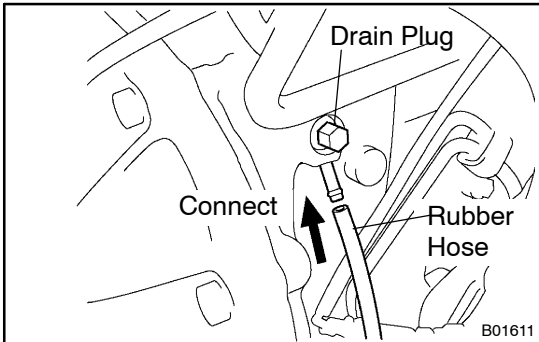
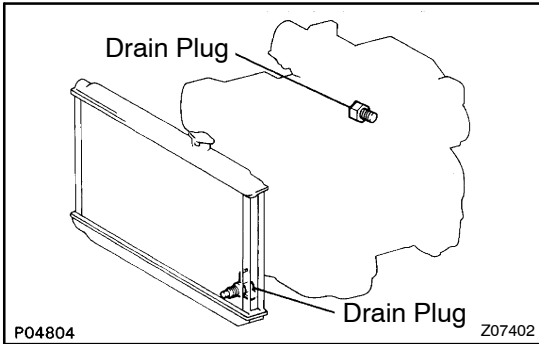




## COOLANT REPLACEMENT

CO09X-06

### CAUTION:

**Do not remove the radiator cap while the engine and radiator are hot.**

#### 1. DRAIN ENGINE COOLANT

- (a) Remove the radiator cap.
- (b) Loosen the 2 drain plugs (for the engine and radiator), and drain the coolant.

### HINT:

To prevent the coolant from spraying over the cylinder block, connect the rubber hose (inside diameter 6 – 8 mm) in the market to the union pipe under the drain plug.

- (c) Close the drain plugs.

**Torque: 30 N·m (300 kgf·cm, 22 ft·lbf) for engine**

#### 2. FILL ENGINE COOLANT

- (a) Slowly fill the system with coolant.

**Coolant: TOYOTA Long Life Coolant or equivalent**

Use of the coolant which includes more than 50% [freezing protection down to  $-35^{\circ}\text{C}$  ( $-31^{\circ}\text{F}$ )] or 60% [freezing protection down to  $-50^{\circ}\text{C}$  ( $-58^{\circ}\text{F}$ )] of ethylene – glycol is recommended, but not more than 70%.

### NOTICE:

- Use of improper coolant may damage the engine cooling system.
- Do not use an alcohol type coolant or plain water alone.
- The coolant should be mixed with plain water (preferable demineralized water or distilled water).

**Capacity: 7.7 liters (8.1 US qts, 6.8 Imp. qts)**

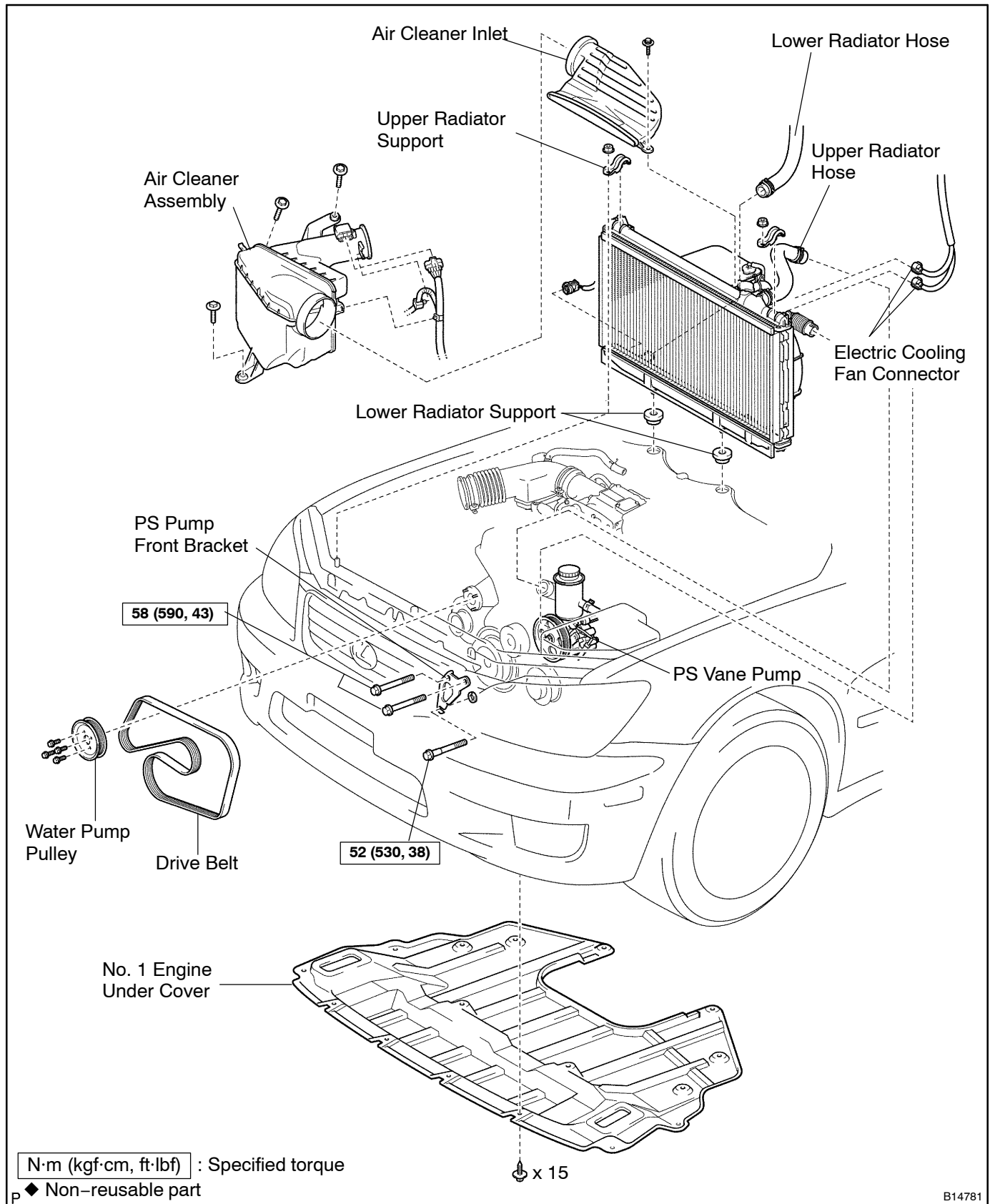
- (b) Install the radiator cap.
- (c) Start the engine, and bleed the cooling system.
- (d) Refill the reservoir with coolant until it reaches the FULL line.

#### 3. CHECK ENGINE COOLANT LEAK

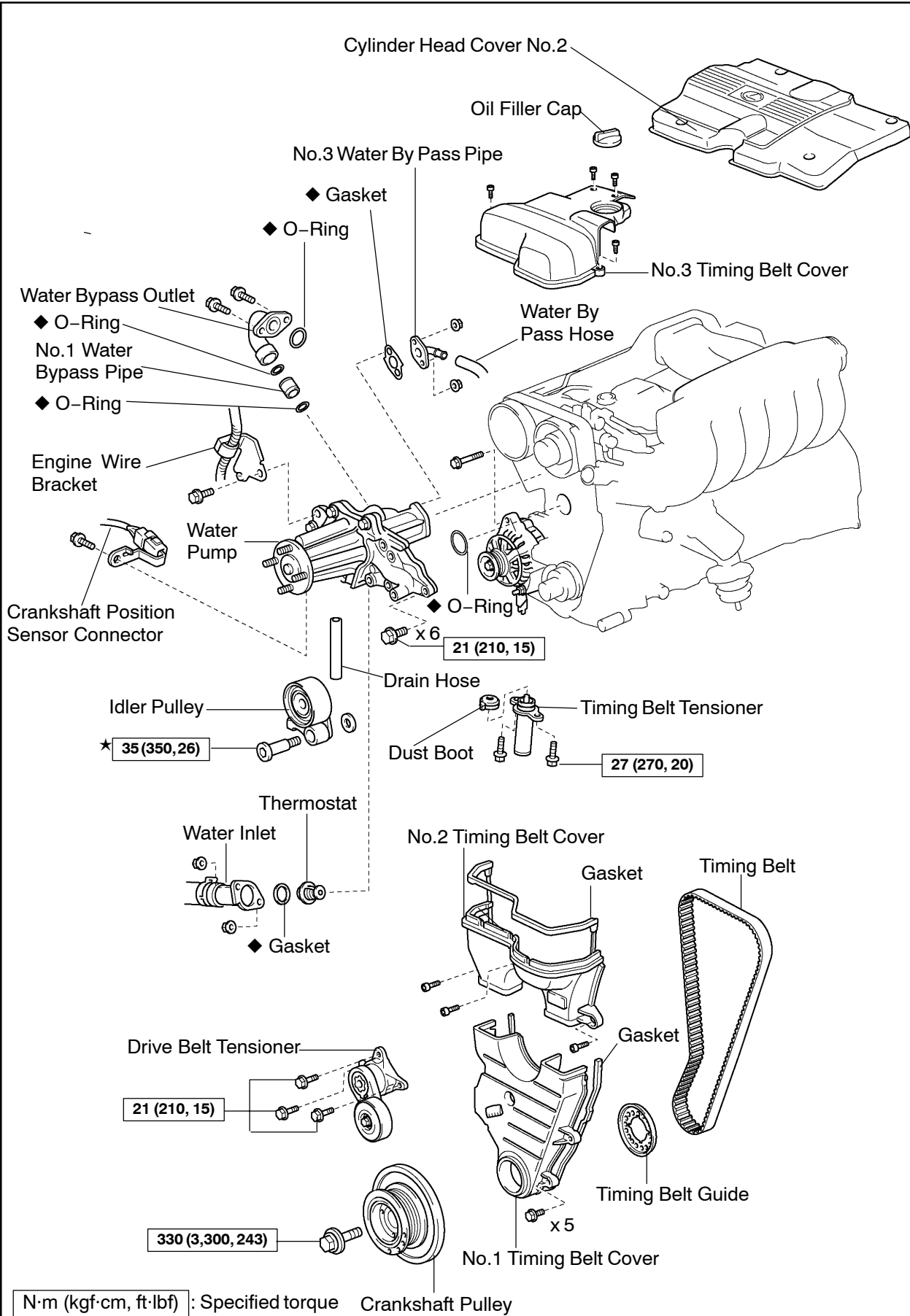
#### 4. CHECK ENGINE COOLANT GRAVITY

# WATER PUMP COMPONENTS

C009Y-06



B14781



N·m (kgf·cm, ft·lbf) : Specified torque

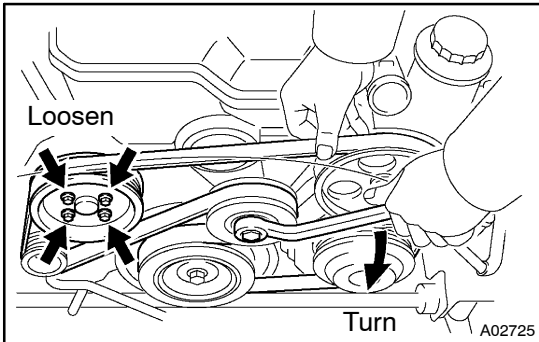
◆ Non-reusable part

★ Precoated part

B14769

## REMOVAL

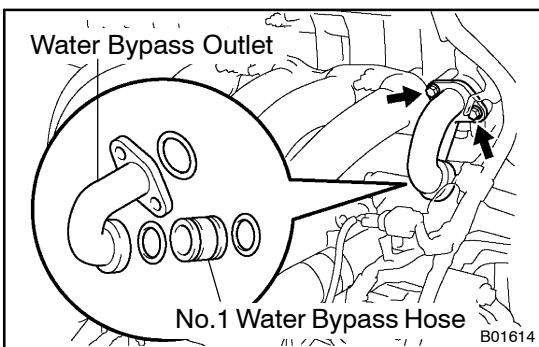
1. **REMOVE RADIATOR ASSEMBLY**  
(See [page CO-15](#))



2. **REMOVE DRIVE BELT AND WATER PUMP PULLEY**

- (a) At first, loosen the 4 nuts of the water pump pulley.
- (b) Remove the drive belt.
- (c) Remove the 4 nuts and water pump pulley.

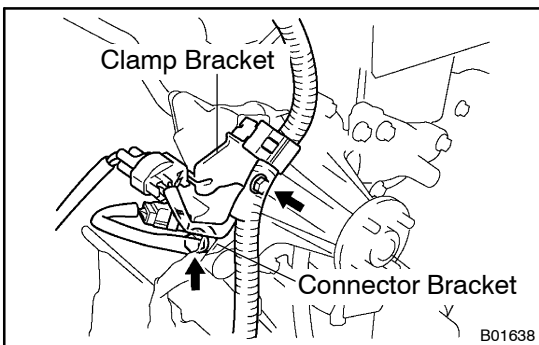
3. **REMOVE TIMING BELT AND IDLER PULLEY**  
(See [page EM-17](#))



4. **REMOVE WATER BYPASS OUTLET AND NO.1 WATER BYPASS PIPE**

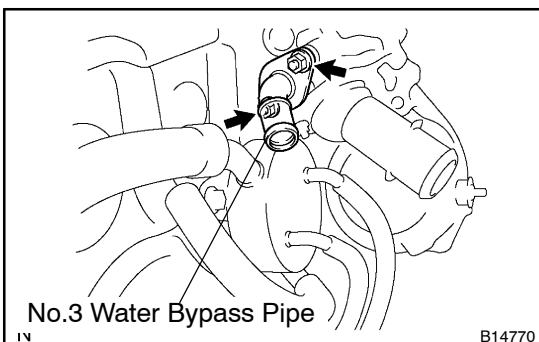
- (a) Remove the 2 bolts, water bypass outlet and No.1 water bypass pipe.
- (b) Remove the 3 O-rings from the water bypass outlet and No.1 water bypass pipe.

5. **REMOVE WATER INLET AND THERMOSTAT**  
(See [page CO-9](#))

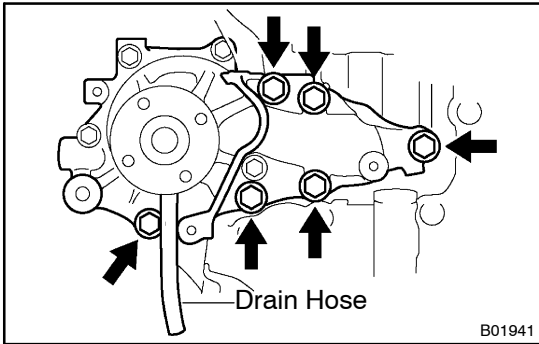


6. **REMOVE WATER PUMP**

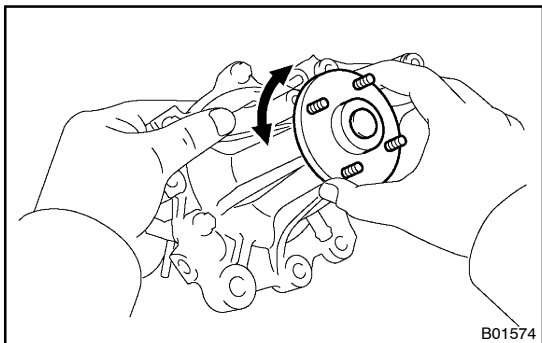
- (a) Loosen the nut and remove the bolt, slide the generator away from the water pump.
- (b) Remove the bolt, and disconnect the clamp bracket (for engine wire).
- (c) Remove the bolt, and disconnect the connector bracket (for crankshaft position sensor connector).



- (d) Disconnect the water bypass hose from the No. 3 water bypass pipe.
- (e) Remove the 2 nuts, gasket and No. 3 water bypass pipe from the water pump.



- (f) Remove the 6 bolts, water pump and gasket.
- (g) Remove the drain hose.
- (h) Remove the O-ring from the cylinder block.



## INSPECTION

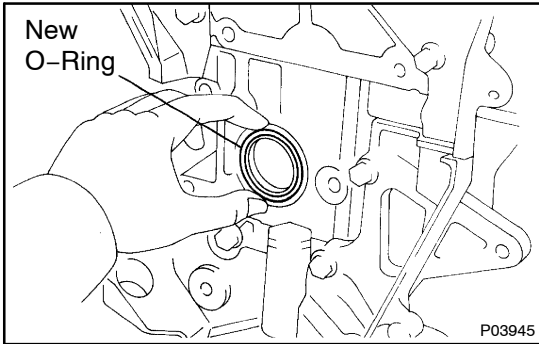
### INSPECT WATER PUMP

- (a) Visually check the air hole and water hole for coolant leakage.

If necessary, replace the water pump.

- (b) Turn the pulley seat, and check that the water pump bearing is not rough or noisy.

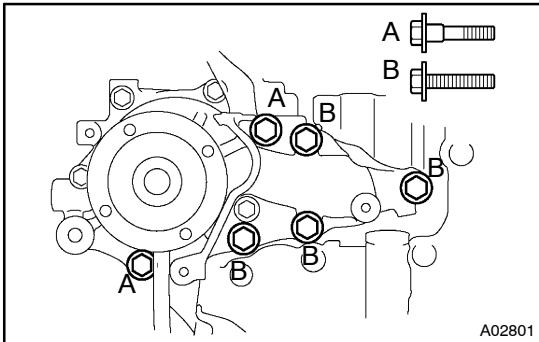
If necessary, replace the water pump.



## INSTALLATION

### 1. INSTALL WATER PUMP

- (a) Install a new O-ring to the cylinder block.
- (b) Install the drain hose.



- (c) Install the water pump with the 2 bolts (A) and 4 bolts (B).

**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

#### HINT:

At first, tighten the bolt A by hand.

- (d) Install a new gasket and the No. 3 water bypass pipe with the 2 nuts.

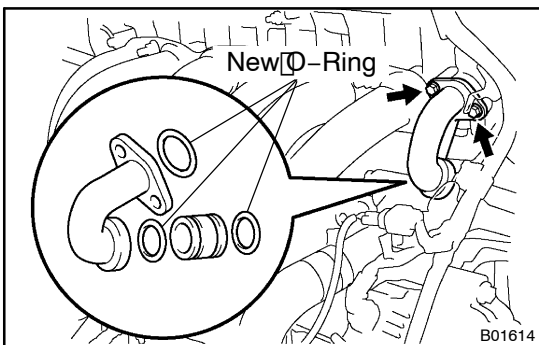
**Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)**

- (e) Connect the water bypass hose to the No. 3 water bypass pipe.
- (f) Install the connector bracket (for crankshaft position sensor connector) with the bolt.
- (g) Install the clamp bracket (for engine wire) with the bolt.
- (h) Install the generator with the bolt and nut.

**Torque: 39 N·m (400 kgf·cm, 30 ft·lbf)**

### 2. INSTALL THERMOSTAT AND WATER INLET

(See page CO-11)



### 3. INSTALL NO. 1 WATER BYPASS PIPE AND WATER BYPASS OUTLET

- (a) Install 2 new O-rings to the No. 1 water bypass pipe.
- (b) Install a new O-ring and the water bypass outlet with the 2 bolts.

**Torque: 9.0 N·m (90 kgf·cm, 80 in·lbf)**

### 4. INSTALL IDLER PULLEY AND TIMING BELT

(See page EM-24)

### 5. INSTALL WATER PUMP PULLEY AND DRIVE BELT

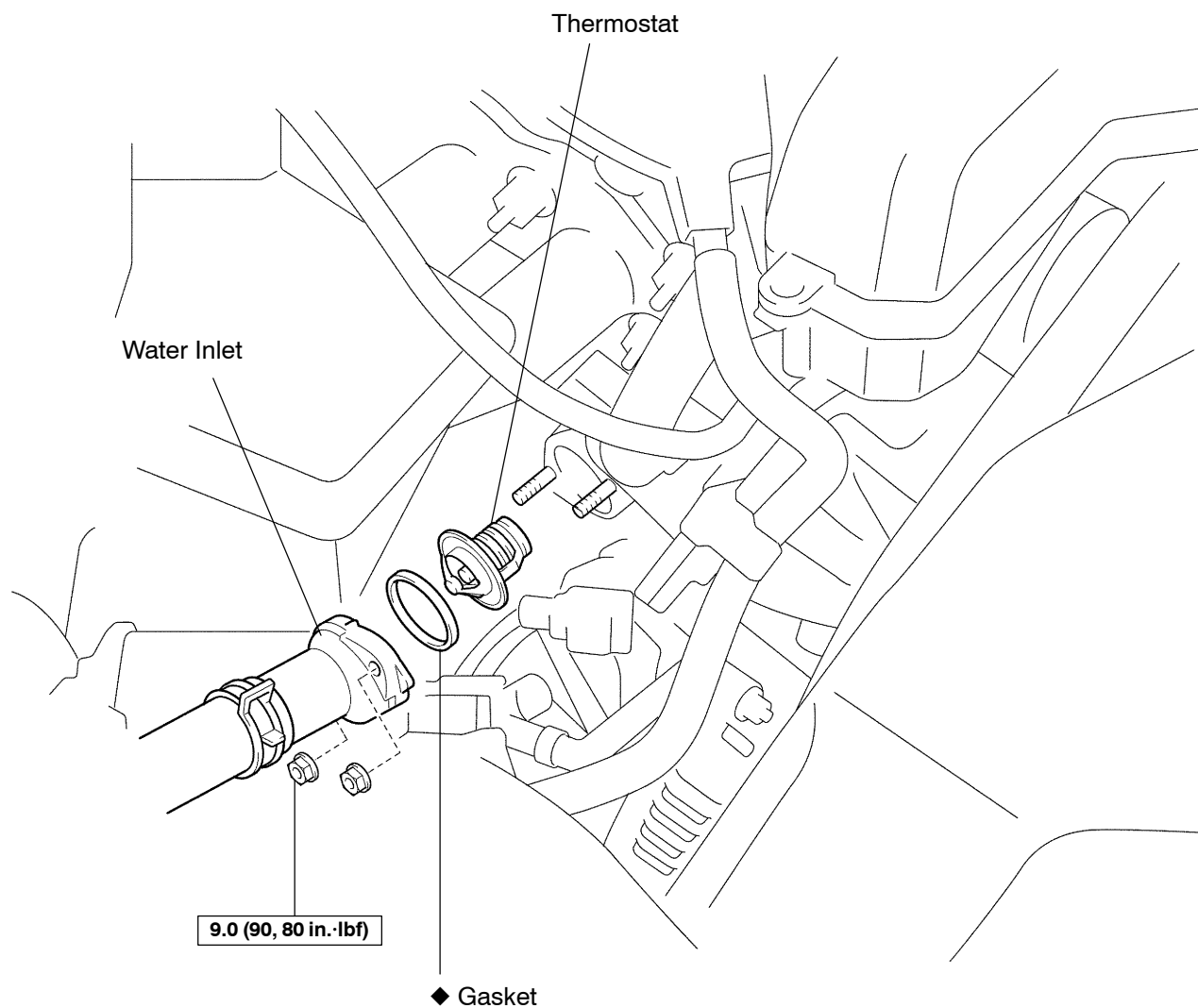
**Torque: 14 N·m (140 kgf·cm, 10 ft·lbf)**

### 6. INSTALL RADIATOR ASSEMBLY

(See page CO-20)

# THERMOSTAT COMPONENTS

C00A2-07



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

P

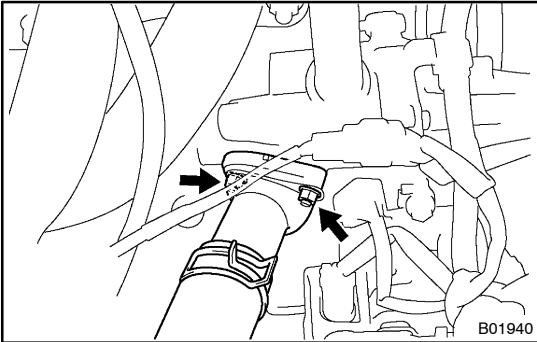
B11922

## REMOVAL

### HINT:

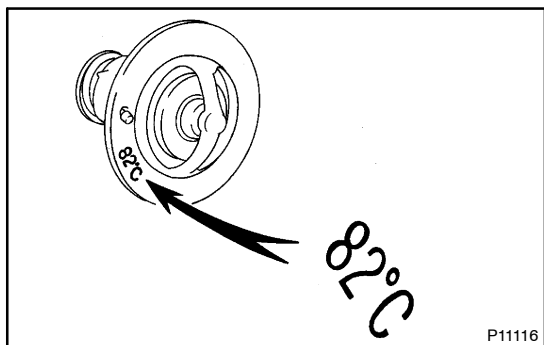
Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

#### 1. DRAIN ENGINE COOLANT



#### 2. DISCONNECT WATER INLET FROM WATER PUMP, AND REMOVE THERMOSTAT

- (a) Remove the 2 nuts holding the water inlet to the water pump, and disconnect the water inlet from the water pump.
- (b) Remove the thermostat.
- (c) Remove the gasket from the thermostat.

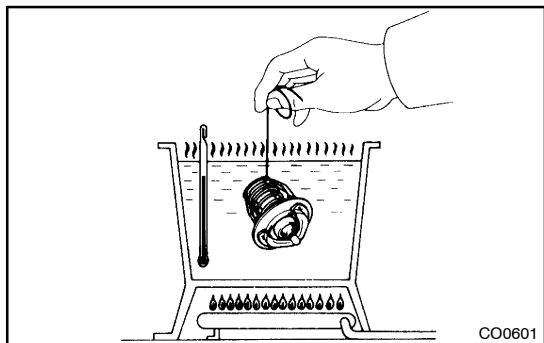


## INSPECTION

### INSPECT THERMOSTAT

#### HINT:

The thermostat is numbered with the valve opening temperature.

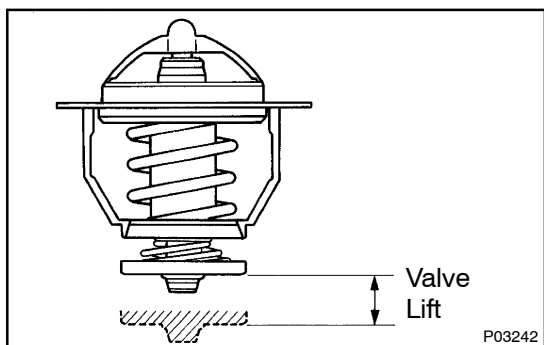


(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.

**Valve opening temperature: 80 – 84 °C (176 – 183 °F)**

If the valve lift is not as specified, replace the thermostat.



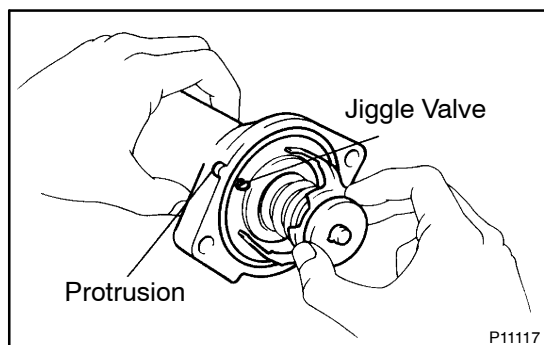
(c) Check the valve lift.

**Valve lift: 8.5 mm (0.335 in.) or more at 95 °C (203 °F)**

If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve is fully closed when the thermostat is at low temperatures (below 40 °C (104 °F)).

If not closed, replace the thermostat.



## INSTALLATION

### 1. PLACE THERMOSTAT IN WATER INLET

- (a) Install a new gasket to the thermostat.
- (b) Align the jiggle valve of the thermostat with the protrusion of the water inlet.

### 2. INSTALL WATER INLET

Install the water inlet with the 2 nuts.

**Torque: 9.0 N·m (90 kgf·cm, 80 in.·lbf)**

### 3. FILL WITH ENGINE COOLANT

### 4. START ENGINE AND CHECK FOR COOLANT LEAKS

# RADIATOR

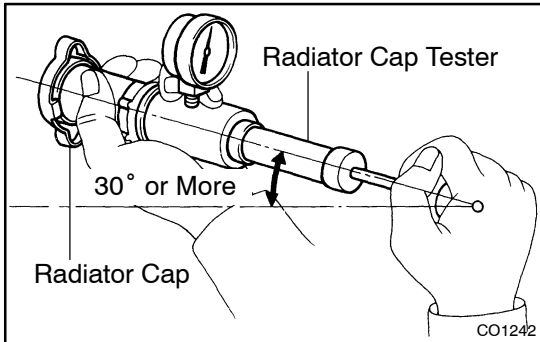
## ON-VEHICLE INSPECTION

### 1. REMOVE RADIATOR CAP

Remove the radiator cap from the radiator.

#### CAUTION:

**Do not remove the radiator cap while the engine and radiator are hot.**



### 2. INSPECT RADIATOR CAP

#### NOTICE:

- If the radiator cap has contaminations, always rinse it with water.
  - Before using a radiator cap tester, wet the relief valve and pressure valve with engine coolant or water.
  - When performing steps (a) and (b) below, keep the tester at an angle of over 30° above the horizontal.
- (a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the vacuum valve.  
**Pump speed: 1 push/(3 seconds or more)**

#### NOTICE:

**Push the pump at a constant speed.**

If air is not coming from the vacuum valve, replace the radiator cap.

- (b) Pump the radiator cap tester, and measure the relief valve opening pressure.

**Pump speed: 1 push within 1 second**

#### NOTICE:

**This pump speed is for the first pump only (in order to close the vacuum valve). After this, the pump speed can be reduced.**

**Standard opening pressure:**

**93 – 123 kPa (0.95 – 1.25 kgf/cm<sup>2</sup>, 13.5 – 17.8 psi)**

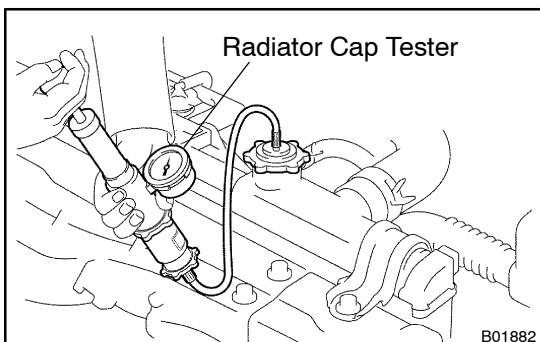
**Minimum opening pressure:**

**78 kPa (0.8 kgf/cm<sup>2</sup>, 11.4 psi)**

#### HINT:

Use the tester's maximum reading as the opening pressure.

If the opening pressure is less than minimum, replace the radiator cap.



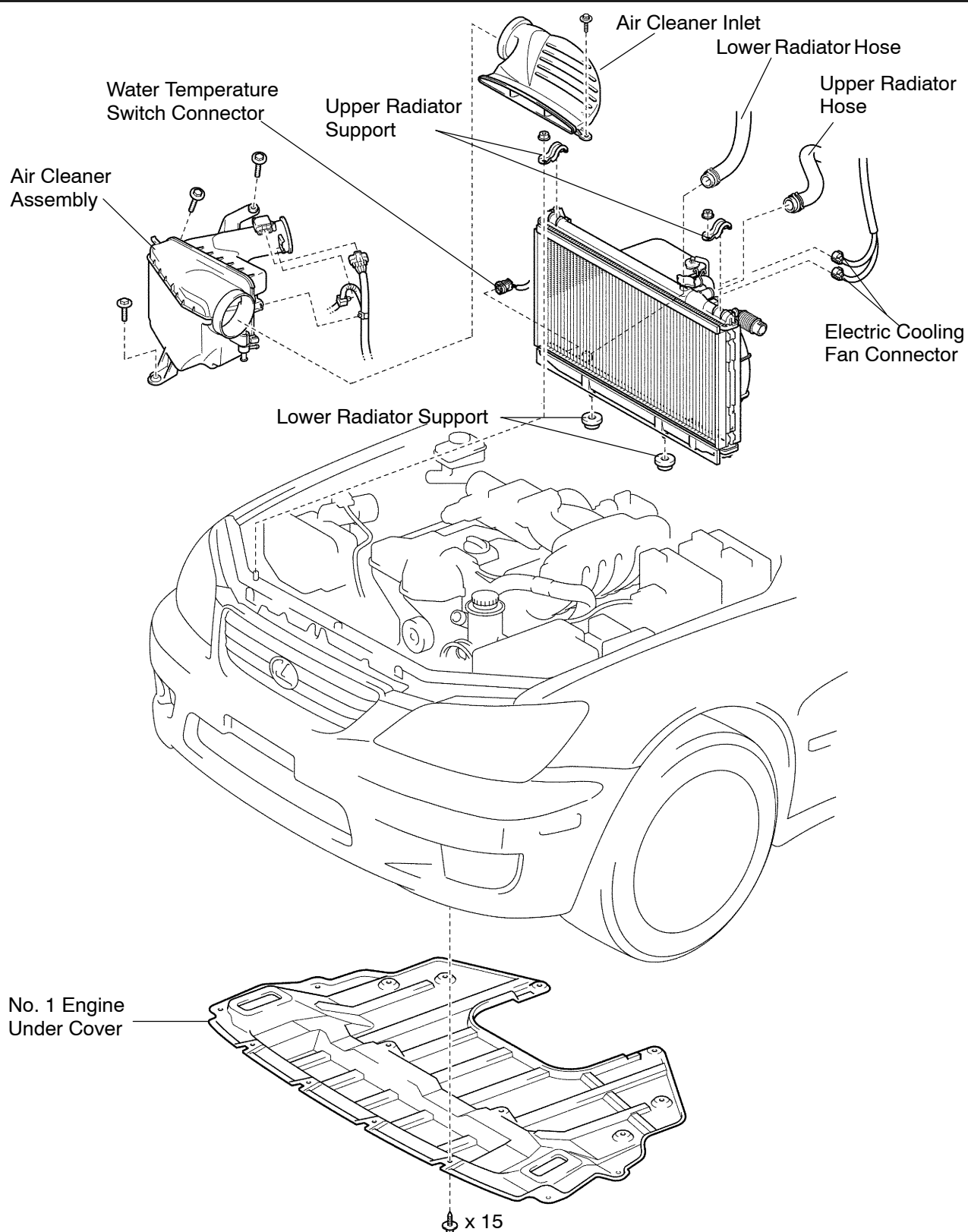
### 3. INSPECT COOLING SYSTEM LEAK

- (a) Fill the radiator with coolant and attach a radiator cap tester.
- (b) Warm up the engine.
- (c) Pump it to 118 kPa (1.2 kgf/cm<sup>2</sup>, 17.1 psi), and check that the pressure does not drop.

If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

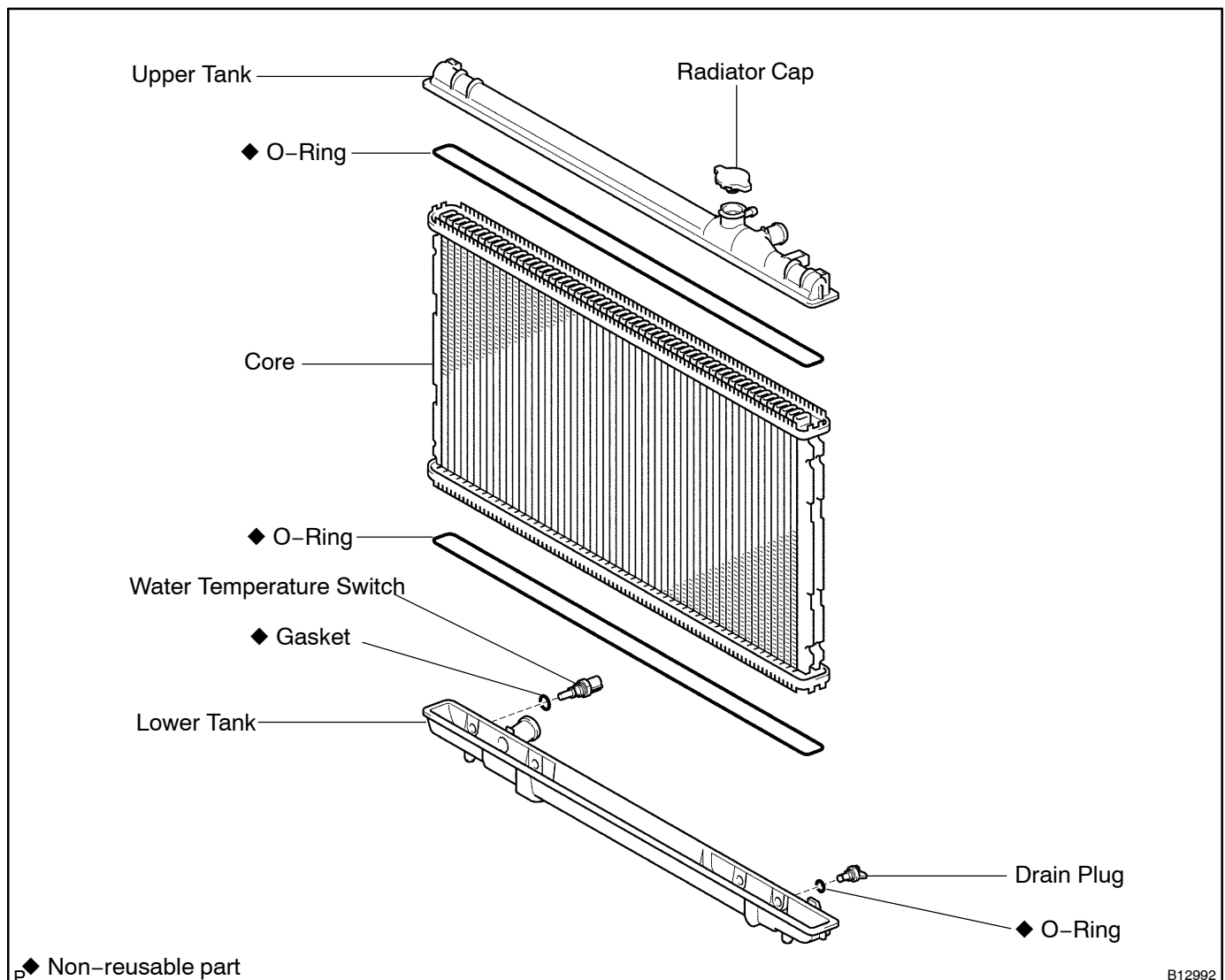
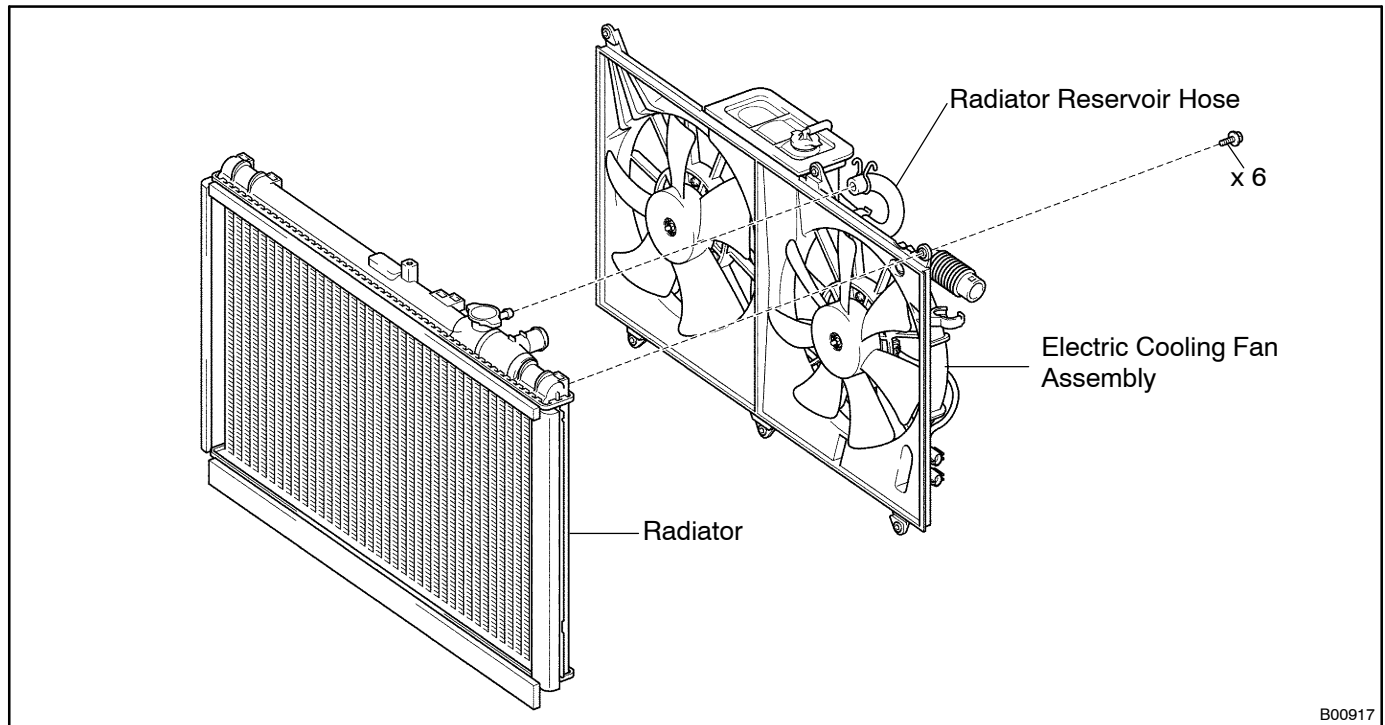
### 4. REINSTALL RADIATOR CAP

## COMPONENTS



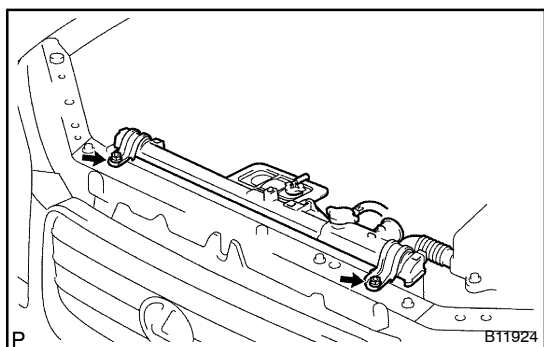
P

B12991



## REMOVAL

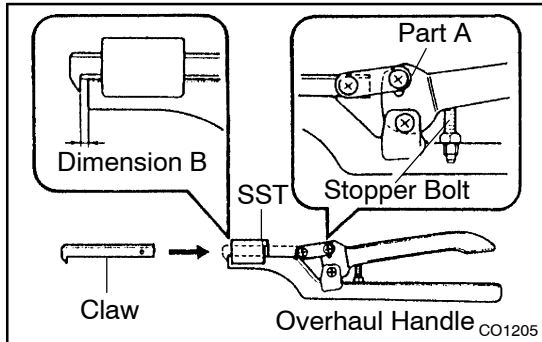
1. **REMOVE NO. 1 ENGINE UNDER COVER**
2. **DRAIN ENGINE COOLANT**
3. **REMOVE AIR CLEANER INLET**
4. **REMOVE AIR CLEANER ASSEMBLY**
5. **REMOVE RADIATOR AND COOLING FAN ASSEMBLY**
  - (a) Disconnect the upper and lower radiator hoses from the radiator.
  - (b) Disconnect the lower radiator hose from the radiator.
  - (c) Disconnect the ECU outlet duct.
  - (d) Disconnect the 2 electric cooling fan connectors.
  - (e) Disconnect the water temperature switch connector.



- (f) Remove the 2 nuts and 2 upper radiator supports.
- (g) Remove the radiator and cooling fan assembly.
- (h) Remove the 2 lower radiator supports.
6. **REMOVE ELECTRIC COOLING FAN ASSEMBLY**
  - (a) Disconnect the radiator reservoir hose from the radiator.
  - (b) Remove the 6 bolts and cooling fan assembly.

## DISASSEMBLY

1. **REMOVE DRAIN PLUG AND O-RING**
2. **REMOVE WATER TEMPERATURE SWITCH**
  - (a) Remove the water temperature switch and O-ring.



### 3. ASSEMBLE SST

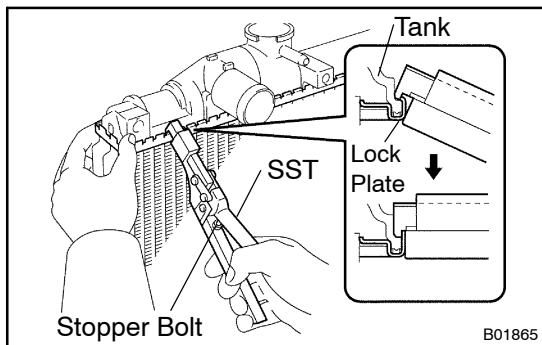
SST 09230-01010

- (a) Install the claw to the overhaul handle, inserting it in the hole in part A as shown in the diagram.
- (b) While gripping the handle, adjust the stopper bolt so that dimension B is as shown in the illustration.

**Dimension B: 0.2 – 0.3 mm (0.008 – 0.012 in.)**

#### NOTICE:

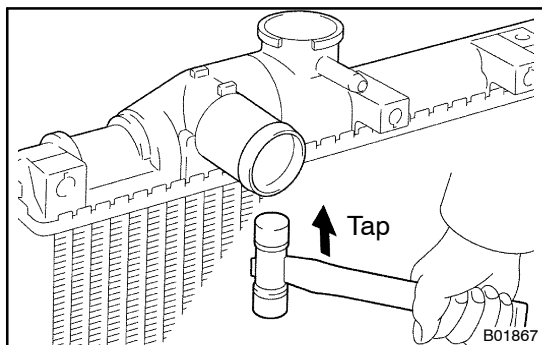
**If this adjustment is not done the claw may be damaged.**



### 4. UNCAULK LOCK PLATES

Using SST to release the caulking, squeeze the handle until stopped by the stopper bolt.

SST 09230-01010



### 5. REMOVE TANKS AND O-RINGS

Lightly tap the bracket of the radiator (or radiator inlet or outlet) with a soft-faced hammer, and remove the tank and the O-ring.

## REASSEMBLY

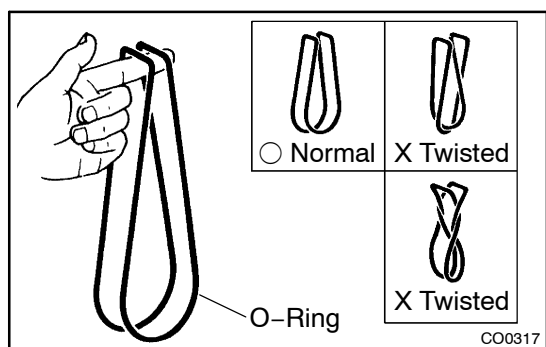
### 1. INSPECT LOCK PLATE FOR DAMAGE

#### HINT:

- If the sides of the lock plate groove are deformed, reassembly of the tank will be impossible.
- Therefore, first correct any deformation with pliers or similar object. Water leakage will result if the bottom of the lock plate groove is damaged or dented.

#### NOTICE:

**The radiator can only be recaulked 2 times. After the 2nd time, the radiator core must be replaced.**

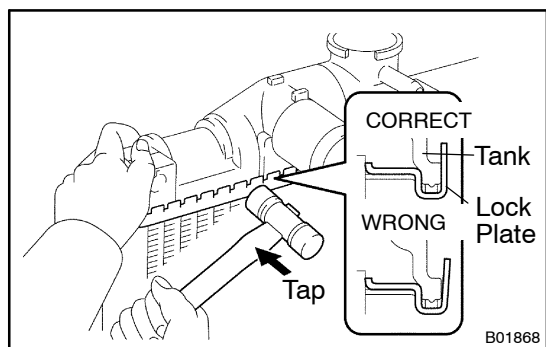


### 2. INSTALL NEW O-RINGS AND TANKS

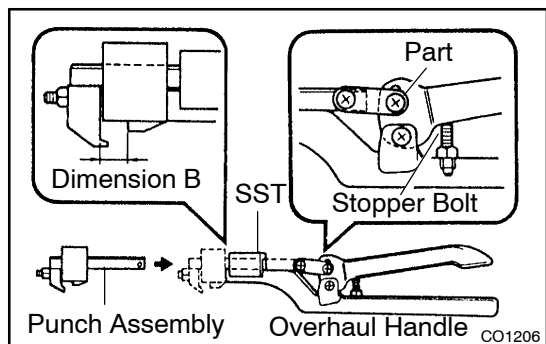
- (a) After checking that there are no foreign objects in the lock plate groove, install a new O-ring without twisting it.

#### HINT:

When cleaning the lock plate groove, lightly rub it with sand paper without scratching it.



- (b) Install the tank without damaging the O-ring.  
(c) Tap the lock plate with a soft-faced hammer so that there is no gap between it and the tank.

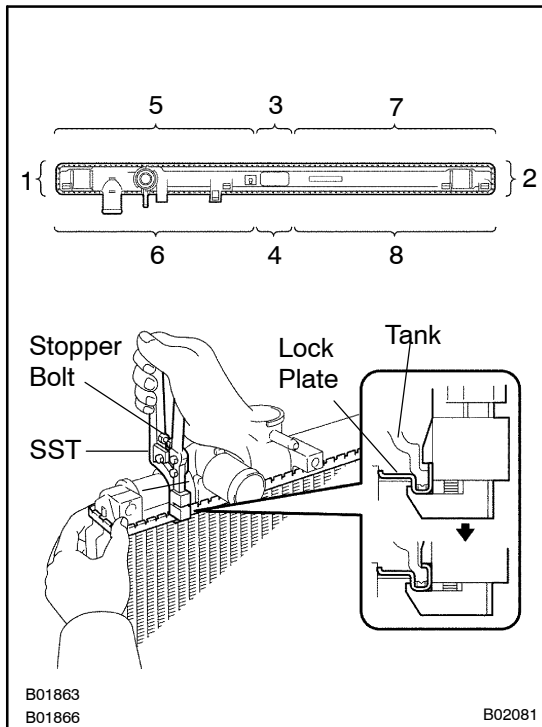


### 3. ASSEMBLE SST

SST 09230-01010, 09231-14010

- (a) Install the punch assembly to the overhaul handle, inserting it in the hole in part A as shown in the illustration.  
(b) While gripping the handle, adjust the stopper bolt so that dimension B is as shown in the illustration.

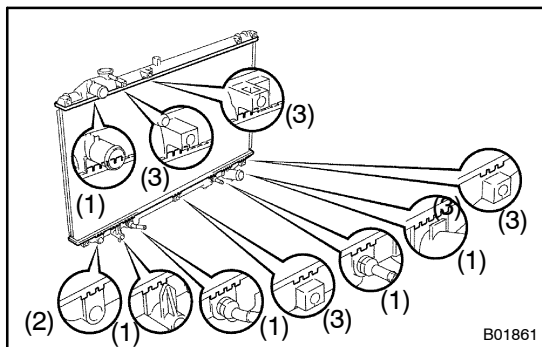
**Dimension B: 8.4 mm (0.331 in.)**



#### 4. CAULK LOCK PLATE

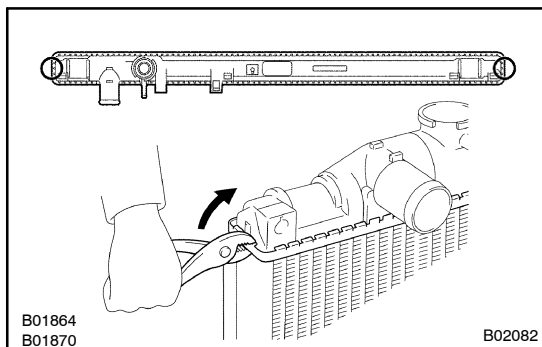
- (a) Lightly press SST against the lock plate in the order shown in the illustration. After repeating this a few times, fully caulk the lock plate by squeezing the handle until stopped by the stopper plate.

SST 09230-01010

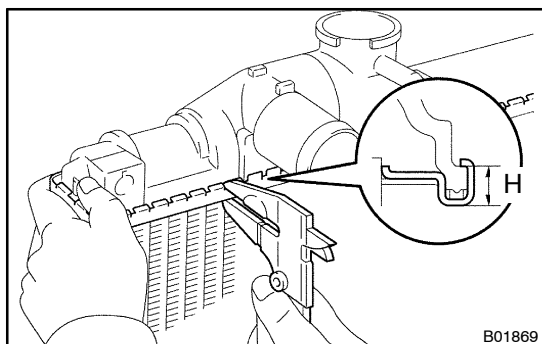


#### HINT:

- Do not stake the areas protruding around the ports (1), flange (2) and bracket (3).



- The points shown in the illustration cannot be staked with the SST. Use pliers or similar object and be careful not to damage the core plates.



- (b) Check the lock plate height (H) after completing the caulking.

**Plate height (H): 7.40 – 7.80 mm (0.2913 – 0.3071 in.)**

If not within the specified height, adjust the stopper bolt of the handle again and caulk again.

#### 5. INSTALL WATER TEMPERATURE SWITCH

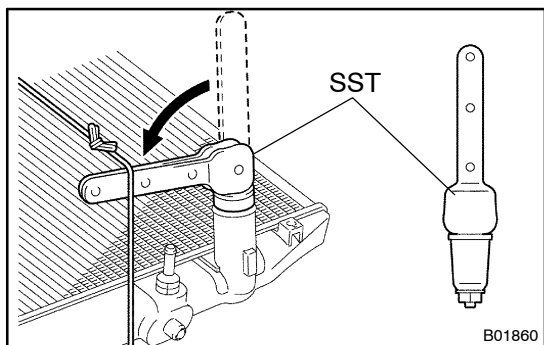
- (a) Install a new O-ring to the water temperature switch.  
(b) Install the water temperature switch.

#### 6. INSTALL DRAIN PLUG

- (a) Install a new O-ring to the drain plug.

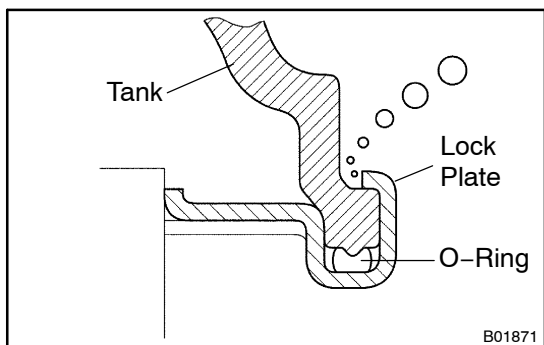
- (b) Install the drain plug.

## 7. INSTALL RADIATOR CAP



## 8. INSPECT WATER LEAK

- (a) Tighten the drain plug.  
 (b) Plug the inlet pipes of the radiator with SST.  
 SST 09230-01010  
 (c) Using a radiator cap tester, apply pressure to the radiator.  
**Test pressure: 177 kPa (1.8 kgf/cm<sup>2</sup>, 26 psi)**  
 (d) Submerge the radiator in water.



- (e) Check the leak.

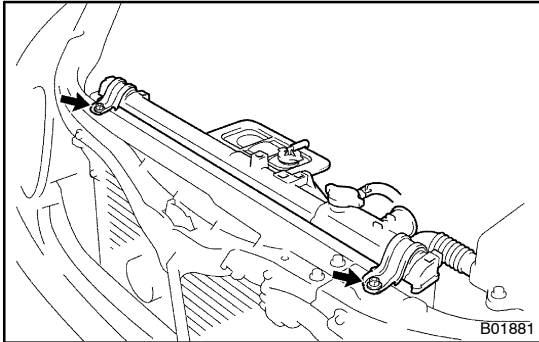
### HINT:

On radiators with resin tanks, there is a clearance between the tank and lock plate where a minute amount of air will remain, giving the appearance of an air leak when the radiator is submerged in water. Therefore, before doing the water leak test, first swish the radiator around in the water until all air bubbles disappear.

## INSTALLATION

### 1. INSTALL COOLING FAN ASSEMBLY

- (a) Install the cooling fan assembly with the 6 bolts.  
**Torque: 5.0 N·m (50 kgf·cm, 44 in·lbf)**
- (b) Connect the radiator reservoir hose to the radiator.



### 2. INSTALL RADIATOR AND COOLING FAN ASSEMBLY

- (a) Install the 2 lower radiator supports to the radiator.
- (b) Attach the 2 lower radiator supports on the radiator to the body bracket.
- (c) Install the radiator and electric cooling fan assembly with the 2 upper radiator supports and 2 nuts.  
**Torque: 13.5 N·m (135 kgf·cm, 10 ft·lbf)**
- (d) Connect these parts:
  - Upper radiator hose to radiator
  - Lower radiator hose to radiator
  - ECU outlet duct to ECU box
  - 2 electric cooling fan connectors
  - Water temperature switch connector

### 3. INSTALL AIR CLEANER ASSEMBLY

### 4. INSTALL AIR CLEANER INLET

### 5. FILL WITH ENGINE COOLANT

### 6. CHECK ENGINE COOLANT LEAK (See page CO-12)

### 7. INSTALL NO. 1 ENGINE UNDER COVER

## ELECTRIC COOLING FAN ON-VEHICLE INSPECTION

CO1AR-01

### 1. CHECK COOLING FAN OPERATION WITH LOW TEMPERATURE (Below 83°C (181°F))

- (a) Turn the ignition switch ON.
- (b) Check that the cooling fan is stopping.

HINT:

If the cooling fan operates, check the water temperature switch and wiring.

- (c) Disconnect the water temperature switch connector.
- (d) Check that the cooling fan rotates.

If the cooling fan does not operate, check the fuses, relays, cooling fan motor and wiring.

- (e) Reconnect the water temperature switch connector.

### 2. CHECK COOLING FAN OPERATION WITH HIGH TEMPERATURE (Above 93°C (199°F))

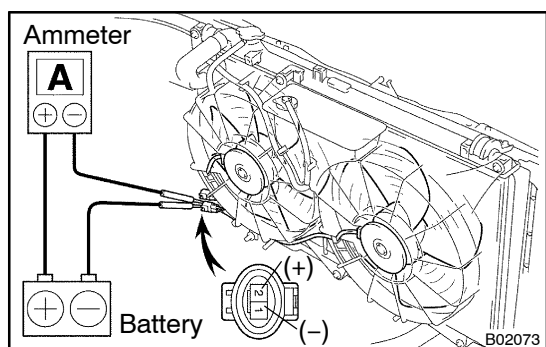
- (a) Start the engine, and raise coolant temperature to above 93°C (199°F).

HINT:

Coolant temperature is the detected value by the water temperature switch on the radiator lower tank.

- (b) Check that the cooling fan rotates.

If not, replace the water temperature switch.



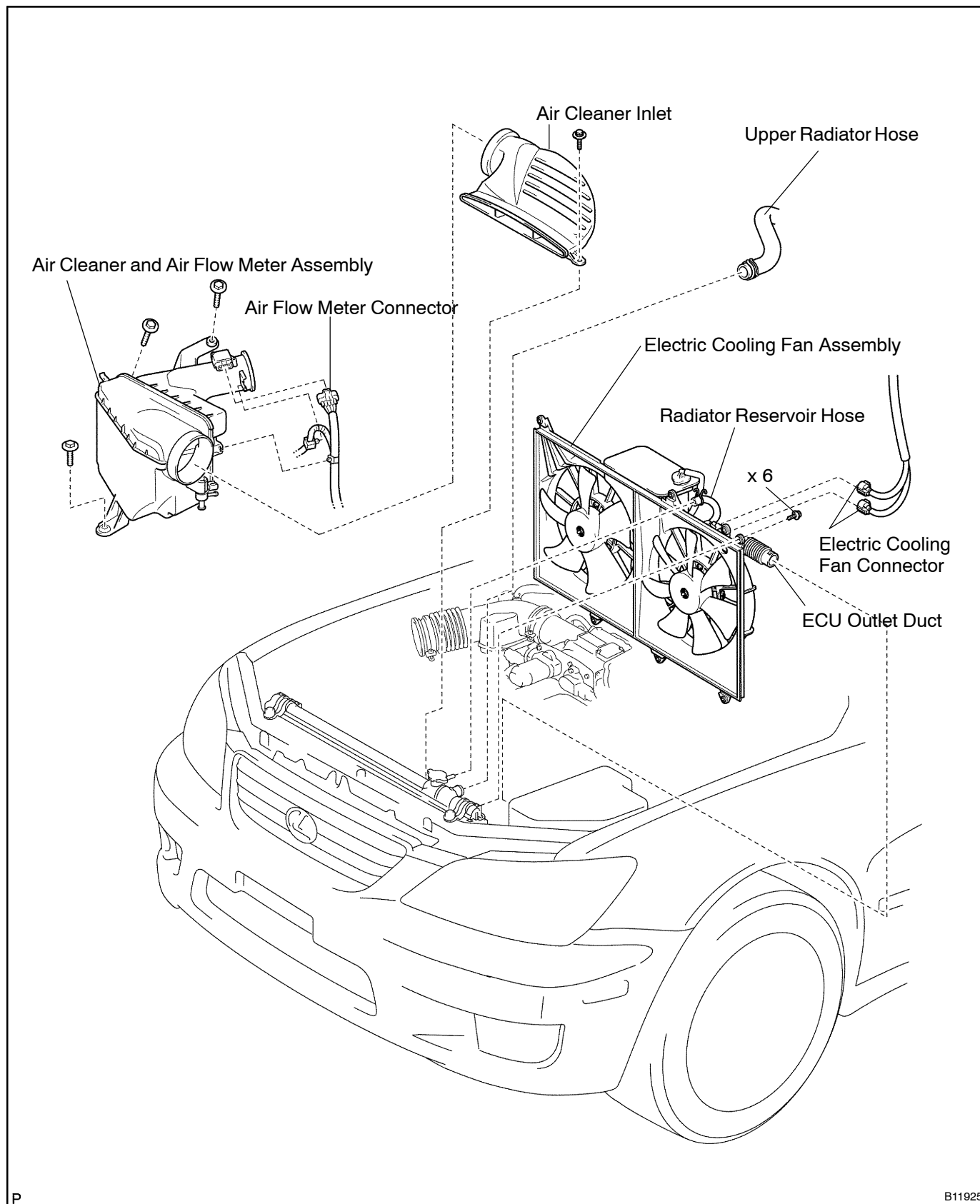
### 3. INSPECT COOLING FANS

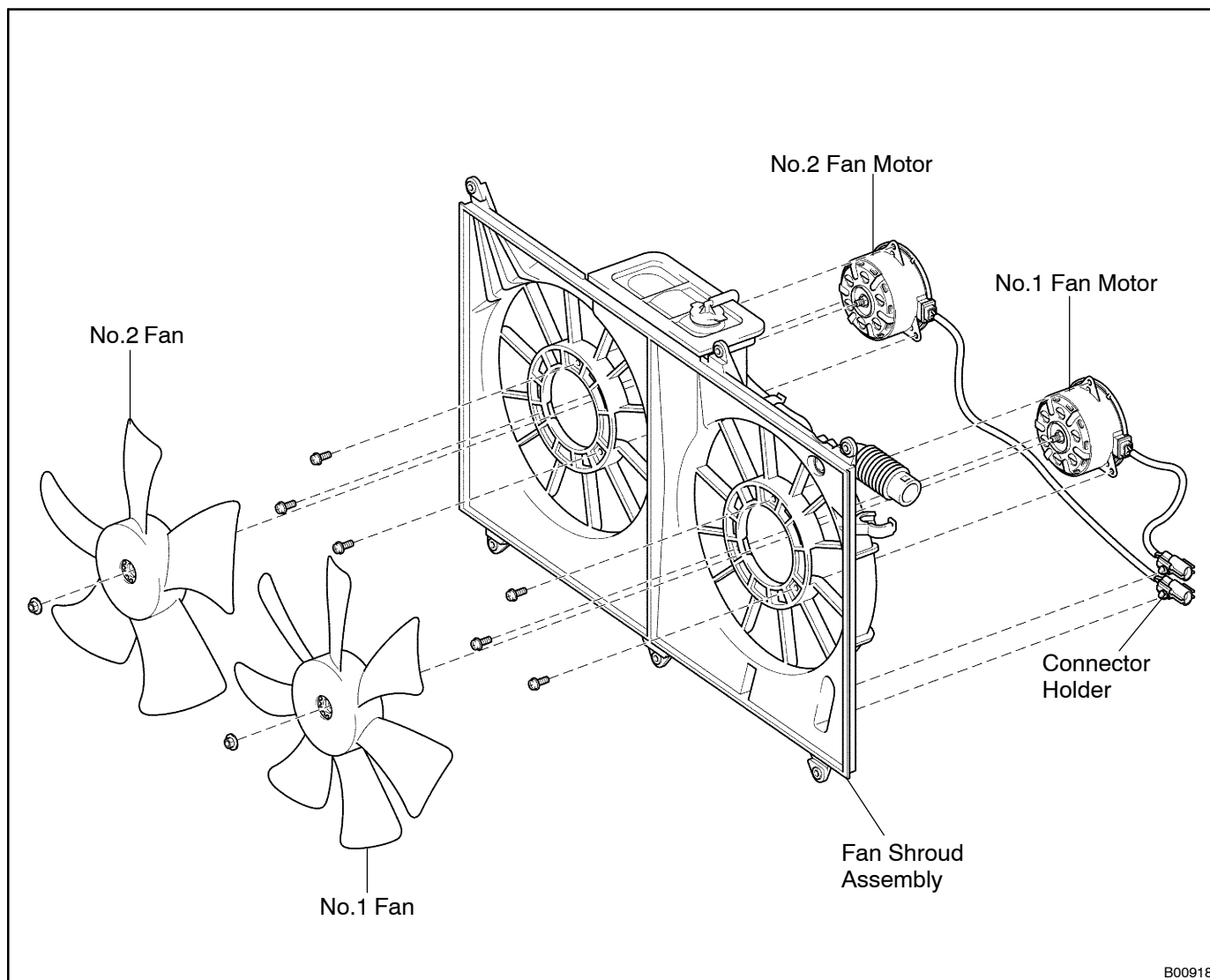
- (a) Disconnect the cooling fan connector.
- (b) Connect battery and ammeter to the cooling fan connector.
- (c) Check that the cooling fan rotates smoothly, and check the reading on the ammeter.

**Standard amperage: 8.5 – 11.5 A at 20°C (68°F)**

- (d) Reconnect the cooling fan connector.

## COMPONENTS

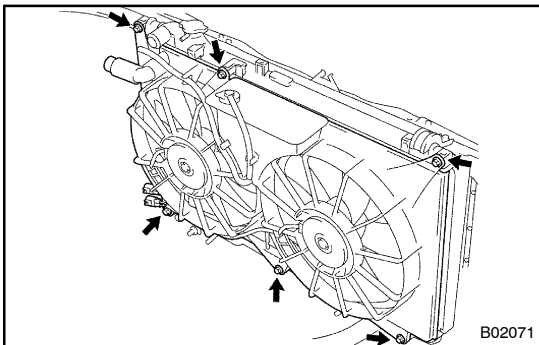




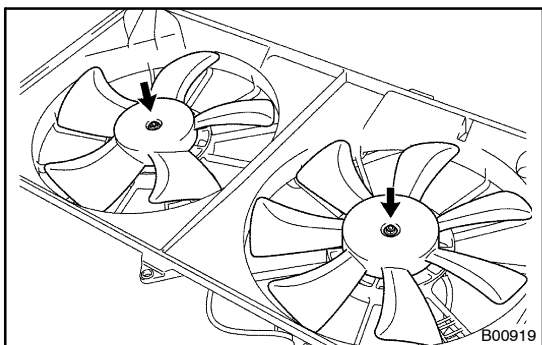
B00918

## REMOVAL

1. **DRAIN ENGINE COOLANT**
2. **REMOVE AIR CLEANER INLET**
3. **REMOVE AIR CLEANER AND AIR FLOW METER ASSEMBLY**
4. **REMOVE ELECTRIC COOLING FAN**
  - (a) Disconnect the upper radiator hose from the radiator.
  - (b) Disconnect the ECU outlet duct from the ECU box.
  - (c) Disconnect the wire for electric cooling fan from the clamp on the electric cooling fan.
  - (d) Disconnect the 2 electric cooling fan connector.
  - (e) Disconnect the radiator reservoir hose from the radiator.



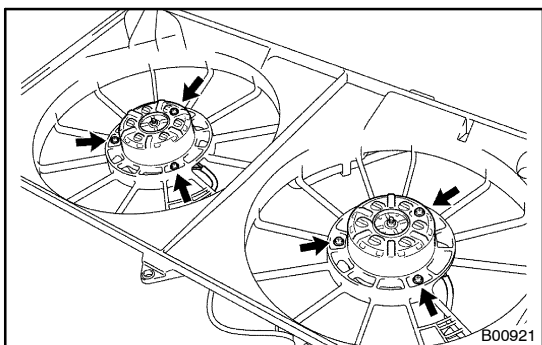
- (f) Remove the 6 bolts and electric cooling fan.



## DISASSEMBLY

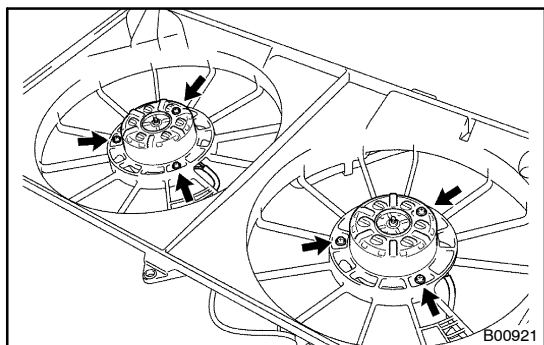
### 1. REMOVE FANS

Remove the nut and fan. Remove the 2 fans.



### 2. REMOVE FAN MOTORS

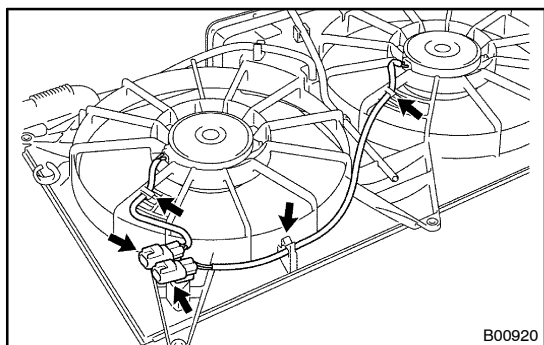
- (a) Disconnect the wires and connector holders from the fan shroud.
- (b) Remove the 3 screws and fan motor. Remove the 2 fan motors.



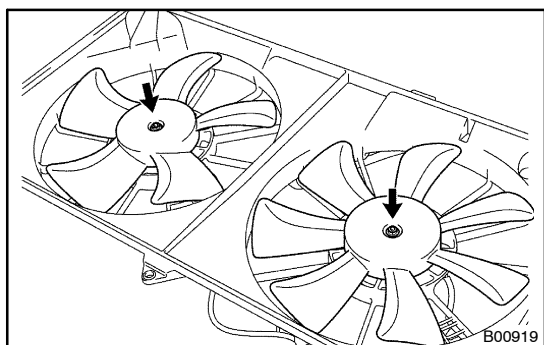
## REASSEMBLY

### 1. INSTALL FAN MOTORS

- (a) Install the fan motor with the 3 screws. Install the 2 fan motors.

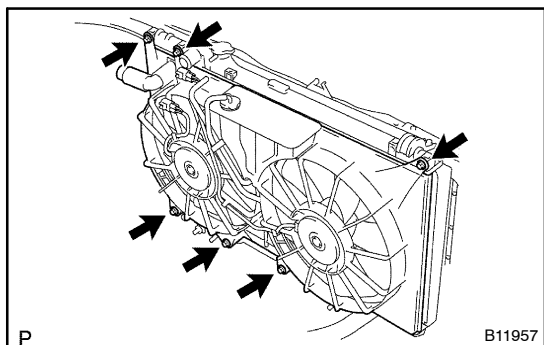


- (b) Install the wires and connector holders to the fan shroud as shown in the illustration.



### 2. INSTALL FANS

Install the fan with the nut. Install the 2 fans.



## INSTALLATION

### 1. INSTALL ELECTRIC COOLING FAN

- (a) Install the electric cooling fan with the 6 bolts.  
**Torque: 5.0 N·m (50 kgf·cm, 44 in·lbf)**
- (b) Connect the upper radiator hose to the radiator.
- (c) Connect the ECU outlet duct to the ECU box.
- (d) Connect the wire for electric cooling fan to clamp on the electric cooling fan.
- (e) Connect the 2 electric cooling fan connectors.
- (f) Connect the radiator reservoir hose to the radiator.

### 2. INSTALL AIR CLEANER AND AIR FLOW METER ASSEMBLY

### 3. INSTALL AIR CLEANER INLET

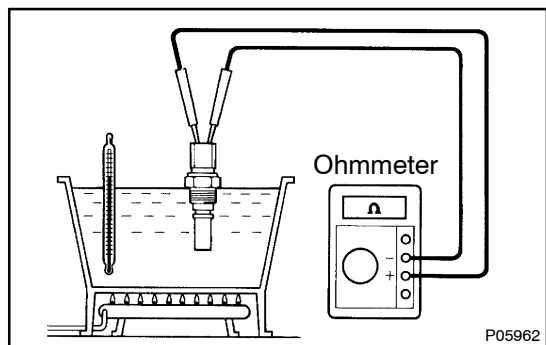
### 4. FILL WITH ENGINE COOLANT

### 5. START ENGINE AND CHECK FOR COOLANT LEAKS

## WATER TEMPERATURE SWITCH INSPECTION

CO1AS-01

1. **DRAIN ENGINE COOLANT**
2. **REMOVE WATER TEMPERATURE SWITCH**
  - (a) Disconnect the connector.
  - (b) Remove the water temperature switch.
  - (c) Remove the O-ring from the water temperature switch.



3. **INSPECT WATER TEMPERATURE SWITCH**

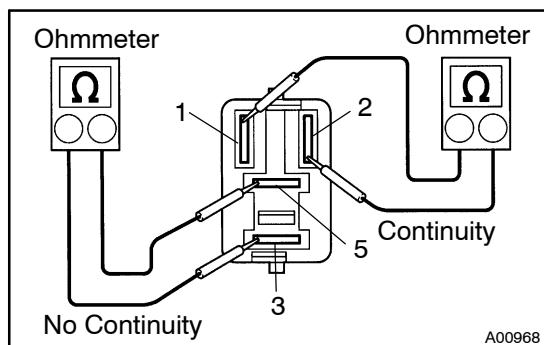
Check the sensor terminals continuity.

**Standard:**

|                      |               |
|----------------------|---------------|
| Water temperature    | Continuity    |
| above 90 °C (194 °F) | Continuity    |
| below 83 °C (181 °F) | No Continuity |

If the continuity is not standard, replace the switch.

4. **REINSTALL WATER TEMPERATURE SWITCH**
  - (a) Install a new O-ring to the water temperature switch.
  - (b) Install the water temperature switch.
  - (c) Connect the connector.
5. **REFILL WITH ENGINE COOLANT**
6. **CHECK ENGINE COOLANT LEAK**



## COOLING FAN RELAY INSPECTION

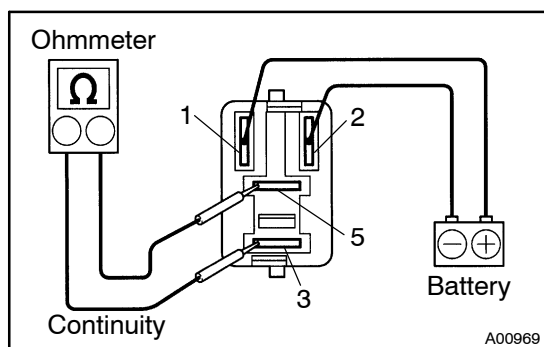
CO1AT-01

### 1. INSPECT NO.1 AND NO. 3 COOLING FAN RELAY (Marking: FAN NO. 1 and FAN NO. 3)

- (a) Inspect the relay continuity.
  - (1) Check that there is continuity between terminals 1 and 2.
  - (2) Check that there is no continuity between terminals 3 and 5.

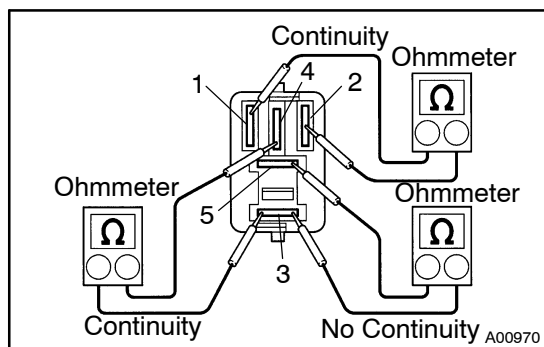
If there is no continuity, replace the relay.

If there is continuity, replace the relay.



- (b) Inspect the relay operation.
  - (1) Apply battery positive voltage to terminals 1 and 2.
  - (2) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is continuity, replace the relay.



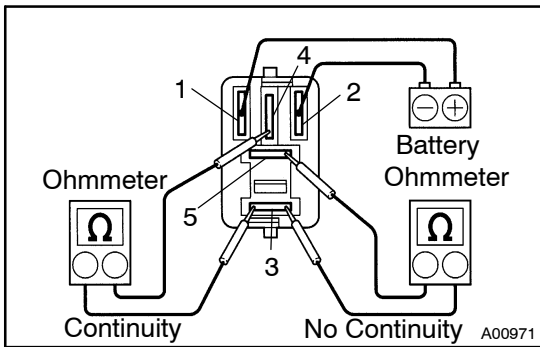
### 2. INSPECT NO. 2 COOLING FAN RELAY (Marking: FAN NO. 2)

- (a) Inspect the relay continuity.
  - (1) Check that there is continuity between terminals 1 and 2.
  - (2) Check that there is continuity between terminals 3 and 4.
  - (3) Check that there is no continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

If there is no continuity, replace the relay.

If there is continuity, replace the relay.



(b) Inspect the relay operation.

- (1) Apply battery positive voltage to terminals 1 and 2.
- (2) Check that there is no continuity between terminals 3 and 4.

If there is continuity, replace the relay.

- (3) Check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.