

# COOLING

# *CO(H4DOTC)*

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# GENERAL DESCRIPTION

COOLING

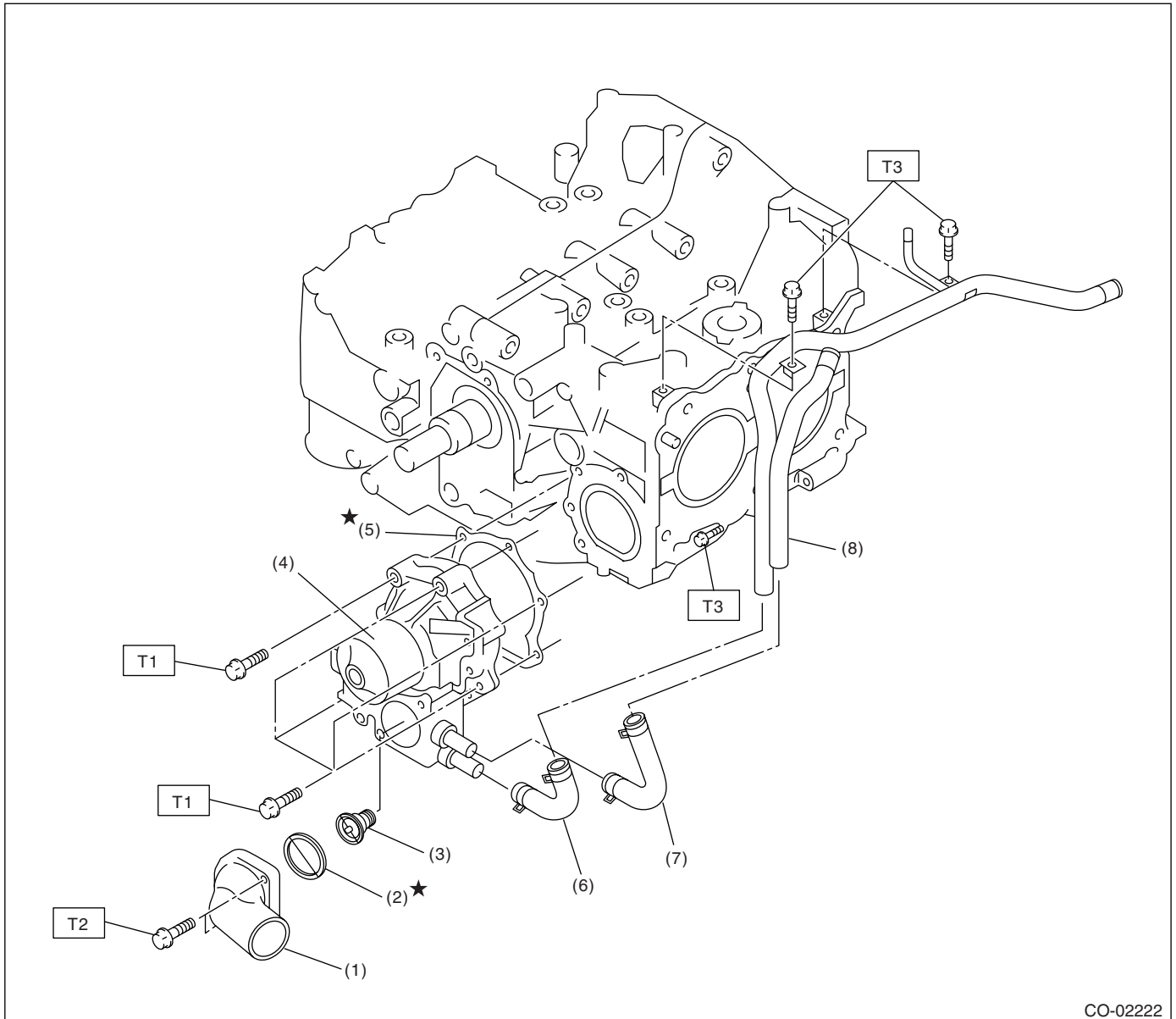
## 1. General Description

### A: SPECIFICATIONS

Model		DOHC TURBO	
Cooling system		Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity		ℓ (US qt, Imp qt)	
		AT: Approx. 7.6 (8.03, 6.69) MT: Approx. 7.7 (8.14, 6.78)	
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed — Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed — Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed — Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter		76 mm (2.99 in)
Number of impeller vanes		8	
Pump pulley diameter		60 mm (2.36 in)	
Clearance between impeller and case	Standard	0.5 — 1.5 mm (0.020 — 0.059 in)	
Thermostat	Type		Wax pellet type
	Starts to open		76 — 80°C (169 — 176°F)
	Fully opened		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more/91°C (196°F)
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor	Main fan	120 W
		Sub fan	120 W
	Fan diameter × Blade		320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)
Radiator	Type		Down flow
	Core dimensions	Width × Height × Thickness	691.5 × 340 × 27 mm (27.22 × 13.39 × 1.06 in)
	Pressure range in which cap valve is open	Coolant filler tank side	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)
		Radiator side	Above only: 137±14.7 kPa (1.40±0.15 kg/cm <sup>2</sup> , 20±2.1 psi)
Fins		Corrugated fin type	
Reservoir tank	Capacity		0.5 ℓ (0.5 US qt, 0.4 Imp qt)

**B: COMPONENT**

**1. WATER PUMP**



CO-02222

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

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

**T1: First 12 (1.2, 8.7)  
Second 12 (1.2, 8.7)**

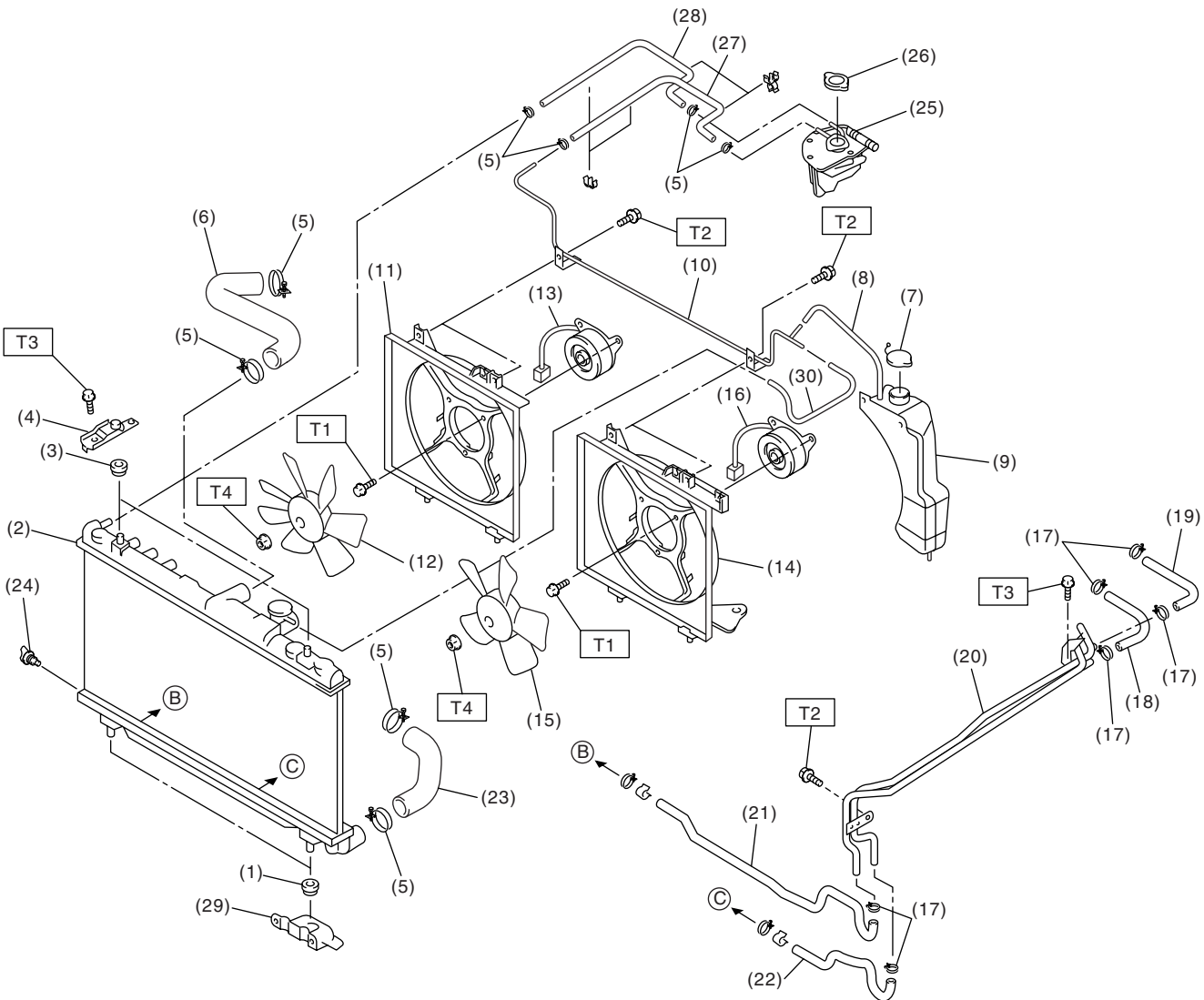
**T2: 12 (1.2, 8.7)**

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

# GENERAL DESCRIPTION

## COOLING

### 2. RADIATOR AND RADIATOR FAN



CO-02122

# GENERAL DESCRIPTION

COOLING

- 
- |                                       |                                   |  |
|---------------------------------------|-----------------------------------|--|
| (1) Radiator lower cushion            | (13) Radiator sub fan motor       | (25) Engine coolant filler tank                    |
| (2) Radiator                          | (14) Radiator main fan shroud     | (26) Radiator cap (engine coolant filler tank cap) |
| (3) Radiator upper cushion            | (15) Radiator main fan            | (27) Engine overflow hose                          |
| (4) Radiator upper bracket            | (16) Radiator main fan motor      | (28) Engine air breather hose                      |
| (5) Clamp                             | (17) ATF hose clamp (AT model)    | (29) Radiator lower bracket                        |
| (6) Radiator inlet hose               | (18) ATF inlet hose A (AT model)  | (30) Overflow hose B                               |
| (7) Engine coolant reservoir tank cap | (19) ATF outlet hose A (AT model) |  |
| (8) Overflow hose A                   | (20) ATF pipe (AT model)          |  |
| (9) Engine coolant reservoir tank     | (21) ATF inlet hose B (AT model)  |  |
| (10) Overflow pipe                    | (22) ATF outlet hose B (AT model) |  |
| (11) Radiator sub fan shroud          | (23) Radiator outlet hose         |  |
| (12) Radiator sub fan                 | (24) Radiator drain plug          |  |

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

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

**T2: 7.5 (0.76, 5.5)**

**T3: 18 (1.8, 13.0)**

**T4: 3.4 (0.35, 2.5)**

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## GENERAL DESCRIPTION

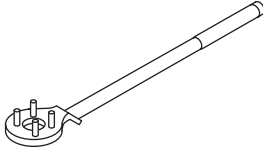
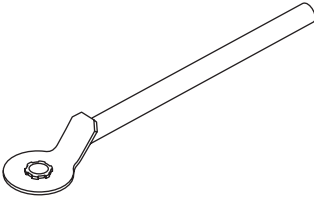
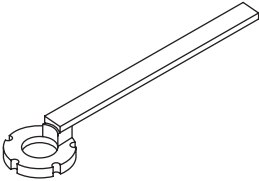
### COOLING

#### C: CAUTION

- 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.

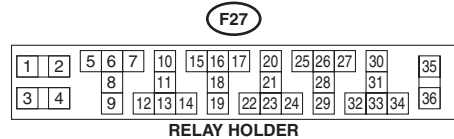
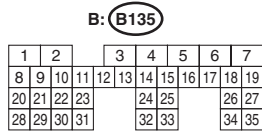
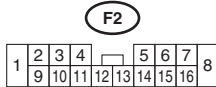
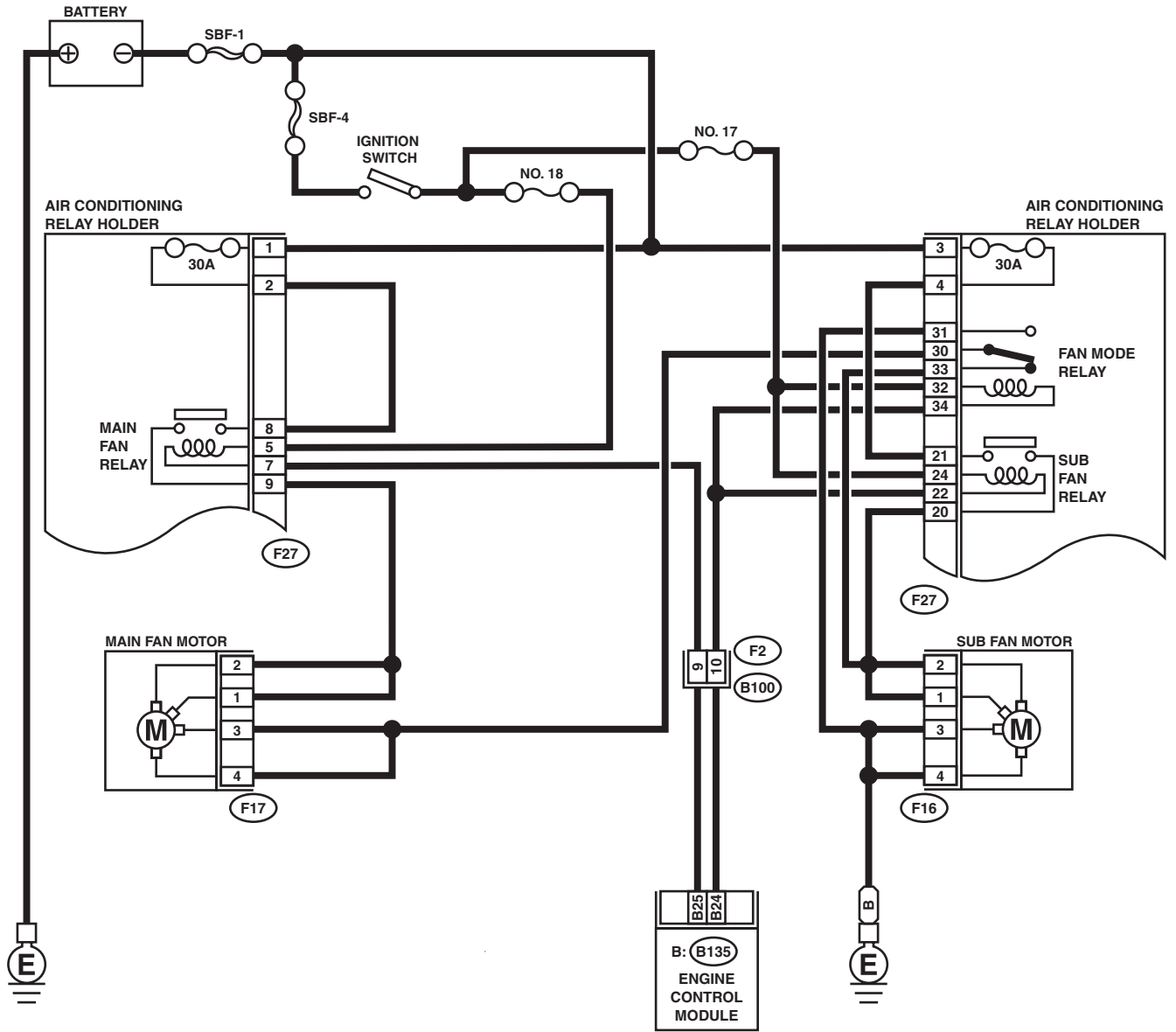
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

#### D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANKSHAFT PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST-499977500	499977500	CAMSHAFT SPROCKET WRENCH	Used for removing and installing intake camshaft sprockets.
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing exhaust camshaft sprockets.

## 2. Radiator Fan System

### A: SCHEMATIC



# RADIATOR FAN SYSTEM

## COOLING

### B: INSPECTION

#### DETECTING CONDITION:

- Engine coolant temperature is above 95°C (203°F).
- Vehicle speed is below 19 km/h (12 MPH).

#### TROUBLE SYMPTOM:

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

Step	Check	Yes	No
<b>1 CHECK OPERATION OF RADIATOR FAN.</b> 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Using Subaru Select Monitor, check the compulsory operation of radiator fan.  <b>NOTE:</b> •With Subaru Select Monitor When checking the compulsory operation of radiator fan, the radiator main and sub fan repeat the rotation in order of following: low speed rotation → high speed rotation → off. •Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(H4DOTC)-53, Compulsory Valve Operation Check Mode.>	Do the radiator main and sub fan rotate at low speed?	Go to step 2.	Go to step 3.
<b>2 CHECK OPERATION OF RADIATOR FAN.</b> 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Using Subaru Select Monitor, check the compulsory operation of radiator fan.  <b>NOTE:</b> •With Subaru Select Monitor When checking the compulsory operation of radiator fan, the radiator main and sub fan repeat the rotation in order of following: low speed rotation → high speed rotation → off. •Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(H4DOTC)-53, Compulsory Valve Operation Check Mode.>	Do the radiator main and sub fan rotate at high speed?	Radiator main fan system is okay.	Go to step 32.
<b>3 CHECK POWER SUPPLY TO MAIN FAN RELAY.</b> 1) Turn the ignition switch to OFF. 2) Remove the main fan relay from A/C relay holder. 3) Measure the voltage between main fan relay terminal and chassis ground.  <b>Connector &amp; terminal</b> <b>(F27) No. 8 (+) — Chassis ground (-):</b>	Is the measured value more than 10 V?	Go to step 4.	Go to step 5.
<b>4 CHECK POWER SUPPLY TO MAIN FAN RELAY.</b> 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay terminal and chassis ground.  <b>Connector &amp; terminal</b> <b>(F27) No. 5 (+) — Chassis ground (-):</b>	Is the measured value more than 10 V?	Go to step 8.	Go to step 7.
<b>5 CHECK FUSE.</b> 1) Remove the 30 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step 6.



# RADIATOR FAN SYSTEM

COOLING

Step	Check	Yes	No
<b>6 CHECK HARNESS OF 30 A FUSE TERMINAL AND MAIN FAN RELAY TERMINAL.</b> 1) Turn the ignition switch to OFF. 2) Measure the resistance between 20 A fuse terminal and main fan relay terminal. <i>Terminal</i> <i>No. 2 — No. 8:</i>	Is the measured value less than 1 Ω?	Repair the power supply line.	Repair the open harness.
<b>7 CHECK FUSE.</b> 1) Turn the ignition switch to OFF 2) Remove the fuse No. 18. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
<b>8 CHECK MAIN FAN RELAY.</b> 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan relay terminals. <i>Terminal</i> <i>No. 8 — No. 9:</i>	Is the measured value more than 1 MΩ?	Go to step 9.	Replace the main fan relay.
<b>9 CHECK MAIN FAN RELAY.</b> 1) Connect the battery to main fan relay terminals No. 5 and No. 7. 2) Measure the resistance between main fan relay terminals. <i>Terminal</i> <i>No. 8 — No. 9:</i>	Is the measured value less than 1 Ω?	Go to step 10.	Replace the main fan relay.
<b>10 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.</b> 1) Disconnect the connector from main fan motor. 2) Measure the resistance between main fan relay terminal and main fan motor connector. <i>Connector &amp; terminal</i> <i>(F17) No. 1 — (F27) No. 9:</i> <i>(F17) No. 2 — (F27) No. 9:</i>	Is the measured value less than 1 Ω?	Go to step 11.	Repair the open harness between main fan relay terminal and main fan motor connector.
<b>11 CHECK HARNESS BETWEEN MAIN FAN MOTOR CONNECTOR AND FAN MODE RELAY CONNECTOR.</b> 1) Remove the fan mode relay from A/C relay holder. 2) Measure the resistance between main fan motor connector and fan mode relay connector. <i>Connector &amp; terminal</i> <i>(F17) No. 3 — (F27) No. 30:</i> <i>(F17) No. 4 — (F27) No. 30:</i>	Is the measured value less than 1 Ω?	Go to step 12.	Repair the open harness between main fan motor connector and fan mode relay connector.
<b>12 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 13.
<b>13 CHECK MAIN FAN MOTOR.</b> Connect the battery positive (+) terminal to terminal No. 1 and No. 2, and ground (-) terminal to terminal No. 3 and No. 4 of main fan motor.	Does the main fan rotate?	Go to step 14.	Replace the main fan motor.
<b>14 CHECK FAN MODE RELAY.</b> Measure the resistance of fan mode relay. <i>Terminal</i> <i>No. 30 — No. 33</i>	Is the measured value less than 1 Ω?	Go to step 15.	Replace the fan mode relay.

# RADIATOR FAN SYSTEM

## COOLING

Step	Check	Yes	No
<b>15 CHECK RESISTANCE BETWEEN FAN MODE RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.</b> 1) Disconnect the connector from sub fan motor. 2) Measure the resistance between fan mode relay terminal and sub fan motor connector. <i>Connector &amp; terminal</i> <i>(F16) No. 1 — (F27) No. 33:</i> <i>(F16) No. 2 — (F27) No. 33:</i>	Is the measured value less than 1 $\Omega$ ?	Go to step 16.	Repair the open harness between fan mode relay terminal and sub fan motor connector.
<b>16 CHECK SUB FAN MOTOR AND GROUND CIRCUIT.</b> Measure the resistance between sub fan motor connector and chassis ground. <i>Connector &amp; terminal</i> <i>(F16) No. 3 — Chassis ground:</i> <i>(F16) No. 4 — Chassis ground:</i>	Is the measured value less than 5 $\Omega$ ?	Go to step 17.	Repair the open harness between sub fan motor connector and chassis ground.
<b>17 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 18.
<b>18 CHECK SUB FAN MOTOR.</b> Connect the battery positive (+) terminal to terminal No. 1 and No. 2, and ground (-) terminal to terminal No. 3 and No. 4 of sub fan motor.	Does the sub fan rotate?	Go to step 19.	Replace the sub fan motor.
<b>19 CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.</b> 1) Disconnect the connector from ECM. 2) Measure the resistance between main fan relay terminal and ECM connector. <i>Connector &amp; terminal</i> <i>(B135) No. 25 — (F25) No. 7:</i>	Is the measured value less than 1 $\Omega$ ?	Go to step 20.	Repair the open harness between main fan relay terminal and ECM.
<b>20 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.
<b>21 CHECK POWER SUPPLY TO SUB FAN RELAY.</b> 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from A/C relay holder. 3) Measure the voltage between fan relay 2 terminal and chassis ground. <i>Connector &amp; terminal</i> <i>(F27) No. 21 (+) — Chassis ground (-):</i>	Is the measured value more than 10 V?	Go to step 22.	Go to step 23.
<b>22 CHECK POWER SUPPLY TO SUB FAN RELAY.</b> 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay terminal and chassis ground. <i>Connector &amp; terminal</i> <i>(F27) No. 24 (+) — Chassis ground (-):</i>	Is the measured value more than 10 V?	Go to step 26.	Go to step 25.
<b>23 CHECK FUSE.</b> 1) Remove the 30 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step 24.

# RADIATOR FAN SYSTEM

COOLING

Step	Check	Yes	No
<b>24 CHECK HARNESS BETWEEN 30 A FUSE TERMINAL AND SUB FAN RELAY TERMINAL.</b> 1) Turn the ignition switch to OFF. 2) Measure the resistance between 30 A fuse terminal and sub fan relay terminal. <i>Terminal</i> <i>No. 4 — No. 21:</i>	Is the measured value less than 1 Ω?	Repair the power supply line.	Repair the open harness.
<b>25 CHECK FUSE.</b> 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
<b>26 CHECK SUB FAN RELAY.</b> 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from A/C relay holder. 3) Measure the resistance of sub fan relay. <i>Terminal</i> <i>No. 20 — No. 21:</i>	Is the measured value more than 1 MΩ?	Go to step 27.	Replace the sub fan relay.
<b>27 CHECK SUB FAN RELAY.</b> 1) Connect the battery to terminals No. 22 and No. 24 of sub fan relay. 2) Measure the resistance of sub fan relay. <i>Terminal</i> <i>No. 20 — No. 21:</i>	Is the measured value less than 1 Ω?	Go to step 28.	Replace the sub fan relay.
<b>28 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.</b> 1) Disconnect the connector from sub fan motor. 2) Measure the resistance between sub fan relay terminal and sub fan motor connector. <i>Connector &amp; terminal</i> <i>(F16) No. 1 — (F27) No. 20:</i> <i>(F16) No. 2 — (F27) No. 20:</i>	Is the measured value less than 1 Ω?	Go to step 30.	Repair the open harness between sub fan relay terminal and sub fan motor connector.
<b>29 CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.</b> 1) Disconnect the connector from ECM. 2) Measure the resistance between sub fan relay terminal and ECM connector. <i>Connector &amp; terminal</i> <i>(B135) No. 24 — (F27) No. 22:</i>	Is the measured value less than 1 Ω?	Go to step 30.	Repair the open harness between sub fan relay terminal and ECM.
<b>30 CHECK HARNESS BETWEEN FAN MODE RELAY AND ECM.</b> Measure the resistance between fan mode relay terminal and ECM connector. <i>Connector &amp; terminal</i> <i>(B135) No. 24 — (F27) No. 34:</i>	Is the measured value less than 1 Ω?	Go to step 31.	Repair the open harness between fan mode relay terminal and ECM.
<b>31 CHECK POOR CONTACT.</b> Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact with your SOA (distributor) service.
<b>32 CHECK OPERATION OF RADIATOR FAN.</b>	Does the radiator main fan rotate when the radiator main and sub fan do not rotate at high speed at step 2?	Go to step 21.	Go to step 33.

# RADIATOR FAN SYSTEM

## COOLING

Step	Check	Yes	No
<b>33</b> <b>CHECK GROUND CIRCUIT OF FAN MODE RELAY.</b> 1) Remove the fan mode relay from A/C relay holder. 2) Measure the resistance between fan mode relay terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F27) No. 31 — Chassis ground:</b>	Is the measured value less than 1 $\Omega$ ?	Go to step <b>34</b> .	Repair the open harness between fan mode relay and chassis ground.
<b>34</b> <b>CHECK POWER SUPPLY TO FAN MODE RELAY.</b> 1) Turn the ignition switch to ON. 2) Measure the voltage between fan mode relay terminal and chassis ground. <b>Connector &amp; terminal</b> <b>(F27) No. 32 (+) — Chassis ground (-):</b>	Is the measured value more than 10 V?	Go to step <b>35</b> .	Repair the power supply line.
<b>35</b> <b>CHECK FAN MODE RELAY.</b> 1) Turn the ignition switch to OFF. 2) Remove the fan mode relay. 3) Measure the resistance of fan mode relay. <b>Terminal</b> <b>(F27) No. 30 — (F27) No. 31:</b>	Is the measured value more than 1 M $\Omega$ ?	Go to step <b>36</b> .	Replace the fan mode relay.
<b>36</b> <b>CHECK FAN MODE RELAY.</b> 1) Connect the battery to terminals No. 32 and No. 34 of fan mode relay. 2) Measure the resistance of fan mode relay. <b>Terminal</b> <b>(F27) No. 30 — (F27) No. 31:</b>	Is the measured value less than 1 $\Omega$ ?	Go to step <b>29</b> .	Replace the fan mode relay.

### 3. Engine Coolant

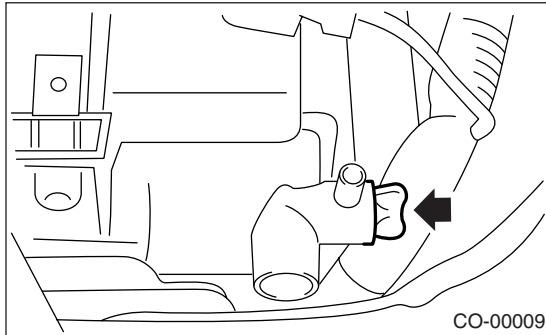
#### A: REPLACEMENT

##### 1. DRAINING OF ENGINE COOLANT

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

**NOTE:**

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



- 4) Install the drain cock.

##### 2. FILLING OF ENGINE COOLANT

- 1) Fill cooling system conditioner from filling port.

**Cooling system protecting agent:**

**COOLING SYSTEM CONDITIONER (Part No. SOA635071)**

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

**Coolant capacity (fill up to "FULL" level):**

**AT model**

**Approx. 7.6 ℓ (8.03 US qt, 6.69 Imp qt)**

**MT model**

**Approx. 7.7 ℓ (8.14 US qt, 6.78 Imp qt)**

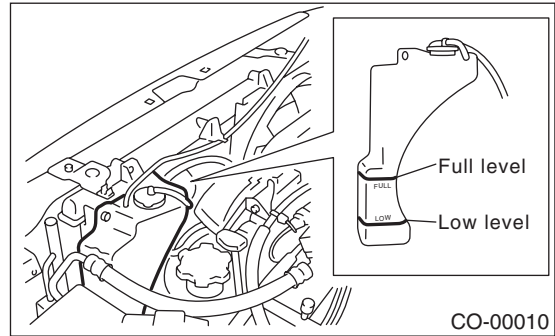
**CAUTION:**

**Do not mix up the coolant filler tank side cap with radiator side cap.**

**NOTE:**

- Do not remove the radiator side cap when filling engine coolant.
- The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crank-case. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

- 3) Fill engine coolant into the reservoir tank up to Full level.



- 4) Warm-up the engine completely for more than 5 minutes at 2,000 to 3,000 rpm.

- 5) If the engine coolant level drops in coolant filler tank, add engine coolant to filler neck position.

- 6) If the engine coolant level drops from Full level of reservoir tank, add engine coolant to Full level.

- 7) Attach the coolant filler tank cap and reservoir tank cap properly.

# ENGINE COOLANT

## COOLING

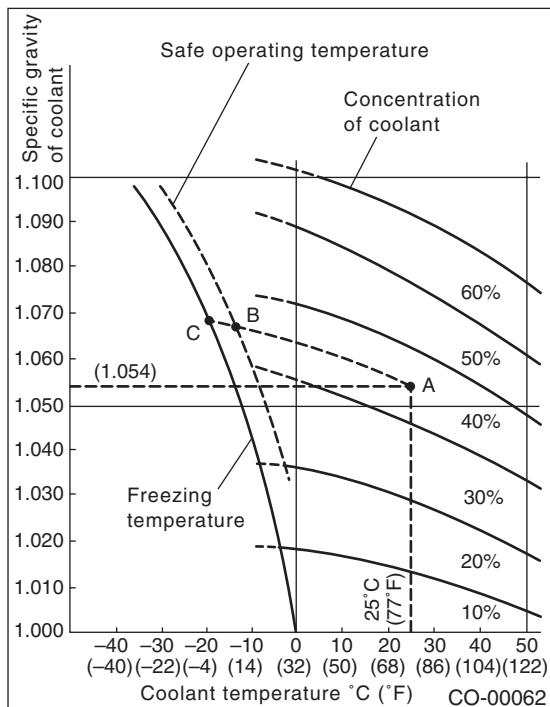
### B: INSPECTION

#### 1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

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 45% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



#### 2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

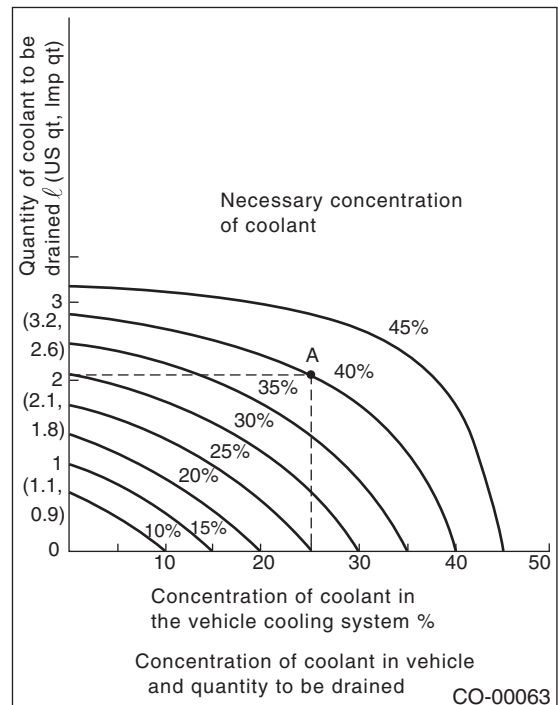
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).

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 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

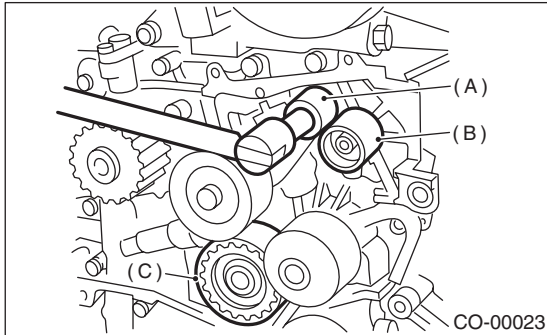
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



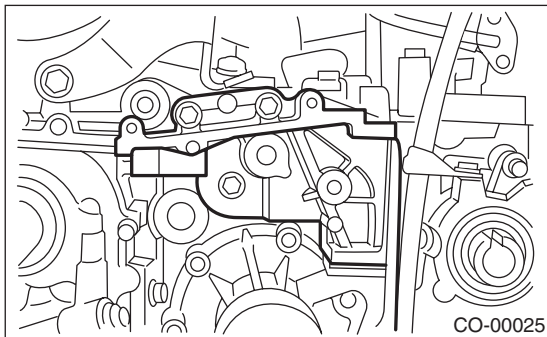
## 4. Water Pump

### A: REMOVAL

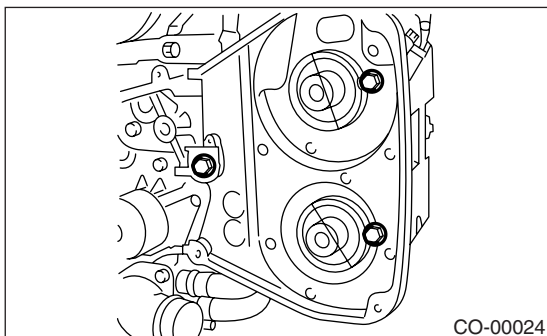
- 1) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL.>
- 2) Remove the V-belts. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
- 3) Remove the timing belt. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt Assembly.>
- 4) Remove the automatic belt tension adjuster (A).
- 5) Remove the belt idler (B).
- 6) Remove the belt idler No. 2 (C).



- 7) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-29, REMOVAL, Camshaft Position Sensor.>
- 8) Remove the camshaft sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-57, REMOVAL, Camshaft Sprocket.>
- 9) Remove the tensioner bracket.

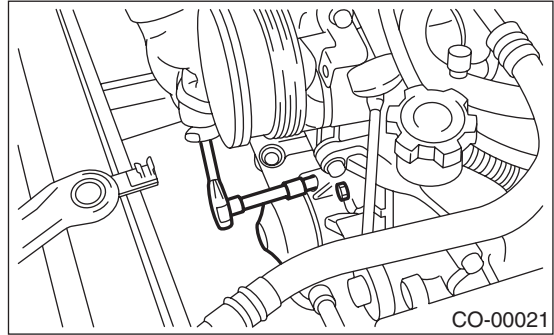


- 10) Remove the belt cover No. 2 (LH).



- 11) Disconnect the hose from water pump.

- 12) Remove the water pump.



### B: INSTALLATION

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

#### NOTE:

- Replace the gasket with a new one.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.

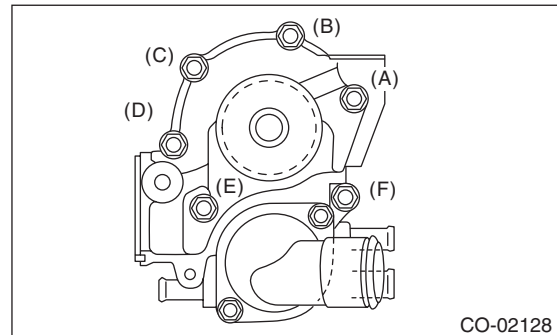
#### Tightening torque:

##### First:

**12 N·m (1.2 kgf-m, 8.7 ft-lb)**

##### Second:

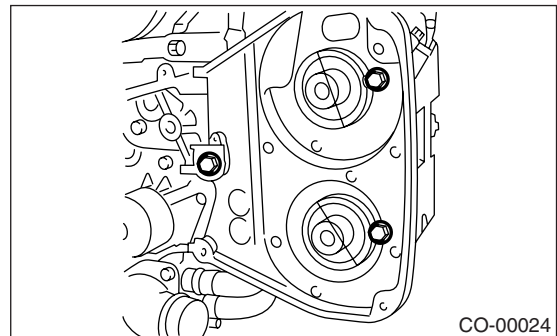
**12 N·m (1.2 kgf-m, 8.7 ft-lb)**



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

#### Tightening torque:

**5 N·m (0.5 kgf-m, 3.6 ft-lb)**



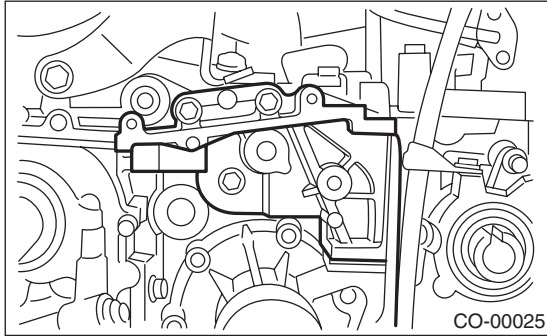
# WATER PUMP

## COOLING

4) Install the tensioner bracket.

**Tightening torque:**

**24.5 N·m (2.5 kgf·m, 18.1 ft·lb)**



5) Install the camshaft sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-57, INSTALLATION, Camshaft Sprocket.>

6) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-29, INSTALLATION, Camshaft Position Sensor.>

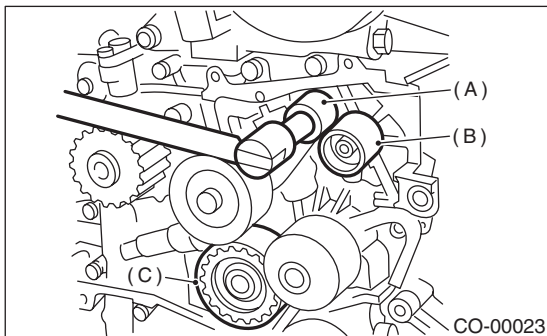
7) Install the belt idler No. 2 (C).

8) Install the belt idler (B).

9) Install the automatic belt tension adjuster (A) which has tension rod held by pin. <Ref. to ME(H4DOTC)-51, INSTALLATION, Timing Belt Assembly.>

**Tightening torque:**

**39 N·m (4.0 kgf·m, 28.9 ft·lb)**



10) Install the timing belt. <Ref. to ME(H4DOTC)-52, TIMING BELT, INSTALLATION, Timing Belt Assembly.>

11) Install the V-belts. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

12) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, Radiator.>

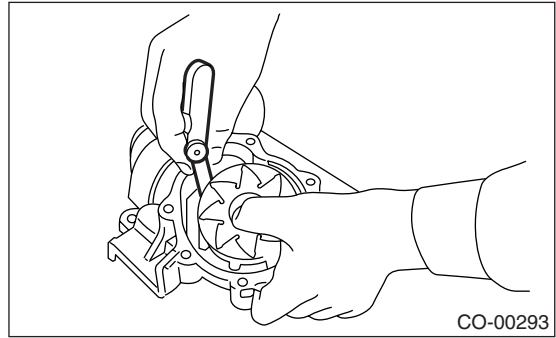
## C: INSPECTION

- 1) Check the water pump bearing for smooth rotation.
- 2) Check the water pump pulley for abnormalities.
- 3) Check the clearance between impeller and pump case.

**Clearance between impeller and pump case:**

**Standard**

**0.5 — 1.5 mm (0.020 — 0.059 in)**



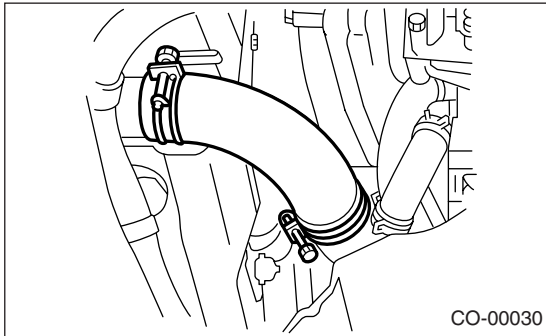
- 4) After water pump installation, check the pulley shaft for engine coolant leaks. If leaks are noted, replace the water pump assembly.



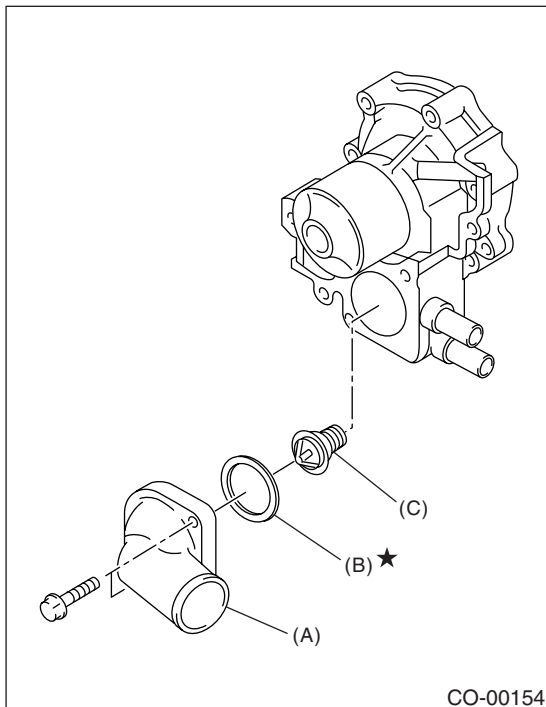
## 5. Thermostat

### A: REMOVAL

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



- 5) Remove the thermostat cover and gasket, and then pull out the thermostat.



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

### B: INSTALLATION

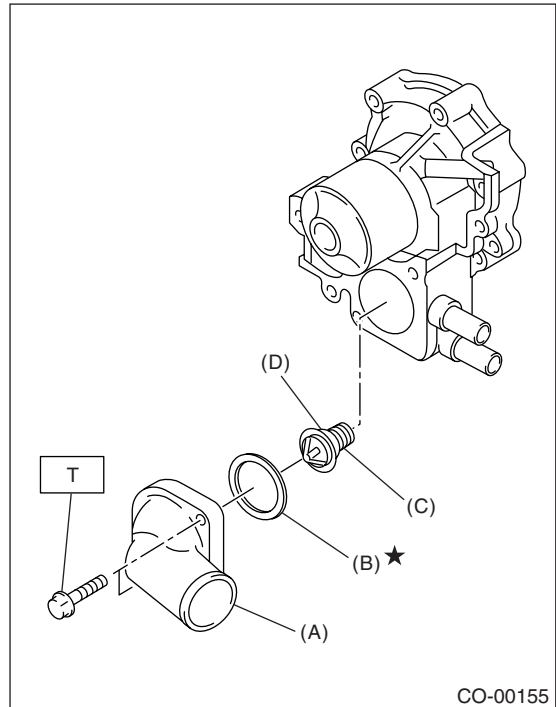
- 1) Install gasket to thermostat, and then install the thermostat with gasket to water pump. After that, install thermostat cover.

#### NOTE:

- When reinstalling the thermostat, use a new gasket.
- The thermostat must be installed with the jiggle pin (D) facing to upper side.

#### Tightening torque:

**12 N·m (1.2 kgf-m, 8.7 ft-lb)**



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

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

# THERMOSTAT

## COOLING

### C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

- Inspection Method

Immerse the thermostat and 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.

NOTE:

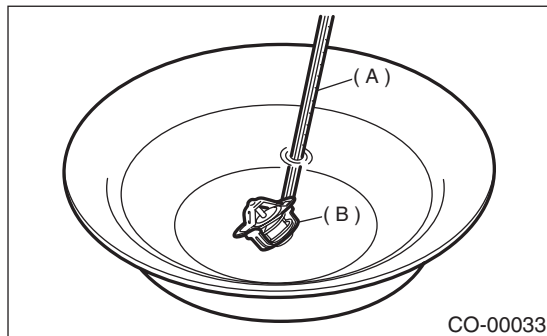
- When measuring amount of valve lift, leave the valve for 5 minutes or more in boiled water.
- Hold the thermostat wire so as not to contact the base of container.

**Starts to open:**

**76 — 80 °C (169 — 176°F)**

**Fully opens:**

**91°C (196°F)**



- (A) Thermometer
- (B) Thermostat

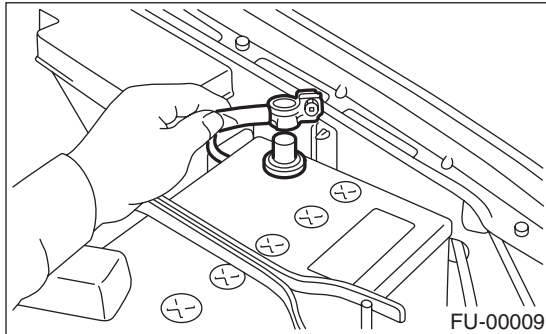
## 6. Radiator

### A: REMOVAL

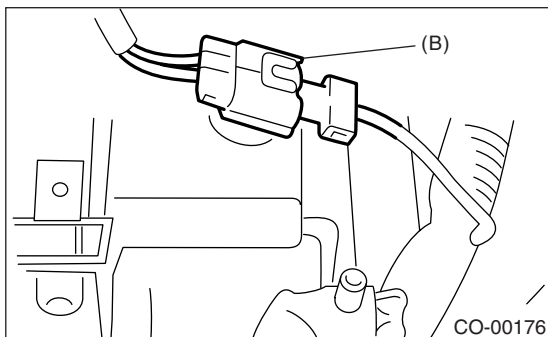
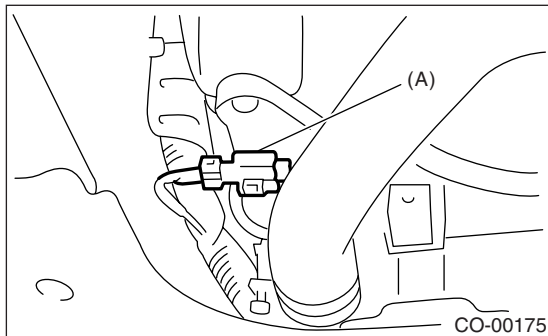
**WARNING:**

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

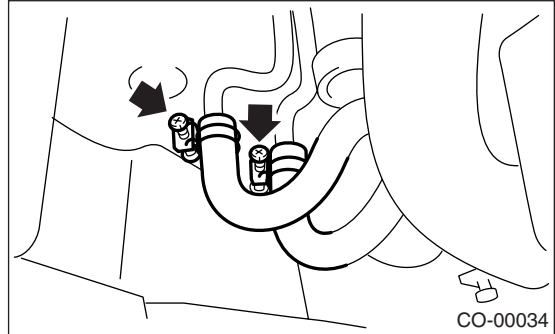
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



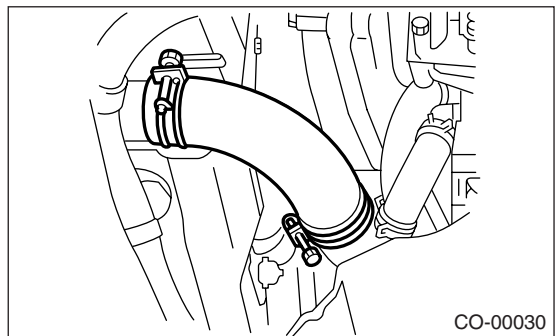
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Drain the engine coolant completely. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).



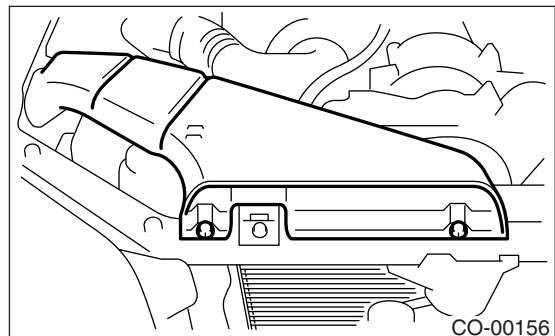
- 7) Disconnect the ATF cooler hose from ATF pipe. (AT model) Plug the openings in the hose and radiator with caps in order to prevent ATF from leaking.



- 8) Disconnect the radiator outlet hose from thermostat cover.



- 9) Lower the vehicle.
- 10) Remove the air intake duct.

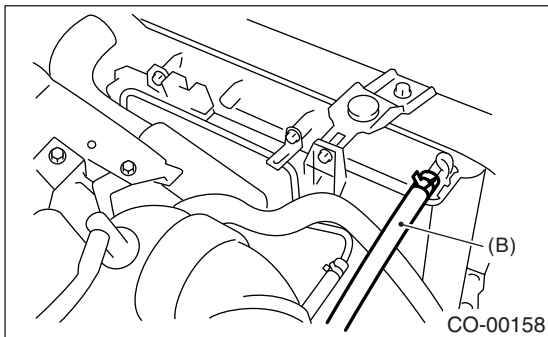
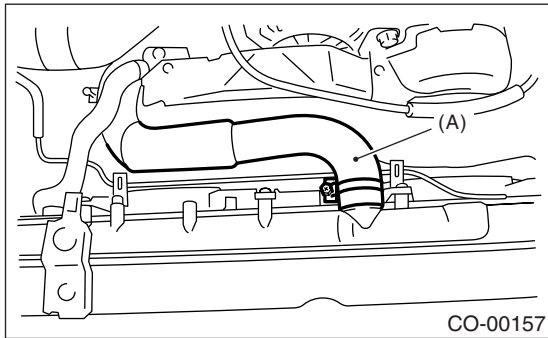


- 11) Remove the V-belt covers.
- 12) Disconnect the overflow hose.
- 13) Remove the reservoir tank. <Ref. to CO(H4DOTC)-28, REMOVAL, Reservoir Tank.>

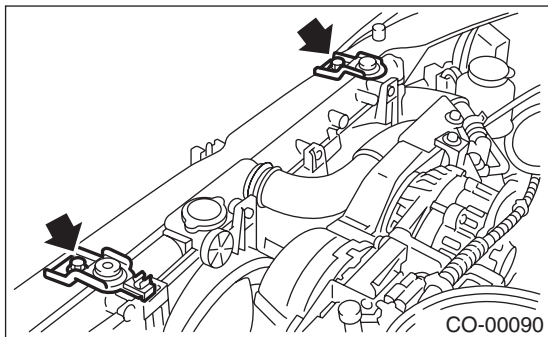
# RADIATOR

## COOLING

14) Disconnect the radiator inlet hose (A) and water tank hose (B) from radiator.



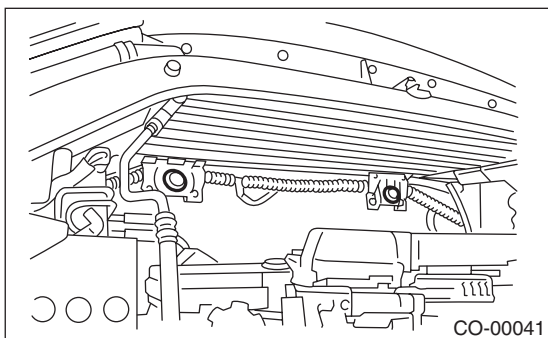
15) Remove the radiator upper brackets.



16) Lift-up the radiator, and then remove it from vehicle.

## B: INSTALLATION

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



2) Install the radiator to vehicle.

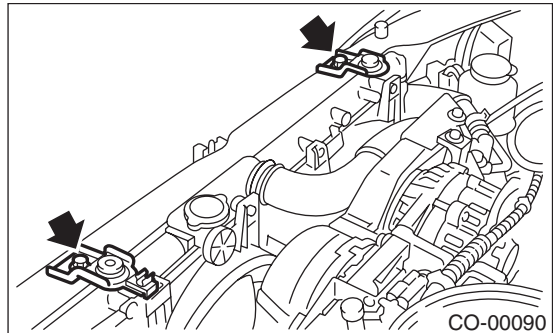
## NOTE:

Fit the pins on lower side of radiator into the cushions on body side.

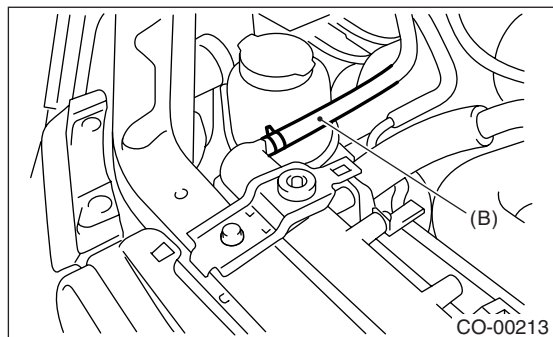
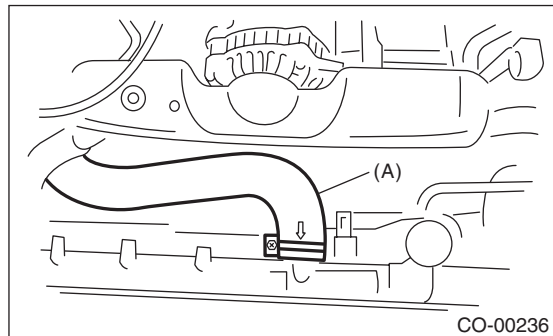
3) Install the radiator brackets, and then tighten the bolts.

## Tightening torque:

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



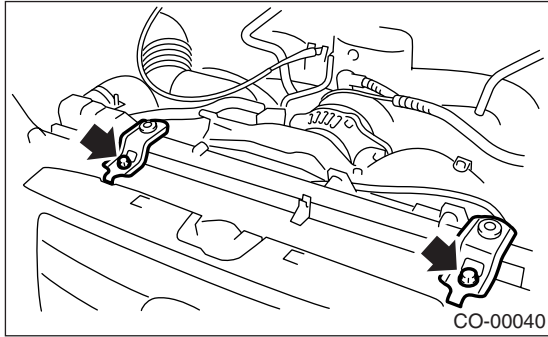
4) Connect the radiator inlet hose (A) and water tank hose (B).



5) Install the reservoir tank. <Ref. to CO(H4DOTC)-28, INSTALLATION, Reservoir Tank.>

6) Connect the overflow hose.

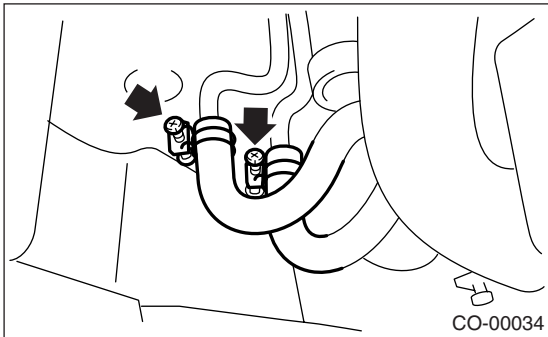
7) Install the V-belt cover.



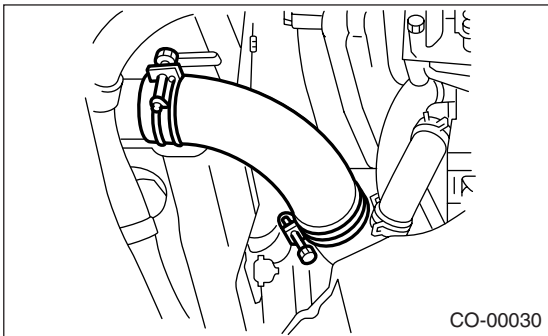
8) Install the air intake duct.  
<Ref. to IN(H4DOTC)-8, INSTALLATION, Air Intake Duct.>

9) Lift-up the vehicle.

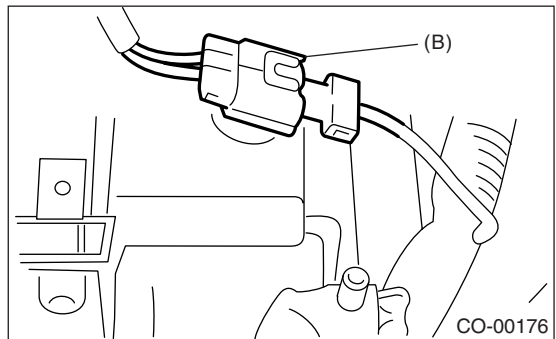
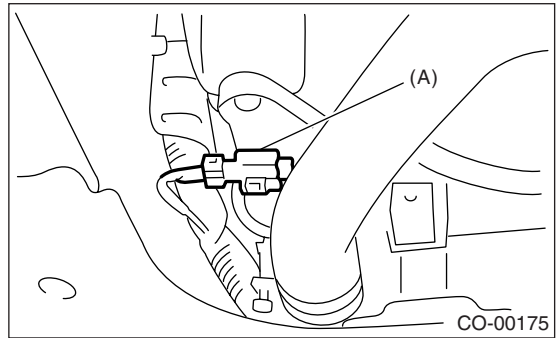
10) Connect the ATF cooler hoses. (AT model).



11) Connect the radiator outlet hose.



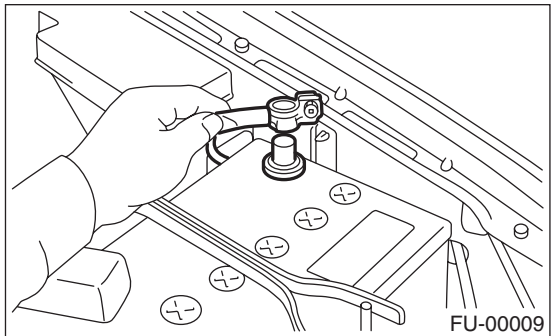
12) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



13) Install the under cover.

14) Lower the vehicle.

15) Connect the battery ground cable to battery.

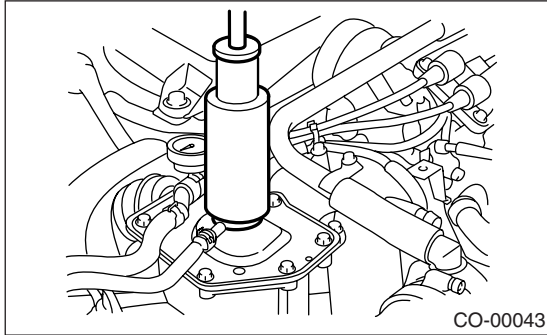


16) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

17) Check the ATF level. <Ref. to 4AT-31, INSPECTION, Automatic Transmission Fluid.>

### C: INSPECTION

1) Remove the coolant filler tank cap, top off coolant filler tank, and then attach the tester to coolant filler tank in place of cap.



2) Apply a pressure of 122 kPa (1.2 kg/cm<sup>2</sup>, 18 psi) to the radiator to check if:

- (1) Engine coolant leaks at/around radiator.
- (2) Engine coolant leaks at/around hoses or connections.

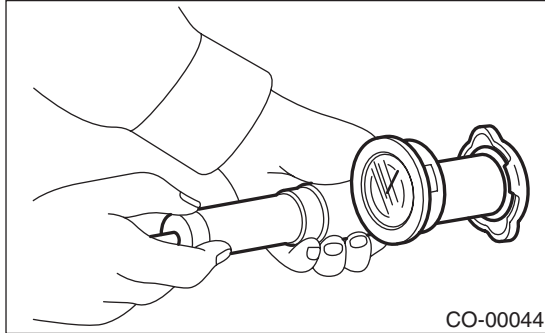
#### CAUTION:

- Inspection must be carried out at the side of coolant filler tank, not at the side of radiator.
- Engine should be turned off.
- Wipe engine coolant from check points in advance.
- Be careful to prevent engine coolant from spurting out when removing the tester.
- Be careful also not to deform the filler neck of coolant filler tank when installing or removing tester.

## 7. Radiator Cap

### A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase the pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 to 6 seconds.

#### **Coolant filler tank side**

##### **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)**

#### **Radiator side**

##### **Standard pressure:**

**122 — 152 kPa (1.24 — 1.55 kg/cm<sup>2</sup>, 18 — 22 psi)**

##### **Service limit pressure:**

**112 kPa (1.14 kg/cm<sup>2</sup>, 16 psi)**

#### **CAUTION:**

- Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.
- Do not mix up the coolant filler tank side cap with radiator side cap.

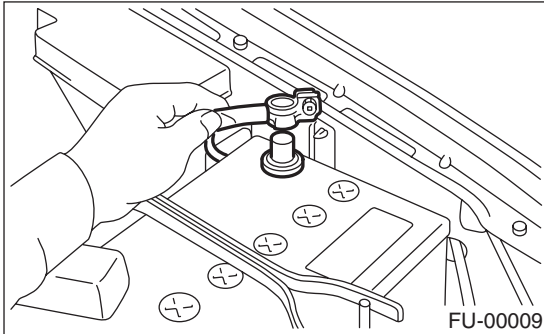
# RADIATOR MAIN FAN AND FAN MOTOR

## COOLING

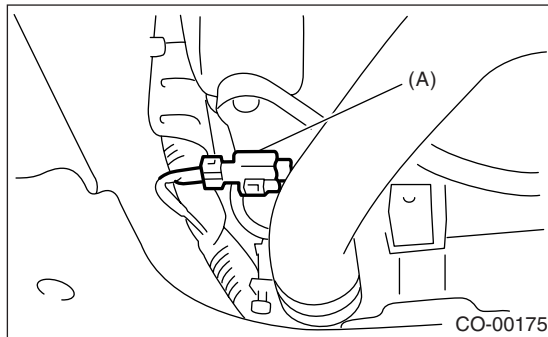
### 8. Radiator Main Fan and Fan Motor

#### A: REMOVAL

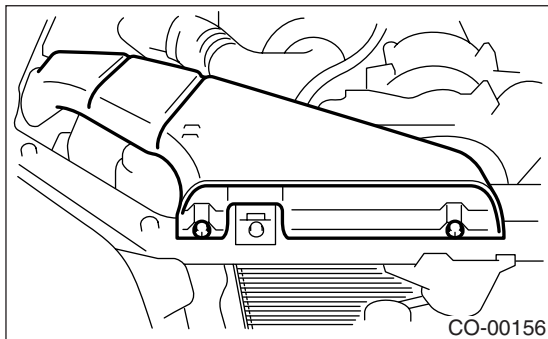
- 1) Disconnect the ground cable from battery.



- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Disconnect the connector of main fan motor.

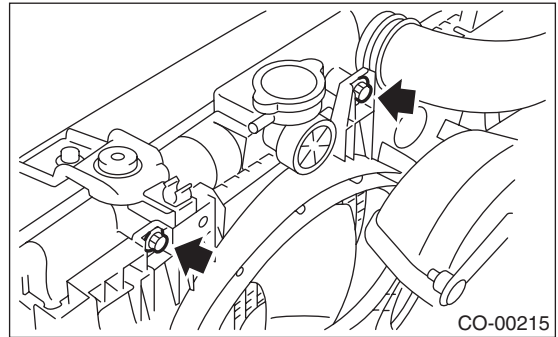


- 5) Lower the vehicle.
- 6) Remove the air intake duct.



- 7) Disconnect the overflow hose.
- 8) Remove the overflow pipe.
- 9) Remove the reservoir tank. <Ref. to CO(H4DOTC)-28, REMOVAL, Reservoir Tank.>

- 10) Remove the radiator main fan motor assembly.



#### B: INSTALLATION

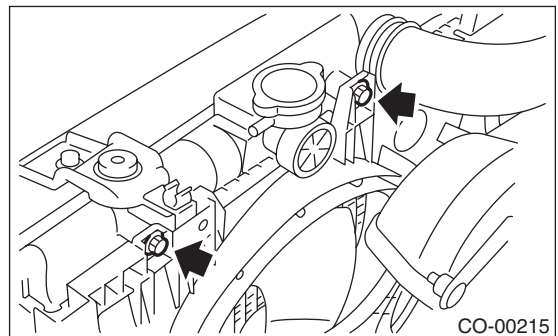
Install in the reverse order of removal.

#### NOTE:

When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it.

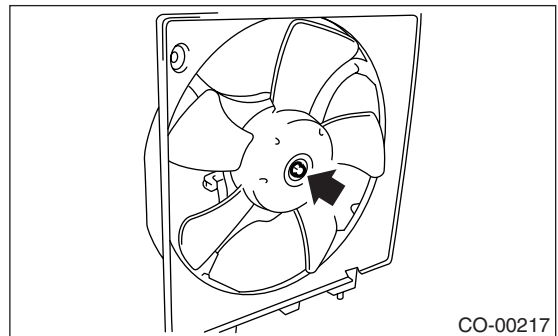
#### Tightening torque:

**4.9 N-m (0.50 kgf-m, 3.6 ft-lb)**



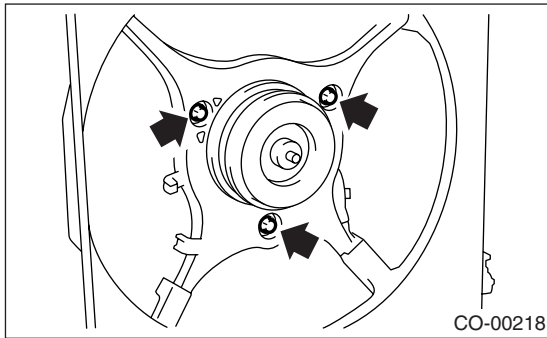
#### C: DISASSEMBLY

- 1) Remove the nut which holds the fan itself onto fan motor and shroud assembly.





2) Remove the bolts which install the fan motor onto shroud.

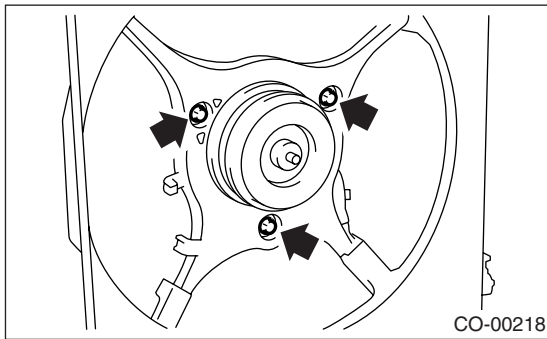


## D: ASSEMBLY

Assemble in the reverse order of disassembly.

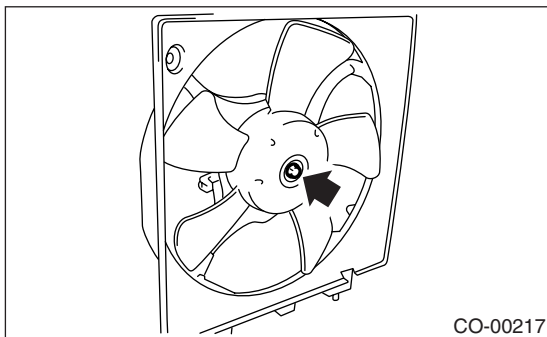
**Tightening torque:**

**4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



**Tightening torque:**

**3.4 N·m (0.35 kgf-m, 2.5 ft-lb)**



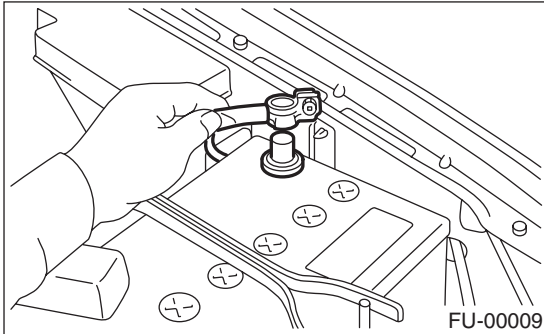
# RADIATOR SUB FAN AND FAN MOTOR

## COOLING

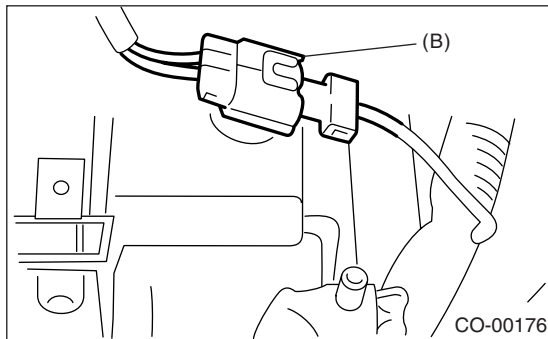
### 9. Radiator Sub Fan and Fan Motor

#### A: REMOVAL

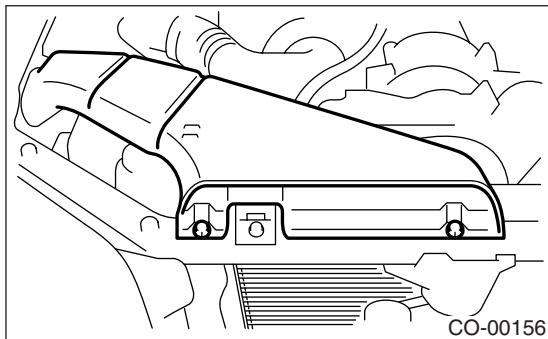
- 1) Disconnect the ground cable from battery.



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

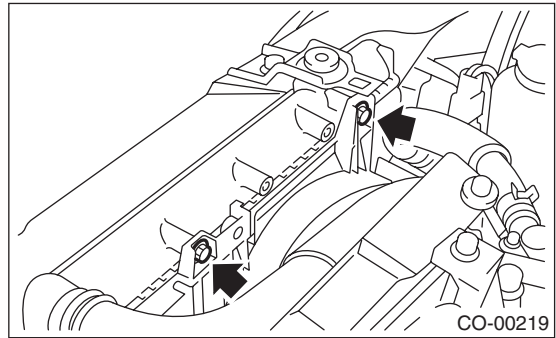


- 5) Lower the vehicle.
- 6) Remove the air intake duct.



- 7) Remove the bolts which hold the sub fan shroud to radiator.
- 8) Remove the overflow pipe.

- 9) Remove the radiator sub fan shroud through the under side of vehicle.

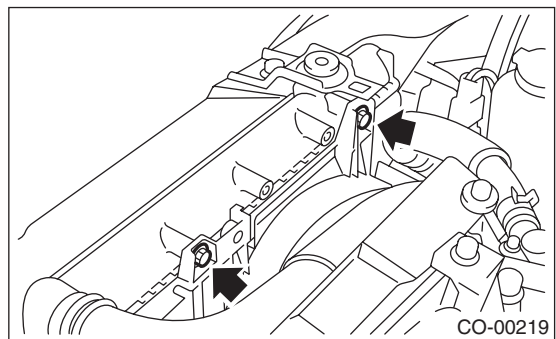


#### B: INSTALLATION

Install in the reverse order of removal.

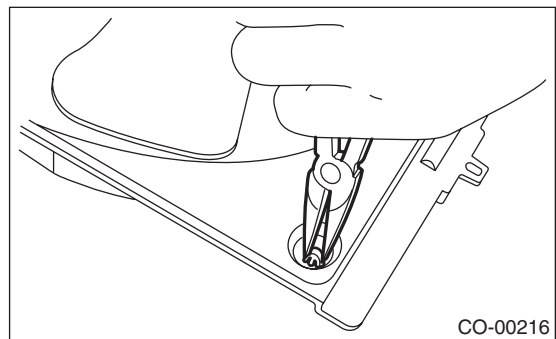
#### Tightening torque:

**4.9 N·m (0.50 kgf·m, 3.6 ft·lb)**

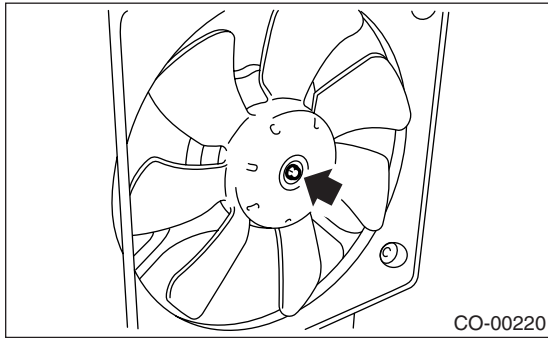


#### C: DISASSEMBLY

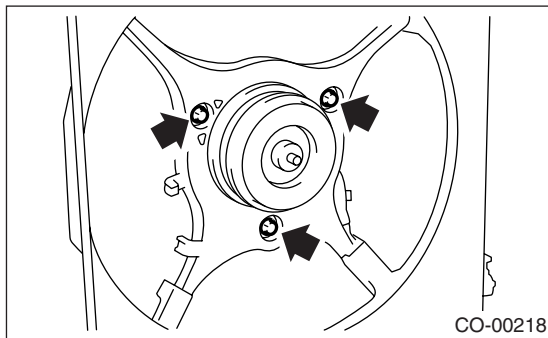
- 1) Remove the clip which holds the motor harness onto shroud.



2) Remove the nut which holds the fan itself onto fan motor and shroud assembly.



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

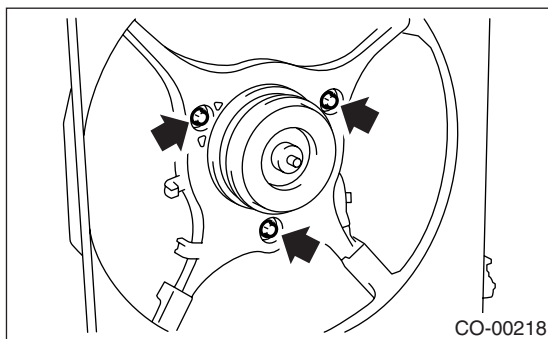


## D: ASSEMBLY

Assemble in the reverse order of disassembly.

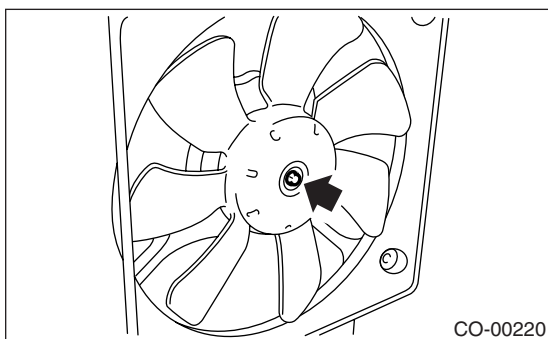
**Tightening torque:**

**4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



**Tightening torque:**

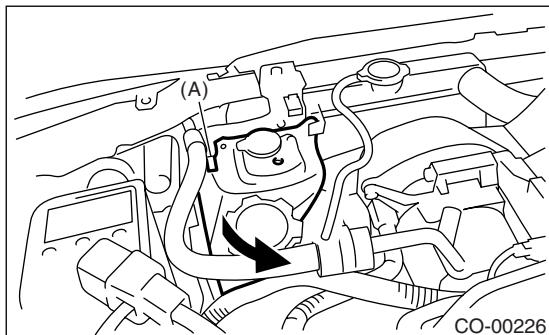
**3.4 N·m (0.35 kgf-m, 2.5 ft-lb)**



### 10. Reservoir Tank

#### A: REMOVAL

- 1) Disconnect the overflow hose from the radiator filler neck position.
- 2) Pull out the reservoir tank to direction of arrow while pushing the pawl (A).



#### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Refer to COMPONENT for tightening torque. <Ref. to CO(H4DOTC)-3, COMPONENT, General Description.>

#### C: INSPECTION

Make sure the engine coolant level is between full and low.

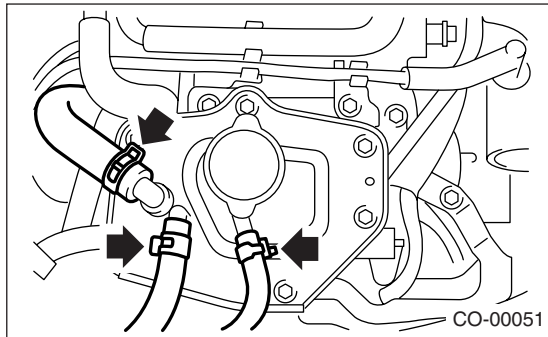
## 11. Coolant Filler Tank

### A: REMOVAL

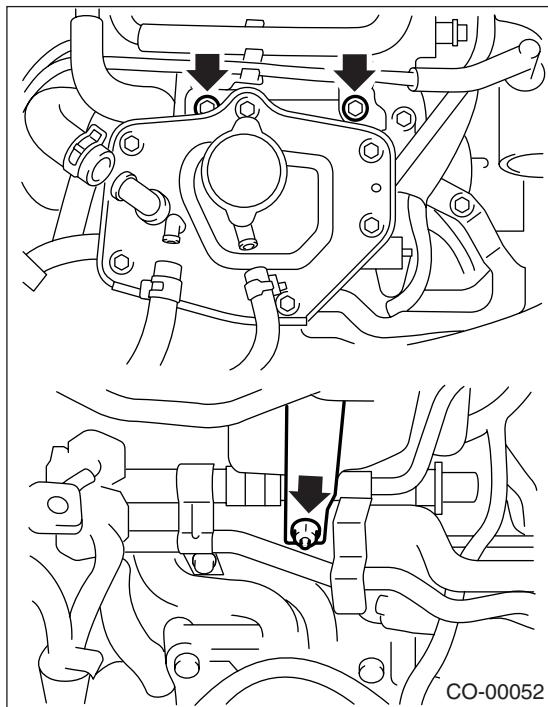
**WARNING:**

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

- 1) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt). <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 2) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
- 3) Remove the air cleaner element.
- 4) Disconnect the engine coolant hoses from coolant filler tank.



- 5) Remove the bolts and nut which install the coolant filler tank.
- 6) Disconnect the engine coolant hose which connects the under side of coolant filler tank.
- 7) Remove the coolant filler tank.



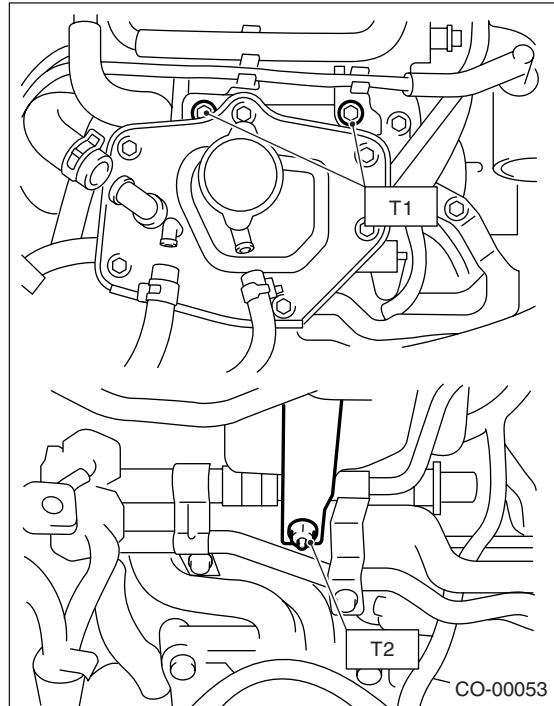
### B: INSTALLATION

- 1) Install in the reverse order of removal.

**Tightening torque:**

**T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)**

**T2: 13 N·m (1.3 kgf-m, 9.6 ft-lb)**



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

# ENGINE COOLING SYSTEM TROUBLE IN GENERAL

COOLING

## 12.Engine Cooling System Trouble in General

### A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish the engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace the timing belt tensioner.
	c. Oil on timing belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair the ignition control system. <Ref. to EN(H4DOTC)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Improper engine oil in engine coolant	Replace the engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H4DOTC)-2, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
o. Malfunction of radiator fan	Inspect the radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.	
Over-cooling	a. Atmospheric temperature extremely low	Partly cover the 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 the cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and cylinder block	Repair or replace.
	f. Damaged or cracked thermostat cover	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 the water pump.
	d. Defective water pump mechanical seal	Replace the water pump.