# SECTION ENGINE COOLING SYSTEM o

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# PRECAUTIONS

# PRECAUTIONS

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

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.

#### Precautions for Liquid Gasket REMOVAL OF LIQUID GASKET SEALING

• After removing the bolts and nuts, separate the mating surface and remove the old liquid gasket sealing using Tool.

**Tool number** 

: KV10111100 (J-37228)

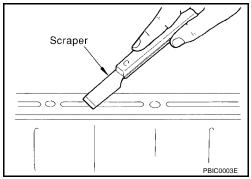
#### CAUTION:

#### Do not damage the mating surfaces.

- Tap the seal cutter to insert it.
- In areas where the Tool is difficult to use, lightly tap to slide it.



- 1. Remove the old liquid gasket adhering to the gasket application surface and the mating surface using suitable tool.
  - Remove the liquid gasket completely from the groove of the liquid gasket application surface, bolts, and bolt holes.
- 2. Thoroughly clean the mating surfaces and remove adhering moisture, grease and foreign material.



() Tap

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WBIA0566E

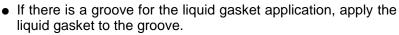
2) Slide

3. Attach the liquid gasket tube to the Tool.

Tool number : WS39930000 ( — )

Use Genuine RTV Silicone Sealant or equivalent. Refer to <u>GI-45, "Recommended Chemical Products and Sealants"</u>.

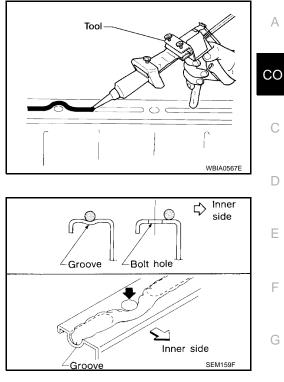
4. Apply the liquid gasket without breaks to the specified location with the specified dimensions.



- As for the bolt holes, normally apply the liquid gasket inside the holes. If specified in the procedure, it should also be applied outside the holes.
- Within five minutes of liquid gasket application, install the mating component.
- If the liquid gasket protrudes, wipe it off immediately.
- Do not retighten after the installation.
- Wait 30 minutes or more after installation before refilling the engine with engine oil and engine coolant.

#### **CAUTION:**

If there are specific instructions in this manual, observe them.



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# PREPARATION

REPARATION		PFP:00002
pecial Service Tools		EBSOOKN
e actual shapes of Kent-Moore tools may c Tool number (Kent-Moore No.) Tool name	liffer from those of special service tools	Illustrated here.
KV10111100 (J-37228) Seal cutter		Removing steel oil pan and rear timing chain case
	NT046	
WS39930000 ( )		Pressing the tube of liquid gasket
Tube pressure		
	S-NT052	
EG17650301 (J-33984-A) Radiator cap tester adapter		Adapting radiator cap tester to radiator cap and radiator filler neck a: 28 (1.10) dia. b: 31.4 (1.236) dia. c: 41.3 (1.626) dia. Unit: mm (in)
	S-NT564	Checking concentration of ethylene glycol in
(J-23688) Engine coolant refractometer		engine coolant
	WBIA0539E	
ommercial Service Tools		EBSOOK
Tool name		Description

Tool name		Description
Power tool	PBIC0190E	Loosening bolts and nuts
Radiator cap tester	PER 1925	Checking radiator and radiator cap
	PBIC1982E	

# PREPARATION

Tool name	Description	_
Coolant system tester adapter	Adapting radiator cap tester to reservoir filler	A
	neck	
		CO
WBIA0408E		С
Coolant system tester adapter	Adapting radiator cap tester to reservoir cap	-
		D
WBIA0409E		E

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# **OVERHEATING CAUSE ANALYSIS**

# OVERHEATING CAUSE ANALYSIS Troubleshooting Chart

PFP:00012

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	Sym	ptom	Checl	k items
		Water pump malfunction	Worn or loose drive belt	
		Thermostat stuck closed	—	
		Damaged fins	Dust contamination or paper clogging	
	Poor heat transfer		Physical damage	
		Clogged radiator cooling tube	Excess foreign material (rust, dirt, sand, etc.)	
		Water cut valve malfunction	Excess foreign material (rust, dirt, sand, etc.), phys- ical damage	
		Cooling fan does not oper- ate		
	Reduced air flow	High resistance to fan rota- tion	Fan assembly	—
		Damaged fan blades		
Cooling sys-	Damaged radiator shroud	_	_	
tem parts malfunction	Improper engine coolant mixture ratio	_		
	Poor engine coolant quality	—	Engine coolant density	—
			Cooling hose	Loose clamp
			Cooling hose	Cracked hose
			Water pump	Poor sealing
			Radiator cap	Loose
		Engine coolant leaks		Poor sealing
	Insufficient engine coolant			O-ring for damage, deterio- ration or improper fitting
			Radiator	Cracked radiator tank
				Cracked radiator core
			Reservoir tank	Cracked reservoir tank
			Exhaust and looks into	Cylinder head deterioration
		Overflowing reservoir tank	Exhaust gas leaks into cooling system	Cylinder head gasket dete- rioration

# **OVERHEATING CAUSE ANALYSIS**

	Syı	nptom	Che	ck items	
				High engine rpm under no load	A
			Abusive driving	Driving in low gear for extended time	СО
				Driving at extremely high speed	-
	_	Overload on engine	Powertrain system mal- function		С
Except cool- ing system			Installed improper size wheels and tires		D
parts mal-			Dragging brakes	_	
function			Improper ignition timing	_	
		Blocked bumper	_		
			Installed car brassiere	_	
	Blocked or restricted air	Blocked radiator grille	Mud contamination or paper clogging		F
	flow	Blocked radiator	—	_	
		Blocked condenser	Blocked air flow		G
		Installed large fog lamp			

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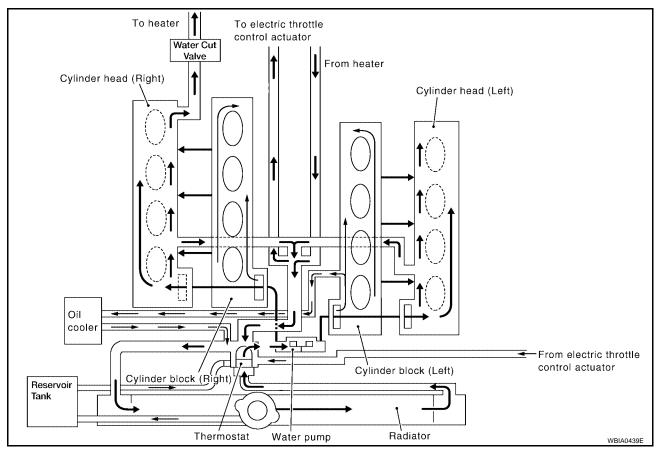
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# **COOLING SYSTEM**

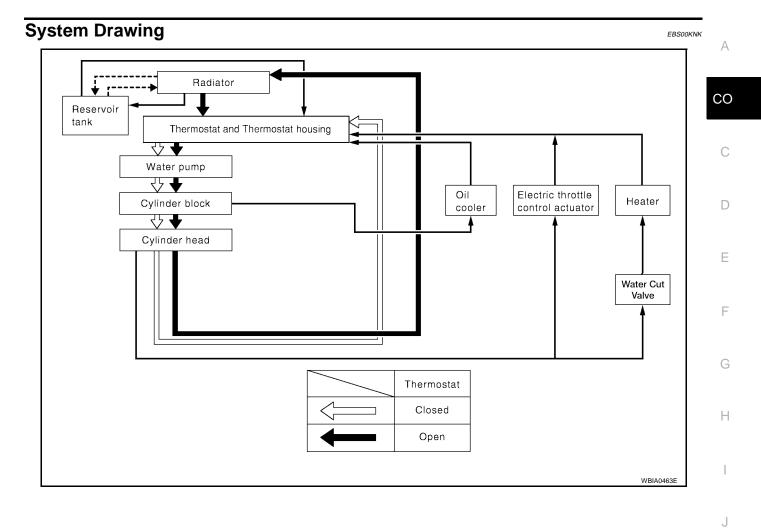
# COOLING SYSTEM Cooling Circuit



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# **COOLING SYSTEM**



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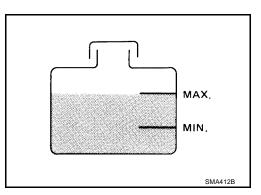
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# **ENGINE COOLANT**

## **ENGINE COOLANT**

#### Inspection LEVEL CHECK

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



#### CHECKING COOLING SYSTEM FOR LEAKS

#### WARNING:

Never remove the radiator or reservoir cap when the engine is hot. Serious burns could occur from high-pressure engine coolant escaping from the radiator or reservoir.

• To check for leakage, apply pressure to the cooling system at the reservoir filler neck using suitable tool and Tool.

Tool number : EG17650301 (J-33984-A)

#### Leakage test pressure : 137 kPa (1.4 kg/cm, 20 psi)

#### **CAUTION:**

Higher pressure than specified may cause radiator damage. NOTE:

In case that engine coolant decreases, replenish cooling system with engine coolant.

• If any concerns are found, repair or replace damaged parts.

#### CHECKING RESERVOIR CAP

• Check reservoir cap relief pressure using suitable tool and Tool.

Tool number : EG17650301 (J-33984-A)

Standard : 95 - 125 kPa (0.97 - 1.28 kg/cm<sup>2</sup>, 14 - 18 psi)

#### NOTE:

Apply engine coolant to the cap seal.

 Replace the reservoir cap if there is any damage in the negative-pressure valve, or if the open-valve pressure is outside of the limit.

#### CHECKING RADIATOR CAP

Inspect the radiator cap.

#### NOTE:

Thoroughly wipe out the radiator filler neck to remove any waxy residue or foreign material.

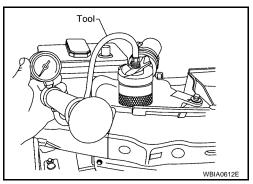
- Replace the cap if the metal plunger cannot be seen around the edge of the black rubber gasket.
- Replace the cap if deposits of waxy residue or other foreign material are on the black rubber gasket or the metal retainer.

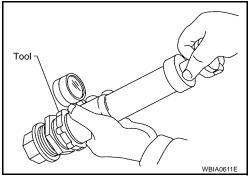
# **Changing Engine Coolant**

Refer to MA-13, "Changing Engine Coolant" .

#### DRAINING ENGINE COOLANT

Refer to MA-13, "DRAINING ENGINE COOLANT" .





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Revision: October 2004

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REFILLING ENGINE COOLANT Refer to MA-14, "REFILLING ENGINE COOLANT".	A
FLUSHING COOLING SYSTEM Refer to MA-15, "FLUSHING COOLING SYSTEM".	СО
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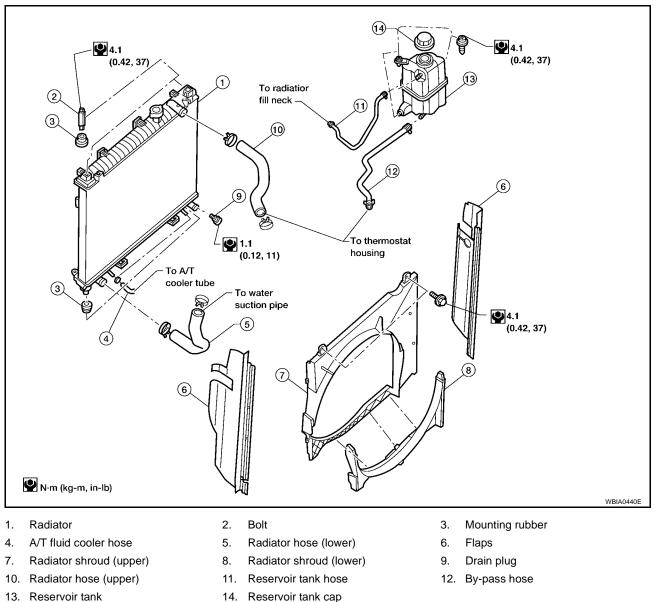
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# RADIATOR

# RADIATOR

#### **Removal and Installation**

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#### WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could occur from high-pressure engine coolant escaping from the radiator.

#### REMOVAL

#### **CAUTION:**

#### Perform when the engine is cold.

- 1. Drain engine coolant from the radiator. Refer to MA-13, "DRAINING ENGINE COOLANT".
- 2. Remove air cleaner and air duct assembly. Refer to EM-14, "REMOVAL".
- 3. Disconnect A/T fluid cooler hoses.
  - Install blind plug to avoid leakage of A/T fluid.
- 4. Disconnect radiator upper and lower hoses from radiator.
- CAUTION: Do not allow coolant to contact drive belts.

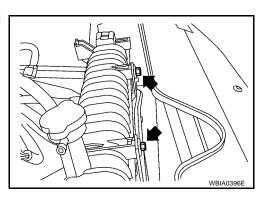
- 5. Remove the lower radiator shroud.
  - Release the tabs, pull lower radiator shroud rearwards and down to remove.

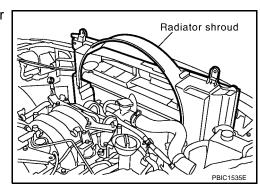
6. Remove the radiator shroud upper bolts and remove the radiator shroud upper.

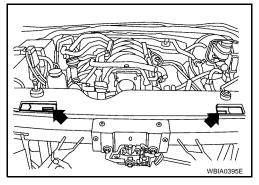
7. Remove the A/C condenser bolts and brackets. NOTE: Lift A/C condenser up and forward to remove from radiator.

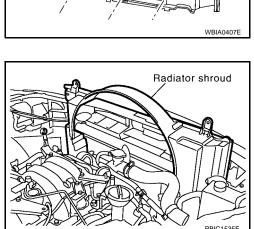
8. Remove A/T oil cooler bolts and oil cooler from radiator and position aside.

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**CO-13** 

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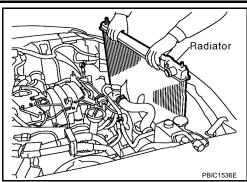
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## 9. Lift up and remove the radiator. CAUTION:

Do not damage or scratch air conditioner condenser and radiator core when removing.



#### INSTALLATION

Installation is in the reverse order of removal.

#### **INSPECTION AFTER INSTALLATION**

- Check for leaks of engine coolant. Refer to CO-10, "CHECKING COOLING SYSTEM FOR LEAKS" .
- Start and warm up the engine. Visually check for leaks of the engine coolant and A/T fluid.

### **Checking Radiator**

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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 electrical 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 surfaces.
- 3. Stop washing when dirt and debris 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 (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 until no water sprays out.

# **ENGINE COOLING FAN**

#### **ENGINE COOLING FAN** PFP:21140 Removal and Installation (Crankshaft driven type) EBS00KNQ **SEC. 210** 44.6 (4.5, 33) Front mark (F) 42.6 (4.3, 31) 8.8 (0.90, 78) 19.5 (0.97, 84) 3 🕑 : N·m (kg-m, in-lb) 2 Engine front 💟 : N·m (kg-m, ft-lb) WBIA0632E Cooling fan 2. Fan coupling 3. Fan bracket 1. 4. Cooling fan pulley

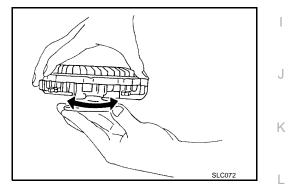
#### REMOVAL

- 1. Remove the air duct and resonator assembly. Refer to EM-14, "Removal and Installation" .
- 2. Remove the engine front undercover using power tool.
- 3. Remove the lower radiator shroud. Refer to CO-12, "Removal and Installation" .
- 4. Remove the drive belt. Refer to EM-12, "Removal and Installation" .
- 5. Remove the cooling fan.

#### **INSPECTION AFTER REMOVAL**

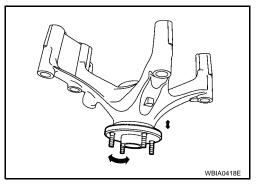
#### **Fan Coupling**

Inspect fan coupling for oil leakage and bimetal conditions.



#### Fan Bracket

- Visually check that there is no significant looseness in the fan bracket shaft, and that it turns smoothly by hand.
- If there are any unusual concerns, replace the cooling fan pulley.



#### INSTALLATION

Installation is in the reverse order of removal.

 Install cooling fan with its front mark "F" facing front of engine. Refer to <u>CO-15</u>, "<u>Removal and Installation</u> (<u>Crankshaft driven type</u>)".

#### **INSPECTION AFTER INSTALLATION**

• Check for leaks of the engine coolant. Refer to CO-10, "CHECKING COOLING SYSTEM FOR LEAKS" .

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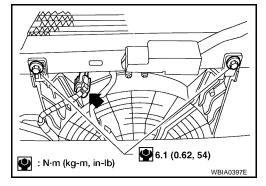
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• Start and warm up the engine. Visually make sure that there are no leaks of the engine coolant.

#### Removal and Installation (Motor driven type) REMOVAL

- 1. Remove front grille. Refer to EI-20, "Removal and Installation" .
- 2. Disconnect harness connector from fan motor.
- 3. Remove the bolt and remove the fan grille and motor assembly.



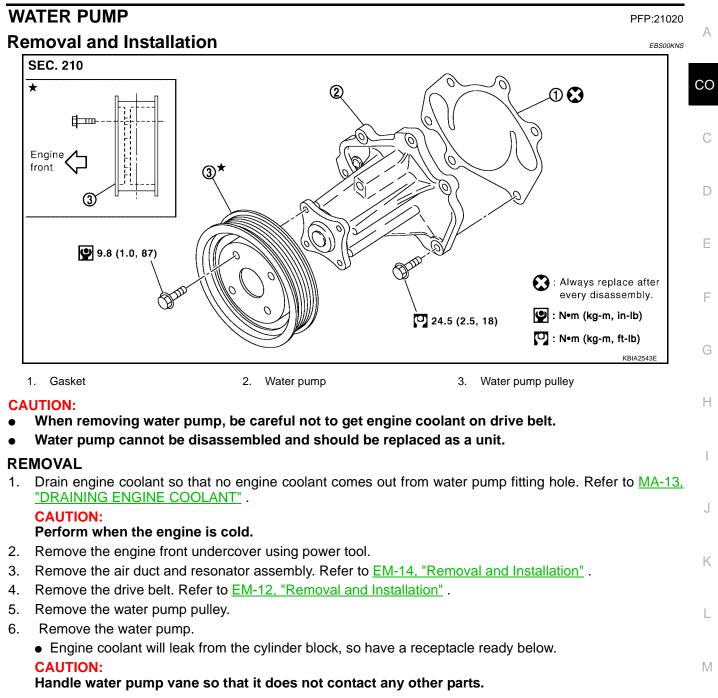
#### INSTALLATION

Installation is in the reverse order of removal.

• Cooling fan is controlled by ECM. For details, refer to EC-436, "Cooling Fan Operation" .

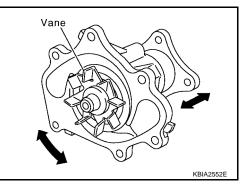
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# WATER PUMP



#### **INSPECTION AFTER REMOVAL**

- Visually check that there is no significant dirt or rust on the water pump body and vane.
- Make sure there is no looseness in the vane shaft, and that it turns smoothly when rotated by hand.
- Replace the water pump assembly, if necessary.



#### INSTALLATION

Installation is in the reverse order of removal.

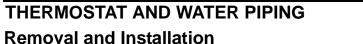
# WATER PUMP

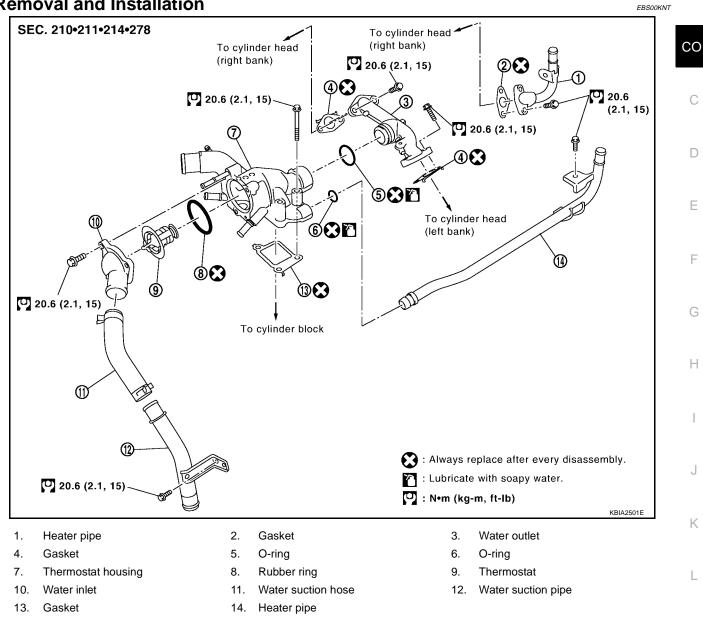
After installation bleed the air from the cooling system. Refer to <u>MA-14</u>, "<u>REFILLING ENGINE COOLANT</u>"

#### INSPECTION AFTER INSTALLATION

- Check for leaks of engine coolant. Refer to CO-10, "CHECKING COOLING SYSTEM FOR LEAKS" .
- Start and warm up engine. Visually check for leaks of the engine coolant.

# THERMOSTAT AND WATER PIPING





#### REMOVAL

#### **Removal of Thermostat**

1. Drain engine coolant from the radiator. Refer to <u>MA-13, "DRAINING ENGINE COOLANT"</u>. CAUTION:

#### Perform when engine is cold.

- 2. Remove the air duct and resonator assembly. Refer to EM-14, "REMOVAL" .
- 3. Remove the engine room cover using power tools.
- 4. Disconnect the water suction hose from the water inlet.
- 5. Remove the water inlet and thermostat.

#### Removal of Thermostat Housing, Water Outlet and Heater Pipe

- 1. Remove the intake manifold. Refer to EM-15, "REMOVAL".
- 2. Remove the thermostat housing, water outlet and heater pipe.

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# THERMOSTAT AND WATER PIPING

#### **Removal of Water Cut Valve**

 Drain the engine coolant from the radiator. Refer to <u>MA-13, "DRAINING ENGINE COOLANT"</u>. CAUTION:

#### Perform when the engine is cold.

- 2. Disconnect the heater hoses.
- 3. Disconnect the water valve electrical connector.
- 4. Remove the water cut valve.

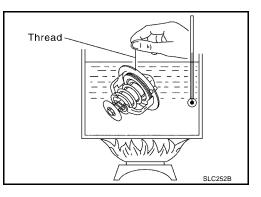
#### Installation of Water Cut Valve

Installation is in the reverse order of removal.

- Check for leaks of the engine coolant using suitable tool. Refer to <u>CO-10, "CHECKING COOLING SYS-</u> <u>TEM FOR LEAKS"</u>.
- Start and warm up the engine. Visually make sure that there is no leaks of the engine coolant.

#### **INSPECTION AFTER REMOVAL**

- Place a thread so that it is caught in the valve 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:

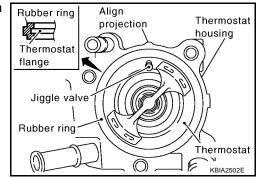
	Thermostat
Valve opening temperature	80 - 84°C (176 - 183° F)
Full-open lift amount	More than 10 mm/ 95°C (0.39 in/ 203°F)
Valve closing temperature	77°C (171°F) or lower

#### INSTALLATION

Installation is in the reverse order of removal.

#### Installation of Thermostat

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



#### Installation of Water Outlet Pipe and Heater Pipe

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

#### **INSPECTION AFTER INSTALLATION**

- Check for leaks of the engine coolant. Refer to <u>CO-10, "CHECKING COOLING SYSTEM FOR LEAKS"</u>.
- Start and warm up the engine. Visually check for leaks of the engine coolant.

# SERVICE DATA AND SPECIFICATIONS (SDS)

		Unit: ℓ (US gal, Imp	gal)
Engine coolant capacity with rese	ervoir ("MAX" level)	12.2 (3 1/4, 2 5/8)	
THERMOSTAT			
Valve opening temperature		80° - 84°C (176° - 183°F)	
Maximum valve lift		More than 10 mm at 95°C (0.39 in at 203°F)	
Valve closing temperature		77°C (171°F) or lower	
	Quadard	Unit: kPa (kg/cm <sup>2</sup> ,	psi)
RADIATOR Reservoir cap relief pressure	Standard		psi)
RADIATOR Reservoir cap relief pressure Leakage test pressure	Standard	Unit: kPa (kg/cm <sup>2</sup> , 95 - 125 (0.97- 1.28, 14 - 18) 137 (1.4, 20)	psi)
Reservoir cap relief pressure	Standard	95 - 125 (0.97- 1.28, 14 - 18)	psi)
Reservoir cap relief pressure	Standard	95 - 125 (0.97- 1.28, 14 - 18)	psi)
Reservoir cap relief pressure	Standard	95 - 125 (0.97- 1.28, 14 - 18)	psi)
Reservoir cap relief pressure	Standard	95 - 125 (0.97- 1.28, 14 - 18)	psi)
Reservoir cap relief pressure	Standard	95 - 125 (0.97- 1.28, 14 - 18)	psi)

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