

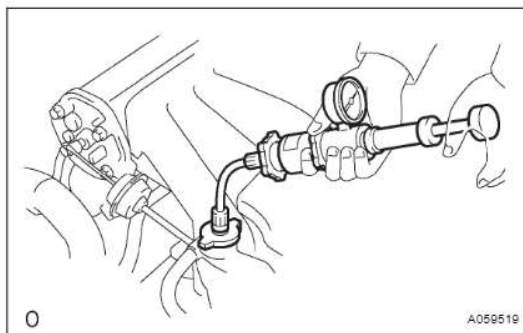
COOLING SYSTEM

ON-VEHICLE INSPECTION

1. INSPECT COOLING SYSTEM FOR LEAKS

CAUTION:

Do not remove the radiator cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.



- Fill the radiator with coolant and attach a radiator cap tester.
- Warm up the engine.
- Using the radiator cap tester, increase the pressure inside the radiator 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 leaks. If no external leaks are found, check the heater core, cylinder block and head.

2. CHECK ENGINE COOLANT LEVEL AT RESERVOIR

- The engine coolant level should be between the "LOW" and "FULL" lines when the engine is cold. If low, check for leaks and add "TOYOTA Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology up to the "FULL" line.

3. CHECK ENGINE COOLANT QUALITY

- Remove the radiator cap.

CAUTION:

Do not remove the radiator cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.

- Check if there are any excessive deposits of rust or scale around the radiator cap and radiator filler hole. Also, the coolant should be free from oil.

HINT:

If excessively dirty, replace the coolant.

- Reinstall the radiator cap.

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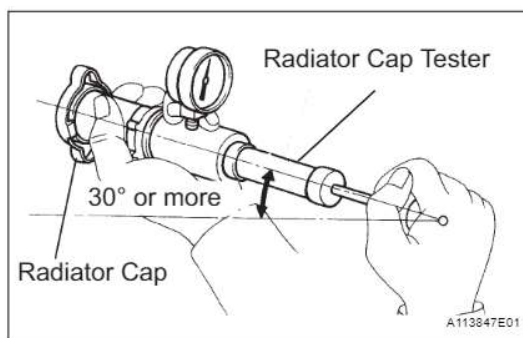
3MZ-FE COOLING – COOLING SYSTEM

INSPECTION

1. INSPECT WATER OUTLET CAP SUB-ASSEMBLY

NOTICE:

- If the reservoir cap is contaminated, 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 being released from the vacuum valve.

Pump speed:

1 push every 3 seconds or more

NOTICE:

Push the pump at a constant speed.

If air is not being released from the vacuum valve, replace the reservoir cap.

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

Pump speed:

1 push within 1 second

NOTICE:

The pump speed above should be followed for the first pump only. It will close the vacuum valve. Once the vacuum valve is closed, the pump speed can be reduced.

Standard opening pressure:

69.0 to 112.8 kPa (0.70 to 1.15 kgf/cm², 10.0 to 16.4 psi)

HINT:

Use the tester's maximum reading as the opening pressure. If the maximum reading is less than the minimum opening pressure above, replace the radiator cap.

ON-VEHICLE INSPECTION

HINT:
The cooling fan may rotate when the ignition switch is turned from ACC to ON. This is normal.

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.
If not, check the cooling fan relay and ECT switches, and check for disconnected connectors or wire breaks between the cooling fan relay and ECT switches

(c) Disconnect the ECT switch No.1 connector

(d) Connect the terminals on the ECT switch No.1 connector.

(e) Check that the No.1 cooling fan rotates at a high speed.
If not, check the No.1 cooling fan relay and No.1 cooling fan.

(f) Reconnect the ECT switch No.1 connector.

(g) Disconnect the ECT switch No.2 connector.

(h) Ground the terminal on the ECT switch No.2 wire harness side connector.

(i) Check that the No.1 and No.2 cooling fans rotate at a low speed.
If not, check the No.2 cooling fan relay, No.3 cooling fan relay and No.2 cooling fan.

(j) Reconnect the ECT switch No.2 connector.
2. CHECK COOLING FAN ASSEMBLY
- (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:
8.0 to 12.0 A at 20 °C (68 °F)
If not, replace the cooling fan.

(d) Reconnect the cooling fan connector.

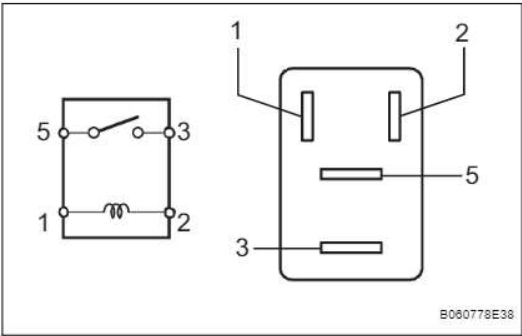
INSPECTION

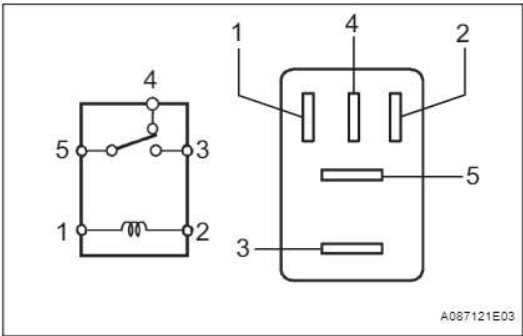
1. INSPECT FAN NO.1 AND FAN NO.3 RELAY
- (a) Check the resistance of the relay.

Resistance

Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (when battery voltage is applied to terminals 1 and 2)

If the result is not as specified, replace the relay.



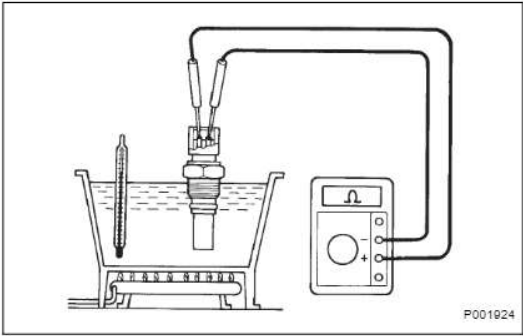


2. INSPECT FAN NO.2 RELAY

- (a) Check the resistance of the relay.
Resistance

Tester Connection	Specified Condition
3 - 4	Below 1 Ω
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (when battery voltage is applied to terminals 1 and 2)

If the result is not as specified, replace the relay.



3. INSPECT NO.1 ECT SWITCH

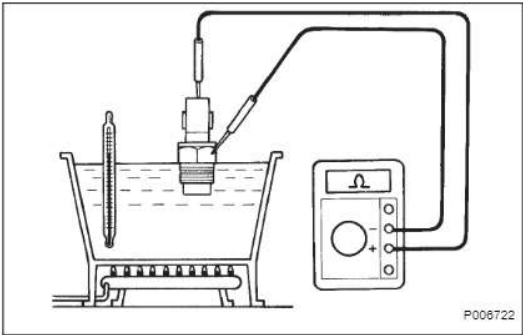
- (a) Check the resistance.
Resistance

Temperature	Specified Condition
Above 98 °C (208 °F)	Below 1 Ω
Below 88 °C (190°F)	10 kΩ or higher

If the result is not as specified, replace the switch.

NOTICE:

When checking the ECT switch in the water, the terminals should be kept dry. After the check, dry the switch.



4. INSPECT NO.2 ECT SWITCH

- (a) Check the resistance.
Resistance

Temperature	Specified Condition
Above 93°C (199 °F)	Below 1 Ω
Below 83°C (181°F)	10 kΩ or higher

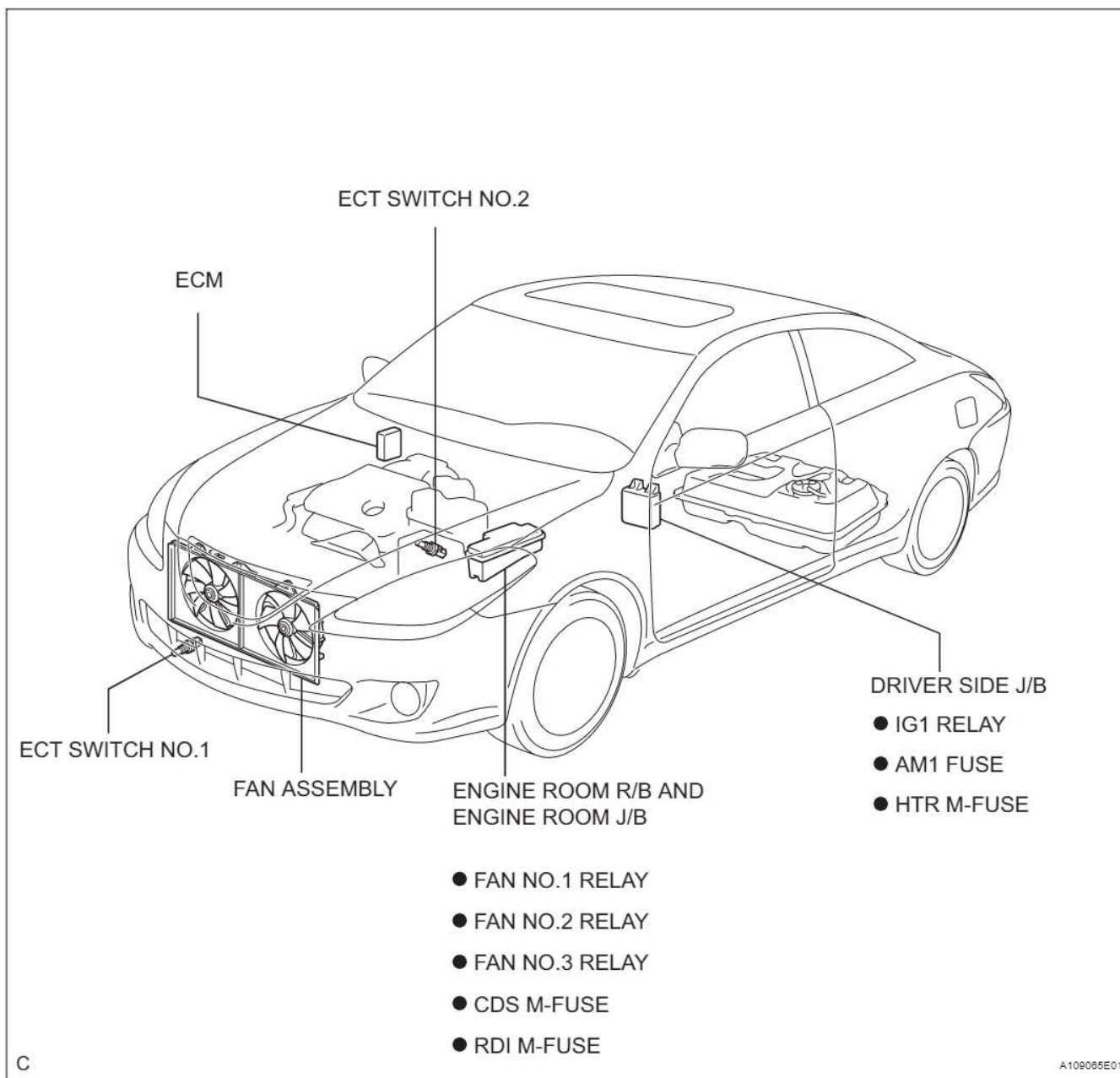
If the result is not as specified, replace the switch.

NOTICE:

When checking the ECT switch in the water, the terminals should be kept dry. After the check, dry the switch.

COOLING FAN SYSTEM

PARTS LOCATION



CO

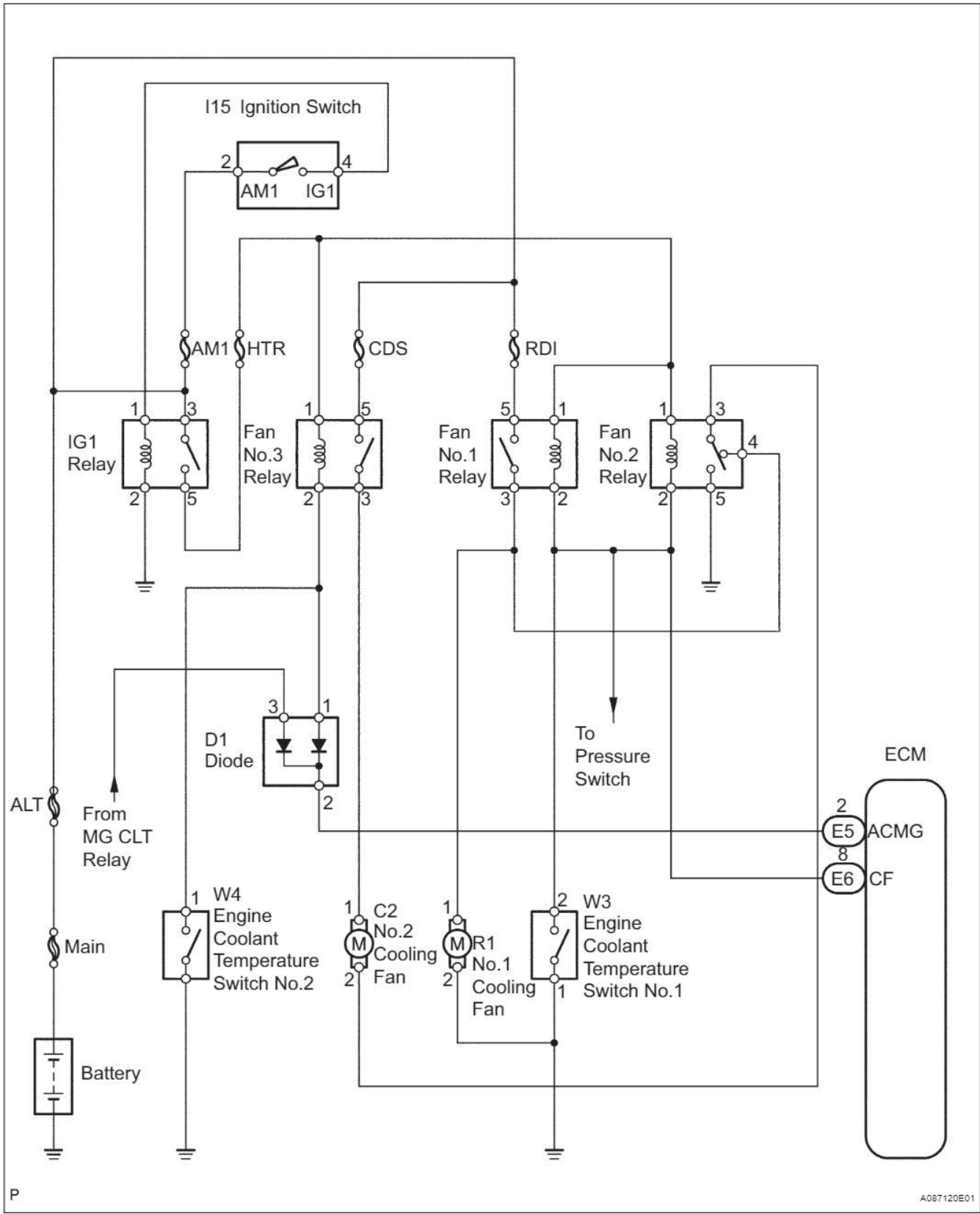
CO-4**3MZ-FE COOLING – COOLING FAN SYSTEM**

SYSTEM DIAGRAM

The electric cooling fan system controls the fan motors using the 2 Engine Coolant Temperature (ECT) switches, and turns the 3 fan relays on and off according to the ECT and the air conditioner's operating condition.

3MZ-FE COOLING – COOLING FAN SYSTEM

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CO

COOLANT

REPLACEMENT

1. DRAIN ENGINE COOLANT

- (a) Remove the radiator cap.

CAUTION:

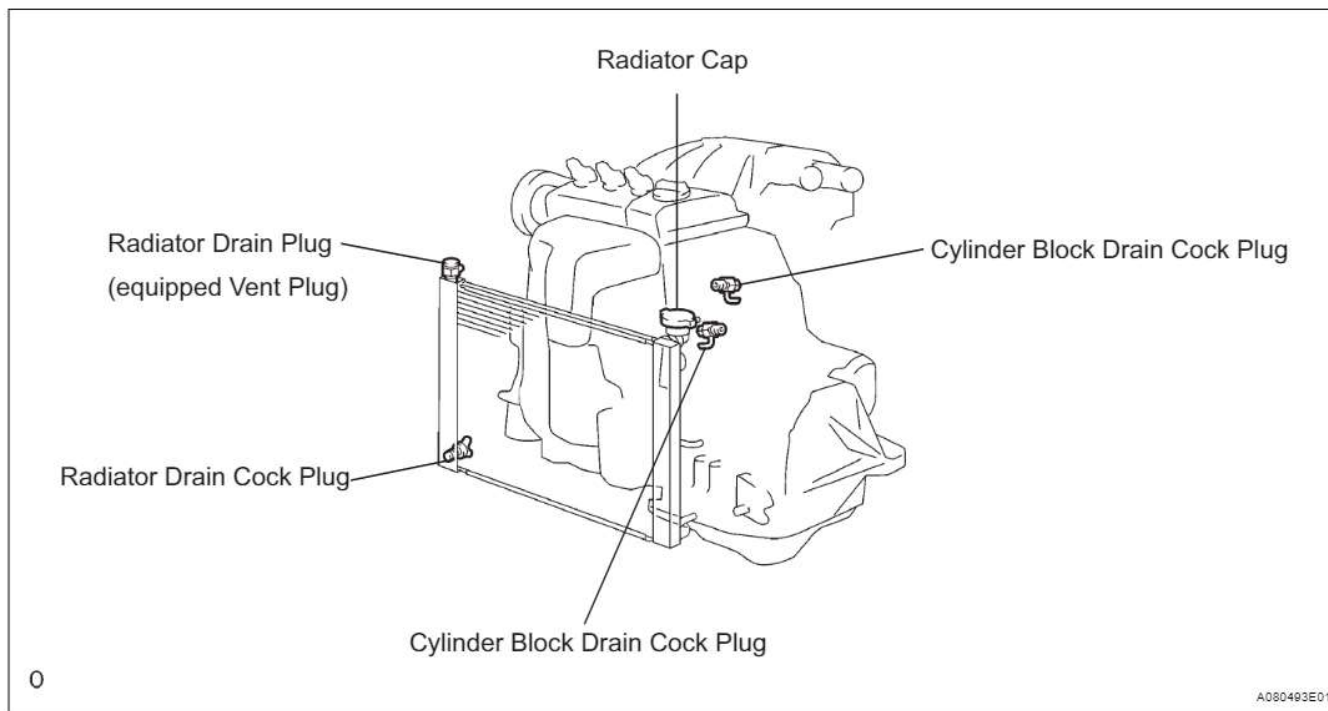
Do not remove the radiator cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.

- (b) Drain engine coolant by loosening the radiator drain cock plug and the engine's cylinder block drain cock plug.

HINT:

Engine coolant inside the radiator is drained from the drain hole located on the bottom of the engine under cover.

- (c) Tighten the cylinder block drain cock plugs.



Torque: 13 N*m (130 kgf*cm, 10 ft.*lbf)

2. ADD ENGINE COOLANT

- (a) Tighten the radiator drain plug.
 (b) Add engine coolant into the radiator until it overflows.

Capacity:

9.2 liters (9.7 US qts, 8.1 Imp. qts)

HINT:

- Use of improper coolants may damage the engine cooling system.

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3MZ-FE COOLING – COOLANT

- Use "TOYOTA Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology.
- New TOYOTA vehicles are filled with TOYOTA Super Long Life Coolant (color is pink, premixed ethylene-glycol concentration is approximately 50% and freezing temperature is -35 °C (-31 °F)). When replacing the coolant, TOYOTA Super Long Life Coolant is recommended.
- Observe the coolant level inside the radiator by pressing the inlet and outlet radiator hoses several times by hand. If the coolant level goes down, add the coolant.

NOTICE:

Do not use plain water alone.

- (c) Pour coolant into the radiator reservoir tank until the coolant reaches the full line (procedure "A").
- (d) Install the radiator cap.
- (e) Warm up the engine.

HINT:

As the engine warms up, press the inlet and outlet radiator hoses several times by hand.

- (f) Stop the engine and wait until the coolant cools down to room temperature.
- (g) Remove the radiator cap and check the coolant level inside the radiator (procedure "B").
- (h) If the coolant level is below the full level, repeat steps "A" to "B" until the coolant level stays the same from step "A" to "B".
- (i) Install the radiator cap and check the radiator reservoir tank coolant level. If it is below the full line, add coolant.

3. CHECK FOR ENGINE COOLANT LEAKS

- (a) Fill the radiator with coolant and attach a radiator cap tester.
- (b) Pump it to 118 kPa (1.2 kgf/cm², 17.1 psi) and check leakage.

CO

INSTALLATION

1. **INSTALL WATER PUMP ASSEMBLY**
 - (a) Install a new gasket and the water pump with the 4 bolts and 2 nuts.
Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)
2. **INSTALL TIMING BELT NO.3 COVER**

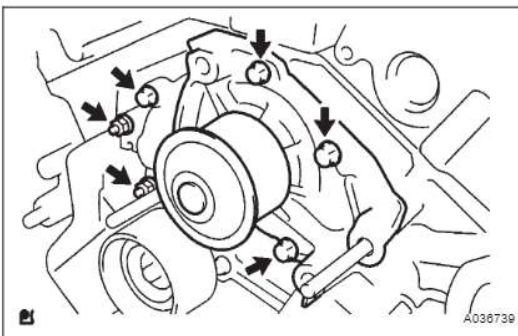
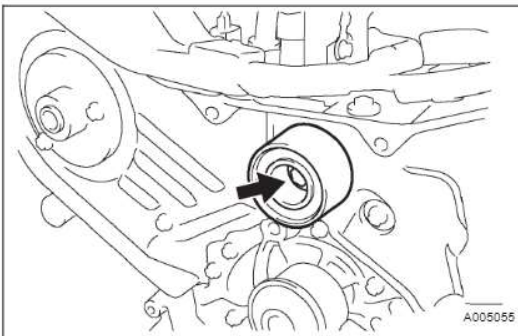
HINT:
See page [EM-21](#)
3. **INSTALL CAMSHAFT TIMING PULLEY** (See page [EM-140](#))
4. **INSTALL NO.2 TIMING BELT IDLER SUB-ASSEMBLY**
Torque: 43 N*m (438 kgf*cm, 32 ft.*lbf)
5. **INSPECT TIMING BELT**
6. **INSTALL TIMING BELT** (See page [EM-21](#))
7. **INSTALL TIMING BELT TENSIONER ASSEMBLY** (See page [EM-23](#))
8. **INSTALL TIMING BELT GUIDE NO.2** (See page [EM-23](#))
9. **INSTALL ENGINE MOUNTING BRACKET RH**
Torque: 28 N*m (286 kgf*cm, 21 ft.*lbf)
10. **INSTALL TIMING BELT NO.2 COVER** (See page [EM-23](#))
11. **INSTALL TIMING BELT NO.1 COVER** (See page [EM-24](#))
12. **INSTALL CRANKSHAFT PULLEY** (See page [EM-24](#))
13. **INSTALL GENERATOR BRACKET NO.2**
Torque: 28 N*m (286 kgf*cm, 21 ft.*lbf)
14. **INSTALL ENGINE MOUNTING STAY NO.2 RH** (See page [EM-82](#))
15. **INSTALL ENGINE MOVING CONTROL ROD** (See page [EM-83](#))
16. **INSTALL VANE PUMP V BELT** (See page [EM-6](#))
17. **INSTALL V BELT NO.1** (See page [EM-6](#))
18. **INSPECT DRIVE BELT TENSION** (See page [EM-1](#))
19. **ADD ENGINE COOLANT** (See page [CO-7](#))
20. **CHECK FOR ENGINE COOLANT LEAKS** (See page [CO-8](#))
21. **INSTALL FRONT WHEEL RH**

3MZ-FE COOLING – WATER PUMP

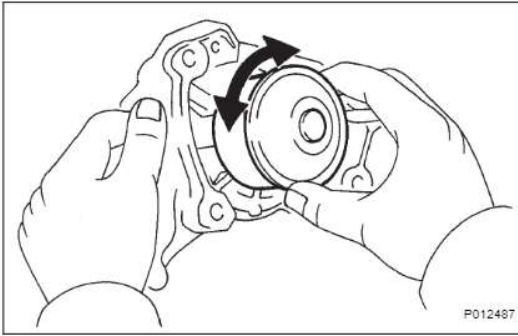
WATER PUMP

REMOVAL

1. REMOVE ENGINE COOLANT (See page [CO-7](#))
2. REMOVE FRONT WHEEL RH
3. REMOVE FRONT FENDER APRON SEAL RH
4. REMOVE V BELT NO.1 (See page [EM-6](#))
5. REMOVE VANE PUMP V BELT (See page [EM-6](#))
6. REMOVE ENGINE MOVING CONTROL ROD (See page [EM-64](#))
7. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page [EM-64](#))
8. REMOVE GENERATOR BRACKET NO.2
9. REMOVE CRANKSHAFT PULLEY
HINT:
See page [EM-95](#)
10. REMOVE TIMING BELT NO.1 COVER
11. REMOVE TIMING BELT NO.2 COVER
12. REMOVE ENGINE MOUNTING BRACKET RH
13. REMOVE TIMING BELT GUIDE NO.2
14. REMOVE TIMING BELT
[EM-19](#)
HINT:
See page
15. REMOVE NO.2 TIMING BELT IDLER SUB-ASSEMBLY
(a) Remove the bolt and timing belt idler.
16. REMOVE CAMSHAFT TIMING PULLEY (See page [EM-98](#))
17. REMOVE TIMING BELT NO.3 COVER
HINT:
See page [EM-85](#)
18. REMOVE WATER PUMP ASSEMBLY
(a) Remove the 4 bolts, 2 nuts and water pump.



CO

CO-10**3MZ-FE COOLING – WATER PUMP****INSPECTION****1. INSPECT WATER PUMP ASSEMBLY**

- (a) Visually check the drain hole for coolant leakage.
- (b) Turn the pulley, and check that the water pump bearing moves smoothly and noiselessly.
If the bearing moves roughly or noisily, replace the water pump.

THERMOSTAT

REMOVAL

1. DRAIN ENGINE COOLANT (See page [CO-7](#))
2. REMOVE AIR CLEANER INLET ASSEMBLY
3. REMOVE AIR CLEANER ASSEMBLY
4. REMOVE AIR CLEANER BRACKET
5. REMOVE AIR CLEANER INLET NO.1
6. REMOVE RADIATOR HOSE OUTLET
7. REMOVE WATER INLET PIPE
 - (a) Remove the bolt and inlet pipe.
8. REMOVE WATER INLET
 - (a) Remove the 3 bolts and water inlet.
9. REMOVE THERMOSTAT

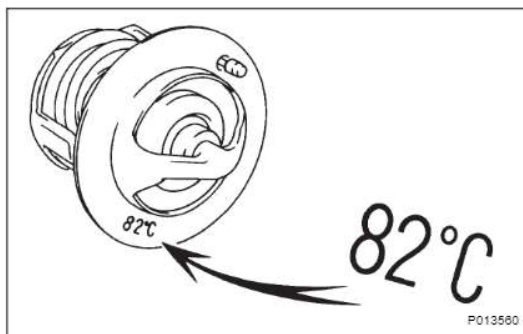
INSPECTION

1. INSPECT THERMOSTAT

HINT:

The thermostat is numbered with the valve opening temperature.

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

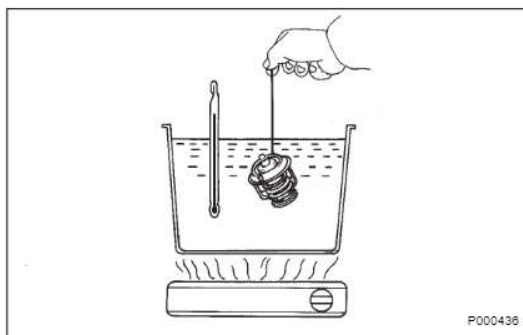


- (b) Check the valve opening temperature.

Valve opening temperature:

80 to 84 °C (176 to 183 °F)

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



- (c) Check the valve lift.

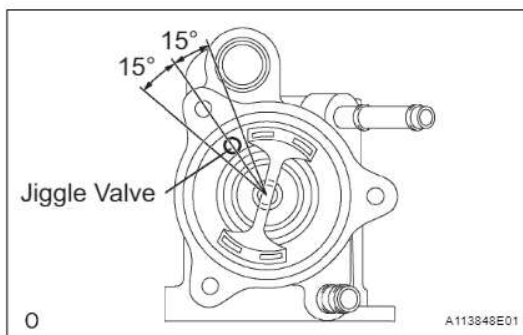
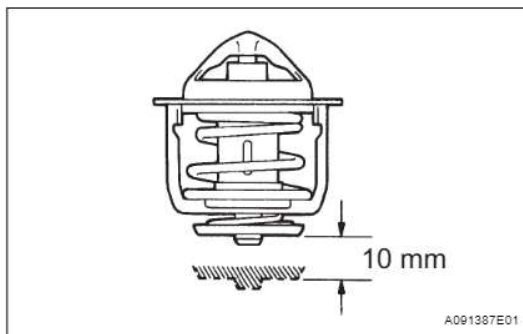
Valve lift:

10 mm (0.394 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. INSTALL THERMOSTAT

- (a) Install a new gasket to the thermostat.
 (b) Align the thermostat jiggle valve with the upper stud bolt, and insert the thermostat in the water inlet housing.

HINT:

The jiggle valve may be set within 15 ° of either side of the prescribed position.

2. INSTALL WATER INLET

Torque: 8.0 N*m (82 kgf*cm, 71 in.*lbf)

3. INSTALL WATER INLET PIPE

- (a) Install a new O-ring to the inlet pipe.
 (b) Apply soapy water to the O-ring.
 (c) Connect the inlet pipe to the water inlet.

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CO-14**3MZ-FE COOLING – THERMOSTAT**

- (d) Install the bolt holding the inlet pipe to the cylinder head.

Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)

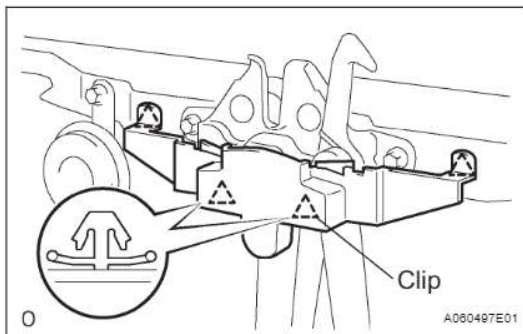
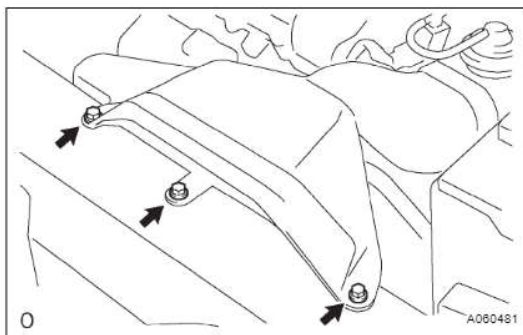
- 4. INSTALL AIR CLEANER ASSEMBLY**
- 5. CONNECT VACUUM HOSES**
- 6. ADD ENGINE COOLANT (See page [CO-7](#))**
- 7. CHECK FOR ENGINE COOLANT LEAKS (See page [CO-8](#))**

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3MZ-FE COOLING – RADIATOR

REMOVAL

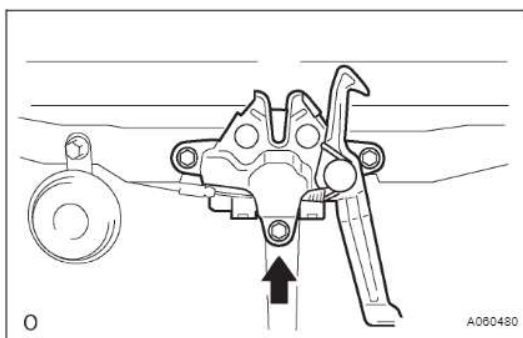
1. DRAIN ENGINE COOLANT (See page CO-7)
2. DISCONNECT RADIATOR RESERVE TANK HOSE OR PIPE
3. DISCONNECT RADIATOR HOSE INLET
4. DISCONNECT RADIATOR HOSE OUTLET
5. DISCONNECT OIL COOLER OUTLET HOSE NO.2
6. DISCONNECT OIL COOLER OUTLET HOSE NO.3
7. REMOVE AIR CLEANER INLET ASSEMBLY
(a) Remove the 3 bolts and 2 air cleaner inlets.
8. REMOVE RADIATOR SUPPORT UPPER
(a) Disconnect the 2 horn connectors.



- (b) Remove the hood lock release lever cover.

- (c) Remove the bolt shown in the illustration.
(d) Remove the 4 bolts and radiator support.

9. REMOVE RADIATOR ASSEMBLY
(a) Disconnect the fan motor connector.
(b) Disconnect the ECT switch No. 1 connector.
(c) Remove the radiator from the body.
10. REMOVE RADIATOR SUPPORT LOWER
11. REMOVE FAN AND MOTOR
(a) Remove the 3 bolts and fan from the radiator.



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3MZ-FE COOLING – RADIATOR

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DISASSEMBLY**1. REMOVE DRAIN PLUG**

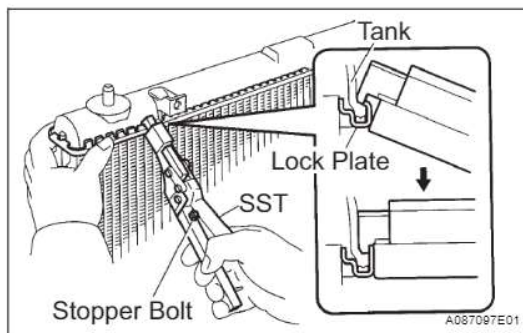
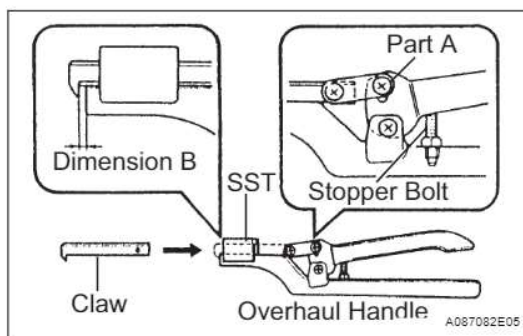
- (a) Remove the drain plug.
- (b) Remove the O-ring.
- (c) Remove the ECT switch No. 1 and gasket.

2. ASSEMBLE SST**SST 09230-01010 (09231-01010, 09231-01030)**

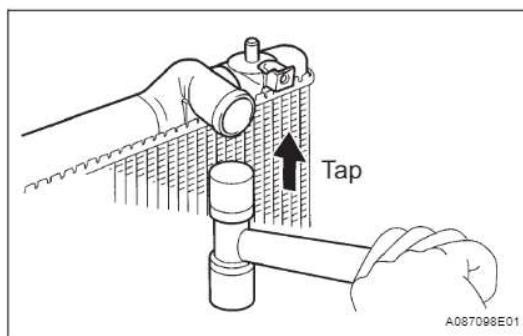
- (a) Install the claw to the overhaul handle, inserting it in the hole in part A as shown in the illustration.
- (b) While gripping the handle, adjust the stopper bolt so that dimension B is as shown in the illustration.

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

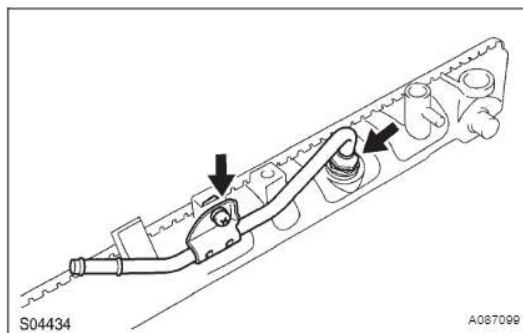
If the stopper bolt is not adjusted, the claw may be damaged.

**3. REMOVE RADIATOR TANK UPPER**

- (a) Using SST to release the caulking, grip the handle until stopped by the stopper bolt.

SST 09230-01010 (09231-01010, 09231-01030)**4. REMOVE RADIATOR TANK LOWER**

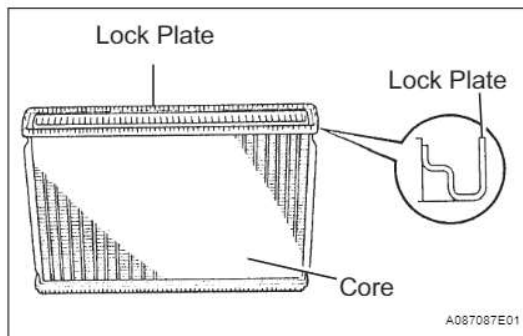
- (a) Lightly tap the bracket of the radiator (or radiator hose inlet or outlet) with a soft-faced hammer and remove the tank.
- (b) Remove the O-ring.

CO**5. REMOVE OIL COOLER ASSEMBLY**

- (a) Remove the screw and pipe.
- (b) Remove the nut and plate washer.
- (c) Remove the oil cooler.
- (d) Remove the 2 O-rings from the oil cooler.

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3MZ-FE COOLING – RADIATOR



INSPECTION

1. INSPECT LOCK PLATE FOR DAMAGE

- (a) Inspect the 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 the lock plate groove's shape with pliers or a similar object, if necessary.
- Water leakage will result if the bottom of the lock plate groove is damaged or dented. Repair or replace if necessary.

NOTICE:

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

2. INSPECT FOR WATER LEAKS

- (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:

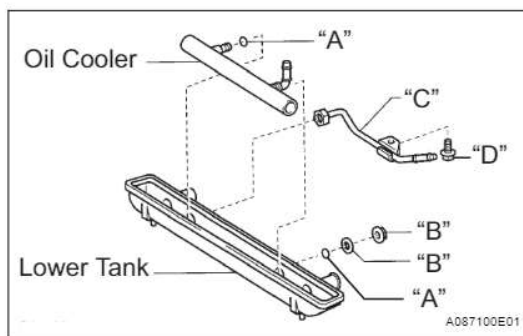
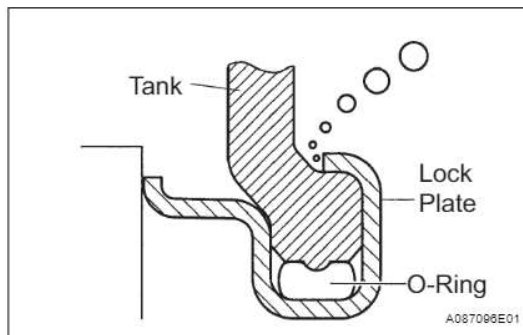
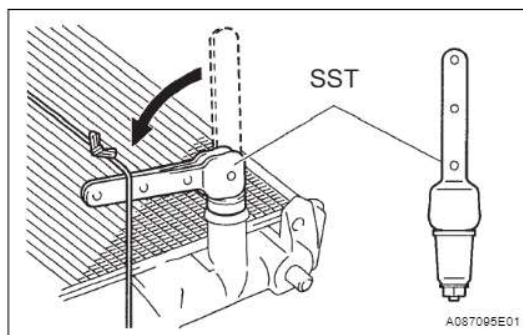
177 kPa (1.8 kgf/cm², 26 psi)

- (c) Submerge the radiator in water.

- (d) Inspect for leaks.

HINT:

On radiators with resin tanks, there is 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.



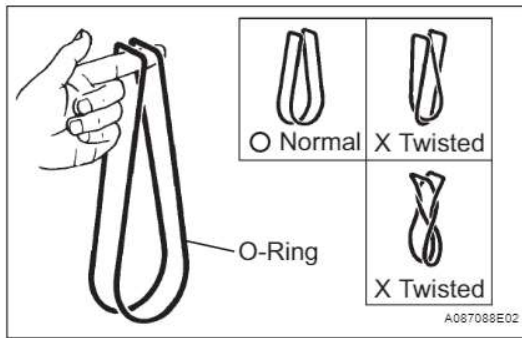
REASSEMBLY

1. INSTALL OIL COOLER ASSEMBLY

- (a) Clean the O-ring contact surface of the lower tank and oil cooler.
- (b) Install 2 new O-rings to the oil cooler (procedure "A").
- (c) Install the oil cooler to the lower tank.
- (d) Install the plate washer and nut (procedure "B").
Torque: 8.3 N*m (85 kgf*cm, 73 in.*lbf)
- (e) Install the pipe (procedure "C").
Torque: 14.7 N*m (150 kgf*cm, 11 ft.*lbf)
- (f) Install the screw (procedure "D").

3MZ-FE COOLING – RADIATOR

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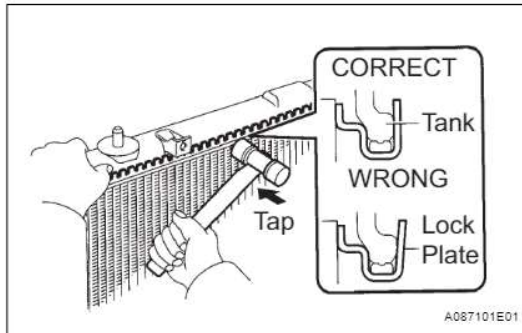


2. INSTALL RADIATOR TANK LOWER

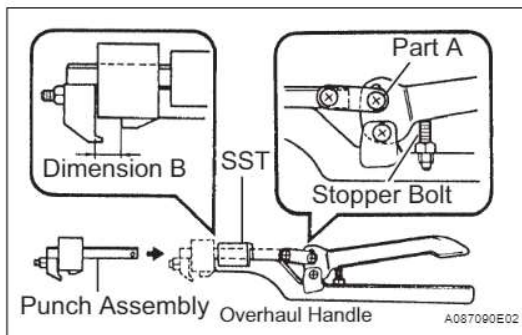
- (a) After checking that there are no foreign objects in the lock plate groove, install a new O-ring without twisting it.

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 the lock plate and the tank.



3. ASSEMBLE SST

- (a) Install the punch assembly to the overhaul handle, inserting it in the hole in part A as shown in the illustration.

SST 09230-01010, 09231-14010

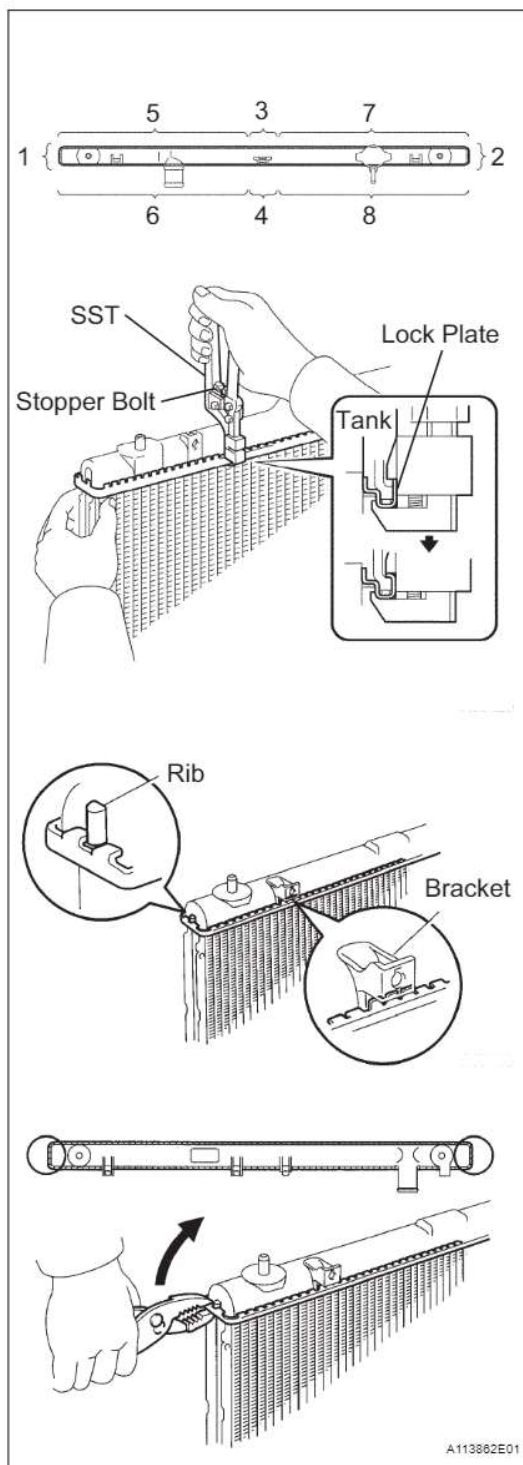
- (b) While gripping the handle, adjust the stopper bolt so that dimension B shown in the illustration.

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

CO

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3MZ-FE COOLING – RADIATOR



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 gripping the handle until stopped by the stopper plate.

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HINT:

- Do not tap the areas protruding around the pipes, brackets or tank ribs.
 - The dotted circles shown in the illustration and parts of the oil cooler near the dotted circles (A/T) cannot be tapped with the SST. Use pliers or similar objects 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 to 7.80 mm (0.2913 to 0.3071 in.)

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

5. INSTALL DRAIN PLUG

- (a) Install a new gasket to the ECT switch No. 1.
- (b) Install the ECT switch.
- Torque: 19.6 N*m (200 kgf*cm, 14 ft.*lbf)**
- (c) Install a new O-ring to the drain plug.
- (d) Install the drain plug.

INSTALLATION

1. INSTALL FAN AND MOTOR

- (a) Install the fan to the radiator with the 3 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)

2. INSTALL RADIATOR ASSEMBLY

- (a) Install the radiator to the body.
- (b) Connect the ECT switch No. 1 connector.
- (c) Connect the fan motor connector.

3. INSTALL RADIATOR SUPPORT UPPER

- (a) Install the radiator support with the 4 bolts.
Torque: 14 N*m (142 kgf*cm, 10 ft.*lbf)
- (b) Connect the 2 horn connectors.

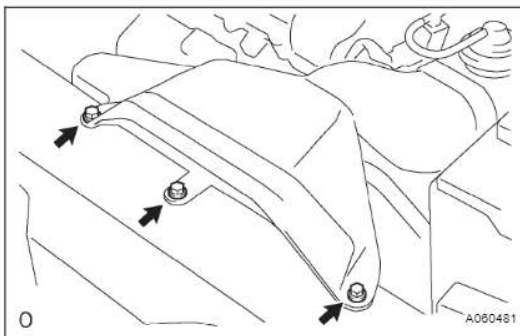
4. INSTALL AIR CLEANER INLET ASSEMBLY

- (a) Install the 2 air cleaner inlets with the 3 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)

5. ADJUST HOOD SUB-ASSEMBLY (See page [ED-4](#))

6. ADD ENGINE COOLANT (See page [CO-7](#))

7. CHECK FOR ENGINE COOLANT LEAKS (See page [CO-8](#))

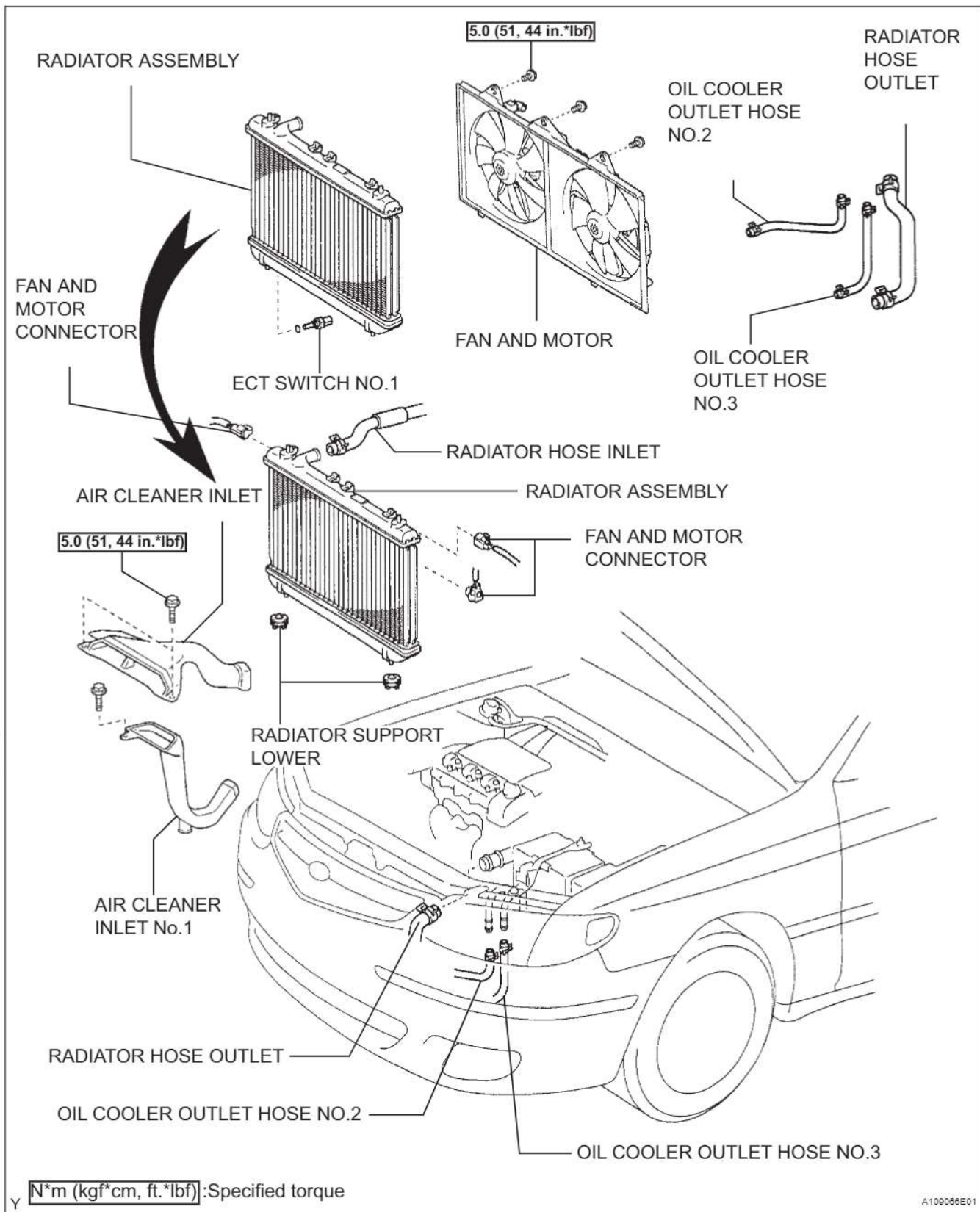


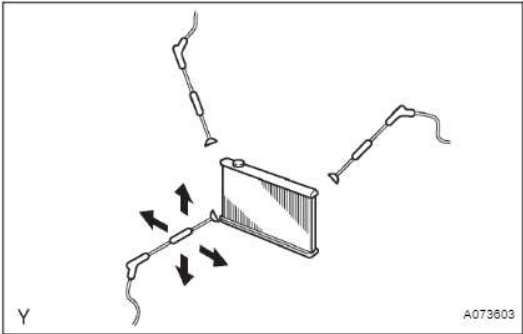
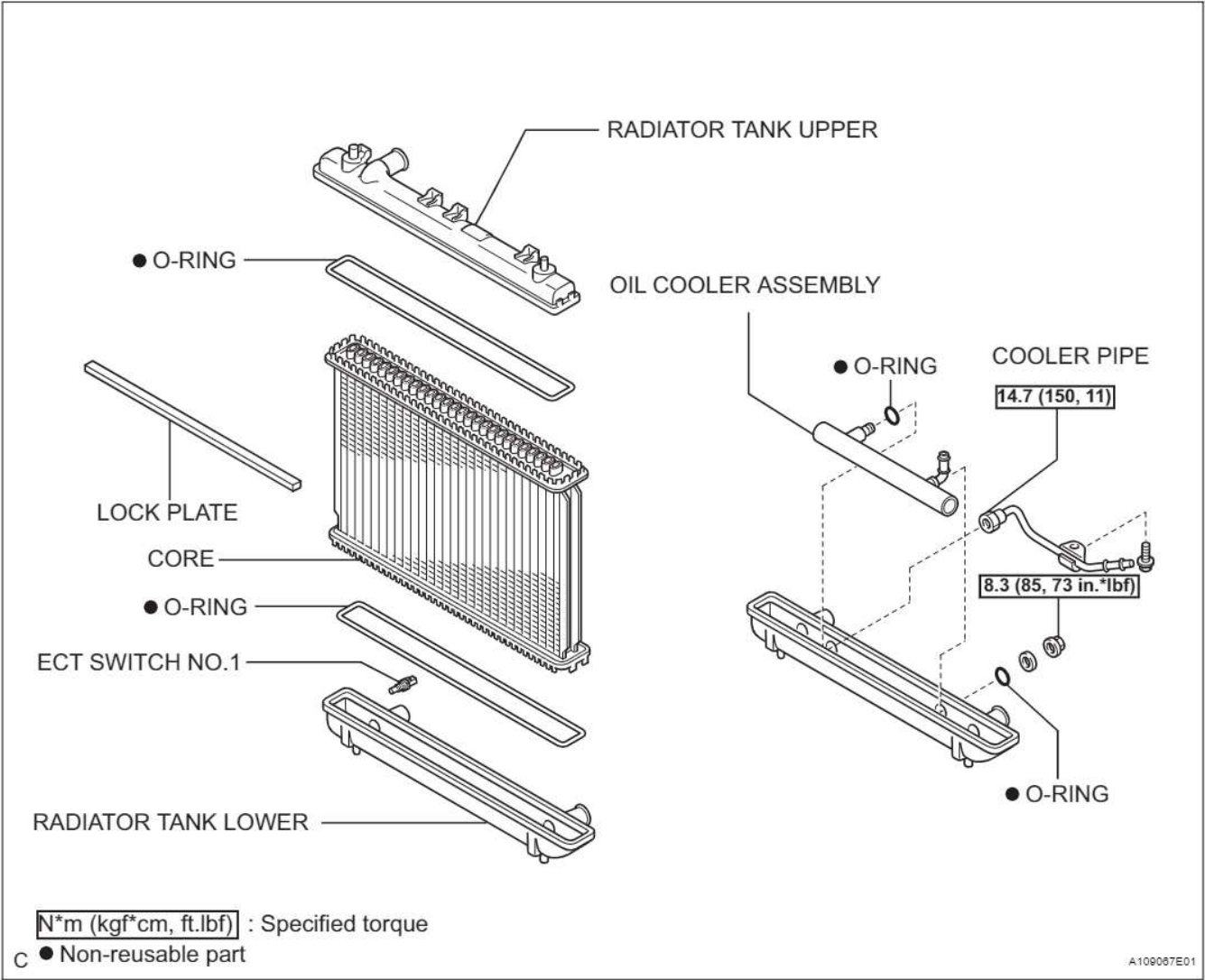
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3MZ-FE COOLING – RADIATOR

RADIATOR

COMPONENTS





ON-VEHICLE CLEANING

1. **INSPECT FINS BLOCKAGE**
If the fins are clogged, wash them with water or a steam cleaner. Dry with compressed air.
- NOTICE:**
- If the distance between the steam cleaner and the core is too close, the fins may become damaged. Keep the following injection distance.
- Standard**

Injection Distance	Injection Pressures
300 mm (11.81 in.)	2,942 to 4,903 kPa (30 to 50 kg/cm ² , 427 to 711 psi)
500 mm (19.69 in.)	4,903 to 7,845 kPa (50 to 80 kg/cm ² , 711 to 1,138 psi)

- If the fins are bent, straighten them with a screwdriver or pliers.
- Never apply water directly onto the electronic components.