

# ENGINE LUBRICATION & COOLING SYSTEMS

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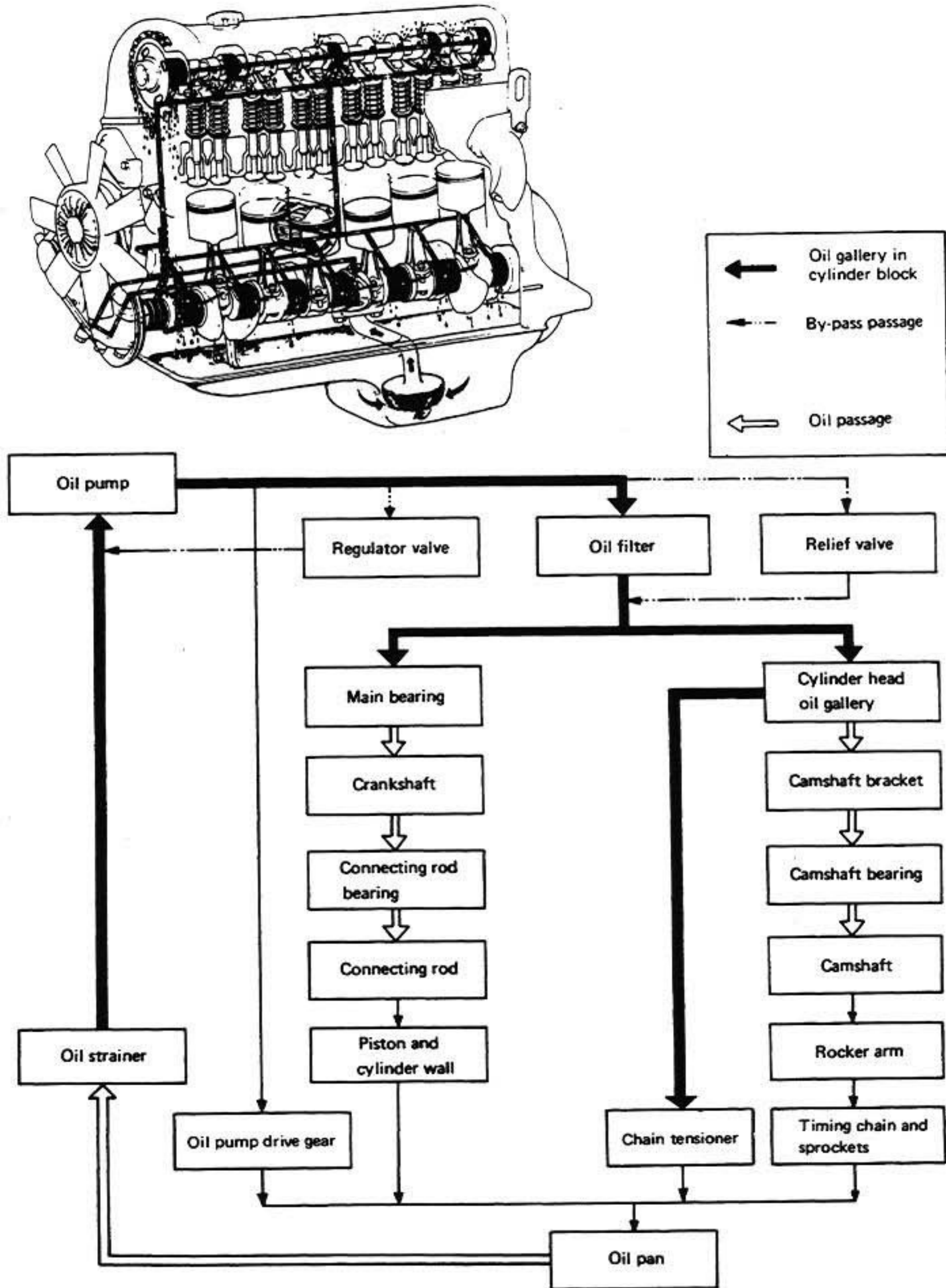
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## ENGINE LUBRICATION SYSTEM

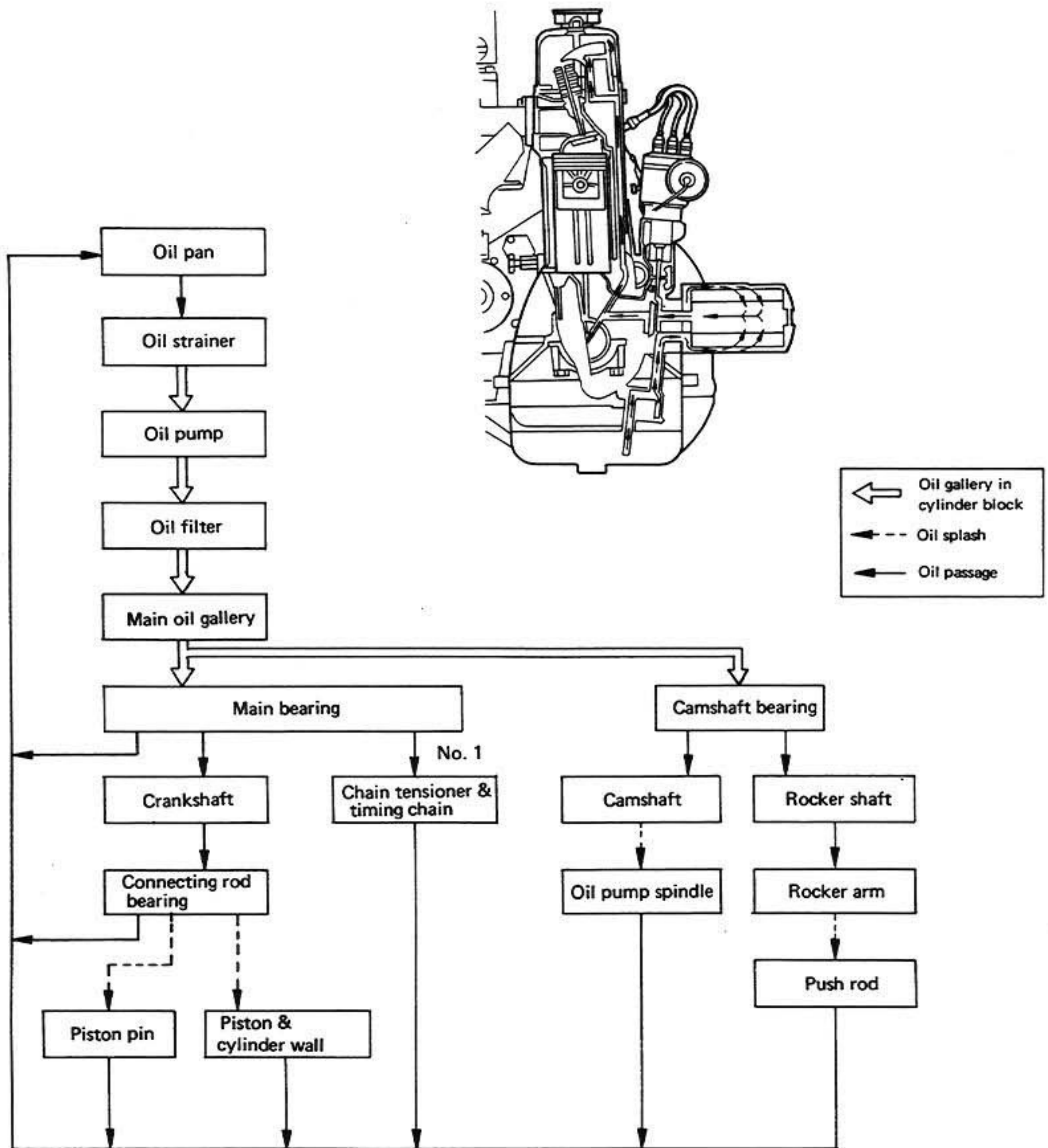
### LUBRICATION CIRCUIT

L28 engine



SLC062

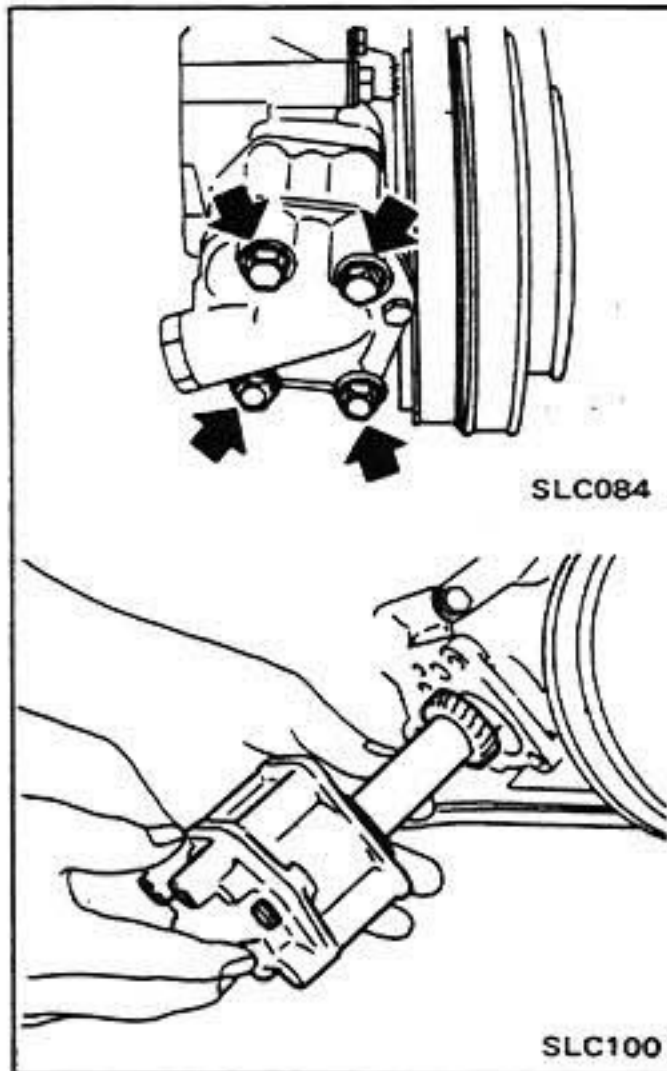
**P40 engine**



## OIL PUMP

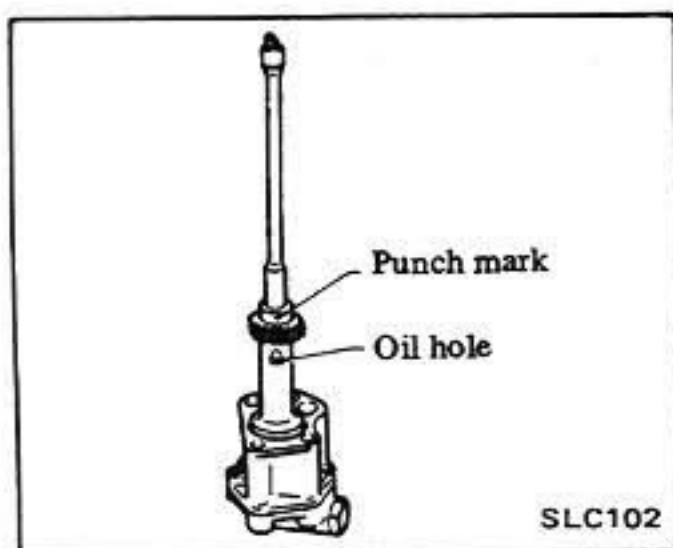
### REMOVAL (L28 engine)

1. Remove oil pan drain plug, and allow oil to drain.
2. Remove distributor.
3. Remove oil pump and drive spindle as an assembly.



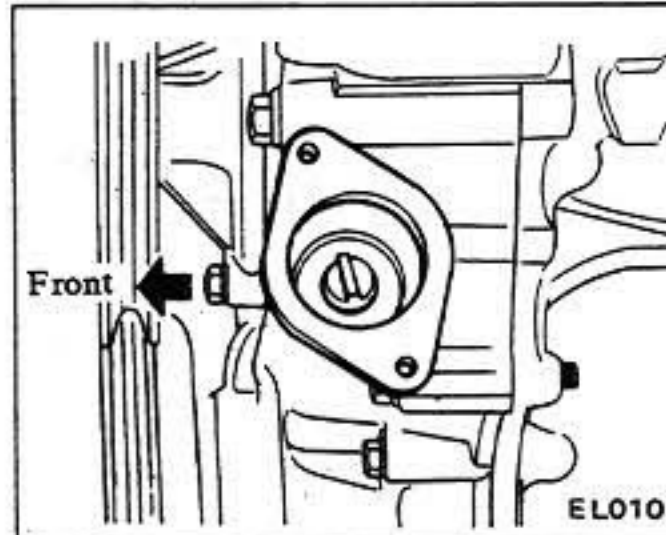
### INSTALLATION (L28 engine)

1. Before installing oil pump in engine, turn crankshaft so that No. 1 piston is at T.D.C. on its compression stroke.
2. Fill pump housing with engine oil, then align punch mark of drive spindle with hole in oil pump.



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

that the projection on its top is located in an 11 : 25 position. At this time, the smaller bow-shape will be placed toward the front.



⊕ : Oil pump mounting bolts  
11 - 15 N·m  
(1.1 - 1.5 kg-m,  
8 - 11 ft-lb)

4. Install distributor.  
Make sure that tip of drive spindle assembly fits distributor fitting hole securely.
5. Refill engine with oil.

#### Oil capacity

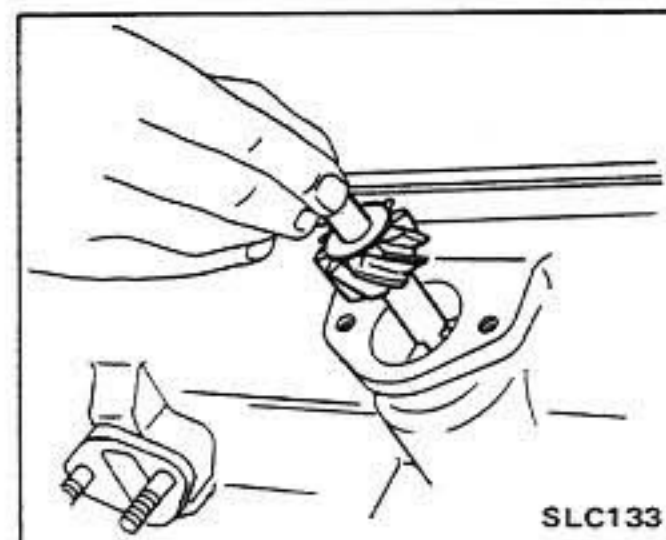
Unit: ℓ (Imp qt)

With oil filter	4.5 (4)
Without oil filter	4.0 (3-1/2)

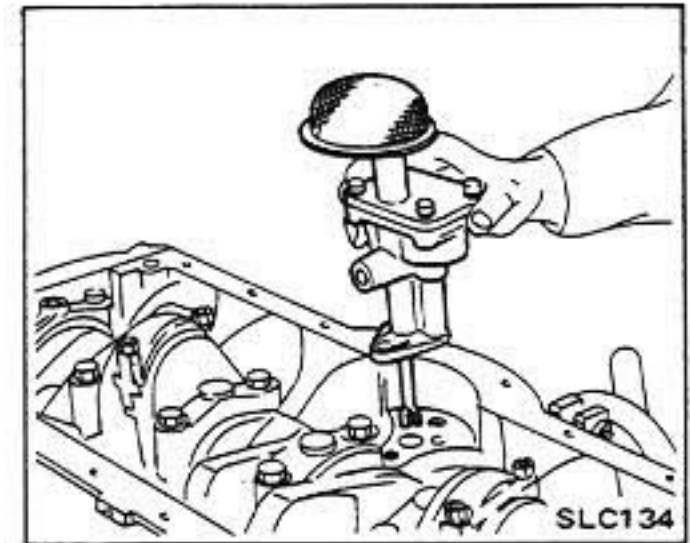
6. Run engine for a few minutes, and check for leaks.

### REMOVAL (P40 engine)

1. Remove oil pan drain plug, and allow oil to drain.
2. Remove distributor and oil pump spindle.



3. Remove oil pan.
4. Remove oil pump body.



### INSTALLATION (P40 engine)

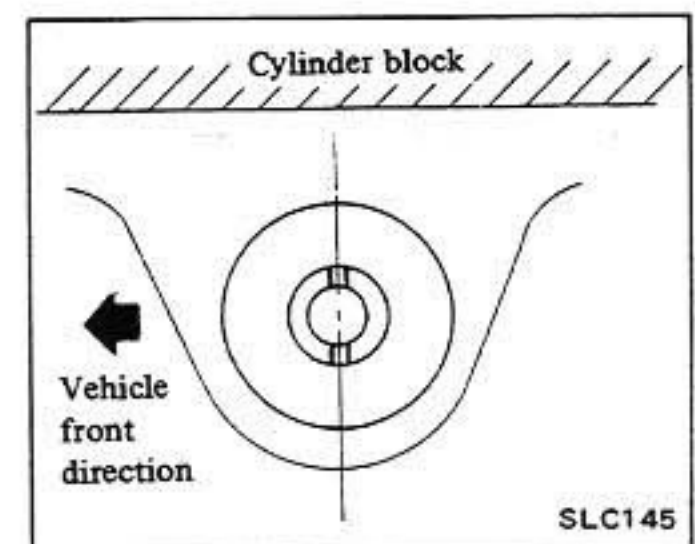
1. Before installing oil pump in engine, turn crankshaft so that No. 1 piston is at T.D.C. on its compression stroke.
2. Install oil pump on cylinder block.

⊕ : Oil pump mounting bolts  
25 - 34 N·m  
(2.5 - 3.5 kg-m,  
18 - 25 ft-lb)

3. Install oil pan.

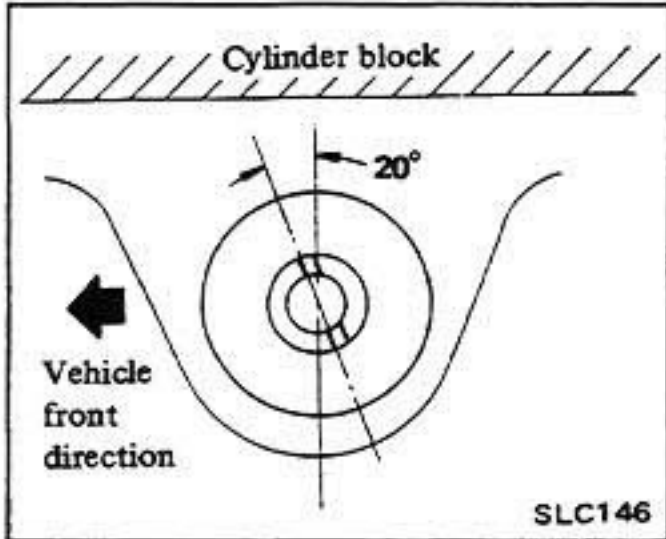
⊕ : Oil pan bolt  
15 - 20 N·m  
(1.5 - 2.0 kg-m,  
11 - 14 ft-lb)

4. Rotate oil pump shaft with a conventional screwdriver as shown.



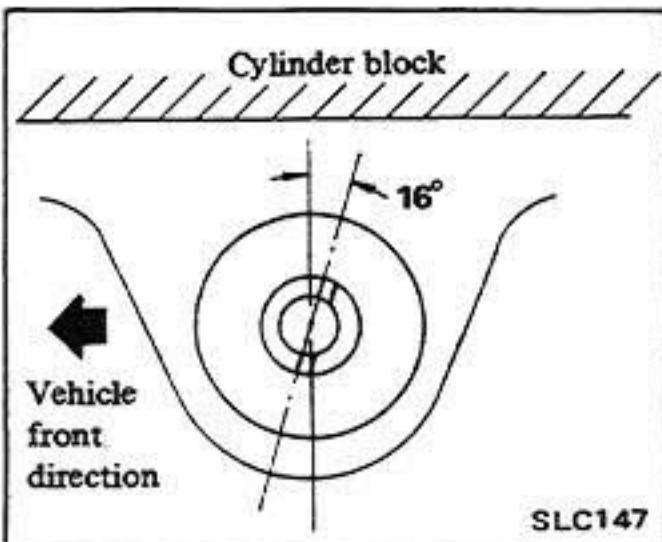
5. Install oil pump spindle as follows:

(1) Set oil pump spindle as shown.



(2) Insert and turn oil pump spindle clockwise.

(3) Confirm that slit on oil pump spindle deflects as shown.



6. Insert distributor, meshing distributor drive slit and driven slit.

7. Refill engine with oil.

**Oil capacity**

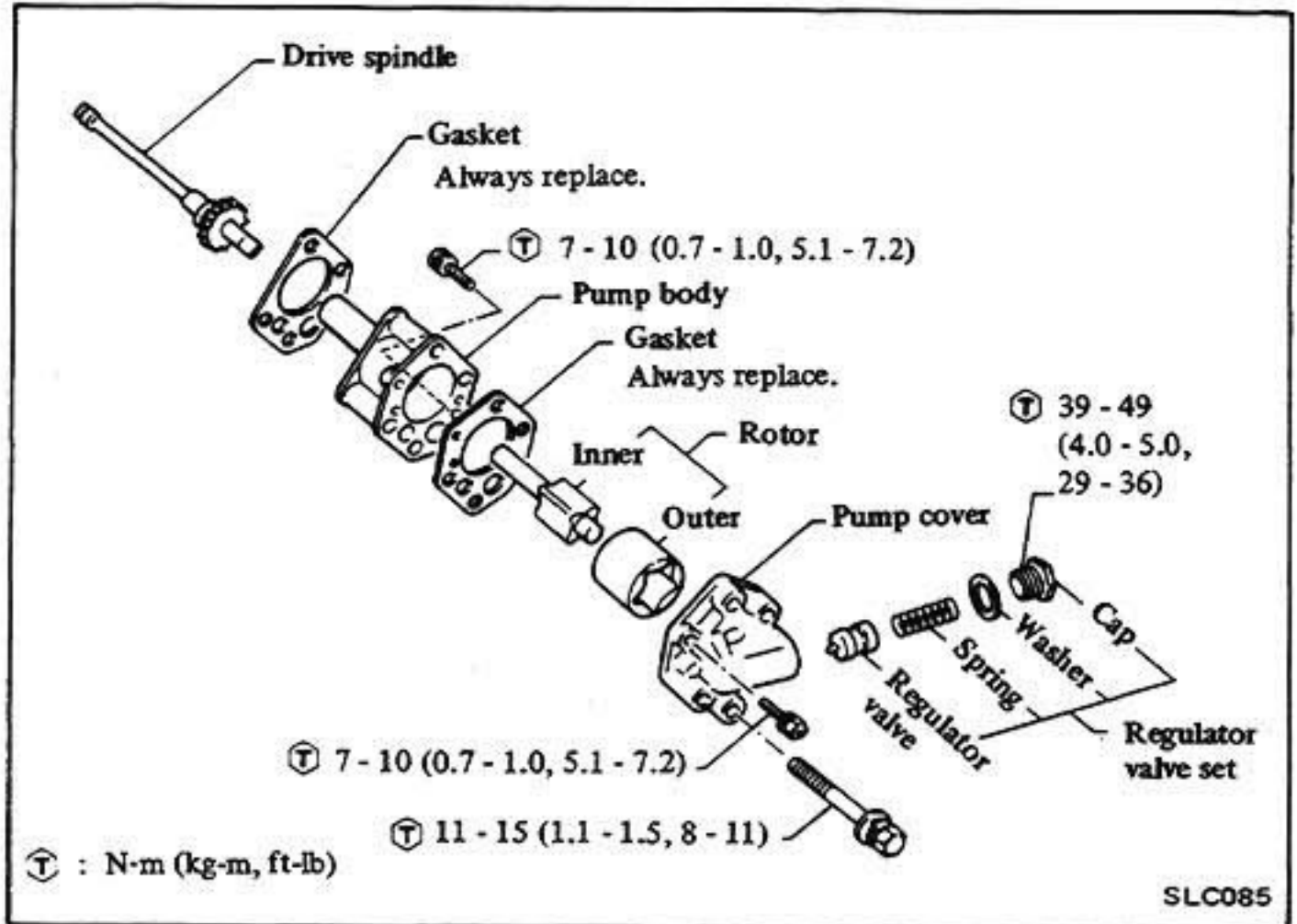
Unit: ℓ (Imp qt)

With oil filter	5.7 (5) 6.5 (5-3/4)*
Without oil filter	5.1 (4-1/2) 5.9 (5-1/4)*

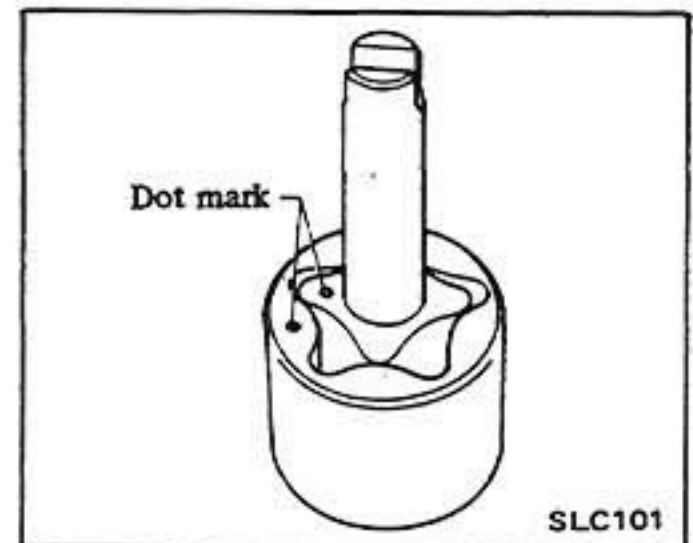
\* With oil cooler unit

**DISASSEMBLY AND ASSEMBLY**

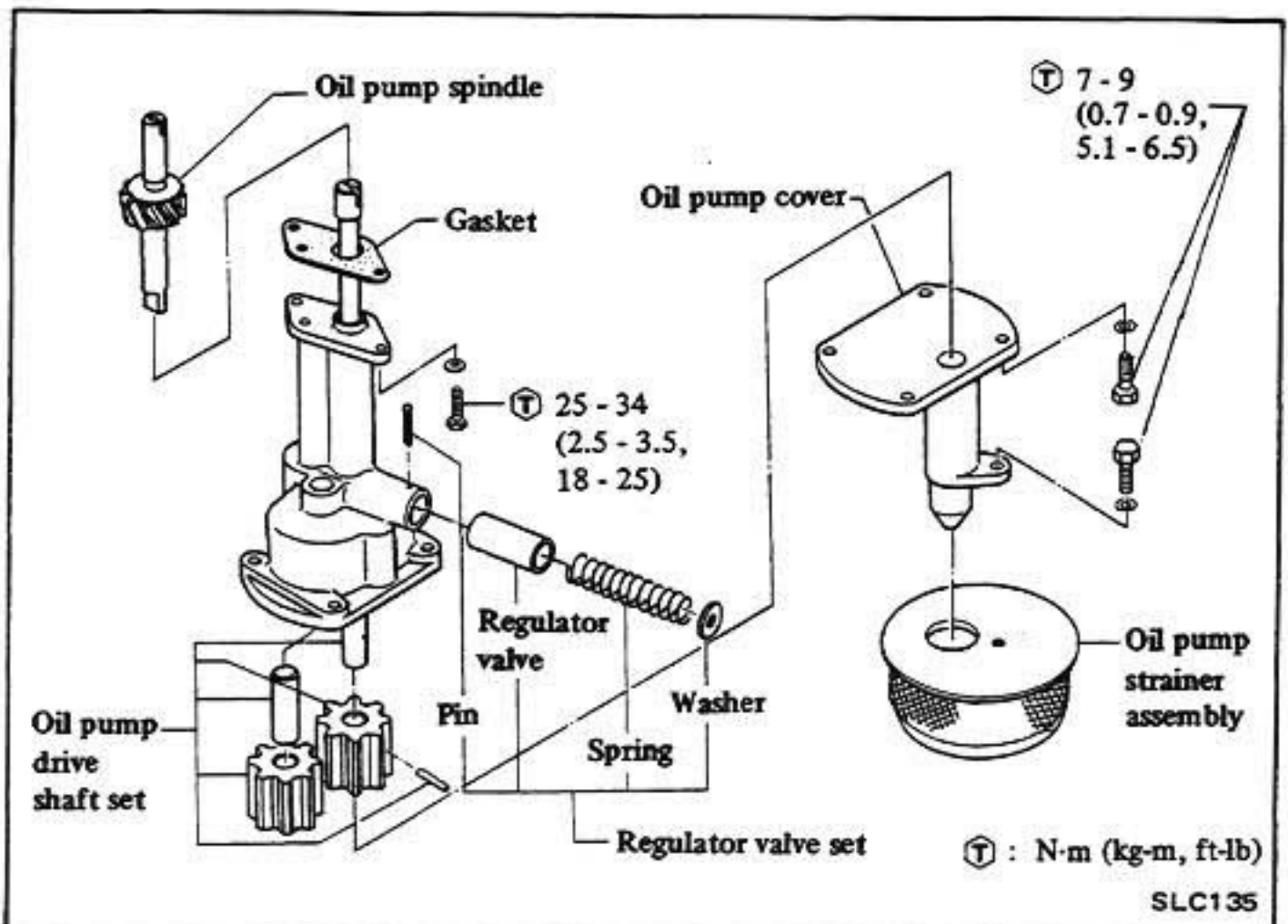
**L28 engine**



- a. The dot on outer and inner rotor should face toward oil pump body.
- b. Always replace with a new gasket.



**P40 engine**



**INSPECTION**

**L28 engine**

1. Inspect the following for wear or damage.

- Pump body and cover
- Pump rotors
- Drive spindle

Pump rotors and body are not serviced separately. If pump rotors or body are damaged or worn, replace pump rotor set or entire oil pump assembly.

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

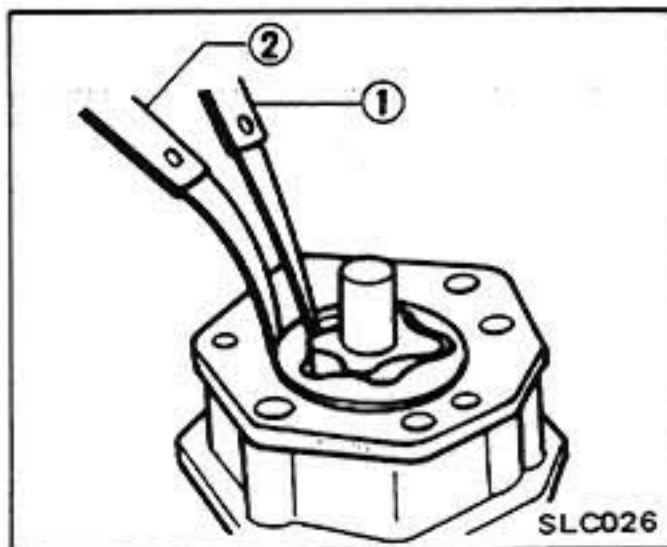
If it exceeds the limit, replace rotor set or entire oil pump assembly.

Rotor tip clearance ①:

Less than 0.20 mm (0.0079 in)

Outer rotor to body clearance ②:

Less than 0.50 mm (0.0197 in)

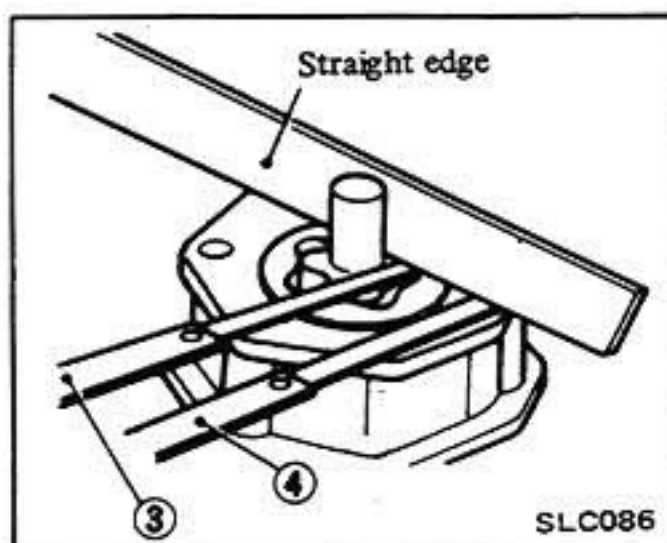


Rotor to straight edge ③:

Less than 0.06 mm (0.0024 in)

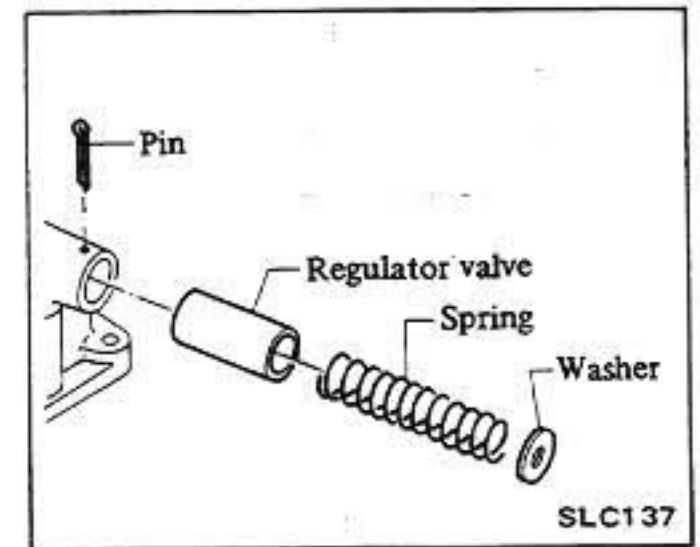
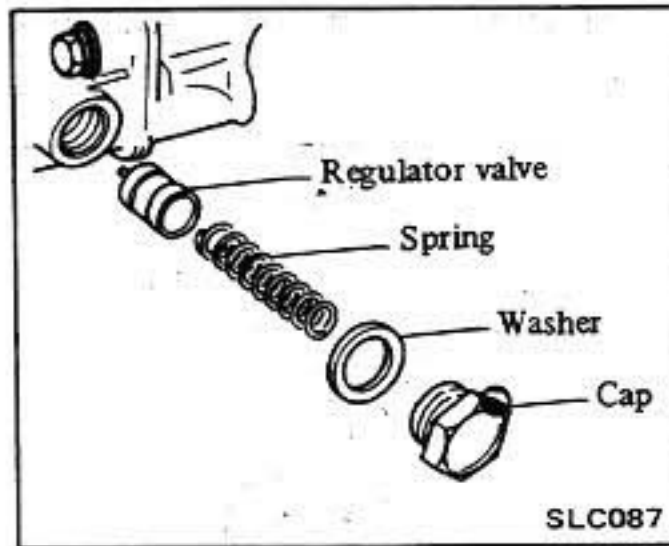
Oil pump body to straight edge ④:

Less than 0.03 mm (0.0012 in)



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

If damaged, replace valve set or pump assembly.



**P40 engine**

1. Inspect the following for wear or damage.

- Pump body and cover
- Pump gears
- Drive spindle

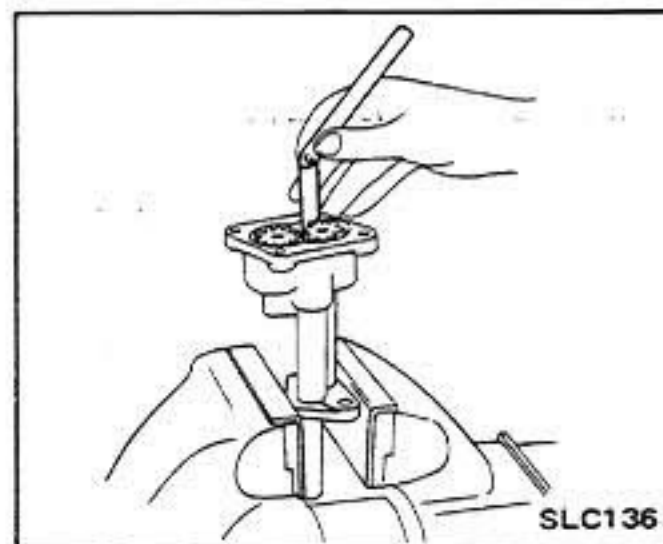
Pump gears and body are not serviced separately. If pump gears or body are damaged or worn, replace drive shaft set or entire oil pump assembly.

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

If it exceeds the limit, replace drive shaft set or entire oil pump assembly.

Pump gear to pump body:

Less than 0.26 mm (0.0102 in)



Pump gear backlash

Less than 0.51 mm (0.0201 in)

Pump gear vertical clearance

Less than 0.115 mm (0.0045 in)

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

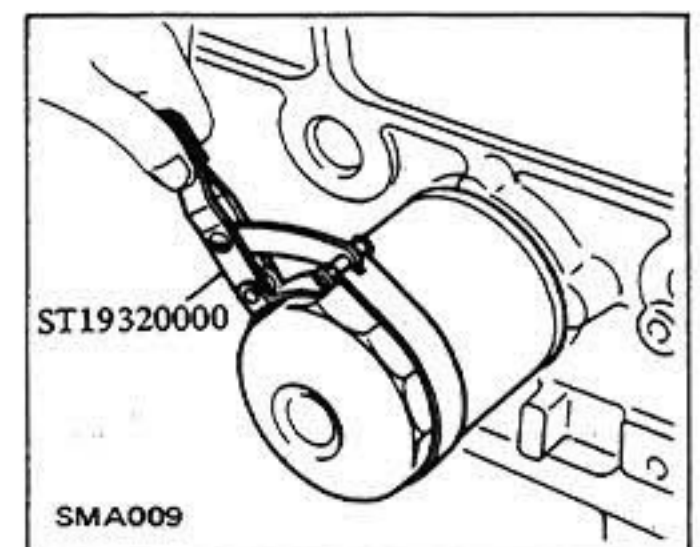
If damaged, replace valve set or pump assembly.

**OIL FILTER**

**REPLACEMENT**

1. Remove oil pan drain plug, and allow oil to drain.

2. Using Tool, remove oil filter.

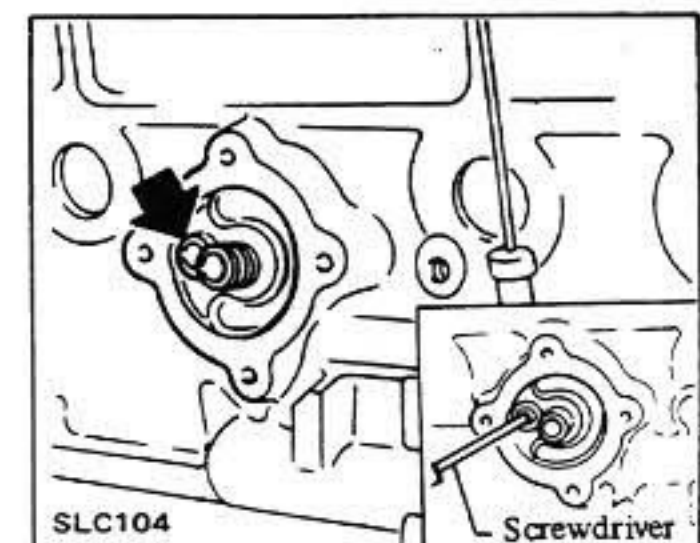


3. Wipe oil filter mounting surface with clean rag.

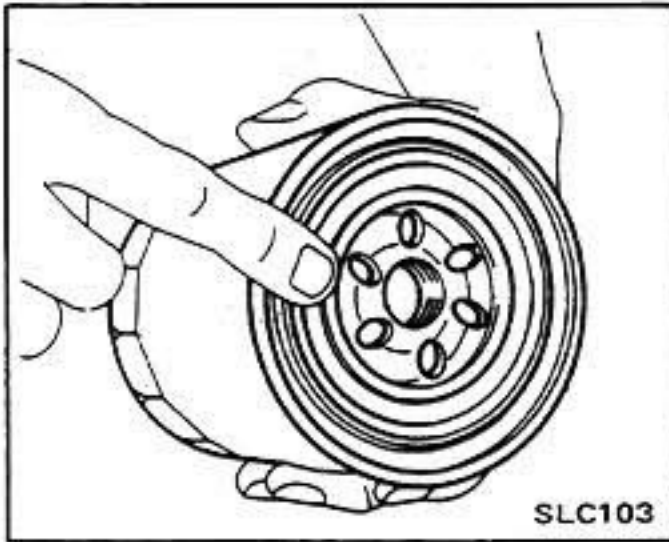
4. Check oil pressure relief valve for cracks or breaks.

If necessary, remove valve by prying it out with a screwdriver.

Install a new valve by tapping it in place.



- Smear a little engine oil on rubber gasket of oil filter.

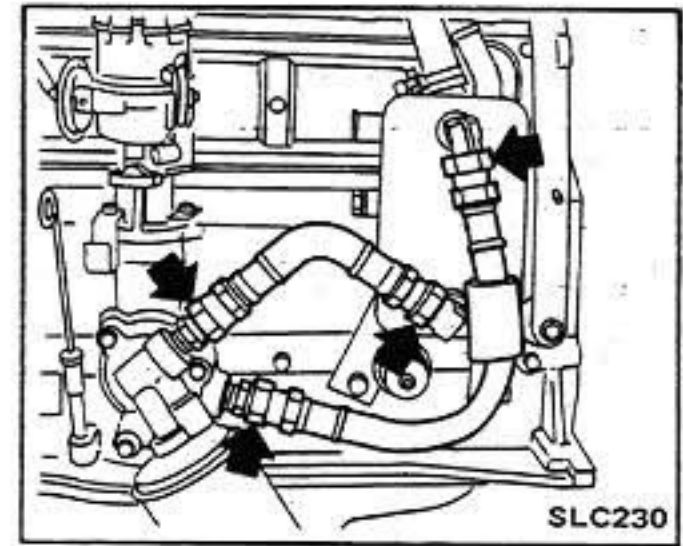


- Install oil filter.  
Hand-tighten **ONLY**.  
**DO NOT** use a wrench to tighten the filter.

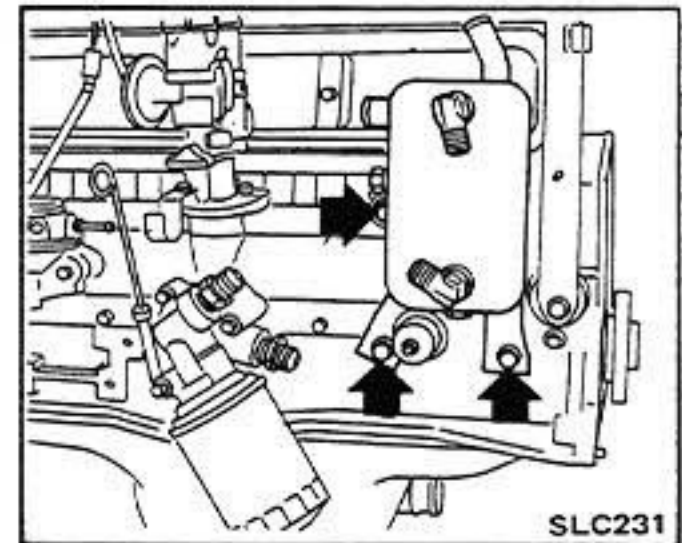
- Refill engine with oil.

Oil capacity:  
**L28 engine**  
 4.5 liters (4 Imp qt)  
**P40 engine**  
 5.7 liters (5 Imp qt)  
 6.5 liters (5-3/4 Imp qt)  
 for models with oil cooler

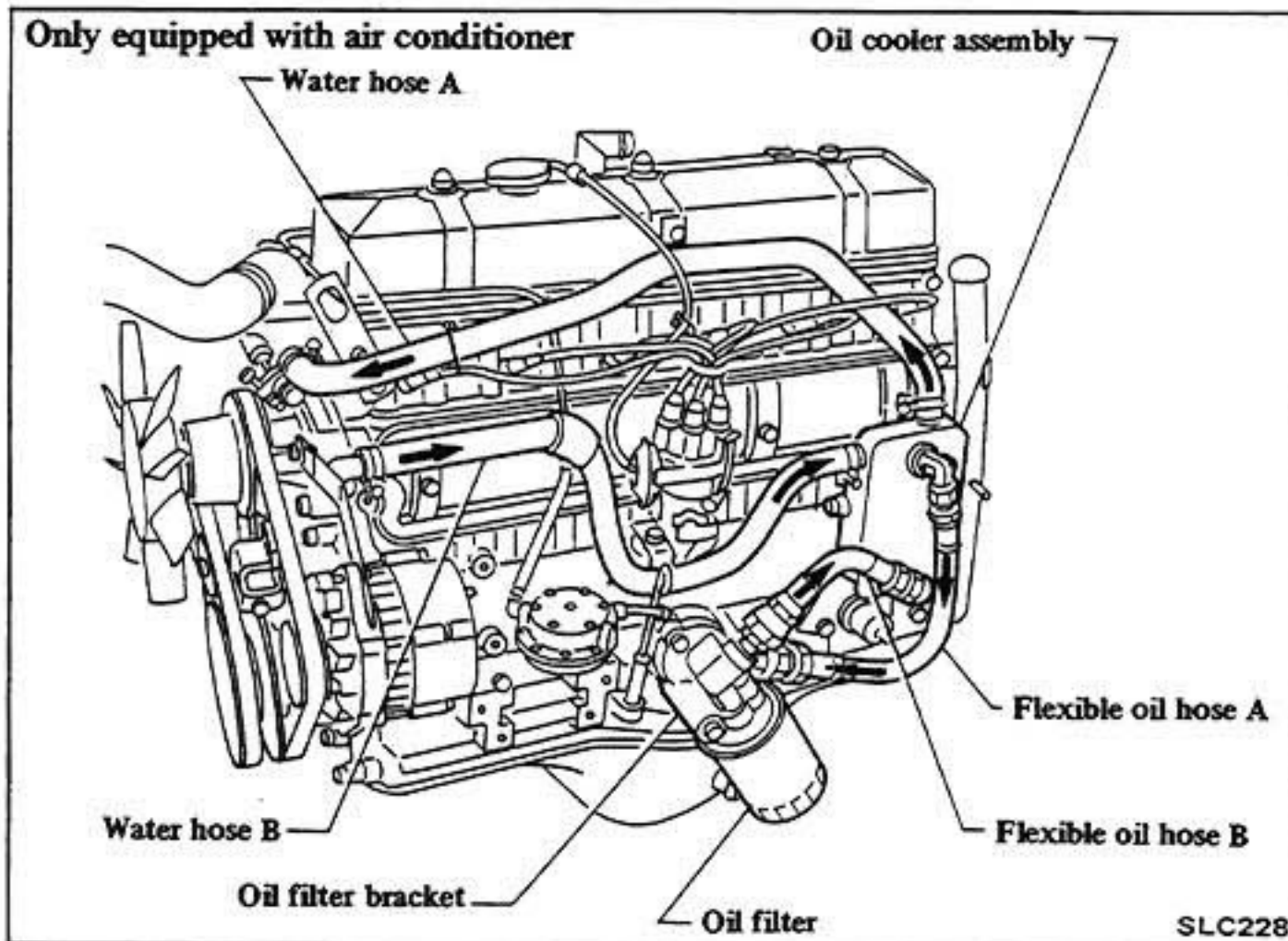
- Run engine for a few minutes, and check for leaks.



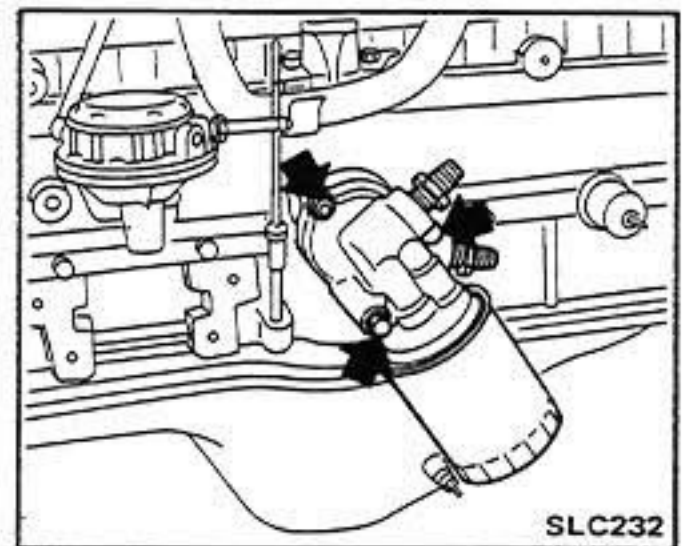
- Remove oil cooler assembly.



### OIL COOLER UNIT (Equipped on P40 engine for Middle East area)



- Remove oil filter bracket with oil filter.



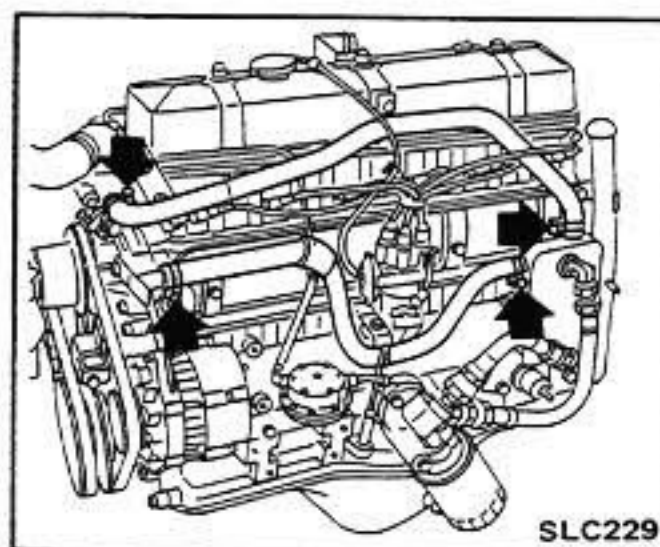
### REMOVAL

- Remove oil pan drain plug and allow oil to drain.
- Remove radiator cap.
- Open radiator drain cock and allow coolant to drain into a suitable container.

#### WARNING:

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

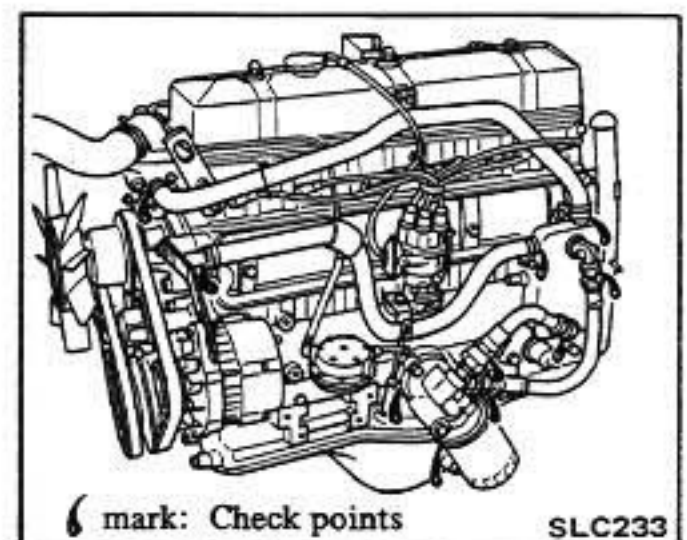
- Disconnect water hoses A and B.



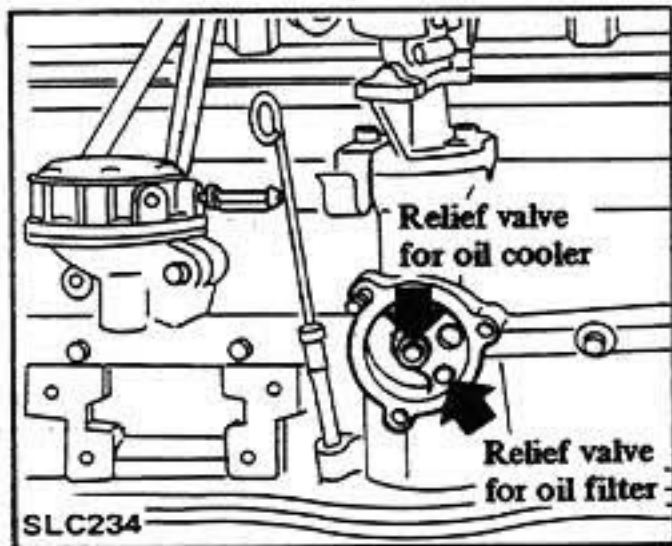
- Disconnect flexible oil hoses A and B.

### INSPECTION

- Check oil cooler system for leaks.



- Check oil pressure relief valves for cracks or breaks.



If necessary, remove valve by prying it out with a screwdriver. Install a new valve by tapping it in place.

### INSTALLATION

Install oil cooler unit in reverse order of removal.

Ⓣ: Flexible oil hose A and B  
59 - 78 N·m  
(6 - 8 kg-m,  
43 - 58 ft-lb)

Oil cooler assembly to cylinder body

29 - 39 N·m  
(3 - 4 kg-m,  
22 - 29 ft-lb)

Oil filter bracket to cylinder body

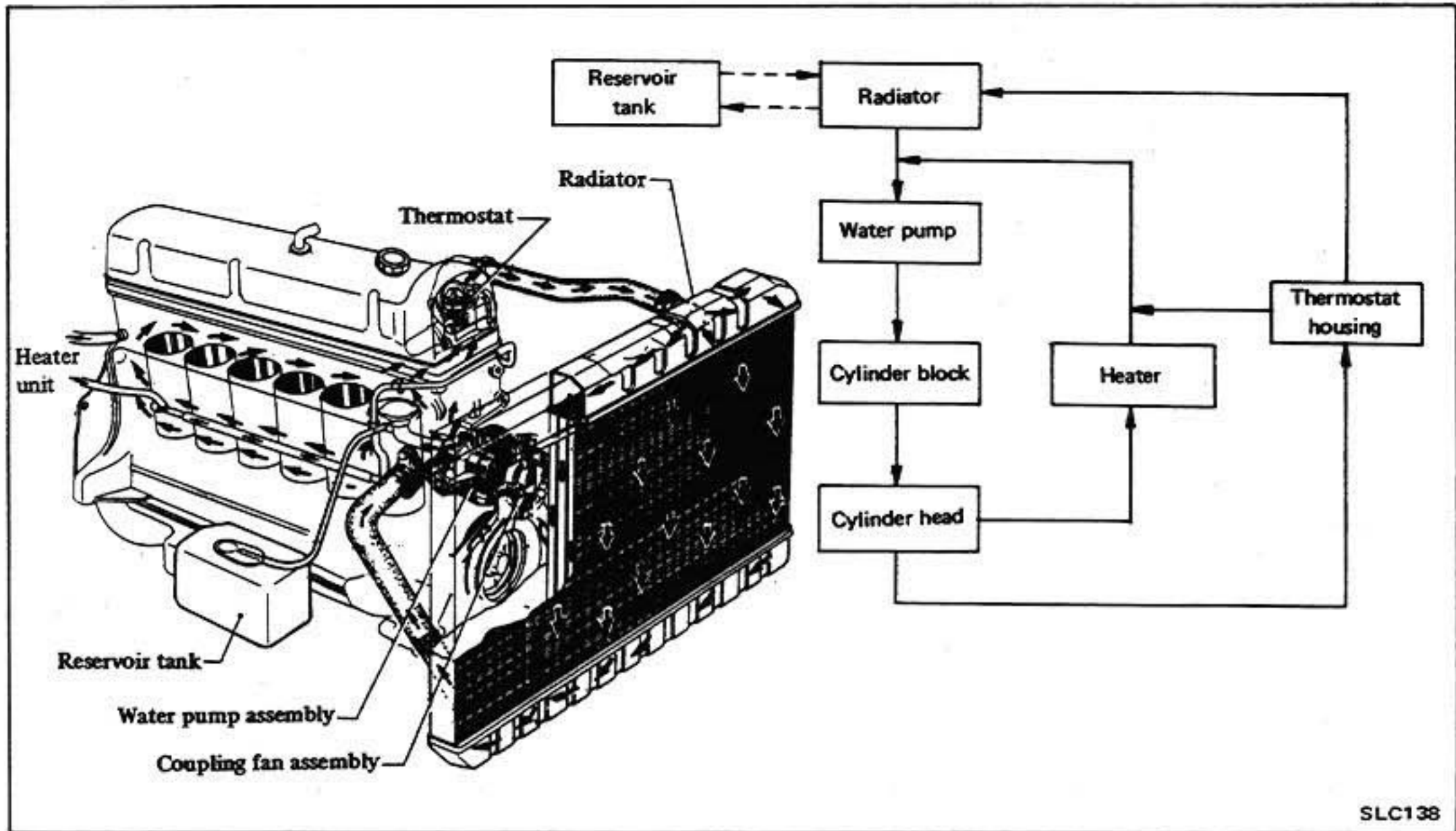
16 - 21 N·m  
(1.6 - 2.1 kg-m,  
12 - 15 ft-lb)



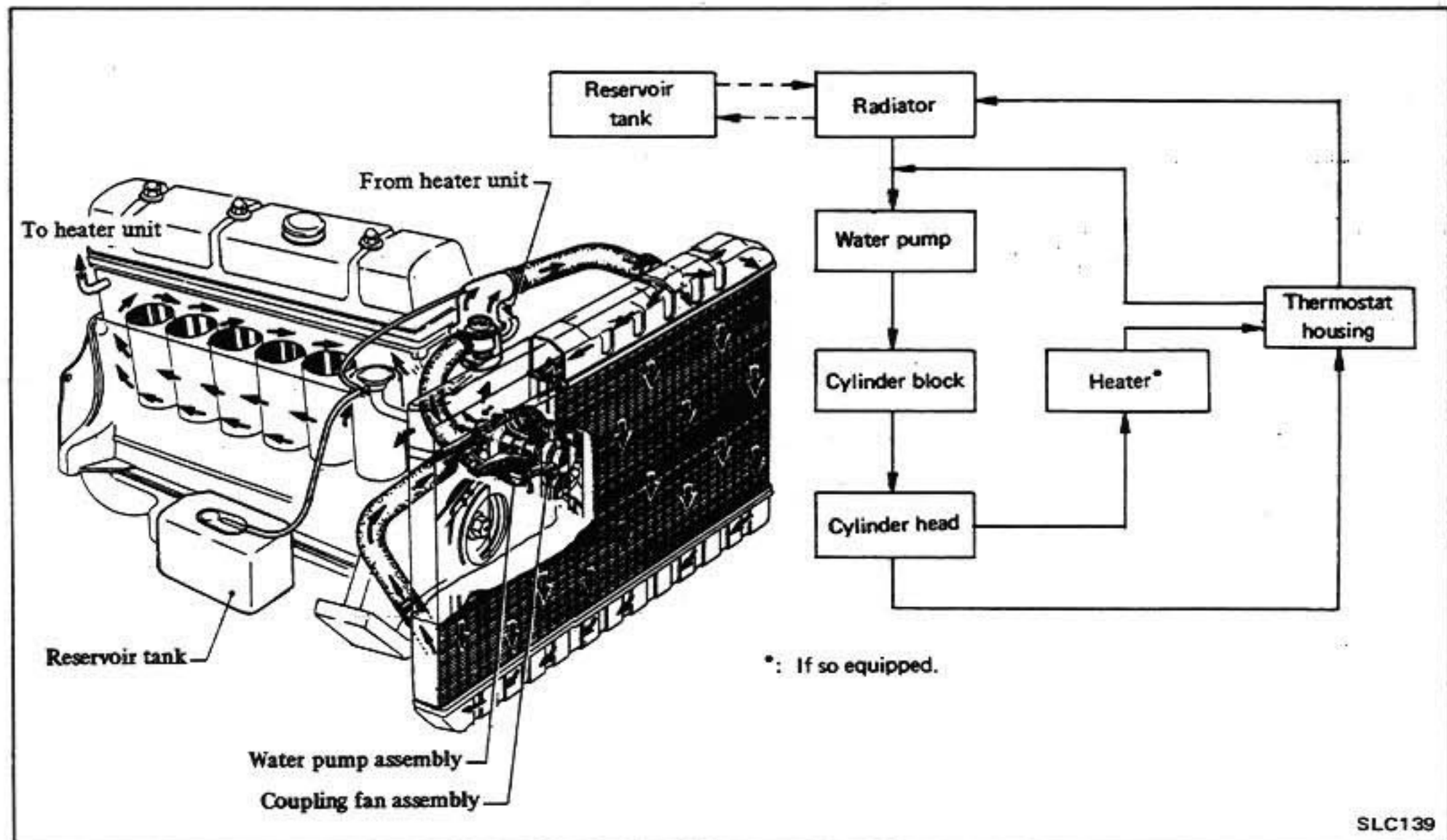
## ENGINE COOLING SYSTEM

### COOLING CIRCUIT

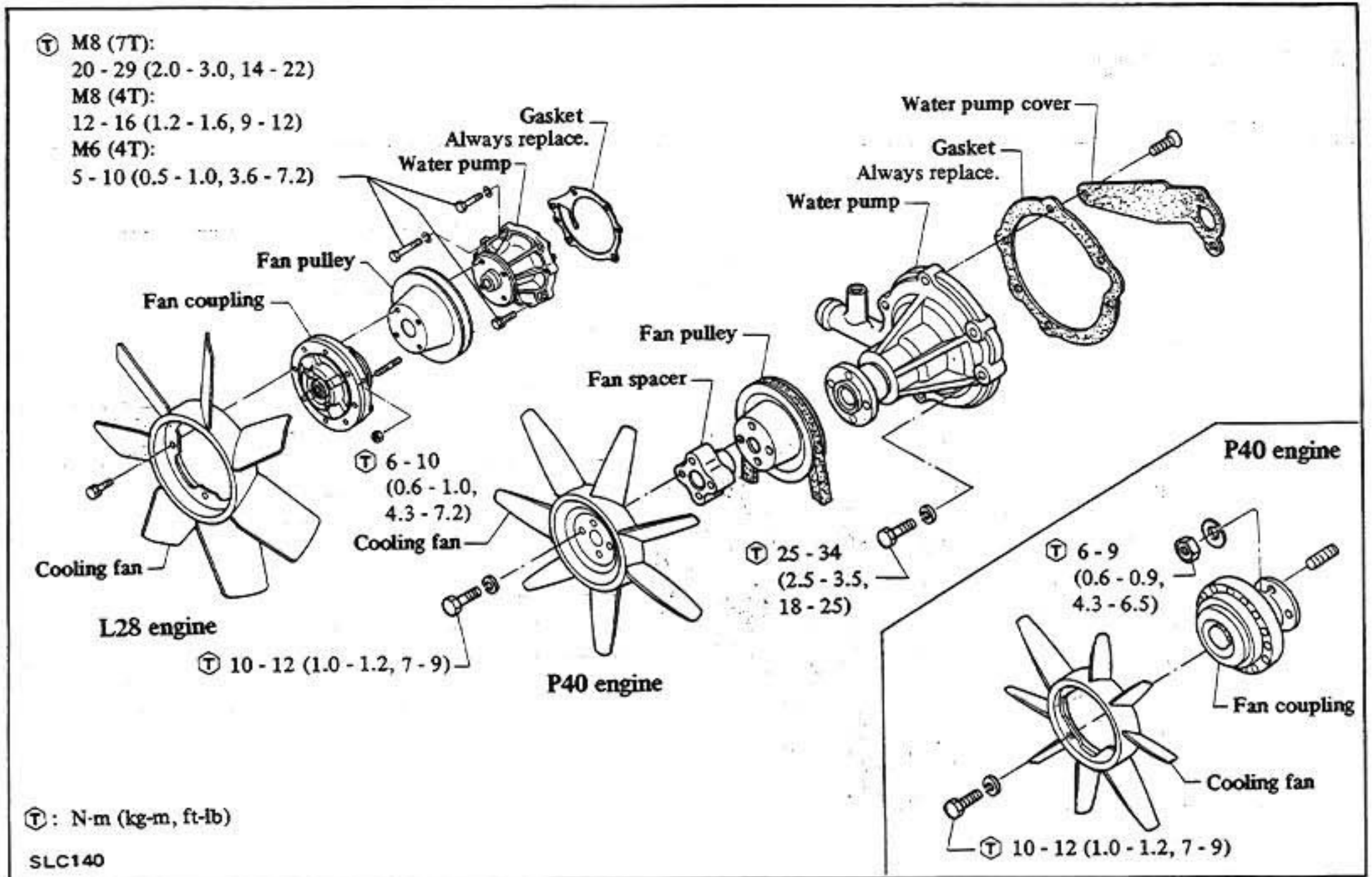
#### L28 engine



#### P40 engine



## WATER PUMP



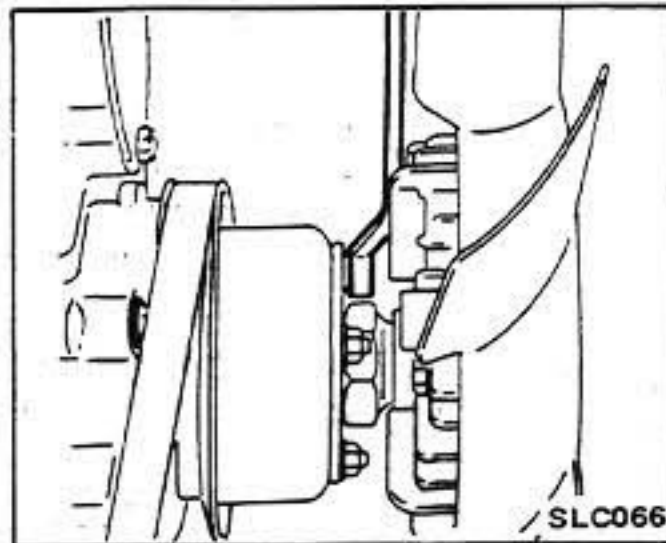
### REMOVAL

1. Open radiator drain cock and allow coolant to drain into a suitable container.

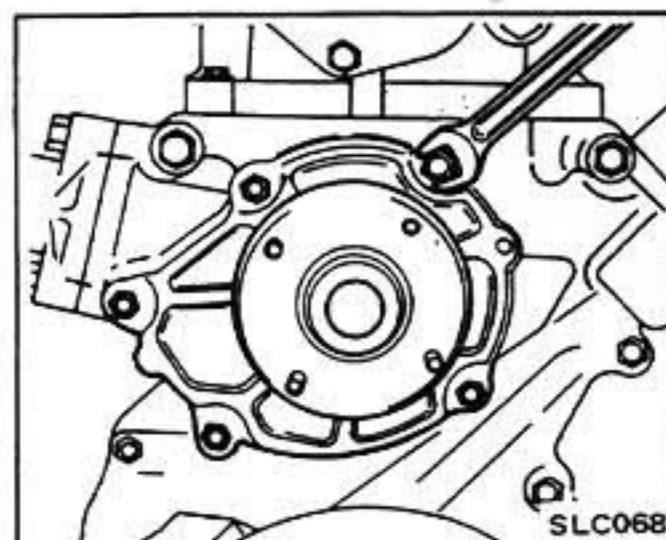
#### WARNING:

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

2. Remove radiator shroud.
3. Loosen fan belt.
  - (1) Loosen alternator securing bolts.
  - (2) Move the alternator toward the engine.
4. Remove fan, fan coupling and fan pulley.



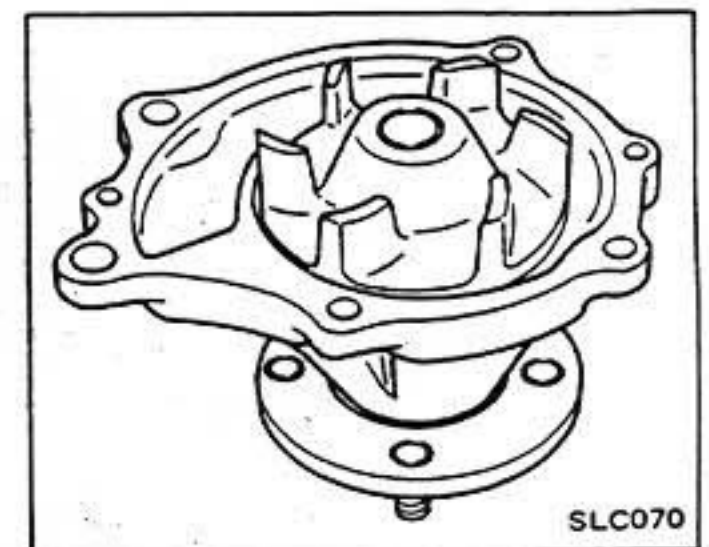
5. Remove water pump with gasket.



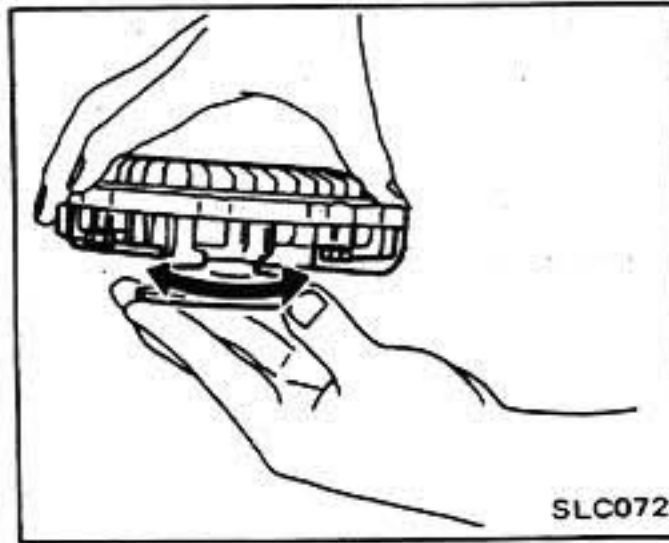
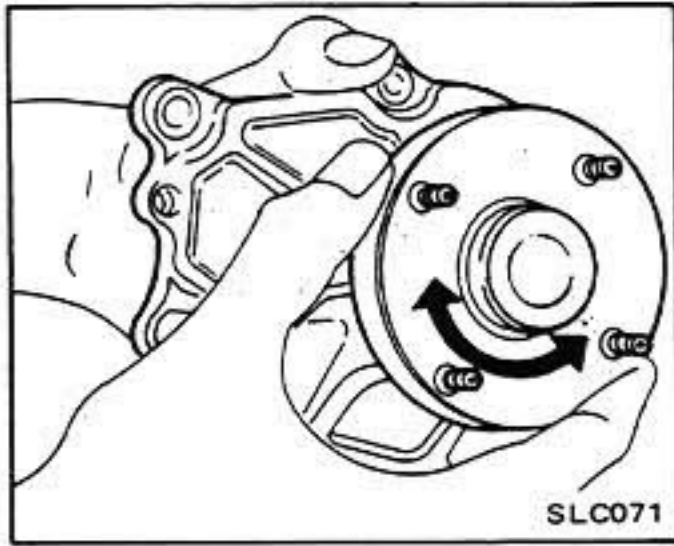
### INSPECTION

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.



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



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.  
For details, refer to Changing Engine Coolant in Section MA.

Coolant capacity with reservoir tank:

L28 engine

10.8 liters (9-1/2 Imp qt)

P40 engine (Except Canvas Top)

14.8 liters (13 Imp qt)

P40 engine (Canvas Top)

19.0 liters (16-3/4 Imp qt)

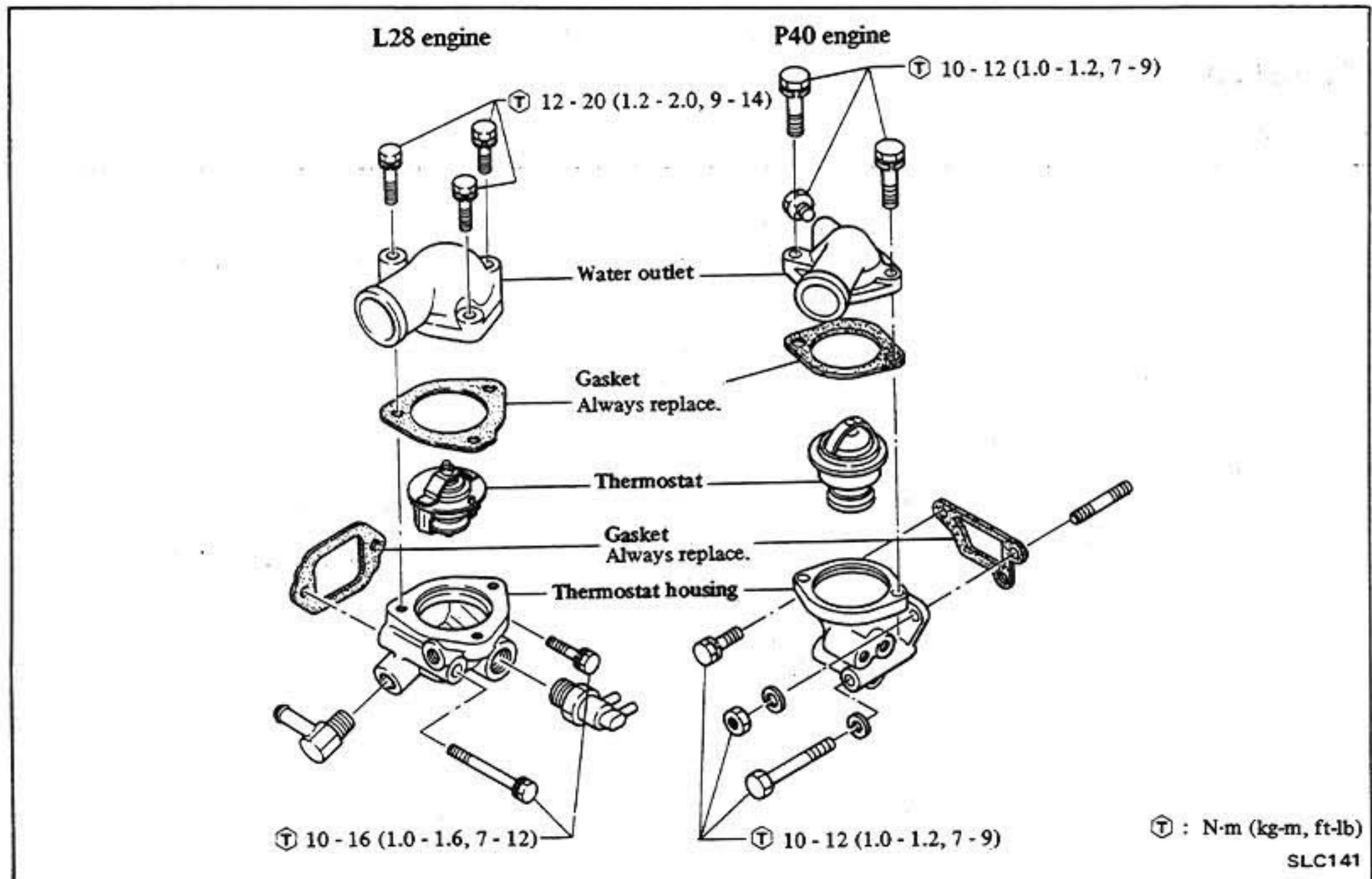
3. Check the fan coupling for oil leakage or bent bimetal.

### INSTALLATION

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

Always use new gasket.

## THERMOSTAT



### REMOVAL

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

### WARNING:

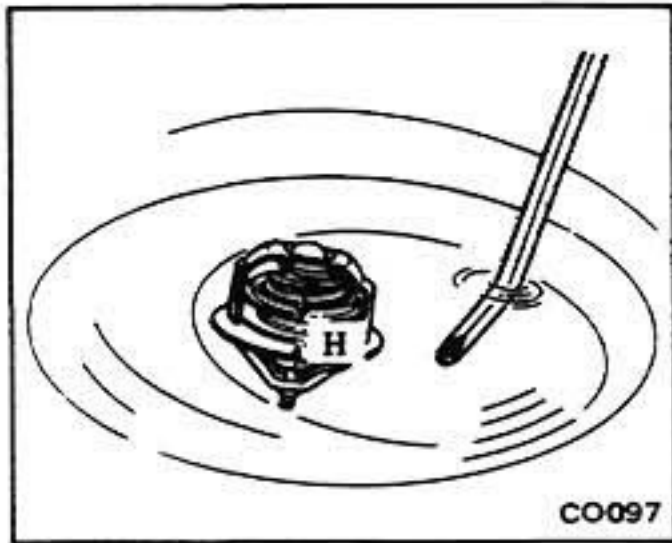
To avoid the danger of being scalded, never attempt to drain the coolant when the engine is hot.

2. Remove water outlet and then remove thermostat.

### INSPECTION

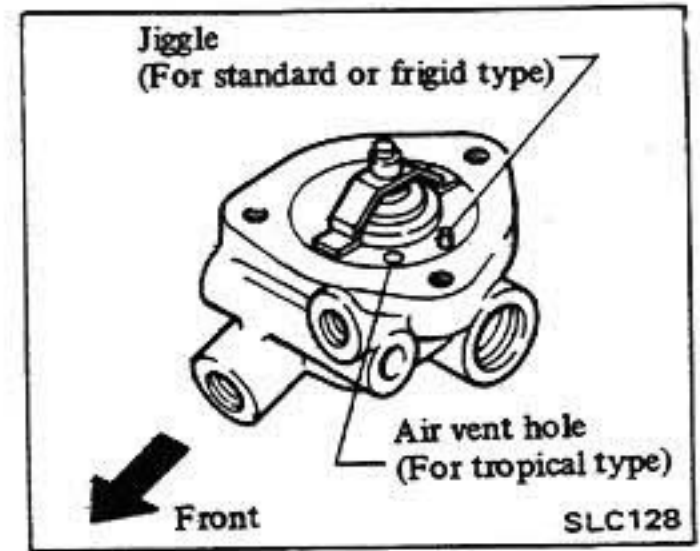
Inspect thermostat for the following and replace if necessary.

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 a new thermostat before installing it in engine.



### INSTALLATION

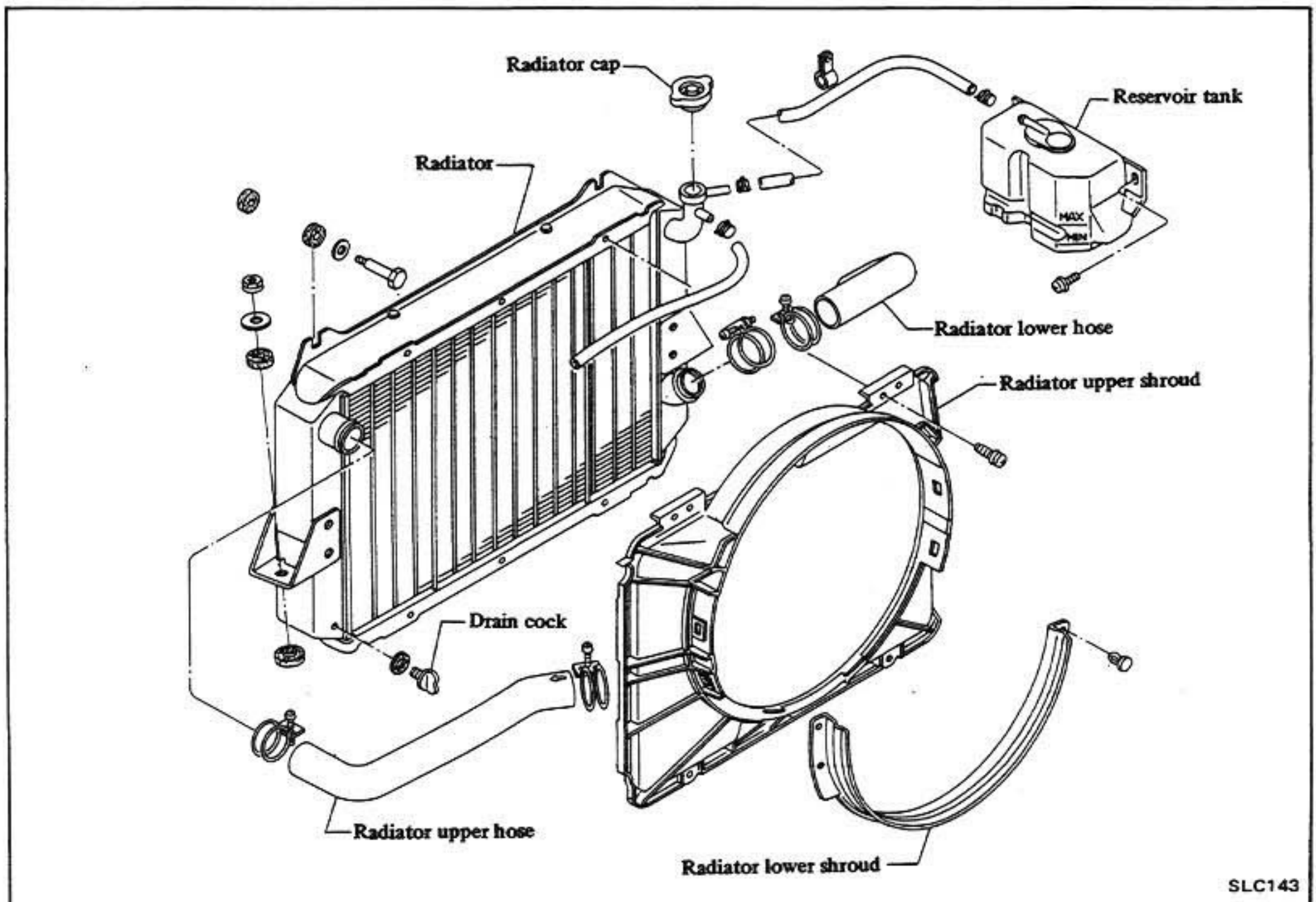
1. Position thermostat on thermostat housing.

When installing thermostat on models equipped with L28 engine, be sure it is positioned in the proper direction.

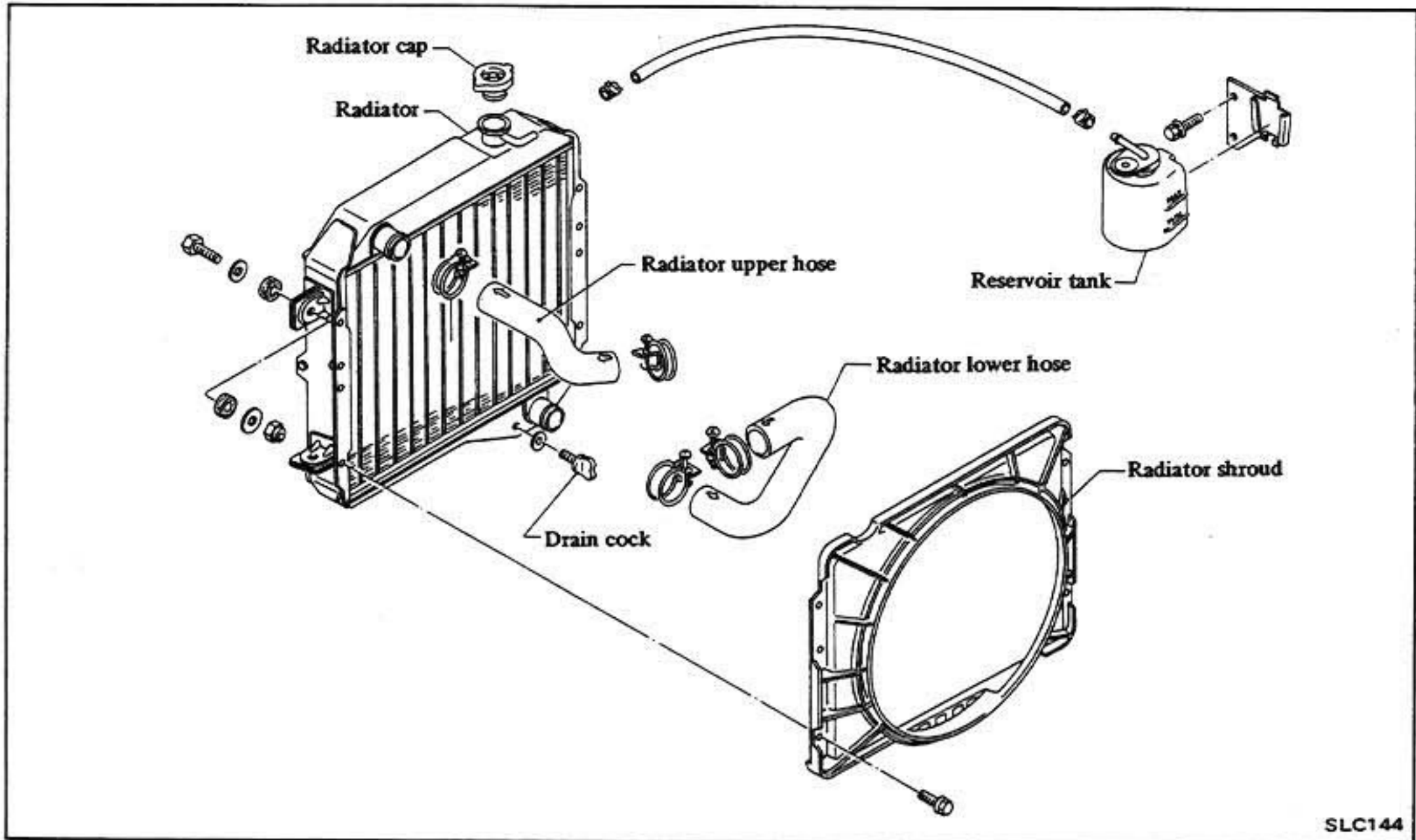
2. Install water outlet with new gasket.
3. Connect radiator upper hose and fill radiator with coolant.
4. Run engine for a few minutes, and check for leaks.

## RADIATOR

Except Canvas Top



**Canvas Top**



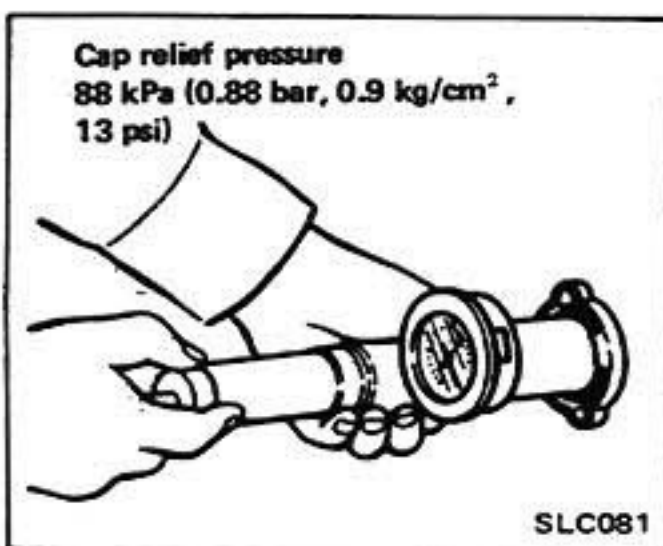
SLC144

**INSPECTION**

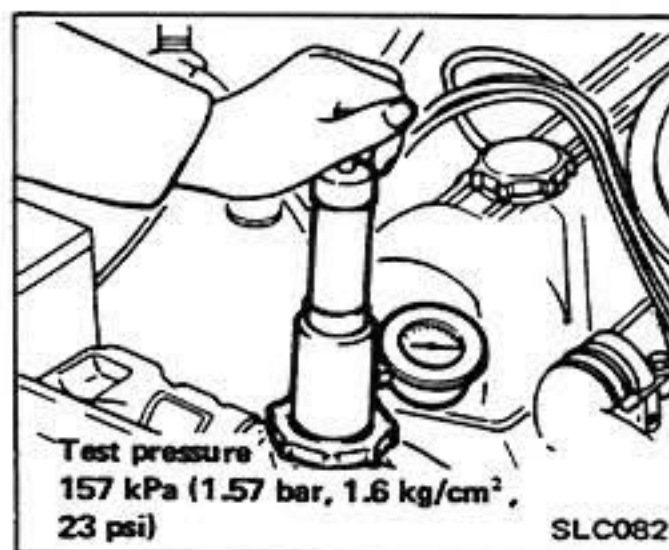
**Checking radiator cap**

Using cap tester, check the radiator cap relief pressure.

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



Cap relief pressure  
88 kPa (0.88 bar, 0.9 kg/cm<sup>2</sup>,  
13 psi)



Test pressure  
157 kPa (1.57 bar, 1.6 kg/cm<sup>2</sup>,  
23 psi)

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 allow to 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 vehicle with automatic transmission, disconnect cooler inlet and outlet lines from radiator.

5. Remove radiator.

6. Installation is in reverse order of removal.

7. Fill radiator with coolant.

**Coolant capacity with reservoir tank:**

L28 engine

10.8 liters (9-1/2 Imp qt)

P40 engine (Except Canvas Top)

14.8 liters (13 Imp qt)

P40 engine (Canvas Top)

19.0 liters (16-3/4 Imp qt)

8. Run engine for a few minutes, and check for leaks.

Refer to Changing Engine Coolant in Section MA.

**Checking cooling system for leaks**

Attach pressure tester, pump tester to the specified pressure.

Check for drop in pressure

## SERVICE DATA AND SPECIFICATIONS

### ENGINE LUBRICATION SYSTEM

#### GENERAL SPECIFICATIONS

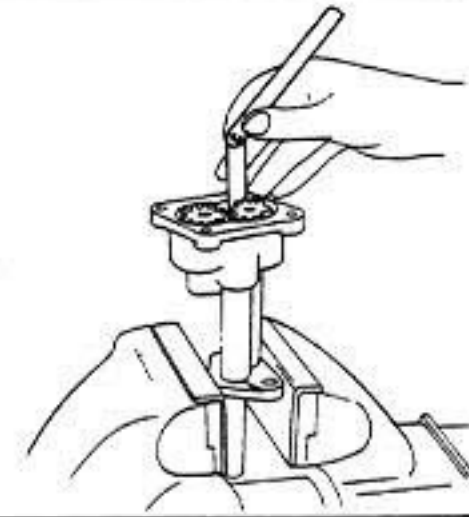
Engine model	L28	P40
Lubrication method	Pressed feed flow	
Oil pump type	Trochoid type	Spur gear type
Oil filter type	Full flow and cartridge type	
Oil capacity ℓ (Imp qt)		
With oil filter	4.5 (4)	5.7 (5) 6.5 (5-3/4)*
Without oil filter	4.0 (3-1/2)	5.1 (4-1/2) 5.9 (5-1/4)*

\* With oil cooler unit

#### P40 engine

Unit: mm (in)

Pump gear to pump body clearance	Less than 0.26 (0.0102)
Pump gear backlash	Less than 0.51 (0.0201)
Pump gear vertical clearance	Less than 0.115 (0.0045)



SLC136

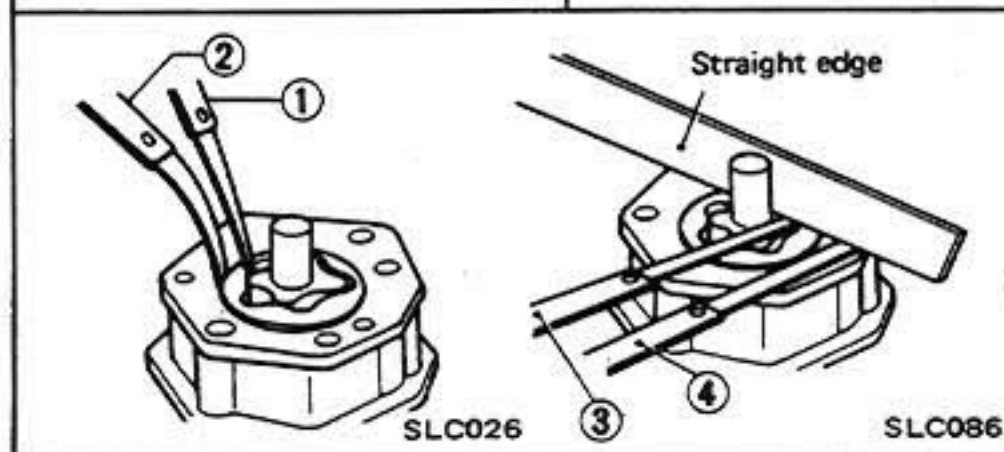
#### INSPECTION AND ADJUSTMENT

##### Oil pump

##### L28 engine

Unit: mm (in)

Rotor tip clearance ①	Less than 0.20 (0.0079)
Outer rotor to body clearance ②	Less than 0.50 (0.0197)
Rotor to straight edge ③	Less than 0.06 (0.0024)
Oil pump body to straight edge ④	Less than 0.03 (0.0012)



#### TIGHTENING TORQUE

Engine model	L28			P40		
	N-m	kg-m	ft-lb	N-m	kg-m	ft-lb
Oil pump mounting bolts	11 - 15	1.1 - 1.5	8 - 11	25 - 34	2.5 - 3.5	18 - 25
Oil pump cover bolt	7 - 10	0.7 - 1.0	5.1 - 7.2	7 - 9	0.7 - 0.9	5.1 - 6.5
Regulator valve cap	39 - 49	4.0 - 5.0	29 - 36	—	—	—
Oil pan drain plug	20 - 29	2.0 - 3.0	14 - 22	20 - 39	2.0 - 4.0	14 - 29
Oil pan bolt				15 - 20	1.5 - 2.0	11 - 14
Flexible oil hose				59 - 78	6 - 8	43 - 58
Oil cooler assembly to cylinder bracket				29 - 39	3 - 4	22 - 29
Oil filter bracket to cylinder bracket				16 - 21	1.6 - 2.1	12 - 15

## ENGINE COOLING SYSTEM

### GENERAL SPECIFICATIONS

Engine model	L28	P40
Cooling method	Water cooling, forced circulation	
Water pump type	Centrifugal	
Thermostat type	Wax-pellet	
Radiator type	Corrugated fin and tube	
Cooling fan Fan dia. x No. of blades mm (in)	430 (16.93) x 8 450 (17.72) x 8 *1	430 (16.93) x 7 450 (17.72) x 8 *1
Fan coupling method	Temperature coupling	
Coolant capacity with reservoir tank	10.8 ℓ (9-1/2 Imp qt)	14.8 ℓ (13 Imp qt) 19.0 ℓ (16-3/4 Imp qt) *2

\*1: Optional  
\*2: Canvas Top

### INSPECTION AND ADJUSTMENT

#### Water pump

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

	Standard type	Frigid type	Tropical type
Valve opening temperature °C (°F)	82 (180)	88 (190)	76.5 (170)
Max. valve lift			
mm/°C (in/°F)			
L28 engine	8/95 (0.31/203)	8/100 (0.31/212)	8/90 (0.31/194)
P40 engine	10/95 (0.39/203)	10/100 (0.39/212)	10/90 (0.39/194)

### Radiator

Unit: kPa (bar, kg/cm<sup>2</sup>, psi)

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

### TIGHTENING TORQUE

#### L28 engine

Unit	N-m	kg-m	ft-lb	
Water pump bolt	M8 (7T)	20 - 29	2.0 - 3.0	14 - 22
	M8 (4T)	12 - 16	1.2 - 1.6	9 - 12
	M6 (4T)	5 - 10	0.5 - 1.0	3.6 - 7.2
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	

#### P40 engine

Unit	N-m	kg-m	ft-lb
Water pump bolt and nut	25 - 34	2.5 - 3.5	18 - 25
Water pump pulley stud	6 - 9	0.6 - 0.9	4.3 - 6.5
Fan pulley bolt	10 - 12	1.0 - 1.2	7 - 9
Thermostat housing	10 - 12	1.0 - 1.2	7 - 9
Water outlet bolt	10 - 12	1.0 - 1.2	7 - 9

## TROUBLE DIAGNOSES AND CORRECTIONS

### ENGINE LUBRICATION SYSTEM

Condition	Probable cause	Corrective action
Oil leakage	Damaged or cracked pump body cover. Oil leakage from gasket and oil seal. Oil leakage from regulator valve. Oil leakage from blind plug.	Replace. Replace. Tighten or replace. Replace.
Decreased oil pressure	Lack of oil in engine oil pan. Dirty oil strainer. Damaged or worn pump rotors/gears. Malfunctioning regulator. Use of poor quality engine oil.	Correct. Clean or replace. Replace. Replace. Replace.
Warning light remains "on" – engine running	Decreased oil pressure. Oil pressure switch unserviceable. Electrical fault.	Previously mentioned. Replace. Check circuit.
Noise	Excessive backlash in pump rotors.	Replace.

### ENGINE COOLING SYSTEM


Condition	Probable cause	Corrective action
Water leakage	Damaged radiator seams. Leaks from heater connections or plugs. Leak from water pump shaft seal. Leak from water temperature gauge. Leaks from gaskets or small cracks.  Loose joints. Damaged cylinder head gasket.  Cracked cylinder block.  Cracked cylinder head. Loose cylinder head bolts.	Repair. Repair. Replace as pump assembly. Tighten. Tighten or use Nissan Cooling System Sealer or equivalent. Tighten. Replace. Check engine oil for contamination and refill as necessary. Replace. Check engine oil in crankcase for mixing with water by pulling oil level gauge. Replace. Replace cylinder head gasket.



## ENGINE LUBRICATION & COOLING SYSTEMS— *Special Service Tool*

Condition	Probable cause	Corrective action
Poor circulation	Restriction in system. Insufficient coolant. Inoperative water pump. Loose fan belt. Inoperative thermostat.	Check hoses for crimps, and clear the system of rust and sludge by flushing radiator. Replenish. Replace. Adjust. Replace.
Corrosion	Excessive impurity in water. Infrequent flushing and draining of system.	Use soft, clean water. (rain water is satisfactory). Cooling system should be drained and flushed thoroughly at least twice a year. Permanent antifreeze (Ethylene glycol base) can be used throughout the seasons of a year.
Overheating	Malfunctioning thermostat, radiator cap and fan coupling. Radiator fin choked with mud, chaff, etc. Incorrect ignition and valve timing. Dirty oil and sludge in engine. Inoperative water pump. Loose fan belt. Restricted radiator. Inaccurate temperature gauge. Impurity in water.	Replace. Clean out air passage thoroughly by using air pressure from engine side of radiator. Adjust. Refill. Replace. Adjust. Flush radiator. Replace. Use soft, clean water.
Overcooling	Malfunctioning thermostat. Inaccurate temperature gauge.	Replace. Replace.
Noise	Squeak at water pump mechanical seal. Damaged or worn water pump bearing.	Replace pump assembly. Replace pump assembly.

## SPECIAL SERVICE TOOL

Tool number	Tool name
ST19320000	Oil filter wrench <div style="text-align: center;">   <small>SLC036</small> </div>