

COOLANT INSPECTION

C0066-04

HINT:

Check the coolant level when the engine is cold.

1. CHECK ENGINE COOLANT LEVEL AT RADIATOR RESERVOIR

The engine coolant level should be between the "LOW" and "FULL" lines.

If low, check for leak and add "Toyota Long Life Coolant" or equivalent up to the "FULL" line.

2. CHECK ENGINE COOLANT QUALITY

- (a) Remove the radiator cap.

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

- (b) There should not be any excessive deposits of rust or scale around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, clean the coolant passages and replace the coolant.

- (c) Reinstall the radiator cap.

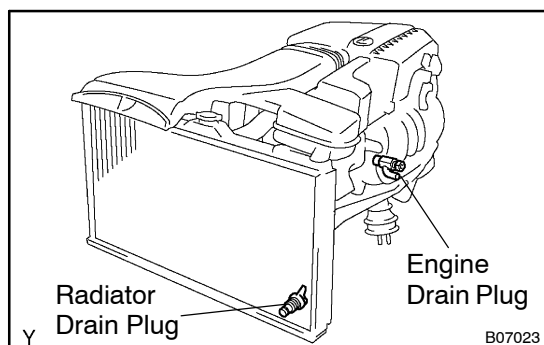
REPLACEMENT

1. DRAIN ENGINE COOLANT

- (a) Remove the radiator cap.

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.



- (b) Loosen the radiator and engine drain plugs, and drain the coolant.

- (c) Close the drain plugs.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf) for engine

2. FILL ENGINE COOLANT

- (a) Slowly fill the system with coolant.

- Use of improper coolants may damage engine cooling system.
- Use "Toyota Long Life Coolant" or equivalent and mix it with plain water according to the manufacturer's directions.
- Using of coolant which includes more than 50 % (freezing protection down to -35°C (-31°F) or 60 % (freezing protection down to -50°C (-58°F)) of ethylene-glycol is recommended but not more than 70 %.

NOTICE:

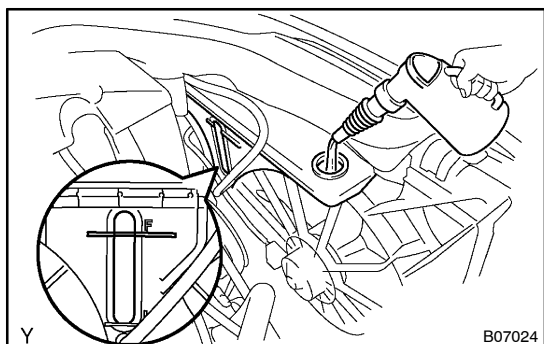
- **Do not use an alcohol type coolant or plain water alone.**
- **The coolant should be mixed with plain water (preferably demineralized water or distilled water).**

Capacity:

Europe	7.1 liters (7.5 US qts, 6.2 Imp. qts)
Others	6.6 liters (7.3 US qts, 6.1 Imp. qts)

- (b) Install the radiator cap.

- (c) Start the engine, and bleed the cooling system.



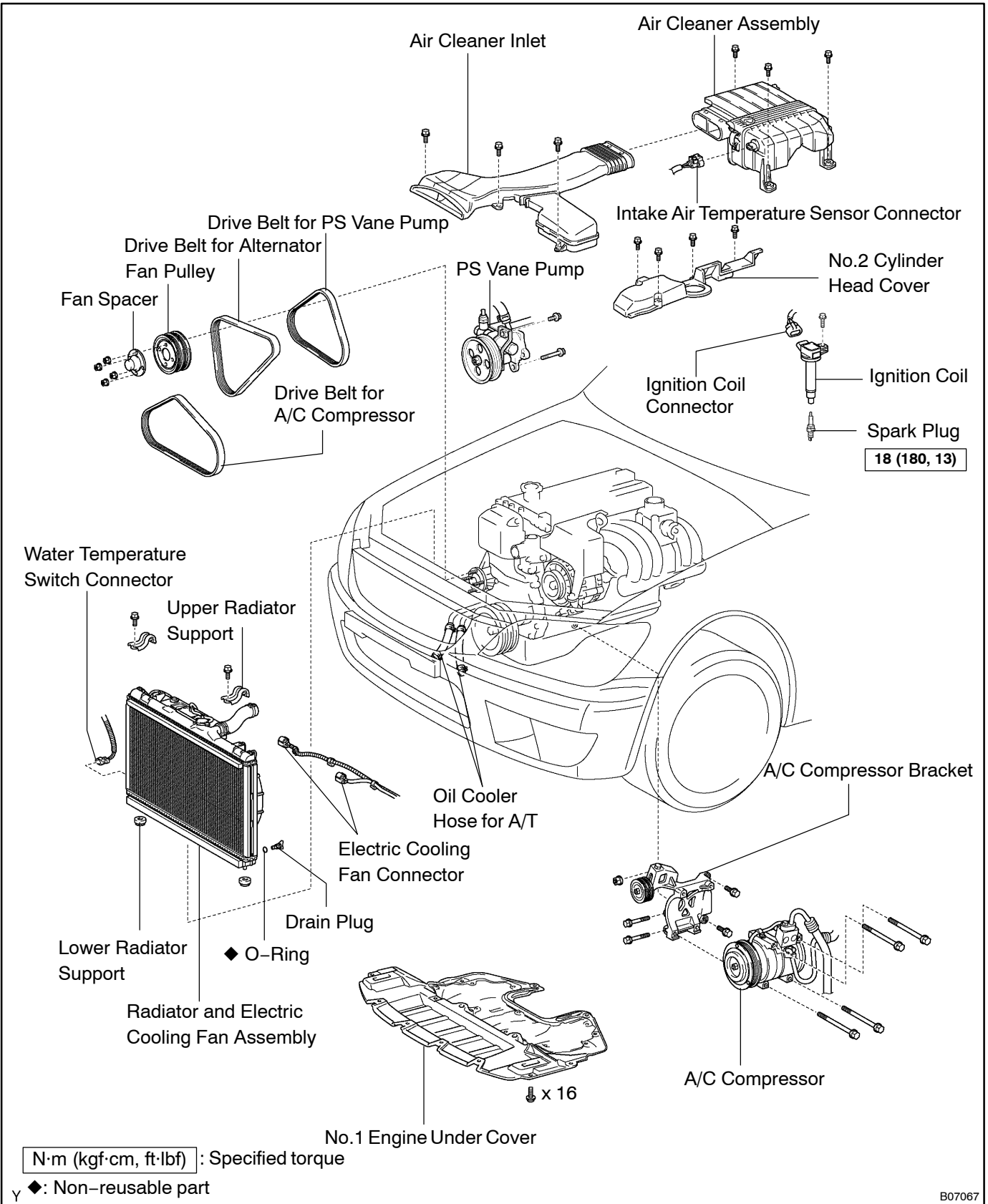
- (d) Refill the radiator reservoir with coolant until it reaches the "FULL" line.

3. CHECK ENGINE COOLANT FOR LEAK

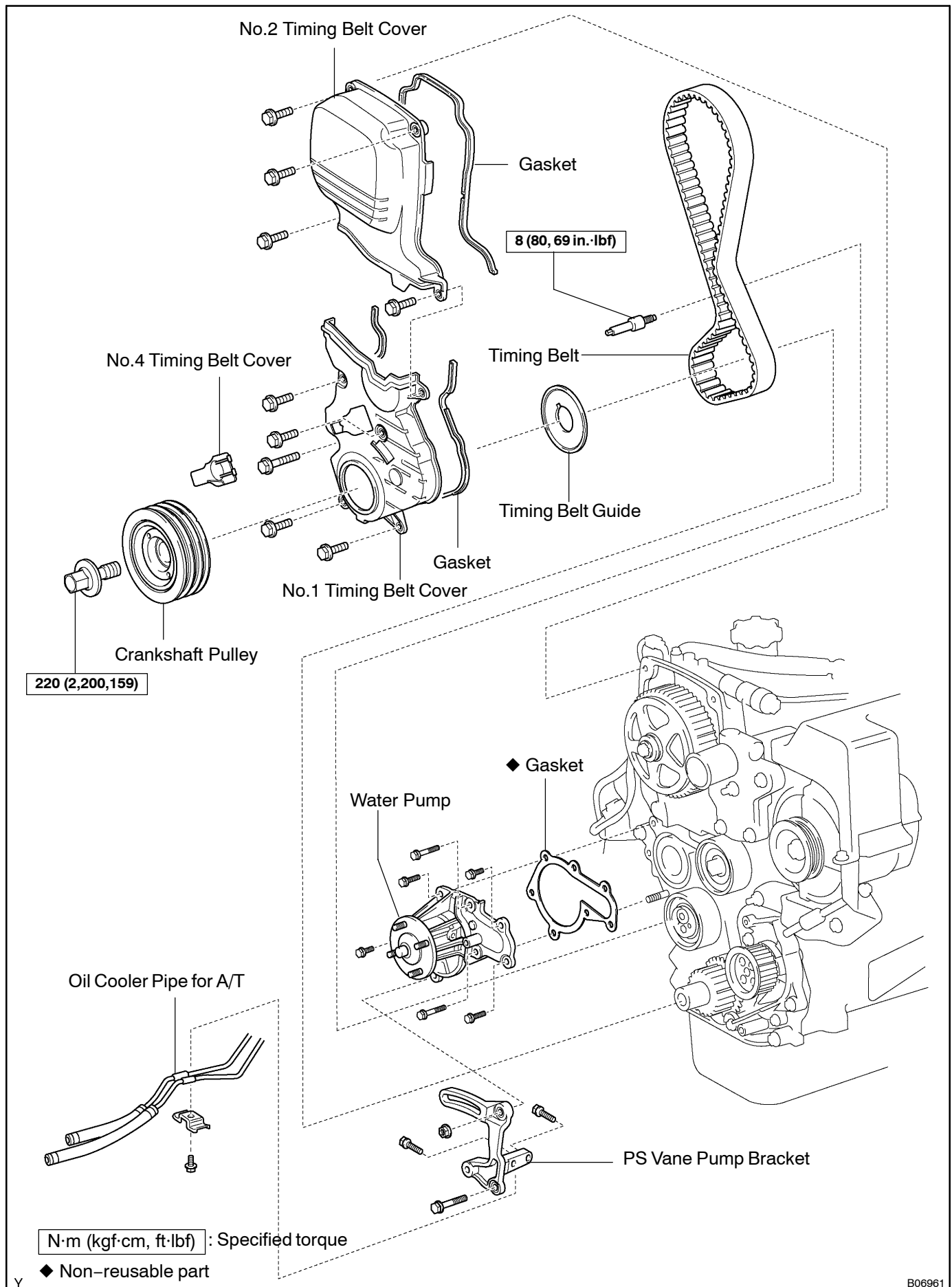
4. CHECK ENGINE COOLANT SPECIFIC GRAVITY CORRECTLY

WATER PUMP COMPONENTS

C0068-04



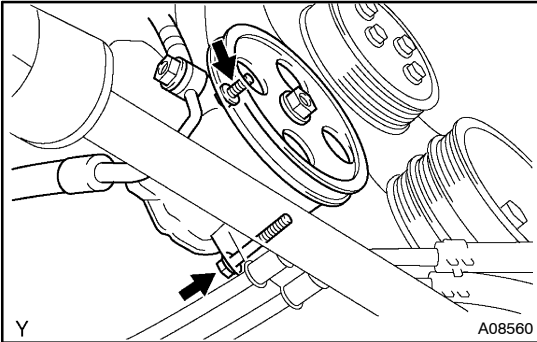
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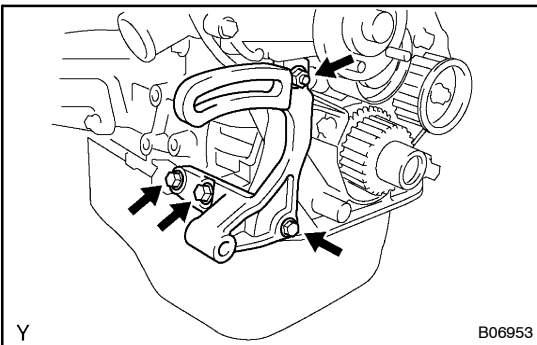
REMOVAL

1. DRAIN ENGINE COOLANT



2. DISCONNECT PS VANE PUMP WITHOUT DISCONNECTING HOSES

3. REMOVE TIMING BELT (See page EM-20)

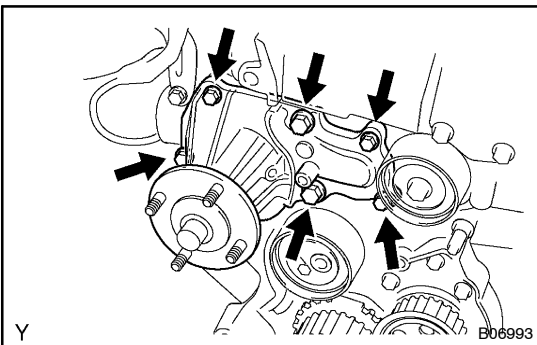


4. REMOVE PS VANE PUMP BRACKET

(a) A/T:

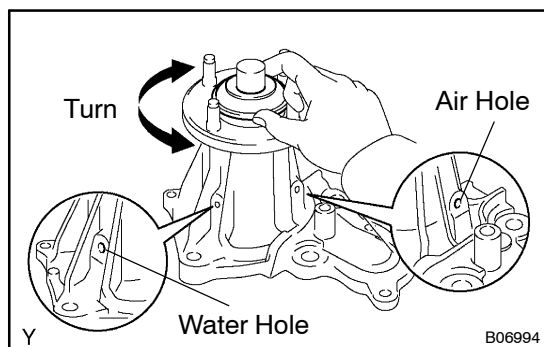
Remove the bolt and pipe clamp, and disconnect the oil cooler pipes for A/T from the pump bracket.

(b) Remove the 3 bolts, nut and pump bracket.



5. REMOVE WATER PUMP

Remove the 6 bolts, water pump and gasket.



INSPECTION

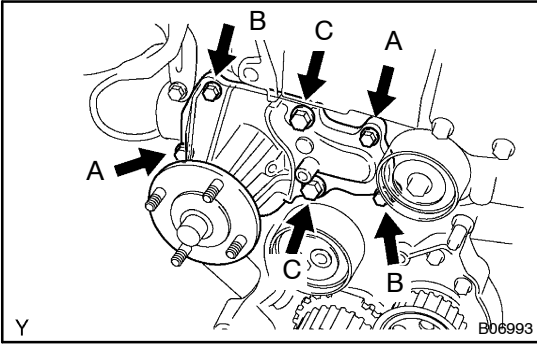
INSPECT WATER PUMP

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

If leakage is found, replace the water pump.

- (b) Turn the pulley, and check that the water pump bearing moves smoothly and quietly.

If necessary, replace the water pump.



INSTALLATION

1. INSTALL WATER PUMP

Install a new gasket and the water pump with the 6 bolts.

Torque:

9.0 N·m (90 kgf·cm, 78 in·lbf) for 10 mm head

18.5 N·m (185 kgf·cm, 13 ft·lbf) for 12 mm head

HINT:

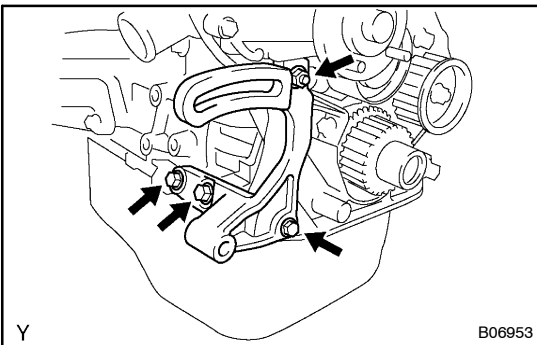
Each bolt length is indicated in the illustration.

Bolt length:

20 mm (0.79 in.) for A

25 mm (0.98 in.) for B

45 mm (1.77 in.) for C



2. INSTALL PS VANE PUMP BRACKET

(a) Remove the pump bracket with the 3 bolts and nut.

Torque:

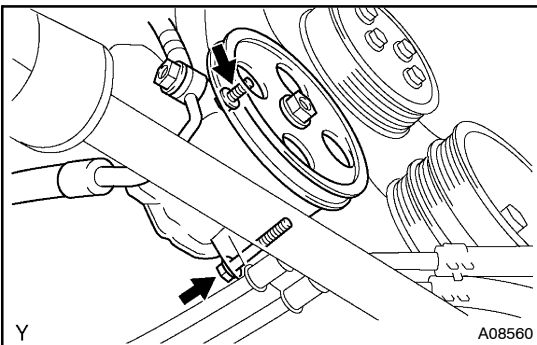
19 N·m (195 kgf·cm, 14 ft·lbf) for 12 mm head

39 N·m (400 kgf·cm, 29 ft·lbf) for 14 mm head

(b) A/T:

Connect the oil cooler pipes for A/T to the pump bracket with the bolt and pipe clamp.

3. INSTALL TIMING BELT (See page EM-26)



4. INSTALL PS VANE PUMP

Torque:

58 N·m (590 kgf·cm, 43 ft·lbf) for pivot bolt

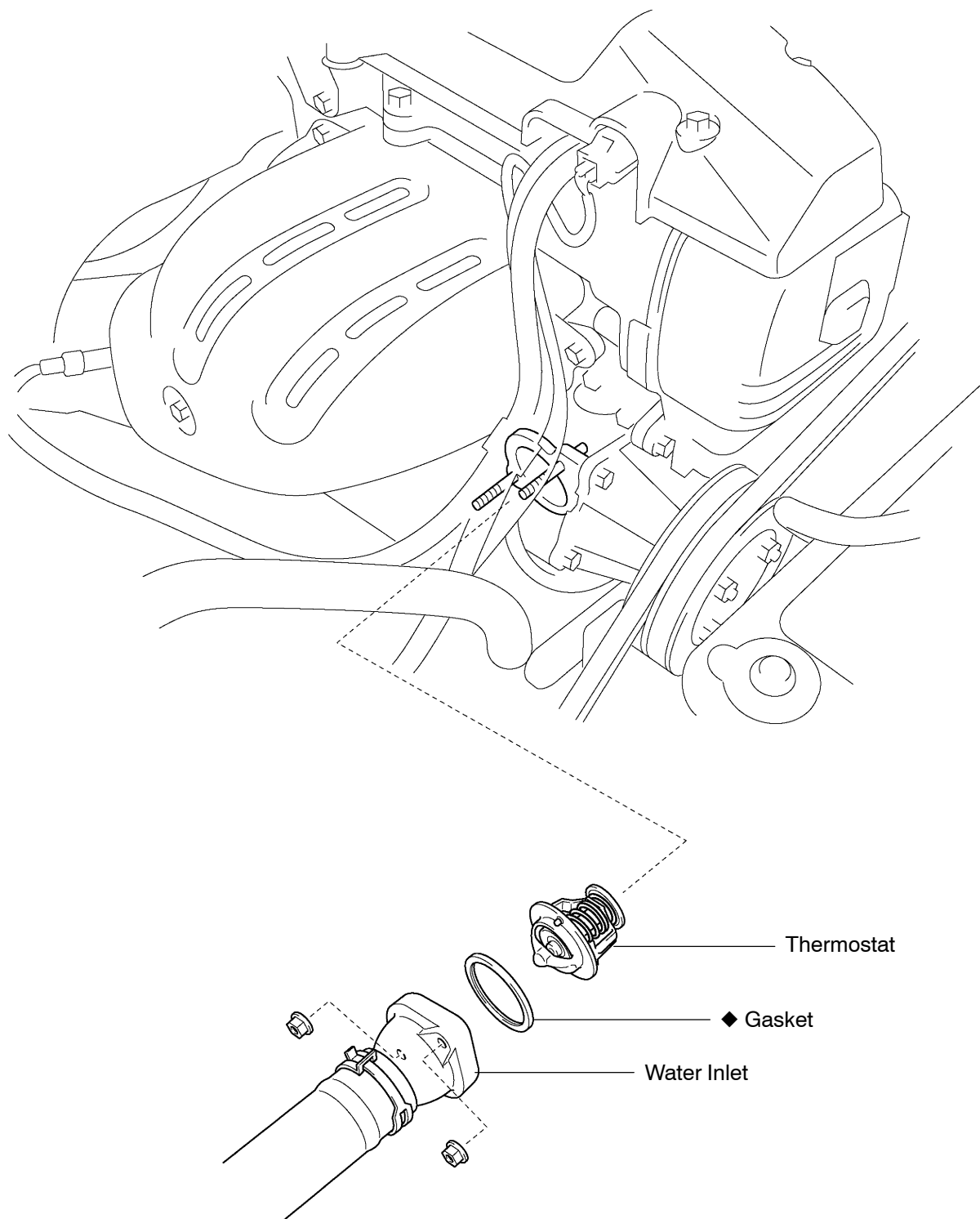
39 N·m (400 kgf·cm, 29 ft·lbf) for adjusting lock bolt

5. FILL WITH ENGINE COOLANT

6. START ENGINE AND CHECK FOR COOLANT LEAK

THERMOSTAT COMPONENTS

C006C-04



Y ◆ Non-reusable part

B07002

REMOVAL

HINT:

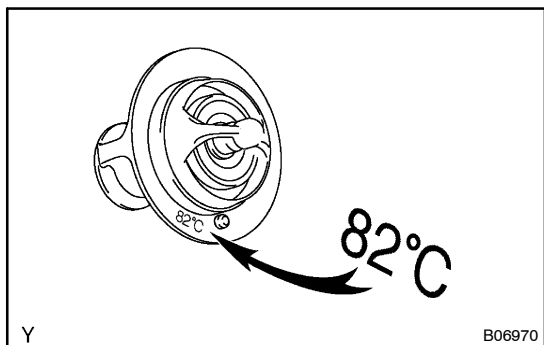
Removal of the thermostat would have an adverse effect, causing a decline in cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

1. DRAIN ENGINE COOLANT



2. REMOVE WATER INLET AND THERMOSTAT

- (a) Remove the 2 nuts, and disconnect the water inlet from the timing belt case.
- (b) Remove the thermostat.
- (c) Remove the gasket from the thermostat.



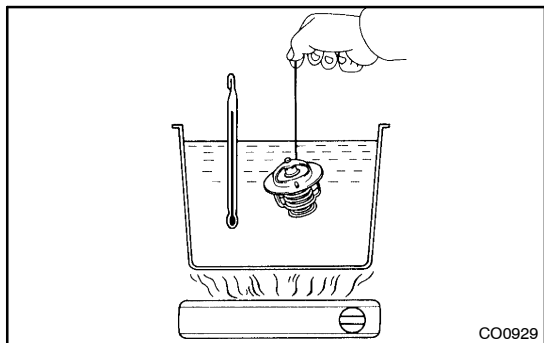
INSPECTION

INSPECT THERMOSTAT

HINT:

The thermostat is numbered with the valve opening temperature.

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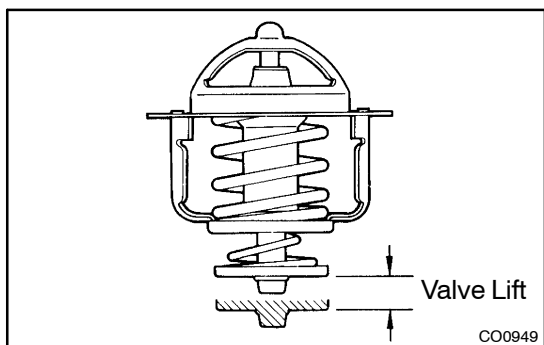


(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.

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

If the valve opening temperature is not as specified, replace the thermostat.



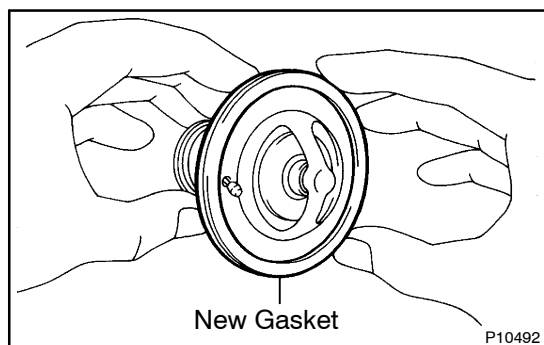
(c) Check the valve lift.

Valve lift: 8 mm (0.31 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 temperature (below 40 °C (104 °F)).

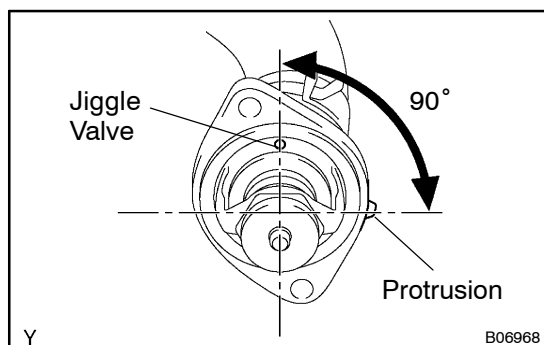
If not closed, replace the thermostat.



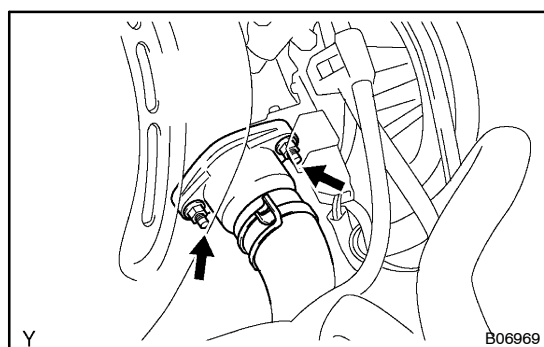
INSTALLATION

1. PLACE THERMOSTAT IN WATER INLET

- (a) Install a new gasket to the thermostat.



- (b) Align the jiggle valve of the thermostat with as shown in the illustration, and insert the thermostat in the water inlet.



2. INSTALL WATER INLET AND THERMOSTAT

Install the water inlet and thermostat with the 2 nuts.

Torque: 9.0 N·m (90 kgf·cm, 78 in.·lbf)

3. FILL WITH ENGINE COOLANT

4. START ENGINE AND CHECK FOR COOLANT LEAK

RADIATOR

ON-VEHICLE CLEANING

C006G-04

Using water or a steam cleaner, remove any mud or dirt from the radiator core.

NOTICE:

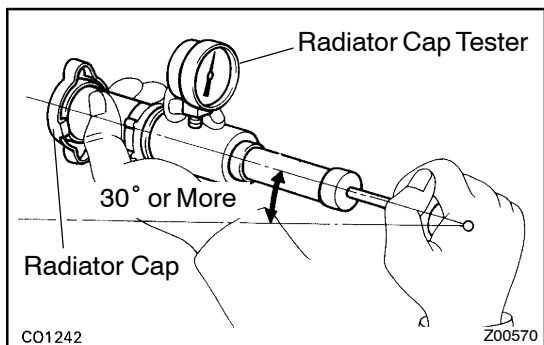
If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. (i.e. Maintain a distance between the cleaner nozzle and radiator core.)

ON-VEHICLE INSPECTION

1. REMOVE RADIATOR CAP

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.



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 if 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 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/cm², 13.5 – 17.8 psi)

Minimum opening pressure:

78 kPa (0.8 kgf/cm², 11.4 psi)

HINT:

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

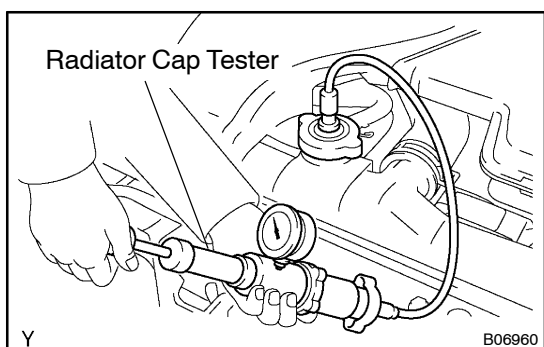
If the opening pressure is less than minimum, replace the radiator cap.

3. INSPECT COOLING SYSTEM FOR LEAK

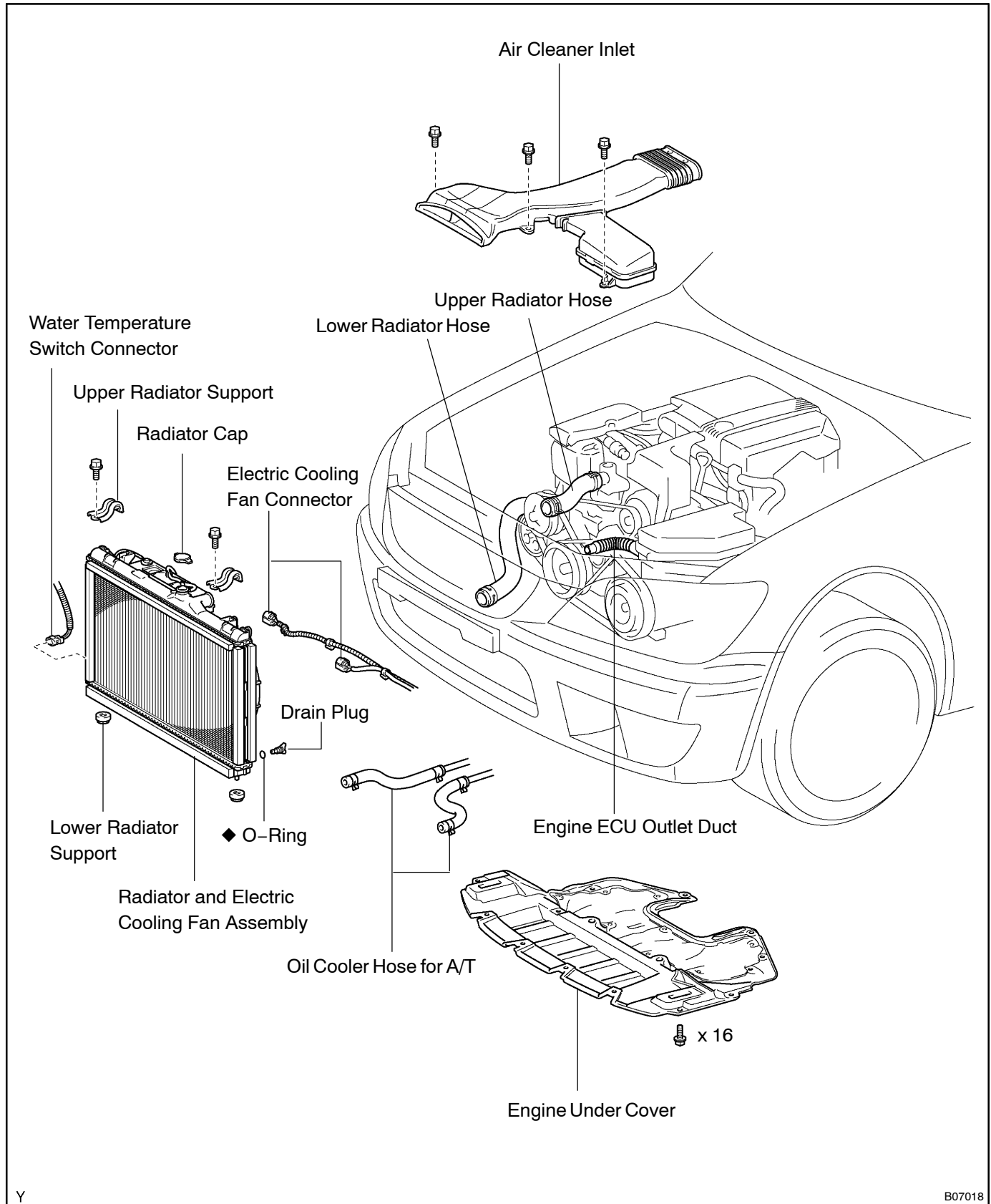
- (a) Fill the radiator with coolant, and attach a radiator cap tester.
- (b) Warm up the engine.
- (c) Pump it to 118 kPa (1.2 kgf/cm², 17.1 psi), and check that the pressure does not drop.

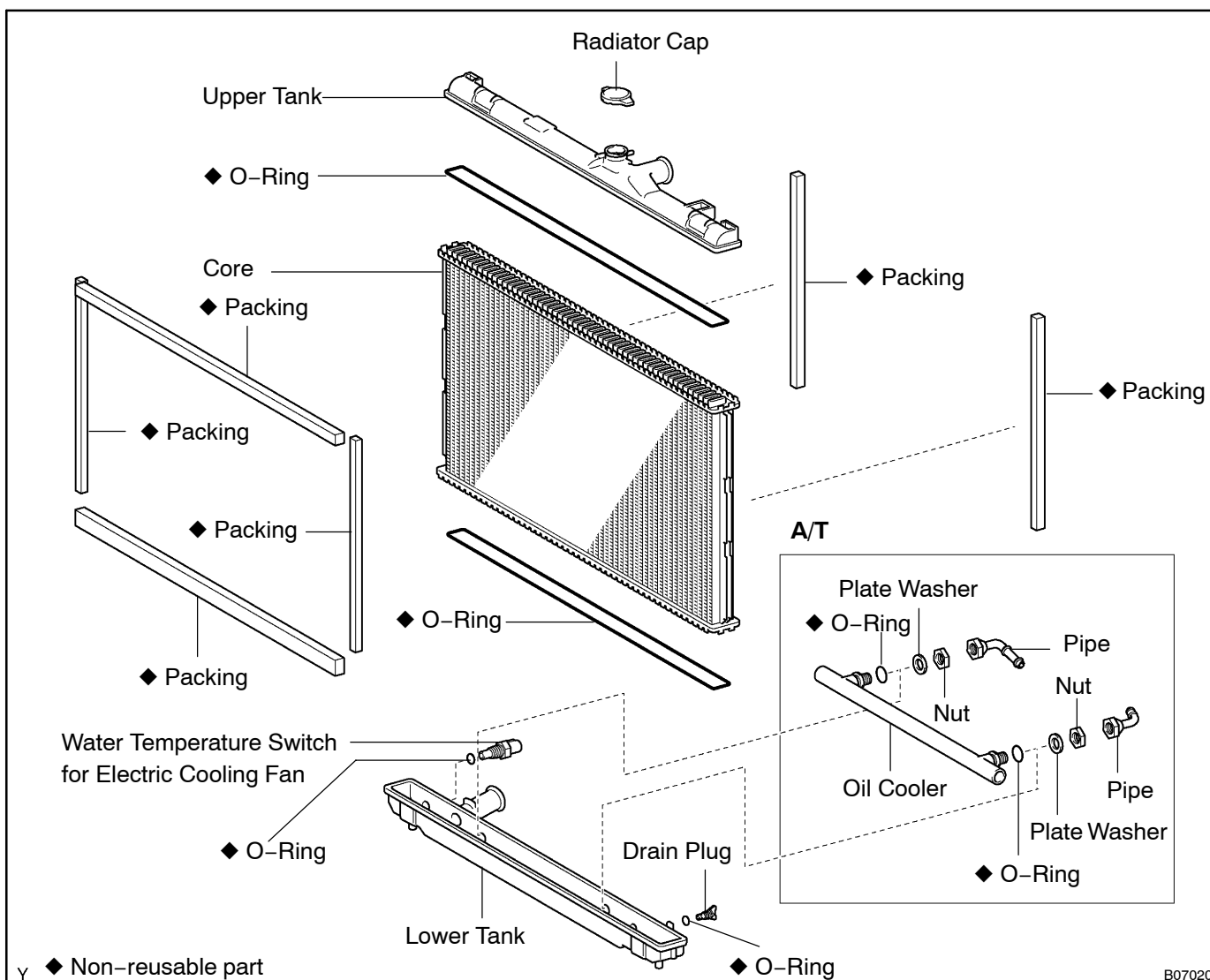
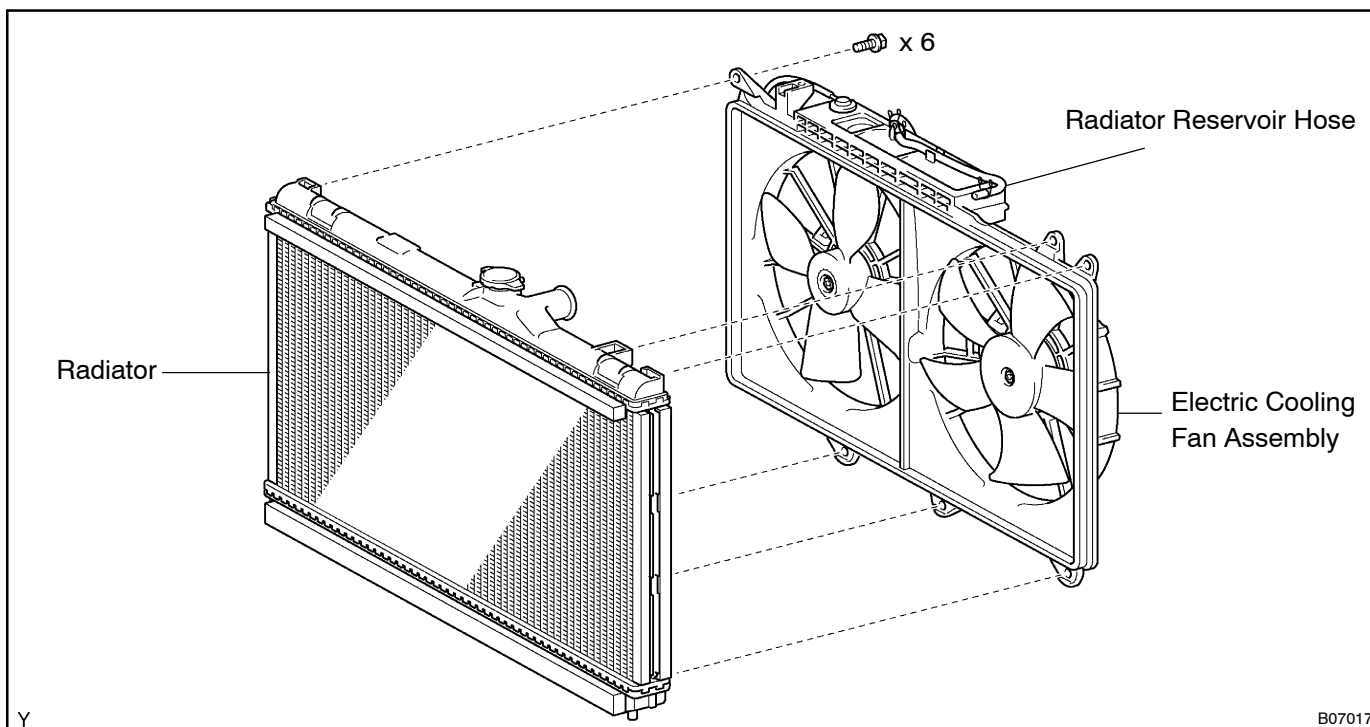
If the pressure drops, check the hoses, radiator or water pump for leak. If no external leak is found, check the heater core, cylinder block and head.

4. REINSTALL RADIATOR CAP



COMPONENTS

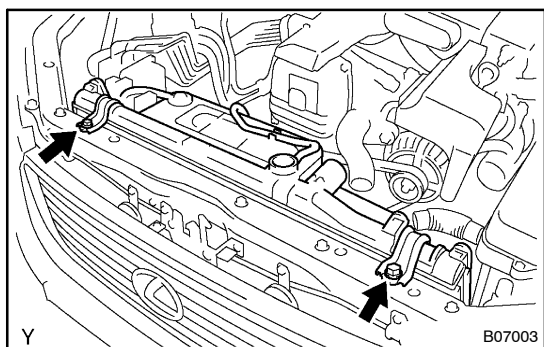




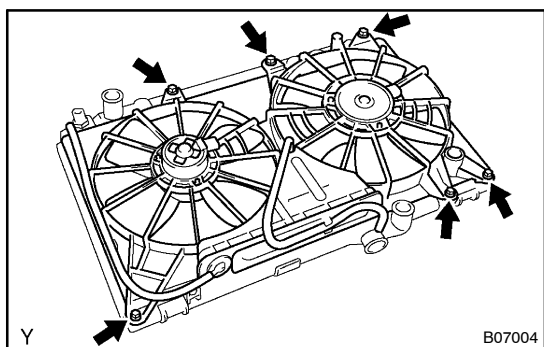
REMOVAL

1. REMOVE NO.1 ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. REMOVE AIR CLEANER INLET
4. REMOVE RADIATOR AND ELECTRIC COOLING FAN ASSEMBLY

- (a) Disconnect the engine ECU outlet duct from the radiator.
- (b) Disconnect the upper radiator hose from the radiator.
- (c) Disconnect the lower radiator hose from the radiator.
- (d) A/T:
Disconnect the 2 oil cooler hoses from the radiator.
- (e) Disconnect the water temperature switch connector for the electric cooling fan.
- (f) Disconnect the 2 electric cooling fan connectors.
- (g) Disconnect the wire for the electric cooling fan from the clamps on the electric cooling fan.



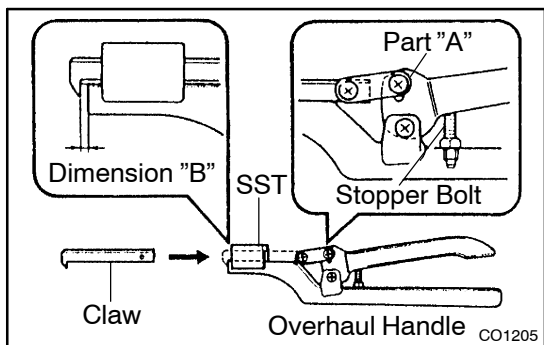
- (h) Remove the 2 bolts and 2 upper radiator supports.
- (i) Lift out the radiator and cooling fan assembly.
- (j) Remove the 2 lower radiator supports.



5. REMOVE ELECTRIC COOLING FAN FROM RADIATOR
- (a) Disconnect the radiator reservoir hose from the radiator.
- (b) Remove the 6 bolts and electric cooling fan.

DISASSEMBLY

1. **REMOVE PACKINGS**
2. **REMOVE RADIATOR CAP**
3. **REMOVE DRAIN PLUG**
 - (a) Remove the drain plug.
 - (b) Remove the O-ring.
4. **REMOVE WATER TEMPERATURE SWITCH**
 - (a) Remove the water temperature switch.
 - (b) Remove the O-ring.



5. ASSEMBLE SST

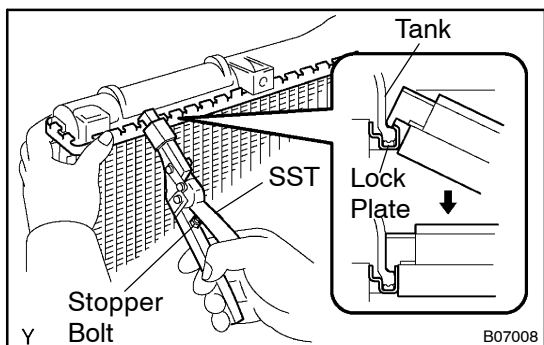
SST 09230-01010

- (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:

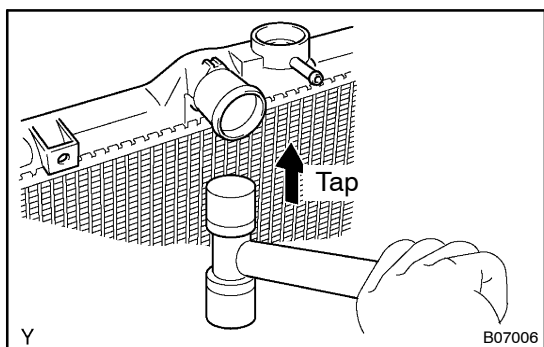
If this adjustment is not done the claw may be damaged.



6. UNCAULK LOCK PLATES

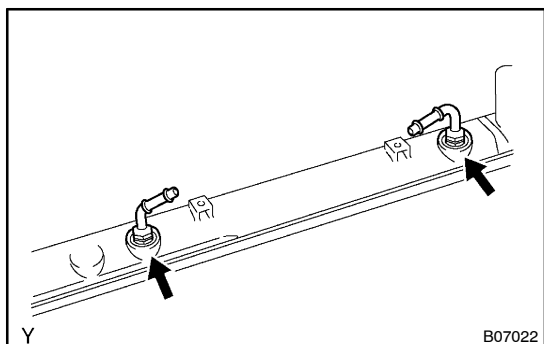
Using SST to release the caulking, squeeze the handle until stopped by the stopper bolt.

SST 09230-01010



7. REMOVE TANKS AND O-RINGS

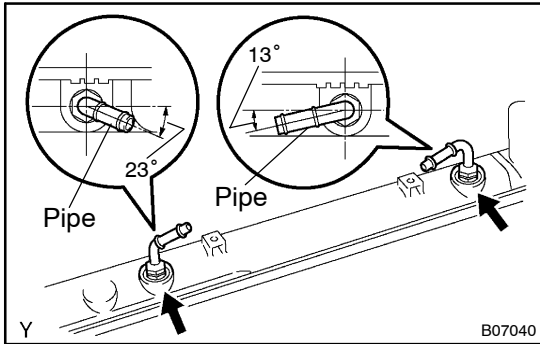
Lightly tap the bracket of the radiator (or radiator inlet or outlet) with a soft-faced hammer, and remove the tank and the O-ring.



8. A/T:

REMOVE OIL COOLER FROM LOWER TANK

- (a) Loosen the nut, and remove the cooler pipe. Remove the 2 cooler pipes.
- (b) Remove the 2 nuts and 2 plate washers.
- (c) Remove the oil cooler and 2 O-rings.



REASSEMBLY

1. A/T:

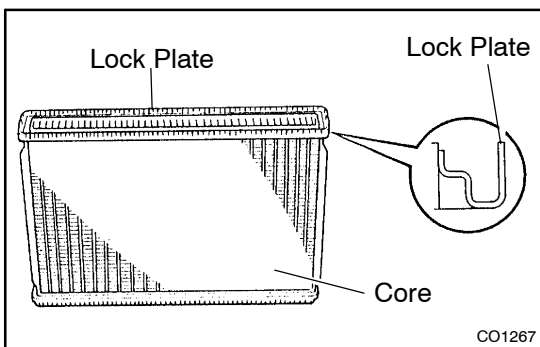
INSTALL OIL COOLER TO LOWER TANK

- (a) Install 2 new O-rings to the oil cooler.
- (b) Install the oil cooler to the lower tank with the 2 plate washers and nuts.

Torque: 8.3 N·m (85 kgf·cm, 74 in.-lbf)

- (c) Install the cooler pipes in the direction indicated in the illustration.

Torque: 14.7 N·m (150 kgf·cm, 11 ft·lbf)



2. 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:

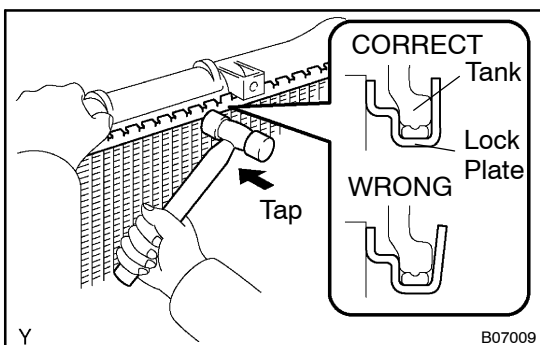
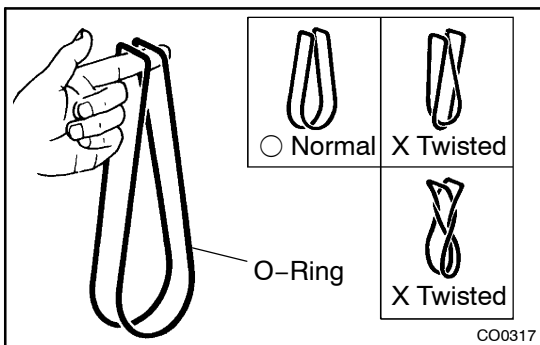
The radiator can only be recaulked 2 times. After the 2nd time, the radiator core must be replaced.

3. INSTALL NEW O-RINGS AND TANKS

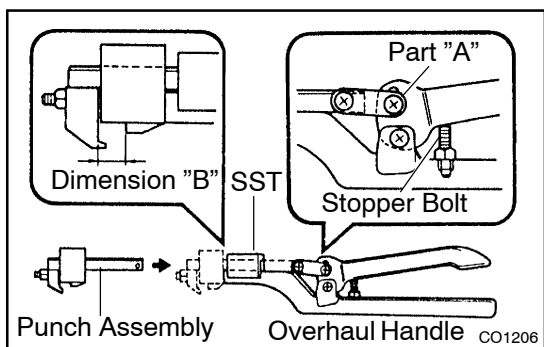
- (a) After checking that there are no foreign objects in the lock plate groove, install the new O-ring without twisting it.

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.

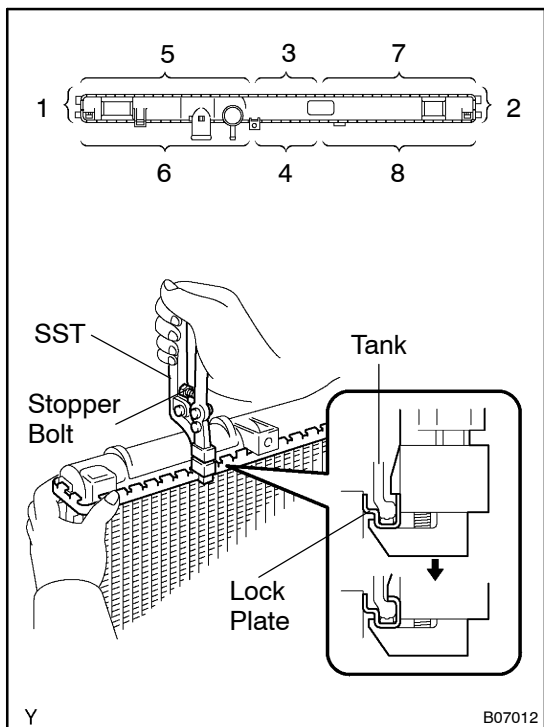


4. ASSEMBLE SST

SST 09230-01010, 09231-14010

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

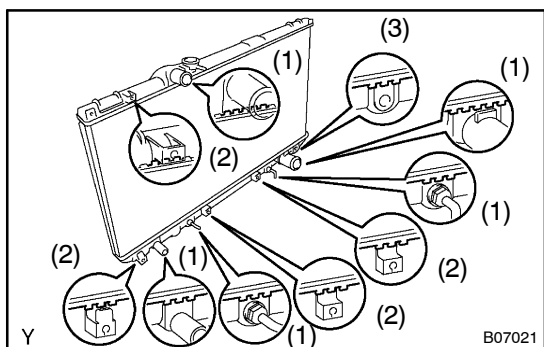
Dimension B: 8.4 mm (0.331 in.)



5. CAULK LOCK PLATE

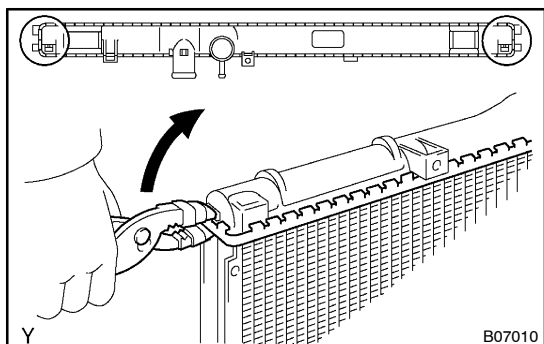
- Lightly press SST against the lock plate in the order shown in the illustration. After repeating this a few times, fully caulk the lock plate by squeezing the handle until stopped by the stopper plate.

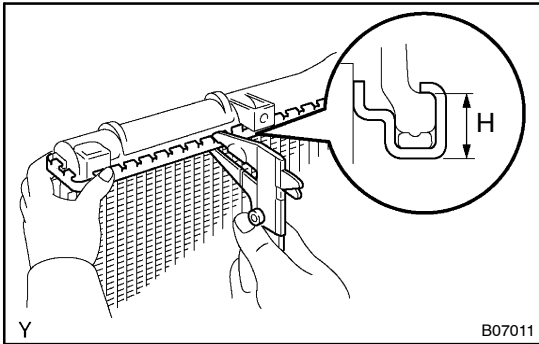
SST 09230-01010



HINT:

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

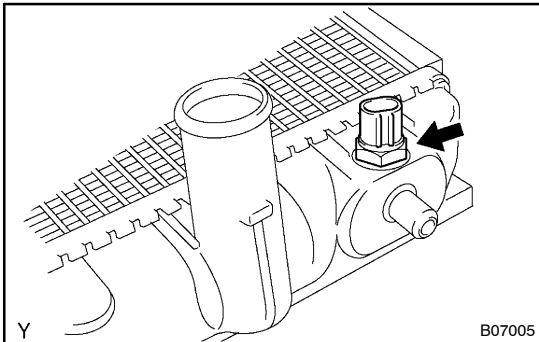




- (b) Check the lock plate height (H) after completing the caulking.

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.



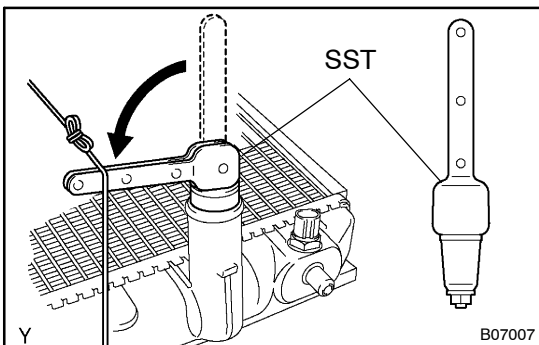
6. INSTALL WATER TEMPERATURE SWITCH

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

7. INSTALL DRAIN PLUG

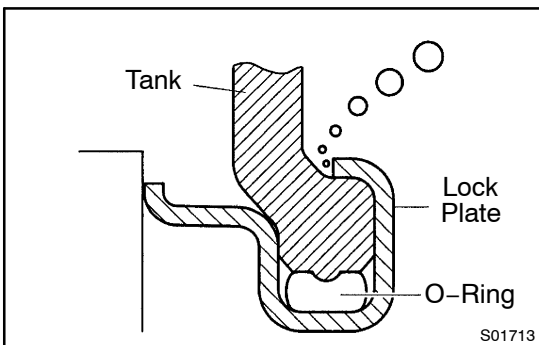
- (a) Install a new O-ring to the drain plug.
(b) Install the drain plug.

8. INSTALL RADIATOR CAP



9. INSPECT FOR WATER LEAK

- (a) Plug the inlet and outlet pipes of the radiator with SST.
SST 09230-01010
(b) Using a radiator cap tester, apply pressure to the radiator.
Test pressure: 177 kPa (1.8 kgf/cm², 26 psi)
(c) Submerge the radiator in water.

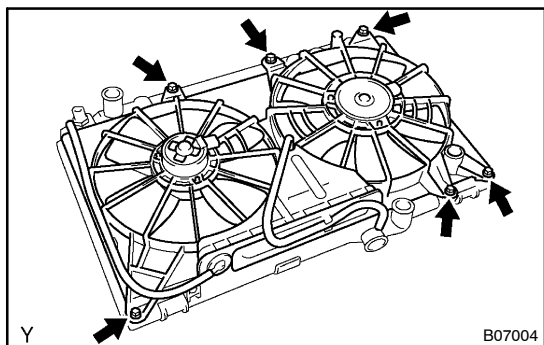


- (d) Inspect for leak.

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.

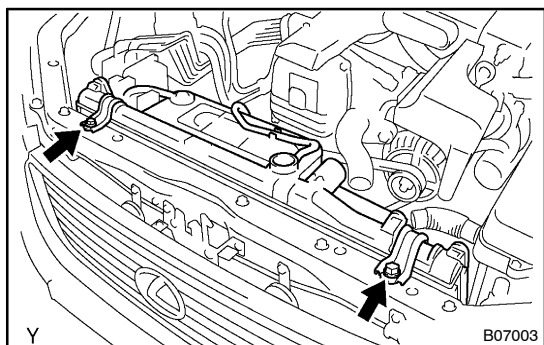
10. INSTALL NEW PACKINGS



INSTALLATION

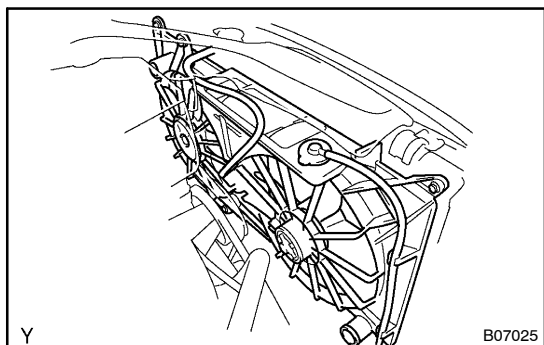
1. INSTALL ELECTRIC COOLING FAN TO RADIATOR

- (a) Install the electric cooling fan 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 ELECTRIC 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 bolts.
Torque: 15.2 N·m (155 kgf·cm, 11 ft·lbf)
 - (d) Connect the wire for the electric cooling fan to clamps on the electric cooling fan.
 - (e) Connect the 2 electric cooling fan connectors.
 - (f) Connect the water temperature switch connector for the electric cooling fan.
 - (g) A/T:
Connect the 2 oil cooler hoses to the radiator.
 - (h) Connect the lower radiator hose to the radiator.
 - (i) Connect the upper radiator hose to the radiator.
 - (j) Connect the engine ECU outlet duct to the radiator.
3. INSTALL AIR CLEANER INLET
 4. FILL WITH ENGINE COOLANT ([See page CO-2](#))
 5. START ENGINE AND CHECK FOR ENGINE COOLANT AND A/T FLUID LEAKS
 6. INSTALL NO.1 ENGINE UNDER COVER

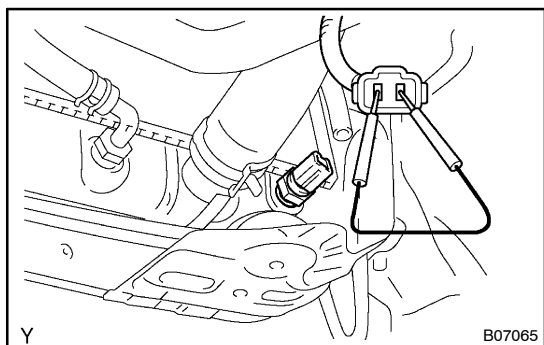


ELECTRIC COOLING FAN ON-VEHICLE INSPECTION

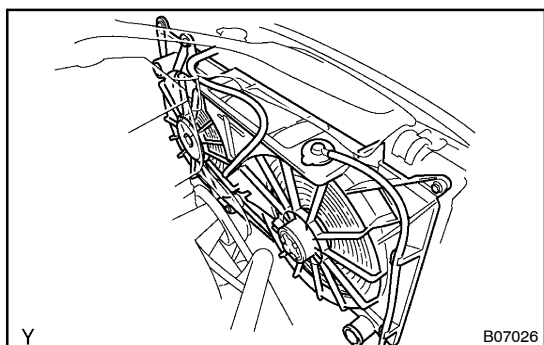
CO0AD-04

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 stops.



- (c) Disconnect the water temperature switch connector.
- (d) Connect the terminals on the water temperature switch connector.



- (e) Check that the cooling fan rotates.
If not, check the fuse, cooling fan relay, cooling fan, and check for an open circuit between the cooling fan relay and water temperature switch.

- (f) Reconnect the water temperature switch connector.

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

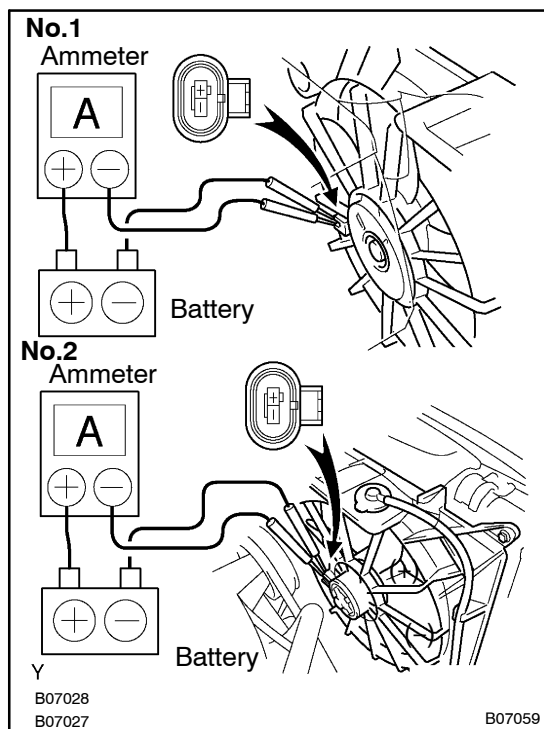
- (a) Start the engine, and raise coolant temperature to above 93°C (199°F).

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**

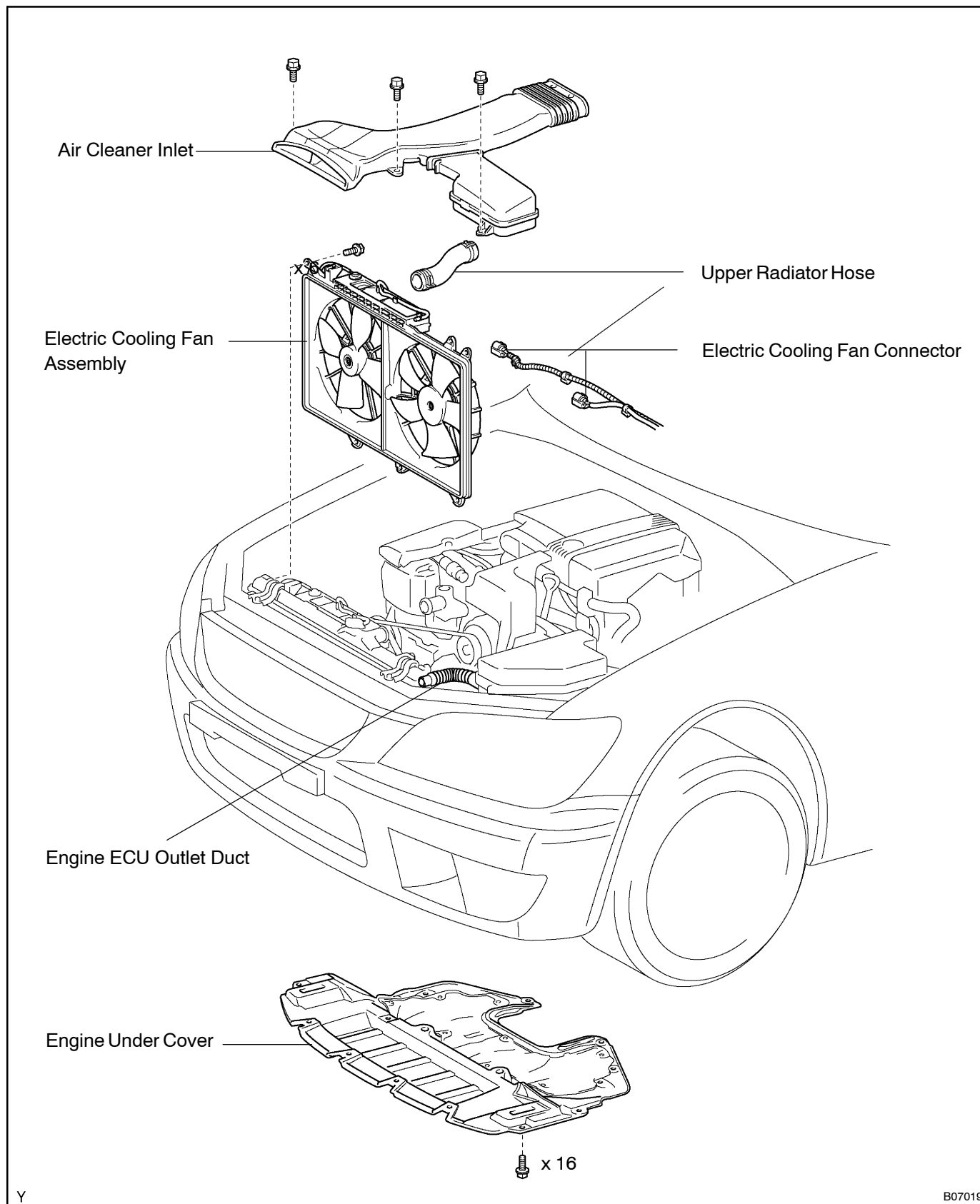
- (a) Disconnect the cooling fan connector.
- (b) Connect battery and ammeter to the cooling fan connector.
- (c) Check that the cooling fan rotates smoothly, and check the reading on the ammeter.

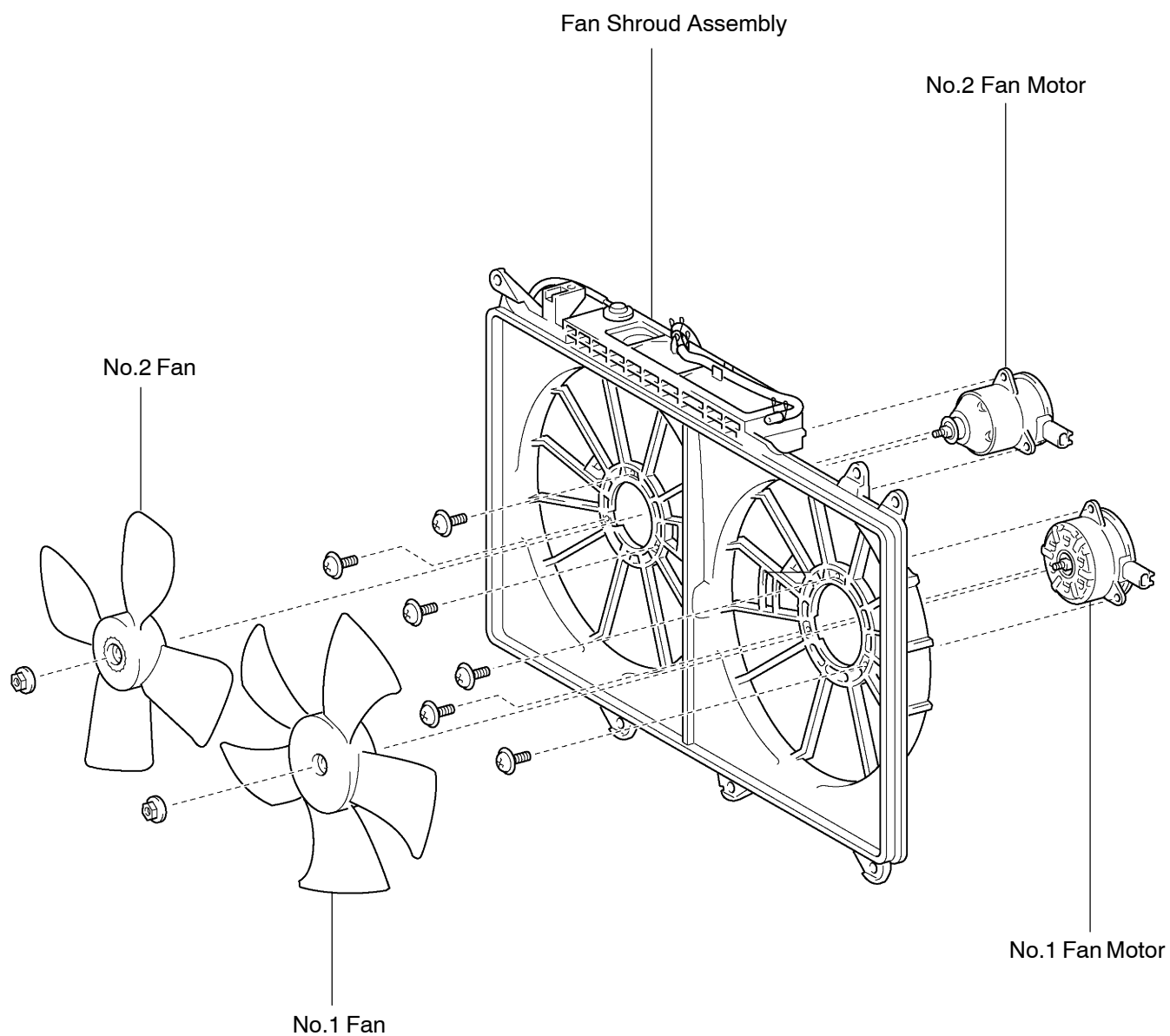
Standard amperage:

No.1	At 20°C (68°F)	7.8 – 11.8 A
No.2	At 20°C (68°F)	5.1 – 8.1 A

- (d) Reconnect the cooling fan connector.

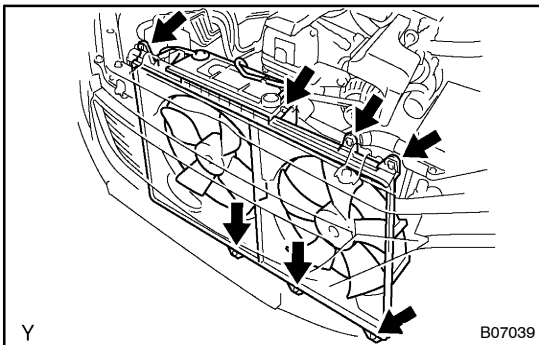
COMPONENTS

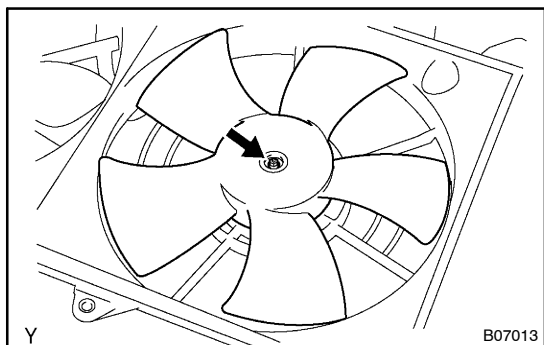




REMOVAL

1. **REMOVE NO.1 ENGINE UNDER COVER**
2. **DRAIN ENGINE COOLANT**
3. **REMOVE AIR CLEANER INLET**
4. **REMOVE ELECTRIC COOLING FAN**
 - (a) Remove the upper radiator hose.
 - (b) Disconnect the engine ECU outlet duct from the fan shroud.
 - (c) Disconnect the 2 electric cooling fan connector.
 - (d) Disconnect the wire for the electric cooling fan from the clamps on the electric cooling fan.
 - (e) Disconnect the radiator reservoir hose from the radiator.
 - (f) Remove the 6 bolts and electric cooling fan.

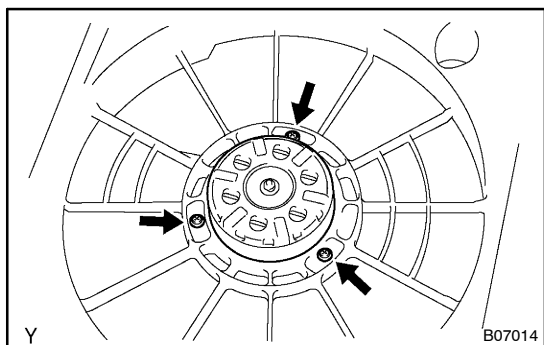




DISASSEMBLY

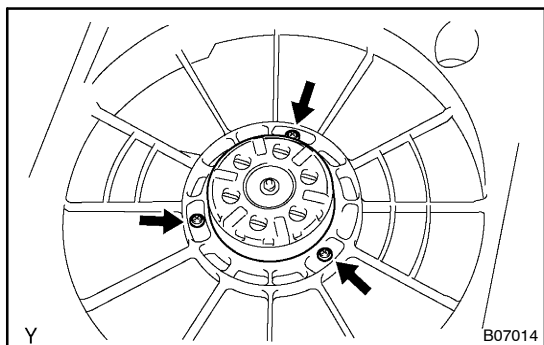
1. REMOVE FANS

Remove the nut and fan. Remove the 2 fans.



2. REMOVE FAN MOTORS

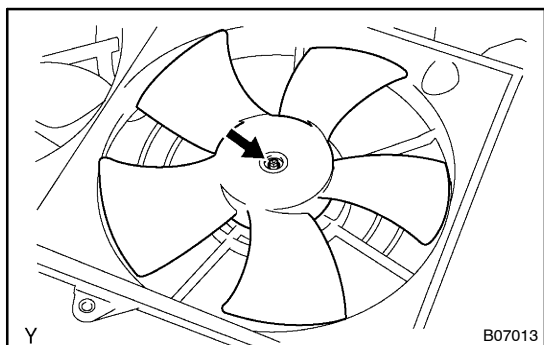
Remove the 3 screws and fan motor. Remove the 2 fan motors.



REASSEMBLY

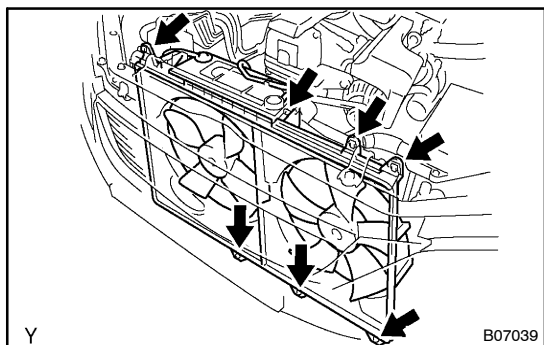
1. INSTALL FAN MOTORS

Install the fan motor with the 3 screws. Install the 2 fan motors.



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 radiator reservoir hose to the radiator.
- (c) Connect the wire for the electric cooling fan to the clamps on the electric cooling fan.
- (d) Connect the 2 electric cooling fan connectors.
- (e) Connect the engine ECU outlet duct to the fan shroud.
- (f) Connect the upper radiator hose to the radiator.

2. INSTALL AIR CLEANER INLET

3. FILL WITH ENGINE COOLANT

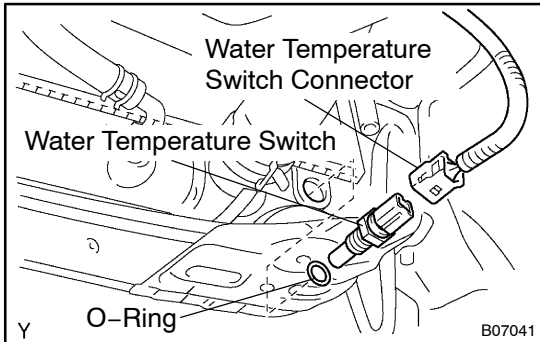
4. INSTALL NO.1 ENGINE UNDER COVER

5. START ENGINE AND CHECK FOR COOLANT LEAK

WATER TEMPERATURE SWITCH INSPECTION

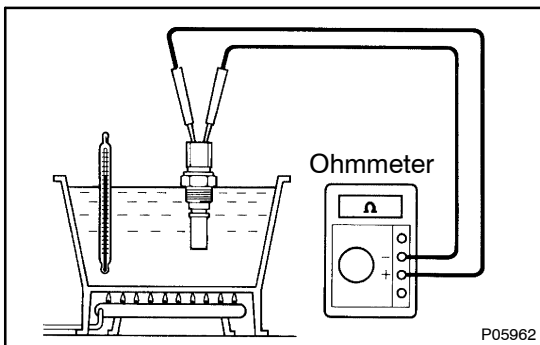
CO0AJ-03

1. REMOVE NO.1 ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT



3. REMOVE WATER TEMPERATURE SWITCH

- (a) Disconnect the connector.
- (b) Remove the water temperature switch.
- (c) Remove the O-ring from the water temperature switch.



4. INSPECT WATER TEMPERATURE SWITCH

- (a) Using an ohmmeter, check that there is continuity between the terminals when the coolant temperature is above 93°C (199°F).

If there is no continuity, replace the switch.

- (b) Using an ohmmeter, check that there is no continuity between the terminals when the coolant temperature is below 83°C (181°F).

If there is continuity, replace the switch.

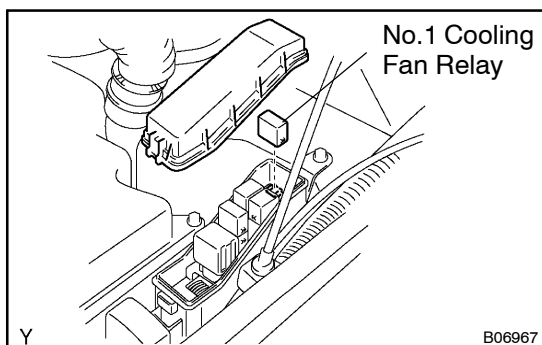
5. REINSTALL WATER TEMPERATURE SWITCH

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

6. REINSTALL NO.1 ENGINE UNDER COVER

7. REFILL WITH ENGINE COOLANT

8. START ENGINE AND CHECK FOR COOLANT LEAK

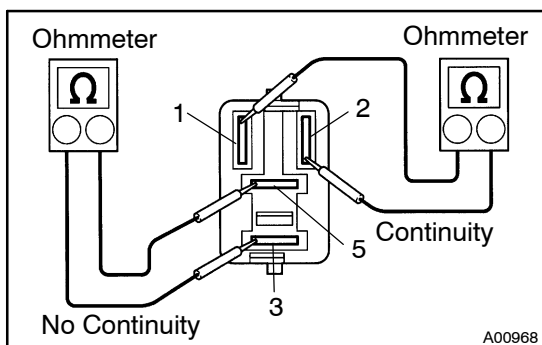


COOLING FAN RELAY INSPECTION

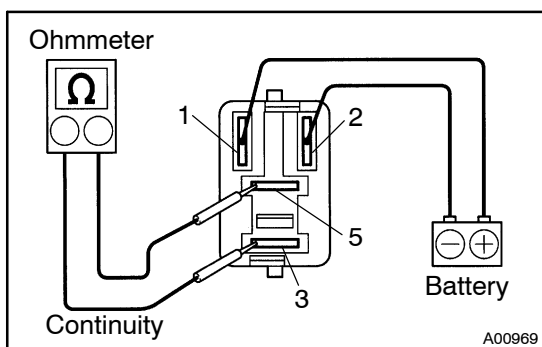
CO0BB-02

1. INSPECT NO.1 COOLING FAN RELAY

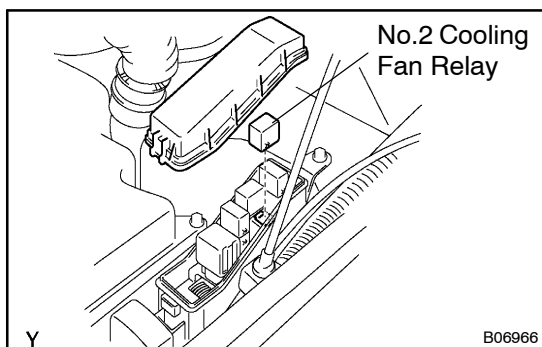
- (a) Remove the relay box cover.
- (b) Remove the No.1 cooling fan relay. (Marking: FAN NO.1)



- (c) Inspect the No.1 cooling fan relay continuity.
 - (1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.
 If there is no continuity, replace the relay.
 - (2) Check that there is no continuity between terminals 3 and 5.
 If there is continuity, replace the relay.

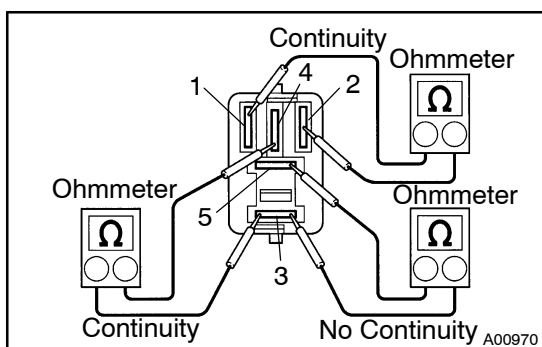


- (d) Inspect the No.1 cooling fan relay operation.
 - (1) Apply battery positive voltage to terminals 1 and 2.
 - (2) Using an ohmmeter, check that there is continuity between terminals 3 and 5.
 If there is continuity, replace the relay.
- (e) Reinstall the No.1 cooling fan relay.
- (f) Reinstall the relay box cover.

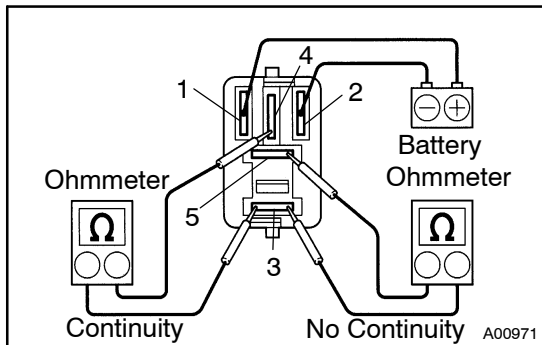


2. INSPECT NO.2 COOLING FAN RELAY

- (a) Remove the relay box cover.
- (b) Remove the No.2 cooling fan relay. (Marking: FAN NO.2)



- (c) Inspect the No.2 cooling fan relay continuity.
 - (1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.
 If there is no continuity, replace the relay.
 - (2) Check that there is continuity between terminals 3 and 4.
 If there is no continuity, replace the relay.
 - (3) Check that there is no continuity between terminals 3 and 5.
 If there is continuity, replace the relay.



- (d) Inspect the No.2 cooling fan relay operation.
- (1) Apply battery positive voltage to terminals 1 and 2.
 - (2) Using an ohmmeter, check that there is no continuity between terminals 3 and 4.

If there is continuity, replace the relay.

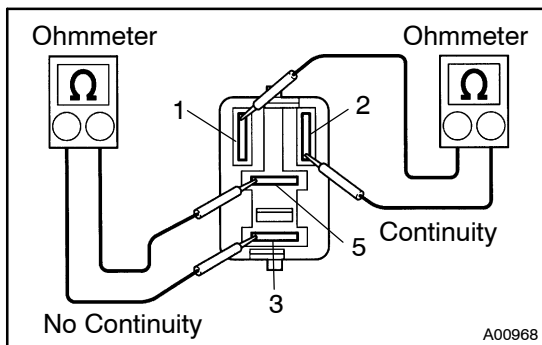
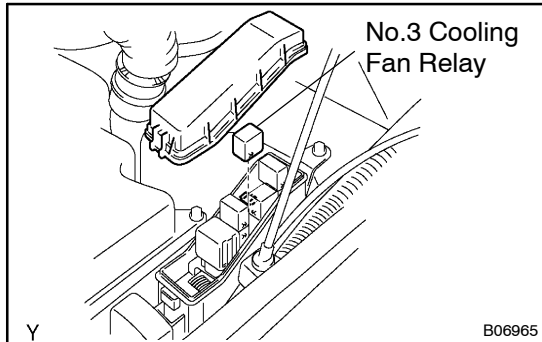
- (3) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

- (e) Reinstall the No.2 cooling fan relay.
- (f) Reinstall the relay box cover.

3. INSPECT NO.3 COOLING FAN RELAY

- (a) Remove the relay box cover.
- (b) Remove the No.3 cooling fan relay. (Marking: FAN NO.3)

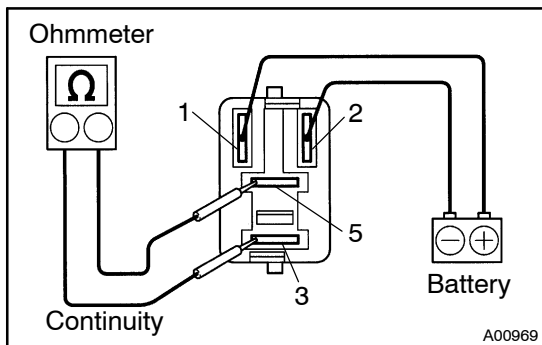


- (c) Inspect the No.3 cooling fan relay continuity.
- (1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

- (2) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



- (d) Inspect the No.3 cooling fan 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 no continuity, replace the relay.

- (e) Reinstall the No.3 cooling fan relay.
- (f) Reinstall the relay box cover.