

2002 ENGINE

Cooling - RAV4

COOLANT

INSPECTION

NOTE: Check the coolant level when the engine is cold.

1. **Check engine coolant level at radiator reservoir .**

The engine coolant level should be between the "L" and "F" lines.

If low, check for leaks and add "Toyota Long Life Coolant" or equivalent up to between the "L" and "F" lines.

2. **Check engine coolant quality .**

- a. Remove the radiator cap.

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

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

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

- c. Reinstall the radiator cap.

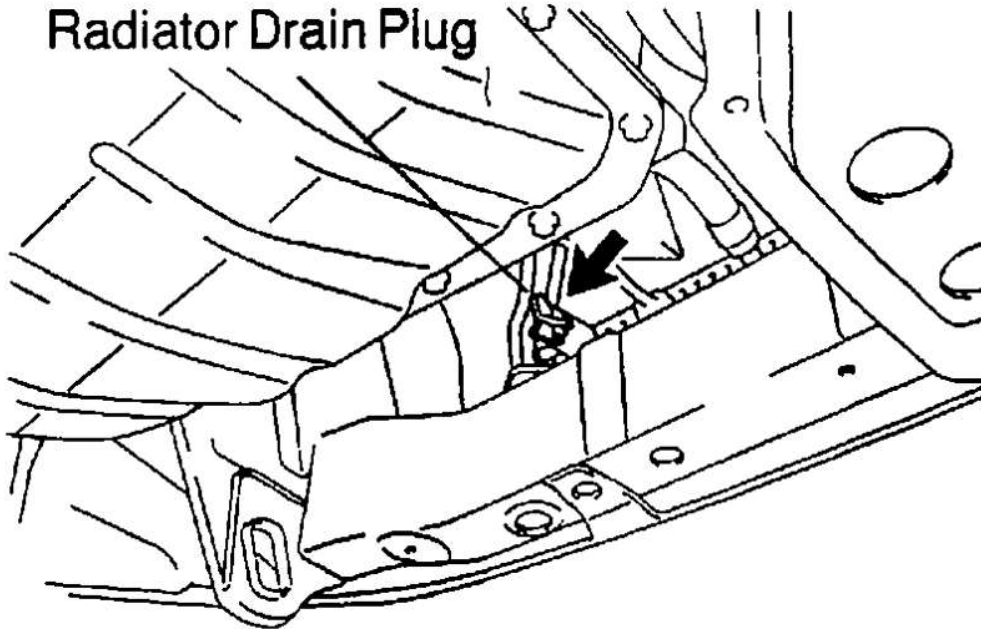
REPLACEMENT

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

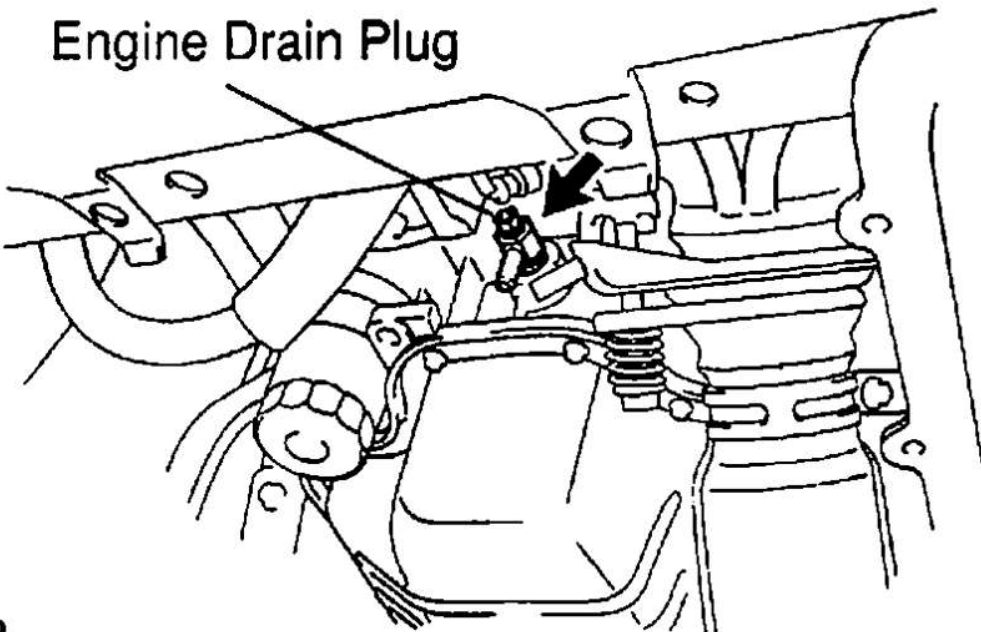
1. **Drain engine coolant .**

- a. Remove the radiator cap.
- b. Loosen the radiator drain plug (on the left side of the radiator lower tank) and engine drain plug, and drain the coolant.

Radiator Drain Plug



Engine Drain Plug



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Fig. 1: Locating Engine & Radiator Drain Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Close the drain plugs.

Torque: 5 N.m (50 kgf.cm, 43 in..lbf) for engine

2. Fill engine coolant .

- a. Slowly fill the system with coolant.

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

NOTE:

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

Coolant Capacity (W/ Heater)

Transmission	
M/T	6.3 liters (6.7 US qts,
A/T	6.2 liters (6.6 US qts,

- Reinstall the radiator cap.
 - Start the engine, and bleed the cooling system.
 - Refill the radiator reservoir with coolant until it reaches the "F" line.
- b. Check engine coolant for leaks .
- c. Check engine coolant specific gravity correctly .

WATER PUMP

ON-VEHICLE INSPECTION

NOTE: Be sure to do checking when the engine coolant is changed.

Inspect Water Pump

- Remove the drive belt (See **CHARGING SYSTEM**).
- Turn the pulley, and check that the water pump bearing moves smoothly and quietly.

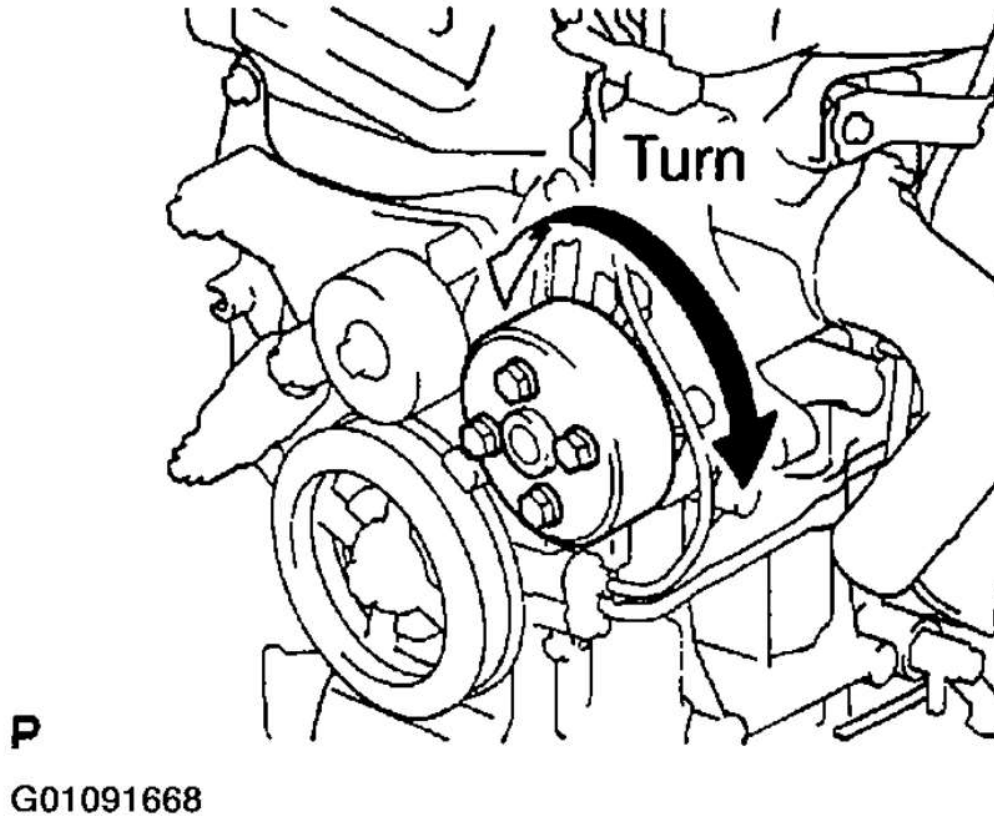
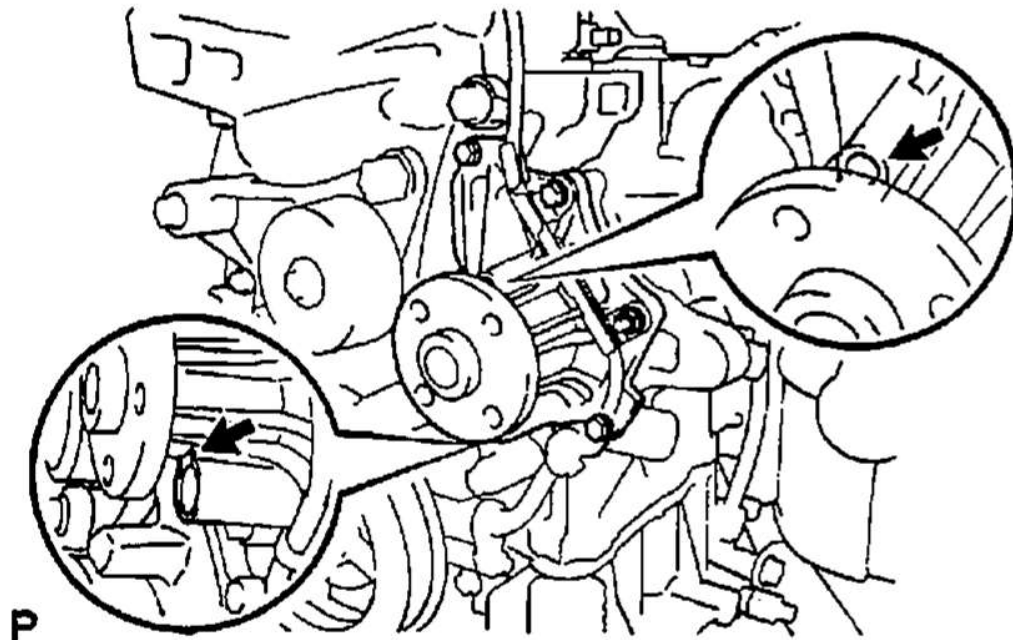


Fig. 2: Checking Water Pump Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If necessary, replace the water pump.

- c. Remove the water pump pulley (See **REMOVAL**).
- d. Visually check the inlet hole and drain hole for coolant leakage.



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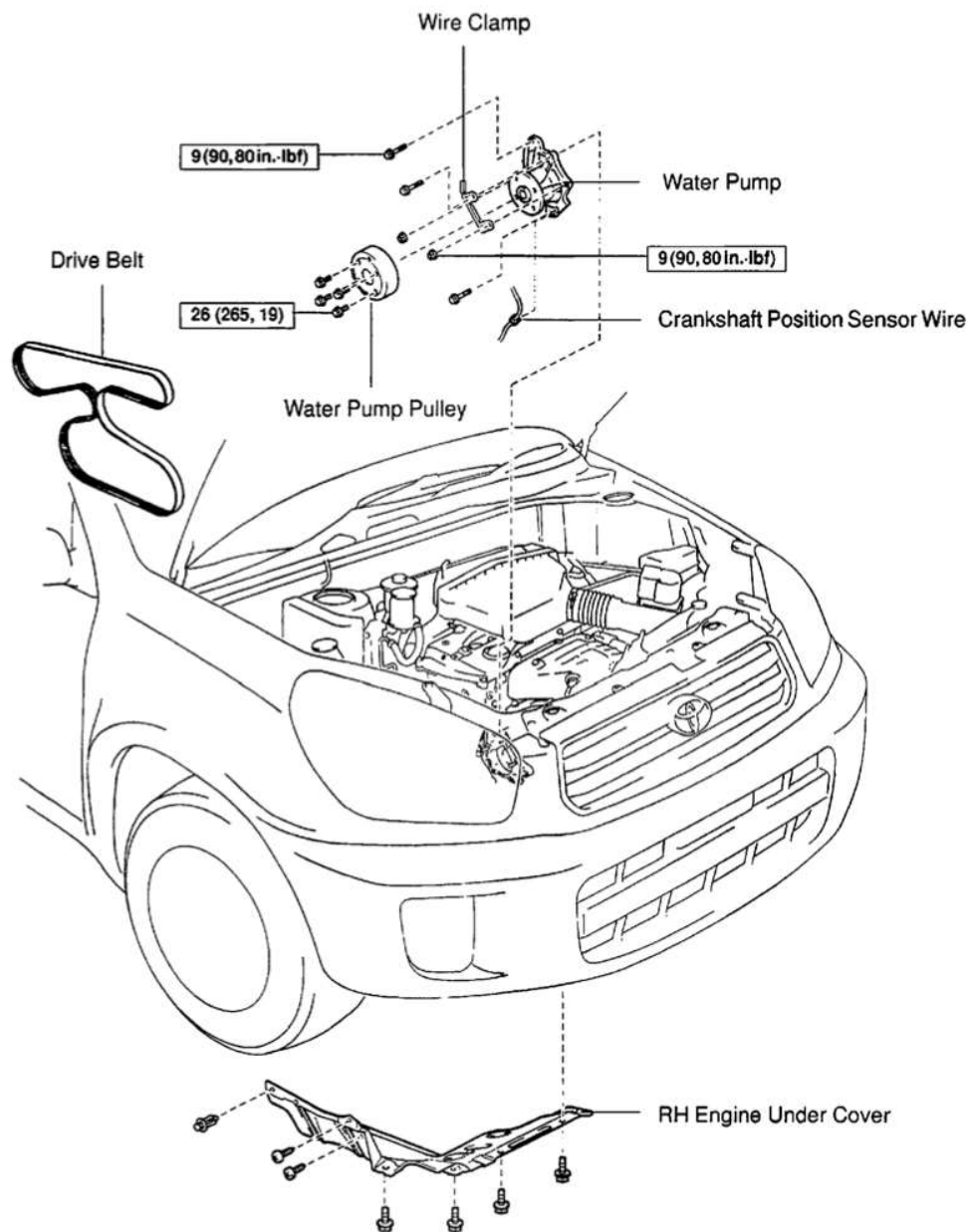
Fig. 3: Checking Inlet Hole

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If leakage is found, replace the water pump.

- e. Reinstall the water pump pulley (See **INSTALLATION**).
- f. Reinstall the drive belt (See **CHARGING SYSTEM**).

COMPONENTS



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

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Fig. 4: Displaying Water Pump Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. Drain engine coolant (See **REPLACEMENT**) .
2. Remove drive belt (See **CHARGING SYSTEM**) .

3. Remove water pump .

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

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

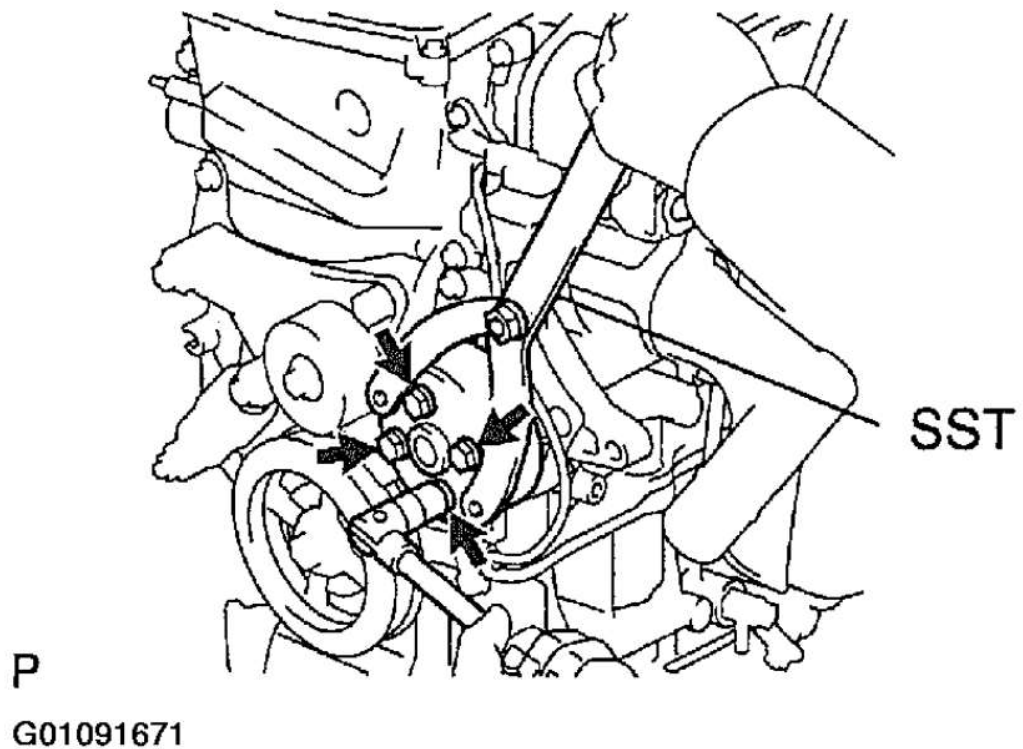
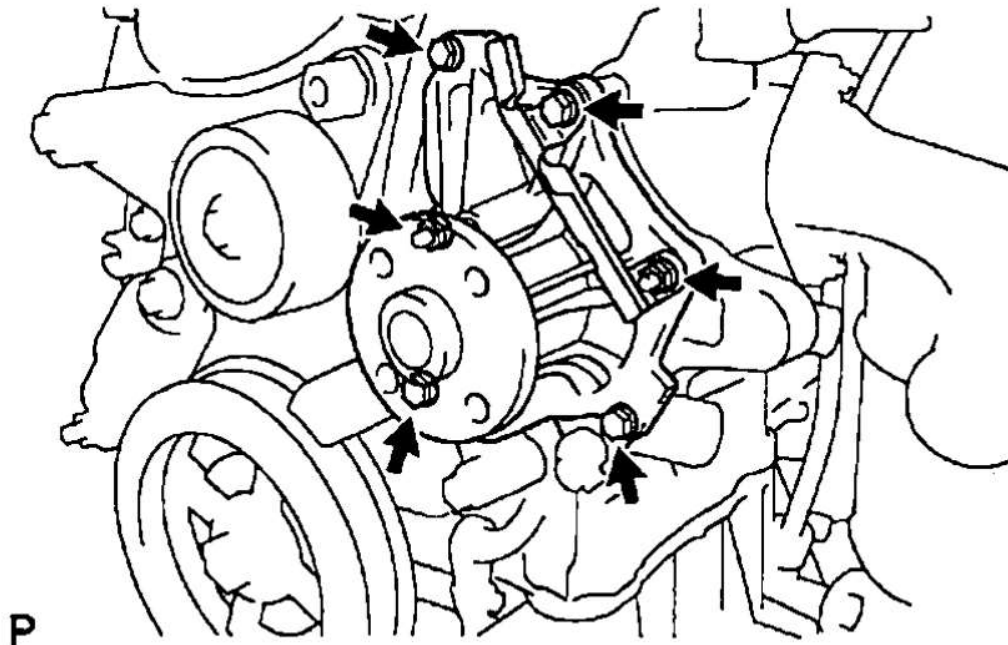


Fig. 5: Removing Water Pump

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Disconnect the crankshaft position sensor wire clamp from the water pump.
- c. Disconnect the crankshaft position sensor wire from the clamp on the water pump.
- d. Remove the 4 bolts, 2 nuts, wire clamp and water pump.

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Fig. 6: Locating Wire Clamp & Water Pump Fasteners

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Using a screwdriver, pry between the water pump and cylinder block, and remove the water pump.

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

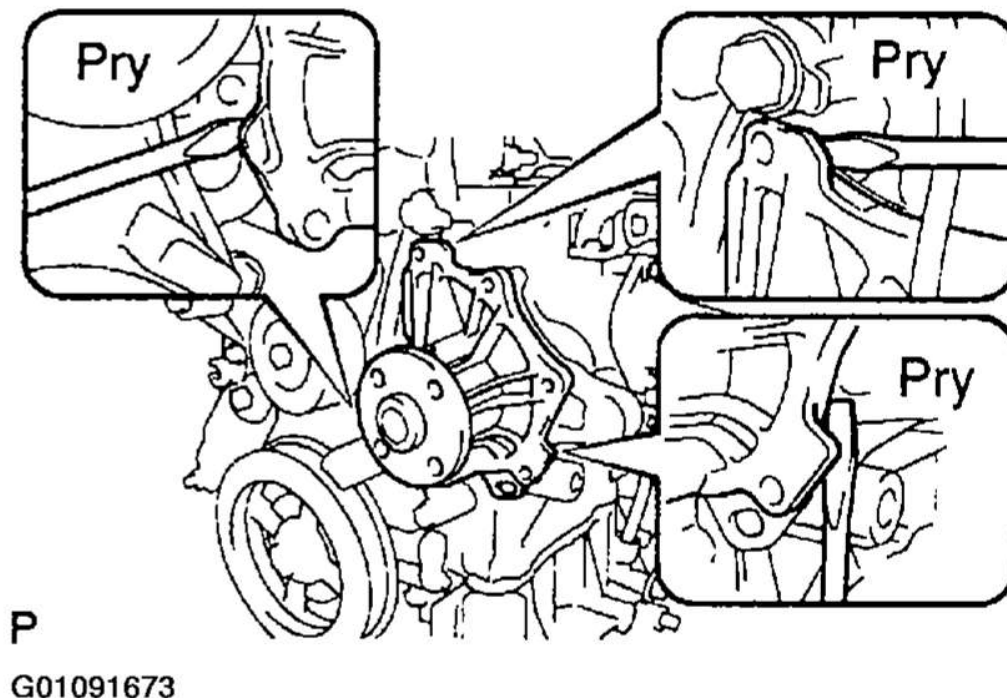


Fig. 7: Removing Water Pump

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. Install water pump .

- a. Remove any old packing (FIPG) material and be careful not to drop any oil on the contacting surfaces of the water pump and cylinder block.
 - Using a razor blade and gasket scraper, remove all the old packing (FIPG) materials from the gasket surfaces and sealing grooves.
 - Thoroughly clean all components to remove all the loose material.
 - Using a non-residue solvent, clean both sealing surfaces.
- b. Apply seal packing to the water pump as shown in the illustration.

Seal packing: Part No. 08826-00100 or equivalent

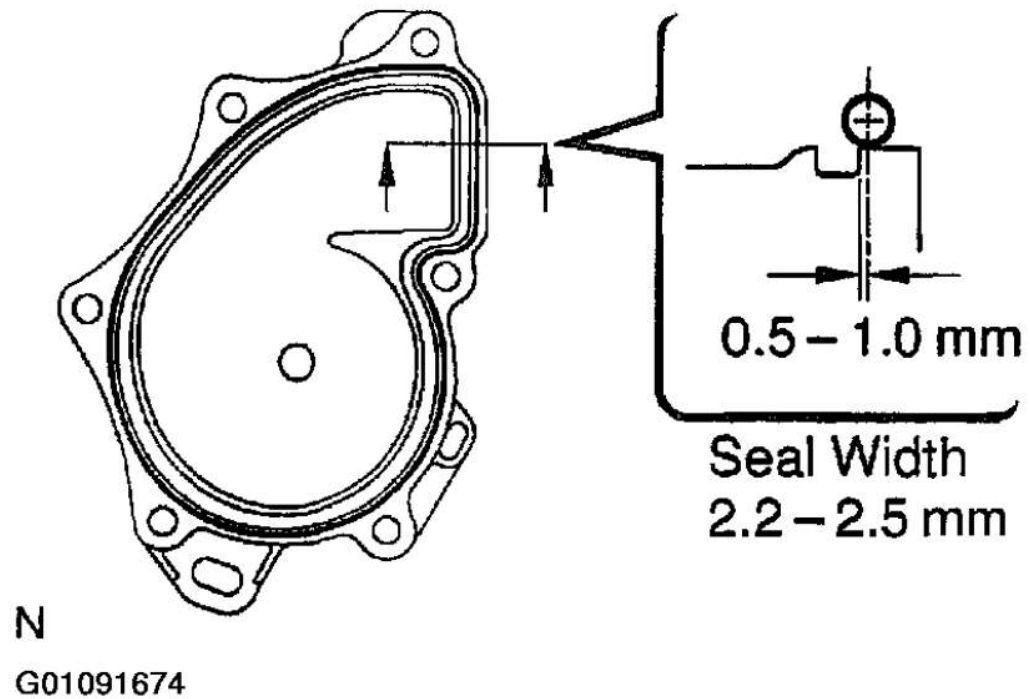
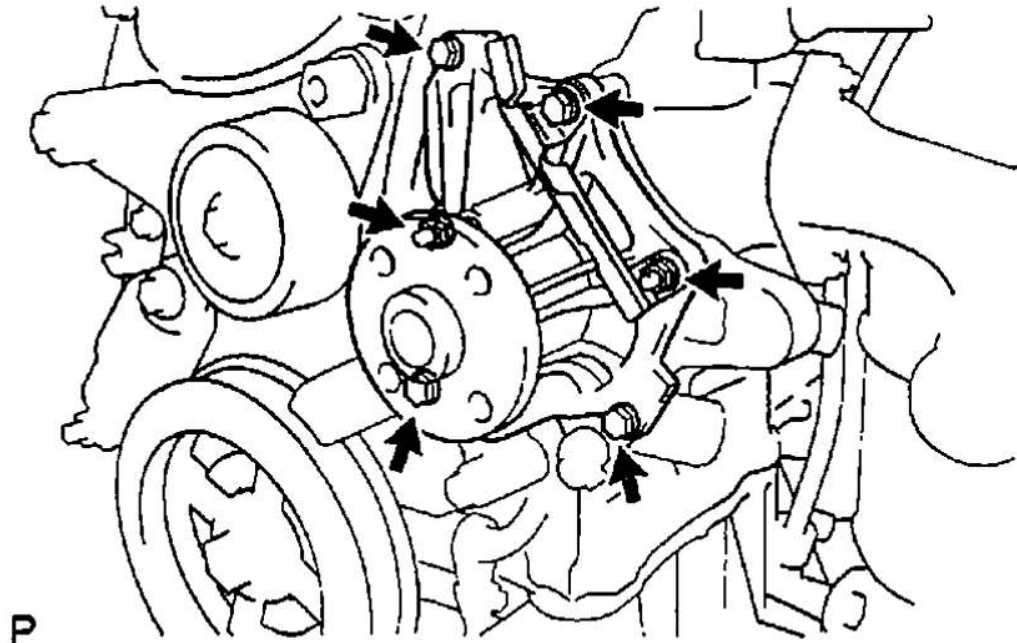


Fig. 8: Applying Seal Packing To Water Pump
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Install a nozzle that has been cut to a 2.2 - 2.5 mm (0.09-0.10 in.) opening.
 - Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
 - Immediately remove nozzle from the tube and reinstall cap.
- c. Install the water pump and wire clamp with the 4 bolts and 2 nuts.

Torque: 9 N.m (90 kgf.cm, 80 in..lbf)



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Fig. 9: Installing Water Pump & Wire Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the crankshaft position sensor wire harness clamp to the water pump.
- e. Install the crankshaft position sensor wire to the wire clamp on the water pump.
- f. Using SST, install the pump pulley with the 4 bolts.
SST 09960-10010 (09962-01000, 09963-00600)

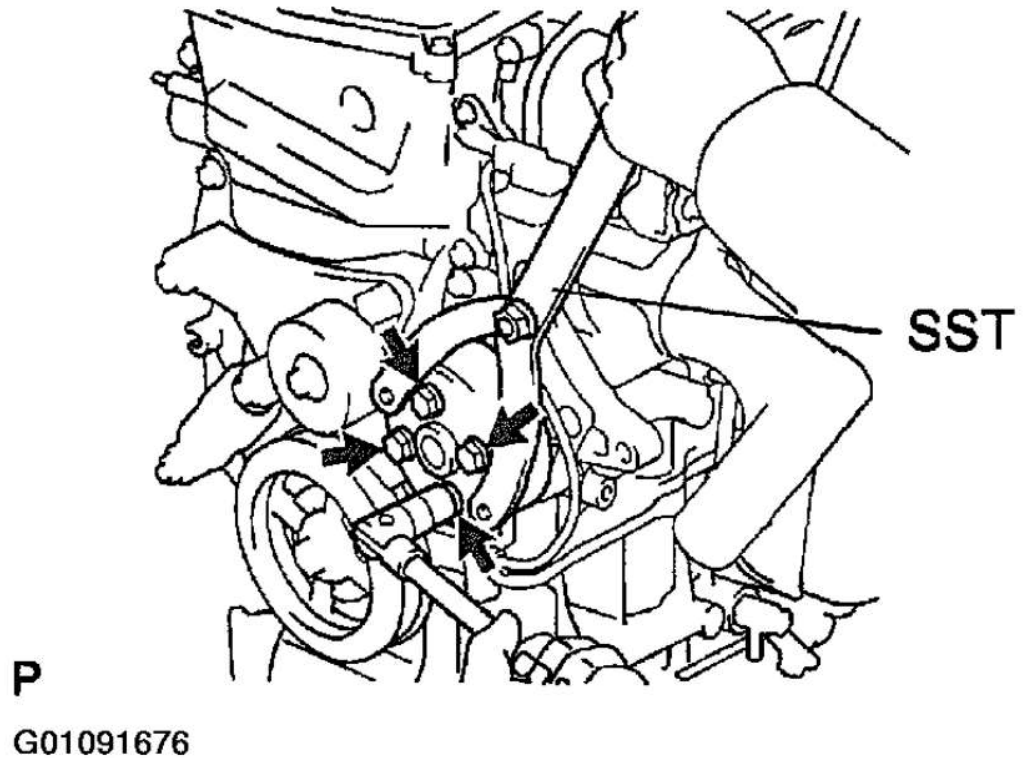


Fig. 10: Installing Pump Pulley Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- g. **Install drive belt (See CHARGING SYSTEM) .**
- h. **Fill with engine coolant .**
- i. **Start engine and check for coolant leaks .**
- j. **Recheck engine coolant level .**

THERMOSTAT

COMPONENTS

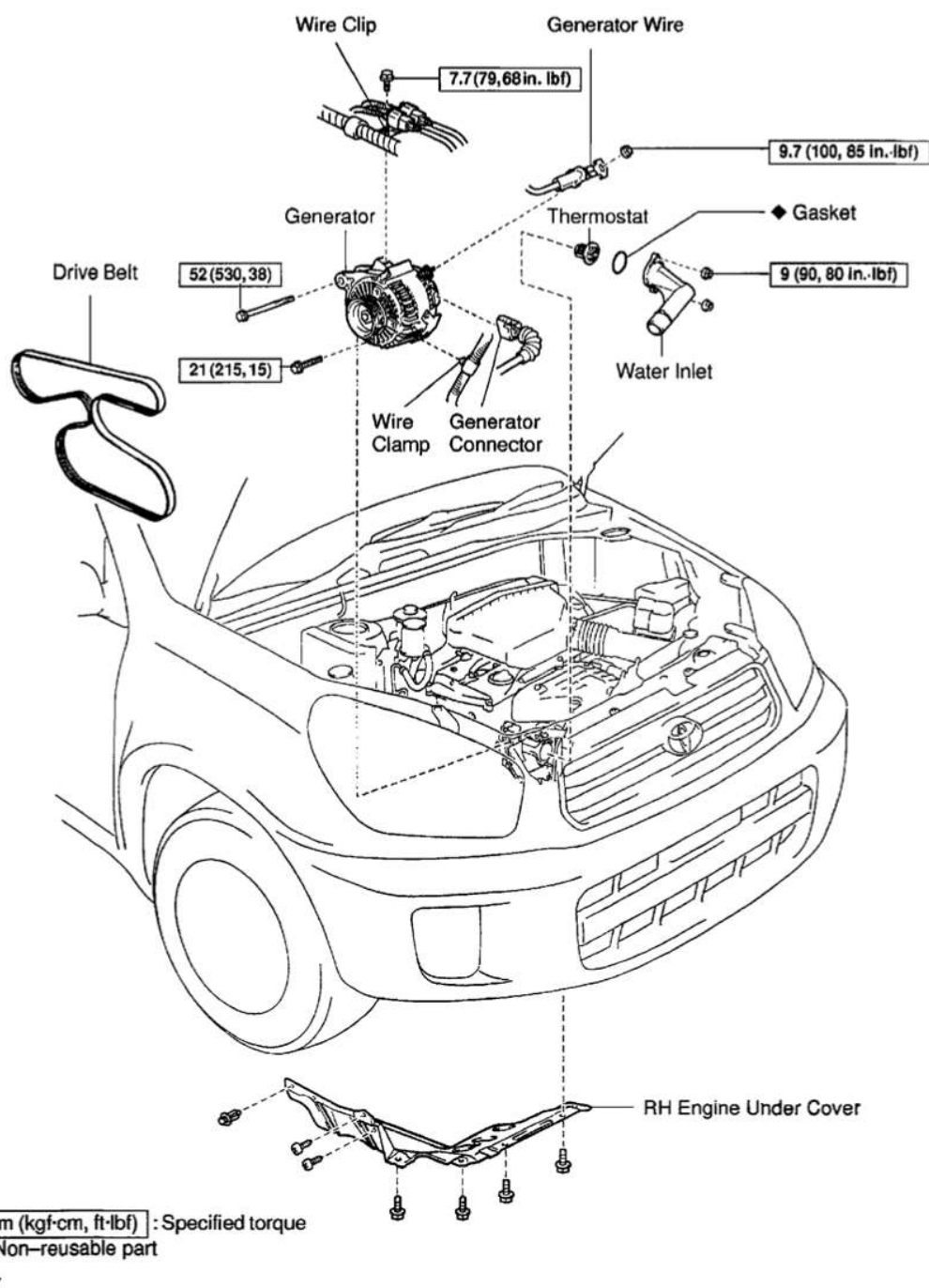
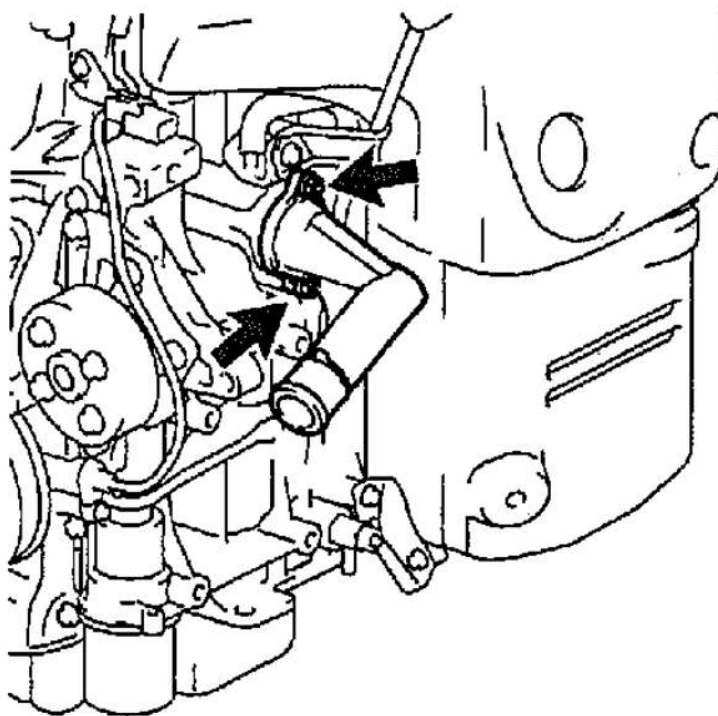


Fig. 11: Identifying Components For Thermostat Removal
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

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

1. Drain engine coolant (See REPLACEMENT) .
2. Remove drive belt (See CHARGING SYSTEM) .
3. Remove generator (See GENERATOR) .
4. Remove water inlet and thermostat .
 - a. Remove the 2 nuts and water inlet.
 - b. Remove the thermostat.
 - c. Remove the gasket from the thermostat.



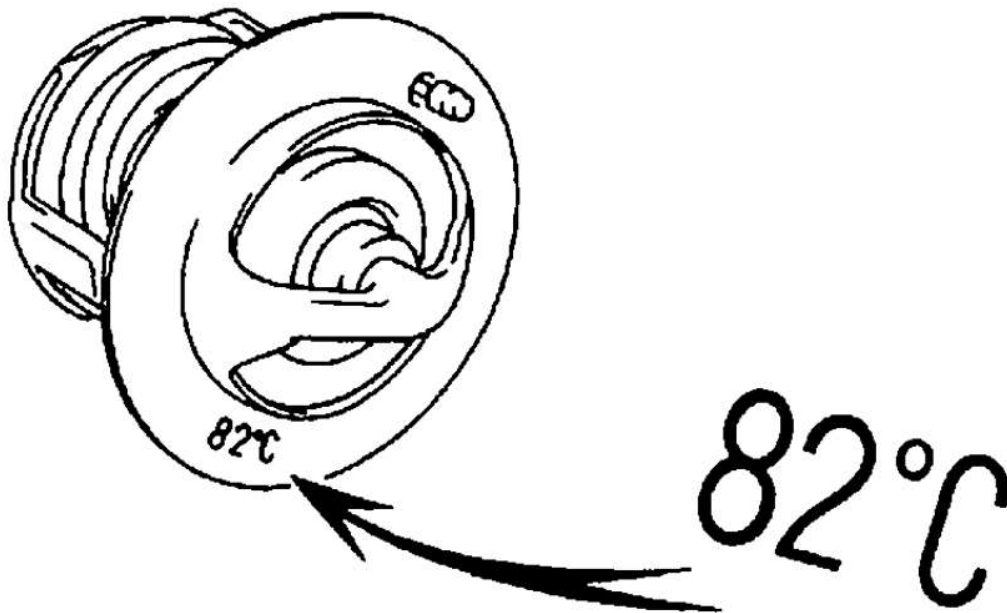
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Fig. 12: Removing Water Inlet & Thermostat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

Inspect Thermostat

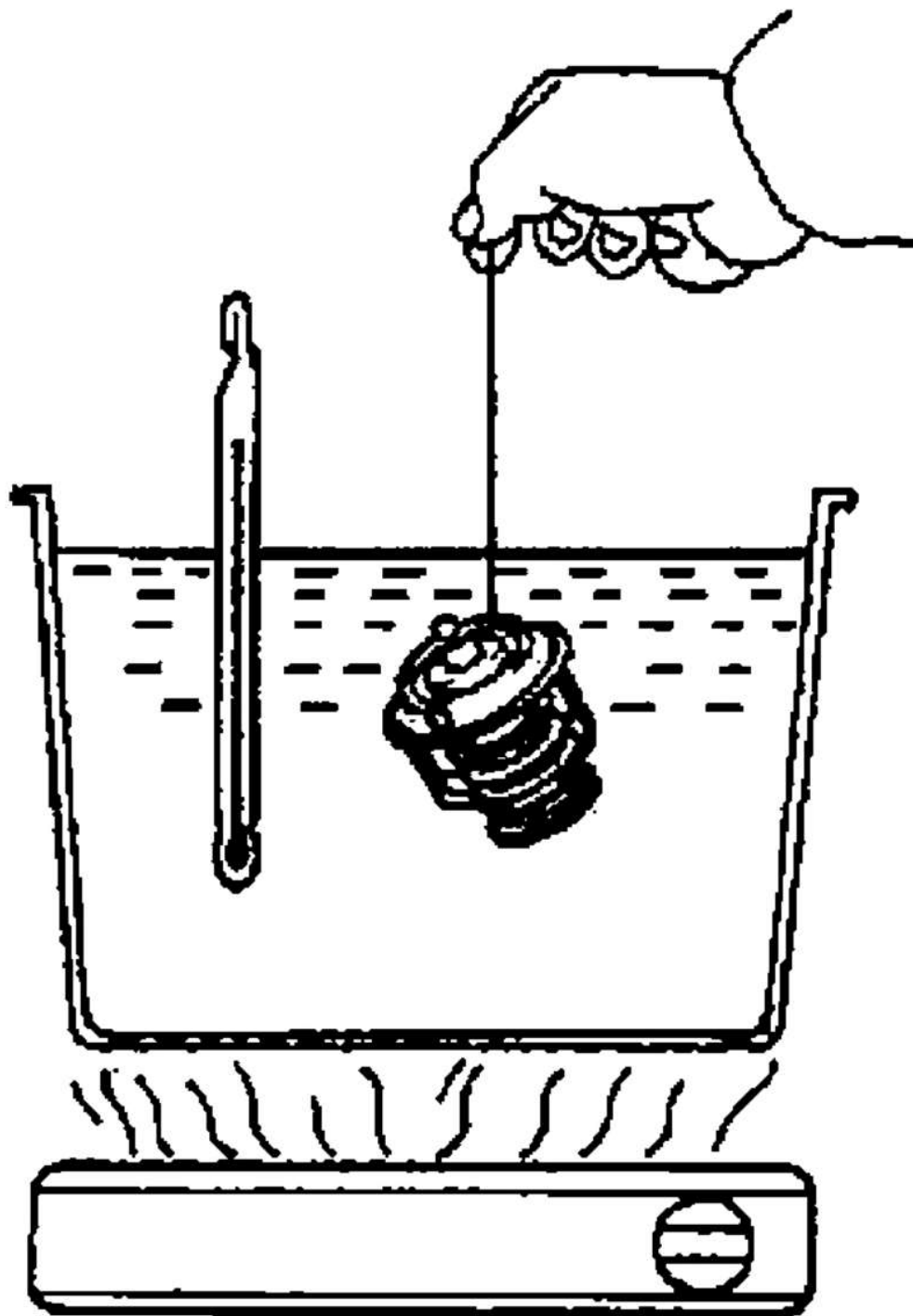


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Fig. 13: Locating Valve Opening Temperature
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: The thermostat is numbered with the valve opening temperature.

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



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Fig. 14: Testing Thermostat In Water

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

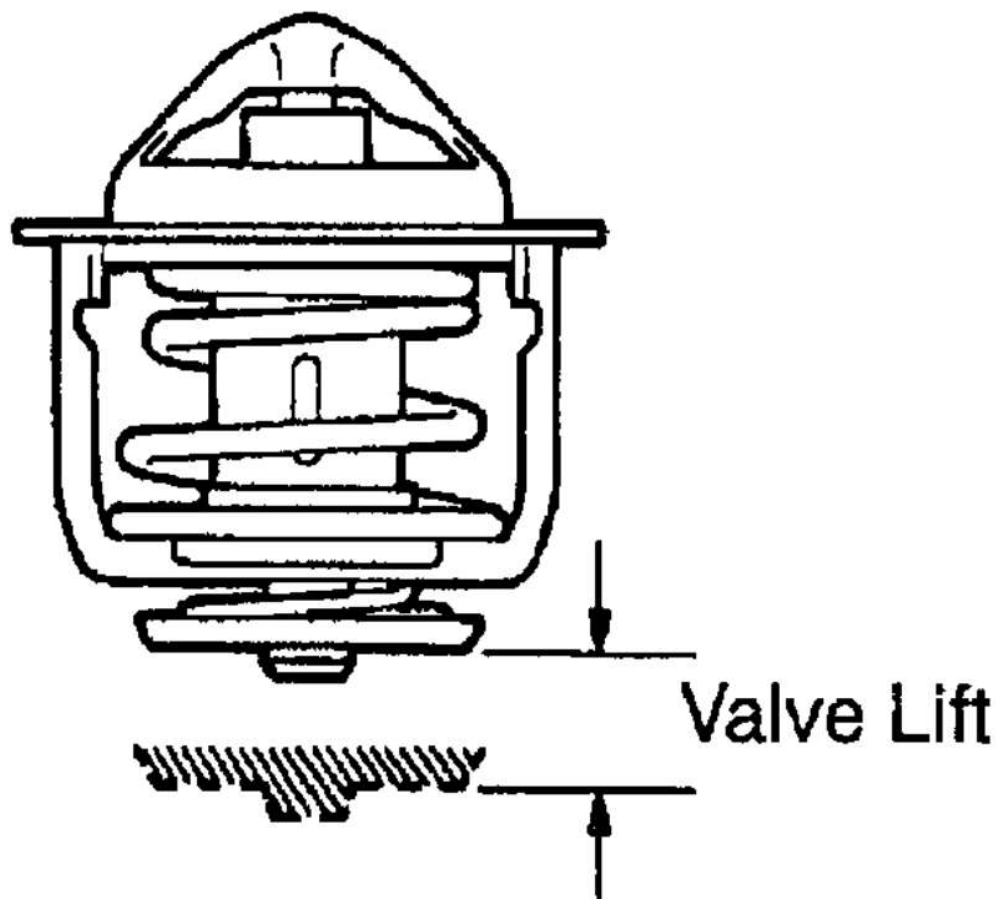
- b. Check the valve opening temperature.

Valve opening temperature: 80-84°C (176-183.2°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)



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Fig. 15: Checking Thermostat Valve Lift

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 40°C (104°F)).

If not closed, replace the thermostat.

INSTALLATION

1. **Place thermostat in cylinder block .**
 - a. Install a new gasket to the thermostat.
 - b. Install the thermostat with the jiggle valve upward.

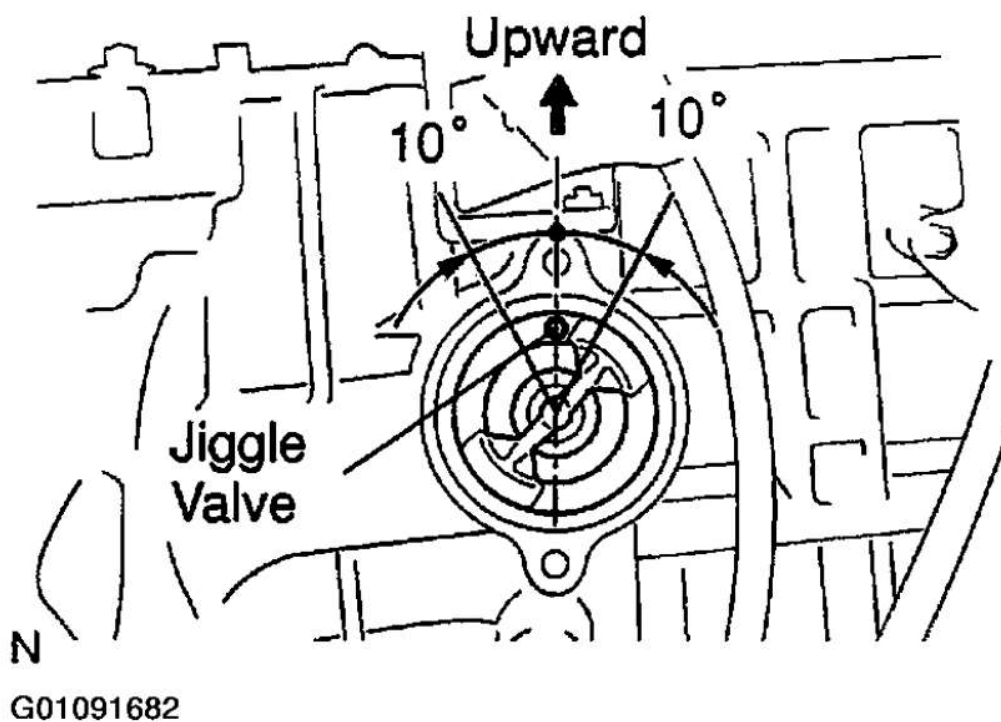
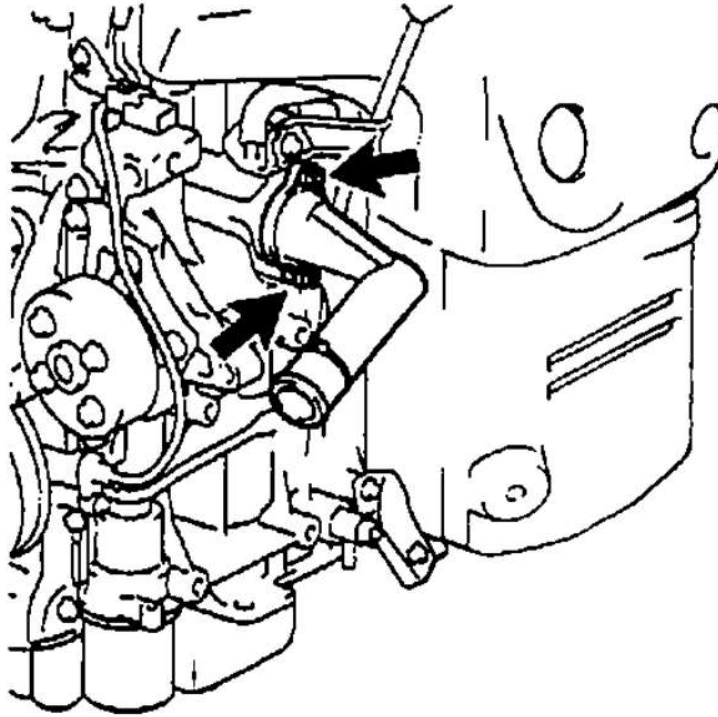


Fig. 16: Locating Jiggle Valve

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: The jiggle valve may be set within 10° of either side of the prescribed position.

2. Install water inlet .



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Fig. 17: Installing Water Inlet

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Install the water inlet with the 2 nuts.

Torque: 9 N.m (90 kgf.cm, 80 in..lbf)

3. Install generator (See CHARGING SYSTEM) .
4. Install drive belt (See CHARGING SYSTEM) .
5. Fill with engine coolant (See REPLACEMENT) .
6. Start engine and check for leaks .
7. Recheck engine coolant level .

RADIATOR

ON-VEHICLE CLEANING

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

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

ON-VEHICLE INSPECTION

1. Remove radiator cap .

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

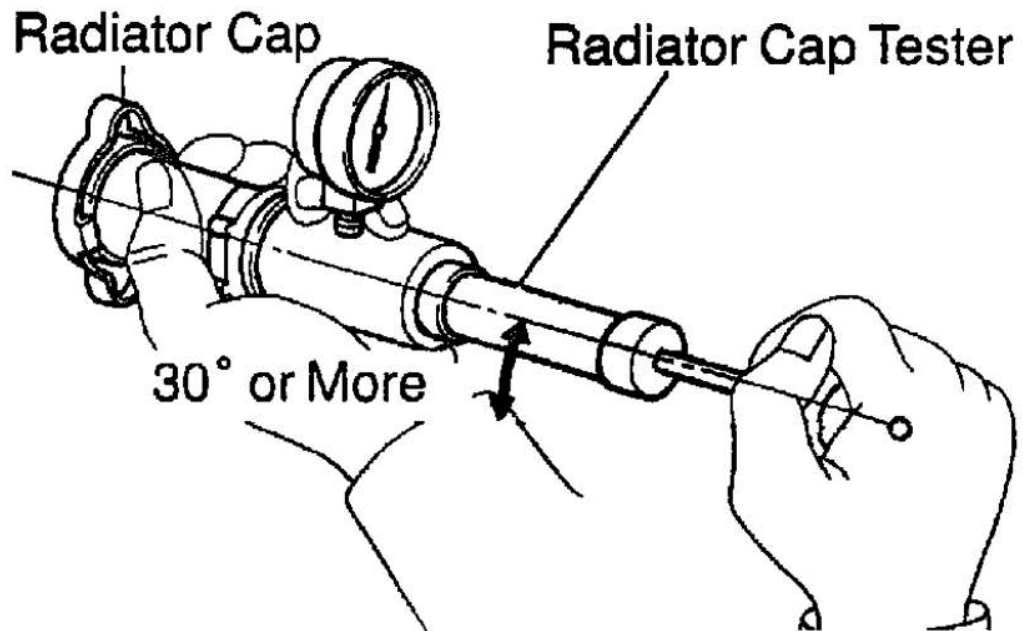
2. Inspect radiator cap .

NOTE:

- If the radiator cap has contaminations, always rinse it with water.
- Before using a radiator cap tester, wet the relief valve and pressure valve with engine coolant or water.
- When performing steps (a) and (b) below, keep the radiator cap 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 coming from the vacuum valve.

Pump speed: 1 push/(3 seconds or more)



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Fig. 18: Displaying Radiator Cap Tester
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Push the pump at a constant speed.

If air is not coming from the vacuum valve, replace the radiator cap.

3. Pump the tester and measure the relief valve opening pressure.

Pump speed: 1 push within 1 second

Radiator Cap Tester

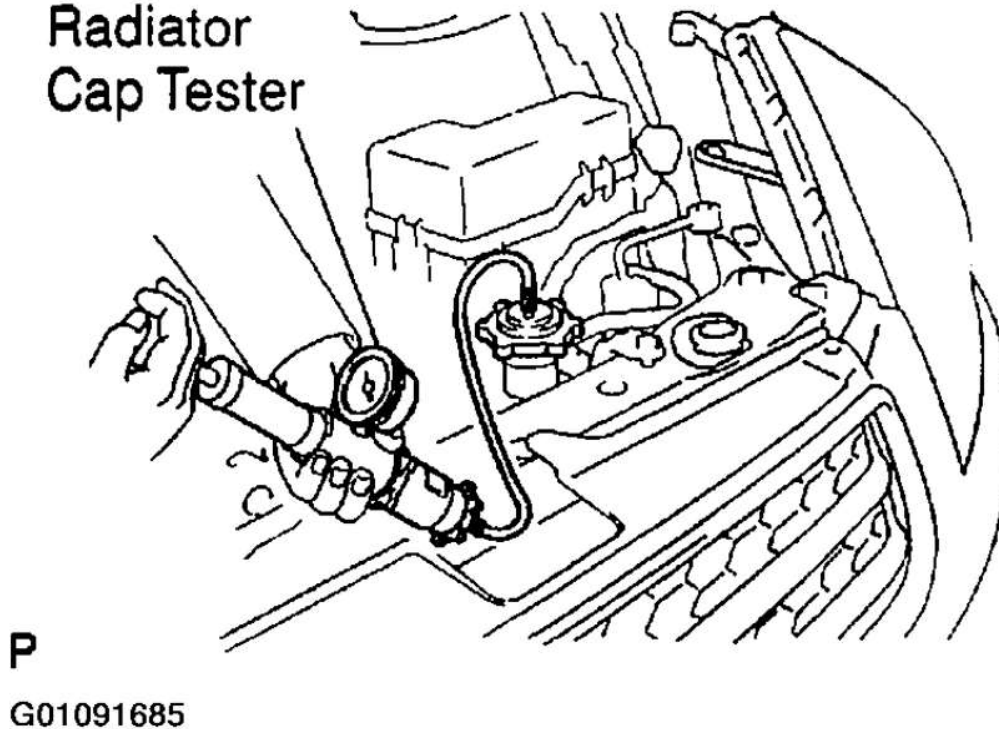


Fig. 19: Displaying Radiator Cap Tester
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: This pump speed is for the first pump only (in order to close the vacuum valve). After this, the pump speed can be reduced.

Standard opening pressure: 93-123 kPa (0.95- 1.25 kgf/cm² ,13.5 -17.8 psi)

Minimum opening pressure: 79 kPa (0.8 kgf/cm² ,11.5 psi)

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

4. Inspect cooling system for leaks .

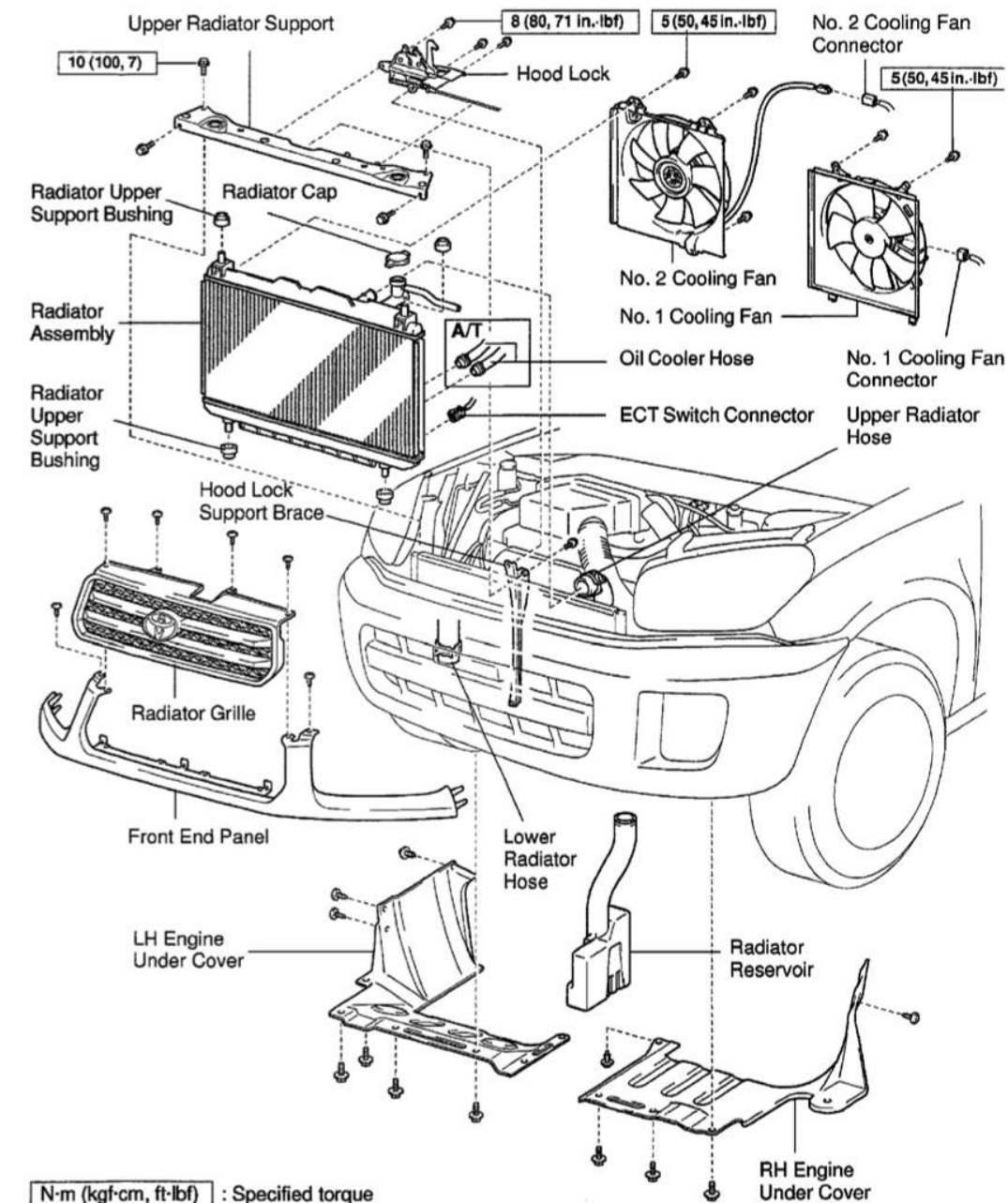
- a. Fill the radiator with coolant and attach a radiator cap tester.
- b. Warm up the engine.
- c. Pump it to 118 kPa (1.2 kgf/cm² , 17.1 psi), and check that the pressure does not drop.

If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are

found, check the heater core, cylinder block and head.

d. Reinstall radiator cap .

COMPONENTS



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Fig. 20: Identifying Components For Radiator Removal

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

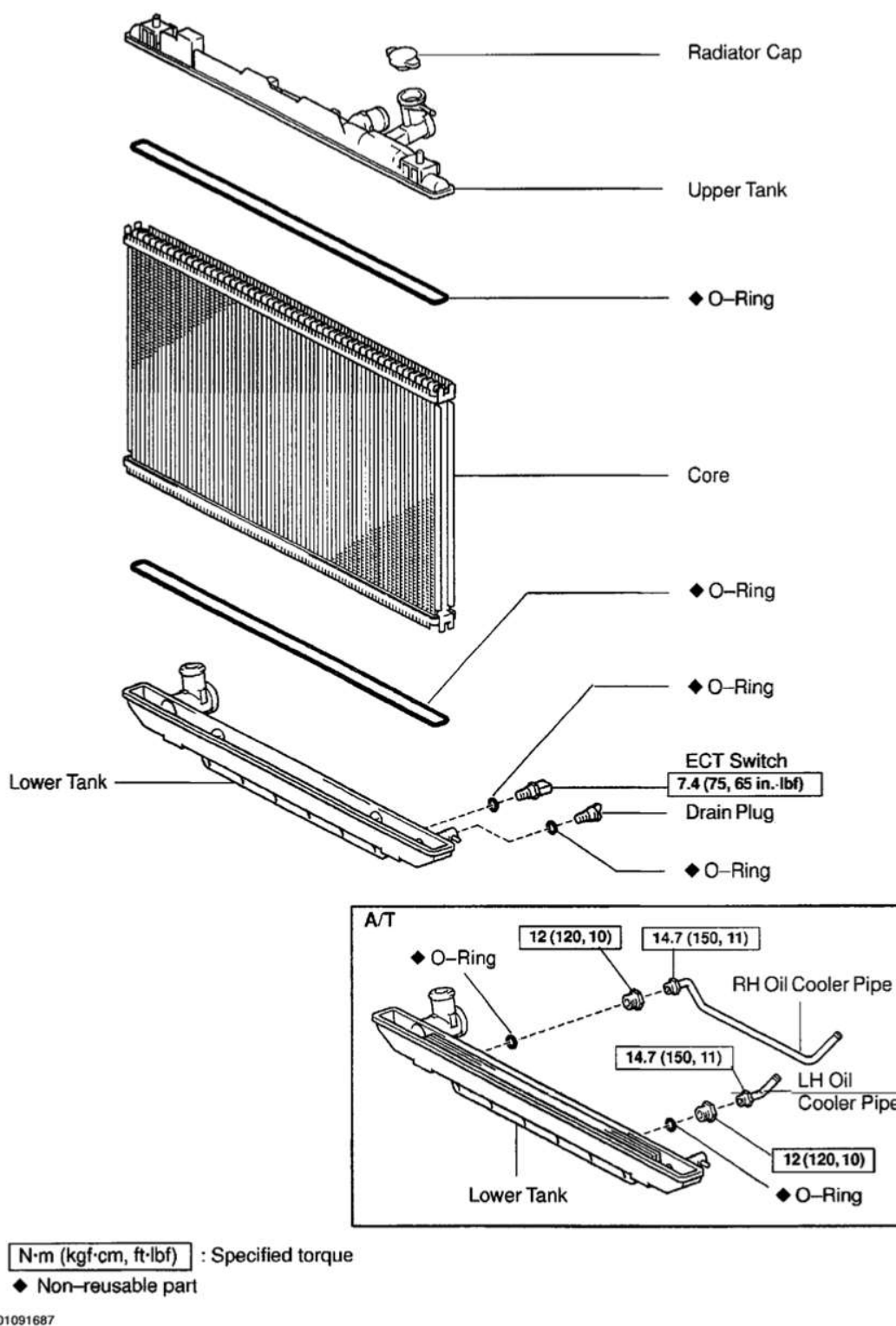


Fig. 21: Exploded View Of Radiator

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. Drain engine coolant.
2. Remove radiator grille .

Remove the 4 screws, 2 clips and radiator grille.

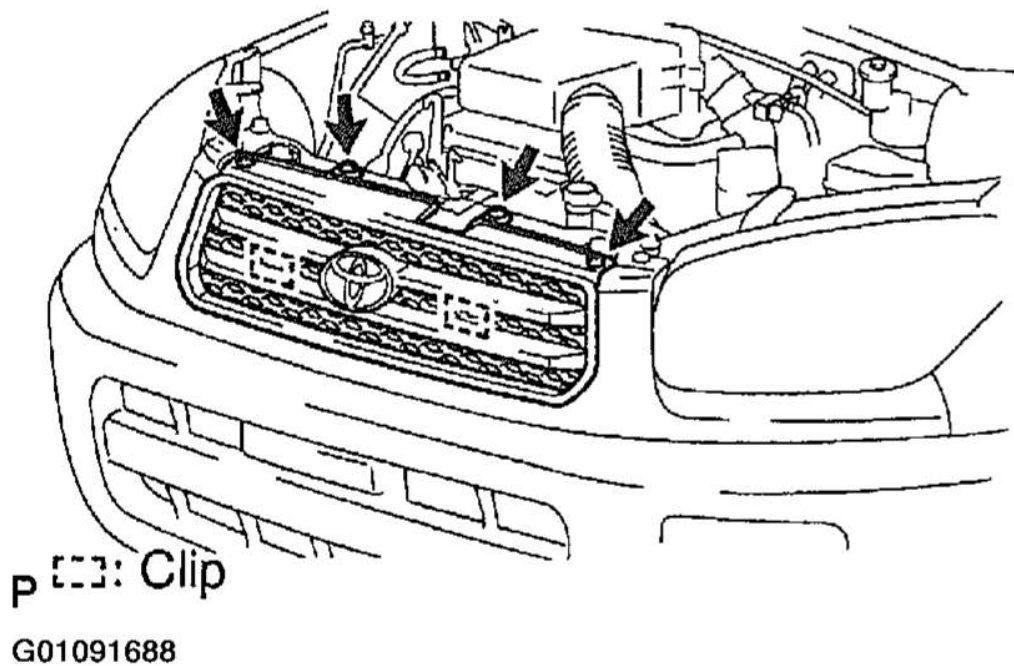


Fig. 22: Locating Radiator Grille Screws

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Remove front end panel .

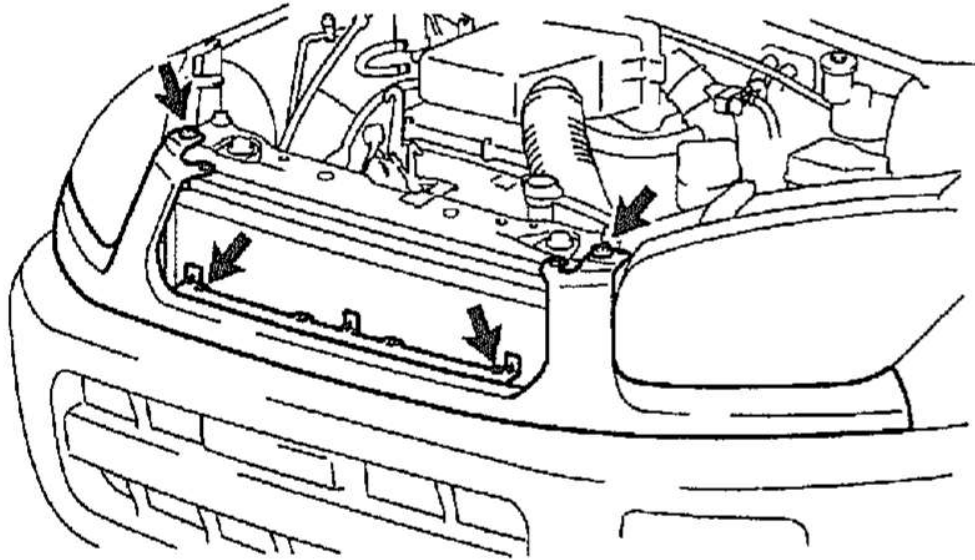
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Fig. 23: Removing Front End Panel

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Remove the 4 screws and front end panel.

4. Disconnect hood lock .

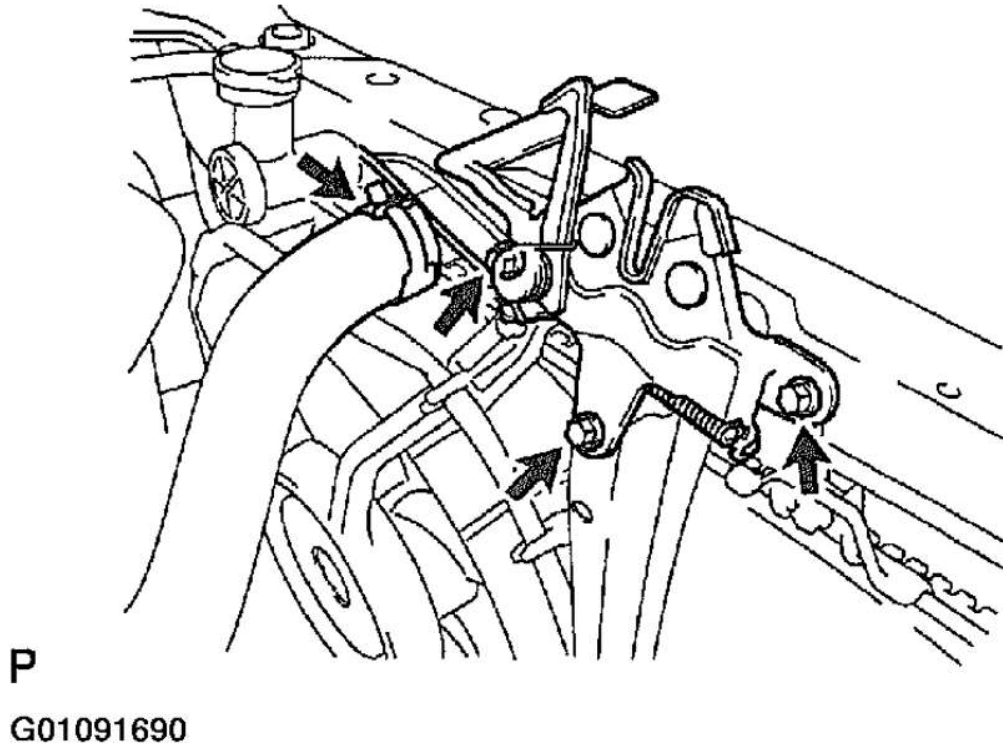


Fig. 24: Disconnecting Hood Lock

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Remove the 3 bolts, and disconnect the hood lock.
 - b. Disconnect the wire from the clamp.
5. **Disconnect upper radiator hose .**
 6. **Remove upper radiator support .**

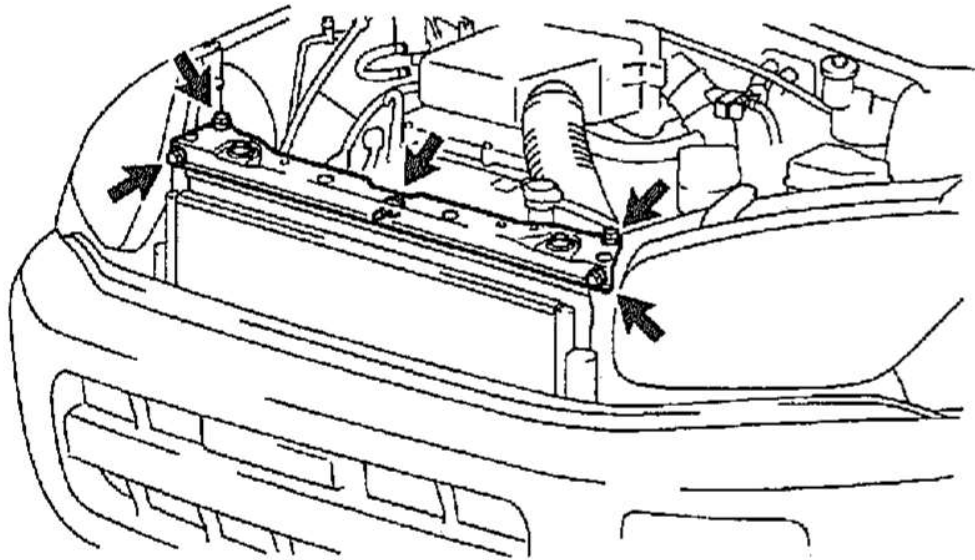
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Fig. 25: Locating Radiator Bolts & Support
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Remove the 5 bolts and radiator support.

7. **Remove LH engine under cover .**
8. **Remove radiator reservoir .**
9. **Remove No. 1 and No. 2 cooling fans (See ELECTRIC COOLING FAN) .**
10. **A/T: Disconnect oil 2 hoses .**

Disconnect the 2 oil cooler hoses from the radiator.

11. **Disconnect ECT switch connector .**
12. **Disconnect lower radiator hose .**
13. **Remove radiator .**
14. **Remove upper and lower radiator supports from radiator .**

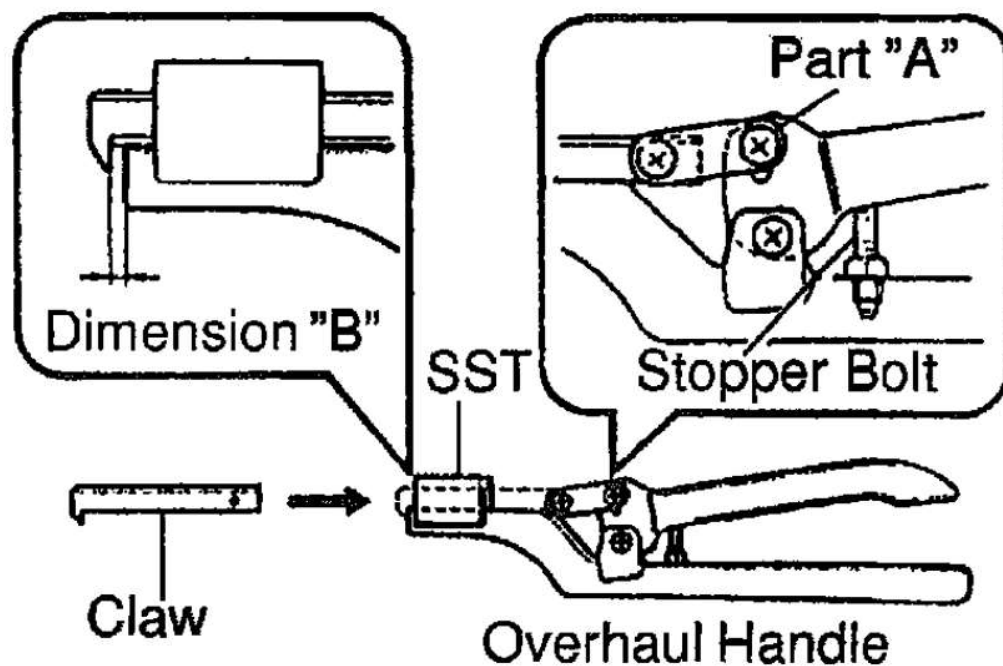
DISASSEMBLY

1. **Remove drain plug .**

- a. Remove the drain plug.
- b. Remove the O-ring.

2. Assemble SST .

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Fig. 26: Displaying SST Assemble

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Dimension "B": 0.2 - 0.3 mm (0.008 - 0.012 in.)

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

3. Uncaulk lock plates .

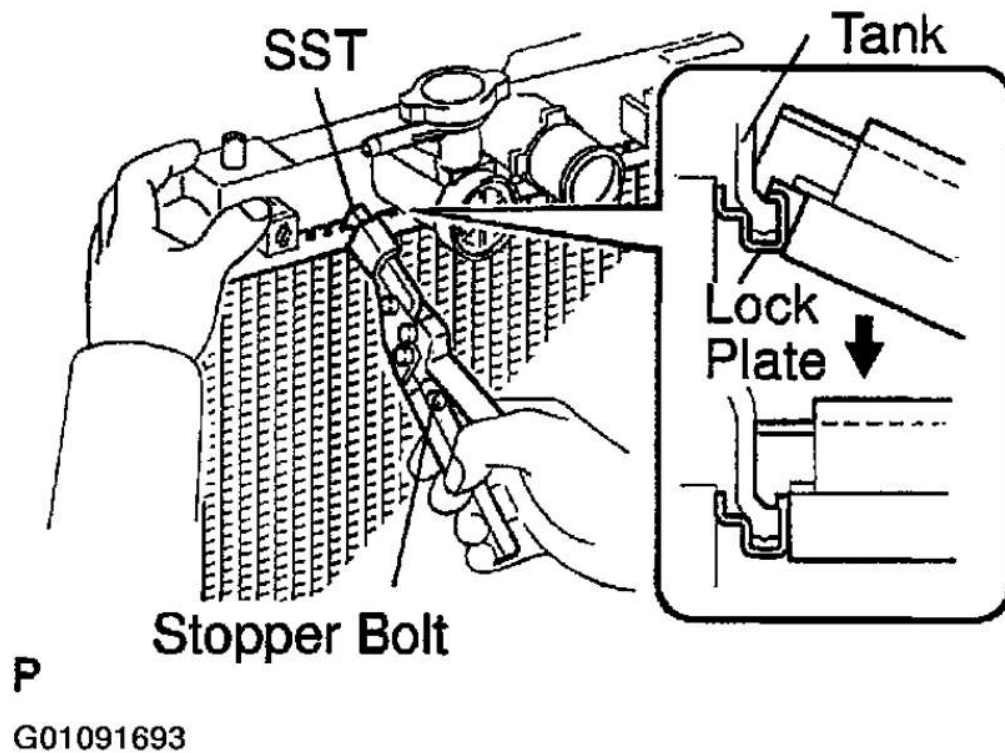


Fig. 27: Uncaulking Lock Plates

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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4. Remove tanks and "O"-rings .

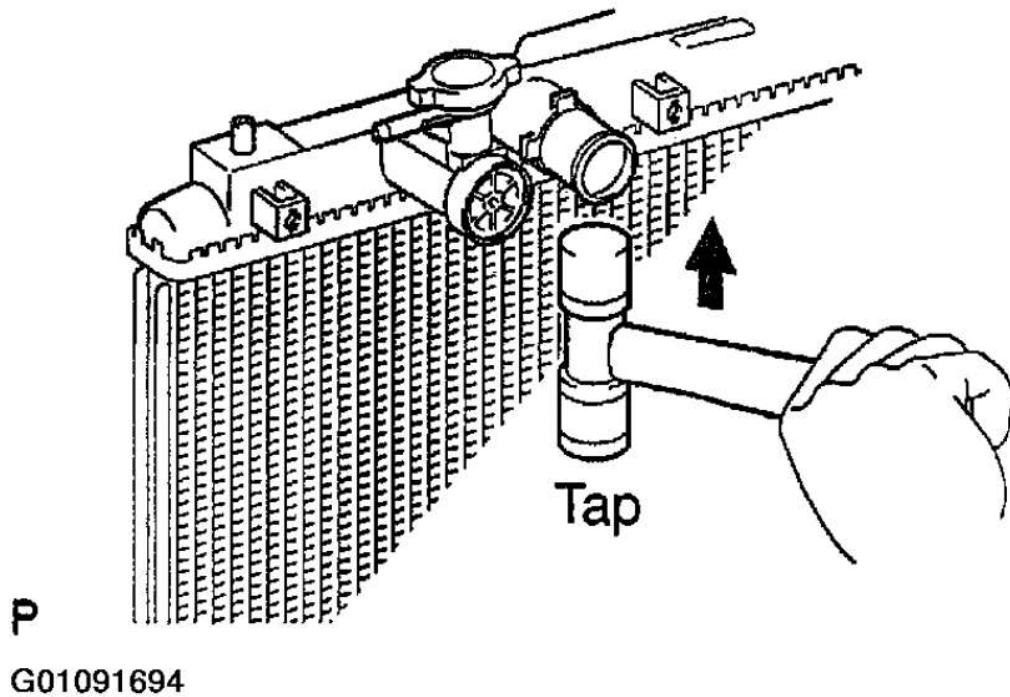


Fig. 28: Removing Tanks & "O"-Rings

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

5. **A/T: Remove oil cooler pipes from lower tank .**

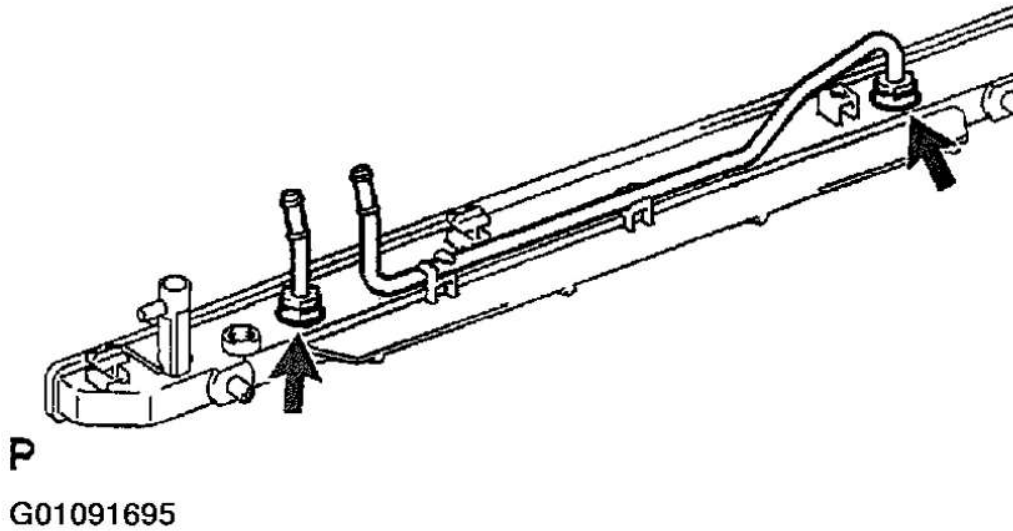


Fig. 29: Removing Oil Cooler Pipes From Lower Tank
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Loosen the 2 nuts, and remove the 2 pipes.
- b. Remove the 2 nuts.
- c. Remove the 2 "O"-rings from the oil cooler.

REASSEMBLY

1. **A/T: Install oil cooler pipes to lower tank .**

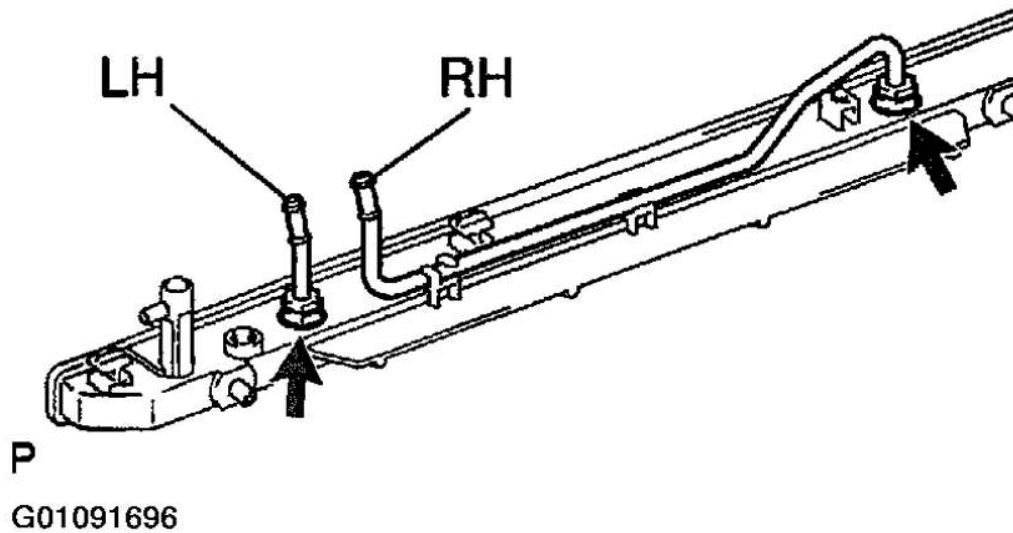


Fig. 30: Installing Oil Cooler Pipes To Lower Tank
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- a. Install 2 new O-rings to the oil cooler.
- b. Install the 2 nuts.
Torque: 12 N.m (120 kgf.cm, 10 ft.lbf)
- c. Install the LH cooler pipe in the direction indicated in the illustration.
Torque: 14.7 N.m (150 kgf.cm, 11 ft.lbf)
- d. Install the RH cooler pipe.
Torque: 14.7 N.m (150 kgf.cm, 11 ft.lbf)

2. Inspect lock plate for damage .

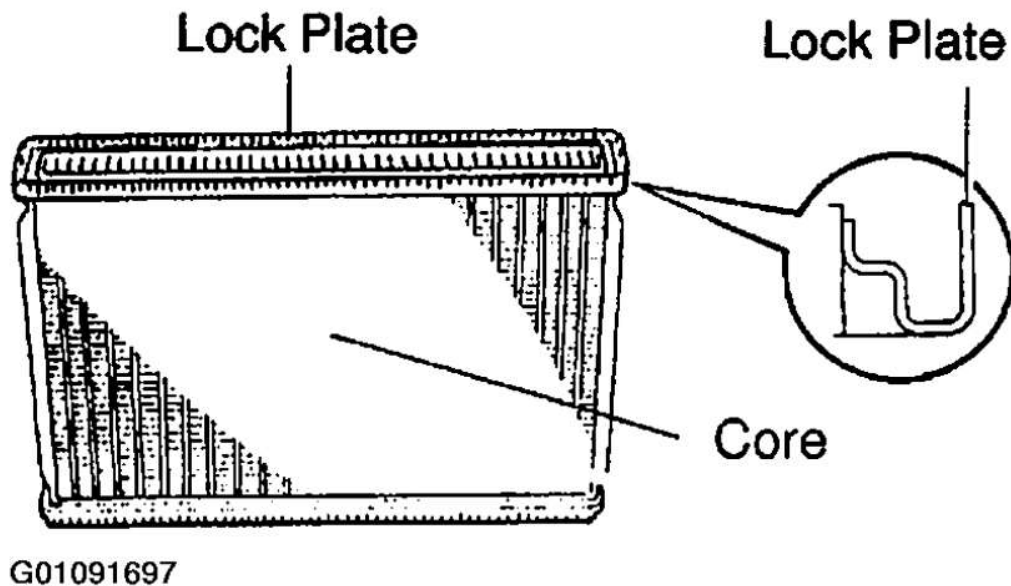


Fig. 31: Inspecting Lock Plates For Damage

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

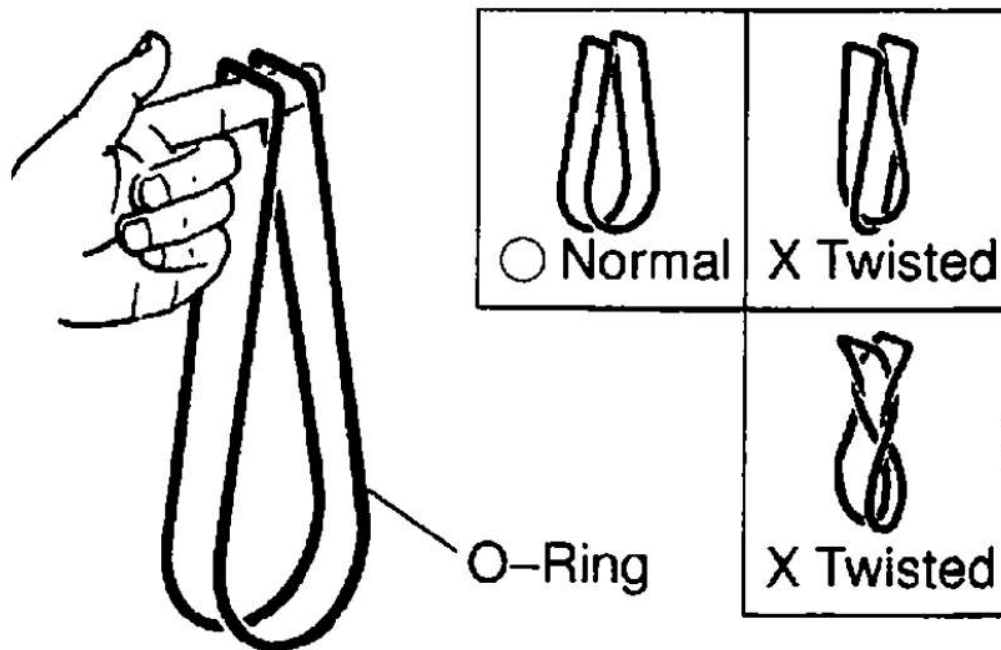
- If the sides of the lock plate groove are deformed, reassembly of the tank will be impossible.
- Therefore, first correct any deformation with pliers or similar object. Water leakage will result if the bottom of the lock plate groove is damaged.

NOTE:

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

3. Install new o-rings and tanks .

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



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Fig. 32: Installing New "O"-Rings & Tanks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: When cleaning the lock plate groove, lightly rub it with sand paper without scratching it.

- Install the tank without damaging the "O"-ring.
- Tap the lock plate with a soft-faced hammer so that there is no gap between it and the tank.

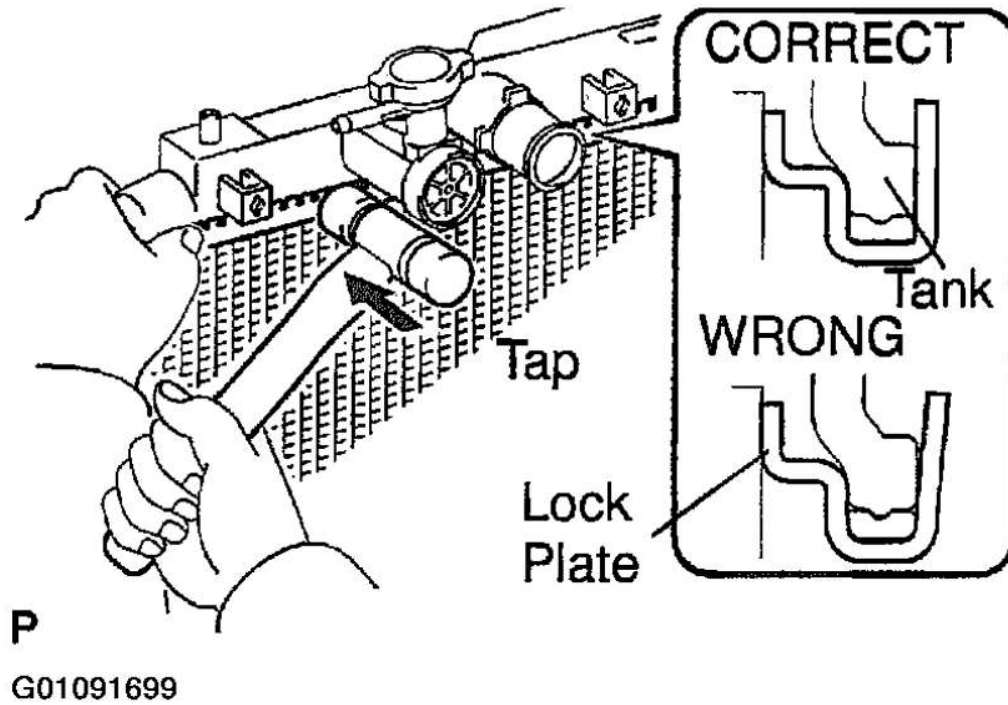


Fig. 33: Tapping Lock Plate

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Assemble SST .

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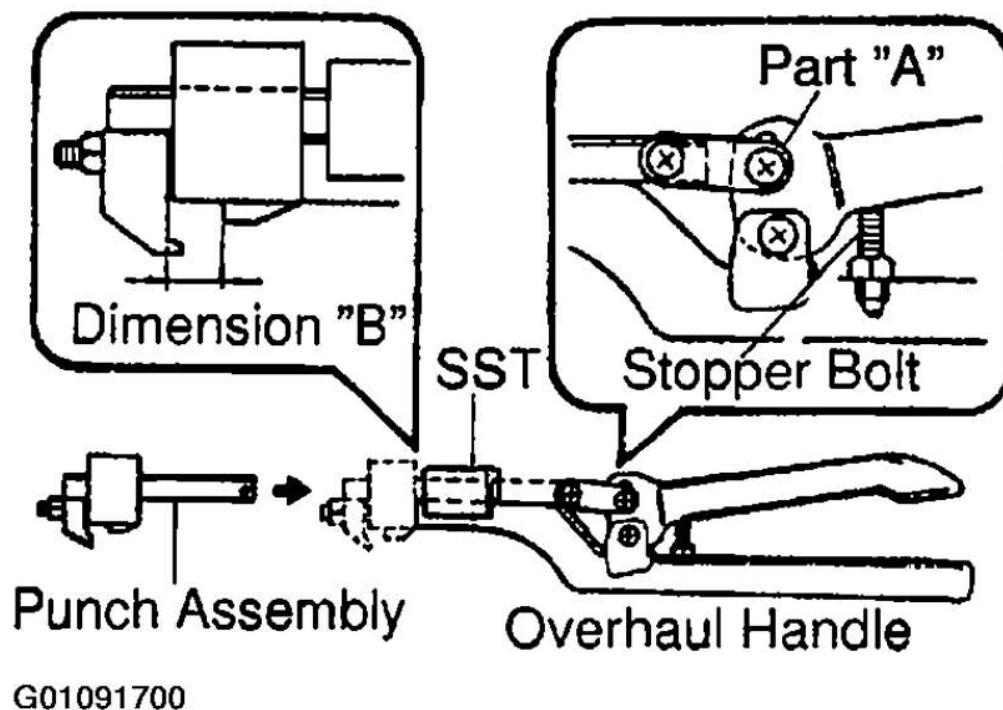


Fig. 34: Displaying SST Tool

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

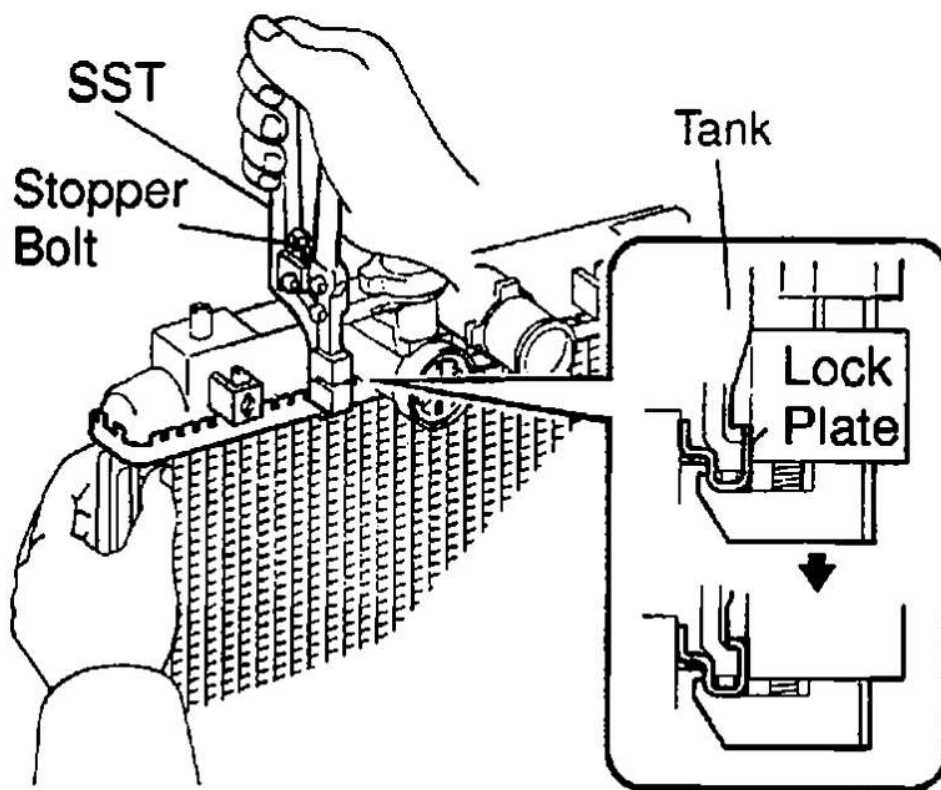
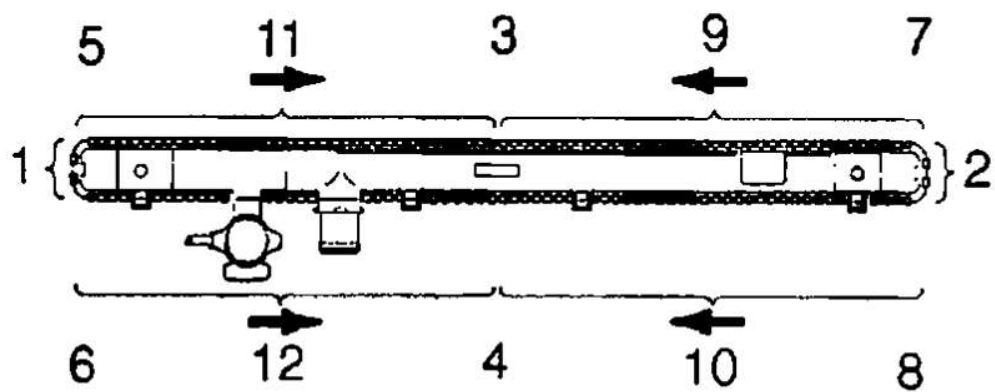
- Install the punch assembly to the overhaul handle, inserting it in the hole in part "A" as shown in the illustration.
- While gripping the handle, adjust the stopper bolt so that dimension "B" is as shown in the illustration.

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

5. Caulk lock plate .

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

SST 09230-01010



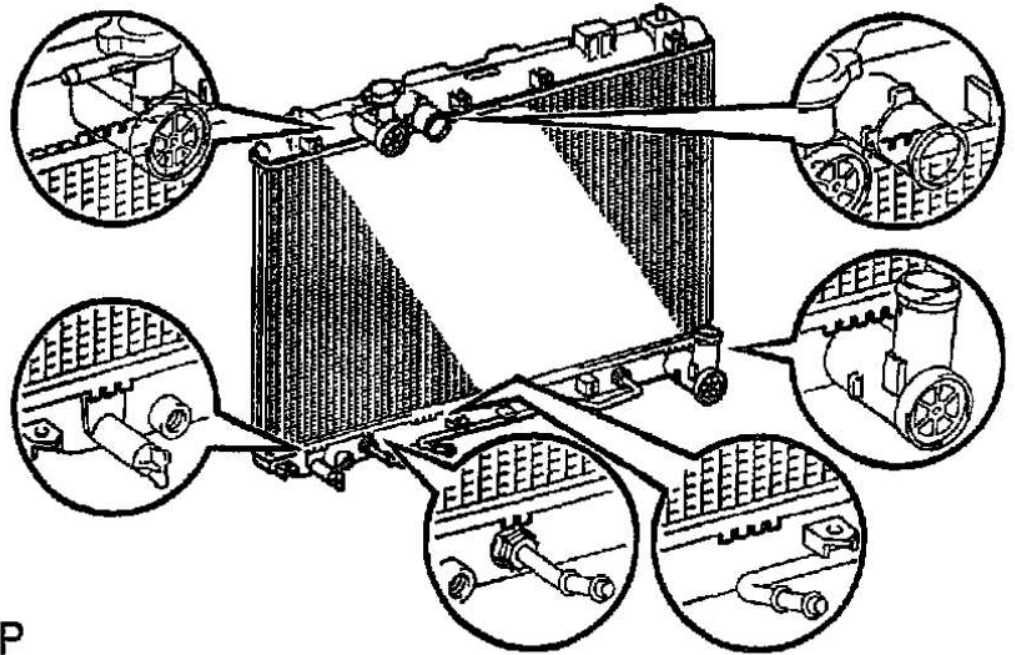
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Fig. 35: Caulking Lock Plate

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- NOTE:**
- Do not stake the areas protruding around the pipes, brackets or tank ril



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Fig. 36: Displaying Tank Areas

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. The points shown in **Fig. 36** cannot be staked with SST. Use pliers or similar object and be careful not to damage the core plates.

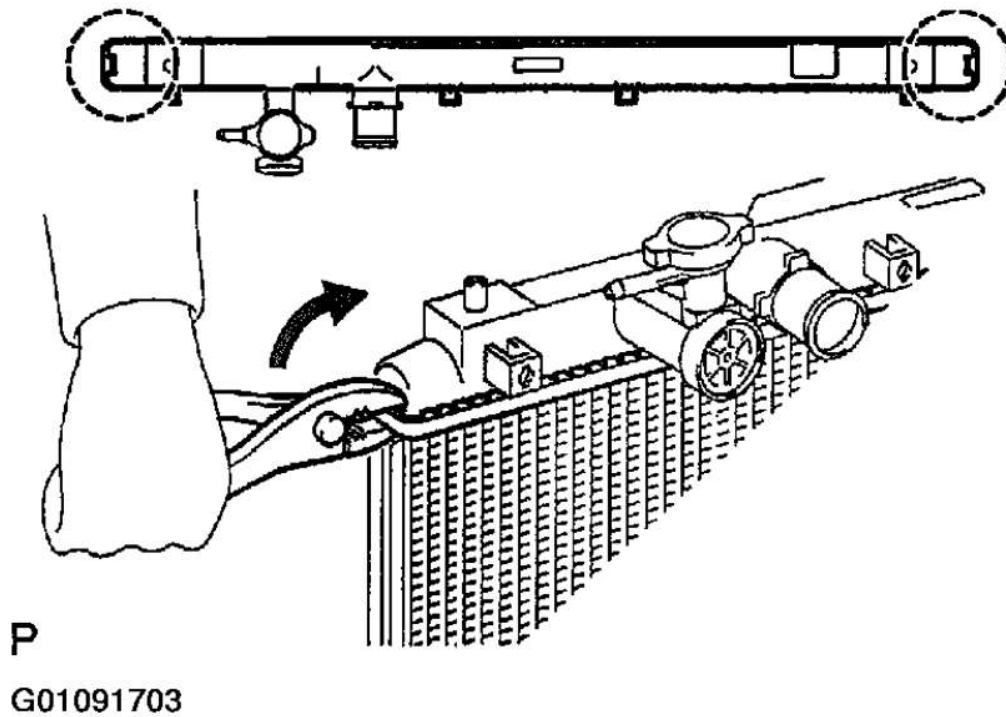


Fig. 37: Displaying Appropriate Plier Use
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Check the lock plate height (H) after completing the caulking.
Plate height (H): 8.45 - 8.85 mm (0.3327 - 0.3484 in.)

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

6. **Install drain plug .**
 - a. Install a new O-ring to the drain plug.
 - b. Install the drain plug.

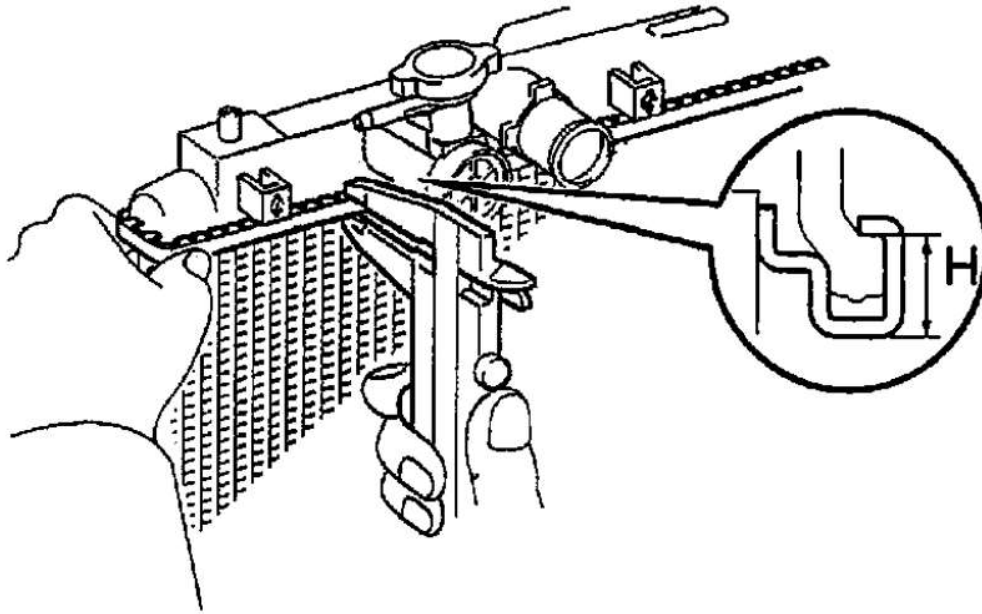
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Fig. 38: Checking Lock Plate Height

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. Inspect for water leaks .

- a. Tighten the drain plug.
- b. Plug the inlet and outlet pipes of the radiator with SST.

SST 09230-01010

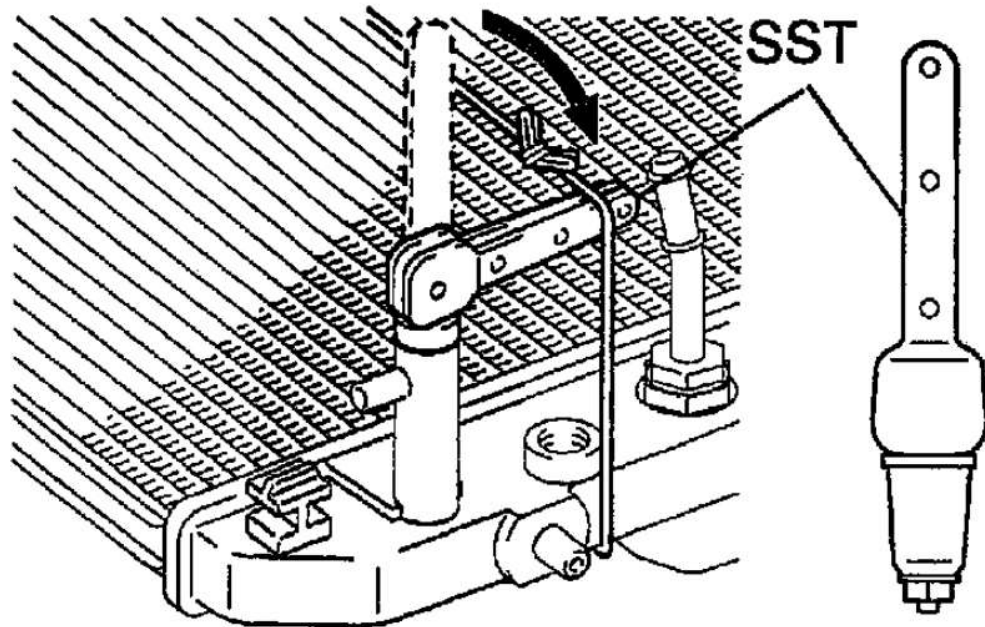
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Fig. 39: Tightening Drain Plugs Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a radiator cap tester, apply pressure to the radiator.

Test pressure: 177 kPa (1.8 kgf/cm² , 26 psi)

- d. Submerge the radiator in water.
e. Inspect for leaks.

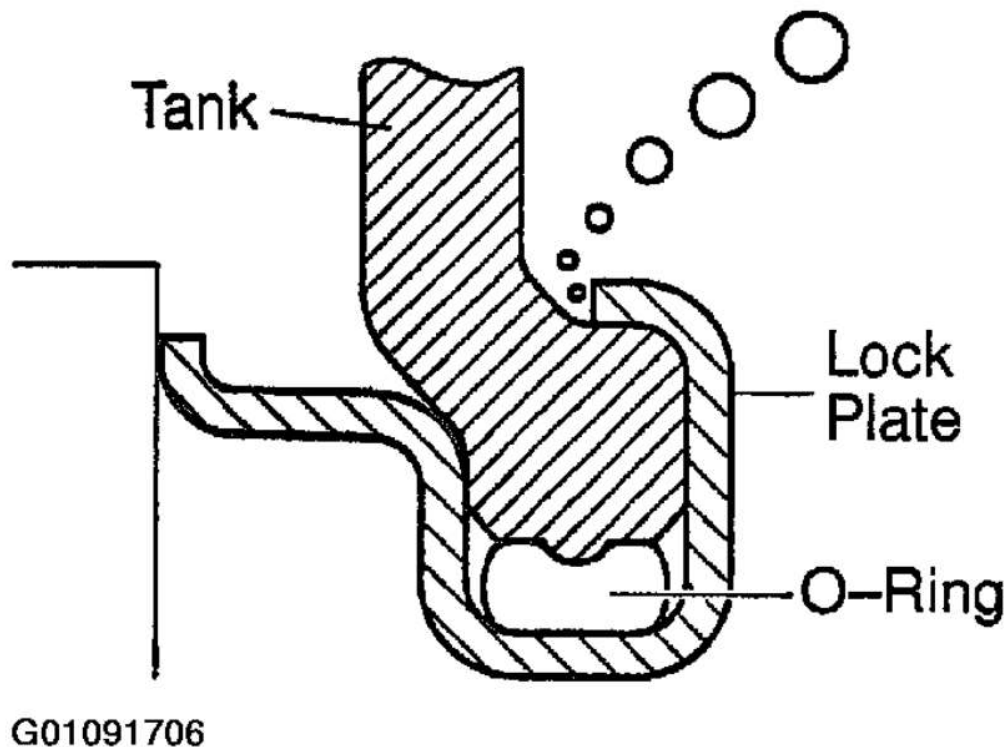


Fig. 40: Inspecting For Water Leaks

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: On radiators with resin tanks, there is a clearance between the tank and lock plate where a minute amount of air will remain, giving the appearance of an air leak when the radiator is submerged in water. therefore, before doing the water leak test, first swish the radiator around in the water until all bubbles disappear.

INSTALLATION

1. Install upper and lower radiator supports to radiator .
2. Install radiator .
3. Connect lower radiator hose .
4. A/T:Connect 2 hoses .

Connect the 2 oil cooler hoses to the radiator.

5. **Connect ECT switch connector .**
6. **Install No. 1 and No. 2 cooling fans (See ELECTRIC COOLING FAN) .**
7. **Install radiator reservoir.**
8. **Install RH engine under cover .**
9. **Install upper radiator support .**

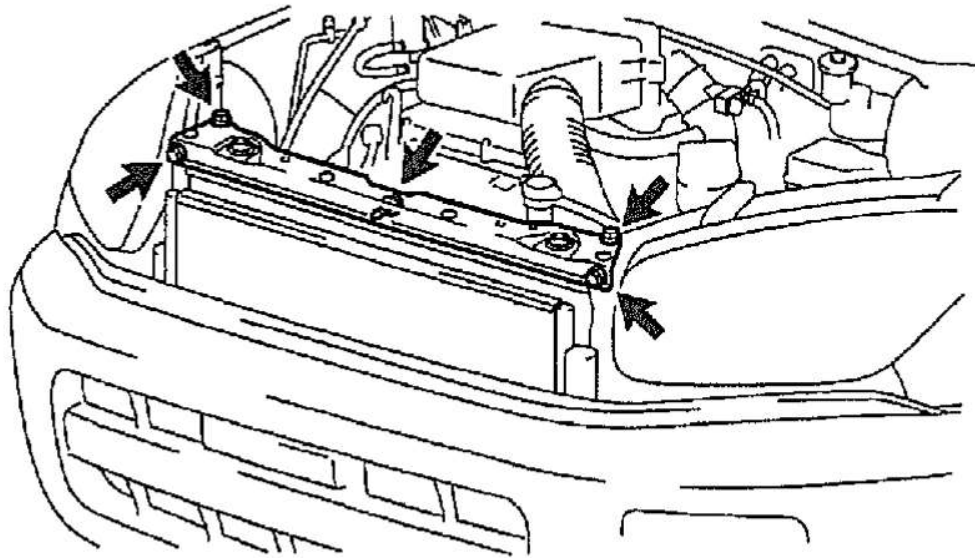
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Fig. 41: Locating Radiator Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Install the radiator upper support with the 5 bolts.

10. **Connect upper radiator hose .**

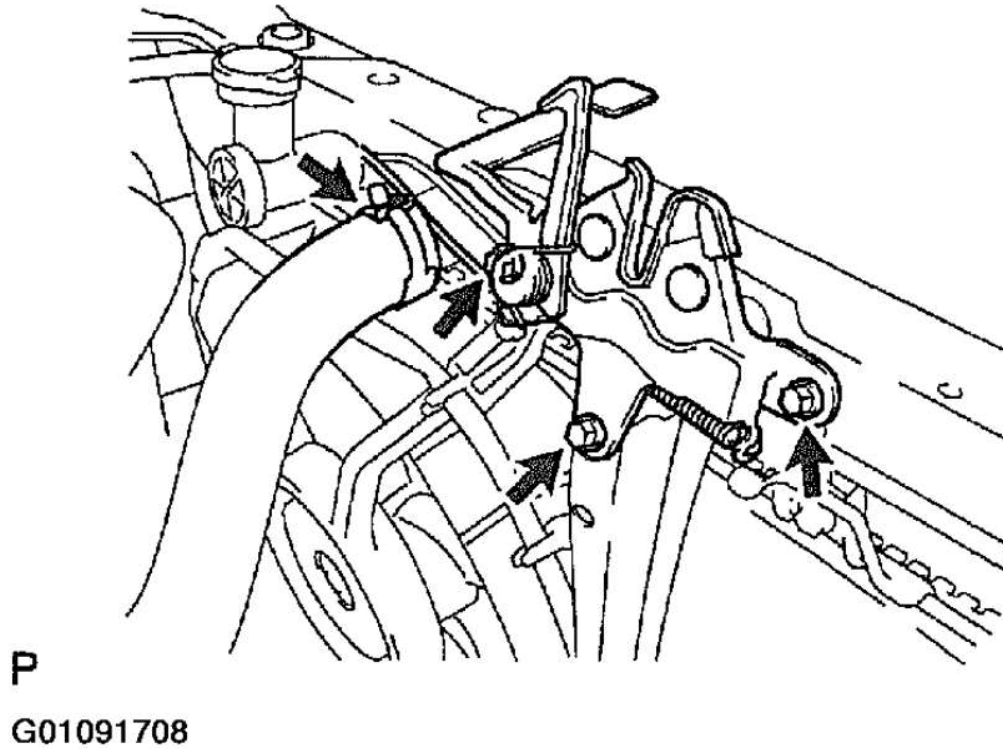


Fig. 42: Locating Upper Radiator Hose Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. Connect hood lock .

- a. Install the hood lock with the 3 bolts.
- b. Install the wire from the clamps.
- c. **Install front end panel .**

Install the front end panel with the 4 screws.

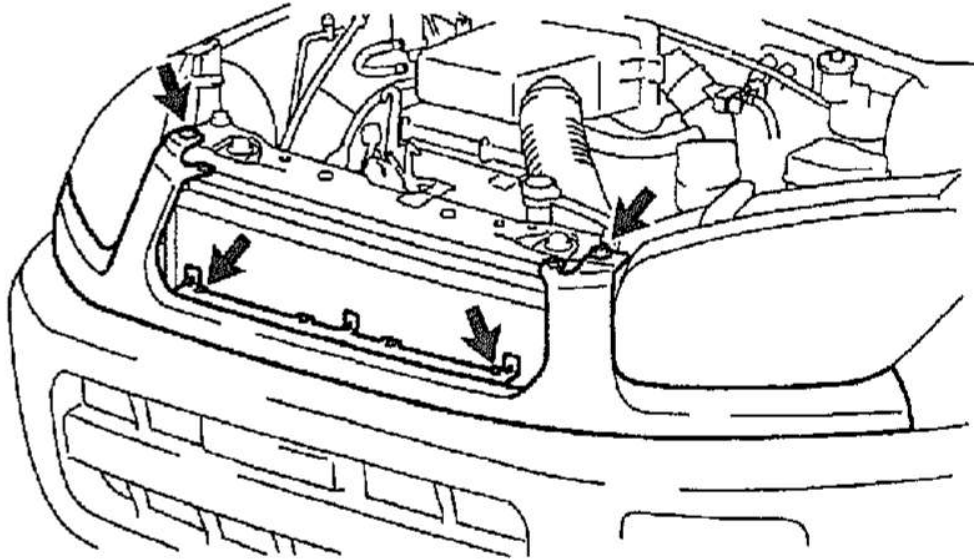
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Fig. 43: Locating Front End Panel Screws

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. **Install radiator grille .**

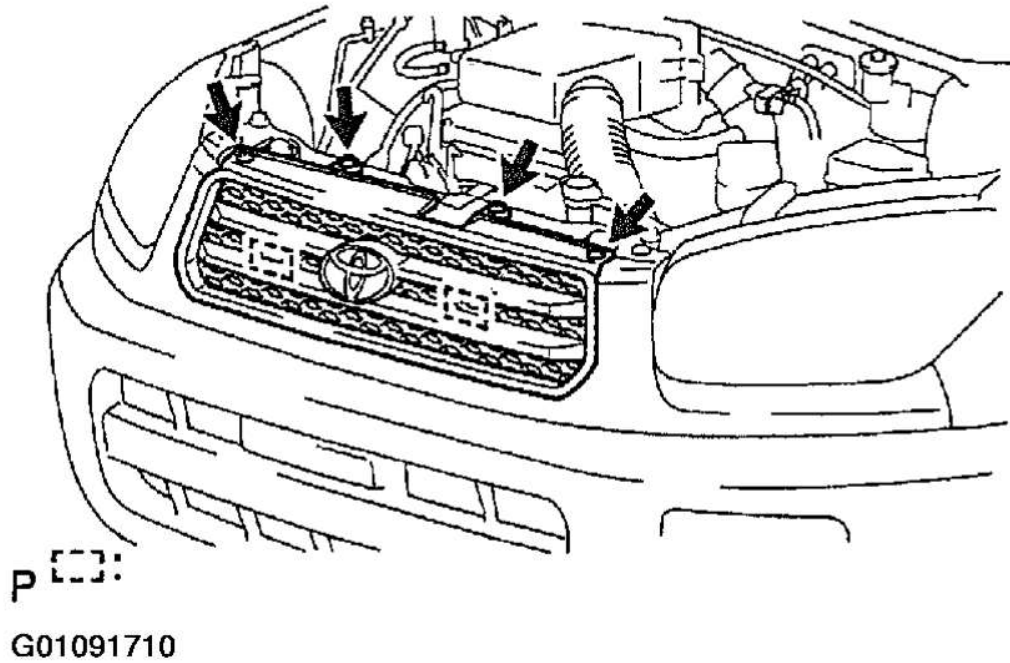


Fig. 44: Locating Radiator Grille Screws & Clips
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Install the radiator grille with the 4 screws and 2 clips.

- e. **Fill with engine coolant .**
- f. **Start engine and check for coolant leaks .**