

COOLING SYSTEM

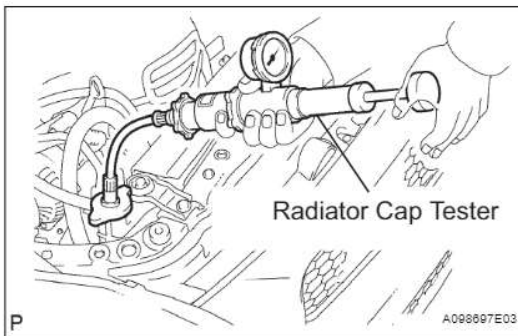
ON-VEHICLE INSPECTION

1. CHECK COOLING SYSTEM FOR LEAKAGE

- (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. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.



- (b) Fill the radiator with coolant, and then attach a radiator cap tester.
- (c) Warm up the engine.
- (d) Pump the radiator cap tester to 118 kPa (1.2 kgf/cm², 17.1 psi), and then check that the pressure does not drop.
- If the pressure drops, check the hoses, radiator and water pump for leakage. If there are no signs of external coolant leaks, check the heater core, cylinder block and head.
- (e) Reinstall the radiator cap.

2. CHECK ENGINE COOLANT LEVEL OF RESERVOIR

- (a) The engine coolant should be between the LOW and FULL lines when the engine is cold.
- If low, check for leakage 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

- (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. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.

- (b) Check for any excessive deposits of rust or scale around the radiator cap and radiator filler hole; the coolant should be free of oil.
- If excessively dirty, replace the coolant.
- (c) Reinstall the radiator cap.

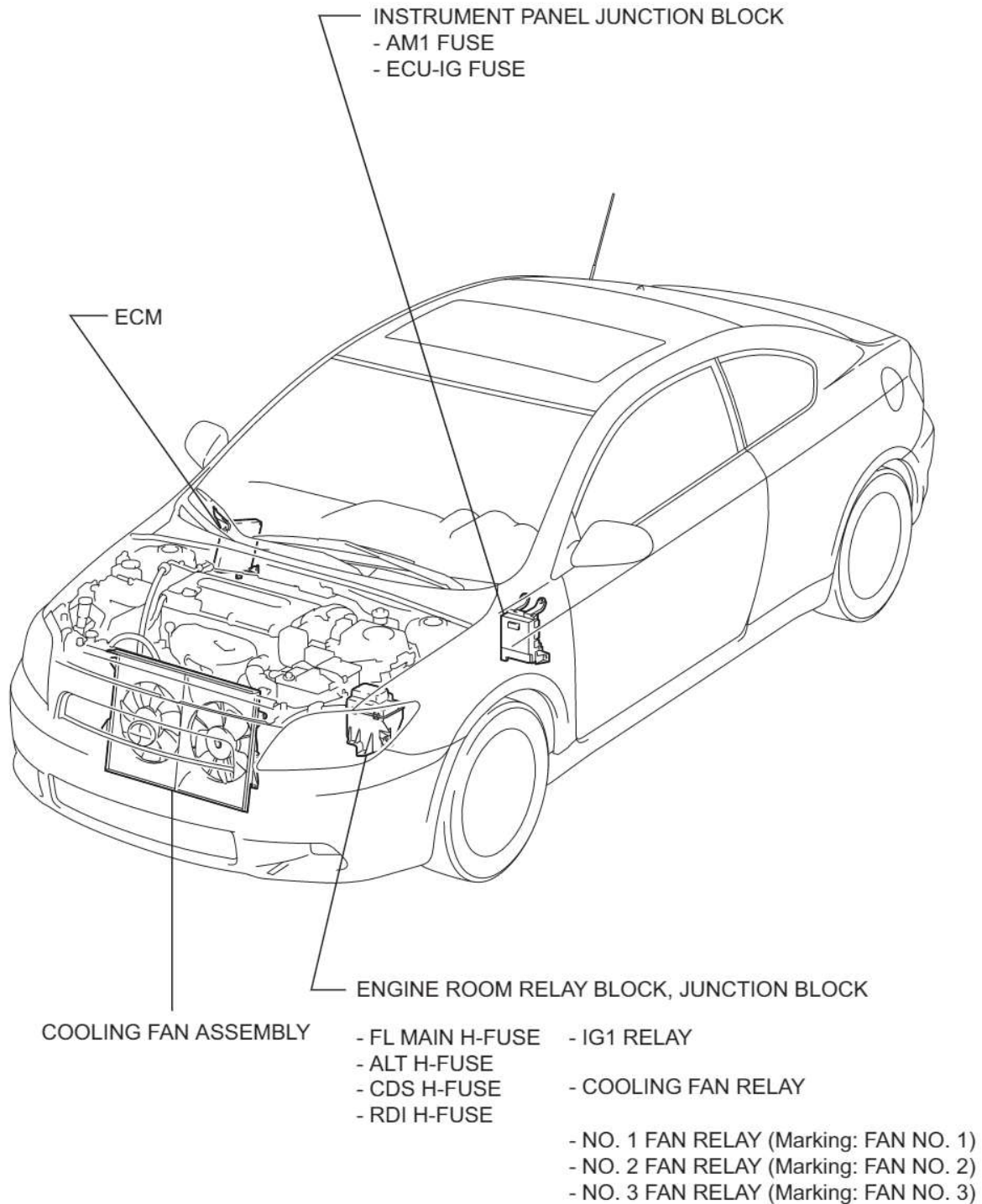
CO

CO-2

2AZ-FE COOLING – COOLING FAN SYSTEM

COOLING FAN SYSTEM

PARTS LOCATION



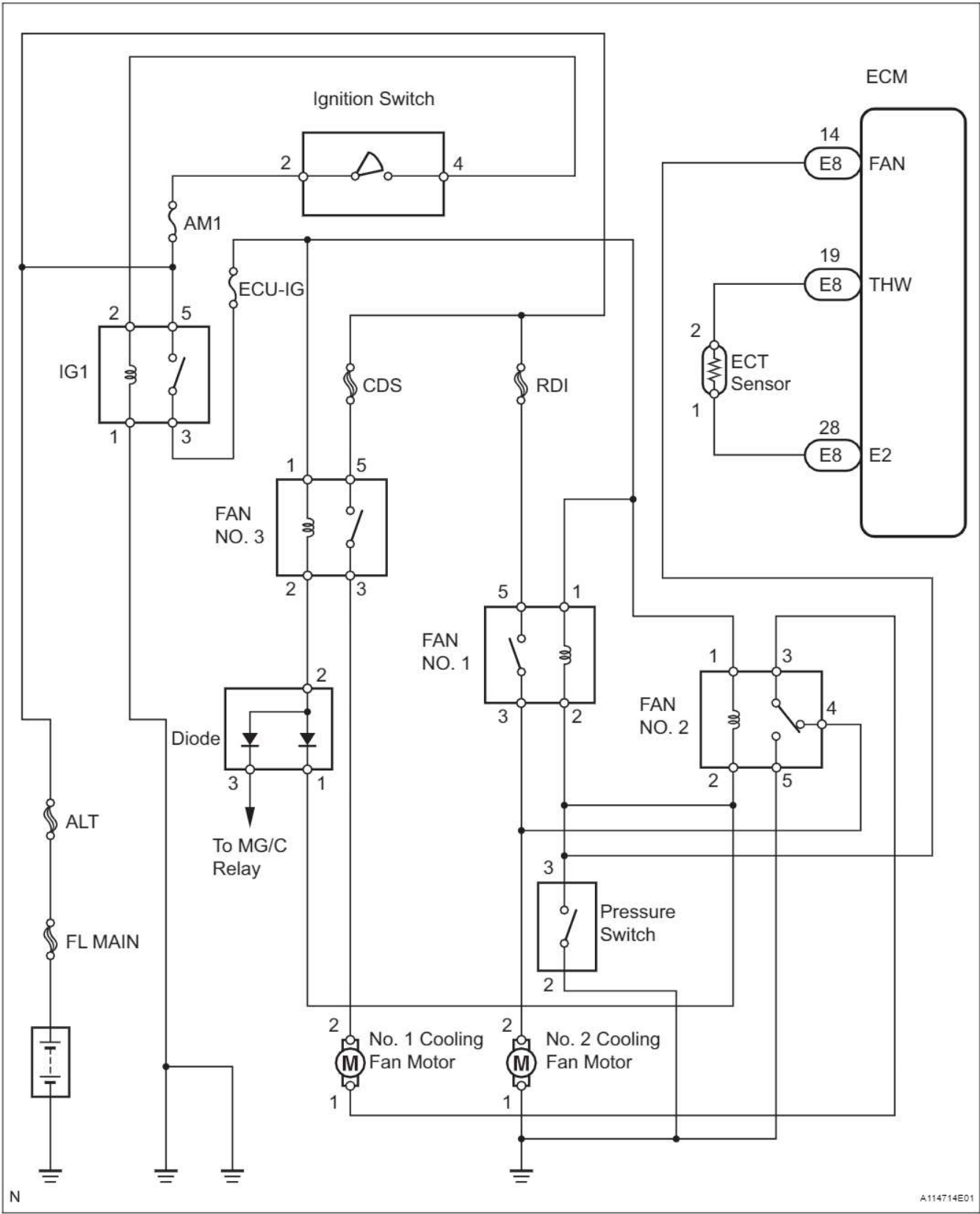
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2AZ-FE COOLING – COOLING FAN SYSTEM

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SYSTEM DIAGRAM



CO-4

2AZ-FE COOLING – COOLING FAN SYSTEM

ON-VEHICLE INSPECTION

HINT:

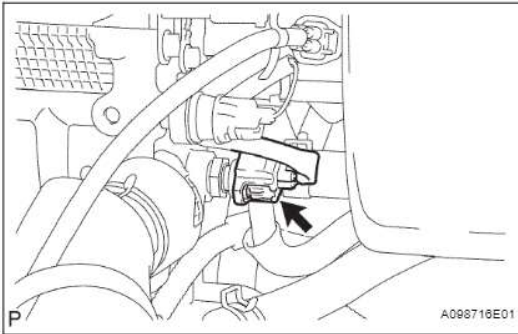
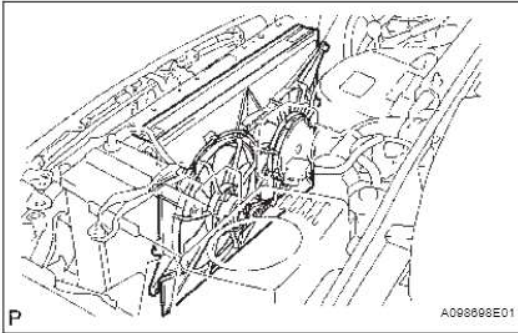
It is normal for the cooling fan to sometimes rotate when the ignition switch is turned from ACC to ON.

1. CHECK COOLING FAN OPERATION AT LOW TEMPERATURES (Below 94°C (201°F))

(a) Turn the ignition switch ON with the A/C switch OFF.

(b) Check that the cooling fan stops.

If not, check the cooling fan relays and engine coolant temperature sensor, and then check for disconnection of the connector or wire break between the cooling fan relay and engine coolant temperature sensor.



(c) Disconnect the engine coolant temperature sensor connector.

(d) Check that the cooling fan rotates.

If not, check the fuses, cooling fan relays, ECM and cooling fan, and then check for a short circuit between the cooling fan relay and engine coolant temperature sensor.

(e) Reconnect the engine coolant temperature sensor connector.

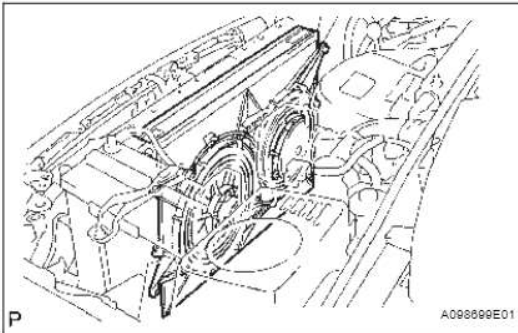
2. CHECK COOLING FAN OPERATION AT HIGH TEMPERATURES (Above 96°C (205°F))

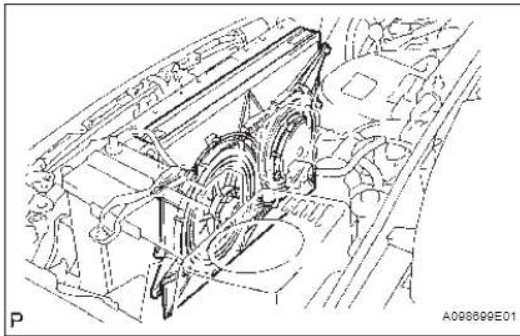
(a) Start the engine, and then raise the coolant temperature to above 96°C (205°F).

HINT:

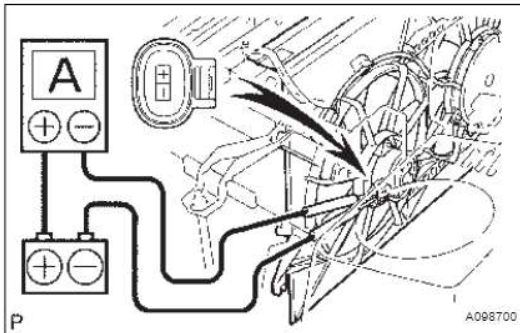
Coolant temperature is the value detected by the engine coolant temperature sensor on the cylinder head.

(b) Check that the A/C switch is OFF.



2AZ-FE COOLING – COOLING FAN SYSTEM**CO-5**

- (c) Check that the cooling fan rotates.
If not, replace the engine coolant temperature sensor.

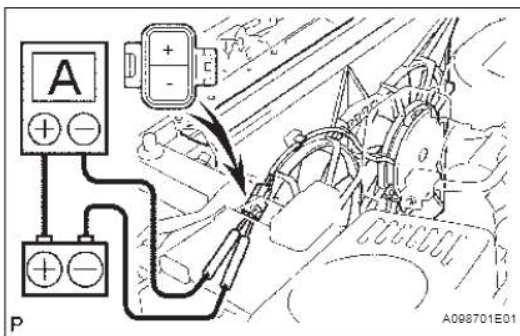
**3. INSPECT NO. 1 COOLING FAN**

- (a) Disconnect the No. 1 fan connector.
(b) Connect the battery and ammeter to the No. 1 fan connector.
(c) Check that the No. 1 fan rotates smoothly, and then check the reading on the ammeter.

Standard amperage:**5.2 to 8.2 A at 20°C (68°F)**

If the result is not as specified, replace the cooling fan motor.

- (d) Reconnect the No. 1 fan connector.

**4. INSPECT NO. 2 COOLING FAN**

- (a) Disconnect the No. 2 fan connector.
(b) Connect the battery and ammeter to the No. 2 fan connector.
(c) Check that the No. 2 fan rotates smoothly, and then check the reading on the ammeter.

Standard amperage:**5.2 to 8.2 A at 20°C (68°F)**

If the result is not as specified, replace the cooling fan motor.

- (d) Reconnect the No. 2 fan connector.

CO

CO-6

2AZ-FE COOLING – COOLANT

COOLANT

ON-VEHICLE INSPECTION

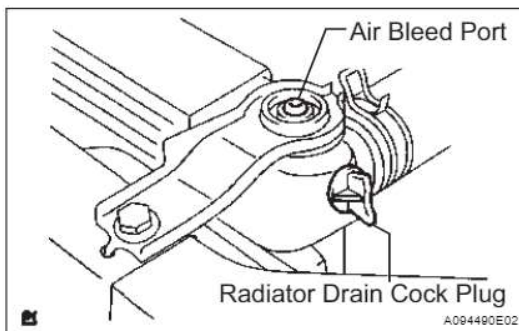
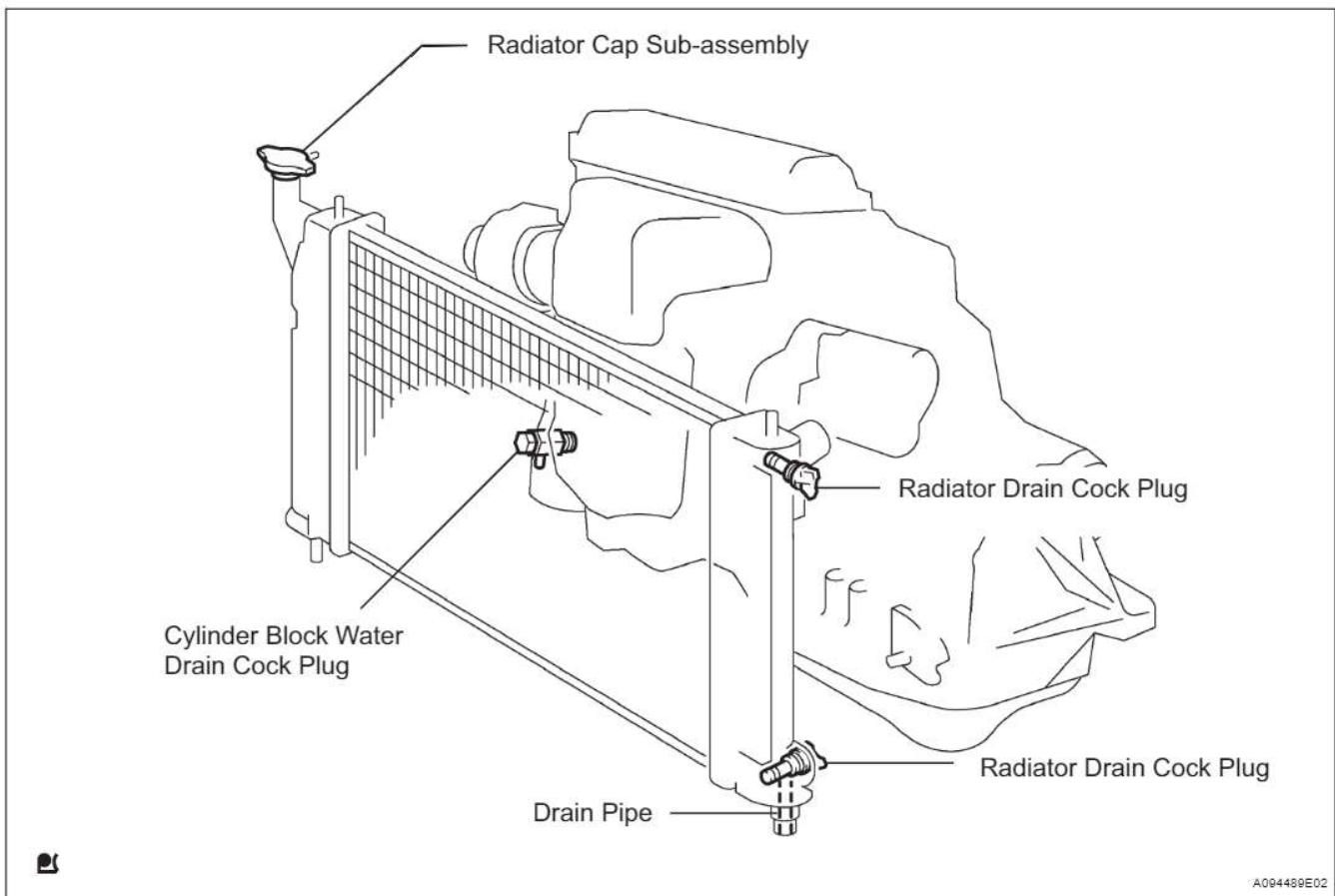
1. DRAIN ENGINE COOLANT

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.

- Loosen the radiator drain cock plug (lower side) and water drain cock plug, and then drain the coolant.
- Remove the radiator cap.
- Close the radiator drain cock plug (lower side).
- Tighten the water drain cock plug.

Torque: 12.7 N*m (129 kgf*cm, 9 ft.*lbf)



2. ADD ENGINE COOLANT

- Loosen the radiator drain cock plug (upper side) by 3 turns.
- Connect a vinyl tube to the air bleed port.
- Fill the radiator with coolant from the fill port. Add coolant until it overflows from the air bleed port and it remains inside the vinyl tube, and then tighten the radiator drain cock plug (upper side).

Standard capacity:

Manual transaxle:

6.8 liters (7.2 US qts, 6.0 Imp. qts)

2AZ-FE COOLING – COOLANT**CO-7****Automatic transaxle:****6.7 liters (7.1 US qts, 5.9 Imp. qts)****Engine Coolant:**

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 (coolant with long-life hybrid organic acid technology consists of a combination of low phosphates and organic acids).

NOTICE:**Do not substitute water for engine coolant.****HINT:**

- Use of improper coolants may damage the engine cooling system.
 - Use only 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 (coolant with long-life hybrid organic acid technology consists of a combination of low phosphates and organic acids).
 - Toyota Super Long Life Coolant is premixed with 50% coolant and 50% deionized water. This coolant provides protection down to about -35°C (-31°F).
- (d) Check 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 coolant.
- (e) Install the radiator cap securely.
- (f) Slowly pour coolant into the radiator reservoir until it reaches the FULL line.
- (g) Warm up the engine until the cooling fan operates.
- (1) Set the air conditioning as follows while warming up the engine.

Item	Condition
Blower speed	Any setting except "OFF"
Set temperature	MAX HOT
Air conditioning switch	"OFF"

- (2) Maintain the engine speed at 2,000 to 2,500 rpm and warm up the engine until the cooling fan operates.
- (h) Press the inlet and outlet radiator hoses several times by hand while warming up the engine.
- (i) Stop the engine and wait until the coolant cools down.
- (j) Remove the radiator cap and check the coolant level inside the radiator.
- (k) If the coolant level is below the full level, perform all of the "ADD ENGINE COOLANT" steps above and repeat the operation until the coolant level stays the full level.

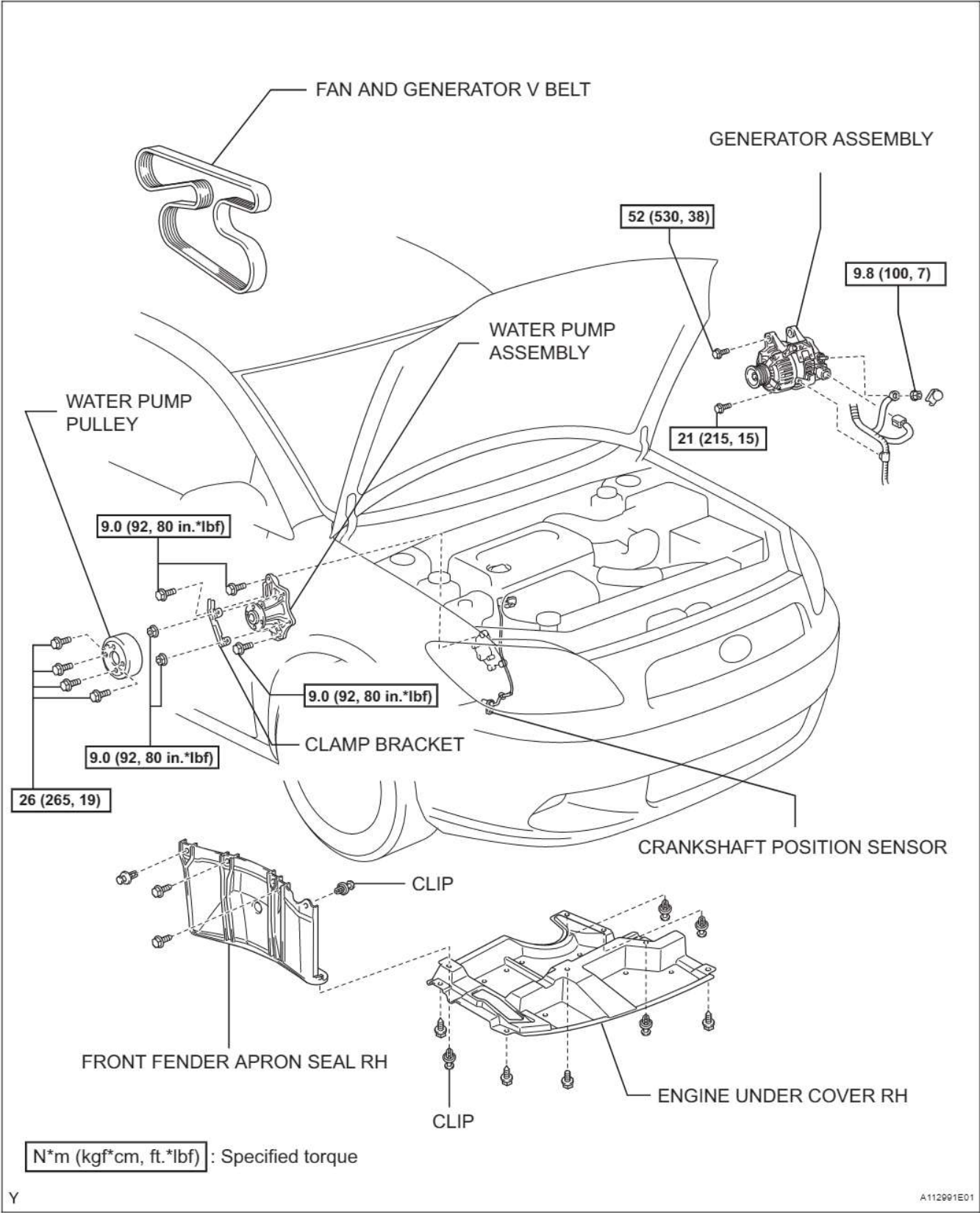
CO-8**2AZ-FE COOLING – COOLANT**

- (I) Recheck the coolant level inside the radiator reservoir tank. If it is below the full level, add coolant.

3. CHECK FOR ENGINE COOLANT LEAKAGE (See page [CO-1](#))

CO

WATER PUMP
COMPONENTS



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2AZ-FE COOLING – WATER PUMP

REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

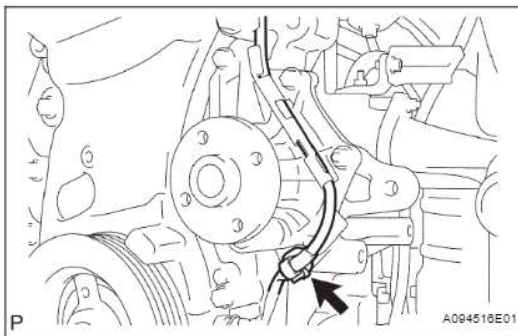
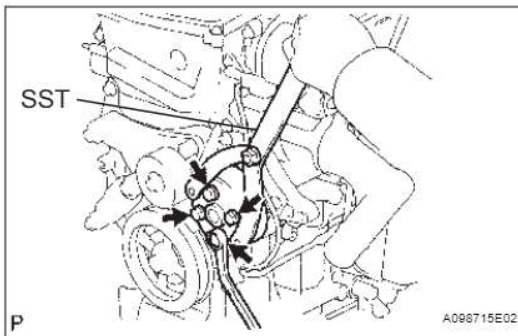
CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. DRAIN ENGINE COOLANT (See page CO-6)
3. REMOVE FRONT FENDER APRON SEAL RH (See page CH-10)
4. REMOVE ENGINE UNDER COVER RH
5. REMOVE FAN AND GENERATOR V BELT (See page EM-6)
6. REMOVE GENERATOR ASSEMBLY (See page CH-10)
7. REMOVE WATER PUMP PULLEY

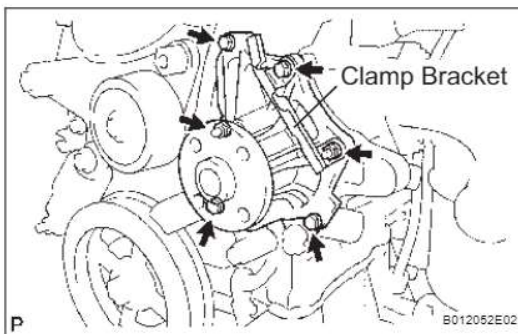
- (a) Using SST, remove the 4 bolts and water pump pulley.

SST 09960-10010 (09962-01000, 09963-00700)



8. REMOVE WATER PUMP ASSEMBLY

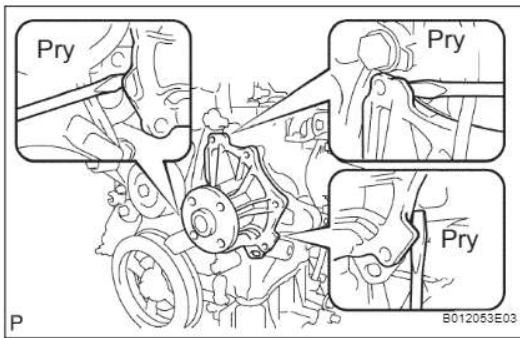
- (a) Remove the clamp of the crankshaft position sensor from the water pump.
- (b) Disconnect the wire of the crankshaft position sensor from the clamp bracket.



- (c) Remove the 4 bolts, 2 nuts and clamp bracket.

2AZ-FE COOLING – WATER PUMP

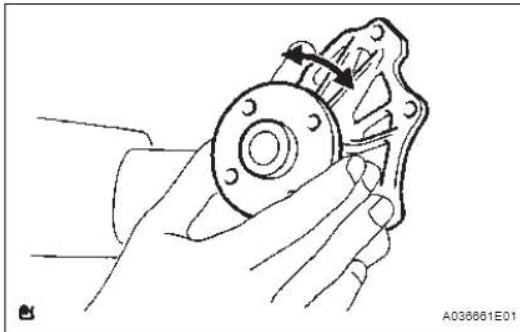
CO-11



- (d) Using a screwdriver, pry between the water pump and cylinder block, and then remove the water pump.

NOTICE:

Be careful not to damage the contact surface of the water pump and cylinder block.

**INSPECTION****1. INSPECT WATER PUMP ASSEMBLY**

- (a) Visually check the drain hole coolant leakage. If leakage is found, replace the water pump.
- (b) Turn the pulley, and then check that the water pump bearing moves smoothly without making a click noise. If it does not move smoothly, replace the water pump.

CO

CO-12

2AZ-FE COOLING – WATER PUMP

INSTALLATION

1. INSTALL WATER PUMP ASSEMBLY

- (a) Remove any old seal packing material from the contact surface.
- (b) Apply a continuous line of seal packing as shown in the illustration.

Seal packing:

Part No. 08826-00080 or equivalent

Standard seal diameter:

2.2 to 2.5 mm (0.09 to 0.10 in.)

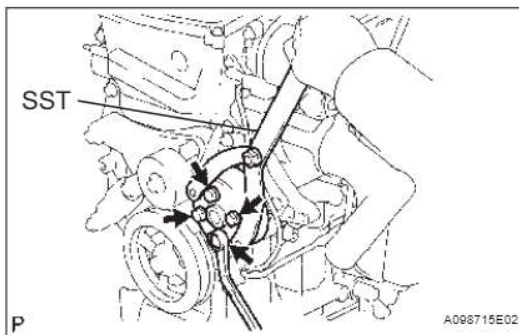
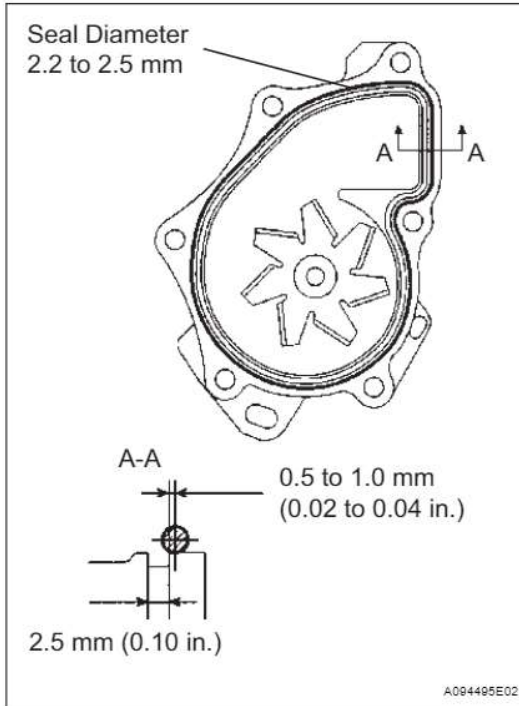
NOTICE:

- Remove any oil from the contact surface.
- The parts must be set within 3 minutes after applying seal packing. Otherwise, the material must be removed and reapplied.

- (c) Install the water pump and clamp bracket with the 4 bolts and 2 nuts.

Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)

- (d) Install the wire of the crankshaft position sensor onto the clamp bracket.
- (e) Install the clamp of the crankshaft position sensor onto the water pump.



2. INSTALL WATER PUMP PULLEY

- (a) Using SST, install the water pump pulley with the 4 bolts.

SST 09960-10010 (09962-01000, 09963-00700)

Torque: 26 N*m (265 kgf*cm, 19 ft.*lbf)

3. INSTALL GENERATOR ASSEMBLY (See page [CH-17](#))4. INSTALL FAN AND GENERATOR V BELT (See page [EM-6](#))5. ADD ENGINE COOLANT (See page [CO-6](#))

6. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

7. CHECK FOR ENGINE COOLANT LEAKAGE (See page [CO-1](#))

8. INSTALL ENGINE UNDER COVER RH

9. INSTALL FRONT FENDER APRON SEAL RH (See page [CH-18](#))

10. PERFORM INITIALIZATION

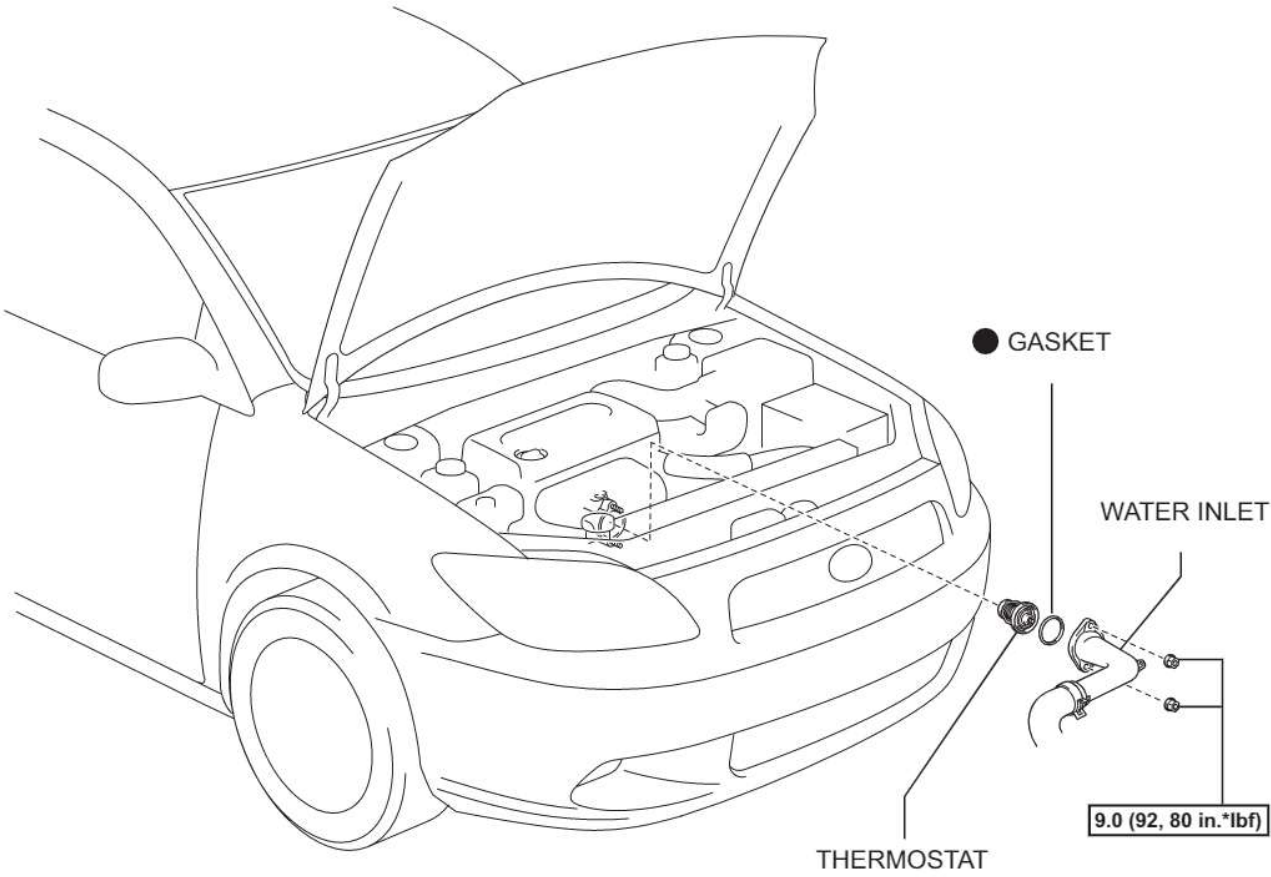
- (a) Perform initialization (see page [IN-23](#)).

NOTICE:

Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

THERMOSTAT

COMPONENTS



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

● Non-reusable part

Y

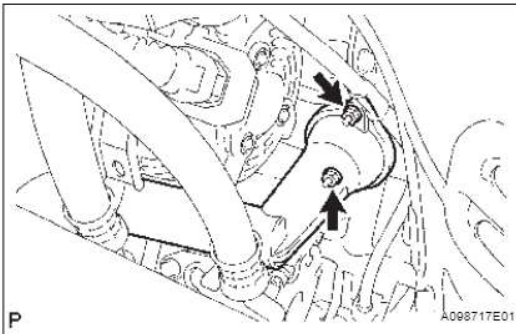
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2AZ-FE COOLING – THERMOSTAT

REMOVAL

1. **DRAIN ENGINE COOLANT** (See page CO-6)
2. **REMOVE WATER INLET**
 - (a) Remove the 2 nuts and disconnect the water inlet from the cylinder block.
3. **REMOVE THERMOSTAT**

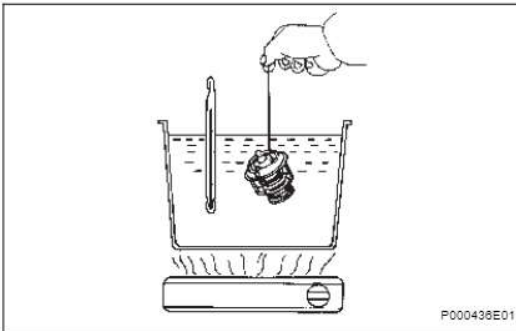
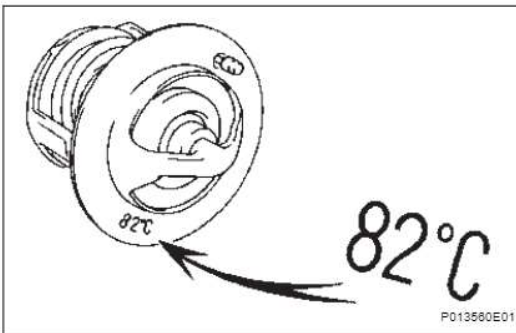


INSPECTION

1. **INSPECT THERMOSTAT**

HINT:

The valve opening temperature is inscribed on the thermostat.

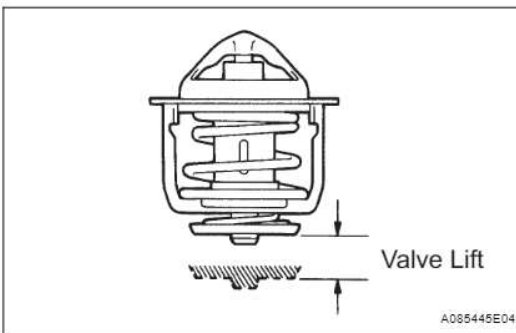


- (a) Immerse the thermostat in water, and then gradually heat the water.
- (b) Check the valve opening temperature of the thermostat.

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 (0.39 in.) or more at 95°C (203°F)

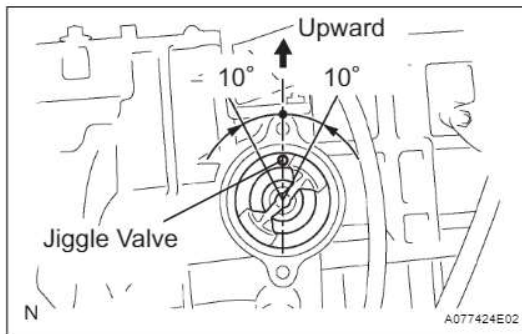
If the valve lift is not as specified, replace the thermostat.

- (d) Check that the valve is fully closed when the thermostat is at low temperatures (below 77°C (171°F)).
If not fully closed, replace the thermostat.

INSTALLATION

1. INSTALL THERMOSTAT

- (a) Install a new gasket onto the thermostat.
- (b) Install the thermostat with the jiggle valve upward.
HINT:
The jiggle valve may be set to within 10° on either side of the prescribed position.



2. INSTALL WATER INLET

- (a) Install the water inlet with the 2 nuts.
Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)

3. ADD ENGINE COOLANT (See page CO-6)

4. CHECK FOR ENGINE COOLANT LEAKAGE (See page CO-1)

COOLING FAN RELAY

ON-VEHICLE INSPECTION

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. REMOVE ENGINE ROOM RELAY BLOCK COVER

3. INSPECT NO. 1 FAN RELAY (Marking: FAN NO. 1)

- (a) Remove the relay from the engine room relay block.
(b) Measure the resistance of the relay.

Standard 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.

- (c) Install the relay.

4. INSPECT NO. 2 FAN RELAY (Marking: FAN NO. 2)

- (a) Remove the relay from the engine room relay block.
(b) Measure the resistance of the relay.

Standard resistance

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

- (c) Install the relay.

5. REMOVE NO. 3 FAN RELAY (Marking: FAN NO. 3)

- (a) Remove the relay from the engine room relay block.
(b) Measure the resistance of the relay.

Standard resistance

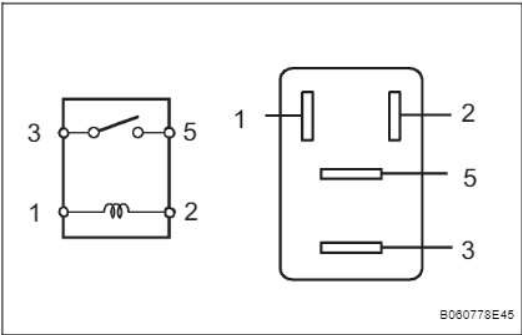
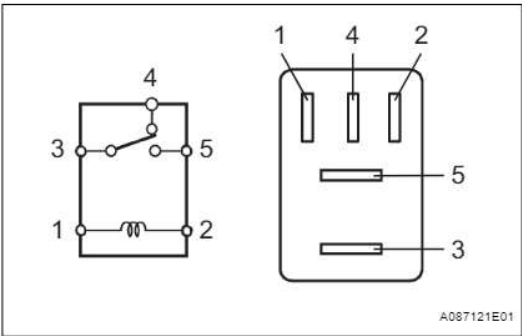
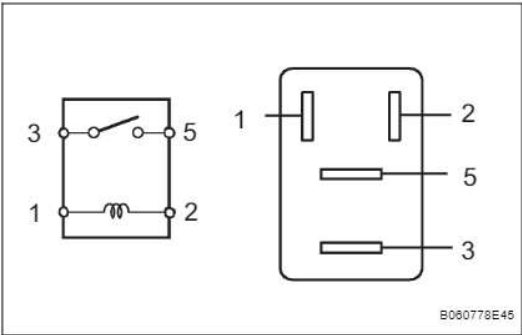
Tester Connection	Specified Condition
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (when battery voltage is applied to terminals 1 and 2)

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

- (c) Install the relay.

6. INSTALL ENGINE ROOM RELAY BLOCK COVER

7. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL



CO

8. PERFORM INITIALIZATION

- (a) Perform initialization (see page [IN-23](#)).

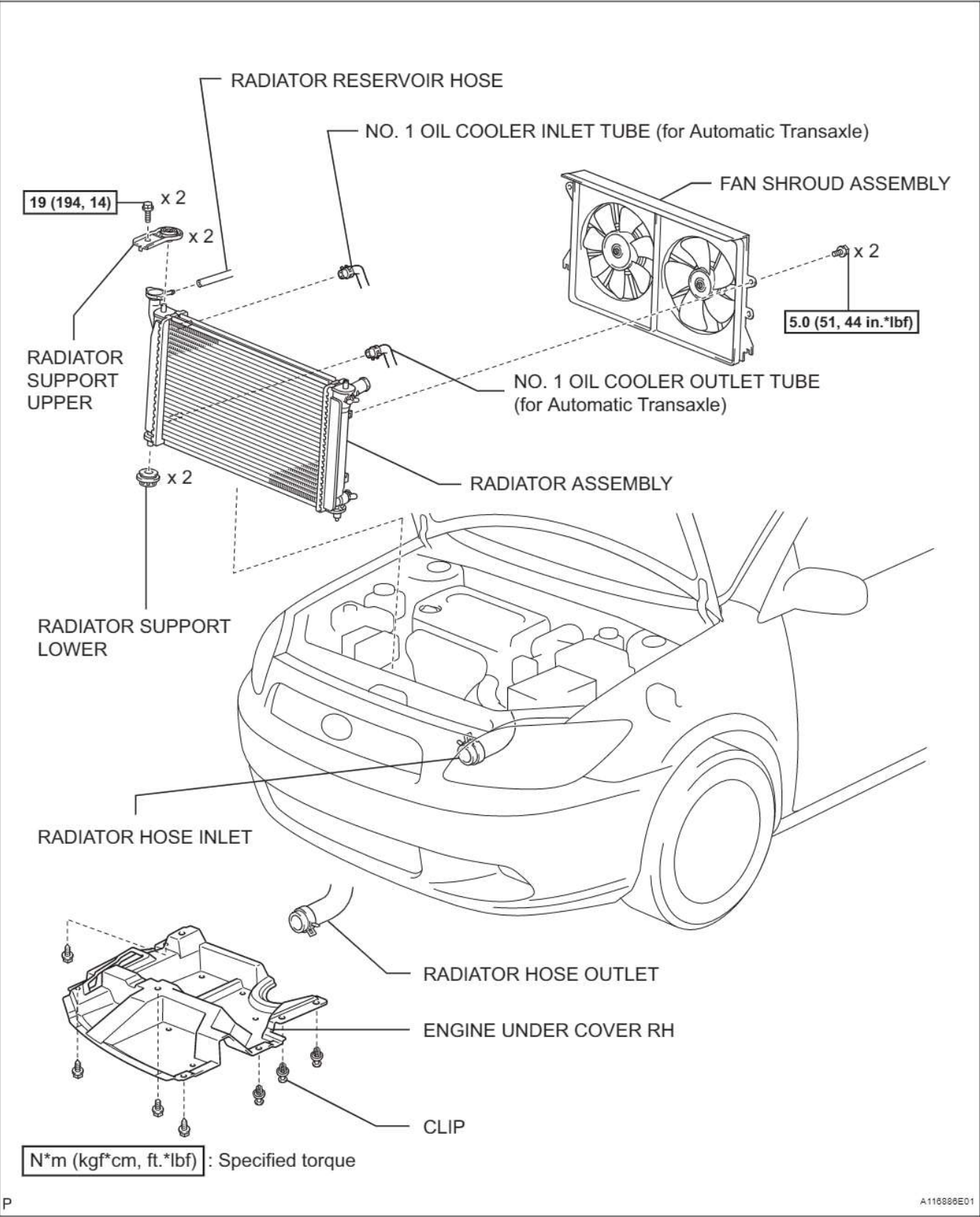
NOTICE:

Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

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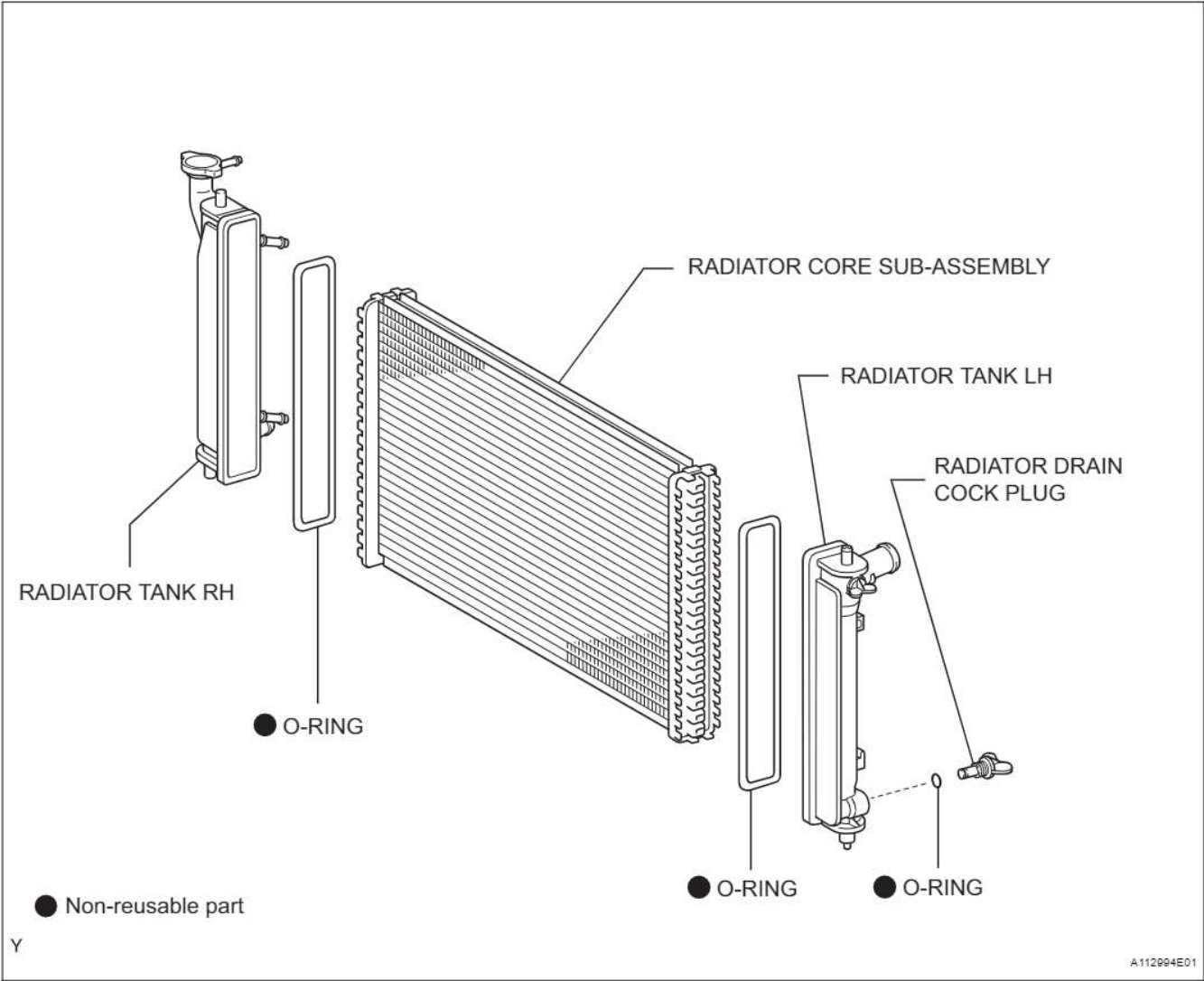
2AZ-FE COOLING – RADIATOR

RADIATOR
COMPONENTS



2AZ-FE COOLING – RADIATOR

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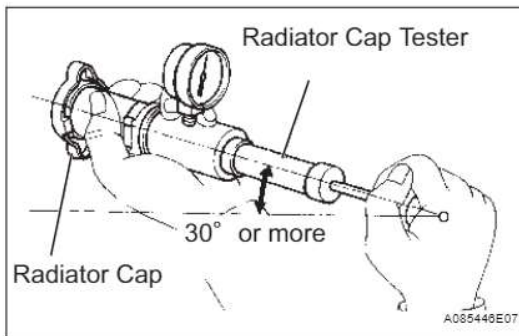
2AZ-FE COOLING – RADIATOR

ON-VEHICLE INSPECTION

1. INSPECT RADIATOR CAP SUB-ASSEMBLY

NOTICE:

- If the radiator cap is contaminated, rinse it with water.
- Before using a radiator cap tester, wet the relief valve and pressure valve with engine coolant or water.
- When performing the following 2 steps, keep the tester at an angle of 30° or more above the horizontal.



- (a) Using a radiator cap tester, slowly pump and check that air is coming from the vacuum valve.

Pumping speed:

1 push every 3 seconds or more

NOTICE:

Push the pump at a constant speed.

If air does not come from the vacuum valve, replace the radiator cap.

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

Pumping speed:

1 push within 1 second

NOTICE:

The above pumping speed is for the first pumping only (in order to close the vacuum valve). After the first pumping, the pumping speed can be reduced.

Standard opening pressure:

74 to 103 kPa (0.75 to 1.05 kgf/cm², 10.7 to 14.9 psi)

Minimum opening pressure:

59 kPa (0.6 kgf/cm², 8.6 psi)

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

HINT:

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

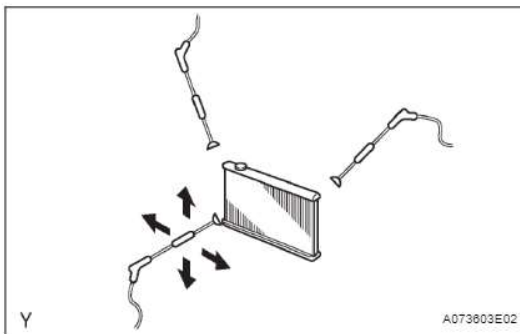
ON-VEHICLE CLEANING

1. CHECK FIN FOR BLOCKAGE

- (a) If the fins are clogged, wash them with water or a steam cleaner, and then dry them with compressed air.

NOTICE:

- If the fins are bent, straighten them with a screwdriver or pliers.
- Be careful not to expose electronic components to water.



- If the distance between the steam cleaner and core is too small, there is a possibility of damaging the fins, so keep the following injection distances.
Standard pressure

Injection Distance	Injection Pressure
300 mm (11.811 in.)	2,942 to 4,903 kPa (30 to 50 kgf/cm ² , 427 to 711 psi)
500 mm (19.685 in.)	4,903 to 7,845 kPa (50 to 80 kgf/cm ² , 711 to 1,138 psi)

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2AZ-FE COOLING – RADIATOR

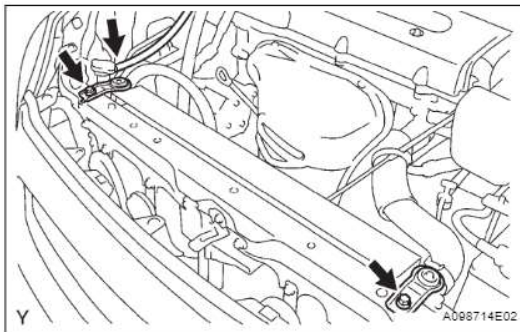
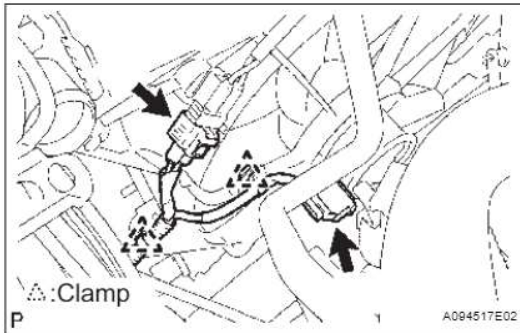
REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

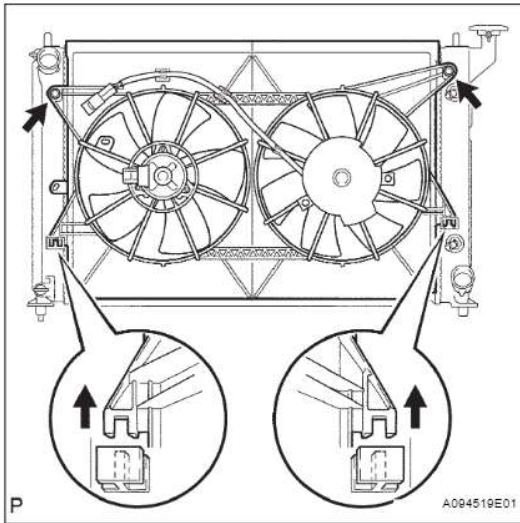
CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. **DRAIN ENGINE COOLANT** (See page [CO-6](#))
3. **REMOVE ENGINE UNDER COVER RH**
4. **DISCONNECT RADIATOR HOSE INLET**
5. **DISCONNECT RADIATOR HOSE OUTLET**
6. **DISCONNECT NO. 1 OIL COOLER INLET TUBE** (for Automatic Transaxle)
7. **DISCONNECT NO. 1 OIL COOLER OUTLET TUBE** (for Automatic Transaxle)
8. **REMOVE RADIATOR ASSEMBLY**
 - (a) Disconnect the 2 cooling fan motor connectors.
 - (b) Disconnect the 2 clamps of the engine room main wire.



- (c) Disconnect the radiator reservoir hose.
 - (d) Remove the 2 bolts and 2 radiator support uppers, and then remove the radiator assembly.
9. **REMOVE RADIATOR SUPPORT LOWER**

2AZ-FE COOLING – RADIATOR**CO-23****10. REMOVE FAN SHROUD ASSEMBLY**

- (a) Remove the 2 bolts.
- (b) Disconnect the 2 pawl fittings, and remove the fan assembly.

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2AZ-FE COOLING – RADIATOR

DISASSEMBLY

1. REMOVE RADIATOR DRAIN COCK PLUG

- (a) Remove the drain cock plug.
- (b) Remove the O-ring from the drain cock plug.

2. ASSEMBLE SST

SST 09230-01010 (09231-01010, 09231-01030)

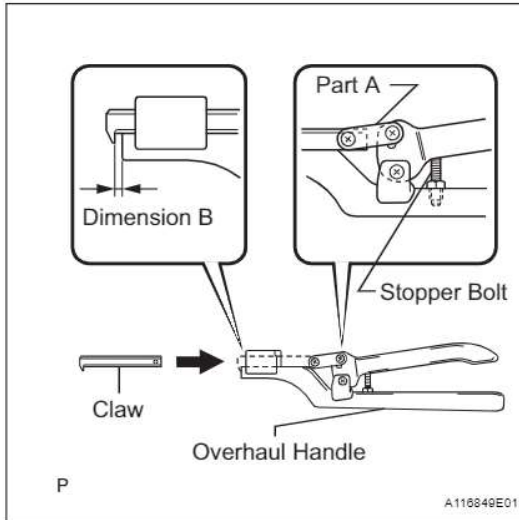
- (a) Install the claw onto the overhaul handle by inserting it in the hole at part A as shown in the illustration.
- (b) While gripping the handle, adjust dimension B to between 0.2 and 0.3 mm using the stopper bolt.

Standard dimension B:

0.2 to 0.3 mm (0.008 to 0.012 in.)

NOTICE:

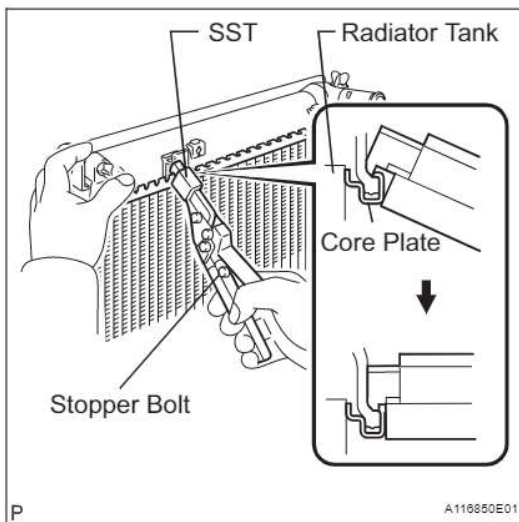
If the stopper bolt is not adjusted, the claw may be damaged.



3. UNCAULK CORE PLATE

- (a) Straighten the core plate by gripping it with SST until stopped by the stopper bolt.

SST 09230-01010 (09231-01010, 09231-01030)



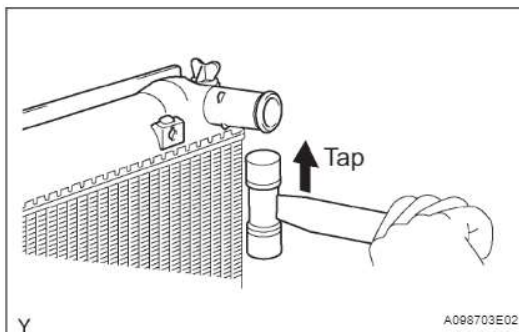
4. REMOVE RADIATOR TANK LH

- (a) Lightly tap the bracket of the radiator tank (or radiator tank pipe) with a soft-faced hammer to remove the radiator tank.
- (b) Remove the O-ring.

5. REMOVE RADIATOR TANK RH

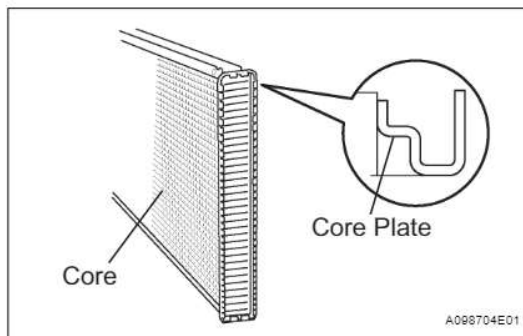
HINT:

Perform the same procedures as the radiator tank.



2AZ-FE COOLING – RADIATOR

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**6. INSPECT RADIATOR CORE SUB-ASSEMBLY**

Check the core plate for damage.

HINT:

- If the sides of the core plate groove are deformed, it is impossible to reassembly the radiator tank. Therefore, first correct any deformation using pliers or a similar tool.
- Water leakage will occur if the bottom of the core plate groove is damaged or dented. Repair or replace it if necessary.

NOTICE:

The radiator can only be recaulked 2 times. After being recaulked 2 times, the radiator assembly must be replaced.

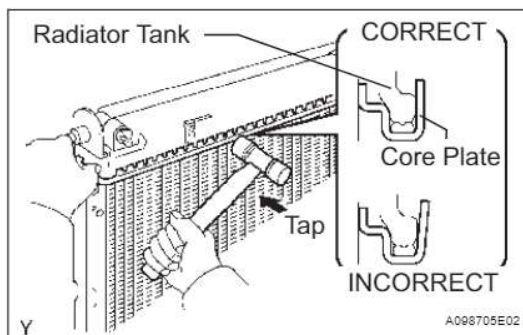
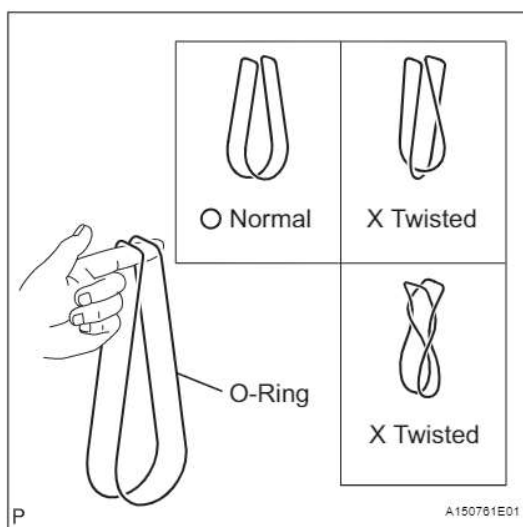
REASSEMBLY**1. INSTALL RADIATOR TANK LH**

- (a) Check that there are no foreign objects in the core plate groove, and then install a new O-ring without twisting it.

HINT:

To clean the core plate groove, lightly rub it with sandpaper without scratching it.

CO



- (b) Install the radiator tank without damaging the O-ring.
- (c) Tap the core plate with a soft-faced hammer so that there is not gap between the core plate and radiator tank.

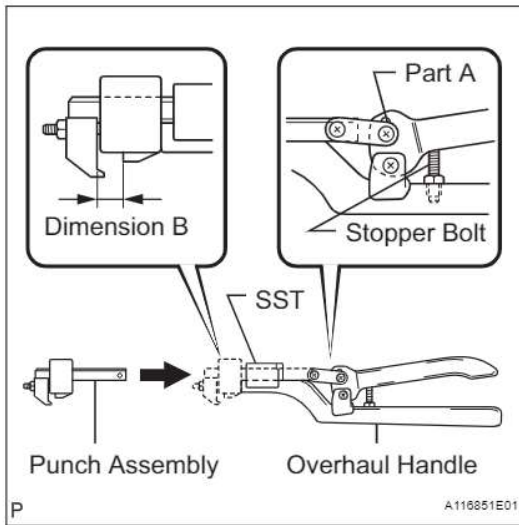
2. INSTALL RADIATOR TANK RH

HINT:

Perform the same procedures as the radiator tank LH.

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2AZ-FE COOLING – RADIATOR



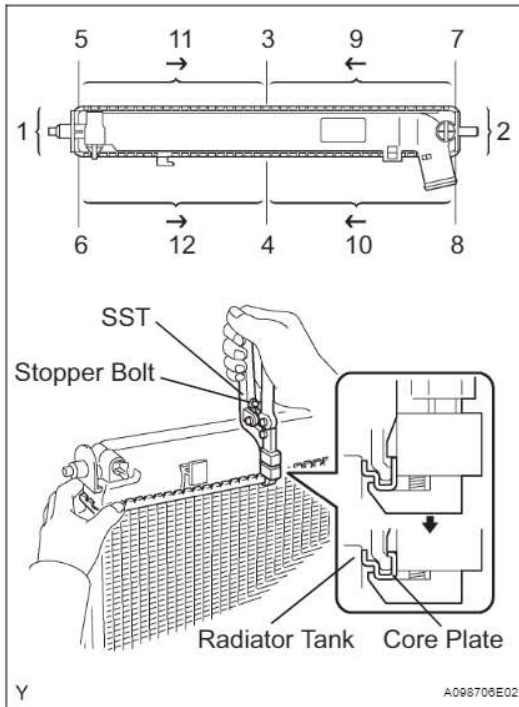
3. ASSEMBLE SST

SST 09230-01010 (09231-01010, 09231-01020)

- Install the punch assembly into the overhaul handle by inserting it in the hole at 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.

Standard dimension B:

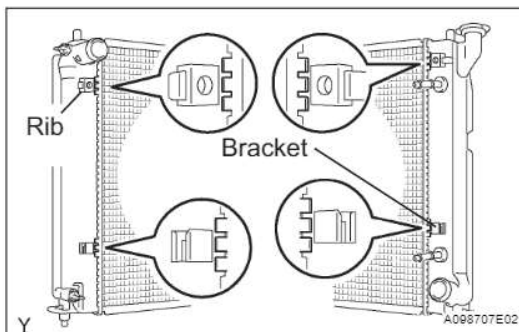
8.4 mm (0.331 in.)



4. CAULK CORE PLATE

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

SST 09230-01010 (09231-01010, 09231-01020)

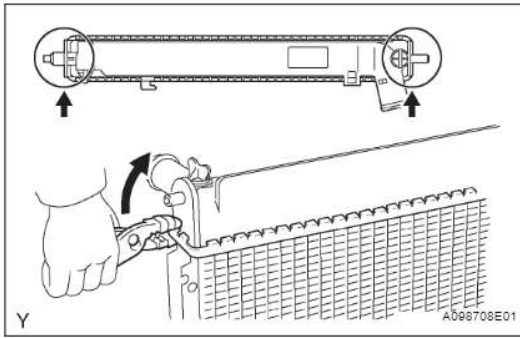


HINT:

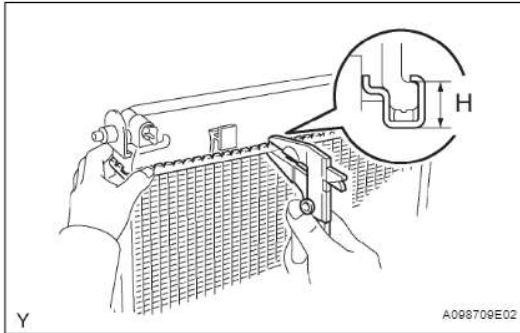
- Do not tap the areas protruding around the pipes, brackets or tank ribs.

2AZ-FE COOLING – RADIATOR

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- Do not tap the sections shown in the illustration or the oil cooler using SST. Use pliers or a similar tool. Be careful not to damage the core plate.



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

Standard plate height (H):**8.7 to 9.1 mm (0.343 to 0.358 in.)**

If the height is not as specified, readjust the stopper bolt of the handle, and then caulk again.

5. INSTALL RADIATOR DRAIN COCK PLUG

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

CO

INSTALLATION

1. **INSTALL FAN SHROUD ASSEMBLY**
 - (a) Attach the 2 pawl fittings of the shroud.
 - (b) Install the fan assembly with the 2 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)
2. **INSTALL RADIATOR SUPPORT LOWER**
3. **INSTALL RADIATOR ASSEMBLY**
 - (a) Install the radiator assembly with the 2 radiator support uppers and 2 bolts.
Torque: 19 N*m (194 kgf*cm, 14 ft.*lbf)
 - (b) Connect the radiator reservoir hose.
 - (c) Connect the 2 clamps of the engine room main wire.
 - (d) Connect the 2 cooling fan motor connectors.
4. **CONNECT NO. 1 OIL COOLER OUTLET TUBE (for Automatic Transaxle)**
5. **CONNECT NO. 1 OIL COOLER INLET TUBE (for Automatic Transaxle)**
6. **CONNECT RADIATOR HOSE OUTLET**
7. **CONNECT RADIATOR HOSE INLET**
8. **ADD ENGINE COOLANT (See page [CO-6](#))**
9. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
10. **CHECK FOR ENGINE COOLANT LEAKAGE (See page [CO-1](#))**
11. **PERFORM INITIALIZATION**
 - (a) Perform initialization (see page [IN-23](#)).
NOTICE:
Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.
12. **INSTALL ENGINE UNDER COVER RH**