

## Section E10

## Engine lubrication system

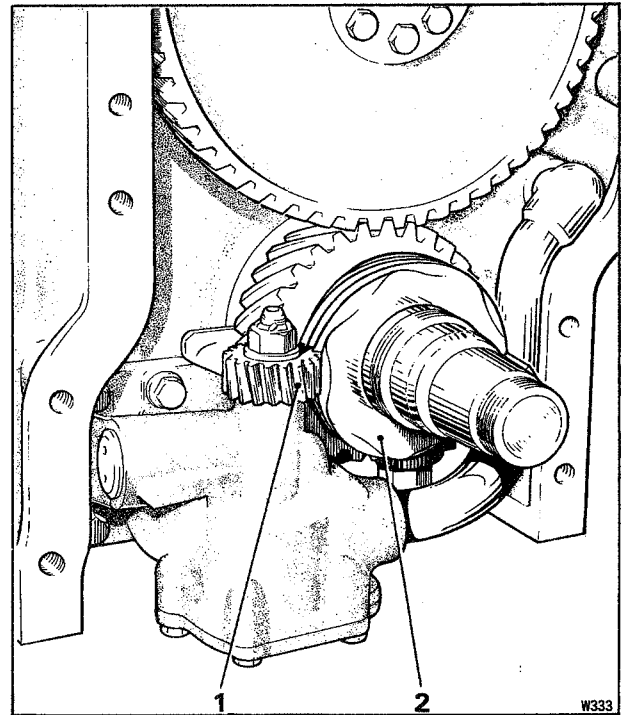
**Oil pump - To remove**

1. Drive the car onto a ramp and chock the road wheels to prevent the car from moving.
2. Carry out the usual workshop safety precautions.
3. Drain the cooling system (see Chapter L).
4. Drain the engine oil.
5. Remove the bonnet as described in Chapter S.
6. Remove the radiator grille.
7. Remove the coolant fan, viscous coupling assembly, radiator and header tank (see Chapter L).
8. Remove the exhaust downtake pipes. Refer to Chapter Q.
9. Using a jack, support the weight of the engine

**Note**

Do not support the weight of the engine under the front pulley.

10. Remove the nuts and washers securing the front engine mounting to the crossmember.
11. Remove the drive belts from the crankshaft pulley.
12. Disconnect the electrical wiring to the alternator, taking a careful note of the connections to ensure correct assembly.
13. Remove the nut, bolt and distance washer from the alternator adjusting strap.
14. Detach the alternator from its front and rear mounting points and remove.
15. Disconnect the alternator adjusting strut.
16. Disconnect the heater pipes from the coolant pump.
17. Disconnect the thermostat by-pass pipe at the coolant pump.
18. Remove the oil pressure gauge capacitor from the front lower casing.
19. Remove the setscrews securing the coolant pump to the crankcase; remove the coolant pump.
20. Discard the Neoprene seal which fits between the coolant pump and front lower casing.
21. Remove the lock-plate and setscrews securing the pulley and damper to the pulley drive flange; remove the pulley and damper.
22. Using the spanner (RH 7131), remove the serrated nut from the crankshaft.
23. Using the withdrawal tool (RH 7097), remove the pulley driving flange (see Fig. E44).
24. Remove the setscrews securing the front lower casing. Note that this casing is doweled to the crankcase.
25. Detach the oil pipe connecting the pump to the filter intake ensuring that the rubber 'O' ring fitted at the filter end of the pipe is also removed.
26. Remove the setscrews securing the pump to the



**Fig. E42 View of oil pump in position**

- 1 Oil pump driven gear
- 2 Oil pump drive gear

crankcase, withdraw the pump together with the dowel inserts.

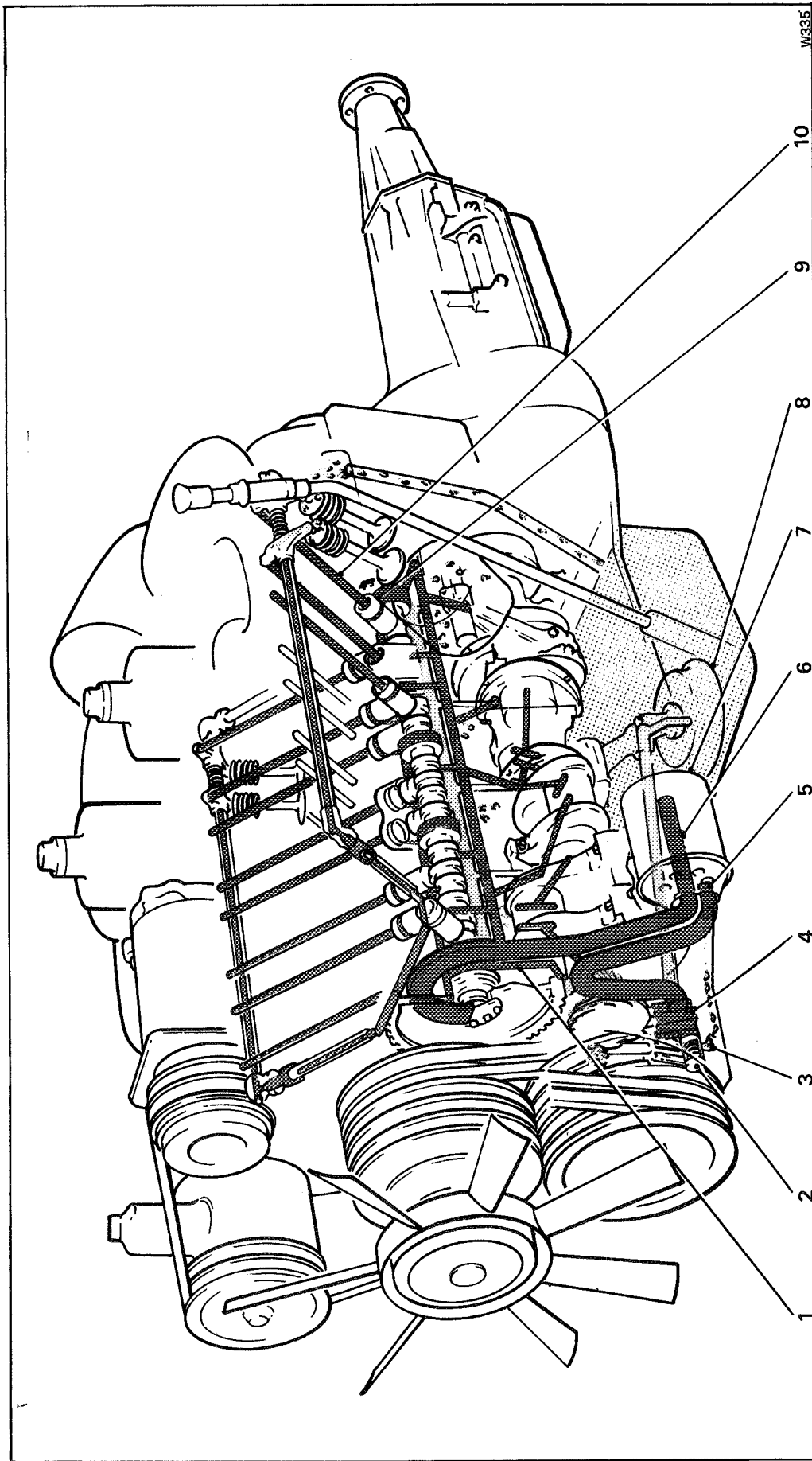
When withdrawing the oil pump, it may be necessary to turn the unit from side to side as it is removed.

**Crankshaft oil pump driving gear - To remove**

1. With the front engine cover removed from the crankcase use the special spanner (RH 7110) to remove the serrated nut from the crankshaft.
2. Remove the washer and the two oil flingers (if fitted).
3. The oil pump driving gear can now be withdrawn.

**Oil pump - To test**

The pump must be tested on a rig which has a variable orifice so that the oil delivery pressure from the pump can be restricted. The rig should also be able to drive the pump at a controlled speed and be capable of maintaining a constant temperature of 80°C. (176°F.) for the duration of the test. If these



**High pressure oil**      **Low pressure oil**      **Crankcase oil or splash**

**Fig. E43 Engine lubrication diagram**  
1 Oil jet to camshaft gear  
2 Relief valve  
3 Return to intake side of pump  
4 Oil pump  
5 Filter intake  
6 Filter feed to oil gallery  
7 Oil filter  
8 Oil pick-up and strainer  
9 Hydraulic tappet  
10 Push rod

facilities are available, the pump should be tested as follows.

1. Drive the pump at 200 r.p.m. then adjust the variable orifice until the pump is delivering oil at 1,055 kgf/sq.cm. (15 lbf/sq.in.); with the orifice at this setting, the pump oil delivery should be at least 4,55 litres/min. (1 gal/min.).
2. Maintain the orifice at this setting then increase the pump speed to 1500 r.p.m. At this speed, the pump oil delivery should be at least 9,00 litres/min. (2 gal/min.) at 2,95 kgf/sq.cm. (42 lbf/sq.in.). The oil pump relief valve should blow at approximately 2,96 kgf/sq.cm. (42 lbf/sq.in.).

If the performance of the pump does not conform to these figures, proceed as follows.

3. Examine the working face of the pump cover and if necessary, remove light wear marks by machining.
4. Compare the pump clearance with the figures given in Section E3, Dimensional data. If necessary renew the pump casing and fit a new matched set of gears.
5. If the condition of the pump is poor, the complete pump should be renewed.

#### Oil pump - To dismantle (see Fig. E45)

1. Hold the external driving gear in a suitable fixture, taking care that sufficient protection is provided to ensure that the teeth of the gear are not damaged.
2. Remove the split pin, nut and washer securing the driving gear to the driving shaft then carefully withdraw the gear. Remove the Woodruff key from the shaft.

Unscrew the six setscrews from the end cover; remove the cover together with the two gears from the casing.

#### Oil pump - To assemble

Assemble the oil pump by reversing the procedure given for dismantling noting the following.

1. Examine all working parts for wear and inspect the end cover and casing for distortion; renew if necessary. If the end cover is lightly scored the marks may be removed by machining.
2. Assemble the oil pump then check that the endfloat in the gears and backlash between the pump driving gear and the driven gear is correct (see Section E3, Dimensional data).
3. Torque tighten the setscrews, nuts and bolts to the figures specified in Chapter P.

#### Oil pump - To fit

Fit the oil pump by reversing the procedure given for removal, noting the following.

1. Always ensure that the oil pump driven gear is of different material to the drive gear on the crankshaft. One should be bronze and the other steel.

**Under no circumstances should gears of like metals be fitted.**

If a new oil pump driven gear is to be fitted, also fit a new oil pump driving gear to the crankshaft.

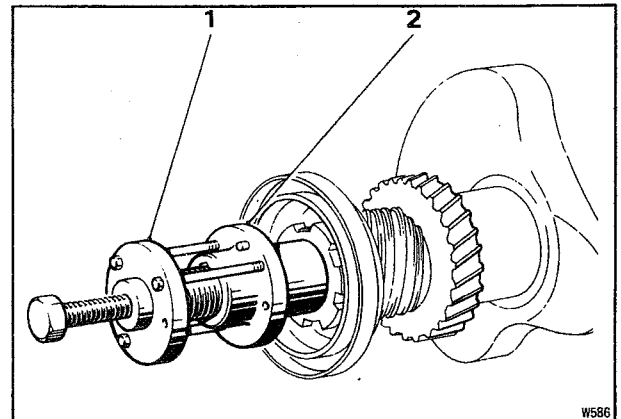


Fig. E44 Withdrawing the crankshaft front flange

- 1 Withdrawal tool (RH 7097)
- 2 Pulley driving flange

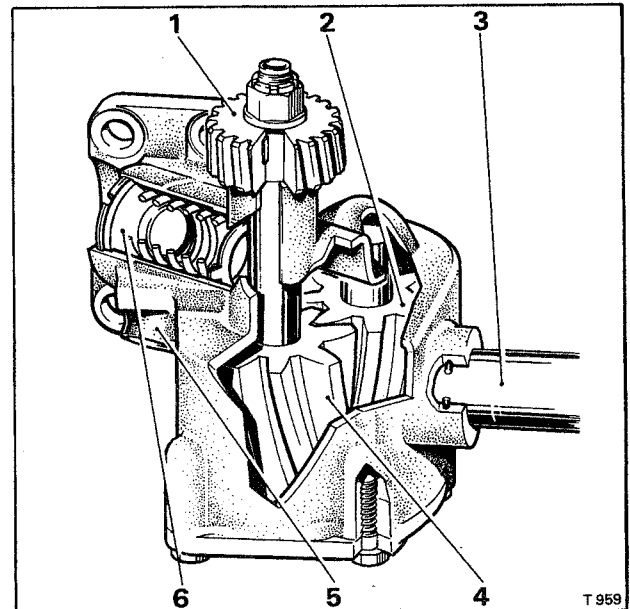


Fig. E45 Cut-away view of oil pump

- 1 Crankshaft driven gear
- 2 Oil pump driven gear
- 3 Oil filter delivery pipe
- 4 Oil pump driving gear
- 5 Oil pump body
- 6 Relief valve

2. Ensure that all setscrews, nuts and bolts are torque tightened to the figures specified in Chapter P.
3. Ensure that the backlash between the driving gear on the crankshaft and the gear on the pump is correct (refer to Section E3, Dimensional data and refer to Fig. E46).
4. When fitting the setscrews securing the pump to the engine, ensure that the dowel inserts are fitted to the holes from which they were removed.

5. The filter delivery pipe is held in position by means of a rubber pad attached to the front cover. Ensure that this pad is in position before fitting the cover. Renew the delivery pipe 'O' rings.
6. Fit new joints to the lower front cover and the oil pump facing. If the front cover to sump joint is damaged or in a poor condition it will be necessary to remove the sump to enable a new joint to be fitted (see Section E6, Connecting rod bearings - To remove).

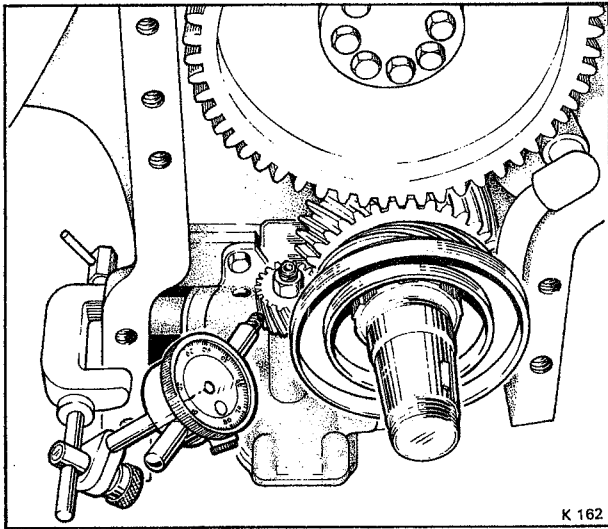


Fig. E46 Checking backlash on the oil pump gears

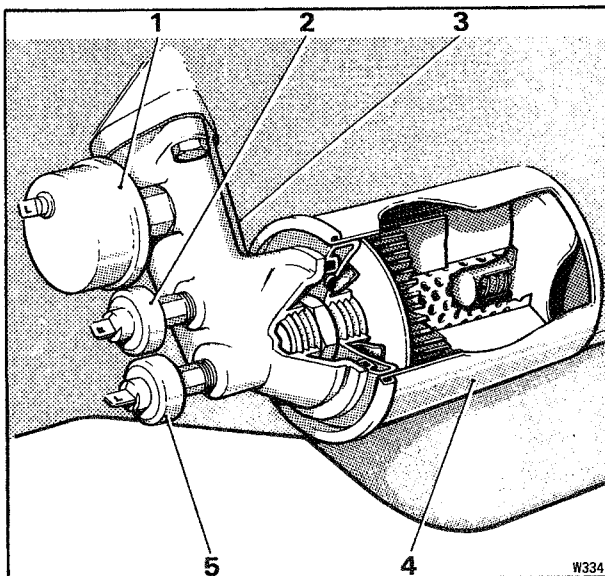


Fig. E47 Oil filter elbow and filter assembly

- 1 Oil pressure transmitter (facia oil gauge)
- 2 Oil pressure switch (warning lamp)
- 3 Oil filter elbow
- 4 Oil filter
- 5 Oil pressure switch [fuel pump(s) relay]

7. Set the engine mounting stop plate gap; this procedure is fully described in Section E12, Engine - To fit.
8. Renew the Neoprene seal between the coolant pump casing and the lower front cover and also the coolant pump 'O' rings.
9. Examine all coolant hoses for deterioration; replace any that are unserviceable.
10. Ensure that the driving belts are adjusted to the correct tension (see Chapter L).
11. Replenish the cooling system with the correct anti-freeze mixture.
12. Fill the engine with an approved oil (see Engine oil, Sump - To fill).

#### Oil filter canister - To renew (see Fig. E47)

1. Drain the oil from the engine by carrying out Operations 1 to 8 inclusive, under the heading Engine oil, Sump - To drain.
2. Position a suitable container beneath the oil filter.
3. Support the filter and unscrew, using a suitable strap spanner.
4. Pour the old oil away and discard the filter canister.
5. Examine the new canister to ensure that it is a suitable approved replacement and that the rubber sealing ring is positioned correctly.
6. Lightly smear the sealing ring with clean engine oil.
7. Fit the new canister and tighten, using hand pressure.

#### Oil pressure transmitter (facia oil gauge) - To assemble

To obtain an accurate oil pressure reading, it is essential that the oil pressure transmitter is correctly assembled to the crankcase oil filter adapter.

The transmitter should be fitted so that the lucar connection is towards the top and within 30° either side of the vertical datum.

The correct position of the transmitter can be achieved by fitting an additional copper washer to the threaded union (see Fig. E47).

#### Oil level sender unit - To replace

1. Disconnect the battery.
2. Before removing the unit which is fitted into the side of the sump, drain the sump oil (see Engine oil, Sump - To drain).
3. Remove the heatshield.
4. Disconnect the electrical leads from the unit, unscrew the six setscrews and remove the unit.
5. Always fit a new joint between the sender and the sump face before replacing an existing unit or fitting a new one.
6. Ensure that the spring washers are fitted to the securing setscrews and the heatshield is replaced.
7. Fill the sump with oil. Refer to Engine oil, Sump - To fill.

**Engine oil****Sump - To drain**

1. Position the car on a ramp and carry out the usual workshop safety precautions.
2. Raise the ramp.
3. Position a suitable container beneath the sump drain plug.
4. Clean the drain plug, sealing washer and a small area of the sump around the drain hole.
5. Unscrew the drain plug, collect the aluminium sealing washer and allow the oil to drain into the container.
6. Examine the condition of the aluminium sealing washer and renew if necessary.
7. Ensure that the plug and washer seating area on the sump is both clean and dry.
8. Fit the sealing washer and plug to the sump and tighten.
9. Fit a new oil filter canister if necessary by carrying out Operations 2 to 7 inclusive, under the heading Oil filter canister - To renew.

**Sump - To fill**

**It is most important that only engine oil of an approved grade and manufacture is used.**

10. Raise the bonnet and open the filler cap.
11. Pour 8,4 litres (14.8 Imp. pts., 17.7 U.S. pts.) of fresh approved oil into the system via the filler, 9,4 litres (16.5 Imp. pts., 19.8 U.S. pts.) if the filter has been changed.
12. Check the oil level by carrying out Operations 13 to 17 inclusive.

**Sump - Oil level to check**

**The vehicle must be standing on level ground and the engine switched off.**

13. Allow at least four minutes for the oil to drain into the sump.
14. Withdraw the engine oil dipstick and wipe it clean.
15. Insert the dipstick into its position.
16. Withdraw the dipstick and read the oil level.  
Maximum and minimum oil level marks are indicated on the dipstick.
17. Top-up the oil level if necessary by carrying out Operations 18 to 21 inclusive.

**Sump - To top-up**

**It is most important that only engine oil of an approved grade and manufacture is used.**

18. Carry out Operations 13 to 16 inclusive.
  19. If necessary, top-up by pouring a small quantity of fresh engine oil through the filler.
  20. Repeat Operations 13 to 19 inclusive until the oil level reaches the maximum (MAX) mark on the dipstick.
- Do not overfill with oil.**
21. After topping-up ensure that the filler cap and bonnet are properly closed.

**Important**

- (a) Do not operate the engine if the oil level is below the MIN mark on the dipstick. Failure to observe this precaution could result in serious damage to the engine.
- (b) If the filter canister and/or the sump drain plug have been disturbed, check for oil leaks from around the two components, as soon as possible after the engine has been started.