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SECTION

ENGINE COOLING SYSTEM

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PRECAUTIONS

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

NBS001PH

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PREPARATION

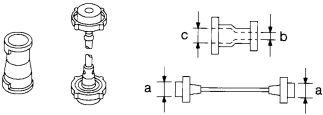


PREPARATION

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Special Service Tools

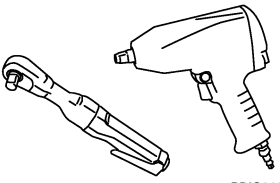
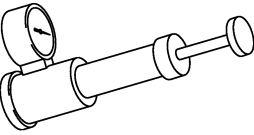
NBS001PI

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
EG17650301 (J33984-A) Radiator cap tester adapter <div style="text-align: center;">  <p>S-NT564</p> </div>	Adapting radiator cap tester to radiator cap and thermostat housing neck a: 28 (1.10) dia. b: 31.4 (1.236) dia. c: 41.3 (1.626) dia. Unit: mm (in)
KV99103510 (-) Radiator plate pliers A <div style="text-align: center;">  <p>S-NT224</p> </div>	Installing radiator upper and lower tanks
KV99103520 (-) Radiator plate pliers B <div style="text-align: center;">  <p>S-NT225</p> </div>	Removing radiator upper and lower tanks

Commercial Service Tools

NBS001PJ

Tool name	Description
Power tool <div style="text-align: center;">  <p>PBIC0190E</p> </div>	Loosening bolts and nuts
Radiator cap tester <div style="text-align: center;">  <p>PBIC1982E</p> </div>	Checking radiator and radiator cap

OVERHEATING CAUSE ANALYSIS

OVERHEATING CAUSE ANALYSIS

PFP:00012

Troubleshooting Chart

NBS001PK

		Symptom		Check items	
Cooling system parts malfunction	Poor heat transfer	Water pump malfunction	Worn or loose drive belt	—	—
		Thermostat and water control valve stuck closed	—		
		Damaged fins	Dust contamination or paper clogging		
			Physical damage		
	Clogged radiator cooling tube	Excess foreign material (rust, dirt, sand, etc.)			
	Reduced air flow	Cooling fan does not operate	Fan assembly	—	
		High resistance to fan rotation			
		Damaged fan blades			
	Damaged radiator shroud	—	—	—	
	Improper engine coolant mixture ratio	—	—	—	
	Poor engine coolant quality	—	Engine coolant density	—	
	Insufficient engine coolant	Engine coolant leaks	Cooling hose	Loose clamp	
				Cracked hose	
			Water pump	Poor sealing	
			Radiator cap	Loose	
Poor sealing					
Radiator		O-ring for damage, deterioration or improper fitting			
		Cracked radiator tank			
		Cracked radiator core			
Reservoir tank	Cracked reservoir tank				
Overflowing reservoir tank	Exhaust gas leaks into cooling system	Cylinder head deterioration			
		Cylinder head gasket deterioration			

OVERHEATING CAUSE ANALYSIS

	Symptom		Check items				
Except cooling system parts malfunction	—	Overload on engine	Abusive driving	High engine rpm under no load	A		
				Driving in low gear for extended time	CO		
				Driving at extremely high speed			
					Powertrain system malfunction		C
					Installed improper size wheels and tires	—	D
					Dragging brakes		
			Improper ignition timing		E		
	Blocked or restricted air flow	Blocked bumper	—				
		Blocked radiator grille	Installed car brassiere				
			Mud contamination or paper clogging	—		F	
		Blocked radiator	—				
		Blocked condenser	Blocked air flow			G	
Installed large fog lamp							

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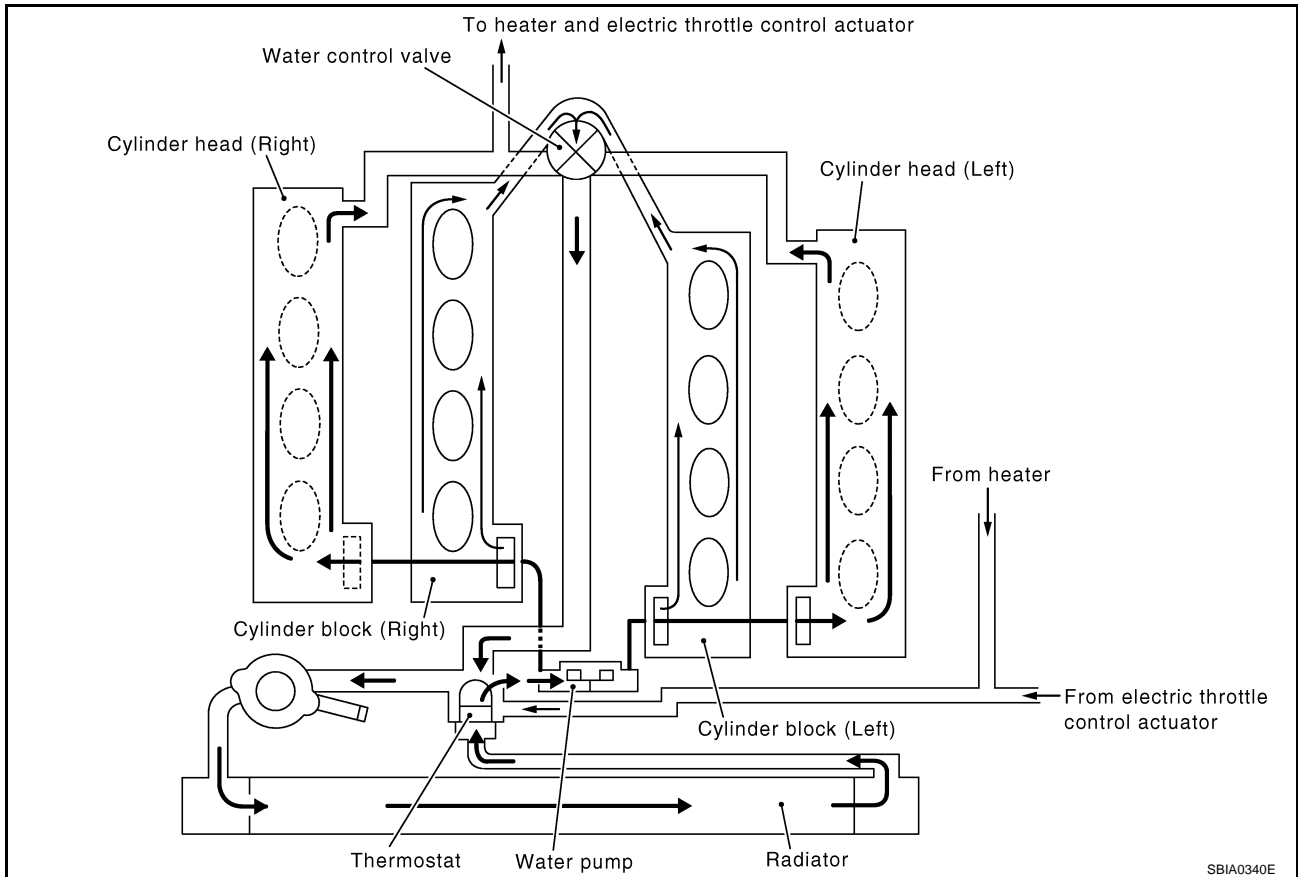
COOLING SYSTEM

COOLING SYSTEM

PFP:21020

Cooling Circuit

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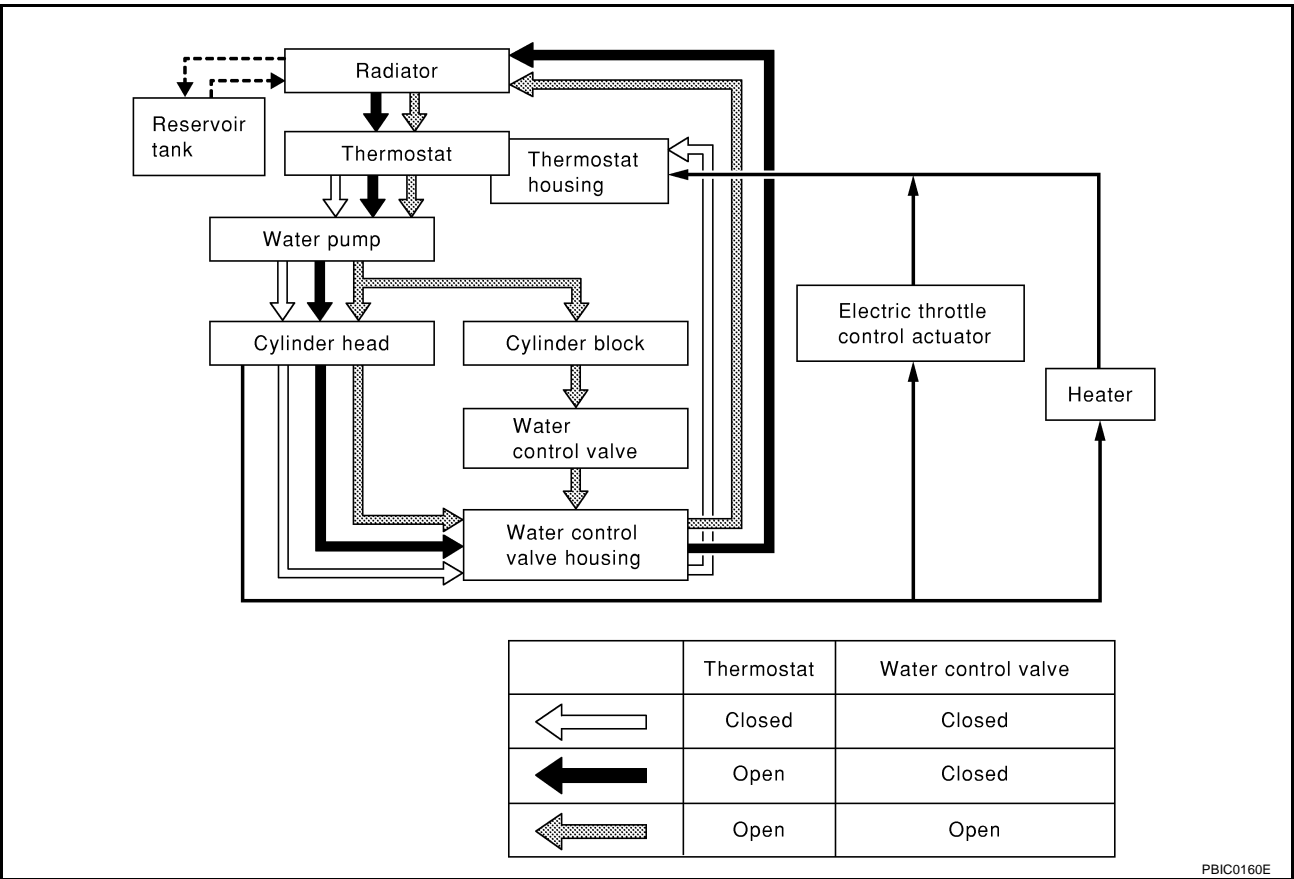


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COOLING SYSTEM

System Chart

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PBIC0160E

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ENGINE COOLANT

ENGINE COOLANT

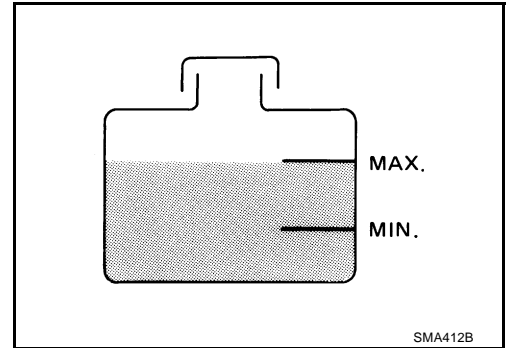
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Inspection

CHECKING ENGINE COOLANT LEVEL

NBS001PN

- Check if the reservoir tank engine coolant level is within “MIN” to “MAX” when engine is cool.
- Adjust engine coolant as necessary.



CHECKING COOLING SYSTEM FOR LEAKS

To check for leakage, apply pressure to the cooling system with the radiator cap tester (commercial service tool) and the radiator cap tester adapter (SST).

Testing pressure : 157 kPa (1.6 kg/cm² , 23 psi)

WARNING:

Do not remove radiator cap when engine is hot. Serious burns could occur from high pressure engine coolant escaping from thermostat housing.

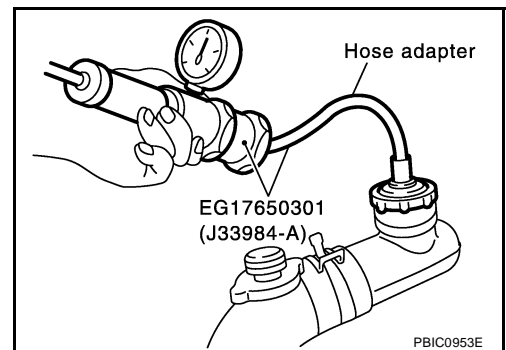
CAUTION:

Higher pressure than specified may cause radiator damage.

NOTE:

In a case that engine coolant decreases, replenish radiator with engine coolant.

- If anything is found, repair or replace damaged parts.



Changing Engine Coolant

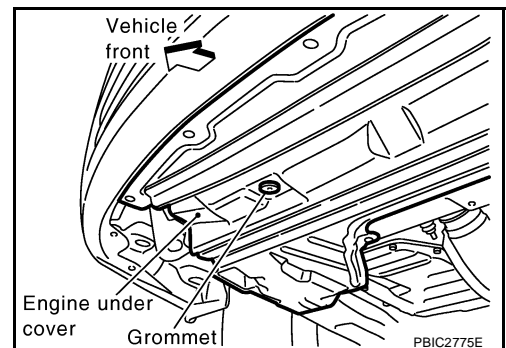
NBS001PO

WARNING:

- To avoid being scalded, do not change engine coolant when engine is hot.
- Wrap a thick cloth around radiator cap and carefully remove radiator cap. First, turn radiator cap a quarter of a turn to release built-up pressure. Then turn radiator cap all the way.

DRAINING ENGINE COOLANT

1. Remove grommet from engine undercover.



2. Open radiator drain plug at the bottom of radiator, and remove radiator cap.

When draining all of engine coolant in the system, open water drain plugs on engine cylinder block. Refer to [EM-84, "DISASSEMBLY"](#) .

3. Check drained engine coolant for contaminants such as rust, corrosion or discoloration. If contaminated, flush the engine cooling system. Refer to [CO-10, "FLUSHING COOLING SYSTEM"](#) .
4. Remove reservoir tank as necessary, drain engine coolant and clean reservoir tank before installing.

ENGINE COOLANT

REFILLING ENGINE COOLANT

1. Install reservoir tank if removed, and radiator drain plug.

CAUTION:

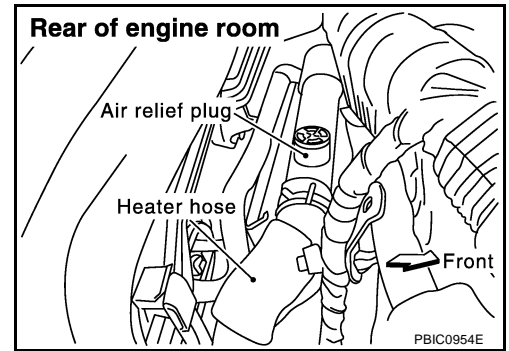
Be sure to clean drain plug and install with new O-ring.

Radiator drain plug:

 : 1.17 N·m (0.12 kg·m, 10 in·lb)

If water drain plugs on cylinder block are removed, close and tighten them. Refer to [EM-88, "ASSEMBLY"](#).

2. Remove air relief plug on heater hose.



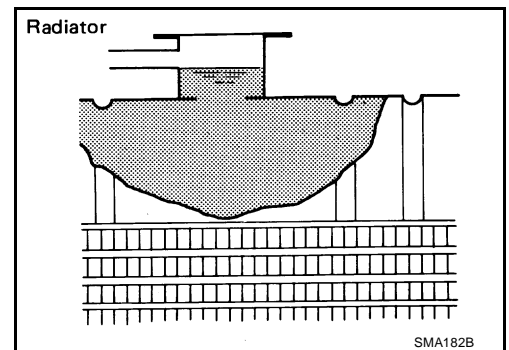
3. Fill radiator and reservoir tank to specified level.

- Use Genuine Nissan Long life Antifreeze/Coolant or equivalent mixed with water (distilled or demineralized). Refer to [MA-10, "RECOMMENDED FLUIDS AND LUBRICANTS"](#).
- Pour engine coolant through engine coolant filler neck slowly of less than 2 l (2-1/8 US qt, 1-3/4 Imp qt) a minute to allow air in system to escape.

Engine coolant capacity

(With reservoir tank at "MAX" level):

Approx. 10.3 l (10-7/8 US qt, 9-1/8 Imp qt)

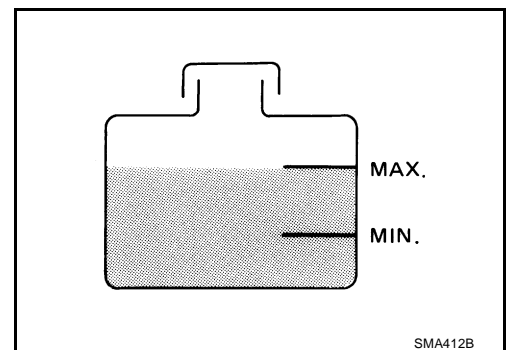


Reservoir tank engine coolant capacity

(At "MAX" level):

0.8 l (7/8 US qt, 3/4 Imp qt)

- When engine coolant overflows air relief hole on heater hose, install air relief plug.



4. Install radiator cap.
5. Warm up until opening thermostat and water control valve. Standard for warming-up time is approximately 10 minutes at 3,000 rpm.

- Make sure thermostat opening condition by touching radiator hose (lower) to see a flow of warm water.

CAUTION:

Watch water temperature gauge so as not to overheat engine.

6. Stop engine and cool down to less than approximately 50°C (122°F).

- Cool down using a fan to reduce the time.
- If necessary, refill radiator up to filler neck with engine coolant.

ENGINE COOLANT

7. Refill reservoir tank to "MAX" level line with engine coolant.
8. Repeat steps 3 through 6 two or more times with radiator cap installed until the engine coolant level no longer drops.
9. Check cooling system for leaks with engine running.
10. Warm up engine, and check for sound of engine coolant flow while running engine from idle up to 3,000 rpm with heater temperature controller set at several position between COOL and WARM.
 - Sound may be noticeable at heater unit.
11. Repeat step 10 three times.
12. If sound is heard, bleed air from cooling system by repeating steps 3 through 6 until engine coolant level no longer drops.

FLUSHING COOLING SYSTEM

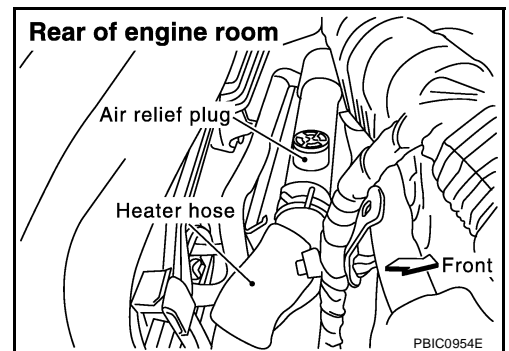
1. Install reservoir tank if removed, and radiator drain plug.

Radiator drain plug

: 1.17 N·m (0.12 kg·m, 10 in·lb)

If water drain plugs on cylinder block are removed, close and tighten them. Refer to [EM-88, "ASSEMBLY"](#).

2. Remove air relief plug on heater hose.



3. Fill radiator with engine coolant until engine coolant spills from the air relief hole, then close air relief plug. Fill radiator and reservoir tank with engine coolant and reinstall radiator cap.
4. Run engine and warm it up to normal operating temperature.
5. Rev engine two or three times under no-load.
6. Stop engine and wait until it cools down.
7. Drain engine coolant from the system. Refer to [CO-8, "DRAINING ENGINE COOLANT"](#).
8. Repeat steps 1 through 7 until clear water begins to drain from radiator.

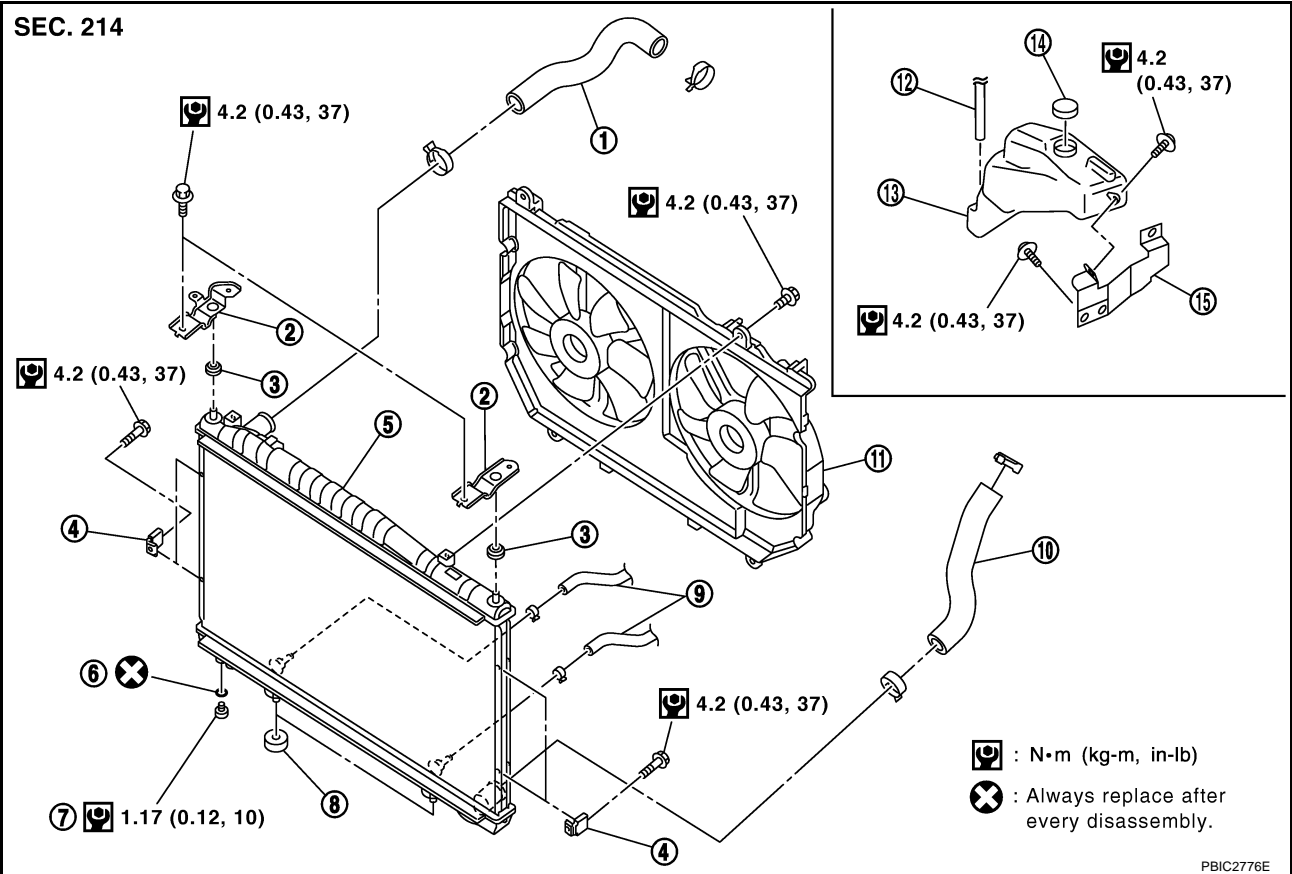
RADIATOR

PFP:21400

RADIATOR

Removal and Installation

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- | | | |
|---------------------------|------------------------------|----------------------------|
| 1. Radiator hose (upper) | 2. Radiator mounting bracket | 3. Mounting rubber |
| 4. Clip | 5. Radiator | 6. O-ring |
| 7. Radiator drain plug | 8. Mounting rubber | 9. A/T fluid cooler hose |
| 10. Radiator hose (lower) | 11. Cooling fan assembly | 12. Reservoir tank hose |
| 13. Reservoir tank | 14. Reservoir tank cap | 15. Reservoir tank bracket |

WARNING:

Do not remove radiator cap when engine is hot. Serious burns could occur from high pressure engine coolant escaping from thermostat housing.

REMOVAL

1. Drain engine coolant from radiator. Refer to [CO-8, "Changing Engine Coolant"](#) .

CAUTION:

- Perform when engine is cold.
 - Do not spill engine coolant on drive belts.
2. Remove cooling fan assembly. Refer to [CO-18, "Removal and Installation"](#) .
 3. Remove A/T fluid cooler hoses.
 - Install blind plug to avoid leakage of A/T fluid.
 4. Remove bolts of both right and left end of radiator core (2 bolts for each).

RADIATOR

- Lift A/C condenser up approximately 2 cm (0.79 in). Remove clips from right and left flange parts of A/C condenser.

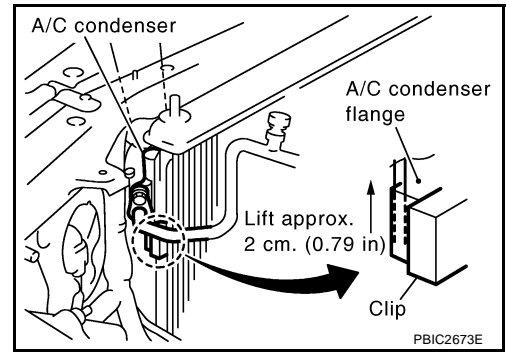
CAUTION:

To avoid putting a load on A/C piping, be careful not to lift too much.

- Lift up and remove radiator.

CAUTION:

- Do not damage or scratch radiator core when removing.
- After removing radiator, fix A/C condenser on the vehicle side with a rope or similar means. This is to prevent a load being applied to A/C piping.

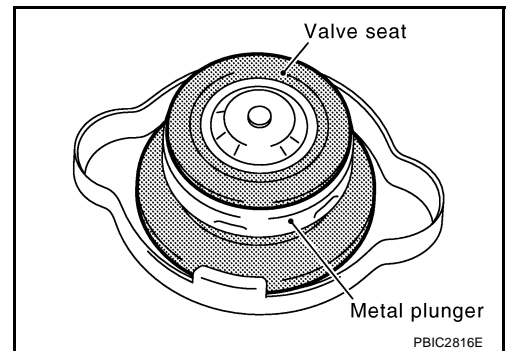


INSTALLATION

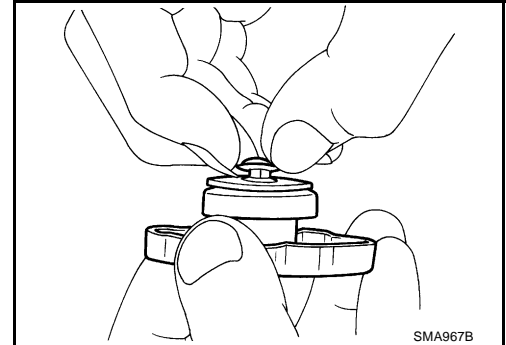
- Install in the reverse order of removal.

CHECKING RADIATOR CAP

- Valve seat of radiator cap inspection.
 - Check if valve seat is swollen to the extent that the edge of the plunger cannot be seen when watching it vertically from the top.
 - Check if valve seat has no soil and damage.



- Pull negative-pressure valve to open it, and make sure that it close completely when released.
 - Make sure that there is no dirt or damage on the valve seat of radiator cap negative-pressure valve.
 - Make sure that there are no unusualness in the opening and closing conditions of negative-pressure valve.

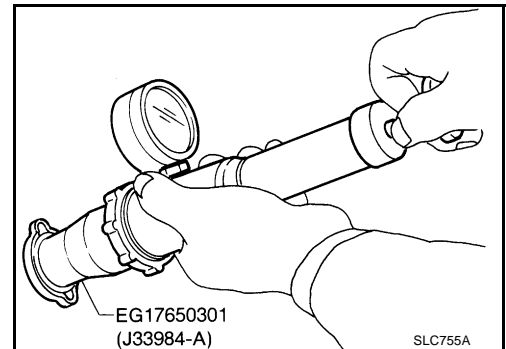


- Check radiator cap relief pressure.

Standard : 78 - 98 kPa (0.8 - 1.0 kg/cm² , 11 - 14 psi)

Limit : 59 kPa (0.6 kg/cm² , 9 psi)

- When connecting radiator cap to the radiator cap tester adapter (SST) and the radiator cap tester (Commercial service tool), apply engine coolant to the cap seal surface.



- Replace radiator cap if there is an unusualness in negative-pressure valve, or if the relief pressure fall below the limit.

CAUTION:

When installing a radiator cap, thoroughly wipe out the radiator filler neck to remove any waxy residue or foreign material.

RADIATOR

CHECKING RADIATOR

Check radiator for mud or clogging. If necessary, clean radiator as follows.

CAUTION:

- **Be careful not to bend or damage radiator fins.**
 - **When radiator is cleaned without removal, remove all surrounding parts such as cooling fan, radiator shroud and horns. Then tape harness and electrical connectors to prevent water from entering.**
1. Apply water by hose to the back side of radiator core vertically downward.
 2. Apply water again to all radiator core surfaces once per minute.
 3. Stop washing if any stains no longer flow out from radiator.
 4. Blow air into the back side of radiator core vertically downward.
 - Use compressed air lower than 490 kPa (5 kg/cm² , 71 psi) and keep distance more than 30 cm (11.8 in).
 5. Blow air again into all the radiator core surfaces once per minute until no water sprays out.

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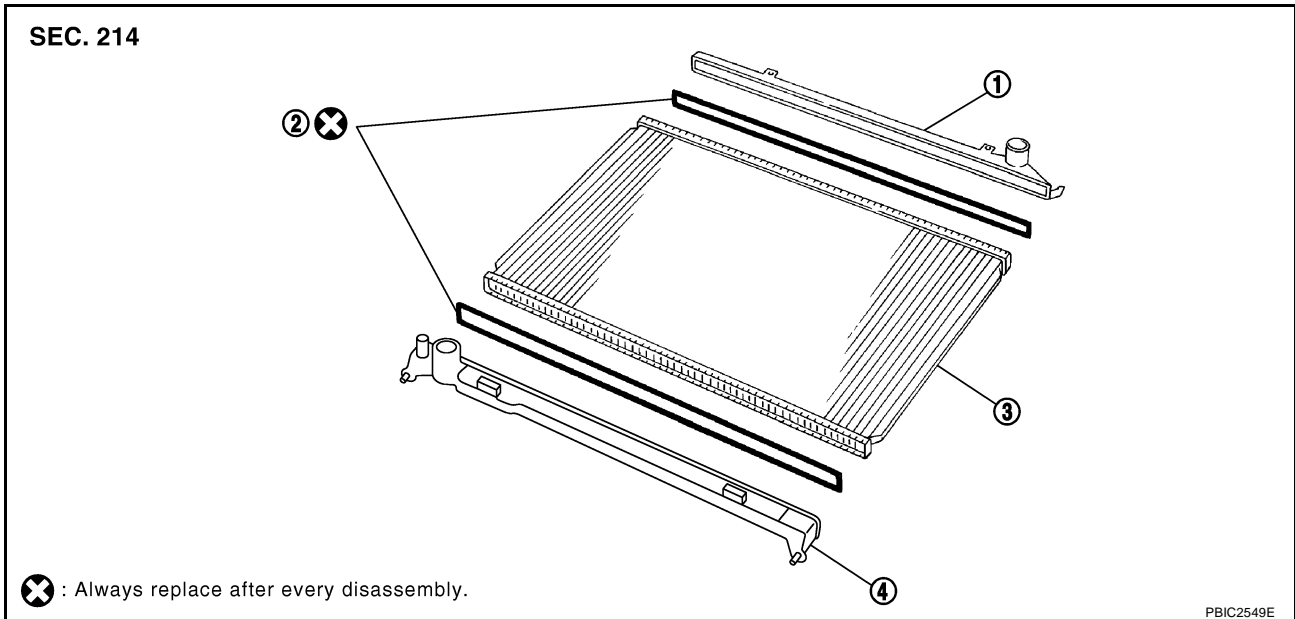
RADIATOR (ALUMINUM TYPE)

PFP:21460

RADIATOR (ALUMINUM TYPE)

Disassembly and Assembly

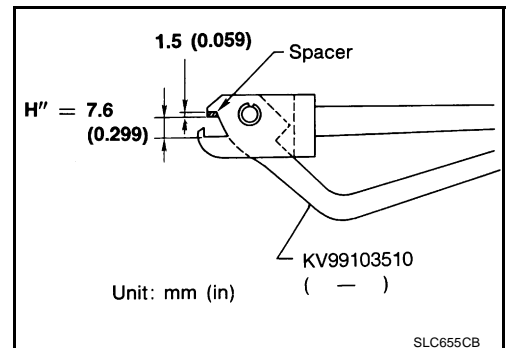
NBS001PQ



1. Upper tank
2. Sealing rubber
3. Core
4. Lower tank (with A/T fluid cooler)

PREPARATION

1. Attach the spacer to the tip of the radiator plate pliers A (SST).
Spacer specification: 1.5 mm (0.059 in) thick x 18 mm (0.71 in) wide x 8.5 mm (0.335 in) long.



2. Make sure that when the radiator plate pliers A (SST) are closed dimension H'' is approx. 7.6 mm (0.299 in).
3. Adjust dimension H'' with the spacer, if necessary.

DISASSEMBLY

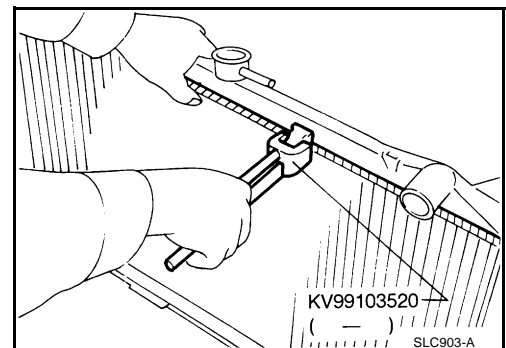
1. Remove upper and lower tanks with the radiator plate pliers B (SST).

CAUTION:

Do not disassemble lower tank and A/T fluid cooler.

NOTE:

Regard lower tank and A/T fluid cooler as an assembly.

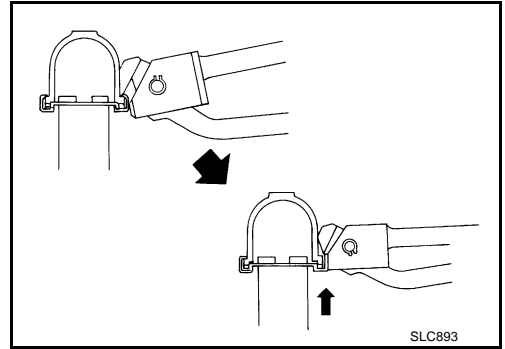


RADIATOR (ALUMINUM TYPE)

- Grip the crimped edge and bend it upwards so that the radiator plate pliers B slips off.

CAUTION:

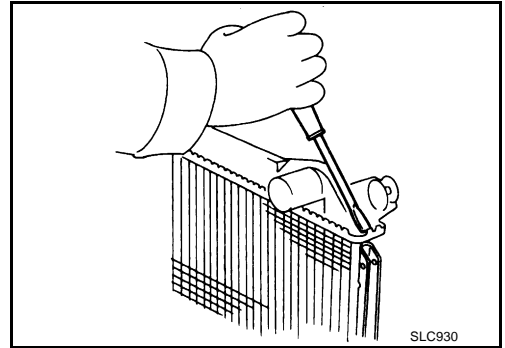
Do not bend excessively.



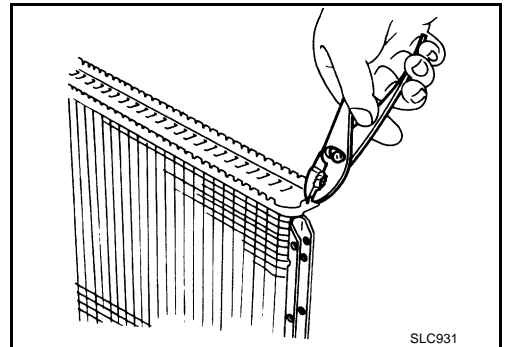
- In areas where the radiator plate pliers B cannot be used, use a screwdriver to bend the edge up.

CAUTION:

Be careful not to damage tank.

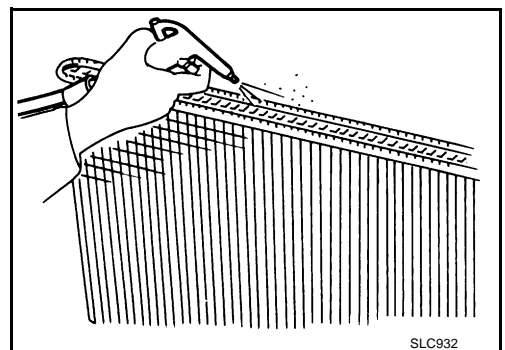


2. Remove sealing rubber.
3. Make sure the edge stands straight up.



ASSEMBLY

1. Clean contact portion of tank.



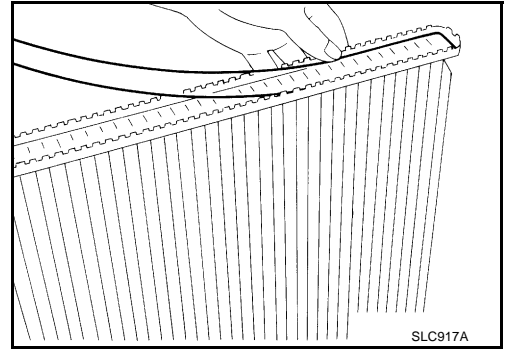
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RADIATOR (ALUMINUM TYPE)

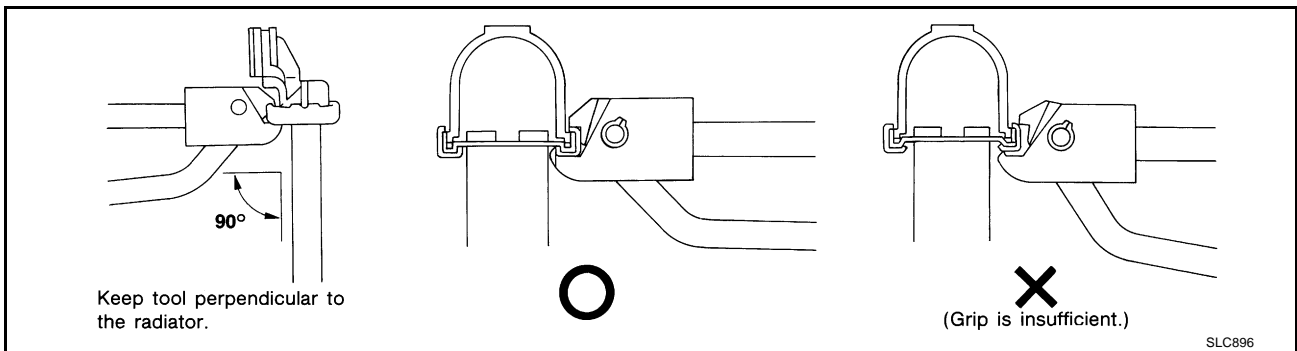
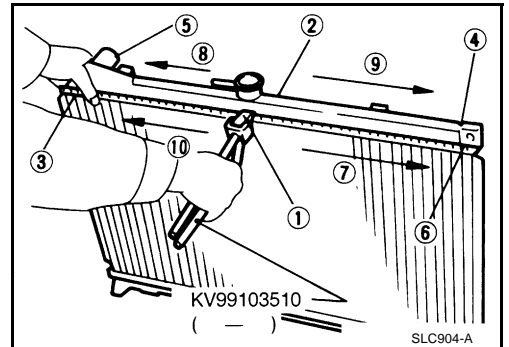
2. Install sealing rubber while pushing it with fingers.

CAUTION:

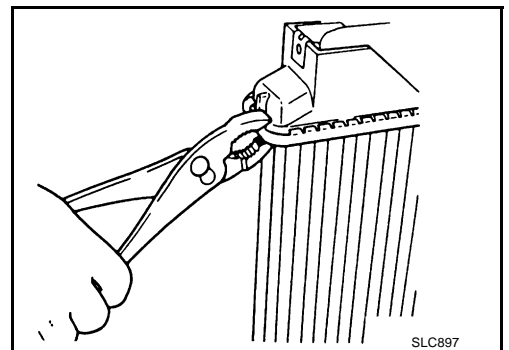
Be careful not to twist sealing rubber.



3. Caulk upper and lower tanks in numerical order as shown in the figure with radiator plate pliers A (SST).



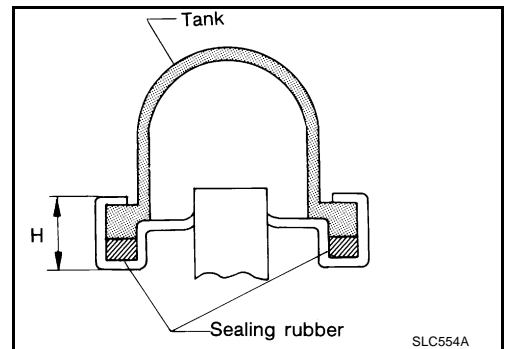
- Use a pliers in the locations where the radiator plate pliers A cannot be used.



RADIATOR (ALUMINUM TYPE)

4. Make sure that the rim is completely crimped down.

Standard height "H" : 8.0 - 8.4 mm (0.315 - 0.331 in)



5. Confirm that there is no leakage. Refer to [CO-17, "INSPECTION"](#).

INSPECTION

1. Apply pressure with the radiator cap tester adapter (SST) and the radiator cap tester (commercial service tool).

- Provide used radiator and connect it to tested radiator using radiator hoses as shown in the figure.

NOTE:

The used radiator should be tested beforehand to confirm it has no leakage. If used one is not available, it is possible to use new service part as a radiator testing tool.

Testing pressure

: 157 kPa (1.6 kg/cm² , 23 psi)

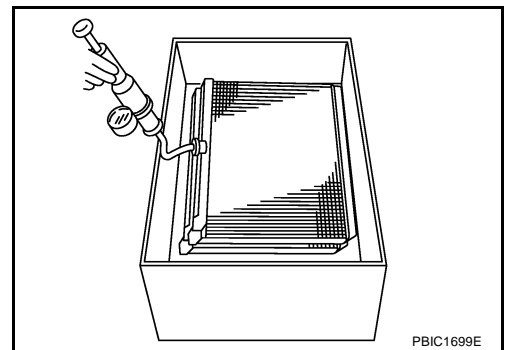
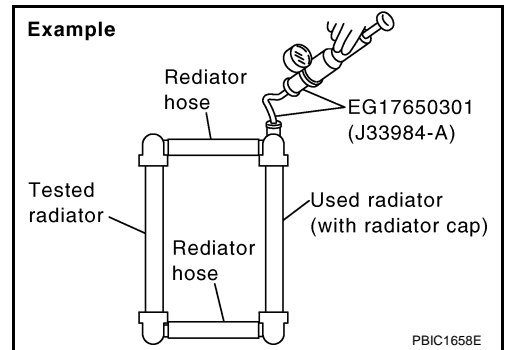
WARNING:

To prevent the risk of the hose coming undone while under pressure, securely fasten it down with a hose clamp.

CAUTION:

Attach a hose to A/T fluid cooler to seal its inlet and outlet.

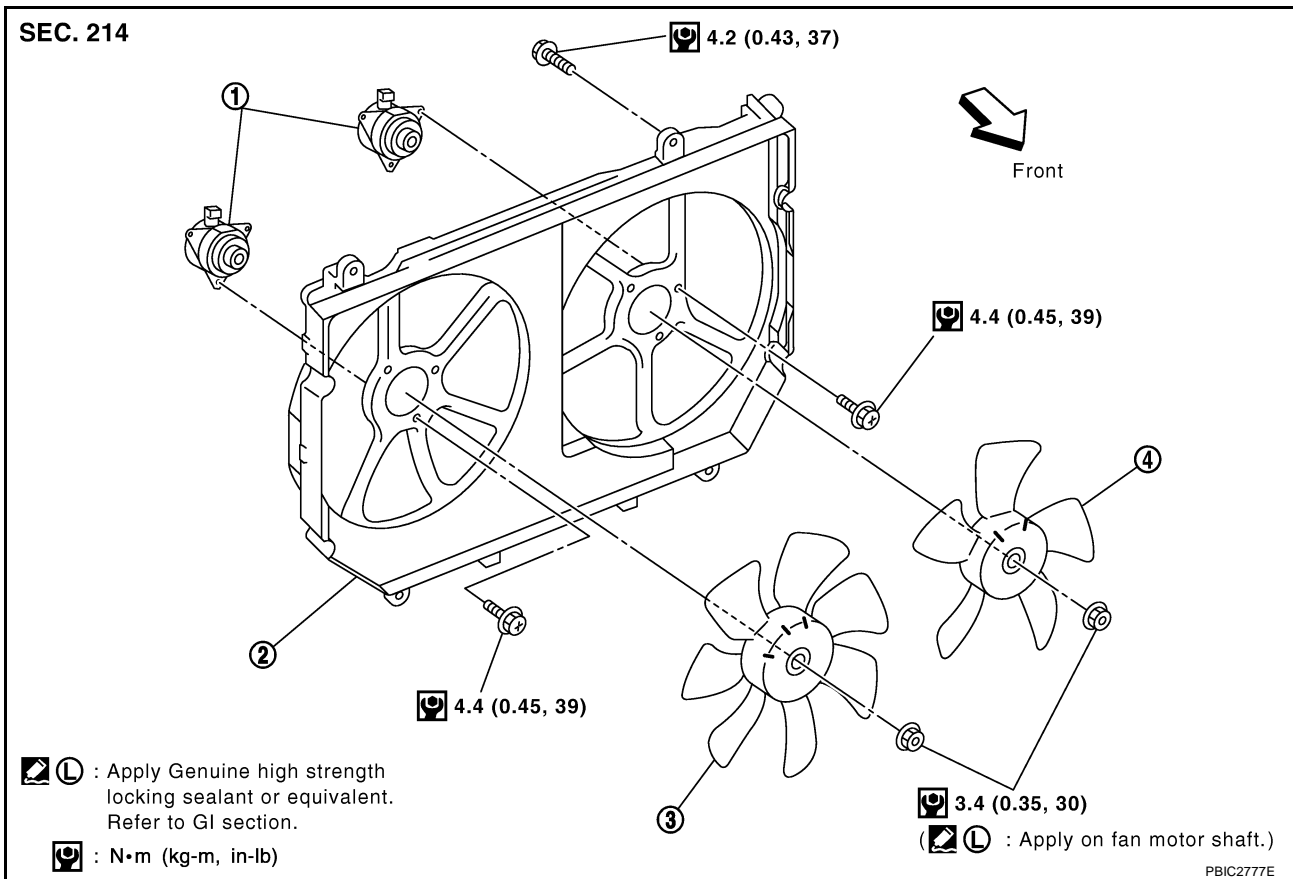
2. Check for leakage by soaking radiator in the water container with the testing pressure applied.



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COOLING FAN

Removal and Installation



1. Cooling fan motor

2. Cooling fan shroud

3. Cooling fan (right)

4. Cooling fan (left)

REMOVAL

1. Remove air duct (inlet), battery cover and air cleaner cover. Refer to [EM-13, "ENGINE ROOM COVER"](#).
2. Remove engine undercover with power tool.
3. Drain engine coolant from radiator. Refer to [CO-8, "Changing Engine Coolant"](#).

CAUTION:

Perform when engine is cold.

4. Remove battery. Refer to [SC-8, "Removal and Installation"](#).
5. Disconnect radiator hoses (upper and lower).
6. Remove A/T fluid cooler hose from fan shroud.
7. Disconnect harness connector from cooling fan motors.
8. Remove cooling fan shroud mounting bolts.
9. Remove radiator mounting bracket. With radiator moved toward the vehicle front, lift up and remove cooling fan shroud.

CAUTION:

Be careful not to scratch or damage radiator core.

INSTALLATION

Note the following, and install in the reverse order of removal.

NOTE:

Cooling fan is controlled by ECM. For details, refer to [EC-514, "DTC P1217 ENGINE OVER TEMPERATURE"](#)

COOLING FAN

NBS001PS

Disassembly and Assembly

DISASSEMBLY

1. Remove cooling fans.
2. Remove cooling fan motors from cooling fan shroud.

INSPECTION AFTER DISASSEMBLY

Cooling Fan

Inspect cooling fan for crack or unusual bend.

- If anything is found, replace cooling fan.

ASSEMBLY

Assemble is the reverse order of disassembly.

CAUTION:

Cooling fans are different between right and left. Be careful not to misassemble them.

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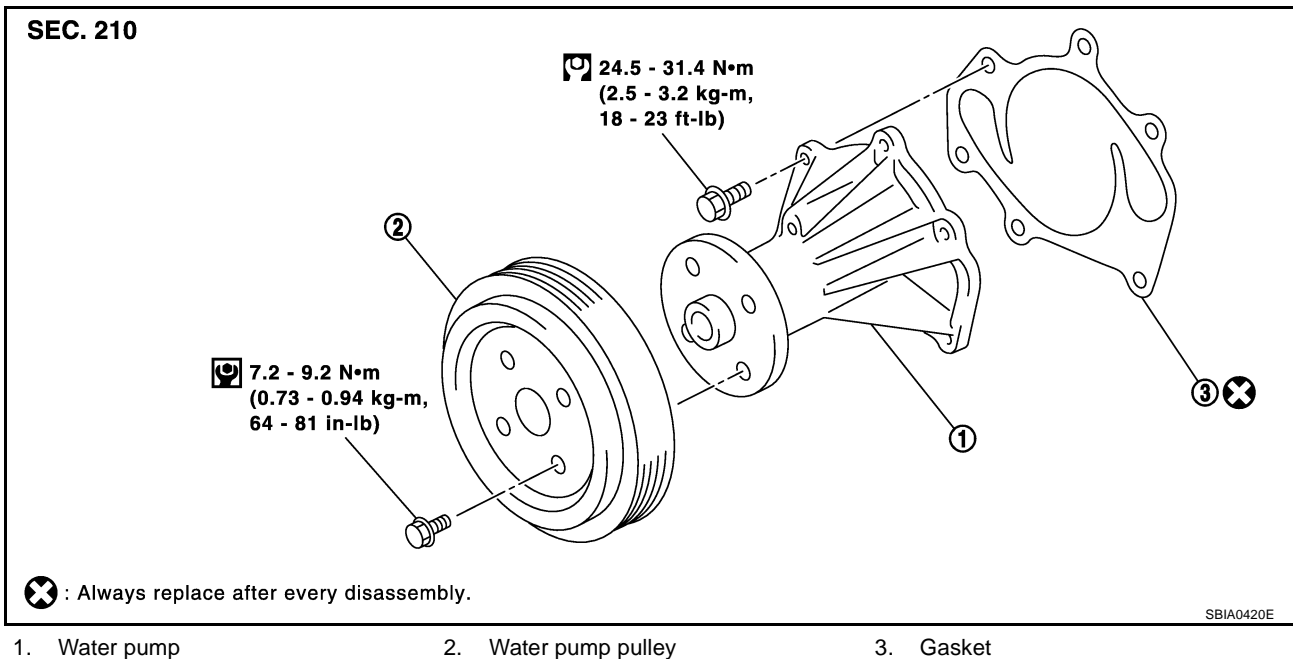
WATER PUMP

WATER PUMP

PFP:21020

Removal and Installation

NBS001PT



WARNING:

Do not remove radiator cap when engine is hot. Serious burns could occur from high pressure engine coolant escaping from thermostat housing.

REMOVAL

1. Drain engine coolant. Refer to [CO-8, "Changing Engine Coolant"](#).

CAUTION:

Perform when engine is cold.

2. Remove the following parts.

- Engine undercover
- Air duct (inlet) and engine cover, refer to [EM-13, "Removal and Installation"](#).
- Alternator, water pump and A/C compressor belt, refer to [EM-14, "Removal and Installation"](#).

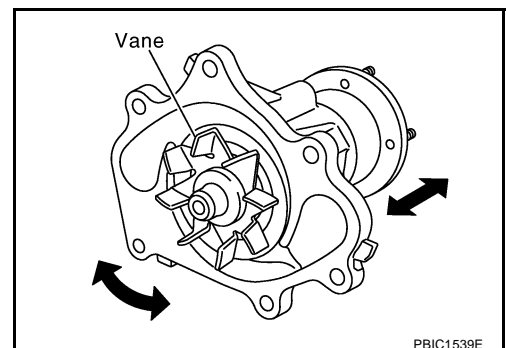
CAUTION:

Leave auto tensioner pulley in its fixed position when removing drive belt.

3. Remove water pump pulley.
4. Remove water pump.
 - Remove water pump with lightly tapping it using wooden piece.

INSPECTION AFTER REMOVAL

- Visually make sure that there is no significant dirt or rusting on water pump body and vane.
- Make sure that there is no looseness in vane shaft, and that it turns smoothly when rotated by hand.
- If there are any unusualness, replace water pump.



INSTALLATION

- Install in the reverse order of removal.

WATER PUMP

INSPECTION AFTER INSTALLATION

- Check for leaks of engine coolant using the radiator cap tester adapter [SST: EG17650301(J33984-A)] and the radiator cap tester (commercial service tool). Refer to [CO-8, "CHECKING COOLING SYSTEM FOR LEAKS"](#) .
- Start and warm up engine. Visually make sure that there is no leaks of engine coolant.

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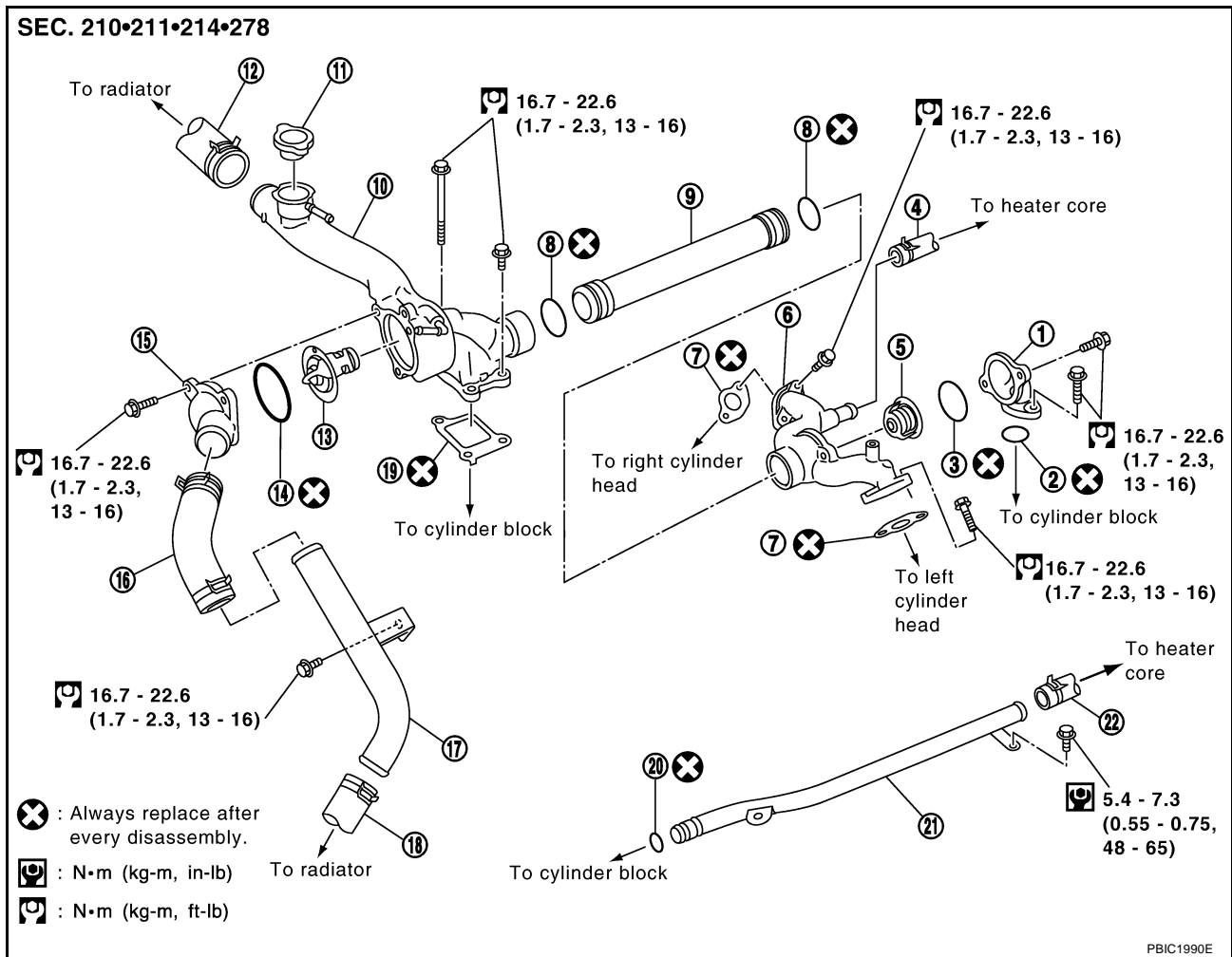
THERMOSTAT AND WATER CONTROL VALVE

PFP:21200

NBS001PU

THERMOSTAT AND WATER CONTROL VALVE

Removal and Installation



PBIC1990E

- | | | |
|------------------------|------------------------|---------------------------|
| 1. Water connector | 2. O-ring | 3. Rubber ring |
| 4. Heater hose | 5. Water control valve | 6. Rear water outlet |
| 7. Gasket | 8. O-ring | 9. Water outlet pipe |
| 10. Thermostat housing | 11. Radiator cap | 12. Radiator hose (upper) |
| 13. Thermostat | 14. Rubber ring | 15. Water inlet |
| 16. Water suction hose | 17. Water suction pipe | 18. Radiator hose (lower) |
| 19. Gasket | 20. O-ring | 21. Heater pipe |
| 22. Heater hose | | |

WARNING:

Do not remove radiator cap when engine is hot. Serious burns could occur from high pressure engine coolant escaping from thermostat housing.

REMOVAL

1. Drain engine coolant from radiator. Refer to [CO-8, "Changing Engine Coolant"](#) .

CAUTION:

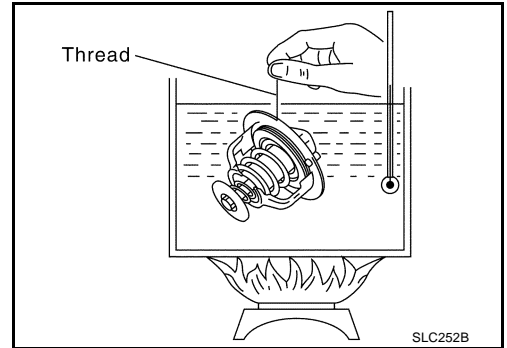
Perform when engine is cold.

2. Remove air duct (inlet) and engine cover. Refer to [EM-13, "Removal and Installation"](#) .
3. Remove water suction hose from water inlet side.
4. Remove water inlet and thermostat.
5. Remove intake manifold (upper and lower). Refer to [EM-19, "INTAKE MANIFOLD"](#) .
6. Remove thermostat housing, water outlet pipe, water control valve, rear water outlet and heater pipe (between left and right banks).

THERMOSTAT AND WATER CONTROL VALVE

INSPECTION AFTER REMOVAL

- Make sure that valves both in thermostat and water control valve are completely closing at normal temperature.
- Place a thread so that it is caught in valves of thermostat and water control valve. Immerse fully in a container filled with water. Heat while stirring. (The example in the figure shows the thermostat.)
- The valve opening temperature is the temperature at which the valve opens and falls from the thread.
- Continue heating. Check the maximum valve lift.
- NOTE:
The maximum valve lift standard temperature for water control valve is the reference value.
- After checking the full-open lift amount, lower the water temperature and check the valve closing temperature.



Standard values

	Thermostat	Water control valve
Valve opening temperature	80 - 84°C (176 - 183° F)	93.5 - 96.5°C (200 - 206°F)
Maximum valve lift	More than 10 mm/ 95°C (0.39 in/ 203 °F)	More than 8 mm/ 108°C (0.315 in/ 226 ° F)
Valve closing temperature	77°C (171°F)	90°C (194° F)

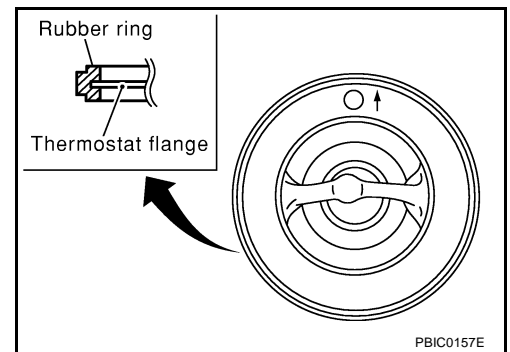
- If the malfunctioning condition, when closing valve at normal temperature, or measured values are out of the standard, replace thermostat and/or water control valve.

INSTALLATION

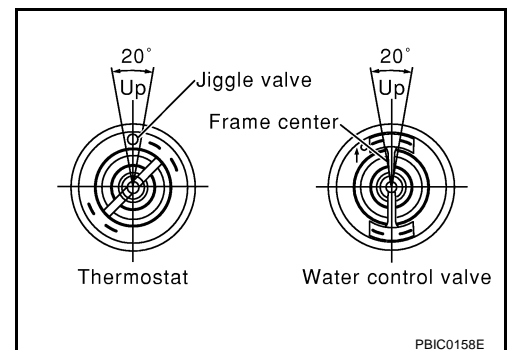
Install in the reverse order of removal.

Installation of thermostat and water control valve

- Install thermostat and water control valve with the whole circumference of each flange part fit securely inside rubber ring. (The example in the figure shows thermostat.)



- Install thermostat with the jiggle-valve facing upwards. (The position deviation may be within the range of 20 degrees.)
- Install water control valve with the up-mark facing up and the frame center part facing upwards. (The position deviation may be within the range of 20 degrees.)



Installation of water outlet pipe and heater pipe

First apply a neutral detergent to O-rings, then quickly insert the insertion parts of water outlet pipe and heater pipe into the installation holes.

THERMOSTAT AND WATER CONTROL VALVE

INSPECTION AFTER INSTALLATION

- Check for leaks of engine coolant using the radiator cap tester adapter [SST: EG17650301 (J33984-A)] and the radiator cap tester (commercial service tool). Refer to [CO-8, "CHECKING COOLING SYSTEM FOR LEAKS"](#) .
- Start and warm up engine. Visually make sure that there is no leaks of engine coolant.

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Standard and Limit CAPACITY

NBS001PV

Unit: ℓ (US qt, Imp qt)

Engine coolant capacity [With reservoir tank ("MAX" level)]	Approx. 10.3 (10-7/8, 9-1/8)
Reservoir tank ("MAX" level)	0.8 (7/8, 3/4)

RADIATOR

Unit: kPa (kg/cm², psi)

Cap relief pressure	Standard	78 - 98 (0.8 - 1.0, 11 - 14)
	Limit	59 (0.6, 9)
Leakage test pressure		157 (1.6, 23)

THERMOSTAT

Valve opening temperature	80 - 84°C (176 - 183°F)
Maximum valve lift	More than 10 mm/95°C (0.39 in/203°F)
Valve closing temperature	77°C (171°F)

WATER CONTROL VALVE

Valve opening temperature	93.5 - 96.5°C (200 - 206°F)
Maximum valve lift	More than 8 mm/108°C (0.315 in/226°F)
Valve closing temperature	90°C (194°F)

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SERVICE DATA AND SPECIFICATIONS (SDS)
