ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

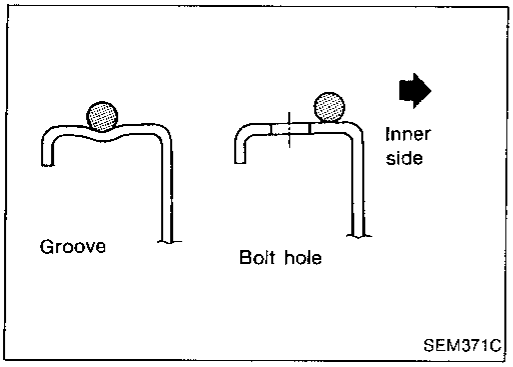
CONTENTS

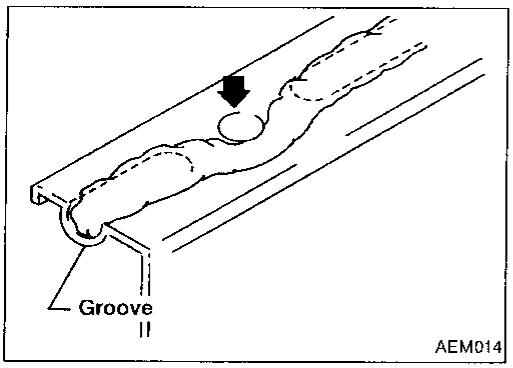
Supplemental Restraint System "AIR BAG"

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:

a. **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.**
b. **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
c. **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".**

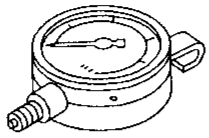
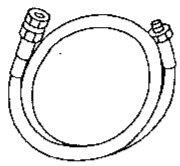
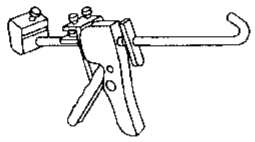
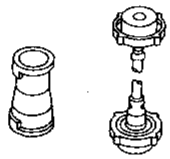




Liquid Gasket Application Procedure

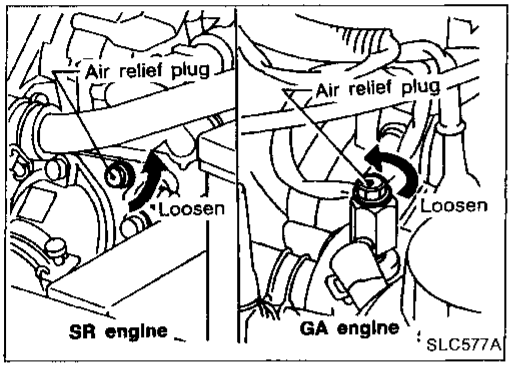
a. **Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.**
b. **Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)**
   - **Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide for SR engine and 3.5 to 4.5 mm (0.138 to 0.177 in) wide for GA engine (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).**
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.**

Special Service Tools

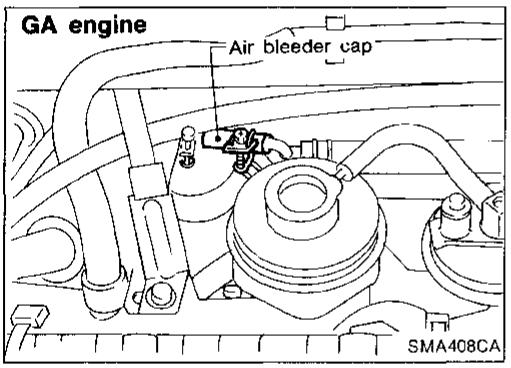
Tool number (Kent-Moore No.) Tool name	Description	Engine application	
		SR	GA
ST25051001 (J25695-1) Oil pressure gauge	 NT050	X	X
ST25052000 (J25695-2) Hose	 NT051 Adapting oil pressure gauge to cylinder block	X	X
WS39930000 (—) Tube presser	 NT052 Pressing the tube of liquid gasket	X	X
EG17650301 (—) Radiator cap tester adapter	 NT053 Adapting radiator cap tester to radiator filler neck	X	X

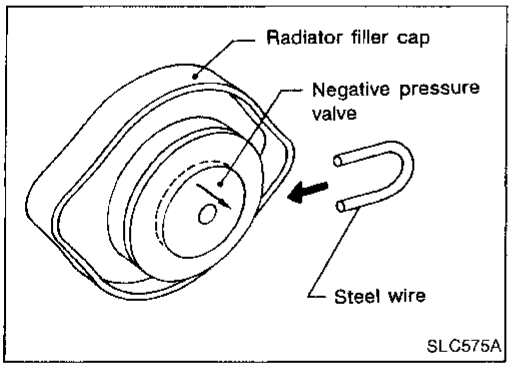
Refilling Engine Coolant

1. Set heater temperature control lever to Maximum Hot position.



2. Remove radiator filler cap, air relief plug and air bleeder cap.
3. Fill radiator with coolant and fill reservoir tank to Max line with coolant.
- Air relief plug is reinstalled once coolant spills from the air relief hole during refill.
  Then fill radiator and reservoir tank with coolant.
4. Reinstall air bleeder cap.



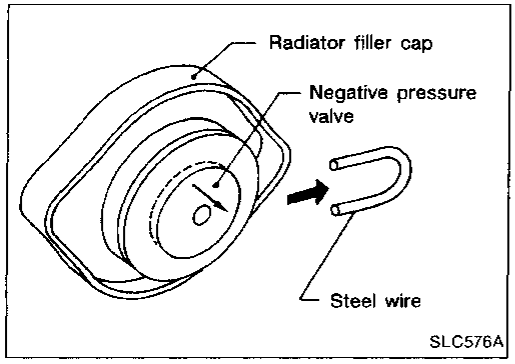


5. Install a temporary radiator filler cap which allows air and coolant in cooling system to be directed into reservoir tank regardless of pressure.
- Install a suitable steel wire between negative pressure valve and its seat as shown in the picture.
6. Warm up engine to normal operating temperature.
7. Run engine at 2,500 rpm for 10 seconds and return to idle speed.
- Repeat 2 or 3 times

Watch coolant temperature gauge so as not to overheat the engine.

8. Stop engine and cool it down.
- Cool down using a fan to reduce the time.
9. Remove the temporary radiator filler cap and check coolant level.
- If necessary, refill radiator up to filler neck with coolant.
10. Refill reservoir tank to Max line with coolant.
11. Repeat step 7 through step 10 two or more times.

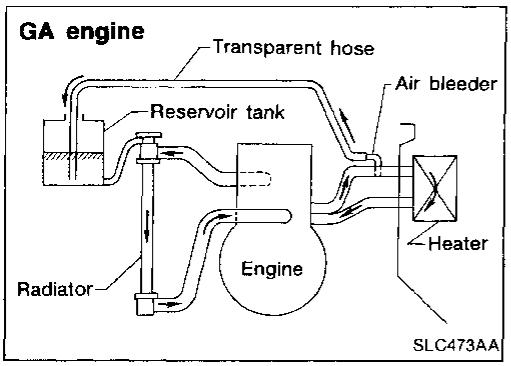
Refilling Engine Coolant (Cont'd)



12. Install a proper radiator filler cap. (Original radiator filler cap)
13. Warm up engine, and check for sound of coolant flow while running engine from idle up to 4,000 rpm with heater temperature control lever set at several positions between COOL and HOT.
- Sound may be noticeable at heater water cock.

14. SR engine: If sound is heard, bleed air from cooling system by repeating steps 5 through 10 until coolant level no longer drops.
    GA engine: If sound is heard, bleed air from cooling system according to the following steps.

1) Cool engine down and remove air bleeder cap on heater inlet hose.



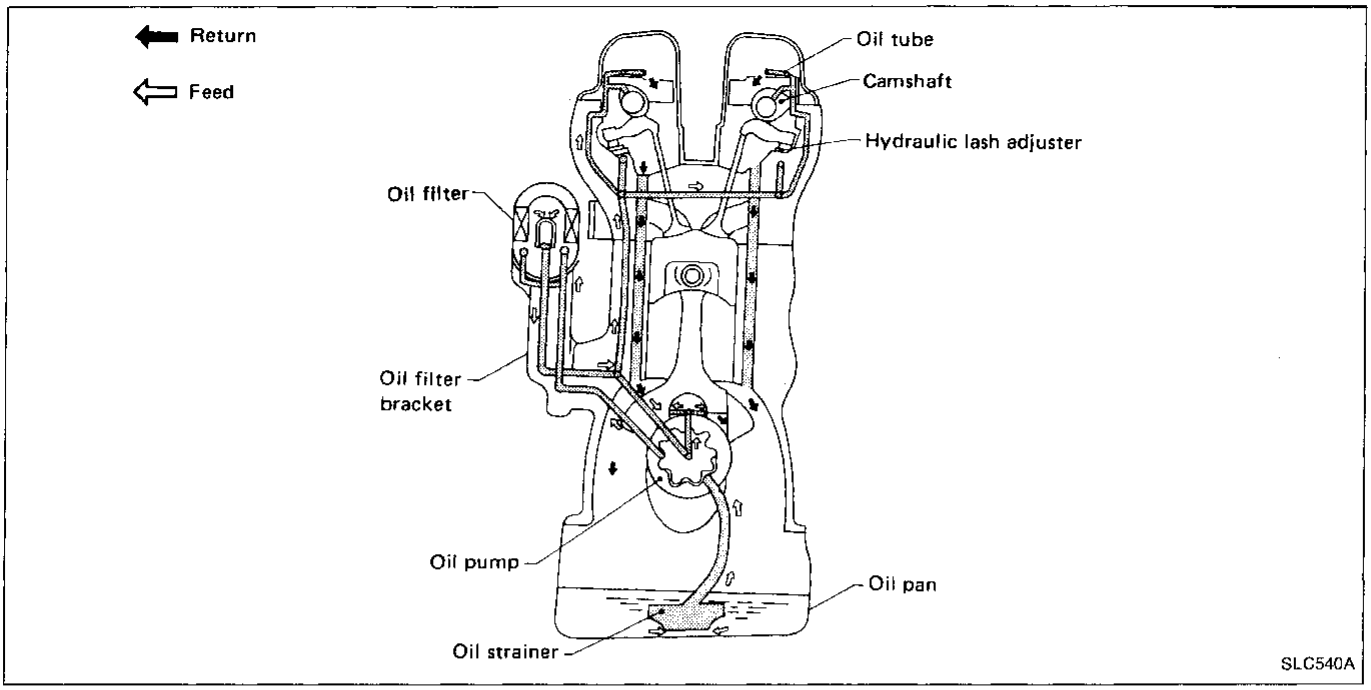
2) Attach a suitable transparent hose at air bleeder pipe and put the opposite end of the hose into coolant of reservoir tank.
3) Install the temporary radiator cap and check for proper connection of all coolant related hoses.
4) Start engine and check for bubbles in reservoir tank.
5) Set heater temperature control lever to max "COOL" position in order to bypass coolant through the transparent hose.
6) Run engine up to 2,300 rpm until bubbles disappear in the transparent hose.

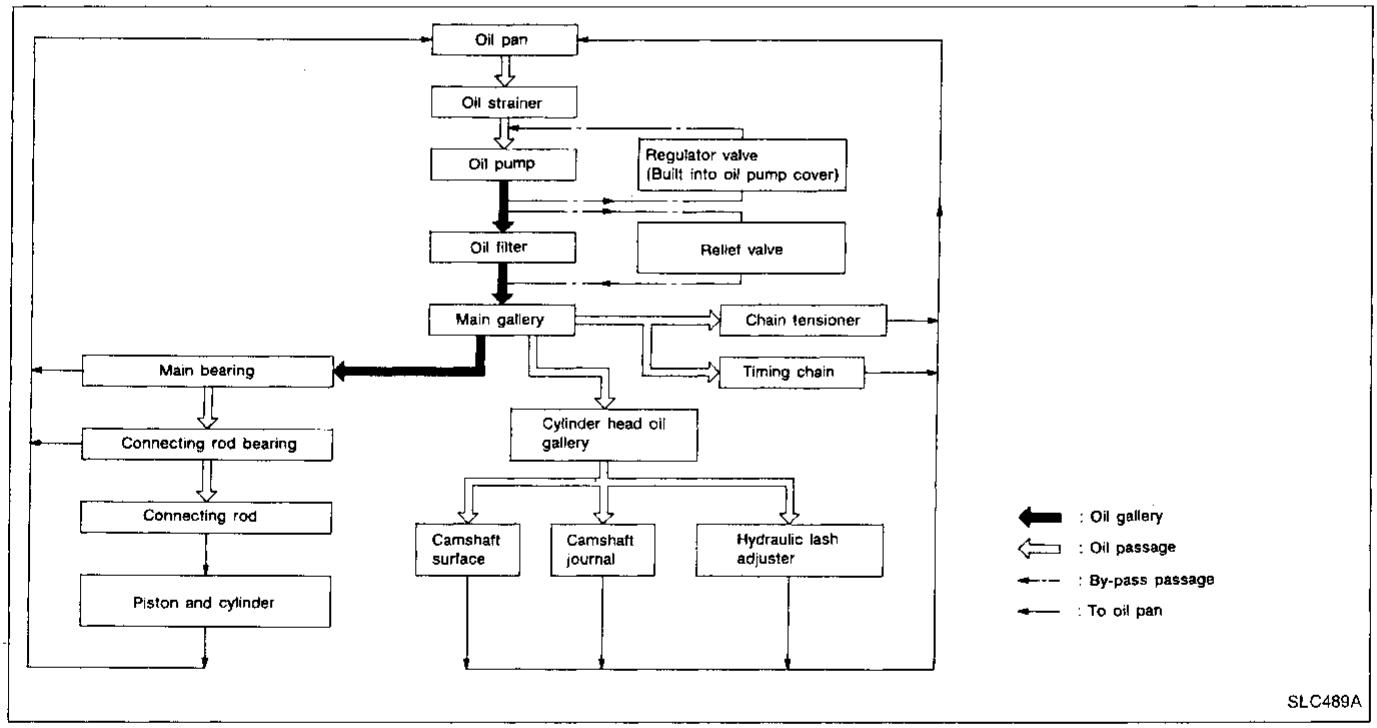
Do not run engine over 2,300 rpm because engine may be damaged due to reduced coolant flow.

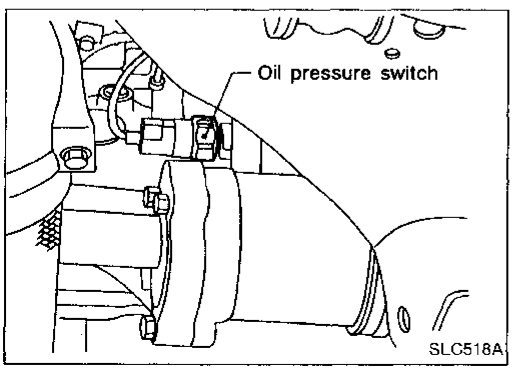
7) After removing bubbles, set heater temperature control lever to max "HOT" position and check for sound of coolant flow.
8) If sound is heard, repeat step 5) through step 7).

15. Stop engine and cool it down.
16. Install a proper radiator cap. (Original radiator cap)
17. Remove the transparent hose and install air bleeder cap.
18. Check any removed parts for secure reinstallation.

Lubrication Circuit







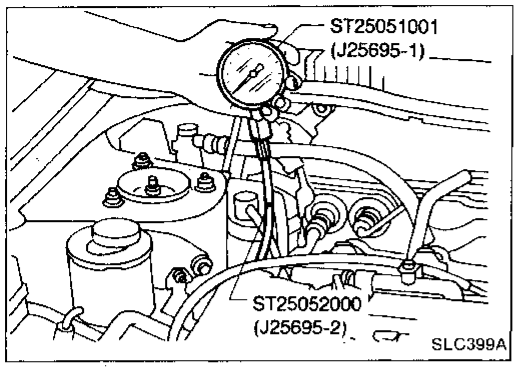
Oil Pressure Check

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.

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.

Engine speed rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed	More than 78 (0.8, 11)
3,200	314 - 392 (3.2 - 4.0, 46 - 57)

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

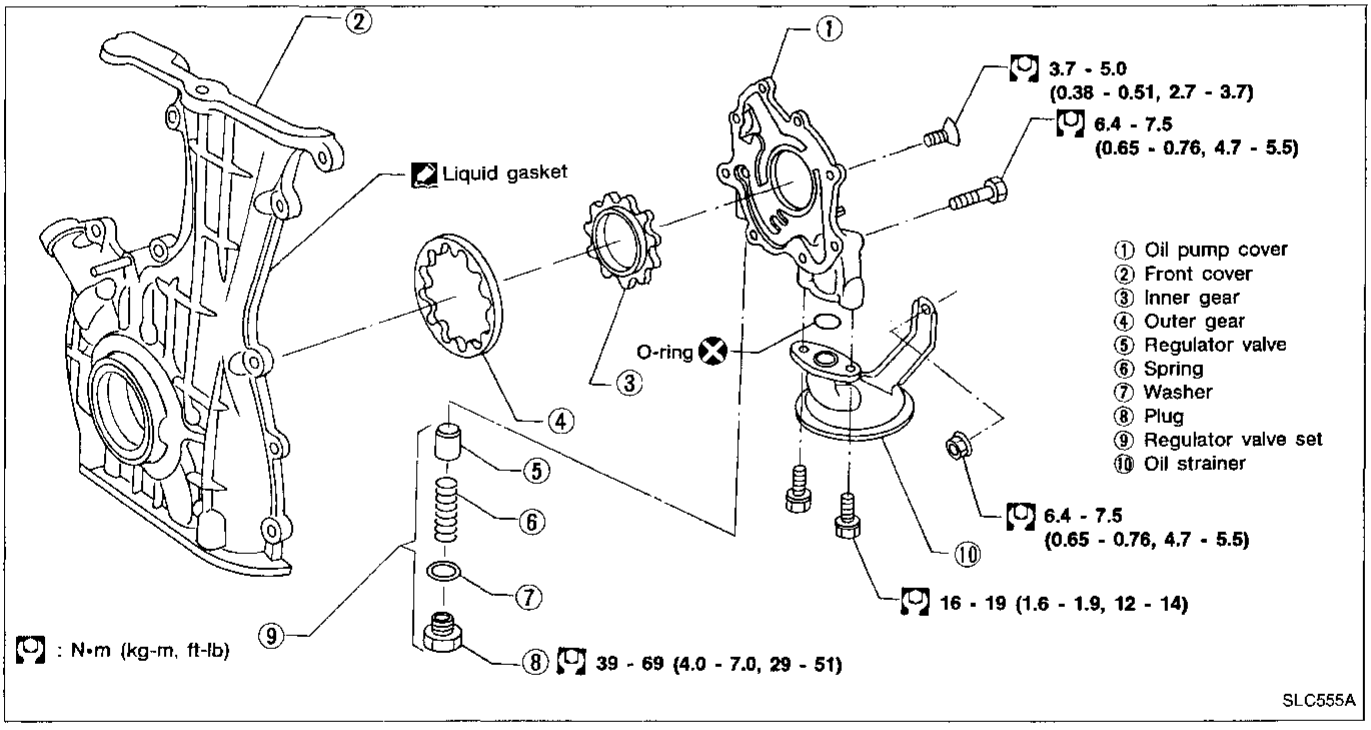
6. Install oil pressure switch with sealant.

Oil Pump

REMOVAL

1. Remove drive belts.
2. Remove cylinder head. (Refer to EM section.)
3. Remove oil pans. (Refer to EM section.)
4. Remove oil strainer and baffle plate.
5. Remove front cover assembly.

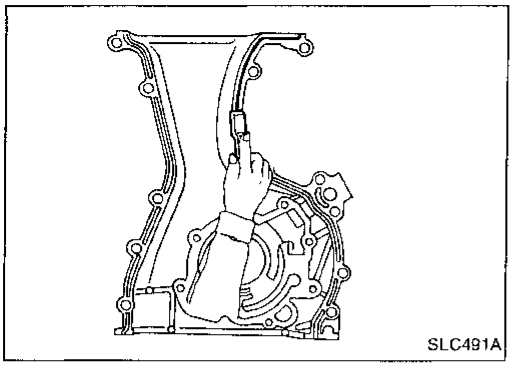
DISASSEMBLY AND ASSEMBLY



- **Always replace oil seal and O-ring with new ones.**
- **When installing oil pump, apply engine oil to inner and outer gears.**
- **Be sure that O-rings are properly fitted.**

Oil Pump (Cont'd)

INSTALLATION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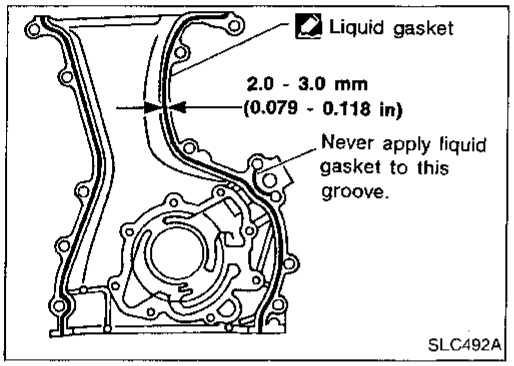
- Before installing front cover assembly, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.



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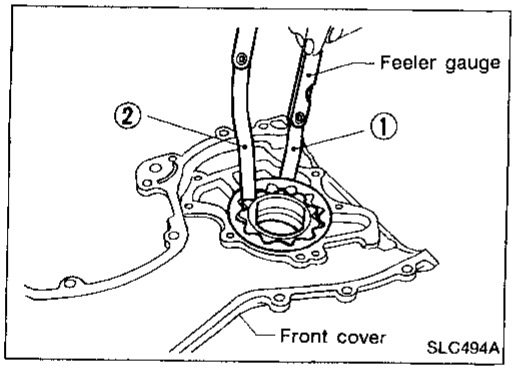
1. Apply a continuous bead of liquid gasket to mating surface of front cover assembly.
   - Use Genuine Liquid Gasket or equivalent.
2. Installation is the reverse order of removal.



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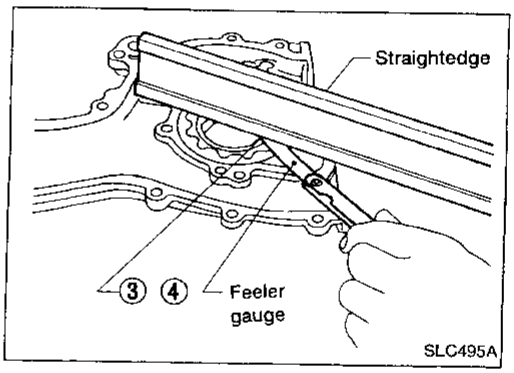

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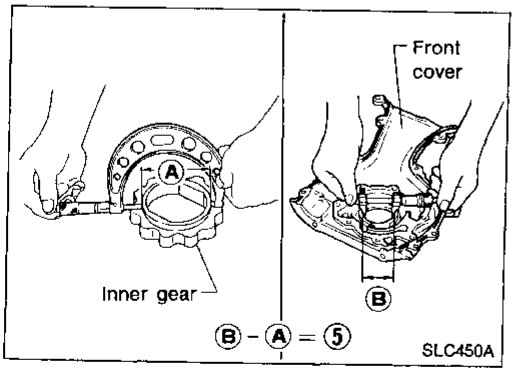

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Oil Pump (Cont'd)

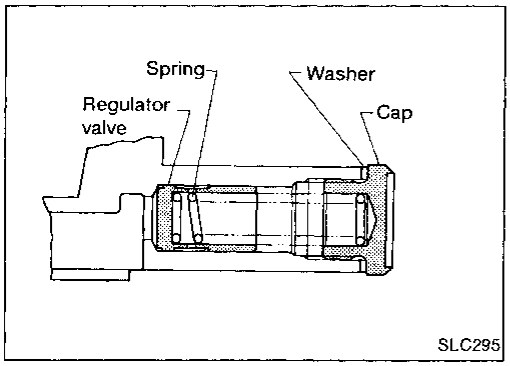
INSPECTION

Using a feeler gauge, 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)

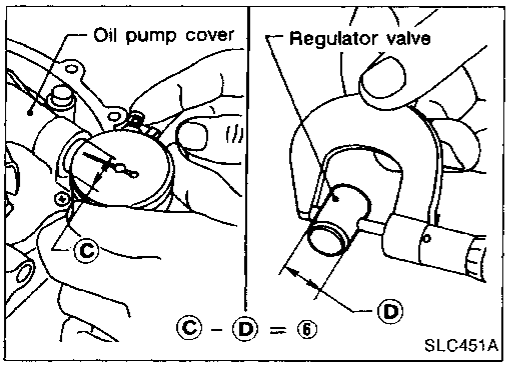
- **If the tip clearance (②) exceeds the limit, replace gear set.**
- **If body to gear clearances (①, ③, ④, ⑤) exceed the limit, replace front cover assembly.**



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.

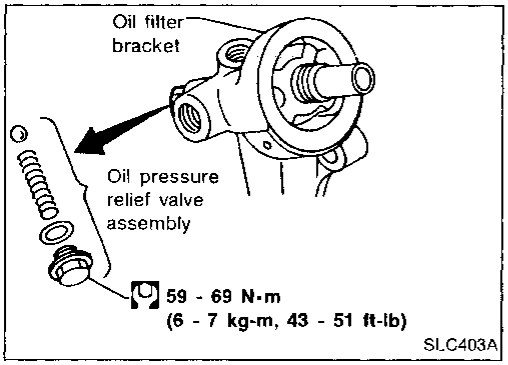


4. Check regulator valve to oil pump cover clearance.

Clearance:

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

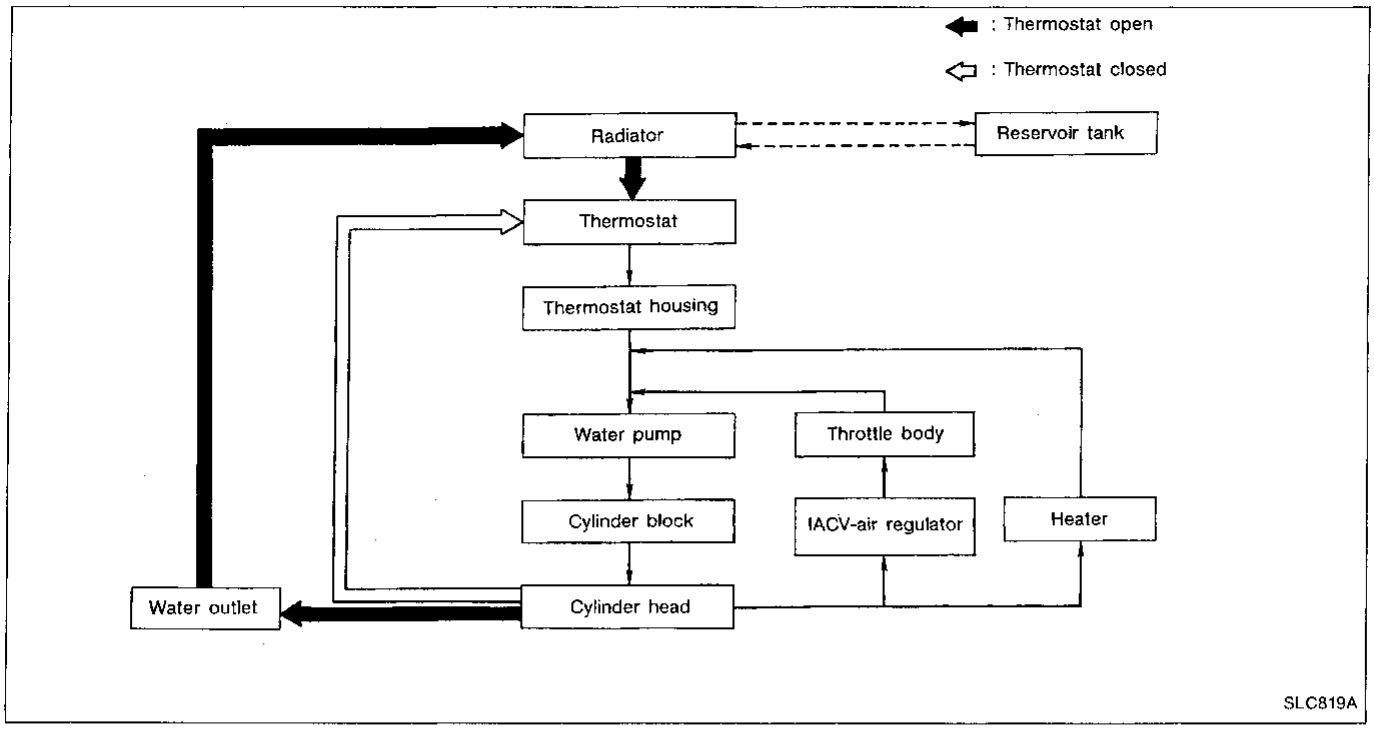
If it exceeds the limit, replace oil pump cover.



OIL PRESSURE RELIEF VALVE INSPECTION

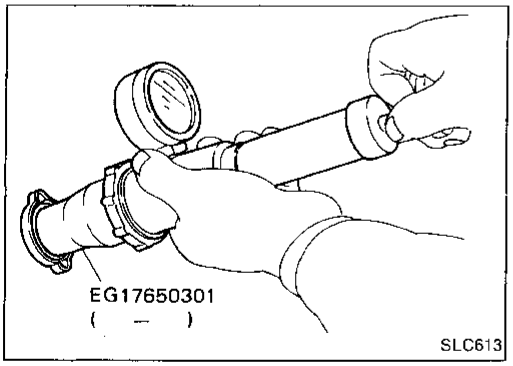
Inspect oil pressure relief valve for movement, cracks and breaks. If damaged, replace oil filter bracket assembly.

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.



Cooling System Inspection

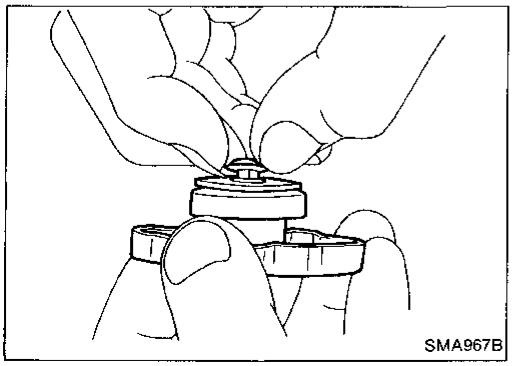
CHECKING HOSES

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

CHECKING RADIATOR CAP

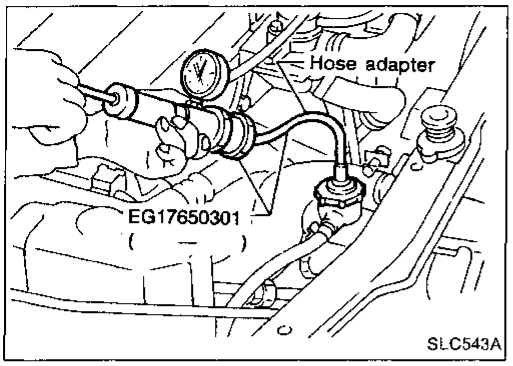
To check radiator cap, apply pressure to cap with a tester.

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



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

Cooling System Inspection (Cont'd)



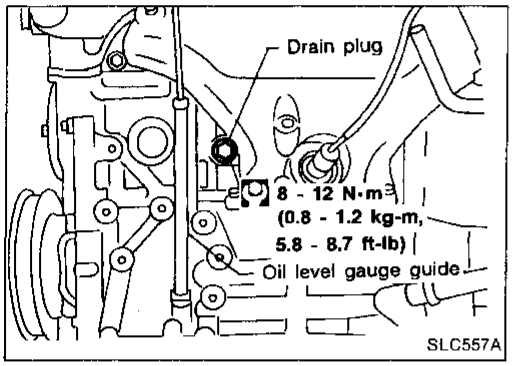
CHECKING COOLING SYSTEM FOR LEAKS

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

Testing pressure:
157 kPa (1.6 kg/cm², 23 psi)

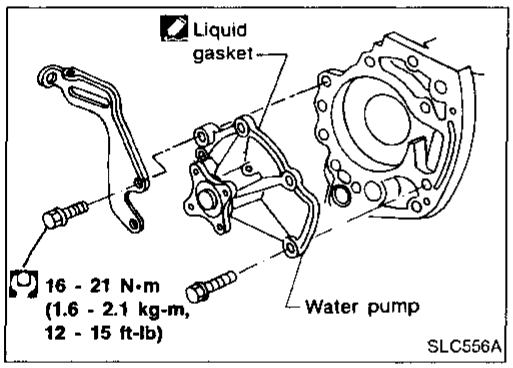
CAUTION:
Higher than the specified pressure may cause radiator damage.

Water Pump



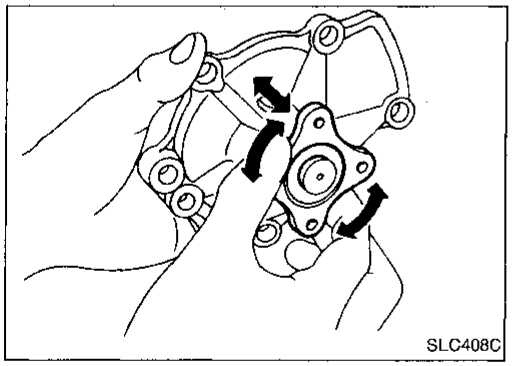
REMOVAL

1. Drain coolant from radiator.
2. Remove cylinder block drain plug located at left front of cylinder block and drain coolant.
3. Remove front RH wheel and engine side cover.
4. Remove drive belts.
5. Remove front engine mounting.



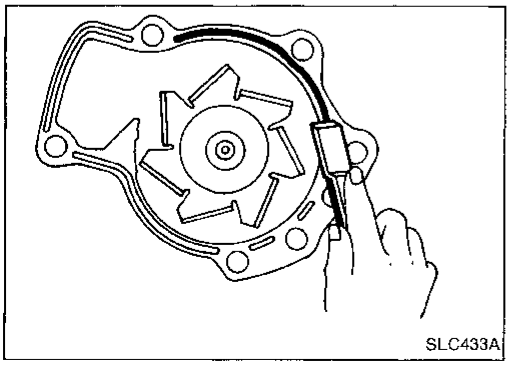
6. Remove water pump.

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.**



INSPECTION

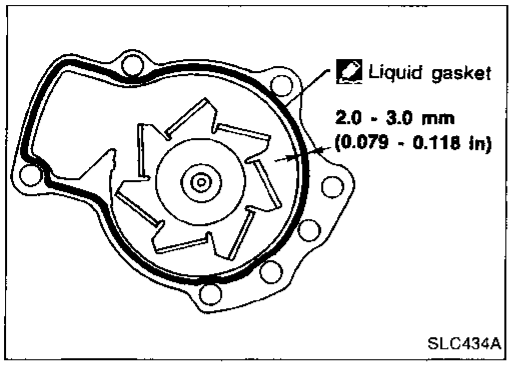
1. Check for badly rusted or corroded body assembly.
2. Check for rough operation due to excessive end play.



INSTALLATION

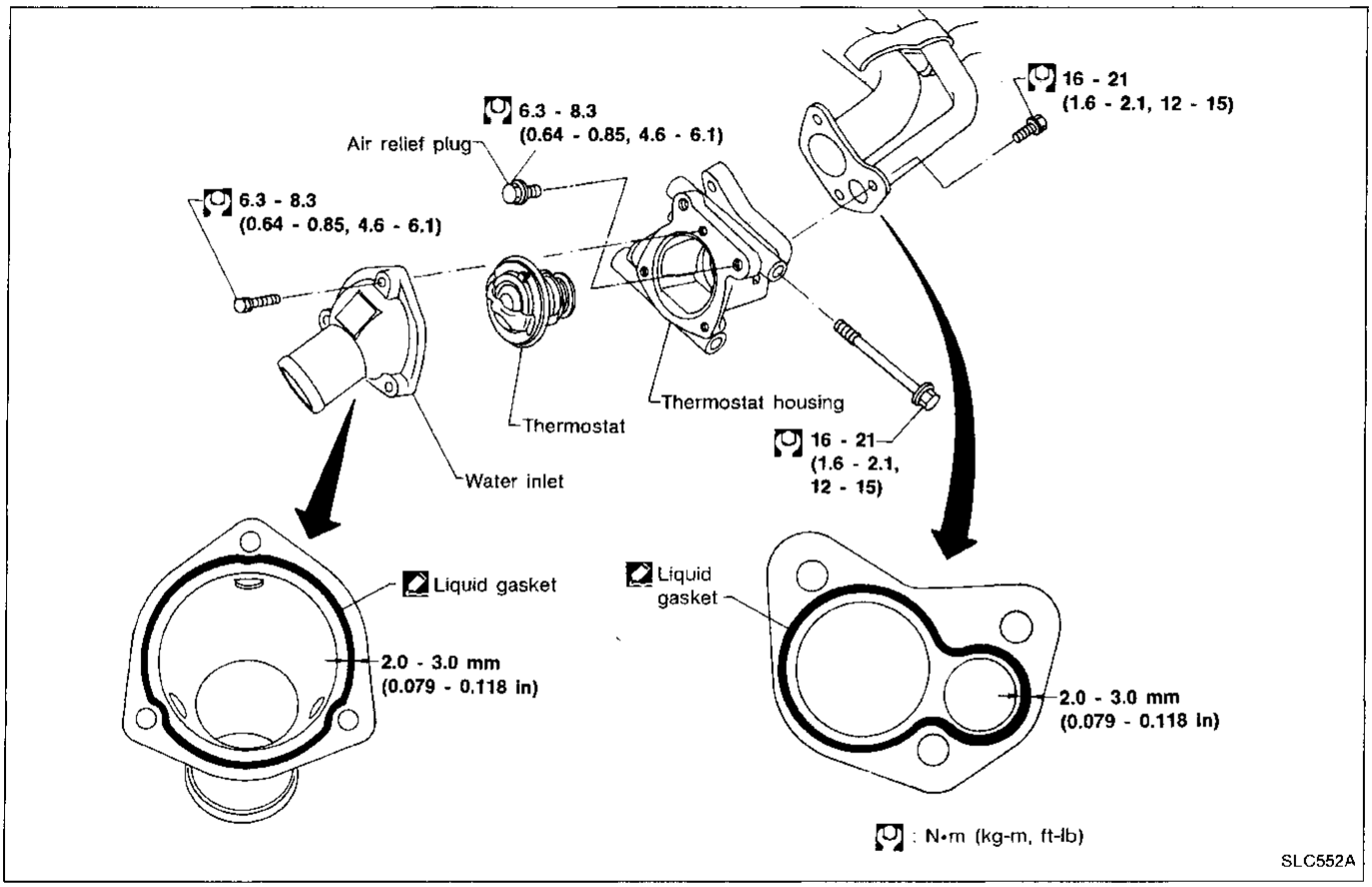
1. Before installing water pump, remove all traces of liquid gasket from mating surface of water pump using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.

Water Pump (Cont'd)



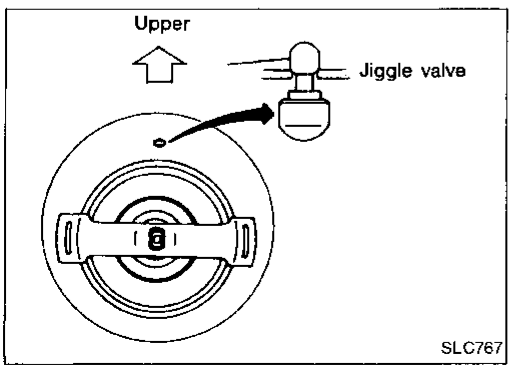
2. Apply a continuous bead of liquid gasket to mating surface of water pump.
- Use Genuine Liquid Gasket or equivalent.

Thermostat



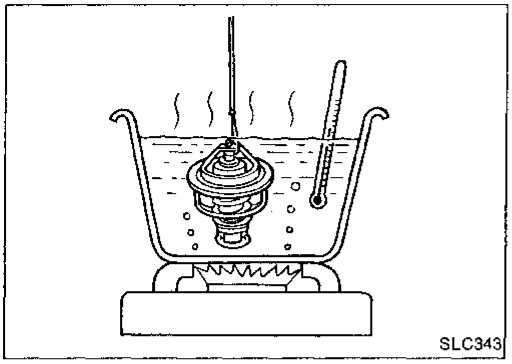
REMOVAL AND INSTALLATION

1. Drain engine coolant.
2. Remove lower radiator hose.
3. Remove water inlet, then take out thermostat.



4. Install thermostat with jiggle valve or air bleeder 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.**

Thermostat (Cont'd)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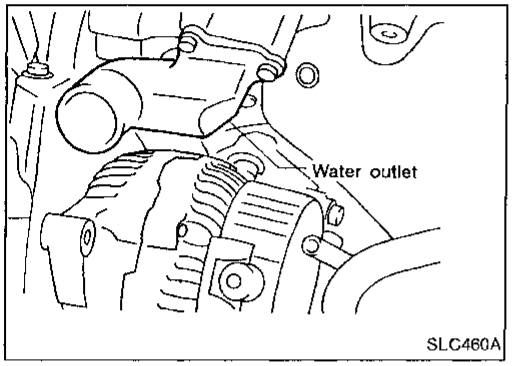
INSPECTION

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

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

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

Water Outlet



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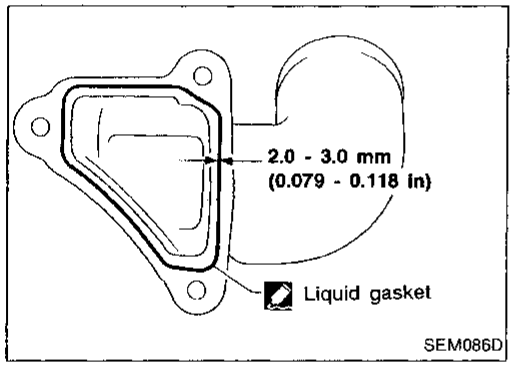
INSPECTION

Visually inspect for water leaks. If there is leakage, apply liquid gasket.

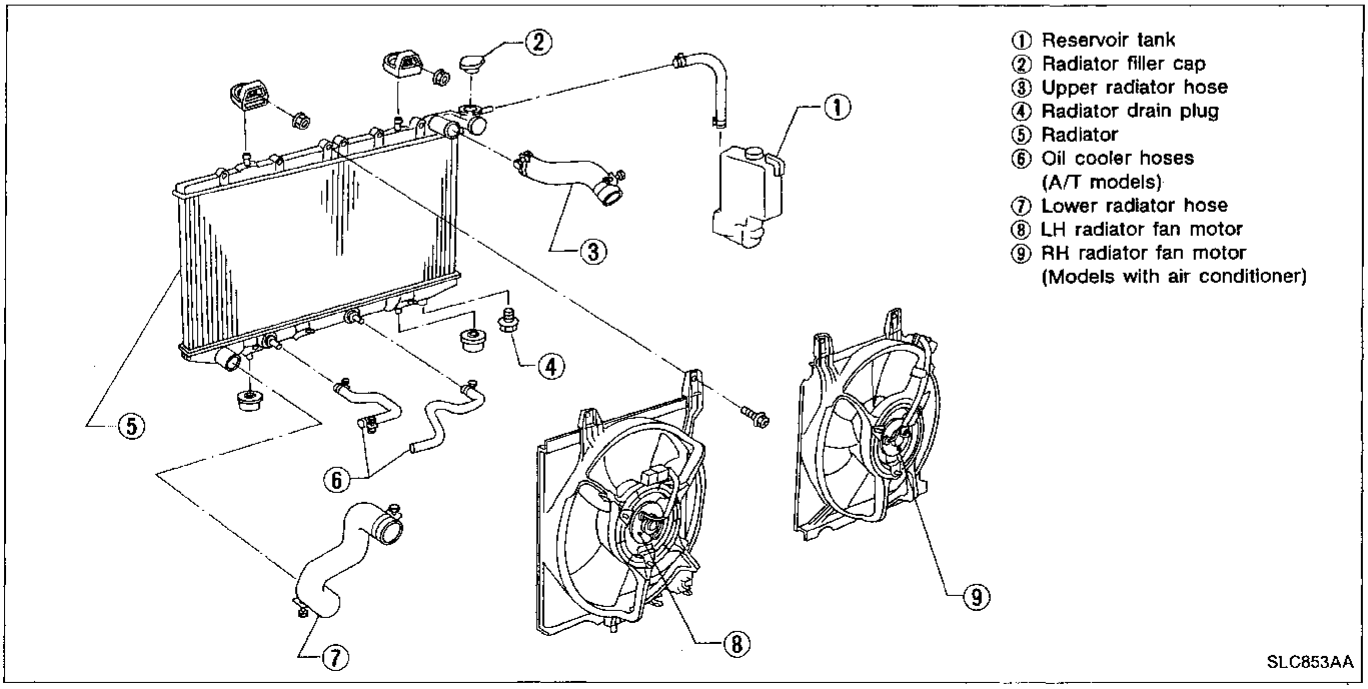


SEM086D

INSTALLATION

1. Before installing water outlet, remove all traces of liquid gasket from mating surface of water outlet using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder head.
2. Apply a continuous bead of liquid gasket to mating surface of water outlet.
- Use Genuine Liquid Gasket or equivalent.

Radiator



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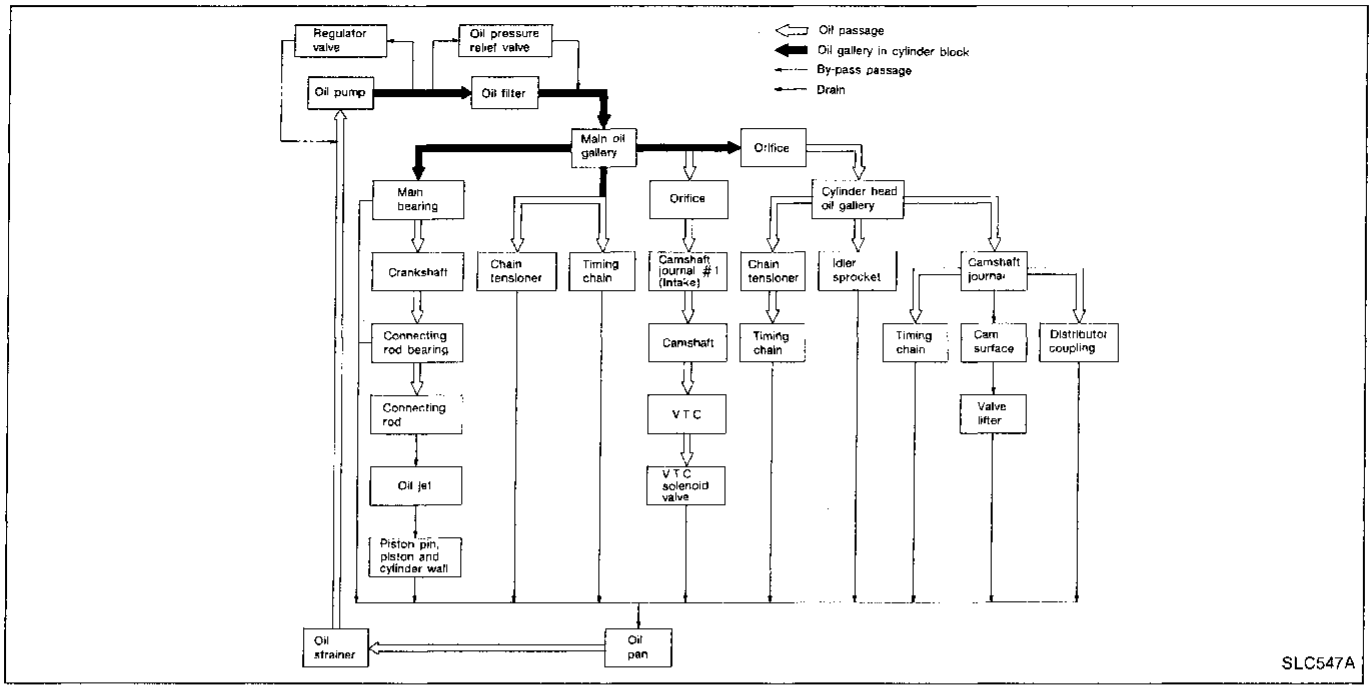
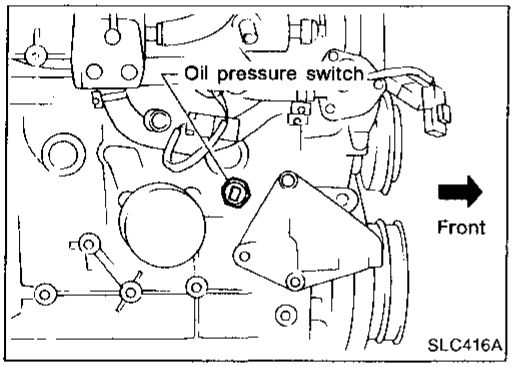
Lubrication Circuit



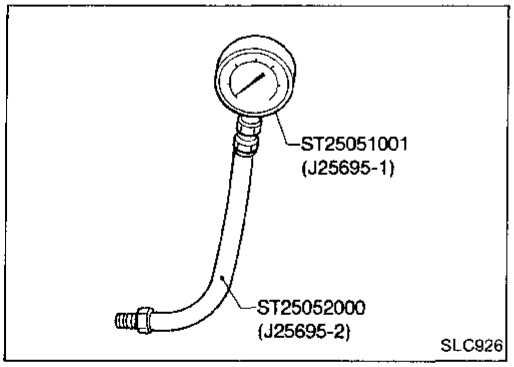


Oil Pressure Check

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.



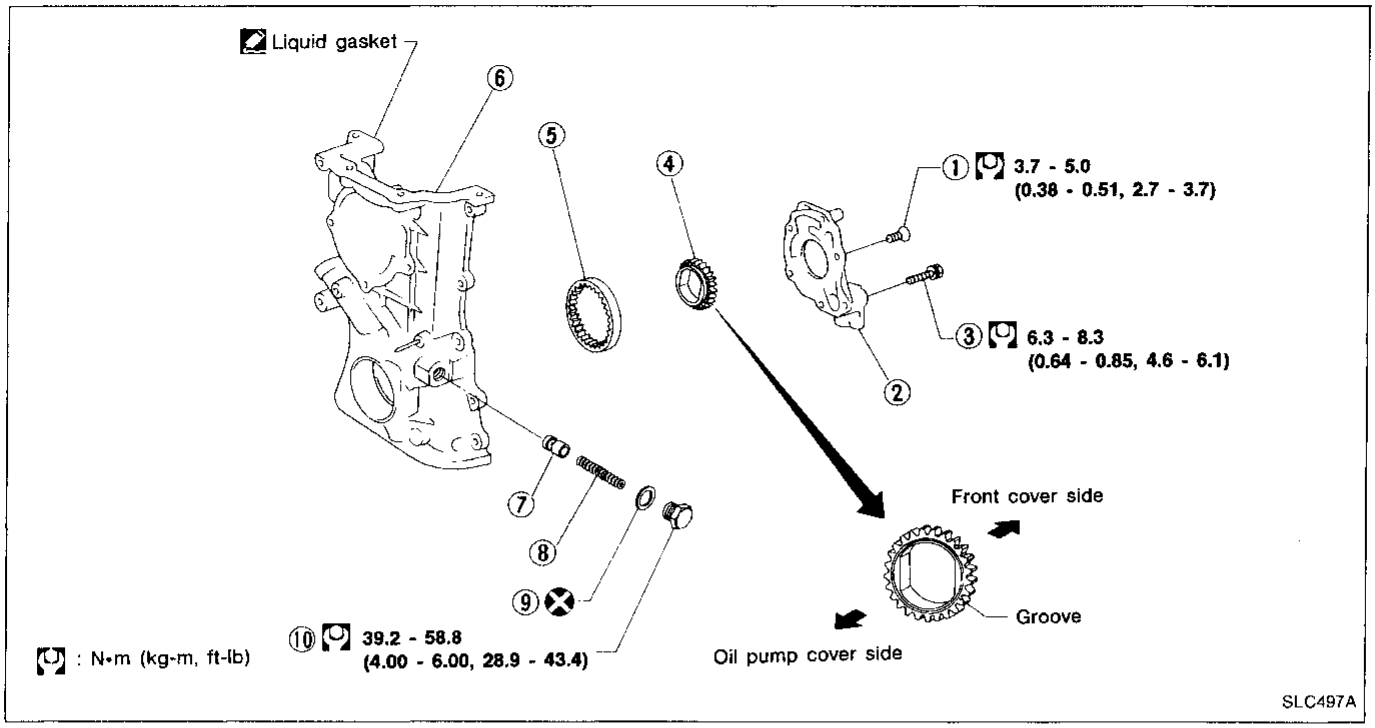
3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

Engine speed rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed	49 - 186 (0.5 - 1.9, 7 - 27)
3,000	343 - 441 (3.5 - 4.5, 50 - 64)

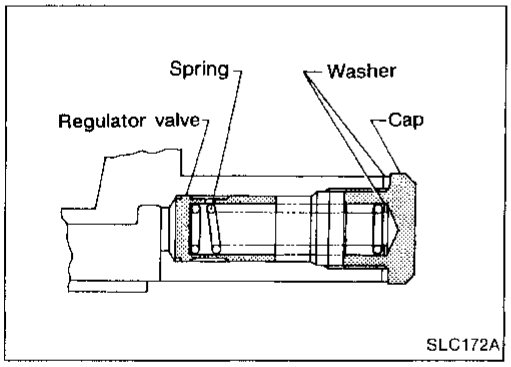
If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch with sealant.

Oil Pump



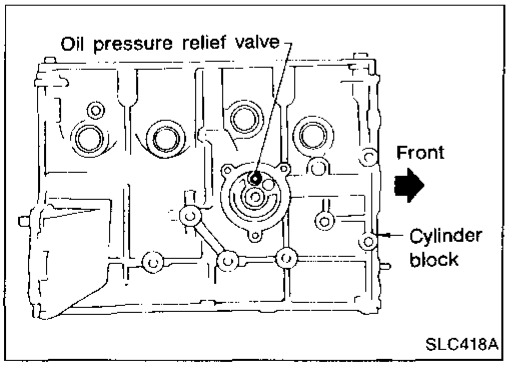
① Screw
② Oil pump cover
③ Bolt
④ Inner gear
⑤ Outer gear
⑥ Front cover
⑦ Regulator valve
⑧ Spring
⑨ Washer
⑩ Plug



REGULATOR VALVE INSPECTION

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

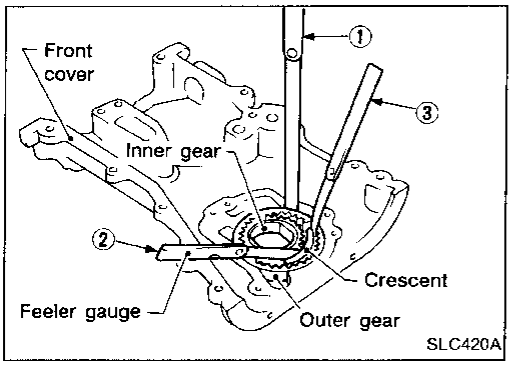
If damaged, replace regulator valve set or oil pump assembly.



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 suitable tool.
Install a new valve in place by tapping it.

Oil Pump (Cont'd)



DISASSEMBLY AND ASSEMBLY

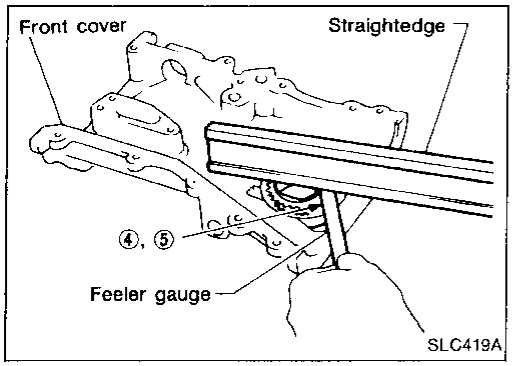
- **Always replace oil seal with a new one.**
- **When installing oil pump, apply engine oil to gears.**
- **Make sure that O-ring is fitted properly.**

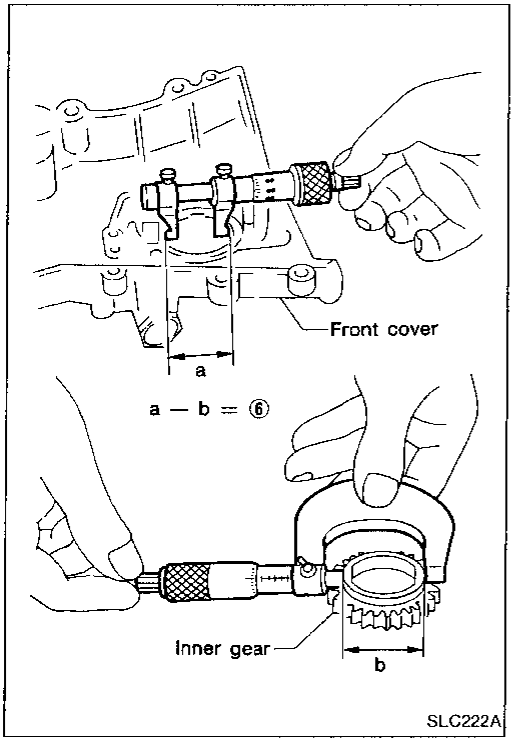
OIL PUMP INSPECTION

Using a feeler gauge, check the following clearance.

Unit: mm (in)

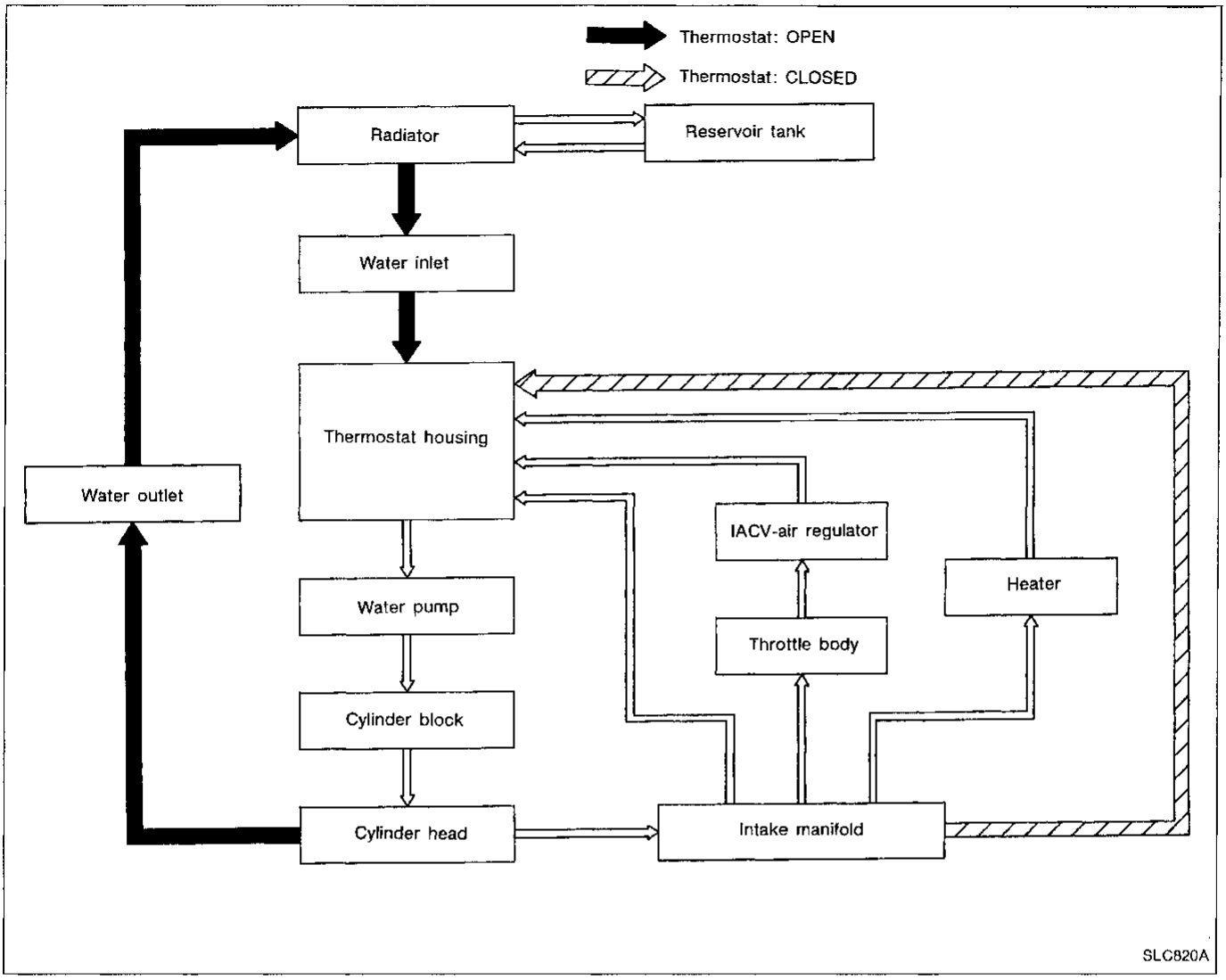
Body to outer gear clearance ①	0.110 - 0.200 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.217 - 0.327 (0.0085 - 0.0129)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Body to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance ⑥	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, ⑥) exceed the limit, replace front cover assembly.**

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.

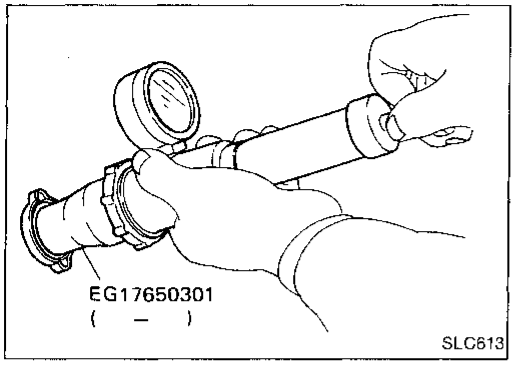
Wrap a thick cloth around cap and carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.

CHECKING COOLING SYSTEM HOSES

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

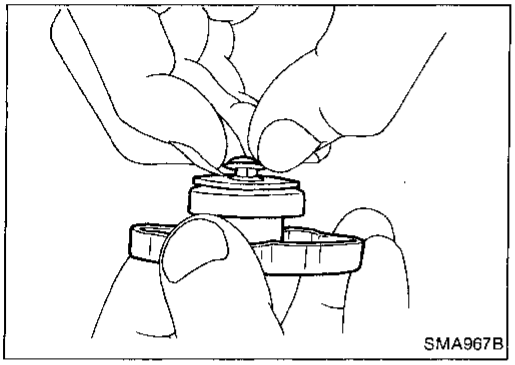
System Check (Cont'd)

CHECKING RADIATOR CAP

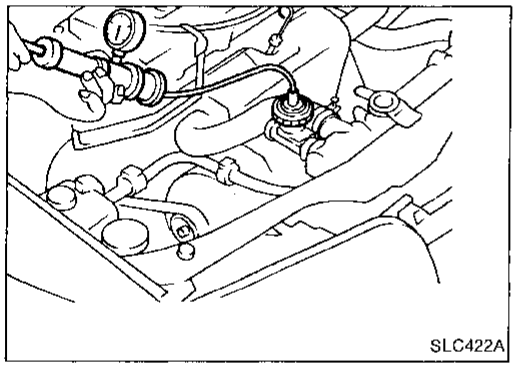


To check radiator cap, apply pressure to cap with a tester.

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



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



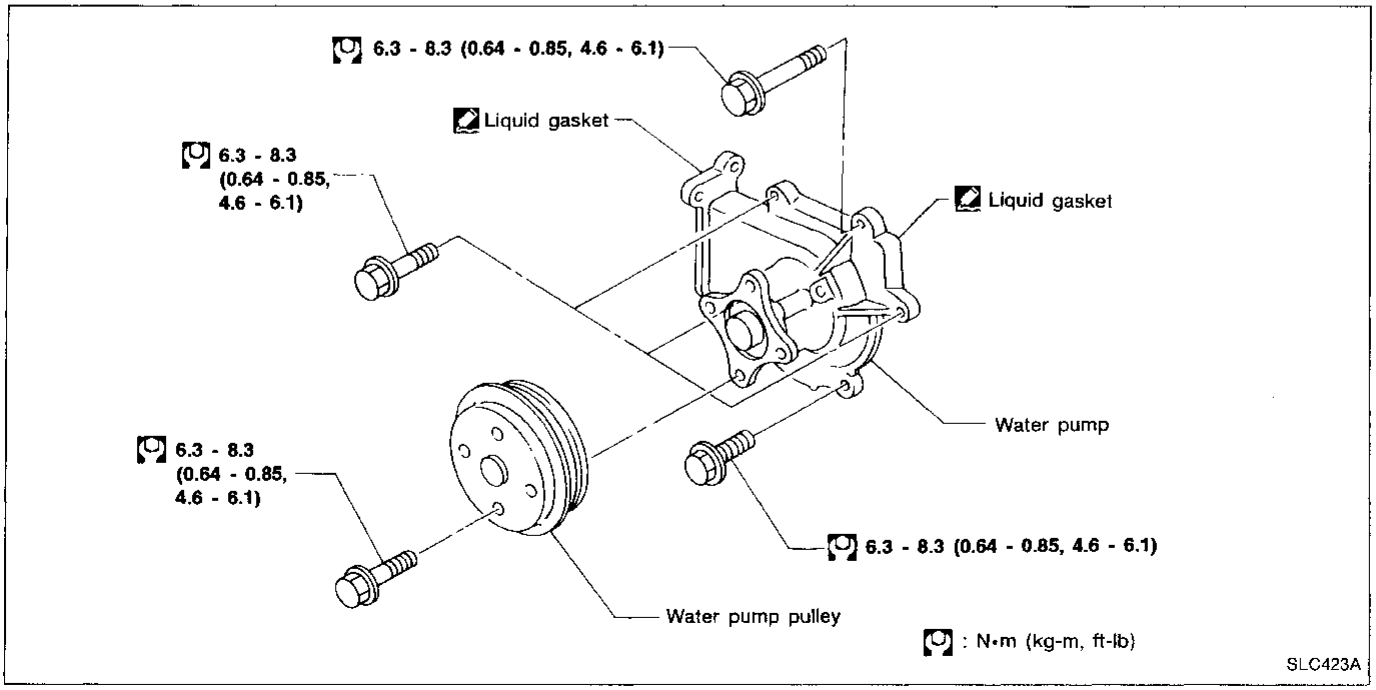
CHECKING COOLING SYSTEM FOR LEAKS

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

Testing pressure:
157 kPa (1.6 kg/cm^2, 23 psi)

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

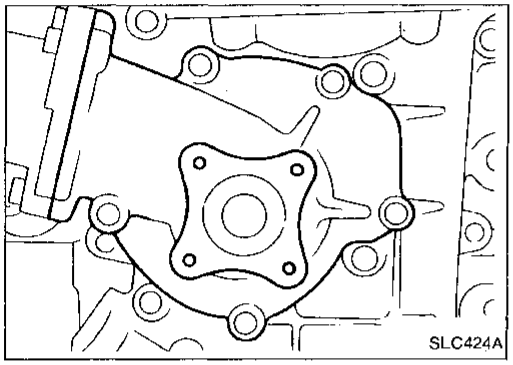
Water Pump



Water Pump (Cont'd)

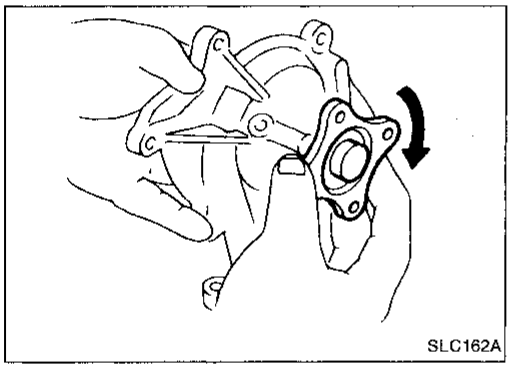
CAUTION:

- **When removing water pump assembly, be careful not to get coolant on timing chain.**
- **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.**


SLC424A

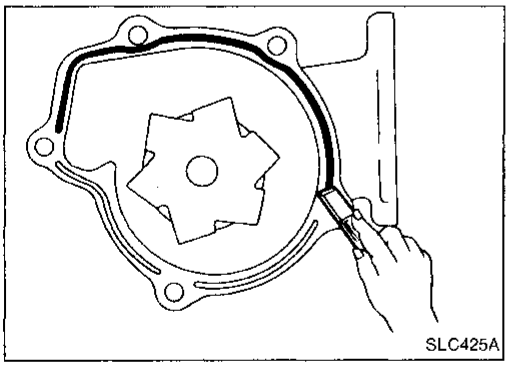
REMOVAL

1. Drain coolant from radiator and cylinder block.
2. Remove drive belts for compressor, power steering pump and alternator.
3. Remove water pump pulley.
4. Remove water pump.


SLC162A

INSPECTION

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

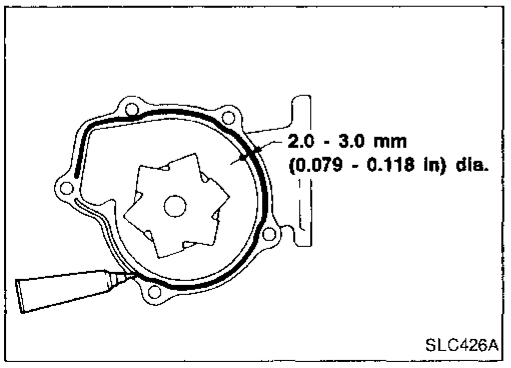

SLC425A

INSTALLATION

- Before installing water pump, remove liquid gasket from mating surface of water pump using a scraper.

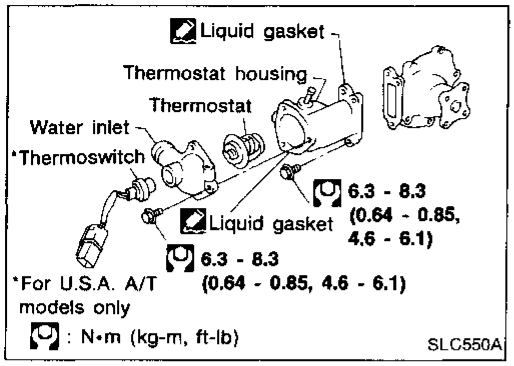
Be sure liquid gasket in grooves is also removed.

- Remove liquid gasket from mating surface of front cover.
- Remove all traces of liquid gasket using white gasoline.



SLC426A

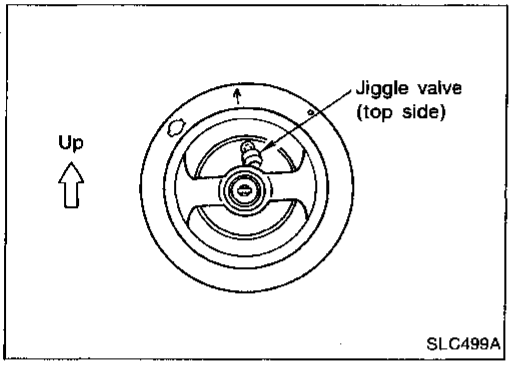
- Apply liquid gasket to mating surface of pump housing as shown.

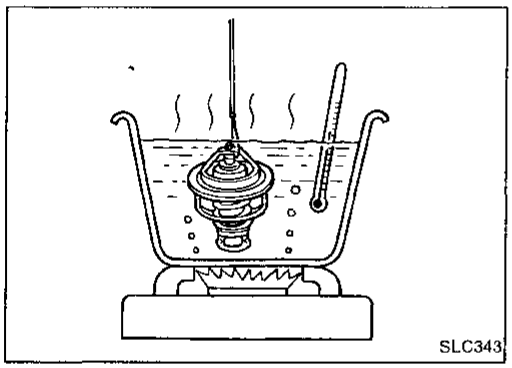


Thermostat

INSPECTION

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





2. Check valve opening temperature and maximum valve lift.

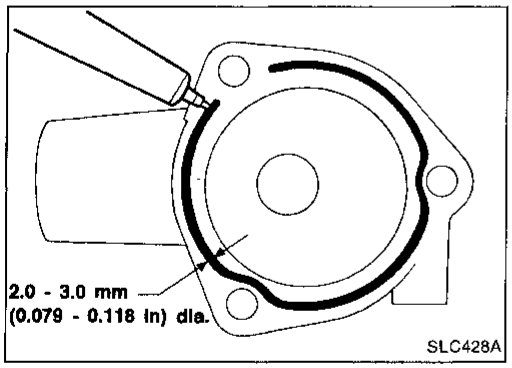
Valve opening temperature	°C (°F)	76.5 (170)
Max. valve lift	mm/°C (in/°F)	8/90 (0.31/194)

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

- **After installation, run engine for a few minutes, and check for leaks.**

INSTALLATION

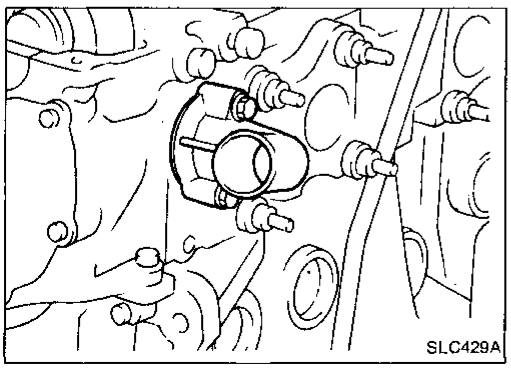
When installing water inlet apply liquid gasket as shown.



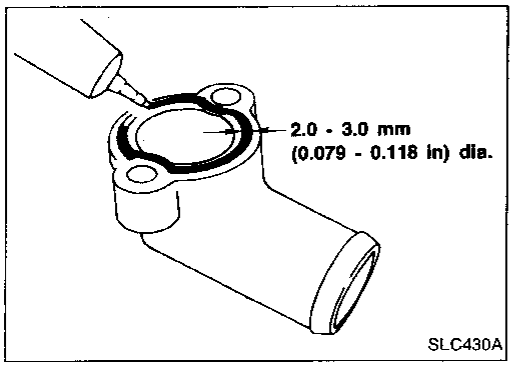
Water Outlet

INSPECTION

Visually inspect for water leaks. If there is leakage, apply liquid gasket.



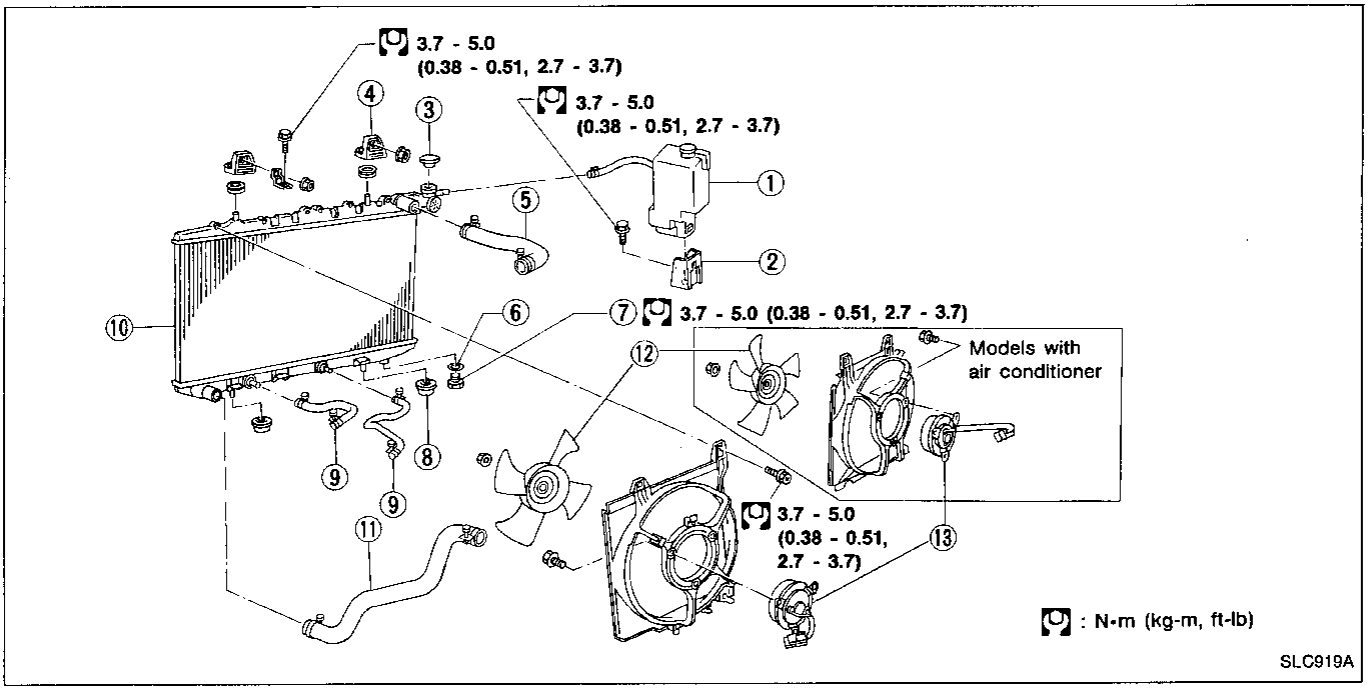
Water Outlet (Cont'd)



INSTALLATION

When installing water outlet, apply liquid gasket as shown.

Radiator



① Reservoir tank
② Reservoir tank bracket
③ Radiator cap
④ Mounting bracket
⑤ Upper hose
⑥ Washer
⑦ Drain plug
⑧ Mounting rubber
⑨ Oil cooler hose (A/T models)
⑩ Radiator
⑪ Lower hose
⑫ Fan
⑬ Fan motor

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

Engine Lubrication System (SR)

Oil pressure check

Engine speed rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed	More than 78 (0.8, 11)
3,200	314 - 392 (3.2 - 4.0, 46 - 57)

Oil pump inspection

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)

Regulator valve inspection

Unit: mm (in)

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

Engine Cooling System (SR)

Thermostat

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

Engine Lubrication System (GA)

Oil pressure check

Engine speed rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed	49 - 186 (0.5 - 1.9, 7 - 27)
3,000	343 - 441 (3.5 - 4.5, 50 - 64)

Oil pump inspection

Unit: mm (in)

Body to outer gear clearance	0.110 - 0.200 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.217 - 0.327 (0.0085 - 0.0129)
Outer gear to crescent clearance	0.21 - 0.32 (0.0083 - 0.0126)
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)

Engine Cooling System (GA)

Thermostat

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