

CO-1

COOLING SYSTEM

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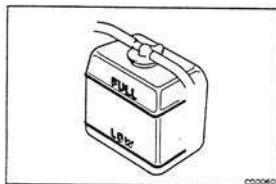
CO

CO-2 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 belt	CH-7
	Dirt, leaves or insects in radiator or condenser	Clean radiator or condenser	CO-12
	Hoses, water pump, thermostat housing, radiator, heater, core plugs or head gasket leakage	Repair as necessary	
	Thermostat faulty	Check thermostat	CO-10
	Injection timing retarded	Adjust timing	EM-23
	Fluid coupling faulty	Replace fluid coupling	CO-4
	Radiator hose plugged or rotted	Replace hose	
	Water pump faulty	Replace water pump	CO-4
	Radiator plugged or cap faulty	Check radiator	CO-12
	Cylinder head or block cracked or plugged	Repair as necessary	

NOTE: If the engine tends to overheat, removal of the thermostat will adversely effect cooling efficiency.

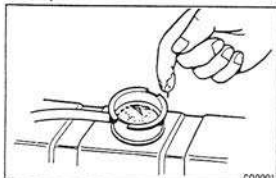


CHECK AND REPLACEMENT OF ENGINE COOLANT

1. CHECK ENGINE COOLANT LEVEL AT RESERVE TANK

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

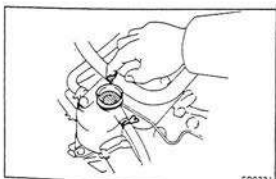
If low, check for leaks and add coolant up to the "FULL" line.



2. CHECK ENGINE COOLANT QUALITY

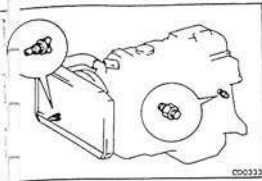
There should not be any excessive deposits of rust or scales around the radiator cap (water outlet cap) or radiator filler hole (water filler hole), and the coolant should be free from oil.

If excessively dirty, replace the coolant.



COOLING SYSTEM — Check and Replacement of Engine Coolant

CO-3



3. REPLACE ENGINE COOLANT

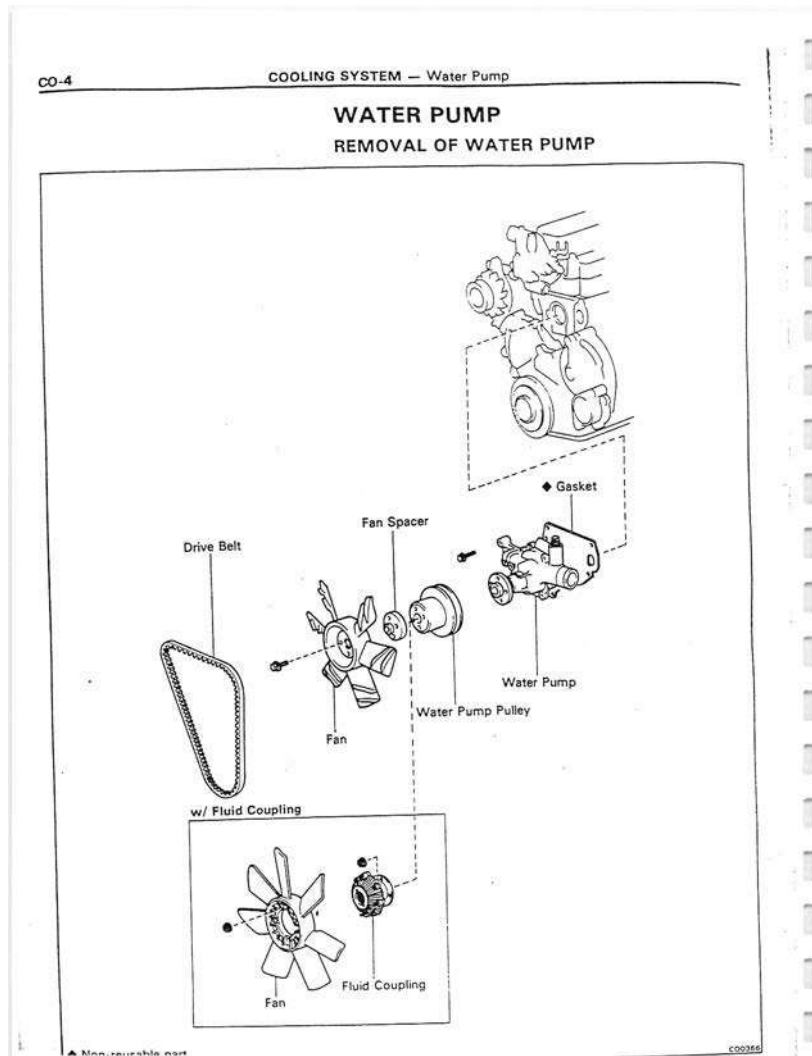
- (a) Remove the radiator cap.
- (b) Drain the coolant from radiator and engine drain cocks. (Engine drain cock is at left front of engine block.)
- (c) Close the drain cocks.
- (d) Fill the system with coolant.

Use a good brand of ethylene-glycol base coolant, mixed according to the manufacturer's directions.

Capacity (w/ Heater)

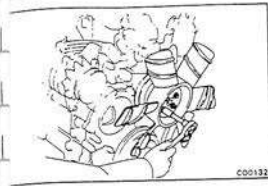
BB20, 22, 30	15.0 liter (15.9 US qts, 13.2 Imp. qts)
BJ60	13.3 liter (14.1 US qts, 11.7 Imp. qts)
BJ70, 71, 73, 74, 75	
3B	13.8 liter (14.6 US qts, 12.1 Imp. qts)
13B-T M/T	14.2 liters (15.0 US qts, 12.5 Imp. qts)
13B-T A/T	13.6 liter (14.4 US qts, 12.0 Imp. qts)
BU60, 61, 62, 63, 65, 70, 75, 76, 80, 81, 82, 85, 86	
Regular cab	12.5 liters (13.2 US qts, 11.0 Imp. qts)
Wide cab	13.0 liters (13.7 US qts, 11.4 Imp. qts)
BY33, 42 (w/o Heater)	
	12.2 liters (12.9 US qts, 10.7 Imp. qts)

- (e) Install the radiator cap (water outlet cap).
- (f) Start the engine and check for leaks.
- (g) Recheck the coolant level and refill as necessary.



COOLING SYSTEM — Water Pump

CO-5



1. DRAIN ENGINE COOLANT (See page CO-3)

2. REMOVE DRIVE BELT

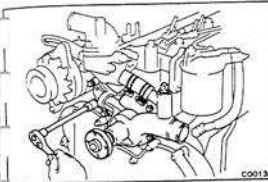
3. REMOVE FAN AND WATER PUMP PULLEY

[w/o Fluid Coupling]

Remove the four bolts holding the fan to the pulley seat, and remove the fan, fan spacer and pump pulley.

[w/ Fluid Coupling]

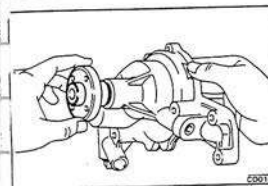
Remove the four nuts holding the fluid coupling to the pulley seat, and remove the fan and fluid coupling assembly and the pump pulley.



4. REMOVE WATER PUMP

(a) Remove the five bolts.

(b) Disconnect the water by-pass hose, and remove the water pump and gasket.

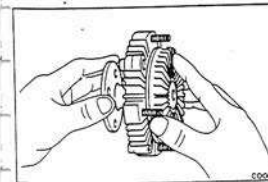


INSPECTION OF WATER PUMP COMPONENTS

1. INSPECT WATER PUMP

Turn the pulley seat and check that the water pump bearing moves smoothly and quietly.

If necessary, replace the water pump bearing.



2. INSPECT FLUID COUPLING

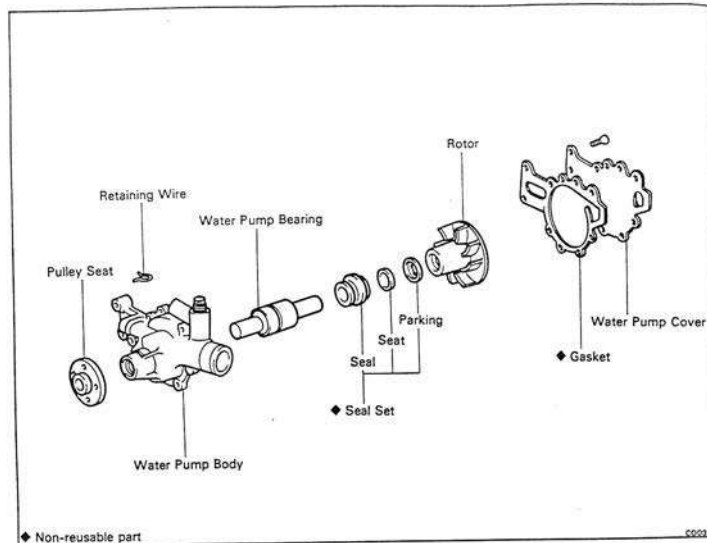
Check that the fluid coupling for damage and silicon oil leakage.

If necessary, replace the fluid coupling.

CO-6

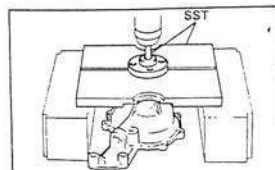
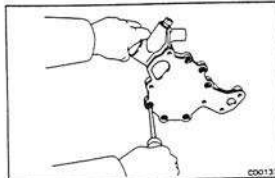
COOLING SYSTEM — Water Pump

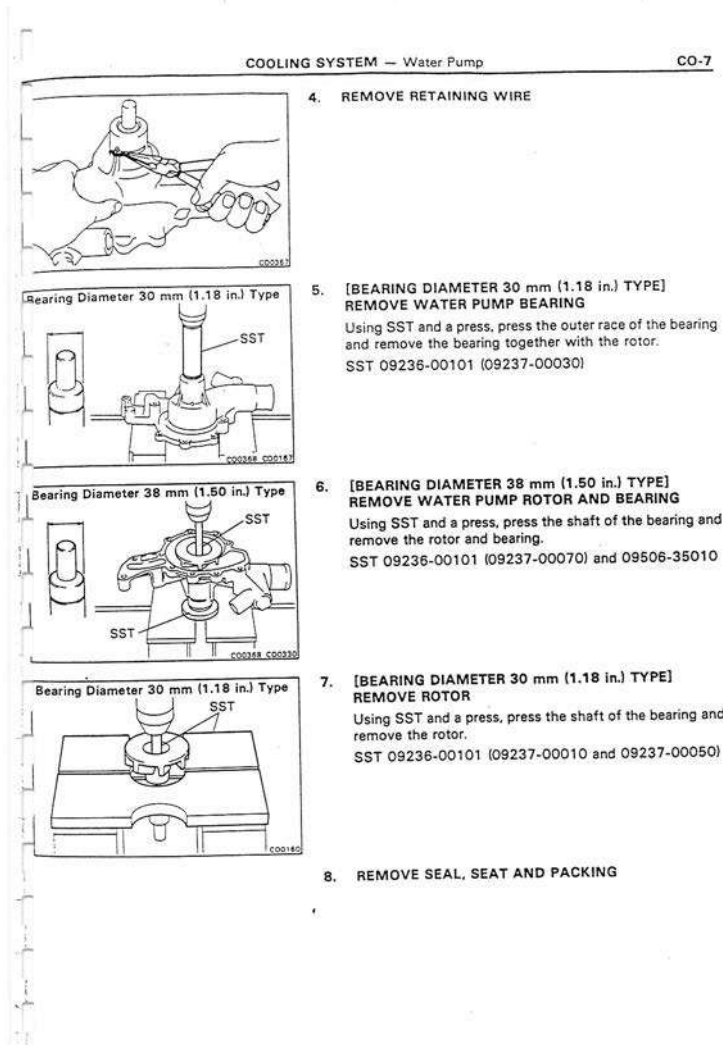
COMPONENTS



DISASSEMBLY OF WATER PUMP

1. [w/ FLUID COUPLING]
REMOVE STUD BOLTS FROM PULLEY SEAT
2. REMOVE WATER PUMP COVER
Remove the six screws, cover and gasket.
3. REMOVE PULLEY SEAT
Using SST and a press, press the shaft of the bearing and remove the pulley seat.
SST 09236-00101 (09237-00010 and 09237-00050)





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COOLING SYSTEM — Water Pump

ASSEMBLY OF WATER PUMP

(See page CO-6)

CAUTION: When installing the water pump, clear away any rust or foreign material which may enter the seal.

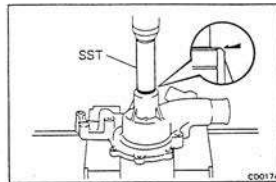
NOTE:

[Bearing Diameter 30 mm (1.18 in.) Type]

Always assemble the water pump with a new seal set.

[Bearing Diameter 38 mm (1.50 in.) Type]

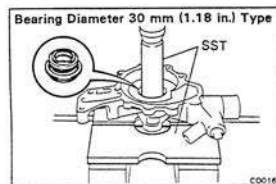
Always assemble the water pump with a new seal set and a new bearing.

**1. INSTALL WATER PUMP BEARING**

Using SST and a press, press the outer race of the bearing until its surface is flush with the water pump body edge.

SST Bearing diameter 30 mm (1.18 in.) type
09236-00101 (09237-00030)

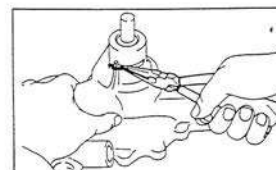
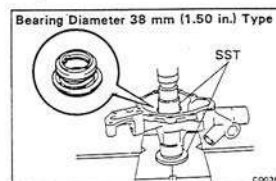
Bearing diameter 38 mm (1.50 in.) type
09236-00101 (09237-00020)

**2. INSTALL SEAL**

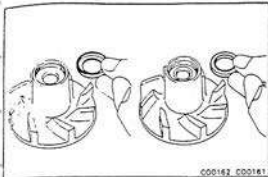
Using SST and a press, press in a new seal.

SST Bearing diameter 30 mm (1.18 in.) type
09236-00101 (09237-00010, 09237-00020)

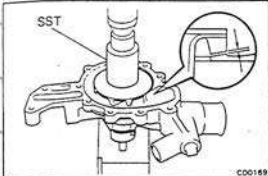
Bearing diameter 38 mm (1.50 in.) type
09236-47012 and 09506-35010

**3. INSTALL RETAINING WIRE**

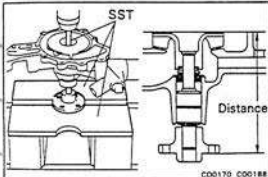
COOLING SYSTEM — Water Pump **CO-9**



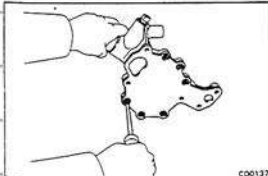
CO0162 CO0161



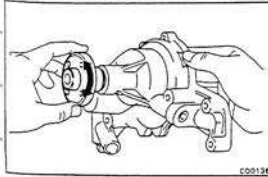
CO0169



CO0170 CO0168



CO0137



CO0138

4. INSTALL ROTOR

(a) Install new packing and seat into the rotor.

(b) Using SST and a press, press in the rotor to a clearance of 0.4 – 1.1 mm (0.016 – 0.043 in.) between the rotor and pump body.
SST 09236-00101 (09238-40010)

5. INSTALL PULLEY SEAT

Using SST and a press, press the shaft of the bearing and install the pulley seat to the indicated distance between the pump body and pulley seat in the figure.
SST 09236-00101 (09237-00010, 09237-00070)

Distance between the pump body and pulley seat:

w/ Fluid coupling	
BB and BJ	133.6 – 135.0 mm (5.260 – 5.315 in.)
BU	117.1 – 118.5 mm (4.610 – 4.665 in.)
w/o Fluid coupling	
	141.2 – 142.6 mm (5.559 – 5.614 in.)

6. INSTALL WATER PUMP COVER

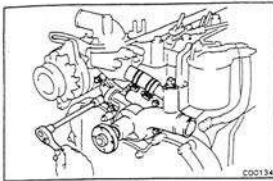
Install a new gasket and the cover with the six screws.

**7. [w/ FLUID COUPLING]
INSTALL STUD BOLTS TO PULLEY SEAT**

8. CHECK WATER PUMP BEARING ROTATES SMOOTHLY

CO-10

COOLING SYSTEM — Water Pump, Thermostat



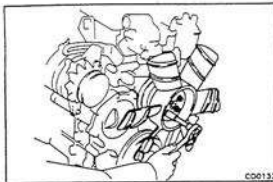
INSTALLATION OF WATER PUMP

(See page CO-4)

1. INSTALL WATER PUMP

Connect the water by-pass hose, install a new gasket and the water pump with the five bolts.

Torque: 250 kg-cm (18 ft-lb, 25 N-m)



2. INSTALL WATER PUMP PULLEY AND FAN

[w/o Fluid Coupling]

Install the pump pulley and the drive shaft and fan assembly with the four bolts.

[w/ Fluid Coupling]

Install the pump pulley and the fluid coupling and fan assembly with the four nuts.

3. INSTALL AND ADJUST DRIVE BELT

(See page CH-7)

4. REFILL WITH COOLANT (See page CO-3)

5. START ENGINE AND CHECK FOR LEAKS

THERMOSTAT

REMOVAL OF THERMOSTAT

1. DRAIN ENGINE COOLANT (See page CO-3)

2. DISCONNECT RADIATOR INLET HOSE FROM WATER OUTLET

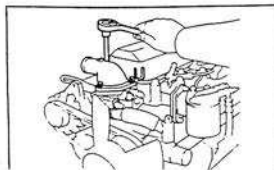
3. [13B-T] DISCONNECT VACUUM PIPE FROM WATER OUTLET

4. [WATER OUTLET CAP TYPE] DISCONNECT COOLANT RESERVOIR HOSE AND WATER BY-PASS HOSE(S) FROM WATER OUTLET

5. REMOVE WATER OUTLET

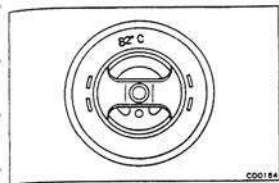
Remove the three bolts, water outlet and gasket.

6. REMOVE THERMOSTAT



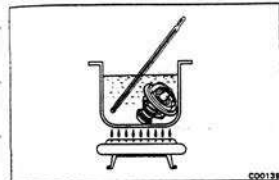
COOLING SYSTEM — Thermostat

CO-11



INSPECTION OF THERMOSTAT

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



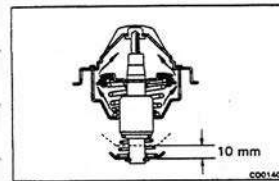
- (a) Immerse the thermostat in water and gradually heat the water.
- (b) Check the valve opening temperature.

Valve opening temperature:

82°C type 80 – 84°C (176 – 183°F)

88°C type 86 – 90°C (187 – 194°F)

If the valve opening temperature is not within specification, replace the thermostat.



- (c) Check the valve lift.

Valve lift:

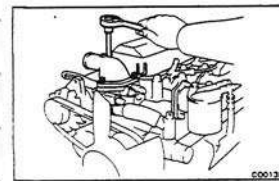
82°C type

10 mm (0.39 in.) or more at 95°C (203°F)

88°C type

10 mm (0.39 in.) or more at 100°C (212°F)

If the valve lift is less than specification, replace the thermostat.



INSTALLATION OF THERMOSTAT

1. PLACE THERMOSTAT IN WATER INLET

2. INSTALL WATER OUTLET

Install a new gasket and the water outlet with the three bolts. Torque the bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

3. [WATER OUTLET CAP TYPE]
CONNECT COOLANT RESERVOIR HOSE AND WATER BY-PASS HOSE(S)

4. [13B-T]
INSTALL VACUUM PIPE

5. CONNECT RADIATOR INLET HOSE

6. FILL ENGINE WITH COOLANT (See page CO-3)

7. START ENGINE AND CHECK FOR LEAKS

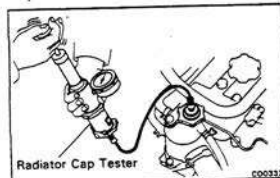
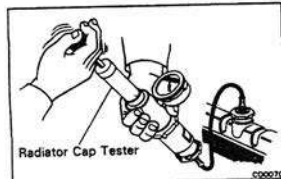
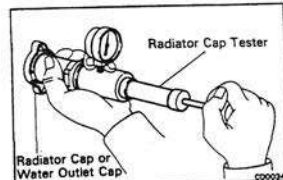
CO-12

COOLING SYSTEM — Radiator

RADIATOR**CLEANING OF RADIATOR**

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

CAUTION: If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. If the cleaner nozzle pressure is 30 – 35 kg/cm² (427 – 498 psi, 2,942 – 3,432 kPa), keep a distance of at least 40 – 50 cm (15.75 – 19.69 in.) between the radiator core and cleaner nozzle.

**INSPECTION OF RADIATOR****1. INSPECT RADIATOR CAP OR WATER OUTLET CAP**

Using a radiator cap tester, pump the tester until the relief valve opens. Check that the valve opens between 0.75 kg/cm² (10.7 psi, 74 kPa) and 1.05 kg/cm² (14.9 psi, 103 kPa).

Check that the pressure does not drop rapidly when pressure on the cap is below 0.6 kg/cm² (8.5 psi, 59 kPa). If either check is not within limits, replace the cap.

2. INSPECT COOLING SYSTEM FOR LEAKS

- (a) Fill the radiator with coolant and attach a pressure tester.
- (b) Warm up the engine.
- (c) Pump it to 1.2 kg/cm² (17 psi, 118 kPa), check that pressure does not drop.

If the pressure drops, check for leaks from the hoses, radiator or water pump. If no external leaks are found, check the heater core, cylinder block and head.