

# ENGINE LUBRICATION & COOLING SYSTEMS

## SECTION LC

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EM  
LC  
EF & EC  
FE  
CL  
MT  
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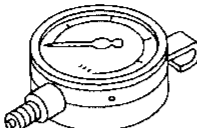
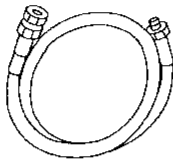
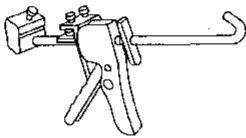
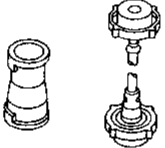
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# PREPARATION AND PRECAUTIONS

## Special Service Tools

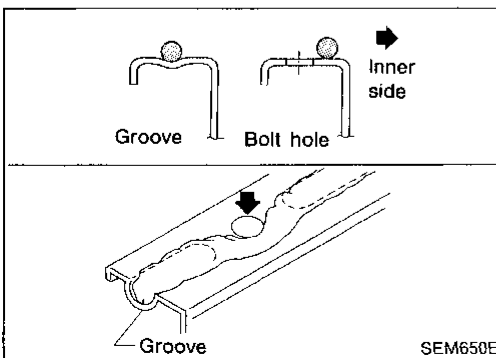
Tool number (Kent-Moore No.) Tool name	Description	Engine application	
		VG	VE
ST25051001 (J25695-1) Oil pressure gauge	 NT050	X	X
ST25052000 (J25695-2) Hose	 NT051	X	X
WS39930000 ( — ) Tube pressure	 NT052	X	X
EG17650301 (J33984-A) Radiator cap tester adapter	 NT053	X	X

## The Supplemental Restraint System "AIR BAG"

The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), sensors, a diagnosis unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **BF** section of this Service Manual.

### WARNING:

- To avoid rendering the SRS inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".



## Liquid Gasket Application Procedure

- Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.
- Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
  - Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (for oil pan).
  - Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).

## PREPARATION AND PRECAUTIONS

### Liquid Gasket Application Procedure (Cont'd)

- c. Apply liquid gasket to inner surface around hole perimeter area.  
(Assembly should be done within 5 minutes after coating.)
- d. Wait at least 30 minutes before refilling engine oil and engine coolant.

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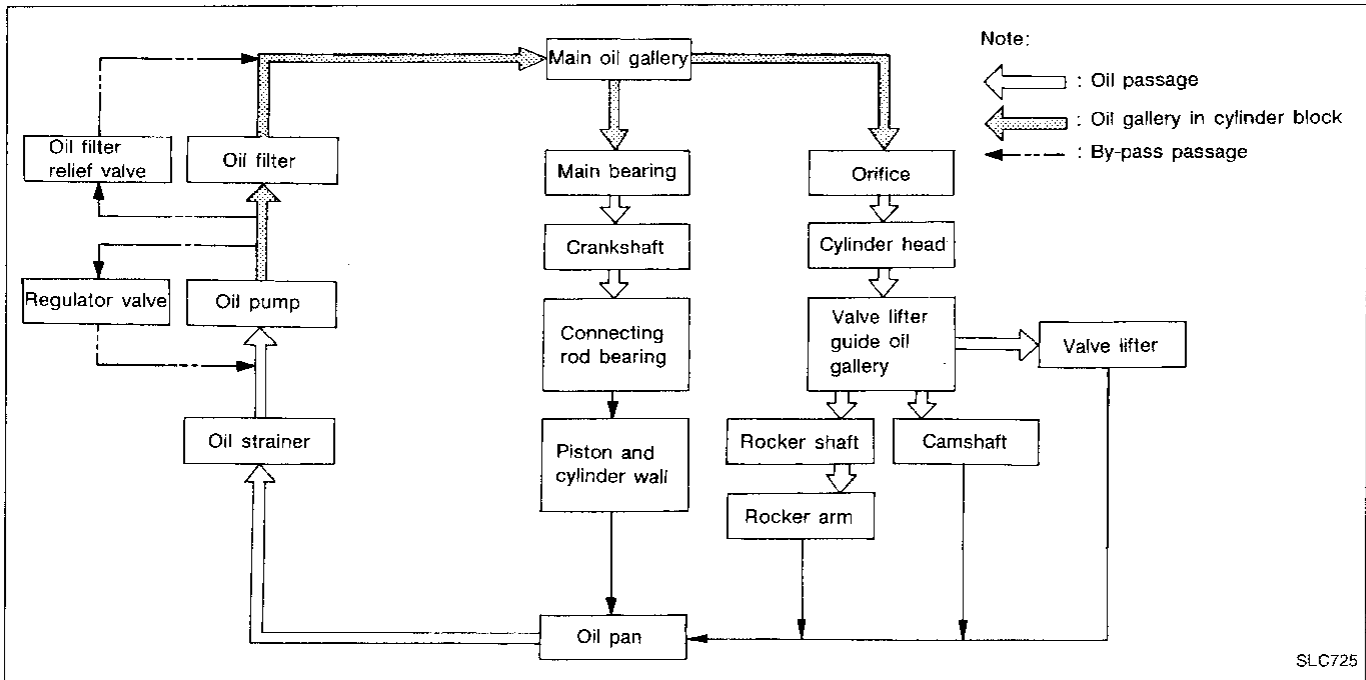
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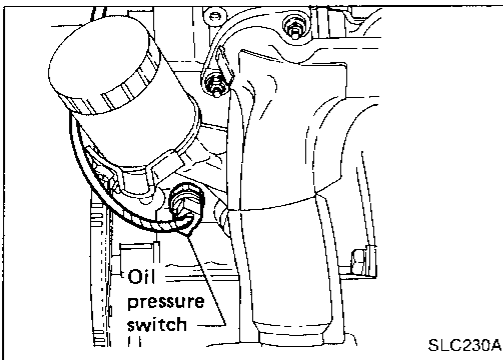
EL

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Lubrication Circuit



SLC725



SLC230A

Oil Pressure Check

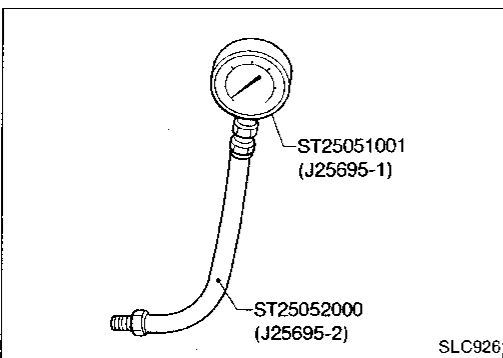
WARNING:

- Be careful not to burn yourself, as the engine and oil may be hot.
  - Oil pressure check should be done in "Neutral 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 3,200	More than 59 (0.6, 9) 363 - 451 (3.7 - 4.6, 53 - 65)

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

6. Install oil pressure switch with sealant.

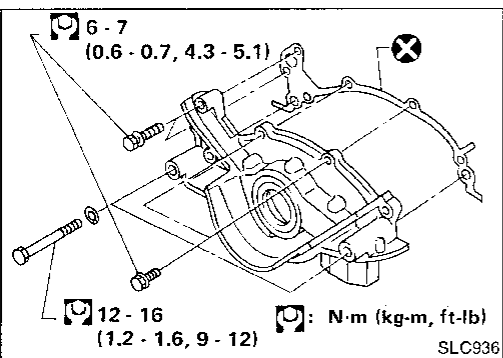


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Oil Pump

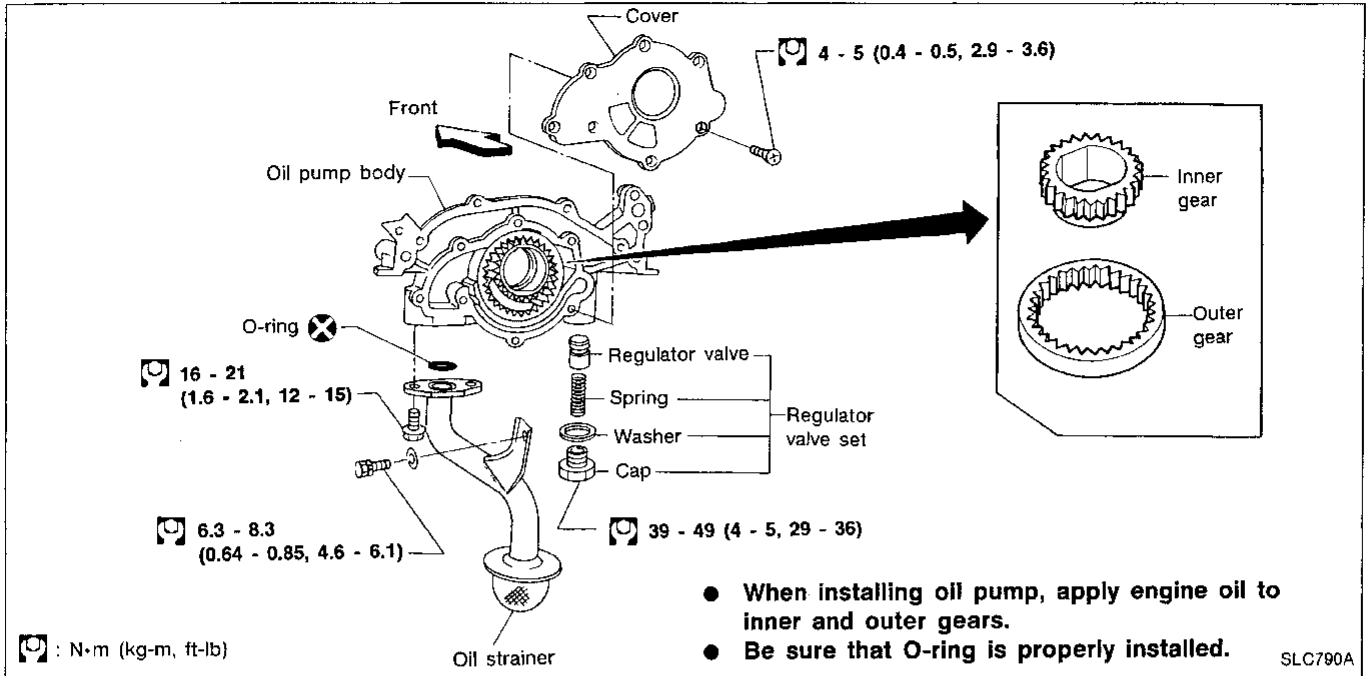
REMOVAL

1. Drain oil.
2. Remove oil pan.
3. Remove oil pump assembly.



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Oil Pump (Cont'd)  
DISASSEMBLY AND ASSEMBLY



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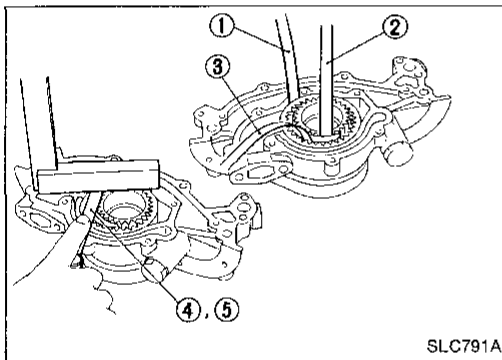
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INSPECTION

Check the clearances with a feeler gauge. If any clearance exceeds the limit, replace gear set or entire oil pump assembly.

Standard clearance:

Unit: mm (in)

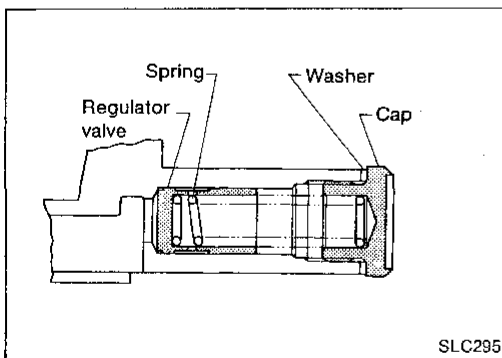
Body to outer gear clearance ①	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Housing to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)

MT

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REGULATOR VALVE INSPECTION

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 and check to make sure that it falls smoothly into the valve hole by its own weight.

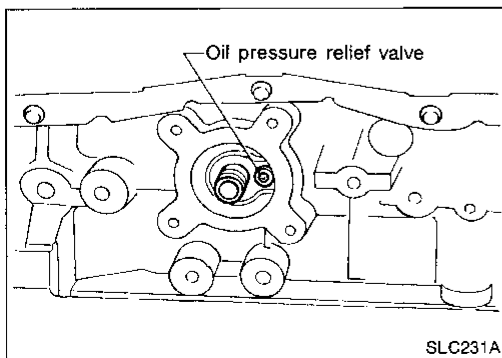
If damaged, replace regulator valve set or oil pump assembly.

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OIL PRESSURE RELIEF VALVE INSPECTION

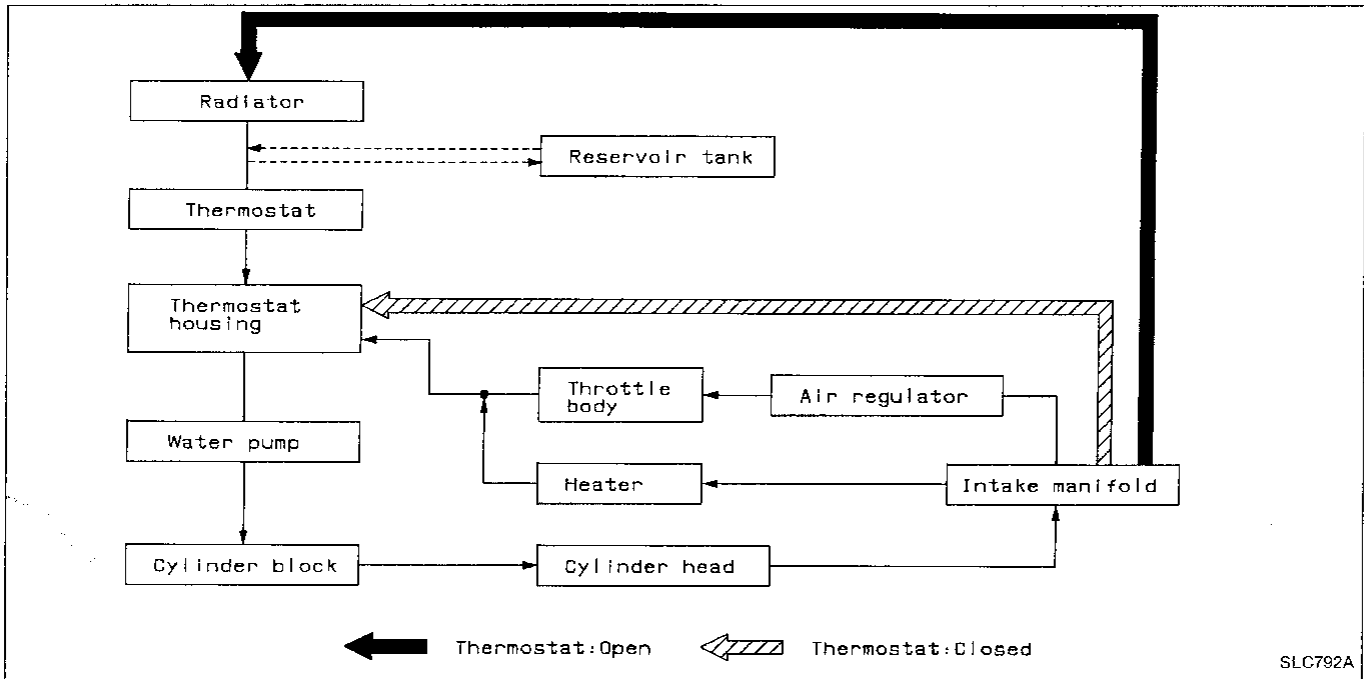
Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with a suitable tool.

Install a new valve by tapping it in place.

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Cooling Circuit



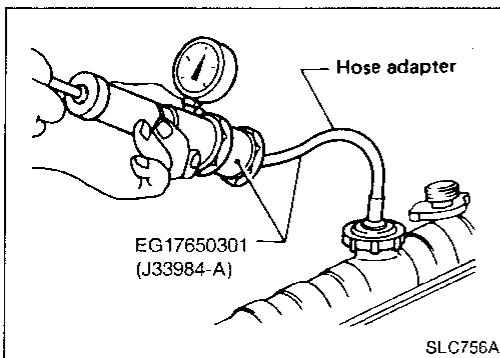
System Check

**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 by turning it a quarter turn to allow built-up pressure to escape. Then continue to turn the cap until it can be removed safely.

CHECKING COOLING SYSTEM HOSES

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

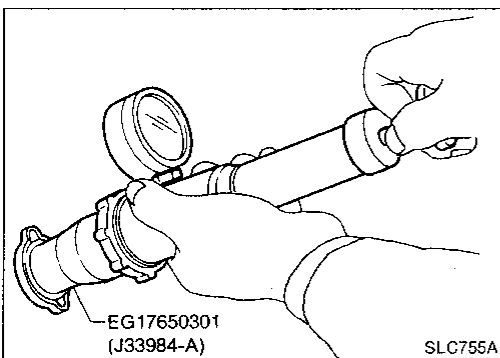


CHECKING COOLING SYSTEM FOR LEAKS

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

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

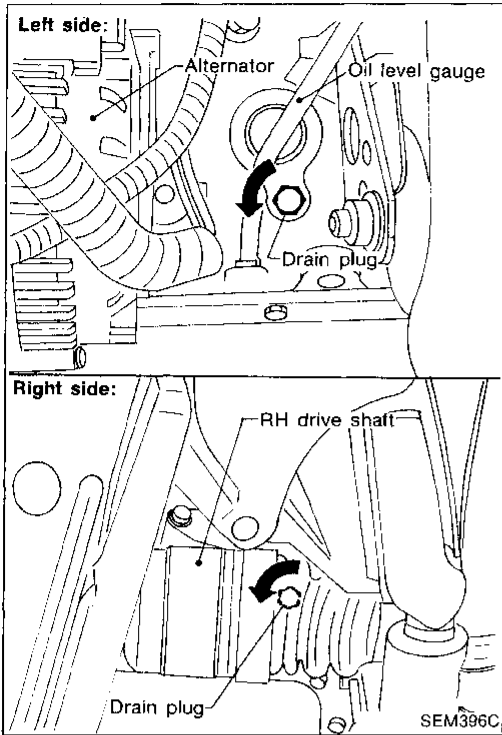
**CAUTION:**  
Higher than the specified pressure may cause radiator damage.



CHECKING RADIATOR CAP

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

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



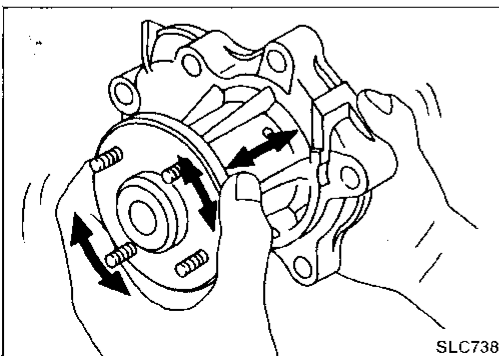
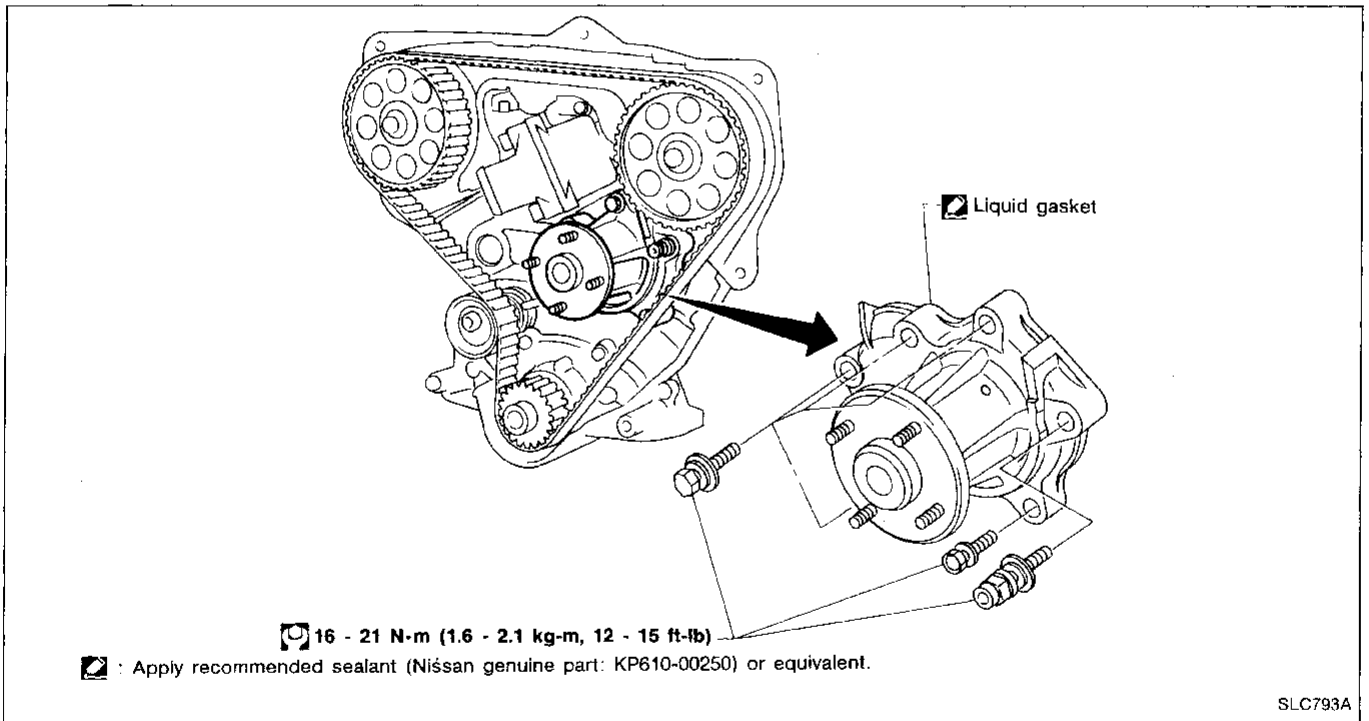
**Water Pump**

**REMOVAL AND INSTALLATION**

Drain coolant from drain cocks on both sides of cylinder block and radiator.

**CAUTION:**

- When removing water pump assembly, be careful not to get coolant on timing belt.
- Water pump cannot be disassembled and should be replaced as a unit.
- To avoid damaging timing cover, make sure there is adequate clearance between it and the hose clamp.
- After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.



**INSPECTION**

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

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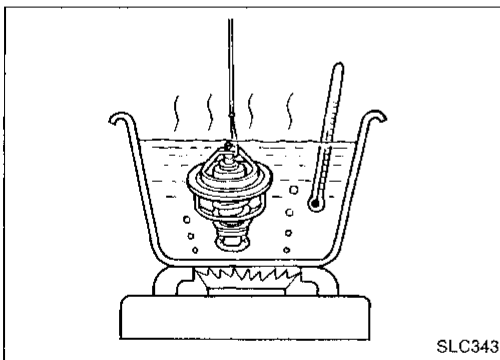
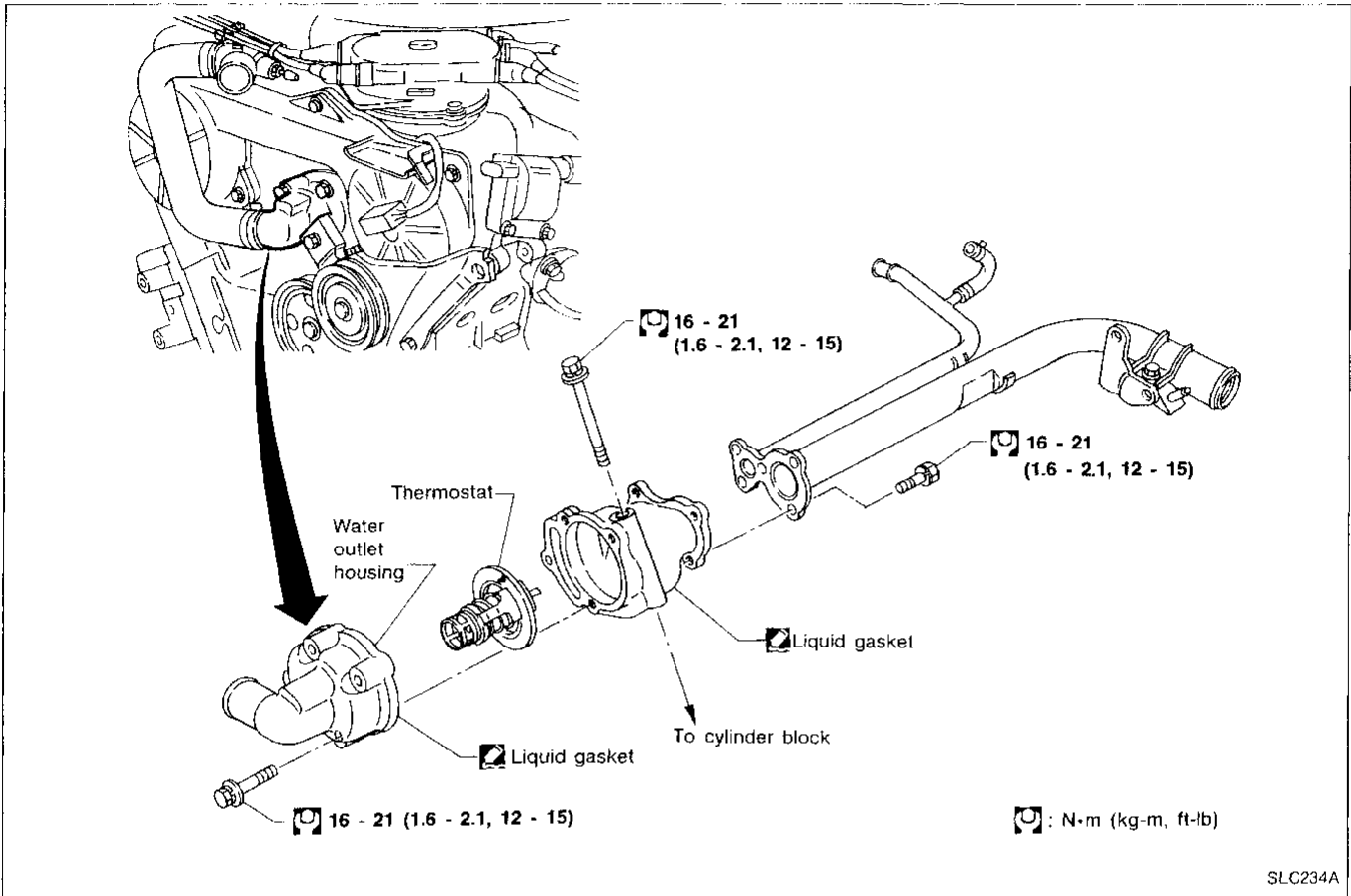
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**Thermostat**

**INSPECTION**

1. Check valve seating condition at ordinary room temperatures. It should seat tightly.



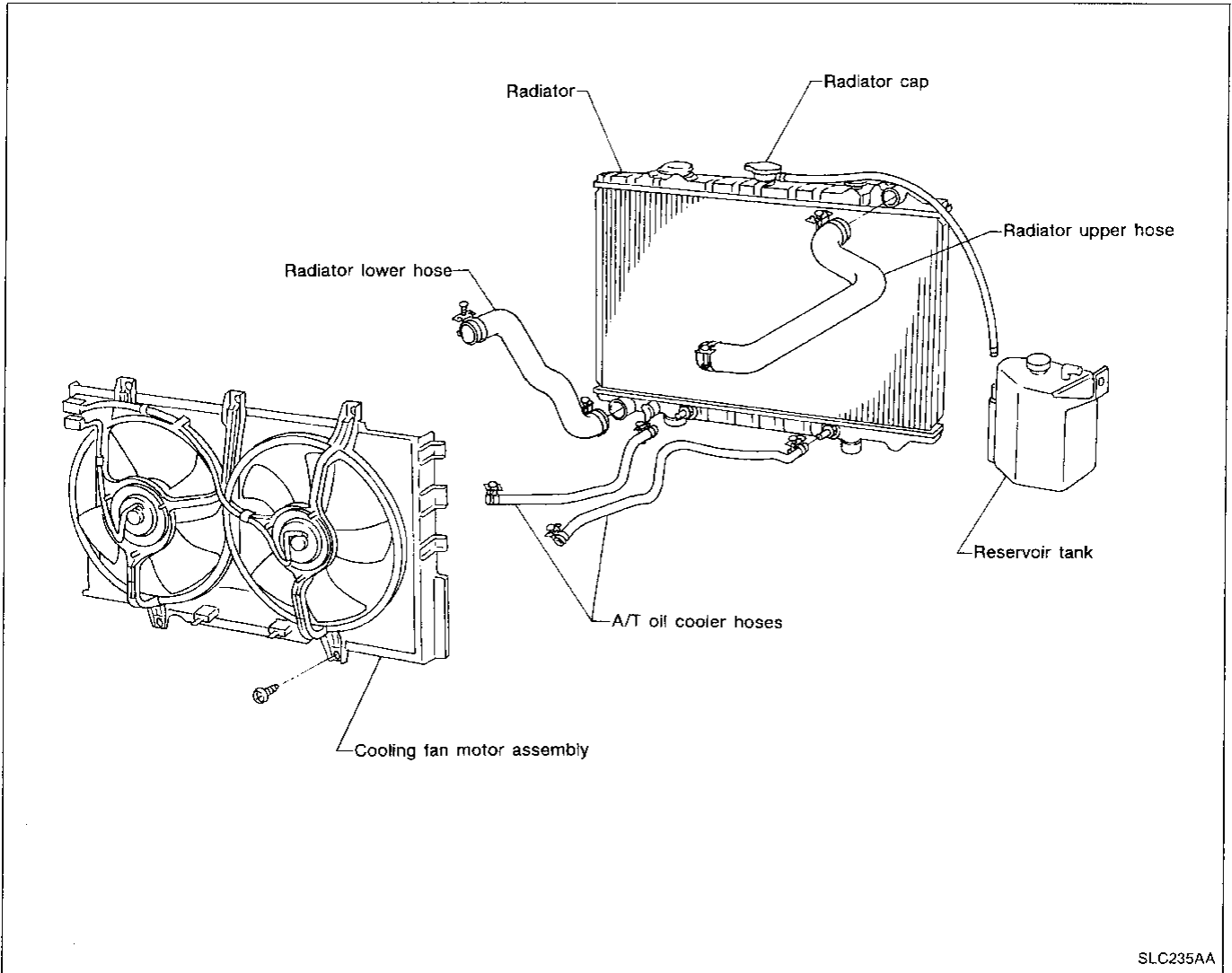
2. Check valve opening temperature and maximum valve lift.

	Standard
Valve opening temperature °C (°F)	82 (180)
Maximum valve lift mm/°C (in/°F)	10/95 (0.39/203)

3. Then check if valve is 5°C (9°F) below valve opening temperature.
  - 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**



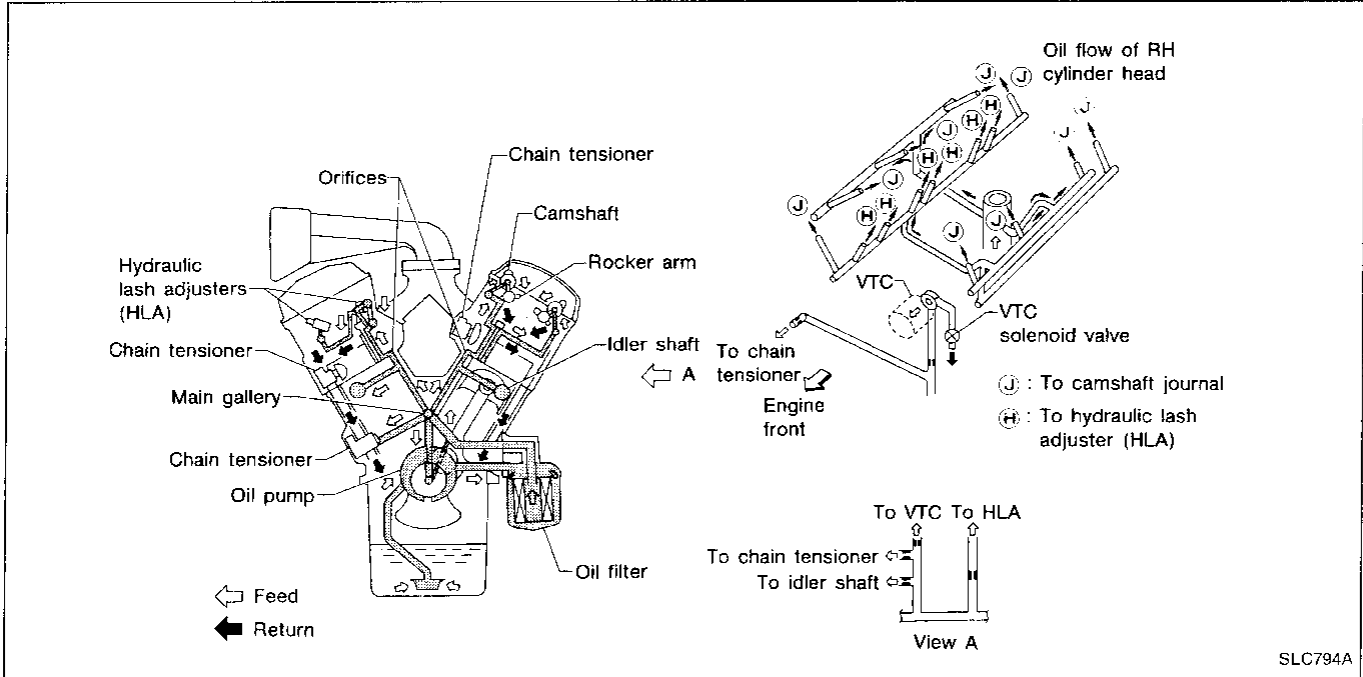
SLC235AA

**Cooling Fan Control System**

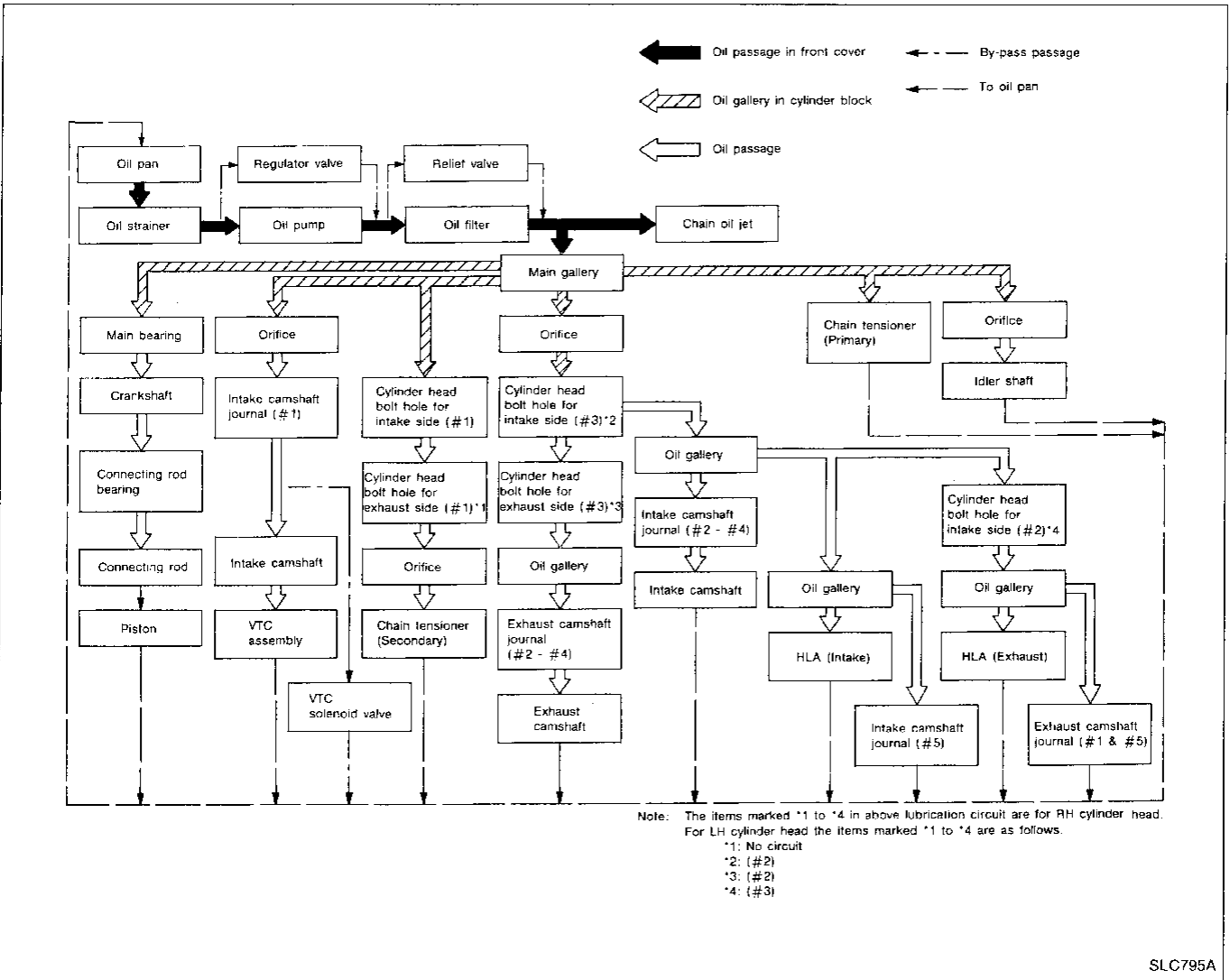
Cooling fans are controlled by ECM (ECCS control module).  
For details, refer to EF & EC section.

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Lubrication Circuit



SLC794A



SLC795A

**Oil Pressure Check**

**WARNING:**

- Be careful not to burn yourself, as the engine and oil may be hot.
- Oil pressure check should be done in "Neutral position".

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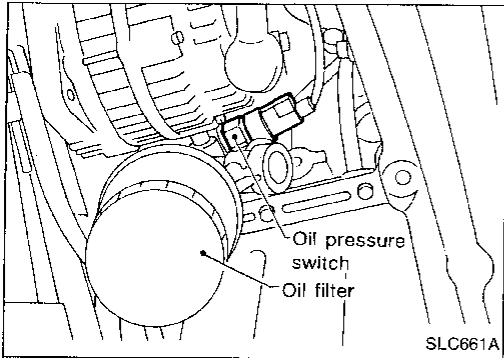
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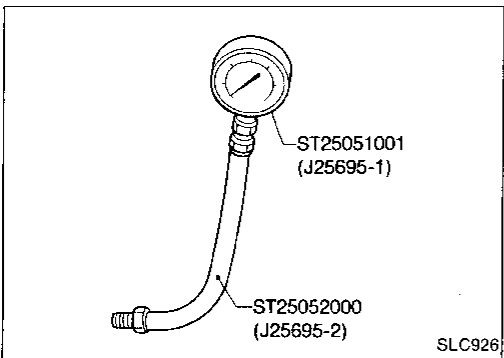
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1. Check oil level.
2. Remove oil pressure switch.



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 3,000	More than 59 (0.6, 9) 412 - 510 (4.2 - 5.2, 60 - 74)

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

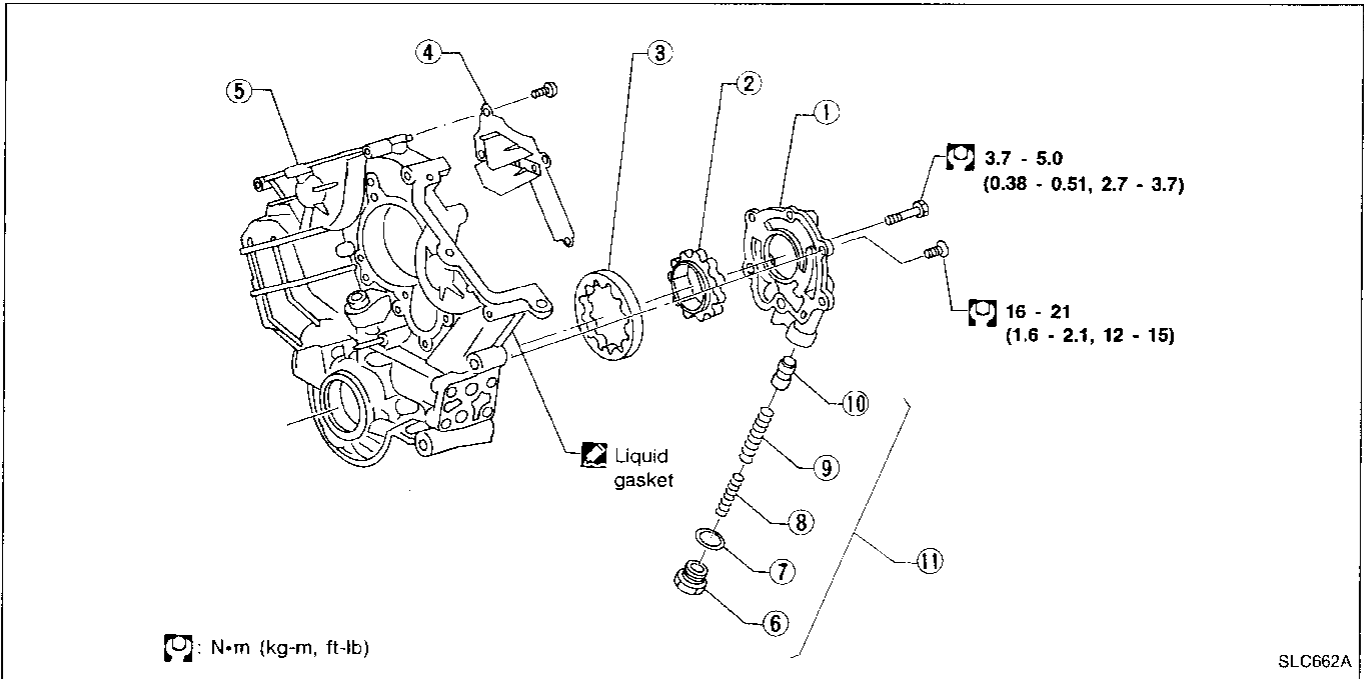
6. Install oil pressure switch with sealant.

**Oil Pump**

**REMOVAL AND INSTALLATION**

1. Drain engine oil.
2. Remove drive belts.
3. Remove cylinder head. (Refer to "Removal" of "CYLINDER HEAD" in EM section.)
4. Remove oil pans. (Refer to "Removal" of "OIL PAN" in EM section.)
5. Remove oil strainer.
6. Remove front cover assembly.
7. Install front cover assembly.
8. Reinstall any parts removed in reverse order of removal.

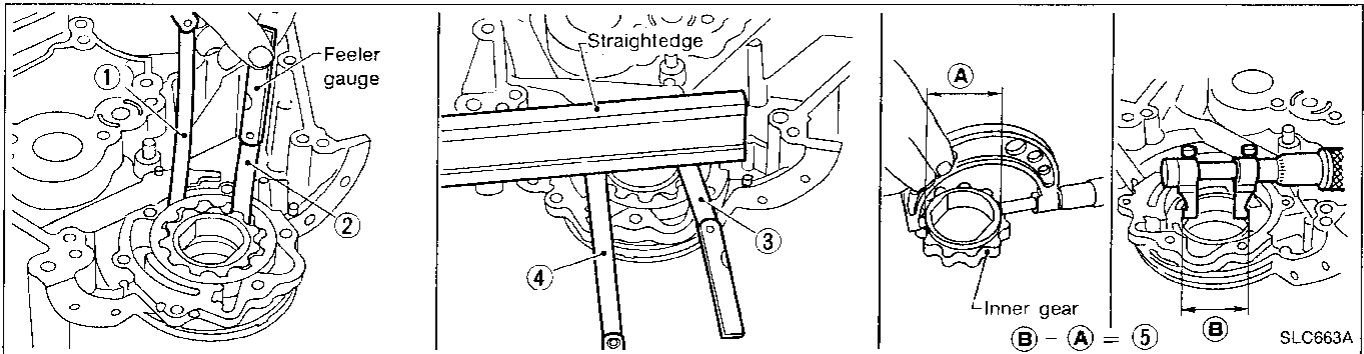
Oil Pump (Cont'd)  
DISASSEMBLY AND ASSEMBLY



- ① Oil pump cover
- ② Inner gear
- ③ Outer gear
- ④ Oil separator
- ⑤ Front cover
- ⑥ Plug
- ⑦ Washer
- ⑧ Spring
- ⑨ Spring
- ⑩ Regulator valve
- ⑪ Regulator valve set

● When installing oil pump, apply engine oil to gears.

OIL PUMP INSPECTION



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

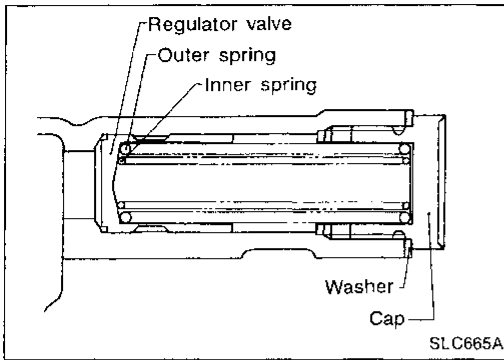
Unit: mm (in)

Body to outer gear clearance ①	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance ②	Below 0.18 (0.0071)
Body to inner gear clearance ③	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance ④	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance ⑤	0.045 - 0.091 (0.0018 - 0.0036)

- If the tip clearance (②) exceeds the limit, replace gear set.
- If body to gear clearances (①, ③, ④, ⑤) exceed the limit, replace front cover assembly.

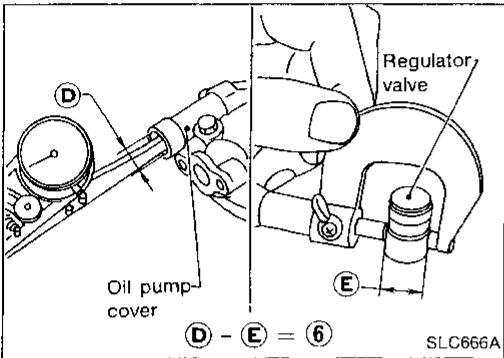
Oil Pump (Cont'd)

REGULATOR VALVE INSPECTION



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 and check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump cover.



4. Check regulator valve to oil pump cover clearance.

Clearance:

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

If it exceeds the limit, replace oil pump cover.

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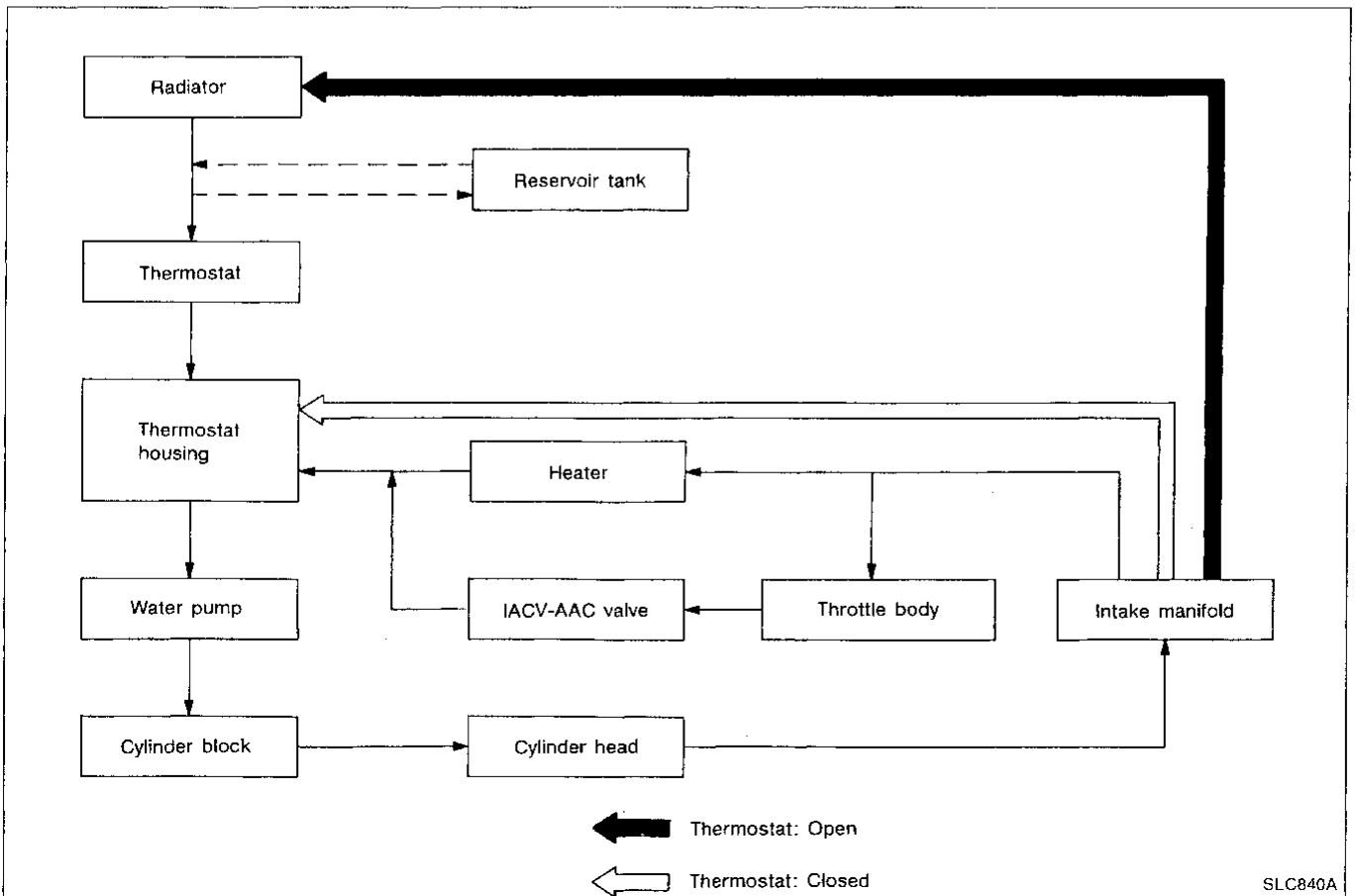
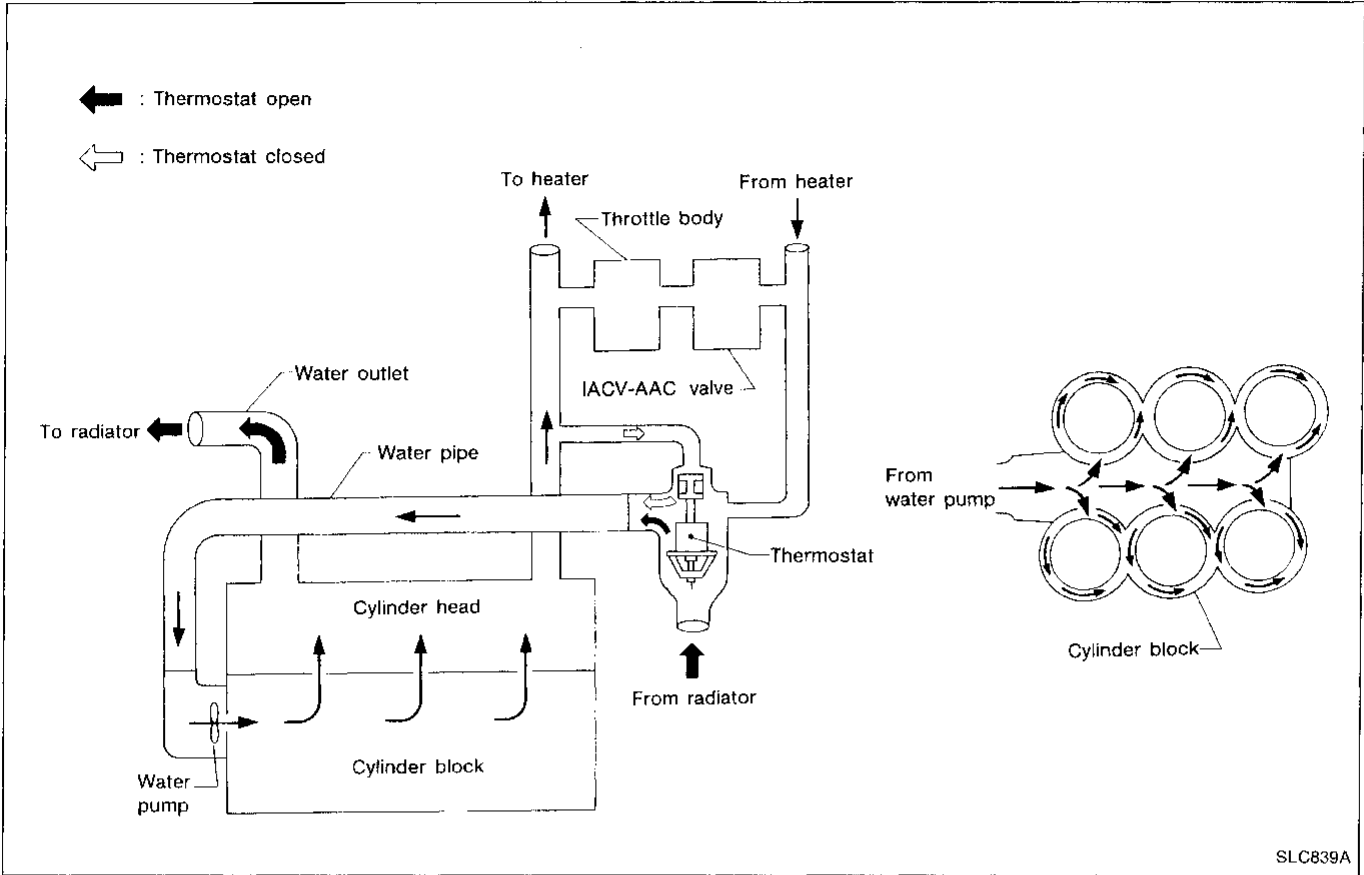
BF

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Cooling Circuit



## System Check

### 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

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

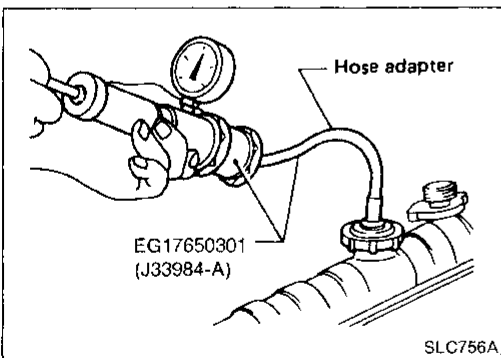
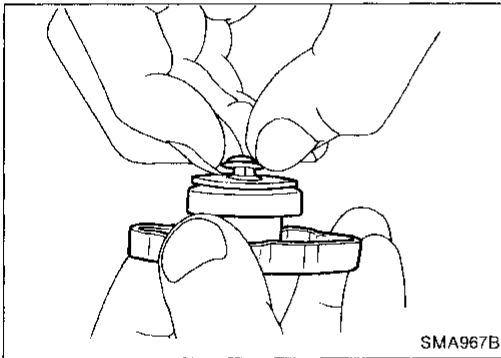
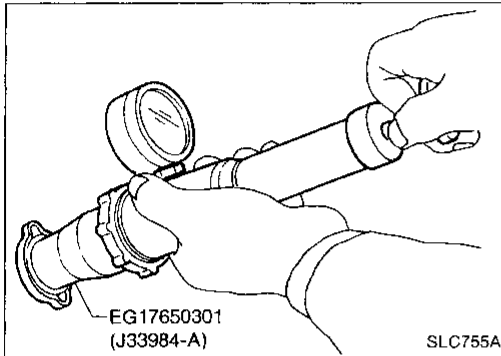
### CHECKING RADIATOR CAP

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

#### Radiator cap relief pressure:

78 - 98 kPa

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



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

### CHECKING COOLING SYSTEM FOR LEAKS

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

#### Testing pressure:

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

### CAUTION:

Higher than the specified pressure may cause radiator damage.

## Water Pump

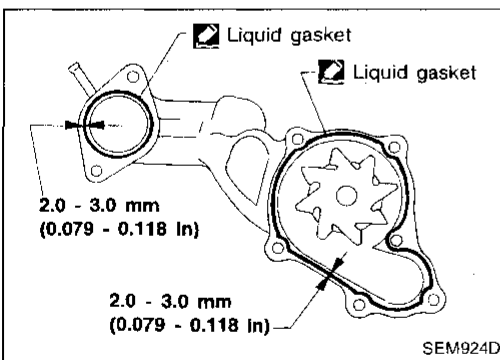
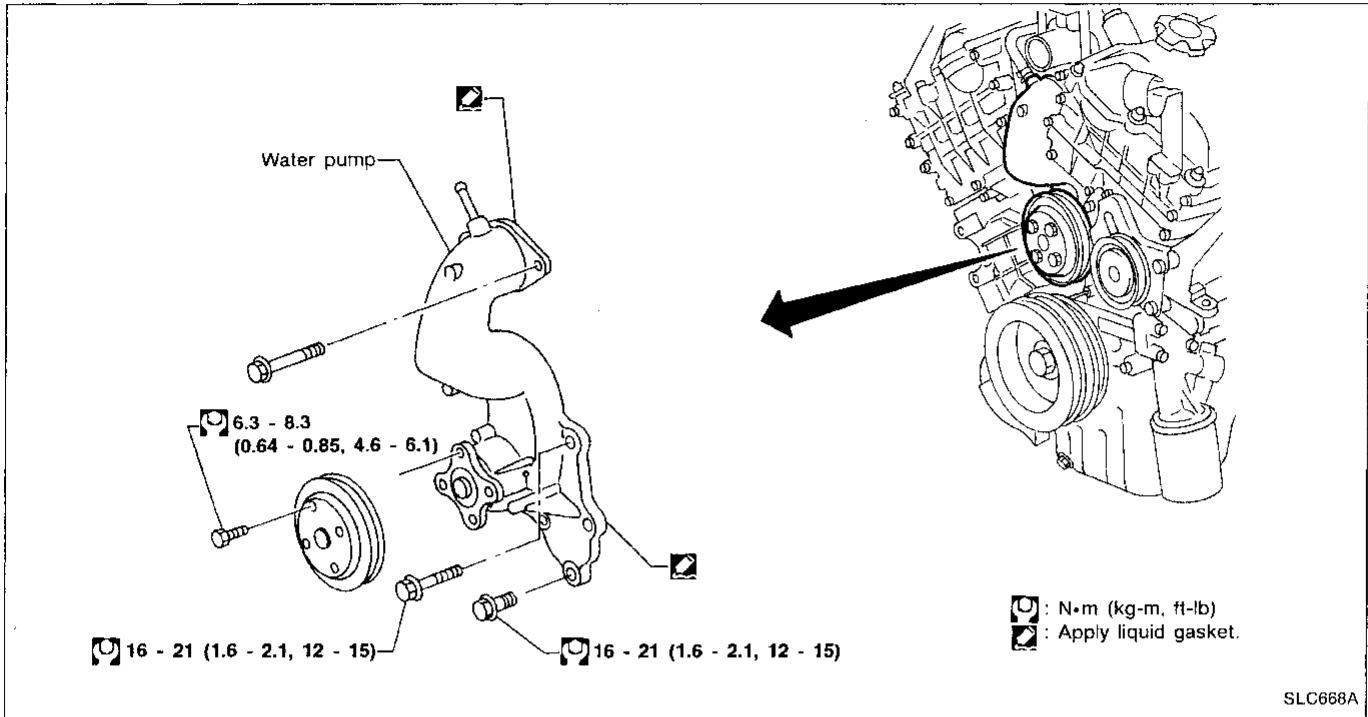
### REMOVAL AND INSTALLATION

#### CAUTION:

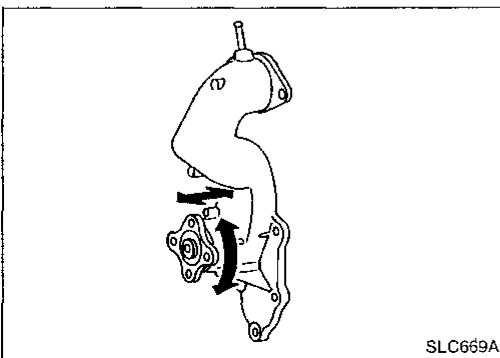
- When removing water pump assembly, be careful not to get coolant on drive belt.
- Water pump cannot be disassembled and should be replaced as a unit.
- After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.

**Water Pump (Cont'd)**

1. Drain coolant from radiator and cylinder block.  
Refer to "Changing Engine Coolant" in "MA" section.
2. Remove drive belts.
3. Remove water pump pulley and water pump.



4. Before installing water pump, remove all traces of liquid gasket from mating surface and grooves of water pump using a scraper.
  - Also remove traces of liquid gasket from mating surface of cylinder block .
5. Apply a continuous bead of liquid gasket to mating surface of water pump.
  - Use Genuine Liquid Gasket or equivalent.
6. Install any parts removed in reverse order of removal.

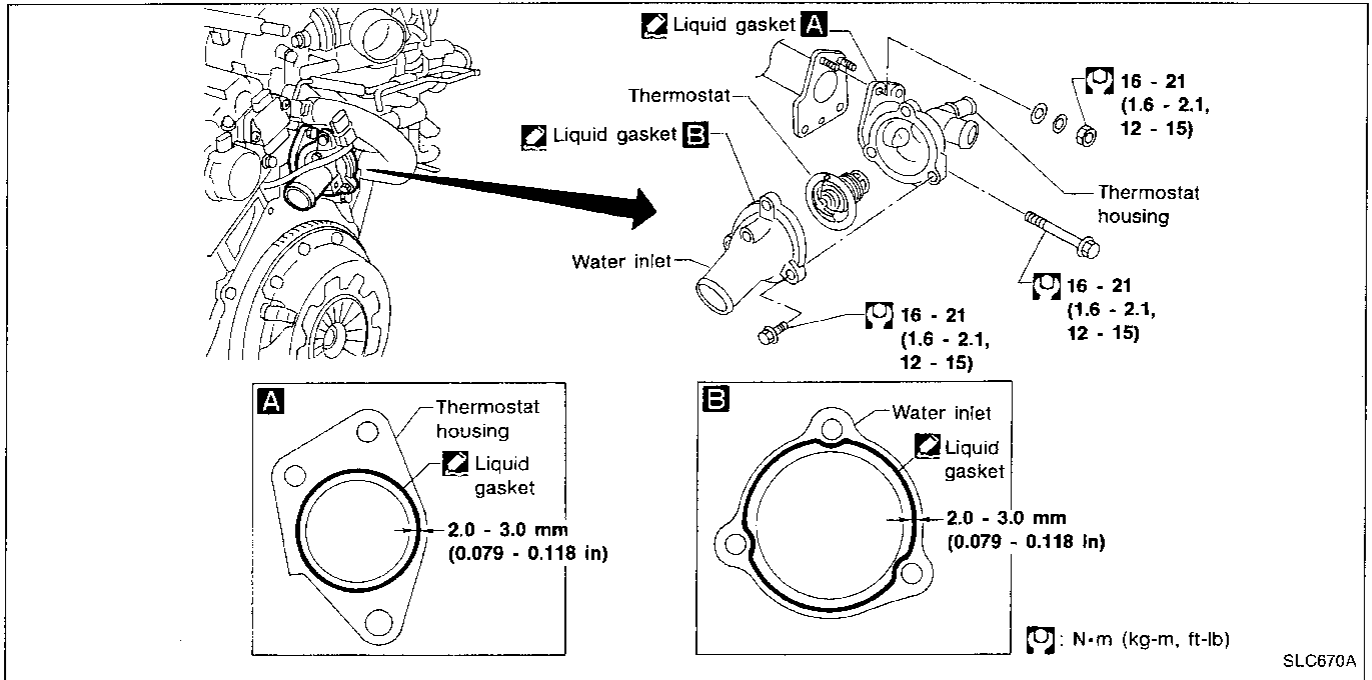


**INSPECTION**

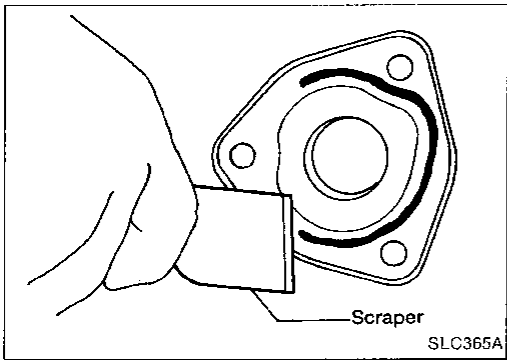
1. Check for badly rusted or corroded body assembly.
2. Check for rough operation due to excessive end play.



Thermostat



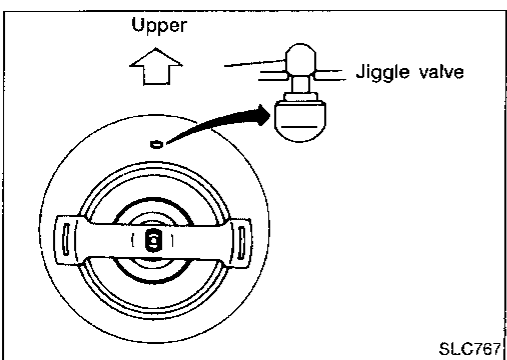
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REMOVAL AND INSTALLATION

1. Drain engine coolant.
2. Remove lower radiator hose.
3. Remove water inlet, then take out thermostat.
4. Before installing thermostat, remove all traces of liquid gasket from mating surface and grooves of each part using a scraper.
  - Also remove traces of liquid gasket from mating surface.
5. Apply a continuous bead of liquid gasket to mating surface of each part.
  - Use Genuine Liquid Gasket or equivalent.
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.

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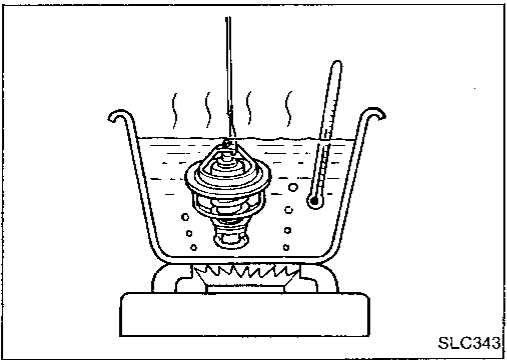


INSPECTION

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	°C (°F)	82 (180)
Max. valve lift	mm/°C (in/°F)	10/95 (0.39/203)

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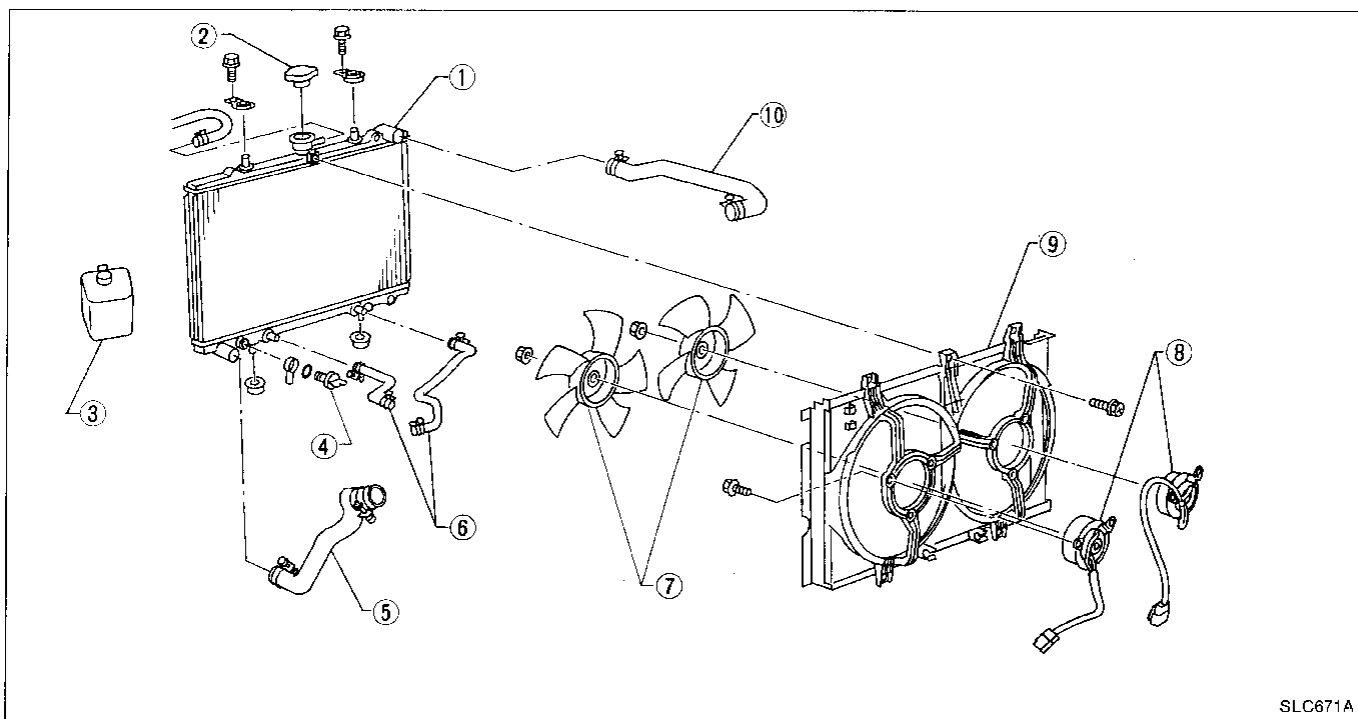
3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

## Radiator

### REMOVAL AND INSTALLATION

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

When filling radiator with coolant, refer to "Changing Engine Coolant" in MA section.



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

### Cooling Fan Control System

Cooling fans are controlled by ECM (ECCS control module). For details, refer to "Cooling Fan Control" of "ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION" in EF & EC section.

# SERVICE DATA AND SPECIFICATIONS (SDS)

## Engine Lubrication System (VG30E)

### Oil pressure

Engine speed rpm	Approximate discharge pressure kPa (kg/cm <sup>2</sup> , psi)
Idle speed	More than 59 (0.6, 9)
3,200	363 - 451 (3.7 - 4.6, 53 - 65)

### Oil pump

	Unit: mm (in)
Body to outer gear clearance	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance	0.21 - 0.32 (0.0083 - 0.0126)
Housing to inner gear side clearance	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear side clearance	0.05 - 0.11 (0.0020 - 0.0043)

GI

MA

EM

LC

## Engine Lubrication System (VE30DE)

### Oil pressure

Engine speed rpm	Approximate discharge pressure kPa (kg/cm <sup>2</sup> , psi)
Idle speed	More than 59 (0.6, 9)
3,000	412 - 510 (4.2 - 5.2, 60 - 74)

### Oil pump

	Unit: mm (in)
Body to outer gear clearance	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance	Below 0.18 (0.0071)
Body to inner gear clearance	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

EF &amp; EC

FE

CL

MT

### Regulator valve

Unit: mm (in)

Regulator valve to oil pump cover clearance	0.040 - 0.097 (0.0016 - 0.0038)
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AT

FA

## Engine Cooling System (VG30E, VE30DE)

### Thermostat

Valve opening temperature	°C (°F)	82 (180)
Max. valve lift	mm/°C (in/°F)	10/95 (0.39/203)

### Radiator

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

Cap relief pressure	78 - 98 (0.8 - 1.0, 11 - 14)
Leakage test pressure	157 (1.6, 23)

RA

BR

ST

BF

HA

EL

IDX