

# ENGINE LUBRICATION & COOLING SYSTEMS

## SECTION **LC**

GI

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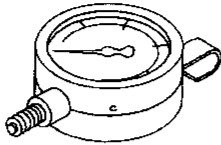
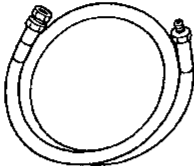
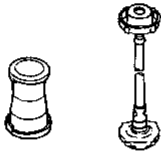
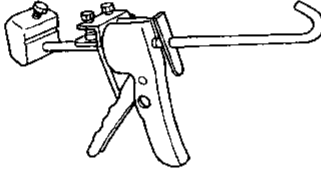
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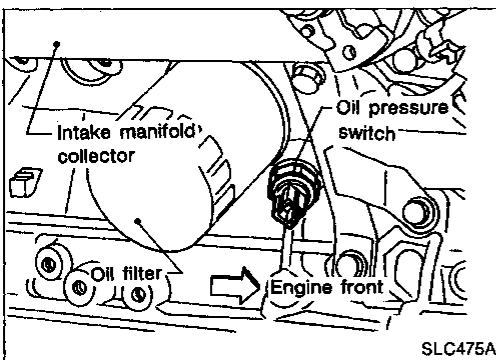
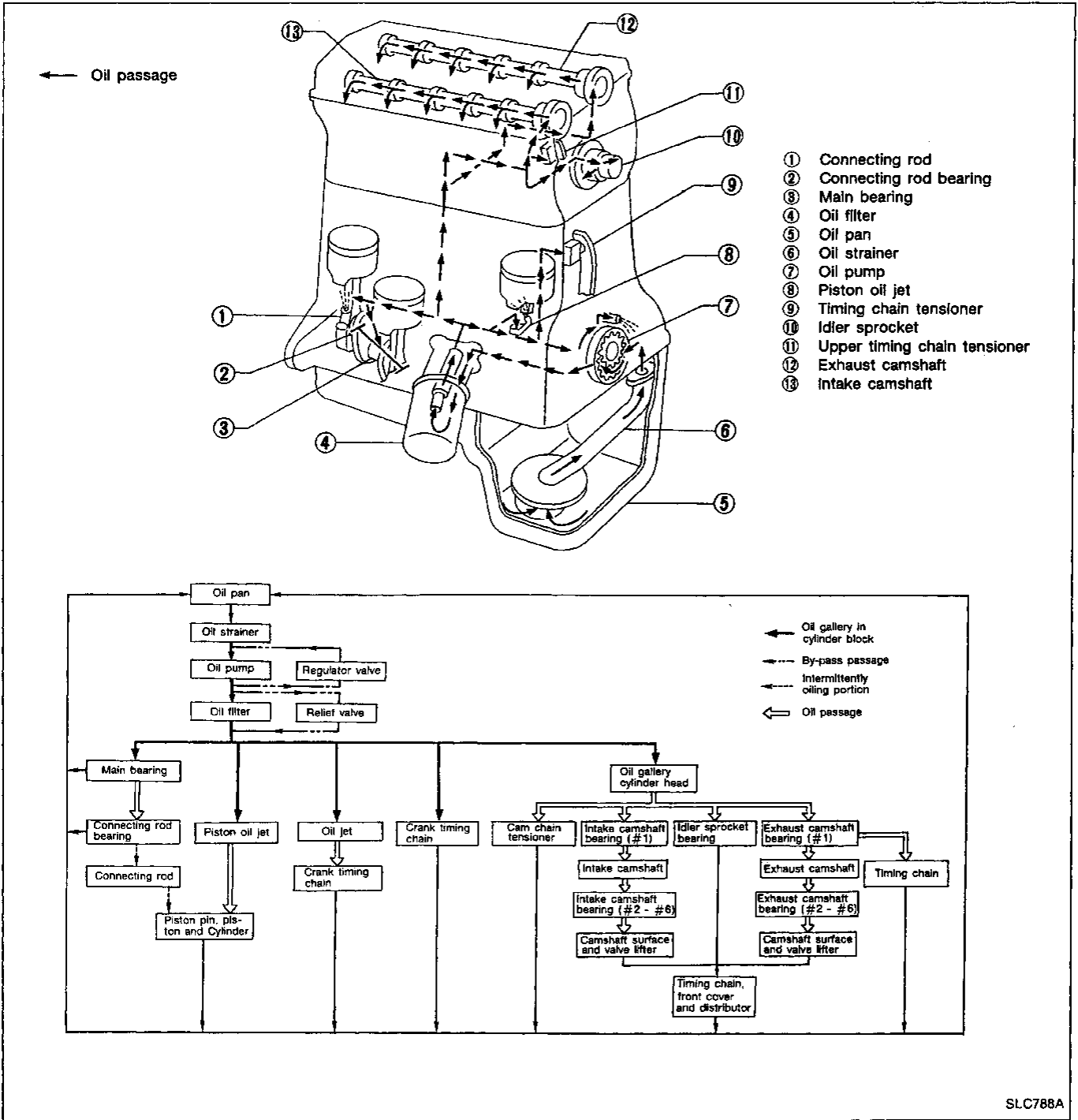
# PREPARATION

## Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
ST25051001 (J25695-1) Oil pressure gauge		
ST25052000 (J25695-2) Hose		Adapting oil pressure gauge to cylinder block
EG17650301 ( — ) Radiator cap tester adapter		Adapting radiator cap tester to radiator filler neck
WS39930000 ( — ) Tube presser		Pressing the tube of liquid gasket

# ENGINE LUBRICATION SYSTEM

## Lubrication Circuit



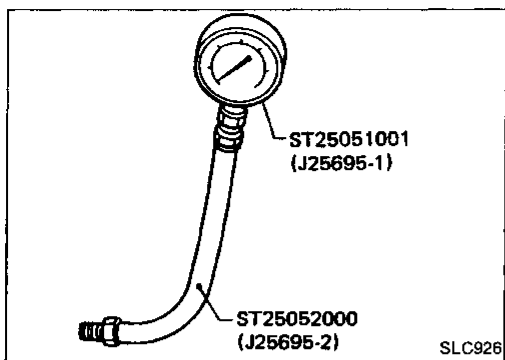
### Oil Pressure Check

#### WARNING:

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

# ENGINE LUBRICATION SYSTEM

## Oil Pressure Check (Cont'd)



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.

**Approximate discharge pressure: kPa (kg/cm<sup>2</sup>, psi)**

**Engine speed at idle**

**More than 78 (0.8, 11)**

**Engine speed at 3,000 rpm**

**412 - 481 (4.2 - 4.9, 60 - 70)**

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

6. Install oil pressure switch with sealant.

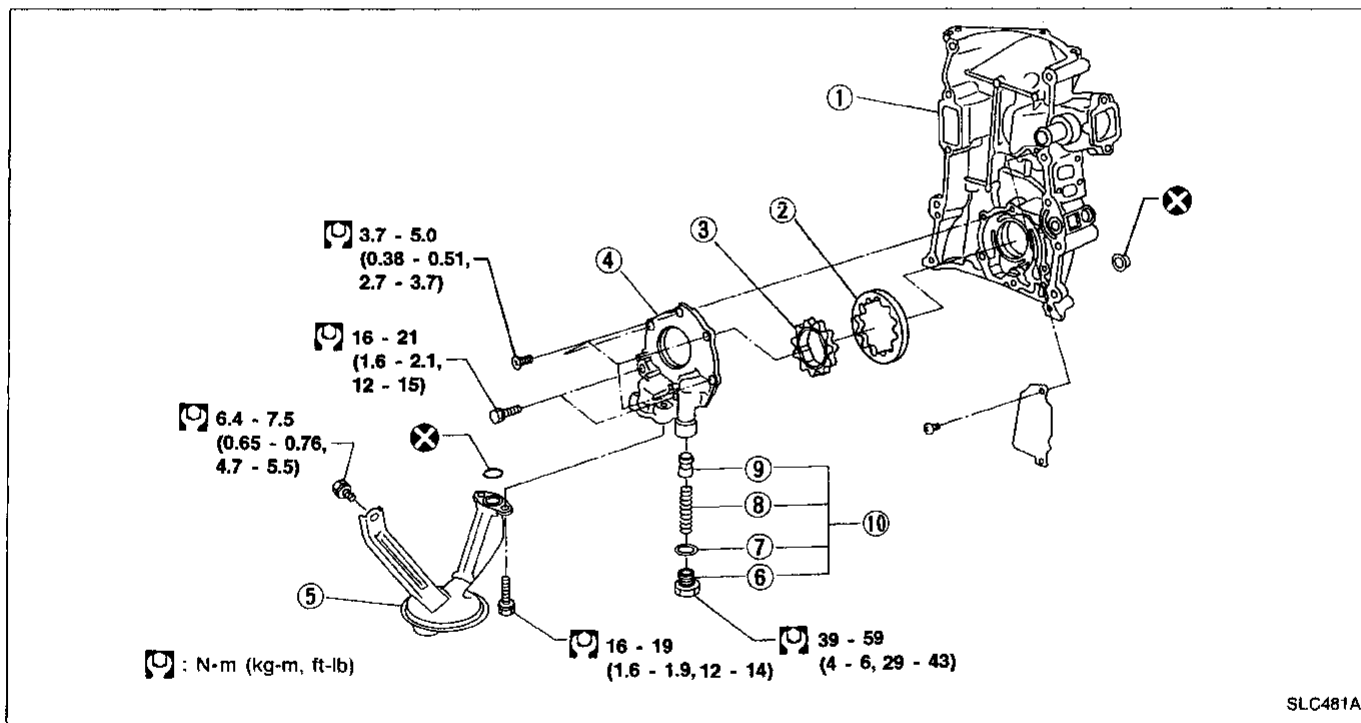
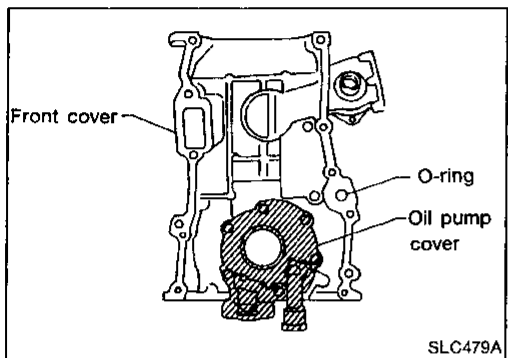
## Oil Pump

### REMOVAL

1. Remove front cover.

**Refer to "TIMING CHAIN" in section EM.**

2. Remove oil pump cover.



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- |                  |                            |
|------------------|----------------------------|
| ① Front cover    | ⑥ Cap                      |
| ② Outer gear     | ⑦ Washer                   |
| ③ Inner gear     | ⑧ Spring                   |
| ④ Oil pump cover | ⑨ Regulator valve          |
| ⑤ Oil strainer   | ⑩ Regulator valve assembly |

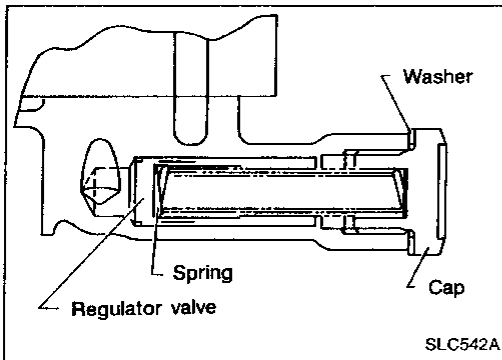
- Always replace oil seals and gaskets with new ones.
- When installing oil pump, apply engine oil to inner and outer gears.

# ENGINE LUBRICATION SYSTEM

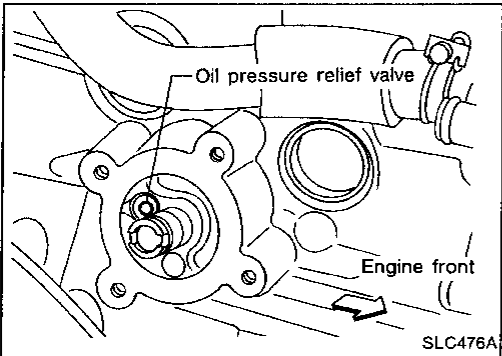
## Oil Pump (Cont'd)

### 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 assembly.



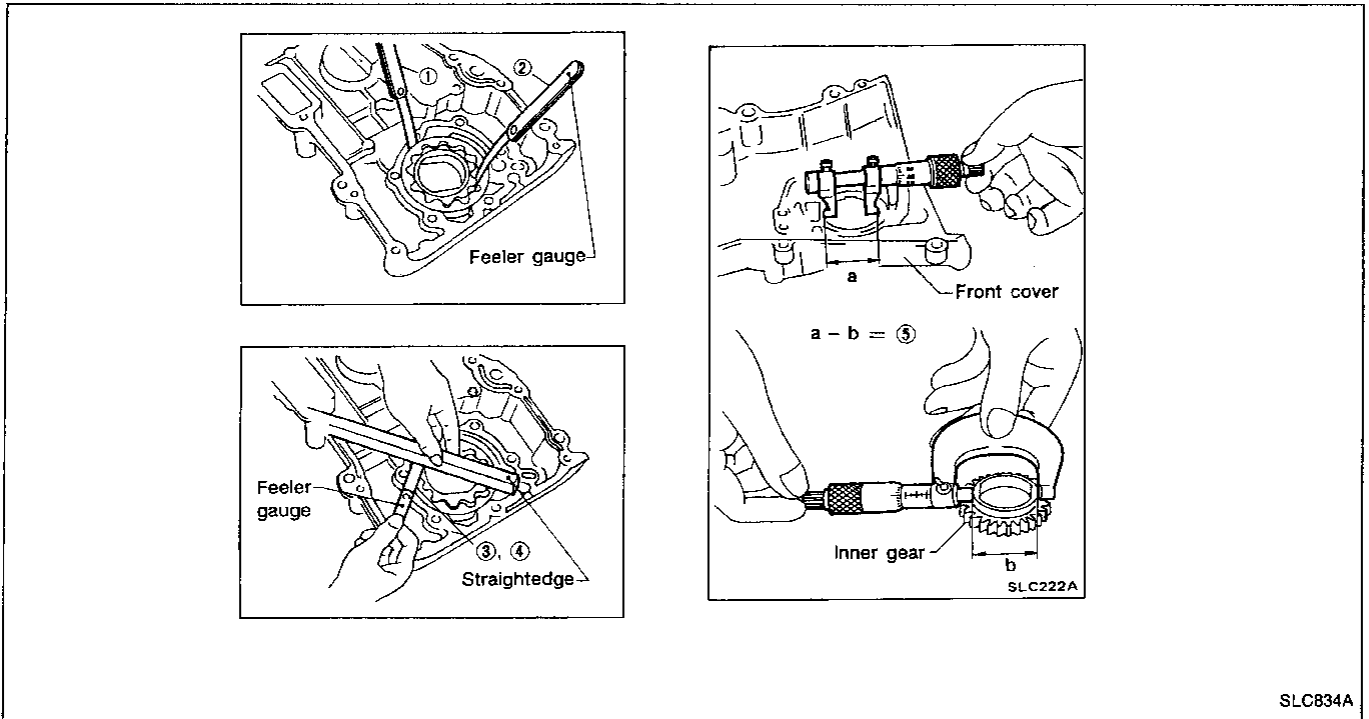
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### OIL PRESSURE RELIEF VALVE INSPECTION

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 in place by tapping it.



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### OIL PUMP INSPECTION

Using a feeler gauge, check the following clearances.

#### Standard clearance:

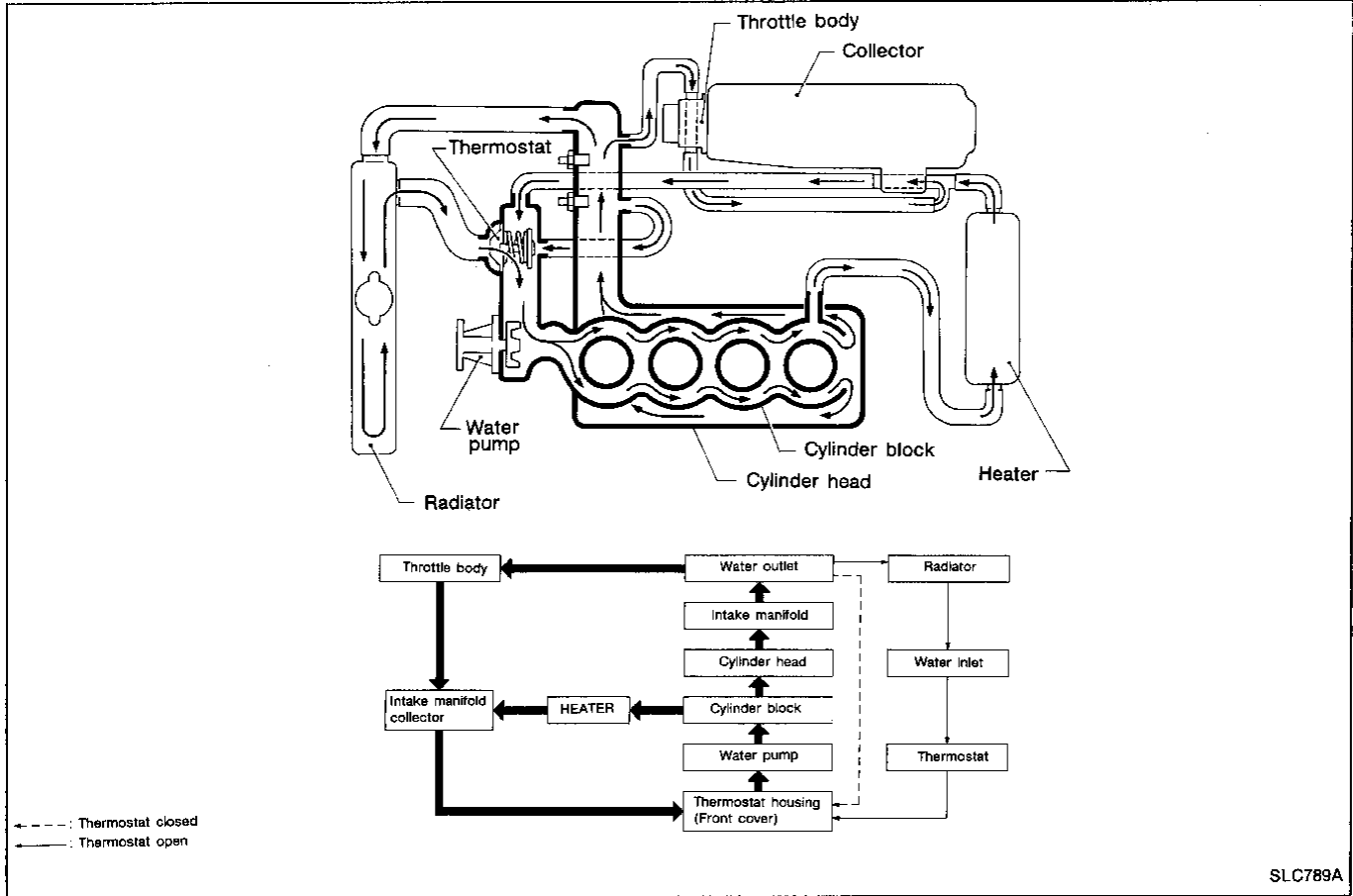
Unit: mm (in)

Body to outer gear clearance ①	.....	0.114 - 0.20 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance ②	.....	0.04 - 0.18 (0.0016 - 0.0071)
Cover to inner gear clearance ③	.....	0.05 - 0.09 (0.0020 - 0.0035)
Cover to outer gear clearance ④	.....	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion 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.

# ENGINE COOLING SYSTEM

## Cooling Circuit



## System Check

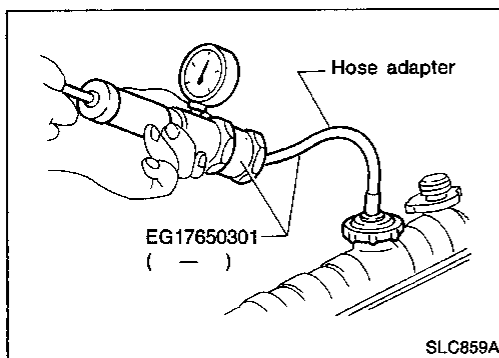
### WARNING:

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 cap and carefully remove the cap 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 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.

# ENGINE COOLING SYSTEM

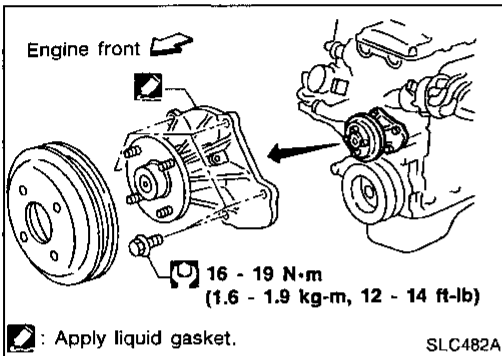
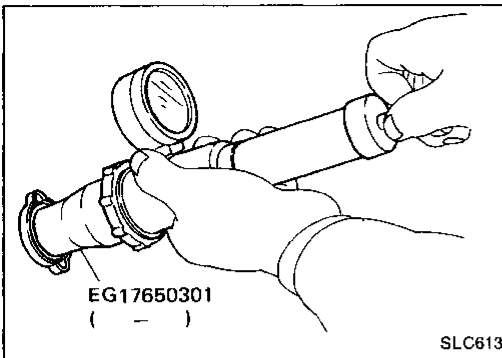
## System Check (Cont'd)

### CHECKING RADIATOR CAP

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

**Radiator cap relief pressure:**

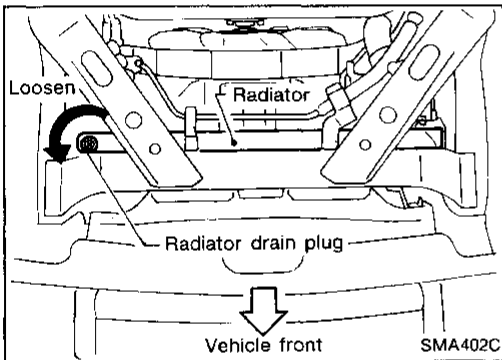
78 - 98 kPa (0.8 - 1.0 kg/cm<sup>2</sup>, 11 - 14 psi)



## Water Pump

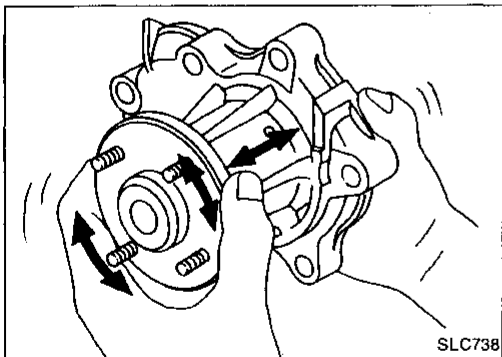
### CAUTION:

- 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.



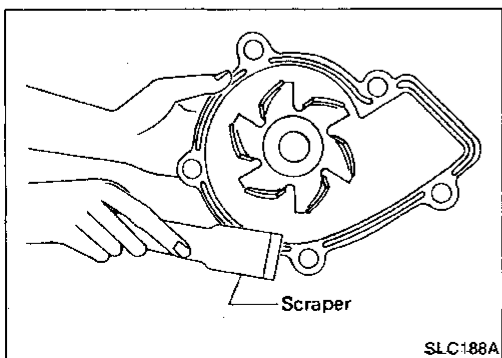
## REMOVAL

1. Drain coolant from cylinder block and radiator.
2. Remove fan coupling with fan.
3. Remove power steering pump drive belt, alternator drive belt and air compressor drive belt.
4. Remove water pump.



## INSPECTION

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

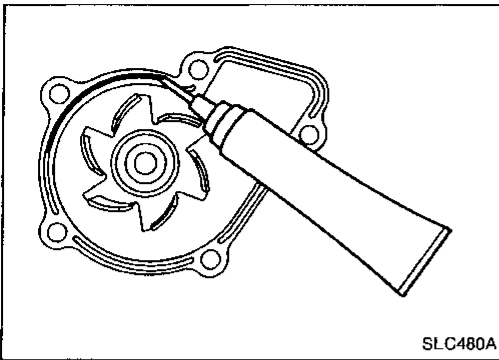


## INSTALLATION

1. Before installing water pump, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.

# ENGINE COOLING SYSTEM

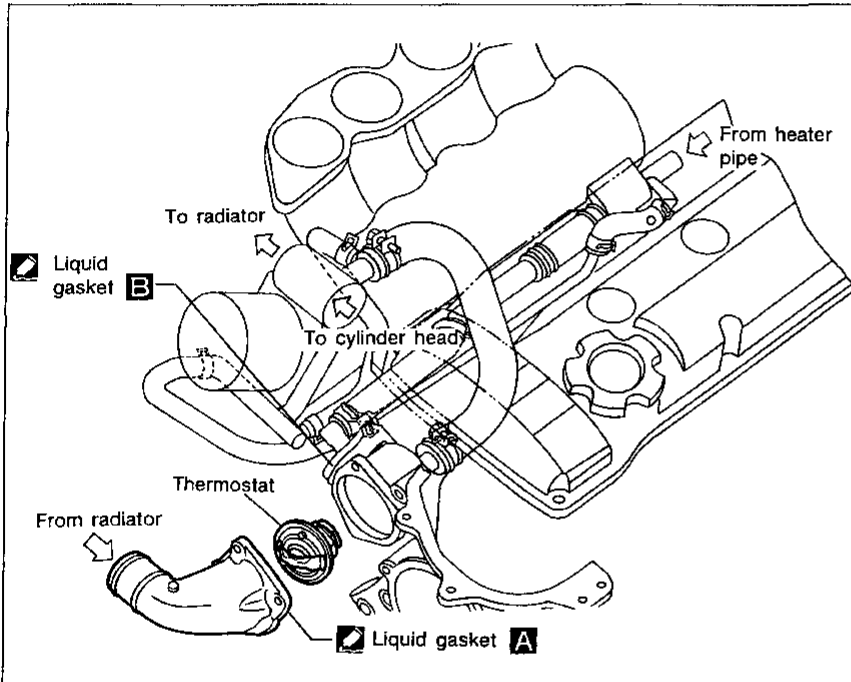
## Water Pump (Cont'd)



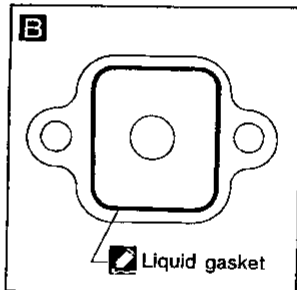
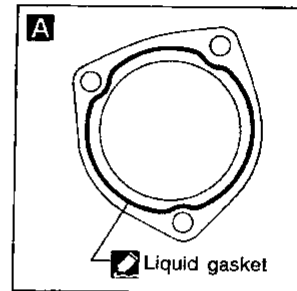
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2. Apply a continuous bead of liquid gasket to mating surface of water pump.
  - Use genuine liquid gasket or equivalent.

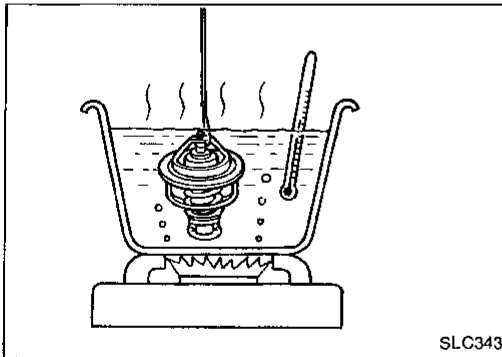
## Thermostat



### Liquid gasket application places



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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.

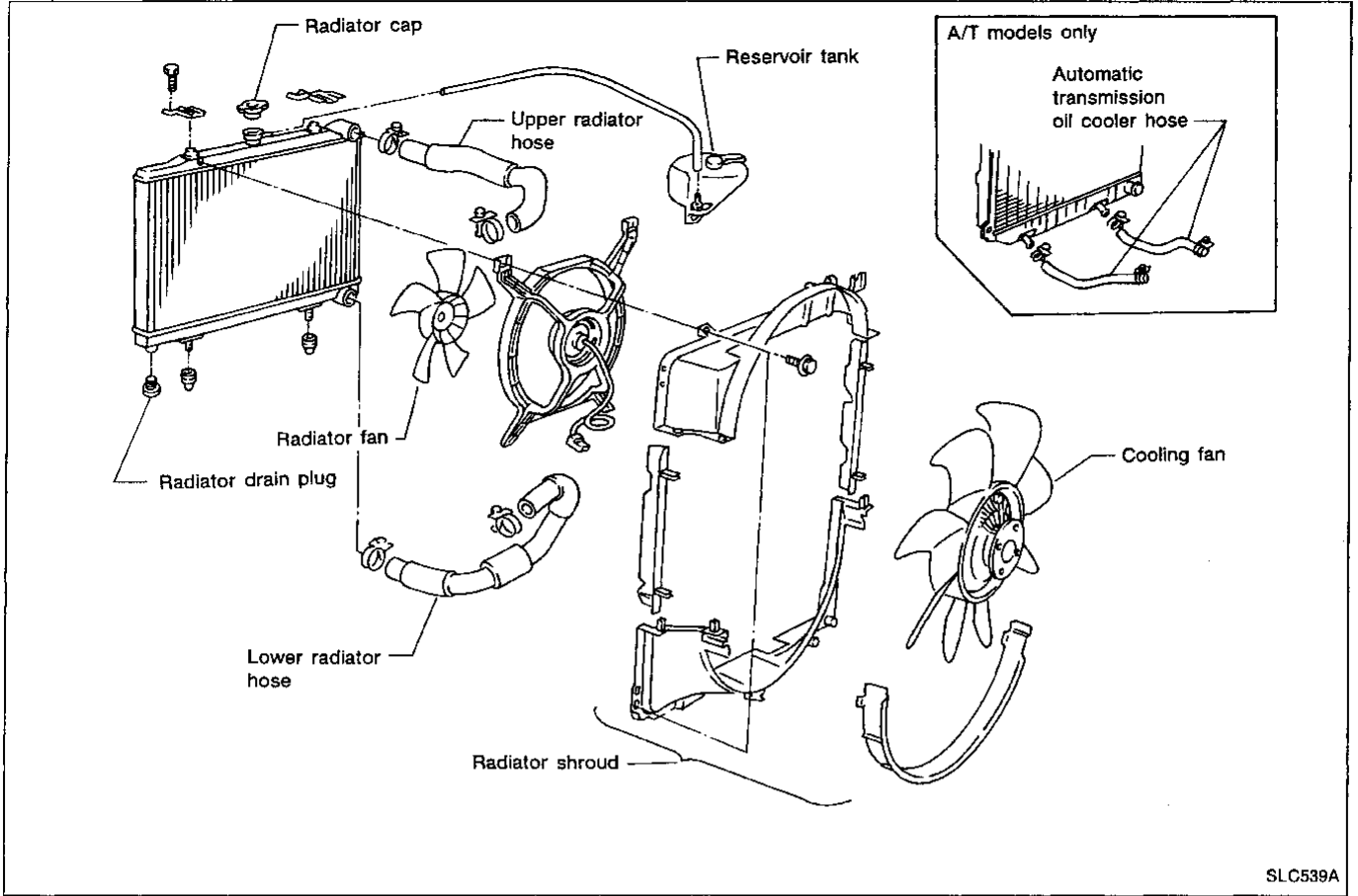
Valve opening temperature	°C (°F)	76.5 (170)
Maximum valve lift	mm/°C (in/°F)	More than 8/90 (0.31/194)

3. Then check if valve is closed at 5°C (9°F) below valve opening temperature.
  - Apply a continuous bead of liquid gasket to mating surface of water inlet. Refer to "Water Pump".
  - 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.

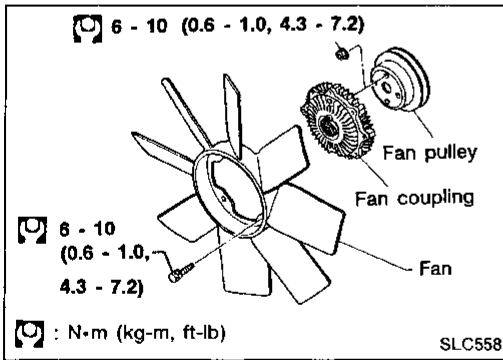


# ENGINE COOLING SYSTEM

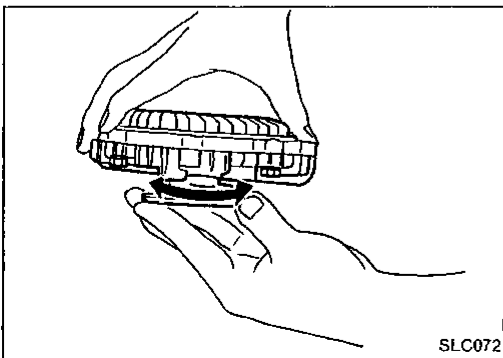
## Radiator



**CAUTION:**  
When filling radiator with coolant, refer to MA section.



## Cooling Fan DISASSEMBLY AND ASSEMBLY



**INSPECTION**  
Check fan coupling for rough operation, oil leakage or bent bimetal.

GI

MA

EM

**LC**

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# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## Engine Lubrication System

### Oil pressure check

Engine speed rpm	Approximate discharge pressure kPa (kg/cm <sup>2</sup> , psi)
Idle speed	More than 78 (0.8, 11)
3,000	412 - 481 (4.2 - 4.9, 60 - 70)

### Oil pump

		Unit: mm (in)
Body to outer gear clearance	.....	0.114 - 0.20 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance	.....	0.04 - 0.18 (0.0016 - 0.0071)
Cover to inner gear clearance	.....	0.05 - 0.09 (0.0020 - 0.0035)
Cover to outer gear clearance	.....	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion clearance	.....	0.045 - 0.091 (0.0018 - 0.0036)

## Engine Cooling System

### Thermostat

Valve opening temperature	°C (°F)	76.5 (170)
Max. valve lift	mm/°C (in/°F)	More than 8/90 (0.31/194)

### 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)