DAIHATSU

TERIOS

J100

TO INDEX

CO

COOLING SYSTEM

JCO00001-00000

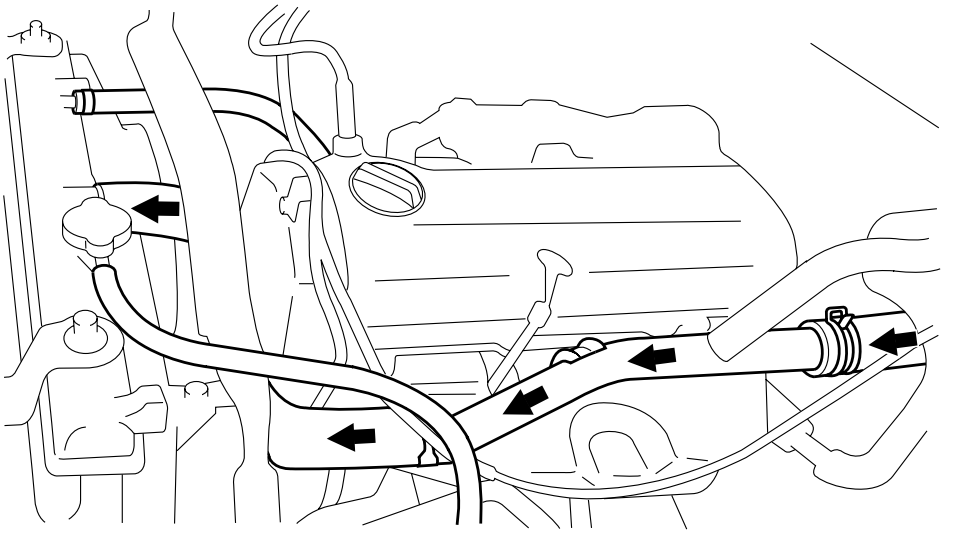
NO. 9710-JE

DESCRIPTION

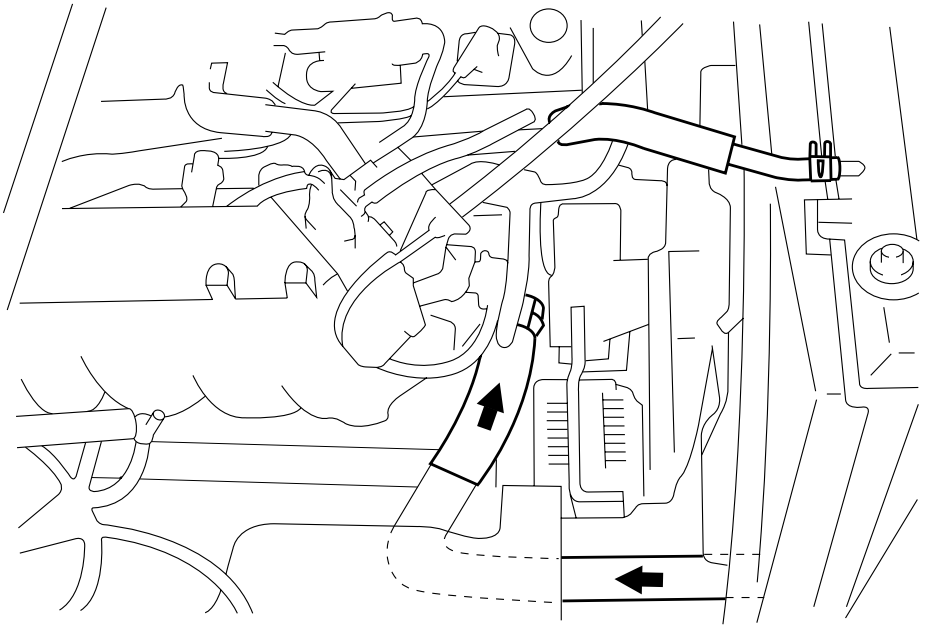
The cooling system is a water-cooled, forced-circulation type. Furthermore, it employs a fluid coupling fan.
The cooling system employs a bottom by-pass type in which the thermostat equipped with a by-pass valve is provided at the inlet side.
The cooling system is composed of the radiator, water pump, thermostat, cylinder head, water jackets of cylinder block, water hoses and their connecting parts.
The total capacity of the cooling water is approximately 5.4 L (for manual transmission models) and 5.3 L (for automatic transmission models)

[HC-E Engine]

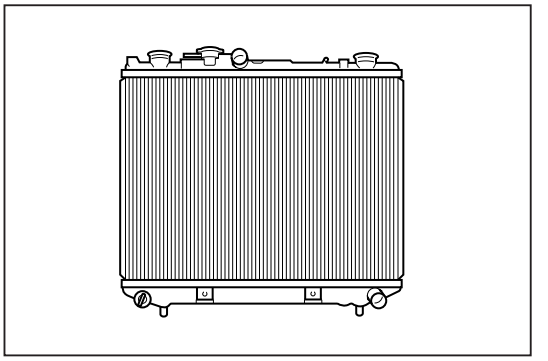
[View from left side]



[View from right side]



RADIATOR



JCO00003-00002

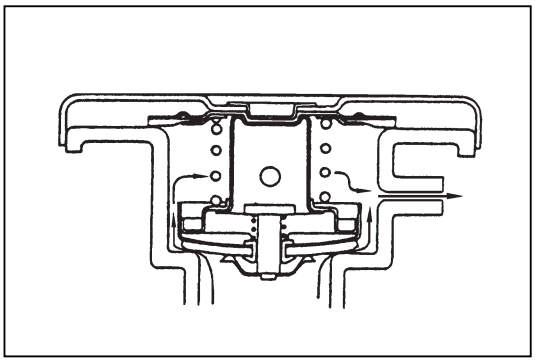
Radiator specification

Item		Specification
Fin pitch	mm	1.6
Radiator water capacity	L	1.66 (M/T) · 1.54 (A/T)
Heat radiating rate	W/h	48.3
Core dimensions (width × height × thickness)	mm	572 × 425 × 27

JCO00004-00000

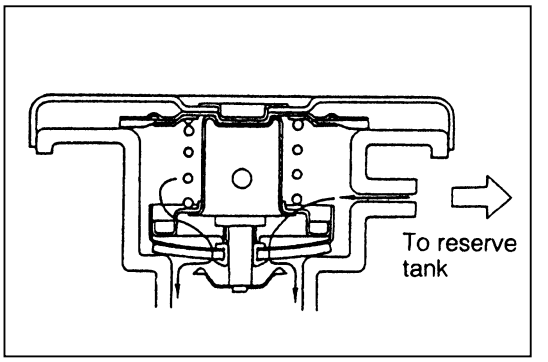
RADIATOR CAP

A pressure type radiator cap is installed at the upper part of the radiator.
The radiator cap has two valves: a pressure regulating valve and a negative pressure valve.
When the pressure of the cooling system exceeds a specified limit, the rising pressure opens the pressure regulating valve of the radiator cap. As a result, the coolant in the radiator flows to the reserve tank.



JCO00005-00003

On the other hand, the negative pressure valve opens when the inner pressure drops below the atmospheric pressure due to a dropped water temperature after the engine has stopped. Thus, the coolant returns from the reserve tank to the radiator.



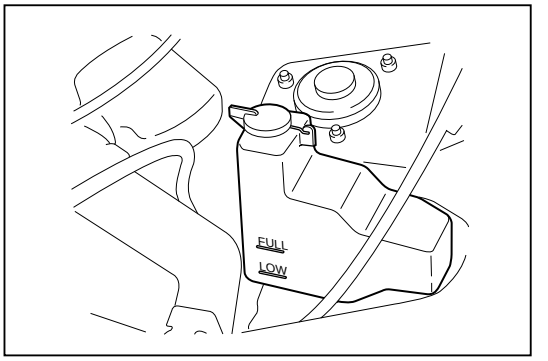
JCO00006-00004

Radiator cap specifications

Item	Specifications
Radiator cap opening pressure kPa (kgf/cm^2)	88.3 (0.9)

RADIATOR RESERVE TANK

A reserve tank with an overflow hose is employed.



JCO00007-00005

Specifications

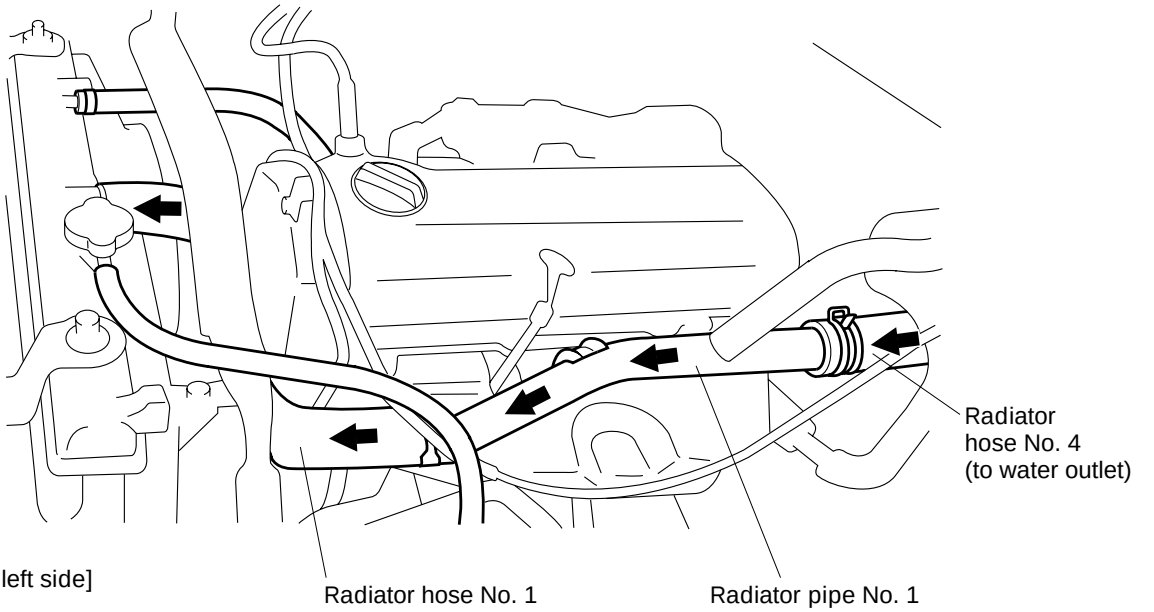
Total capacity		L	1.1 or more
Cooling water capacity	L	F level	0.6
		L level	0.15

RADIATOR HOSES & PIPES

These components come in four radiator hoses and two radiator pipe subassemblies.

Radiator hose	No. 1 No. 2 No. 4	Radiator pipe No. 1 to radiator upper tank Radiator lower tank to inlet of cylinder block section Outlet at rear of cylinder head to radiator pipe No. 1
Radiator pipe	No. 1	Radiator hose No. 4 to radiator hose No. 1

JCO00008-00000



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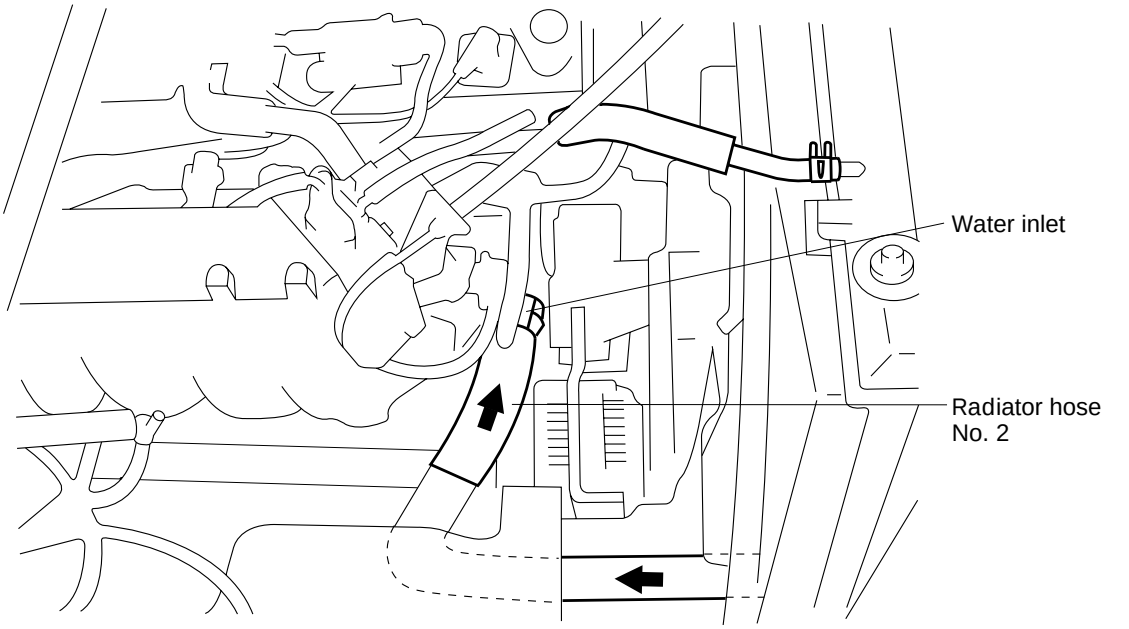


[View from right side]

JCO00000-00006

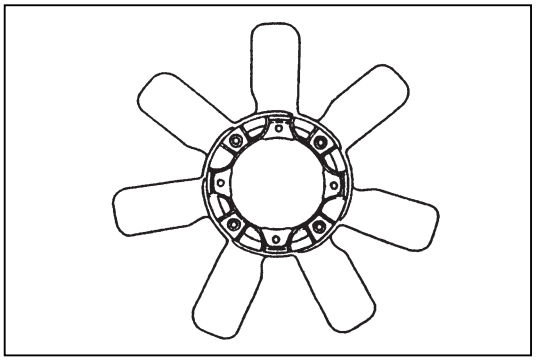
FAN-EQUIPPED FLUID COUPLING

The fan-equipped fluid coupling with a temperature control device is employed in order that the noise level may be reduced.
Furthermore, the drop in engine output due to the installation of cooling fan has been kept to a minimum level.

JCO00009-00000

1. COOLING FAN

The fan made of propylene is a seven-blade fan.



JCO00010-00007

Specifications

Item		Specification
Fan outer diameter	mm	380
Number of blades		7
Type		Axial flow
Air flow rate	m^3/sec	0.40 at 1000 rpm
		0.85 at 2000 rpm

JCO00011-00000

2. FLUID COUPLING WITH FAN

The fluid coupling employs a two-stage temperature control type.
The fluid coupling is available in two kinds. The optimum fluid coupling can be selected and installed in accordance with the vehicle specifications.

JCO00012-00000

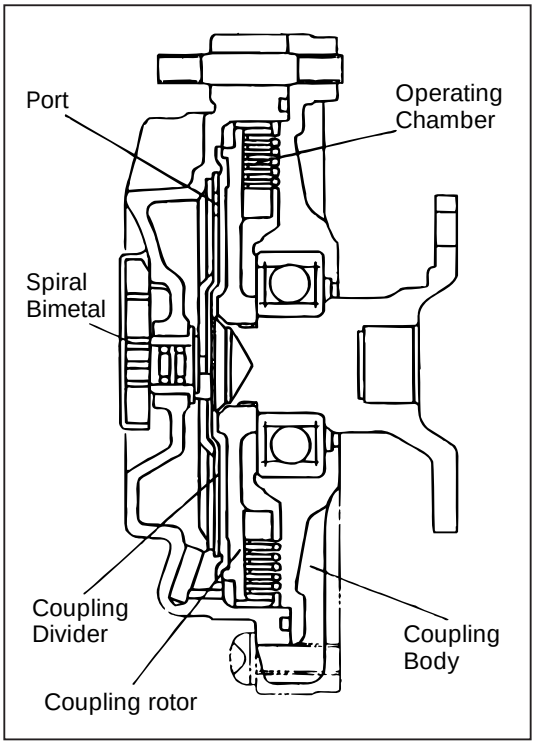
Specifications

Item		Specifications	
		M/T	A/T
Fluid coupling outer diameter	mm	136	
Fan revolution speed (when the water pump revolution speed is 4000 rpm)	rpm	1300 at 70℃	
		2500 at 80℃	2900 at 80℃

JCO00013-00000

Operation of coupling fan
During cold operation (Below about 55°C)
When the cooling water temperature is low, the port is closed by the coupling divider. Consequently, the silicon oil will not move into the operating chamber. Hence, the coupling body remains at its low speed operation.

During hot operation
(Above about 70°C)
When the spiral bimetal detects the temperature of the air passing through the radiator, this rotates the coupling divider integral with the bimetal shaft. As a result, the silicon oil flowing out from the port enters into the operating chamber, thus pushing the coupling rotor. Consequently, the coupling body is rotated.
As is explained above, the revolution speed of the coupling fan is switched over two stages. In this way, the output loss due to the cooling fan has been kept at a minimum level and the fan noise level has been reduced.



JCO00014-00008

3. WATER PUMP PULLEY

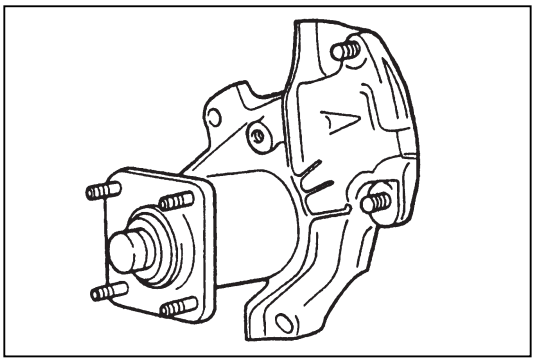
The water pump pulley is made of sheet metal. This pulley is attached to the water pump pulley seat along with the fluid coupling by means of four nuts.
All water pump pulleys use a V rib belt.

JCO00015-00000

Water pump
The water pump used for circulating the cooling water is installed at the front section of the cylinder block.

Specifications

Item		Specifications
Type		Centrifugal type
Delivery output (When shaft revolution speed is 2000 rpm)	L/min	35
Rotor outer diameter	mm	62

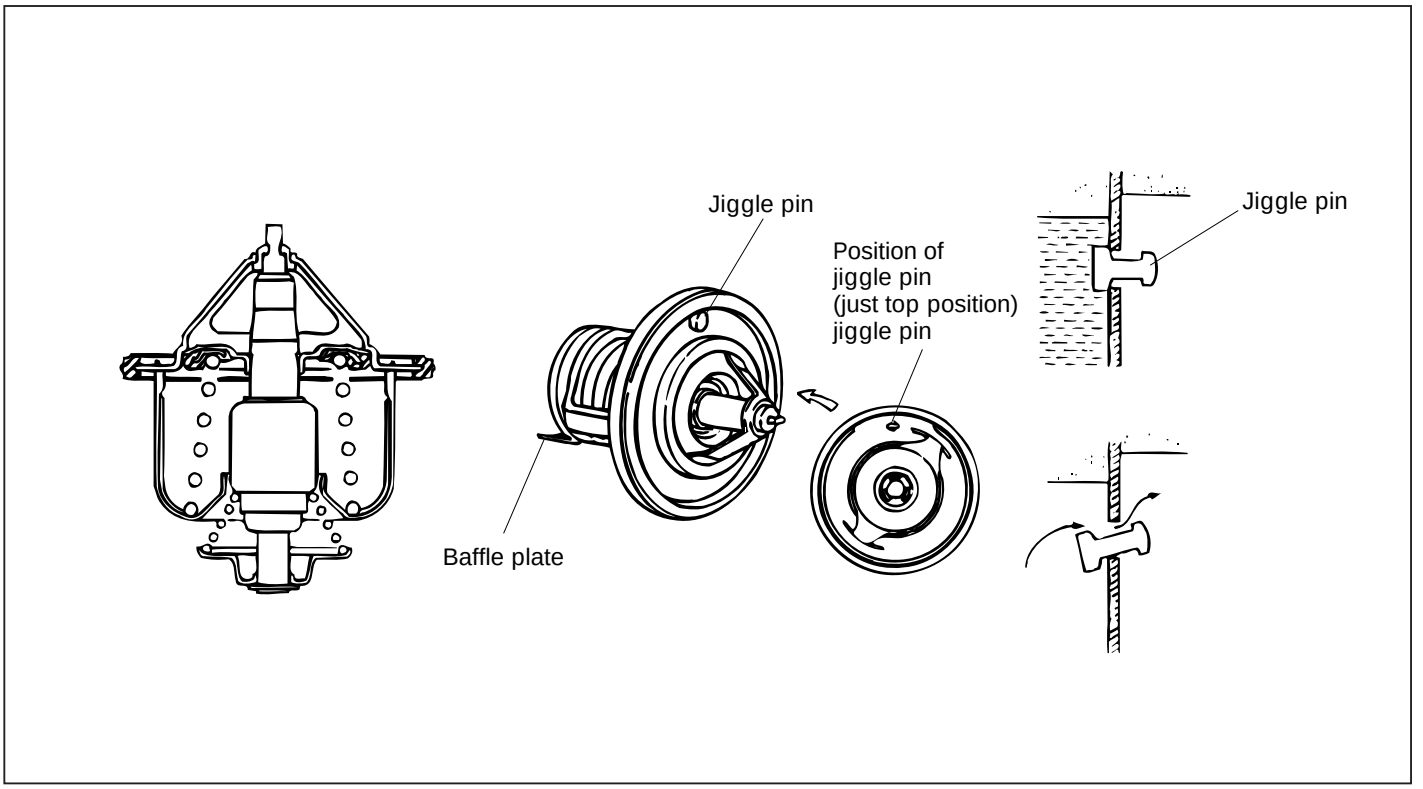

JCO00016-00010

THERMOSTAT

The thermostat is a wax type with a bypass valve. The thermostat helps the engine to warm up quickly by allowing the cooling water to be recirculated through the cylinder block and cylinder head without passing through the radiator.

Furthermore, the thermostat is equipped with a jiggle pin which performs the air bleeding while the engine is stopped. Also, the jiggle pin allows the temperature of the cooling water to rise quickly during the warming-up period.

Moreover, a baffle plate attached to the thermostat makes it possible to get better temperature sensing characteristics.



JCO00017-00011

Thermostat specifications

Item		Standard specifications	Cold region specifications
Type		Wax type	
Valve opening temperature	ϒC	78	84
Valve full opening temperature	ϒC	91	97

JCO00018-00000

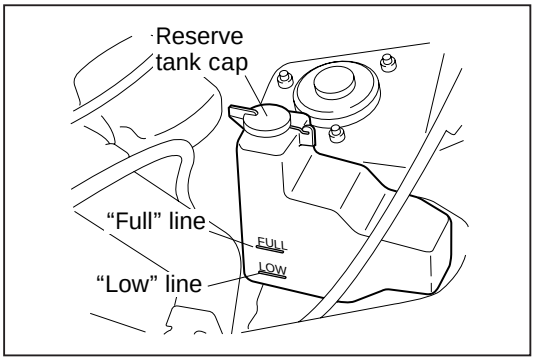
PRECAUTIONS

- As regards water to be used as cooling water, use soft water which does not contain salts of minerals, calcium, magnesium and so forth.
- If the coolant gets to the vehicle body, immediately flush away the coolant using water.
- Never open the radiator cap when the cooling water is hot.
  WARNING:
  - The inside of the radiator is under a pressurized condition when the cooling water is hot. Therefore, if the radiator cap should be removed, the cooling water will blow off, possibly causing injuries such as scald.

JCO00019-00000

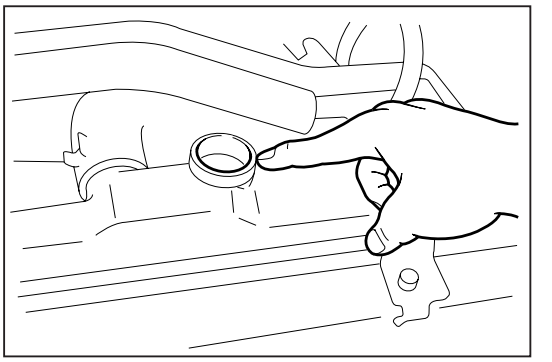
CHECK & CHANGE OF ENGINE COOLANT

1. Check of coolant level
   Check to see if the coolant level is between the LOW and FULL lines of the reserve tank.
   If the coolant level is near the low level or below the low level, add the coolant up to the full level.



JCO00020-00012

2. Check of coolant quality
   There should not be any excessive deposits of rust or water scales around the radiator cap or the radiator filler hole. Also, the coolant should be free of oil.
   Change the coolant if it is excessively dirty or the time due to change the coolant has already arrived.
   WARNING:
   - Never open the radiator cap when the engine is hot.

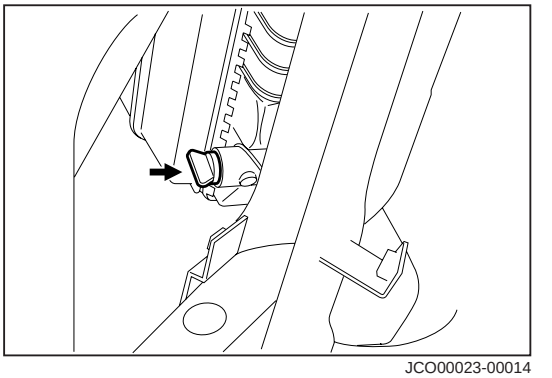


JCO00021-00013

3. Change of engine coolant
   (1) Remove the radiator cap.
   WARNING:
   - Never open the radiator cap and/or the drain plug when the engine is still hot. Care must be exercised to avoid getting scalded.

JCO00022-00000

   (2) Remove the engine under cover.
   (3) Place an adequate container below the radiator drain plug. Drain the coolant by removing the drain plug.
   (4) Close the drain plug.
   (5) Fill the system with water.
   (6) Start the engine, and stop it.
   (7) Repeat the steps (1) through (5) two to three times.
   NOTE:
   - Replace the drain plug gasket with a new one.



JCO00023-00014

(8) Fill the radiator and reserve tank with antifreeze solution in accordance with the instructions of the manufacturer of the antifreeze solution.

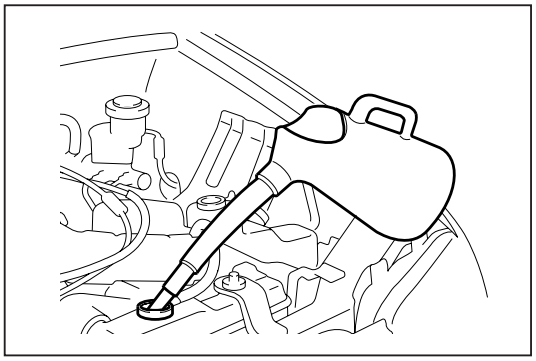
CAUTION:

- Use a Good brand of ethylene-glycol base antifreeze solution.

  Coolant Capacity (Vehicle with front heater):

  5.3 liter (for automatic transmission)

  5.4 liter (for manual transmission)



JCO00024-00015

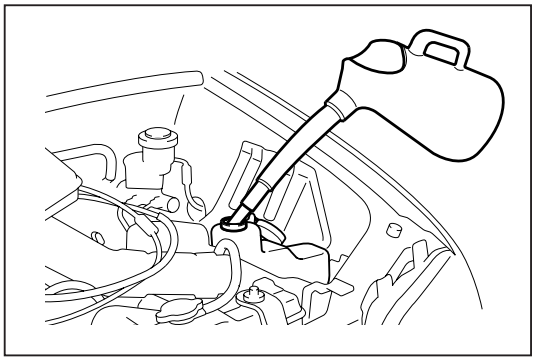
(9) Fill the system with water.

(10) Start the engine. Check the coolant level. Add water, as required.

(11) Tighten the radiator cap.

(12) Warm the engine. Afterwards, allow the coolant to cool down to the atmospheric temperature. Recheck the coolant level at the reserve tank. Add coolant to the full level, as required.

If no coolant remains at all in the reserve tank, recheck the coolant level in the radiator. Replenish the radiator with water, as required. Replenish the reserve tank with coolant up to the full level.



JCO00025-00016

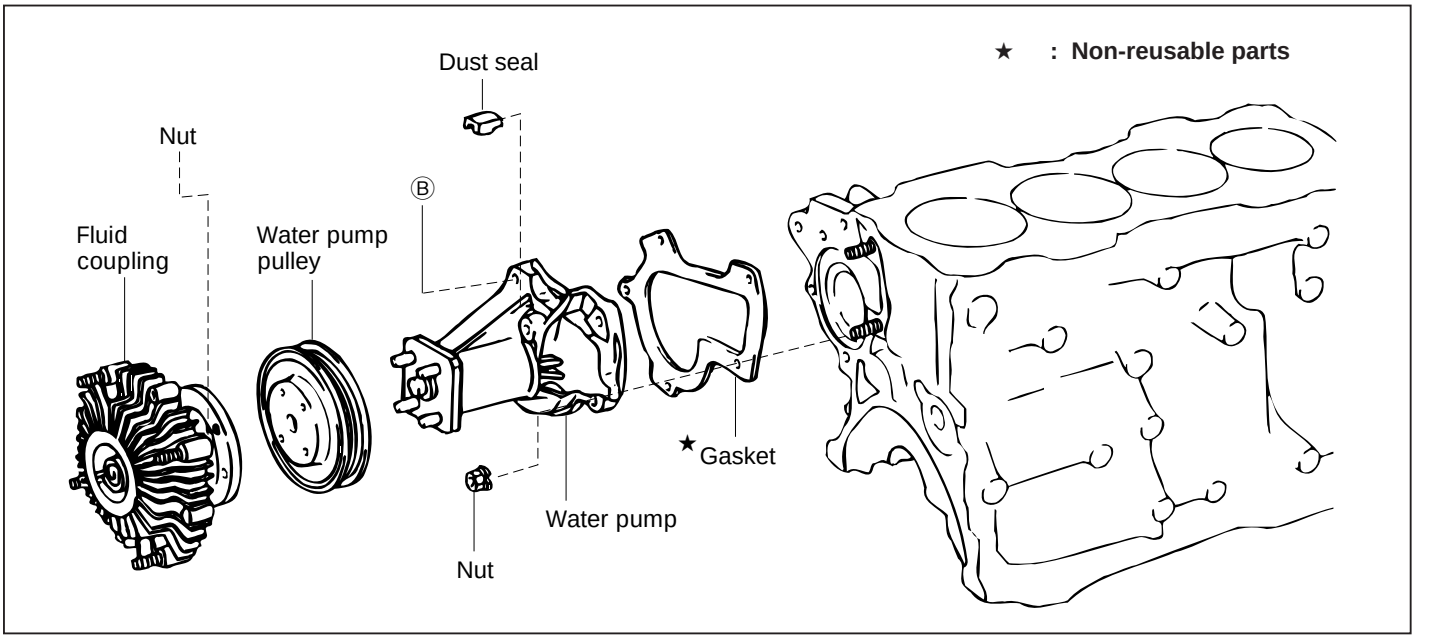
NOTE:

- Here, the coolant refers to the mixture of water and antifreeze that has been mixed in accordance with the instructions of the antifreeze manufacturer.

(13) Install the engine under cover with attaching bolts.

WATER PUMP

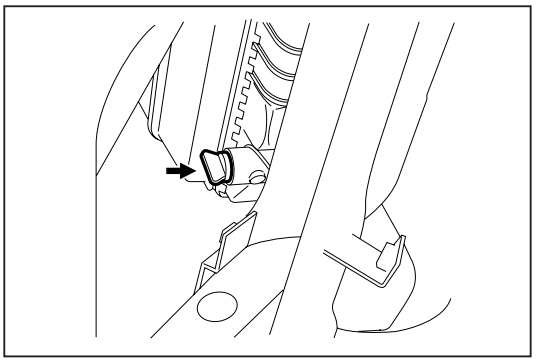
COMPONENTS



JCO00026-00017

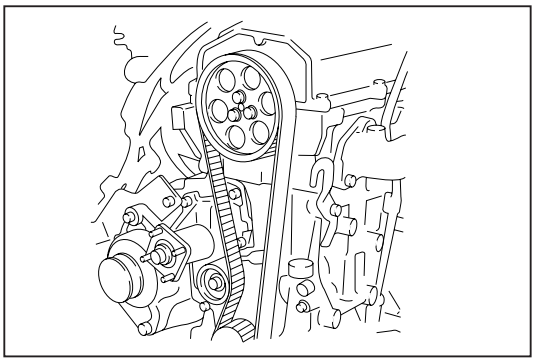
REMOVAL OF WATER PUMP

1. Disconnect the battery ground cable from the negative (–) terminal of the battery.
2. Remove the engine under cover.
3. Drain the coolant. (See page CO–8.)
   Open the radiator cap and drain plug, and allow the coolant to drain into a container.
   WARNING:
   - Never open the radiator cap and/or drain plug. When the engine is hot.



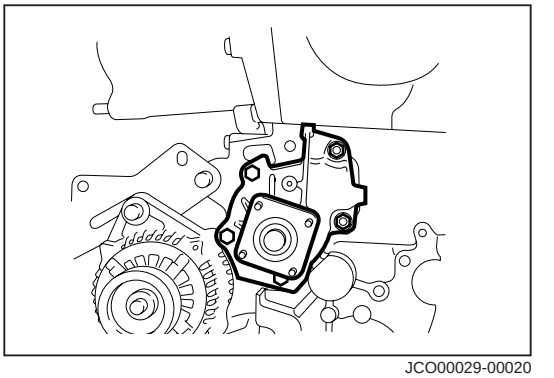
JCO00027-00018

4. Remove the timing belt.
   (Refer to the EM section.)



JCO00028-00019

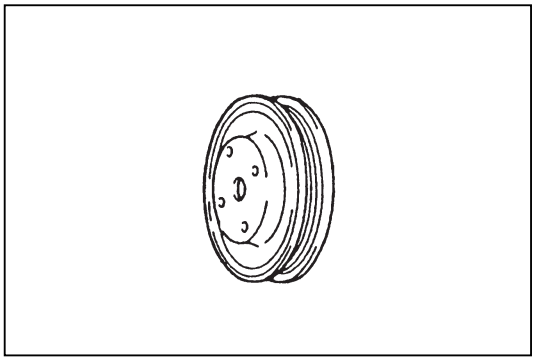
5. Remove the water pump by removing the attaching bolts and nuts of the water pump.



JCO00029-00020

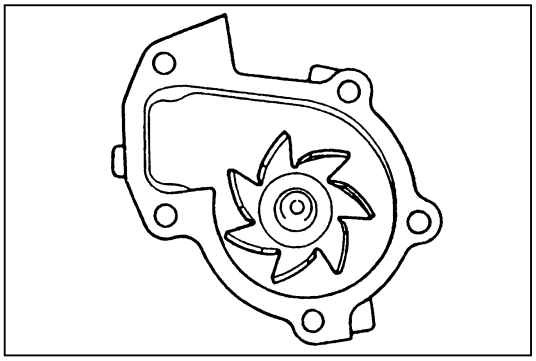
INSPECTION OF WATER PUMP-RELATED PARTS

1. Check the water pump pulley for damage or deformation.
   Replace the water pump if it exhibits damage or deformation.



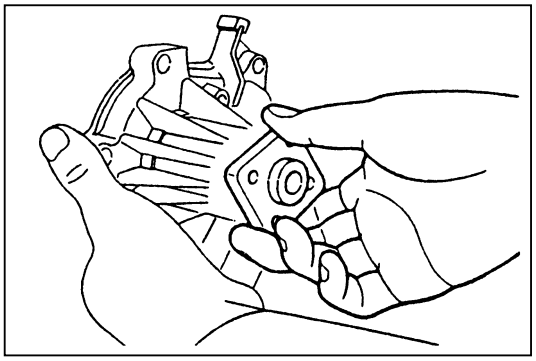
JCO00030-00021

2. Visually inspect the water pump rotor for damage or deformation.
   Replace the water pump if the water pump rotor exhibits damage or deformation.



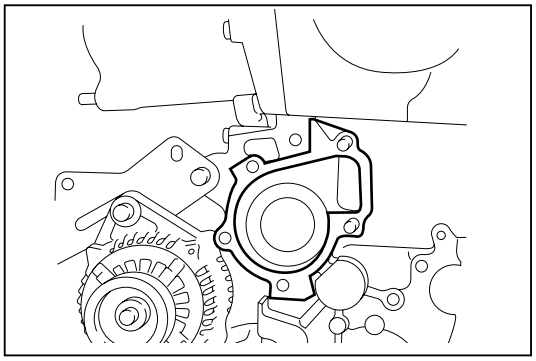
JCO00031-00022

3. Ensure that the water pump rotates smoothly by hand.
   Replace the water pump if it will not rotate smoothly.



JCO00032-00023

4. Check the water pump cover section of the cylinder block for damage or wear.
   Replace the cylinder block if the water pump cover section exhibits damage or wear.



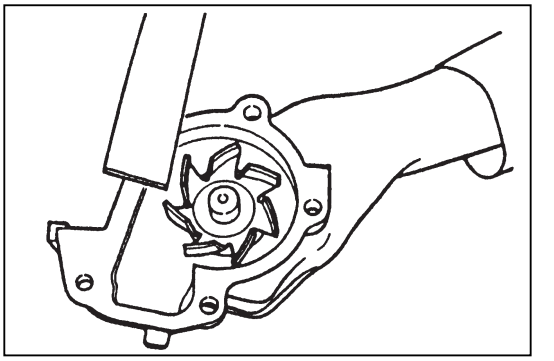
JCO00033-00024

INSTALLATION OF WATER PUMP

1. Remove the gasket material from the water pump installing surface of the cylinder block, using a gasket scraper.

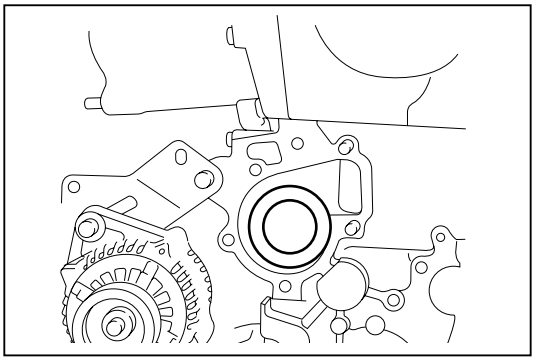
JCO00034-00000

2. Remove the gasket material from the water pump, using a gasket scraper.



JCO00035-00025

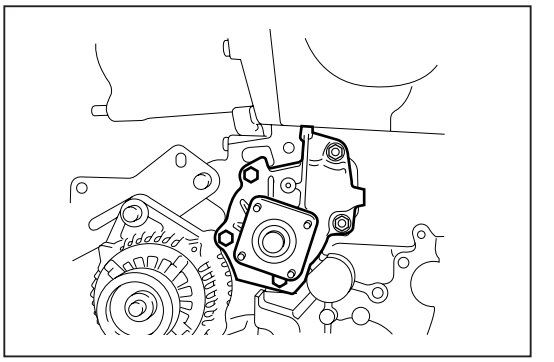
3. Install a new gasket to the cylinder block.



JCO00036-00026

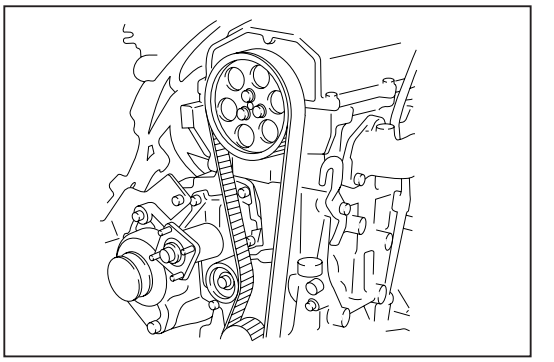
4. Install the water pump to the cylinder block. Tighten the attaching bolts and nuts evenly over two or three stages to the specified torque.
   Tightening Torque:
   14.7 - 21.6 N·m (1.5 - 2.2 kgf-m)

   NOTE:
   - After tightening bolts, ensure that the water pump rotates smoothly by hand.



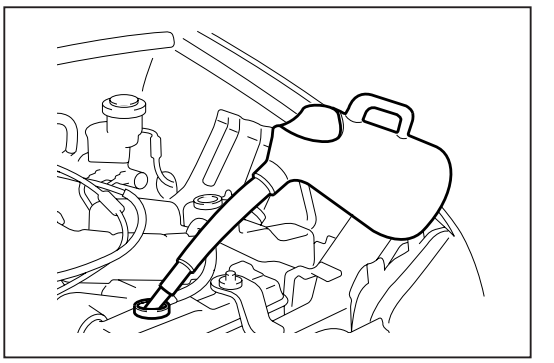
JCO00037-00027

5. Install the timing belt.
   (Refer to the EM section.)



JCO00038-00028

6. Fill coolant.
   (See page CO–9.)
7. Install the engine under cover.
8. Connect the battery ground cable to the negative (–) terminal of the battery.

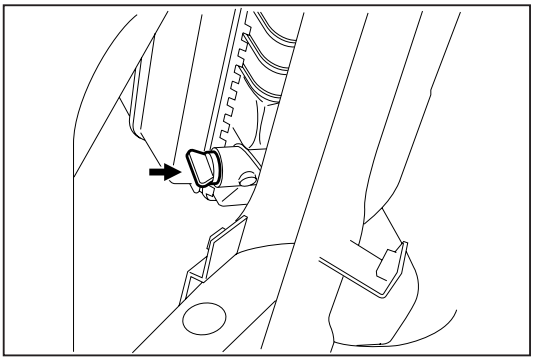


JCO00039-00029

THERMOSTAT

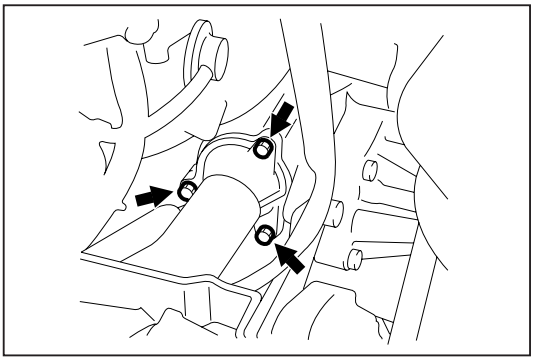
REMOVAL OF THERMOSTAT

1. Disconnect the ground cable terminal from the negative (–) terminal of battery.
2. Drain the coolant
   (See page CO–8.)
   WARNING:
   - Never open the radiator cap and/or drain plug when the coolant is hot.



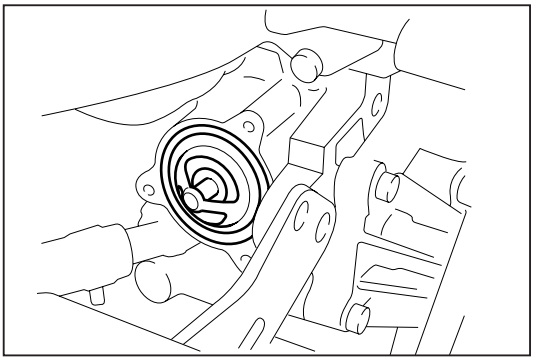
JCO00040-00030

3. Remove the power steering vane pump assembly.
   (Refer to the EM section.)
4. Remove the radiator hose No. 2 from the water inlet.
   CAUTION:
   - Cover the alternator to prevent entering the cooling water to the alternator.



JCO00041-00031

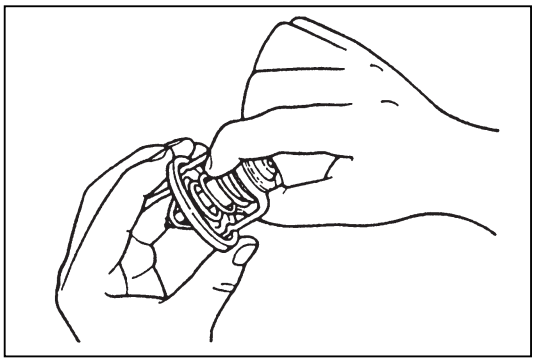
5. Remove the water inlet and the thermostat.



JCO00042-00032

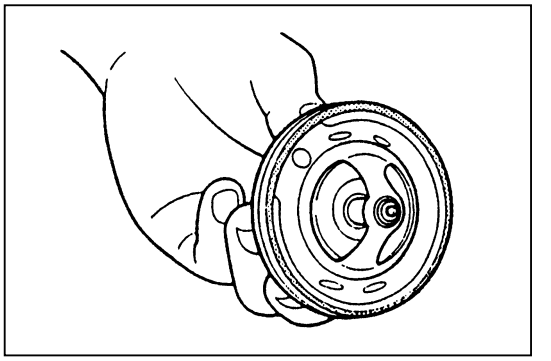
INSPECTION OF THERMOSTAT

1. Ensure that the thermostat valve is closed completely at room temperature 20°C and the spring has no play.
   Replace the thermostat if the valve is open or the spring has a play.



JCO00043-00033

2. Check the rubber grommet of the thermostat for damage or crack.
   Replace the thermostat if the rubber grommet exhibits damage or crack.

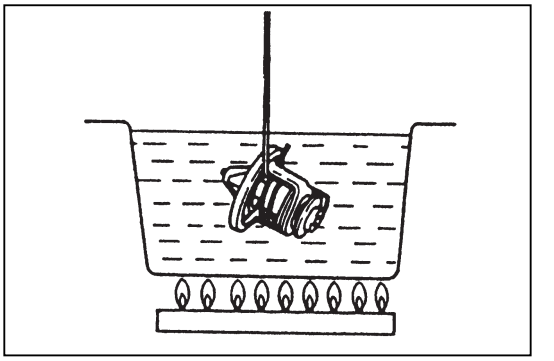


JCO00044-00034

3. Immerse the thermostat in water, and check the valve opening temperature by heating the water gradually.

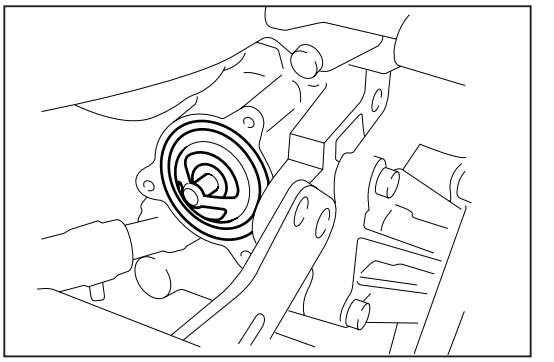
Specifications	Valve opening temperature ϒC	Valve lift
Cold region specifications	82 - 86	8.5 mm or more at 97ϒC
Standard specifications	76 - 80	8.5 mm or more at 91ϒC

Replace the thermostat if the valve operation fails to conform to the specifications.


JCO00045-00035

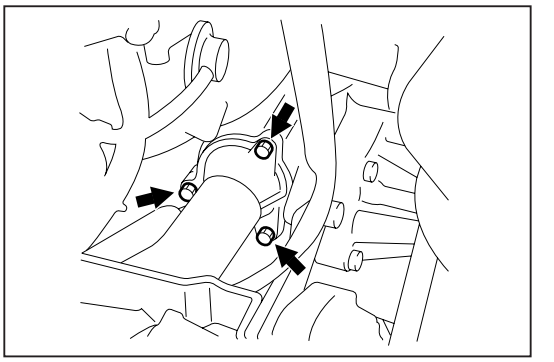
INSTALLATION OF THERMOSTAT

1. Assemble the thermostat in such a way that the jiggle pin comes exactly at the top of the engine.
   NOTE:
   - The thermostat should be installed in such a way the jiggle pin may face upward. Failure to observe this caution may cause engine malfunction.

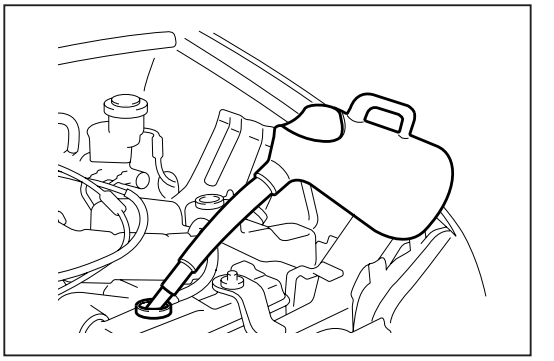

JCO00046-00036

2. Install the water inlet.
   Tightening Torque: 5.9 - 8.8 N·m (0.6 - 0.9 kgf-m)

3. Install the power steering vane pump assembly into position.
   (Refer to the EM section.)


JCO00047-00037

4. Fill coolant.
   (See page CO–9.)
5. Connect the battery ground cable to the negative (–) terminal of battery.
6. Start the engine and check it for leakage.
   Repair the leaky point if the leakage exists.


JCO00048-00038

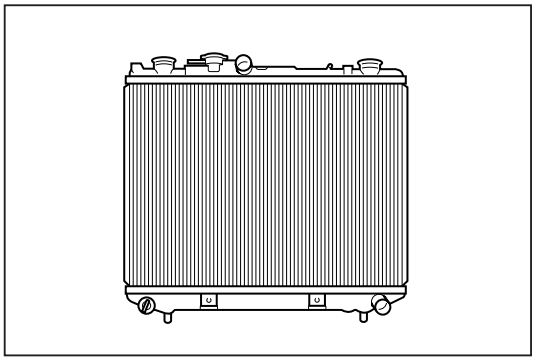
RADIATOR

CLEANING OF RADIATOR

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

CAUTION:

- When using a high pressure type cleaner, be careful not to deform radiator core fins.
- Keep a distance of more than 40 - 50 cm between the radiator core and cleaner nozzle when the cleaner nozzle pressure is 2.9 - 3.4 MPa (30 - 35 kgf/cm^2). Also, the injection angle of pressurized water should be right angles to the radiator.



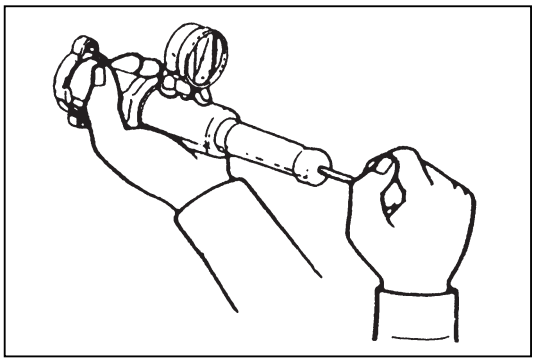
JCO00049-00039

INSPECTION OF RADIATOR

1. Check of radiator cap
   (1) Check the radiator cap by means of a radiator cap tester to see if the relief valve opens at a pressure of 74 - 103 kPa (0.75 - 1.05 kgf/cm^2).
   If the radiator cap does not conform to the specification, replace the radiator cap.

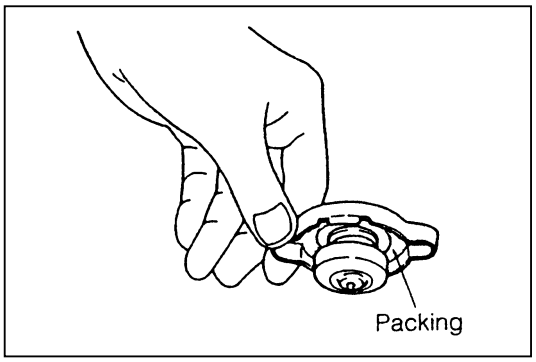
   WARNING:

   - Never open the radiator cap when the engine is hot.



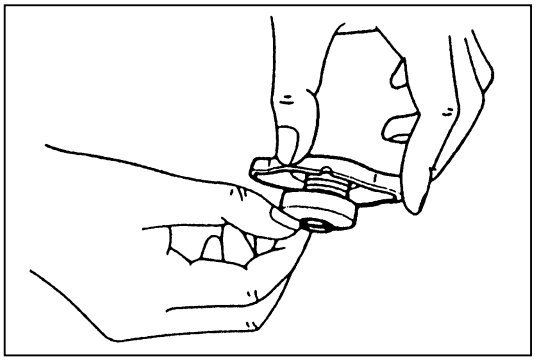
JCO00050-00040

   (2) Check the seal packing of the radiator cap for damage.
   Replace the radiator cap with a new one, if any damage exists.



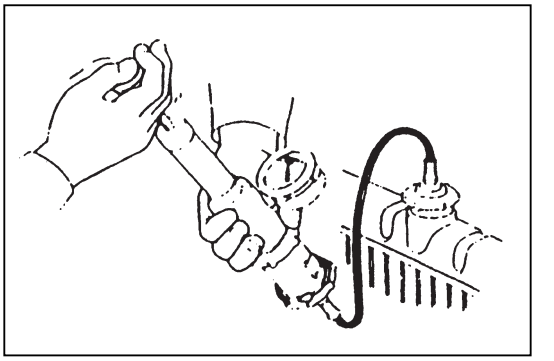
JCO00051-00041

   (3) Lift the valve at the vacuum side with your fingers.
   Ensure that the valve is functioning properly.
   Replace the radiator cap with a new one, if the valve fails to function.



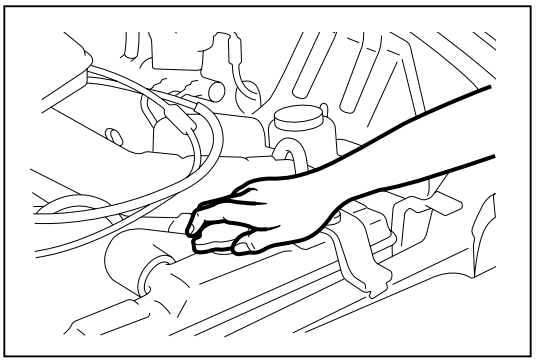
JCO00052-00042

2. Check of cooling system for leakage
   (1) Fill the radiator with coolant. Attach a radiator cap tester.
   (2) Warm up the engine.
   (3) Apply a pressure of 118 kPa (1.2 kgf/cm^2) to the cooling system by means of a radiator tester.
   If the pressure drops, check the hoses, radiator, water pump and heater for evidence of leakage.
   If no external leakage is found, check the heater core, cylinder block, cylinder head, oil cooler and throttle body for evidence of leakage.
   Check the hoses for deterioration, cracks, bulge or damage.
   Replace the defective part(s) if necessary.
   (4) Remove the radiator cap tester from the radiator.
   WARNING:
   - Never remove the radiator cap tester when the coolant temperature is high.

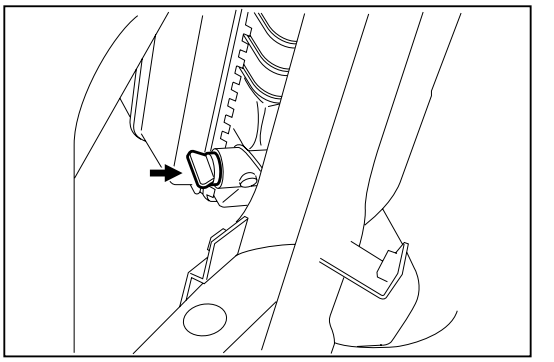

JCO00053-00043

REMOVAL OF RADIATOR

1. Disconnect the battery ground cable terminal from the negative (–) terminal of the battery.
2. Drain the coolant as follows:
   (1) Remove the radiator cap.
   WARNING:
   - Never open the radiator cap and/or drain plug when the coolant is hot.

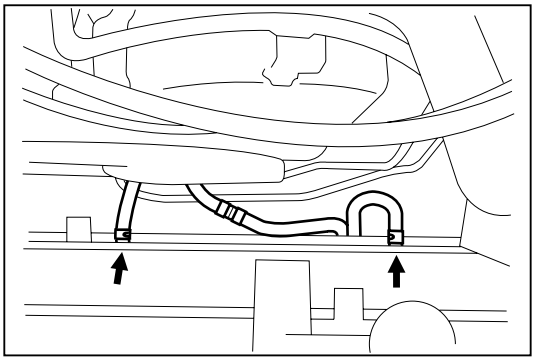

JCO00054-00044

   (2) Remove the engine under cover.
   (3) Place a suitable container below the radiator drain plug. Drain the coolant by removing the drain plug.
   (4) Tighten the drain plug.


JCO00055-000045

3. Disconnect the two oil cooler hoses for the automatic transmission. (A/T vehicle for European market only)
   NOTE:
   - Receive the oil with a suitable container because the torque converter oil flows out.
   - Prevent oil flowing by installing suitable plugs to the disconnected hoses.

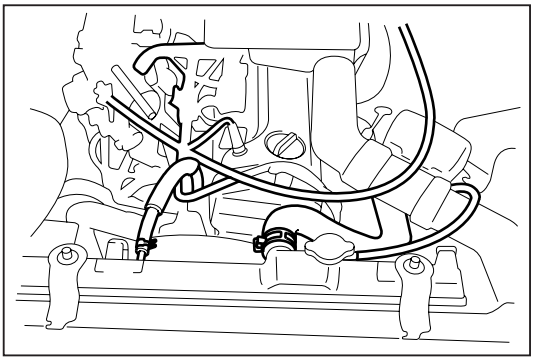
   CAUTION:
   - Never reuse the oil cooler hoses and hose bands for automatic transmission use. Failure to observe this caution will cause the hoses to be disconnected.


JCO00056-00046

4. Removal of radiator
   (1) Temporarily detach the power steering vane pump.
   (2) Remove the radiator hose No. 1 and the breather hoses at radiator side.
   CAUTION:
   - When the radiator hose is loosened, be sure to protect the alternator because the coolant flows out.

   (3) Disconnect the radiator hose No. 2 from the radiator lower tank.

   (4) Remove the two attaching bolts of the radiator upper tank.
   (5) Remove the two attaching bolts of the fan shroud. Then, disconnect the lock section of the fan shroud from radiator.
   (6) Remove the four attaching nuts of the cooling fan.
   (7) Remove the fan shroud and the cooling fan at the same time.
   (8) Remove the radiator.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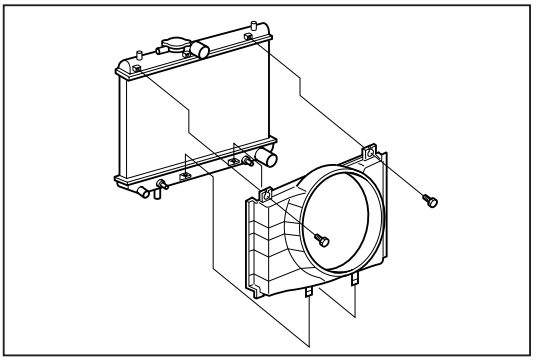
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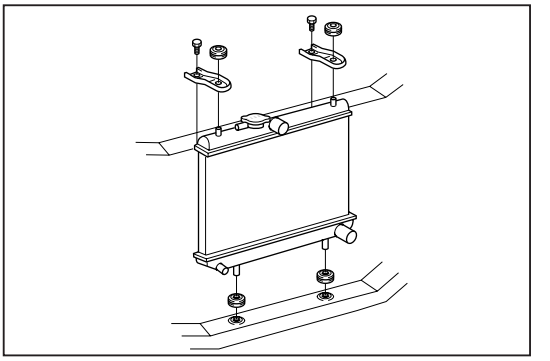
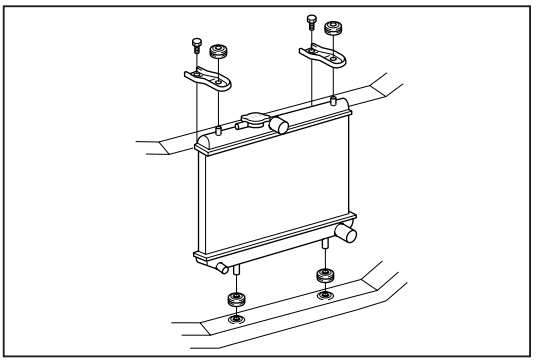

JCO00000-00049

INSTALLATION OF RADIATOR

1. Radiator installation
   (1) Place the radiator fan shroud to the cooling fan side.
   (2) Install the radiator in the engine room.
   NOTE:
   - Before attaching the fan shroud to the radiator, insert the lock section of the fan shroud to the lower section of the radiator.

   (3) Tighten the two attaching bolts of the radiator upper tank.
   (4) Tighten the two attaching bolts of the fan shroud.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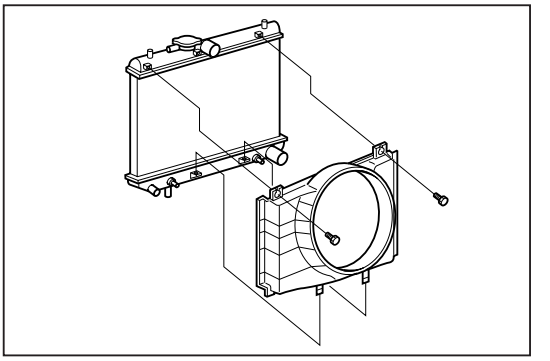
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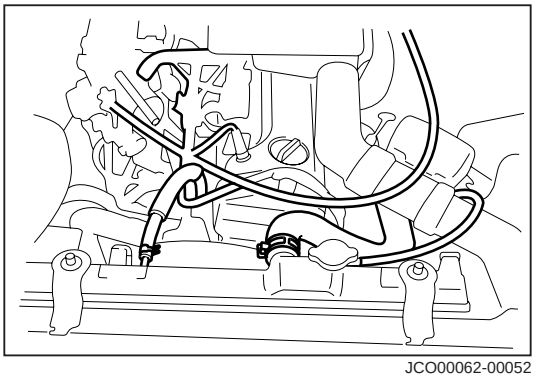
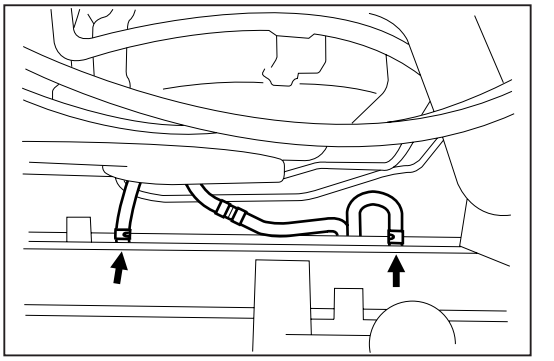
(5) Connect the radiator hose No. 1 and the breather hoses to the radiator upper tank.
(6) Connect the radiator hose No. 2 to the radiator lower tank.

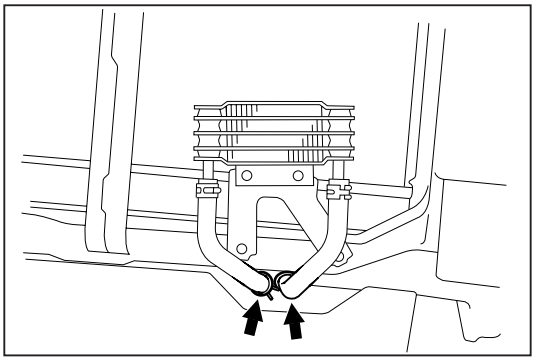

JCO00062-00052

(7) Connection of oil cooler hoses (A/T vehicle for European market only)
① Remove the oil cooler hoses.
② Wipe off any oil from the connecting section of the oil cooler hoses.
③ Connect new oil cooler hoses. Install new hose clips.

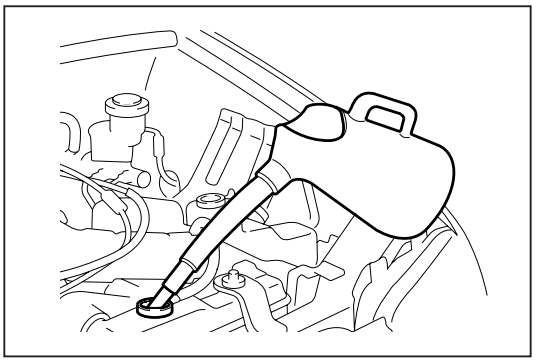
CAUTION:
- Never reuse the oil cooler hoses and hose clips.
- Make sure that no oil or dirt gets to the connected sections.
- Failure to observe this caution will cause the hoses to be disconnected.


JCO00063-00053

(8) Add automatic transmission oil
(See the Chassis Workshop Manual)
(9) Install the power steering vane pump.


JCO00064-00054

2. Fill the coolant.
(See page CO–9.)
3. Connect the battery ground cable to the negative (–) terminal of the battery.
4. Start the engine and check it for leakage.
Repair the leaky point if leakage exists.


JCO00065-00055

TIGHTENING TORQUE

Tightening component	Tightening torque		Remark
	N·m	kgf-m	
Cylinder head × Water temperature sensor	24.5 - 34.3	2.5 - 3.5	Dry
Cylinder block × Water inlet	5.9 - 8.8	0.6 - 0.9	Dry
Cylinder block × Water pump	14.7 - 21.6	1.5 - 2.2	Dry
Fluid coupling × Water pump pulley × Water pump	10 - 18	1.0 - 1.8	Dry
Cooling fan × Fluid coupling	4.3 - 6.5	0.44 - 0.66	Dry

JCO00066-00000

SERVICE SPECIFICATION

Coolant capacity w/heater [Excluding 1.1 L for reserve tank]			5.4 L (M/T) · 5.3 L (A/T)
Radiator cap	Relief valve opening pressure		
		Standard	73.5 - 103.0 kPa (0.75 - 1.05 kgf/cm^2)
		Minimum	58.8 kPa (0.6 kgf/cm^2)
Thermostat	Valve opening temperature		
		Cold region specifications	82 - 86ϒC
		Standard specifications	76 - 80ϒC
	Valve lift		
		Cold region specifications	8.5 mm or more at 97ϒC
		Standard specifications	8.5 mm or more at 91ϒC

JCO00067-00000

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