

# CO

## SECTION

### ENGINE COOLING SYSTEM

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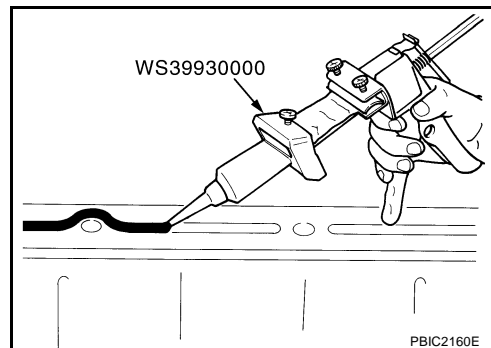
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## PRECAUTIONS

### Precautions for Liquid Gasket LIQUID GASKET APPLICATION PROCEDURE

1. Remove old liquid gasket adhering to the liquid gasket application surface and the mating surface.
  - Remove liquid gasket completely from the liquid gasket application surface, mounting bolts, and bolt holes.
2. Wipe the liquid gasket application surface and the mating surface with white gasoline (lighting and heating use) to remove adhering moisture, grease and foreign materials.
3. Attach liquid gasket tube to the tube presser (SST).  
**Use Genuine Liquid Gasket or equivalent.**
  - Within five minutes of liquid gasket application, install the mating component.
  - If liquid gasket protrudes, wipe it off immediately.
  - Do not retighten mounting bolts or nuts after the installation.
  - Wait 30 minutes or more after installation before refilling engine oil and engine coolant.



# PREPARATION

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PFP:00002

BBS00181

## PREPARATION

### Special Service Tools

Tool number Tool name	Description
EG17650301 Radiator cap tester adapter	Adapting radiator cap tester to radiator cap and radiator filler neck <b>a: 28 (1.10) dia.</b> <b>b: 31.4 (1.236) dia.</b> <b>c: 41.3 (1.626) dia.</b> Unit: mm (in)
KV99103510 Radiator plate pliers A	Installing radiator upper and lower tanks
KV99103520 Radiator plate pliers B	Removing radiator upper and lower tanks
WS39930000 Tube presser	Pressing the tube of liquid gasket

### Commercial Service Tools

BBS00182

Tool name	Description
Radiator cap tester	Checking radiator and radiator cap

# OVERHEATING CAUSE ANALYSIS

[QR]

PPF:00012

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## OVERHEATING CAUSE ANALYSIS

### Troubleshooting Chart

BBS00183

	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 viscosity	—
	Insufficient engine coolant	Engine coolant leaks	Cooling hose	Loose clamp
				Cracked hose
			Water pump	Poor sealing
			Radiator cap	Loose
		Radiator		Poor sealing
				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

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# OVERHEATING CAUSE ANALYSIS

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

# COOLING SYSTEM

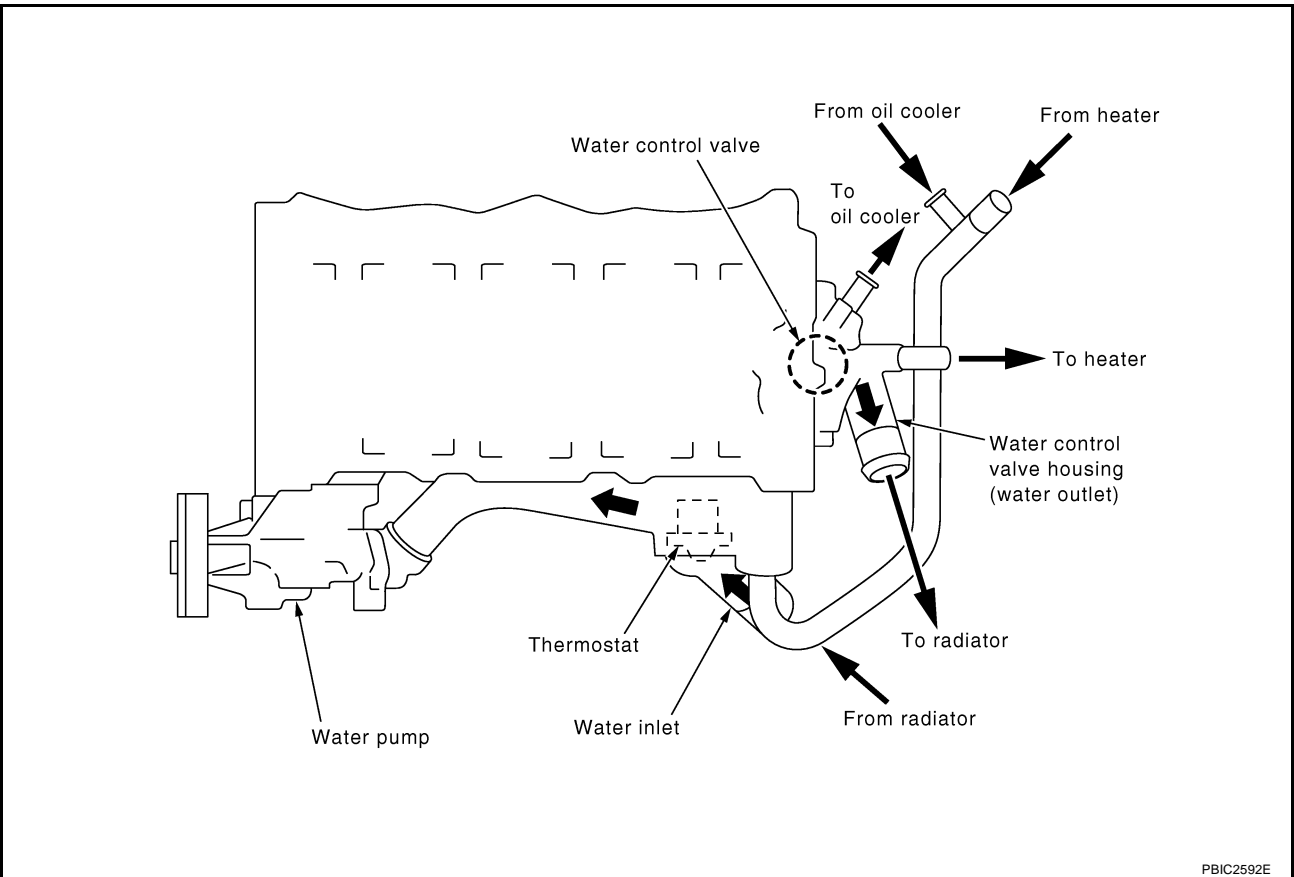
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## COOLING SYSTEM

PFP:21020

### Cooling Circuit

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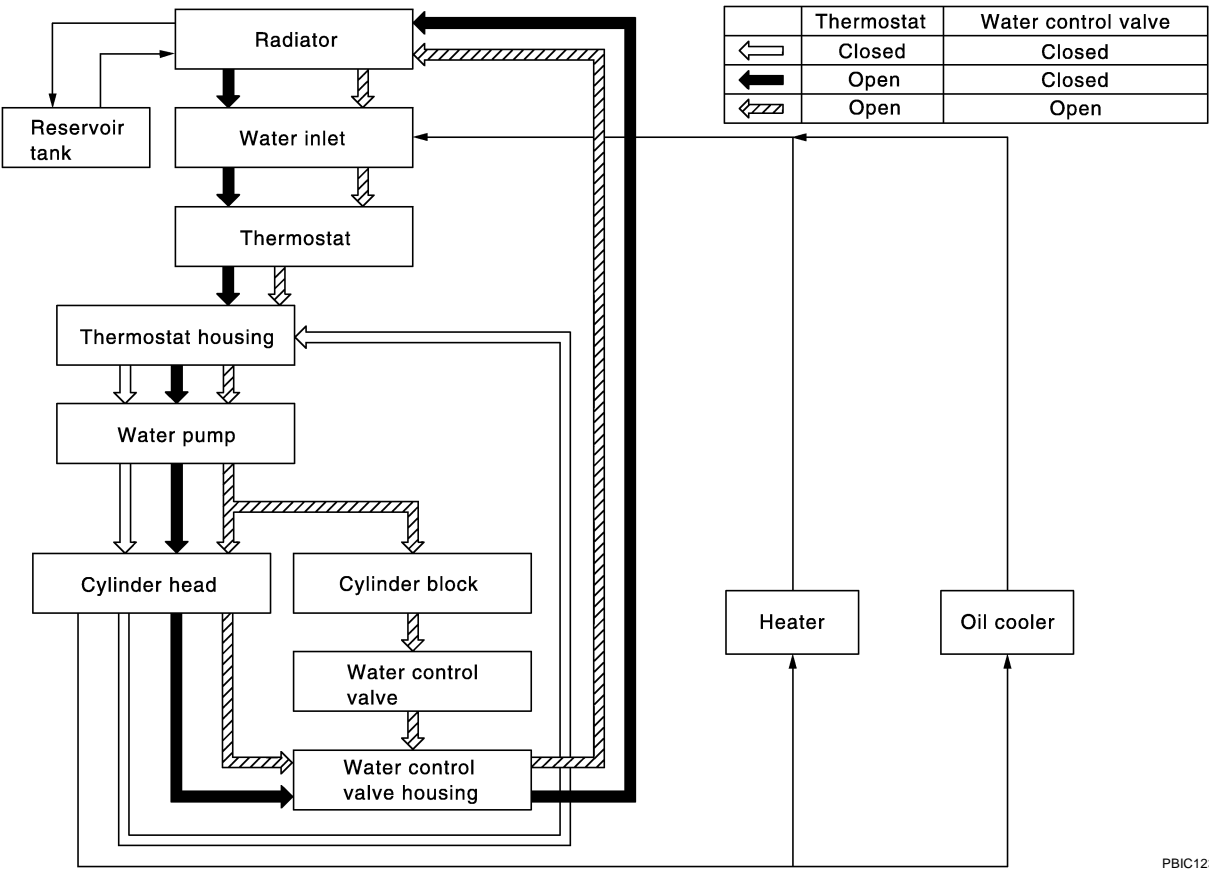
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COOLING SYSTEM

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System Chart

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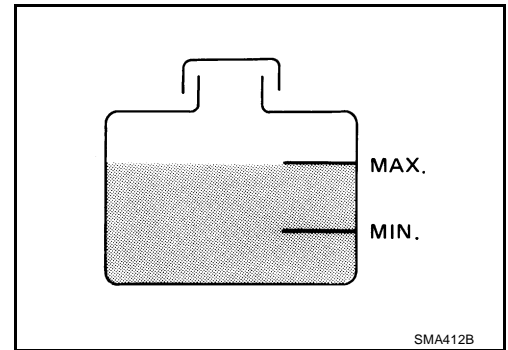
## ENGINE COOLANT

PFP:KQ100

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### Inspection LEVEL CHECK

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



### LEAK CHECK

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

**Testing pressure:**

**157 kPa (1.57 bar, 1.6 kg/cm<sup>2</sup> , 23 psi)**

**WARNING:**

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

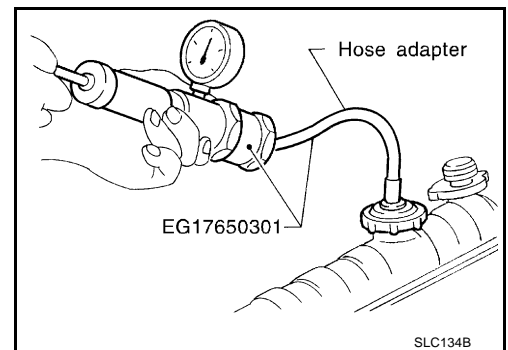
**CAUTION:**

Higher test 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

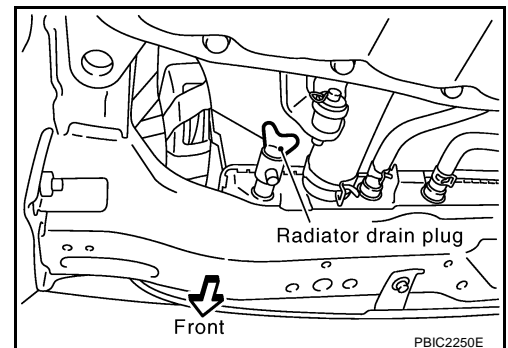
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**WARNING:**

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

### DRAINING ENGINE COOLANT

1. Remove RH and LH undercovers.
2. Open radiator drain plug at the bottom of radiator, and then remove radiator cap.



When drain all of engine coolant in the system, open water drain plug on cylinder block. Refer to [EM-94, "ASSEMBLY"](#).

3. Remove reservoir tank as necessary, and drain engine coolant and clean reservoir tank before installing.

4. Check drained engine coolant for contaminants such as rust, corrosion or discoloration. If contaminated, flush the engine cooling system. Refer to [CO-11, "FLUSHING COOLING SYSTEM"](#).

## 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.

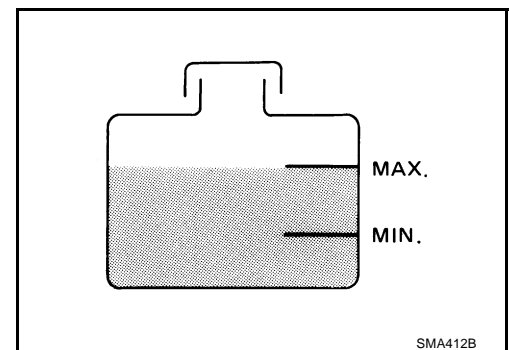
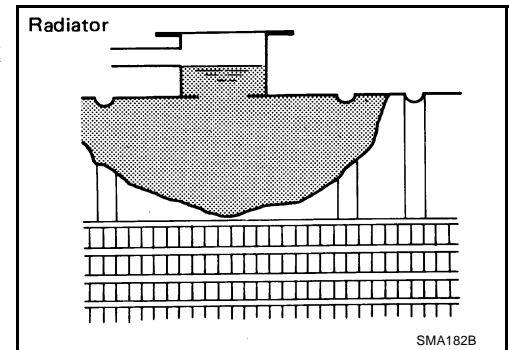
- If water drain plug on cylinder block is removed, close and tighten it. Refer to [EM-89, "CYLINDER BLOCK"](#).
2. Make sure that each hose clamp has been firmly tightened.
  3. Fill radiator and reservoir tank to specified level.
    - Pour engine coolant through engine coolant filler neck slowly of less than 2 ℓ (1-3/4 Imp qt) a minute to allow air in system to escape.
    - Use Genuine NISSAN Anti-freeze Coolant or equivalent mixed with water (distilled or demineralized). Refer to [MA-17, "RECOMMENDED FLUIDS AND LUBRICANTS"](#).

Engine coolant capacity  
(with reservoir tank at "MAX" level)

: Approx. 7.1 ℓ (6-1/4 Imp qt)

Reservoir tank capacity (at "MAX" level)

: 0.7 ℓ (5/8 Imp qt)



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 the engine.
6. Stop the engine and cool down to less than approximately 50°C (122°F).
    - Cool down using fan to reduce the time.
    - If necessary, refill radiator up to filler neck with 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 the engine running.
  10. Warm up the engine, and check for sound of engine coolant flow while running the 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 step 3 through 6 until the engine coolant level no longer drops.

**FLUSHING COOLING SYSTEM**

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

**CAUTION:**

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

- If water drain plug on cylinder block is removed, close and tighten it. Refer to [EM-89, "CYLIN-  
DER BLOCK"](#).
2. Fill radiator and reservoir tank with water and reinstall radiator cap.
  3. Run the engine and warm it up to normal operating temperature.
  4. Rev the engine two or three times under no-load.
  5. Stop the engine and wait until it cools down.
  6. Drain water from the system. Refer to [CO-9, "DRAINING ENGINE COOLANT"](#).
  7. Repeat steps 1 through 6 until clear water begins to drain from radiator.

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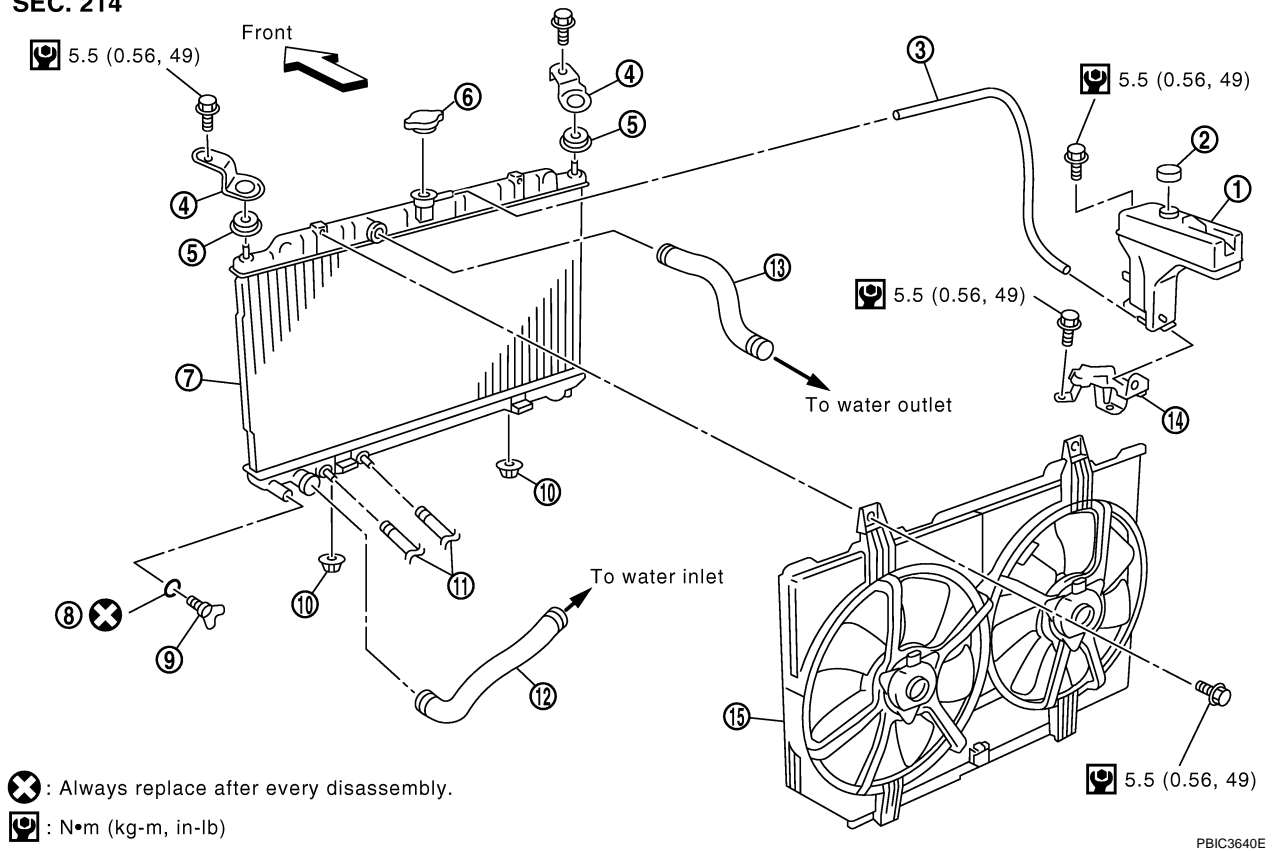
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## RADIATOR

### Removal and Installation

#### SEC. 214



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

#### WARNING:

Do not remove radiator cap when the engine is hot. Serious burns could occur from high-pressure engine coolant escaping from radiator. Wrap a thick cloth around the cap. Slowly turn it a quarter of a turn to release built-up pressure. Carefully remove radiator cap by turning it all the way.

#### REMOVAL

1. Remove RH and LH undercovers.
2. Drain engine coolant. Refer to [CO-9, "Changing Engine Coolant"](#).

#### CAUTION:

- Perform this step when engine is cold.
- Do not spill engine coolant on drive belt.

3. Remove air duct (inlet) and air duct assembly. Refer to [EM-16, "AIR CLEANER AND AIR DUCT"](#).
4. Disconnect harness connector from fan motor, and move it aside.
5. Disconnect radiator hoses (upper and lower).
6. Remove A/T fluid cooler hoses. (A/T models)
  - Install blind plug to avoid leakage of A/T fluid.
7. Remove radiator mounting brackets.
8. Remove radiator and radiator cooling fan assembly.

#### CAUTION:

Do not damage or scratch radiator core when removing.

## INSTALLATION

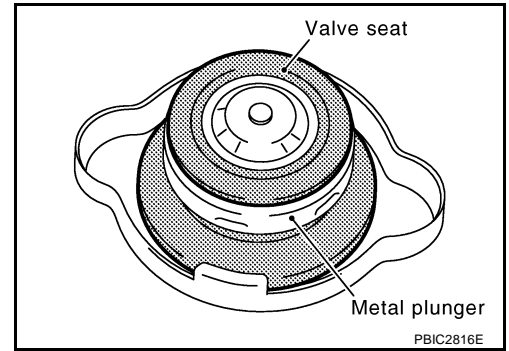
Installation is the reverse order of removal.

## INSPECTION AFTER INSTALLATION

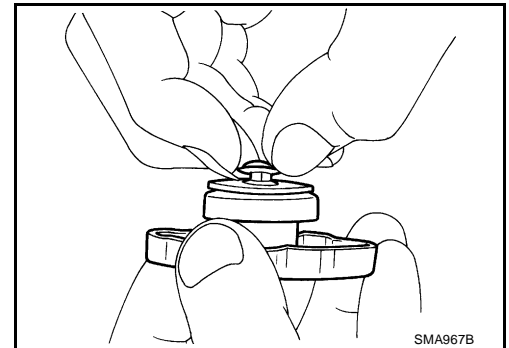
- Check for leaks of engine coolant using a radiator cap tester adapter [SST: EG17650301] and a radiator cap tester (commercial service tool). Refer to [CO-9, "LEAK CHECK"](#).
- Start and warm up engine. Visually check if there is no leaks of engine coolant and A/T fluid (A/T models).

## Checking Radiator Cap

- Check valve seat of radiator cap.
  - 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 is completely closed 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.

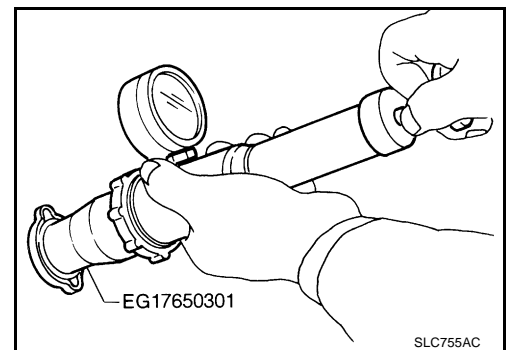
### Standard:

**78 - 98 kPa (0.78 - 0.98bar, 0.8 - 1.0 kg/cm<sup>2</sup>, 11 - 14 psi)**

### Limit:

**59 kPa (0.59bar, 0.6 kg/cm<sup>2</sup>, 9 psi)**

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



- Replace radiator cap if there is an unusualness related to the above three.

## CAUTION:

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

## Checking Radiator

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

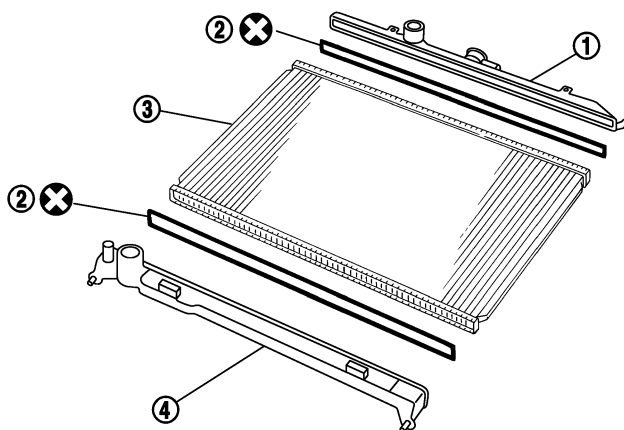
- Be careful not to bend or damage radiator fins.
  - When radiator is cleaned without removal, remove all surrounding parts such as cooling fan, radiator shroud and horns. Then tape harness and connectors to prevent water from entering.
1. Apply water by hose to the back side of the radiator core vertically downward.
  2. Apply water again to all radiator core surface once per minute.

3. Stop washing if any stains no longer flow out from the radiator.
4. Blow air into the back side of radiator core vertically downward.
  - Use compressed air lower than 490 kPa (4.9 bar, 5 kg/cm<sup>2</sup>, 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.

## RADIATOR (ALUMINUM TYPE)

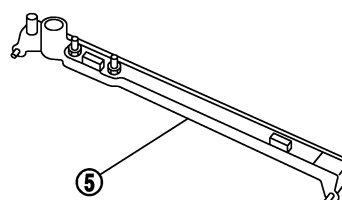
### Disassembly and Assembly

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✕ : Always replace after every disassembly.

A/T models

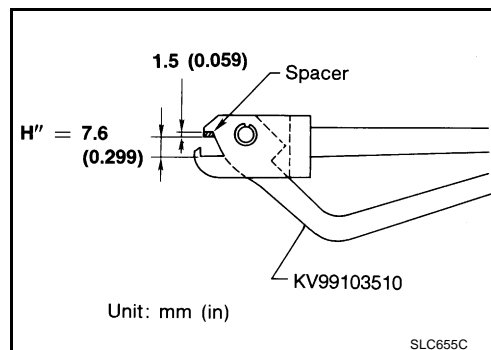


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- |               |                                       |         |
|---------------|---------------------------------------|---------|
| 1. Upper tank | 2. Sealing rubber                     | 3. Core |
| 4. Lower tank | 5. Lower tank (with A/T fluid cooler) |         |

### PREPARATION

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



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

### DISASSEMBLY

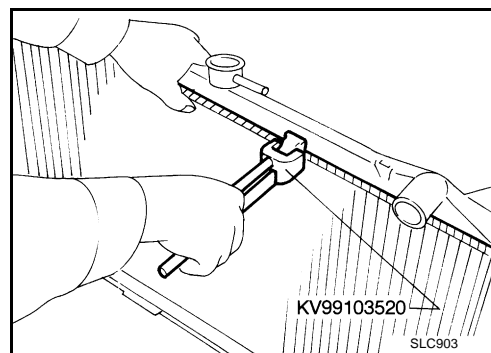
1. Remove upper and lower tanks with a radiator plate pliers B (SST).

#### CAUTION:

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

#### NOTE:

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



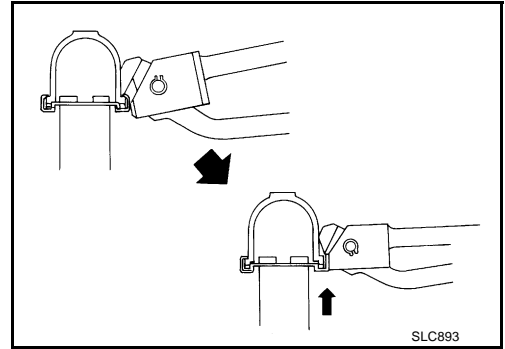
## RADIATOR (ALUMINUM TYPE)

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

**CAUTION:**

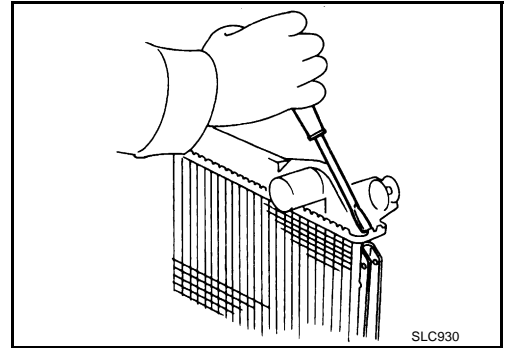
**Do not bend excessively.**



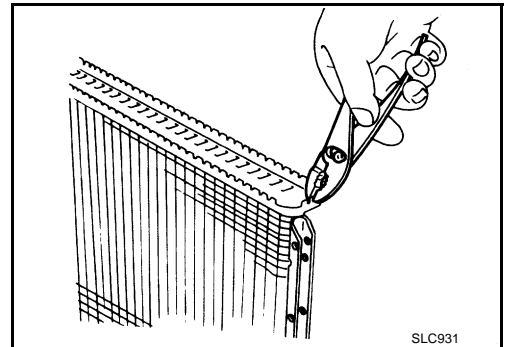
- In areas where radiator plate pliers B cannot be used, use screwdriver to bend the edge up.

**CAUTION:**

**Be careful not to damage tank.**

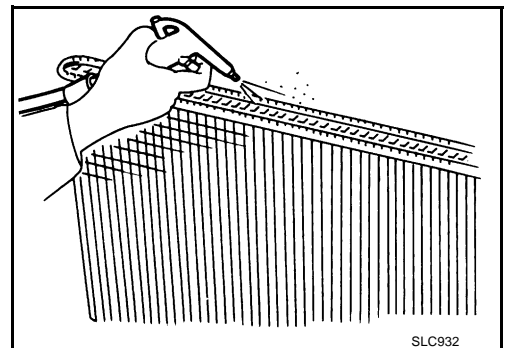


2. Remove sealing rubber.
3. Make sure the edge stands straight up.



### ASSEMBLY

1. Clean contact portion of tank.





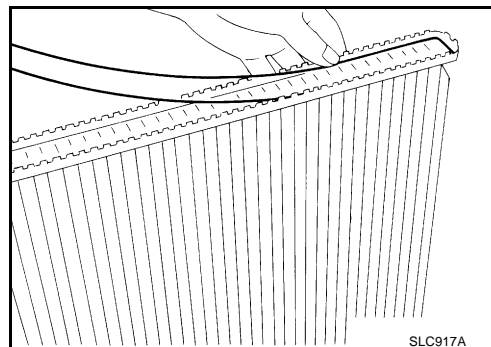
# RADIATOR (ALUMINUM TYPE)

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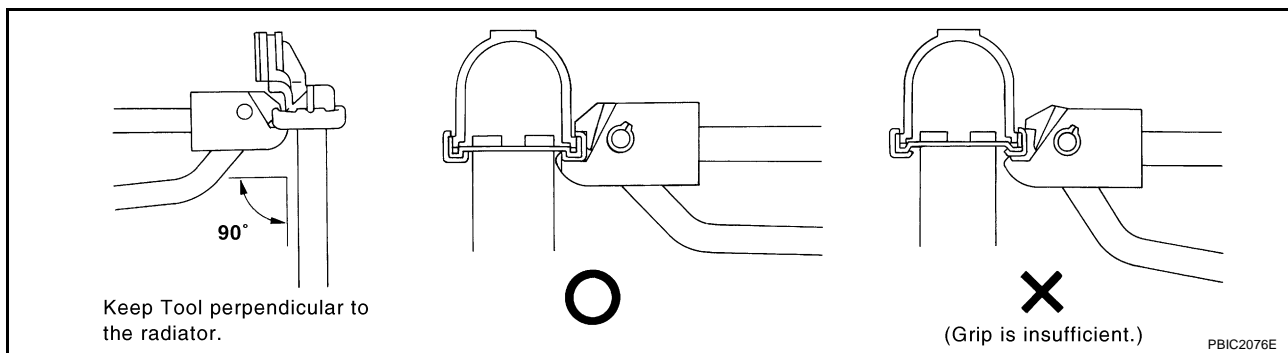
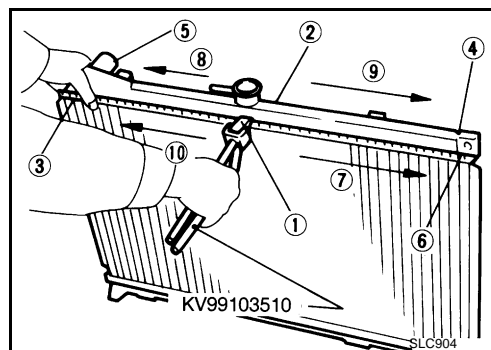
2. Install sealing rubber while pushing it in with fingers.

**CAUTION:**

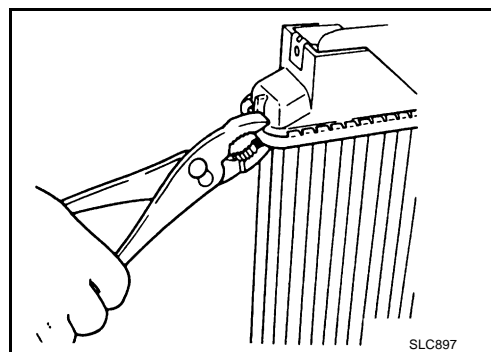
Be careful not to twist sealing rubber.



3. Caulk tank in numerical order as shown in the figure with radiator plate pliers A (SST).



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

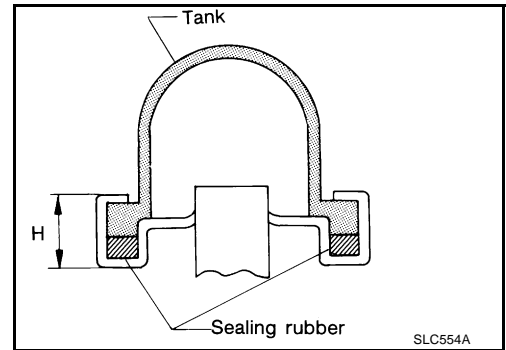


## RADIATOR (ALUMINUM TYPE)

[QR]

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

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



5. Make sure that there is no leakage.  
Refer to **CO-18, "INSPECTION"**.

### INSPECTION

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

**Testing pressure**

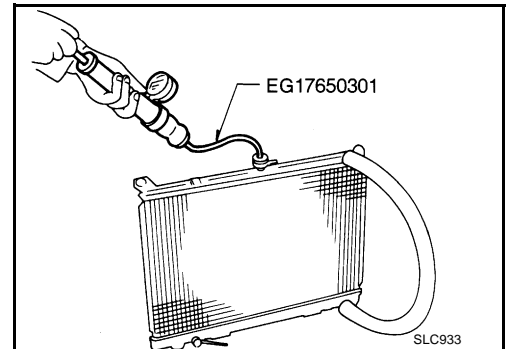
**: 157 kPa (1.57 bar, 1.6 kg/cm<sup>2</sup>, 23 psi)**

#### **WARNING:**

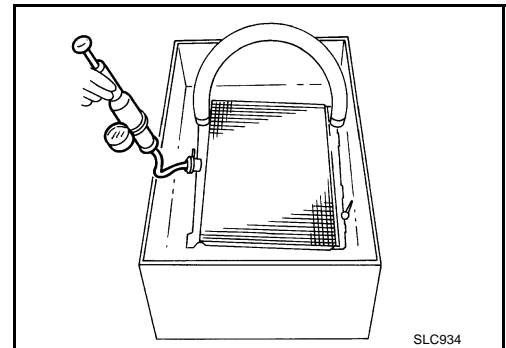
**To prevent the risk of hose coming undone while under pressure, securely fasten it down with hose clamp.**

#### **CAUTION:**

**Attach hose to A/T fluid cooler to seal its inlet and outlet.  
(A/T models)**



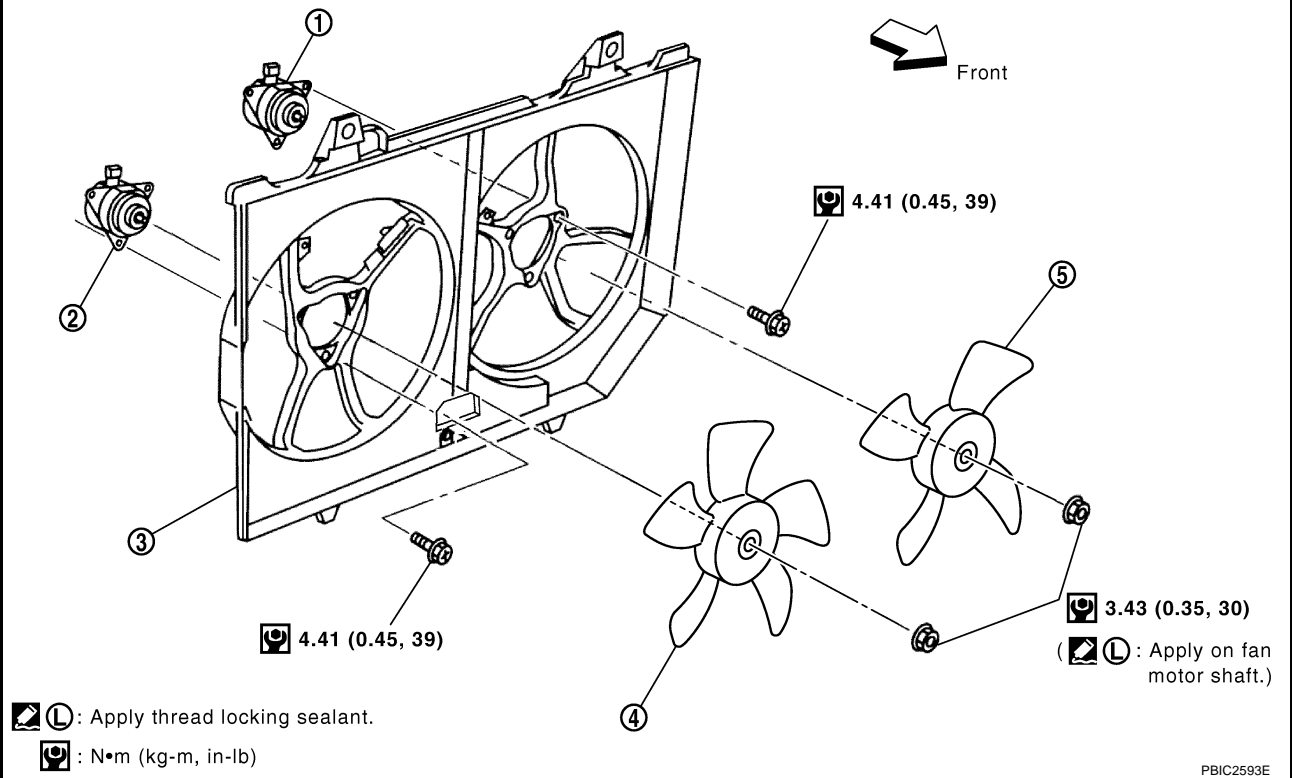
2. Check for leakage by soaking radiator in water container with the testing pressure applied.



## COOLING FAN

### Removal and Installation

SEC. 214



- |                     |                     |               |
|---------------------|---------------------|---------------|
| 1. Fan motor (LH)   | 2. Fan motor (RH)   | 3. Fan shroud |
| 4. Cooling fan (RH) | 5. Cooling fan (LH) |               |

### REMOVAL

1. Drain engine coolant from radiator. Refer to [CO-9, "Changing Engine Coolant"](#).  
**CAUTION:**  
  - Perform this step when engine is cold.
  - Do not spill engine coolant on drive belt.
2. Remove air duct (inlet) and air duct assembly. Refer to [EM-16, "AIR CLEANER AND AIR DUCT"](#).
3. Disconnect radiator hose (upper) at radiator side. Refer to [CO-12, "RADIATOR"](#).  
**CAUTION:**  
Do not spill engine coolant on drive belt.
4. Disconnect harness connectors from fan motors, and move them to aside.
5. Remove radiator cooling fan assembly.

**CAUTION:**  
Be careful not to damage or scratch on radiator core.

### INSTALLATION

Installation is the reverse order of removal.

#### NOTE:

Cooling fans are controlled by ECM. For details, refer to [EC-355, "DTC P1217 ENGINE OVER TEMPERATURE"](#) (WITH EURO-OBD) or [EC-757, "DTC P1217 ENGINE OVER TEMPERATURE"](#) (WITHOUT EURO-OBD).

## Disassembly and Assembly

### DISASSEMBLY

1. Remove cooling fans (RH and LH) from fan motors (RH and LH).
  - Put marks to identify installation positions of cooling fans (RH and LH).
2. Remove fan motors (RH and LH) from fan shroud.
  - Put marks to identify installation positions of cooling fan motors (RH and LH).

### INSPECTION AFTER DISASSEMBLY

#### Cooling Fan

Inspect cooling fan for crack or unusual bend.

- If anything is found, replace cooling fan.

### ASSEMBLY

Assembly is the reverse order of disassembly.

#### CAUTION:

**RH and LH cooling fans and fan motors are different. Be careful not to misassemble them.**

## WATER PUMP

### Removal and Installation

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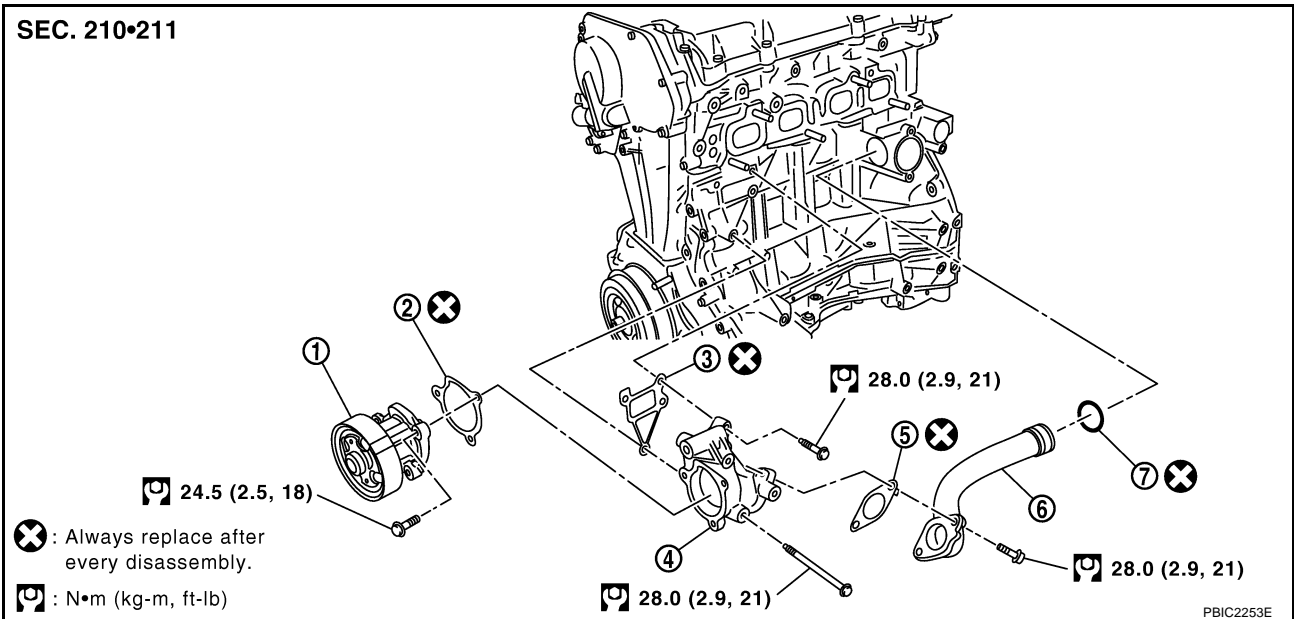
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SEC. 210•211



PBIC2253E

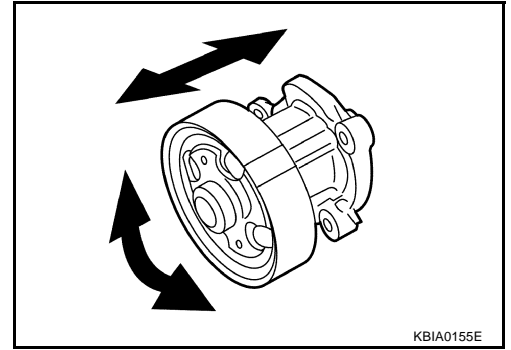
- |                       |           |               |
|-----------------------|-----------|---------------|
| 1. Water pump         | 2. Gasket | 3. Gasket     |
| 4. Water pump housing | 5. Gasket | 6. Water pipe |
| 7. O-ring             |           |               |

### REMOVAL

1. Drain engine coolant. Refer to [CO-9, "Changing Engine Coolant"](#) .  
**CAUTION:**
  - Perform this step when engine is cold.
  - Do not spill engine coolant on drive belt.
2. Remove the following parts.
  - RH undercover
  - Drive belt; Refer to [EM-13, "DRIVE BELTS"](#) .
  - Drive belt auto-tensioner; Refer to [EM-14, "Removal and Installation of Drive Belt Auto-Tensioner"](#) .
3. Remove water pump.
  - Engine coolant will leak from cylinder block, so have a receptacle ready below.
  - CAUTION:**
    - Handle water pump vane so that it does not contact any other parts.
    - Water pump cannot be disassembled and should be replaced as a unit.
4. Remove water pump housing with the following procedure;
  - a. Remove alternator. Refer to [SC-13, "CHARGING SYSTEM"](#) .
  - b. Remove oil level gauge and oil level gauge guide. Refer to [EM-27, "OIL PAN AND OIL STRAINER"](#) .  
**CAUTION:**  
**Plug the oil level gauge guide opening to prevent oil pan from entering foreign materials.**
  - c. Remove mounting bolts for water pipe.
  - d. Remove water pump housing.
5. Remove exhaust manifold and three way catalyst assembly. Refer to [EM-25, "EXHAUST MANIFOLD AND THREE WAY CATALYST"](#) .
6. Remove water pipe.

## INSPECTION AFTER REMOVAL

- Visually check if 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.
- Replace water pump, if necessary.



## INSTALLATION

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

- When inserting water pipe end into cylinder block, apply a neutral detergent to O-ring. Then insert it immediately.

## INSPECTION AFTER INSTALLATION

- Check for engine coolant leaks using a radiator cap tester adapter [SST: EG17650301] and radiator cap tester (commercial service tool). Refer to [CO-9, "LEAK CHECK"](#).
- Start and warm up engine. Visually check if there is no leaks of engine coolant.

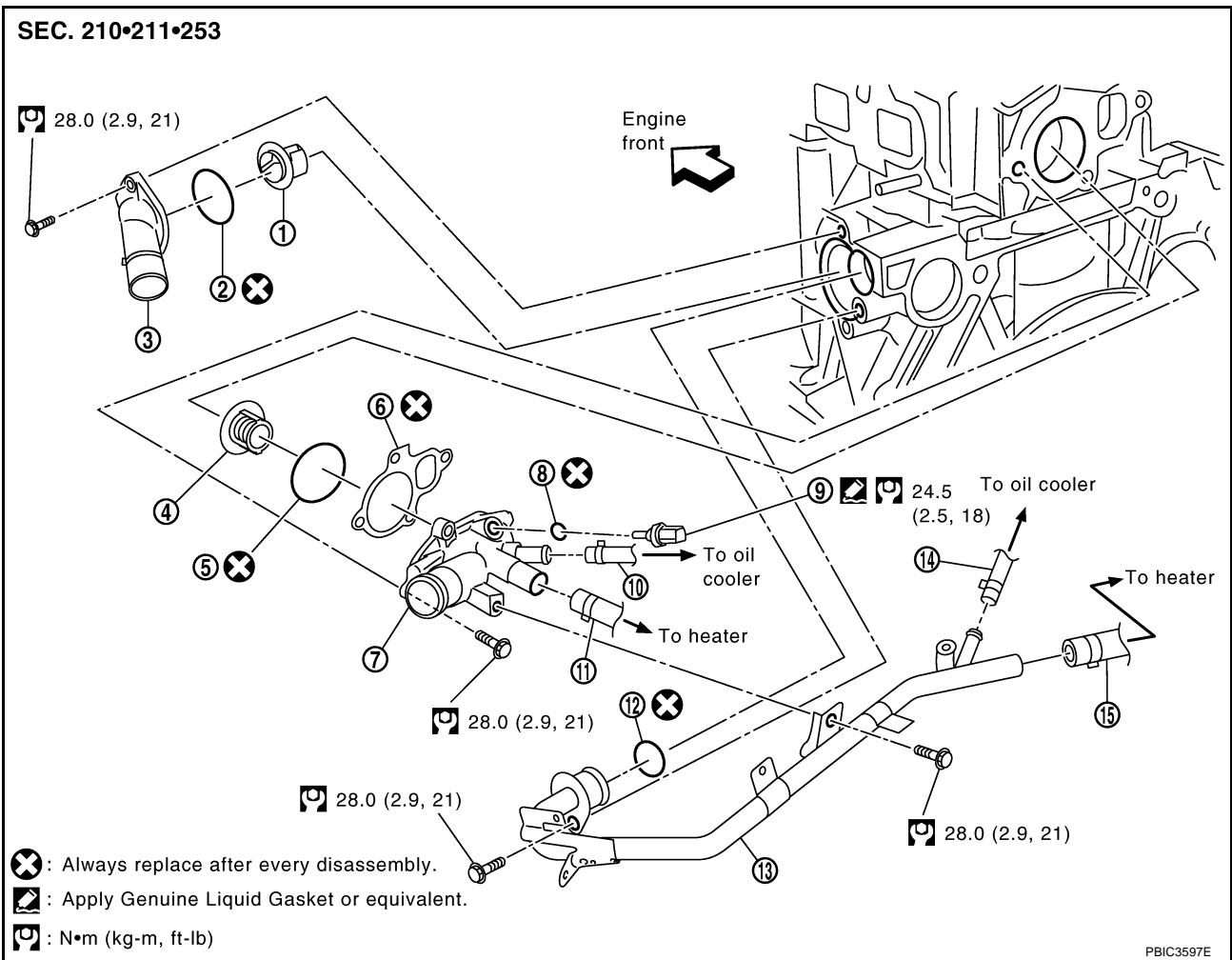
## THERMOSTAT AND WATER CONTROL VALVE

PFP:21200

## Removal and Installation

*BBS0018F*

**SEC. 210•211•253**



- |   |                 |                                      |
|---|-----------------|--------------------------------------|
| 1. Thermostat                                 | 2. O-ring       | 3. Water inlet                       |
| 4. Water control valve                        | 5. O-ring       | 6. Gasket                            |
| 7. Water control valve housing (water outlet) | 8. Washer       | 9. Engine coolant temperature sensor |
| 10. Water hose                                | 11. Heater hose | 12. O-ring                           |
| 13. Heater pipe                               | 14. Water hose  | 15. Heater hose                      |

## REMOVAL

1. Drain engine coolant. Refer to [CO-9, "Changing Engine Coolant"](#) .  
**CAUTION:**
  - **Perform this step when engine is cold.**
  - **Do not spill engine coolant on drive belt.**
2. Disconnect radiator hose (lower) at water inlet side. Refer to [CO-12, "RADIATOR"](#) .
3. Remove water inlet and thermostat.
4. Remove water control valve with the following procedure:
  - a. Disconnect radiator hose (upper) at water control valve housing (water outlet) side.
  - b. Disconnect harness connector from engine coolant temperature sensor.
  - c. Disconnect water hoses.
  - d. Remove heater pipe and heater hose.
  - e. After removing water control valve housing (water outlet) and water control valve.

## INSPECTION AFTER REMOVAL

- Place a thread so that it is caught in the valves of thermostat and water control valve. Immerse fully in a container filled with water. Heat while stirring. (The example in the figure shows 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 amount.

### NOTE:

The maximum valve lift amount standard temperature for water control valve is the reference value.

- After checking the maximum valve lift amount, lower the water temperature and check the valve closing temperature.

### Standard:

Items	Thermostat	Water control valve
Valve opening temperature	80.5 - 83.5°C (177 - 182°F)	93.5 - 96.5°C (200 - 206°F)
Maximum valve lift	8 mm/ 95°C (0.315 in/ 203°F)	8 mm/ 108°C (0.315 in/ 226°F)
Valve closing temperature	77°C (171°F)	90°C (194°F)

- If out of the standard, replace either or both thermostat and water control valve.

## INSTALLATION

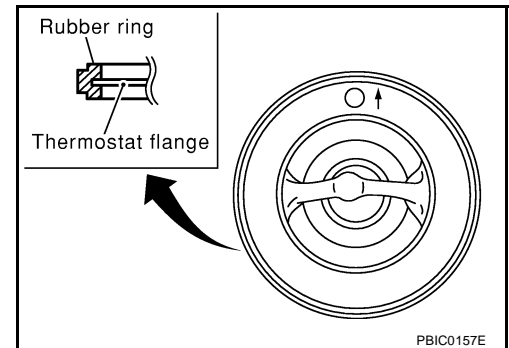
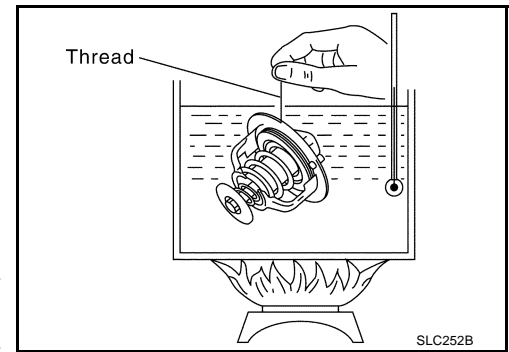
Note the following, and install in the reverse order of removal.

### Thermostat and Water Control Valve

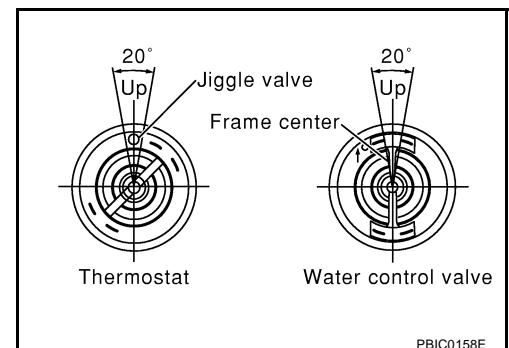
- Install thermostat with making rubber ring groove fit to thermostat flange with the whole circumference. (The example in the figure shows thermostat.)

### NOTE:

Same procedure is applied for installation of water control valve.



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



## Heater Pipe Installation

Apply a neutral detergent to O-ring, then quickly insert the insertion part of heater pipe into cylinder block.

## INSPECTION AFTER INSTALLATION

- Check for leaks of engine coolant using a radiator cap tester adapter [SST: EG17650301] and a radiator cap tester (commercial service tool). Refer to [CO-9, "LEAK CHECK"](#).
- Start and warm up engine. Visually check if there is no leaks of engine coolant and A/T fluid (A/T models).



# SERVICE DATA AND SPECIFICATIONS (SDS)

[QR]

## SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

### Standard and Limit CAPACITY

BBS0018G

Unit: ℓ (Imp qt)

Engine coolant capacity (With reservoir tank at "MAX" level)	Approx. 7.1 (6-1/4)
Reservoir tank	0.7 (5/8)

## RADIATOR

Unit: kPa (bar, kg/cm<sup>2</sup>, psi)

Cap relief pressure	Standard	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11- 14)
	Limit	59 (0.59, 0.6, 9)
Leakage test pressure		157 (1.57, 1.6, 23)

## THERMOSTAT

Valve opening temperature	80.5 - 83.5°C (177 - 182°F)
Maximum valve lift	8 mm/ 95°C (0.315 in/ 203°F)
Valve closing temperature	77°C (171°F)

## WATER CONTROL VALVE

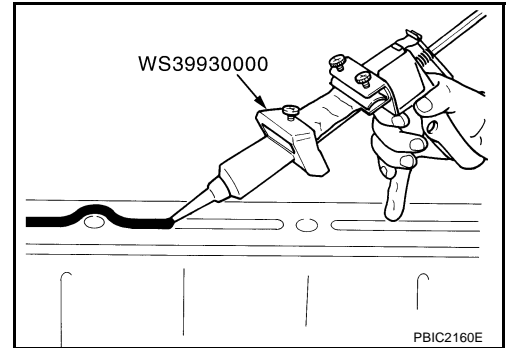
Valve opening temperature	93.5 - 96.5°C (200 - 206°F)
Maximum valve lift	8 mm/ 108°C (0.315 in/ 226°F)*
Valve closing temperature	90°C (194°F)

\*: Reference data

## PRECAUTIONS

### Precautions for Liquid Gasket LIQUID GASKET APPLICATION PROCEDURE

1. Remove old liquid gasket adhering to the liquid gasket application surface and the mating surface.
  - Remove liquid gasket completely from the liquid gasket application surface, mounting bolts, and bolt holes.
2. Wipe the liquid gasket application surface and the mating surface with white gasoline (lighting and heating use) to remove adhering moisture, grease and foreign materials.
3. Attach liquid gasket tube to the tube presser [SST].  
**Use Genuine Liquid Gasket or equivalent.**
  - Within five minutes of liquid gasket application, install the mating component.
  - If liquid gasket protrudes, wipe it off immediately.
  - Do not retighten mounting bolts or nuts after the installation.
  - After 30 minutes or more have passed from the installation, fill engine oil and engine coolant.



# PREPARATION

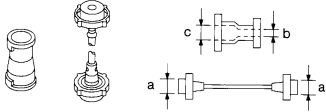

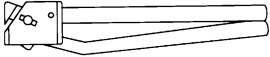
[YD22DDTi]

PPF:00002

BBS0018J

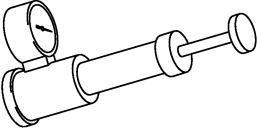
## PREPARATION

### Special Service Tools

Tool number Tool name	Description
EG17650301 Radiator cap tester adapter	 <p><b>a: 28 (1.10) dia.</b> <b>b: 31.4 (1.236) dia.</b> <b>c: 41.3 (1.626) dia.</b> Unit: mm (in)</p> <p>S-NT564</p>
KV99103510 Radiator plate pliers A	 <p>S-NT224</p>
KV99103520 Radiator plate pliers B	 <p>S-NT225</p>

### Commercial Service Tools

BBS0018K

Tool name	Description
Radiator cap tester	 <p>PBIC1982E</p>

# OVERHEATING CAUSE ANALYSIS

[YD22DDTi]

## OVERHEATING CAUSE ANALYSIS

PFP:00012

### Troubleshooting Chart

BBS0018L

	Symptom		Check items	
Cooling system parts malfunction	Poor heat transfer	Water pump malfunction	Worn or loose drive belt	—
		Thermostat 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	Refer to DTC in EC1217 (cooling system)	—
		High resistance to fan rotation	Fan assembly	
		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

[YD22DDTi]

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

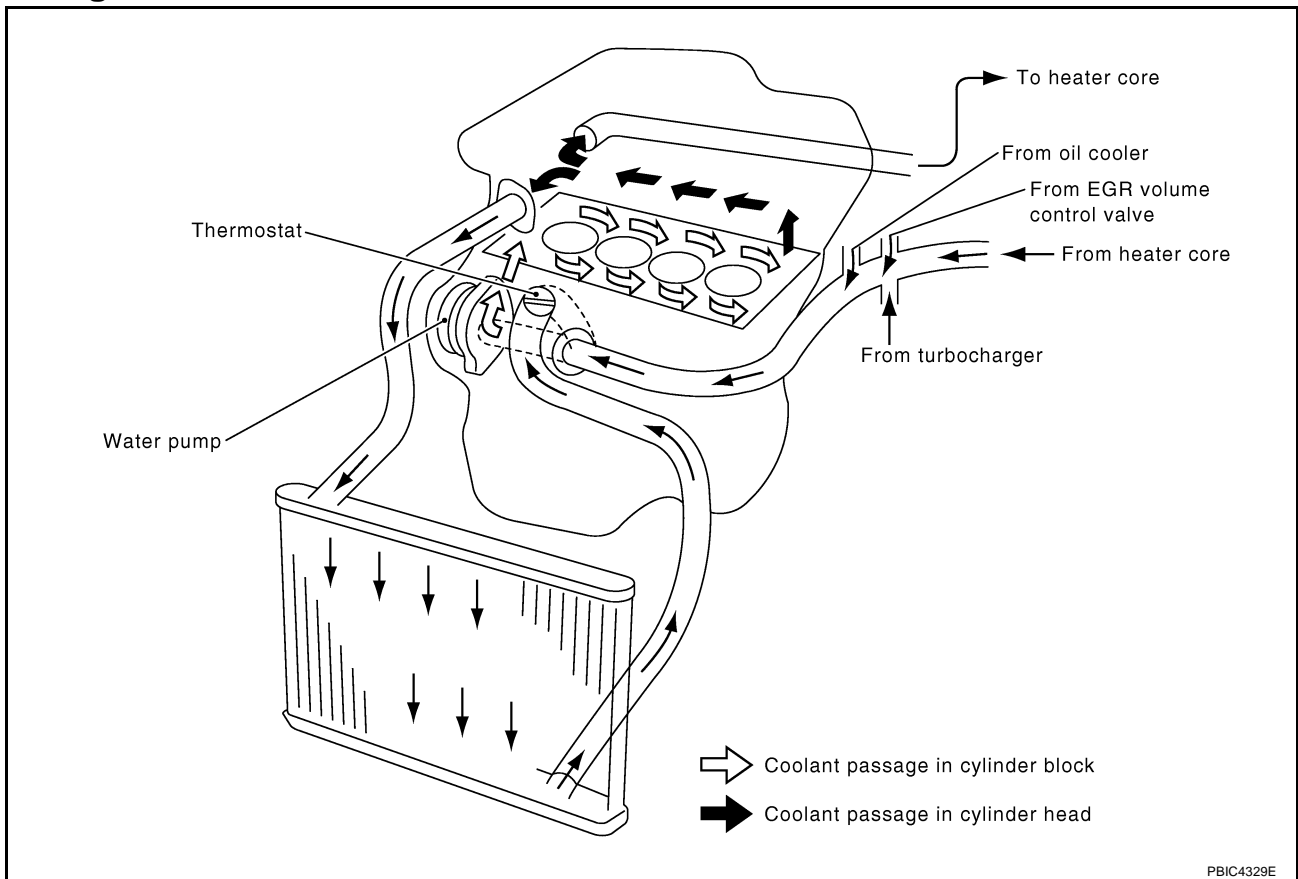
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## COOLING SYSTEM

PFP:21020

### Cooling Circuit

BBS0018M

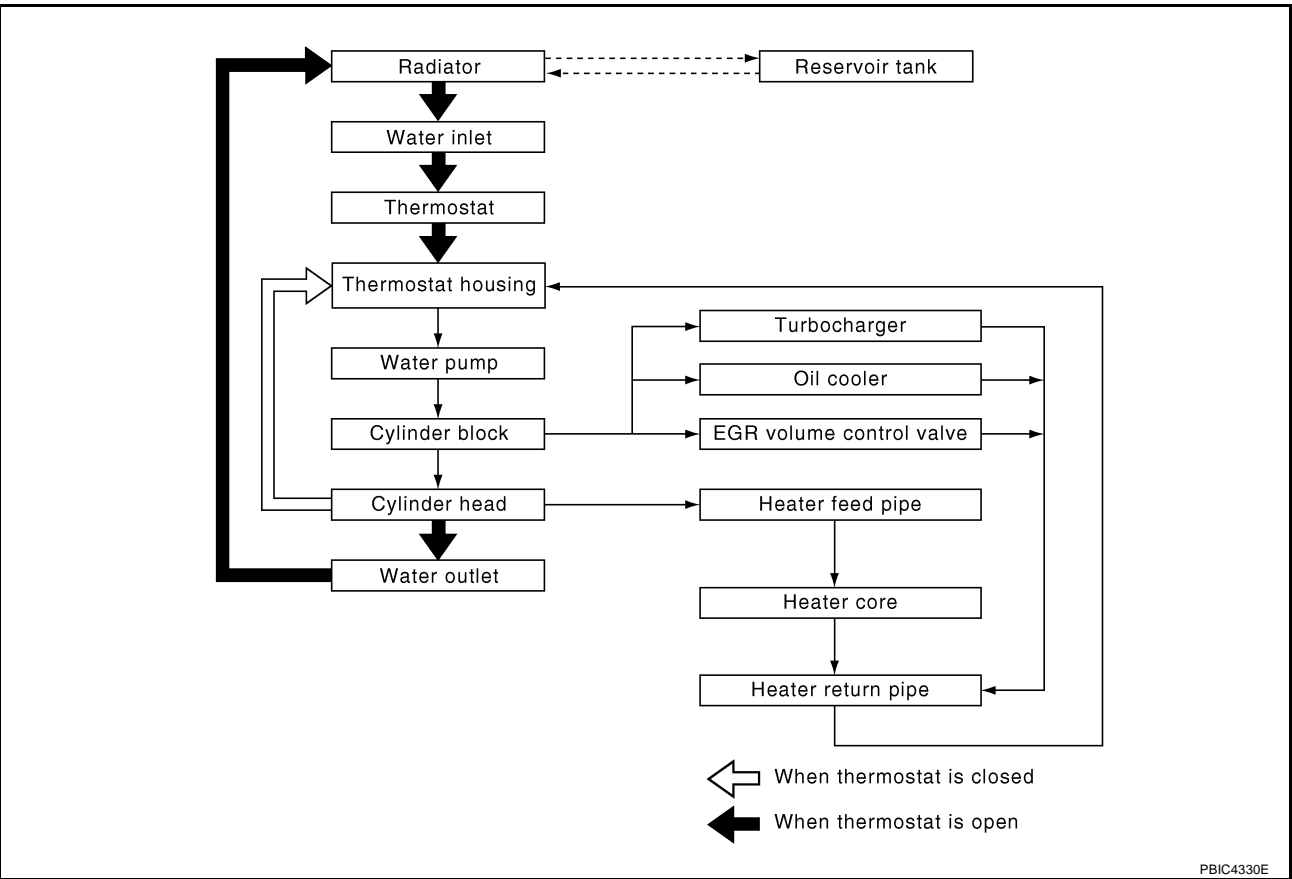


# COOLING SYSTEM

[YD22DDTi]

## System Chart

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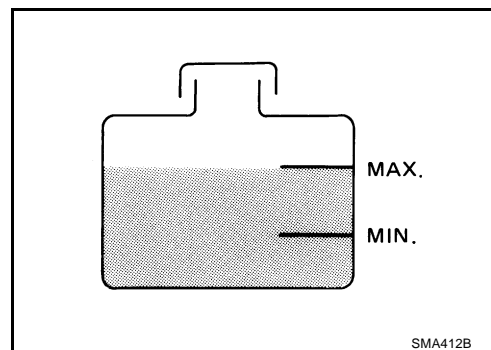
## ENGINE COOLANT

PFP:KQ100

### Inspection LEVEL CHECK

BBS0018O

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



### CHECKING RADIATOR SYSTEM FOR LEAKS

- To check for leaks, 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 (1.57 bar, 1.6 kg/cm<sup>2</sup> , 23 psi)**

#### **WARNING:**

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

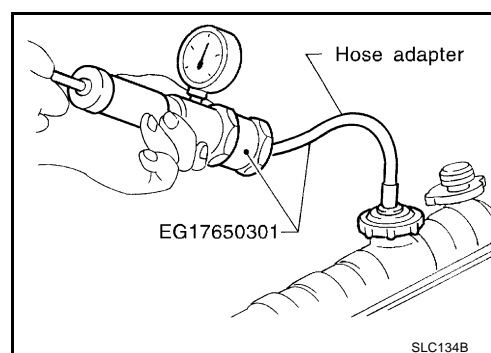
#### **CAUTION:**

Higher test 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

BBS0018P

#### **WARNING:**

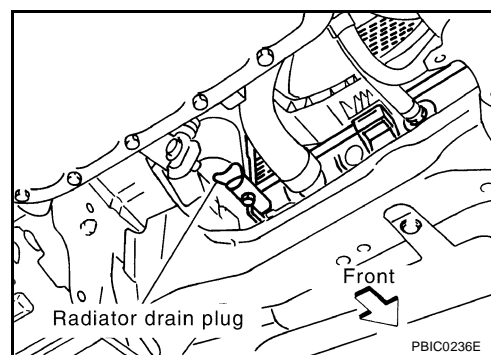
- To avoid being scalded, do not change engine coolant when engine is hot.
- Wrap a thick cloth around cap and carefully remove radiator cap. First, turn radiator cap a quarter of a turn to release built-up pressure. Then turn the cap all the way.

### DRAINING ENGINE COOLANT

1. Remove engine undercover.
2. Open radiator drain plug at the bottom of radiator, and remove radiator cap.

#### **CAUTION:**

- Be careful not to allow engine coolant to contact drive belts.
- Cover the exhaust tube heat shield to prevent from splashing engine coolant.



When draining all engine coolant in the system, open water drain plug on engine cylinder block. Refer to [EM-236, "DISASSEMBLY"](#).

3. Remove reservoir tank, drain engine coolant, then clean reservoir tank.
4. Check drained engine coolant for contaminants such as rust, corrosion or discoloration.



If contaminated, flush engine cooling system. Refer to [CO-34. "FLUSHING COOLING SYSTEM"](#).

## REFILLING ENGINE COOLANT

1. Install reservoir tank, and radiator drain plug.

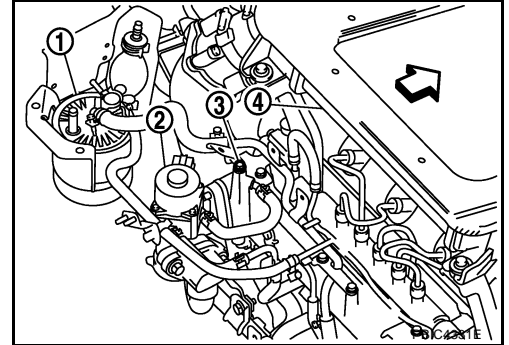
### CAUTION:

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

- If water drain plug on cylinder block is removed, close and tighten it. Refer to [EM-239. "ASSEMBLY"](#).

2. Remove air relief plug (3).

- 1 : Fuel filter
- 2 : EGR volume control valve
- 4 : Charge air cooler
- ↔ : Vehicle front



3. Fill radiator and reservoir tank to the specified level.

- Pour engine coolant through engine coolant filler neck slowly of less than 2 ℓ (1-3/4 Imp qt) a minute to allow air in system to escape.
- Use Genuine Nissan Anti-freeze Coolant or equivalent mixed with water (distilled or demineralized). Refer to [MA-17. "RECOMMENDED FLUIDS AND LUBRICANTS"](#).

**Engine coolant capacity  
(with reservoir tank at "MAX" level)**

**: Approx. 9.5 ℓ (8-3/8 Imp qt)**

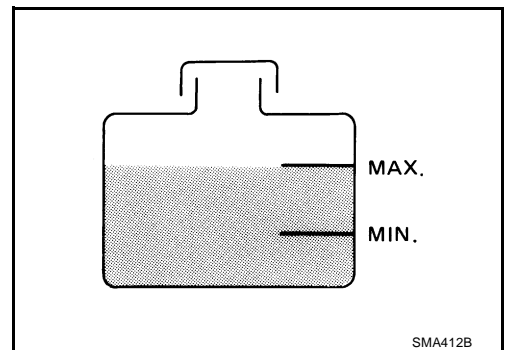
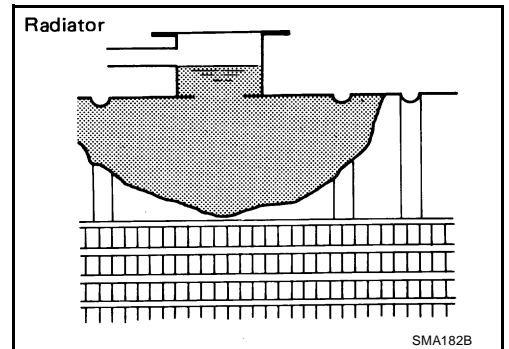
**Reservoir tank capacity (at "MAX" level)**

**: 0.7 ℓ (5/8 Imp qt)**

- When engine coolant overflows air relief hole, install air relief plug with new copper washer.

**Air relief plug**

**⚙ : 7.4 N-m (0.75 kg-m, 65 in-lb)**



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.
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 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.

**CAUTION:**

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

- If water drain plug on cylinder block is removed, close and tighten it. Refer to [EM-239, "ASSEMBLY"](#).
2. Fill radiator with water until water spills from the air relief hole, then close air relief plug. Fill radiator and reservoir tank with water and reinstall radiator cap.
  3. Run engine and warm it up to normal operating temperature.
  4. Rev engine two or three times under no-load.
  5. Stop engine and wait until it cools down.
  6. Drain water from the system. Refer to [CO-32, "DRAINING ENGINE COOLANT"](#).
  7. Repeat steps 1 through 6 until clear water begins to drain from radiator.

## RADIATOR

## Removal and Installation

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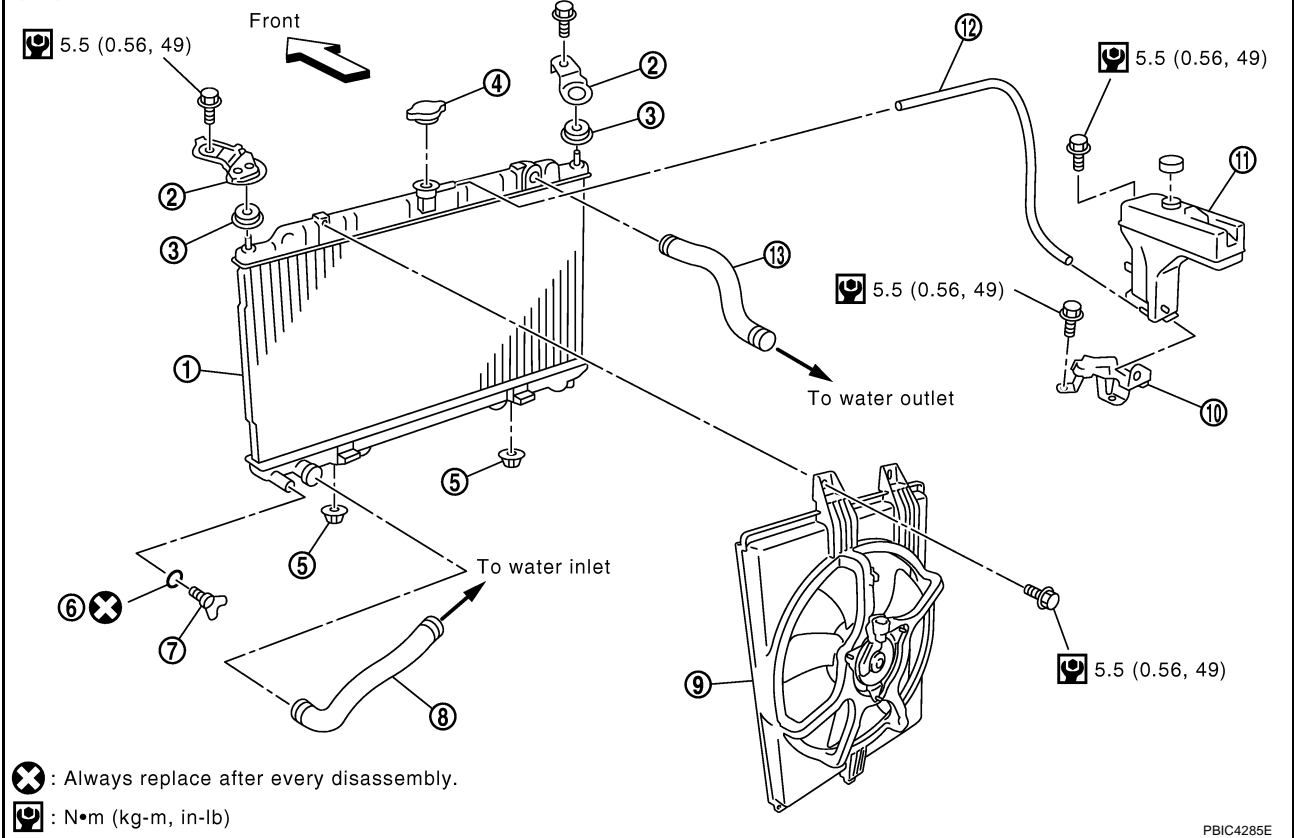
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## SEC. 214



PBIC4285E

- |                            |                              |                            |
|----------------------------|------------------------------|----------------------------|
| 1. Radiator                | 2. Radiator mounting bracket | 3. Mounting rubber (upper) |
| 4. Radiator cap            | 5. Mounting rubber (lower)   | 6. O-ring                  |
| 7. Drain plug              | 8. Radiator hose (lower)     | 9. Cooling fan assembly    |
| 10. Reservoir tank bracket | 11. Reservoir tank           | 12. Reservoir tank hose    |
| 13. Radiator hose (upper)  |                              |                            |

**WARNING:**

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

**REMOVAL**

1. Drain engine coolant from radiator. Refer to [CO-32, "DRAINING ENGINE COOLANT"](#).

**CAUTION:**

- Perform this step when engine is cold.
- Do not spill engine coolant on drive belts.

2. Disconnect radiator hose (upper and lower).
3. Remove reservoir tank hose and radiator mounting bracket.
4. Remove radiator and cooling fan assembly.

**CAUTION:**

Do not damage or scratch radiator core when removing.

**INSTALLATION**

Installation is the reverse order of removal.

**INSPECTION AFTER INSTALLATION**

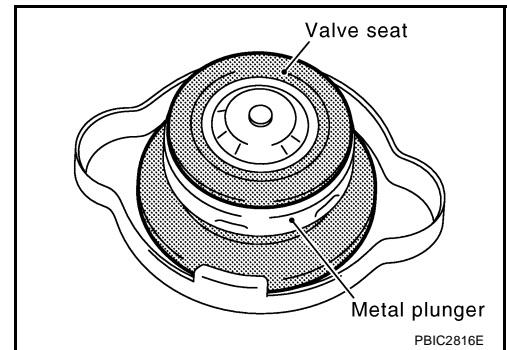
- Check for leaks of engine coolant using the radiator cap tester adapter [SST: EG17650301] and the radiator cap tester (commercial service tool). Refer to [CO-32, "CHECKING RADIATOR SYSTEM FOR LEAKS"](#)

- Start and warm up engine. Visually check if there is no leaks of engine coolant.

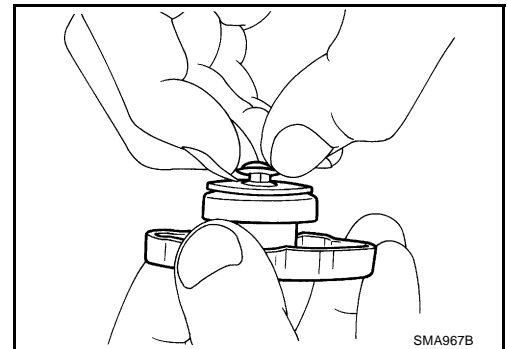
## Checking Radiator Cap

BBS0018R

- Check valve seat of radiator cap.
  - 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 is completely closed 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.

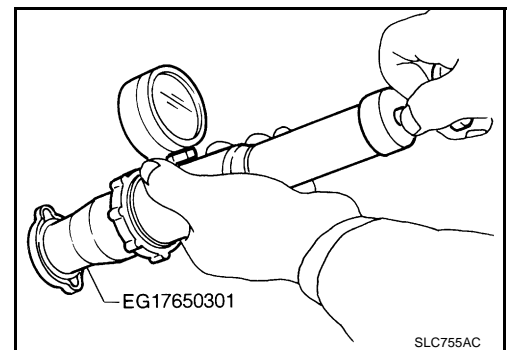
### Standard:

**78 - 98 kPa (0.78 - 0.98bar, 0.8 - 1.0 kg/cm<sup>2</sup> , 11 - 14 psi)**

### Limit:

**59 kPa (0.59bar, 0.6 kg/cm<sup>2</sup> , 9 psi)**

- When connecting radiator cap to the radiator cap tester (commercial service tool) and the radiator cap tester adapter [SST], 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 falls below the limit.

### CAUTION:

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

## Checking Radiator

BBS0018S

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

- Be careful not to bend or damage the radiator fins.
  - When radiator is cleaned without removal, remove all surrounding parts such as cooling fan, radiator shroud and horns. Then tape the harness and connectors to prevent water from entering.
1. Apply water by hose to the back side of the radiator core vertically downwards.
  2. Apply water again to all radiator core surface once per minute.
  3. Stop washing if any stains no longer flow out from the radiator.
  4. Blow air into the back side of radiator core vertically downwards.
    - Use compressed air lower than 490 kPa (4.9 bar, 5 kg/cm<sup>2</sup> , 71psi) and keep distance more than 30 cm (11.8 in).

5. Blow air again into all the radiator core surface once per minute until no water sprays out.

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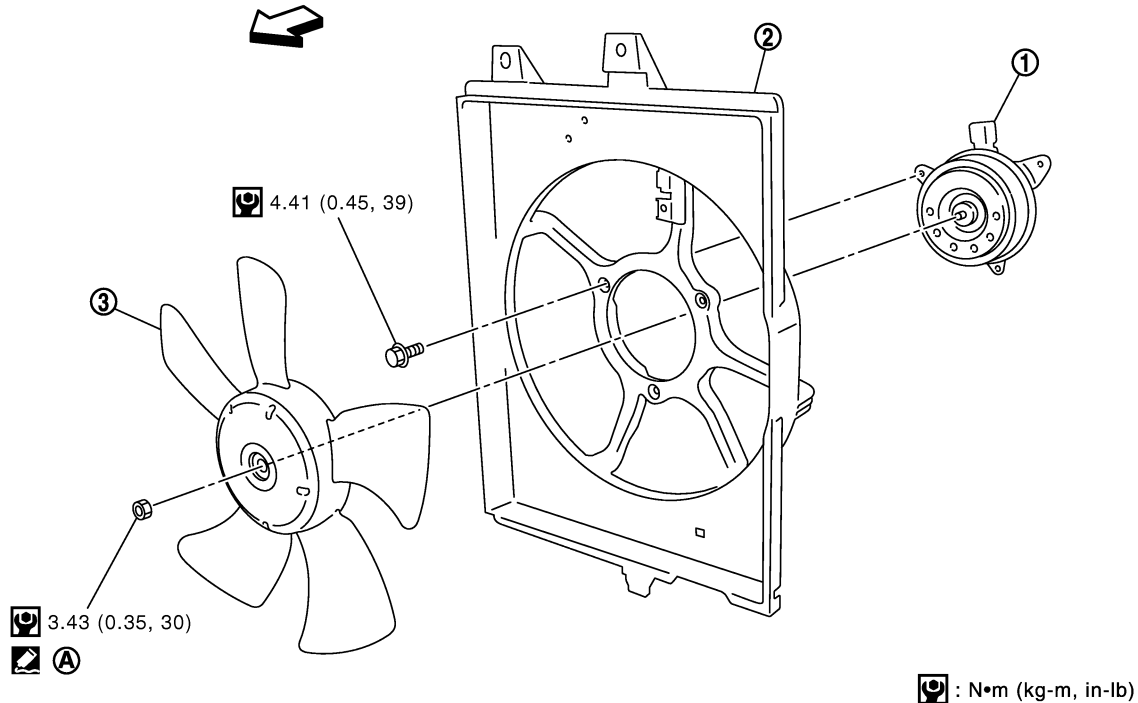
L

M

## COOLING FAN

### Removal and Installation (Radiator Side)

SEC. 214



PBIC4287E

1. Cooling fan motor
  2. Cooling fan shroud
  3. Cooling fan
- A. Apply on fan motor shaft.
- : Apply thread locking sealant
- ← Vehicle front

### REMOVAL

1. Disconnect harness connector from fan motor, and move them to aside.
2. Remove radiator cooling fan assembly. Refer to [CO-35, "RADIATOR"](#).

#### CAUTION:

Be careful not to damage or scratch on radiator core.

### INSTALLATION

Installation is the reverse order of removal.

- Cooling fans are controlled by ECM. For details, refer to [EC-1160, "DTC P0217 ENGINE OVER TEMPERATURE"](#) (WITH EURO-OBD), [EC-1589, "DTC P0217 ENGINE OVER TEMPERATURE"](#) (WITHOUT EURO-OBD).

### DISASSEMBLY AND ASSEMBLY

#### Disassembly

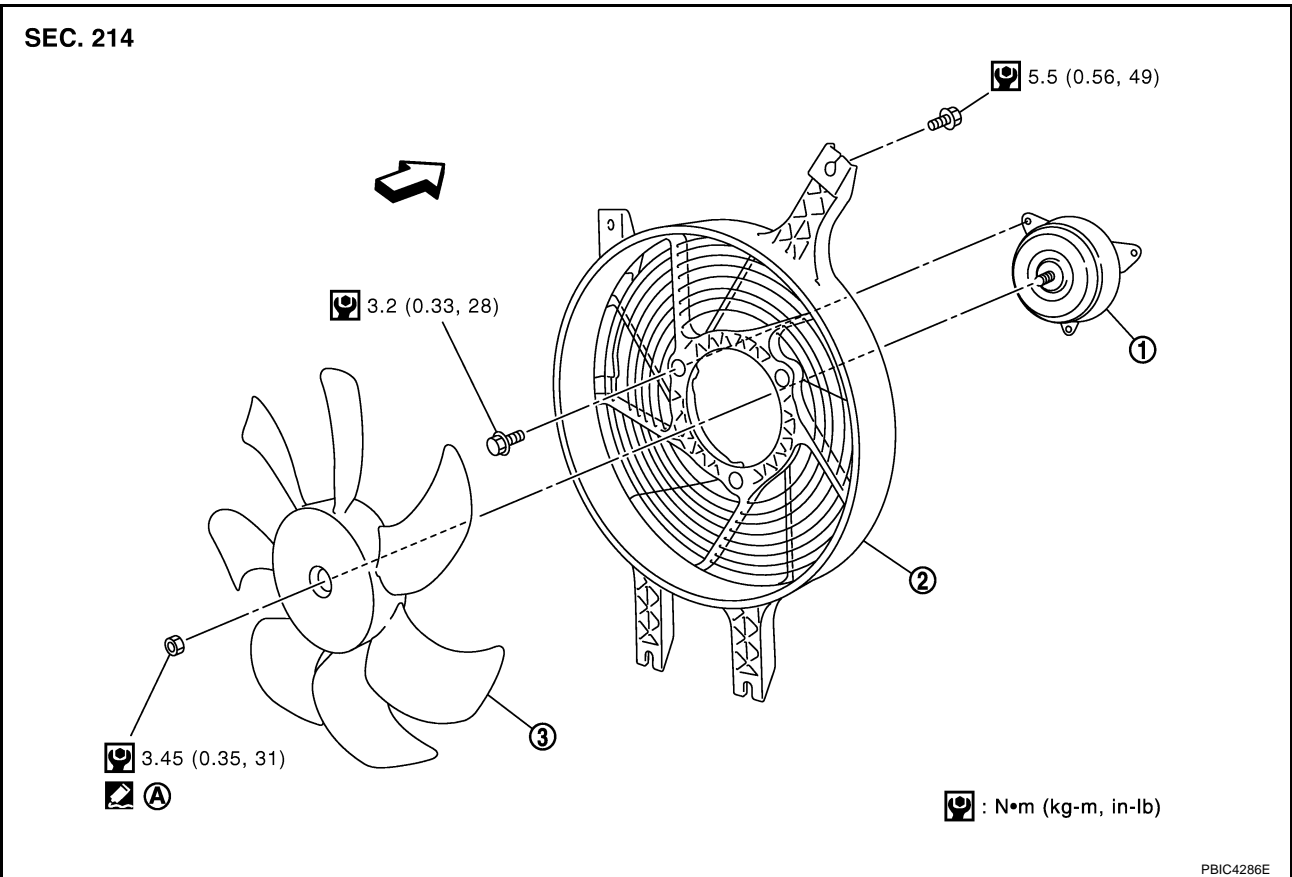
1. Remove cooling fan.
2. Remove cooling fan motor from cooling fan shroud.

#### Assembly

Assembly is the reverse order of disassembly.

## Removal and Installation (Condenser Side)

BBS002J6



1. Cooling fan motor
  2. Cooling fan shroud
  3. Cooling fan
- A. Apply on fan motor shaft.
- : Apply thread locking sealant
- Vehicle front

### REMOVAL

1. Remove front bumper. Refer to [EI-14, "FRONT BUMPER"](#).
2. Disconnect harness connector from fan motor, and move them to aside.
3. Remove cooling fan assembly.

#### CAUTION:

Be careful not to damage or scratch on radiator core.

### INSTALLATION

Installation is the reverse order of removal.

- Cooling fans are controlled by ECM. For details, refer to [EC-1160, "DTC P0217 ENGINE OVER TEMPERATURE"](#) (WITH EURO-OBD), [EC-1589, "DTC P0217 ENGINE OVER TEMPERATURE"](#) (WITHOUT EURO-OBD).

### DISASSEMBLY AND ASSEMBLY

#### Disassembly

1. Remove cooling fan.
2. Remove cooling fan motor from cooling fan shroud.

#### Assembly

Assembly is the reverse order of disassembly.

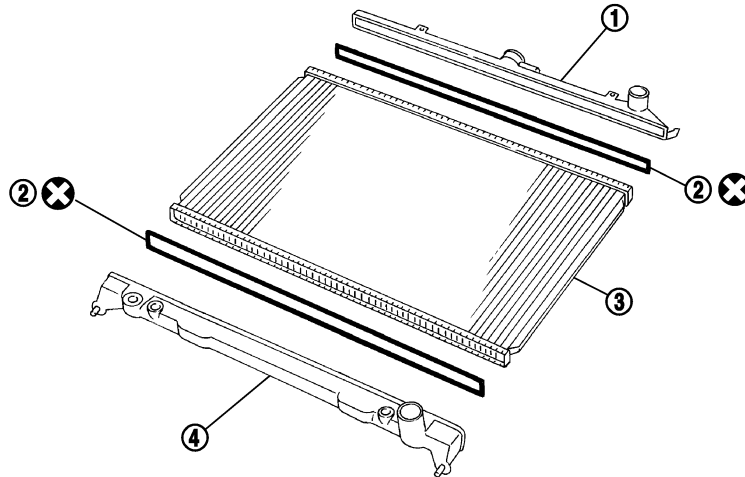
## RADIATOR (ALUMINUM TYPE)

PFP:21460

### Disassembly and Assembly

BBS0018U

SEC. 214



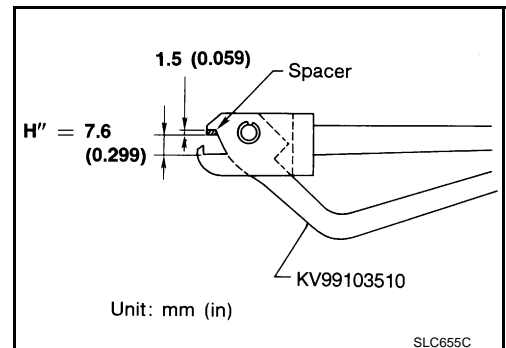
⊗ : Always replace after every disassembly.

PBIC2075E

1. Upper tank
2. Sealing rubber
3. Core
4. Lower tank

### PREPARATION

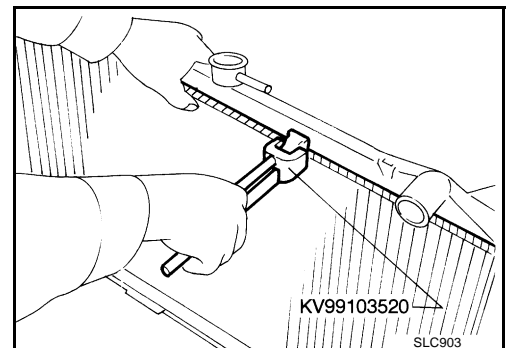
1. Attach the spacer to the tip of the radiator plate pliers A [SST].  
Spacer specification: 1.5 mm (0.059 in) thick x 18 mm (0.71 in) wide x 8.5 mm (0.335 in) long.
2. Make sure that when radiator plate pliers A [SST] are closed dimension H'' is approx. 7.6 mm (0.299 in).
3. Adjust dimension H'' with the spacer, if necessary.



SLC655C

### DISASSEMBLY

1. Remove upper or lower tanks with radiator plate pliers B [SST].



SLC903



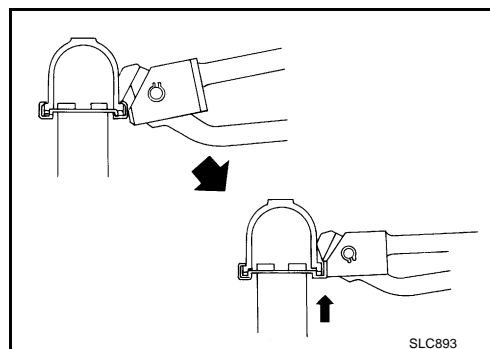
## RADIATOR (ALUMINUM TYPE)

[YD22DDTi]

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

**CAUTION:**

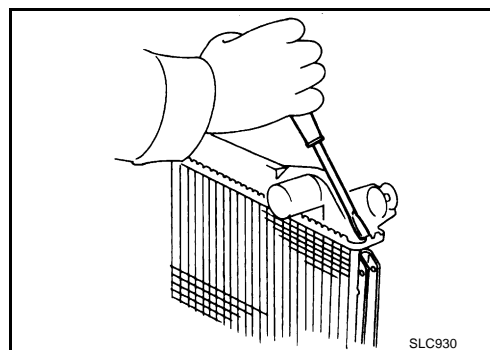
**Do not bend excessively.**



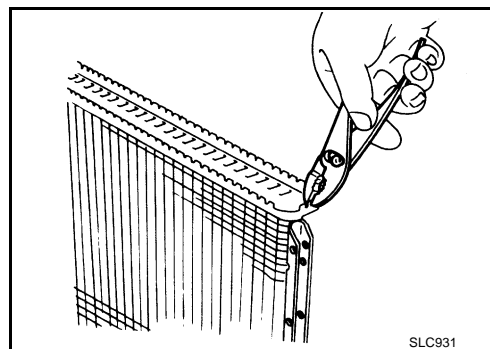
- In areas where radiator plate pliers B cannot be used, use a screwdriver to bend the edge up.

**CAUTION:**

**Be careful not to damage tank.**

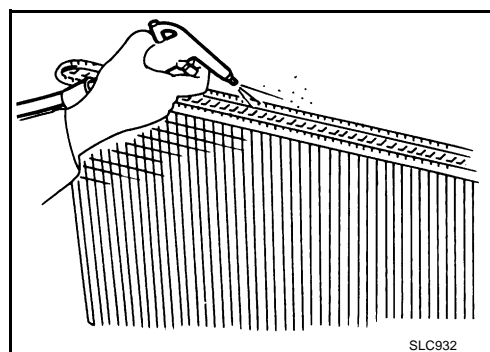


2. Remove sealing rubber.
3. Make sure the edge stands straight up.



### ASSEMBLY

1. Clean contact portion of tank.



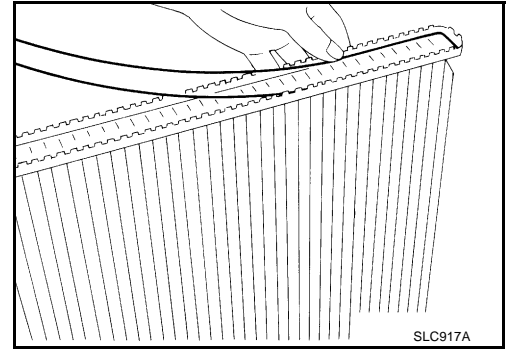
# RADIATOR (ALUMINUM TYPE)

[YD22DDTi]

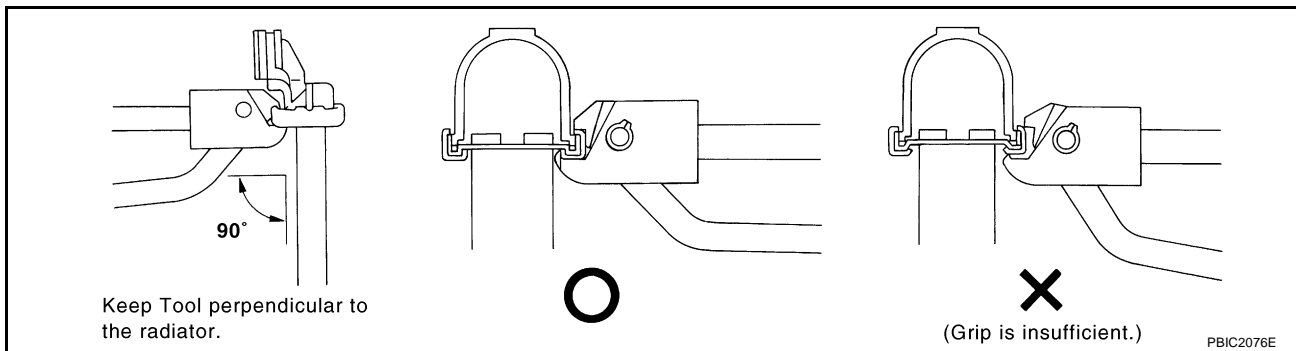
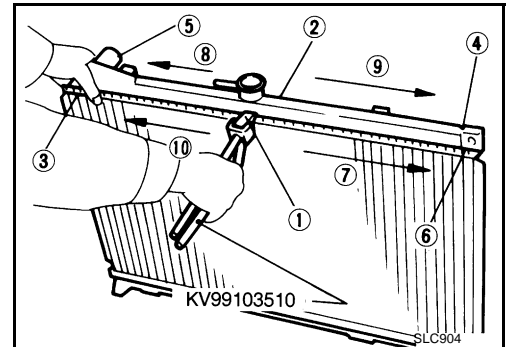
2. Install sealing rubber while pushing it with fingers.

**CAUTION:**

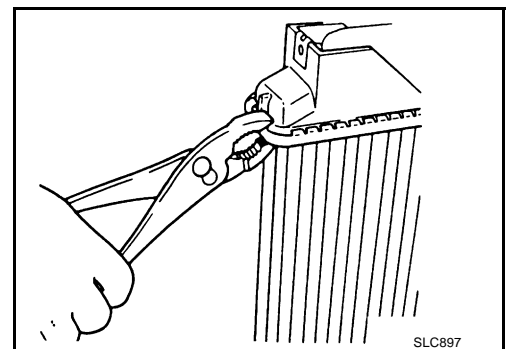
Be careful not to twist sealing rubber.



3. Caulk tank in numerical order as shown in the figure with radiator plate pliers A [SST].



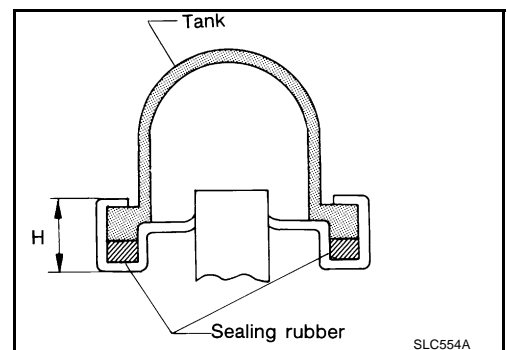
- Use pliers in the locations where radiator plate pliers A cannot be used.



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

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

5. Make sure that there is no leakage.  
Refer to [CO-43, "INSPECTION"](#).



## INSPECTION

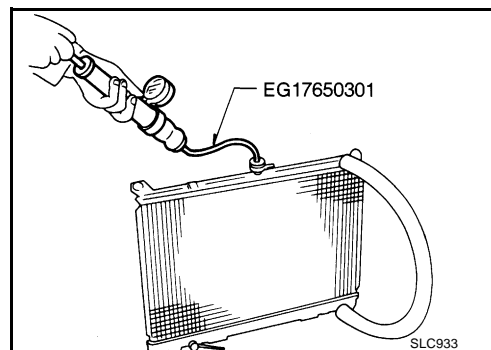
1. Apply pressure with the radiator cap tester adapter [SST] and the radiator cap tester (commercial service tool).

### Testing pressure

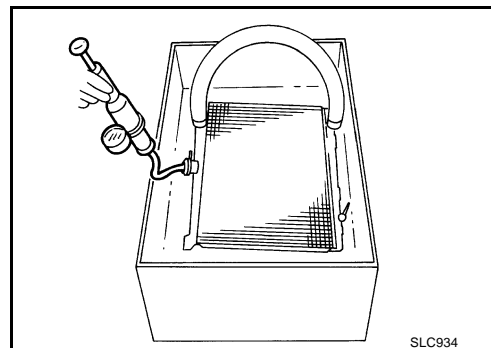
: 157 kPa (1.57 bar, 1.6 kg/cm<sup>2</sup> , 23 psi)

### **WARNING:**

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



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



A

CO

C

D

E

F

G

H

I

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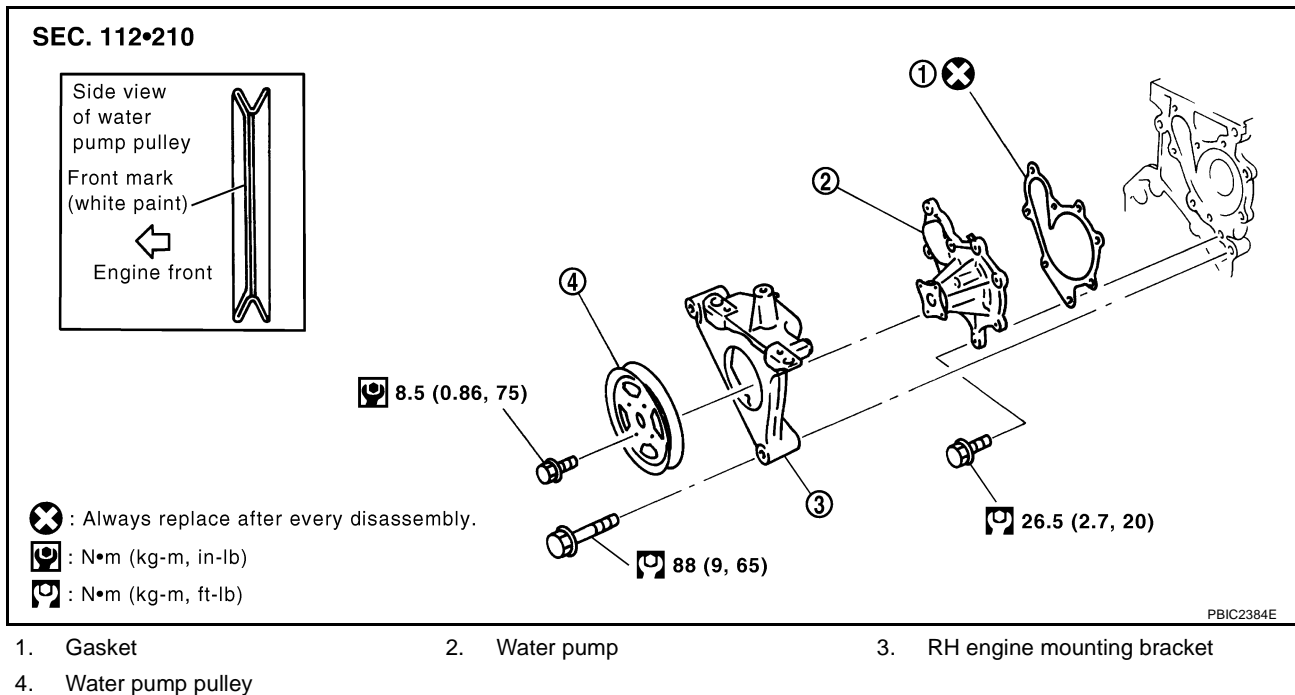
K

L

M

## WATER PUMP

### Removal and Installation



#### **WARNING:**

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

#### **REMOVAL**

1. Remove RH engine undercover.
2. Remove drive belt. Refer to [EM-139, "DRIVE BELTS"](#).
3. Drain engine coolant. Refer to [CO-32, "DRAINING ENGINE COOLANT"](#).

#### **CAUTION:**

**Perform when engine is cold.**

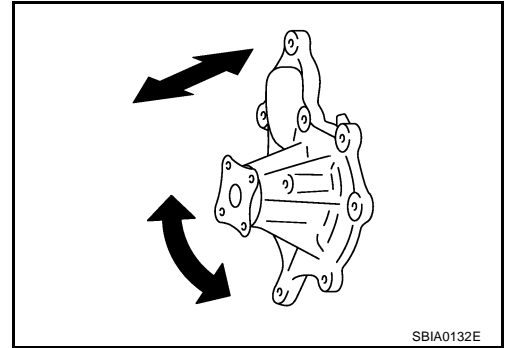
4. Support the bottom of oil pan (lower) with a floor jack etc, and remove RH engine mounting insulator (front side of engine). Refer to [EM-227, "ENGINE ASSEMBLY"](#).
5. Remove water pump pulley.
  - Loosen the pulley bolts after fixing the pulley using a screwdriver etc.
6. Remove RH engine mounting bracket.
7. Remove water pump.
  - Engine coolant will leak from cylinder block, so have a receptacle ready below.

#### **CAUTION:**

- Handle the water pump vane so that it does not contact any other parts.
- Water pump cannot be disassembled and should be replaced as a unit.

## INSPECTION AFTER REMOVAL

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



## INSTALLATION

- Installation is the reverse order of removal.
- Install water pump pulley with the front mark (painted white, used to prevent errors during assembly) facing the front of engine. Refer to [CO-44, "WATER PUMP"](#).

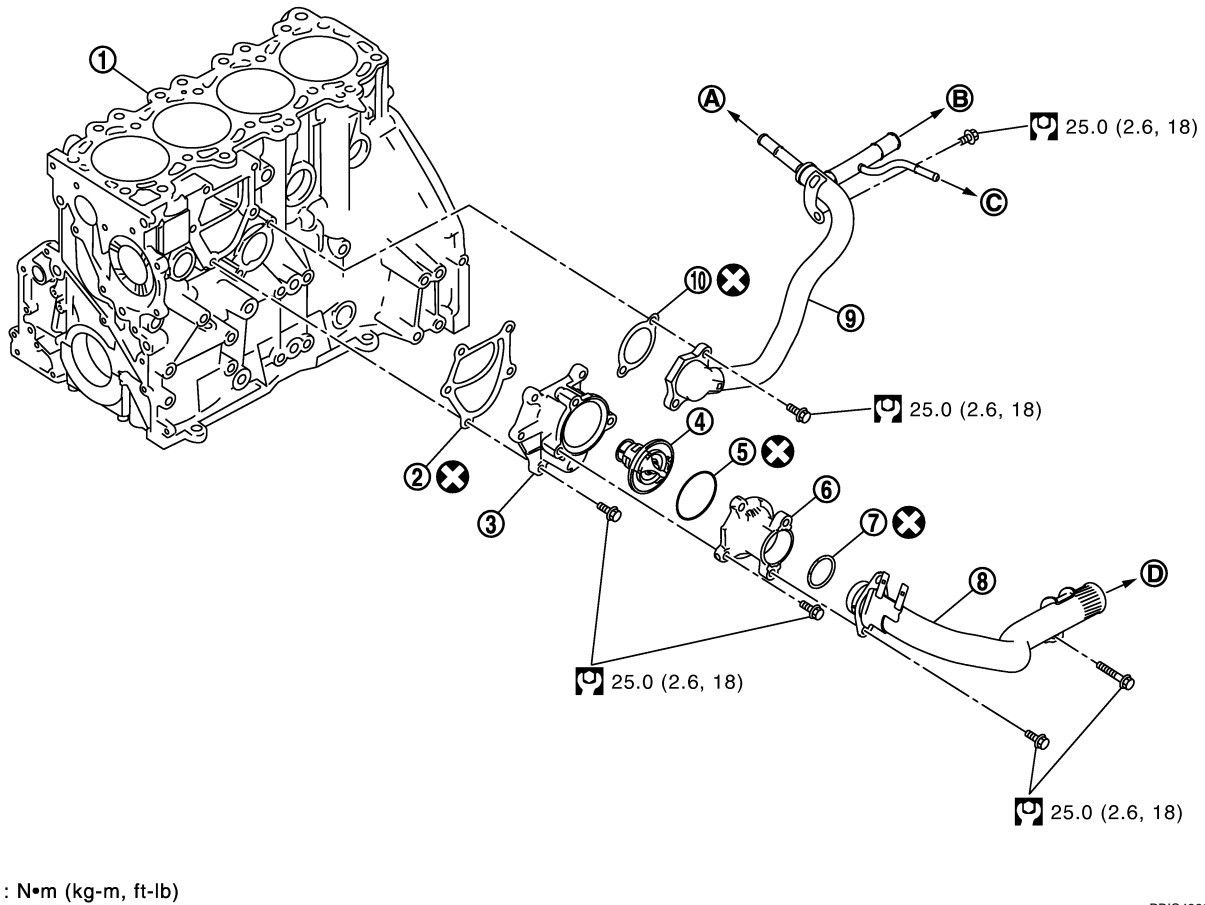
## INSPECTION AFTER INSTALLATION

- Check for leaks of engine coolant using the radiator cap tester adapter [SST: EG17650301] and the radiator cap tester (commercial service tool). Refer to [CO-32, "CHECKING RADIATOR SYSTEM FOR LEAKS"](#).
- Start and warm up engine. Visually check if there is no leaks of engine coolant.

## THERMOSTAT AND WATER PIPING

## Removal and Installation

SEC. 210•211•212



: N•m (kg-m, ft-lb)

PBIC4332E

- |                             |                     |                       |
|-----------------------------|---------------------|-----------------------|
| 1. Cylinder block           | 2. Gasket           | 3. Thermostat housing |
| 4. Thermostat               | 5. Rubber ring      | 6. Water inlet        |
| 7. O-ring                   | 8. Water inlet pipe | 9. Heater return pipe |
| 10. Gasket                  |                     |                       |
| A. To oil cooler            | B. To EGR cooler    | C. To turbocharger    |
| D. To radiator hose (lower) |                     |                       |

- Refer to [GI-9, "Components"](#) for symbol marks in the figure.

**WARNING:**

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

**NOTE:**

In this chapter, "oxidation catalyst with DPF" is called "catalyst" (models with DPF).

**REMOVAL**

- Remove engine undercover.
- Drain engine coolant. Refer to [CO-32, "DRAINING ENGINE COOLANT"](#).

**CAUTION:**

Perform when engine is cold.

- Remove radiator hose (lower) from water inlet pipe. Refer to [CO-35, "RADIATOR"](#).
- Remove water inlet pipe, water inlet and thermostat.

**CAUTION:**

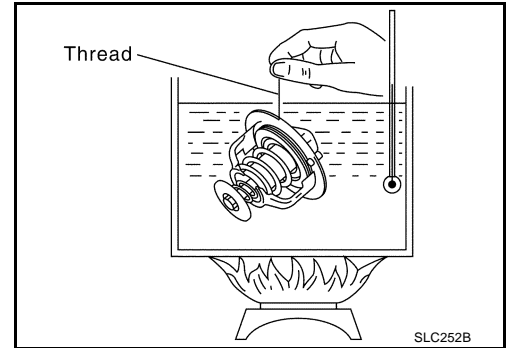
Cover radiator with suitable equipment to avoid damaging radiator core.

5. Remove thermostat housing.
6. Remove catalyst, exhaust manifold and turbocharger. Refer to [EM-150, "CATALYST"](#) , [EM-154, "TURBO CHARGER"](#) and [EM-159, "EXHAUST MANIFOLD"](#) .
7. Disconnect each water hoses and remove heater return pipe.

## INSPECTION AFTER REMOVAL

### Thermostat

- Place a string so that it is caught in the valves of the thermostat. Immerse fully in a container filled with water. Heat while stirring.
- The valve opening temperature is the temperature at which the valve opens and falls from the thread.
- Continue heating. Check the full-open lift amount.
- After checking the full-open lift amount, lower the water temperature and check the valve closing temperature.



### Standard values

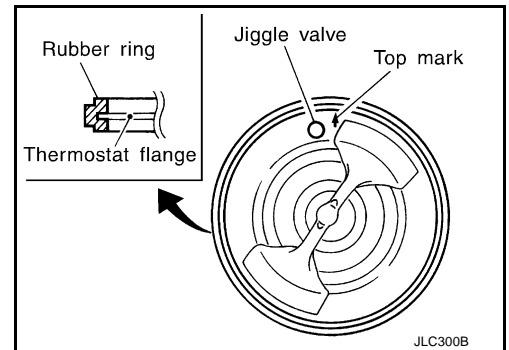
Item	Thermostat
Valve opening temperature	80 - 84°C (176 - 183° F)
Full-open lift amount	More than 10 mm/ 95°C (0.39 in/ 203 °F)
Valve closing temperature	More than 77°C (171°F)

- If out of the standard, replace thermostat.

## INSTALLATION

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

- Install the thermostat with the whole circumference of each flange part fit securely inside the rubber ring.
- Install the thermostat with the jiggle valve facing upwards.



### Water Inlet Pipe Installation

Apply a neutral detergent to O-ring, then quickly insert the insertion part of water inlet pipe into water inlet.

## INSPECTION AFTER INSTALLATION

- Check for leaks of engine coolant using the radiator cap tester adapter [SST: EG17650301] and the radiator cap tester (commercial service tool). Refer to [CO-32, "CHECKING RADIATOR SYSTEM FOR LEAKS"](#) .
- Start and warm up engine. Visually check if there is no leaks of engine coolant.

# SERVICE DATA AND SPECIFICATIONS (SDS)

[YD22DDTi]

## SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

### Standard and Limit CAPACITY

BBS0018X

Unit: ℓ (Imp qt)

Engine coolant capacity (With reservoir tank at "MAX" level)	Approx 9.5 (8-3/8)
Reservoir tank	0.7 (5/8)

### THERMOSTAT

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

### RADIATOR

Unit: kPa (bar, kg/cm<sup>2</sup>, psi)

Cap relief pressure	Standard	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11 - 14)
	Limit	59 (0.59, 0.6, 9)
Leakage test pressure		157 (1.57, 1.6, 23)