

## GROUP 25 INTAKE AND EXHAUST SYSTEM

### Description

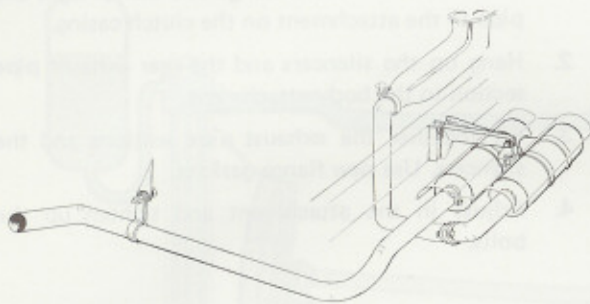


Fig. 25-1. Exhaust system

The intake and exhaust manifolds are made of nodular iron and are cast onto a branch pipe.

Each intake port houses a spring-loaded throttle (secondary throttle). The function of the secondary throttle is described on page 23:3.

Otherwise the system consists of a front exhaust pipe section, two silencers and a rear exhaust pipe section.

### Service Procedures

#### MANIFOLD

##### Removing

1. Remove the inspection cover from the front engine casing and the floor cover in the platform.
2. Release the clasps and remove the upper part of the air cleaner housing.
3. Remove the choke wire from the rear carburettor.
4. Remove the lock clips and disconnect the carburettor link rods from the throttle control spindle. Remove the throttle control spindle lock clip and disconnect the spindle from the manifold bracket. Hang up the spindle.
5. Remove the fuel hose from the branch pipe on the carburettors and the vacuum hose from the front carburettor.
6. Remove the vacuum hoses from the manifold and the hoses for the crankcase ventilation from the manifold and air cleaner.
7. Remove the front exhaust pipe section from the manifold and from the attachment to the clutch casing.
8. Remove the manifold retaining nuts.
9. Lift forward the manifold.
10. Remove the manifold gasket.

##### Installing

1. Clean the contact surfaces on the manifold and cylinder head.
2. Place the manifold gasket on the guide sleeves on the cylinder head.
3. Position the manifold and install the washers and retaining nuts.
4. Install the front exhaust pipe section and clamp the pipe securely to the attachment on the clutch casing.
5. Fit and connect the vacuum hoses to the manifold and the hoses for the crankcase ventilation to the manifold and air cleaner.
6. Install and fit the vacuum hose to the front carburettor and the fuel hose to the branch pipe on the carburettors.
7. Press firmly the throttle control spindle on to the branch bracket and fit the lock clip. Press the link rods firmly on to the throttle spindle for the carburettors and fit the lock clips.
8. Install the choke wire onto the rear carburettor.
9. Install the upper part of the air cleaner housing.
10. Install the floor cover in the platform and the inspection cover on the front engine casing.

## EXHAUST SYSTEM

### Removing

1. Remove the nuts on the manifold flange. Remove the front exhaust pipe section from the gearbox attachment.
2. Remove the silencers from the body attachment. Take down the exhaust system.

### Installing

1. Install a new flange gasket and lift the front exhaust pipe section up into position. Fit the nuts on the manifold flange and clamp tight the pipe to the attachment on the clutch casing.
2. Hang up the silencers and the rear exhaust pipe section to the body attachment.
3. Fit together the exhaust pipe sections and the silencers. Use new flange gaskets.
4. Adjust in the attachment and tighten up the bolts.

## GROUP 26 COOLING SYSTEM

### Description

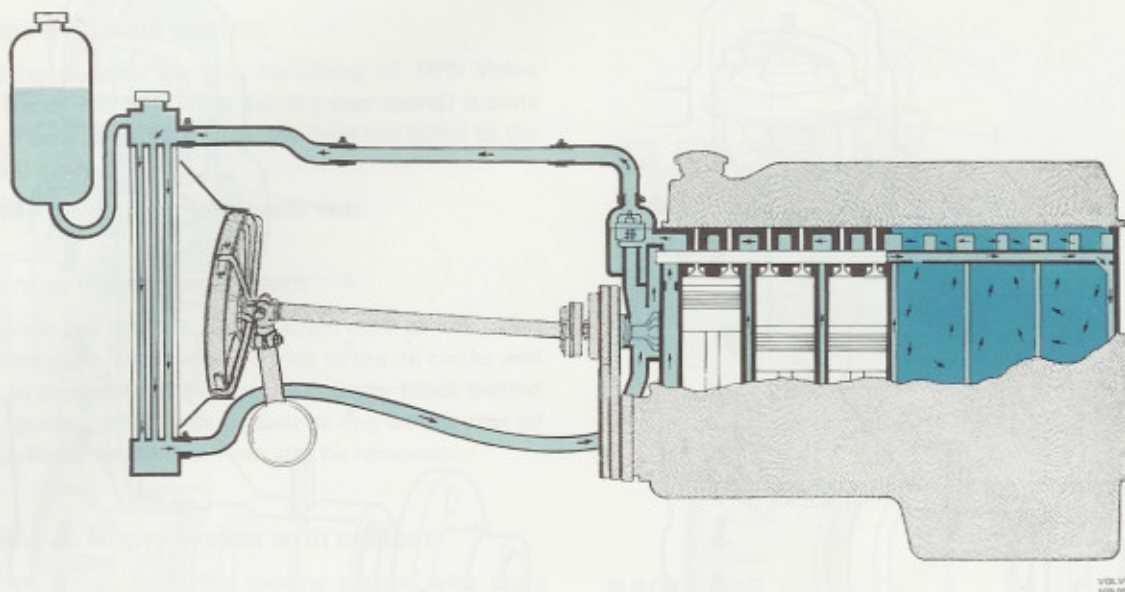


Fig. 26-1. Sealed cooling system

The engine is fluid-cooled and the cooling system is of the sealed type, see Fig. 26-1. Coolant circulation is provided by a centrifugal pump, Fig. 26-2, and a double-operating thermostat ensures rapid heating of the engine and contributes to the maintenance of the most suitable temperature for the engine under all operating conditions.

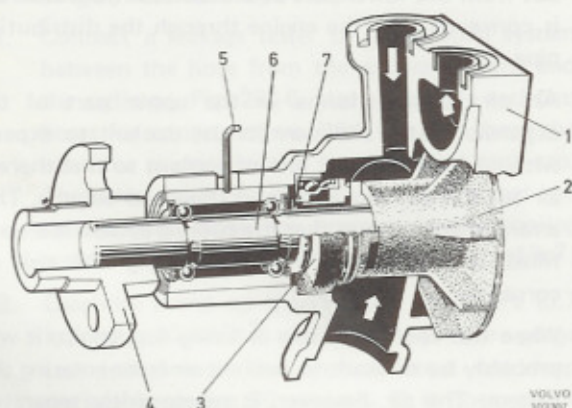


Fig. 26-2. Coolant pump

1. Housing
2. Impeller
3. Seal ring
4. Flange
5. Lock spring
6. Shaft with ball bearings (integral unit)
7. Wear ring

To achieve the desired effect with the sealed cooling system, it must be well-filled and it must not leak. As coolant, a mixture of 50% Volvo anti-freeze\* and 50% water should be used all the year round. This mixture provides protection against frost down to  $-35^{\circ}\text{C}$  ( $-32^{\circ}\text{F}$ ). The coolant should be changed every other year. On this occasion the engine, radiator and expansion tank should be flushed clean with water at the same time.

\*Volvo anti-freeze (red-coloured) should not be mixed with other types of anti-freeze.

The cooling fan drive mechanism can be seen from Fig. 26-3.

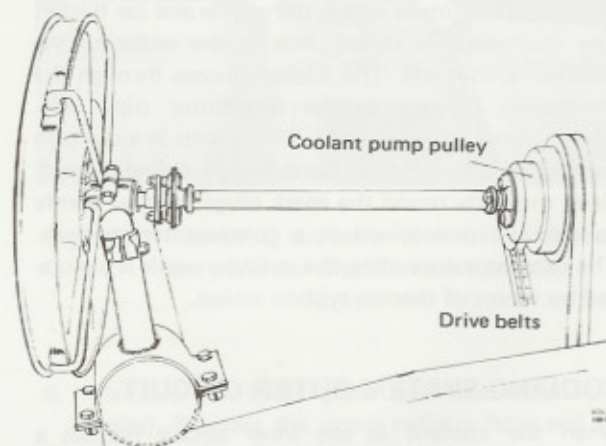


Fig. 26-3. Fan coupling

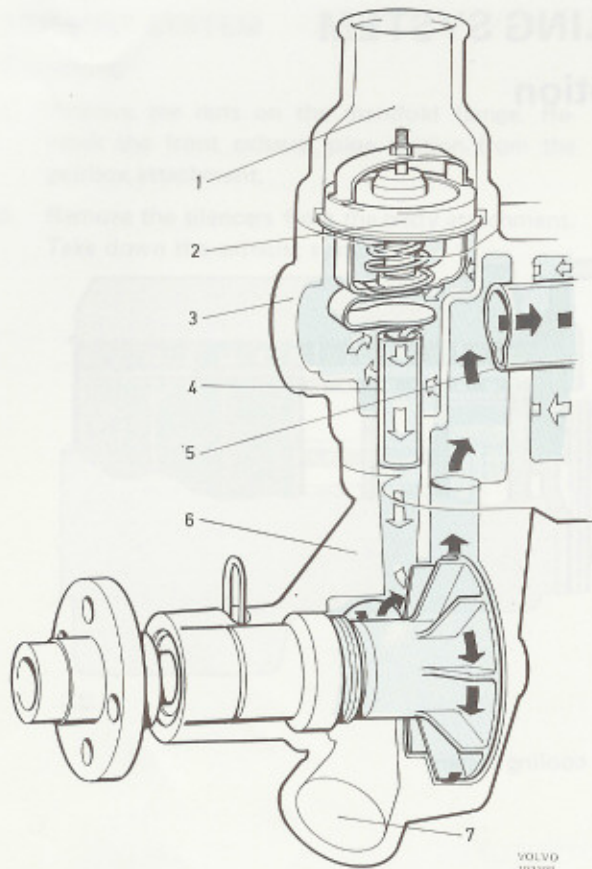


Fig. 26-4. Coolant flow, thermostat closed

- |                  |                      |
|------------------|----------------------|
| 1. To radiator   | 5. Distributing pipe |
| 2. Thermostat    | 5. Water pump        |
| 3. Cylinder head | 7. From radiator     |
| 4. By-pass pipe  |                      |

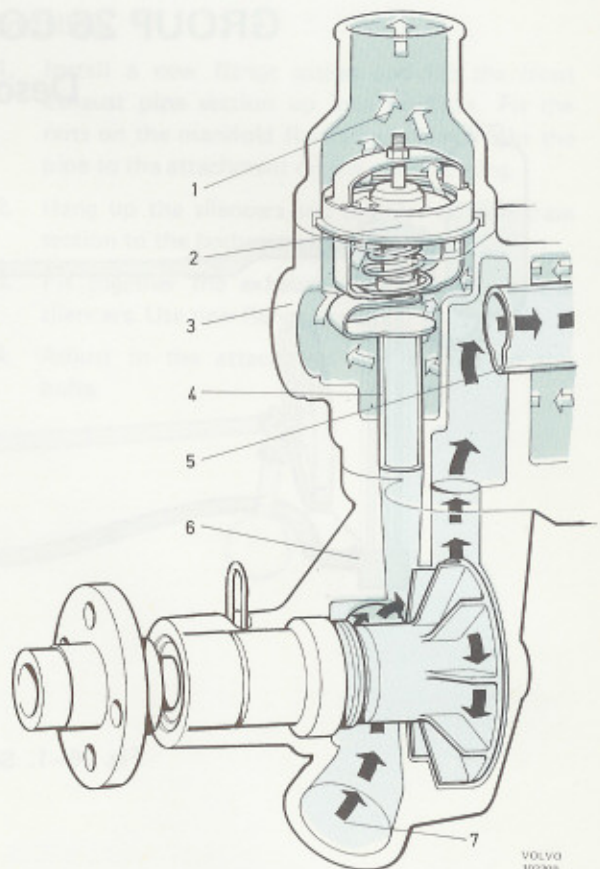
### COOLING SYSTEM INNER CIRCUIT (BY-PASS)

The cooling system consists of two circuits, an inner and an outer one.

When the engine is warming up and in very cold weather when large quantities of heat are required for heating up the inside of the car, the coolant circulates almost exclusively through the inner circuit (the by-pass). This circuit covers the engine and car heater. The thermostat is closed, that is, the outlet to the radiator is shut off. The coolant passes through the thermostat by-pass to the distributor pipe (Fig. 26-4) in the cylinder head. This results in a uniform cooling of the warmest parts in the cylinder head. Even the parts round the spark plugs are also evenly cooled and maintained at a constant temperature. The coolant surrounding the cylinder walls is circulated by means of thermo-syphon action.

### COOLING SYSTEM OUTER CIRCUIT

When the coolant in the inner circuit reaches a suitable temperature for the engine, the thermostat begins to open during which time the by-pass

Fig. 26-5. Coolant flow, thermostat open  
Concerning numbers above, see previous figure

between the thermostat housing and the pump gradually closes, see Fig. 26-5.

Coolant flows from the engine into the upper part of the radiator, is cooled and then sucked by the pump out from the lower part of the radiator from where it is conveyed into the engine through the distributing pipe.

An air cushion forms in the upper part of the expansion tank and permits the coolant to expand without involving any loss of coolant so that there is air suction at reduced temperature and volume. This arrangement ensures that the cooling system is always filled with coolant, thus minimizing the risk of corrosion.

When the cooling system is being topped-up, it will probably be difficult to prevent air from entering the system. The air, however, is subsequently separated and forced out into the expansion tank where it is replaced by coolant from this tank. It is, therefore, important to check the coolant level after the system has been emptied and filled with new coolant.

The expansion tank cap is provided with a valve, which opens when the pressure in the system goes up to 0.7 atmospheric gauge. There is also a valve which opens when there is vacuum in the system and admits air into the expansion tank.

## Service Procedures

### Topping-up with coolant

Topping-up with coolant, consisting of 50% Volvo anti-freeze and 50% water (all the year round) is done in the expansion tank when the level has fallen to the MIN mark.

**NOTE!** Never top up with water only.

### Draining the cooling system

To drain the coolant, open a drain cock on the lower radiator pipe. There is also a plug in the oil cooler and one in the left-hand side of the cylinder block behind the ignition distributor as well as one on the rear of the cylinder head. These can also be removed.

### Filling an empty system with coolant

Before filling, flush the cooling system with clean water. When filling with coolant, through the filler opening on top of the radiator, the heater control should be set to MAX. Fill the radiator to the top and fit the cap. Also fill the expansion tank to MAX or to max. 30 mm (1/8") above this mark. Run the engine for several minutes at different speeds. If necessary, top up with more coolant and then fit the expansion tank cap. After driving for a short time, check the coolant level and top up with more coolant since it takes some time before the system is completely devoid of air.

### Cooling system leakage check

1. Connect a leakage tester to the cooling system between the hose from the expansion tank and the radiator, Fig. 26-6. Use a T-nipple and two hoses for connecting up. With this also check the valve for overpressure in the expansion tank cap. The valve should be pressed up from its seat and should open when the pressure in the cooling system exceeds 70 kPa (0.7 kp/cm<sup>2</sup> = 10 lbf/in<sup>2</sup>)
2. Carefully pump up the pressure to 70 kPa (0.7 kp/cm<sup>2</sup> = 10 lbf/in<sup>2</sup>) and note the pressure gauge test instrument. The pressure must not drop noticeably during 30 seconds. If it does, check this and remedy any leakages.
3. Remove the pressure tester for the cooling system and connect the hose from the expansion tank to the radiator.
4. Remove the expansion tank cap. Feel to see whether the valve for the vacuum, in the centre of the cap has not stuck against its seat.
5. Fit the cap.

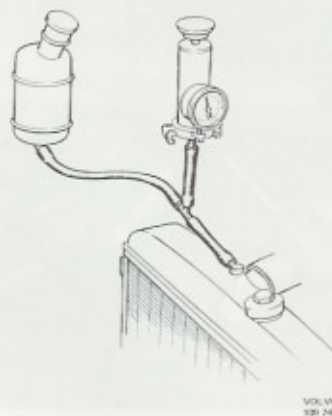


Fig. 26-6. Pressure-testing the cooling system

## RADIATOR

### Removing

1. Remove the lower radiator pipe clamps (2) from the side member.
2. Remove the lower radiator hose from the radiator and drain the coolant.
3. Remove the cover on the dashboard (part with ashtray) and the panel for the diff. lock controls, Fig. 26-7.

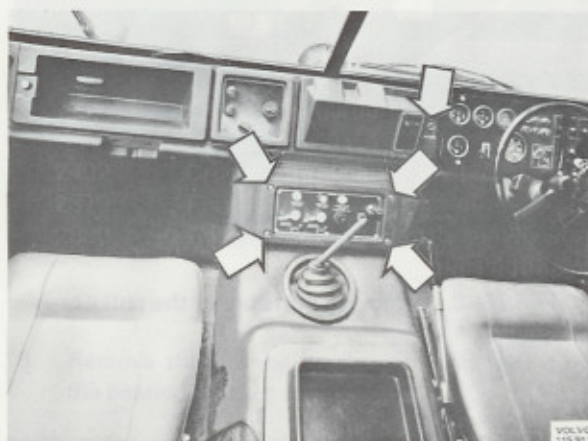


Fig. 26-7. Removing the cover over the radiator and the panel for the diff. lock controls

4. Remove the cover plate over the radiator (4 bolts). Remove the upper radiator hose and the hose running from the expansion tank to the radiator.

5. Remove the retaining bolts on the side of the radiator (1 per side), Fig. 26-8.

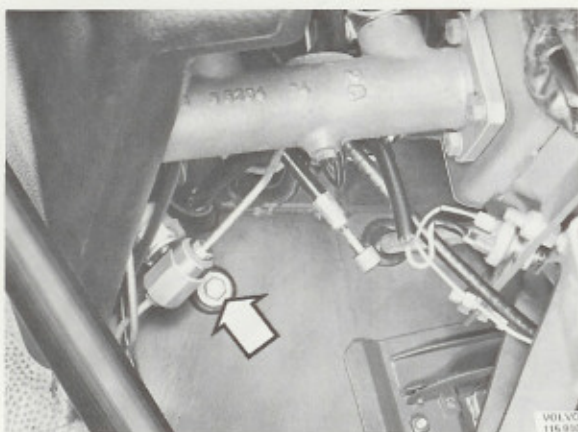


Fig. 26-8. Retaining bolt on side of radiator

6. Remove the bumper centre stay and the clamp for the clutch wire, Fig. 26-9.
7. Remove the member under the radiator, Fig. 26-9. Move the wires to the one side and take down the radiator.

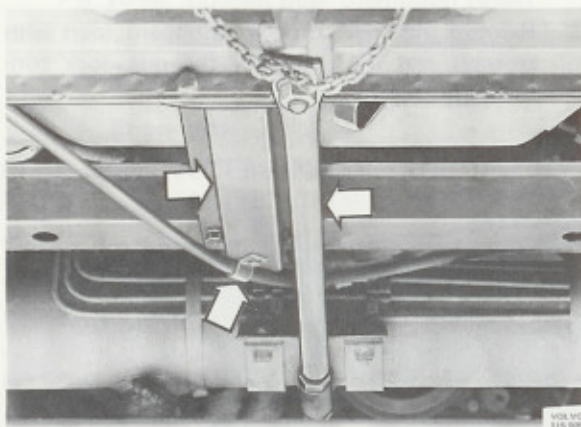


Fig. 26-9. Removing parts under the radiator

#### Installing

1. Lift up and fit in the radiator.
2. Install the member under the radiator.
3. Install the lower radiator hose and clamp tight the radiator pipe to the side member (2 clamps).
4. Install the bumper centre stay and clamp tight the clutch wire.
5. Install the retaining bolts on the side of the radiator.

6. Install the upper radiator hose and the hose running from the expansion tank to the radiator.
7. Fit the panel for the diff. lock controls.
8. Fill with coolant through the opening on the radiator, the heater-control on the panel should be at MAX. Also fill the expansion tank to the MAX mark.
9. Install the cover plate over the radiator and the cover over the dashboard.

#### Replacing the coolant pump

1. Drain the coolant by opening the drain cock on the lower radiator pipe.
2. Slacken the drive belts.
3. Remove the fan shaft retaining nuts at the flanges on the coolant pump pulley and at the fan bearing bracket.
4. Release the clamping screw securing the fan bearing to the bearing bracket. Move the fan bearing forwards and remove the fan shaft.
5. Remove the coolant pump pulley.
6. Remove the retaining bolts for the coolant pipes and pull the pipes out of the coolant pump.
7. Screw loose and remove the coolant pump. The fan shaft is carefully moved to the one side.
8. Clean the cylinder block of old gasket residues.
9. Install the sealing rings on top of the pump and the rings on the pipes.
10. Provide the pump with a new gasket, "pump - cylinder block".
11. Install the pump in position with the upper coolant pipe pushed into the pump. Press the pump upwards against the cylinder head extension under the bolting so as to obtain complete sealing between pump and cylinder head.
12. Install the lower coolant pipe. Push the coolant pipes well into position before tightening up their retaining bolts.
13. Close the drain cock on the lower radiator pipe.
14. Install the pulley and drive belts, and adjust the belt tension.
15. Install the fan shaft and tighten up the fan bearing clamping screw.
16. Fill the system with coolant through the opening on the radiator, with the heater control at MAX. Also fill the expansion tank to the MAX mark. Test-run the engine and check for leakage.

### Testing the thermostat

After being removed, the thermostat can be tested in a vessel containing heated water, Fig. 26-10. The thermostat, which is marked 82°O, should start opening at 79-83°C (175-182°F) and should be fully open at 95°C (203°F).

If necessary replace the thermostat. Use a new gasket when installing the thermostat.

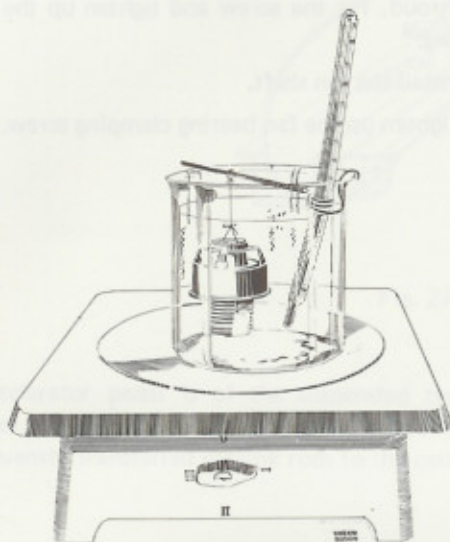


Fig. 26-10. Testing the thermostat

### Replacing the drive belts

1. Slacken the drive belts.
2. Remove the fan shaft retaining nuts at the flanges on the coolant pump pulley and at the fan bearing bracket.
3. Release the clamping screw securing the fan bearing to the bearing bracket. Move the fan bearing forwards and remove the fan shaft.
4. Carefully move the fan shaft to the one side. Remove the drive belts and fit new ones (HC 38x888).
5. Install the fan shaft and tighten up the fan bearing clamping screw.
6. Tension the drive belts. If the belts are properly tensioned it should be possible to depress them 5-10 mm (3/8") halfway with the thumb between the alternator and coolant pump pulleys.

**NOTE!** The alternator must be obliquely loaded. If a levering bar is used for the adjustment, this should be applied between the engine and the front of the alternator.

**NOTE!** If the lower alternator bolt is not slackened for this adjustment, there will be a great deal of stress on the drive bearing shield.

### FAN DRIVE ASSEMBLY

#### Removing fan and bearing bracket

1. Remove the fan shaft retaining nuts for the flanges on the coolant pump pulley and at the fan bearing bracket.
2. Release the clamping screw securing the fan bearing to the bearing bracket. Move the fan bearing forwards and remove the fan shaft.
3. Remove the screw for the clamp round the fan shroud. Release the air bellows from the fan shroud and remove it forwards.
4. Remove the band clamps securing the brake pipes to the front tubular member.
5. Mark up the location of the bearing bracket, see Fig. 26-11. **Note!** This must be done to ensure that the bearing bracket is re-installed in the correct position.

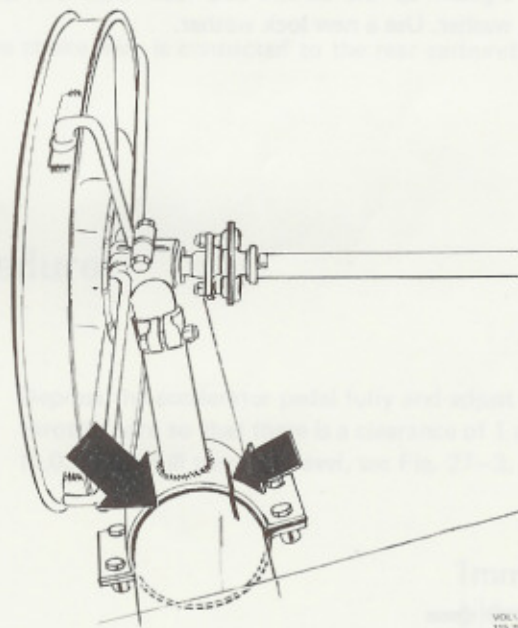


Fig. 26-11. Marking of fan bearing bracket

6. Remove the bearing bracket cap and take down the bearing bracket and fan.

#### Replacing cooling fan (Removed from vehicle)

1. Bend up the lock washer and remove the fan's retaining screws.
2. Remove the fan.
3. Install the fan, washer and lock washer. Fit and tighten up the screws. Lock with the lock washer. Use a new lock washer.

### Replacing fan journalling (Removed from vehicle)

1. Bend up the lock washer and remove the fan's retaining screws. Remove the fan.
2. Pull off the rear flange (against the fan shaft) with a standard puller.
3. Pull the fan journalling out of the bearing bracket.
4. Press the fan hub off the fan journalling.
5. Press the fan hub onto the new fan journalling. There should be a gap of about 3 mm (1/8") between hub and bearing.
6. Install the fan journalling in the bearing bracket.
7. Press the flange onto the fan journalling. The flange should be flush with the end of the bearing shaft.
8. Install the fan, washer and lock washer. Fit and tighten up the screws and lock with the lock washer. Use a new lock washer.

### Installing fan and bearing bracket

1. Place the bearing bracket and fan on the tubular member.
2. Fit the cap and tighten up the front screws. Adjust the bearing bracket according to the line-up marks and tighten up the rear screws.
3. Install the band clamps round the brake pipes.
4. Fit the air bellows and clamp round the fan shroud. Fit the screw and tighten up the clamp ring.
5. Install the fan shaft.
6. Tighten up the fan bearing clamping screw.