

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 83°C (181°F))

- (a) Turn the ignition switch ON with the A/C switch OFF.
- (b) Check that the cooling fan stops.
If it does not, check the cooling fan relay and engine coolant temperature sensor, and check if there is disconnection or circuit open between them.
- (c) Disconnect the engine coolant temperature sensor connector.
- (d) Check that the cooling fan rotates.
If it does not, check the fuses, cooling fan relay, ECM and cooling fan, and check for short in 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 93°C (199°F))

- (a) Start the engine, and raise the coolant temperature to above 93°C (199°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.
- (c) Check that the cooling fan rotates.
If it does not, check the fuses, cooling fan relay, ECM, cooling fan and engine coolant temperature sensor.

3. CHECK COOLING FAN

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

Standard amperage:

11.7 to 14.7 A

- (d) Reconnect the cooling fan connector.

CO-10

1NZ-FE COOLING – WATER PUMP

INSTALLATION**1. INSTALL WATER PUMP ASSEMBLY**

- (a) Install a new gasket and the water pump with the 3 bolts and 2 nuts.

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

2. INSTALL WATER PUMP PULLEY

- (a) Using SST, install the pump pulley with the 3 bolts.

SST 09960-10010 (09962-01000, 09963-00600)

Torque: 15 N*m (153 kgf*cm, 11 ft.*lbf)

3. INSTALL ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH (See page [EM-30](#))**4. INSTALL GENERATOR V BELT (See page [EM-7](#))****5. ADJUST GENERATOR V BELT (See page [EM-7](#))****6. INSTALL ENGINE UNDER COVER RH****7. ADD ENGINE COOLANT (See page [CO-5](#))****8. CHECK FOR ENGINE COOLANT LEAKS (See page [CO-7](#))****CO**

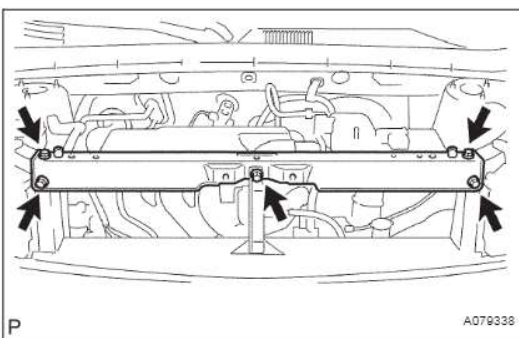
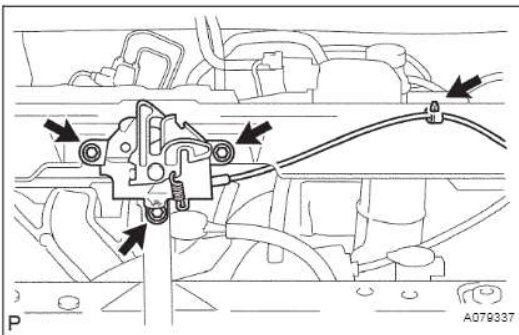
REMOVAL

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.

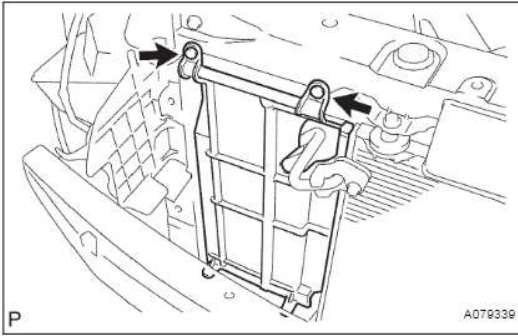
2. DRAIN ENGINE COOLANT (See page [CO-5](#))
3. DISCONNECT RADIATOR HOSE INLET
4. DISCONNECT RADIATOR HOSE OUTLET
5. DISCONNECT OIL COOLER INLET HOSE (for Automatic Transaxle)
6. DISCONNECT OIL COOLER OUTLET HOSE (for Automatic Transaxle)
7. REMOVE RADIATOR GRILLE (See page [ET-2](#))
8. REMOVE FRONT FENDER LINER LH (See page [ET-2](#))
9. REMOVE FRONT FENDER LINER RH (See page [ET-2](#))
10. REMOVE FRONT BUMPER COVER (See page [ET-2](#))
11. REMOVE HOOD LOCK ASSEMBLY
 - (a) Remove the 3 bolts, clip and hood lock.

CO

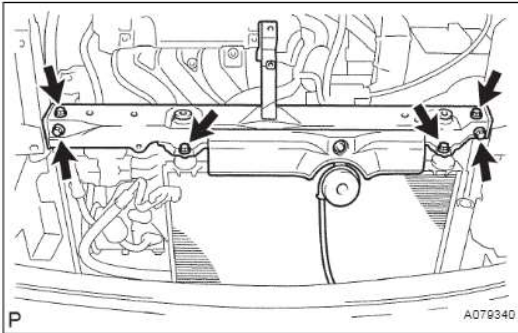
12. REMOVE HOOD LOCK SUPPORT BRACE
 - (a) Remove the 5 bolts and support brace.

CO-20

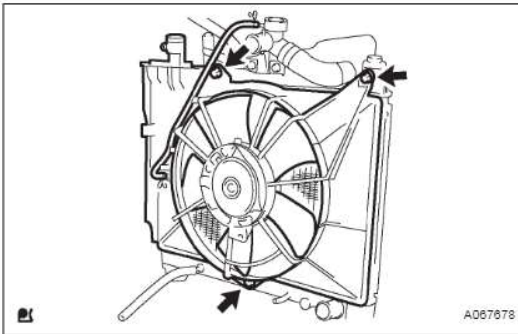
1NZ-FE COOLING – RADIATOR

**13. REMOVE RADIATOR SUPPORT OPENING COVER**

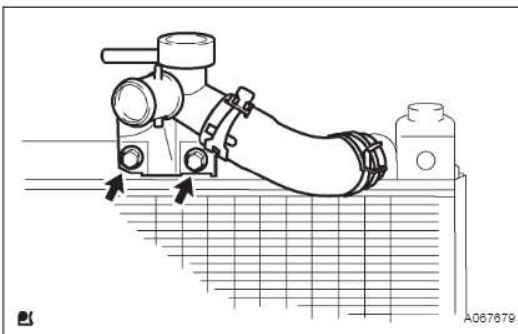
- (a) Remove the 2 clips and support opening cover.

**14. REMOVE RADIATOR SUPPORT SUB-ASSEMBLY UPPER**

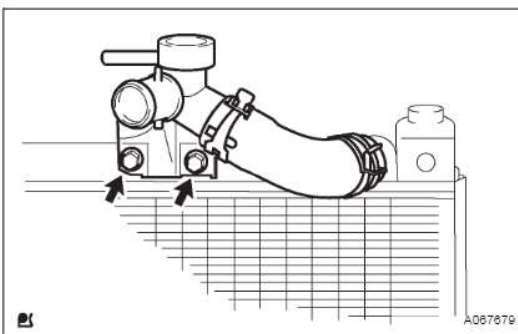
- (a) Disconnect the connector from the horn.
 (b) Remove the 2 bolts and disconnect the condenser from the radiator support upper.
 (c) Remove the 4 bolts and radiator support upper.

**15. REMOVE RADIATOR ASSEMBLY**

- (a) Disconnect the connector from the cooling fan motor and remove the radiator from the engine compartment.
 (b) Remove the 3 bolts and detach the fan shroud with fan.



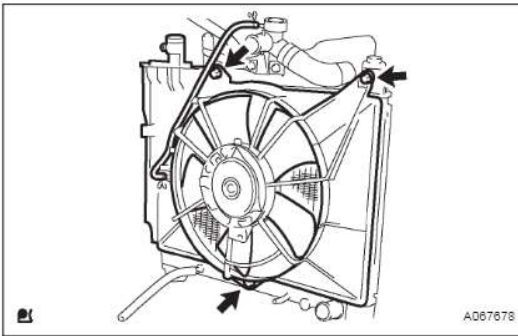
- (c) Remove the 2 bolts and water filler.
 (d) Remove the 2 radiator support cushions and radiator support lower.

**INSTALLATION****1. INSTALL RADIATOR ASSEMBLY**

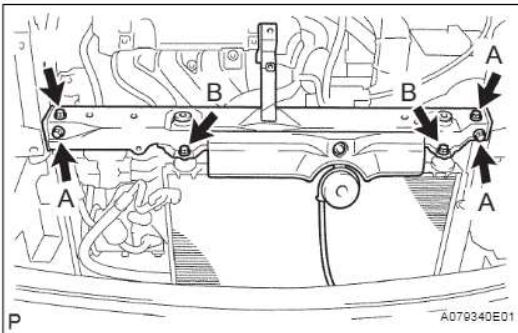
- (a) Install the 2 radiator support cushions and radiator support lower onto the radiator.
 (b) Install the water filler with the 2 bolts.
Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

1NZ-FE COOLING – RADIATOR

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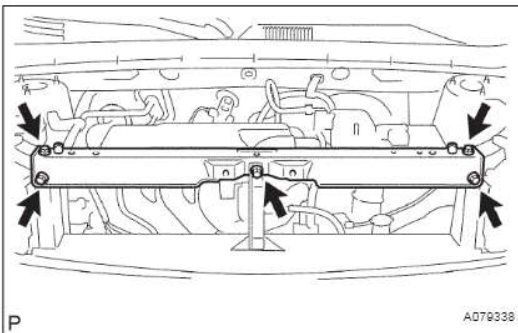


- (c) Install the fan shroud with fan with the 3 bolts.
Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)
- (d) Install the radiator, and connect the connector to the cooling fan motor.



2. INSTALL RADIATOR SUPPORT SUB-ASSEMBLY UPPER

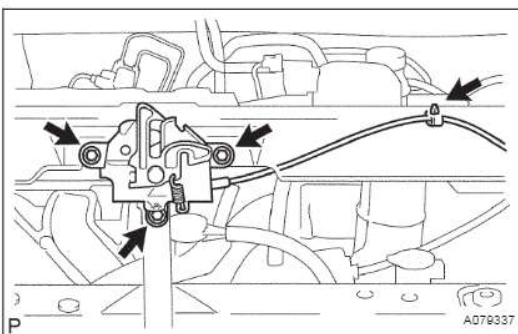
- (a) Install the radiator support upper with the 4 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf) for bolt A
- (b) Install the condenser to the radiator support upper with the 2 bolts.
Torque: 9.8 N*m (100 kgf*cm, 7.2 ft.*lbf) for bolt B
- (c) Connect the connector to the horn.



3. INSTALL RADIATOR SUPPORT OPENING COVER

4. INSTALL HOOD LOCK SUPPORT BRACE

- (a) Install the support brace with the 5 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)



5. INSTALL HOOD LOCK ASSEMBLY

- (a) Temporarily install the hood lock with the 3 bolts and clip.

6. ADJUST HOOD LOCK ASSEMBLY

7. INSTALL FRONT BUMPER COVER (See page ET-4)

8. INSTALL FRONT FENDER LINER LH (See page ET-4)

9. INSTALL FRONT FENDER LINER RH (See page ET-4)

10. INSTALL RADIATOR GRILLE (See page ET-4)

11. CONNECT OIL COOLER OUTLET HOSE (for Automatic Transaxle)

12. CONNECT OIL COOLER INLET HOSE (for Automatic Transaxle)

13. CONNECT RADIATOR HOSE OUTLET

14. CONNECT RADIATOR HOSE INLET

15. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

16. ADD ENGINE COOLANT (See page CO-5)

CO

CO-22**1NZ-FE COOLING – RADIATOR**

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

CO

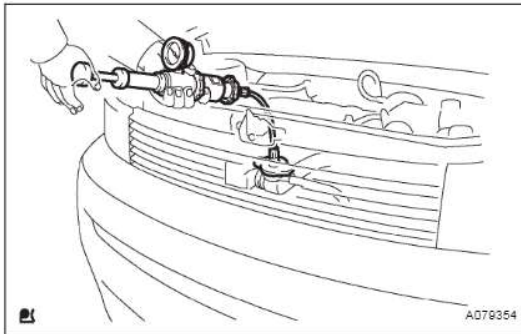
COOLING SYSTEM

ON-VEHICLE INSPECTION

1. CHECK 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.



- (a) Fill the radiator with coolant and attach a radiator cap tester.
- (b) Warm up the engine.
- (c) Using a radiator cap tester, increase the pressure inside the radiator to 137 kPa (1.4 kgf/cm², 19.9 psi), and check that the pressure does not drop. If the pressure drops, check the hoses, radiator and water pump for leaks. If no external leaks are found, check the cylinder block and head.

2. CHECK ENGINE COOLANT LEVEL IN RESERVOIR

- (a) The engine coolant 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 (SLLC) or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, non-borate coolant with long-life hybrid organic acid technology up to the full line.

NOTICE:

Never use water as a substitute for engine coolant.

3. CHECK ENGINE COOLANT QUALITY

- (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) Check if there are excessive deposits of rust or scale around the radiator cap and radiator filler hole. Also, the coolant should be free of oil. If excessively dirty, replace the coolant.
- (c) Install the radiator cap.

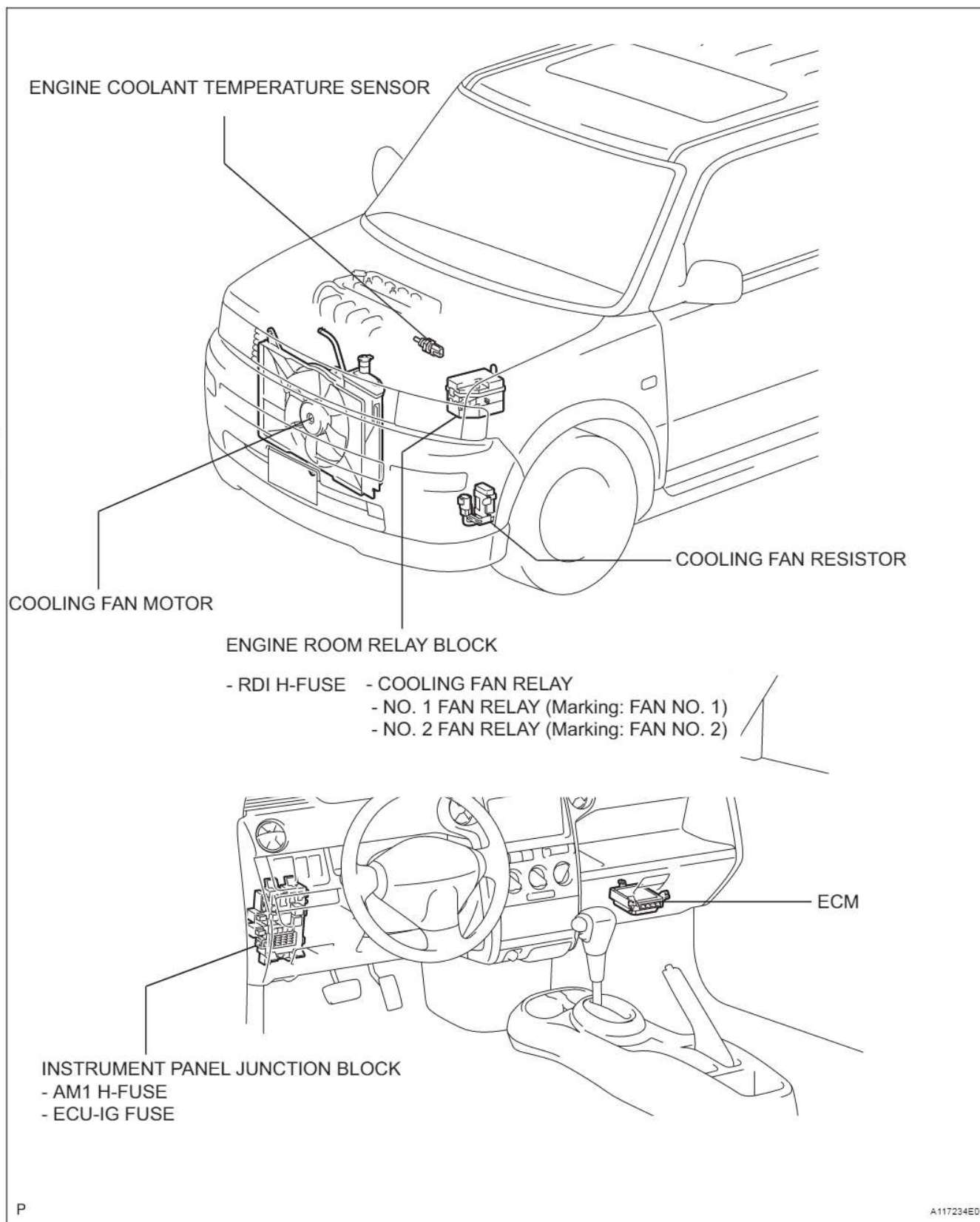
CO

CO-2

1NZ-FE COOLING - COOLING FAN SYSTEM

COOLING FAN SYSTEM

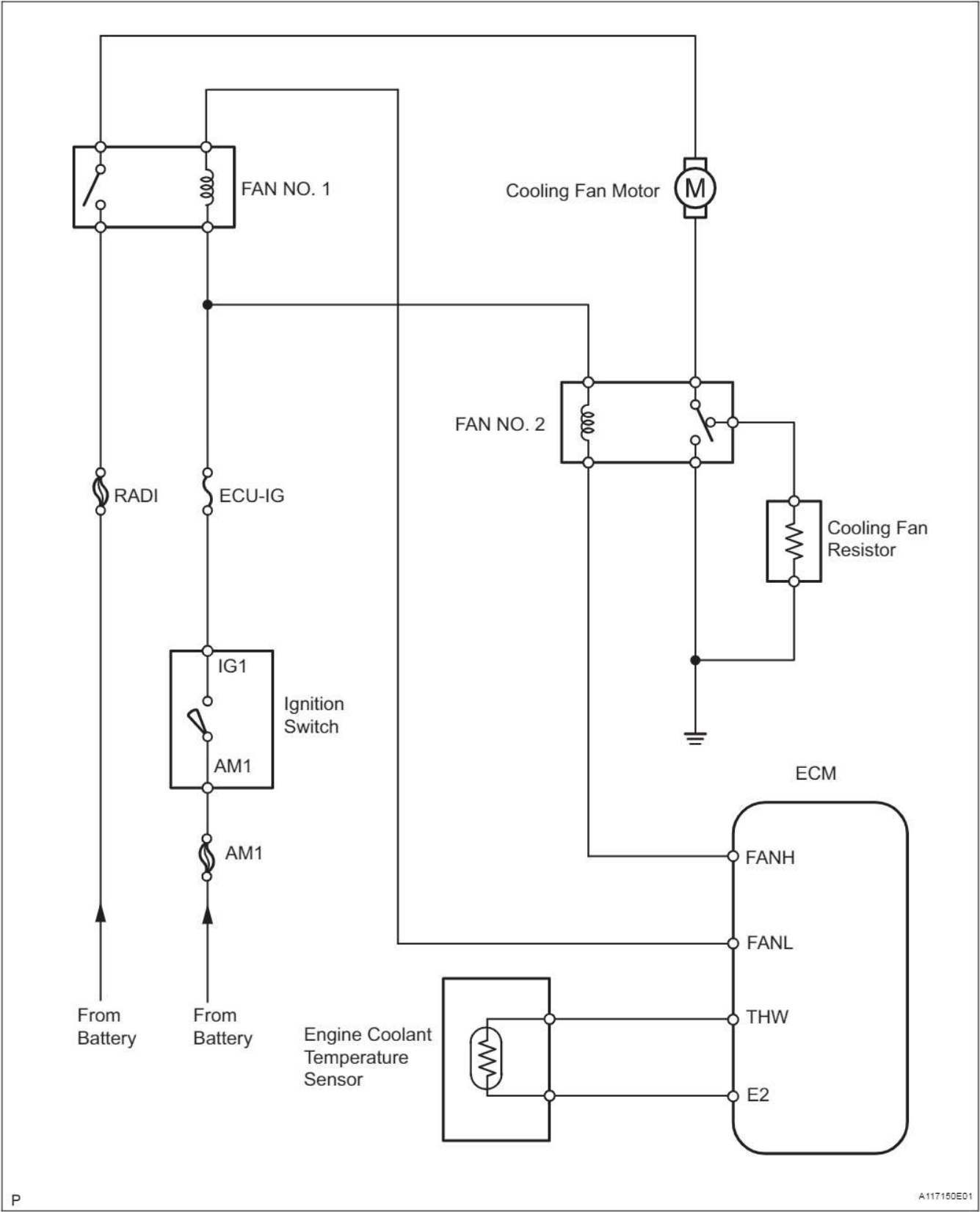
PARTS LOCATION



1NZ-FE COOLING – COOLING FAN SYSTEM

CO-3

SYSTEM DIAGRAM



CO

COOLANT

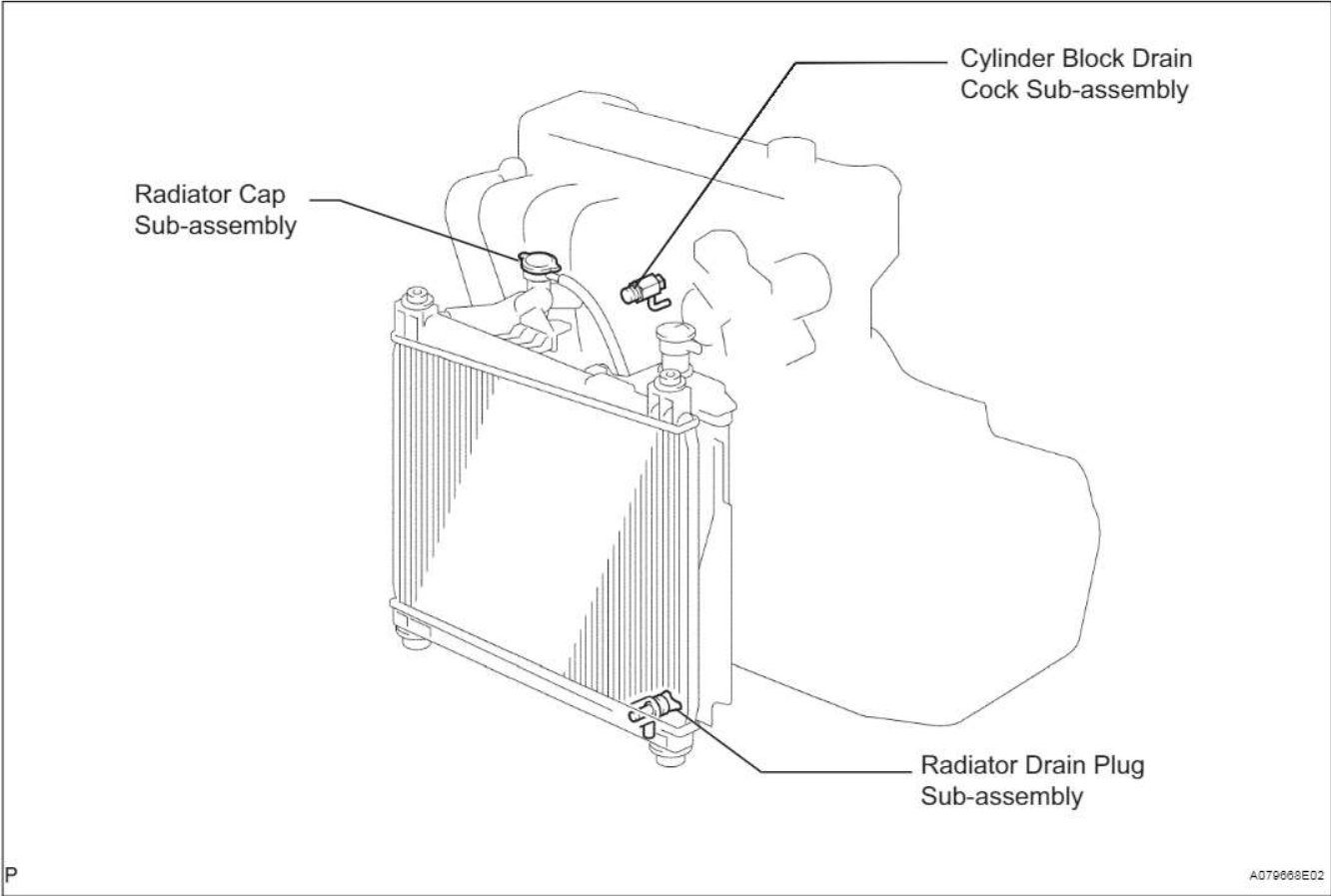
ON-VEHICLE INSPECTION

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.

1. DRAIN ENGINE COOLANT
- (a) Loosen the radiator drain plug.

(b) Remove the radiator cap and drain the coolant.

(c) Loosen the cylinder block drain cock.
- HINT:
Dispose of the coolant according to the regulations in your area.



2. ADD ENGINE COOLANT
- (a) Tighten all the plugs and fill the radiator with TOYOTA Super Long Life Coolant (SLLC).
Torque: 13 N*m (129 kgf*cm, 9.4 ft.*lbf)
Standard capacity

Item	Specified Condition
M/T	4.4 liters (4.6 US qts, 3.9 Imp. qts)
A/T	4.3 liters (4.5 US qts, 3.8 Imp. qts)

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1NZ-FE COOLING – COOLANT

- (b) Fill the radiator reservoir with TOYOTA Super Long Life Coolant (SLLC) to the full line.

HINT:

- The use of improper coolant may damage the engine cooling system.
- Only 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 (coolant with long-life hybrid organic acid technology consists of a combination of low phosphates and organic acids).
- 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.

NOTICE:

Never use water as a substitute for engine coolant.

- (c) 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.
- (d) Install the radiator cap securely.
- (e) Slowly pour coolant into the radiator reservoir until it reaches the full line.
- (f) Warm up the engine until the cooling fan operates.
(1) Set the air conditioning as follows while warming up the engine.

Manual air conditioning system	Automatic air conditioning system
Fan speed - Any setting except OFF Temperature - Toward WARM Air conditioning switch - OFF	Fan speed - Any setting except OFF Temperature - To the highest temperature 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.
- (g) Press the inlet and outlet radiator hoses several times by hand while warming up the engine.
- NOTICE:**
When pressing the radiator hoses:
- **Wear protective gloves.**
 - **Be careful as the radiator hoses are hot.**
 - **Keep your hands away from the radiator fan.**
- (h) Stop the engine and wait until the coolant cools down.
- (i) Remove the radiator cap and check the coolant level inside the radiator.
- (j) Check the coolant level in the radiator reservoir.
If the coolant level is low, add SLLC to the reservoir full line.

1NZ-FE COOLING – COOLANT**CO-7****3. CHECK FOR ENGINE COOLANT LEAKS**

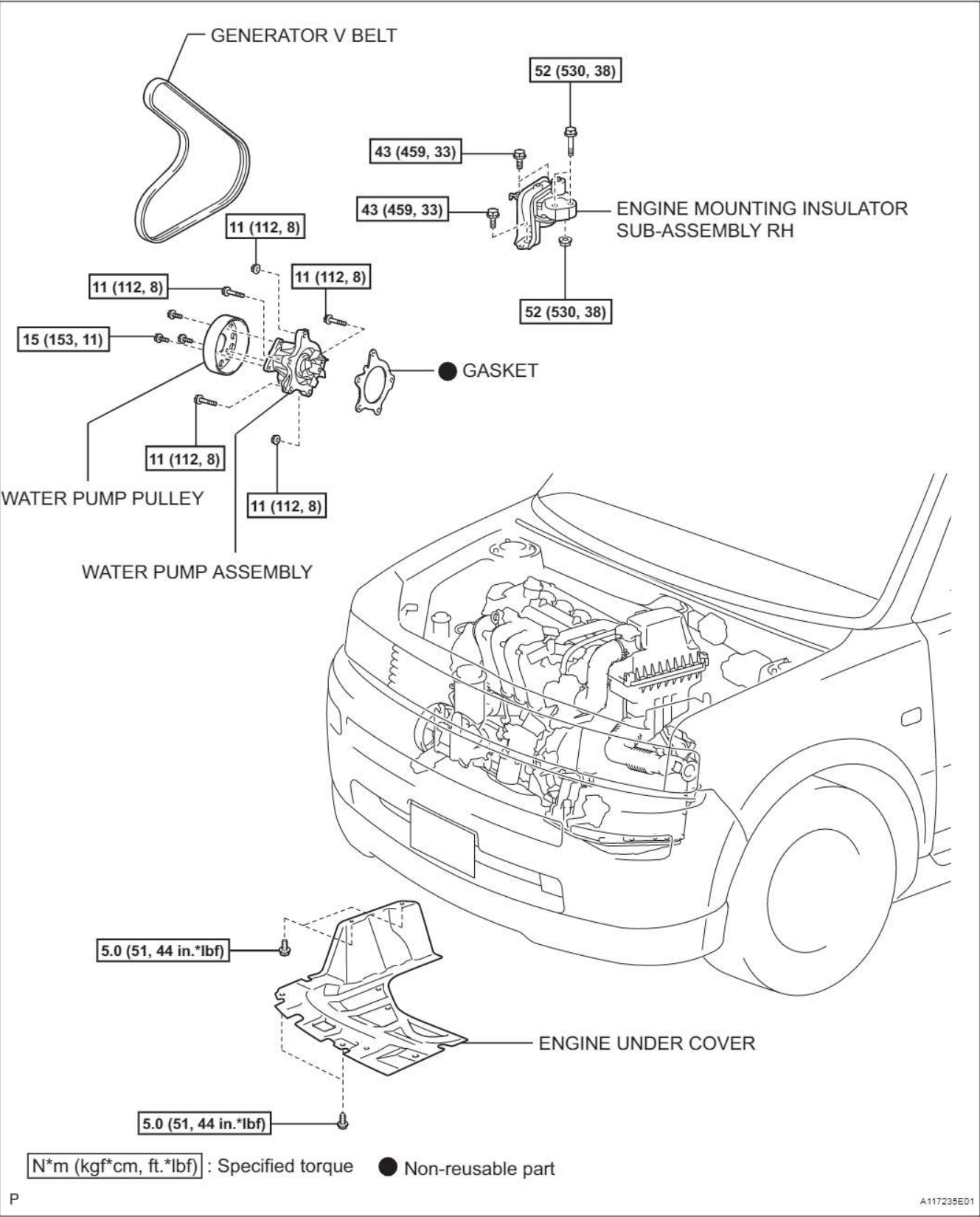
- (a) Fill the radiator with engine coolant and attach a radiator cap tester.
- (b) Pump the tester to 137 kPa (1.4 kgf/cm², 19.9 psi) and check for leakage.

CO

CO-8

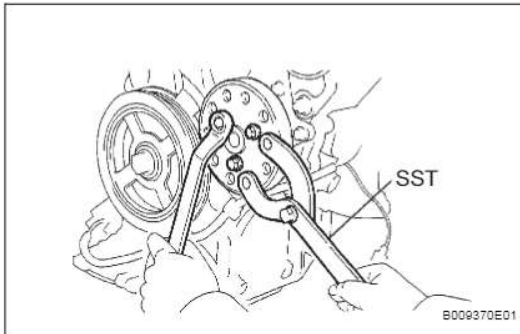
1NZ-FE COOLING – WATER PUMP

WATER PUMP
COMPONENTS

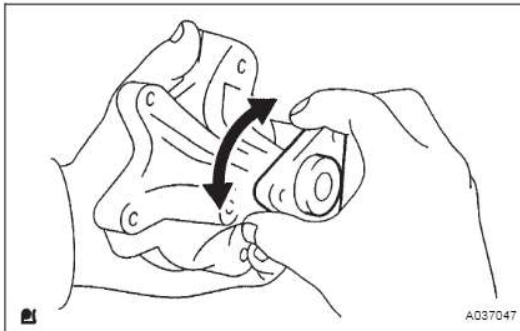
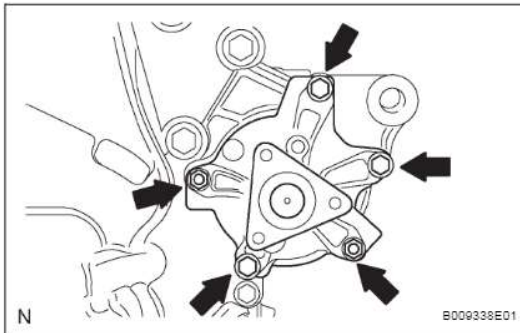


REMOVAL

1. DRAIN ENGINE COOLANT (See page [CO-5](#))
2. REMOVE ENGINE UNDER COVER RH
3. REMOVE GENERATOR V BELT (See page [EM-7](#))
4. REMOVE ENGINE MOUNTING INSULATOR SUB-ASSEMBLY RH (See page [EM-27](#))
5. REMOVE WATER PUMP PULLEY
 - (a) Using SST, hold the pump pulley.
SST 09960-10010 (09962-01000, 09963-00600)
 - (b) Remove the 3 bolts and pump pulley.



6. REMOVE WATER PUMP ASSEMBLY
 - (a) Remove the 3 bolts and 2 nuts.
 - (b) Remove the water pump and gasket.

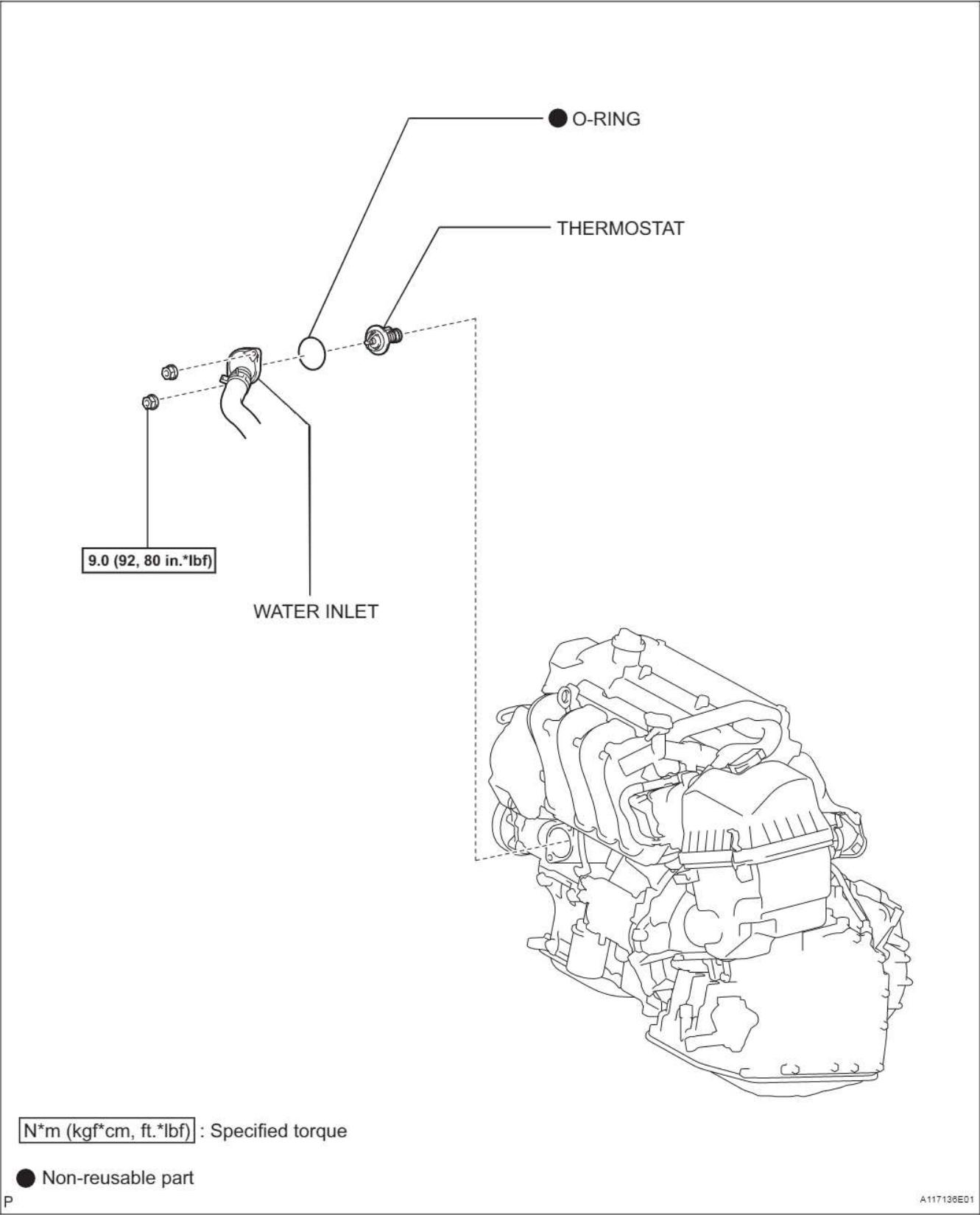


INSPECTION

1. INSPECT WATER PUMP ASSEMBLY
 - (a) Visually check the water hole and air hole for coolant leakage.
If leakage is found, replace the water pump assembly.
 - (b) Turn the pulley, and check that the pump bearing moves smoothly and quietly.
If it moves roughly or noisily, replace the water pump assembly.

CO

THERMOSTAT COMPONENTS



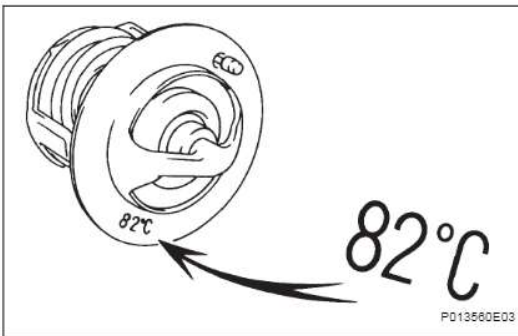
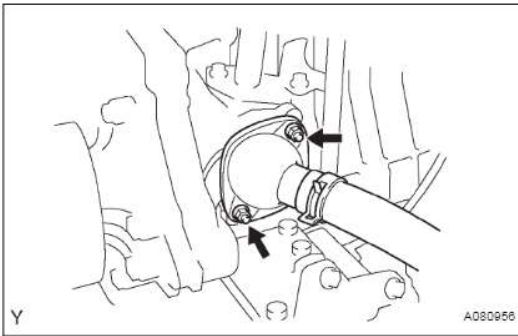
CO

CO-12

1NZ-FE COOLING – THERMOSTAT

REMOVAL

1. DRAIN ENGINE COOLANT (See page CO-5)
2. REMOVE WATER INLET
 - (a) Remove the 2 nuts and disconnect the water inlet from the cylinder block.
3. REMOVE THERMOSTAT

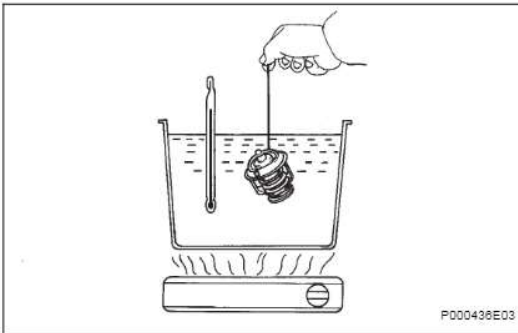


INSPECTION

1. INSPECT THERMOSTAT

HINT:

The valve opening temperature is inscribed on the thermostat.

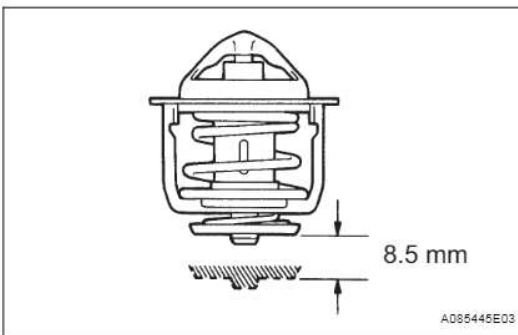


- (a) Immerse the thermostat in the water and then gradually heat the water.
- (b) Check the valve opening temperature of the thermostat.

Standard 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.

Standard valve lift:

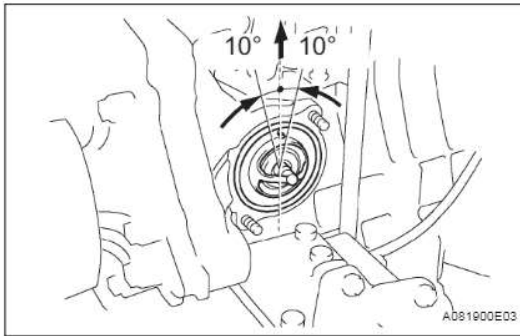
8.5 mm (0.33 in.) or more at 95°C (203°F)

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

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

1NZ-FE COOLING – THERMOSTAT

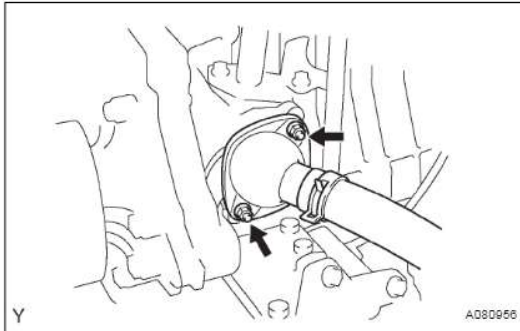
CO-13

**INSTALLATION****1. INSTALL THERMOSTAT**

- (a) Install a new gasket onto the thermostat.
- (b) Install the thermostat with the jiggle valve facing upward.

HINT:

The jiggle valve may be set within 10° of either side as shown in the illustration.

**2. INSTALL WATER INLET**

- (a) Install the water inlet to the cylinder block with the 2 nuts.

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

NOTICE:

Ensure that the gasket is not stuck between the water inlet and cylinder block.

3. ADD ENGINE COOLANT (See page [CO-5](#))**4. CHECK FOR ENGINE COOLANT LEAKS (See page [CO-7](#))****CO**

COOLING FAN RELAY

ON-VEHICLE INSPECTION

1. REMOVE ENGINE ROOM RELAY BLOCK COVER
2. INSPECT NO. 1 FAN RELAY (Marking: FAN NO. 1)

(a) Remove the relay from the engine room relay block.
(b) Measure the resistance between the terminals 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.

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

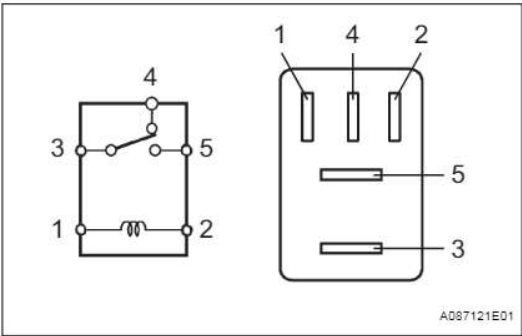
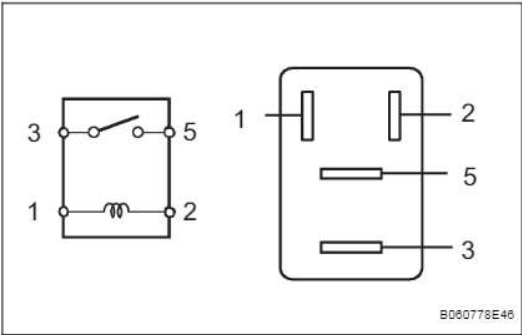
(a) Remove the relay from the engine room relay block.
(b) Measure the resistance between each terminal of the relay.

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.

4. INSTALL ENGINE ROOM RELAY BLOCK COVER



COOLING FAN RESISTOR

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 COOLING FAN RESISTOR

3. INSPECT COOLING FAN RESISTOR

(a) Measure the resistance between the terminals.

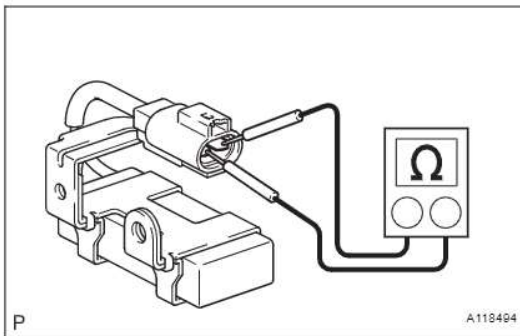
Standard resistance:

1.17 to 1.43 Ω at 20°C (68°F)

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

4. INSTALL COOLING FAN RESISTOR

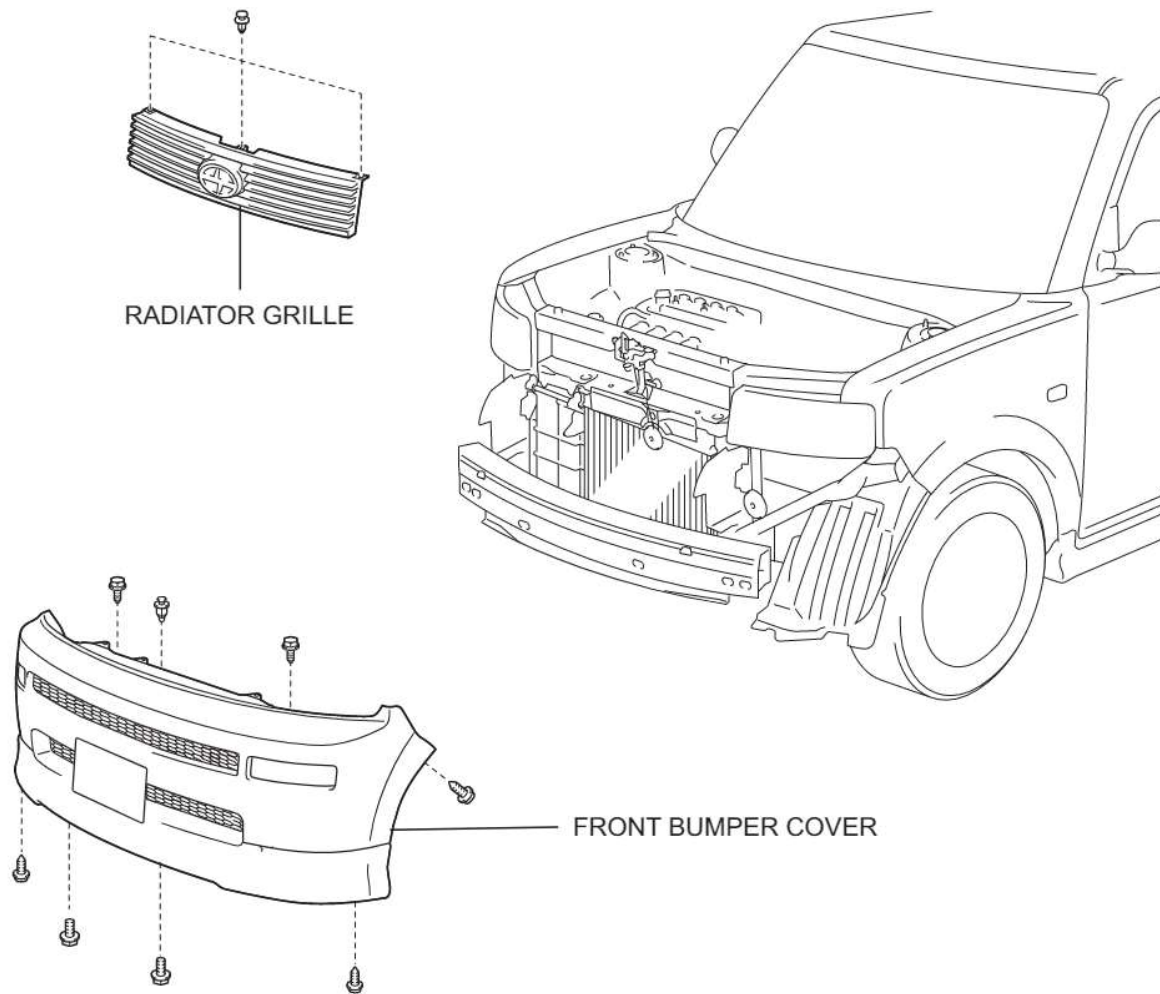
5. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

**CO**

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1NZ-FE COOLING – RADIATOR

RADIATOR COMPONENTS



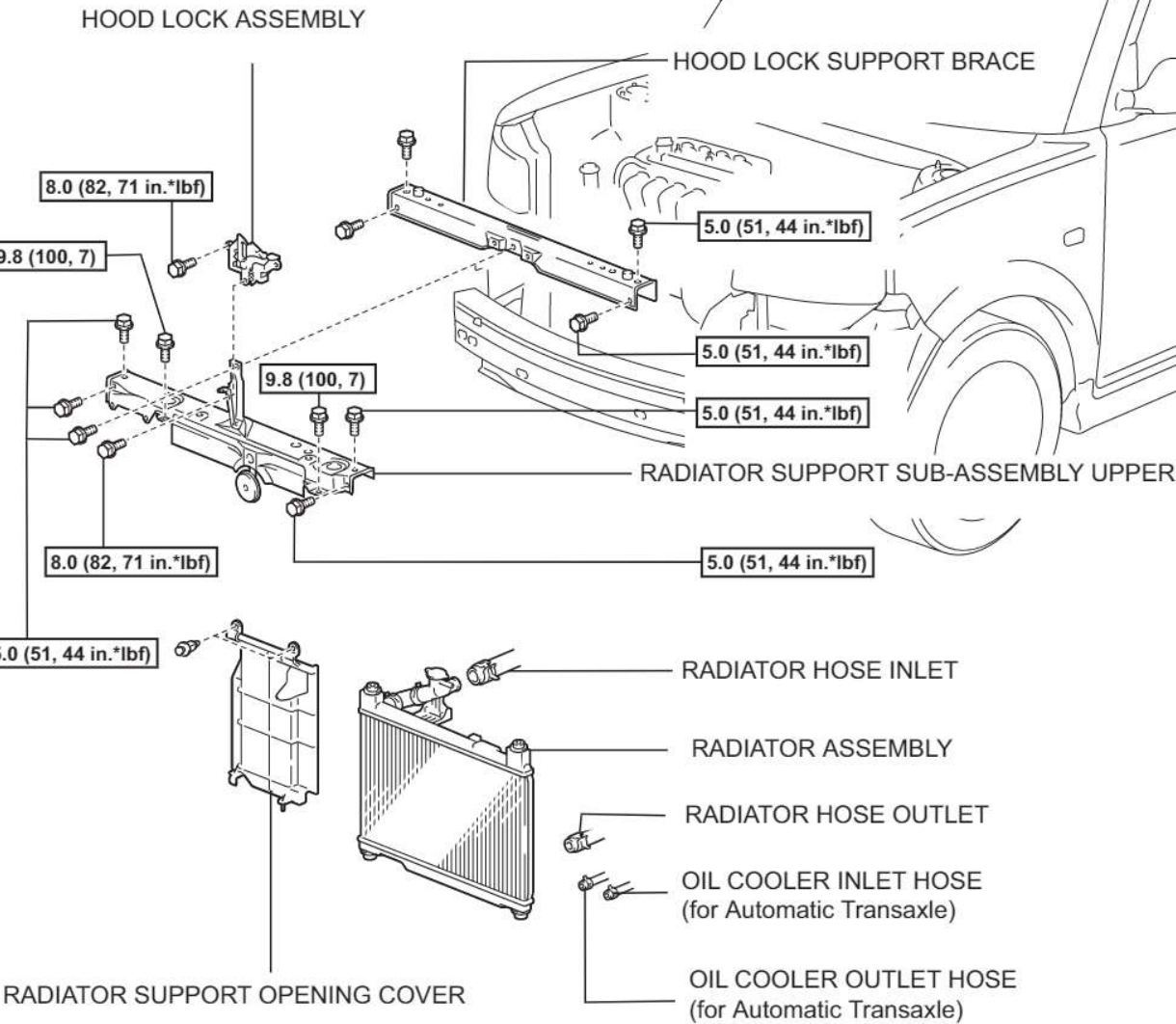
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1NZ-FE COOLING – RADIATOR

CO-17

CO



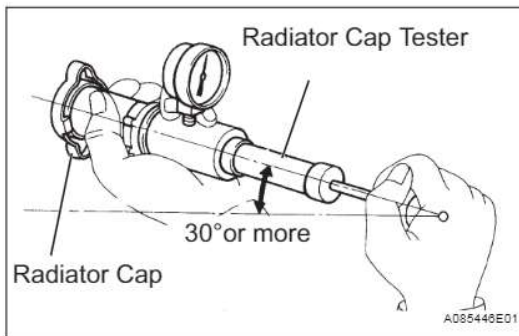
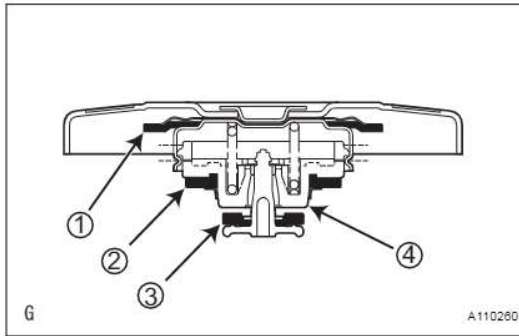
N*m (kgf*cm, ft.*lbf) : Specified torque

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1NZ-FE COOLING – RADIATOR



ON-VEHICLE INSPECTION

1. CHECK RADIATOR CAP SUB-ASSEMBLY

- (a) Measure the valve opening pressure.
 - (1) If there are water stains or foreign matter on rubber packing 1, 2 or 3, clean the part(s) with water and finger scouring.
 - (2) Check that 1, 2 or 3 is not deformed, cracked or swollen.
 - (3) Check that 3 and 4 are not stuck together.
 - (4) Apply engine coolant to 2 and 3 before using a radiator cap tester.
 - (5) Pump the cap tester several times, and check the maximum pressure*.

NOTICE:

When using the cap tester, keep the tester at an angle of 30° or more above horizontal.

Pumping speed:

1 pump per second

*: Even if the cap cannot maintain the maximum pressure, it is not a defect.

Judgment criterion

Item	Specified Condition
Standard value (for brand-new cap)	93.3 to 122.7 kPa (0.95 to 1.25 kgf/cm ² , 13.5 to 17.8 psi)
Minimum standard value (after using cap)	78.5 kPa (0.8 kgf/cm ² , 11.4 psi)

If the maximum pressure is less than the minimum standard value, replace the radiator cap sub-assembly.

ON-VEHICLE CLEANING

1. CHECK FINS FOR BLOCKAGE

- (a) Check that the radiator and condenser are not blocked with leaves, dirt, or insects. Clean the hose connections.
If the fins are blocked, wash them with water or a steam cleaner.

NOTICE:

- If the distance between the steam cleaner and core is too close, the fins may be damaged.
- Keep the following injection distance.

Standard injection distance

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

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

- (b) Dry the fins with compressed air.

