

# ENGINE LUBRICATION & COOLING SYSTEMS

## SECTION LC

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# ENGINE LUBRICATION SYSTEM

Precautions

## Precautions

### SUPPLEMENTAL RESTRAINT SYSTEM (SRS) “AIR BAG” AND “SEAT BELT PRE-TENSIONER”

NHLC0036

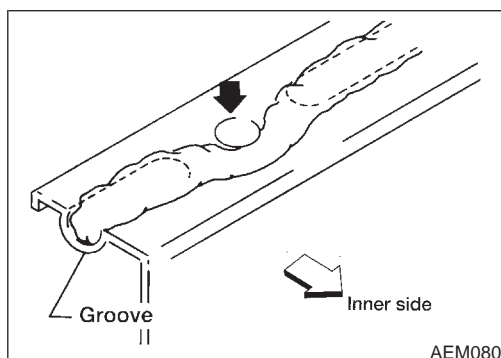
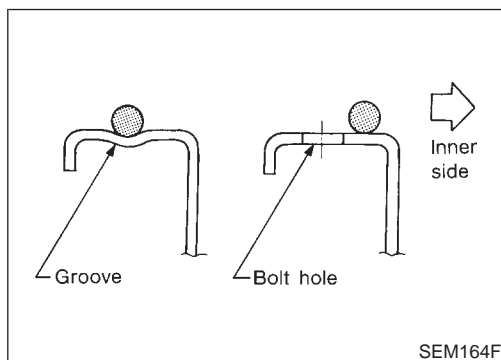
The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. 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. The SRS system composition which is available to INFINITI I35 is as follows (The composition varies according to optional equipment.):

- For a frontal collision  
The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioners, a diagnosis sensor unit, crash zone sensor, warning lamp, wiring harness and spiral cable.
- For a side collision  
The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), satellite sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

Information necessary to service the system safely is included in the **RS 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 should be performed by an authorized 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 RS 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 harness connector (and by yellow harness protector or yellow insulation tape before the harness connectors).



### LIQUID GASKET APPLICATION PROCEDURE

NHLC0001

1. Use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves. Also, completely clean any oil from these areas.
2. Apply a continuous bead of liquid gasket to mating surfaces. **(Use Genuine RTV silicone sealant or equivalent. Refer to GI-52.)**
  - For oil pan, be sure liquid gasket diameter is 3.5 to 4.5 mm (0.138 to 0.177 in) or 4.5 to 5.5 mm (0.177 to 0.217 in) as specified.
3. Apply liquid gasket around the inner side of bolt holes (unless otherwise specified).
4. Assembly should be done within 5 minutes after coating.
5. Wait at least 30 minutes before refilling engine oil and engine coolant.

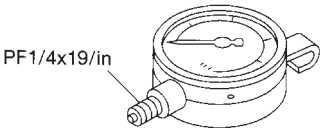
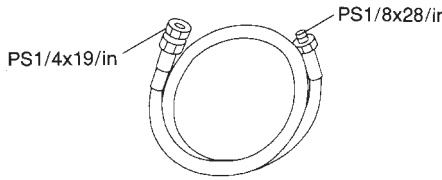
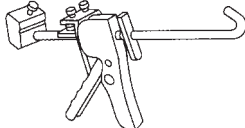
# ENGINE LUBRICATION SYSTEM

Preparation

## Preparation SPECIAL SERVICE TOOLS

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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		
ST25051001 (J25695-1) Oil pressure gauge	 <p>PF1/4x19/in</p> <p>NT558</p>	Measuring oil pressure <b>Maximum measuring range:</b> <b>2,452 kPa (25 kg/cm<sup>2</sup>, 356 psi)</b>	GI MA EM <b>LC</b>
ST25052000 (J25695-2) Hose	 <p>PS1/4x19/in</p> <p>PS1/8x28/in</p> <p>NT559</p>	Adapting oil pressure gauge to upper oil pan	EC FE AT
WS39930000 ( — ) Tube pressure	 <p>NT052</p>	Pressing the tube of liquid gasket	AX SU

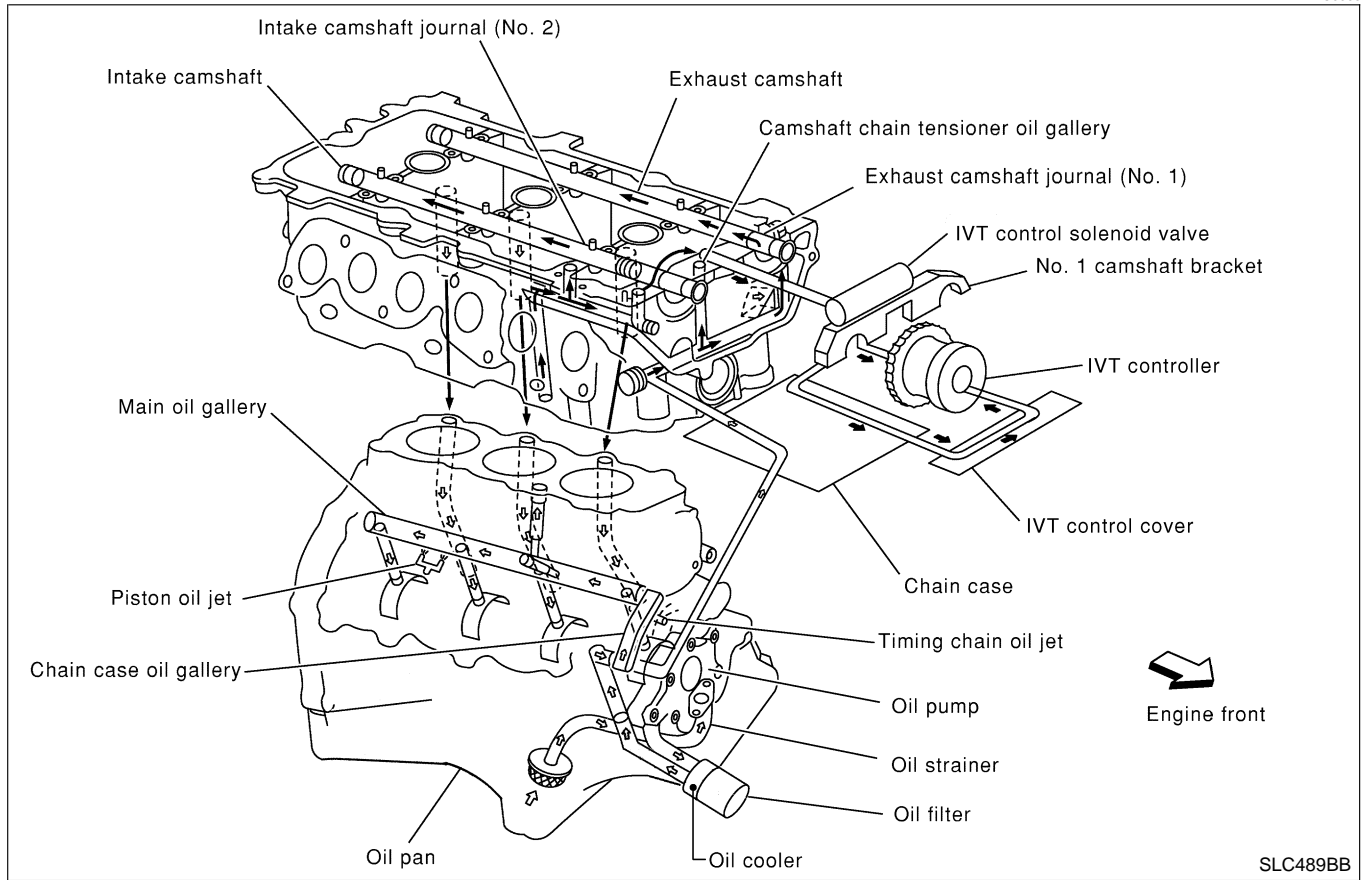
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# ENGINE LUBRICATION SYSTEM

Lubrication Circuit

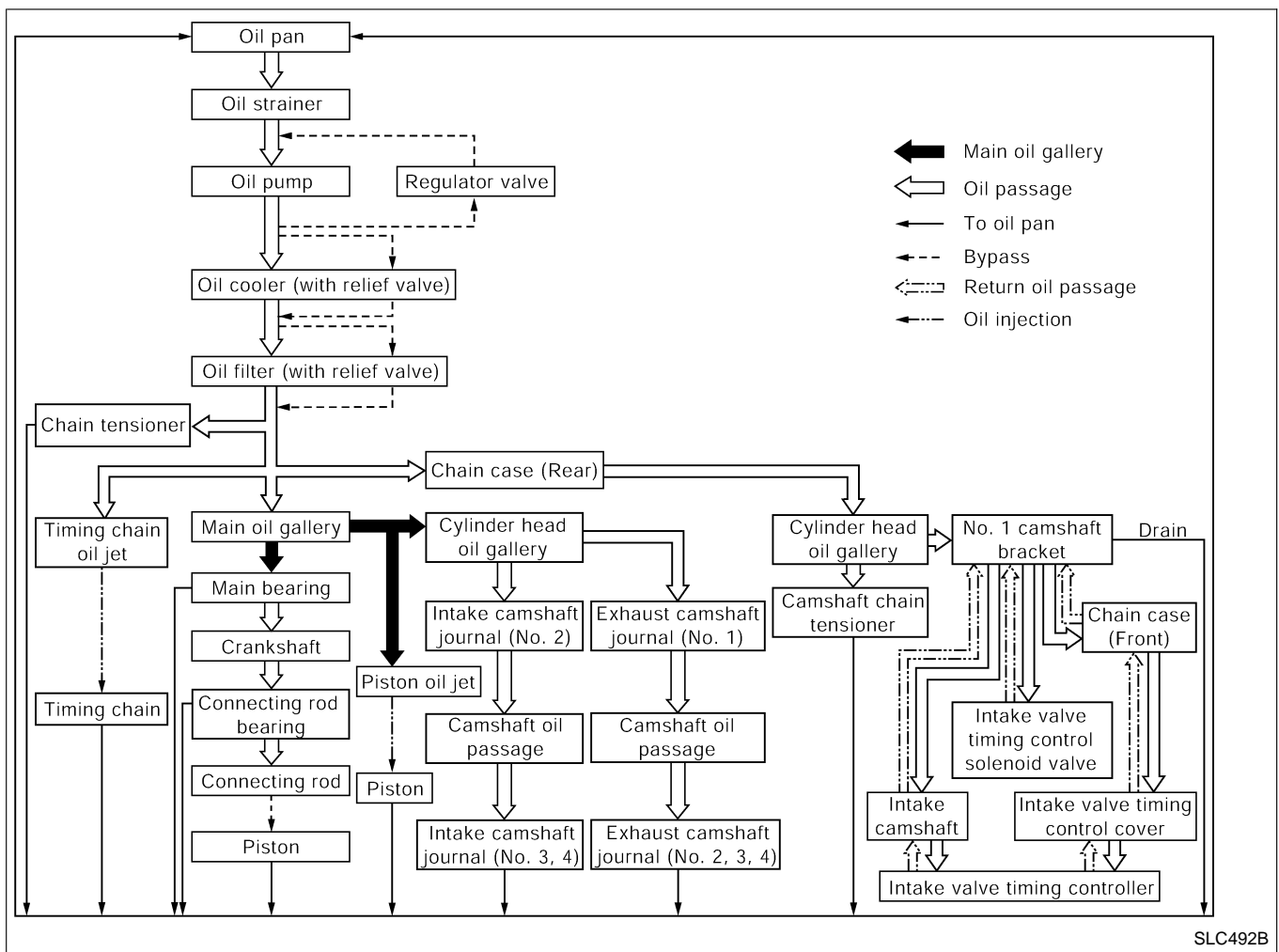
## Lubrication Circuit

NHLC0003



# ENGINE LUBRICATION SYSTEM

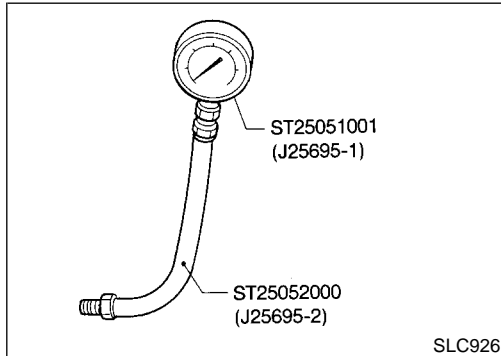
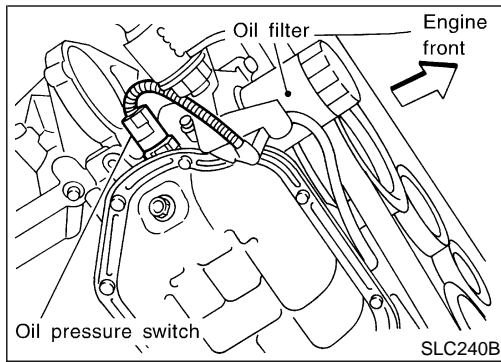
Lubrication Circuit (Cont'd)



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# ENGINE LUBRICATION SYSTEM

## Oil Pressure Check



## Oil Pressure Check

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### WARNING:

- Be careful not to burn yourself, as the engine and oil may be hot.
  - Oil pressure check should be done in "Parking position".
1. Check oil level.
  2. Remove oil pressure switch.
  3. Install pressure gauge.
  4. Start engine and warm it up to normal operating temperature.
  5. Check oil pressure with engine running under no-load.

Engine speed rpm	Approximate discharge pressure kPa (kg/cm <sup>2</sup> , psi)
Idle speed 2,000	More than 98 (1.0, 14) 294 (3.0, 43)

**If difference is extreme, check oil passage and oil pump for oil leaks.**

6. Install oil pressure switch with sealant.

## Oil Pump

### REMOVAL AND INSTALLATION

NHLC0005

### CAUTION:

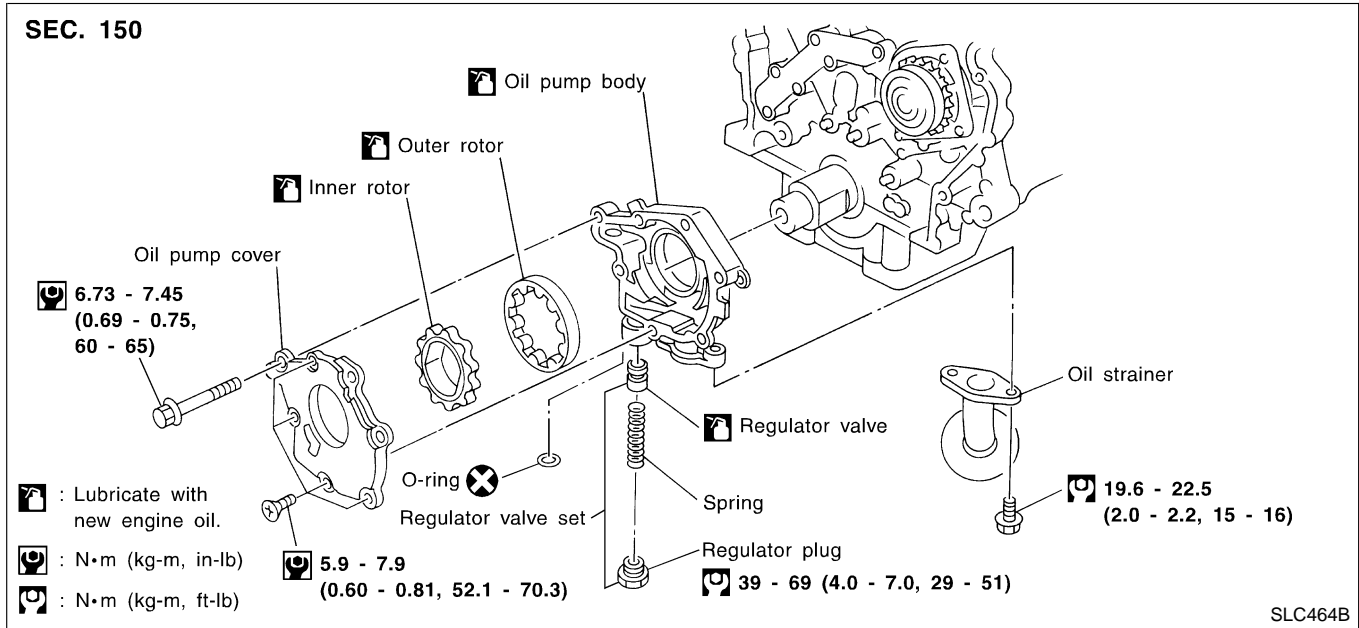
**When removing the oil pans, oil pump assembly and timing chain from engine, first remove the crankshaft position sensor (POS) from the assembly.**

**Be careful not to damage sensor edge.**

1. Drain engine oil.
2. Remove drive belts.
3. Remove crankshaft position sensor (POS).
4. Remove engine lower covers.
5. Remove crankshaft pulley.
6. Remove front exhaust tube and its support.
7. Support engine at right and left side engine slingers with a suitable hoist.
8. Remove engine right side mounting insulator and bracket bolts and nuts.
9. Remove center member assembly.
10. Remove air compressor assembly and bracket.
11. Remove oil pans. Refer to EM-14, "Removal".
12. Remove water pump cover.
13. Remove front cover assembly.
14. Remove timing chain. Refer to EM-24, "Removal".
15. Remove oil pump assembly.
16. Reinstall any parts removed in reverse order of removal.

## DISASSEMBLY AND ASSEMBLY

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- When installing oil pump, apply engine oil to rotors.

### OIL PUMP INSPECTION

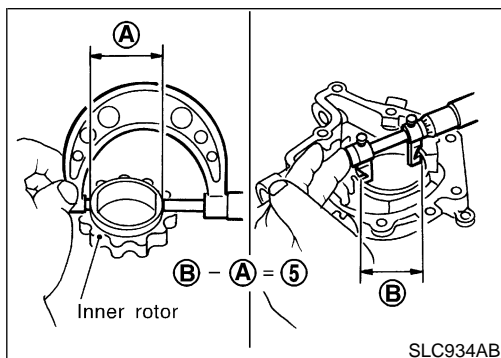
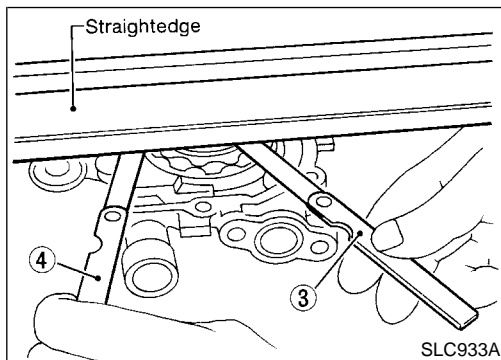
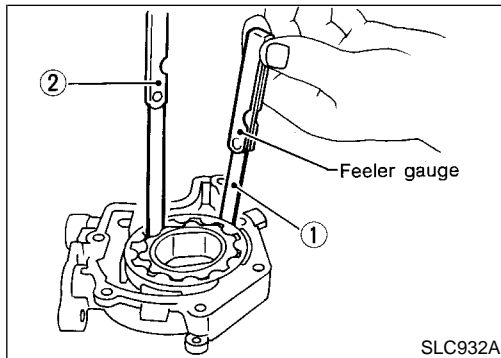
NHLC0007

Using a feeler gauge, straightedge and micrometers, check the following clearances:

Unit: mm (in)

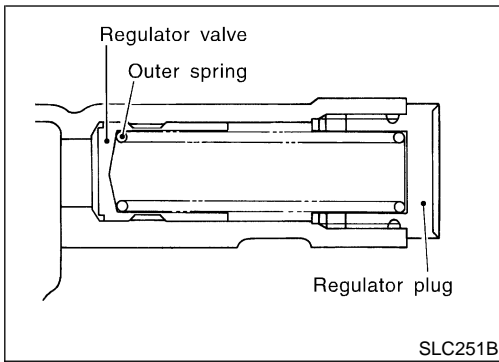
Body to outer rotor radial clearance 1	0.114 - 0.260 (0.0045 - 0.0102)
Inner rotor to outer rotor tip clearance 2	Below 0.18 (0.0071)
Body to inner rotor axial clearance 3	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor axial clearance 4	0.050 - 0.110 (0.0020 - 0.0043)
Inner rotor to brazed portion of housing clearance 5	0.045 - 0.091 (0.0018 - 0.0036)

- If the tip clearance (2) exceeds the limit, replace rotor set.
- If body to rotor clearances (1, 3, 4, 5) exceed the limit, replace oil pump body assembly.



# ENGINE LUBRICATION SYSTEM

## Oil Pump (Cont'd)

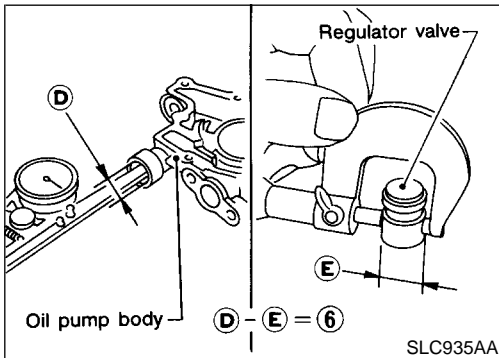


### REGULATOR VALVE INSPECTION

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1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil. Check that it falls smoothly into the valve hole by its own weight.

**If damaged, replace regulator valve set or oil pump body.**

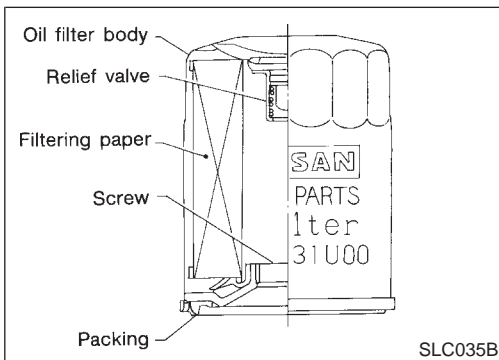


4. Check regulator valve to oil pump body clearance.

#### Clearance:

**6 : 0.040 - 0.097 mm (0.0016 - 0.0038 in)**

**If it exceeds the limit, replace oil pump body.**



### Oil Filter

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The oil filter is a small, full-flow cartridge type and is provided with a relief valve.

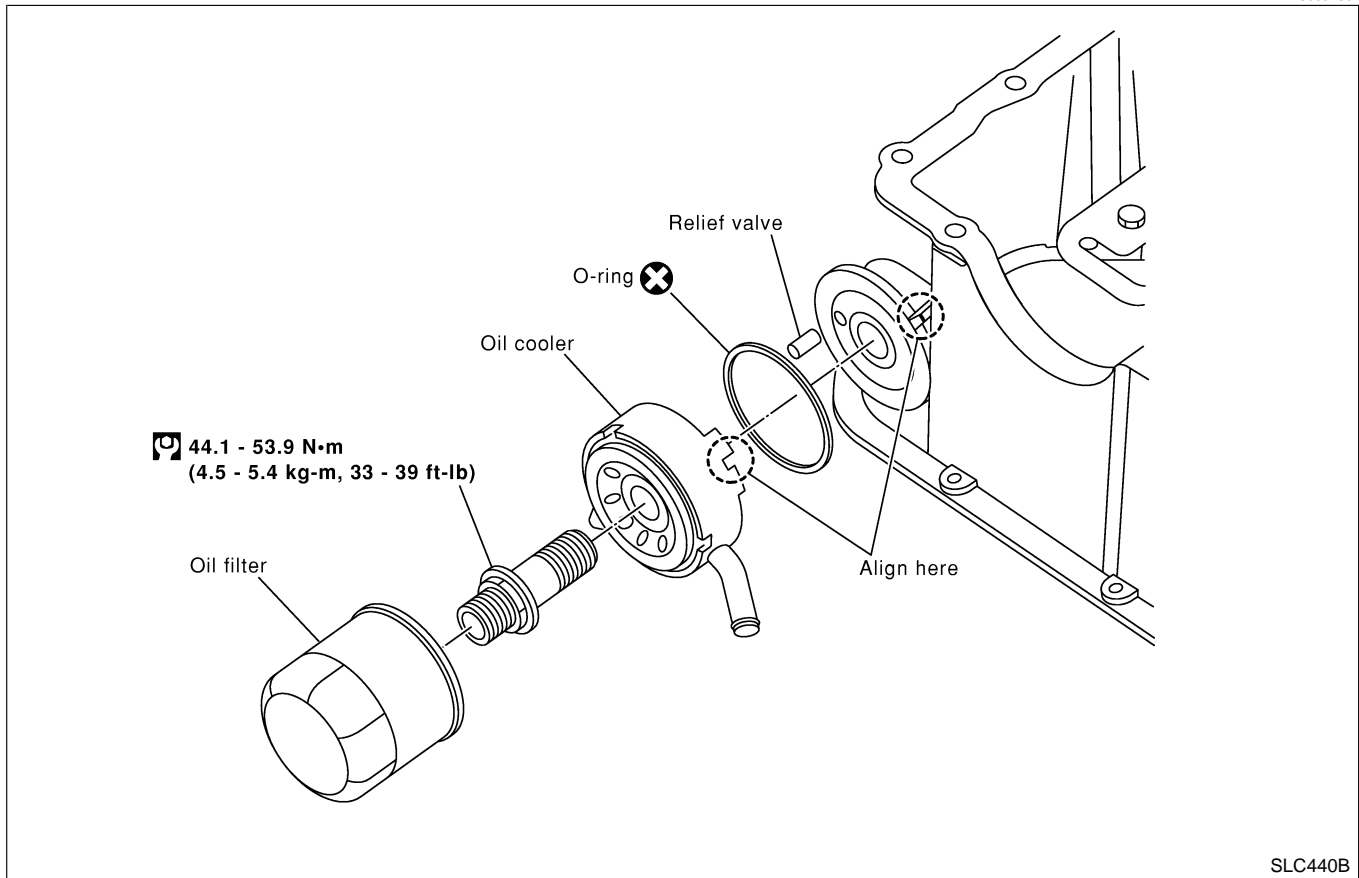
- Use Tool specified in MA-17 for changing oil filter.



## Oil Cooler REMOVAL AND INSTALLATION

NHLC0037

NHLC0037S01



1. Drain engine oil and coolant.
2. Remove oil cooler.
3. Installation is in reverse order of removal.
  - Do not spill coolant on the drive belt.
  - Install oil cooler to oil pan aligning the protrusion of flange as shown.

### INSPECTION

#### Oil Cooler

NHLC0037S02

NHLC0037S0201

1. Check oil cooler for cracks.
2. Check oil cooler for clogging by blowing through coolant inlet. If necessary, replace oil cooler assembly.

#### Relief Valve

NHLC0037S0202

Inspect relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with a suitable tool. Install a new valve in place by tapping it.

# ENGINE LUBRICATION SYSTEM

Service Data and Specifications (SDS)

## Service Data and Specifications (SDS)

### OIL PRESSURE

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Engine speed rpm	Approximate discharge pressure kPa (kg/cm <sup>2</sup> , psi)
Idle speed 2,000	More than 98 (1.0, 14) 294 (3.0, 43)

### REGULATOR VALVE

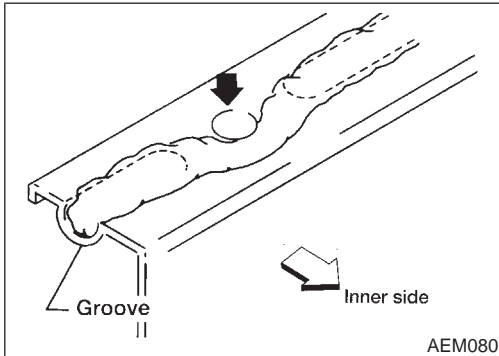
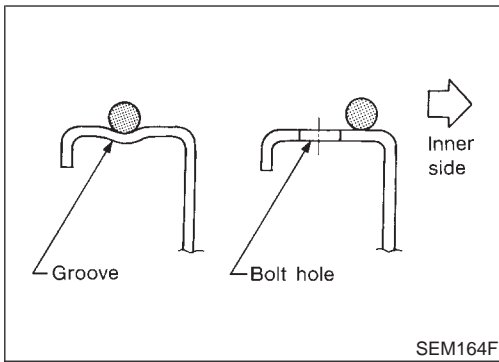
NHLC0011  
Unit: mm (in)

Regulator valve to oil pump cover clearance	0.040 - 0.097 (0.0016 - 0.0038)
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### OIL PUMP

NHLC0012  
Unit: mm (in)

Body to outer rotor radial clearance	0.114 - 0.260 (0.0045 - 0.0102)
Inner rotor to outer rotor tip clearance	Below 0.18 (0.0071)
Body to inner rotor axial clearance	0.030 - 0.070 (0.0012 - 0.0028)
Body to outer rotor axial clearance	0.050 - 0.110 (0.0020 - 0.0043)
Inner rotor to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)



## Precautions

### LIQUID GASKET APPLICATION PROCEDURE

NHLC0013

1. Use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves. Also, completely clean any oil from these areas.
2. Apply a continuous bead of liquid gasket to mating surfaces. **(Use Genuine RTV silicone sealant or equivalent. Refer to GI-52.)**
  - For areas except oil pan, be sure liquid gasket diameter is 2.3 to 3.3 mm (0.091 to 0.130 in).
3. Apply liquid gasket around the inner side of bolt holes (unless otherwise specified).
4. Assembly should be done within 5 minutes after coating.
5. Wait at least 30 minutes before refilling engine oil and engine coolant.

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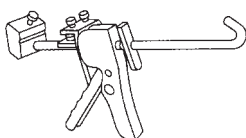
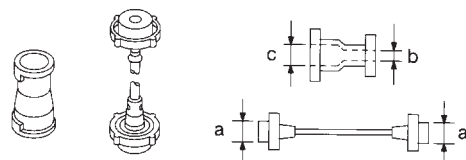


## Preparation

### SPECIAL SERVICE TOOLS

NHLC0014

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

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Tool number (Kent-Moore No.) Tool name	Description
WS39930000 ( — ) Tube pressure	 Pressing the tube of liquid gasket NT052
EG17650301 (J33984-A) Radiator cap tester adapter	 Adapting radiator cap tester to 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) NT564
KV99103510 ( — ) Radiator plate pliers A	 Installing radiator upper and lower tanks NT224
KV99103520 ( — ) Radiator plate pliers B	 Removing radiator upper and lower tanks NT225

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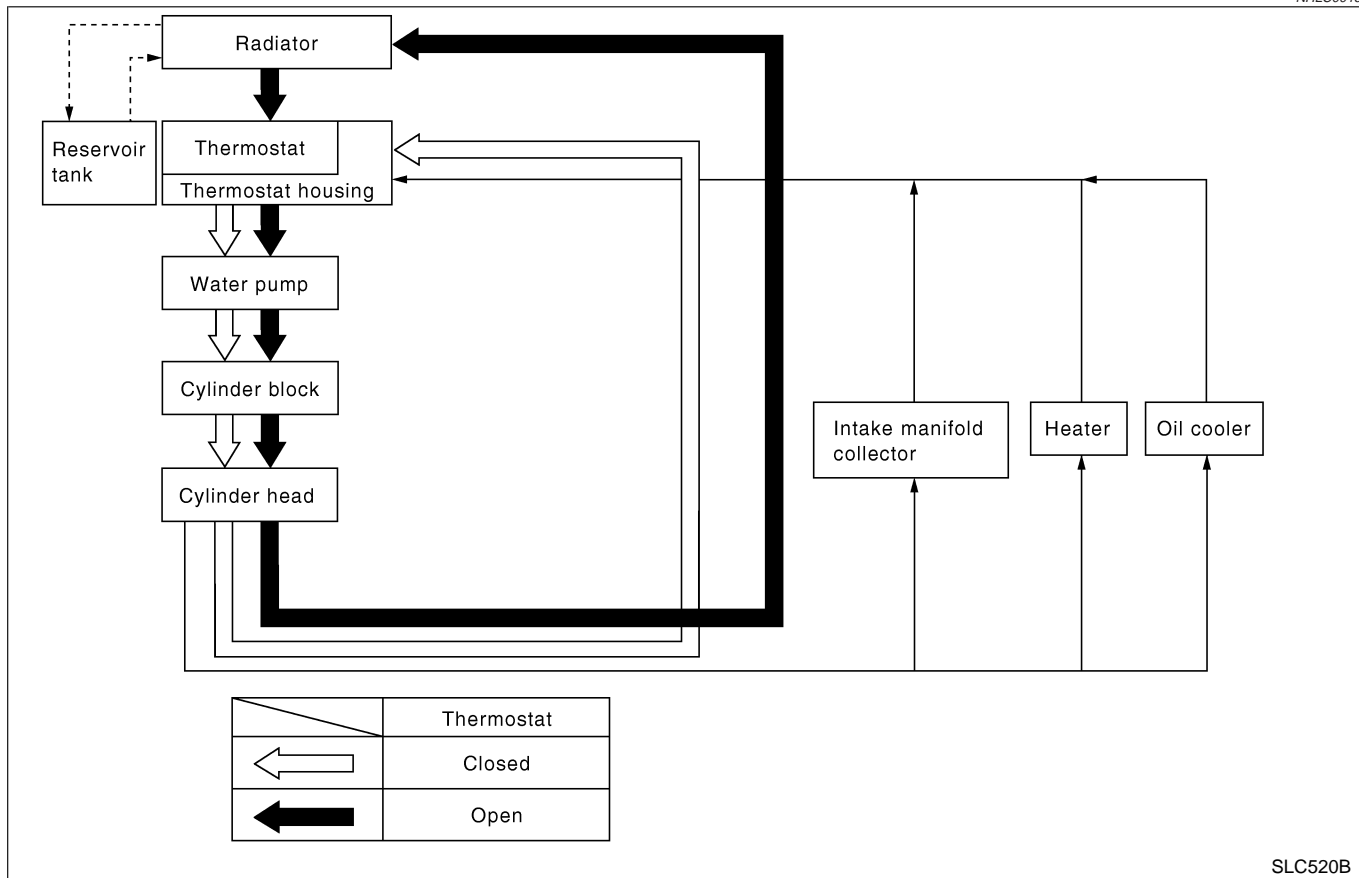
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# ENGINE COOLING SYSTEM

Cooling Circuit

## Cooling Circuit

NHLC0015



SLC520B

## System Check

NHLC0016

### **WARNING:**

Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around the cap and carefully remove it by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.

### **CHECKING COOLING SYSTEM HOSES**

NHLC0016S01

Check hoses for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

### **CHECKING RADIATOR**

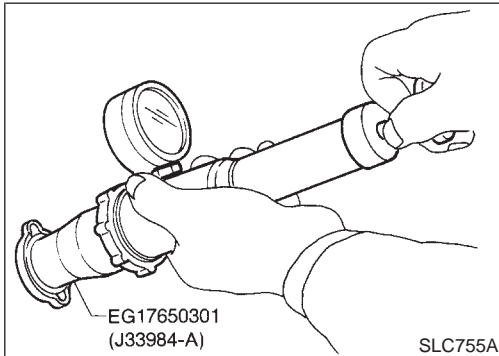
NHLC0016S02

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 downward.

2. Apply water again to all radiator core surfaces 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 (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.

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## CHECKING RADIATOR CAP

To check radiator cap, apply pressure to cap with a tester. NHLC0016S03

### Radiator cap relief pressure:

#### Standard

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

#### Limit

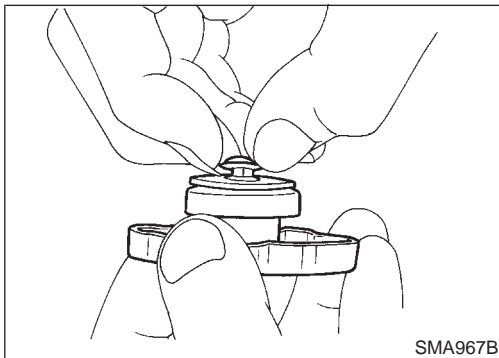
**59 kPa  
(0.6 kg/cm<sup>2</sup>, 9 psi)**

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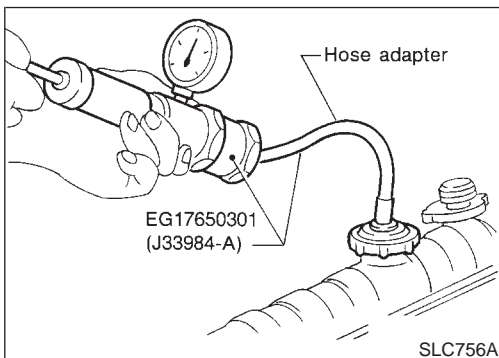
Pull the negative pressure valve to open it. Check that it closes completely when released.

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## CHECKING COOLING SYSTEM FOR LEAKS

To check for leakage, apply pressure to the cooling system with a tester. NHLC0016S04

### Testing pressure:

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

### CAUTION:

Higher than the specified pressure may cause radiator damage.

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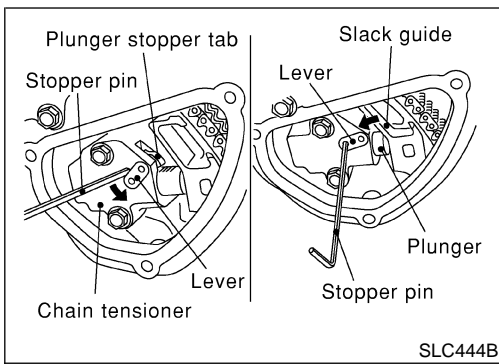
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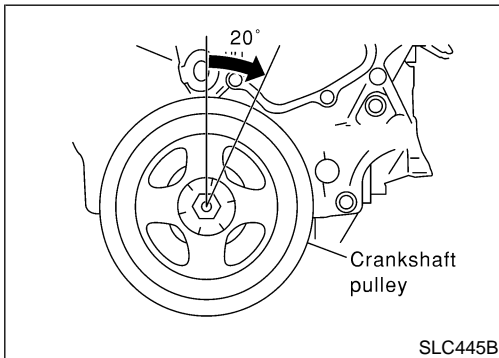


# ENGINE COOLING SYSTEM

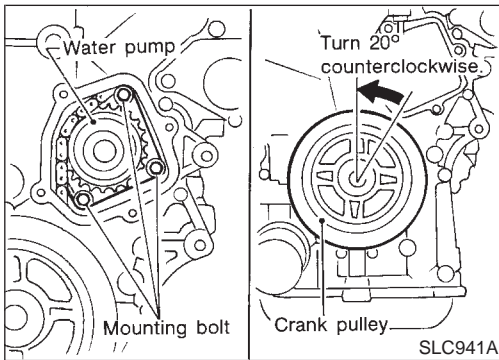
Water Pump (Cont'd)



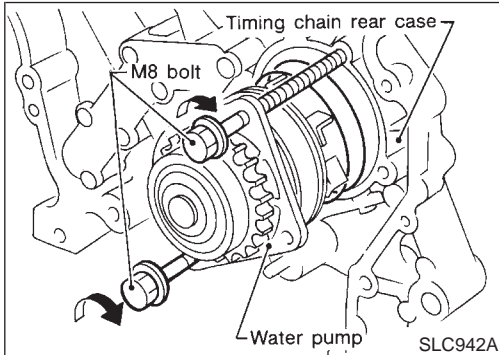
6. Pull lever down, and release plunger stopper tab.
  - Plunger stopper tab can be pushed up to release (coaxial structure with lever).
7. Insert stopper pin into tensioner body hole to fix lever, and keep the tab released.
8. Insert plunger into tensioner body by pressing slack guide.
9. Keep slack guide pressed, and fix it by pushing stopper pin through lever hole and body hole.
10. Turn crankshaft pulley approx. 20° clockwise so that the timing chain on the chain tensioner side is loose.
11. Remove chain tensioner.



**CAUTION:**  
Be careful not to drop mounting bolts inside chain case.



12. Remove the 3 water pump fixing bolts. Secure a gap between water pump gear and timing chain, by turning crankshaft pulley 20° backwards.



13. Put M8 bolts to two M8-threaded holes out of 3 water pump fixing bolt holes.

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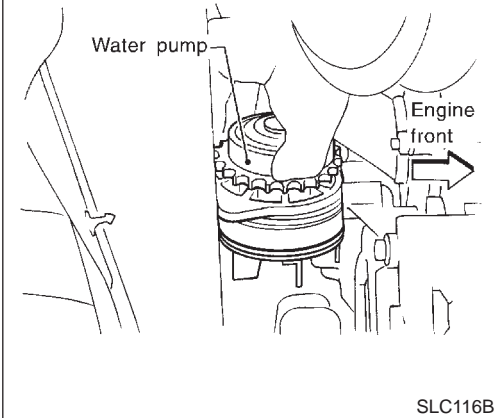
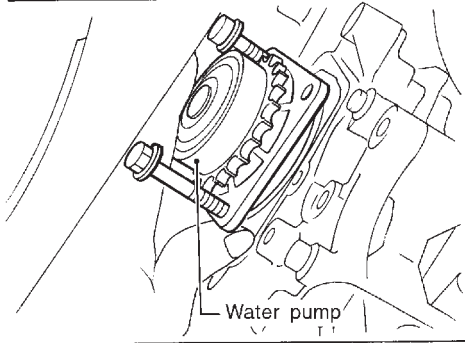
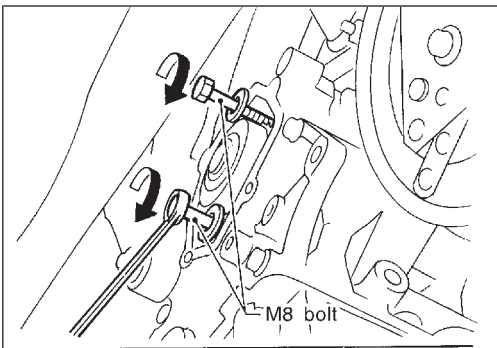
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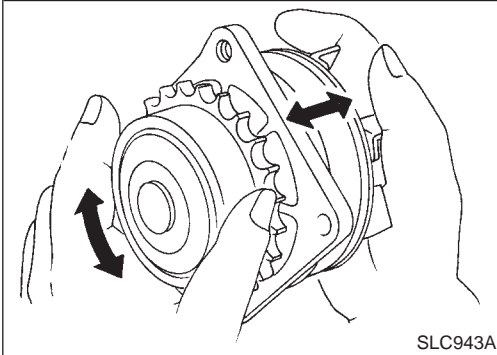
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# ENGINE COOLING SYSTEM

## Water Pump (Cont'd)



SLC116B



SLC943A

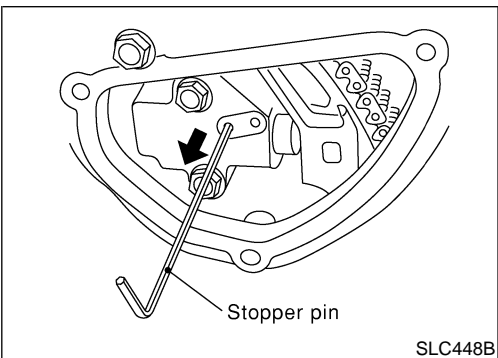
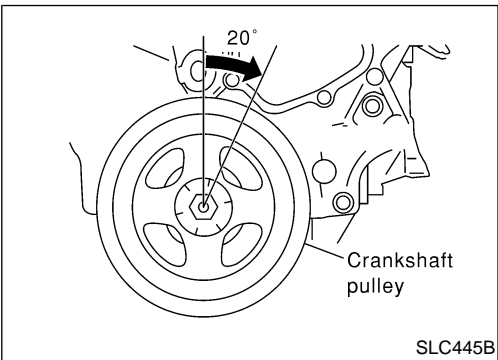
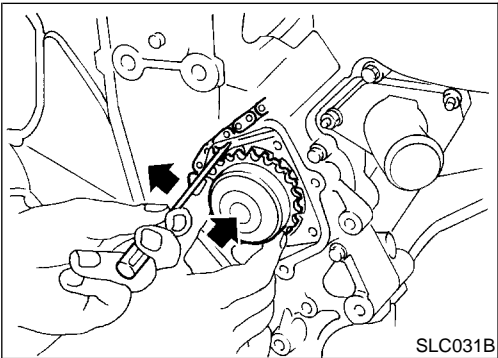
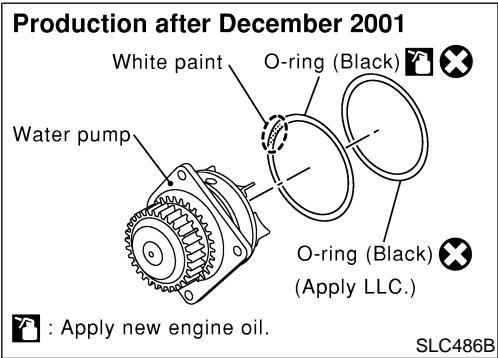
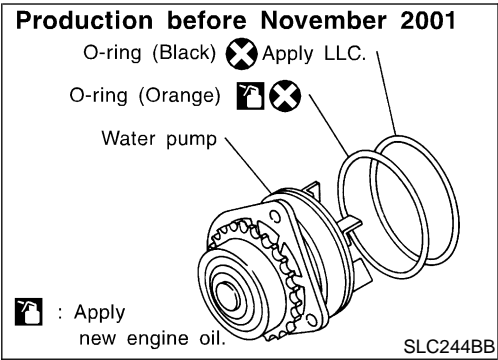
14. Tighten M8 bolts by turning half turn alternately until they reach timing chain rear case.
  - In order to prevent damages to water pump or timing chain rear case, do not tighten one bolt continuously. Always turn each bolt half turn each time.
15. Lift up water pump and remove it.
  - When lifting up water pump, do not allow water pump gear to hit timing chain.

### INSPECTION

1. Check for badly rusted or corroded body assembly.
2. Check for rough operation due to excessive end play.

NHLC0019





## INSTALLATION

1. Apply engine oil and coolant to O-rings as shown in the figure. <sup>=NHL C0020</sup>

- On models with two black O-rings, install the one with a white paint mark to the front side.

2. Install water pump.

- Do not allow cylinder block to nip O-rings when installing water pump.**

3. Return the crankshaft pulley to its original position by turning it 20° forward.

4. Install timing chain tensioner, then remove the stopper pin.

- When installing the timing chain tensioner, engine oil should be applied to the oil hole and tensioner.**

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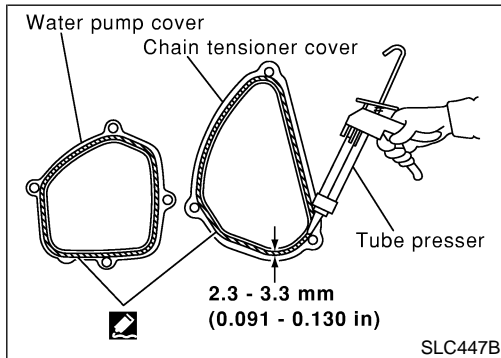
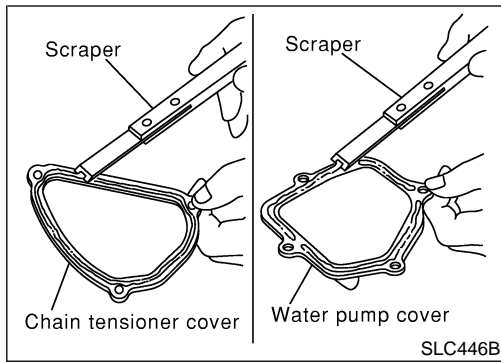
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# ENGINE COOLING SYSTEM

## Water Pump (Cont'd)

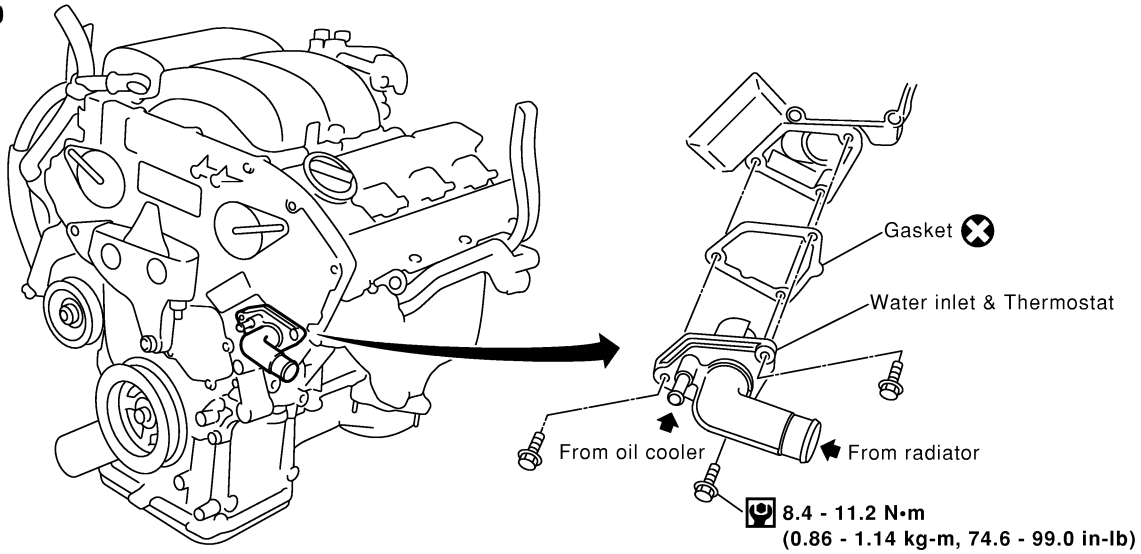


5. Install chain tensioner cover and water pump cover.
  - a. Before installing, remove all traces of liquid gasket from mating surface of water pump cover and chain tensioner cover using a scraper. Also remove traces of liquid gasket from mating surface of front cover.
  - b. Apply a continuous bead of liquid gasket to mating surface of chain tensioner cover and water pump cover.
6. Install drain plug on cylinder block.
7. Reinstall any parts removed in reverse order of removal.
  - **After starting engine, let idle for three minutes, then rev engine up to 3,000 rpm under no load to purge air from the high-pressure chamber of the chain tensioners. The engine may produce a rattling noise. This indicates that air still remains in the chamber and is not a matter of concern.**

## Thermostat REMOVAL AND INSTALLATION

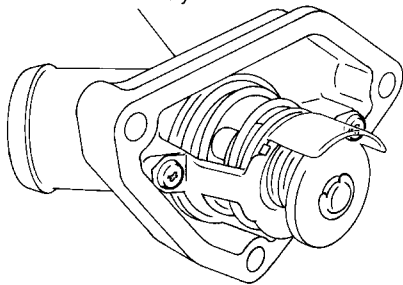
=NHLC0021

SEC. 210



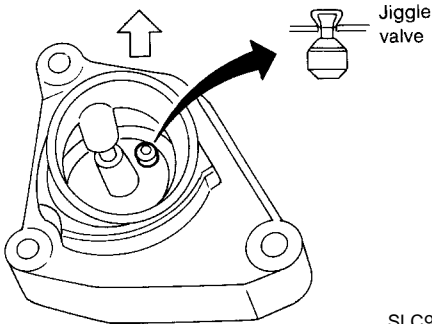
SLC449B

Thermostat assembly



SLC962AA

UP



SLC948A

1. Drain coolant from drain plugs on radiator and both sides of cylinder block.
2. Remove drive belts and idler pulley bracket.
3. Remove water pump drain plug on pump side of cylinder block.
4. Remove lower radiator hose.
5. Remove water inlet and thermostat assembly.
  - **Do not disassemble water inlet and thermostat. Replace them as a unit, if necessary.**
6. Install thermostat with jiggle valve facing upward.
  - **After installation, run engine for a few minutes, and check for leaks.**
  - **Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.**

### INSPECTION

NHLC0022

1. Check valve seating condition at ordinary room temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.

	Standard
Valve opening temperature	82°C (180°F)
Valve lift	More than 8.6 mm/95°C (0.339 in/203°F)

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SLC949A

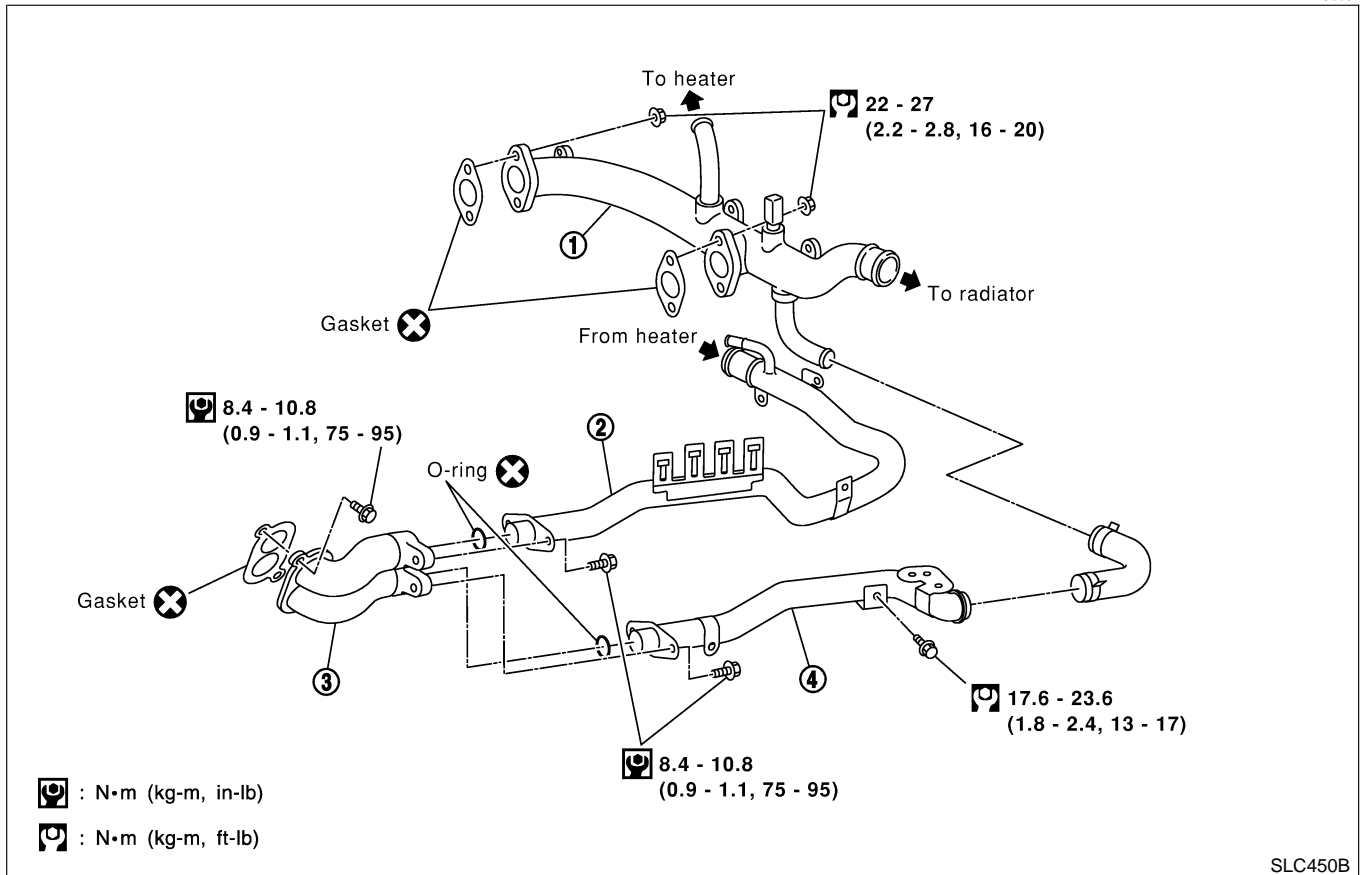
# ENGINE COOLING SYSTEM

Thermostat (Cont'd)

3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

## Water Outlet and Water Piping REMOVAL AND INSTALLATION

NHLC0032



1. Water outlet
2. Heater pipe

3. Water connector

4. Water bypass pipe

1. Drain coolant from drain plugs on radiator and both sides of cylinder block.
2. Remove water connector, heater pipe and water bypass pipe.
3. Install in the reverse order of removal.
  - **After installation, run engine for a few minutes, and check for leaks.**
  - **Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.**

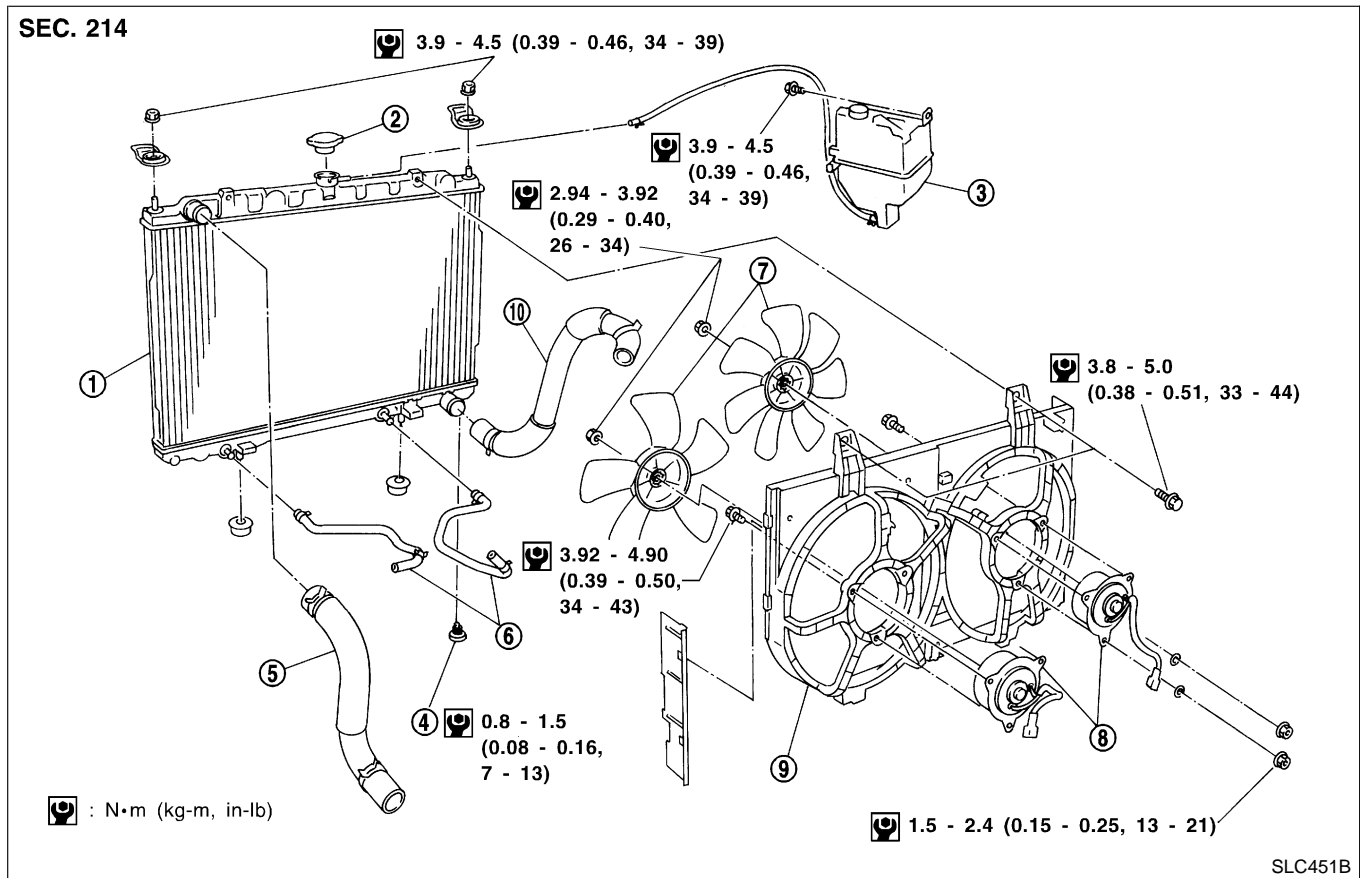
## Radiator

### REMOVAL AND INSTALLATION

=NHLCO023

1. Remove under cover.
2. Drain coolant from radiator.
3. Disconnect radiator upper and lower hoses.
4. Remove radiator shroud.
5. Remove A/T oil cooler hoses.
6. Disconnect reservoir tank hose.
7. Remove radiator mounting bracket.
8. Remove radiator.
9. After repairing or replacing radiator, install any part removed in reverse order of removal.

**When filling radiator with coolant, refer to MA-14, "Changing Engine Coolant".**



- |                        |                        |                         |
|------------------------|------------------------|-------------------------|
| 1. Radiator            | 5. Upper radiator hose | 8. Cooling fan motors   |
| 2. Radiator filler cap | 6. Oil cooler hoses    | 9. Radiator shroud      |
| 3. Reservoir tank      | 7. Cooling fans        | 10. Lower radiator hose |
| 4. Radiator drain cock |                        |                         |

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# ENGINE COOLING SYSTEM

## Cooling Fan Control System

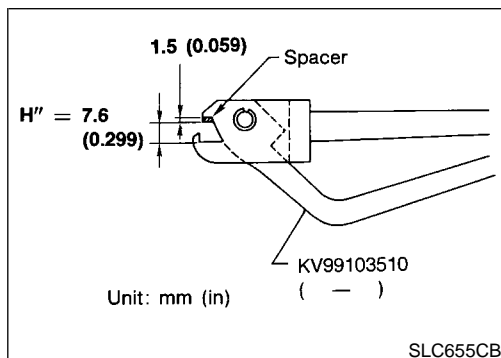
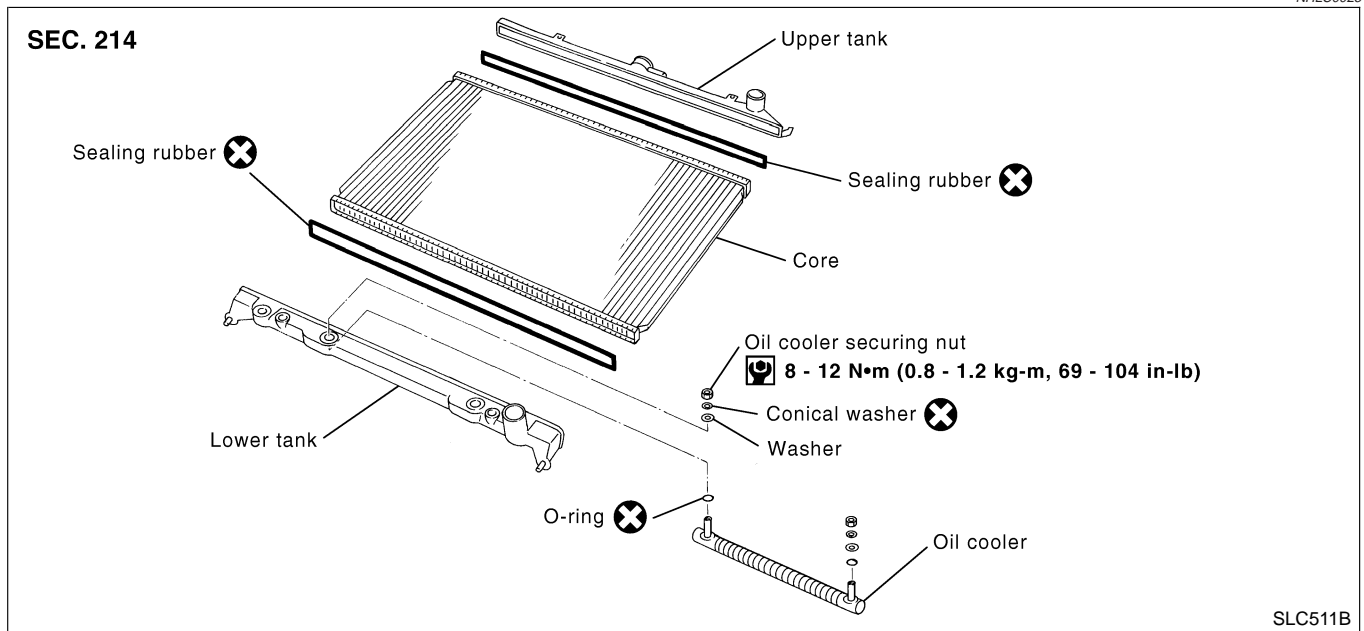
Cooling fans are controlled by ECM. For details, refer to EC-524. <sup>NHLC0024</sup>

## Refilling Engine Coolant

For details on refilling engine coolant, refer to MA-15, "REFILLING ENGINE COOLANT". <sup>NHLC0034</sup>

## Radiator (Aluminum type) PREPARATION

NHLC0025

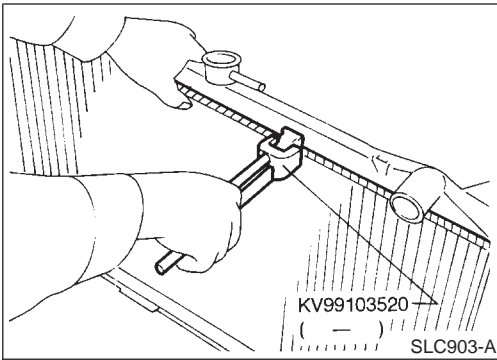


1. Attach the spacer to the tip of the radiator plate pliers A. Spacer specification: 1.5 mm (0.059 in) thick x 18 mm (0.71 in) wide x 8.5 mm (0.335 in) long.
2. Make sure that when radiator plate pliers A are closed dimension H'' is approx. 7.6 mm (0.299 in).
3. Adjust dimension H'' with the spacer,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

# ENGINE COOLING SYSTEM

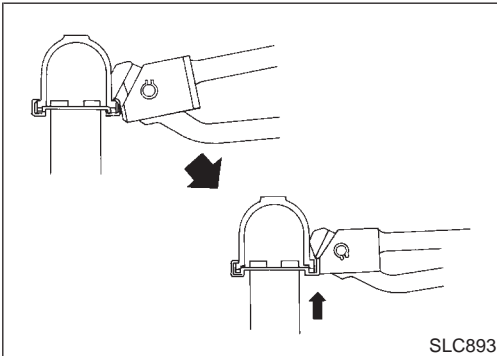
Radiator (Aluminum type) (Cont'd)

NHLC0026



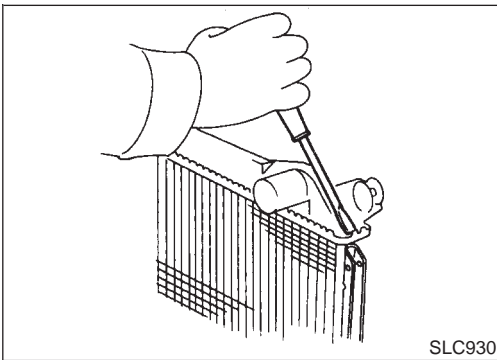
## DISASSEMBLY

1. Remove upper and lower tanks with Tool.



- Grip the crimped edge and bend it upwards so that Tool slips off.

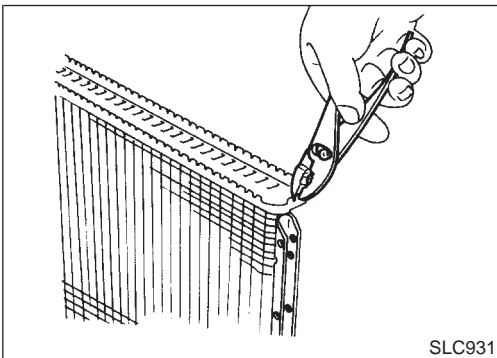
**Do not bend excessively.**



- In areas where Tool cannot be used, use a screwdriver to bend the edge up.

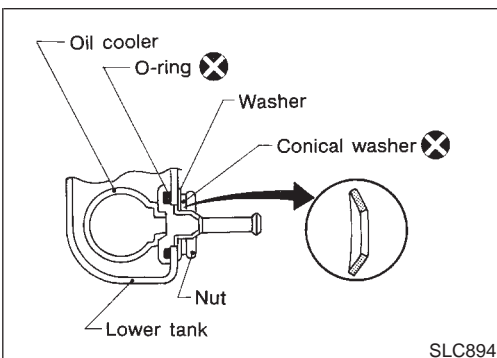
**Be careful not to damage tank.**

2. Remove sealing rubbers.



3. Make sure the edge stands straight up.

4. Remove oil cooler from tank.



## ASSEMBLY

1. Install oil cooler.

**Pay attention to direction of conical washer.**

NHLC0027

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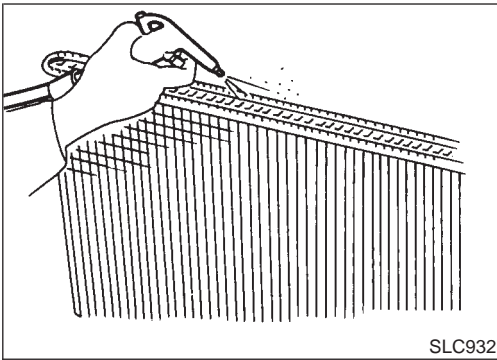
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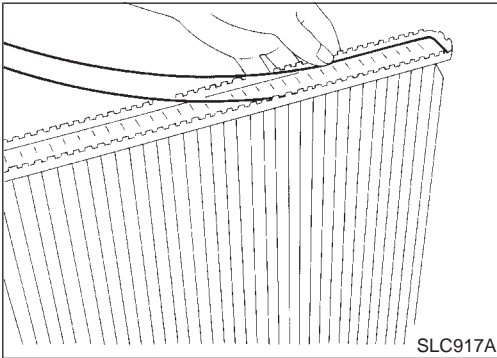
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# ENGINE COOLING SYSTEM

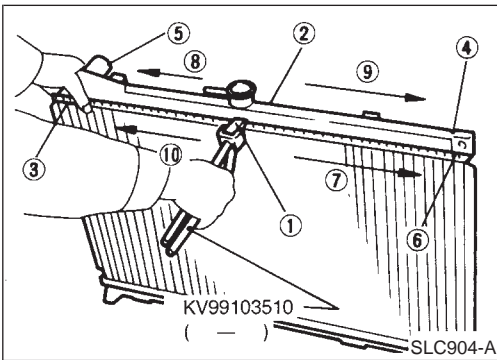
Radiator (Aluminum type) (Cont'd)



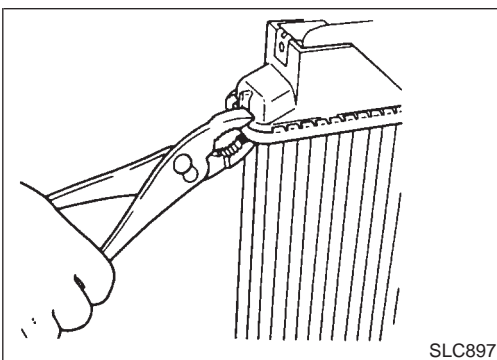
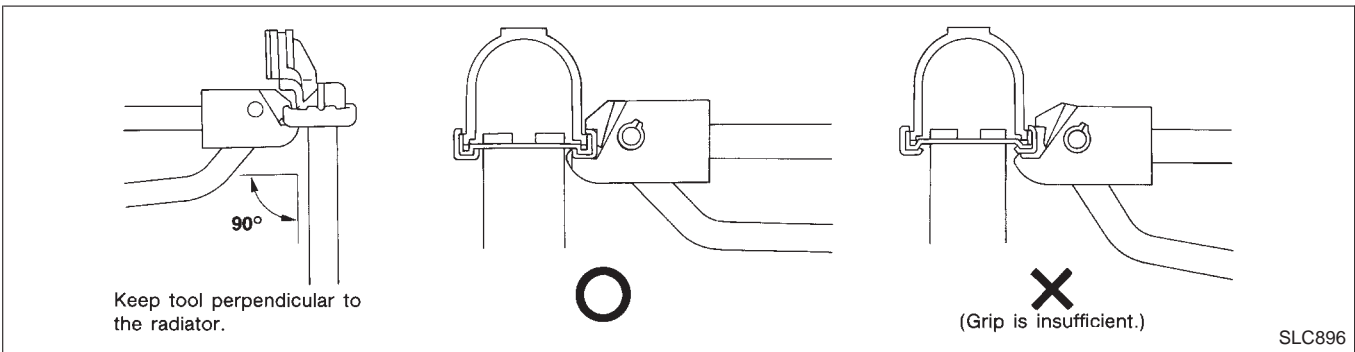
2. Clean contact portion of tank.



3. Install sealing rubber.  
**Push it in with fingers.**  
**Be careful not to twist sealing rubber.**



4. Caulk tank in specified sequence with Tool.

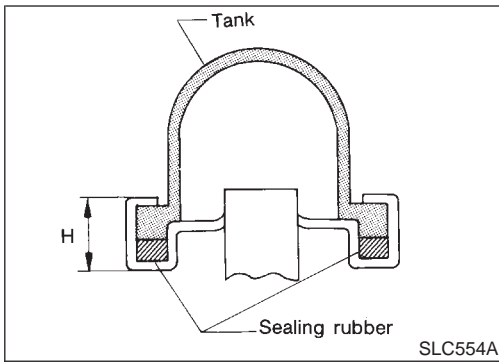


- Use pliers in the locations where Tool cannot be used.



# ENGINE COOLING SYSTEM

Radiator (Aluminum type) (Cont'd)



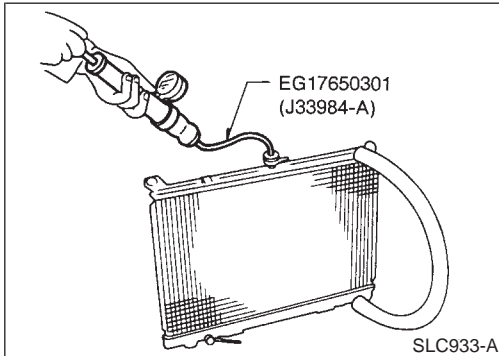
5. Make sure that the rim is completely crimped down.

**Standard height "H":**

**8.0 - 8.4 mm (0.315 - 0.331 in)**

6. Confirm that there is no leakage.

**Refer to Inspection.**



## INSPECTION

1. Apply pressure with Tool.

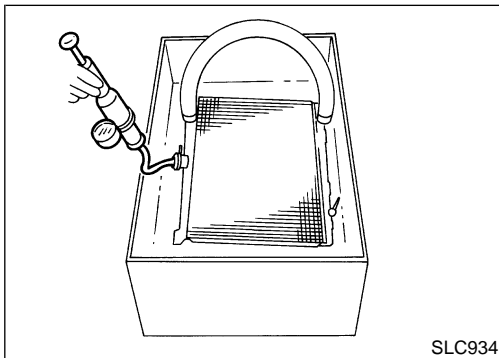
**Specified pressure value:**

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

### **WARNING:**

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

Attach a hose to the oil cooler to seal its inlet and outlet.



2. Check for leakage by soaking radiator in water container.

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# ENGINE COOLING SYSTEM

Overheating Cause Analysis

## Overheating Cause Analysis

NHLC0029

	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 P1217 in EC section.	—	
		High resistance to fan rotation	Fan assembly		
		Damaged fan blades			
		Damaged radiator shroud	—	—	
		Improper coolant mixture ratio	—	—	
		Poor coolant quality	—	Coolant density	—
	Insufficient coolant	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			

# ENGINE COOLING SYSTEM

Overheating Cause Analysis (Cont'd)

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

## Service Data and Specifications (SDS)

### THERMOSTAT

NHLC0030

Valve opening temperature	82°C (180°F)	BT
Valve lift	More than 8.6 mm/95°C (0.339 in/203°F)	HA

### RADIATOR

NHLC0031  
Unit: kPa (kg/cm<sup>2</sup>, psi)

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

## NOTES