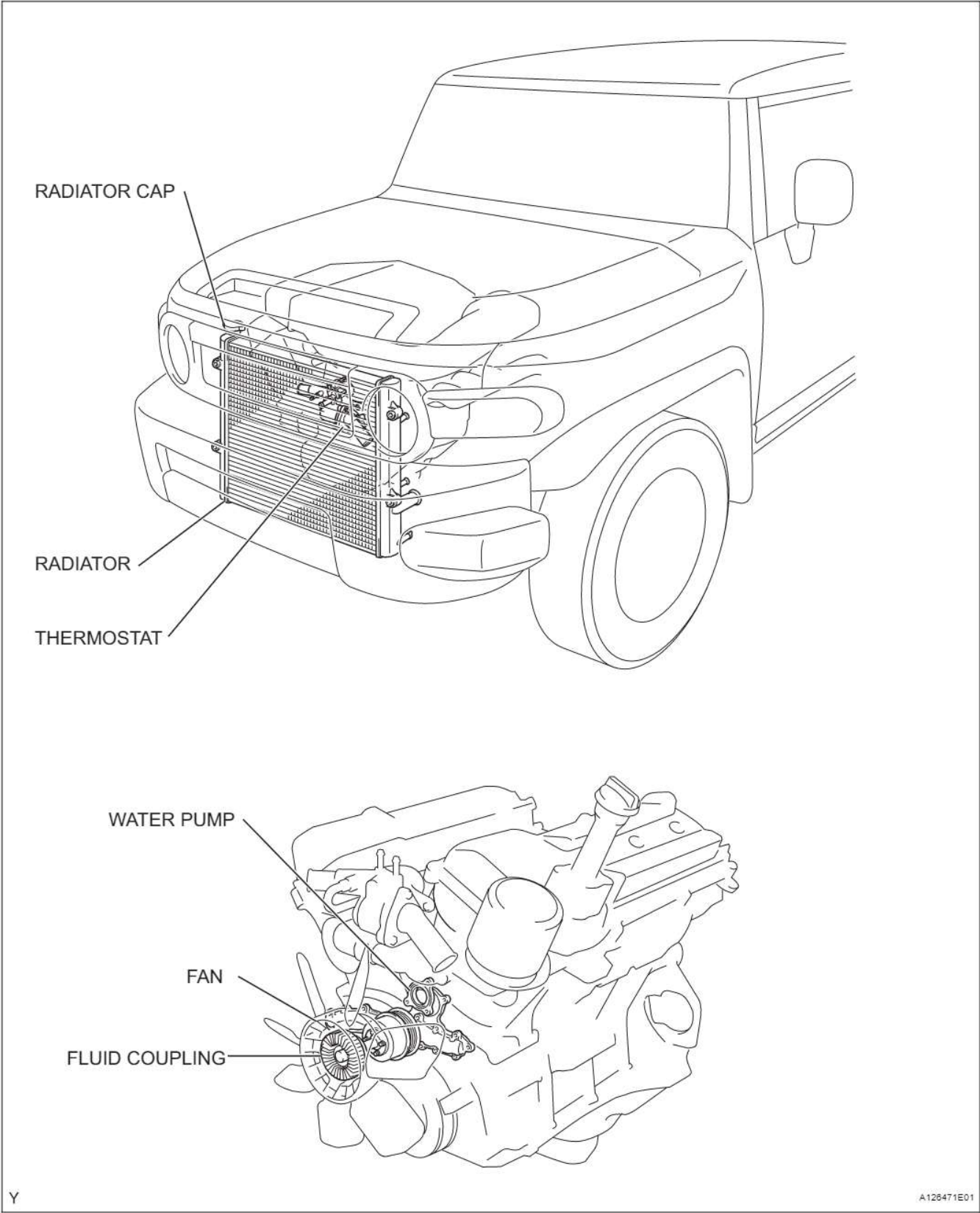


COOLING SYSTEM
PARTS LOCATION



CO

CO-2

1GR-FE COOLING – COOLING SYSTEM

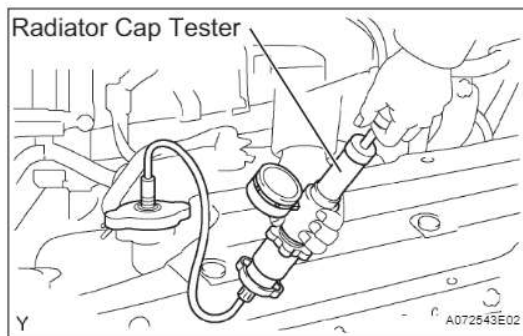
ON-VEHICLE INSPECTION

1. CHECK COOLING SYSTEM FOR LEAKAGE

- (a) Remove the radiator cap.

CAUTION:

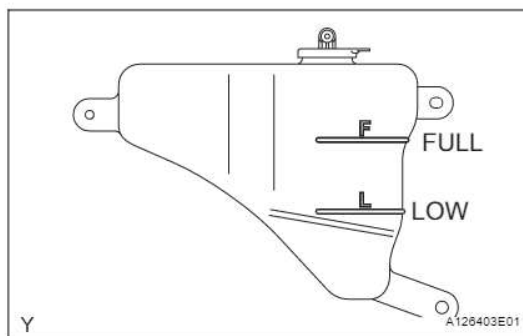
To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.



- (b) Fill the radiator with coolant and attach a radiator cap tester.
 (c) Warm up the engine.
 (d) Pump it to 118 kPa (1.2 kgf/cm², 17.1 psi), 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 leakage, check the heater core, cylinder block and head.
 (e) Reinstall the radiator cap.

2. CHECK 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.



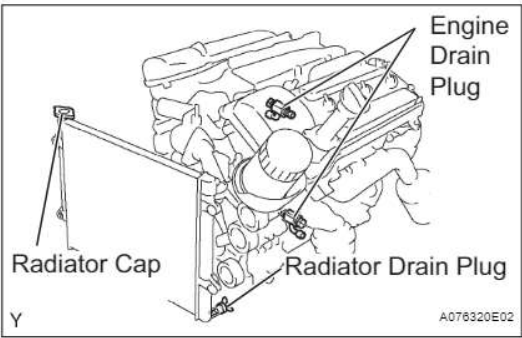
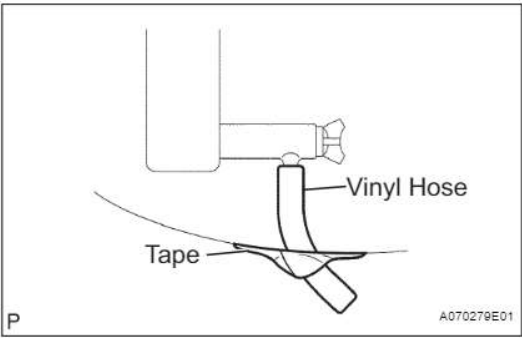
3. CHECK ENGINE COOLANT QUALITY

- (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.



COOLANT

REPLACEMENT

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.
- (a) Remove the service hole cover from the engine under cover.
 - (b) Install a vinyl hose onto the drain on the radiator side.
 - (c) Fix the vinyl hose with tape.
 - (d) Loosen the 3 drain plugs on the engine and radiator, and drain the coolant.
 - (e) Remove the radiator cap.
 - (f) Drain the coolant from the reservoir tank.
 - (g) Tighten the 3 drain plugs.
Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf) for the engine
 - (h) Remove the vinyl hose from the radiator.

2. ADD ENGINE COOLANT

- (a) Pour coolant into the radiator until it overflows.
Capacity

Transmission	Capacity
Manual Transmission	9.4 liters (9.9 Us qts, 8.3 Imp. qts)
Automatic Transmission	9.8 liters (10.4 Us qts, 8.6 Imp. qts)

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

- Use of improper coolants may damage the engine cooling system.
 - Use only TOYOTA SLLC 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 SLLC (color is pink, premixed ethylene glycol concentration is approximately 50 % and freezing temperature is -35°C (-31°F)). When replacing the coolant, TOYOTA SLLC is recommended.
- (b) Check the coolant level inside the radiator by squeezing the inlet and outlet radiator hoses several times by hand. If the coolant level goes down, add coolant.
 - (c) Install the radiator cap securely.

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

Item	Condition
Fan Speed	Any setting except OFF
Temperature	Toward WARM
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.

NOTICE:

 - **Make sure that the radiator reservoir still has some coolant in it.**
 - **Pay attention to the needle of the water temperature meter. Make sure that the needle does not show an abnormally high temperature.**
 - **If there is not enough coolant, the engine may burn out or overheat.**

- (f) Squeeze the inlet and outlet radiator hoses several times by hand while warming up the engine to bleed the air.

CAUTION:

When pressing the radiator hoses:

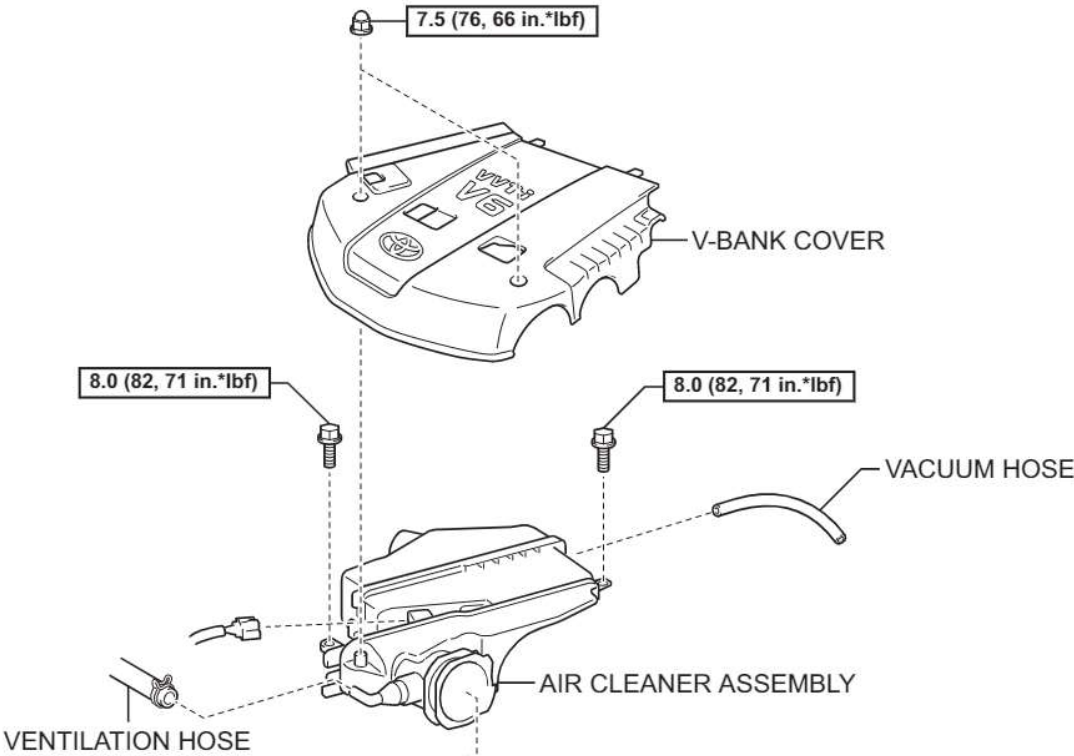
- **Wear protective gloves.**
- **Be careful as the radiator hoses are hot.**
- **Keep your hands away from the fan.**
- (g) Stop the engine and wait until the coolant cools down.
- (h) Remove the radiator cap and check the coolant level inside the radiator.
- (i) If the coolant level is below the full level, repeat the operation until the coolant level remains at the full level.
- (j) Check the coolant level inside the radiator reservoir tank again. If it is below the full level, add coolant.

3. CHECK FOR ENGINE COOLANT LEAKAGE

- (a) Fill the radiator with coolant and attach a radiator cap tester.
- (b) Pump it to 177 kPa (1.8 kgf/cm² 25.7 psi), then check for leakage.

CO

WATER PUMP
COMPONENTS



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

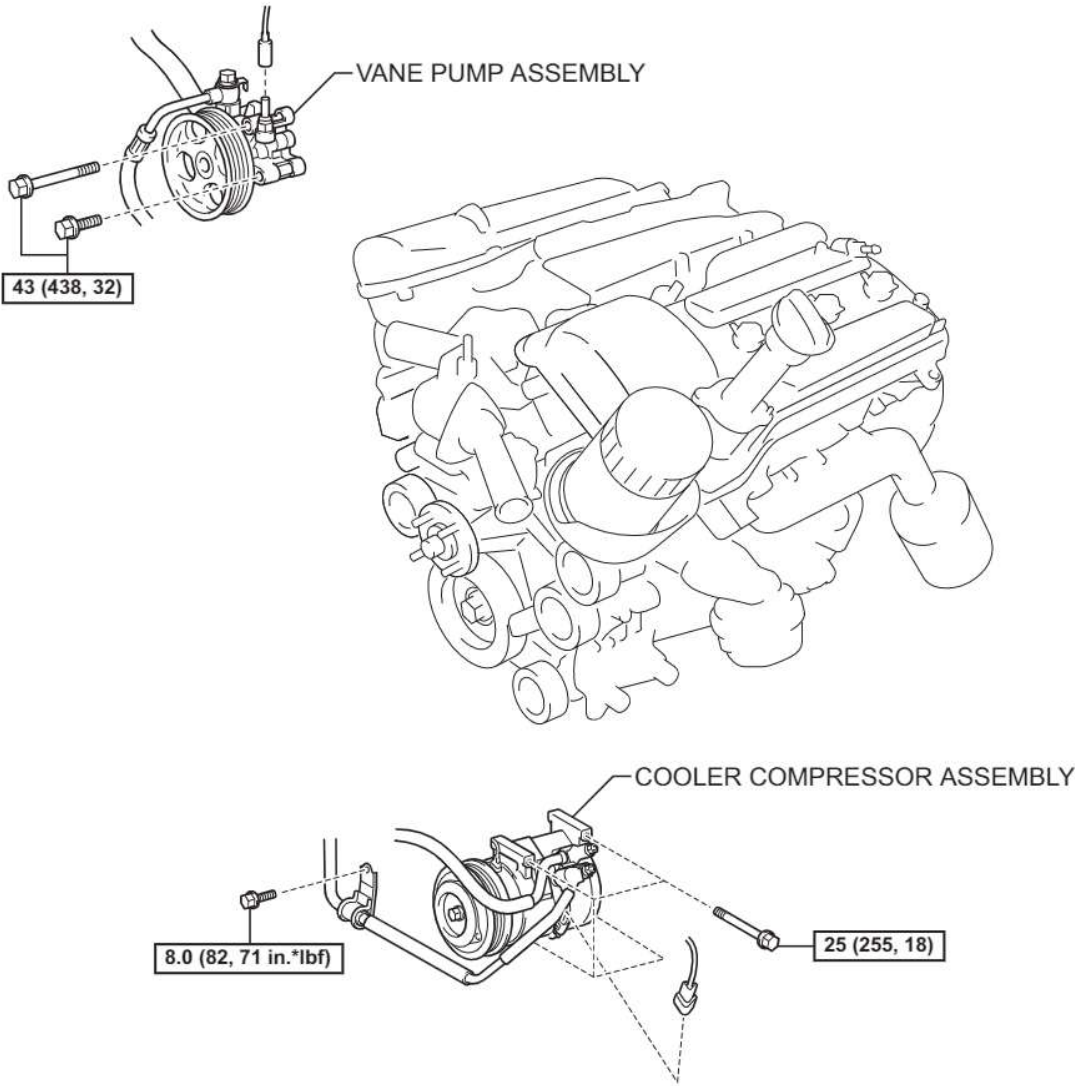
CO

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CO-6

1GR-FE COOLING – WATER PUMP



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

● Non-reusable part

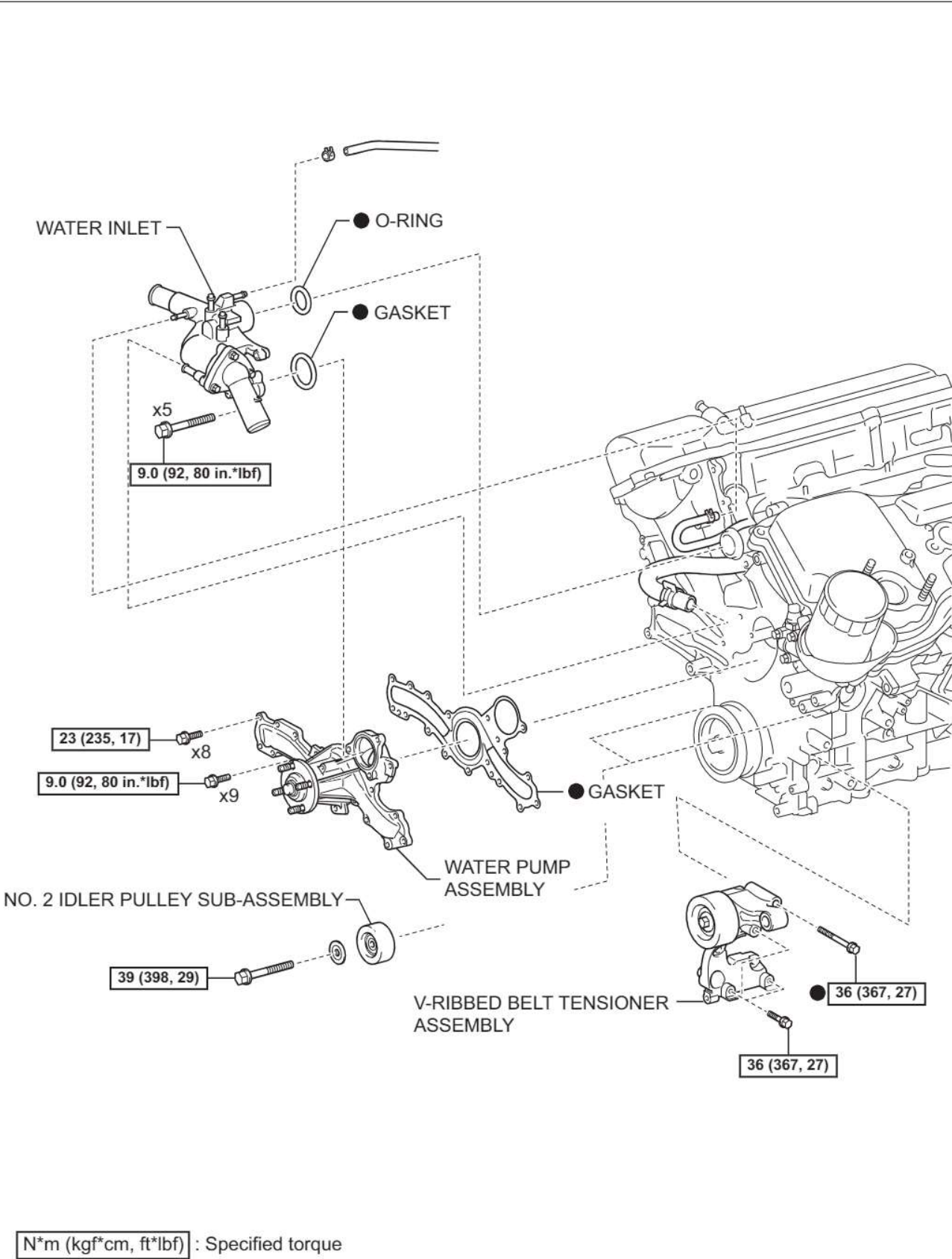
Y

A126421E02

1GR-FE COOLING – WATER PUMP

CO-7

CO



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

● Non-reusable part

Y

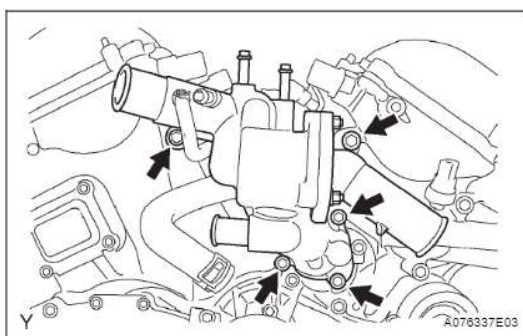
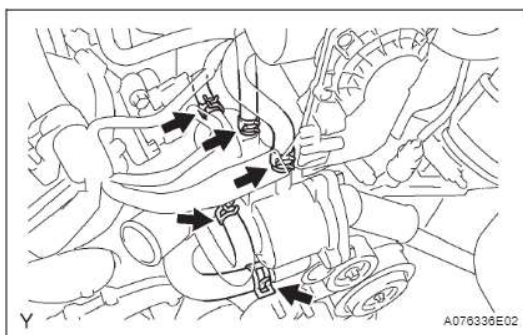
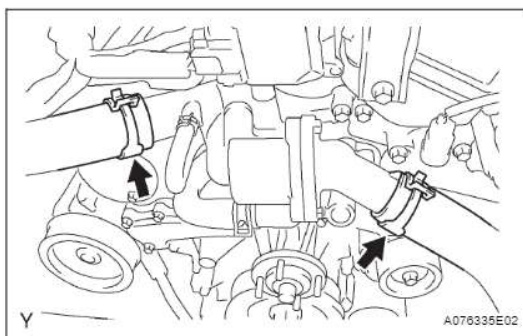
A126419E01

CO-8

1GR-FE COOLING – WATER PUMP

REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **REMOVE FAN**
Refer to the procedures up to "REMOVE FAN" (See page [CO-17](#)).
3. **REMOVE V-BANK COVER** (See page [ES-428](#))
4. **REMOVE AIR CLEANER ASSEMBLY** (See page [ES-429](#))
5. **REMOVE GENERATOR ASSEMBLY**
Refer to the procedures up to "REMOVE GENERATOR ASSEMBLY" (See page [CH-9](#))
6. **REMOVE WATER INLET**
 - (a) Disconnect the 2 radiator hoses.



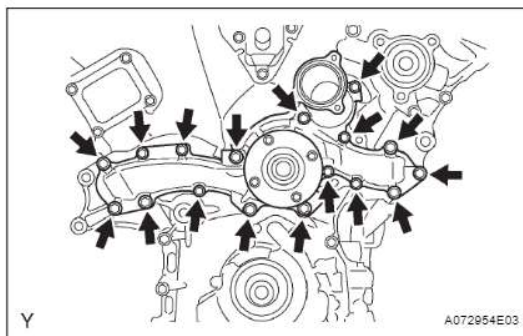
(b) Disconnect the 5 water by-pass hoses.

- (c) Remove the 5 bolts and water inlet.
- (d) Remove the O-ring from the water outlet pipe.
- (e) Remove the gasket from the water pump.

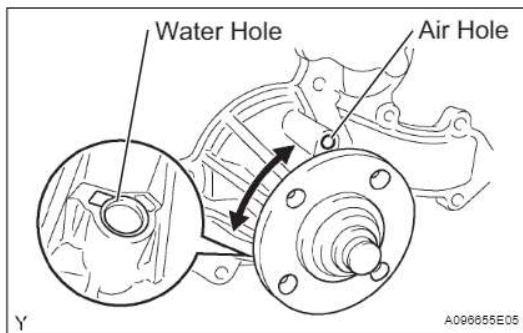
7. **REMOVE NO. 2 IDLER PULLEY SUB-ASSEMBLY** (See page [EM-23](#))
8. **SEPARATE COOLER COMPRESSOR ASSEMBLY** (See page [ES-420](#))
9. **REMOVE V-RIBBED BELT TENSIONER ASSEMBLY** (See page [EM-22](#))
10. **SEPARATE VANE PUMP ASSEMBLY** (See page [EM-22](#))

1GR-FE COOLING – WATER PUMP

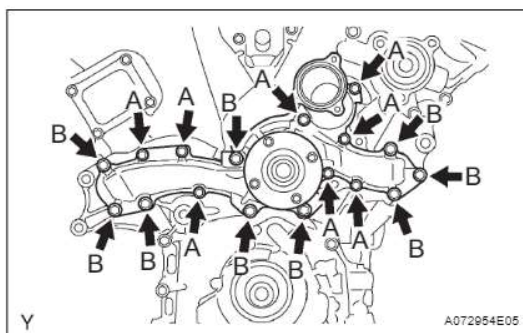
CO-9

**11. REMOVE WATER PUMP ASSEMBLY**

- (a) Remove the 17 bolts, then remove the water pump and gasket.

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

- (a) Visually check the water hole for coolant leakage. If leakage is found, replace the water pump assembly.
- (b) Turn the pulley and check that the water pump bearing moves smoothly and quietly. If necessary, replace the water pump assembly.

**INSTALLATION****1. INSTALL WATER PUMP ASSEMBLY**

- (a) Install a new gasket and the water pump with the 17 bolts.

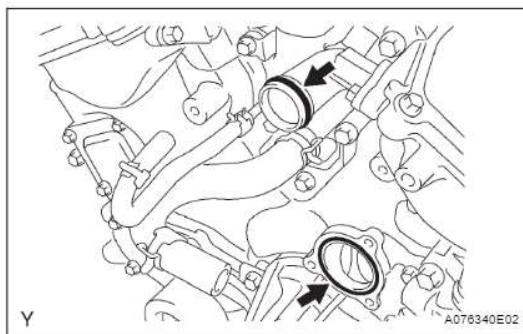
Torque: For Bolt A

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

For Bolt B

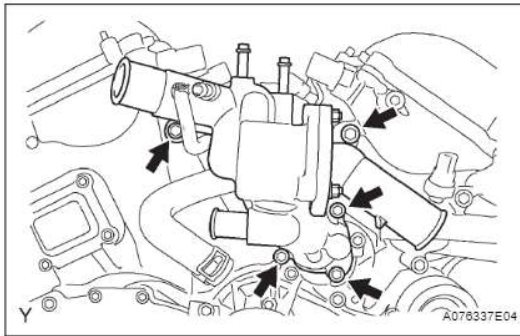
23 N*m (235 kgf*cm, 17 ft.*lbf)

2. INSTALL VANE PUMP ASSEMBLY (See page [EM-33](#))
3. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY (See page [EM-33](#))
4. INSTALL COOLER COMPRESSOR ASSEMBLY (See page [ES-421](#))
5. INSTALL NO. 2 IDLER PULLEY SUB-ASSEMBLY (See page [EM-33](#))
6. INSTALL WATER INLET

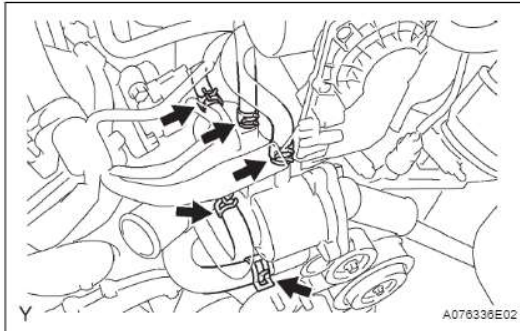
**CO**

CO-10

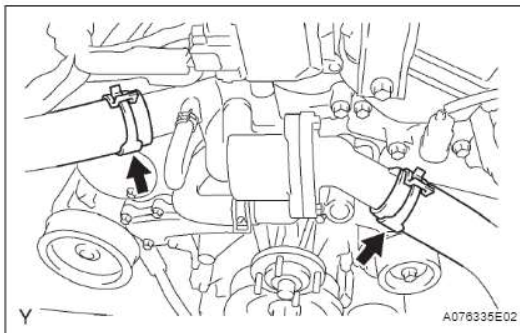
1GR-FE COOLING – WATER PUMP



- (d) Install the water inlet with the 5 bolts.
Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)



- (e) Connect the 5 water by-pass hoses.



- (f) Connect the 2 radiator hoses.

7. INSTALL GENERATOR ASSEMBLY

Refer to the procedures up to "INSTALL GENERATOR ASSEMBLY" (See page [CH-17](#))

8. INSTALL AIR CLEANER ASSEMBLY (See page [ES-431](#))

9. INSTALL FAN

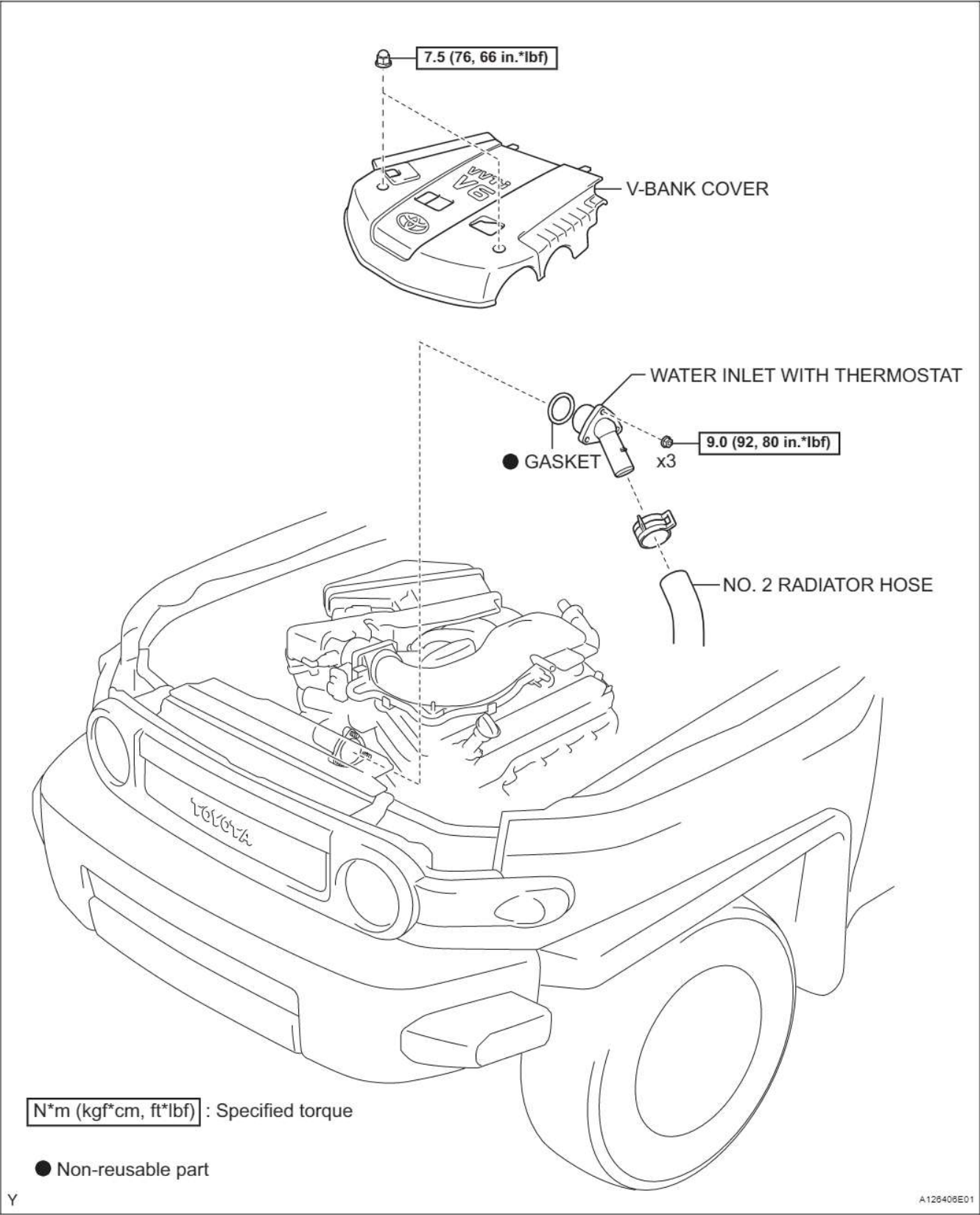
Refer to the procedures up to "INSTALL FAN" (See page [CO-17](#)).

10. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

11. INSTALL V-BANK COVER (See page [ES-431](#))

THERMOSTAT
COMPONENTS



CO

CO-12

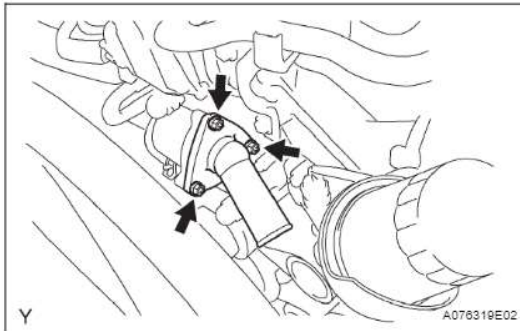
1GR-FE COOLING – THERMOSTAT

REMOVAL

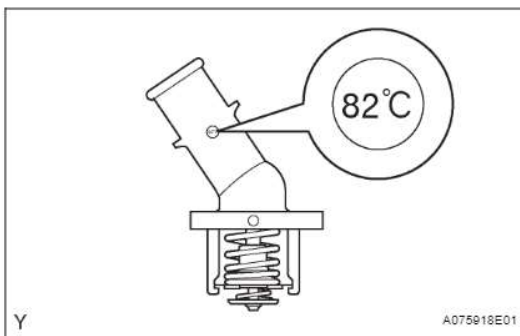
HINT:

If the thermostat is not installed, cooling efficiency will be reduced. Do not remove the thermostat, to prevent the engine from overheating.

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **DRAIN ENGINE COOLANT** (See page [CO-3](#))
3. **REMOVE V-BANK COVER** (See page [ES-428](#))
4. **REMOVE NO. 2 RADIATOR HOSE**
5. **REMOVE WATER INLET WITH THERMOSTAT**
 - (a) Remove the 3 nuts, then remove the water inlet with thermostat and gasket.



CO

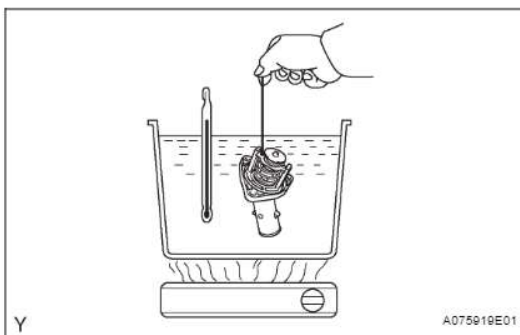


INSPECTION

1. **INSPECT WATER INLET WITH THERMOSTAT**

HINT:

The valve opening temperature is inscribed on the thermostat.



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

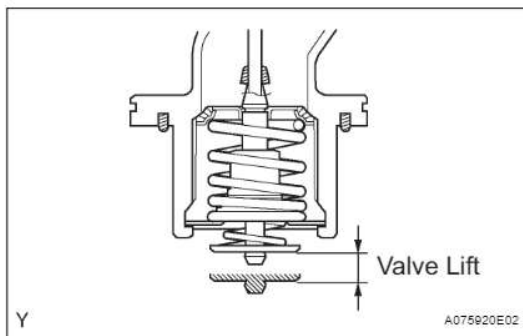
Valve opening temperature:

80 to 84°C (176 to 183°F)

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

1GR-FE COOLING – THERMOSTAT

CO-13



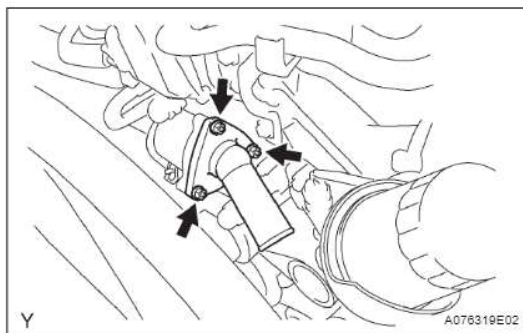
- (c) Check the valve lift.

Valve lift:

8.0 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 temperatures (below 77°C (171°F)).
If not fully closed, replace the thermostat.

**INSTALLATION****1. INSTALL WATER INLET WITH THERMOSTAT**

- (a) Install a new gasket onto the water inlet with thermostat.
(b) Install the water inlet with thermostat with the 3 nuts.
Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)

2. CONNECT NO. 2 RADIATOR HOSE**3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

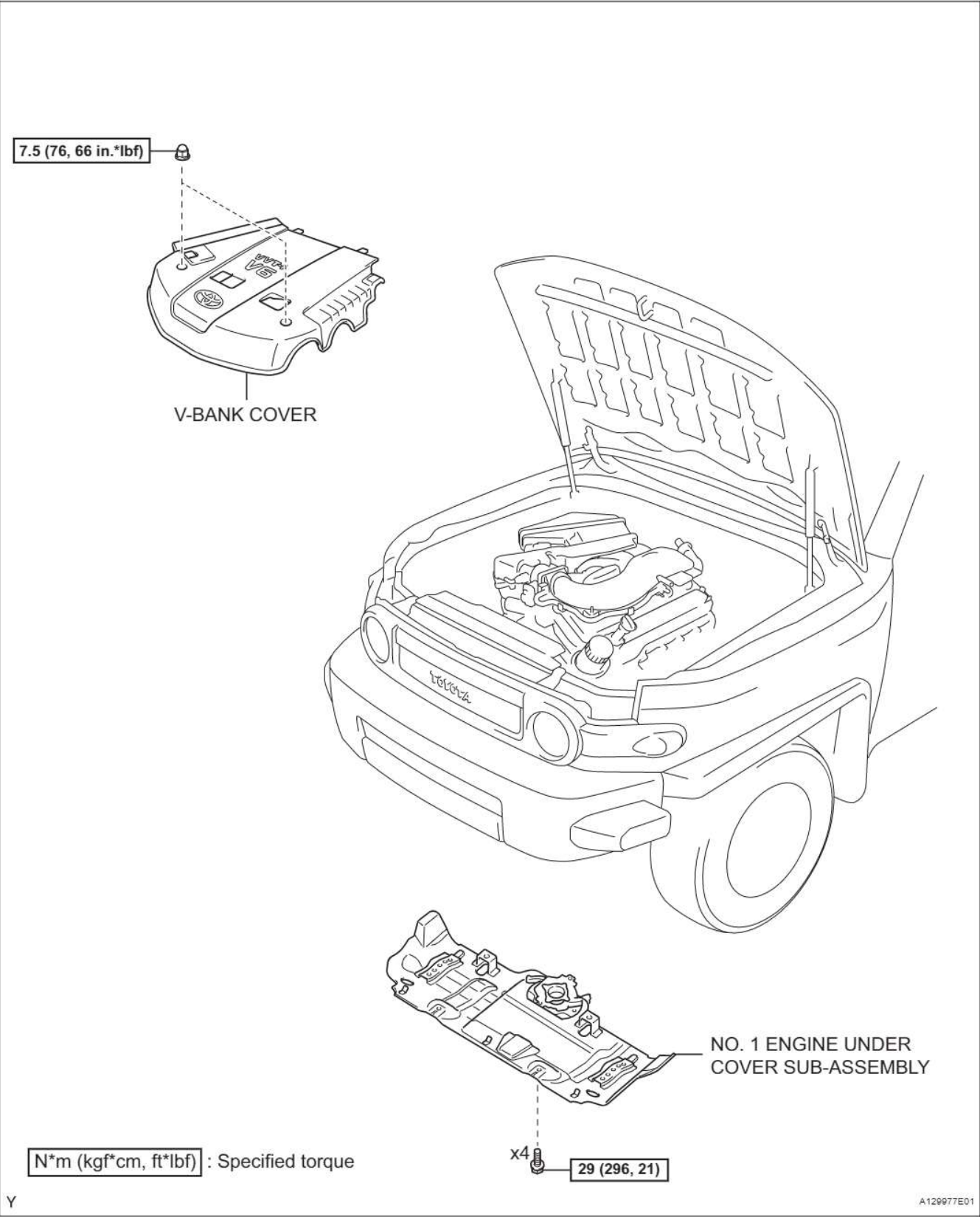
Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

4. ADD ENGINE COOLANT (See page [CO-3](#))**5. CHECK FOR ENGINE COOLANT LEAKAGE (See page [CO-4](#))****6. INSTALL V-BANK COVER (See page [ES-431](#))****CO**

CO-14

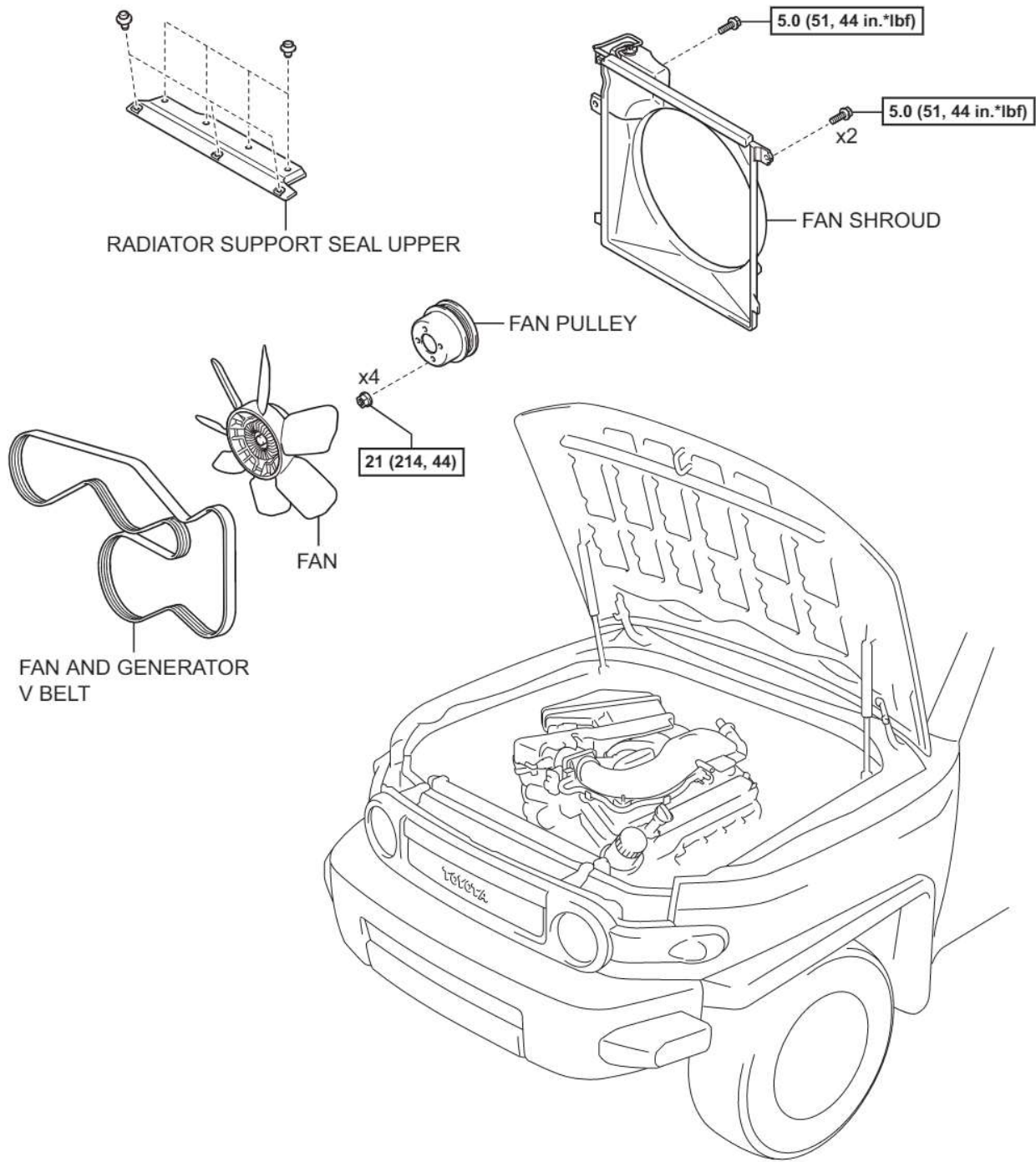
1GR-FE COOLING – FAN

FAN
COMPONENTS



1GR-FE COOLING – FAN

CO-15

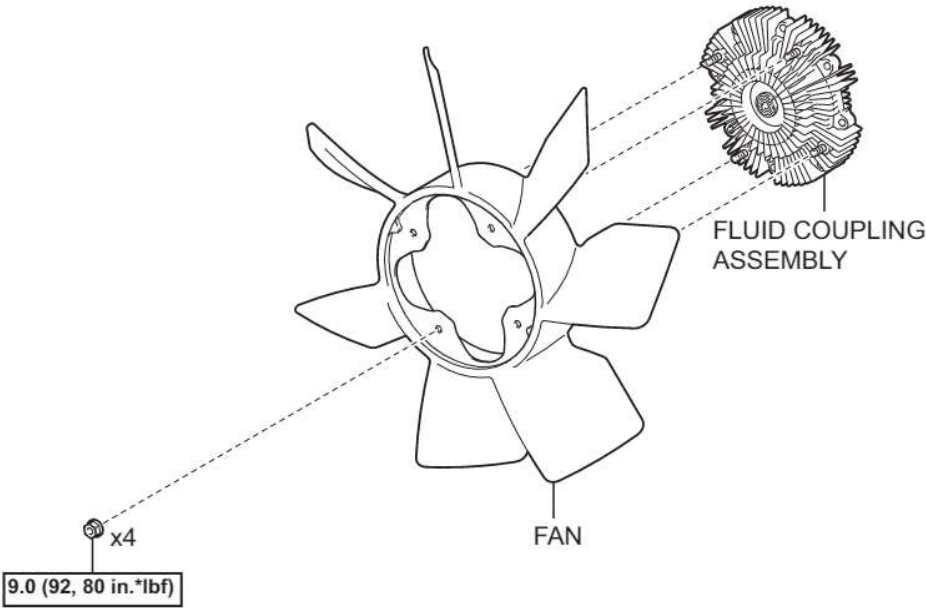


[N*m (kgf*cm, ft*lb)] : Specified torque

CO

Y

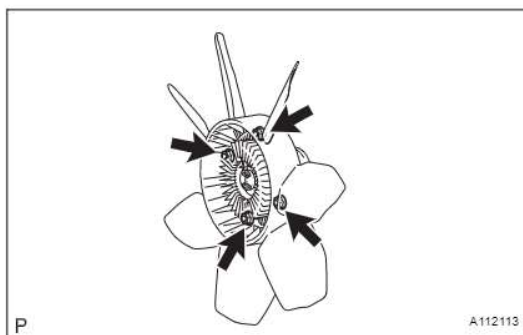
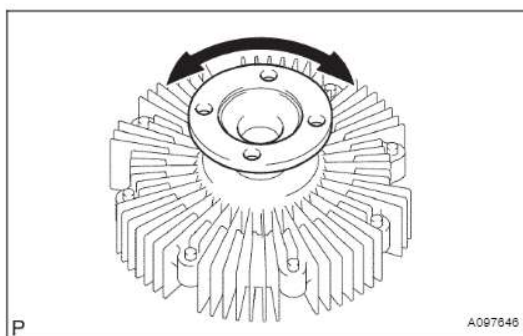
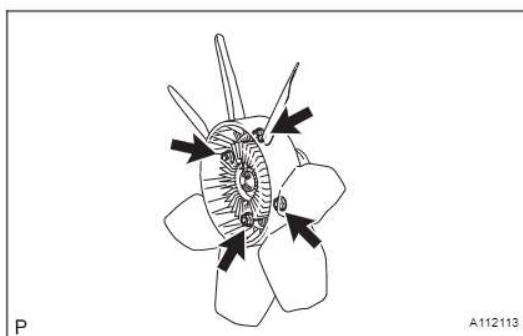
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CO

REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE V-BANK COVER (See page [ES-428](#))
3. REMOVE NO.1 ENGINE UNDER COVER SUB-ASSEMBLY (See page [EM-6](#))
4. REMOVE RADIATOR SUPPORT SEAL UPPER (See page [CO-23](#))
5. REMOVE FAN SHROUD (See page [CO-23](#))
6. REMOVE FAN
 - (a) Remove the 4 nuts and the fan from the fluid coupling.



INSPECTION

1. INSPECT FLUID COUPLING ASSEMBLY
 - (a) Check the fluid coupling for damage and silicon oil leakage.
If necessary, replace the fluid coupling.

CO

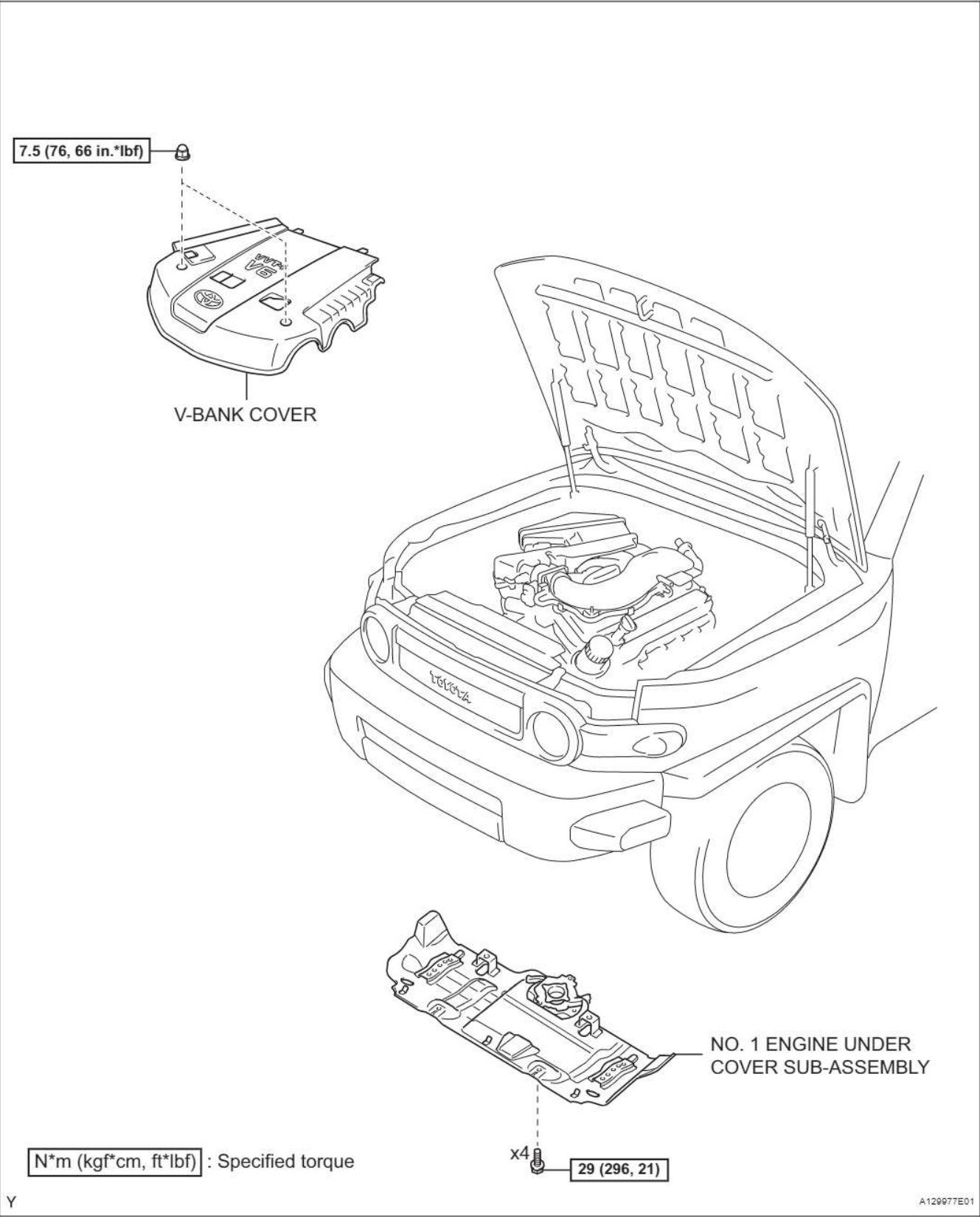
INSTALLATION

1. INSTALL FAN
 - (a) Install the fan onto the coupling with the 4 nuts.
Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)
2. INSTALL FAN SHROUD (See page [CO-30](#))
3. INSTALL RADIATOR SUPPORT SEAL UPPER (See page [CO-31](#))
4. INSTALL NO.1 ENGINE UNDER COVER SUB-ASSEMBLY (See page [EM-7](#))
5. INSTALL V-BANK COVER (See page [ES-431](#))
6. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 3.9 N*m (40 kgf*cm, 35 ft.*lbf)

CO-18

1GR-FE COOLING – RADIATOR

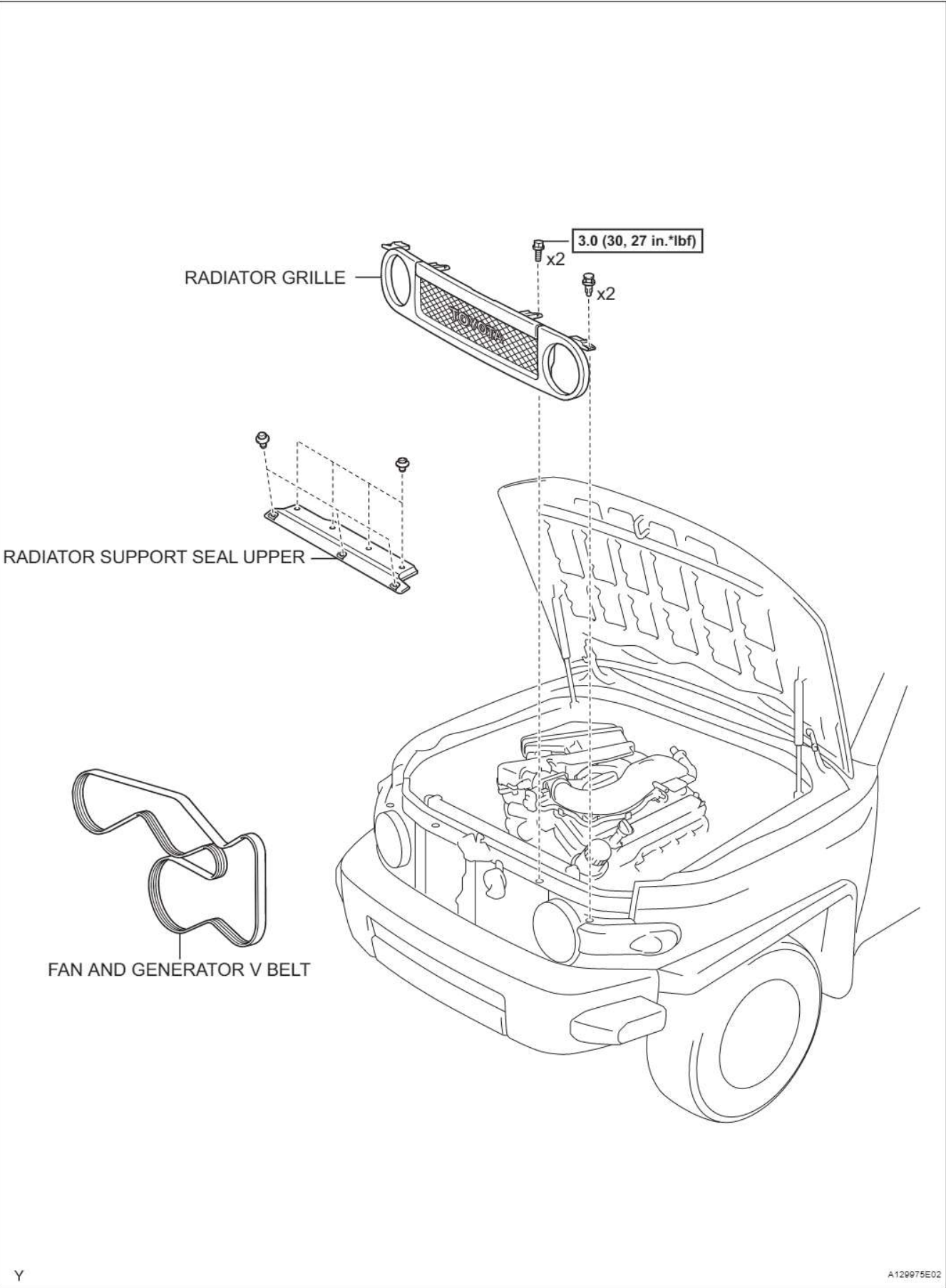
RADIATOR
COMPONENTS



1GR-FE COOLING – RADIATOR

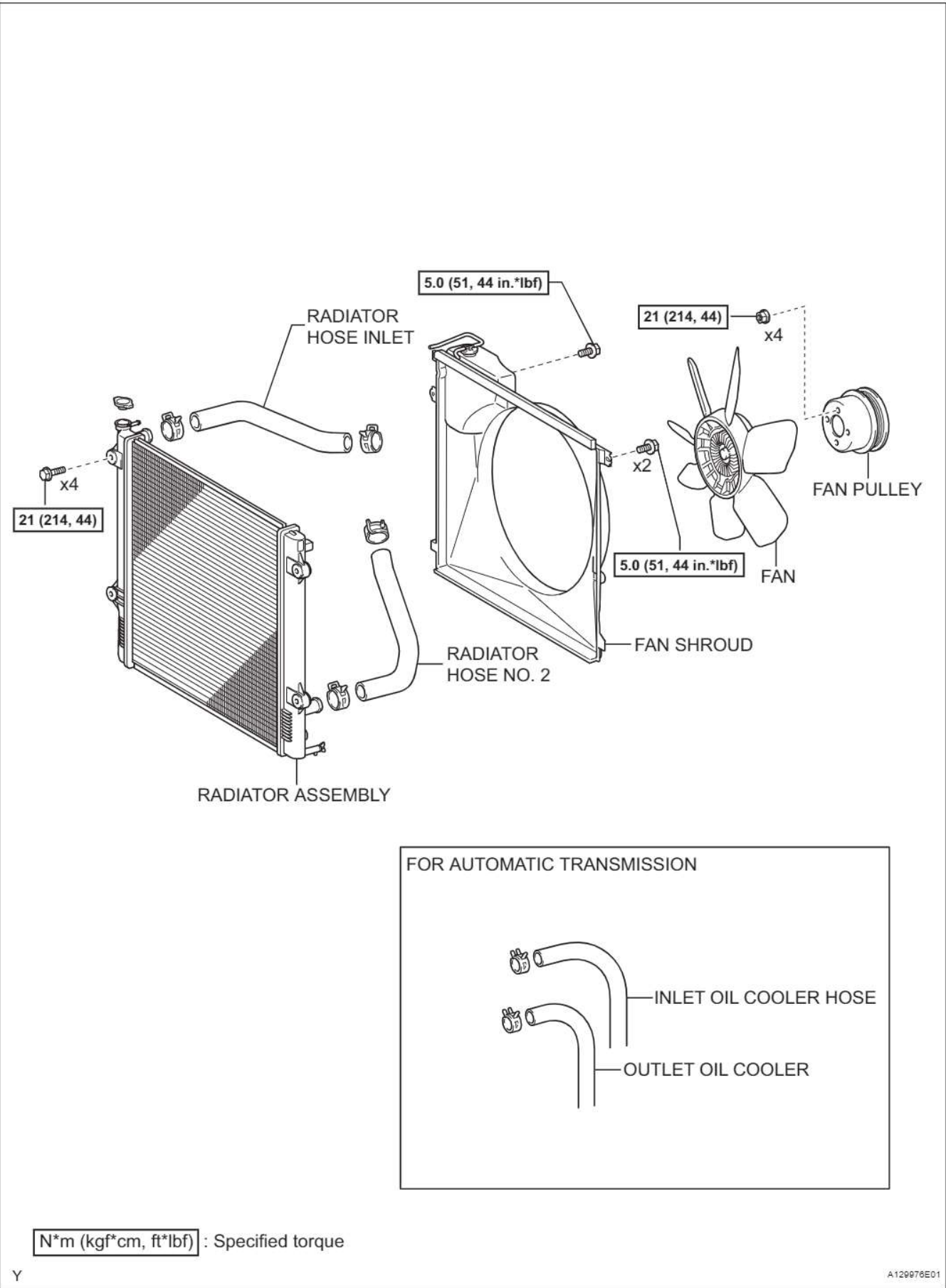
CO-19

CO



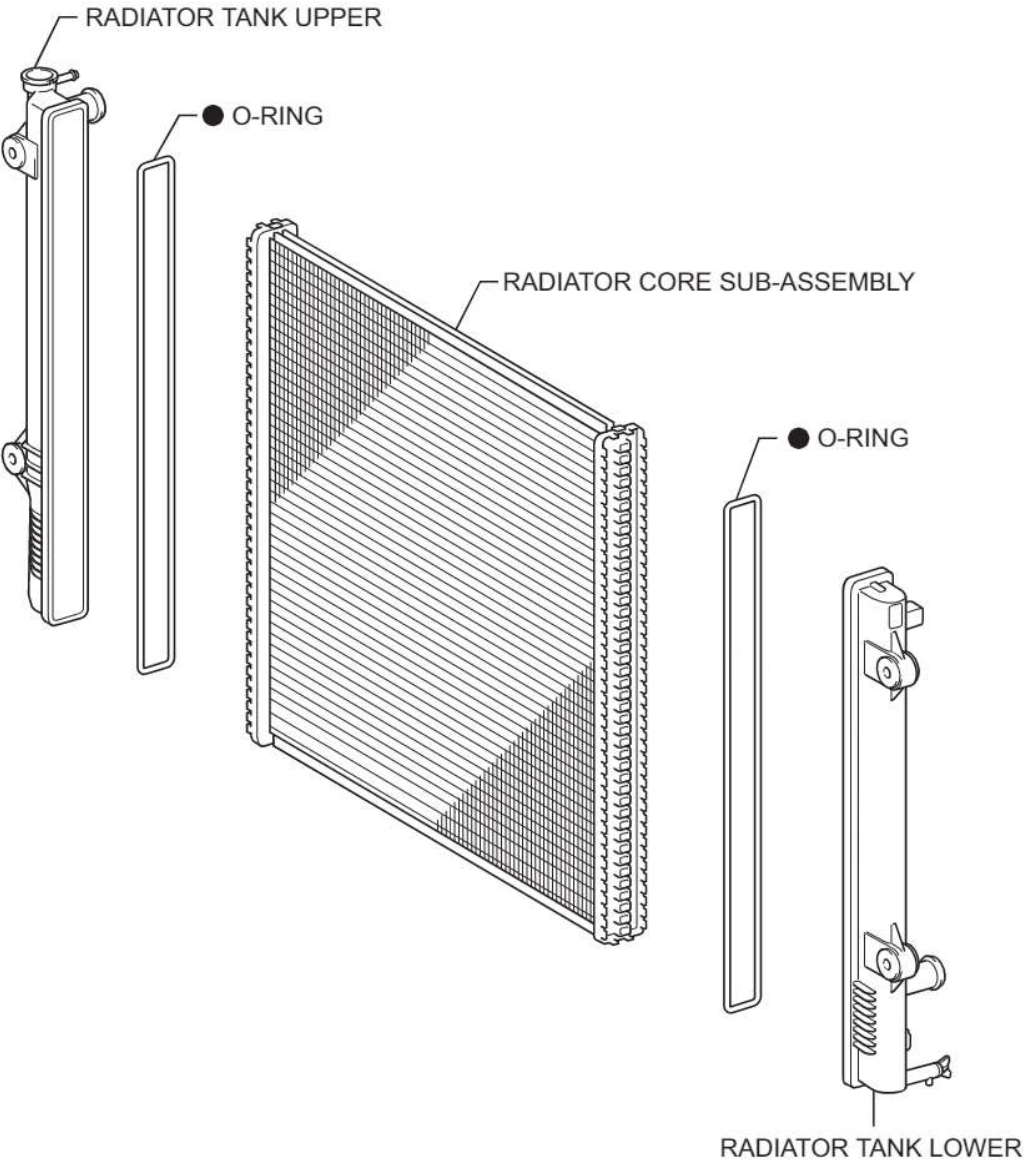
CO-20

1GR-FE COOLING – RADIATOR



1GR-FE COOLING – RADIATOR

CO-21



● Non-reusable part

Y

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CO

CO-22

1GR-FE COOLING – RADIATOR

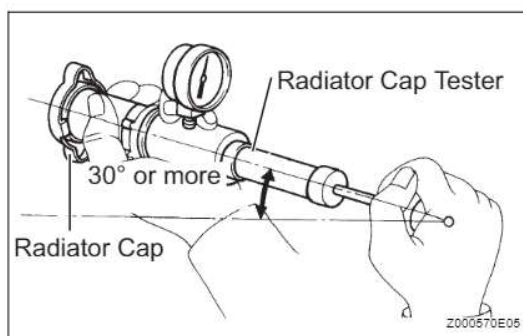
ON-VEHICLE INSPECTION

1. INSPECT RADIATOR CAP SUB-ASSEMBLY

- (a) Measure the valve opening pressure.
- (1) If there are water stains or foreign matter on rubber packings 1, 2 or 3, clean the parts with water and finger scouring.
 - (2) Check that rubber packings 1, 2 or 3, is not deformed, cracked or swollen.
 - (3) Check that rubber packings 3 and 4 are not stuck together.
 - (4) Apply engine coolant to rubber packings 2 and 3 before using the radiator cap tester.
 - (5) When using the cap tester, tilt it to more than 30 degrees.
 - (6) Pump the cap tester several times, and check the maximum pressure *1.

Pumping speed:**1 pump per second.**

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

Judgement criteria

Item	Specified Condition
Standard value (for brand new cap)	93 to 123 kPa (0.95 to 1.25 kgf/cm ² , 13.5 to 17.8 psi)
Minimum standard value (after using cap)	78 kPa (0.8 kgf/cm ² 11.4 psi)

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

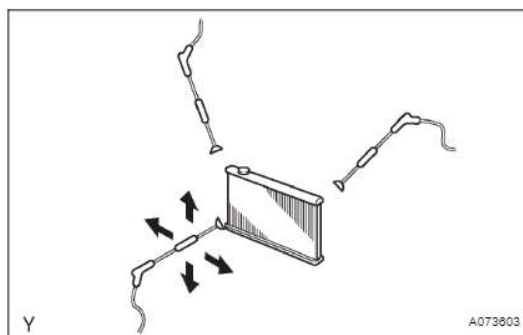
ON-VEHICLE CLEANING

1. CHECK FIN FOR BLOCKAGE

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

NOTICE:

- If the steam cleaner is too close to the core, there is a possibility of damaging the fins, so keep to the following injection distances.

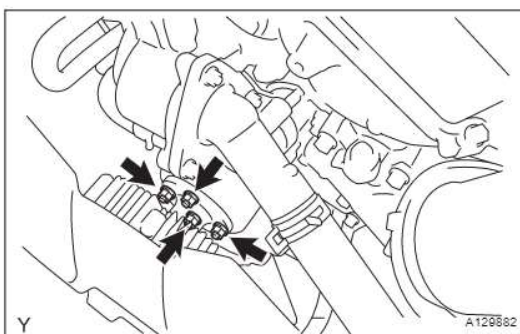
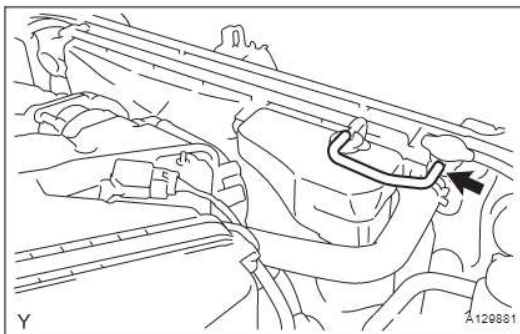
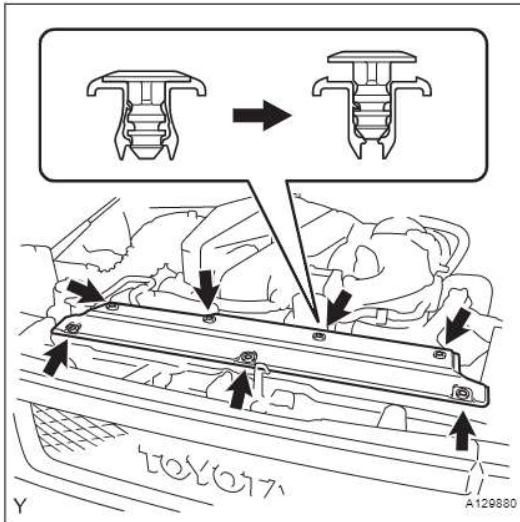


Injection Pressure kPa (kgf/cm ² , psi)	Injection Distance mm (in.)
2,942 to 4,903 (30 to 50, 427 to 711)	300 (11.811)
4,903 to 7,845 (50 to 80, 711 to 1,138)	500 (19.685)

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

REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE V-BANK COVER (See page [ES-428](#))
3. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY (See page [EM-6](#))
4. DRAIN ENGINE COOLANT (See page [CO-3](#))
5. REMOVE RADIATOR SUPPORT SEAL UPPER
 - (a) Disengage the 7 clips, then remove the radiator support seal.

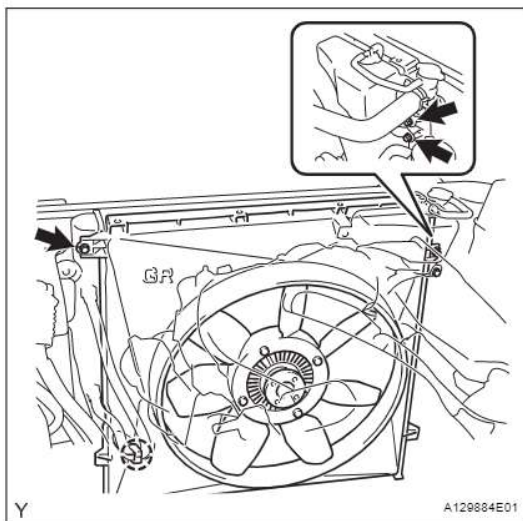


6. REMOVE FAN SHROUD
 - (a) Disconnect the hose from the radiator.
 - (b) Loosen the 4 nuts from the fan pulley.
 - (c) Remove the fan and generator V belt. (See page [EM-6](#))
 - (d) Remove the 4 nuts and the fluid coupling assembly with fan.
 - (e) Remove the bolt from the reserve tank.

CO

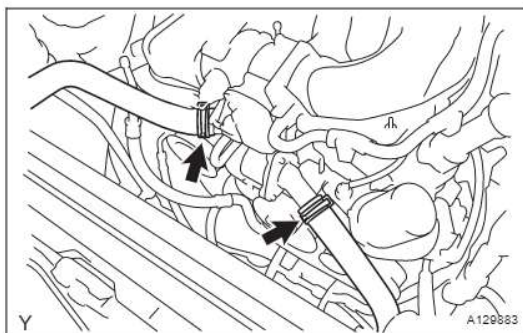
CO-24

1GR-FE COOLING – RADIATOR



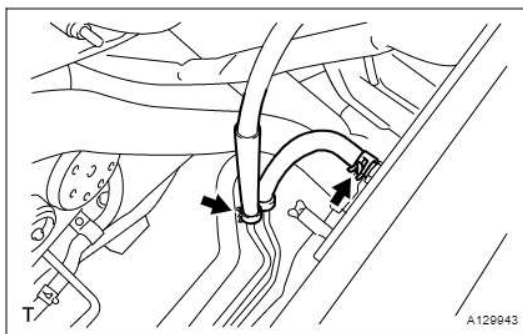
- (f) Remove the 2 bolts from the fan shroud.
- (g) Remove the fluid coupling assembly with fan and fan shroud.
- (h) Remove the fan pulley.

7. REMOVE RADIATOR GRILLE (See page [ET-4](#))



8. REMOVE RADIATOR ASSEMBLY

- (a) Disconnect the 2 radiator hoses.

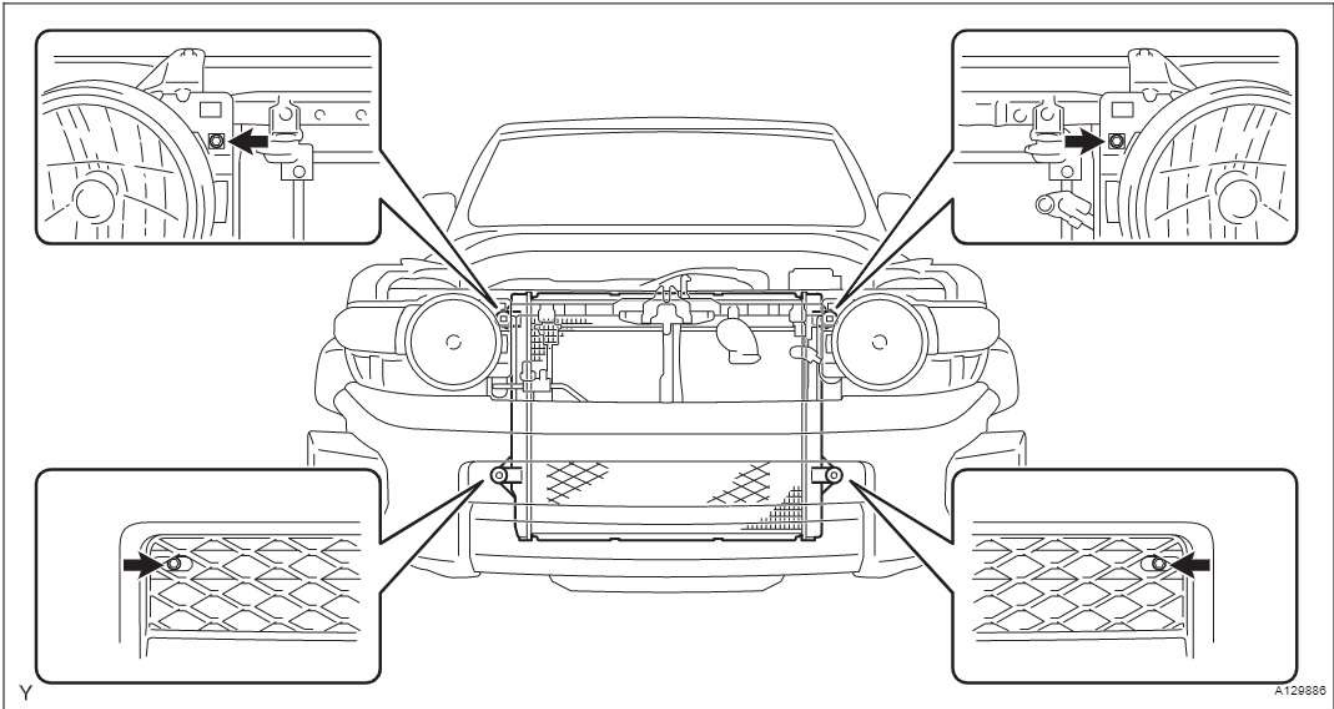


- (b) Disconnect the 2 oil cooler hoses (w/ automatic transmission).

1GR-FE COOLING – RADIATOR

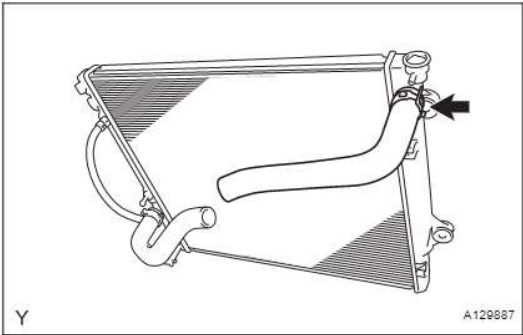
CO-25

(c) Remove the 4 bolts, then remove the radiator.

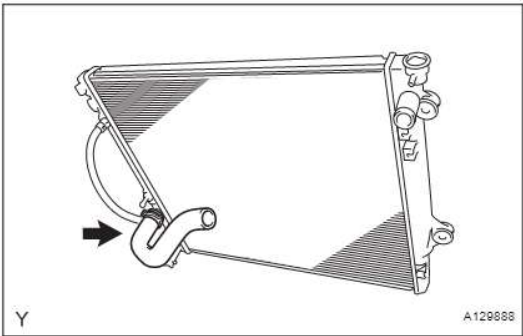


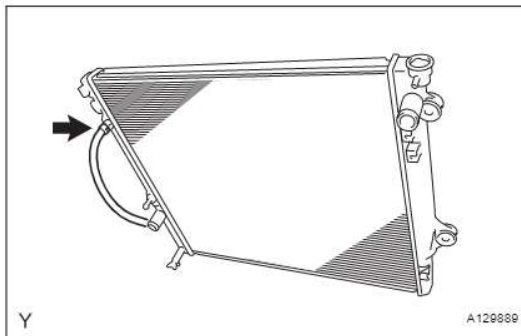
9. REMOVE RADIATOR HOSE INLET

CO



10. REMOVE NO. 2 RADIATOR HOSE



CO-26**1GR-FE COOLING – RADIATOR****11. REMOVE OIL COOLER HOSE****CO**

1GR-FE COOLING – RADIATOR

CO-27

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)

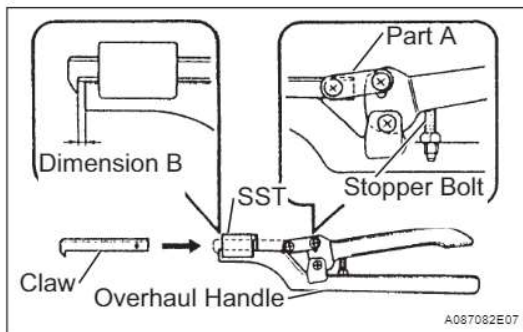
- (a) Engage the claw with the overhaul handle by inserting it into the hole in part A as shown in the illustration.
- (b) While gripping the handle, adjust dimension B to between 0.2 and 0.3 mm, using the stopper bolt.

Dimension B:

0.2 to 0.3 mm (0.008 to 0.012 in)

NOTICE:

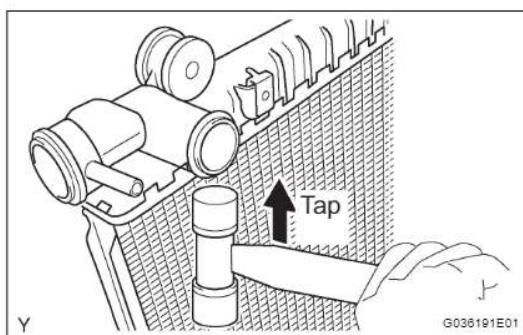
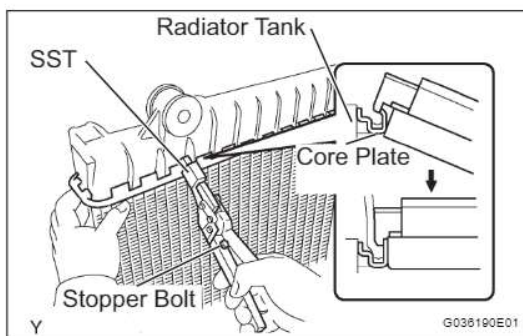
If the stopper bolt can not be adjusted, the claw may be damaged.



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)



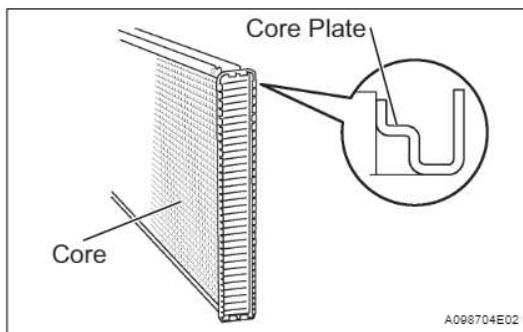
4. REMOVE RADIATOR TANK UPPER

- (a) Lightly tap the radiator tank bracket (or radiator tank pipe) with a soft-faced hammer to remove the radiator tank.

5. REMOVE RADIATOR TANK LOWER

HINT:

Perform the same procedures as for the radiator tank upper.



INSPECTION

1. 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 reassemble 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 the core plate if necessary.

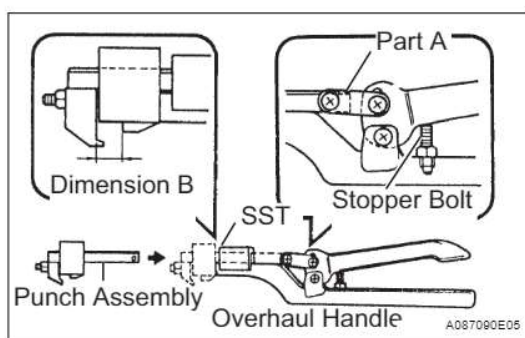
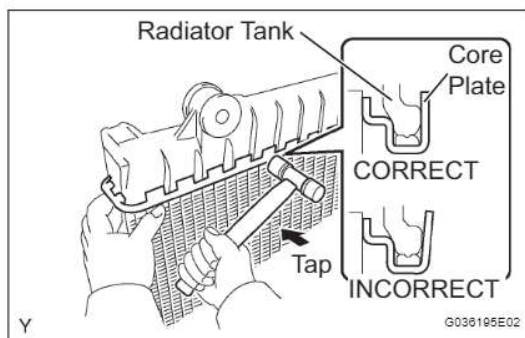
NOTICE:

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

CO

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1GR-FE COOLING – RADIATOR



REASSEMBLY

1. INSTALL RADIATOR TANK UPPER

- Install a new radiator tank.
- Tap the core plate with a soft-faced hammer until there is no gap between the core plate and radiator tank.

2. REMOVE RADIATOR TANK LOWER

HINT:

Perform the same procedures as for the radiator tank upper.

3. ASSEMBLE SST

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

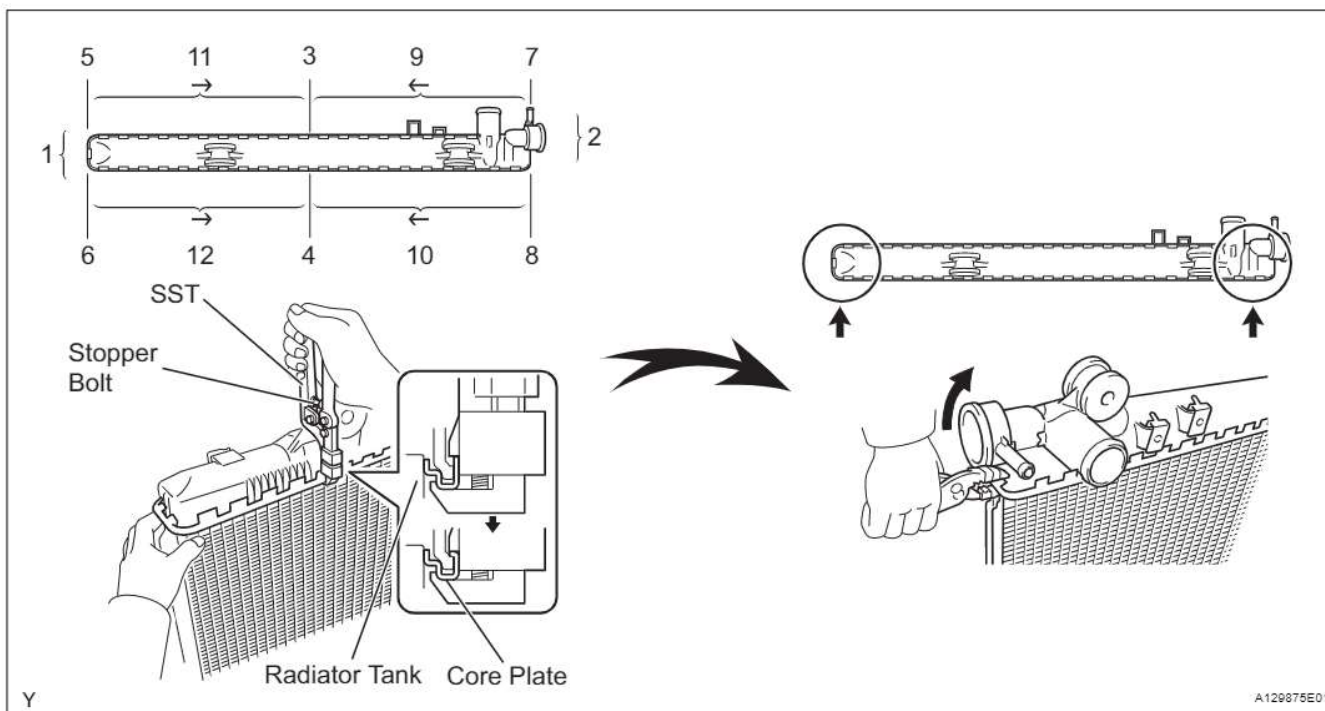
- Install the punch assembly into the overhaul handle by inserting it into the hole in part A as shown in the illustration.
- While gripping the handle, adjust the stopper bolt so that dimension B is as shown in the illustration.

Dimension B:

8.4 mm (0.331 in.)

4. CAULK CORE PLATE

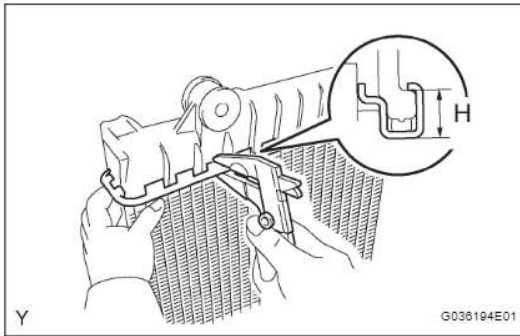
- Lightly press SST against the core plate in the order shown in the illustration. After repeating this a few times, fully caulk the core plate by gripping the handle until stopped by the stopper bolt.



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

HINT:

Do not tap the portions indicated in the illustration or the oil cooler using SST. Use pliers or a similar tool. Do not damage the core plate.

1GR-FE COOLING – RADIATOR**CO-29**

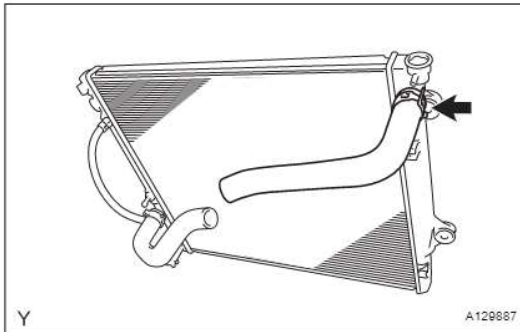
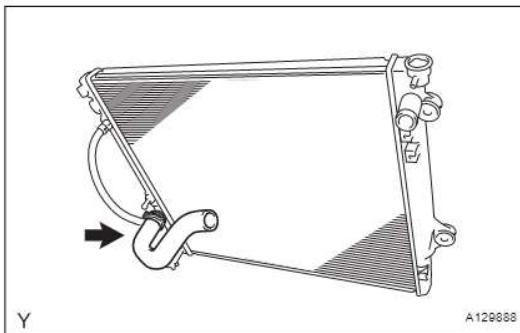
- (b) Check the core plate height (H) after completing the caulking.

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

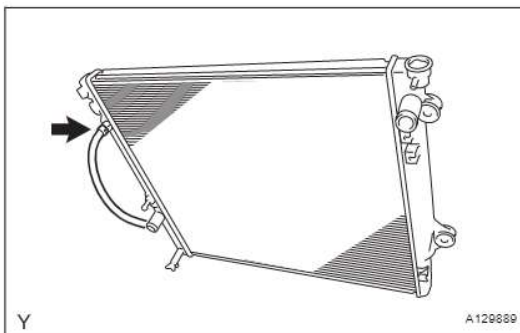
If the height is not as specified, readjust the stopper bolt of the handle, then caulk it again.

5. INSTALL RADIATOR DRAIN COCK PLUG

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

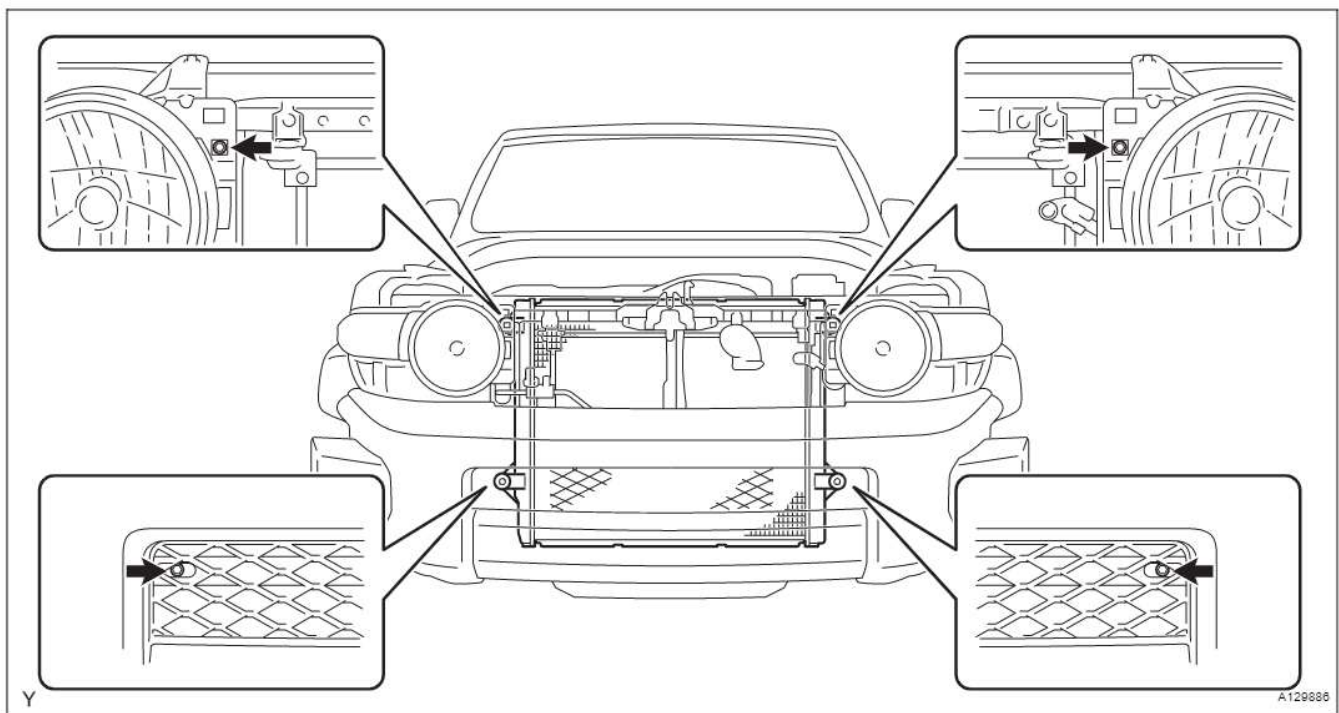
INSTALLATION**1. INSTALL RADIATOR HOSE INLET****2. INSTALL RADIATOR HOSE NO. 2****3. INSTALL OIL COOLER HOSE****4. INSTALL RADIATOR ASSEMBLY**

- (a) Install the radiator with the 4 bolts.
Torque: 21 N*m (214 kgf*cm, 44 ft.*lbf)

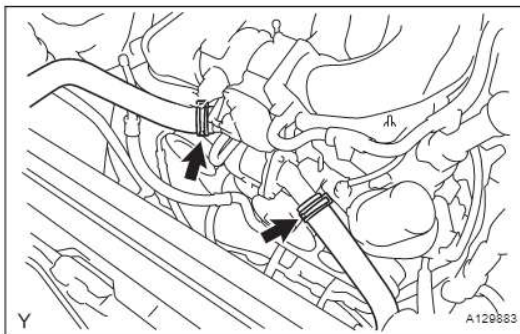
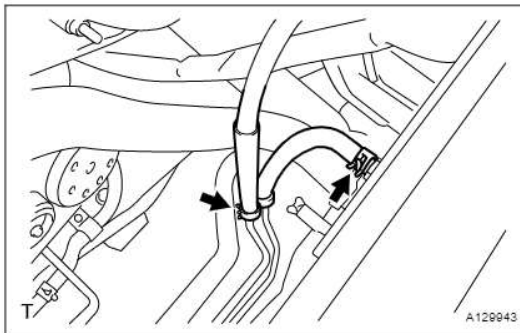
**CO**

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1GR-FE COOLING – RADIATOR



- (b) Connect the 2 oil cooler hoses (w/ automatic transmission).

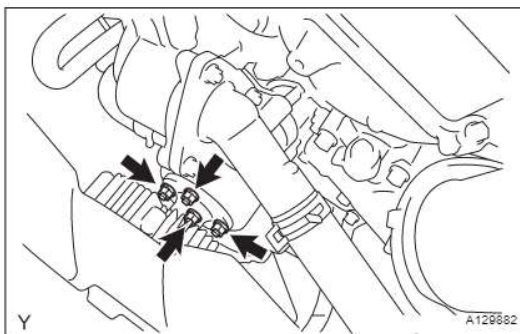


- (c) Install the 2 radiator hoses.

5. INSTALL RADIATOR GRILLE (See page ET-11)

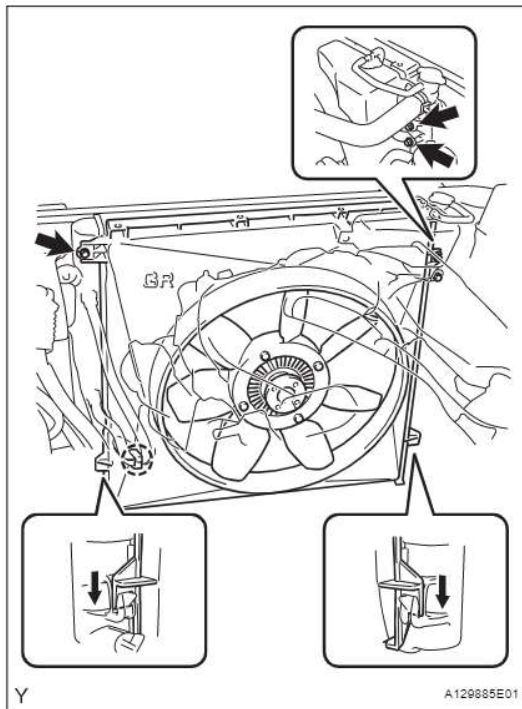
6. INSTALL FAN SHROUD

- (a) Temporarily install the fan shroud together with the fluid coupling assembly with fan.
 (b) Temporarily install the fluid coupling assembly with fan with the 4 nuts.
 (c) Install the fan and generator V belt.
 (See page EM-6)
 (d) Install the fan pulley with the 4 nuts.
Torque: 21 N*m (214 kgf*cm, 44 in.*lbf)

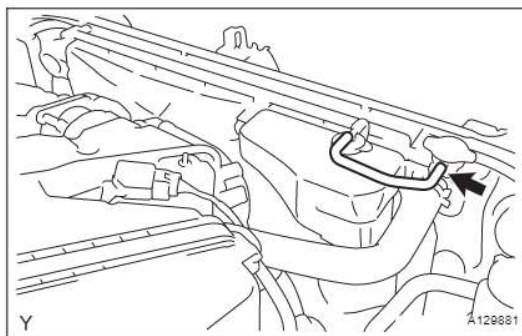


1GR-FE COOLING – RADIATOR

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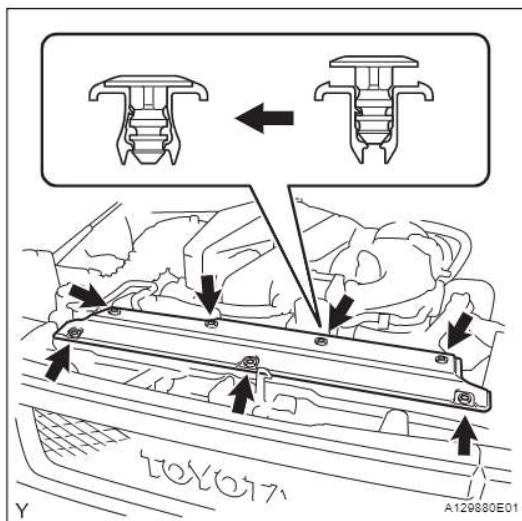


- (e) Install the bolt to the reserve tank.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)
- (f) Install the fan shroud with the 2 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)
- (g) Install the bolt to the reserve tank.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)
- (h) Connect the 2 oil cooler hoses with the 2 clamps (w/ automatic transmission).



- (i) Connect the hose to the radiator reserve tank.

CO



7. **INSTALL RADIATOR SUPPORT SEAL UPPER**
 - (a) Engage the 7 clips, then install the radiator support seal.
8. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)
9. **ADD ENGINE COOLANT** (See page [CO-3](#))
10. **CHECK ENGINE COOLANT LEAKAGE** (See page [CO-2](#))
11. **INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY** (See page [EM-7](#))
12. **INSTALL V-BANK COVER** (See page [ES-431](#))