



# SERVICE MANUAL

TRUCKS

**L 385**

*Export Service Department*

AKTIEBOLAGET

**VOLVO**

GÖTEBORG, SWEDEN

## Air-venting the Fuel System

1. If the fuel system has been completely emptied, the fuel lines, the feed pump, the filters and the fuel injection pump must be filled with fuel by operating the hand primer pump.

Since air collects in the highest points in the system, air-venting is commenced by opening the air-venting cock on the upper fuel filter and operating the hand primer pump until the fuel passing out is completely free from air bubbles.

Close the air-venting cock on the upper fuel filter and then open the air-venting cock on the fuel injection pump.

3. Continue to operate the hand primer pump until the fuel passing out is free from air bubbles.
4. A final air-venting which is sometimes necessary concerns the delivery pipes since it is not possible to air-vent the injectors themselves.

Loosen the delivery pipe nuts and remove the inspection cover on the fuel injection pump. Operate the plunger units in the injection pump one at a time by inserting a special tool in the plunger lifter hole to the right of the guide groove at the top and use this tool as a lever. Continue pumping until the fuel passing out is free from air bubbles after which the nut on the delivery pipe is tightened and pumping is continued on the next plunger unit.

NOTE. While this pumping is being carried out, the stop arm should be in such a position that full feed is being obtained. The cold starting device should also be coupled in since this increases the amount of fuel delivered by the pump.

## COOLING SYSTEM

### Cooling Water Pump

The cooling water pump can be removed without having to take off the radiator. Removal is carried out in the following way:

1. Drain off the cooling system.
2. Remove the fan.
3. Loosen the tensioning device for the drive belts and the generator and then remove the drive belts.
4. Loosen the hose connections between the pump and the thermostat housing and between the pump and the radiator.
5. Loosen the attaching bolts and lift out the pump.

## Disassembly

1. Remove the four bolts (wrench size 12 mm across flats), holding together the fan hub and the pulley. Remove the slotted pin locking the pump shaft at the fan hub by striking it out or drilling it out. Fit puller SVO 2265 on the fan hub and pull off the hub. The puller is attached to the fan hub retaining bolts. See Fig. 1-133.
2. Remove the key from the pump shaft.
3. Place the pump on a backing plate in such a way that the impeller rotates freely and press out the impeller by using tool SVO 2268 (Fig. 1-134) as well as the shaft, the seal, the slinger ring and the rear bearing. This is done in one operation.

NOTE. The slinger ring will be damaged in this operation and for this reason it should always be replaced.

NOTE. If the bearing should remain attached to the impeller shaft, it can be removed by using ring SVO 1526.

4. Remove the pulley lock ring.
5. Place tool SVO 2266 (see Fig. 1-135) in the extension of the pump housing bearing journal and fit puller SVO 2265. Pull off the pulley whereby the bearing and the spacer ring between the bearings will accompany it.
6. Lay the pulley on a press plate with the front section downwards. Make sure that the bearings are free and then press out the bearings with the help of tool SVO 2267. See Fig. 1-136.
7. Unscrew the lubricating nipple.

## Inspection

The pump should be thoroughly cleaned after disassembly. Make sure that the lubricating channels are free from old grease.

Check the bearings. These should not chafe but should run easily. There should be no signs of blueing on the ball or the ball races. Check the fit of the bearings against the shaft and the housing and the fit between the housing and the pulley. The bearing should not have rotated in any way. A damaged bearing should be replaced.

The surface of the impeller towards the seal should be neither scored nor damaged in any way. An uneven surface here can cause water leakage.

The seal and the slinger ring should be replaced each time the pump is reconditioned.

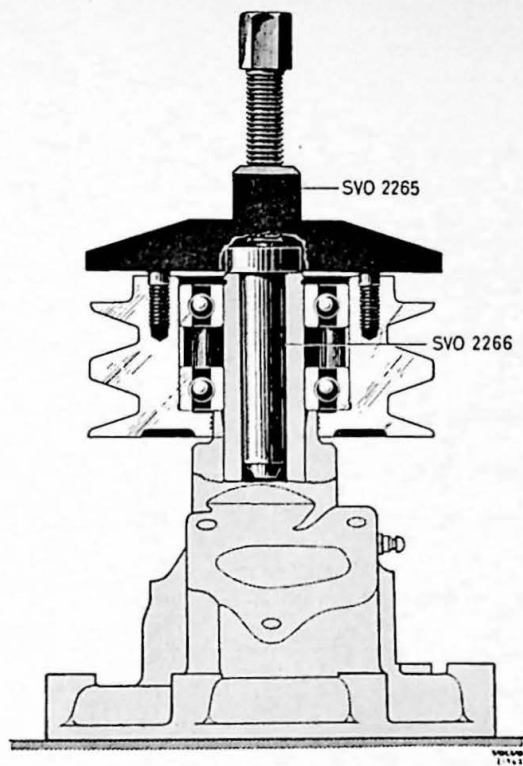


Fig. 1-135. Removing pulley.

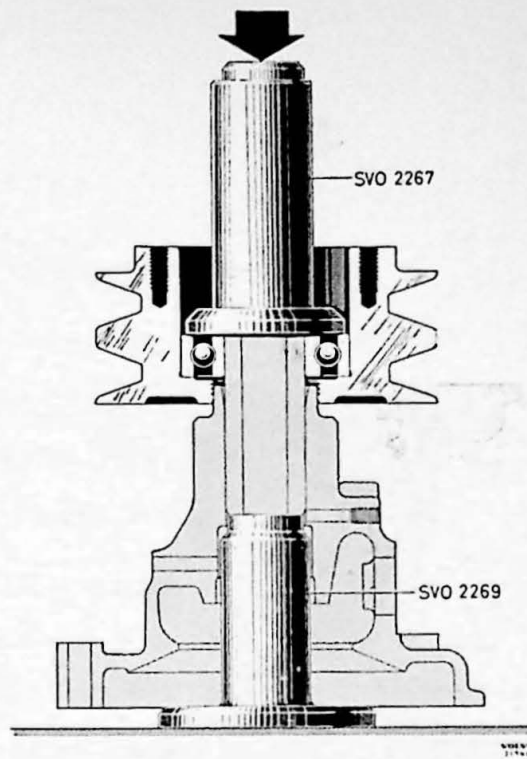


Fig. 1-138. Fitting pulley with bearing.

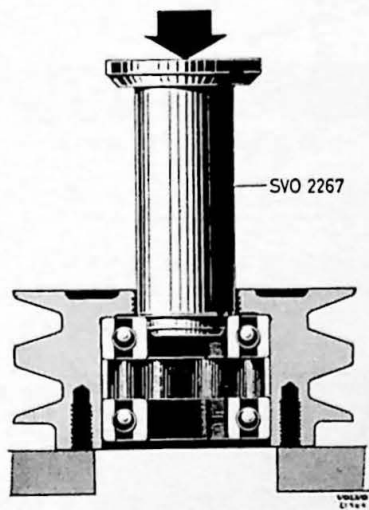


Fig. 1-136. Removing bearing.

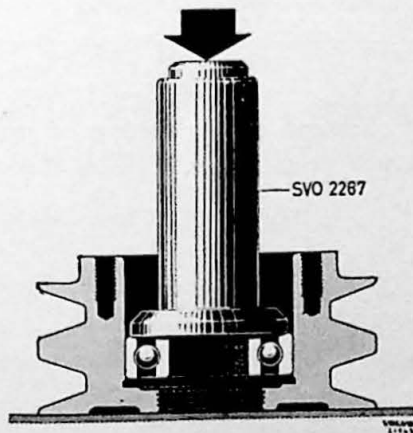


Fig. 1-137. Fitting rear bearing in pulley.

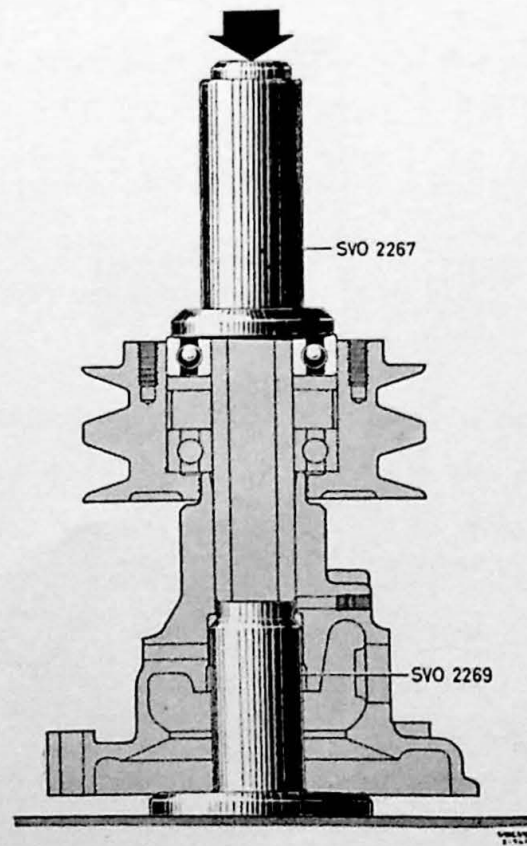


Fig. 1-139. Fitting forward bearing in pulley.

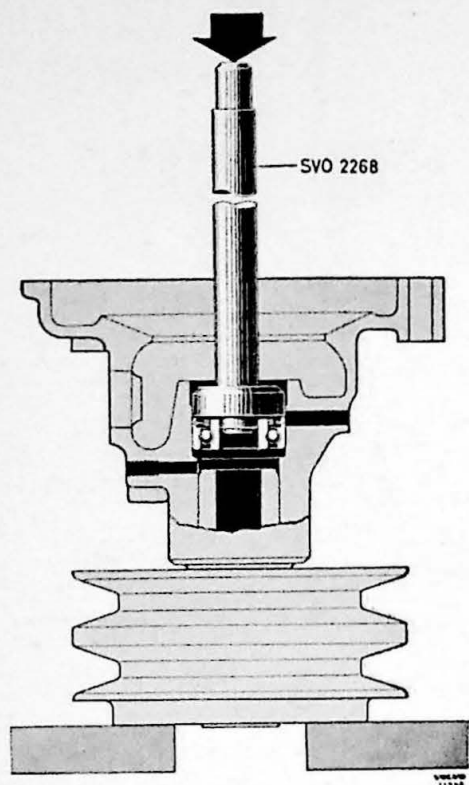


Fig. 1—140. Fitting bearing in housing.

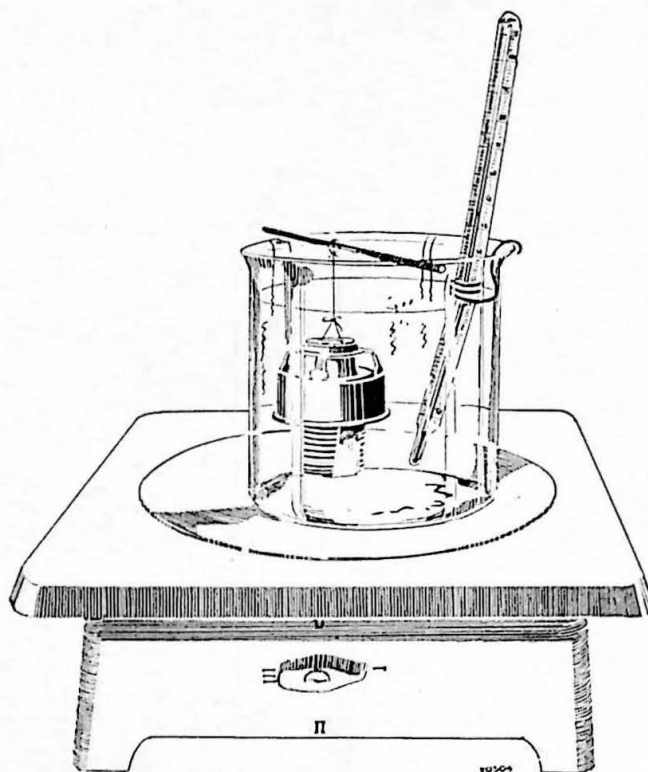


Fig. 1—142. Checking the thermostat.

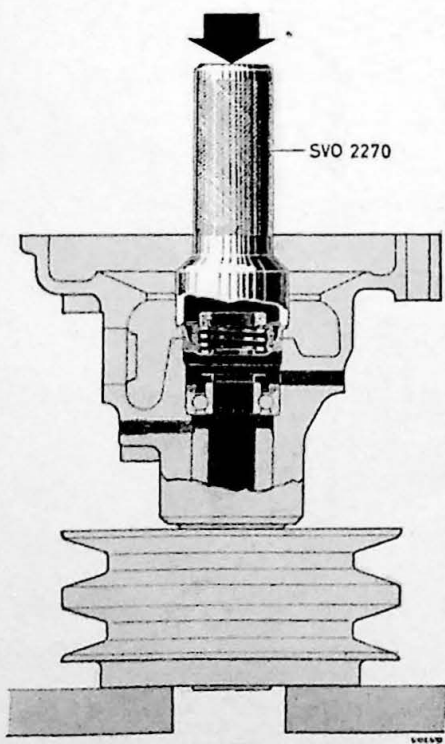
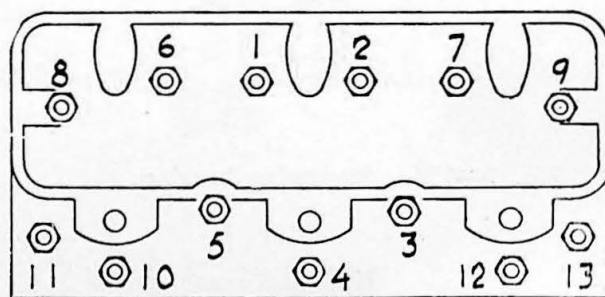


Fig. 1—141. Fitting seal.



**VOLVO**  
20784

Fig. 1—143. Scheme for tightening of cylinder head nuts.

## Assembly .....

1. Pack the bearings with heat-resistant ball bearing grease.
2. Use tool SVO 2267 to press the rear bearing in the pulley. See Fig. 1-137.
3. Place tool SVO 2269 in the place normally occupied by the impeller (see Fig. 1-138). Press tool SVO 2267 (see Fig. 1-138) on to the pulley with the rear bearing. Exert pressure until the pulley and bearing are correctly in position.
4. Fit the spacer ring after having half filled it with grease and press in the front bearing with tool SVO 2267. The housing should still be on the plate with tool SVO 2269 in the place of the impeller (Fig. 1-139). Fit the lock ring for the forward bearing on the bearing journal extending from the housing.
5. Place the pump housing (see Fig. 1-140) on a press plate and then press in the rear bearing with tool SVO 2268. The bearing should be turned in such a way that the seal faces the impeller.
6. Insert the slinger ring with the flange turned away from the bearing and then drive in the seal with tool SVO 2270 or SVO 1465 B (see Fig. 1-141).
7. Place the housing so that the press plate is against the bearing journal and the pump shaft can rotate freely.

Make sure that the slinger ring is correctly in position and then insert the shaft through the seal. Press in the shaft with impeller, pressure being applied against the end of the shaft. Continue to press in the shaft until the rear surface of the impeller is level with the pump housing.

8. Insert a Woodruff key in the shaft. Place the housing so that the press plate is against the impeller and press the fan hub onto the pump shaft. Make sure that the key comes correctly into position into the keyway in the fan hub and then continue to press on the hub until the hole for the lock pin in the hub and the shaft are opposite each other. Drive in the slotted pin.
9. Fit and tighten the four bolts holding the hub and the pulley together.
10. Screw in the lubricating nipple and then press in heat-resistant ball bearing grease.

## Fitting .....

The pump is fitted in the reverse order to that used when removing. Use new gaskets. Adjust tension of the fan belts and then fill the cooling system with water.

## Thermostat

If the engine has become overheated, the thermostat can be damaged with the result that it will be permanently in the open position. If there is reason to believe that the thermostat does not function in a satisfactory manner, it should be removed in accordance with the instructions on page 1-25 "Replacement of Thermostat", points 1-4.

The thermostat itself can be neither adjusted nor disassembled.

In order to check the function of the thermostat, the following procedure is carried out:

1. Check that the bellows and the valve are not damaged.
2. Suspend the thermostat and a thermometer in a beaker filled with water in such a way that they do not contact the bottom of the beaker since this could cause faulty readings.
3. Heat up the water gradually and stir it so that the thermostat is at the same temperature as the water.
4. Control the opening pressure which should be  $69-72^{\circ}\text{C}$  ( $156^{\circ} - 162^{\circ}\text{F}$ ).

The thermostat valve should be fully opened at  $82-85^{\circ}\text{C}$  ( $180-185^{\circ}\text{F}$ ).

If the thermostat does not function in a satisfactory manner, it should be replaced. No attempt should be made to repair it.

When replacing the thermostat, make sure that the new thermostat is marked 160-165.

## Radiator

### Blocked Radiator .....

It is extremely important, particularly during warm weather, that the radiator has the required cooling capacity.

Certain deposits gradually form in the cooling system and these consists mainly of calcium carbonate, rust or deposits from various compounds dissolved in the cooling water. For this reason it is preferable to use "soft" water such as rain water in order to limit the amount of material deposits in the radiator. If it should become obvious, however, that the radiator is blocked (radiator partially cold in spite of the fact that the engine and the rest of the radiator have a normal operating temperature), the radiator is rinsed by flushing out the system with water in a reverse direction.

First the thermostat is removed since this is closed with cold water. Then the upper and lower radiator hoses are removed. The radiator cap should be in position. Attach a short

hose to the lower radiator attachment. Insert a flushing nozzle in this hose and then turn on the water until the radiator is full after which compressed air is applied in short bursts. Continue to rinse in this way until the water running out is clean. The engine cooling system is flushed in the same way with the flushing jet fitted to the thermostat housing outlet pipe. If this flushing does not have a satisfactory result, the system can be cleaned out by using one of the commercial cleaning agents available and carefully following the instructions for use. When this is being done, reverse flushing should always be carried out in order to rinse out any chemicals that may remain in the system. If an extremely thorough cleaning out is required, the following procedure can be followed:

375 grammes of oxalic acid for every 10 liters of cooling fluid (13 oz. of oxalic acid for every 2 1/2 U.S. gallons), and let the engine run warm for 1 hour or, in the case of severe blockage, 2-3 hours. Then drain the cooling system.

**WARNING.** Oxalic acid has a corrosive effect on clothes so care should be taken for splashes.

Then fill the cooling system with clean water and run it warm for about 10 minutes. The system should be flushed out in this way three times.

Then sodium carbonate is added (a suitable amount is 60 grammes for every 10 liters cooling fluid = 2 oz. for every 2 1/2 U.S. gallons), run the engine warm and then flush out three times with clean water. After the above-mentioned cleaning has been carried out, the cooling system should be flushed in a reverse direction to remove any chemicals that may remain in the system.

**NOTE.** As far as an old radiator is concerned, this method implies a certain risk since the action of the chemicals is very powerful. Leaks which may earlier have been blocked by rust etc. become apparent when the rust has been removed.

#### Removing the Radiator .....

1. Drain the cooling system and disconnect the hose connections.
2. Remove the bolts retaining the radiator grille to the hood side plates, as well as the attaching stays and the bolts retaining the radiator on the frame at the bottom.
3. Disconnect the radiator blind cable.
4. Lift off the radiator grille complete with radiator.
5. Remove the radiator from the radiator grille.

### Fitting the Radiator

Fitting is carried out in a reverse order to that used when removing.

When fitting ensure that new hoses are fitted where required and that the clamps are replaced.

### Repair of Radiator

If a leak occurs in the radiator it should be repaired immediately. It is not sufficient to seal the leaks with radiator cement. The result of this is that the cooling channels are blocked. The capacity of the radiator will be decreased and brazing will be more difficult. Brazing is the only correct way to repair a leak on the radiator.

In order to localize the leak and determine its size, the radiator should be immersed in a vessel full of water after having plugged all the openings except one, preferably the overflow pipe. Air is then blown carefully in through a reduction valve so that the maximum pressure should not exceed  $0.25 \text{ kg/cm}^2$  (3 1/2 p.s.i.). After the leak has been localized, examination should be carried out to determine whether the damage is merely on the surface or whether it is so extensive that the section of the radiator requires replacement in which case this should be carried out by a special workshop so that the work is carried out in a satisfactory manner. Should it be a small leak, it can be soldered. Never use an oxy-acetylene flame since this can do more harm than good. An oxy-acetylene flame can also melt the solder and cause uneven stresses. If the radiator has been soldered several times it may be found difficult to avoid damaging earlier soldered points and the work may take so much time that in many cases it pays to fit a new radiator.

### Anti-freeze

A mixture of ethylene glycol and water is the most used anti-freeze. The boiling point of this mixture is above  $100^\circ \text{C}$  ( $212^\circ \text{F}$ ). Glycol does not evaporate since its boiling point is as high as  $160^\circ \text{C}$  ( $320^\circ \text{F}$ ). The system just needs topping up now and then with clean water (preferably rain water). Anti-freeze and water are mixed in the proportions shown in the table in part 13, Specifications.

Use Volvo anti-freeze so that you can be sure that this anti-freeze is free from any compounds that might damage the cooling system.

The use of methylated spirit as anti-freeze is unsuitable since its boiling point is as low as  $78^\circ \text{C}$  ( $172^\circ \text{F}$ ) and the diesel engine operates at a temperature of  $80\text{--}85^\circ \text{C}$  ( $176\text{--}185^\circ \text{F}$ ). Methylated spirit evaporates quickly particularly when the engine is heavily loaded and if the amount of methylated spirit remaining in the system is not tested regularly

there is risk that the solution may become too weak with consequent frost damage to the radiator and the engine.

Before adding anti-freeze the following procedure should be carried out:

1. Flush out the cooling system well with clean water.
2. Check that the radiator is not leaking. Examine the radiator hoses.
3. Tighten the cylinder head nuts. Check that the gaskets on the thermostat housing and the cooling water pump are in good condition.
4. Check that the thermostat is operating properly.

#### ASSEMBLY OF ENGINE

The assembly of the various components of the engine have been treated under separate headings to which we refer. Assembly is carried out in the following order: crankshaft with seals, cylinder liners, pistons and connecting rods, camshaft and valve lifters, flywheel, auxiliary drive gears, vacuum pump, auxiliary drive gear casing, crankshaft pulley, cylinder heads with valve mechanism, fuel injection pump, exhaust and induction manifolds, cooling water pump, oil pump and oil pan, generator, starter motor and other components.

The following points should be observed when the engine is being assembled:

1. Accuracy and cleanliness.
2. Oil in all moving parts before fitting.
3. Pay attention to all markings and refit components, which have not been replaced, in their original positions.
4. Tighten all the more important nuts and bolts with a torque wrench. See the specifications for the various tightening torques.
5. Oil in all threads before tightening nuts and bolts.
6. Do not forget to secure with lock wire, spring washers and lock washers.
7. Only use tools that are in good condition.
8. Use fixed wrenches of the correct size for the various nuts and bolts.

#### RUNNING IN THE ENGINE

If a test bench is available, the engine should be run in after reconditioning in order to give the new pistons, piston rings, cylinder bores, bearings and the newly ground crankshaft a better chance to adjust themselves.

If there is no test bench available, the engine should be run for 3-4 hours at a rapid idling