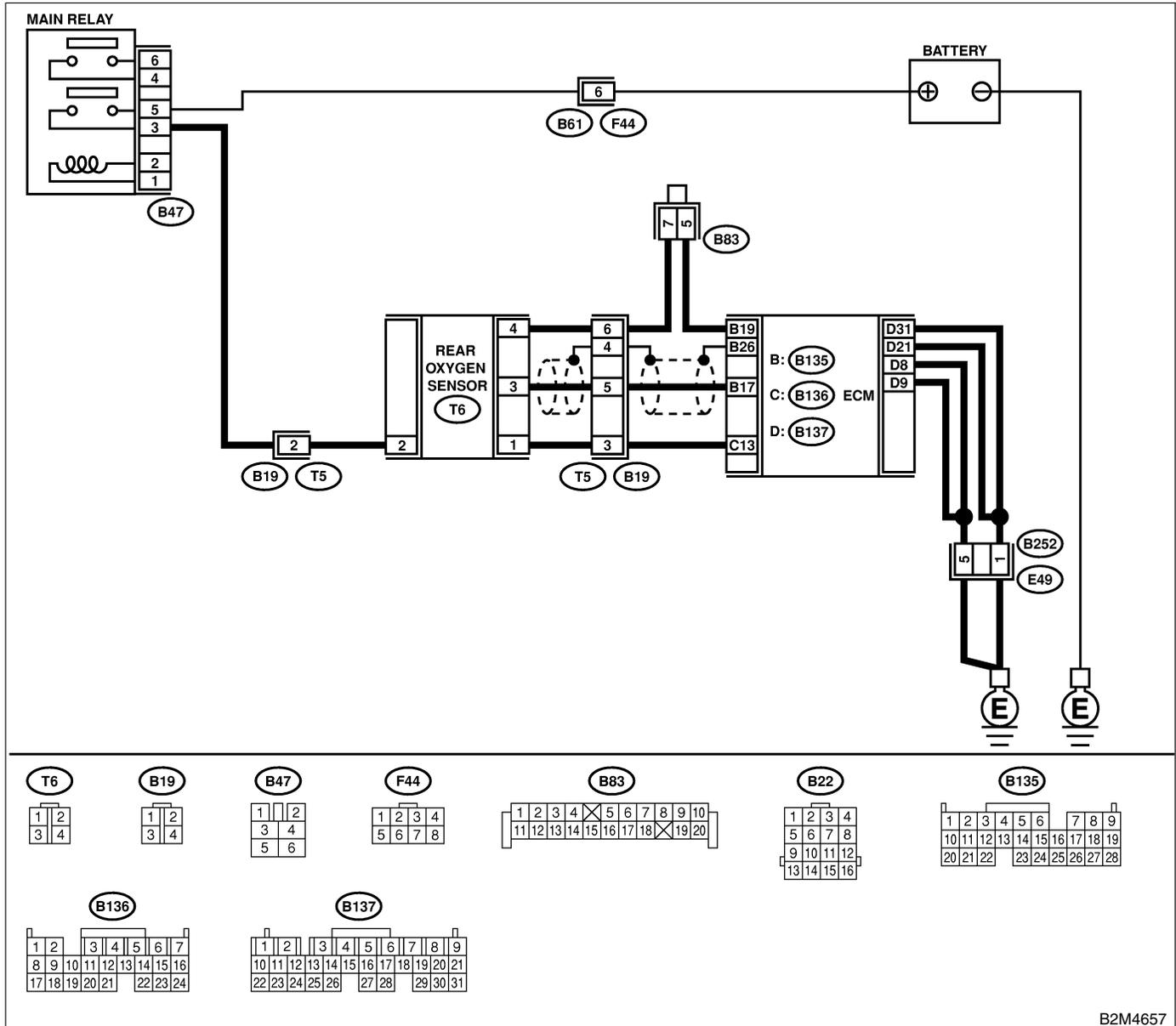
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4657

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK GROUND CIRCUIT OF ECM.</b>                      1) Repair harness and connector.                      NOTE:                      In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and engine ground terminal</li> <li>● Poor contact in ECM connector</li> <li>● Poor contact in coupling connector (B22)</li> </ul> <p>2) Measure resistance of harness between ECM connector and chassis ground.  <b>Connector &amp; terminal</b>                      (B137) No. 31 — Chassis ground:                      (B137) No. 21 — Chassis ground:                      (B137) No. 8 — Chassis ground:                      (B137) No. 9 — Chassis ground:</p>	Is the resistance less than 5 Ω?	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between ECM and engine ground terminal ● Poor contact in ECM connector ● Poor contact in coupling connector
2	<p><b>CHECK CURRENT DATA.</b>                      1) Start engine.                      2) Read data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool.                      NOTE:                      ● Subaru Select Monitor                      For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".                      &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;                      ● OBD-II scan tool                      For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value more than 0.2 A?	Repair connector. NOTE: In this case, repair the following: ● Poor contact in rear oxygen sensor connector ● Poor contact in rear oxygen sensor connecting harness connector ● Poor contact in ECM connector	Go to step 3.
3	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Start and idle the engine.                      2) Measure voltage between ECM connector and chassis ground.  <b>Connector &amp; terminal</b>                      (B136) No. 13 (+) — Chassis ground (-):</p>	Is the voltage less than 1.0 V?	Go to step 6.	Go to step 4.
4	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      Measure voltage between ECM connector and chassis ground.  <b>Connector &amp; terminal</b>                      (B136) No. 13 (+) — Chassis ground (-):</p>	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step 5.
5	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Disconnect connector from rear oxygen sensor.                      2) Measure voltage between ECM connector and chassis ground.  <b>Connector &amp; terminal</b>                      (B136) No. 13 (+) — Chassis ground (-):</p>	Is the voltage less than 1.0 V?	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<p><b>CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Disconnect connector from rear oxygen sensor.                      3) Turn ignition switch to ON.                      4) Measure voltage between rear oxygen sensor connector and engine ground or chassis ground.</p> <p><b>Connector &amp; terminal</b>  <b>(T6) No. 2 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Go to step 7.	Repair power supply line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between main relay and rear oxygen sensor connector</li> <li>● Poor contact in rear oxygen sensor connector</li> <li>● Poor contact in coupling connector</li> </ul>
7	<p><b>CHECK REAR OXYGEN SENSOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Measure resistance between rear oxygen sensor connector terminals.</p> <p><b>Terminals</b>  <b>No. 1 — No. 2:</b></p>	Is the resistance less than 30 Ω?	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>● Poor contact in rear oxygen sensor connector</li> <li>● Poor contact in ECM connector</li> <li>● Poor contact in coupling connector</li> </ul>	Replace rear oxygen sensor. <Ref. to FU(H6)-46, Rear Oxygen Sensor.>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## D: DTC P0038 — BANK #1 AND SENSOR #2 OXYGEN SENSOR (REAR) HEATER CIRCUIT HIGH INPUT — S048521H24

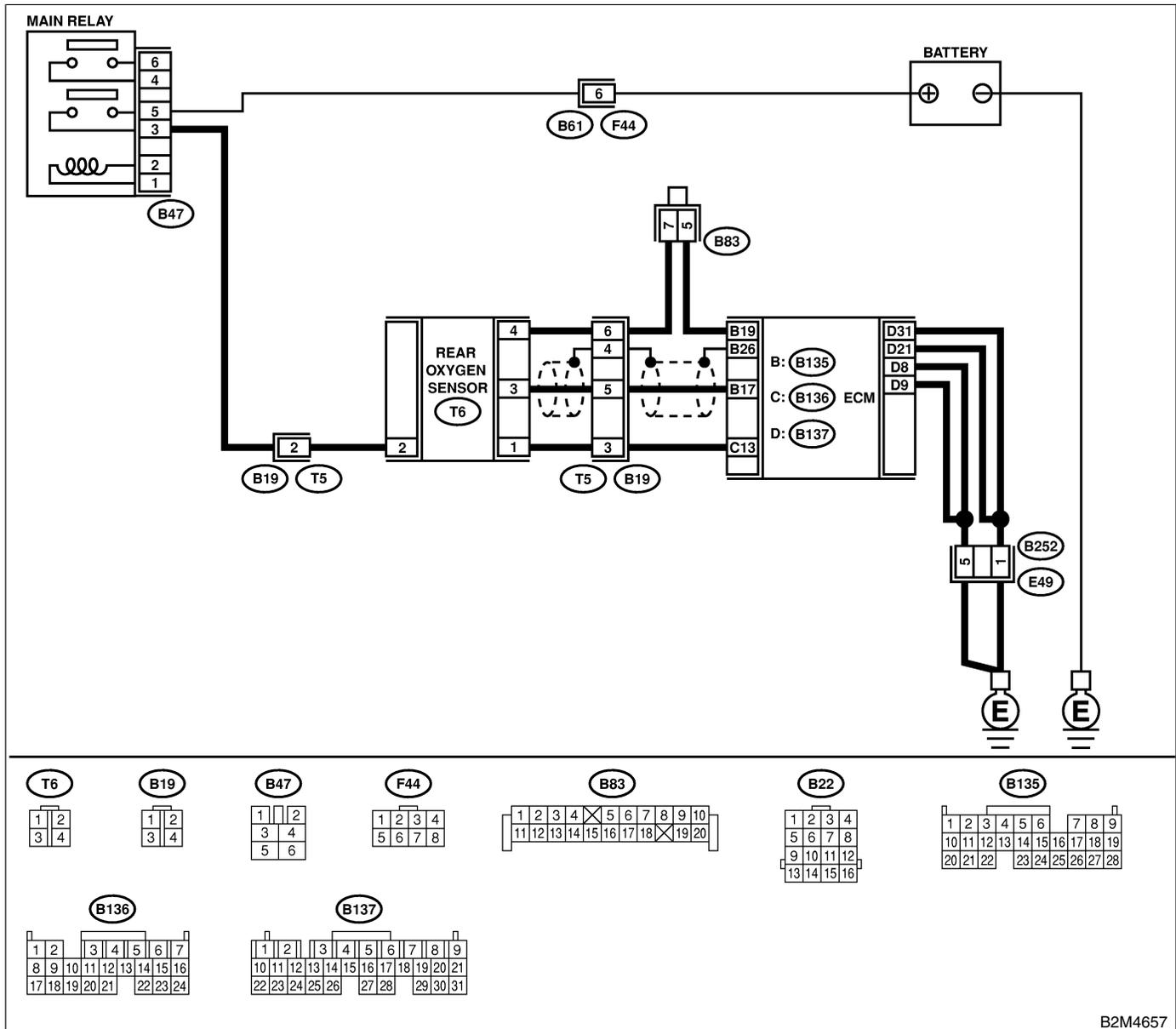
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4657

No.	Step	Check	Yes	No
1	<b>CHECK INPUT SIGNAL FOR ECM.</b> Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal (B136) No. 13 (+) — Chassis ground (-):</b>	Is the voltage more than 8 V?	Go to step 2.	Go to step 3.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<p><b>CHECK CURRENT DATA.</b></p> <p>1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and rear oxygen sensor connector. 3) Turn ignition switch to ON. 4) Read data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"><li>● Subaru Select Monitor</li></ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"><li>● OBD-II general scan tool</li></ul> <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value more than 7 A?	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	END
3	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

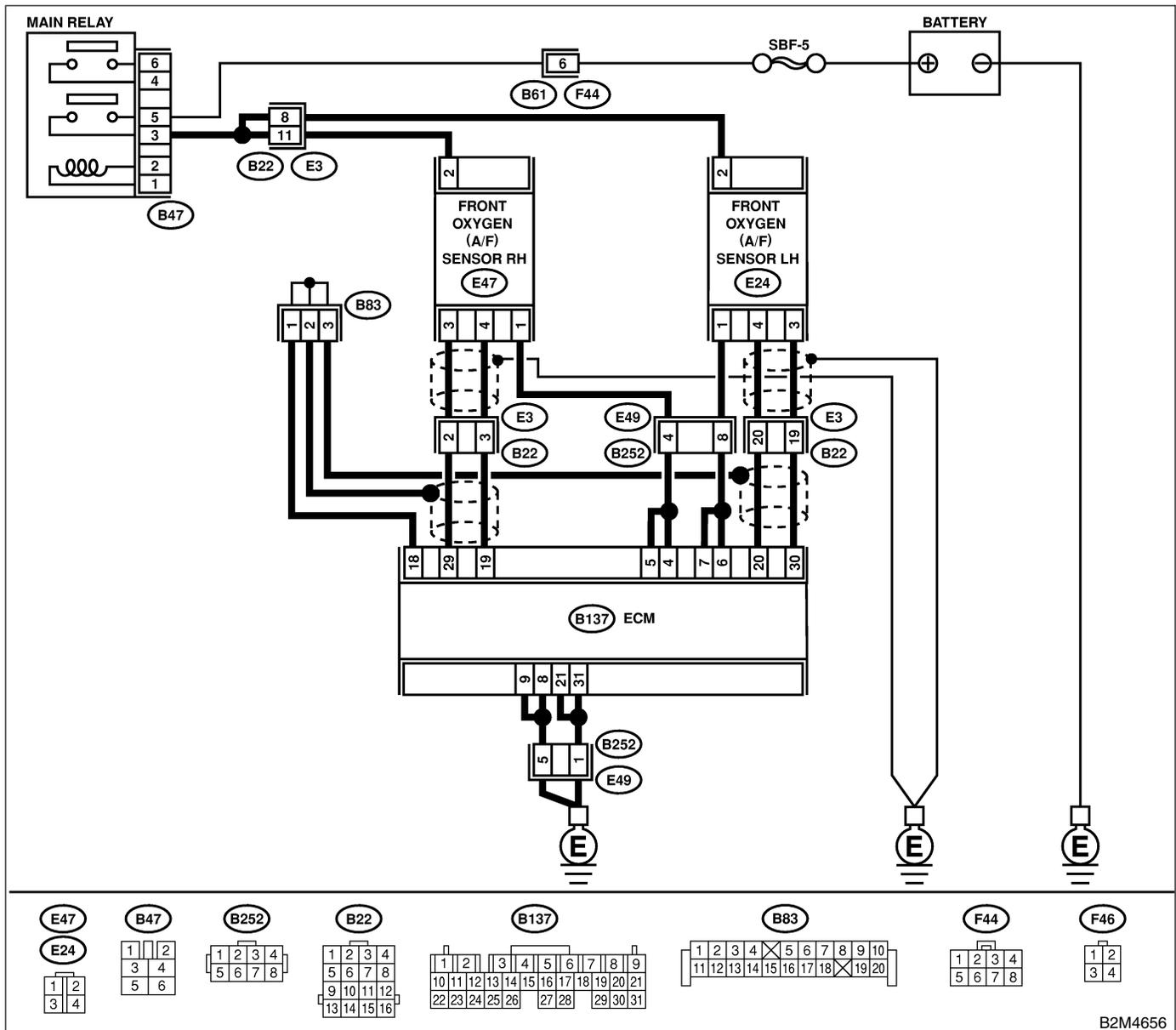
## E: DTC P0051 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) HEATER CIRCUIT LOW INPUT — S048521H25

- DTC DETECTING CONDITION:
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031, P0051 and P0037 at the same time?	Go to step 2.	Go to step 3.
2	<b>CHECK GROUND CIRCUIT OF ECM.</b> Measure resistance of harness between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 31 — Chassis ground:</b> <b>(B137) No. 21 — Chassis ground:</b> <b>(B137) No. 8 — Chassis ground:</b> <b>(B137) No. 9 — Chassis ground:</b>	Is the resistance less than 5 Ω?	Go to step 3.	Repair harness and connector. <b>NOTE:</b> In this case, repair the following: ● Open circuit in harness between ECM and engine ground terminal ● Poor contact in ECM connector ● Poor contact in coupling connector
3	<b>CHECK CURRENT DATA.</b> 1) Start engine 2) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. <b>NOTE:</b> ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6)-37, Subaru Select Monitor.> ● OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 0.2 A?	Repair poor contact in connector. <b>NOTE:</b> In this case, repair the following: ● Poor contact in front oxygen (A/F) sensor connector ● Poor contact in ECM connector	Go to step 4.
4	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 7 (+) — Chassis ground (-):</b>	Is the voltage less than 1.0 V?	Go to step 6.	Go to step 5.
5	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 7 (+) — Chassis ground (-):</b>	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step 6.
6	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 6 (+) — Chassis ground (-):</b>	Is the voltage less than 1.0 V?	Go to step 8.	Go to step 7.
7	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 6 (+) — Chassis ground (-):</b>	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step 7.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
8	<p><b>CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Disconnect connector from front oxygen (A/F) sensor.                      3) Turn ignition switch to ON.                      4) Measure voltage between front oxygen (A/F) sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b>  <b>(E24) No. 2 (+) — Engine ground (-):</b></p>	Is the voltage more than 10 V?	Go to step 9.	<p>Repair power supply line.</p> <p>NOTE:                      In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between main relay and front oxygen (A/F) sensor connector</li> <li>● Poor contact in front oxygen (A/F) sensor connector</li> <li>● Poor contact in main relay connector</li> </ul>
9	<p><b>CHECK FRONT OXYGEN (A/F) SENSOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Measure resistance between front oxygen (A/F) sensor connector terminals.</p> <p><b>Terminals</b>  <b>No. 2 — No. 1:</b></p>	Is the resistance less than 10 Ω?	<p>Repair harness and connector.</p> <p>NOTE:                      In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector</li> <li>● Poor contact in front oxygen (A/F) sensor connector</li> <li>● Poor contact in ECM connector</li> </ul>	<p>Replace front oxygen (A/F) sensor.                      &lt;Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.&gt;</p>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

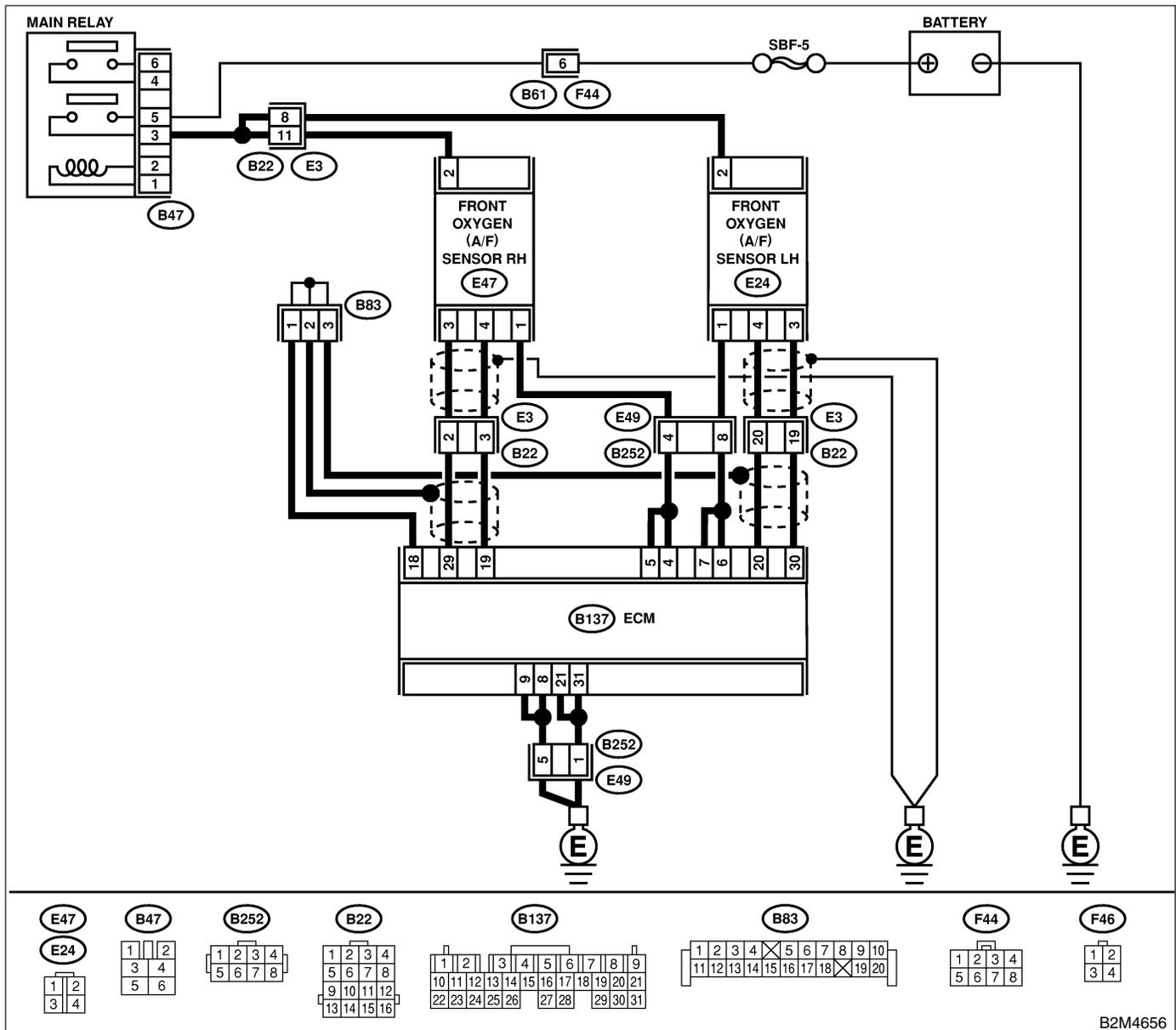
## F: DTC P0052 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) HEATER CIRCUIT HIGH INPUT — S048521H26

- DTC DETECTING CONDITION:
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. <i>Connector &amp; terminal</i> <i>(B137) No. 6 (+) — Chassis ground (-):</i>	Is the voltage more than 8 V?	Go to step 3.	Go to step 2.
2	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <i>Connector &amp; terminal</i> <i>(B137) No. 7 (+) — Chassis ground (-):</i>	Is the voltage more than 8 V?	Go to step 3.	Go to step 4.
3	<b>CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.</b> 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn ignition switch to ON. 4) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6)-37, Subaru Select Monitor.> ● OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 2.3 A?	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	END
4	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <i>Connector &amp; terminal</i> <i>(B137) No. 6 (+) — Chassis ground (-):</i>	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step 5.
5	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM connector and chassis ground. <i>Connector &amp; terminal</i> <i>(B137) No. 7 (+) — Chassis ground (-):</i>	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

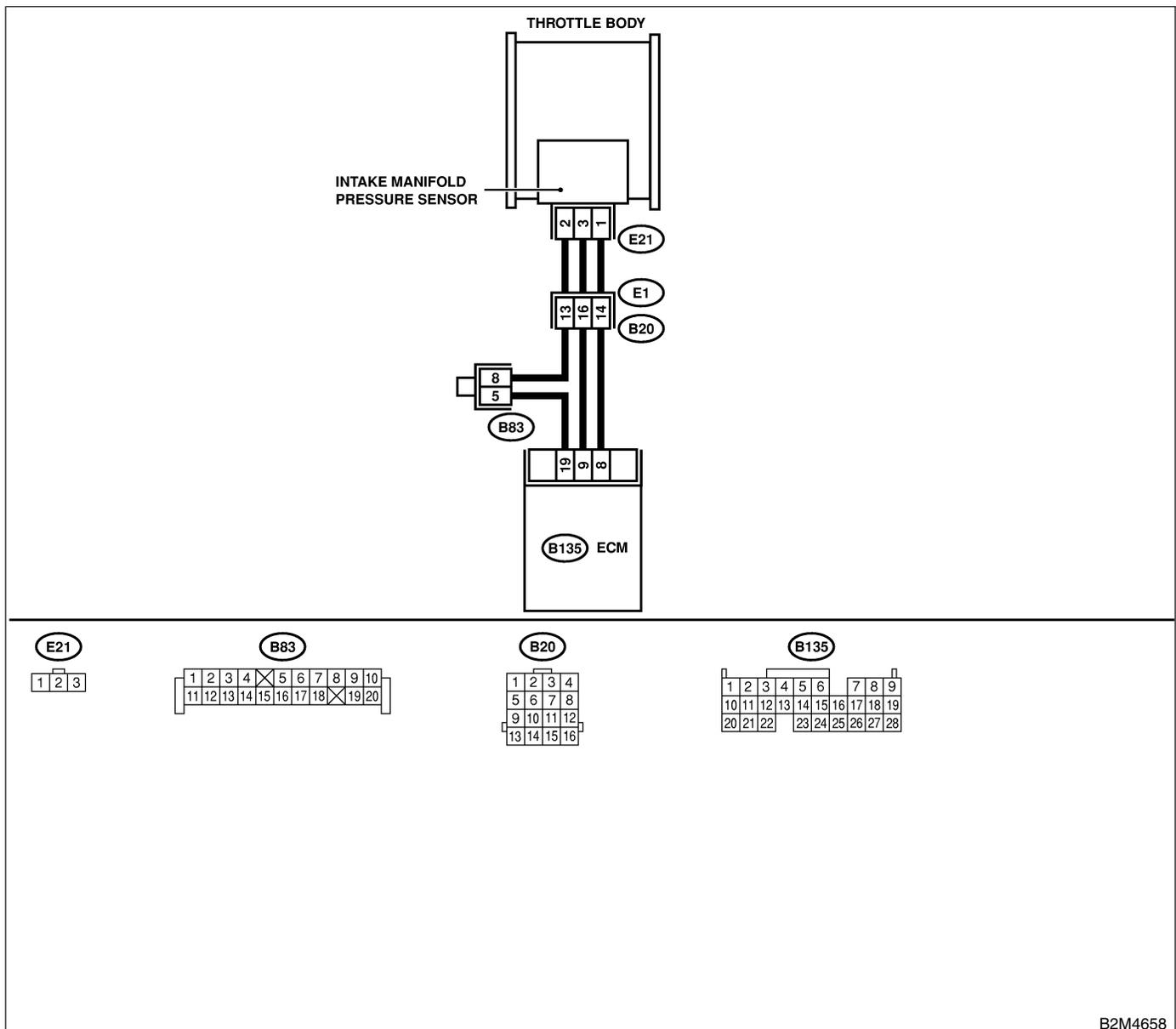
## G: DTC P0106 — INTAKE MANIFOLD PRESSURE SENSOR CIRCUIT RANGE/ PERFORMANCE PROBLEM — S048521F00

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM**
  - Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4658

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK IDLE SWITCH SIGNAL.</b></p> <p>1) Turn ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p>	Does the LED of {Idle Switch Signal} come on?	Go to step 2.	Check throttle position sensor circuit. <Ref. to EN(H6)-146, DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/ PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2	<p><b>CHECK ANY OTHER DTC ON DISPLAY.</b></p>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step 3.
3	<p><b>CHECK CONDITION OF INTAKE MANIFOLD PRESSURE SENSOR.</b></p>	Is the intake manifold pressure sensor installation bolt tightened securely?	Go to step 4.	Tighten intake manifold pressure sensor installation bolt securely.
4	<p><b>CHECK CONDITION OF THROTTLE BODY.</b></p>	Is the throttle body installation bolt tightened securely?	Go to step 5.	Tighten throttle body installation bolt securely.
5	<p><b>CHECK CONDITION OF EGR VALVE.</b></p>	Is there any foreign object caught between EGR solenoid valve and intake manifold?	Completely remove foreign object, and install EGR solenoid valve securely to the intake manifold.	Replace intake manifold pressure sensor. <Ref. to FU(H6)-34, Intake Manifold Pressure Sensor.>

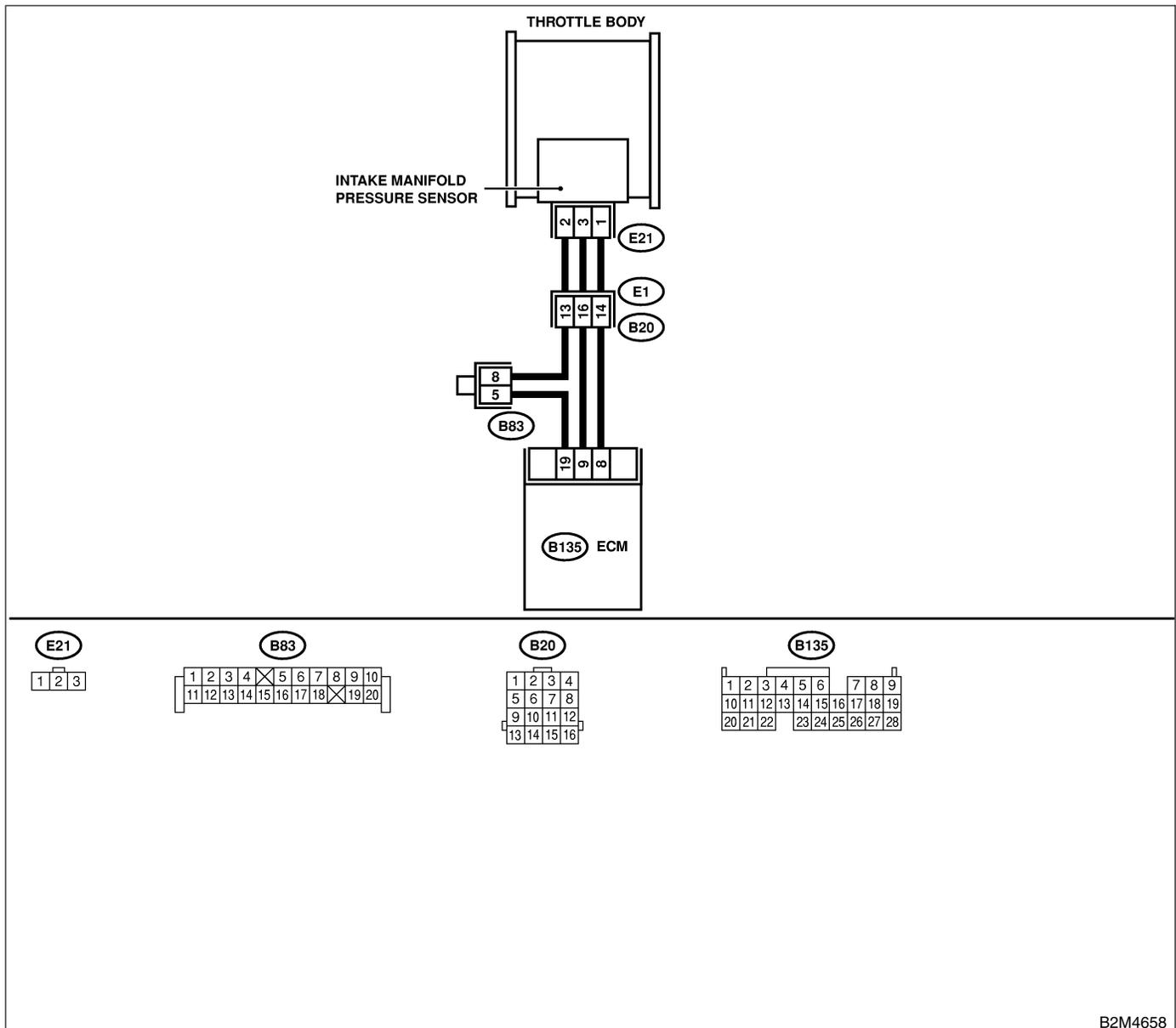
**H: DTC P0107 — INTAKE MANIFOLD PRESSURE SENSOR CIRCUIT LOW INPUT —** S048521F01

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4658

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b>                      1) Start engine.                      2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool.                      NOTE:                      ● Subaru Select Monitor                      For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".                      &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;                      ● OBD-II general scan tool                      For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value less than 1.7 kPa (13 mmHg, 0.51 inHg)?	Go to step 3.	Go to step 2.
2	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM and pressure sensor connector.</p>	Is there poor contact in ECM or pressure sensor connector?	Repair poor contact in ECM or pressure sensor connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.
3	<p><b>CHECK INPUT SIGNAL FOR ECM.</b>                      Measure voltage between ECM connector and chassis ground.  <i>Connector &amp; terminal</i>  <i>(B135) No. 9 (+) — Chassis ground (-):</i></p>	Is the voltage more than 4.5 V?	Go to step 5.	Go to step 4.
4	<p><b>CHECK INPUT SIGNAL FOR ECM.</b>                      Measure voltage between ECM connector and chassis ground.  <i>Connector &amp; terminal</i>  <i>(B135) No. 9 (+) — Chassis ground (-):</i></p>	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with SOA service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	<p><b>CHECK INPUT SIGNAL FOR ECM.</b>                      Measure voltage between ECM and chassis ground.  <i>Connector &amp; terminal</i>  <i>(B135) No. 8 (+) — Chassis ground (-):</i></p>	Is the voltage less than 0.7 V?	Go to step 7.	Go to step 6.
6	<p><b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b>                      Read data of atmospheric absolute pressure signal using Subaru Select Monitor.                      NOTE:                      ● Subaru Select Monitor                      For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".                      &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p>	Does the value change more than 1.7 kPa (13 mmHg, 0.51 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step 7.
7	<p><b>CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connector from intake manifold pressure sensor.                      3) Turn ignition switch to ON.                      4) Measure voltage between intake manifold pressure sensor connector and engine ground.  <i>Connector &amp; terminal</i>  <i>(E21) No. 3 (+) — Engine ground (-):</i></p>	Is the voltage more than 4.5 V?	Go to step 8.	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
8	<p><b>CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and intake manifold pressure sensor connector.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 19 — (E21) No. 2:</b></p>	Is the resistance less than 1 Ω?	Go to step 9.	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
9	<p><b>CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</b></p> <p>Measure resistance of harness between intake manifold pressure sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b> <b>(E21) No. 1 — Engine ground:</b></p>	Is the resistance more than 500 kΩ?	Go to step 10.	Repair ground short circuit in harness between ECM and intake manifold pressure sensor connector.
10	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in intake manifold pressure sensor connector.</p>	Is there poor contact in intake manifold pressure sensor connector?	Repair poor contact in intake manifold pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(H6)-34, Intake Manifold Pressure Sensor.>

**MEMO:**

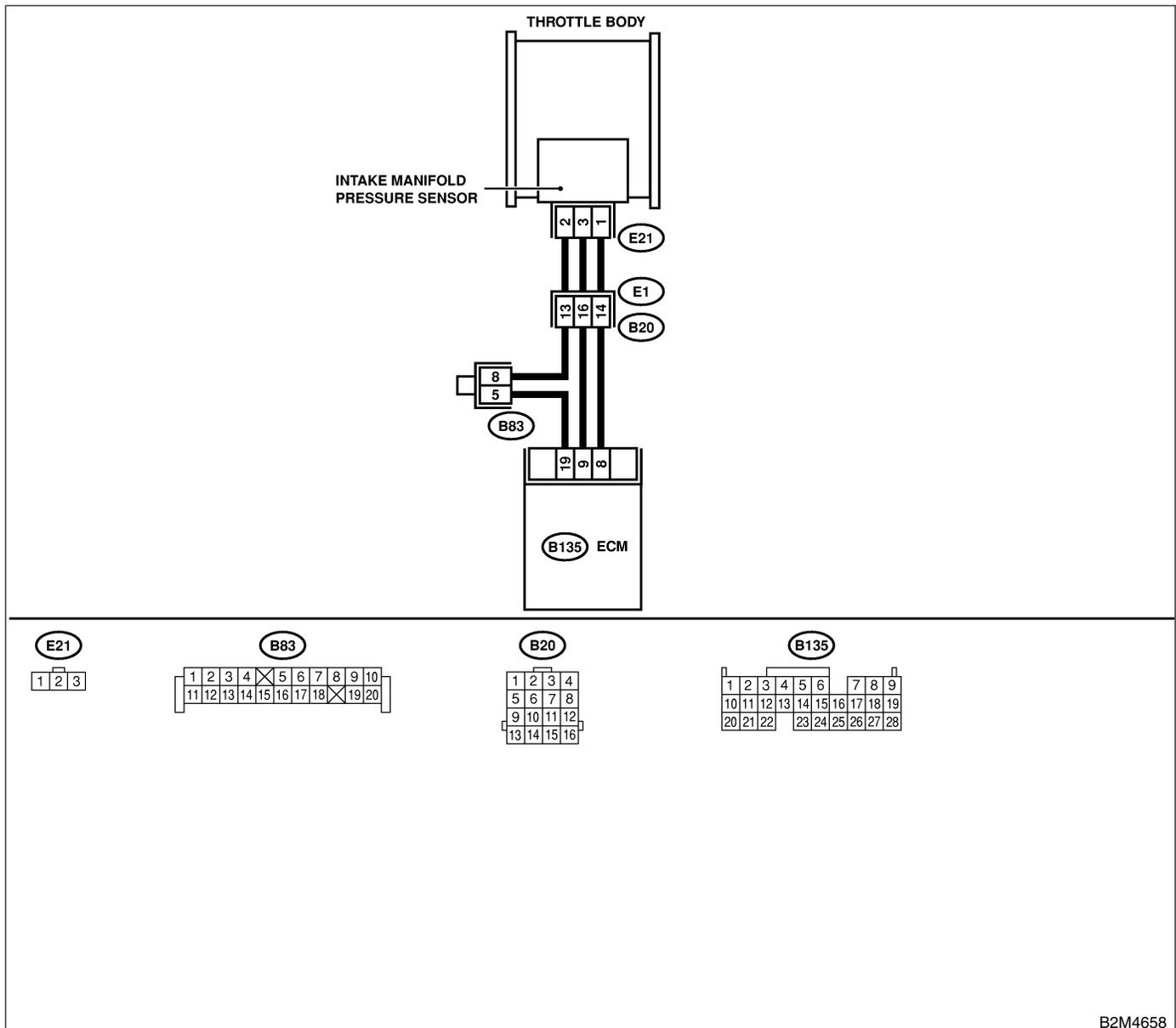
**I: DTC P0108 — INTAKE MANIFOLD PRESSURE SENSOR CIRCUIT HIGH INPUT —** S048521F02

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4658

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b>                      1) Start engine.                      2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool.                      NOTE:                      ● Subaru Select Monitor                      For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".                      &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;                      ● OBD-II general scan tool                      For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value more than 130 kPa (975 mmHg, 38.39 inHg)?	Go to step 10.	Go to step 2.
2	<p><b>CHECK INPUT SIGNAL FOR ECM.</b>                      Measure voltage between ECM connector and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B135) No. 9 (+) — Chassis ground (-):</b></p>	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3	<p><b>CHECK INPUT SIGNAL FOR ECM.</b>                      Measure voltage between ECM connector and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B135) No. 9 (+) — Chassis ground (-):</b></p>	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with SOA service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	<p><b>CHECK INPUT SIGNAL FOR ECM.</b>                      Measure voltage between ECM connector and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B135) No. 8 (+) — Chassis ground (-):</b></p>	Is the voltage less than 0.7 V?	Go to step 6.	Go to step 5.
5	<p><b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b>                      Read data of atmospheric absolute pressure signal using Subaru Select Monitor.                      NOTE:                      ● Subaru Select Monitor                      For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".                      &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p>	Does the value change more than 1.7 kPa (13 mmHg, 0.51 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step 6.
6	<p><b>CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connector from intake manifold pressure sensor.                      3) Turn ignition switch to ON.                      4) Measure voltage between intake manifold pressure sensor connector and engine ground.  <b>Connector &amp; terminal</b>  <b>(E21) No. 3 (+) — Engine ground (-):</b></p>	Is the voltage more than 4.5 V?	Go to step 7.	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
7	<p><b>CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and intake manifold pressure sensor connector.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 8 — (E21) No. 1:</b></p>	Is the resistance less than 1 Ω?	Go to step 8.	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
8	<p><b>CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.</b></p> <p>Measure resistance of harness between ECM and intake manifold pressure sensor connector.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 19 — (E21) No. 2:</b></p>	Is the resistance less than 1 Ω?	Go to step 9.	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
9	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in intake manifold pressure sensor connector.</p>	Is there poor contact in intake manifold pressure sensor connector?	Repair poor contact in intake manifold pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(H6)-34, Intake Manifold Pressure Sensor.>
10	<p><b>CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2) Disconnect connector from pressure sensor. 3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Read data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</li> <li>● OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</li> </ul>	Is the value more than 130 kPa (975 mmHg, 38.39 inHg)?	Repair battery short circuit in harness between ECM and intake manifold pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(H6)-34, Intake Manifold Pressure Sensor.>

**MEMO:**

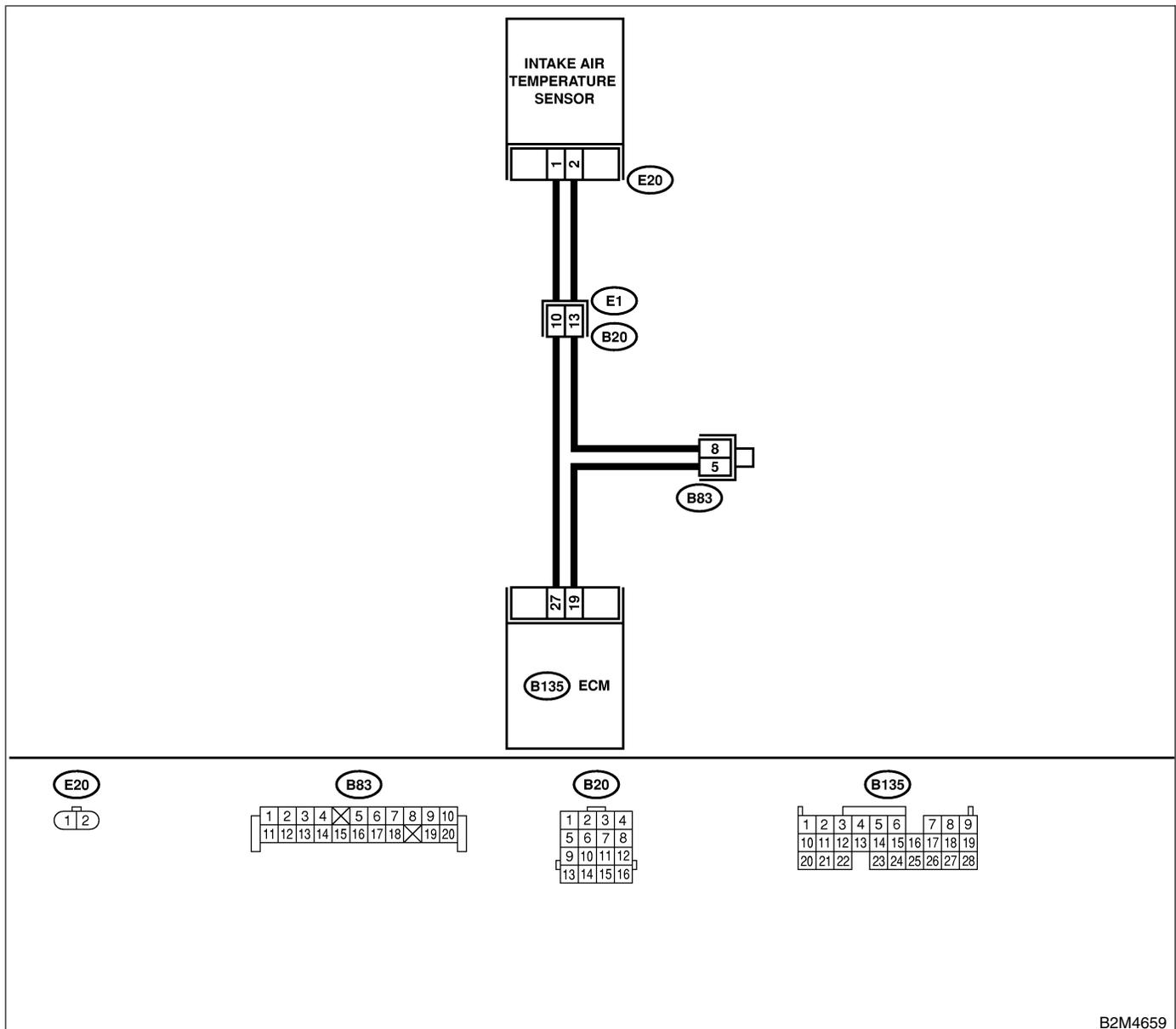
**J: DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —** S048521B14

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4659

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Replace intake air temperature sensor. <Ref. to FU(H6)-35, Intake Air Temperature Sensor.>

**K: DTC P0112 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW INPUT**

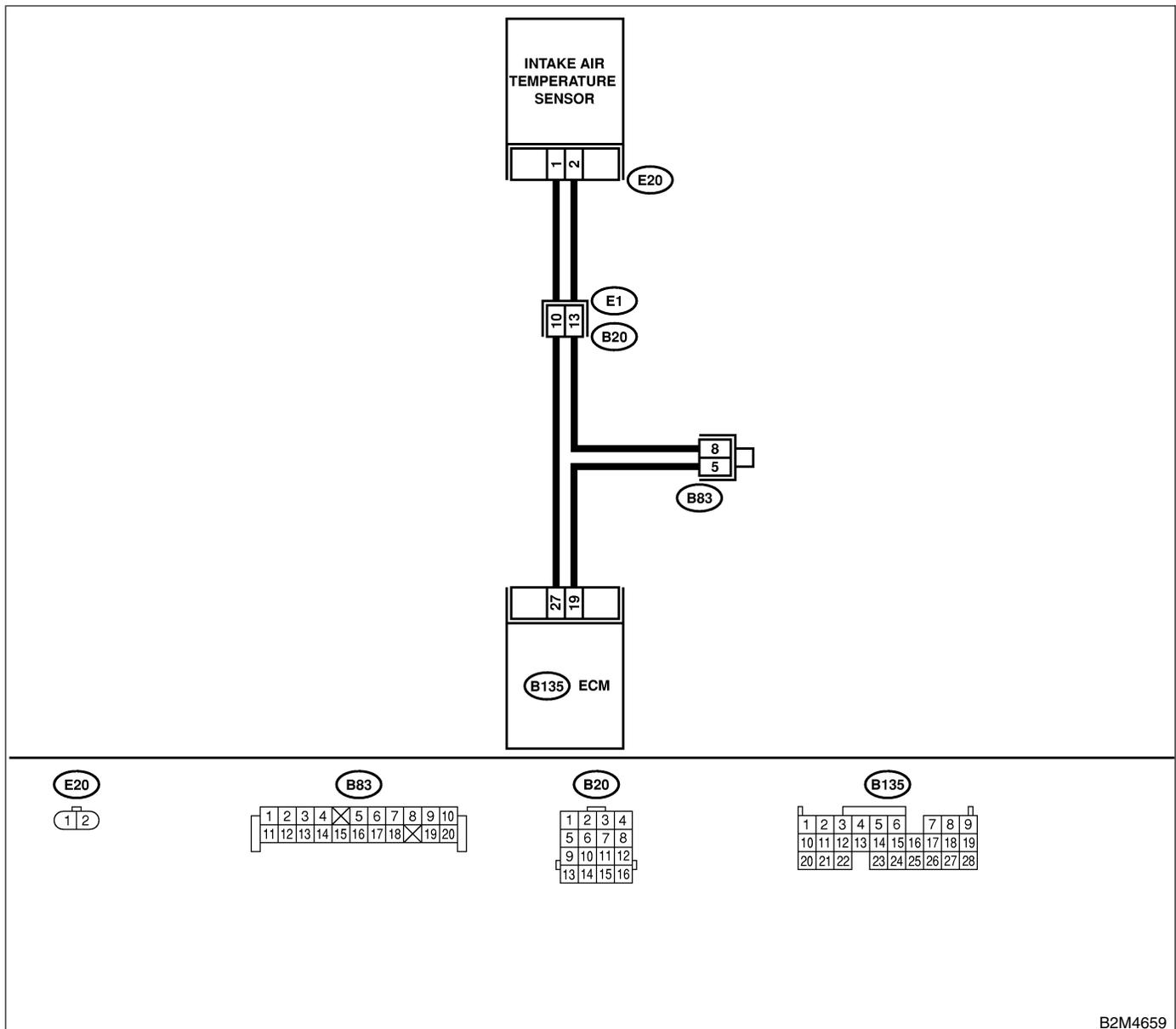
— S048521B15

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4659

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b></p> <p>1) Start engine. 2) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value greater than 120°C (248°F)?</p>	<p>Go to step 2.</p>	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Poor contact in intake air temperature sensor</li> <li>● Poor contact in ECM</li> <li>● Poor contact in coupling connector</li> <li>● Poor contact in joint connector</li> </ul>
2	<p><b>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from intake air temperature sensor. 3) Turn ignition switch to ON. 4) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than -40°C (-40°F)?</p>	<p>Replace intake air temperature sensor. &lt;Ref. to FU(H6)-35, Intake Air Temperature Sensor.&gt;</p>	<p>Repair ground short circuit in harness between intake air temperature sensor and ECM connector.</p>

**L: DTC P0113 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH INPUT**

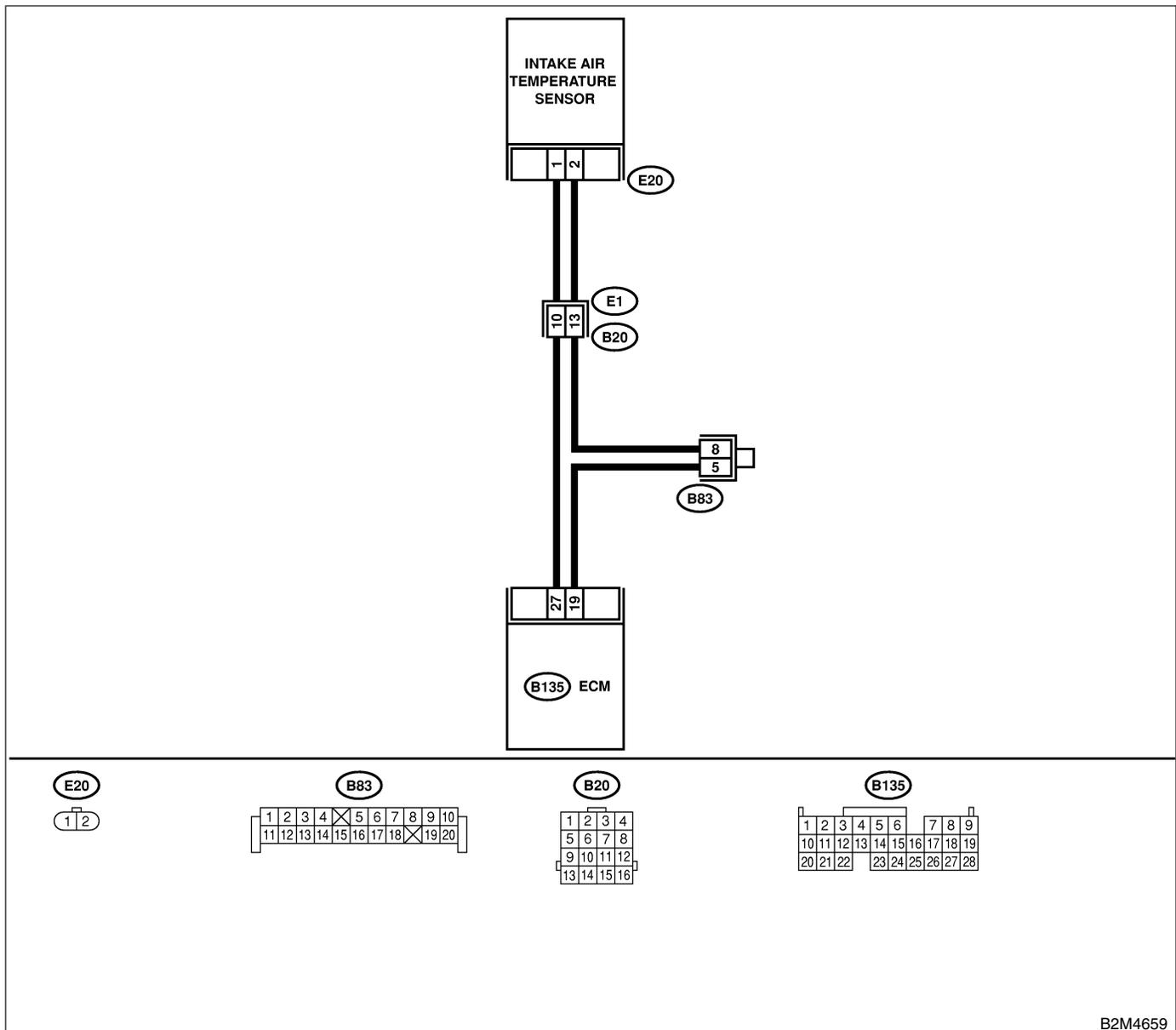
— S048521B16

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4659

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b></p> <p>1) Turn ignition switch to ON. 2) Start engine. 3) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value less than -40°C (-40°F)?	Go to step 2.	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Poor contact in intake air temperature sensor</li> <li>● Poor contact in ECM</li> <li>● Poor contact in coupling connector</li> <li>● Poor contact in joint connector</li> </ul>
2	<p><b>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from intake air temperature sensor. 3) Measure voltage between intake air temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b> <b>(E20) No. 1 (+) — Engine ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step 3.
3	<p><b>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to ON. 2) Measure voltage between intake air temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b> <b>(E20) No. 1 (+) — Engine ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step 4.
4	<p><b>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>Measure voltage between intake air temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b> <b>(E20) No. 1 (+) — Engine ground (-):</b></p>	Is the voltage more than 3 V?	Go to step 5.	<p>Repair harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between intake air temperature sensor and ECM connector</li> <li>● Poor contact in intake air temperature sensor</li> <li>● Poor contact in ECM</li> <li>● Poor contact in coupling connector</li> <li>● Poor contact in joint connector</li> </ul>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
5	<p><b>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Measure resistance of harness between intake air temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b> <b>(E20) No. 2 — Engine ground:</b></p>	Is the resistance less than 5 $\Omega$ ?	Replace intake air temperature sensor. <Ref. to FU(H6)-35, Intake Air Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"><li>● Open circuit in harness between intake air temperature sensor and ECM connector</li><li>● Poor contact in intake air temperature sensor</li><li>● Poor contact in ECM</li><li>● Poor contact in coupling connector</li><li>● Poor contact in joint connector</li></ul>

**MEMO:**

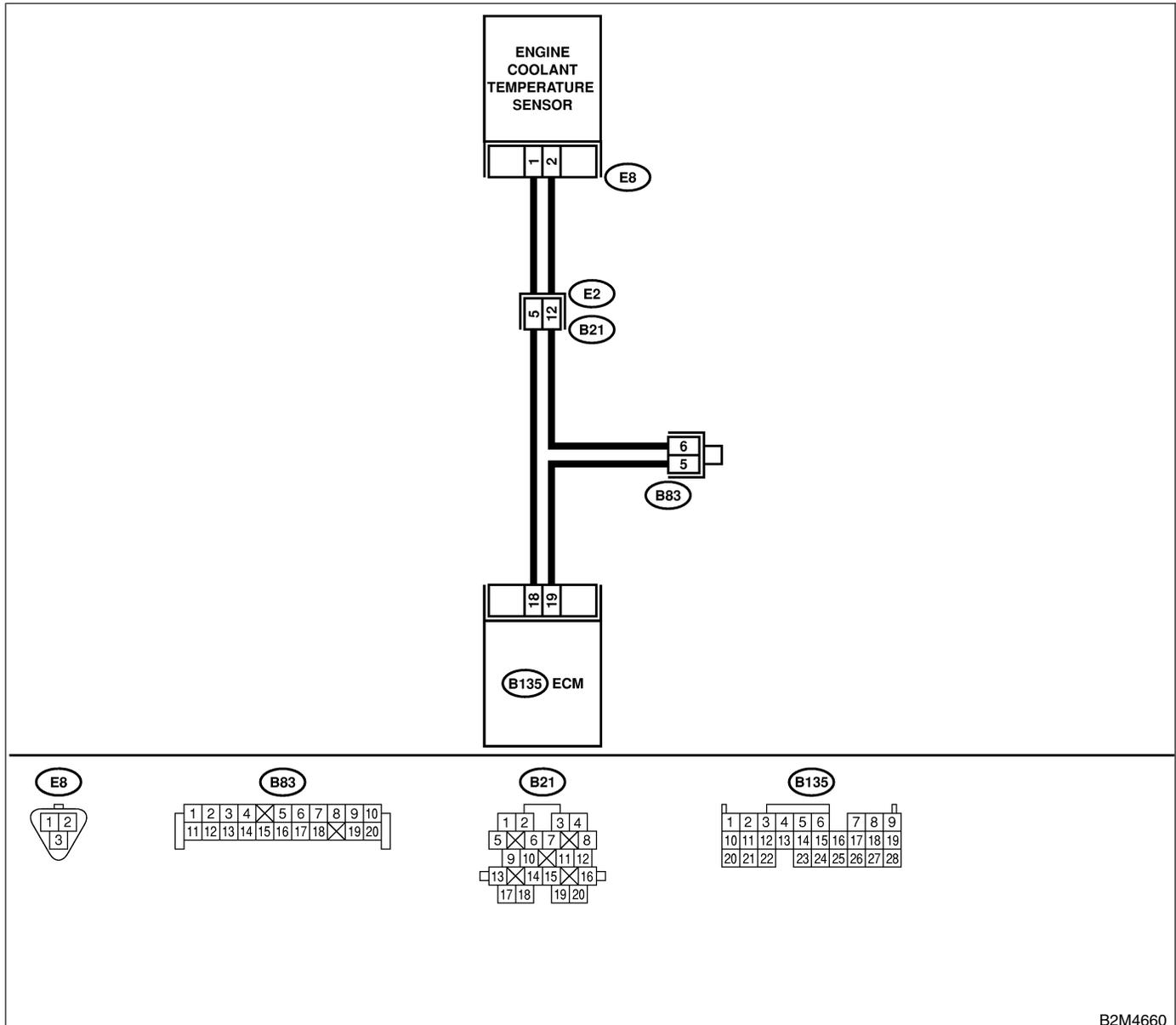
**M: DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —** S048521F91

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4660

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b></p> <p>1) Start engine.</p> <p>2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value greater than 120°C (248°F)?</p>	<p>Go to step 2.</p>	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Poor contact in engine coolant temperature sensor</li> <li>● Poor contact in ECM</li> <li>● Poor contact in coupling connector</li> <li>● Poor contact in joint connector</li> </ul>
2	<p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from engine coolant temperature sensor.</p> <p>3) Turn ignition switch to ON.</p> <p>4) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than -40°C (-40°F)?</p>	<p>Replace engine coolant temperature sensor. &lt;Ref. to FU(H6)-29, Engine Coolant Temperature Sensor.&gt;</p>	<p>Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.</p>

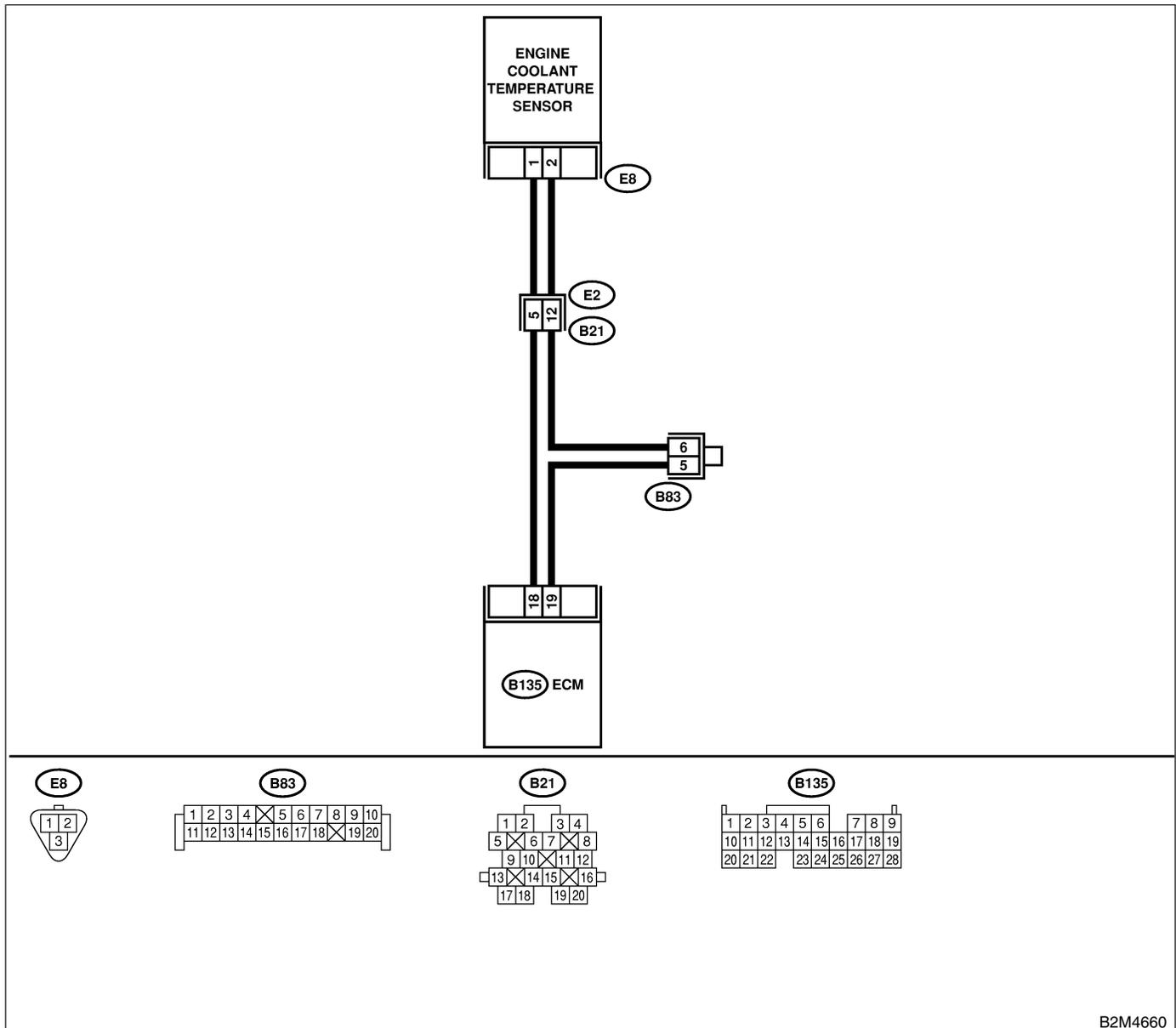
**N: DTC P0118 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —** S048521F92

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4660

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b></p> <p>1) Start engine. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value less than -40°C (-40°F)?	Go to step 2.	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Poor contact in engine coolant temperature sensor</li> <li>● Poor contact in ECM</li> <li>● Poor contact in coupling connector</li> <li>● Poor contact in joint connector</li> </ul>
2	<p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from engine coolant temperature sensor. 3) Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b> <b>(E8) No. 1 (+) — Engine ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 3.
3	<p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to ON. 2) Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b> <b>(E8) No. 1 (+) — Engine ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 4.
4	<p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>Measure voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b> <b>(E8) No. 1 (+) — Engine ground (-):</b></p>	Is the voltage more than 4 V?	Go to step 5.	<p>Repair harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and engine coolant temperature sensor connector</li> <li>● Poor contact in engine coolant temperature sensor connector</li> <li>● Poor contact in ECM connector</li> <li>● Poor contact in coupling connector</li> <li>● Poor contact in joint connector</li> </ul>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
5	<p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Measure resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b> <b>(E8) No. 2 — Engine ground:</b></p>	Is the resistance less than 5 Ω?	Replace engine coolant temperature sensor. <Ref. to FU(H6)-29, Engine Coolant Temperature Sensor.>	<p>Repair harness and connector.</p> <p><b>NOTE:</b> In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and engine coolant temperature sensor connector</li> <li>● Poor contact in engine coolant temperature sensor connector</li> <li>● Poor contact in ECM connector</li> <li>● Poor contact in coupling connector</li> <li>● Poor contact in joint connector</li> </ul>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## O: DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) — S048521B19

### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

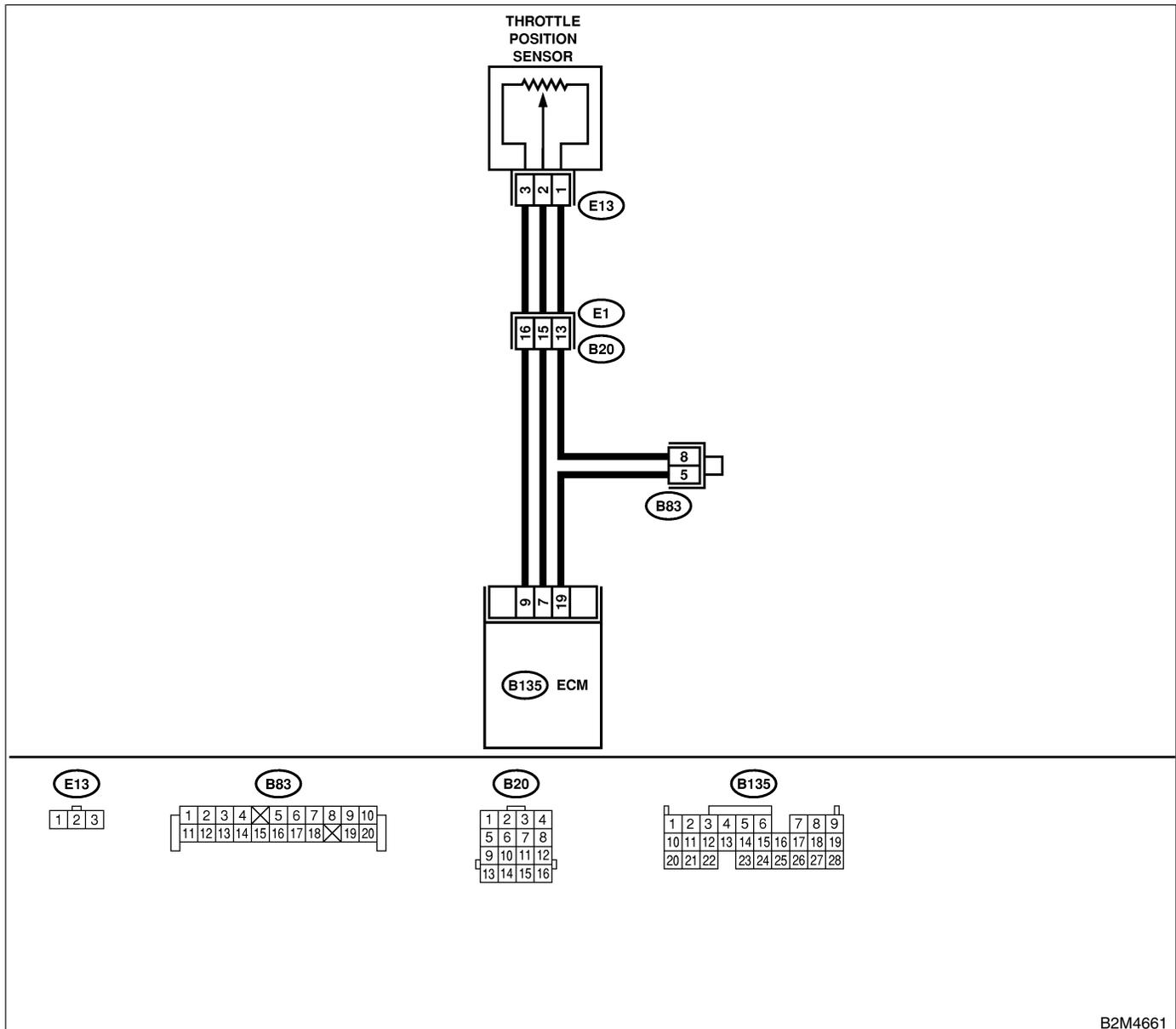
### ● TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4661

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace throttle position sensor. <Ref. to FU(H6)-33, Throttle Position Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## P: DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —

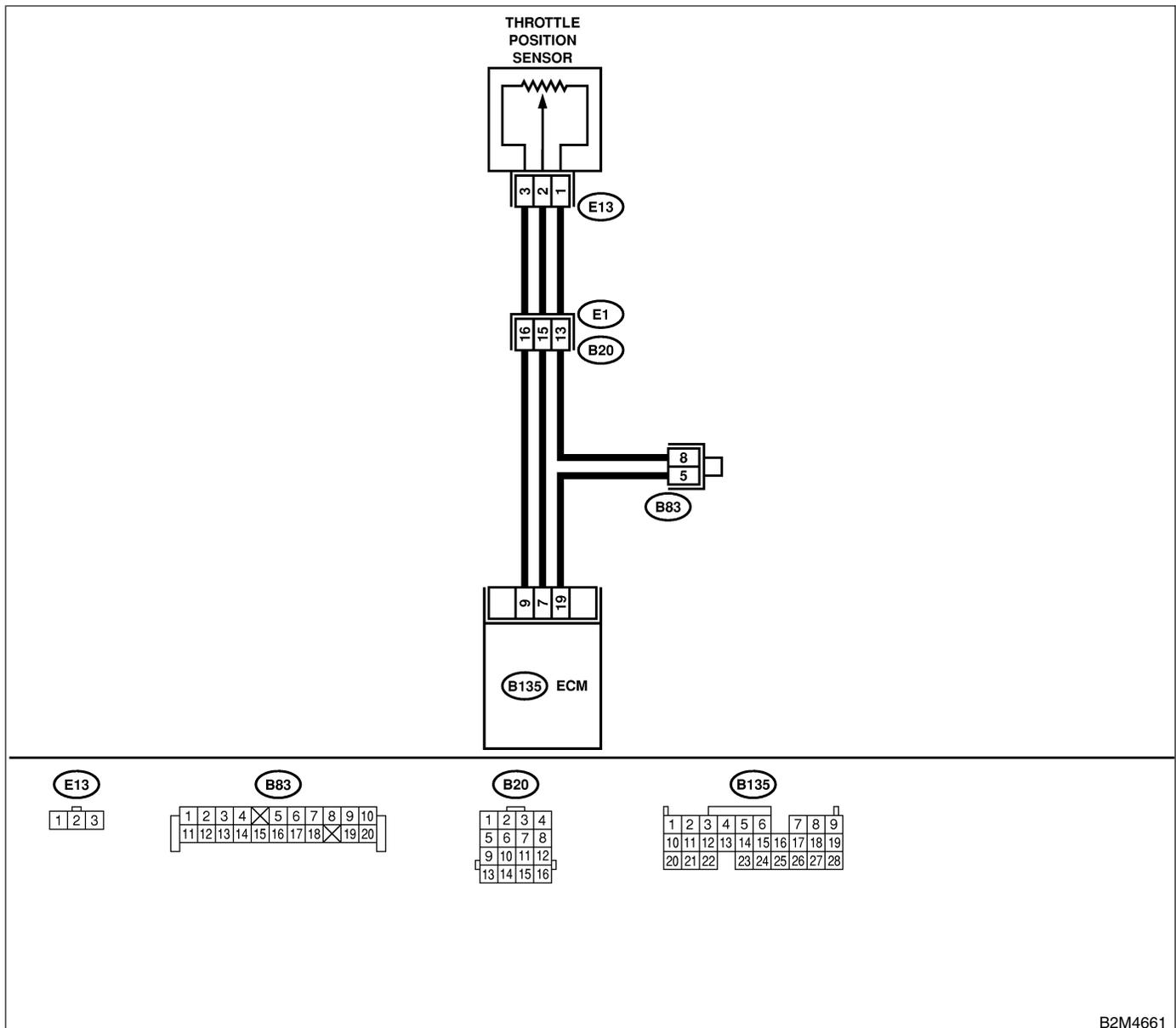
S048521B20

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4661

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b>                      1) Start engine.                      2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool.                      NOTE:                      ● Subaru Select Monitor                      For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".                      &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;                      ● OBD-II general scan tool                      For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value less than 0.1 V?	Go to step 2.	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: ● Poor contact in throttle position sensor connector ● Poor contact in ECM connector ● Poor contact in coupling connector
2	<p><b>CHECK INPUT SIGNAL FOR ECM.</b>                      Measure voltage between ECM connector and chassis ground while throttle valve is fully closed.  <i>Connector &amp; terminal</i>                      (B135) No. 7 (+) — Chassis ground (-):</p>	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3	<p><b>CHECK INPUT SIGNAL FOR ECM.</b>                      Measure voltage between ECM connector and chassis ground.  <i>Connector &amp; terminal</i>                      (B135) No. 7 (+) — Chassis ground (-):</p>	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	<p><b>CHECK INPUT SIGNAL FOR ECM.</b>                      Measure voltage between ECM connector and chassis ground.  <i>Connector &amp; terminal</i>                      (B135) No. 9 (+) — Chassis ground (-):</p>	Is the voltage less than 0.1 V?	Go to step 6.	Go to step 5.
5	<p><b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b>                      Measure voltage between ECM connector and chassis ground.</p>	Does the voltage change more than 0.1 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step 6.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<p><b>CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Disconnect connectors from throttle position sensor.                      3) Turn ignition switch to ON.                      4) Measure voltage between throttle position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b>  <b>(E13) No. 1 (+) — Engine ground (-):</b></p>	Is the voltage more than 4.5 V?	Go to step 7.	<p>Repair harness and connector.</p> <p>NOTE:                      In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between throttle position sensor and ECM connector</li> <li>● Poor contact in throttle position sensor connector</li> <li>● Poor contact in ECM connector</li> <li>● Poor contact in coupling connector</li> <li>● Poor contact in joint connector</li> </ul>
7	<p><b>CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Measure resistance of harness between ECM connector and throttle position sensor connector.</p> <p><b>Connector &amp; terminal</b>  <b>(B135) No. 9 — (E13) No. 3:</b></p>	Is the resistance less than 1 $\Omega$ ?	Go to step 8.	<p>Repair harness and connector.</p> <p>NOTE:                      In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between throttle position sensor and ECM connector</li> <li>● Poor contact in ECM connector</li> <li>● Poor contact in throttle position sensor connector</li> <li>● Poor contact in coupling connector</li> </ul>
8	<p><b>CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</b></p> <p>Measure resistance of harness between throttle position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b>  <b>(E13) No. 3 — Engine ground:</b></p>	Is the resistance less than 10 $\Omega$ ?	Repair ground short circuit in harness between throttle position sensor and ECM connector.	Go to step 9.
9	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in throttle position sensor connector.</p>	Is there poor contact in throttle position sensor connector?	Repair poor contact in throttle position sensor connector.	Replace throttle position sensor. <Ref. to FU(H6)-33, Throttle Position Sensor.>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## Q: DTC P0123 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —

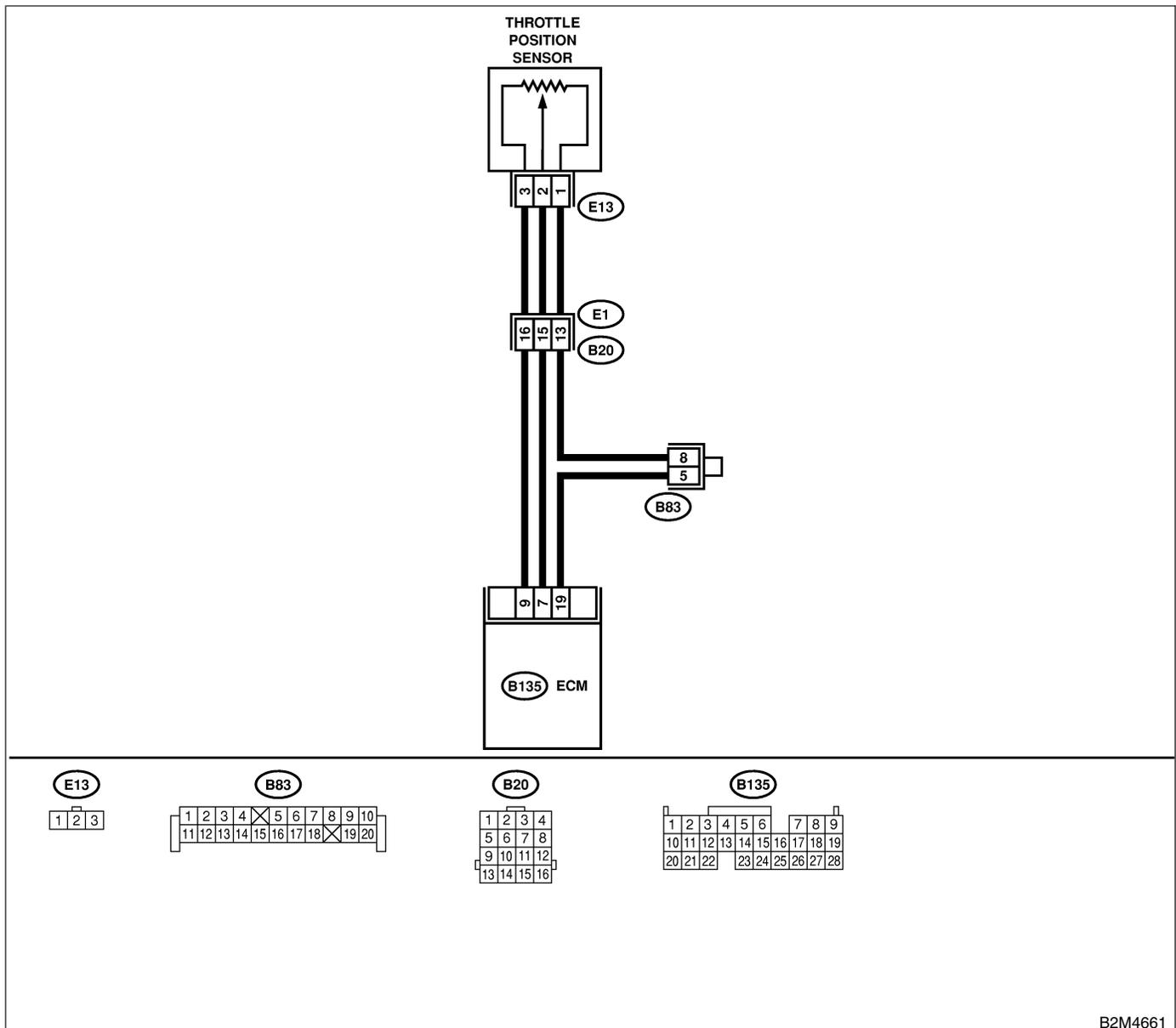
S048521B21

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4661

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b></p> <p>1) Start engine. 2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value more than 4.75 V?	Go to step 2.	<p>Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Poor contact in throttle position sensor connector</li> <li>● Poor contact in ECM connector</li> <li>● Poor contact in coupling connector</li> </ul>
2	<p><b>CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from throttle position sensor. 3) Measure resistance of harness between throttle position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b> <b>(E13) No. 2 — Engine ground:</b></p>	Is the resistance less than 5 Ω?	Go to step 3.	<p>Repair harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between throttle position sensor and ECM connector</li> <li>● Poor contact in coupling connector</li> <li>● Poor contact in joint connector</li> </ul>
3	<p><b>CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to ON. 2) Measure voltage between throttle position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b> <b>(E13) No. 3 (+) — Engine ground (-):</b></p>	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	<p>Replace throttle position sensor. &lt;Ref. to FU(H6)-33, Throttle Position Sensor.&gt;</p>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## R: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL — S048521B22

### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

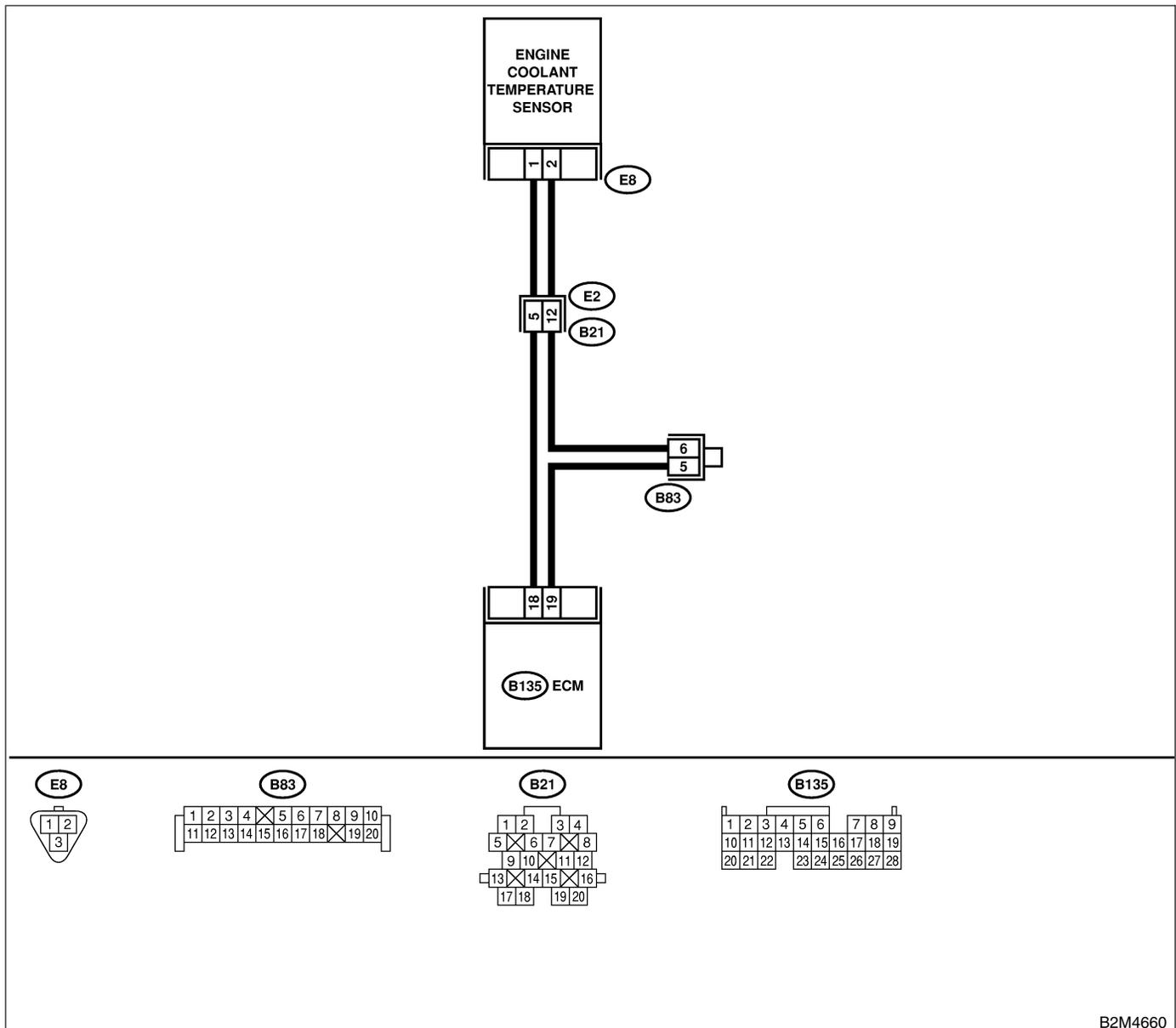
### ● TROUBLE SYMPTOM:

- Engine does not return to idle.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4660

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step 2.
2	<b>CHECK TIRE SIZE.</b>	Is the tire size the same as designated tire and four-wheel tire?	Go to step 3.	Replace tire.
3	<b>CHECK ENGINE COOLANT.</b> Check the following items. <ul style="list-style-type: none"><li>● Engine coolant volume</li><li>● Engine coolant freezing</li><li>● Contamination in engine coolant</li></ul>	Is the engine coolant normal?	Go to step 4.	Refill or replace coolant. <Ref. to CO(H6)-18, INSPECTION, Engine Coolant.>
4	<b>CHECK THERMOSTAT.</b>	Does thermostat remain open?	Replace thermostat. <Ref. to CO(H6)-21, Thermostat.>	Replace engine coolant temperature sensor. <Ref. to FU(H6)-29, Engine Coolant Temperature Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## S: DTC P0128 — THERMOSTAT MALFUNCTION — S048521F93

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Thermostat remains open.

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

No.	Step	Check	Yes	No
1	<b>CHECK VEHICLE CONDITION.</b>	Has engine operated at idle or has vehicle been driven with part of engine submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step 2.
2	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Go to step 3.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>
3	<b>CHECK TIRE SIZE.</b>	Is the tire size the same as designated tire and four wheel tire?	Go to step 4.	Replace tire.
4	<b>CHECK ENGINE COOLANT.</b>	Are coolant level and mixture ratio of cooling water to anti-freeze solution correct?	Go to step 5.	Replace engine coolant. <Ref. to CO(H6)-18, REPLACEMENT, Engine Coolant.>
5	<b>CHECK RADIATOR FAN.</b> 1) Start the engine. 2) Check radiator fan operation.	Does radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H6)-28, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H6)-31, Radiator Sub Fan and Fan Motor.>	Replace thermostat. <Ref. to CO(H6)-21, Thermostat.>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

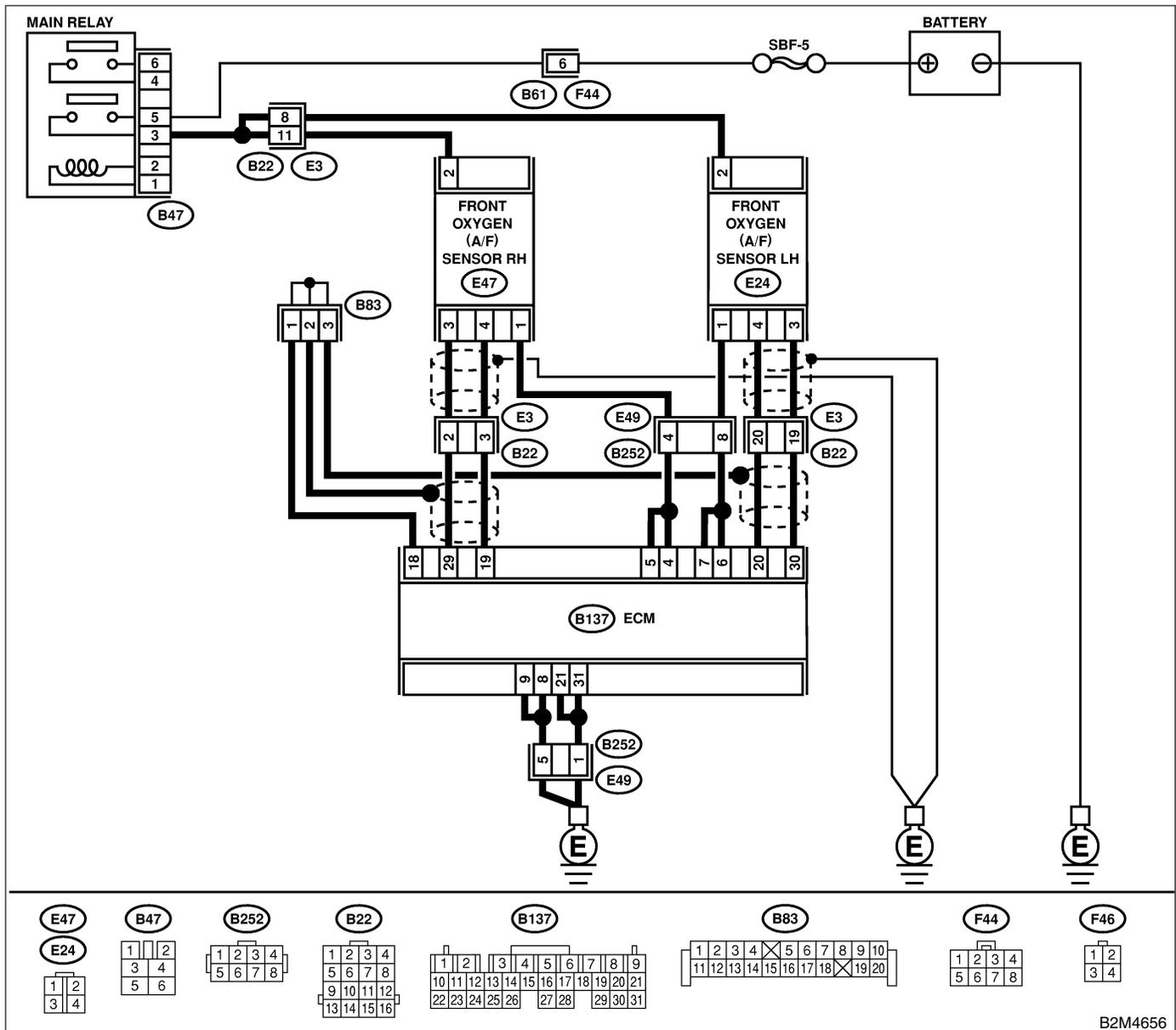
## T: DTC P0131 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) CIRCUIT MALFUNCTION (OPEN CIRCUIT) — S048521J99

- DTC DETECTING CONDITION:
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector.                      3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b>  <b>(B137) No. 19 — (E47) No. 4:</b></p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and front oxygen (A/F) sensor connector</li> <li>● Poor contact in front oxygen (A/F) sensor connector</li> <li>● Poor contact in ECM connector</li> </ul>
2	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b>  <b>(B137) No. 29 — (E47) No. 3:</b></p>	Is the resistance less than 1 Ω?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and front oxygen (A/F) sensor connector</li> <li>● Poor contact in front oxygen (A/F) sensor connector</li> <li>● Poor contact in ECM connector</li> </ul>
3	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in front oxygen (A/F) sensor connector.</p>	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

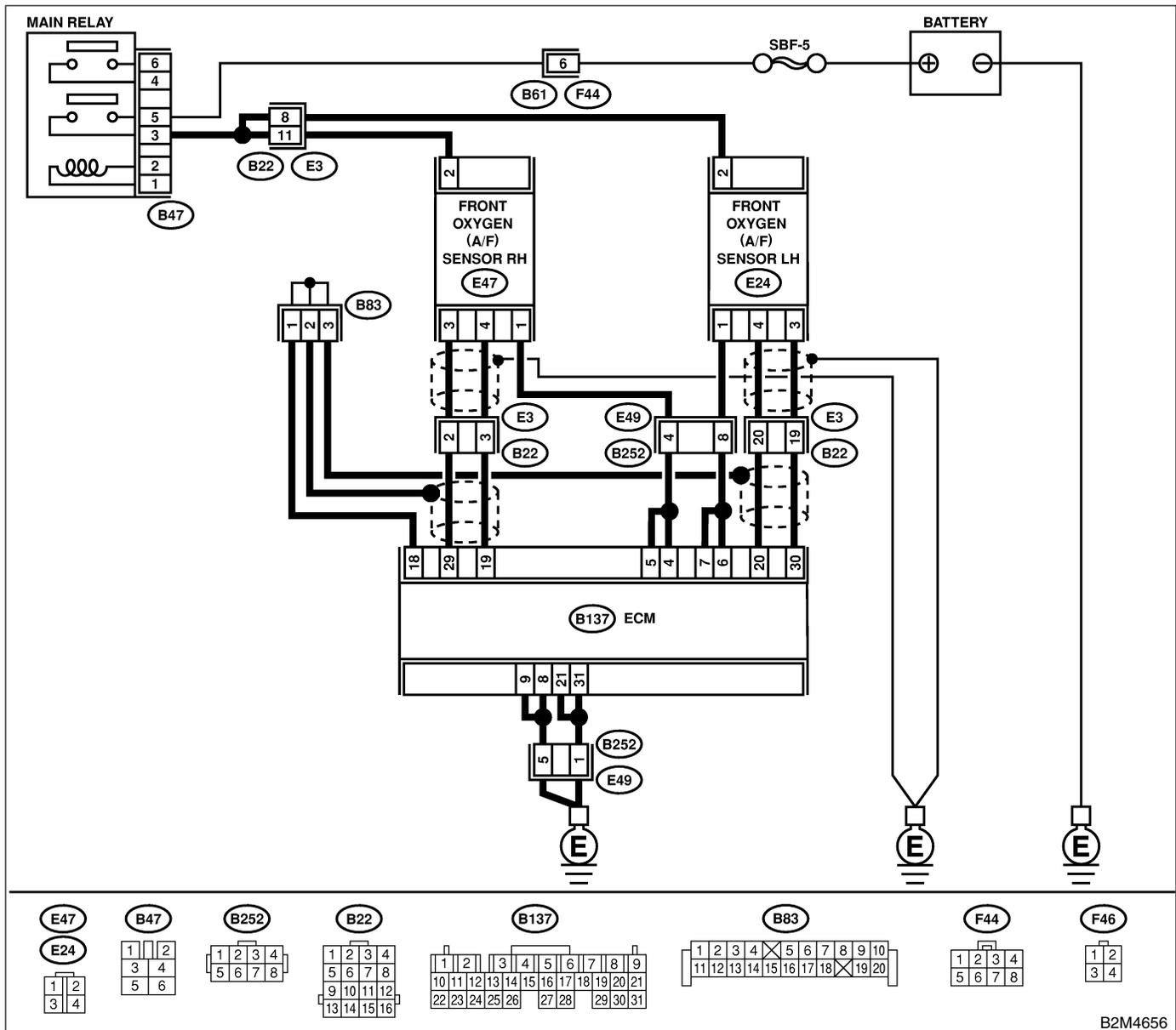
## U: DTC P0132 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) CIRCUIT MALFUNCTION (SHORT CIRCUIT) — S048521K00

- DTC DETECTING CONDITION:
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 19 — Chassis ground:</b></p>	Is the resistance more than 10 Ω?	Go to step 2.	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure resistance of harness between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 29 — Chassis ground:</b></p>	Is the resistance more than 10 Ω?	Go to step 3.	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	<p><b>CHECK OUTPUT SIGNAL FOR ECM.</b></p> <p>1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 19 (+) — Chassis ground (-):</b></p>	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 5.
4	<p><b>CHECK OUTPUT SIGNAL FOR ECM.</b></p> <p>Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 19 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Repair poor contact in ECM connector.
5	<p><b>CHECK OUTPUT SIGNAL FOR ECM.</b></p> <p>Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 29 (+) — Chassis ground (-):</b></p>	Is the voltage more than 4.95 V?	Go to step 6.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>
6	<p><b>CHECK OUTPUT SIGNAL FOR ECM.</b></p> <p>Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 29 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Repair poor contact in ECM connector.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## V: DTC P0133 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) CIRCUIT SLOW RESPONSE —

S048521H29

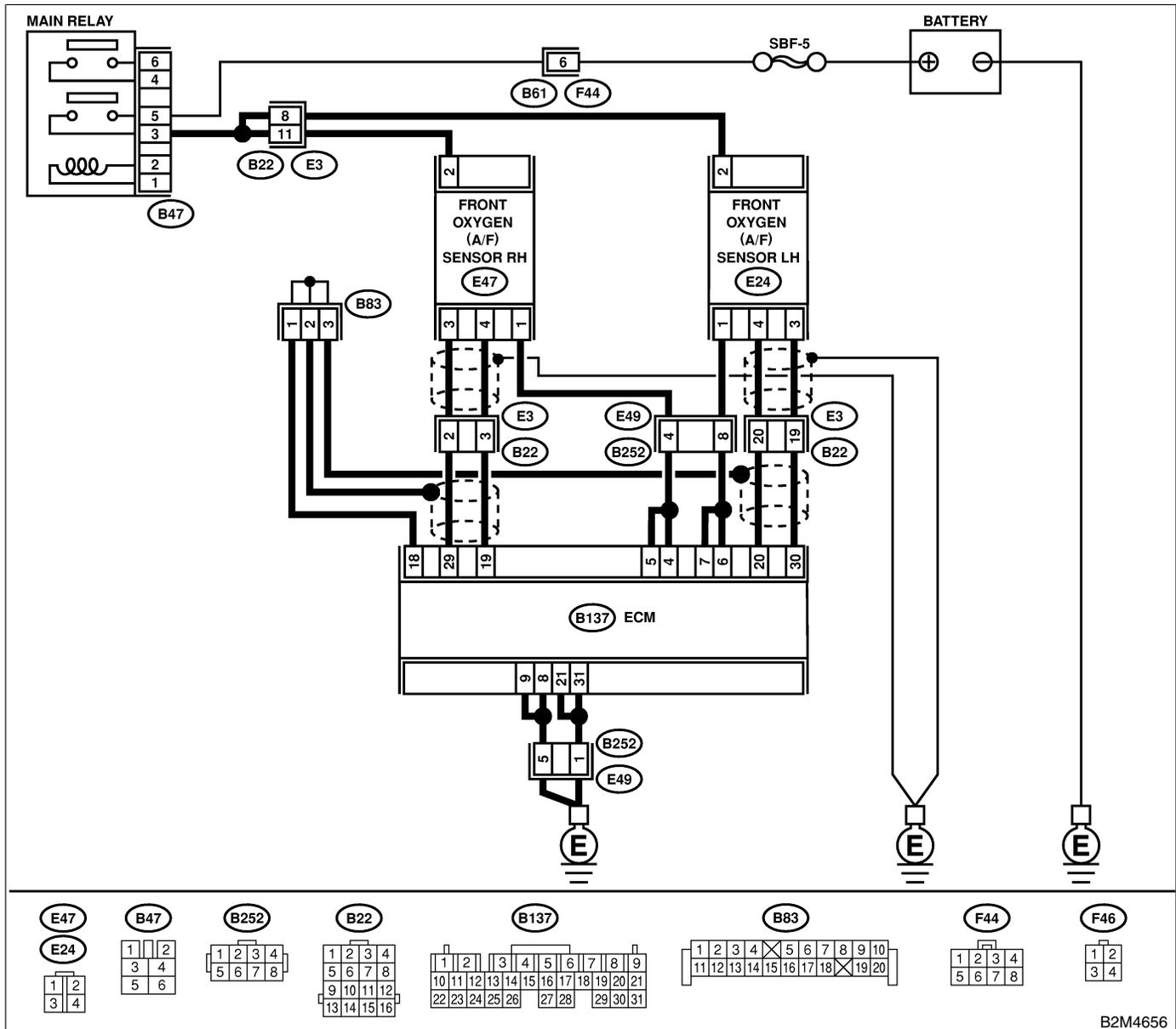
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step 2.
2	<b>CHECK EXHAUST SYSTEM.</b> NOTE: Check the following items. <ul style="list-style-type: none"><li>● Loose installation of front portion of exhaust pipe onto cylinder heads</li><li>● Loose connection between front exhaust pipe and front catalytic converter (RH side)</li><li>● Damage of exhaust pipe resulting in a hole</li></ul>	Is there a fault in exhaust system?	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) Engine (DIAGNOSTICS)

## W: DTC P0137 — BANK #1 AND SENSOR #2 OXYGEN SENSOR (REAR) CIRCUIT LOW INPUT — S048521K01

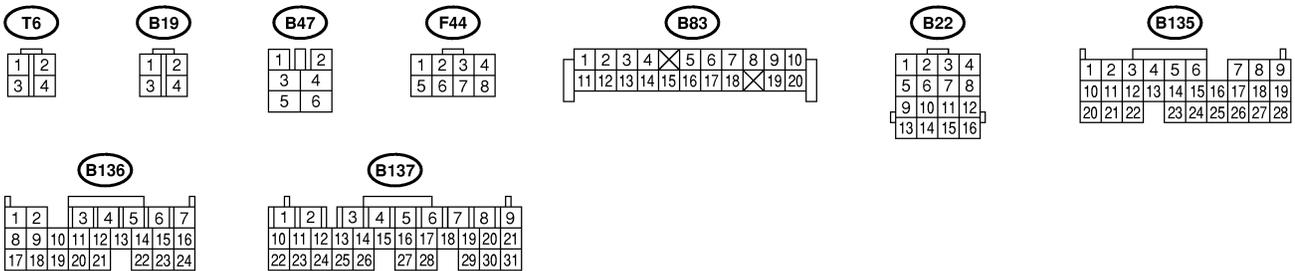
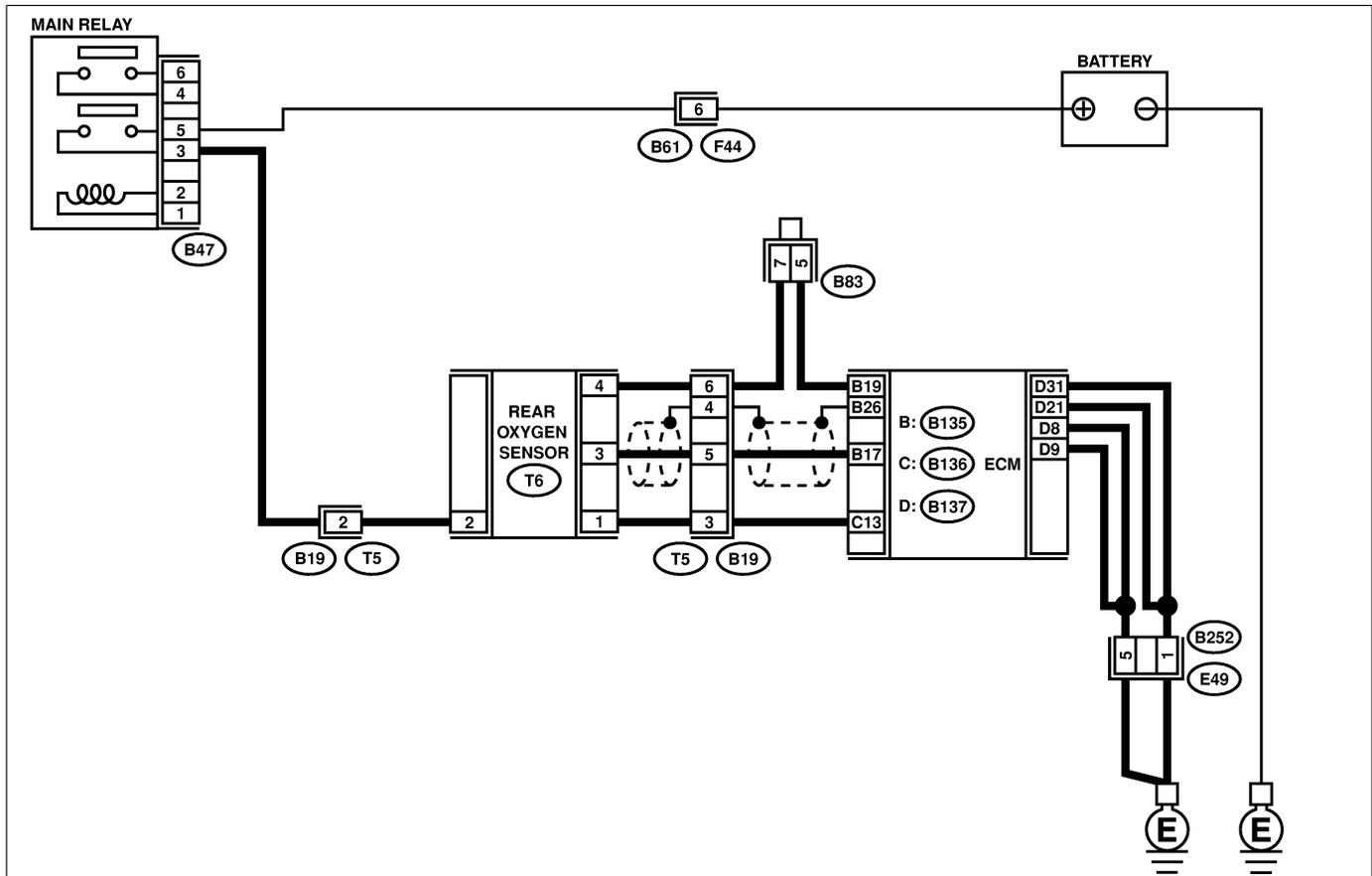
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4657

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131, P0132, P0151 or P0152?	Go to step 2.	Go to step 3.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<p><b>CHECK OTHER DTCs.</b> Inspect DTC P0131, P0132, P0151 or P0152 using "List of Diagnostic Trouble Code (DTC)". &lt;Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).&gt;</p>	Is the failure cause of P0131, P0132, P0151 or P0152 in the fuel system?	Check fuel system. NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step 3.
3	<p><b>CHECK REAR OXYGEN SENSOR DATA.</b> 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes. 2) Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt; ● OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Does the value fluctuate?	Go to step 7.	Go to step 4.
4	<p><b>CHECK REAR OXYGEN SENSOR DATA.</b> Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II General Scan Tool.</p>	Is output maximum value 0.49 V or more and output minimum value 0.25 V or less?	Go to step 5.	Replace rear oxygen sensor. <Ref. to FU(H6)-46, Rear Oxygen Sensor.>
5	<p><b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and rear oxygen sensor. 3) Measure resistance of harness between ECM and rear oxygen sensor connector. <b>Connector &amp; terminal</b> <b>(B135) No. 19 — (T6) No. 4:</b></p>	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 6.
6	<p><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor harness connector and engine ground or chassis ground. <b>Connector &amp; terminal</b> <b>(T6) No. 3 (+) — Engine ground (-):</b></p>	Is the voltage more than 0.2 V?	Replace rear oxygen sensor. <Ref. to FU(H6)-46, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between rear oxygen sensor and ECM connector ● Poor contact in rear oxygen sensor connector ● Poor contact in ECM connector

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
7	<b>CHECK EXHAUST SYSTEM.</b> Check exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none"><li>● Loose installation of portions</li><li>● Damage (crack, hole etc.) of parts</li><li>● Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</li></ul>	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace rear oxygen sensor. <Ref. to FU(H6)-46, Rear Oxygen Sensor.>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## X: DTC P0138 — BANK #1 AND SENSOR #2 OXYGEN SENSOR (REAR) CIRCUIT HIGH INPUT — S048521K02

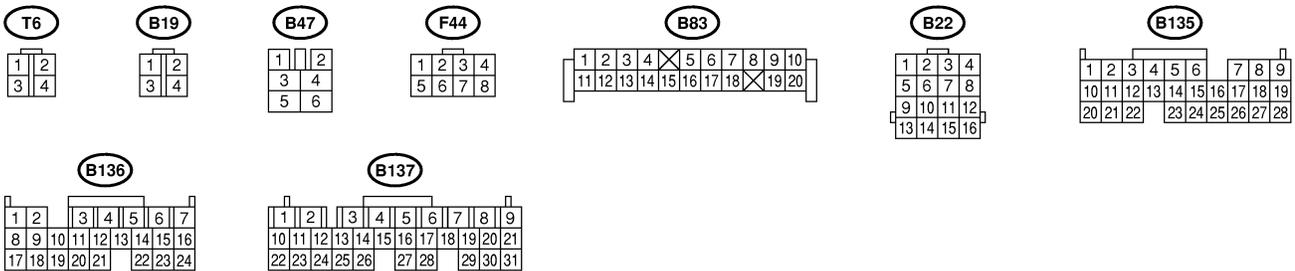
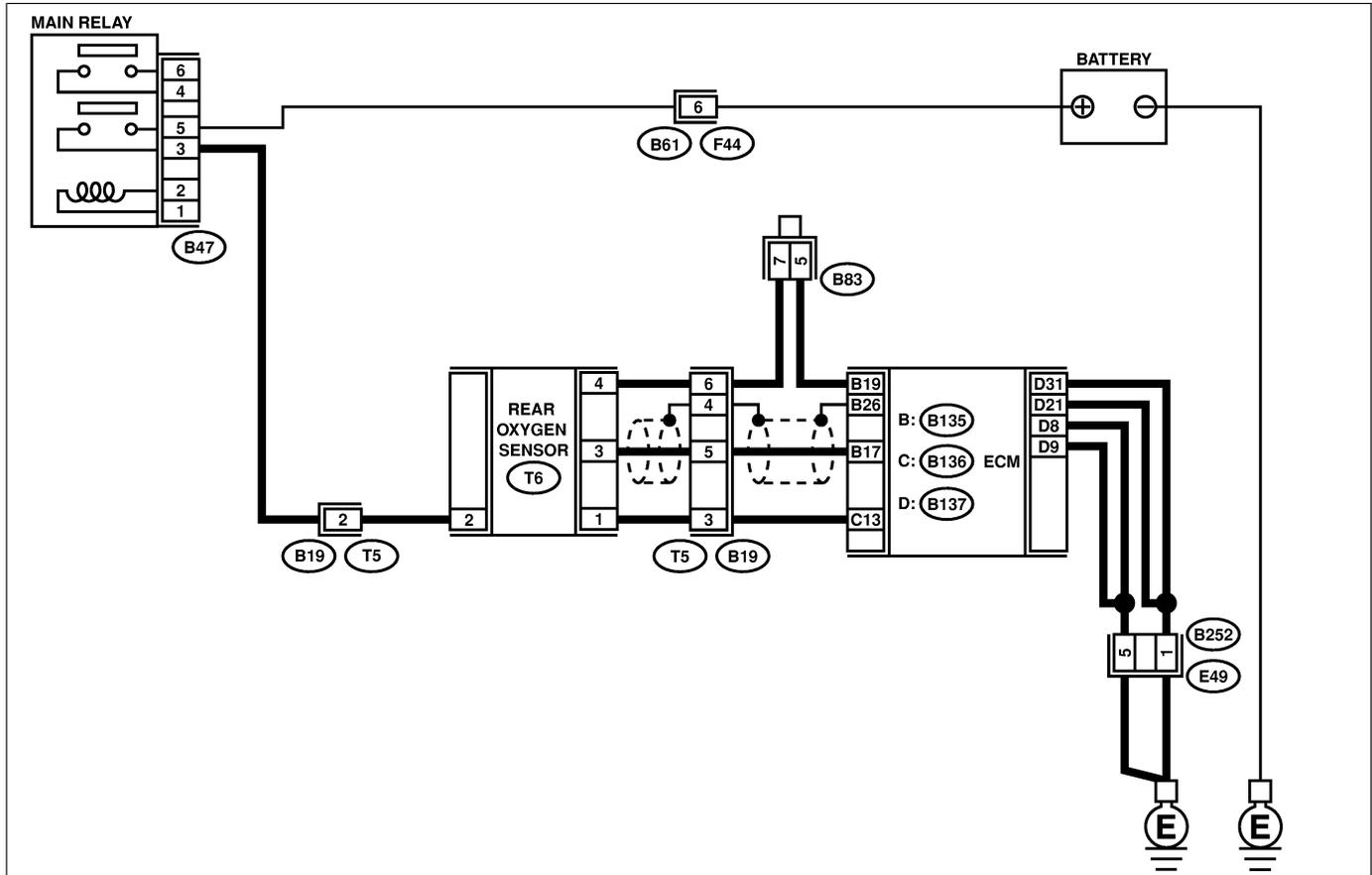
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4657

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1152, P1153, P1154 or P1155?	Go to step 2.	Go to step 3.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<p><b>CHECK OTHER DTCs.</b> Inspect DTC P0131, P0132, P0151 or P0152 using "List of Diagnostic Trouble Code (DTC)". &lt;Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).&gt;</p>	Is the failure cause of P0131, P0132, P0151 or P0152 in the fuel system?	Check fuel system. NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step 3.
3	<p><b>CHECK REAR OXYGEN SENSOR DATA.</b> 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes. 2) Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt; ● OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Does the value fluctuate?	Go to step 7.	Go to step 4.
4	<p><b>CHECK REAR OXYGEN SENSOR DATA.</b> Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II General Scan Tool.</p>	Is output maximum value 0.49 V or more and output minimum value 0.25 V or less?	Go to step 5.	Replace rear oxygen sensor. <Ref. to FU(H6)-46, Rear Oxygen Sensor.>
5	<p><b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and rear oxygen sensor. 3) Measure resistance of harness between ECM and rear oxygen sensor connector. <b>Connector &amp; terminal</b> <b>(B135) No. 19 — (T6) No. 4:</b></p>	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 6.
6	<p><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor harness connector and engine ground or chassis ground. <b>Connector &amp; terminal</b> <b>(T6) No. 3 (+) — Engine ground (-):</b></p>	Is the voltage more than 0.2 V?	Replace rear oxygen sensor. <Ref. to FU(H6)-46, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between rear oxygen sensor and ECM connector ● Poor contact in rear oxygen sensor connector ● Poor contact in ECM connector

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
7	<b>CHECK EXHAUST SYSTEM.</b> Check exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none"><li>● Loose installation of portions</li><li>● Damage (crack, hole etc.) of parts</li><li>● Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</li></ul>	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace rear oxygen sensor. <Ref. to FU(H6)-46, Rear Oxygen Sensor.>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## Y: DTC P0139 — BANK #1 AND SENSOR #2 OXYGEN SENSOR (REAR) CIRCUIT SLOW RESPONSE — S048521H31

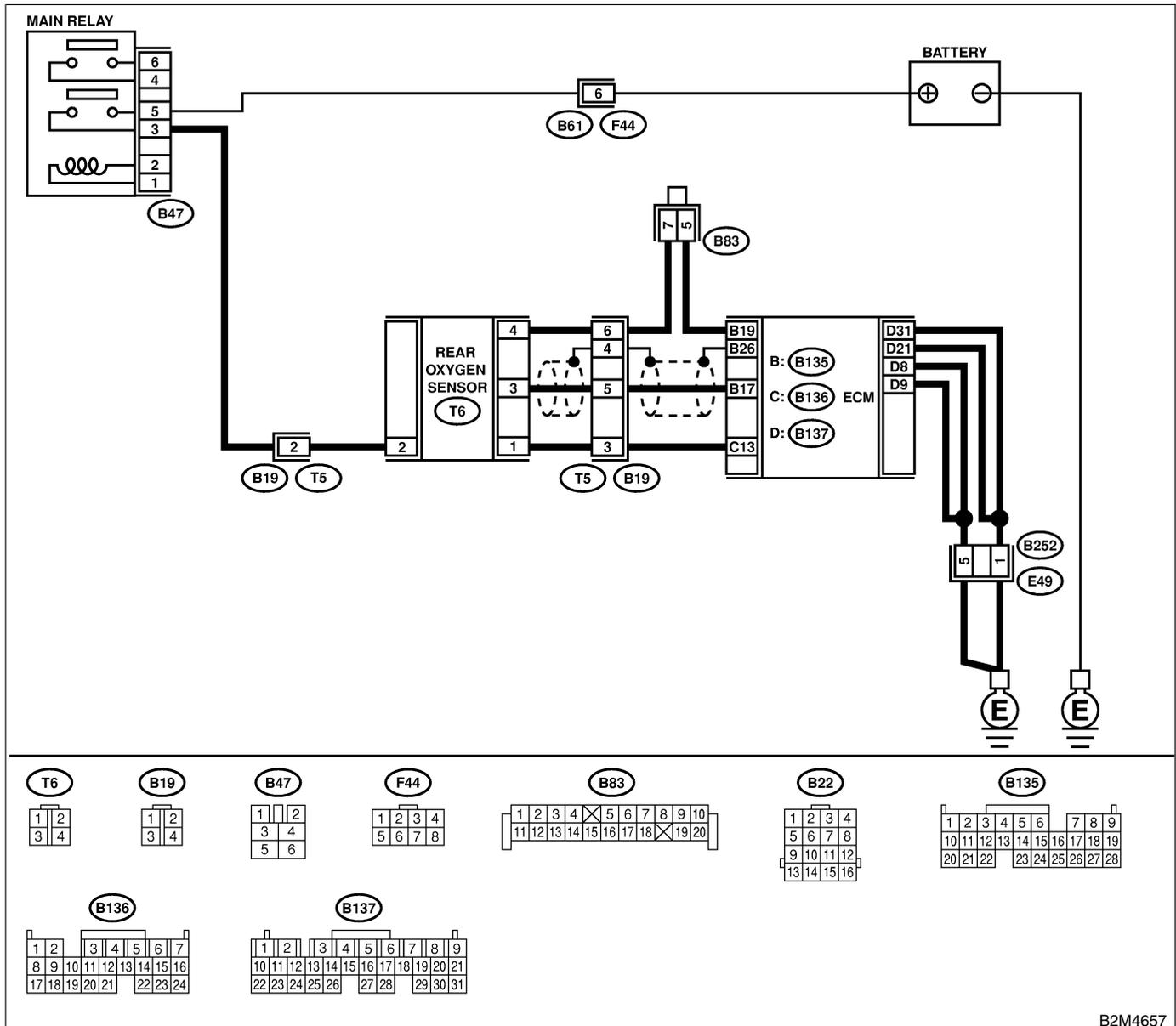
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4657

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace rear oxygen sensor. <Ref. to FU(H6)-46, Rear Oxygen Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

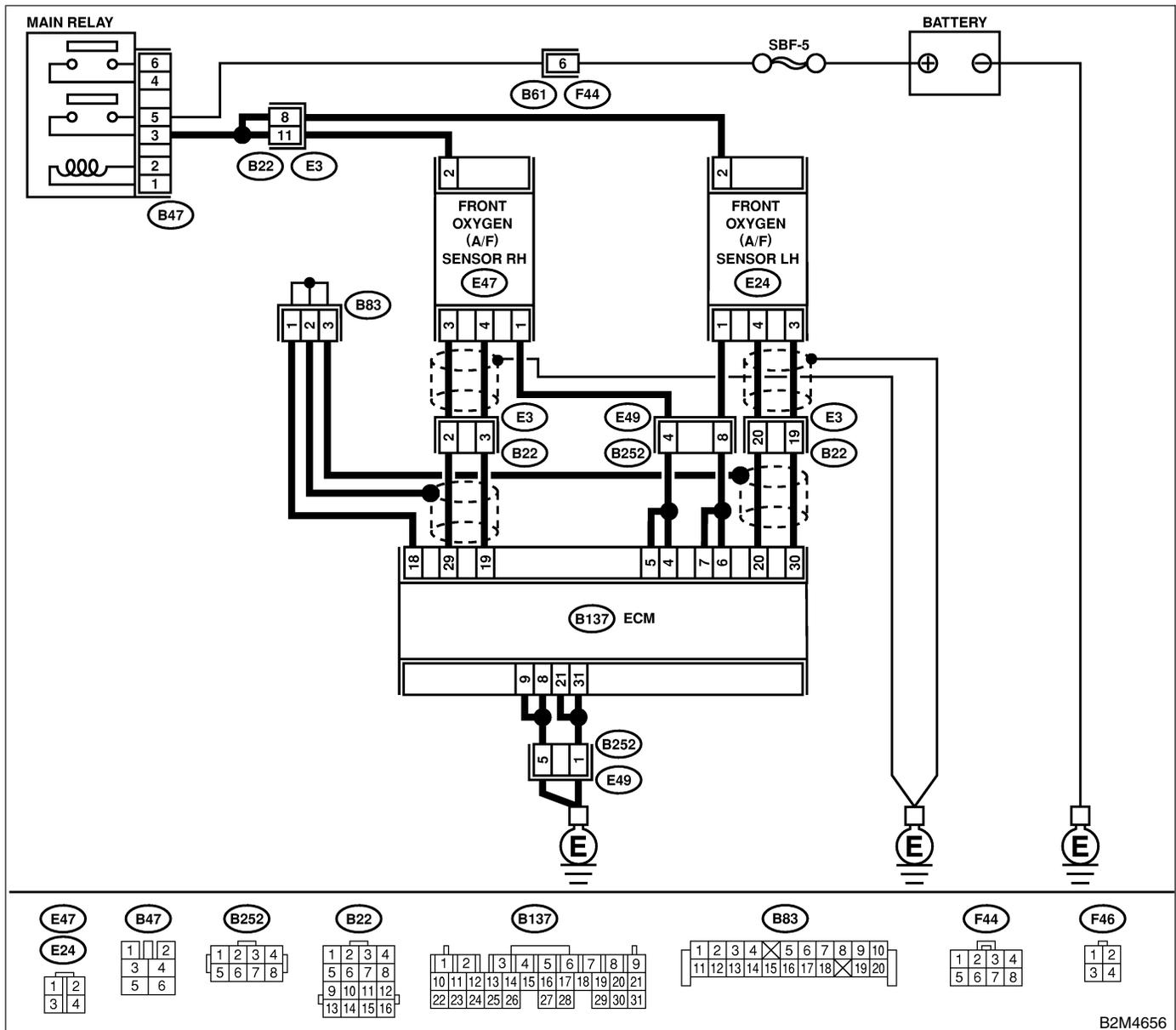
## Z: DTC P0151 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) CIRCUIT MALFUNCTION (OPEN CIRCUIT) — S048521K03

- DTC DETECTING CONDITION:
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector.                      3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b>  <b>(B137) No. 20 — (E24) No. 4:</b></p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and front oxygen (A/F) sensor connector</li> <li>● Poor contact in front oxygen (A/F) sensor connector</li> <li>● Poor contact in ECM connector</li> </ul>
2	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b>  <b>(B137) No. 30 — (E24) No. 3:</b></p>	Is the resistance less than 1 Ω?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and front oxygen (A/F) sensor connector</li> <li>● Poor contact in front oxygen (A/F) sensor connector</li> <li>● Poor contact in ECM connector</li> </ul>
3	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in front oxygen (A/F) sensor connector.</p>	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

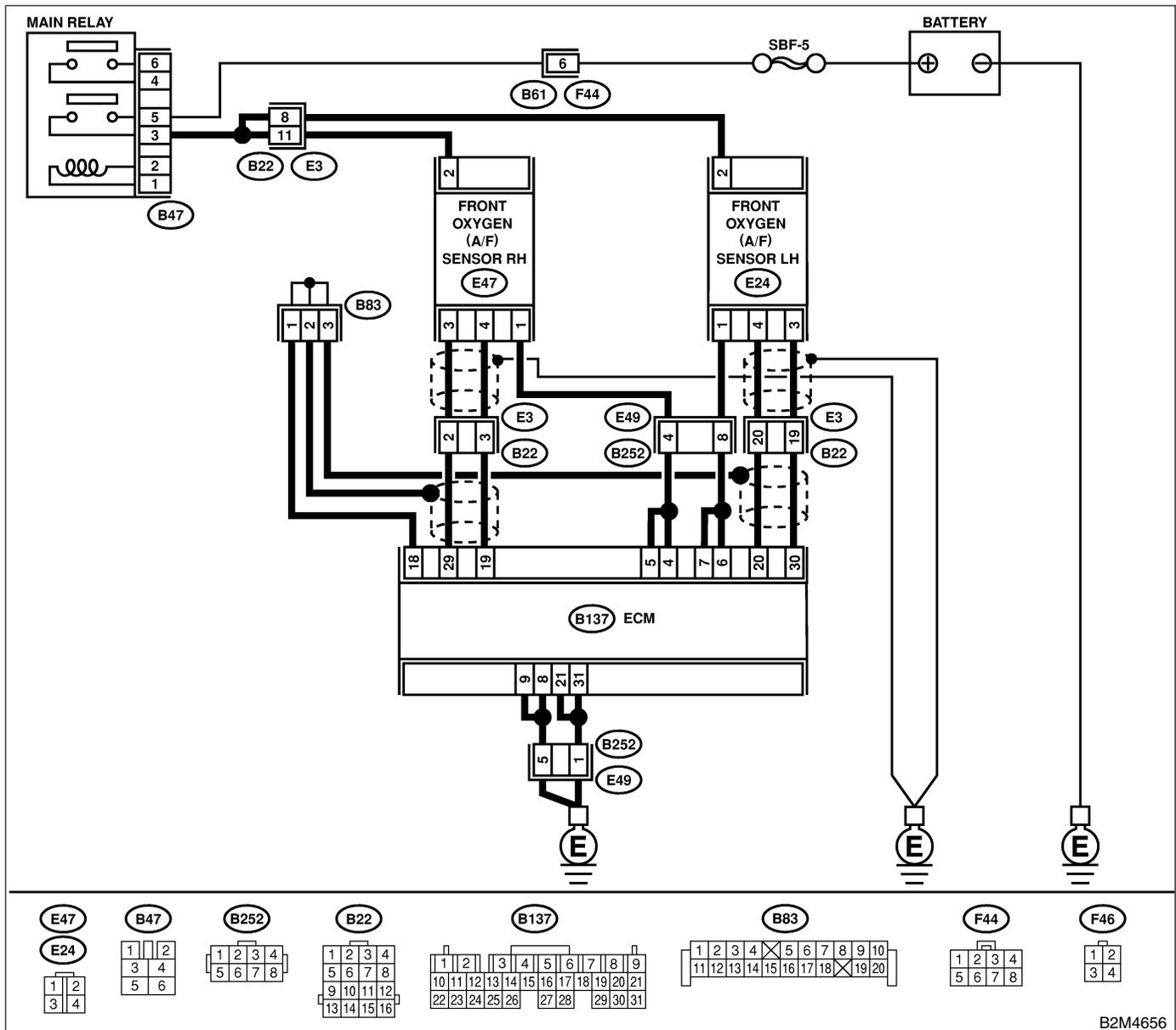
## AA: DTC P0152 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) CIRCUIT MALFUNCTION (SHORT CIRCUIT) — S048521K04

- DTC DETECTING CONDITION:
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 20 — Chassis ground:</b></p>	Is the resistance more than 10 Ω?	Go to step 2.	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure resistance of harness between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 30 — Chassis ground:</b></p>	Is the resistance more than 10 Ω?	Go to step 3.	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	<p><b>CHECK OUTPUT SIGNAL FOR ECM.</b></p> <p>1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 20 (+) — Chassis ground (-):</b></p>	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 5.
4	<p><b>CHECK OUTPUT SIGNAL FOR ECM.</b></p> <p>Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 20 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Repair poor contact in ECM connector.
5	<p><b>CHECK OUTPUT SIGNAL FOR ECM.</b></p> <p>Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 30 (+) — Chassis ground (-):</b></p>	Is the voltage more than 4.95 V?	Go to step 6.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>
6	<p><b>CHECK OUTPUT SIGNAL FOR ECM.</b></p> <p>Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 30 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Repair poor contact in ECM connector.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## AB: DTC P0153 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) CIRCUIT SLOW RESPONSE — SO48521H34

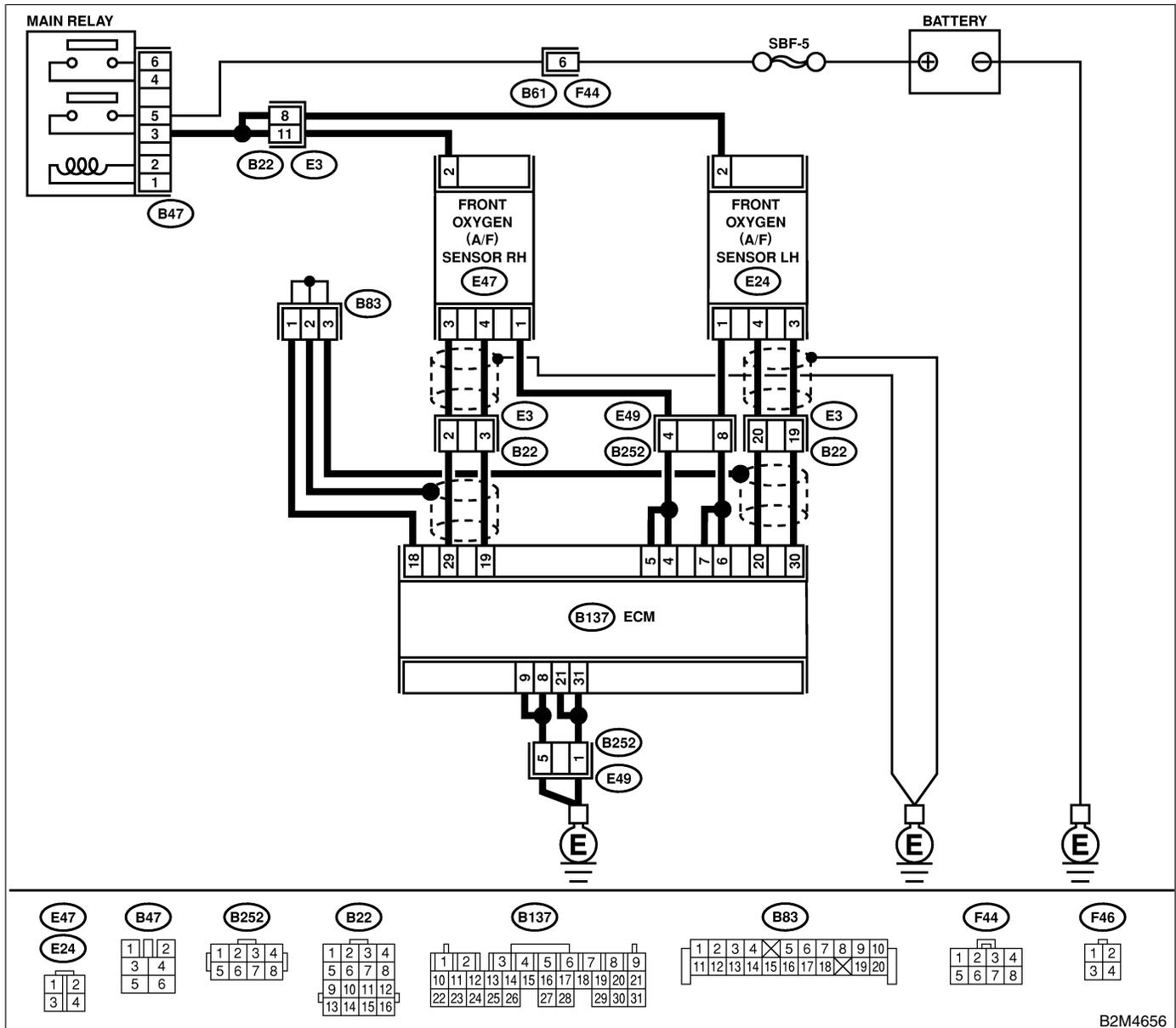
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0153.	Go to step 2.
2	<b>CHECK EXHAUST SYSTEM.</b> NOTE: Check the following items. <ul style="list-style-type: none"><li>● Loose installation of front portion of exhaust pipe onto cylinder heads</li><li>● Loose connection between front exhaust pipe and front catalytic converter (RH side)</li><li>● Damage of exhaust pipe resulting in a hole</li></ul>	Is there a fault in exhaust system?	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## AC: DTC P0171 — FUEL TRIM #1 (RH) MALFUNCTION (A/F TOO LEAN) — S048521H35

### NOTE:

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H6)-180, DTC P0172 — FUEL TRIM #1 (RH) MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## AD: DTC P0172 — FUEL TRIM #1 (RH) MALFUNCTION (A/F TOO RICH) — S048521H36

### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### ● TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair exhaust system.	Go to step 3.
3	CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step 4.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
4	<p><b>CHECK FUEL PRESSURE.</b>  <b>WARNING:</b>  <ul style="list-style-type: none"> <li>● Place “NO FIRE” signs near the working area.</li> <li>● Be careful not to spill fuel on the floor.</li> </ul>                     1) Release fuel pressure.                          (1) Disconnect connector from fuel pump relay.                          (2) Start the engine and run it until it stalls.                          (3) After the engine stalls, crank it for five more seconds.                          (4) Turn ignition switch to OFF.                      2) Connect connector to fuel pump relay.                      3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge.                      4) Install fuel filler cap.                      5) Start the engine and idle while gear position is neutral.                      6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.  <b>WARNING:</b>  <b>Before removing fuel pressure gauge, release fuel pressure.</b>  <b>NOTE:</b>                      If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</p>	Is fuel pressure between 284 and 314 kPa (2.9 — 3.2 kg/cm <sup>2</sup> , 41 — 46 psi)?	Go to step 5.	Repair the following items. <b>Fuel pressure too high</b> <ul style="list-style-type: none"> <li>● Clogged fuel return line or bent hose</li> </ul> <b>Fuel pressure too low</b> <ul style="list-style-type: none"> <li>● Improper fuel pump discharge</li> <li>● Clogged fuel supply line</li> </ul>
5	<p><b>CHECK FUEL PRESSURE.</b>                      After connecting pressure regulator vacuum hose, measure fuel pressure.  <b>WARNING:</b>  <b>Before removing fuel pressure gauge, release fuel pressure.</b>  <b>NOTE:</b>  <ul style="list-style-type: none"> <li>● If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</li> <li>● If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.</li> </ul> </p>	Is fuel pressure between 206 and 235 kPa (2.1 — 2.4 kg/cm <sup>2</sup> , 30 — 34 psi)?	Go to step 6.	Repair the following items. <b>Fuel pressure too high</b> <ul style="list-style-type: none"> <li>● Faulty pressure regulator</li> <li>● Clogged fuel return line or bent hose</li> </ul> <b>Fuel pressure too low</b> <ul style="list-style-type: none"> <li>● Faulty pressure regulator</li> <li>● Improper fuel pump discharge</li> <li>● Clogged fuel supply line</li> </ul>
6	<p><b>CHECK FUEL INJECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Remove right bank fuel injector. &lt;Ref. to FU(H6)-39, REMOVAL, Fuel Injector.&gt;                      3) Check fuel injector</p>	Is fuel injector clogged?	Replace fuel injector. <Ref. to FU(H6)-39, Fuel Injector.>	Go to step 7.
7	<p><b>CHECK FUEL INJECTOR.</b>                      Measure resistance between terminals of fuel injector.  <b>Terminals</b>  <b>No. 1 — No. 2</b></p>	Is the resistance between 5 and 20 Ω?	Go to step 8.	Replace fuel injector. <Ref. to FU(H6)-39, Fuel Injector.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
8	<p><b>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is temperature greater than 75°C (167°F)?	Go to step 9.	Replace engine coolant temperature sensor. <Ref. to FU(H6)-29, Engine Coolant Temperature Sensor.>
9	<p><b>CHECK INTAKE MANIFOLD PRESSURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p> <p>Specification:</p> <ul style="list-style-type: none"> <li>● Intake manifold absolute pressure</li> </ul> <p><b>Ignition ON</b> 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)</p> <p><b>Idling</b> 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)</p>	Is the value within the specifications?	Go to step 10.	Replace intake manifold pressure sensor. <Ref. to FU(H6)-34, Intake Manifold Pressure Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
10	<p><b>CHECK INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn A/C switch to OFF.</p> <p>4) Turn all accessory switches to OFF.</p> <p>5) Open front hood.</p> <p>6) Measure ambient temperature.</p> <p>7) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"><li>● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</li><li>● OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</li></ul>	<p>Is value obtained when ambient temperature is subtracted from intake air temperature greater than -10°C (14°F) and less than 50°C (122°F)?</p>	<p>Contact with SOA (distributor) service.</p> <p>NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>	<p>Check intake air temperature sensor. &lt;Ref. to FU(H6)-35, Intake Air Temperature Sensor.&gt;</p>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## AE: DTC P0174 — FUEL TRIM #2 (LH) MALFUNCTION (A/F TOO LEAN) — S048521H37

### NOTE:

For the diagnostic procedure, refer to DTC P0175. <Ref. to EN(H6)-184, DTC P0175 — FUEL TRIM #2 (LH) MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## AF: DTC P0175 — FUEL TRIM #2 (LH) MALFUNCTION (A/F TOO RICH) — S048521H38

### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### ● TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair exhaust system.	Go to step 3.
3	CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step 4.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
4	<p><b>CHECK FUEL PRESSURE.</b>  <b>WARNING:</b>  <ul style="list-style-type: none"> <li>● Place “NO FIRE” signs near the working area.</li> <li>● Be careful not to spill fuel on the floor.</li> </ul>                     1) Release fuel pressure.                          (1) Disconnect connector from fuel pump relay.                          (2) Start the engine and run it until it stalls.                          (3) After the engine stalls, crank it for five more seconds.                          (4) Turn ignition switch to OFF.                      2) Connect connector to fuel pump relay.                      3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge.                      4) Install fuel filler cap.                      5) Start the engine and idle while gear position is neutral.                      6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.  <b>WARNING:</b>  <b>Before removing fuel pressure gauge, release fuel pressure.</b>  <b>NOTE:</b>                      If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</p>	Is fuel pressure between 284 and 314 kPa (2.9 — 3.2 kg/cm <sup>2</sup> , 41 — 46 psi)?	Go to step 5.	Repair the following items. <b>Fuel pressure too high</b> <ul style="list-style-type: none"> <li>● Clogged fuel return line or bent hose</li> </ul> <b>Fuel pressure too low</b> <ul style="list-style-type: none"> <li>● Improper fuel pump discharge</li> <li>● Clogged fuel supply line</li> </ul>
5	<p><b>CHECK FUEL PRESSURE.</b>                      After connecting pressure regulator vacuum hose, measure fuel pressure.  <b>WARNING:</b>  <b>Before removing fuel pressure gauge, release fuel pressure.</b>  <b>NOTE:</b>  <ul style="list-style-type: none"> <li>● If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</li> <li>● If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.</li> </ul> </p>	Is fuel pressure between 206 and 235 kPa (2.1 — 2.4 kg/cm <sup>2</sup> , 30 — 34 psi)?	Go to step 6.	Repair the following items. <b>Fuel pressure too high</b> <ul style="list-style-type: none"> <li>● Faulty pressure regulator</li> <li>● Clogged fuel return line or bent hose</li> </ul> <b>Fuel pressure too low</b> <ul style="list-style-type: none"> <li>● Faulty pressure regulator</li> <li>● Improper fuel pump discharge</li> <li>● Clogged fuel supply line</li> </ul>
6	<p><b>CHECK FUEL INJECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Remove left bank fuel injector. &lt;Ref. to FU(H6)-39, REMOVAL, Fuel Injector.&gt;                      3) Check fuel injector.</p>	Is fuel injector clogged?	Replace fuel injector. <Ref. to FU(H6)-39, Fuel Injector.>	Go to step 7.
7	<p><b>CHECK FUEL INJECTOR.</b>                      Measure resistance between terminals of fuel injector.  <b>Terminals</b>  <b>No. 1 — No. 2</b></p>	Is the resistance between 5 and 20 Ω?	Go to step 8.	Replace fuel injector. <Ref. to FU(H6)-39, Fuel Injector.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
8	<p><b>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is temperature greater than 75°C (167°F)?	Go to step 9.	Replace engine coolant temperature sensor. <Ref. to FU(H6)-29, Engine Coolant Temperature Sensor.>
9	<p><b>CHECK INTAKE MANIFOLD PRESSURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p> <p>Specification:</p> <ul style="list-style-type: none"> <li>● Intake manifold absolute pressure</li> </ul> <p><b>Ignition ON</b> 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)</p> <p><b>Idling</b> 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)</p>	Is the value within the specifications?	Go to step 10.	Replace intake manifold pressure sensor. <Ref. to FU(H6)-34, Intake Manifold Pressure Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
10	<p><b>CHECK INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn A/C switch to OFF.</p> <p>4) Turn all accessory switches to OFF.</p> <p>5) Open front hood.</p> <p>6) Measure ambient temperature.</p> <p>7) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"><li>● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</li><li>● OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</li></ul>	<p>Is value obtained when ambient temperature is subtracted from intake air temperature greater than -10°C (14°F) and less than 50°C (122°F)?</p>	<p>Contact with SOA (distributor) service.</p> <p>NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>	<p>Check intake air temperature sensor. &lt;Ref. to FU(H6)-35, Intake Air Temperature Sensor.&gt;</p>

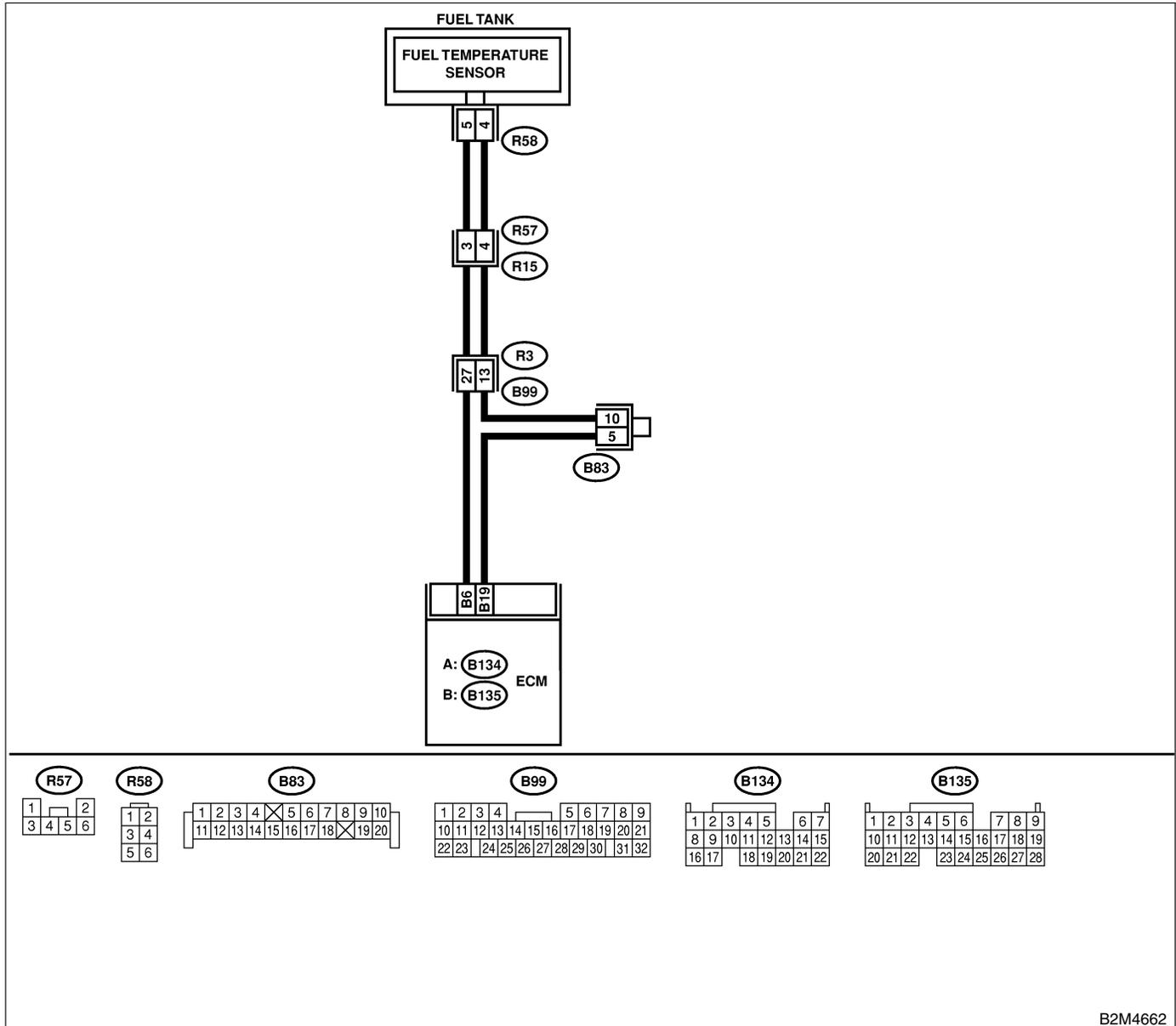
**AG: DTC P0181 — FUEL TEMPERATURE SENSOR A CIRCUIT RANGE/PERFORMANCE PROBLEM —** S048521B34

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4662

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace fuel temperature sensor. <Ref. to EC(H6)-13, Fuel Temperature Sensor.>

**AH: DTC P0182 — FUEL TEMPERATURE SENSOR A CIRCUIT LOW INPUT —**

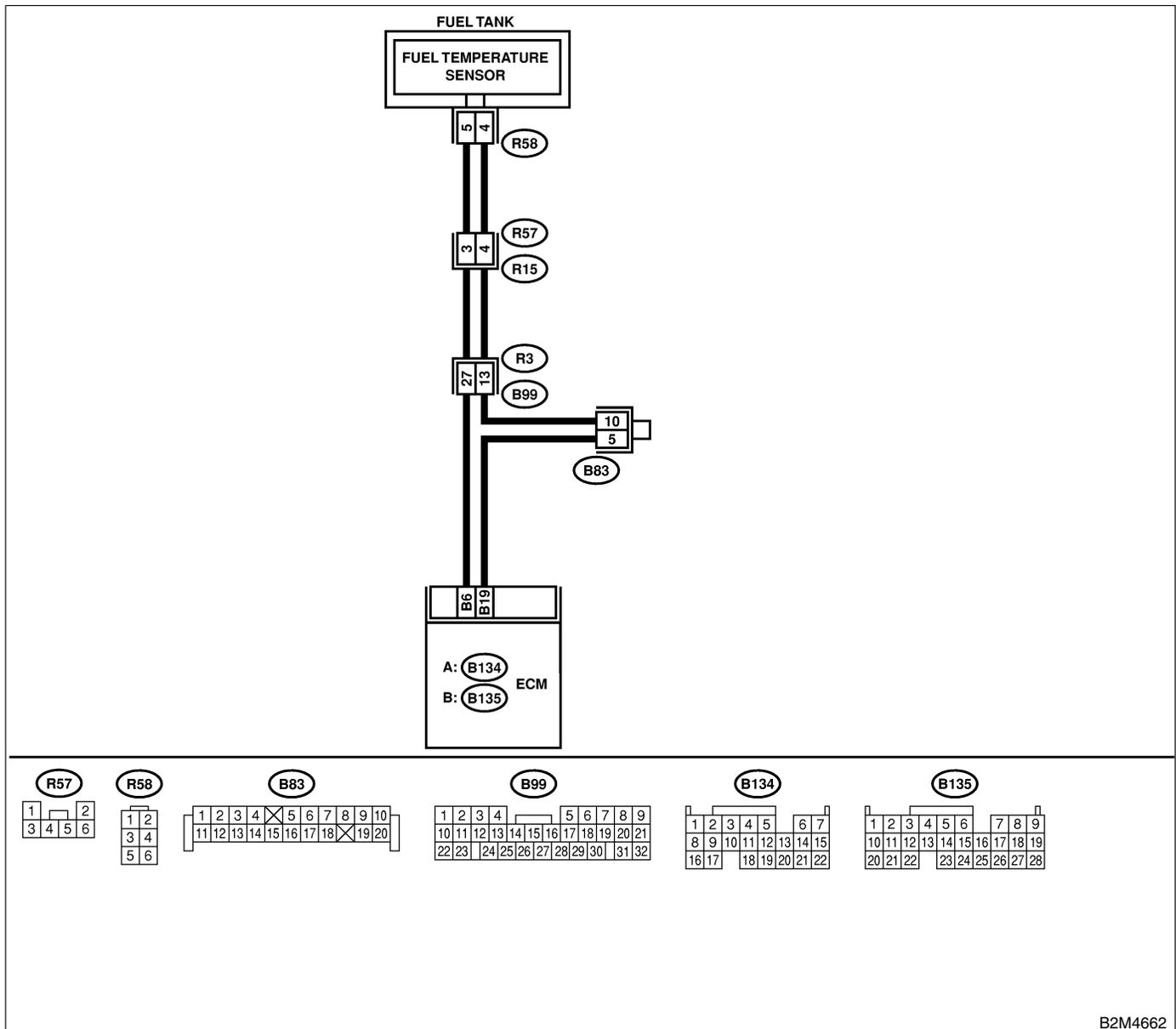
S048521B35

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



B2M4662

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b></p> <p>1) Start engine. 2) Read data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"><li>● Subaru Select Monitor</li></ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"><li>● OBD-II general scan tool</li></ul> <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value greater than 120°C (248°F)?	Go to step 2.	Even if MIL lights up, the circuit has returned to a normal condition at this time.
2	<p><b>CHECK CURRENT DATA.</b></p> <p>1) Turn ignition switch to OFF. 2) Remove access hole lid. 3) Disconnect connector from fuel pump. 4) Turn ignition switch to ON. 5) Read data of fuel temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"><li>● Subaru Select Monitor</li></ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"><li>● OBD-II general scan tool</li></ul> <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value less than -40°C (-40°F)?	Replace fuel temperature sensor. <Ref. to EC(H6)-13, Fuel Temperature Sensor.>	Repair ground short circuit in harness between fuel pump and ECM connector.

**AI: DTC P0183 — FUEL TEMPERATURE SENSOR A CIRCUIT HIGH INPUT —**

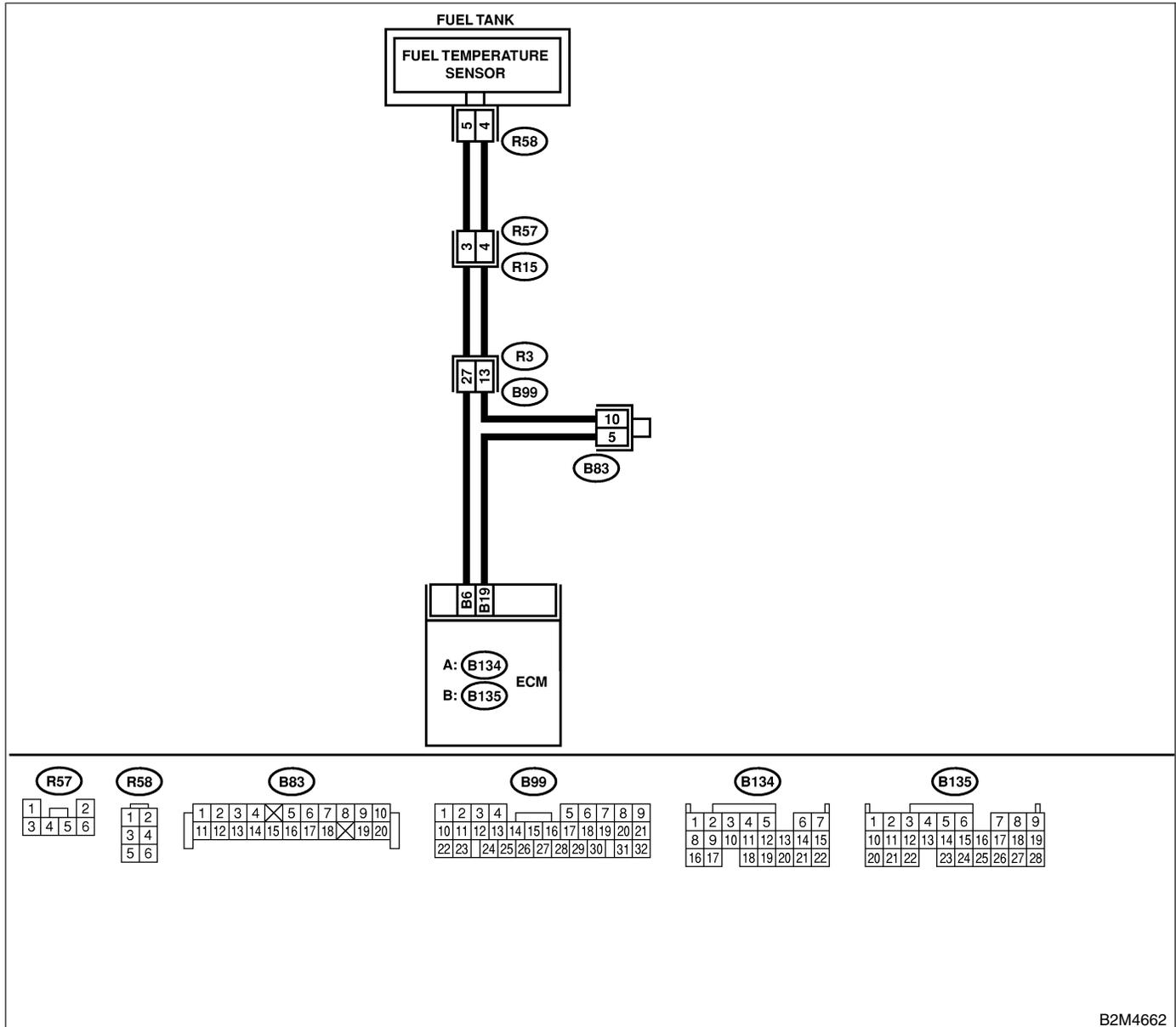
S048521B36

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4662

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b></p> <p>1) Start engine. 2) Read data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>OBD-II general scan tool</li> </ul> <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value less than -40°C (-40°F)?	Go to step 2.	<p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>Poor contact in fuel pump connector</li> <li>Poor contact in ECM connector</li> <li>Poor contact in coupling connectors</li> <li>Poor contact in joint connector</li> </ul>
2	<p><b>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Remove access hole lid. 3) Disconnect connector from fuel pump. 4) Measure voltage between fuel pump connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(R58) No. 5 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel pump connector.	Go to step 3.
3	<p><b>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to ON. 2) Measure voltage between fuel pump connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(R58) No. 5 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel pump connector.	Go to step 4.
4	<p><b>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>Measure voltage between fuel pump connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(R58) No. 5 (+) — Chassis ground (-):</b></p>	Is the voltage more than 4 V?	Go to step 5.	<p>Repair harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>Open circuit in harness between ECM and fuel pump connector</li> <li>Poor contact in fuel pump connector</li> <li>Poor contact in ECM connector</li> <li>Poor contact in coupling connectors</li> </ul>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
5	<p><b>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Measure resistance of harness between fuel pump connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(R58) No. 4 — Chassis ground:</b></p>	Is the resistance less than 5 $\Omega$ ?	Replace fuel temperature sensor. <Ref. to EC(H6)-13, Fuel Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"><li>● Open circuit in harness between ECM and fuel pump connector</li><li>● Poor contact in fuel pump connector</li><li>● Poor contact in ECM connector</li><li>● Poor contact in coupling connectors</li><li>● Poor contact in joint connector</li></ul>

**AJ: DTC P0301 — CYLINDER 1 MISFIRE DETECTED —** S048521B37

NOTE:

For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6)-196, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**AK: DTC P0302 — CYLINDER 2 MISFIRE DETECTED —** S048521B38

NOTE:

For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6)-196, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**AL: DTC P0303 — CYLINDER 3 MISFIRE DETECTED —** S048521B39

NOTE:

For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6)-196, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

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## **AM: DTC P0304 — CYLINDER 4 MISFIRE DETECTED —** S048521B40

### **NOTE:**

For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6)-196, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **AN: DTC P0305 — CYLINDER 5 MISFIRE DETECTED —** S048521H02

### **NOTE:**

For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6)-196, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **AO: DTC P0306 — CYLINDER 6 MISFIRE DETECTED —** S048521H03

### **● DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)

### **● TROUBLE SYMPTOM:**

- Engine stalls.
- Erroneous idling
- Rough driving

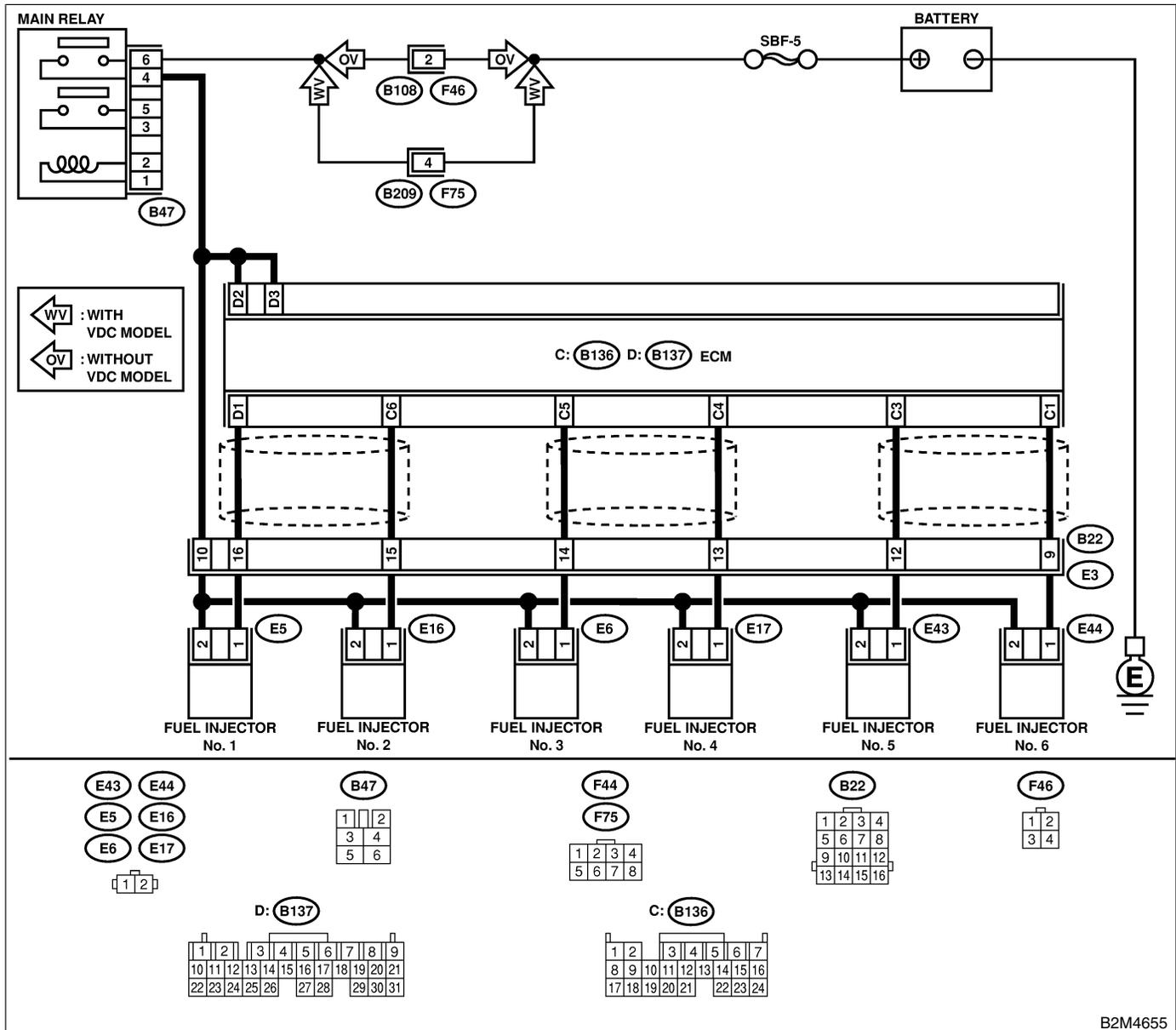
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## ● WIRING DIAGRAM:



B2M4655

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303, P0304, P0305 and P0306.	Go to step 2.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between ECM connector and chassis ground on faulty cylinders.</p> <p><b>Connector &amp; terminal</b>                      #1 (B137) No. 1 (+) — Chassis ground (-):                      #2 (B136) No. 6 (+) — Chassis ground (-):                      #3 (B136) No. 5 (+) — Chassis ground (-):                      #4 (B136) No. 4 (+) — Chassis ground (-):                      #5 (B136) No. 3 (+) — Chassis ground (-):                      #6 (B136) No. 1 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 7.	Go to step 3.
3	<p><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connector from fuel injector on faulty cylinders.                      3) Measure voltage between ECM connector and engine ground on faulty cylinders.</p> <p><b>Connector &amp; terminal</b>                      #1 (E5) No. 1 — Engine ground:                      #2 (E16) No. 1 — Engine ground:                      #3 (E6) No. 1 — Engine ground:                      #4 (E17) No. 1 — Engine ground:                      #5 (E43) No. 1 — Engine ground:                      #6 (E44) No. 1 — Engine ground:</p>	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between fuel injector and ECM connector.	Go to step 4.
4	<p><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b>                      Measure resistance of harness connector between ECM connector and fuel injector on faulty cylinders.</p> <p><b>Connector &amp; terminal</b>                      #1 (B137) No. 1 — (E5) No. 1:                      #2 (B136) No. 6 — (E16) No. 1:                      #3 (B136) No. 5 — (E6) No. 1:                      #4 (B136) No. 4 — (E17) No. 1:                      #5 (B136) No. 3 — (E43) No. 1:                      #6 (B136) No. 1 — (E44) No. 1:</p>	Is the resistance less than 1 Ω?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between ECM and fuel injector connector ● Poor contact in coupling connector
5	<p><b>CHECK FUEL INJECTOR.</b>                      Measure resistance between fuel injector terminals on faulty cylinder.</p> <p><b>Terminals</b>                      No. 1 — No. 2:</p>	Is the resistance between 5 and 20 Ω?	Go to step 6.	Replace faulty fuel injector. <Ref. to FU(H6)-39, Fuel Injector.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<p><b>CHECK POWER SUPPLY LINE.</b></p> <p>1) Turn ignition switch to ON. 2) Measure voltage between fuel injector and engine ground on faulty cylinders.</p> <p><b>Connector &amp; terminal</b></p> <p><b>#1 (E5) No. 2 (+) — Engine ground (-):</b>  <b>#2 (E16) No. 2 (+) — Engine ground (-):</b>  <b>#3 (E6) No. 2 (+) — Engine ground (-):</b>  <b>#4 (E17) No. 2 (+) — Engine ground (-):</b>  <b>#5 (E43) No. 2 (+) — Engine ground (-):</b>  <b>#6 (E44) No. 2 (+) — Engine ground (-):</b></p>	Is the voltage more than 10 V?	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between main relay and fuel injector connector on faulty cylinders</li> <li>● Poor contact in coupling connector</li> <li>● Poor contact in main relay connector</li> <li>● Poor contact in fuel injector connector on faulty cylinders</li> </ul>
7	<p><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector on faulty cylinder. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground on faulty cylinders.</p> <p><b>Connector &amp; terminal</b></p> <p><b>#1 (B137) No. 1 (+) — Chassis ground (-):</b>  <b>#2 (B136) No. 6 (+) — Chassis ground (-):</b>  <b>#3 (B136) No. 5 (+) — Chassis ground (-):</b>  <b>#4 (B136) No. 4 (+) — Chassis ground (-):</b>  <b>#5 (B136) No. 3 (+) — Chassis ground (-):</b>  <b>#6 (B136) No. 1 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Go to step 8.
8	<p><b>CHECK FUEL INJECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between fuel injector terminals on faulty cylinder.</p> <p><b>Terminals</b></p> <p><b>No. 1 — No. 2:</b></p>	Is the resistance less than 1 Ω?	Replace faulty fuel injector <Ref. to FU(H6)-39, Fuel Injector.> and ECM <Ref. to FU(H6)-47, Engine Control Module.>.	Go to step 9.
9	<p><b>CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.</b></p>	Is camshaft position sensor or crankshaft position sensor loosely installed?	Tighten camshaft position sensor or crankshaft position sensor.	Go to step 10.
10	<p><b>CHECK CRANKSHAFT PLATE.</b></p>	Is crankshaft plate rusted or does it have broken teeth?	Replace crankshaft plate.	Go to step 11.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
11	<b>CHECK INSTALLATION CONDITION OF TIMING CHAIN.</b> Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark. ST 499987500 CRANKSHAFT SOCKET	Is timing chain dislocated from its proper position?	Repair installation condition of timing chain. <Ref. to ME(H6)-42, Timing Chain Assembly.>	Go to step 12.
12	<b>CHECK FUEL LEVEL.</b>	Is the fuel meter indication higher than the "Lower" level?	Go to step 13.	Replenish fuel so fuel meter indication is higher than the "Lower" level. After replenishing fuel, Go to step 13.
13	<b>CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).</b> 1) Clear memory using Subaru Select Monitor. <Ref. to EN(H6)-58, Clear Memory Mode.> 2) Start engine, and drive the vehicle more than 10 minutes.	Is the MIL coming on or blinking?	Go to step 15.	Go to step 14.
14	<b>CHECK CAUSE OF MISFIRE DIAGNOSED.</b>	Was the cause of misfire diagnosed when the engine is running?	Finish diagnostics operation, if the engine has no abnormality. NOTE: Ex. Remove spark plug cord, etc.	Repair poor contact. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Poor contact in ignitor connector</li> <li>● Poor contact in ignition coil connector</li> <li>● Poor contact in fuel injector connector on faulty cylinders</li> <li>● Poor contact in ECM connector</li> <li>● Poor contact in coupling connector</li> </ul>
15	<b>CHECK AIR INTAKE SYSTEM.</b>	Is there a fault in air intake system?	Repair air intake system. NOTE: Check the following items: <ul style="list-style-type: none"> <li>● Are there air leaks or air suction caused by loose or dislocated nuts and bolts?</li> <li>● Are there cracks or any disconnection of hoses?</li> </ul>	Go to step 16.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
16	<b>CHECK MISFIRE SYMPTOM.</b> 1) Turn ignition switch to ON. 2) Read diagnostic trouble code (DTC). ● Subaru Select Monitor <Ref. to EN(H6)-37, Subaru Select Monitor.> ● OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual. NOTE: Perform diagnosis according to the items listed below.	Does the Subaru Select Monitor or OBD-II general scan tool indicate only one DTC?	Go to step 22.	Go to step 17.
17	<b>CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.</b>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0302?	Go to step 23.	Go to step 18.
18	<b>CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.</b>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0303 and P0304?	Go to step 24.	Go to step 19.
19	<b>CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.</b>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0305 and P0306?	Go to step 25.	Go to step 20.
20	<b>CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.</b>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301, P0303 and P0305?	Go to step 26.	Go to step 21.
21	<b>CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.</b>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0302, P0304 and P0306?	Go to step 27.	Go to step 28.
22	<b>ONLY ONE CYLINDER</b>	Is there a fault in that cylinder?	Repair or replace faulty parts. NOTE: Check the following items. ● Spark plug ● Spark plug cord ● Fuel injector ● Compression ratio	Inspect DTC P0171, P0172, P0173, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
23	<b>GROUP OF #1 AND #2 CYLINDERS</b>	Are there faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: ● Check the following items. Spark plugs Fuel injectors Ignition coil Compression ratio ● If no abnormality is discovered, check for "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side. <Ref. to EN(H6)-86, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0173, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>
24	<b>GROUP OF #3 AND #4 CYLINDERS</b>	Are there faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: ● Check the following items. Spark plugs Fuel injectors Ignition coil ● If no abnormality is discovered, check for "16. D: IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(H6)-86, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0173, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
25	<b>GROUP OF #5 AND #6 CYLINDERS</b>	Are there faults in #5 and #6 cylinders?	Repair or replace faulty parts. NOTE: ● Check the following items: Spark plugs, fuel injector, ignition coil and compression ratio ● If no abnormality is discovered, check for "16. IGNITION CONTROL SYSTEM" of #5 and #6 cylinders side. <Ref. to EN(H6)-86, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0173, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>
26	<b>GROUP OF #1, #3 AND #5 CYLINDERS</b>	Are there faults in #1, #3 and #5 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. ● Spark plugs ● Fuel injectors ● Skipping timing belt teeth	Inspect DTC P0171, P0172, P0173, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>
27	<b>GROUP OF #2, #4 AND #6 CYLINDERS</b>	Are there faults in #2, #4 and #6 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. ● Spark plugs ● Fuel injectors ● Compression ratio ● Skipping timing belt teeth	Inspect DTC P0171, P0172, P0173, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>
28	<b>CYLINDER AT RANDOM</b>	Is the engine idle rough?	Go to DTC P0171. <Ref. to EN(H6)-180, DTC P0171 — FUEL TRIM #1 (RH) MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. ● Spark plugs ● Fuel injectors ● Compression ratio

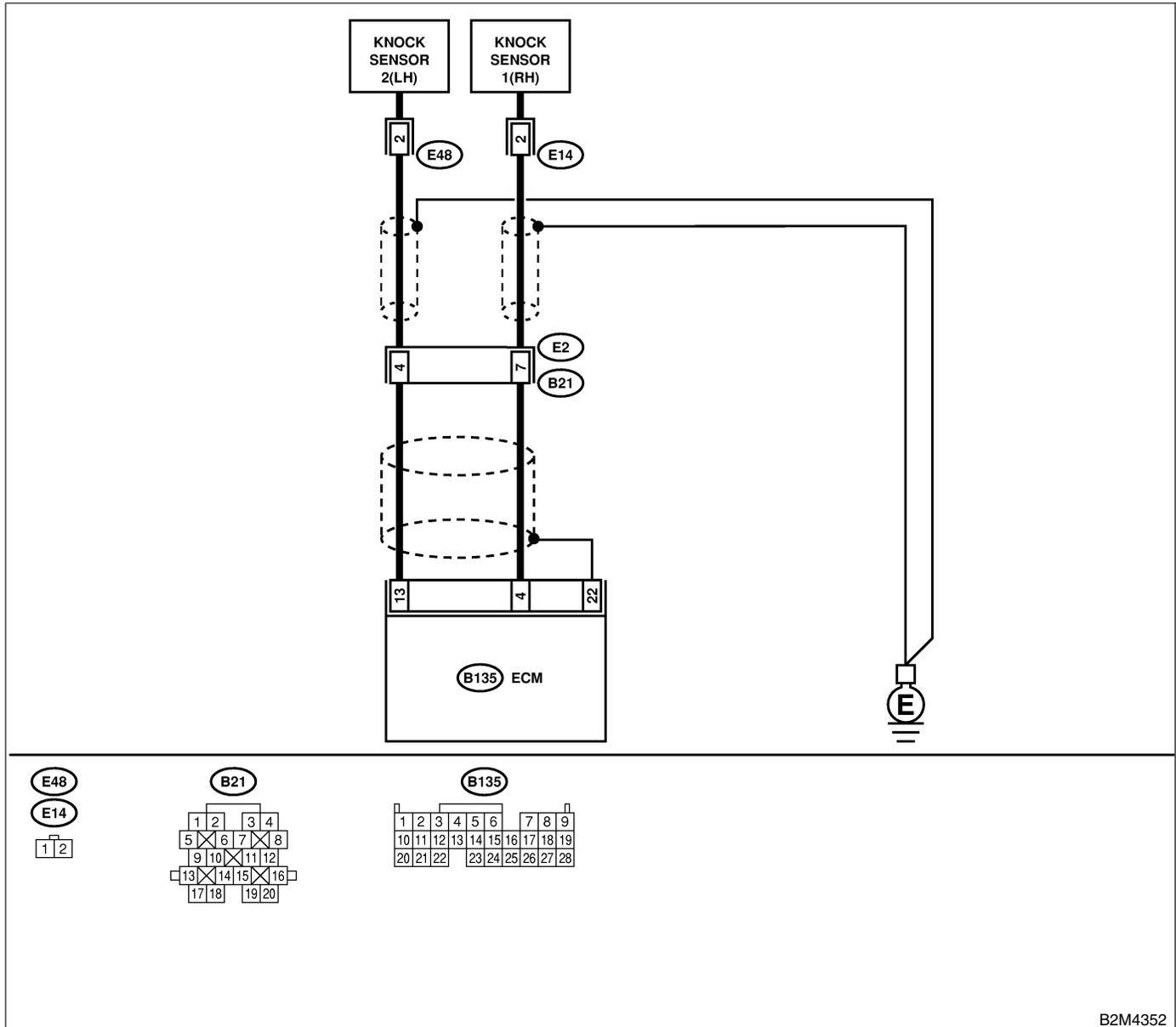
**AP: DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT —** S048521H04

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4352

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN KNOCK SENSOR 1 AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between ECM harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 4 — Chassis ground:</b></p>	Is the resistance more than 700 k $\Omega$ ?	Go to step 2.	<p>Repair harness and connector.</p> <p><b>NOTE:</b> In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between knock sensor 1 (RH) and ECM connector</li> <li>● Poor contact in knock sensor 1 (RH) connector</li> <li>● Poor contact in coupling connector</li> </ul>
2	<p><b>CHECK KNOCK SENSOR 1 (RH).</b></p> <p>1) Disconnect connector from knock sensor 1 (RH). 2) Measure resistance between knock sensor connector terminal and engine ground.</p> <p><b>Terminal</b> <b>No. 2 — Engine ground:</b></p>	Is the resistance more than 700 k $\Omega$ ?	Go to step 3.	<p>Repair harness and connector.</p> <p><b>NOTE:</b> In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between knock sensor 1 (RH) and ECM connector</li> <li>● Poor contact in knock sensor 1 (RH) connector</li> <li>● Poor contact in coupling connector</li> </ul>
3	<p><b>CHECK CONDITION OF KNOCK SENSOR 1 (RH) INSTALLATION.</b></p>	Is the knock sensor 1 (RH) installation bolt tightened securely?	Replace knock sensor 1 (RH). <Ref. to FU(H6)-32, Knock Sensor.>	Tighten knock sensor 1 (RH) installation bolt securely.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

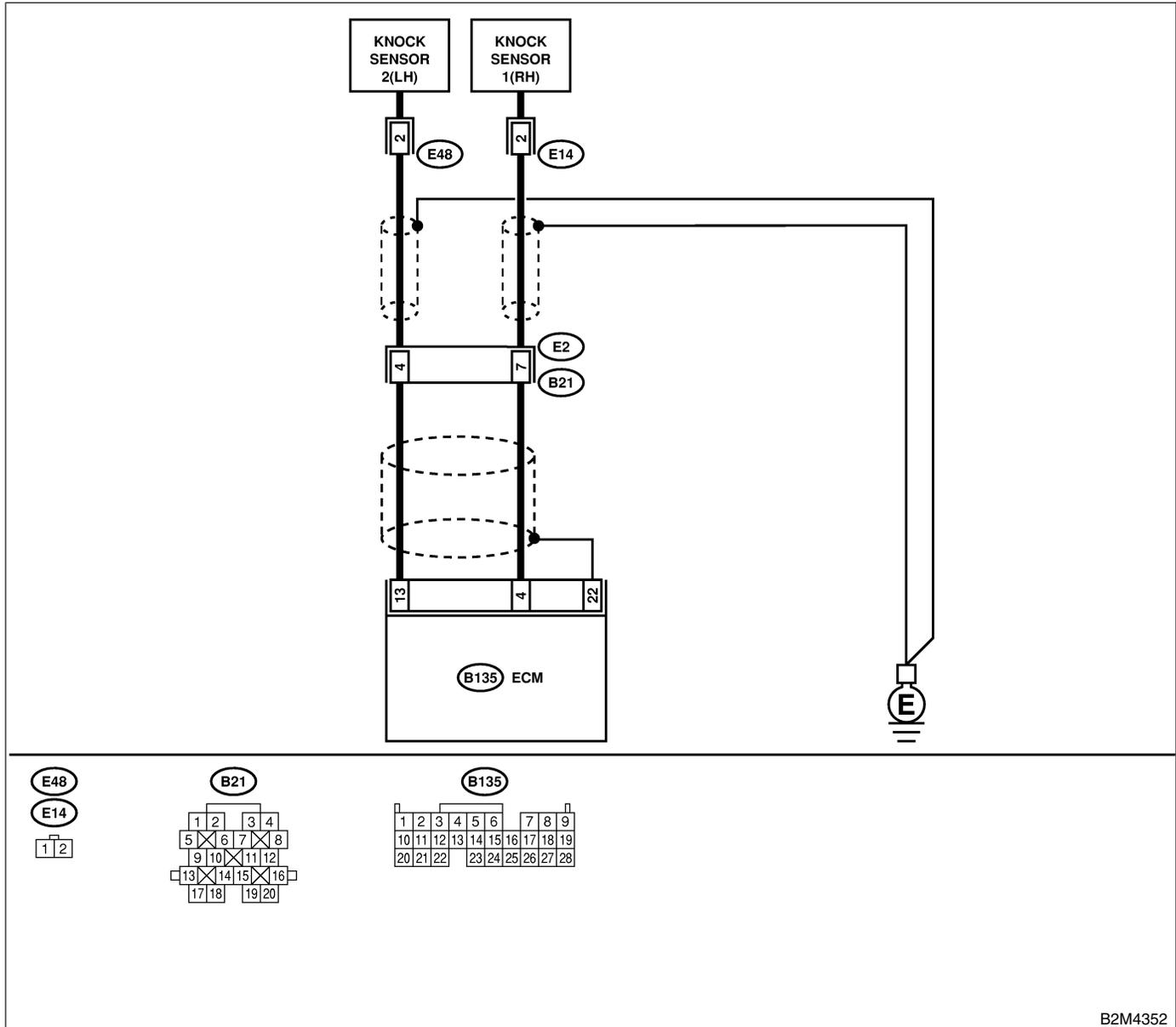
## AQ: DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT — S048521H05

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN KNOCK SENSOR 1 (RH) AND ECM CONNECTOR.</b> Measure resistance of harness between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 4 — Chassis ground:</b></p>	Is the resistance less than 400 k $\Omega$ ?	Go to step 2.	Go to step 3.
2	<p><b>CHECK KNOCK SENSOR 1 (RH).</b> 1) Disconnect connector from knock sensor 1 (RH). 2) Measure resistance between knock sensor connector terminal and engine ground.</p> <p><b>Terminal</b> <b>No. 2 — Engine ground:</b></p>	Is the resistance less than 400 k $\Omega$ ?	Replace knock sensor 1 (RH). <Ref. to FU(H6)-32, Knock Sensor.>	Repair ground short circuit in harness between knock sensor 1 (RH) connector and ECM connector. <b>NOTE:</b> The harness between both connectors is shielded. Repair short circuit of harness together with shield.
3	<p><b>CHECK INPUT SIGNAL FOR ECM.</b> 1) Connect connectors to ECM and knock sensor 1 (RH). 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 4 (+) — Chassis ground (-):</b></p>	Is the voltage more than 2 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) <b>NOTE:</b> In this case, repair the following: <ul style="list-style-type: none"> <li>● Poor contact in knock sensor 1 (RH) connector</li> <li>● Poor contact in ECM connector</li> <li>● Poor contact in coupling connector</li> </ul>	Repair poor contact in ECM connector.

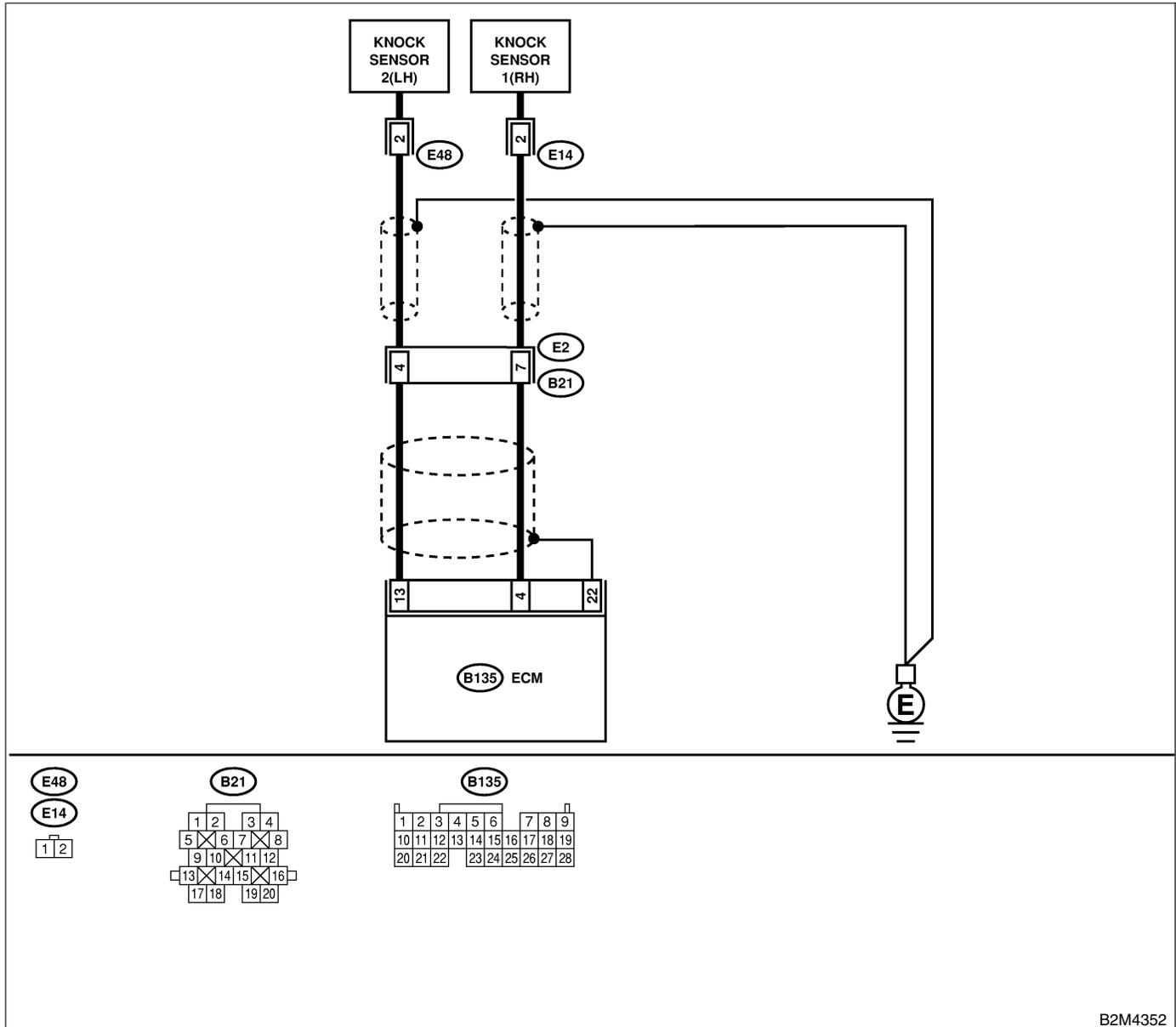
**AR: DTC P0332 — KNOCK SENSOR 2 CIRCUIT LOW INPUT —** S048521H06

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN KNOCK SENSOR 2 (LH) AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between ECM harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 13 — Chassis ground:</b></p>	Is the resistance more than 700 kΩ?	Go to step 2.	<p>Repair harness and connector.</p> <p><b>NOTE:</b> In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between knock sensor 2 (LH) and ECM connector</li> <li>● Poor contact in knock sensor 2 (LH) connector</li> <li>● Poor contact in coupling connector</li> </ul>
2	<p><b>CHECK KNOCK SENSOR 2 (LH).</b></p> <p>1) Disconnect connector from knock sensor 2 (LH). 2) Measure resistance between knock sensor 2 (LH) connector terminal and engine ground.</p> <p><b>Terminal</b> <b>No. 2 — Engine ground:</b></p>	Is the resistance more than 700 kΩ?	Go to step 3.	<p>Repair harness and connector.</p> <p><b>NOTE:</b> In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between knock sensor 2 (LH) and ECM connector</li> <li>● Poor contact in knock sensor 2 (LH) connector</li> <li>● Poor contact in coupling connector</li> </ul>
3	<p><b>CHECK CONDITION OF KNOCK SENSOR 2 (LH) INSTALLATION.</b></p>	Is the knock sensor 2 (LH) installation bolt tightened securely?	Replace knock sensor 2 (LH). <Ref. to FU(H6)-32, Knock Sensor.>	Tighten knock sensor 2 (LH) installation bolt securely.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

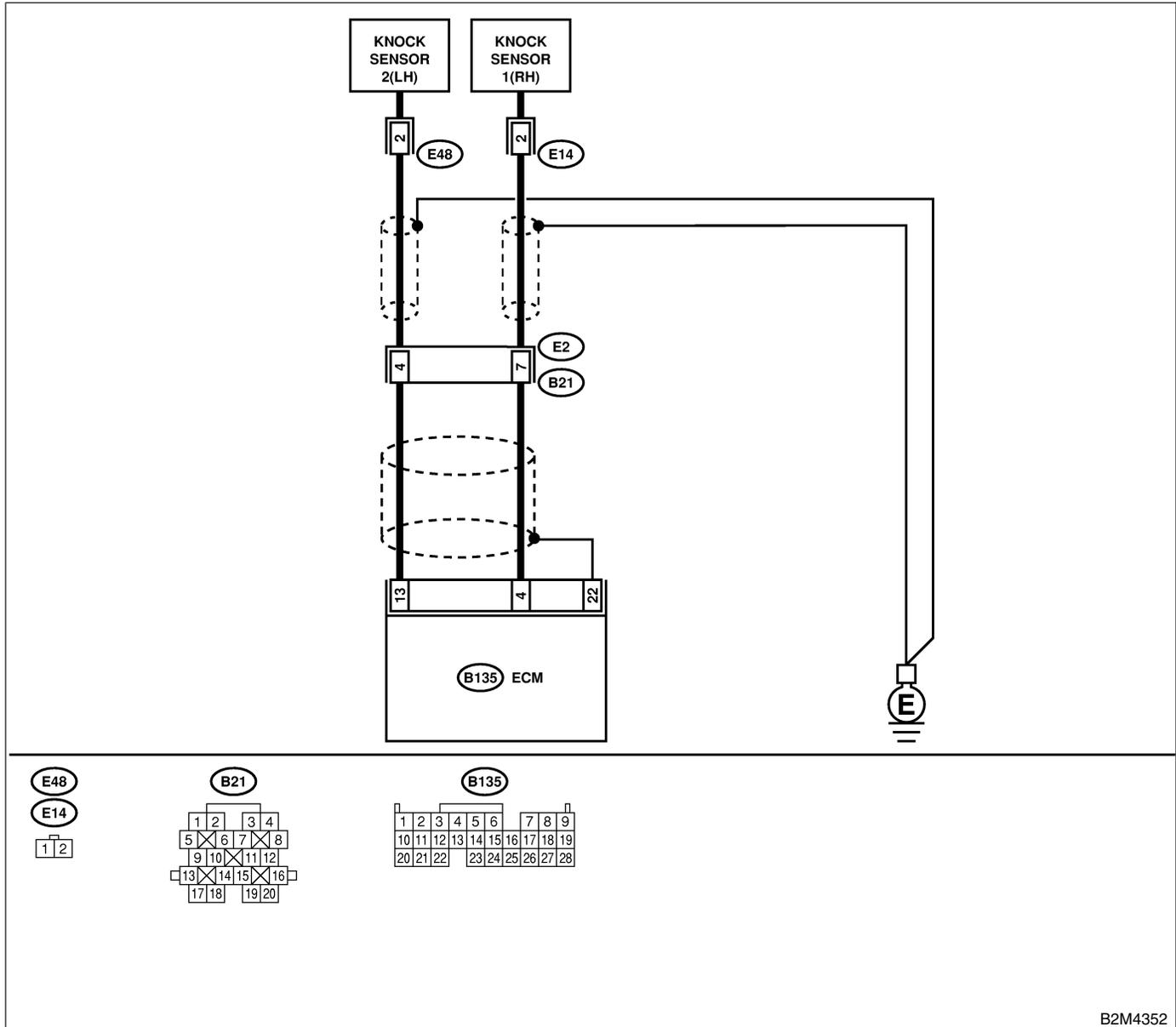
## AS: DTC P0333 — KNOCK SENSOR 2 CIRCUIT HIGH INPUT — S048521H07

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN KNOCK SENSOR 2 (LH) AND ECM CONNECTOR.</b> Measure resistance of harness between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 13 — Chassis ground:</b></p>	Is the resistance less than 400 k $\Omega$ ?	Go to step 2.	Go to step 3.
2	<p><b>CHECK KNOCK SENSOR 2 (LH).</b> 1) Disconnect connector from knock sensor 2 (LH). 2) Measure resistance between knock sensor 2 (LH) connector terminal and engine ground.</p> <p><b>Terminal</b> <b>No. 2 — Engine ground:</b></p>	Is the resistance less than 400 k $\Omega$ ?	Replace knock sensor 2 (LH). <Ref. to FU(H6)-32, Knock Sensor.>	Repair ground short circuit in harness between knock sensor 2 (LH) connector and ECM connector. <b>NOTE:</b> The harness between both connectors is shielded. Repair short circuit of harness together with shield.
3	<p><b>CHECK INPUT SIGNAL FOR ECM.</b> 1) Connect connectors to ECM and knock sensor 2 (LH). 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 13 (+) — Chassis ground (-):</b></p>	Is the voltage more than 2 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) <b>NOTE:</b> In this case, repair the following: <ul style="list-style-type: none"> <li>● Poor contact in knock sensor connector 2 (LH)</li> <li>● Poor contact in ECM connector</li> <li>● Poor contact in coupling connector</li> </ul>	Repair poor contact in ECM connector.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

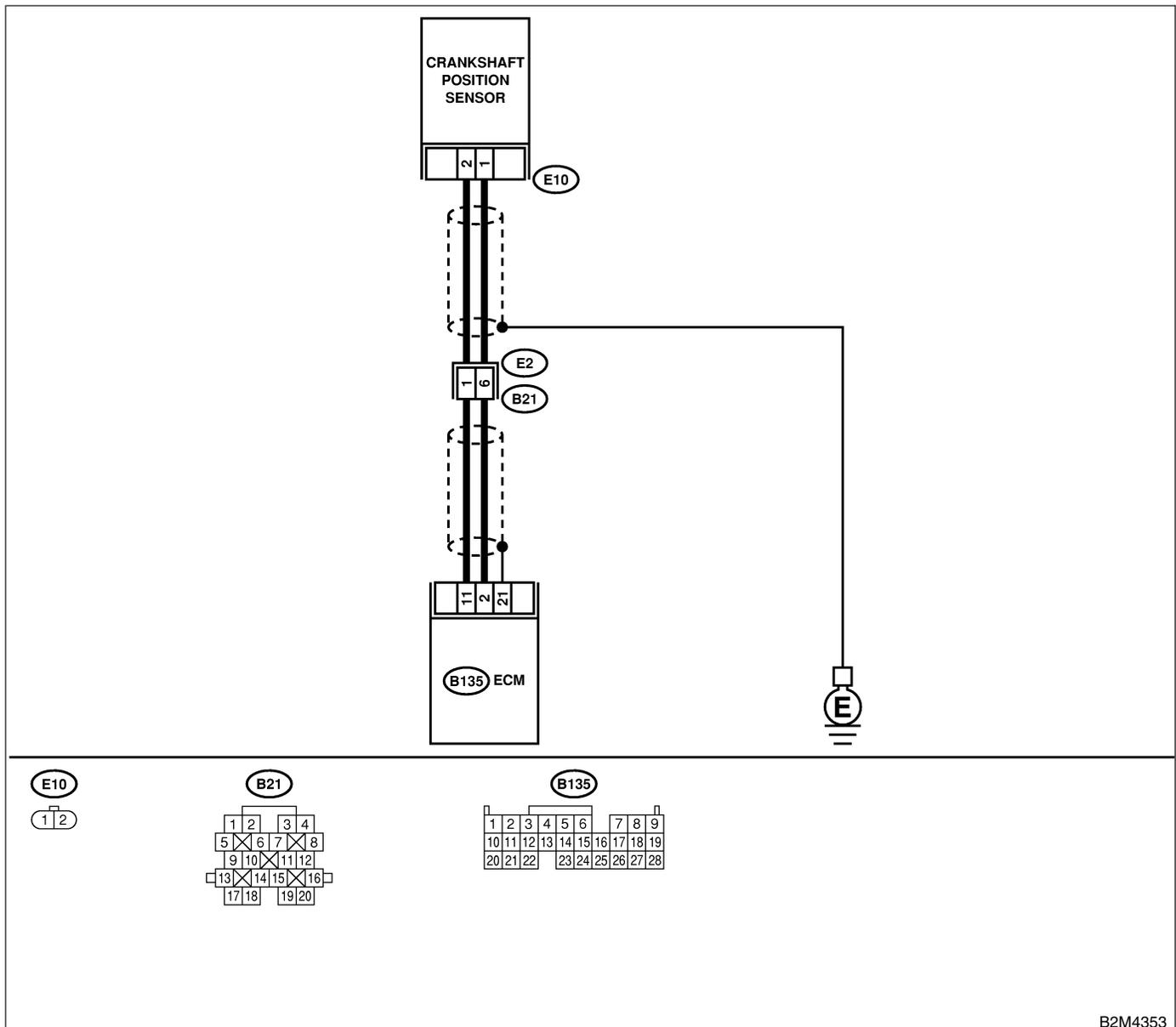
## AT: DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION — S048521B42

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4353

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between crankshaft position sensor and ECM. <i>Connector &amp; terminal</i> (E10) No. 1 — (B135) No. 2: (E10) No. 2 — (B135) No. 11:	Is the resistance less than 1 Ω?	Go to step 2.	Repair open circuit between crankshaft position sensor and ECM.
2	<b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM.</b> Measure resistance between crankshaft position sensor and engine ground. <i>Connector &amp; terminal</i> (E10) No. 1 — Engine ground: (E10) No. 2 — Engine ground:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair ground short circuit between crankshaft position sensor and ECM.
3	<b>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</b>	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 4.	Tighten crankshaft position sensor installation bolt.
4	<b>CHECK CRANKSHAFT POSITION SENSOR.</b> 1) Turn ignition switch to OFF. 2) Remove crankshaft position sensor. 3) Measure resistance between connector terminals of crankshaft position sensor. <i>Terminals</i> No. 1 — No. 2:	Is the resistance between 800 and 1300 kΩ?	Go to step 5.	Replace crankshaft position sensor. <Ref. to FU(H6)-31, Camshaft Position Sensor.>
5	<b>CHECK POOR CONTACT.</b> Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>

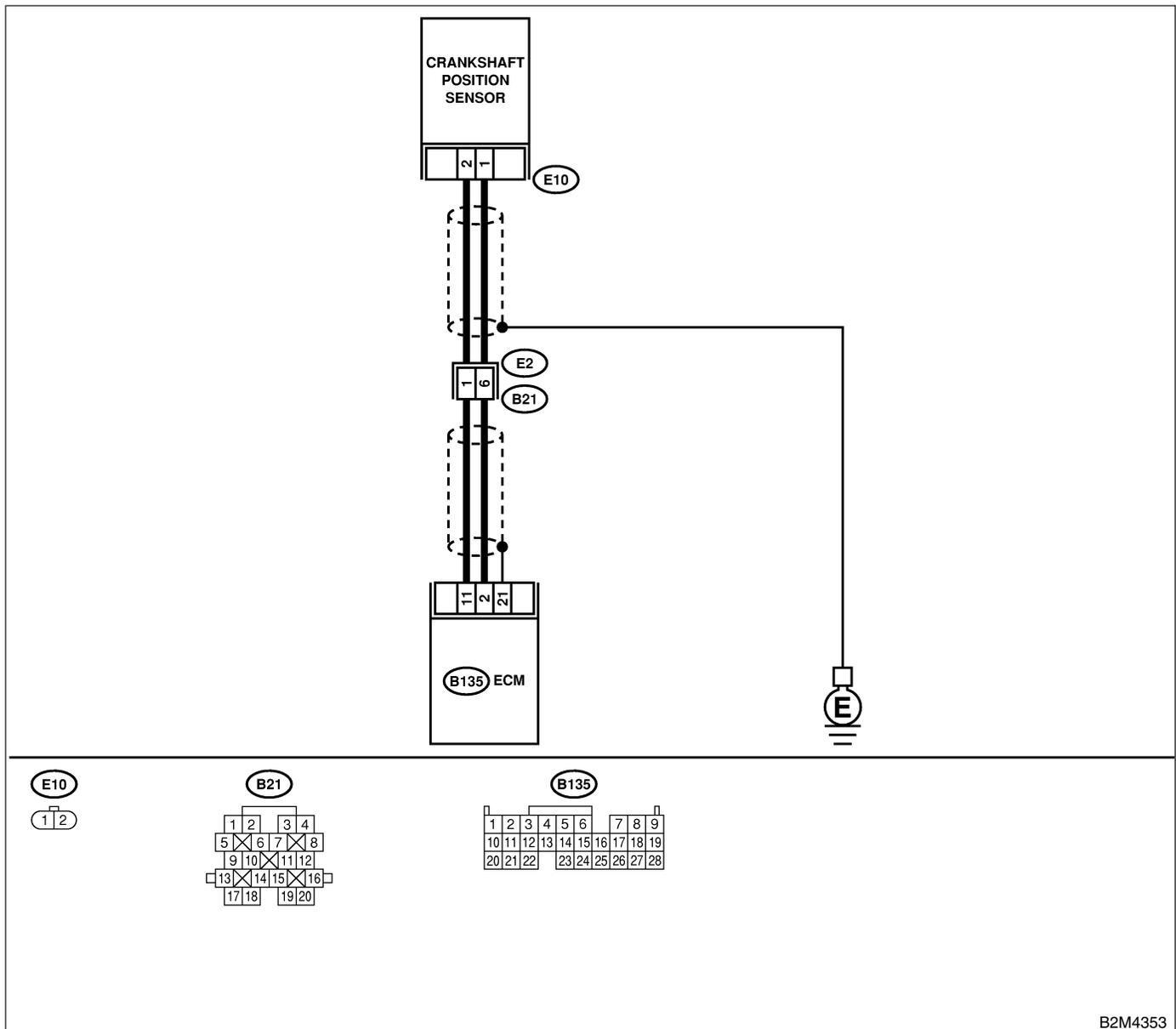
**AU: DTC P0336 — CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —** S048521B43

- **DTC DETECTING CONDITION:**
  - Tow consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0335?	Inspect DTC P0335 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</b> Turn ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 3.	Tighten crankshaft position sensor installation bolt securely.
3	<b>CHECK CRANKSHAFT PLATE.</b>	Are crankshaft plate teeth cracked or damaged?	Replace crankshaft plate.	Go to step 4.
4	<b>CHECK INSTALLATION CONDITION OF TIMING CHAIN.</b> Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET	Is timing chain dislocated from its proper position?	Repair installation condition of timing chain. <Ref. to ME(H6)-42, Timing Chain Assembly.>	Replace crankshaft position sensor. <Ref. to FU(H6)-30, Crankshaft Position Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## AV: DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

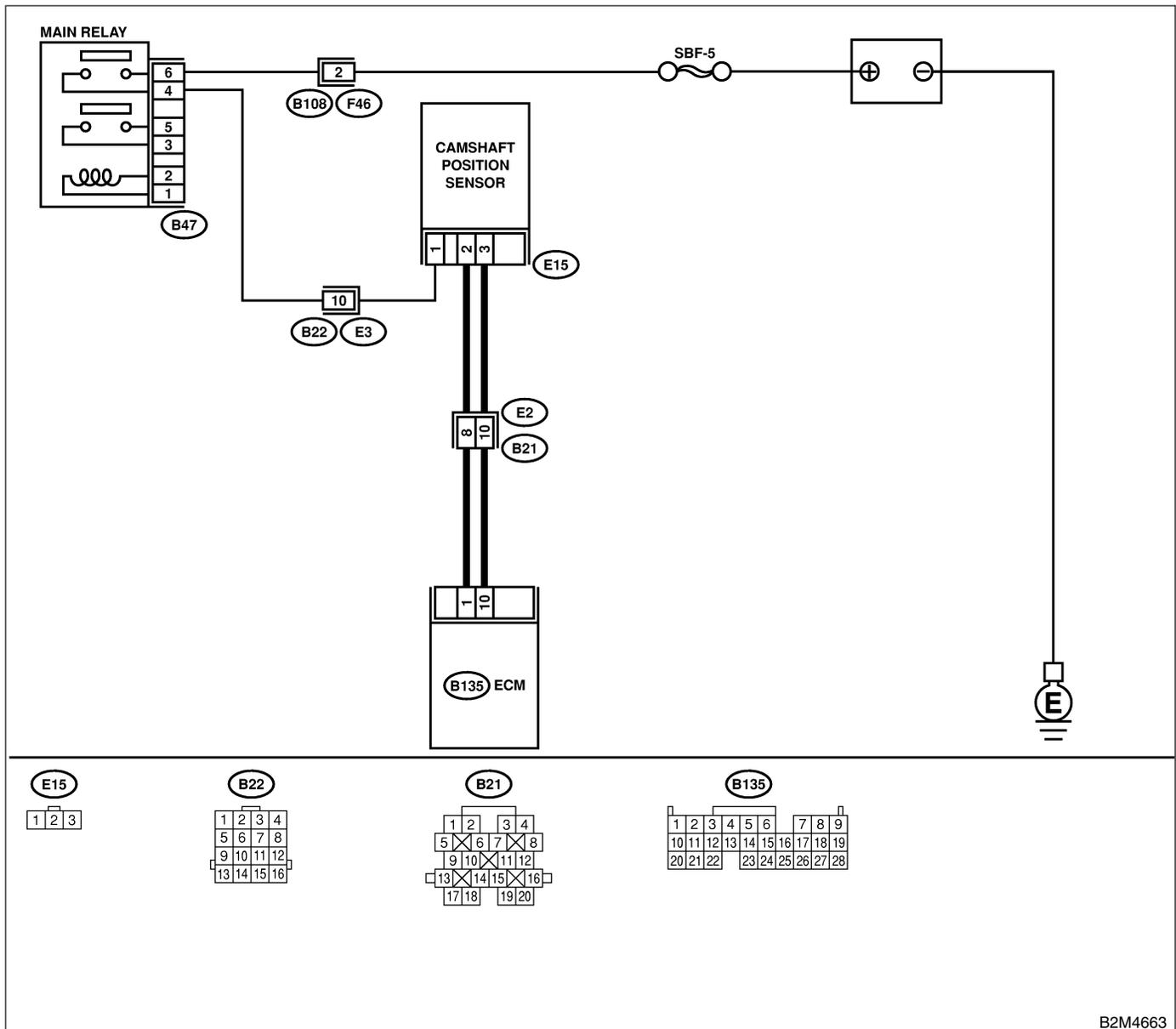
— S048521B44

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from camshaft position sensor. 3) Measure voltage between camshaft position sensor and engine ground. <b>Connector &amp; terminal</b> <b>(E15) No. 1 (+) — Engine ground (-):</b>	Is the voltage more than 10V ?	Repair ground short circuit between main relay connector and camshaft position sensor connector.	Go to step 2.
2	<b>CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b> 1) Turn ignition switch to ON. 2) Measure voltage between camshaft position sensor and engine ground. <b>Connector &amp; terminal</b> <b>(E15) No. 1 (+) — Engine ground (-):</b>	Is the voltage more than 10V ?	Go to step 3.	Repair open or ground short circuit between main relay connector and camshaft position sensor connector.
3	<b>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between camshaft position sensor and ECM. <b>Connector &amp; terminal</b> <b>(E15) No. 2 — (B135) No. 1:</b> <b>(E15) No. 3 — (B135) No. 10:</b>	Is the resistance less than 1 Ω?	Go to step 4.	Repair open circuit between camshaft position sensor and ECM.
4	<b>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b> Measure resistance between camshaft position sensor and engine ground. <b>Connector &amp; terminal</b> <b>(E15) No. 2 — Engine ground:</b> <b>(E15) No. 3 — Engine ground:</b>	Is the resistance more than 1 MΩ?	Go to step 5.	Repair ground short circuit between camshaft position sensor and ECM.
5	<b>CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</b>	Is the camshaft position sensor installation bolt tightened securely?	Go to step 6.	Tighten camshaft position sensor installation bolt.
6	<b>CHECK CAMSHAFT POSITION SENSOR.</b> Check camshaft position sensor wave form. <Ref. to EN(H6)-29, WAVEFORM, MEASUREMENT, Engine Control Module (ECM) I/O Signal.>	Is any abnormality found in waveform?	Go to step 7.	Replace camshaft position sensor. <Ref. to FU(H6)-31, Camshaft Position Sensor.>
7	<b>CHECK POOR CONTACT.</b> Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0340?	Inspect DTC P0340 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</b>	Is the camshaft position sensor installation bolt tightened securely?	Go to step 3.	Tighten camshaft position sensor installation bolt securely.
3	<b>CHECK CAMSHAFT SPROCKET.</b> Remove front chain cover. <Ref. to ME(H6)-40, Front Chain Cover.>	Are camshaft sprocket teeth cracked or damaged?	Replace camshaft sprocket. <Ref. to ME(H6)-47, Camshaft Sprocket.>	Go to step 4.
4	<b>CHECK INSTALLATION CONDITION OF TIMING CHAIN.</b> Turn camshaft using ST, and align alignment mark on camshaft sprocket with alignment mark. ST 18231AA000 CAMSHAFT SPROCKET WRENCH	Is timing belt dislocated from its proper position?	Repair installation condition of timing chain. <Ref. to ME(H6)-42, Timing Chain Assembly.>	Replace camshaft position sensor. <Ref. to FU(H6)-31, Camshaft Position Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

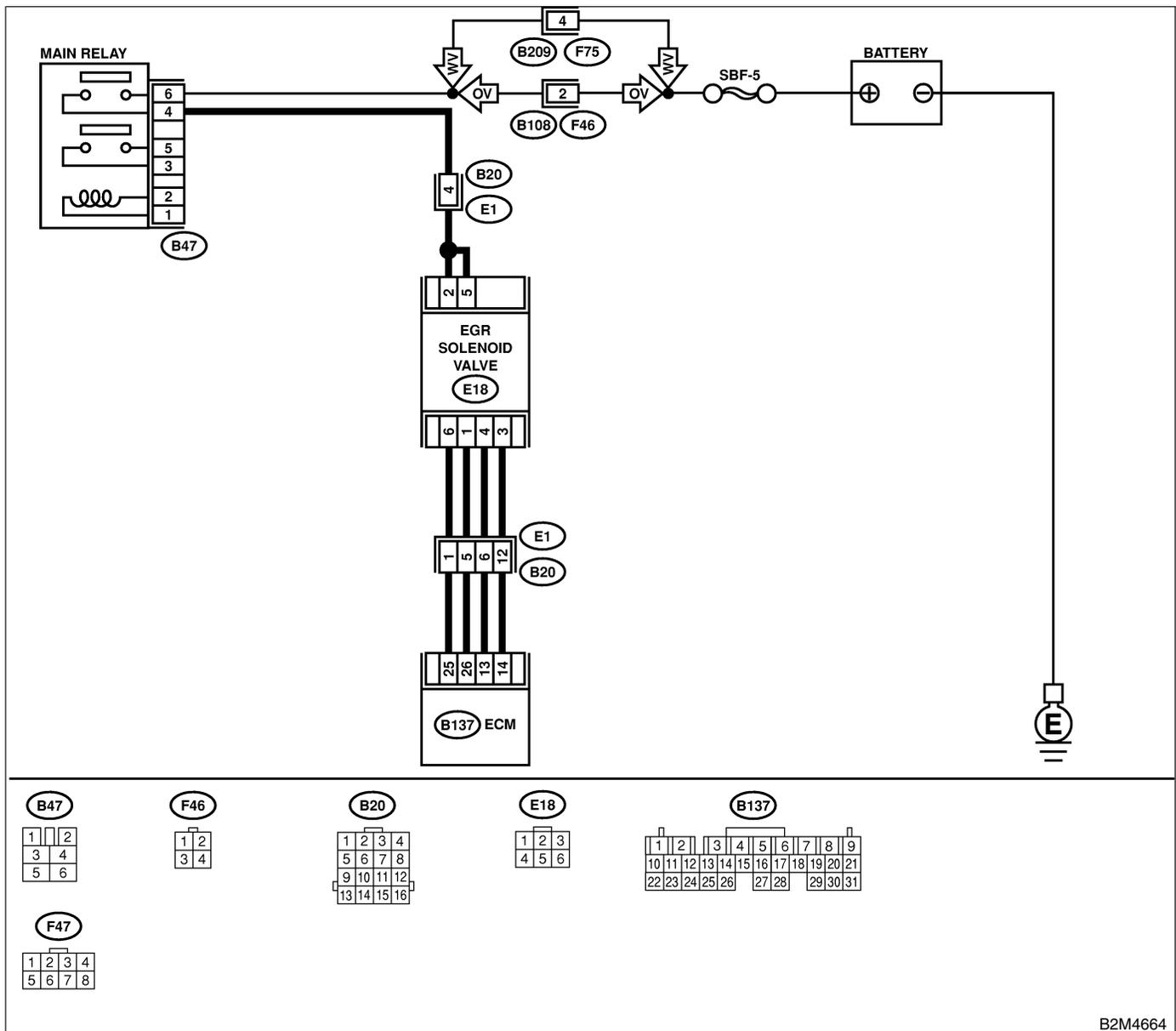
## AX: DTC P0400 — EGR SYSTEM MALFUNCTION — S048521H08

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Poor driving performance on low engine speed
  - Erroneous idling
  - Poor driving performance.

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4664

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK CURRENT DATA.</b> 1) Start engine. 2) Rear the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. EN(H6)-37, Subaru Select Monitor.> ● OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 53.3 kPa (400 mmHg, 15.75 inHg)?	Check if EGR valve, intake manifold pressure sensor and throttle body are securely installed.	Go to step 3.
3	<b>CHECK POWER SUPPLY TO EGR SOLENOID VALVE.</b> 1) Disconnect connector from EGR solenoid valve. 2) Turn ignition switch to ON. 3) Measure voltage between EGR solenoid valve and engine ground. <b>Connector &amp; terminal</b> <b>(E18) No. 2 — Engine ground:</b> <b>(E18) No. 5 — Engine ground:</b>	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between main relay and EGR solenoid valve connector.
4	<b>CHECK EGR SOLENOID VALVE.</b> Measure resistance between EGR solenoid valve terminals. NOTE: Make sure there are no foreign objects caught between EGR solenoid valve and valve seat. <b>Terminals</b> <b>No. 1 — No. 2:</b> <b>No. 3 — No. 2:</b> <b>No. 4 — No. 5:</b> <b>No. 6 — No. 5:</b>	Is the resistance between 20 and 30 Ω?	Go to step 5.	Replace EGR solenoid valve. <Ref. to EC(H6)-10, EGR Valve.>
5	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> 1) Turn ignition switch to OFF. 2) Connect connectors to ECM and EGR solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. <b>Connector &amp; terminal</b> <b>(B137) No. 25 — Chassis ground:</b> <b>(B137) No. 26 — Chassis ground:</b> <b>(B137) No. 13 — Chassis ground:</b> <b>(B137) No. 14 — Chassis ground:</b>	Does voltage change between 0 and 10 V?	Repair poor contact in ECM connector.	Go to step 6.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<p><b>CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Disconnect connectors from EGR solenoid valve and ECM.                      3) Measure resistance of harness between EGR solenoid valve and ECM connector.</p> <p><b>Connector &amp; terminal</b>                      (B137) No. 25 — (E18) No. 6:                      (B137) No. 26 — (E18) No. 1:                      (B137) No. 13 — (E18) No. 4:                      (B137) No. 14 — (E18) No. 3:</p>	Is the resistance less than 1 Ω?	Go to step 7.	Repair open circuit in harness between ECM and EGR solenoid valve connector.
7	<p><b>CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.</b></p> <p>Measure resistance of harness between EGR solenoid valve and chassis ground.</p> <p><b>Connector &amp; terminal</b>                      (B137) No. 25 — Chassis ground:                      (B137) No. 26 — Chassis ground:                      (B137) No. 13 — Chassis ground:                      (B137) No. 14 — Chassis ground:</p>	Is the resistance more than 1 MΩ?	Go to step 8.	Repair short circuit in harness between main relay and EGR solenoid valve connector.
8	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in ECM and EGR solenoid valve connector.</p>	Is there poor contact in ECM and EGR solenoid valve connector?	Repair poor contact in ECM and EGR solenoid valve connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## AY: DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —

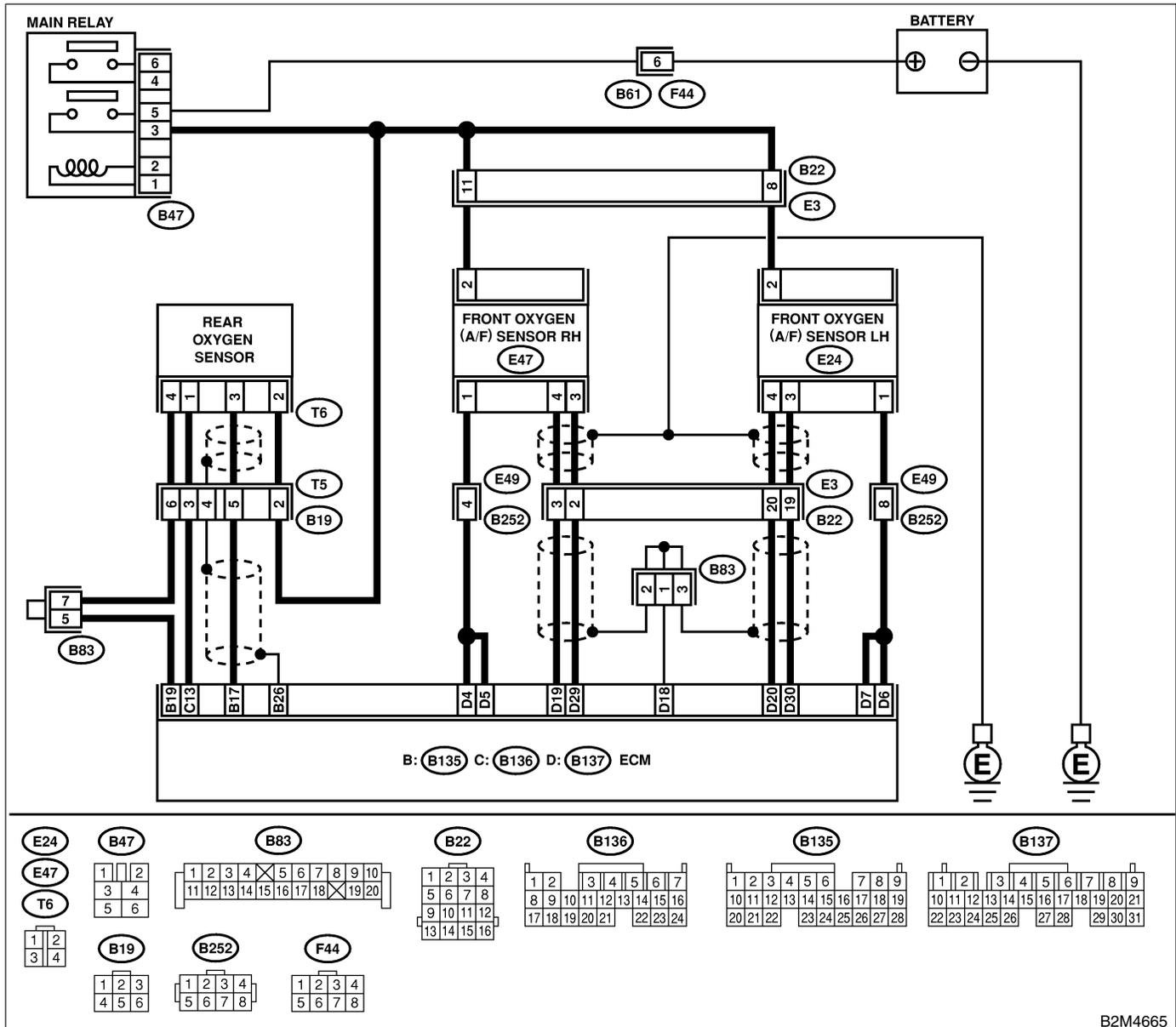
S048521B46

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Idle mixture is out of specifications.

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step 2.
2	<b>CHECK EXHAUST SYSTEM.</b> 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. <ul style="list-style-type: none"> <li>● Between cylinder head and front exhaust pipe</li> <li>● Between front exhaust pipe and front catalytic converter</li> <li>● Between front catalytic converter and rear catalytic converter</li> </ul>	Is there a fault in exhaust system?	Repair or replace exhaust system.	Go to step 3.
3	<b>CHECK REAR CATALYTIC CONVERTER.</b> Separate rear catalytic converter from rear exhaust pipe.	Is there damage at rear face of rear catalyst?	Replace front catalytic converter <Ref. to EC(H6)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(H6)-6, Rear Catalytic Converter.>.	Go to step 4.
4	<b>CHECK FRONT CATALYTIC CONVERTER.</b> Remove front catalytic converter.	Is there damage at rear face or front face of front catalyst?	Replace front catalytic converter. <Ref. to EC(H6)-3, Front Catalytic Converter.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

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## AZ: DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM MALFUNCTION — S048521B48

- **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

- **TROUBLE SYMPTOM:**

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

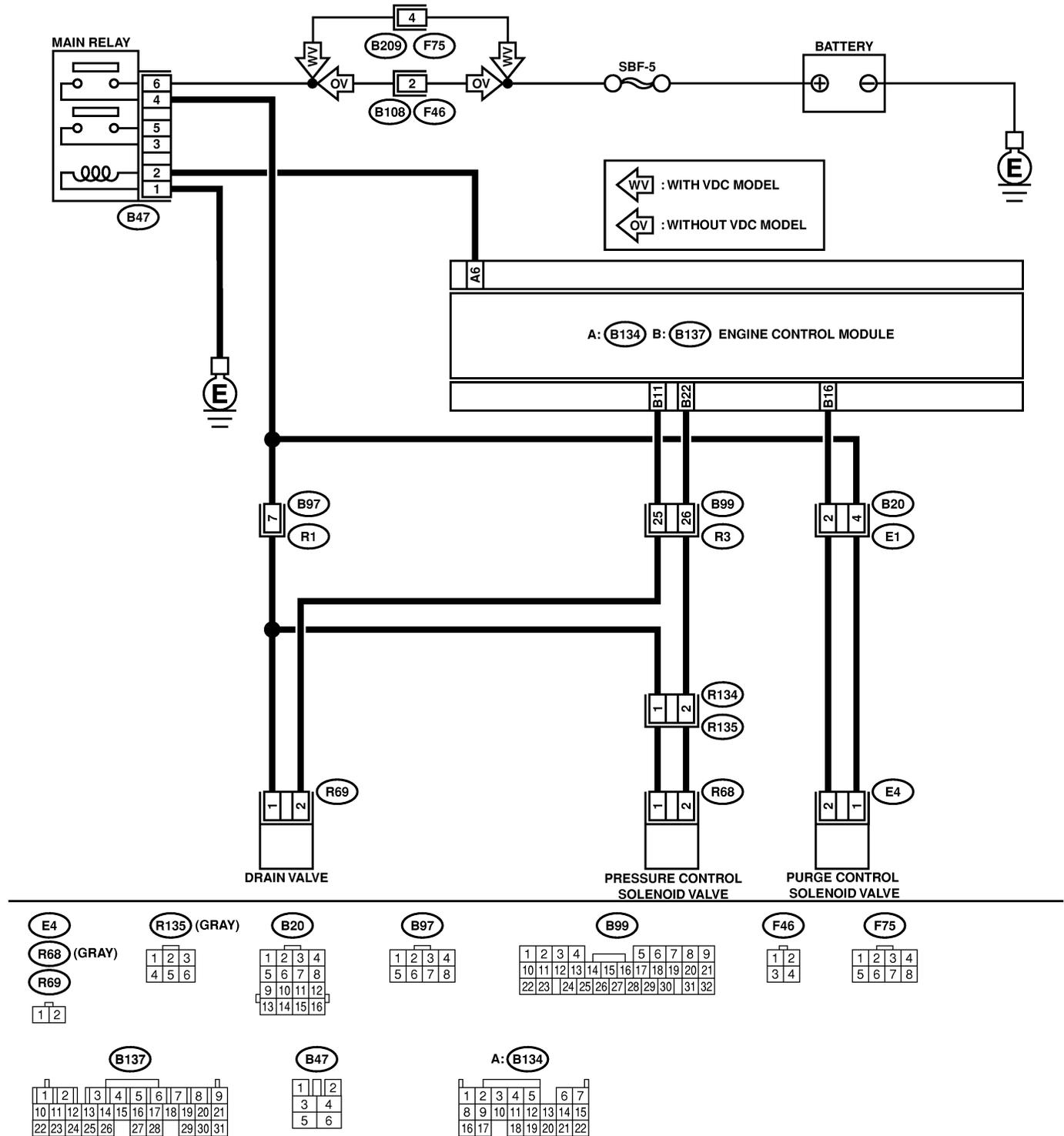
**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

● WIRING DIAGRAM:



B2M4666

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK FUEL FILLER CAP.</b> 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC code is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3	<b>CHECK FUEL FILLER PIPE PACKING.</b>	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace fuel filler cap and fuel filler pipe. <Ref. to FU(H6)-62, Fuel Filler Pipe.>	Go to step 4.
4	<b>CHECK DRAIN VALVE.</b> 1) Connect test mode connector. 2) Turn ignition switch to ON. 3) Operate drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.>	Does drain valve produce operating sound?	Go to step 5.	Replace drain valve. <Ref. to EC(H6)-20, Drain Valve.>
5	<b>CHECK PURGE CONTROL SOLENOID VALVE.</b> Operate purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.>	Does purge control solenoid valve produce operating sound?	Go to step 6.	Replace purge control solenoid valve. <Ref. to EC(H6)-8, Purge Control Solenoid Valve.>
6	<b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b> Operate pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.>	Does pressure control solenoid valve produce operating sound?	Go to step 7.	Replace pressure control solenoid valve. <Ref. to EC(H6)-16, Pressure Control Solenoid Valve.>
7	<b>CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.</b> Turn ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on fuel line?	Repair or replace fuel line. <Ref. to FU(H6)-78, Fuel Delivery, Return and Evaporation Lines.>	Go to step 8.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
8	<b>CHECK CANISTER.</b>	Is canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace canister. <Ref. to EC(H6)-7, Canister.>	Go to step 9.
9	<b>CHECK FUEL TANK.</b> Remove fuel tank. <Ref. to FU(H6)-53, Fuel Tank.>	Is fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace fuel tank. <Ref. to FU(H6)-53, Fuel Tank.>	Go to step 10.
10	<b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace hoses or pipes.	Contact with SOA (distributor) service. <b>NOTE:</b> Inspection by DTM is required, because probable cause is deterioration of multiple parts.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## BA: DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL LOW INPUT —

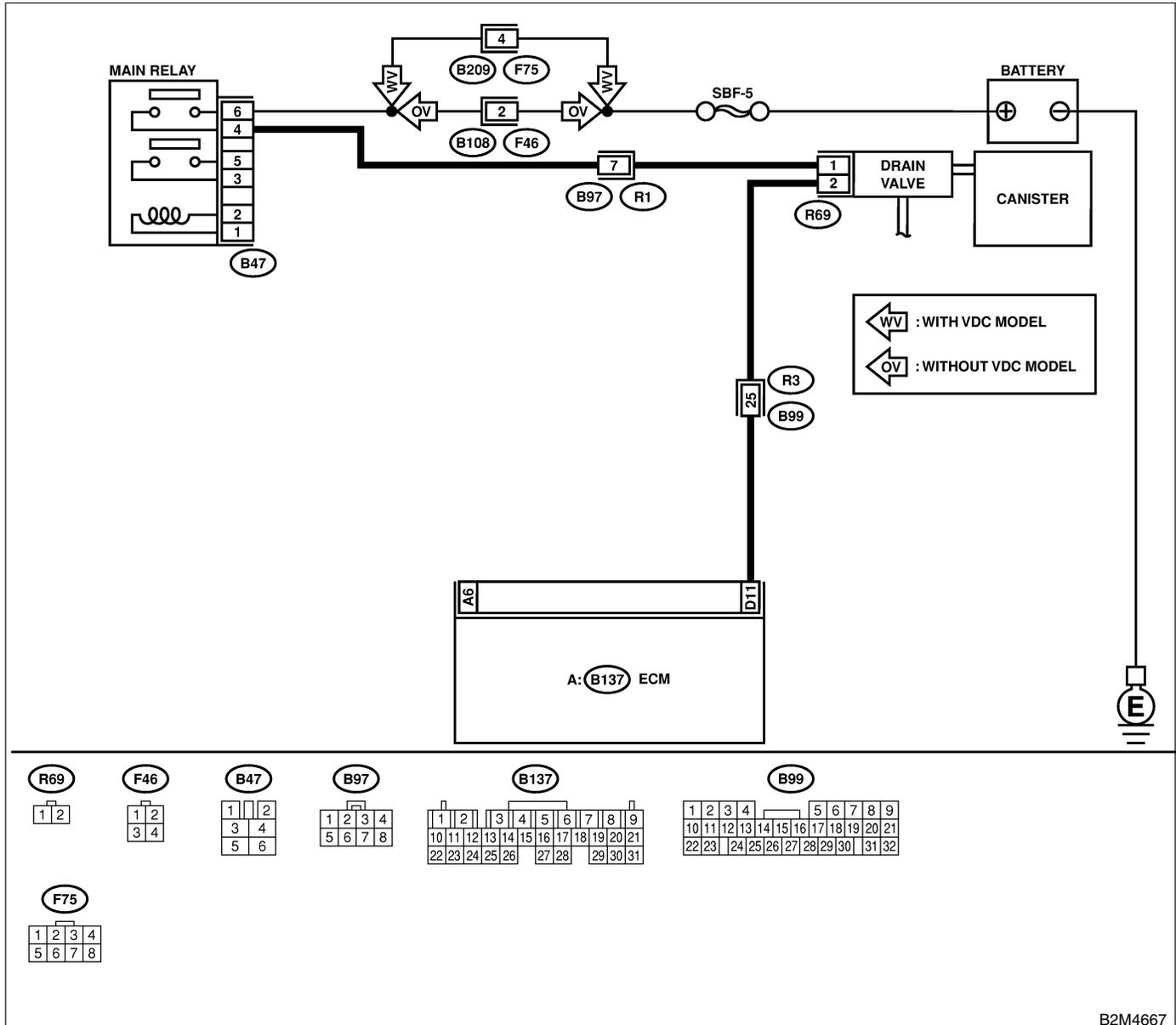
S048521F98

- DTC DETECTING CONDITION:
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4667

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b>  <i>(B137) No. 11 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 2.	Go to step 3.
2	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Poor contact in drain valve connector</li> <li>● Poor contact in ECM connector</li> <li>● Poor contact in coupling connectors</li> </ul>
3	<p><b>CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connectors from drain valve and ECM.                      3) Measure resistance of harness between drain valve connector and chassis ground.</p> <p><b>Connector &amp; terminal</b>  <i>(R69) No. 2 — Chassis ground:</i></p>	Is the resistance less than 10 $\Omega$ ?	Repair ground short circuit in harness between ECM and drain valve connector.	Go to step 4.
4	<p><b>CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b>                      Measure resistance of harness between ECM and drain valve connector.</p> <p><b>Connector &amp; terminal</b>  <i>(B137) No. 11 — (R69) No. 2:</i></p>	Is the voltage less than 1 $\Omega$ ?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and drain valve connector</li> <li>● Poor contact in coupling connectors</li> </ul>
5	<p><b>CHECK DRAIN VALVE.</b>                      Measure resistance between drain valve terminals.</p> <p><b>Terminals</b>  <i>No. 1 — No. 2:</i></p>	Is the resistance between 10 and 100 $\Omega$ ?	Go to step 6.	Replace drain valve. <Ref. to EC(H6)-20, Drain Valve.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<p><b>CHECK POWER SUPPLY TO DRAIN VALVE.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between drain valve and chassis ground.  <b>Connector &amp; terminal</b>  <b>(R69) No. 1 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between main relay and drain valve</li> <li>● Poor contact in coupling connectors</li> <li>● Poor contact in main relay connector</li> </ul>
7	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in drain valve connector.</p>	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

**MEMO:**

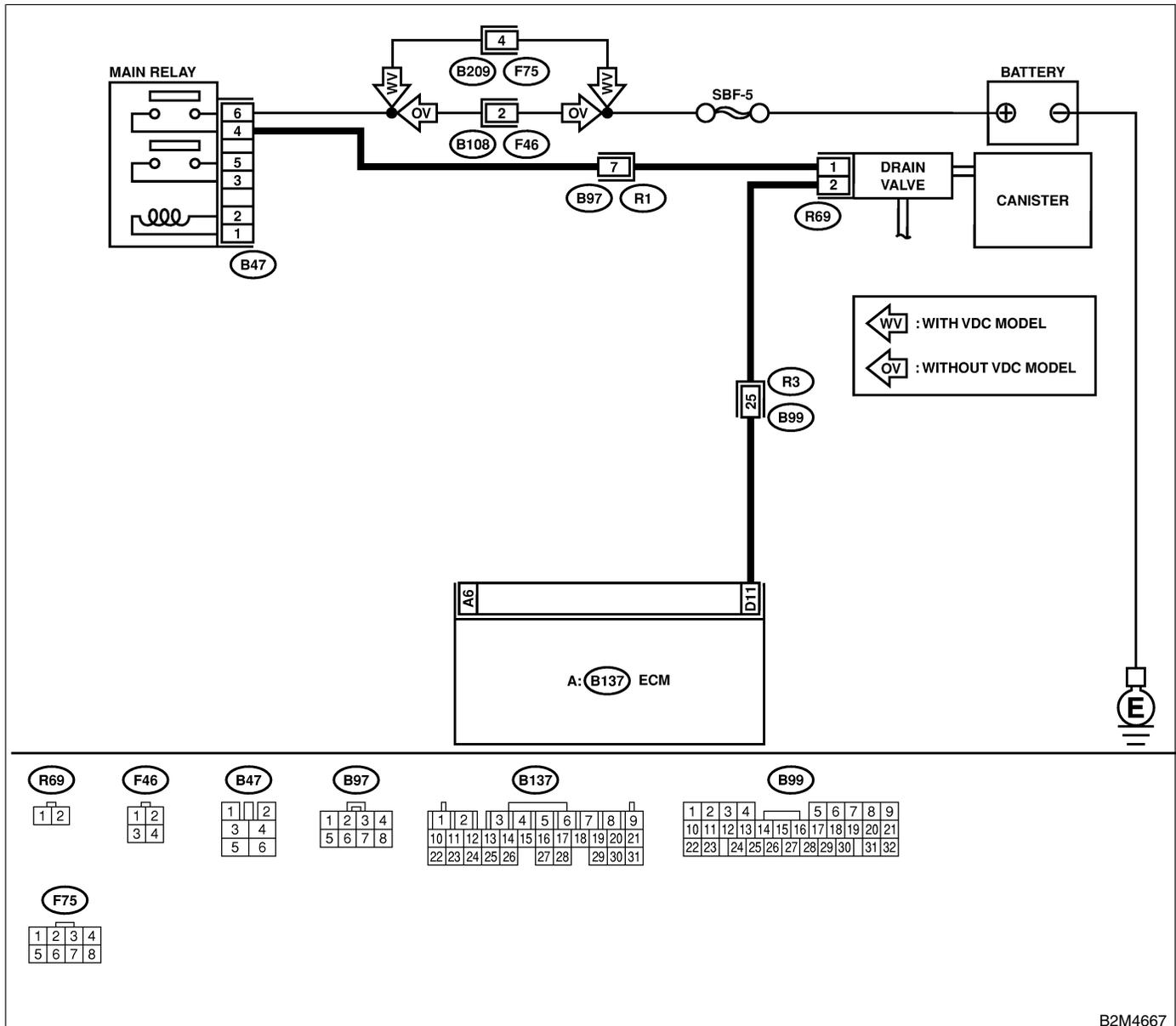
**BB: DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL HIGH INPUT —** S048521F99

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4667

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to OFF.                      2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.                      3) Turn ignition switch to ON.                      4) While operating drain valve, measure voltage between ECM and chassis ground.                      NOTE:                      Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".                      &lt;Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.&gt;  <b>Connector &amp; terminal</b>  <b>(B137) No. 11 (+) — Chassis ground (-):</b></p>	Does voltage change between 0 and 10 V?	Go to step 2.	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between ECM and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B137) No. 11 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>
4	<p><b>CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connector from drain valve.                      3) Turn ignition switch to ON.                      4) Measure voltage between ECM and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B137) No. 11 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and drain valve connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Go to step 5.
5	<p><b>CHECK DRAIN VALVE.</b>                      1) Turn ignition switch to OFF.                      2) Measure resistance between drain valve terminals.  <b>Terminals</b>  <b>No. 1 — No. 2:</b></p>	Is the resistance less than 1 $\Omega$ ?	Replace drain valve <Ref. to EC(H6)-20, Drain Valve.> and ECM <Ref. to FU(H6)-47, Engine Control Module.>	Go to step 6.
6	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## BC: DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE PROBLEM — S048521B51

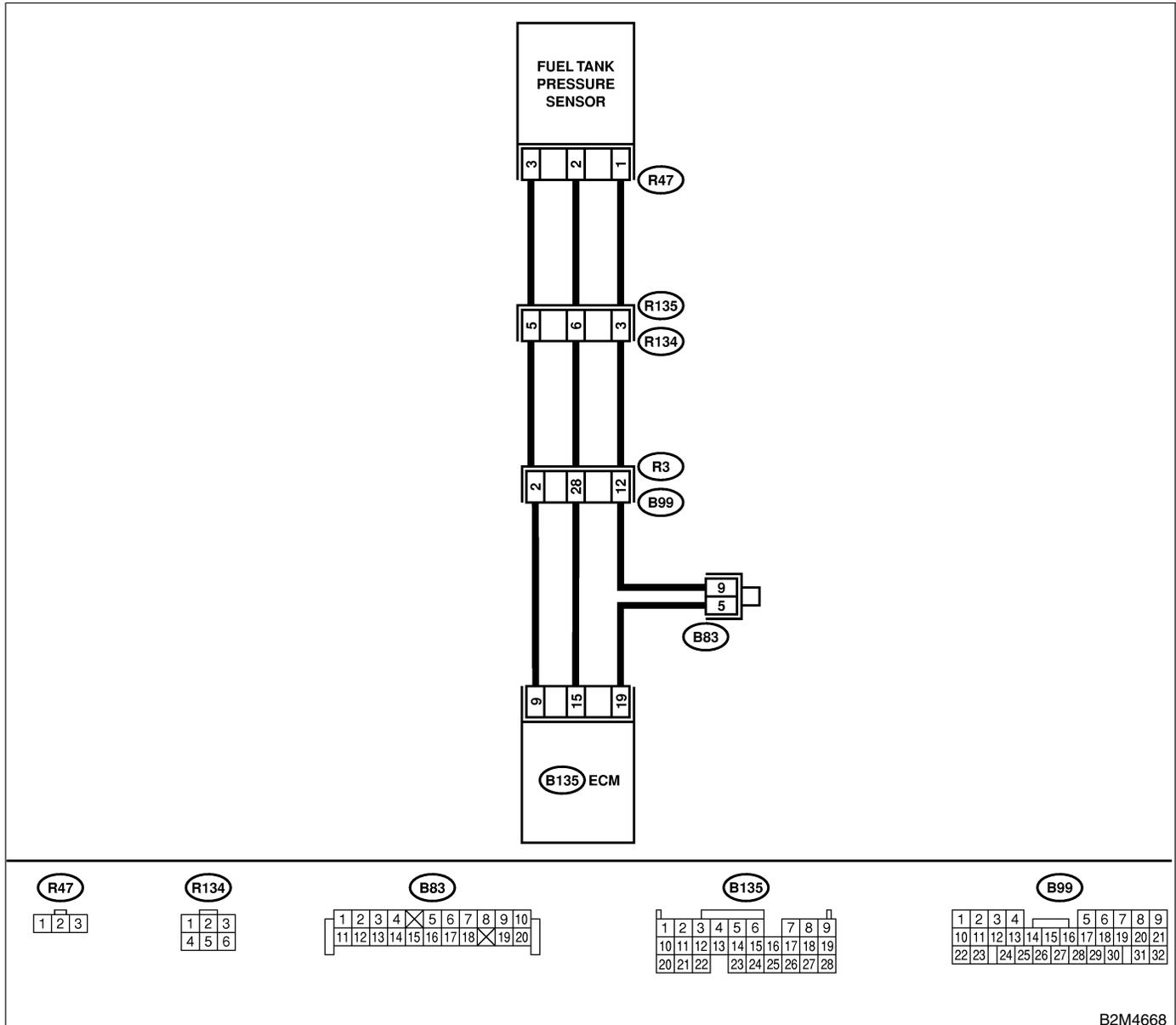
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4668

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK FUEL FILLER CAP.</b> 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3	<b>CHECK PRESSURE/VACUUM LINE.</b> NOTE: Check the following items. <ul style="list-style-type: none"><li>● Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank</li><li>● Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank</li></ul>	Is there a fault in pressure/vacuum line?	Repair or replace hoses and pipes.	Replace fuel tank pressure sensor. <Ref. to EC(H6)-15, Fuel Tank Pressure Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

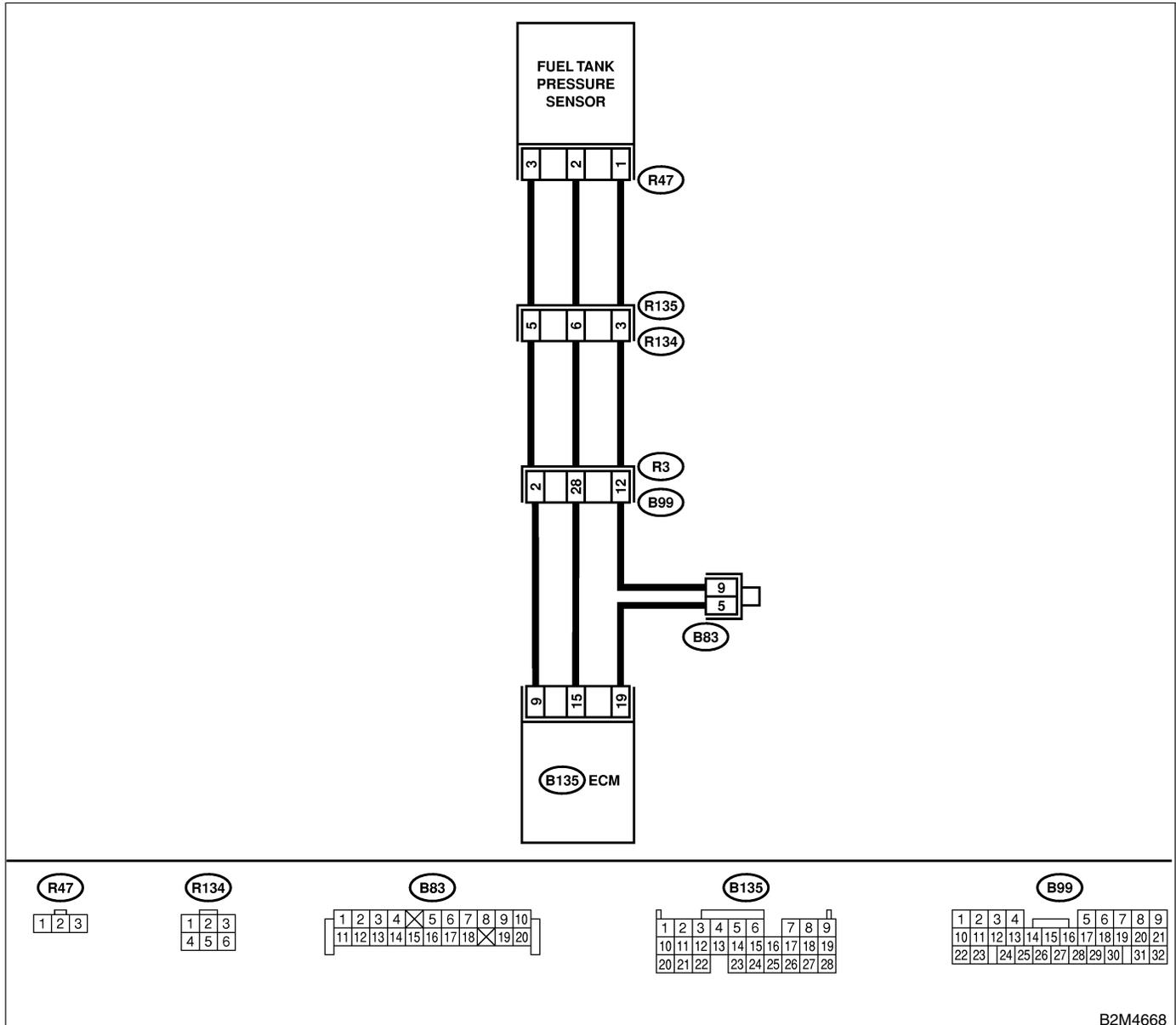
## BD: DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT — S048521B52

- DTC DETECTING CONDITION:
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

- WIRING DIAGRAM:



B2M4668

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b></p> <p>1) Turn ignition switch to OFF. 2) Remove fuel filler cap. 3) Install fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value less than -2.8 kPa (-21.0 mmHg, -0.827 inHg)?	Go to step 2.	Even if MIL lights up, the circuit has returned to a normal condition at this time.
2	<p><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 9 (+) — Chassis ground (-):</b></p>	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3	<p><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 9 (+) — Chassis ground (-):</b></p>	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	<p><b>CHECK INPUT SIGNAL FOR ECM.</b></p> <p>Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 15 (+) — Chassis ground (-):</b></p>	Is the voltage less than 0.2 V?	Go to step 6.	Go to step 5.
5	<p><b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b></p> <p>Read data of fuel tank pressure sensor signal using Subaru Select Monitor.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p>	Does the value change more than -2.8 kPa (-21.0 mmHg, -0.827 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step 6.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<p><b>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b></p> <p>1) Turn ignition switch to OFF. 2) Remove rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure voltage between rear wiring harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(R135) No. 5 (+) — Chassis ground (-):</b></p>	Is the voltage more than 4.5 V?	Go to step 7.	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and rear wiring harness connector</li> <li>● Poor contact in coupling connector</li> </ul>
7	<p><b>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and rear wiring harness connector.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 19 — (R135) No. 1:</b></p>	Is the resistance less than 1 $\Omega$ ?	Go to step 8.	<p>Repair harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and rear wiring harness connector</li> <li>● Poor contact in coupling connector</li> <li>● Poor contact in joint connector</li> </ul>
8	<p><b>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b></p> <p>Measure resistance of harness between rear wiring harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(R135) No. 1 — Chassis ground:</b></p>	Is the resistance more than 500 k $\Omega$ ?	Go to step 9.	Repair ground short circuit in harness between ECM and rear wiring harness connector.
9	<p><b>CHECK FUEL TANK CORD.</b></p> <p>1) Disconnect connector from fuel tank pressure sensor. 2) Measure resistance of fuel tank cord.</p> <p><b>Connector &amp; terminal</b> <b>(R134) No. 5 — (R47) No. 3:</b></p>	Is the resistance less than 1 $\Omega$ ?	Go to step 10.	Repair open circuit in fuel tank cord.
10	<p><b>CHECK FUEL TANK CORD.</b></p> <p>Measure resistance of fuel tank cord.</p> <p><b>Connector &amp; terminal</b> <b>(R134) No. 1 — (R47) No. 1:</b></p>	Is the resistance less than 1 $\Omega$ ?	Go to step 11.	Repair open circuit in fuel tank cord.
11	<p><b>CHECK FUEL TANK CORD.</b></p> <p>Measure resistance of harness between fuel tank pressure sensor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(R47) No. 2 — Chassis ground:</b></p>	Is the resistance more than 500 k $\Omega$ ?	Go to step 12.	Repair ground short circuit in fuel tank cord.
12	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in fuel tank pressure sensor connector.</p>	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to EC(H6)-15, Fuel Tank Pressure Sensor.>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## BE: DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

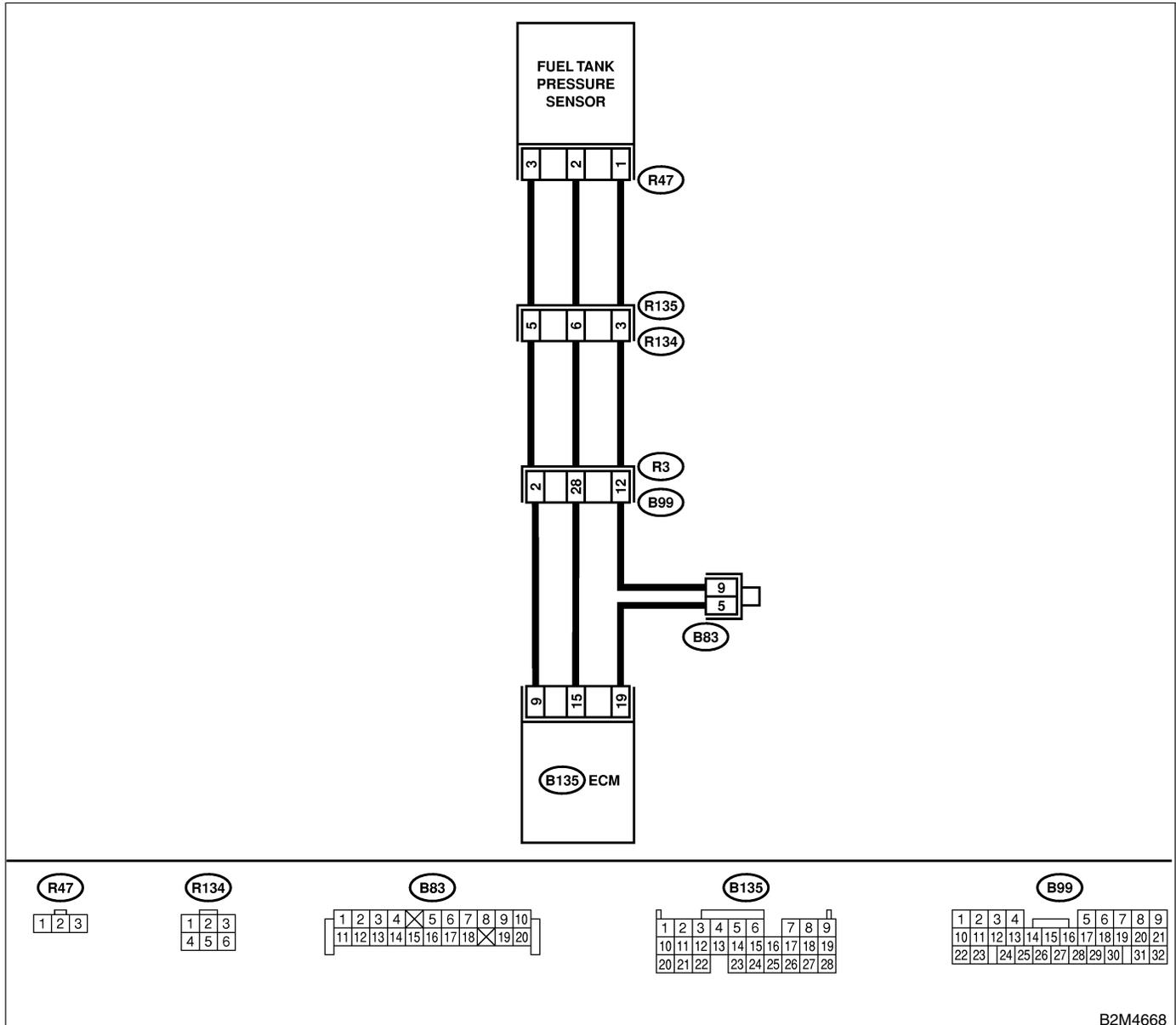
S048521B53

- DTC DETECTING CONDITION:
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

- WIRING DIAGRAM:



B2M4668

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK CURRENT DATA.</b></p> <p>1) Turn ignition switch to OFF. 2) Remove fuel filler cap. 3) Install fuel filler cap. 4) Turn ignition switch to ON. 5) Read data of fuel tank pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>● OBD-II general scan tool</li> </ul> <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Go to step 12.	Go to step 2.
2	<p><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 9 (+) — Chassis ground (-):</b></p>	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3	<p><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 9 (+) — Chassis ground (-):</b></p>	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>
4	<p><b>CHECK INPUT SIGNAL FOR ECM.</b></p> <p>Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B137) No. 15 (+) — Chassis ground (-):</b></p>	Is the voltage less than 0.2 V?	Go to step 6.	Go to step 5.
5	<p><b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b></p> <p>Read data of fuel tank pressure sensor signal using Subaru Select Monitor.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>● Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p>	Does the value change more than -2.8 kPa (-21.0 mmHg, -0.827 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step 6.
6	<p><b>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b></p> <p>1) Turn ignition switch to OFF. 2) Remove rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure voltage between rear wiring harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(R135) No. 5 (+) — Chassis ground (-):</b></p>	Is the voltage more than 4.5 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between ECM and rear wiring harness connector ● Poor contact in coupling connector

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
7	<p><b>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and rear wiring harness connector.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 15 — (R135) No. 4:</b></p>	Is the resistance less than 1 Ω?	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between ECM and rear wiring harness connector ● Poor contact in coupling connector
8	<p><b>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b></p> <p>Measure resistance of harness between rear wiring harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 9 — (R135) No. 5:</b></p>	Is the resistance less than 1 Ω?	Go to step 9.	Repair ground short circuit in harness between ECM and rear wiring harness connector.
9	<p><b>CHECK FUEL TANK CORD.</b></p> <p>1) Disconnect connector from fuel tank pressure sensor. 2) Measure resistance of fuel tank cord.</p> <p><b>Connector &amp; terminal</b> <b>(R134) No. 4 — (R47) No. 2:</b></p>	Is the resistance less than 1 Ω?	Go to step 10.	Repair open circuit in fuel tank cord.
10	<p><b>CHECK FUEL TANK CORD.</b></p> <p>Measure resistance of fuel tank cord.</p> <p><b>Connector &amp; terminal</b> <b>(R134) No. 1 — (R47) No. 1:</b></p>	Is the resistance less than 1 Ω?	Go to step 11.	Repair open circuit in fuel tank cord.
11	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in fuel tank pressure sensor connector.</p>	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to FU(H6)-15, Fuel Tank Pressure Sensor.>
12	<p><b>CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from fuel tank pressure sensor. 3) Turn ignition switch to ON. 4) Read data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt; ● OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair battery short circuit in harness between ECM and fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to FU(H6)-15, Fuel Tank Pressure Sensor.>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

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## **BF: DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM MALFUNCTION —** S048521K05

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Gasoline smell
  - Fuel filler cap loose or missing

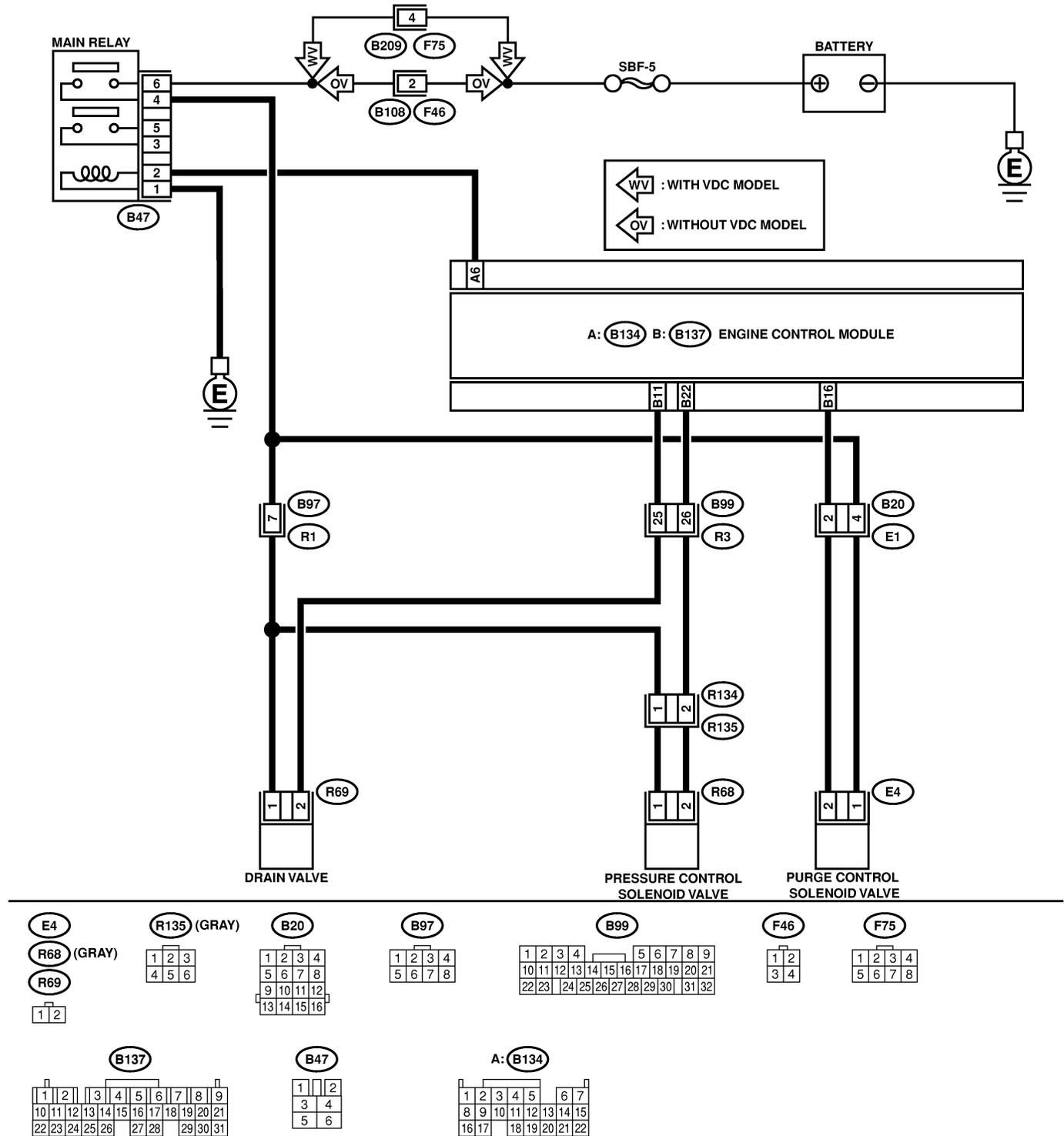
### **CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## ● WIRING DIAGRAM:



B2M4666

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK FUEL FILLER CAP.</b> 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC code is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3	<b>CHECK FUEL FILLER PIPE PACKING.</b>	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace fuel filler cap and fuel filler pipe. <Ref. to FU(H6)-62, Fuel Filler Pipe.>	Go to step 4.
4	<b>CHECK DRAIN VALVE.</b> 1) Connect test mode connector. 2) Turn ignition switch to ON. 3) Operate drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.>	Does drain valve produce operating sound?	Go to step 5.	Replace drain valve. <Ref. to EC(H6)-17, Drain Valve.>
5	<b>CHECK PURGE CONTROL SOLENOID VALVE.</b> Operate purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.>	Does purge control solenoid valve produce operating sound?	Go to step 6.	Replace purge control solenoid valve. <Ref. to EC(H6)-8, Purge Control Solenoid Valve.>
6	<b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b> Operate pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.>	Does pressure control solenoid valve produce operating sound?	Go to step 7.	Replace pressure control solenoid valve. <Ref. to EC(H6)-16, Pressure Control Solenoid Valve.>
7	<b>CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.</b> Turn ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on fuel line?	Repair or replace fuel line. <Ref. to FU(H6)-78, Fuel Delivery, Return and Evaporation Lines.>	Go to step 8.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
8	<b>CHECK CANISTER.</b>	Is canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace canister. <Ref. to EC(H6)-7, Canister.>	Go to step 9.
9	<b>CHECK FUEL TANK.</b> Remove fuel tank. <Ref. to FU(H6)-53, Fuel Tank.>	Is fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace fuel tank. <Ref. to FU(H6)-53, Fuel Tank.>	Go to step 10.
10	<b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace hoses or pipes.	Contact with SOA (distributor) service. <b>NOTE:</b> Inspection by DTM is required, because probable cause is deterioration of multiple parts.

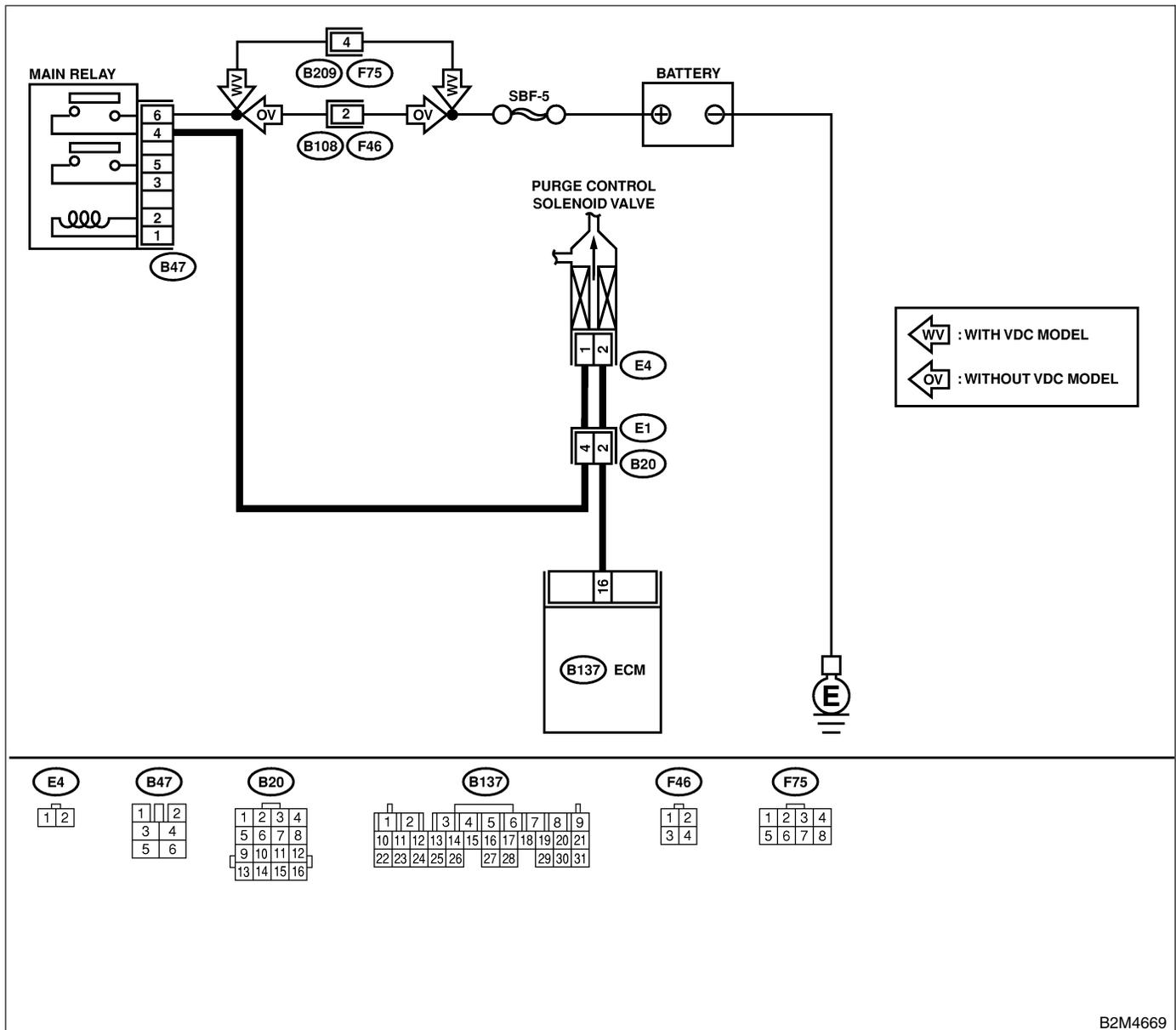
**BG: DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —** SO48521K06

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4669

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between ECM and chassis ground.  <b>Connector &amp; terminal</b>  <i>(B137) No. 16 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
2	<p><b>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connectors from purge control solenoid valve and ECM.                      3) Measure resistance of harness between purge control solenoid valve connector and engine ground.  <b>Connector &amp; terminal</b>  <i>(E4) No. 2 — Engine ground:</i></p>	Is the resistance less than 10 $\Omega$ ?	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.	Go to step 3.
3	<p><b>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b>                      Measure resistance of harness between ECM and purge control solenoid valve of harness connector.  <b>Connector &amp; terminal</b>  <i>(B137) No. 16 — (E4) No. 2:</i></p>	Is the resistance less than 1 $\Omega$ ?	Go to step 4.	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and purge control solenoid valve connector</li> <li>● Poor contact in coupling connector</li> </ul>
4	<p><b>CHECK PURGE CONTROL SOLENOID VALVE.</b>                      1) Remove purge control solenoid valve.                      2) Measure resistance between purge control solenoid valve terminals.  <b>Terminals</b>  <i>No. 1 — No. 2:</i></p>	Is the resistance between 10 and 100 $\Omega$ ?	Go to step 5.	Replace purge control solenoid valve. <Ref. to EC(H6)-8, Purge Control Solenoid Valve.>
5	<p><b>CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between purge control solenoid valve and engine ground.  <b>Connector &amp; terminal</b>  <i>(E4) No. 1 (+) — Engine ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 6.	Repair open circuit in harness between main relay and purge control solenoid valve connector.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<b>CHECK POOR CONTACT.</b> Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge control solenoid valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## BH: DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —

S048521K07

### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

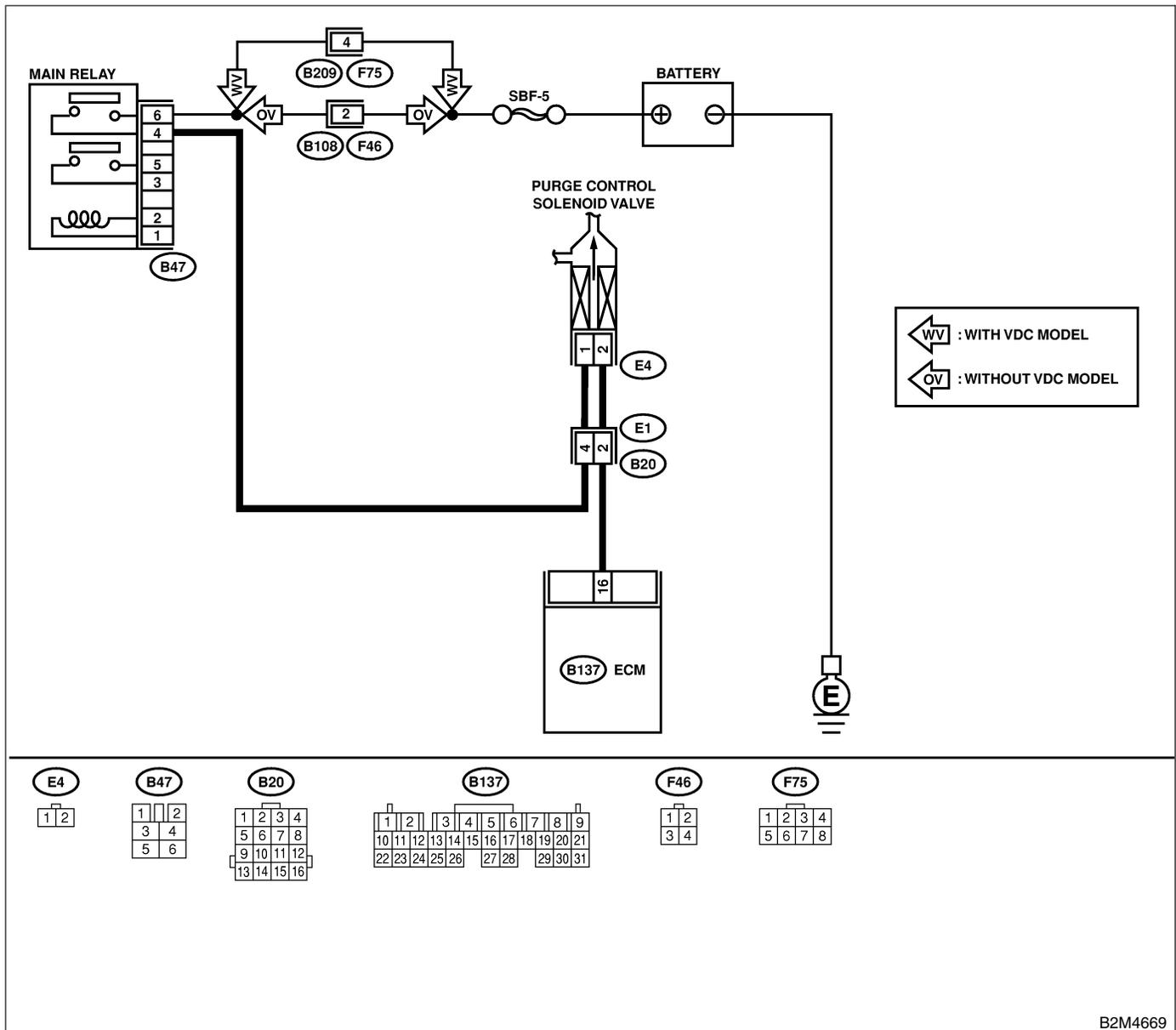
### ● TROUBLE SYMPTOM:

- Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4669

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to OFF.                      2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.                      3) Turn ignition switch to ON.                      4) While operating purge control solenoid valve, measure voltage between ECM and chassis ground.                      NOTE:                      Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.&gt;  <b>Connector &amp; terminal</b>  <b>(B137) No. 16 (+) — Chassis ground (-):</b></p>	Does voltage change between 0 and 10 V?	Go to step 2.	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between ECM and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B137) No. 16 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>
4	<p><b>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connector from purge control solenoid valve.                      3) Turn ignition switch to ON.                      4) Measure voltage between ECM and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B137) No. 16 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Go to step 5.
5	<p><b>CHECK PURGE CONTROL SOLENOID VALVE.</b>                      1) Turn ignition switch to OFF.                      2) Measure resistance between purge control solenoid valve terminals.  <b>Terminals</b>  <b>No. 1 — No. 2:</b></p>	Is the resistance less than 1 $\Omega$ ?	Replace purge control solenoid valve <Ref. to EC(H6)-8, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H6)-47, Engine Control Module.>	Go to step 6.
6	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace fuel level sensor <Ref. to EC(H6)-12, Main Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(H6)-14, Fuel Sub Level Sensor.>.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## BJ: DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT — S048521B55

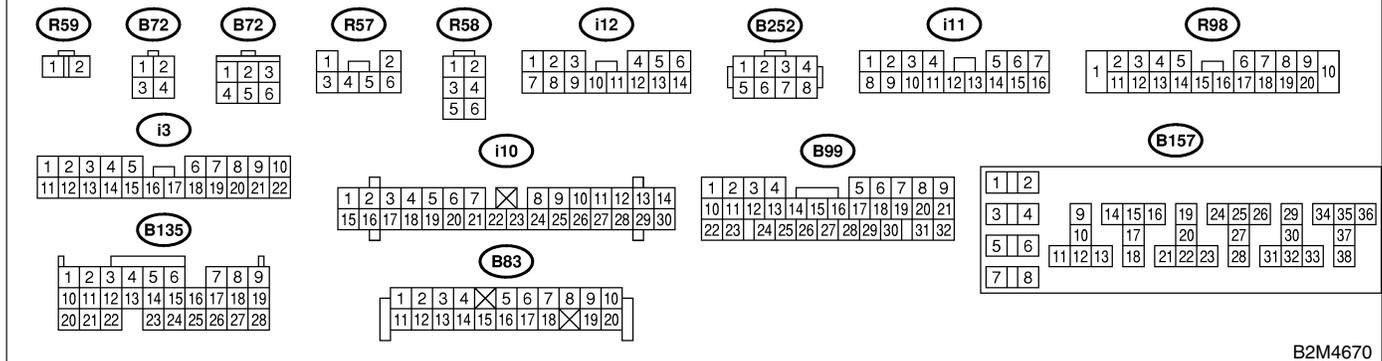
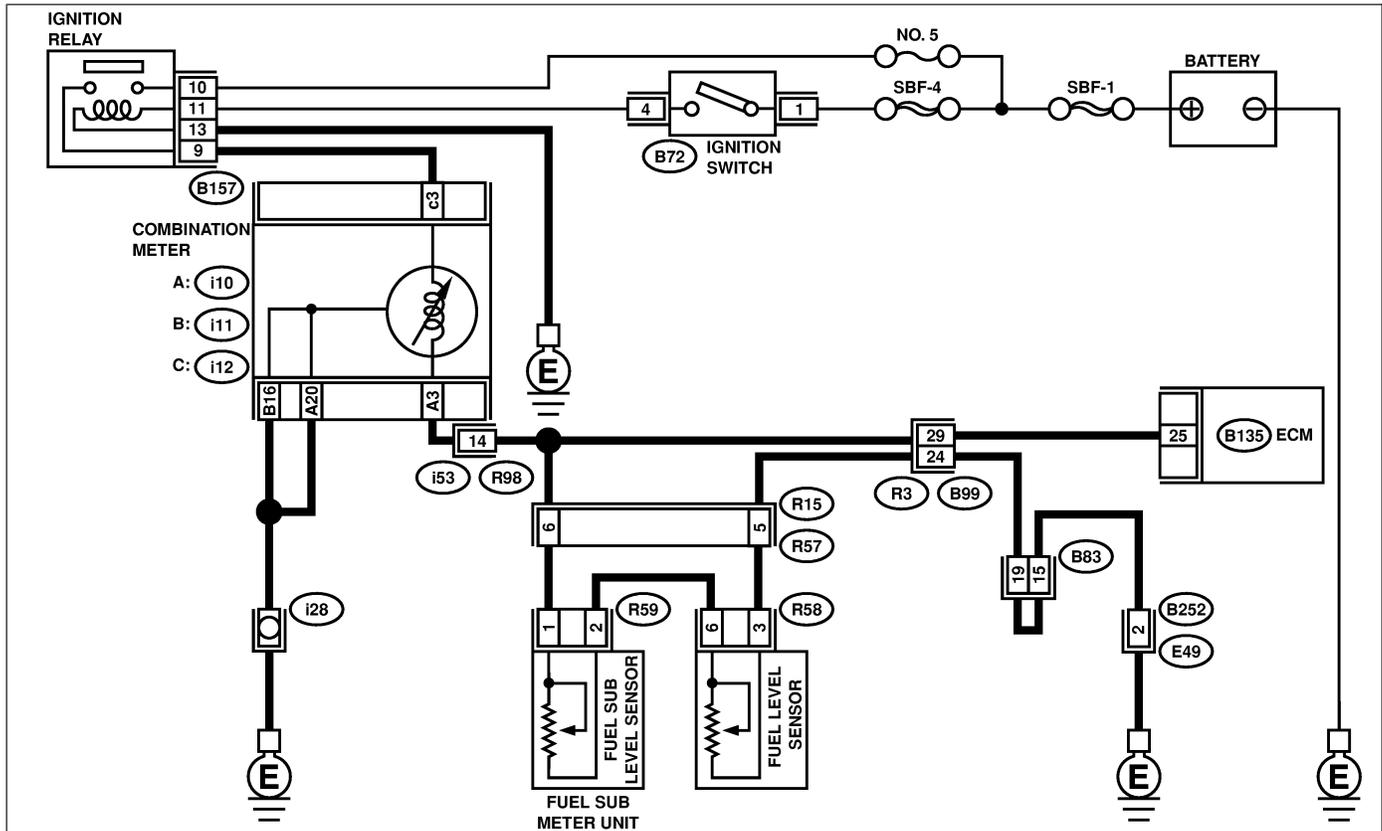
### • DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### • WIRING DIAGRAM:



B2M4670

No.	Step	Check	Yes	No
1	CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does speedometer and tachometer operate normally?	Go to step 2.	Repair or replace combination meter. <Ref. to IDI-4, Combination Meter System.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<p><b>CHECK INPUT SIGNAL FOR ECM.</b>                      1) Turn ignition switch to ON. (Engine OFF)                      2) Measure voltage between ECM connector and chassis ground.  <i>Connector &amp; terminal</i>  <i>(B135) No. 25 (+) — Chassis ground (-):</i></p>	Is the voltage less than 0.12 V?	Go to step 4.	Go to step 3.
3	<p><b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b>                      Read data of fuel level sensor signal using Subaru Select Monitor.                      NOTE:                      ● Subaru Select Monitor                      For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".                      &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p>	Does the value change less than 0.12 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: ● Poor contact in combination meter connector ● Poor contact in ECM connector ● Poor contact in coupling connectors
4	<p><b>CHECK INPUT VOLTAGE OF ECM.</b>                      1) Turn ignition switch to OFF.                      2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15).                      3) Turn ignition switch to ON.                      4) Measure voltage of harness between ECM connector and chassis ground.  <i>Connector &amp; terminal</i>  <i>(B135) No. 25 (+) — Chassis ground (-):</i></p>	Is the voltage more than 0.12 V?	Go to step 5.	Go to step 7.
5	<p><b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connector from connector (i10) and ECM connector.                      3) Measure resistance between ECM and chassis ground.  <i>Connector &amp; terminal</i>  <i>(B135) No. 25 — Chassis ground:</i></p>	Is the resistance more than 1 MΩ?	Go to step 6.	Repair ground short circuit in harness between ECM and combination meter connector.
6	<p><b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER.</b>                      Measure resistance between ECM and combination meter connector.  <i>Connector &amp; terminal</i>  <i>(B135) No. 25 — (i10) No. 3:</i></p>	Is the resistance less than 10 Ω?	Repair or replace combination meter. <Ref. to IDI-4, Combination Meter System.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
7	<p><b>CHECK FUEL TANK CORD.</b></p> <p>1) Turn ignition switch to OFF.</p> <p>2) Disconnect connector from fuel sub level sensor.</p> <p>3) Measure resistance between fuel sub level sensor and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(R59) No. 1 — Chassis ground:</b></p>	Is the resistance more than 1 MΩ?	Go to step 8.	Repair ground short circuit in fuel tank cord.
8	<p><b>CHECK FUEL TANK CORD.</b></p> <p>1) Disconnect connector from fuel pump assembly.</p> <p>2) Measure resistance between fuel pump assembly and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(R59) No. 2 — Chassis ground:</b></p>	Is the resistance more than 1 MΩ?	Go to step 9.	Repair ground short circuit in fuel tank cord.
9	<p><b>CHECK FUEL LEVEL SENSOR.</b></p> <p><b>WARNING:</b> <b>During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.</b></p> <p>1) Remove fuel pump assembly. &lt;Ref. to FU(H6)-70, Fuel Pump.&gt;</p> <p>2) Measure resistance between fuel level sensor and terminals with its float set to the full position.</p> <p><b>Terminals</b> <b>No. 3 — No. 6:</b></p>	Is the resistance between 0.5 and 2.5 Ω?	Go to step 10.	Replace fuel level sensor.
10	<p><b>CHECK FUEL SUB LEVEL SENSOR.</b></p> <p><b>WARNING:</b> <b>During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.</b></p> <p>1) Remove fuel sub level sensor. &lt;Ref. to FU(H6)-74, Fuel Sub Level Sensor.&gt;</p> <p>2) Measure resistance between fuel sub level sensor and terminals with its float set to the full position.</p> <p><b>Terminals</b> <b>No. 1 — No. 2:</b></p>	Is the resistance between 0.5 and 2.5 Ω?	Repair poor contact in harness between ECM and combination meter connector.	Replace fuel sub level sensor.

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## BK: DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT — S048521B56

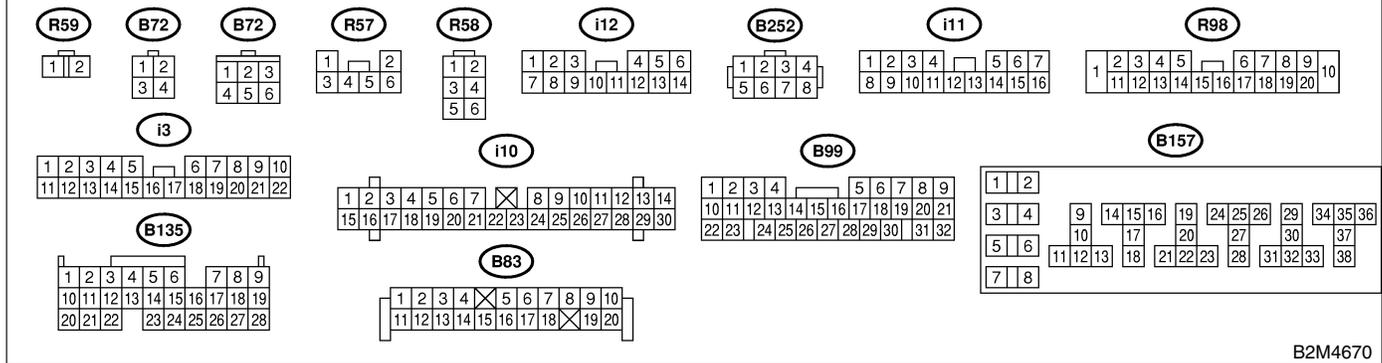
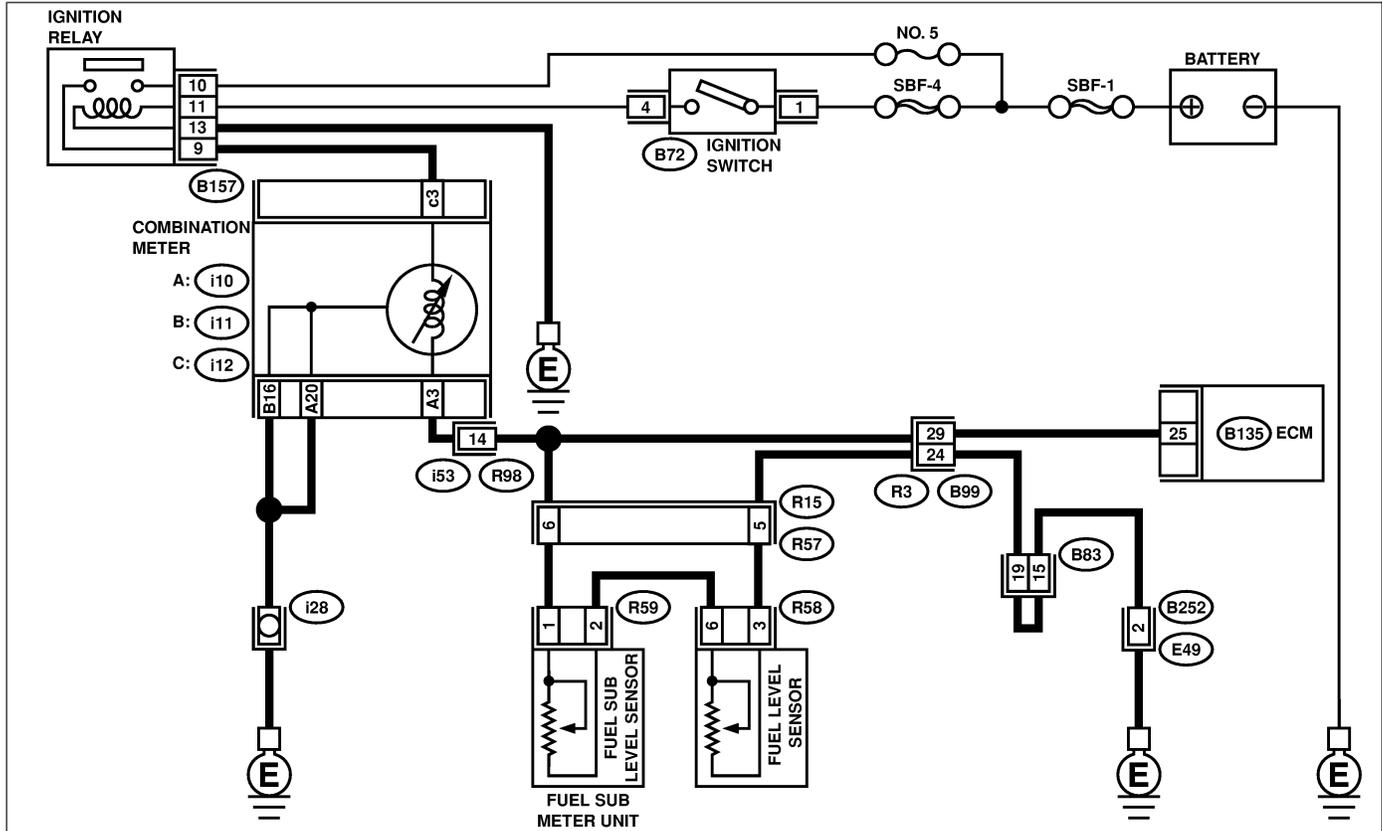
### • DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### • WIRING DIAGRAM:



B2M4670

No.	Step	Check	Yes	No
1	CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does speedometer and tachometer operate normally?	Go to step 2.	Repair or replace combination meter. <Ref. to IDI-4, Combination Meter System.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<p><b>CHECK INPUT SIGNAL FOR ECM.</b>                      1) Turn ignition switch to ON. (Engine OFF)                      2) Measure voltage between ECM connector and chassis ground.  <b>Connector &amp; terminal</b>  <i>(B135) No. 25 (+) — Chassis ground (-):</i></p>	Is the voltage more than 4.75 V?	Go to step 3.	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Poor contact in fuel pump connector</li> <li>● Poor contact in coupling connector</li> </ul>
3	<p><b>CHECK INPUT VOLTAGE OF ECM.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect combination meter connector (i10) and ECM connector.                      3) Turn ignition switch to ON.                      4) Measure voltage of harness between ECM and chassis ground.  <b>Connector &amp; terminal</b>  <i>(B135) No. 25 (+) — Chassis ground (-):</i></p>	Is the voltage more than 4.75 V?	Go to step 4.	Repair battery short circuit between ECM and combination meter connector.
4	<p><b>CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.</b>                      1) Turn ignition switch to OFF.                      2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15).                      3) Measure resistance between ECM and fuel tank cord.  <b>Connector &amp; terminal</b>  <i>(B135) No. 25 — (R15) No. 6:</i></p>	Is the resistance less than 5 Ω?	Go to step 5.	Repair open circuit between ECM and fuel tank cord.
5	<p><b>CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.</b>                      Measure resistance between fuel tank cord and chassis ground.  <b>Connector &amp; terminal</b>  <i>(R15) No. 5 — Chassis ground:</i></p>	Is the resistance less than 5 Ω?	Go to step 6.	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors
6	<p><b>CHECK FUEL TANK CORD.</b>                      1) Disconnect connector from fuel level sensor.                      2) Measure resistance between fuel level sensor and coupling connector.  <b>Connector &amp; terminal</b>  <i>(R57) No. 5 — (R58) No. 3:</i></p>	Is the resistance less than 10 Ω?	Go to step 7.	Repair open circuit between coupling connector and fuel level sensor.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
7	<p><b>CHECK FUEL TANK CORD.</b></p> <p>1) Disconnect connector from fuel sub level sensor.</p> <p>2) Measure resistance between fuel level sensor and fuel sub level sensor.</p> <p><b>Connector &amp; terminal</b> <b>(R58) No. 6 — (R59) No. 2:</b></p>	Is the resistance less than 10 Ω?	Go to step 8.	Repair open circuit between fuel level sensor and fuel sub level sensor.
8	<p><b>CHECK FUEL TANK CORD.</b></p> <p>Measure resistance between fuel sub level sensor and coupling connector.</p> <p><b>Connector &amp; terminal</b> <b>(R57) No. 6 — (R59) No. 1:</b></p>	Is the resistance less than 10 Ω?	Go to step 9.	Repair open circuit between coupling connector and fuel sub level sensor.
9	<p><b>CHECK FUEL LEVEL SENSOR.</b></p> <p><b>WARNING:</b> <b>During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.</b></p> <p>1) Remove fuel pump assembly. &lt;Ref. to FU(H6)-70, Fuel Pump.&gt;</p> <p>2) While moving fuel level sensor float up and down, measure resistance between fuel level sensor terminals.</p> <p><b>Terminals</b> <b>No. 3 — No. 6:</b></p>	Is the resistance more than 54.5 Ω?	Replace fuel level sensor. <Ref. to FU(H6)-73, Fuel Level Sensor.>	Go to step 10.
10	<p><b>CHECK FUEL SUB LEVEL SENSOR.</b></p> <p><b>WARNING:</b> <b>During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.</b></p> <p>1) Remove fuel sub level sensor. &lt;Ref. to FU(H6)-74, Fuel Sub Level Sensor.&gt;</p> <p>2) While moving fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals.</p> <p><b>Terminals</b> <b>No. 1 — No. 2:</b></p>	Is the resistance more than 41.5 Ω?	Replace fuel sub level sensor. <Ref. to FU(H6)-74, Fuel Sub Level Sensor.>	Replace combination meter. <Ref. to IDI-11, Combination Meter Assembly.>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## BL: DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT INPUT— S048521G01

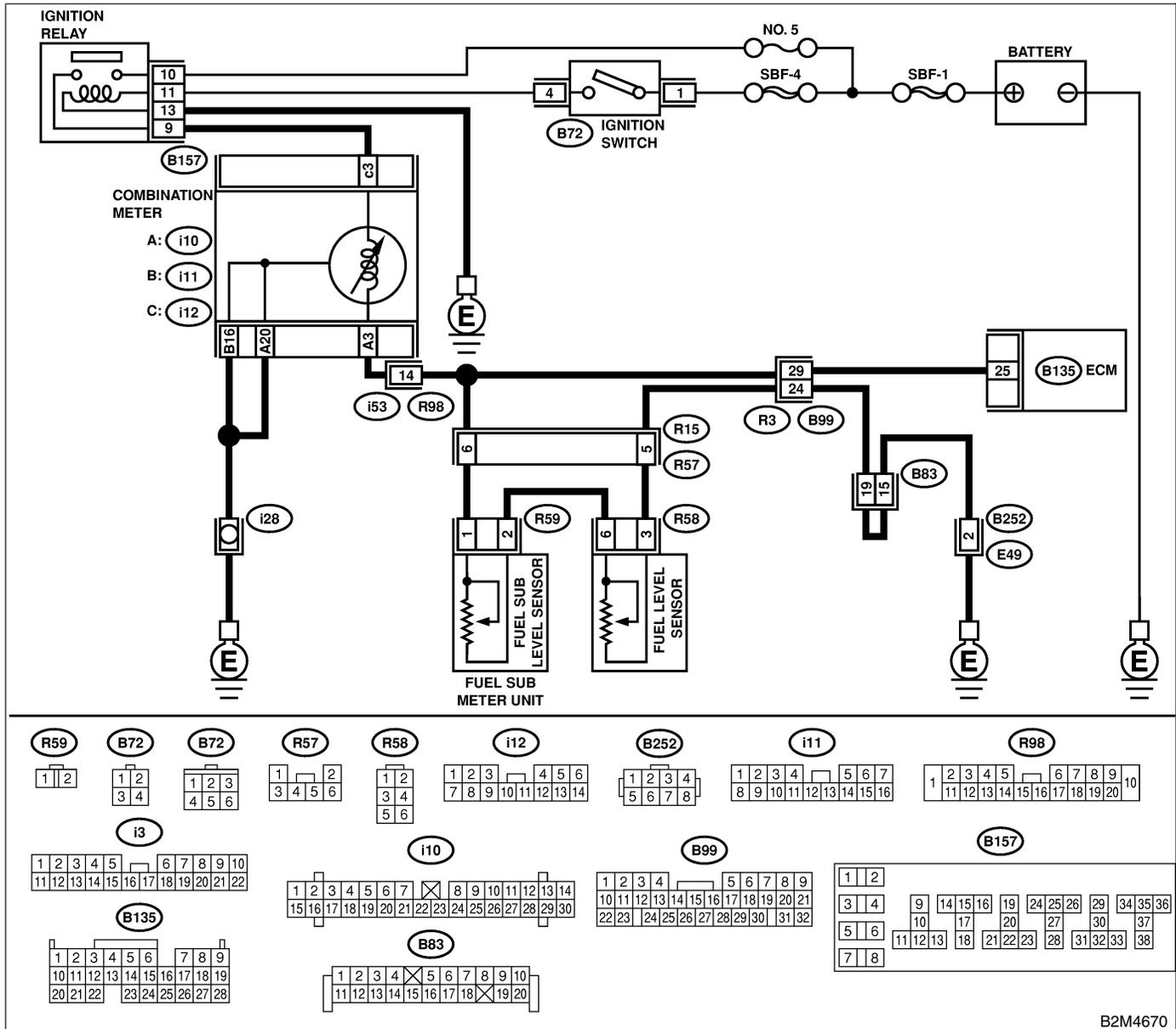
### • DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### • WIRING DIAGRAM:



B2M4670

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK FUEL LEVEL SENSOR.</b> 1) Remove fuel pump assembly. <Ref. to FU(H6)-70, Fuel Pump.> 2) While moving fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. <b>Terminals</b> <b>No. 3 — No. 6:</b>	Does the resistance change smoothly?	Go to step 3.	Replace fuel level sensor. <Ref. to FU(H6)-73, Fuel Level Sensor.>
3	<b>CHECK FUEL SUB LEVEL SENSOR.</b> <b>WARNING:</b> <b>During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.</b> 1) Remove fuel sub level sensor. <Ref. to FU(H6)-74, Fuel Sub Level Sensor.> 2) While moving fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. <b>Terminals</b> <b>No. 1 — No. 2:</b>	Does the resistance change smoothly?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace fuel sub level sensor. <Ref. to FU(H6)-74, Fuel Sub Level Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

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## BM: DTC P0483 — COOLING FAN FUNCTION PROBLEM — S048521B58

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Occurrence of noise
  - Overheating

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

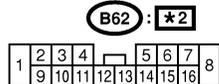
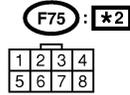
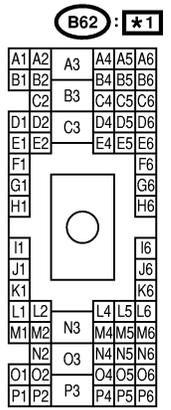
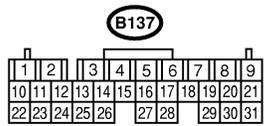
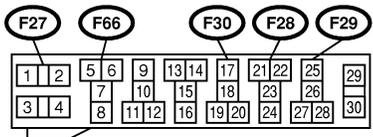
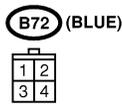
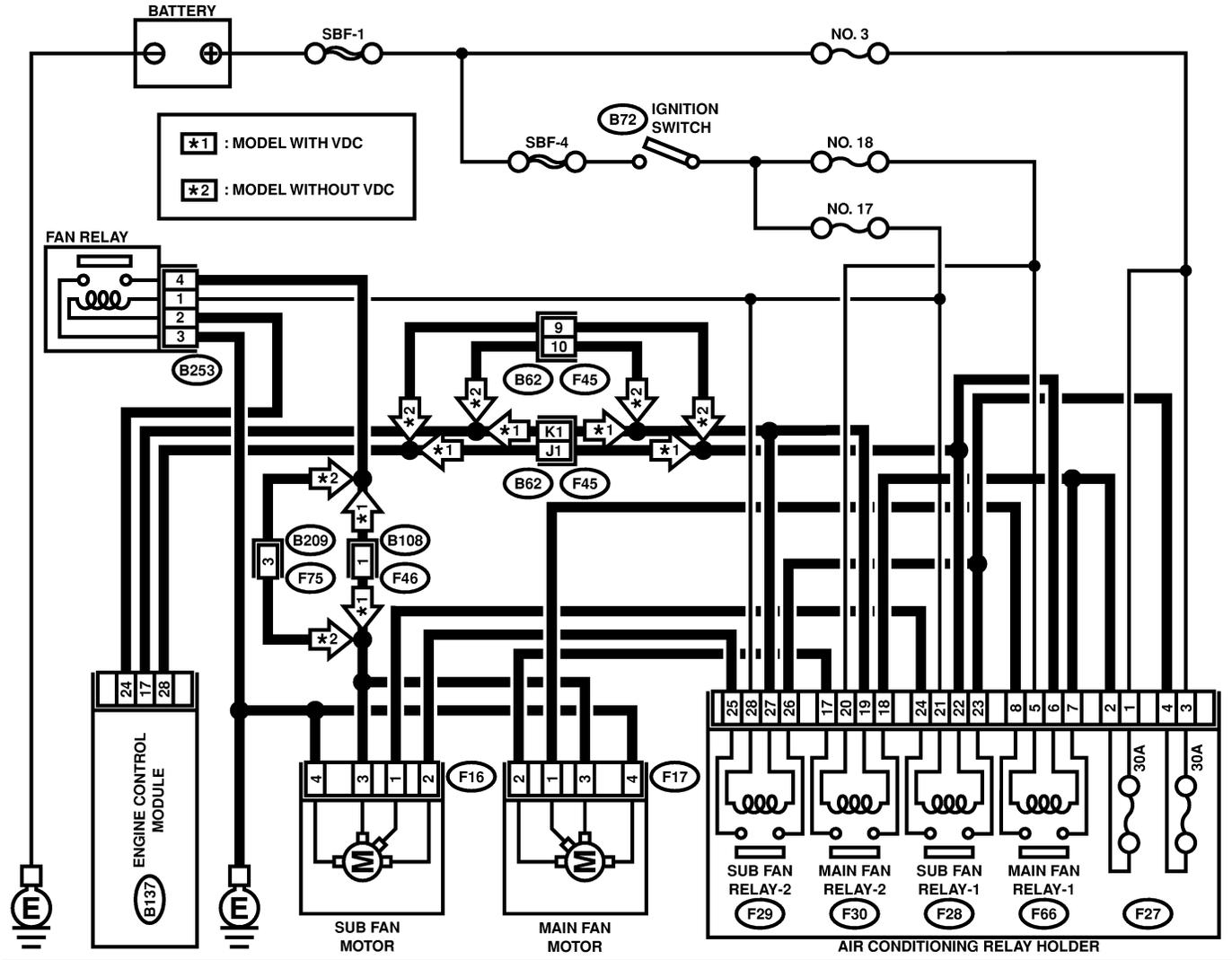
### NOTE:

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.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

● WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor. <Ref. to CO(H6)-7, INSPECTION, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H6)-13, INSPECTION, Radiator Sub Fan and Fan Motor.>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

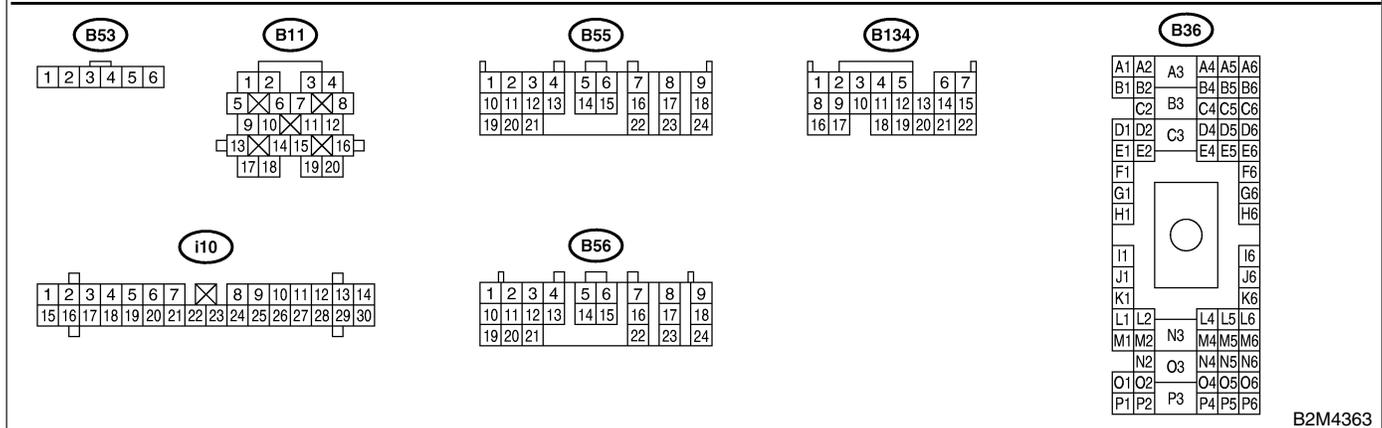
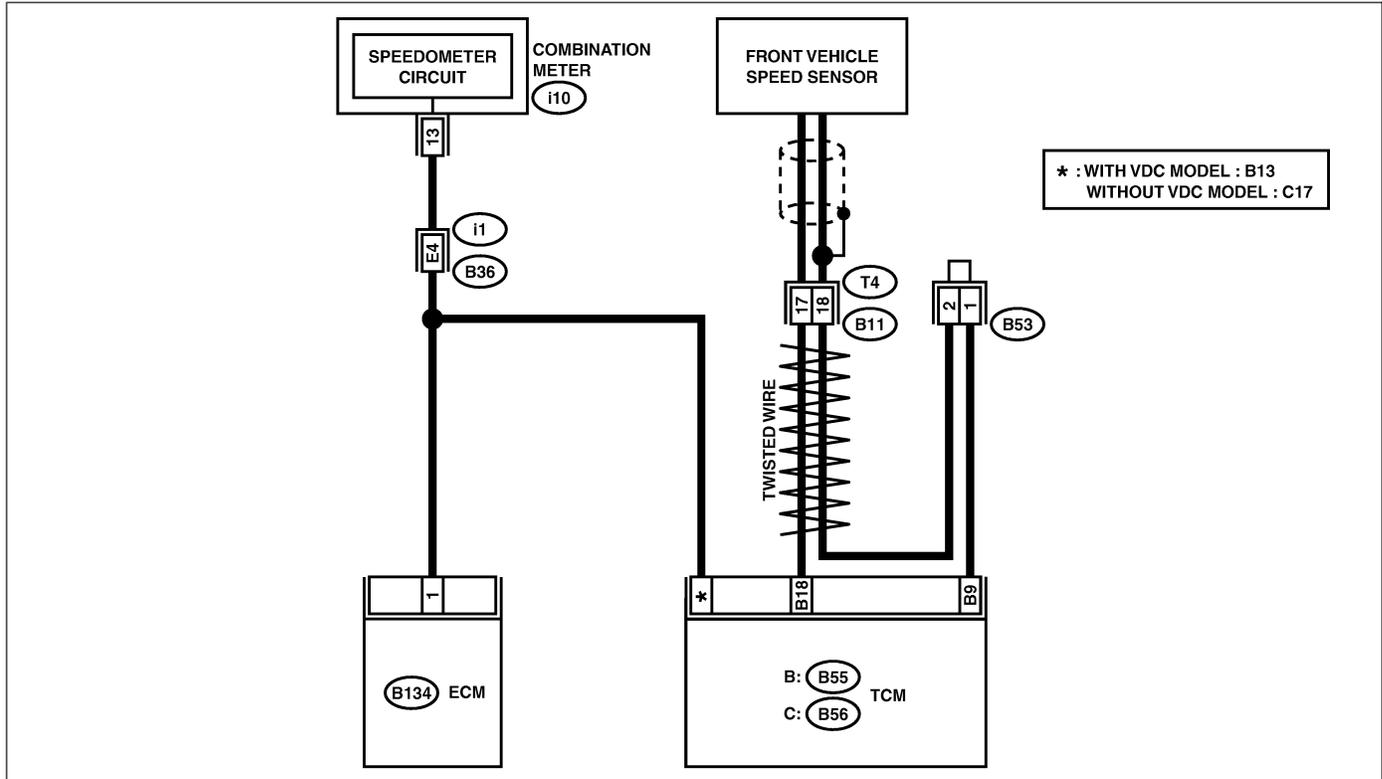
## BN: DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION — S048521B59

- DTC DETECTING CONDITION:
  - Immediately at fault recognition

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

- WIRING DIAGRAM:



B2M4363

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK DTC P0720 ON DISPLAY.</b>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check front vehicle speed sensor signal circuit. <Ref. to AT-60, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK SPEEDOMETER OPERATION IN COMBINATION METER.</b>	Does speedometer operate normally?	Go to step 3.	Check speedometer and vehicle speed sensor. <Ref. to IDI-13, Speedometer.>, <Ref. to AT-33, Front Vehicle Speed Sensor.>, <Ref. to AT-37, Rear Vehicle Speed Sensor.> and <Ref. to AT-38, Torque Converter Turbine Speed Sensor.>
3	<b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from combination meter. 3) Measure resistance between ECM and combination meter. <b>Connector &amp; terminal</b> <b>(B134) No. 1 — (i10) No. 13:</b>	Is the resistance less than 10 Ω?	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between ECM and combination meter connector ● Poor contact in ECM connector ● Poor contact in combination meter connector ● Poor contact in coupling connector

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## BO: DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

S048521B61

### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

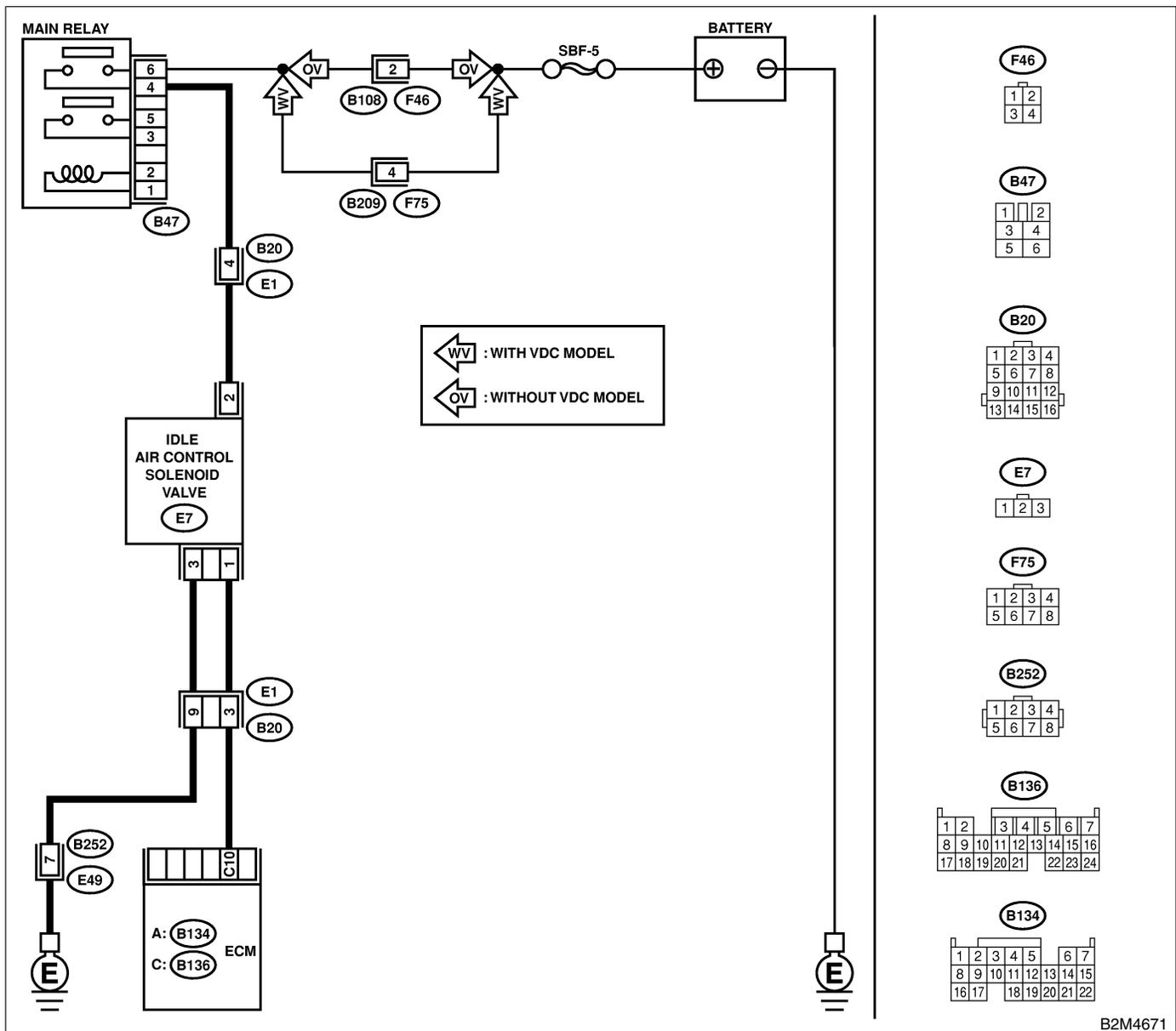
### ● TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4671

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between ECM and chassis ground.  <b>Connector &amp; terminal</b>  <i>(B136) No. 10 (+) — Chassis ground (-):</i></p>	Is the voltage more than 3 V?	Repair poor contact in ECM connector.	Go to step 2.
2	<p><b>CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connector from idle air control solenoid valve.                      3) Turn ignition switch to ON.                      4) Measure voltage between idle air control solenoid valve and engine ground.  <b>Connector &amp; terminal</b>  <i>(E7) No. 2 (+) — Engine ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between idle air control solenoid valve and main relay connector</li> <li>● Poor contact in coupling connector</li> </ul>
3	<p><b>CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connector from ECM.                      3) Measure resistance of harness between ECM and idle air control solenoid valve connector.  <b>Connector &amp; terminal</b>  <i>(B136) No. 10 — (E7) No. 1:</i></p>	Is the resistance less than 1 $\Omega$ ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and idle air control solenoid valve connector</li> <li>● Poor contact in coupling connector</li> </ul>
4	<p><b>CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.</b>                      Measure resistance of harness between ECM and chassis ground.  <b>Connector &amp; terminal</b>  <i>(B136) No. 10 — Chassis ground:</i></p>	Is the resistance less than 10 $\Omega$ ?	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.	Go to step 5.
5	<p><b>CHECK GROUND CIRCUIT OF IDLE AIR CONTROL SOLENOID VALVE.</b>                      Measure resistance of harness between idle air control solenoid valve connector and engine ground.  <b>Connector &amp; terminal</b>  <i>(E7) No. 3 — Engine ground:</i></p>	Is the resistance less than 5 $\Omega$ ?	Go to step 6.	Repair open circuit in harness between idle air control solenoid valve connector and engine ground terminal.
6	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM and idle air control solenoid valve connectors.</p>	Is there poor contact in ECM and idle air control solenoid valve connectors?	Repair poor contact in ECM and idle air control solenoid valve connectors.	Replace idle air control solenoid valve. <Ref. to FU(H6)-36, Idle Air Control Solenoid Valve.>

**BP: DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED**

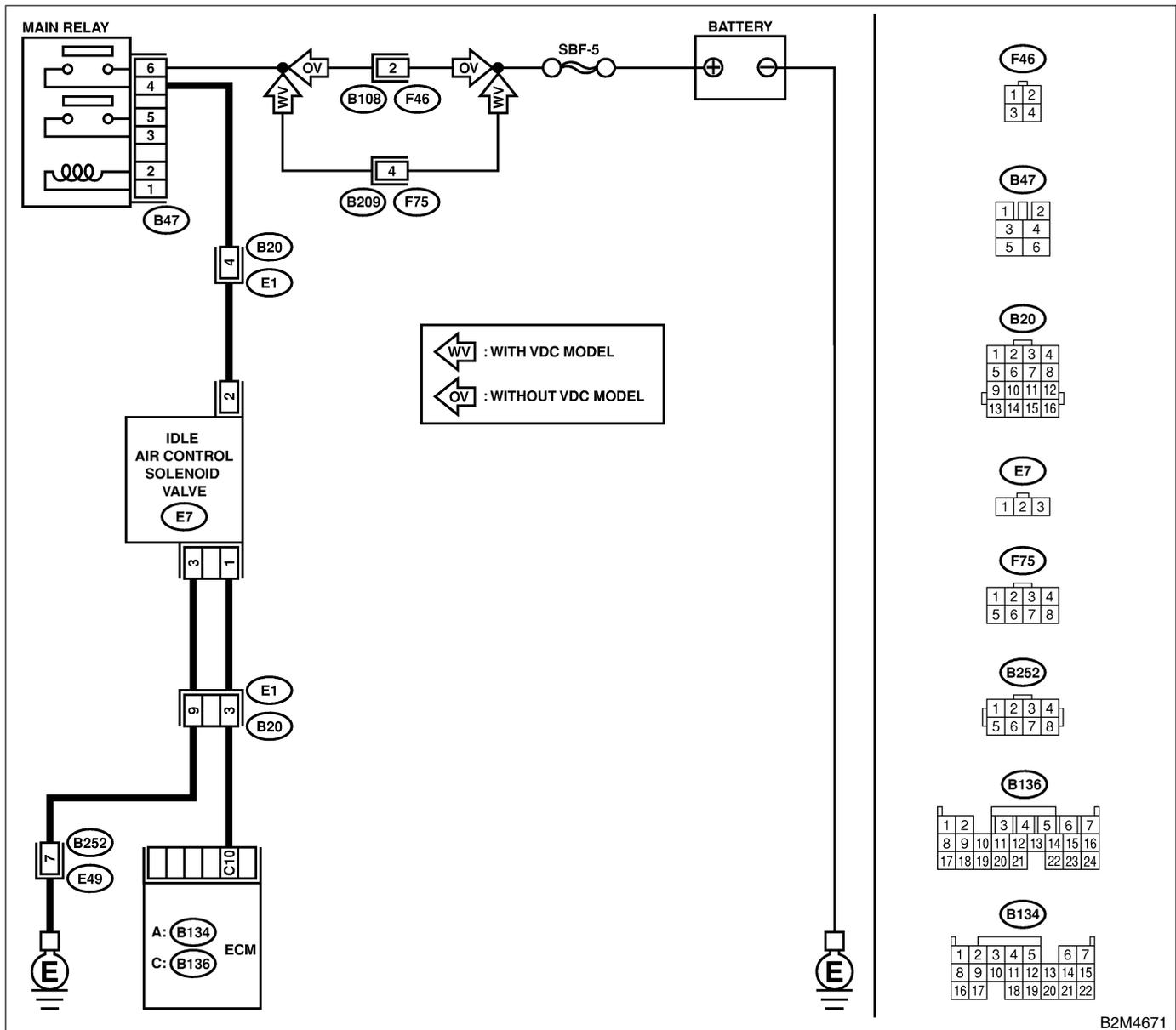
— S048521B62

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine does not return to normal idle speed.

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4671

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step 2.
2	<b>CHECK IDLE AIR CONTROL SOLENOID VALVE.</b> 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H6)-36, Idle Air Control Solenoid Valve.> 3) Using an air gun, force air into idle air control solenoid valve by-pass air inlet. Confirm that forced air subsequently escapes from both main air passage and assist air passage.	Does air flow out?	Go to step 4.	Replace idle air control solenoid valve. <Ref. to FU(H6)-36, Idle Air Control Solenoid Valve.> After replace, Go to step 3.
3	<b>CHECK IDLE AIR CONTROL SOLENOID VALVE DUTY RATIO.</b> 1) Turn ignition switch to ON. 2) Start engine, and warm-up the engine. 3) Turn all accessory switches to OFF. 4) Read data of idle air control solenoid valve duty ratio using Subaru Select Monitor or OBD-II general scan tool. NOTE: ● Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6)-37, Subaru Select Monitor.> ● OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 60%?	Go to step 4.	END.
4	<b>CHECK BY-PASS AIR LINE.</b> 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H6)-36, Idle Air Control Solenoid Valve.> 3) Remove throttle body to intake manifold. <Ref. to FU(H6)-16, Throttle Body.> 4) Using an air gun, force air into solenoid valve installation area and throttle valve interior. Confirm that forced air subsequently escapes from both these areas.	Does air flow out?	Replace idle air control solenoid valve. <Ref. to FU(H6)-36, Idle Air Control Solenoid Valve.>	Replace throttle body. <Ref. to FU(H6)-16, Throttle Body.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

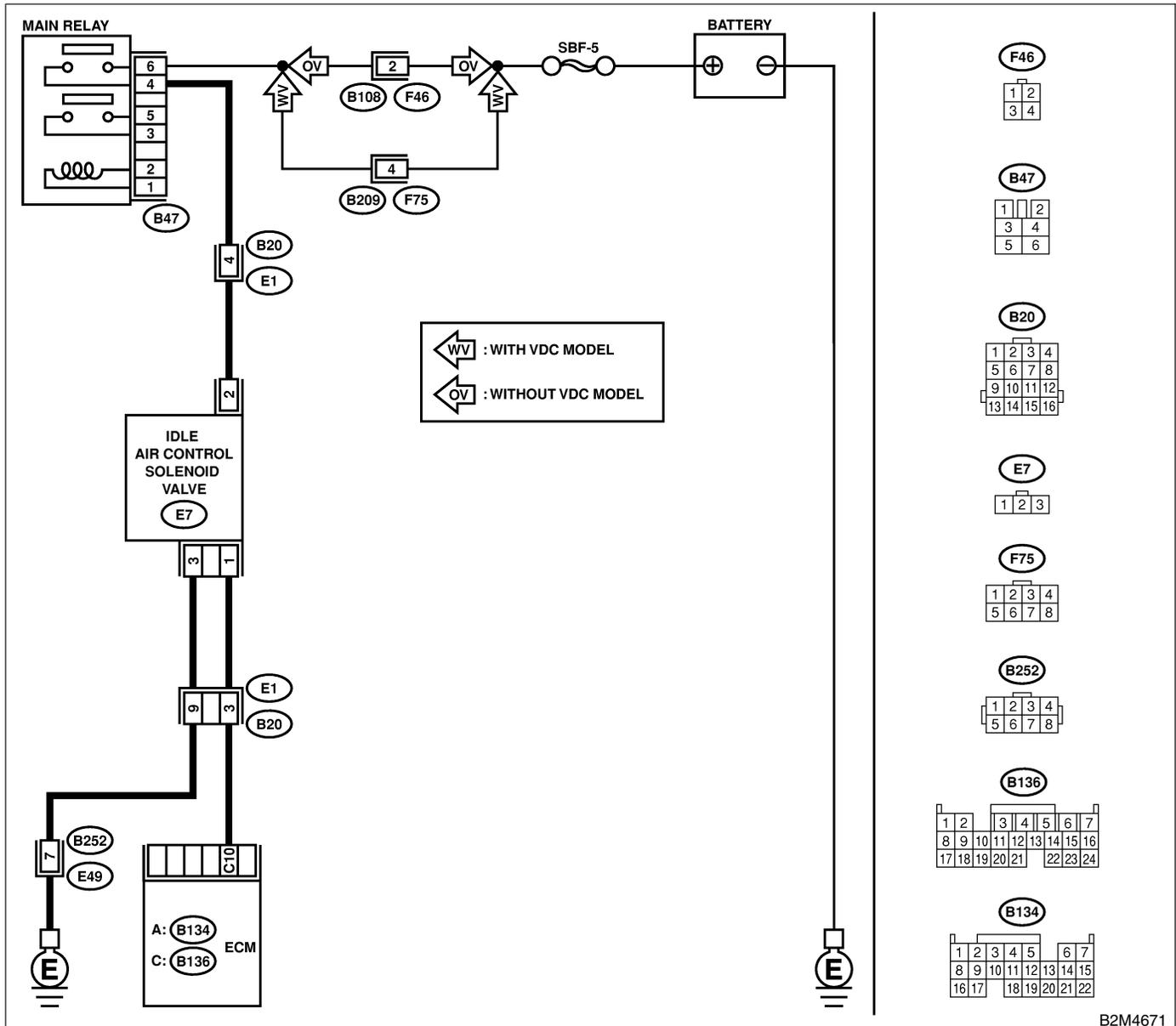
## BQ: DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW INPUT — S048521H09

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4671

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between ECM and chassis ground.  <i>Connector &amp; terminal</i>  <i>(B136) No. 10 (+) — Chassis ground (-):</i></p>	Is the voltage more than 3 V?	Repair poor contact in ECM connector.	Go to step 2.
2	<p><b>CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connector from idle air control solenoid valve.                      3) Turn ignition switch to ON.                      4) Measure voltage between idle air control solenoid valve and engine ground.  <i>Connector &amp; terminal</i>  <i>(E7) No. 2 (+) — Engine ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 3.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between idle air control solenoid valve and main relay connector</li> <li>● Poor contact in coupling connector</li> </ul>
3	<p><b>CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connector from ECM.                      3) Measure resistance of harness between ECM and idle air control solenoid valve connector.  <i>Connector &amp; terminal</i>  <i>(B136) No. 10 — (E7) No. 1:</i></p>	Is the resistance less than 1 $\Omega$ ?	Go to step 4.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and idle air control solenoid valve connector</li> <li>● Poor contact in coupling connector</li> </ul>
4	<p><b>CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.</b>                      Measure resistance of harness between ECM and chassis ground.  <i>Connector &amp; terminal</i>  <i>(B136) No. 10 — Chassis ground:</i></p>	Is the resistance less than 10 $\Omega$ ?	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.	Go to step 5.
5	<p><b>CHECK GROUND CIRCUIT OF IDLE AIR CONTROL SOLENOID VALVE.</b>                      Measure resistance of harness between idle air control solenoid valve connector and engine ground.  <i>Connector &amp; terminal</i>  <i>(E7) No. 3 — Engine ground:</i></p>	Is the resistance less than 5 $\Omega$ ?	Go to step 6.	Repair open circuit in harness between idle air control solenoid valve connector and engine ground terminal.
6	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM and idle air control solenoid valve connectors.</p>	Is there poor contact in ECM and idle air control solenoid valve connectors?	Repair poor contact in ECM and idle air control solenoid valve connectors.	Replace idle air control solenoid valve. <Ref. to FU(H6)-36, Idle Air Control Solenoid Valve.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

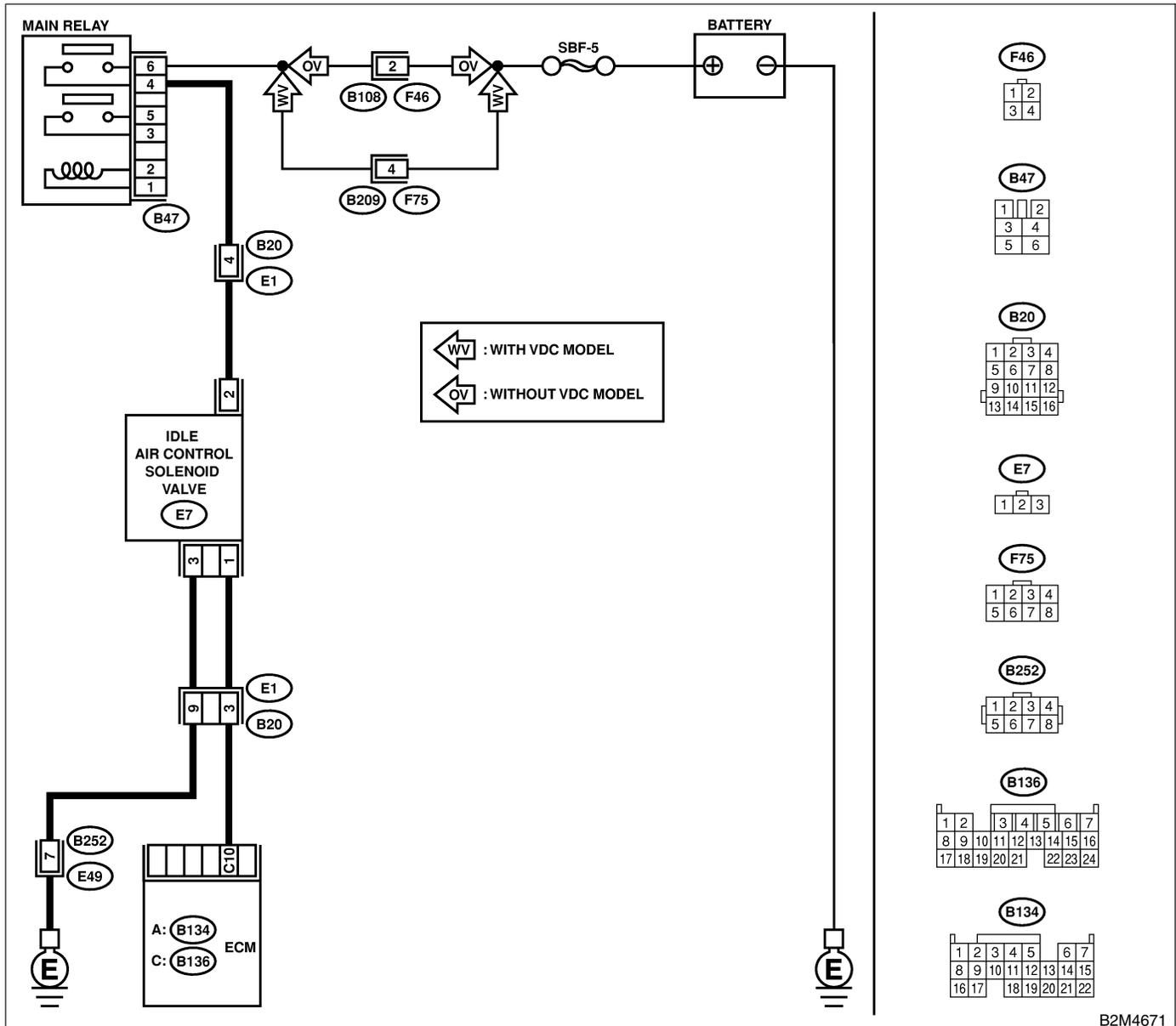
## BR: DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH INPUT — S048521H10

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4671

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK THROTTLE CABLE.</b>	Does throttle cable have play for adjustment?	Go to step 2.	Adjust throttle cable. <Ref. to SP(H6)-6, Accelerator Control Cable.>
2	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. <b>Connector &amp; terminal</b> <b>(B136) No. 10 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Go to step 3.	Go to step 4.
3	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. <b>Connector &amp; terminal</b> <b>(B136) No. 10 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Replace idle air control solenoid valve <Ref. to FU(H6)-36, Idle Air Control Solenoid Valve.> and ECM <Ref. to FU(H6)-47, Engine Control Module.>.
4	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM and chassis ground. <b>Connector &amp; terminal</b> <b>(B136) No. 10 (+) — Chassis ground (-):</b>	Does the voltage change more than 10 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

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## **BS: DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —** S048521G02

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

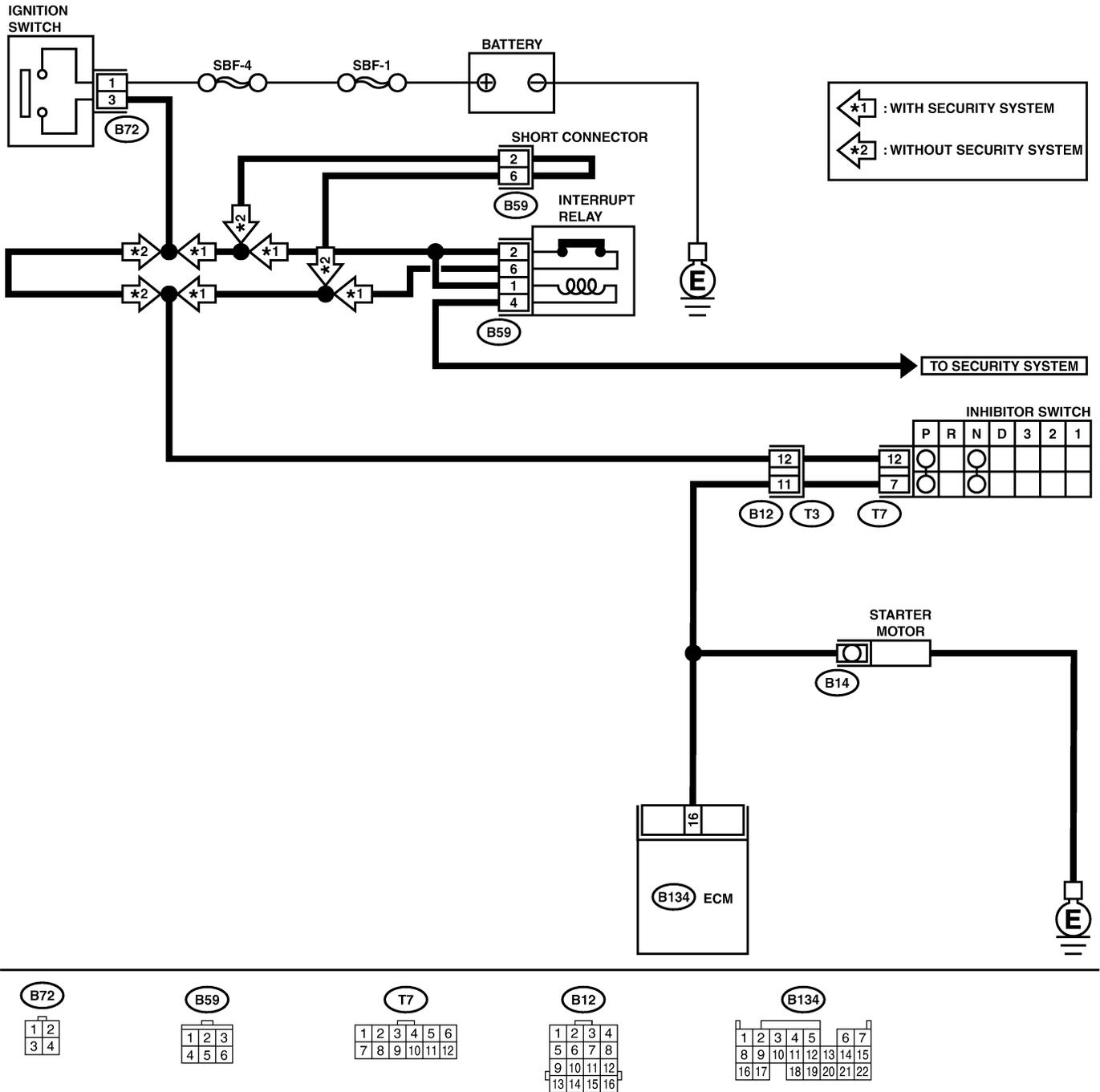
### **CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

● WIRING DIAGRAM:



B2M4339

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK OPERATION OF STARTER MOTOR.</b> NOTE: Place the inhibitor switch in each position.	Does starter motor operate when ignition switch to "ON"?	Repair battery short circuit in starter motor circuit.	Check starter motor circuit. <Ref. to EC(H6)-77, Diagnostics for Engine Starting Failure.>

**MEMO:**

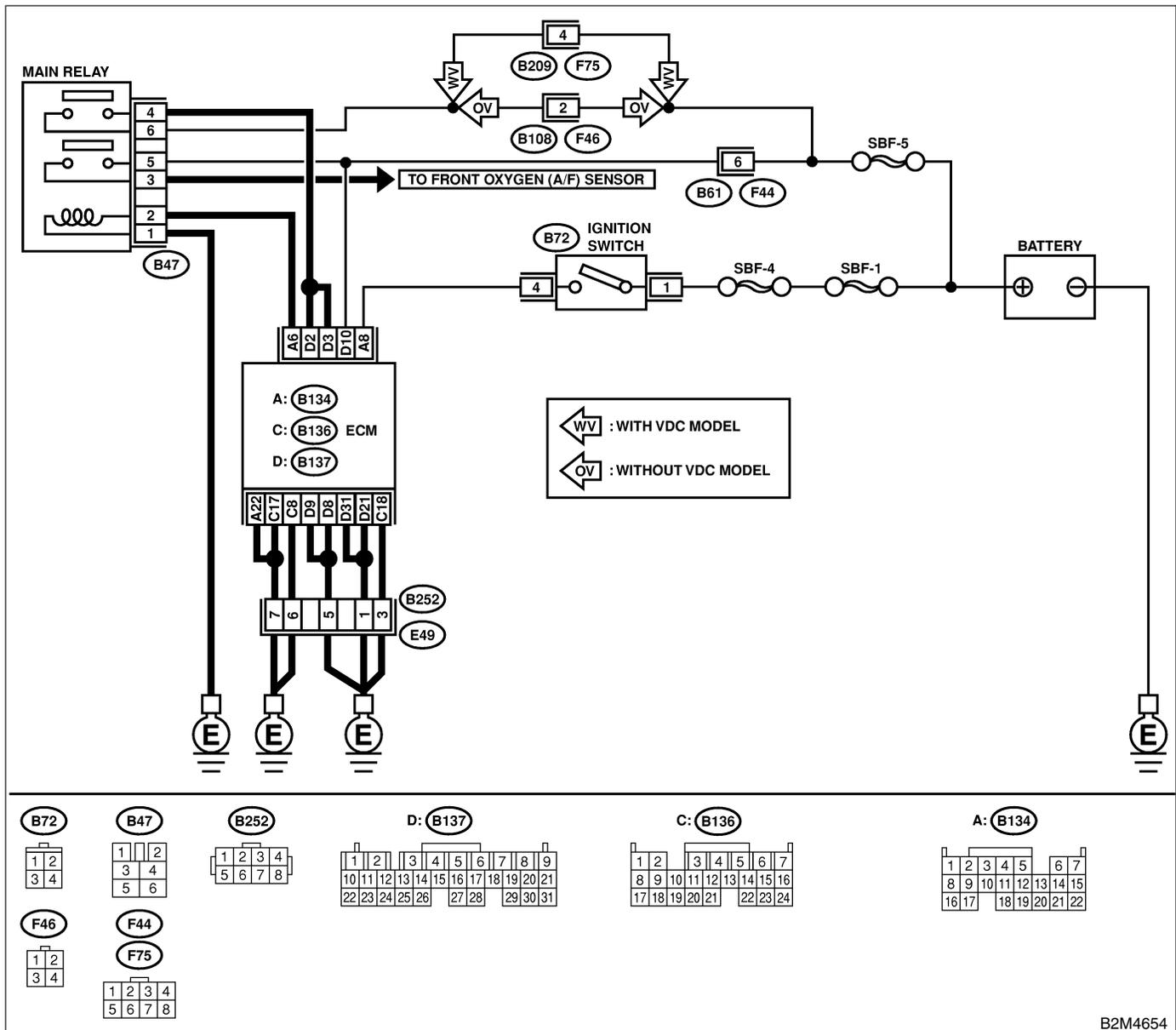
**BT: DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR** — S048521G03

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine does not start.
  - Engine stalls.

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4654

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	It is not necessary to inspect DTC P0604.

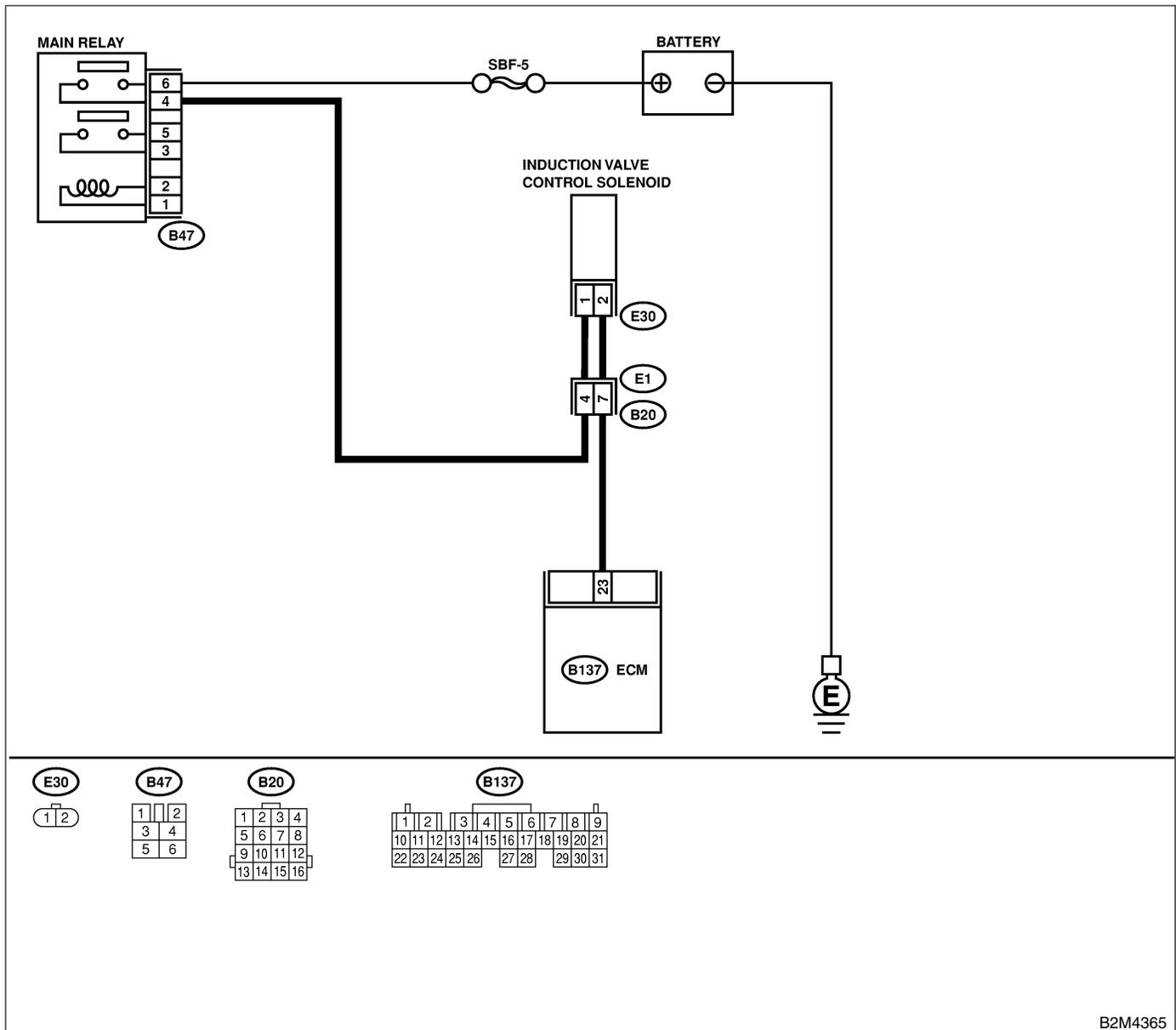
**BU: DTC P0661 — INDUCTION VALVE CONTROL SOLENOID CIRCUIT LOW INPUT** — S048521H11

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4365

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK INPUT SIGNAL OF ECM.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b>  <i>(B137) No. 23 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
2	<p><b>CHECK HARNESS BETWEEN INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connectors from induction control solenoid valve and ECM.                      3) Measure resistance of harness between induction control solenoid valve connector and engine ground.</p> <p><b>Connector &amp; terminal</b>  <i>(E30) No. 2 — Engine ground:</i></p>	Is the resistance less than 10 $\Omega$ ?	Repair ground short circuit in harness between ECM and induction control solenoid valve connector.	Go to step 3.
3	<p><b>CHECK HARNESS BETWEEN INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b>                      Measure resistance of harness between ECM and induction control solenoid valve of harness connector.</p> <p><b>Connector &amp; terminal</b>  <i>(B137) No. 23 — (E30) No. 2:</i></p>	Is the resistance less than 1 $\Omega$ ?	Go to step 4.	Repair open circuit in harness between ECM and induction control solenoid valve connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and induction control solenoid valve connector</li> <li>● Poor contact in coupling connector</li> </ul>
4	<p><b>CHECK INDUCTION CONTROL SOLENOID VALVE.</b>                      1) Remove induction control solenoid valve.                      2) Measure resistance between induction control solenoid valve terminals.</p> <p><b>Terminals</b>  <i>No. 1 — No. 2:</i></p>	Is the resistance between 37 and 44 $\Omega$ ?	Go to step 5.	Replace induction control solenoid valve. <Ref. to FU(H6)-38, Induction Valve Control Solenoid.>
5	<p><b>CHECK POWER SUPPLY TO INDUCTION CONTROL SOLENOID VALVE.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between induction control solenoid valve and engine ground.</p> <p><b>Connector &amp; terminal</b>  <i>(E30) No. 1 (+) — Engine ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 6.	Repair open circuit in harness between main relay and induction control solenoid valve connector.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<b>CHECK POOR CONTACT.</b> Check poor contact in induction control solenoid valve connector.	Is there poor contact in induction control solenoid valve connector?	Repair poor contact in induction control solenoid valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## BV: DTC P0662 — INDUCTION VALVE CONTROL SOLENOID CIRCUIT HIGH INPUT — S048521H12

### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

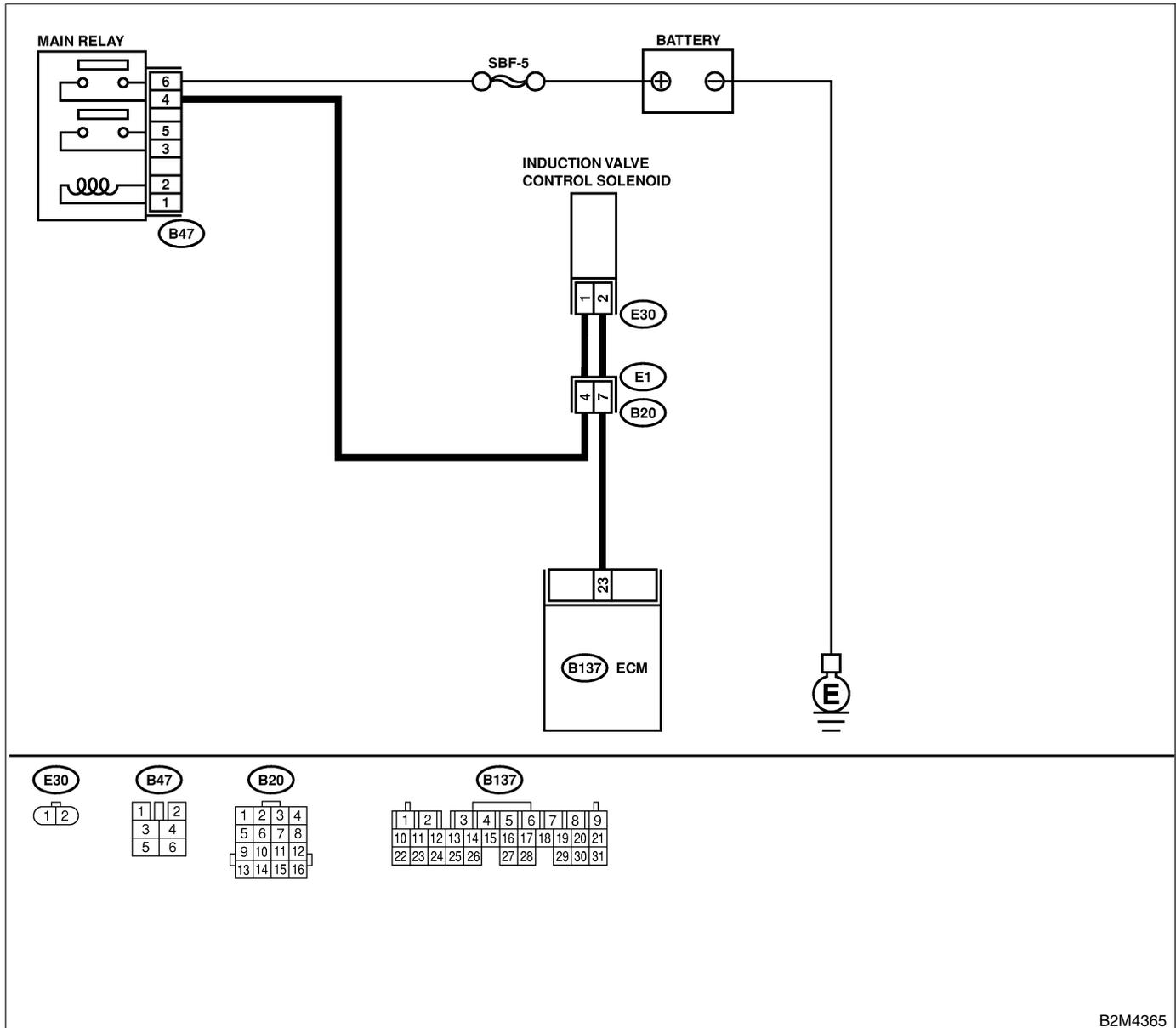
### ● TROUBLE SYMPTOM:

- Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4365

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK INPUT SIGNAL OF ECM.</b> 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. <i>Connector &amp; terminal</i> <i>(B137) No. 23 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 3.	Go to step 2.
2	<b>CHECK POOR CONTACT.</b> Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>
3	<b>CHECK HARNESS BETWEEN INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connector from induction control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. <i>Connector &amp; terminal</i> <i>(B134) No. 23 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and induction control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Go to step 4.
4	<b>CHECK INDUCTION CONTROL SOLENOID VALVE.</b> 1) Turn ignition switch to OFF. 2) Measure resistance between induction control solenoid valve terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance less than 1 $\Omega$ ?	Replace induction control solenoid valve <Ref. to FU(H6)-38, Induction Valve Control Solenoid.> and ECM <Ref. to FU(H6)-47, Engine Control Module.>	Go to step 5.
5	<b>CHECK POOR CONTACT.</b> Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

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## **BW: DTC P0691 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —** S048521K19

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

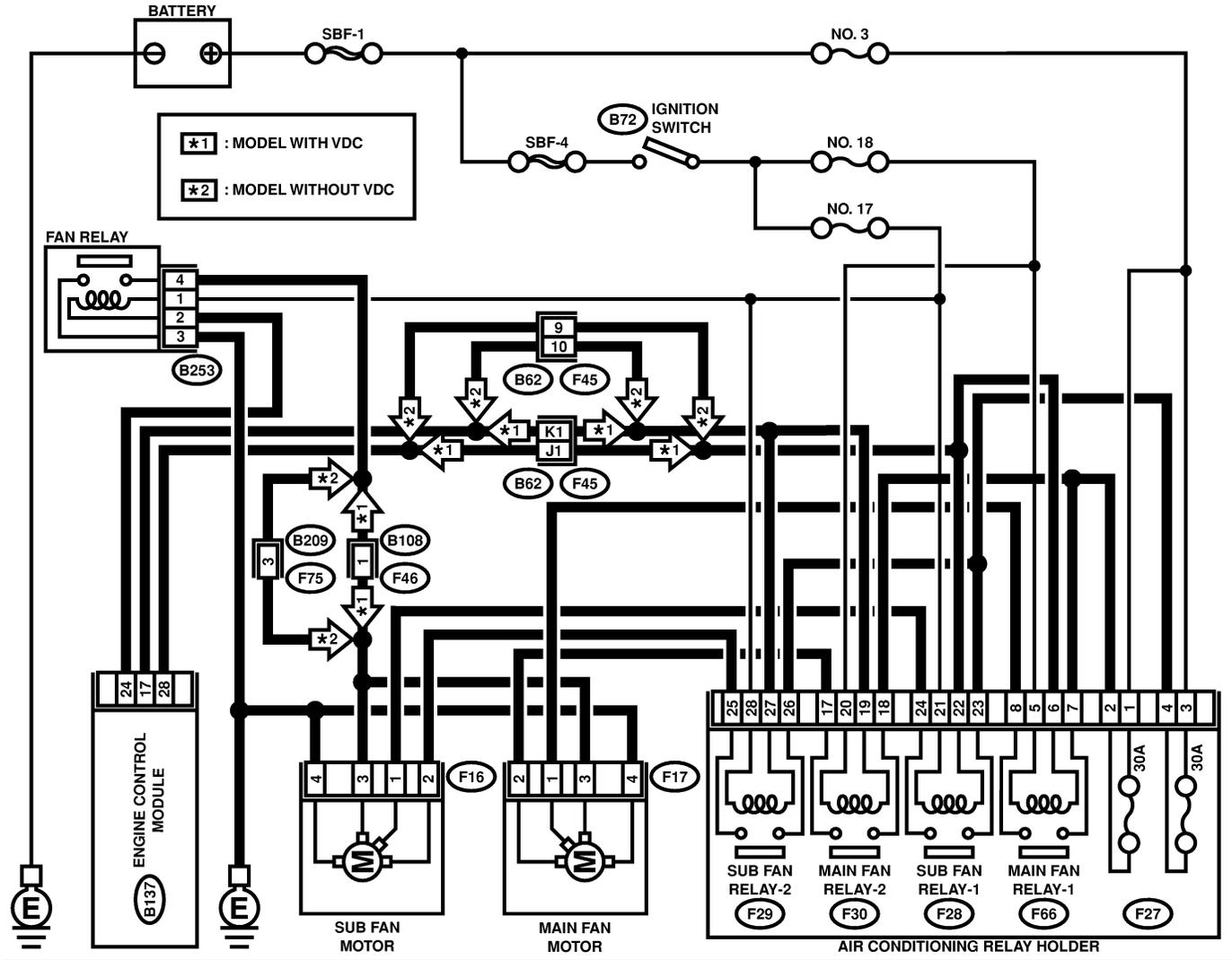
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

● WIRING DIAGRAM:



**(B72) (BLUE)**

1	2
3	4

**(F27) (F66) (F30) (F28) (F29)**

1	2	5	6	9	13	14	17	21	22	25	29
3	4	7	10	15	18	23	26				
		8	11	12	16	19	20	24	27	28	30

**(B137)**

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31					

**(B62) : \*1**

A1	A2	A3	A4	A5	A6
B1	B2	B3	B4	B5	B6
C1	C2	C3	C4	C5	C6
D1	D2	D3	D4	D5	D6
E1	E2	E3	E4	E5	E6
F1	F2	F3	F4	F5	F6
G1	G2	G3	G4	G5	G6
H1	H2	H3	H4	H5	H6
I1	I2	I3	I4	I5	I6
J1	J2	J3	J4	J5	J6
K1	K2	K3	K4	K5	K6
L1	L2	L3	L4	L5	L6
M1	M2	M3	M4	M5	M6
N1	N2	N3	N4	N5	N6
O1	O2	O3	O4	O5	O6
P1	P2	P3	P4	P5	P6

**(F16)**

1	2
3	4

**(B253)**

1	2	3
4	X	5

**(F75) : \*2**

1	2	3	4
5	6	7	8

**(B62) : \*2**

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

**(F46) : \*1**

1	2
3	4

B2M4755

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b></p> <p>1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) While operating radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(H6)-37, Subaru Select Monitor.&gt;</p> <p><b>Connector &amp; terminal</b> (B137) No. 28 (+) — Chassis ground (-): (B137) No. 17 (+) — Chassis ground (-):</p>	Does voltage change between 0 and 10 V?	Repair poor contact in ECM connector.	Go to step 2.
2	<p><b>CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY 1 CONTROL CIRCUIT.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. <b>Connector &amp; terminal</b> (B137) No. 28 — Chassis ground: (B137) No. 17 — Chassis ground:</p>	Is the resistance less than 10 Ω?	Repair ground short circuit in radiator fan relay 1 control circuit.	Go to step 3.
3	<p><b>CHECK POWER SUPPLY FOR RELAY.</b></p> <p>1) Remove main fan relays from A/C relay holder. 2) Turn ignition switch to ON. 3) Measure voltage between fuse and relay box (F/B) connector and chassis ground. <b>Connector &amp; terminal</b> (F66) No. 5 (+) — Chassis ground (-): (F30) No. 20 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	<p><b>CHECK MAIN FAN RELAYS.</b></p> <p>1) Turn ignition switch to OFF. 2) Measure resistance between main fan relay terminals. <b>Terminal</b> (F66) No. 5 — No. 6: (F30) No. 19 — No. 20:</p>	Is the resistance between 87 and 107 Ω?	Go to step 5.	Replace main fan relay.
5	<p><b>CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.</b></p> <p>Measure resistance of harness between ECM and main fan relay connector. <b>Connector &amp; terminal</b> (B137) No. 28 — (F66) No. 6: (B137) No. 17 — (F30) No. 20:</p>	Is the resistance less than 1 Ω?	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between ECM and main fan relay connector ● Poor contact in coupling connector

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<b>CHECK POOR CONTACT.</b> Check poor contact in ECM or main fan relay connector.	Is there poor contact in ECM or main fan relay connector?	Repair poor contact in ECM or main fan relay connector.	Contact with SOA (distributor) service.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

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## **BX: DTC P0692 — COOLING FAN RELAY 1 CIRCUIT HIGH INPUT —** S048521K20

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

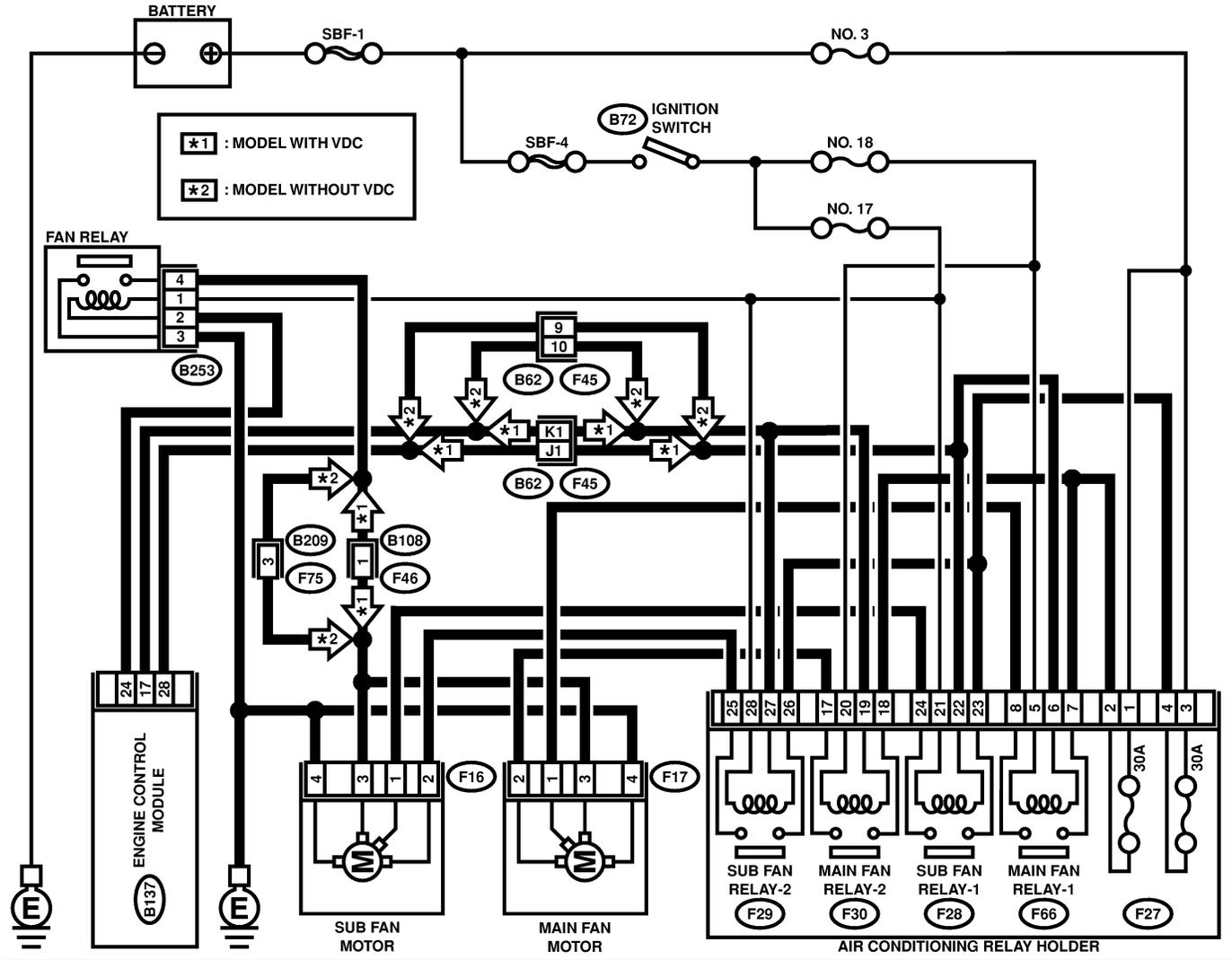
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

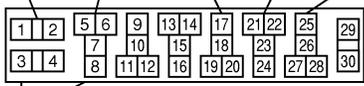
● WIRING DIAGRAM:



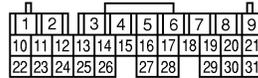
(B72) (BLUE)



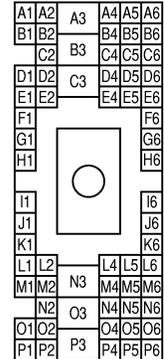
(F27) (F66) (F30) (F28) (F29)



(B137)



(B62) : \*1



(F16)



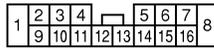
(B253)



(F75) : \*2



(B62) : \*2



(F46) : \*1



B2M4755

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b></p> <p>1) Turn ignition switch to OFF.                      2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.                      3) Turn ignition switch to ON.                      4) While operating radiator fan relay, measure voltage between ECM and chassis ground.</p> <p>NOTE:                      Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.&gt;</p> <p><b>Connector &amp; terminal</b>                      (B137) No. 28 (+) — Chassis ground (-):                      (B137) No. 17 (+) — Chassis ground (-):</p>	Does voltage change between 0 and 10 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step 2.
2	<p><b>CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.</b></p> <p>1) Turn ignition switch to OFF.                      2) Remove main fan relay and sub fan relay. (with A/C models)                      3) Disconnect test mode connector.                      4) Turn ignition switch to ON.                      5) Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b>                      (B137) No. 28 (+) — Chassis ground (-):                      (B137) No. 17 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Repair battery short circuit in radiator fan relay control circuit.	Go to step 3.
3	<p><b>CHECK MAIN FAN RELAY.</b></p> <p>1) Turn ignition switch to OFF.                      2) Remove main fan relay.                      3) Measure resistance between main fan relay terminals.</p> <p><b>Terminal</b>                      (F66) No. 5 — No. 6:                      (F30) No. 19 — No. 20:</p>	Is the resistance less than 1 Ω?	Replace main fan relay.	Go to step 4.
4	<p><b>CHECK SUB FAN RELAY.</b></p> <p>1) Remove sub fan relay.                      2) Measure resistance between sub fan relay terminals.</p> <p><b>Terminal</b>                      (F28) No. 21 — No. 22:                      (F29) No. 27 — No. 28:</p>	Is the resistance less than 1 Ω?	Replace sub fan relay.	Go to step 5.
5	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

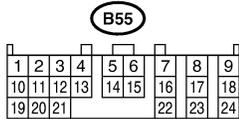
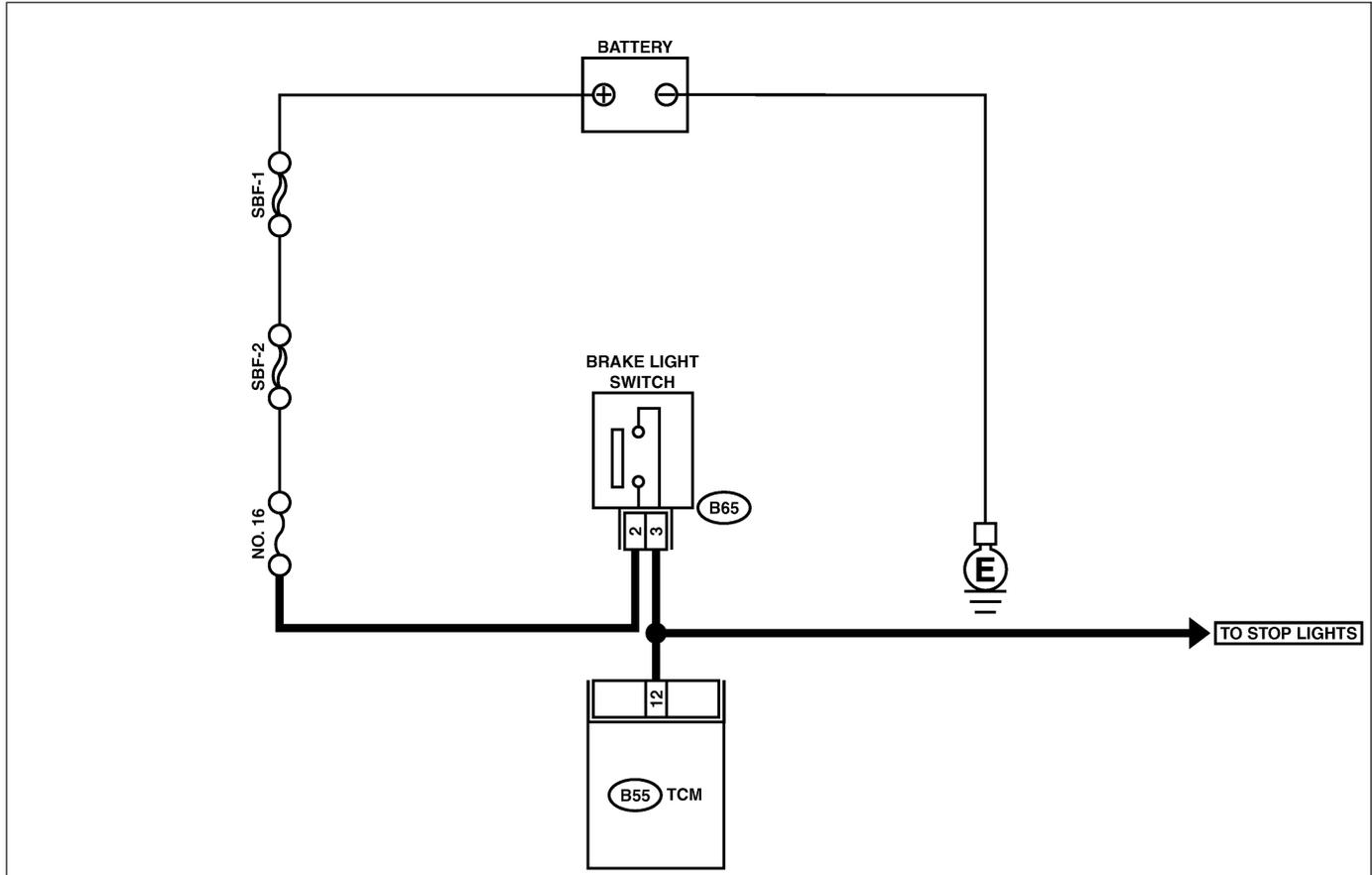
## BY: DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION — S048521B64

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



B2M4366

No.	Step	Check	Yes	No
1	CHECK OPERATION OF BRAKE LIGHT.	Does brake light come on when depressing the brake pedal?	Go to step 2.	Repair or replace brake light circuit.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<p><b>CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.</b>                      1) Disconnect connectors from TCM and brake light switch.                      2) Measure resistance of harness between TCM and brake light switch connector.  <b>Connector &amp; terminal</b>  <b>(B55) No. 12 — (B65) No. 3:</b></p>	Is the resistance less than 1 Ω?	Go to step 3.	Repair or replace harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between TCM and brake light switch connector</li> <li>● Poor contact in TCM connector</li> <li>● Poor contact in brake light switch connector</li> </ul>
3	<p><b>CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.</b>                      Measure resistance of harness between TCM and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B55) No. 12 — Chassis ground:</b></p>	Is the resistance more than 1 MΩ?	Go to step 4.	Repair ground short circuit in harness between TCM and brake light switch connector.
4	<p><b>CHECK INPUT SIGNAL FOR TCM.</b>                      1) Connect connectors to TCM and brake light switch.                      2) Measure voltage between TCM and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B55) No. 12 (+) — Chassis ground (-):</b></p>	Is the voltage less than 1 V when releasing the brake pedal?	Go to step 5.	Adjust or replace brake light switch. <Ref. to LI-7, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
5	<p><b>CHECK INPUT SIGNAL FOR TCM.</b>                      Measure voltage between TCM and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B55) No. 12 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V when depressing the brake pedal?	Go to step 6.	Adjust or replace brake light switch. <Ref. to LI-7, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in TCM connector.</p>	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-49, Transmission Control Module.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

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## **BZ: DTC P0731 — GEAR 1 INCORRECT RATIO —** S048521B70

### NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6)-305, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **CA: DTC P0732 — GEAR 2 INCORRECT RATIO —** S048521B71

### NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6)-305, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **CB: DTC P0733 — GEAR 3 INCORRECT RATIO —** S048521B72

### NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6)-305, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## CC: DTC P0734 — GEAR 4 INCORRECT RATIO — S048521B73

● **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault

● **TROUBLE SYMPTOM:**

- Shift point too high or too low; engine brake not effective in “3” range; excessive shift shock; excessive tight corner “braking”

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK THROTTLE POSITION SENSOR CIRCUIT.</b> Check throttle position sensor circuit. <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace throttle position sensor circuit.	Go to step 3.
3	<b>CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.</b> Check front vehicle speed sensor circuit. <Ref. to AT-60, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Trouble Code (DTC).>	Is there any trouble in vehicle speed sensor 2 circuit?	Repair or replace vehicle speed sensor 2 circuit.	Go to step 4.
4	<b>CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.</b> Check torque converter turbine speed sensor circuit. <Ref. to AT-66, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace torque converter turbine speed sensor circuit.	Go to step 5.
5	<b>CHECK POOR CONTACT.</b> Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step 6.
6	<b>CHECK MECHANICAL TROUBLE.</b> Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace TCM. <Ref. to AT-49, Transmission Control Module (TCM).>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## CD: DTC P0741 — TORQUE CONVERTER CLUTCH SYSTEM MALFUNCTION

S048521G04

### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### ● TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)
- No shift or excessive tight corner “braking”

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK LOCK-UP DUTY SOLENOID CIRCUIT.</b> Check lock-up duty solenoid circuit. <Ref. to AT-100, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Trouble Code (DTC).>	Is there any trouble in lock-up duty solenoid circuit?	Repair or replace lock-up duty solenoid circuit.	Go to step 3.
3	<b>CHECK THROTTLE POSITION SENSOR CIRCUIT.</b> Check throttle position sensor circuit. <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace throttle position sensor circuit.	Go to step 4.
4	<b>CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.</b> Check torque converter turbine speed sensor circuit. <Ref. to AT-66, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace torque converter turbine speed sensor circuit.	Go to step 5.
5	<b>CHECK ENGINE SPEED INPUT CIRCUIT.</b> Check engine speed input circuit. <Ref. to AT-44, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Trouble Code (DTC).>	Is there any trouble in engine speed input circuit?	Repair or replace engine speed input circuit.	Go to step 6.
6	<b>CHECK INHIBITOR SWITCH CIRCUIT.</b> Check inhibitor switch circuit. <Ref. to AT-122, CHECK INHIBITOR SWITCH, Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Is there any trouble in inhibitor switch circuit?	Repair or replace inhibitor switch circuit.	Go to step 7.
7	<b>CHECK BRAKE LIGHT SWITCH CIRCUIT.</b> Check brake light switch circuit. <Ref. to AT-120, CHECK BRAKE SWITCH, Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Is there any trouble in brake light switch circuit?	Repair or replace brake light switch circuit.	Go to step 8.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
8	<b>CHECK ATF TEMPERATURE SENSOR CIRCUIT.</b> Check ATF temperature sensor circuit. <Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Trouble Code (DTC).>	Is there any trouble in ATF temperature sensor circuit?	Repair or replace ATF temperature sensor circuit.	Go to step 9.
9	<b>CHECK POOR CONTACT.</b> Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step 10.
10	<b>CHECK MECHANICAL TROUBLE.</b> Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace TCM. <Ref. to AT-49, Transmission Control Module (TCM).>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## CE: DTC P0851 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT —

S048521K41

### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

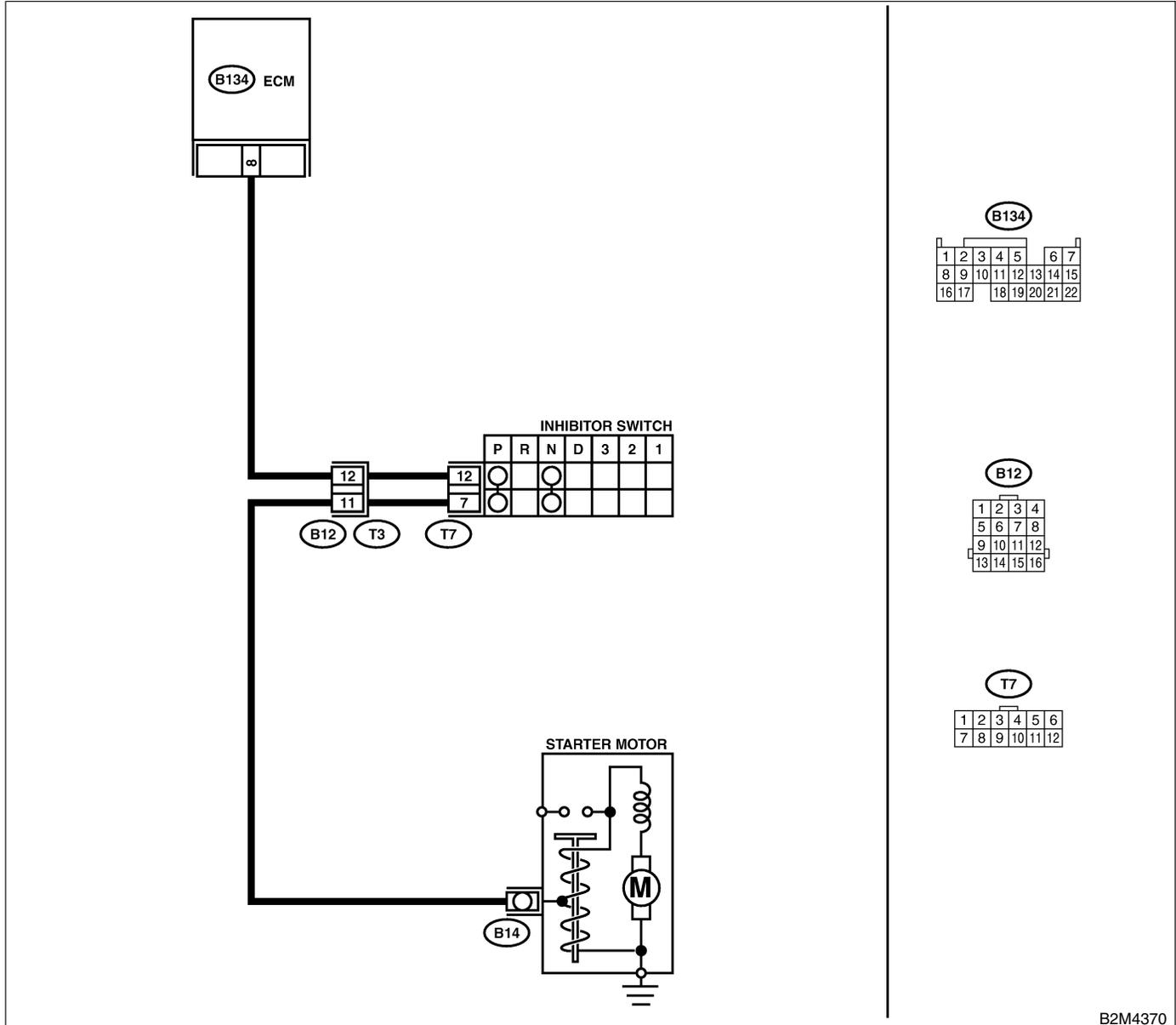
### ● TROUBLE SYMPTOM:

- Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4370

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK INPUT SIGNAL FOR ECM.</b> 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. <b>Connector &amp; terminal</b> <b>(B134) No. 8 (+) — Chassis ground (-):</b>	Is the voltage between 4.5 and 5.5 V at except "N" and "P" positions?	Even if MIL lights up, the circuit has returned to a normal condition at this time.	Go to step 3.
3	<b>CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and transmission harness connector (T3). 3) Measure resistance of harness between ECM connector and chassis ground. <b>Connector &amp; terminal</b> <b>(B134) No. 8 — Chassis ground:</b>	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step 4.
4	<b>CHECK TRANSMISSION HARNESS CONNECTOR.</b> 1) Disconnect connector from inhibitor switch. 2) Measure resistance of harness between transmission harness connector and engine ground. <b>Connector &amp; terminal</b> <b>(T3) No. 12 — Engine ground:</b>	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.	Go to step 5.
5	<b>CHECK INHIBITOR SWITCH.</b> Measure resistance between inhibitor switch connector receptacle's terminals in selector lever except for "N" position. <b>Terminals</b> <b>No. 7 — No. 12:</b>	Is the resistance more than 1 MΩ at except "N" and "P" positions?	Go to step 6.	Replace inhibitor switch. <Ref. to AT-29, Inhibitor Switch.>
6	<b>CHECK SELECTOR CABLE CONNECTION.</b>	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-27, INSPECTION, Select Cable.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## CF: DTC P0852 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT —

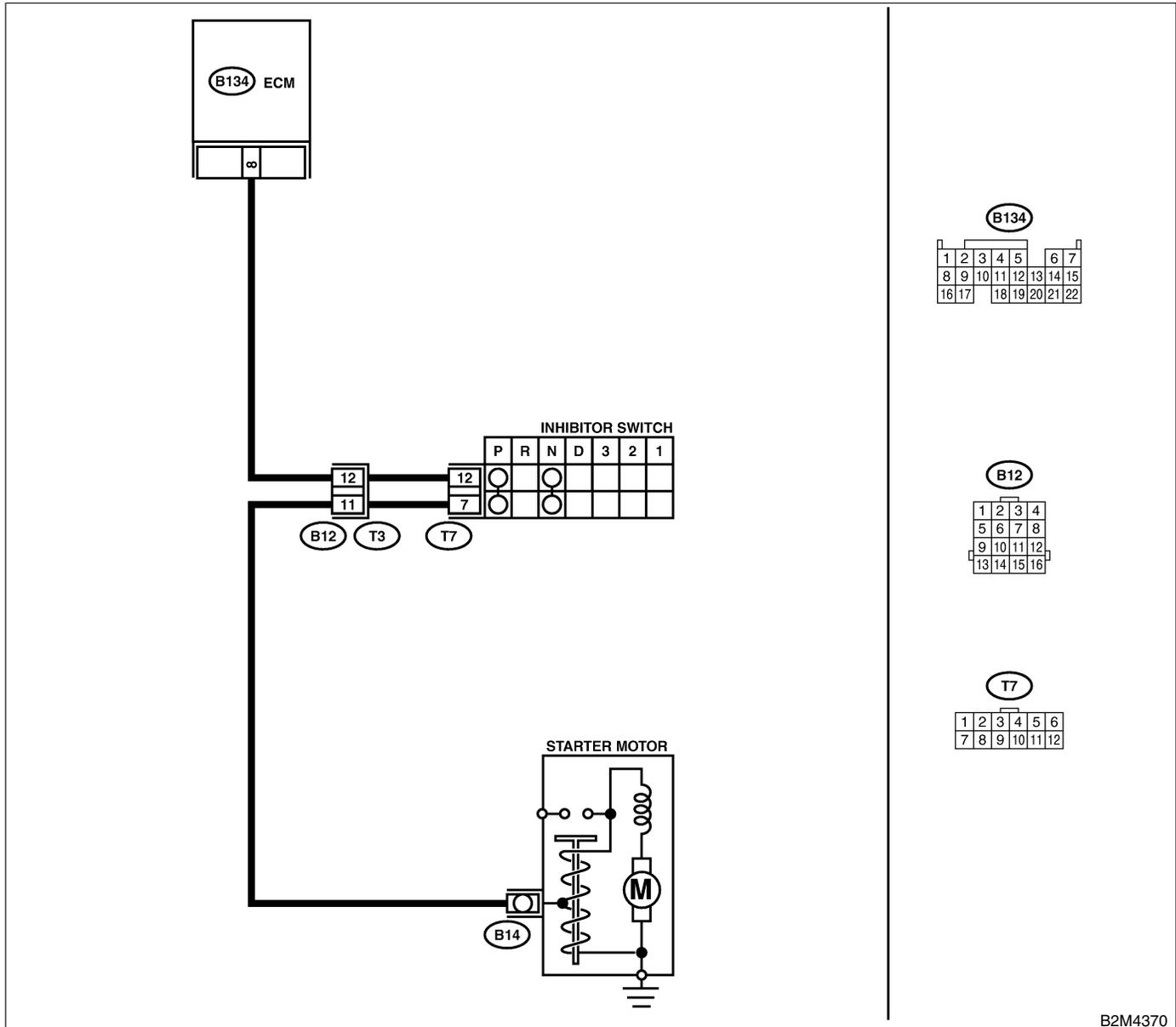
S048521K42

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK INPUT SIGNAL FOR ECM.</b> 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground in selector lever "N" and "P" positions. <b>Connector &amp; terminal</b> <b>(B134) No. 8 (+) — Chassis ground (-):</b>	Is the voltage less than 1 V?	Go to step 3.	Go to step 5.
3	<b>CHECK INPUT SIGNAL FOR ECM.</b> Measure voltage between ECM and chassis ground in selector lever except for "N" and "P" positions. <b>Connector &amp; terminal</b> <b>(B134) No. 8 (+) — Chassis ground (-):</b>	Is the voltage between 4.5 and 5.5 V?	Go to step 4.	Go to step 5.
4	<b>CHECK POOR CONTACT.</b> Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	<b>CHECK INPUT SIGNAL FOR ECM.</b> Measure voltage between ECM and chassis ground. <b>Connector &amp; terminal</b> <b>(B134) No. 8 (+) — Chassis ground (-):</b>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step 6.
6	<b>CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and inhibitor switch. 3) Measure resistance of harness between ECM and inhibitor switch connector. <b>Connector &amp; terminal</b> <b>(B134) No. 8 — (T7) No. 12:</b>	Is the resistance less than 1 Ω?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between ECM and inhibitor switch connector ● Poor contact in coupling connector ● Poor contact in inhibitor switch connector ● Poor contact in ECM connector

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
7	<p><b>CHECK INHIBITOR SWITCH GROUND LINE.</b>                      Measure resistance of harness between inhibitor switch connector and engine ground.  <b>Connector &amp; terminal</b>  <i>(T7) No. 7 — Engine ground:</i></p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 8.</p>	<p>Repair open circuit in harness between inhibitor switch connector and starter motor ground line.                      NOTE:                      In this case, repair the following:</p> <ul style="list-style-type: none"> <li>● Open circuit in harness between inhibitor switch connector and starter motor ground line</li> <li>● Poor contact in starter motor connector</li> <li>● Poor contact in starter motor ground</li> <li>● Starter motor</li> </ul>
8	<p><b>CHECK INHIBITOR SWITCH.</b>                      Measure resistance between inhibitor switch connector receptacle's terminals in selector lever "N" and "P" positions.  <b>Terminals</b>  <i>No. 7 — No. 12:</i></p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 9.</p>	<p>Replace inhibitor switch. &lt;Ref. to AT-29, Inhibitor Switch.&gt;</p>
9	<p><b>CHECK SELECTOR CABLE CONNECTION.</b></p>	<p>Is there any fault in selector cable connection to inhibitor switch?</p>	<p>Repair selector cable connection.                      &lt;Ref. to CS-27, INSPECTION, Select Cable.&gt;</p>	<p>Contact with SOA (distributor) service.                      NOTE:                      Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>

**MEMO:**

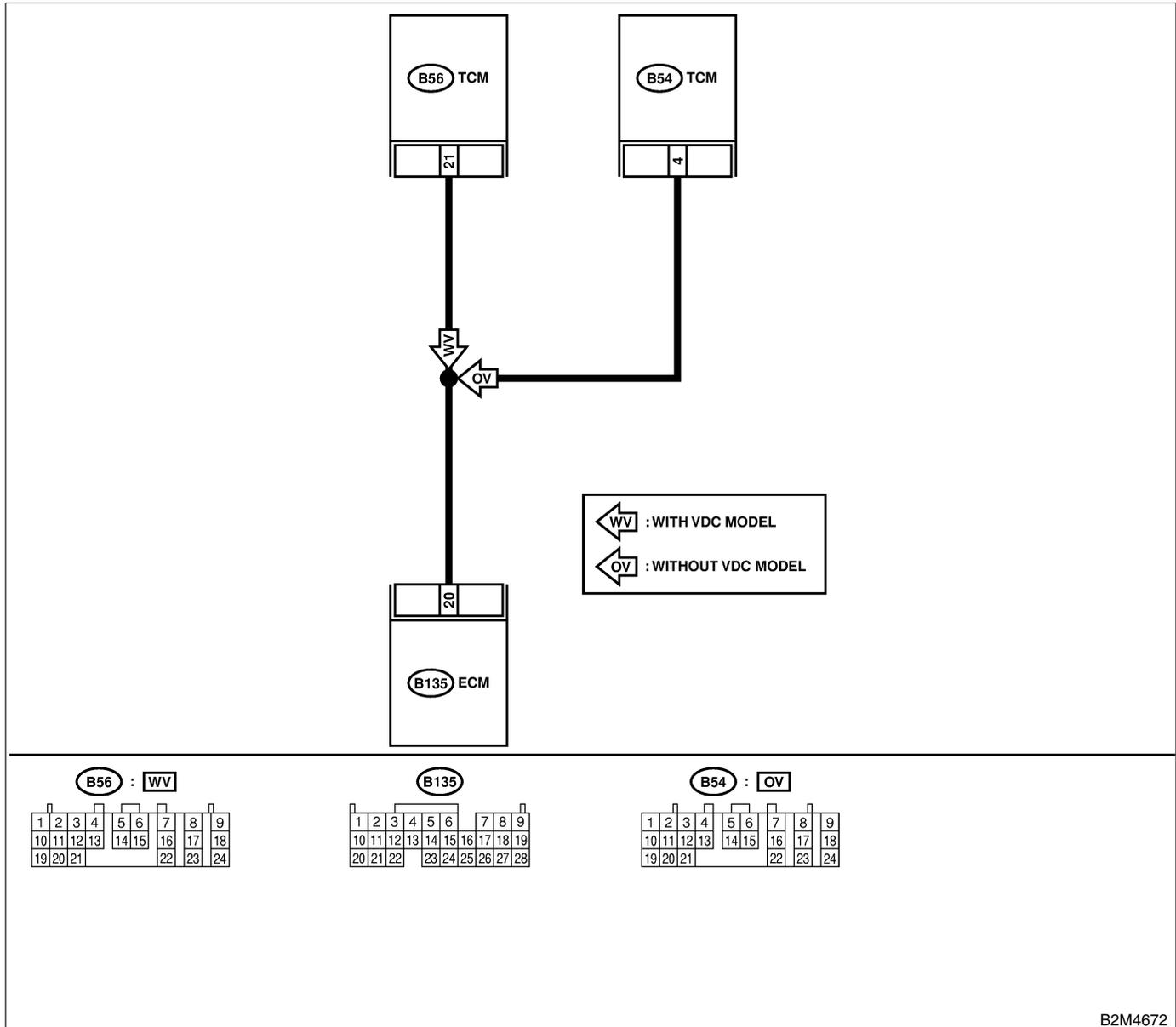
**CG: DTC P0864 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION** — S048521K10

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



No.	Step	Check	Yes	No
1	<b>CHECK DRIVING CONDITION.</b> 1) Start and warm-up the engine until the radiator fan makes one complete rotation. 2) Drive the vehicle.	Is AT shift control functioning properly?	Go to step 2.	Replace TCM. <Ref. to AT-49, Transmission Control Module (TCM).>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	CHECK ACCESSORY.	Are car phone and/or CB installed on vehicle?	Repair grounding line of car phone or CB system.	Replace TCM. <Ref. to AT-49, Transmission Control Module (TCM).>

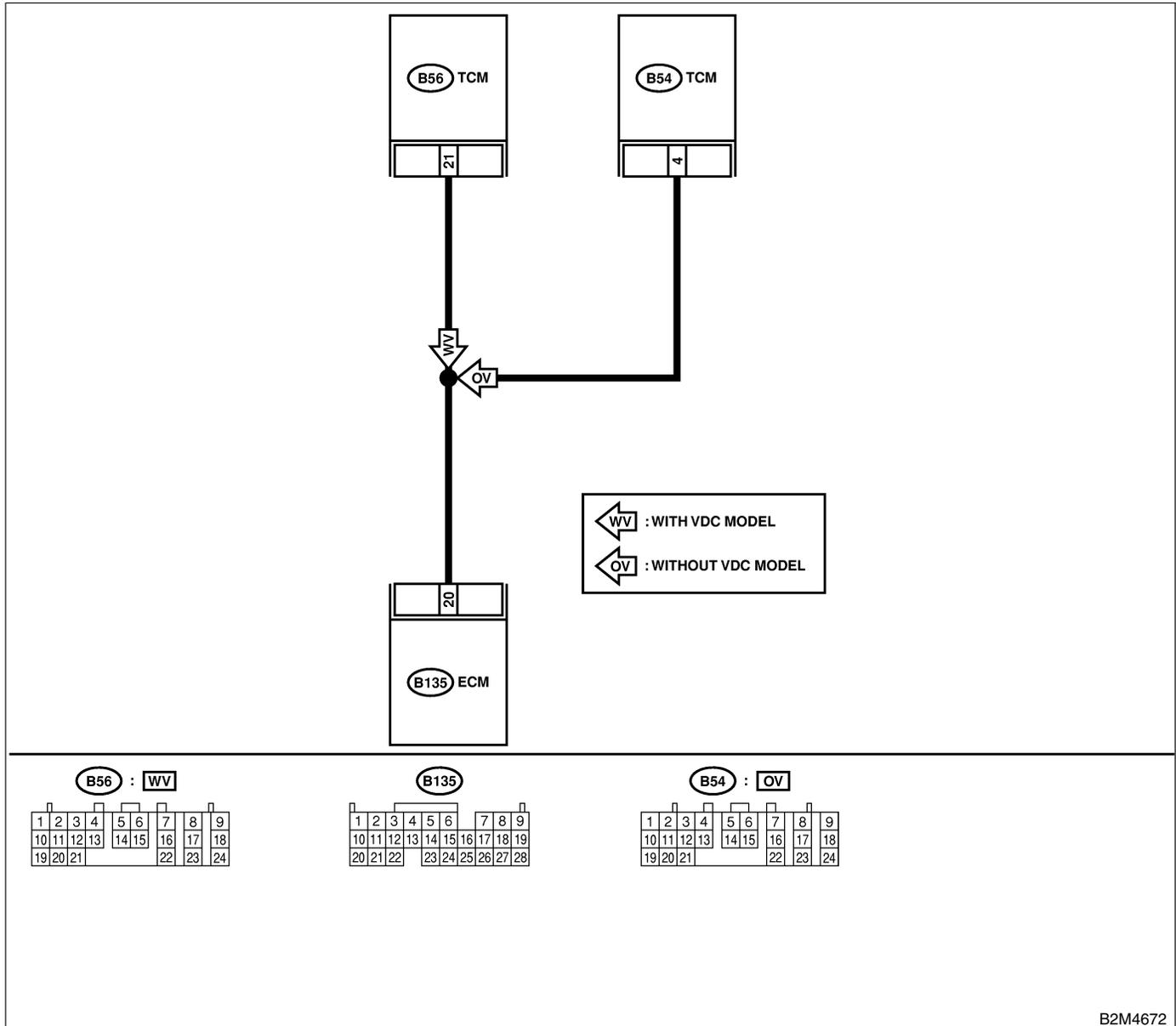
**CH: DTC P0865 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT LOW INPUT —** S048521K11

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b></p> <p>1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 20 (+) — Chassis ground (-):</b></p>	Is the voltage less than 1 V?	Go to step 2.	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: ● Poor contact in ECM connector ● Poor contact in TCM connector
2	<p><b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 20 — Chassis ground:</b></p>	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step 3.
3	<p><b>CHECK OUTPUT SIGNAL FOR ECM.</b></p> <p>1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B135) No. 20 (+) — Chassis ground (-):</b></p>	Is the voltage more than 5 V?	Go to step 4.	Repair poor contact in ECM connector.
4	<p><b>CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION.</b></p> <p>Read trouble code for automatic transmission. &lt;Ref. to AT-25, Read Diagnostic Trouble Code (DTC).&gt;</p>	Does trouble code appear for automatic transmission?	Inspect trouble code for automatic transmission. <Ref. to AT-44, Diagnostic Procedure with Diagnostic Trouble Code.>	Replace TCM. <Ref. to AT-49, Transmission Control Module (TCM).>

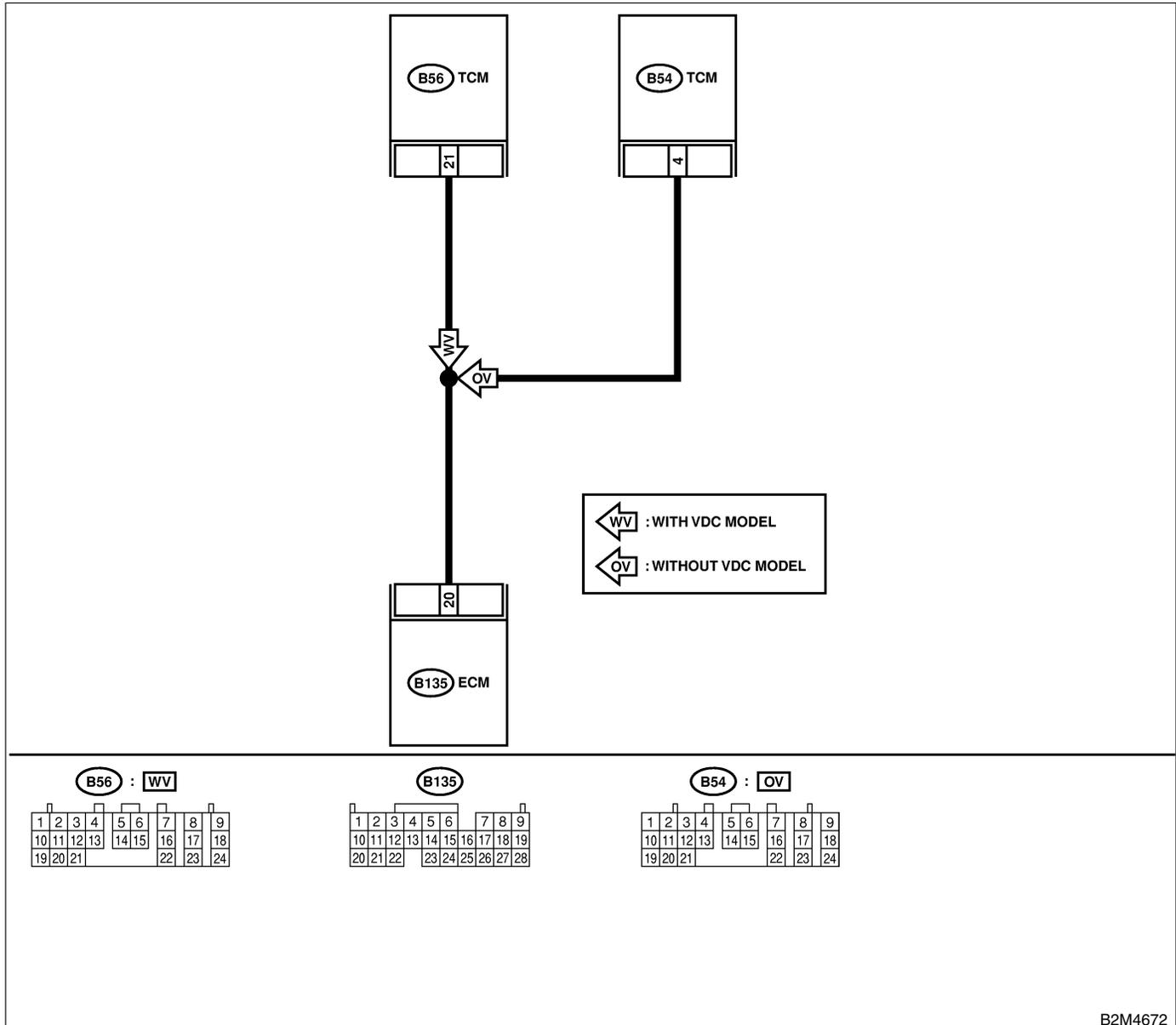
**CI: DTC P0866 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT HIGH INPUT —** S048521K12

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b> 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. <i>Connector &amp; terminal</i> <i>(B135) No. 20 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step 2.
2	<b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b> Measure voltage between ECM connector and chassis ground. <i>Connector &amp; terminal</i> <i>(B135) No. 20 (+) — Chassis ground (-):</i>	Is the voltage more than 4 V?	Go to step 5.	Go to step 3.
3	<b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b> Measure voltage between ECM connector and chassis ground. <i>Connector &amp; terminal</i> <i>(B135) No. 20 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Repair poor contact in ECM connector.	Go to step 4.
4	<b>CHECK OUTPUT SIGNAL FROM ECM.</b> Measure voltage between ECM and chassis ground. <i>Connector &amp; terminal</i> <i>(B135) No. 20 (+) — Chassis ground (-):</i>	Does the voltage change from 1 V to 4 V while monitoring the value with voltage meter?	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: ● Poor contact in ECM connector ● Poor contact in TCM connector	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	<b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b> Measure voltage between TCM and chassis ground. <i>Connector &amp; terminal</i> <b>WITH VDC MODEL:</b> <i>(B56) No. 21 (+) — Chassis ground (-):</i> <b>WITHOUT VDC MODEL:</b> <i>(B54) No. 4 (+) — Chassis ground (-):</i>	Is the voltage more than 4 V?	Go to step 6.	Repair open circuit in harness between ECM and TCM connector.
6	<b>CHECK POOR CONTACT.</b> Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## CJ: DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT LOW INPUT

— S048521B84

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1110.

## CK: DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT HIGH INPUT —

— S048521B85

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111?	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1111.

**CL: DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/  
 PERFORMANCE PROBLEM —** S048521B86

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.

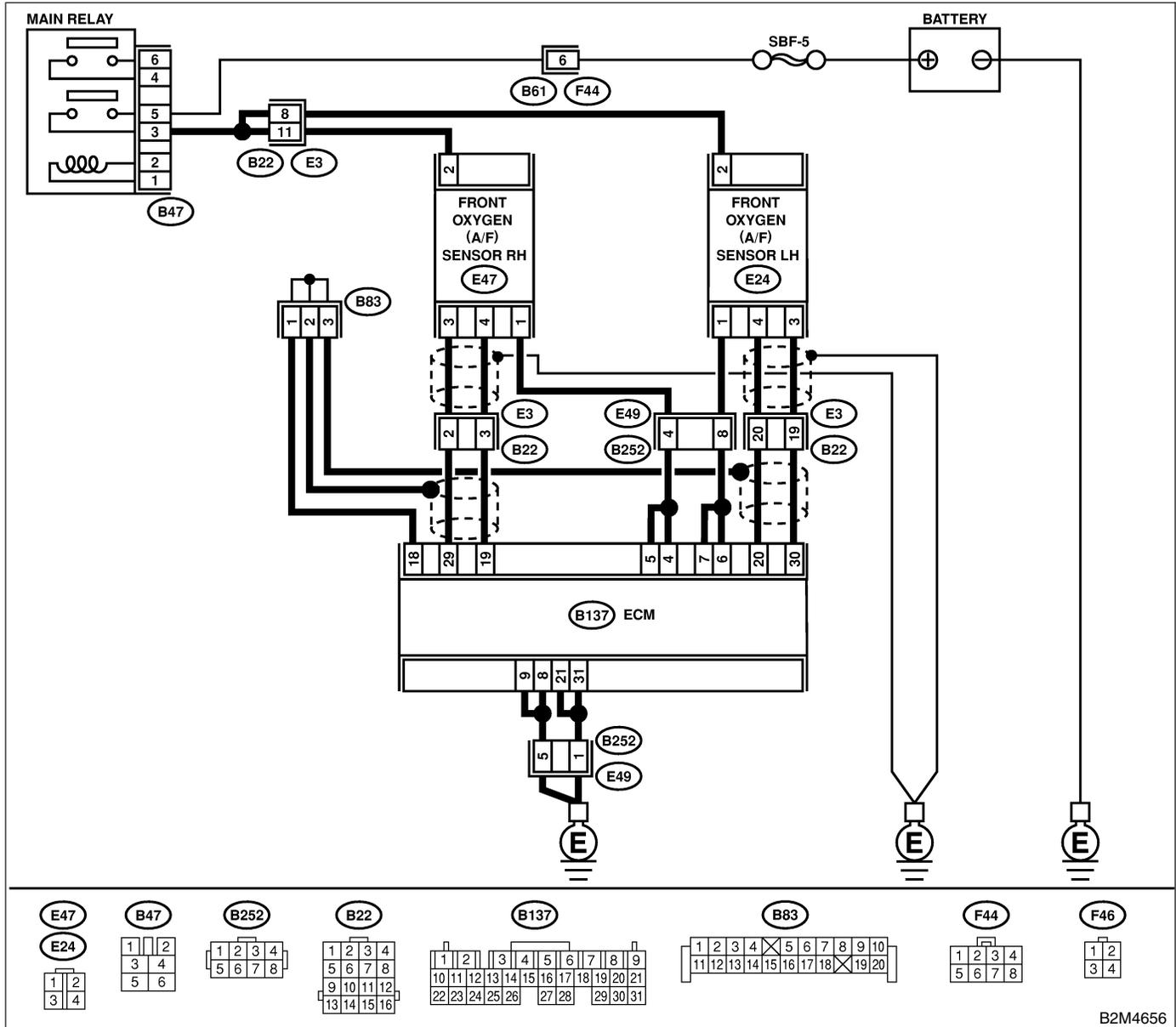
**CM: DTC P1134 — FRONT OXYGEN (A/F) SENSOR MICRO-COMPUTER PROBLEM —** S048521B96

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1134?	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	It is not necessary to inspect DTC P1134.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## CN: DTC P1139 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) HEATER CIRCUIT RANGE/PERFORMANCE PROBLEM —

S048521H43

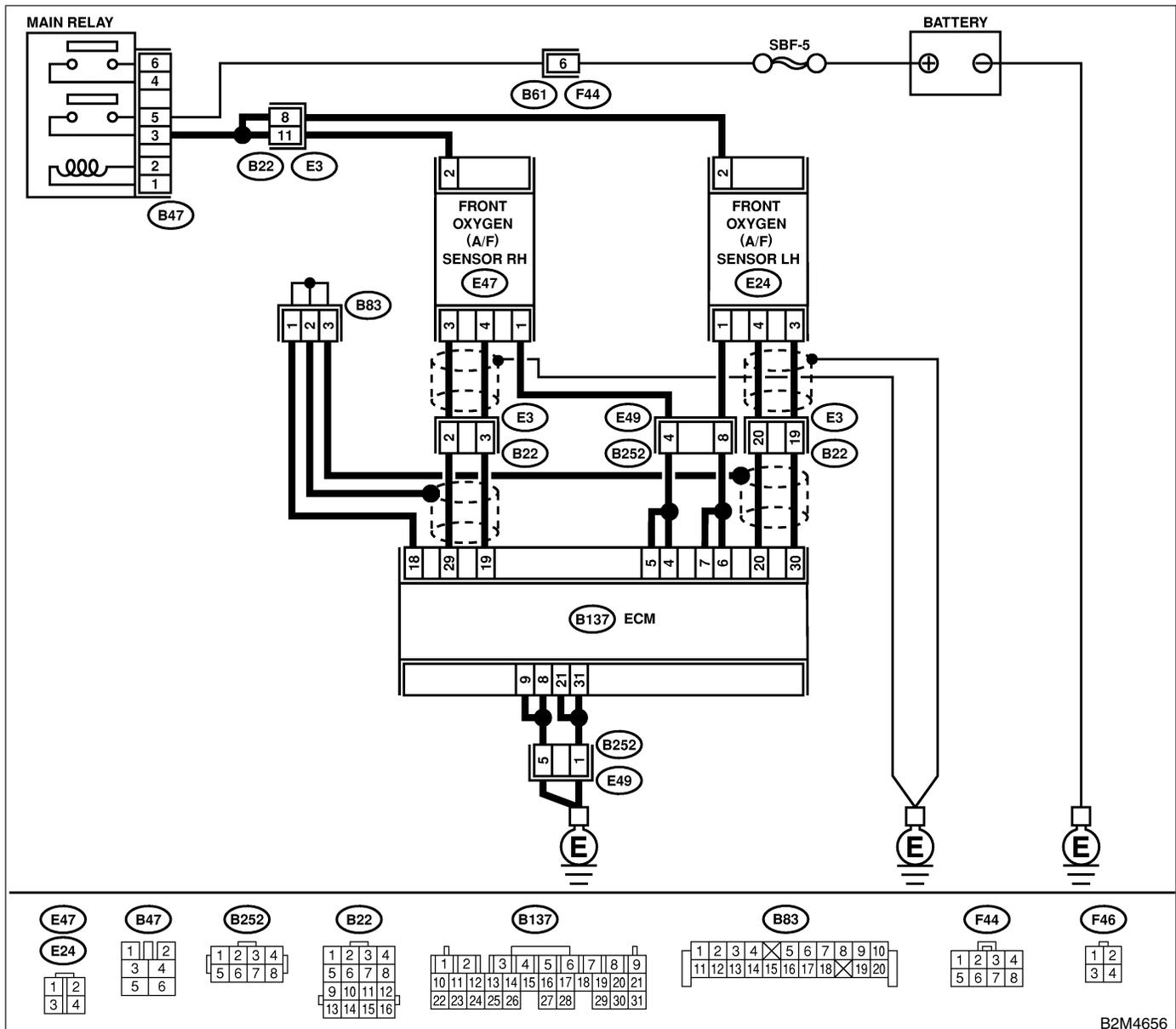
### • DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### • WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connectors from ECM and front oxygen (A/F) sensor. 4) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b> (B137) No. 4 — (E47) No. 1: (B137) No. 5 — (E47) No. 1:</p>	Is the resistance less than 1 $\Omega$ ?	Go to step 2.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b> (B137) No. 19 — (E47) No. 4:</p>	Is the resistance less than 1 $\Omega$ ?	Go to step 3.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b> (B137) No. 29 — (E47) No. 3:</p>	Is the resistance less than 1 $\Omega$ ?	Go to step 4.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	<p><b>CHECK FRONT OXYGEN (A/F) SENSOR.</b></p> <p>Measure resistance between front oxygen (A/F) sensor connector terminals.</p> <p><b>Terminals</b> No. 2 — No. 1:</p>	Is the resistance less than 5 $\Omega$ ?	Go to step 5.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>
5	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in ECM and front oxygen (A/F) sensor connector.</p>	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair poor contact in ECM or front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## CO: DTC P1140 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) HEATER CIRCUIT RANGE/PERFORMANCE PROBLEM —

S048521H44

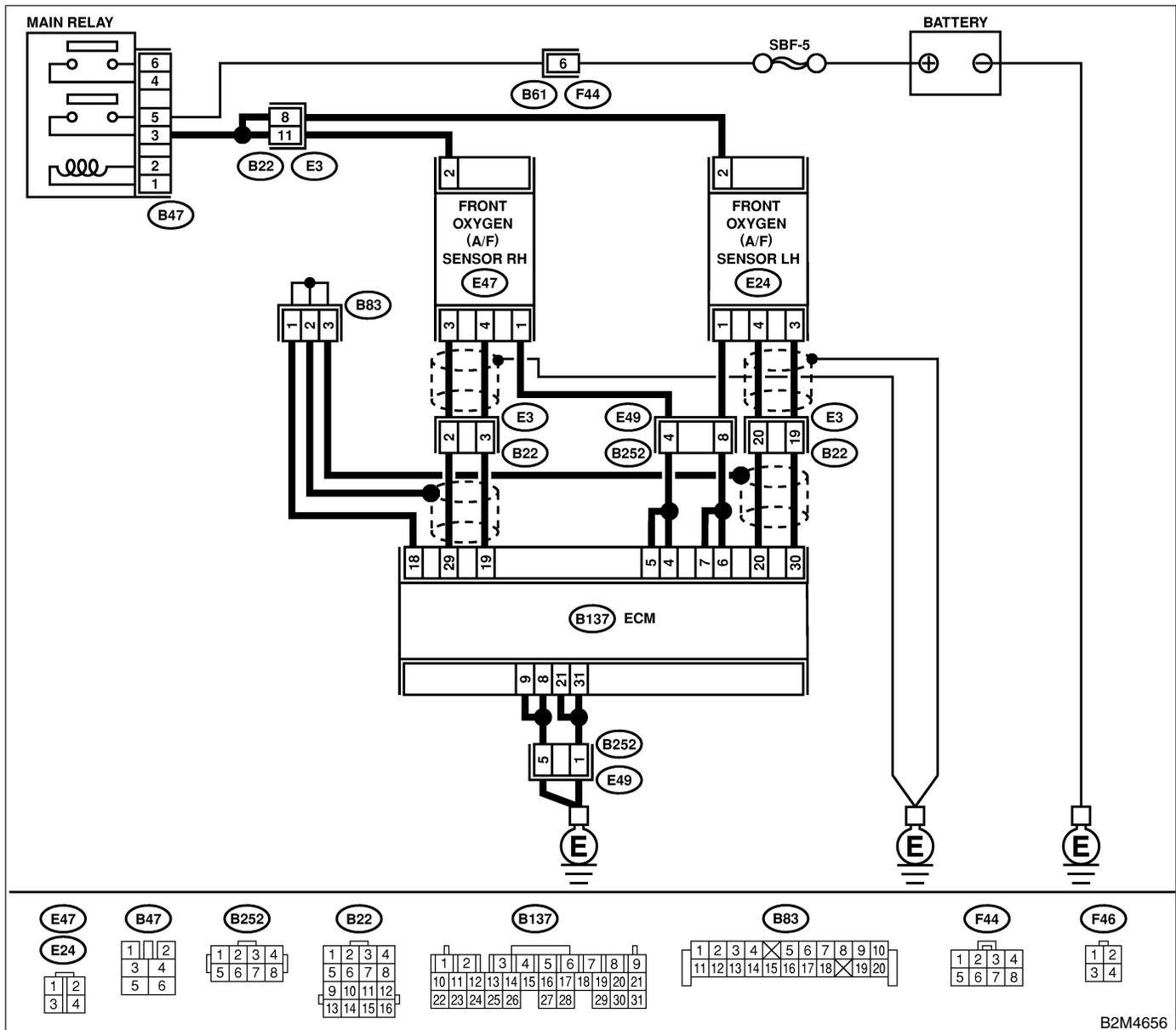
### • DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### • WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>1) Start engine, and warm-up the engine.                      2) Turn ignition switch to OFF.                      3) Disconnect connectors from ECM and front oxygen (A/F) sensor.                      4) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b>                      (B137) No. 4 — (E24) No. 6:                      (B137) No. 5 — (E24) No. 7:</p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b>                      (B137) No. 20 — (E24) No. 4:</p>	Is the resistance less than 1 Ω?	Go to step 3.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	<p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b>                      (B137) No. 30 — (E24) No. 3:</p>	Is the resistance less than 1 Ω?	Go to step 4.	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	<p><b>CHECK FRONT OXYGEN (A/F) SENSOR.</b></p> <p>Measure resistance between front oxygen (A/F) sensor connector terminals.</p> <p><b>Terminals</b>                      No. 2 — No. 1:</p>	Is the resistance less than 5 Ω?	Go to step 5.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>
5	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in ECM and front oxygen (A/F) sensor connector.</p>	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair poor contact in ECM or front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## CP: DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) — S048521B99

### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

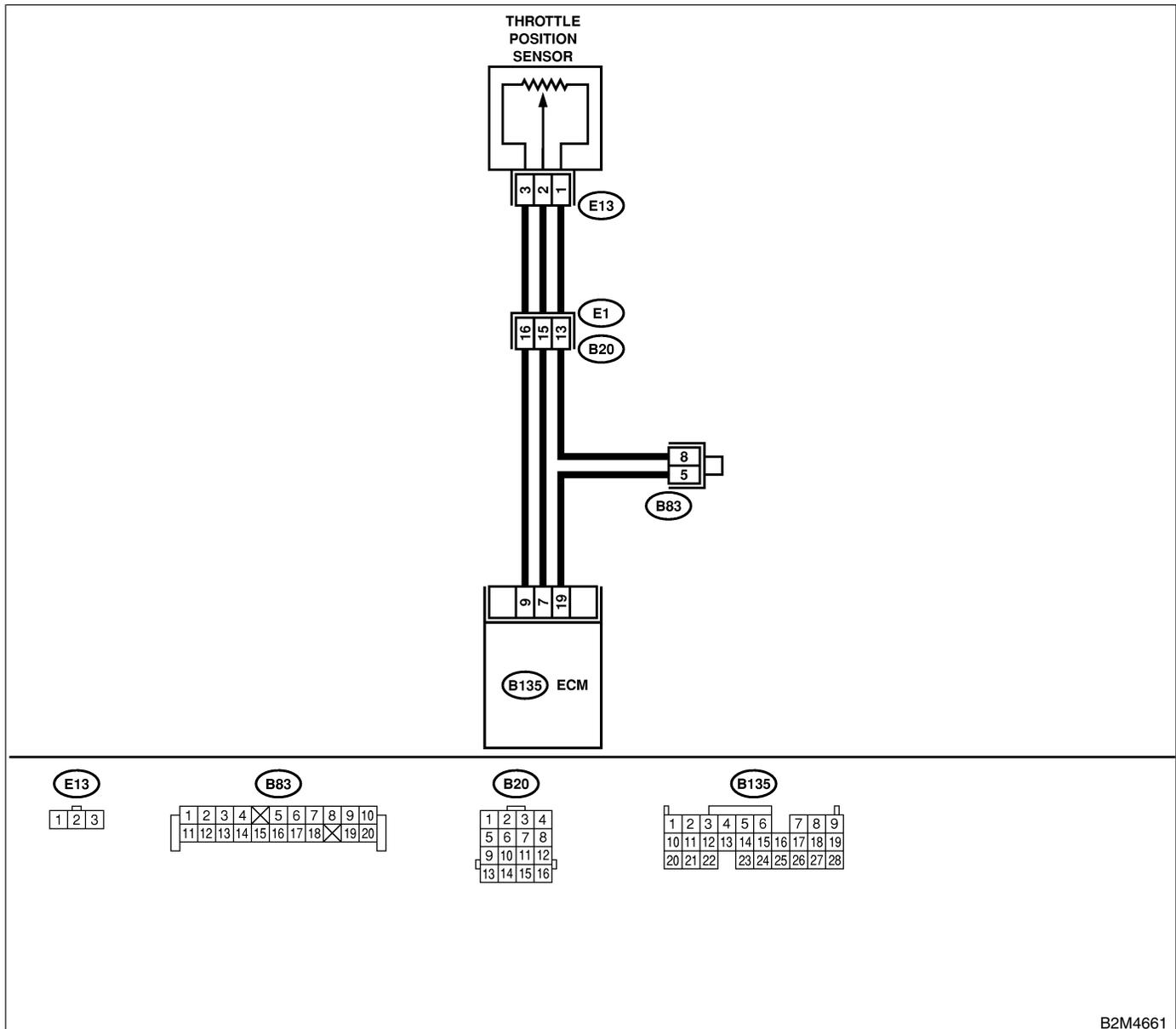
### ● TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1142.	Replace throttle position sensor. <Ref. to FU(H6)-33, Throttle Position Sensor.>

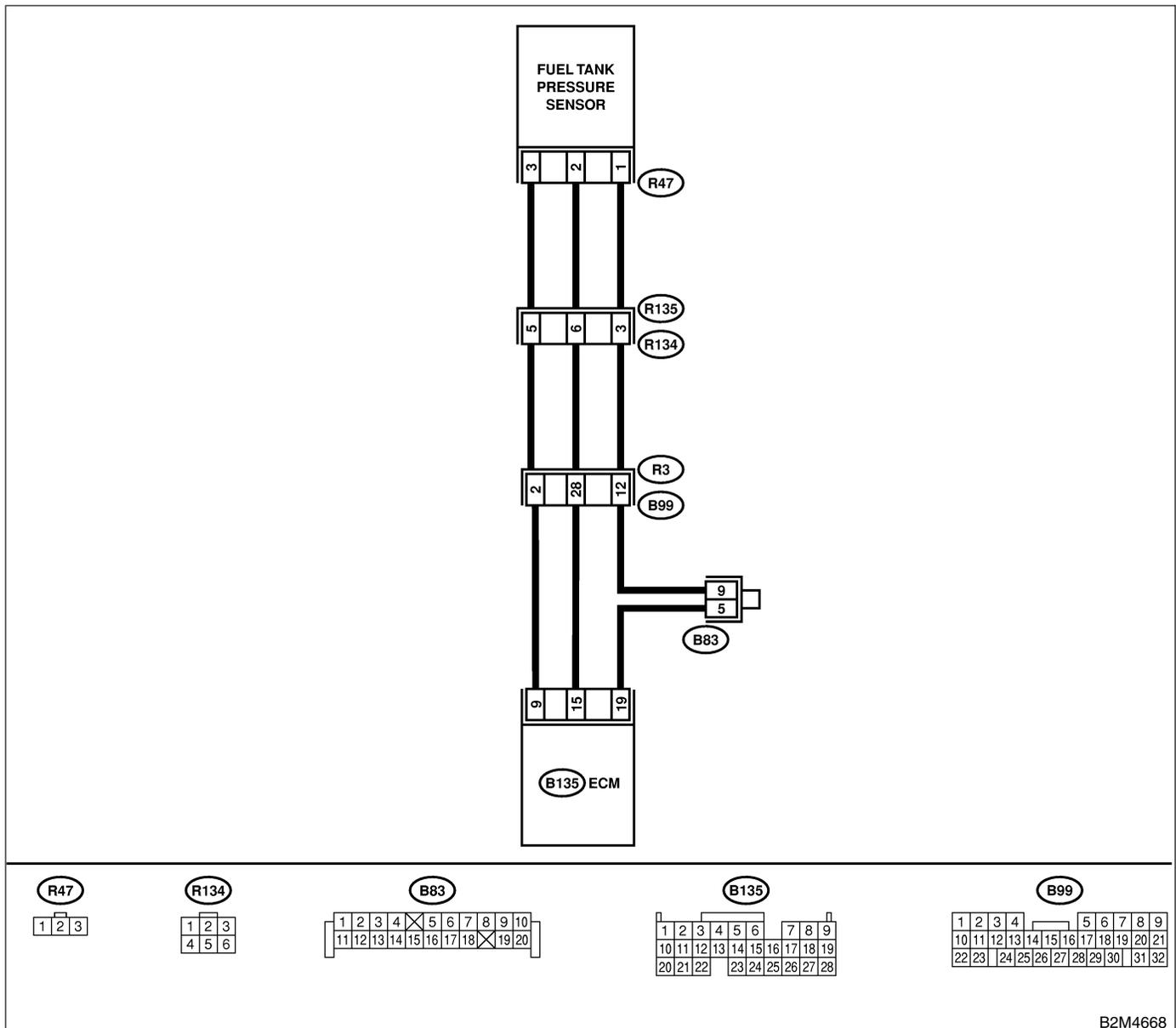
**CQ: DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —** S048521G07

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4668

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step 2.
2	<b>CHECK AIR INTAKE SYSTEM.</b>	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step 3.
3	<b>CHECK PRESSURE SENSOR.</b> 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in the selector lever in "N" or "P" position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6)-37, Subaru Select Monitor.> ● OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. Specification: ● Intake manifold absolute pressure <b>Ignition ON</b> <b>73.3 — 106.6 kPa (550 — 800 mmHg,</b> <b>21.65 — 31.50 inHg)</b> <b>Idling</b> <b>20.0 — 46.7 kPa (150 — 350 mmHg,</b> <b>5.91 — 13.78 inHg)</b>	Is the value within the specifications?	Go to step 4.	Replace intake air temperature sensor and pressure sensor. <Ref. to FU(H6)-35, Intake Air Temperature Sensor.>
4	<b>CHECK THROTTLE POSITION.</b> Read data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6)-37, Subaru Select Monitor.> ● OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is throttle positioning ratio equal to or less than 5% when throttle is fully closed?	Go to step 5.	Adjust or replace throttle position sensor. <Ref. to FU(H6)-33, Throttle Position Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
5	CHECK THROTTLE POSITION.	Is throttle positioning ratio equal to or more than 85% when throttle is fully open?	Replace intake air temperature and pressure sensor. <Ref. to FU(H6)-35, Intake Air Temperature Sensor.>	Replace throttle position sensor. <Ref. to FU(H6)-33, Throttle Position Sensor.>

**CR: DTC P1152 — BANK #1 AND SENSOR #2 OXYGEN (A/F) SENSOR  
(FRONT RH) CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —**

S048521K13

**NOTE:**

For the diagnostic procedure, refer to DTC P1153. <Ref. to EN(H6)-334, DTC P1153 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## CS: DTC P1153 — BANK #1 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT RH) CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

S048521K14

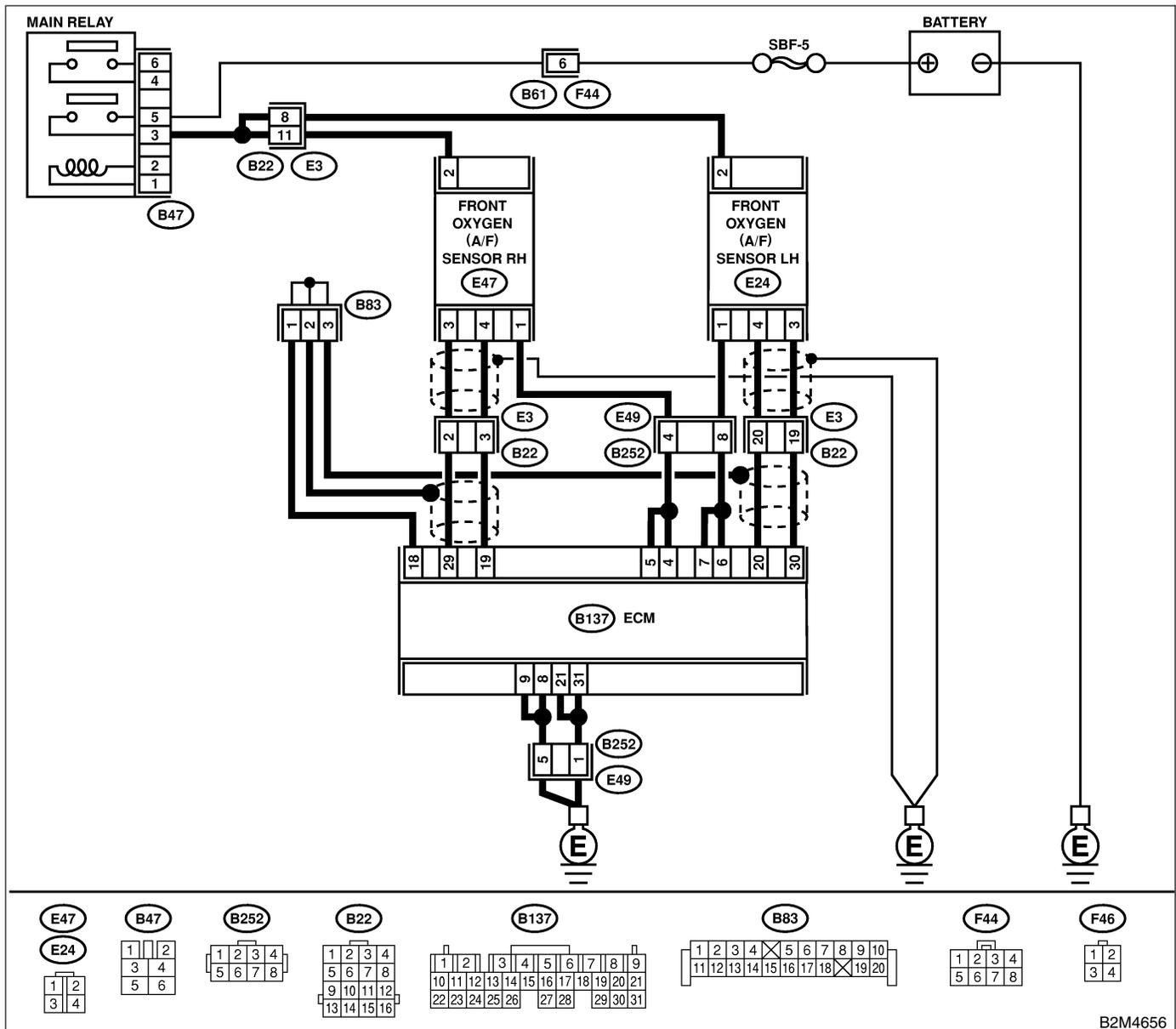
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK FRONT (A/F) OXYGEN SENSOR DATA.</b> 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6)-37, Subaru Select Monitor.> ● OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value equal to or more than 0.85 and equal to less than 1.15 in idling?	Go to step 3.	Go to step 4.
3	<b>CHECK REAR OXYGEN SENSOR SIGNAL.</b> 1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6)-37, Subaru Select Monitor.>	Does the LED of {Rear O2 Rich Signal} blink?	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check rear oxygen sensor circuit. <Ref. to FU(H6)-46, Rear Oxygen Sensor.>
4	<b>CHECK EXHAUST SYSTEM.</b> Check exhaust system parts. NOTE: Check the following items. ● Loose installation of portions ● Damage (crack, hole etc.) of parts ● Looseness of front oxygen (A/F) sensor ● Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>

## DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

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### **CT: DTC P1154 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —**

S048521K15

#### **NOTE:**

For the diagnostic procedure, refer to DTC P1155. <Ref. to EN(H6)-338, DTC P1155 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## CU: DTC P1155 — BANK #2 AND SENSOR #1 OXYGEN (A/F) SENSOR (FRONT LH) CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

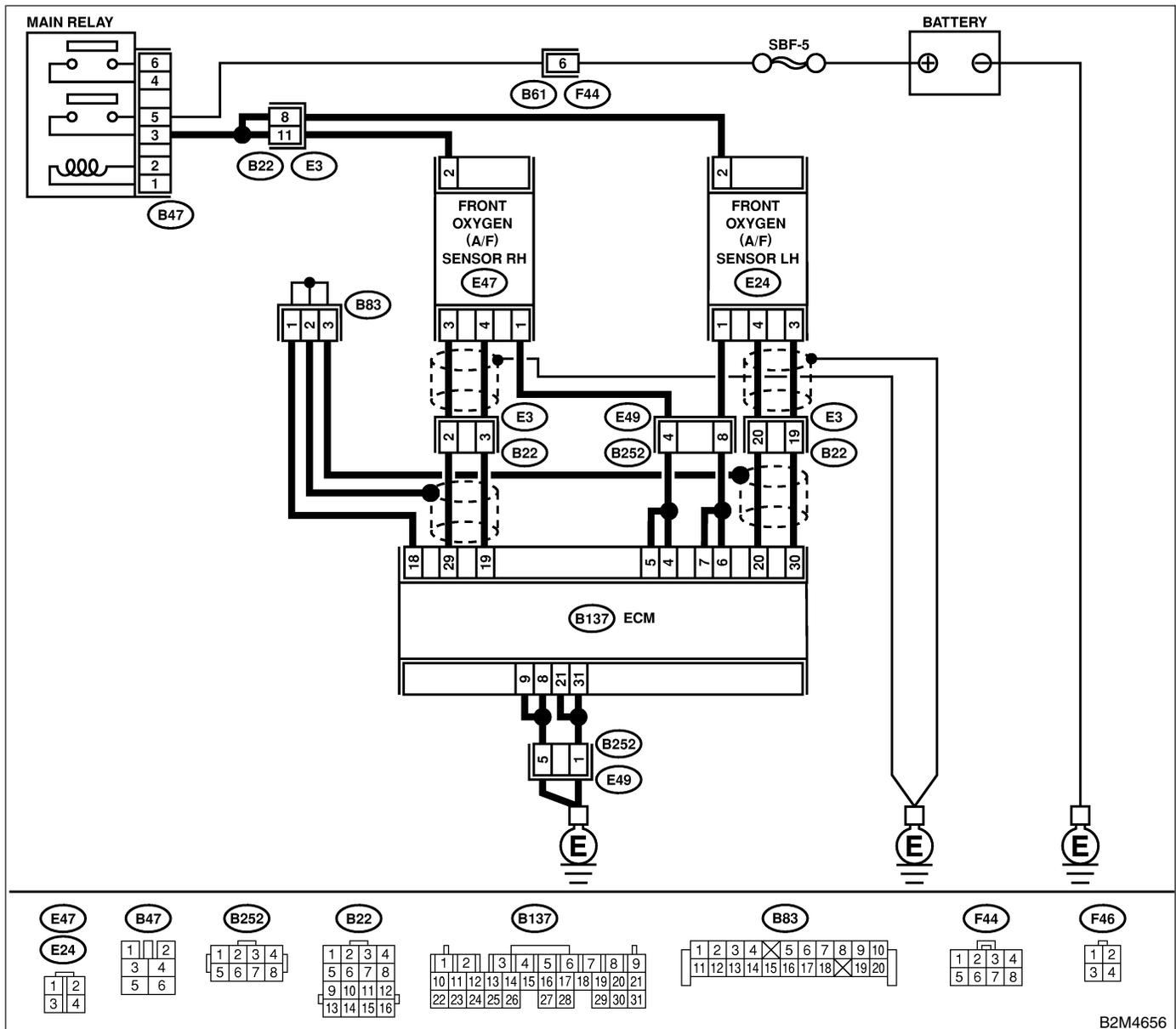
S048521K16

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4656

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK FRONT (A/F) OXYGEN SENSOR DATA.</b> 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6)-37, Subaru Select Monitor.> ● OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value equal to or more than 0.85 and equal to less than 1.15 in idling?	Go to step 3.	Go to step 4.
3	<b>CHECK REAR OXYGEN SENSOR SIGNAL.</b> 1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. NOTE: ● Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6)-37, Subaru Select Monitor.>	Does the LED of {Rear O2 Rich Signal} blink?	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check rear oxygen sensor circuit. <Ref. to FU(H6)-46, Rear Oxygen Sensor.>
4	<b>CHECK EXHAUST SYSTEM.</b> Check exhaust system parts. NOTE: Check the following items. ● Loose installation of portions ● Damage (crack, hole etc.) of parts ● Looseness of front oxygen (A/F) sensor ● Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6)-43, Front Oxygen (A/F) Sensor.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## CV: DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW INPUT — S048521C07

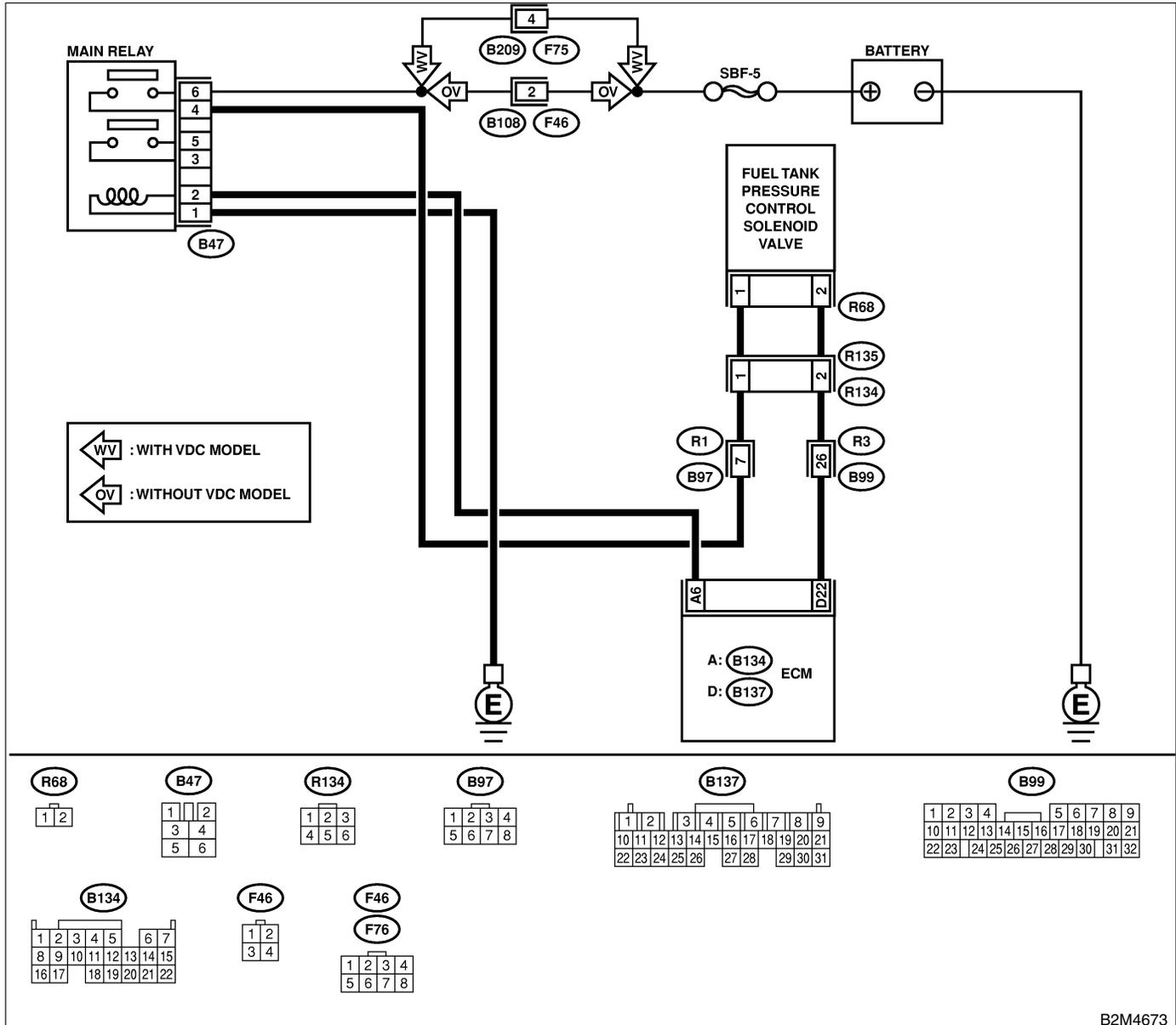
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4673

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b>  <i>(B137) No. 22 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 2.	Go to step 3.
2	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	<p><b>CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connectors from fuel tank pressure control solenoid valve and ECM.                      3) Measure resistance of harness between fuel tank pressure control solenoid valve connector and chassis ground.</p> <p><b>Connector &amp; terminal</b>  <i>(R68) No. 2 — Chassis ground:</i></p>	Is the resistance less than 10 $\Omega$ ?	Repair ground short circuit in harness between ECM and fuel tank pressure control solenoid valve connector.	Go to step 4.
4	<p><b>CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b>                      Measure resistance of harness between ECM and fuel tank pressure control solenoid valve connector.</p> <p><b>Connector &amp; terminal</b>  <i>(B137) No. 22 — (R68) No. 2:</i></p>	Is the voltage less than 1 $\Omega$ ?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between ECM and fuel tank pressure control solenoid valve connector</li> <li>● Poor contact in coupling connectors</li> </ul>
5	<p><b>CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.</b>                      Measure resistance between fuel tank pressure control solenoid valve terminals.</p> <p><b>Terminals</b>  <i>No. 1 — No. 2:</i></p>	Is the resistance between 10 and 100 $\Omega$ ?	Go to step 6.	Replace fuel tank pressure control solenoid valve. <Ref. to EC(H6)-16, Pressure Control Solenoid Valve.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
6	<p><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE CONTROL SOLENOID VALVE.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between fuel tank pressure control solenoid valve and chassis ground.</p> <p><i>Connector &amp; terminal</i>  <i>(R68) No. 1 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> <li>● Open circuit in harness between main relay and fuel tank pressure control solenoid valve connector</li> <li>● Poor contact in coupling connectors</li> <li>● Poor contact in main relay connector</li> </ul>
7	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in fuel tank pressure control solenoid valve connector.</p>	Is there poor contact in fuel tank pressure control solenoid valve connector?	Repair poor contact in fuel tank pressure control solenoid valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## CW: DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT — S048521C08

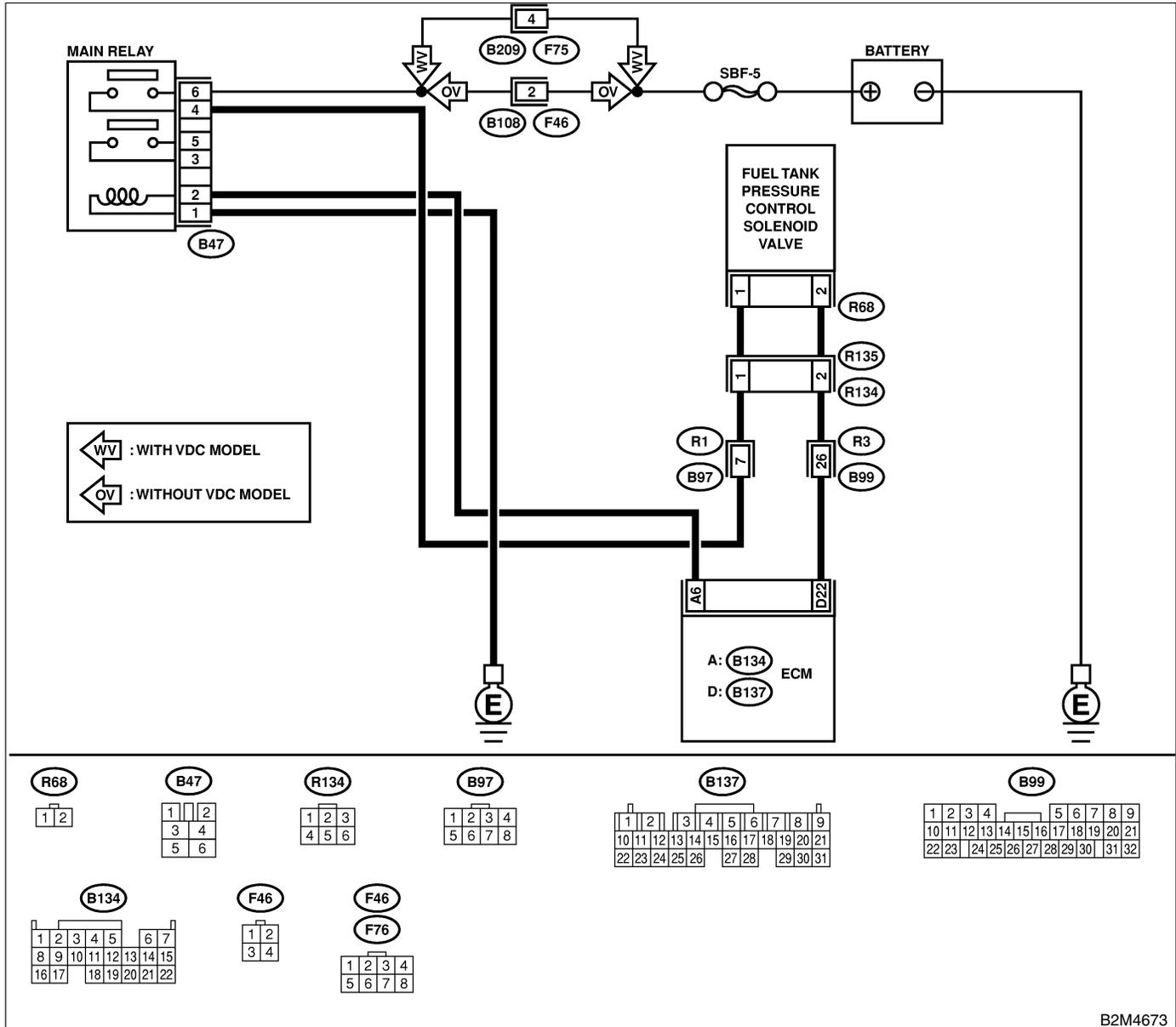
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4673

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to OFF.                      2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.                      3) Turn ignition switch to ON.                      4) While operating fuel tank pressure control solenoid valve, measure voltage between ECM and chassis ground.                      NOTE:                      Fuel tank pressure control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.&gt;  <b>Connector &amp; terminal</b>  <b>(B137) No. 22 (+) — Chassis ground (-):</b></p>	Does voltage change between 0 and 10 V?	Go to step 2.	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Turn ignition switch to ON.                      2) Measure voltage between ECM and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B137) No. 22 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>
4	<p><b>CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connector from fuel tank pressure control solenoid valve.                      3) Turn ignition switch to ON.                      4) Measure voltage between ECM and chassis ground.  <b>Connector &amp; terminal</b>  <b>(B137) No. 22 (+) — Chassis ground (-):</b></p>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel tank pressure control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Go to step 5.
5	<p><b>CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.</b>                      1) Turn ignition switch to OFF.                      2) Measure resistance between fuel tank pressure control solenoid valve terminals.  <b>Terminals</b>  <b>No. 1 — No. 2:</b></p>	Is the resistance less than 1 $\Omega$ ?	Replace fuel tank pressure control solenoid valve <Ref. to EC(H6)-16, Pressure Control Solenoid Valve.> and ECM <Ref. to FU(H6)-47, Engine Control Module.>	Go to step 6.
6	<p><b>CHECK POOR CONTACT.</b>                      Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

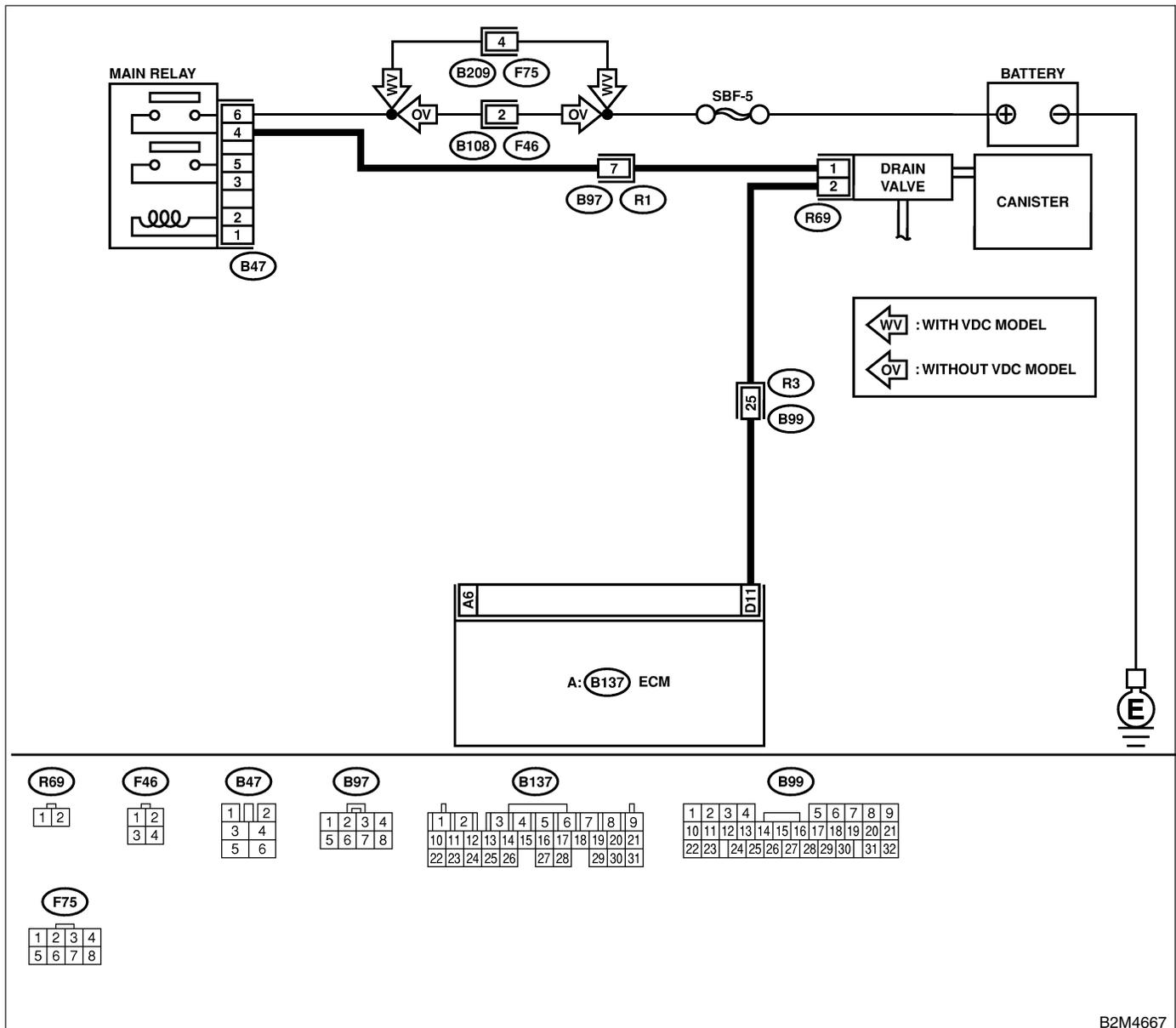
## CX: DTC P1443 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL FUNCTION PROBLEM — S048521C12

- **DTC DETECTING CONDITION:**
  - Immediately after fault occurrence
- **TROUBLE SYMPTOM:**
  - Improper fuel supply

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



B2M4667

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	<b>CHECK VENT LINE HOSES.</b> Check the following items. <ul style="list-style-type: none"><li>● Clogging of vent hoses between canister and drain valve</li><li>● Clogging of vent hose between drain valve and air filter</li><li>● Clogging of drain filter</li></ul>	Is there a fault in vent line?	Repair or replace the faulty part.	Go to step 3.
3	<b>CHECK DRAIN VALVE OPERATION.</b> 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) Operate drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to the "Compulsory Valve Operation Check Mode". <Ref. to EN(H6)-59, Compulsory Valve Operation Check Mode.>	Does drain valve produce operating sound?	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace drain valve. <Ref. to EC(H6)-20, Drain Valve.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) Engine (DIAGNOSTICS)

## CY: DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

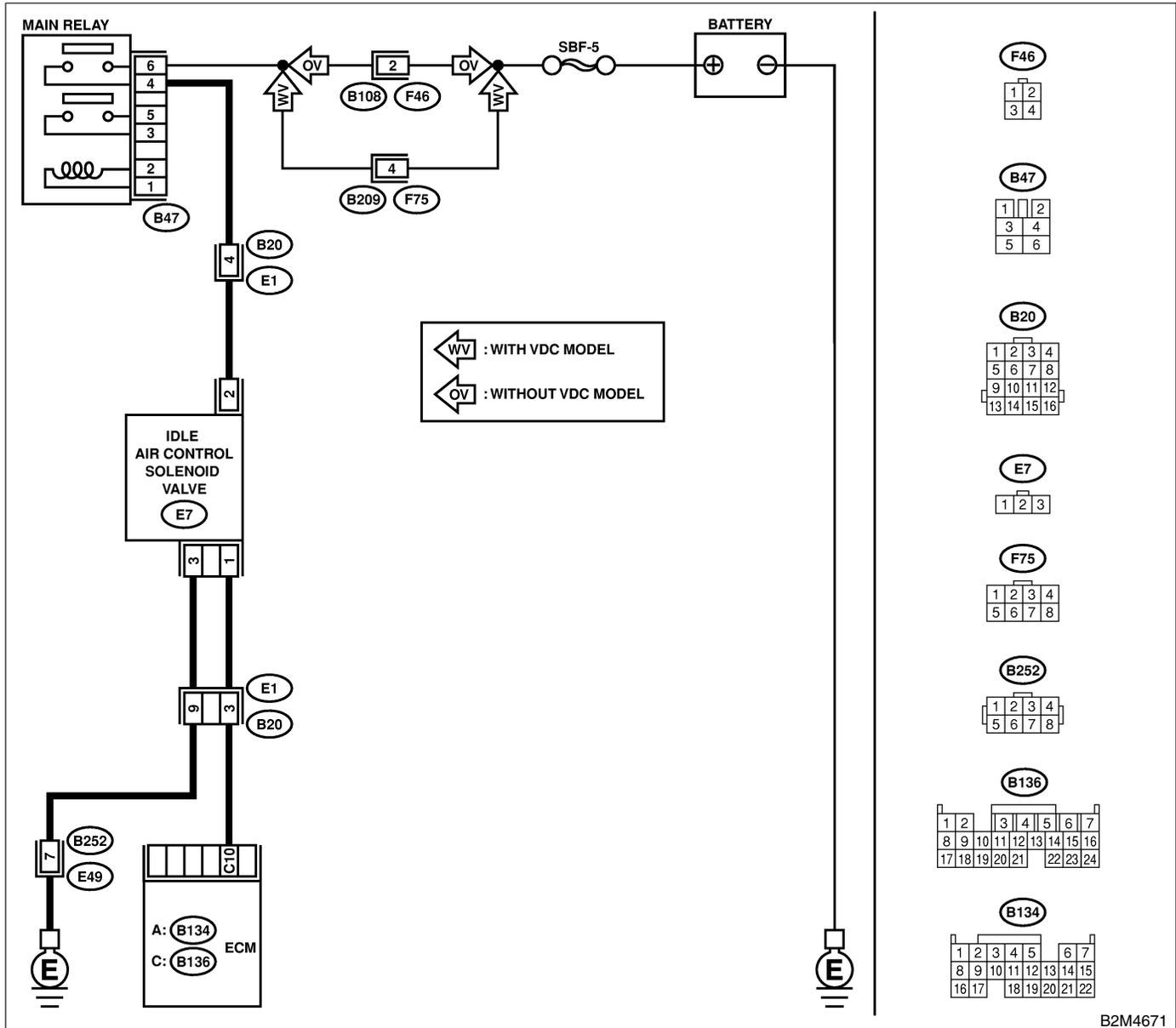
S048521C16

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine does not return to normal idle speed.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4671

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK ANY OTHER DTC ON DISPLAY.</b>	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6)-96, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1507.	Go to step 2.
2	<b>CHECK THROTTLE CABLE.</b>	Does throttle cable have play for adjustment?	Go to step 3.	Adjust throttle cable. <Ref. to SP(H6)-6, Accelerator Control Cable.>
3	<b>CHECK AIR INTAKE SYSTEM.</b> 1) Turn ignition switch to ON. 2) Start engine, and idle it. 3) Check the following items. <ul style="list-style-type: none"><li>● Loose installation of intake manifold, idle air control solenoid valve and throttle body</li><li>● Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket</li><li>● Disconnections of vacuum hoses</li></ul>	Is there a fault in air intake system?	Repair air suction and leaks.	Replace idle air control solenoid valve. <Ref. to FU(H6)-36, Idle Air Control Solenoid Valve.>

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

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## **CZ: DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —** S048521G09

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

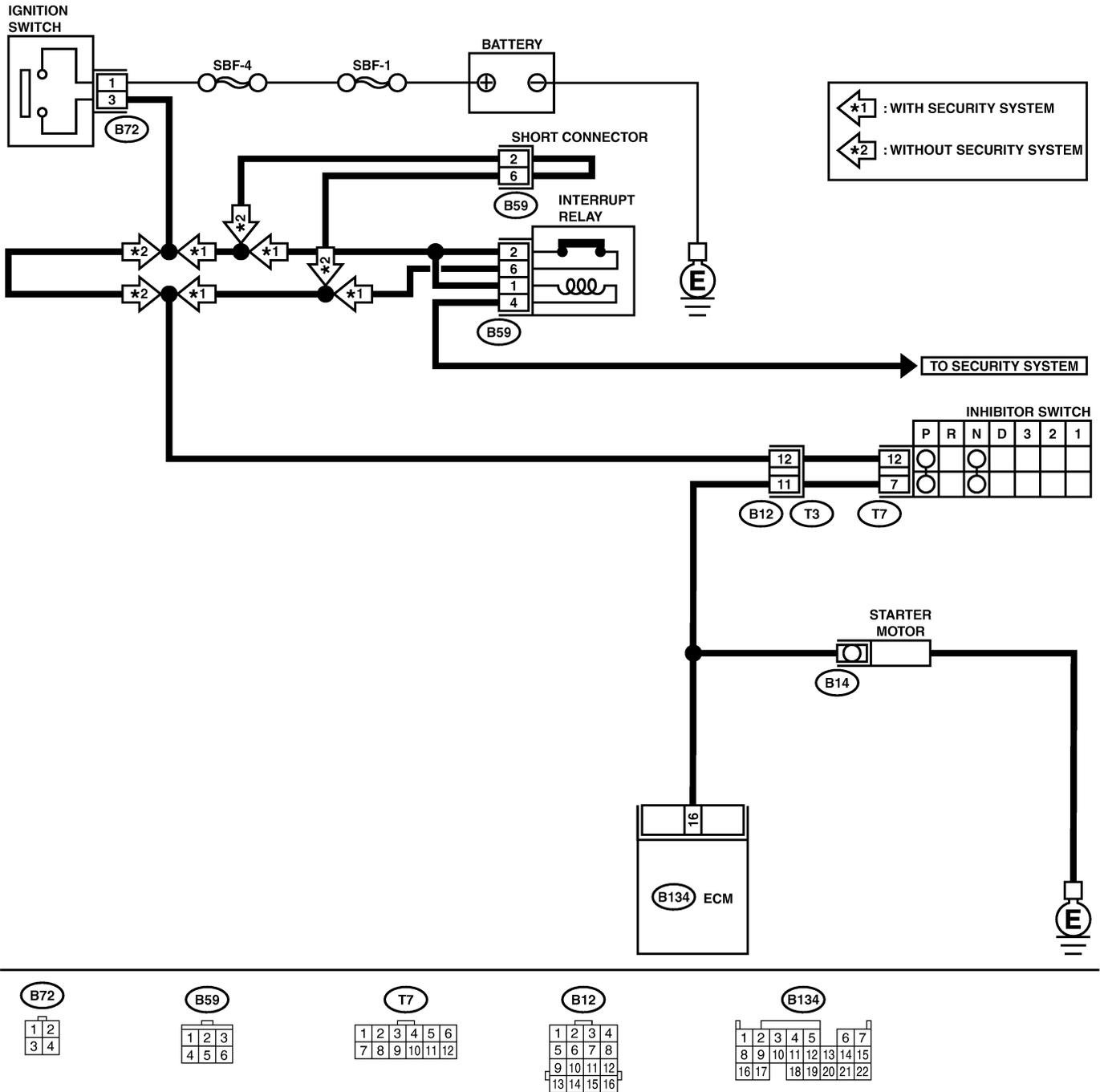
### **CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

● WIRING DIAGRAM:



B2M4339

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK OPERATION OF STARTER MOTOR.</b> NOTE: Place the inhibitor switch in the "P" or "N" position.	Does starter motor operate when ignition switch to "ST"?	Repair harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"><li>● Open or ground short circuit in harness between ECM and starter motor connector.</li><li>● Poor contact in ECM connector.</li></ul>	Check starter motor circuit. <Ref. to EN(H6)-78, STARTER MOTOR CIRCUIT, Diagnostic for Engine Starting Failure.>

**MEMO:**

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

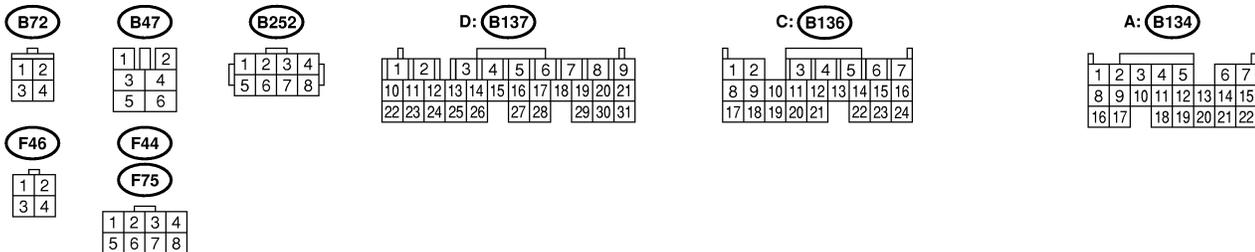
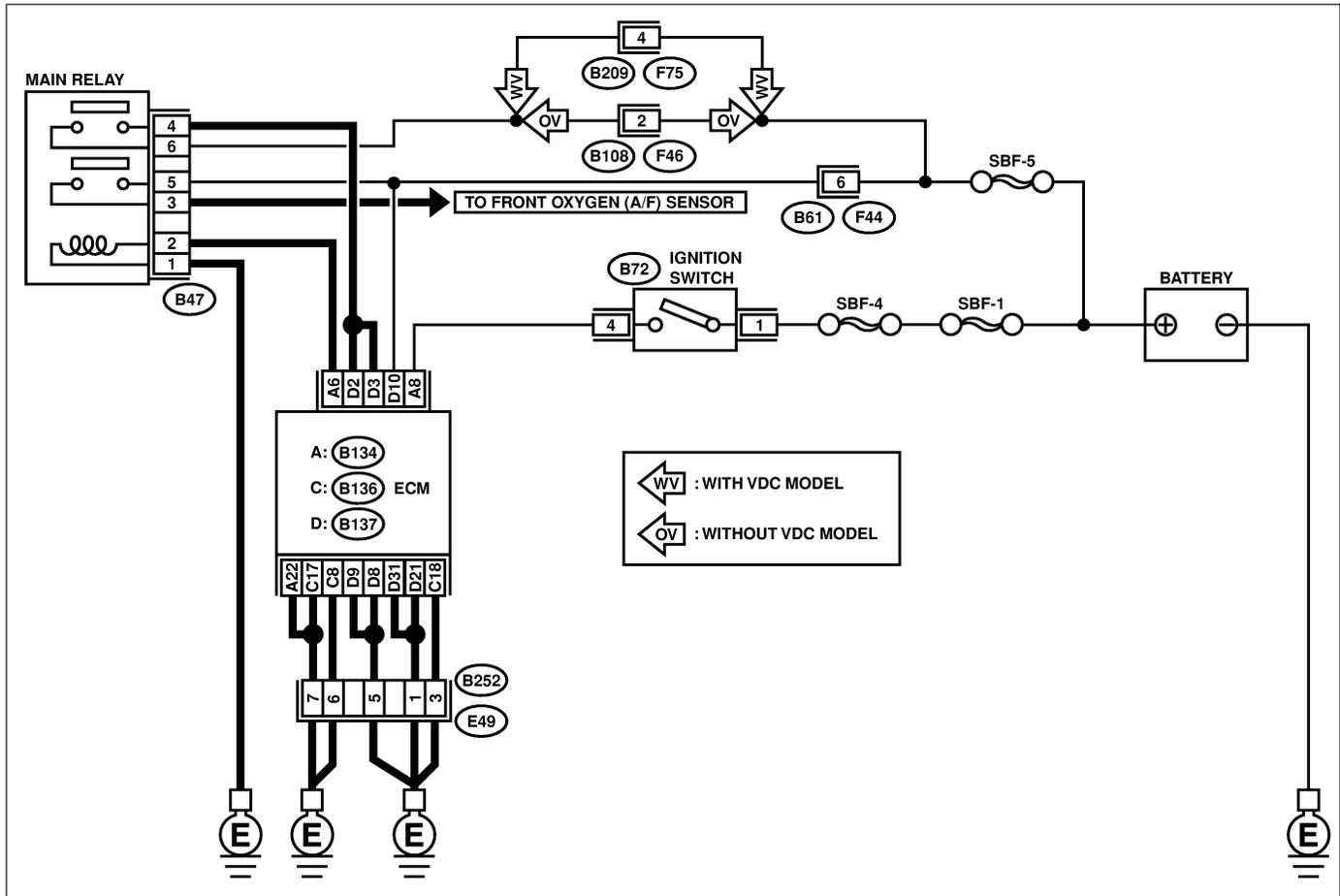
## DA: DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION — S048521C27

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4654

No.	Step	Check	Yes	No
1	<b>CHECK INPUT SIGNAL FOR ECM.</b> 1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground. <b>Connector &amp; terminal</b> (B137) No. 10 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair poor contact in ECM connector.	Go to step 2.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
2	<b>CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.</b> 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground. <i>Connector &amp; terminal (B137) No. 10 — Chassis ground:</i>	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step 3.
3	<b>CHECK FUSE SBF-5.</b>	Is fuse blown?	Replace fuse.	Repair harness and connector. NOTE: In this case, repair the following: ● Open circuit in harness between ECM and battery ● Poor contact in ECM connector ● Poor contact in battery terminal

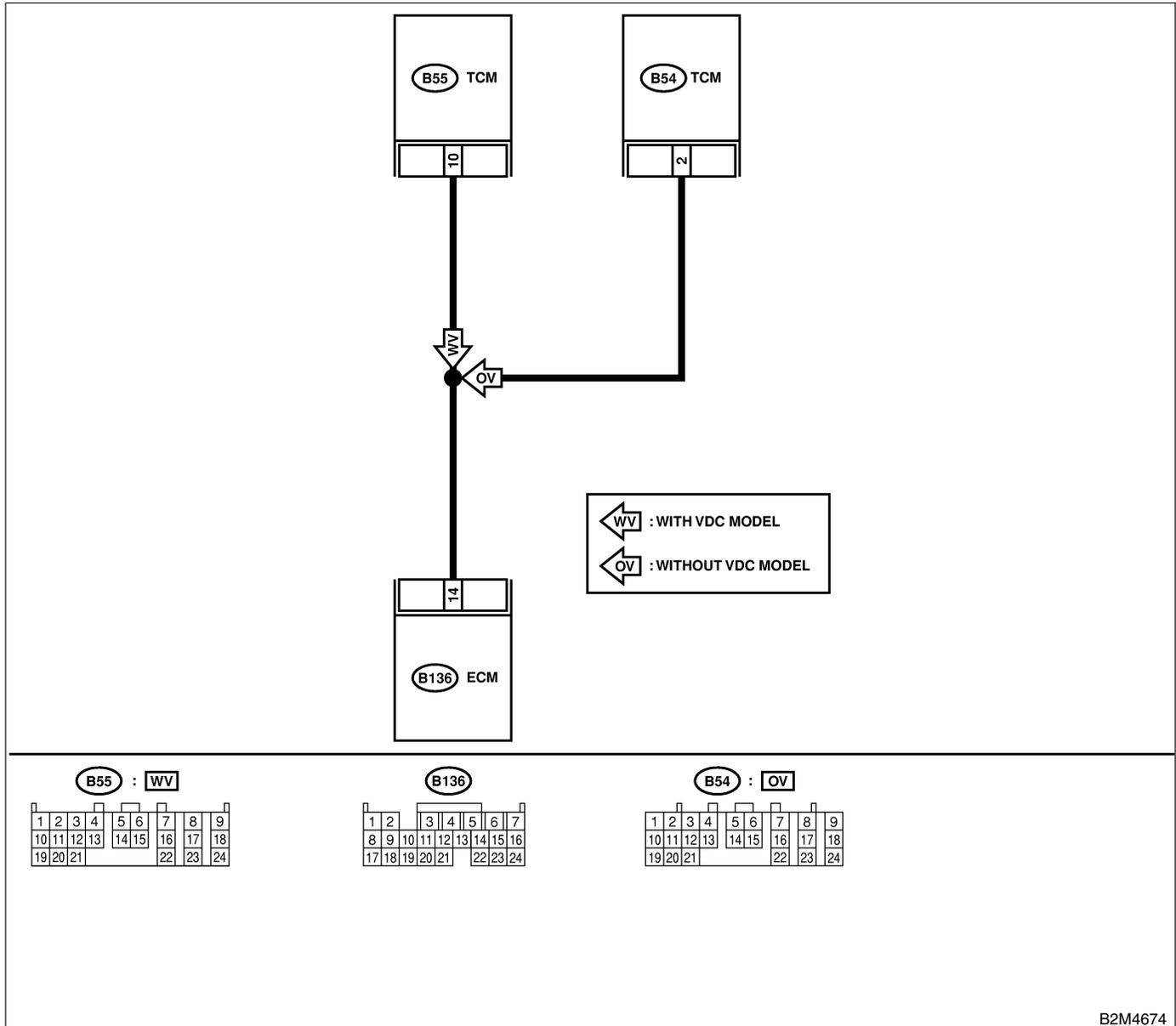
**DB: DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT** — S048521G15

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b>                      1) Start engine, and warm-up the engine.                      2) Turn ignition switch to OFF.                      3) Turn ignition switch to ON.                      4) Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b>  <b>(B136) No. 14 (+) — Chassis ground (-):</b></p>	Is the voltage more than 3 V?	Repair poor contact in ECM connector.	Go to step 2.
2	<p><b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b>                      1) Turn ignition switch to OFF.                      2) Disconnect connectors from ECM and TCM.                      3) Measure resistance of harness between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b>  <b>(B136) No. 14 — Chassis ground:</b></p>	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step 3.
3	<p><b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b>                      Measure resistance of harness between ECM and TCM connector.</p> <p><b>Connector &amp; terminal</b>  <b>(B136) No. 14 — (B55) No. 20:</b></p>	Is the resistance less than 1 Ω?	Repair poor contact in ECM or TCM connector.	Repair open circuit in harness between ECM and TCM connector.

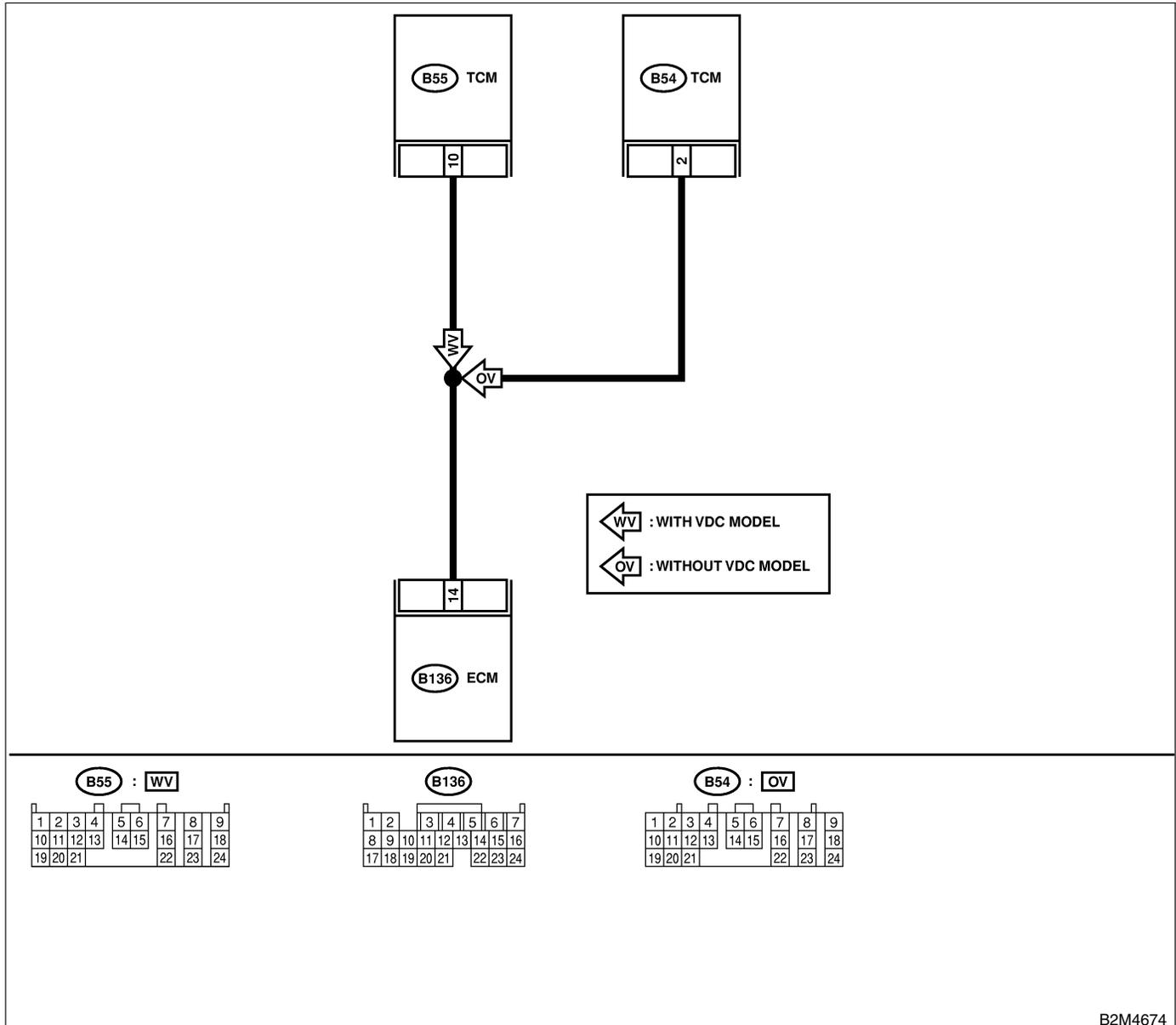
**DC: DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT** — S048521G16

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK OUTPUT SIGNAL FROM ECM.</b></p> <p>1) Start engine, and warm-up the engine.                      2) Turn ignition switch to OFF.                      3) Disconnect connector from TCM.                      4) Turn ignition switch to ON.                      5) Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b>  <b>(B136) No. 14 (+) — Chassis ground</b>  <b>(-):</b></p>	Is the voltage less than 3 V?	Go to step 2.	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>
2	<p><b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.                      2) Measure voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b>  <b>(B136) No. 14 (+) — Chassis ground</b>  <b>(-):</b></p>	Does the voltage change more than 10 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H6)-47, Engine Control Module.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

## DD: DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION — S048521C29

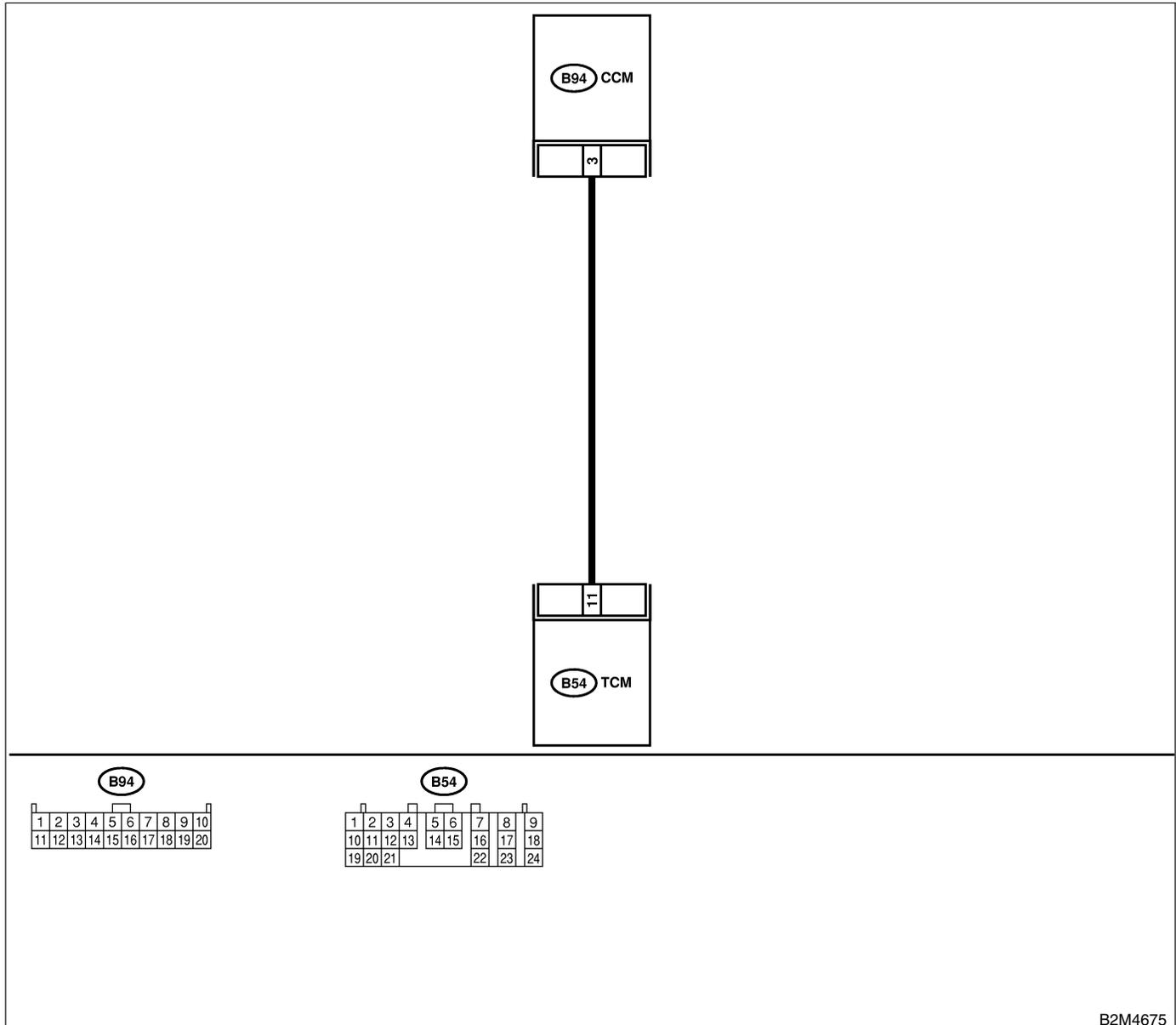
### ● DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

### ● WIRING DIAGRAM:



B2M4675

# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<p><b>CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and CCM. 3) Measure resistance of harness between TCM and CCM connector.</p> <p><b>Connector &amp; terminal</b> <b>(B54) No. 11 — (B94) No. 3:</b></p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair open circuit in harness between TCM and CCM connector.
2	<p><b>CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.</b></p> <p>Measure resistance of harness between TCM and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B54) No. 11 — Chassis ground:</b></p>	Is the resistance less than 10 Ω?	Repair short circuit in harness between TCM and CCM connector.	Go to step 3.
3	<p><b>CHECK INPUT SIGNAL FOR TCM.</b></p> <p>1) Connect connector to TCM and CCM. 2) Lift-up the vehicle or set the vehicle on free rollers.</p> <p><b>CAUTION:</b> <b>On AWD models, raise all wheels off ground.</b></p> <p>3) Start the engine. 4) Cruise control main switch to ON. 5) Move selector lever to “D” and slowly increase vehicle speed to 50 km/h (31 MPH). 6) Cruise control command switch to ON. 7) Measure voltage between TCM and chassis ground.</p> <p><b>Connector &amp; terminal</b> <b>(B54) No. 11 (+) — Chassis ground (-):</b></p>	Is the resistance less than 1 V?	Go to step 4.	Check cruise control command switch circuit. <Ref. to CC-6, INSPECTION, Cruise Control Command Switch.>
4	<p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in TCM connector.</p>	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-49, Transmission Control Module (TCM).>

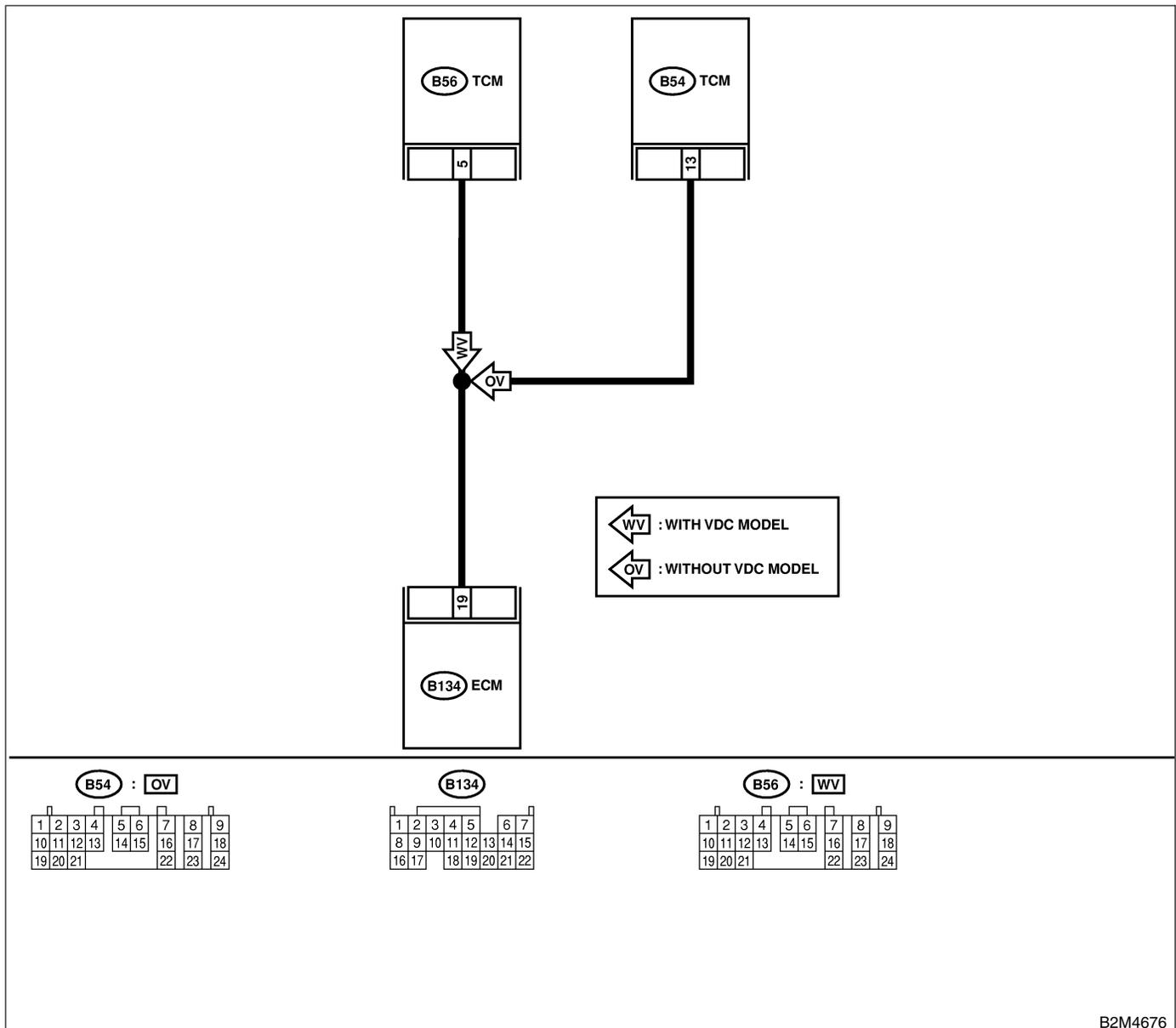
**DE: DTC P1711 — ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION** — S048521G17

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK INPUT SIGNAL FOR ECM.</b> 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. <b>Connector &amp; terminal</b> <i>(B135) No. 19 (+) — Chassis ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 2.	Go to step 4.
2	<b>CHECK INPUT SIGNAL FOR ECM.</b> Measure voltage between ECM and chassis ground. <b>Connector &amp; terminal</b> <i>(B135) No. 19 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step 3.
3	<b>CHECK POOR CONTACT.</b> Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	<b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. <b>Connector &amp; terminal</b> <b>Model with VDC:</b> <i>(B134) No. 19 — (B56) No. 5:</i> <b>Model without VDC:</b> <i>(B134) No. 19 — (B54) No. 13:</i>	Is the resistance less than 1 $\Omega$ ?	Go to step 5.	Repair open circuit in harness between ECM and TCM connector.
5	<b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b> Measure resistance of harness between ECM and chassis ground. <b>Connector &amp; terminal</b> <i>(B135) No. 19 — Chassis ground:</i>	Is the resistance less than 10 $\Omega$ ?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step 6.
6	<b>CHECK POOR CONTACT.</b> Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-49, Transmission Control Module (TCM).>

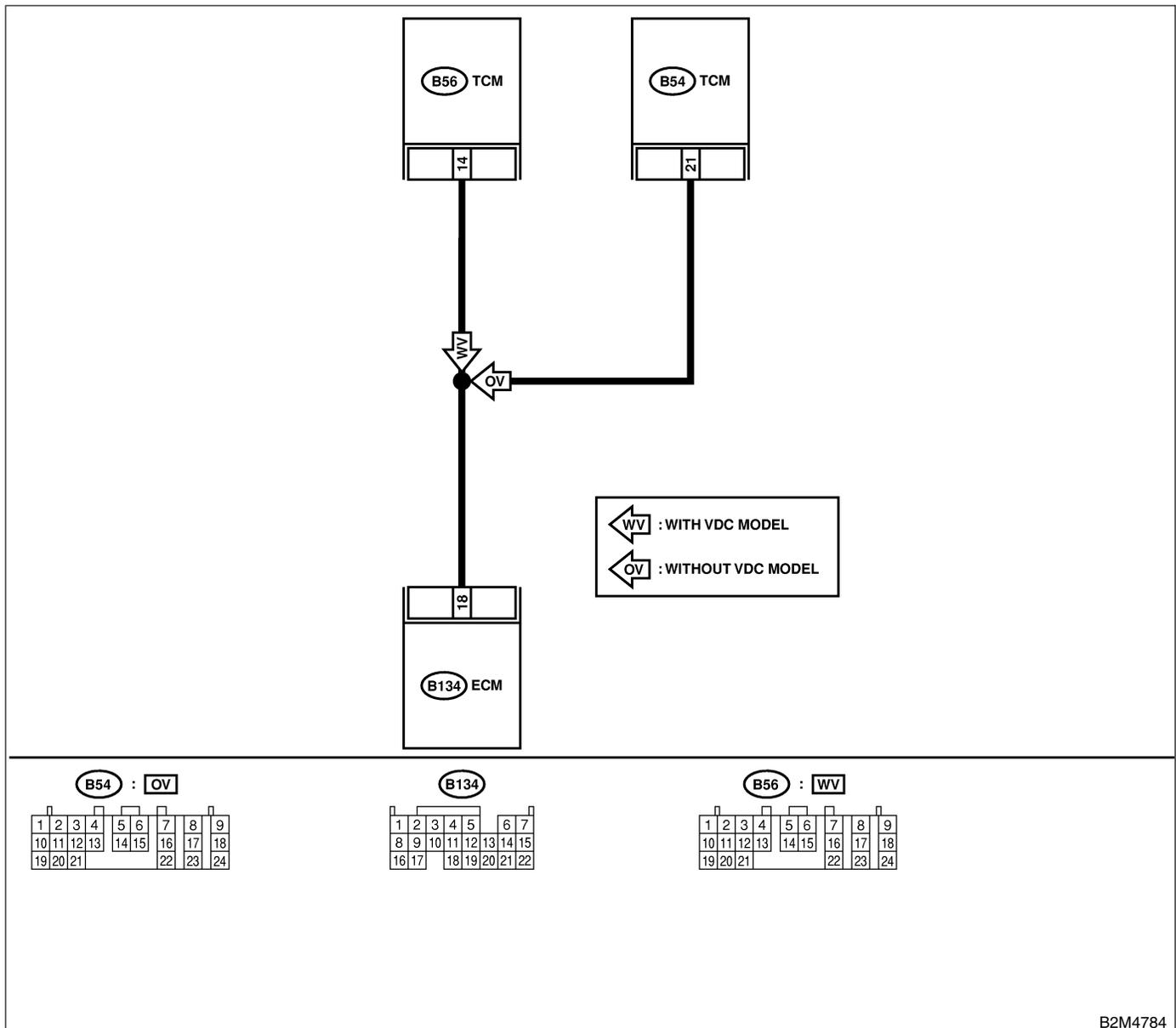
**DF: DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION** — S048521G18

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6)-50, OPERATION, Inspection Mode.>.

● **WIRING DIAGRAM:**



# DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

Engine (DIAGNOSTICS)

No.	Step	Check	Yes	No
1	<b>CHECK INPUT SIGNAL FOR ECM.</b> 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. <i>Connector &amp; terminal</i> <i>(B134) No. 18 (+) — Chassis ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 2.	Go to step 4.
2	<b>CHECK INPUT SIGNAL FOR ECM.</b> Measure voltage between ECM and chassis ground. <i>Connector &amp; terminal</i> <i>(B134) No. 18 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step 3.
3	<b>CHECK POOR CONTACT.</b> Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	<b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b> 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. <i>Connector &amp; terminal</i> <i>Model with VDC:</i> <i>(B134) No. 18 — (B56) No. 14:</i> <i>Model without VDC:</i> <i>(B134) No. 18 — (B54) No. 21:</i>	Is the resistance less than 1 $\Omega$ ?	Go to step 5.	Repair open circuit in harness between ECM and TCM connector.
5	<b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b> Measure resistance of harness between ECM and chassis ground. <i>Connector &amp; terminal</i> <i>(B134) No. 18 — Chassis ground:</i>	Is the resistance less than 10 $\Omega$ ?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step 6.
6	<b>CHECK POOR CONTACT.</b> Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-49, Transmission Control Module (TCM).>

# GENERAL DIAGNOSTIC TABLE

Engine (DIAGNOSTICS)

## 20. General Diagnostic Table

S048257

### A: INSPECTION S048257A10

#### 1. ENGINE S048257A1001

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(H6)-76, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Intake air temperature and pressure sensor 5) Ignition parts (*1) 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) Fuel injection parts (*4) 10) EGR valve
2. Rough idling	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Intake air temperature and pressure sensor 5) Engine coolant temperature sensor (*2) 6) Ignition parts (*1) 7) Air intake system (*5) 8) Fuel injection parts (*4) 9) Throttle position sensor 10) Crankshaft position sensor (*3) 11) Camshaft position sensor (*3) 12) Oxygen sensor 13) Fuel pump and fuel pump relay 14) EGR valve
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Intake manifold pressure sensor 6) Intake air temperature sensor 7) Intake air temperature and pressure sensor 8) EGR valve
4. Poor acceleration	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Throttle position sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay 7) Engine coolant temperature sensor (*2) 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) A/C switch and A/C cut relay 11) Engine torque control signal circuit 12) Ignition parts (*1) 13) EGR valve

# GENERAL DIAGNOSTIC TABLE

Engine (DIAGNOSTICS)

Symptom	Problem parts
5. Engine stalls or engine sags or hesitates at acceleration.	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Purge control solenoid valve 8) Fuel injection parts (*4) 9) Throttle position sensor 10) Fuel pump and fuel pump relay 11) EGR valve
6. Surge	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay 10) EGR valve
7. Spark knock	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor 5) Knock sensor 6) Fuel injection parts (*4) 7) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay

\*1: Check ignition coil & 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.

\*6: Adjust accelerator cable.

## 2. AUTOMATIC TRANSMISSION S048257A1002

NOTE:

Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to AT-2, Basic Diagnostic Procedure.>

# GENERAL DIAGNOSTIC TABLE

Engine (DIAGNOSTICS)

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**MEMO:**