






# Chapter 2 Part B: XU series engine

## in-car engine repair procedures

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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>Fairy 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

#### Engine (general)

Designation:	
1580 cc engine. . . . .	XU5
1761 cc engine. . . . .	XU7
1905 cc engine. . . . .	XU9
1998 cc engines. . . . .	XU10
Engine codes*:	
1580 cc engine without a catalytic converter. . . . .	B4A (XU5M 2K, XU5M 3K or XU5M 4K)
1580 cc engine with a catalytic converter. . . . .	BDY (XU5M 3L/Z)
1761 cc engine. . . . .	LFZ (XU7JP L/Z)
1905 cc engine without a catalytic converter. . . . .	D6E (XU9JA K)
1905 cc engine with a catalytic converter. . . . .	DKZ (XU9JA Z)
1998 cc 8-valve engine. . . . .	RFX (XU10J2C LZ)
1998 cc 16-valve engine. . . . .	RFY (XU10J4 LZ)
Bore:	
1580 cc, 1761 cc and 1905 cc engines. . . . .	83.00 mm
1998 cc engines. . . . .	86.00 mm
Stroke:	
1580 cc engine. . . . .	73.00 mm
1761 cc engine. . . . .	81.00 mm
1905 cc engine. . . . .	88.00 mm
1998 cc engines. . . . .	86.00 mm
Direction of crankshaft rotation. . . . .	Clockwise (viewed from the right-hand side of vehicle)
No 1 cylinder location. . . . .	At the transmission end of block
Compression ratio:	
1580 cc engine. . . . .	8.95 :1
1761 cc engine. . . . .	9.25 :1
1905 cc engine. . . . .	9.2 :1
1998 cc 8-valve engine. . . . .	9.5 :1
1998 cc 16-valve engine. . . . .	10.4 :1

Engine (general) (continued)

Maximum power:

1580 cc engine. . . . .	.88.5 bhp (65 kW) @ 6400 rpm
1761 cc engine. . . . .	.100.8 bhp (74 kW) @ 6000 rpm
1905 cc engine:	
Without catalytic converter. . . . .	.127.3 bhp (93.5 kW) @ 6000 rpm
With catalytic converter. . . . .	.119.8 bhp (88 kW) @ 6000 rpm
1998 cc 8-valve engine. . . . .	.121.1 bhp (89 kW) @ 5750 rpm
1998 cc 16-valve engine. . . . .	.151.8 bhp (111.6 kW) @ 6500 rpm

Maximum torque:

1580 cc engine. . . . .	.131.2 Nm (96.8 lbf ft) @ 3000 rpm
1761 cc engine. . . . .	.156.8 Nm (115.7 lbf ft) @ 3000 rpm
1905 cc engine:	
Without catalytic converter. . . . .	.165 Nm (121.8 lbf ft) @ 3250 rpm
With catalytic converter..... . . . .	.153.8 Nm (113.5 lbf ft) @ 3000 rpm
1998 cc 8-valve engine. . . . .	.180 Nm (133.1 lbf ft) @ 2750 rpm
1998 cc 16-valve engine. . . . .	.186.6 Nm (137.7 lbf ft) @ 3500 rpm

*\*The engine code is either stamped on a plate attached to the front right-hand end of the cylinder block (next to the engine mounting), or stamped directly onto the front face of the cylinder block (just to the left of the oil filter). This is the code most often used by Citroen. The full code given in brackets is the factory identification number, and is not often referred to by Citroen or this manual.*

Camshaft

Drive. . . . .	.Toothed belt
No of bearings. . . . .	.5
Cam lift:	
1580 cc engine. . . . .	.9.7 mm
1905 cc engine. . . . .	.11.5 mm
1761 and 1998 cc engines. . . . .	.Not available

Camshaft bearing journal diameter (outside diameter):

1580 cc and 1905 cc models:	
No 1. . . . .	.26.980 to 26.959 mm
No2. . . . .	.27.480 to 27.459 mm
No 3. . . . .	.27.980 to 27.959 mm
No 4. . . . .	.28.480 to 28.459 mm
No 5. . . . .	.35.975 to 35.950 mm
1761 cc and 1998 cc models. . . . .	.Not available

Cylinder head bearing journal diameter (inside diameter):

1580 cc and 1905 cc models:	
No 1. . . . .	.27.000 to 27.033 mm
No 2. . . . .	.27.500 to 27.533 mm
No 3. . . . .	.28.000 to 28.033 mm
No 4. . . . .	.28.500 to 28.533 mm
No 5. . . . .	.36.000 to 36.039 mm
1761 cc and 1998 cc models. . . . .	.Not available

**Note:** *At the time of writing, no camshaft specifications were available for the 1761 cc and 1998 cc models.*

Valve clearances

Inlet . . . . .	.0.20 mm
Exhaust . . . . .	.0.40 mm

Lubrication system

Oil pump type. . . . .	.Gear-type, chain-driven off the crankshaft right-hand end
Minimum oil pressure at 90°C. . . . .	.4.5 bars at 4000 rpm
Oil pressure warning switch operating pressure. . . . .	.0.8 bars

Torque wrench settings

	Nm	ibf ft
<b>1580cc, 1761 cc and 1905 cc engines</b>		
Cylinder head cover nuts/bolts. . . . .	.10	7
Timing belt cover bolts. . . . .	.8	6
Crankshaft pulley retaining bolt . . . . .	.110	81
Timing belt tensioner:		
Semi-automatic timing belt tensioner:		
Retaining nuts. . . . .	.16	12
Cam spindle locknut . . . . .	.13	10
Manually-adjusted tensioner pulley bolt . . . . .	.20	15
Camshaft sprocket retaining bolt. . . . .	.35	26
Camshaft bearing cap nuts. . . . .	.15	11
Crankshaft sprocket retaining bolt . . . . .	.110	81

<b>1580 cc, 1761 cc and 1905 cc engines (continued)</b>	<b>Nm</b>	<b>lbf ft</b>
Cylinder head bolts:		
Stage 1. . . . .	.60	44
Fully slacken all bolts, then tighten to:		
Stage 2. . . . .	.20	15
Stage 3. . . . .	Angle-tighten through 300°	Angle-tighten through 300°
Sump retaining bolts. . . . .	.16	12
Oil pump retaining bolts. . . . .	.13	10
Flywheel/driveplate retaining bolts. . . . .	.50	37
Big-end bearing cap nuts:		
Stage 1. . . . .	.40	30
Fully slacken all nuts, then tighten to:		
Stage 2. . . . .	.20	15
Stage 3. . . . .	Angle-tighten through 70°	Angle-tighten through 70°
Main bearing cap nuts/bolts:		
Retaining nuts/bolts. . . . .	.54	40
Centre bearing cap side bolts. . . . .	.23	17
Front oil seal carrier bolts. . . . .	.16	12
Engine/transmission right-hand mounting:		
Mounting bracket retaining nuts. . . . .	.45	33
Engine/transmission left-hand mounting:		
Mounting bracket-to-body bolts. . . . .	.25	18
Mounting stud. . . . .	.50	37
Centre nut. . . . .	.80	59
Engine/transmission rear mounting:		
Mounting assembly-to-block bolts. . . . .	.45	33
Mounting bracket-to-mounting bolt. . . . .	.50	37
Mounting bracket-to-subframe bolt. . . . .	.50	37
<b>1998 cc 8-valve and 16-valve engines</b>		
Cylinder head cover nuts/bolts. . . . .	.10	7
Timing belt cover bolts. . . . .	.8	6
Crankshaft pulley retaining bolt(s):		
8-valve engine. . . . .	.110	81
16-valve engine. . . . .	.27	20
Crankshaft sprocket retaining bolt - 16-valve engine. . . . .	.110	81
Timing belt tensioner:		
8-valve engine. . . . .	.20	15
16-valve engine (both pulley bolt and backplate bolts). . . . .	.20	15
Camshaft sprocket retaining bolt:		
8-valve engine. . . . .	.35	26
16-valve engine. . . . .	.45	33
Camshaft bearing cap nuts/bolts:		
8-valve engine. . . . .	.16	12
16-valve engine. . . . .	.10	7
Cylinder head bolts:		
Stage 1. . . . .	.40	30
Stage 2. . . . .	.75	55
Stage 3. . . . .	Angle-tighten through 165°	Angle-tighten through 165°
Sump retaining bolts. . . . .	.16	12
Oil pump retaining bolts. . . . .	.13	10
Flywheel/driveplate retaining bolts. . . . .	.50	37
Big-end bearing cap nuts:		
Stage 1. . . . .	.40	30
Fully slacken all nuts, then tighten to:		
Stage 2. . . . .	.20	15
Stage 3. . . . .	Angle-tighten through 70°	Angle-tighten through 70°
Main bearing cap bolts. . . . .	.70	52
Piston oil jet spray tube bolt. . . . .	.10	7
Front oil seal carrier bolts. . . . .	.16	12
Engine/transmission right-hand mounting:		
Mounting bracket retaining nuts/bolts. . . . .	.45	33
Curved retaining plate. . . . .	.20	15
Engine/transmission left-hand mounting:		
Mounting bracket-to-body bolts. . . . .	.25	18
Mounting stud. . . . .	.50	37
Centre nut. . . . .	.80	59
Engine/transmission rear mounting:		
Mounting assembly-to-block bolts. . . . .	.45	33
Mounting bracket-to-mounting bolt. . . . .	.50	37
Mounting bracket-to-subframe bolt. . . . .	.50	37

## 1 General information

### How to use this Chapter

This Part of Chapter 2 describes those repair procedures that can reasonably be carried out on the XU series engine (1580 cc "and larger), while it remains in the car. If the engine has been removed from the car and is being dismantled as described in Part C, any preliminary dismantling procedures can be ignored. Refer to Part A for information on the TU series engine (1124 cc and 1360 cc).

Note that, while it may be possible physically to overhaul items such as the piston/connecting rod assemblies while the engine is in the car, such tasks are not usually carried out as separate operations. Usually, several additional procedures (not to mention the cleaning of components and of oilways) have to be carried out. For this reason, all such tasks are classed as major overhaul procedures, and are described in Part C of this Chapter.

Part C describes the removal of the engine/transmission unit from the vehicle, and the full overhaul procedures that can then be carried out.

### XU series engine description

The XU series engine is a well-proven engine which has been fitted to many previous Citroen and Peugeot vehicles. The engine is of the in-line four-cylinder type, mounted transversely at the front of the car. The clutch and transmission are attached to its left-hand end. The ZX range is available with 1580 cc, 1761 cc, 1905 cc, 1998 cc 8-valve, and 1998 cc 16-valve versions of the XU series engine. The 1998 cc 16-valve engine is of the DOHC (double overhead camshaft) type; all the others are SOHC (single overhead camshaft) engines.

The crankshaft runs in five main bearings. Thrustwashers are fitted to No 2 main bearing cap, to control crankshaft endfloat.

The connecting rods rotate on horizontally-split bearing shells at their big-ends. The pistons are attached to the connecting rods by gudgeon pins. On 1998 cc 16-valve models, the gudgeon pins are a sliding fit in the connecting rod, and are secured in position with circlips. On all other models, they are an interference fit in the connecting rod small-end eyes. The aluminium alloy pistons are fitted with three piston rings - two compression rings and an oil control ring.

On 1580 cc, 1761 cc and 1905 cc models, the cylinder block is of the "wet-liner" type. The cylinder block is cast in aluminium alloy, and the bores have replaceable cast-iron liners that are located from their top ends. Sealing O-rings are fitted at the base of each liner, to prevent the escape of coolant into the sump.

On all 1998 cc models (both 8- and 16-

valve), the engine is of the conventional "dry-liner" type. The cylinder block is cast in iron, and no separate bore liners are fitted.

On 1998 cc 16-valve models, both inlet and exhaust camshafts are driven by a toothed timing belt. The camshafts operate the sixteen valves via self-adjusting hydraulic tappets (fitted to the cam followers), thus eliminating the need to manually adjust the valve clearances. Both camshafts run in bearing caps which are bolted to the top of the cylinder head. The inlet and exhaust valves are each closed by coil springs, and operate in guides pressed into the cylinder head.

On all other models, the camshaft is driven by a toothed timing belt, and it operates the eight valves via followers located beneath each cam lobe. The valve clearances are adjusted by shims, positioned between the followers and the tip of the valve stem. The camshaft runs in bearing caps which are bolted to the top of the cylinder head. The inlet and exhaust valves are each closed by coil springs, and operate in guides pressed into the cylinder head. Both the valve seats and guides can be renewed separately if worn.

On all models, the water pump is driven by the timing belt.

Lubrication is by means of an oil pump which is driven (via a chain and sprocket) off the crankshaft right-hand end. It draws oil through a strainer located in the sump, and then forces it through an externally-mounted filter into galleries in the cylinder block/crankcase. From there, the oil is distributed to the crankshaft (main bearings) and camshaft. The big-end bearings are supplied with oil via internal drillings in the crankshaft; the camshaft bearings also receive a pressurised supply. The camshaft lobes and valves are lubricated by splash, as are all other engine components. On 1998 cc 16-valve models, an oil cooler is mounted beneath the oil filter cartridge, to keep the oil temperature constant under severe operating conditions. The oil cooler is supplied with coolant from the engine cooling system.

Throughout the manual, it is often necessary to identify the engines not only by their cubic capacity, but also by their engine code. The engine code, consisting of three letters (eg. RFY), is stamped on a plate attached to the front right-hand end of the cylinder block, next to the right-hand engine/transmission mounting. Otherwise, the engine code may be stamped directly onto the front face of the cylinder block, on the machined surface located just to the left of the oil filter (next to the crankcase vent hose union).

### Repair operations possible with the engine in the car

The following work can be carried out with the engine in the car:

- Compression pressure - testing.
- Cylinder head cover - removal and refitting.

- Crankshaft pulley - removal and refitting.
- Timing belt covers - removal and refitting.
- Timing belt - removal, refitting and adjustment.
- Timing belt tensioner and sprockets - removal and refitting.
- Camshaft oil seal(s) - renewal.
- Camshaft(s) and followers - removal, inspection and refitting.
- Valve clearances - checking and adjustment.
- Cylinder head - removal and refitting.
- Cylinder head and pistons - decarbonising.
- Sump - removal and refitting.
- Oil pump - removal, overhaul and refitting.
- Crankshaft oil seals - renewal.
- Engine/transmission mountings - inspection and renewal.
- Flywheel/driveplate - removal, inspection and refitting.
- Oil cooler (1998 cc 16-valve models) - removal and refitting.

## 2 Compression test - description and interpretation

Refer to Part A, Section 2.

## 3 Engine assembly/valve timing holes - general information and usage

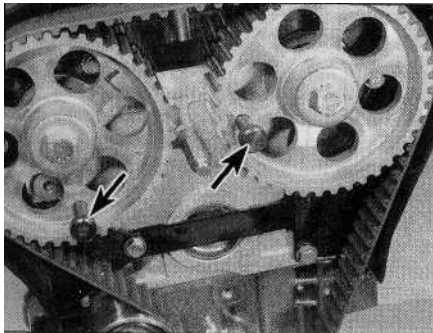
**Note:** Do not attempt to rotate the engine whilst the crankshaft/camshaft are locked in position. If the engine is to be left in this state for a long period of time, it is a good idea to place suitable warning notices inside the vehicle, and in the engine compartment. This will reduce the possibility of the engine being accidentally cranked on the starter motor, which is likely to cause damage with the locking pins in place.

1 On all models, timing holes are drilled in the camshaft sprocket(s) and crankshaft pulley. The holes are used to align the crankshaft and camshaft(s), to prevent the possibility of the valves contacting the pistons when refitting the cylinder head, or when refitting the timing belt. When the holes are aligned with their corresponding holes in the cylinder head and cylinder block (as appropriate), suitable diameter pins can be inserted to lock both the camshaft and crankshaft in position, preventing them rotating unnecessarily. Proceed as follows.

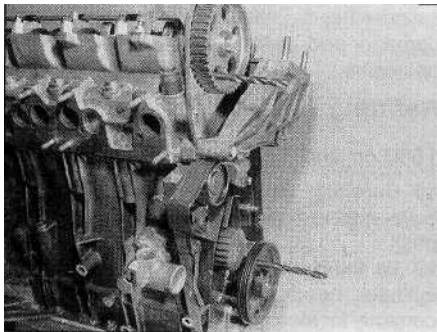
2 Remove the timing belt upper cover as described in Section 6.

3 Apply the handbrake, jack up the front of the car and support it on axle stands. Remove the right-hand front roadwheel.

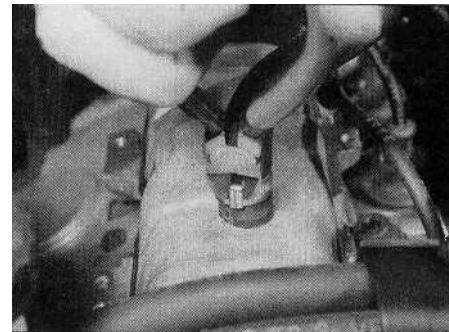
4 From underneath the front of the car, prise out the two retaining clips and remove the plastic cover from the wing valance, to gain



**3.7 Camshaft sprocket locking pins in position (arrowed) -1998 cc 16-valve models**



**3.13 Camshaft sprocket and crankshaft pulley locking pins in position (1580 cc model shown)**



**4.4 Where original Citroen hose clips are still fitted, cut them off and discard them**

access to the crankshaft pulley bolt. Where necessary, unclip the coolant hoses from the bracket, to improve access further. The crankshaft can then be turned using a suitable socket and extension bar fitted to the pulley bolt. Note that the crankshaft must always be turned in a clockwise direction (viewed from the right-hand side of vehicle).

#### 1998 cc 16-valve models

**5** Rotate the crankshaft pulley until the timing holes in both camshafts are aligned with their corresponding holes in the cylinder head. The holes are aligned when the inlet camshaft sprocket hole is in the 8 o'clock position, and the exhaust camshaft sprocket is in the 6 o'clock position, when viewed from the right-hand end of the engine.

**6** With the camshaft sprocket holes correctly positioned, insert a 6 mm diameter bolt (or a drill of suitable size), through the timing hole in the crankshaft pulley, and locate it in the corresponding hole in the end of the cylinder block. Note that it may be necessary to rotate the crankshaft slightly, to get the holes to align.

**7** With the crankshaft pulley locked in position, insert a 6 mm diameter bolt (or a drill) through the timing hole in each camshaft sprocket, and locate it in the cylinder head. Note that the special Citroen locking pins are actually 8 mm in diameter, with only their ends stepped down to 6 mm to locate in the cylinder head (**see illustration**). To simulate this, wrap insulation tape around the outer end of the bolt or drill, to build it up until it is a snug fit in the camshaft hole.

**8** The crankshaft and camshafts are now locked in position, preventing unnecessary rotation.

#### All other models

**9** Rotate the crankshaft pulley until the timing hole in the camshaft sprocket is aligned with its corresponding hole in the cylinder head. Note that the hole is aligned when the sprocket hole is in the 8 o'clock position, when viewed from the right-hand end of the engine.

**10** On early 1580 cc and 1905 cc models having a semi-automatic timing belt tensioner,

a 10 mm diameter bolt (or a drill of suitable size) will be required to lock the crankshaft pulley in position.

**11** On later 1580 cc and 1905 cc models, and all 1761 and 1998 cc 8-valve models (which have a manually-adjusted timing belt tensioner pulley) the pulley can be locked in position with an 8 mm diameter bolt or drill. The special Citroen locking pin is actually 10 mm in diameter, with only its end stepped down to 8 mm to locate in the cylinder block. To simulate this, wrap insulation tape around the outer end of the bolt/drill, to build it up until it is a snug fit in the pulley hole.

**12** With the camshaft sprocket holes correctly positioned, insert the required bolt or drill through the timing hole in the crankshaft pulley, and locate it in the corresponding hole in the end of the cylinder block. Note that it may be necessary to rotate the crankshaft slightly, to get the holes to align.

**13** With the crankshaft pulley locked in position, insert the appropriate bolt or drill through the timing hole in the camshaft sprocket and locate it in the cylinder head (**see illustration**).

**14** The crankshaft and camshaft are now locked in position, preventing unnecessary rotation.

#### 4 Cylinder head cover - removal and refitting



##### Removal

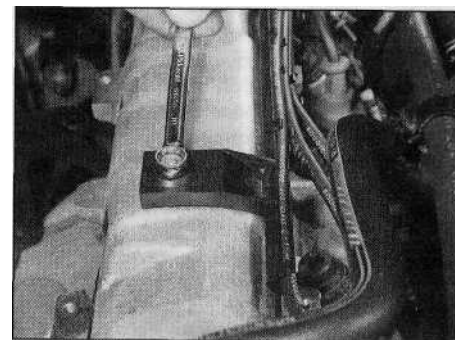
**1** Disconnect the battery negative lead.

##### 1580 cc and 1905 cc models

**2** On 1580 cc models, remove the air cleaner-to-throttle body duct, and the air cleaner housing, as described in Chapter 4.

**3** On 1905 cc models, remove the air cleaner housing as described in Chapter 4, and position the intake duct clear of the cylinder head cover.

**4** On all models, slacken the retaining clip and disconnect the breather hose from the top of the cylinder head cover. Where the original crimped-type Citroen hose clip is still fitted, cut it off and discard it. Replace it with



**4.5 On 1580 cc and 1905 cc models, undo the retaining bolts/nuts and position the HT lead retaining clips clear of the head cover**

a standard worm-drive hose clip on refitting (**see illustration**).

**5** Undo the two nuts/bolts securing the HT lead retaining bracket to the cylinder head, and position the bracket clear of the head cover (**see illustration**).

**6** Slacken and remove the two remaining cylinder head cover retaining bolts, along with their sealing washers.

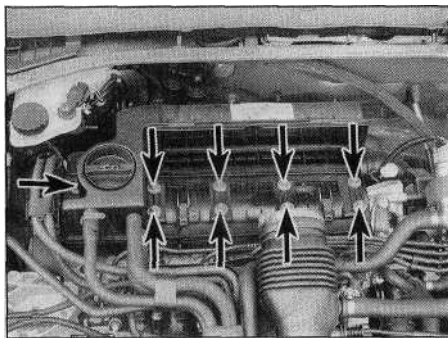
**7** Lift off the cylinder head cover, and remove it along with its rubber seal. Examine the seal for signs of damage and deterioration, and if necessary, renew it. Also examine the retaining bolt sealing washers for signs of damage, and renew if required.

##### 1761 cc and 1998 cc 8-valve models

**8** Slacken the retaining clips, and disconnect the breather hoses from the front right-hand end of the cover. Where the original crimped-type Citroen hose clips are still fitted, cut them off and discard them; use standard worm-drive hose clips on refitting.

**9** Slacken the retaining clip, and disconnect the air cleaner-to-throttle housing duct from the front of the cylinder head cover. Also remove the intake duct from the left-hand side of the head cover.

**10** Release the two retaining clips, then undo the two retaining screws located at the front, and remove the air cleaner element cover from the cylinder head cover. Remove the air cleaner element, and store it with the cover.



**4.11 Cylinder head cover retaining nuts (arrowed) -1761 cc and 1998 cc 8-valve models**

**11** Slacken and remove the ten cylinder head cover retaining nuts, lift off the cylinder head cover, and remove it along with its rubber seal (see illustration). Examine the seal for signs of damage and deterioration, and if necessary, renew it.

#### 1998 cc 16-valve models

**12** Refer to the information given in Chapter 4 on depressurising the fuel system. Slacken the retaining clips, and disconnect the fuel feed and return hoses from their unions at the front of the head cover. Where the original crimped-type Citroen hose clips are still fitted, cut them off and discard them; use standard worm-drive hose clips on refitting. Plug both the hose and fuel rail ends, to prevent the possible entry of dirt into the fuel system. Mop up any spilt fuel.

**13** Undo the retaining nut and bolt securing the fuel hose retaining clips to the top of the cylinder head cover, and remove both clips. Position both fuel hoses clear of the head cover, so that they do not hinder the removal procedure.

**14** Slacken and remove the remaining seven retaining bolts, and lift the spark plug access cover off the cylinder head cover.

**15** Pull each ignition HT coil off its spark plug. Trace the coil wiring back to its connector on the left-hand end of the cylinder head. Rotate the locking ring anti-clockwise, disconnect it from the main wiring loom, and remove the wiring and coils as an assembly.

**16** Disconnect the breather hose from the left-hand end of the cylinder head. Any original crimped-type hose clips can be discarded, as already mentioned.

**17** Slacken and remove the twelve cylinder head cover retaining bolts, noting the correct fitted positions of any brackets or clips. Note that the bolts are of four different lengths, and it is important that each is refitted in the correct position. To avoid confusion on refitting, remove each bolt in turn, and store it in its correct fitted position by pushing it through a clearly-marked cardboard template.

**18** Lift off the cylinder head cover, and remove it along with its rubber seal. Recover the four spark plug hole sealing rings from the

cylinder head. Examine all seals for signs of damage and deterioration, and renew as necessary.

### Refitting

#### 1580 cc and 1905 cc models

**19** Carefully clean the cylinder head and cover mating surfaces, and remove all traces of oil.

**20** Fit the rubber seal over the edge of the cylinder head cover, ensuring that it is correctly located along its entire length.

**21** Carefully refit the cylinder head cover to the engine, taking great care not to displace the rubber seal.

**22** Check that the seal is correctly located, then refit the cover retaining bolts and sealing washers (not forgetting to position the HT lead bracket under the centre bolt head), and tighten them to the specified torque.

**23** Refit the remaining HT lead bracket retaining bolt, and tighten it securely.

**24** Reconnect the breather hose to the cylinder head cover, and securely tighten its retaining clip.

**25** Refit the air cleaner housing and duct as described in Chapter 4, and reconnect the battery negative terminal.

#### 1761 cc and 1998 cc 8-valve models

**26** Clean the cylinder head and cover mating surfaces, and remove all traces of oil.

**27** Locate the rubber seal in the cover groove, ensuring that it is correctly located along its entire length.

**28** Carefully refit the cylinder head cover to the engine, taking great care not to displace the rubber seal.

**29** Check that the seal is correctly located, then refit the cover retaining nuts, and tighten them evenly and progressively to the specified torque.

**30** Refit the air cleaner element, and install the element cover. Securely tighten the cover retaining screws, and secure it in position with the retaining clips.

**31** Reconnect the breather hoses, intake duct and throttle housing duct to the cover, tightening their retaining clips securely. Reconnect the battery.

#### 1998 cc 16-valve models

**32** Carry out the operations described in paragraphs 26 to 28. Fit the four spark plug hole seals to the recesses in the cylinder head.

**33** Check that the seal is correctly located, then refit the cover retaining bolts. Ensure that each bolt is refitted in its correct location, and that all retaining clips/brackets are correctly positioned. Tighten the cylinder head cover retaining bolts evenly and progressively to the specified torque.

**34** Reconnect the breather hose to the end of the cover, and securely tighten its retaining clip.

**35** Connect the HT coil wiring loom to its

wiring connector, and secure it in position by rotating the locking ring. Ensuring that the wiring is correctly routed, reconnect the HT coils to the tops of the spark plugs.

**36** Refit the spark plug access cover to the head cover, and refit its retaining bolts (not forgetting the fuel hose retaining clip). Ensure that the HT coil wiring is correctly located in the cover cutout, and that the fuel hoses are positioned under the retaining clip, then securely tighten the retaining bolts.

**37** Fit the rear fuel hose retaining clip, and securely tighten its retaining nut.

**38** Reconnect the feed and return hoses to their respective fuel rail unions, ensuring their retaining clips are securely tightened.

**39** Reconnect the battery negative terminal. On completion, start the engine and check the fuel hose unions for signs of leakage.

### 5 Crankshaft pulley - removal and refitting



#### Removal

**1** Remove the auxiliary drivebelt as described in Chapter 1.

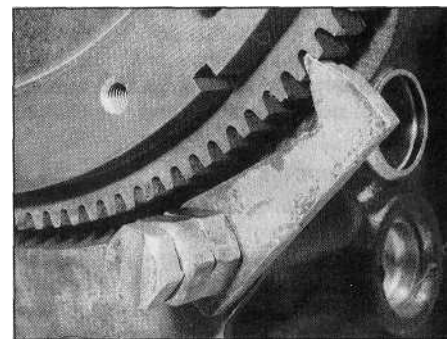
#### 1998 cc 16-valve models

**2** Undo the four pulley retaining bolts and remove the pulley from the end of the crankshaft, noting which way around it is fitted. If the pulley locating roll pin is a loose fit, remove it and store it with the pulley for safe-keeping. If necessary, the pulley can be prevented from rotating as described in paragraph 3.

#### All other models

**3** To prevent crankshaft turning whilst the pulley retaining bolt is being slackened, select top gear and have an assistant apply the brakes firmly. If the engine has been removed from the vehicle, lock the flywheel ring gear using the arrangement shown (see illustration). Do not attempt to lock the pulley by inserting a bolt/drill through the pulley timing hole.

**4** Unscrew the retaining bolt and washer, then slide the pulley off the end of the



**5.3 Use a fabricated tool like this one to lock the flywheel ring gear and prevent crankshaft rotation**

crankshaft. If the pulley locating roll pin or Woodruff key (as applicable) is a loose fit, remove it and store it with the pulley for safe-keeping.

## Refitting

### 1998 cc 16-valve models

5 Ensure that the locating roll pin is in position in the crankshaft. Offer up the pulley, ensuring that it is the correct way around. Locate the pulley on the roll pin, then refit the retaining bolts and tighten them to the specified torque. If necessary, prevent the pulley from rotating as described in paragraph 3.

6 Refit and tension the auxiliary drivebelt as described in Chapter 1.

### All other models

7 Ensure that the Woodruff key is correctly located in its crankshaft groove, or that the roll pin is in position (as applicable). Refit the pulley to the end of the crankshaft, aligning its locating groove or hole with the Woodruff key or pin.

8 Thoroughly clean the threads of the pulley retaining bolt, then apply a coat of locking compound to the bolt threads. Citroen recommend the use of Frenbloc E6 (available from your Citroen dealer); in the absence of this, any good-quality locking compound may be used.

9 Refit the crankshaft pulley retaining bolt and washer. Tighten the bolt to the specified torque, preventing the crankshaft from turning using the method employed on removal.

10 Refit and tension the auxiliary drivebelt as described in Chapter 1.

## 6 Timing belt covers removal and refitting



### 1580 cc and 1905 cc models

#### Upper cover

1 Release the retaining clips, and free the fuel hoses from the top of the cover.

2 Undo the two cover retaining bolts (situated at the base of the cover), and remove the cover from the engine compartment.

#### Centre cover - early (pre-1992) models with a semi-automatic belt tensioner

3 Slacken and remove the four cover retaining nuts and bolts (two directly below the mounting bracket, and two at the base of the cover), then manoeuvre the cover upwards out of the engine compartment.

#### Centre cover - later (1992-on) models with a manually-adjusted belt tensioner pulley

4 Slacken and remove the two cover retaining bolts (located directly beneath the mounting

bracket). Move the cover upwards to free it from the two locating pins situated at the base of the cover, and remove it from the engine compartment.

#### Lower cover

5 Remove the crankshaft pulley as described in Section 5?

6 Remove the centre cover as described above.

7 On early models, undo the three lower cover retaining bolts and remove the cover from the engine.

8 On later models, undo the two cover retaining bolts and remove the cover from the engine.

#### Lower (inner) cover - early (pre-1992) models with a semi-automatic belt tensioner

9 Remove the timing belt as described in Section 7.

10 Slacken and remove the remaining bolts, noting their correct fitted positions, and remove the cover from the end of the cylinder block.

### 1761 cc models

#### Upper cover

11 Proceed as described in paragraphs 1 and 2.

#### Centre cover

12 Proceed as described in paragraph 4.

#### Lower cover

13 Remove the crankshaft pulley as described in Section 5.

14 Remove the centre cover as described in paragraph 4.

15 Undo the two cover retaining bolts, and remove the cover from the engine.

### 1998 cc 8-valve models

#### Upper cover

16 Release the retaining clip, and free the fuel hoses from the top of the timing belt cover.

17 Slacken and remove the two cover retaining bolts, then lift the upper cover upwards and out of the engine compartment.

#### Lower cover

18 Remove the crankshaft pulley as described in Section 5.

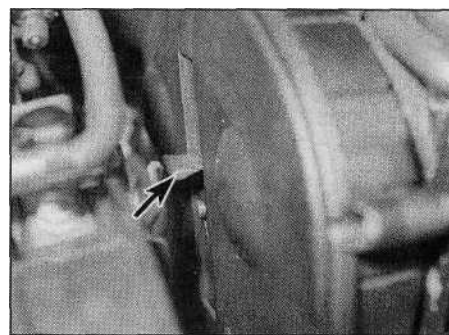
19 Slacken and remove the three retaining bolts, then remove the lower timing belt cover from the engine.

### 1998 cc 16-valve models

#### Upper (outer) cover

20 Undo the two upper retaining bolts securing the outer cover to the inner cover. Slide the cover retaining clip upwards to release it from its fasteners (see illustration).

21 Ease the outer cover away from the engine. Lift it upwards, freeing it from its locating bolts at the base of the cover, and out of the engine compartment.



6.20 Timing belt upper (outer) cover retaining clip (arrowed) - 1998 cc 16-valve models

#### Lower cover

22 Remove the crankshaft pulley as described in Section 5.

23 Remove the upper (outer) cover as described above.

24 Slacken and remove the two upper cover lower locating bolts, along with their spacers. Undo the two lower cover retaining bolts, and remove the cover from the engine.

#### Upper (inner) cover

25 Remove the timing belt as described in Section 7.

26 Remove both camshaft sprockets as described in Section 8.

27 Undo the six bolts securing the cover to the side of the cylinder head, and remove the cover from the engine.

## Refitting

28 Refitting is a reversal of the relevant removal procedure, ensuring that each cover section is correctly located, and that the cover retaining nuts and/or bolts are securely tightened (to the specified torque, where given).

## 7 Timing belt - general information, removal and refitting.

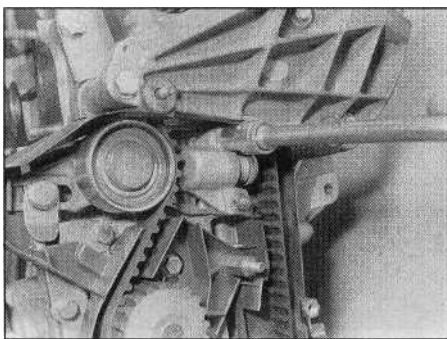


### General information

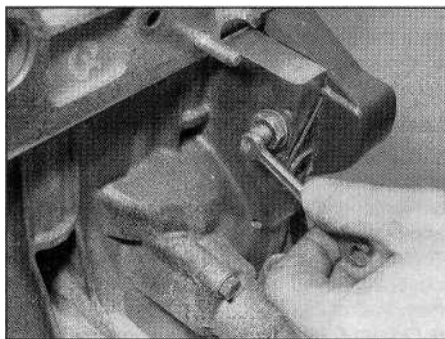
1 The timing belt drives the camshaft(s) and coolant pump from a toothed sprocket on the front of the crankshaft. If the belt breaks or slips in service, the pistons are likely to hit the valve heads, resulting in extensive (and expensive) damage.

2 The timing belt should be renewed at the specified intervals (see Chapter 1), or earlier if it is contaminated with oil, or if it is at all noisy in operation (a "scraping" noise due to uneven wear).

3 If the timing belt is being removed, it is a wise precaution to check the condition of the coolant pump at the same time (check for signs of coolant leakage). This may avoid the need to remove the timing belt again at a later stage, should the coolant pump fail.



**7.7** On early 1580 cc and 1905 cc models, slacken the tensioner assembly retaining nuts...



**7.8** ... and the spindle locknut, then release the belt tension by turning the tensioner cam spindle using an open-ended spanner

## Removal

### Early (pre-1992) 1580 cc and 1905 cc models with a semi-automatic belt tensioner

**4** Disconnect the battery negative terminal.  
**5** Align the engine assembly/valve timing holes as described in Section 3, and lock the camshaft sprocket and crankshaft pulley in position. *Do not* attempt to rotate the engine whilst the pins are in position.

**6** Remove the centre and lower timing belt covers as described in Section 6.

**7** Slacken (but do not remove) the two nuts securing the tensioner assembly to the end of the cylinder block (**see illustration**). Loosen the tensioner cam spindle locknut, located on the rear of cylinder block flange.

**8** Using a suitable open-ended spanner on the square-section end of the tensioner cam spindle, rotate the cam until the tensioner spring is fully compressed and the belt tension is relieved (**see illustration**). Hold the cam in this position, and securely tighten the locknut.

**9** Place a jack beneath the engine, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the engine.

**10** Slacken and remove the three nuts securing the engine/transmission right-hand mounting bracket to the engine bracket. Remove the single nut securing the bracket to the mounting rubber, and lift off the bracket. Undo the three bolts securing the engine bracket to the end of the cylinder head/block, and remove the bracket.

**11** If the timing belt is to be re-used, use white paint or chalk to mark the direction of rotation on the belt (if markings do not already exist), then slip the belt off the sprockets. Note that the crankshaft must not be rotated whilst the belt is removed.

**12** Check the timing belt carefully for any signs of uneven wear, splitting, or oil contamination. Pay particular attention to the roots of the teeth. Renew it if there is the slightest doubt about its condition. If the engine is undergoing an overhaul, and has covered more than 24 000 miles (40 000 km)

with the existing belt fitted, renew the belt as a matter of course, regardless of its apparent condition. The cost of a new belt is nothing compared with the cost of repairs, should the belt break in service. If signs of oil contamination are found, trace the source of the oil leak and rectify it. Wash down the engine timing belt area and all related components, to remove all traces of oil.

### Later (1992-on) 1580 cc and 1905 cc models with a manually-adjusted belt tensioner pulley, and all 1761 cc and 1998 cc 8-valve models

**13** Disconnect the battery negative terminal.

**14** Align the engine assembly/valve timing holes as described in Section 3, and lock the camshaft sprocket and crankshaft pulley in position. *Do not* attempt to rotate the engine whilst the pins are in position.

**15** Remove the centre and/or lower timing belt cover(s) as described in Section 6 (as applicable).

**16** Loosen the timing belt tensioner pulley retaining bolt. Pivot the pulley in a clockwise direction, using a suitable square-section key fitted to the hole in the pulley hub, then securely retighten the retaining bolt.

**17** On 1580 cc, 1761 cc and 1905 cc models, dismantle the engine right-hand mounting as described above in paragraphs 9 and 10.

**18** On all models, remove and inspect the timing belt as described in paragraphs 11 and 12.

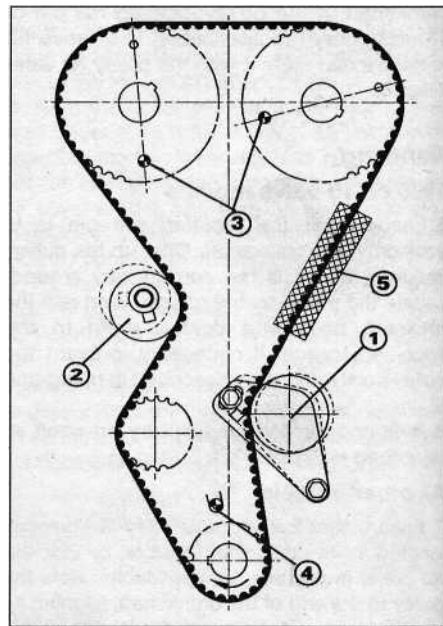
### 1998 cc 16-valve models

**19** Disconnect the battery negative terminal.

**20** Align the engine assembly/valve timing holes as described in Section 3, and lock the camshaft sprockets and crankshaft pulley in position. *Do not* attempt to rotate the engine whilst the pins are in position.

**21** Remove the timing belt lower cover as described in Section 6.

**22** Loosen the timing belt rear tensioner pulley retaining bolt. Pivot the pulley in a clockwise direction, using a suitable square-section key fitted to the hole in the pulley hub, then securely retighten the retaining bolt (**see illustration**).



**7.22** Timing belt arrangement - 1998 cc 16-valve models

- 1 Front tensioner assembly
- 2 Rear tensioner pulley
- 3 Camshaft sprocket timing holes
- 4 Crankshaft pulley timing hole
- 5 Belt tension measuring area (using Citroen special tool)

**23** Loosen the two front tensioner assembly retaining bolts. Move the tensioner pulley away from the belt, using the same square-section key on the pulley backplate.

**24** Check that the camshaft sprocket and crankshaft locking pins are still in position, then remove and inspect the timing belt as described in paragraphs 11 and 12.

## Refitting

### Early (pre-1992) 1580 cc and 1905 cc models with a semi-automatic belt tensioner

**25** Before refitting, thoroughly clean the timing belt sprockets. Check that the tensioner pulley rotates freely, without any sign of roughness. If necessary, renew the tensioner pulley as described in Section 8.

**26** Ensure that the camshaft sprocket locking pin is still in position. Temporarily refit the crankshaft pulley, and insert the locking pin through the pulley timing hole to ensure that the crankshaft is still correctly positioned.

**27** Remove the crankshaft pulley. Manoeuvre the timing belt into position, ensuring that any arrows on the belt are pointing in the direction of rotation (clockwise when viewed from the right-hand end of the engine).

**28** Do not twist the timing belt sharply while refitting it. Fit the belt over the crankshaft and camshaft sprockets. Ensure that the belt "front run" is taut - ie, any slack should be on the tensioner pulley side of the belt. Fit the



belt over the water pump sprocket and tensioner pulley. Ensure that the belt teeth are seated centrally in the sprockets.

**29** Slacken the tensioner cam spindle locknut, and check that the tensioner pulley is forced against the timing belt by spring pressure.

**30** Refit the crankshaft pulley, tightening its retaining bolt by hand only.

**31** Rotate the crankshaft through at least two complete rotations in a clockwise direction (viewed from the right-hand end of the engine). Realign the camshaft and crankshaft engine assembly/valve timing holes (see Section 3). *Do not* at any time rotate the crankshaft anti-clockwise. Both camshaft and crankshaft timing holes should be aligned so that the locking pins can be easily inserted. This indicates that the valve timing is correct.

**32** If the timing holes are not correctly positioned, release the tensioner assembly as described in paragraph 8, and disengage the belt from the camshaft sprocket. Rotate the camshaft and crankshaft slightly as required until both locking pins are in position. Relocate the timing belt on the camshaft sprocket. Ensure that the belt "front run" is taut - ie, that any slack is on the tensioner pulley side of the belt. Slacken the tensioner locknut, then remove the locking pins and repeat the procedure described in paragraph 31.

**33** Once both timing holes are correctly aligned, tighten the two tensioner assembly retaining nuts to the specified torque. Tighten the tensioner cam spindle locknut to its specified torque.

**34** With the belt correctly installed and tensioned, refit the engine bracket to the side of the cylinder head/block, and securely tighten its retaining bolts. Refit the right-hand mounting bracket, and tighten its retaining nuts to the specified torque. The jack can then be removed from underneath the engine.

**35** Remove the crankshaft pulley, then refit the timing belt covers as described in Section 6.

**36** Install the crankshaft pulley as described in Section 5, and reconnect the battery negative terminal.

### **Later (1992-on) 1580 cc and 1905 cc models with a manually-adjusted belt tensioner pulley, and all 1761 cc and 1998 cc 8-valve models**

**Note:** *Citroen specify the use of a special electronic tool (SEEM belt tension measuring tool) to correctly set the timing belt tension. If this equipment is not available, an approximate setting can be achieved using the method described below. If this method is used, however, the belt tension must be checked using the special electronic tool at the earliest possible 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 Citroen dealer for advice.*

**37** Install the timing belt as described above in paragraphs 25 to 28.

**38** Loosen the tensioner pulley retaining bolt. Using the square-section key, pivot the pulley anti-clockwise to remove all free play from the timing belt.

**39** If the special belt tension measuring equipment is available, it should be fitted to the "front run" of the timing belt. The tensioner roller should be adjusted so that the initial belt tension is  $16 \pm 2$  units on 1998 cc 8-valve models, and  $30 \pm 2$  units on all other models.

**40** Tighten the pulley retaining bolt to the specified torque. Refit the crankshaft pulley again, tightening its retaining bolt by hand only.

**41** Carry out the operations described in paragraph 31 (and where necessary, paragraph 32, ignoring the information about the tensioner) to ensure that both timing holes are correctly aligned and the valve timing is correct.

**42** If the tension is being set without using the special measuring tool, proceed as follows. Check that, under moderate pressure from the thumb and forefinger, the belt can just be twisted through  $90^\circ$  at the mid-point of the "front run" of the belt. Note that this method is only an initial setting, and the belt tension *must* be checked at the earliest available opportunity using the special measuring tool. Failure to do so could lead to the belt breaking (through over-tightening) or slipping (through slackness), resulting in serious engine damage. If necessary, readjust the tensioner pulley position as required. Tighten its retaining bolt to the specified torque on completion.

**43** If the special measuring tool is being used, the belt tension on the "front run" of the belt on all models should be  $44 \pm 2$  units. Readjust the tensioner pulley position as required, then retighten the retaining bolt to the specified torque. Rotate the crankshaft through a further two rotations clockwise, and recheck the tension. Repeat this procedure as necessary until the correct tension reading is obtained after rotating the crankshaft.

**44** With the belt tension correctly set, on 1580 cc, 1761 cc and 1905 cc models, refit the engine bracket to the side of the cylinder head/block, and securely tighten its retaining bolts. Refit the right-hand engine mounting bracket, and tighten its retaining nuts to the specified torque. The jack can then be removed from underneath the engine.

**45** On all models, remove the crankshaft pulley, then refit the timing belt cover(s) as described in Section 6.

**46** Refit the crankshaft pulley as described in Section 5, and reconnect the battery negative terminal.

### **1998 cc 16-valve models**

**Note:** *Citroen specify the use of a special electronic tool (SEEM belt tension measuring tool) to correctly set the timing belt tension. If*

*this equipment is not available, an approximate setting can be achieved using the method described below. If this method is used, however, the tension must be checked using the special electronic tool at the earliest possible 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 Citroen dealer for advice.*

**47** Before refitting, thoroughly clean the timing belt sprockets. Check that each tensioner pulley rotates freely, without any sign of roughness. If necessary, renew the tensioner pulley(s) as described in Section 8.

**48** Ensure that the camshaft and crankshaft sprocket locking pins are still in position. Slacken both tensioner mounting bolts so that they are free to pivot easily.

**49** Manoeuvre the timing belt into position, ensuring that any arrows on the belt are pointing in the direction of rotation (clockwise when viewed from the right-hand end of the engine).

**50** Note that there are also timing marks on the belt, in the form of yellow lines, to ensure it is correctly positioned on both camshaft sprockets and the crankshaft sprocket. The two single-line timing marks should be aligned with the timing dot (directly opposite the sprocket timing hole) on each camshaft sprocket. The double-line timing mark should be aligned with the crankshaft sprocket, where it will be directly opposite the sprocket Woodruff key slot. Citroen state that the use of these timing marks is optional, but they are useful in helping to ensure that the valve timing is correctly set at the first attempt.

**51** With the three locking pins in position, move both the front and rear tensioner pulleys towards the timing belt until both pulleys are contacting the belt. Securely tighten the rear tensioner retaining bolt.

**52** If the tension is being set without the use of the special measuring tool, proceed as follows. Using the square-section key fitted to the hole in the tensioner backplate, move the front tensioner pulley against the belt until all free play is removed from the belt. Hold the tensioner in this position, and tighten the pulley retaining bolts to the specified torque.

**53** If the special belt tension measuring equipment is available, it should be fitted to the "front run" of the timing belt, between the front tensioner and the camshaft sprocket. Move the tensioner pulley backplate so that the belt is initially over-tensioned to a setting of 45 units, then back the tensioner off until the belt tension is  $22 \pm 2$  units. Hold the backplate in this position, and tighten both the tensioner pulley retaining bolts to the specified torque.

**54** Slacken the rear tensioner pulley retaining bolt. Using the square-section key, pivot the pulley anti-clockwise until all free play is removed from the belt. If the belt tension measuring equipment is being used, set the tensioner pulley so that the belt tension on the "front run" is  $32 \pm 2$  units. Hold the tensioner

in position, and tighten its retaining bolt to the specified torque setting.

**55** Remove the locking pins from the camshaft and crankshaft sprockets and, where fitted, the tensioning measuring device from the belt.

**56** Rotate the crankshaft through at least two complete rotations in a clockwise direction (viewed from the right-hand end of the engine). Realign the camshaft and crankshaft engine assembly/valve timing holes (see Section 3). *Do not* at any time rotate the crankshaft anti-clockwise. Both camshaft timing holes and the crankshaft timing hole should be correctly positioned so that the locking pins can be easily inserted, indicating that the valve timing is correct.

**57** If the timing holes are not correctly positioned, slacken the tensioner assembly retaining bolts, and disengage the belt from the camshaft sprockets. Rotate the camshafts and crankshaft slightly as required until all locking pins are in position, then relocate the timing belt on the camshaft sprocket. Ensure that the belt "top run" and "front run" are taut - ie, ensure that any slack is on the rear tensioner pulley and water pump side of the belt. Repeat the tensioning procedure described in paragraphs 51 to 56 until the valve timing is correct.

**58** Once the valve timing is correctly set, remove the locking pins and recheck the belt tension.

**59** If the tension is being set without the special measuring tool, proceed as follows. Check that, under moderate pressure from the thumb and forefinger, the belt can just be twisted through 45°, at the mid-point between the camshaft sprocket and tensioner pulley on the "front run" of the belt. Note that this method is only an initial setting, and the belt tension *must* be checked at the earliest available opportunity using the special measuring tool. Failure to do so could lead to the belt breaking (through over-tightening) or slipping (through slackness), resulting in serious engine damage. If necessary, readjust the rear tensioner pulley position as required, and tighten its retaining bolt to the specified torque.

**60** If the special measuring tool is being used, the final belt tension on the "front run" of the belt, between the camshaft sprocket and tensioner pulley, should be 53 ± 2 units. Readjust the rear tensioner pulley position as required, then retighten the retaining bolt to the specified torque. Rotate the crankshaft through a further two rotations clockwise, and recheck the tension. Repeat this procedure as necessary, until the correct tension reading is obtained after the crankshaft has been rotated.

**61** Once the belt tension is correctly set, refit the timing belt covers as described in Section 6. Refit the crankshaft pulley as described in Section 5, and reconnect the battery negative terminal

## 8 Timing belt tensioner and sprockets - removal, inspection and refitting



**Note:** *This Section describes the removal and refitting of the components concerned as individual operations - if more than one is to be removed at the same time, start by removing the timing belt as described in Section 7; remove the actual component as described below, ignoring the preliminary dismantling steps.*

### Removal

- 1** Disconnect the battery negative lead.
- 2** Align the engine assembly/valve timing holes as described in Section 3, locking the camshaft sprocket(s) and the crankshaft pulley in position, and proceed as described under the relevant sub-heading. *Do not* attempt to rotate the engine whilst the pins are in position.

#### Camshaft sprocket - early (pre-1992) 1580 cc and 1905 cc models with a semi-automatic belt tensioner

- 3** Remove the centre timing belt cover as described in Section 6.
- 4** Slacken (but do not remove) the two nuts securing the tensioner assembly to the end of the cylinder block. Loosen the tensioner cam spindle locknut, located on the rear of cylinder block flange.
- 5** Using a suitable open-ended spanner on the square-section end of the tensioner cam spindle, rotate the cam until the tensioner spring is fully compressed and the belt tension is relieved. Hold the cam in this position, and securely tighten the locknut.
- 6** Remove the locking pin from the camshaft sprocket. Disengage the timing belt from the sprocket and position it clear, taking care not to bend or twist the belt sharply.
- 7** Slacken the camshaft sprocket retaining bolt and remove it, along with its washer. To prevent the camshaft rotating as the bolt is slackened, a sprocket holding tool will be required. *Do not* attempt to use the sprocket locking pin to prevent the sprocket from rotating whilst the bolt is slackened



**TOOL TIP** *To prevent the camshaft sprocket from rotating, use two lengths of steel strip (one long, the other short), and three nuts and bolts; one nut and bolt forms the pivot of a forked tool, with the remaining two nuts and bolts at the tips of the "forks" to engage with the sprocket spokes as shown in illustration 8.39.*

- 8** With the retaining bolt removed, slide the sprocket off the end of the camshaft. If the locating peg is a loose fit in the rear of the sprocket, remove it for safe-keeping. Examine

the camshaft oil seal for signs of oil leakage and, if necessary, renew it as described in Section 9.

#### Camshaft sprocket - later (1992-on) 1580 cc and 1905 cc models with a manually-adjusted belt tensioner pulley, and all 1761 cc and 1998 cc 8-valve models

- 9** On all except 1998 cc 8-valve models, remove the centre timing belt cover as described in Section 6.
- 10** Loosen the timing belt tensioner pulley retaining bolt. Rotate the pulley in a clockwise direction, using a suitable square-section key fitted to the hole in the pulley hub, then retighten the retaining bolt.
- 11** Remove the camshaft sprocket as described above in paragraphs 6 to 8.

#### Camshaft sprocket(s) - 1998 cc 16-valve models

- 12** Loosen the timing belt rear tensioner pulley retaining bolt. Pivot the pulley in a clockwise direction, using a suitable square-section key fitted to the hole in the pulley hub, then securely retighten the retaining bolt.
- 13** Loosen the two front tensioner assembly retaining bolts. Move the tensioner pulley away from the belt, using the same square-section key on the pulley backplate.
- 14** Remove the camshaft sprocket retaining bolt as described above in paragraphs 6 and 7.
- 15** Slide the sprocket off the end of the camshaft. If the Woodruff key is a loose fit in the camshaft, remove it and store it with the sprocket for safe-keeping. Examine the camshaft oil seal for signs of oil leakage and, if necessary, renew it as described in Section 9.

#### Crankshaft sprocket - 1580 cc, 1761 cc, 1905 cc and 1998 cc 8-valve models

- 16** Remove the centre and/or lower timing belt cover(s) (as applicable) as described in Section 6.
- 17** On early (pre-1992) 1580 cc and 1905 cc models with a semi-automatic belt tensioner, release the timing belt tensioner as described above in paragraphs 4 and 5.
- 18** On later (1992-on) 1580 cc and 1905 cc models with a manually-adjusted belt tensioner pulley, and all 1761 cc and 1998 cc 8-valve models, release the timing belt tensioner as described in paragraph 10.
- 19** Disengage the timing belt from the crankshaft sprocket, and slide the sprocket off the end of the crankshaft. Remove the Woodruff key from the crankshaft, and store it with the sprocket for safe-keeping. Where necessary, also slide the flanged spacer (where fitted) off the end of the crankshaft.
- 20** Examine the crankshaft oil seal for signs of oil leakage and, if necessary, renew it as described in Section 16.

#### Crankshaft sprocket - 1998 cc 16-valve models

- 21** Remove the lower timing belt cover as described in Section 6.

**22** Release the timing belt tensioners as described above in paragraphs 12 and 13. Disengage the timing belt from the crankshaft sprocket, and remove the locking pin.

**23** To prevent the crankshaft turning whilst the sprocket retaining bolt is being slackened, select top gear, and have an assistant apply the brakes firmly. If the engine has been removed from the vehicle, lock the flywheel ring gear using the arrangement shown in illustration 5.3 (Section 5). *Do not* be tempted to use the locking pin to prevent the crankshaft from rotating.

**24** Unscrew the retaining bolt and washer, then slide the sprocket off the end of the crankshaft. If the Woodruff key is a loose fit in the crankshaft, remove it and store it with the sprocket for safe-keeping.

**25** Where necessary, slide the flanged spacer (where fitted) off the end of the crankshaft.

**26** Examine the crankshaft oil seal for signs of oil leakage and, if necessary, renew it as described in Section 16.

#### **Tensioner assembly - early (pre-1992) 1580 cc and 1905 cc models with a semi-automatic belt tensioner**

**27** Remove the centre timing belt cover as described in Section 6.

**28** Slacken and remove the two nuts and washers securing the tensioner assembly to the end of the cylinder block. Carefully ease the spring cover off its studs, taking care not to allow the spring to fly out as the cover is withdrawn. Remove the spring and cover from the engine (*see illustration*).

**29** Slacken and remove the tensioner cam spindle locknut and washer, located on the rear of cylinder block flange, and withdraw the cam spindle.

**30** The tensioner pulley and backplate assembly can then be manoeuvred out from behind the timing belt.

#### **Tensioner pulley - later (1992-on) 1580 cc and 1905 cc models with a manually-adjusted belt tensioner pulley, and all 1761 cc and 1998 cc 8-valve models**

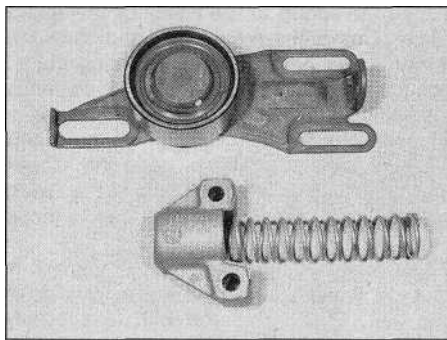
**31** On all except 1998 cc 8-valve models, remove the centre timing belt cover as described in Section 6.

**32** Slacken and remove the timing belt tensioner pulley retaining bolt, and slide the pulley off its mounting stud. Examine the mounting stud for signs of damage and if necessary, renew it.

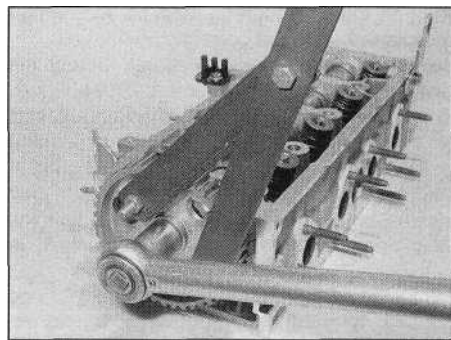
#### **Tensioner pulleys - 1998 cc 16-valve models**

**33** The rear tensioner pulley is removed as described above in paragraph 32.

**34** To remove the front tensioner pulley, slacken and remove the two bolts securing the pulley backplate to the cylinder block, and remove the assembly from the engine unit.



**8.28 Timing belt tensioner assembly components - early 1580 cc and 1905 cc models**



**8.39 Using a home-made tool to retaining the camshaft sprocket whilst the sprocket retaining bolt is tightened (TU engine shown)**

### **Inspection**

**35** Clean the camshaft/crankshaft sprockets thoroughly, and renew any that show signs of wear, damage or cracks.

**36** Clean the tensioner assembly, but do not use any strong solvent which may enter the pulley bearing. Check that the pulley rotates freely on the backplate, with no sign of stiffness or free play. Renew the assembly if there is any doubt about its condition, or if there are any obvious signs of wear or damage.

**37** On early 1580 cc and 1905 cc models, the tensioner spring should also be carefully checked, as its condition is critical for the correct tensioning of the timing belt. The only way of checking the spring tension is to compare it with a new one; if there is any doubt as to its condition, the spring should be renewed.

### **Refitting**

#### **Camshaft sprocket - early (pre-1992) 1580 cc and 1905 cc models with a semi-automatic belt tensioner**

**38** Refit the locating peg (where removed) to the rear of the sprocket. Locate the sprocket on the end of the camshaft, ensuring that the locating peg is correctly engaged with the cutout in the camshaft end.

**39** Refit the sprocket retaining bolt and washer, and tighten it to the specified torque. Retain the sprocket with the tool used on removal (*see illustration*).

**40** Realign the hole in the camshaft sprocket with the corresponding hole in the cylinder head, and refit the locking pin. Check that the crankshaft pulley locking pin is still in position.

**41** Refit the timing belt to the camshaft sprocket. Ensure that the "front run" of the belt is taut - ie, that any slack is on the tensioner pulley side of the belt. Do not twist the belt sharply while refitting it, and ensure that the belt teeth are seated centrally in the sprockets.

**42** Release the tensioner cam spindle locknut, and check that the tensioner pulley is forced against the timing belt under spring pressure.

**43** Tension the timing belt as described in paragraphs 31 to 33 of Section 7.

**44** With the belt correctly tensioned, and the tensioner retaining nuts and locknut tightened to the specified torque setting, refit the timing belt covers as described in Section 6. Reconnect the battery on completion.

#### **Camshaft sprocket - later (1992-on) 1580 cc and 1905 cc models with a manually-adjusted belt tensioner pulley, and all 1761 cc and 1998 cc 8-valve models**

**45** Refit the camshaft sprocket as described above in paragraphs 38 to 41.

**46** With the timing belt correctly engaged on the sprockets, tension the belt as described in paragraphs 38 to 43 of Section 7.

**47** Once the belt is correctly tensioned, refit the timing belt covers as described in Section 6.

#### **Camshaft sprocket(s) - 1998 cc 16-valve models**

**48** Refit the Woodruff key to its slot in the camshaft end. Slide on the sprocket, aligning its slot with the Woodruff key.

**49** Refit the sprocket retaining bolt and washer. Tighten the bolt to the specified torque, whilst retaining the sprocket with the tool used on removal.

**50** Realign the hole in the camshaft sprocket with the corresponding hole in the cylinder head, and refit the locking pin.

**51** Relocate the timing belt on the camshaft sprocket(s), and tension the timing belt as described in paragraphs 50 to 60 of Section 7.

**52** Once the belt is correctly tensioned, refit the timing belt cover as described in Section 6.

#### **Crankshaft sprocket - 1580 cc, 1761 cc, 1905 cc and 1998 cc 8-valve models**

**53** Slide on the flanged spacer (where fitted), and refit the Woodruff key to its slot in the crankshaft end.

**54** Slide on the crankshaft sprocket, aligning its slot with the Woodruff key.

**55** Ensure that the camshaft sprocket locking pin is still in position. Temporarily refit the crankshaft pulley, and insert the locking pin

through the pulley timing hole, to ensure that the crankshaft is still correctly positioned.

**56** Remove the crankshaft pulley. Engage the timing belt with the crankshaft sprocket. Ensure that the belt "front run" is taut - ie, that any slack is on the tensioner pulley side of the belt. Fit the belt over the water pump sprocket and tensioner pulley. Do not twist the belt sharply while refitting it, and ensure that the belt teeth are seated centrally in the sprockets.

**57** On early (pre-1992) 1580 cc and 1905 cc models with a semi-automatic tensioner, release the tensioner cam spindle locknut, checking that the tensioner pulley is forced against the timing belt under spring pressure. Tension the timing belt as described in paragraphs 30 to 33 of Section 7.

**58** On later (1992-on) 1580 cc and 1905 cc models with a manually-adjusted belt tensioner pulley, and all 1761 cc and 1998 cc 8-valve models, tension the timing belt as described in 38 to 43 of Section 7.

**59** On all models, remove the crankshaft pulley, then refit the timing belt cover(s) as described in Section 6.

**60** Refit the crankshaft pulley as described in Section 5, and reconnect the battery negative terminal.

**Crankshaft sprocket -1998 cc 16-valve models**

**61** Slide on the flanged spacer (where fitted), and refit the Woodruff key to its slot in the crankshaft end.

**62** Slide on the crankshaft sprocket, aligning its slot with the Woodruff key.

**63** Thoroughly clean the threads of the sprocket retaining bolt, then apply a coat of locking compound to the threads of the bolt. Citroen recommend the use of Frenbloc E6 (available from your Citroen dealer); in the absence of this, any good-quality locking compound may be used.

**64** Refit the crankshaft sprocket retaining bolt and washer. Tighten the bolt to the specified torque, whilst preventing crankshaft rotation using the method employed on removal.

**65** Refit the locking pin to the crankshaft sprocket, and check that both the camshaft sprocket locking pins are still in position.

**66** Relocate the timing belt on the crankshaft sprocket, and tension the timing belt as described in paragraphs 50 to 60 of Section 7.

**67** Once the belt is correctly tensioned, refit the timing belt cover as described in Section 6.

**Tensioner assembly - early (pre-1992) 1580 cc and 1905 cc models with a semi-automatic belt tensioner**

**68** Manoeuvre the tensioner pulley and backplate assembly into position behind the timing belt, and locate it on the mounting studs.

**69** Insert the tensioner cam spindle through the backplate from the front of the block, and refit its washer and locknut, tightening it by hand only at this stage.

**70** Fit the spring to the inside of the spring cover. Compress the spring, and slide the spring cover onto the two mounting studs, ensuring that the spring end is correctly located behind the backplate tang.

**71** Refit the tensioner mounting nuts and washers, tightening them by hand only. Check that the tensioner is forced against the timing belt by spring pressure, and is free to move smoothly and easily.

**72** Ensure that the "front run" of the belt is taut - ie, that any slack is on the pulley side of the belt. Check that the belt is centrally located on all its sprockets, then release the tensioner assembly and allow it to tension the belt.

**73** Tension the timing belt, and check the valve timing as described in paragraphs 31 to 33 of Section 7.

**74** With the belt correctly tensioned, and the tensioner retaining nuts and locknut tightened to the specified torque setting, refit the timing belt covers as described in Section 6. Reconnect the battery on completion.

**Tensioner pulley - later (1992-on) 1580 cc and 1905 cc models with a manually-adjusted belt tensioner pulley, and all 1761 cc and 1998 cc 8-valve models**

**75** Refit the tensioner pulley to its mounting stud, and fit the retaining bolt.

**76** Ensure that the "front run" of the belt is taut - ie, that any slack is on the pulley side of the belt. Check that the belt is centrally located on all its sprockets. Rotate the pulley anti-clockwise to remove all free play from the timing belt, and securely tighten the pulley retaining nut.

**77** Tension the belt as described in 38 to 43 of Section 7.

**78** Once the belt is correctly tensioned, refit the timing belt covers as described in Section 6.

**Tensioner pulleys -1998 cc 16-valve models**

**79** Refit the rear tensioner pulley to its mounting stud, and fit the retaining bolt. Align the front pulley backplate with its holes, and refit both its retaining bolts. Tighten all retaining bolts finger-tight only, so that both tensioners are free to pivot.

**80** Tension the timing belt as described in paragraphs 51 to 60 of Section 7.

**81** Once the belt is correctly tensioned, refit the timing belt cover as described in Section 6.

**9 Camshaft oil seal(s) - renewal**

**Note:** *If the camshaft oil seal is to be renewed with the timing belt still in place, check first that the belt is free from oil contamination. (Renew the belt as a matter of course if signs of oil contamination are found; see Section 7.) Cover the belt, to protect it from contamination by oil while work is in progress. If the timing belt is removed, ensure that all traces*

*of oil are removed from the area before the belt is refitted.*

**1** Remove the camshaft sprocket(s) as described in Section 8.

**2** Punch or drill two small holes opposite each other in the oil seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal.

**3** Clean the seal housing, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.

**4** Lubricate the lips of the new seal with clean engine oil, and drive it into position until it seats on its locating shoulder. Use a suitable tubular drift, such as a socket, which bears only on the hard outer edge of the seal. Take care not to damage the seal lips during fitting. Note that the seal lips should face inwards.

**5** Refit the camshaft sprockets) as described in Section 8.

**10 Camshaft(s) and followers - removal, inspection and refitting**

**Removal**

**1** Disconnect the battery negative terminal, and remove the cylinder head cover as described in Section 4. Proceed as described under the relevant sub-heading.

**1998 cc 16-valve models**

**2** Remove the vacuum pump from the left-hand end of the cylinder head, as described in Chapter 9.

**3** Remove both camshaft sprockets as described in Section 8.

**4** Undo the six bolts securing the inner timing belt cover to the side of the cylinder head, and remove the cover from the engine.

**5** Carefully ease the oil supply pipe out from the top of the camshaft bearing caps, and remove it. Note the O-ring seals fitted to each of the pipe unions.

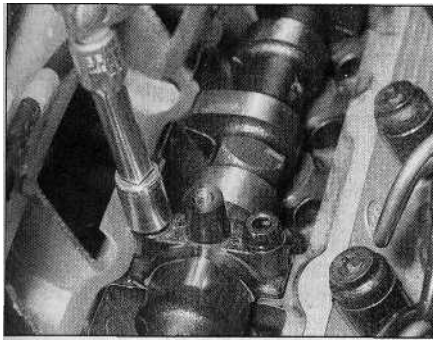
**6** The camshaft bearing caps should be numbered 1 to 5, number 1 being at the transmission end of the engine. If not, make identification marks on the caps, using white paint or a suitable marker pen.

**7** Working in the reverse of the sequence shown in illustration 10.28, evenly and progressively slacken the camshaft bearing cap retaining screws by one turn at a time. This will relieve the valve spring pressure on the bearing caps gradually and evenly. Once the pressure has been relieved, the bolts can be fully unscrewed and removed.

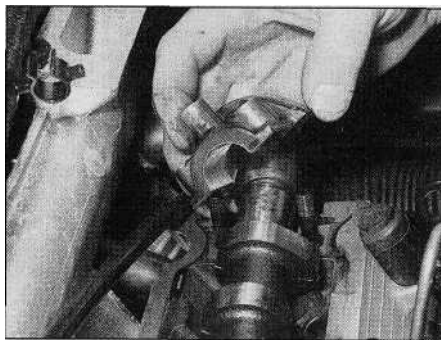
**8** Lift off the bearing caps, noting the correct fitted location of the locating dowels. If the dowels are a loose fit, remove them and store them with the bearing caps for safe-keeping.

**9** Lift the camshafts out of the cylinder head, and slide the oil seals off the camshaft ends. The inlet camshaft can be identified by the braking system vacuum pump drive slot in its left-hand end; therefore, there is no need to mark the camshafts for identification.

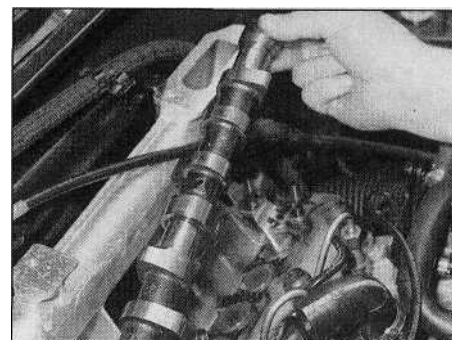
**10** Obtain sixteen small, clean plastic



**10.17** Working as described in the text, unscrew the retaining nuts ...



**10.18** ... and remove the camshaft bearing caps ...



**10.19** ... then lift the camshaft away from the cylinder head

containers, and number them 1 to 16. Using a rubber sucker, withdraw each cam follower in turn, invert it to prevent oil loss, and place it in its respective container. The container should then be filled with clean engine oil. Do not interchange the cam followers, or the rate of wear will be much-increased. Do not allow them to lose oil, or the hydraulic tappet mechanism will take a long time to refill with oil on restarting the engine, resulting in incorrect valve clearances.

#### All other models

**11** Remove the camshaft sprocket as described in Section 8.

**12** On models with a distributor, remove the distributor as described in Chapter 5.

**13** On models with a static (distributorless) ignition system, remove the ignition HT coil as described in Chapter 5.

**14** With the distributor or coil removed (as applicable), slacken the upper bolt securing the thermostat housing to the left-hand end of the cylinder head. Remove the bolt, along with its sealing washer. This is necessary since the bolt screws into the left-hand (No 1) camshaft bearing cap.

**15** Carefully ease the oil supply pipe out from the top of the camshaft bearing caps, and remove it. Note the O-ring seals fitted to each of the pipe unions.

**16** The camshaft bearing caps should be numbered 1 to 5, number 1 being at the transmission end of the engine. If not, make identification marks on the caps, using white

paint or a suitable marker pen. Also mark each cap in some way to indicate its correct fitted orientation. This will avoid the possibility of installing the caps the wrong way around on refitting.

**17** Evenly and progressively slacken the camshaft bearing cap retaining nuts by one turn at a time. This will relieve the valve spring pressure on the bearing caps gradually and evenly. Once the pressure has been relieved, the nuts can be fully unscrewed and removed (see illustration).

**18** Note the correct fitted orientation of the bearing caps, then remove them from cylinder head (see illustration).

**19** Lift the camshaft away from the cylinder head, and slide the oil seal off the camshaft end (see illustration).

**20** Obtain eight small, clean plastic containers, and number them 1 to 8; alternatively, divide a larger container into eight compartments. Using a rubber sucker, withdraw each follower in turn, and place it in its respective container. Do not interchange the cam followers, or the rate of wear will be much-increased. If necessary, also remove the shim from the top of the valve stem, and store it with its respective follower. Note that the shim may stick to the inside of the follower as it is withdrawn. If this happens, take care not to allow it to drop out as the follower is removed.

#### Inspection

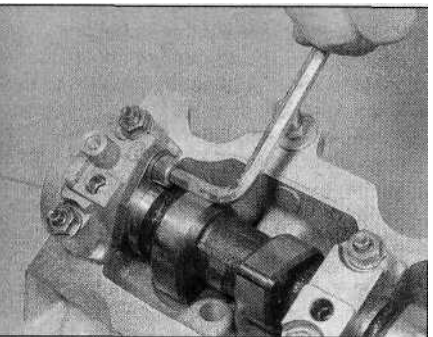
**21** Examine the camshaft bearing surfaces and cam lobes for signs of wear ridges and

scoring. Renew the camshaft if any of these conditions are apparent. Examine the condition of the bearing surfaces, both on the camshaft journals and in the cylinder head/bearing caps. If the head bearing surfaces are worn excessively, the cylinder head will need to be renewed. If suitable measuring equipment is available, camshaft bearing journal wear can be checked by direct measurement (where the necessary specifications have been quoted by Citroen), noting that No 1 journal is at the transmission end of the head.

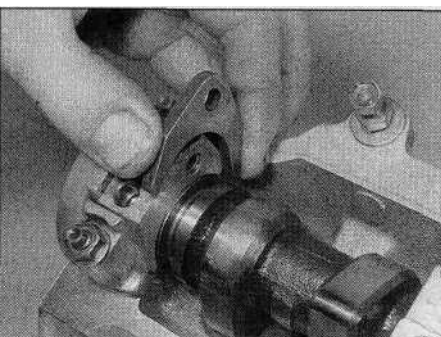
**22** Examine the cam follower bearing surfaces which contact the camshaft lobes for wear ridges and scoring. Renew any follower on which these conditions are apparent. If a follower bearing surface is badly scored, also examine the corresponding lobe on the camshaft for wear, as it is likely that both will be worn. Renew worn components as necessary.

**23** On 1998 cc 16-valve models, if the engine's valve clearances have sounded noisy, particularly if the noise persists after initial start-up from cold, there is reason to suspect a faulty hydraulic tappet mechanism. Only a good mechanic experienced in these engines can tell whether the noise level is typical, or if renewal of one or more of the tappets is warranted. If a faulty hydraulic tappet is diagnosed and the engine's service history is unknown, it is always worth trying the effect of renewing the engine oil and filter before going to the expense of renewing any of the cam followers. Use only *good-quality* engine oil of the recommended viscosity and specification (Chapter 1). It is not possible to overhaul the hydraulic tappet mechanism, so if any tappet's operation is faulty, it must be renewed.

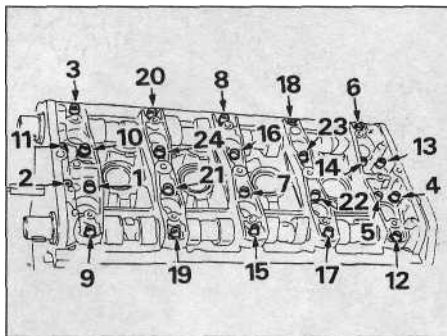
**24** On earlier 1580 cc and 1905 cc models, inspect the camshaft thrust fork (fitted to the side of No 5 camshaft bearing cap) for signs of wear or scoring, and if necessary renew it (see illustrations). The fork is retained by a single bolt; on refitting, ensure that the bolt is securely tightened. On later models, the thrust fork is no longer fitted, and the camshaft endfloat is controlled by the camshaft bearing cap.



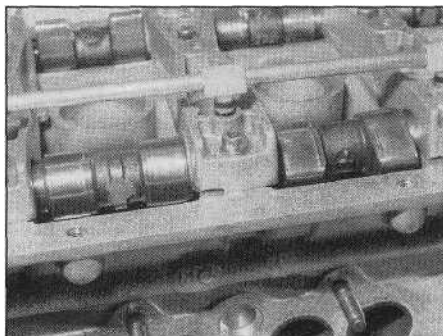
**10.24a** On early 1580 cc and 1905 cc models, slacken the retaining bolt...



**10.24b** ... and remove the camshaft thrust fork from the bearing cap



**10.28 Camshaft bearing cap bolt tightening sequence -1998 cc 16-valve models**



**10.29 Take care not to displace the O-rings when refitting the oil supply pipe to the camshaft bearing caps**

## Refitting

### 1998 cc 16-valve models

**25** Liberally oil the cylinder head cam follower bores and the followers. Note that, if new followers are being fitted, they must be charged with oil before installation by placing them in a bath of clean engine oil and "working" them. Carefully refit the followers to the cylinder head, ensuring that each follower is refitted to its original bore, where applicable. Some care will be required to enter the followers squarely into their bores.

**26** Liberally oil the camshaft bearings and lobes, then refit the camshafts to the cylinder head. Temporarily refit the Woodruff keys and sprockets to the end of each camshaft. Set each camshaft so that its sprocket timing hole is aligned with the corresponding cutout in the cylinder head. Also ensure that the crankshaft is still locked in position (see Section 3).

**27** Ensure that the bearing cap locating dowels are pressed firmly into their recesses. Check that the mating surfaces are completely clean, unmarked and free from oil. Refit the bearing caps, using the identification marks noted on removal to ensure that each is installed correctly and in its original location.

**28** Working in the sequence shown, progressively tighten the camshaft bearing cap bolts by one turn at a time, until the caps touch the cylinder head evenly. Go round again, working in the same sequence, and tighten all the bolts to the specified torque setting (see illustration). Work only as described, to impose the pressure of the valve springs gradually and evenly on the bearing caps.

**29** Examine the oil supply pipe union O-rings for signs of damage or deterioration, and renew as necessary. Check that the supply pipe oil spray holes are clear, unblocking them with a pin if necessary. Apply a smear of clean engine oil to the O-rings. Ease the pipe assembly into position in the top of the bearing caps, taking great care not to displace the O-rings (see illustration).

**30** Refit the inner timing belt cover to the side of the cylinder head, and tighten its retaining bolts to the specified torque.

**31** Fit two new camshaft oil seals using the information given in Section 7, then refit the camshaft sprockets as described in Section 8.

**32** Refit the vacuum pump as described in Chapter 9.

**33** Refit the cylinder head cover as described in Section 4, and reconnect the battery negative terminal.

### All other models

**32** Where removed, refit each shim to the top of its original valve stem. *Do not* interchange the shims, as this will upset the valve clearances (see Section 11).

**33** Liberally oil the cylinder head cam follower bores and the followers. Carefully refit the followers to the cylinder head, ensuring that each follower is refitted to its original bore. Some care will be required to enter the followers squarely into their bores.

**34** Liberally oil the camshaft bearings and lobes, then refit the camshaft to the cylinder head. Temporarily refit the sprocket to the end of the shaft, and position it so that the sprocket timing hole is aligned with the corresponding cutout in the cylinder head. Also ensure that the crankshaft is still locked in position (see Section 3).

**35** Ensure that the bearing cap and head mating surfaces are completely clean, unmarked, and free from oil. Refit the bearing caps, using the identification marks noted on removal to ensure that each is installed correctly and in its original location.

**36** Evenly and progressively tighten the camshaft bearing cap nuts by one turn at a time until the caps touch the cylinder head. Then go round again and tighten all the nuts to the specified torque setting. Work only as described, to impose the pressure of the valve springs gradually and evenly on the bearing caps.

**37** Examine the oil supply pipe union O-rings for signs of damage or deterioration, and renew as necessary. Apply a smear of clean engine oil to the O-rings. Ease the pipe into position in the top of the bearing caps, taking great care not to displace the O-rings.

**38** Examine the sealing washer for signs of damage or deterioration, and renew it if

necessary. Refit the upper retaining bolt to the thermostat housing, tightening it to the specified torque setting.

**39** On models with a distributor, refit the distributor as described in Chapter 5.

**40** On models with a static (distributorless) ignition system, refit the ignition HT coil as described in Chapter 5.

**41** Fit a new camshaft oil seal, using the information given in Section 7, then refit the camshaft sprocket as described in Section 8.

**42** Refit the cylinder head cover as described in Section 4, and reconnect the battery negative terminal.

## 11 Valve clearances - checking and adjustment



## Checking

### 1998 cc 16-valve models

**1** On 1998 cc 16-valve models, the valve clearances are automatically adjusted by the hydraulic tappet mechanism fitted to each cam follower. Therefore it is not necessary, or indeed possible, to check or adjust the valve clearances manually. If the valve gear has become noisy, a faulty tappet mechanism should be suspected. Refer to paragraph 23 of Section 10 for further information.

### All other models

**2** On these models, the importance of having the valve clearances correctly adjusted cannot be overstressed, as they vitally affect the performance of the engine. Checking should not be regarded as a routine operation, however. It should only be necessary when the valve gear has become noisy, after engine overhaul, or when trying to trace the cause of power loss. The clearances are checked as follows. The engine must be cold for the check to be accurate.

**3** Apply the handbrake, then jack up the front of the car and support it on axle stands. Remove the right-hand front roadwheel.

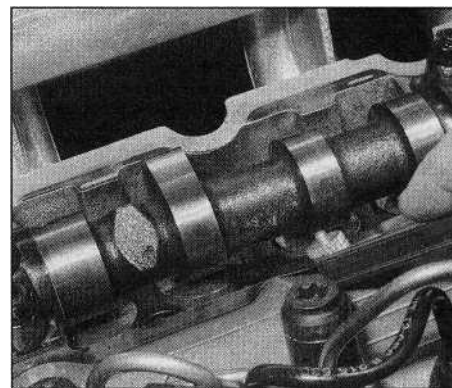
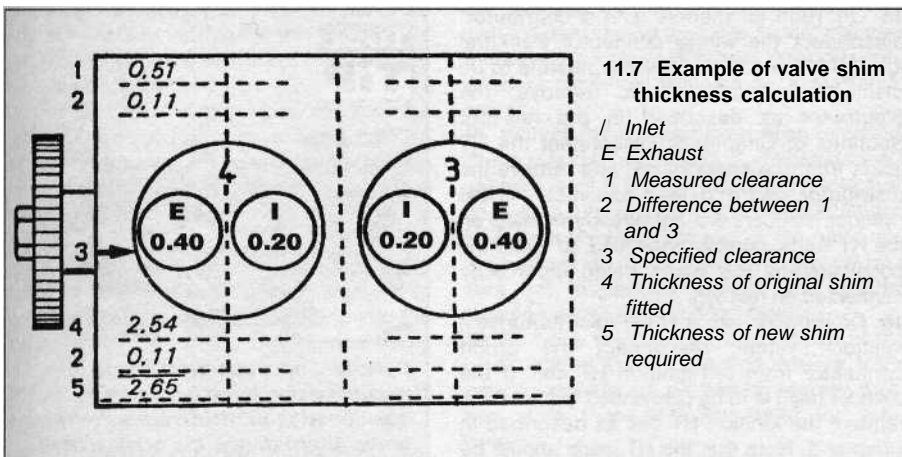
**4** From underneath the front of the car, prise out the two retaining clips, and remove the plastic cover from the wing valance to gain access to the crankshaft sprocket bolt. Where necessary, unclip the coolant hoses from the bracket to improve access further.

**5** The engine can now be turned over using a suitable socket and extension bar fitted to the crankshaft pulley bolt.

**6** Remove the cylinder head cover as described in Section 4.

**7** Draw the outline of the engine on a piece of paper, numbering the cylinders 1 to 4, with No 1 cylinder at the transmission end of the engine. Show the position of each valve, together with the specified valve clearance (see paragraph 11). Above each valve, draw two lines for noting (1) the actual clearance





**11.9 Measuring a valve clearance using a feeler gauge**

and (2) the amount of adjustment required (see illustration).

**8** Turn the crankshaft until the inlet valve of No 1 cylinder (nearest the transmission end) is fully closed, with the tip of the cam facing directly away from the cam follower.

**9** Using feeler gauges, measure the clearance between the base of the cam and the follower (see illustration). Record the clearance on line (1).

**10** Repeat the measurement for the other seven valves, turning the crankshaft as necessary so that the cam lobe in question is always facing directly away from the relevant follower.

**11** Calculate the difference between each measured clearance and the desired value, and record it on line (2). Since the clearance is different for inlet and exhaust valves, make sure that you are aware which valve you are dealing with. The valve sequence from either end of the engine is:

Ex - In - In - Ex - Ex - In - In - Ex

**12** If all the clearances are within tolerance, refit the cylinder head cover with reference to Section 4. Clip the coolant hoses into position (if removed) and refit the plastic cover to the wing valance. Refit the roadwheel, and lower the vehicle to the ground.

**13** If any clearance measured is outside the specified tolerance, adjustment must be carried out as described in the following paragraphs.

## Adjustment

### 1998 cc 16-valve models

**14** See paragraph 1.

### All other models

**15** Remove the camshaft as described in Section 10.

**16** Withdraw the first follower from the cylinder head, and recover the shim from the top of the valve stem. Note that the shim may stick to the inside of the follower as it is withdrawn. If this happens, take care not to allow it to drop out as the follower is removed. Remove all traces of oil from the shim, and

measure its thickness with a micrometer (see illustrations). The shims usually carry thickness markings, but wear may have reduced the original thickness.

**17** Refer to the clearance recorded for the valve concerned. If the clearance was more than that specified, the shim thickness must be *increased* by the difference recorded (2). If the clearance was less than that specified, the thickness of the shim must be *decreased* by the difference recorded (2).

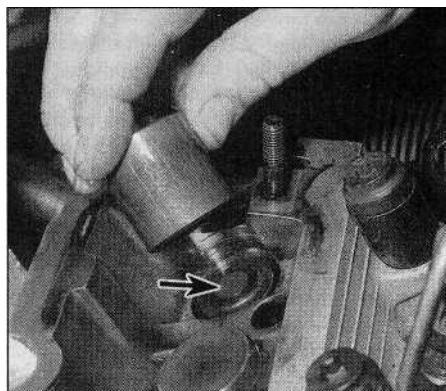
**18** Draw three more lines beneath each valve on the calculation paper, as shown in illustration 11.7. On line (4), note the measured thickness of the shim, then add or deduct the difference from line (2) to give the final shim thickness required on line (5).

**19** Shims are available in thicknesses between 2.225 mm and 3.550 mm, in steps of 0.025 mm. Clean new shims before measuring or fitting them.

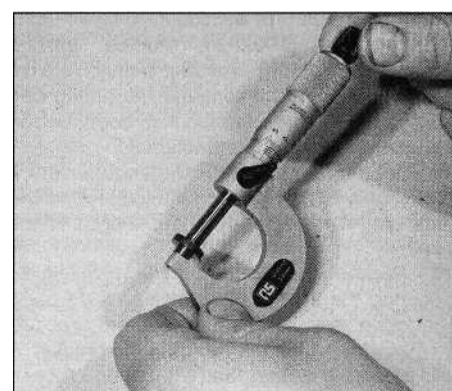
**20** Repeat the procedure given in paragraphs 16 to 18 on the remaining valves, keeping each follower identified for position.

**21** When reassembling, oil the shim, and fit it on the valve stem with the size marking face downwards. Oil the follower, and lower it onto the shim. Do not raise the follower after fitting, as the shim may become dislodged.

**22** When all the followers are in position,



**11.16a Lift out the follower and remove the shim (arrowed)**



**11.16b Using a micrometer to measure shim thickness**

complete with their shims, refit the camshaft as described in Section 10. Recheck the valve clearances before refitting the cylinder head cover, to make sure they are correct.

## 12 Cylinder head - removal and refitting

### Removal

- 1 Disconnect the battery negative lead.
- 2 Drain the cooling system as described in Chapter 1.
- 3 Align the engine assembly/valve timing holes as described in Section 3, locking both the camshaft sprocket and crankshaft pulley in position, and proceed as described under the relevant sub-heading. *Do not* attempt to rotate the engine whilst the pins are in position.

### 1580 cc and 1905 cc models

- 4 Remove the cylinder head cover as described in Section 4, and remove the air cleaner mounting bracket from the rear of cylinder head.
- 5 Note that the following text assumes that the cylinder head will be removed with both inlet and exhaust manifolds attached; this is

easier, but makes it a bulky and heavy assembly to handle. If it is wished first to remove the manifolds, proceed as described in Chapter 4.

**6** Working as described in Chapter 4, disconnect the exhaust system front pipe from the manifold. Where necessary, disconnect or release the lambda sensor wiring, so that it is not strained by the weight of the exhaust.

**7** Disconnect the following from the throttle body/housing and inlet manifold, as described in Chapter 4:

- (a) *Depressurise the fuel system, and disconnect the fuel feed and return hoses. Plug all openings, to prevent loss of fuel and the entry of dirt into the system.*
- (b) *Disconnect the accelerator cable.*
- (c) *Disconnect the vacuum servo unit vacuum hose, coolant hose and all the other relevant vacuum/breather hoses, from the inlet manifold and throttle body/housing.*
- (d) *Undo the retaining nut, and position the oil filler neck clear of the inlet manifold.*
- (e) *On 1580 cc models, disconnect the three electrical connector plugs from the throttle body.*
- (f) *On 1905 cc models, disconnect the wiring connectors from the throttle potentiometer and the fuel injectors, and free the wiring loom from the manifold.*

**8** Slacken the retaining clips, and disconnect the coolant hoses from the thermostat housing (on the left-hand end of the cylinder head).

**9** Depress the retaining clip(s), and disconnect the wiring connector(s) from the electrical switch(es) and/or sensor(s) which are screwed into the thermostat housing, or into the left-hand end of the cylinder head (as appropriate).

**10** Slacken and remove the bolt securing the engine oil dipstick to the rear of the cylinder head, and withdraw the tube from the cylinder block.

**11** On early (pre-1992) models with a semi-automatic timing belt tensioner, release the tensioner and disengage the timing belt from the camshaft sprocket as described in paragraphs 3 to 6 of Section 8.

**12** On later (1992-on) models with a manually-adjusted tensioner pulley, release the tensioner and disengage the timing belt from the camshaft sprocket as described in paragraphs 9 and 10 of Section 8.

**13** Place a jack beneath the engine, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the engine.

**14** Slacken and remove the three nuts securing the engine/transmission right-hand mounting bracket to the engine bracket. Remove the single nut securing the bracket to the mounting rubber, and lift off the bracket. Undo the three bolts securing the engine bracket to the end of the cylinder head/block, and remove the bracket.

**15** On 1905 cc models with a distributor, disconnect the wiring connector from the ignition HT coil. If the cylinder head is to be dismantled for overhaul, remove the distributor as described in the relevant Sections of Chapter 5. Disconnect the HT leads from the spark plugs, and remove the distributor cap and lead assembly. If the cylinder numbers are not already marked on the HT leads, number each lead, to avoid the possibility of the leads being incorrectly connected on refitting.

**16** On models with a static (distributorless) ignition system, disconnect the wiring connector from the ignition HT coil. If the cylinder head is to be dismantled for overhaul, remove the ignition HT coil as described in Chapter 5. Note that the HT leads should be disconnected from the spark plugs instead of the coil, and the coil and leads removed as an assembly. If the cylinder numbers are not already marked on the HT leads, number each lead, to avoid the possibility of the leads being incorrectly connected on refitting.

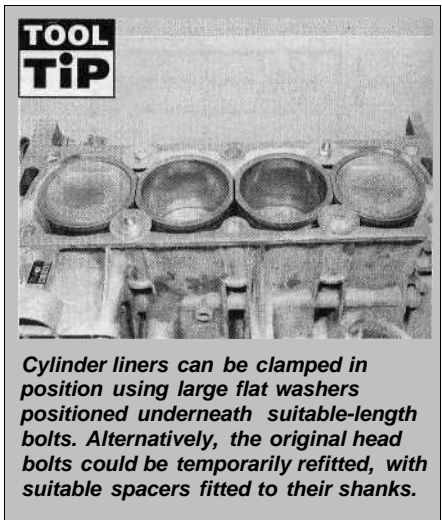
**17** Working in the reverse of the sequence shown in illustration 12.61, progressively slacken the ten cylinder head bolts by half a turn at a time, until all bolts can be unscrewed by hand. Remove the bolts along with their washers, noting the correct location of the spacer fitted to the front left-hand bolt.

**18** With all the cylinder head bolts removed, the joint between the cylinder head and gasket and the cylinder block/crankcase must now be broken without disturbing the wet liners. Although these liners are better-located and sealed than some wet-liner engines, there is still a risk of coolant and foreign matter leaking into the sump if the cylinder head is lifted carelessly. If care is not taken and the liners are moved, there is also a possibility of the bottom seals being disturbed, causing leakage after refitting the head.

**19** To break the joint, obtain two L-shaped metal bars which fit into the cylinder head bolt holes, and gently "rock" the cylinder head free towards the front of the car (see Part A, Section 10, illustration 10.23). Do not try to swivel the head on the cylinder block/crankcase; it is located by dowels, as well as by the tops of the liners.

**20** When the joint is broken, lift the cylinder head away. Seek assistance if possible, as it is a heavy assembly, especially if it is complete with the manifolds. Remove the gasket from the top of the block, noting the two locating dowels. If the locating dowels are a loose fit, remove them and store them with the head for safe-keeping. Do not discard the gasket; it will be needed for identification purposes (see paragraphs 51 and 52).

**21** Do not attempt to turn the crankshaft with the cylinder head removed, otherwise the wet liners may be displaced. Operations that require the crankshaft to be turned (eg cleaning the piston crowns), should only be carried out once the cylinder liners are firmly clamped in position.



**Cylinder liners can be clamped in position using large flat washers positioned underneath suitable-length bolts. Alternatively, the original head bolts could be temporarily refitted, with suitable spacers fitted to their shanks.**

**22** If the cylinder head is to be dismantled for overhaul, remove the camshaft as described in Section 10, then refer to Part C of this Chapter.

**1761 cc models**

**23** Remove the cylinder head cover as described in Section 4.

**24** Remove the air cleaner-to-throttle housing duct as described in Chapter 4.

**25** Note that the following text assumes that the cylinder head will be removed with both inlet and exhaust manifolds attached; this is easier, but makes it a bulky and heavy assembly to handle. If it is wished first to remove the manifolds, proceed as described in Chapter 4.

**26** Working as described in Chapter 4, disconnect the exhaust system front pipe from the manifold. Where necessary, disconnect or release the lambda sensor wiring, so that it is not strained by the weight of the exhaust.

**27** Carry out the following operations as described in Chapter 4:

- (a) *Depressurise the fuel system, and disconnect the fuel feed and return hoses. Plug all openings, to prevent loss of fuel and the entry of dirt into the system.*
- (b) *Disconnect the accelerator cable.*
- (c) *Disconnect the vacuum servo unit vacuum hose, and all the other relevant vacuum/breather hoses, from the inlet manifold and throttle housing. Release the hoses from the retaining clips on the manifold.*
- (d) *Disconnect all the electrical connector plugs from the throttle housing.*
- (e) *Disconnect the wiring connectors from the fuel injectors, and free the wiring loom from the manifold.*
- (f) *Remove the idle speed auxiliary air valve.*

**28** Slacken the retaining clips, and disconnect the coolant hoses from the thermostat housing (on the left-hand end of the cylinder head).

**29** Depress the retaining clip(s), and disconnect the wiring connector(s) from the electrical switch(es) and/or sensor(s) which are screwed into the thermostat housing, or into the left-hand end of the cylinder head (as appropriate).



**30** Slacken and remove the bolt securing the engine oil dipstick tube to the left-hand end of the cylinder head, and withdraw the tube from the cylinder block.

**31** Disconnect the wiring connector from the ignition HT coil. If the cylinder head is to be dismantled for overhaul, remove the ignition HT coil as described in Chapter 5. Note that the HT leads should be disconnected from the spark plugs instead of the coil, and the coil and leads removed as an assembly. If the cylinder numbers are not already marked on the HT leads, number each lead, to avoid the possibility of the leads being incorrectly connected on refitting.

**32** Remove the cylinder head as described above in paragraphs 17 to 22.

### 1998 cc 8-valve models

**33** Carry out the operations described in paragraphs 23 to 31. Note that there is no idle speed auxiliary air valve, and that the dipstick tube is mounted onto the side of the inlet manifold.

**34** Working in the *reverse* of the sequence shown in illustration 12.61, progressively slacken the ten cylinder head bolts by half a turn at a time, until all bolts can be unscrewed by hand.

**35** Remove all the bolts, along with their washers, and discard them; the bolts and washers must be renewed as a matter of course.

**36** With all the cylinder head bolts removed, lift the cylinder head away. Seek assistance if possible, as it is a heavy assembly.

**37** Remove the gasket from the top of the block, noting the two locating dowels. If the locating dowels are a loose fit, remove them and store them with the head for safe-keeping.

**38** If the cylinder head is to be dismantled for overhaul, remove the camshaft as described in Section 10, then refer to the relevant Sections of Part C of this Chapter.

### 1998 cc 16-valve models

**39** Remove the camshafts as described in Section 10.

**40** Remove the exhaust manifold, and the inlet manifold and ACAV assembly, as described in Chapter 4.

**41** Slacken the retaining clips, and disconnect the coolant hoses from the thermostat housing (on the left-hand end of the cylinder head).

**42** Depress the retaining clip(s), and disconnect the wiring connector(s) from the electrical switch(es) and/or sensor(s) which are screwed into the coolant outlet housing on the left-hand end of the cylinder head.

**43** Slacken and remove the bolt securing the engine oil dipstick tube to the rear of the cylinder head, and withdraw the tube from the cylinder block.

**44** Working in the *reverse* of the sequence shown in illustration 12.61, progressively slacken the ten cylinder head bolts by half a

turn at a time, until all bolts can be unscrewed by hand. Remove all the bolts, along with their washers, and discard them; the bolts and washers must be renewed as a matter of course.

**45** With all the cylinder head bolts removed, lift the cylinder head away. Seek assistance if possible, as it is a heavy assembly. Note that, on right-hand drive models, there is limited clearance between the top of the head and the braking system master cylinder, so take care not to damage the master cylinder reservoir as the head is lifted clear.

**46** Remove the gasket from the top of the block, noting the two locating dowels. If the locating dowels are a loose fit, remove them and store them with the head for safe-keeping.

**47** Refer to Part C of this Chapter for cylinder head overhaul information.

### Preparation for refitting

**48** The mating faces of the cylinder head and cylinder block/crankcase must be perfectly clean before refitting the head. Use a hard plastic or wooden scraper to remove all traces of gasket and carbon; also clean the piston crowns. On 1580 cc, 1761 cc and 1905 cc engines, refer to paragraph 21 before turning the engine. Take particular care on these models, as the soft aluminium alloy is easily damaged. On all models, make sure that the carbon is not allowed to enter the oil and water passages - this is particularly important for the lubrication system, as carbon could block the oil supply to the engine's components. Using adhesive tape and paper, seal the water, oil and bolt holes in the cylinder block/crankcase. To prevent carbon entering the gap between the pistons and bores, smear a little grease in the gap. After cleaning each piston, use a small brush to remove all traces of grease and carbon from the gap, then wipe away the remainder with a clean rag. Clean all the pistons in the same way.

**49** Check the mating surfaces of the cylinder block/crankcase and the cylinder head for nicks, deep scratches and other damage. If slight, they may be removed carefully with a file, but if excessive, machining may be the only alternative to renewal. If warpage of the cylinder head gasket surface is suspected, use a straight-edge to check it for distortion. Refer to Part C of this Chapter if necessary.

**5P** On 1580 cc, 1761 cc and 1905 cc models, check the cylinder liner protrusion as described in Part C of this Chapter, Section 12.

### Cylinder head gasket and head bolt information -1580 cc, 1761 cc and 1905 cc models

**51** On these models (aluminium cylinder block, wet-liner type engine) when purchasing a new cylinder head gasket, it is essential that a gasket of the correct thickness is obtained. There are two different thicknesses available, the standard (1.2 mm) gasket which is fitted at

the factory, and a slightly thicker (1.4 mm) gasket, for use once the head gasket face has been machined. The two gaskets can be identified as follows, by the holes in the tab on the left-hand end of the gasket.

**52** With the gasket fitted the correct way up on the cylinder block, there will be either a single hole, or series of holes, punched in the tab on the left-hand end of the gasket. The standard (1.2 mm) gasket has only one hole punched in it; the slightly thicker (1.4 mm) gasket has either two or three holes punched in it, depending on its manufacturer. Identify the gasket type, and ensure that the new gasket obtained is of the correct thickness. If there is any doubt as to which gasket is fitted, take the old gasket along to your Citroen dealer, and have the dealer confirm the gasket type.

**53** Check the condition of the cylinder head bolts, and particularly their threads, whenever they are removed. Wash the bolts in a suitable solvent, and wipe them dry. Check each bolt for any sign of visible wear or damage, renewing them if necessary. Measure the length of each bolt, to check for stretching (although this is not a conclusive test, in the event that all ten bolts have stretched by the same amount). Although Citroen do not actually specify that the bolts must be renewed, it is strongly recommended that the bolts should be renewed as a complete set whenever they are disturbed.

### Cylinder head gasket and head bolt information -1998 cc 8-valve and 16-valve models

**54** On 1998 cc models (cast-iron cylinder block without separate liners) there is only one thickness of head gasket available. The holes described above in paragraphs 51 and 52 are still punched into the left-hand end of the gasket, but are of little importance, as they only identify the gasket manufacturer.

**55** Regardless of their apparent condition, all the cylinder head bolts and their washers *must* be renewed as a complete set whenever they are disturbed.

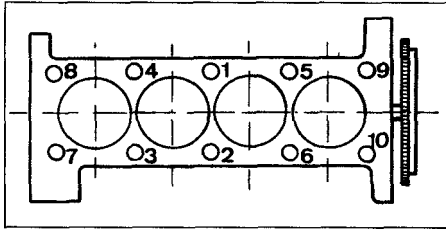
### Refitting

**56** Wipe clean the mating surfaces of the cylinder head and cylinder block/crankcase. Check that the two locating dowels are in position at each end of the cylinder block/crankcase surface. Where applicable, remove the cylinder liner clamps.

**57** Position a new gasket on the cylinder block/crankcase surface, ensuring that its identification holes are at the left-hand end of the gasket.

### 1580 cc and 1905 cc models

**58** Check that the crankshaft pulley and camshaft sprocket are still locked in position with their respective pins. With the aid of an assistant, carefully refit the cylinder head assembly to the block, aligning it with the locating dowels.



**12.61 Cylinder head bolt tightening sequence**

**59** Apply a smear of grease to the threads, and to the underside of the heads, of the cylinder head bolts. Citroen recommend the use of Molykote G10 grease (available from your Citroen dealer); in the absence of the specified grease, any good-quality high-melting-point grease may be used.

**60** Carefully enter each bolt and washer into its relevant hole (do *not* drop it in) and screw it in finger-tight, not forgetting to fit the spacer to the front left-hand bolt.

**61** Working progressively and in the sequence shown, tighten the cylinder head bolts to their stage 1 torque setting, using a torque wrench and suitable socket (**see illustration**).

**62** Once all the bolts have been tightened to their stage 1 torque setting, fully slacken all the head bolts, working in the reverse of the tightening sequence. Once the bolts are loose, tighten all bolts to their stage 2 specified torque setting, again following the specified sequence.

**63** With all the bolts tightened to their stage 2 setting, working again in the specified sequence, angle-tighten the bolts through the specified stage 3 angle, using a socket and extension bar. It is recommended that an angle-measuring gauge is used during this stage of tightening, to ensure accuracy. If a gauge is not available, use white paint to make alignment marks between the bolt head and cylinder head prior to tightening; the marks can then be used to check that the bolt has rotated sufficiently.

**64** Once the cylinder head bolts are correctly tightened, reconnect the wiring connector to the ignition HT coil. Otherwise, if the head was stripped for overhaul, refit the HT coil or distributor (as applicable), as described in Chapter 5.

**65** Fit the timing belt over the camshaft sprocket. Refit the mounting bracket to the end of the cylinder head, and securely tighten its retaining bolts. Refit the engine right-hand mounting bracket, and tighten its retaining nuts to the specified torque. The jack can then be removed from underneath the engine.

**66** On early (pre-1992) models with a semi-automatic timing belt tensioner, refit and tension the timing belt as described in paragraphs 40 to 44 of Section 8.

**67** On later (1992-on) models with a manually-adjusted belt tensioner pulley, refit the belt to the camshaft sprocket as described in paragraphs 40 and 41 of Section

8. Tension the belt as described in paragraphs 38 to 43 of Section 7.

**68** The remainder of the refitting procedure is a reversal of removal, noting the following points:

- Ensure that all wiring is correctly routed, and that all connectors are securely reconnected to the correct components.
- Ensure that the coolant hoses are correctly reconnected, and that their retaining clips are securely tightened.
- Ensure that all vacuum/breather hoses are correctly reconnected.
- Refit the cylinder head cover as described in Section 4.
- Reconnect the exhaust system to the manifold, refit the air cleaner housing and ducts, and adjust the accelerator cable, as described in Chapter 4. If the manifolds were removed, refit these as described in Chapter 4.
- On completion, refill the cooling system as described in Chapter 1, and reconnect the battery.

#### 1761 cc models

**69** Refit the cylinder head as described above in paragraphs 58 to 65!

**70** Refit the timing belt to the camshaft sprocket as described in paragraphs 40 and 41 of Section 8, and tension the belt as described in paragraphs 38 to 43 of Section 7.

**71** The remainder of the refitting procedure is a reversal of removal, noting the points made in paragraph 68.

#### 1998 cc 8-valve models

**72** Refit the cylinder head as described above in paragraphs 58 to 60, noting the following points:

- Ensure that new head bolts and washers are used.
- Ignore the remark about the spacer fitted to the front left-hand bolt.

**73** Working progressively and in the sequence shown in illustration 12.61, tighten the cylinder head bolts to their stage 1 torque setting, using a torque wrench and suitable socket.

**74** Once all the bolts are tightened to their stage 1 torque setting, tighten all bolts to their stage 2 specified torque setting, again following the specified sequence.

**75** Working in the specified sequence, angle-tighten the bolts through the specified stage 3 angle, using a socket and extension bar, referring to the information given in paragraph 63.

**76** Once the cylinder head bolts are correctly tightened, reconnect the wiring connector to the ignition HT coil. Otherwise, if the head was stripped for overhaul, refit the HT coil or distributor (as applicable), as described in Chapter 5.

**77** Refit the timing belt to the camshaft sprocket as described in paragraphs 40 and 41 of Section 8, and tension the belt as described in paragraphs 38 to 43 of Section 7.

**78** The remainder of the refitting procedure is a reversal of removal, noting the points made in paragraph 68.

#### 1998 cc 16-valve models

**79** Refit the cylinder head using the information given in paragraphs 72 to 75.

**80** Refit the camshafts as described in Section 10.

**81** The remainder of the refitting procedure is a direct reversal of removal, noting the relevant points made in paragraph 68.

## 13 Sump - removal and refitting

### Removal

**1** Disconnect the battery negative lead.

**2** Drain the engine oil, then clean and refit the engine oil drain plug, tightening it securely. If the engine is nearing its service interval when the oil and filter are due for renewal, it is recommended that the filter is also removed, and a new one fitted. After reassembly, the engine can then be refilled with fresh oil. Refer to Chapter 1 for further information.

**3** Apply the handbrake, jack up the front of the vehicle and support it on axle stands.

**4** On models with air conditioning, where the compressor is mounted onto the side of the sump, remove the drivebelt as described in Chapter 1. Unbolt the compressor, and position it clear of the sump. Support the weight of the compressor by tying it to the vehicle, to prevent any excess strain being placed on the compressor lines. *Do not* disconnect the refrigerant lines from the compressor (refer to the warnings given in Chapter 3).

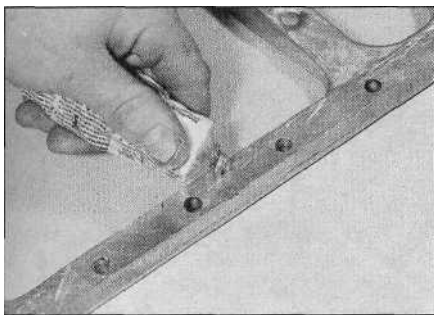
**5** Where necessary, disconnect the wiring connector from the oil temperature sender unit, which is screwed into the sump.

**6** Progressively slacken and remove all the sump retaining bolts. Since the sump bolts vary in length, remove each bolt in turn, and store it in its correct fitted order by pushing it through a clearly-marked cardboard template. This will avoid the possibility of installing the bolts in the wrong locations on refitting.

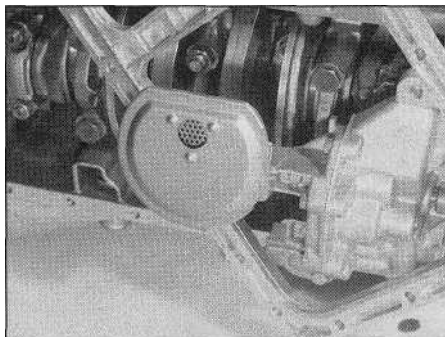
**7** Break the joint by striking the sump with the palm of your hand. Lower the sump, and withdraw it from underneath the vehicle. Remove the gasket (where fitted), and discard it; a new one must be used on refitting.

**8** While the sump is removed, take the opportunity to check the oil pump pick-up/strainer for signs of clogging or splitting. If necessary, remove the pump as described in Section 14, and clean or renew the strainer.

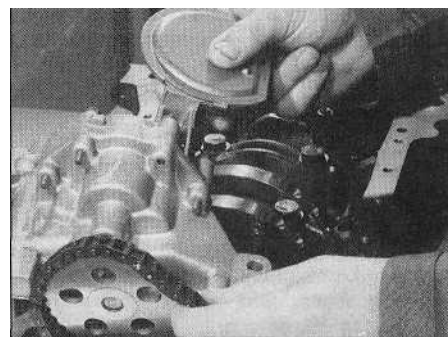
**9** On some models, a large spacer plate is fitted between the sump and the base of the cylinder block/crankcase. If this plate is fitted, undo the two retaining screws from diagonally-opposite corners of the plate. Remove the plate from the base of the engine, noting which way round it is fitted.



**13.10a** Where a sump spacer plate is fitted, apply a coat of suitable sealant to the plate upper surface ...



**13.10b** ... then refit the plate to the base of the cylinder block/crankcase



**14.3** Removing the oil pump

### Refitting

**9** Clean all traces of sealant/gasket from the mating surfaces of the cylinder block/crankcase and sump, then use a clean rag to wipe out the sump and the engine's interior.

**10** Where a spacer plate is fitted, remove all traces of sealant/gasket from the spacer plate, then apply a thin coating of suitable sealant (see paragraph 11) to the plate upper mating surface (**see illustration**). Offer up the plate to the base of the cylinder block/crankcase, and securely tighten its retaining screws.

**11** On models where the sump was fitted without a gasket (cast-aluminium sump), ensure that the sump mating surfaces are clean and dry, then apply a thin coating of suitable sealant to the sump mating surface. Citroen recommend the use of Auto-Joint E10 sealant (available from your Citroen dealer); in the absence of the specified sealant, any good-quality sealant may be used.

**12** On models where the sump was fitted with a gasket (pressed-steel sump), ensure that all traces of the old gasket have been removed, and that the sump mating surfaces are clean and dry. Position the new gasket on the top of the sump, using a dab of grease to hold it in position.

**13** Offer up the sump to the cylinder block/crankcase. Refit its retaining bolts, ensuring that each is screwed into its original location. Tighten the bolts evenly and

progressively to the specified torque setting.

**14** Where necessary, align the air conditioning compressor with its mountings on the sump, and insert the retaining bolts. Securely tighten the compressor retaining bolts, then refit the drivebelt as described in Chapter 1.

**15** Reconnect the wiring connector to the oil temperature sensor (where fitted).

**16** Lower the vehicle to the ground, then refill the engine with oil as described in Chapter 1.

### 14 Oil pump - removal, inspection and refitting



#### Removal

**1** Remove the sump as described in Section 13.

**2** Where necessary, undo the two retaining screws, and slide the sprocket cover off the front of the oil pump.

**3** Slacken and remove the three bolts securing the oil pump to the base of the cylinder block/crankcase. Disengage the pump sprocket from the chain, and remove the oil pump (**see illustration**). Where necessary, also remove the spacer plate which is fitted behind the oil pump.

#### Inspection

**4** Examine the oil pump sprocket for signs of damage and wear, such as chipped or

missing teeth. If the sprocket is worn, the pump assembly must be renewed, since the sprocket is not available separately. It is also recommended that the chain and drive sprocket, fitted to the crankshaft, be renewed at the same time. To renew the chain and drive sprocket, first remove the crankshaft timing belt sprocket as described in Section 8. Unbolt the oil seal carrier from the cylinder block. The sprocket and chain can then be slid off the end of the crankshaft. Refer to Part C for further information.

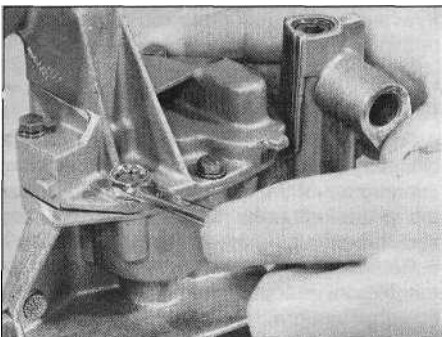
**5** Slacken and remove the bolts (along with the baffle plate, where fitted) securing the strainer cover to the pump body. Lift off the strainer cover, and take off the relief valve piston and spring, noting which way round they are fitted (**see illustrations**).

**6** Examine the pump rotors and body for signs of wear ridges or scoring. If worn, the complete pump assembly must be renewed.

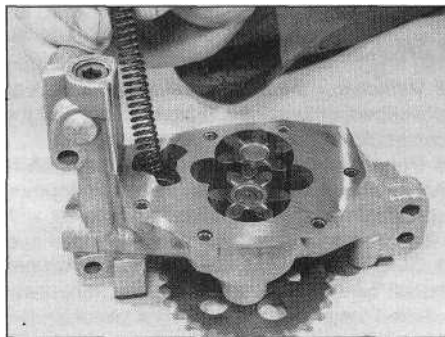
**7** Examine the relief valve piston for signs of wear or damage, and renew if necessary. The condition of the relief valve spring can only be measured by comparing it with a new one; if there is any doubt about its condition, it should also be renewed. Both the piston and spring are available individually.

**8** Thoroughly clean the oil pump strainer with a suitable solvent, and check it for signs of clogging or splitting. If the strainer is damaged, the strainer and cover assembly must be renewed.

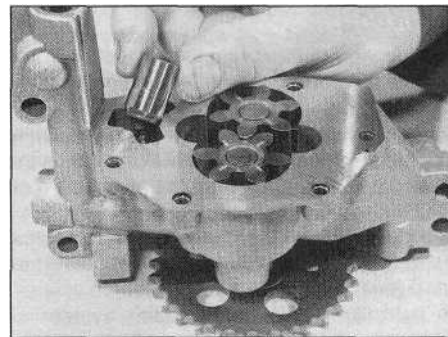
**9** Locate the relief valve spring and piston in



**14.5a** Remove the oil pump cover retaining bolts ...



**14.5b** ... then lift off the cover and remove the spring ...



**14.5c** ... and relief valve piston, noting which way round it is fitted

the strainer cover. Refit the cover to the pump body, aligning the relief valve piston with its bore in the pump. Refit the baffle plate (where fitted) and the cover retaining bolts, and tighten them securely.

### Refitting

**10** Offer up the spacer plate (where fitted), then locate the pump sprocket with its drive chain. Seat the pump on the base of the cylinder block/crankcase. Refit the pump retaining bolts, and tighten them to the specified torque setting.

**11** Where necessary, slide the sprocket cover into position on the pump. Refit its retaining bolts, tightening them securely.

**12** Refit the sump as described in Section 13.

## 15 Oil cooler (1998 cc 16-valve models) - removal and refitting



### Removal

**1** Firmly apply the handbrake, then jack up the front of the vehicle and support it on axle stands.

**2** Drain the cooling system as described in Chapter 1. Alternatively, clamp the oil cooler coolant hoses directly above the cooler, and be prepared for some coolant loss as the hoses are disconnected.

**3** Position a suitable container beneath the oil filter. Unscrew the filter using an oil filter removal tool if necessary, and drain the oil into the container. If the oil filter is damaged or distorted during removal, it must be renewed. Given the low cost of a new oil filter relative to the cost of repairing the damage which could result if a re-used filter springs a leak, it is probably a good idea to renew the filter in any case.

**4** Release the hose clips, and disconnect the coolant hoses from the oil cooler.

**5** Unscrew the oil cooler/oil filter mounting bolt from the cylinder block, and withdraw the cooler. Note the locating notch in the cooler flange, which fits over the lug on the cylinder block (**see illustration**). Discard the oil cooler sealing ring; a new one must be used on refitting.

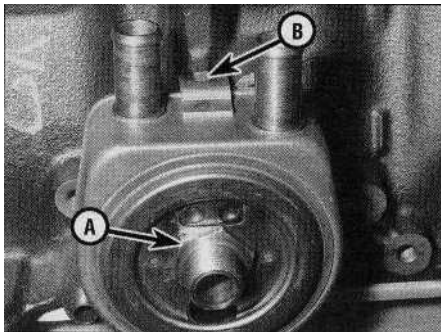
### Refitting

**6** Fit a new sealing ring to the recess in the rear of the cooler, then offer the cooler to the cylinder block.

**7** Ensure that the locating notch in the cooler flange is correctly engaged with the lug on the cylinder block, then refit the mounting bolt and tighten it securely.

**8** Fit the oil filter, then lower the vehicle to the ground. Top-up the engine oil level as described in Chapter 1.

**9** Refill or top-up the cooling system as described in Chapter 1 (as applicable). Start the engine, and check the oil cooler for signs of leakage.



**15.5 Oil cooler/oil filter mounting bolt (A) and locating notch (B) - 1998 cc 16-valve models**

## 16 Crankshaft oil seals - renewal



### Right-hand oil seal

**1** Remove the crankshaft sprocket and flanged spacer as described in Section 8. Secure the timing belt clear of the working area, so that it cannot be contaminated with oil. Make a note of the correct fitted depth of the seal in its housing.

**2** Punch or drill two small holes opposite each other in the seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal (**see illustration**). Alternatively, the seal can be levered out of position. Use a flat-bladed screwdriver, and take great care not to damage the crankshaft shoulder or seal housing.

**3** Clean the seal housing, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.

**4** Lubricate the lips of the new seal with clean engine oil, and carefully locate the seal on the end of crankshaft. Note that its sealing lip must be facing inwards. Take care not to damage the seal lips during fitting.

**5** Fit the new seal using a suitable tubular drift, such as a socket, which bears only on the hard outer edge of the seal. Tap the seal into position, to the same depth in the housing as the original was prior to removal.

**6** Wash off any traces of oil, then refit the crankshaft sprocket as described in Section 8.

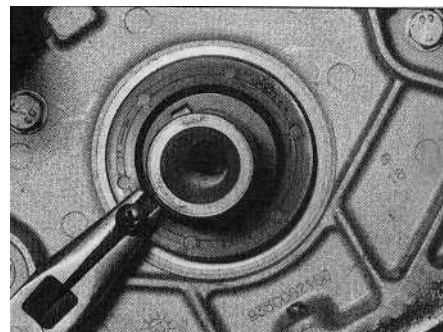
### Left-hand oil seal

**7** Remove the flywheel/driveplate as described in Section 17. Make a note of the correct fitted depth of the seal in its housing.

**8** Punch or drill two small holes opposite each other in the seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal.

**9** Clean the seal housing, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.

**10** Lubricate the lips of the new seal with clean engine oil, and carefully locate the seal on the end of the crankshaft.



**16.2 Using a self-tapping screw and pliers to remove the crankshaft oil seal**

**11** Fit the new seal using a suitable tubular drift, which bears only on the hard outer edge of the seal. Drive the seal into position, to the same depth in the housing as the original was prior to removal.

**12** Wash off any traces of oil, then refit the flywheel/driveplate as described in Section 17.

## 17 Flywheel/driveplate - removal, inspection and refitting



### Removal

#### Flywheel (models with manual transmission)

**1** Remove the transmission as described in Chapter 7A, then remove the clutch assembly as described in Chapter 6.

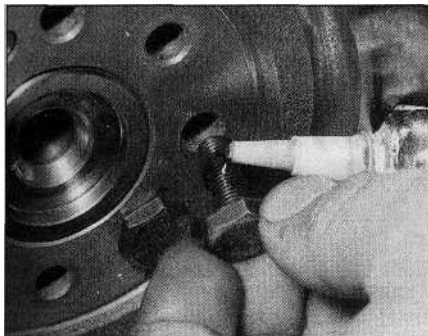
**2** Prevent the flywheel from turning by locking the ring gear teeth with a similar arrangement to that shown in illustration 5.3 (Section 5). Alternatively, bolt a strap between the flywheel and the cylinder block/crankcase. *Do not* attempt to lock the flywheel in position using the crankshaft pulley locking pin described in Section 3.

**3** Slacken and remove the flywheel retaining bolts, and remove the flywheel from the end of the crankshaft. Be careful not to drop it; it is heavy. If the flywheel locating dowel is a loose fit in the crankshaft end, remove it and store it with the flywheel for safe-keeping. Discard the flywheel bolts; new ones must be used on refitting.

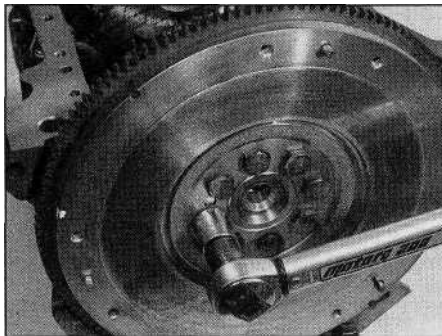
#### Driveplate (models with automatic transmission)

**4** Remove the transmission as described in Chapter 7B. Lock the driveplate as described in paragraph 2. Mark the relationship between the torque converter plate and the driveplate, and slacken all the driveplate retaining bolts.

**5** Remove the retaining bolts, along with the torque converter plate and the two shims (one fitted on each side of the torque converter plate). Note that the shims are of different thickness, the thicker one being on the outside of the torque converter plate. Discard



**17.10** If the new flywheel bolt threads are not supplied with their threads pre-coated, apply a suitable locking compound to them ...



**17.12** ... then refit the flywheel, and tighten the bolts to the specified torque

the driveplate retaining bolts; new ones must be used on refitting.

**6** Remove the driveplate from the end of the crankshaft. If the locating dowel is a loose fit in the crankshaft end, remove it and store it with the driveplate for safe-keeping.

### Inspection

**7** On models with manual transmission, examine the flywheel for scoring of the clutch face, and for wear or chipping of the ring gear teeth. If the clutch face is scored, the flywheel may be surface-ground, but renewal is preferable. Seek the advice of a Citroen dealer or engine reconditioning specialist to see if machining is possible. If the ring gear is worn or damaged, the flywheel must be renewed, as it is not possible to renew the ring gear separately.

**8** On models with automatic transmission, check the torque converter driveplate carefully for signs of distortion. Look for any hairline cracks around the bolt holes or radiating outwards from the centre, and inspect the ring gear teeth for signs of wear or chipping. If any sign of wear or damage is found, the driveplate must be renewed.

### Refitting

#### Flywheel - models with manual transmission

**9** Clean the mating surfaces of the flywheel and crankshaft. Remove any remaining locking compound from the threads of the crankshaft holes, using the correct-size tap, if available.

**10** If the new flywheel retaining bolts are not supplied with their threads already pre-coated, apply a suitable thread-locking compound to the threads of each bolt. Citroen recommend the use of Frenetanch E3 (available from your Citroen dealer); in the absence of this, any good-quality locking compound may be used (see illustration).

**11** Ensure the locating dowel is in position. Offer up the flywheel, locating it on the dowel, and fit the new retaining bolts.

**12** Lock the flywheel using the method employed on dismantling, and tighten the

retaining bolts to the specified torque (see illustration).

**13** Refit the clutch as described in Chapter 6. Remove the flywheel locking tool, and refit the transmission as described in Chapter 7A.

#### Driveplate - models with automatic transmission

**14** Carry out the operations described above in paragraphs 9 and 10, substituting "driveplate" for all references to the flywheel.

**15** Locate the driveplate on its locating dowel.

**16** Offer up the torque converter plate, with the thinner shim positioned behind the plate and the thicker shim on the outside, and align the marks made prior to removal.

**17** Fit the new retaining bolts, then lock the driveplate using the method employed on dismantling. Tighten the retaining bolts to the specified torque wrench setting.

**18** Remove the driveplate locking tool, and refit the transmission as described in Chapter 7B.

#### 18 Engine/transmission mountings - inspection and renewal

### Inspection

**1** If improved access is required, raise the front of the car and support it securely on axle stands.

**2** Check the mounting rubber to see if it is cracked, hardened or separated from the metal at any point; renew the mounting if any such damage or deterioration is evident.

**3** Check that all the mounting's fasteners are securely tightened; use a torque wrench to check if possible.

**4** Using a large screwdriver or a crowbar, check for wear in the mounting by carefully levering against it to check for free play. Where this is not possible, enlist the aid of an assistant to move the engine/transmission unit back and forth, or from side to side, while you watch the mounting. While some free play is to be expected even from new components, excessive wear should be

obvious. If excessive free play is found, check first that the fasteners are correctly secured, then renew any worn components as described below.

### Renewal

#### Right-hand mounting -1580 cc, 1761 cc and 1905 cc models

**5** Disconnect the battery negative lead. Release all the relevant hoses and wiring from their retaining clips, and position clear of the mounting so that they do not hinder the removal procedure.

**6** Place a jack beneath the engine, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the engine.

**7** Slacken and remove the three nuts securing the right-hand mounting bracket to the engine unit. Remove the single nut securing the bracket to the mounting rubber, and lift off the bracket.

**8** Lift the rubber buffer plate off the mounting rubber stud, then unscrew the mounting rubber from the body and remove it from the vehicle. If necessary, the mounting bracket can be unbolted and removed from the side of the cylinder head.

**9** Check all components carefully for signs of wear or damage, and renew them where necessary.

**10** On reassembly, screw the mounting rubber into the vehicle body, and tighten it securely. Where removed, refit the mounting bracket to the side of the cylinder head, and securely tighten its retaining bolts.

**11** Refit the rubber buffer plate to the mounting rubber stud, and install the mounting bracket.

**12** Tighten the mounting bracket retaining nuts to the specified torque setting.

**13** Remove the jack from underneath the engine, and reconnect the battery negative terminal.

#### Right-hand mounting -1998 cc 8-valve and 16-valve models

**14** Disconnect the battery negative lead. Release all the relevant hoses and wiring from their retaining clips. Place the hoses/wiring clear of the mounting so that the removal procedure is not hindered.

**15** Place a jack beneath the engine, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the engine.

**16** Undo the two bolts securing the curved mounting retaining plate to the body. Lift off the plate, and withdraw the rubber damper from the top of the mounting bracket.

**17** Slacken and remove the two nuts and two bolts securing the right-hand engine/transmission mounting bracket to the engine. Remove the single nut securing the bracket to the mounting rubber, and lift off the bracket.

**18** Lift the rubber buffer plate off the mounting rubber stud, then unscrew the mounting rubber from the body and remove it

from the vehicle. If necessary, the mounting bracket can be unbolted and removed from the front of the cylinder block.

**19** Check all components carefully for signs of wear or damage, and renew as necessary.

**20** On reassembly, screw the mounting rubber into the vehicle body, and tighten it securely. Where removed, refit the mounting bracket to the front of the cylinder block, and securely tighten its retaining bolts.

**21** Refit the rubber buffer plate to the mounting rubber stud, and install the mounting bracket.

**22** Tighten the mounting bracket retaining nuts to the specified torque setting, and remove the jack from underneath the engine.

**23** Refit the rubber damper to the top of the mounting bracket, and refit the curved retaining plate. Tighten the retaining plate bolts to the specified torque, and reconnect the battery.

### Left-hand mounting

**24** Remove the battery and battery tray, as described in Chapter 5. Slacken and remove the battery support plate mounting bolts. Release the wiring from its retaining clip on the plate, and remove the plate from the engine compartment.

**25** Place a jack beneath the transmission, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the transmission.

**26** Slacken and remove the centre nut and washer from the left-hand mounting. Undo the two bolts securing the mounting bracket assembly to the vehicle body, and remove the assembly from the mounting stud.

**27** Slide the spacer off the mounting stud, then unscrew the stud from the top of the transmission housing, and remove it along with its washer. If the mounting stud is tight, a

universal stud extractor can be used to unscrew it.

**28** Check all components carefully for signs of wear or damage, and renew as necessary.

**29** Clean the threads of the mounting stud, and apply a coat of thread-locking compound to its threads. Refit the stud and washer to the top of the transmission, and tighten it to the specified torque setting.

**30** Slide the spacer onto the mounting stud, then refit the mounting bracket assembly. Tighten both the mounting bracket-to-body bolts and the mounting centre nut to their specified torque settings, and remove the jack from underneath the transmission.

**31** Refit the battery support plate, tightening its retaining bolts securely, then refit the battery as described in Chapter 5.

### Rear mounting

**32** Refer to Part A of this Chapter, Section 15.