

ENGINE LUBRICATION &
COOLING SYSTEMS

SECTION **LC**

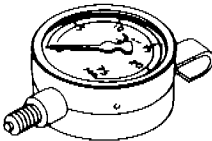
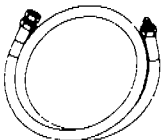
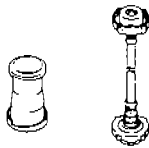
LC

CONTENTS

PREPARATION	LC- 2
ENGINE LUBRICATION SYSTEM	LC- 3
ENGINE COOLING SYSTEM	LC- 8
SERVICE DATA AND SPECIFICATIONS (S.D.S.)	LC-15

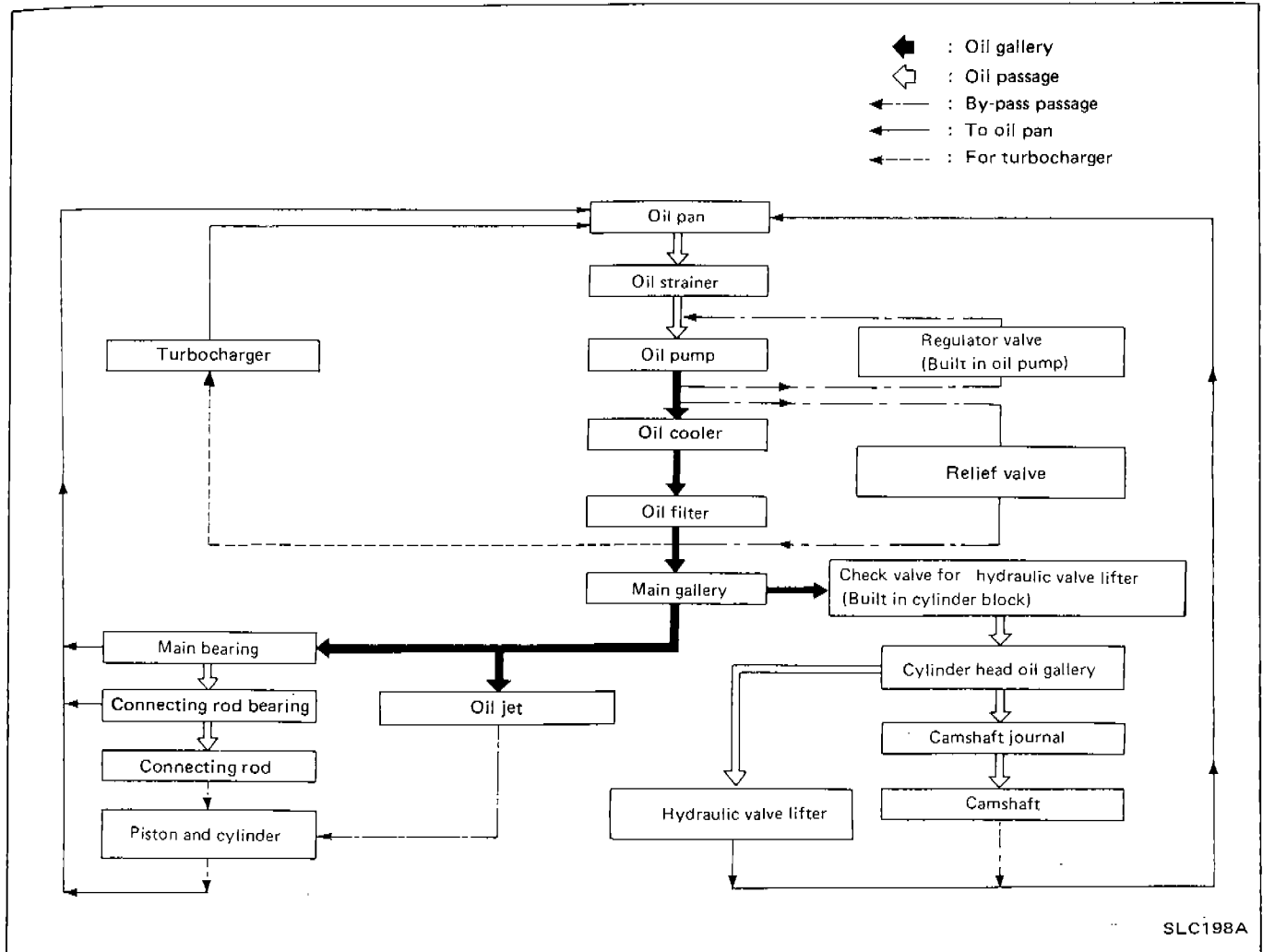
PREPARATION

SPECIAL SERVICE TOOLS

Tool number Tool name	Description
ST25051001 Oil pressure gauge	
ST25052000 Hose	 Adapting oil pressure gauge to cylinder block
EG17650301 Radiator cap tester adapter	 Adapting radiator cap tester to radiator filler neck
KV99103510 Radiator plate pliers A	 Installing radiator upper and lower tanks
KV99103520 Radiator plate pliers B	 Removing radiator upper and lower tanks

ENGINE LUBRICATION SYSTEM

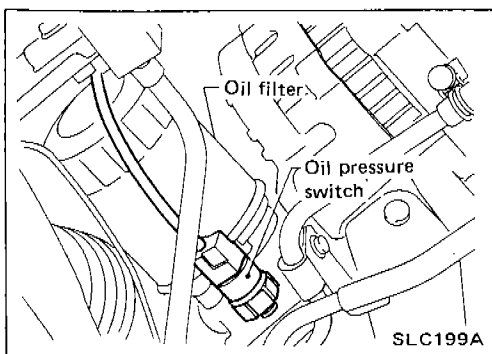
Lubrication Circuit



Oil Pressure Check

WARNING:

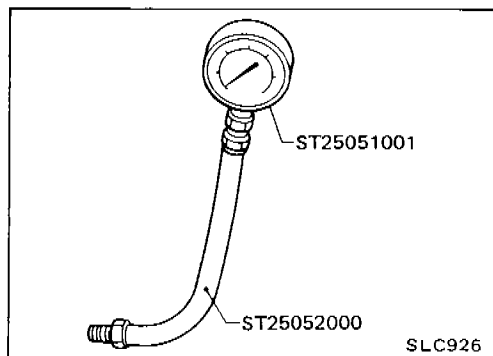
- Be careful not to burn yourself, as the engine and oil may be hot.
- Oil pressure check should be done in "Neutral" gear position.



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

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.

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm ² , psi)
Idle speed	More than 78 (0.78, 0.8, 11)
3,000	353 - 412 (3.53 - 4.12, 3.6 - 4.2, 51 - 60)

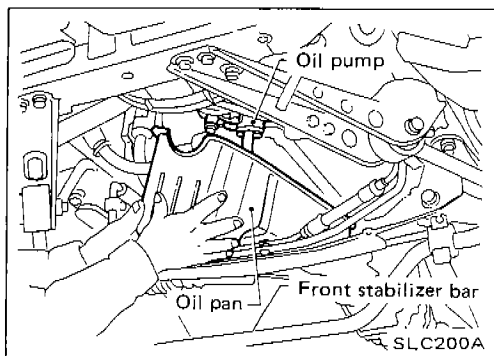
If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch with sealant.

Use proper liquid sealant.

Oil pressure switch:

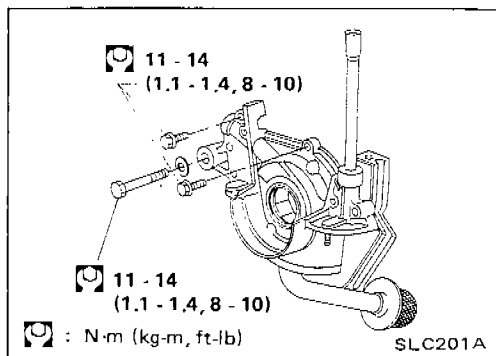
⌚: 10 - 16 N·m (1.0 - 1.6 kg-m, 7 - 12 ft-lb)



Oil Pump

REMOVAL AND INSTALLATION

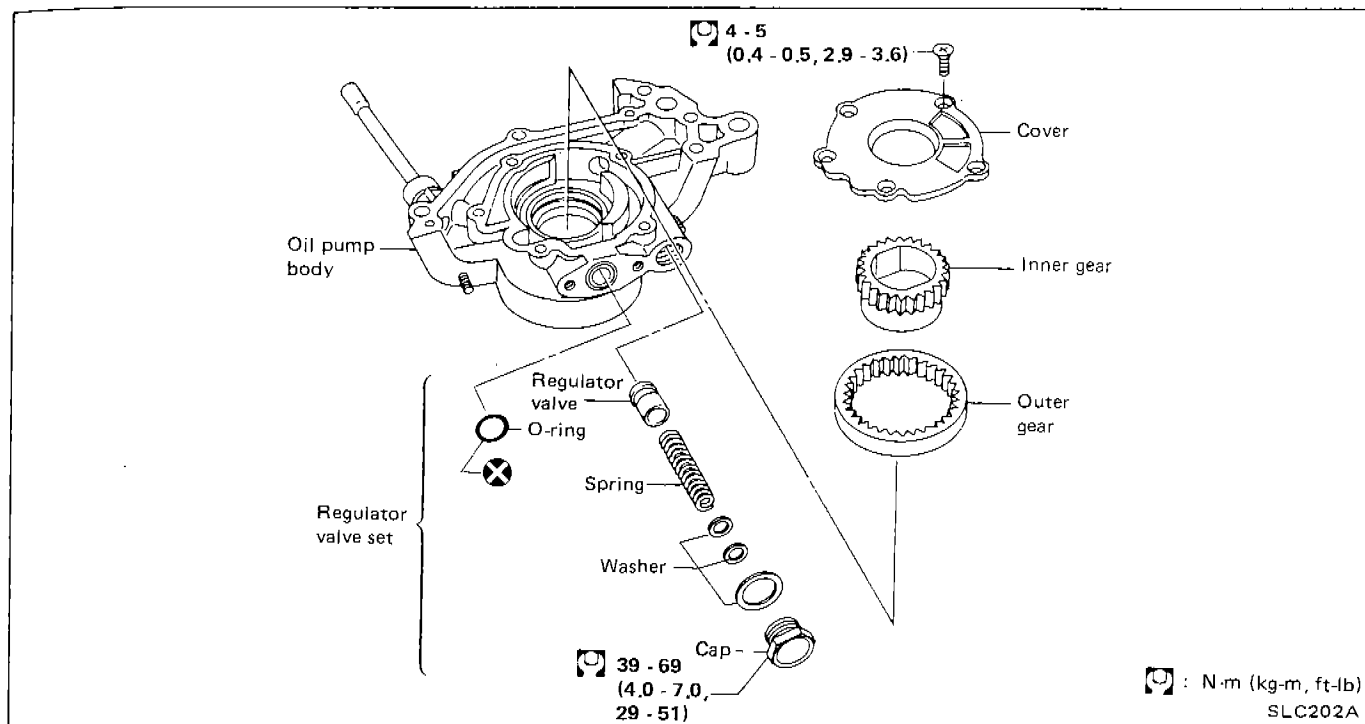
1. Remove drive belts.
2. Remove timing belt covers and timing belt.
3. Remove front stabilizer bar.
4. Loosen front engine mounting nuts. (Do not loosen nuts completely.)
5. Lift up engine slightly using engine slings.
6. Remove oil pan.
7. Remove oil pump assembly with oil strainer.
8. Installation is in reverse order of removal.



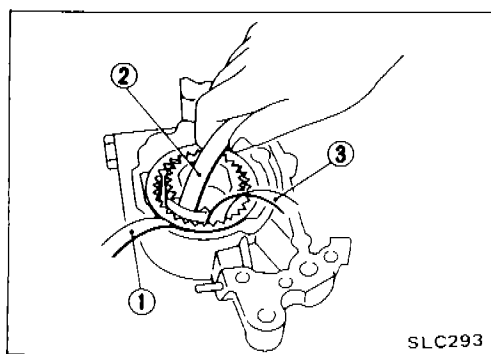
ENGINE LUBRICATION SYSTEM

Oil Pump (Cont'd)

DISASSEMBLY AND ASSEMBLY



- When installing oil pump, apply engine oil to inner and outer gear.
- Be sure that O-ring is properly fitted.



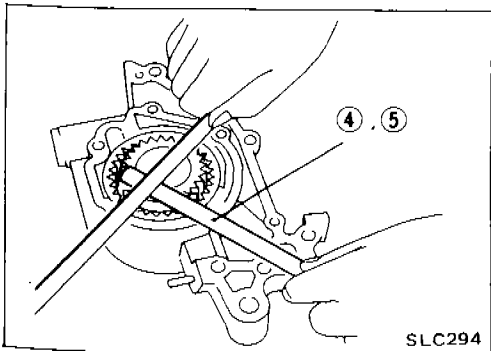
INSPECTION

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	0.15 - 0.26 (0.0059 - 0.0102)
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 it exceeds the limit, replace gear set or entire oil pump assembly.



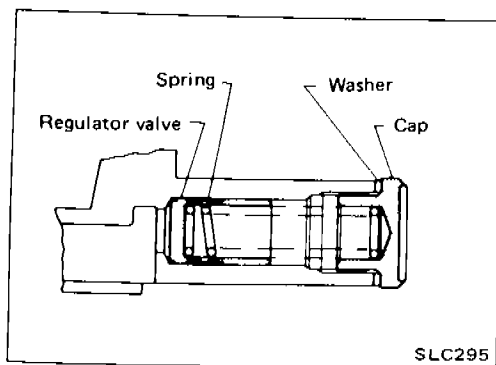
ENGINE LUBRICATION SYSTEM

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.



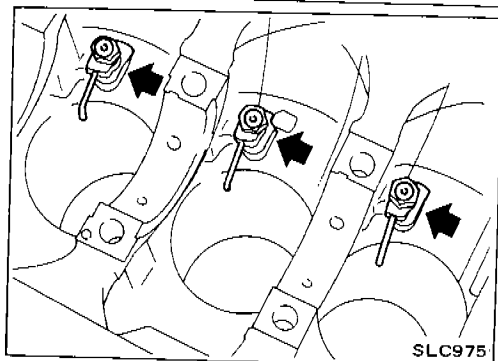
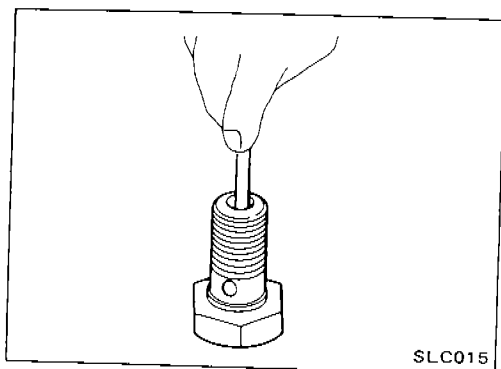
OIL PRESSURE RELIEF VALVE INSPECTION

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.

Oil Jet

INSPECTION (For piston)

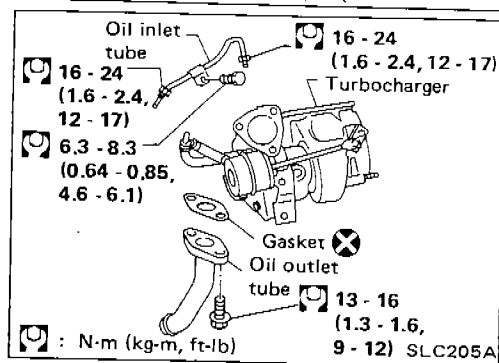
1. Blow through outlet of oil jet and make sure that air comes out of inlet.
2. Push cut-off valve of oil jet bolt with a clean resin or brass rod and make sure that cut-off valve moves smoothly with proper repulsion.



When installing oil jet, align oil jet's boss with hole on cylinder block.

Oil jet bolt:

⌘: 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

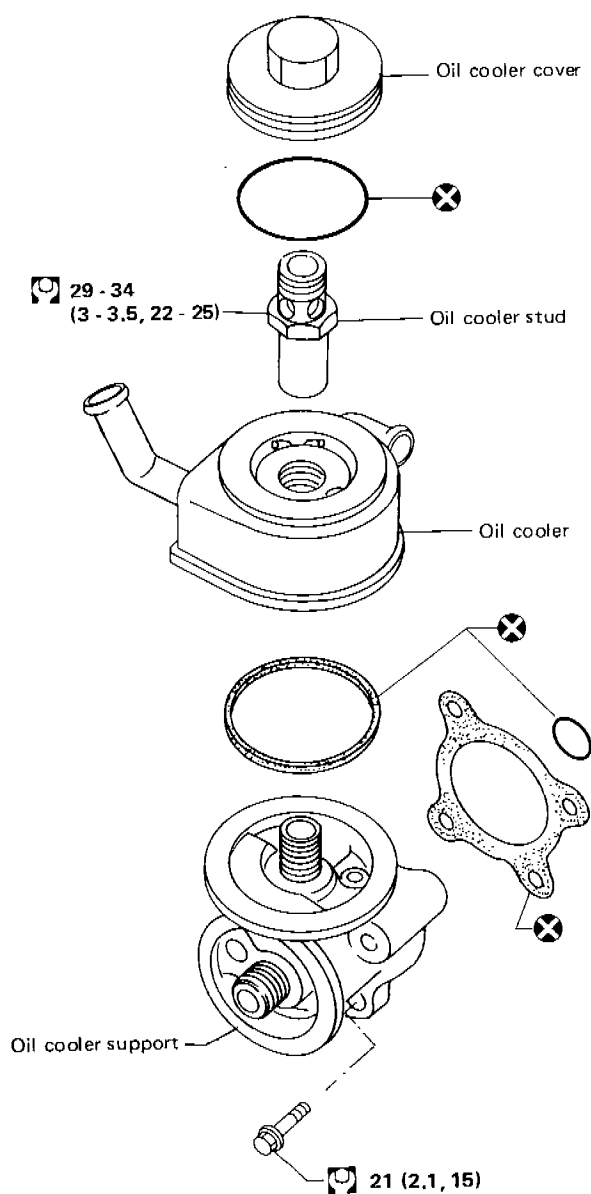


Turbocharger

- Before removing water tube, drain coolant first.
- After installation, run engine for a few minutes and check for leaks.

ENGINE LUBRICATION SYSTEM

Oil Cooler



: N·m (kg-m, ft-lb)

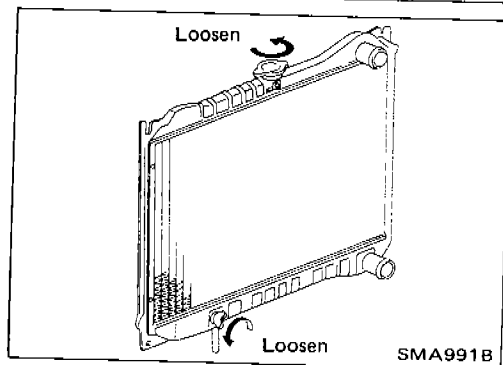
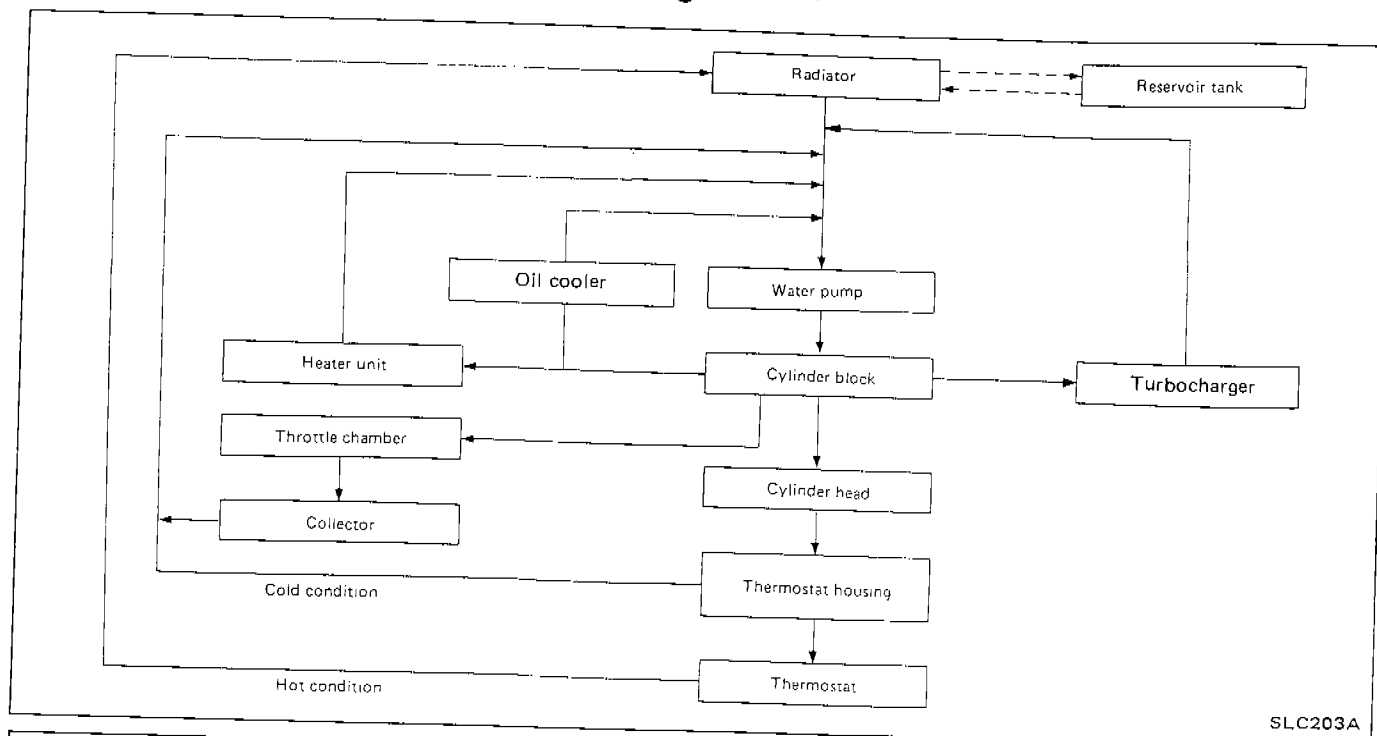
SLC207A

INSPECTION

1. Check oil cooler element and housing for cracks.
 2. Check oil cooler for clogging by blowing through coolant inlet.
- Replace it if necessary.

ENGINE COOLING SYSTEM

Cooling Circuit

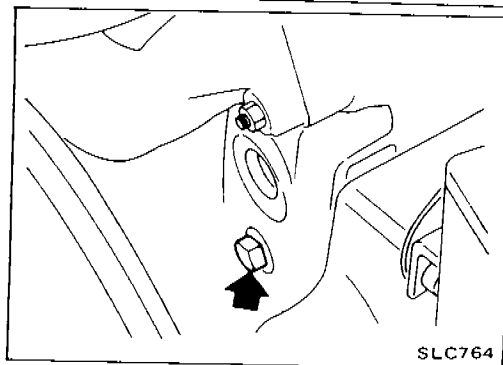


Water Pump

REMOVAL AND INSTALLATION

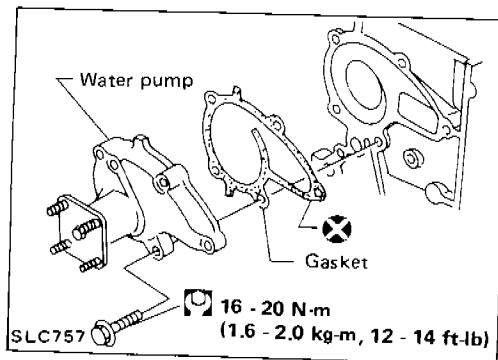
1. Drain coolant from radiator.

2. Remove cylinder block drain plug located at left rear of cylinder block and drain coolant.



CAUTION:

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

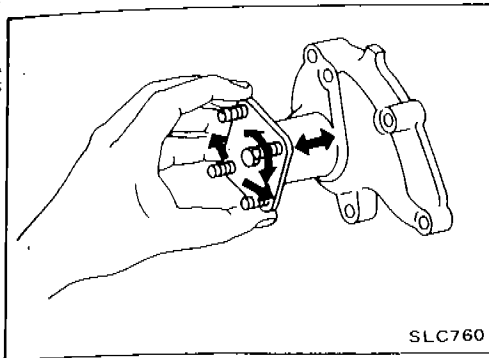


ENGINE COOLING SYSTEM

Water Pump (Cont'd)

INSPECTION

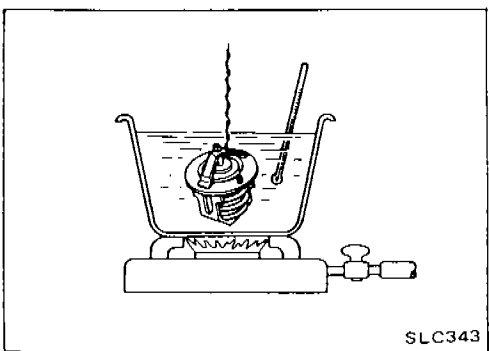
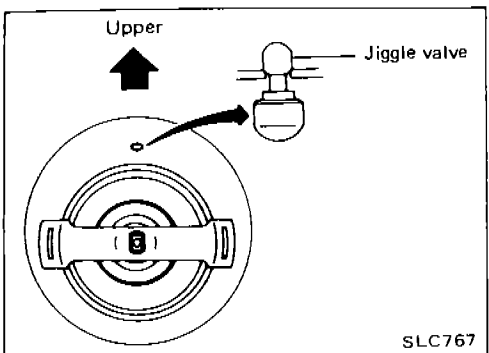
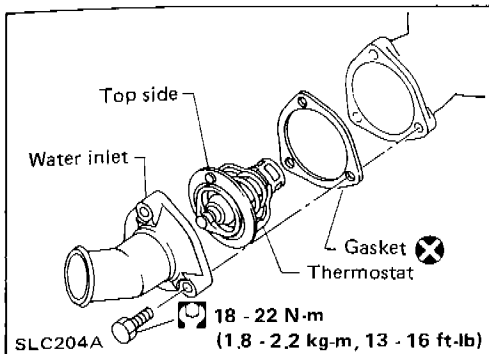
1. Check for badly rusted or corroded body assembly and vane.
2. Check for rough operation due to excessive end play.



Thermostat

INSPECTION

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



2. Check valve opening temperature and maximum valve lift.

	Standard	Cold type	Hot type*
Valve opening temperature °C (°F)	82 (180)	88 (190)	76.5 (170)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)	8/90 (0.31/194)

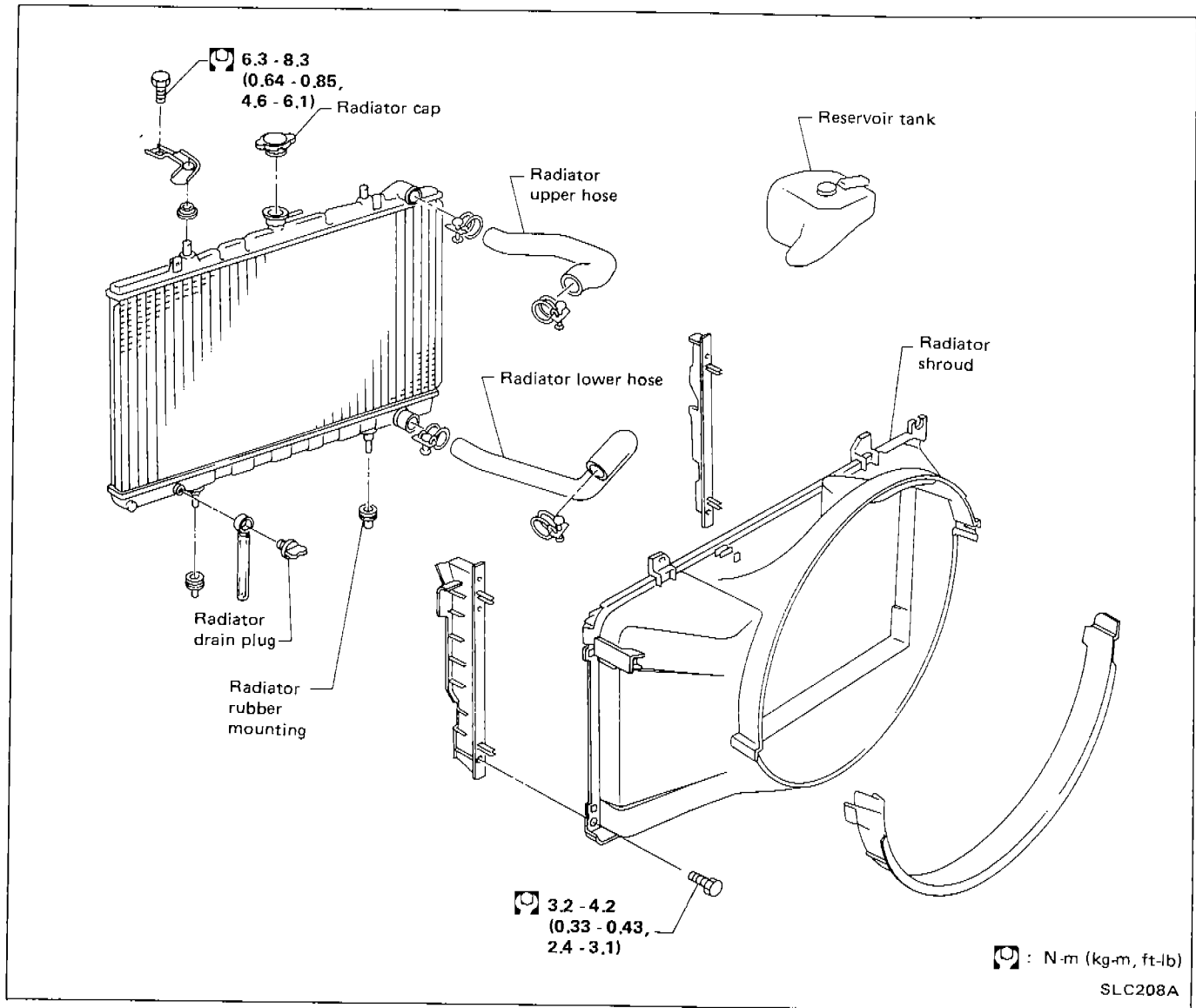
*For general areas only

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.

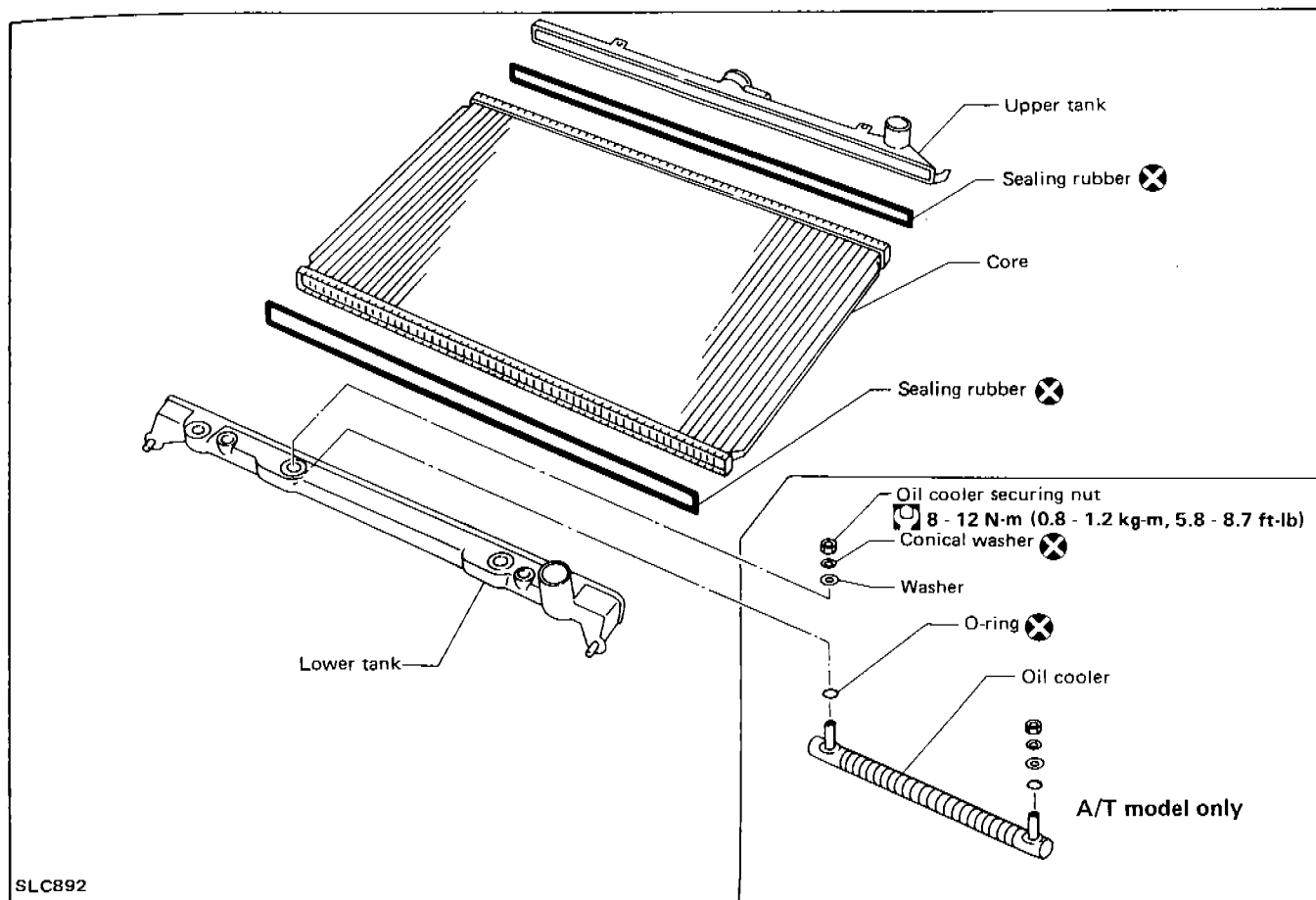
ENGINE COOLING SYSTEM

Radiator



ENGINE COOLING SYSTEM

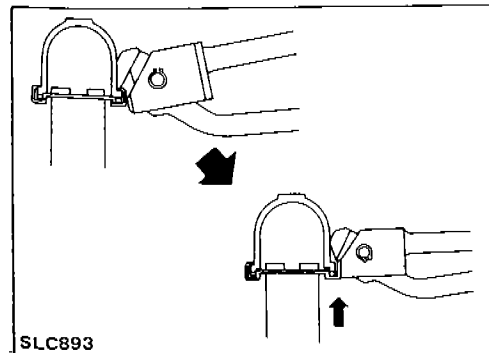
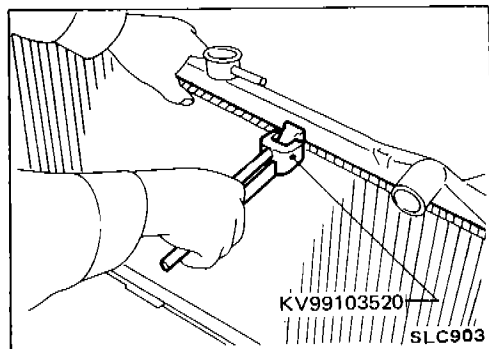
Radiator (Aluminum type)



Aluminum radiator can be disassembled by using special procedures and special service tools.

DISASSEMBLY

1. Remove tank with Tool.

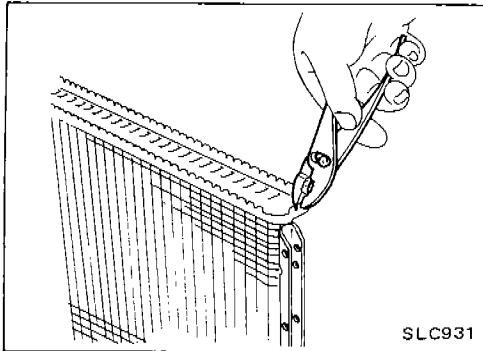
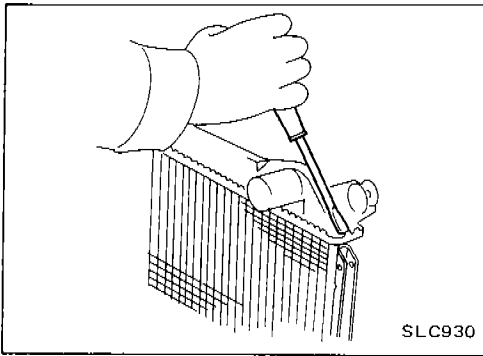


- Grip the crimped edge and bend it upwards so that Tool slips off.
Do not bend excessively.

ENGINE COOLING SYSTEM

Radiator (Aluminum type)(Cont'd)

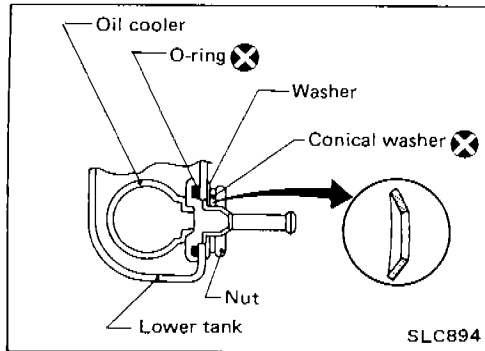
- In areas where Tool cannot be used, use a screwdriver to bend the edge up.
Be careful not to damage tank.



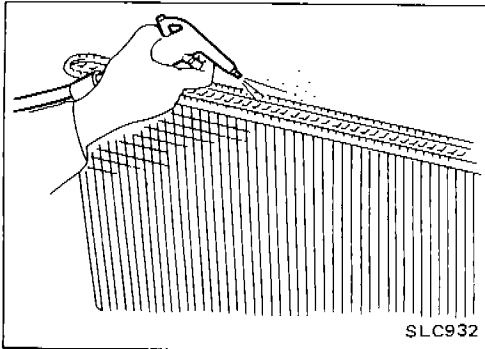
2. Make sure the edge stands straight up.
3. Remove oil cooler from tank. (A/T model only)

ASSEMBLY

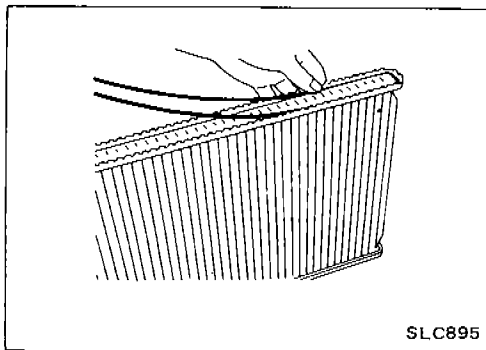
1. Install oil cooler. (A/T model only)
Pay attention to direction of conical washer.



2. Clean contact portion of tank.



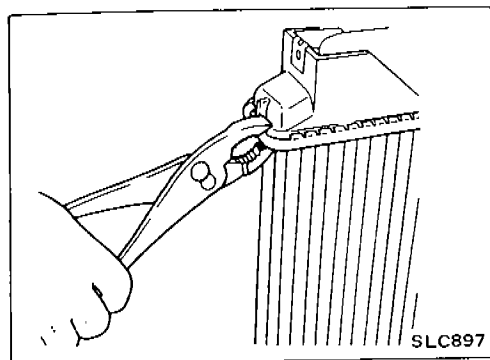
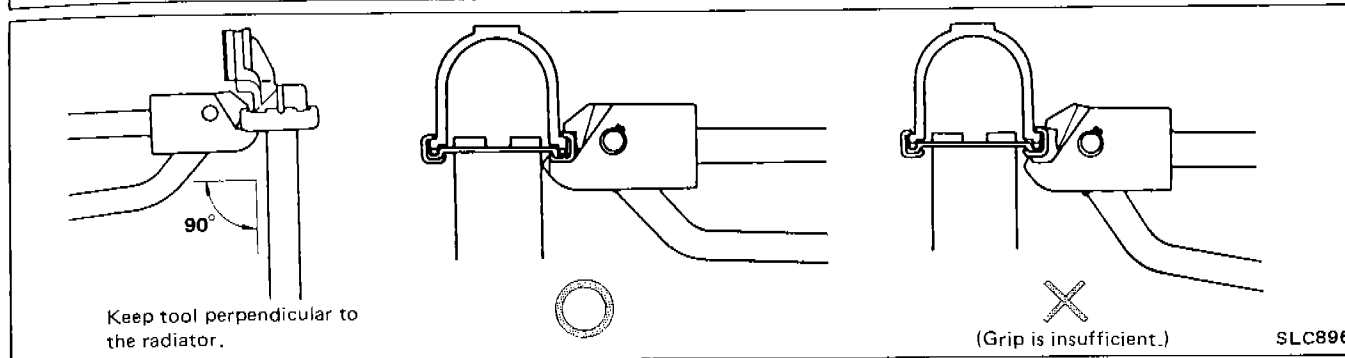
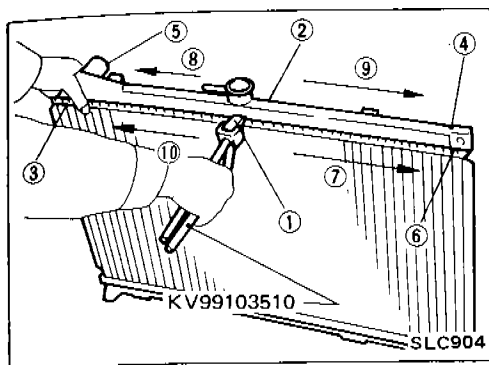
3. Install sealing rubber.
Push it in with fingers.
Be careful not to twist sealing rubber.



ENGINE COOLING SYSTEM

Radiator (Aluminum type)(Cont'd)

4. Caulk tank in specified sequence with Tool.



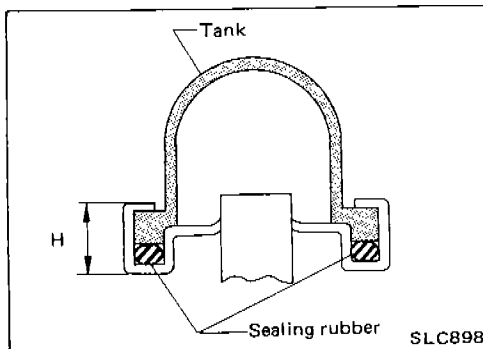
- Use pliers in the locations where Tool cannot be used.

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

Standard height "H":
11.5 mm (0.453 in)

6. Confirm that there is no leakage.

Refer to "INSPECTION".



INSPECTION

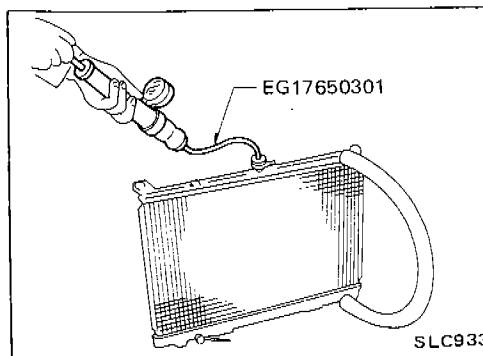
1. Apply pressure with Tool.

Specified pressure value:

157 kPa (1.57 bar, 1.6 kg/cm², 23 psi)

WARNING:

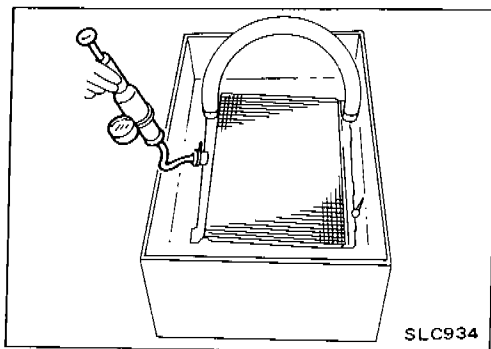
To prevent the risk of the hose coming undone while under pressure, securely fasten it down with a hose clamp.
Attach a hose to the oil cooler as well. (A/T model only)



ENGINE COOLING SYSTEM

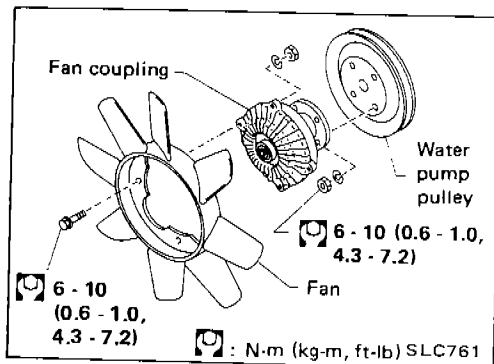
Radiator (Aluminum type)(Cont'd)

2. Check leakage.



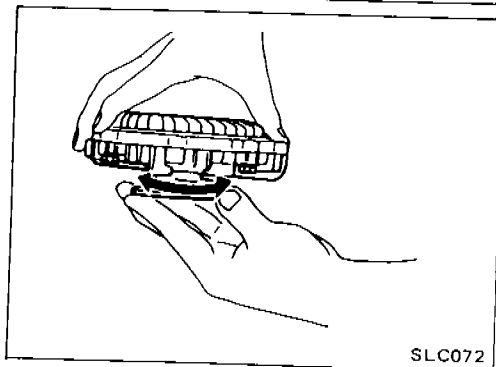
Cooling Fan

DISASSEMBLY AND ASSEMBLY

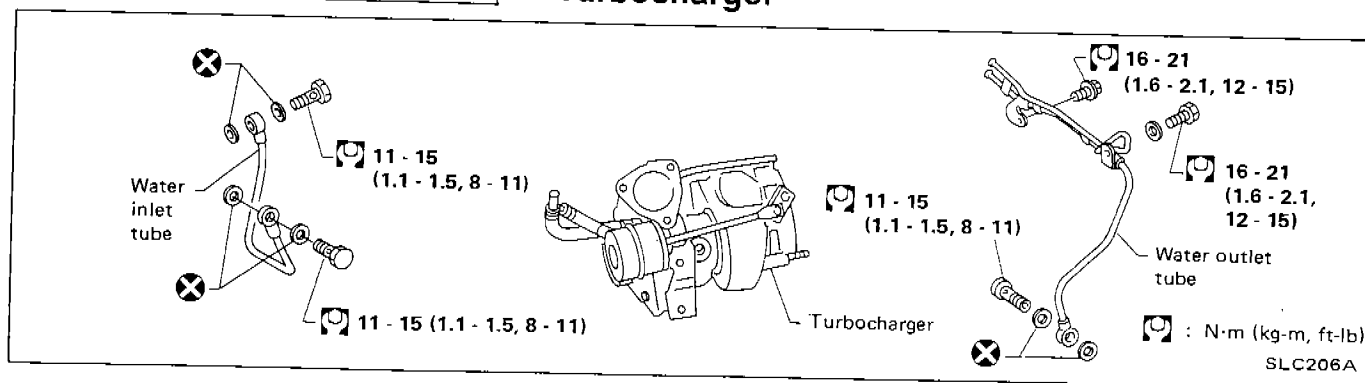


INSPECTION

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



Turbocharger



- When installing oil tubes, first hand-tighten nuts connecting tubes, then slightly tighten bracket securing bolts, and tighten nuts and bolts securely.
- Be careful not to deform tubes.
- After installation, run engine for a few minutes, and check for oil leakage.

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

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)
3,000	353 - 412 (3.53 - 4.12, 3.6 - 4.2, 51 - 60)

OIL PUMP INSPECTION

Unit: mm (in)

Body to outer gear clearance	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.15 - 0.26 (0.0059 - 0.0102)
Outer gear to crescent clearance	0.21 - 0.32 (0.0083 - 0.0126)
Housing to inner gear clearance	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear clearance	0.05 - 0.11 (0.0020 - 0.0043)

Engine Cooling System

THERMOSTAT

	Standard	Cold type	Hot type*
Valve opening temperature °C (°F)	82 (180)	88 (190)	76.5 (170)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)	8/90 (0.31/194)

*For general areas only

RADIATOR

Leakage test pressure	157 kPa (1.57 bar, 1.6 kg/cm ² , 23 psi)
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