






# Chapter 2 Part D: D6C engine

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## Degrees of difficulty

<b>Easy</b> , suitable for novice with little experience 	<b>Fairly easy</b> , suitable for beginner with some experience 	<b>Fairly difficult</b> , suitable for competent DIY mechanic 	<b>Difficult</b> , suitable for experienced DIY mechanic 	<b>Very difficult</b> , suitable for expert DIY or professional 
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## Specifications

Specifications are as for the type 159 engine (see Chapter 2B) except for the following:

### General

Model application:	D6C (XU9J4)
BX 19 GTi 16 valve	10.4:1
Compression ratio	160 at 6500 rpm
Maximum power DIN (BHP)	133 at 5000 rpm
Maximum torque DIN (lbf ft)	

### Valves

Head diameter:	
Inlet	34.7 mm
Exhaust	29.7 mm
Cam followers	Hydraulic (valve clearance adjustment not required)

### Valve timing

Valve lift	9.2 mm
Inlet opens*	1° 35' BTDC
Inlet closes*	45° 50' ABDC
Exhaust opens*	47° 0' BBDC
Exhaust closes*	0° 30' ATDC

\*With valve clearance of 1.0 mm

### Crankshaft

Endfloat thrustwasher thicknesses	2.33 to 2.53 mm (in increments of 0.05 mm)
Crank journal diameter	59.7 to 60.0 mm
Crankpin diameter	49.7 to 50.0 mm

### Lubrication system

Oil pressure:	
At 850 rpm	2.0 bar
At 3000 rpm	4.8 bar
Oil filter	Champion F104
Oil capacity (with filter change)	5.3 litres (9.3 pints)
Dipstick minimum to maximum	1.5 litres (2.6 pints)

Torque wrench settings	Nm	lbf ft
Camshaft bearing cap Allen screws	10	7
Main bearing cap bolts and nuts	50	37
Centre main bearing cap side bolts	25	18
Sump pan bolts	20	15
Big-end bearing cap nuts:		
Stage 1	40	30
Stage 2: slacken, then tighten to	20	15
Stage 3: then immediately	Tighten a further 70°	
Oil pump bolts	20	15
Flywheel bolts	50	37
Clutch cover bolts	25	18
Crankshaft sprocket bolt	110	82
Coolant pump bolts	15	11
Camshaft sprocket bolts	45	33
Timing belt tensioner locking screw	20	15
Engine mounting bracket at timing cover end:		
Larger bolts	72	53
Smaller bolts	45	33
Crankshaft damper bolts	25	18
Camshaft rear pulley bolt	45	33
Inlet manifold bolts	20	15
Exhaust manifold bolts	25	18
Cylinder head bolts:		
Stage 1	60	43
Stage 2: slacken, and then tighten each bolt in turn to	20	15
Stage 3: then immediately	Tighten a further 300°	

## 1 General information and precautions

### General information

The D6C engine is fitted to all BX 19 GTi 16 valve models and is a development of the D6A engine, which itself is based upon the 159A engine dealt with in Chapter 2B.

Introduced in July 1987, the essential difference is the 16 valve double overhead camshaft cylinder head, the camshafts being driven by a toothed belt tensioned by two idler rollers.

The need for valve clearance adjustment is eliminated by the incorporation of Hydraulic tappets (cam followers).

The pistons have been re-designed, with valve head recesses machined in the piston crown and the gudgeon pins are now of the "floating" type, secured by circlips in the piston. The undersides of the pistons are cooled by oil jets located in lubrication pipes within the crankcase.

The crankshaft has lighter balancing counterweights with a damper fitted to the sprocket end.

Pressurised oil is supplied by an oil pump located within the sump pan, the pump being driven by chain from the crankshaft.

Due to an oil cooler being fitted, oil capacity has increased. The oil filter is of disposable screw-on canister type, mounted on the oil cooler housing. The oil filler pipe is an independent assembly, remote from the engine, in order to provide a reasonable position for pouring oil into the steeply-canted engine.

### 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:

- Timing belt and camshafts.
- Cylinder head.
- Sump pan
- Oil pump.
- Engine mountings.

## 4 Major operations requiring engine removal

The engine must be removed for the following operation:

- Removal of the crankshaft and main bearings

## 5 Timing belt - removal and refitting



**Note:** If there is the slightest doubt about the condition of the timing belt then it must be renewed.

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

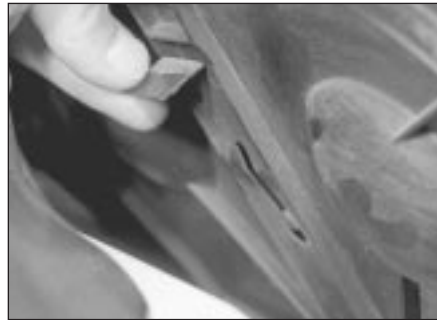
**Note:** Accurate adjustment of the timing belt entails the use of Citroën special tools. An approximate setting can be achieved using the method described in this Section but is essential that the tension is checked by a dealer on completion.

### Removal

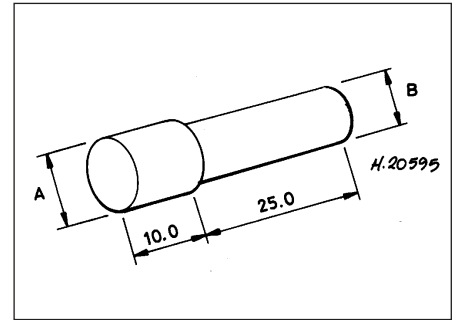
- Disconnect the battery.
- Remove the front right-hand roadwheel, then unclip and remove the wheel arch blanking panel to provide access to the timing cover, the crankshaft sprocket and damper (see illustration).
- Loosen the alternator mounting bolts and the belt adjuster link, then remove the alternator drivebelt.



5.2 Removing front right-hand wheel arch blanking panel



5.4 Removing a timing belt cover spring clip



5.11 Stepped pin fabrication  
a 8.43 mm b 6.38 mm

4 Pull out the keyhole slot-type spring clips from the front face of the timing belt cover (see illustration).

5 Extract the screws and remove the timing belt cover.

6 Using the centre bolt in the crankshaft damper, turn the crankshaft until the slot in the crankshaft sprocket is aligned with the one on the oil pump cover, and the pin holes in the camshaft sprockets are aligned with the holes in the cylinder head.

7 Unscrew the bolts and take off the damper from the front end of the crankshaft.

8 Remove the timing belt lower cover.

9 Using an Allen key, release the belt tensioner locking screws.

10 Remove the timing belt.

### Refitting

**Caution:** Take care not to kink or contaminate the timing belt with oil

11 Setting tools will be required when fitting the new belt. In the absence of Citroën special tools (01 53M and 01 53G), make up two stepped pins as shown (see illustration). Obtain a short length of rod which will be a snug fit in the cut-outs of the crankshaft sprocket and the oil pump cover.

12 Insert the camshaft sprocket stepped pins and the crankshaft rod (see illustrations).

13 Fit the new timing belt in a clockwise direction, following the numerical sequence shown (see illustration). Adjust the tensioning pulleys on both sides to make the belt taut. Check that the longest run of the belt can be twisted through 45° when gripped



5.12a Camshaft sprocket locking pins in position



5.12b Crankshaft sprocket locking rod in position

between the finger and thumb. Tighten the tensioner screws to the specified torque. Note that in this application, the tensioners serve two purposes, both to tension the belt and to provide fine adjustment of the valve timing.

14 Remove the two stepped pins and the rod.

15 Turn the crankshaft through two complete revolutions. Fit the crankshaft sprocket locking rod.

16 The two stepped pins should now slide smoothly through the holes of the camshaft sprockets into the holes in the cylinder head. Even the slightest misalignment will require re-adjustment of the tensioner pulleys to provide perfect alignment.

17 Remove the pins and rod, and recheck after turning the crankshaft through two more complete revolutions. It is strongly recommended that the belt tension should be

checked by your Citroën dealer using the special tensioner device (Seemtronic 87).

18 Fit the timing belt lower cover, the crankshaft damper and the belt main cover (see illustrations).

19 Refit and reconnect all the other components in reverse order of removal, referring to the *Specifications* for the appropriate torque wrench settings.

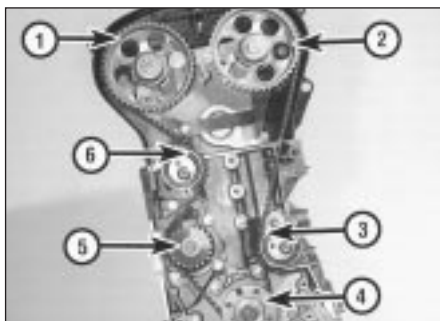
## 6 Cylinder head - removal, overhaul and refitting



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

### Removal

1 Drain the engine cooling system and disconnect the battery.



5.13 Fit timing belt in clockwise direction, starting at No 1



5.18a Timing belt lower cover refitted



5.18b Fitting a crankshaft damper bolt



6.2 Removing camshaft centre cover plate



6.8a Extracting a camshaft cover screw



6.8b Extracting a timing belt cover screw

2 Release the screws and remove the cover plate from the centre of the camshaft cover (see illustration).

3 Disconnect the spark plug leads from the spark plugs and disconnect the coolant temperature sender lead.

4 Extract the screws and remove the distributor cap, complete with leads.

5 Disconnect the fuel hose from the fuel rail.

6 Disconnect the fuel injector wiring plugs and then unbolt the fuel rail and remove complete with injectors.

7 Disconnect the coolant hoses from their cylinder head connections.

8 Extract the screws and take off the camshaft cover and the timing belt cover (see illustrations).

9 Using the centre bolt in the crankshaft damper, turn the crankshaft until the slot in the crankshaft is aligned with the one on the oil pump cover and the pin holes in the camshaft sprockets are aligned with the holes in the cylinder head. Use two stepped pins to lock the sprockets in this position as shown in illustration 5.12a.

10 Release the tension of the timing belt by slackening the Allen screws in the two tensioner rollers. Mark the direction of rotation on the belt then slip the belt from the camshaft sprockets.

11 Pull the lubrication pipes from the camshaft bearing caps. The camshafts can be removed independently of the cylinder head if required, or the complete cylinder head can be removed and then dismantled.

12 Assuming that the cylinder head is to be

removed complete, release and remove the high pressure pump drivebelt from the end of the exhaust valve camshaft.

13 Note that the camshaft bearing caps are numbered 1 to 5 from the flywheel end of the engine and are doweled so that they can only be fitted one way.

14 Progressively unscrew the Allen screws in the reverse order to that shown for tightening. Remove the camshaft bearing caps in the following order - No 4 first, then Nos 2, 3, 1 and 5.

15 Lift out the camshafts, labelling them "Exhaust" and "Inlet".

16 Disconnect the air inlet duct from the air cleaner and the hoses, control cables and leads from the inlet manifold and throttle housing.

17 Unscrew the inlet manifold nuts and lift the manifold from the cylinder head.

18 Unscrew the exhaust manifold nuts and pull it away from the cylinder head. The lower nuts are more accessible from underneath.

19 Using a TX55 Torx bit, unscrew and remove the cylinder head bolts in the reverse order to that shown for tightening.

20 Remove the cylinder head. If it is stuck, rock it using pieces of wood inserted in the inlet ports. Discard the cylinder head gasket.

21 As soon as the head is removed, fit liner clamps to prevent the liner base seals being disturbed.

### Overhaul

22 Remove the hydraulic tappets (cam followers), keeping them in order of installation.

23 Removal of the valves and decarbonising are as described in Section 13 in Part A of this Chapter but the valves must be identified as to original location (see illustrations).

24 When refitting a valve, some difficulty may be experienced in inserting the split collets. Use of a pencil magnet or a dab of thick grease will help.

25 The valve stem oil seals can be removed with a pair of long-nosed pliers. Fit the new ones using a piece of tubing of suitable bore.

### Refitting

26 Ensure that all components are clean and new gaskets are to hand. Remember that as refitting proceeds, all nuts and bolts must be tightened to the torque wrench settings given in the *Specifications*. Remove the liner clamps.

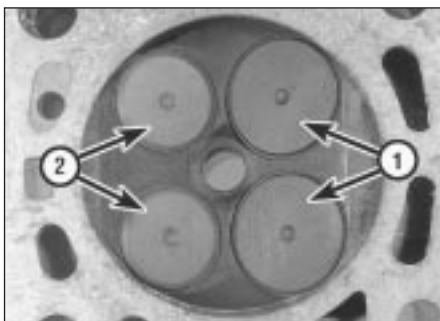
27 Smear the hydraulic tappets (cam followers) with grease, then refit them in their original locations.

28 Place a new cylinder head gasket on the top of the cylinder block (see illustration).

29 Lower the cylinder head onto the positioning dowels.

30 Lightly oil the cylinder head bolts, then insert and tighten them in the order shown to the torque wrench settings given in *Specifications* (see illustrations).

31 Locate the camshafts with new oil seals. Assuming that the crankshaft has not been moved from its position aligned with the oil pump housing, the camshafts should be set with the keyways at the 3 o'clock position. This is so that when the camshaft sprockets are fitted, the pin holes will be in alignment with the corresponding holes in the cylinder head.



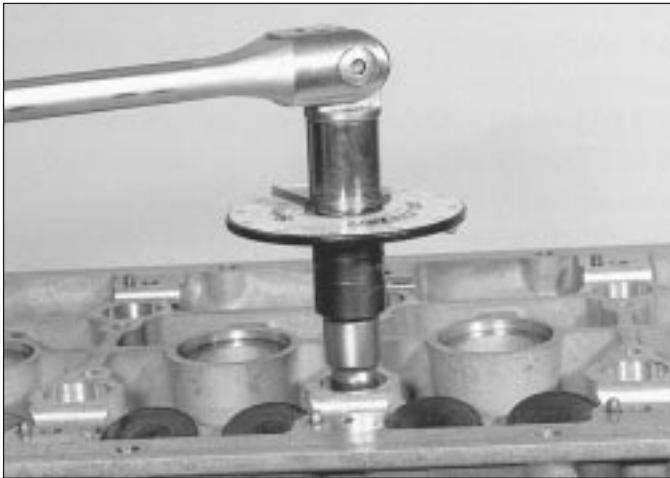
6.23a View of combustion chamber showing inlet valves (1) and exhaust valves (2)



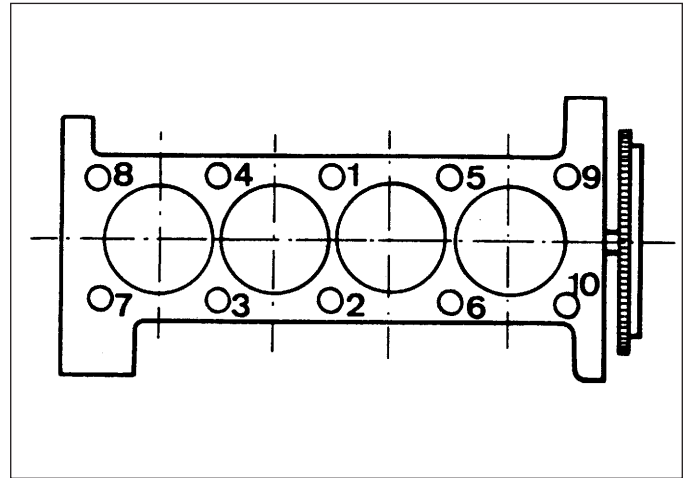
6.23b Valve components



6.28 Fitting a new cylinder head gasket



6.30a Angle-tightening a cylinder head bolt



6.30b Cylinder head bolt tightening sequence

32 Fit the camshaft bearing caps and tighten the bolts to the specified torque in the sequence shown (see illustrations).

33 Fit the camshaft lubrication pipes (see illustration).

34 Fit the timing belt rear cover and the camshaft sprockets, ensuring that the alignment is correct by using the stepped pins

described earlier. Use an open-ended spanner on the flats of the camshaft to hold it whilst tightening the sprocket bolt to the specified torque (see illustrations).

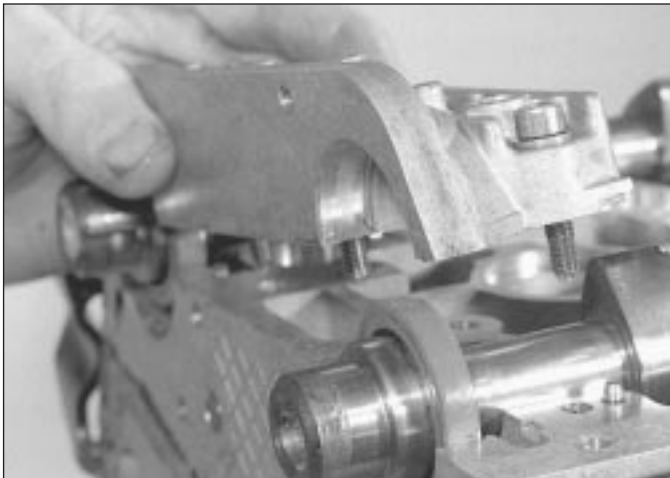
35 Refit the timing belt.

36 Fit the timing belt cover. Check that the spark plug hole oil seals are in position (see illustration) and then fit the cam cover.

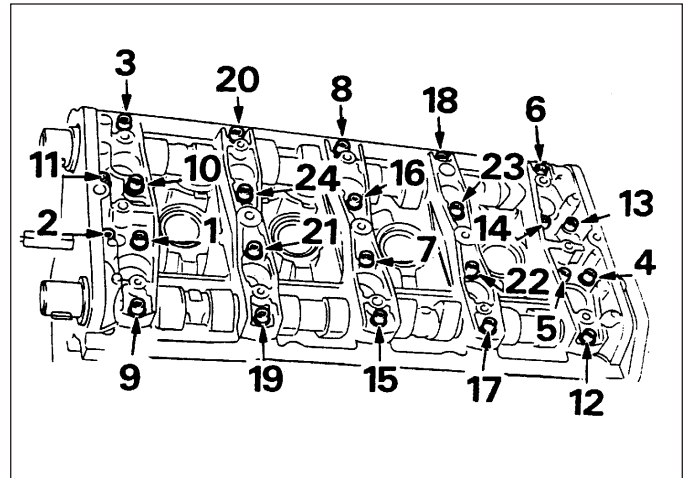
37 Fit the distributor cap and connect the spark plug leads.

38 Using new gaskets, reconnect the inlet and exhaust manifolds to the cylinder head (see illustrations).

39 Reconnect and tension the drivebelts, then connect the air cleaner inlet.



6.32a Fitting a camshaft bearing cap



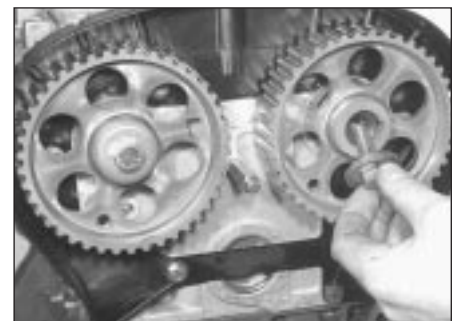
6.32b Camshaft bearing cap bolt tightening sequence



6.33 Camshaft lubrication pipe - note seal on spigot



6.34a Timing belt rear cover correctly refitted



6.34b Fitting a camshaft sprocket bolt



6.36 Spark plug hole oil seal



6.38a Exhaust manifold gasket correctly located



6.38b Exhaust manifold fitted

40 Reconnect the electrical leads to the cylinder head switches and then reconnect the coolant hoses and control cables.

41 Reconnect the fuel hoses, fuel rail and injectors (see illustration).

42 Reconnect the battery.

43 Refill the cooling system.

## 7 Engine/transmission - removal



1 This operation is essentially as described in Part B of this Chapter. The connections for the Motronic engine management system must be taken into account and any references to a carburettor ignored.

2 The pressure regulator for the hydraulic system (located on the forward-facing side of the crankcase) must be withdrawn and tied aside.

3 The hydraulic pump (driven by the exhaust camshaft pulley) must be removed from its drivebelt and mounting and tied to one side (see illustrations).

## 8 Engine dismantling - general information

Refer to Section 8 in Part A of this Chapter.



7.3a Hydraulic pump drive pulley (arrowed)



7.3b Hydraulic pump (arrowed)



6.38c Inlet manifold fitted



6.41 Fitting fuel rail and injectors

## 9 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. 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.

## 10 Engine - separation from transmission



Refer to Section 12 in Part B of this Chapter.

## 11 Engine - complete dismantling



**Note:** As dismantling of the engine requires the timing belt to be removed, it is advisable to read the procedure for timing belt removal and refitting before starting work.

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

2 Clean away all external dirt using water-soluble solvent or paraffin and a stiff brush.

3 Unbolt the ignition coil from the inlet manifold.

4 Withdraw the engine oil dipstick.

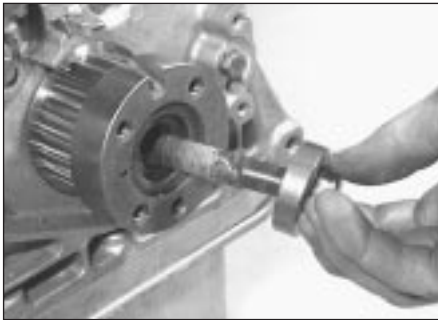
5 Remove the oil filler pipe assembly.

6 Unplug the fuel injectors, release the fuel rail (two screws) and withdraw the rail/injector assembly.

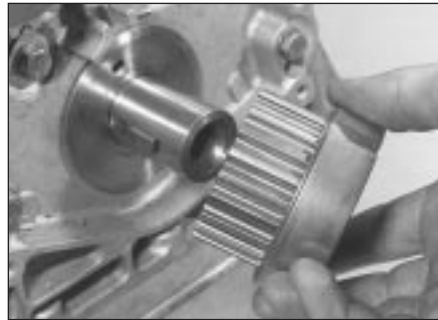
7 Remove the cover plate from the centre of the cam cover then remove the cam cover itself. Disconnect and withdraw the spark plug HT leads.

8 Unscrew and remove the spark plugs.

9 Disconnect the hoses and remove the coolant distribution pipe.



11.23a Removing crankshaft sprocket bolt and spacer



11.23b Removing crankshaft sprocket



11.32a Extract Allen screws (arrowed) . . .

10 Unbolt and remove the inlet manifold complete with throttle housing. Discard the gasket.

11 Unbolt and remove the thermostat housing.

12 Unbolt the exhaust manifold and discard its gasket.

13 Unbolt and remove the coolant multi-union from the exhaust side of the crankcase.

14 Unbolt and remove the mounting bracket from the front of the cylinder block.

15 Remove the distributor and drive flange.

16 Remove the pulley and plastic guard from the rear end of the exhaust camshaft. The camshaft may be held against rotation using the spanner flats on the camshaft.

17 Unscrew and remove the oil pressure, temperature and level switches.

18 Remove the oil filter.

19 If necessary, remove the oil cooler by disconnecting the hoses and then unscrewing the large fixing nut.

20 Extract the Allen screws, slide the timing belt cover upwards and remove it.

21 Remove the timing belt.

22 Hold the flats on the camshafts with an open-ended spanner, unscrew the bolts which secure the camshaft sprockets, then remove the sprockets.

23 Unbolt and remove the crankshaft sprocket. Take out the Woodruff key (see illustrations).

24 Remove the timing belt guide plate from the crankshaft.



11.32b . . . and remove sump spacer plate



11.34a Oil pump in position

25 Remove the timing belt upper cover backplate.

26 Remove the coolant pump.

27 Pull off the camshaft lubrication pipes.

28 Remove the cylinder head.

29 Unbolt and remove the clutch assembly.

30 Unbolt and remove the flywheel.

31 Remove the sump pan securing bolts and remove the sump pan.

32 Extract the Allen screws and remove the sump spacer plate (see illustrations).

33 Extract the bolts and remove the front oil seal carrier plate.

34 Extract the bolts and withdraw the oil pump, at the same time sliding the drivechain and sprocket off the crankshaft. Note the adjustment shim used to tension the drivechain during production (see illustrations).

35 Mark the adjacent surfaces of the connecting rods and their caps by

centre-punching 1 to 4 from the flywheel end on the inlet manifold side.

36 Unbolt the big-end cap nuts and remove the caps, keeping the shell bearings with their respective rods or caps if they are to be used again.

37 Mark the upper rims of the cylinder liners 1 to 4 from the flywheel end, using paint marks as shown (see illustration). Make the marks on the inlet side if the original liners are to be used again.

38 Discard the liner base seals after the piston, connecting rod and liner assemblies have been withdrawn.

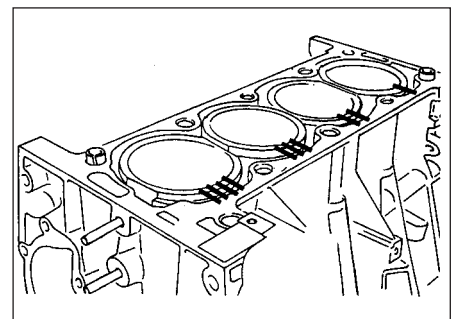
39 If the piston rings are to be removed, push the piston and connecting rod out of the liner and insert three old feeler blades at equidistant points behind the top ring. Remove the ring off the top of the piston using a twisting motion.



11.34b Removing oil pump with drivechain and sprocket



11.34c Removing oil pump drivechain tension adjustment shim



11.37 Method of marking cylinder liner numbering from flywheel end

40 Extract the circlips and push the gudgeon pin out of the piston and connecting rod. If the pin is tight, immerse the piston in very hot water.

41 Note the marking of the main bearing caps - N at the flywheel end and then 2, 3, 4 and 5, read from the flywheel end.

42 Unscrew the main bearing cap bolts or the nuts on the centre cap. The centre cap is also secured by bolts entered from each side of the crankcase.

43 Remove the main bearing caps, keeping the bearing shells with their respective caps if the shells are to be used again.

44 Semi-circular thrustwashers are located at No 2 main bearing cap.

45 Lift out the crankshaft. Retrieve the thrustwashers from their crankcase seats at No 2 main bearing.

46 If necessary, remove the lubrication pipes.

**12 Engine - examination and renovation**



**General information**

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

**Component examination and renovation**

2 Refer to Section 12 in Part A of this Chapter, ignoring references to rocker gear and timing chain.



**12.4 Removing a hydraulic tappet**

3 The rubber toothed timing belt and the oil pump drive chain should be renewed at the time of major overhaul.

4 The hydraulic tappets (cam followers) cannot be dismantled. Noisy operation will indicate the need for renewal (see illustration).

**13 Engine reassembly - general information**

Refer to Section 14 in Part A of this Chapter.

**14 Engine - preparation for reassembly**

Refer to Section 15 in Part A of this Chapter.

**15 Cylinder liners - checking protrusion**



Refer to Section 16 in Part A of this Chapter.

**16 Engine - complete reassembly**



**Note:** Maintain conditions of absolute cleanliness when reassembling the engine

**Crankshaft**

1 With the crankcase clean and oil galleries probed clean, commence reassembly by fitting the lubrication pipes. Note that the pipes are offset towards the crankcase webs (see illustration).

2 Wipe out the main bearing shell seats in the crankcase and fit the grooved shells (see illustration).

3 Using thick grease, place the thrustwashers (oil grooves visible) on each side of No 2 web (see illustration).

4 Lubricate the shells with clean engine oil and lower the crankshaft into the crankcase (see illustration).

5 Fit the plain shells in the main bearing caps and fit the caps in numbered sequence, making sure that the thrustwashers are located in No 2 cap (see illustrations).



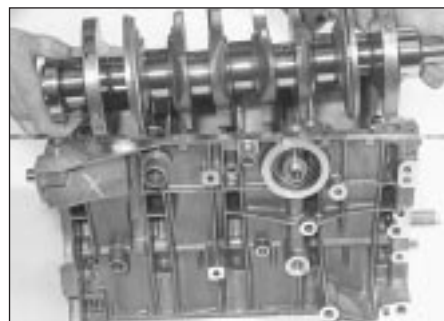
**16.1 Fitting a crankcase lubrication pipe**



**16.2 Fitting a grooved bearing shell to the crankcase**



**16.3 Fitting a crankshaft thrustwasher**



**16.4 Lowering crankshaft into crankcase**

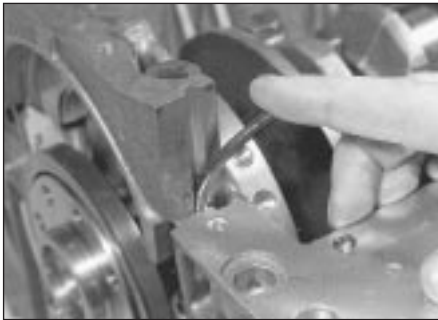


**16.5a Main bearing cap with plain shell fitted**

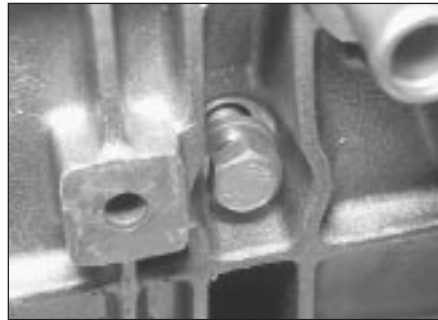


**16.5b Fitting a main bearing cap**

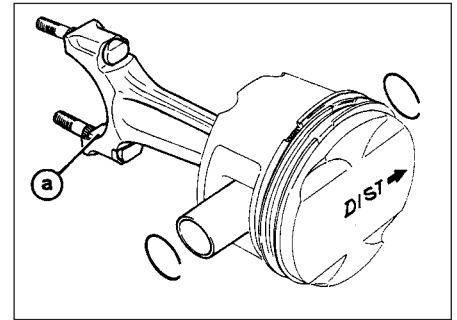




16.6 Flywheel end main bearing cap showing side sealing strip



16.8 Centre main bearing cap side bolt



16.9a Piston-to-connecting rod alignment  
a Bearing shell notch

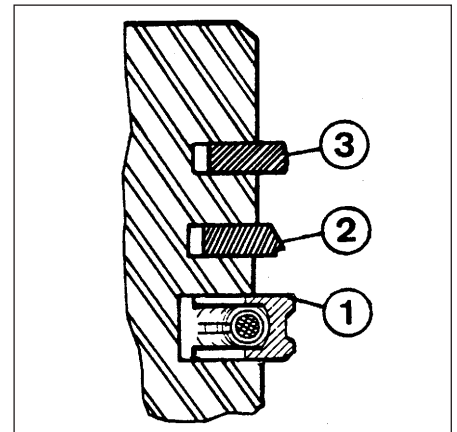
6 Fit the crankshaft rear oil seal before tightening down the main bearing cap at the flywheel end. Make sure that the new cap side sealing strips are correctly located (see illustration).

7 Tighten the main bearing cap bolts and nuts to the specified torque. Using a dial gauge or feeler blades, check the crankshaft endfloat as described in Part A of this Chapter. If necessary, change the thrustwashers to bring the endfloat within tolerance.

8 Fit and tighten the centre main bearing cap side bolts to the specified torque (see illustration).



16.9b Inserting a gudgeon pin circlip



16.10 Piston ring fitting

- 1 Oil control ring (scraper)
- 2 Second compression ring
- 3 Top compression ring

### Pistons and liners

9 Assemble the pistons to the connecting rods. The gudgeon pin should be a sliding fit in the piston and connecting rod small end. If necessary, immerse the piston in hot water to ease gudgeon pin installation. The gudgeon pin is retained by circlips which have the gaps facing the rings when fitted. Make sure that the piston-to-rod alignment is correct, as shown (see illustrations).

10 Fit the piston rings as shown (see illustration) and space the ring gaps at 120° either side of the scraper (bottom) ring gap.

11 Using a piston ring compressor and plenty of clean engine oil, slide the piston assemblies into their liners.

12 Fit a new O-ring seal to the base of each cylinder liner and install each piston/connecting rod/liner assembly into the block. If old assemblies are being fitted, ensure that they are located in their original positions. Check that the pistons are correctly aligned with the arrow on the piston crown towards the timing belt. Fit cylinder liner retaining clamps (see illustrations).

13 Push the pistons down their bores and connect the connecting rod big-end (complete

with shell bearing) to the crankshaft.

14 Fit the big-end caps (complete with shell bearings) to their respective connecting rods.

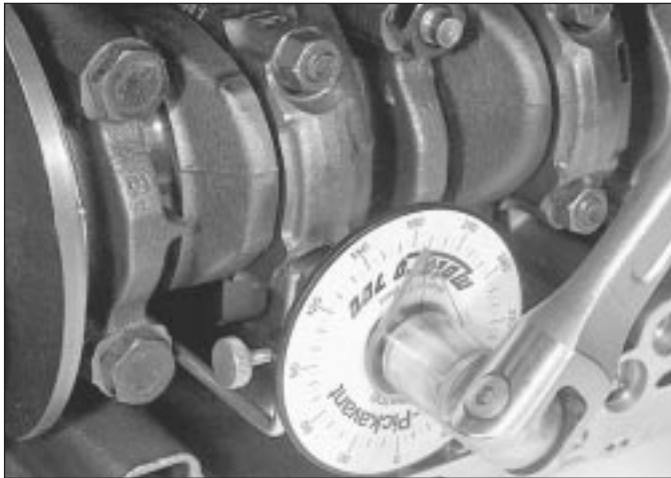
15 Screw on the nuts and tighten to the specified torque. The crankshaft may have to be turned to facilitate fitting the bearing caps and to tighten the nuts (see illustration).



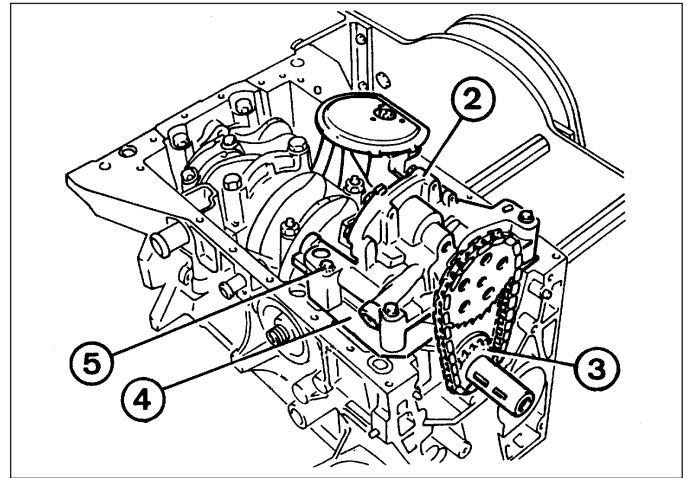
16.12a Fitting a piston/connecting rod/liner assembly



16.12b Typical cylinder liner clamps fitted



16.15 Angle-tightening a big-end cap nut



16.17 Fitting the oil pump

- |                      |                     |
|----------------------|---------------------|
| 2 Pump body          | 4 L-shaped shim     |
| 3 Chain and sprocket | 5 Centralising bolt |

### Oil pump

16 Before refitting the oil pump, fit a new oil seal. A new pump must be primed with clean engine oil.

17 Use a new pump gasket and note that bolt "5" (see illustration) centralises the pump and should be fitted first.

### Sump pan

18 Use silicone-type instant gasket (applied to clean surfaces) to seal the sump spacer plate to the crankcase (see illustration).



16.18 Applying instant gasket to sump spacer plate

19 With the mating surfaces clean and using a new gasket, refit the sump pan, ensuring that the gasket does not move (see illustration). Tighten the retaining bolts to the specified torque wrench settings.

### Flywheel and clutch

20 Bolt the flywheel to the end of the crankshaft (the flywheel has a positioning dowel). Apply thread-locking fluid to the cleaned bolt threads and tighten to the specified torque (see illustration).

21 Fit the clutch driven plate with the longer



16.19 Refitting sump pan and gasket

projecting hub facing the clutch cover (see illustration). Remember to align the driven plate.

### Cylinder head and camshafts

22 Fit the cylinder head and camshafts as described earlier in Section 6.

23 Fit the camshaft lubrication pipes.

### Coolant pump

24 Fit the coolant pump as described in Chapter 3.

### Timing belt and sprockets

25 Fit the timing belt upper cover backplate.

26 Fit the Woodruff key to the crankshaft, then push on the timing belt guide and the sprocket. Apply thread-locking fluid to the bolt threads, then fit the bolt and spacer. Tighten the bolt to the specified torque.

27 Fit the two camshaft sprockets, tightening the securing bolts to the specified torque.

28 Fit and tension the timing belt as described in Section 5.

### Remaining components

29 Fit the timing belt lower cover, then bolt on the crankshaft damper, tightening the bolts to the specified torque.



16.20 Tightening a flywheel bolt



16.21 Fitting clutch components



16.32 Fitting oil cooler retaining tube and nut



16.34 Oil temperature switch in sump pan



16.35a Refitting oil pressure switch

30 Locate the spark plug hole seals and fit the camshaft cover, tightening the bolts to the specified torque.

31 Fit the main timing belt cover.

32 Fit the oil cooler using a new gasket, then tighten the fixing nut (see illustration).

33 Apply a smear of clean engine oil to the rubber seal of a new oil filter, then screw it on, using hand pressure only.

34 Screw the oil temperature switch into the sump pan (see illustration).

35 Screw the oil pressure switch into the crankcase. Refit the oil level sensor (see illustrations).

36 Fit the plastic guard and the pulley to the rear end of the exhaust camshaft (see illustration).

37 Fit the distributor components to the end of the inlet camshaft.

38 Bolt the engine mounting bracket to the front of the cylinder block.

39 Bolt the coolant multi-hose union to the exhaust side of the crankcase (see illustration).



16.35b Refitting oil level sensor



16.36 Camshaft plastic guard and pulley correctly refitted

40 Fit the exhaust manifold with new gaskets.

41 Bolt on the thermostat housing.

42 Bolt on the inlet manifold using new gaskets. Note the support strut at the front of the manifold.

43 Connect and secure the coolant distribution pipe (see illustration).

44 Fit the fuel rail and injectors.

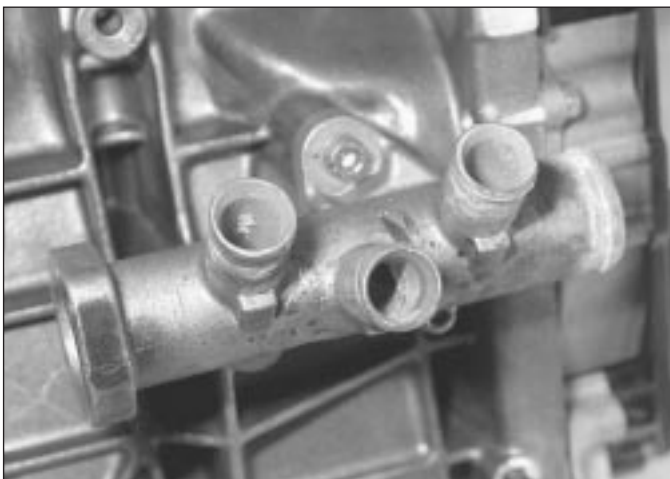
45 Fit the oil filler pipe assembly.

46 Insert the oil dipstick.

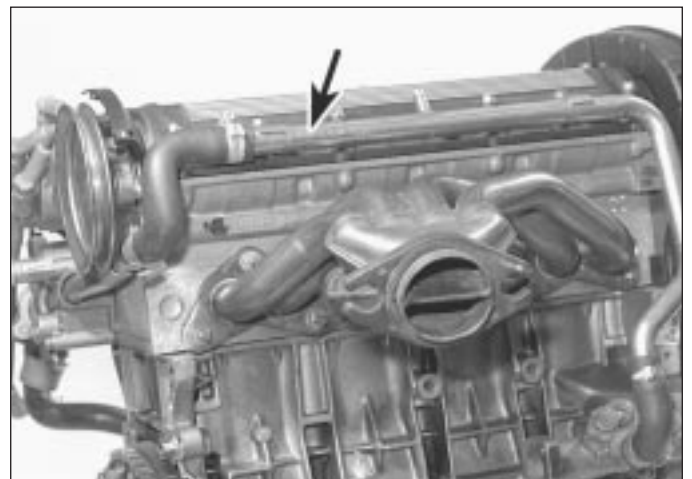
47 Bolt the ignition coil to its bracket.

48 Screw in the spark plugs using a suitable plug spanner.

49 Connect and route the HT leads and then fit the cover plate to the centre of the cam cover. Do not overtighten the two fixing screws.



16.39 Coolant multi-hose union correctly refitted



16.43 Coolant distribution pipe (arrowed)

### 17 Engine - reconnection to transmission



Refer to Section 20 in Part B of this Chapter.

### 18 Engine/transmission - refitting



This operation is essentially as described in Part B of this Chapter with the addition of the following, mentioned in Section 7 of this Chapter:

- a) *Connections for the Motronic engine management system*
- b) *References to carburettor (to be ignored)*
- c) *Pressure regulator for the hydraulic system*
- d) *Hydraulic pump connections*

### 19 Engine - initial start-up after overhaul



- 1 Ensure that the battery is fully charged.
- 2 Ensure that lubricants, coolant and fuel are replenished.
- 3 Top-up the hydraulic system and prime the high pressure (HP) pump.
- 4 As soon as the engine fires and runs, keep it going at a fast tickover only and bring it up to the normal working temperature.
- 5 With the engine running, repressurise the hydraulic system.
- 6 As the engine warms up, there will be odd smells and some smoke from parts getting hot and burning off oil deposits. Look for oil and coolant leaks, which will be obvious if serious.
- 7 Check the exhaust pipe and manifold connections, as these do not always find their

exact gas-tight position until warmth and vibration have acted on them. It is almost certain that they will need tightening further. This should be done with the engine stopped.

8 Check all fuel system connections for any sign of leakage.

9 Road test the car to check that the ignition timing is correct and that the engine is giving the necessary smoothness and power. Do not race the engine. If new bearings and/or pistons have been fitted, the engine should be treated as new and run-in at a reduced speed.

10 If many of the engine internal components have been renewed, then change the engine oil at 1000 miles (1600 km).