VOLVO SERVICE

CARS

PART 2 B
ENGINE
B 18 B B 18 D

SERVICE MANUAL

CONTENTS

DESCRIPTION

This Service Manual, which concerns B 18 B and B 18 D engines, is intended as a supplement to the Service Manual for the B 18 engine and therefore deals only with those components which are characteristic for the B 18 B and B 18 D engines. Other instructions which are common for all the engines in the B 18 series are included in the Service Manual for the B 18 A engine. However, the specifications at the end of this book are complete.

GENERAL

The B 18 B and B 18 D engines are both fitted with twin horizontal carburettors.

Since the B 18 B engine has a higher compression ratio and a camshaft with different timing, is has a higher output and also a higher rated speed.

The outputs are thus as follows:

B 18 B (496800) 100 h.p. at 5500 r.p.m. (SAE)

B 18 B (496812-817) 108 h.p. at 5800 r.p.m. (SAE)

B 18 D (496802-15-16-18) 90 h.p. at 5000 r.p.m. (SAE)

On B 18 B engines, both the main and big-end bearings consists of steel shells lined with indium-plated lead-bronze bearing metal. On B 18 D (and also B 18 A) engines, the bearing metal in the main bearing shells consists of Babbit's metal.

For other detailed information, see the specifications at the end of this book.

OIL COOLER (B 18 B)

The oil cooler (Fig. 6) is fitted between the oil filter and the cylinder block and consists of an inner section for the oil which is surrounded by a cooling jacket. On its way to the oil filter, the oil passes through the cooler and some of the heat in the oil is conducted away by the coolant. The coolant cannot pass the shortest way from the inlet (1) to the outlet (6), but is forced to circulate round the cooler through channels formed by the baffles (5). The oil is forced between the pairs of discs in turn due to the transverse baffles (4) in the discs and then finally passes out to the oil filter.

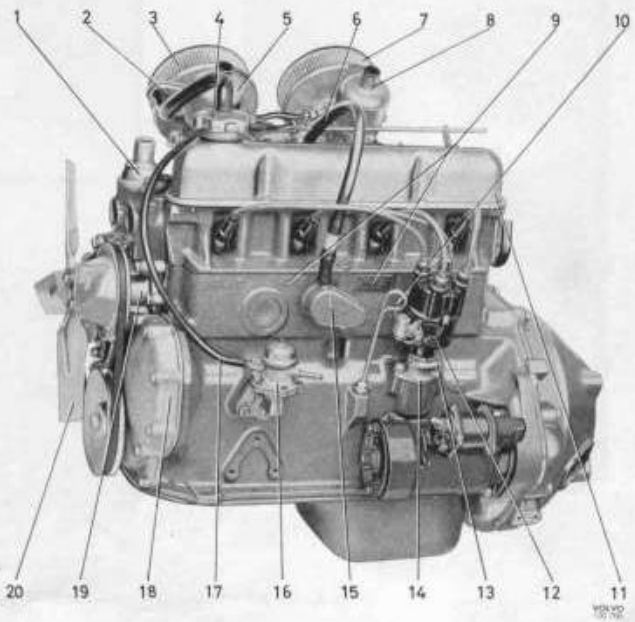


Fig. 1. The engine viewed from the left.

1. Water outlet pipe
2. Intermediate piece for crankcase ventilation (B 18 B)
3. Front air cleaner
4. Oil filling cap
5. Front carburettor
6. Rubber hose for crankcase ventilation (B 18 B)
7. Rear air cleaner
8. Rear carburettor
9. Engine number
10. Oil dipstick
11. Rocker arm casing
12. Distributor
13. Clamping screw
14. Retainer
15. Oil trap for crankcase ventilation (B 18 B)
16. Fuel pump
17. Fuel hose
18. Timing gear casing
19. Water pump
20. Fan

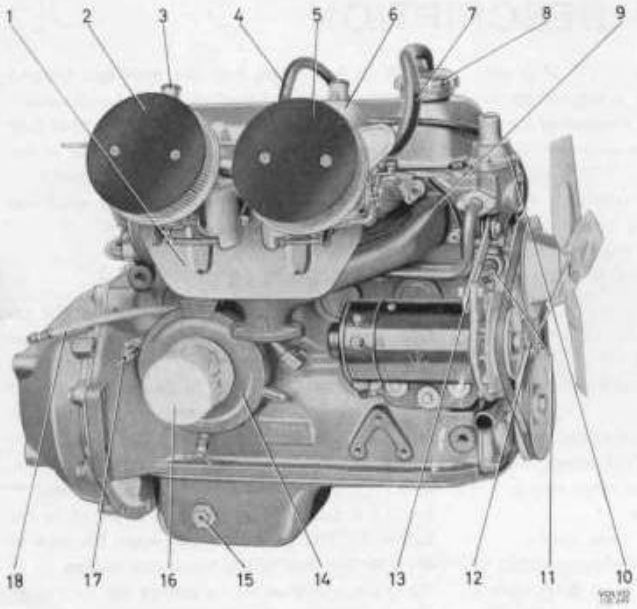
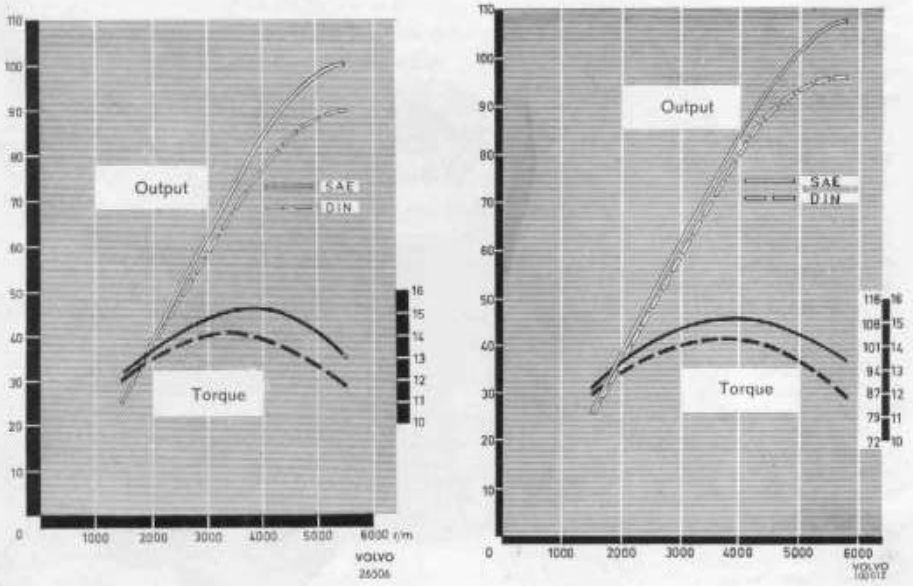


Fig. 2. The engine viewed from the right. (Oil cooler only on B 18 B.)

1. Shield plate
2. Rear air cleaner
3. Rear carburettor
4. Rubber hose for crankcase ventilation (B 18 B)
5. Front air cleaner
6. Front carburettor
7. Rubber hose for crankcase ventilation (B 18 B)
8. Oil filling cap
9. Exhaust manifold
10. Water outlet pipe
11. Water pipe from heater
12. Ignition timing mark
13. Belt tensioner
14. Oil cooler (B 18 B)
15. Outlet for oil temperature gauge (B 18 B)
16. Oil filter
17. Draining cock
18. Hose for oil pressure gauge



Early production

Late production

Fig. 3. Output and torque curves for B 18 B.
r/m = r.p.m.

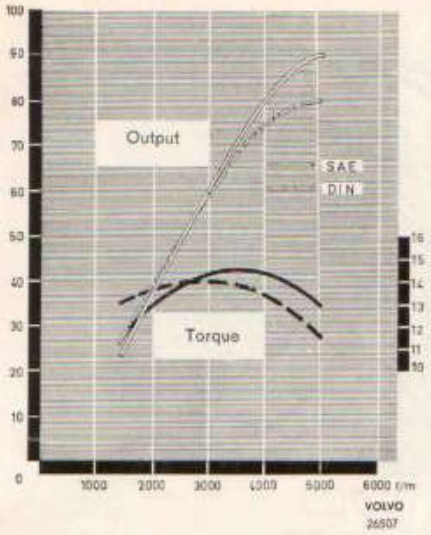


Fig. 4. Output and torque curves for B 18 D
r/m = r.p.m.

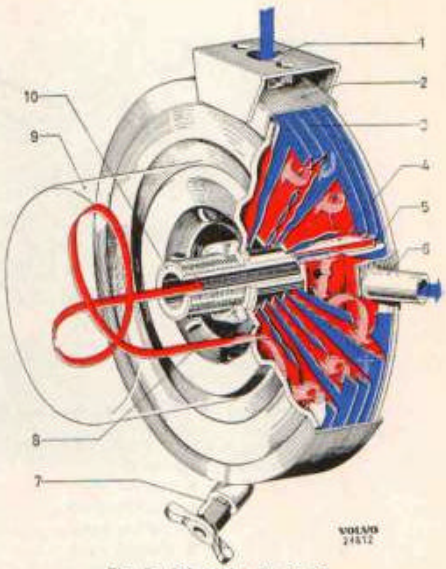


Fig. 6. Oil cooler (B 18 B).

1. Coolant inlet
2. Housing
3. Discs
4. Transverse baffles
5. Baffles
6. Coolant outlet
7. Drain cock for coolant
8. Nut
9. Oil filter
10. Nipple

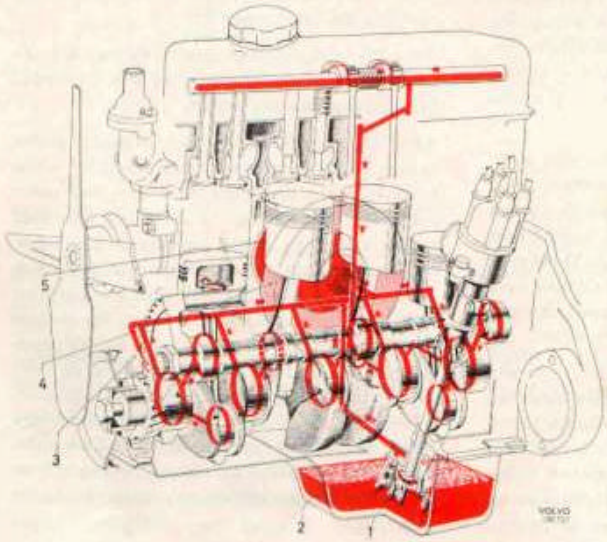


Fig. 5. Lubricating system.

1. Oil pump
2. Sump
3. Nozzle
4. Oil cooler (B 18 B)
5. Oil filter

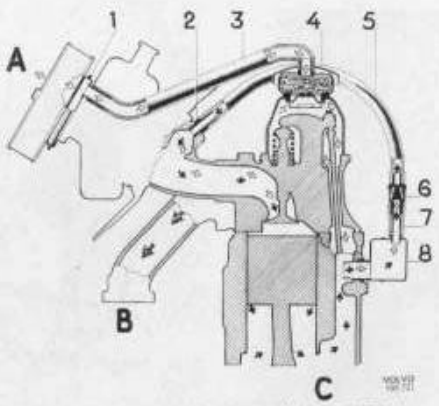


Fig. 7. Positive crankcase ventilation (B 18 B).

1. Intermediate piece
2. Nipple
3. Rubber hose
4. Oil filling cap
5. Rubber hose
6. Control valve
7. Rubber hose
8. Oil trap

A. Fresh air
B. Exhaust gases
C. Crankcase gases

POSITIVE CRANKCASE VENTILATION (B 18 B)

The B 18 B engine is provided with positive crankcase ventilation.

This arrangement prevents the crankcase gases from being released into the atmosphere. Instead the gases are sucked into the engine through the intake manifold and participate in the combustion process. The residue is blown out through the exhaust pipe together with the other products of combustion.

Between the engine crankcase and intake manifold there is a connection which consists of an oil trap (8) attached to the valve inspection cover on the right-hand side of the engine (viewed from the front), and two rubber hoses (5 and 7) between which there is a control valve (6). The rubber hose (5) is connected to a nipple (2) screwed centrally in the equalizing pipe of the intake manifold.

The partial vacuum which occurs when the engine is running causes the crankcase gases combined with fresh air to flow from the crankcase to the intake manifold. The amount of flow is regulated by the control valve. Fresh air is supplied to the crankcase through the carburettor air filter via an intermediate piece (1), rubber hose (3) and oil filling cap (4) to the rocker arm casing, which is in connection with the crankcase through the push rod holes. The oil filling cap, which is sealed, has a built-in flame trap. This flame trap, in the same way as the control valve, which also functions as a check valve, prevents the flame from any backfiring in the carburettors or intake manifold from reaching the crankcase.

Since the fresh air supply passes through the carburettor air cleaners, impurities are prevented from getting into the engine.

When there is a medium or high degree of partial vacuum in the crankcase (intake manifold), which happens during idling and when operating under light load, the system functions as described above. When the partial vacuum in the crankcase is less than that in the air cleaner, which occurs at full load and/or with large low quantities, no fresh air is supplied, but the flow in the connection between the rocker arm casing and air cleaners reverses and the crankcase gases go both ways, partly through the control valve and partly through the air cleaners and carburettors to the intake manifold. In this way the crankcase ventilation system can deal with relatively large quantities of crankcase gases without any escaping into the atmosphere.

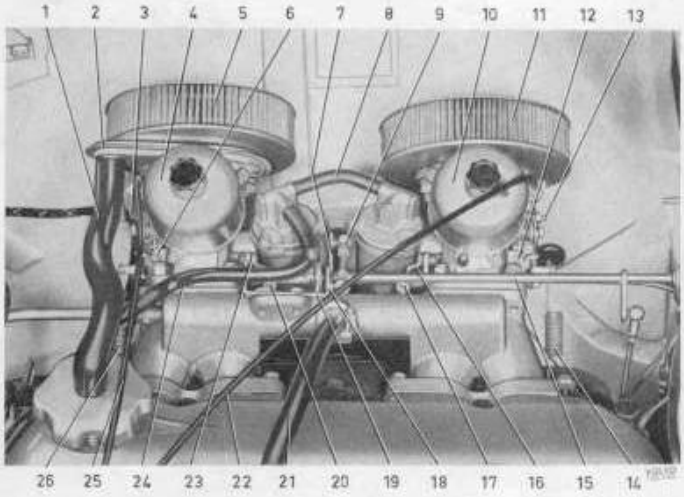


Fig. 8.

1. Rubber hose for crankcase ventilation (B 18 B)
2. Intermediate piece for crankcase ventilation
3. Clamping screw for choke control
4. Front carburettor
5. Front air cleaner
6. Idle adjusting screw
7. Lever
8. Fuel hose
9. Link
10. Rear carburettor
11. Rear air cleaner
12. Idle adjusting screw
13. Clamping screw for choke control
14. Return spring
15. Control shaft
16. Lever on intermediate shaft
17. Locking screw
18. Lever
19. Stop
20. Locking screw
21. Rubber hose for crankcase ventilation (B 18 B)
22. Choke control
23. Lever on intermediate shaft
24. Fuel hose
25. Choke control
26. Return spring

FUEL SYSTEM

The fuel is sucked by a diaphragm pump from the tank through a filter and then fed to the carburettor float chambers.

Carburettors

Both the carburettors, SU-HS 6, are of the horizontal type. The movements of the accelerator pedal are transmitted to the throttle flap by means of the shaft between the carburettors which is flexibly mounted in the throttle flap spindle levers. When starting from cold, the fuel/air mixture is enriched by lowering the jets. This also operates the fast idling device. The various functions are described under the following headings.

Float

The float chamber is attached to the carburettor housing by screws. The valve (4, Fig. 11) which is opened and closed by the float, is fitted in the cover. The fuel is taken to the lower end of the jet through a flexible hose (8) from the lower part of the float chamber.

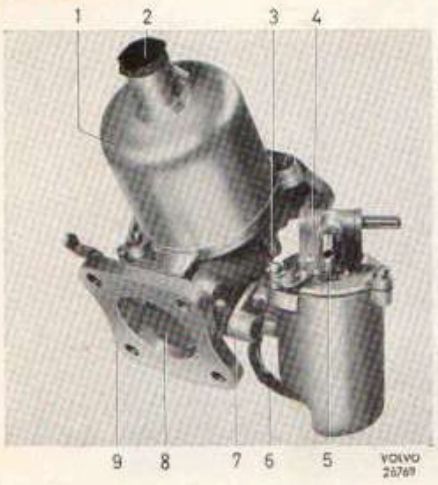


Fig. 9. Carburettor viewed from left.

1. Suction chamber
2. Screw for damping piston
3. Lifting pin
4. Float chamber cover
5. Ventilation hole
6. Fuel line
7. Lever
8. Throttle flap
9. Connecting flange

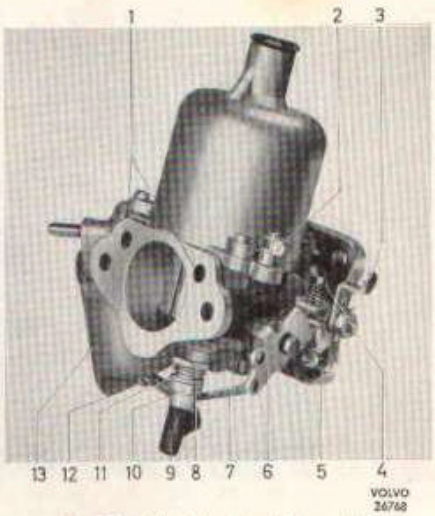


Fig. 10. Carburettor viewed from right.

1. Ventilation holes
2. Attachment for choke control
4. Idling screw
3. Lever
5. Screw for fast idling
6. Lever
7. Link for jet
8. Locknut
9. Jet
10. Adjusting nut
11. Spring
12. Fuel line
13. Float chamber

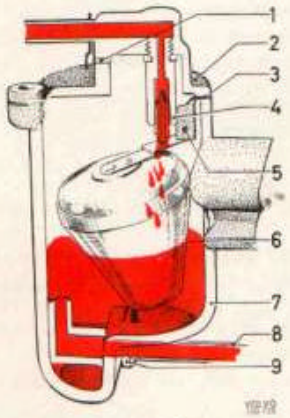


Fig. 11. Float.

1. Ventilation hole with protective washer
2. Float chamber cover
3. Gasket
4. Valve
5. Pin
6. Float
7. Float chamber
8. Fuel line
9. Union

Starting from cold

When the engine is started from cold, the fuel/air mixture can be enriched by lowering the jets, see Fig. 12, which is done through a linkage system from the choke control on the instrument panel. Since the fuel needle is tapered, the cross-sectional area for the fuel flow increases when the jet is lowered.

When the control is pulled out, the outer end of the lever (3) is pressed downwards and influences the jet so that this is also pressed down. In addition, the fast idling screw is influenced by the cam on the lever (2, Fig. 15) and the throttle flap opens slightly.

Running

The flow of air passing through the carburettors when the engine is running increases in speed

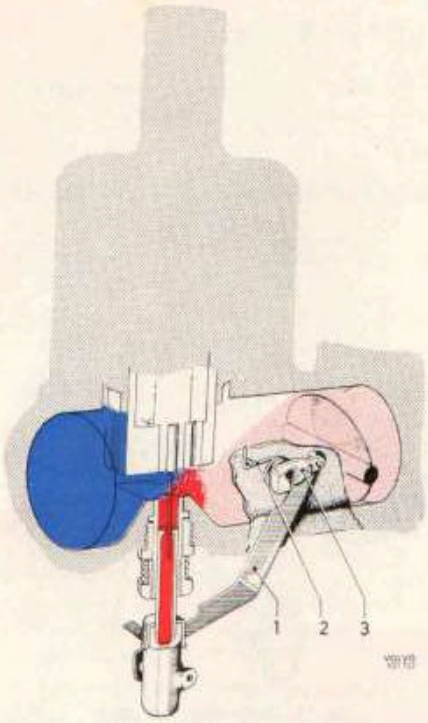


Fig. 12. Starting from cold.

1. Link
2. Return spring
3. Lever

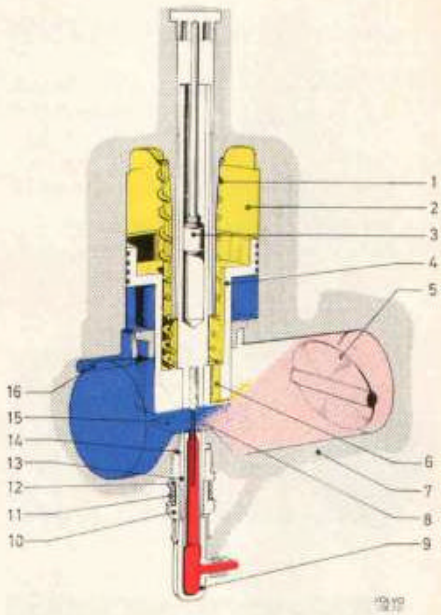


Fig. 13. Carburettor function, normal running.

Blue = Atmospheric pressure
Yellow = Vacuum
Red = Fuel
Light red = Fuel/air mixture

1. Spring
2. Suction chamber
3. Damping piston
4. Vacuum piston
5. Throttle flap
6. Channel
7. Housing
8. Fuel needle
9. Jet
10. Adjusting nut
11. Locking spring
12. Lock nut
13. Jet sleeve
14. Washer
15. Bridge
16. Channel

when it passes through the constriction known as the bridge (15, Fig. 13).

Fuel is supplied to the flow of air through the jet which opens out at the bridge.

The vertical position of the vacuum piston is determined by the difference between the vacuum in the carburettor and atmospheric pressure since the top of the piston has access to the space between the throttle flap and bridge, whereas the underside of the piston is influenced by atmospheric pressure. When loading on the engine increases, the degree of vacuum also increases, so that the piston and the tapered fuel needle rise and permit an increased amount of fuel/air mixture to flow to the cylinders.

The supply of fuel and air is thus dependent on the degree of vacuum in the carburettor venturi, so that the carburettors work in accordance with the continuously variable principle.

In order to prevent excessively rapid movements of the vacuum piston, there is a damping piston (3) which runs in an oil-filled cylinder.

Idling

When the engine is idling, only a small amount of fuel/air mixture passes through the carburettors. The throttle flap is held slightly open by the idling screw (1, Fig. 14). The idle adjustment on each carburettor is done independently. The shaft between the carburettors, see Fig. 8, is not permanently fixed to the throttle flap spindles but is flexibly mounted in the ends of the levers.

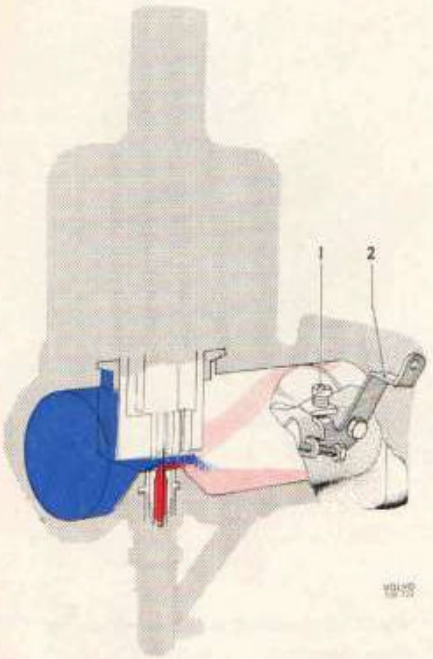


Fig. 14. Carburettor, idling

1. Idle adjusting screw
2. Lever for return spring

The fuel/air mixture is adjusted with the adjusting nuts (10, Fig. 13) on the jets and adjustment is carried out at idling speed to cover the whole speed range.

Fast idling

When the choke control is pulled out, the throttle flap is also influenced. One end of the lever (2, Fig. 15) is in the form of a cam which presses on the fast idle screw (4) whereby the throttle flap is opened.

This means that the engine runs at a faster idling speed during the time the choke control is pulled out.

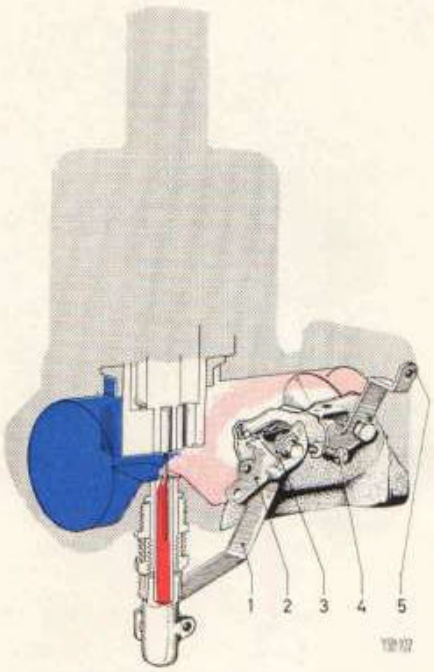


Fig. 15. Carburettor, fast idling.

1. Link
2. Lever
3. Return spring
4. Fast idle screw
5. Lever for throttle flap spindle

AIR CLEANERS

The air cleaners, one on each carburettor, consist of a sheet-metal casing with an element made of special paper, see Fig. 16. Particles of dust and other impurities in the air are trapped when the air passes through the element. The air cleaners require no servicing and may not be oiled. They should be replaced with new ones after a certain mileage.

On P 120 right-hand drive cars, the air cleaners are provided with replaceable paper elements.

REPAIR INSTRUCTIONS

The repair instructions below only concern the oil cooler and carburettors. For other repair instructions, please refer to the Service Manual for the B 18 A engine.

REPLACING THE OIL COOLER (B 18 B)

1. Drain off the engine coolant.
2. Disconnect the coolant connections on the oil cooler. Remove the oil filter.
3. Unscrew the nut (2, Fig. 17) on the nipple for the oil cooler and pull off the cooler.
4. Fit the oil cooler in the reverse order. The O-ring against the cylinder block should be replaced if necessary, in which case it should be stuck into the groove on the oil cooler before fitting. Coat the groove with a thin layer of adhesive which is resistant to oil up to temperatures of 140°C (280°F) (for example Pliobond 20). With the nut tightened to a torque of 1 kgm (7 lb.ft.), check that the cooler is in good contact with the cylinder block all round. The nut is finally tightened to a torque of 3–3.5 kgm (23–25 lb.ft.).
5. Fit the oil filter and connect the coolant pipes.
6. Fill up with coolant and, if necessary, also engine oil.
7. Start the engine and check for leakage.
8. If the nipple (3) has been replaced, the new one should be tightened to a torque of 4.5–5.5 kgm (33–40 lb.ft.).

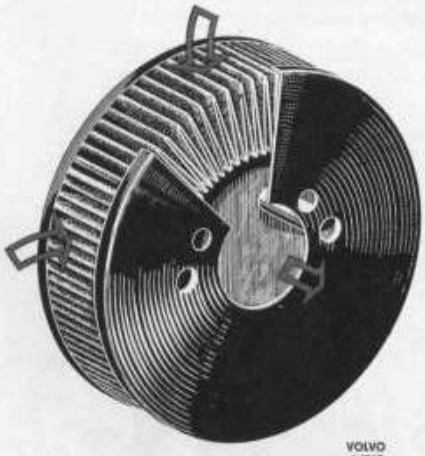


Fig. 16. Air cleaner.

POSITIVE CRANKCASE VENTILATION

Overhauling

At intervals of 20 000 km (12 500 miles) or less, depending on driving conditions, the valve (6, Fig. 7) should be replaced. At the same time, the oil trap (8), the hoses (5 and 7) and the nipple

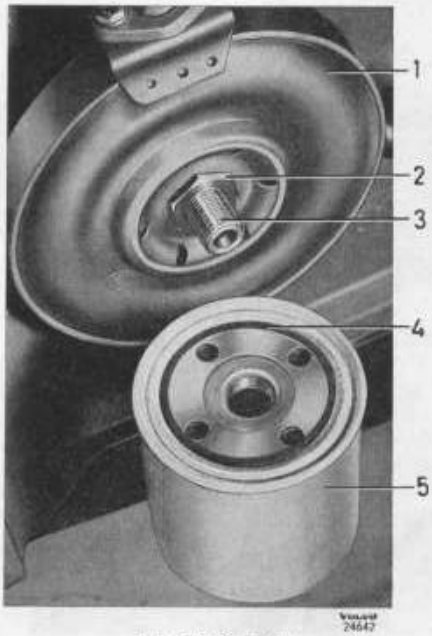


Fig. 17. Oil cooler

1. Cooler
2. Nut
3. Nipple
4. Gasket
5. Oil filter

(2) should be removed from the engine and thoroughly cleaned. If the rubber hoses are in poor condition, they should be replaced.

Make sure that a valve with the correct designation (CV–584) is fitted. An incorrect valve can cause impaired ventilation or oil leakage.

FUEL SYSTEM

Carburettors

At every all-round lubrication of the vehicle, the oil level in the carburettor damping cylinders should be checked. If necessary, top up with engine oil SAE 20 (not multigrade). See Fig. 18.

Do not add too much oil. Only the actual centre spindle should be filled and not the part above it.

REMOVING THE CARBURETTORS

Both the carburettors must be removed at the same time from the intake manifold since the intermediate shaft is mounted in the levers on the throttle flap spindles.

Fig. 18. Checking the oil level.

1. Nut 2. Suction chamber

1. Remove the air cleaners, fuel pipes, vacuum hose and controls from the carburettors.
2. Unscrew all nuts which hold the carburettors to the intake manifold.
3. Pull both the carburettors off at the same time from the intake manifold. Cover the induction ports with masking tape.

DISMANTLING THE CARBURETTORS

1. Remove the damping piston and suction chamber complete with piston.
2. Unscrew the float chamber cover and lift it up. Then remove the float chamber.
3. Unscrew the screws which hold the levers for the choke and fast idling control, pull them off and remove the jet.
   Remove the adjusting nut and locknut as well as the jet sleeve, see Fig. 23.
4. Wash all parts in white spirit and blow them dry with compressed air.

   The air cleaners must not be washed since they have paper elements.

CHECKING AND ASSEMBLING THE CARBURETTORS

Before assembling, check that all parts are undamaged. The fit of the vacuum piston in the chamber is particularly close and its character must not be altered by filing or scraping. Minor unevennesses can be removed by careful polishing with fine emery cloth.

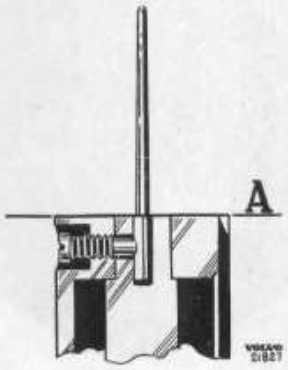


Fig. 19. Attachment of fuel needle.

A=Attachment line

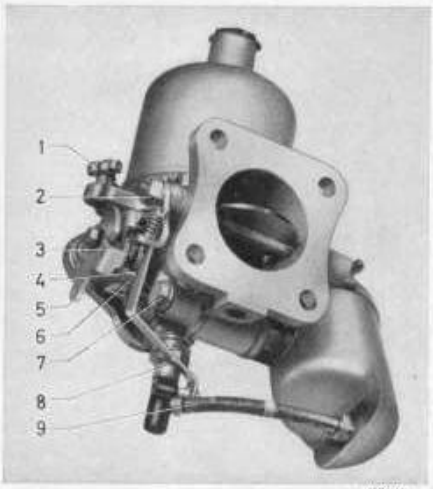


Fig. 20. Levers and springs.

1. Attachment for choke control outer casing
2. Throttle flap spindle
3. Return spring
4. Return spring
5. Lever for fast idling, etc.
6. Lever for lowering jet
7. Bolt for float chamber
8. Link for lowering jet
9. Fuel line

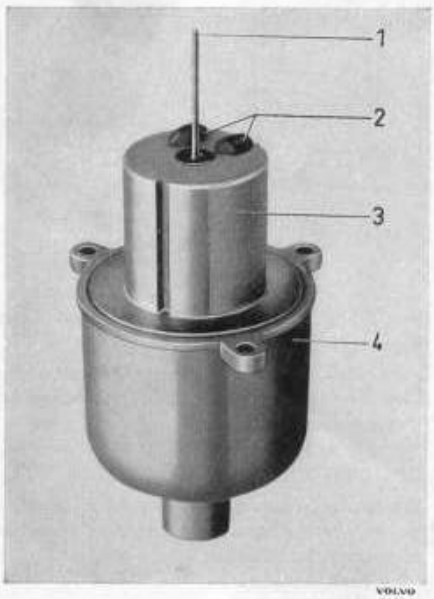


Fig. 21. Fit of vacuum piston.

1. Fuel needle
2. Rubber or cork plugs
3. Vacuum piston
4. Suction chamber

1. Fit the fuel needle as shown in Fig. 19. Only the tapered part of the needle should project outside the piston.
2. Fit the spring, washer and piston in the suction chamber and bolt this to the carburettor housing.
3. Fit the jet sleeve and locknut, see Fig. 23. Push in the jet and centre it, see "Centring the jet".
4. Fit the spring for the adjusting nut and jet, see Fig. 20.
5. Check and attach the float valve (see Fig. 22). Fit the float and cover. Fit on the float chamber and connect the line to the jet.

FIT OF VACCUM PISTON

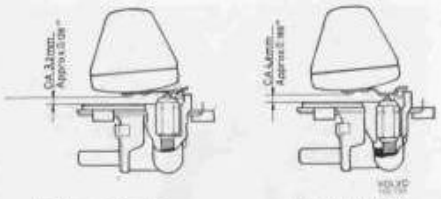
The fit can be checked by plugging the air holes in the piston with, for example, small corks, placing them in the suction chamber and holding the parts upside down. The damping piston should be fitted but not filled with oil. The vacuum piston spring should not be fitted. The piston should normally sink to the bottom from the position shown in Fig. 21 in 5–7 seconds.

REPLACING THE FLOAT VALVE

1. Remove the float chamber cover and turn it upside down.
2. Remove the pin for the float lever. Remove the float.
3. Screw out the valve and fit a new one. Fit the float.
4. Check that the cover gasket is in good condition and then fit and tighten the cover.

CHECKING THE FLOAT LEVEL

These carburettors are relatively insensitive to variations in the float level. As a guiding value for the correct level, the position of the float can be



Early production Late production

Fig. 22. Checking the float level.

checked in accordance with the measurements shown in Fig. 22.

If the measurements are incorrect, the lever on the float should not be adjusted but the faulty part should be replaced.

CENTRING THE JET

It is usually only necessary to centre the jet when the carburettors have been dismantled, or when such parts that influence the centring of the jet have been replaced.

When centring is carried out, the carburettors should be removed. The carburettor concerned is laid on a bench as shown in Fig. 24, and the vacuum piston moved backwards and forwards with a finger while exerting light pressure against the throttle flap. This centres the jet correctly in relation to the position taken up by the vacuum piston when the engine is running. The piston is, in fact, pressed over towards the throttle flap due to the vacuum prevailing between the piston and throttle flap.

1. Remove the jet by screwing out the screw at the lower end of the link and the fuel line nipple.
2. Remove the adjusting nut (6) and spring (5, Fig. 23). Slacken the locknut so that the sleeve can be moved.
3. Push the jet into position. Note that the fuel line for the jet should be at the same angle as it is when fitted, see Fig. 24.
4. Push up the jet against the jet sleeve and, at the same time, move the vacuum piston backwards and forwards right down to the bridge while exerting light pressure against the throttle flap. Centre the jet sleeve so that it does not prevent this movement. Tighten the locknut (2) and then check that the piston can move easily right down to its lowest position when the jet is held in the upper position as described in point 3.
5. Fit the parts which have been removed. Make sure that the fuel line is not twisted when connecting it to the float chamber.

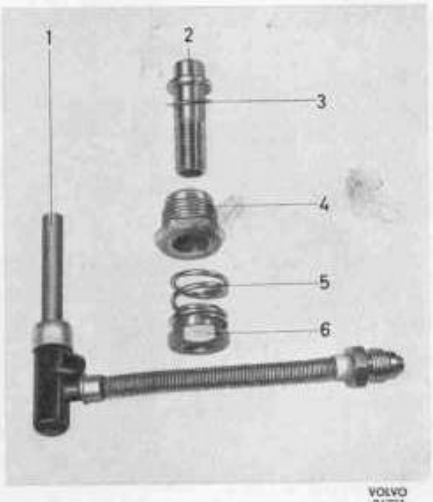


Fig. 23. The jet dismantled.

1. Jet with fuel line, complete
2. Jet sleeve
3. Washer
4. Locknut
5. Spring
6. Adjusting nut

Fitting the carburettors

1. Remove the masking tape from the induction ports. Place on new gaskets.
2. Fit the intermediate shaft in position between the carburettors, see Fig. 25. Make sure that the protective plate is in good condition and that the sealing surfaces are clean.
3. Fit both the carburettors with intermediate shaft in position at the same time. Tighten the nuts and connect up the controls and lines.
4. Carry out any necessary carburettor setting adjustments, see "Carburettor settings after fitting".
5. Fit the air cleaners but make sure that the gaskets come into their correct positions. Fill

the damping cylinders with engine oil SAE 20 (not multigrade) if necessary.

Carburettor settings after fitting (synchronizing)

In order to enable the carburettor settings to be carried out correctly, the following points must first be checked and adjusted if necessary:

Valve clearance, sparking plugs, compression, dwell angle of contact breakers, ignition timing.

If these adjustments are carried out carefully, subsequent readjustment is very seldom necessary.

At certain intervals, for example, when replacing the air cleaners, it is, however, advisable to remove and clean the suction chamber and piston thoroughly.

The float chambers should also be cleaned at the same time. This can easily be done after the float chamber covers have been removed.

Synchronizing of the carburettors includes adjustment of the clearance on the intermediate shaft, adjustment of the fuel/air mixture and idling as well as adjustment of the choke control and fast idling.

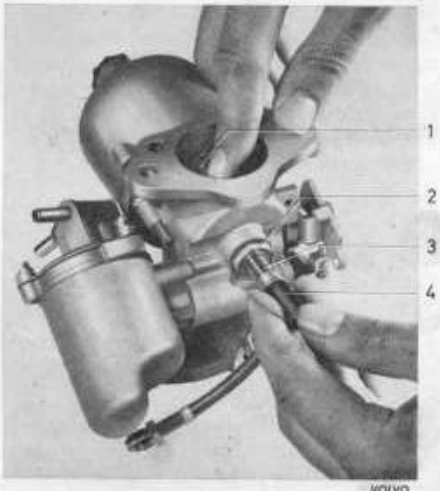


Fig. 24. Centring the jet.

1. Lower part of vacuum piston
2. Locknut
3. Jet sleeve
4. Jet

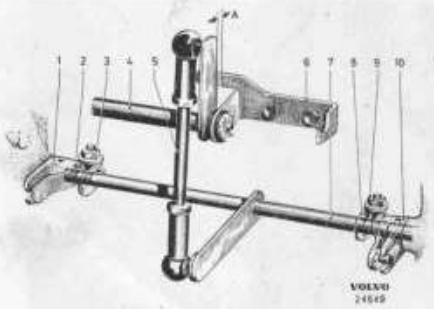


Fig. 25. Intermediate shaft and levers.

A = Clearance between stop and lever

1. Lever on throttle flap spindle
2. Lever on intermediate shaft
3. Locknut
4. Control shaft
5. Link
6. Bracket
7. Intermediate shaft
8. Lever on intermediate shaft
9. Locknut
10. Lever on throttle flap spindle

Adjusting clearance of intermediate shaft

1. Place a 0.5 mm (0.020") thick feeler gauge at "A", Fig. 25, between the lever and stop. Screw out the idle screws (2, Fig. 26) so that the throttle flap is completely closed.
2. Slacken the locknuts (3 and 9, Fig. 25) and press the outer end of the levers (2 and 8) on the intermediate shaft carefully downwards so that the pins just contact the lower tooth on the throttle flap spindle levers (1 and 10). N.B. Do not press so hard that the throttle flap is affected. Tighten the nuts (3 and 9) in this position. When tightening, note that the end float of the shaft should be distributed equally in both directions and that there is a small axial clearance between the levers on the intermediate shaft and the throttle flap spindle levers.
3. Remove the feeler gauge. Then check by lifting the lever at "A" that both throttle flaps are actuated simultaneously. Also make sure that the intermediate shaft is free and can be moved backwards and forwards slightly. It must not be pinched, for example, by the levers (2 and 8) being fitted too close to the carburettors.

Fig. 26. Controls.

1. Attachment for choke control outer casing
2. Idle adjusting screw
3. Fast idle adjusting screw
4. Lever
5. Locking screw for choke control
6. Locknut
7. Adjusting nut
8. Jet

Adjusting fuel/air mixture and idling

1. Roughly adjust the height of the jet by first screwing up the adjusting nut (7, Fig. 26) to its upper position and then screwing it back 1½ turns. Adjust both carburettors equally.
2. Turn the idle adjusting screws (2) so that they just touch the throttle flap spindle levers when the throttle flaps are closed. Then screw them down half a turn.
3. Fill the carburettor damping cylinders with oil. Use engine oil SAE 20, not multigrade. Only fill the centre spindle of the vacuum piston, not the part above it.
4. Start the engine. Adjust idling speed to 600–800 r.p.m. (B 18 B) and 500–700 r.p.m. (B 18 D) with the idle adjusting screws (2). Turn the screws so that the induction sound is equally strong on both carburettors. Run the engine warm.
5. Adjust the height of the jet (and thereby the fuel/air mixture) accurately by turning the adjusting nut (7). The best position is reached when the highest engine speed is obtained without altering the idle adjusting screw. When adjusting, screw the adjusting nut first slowly downwards (richer mixture) until the engine starts to run roughly, and then slightly upwards (leaner mixture) so that the engine runs smoothly. Adjust the carburettors one at a time.
6. Adjust the idling speed with the idle adjusting screws. Remember to adjust equally on both carburettors.
7. Check that the fuel/air mixture is correct on both carburettors. First lift the piston in one of the carburettors by using the pin beside the air intake and then lift the piston in the other carburettor the same amount. The engine should run about equally unevenly in both cases. The engine speed should also fall off by about 100–150 r.p.m. in both cases. If the engine stalls when one of the carburettor pistons is lifted, this usually indicates that the mixture in the other carburettor is too lean. If the engine speed increase, the mixture in the other carburettor is too rich.

   Adjustment must be carried out particularly accurately in the two last-mentioned cases.

Adjusting the choke control and fast idling

The fast idling adjustment described below is a normal setting. The setting can also be varied to suit different requirements and temperatures. In very cold weather it may be advisable to adjust the fast idle screw so that it contacts the idling cam earlier than in the setting described below.

Adjustment must always be carried out in such a way that both carburettors are affected to exactly the same extent by the control.

1. Pull out the choke control on the instrument panel about 15 mm (5/8").
2. Loosen the screw (5, Fig. 26) for the control cable. Lift the lever so much that the jet just starts to go down.
3. Adjust the fast idle screw (3) so that it just touches the fast idle cam on the lever (4) when the jet starts to be influenced as described in the previous point. Tighten the locking screw for the control cable in this position.
4. Carefully adjust the other carburettor in the same way.

Fig. 27. Replacing air cleaner element (P 120 right-hand drive)

1. Cover
2. Element
3. Retainer

5. Check by pulling out the control that both carburettors are influenced to exactly the same extent. The easiest way of doing this is to pull out the control about 20 mm ($^{13}/_{16}$") and then watching the jets go down.

   Adjust the setting if the jets do not go down equally.

After adjustments have been carried out, the vehicle should be test-run and a further check of the fuel mixture done **out-of-doors.** This is particularly important during winter with low outside temperatures. The large temperature variations between a heated workshop and below-zero weather outside affect the composition of the fuel mixture.

Adjusting the accelerator pedal

The length of the long vertical push rod from the control on the body should be adjusted so that there is a clearance of 1 mm (0.04") between the heel of the throttle flap spindle lever and the full throttle stop on the carburettors when the accelerator pedal is fully depressed. This means that when the pedal is fully depressed, the thrust exerted by the driver's foot will then be taken up against the floorboard without subjecting the throttle control system to unnecessary loading.

Fig. 28. Replacing air cleaner.

AIR CLEANERS

The only servicing measure required here is to replace both the air cleaners with new ones after every 20 000 km (12 500 miles). The old cleaners should be discarded.

When most of the driving is done over dusty roads or in districts with particularly contaminated air, the air cleaners should be changed more frequently, about every 10 000 km (6 000 miles).

No cleaning of any sort is permitted between the changes specified above.

The vehicle should not be run without air cleaners fitted, since the carburettors are dependent on the resistance to air flow through the air cleaner elements. Engine wear will also increase considerably if the air is not cleaned.

1. Remove the air cleaners by unscrewing the attaching bolts.
2. Make sure the gaskets are turned the right way round, see Fig. 28, and fit the new air cleaners.

   If the gaskets are turned the wrong way, the ventilation holes for the vacuum pistons will be blocked and the carburettors will not be able to function properly.

   On P 120 right-hand drive vehicles the air cleaners have replaceable elements. The changing intervals for the elements are the same as those for air cleaners with non-replaceable elements.

   Remove the wing nut, lift off the casing and replace the element with a new one. Make sure the contact surfaces for the element are clean. Take care that no dirt gets into the air intake or on the inside of the element.

FAULT TRACING

FAULT	
REASON	**REMEDY**
The engine stalls or runs very roughly at idling speed	
Faulty sparking plug or suppressor.	Check or replace sparking plug or suppressor.
Air leaks at carburettor connections.	Check for tightness. Replace faulty gaskets and washers.
Idling speed too low.	Increase idling speed and check that the induction sound is equally strong on both carburettors.
Uneven carburettor settings.	See "Carburettor settings after fitting".
The engine runs unevenly at low speeds	
Fuel needle and jet worn.	Replace the needle and jet.
Uneven running with cold engine and choke in use	
The carburettors are not being influenced to the same extent by the choke control.	Adjust settings. See "Adjusting the choke control and fast idling".
The engine runs jerkily during acceleration	
Dirty sparking plug insulators.	Clean insulators.
Faulty sparking plugs.	Check or replace sparking plugs.
Dirty, faulty or moist distributor cap.	Remove and clean or change distributor cap. Check, clean or replace cables. See also Part 3.
Oil in carburettor damping cylinders insufficient or too thin.	Top up with oil of the right grade and viscosity.
Dirt in carburettors.	Remove float chamber covers and clean chambers.
Fuel/air mixture too lean.	Check carburettor settings.
Faulty fuel pump supplying too little fuel.	Check fuel pump pressure and capacity.
Engine output low	
Air cleaners blocked.	Fit new air cleaners.
Poor fuel being used, too low octane rating.	Check fuel grade, use correct fuel.
Faulty ignition setting.	Adjust ignition setting at fast idling speed by using stroboscope. See "Ignition setting".
Faulty and uneven settings on carburettors.	Check and adjust carburettor settings. See "Carburettor settings after fitting".
Faulty valve clearances.	Check and adjust valve clearances.
Low compression on one cylinder.	Measure compression pressure. If values are too low, remove cylinder head for closer investigation of engine.
Binding piston.	Remove cylinder head for investigation.
Wheel bearings binding or brakes badly adjusted.	See Parts 5 and 7.

Knocking noise from valve mechanism

Valve clearances too large.	Adjust valve clearances.
Worn or damaged parts in valve mechanism.	Recondition or replace parts where necessary.

Heavy regular knocking sound, more obvious when engine is under loading

Worn main or big-end bearings, worn piston and gudgeon pins.	Locate sound by short-circuiting the sparking plugs one after another. Then dismantle as far as required to examine bearings and pistons.

Low oil pressure

Low pressure at idling speed.	When the engine has been run hard and then allowed to run at the lowest idling speed, the oil pressure is normally quite low.
Oil filter blocked. (The engine must run for a longer time than usual after starting before pressure is registered).	Change the oil filter.
Faulty oil pressure contact, pressure gauge or pipe.	Measure pressure with reference pressure gauge. Replace faulty contact, pressure gauge or pipe.
Faulty spring in relief valve or worn oil pump.	Remove oil pump. Check spring and pump.
One or more bearings worn.	Examine and replace bearing shells.
Excessively wear generally.	Replace or reconditioning the engine.

High oil consumption

Hard driving.	No action necessary. Oil consumption can increase to a certain extent when the car is driven very hard.
Leakage at joints.	Tighten bolts and screws, replace faulty or poor gaskets and washers all round.
Oil level too high.	Do not top up with oil until the level starts to go down towards the lower mark on the dipstick.
Worn valve guides.	Recondition valve system.
Worn piston rings.	Replace piston rings.

High fuel consumption

Hard driving on motorways or much town driving.	No action necessary. Normal under these conditions.
Blocked air cleaners.	Replace air cleaners.
Carburettor flooding.	Check and if necessary replace float valves. Also check fuel pump pressure.
Faulty carburettor settings, excessively rich fuel/air mixture.	Adjust settings.
Poor suppressors on sparking plugs. Faulty contact breaker points.	Replace sparking plug suppressors. Adjust distributor.
Faulty dwell angle and ignition timing.	Adjust dwell angle and ignition timing. Use stroboscope for adjustment of ignition timing.

Engine runs abnormally warm

Not enough cooling water.	Fill up with cooling water.
Faulty temperature gauge.	Check or replace temperature gauge.
Fuel has too low an octane rating (knocking).	Fill up with fuel of correct octane rating.
Faulty thermostat.	Replace thermostat.
Faulty ignition timing.	Adjust ignition timing.
Faulty carburettor settings (excessively lean fuel/air mixture)	Adjust carburettor settings.
Blocked cooling system.	Clean out cooling system.
Fan belt insufficiently tensioned.	Adjust belt tension.

Loss of cooling water

Leaking hose connections.	Check or replace hoses and hose clips.
Faulty radiator cap.	Replace radiator cap.
Faulty cylinder head gasket (oil in cooling water).	Replace cylinder head gasket.

SPECIFICATIONS

GENERAL

	B 18 B	B 18 D (496802-815-816-817)
Type designation		
Output, b.h.p. at r.p.m. (SAE)	100/5500 (496800)*	90/5000
(DIN)	90/5500	80/5000
(SAE)	108/5800 (496812-817)	
(DIN)	95/5600	
Max. torque, kgm (lb.ft.) at r.p.m. (SAE)	15.0 (108)/4000 (496800)	14.5 (105)/3500 14.0 (101)/3000
(SAE)	14.5 (105)/3500	
(DIN)	15.2 (110)/4000 (496812-817)	
(DIN)	14.3 (103)/3800	
Compression pressure (warm engine) when turned over with starter motor at 250–300 r.p.m., kg/cm²	12–14	11–13
lb/sq.in.	170–200	156–185
Compression ratio	9.5:1 (496800)	8.5:1
	10.0:1 (496812-817)	–
Number of cylinders	4	
Bore	84.14 mm (3.313")	
Stroke	80 mm (3.150")	
Displacement	1.78 litres	

CYLINDER BLOCK

Material	Special-alloy cast iron
Bore, standard	84.14 mm (3.313")
0.020" oversize	84.65 mm (3.332")
0.030" "	84.90 mm (3.342")
0.040" "	85.16 mm (3.353")
0.050" "	85.41 mm (3.362")

PISTONS

Material	Light-alloy
Permissible weight difference between pistons in same engine	10 gm (0.35 oz.)
Height, overall, early prod.	83.5 mm (3.29")
late prod.	71.0 mm (2.79")
Height from centre of gudgeon pin to piston crown	46 mm (1.81")
Piston clearance	0.02–0.04 mm (0.0008–0.0016")

PISTON RINGS

Piston ring gap measured in ring opening	0.25–0.50 mm (0.010–0.020")
Piston ring oversizes	0.020"
	0,030"
	0.040"
	0.050"

* The figures in brackets refer to the engine type number and are stamped on the engine (9, Fig. 1), where the front number refers to the type and the rear one to the consecutive manufacturing serial number.

	B 18 B	B 18 D
Compression rings		
Marked "TOP". Upper ring on each piston chromed.		
Number of rings on each piston		2
Height		1.98 mm (0.078")
Piston ring clearance in groove		0.054–0.081 mm (0.0021–0.0032")
Scraper rings		
Number on each piston		1
Height		4.74 mm (0.187 = 3/16")
Piston ring clearance in groove		0.044–0.072 mm (0.0017–0.0028")
GUDGEON PINS		
Floating fit. Circlips at both ends in piston.		
Fit:		
In connecting rod		Close running fit.
In piston		Push fit
Diameter, standard		22.00 mm (0.866")
0.05 mm (0.002") oversize		22.05 mm (0.868")
0.10 mm (0.004") "		22.10 mm (0.870")
0.20 mm (0.008") "		22.20 mm (0.874")
CYLINDER HEAD		
Height, measured from cylinder head contact surface to face under bolt heads	87.0 mm (3.425") (496800) 86.2 mm (3.394") (496812-817)	88 mm (3.465")
Distance from upper surface of cylinder head to upper end of overflow pipe (pipe located under thermostat)		35 mm (1.38")
CRANKSHAFT		
Crankshaft end float		0.017–0.108 mm (0.0007–0.0042")
Big-end bearings, radial clearance		0.039–0.081 mm (0.0015–0.0032")
Main bearings, radial clearance	0.038–0.089 mm (0.0015–0.0035")	0.026–0.077 mm (0.0010–0.0030")
MAIN BEARINGS		
Main bearing journals		
Diameter, standard		63.441–63.454 mm (2.4977–2.4982")
undersize 0.010"		63.187–63.200 mm (2.4877–2.4882")
0.020"		62.933–62.946 mm (2.4777–2.4782")
0.030"		62.679–62.692 mm (2.4677–2.4682")
0.040"		62.425–62.438 mm (2.4577–2.4582")
0.050"		62.171–62.184 mm (2.4477–2.4482")
Width on crankshaft for flange bearing shell		
Standard		38.930–38.970 mm (1.5327–1.5342")
Oversize 1 (undersize shell 0.010")		39.031–39.072 mm (1.5367–1.5383")
2 (" " 0.020")		39.133–39.173 mm (1.5407–1.5422")
3 (" " 0.030")		39.235–39.275 mm (1.5447–1.5463")
4 (" " 0.040")		39.336–39.376 mm (1.5487–1.5502")
5 (" " 0.050")		39.438–39.478 mm (1.5527–1.5543")

MAIN BEARING SHELLS

	B 18 B	B 18 D
Thickness, standard	1.979–1.985 mm (0.0779–0.0781")	1.985–1.991 mm (0.0781–0.0784")
undersize 0.010"	2.106–2.112 mm (0.0829–0.0831")	2.112–2.118 mm (0.0831–0.0834")
0.020"	2.233–2.239 mm (0.0879–0.0881")	2.239–2.245 mm (0.0881–0.0884")
0.030"	2.360–2.366 mm (0.0929–0.0931")	2.366–2.372 mm (0.0931–0.0934")
0.040"	2.487–2.493 mm (0.0979–0.0981")	2.493–2.499 mm (0.0981–0.0984")
0.050"	2.614–2.620 mm (0.1029–0.1031")	2.620–2.626 mm (0.1031–0.1034")

BIG-END BEARINGS

Big-end bearing journals

Bearing seat width	31.950–32.050 mm (1.2579–1.2618")
Diameter, standard	54.089–54.102 mm (2.1295–2.1300"
undersize 0.010"	53.835–53.848 mm (2.1195–2.1200")
0.020"	53.581–53.594 mm (2.1095–2.1100")
0.030"	53.327–53.340 mm (2.0995–2.1000")
0.040"	53.073–53.086 mm (2.0895–2.0900")
0.050"	52.819–52.832 mm (2.0795–2.0800")

Big-end bearing shells

Thickness, standard	1.833–1.841 mm (0.0722–0.0725")
undersize 0.010"	1.960–1.968 mm (0.0772–0.0775")
0.020"	2.087–2.095 mm (0.0822–0.0825")
0.030"	2.214–2.222 mm (0.0872–0.0875")
0.040"	2.341–2.349 mm (0.0922–0.0925")
0.050"	2.468–2.476 mm (0.0972–0.0975")

CONNECTING RODS

End float on crankshaft	0.15–0.35 mm (0.006–0.014")
Length, centre–centre	145 ± 0.1 mm (5.710 ± 0.004")
Maximum permissible difference in weight between connecting rods in the same engine	6 grammes (0.21 oz.)

FLYWHEEL

Permissible axial throw, max.	0.05 mm/150 mm diam. (0.002"/6" diam.)
Ring gear (chamber facing forwards)	142 teeth

FLYWHEEL HOUSING

Permissible axial throw, max.	0.05 mm/100 mm diam. (0.002"/4" diam.)
Max. radial throw for rear guide	0.15 mm (0.006")

CAMSHAFT

Marked	B (496800) C (496812-817)	A
Number of bearings	3	

	B 18 B	B 18 D
Front bearing journal, diameter	46.975–47.000 mm (1.8494–1.8504")	
Centre bearing journal, diameter	42.975–43.000 mm (1.6919–1.6929")	
Rear bearing journal, diameter	36.975–37.000 mm (1.4557–1.4567")	
Radial clearance	0.020–0.075 mm (0.0008–0.0030")	
End float	0.020–0.060 mm (0.0008–0.0024")	
Valve clearance for check of camshaft setting (cold engine)		
B 18 B	1.15 mm (0.045") (496800)	
B 18 B	1.45 mm (0.057") (496812-817)	
B 18 D		1.1 mm (0.043")
Inlet valve should then open at	0° (T.D.C.)	10° after T.D.C.

CAMSHAFT BEARINGS

Front bearing, diameter	47.020–47.050 mm (1.8512–1.8524")
Centre bearing, diameter	43.025–43.050 mm (1.6939–1.6949")
Rear bearing, diameter	37.020–37.045 mm (1.4575–1.4585")

TIMING GEARS

Crankshaft gear, number of teeth	21
Camshaft gear, (fibre), number of teeth	42
Tooth flank clearance	0.04–0.08 mm (0.0016–0.0032")
End float, camshaft	0.02–0.06 mm (0.0008–0.0023")

VALVES

Inlet

Disc diameter	40 mm (1.58")
Stem diameter	8.685–8.700 mm (0.3419–0.3425")
Valve seat angle	44.5°
Cylinder head seat angle	45°
Seat width in cylinder head	1.4 mm (0.055")

Exhaust

Disc diameter	35 mm (1.38")
Stem diameter	8.645–8.660 mm (0.3403–0.3409")
Valve seat angle	44.5°
Cylinder head seat angle	45°
Seat width in cylinder head	1.4 mm (0.055")

Valve clearances

Clearance, warm engine and cold engine, inlet	0.50–0.55 mm (0.020–0.022")	0.40–0.45 mm (0.016–0.018")
Clearance, warm and cold engine, exhaust	0.50–0.55 mm (0.020–0.022")	0.40–0.45 mm (0.016–0.018")

VALVE GUIDES

Length	63 mm (2.48")
Inner diameter	8.725–8.740 mm (0.3435–0.3441")

	B 18 B	B 18 D
Height above upper surface of head		21 mm (0.83")
Clearance, valve stem–guide, inlet valves		0.025–0.055 mm (0.0010–0.0022")
exhaust valves		0.065–0.095 mm (0.0026–0.0037")

VALVE SPRINGS

Early production	
Length, unloaded, approx.	45 mm (1.77")
loaded with 25.5±2 kg (56±4½ lb.)	39 mm (1.54")
66±3.5 kg (145±8 lb.)	30.5 mm (1.20")
Late production	
Length, unloaded, approx.	46 mm (1.81")
loaded with 29.5±2.3 kg (65±5 lb.)	40 mm (1.57")
82.5±4.3 kg (182±9½ lb.)	30 mm (1.18")

LUBRICATING SYSTEM

Oil capacity, including oil filter	3.75 litres (3¼ Imp.qts = 4 US qts.)
Oil capacity, excluding oil filter	3.25 litres (3¼ Imp.qts = 3½ US qts.)
Oil pressure at 2000 r.p.m. (with warm engine and new oil filter)	3.5–6.0 kg/cm² (50–85 lb./sq.in.)
Lubricant	Engine oil "For Service MS"
viscosity, below 0°C (32°F)	SAE 10 W } or multigrade oil
between 0°C (32°F) and +30°C (90°F)	SAE 20 } SAE 10 W–30
above +30°C (90°F)	SAE 30 }

Lubricating oil filter

Type	Full-flow
Make	Wix or Mann

Lubricating oil pump

Oil pump, type	Gear pump
Oil pump, number of teeth on each gear	10
end float	0.02–0.10 mm (0.0008–0.0040")
radial clearance	0.08–0.14 mm (0.0032–0.0055")
tooth flank clearance	0.15–0.35 mm (0.0060–0.0140")

Relief valve spring (in oil pump)

Length, unloaded, early prod.	approx. 31 mm (1.22")
late prod.	approx. 32.5 mm (1.28")
loaded with 4.0±0.2 kg (9±½ lb.)	27.5 mm (1.08")
9.5±0.3 kg (21±¾ lb.)	22.5 mm (0.88")
8.0±0.8 kg (18±1¾ lb.)	22.5 mm (0.88")

FUEL SYSTEM

Fuel pump

Fuel pump, type I. Diaphragm pump	AC–UG
Fuel pump, type II. Diaphragm pump	Pierburg APG
Fuel pump, type III. Diaphragm pump	AC–YD
Fuel pressure, measured at same height as pump	min. 0.11 kg/cm² (1.5 lb./sq.in.)
	max. 0.25 kg/cm² (3.5 lb./sq.in.)

Carburettors

	B 18 B	B 18 D
Type	Horizontal, twin	
Make and designation	SU-HS 6	
Number of carburettors	2	
Size (air intake)	44.5 mm (1¾")	
Fuel needle, designation	ZH	
Idling speed	600–800 r.p.m.	500–700 r.p.m.
Oil for damping cylinders	SAE 20 engine oil (not multigrade)	

IGNITION SYSTEM

Voltage	12 V	
Order of firing	1–3–4–2	
Ignition timing setting with stroboscope at 1500 r.p.m., 97–100 octane (Research Method) (vacuum regulator on B 18 D disconnected)		22–24° before T.D.C.
Ignition timing setting with stroboscope at 1500 r.p.m., 100 octane (Research Method)	17–19° before T.D.C.	
Sparking plugs	Bosch W225 T1	Bosch W175 T1
Sparking plug gap	0.7–0.8 mm (0.028–0.032")	
tightening torque	3.8–4.5 mm (28–32 lb.ft.)	

Distributor

Make	Bosch
Contact breaker gap	0.4–0.5 mm (0.016–0.020")
pressure	0.4–0.6 kg (0.8–1.3 lb.)
Dwell angle	62±3°
Direction of rotation	Anti-clockwise

COOLING SYSTEM

Type	Pressure
Radiator cap valve opens at	0.23–0.30 kg/cm² (3–4 lb./sq.in.)
Capacity	approx. 8.5 litres (2 Imp. galls= 2¼ US galls.)
Fan belt, designation	HC 38×35"
tension: the pulley should start slipping when the force applied is	8.0–11 kg (17.6–24.3 lb.) at a lever of 150 mm (6")

Anti-freeze

Amount of glycol required for frost protection down to

–10°C (15°F)	2 litres (3½ Imp.pints=4 US pints)
–20°C (–5°F)	3 litres (5¼ Imp.pints=6 US pints)
–30°C (–22°F)	4 litres (7 Imp.pints=9 US pints)
–40°C (–40°F)	4.5 litres (1 Imp.gall=1¼ US galls)

The maximum depression of freezing point (–56°C=–69°F) is obtained by the addition of 5.1 litres (9 Imp.pints=11 US pints) of ethylene glycol.

Thermostat

Type	Fulton Sylphon 1–1700–D3
Marking	170

	B 18 B	B 18 D
Starts to open at		75–78°C (167–172°F)
Fully open at		89°C (192°F)

WEAR TOLERANCES

Cylinders

To be rebored when wear reaches (if engine shows abnormal oil consumption)	0.25 mm (0.010")

Crankshaft

Permissible out-of-round on main bearing journals, max.	0.05 mm (0.0020")
Permissible out-of-round on big-end bearing journals, max.	0.07 mm (0.0030")
Max. crankshaft end float	0.15 mm (0.0060")

Valves

Permissible clearance between valve stems and valve guides, max.	0.15 mm (0.0060")
Valve stems, permissible wear, max.	0.02 mm (0.0008")

Camshaft

Permissible out-of-round (with new bearings) max.	0.07 mm (0.0030")
Bearings, permissible wear	0.20 mm (0.0008")

Timing gears

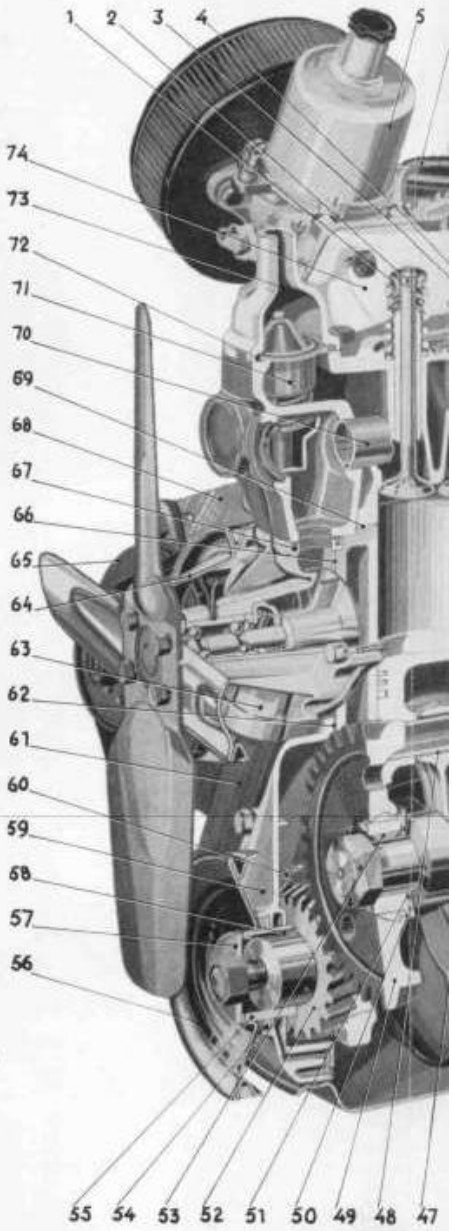
Permissible backlash, max.	0.12 mm (0.0050")

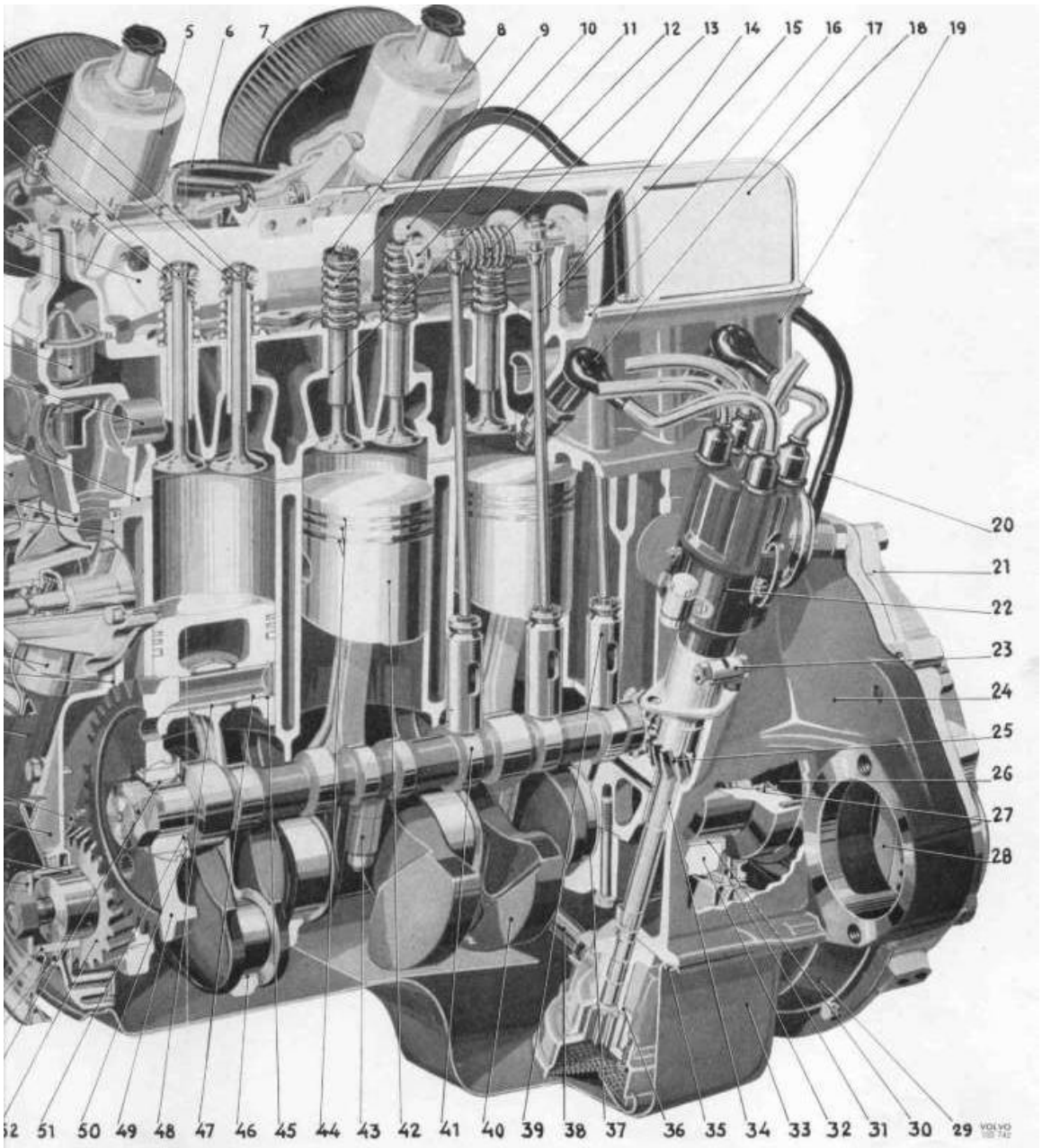
TIGHTENING TORQUES

	kgm	lb.ft.
Cylinder head	8.5–9.5	61–69
Main bearings	12–13	87–94
Big-end bearings	5.2–5.8	38–42
Flywheel	4.5–5.5	33–40
Sparking plugs	3.8–4.5	28–32
Camshaft nut	13–15	94–108
Crankshaft pulley bolt	7–8	51–58
Dynamo bolt (3/8"–16)	3.5–4.0	25–29
Oil cooler nut	3.0–3.5	22–25
Nipple for oil cooler and oil filter	4.5–5.5	33–40
Sump bolts	0.8–1.1	6–8

Illustration I. Sectional view of the B 18 B/D engine.

1. Upper valve washer
2. Exhaust valve
3. Valve cotter
4. Inlet valve
5. Front carburettor
6. Fuel hose
7. Rear air cleaner
8. Sealing ring
9. Valve spring
10. Rocker arm
11. Rocker arm shaft
12. Valve guide
13. Spring
14. Bearing block
15. Push rod
16. Rocker arm casing gasket
17. Cable terminal on sparking plug
18. Rocker arm casing
19. Cylinder head
20. Vacuum hose
21. Flywheel housing
22. Distributor
23. Clamp
24. Cylinder block
25. Distributor drive gear
26. Circlip and washer
27. Pilot bearing
28. Flywheel
29. Cover plate
30. Flange bearing shell
31. Sealing flange
32. Main bearing cap
33. Sump
34. Bush
35. Gasket
36. Oil pump
37. Main bearing shell
38. Delivery pipe
39. Valve tappet
40. Crankshaft
41. Camshaft
42. Piston
43. Connecting rod
44. Piston rings
45. Circlip
46. Big-end bearing shell
47. Gudgeon pin
48. Gudgeon pin bush
49. Camshaft gear
50. Thrust washer
51. Spacing ring
52. Crankshaft gear
53. Key
54. Seal
55. Hub
56. Belt pulley
57. Washer
58. Key
59. Timing gear casing
60. Oil nozzle
61. Coolant inlet
62. Gasket
63. Water pump
64. Belt pulley
65. Dynamo
66. Gasket
67. Sealing ring
68. Belt tensioner
69. Cylinder head gasket
70. Distributor pipe
71. Thermostat
72. Gasket
73. Coolant inlet
74. Intake manifold

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VOLVO
TP 10115/1
5.000. 6.65.
Engelska
Printed in Sweden

RUNDQVISTS BOKTRYCKERI, GÖTEBORG 1965