ENGINE LUBRICATION & COOLING SYSTEMS

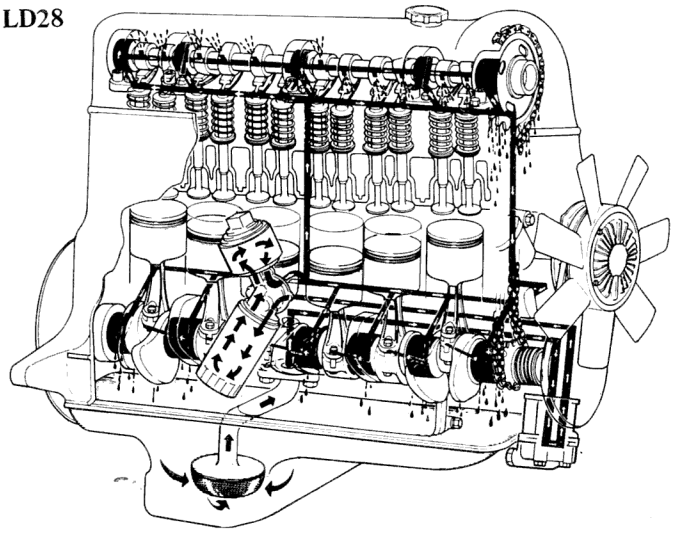
SECTION LC

CONTENTS

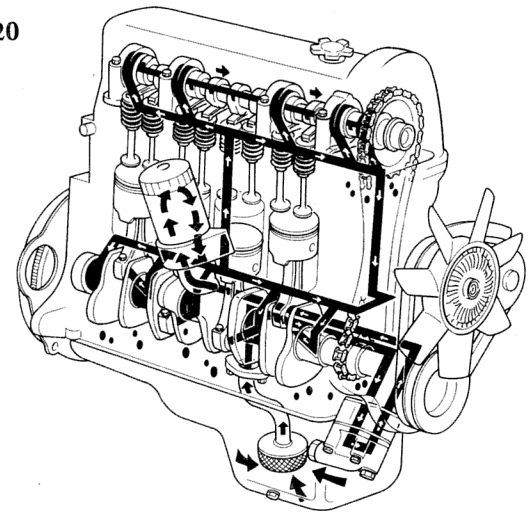
ENGINE LUBRICATION SYSTEM

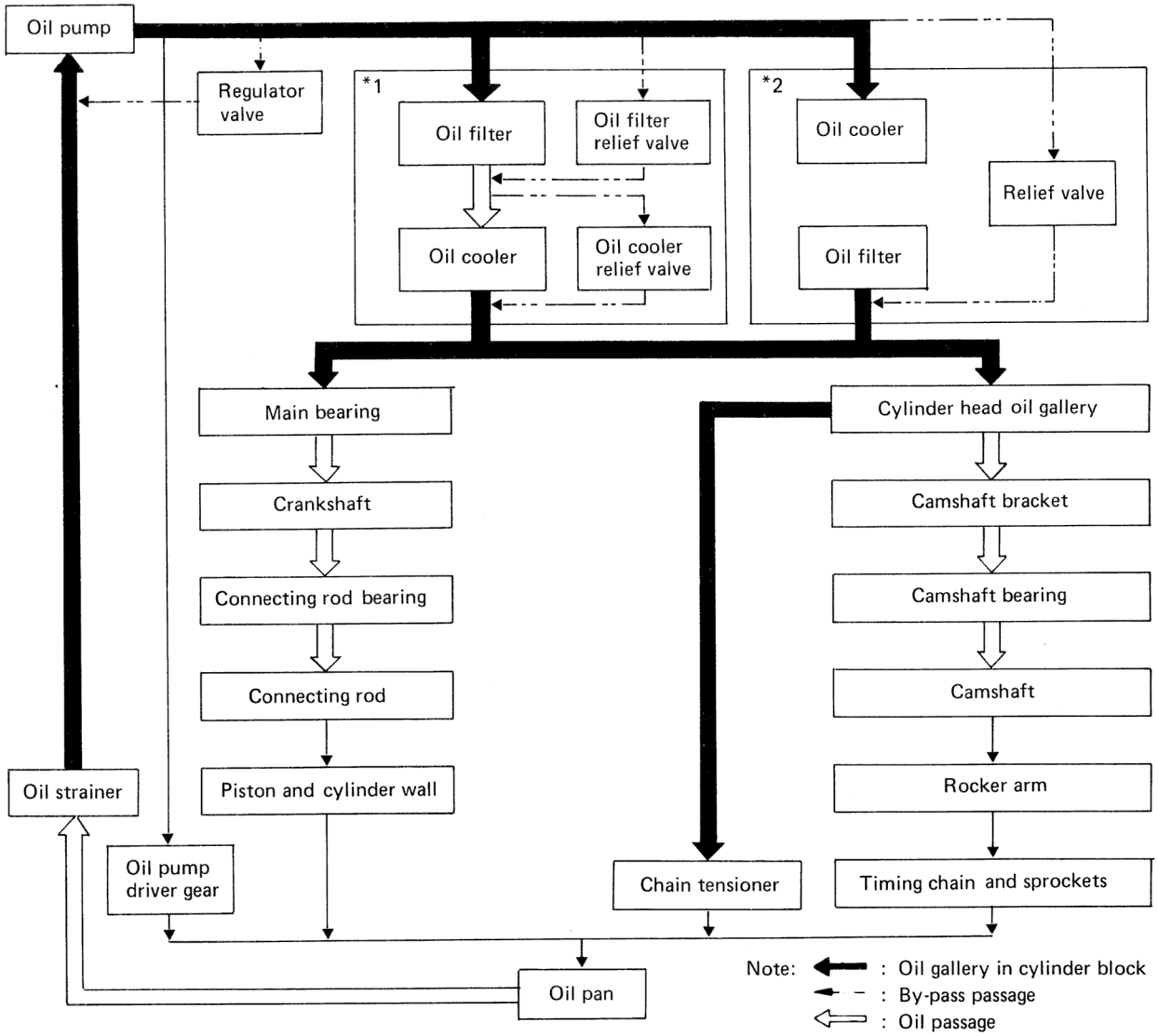
LUBRICATION CIRCUIT

LD28



LD20



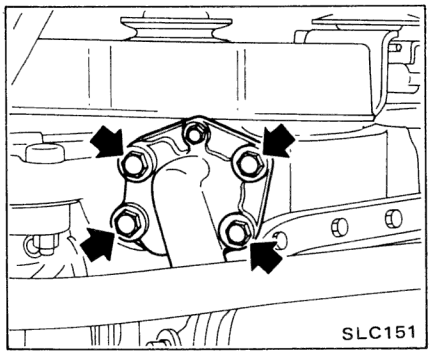


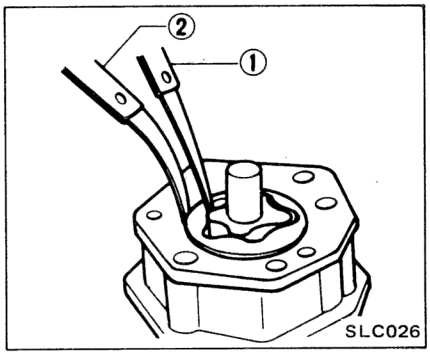
SLC235

OIL PUMP

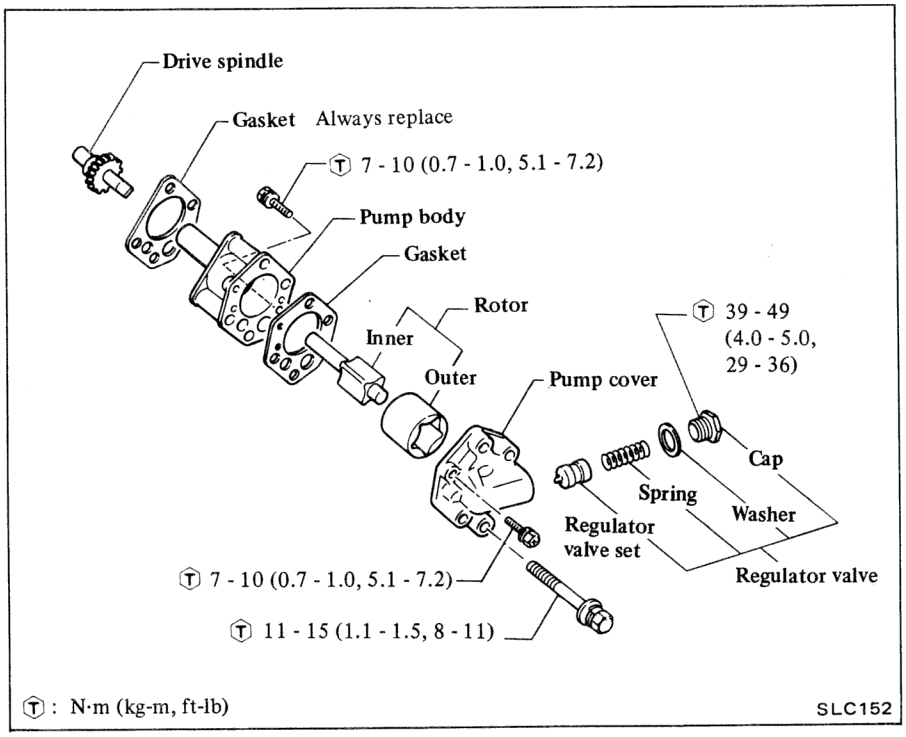
REMOVAL

1. Remove engine undercover.
2. Remove oil pump and drive spindle as an assembly.

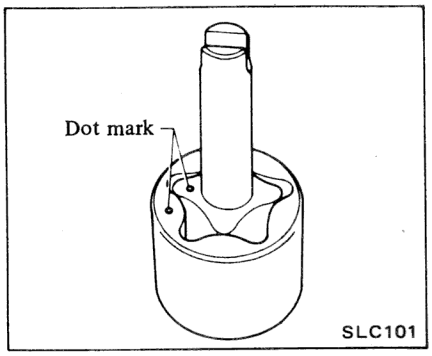




DISASSEMBLY AND ASSEMBLY



The dot on outer and inner rotor should face toward oil pump body.



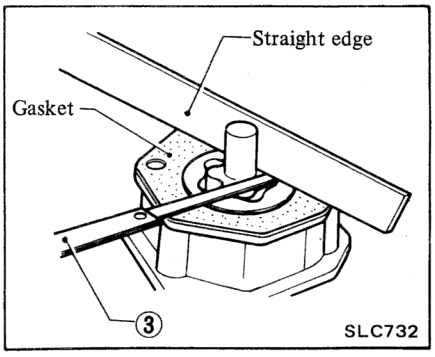
INSPECTION

1. Using a feeler gauge, check the following clearance.

If it exceeds limit, replace rotor set or entire oil pump assembly.

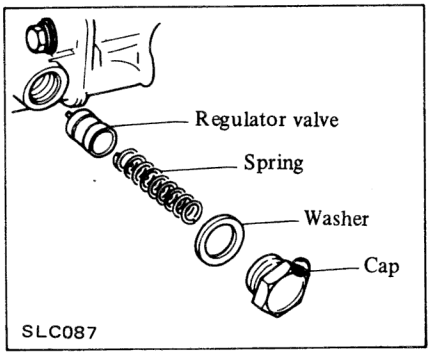
Rotor tip clearance ①:
Less than 0.12 mm (0.0047 in)
Outer rotor to body clearance ②:
0.15 - 0.21 mm
(0.0059 - 0.0083 in)

Outer and inner rotor side clearance (with gasket) ③:
0.04 - 0.08 mm
(0.0016 - 0.0031 in)



2. Check oil pressure regulator valve sliding surface and valve spring.

If damaged, replace valve set or pump assembly.

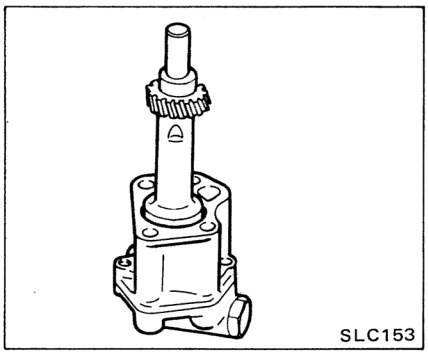


INSTALLATION

1. Install pump cover with gasket.

Ⓣ : **Cover bolt**
7 - 10 N·m
(0.7 - 1.0 kg-m,
5.1 - 7.2 ft-lb)

2. Fill pump housing with engine oil, then install drive spindle.


SLC153

3. Using a new gasket, install oil pump and drive spindle assembly.

Ⓣ : **Oil pump to front cover**
11 - 15 N·m
(1.1 - 1.5 kg-m,
8 - 11 ft-lb)

4. Refill engine with oil.

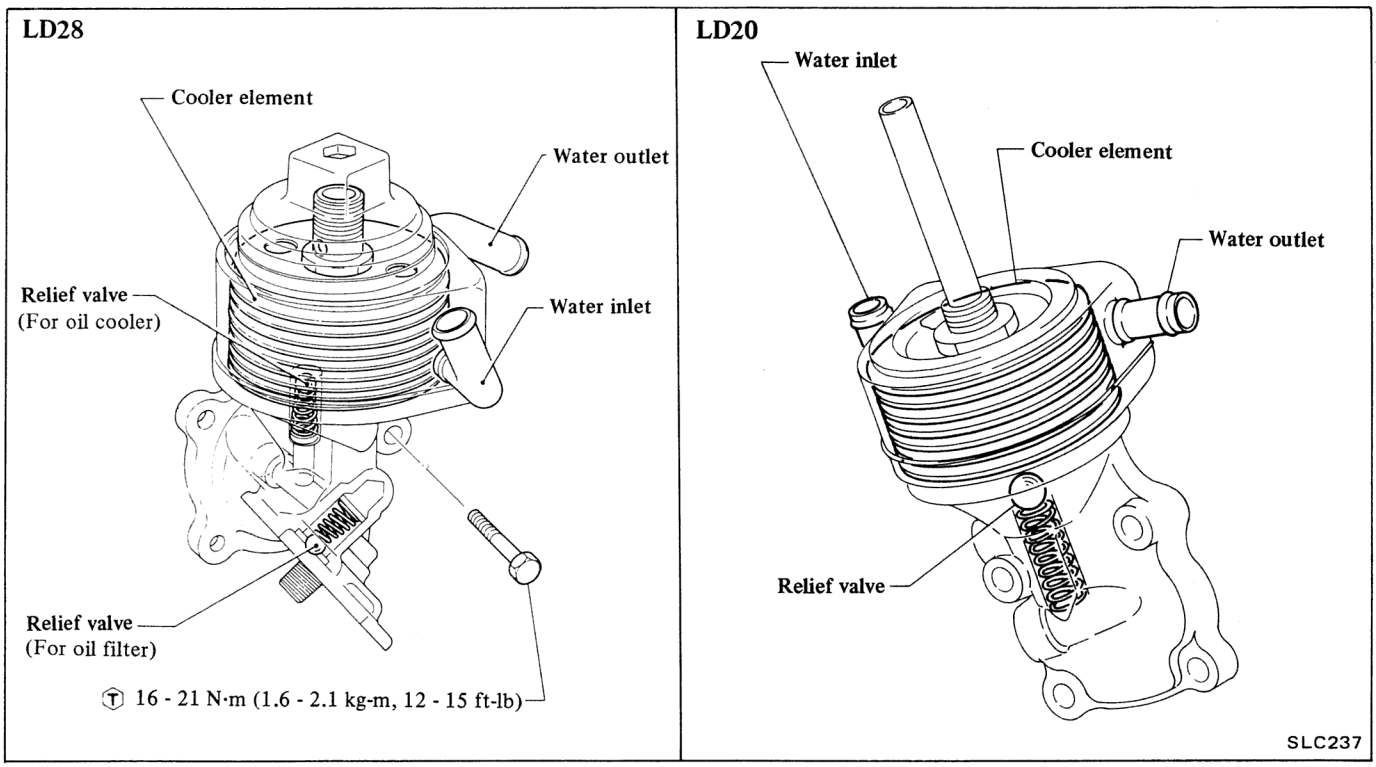
Approximate oil refill capacity

Unit: liter (Imp qt)

		Without oil filter change	With oil filter change
LD20	910	3.8 (3-3/8)	4.5 (4)
	C120	3.6 (3-1/8)	4.3 (3-3/4)
LD28	430	4.3 (3-3/4)	5.0 (4-3/8)
	C31	4.3 (3-3/4)	5.0 (4-3/8)

After installing, run engine for a few minutes, and check for leaks.

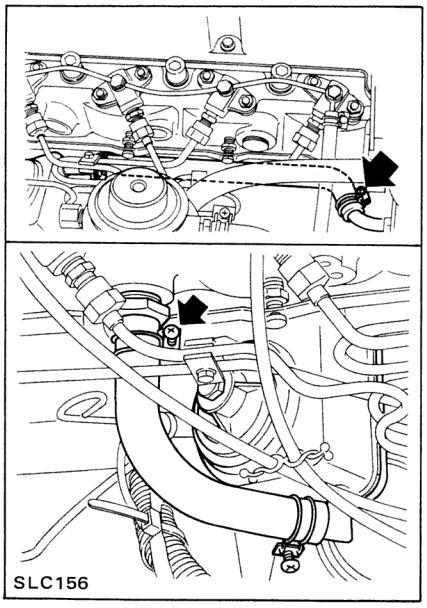
OIL COOLER



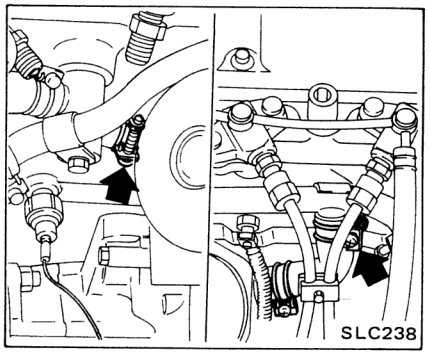
REMOVAL

1. Remove radiator drain plug and radiator cap, and drain coolant.
2. Remove coolant hoses.

LD28



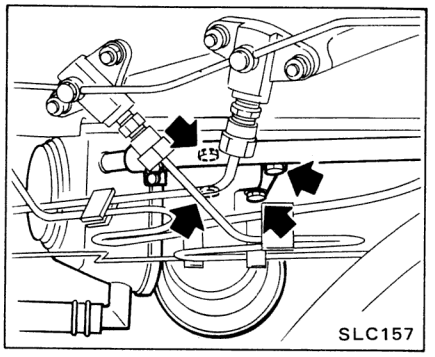
LD20



3.

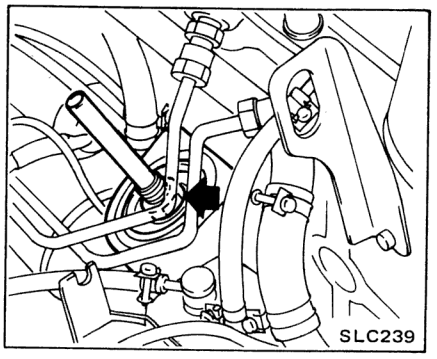
LD28

- Remove oil cooler assembly with oil filter and hoses.

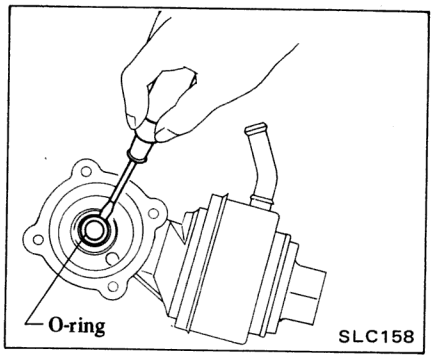


LD20

- Remove oil filter and nut, then take out oil cooler.



4. Remove O-ring from bracket (LD28).



INSTALLATION

Install oil cooler in the reverse order of removal.

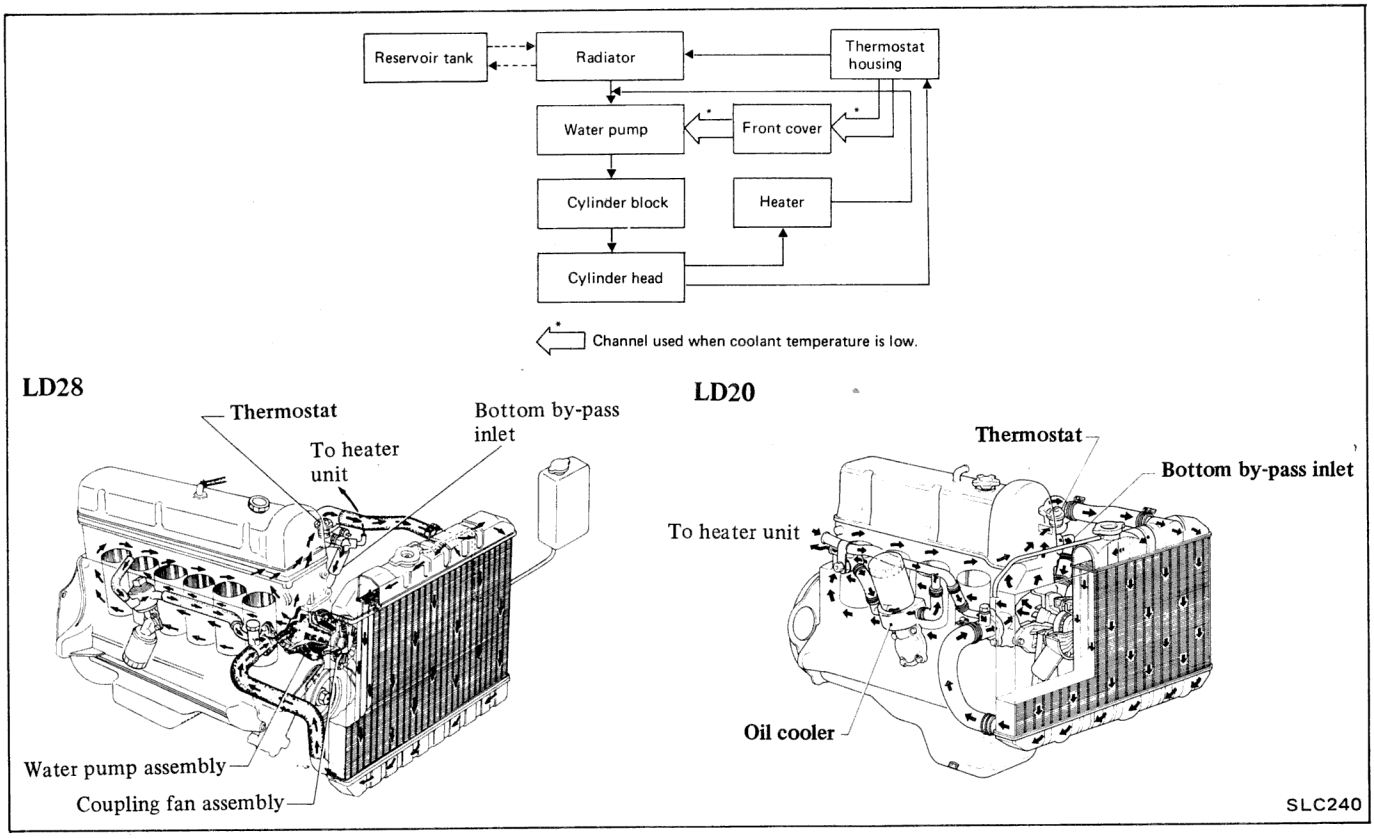
Always use new gasket.

Ⓣ : **Oil cooler fixing bolt**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

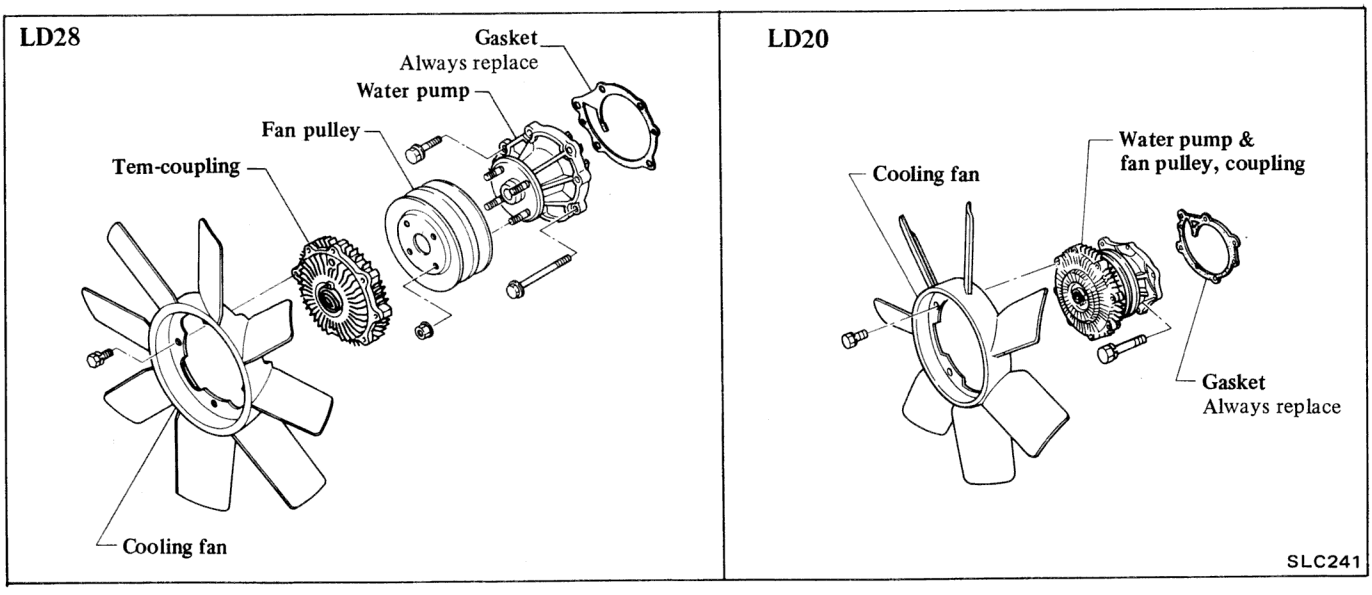
After installing, run engine for a few minutes, and check for leaks.

ENGINE COOLING SYSTEM

COOLING CIRCUIT



WATER PUMP

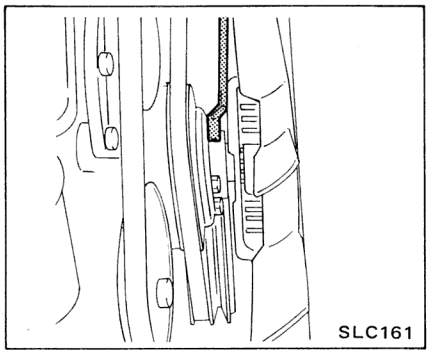


REMOVAL

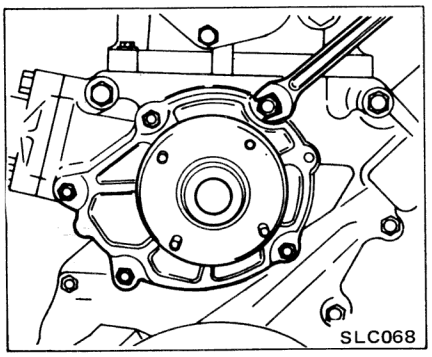
1. Open radiator drain cock and radiator cap, and drain coolant.

WARNING:
To avoid the danger of being scalded, never attempt to drain the coolant when the engine is hot.

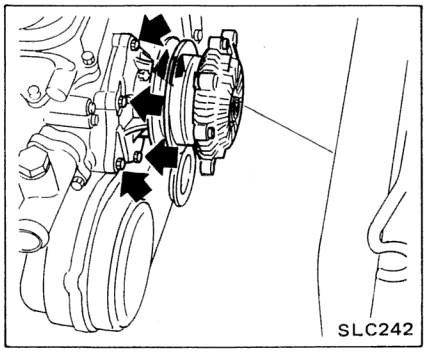
2. Remove radiator shroud.
3. Loosen fan pulley nuts (LD28).



4. Loosen fan belt.
(1) Loosen alternator securing bolts.
(2) Move the alternator toward the engine.
5. Remove fan pulley with fan coupling and fan (LD28).
6. Remove fan (LD20).
7.
- Remove water pump with gasket (LD28).



- Remove water pump with fan pulley, fan coupling and gasket (LD20).

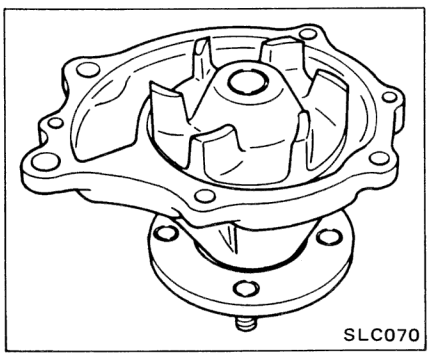


INSPECTION

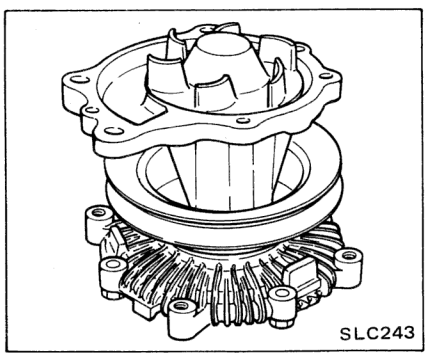
The water pump and fan coupling cannot be disassembled and should be replaced as a unit.

1. Inspect water pump body and vane for rust or corrosion.

LD28

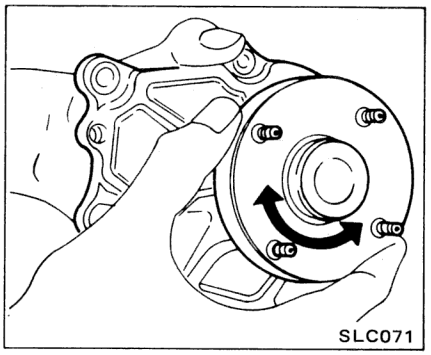


LD20

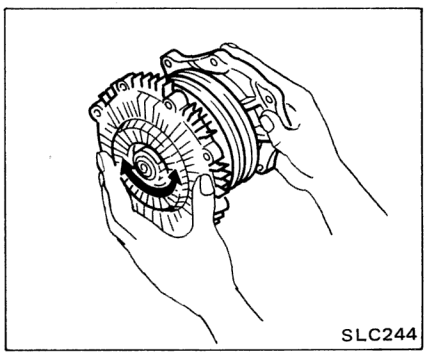


2. Inspect water pump bearing.
Check for excessive end play or rough operation.

LD28

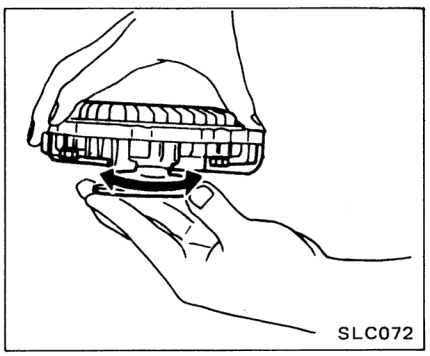


LD20

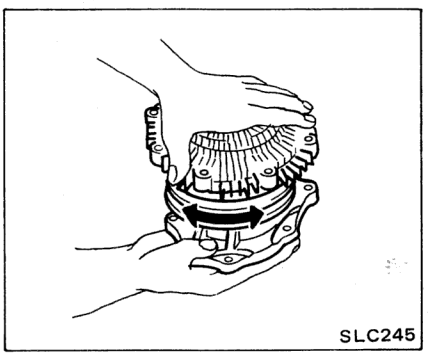


3. Inspect fan coupling.
Check the coupling for oil leakage or bent bimetal.

LD28



LD20



INSTALLATION

1. Install water pump in the reverse order of removal.

Always use new gasket.

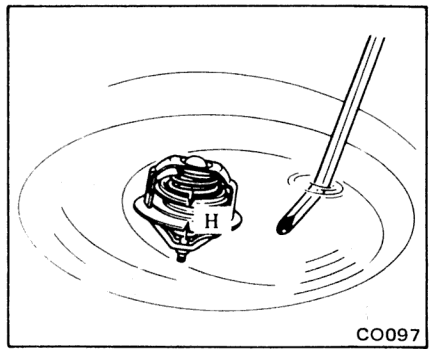
2. Adjust fan belt tension.

Fan belt deflection:
8 - 12 mm (0.31 - 0.47 in)

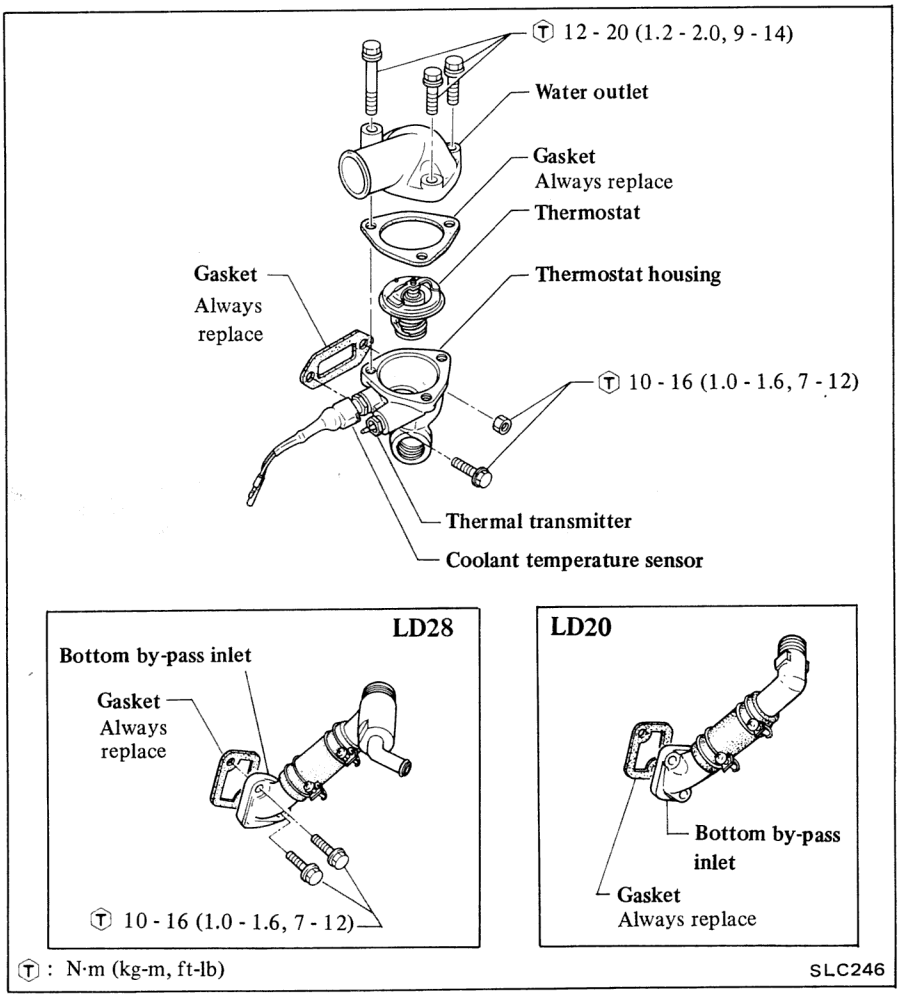
Pushing force:
98 N (10 kg, 22 lb)

3. Fill radiator with coolant.

After installing, run engine for a few minutes and check for leaks.



THERMOSTAT



REMOVAL

1. Drain a small amount of coolant partially and disconnect radiator upper hose at water outlet.

WARNING:
To avoid the danger of being scalded, never attempt to drain the coolant when the engine is hot.

2. Remove water outlet and then remove thermostat.

INSPECTION

Inspect thermostat for the following and replace if necessary.

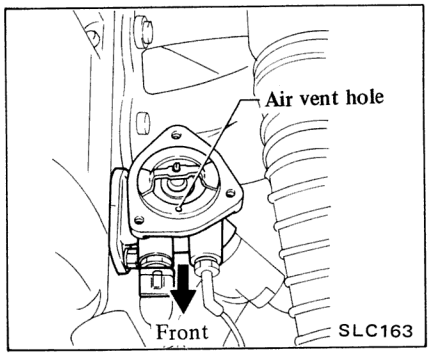
1. Valve seating condition at ordinary temperature. It should seat tightly.
2. Valve opening temperature and maximum valve lift. (Refer to S.D.S.)

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

It is necessary to check the new thermostat before installing it.

INSTALLATION

1. Position thermostat on thermostat housing with the air vent hole facing the front side of the engine.



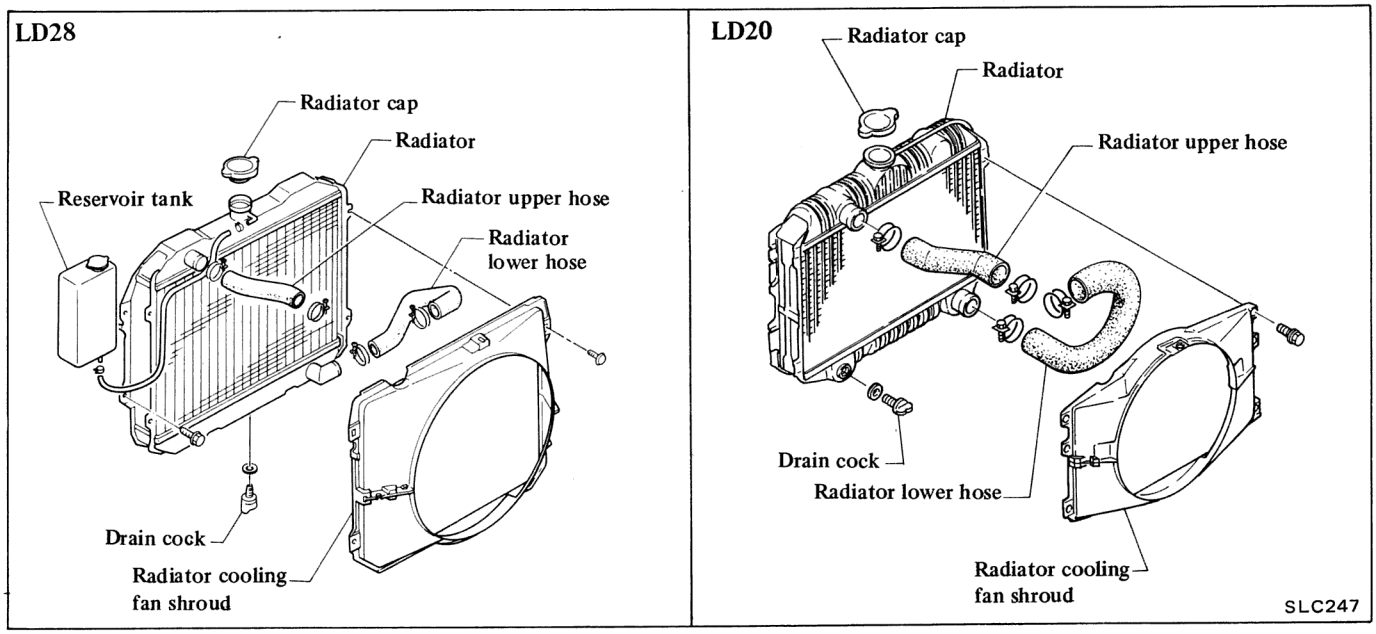
2. Install water outlet with new gasket.

Ⓣ : Attaching bolt
12 - 20 N·m
(1.2 - 2.0 kg-m,
9 - 14 ft-lb)

3. Connect radiator upper hose and fill radiator with coolant.

After installing, run engine for a few minutes, and check for leaks.

RADIATOR



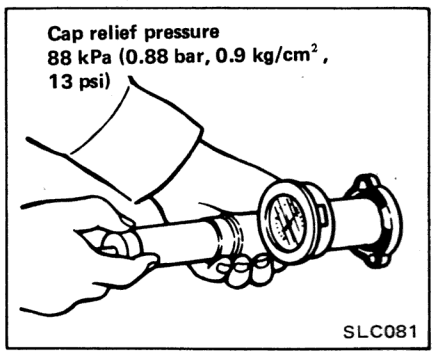
WARNING:
Never remove the radiator cap when the engine is hot; serious burns can be caused by high pressure fluid escaping from the radiator, wrap a thick cloth around cap and carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape, and then turn the cap all the way off.

INSPECTION

Checking radiator cap

Using cap tester, check the radiator cap relief pressure.

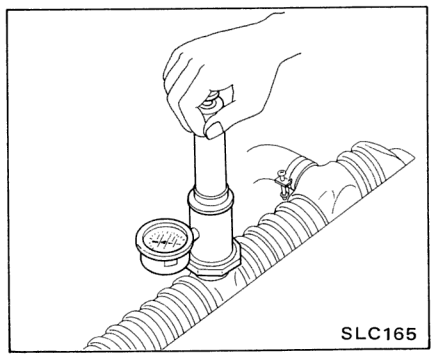
If the pressure gauge drops rapidly and excessively, replace the radiator cap.



Checking cooling system for leaks

Attach pressure tester, pump tester to the specified pressure.

Check for drop in pressure.



If the pressure drops, check for leaks from hoses, radiator, or water pump.

If no external leaks are found, check heater core, block and head.

REMOVAL AND INSTALLATION

1. Open radiator drain cock and remove radiator cap. Drain coolant into a suitable container.

WARNING:
To avoid the danger of being scalded, never attempt to drain the coolant when the engine is hot.

2. Remove radiator shroud attaching screws and place radiator shroud close to engine. (Radiator shroud can be removed after removing radiator.)
3. Disconnect radiator upper and lower hoses, and reservoir tank hose.
4. On a car with automatic transmission, disconnect cooler inlet and outlet lines from radiator.
5. Remove radiator.
6. Install radiator in the reverse order of removal.
7. Fill radiator with coolant to specified quantity.

After installing, run engine for a few minutes, and check for leaks.

SERVICE DATA AND SPECIFICATIONS

ENGINE LUBRICATION SYSTEM

GENERAL SPECIFICATIONS

Lubrication method	Pressed feed flow
Oil pump type	Trochoid type
Oil filter type	Full flow and cartridge type

Approximate oil refill capacity

Unit: liter (Imp qt)

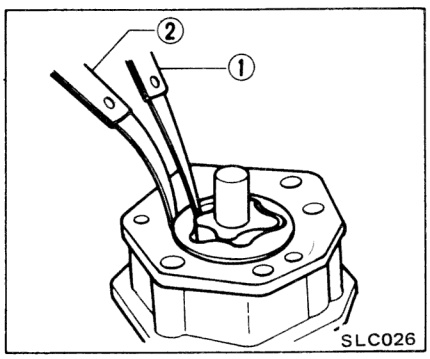
		Without oil filter change	With oil filter change
LD20	910	3.8 (3-3/8)	4.5 (4)
	C120	3.6 (3-1/8)	4.3 (3-3/4)
LD28	430	4.3 (3-3/4)	5.0 (4-3/8)
	C31	4.3 (3-3/4)	5.0 (4-3/8)

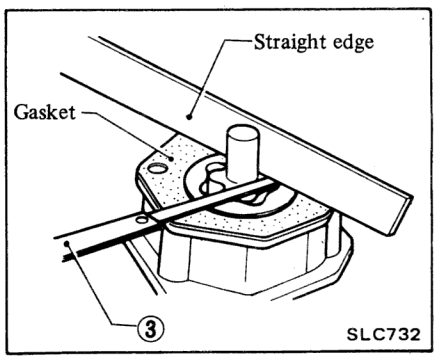
INSPECTION AND ADJUSTMENT

Oil pump

Unit: mm (in)

Rotor tip clearance ①	Less than 0.12 (0.0047)
Outer rotor to body clearance ②	0.15 - 0.21 (0.0059 - 0.0083)
Outer and inner rotor side clearance (with gasket) ③	0.04 - 0.08 (0.0016 - 0.0031)





TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Oil pump mounting bolts	11 - 15	1.1 - 1.5	8 - 11
Oil pump cover bolt	7 - 10	0.7 - 1.0	5.1 - 7.2
Regulator valve cap	39 - 49	4.0 - 5.0	29 - 36
Oil pan drain plug	20 - 29	2.0 - 3.0	14 - 22
Oil cooler fixing bolt	16 - 21	1.6 - 2.1	12 - 15

ENGINE COOLING SYSTEM

GENERAL SPECIFICATIONS

Cooling method	Water cooling, forced circulation
Water pump type	Centrifugal
Thermostat type	Wax-pellet
Radiator type	Corrugated fin and tube
Fan coupling method	Temperature coupling

INSPECTION AND ADJUSTMENT

Water pump

Fan belt deflection [Applied force 98 N (10 kg, 22lb)]	mm (in)	8 - 12 (0.31 - 0.47)

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)

Radiator

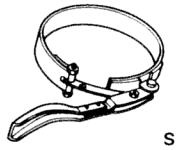
kPa (bar, kg/cm^2, psi)

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	4 - 10	0.4 - 1.0	2.9 - 7.2
	M8	10 - 16	1.0 - 1.6	7 - 12
Water pump pulley stud		6 - 10	0.6 - 1.0	4.3 - 7.2
Thermostat housing		10 - 16	1.0 - 1.6	7 - 12
Water outlet bolt		12 - 20	1.2 - 2.0	9 - 14

SPECIAL SERVICE TOOL

Tool number	Tool name
ST19320000	Oil filter wrench  SLC036