

# Chapter 2 Part A:

## TU petrol engine in-car 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>Fairly difficult</b> , suitable for competent DIY mechanic		<b>Difficult</b> , suitable for experienced DIY mechanic		<b>Very difficult</b> , suitable for expert DIY or professional	
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### Specifications

#### Engine (general)

Designation	TU3
Engine code:	
UK models (10/92 to 08/93)	KDX (TU3MC/L/Z)
Non-UK models (07/87 to 06/88)	K1A (TU3)
Non-UK models (07/88-on)	K1G (TU3A)
Non-UK models (11/87-on)	K3A (TU3TR)
Non-UK models (1993-on)	K2D (TU3F2/K)
Capacity	1360 cc
Bore	75.00 mm
Stroke	77.00 mm
Direction of crankshaft rotation	Clockwise (viewed from right-hand side of vehicle)
No 1 cylinder location	At transmission end of block
Compression ratio:	
Except K3A	9.3 : 1
K3A	8.3 : 1

\*The engine code is situated on the front left-hand end of the cylinder block. It is either stamped on a plate which is riveted to the block (aluminium block engines) or stamped directly on the cylinder block (cast-iron block engines). The code given in brackets is the factory identification number, and is not often referred to by this manual.

#### Camshaft

Drive	Toothed belt
Number of bearings	5
Camshaft bearing journal diameter (outside diameter):	
No 1	36.950 to 36.925 mm
No 2	40.650 to 40.625 mm
No 3	41.250 to 41.225 mm
No 4	41.850 to 41.825 mm
No 5	42.450 to 42.425 mm
Cylinder head bearing journal diameter (inside diameter):	
No 1	37.000 to 37.039 mm
No 2	40.700 to 47.739 mm
No 3	41.300 to 41.339 mm
No 4	41.900 to 41.939 mm
No 5	42.500 to 42.539 mm

#### Valve clearances (engine cold)

Inlet	0.20 mm
Exhaust	0.40 mm

**Lubrication system**

Oil pump type	Gear-type, chain-driven off the crankshaft	
Minimum oil pressure at 90°C:		
Except K2D	4 bars at 4000 rpm	
K2D	3 bars at 2000 rpm	
Oil pressure warning switch operating pressure	0.8 bars	

**Torque wrench settings**

	Nm	lbf ft
Cylinder head cover nuts	16	12
Timing belt cover bolts	8	6
Crankshaft pulley retaining bolts	8	6
Timing belt tensioner pulley nut	23	17
Camshaft sprocket retaining bolt	80	59
Crankshaft sprocket retaining bolt	110	81
Camshaft thrust fork retaining bolt	16	12
Cylinder head bolts (aluminium block engine):		
Stage 1	20	15
Stage 2	Angle-tighten a further 240°	
Cylinder head bolts (cast-iron block engine):		
Stage 1	20	15
Stage 2	Angle-tighten a further 120°	
Stage 3	Angle-tighten a further 120°	
Sump drain plug	30	22
Sump retaining nuts and bolts	8	6
Oil pump retaining bolts	8	6
Flywheel retaining nuts and bolts	65	48
Piston oil jet spray tube bolts - 1587 cc models	10	7
Big-end bearing cap nuts	40	30
Main bearing ladder casting (aluminium block engine):		
11 mm bolts:		
Stage 1	20	15
Stage 2	Angle-tighten a further 45°	
6 mm bolts	8	6
Main bearing cap bolts (cast-iron block engine):		
Stage 1	20	15
Stage 2	Angle-tighten a further 45°	

**1 General information****How to use this Chapter**

**1** This Part of Chapter 2 describes those repair procedures that can reasonably be carried out on the TU series 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. Refer to Part B for the XU series petrol engine.

**2** 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 normally 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.

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

**TU series engine description**

**4** The TU series engine is a well-proven engine which has been fitted to many previous Peugeot and Citroën vehicles. The engine is of the in-line four-cylinder, overhead camshaft (OHC) type, mounted transversely at the front of the car. The clutch and transmission are attached to its left-hand end. The 405 range is fitted with the 1360 cc version of the engine; carburettor and fuel-injected versions are available (carburettor versions not available in the UK).

**5** The crankshaft runs in five main bearings. Thrustwashers are fitted to No 2 main bearing (upper half) to control crankshaft endfloat.

**6** The connecting rods rotate on horizontally-split bearing shells at their big-ends. The pistons are attached to the connecting rods by gudgeon pins, which 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.

**7** Where the cylinder block is made of aluminium, replaceable wet liners are fitted. Sealing O-rings are fitted at the base of each liner, to prevent the escape of coolant into the sump.

**8** Where the cylinder block is made from cast

iron, the cylinder bores are an integral part of the cylinder block. On this type of engine the cylinder bores are sometimes referred to as having dry liners.

**9** The inlet and exhaust valves are each closed by coil springs, and operate in guides pressed into the cylinder head; the valve seat inserts are also pressed into the cylinder head, and can be renewed separately if worn.

**10** The camshaft is driven by a toothed timing belt, and operates the eight valves via rocker arms. Valve clearances are adjusted by a screw-and-locknut arrangement. The camshaft rotates directly in the cylinder head. The timing belt also drives the coolant pump.

**11** Lubrication is by means of an oil pump, which is driven (via a chain and sprocket) off the right-hand end of the crankshaft. 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, while the camshaft bearings also receive a pressurised supply. The camshaft lobes and valves are lubricated by splash, as are all other engine components.



**1.12 Engine code is stamped on a plate (arrowed) attached to the front of the cylinder block - viewed from above**

12 Throughout this manual, it is often necessary to identify the engines not only by their capacity, but also by their engine code which can be found on the left-hand end of the front face of the cylinder block. On models with an aluminium cylinder block the code is stamped on a plate which is riveted to the block, and on models with a cast iron cylinder block the number is stamped on a machined surface on the cylinder block, at the flywheel end. The first part of the engine number gives the engine code - eg "KDX" (see illustration).

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

13 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) Timing belt covers - removal and refitting.
- d) Timing belt - removal, refitting and adjustment.
- e) Timing belt tensioner and sprockets - removal and refitting.
- f) Camshaft oil seal(s) - renewal.
- g) Camshaft and rocker arms - removal, inspection and refitting.\*
- h) Cylinder head - removal and refitting.
- i) Cylinder head and pistons - decarbonising.
- j) Sump - removal and refitting.
- k) Oil pump - removal, overhaul and refitting.
- l) Crankshaft oil seals - renewal.
- m) Engine/transmission mountings - inspection and renewal.
- n) Flywheel - removal, inspection and refitting.

\*The cylinder head must be removed for the successful completion of this work. Refer to Section 10 for details.

## 2 Compression test

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 On carburettor models, disable the ignition system by disconnecting the ignition HT coil lead from the distributor cap and earthing it on the cylinder block. Use a jumper lead or similar wire to make a good connection.

4 On fuel-injected models, disable the ignition system by disconnecting the LT wiring connector from the ignition HT coil(s), referring to Chapter 5 for further information.

5 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.

6 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.

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

8 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.

9 Although Peugeot 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 Peugeot dealer or other specialist if in doubt as to whether a particular pressure reading is acceptable.

10 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.

11 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.

12 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.

13 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.

14 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.

15 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 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 in the rear of the flywheel. The holes are used to ensure that the crankshaft and camshaft are correctly positioned when assembling the engine (to prevent the possibility of the valves contacting the pistons when refitting the cylinder head), or refitting the timing belt. When the timing holes are aligned with the special holes in the cylinder head and the front of the cylinder block, suitable diameter pins can be inserted to lock both the camshaft and crankshaft in position, preventing them from rotating. Proceed as follows.

2 Remove the timing belt upper cover as described in Section 5.

3 The crankshaft must now be turned until the timing hole in the camshaft sprocket is aligned with the corresponding hole in the cylinder head. The holes are aligned when the camshaft sprocket hole is in the 2 o'clock position, when viewed from the right-hand end of the engine. The crankshaft can be turned by using a spanner on the crankshaft sprocket bolt, noting that it should always be rotated in a clockwise direction (viewed from the right-hand end of the engine).

4 With the camshaft sprocket hole correctly positioned, insert a 6 mm diameter bolt or drill through the hole in the front, left-hand flange of the cylinder block, and locate it in the timing hole in the rear of the flywheel (see illustration). Note that it may be necessary to



**3.4 Insert a 6 mm bolt (arrowed) through hole in cylinder block flange and into timing hole in the flywheel . . .**



3.5 . . . then insert a 10 mm bolt through the cam sprocket timing hole, and locate it in the cylinder head

rotate the crankshaft slightly, to get the holes to align.

5 With the flywheel correctly positioned, insert a 10 mm diameter bolt or a drill through the timing hole in the camshaft sprocket, and locate it in the hole in the cylinder head (see illustration).

6 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.
- 2 Where necessary, undo the bolts securing



4.3 Disconnect the breather hose from the cylinder head cover . . .



4.6a Lift off the spacers (second one arrowed) . . .

the HT lead retaining clips to the rear of the cylinder head cover, and position the clips clear of the cover.

3 Slacken the retaining clip, and disconnect the breather hose from the left-hand end of the cylinder head cover (see illustration). Where the original crimped-type Peugeot hose clip is still fitted, cut it off and discard it. Use a standard worm-drive clip on refitting.

4 Undo the two retaining nuts, and remove the washer from each of the cylinder head cover studs (see illustration).

5 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.

6 Lift off the spacer from each stud, and remove the oil baffle plate (see illustrations).

##### Refitting

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

8 Fit the rubber seal over the edge of the cylinder head cover, ensuring that it is correctly located along its entire length (see illustration).

9 Refit the oil baffle plate to the engine, and locate the spacers in their recesses in the baffle plate.

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

11 Check that the seal is correctly located, then refit the washers and cover retaining nuts, and tighten them to the specified torque.

12 Where necessary, refit the HT lead clips to



4.4 . . . then slacken and remove the cover retaining nuts and washers (arrowed) . . .



4.6b . . . and remove the oil baffle plate

the rear of the head cover, and securely tighten their retaining bolts.

13 Reconnect the breather hose to the cylinder head cover, securely tightening its retaining clip, and reconnect the battery negative lead.

#### 5 Timing belt covers - removal and refitting



##### Removal

###### Upper cover

1 Slacken and remove the two retaining bolts (one at the front and one at the rear), and remove the upper timing cover from the cylinder head (see illustrations).

###### Centre cover

2 Remove the upper cover as described in paragraph 1, then free the wiring from its clips on the centre cover (see illustration).

3 Slacken and remove the three retaining bolts (one at the rear of the cover, beneath the engine mounting plate, and two directly above the crankshaft pulley), and manoeuvre the centre cover out from the engine compartment (see illustration).

###### Lower cover

4 Remove the auxiliary drivebelt as described in Chapter 1.

5 Remove the upper and centre covers as described in paragraphs 1 to 3.



4.5 . . . and lift off the cylinder head cover



4.8 On refitting, ensure the rubber seal is located on the cylinder head cover



5.1a Undo the two retaining bolts (arrowed) . . .



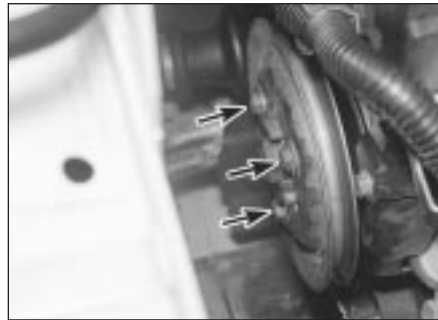
5.1b . . . and remove the upper timing belt cover



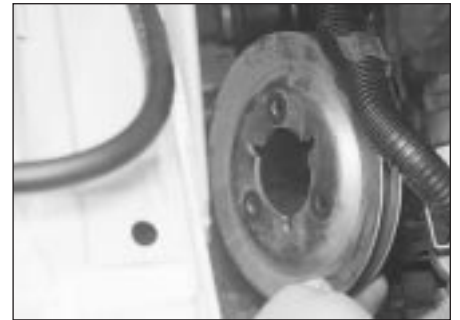
5.2 Free the wiring loom from its retaining clip . . .



5.3 . . . then undo the three bolts (locations arrowed) and remove the centre belt cover



5.6a Undo the three retaining bolts (arrowed) . . .



5.6b . . . and remove the crankshaft pulley



5.7 Undo the retaining bolt and remove the lower timing belt cover

6 Undo the three crankshaft pulley retaining bolts and remove the pulley, noting which way round it is fitted (see illustrations).

7 Slacken and remove the single retaining bolt, and slide the lower cover off the end of the crankshaft (see illustration).

### Refitting

#### Upper cover

8 Refit the cover, ensuring it is correctly located with the centre cover, and tighten its retaining bolts.

#### Centre cover

9 Manoeuvre the centre cover back into position, ensuring it is correctly located with the lower cover, and tighten its retaining bolts.

10 Clip the wiring loom into its retaining clips on the front of the centre cover, then refit the upper cover as described in paragraph 8.

### Lower cover

11 Locate the lower cover over the timing belt sprocket, and tighten its retaining bolt.

12 Fit the pulley to the end of the crankshaft, ensuring it is fitted the correct way round, and tighten its retaining bolts to the specified torque.

13 Refit the centre and upper covers as described above, then refit and tension the auxiliary drivebelt as described in Chapter 1.

## 6 Timing belt - general information, removal and refitting



**Note:** Peugeot specify the use of a special electronic tool (SEEM C.TRONIC type 105 or 105.5 belt tensioning measuring tool) to correctly set 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 Peugeot 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.

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 Align the engine assembly/valve timing holes as described in Section 3, and lock both the camshaft sprocket and the flywheel in position. Do not attempt to rotate the engine whilst the locking tools are in position.

6 Remove the timing belt centre and lower covers as described in Section 5.

7 Loosen the timing belt tensioner pulley retaining nut. Pivot the pulley in a clockwise direction, using a square-section key fitted to the hole in the pulley hub, then retighten the retaining nut.

8 If the timing belt is to be re-used, use white paint or similar to mark the direction of rotation on the belt (if markings do not already exist) (see illustration). Slip the belt off the sprockets.

9 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 the belt if there is the slightest



6.8 Mark the direction of rotation on the belt, if it is to be re-used

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 when compared to 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

10 Prior to 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 7. Make sure that the locking tools are still in place, as described in Section 3.

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

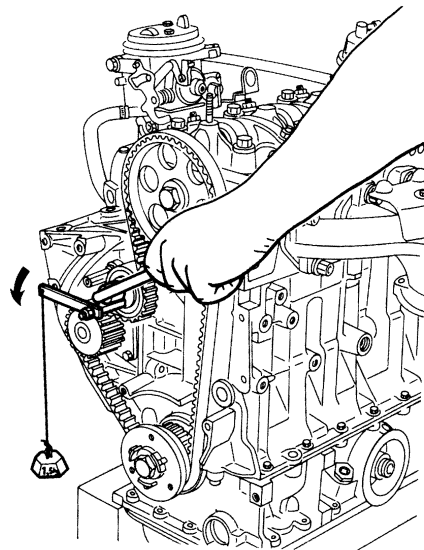
12 Do not twist the timing belt sharply while refitting it. Fit the belt over the crankshaft and camshaft sprockets. Make sure that the "front run" of the belt is taut - ie, ensure that any slack is on the tensioner pulley side of the belt. Fit the belt over the coolant pump sprocket and tensioner pulley. Ensure that the belt teeth are seated centrally in the sprockets.

13 Loosen the tensioner pulley retaining nut. Pivot the pulley anti-clockwise to remove all free play from the timing belt, then retighten the nut. Tension the timing belt as described under the relevant sub-heading.

### Tensioning without the special electronic measuring tool

**Note:** If this method is used, ensure that the belt tension is checked by a Peugeot dealer at the earliest possible opportunity.

14 Peugeot dealers use a special tool to tension the timing belt. A similar tool may be fabricated using a suitable square-section bar attached to an arm made from a metal strip; a hole should be drilled in the strip at a distance of 80 mm from the centre of the square-section bar. Fit the tool to the hole in the



6.14 Using the Peugeot special tool to tension the timing belt

tensioner pulley, keeping the tool arm as close to the horizontal as possible, and hang a 1.5 kg (3.3 lb) weight (aluminium block engine) or 2.0 kg (4.4 lb) weight (cast-iron block engine) from the hole in the tool (see illustration). In the absence of an object of the specified weight, a spring balance can be used to exert the required force, ensuring that the spring balance is held at 90° to the tool arm. Slacken the pulley retaining nut, allowing the weight or force exerted (as applicable) to push the tensioner pulley against the belt, then retighten the pulley nut.

15 If this special tool is not available, an approximate setting may be achieved by pivoting the tensioner pulley anti-clockwise until it is just possible to twist the timing belt through 90° by finger and thumb, midway between the crankshaft and camshaft sprockets. The deflection of the belt at the mid-point between the sprockets should be approximately 6.0 mm.

16 Remove the locking tools from the camshaft sprocket and flywheel.

17 Using a suitable socket and extension bar on the crankshaft sprocket bolt, rotate the crankshaft through four complete rotations in a clockwise direction (viewed from the right-hand end of the engine). Do not at any time rotate the crankshaft anti-clockwise.

18 Slacken the tensioner pulley nut, re-tension the belt as described in paragraph 14 or 15, then tighten the tensioner pulley nut to the specified torque.

19 Rotate the crankshaft through a further two turns clockwise, and check that both the camshaft sprocket and flywheel timing holes are still correctly aligned.

20 If all is well, refit the timing belt covers as described in Section 5, and reconnect the battery negative terminal.

### Tensioning using the special electronic measuring tool

21 Fit the special belt tensioning measuring equipment to the "front run" of the timing belt, approximately midway between the camshaft and crankshaft sprockets. Position the tensioner pulley so that the belt is tensioned to a setting of 45 units, then retighten its retaining nut.

22 Remove the locking tools from the camshaft sprocket and flywheel, and remove the measuring tool from the belt.

23 Using a suitable socket and extension bar on the crankshaft sprocket bolt, rotate the crankshaft through four complete rotations in a clockwise direction (viewed from the right-hand end of the engine). Do not at any time rotate the crankshaft anti-clockwise.

24 Slacken the tensioner pulley retaining nut, and refit the measuring tool to the belt. If a "new" belt is being fitted, tension it to a setting of 40 units. If an "old" belt is being re-used, tighten it to a setting of 36 units. **Note:** Peugeot state that a belt becomes "old" after 1 hour's use. With the belt correctly tensioned, tighten the pulley retaining nut to the specified torque.

25 Remove the measuring tool from the belt, then rotate the crankshaft through another two complete rotations in a clockwise direction, so that both the camshaft sprocket and flywheel timing holes are realigned. Do not at any time rotate the crankshaft anti-clockwise. Fit the measuring tool to the belt, and check the belt tension. A "new" belt should give a reading of  $51 \pm 3$  units; an "old" belt should be  $45 \pm 3$  units.

26 If the belt tension is incorrect, repeat the procedures in paragraphs 24 and 25.

27 With the belt tension correctly set, refit the timing belt covers as described in Section 5, and reconnect the battery negative terminal.

## 7 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 of them is to be removed at the same time, start by removing the timing belt as described in Section 6; remove the actual component as described below, ignoring the preliminary dismantling steps.

### Removal

1 Disconnect the battery negative terminal.  
2 Position the engine assembly/valve timing holes as described in Section 3, and lock both the camshaft sprocket and flywheel in position. Do not attempt to rotate the engine whilst the pins are in position.

### Camshaft sprocket

3 Remove the centre timing belt cover as described in Section 5.

4 Loosen the timing belt tensioner pulley retaining nut. 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 nut.

5 Disengage the timing belt from the sprocket, and move the belt clear, taking care not to bend or twist it sharply. Remove the locking pin from the camshaft 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 Peugeot tool, an acceptable substitute can be fabricated as follows. 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 the accompanying "Tool Tip". *Do not* attempt to use the sprocket locking pin to prevent the sprocket from rotating whilst the bolt is slackened.

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 as described in Section 8.

### Crankshaft sprocket

8 Remove the centre and lower timing belt covers as described in Section 5.

9 Remove the timing belt from the sprockets as described in Section 6.

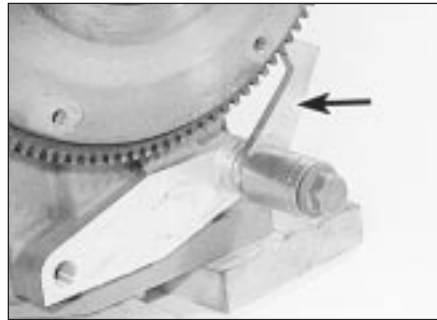
10 To prevent crankshaft rotation whilst the sprocket retaining bolt is slackened, select 4th gear, and have an assistant apply the brakes firmly. If the engine has been removed from the vehicle, lock the flywheel ring gear, using an arrangement similar to that shown (see illustration). *Do not* be tempted to use the flywheel locking pin to prevent the crankshaft from rotating; temporarily remove the locking pin from the rear of the flywheel prior to slackening the pulley bolt, then refit it once the bolt has been slackened. *Do not* allow the crankshaft to turn more than a few degrees while loosening the bolt otherwise the pistons may touch the valves.

11 Unscrew the retaining bolt and washer, then slide the sprocket off the end of the crankshaft (see illustrations). Refit the locating pin to the rear of the timing hole in the rear of the flywheel.

12 If the Woodruff key is a loose fit in the crankshaft, remove it and store it with the sprocket for safe-keeping. If necessary, also slide the flanged spacer off the end of the crankshaft (see illustration). Examine the crankshaft oil seal for signs of oil leakage and, if necessary, renew it (refer to Section 14).

### Tensioner pulley

13 Remove the centre timing belt cover as described in Section 5.



7.10 Use the fabricated tool shown to lock flywheel ring gear and prevent the crankshaft rotating



7.11b . . . then slide off the sprocket



7.11a Remove the crankshaft sprocket retaining bolt . . .



7.12 Remove the flanged spacer if necessary

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

### Inspection

15 Clean the sprockets thoroughly, and renew any that show signs of wear, damage or cracks.

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

### Refitting

#### Camshaft sprocket

17 Refit the locating peg (where removed) to the rear of the sprocket, then locate the sprocket on the end of the camshaft. Ensure that the locating peg is correctly engaged with the cutout in the camshaft end.

18 Refit the sprocket retaining bolt and washer. Tighten the bolt to the specified torque, whilst retaining the sprocket with the tool used on removal (see Tool Tip).

19 Realign the timing hole in the camshaft sprocket (see Section 3) with the corresponding hole in the cylinder head, and refit the locking pin.

20 Refit the timing belt to the camshaft sprocket. Ensure that the "front run" of the

belt is taut - ie, ensure 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.

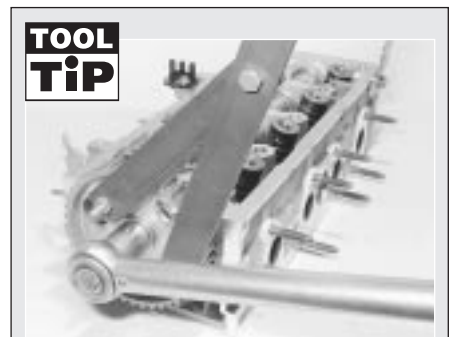
21 Loosen the tensioner pulley retaining nut. Rotate the pulley anti-clockwise to remove all free play from the timing belt, then retighten the nut.

22 Tension the belt as described in paragraphs 14 to 19 of Section 6.

23 Refit the timing belt covers as described in Section 5.

### Crankshaft sprocket

24 Where removed, locate the Woodruff key in the crankshaft end, then slide on the



Using a home-made tool to hold the camshaft sprocket stationary whilst the retaining bolt is tightened (shown with cylinder head removed)

flanged spacer, aligning its slot with the Woodruff key.

**25** Align the crankshaft sprocket slot with the Woodruff key, and slide it onto the end of the crankshaft.

**26** Temporarily remove the locking pin from the rear of the flywheel, then 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. Refit the locking pin to the rear of the flywheel.

**27** Relocate the timing belt on the sprockets. Ensure that the "front run" of the belt is taut - ie, ensure 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.

**28** Loosen the tensioner pulley retaining nut. Rotate the pulley anti-clockwise to remove all free play from the timing belt, then retighten the nut.

**29** Tension the belt as described in paragraphs 14 to 19 of Section 6.

**30** Refit the timing belt covers as described in Section 5.

### Tensioner pulley

**31** Refit the tensioner pulley to its mounting stud, and fit the retaining nut.

**32** Ensure that the "front run" of the belt is taut - ie, ensure 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, then tighten the pulley retaining nut securely.

**33** Tension the belt as described in paragraphs 14 to 19 of Section 6.

**34** Refit the timing belt covers as described in Section 5.

## 8 Camshaft oil seal - 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 6.) Cover the belt to protect it from oil contamination while work is in progress. 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 7.

**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 7.

## 9 Valve clearances - checking and adjustment



**Note:** The valve clearances must be checked and adjusted only when the engine is cold.

**1** The importance of having the valve clearances correctly adjusted cannot be overstressed, as they vitally affect the performance of the engine. If the clearances are too big, the engine will be noisy (characteristic rattling or tapping noises) and engine efficiency will be reduced, as the valves open too late and close too early. A more serious problem arises if the clearances are too small, however. If this is the case, the valves may not close fully when the engine is hot, resulting in serious damage to the engine (eg. burnt valve seats and/or cylinder head warping/cracking). The clearances are checked and adjusted as follows.

**2** Remove the cylinder head cover and oil baffle plate as described in Section 4.

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



**Turning the engine will be easier if the spark plugs are removed first - see Chapter 1**

**4** It is important that the clearance of each valve is checked and adjusted only when the valve is fully closed, with the rocker arm resting on the heel of the cam (directly opposite the peak). This can be ensured by carrying out the adjustments in the following sequence, noting that No 1 cylinder is at the transmission end of the engine. The correct valve clearances are given in the Specifications at the start of this Chapter. The valve locations can be determined from the position of the manifolds.

### Valve fully open

No 1 exhaust  
No 3 exhaust  
No 4 exhaust  
No 2 exhaust

### Adjust valves

No 3 inlet and No 4 exhaust  
No 4 inlet and No 2 exhaust  
No 2 inlet and No 1 exhaust  
No 1 inlet and No 3 exhaust

**5** With the relevant valve fully open, check the clearances of the two valves specified. Clearances are checked by inserting a feeler blade of the correct thickness between the valve stem and the rocker arm adjusting screw. The feeler blade should be a light, sliding fit. If adjustment is necessary, slacken the adjusting screw locknut, and turn the

screw as necessary. Once the correct clearance is obtained, hold the adjusting screw and securely tighten the locknut. Recheck the valve clearance, and adjust again if necessary.

**6** Rotate the crankshaft until the next valve in the sequence is fully open, and check the clearances of the next two specified valves.

**7** Repeat the procedure until all eight valve clearances have been checked (and if necessary, adjusted), then refit the oil baffle plate and cylinder head cover as described in Section 4.

## 10 Camshaft and rocker arms - removal, inspection and refitting



### General information

**1** The rocker arm assembly is secured to the top of the cylinder head by the cylinder head bolts. Although in theory, it is possible to undo the head bolts and remove the rocker arm assembly without removing the head, in practice, this is not recommended. Once the bolts have been removed, the head gasket will be disturbed, and the gasket will almost certainly leak or blow after refitting. For this reason, removal of the rocker arm assembly cannot be done without removing the cylinder head and renewing the head gasket.

**2** The camshaft is slid out of the right-hand end of the cylinder head, and it therefore cannot be removed without first removing the cylinder head, due to a lack of clearance.

### Removal

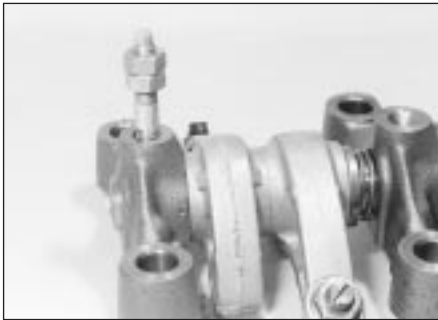
#### Rocker arm assembly

**3** Remove the cylinder head as described in Section 11.

**4** To dismantle the rocker arm assembly, carefully prise off the circlip from the right-hand end of the rocker shaft; retain the rocker pedestal, to prevent it being sprung off the end of the shaft. Slide the various components off the end of the shaft, keeping all components in their correct fitted order (see illustration). Make a note of each component's correct fitted position and orientation as it is removed, to ensure it is fitted correctly on reassembly.



**10.4** Remove the circlip, and slide the components off the end of the rocker arm



**10.5a** To remove the left-hand pedestal, lock two nuts together and unscrew the stud . . .

5 To separate the left-hand pedestal and shaft, first unscrew the cylinder head cover retaining stud from the top of the pedestal; this can be achieved using a stud extractor, or alternatively, by using two nuts locked together. With the stud removed, unscrew the grub screw from the top of the pedestal, and carefully withdraw the rocker shaft (see illustrations).

#### Camshaft

6 Remove the cylinder head as described in Section 11.

7 With the head on a bench, remove the locking pin, then remove the camshaft sprocket as described in paragraphs 6 and 7 of Section 7.

8 Unbolt the housing from the left-hand end of the cylinder head, then undo the retaining bolt, and remove the camshaft thrust fork from the cylinder head (see illustration).

9 Using a large flat-bladed screwdriver, carefully prise out the oil seal out of the right-hand end of the cylinder head, then carefully slide out the camshaft (see illustrations). Discard the seal - a new one must be used on refitting.

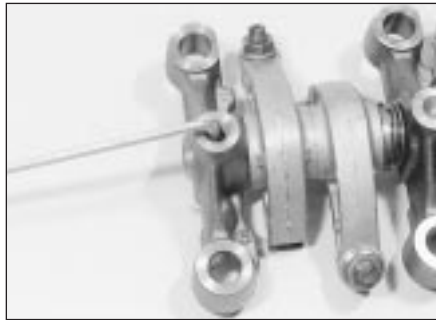
#### Inspection

##### Rocker arm assembly

10 Examine the rocker arm bearing surfaces which contact the camshaft lobes for wear ridges and scoring. Renew any rocker arms on which these conditions are apparent. If a rocker arm 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. The rocker arm assembly can be dismantled as described in paragraphs 4 and 5.

11 Inspect the ends of the (valve clearance) adjusting screws for signs of wear or damage, and renew as required.

12 If the rocker arm assembly has been dismantled, examine the rocker arm and shaft bearing surfaces for wear ridges and scoring. If there are obvious signs of wear, the relevant rocker arm(s) and/or the shaft must be renewed.



**10.5b** . . . then remove the grub screw



**10.9a** . . . prise out the oil seal . . .

#### Camshaft

13 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. If the head bearing surfaces are worn excessively, the cylinder head will need to be renewed. If the necessary measuring equipment is available, camshaft bearing journal wear can be checked by direct measurement, noting that No 1 journal is at the transmission end of the head.

14 Examine the thrust fork for signs of wear or scoring, and renew as necessary.

#### Refitting

##### Rocker arm assembly

15 If the rocker arm assembly was dismantled, refit the rocker shaft to the left-hand pedestal, aligning its locating hole with the pedestal threaded hole. Refit the grub screw, and tighten it securely. With the grub screw in position, refit the cylinder head cover mounting stud to the pedestal, and tighten it securely. Apply a smear of clean engine oil to the shaft, then slide on all removed components, ensuring each is correctly fitted in its original position. Once all components are in position on the shaft, compress the right-hand pedestal and refit the circlip. Ensure that the circlip is correctly located in its groove on the shaft.

16 Refit the cylinder head and rocker arm assembly as described in Section 11.



**10.8** Undo the retaining bolt, and remove the camshaft thrust fork (arrowed) . . .



**10.9b** . . . and slide out the camshaft

#### Camshaft

17 Ensure that the cylinder head and camshaft bearing surfaces are clean, then liberally oil the camshaft bearings and lobes. Slide the camshaft back into position in the cylinder head. On carburettor engines, take care that the fuel pump operating lever is not trapped by the camshaft as it is slid into position. To prevent this, remove the fuel pump before refitting the camshaft, then refit it afterwards.

18 Locate the thrust fork with the left-hand end of the camshaft. Refit the fork retaining bolt, tightening it to the specified torque setting.

19 Ensure that the housing and cylinder head mating surfaces are clean and dry, then apply a smear of sealant to the housing mating surface. Refit the housing to the left-hand end of the head, and securely tighten its retaining bolts.

20 Lubricate the lips of the new seal with clean engine oil, then 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.

21 Refit the camshaft sprocket as described in paragraphs 17 to 19 of Section 7.

22 Refit the cylinder head as described in Section 11.

## 11 Cylinder head - removal and refitting



### Removal

- 1 Disconnect the battery negative lead.
- 2 Drain the cooling system (see Chapter 1).
- 3 Remove the cylinder head cover and oil baffle plate as described in Section 4.
- 4 Align the engine assembly/valve timing holes as described in Section 3, and lock both the camshaft sprocket and flywheel in position. *Do not* attempt to rotate the engine whilst the tools are in position.
- 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 to remove the manifolds first, proceed as described in the relevant Part of Chapter 4.
- 6 Working as described in the relevant Part of Chapter 4, disconnect the exhaust system front pipe from the manifold. Where fitted, disconnect or release the lambda sensor wiring, so that it is not strained by the weight of the exhaust.
- 7 Remove the air cleaner housing and inlet duct assembly as described in Chapter 4.
- 8 On carburettor engines, disconnect the following from the carburettor and inlet manifold as described in Chapter 4A:
  - a) Fuel feed hose from the pump and the return hose from the anti-percolation chamber (plug all openings, to prevent loss of fuel and the entry of dirt into the system).
  - b) Accelerator cable.
  - c) Choke cable.
  - d) Carburettor heating element and idle cut-off solenoid wiring connector(s).
  - e) Vacuum servo unit vacuum hose, coolant hose and all other relevant breather/vacuum hoses from the manifold.
- 9 On fuel injection engines, carry out the following operations as described in the relevant Part of Chapter 4:
  - a) Depressurise the fuel system, and disconnect the fuel feed and return hoses from the throttle body/fuel rail (plug all openings, to prevent loss of fuel and entry of dirt into the fuel system).
  - b) Disconnect the accelerator cable.
  - c) On single-point injection models, disconnect the relevant electrical connectors from the throttle body.
  - d) On multi-point injection models, disconnect the relevant electrical connectors from the throttle housing, fuel injectors and (where necessary) the idle speed auxiliary air valve.
  - e) Disconnect the vacuum servo unit hose, coolant hose(s) and all the other relevant/breather hoses from the manifold.

10 Remove the centre timing belt cover as described in Section 5.

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

12 Disengage the timing belt from the camshaft sprocket, and position the belt clear of the sprocket. Ensure that the belt is not bent or twisted sharply.

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

14 Depress the retaining clip(s), and disconnect the wiring connector(s) from the electrical switch and/or sensor(s) which are screwed into the thermostat housing/cylinder head (as appropriate). Also where necessary, release the TDC connector from its support on the distributor bracket on the left-hand end of the cylinder head.

### Carburettor models

15 Disconnect the LT wiring connectors from the distributor and HT coil. Release the TDC sensor wiring connector from the side of the coil mounting bracket, and disconnect the vacuum pipe from the distributor vacuum diaphragm unit. If the cylinder head is to be dismantled for overhaul, remove the distributor and ignition HT coil as described in Chapter 5. 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. Disconnect the HT leads from the spark plugs, and remove the distributor cap and lead assembly.

### Fuel-injected models

16 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. 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. 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.

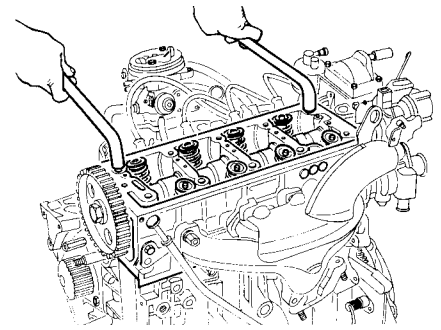
### All models

17 Slacken and remove the bolt securing the engine oil dipstick tube to the cylinder head.

18 Working in the reverse of the sequence shown in illustration 11.38a, progressively slacken the ten cylinder head bolts by half a turn at a time, until all bolts can be unscrewed by hand.

19 With all the cylinder head bolts removed, lift the rocker arm assembly off the cylinder head. Note the locating pins which are fitted to the base of each rocker arm pedestal. If any pin is a loose fit in the head or pedestal, remove it for safe-keeping.

20 On engines with a cast-iron cylinder



11.21 Using two angled metal rods to free the cylinder head from the block

block, lift the cylinder head away; seek assistance if possible, as it is a heavy assembly, especially if it is being removed complete with the manifolds.

21 On engines with an aluminium cylinder block, the joint between the cylinder head and gasket and the cylinder block/crankcase must now be broken without disturbing the wet liners. To break the joint, obtain two L-shaped metal bars which fit into the cylinder head bolt holes. Gently "rock" the cylinder head free towards the front of the car (see illustration). 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. **Note:** *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.* When the joint is broken, lift the cylinder head away; seek assistance if possible, as it is a heavy assembly, especially if it is being removed complete with the manifolds.

22 On all models, 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 - on some models it will be needed for identification purposes (see paragraphs 28 and 29).

**Caution:** *On aluminium block engines, do not attempt to rotate the crankshaft with the cylinder head removed, otherwise the wet liners may be displaced. Operations that require the rotation of the crankshaft (eg cleaning the piston crowns), should only be carried out once the cylinder liners are firmly clamped in position. In the absence of the special Peugeot liner clamps, the 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.*

23 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.

### Preparation for refitting

24 The mating faces of the cylinder head and cylinder block/crankcase must be perfectly clean before refitting the head. Use a hard

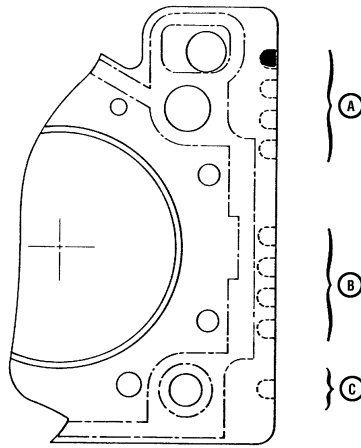
plastic or wood scraper to remove all traces of gasket and carbon; also clean the piston crowns. Refer to paragraph 23 before turning the crankshaft on aluminium block engines. Take particular care during the cleaning operations, as aluminium alloy is easily damaged. Also, make sure that the carbon is 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.

**25** 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.

**26** 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.

**27** 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 all 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.

**28** With the gasket fitted the correct way up on the cylinder block, there will be a single cut-out, or no cut-out at all, at the rear of the



**11.28** TU engine series gasket markings

- A Engine type identification cut-outs*  
*B Gasket manufacturer identification cut-outs*  
*C Gasket thickness identification cut-out*

left-hand side of the gasket identifying the engine type (ie. TU engine). In the centre of the gasket there may be another series of between 0 and 4 cut-outs, identifying the manufacturer of the gasket and whether or not it contains asbestos (these cut-outs are of little importance). The important cut-out location is at the front of the gasket; on the standard gasket there will be no cut-out in this position, whereas on the thicker "repair" gasket there will be a single cut-out (**see illustration**). 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 Peugeot dealer, and have him confirm the gasket type.

**29** Check the condition of the cylinder head bolts, and particularly their threads, whenever they are removed. Wash the bolts in suitable solvent, and wipe them dry. Check each for any sign of visible wear or damage, renewing any bolt 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 Peugeot 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.

**30** On aluminium block engines, prior to refitting the cylinder head, check the cylinder liner protrusion as described in Part C of this Chapter.

### Refitting

**31** 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 and, if necessary, remove the cylinder liner clamps.

**32** Position a new gasket on the cylinder block/crankcase surface, ensuring that its identification cut-outs are at the left-hand end of the gasket (**see illustration**) and the manufacturer's name is uppermost.

**33** Check that the flywheel and camshaft sprocket are still correctly locked in position with their respective tools then, with the aid of an assistant, carefully refit the cylinder head assembly to the block, aligning it with the locating dowels (**see illustration**).

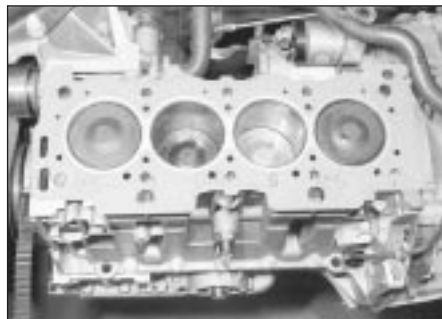
**34** Ensure that the locating pins are in position in the base of each rocker pedestal, then refit the rocker arm assembly to the cylinder head (**see illustration**).

**35** Apply a smear of grease to the threads, and to the underside of the heads, of the cylinder head bolts. Peugeot recommend the use of Molykote G Rapid Plus grease (available from your Peugeot dealer - a sachet is supplied with the top-end gasket set); in the absence of the specified grease, a good-quality high-melting-point grease may be used.

**36** Carefully enter each bolt into its relevant hole (*do not drop them in*) and screw in, by hand only, until finger-tight.

**37** 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 illustrations**).

**38** Once all the bolts have been tightened to their Stage 1 setting, working again in the given sequence, angle-tighten the bolts through the specified Stage 2 angle, using a socket and extension bar. It is recommended



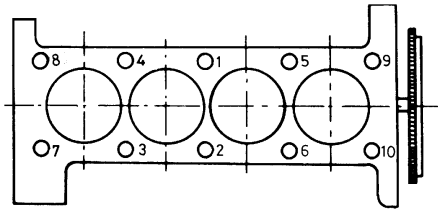
**11.32** Locate the cylinder head gasket on the block . . .



**11.33** . . . then lower the cylinder head into position . . .



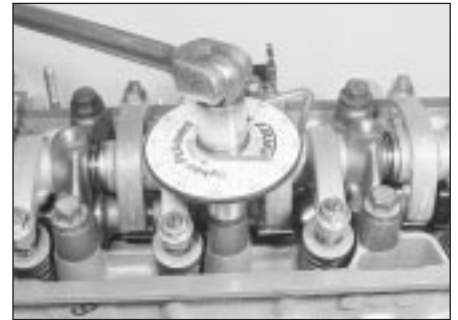
**11.34** . . . and refit the rocker arm assembly



11.37a Cylinder head bolt tightening sequence



11.37b Working in the sequence shown, tighten the head bolts first to the stage 1 torque setting . . .



11.38 . . . then through the angle specified for stage 2

that an angle-measuring gauge is used during this stage of the tightening, to ensure accuracy (**see illustration**). 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 been rotated through the correct angle during tightening.

**39** On cast-iron block engines, it will then be necessary to tighten the bolts through the specified Stage 3 angle setting.

**40** With the cylinder head bolts correctly tightened, refit the dipstick tube retaining bolt and tighten it securely.

**41** Refit the timing belt to the camshaft sprocket. Ensure that the "front run" of the belt is taut - ie, ensure 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** Loosen the tensioner pulley retaining nut. Pivot the pulley anti-clockwise to remove all free play from the timing belt, then retighten the nut.

**43** Tension the belt as described under the relevant sub-heading in Section 6, then refit the centre and upper timing belt covers as described in Section 5.

#### Carburettor models

**44** If the head was stripped for overhaul, refit the distributor and HT coil as described in Chapter 5, ensuring that the HT leads are correctly reconnected. If the head was not stripped, reconnect the wiring connector and vacuum pipe to the distributor, and the HT lead to the coil; clip the TDC sensor wiring connector onto the coil bracket.

#### Fuel-injected models

**45** If the head was stripped for overhaul, refit the ignition HT coil and leads as described in Chapter 5, ensuring that the leads are correctly reconnected. If the head was not stripped, simply reconnect the wiring connector to the HT coil.

#### All models

**46** Reconnect the wiring connector(s) to the coolant switch/sensor(s) on the left-hand end of the head.

**47** Reconnect the coolant hoses to the thermostat housing, securely tightening their retaining clips.

**48** Working as described in the relevant Part of Chapter 4, carry out the following tasks:

- Refit all disturbed wiring, hoses and control cable(s) to the inlet manifold and fuel system components.
- On carburettor models, reconnect and adjust the choke and accelerator cables.
- On fuel injection models, reconnect and adjust the accelerator cable.
- Reconnect the exhaust system front pipe to the manifold. Where applicable, reconnect the lambda sensor wiring connector.
- Refit the air cleaner housing and inlet duct.

**49** Check and, if necessary, adjust the valve clearances as described in Section 9.

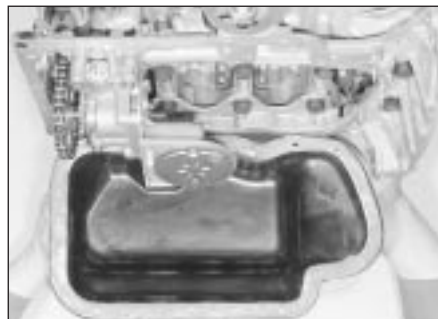
**50** On completion, reconnect the battery, and refill the cooling system as described in Chapter 1.

## 12 Sump - removal and refitting



### Removal

**1** Firmly apply the handbrake, then jack up the front of the vehicle and support it on axle stands (*see "Jacking and Vehicle Support"*). Disconnect the battery negative lead.



**12.5** Slacken and remove the sump retaining nuts and bolts, then remove the sump from the engine

**2** Drain the engine oil, then clean and refit the engine oil drain plug, tightening it to the specified torque. 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** Remove the exhaust system front pipe as described in the relevant Part of Chapter 4.

**4** Progressively slacken and remove all the sump retaining nuts and bolts. On cast-iron block engines, it may be necessary to unbolt the flywheel cover plate from the transmission to gain access to the left-hand sump bolts.

**5** Break the joint by striking the sump with the palm of your hand, then lower the sump and withdraw it from underneath the vehicle (**see illustration**).

**6** 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 13, and clean or renew the strainer.

### Refitting

**7** Clean all traces of sealant 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.

**8** Ensure that the sump and cylinder block/crankcase mating surfaces are clean and dry, then apply a coating of suitable sealant to the sump mating surface.

**9** Offer up the sump, locating it on its retaining studs, and refit its retaining nuts and bolts. Tighten the nuts and bolts evenly and progressively to the specified torque.

**10** Refit the exhaust front pipe as described in the relevant Part of Chapter 4.

**11** Replenish the engine oil (*see Chapter 1*).

## 13 Oil pump - removal, inspection and refitting



### Removal

**1** Remove the sump (*refer to Section 12*).

**2** Slacken and remove the three bolts



13.2 Oil pump is retained by three bolts

securing the oil pump in position (see illustration). Disengage the pump sprocket from the chain, and remove the oil pump. If the pump locating dowel is a loose fit, remove and store it with the retaining bolts for safe-keeping.

### Inspection

3 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, as the sprocket is not available separately. It is also recommended that the chain and drive sprocket, fitted to the crankshaft, is renewed at the same time. On aluminium block engines, renewal of the chain and drive sprocket is an involved operation requiring the removal of the main bearing ladder, and therefore cannot be carried out with the engine still fitted to the vehicle. On cast-iron block engines, the oil pump drive sprocket and chain can be removed with the engine in situ, once the crankshaft sprocket has been removed and the crankshaft oil seal housing has been unbolted. Refer to Part D for further information.

4 Slacken and remove the bolts securing the strainer cover to the pump body, then lift off the strainer cover. Remove the relief valve piston and spring (and guide pin - cast-iron block engines only), noting which way round they are fitted.

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

6 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.

7 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.

8 Locate the relief valve spring, piston and (where fitted) the guide pin in the strainer cover, then refit the cover to the pump body. Align the relief valve piston with its bore in the pump. Refit the cover retaining bolts, tightening them securely.

### Refitting

9 Ensure that the locating dowel is in position, then engage the pump sprocket with its drive chain. Locate the pump on its dowel and refit the pump retaining bolts, tightening them to the specified torque setting.

10 Refit the sump as described in Section 12.

### 14 Crankshaft oil seals - renewal



### Right-hand oil seal

1 Remove the crankshaft sprocket and flanged spacer as described in Section 7. 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. Alternatively, the seal can be levered out of position using a suitable flat-bladed screwdriver, taking great care not to damage the crankshaft shoulder or seal housing (see illustration).

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 face inwards. Take care not to damage the seal lips during fitting.

5 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. The inner face of the seal must end up flush with the inner wall of the crankcase.

6 Wash off any traces of oil, then refit the crankshaft sprocket as described in Section 7.

### Left-hand oil seal

7 Remove the flywheel (see Section 15).

8 Make a note of the correct fitted depth of the seal in its housing. Punch or drill two small holes opposite each other in the seal. Screw a



14.2 Using a screwdriver to lever out the crankshaft front oil seal

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 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 as described in Section 15.

### 15 Flywheel - removal, inspection and refitting



### Removal

1 Remove the transmission (Chapter 7A), then remove the clutch assembly (Chapter 6).

2 Prevent the flywheel from turning by locking the ring gear teeth with a similar arrangement to that shown in illustration 7.10. Alternatively, bolt a strap between the flywheel and the cylinder block/crankcase. Do not attempt to lock the flywheel in position using the locking pin described in Section 3.

3 Slacken and remove the flywheel retaining bolts, and discard them; they must be renewed whenever they are disturbed.

4 Remove the flywheel. Do not drop it, as it is very heavy. If the locating dowel is a loose fit in the crankshaft end, remove and store it with the flywheel for safe-keeping.

### Inspection

5 If the flywheel's clutch mating surface is deeply scored, cracked or otherwise damaged, the flywheel must be renewed. However, it may be possible to have it surface-ground; seek the advice of a Peugeot dealer or engine reconditioning specialist.

6 If the ring gear is badly worn or has missing teeth, it must be renewed. This job is best left to a Peugeot dealer or engine reconditioning specialist. The temperature to which the new ring gear must be heated for installation is critical and, if not done accurately, the hardness of the teeth will be destroyed.

### Refitting

7 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.



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

**8** 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.

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

**10** Lock the flywheel using the method employed on dismantling, and tighten the retaining bolts to the specified torque.

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

## 16 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 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 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.

**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 engine mounting upper bracket to the bracket on the cylinder block. Remove the nut securing the bracket to the mounting rubber, and lift off the bracket.

**8** Lift the buffer plate off the mounting rubber stud, then unscrew the mounting rubber from the body.

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

**10** On reassembly, securely tighten the mounting rubber in the body.

**11** Refit the buffer plate (where fitted) to the mounting rubber stud, then 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 lead.

#### Left-hand mounting

**14** Remove the battery and tray (Chapter 5A).

**15** 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.

**16** Slacken and remove the mounting rubber's centre nut, and two nuts, and remove the mounting from the engine compartment.

**17** If necessary, undo the two retaining bolts and remove the mounting bracket from the body. Disconnect the clutch cable from the transmission (see Chapter 6) then unscrew the retaining nuts and remove the bracket from the top of the transmission.

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

**19** Refit the bracket to the transmission, tightening its mounting nuts to the specified torque. Reconnect the clutch cable and adjust as described in Chapter 6. Refit the mounting bracket to the vehicle body and tighten its bolts to the specified torque.

**20** Fit the mounting rubber to the bracket and tighten its retaining nuts to the specified torque. Refit the mounting centre nut, and tighten it to the specified torque.

**21** Remove the jack from underneath the transmission, then refit the battery as described in Chapter 5.

#### Rear mounting

**22** If not already done, firmly apply the handbrake, then jack up the front of the vehicle and support it securely on axle stands (see *“Jacking and Vehicle Support”*).

**23** Unscrew and remove the bolt securing the rear mounting link to the mounting on the rear of the cylinder block.

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

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

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

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

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

**29** Refit the rear mounting link, and tighten both its bolts to their specified torque settings.

**30** Lower the vehicle to the ground.