

ENGINE LUBRICATION & COOLING SYSTEMS

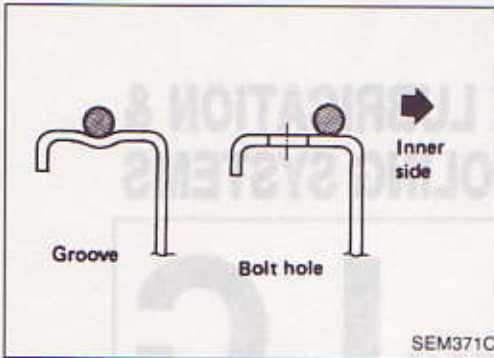
SECTION LC

LC

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PRECAUTIONS







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 4.0 to 5.0 mm (0.157 to 0.197 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).
- Apply liquid gasket to inner surface around hole perimeter area.
(Assembly should be done within 5 minutes after coating.)
- Wait at least 30 minutes before refilling engine oil and engine coolant.

SPECIAL SERVICE TOOLS

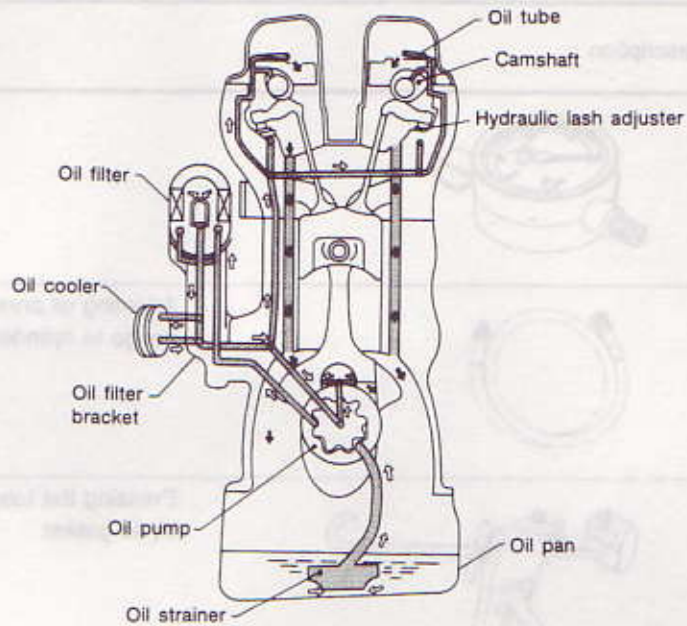
*: Special tool or commercial equivalent

Tool number Tool name	Description	Engine application		
		SR	GA	LD
ST25051001* Oil pressure gauge		X	X	X
ST25052000 Hose	 Adapting oil pressure gauge to cylinder block	X	X	X
WS39930000 Tube presser	 Pressing the tube of liquid gasket	X	X	X
EG17650301 Radiator cap tester adapter	 Adapting radiator cap tester to radiator filler-neck	X	X	X

Lubrication Circuit

SR20DE

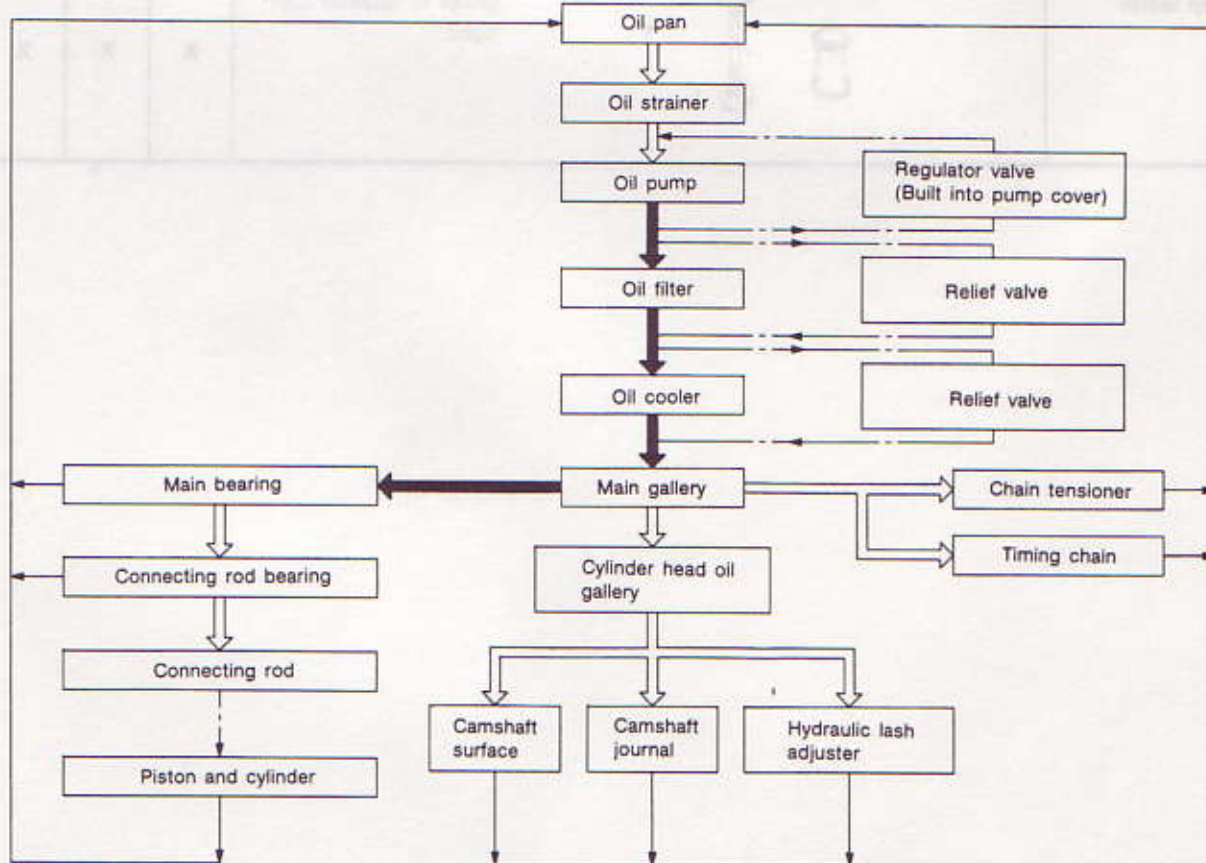
Return
Feed



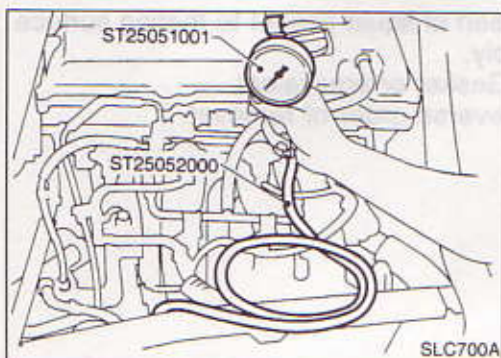
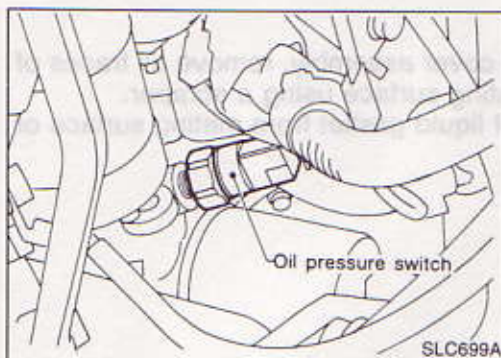
SLC594A

SR20DE

Oil gallery
Oil passage
By-pass passage
To oil pan



SLC595A



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" gear 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 rpm	Approximate discharge pressure kPa (bar, kg/cm ² , psi)
Idle speed	More than 78 (0.78, 0.8, 11)
3,200	314 - 392 (3.14 - 3.92, 3.2 - 4.0, 46 - 57)

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

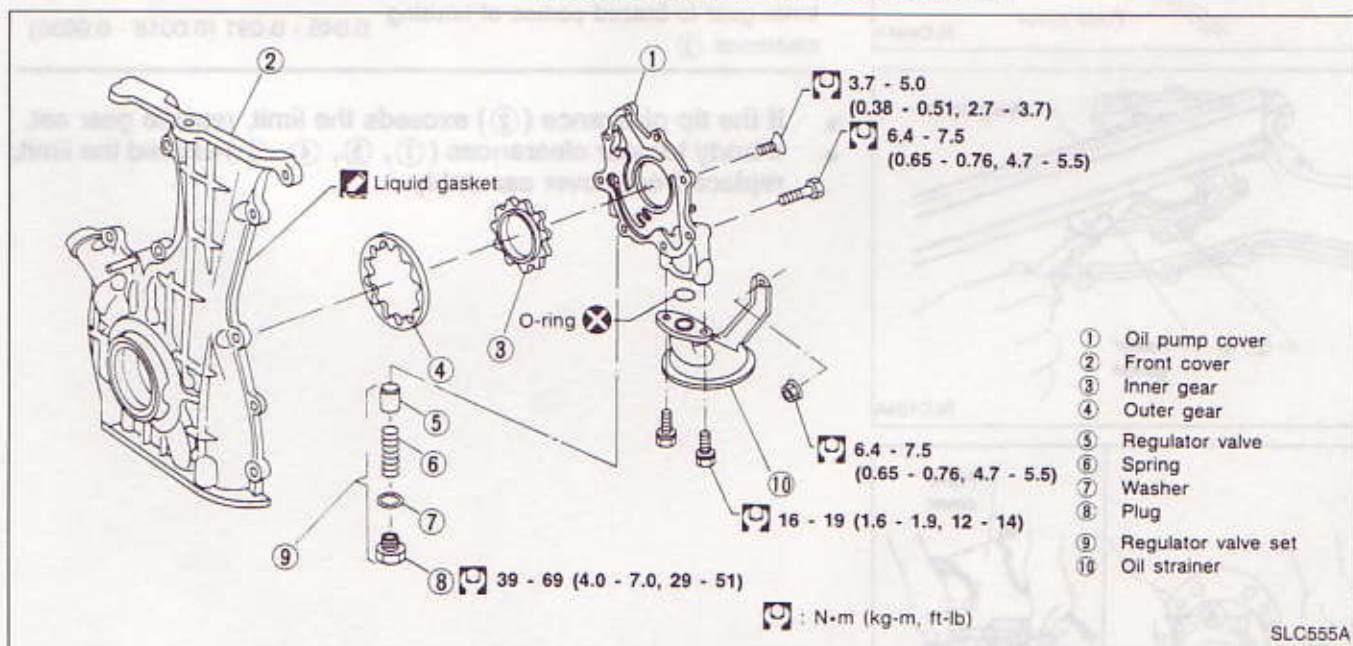
6. Install oil pressure switch with sealant.

Oil Pump

REMOVAL

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

DISASSEMBLY AND ASSEMBLY

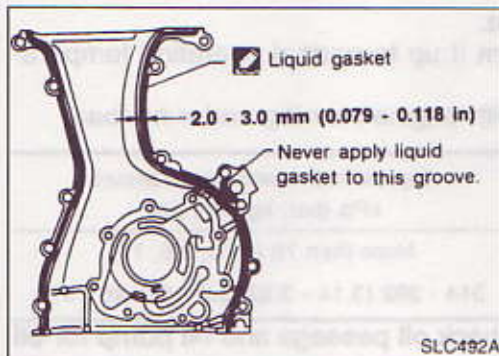
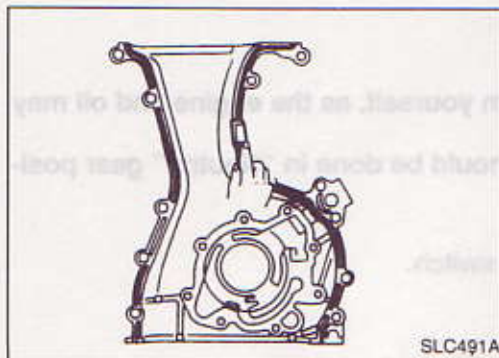


- Always replace oil seal and O-ring with new ones.
- When installing oil pump, apply engine oil to inner and outer gears.
- Be sure that O-rings are properly fitted.

Oil Pump (Cont'd)

INSTALLATION

- 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.



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

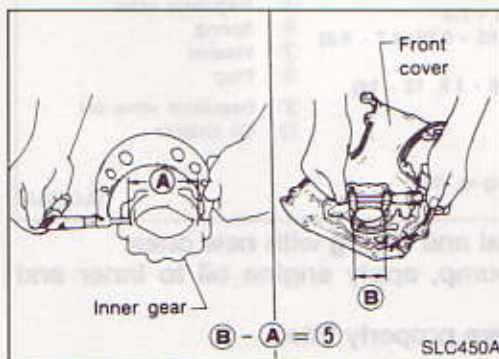
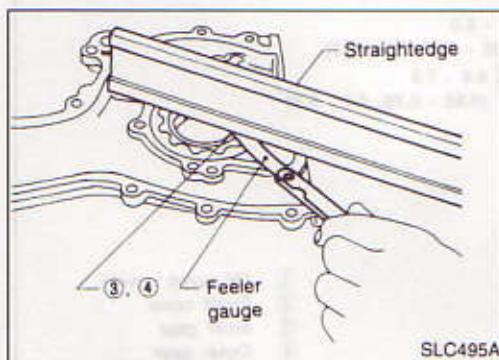
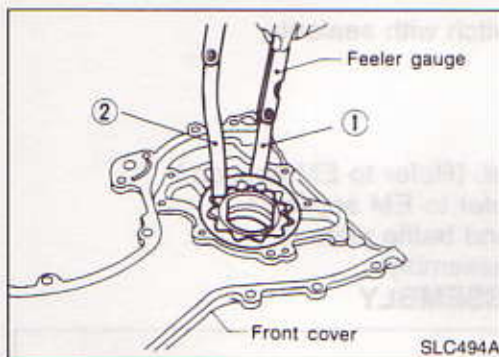
INSPECTION

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.

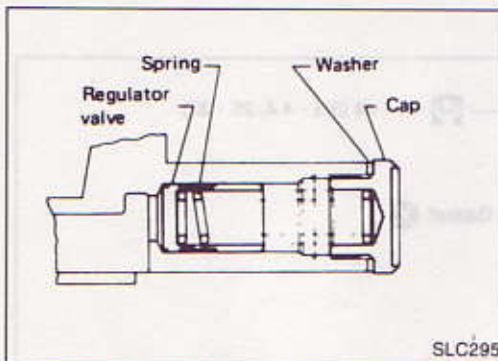


Oil Pump (Cont'd)

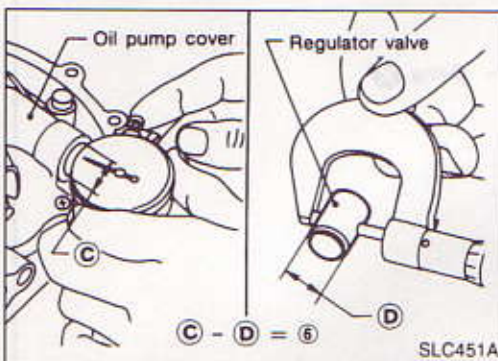
REGULATOR VALVE INSPECTION

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.



SLC295



SLC451A

4. Check regulator valve to oil pump cover clearance.

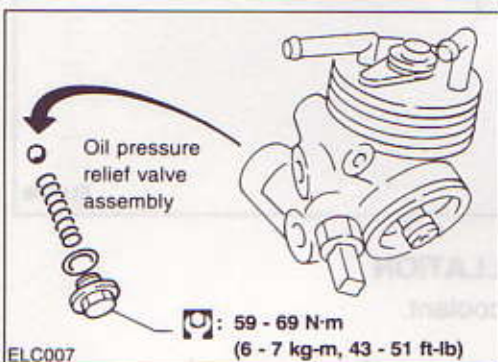
Clearance:

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

If it exceeds the limit, replace oil pump cover.

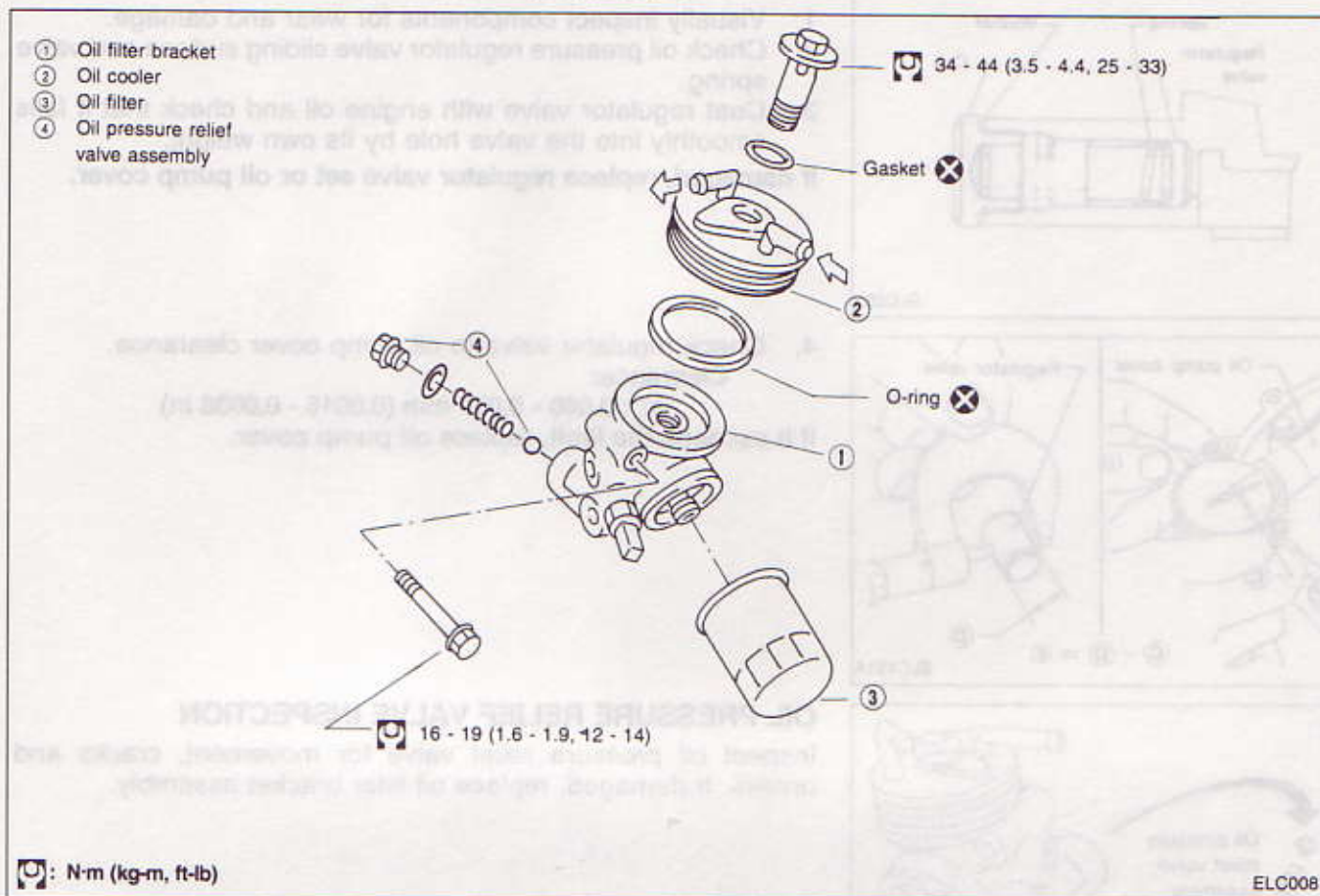
OIL PRESSURE RELIEF VALVE INSPECTION

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



ELC007

Oil Cooler



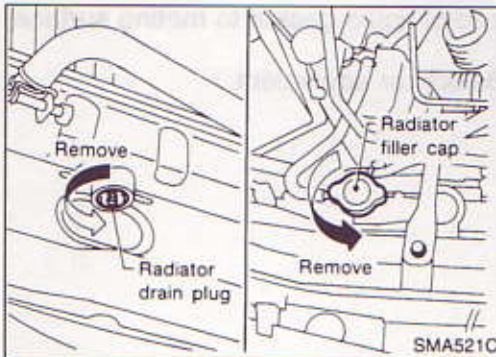
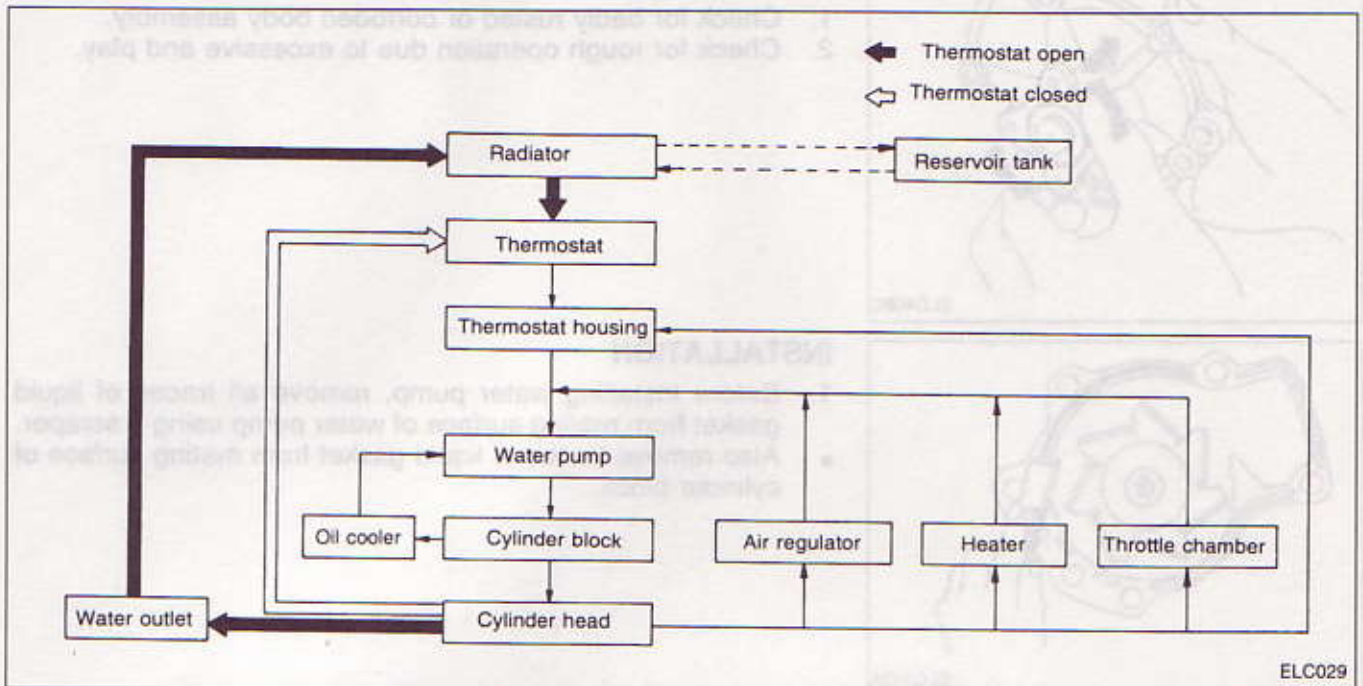
REMOVAL AND INSTALLATION

1. Drain engine oil and coolant.
2. Remove oil cooler.
3. Installation is in the reverse order of removal.

INSPECTION

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

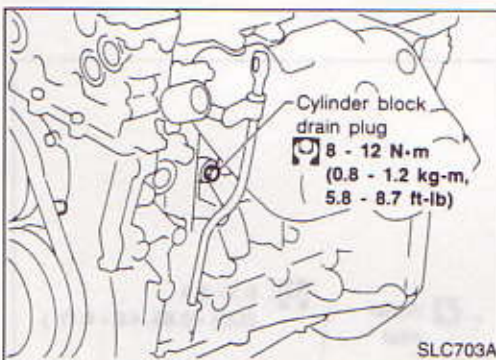
Cooling Circuit



Water Pump

REMOVAL

1. Drain coolant from radiator.



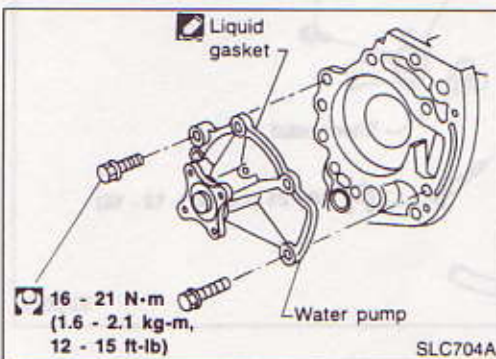
2. Remove under cover.

3. Remove cylinder block drain plug located at left front of cylinder block and drain coolant.

4. Remove engine room fan.

5. Remove drive belts.

6. Remove water pump pulley.



7. Remove water pump.

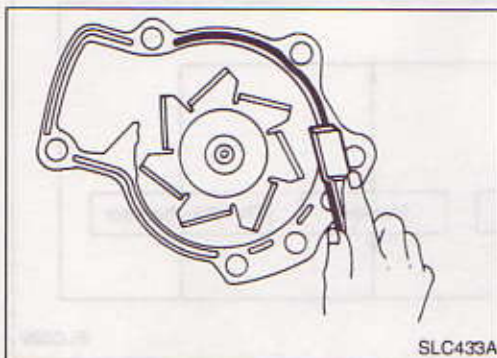
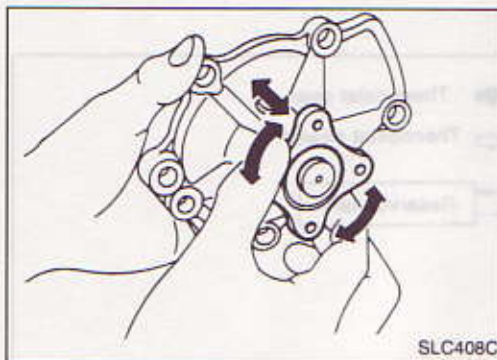
CAUTION:

- When removing water pump assembly, be careful not to spill 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)

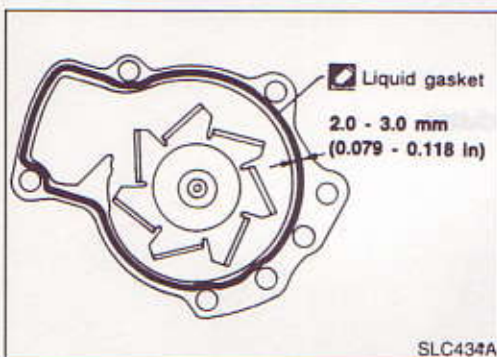
INSPECTION

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



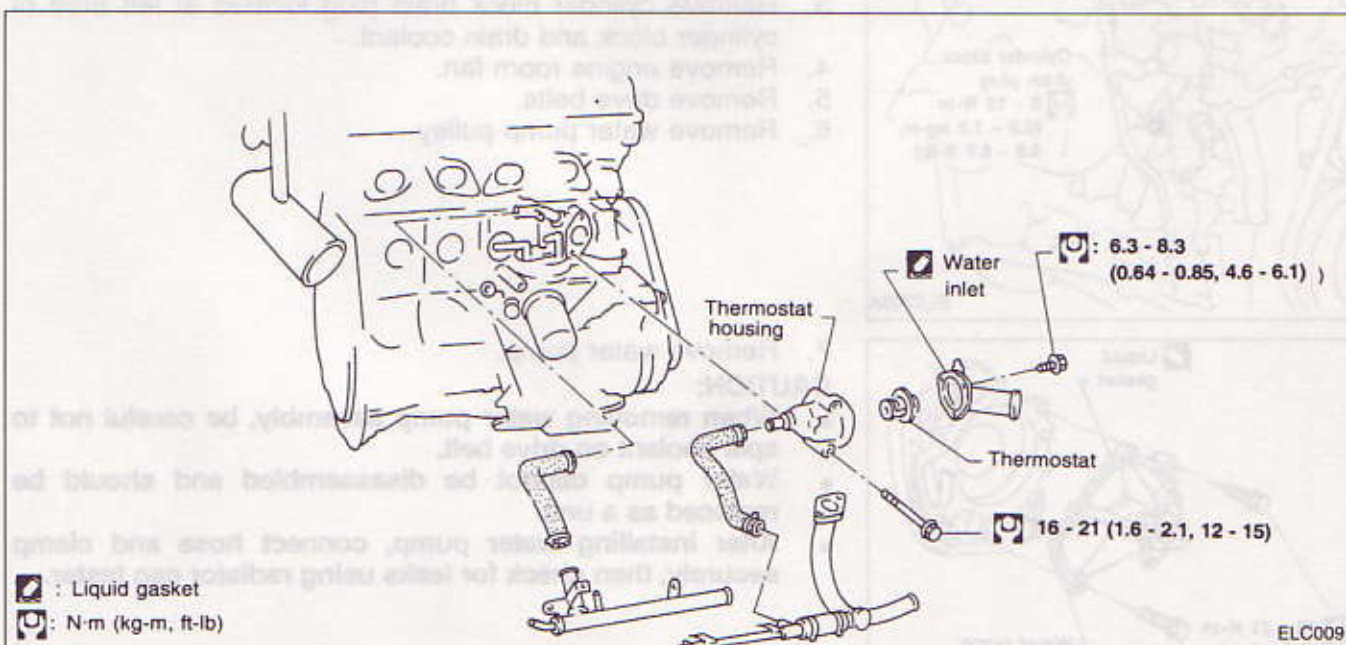
INSTALLATION

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.



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

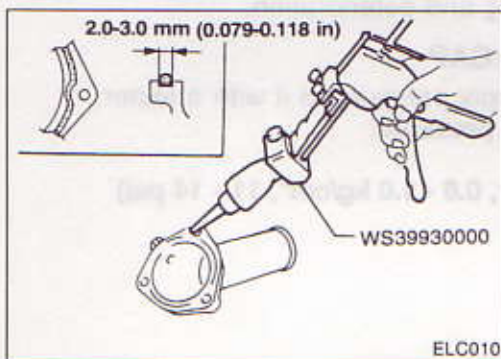
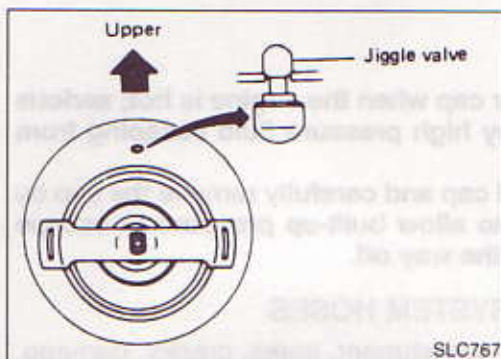
Thermostat



Thermostat (Cont'd)

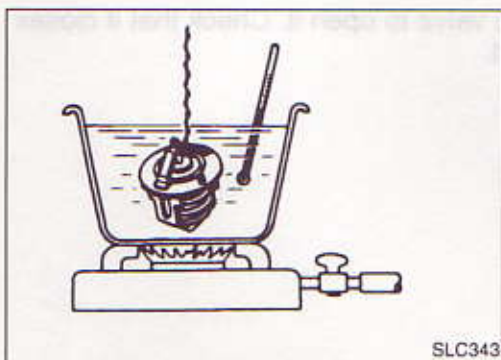
REMOVAL AND INSTALLATION

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.

5. When installing water inlet, apply liquid gasket as shown.
 - 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

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

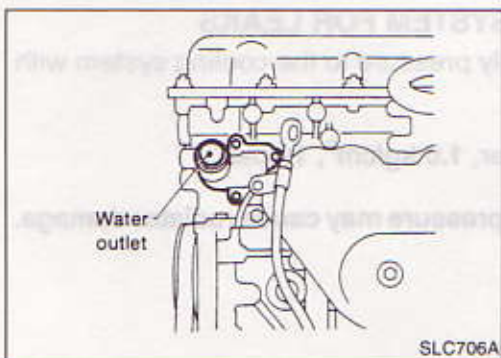
Valve opening temperature	°C (°F)	76.5 (170)
Max. valve lift	mm/°C (in/°F)	8/90 (0.31/194)

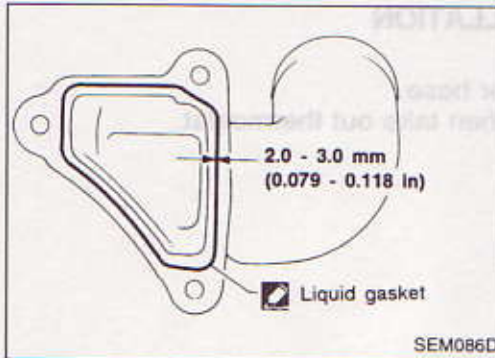
3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

Water Outlet

INSPECTION

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



Water Outlet (Cont'd)**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.

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.

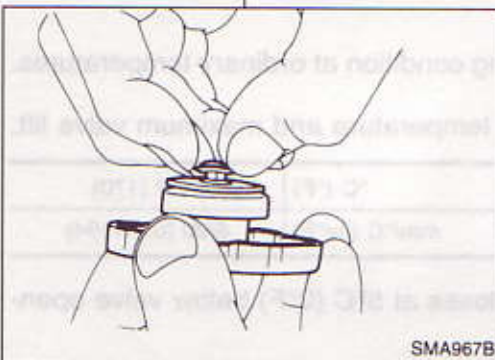
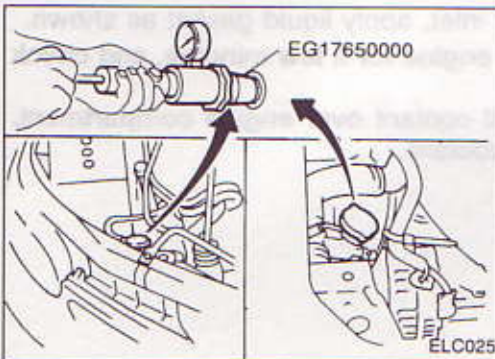
CHECKING RADIATOR CAP

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

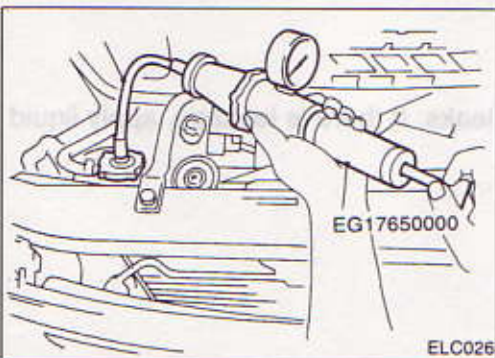
Radiator cap relief pressure:

78 - 98 kPa

(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm², 11 - 14 psi)



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

**CHECKING COOLING SYSTEM FOR LEAKS**

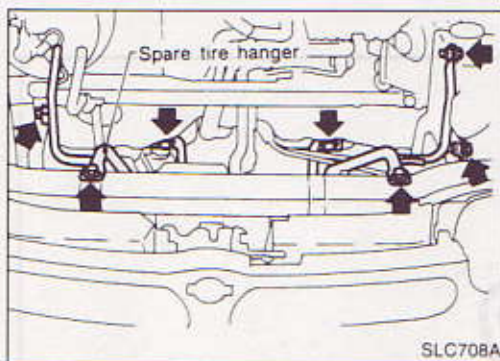
To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure:

98 kPa (0.98 bar, 1.0 kg/cm², 14 psi)

CAUTION:

Higher than the specified pressure may cause radiator damage.

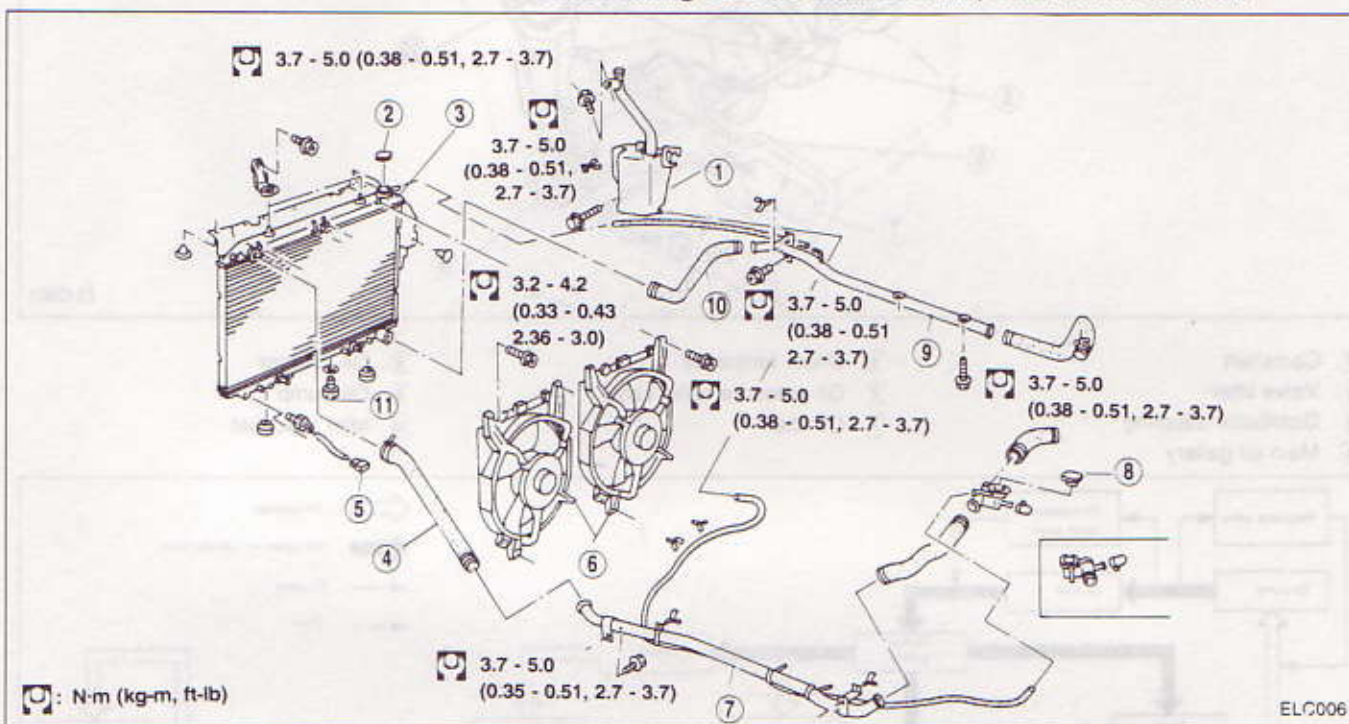


Radiator (Aluminum type)

REMOVAL AND INSTALLATION

1. Remove under cover.
2. Drain coolant from radiator.
3. Remove air duct.
4. Remove spare tire and spare tire hanger.
5. Disconnect upper and lower radiator hoses.
6. Disconnect reservoir tank hose.
7. Remove radiator.
8. After repairing or replacing radiator, install any part removed in reverse order of removal.

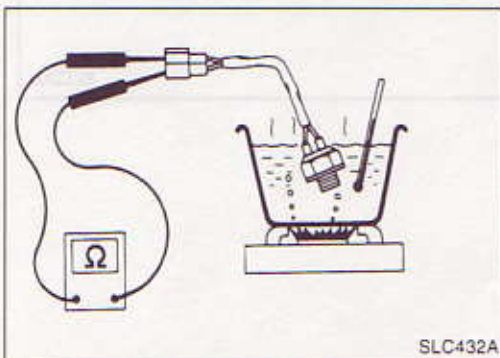
When filling radiator with coolant, refer to MA section.



- ① Reservoir tank
- ② Radiator filler cap
- ③ Radiator
- ④ Upper radiator hose

- ⑤ Thermoswitch
- ⑥ Radiator shroud
- ⑦ Metal tube
- ⑧ Check cap

- ⑨ Metal tube
- ⑩ Lower radiator hose
- ⑪ Radiator drain plug



Thermoswitch

INSPECTION

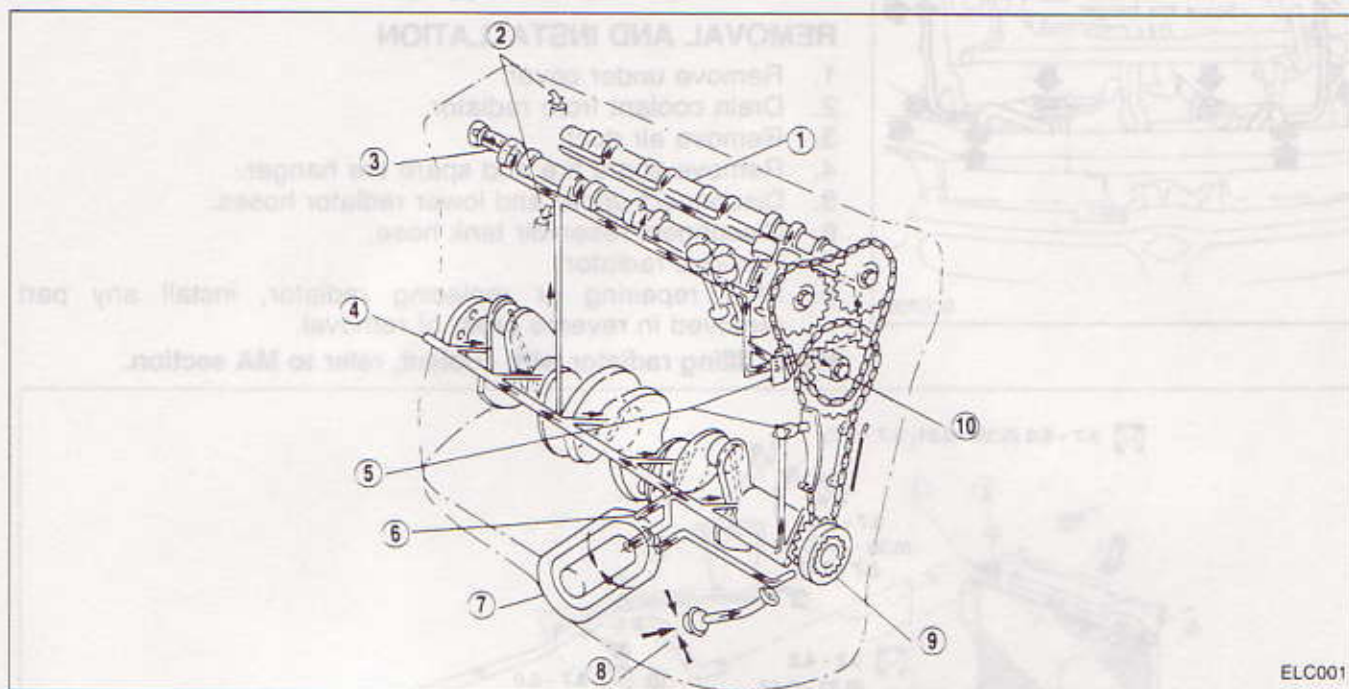
1. Drain about one liter of coolant.
2. Remove thermostatic switch.
3. Check thermostatic switch for proper operation.

Operating temperature:

OFF → ON 82 - 88°C (180 - 190 °F)

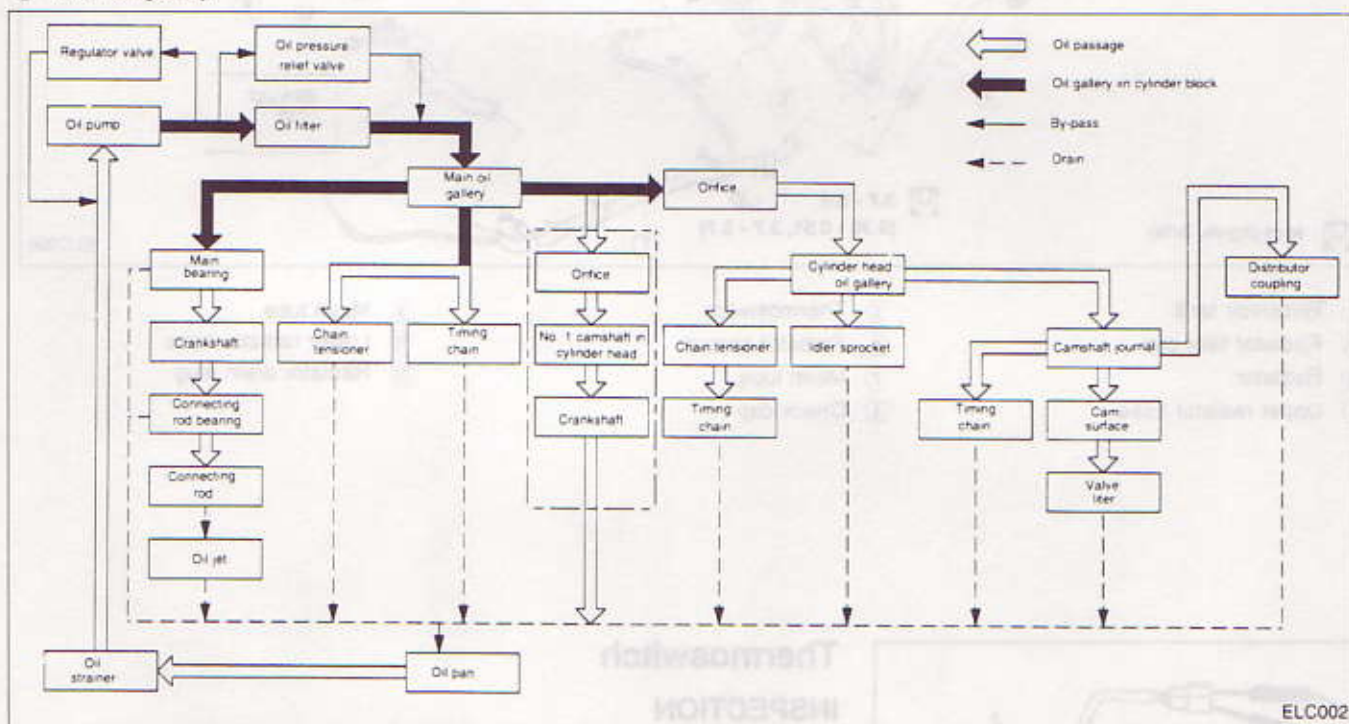
4. Refill cooling system.

Lubrication Circuit



ELC001

- | | | |
|------------------------|-----------------------------|------------------|
| ① Camshaft | ⑤ Chain tensioner | ⑧ Oil strainer |
| ② Valve lifter | ⑥ Oil pressure relief valve | ⑨ Oil pump |
| ③ Distributor coupling | ⑦ Oil filter | ⑩ Idler sprocket |
| ④ Main oil gallery | | |

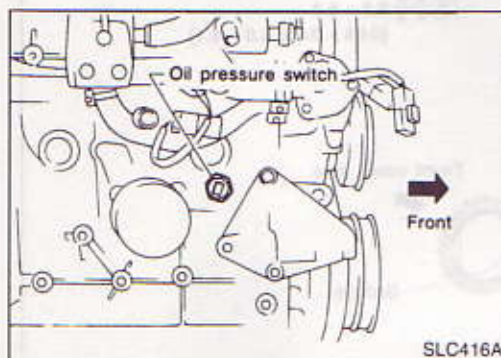


ELC002

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" gear position.



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



Engine rpm	Approximate discharge pressure kPa (bar, kg/cm ² , psi)
Idle speed	49 - 186 (0.49 - 1.86, 0.5 - 1.9, 7 - 27)
3,000	343 - 441 (3.43 - 4.41, 3.5 - 4.5, 50 - 64)

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.

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

6. Install oil pressure switch with sealant.

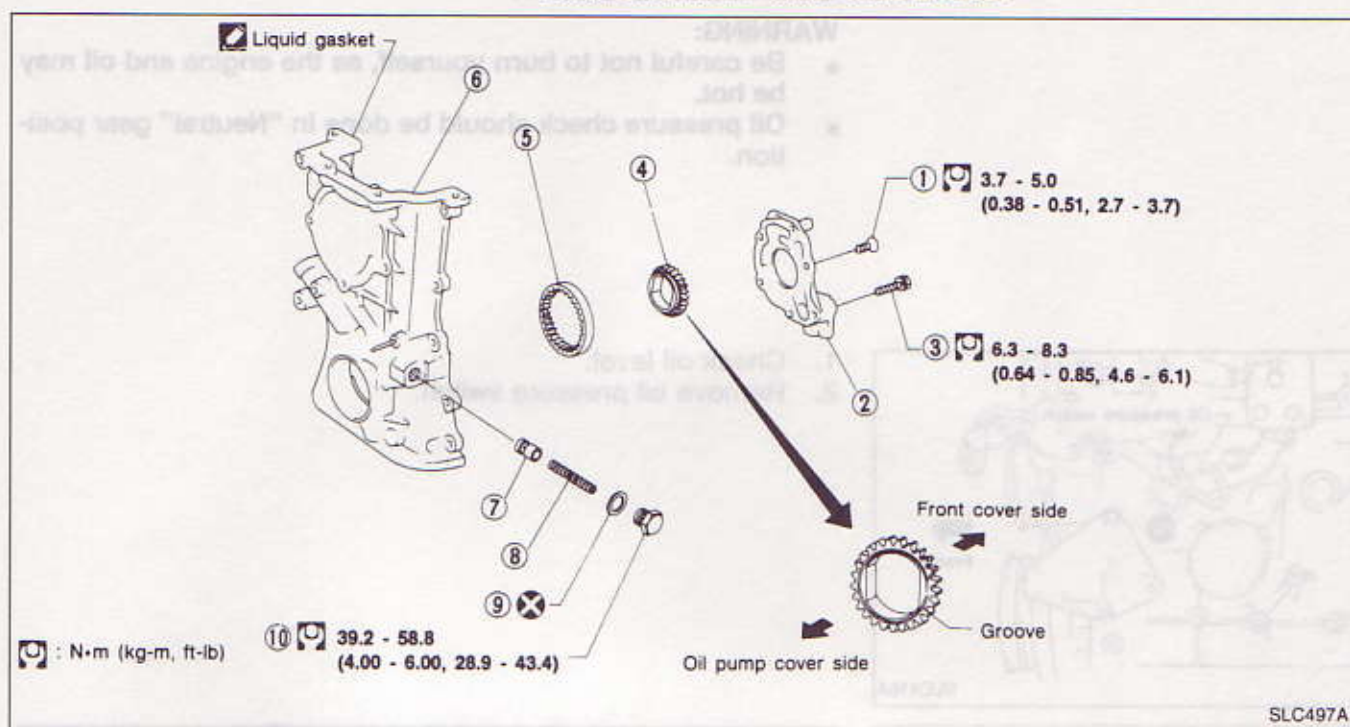
Oil Pump

REMOVAL

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

Oil Pump (Cont'd)

DISASSEMBLY AND ASSEMBLY



- ① Screw
- ② Oil pump cover
- ③ Bolt
- ④ Inner gear

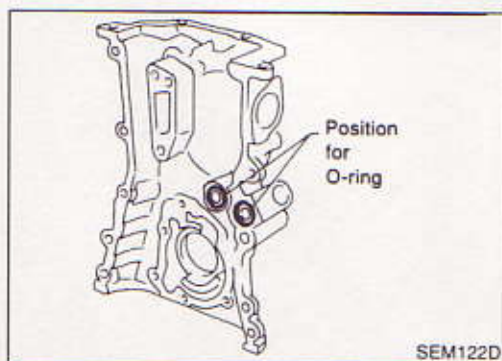
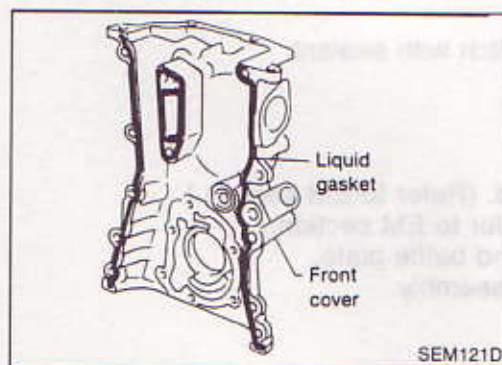
- ⑤ Outer gear
- ⑥ Front cover
- ⑦ Regulator valve

- ⑧ Spring
- ⑨ Washer
- ⑩ Plug

- 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.

INSTALLATION

- 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.



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

Oil Pump (Cont'd)

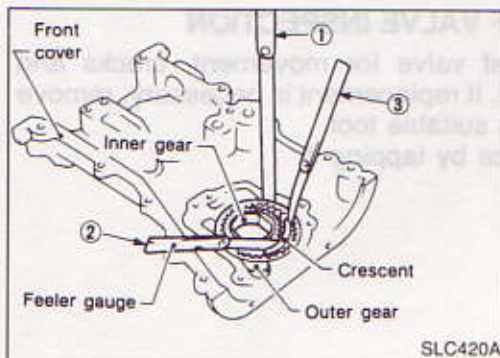
OIL PUMP INSPECTION

Using a feeler gauge, check the following clearance.

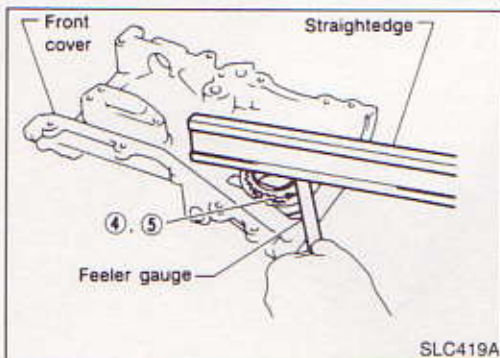
Unit: mm (in)

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)

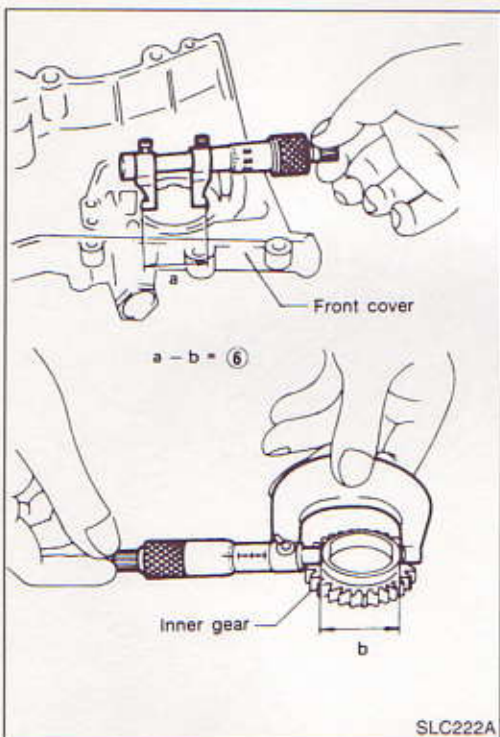
- If the tip clearance (②) exceeds the limit, replace gear set.
- If body to gear clearances (①, ③, ④, ⑤, ⑥) exceed the limit, replace front cover assembly.



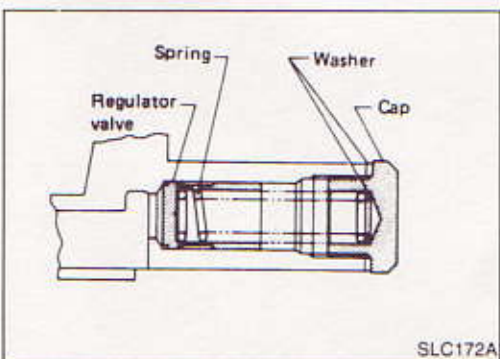
SLC420A



SLC419A



SLC222A



SLC172A

REGULATOR VALVE INSPECTION

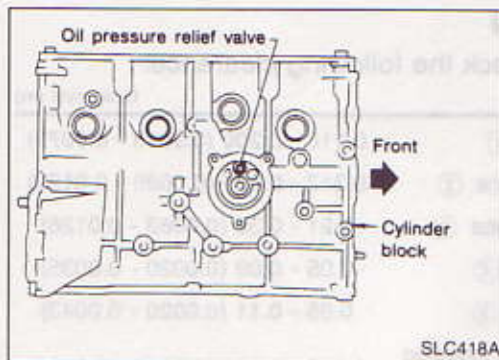
1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Apply regulator valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

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

Oil Pump (Cont'd)

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.

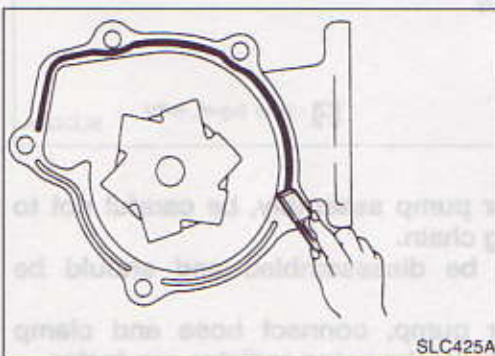
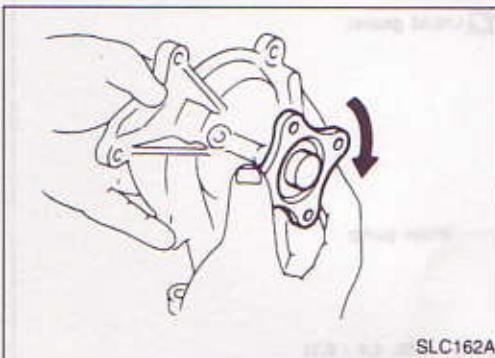
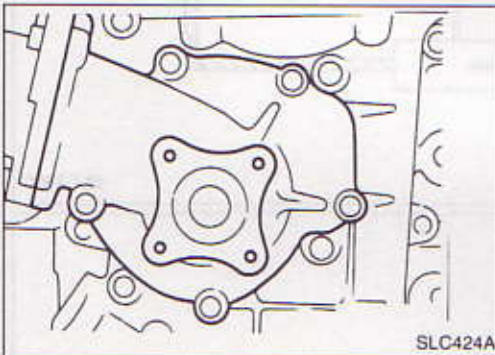
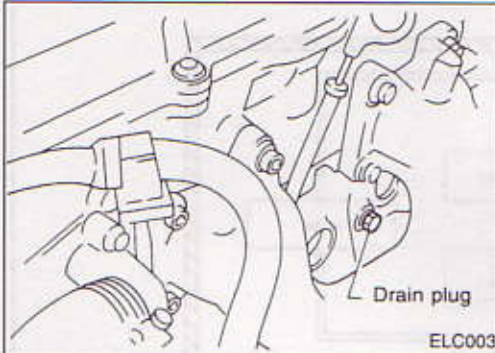
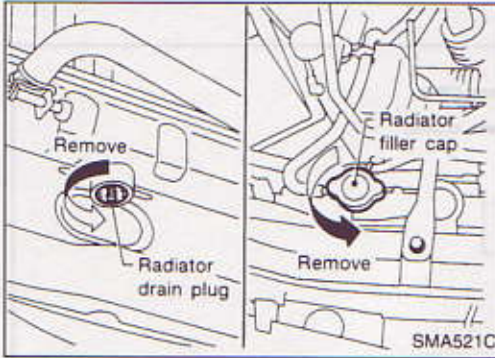


Cooling Circuit



CAUTION:

- When removing water pump assembly, be careful not to spill 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.



Water Pump

REMOVAL

1. Drain coolant from radiator.
2. Remove under cover.
3. Remove cylinder block drain plug located at left front of cylinder block and drain coolant.
4. Remove engine room fan.
5. Remove drive belts.
6. Remove water pump pulley.
7. Remove water pump.

INSPECTION

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

INSTALLATION

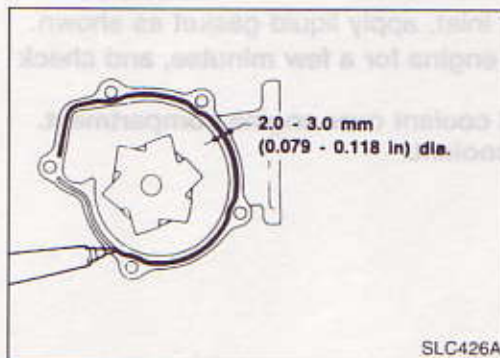
- Before installing water pump, remove liquid gasket from mating surface of water pump using a scraper.

Make sure to remove liquid gasket from grooves as well.

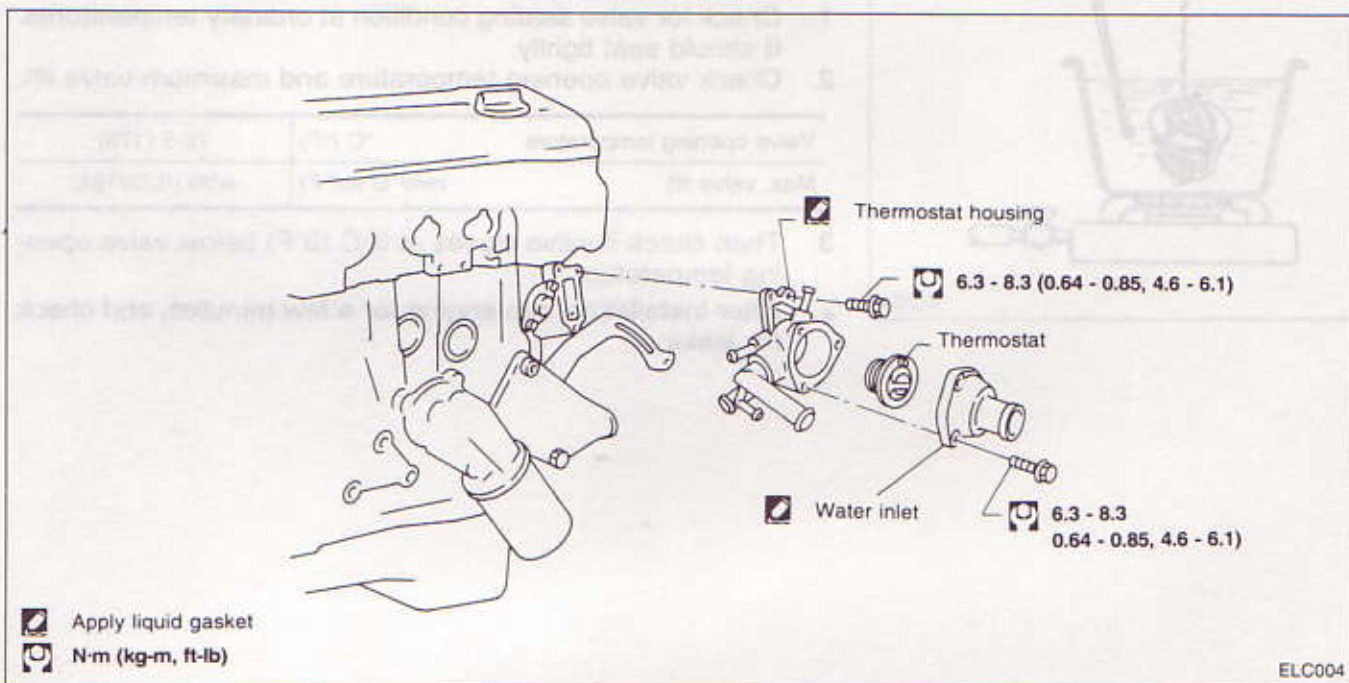
- Remove liquid gasket from mating surface of front cover.
- Remove all traces of liquid gasket using white gasoline.

Water Pump (Cont'd)

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

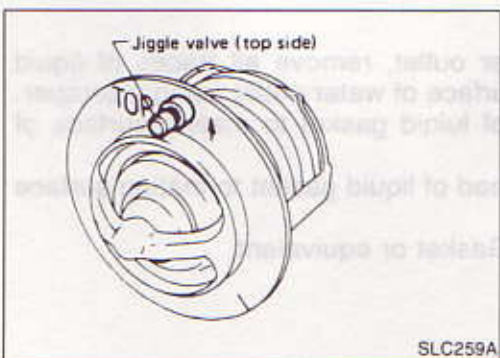


Thermostat



REMOVAL AND INSTALLATION

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

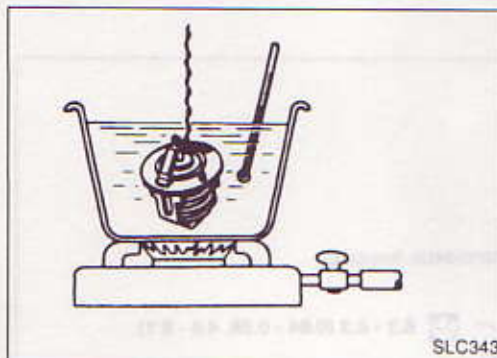


4. Install thermostat with jiggle valve or air bleeder facing upward.

Thermostat (Cont'd)



5. When installing water inlet, apply liquid gasket as shown.
 - 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

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 (0.32/194)

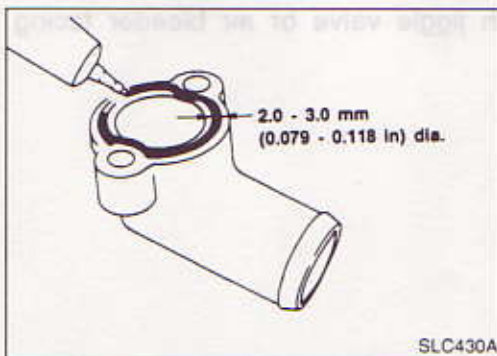
3. Then check if valve closes at 5°C (9°F) below valve opening temperature.
 - After installation, run engine for a few minutes, and check for leaks.



Water Outlet

INSPECTION

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



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 to 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.

Cooling System Inspection

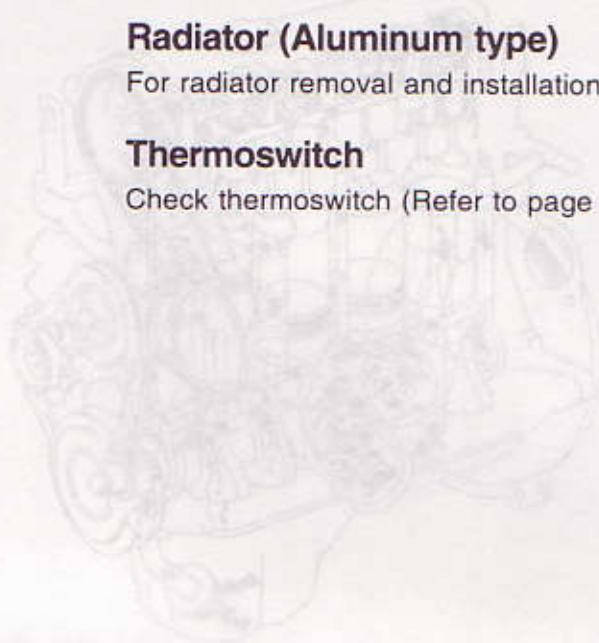
Check cooling system (Refer to page LC-12).

Radiator (Aluminum type)

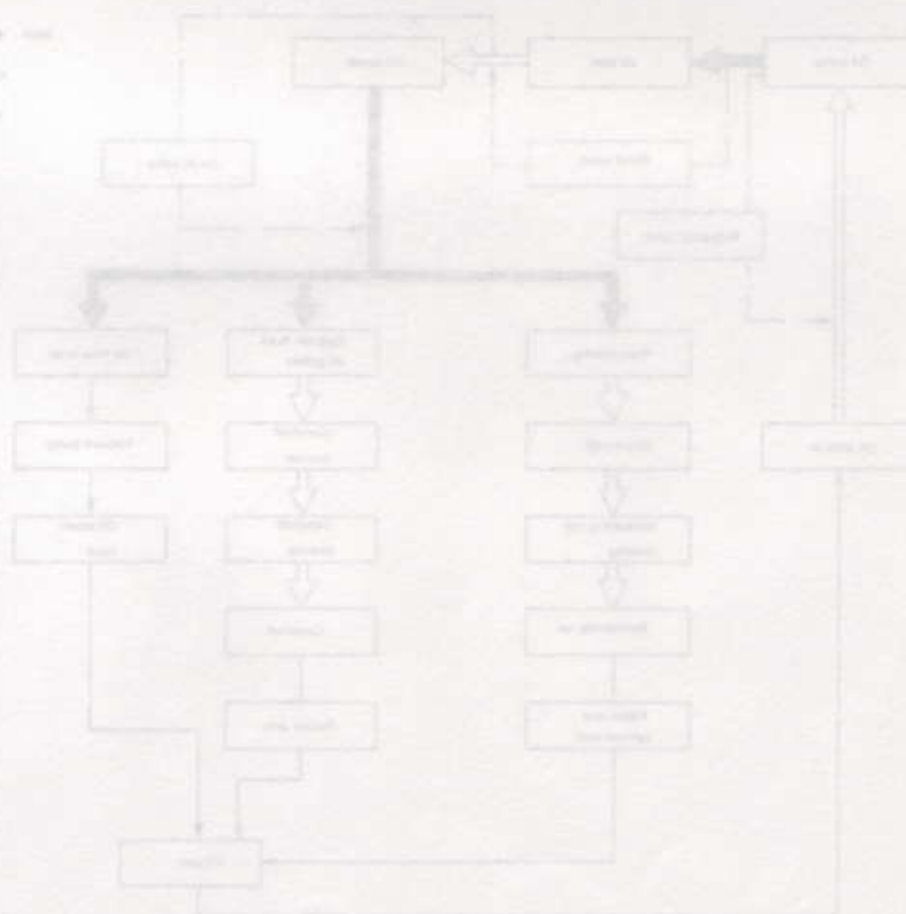
For radiator removal and installation, refer to page LC-13.

Thermostat

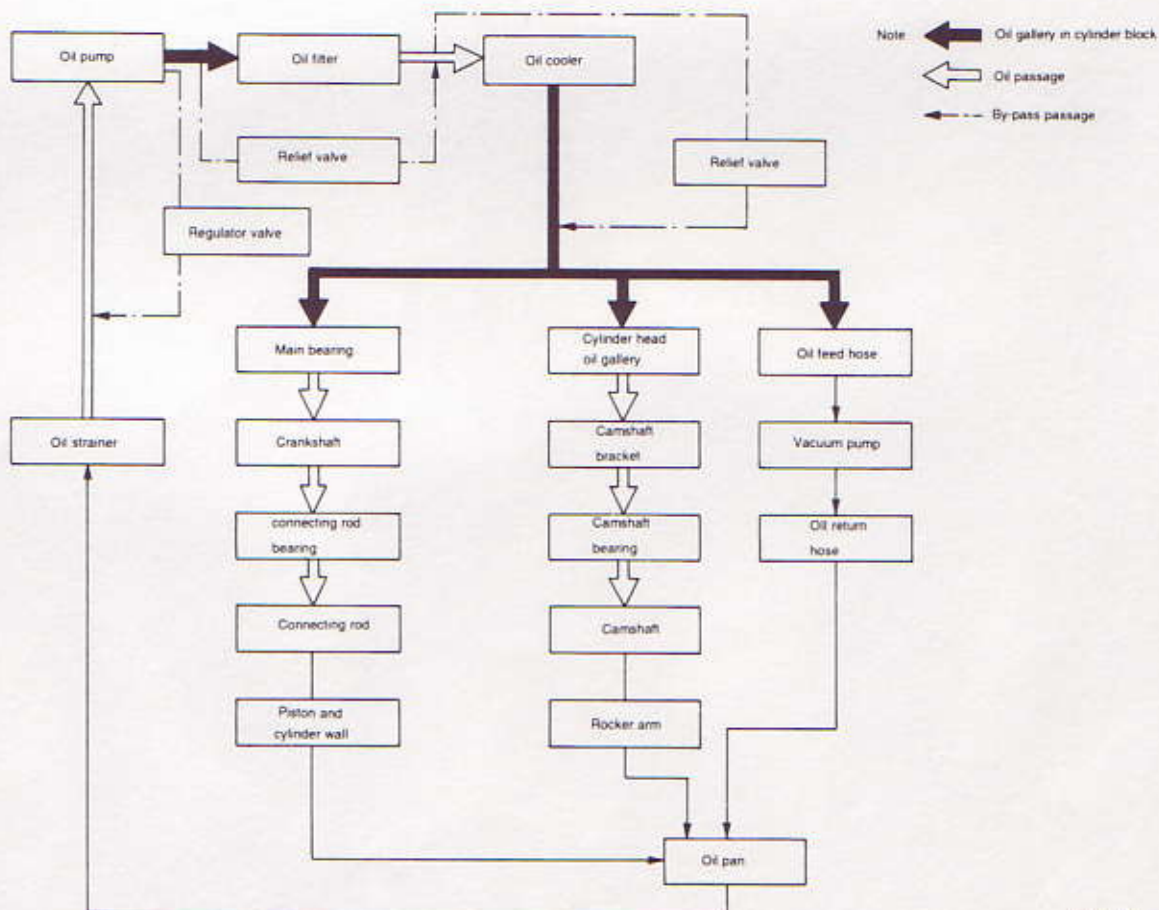
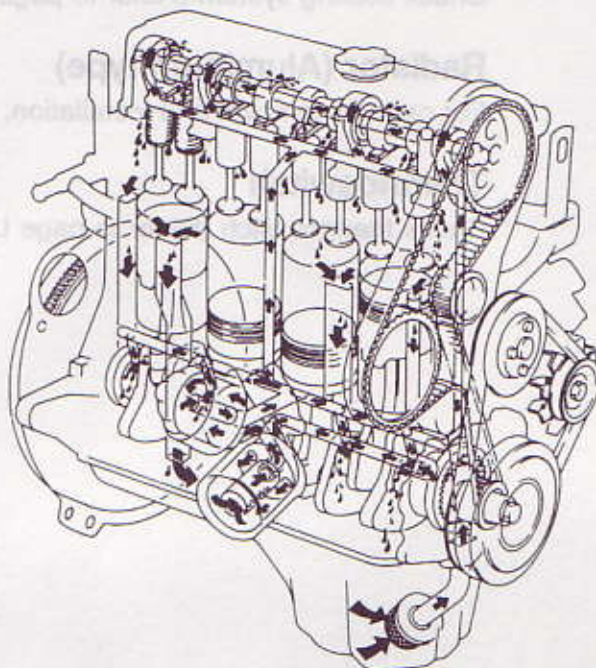
Check thermostat (Refer to page LC-13).

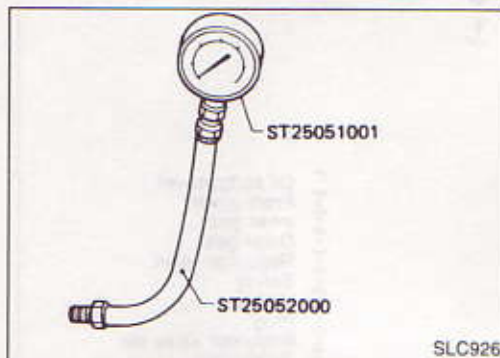
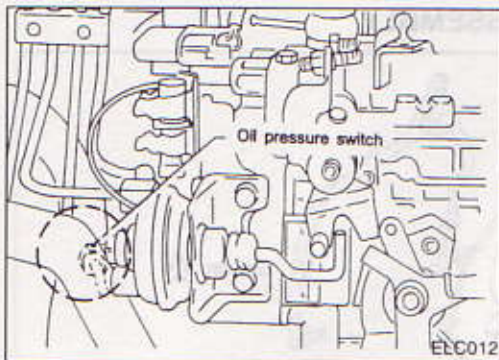


COOLANT FLOW DIRECTION
 (UPPER HOSE)
 (LOWER HOSE)



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" gear 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 rpm	Approximate discharge pressure kPa (bar, kg/cm ² , psi)
Idle speed	More than 59 (0.59, 0.6, 9)
2,000	294 (2.9, 3, 43)
5,000	392 (3.9, 4, 57)

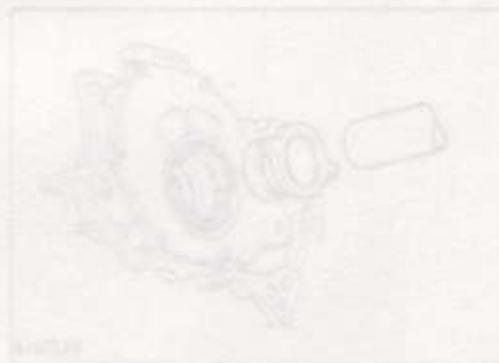
If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch with sealant.

Oil Pump

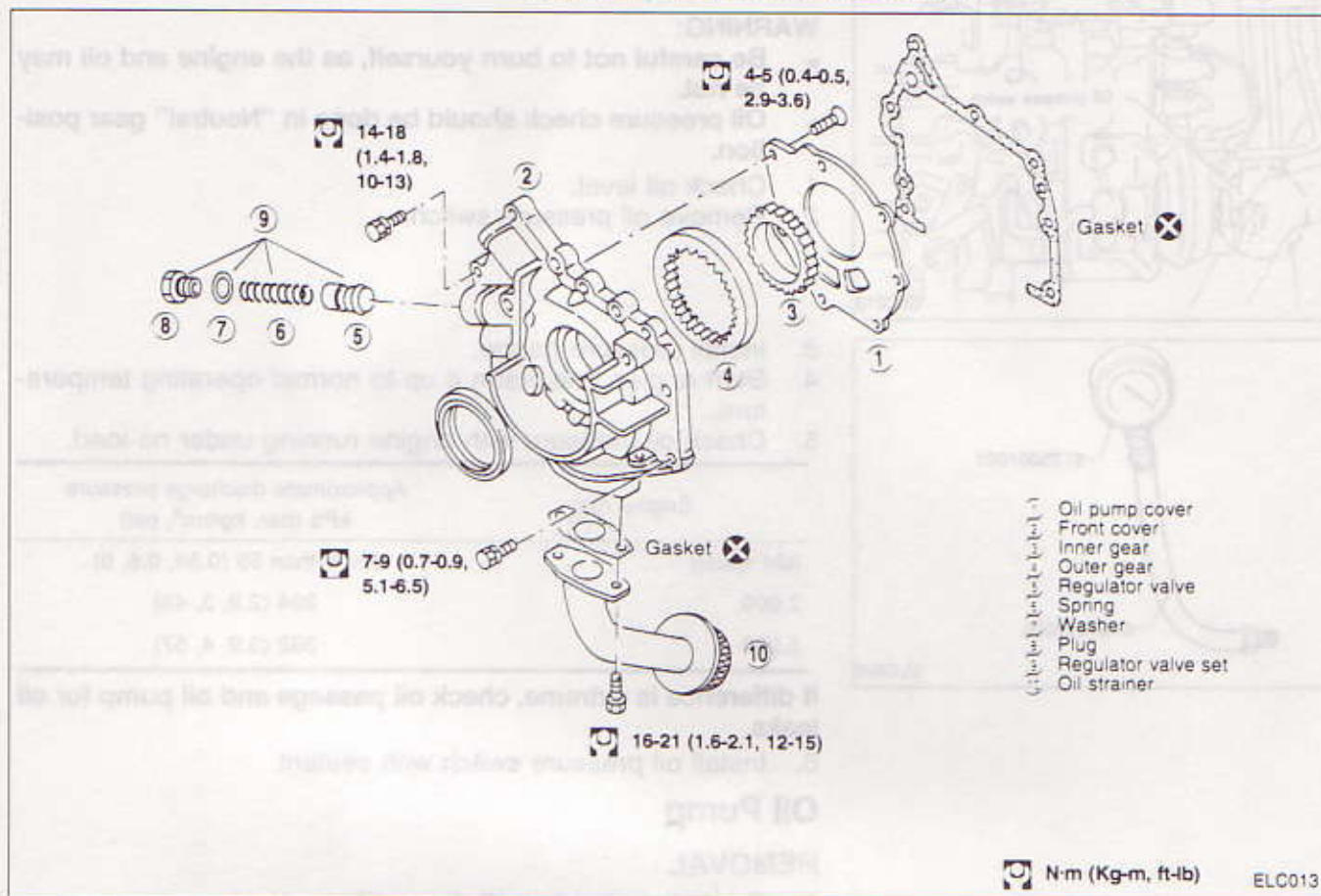
REMOVAL

1. Remove timing belt (Refer to EM section).
2. Remove back covers of timing belt.
3. Remove oil pan (Refer to EM section).
4. Remove oil pump.

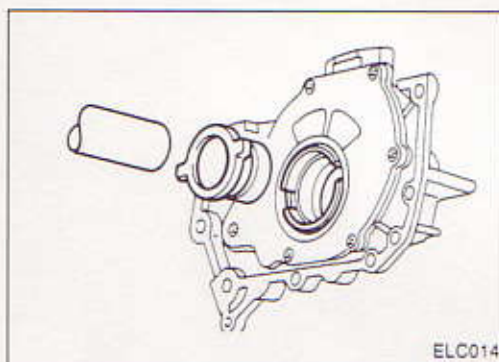


Oil Pump (Cont'd)

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.



INSTALLATION

1. Install oil pump.
 - Before installing oil pump 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.
 - Apply a continuous bead of liquid gasket to mating surface of front cover assembly.
 - Use Genuine Liquid Gasket or equivalent.
 - Installation is in reverse order of removal.

Oil Pump (Cont'd)

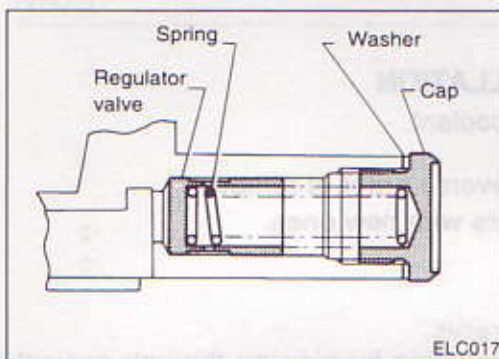
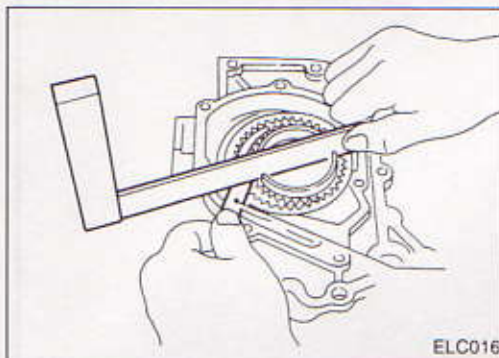
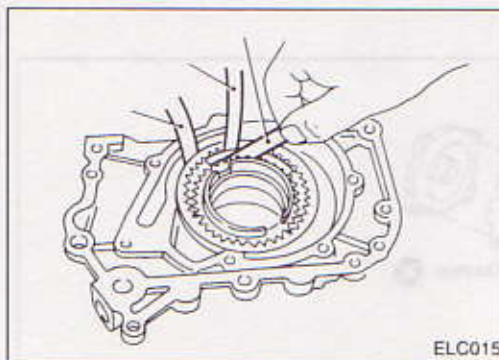
INSPECTION

Using a feeler gauge, check the following clearances:

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)

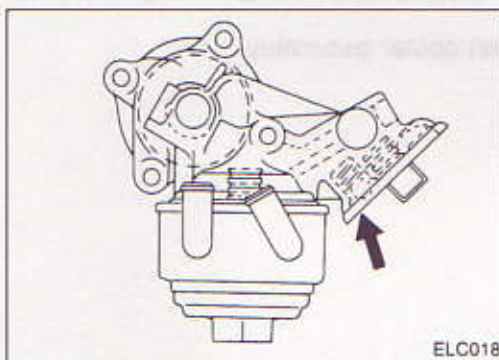
- If the tip clearance (②) exceeds the limit, replace gear set.
- If body to gear clearances (①, ③, ④, ⑤) exceed the limit, replace front cover assembly.



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.

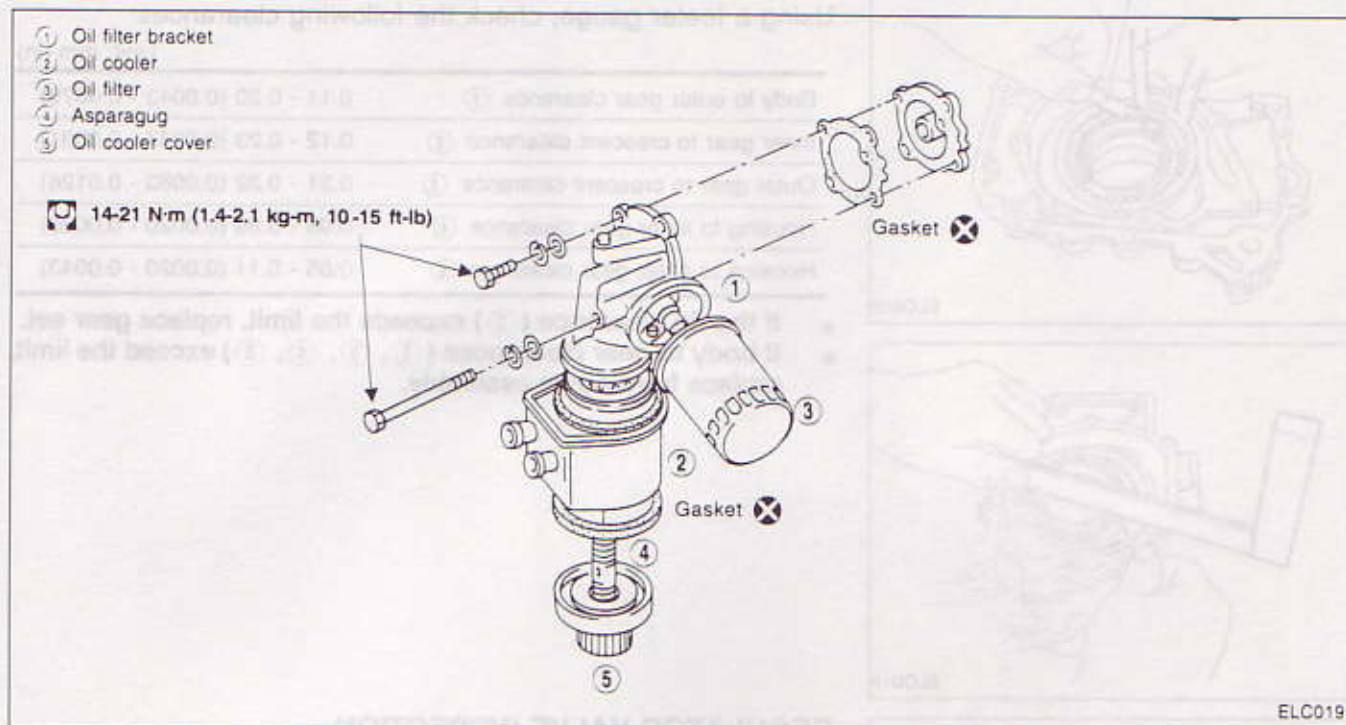
If damaged, replace regulator valve set or front cover assembly.



OIL PRESSURE RELIEF VALVE

Inspect it for smooth operation by pushing the ball. If valve is sticky or damaged, replace oil filter bracket assembly.

Oil Cooler



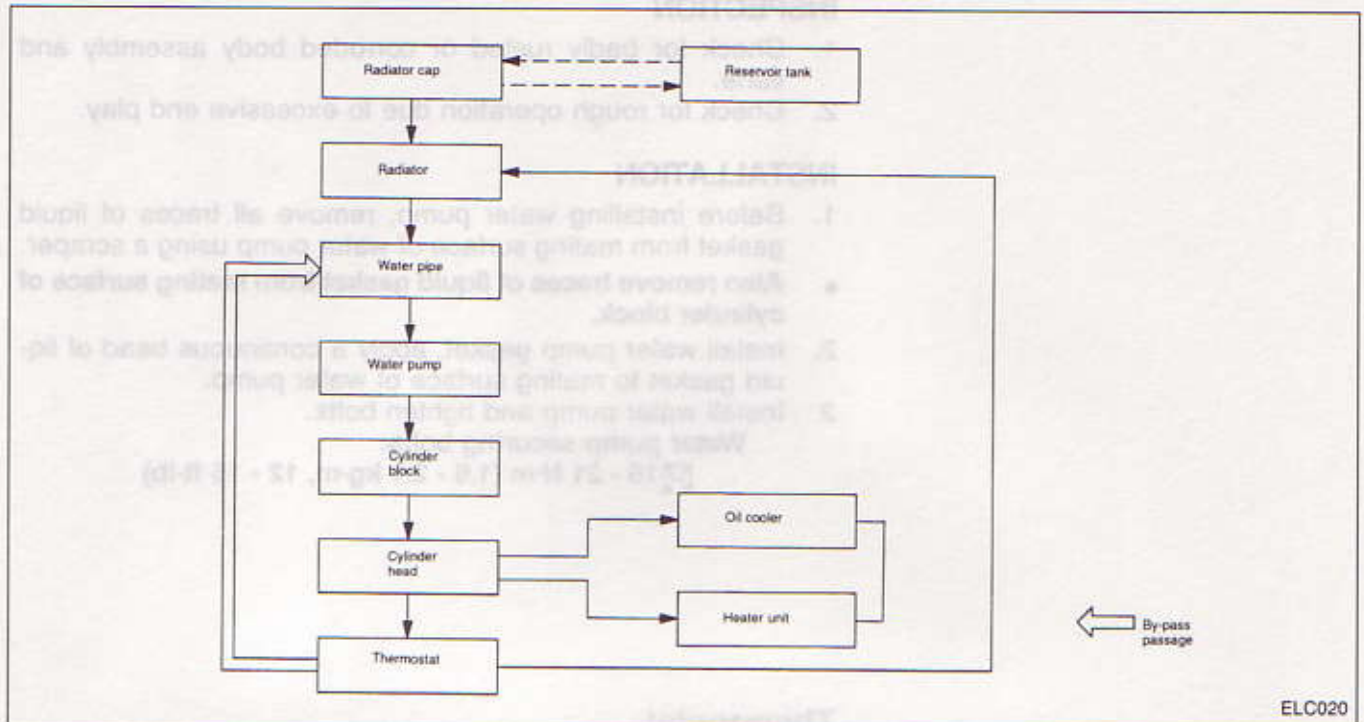
REMOVAL AND INSTALLATION

1. Drain engine oil and coolant.
 2. Remove oil cooler.
 3. Installation is in the reverse order of removal.
- **Always replace gaskets with new ones.**

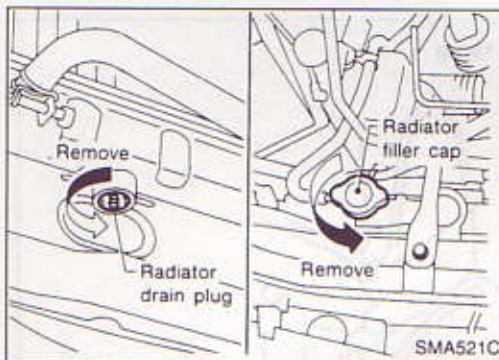
INSPECTION

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

Cooling Circuit



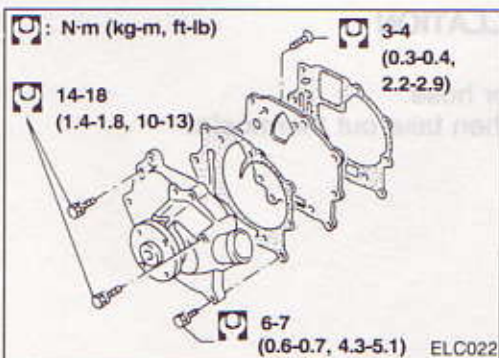
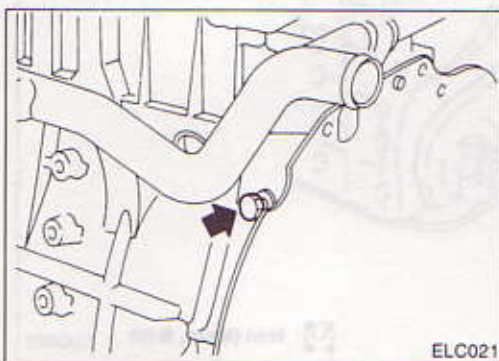
ELC020



Water Pump

REMOVAL

1. Drain coolant from radiator.
2. Remove under cover.
3. Remove cylinder block drain plug located at left rear of cylinder block and drain coolant.
4. Remove drive belts.
5. Remove water pump pulley.



6. Remove water pump.

CAUTION:

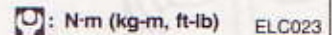
- Water pump cannot be disassembled and should be replaced as a unit.
- After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.

INSPECTION

- ## INSTALLATION

- Water pump securing bolts:**

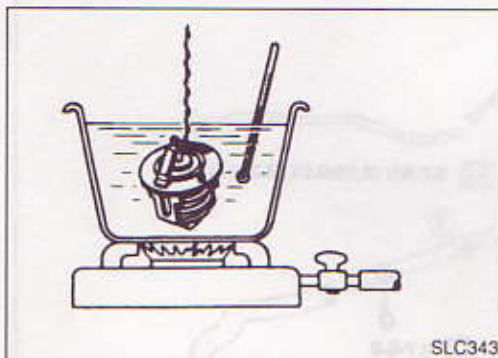
Thermostat



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

Thermostat (Cont'd)

4. Install thermostat with jiggle valve or air bleeder facing upward.
5. Always replace gaskets with new ones.
 - 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.

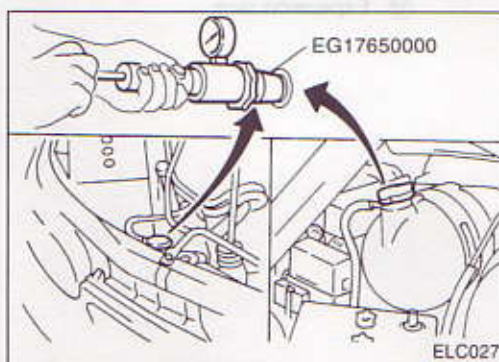


INSPECTION

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

	FRIGID TYPE	STANDARD TYPE	TROPICAL TYPE
Valve opening temperature °C (°F)	88 (190)	82 (180)	76.5 (170)
Maximum valve lift mm/°C (in/°F)	8/100 (0.31/212)	8/95 (0.31/203)	8/90 (0.31/194)

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

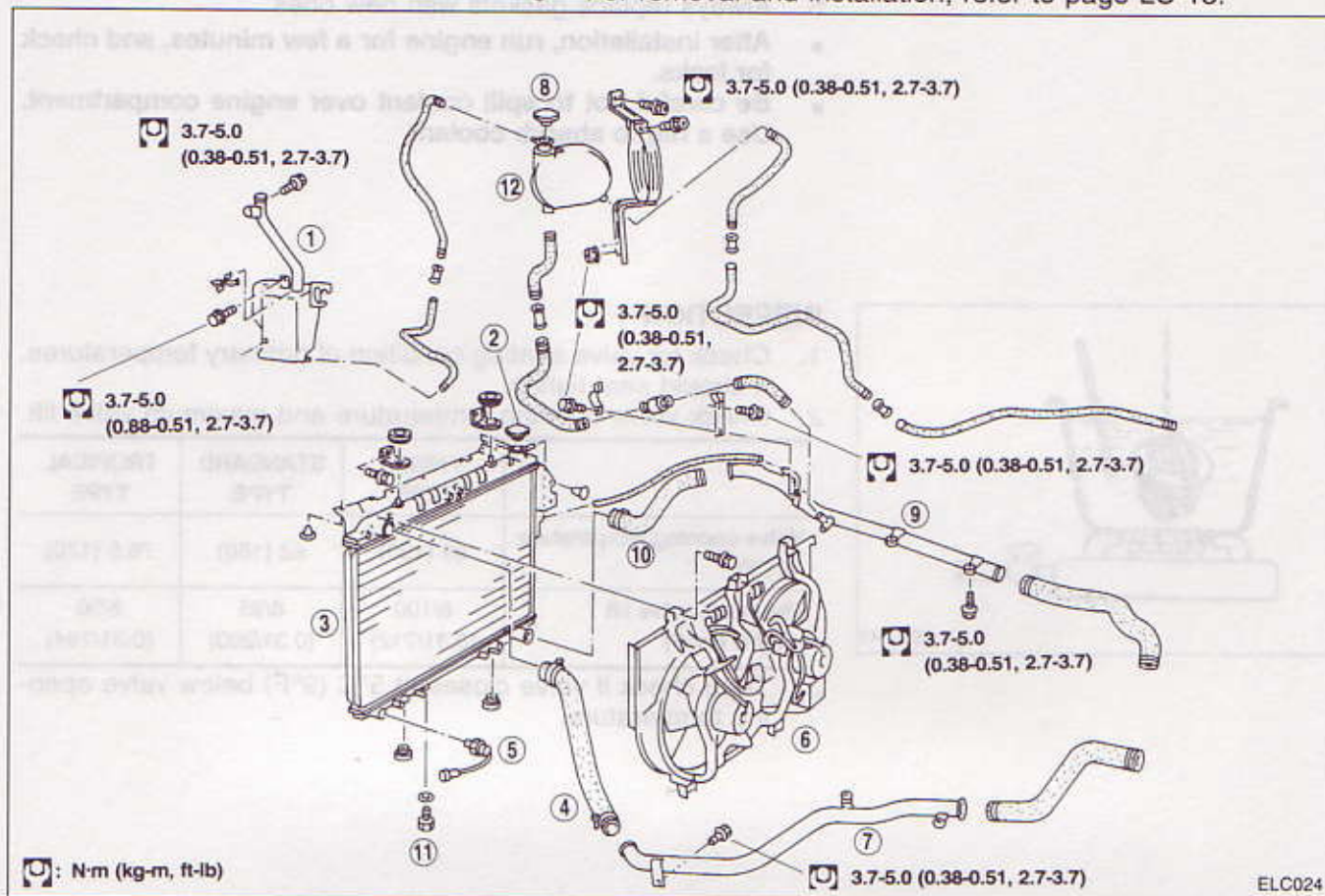


System Check

- Refer to page LC-12.
- Check expansion tank cap.

Radiator (Aluminum type)

- For removal and installation, refer to page LC-13.



ELC024

- | | | |
|-----------------------|----------------------|-----------------------|
| ① Reservoir tank | ⑤ Thermoswitch | ⑨ Metal tube |
| ② Radiator filler cap | ⑥ Radiator shroud | ⑩ Lower radiator hose |
| ③ Radiator | ⑦ Metal tube | ⑪ Radiator drain plug |
| ④ Upper radiator hose | ⑧ Expansion tank cap | ⑫ Expansion tank |

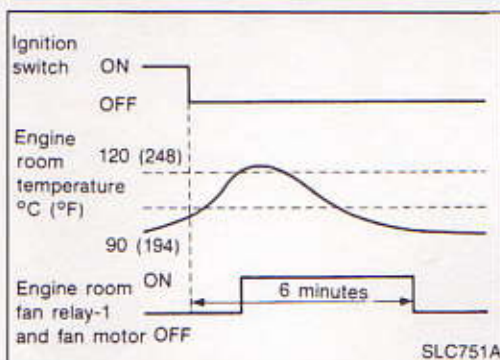
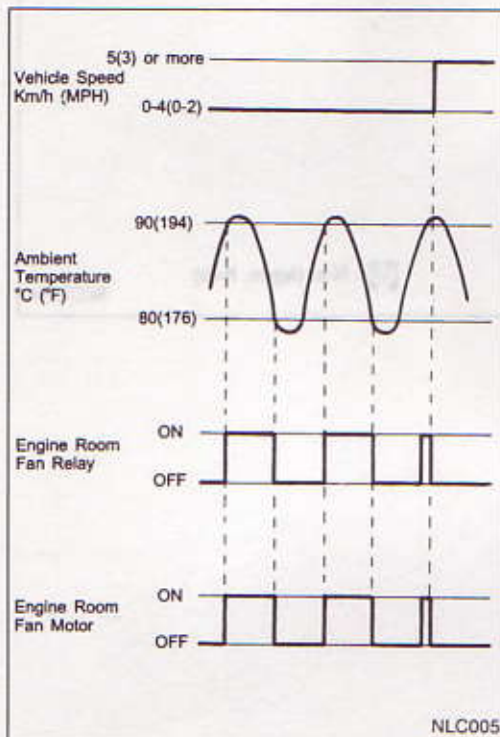
Description

A fan is installed at the bottom of the engine room to eliminate the heat generated when the engine is running or after it has stopped. The engine room fan ON-OFF is operated by a control unit based on the vehicle's speed and temperature in the engine room. If the fan signal line should ever break for whatever reason, oil pressure and brake oil level warning lamps will turn ON simultaneously to warn the driver.

Operation

WHEN ENGINE IS RUNNING AT IDLE SPEED

- Vehicle speed is 4 km/h (2MPH) or less: engine room fan relay-1 is actuated to turn ON the fan when engine room temperature is above 90°C (194°F) and actuated below 80°C (176°F) to turn off the fan.
- Vehicle speed is 5 km/h (3 MPH) or more: Engine room fan motor does not rotate.

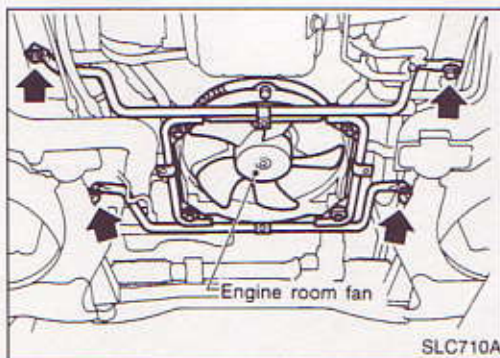


WHEN ENGINE IS STOPPED

If engine room temperature becomes higher than 120°C (248°F) immediately after engine is stopped, engine room fan relay is actuated for approximately six minutes after ignition switch is turned OFF.

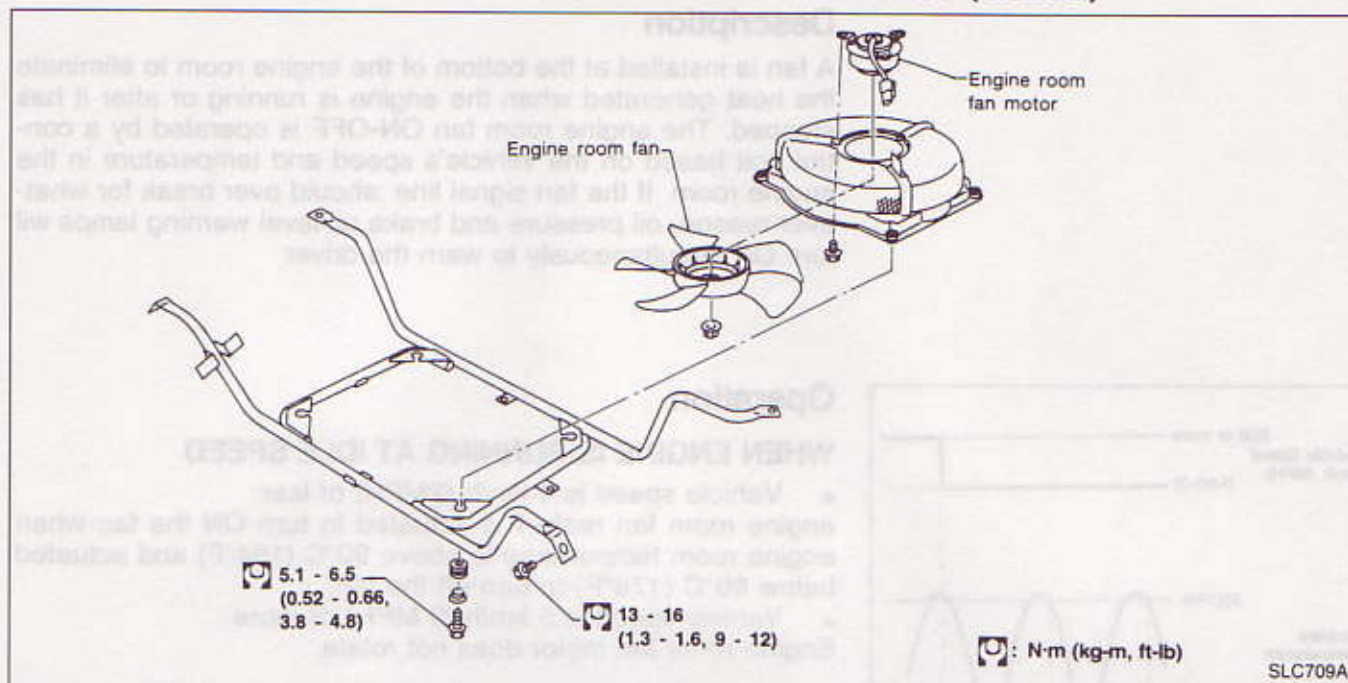
Removal and Installation

1. Remove under cover.
2. Disconnect engine room fan harness connector.
3. Remove engine room fan.
4. After repairing or replacing engine room fan, install any part removed in reverse order of removal.

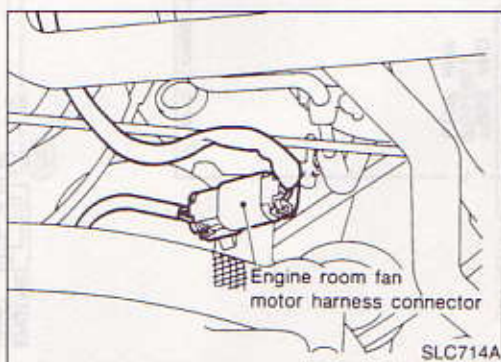
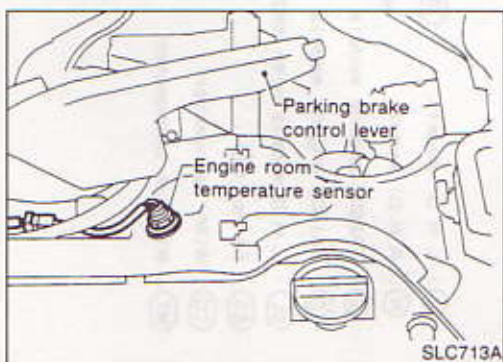
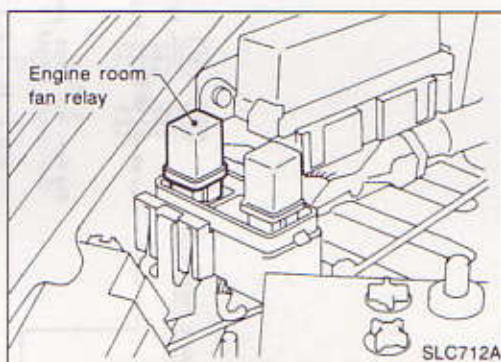
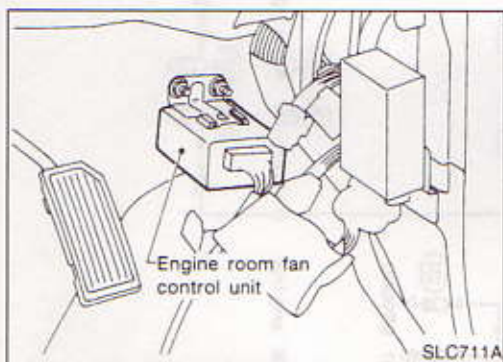
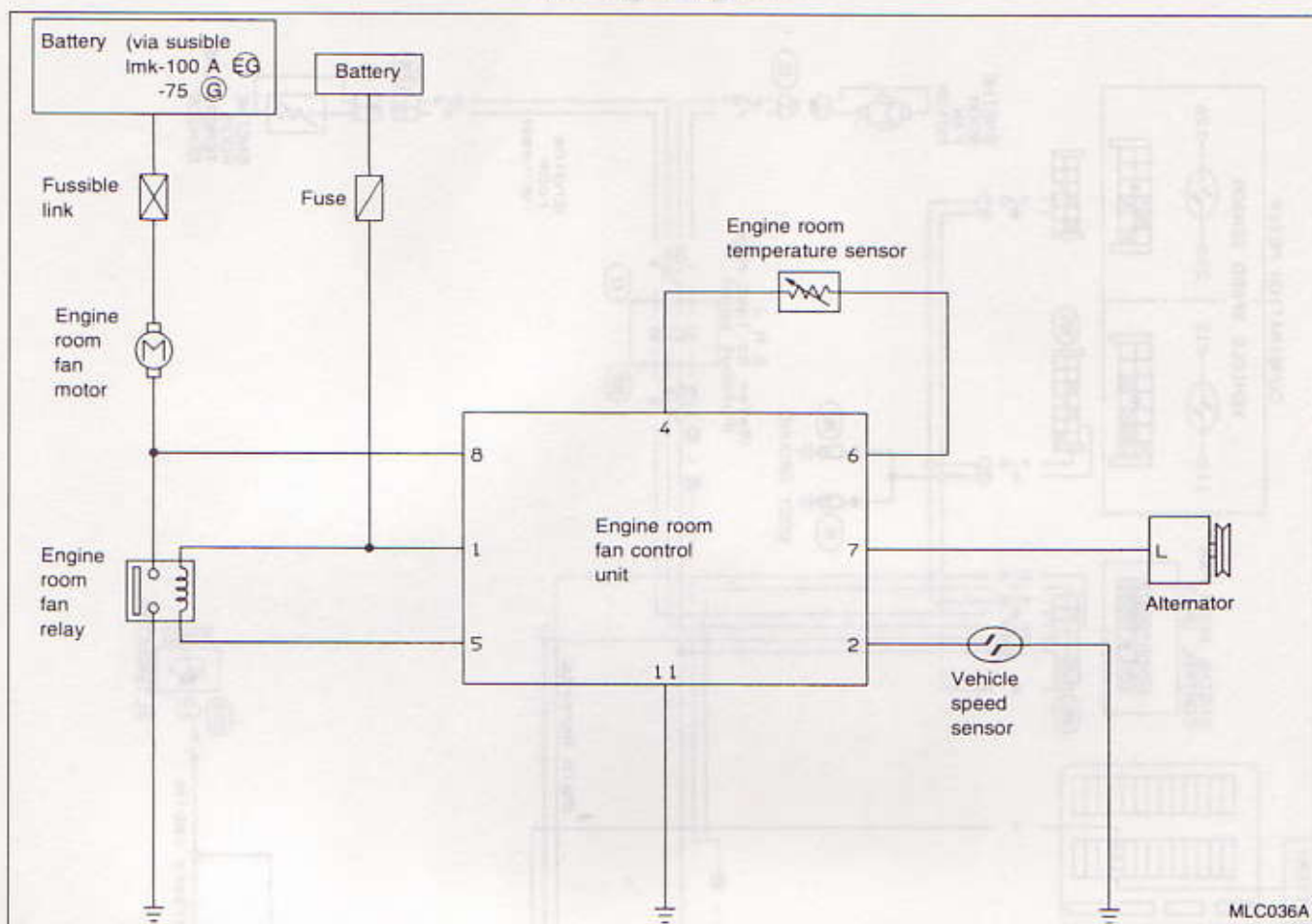


ENGINE ROOM FAN MOTOR ELECTRICAL CIRCUIT

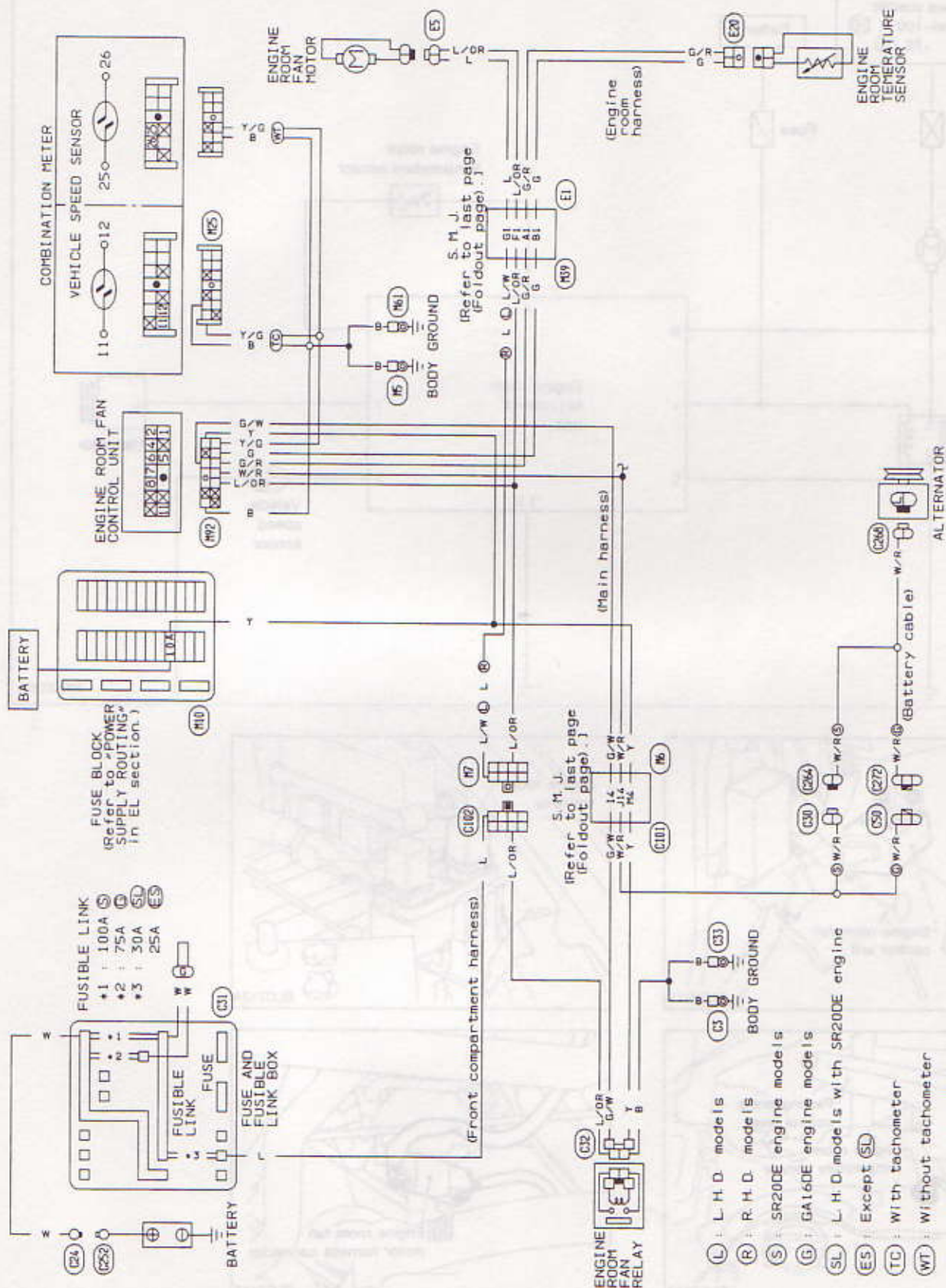
Removal and Installation (Cont'd)

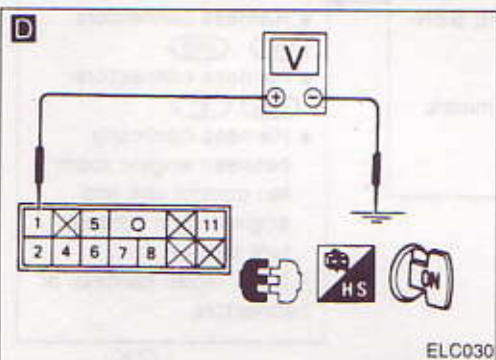
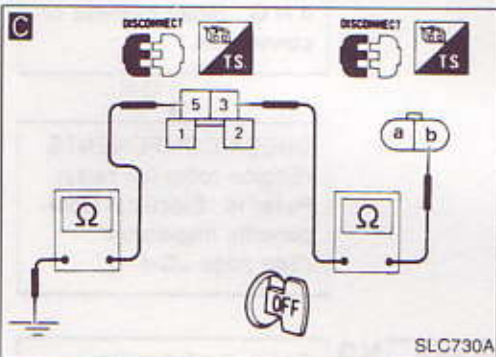
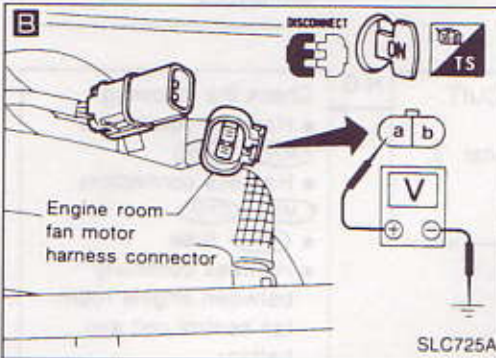
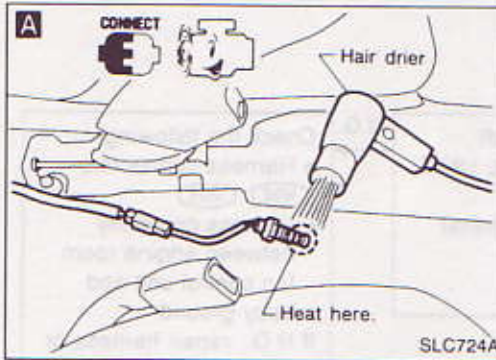


Circuit Diagram



Wiring Diagram





Diagnostic Procedure-1

SYMPTOM:

Even though engine room is hot, the engine room fan motor does not rotate.

INSPECTION START

A
CHECK ENGINE ROOM FAN OPERATION.

- 1) Remove engine room temperature sensor.
- 2) Start engine.
- 3) Heat engine room temperature sensor to "A" (To see page 33) or more with a hair drier.
- 4) Make sure that engine room fan operates.

O.K. INSPECTION END

N.G.

B
CHECK POWER SUPPLY FOR ENGINE ROOM FAN MOTOR.

- 1) Stop engine.
- 2) Disconnect engine room fan motor harness connector.
- 3) Turn ignition switch "ON".
- 4) Check voltage between terminal (a) and ground.

Voltage: Battery voltage

O.K.

N.G. Check the following:

- Harness connectors (E1, M39)
- Harness connectors (M7, C102)
- 25A fuse (E5)
- 30A fuse (5L)
- Harness continuity between battery and engine room fan motor.

If N.G., repair harness or connectors.

C
CHECK GROUND CIRCUIT FOR ENGINE ROOM FAN MOTOR.

- 1) Turn ignition switch "OFF".
- 2) Disconnect engine room fan relay.
- 3) Check continuity between terminals (b) and (3), (5) and ground.

Continuity should exist.

O.K.

N.G. Check the following:

- Harness connectors (E1, M39)
- Harness connectors (M7, C102)
- Harness continuity between engine room fan motor and body ground.

If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT (Engine room fan relay)
Refer to "Electrical Components Inspection".
(See page LC-41.)

D
CHECK POWER SUPPLY FOR ENGINE ROOM FAN CONTROL UNIT.

- 1) Turn ignition switch "OFF".
- 2) Disconnect engine room fan control unit harness connector.
- 3) Turn ignition switch "ON".
- 4) Check voltage between terminal (1) and ground.

Voltage: Battery voltage

O.K.

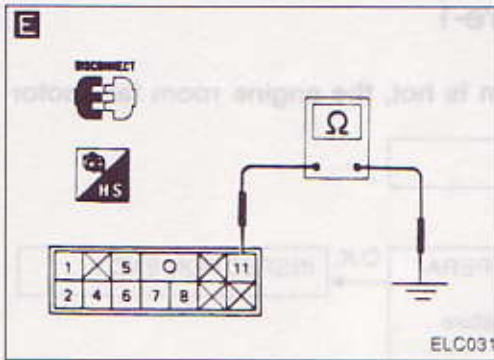
N.G. Check the following:

- Harness connectors (M6, C101)
- 10A fuse
- Harness continuity between battery and engine room fan control unit.

If N.G., repair harness or connectors.

A

Diagnostic Procedure-1 (Cont'd)



E

CHECK GROUND CIRCUIT FOR ENGINE ROOM FAN CONTROL UNIT.

- 1) Turn ignition switch "OFF".
- 2) Check continuity between terminal ⑪ and ground.

Continuity should exist.

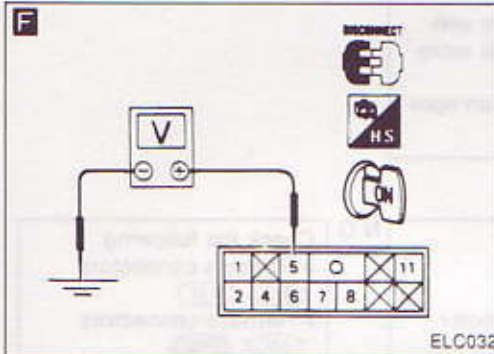
N.G.

Check the following:

- Harness connectors (M92, M25)
- Harness continuity between engine room fan control unit and body ground.

If N.G., repair harness or connectors.

O.K.



F

CHECK OUTPUT SIGNAL CIRCUIT.

- 1) Turn ignition switch "ON".
- 2) Check voltage between terminal ⑤ and ground.

Voltage: Battery voltage

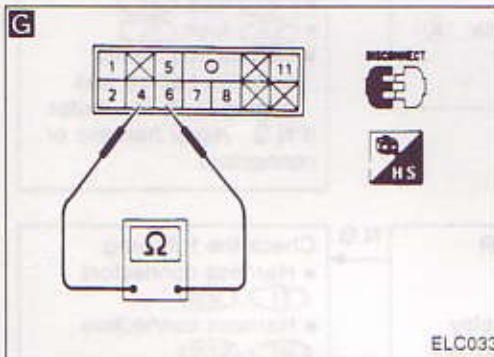
N.G.

Check the following:

- Harness connectors (M92, M25)
- Harness connectors (M6, C101)
- 10A fuse
- Harness continuity between engine room fan control unit and battery.

If N.G., repair harness or connectors.

O.K.



G

CHECK INPUT SIGNAL CIRCUIT FOR ENGINE ROOM TEMPERATURE SENSOR.

- 1) Turn ignition switch "OFF".
- 2) Check continuity between terminals ④ and ⑥.

Continuity should exist.

N.G.

Check the following:

- Harness connectors (M92, M25)
- Harness connectors (M39, E1)
- Harness continuity between engine room fan control unit and engine room temperature sensor.

If N.G., repair harness or connectors.

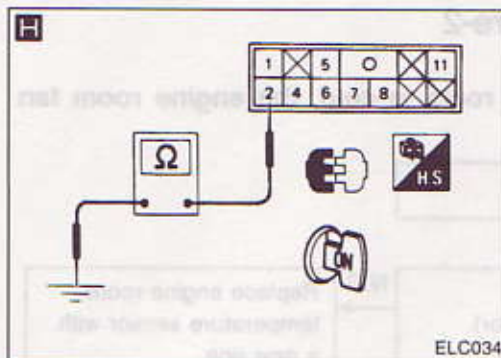
O.K.

O.K.

CHECK COMPONENT (Engine room temperature sensor). Refer to "Electrical Components Inspection". (See page LC-41.)

B

Diagnostic Procedure-1 (Cont'd)



H

CHECK INPUT SIGNAL CIRCUIT FOR VEHICLE SPEED SENSOR.

- 1) Jack up rear wheels.
- 2) Turn ignition switch "ON".
- 3) Rotate rear wheel by hand.
- 4) Check harness continuity between ② and ground.

Continuity should exist initially but then go away.

N.G.

Check the following:

- Harness connectors
 - M92, M25
 - Harness continuity between combination meter and engine room fan control unit.
- If N.G., repair harness or connectors.
- Check vehicle speed sensor and circuit.
- (Refer to EL section.)

O.K.

CHECK COMPONENT
(Engine room fan motor).
Refer to "Electrical Components Inspection".
(See page LC-41.)

O.K.

Check engine room fan control unit terminals and harness connector for damage or improper connection.

O.K.

Try a known good engine room fan control unit.

Diagnostic Procedure-2

SYMPTOM:

Even though the engine room is cold, the engine room fan motor is rotating.

INSPECTION START

CHECK COMPONENT
(Engine room temperature sensor).
Refer to "Electrical Components Inspection".
(See page LC-41.)

N.G.

Replace engine room temperature sensor with a new one.

O.K.

CHECK COMPONENT
(Engine room fan relay).
Refer to "Electrical Components Inspection".
(See page LC-41.)

N.G.

Replace engine room fan relay with a new one.

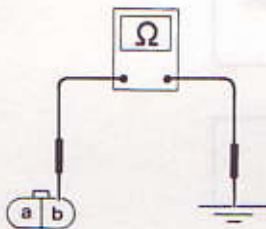
O.K.

A

DISCONNECT

TS

OFF



SLC735A

CHECK HARNESS SHORT CIRCUIT BETWEEN ENGINE ROOM FAN MOTOR AND ENGINE ROOM FAN RELAY.

- 1) Disconnect engine room fan motor harness connector.
- 2) Disconnect engine room fan relay.
- 3) Check continuity between terminal (b) and ground.

Continuity should not exist.

N.G.

Repair harness.

O.K.

B



ELC035

CHECK HARNESS SHORT CIRCUIT BETWEEN ENGINE ROOM FAN MOTOR AND ENGINE ROOM FAN CONTROL UNIT.

- 1) Disconnect engine room fan control unit harness connector.
- 2) Check continuity between terminal (8) and ground.

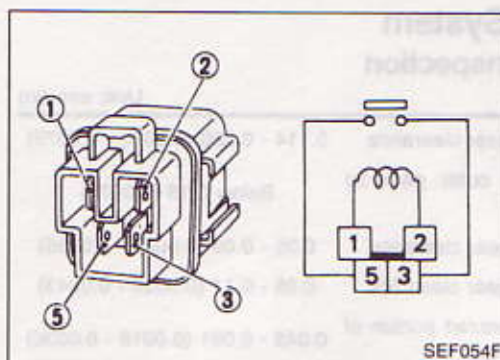
Continuity should not exist.

N.G.

Repair harness.

O.K.

Try a known good engine room fan control unit.



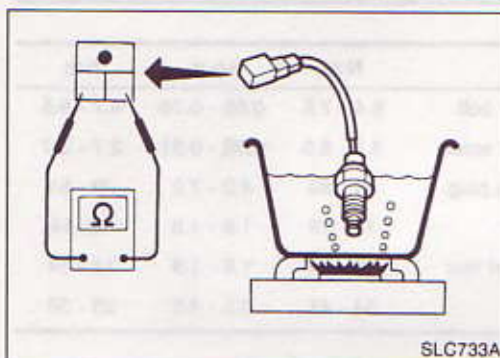
Electrical Components Inspection

ENGINE ROOM FAN RELAY

Check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

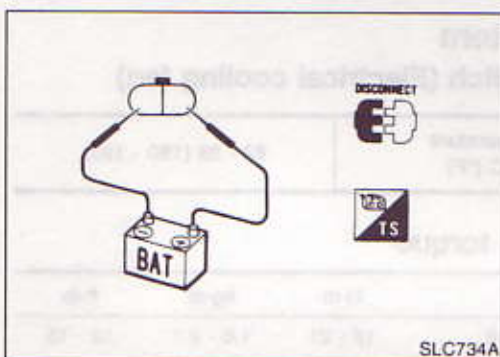
If N.G., replace relay.



ENGINE ROOM TEMPERATURE SENSOR

1. Disconnect engine room temperature sensor harness connector.
2. Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	Approx. 360
90 (194)	Approx. 20



ENGINE ROOM FAN MOTOR

1. Disconnect engine room fan motor harness connector.
2. Supply engine room fan motor terminals with battery voltage and check operation.

Engine room fan motor should operate.

If N.G., replace engine room fan motor.

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm ² , psi)
Idle speed	More than 78 (0.78, 0.8, 11)
3,200	314 - 392 (3.14 - 3.92, 3.2 - 4.0, 46 - 57)

Regulator valve inspection

Unit: mm (in)

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

	N·m	kg·m	ft·lb
Oil pump cover bolt	6.4 - 7.5	0.65 - 0.76	4.7 - 5.5
Oil pump cover screw	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Regulator valve plug	39 - 69	4.0 - 7.0	29 - 51
Oil strainer bolt	16 - 19	1.6 - 1.9	12 - 14
Oil filter support bolt	16 - 19	1.6 - 1.9	12 - 14
Oil cooler bolt	34 - 44	3.5 - 4.5	25 - 33

Engine Cooling System

Thermostat

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

Thermoswitch (Electrical cooling fan)

Operating temperature (OFF → ON) °C (°F)	82 - 88 (180 - 190)
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Tightening torque

	N·m	kg·m	ft·lb
Water pump bolt	16 - 21	1.6 - 2.1	12 - 15
Water pump pulley bolt	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Thermostat housing	16 - 21	1.6 - 2.1	12 - 15
Water inlet	6.3 - 8.3	0.84 - 0.85	4.6 - 6.1
Water outlet	6.3 - 8.3	0.84 - 0.85	4.6 - 6.1

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm ² , psi)
Idle speed	49 - 186 (0.49 - 1.86, 0.5 - 1.9, 7 - 27)
3,000	343 - 441 (3.43 - 4.41, 3.5 - 4.5, 50 - 64)

Tightening torque

	N-m	kg-m	ft-lb
Oil pump cover bolt	3.7 - 5.0	0.38 - 5.1	2.7 - 3.7
Oil pump cover screw	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Regulator valve plug	39.2 - 58.8	4.00 - 6.00	28.9 - 43.4

Oil pump inspection

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 - 0.0091 (0.0018 - 0.0036)

Engine Cooling System

Thermostat

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

Thermostat (Electrical cooling fan)

Operating temperature (OFF → ON) °C (°F)	82 - 88 (180 - 190)
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Tightening torque

	N-m	kg-m	ft-lb
Water pump bolt	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Water pump pulley bolt	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Thermostat housing	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Water outlet bolt	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm ² , psi)
Idle speed	More than 59 (0.59, 0.6, 9)
2,000	294 (2.9, 3, 43)
5,000	392 (3.9, 4, 57)

Oil pressure regulator valve

Opening pressure kPa (bar, kg/cm ² , psi)/rpm	471 - 510 (4.71 - 5.10; 4.8 - 5.2; 68 - 74)/2,000
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Oil pump

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)

Tightening torque

Unit	N·m	kg·m	ft·lb
Oil pump securing bolt			
M6	7 - 9	0.7 - 0.9	5.1 - 6.5
M8	16 - 21	1.6 - 2.1	12 - 15
Oil pump cover screw	4 - 5	0.4 - 0.5	2.9 - 3.6
Regulator valve cap bolt	39 - 49	4 - 5	29 - 36
Oil strainer bolt	16 - 21	1.6 - 2.1	12 - 15
Oil pressure switch	10 - 16	1.0 - 1.6	7 - 12
Oil filter support screw	14 - 21	1.4 - 2.1	10.5 - 15.5

Engine Cooling System

Thermostat

	FRIGID TYPE	STANDARD TYPE	TROPICAL TYPE
Valve opening temperature °C (°F)	88 (190)	82 (180)	76.5 (170)
Max. valve lift mm/°C (in °F)	8/100 (0.31/212)	8/95 (0.31/203)	8/90 (0.31/194)

Thermoswitch

Operating temperature	
OFF → ON	90°C (194°F)
ON → OFF	83°C (181°F)

Expansion tank cap

kPa (bar, kg/cm², psi)

Cap relief pressure	88 (0.88; 0.9; 13)
Leakage test pressure	157 (1.57; 1.6; 23)

Tightening torque

UNIT	N·m	kg·m	ft·lb
Water pump bolt			
M6	6 - 7	0.6 - 0.7	4.3 - 5.1
M8	14 - 18	1.4 - 1.8	10 - 13
Water pump pulley-bolt	6 - 10	0.6 - 1.0	4.3 - 7.2
Thermostat housing	15 - 25	1.5 - 2.5	11 - 15.5
Water outlet bolt	20 - 25	2.0 - 2.5	15 - 18.5