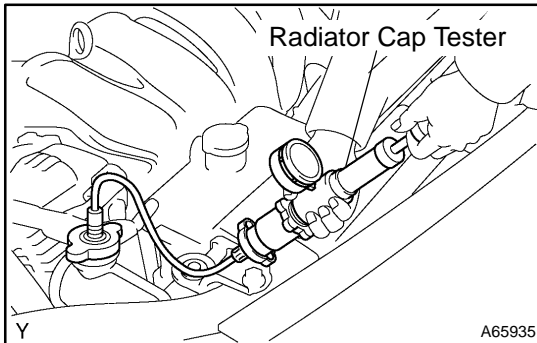


COOLING SYSTEM (April, 2003)

ON-VEHICLE INSPECTION

160NX-02



1. INSPECT COOLING SYSTEM FOR LEAKS

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.

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

HINT:

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.

2. CHECK ENGINE COOLANT LEVEL AT RESERVOIR

- The engine coolant level should be between the "LOW" and "FULL" line.

HINT:

If low, check for leaks and add "Toyota Long Life Coolant" or equivalent up to the "FULL" line.

3. CHECK ENGINE COOLANT QUALITY

- Remove the radiator cap.

CAUTION:

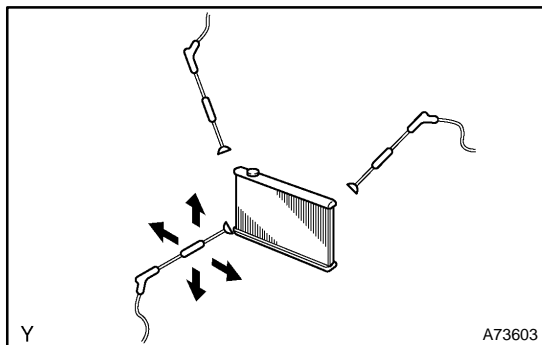
To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

- Check if there is any excessive deposits of rust or scale around the radiator cap and radiator filler hole; the coolant should be free from oil.

HINT:

If excessively dirty, replace the coolant.

- Reinstall the radiator cap.



4. INSPECT FINS BLOCKAGE

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

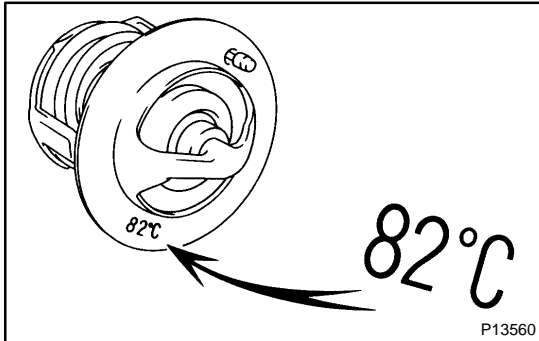
NOTICE:

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

Injection Pressures 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.
- Be careful not pour water directly onto electronic components.

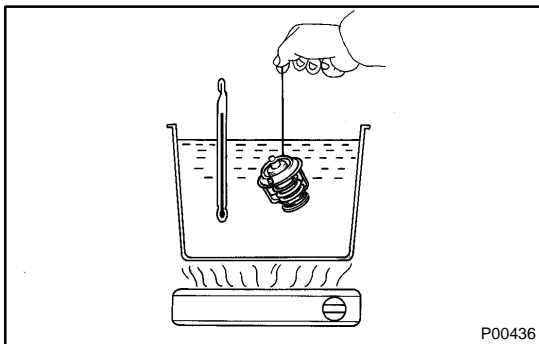
INSPECTION



1. THERMOSTAT

HINT:

The thermostat is numbered with the valve opening temperature.



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

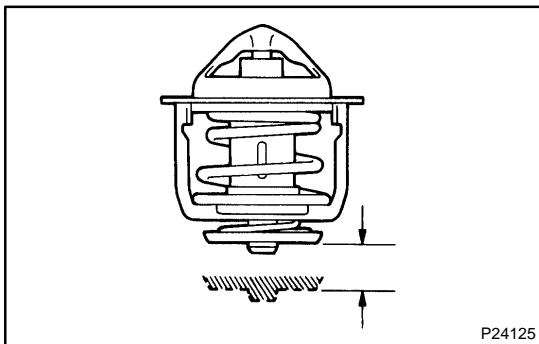
(b) Check the valve opening temperature.

Valve opening temperature:

80 to 84°C (176 to 183°F)

HINT:

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)

HINT:

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)).

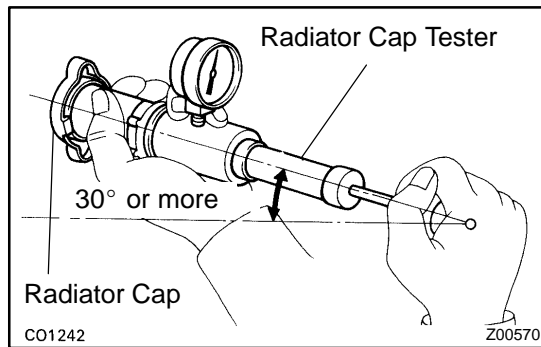
HINT:

If not closed, replace the thermostat.

2. RADIATOR CAP SUB-ASSY

NOTICE:

- 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 step (a) and (b) below, keep the 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

NOTICE:

Push the pump at a constant speed.

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

- (b) Pump the tester and measure the relief valve opening pressure.

Pump speed: 1 push within 1 second

NOTICE:

The above pump speed is for the first pump only (in order to close the vacuum valve). After the first pump, the pump speed can be reduced.

Standard opening pressure:

74 to 103 kPa (0.75 to 1.05 kgf/cm², 10.7 to 14.9 psi)

Minimum opening pressure:

59 kPa (0.6 kgf/cm², 8.5 psi)

HINT:

Use the tester's maximum reading as the opening pressure.

If the opening pressure is less than minimum, replace the radiator cap.

COOLING FAN SYSTEM

ON-VEHICLE INSPECTION

160C6-02

1. CHECK COOLING FAN OPERATION WITH LOW TEMPERATURE (Below 83°C (181°F))

- (a) Turn the ignition switch ON.
- (b) Check that the cooling fan stops.

HINT:

If not, check the cooling fan relay and water temperature sensor, and check for separated connector or severed wire between the cooling fan relay and water temperature sensor.

- (c) Disconnect the water temperature sensor connector.
- (d) Check that the cooling fan rotates.

If not, check the fuses, cooling fan relay, ECM and cooling fan, and check for a short circuit between the cooling fan relay and water temperature sensor.

- (e) Reconnect the water temperature sensor connector.

2. CHECK COOLING FAN OPERATION WITH HIGH TEMPERATURE (Above 93°C (199°F))

- (a) Start the engine, and raise coolant temperature to above 93°C (199°F).

HINT:

Coolant temperature is the detected value by the water temperature sensor on the water outlet.

- (b) Check that the cooling fan rotates.

HINT:

If not, replace the water temperature sensor.

3. INSPECT COOLING FAN

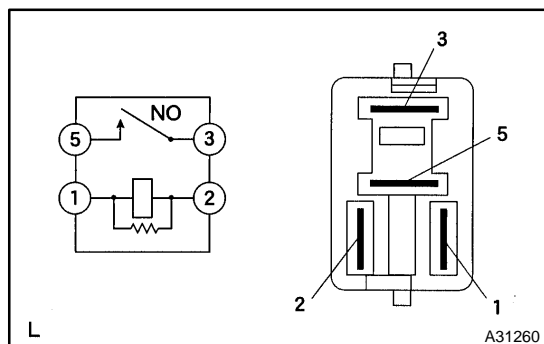
- (a) Disconnect the cooling fan connector.
- (b) Connect battery and ammeter to the connector.
- (c) Check that the cooling fan rotates smoothly, and check the reading on the ammeter.

Standard amperage:

Approx. 8.0 – 12.0 A at 20°C (68°F)

- (d) Reconnect the cooling fan connector.

INSPECTION



1. COOLING FAN RELAY

(a) Inspect the cooling fan relay continuity.

- (1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

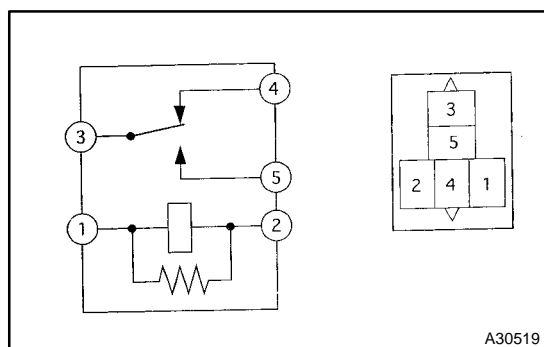
If there is no continuity, replace the relay.

- (2) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.

- (3) Apply battery voltage across terminals 1 and 2.
- (4) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.



2. COOLING FAN RELAY NO.2

(a) Inspect the cooling fan relay continuity.

- (1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

- (2) Using an ohmmeter, check that there is continuity between terminals 3 and 4.

If there is no continuity, replace the relay.

- (3) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.

- (4) Apply battery voltage across terminals 1 and 2.
- (5) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

3. COOLING FAN RESISTOR

(a) Using an ohmmeter, measure the resistance between the terminals.

Resistance: 1.17 – 1.43 Ω at 20 °C (68 °F)

COOLANT REPLACEMENT

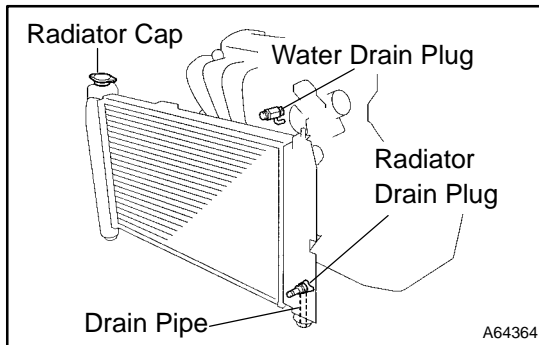
160C8-01

1. DRAIN COOLANT

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.

(a) Remove the radiator cap.



(b) Loosen the radiator and engine drain plugs, and drain the coolant.

(c) Close the drain plugs.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf) for engine

2. ADD COOLANT

(a) Slowly fill the system with coolant.

HINT:

- 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 of coolant with 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 %.

NOTICE:

- **Do not use an alcohol type coolant or plain water alone.**
- **The coolant should be mixed with plain water (preferably demineralized water).**
Capacity: 6.5 liters (6.9 US qts, 5.7 Imp. qts)

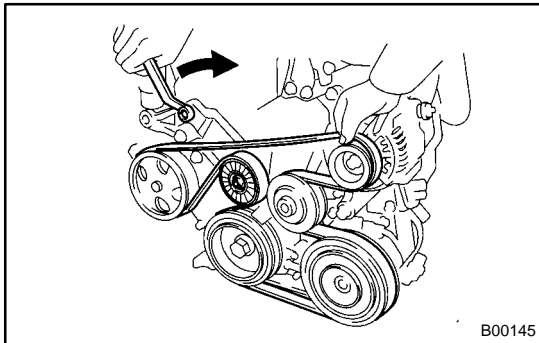
3. CHECK ENGINE COOLANT LEAK

- (a) Fill the radiator with coolant and attach a radiator cap tester.
- (b) Pump it to 118 kPa and check leakage.

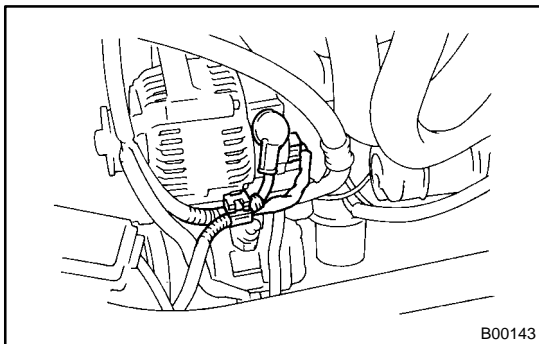
WATER PUMP ASSY REPLACEMENT

160C9-01

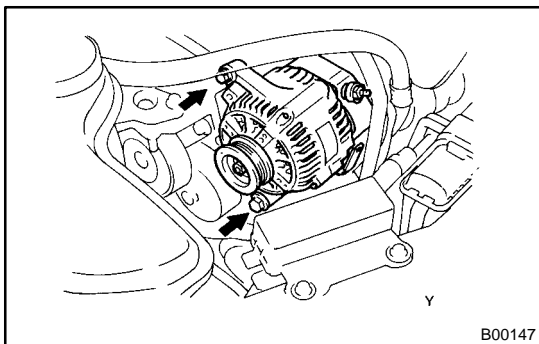
1. REMOVE ENGINE UNDER COVER RH
2. DRAIN COOLANT (See page 16-7)



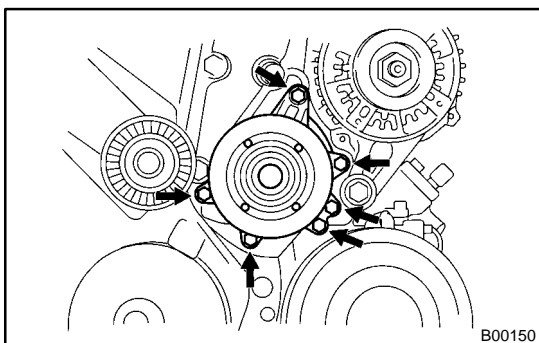
3. REMOVE FAN AND GENERATOR V BELT
(See page 14-4)



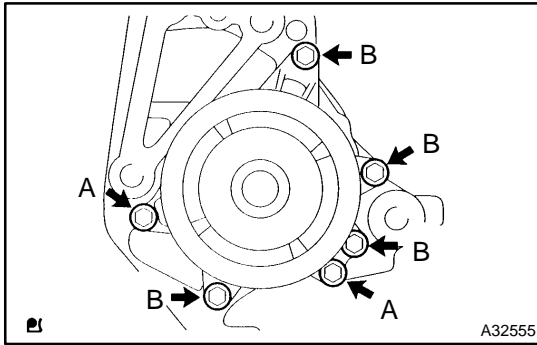
4. REMOVE GENERATOR ASSY
 - (a) Disconnect the wire clamp from the wire clip on the rectifier end frame.
 - (b) Remove the rubber cap and nut, and disconnect the alternator wire.
 - (c) Disconnect the alternator connector.



- (d) Remove the 2 bolts and alternator.



5. REMOVE WATER PUMP ASSY
 - (a) Remove the 6 bolts, water pump and O-ring.

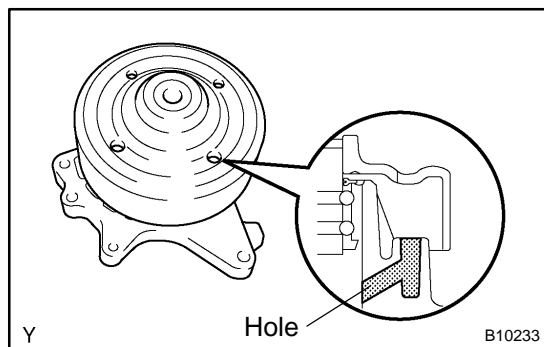
**6. INSTALL WATER PUMP ASSY**

- (a) Place a new O-ring on the timing chain cover.
- (b) Install the water pump with the 6 bolts.

Torque:**Bolt A 9.0 N·m (92 kgf·cm, 80 in·lbf)****Bolt B 11 N·m (113 kgf·cm, 8 ft·lbf)****7. INSTALL GENERATOR ASSY****Torque:****12 mm head 25 N·m (250 kgf·cm, 18 ft·lbf)****14 mm head 54 N·m (550 kgf·cm, 39 ft·lbf)**

- 8. ADD COOLANT (See page 16-7)**
- 9. CHECK ENGINE COOLANT LEAK (See page 16-7)**

INSPECTION



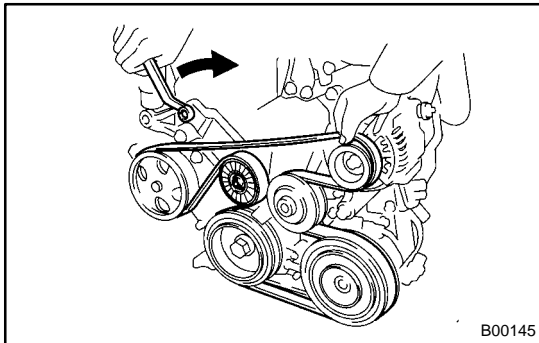
1. INSPECT WATER PUMP ASSY

- (a) Visually check the drain hole for coolant leakage.

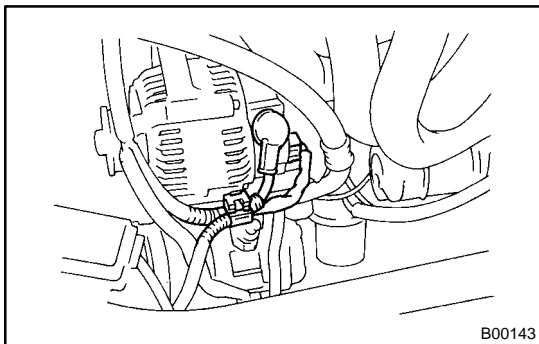
THERMOSTAT REPLACEMENT

160CB-01

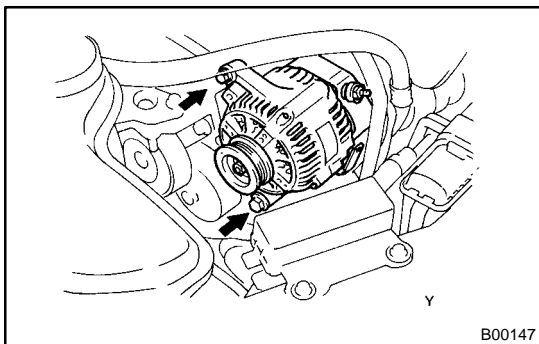
1. REMOVE ENGINE UNDER COVER RH
2. DRAIN COOLANT (See page 16-7)



3. REMOVE FAN AND GENERATOR V BELT
(See page 14-4)

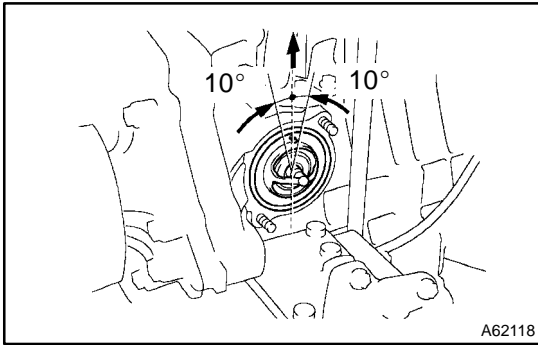


4. REMOVE GENERATOR ASSY
 - (a) Disconnect the wire clamp from the wire clip on the rectifier end frame.
 - (b) Remove the rubber cap and nut, and disconnect the alternator wire.
 - (c) Disconnect the alternator connector.



- (d) Remove the 2 bolts and alternator.

5. REMOVE WATER INLET
6. REMOVE THERMOSTAT

**7. INSTALL THERMOSTAT**

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

8. INSTALL WATER INLET

Torque: 11 N·m (113 kgf·cm, 8 ft·lbf)

9. INSTALL GENERATOR ASSY

Torque:

12mm head 25 N·m (250 kgf·cm, 18 ft·lbf)

14mm head 54 N·m (550 kgf·cm, 39 in·lbf)

10. ADD COOLANT (See page 16-7)**11. CHECK ENGINE COOLANT LEAK (See page 16-7)**

RADIATOR ASSY

160CC-02

REPLACEMENT

1. **DRAIN COOLANT**(See page 16-7)
2. **SEPARATE RADIATOR HOSE INLET**
3. **SEPARATE RADIATOR HOSE OUTLET**
4. **SEPARATE OIL COOLER INLET TUBE NO.1**
5. **SEPARATE OIL COOLER OUTLET TUBE NO.1**
6. **REMOVE RADIATOR ASSY**
 - (a) Disconnect the fan motor connector.
 - (b) Disconnect two clamps for wire-harness from fan-shroud.
 - (c) Remove the two fan mount bolts.
 - (d) Remove the fan w/motor.
7. **ADD COOLANT** (See page 16-7)
8. **CHECK ENGINE COOLANT LEAK** (See page 16-7)