

Chapter 2 Part B:

171 and 159 engines



*Including engine variants B1A/A, B2C, BDY, D2A, D2E, D2F, D6A, D6D and DKZ.
For model applications refer to Specifications*

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Degrees of difficulty

2B

| | | | | |
|--|---|---|--|---|
| Easy , suitable for novice with little experience  | Fairly easy , suitable for beginner with some experience  | Fairly difficult , suitable for competent DIY mechanic  | Difficult , suitable for experienced DIY mechanic  | Very difficult , suitable for expert DIY or professional  |
|--|---|---|--|---|

Specifications

Model application

| | |
|--|-------------------|
| BX 16 | 171 B or C (XU5S) |
| BX 19 | 159 A (XU9S) |
| BX 16 RE | B1A/A |
| BX 16 (except TXi model - from September 1988) | B2C (XU52C) |
| BX 16 - fuel-injected | BDY (XU5M 3Z) |
| BX 19 TRS (from July 1986) | D2A (XU92C) |
| BX 19 TRS/TZS (for 1990) | D2E (XU92C+) |
| BX 19 TZS (from 1991) | D2F (XU92C+) |
| BX 19 GTi (up to 1991) | D6A (XU9J2) |
| BX 19 GTi (from 1991) | D6D (XU9J2) |
| BX 19 TZi with catalytic converter | DKZ (XU9JAZ) |

171 engine

General

| | |
|--|---|
| Type | Four-cylinder, in-line, OHC, liquid cooled, transverse mounting |
| Bore | 83.0 mm |
| Stroke | 73.0 mm |
| Capacity | 1580 cc |
| Compression ratio | 9.5:1 |
| Firing order | 1 - 3 - 4 - 2 |
| Location of No 1 cylinder | At clutch end of block |
| Direction of crankshaft rotation | Clockwise viewed from pulley end |
| Maximum power DIN (BHP) | 92 (94*) at 6000 rpm |
| Maximum torque DIN (lbf ft) | 96.9 at 3500 rpm |

*171 C engine from October 1984

2B•2 171 and 159 engines

Cylinder head

| | |
|------------------------------|---|
| Type | Aluminium alloy, in-line valves and five bearing camshaft |
| Maximum allowable distortion | 0.05 mm |
| Valve seat angle | 90° |
| Valve guide bore diameter | 8.0 to 8.022 mm |

Valves

| | |
|---------------------------|---|
| Stem diameter: | |
| Inlet | 7.98 to 7.83 mm |
| Exhaust | 7.96 to 7.81 mm |
| Head diameter: | |
| Inlet | 40.0 mm |
| Exhaust | 32.0 mm |
| Length: | |
| Inlet | 107.49 ± 0.1mm |
| Exhaust | 106.92 ± 0.1mm |
| Springs: | |
| Wire diameter: | 4.4 mm |
| Length under load: | |
| Inlet | 40.5/41 mm/kg |
| Exhaust | 30.0/80 mm/kg |
| Valve clearance (cold): | |
| Inlet | 0.15 to 0.25 mm |
| Exhaust | 0.35 to 0.45 mm |
| Adjustment shim thickness | 2.225 mm to 3.025 mm (in steps of 0.025 mm) 3.100 mm to 3.550 mm (in steps of 0.075 mm) |

Valve timing

| | |
|-----------------|--|
| Valve lift | 10.4 mm or 9.7 mm (from December 1983) |
| Inlet opens* | 0° 48' BTDC |
| Inlet closes* | 37° ABDC |
| Exhaust opens* | 35° 36' BBDC |
| Exhaust closes* | 2° 12' ATDC |

*With valve clearance of 1.0 mm

Camshaft

| | |
|----------|-----------------|
| Endfloat | 0.07 to 0.16 mm |
|----------|-----------------|

Crankshaft and main bearings

| | |
|---|---------------------------------|
| Number of bearings | Five |
| Crankshaft endfloat | 0.07 to 0.27 mm |
| Thrustwasher thicknesses | 2.30, 2.35, 2.40, 2.45, 2.50 mm |
| Maximum allowable ovality of crankpins and journals | 0.007 mm |
| Crank journal dimensions: | |
| Standard diameter | 60.0 to 59.981 mm |
| Regrind diameter | 59.7 to 59.681 mm |
| Standard main bearing thickness | 1.842 mm |
| Replacement main bearing thickness after regrind | 1.992 mm |
| Crankpin dimensions: | |
| Standard diameter | 45.0 mm |
| Regrind diameter | 44.7 mm |
| Standard bearing thickness | 1.817 mm |
| Replacement bearing thickness after regrind | 1.967 mm |

Connecting rods

| | |
|--------------------------|-------------------|
| Small-end bore diameter | 22.0 mm |
| Small-end to gudgeon pin | 0.020 to 0.041 mm |
| Big-end bore diameter | 48.655 mm |

Cylinder liners

| | |
|--|---------------------|
| Type | Cast iron, wet type |
| Liner base seal | O-ring |
| Liner protrusion - clamped or without seal | 0.08 to 0.15 mm |
| Maximum allowable projection difference between two liners | 0.05 mm |
| Piston offset | 1.5 mm |
| Grades: | |
| Piston: | |
| A | One file mark |
| B | Two file marks |
| C | Three file marks |

Pistons

| | |
|--------------------------------|---|
| Type | Aluminium alloy, two compression and one oil control ring. Gudgeon pin free in piston, interference fit in connecting rod |
| Piston fitting direction | Arrow mark on crown points to the timing gear (DT) |
| Gudgeon pin classes | Three, colour-coded to marks on piston crown |
| Running clearance | 0.07 to 0.09 mm |

Lubrication system

| | |
|-----------------------------------|------------------------|
| Oil pressure at 4000 rpm | 3.5 bar |
| Oil pressure switch calibration: | |
| Operates between | 0.44 and 0.58 bar |
| Stops operating at | 0.8 bar (maximum) |
| Oil filter | Champion F104 |
| Oil capacity: | |
| New or reconditioned engine | 5.2 litres (9.1 pints) |
| After draining | 5.0 litres (8.8 pints) |
| Dipstick minimum to maximum | 1.5 litres (2.6 pints) |

Torque wrench settings

| | Nm | lbf ft |
|--|------------------------|--------|
| Cam cover | 10 | 7 |
| Camshaft bearing cap bolts | 15 | 11 |
| Camshaft sprocket | 80 | 58 |
| Camshaft stop (thrust plate) | 15 | 11 |
| Camshaft inner cover | 7 | 5 |
| Exhaust manifold | 22 | 16 |
| Inlet manifold | 22 | 16 |
| Timing covers | 8 | 6 |
| Mounting bracket | 20 | 15 |
| Cylinder head bolts: | | |
| Stage 1 | 60 | 43 |
| Stage 2 (after slackening) | 20 | 15 |
| Stage 3: | | |
| Hexagon headed bolts | Tighten a further 120° | |
| Torx headed bolts | Tighten a further 300° | |
| Timing belt tensioner | 16 | 12 |
| Timing belt tensioner lock cam (interlock plunger) | 15 | 11 |
| Crankshaft pulley | 110 | 80 |
| Crankshaft main bearing cap bolts | 53 | 38 |
| Connecting rod big-end cap bolts | 49 | 35 |
| Sump bolts | 19 | 14 |
| Sump drain plug | 30 | 33 |
| Suction drain pipe nuts | 5 | 4 |
| Oil pump bolts | 19 | 14 |
| Crankshaft front cover | 16 | 12 |
| Flywheel bolts | 49 | 35 |
| Coolant temperature sender units | 18 | 13 |
| Engine mountings - See illustration 21.6: | | |
| A | 35 | 25 |
| B | 28 | 20 |
| C | 23 | 17 |
| D | 45 | 33 |
| E | 18 | 13 |
| F | 50 | 36 |
| G | 20 | 15 |

159 engine

Specification as for the type 171 engine except for the following:

General

| | |
|-----------------------------------|------------------|
| Stroke | 88.0 mm |
| Capacity | 1905 cc |
| Compression ratio | 9.3:1 |
| Maximum power DIN (BHP) | 105 at 5600 rpm |
| Maximum torque DIN (lbf ft) | 88.1 at 2000 rpm |

Valves

| | |
|----------------|---------|
| Head diameter: | |
| Inlet | 39.5 mm |
| Exhaust | 33.0 mm |

2B•4 171 and 159 engines

Valve timing

| | |
|-----------------|----------|
| Valve lift | 10.3 mm |
| Inlet opens* | -3° BTDC |
| Inlet closes* | 46° ABDC |
| Exhaust opens* | 40° BBDC |
| Exhaust closes* | 2° ATDC |

*With valve clearance of 1.0 mm

B1A/A engine

Specification as for the type 171 engine except for the following:

General

| | |
|-----------------------------|------------------|
| Compression ratio | 9.35 to 1 |
| Maximum power DIN (BHP) | 80 at 5600 rpm |
| Maximum torque DIN (lbf ft) | 97.6 at 2800 rpm |

Valves

| | |
|--------------------------|-----------------|
| Valve clearances (cold): | |
| Inlet | 0.15 to 0.20 mm |
| Exhaust | 0.35 to 0.40 mm |

Valve timing

| | |
|----------------|-------------|
| Inlet opens | 5° 6' BTDC |
| Inlet closes | 23° 7' ABDC |
| Exhaust opens | 35° 8' BBDC |
| Exhaust closes | 0° 8' BTDC |

B2C engine

Specification as for the type 171C engine except for the following:

General

| | |
|-----------------------------|----------------|
| Compression ratio | 8.95:1 |
| Maximum power DIN (BHP) | 94 at 6000 rpm |
| Maximum torque DIN (lbf ft) | 97 at 3200 rpm |

Valves

| | |
|----------------|----------|
| Length | 108.0 mm |
| Head diameter: | |
| Inlet | 41.5 mm |
| Exhaust | 34.5 mm |

BDY engine

Specification as for the type 171C engine except for the following:

General

| | |
|-----------------------------|----------------|
| Compression ratio | 8.95:1 |
| Maximum power DIN (BHP) | 89 at 6400 rpm |
| Maximum torque DIN (lbf ft) | 97 at 3000 rpm |

D2A engine

Specification as for the type 159A engine except for the following:

General

| | |
|-----------------------------|-----------------|
| Maximum power DIN (BHP) | 105 at 5600 rpm |
| Maximum torque DIN (lbf ft) | 119 at 3000 rpm |

D2E engine

Specification as for the type 159A engine except for the following:

General

| | |
|-----------------------------|-----------------|
| Maximum power DIN (BHP) | 105 at 6000 rpm |
| Maximum torque DIN (lbf ft) | 118 at 3000 rpm |

D2F engine

Specification as for the type 159A engine except for the following:

General

| | |
|-----------------------------|-------------------|
| Maximum power DIN (BHP) | 107 at 6000 rpm |
| Maximum torque DIN (lbf ft) | 122.5 at 3000 rpm |

D6A engine

Specification as for the type 159A engine except for the following:

General

| | |
|-----------------------------------|-----------------|
| Compression ratio | 9.3:1 |
| Maximum power DIN (BHP) | 125 at 5500 rpm |
| Maximum torque DIN (lbf ft) | 129 at 4500 rpm |

Valves

| | |
|-------------------------|-----------------|
| Head diameter: | |
| Inlet | 40.6 mm |
| Exhaust | 33.0 mm |
| Length | 105 mm |
| Valve clearance (cold): | |
| Inlet | 0.10 to 0.15 mm |
| Exhaust | 0.20 to 0.30 mm |

Valve timing

| | |
|-----------------------|-------------|
| Valve lift | 11.5 mm |
| Inlet opens* | 5° 9' BTDC |
| Inlet closes* | 48° ABDC |
| Exhaust opens* | 43° 4' BBDC |
| Exhaust closes* | 1° 10' ABDC |

*With valve clearance of 0.7 mm

D6D engine

Specification as for the type D6A engine except for the following:

General

| | |
|-----------------------------------|-----------------|
| Maximum power DIN (BHP) | 123 at 5500 rpm |
| Maximum torque DIN (lbf ft) | 127 at 2750 rpm |

DKZ engine

Specification as for the type D6A engine except for the following:

General

| | |
|-----------------------------------|-----------------|
| Compression ratio | 9.18:1 |
| Maximum power DIN (BHP) | 122 at 6000 rpm |
| Maximum torque DIN (lbf ft) | 115 at 3000 rpm |

Valves

| | |
|----------------|----------|
| Head diameter: | |
| Inlet | 34.5 mm |
| Exhaust | 41.5 mm |
| Length | 108.0 mm |

1 General information and precautions

General information

171 and 159 engines

These engines, which are fitted to the Citroën BX 16 and BX 19 models respectively, have four wet liner cylinders, a five bearing crankshaft and an overhead camshaft. The engine is mounted transversely in the engine compartment.

Camshaft drive is by toothed belt. The belt is tensioned by a spring-loaded wheel and also drives the coolant pump. The camshaft operates directly on bucket tappets (cam followers). Valve clearance adjustment is by shims inserted between the tappet and the

valve stem. The distributor is driven directly from the tail of the camshaft.

A pressure feed lubrication system is fitted, oil being circulated round the engine by a high output rotary pump drawing oil from the sump. This pump is located in the bottom of the timing case and it is driven by a chain connected to a sprocket on the front of the crankshaft. Oil is drawn through a strainer in the sump and delivered to a filter cartridge mounted on the front of the crankcase. A relief valve operates to prevent excessive oil pressure.

A pressure switch located directly above the oil filter will light the oil pressure warning light in the instrument panel if the pressure falls below a certain pressure. In the event of the cartridge filter becoming clogged, a safety bypass valve located in the filter mounting will open to prevent oil starvation. Unfiltered oil is then supplied to the bearing surfaces.

B1A/A and B2C engines

These engines are used in later BX 16 models and are a development of the 171 engine. All modifications are of a minor nature, mainly concerning the fuel and exhaust systems.

All procedures for these engines are as described for the 171 engine. Refer to the relevant text for applicable modifications.

BDY engine

This engine is used in the fuel-injected BX 16 models first introduced in late 1992. The engine is fed by a Magneti Marelli single-point injection engine management system incorporating a closed-loop catalytic converter.

This engine is a development of the 171 engine and all procedures are as described for that engine. Refer to the relevant text for applicable modifications.

D2A, D2E and D2F engines

The D2A engine supersedes the 159A engine used in BX 19 models for the 1987 model year. The D2A engine was itself superseded by the D2E for the 1990 model year. As part of a process of continual development, the D2E engine was replaced by the D2F engine for the 1991 model year. All modifications to these engines are of a minor nature, mainly concerning the fuel and ignition systems.

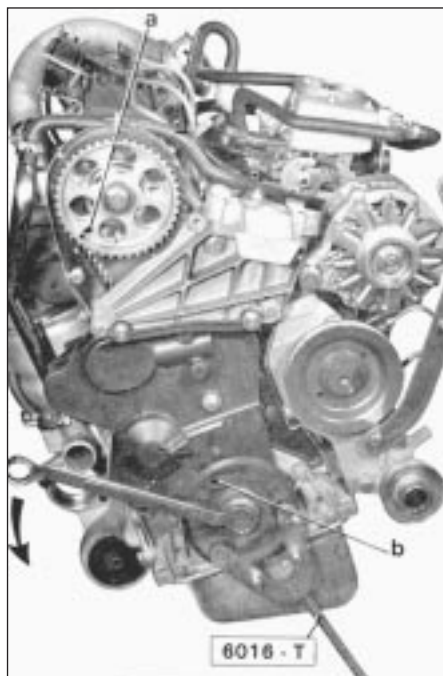
All procedures for these engines are as described for the 159A engine. Refer to the relevant text for applicable modifications.

D6A and D6D engines

The D6A engine powers the BX 19 GTI model and is a development of the 159A engine. All modifications are of a minor nature, mainly concerned with the cylinder head and the fuel injection system components which replace the carburettor fitted to other BX 19 models.



6.3 Camshaft timing sprocket cover removal



6.4a Set crankshaft pulley and camshaft sprocket dowel holes to positions "a" and "b"

The D6D engine supersedes the D6A engine for the 1991 model year and uses a Motronic engine management system.

All procedures for these engines are as described for the 159A engine. Refer to the relevant text for applicable modifications.

DKZ engine

This engine is used in the BX 19 TZI models from March 1990, and operates in conjunction with a catalytic converter.

The engine is a development of the 159A engine and all procedures are as described for the same. Refer to the relevant text for applicable modifications.

Precautions

Because of the unusual layout of the engine and transmission systems, extra care and attention are necessary during maintenance and overhaul procedures which, in many instances, differ from more conventional systems.

Read through the various Sections concerned before tackling any job, and analyse the instructions, so that any snags or possible difficulties can be noted in advance. Because the sub-assembly castings are made from aluminium alloy it is of utmost importance that, where specified, all fastenings are tightened to the correct torque and, in some instances, in the correct sequence.

2 Oil filter - removal and refitting

Refer to Chapter 1, Section 9.

3 Major operations possible with engine in vehicle

The following items can be removed and refitted with the engine in the vehicle:

- a) Cylinder head
- b) Camshaft and camshaft drivebelt
- c) Clutch and flywheel (after removal of transmission)



6.4b Timing dowels (drills) in position

- d) Sump (after removal of the support member between the crossmember and the front cross panel. Disconnect the hydraulic line from the clip attached to the support member)

4 Major operations requiring engine removal

The engine must be removed for the following operation:

- a) Removal of the crankshaft and main bearings

5 Valve clearances - checking and adjustment

Refer to Chapter 1, Section 22.

6 Camshaft drivebelt - removal and refitting

Note: The following operation was carried out with the engine in the vehicle.

171, 159, B1A/A, D2A, D2E and D6A engines. Also B2C, BDY, D2F, D6D and DKZ engines prior to January 1992

Removal

- 1 Disconnect the battery earth lead.
- 2 Remove the alternator drivebelt and HP pump drivebelt.
- 3 Unbolt and remove the camshaft timing sprocket cover (see illustration).
- 4 Turn the crankshaft until the dowel hole in the pulley is at approximately 12 o'clock and the hole in the camshaft sprocket is at approximately 7 o'clock. In this position a 10 mm dowel should pass through each hole and into the timing recess behind (see illustration). Verify this and then remove the dowels (see illustration).
- 5 Remove the clutch/torque converter bottom shield. Have an assistant jam the starter ring gear while the crankshaft pulley bolt is undone. This bolt is very tight. Do not jam the pulley by means of the timing dowel as damage will result. Remove the bolts and washer.
- 6 Check that the 10 mm dowels will still enter the timing holes. Adjust the crankshaft position if necessary by means of the starter ring gear. Remove the crankshaft pulley, retrieving the Woodruff key if it is loose.
- 7 Remove the timing covers from the front of the camshaft drivebelt (see illustration). Note that from May 1987, a simplified three-piece timing belt cover has been fitted. This simplified cover can be fitted to earlier vehicles but will require the purchase of an additional nut and screw.

8 Slacken the two nuts on the front of the drivebelt tensioner and the single nut at the rear. Use a spanner on the square end of the tensioner cam spindle to turn the cam to the horizontal position and so compress the tensioner spring. Tighten the cam locknut (see illustration).

9 Remove the camshaft drivebelt, taking care not to kink it or contaminate it with oil if it is to be re-used.

Refitting

10 Commence refitting by positioning the belt on the crankshaft sprocket, then refitting the pulley and verifying the correct position of the crankshaft by means of the dowel. Observe the arrows on the belt showing the direction of rotation, and the timing lines which align with marks on the crankshaft and camshaft sprockets (see illustrations). The drivebelt used with the type of tensioner mechanism fitted to these engines should have 113 teeth and white markings.

11 Fit the belt to the camshaft sprocket, around the tensioner and to the coolant pump sprocket.

12 Release the tensioner cam locknut and turn the cam downwards to release the spring. Tighten the locknut and the tensioner front nuts (see illustrations).

13 Remove the timing dowels and turn the crankshaft through two full turns in the normal direction of rotation. Turn the crankshaft further to bring No 1 piston to TDC on the firing stroke (flywheel index mark aligned with the O-mark).

14 Slacken the tensioner front nuts and the cam locknut, then retighten them to the specified torque.

15 Turn the crankshaft further and make sure that the timing dowels can still be inserted. If not, remove the drivebelt and start again.

16 If a new belt has been fitted, it must be run in and retensioned as follows.

17 Tighten the crankshaft pulley bolt to the specified torque, then refit and tension the alternator drivebelt and the HP drivebelt. Temporarily refit the camshaft sprocket cover.

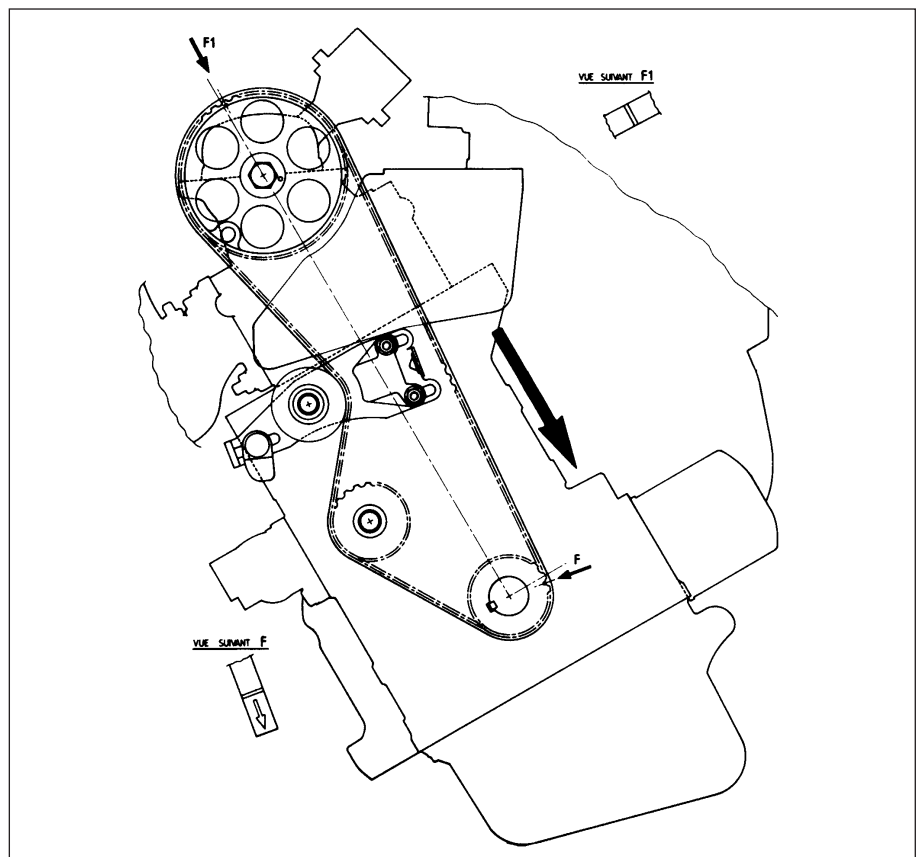
18 Run the engine up to operating temperature (indicated by the cooling fan operating) then stop it and allow it to cool for at least two hours.



6.7 Central timing cover removed for access to tensioner



6.8 Tensioner cam spindle (square end) and locknut



6.10a Timing belt-to-sprockets alignment. Arrow indicates normal direction of belt rotation



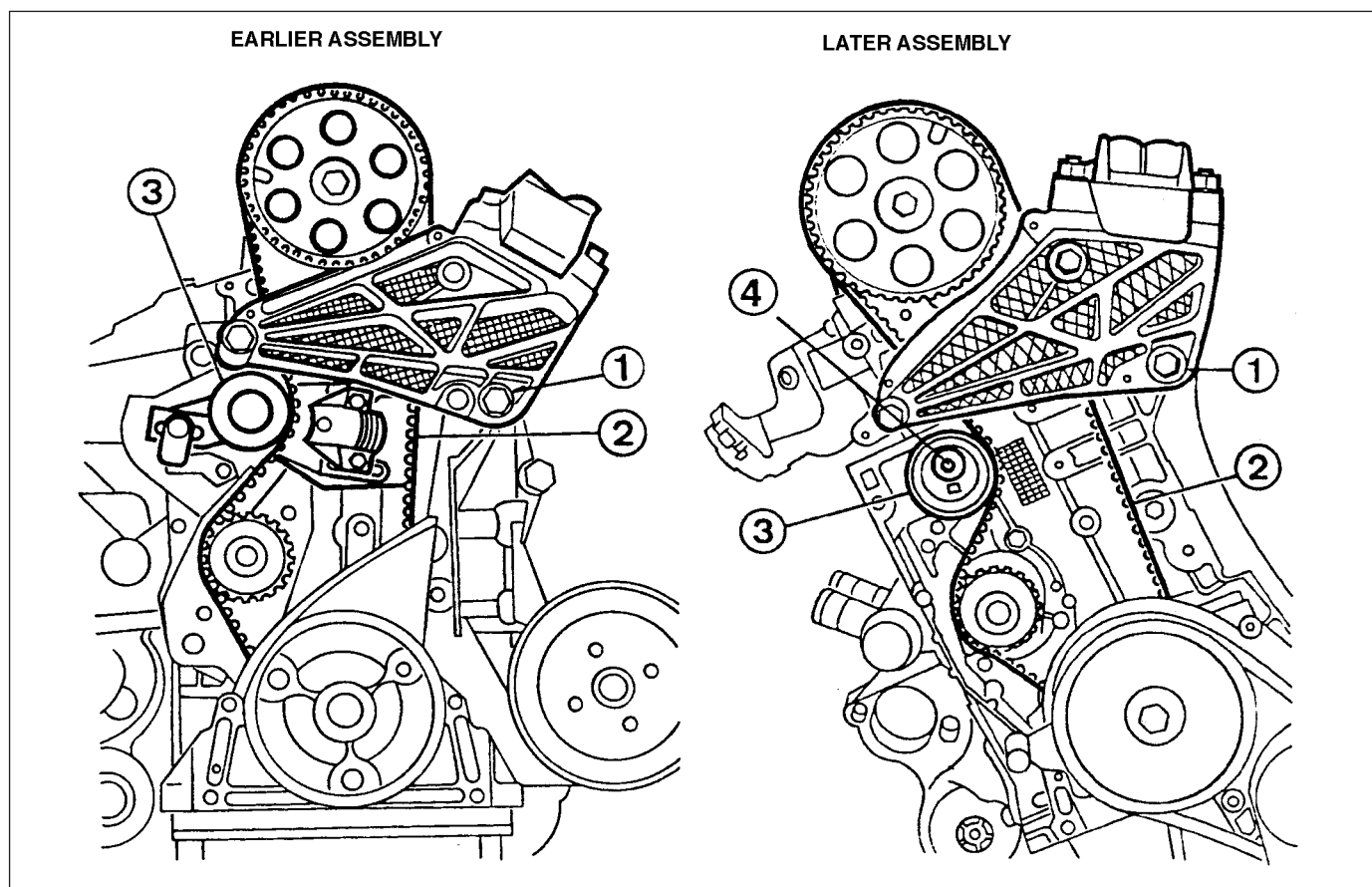
6.10b Line on belt aligns with mark on camshaft sprocket



6.12a Turn tensioner cam downwards . . .



6.12b . . . and tighten drivebelt tensioner front nuts



6.23 Modified timing belt and tensioner arrangement

1 Right-hand engine mounting

2 Timing belt

3 Tensioner assembly

4 Tensioner roller bolt

19 Rotate the crankshaft to the TDC position, No 1 cylinder firing, then slacken and retighten the tensioner nuts once more.

20 Remove the alternator drivebelt, the HP drivebelt and the crankshaft pulley. Refit and secure the covers, then refit the pulley and tighten its bolt to the specified torque. Refit and tension the alternator drivebelt and the HP drivebelt.

21 Check the ignition timing and adjust if necessary.

B2C, BDY, D2F, D6D and DKZ engines from January 1992

22 On these engines, the tensioner mechanism is of an eccentric roller type.

23 To accommodate this revised mechanism, a number of the surrounding engine components have been changed from those fitted to engines manufactured before January 1992 (see illustration). They are as follows:

- Tensioner assembly
- Camshaft drivebelt
- Front crankshaft oil seal carrier plate
- Coolant pump
- Right-hand engine mounting
- Cylinder block (has an extra threaded hole for tensioner centre bolt)
- Camshaft drivebelt covers

24 Note that the type of camshaft drivebelt fitted to these engines should have 114 teeth and yellow/orange markings. If the drivebelt is to be renewed, ensure that the correct type of replacement drivebelt is obtained.

Removal

Note: Citroën specify the use of a special tool (SEEM belt tension measuring equipment) to correctly set the belt tension. If this equipment cannot be obtained, an approximate setting can be achieved using the method described below. If the method described here is used, the tension must be checked using the special equipment at the earliest opportunity. Do not drive the vehicle over large distances, or use high engine speeds, until the belt tension is known to be correct. Refer to a Citroën dealer for advice.

25 Proceed as described in paragraphs 1 to 7, noting that the crankshaft pulley timing dowel must be of 10 mm diameter, stepped down to 8 mm at one end to engage with the smaller hole in the timing recess.

26 With the camshaft timing belt covers removed, slacken the tensioner roller bolt to relieve the belt tension, then withdraw the belt, noting the direction of fitting and the markings.

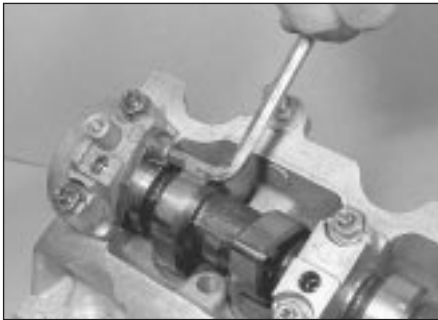
Refitting

27 Commence refitting by slipping the belt over the camshaft sprocket, followed by the crankshaft sprocket, the coolant pump sprocket, and finally over the tensioner roller. Observe the arrows on the belt indicating the direction of rotation and the timing lines which align with corresponding marks on the crankshaft and camshaft sprockets.

28 With the camshaft timing dowel fitted, rotate the tensioner roller anti-clockwise by hand as far as possible to take up any slack in the belt, then tighten the tensioner roller bolt sufficiently to hold the roller in position. If the special belt tension measuring equipment is available then it should be fitted to the front run of the belt and the tensioner roller should be moved to give a reading of 30 SEEM units. Tighten the roller bolt to the specified torque, taking care not to move the roller as the bolt is tightened.

29 Check that the crankshaft and camshaft are still positioned correctly by temporarily refitting the crankshaft pulley and reinserting the timing dowel.

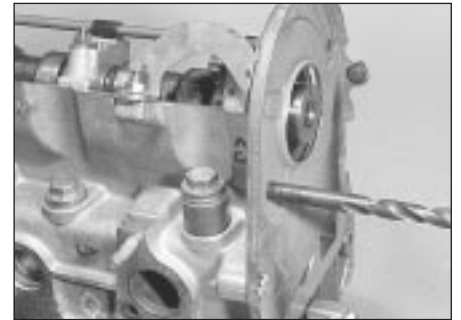
30 Remove the timing dowels, temporarily refit the crankshaft pulley and turn the crankshaft through two full turns in the normal direction of rotation. Check that both timing



7.7a Undo retaining screw . . .



7.7b . . . and remove camshaft thrust plate



7.16 Locating cover plate with 10 mm dowel

dowels can still be inserted. If not, remove the drivebelt and start again. Never turn the crankshaft backwards during this procedure.

31 If all is well, remove the dowels and turn the crankshaft through two further turns in the normal direction of rotation.

32 Refit the camshaft timing dowel and check that the belt can just be twisted through 90° (using moderate pressure from the forefinger and thumb) at the midpoint of the longest belt run between the camshaft and crankshaft sprockets. If in doubt about this setting, it is better to err on the tight side until the tension can be checked by a Citroën dealer. If the belt is too slack, it may jump on the sprockets resulting in serious engine damage. If the special belt tension measuring equipment is available, it should be refitted to the front run of the belt. The reading should now be between 42 and 46 units.

33 If the tension is not as specified, repeat the tensioning operation.

34 On completion, refit all disturbed components, tightening the crankshaft pulley bolt to the specified torque. Tension the alternator drivebelt and HP pump drivebelt.

7 Camshaft - removal and refitting



Note: The following operation was carried out with the engine in the vehicle.

Removal

- 1 Remove the camshaft drivebelt.
- 2 Remove the camshaft cover. For ease of access, remove the distributor cap and HT leads also.
- 3 Remove the distributor and the fuel pump from the thermostat housing.
- 4 Remove the camshaft lubrication manifold.
- 5 Lock the camshaft sprocket (eg. with a timing dowel) and remove the sprocket retaining bolt. Remove the sprocket.
- 6 Unbolt and remove the camshaft sprocket inner cover plate from the cylinder head.
- 7 Unbolt and remove the camshaft thrust plate (see illustrations).
- 8 The camshaft bearing caps can now be removed, starting with bearing No 4 at the

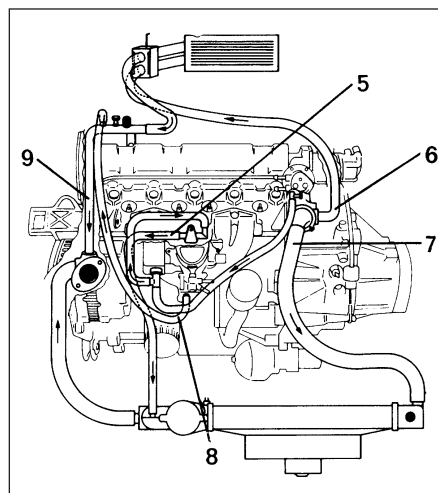
distributor end. Make identifying marks if necessary then progressively loosen the bearing cap securing nuts. As the No 4 bearing is removed take care not to damage the seal between the distributor support and the bearing. Be prepared for the camshaft to spring upwards. Remove the camshaft.

Refitting

9 Commence refitting by making sure that the crankshaft is in the correct (doweled) position. If not, move it to this position to avoid possible piston/valve contact.

10 Lubricate the camshaft bearings and lower the camshaft into position so that the fourth and sixth cams are resting on the tappets. Fit the centre bearing cap so that the oil hole is towards the front.

11 Refit the remaining bearing caps and tighten them to the specified torque in a progressive sequence. The seal bearing surface should have sealant applied. If the seal was damaged during dismantling, renew it and coat with a sealing compound.



8.5a Disconnect hoses indicated for cylinder head removal

- 5 Carburettor heating return hose
- 6 Water outlet duct hose
- 7 Water outlet duct hose
- 8 Inlet manifold hose
- 9 Heater coolant return pipe hose

12 When renewing the oil seal at the camshaft sprocket end, lubricate it with engine oil and drive it into position.

13 Refit and secure the camshaft stop thrust plate.

14 Check that the camshaft endfloat is as specified and if necessary renew the thrust plate.

15 Check that the valve clearances are as specified.

16 Refit the sprocket rear cover plate, locate it correctly with a 10 mm dowel and tighten its fastenings (see illustration). Fit the camshaft sprocket, dowel it and tighten its securing bolt to the specified torque.

17 Refit the fuel pump, the distributor and the lubrication manifold.

18 Refit the camshaft cover, the HT leads and the distributor cap.

19 Refit the camshaft drivebelt.

8 Cylinder head - removal and refitting



Note: The following operation was carried out with the engine in the vehicle.

Removal

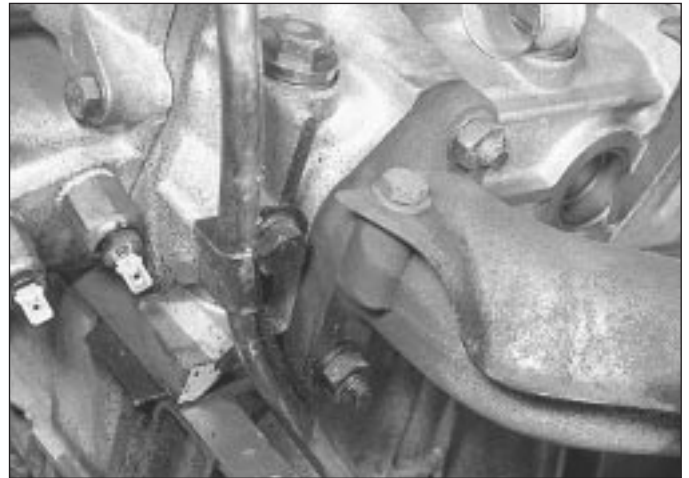
- 1 Disconnect the battery earth lead.
- 2 Drain the cooling system.
- 3 Remove the air filter.
- 4 Disconnect and plug the feed and return hoses at the fuel pump.
- 5 Disconnect the coolant hoses from the thermostat housing, the inlet manifold and carburettor (heating return) (see illustrations).



8.5b Coolant hose connections to carburettor auto-choke



8.6a Heater coolant hose and support clamp



8.6b Dipstick guide tube support bracket

6 Detach the heater coolant return hose from its securing clamp and support lug. Unbolt the dipstick tube support bracket (see illustrations).

7 On engines manufactured before March 1986, remove the engine breather support screw. Engines manufactured after March 1986 are equipped with a modified crankcase breather circuit (see illustration). The oil separator unit fitted to earlier engines is no longer fitted and the rocker cover now has a breather pipe connection.

8 Disconnect the accelerator cable at the carburettor.

9 Disconnect the coolant temperature leads and the lead from the carburettor idle cut-off solenoid.

10 Unclip and remove the distributor cap, detach the HT leads from the spark plugs and place them out of the way. Also disconnect the distributor LT leads. Remove the spark plugs.

11 Detach and remove the lining from the front right-hand wheel arch. This is best achieved with the vehicle raised at the front end and supported on safety stands. The roadwheel can then be removed to improve access under the wing for guard removal and subsequent operations.

12 Locate a spanner onto the crankshaft pulley bolt and turn the engine over to align the dowel hole in the pulley with the timing recess behind it. Insert a 10 mm dowel rod to lock the crankshaft in this position. The pistons must be at the half stroke position in their cylinders.

13 Unbolt and detach the exhaust downpipe.

14 Position a jack under the sump. Place a piece of wood between the jack and sump to protect the sump, then raise the jack to support the weight of the engine.

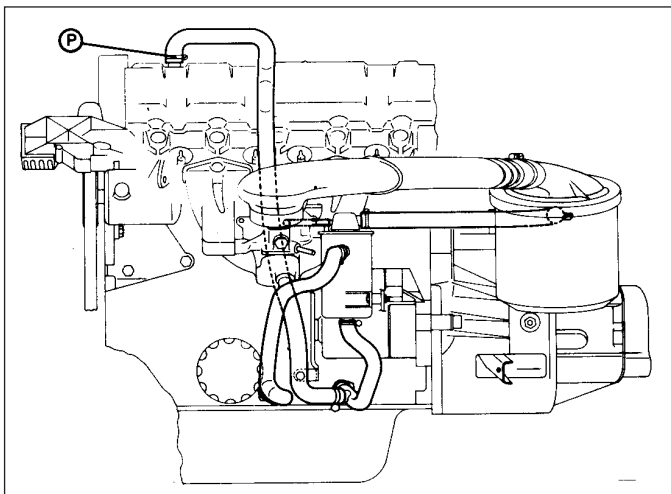
15 Remove the alternator fan guard, then unbolt and remove the right-hand engine mounting (see illustration).

16 Unbolt and remove the upper and central timing covers.

17 Loosen the camshaft drivebelt tension then disengage the belt from the camshaft sprocket.

18 Remove the camshaft cover. The cylinder head bolts can now be loosened half a turn at a time in the reverse order to that shown for tightening and then removed. Discard the bolts and obtain a new set for refitting. Note that from February 1987, Torx type cylinder head bolts are fitted, replacing the original hex-head bolts. It is not necessary to retighten these bolts once the engine has been warmed up to normal operating temperature. However, they must be renewed whenever they are disturbed.

19 Remove the cylinder head, using a couple of bars through two of the bolt holes and rocking it towards the front of the vehicle (see illustration). Remove the gasket and recover any loose dowels.

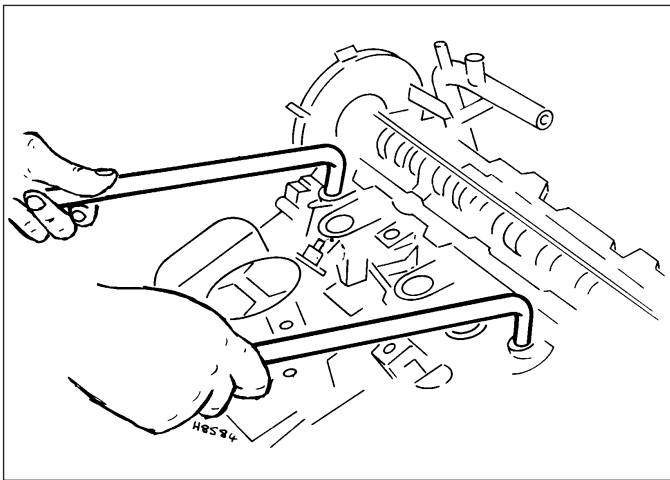


8.7 Modified crankcase breather circuit

P Rocker cover connection



8.15 Right-hand engine mounting



8.19 Cylinder head removal using two bars



8.20 Cylinder liners clamped with washers and bolts

20 Fit cylinder liner clamps, or large washers secured with nuts and bolts, to keep the liners in position (see illustration). If the liners are disturbed, the engine will have to be removed for new seals to be fitted.

21 Before refitting the cylinder head, check that its mating faces are clean. Before removing the liner clamps, the liner protrusions must be checked.

22 The oil filter in the cylinder head should be removed and renewed before refitting the cylinder head (see illustration).

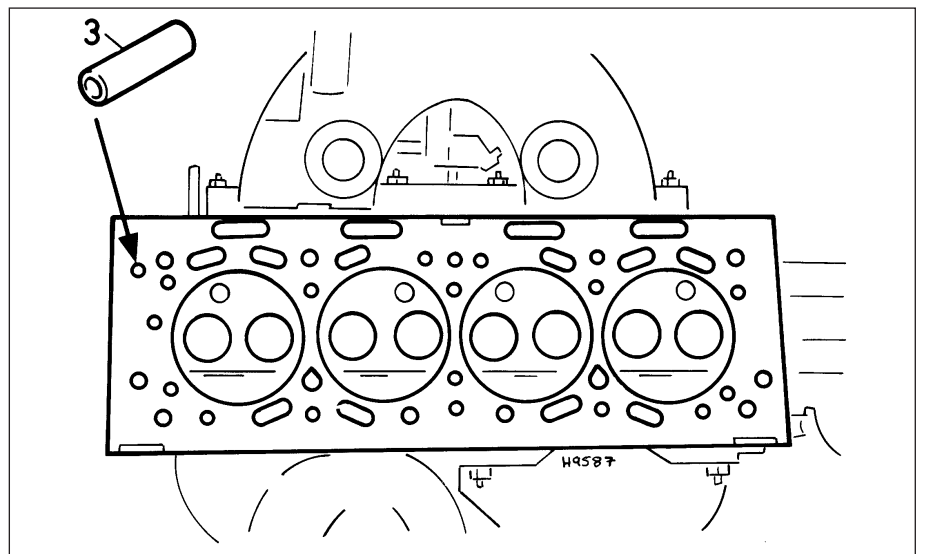
Refitting

23 Commence refitting by fitting the dowels to the cylinder block. Keep the flywheel end dowel raised by inserting a 5 mm punch or large nail through the hole in the front of the block (see illustration). Remove the liner clamps.

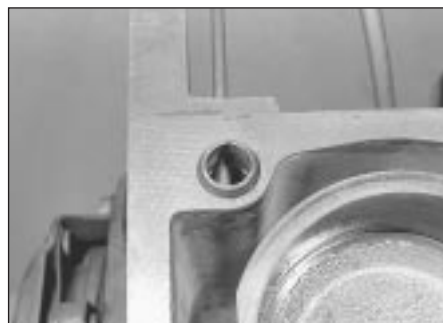
24 Fit the new gasket, dry and with the tab at the flywheel end. Lower the cylinder head into position, making sure that it mates with the dowels. Remove the punch or nail.

25 Fit the new cylinder head bolts with their threads cleaned and lightly oiled. Remember to fit the spacer to the bolt above the coolant pump.

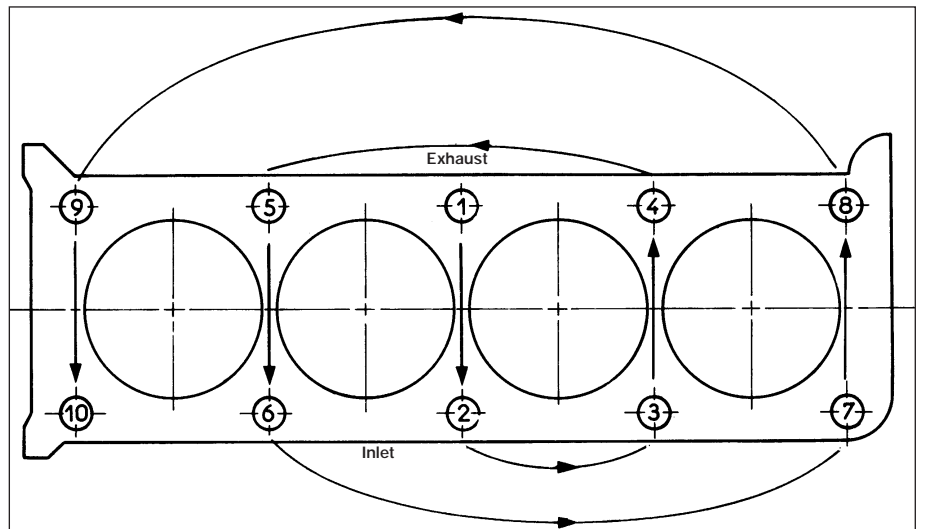
26 Progressively tighten the bolts in the order shown to the Stage 1 specified torque (see illustration).



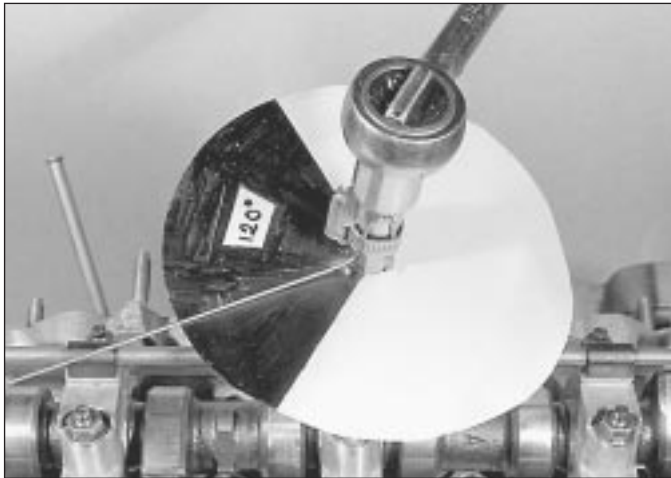
8.22 Oil filter location in cylinder head (3)



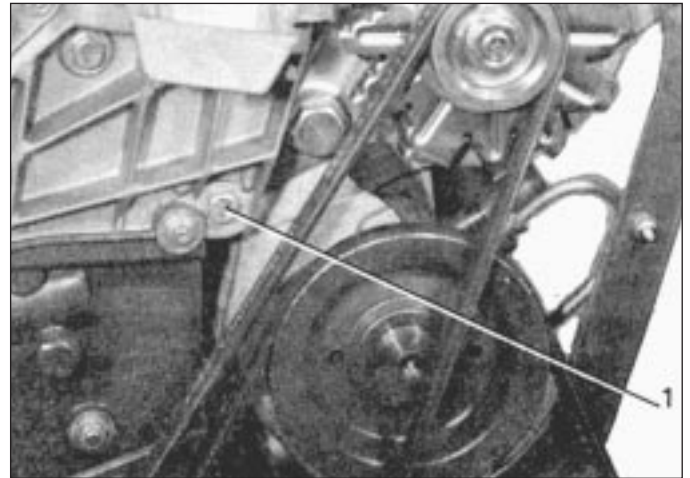
8.23 Dowel is kept raised by inserting a rod or nail beneath it



8.26 Cylinder head bolt tightening sequence



8.27 Home-made disc for measuring tightening angle. Disc is fixed and pointer rotates



8.32 Loosen engine mounting bolt indicated (1)

27 Loosen cylinder head bolt number 1, then immediately retighten it to the Stage 2 specified torque, then tighten it further by the angle specified for Stage 3. Repeat for all the bolts, following the tightening sequence (see illustration).

28 Check the valve clearances and if necessary adjust them. This is applicable even though the clearances may have been set when the cylinder head was removed.

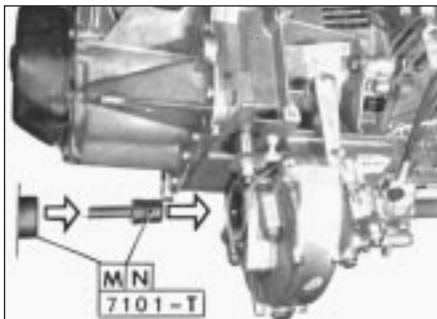
29 Refit the timing belt and covers. Also refit the right-hand engine mountings. Tighten all securing bolts to the specified torque settings.

30 Refit the remaining components in the reverse order of removal. When reconnecting the exhaust balljoint connection, smear the tube and bolts with Gripcott AF grease or similar.

31 Refill the cooling system.

32 If hexagon headed cylinder head bolts are used, start the engine and warm it up until the cooling fan cuts in, then switch off and allow it to cool for at least two hours. Loosen the engine mounting bolt indicated (see illustration) then retighten the cylinder head bolts as described in paragraph 27. Retighten the mounting bolt then check the valve clearances. Remember that if Torx type cylinder head bolts are fitted, retightening after warm-up is not required.

33 If a new belt has been fitted, retension it.



9.6 Citroën tool used to support differential sun gears

9 Engine/transmission - removal



Note: The engine/transmission removal, separation and refitting procedures described in this Chapter deal with the engine and manual gearbox. If automatic transmission is fitted, the procedures are similar except for the control linkages. Limited information was available at the time of writing.



Warning: If air conditioning is fitted, the system must be depressurised by a Specialist before disconnecting any system components.

1 The combined weight of the engine and transmission is not great due to the extensive use of aluminium alloy, but care must be taken not to damage components. An assistant will be required for some tasks.

2 Unbolt and remove the bonnet.

3 Detach the battery leads and remove the battery.

4 Chock the rear roadwheels, then raise the vehicle at the front so that the front roadwheels are clear of the ground. Remove the front roadwheels.

5 The driveshafts must now be separated from the final drive housing. On the left-hand side, unbolt and release the anti-roll bar connecting link, then separate the stub axle from the steering balljoint. Position a drain tray under the final drive housing then pull the left-hand driveshaft and wheel hub outwards to withdraw the inner end of the driveshaft from the final drive housing. About 1 litre of oil will drain from the final drive housing as the shaft is withdrawn.

6 Before removing the right-hand driveshaft, the differential sun gears must be supported in place, if possible using Citroën special tools 7101-TM and 7101-TN (see illustration). If these special tools are not available, it is possible to improvise using a suitable length of

wooden dowel or tube approximately 24 mm in diameter, chamfered at the leading end to allow entry into the side gear splines.

7 The right-hand driveshaft is disconnected from the differential housing by removing it completely.

8 The hydraulic circuit must now be depressurised.

9 Remove the air cleaner unit. Also unbolt and remove the air cleaner support bracket (see illustration).

10 Drain the cooling system and remove the radiator.

11 Disconnect the throttle cable from the carburettor by releasing the inner cable nipple from the throttle quadrant then pulling the inner/outer cable from its support bracket. Place the cable out of the way.

12 Disconnect the vent hose from the carburettor (this hose runs down to the radiator left-hand lower side).

13 Disconnect the fuel supply hose to the fuel pump and plug the hose.

14 Note the positions of the spark plug HT leads in the location clips on the top face of the cam cover and release them. Detach the HT leads from the spark plugs and release the distributor cap. Disconnect the LT leads from the distributor, then place the cap and leads out of the way.



9.9 Air cleaner support bracket



9.16 Reversing light switch and lead connections

15 Disconnect the wiring harness connection blocks under the battery support frame, also the wiring terminal block in line with the battery positive lead.

16 Disconnect the reversing light switch leads from the gearbox (see illustration).

17 Undo the retaining nut and detach the battery earth lead from the battery support tray. Remove the tray.

18 Disconnect the clutch cable from the lever by prising the lever rearwards.

19 Disconnect the battery earth lead and the braided earth strap from the gearbox.

20 Detach the diagnostic socket lead connector at the left-hand side under the ignition coil.

21 Disconnect the speedometer drive cable (see illustration).

22 Disconnect the heater coolant hoses at the bulkhead.



9.21 Speedometer drive cable connection between engine and bulkhead

23 Disconnect the hydraulic suction pipe from the HP pump and the hydraulic pump from the pressure regulator outlet. Plug the pipes to prevent fluid loss and the ingress of dirt.

24 Detach the hydraulic pipe support clip from the alternator support strap.

25 Disconnect the rigid pipe from the pressure regulator unit and detach the pipe support clip. Position the pipe out of the way, but do not over-distort the pipe. Plug the end of the pipe.

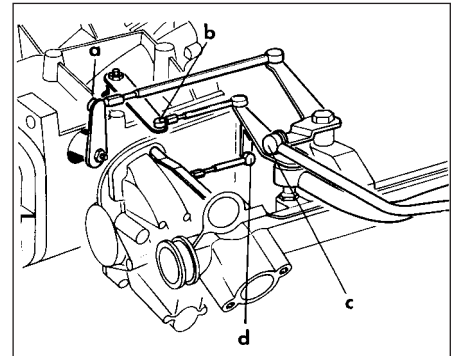
26 Disconnect the gearchange linkages at the points indicated (see illustration). The linkage rods have balljoints which are simply prised apart.

27 Working from underneath the vehicle, unbolt the exhaust downpipe and disconnect it from the manifold.

28 Unclip and detach the coolant bottom hose at connection on the right-hand rear lower corner of the engine. As the hose is pulled free from the connection allow for additional coolant spillage.

29 Fit the lifting sling and hoist into position. Take the weight of the engine and transmission. Arrange the lifting sling so that when connected to the lifting eyes it will allow the gearbox to be tilted downwards at an angle of about 45° when the units are being lifted out (see illustration).

30 Working underneath the vehicle, detach the torque link by unscrewing and removing its through-bolt. If necessary position a jack under the engine to allow it to be raised and allow the bolt to be removed (see illustration).



9.26 Disconnect gear linkages at joints a, b, c and d

31 Unbolt and detach the left-hand side transmission mounting (see illustration).

32 Unbolt and remove the right-hand upper engine mounting.

33 Check around the engine/transmission to ensure that all attachments are disconnected. Before lifting out the unit, it is advisable to position a protector plate of some description between the height corrector unit and the engine to prevent damage to the rubber dust cover during removal.

34 Carefully lift the engine/transmission upwards, tilting the transmission downwards as the unit is manoeuvred from the engine compartment. Assistance is necessary to guide the unit clear of its surrounding fittings (see illustration).

35 Once clear of the vehicle, the engine/transmission can be removed for cleaning and repairs as necessary.

10 Engine dismantling - general information

Refer to Section 8 in Part A of this Chapter .

11 Engine dismantling - ancillary items

The extent of engine ancillary items to be removed is dependent on the extent to which the engine is to be dismantled and repaired.



9.29 Engine lift support bracket - front right-hand side



9.30 Torque link and through-bolt (arrowed)



9.31 Left-hand side transmission mounting



9.34 Engine and transmission removal



12.1a Starter motor is secured by three Allen bolts . . .



12.1b . . . and a mounting bracket



13.12 Lock camshaft sprocket with a 10 mm rod

Refer to Section 9 in Part A of this Chapter and remove those items listed which are applicable, ignoring references to the coolant pump and, if the cylinder head is to be removed, the exhaust manifold. These two items are best removed later during the engine dismantling procedures.

Note that the clutch unit is removed after the engine and gearbox are separated.

12 Engine - separation from transmission



1 If still in position, unbolt and remove the starter motor (see illustrations).

2 Unbolt and remove the remaining engine-to-transmission bolts.

3 Support the engine and pull the transmission away from it. Do not allow the weight of the transmission to hang on the primary shaft. Recover any loose dowels.

13 Engine - complete dismantling



1 Support the engine on a clean bench or strong table.

2 Remove any remaining ancillary components still attached to the engine.

3 The exhaust manifold may be removed now, or it can be left in place to serve as a handle until the head is removed.



13.19 Location of three Allen head bolts

4 Unbolt and remove the crankshaft pulley. Jam the flywheel teeth when undoing the pulley bolt to stop the crankshaft rotating.

5 Remove the camshaft drivebelt covers, noting the location of the various sizes of bolt.

6 Unbolt and remove the camshaft cover.

7 Rotate the crankshaft by means of the flywheel until a 10 mm diameter rod can be passed through the hole in the camshaft sprocket and into the timing recess. The pistons are now at mid-stroke so piston/valve contact cannot occur.

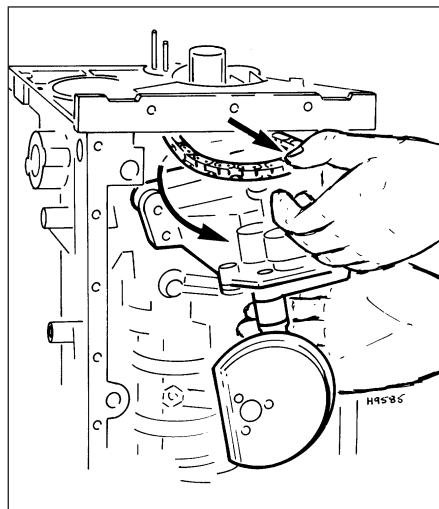
8 Release the camshaft drivebelt tensioner by slackening its nuts (two at the front and one behind the front plate) and using the square end of the cam spindle to bring the cam into a horizontal position.

9 Remove the camshaft drivebelt, taking care not to kink it and noting its direction of travel if it is to be re-used.

10 Unbolt and remove the camshaft drivebelt tensioner.

11 Remove the belt side covers and crankshaft sprocket. Recover the Woodruff key.

12 Unbolt and remove the camshaft sprocket. Restrain the sprocket from turning if necessary using the 10 mm diameter rod inserted through the timing hole in the sprocket (see illustration).



13.22 Oil pump removal

13 Unbolt and remove the engine mounting bracket, the camshaft sprocket backplate and the coolant pump.

14 Slacken the ten cylinder head bolts, working in the reverse sequence of that used for tightening. Remove the bolts and washers.

15 Remove the cylinder head. If it seems to be stuck, use a couple of metal rods in two of the bolt holes to rock it free. Do not attempt to hammer or lever it off. Retrieve the two locating dowels if they are loose.

16 Fit liner clamps if it is not proposed to remove the pistons and liners then invert the engine.

17 Unbolt and remove the flywheel. It is doweled so it can only be refitted one way.

18 Remove the suction drain pipe from the side of the sump.

19 Unbolt and remove the sump. Note the location of the three Allen-headed bolts (see illustration).

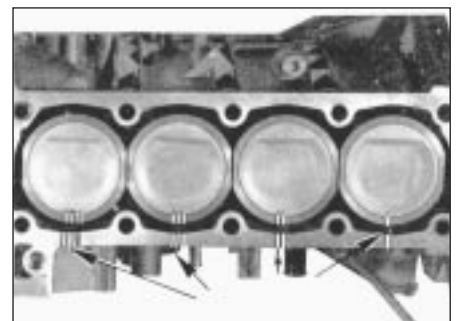
20 Remove the bolts which secure the oil pump, noting the special centring bolt at the rear.

21 Unbolt and remove the oil seal carrier plate.

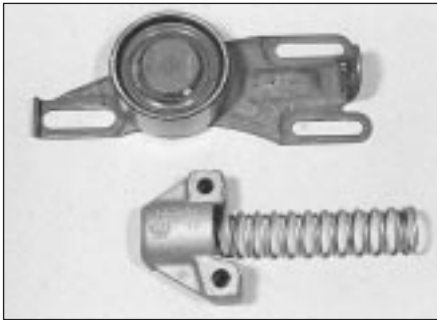
22 Lower the oil pump into the engine so that its chain can be removed. Withdraw the pump and recover the spacer, the dowel and the chain (see illustration).

23 Pull the oil pump sprocket off the crankshaft and recover the Woodruff key.

24 Unscrew the connecting rod cap bolts. Before removing the caps, check that they are marked in numerical order, also the connecting rods, liners and pistons. Mark them if they are not (see illustration).



13.24 Relative positions of cylinder liners and block must be marked before removal



14.9 Camshaft (timing) drivebelt tensioner components

25 If the cylinder liners are being removed, then the pistons, rods and liners can be lifted out of the block as individual units, but mark their relative positions.

26 Remove the bolts from main bearing caps 1, 2, 4 and 5. Also remove the two nuts and the two side bolts from the centre cap. Make alignment marks on the bearing caps and remove them. Keep the bearing shells with their caps if they are to be re-used. Recover the thrustwasher segments from either side of No 2 bearing cap.

27 Remove the oil seal from the flywheel end of the crankshaft.

28 Lift the crankshaft out of the crankcase. Recover the upper half main bearing shells and the other two thrustwasher segments.

29 If the cylinder liners have been left clamped in position in the cylinder block, their protrusions above the cylinder block face must be checked before reassembling the engine.

14 Engine - examination and renovation



General information

1 Refer to Section 12 in Part A of this Chapter.

Crankshaft and main bearings

2 Refer to Section 12 in Part A of this Chapter.

3 Later 171 engines (from 1984 on), in common with 159 engines, have no spigot bush in the crankshaft tail. The diameter of the



14.10 Separating two halves of oil pump

gearbox input shaft is correspondingly increased.

4 Therefore, on 171 engines, if the later type crankshaft is being fitted and being mated to an earlier type input shaft, it will be necessary to obtain and insert a spigot bush.

5 If the reverse situation applies (new input shaft and old crankshaft), extract the spigot bush.

Big-end bearings

6 Refer to Section 12 in Part A of this Chapter.

Cylinder liners, pistons, gudgeon pins and connecting rods

7 Refer to Section 12 in Part A of this Chapter.

Timing drivebelt, sprockets and tensioner

8 Renew the drivebelt as a matter of course unless it is in perfect condition and is known to have covered only a nominal mileage. Renew the sprockets if they are damaged.

9 The drivebelt tensioner should be examined for roughness of the wheel bearing and wear or distortion of the spring (where applicable). Renew as necessary (see illustration). The wheel, bearing and backplate must be renewed as an assembly.

Oil pump

10 Remove the six bolts which hold the two halves of the oil pump together. Separate the halves, being prepared for the release of the relief valve spring and plunger (see illustration).

11 Inspect the rotors and their housing for wear and damage. No wear limits are published for this pump. Any visible wear on the moving parts suggests that renewal is necessary. With the exception of the relief valve spring and plunger, individual components are not available (see illustrations).

12 Lubricate the pump components well before reassembly. Bolt the two halves together, being careful not to trap the spring.

13 If the pump is to be renewed, it is wise to renew the chain and the crankshaft sprocket also.

Camshaft and tappets

14 Inspect the camshaft lobes and bearing journals for wear and damage. If wear and damage is evident, renewal is probably necessary. Also inspect the bearing surfaces in the cylinder head and bearing caps.

15 Clean the camshaft lubrication manifold with solvent and then blow through it with compressed air. All the holes must be clear (see illustration).

16 Inspect the tappets for wear and scuffing and renew as necessary. New tappets must be fitted if the camshaft is renewed, it is also advisable to renew the valve springs.

Flywheel and starter ring gear

17 Refer to Section 12 in Part A of this Chapter but ignore paragraph 49 as this is already dealt with in this Section.

15 Cylinder head - dismantling, decarbonising, inspection and reassembly



Dismantling

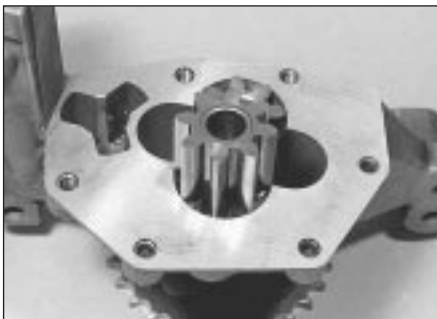
1 Unbolt and remove the inlet manifold (with carburettor) and the exhaust manifold. Renew their respective gaskets.

2 Remove the camshaft from the cylinder head.

3 Remove the tappets and shims, identifying their locations if they are to be re-used (see illustration).

4 Extract the oil filter gauze from the oilway.

5 Proceed as described in Section 13 in Part A of this Chapter to remove the valves.



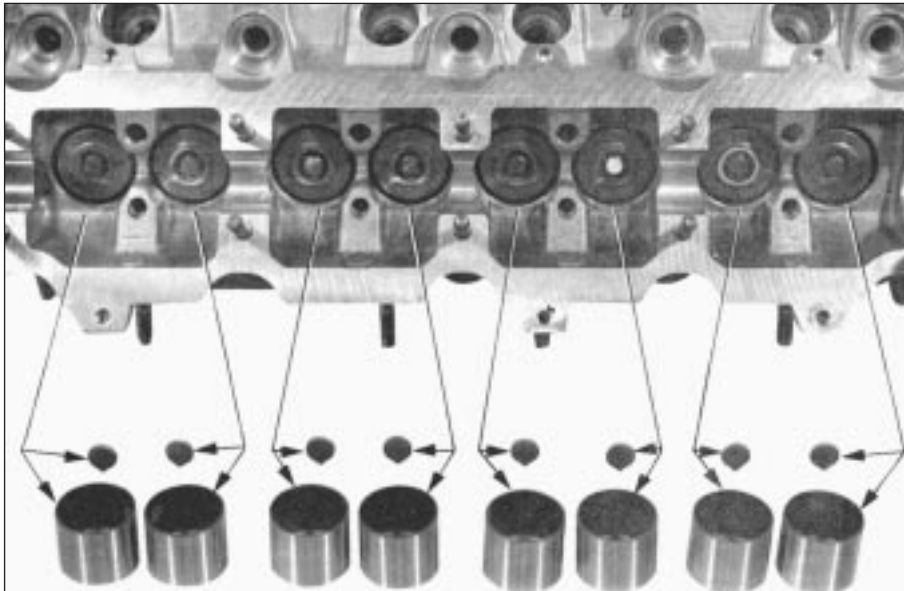
14.11a Inspect pump gears for excessive wear



14.11b Oil pump relief valve spring and plunger



14.15 Pinholes of lubrication manifold must be clear



15.3 Remove tappets and shims and keep in order

Decarbonising and inspection

6 Proceed as described in Section 13 in Part A of this Chapter and clean and inspect the various engine components. Note, however, that the makers state that no machining of the cylinder head surface is permitted. A warped head must therefore be renewed. Factory exchange cylinder heads may have had 0.2 mm machined off the mating face. These heads are identified by the letter R stamped on a boss at the distributor end of the head. A gasket 0.2 mm thicker than normal must be used with such a head. The thicker gasket is identified by a cut-out in the tab at the clutch end.

Reassembly

7 Commence reassembly of the cylinder head by fitting new valve stem oil seals into position, then locate the valves, the spring seat washers (lubricated with clean engine oil), the springs and collets. Oil the valve stems liberally. A smear of grease will hold the collets in position while the spring is compressed. The valve springs can be fitted either way up.

8 Lubricate the tappet bores. Secure each shim to its valve stem with a dab of grease and carefully fit the tappets. If new components have been fitted so that the valve clearances are unknown, fit the thinnest possible shims to all valves.

9 Fit the camshaft to the head and oil its lobes and journals (**see illustration**). Fit the bearing caps, making sure that the middle ones are the right way round. Progressively tighten the bearing cap nuts to the specified torque.

10 Fit the camshaft thrust plate and tighten its securing bolt.

11 Press the lubrication manifold into position (**see illustration**).

12 Fit a new filter gauze in the oilway (**see illustration**).

13 Fit the coolant outlet housing, using a new gasket. Fit the thermostat and its elbow to the housing, again with a new gasket.

14 Fit the inlet and exhaust manifolds, using new gaskets, and tighten their fastenings to the specified torque.

15 Fit and secure the fuel pump (new gasket)

and the distributor. If alignment marks were not made when dismantling, set the distributor in mid-slot. The drive is offset so it can only be fitted one way.

16 Fit the carburettor and its heat insulator.

17 Fit a new oil seal to the sprocket end of the camshaft, using a piece of tube to drive it home.

18 If valve clearance adjustment is to be carried out now, temporarily fit the camshaft sprocket and stand the cylinder head on wooden blocks so that open valves do not strike the work surface.

16 Engine reassembly - general information

Refer to Section 14 in Part A of this Chapter.

17 Engine - preparation for reassembly



Refer to Section 15 in Part A of this Chapter.

18 Cylinder liners - checking protrusion



Refer to Section 16 in Part A of this Chapter.

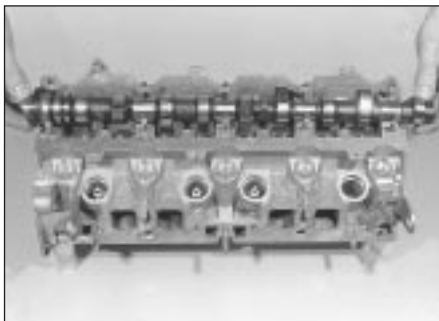
19 Engine - complete reassembly



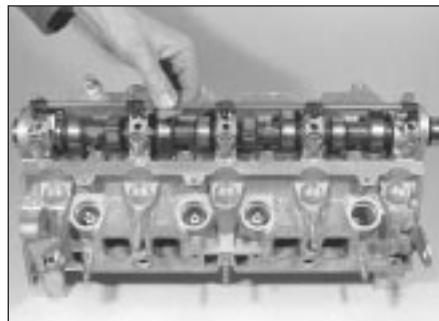
Pistons and liners

1 Reassemble the piston rings to the pistons and the pistons to the liners. Orientate the piston rings as shown (**see illustration**) and arrange the oil control rings so that the rail gaps are offset to each other and from the gudgeon pin hole by 20 to 30 mm.

2 The piston and liner assemblies can be fitted to the crankcase at this stage or, if preferred, after the crankshaft has been fitted.



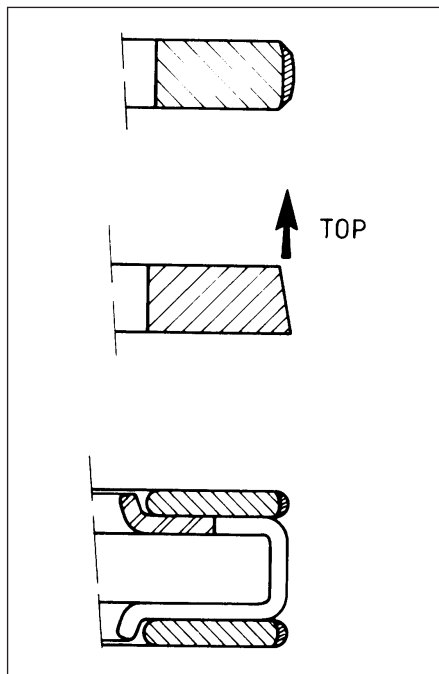
15.9 Fit camshaft into position



15.11 Refit camshaft lubrication manifold



15.12 Insert oil filter gauze in cylinder head oilway



19.1 Fitting direction for standard piston rings

Crankshaft

3 Position the cylinder block for access to the bottom end and fit the main bearing upper shells. Also fit the thrustwasher segments to No 2 bearing, grooved sides outwards (see illustration), retaining them with a smear of



19.3 Fitting thrustwasher upper segments

grease. It will be noted that the main bearing shells supplied comprise plain and grooved type half shells which differ according to engine type as follows:

Early engines

4 On these engines there are two grooved half shells supplied, these being fitted to the No 2 and No 4 bearings on the top (crankcase) side.

Engines manufactured prior to July 1986

5 On these engines, the bearing set contains seven grooved and three plain bearing shells, one plain bearing shell being located at the top (crankcase) side of No 3 bearing and the other two fitted to the No 2 and No 4 bearing caps (see illustrations).

Engines manufactured after July 1986

6 On these engines, there is a further arrangement for the location and fitting of the

bearing shells. The plain bearing shells are fitted to the bearing caps of Nos 2 to 5 bearings inclusive. The No 1 bearing cap and upper half-shells are all grooved (see illustration). The bearing shell location lug recesses in the crankcase are changed to suit the new bearings. Earlier and later-type shell bearings are thus not compatible. When ordering replacement bearing shells, it is therefore important to be specific on which type is required.

Engines manufactured after July 1987

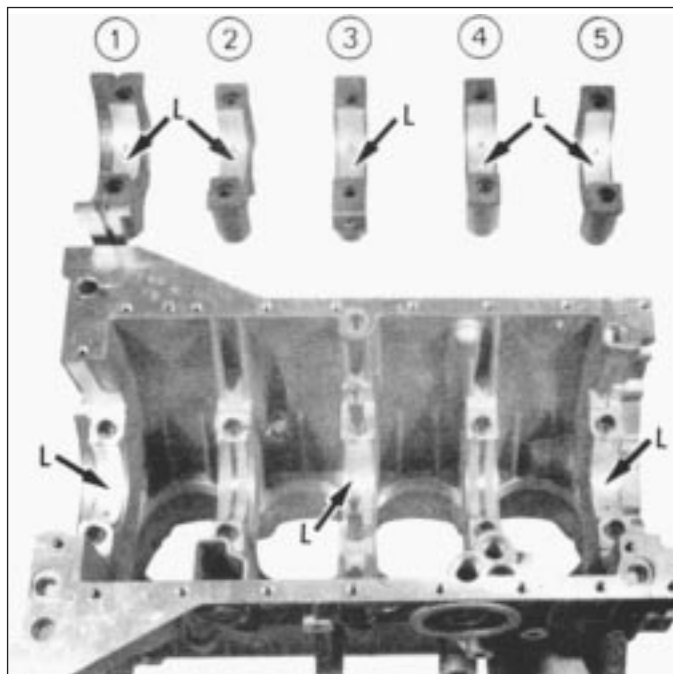
7 As from this date, grooved shells are used in the crankcase seats, and plain shells in the bearing caps.

All engine types

8 Oil the bearing shells and lower the crankshaft into position, taking care not to dislodge the thrustwasher segments (see illustration). Inject some clean engine oil into the crankshaft oilways.

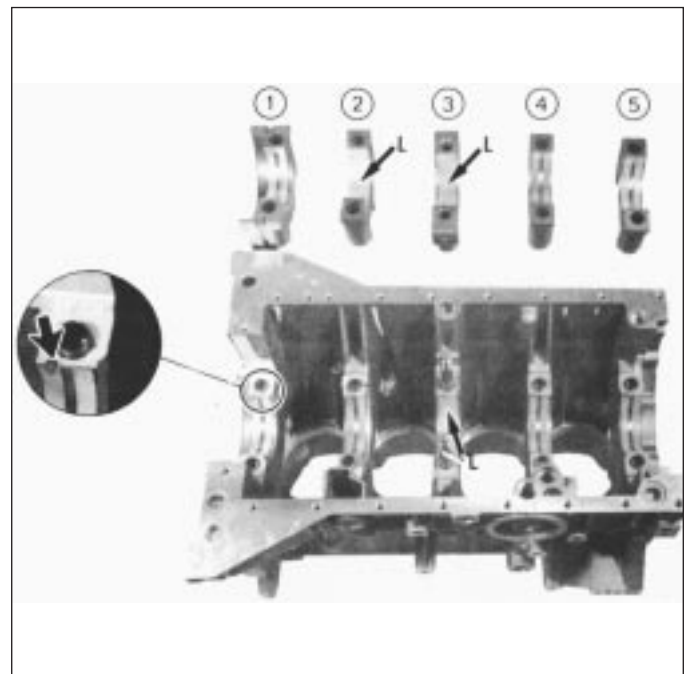
9 Check the crankshaft endfloat by pushing it in one direction then the other along its length. A dial gauge or feeler blades should be used to measure the endfloat. If the endfloat measured is not within the specified limits change the thrustwasher segments and fit alternatives of suitable thickness. Thrustwashers are available in a choice of five thicknesses.

10 Fit new side seals to No 1 main bearing cap. Carefully fit the cap with its bearing shell. Using clean engine oil, lubricate the shell, the sides of the cap and the locating surfaces in the block. There is a risk of displacing or



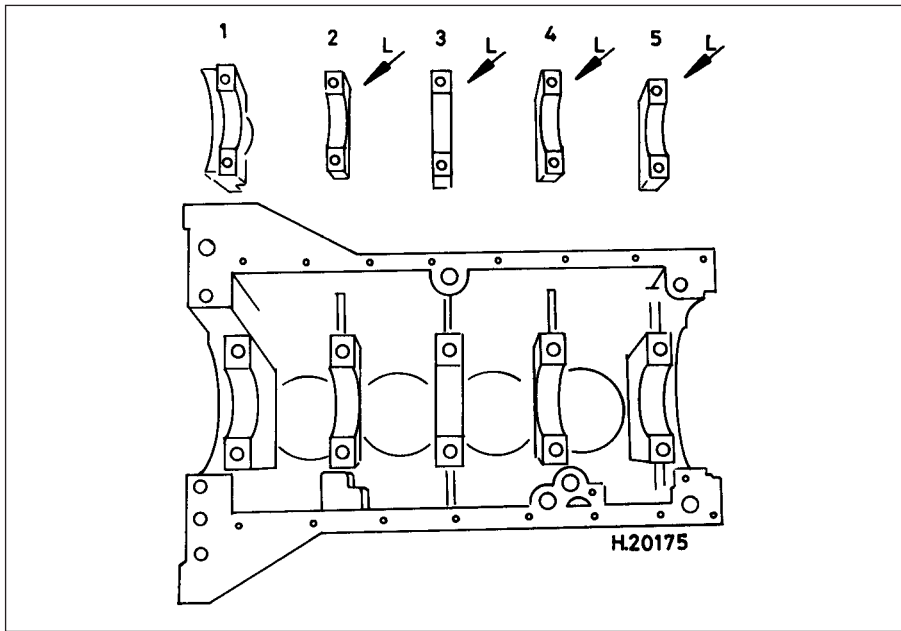
19.5a Main bearing cap fitting positions - early type

L Plain bearing half shell positions



19.5b Main bearing cap fitting positions - later type

L Plain bearing half shell positions



19.6 Main bearing shell locations - BX 16 and BX 19 from July 1986

L Plain shells in caps

distorting the side seals as the cap is fitted, so protect them with a couple of feeler blades or thin strips of tin which can be withdrawn rearwards after fitting the cap (see illustrations).

11 Fit the shells to the other main bearing caps, lubricate them and fit the caps. Fit the

thrustwasher segments (grooved side outwards) to No 2 cap. Observe the mating marks made when dismantling. The lug on each bearing cap points towards the timing sprockets. Ensure that the thrustwasher segment on each side of the No 2 main bearing cap is of equal thickness to the

corresponding upper segment washer selected when setting the crankshaft endfloat. 12 Fit the main bearing cap nuts and bolts and tighten them to the specified torque. Tighten the side bolts on No 3 cap last (see illustration).

13 Check the protrusion of No 1 cap side seals above the sump mating face, this should be 2 mm. Trim off any excess.

14 Recheck the crankshaft endfloat and ensure that it rotates freely.

15 Fit a new oil seal (lips inwards and lubricated) to the flywheel end of the crankshaft. Drive it into place with a piece of tube (see illustration).

16 If not already fitted, fit new O-ring seals to the cylinder liners, then fit the pistons and liners (see illustration).

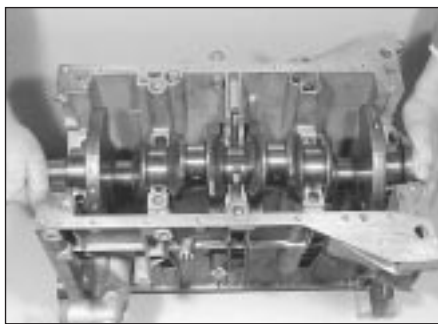
17 Reconnect the connecting rod big-ends to the crankshaft.

Oil pump

18 Fit the Woodruff key and oil pump drive sprocket to the crankshaft nose. Fit the chain over the sprocket (see illustrations).

19 Make sure that the locating dowel is in position, then engage the oil pump sprocket in the chain and offer the pump to the block. Engage the pump on the dowel, then lift it up far enough to slide the L-shaped spacer in underneath it (see illustrations).

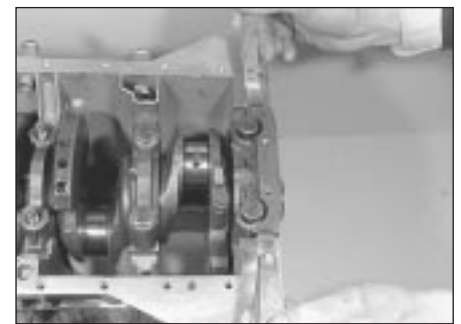
20 Fit the oil pump securing bolts, remembering that the special centring bolt is nearest the flywheel, and tighten them to the



19.8 Fitting the crankshaft



19.10a Fitting a side seal to No 1 main bearing



19.10b Protecting side seals with feeler blades



19.12 Tightening No. 3 main bearing side bolt



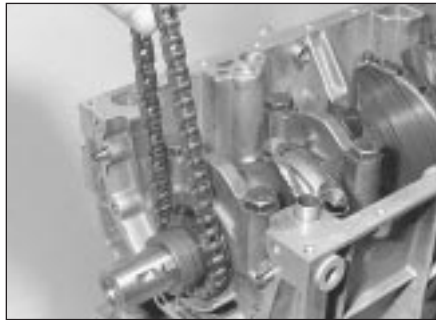
19.15 Crankshaft oil seal - flywheel end



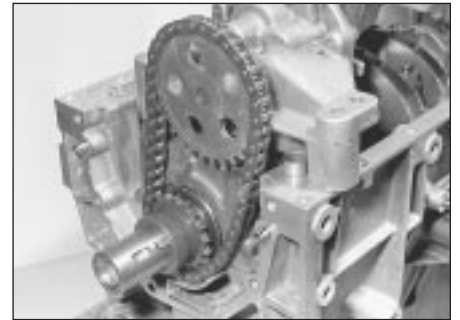
19.16 Arrow mark on piston crowns must point to camshaft sprocket end (letter and number indicate liner and gudgeon pin grade)



19.18a Fitting oil pump drive sprocket



19.18b Oil pump drive chain



19.19a Fitting oil pump - chain must be engaged first

specified torque. Generously lubricate the pump and the chain with clean engine oil (see illustration).

21 Refit the pulley oil seal carrier plate, using silicone jointing compound on the block mating faces. Fit a new oil seal, lubricated lips inwards, and drive it home with a piece of tube.

22 Fit the sump, using a new gasket, and tighten its securing bolts progressively to the specified torque. Remember the correct location of the three Allen-headed bolts.

23 Refit the suction drain pipe, using a new O-ring. Do not overtighten the securing nuts, refer to the *Specifications* for the correct torque setting.

Flywheel and clutch

24 Fit the flywheel to the crankshaft flange and secure with new bolts, using thread locking compound. Tighten the bolts progressively to the specified torque.

25 Fit the clutch friction plate and pressure plate.

Cylinder head

26 Position the engine for access to the cylinder head face. Rotate the crankshaft to bring the pistons to mid-stroke (none at TDC), then remove the liner clamps.

27 Check that the head mating surface is clean and that the two locating dowels are present. Place a 5 mm diameter rod in the hole beneath the dowel at the flywheel end to stop the dowel being displaced downwards.

28 Fit a new cylinder head gasket, dry and with the protruding tab at the flywheel end (see illustration).

29 Lower the assembled cylinder head into position, making sure that it engages with the dowels.

30 Fit the cylinder head bolts, with their threads clean and lightly oiled. Remember to fit the spacer to the bolt above the coolant pump.

31 Tighten the cylinder head bolts progressively in the order shown in illustration 8.26 to the Stage 1 specified torque.

32 Slacken cylinder head bolt number 1, then immediately retighten it to the Stage 2 specified torque, then tighten it further through the angle specified for Stage 3. Repeat this operation on the other bolts in sequence.

Camshaft drivebelt

33 Fit the camshaft sprocket backplate, using a 10 mm rod through the timing hole to locate it precisely before tightening its securing bolts.



19.19b Locating oil pump spacer

34 Fit the camshaft sprocket, washer and bolt. Use the 10 mm rod to lock the sprocket in the correct position and tighten the bolt to the specified torque. Remove the rod.

35 Fit and secure the coolant pump, using a new gasket. Tighten the bolts to the specified torque.

36 Fit the covers around the coolant pump, noting the locations of the various special bolts (see illustration). Smear the large bolt threads with sealant.

37 Fit the Woodruff key and the crankshaft sprocket.

38 Fit the camshaft drivebelt tensioner but leave the nuts slack. Compress the spring by locking the cam in the horizontal position.



19.20 Special bolt location



19.28 Head gasket correctly fitted

39 Temporarily fit the crankshaft pulley, its washer and bolt. Lightly tighten the bolt. Carefully turn the crankshaft until a 10 mm rod will pass through the timing hole in the pulley and into the timing recess. If piston/valve contact occurs, back off and try again with the camshaft in a slightly different position. Do not try to force the crankshaft if a piston contacts a valve.

40 Use the 10 mm rod to position the camshaft sprocket, then remove the crankshaft pulley and fit the camshaft drivebelt. Be careful not to kink the belt as it is fitted and observe the arrows showing the correct direction of rotation. The stripes on the belt should align

with the timing marks on the sprockets.

41 Withdraw the timing rod. Tension the belt by turning the tensioner cam so that it points downwards and secure it with its locknut. Tighten the two nuts at the front of the tensioner.

42 Turn the crankshaft through two full turns in the normal direction of rotation. Rotate it further to bring Nos 1 and 4 pistons to TDC with the valves on No 1 cylinder open.

43 Slacken the two nuts and the cam locknut on the drivebelt tensioner, then retighten them.

44 Temporarily refit the crankshaft pulley, rotate the crankshaft and check that the timing rods can be inserted simultaneously in

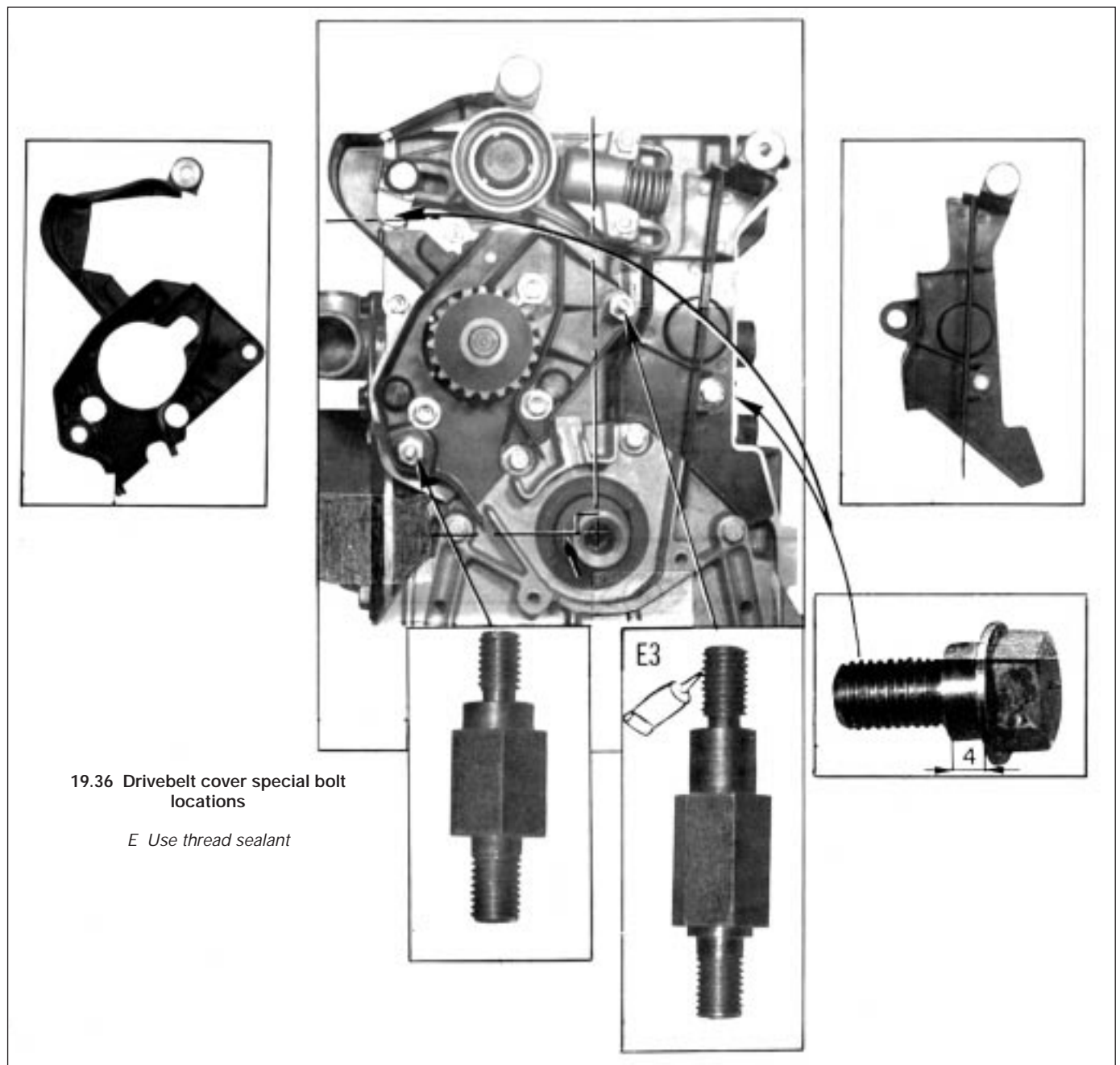
the crankshaft pulley and camshaft sprocket holes. If not, remove the belt and try again. Remove the pulley.

45 Fit the engine mounting bracket and tighten its bolts.

46 Refit the drivebelt covers, but note that they will have to be removed later to retension the drivebelt if a new one has been fitted.

47 Fit the crankshaft pulley, washer and bolt, making sure that the Woodruff key is still in position. Jam the starter ring gear teeth and tighten the bolt to the specified torque.

48 Refit the camshaft cover, noting the copper washer at the sprocket end bolt and using a new gasket.



Ancillary components

49 Refit the ancillary components listed below. It may be preferable to leave delicate items such as the alternator and distributor until after the engine is refitted:

- a) Oil filler/breather pipe
- b) Oil pressure switch
- c) Coolant inlet housing and pipe (see illustration)
- d) Spark plugs, distributor and HT leads
- e) HP pump and drivebelt (see illustration)
- f) Alternator and drivebelt

50 Fit a new oil filter with its sealing ring well lubricated. Tighten by hand only.



19.49a Securing coolant pipe to inlet housing



19.49b Refitting HP pump and drivebelt

20 Engine - reconnection to transmission



1 Check that the clutch release components are correctly fitted in the gearbox and that the pressure plate and friction disc are fitted to the flywheel. On automatic transmission models, check that the torque converter is properly located.

2 Smear a little anti-seize compound on the nose and splines of the transmission primary (input) shaft, then offer the transmission to the engine. Do not allow the weight of the transmission to hang on the input shaft. If the input shaft does not wish to pass the clutch, it is possible that the clutch disc is not centred. Check also that the transmission input shaft is compatible with the spigot recess in the crankshaft.

3 Engage the engine-to-transmission dowels and loosely fit the bolts. Also fit the starter

motor, which is secured by three Allen bolts and a bracket.

4 On manual gearbox models, fit the clutch cable guide and pivot brackets.

21 Engine/transmission - refitting



1 Arrange the lift sling so that the gearbox tilts down at an angle of 45° when the engine/transmission is raised.

2 An assistant should be at hand to guide the unit into position as it is lowered. Take care not to damage any associated components within the engine compartment, the hydraulic lines in particular. The suspension height corrector control unit can be protected from possible damage by shielding it with a suitable piece of sheet metal. Also, before lowering the combined units into position,

check that the gearchange return levers are set parallel to the steering gear unit.

3 Carefully lower the engine/transmission into the engine compartment, guiding the gearbox down forwards of the battery tray support. When clear of the support, swivel the gearbox rearwards then raise it so that the mounting stud enters the mounting slot. Locate the mounting rubber (cone face upwards), then fit the flat washer and nut. Do not fully tighten it at this stage.

4 Further lower the lifting hoist to guide the engine down so that it engages with the right-hand mounting and its torque link (underneath towards the rear).

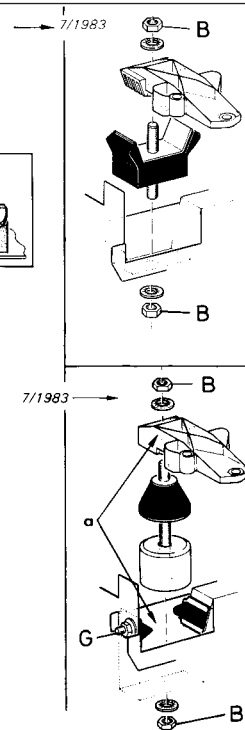
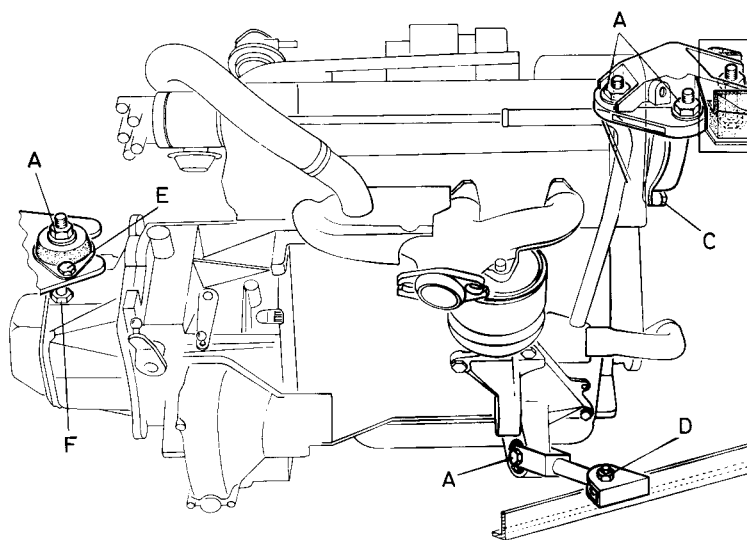
5 Locate a plain nut and washer to secure the right-hand mounting and insert the through-bolt and fit the self-locking nut to secure the torque link.

6 Tighten the mounting nuts and the torque link nut and bolt to their specified torque settings (see illustration).

2B

21.6 Engine mountings

Inset top Right-hand mounting up to July 1983
Inset bottom Right-hand mounting from July 1983



7 Reconnect the following items, referring where necessary to the relevant Section or Chapter for further details:

- a) *The gearchange link rods*
- b) *The speedometer cable*
- c) *The coolant hoses to the coolant manifold located between the cylinder head and the bulkhead*
- d) *Fuel feed and return hoses*
- e) *The HP pump unit hoses. Retighten the regulator bleed screw*
- f) *Accelerator cable to the carburettor*
- g) *Wiring harnesses*
- h) *Clutch cable to release arm. Lubricate the pushrod with grease at each end before assembling*
- i) *Exhaust downpipe*
- j) *Radiator and coolant hoses*
- k) *Braided earth straps to the gearbox, battery support tray and battery*

8 When refitting the alternator guard, press the retaining grommet into the right-hand engine mounting bracket as shown using a rod and pliers (**see illustration**). Take care not to pierce the bottom end of the grommet and smear it with a little soapy solution to ease fitting.



21.8 Method devised for securing alternator guard retaining grommet

9 The driveshafts and associated steering/suspension components should be refitted in accordance with the instructions given in the appropriate Chapter. Refit the right-hand drive shaft first.

10 Before refitting the air filter and air ducts, check around the engine/transmission to ensure that all fittings are securely and correctly made.

11 Top-up and bleed the cooling system.

12 Top-up the engine oil level, having checked

that the sump plug is securely fitted.

13 Top-up the gearbox oil level with the specified quantity of oil. Note that the gearbox filler plug is not a level plug.

22 Engine - initial start-up after overhaul



1 Follow the check procedures described in paragraphs 1 to 7 inclusive in Section 19 in Part A of this Chapter.

2 If hexagon headed cylinder head bolts are fitted, allow the engine to cool for at least two hours. Loosen the bolt which secures the engine right-hand mounting bracket to the block, then retighten the cylinder head bolts as described in Section 8. Tighten the mounting bracket bolt on completion. No subsequent retightening is necessary. Note that where Torx type cylinder head bolts are fitted, retightening after warm-up is not required.

3 Recheck the valve clearances.

4 If a new camshaft drivebelt was fitted then retension it.