

COOLING SYSTEM

REFER TO 2L, 3L ENGINE REPAIR MANUAL
(Pub. No. RM123E)

NOTE: The following pages contain only the points which differ from the above listed manual.

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CO

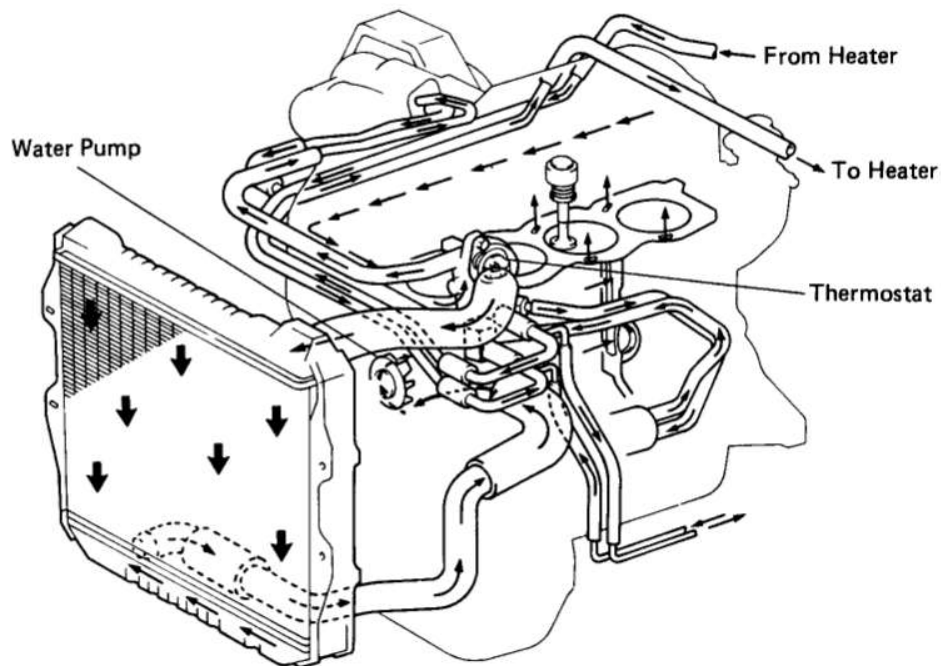
CO-2

COOLING SYSTEM – Description

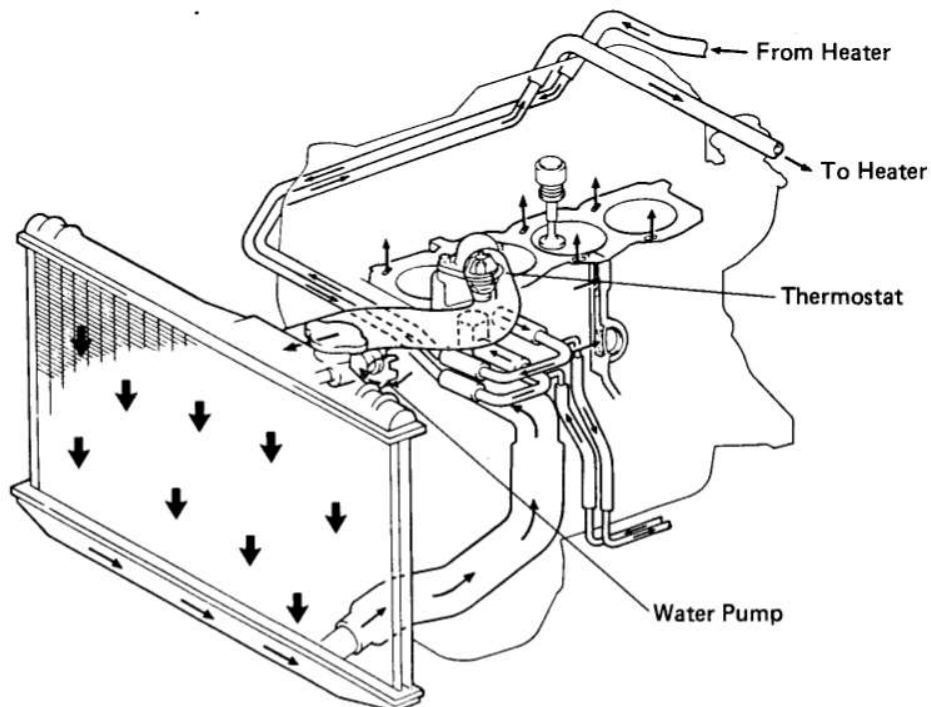
DESCRIPTION

This engine utilizes a pressurized water forced circulation cooling system which includes a thermostat equipped with a by-pass valve mounted on the inlet side.

2L-T



3L

CO1166
CO1174

COOLING SYSTEM – Description**CO-3**

The cooling system is composed of the water jacket (inside the cylinder block and cylinder head), radiator, water pump, thermostat, cooling fan, hoses and other components. Coolant which is heated in the water jacket is pumped to the radiator, where it is cooled by the cooling fan and the vehicle windstream. Coolant which has been cooled is then sent back to the engine by the water pump, where it cools the engine. The water jacket is a network of channels in the shell of the cylinder block and cylinder head through which coolant passes. It is designed to provide adequate cooling of the cylinders and combustion chambers which become the hottest during engine operation.

RADIATOR

The radiator performs the function of cooling the coolant which has passed through the water jacket and become hot, and it is mounted in the front of the vehicle. The radiator consists of an upper tank and lower tank, and a core which connects the two tanks. The upper tank contains an inlet for coolant from the water jacket and a filler inlet. It also has a hose through which excess coolant or steam can flow. The lower tank has an outlet and drain cock for the coolant. The core contains many tubes and cooling fins through which coolant flows from the upper tank to the lower tank so that coolant has been heated up as it passes through the water jacket is cooled here by the air sucked through the radiator by the cooling fan, as well as by the wind generated by the vehicle's travel. Models with an automatic transmission include an automatic transmissions fluid cooler built into the lower tank of the radiator.

RADIATOR CAP

The radiator cap is a pressure type cap which seals the radiator, resulting in pressurization of the radiator as the coolant expands. The pressurization prevents the coolant from boiling even when the coolant temperature exceeds 100°C (212°F). A relief valve (pressurization valve) and a vacuum valve (negative pressure valve) are built into the radiator cap. When the pressure generated inside the cooling system exceeds the limit (coolant temperature: 110 – 120°C, 230 – 248°F, pressure; 0.3 – 1.0 kg/cm², 4.3 – 14.2 psi, 29.4 – 98.1 kPa) the relief valve is opened by the pressure and lets steam escape through the overflow pipe. The vacuum valve opens to allow atmospheric air to enter to alleviate the vacuum which develops in the cooling system after the engine is stopped and the coolant temperature drops. The valve's opening allows the pressure in the cooling system to return to the reservoir tank.

RESERVOIR TANK

The reservoir tank is used to catch coolant which overflows the cooling system as a result of volumetric expansion when the coolant is heated. When the coolant temperature drops, the coolant in the reservoir tank returns to the radiator, thus keeping the radiator full at all times and avoiding needless coolant loss. To find out if the coolant needs to be replenished, check the reservoir tank level.

WATER PUMP

The water pump is used for forced circulation of coolant through the cooling system. It is mounted on the front of the cylinder block and driven by a drive belt.

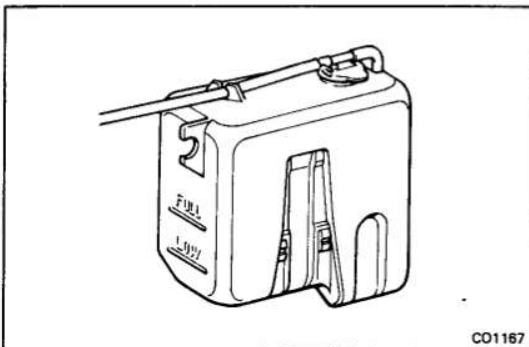
THERMOSTAT

The thermostat has a wax type by-pass valve and is mounted in the water outlet housing. The thermostat is a type of automatic valve operated by fluctuations in the coolant temperature. This valve closes when the coolant temperature drops, preventing the circulation of coolant through the radiator and thus permitting the engine to warm up rapidly. The valve opens when the coolant temperature has risen, allowing the circulation of coolant. Wax inside the thermostat expands when heated and contracts when cooled. Heating the wax thus generates pressure which overpowers the force of the spring which keeps the valve closed, thus opening the valve. When the wax cools, its contraction causes the force of the spring to take effect once more, closing the valve. The thermostat in this engine operates at a temperature of 88°C (191°F).

CO-4 COOLING SYSTEM – Troubleshooting, Check and Replacement of Engine Coolant**TROUBLESHOOTING**

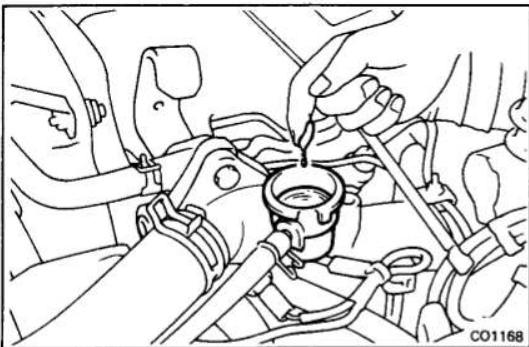
Problem	Possible cause	Remedy	Page
Engine overheats	Fan belt loose or missing	Adjust or replace belts	CH-3
	Dirt, leaves or insects on radiator or condenser	Clean radiator or condenser	
	Hoses, water pump, thermostat housing, radiator, heater, core plugs or head gasket leakage	Repair as necessary	
	Thermostat faulty	Check thermostat	CO-6 EM-24 or 25
	Injection timing retarded	Adjust timing	
	Fluid coupling faulty	Replace fluid coupling	
	Radiator hose plugged or rotten	Replace hose	
	Water pump faulty	Replace water pump	
	Radiator plugged or cap faulty	Check radiator	
	Cylinder head or block cracked or plugged	Repair as necessary	

HINT: 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.

**CHECK AND REPLACEMENT OF ENGINE COOLANT****1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK**

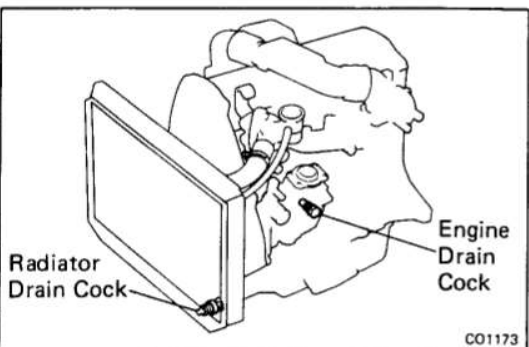
The coolant level should be between the "LOW" and "FULL" lines.

If low, check for leaks and add coolant up to the "FULL" line.

**2. CHECK ENGINE COOLANT QUALITY**

There should not be any excessive deposits of rust or scales around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, replace the coolant.

**3. REPLACE ENGINE COOLANT**

(a) Remove the radiator cap.

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

(b) Drain the coolant from the radiator and engine drain cocks.

(c) Close the drain cocks.

Torque (Engine drain cock):
300 kg-cm (22 ft-lb, 29 N·m)

COOLING SYSTEM — Check and Replacement of Engine Coolant**CO-5**

- (d) Fill the system with coolant.

Use a good brand of ethylene-glycol or TOYOTA radiator conditioner or equivalent anticorrosive, mixed according to the manufacturer's directions.

Ethylene-glycol type: This type has an antifreeze and anticorrosive effect.

TOYOTA radiator conditioner: This has only an anticorrosive effect.

NOTICE:

- Do not use alcohol type coolant.
- The coolant should be mixed with demineralized water or distilled water.

Capacity (w/o Heater):

LJ		10.0 liters (10.6 US qts, 8.8 Imp. qts)
LN	2L-T	8.2 liters (8.7 US qts, 7.2 Imp. qts)
	3L	8.1 liters (8.6 US qts, 7.1 Imp. qts)

Capacity (w/ Heater):

LJ		10.9 liters (11.5 US qts, 9.6 Imp. qts)
LN	2L-T	9.1 liters (9.6 US qts, 8.8 Imp. qts)
	3L	9.0 liters (9.5 US qts, 7.9 Imp. qts)

Capacity (w/ Front and rear heaters):

LJ	2L-T	11.5 liters (12.2 US qts, 10.1 Imp. qts)
LN	2L-T	9.4 liters (9.9 US qts, 8.3 Imp. qts)
	3L	9.3 liters (9.8 US qts, 8.2 Imp. qts)

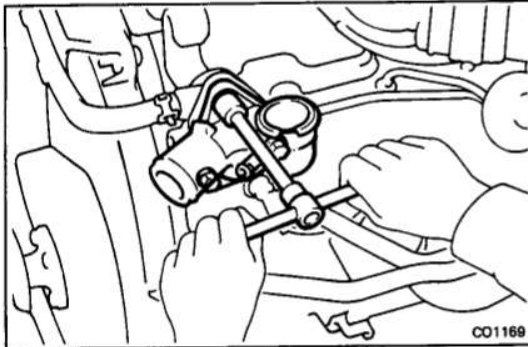
- (e) Reinstall the radiator cap.
- (f) Warm up the engine and check for leaks.
- (g) Recheck the coolant level and refill as necessary.

CO-6

COOLING SYSTEM – Thermostat (2L-T)

THERMOSTAT (2L-T)**REMOVAL OF THERMOSTAT**

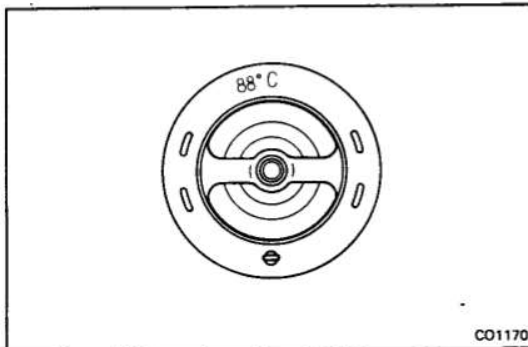
1. DRAIN ENGINE COOLANT (See page CO-4)



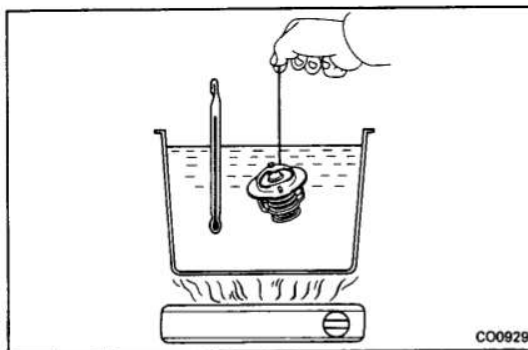
2. REMOVE WATER OUTLET

Remove the three bolts and water outlet from the water outlet housing.

3. REMOVE THERMOSTAT

**INSPECTION OF THERMOSTAT****INSPECT THERMOSTAT**

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

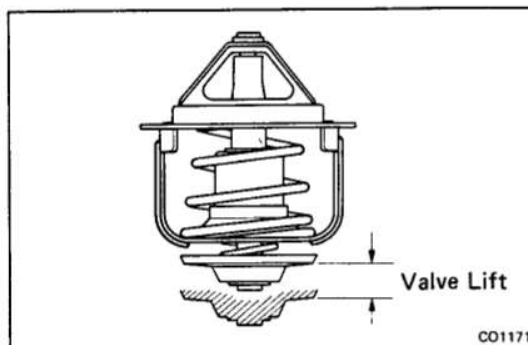


- (a) Immerse the thermostat in water and gradually heat the water.

- (b) Check the valve opening temperature.

Valve opening temperature: 86 – 90°C (187 – 194°F)

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



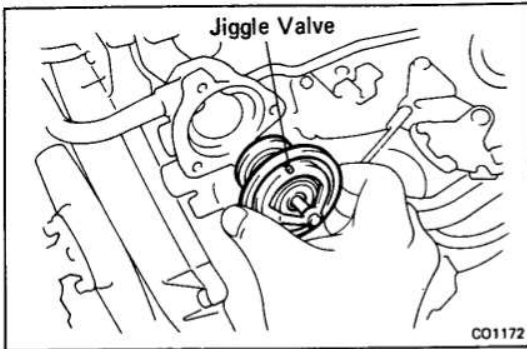
- (c) Check the valve lift.

Valve lift: 8 mm (0.31 in.) or more at 100°C (212°F)

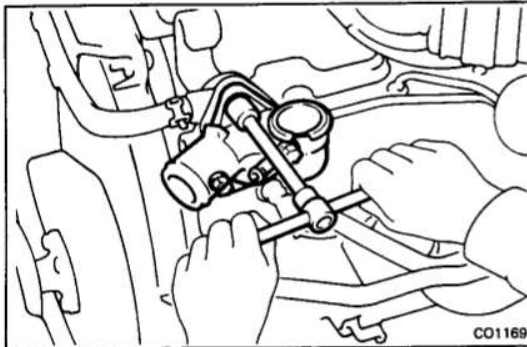
If the valve lift is not as specified, replace the thermostat.

- (d) Check that the valve spring is tight when the thermostat is fully closed.

If necessary, replace the thermostat.

COOLING SYSTEM – Thermostat (2L-T)**CO-7****INSTALLATION OF THERMOSTAT****1. PLACE THERMOSTAT IN WATER OUTLET HOUSING**

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

**2. INSTALL WATER OUTLET TO WATER OUTLET HOUSING**

Install the water outlet with the three bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)

3. FILL WITH ENGINE COOLANT (See page CO-5)**4. START ENGINE AND CHECK FOR LEAKS**

