

Chapter 2 Part A:

Petrol engine in-car repair procedures

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Degrees of difficulty

Easy, suitable for novice with little experience



Fairly easy, suitable for beginner with some experience



Fairly difficult, suitable for competent DIY mechanic



Difficult, suitable for experienced DIY mechanic



Very difficult, suitable for expert DIY or professional



Specifications

Engine (general)

Note: At the time of writing, no definitive manufacturers specifications were available for the 2.0 litre turbocharged engine; refer to your Citroën dealer for the latest details regarding this engine. Figures given here relate to the 2.0 litre injection, normally aspirated engine.

Designation	XU10
Engine codes*:	
1998 cc fuel injected engine	R6A, RFZ or RDZ (XU10 J2/Z/M)
1998 cc fuel injected, turbocharged engine	RGY or RGX (XU10 J2T/Z/L/L3)
Bore	86.00 mm
Stroke	86.00 mm
Direction of crankshaft rotation	Clockwise (viewed from the right-hand side of vehicle)
No 1 cylinder location	At transmission end of block
Compression ratio:	
1998 cc engine	8.8 : 1
1998 cc turbo engine	7.9 : 1

*The engine code is stamped directly onto the front face of the cylinder block (just to the left of the oil filter) on 1998 cc engines. This is the code most often used by Citroën. The code given in brackets is the factory identification number, and is not often referred to by Citroën or this manual.

Camshaft

Drive	Toothed belt
No of bearings	5 (No 1 at transmission end of engine)
Camshaft bearing journal diameter (external diameter):	
No 1 journal	26.980 to 26.959 mm
No 2 journal	27.480 to 27.459 mm
No 3 journal	27.980 to 27.959 mm
No 4 journal	28.480 to 28.459 mm
No 5 journal	35.975 to 35.950 mm
Cylinder head bearing journal diameter (internal diameter):	
No 1 journal	27.000 to 27.033 mm
No 2 journal	27.500 to 27.533 mm
No 3 journal	28.000 to 28.033 mm
No 4 journal	28.500 to 28.533 mm
No 5 journal	36.000 to 36.039 mm



Valve clearances

Inlet	0.20 ± 0.05 mm
Exhaust	0.40 ± 0.05 mm

Lubrication system

Oil pump type	Gear-type, chain-driven off the crankshaft right-hand end
Minimum oil pressure at 80°C:	
R6A, RFZ, RDZ	4.0 bars at 4000 rpm
RGX, RGY	6.4 bars at 4000 rpm
Oil pressure warning switch operating pressure	0.5 bars

Torque wrench settings

	Nm	lbf ft
Cylinder head cover nuts/bolts	10	7
Timing belt cover bolts	8	6
Crankshaft pulley retaining bolt	110	81
Timing belt tensioner pulley bolt	20	15
Camshaft sprocket retaining bolt	35	26
Camshaft bearing cap nuts/bolts	16	12
Cylinder head bolts:		
Stage 1	35	26
Stage 2	70	52
Stage 3	Angle-tighten a further 160°	
Sump retaining bolts	19	14
Alternator bracket bolts	22	16
Oil pump retaining bolts	16	12
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 a further 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	45	33
Curved retaining plate	20	15
Engine/transmission left-hand mounting:		
Mounting rubber-to-body bolts	20	15
Mounting stud	50	37
Centre nut	65	48
Engine/transmission rear mounting:		
Mounting assembly-to-block bolts	45	33
Mounting link-to-mounting bolt	50	37
Mounting link-to-subframe bolt	70	52

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 petrol engine, 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.

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 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 Citroën 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 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. The gudgeon pins 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.

The engine is of the conventional 'dry-line' type. The cylinder block is cast in iron, and no separate bore liners are fitted.

On all 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.

The water pump is driven by the timing belt and located in the right-hand end of the cylinder block.

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. An oil cooler is fitted to some models to keep the oil temperature constant under severe operating conditions - it is mounted behind the oil filter. 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 consists of three letters (eg. R6A), and is 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:

- a) Compression pressure - testing.
- b) Cylinder head cover - removal and refitting.
- c) Crankshaft pulley - removal and refitting.
- d) Timing belt covers - removal and refitting.
- e) Timing belt - removal, refitting and adjustment.
- f) Timing belt tensioner and sprockets - removal and refitting.
- g) Camshaft oil seal - renewal.
- h) Camshaft and followers - removal, inspection and refitting.
- i) Valve clearances - checking and adjustment.
- j) Cylinder head - removal and refitting.
- k) Cylinder head and pistons - decarbonising.
- l) Sump - removal and refitting.
- m) Oil pump - removal, overhaul and refitting.
- n) Crankshaft oil seals - renewal.

- o) Engine/transmission mountings - inspection and renewal.
- p) Flywheel/driveplate - removal, inspection and refitting.

2 Compression test - description and interpretation

1 When engine performance is down, or if misfiring occurs which cannot be attributed to the ignition or fuel systems, a compression test can provide diagnostic clues as to the engine's condition. If the test is performed regularly, it can give warning of trouble before any other symptoms become apparent.

2 The engine must be fully warmed-up to normal operating temperature, the battery must be fully charged, and all the spark plugs must be removed (Chapter 1). The aid of an assistant will also be required.

3 Disable the ignition system by disconnecting the LT wiring connector from the ignition HT coil(s), referring to Chapter 5 for further information.

4 Fit a compression tester to the No 1 cylinder spark plug hole - the type of tester which screws into the plug thread is to be preferred.

5 Have the assistant hold the throttle wide open, and crank the engine on the starter motor; after one or two revolutions, the compression pressure should build up to a maximum figure, and then stabilise. Record the highest reading obtained.

6 Repeat the test on the remaining cylinders, recording the pressure in each.

7 All cylinders should produce very similar pressures; a difference of more than 2 bars between any two cylinders indicates a fault. Note that the compression should build up quickly in a healthy engine; low compression on the first stroke, followed by gradually-increasing pressure on successive strokes, indicates worn piston rings. A low compression reading on the first stroke, which does not build up during successive strokes, indicates leaking valves or a blown head gasket (a cracked head could also be the cause). Deposits on the undersides of the valve heads can also cause low compression.

8 Citroën do not specify exact compression pressures. As a guide, any cylinder pressure of below 10 bars can be considered as less than healthy. Refer to a Citroën dealer or other specialist if in doubt as to whether a particular pressure reading is acceptable.

9 If the pressure in any cylinder is low, carry out the following test to isolate the cause. Introduce a teaspoonful of clean oil into that cylinder through its spark plug hole, and repeat the test.

10 If the addition of oil temporarily improves the compression pressure, this indicates that bore or piston wear is responsible for the pressure loss. No improvement suggests that

leaking or burnt valves, or a blown head gasket, may be to blame.

11 A low reading from two adjacent cylinders is almost certainly due to the head gasket having blown between them; the presence of coolant in the engine oil will confirm this.

12 If one cylinder is about 20 percent lower than the others and the engine has a slightly rough idle, a worn camshaft lobe could be the cause.

13 If the compression reading is unusually high, the combustion chambers are probably coated with carbon deposits. If this is the case, the cylinder head should be removed and decarbonised.

14 On completion of the test, refit the spark plugs and reconnect the ignition system.

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.

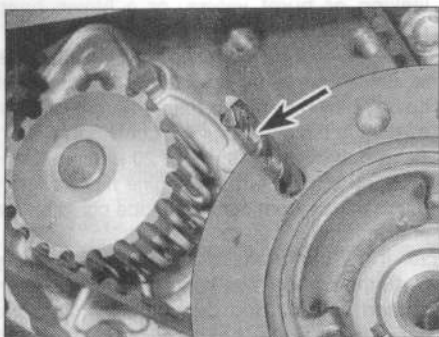
1 On all models, timing holes are drilled in the camshaft sprocket and crankshaft pulley. The holes are used to align the crankshaft and camshaft, to prevent the possibility of the valves contacting the pistons when refitting the cylinder head, or when refitting the timing belt. When the holes are aligned 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. Proceed as follows:

2 Jack up the front of the car and support it on axle stands (see *Jacking and Vehicle Support*). Remove the right-hand front roadwheel.

3 From underneath the front of the car, unscrew the bolts and prise out the clips securing the plastic cover to the inner wing valance. Remove the cover to gain access to the crankshaft pulley bolt. 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).

4 Remove the timing belt upper cover with reference to Section 6.

5 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 holes are aligned when the sprocket hole is in the 8 o'clock position, when viewed from the right-hand end of the engine.



3.6 8 mm diameter drill inserted through the crankshaft pulley timing hole

6 With the camshaft sprocket timing hole correctly positioned, insert an 8 mm diameter bolt or drill through the timing (8 mm diameter) hole in the crankshaft pulley, and locate it in the corresponding hole in the end of the cylinder block (see illustration). Note that it may be necessary to rotate the crankshaft slightly, to get the holes to align.

7 Once the crankshaft pulley is locked in position, insert an 9.5 mm diameter bolt or drill through the camshaft sprocket hole and locate it in the cylinder head (see illustration).

8 The crankshaft and camshaft are now locked in position, preventing rotation.

4 Cylinder head cover - removal and refitting

Removal

- 1 Disconnect the battery negative lead.
- 2 Slacken the retaining clips, and disconnect the breather hoses from the front right-hand end of the cover. Where the original crimped-type Citroën hose clips are still fitted, cut them off and discard them; use standard worm-drive hose clips on refitting.
- 3 Slacken the retaining clip, and disconnect the air cleaner-to-throttle housing duct from



3.7 9.5 mm diameter drill inserted through the camshaft pulley timing hole

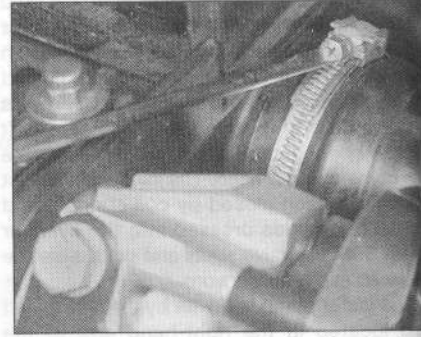
the front of the cylinder head cover. Also remove the intake duct from the left-hand side of the head cover (see illustration).

4 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.

5 Evenly and progressively unscrew 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.

Refitting

- 6 Clean the cylinder head and cover mating surfaces, and remove all traces of oil.
- 7 Locate the rubber seal in the cover groove, ensuring that it is correctly located along its entire length.
- 8 Apply a smear of suitable sealant to each camshaft end bearing cap around the area where the cap contacts the cylinder head mating surface (see illustration).
- 9 Carefully refit the cylinder head cover to the engine, taking great care not to displace the rubber seal.
- 10 Check that the seal is correctly located, then refit the cover retaining nuts and, working in a spiral sequence, starting at the centre of the cover, tighten them evenly and



4.3 Disconnecting the intake duct

progressively to the specified torque (see Specifications).

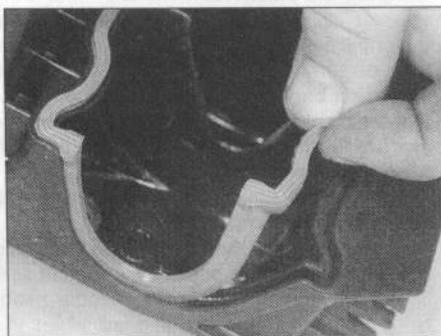
11 Refit the air cleaner element, and install the element cover. Securely tighten the cover retaining screws, and secure it in position with the retaining clips.

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

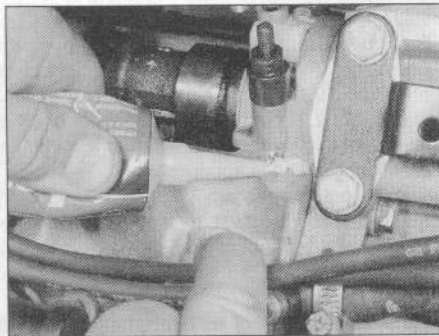
5 Crankshaft pulley - removal and refitting

Removal

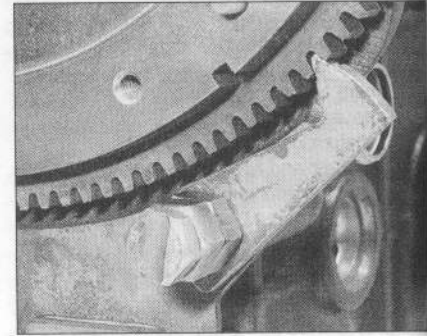
- 1 Remove the auxiliary drivebelt (Chapter 1).
- 2 To prevent the crankshaft turning whilst the pulley retaining bolt is being slackened, select 4th gear and have an assistant apply the brakes firmly. If the engine has been removed from the vehicle, lock the flywheel ring gear using the arrangement shown (see illustration). Do not attempt to lock the pulley by inserting a bolt/drill through the timing hole. If the locking pin is in position temporarily remove it prior to slackening the pulley bolt, then refit it once the bolt has been slackened.
- 3 Unscrew the retaining bolt and washer, then slide the pulley off the end of the



4.5 Removing the cylinder head cover seal



4.8 Applying sealant to the camshaft end bearing caps



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

crankshaft (see illustrations). 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. If the pulley is tight fit, it can be drawn off the crankshaft using a suitable puller.

Refitting

4 Ensure 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.

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

6 Refit the crankshaft pulley retaining bolt and washer. Tighten the bolt to the specified torque (see *Specifications*), preventing the crankshaft from turning using the method employed on removal.

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

6 Timing belt covers - removal and refitting

Removal

Upper cover

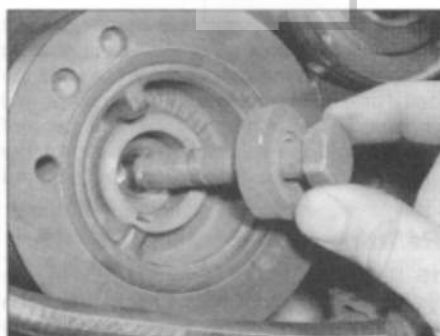
1 Release the retaining clip, and free the fuel hoses from the top of the timing belt cover.

2 Slacken and remove the two cover retaining bolts, then lift the upper cover upwards and out of the engine compartment (see illustrations).

Lower cover

3 Remove the crankshaft pulley (Section 5).

4 Slacken and remove the three retaining bolts, then remove the lower timing belt cover from the engine. Note that on some models it may be necessary to unbolt the auxiliary



5.3a Removing the crankshaft pulley retaining bolt

drivebelt tensioner assembly and remove it from the engine in order to allow the cover to be removed (see illustrations).

Refitting

5 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 (see *Specifications*).

7 Timing belt - general information, removal and refitting

Note: Citroën specify the use of a special electronic tool (SEEM 4122-T) to correctly set

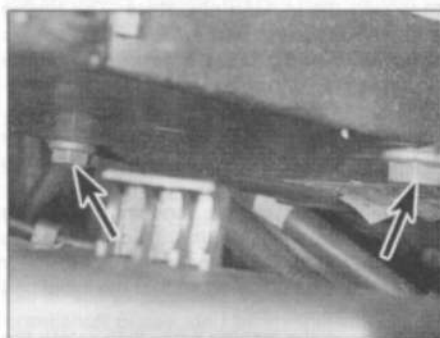


5.3b Removing the crankshaft pulley from the end of the crankshaft

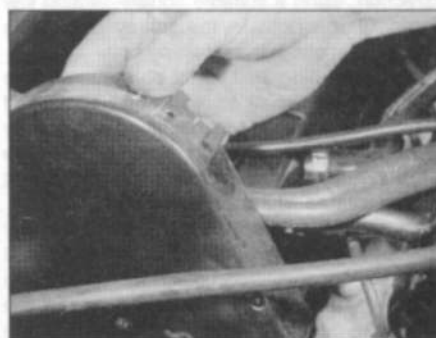
the timing belt tension. If access to this equipment cannot be obtained, an approximate setting can be achieved using the method described below. If the method described is used, the tension must be checked using the special electronic tool at the earliest possible opportunity. Do not drive the vehicle over large distances, or use high engine speeds, until the belt tension is known to be correct. Refer to a Citroën dealer for advice.

General information

1 The timing belt drives the camshaft 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.



6.2a Upper timing belt cover retaining bolts (arrowed)



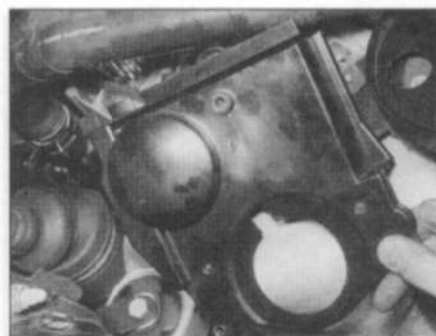
6.2b Removing the upper timing belt cover



6.4a Removing the auxiliary drivebelt tensioner assembly



6.4b Unscrew the retaining bolts ...



6.4c ... and remove the lower timing cover

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.

Removal

- 4 Disconnect the battery negative terminal.
- 5 Jack up the front of the vehicle and support it on axle stands (see *Jacking and Vehicle Support*). Remove the right-hand front wheel.
- 6 Prise out the clips and unbolt the inner splash guard.
- 7 Remove the auxiliary drivebelt as described in Chapter 1. Also unbolt and remove the auxiliary drivebelt tensioner.
- 8 Unbolt and remove the upper timing belt cover as described in Section 6.
- 9 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.*
- 10 Remove the crankshaft pulley as described in Section 5.
- 11 Unbolt and remove the lower timing belt cover (refer to Section 6 if necessary).
- 12 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.
- 13 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 (see *illustration*). Note that the crankshaft must not be rotated whilst the belt is removed.
- 14 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 36 000 miles (60 000 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.

Refitting

- 15 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.
- 16 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.
- 17 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).
- 18 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.
- 19 Temporarily refit the crankshaft pulley at this stage and tighten the bolt moderately, then refit the locking pin. **Note:** *The timing belt is tensioned with the timing covers removed, then the pulley is removed to fit the covers and finally refitted.*
- 20 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.
- 21 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 ± 2 units.
- 22 Remove the locking pins, then rotate the crankshaft through 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. If all is well, remove the pins.
- 23 If the timing holes are not correctly positioned, repeat the fitting procedure so far.
- 24 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° 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 'jumping a tooth' (through slackness), resulting in serious engine damage. If necessary, readjust the tensioner pulley position as required. Tighten its retaining bolt to the specified torque (see *Specifications*) on completion.

- 25 If the special measuring tool is being used, rotate the crankshaft two more turns without turning backwards and refit the camshaft locking pin, then check that the final belt tension on the taut 'front run' of the belt is 44 ± 2 units. If not, repeat the complete fitting procedure.
- 26 With the belt tension correctly set remove the camshaft locking pin, then remove the crankshaft pulley and refit the timing cover(s).
- 27 Refit the crankshaft pulley but this time apply locking fluid to the threads of the bolt before inserting it. Tighten the bolt to the specified torque (see *Specifications*) and refer to Section 5 if necessary.
- 28 Refit the auxiliary drivebelt tensioner then refit and tension the drivebelt with reference to Chapter 1.
- 29 Refit the inner splash guard and front right-hand wheel, then lower the vehicle to the ground.
- 30 Reconnect the battery negative terminal.

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

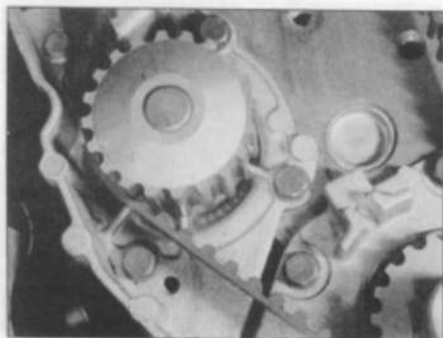
Note: *This Section describes the removal and refitting of the components concerned as individual operations - if more than one is to be removed at the same time, start by removing the timing belt as described in Section 7; remove the actual component as described below, ignoring the preliminary dismantling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

- 3 Remove the upper timing belt cover as described in Section 6.
- 4 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.
- 5 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.



7.13 Removing the timing belt from the water pump sprocket

6 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. In the absence of the special Citroën tool, an acceptable substitute can be fabricated from two lengths of steel strip (one long, the other short) and three nuts and bolts, as follows. One nut and bolt form 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 (**see Tool Tip**). Do not attempt to use the sprocket locking pin to prevent the sprocket from rotating whilst the bolt is slackened.



Using a home-made tool to retain the camshaft sprocket whilst the sprocket retaining bolt is tightened

7 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 (see Section 9).

Crankshaft sprocket

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

9 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.

10 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 spacer (where fitted) off the end of the crankshaft.

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

Tensioner pulley

12 Remove the upper and where necessary the centre timing belt covers (see Section 6).

13 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.

Inspection

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

15 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 signs of wear or damage.

Refitting

Camshaft sprocket

16 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.

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

18 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.

19 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.

20 With the timing belt correctly engaged on the sprockets, tension the belt (see Section 7).

21 Once the belt is correctly tensioned, refit the timing belt covers (refer to Section 6).

Crankshaft sprocket

22 Slide the spacer (where fitted) into position, taking great care not to damage the crankshaft oil seal, and refit the Woodruff key to its slot in the crankshaft end.

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

24 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.

25 Remove the crankshaft pulley. Engage the timing belt with the crankshaft sprocket. Ensure 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 the belt teeth are seated centrally in the sprockets.

26 Tension the timing belt (see Section 7).

27 Remove the crankshaft pulley, then refit the timing belt cover(s) (refer to Section 6).

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

Tensioner pulley

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

30 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.

31 Tension the belt (see Section 7).

32 Once the belt is correctly tensioned, refit the timing belt covers (refer to 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 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 sprocket as described in Section 8.

10 Camshaft and followers - removal, inspection and refitting

Removal

1 Disconnect the battery negative terminal, and remove the cylinder head cover as described in Section 4.

2 Remove the camshaft sprocket as described in Section 8.

3 Remove the ignition HT coil as described in Chapter 5B.

4 With the coil removed, 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.

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



10.5 Removing the oil supply pipe from the camshaft bearing caps

of the pipe unions (see illustration). Also note the position of the adapters at each end of the supply tube.

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. 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.

7 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).

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

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

10 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



10.7 Working as described in the text, unscrew the retaining nuts . . .

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

11 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 Citroën), noting that No 1 journal is at the transmission end of the head.

12 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.

Refitting

13 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).



10.8 . . . and remove the camshaft bearing caps . . .



10.9 . . . then lift the camshaft away from the cylinder head

14 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.

15 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).

16 Ensure that the bearing cap and head mating surfaces are completely clean, unmarked, and free from oil. Apply a smear of sealant to the thermostat housing mating surface of the left-hand (No 1) bearing cap, then refit all the caps, using the identification marks noted on removal to ensure that each is installed correctly and in its original location.

17 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 (see *Specifications*). Work only as described, to impose the pressure of the valve springs gradually and evenly on the bearing caps.

18 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.

19 Examine the sealing washer for signs of damage or deterioration, and renew it if necessary. Refit and tighten the thermostat housing upper retaining bolt.

20 Refit the ignition HT coil as described in Chapter 5B.

21 Fit a new camshaft oil seal, using the information given in Section 9, then refit the camshaft sprocket as described in Section 8.

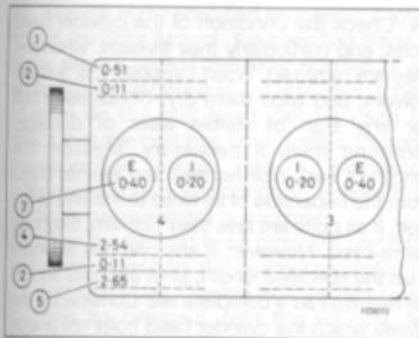
22 Check the valve clearances as described in Section 11.

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

11 Valve clearances - checking and adjustment

Checking

1 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



11.6 Example of valve shim thickness calculation

- 1 Inlet
- E Exhaust
- 1 Measured clearance
- 2 Difference between 1 and 3
- 3 Specified clearance
- 4 Thickness of original shim fitted
- 5 Thickness of new shim required

follows. The engine must be cold for the check to be accurate.

2 Apply the parking brake, then jack up the front of the car and support it on axle stands (see *Jacking and Vehicle Support*). Remove the right-hand front roadwheel.

3 From underneath the front of the car, prise out the retaining clips and unscrew the bolts, 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.

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

5 Remove the cylinder head cover as described in Section 4.

6 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 10). Above each valve, draw two lines for noting (1) the actual clearance and (2) the amount of adjustment required (see illustration).

7 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.

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

9 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.

10 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

11 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.

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

Adjustment

13 Remove the camshaft as described in Section 10.

14 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.

15 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).

16 Draw three more lines beneath each valve on the calculation paper, as shown in illustration 11.6. 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).

17 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.

18 Repeat the procedure in paragraphs 14 to 16 on the remaining valves, keeping each follower identified for position.

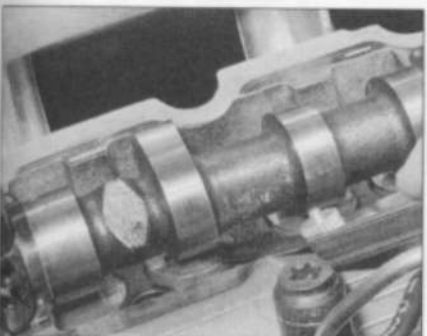
19 When reassembling, oil the shim, and fit it on the valve stem with the size marking face downwards. Alternatively, if the shims have chamfered sides ensure that these sides face the followers. Oil the follower, and lower it onto the shim. Do not raise the follower after fitting, as the shim may become dislodged.

20 When all the followers are in position, 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 (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.
- 4 Remove the cylinder head cover as described in Section 4.
- 5 Remove the air cleaner-to-throttle housing duct as described in Chapter 4A.
- 6 Note that the following text assumes that the cylinder head will be removed with both inlet and exhaust manifolds attached; this is



11.8 Measuring a valve clearance using a feeler blade



11.14a Lift out the follower and remove the shim (arrowed)



11.14b Using a micrometer to measure shim thickness

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 4A.

7 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.

8 Carry out the following operations as described in Chapter 4:

- 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.*
- Disconnect the accelerator cable.*
- Disconnect all the other relevant vacuum/breather hoses, from the inlet manifold and throttle housing. Release the hoses from the retaining clips on the manifold.*
- Disconnect all the electrical connector plugs from the throttle housing.*
- Disconnect the wiring connectors from the fuel injectors, and free the wiring loom from the manifold.*

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

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

11 Slacken and remove the bolt securing the engine oil dipstick tube to the inlet manifold and withdraw the tube from the cylinder block.

12 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 5B. 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.

13 Remove the engine mounting bracket from the right-hand end of the cylinder head. Release the timing belt tensioner and disengage the timing belt from the camshaft sprocket as described in Section 8.

14 Working in the reverse of the sequence shown in illustration 12.37, progressively slacken the ten cylinder head bolts by half a turn at a time, until all bolts can be unscrewed by hand.

15 Remove all the bolts, along with their washers, and check them as described in paragraph 24.

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

17 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.

18 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.

Preparation for refitting

19 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. 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.

20 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.

21 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.

22 When purchasing a new cylinder head gasket, it is essential that a gasket of the correct thickness is obtained. On some models only one thickness of gasket is available, so this is not a problem. However on other models, there are two different thicknesses available - the standard gasket which is fitted at the factory, and a slightly thicker 'repair' gasket (+ 0.2 mm), for use once the head gasket face has been machined. If the cylinder head has been machined, it should have the letter 'R' stamped adjacent to the No 3 exhaust port, and the gasket should also have the letter 'R' stamped adjacent to No 3 cylinder on its front upper face. The gaskets can also be identified as described in the following paragraph, using the cut-outs on the left-hand end of the gasket.

23 With the gasket fitted the correct way up on the cylinder block, there will be either a single hole, or a 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 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 Citroën dealer, and have the dealer confirm the gasket type.

24 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 (without the washer fitted) from the underside of its head to the end of the bolt. If all bolts are less than 122 mm, they may be re-used. However, if any one bolt is longer than the specified length, all of the bolts should be renewed as a complete set. Considering the stress which the cylinder head bolts are under, it is recommended that they are renewed, regardless of their apparent condition.

Refitting

25 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.

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

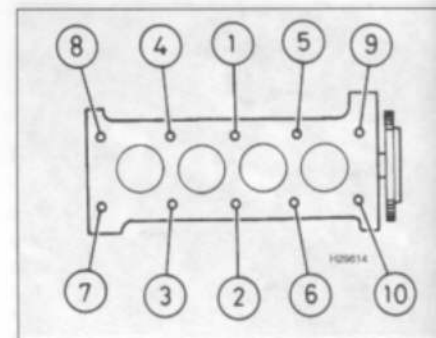
27 Check that the crankshaft pulley and camshaft sprocket are still locked in position with their respective pins. With the aid of an assistant, carefully refit the cylinder head assembly to the block, aligning it with the locating dowels.

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

29 Carefully enter each bolt and washer into its relevant hole (do not drop it in) and screw it in finger-tight.

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

31 Once all the bolts are tightened to their stage 1 torque setting, tighten all bolts to their stage 2 torque setting, again following the specified sequence (see Specifications).



12.30 Cylinder head bolt tightening sequence

32 Working in the specified sequence, angle-tighten the bolts through the specified stage 3 angle, using a socket and extension bar. If an angle tightening gauge is not available, a dab of paint on the bolt head can be used to check that the bolt has been turned through the specified angle. Use a protractor (obtainable from a stationers) to ensure that the angle measurement is accurate.

33 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, as described in Chapter 5B.

34 Refit the timing belt to the camshaft sprocket as described in Section 8, and tension the belt as described in Section 7.

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

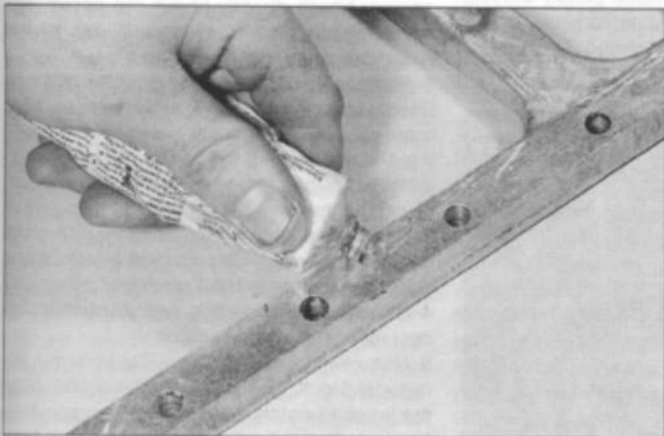
- a) Ensure that all wiring is correctly routed, and that all connectors are securely reconnected to the correct components.
- b) Ensure that the coolant hoses are correctly reconnected, and that their retaining clips are securely tightened.
- c) Ensure that all vacuum/breather hoses are correctly reconnected.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

13 Sump - removal and refitting



Removal

- 1 Disconnect the battery negative lead.



13.13a If a sump spacer plate is fitted, apply sealant to the plate upper surface ...

2 Chock the rear wheels, jack up the front of the vehicle and support it on axle stands (see *Jacking and Vehicle Support*).

3 Drain the engine oil (Chapter 1), 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 *Weekly Checks*.

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

5 Move the pressure regulator accumulator to one side and remove the auxiliary drivebelt as described in Chapter 1.

6 On models without air conditioning, unbolt the hydraulic high pressure pump and pipe. Tie it to one side without disconnecting the hydraulic lines. Also remove the alternator (Chapter 5A) and unbolt the bracket from the side of the sump.

7 On models with air conditioning, where the compressor is located on the side of the sump, 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).

8 On models with air conditioning, unbolt the transmission lower cover plate.

9 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.

10 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. 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.

11 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.

Refitting

12 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.

13 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 14) to the plate upper mating surface. Offer up the plate to the base of the cylinder block/crankcase, and securely tighten its retaining screws (see *illustrations*).

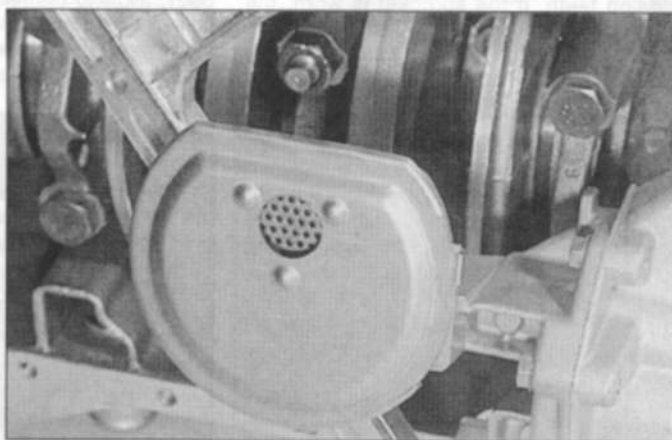
14 On models where the sump was fitted without a gasket, ensure that the sump mating surfaces are clean and dry, then apply a thin coating of sealant to the sump mating surface.

15 On models where the sump was fitted with a gasket, 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.

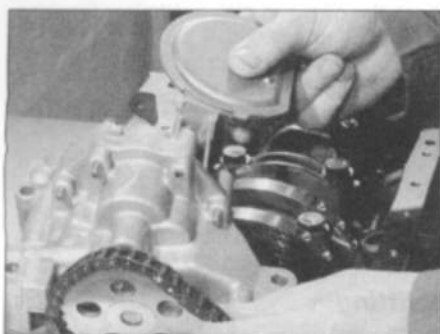
16 Offer up the sump to the cylinder block/crankcase. Refit its retaining bolts, ensuring that each is screwed into its original location. Tighten the bolts evenly and progressively to the specified torque setting (see *Specifications*).

17 On models with air conditioning, refit the transmission lower cover plate and tighten the bolts securely. Refit the compressor to the side of the sump and tighten the bolts to the specified torque (see *Specifications*).

18 On models without air conditioning, refit



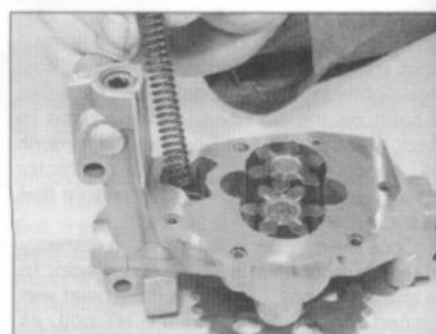
13.13b ... then refit the plate to the base of the cylinder block/crankcase



14.3 Removing the oil pump



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



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

the alternator bracket, alternator and hydraulic high pressure pump and pipe.

19 Refit the auxiliary drivebelt (see Chapter 1) and the pressure regulator accumulator.

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

21 Lower the vehicle to the ground, then refill the engine with oil (see *Weekly Checks*) and reconnect the battery negative lead.

14 Oil pump - removal, inspection and refitting



Removal

1 Remove the sump (see Section 13).

2 Undo the two 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 - the sprocket is not available separately. It is 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 (see Section 8). Unbolt the oil seal carrier from the cylinder block. The sprocket, spacer (where fitted) and chain are then slid off the end of the crankshaft. See Part C for more information.

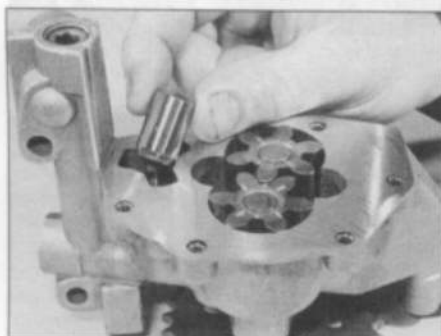
5 Slacken and remove the bolts (along with the baffle plate, where fitted) securing the strainer cover to the pump body. Lift off the strainer cover, and take off the relief valve piston and spring, noting which way round they are fitted (see illustrations).

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

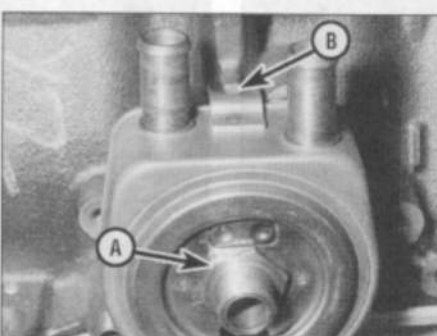
7 Examine the relief valve piston for signs of wear or damage, and renew if necessary. The condition of the relief valve spring can only be measured by comparing it with a new one; if there is any doubt about its condition, it should also be renewed. Both the piston and spring are available individually.

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 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.



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



15.5 Oil cooler/oil filter mounting bolt (A) and locating notch (B)

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 (see *Specifications*).

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.

13 Before starting the engine, prime the oil pump as follows. Disconnect the fuel injection ECU, then spin the engine on the starter until the oil pressure light goes out. Reconnect the ECU on completion.

15 Oil cooler - removal and refitting



Removal

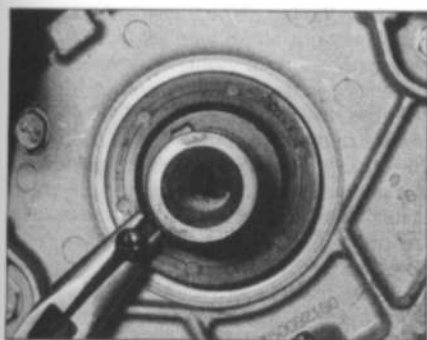
1 Firmly apply the parking brake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and Vehicle Support*).

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 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 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.



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

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 *Weekly Checks*.

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

16 Crankshaft oil seals - renewal

Right-hand oil seal

1 Remove the crankshaft sprocket and (where fitted) spacer (see 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 the 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 (see 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.

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 (see Section 17).

17 Flywheel/driveplate - removal, inspection and refitting

Removal

Flywheel (manual transmission models)

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 5.2. 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 bolts, and remove the flywheel from the end of the crankshaft. Take care not to drop it; it is heavy. If the flywheel locating dowel is loose in the crankshaft end, remove and store it with the flywheel for safe-keeping. Discard the flywheel bolts; new ones must be used on refitting.

Driveplate (automatic transmission models)

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 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 Citroën dealer or engine 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 locking compound from the threads of the crankshaft holes, using the correct-size tap, if available.



If a suitable tap is not available, cut two lengthwise slots into the threads of an old flywheel bolt and use the bolt to remove the locking compound from the threads.

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 (*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



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



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

retaining bolts to the specified torque (see *Specifications*) (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 (see *Specifications*).

18 Remove the driveplate locking tool, and refit the transmission (refer to 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 (see *Jacking and Vehicle Support*).

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 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

5 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.

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 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.

8 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.

9 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.

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

11 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 head, and securely tighten its retaining bolts.

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

13 Tighten the mounting bracket retaining nuts to the specified torque setting (see *Specifications*), and remove the jack from underneath the engine.

14 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 (see *Specifications*), and reconnect the battery.

Left-hand mounting

15 Remove the battery and battery tray, as described in Chapter 5A.

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

17 Slacken and remove the centre nut and washer from the left-hand mounting, then undo the nuts securing the mounting in position and remove it from the engine compartment.

18 If necessary, slide the spacer (where fitted) 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.

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

20 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 (see *Specifications*).

21 Slide the spacer (where fitted) onto the mounting stud, then refit the rubber mounting. Tighten both the mounting-to-body bolts and the mounting centre nut to their specified torque settings (see *Specifications*), and remove the jack from below the transmission.

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

Rear mounting

23 If not already done, chock the rear wheels, then jack up the front of the vehicle and support it securely on axle stands (see *Jacking and Vehicle Support*).

24 Unscrew and remove the bolt securing the rear mounting link to the mounting on the rear of the cylinder block (see illustration).

25 Remove the bolt securing the rear mounting link to the bracket on the underbody. Withdraw the link.

26 To remove the mounting assembly it will first be necessary to remove the right-hand driveshaft as described in Chapter 8.

27 With the driveshaft removed, undo the retaining bolts and remove the mounting from the rear of the cylinder block.

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

29 On reassembly, fit the rear mounting assembly to the rear of the cylinder block, and tighten its retaining bolts to the specified torque (see *Specifications*). Refit the driveshaft as described in Chapter 8.

30 Refit the rear mounting link, and tighten both its bolts to their specified torque settings (see *Specifications*).

31 Lower the vehicle to the ground.



18.24 Rear engine mounting and link