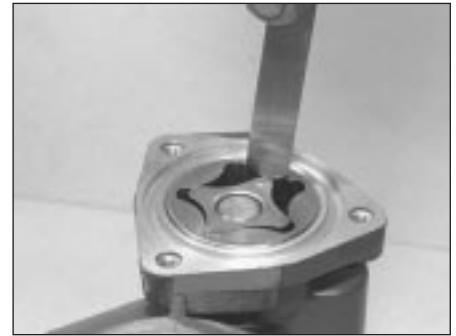




13.1 Extract the O-ring from the groove in the oil pump



13.4a Checking the outer body-to-rotor clearance



13.4b Checking the inner rotor-to-outer rotor clearance

8 Fit a new oil filter into position on the oil pump body, as described in Chapter 1.

9 Lower the vehicle to the ground, and top-up the engine oil as described in "Weekly Checks".

### 13 Oil pump - dismantling, inspection and reassembly



#### Dismantling

1 To inspect the oil pump components for excessive wear, undo the retaining bolts and remove the cover plate from the pump body. Remove the O-ring seal from the cover face (see illustration).

2 Wipe the exterior of the pump housing clean housing.

#### Inspection

3 Noting their orientation, extract and clean the rotors and the inner body of the pump housing. Inspect them for signs of severe scoring or excessive wear, which if evident will necessitate renewal of the complete pump.

4 Using feeler gauges, check the clearances between the pump body and the outer rotor, the inner-to-outer rotor clearance, and the amount of rotor endfloat (see illustrations).



13.4c Checking the rotor endfloat

5 Check the drivegear for signs of excessive wear or damage.

6 If the clearances measured are outside the specified maximum clearances and/or the drivegear is in poor condition, the complete pump unit must be renewed.

#### Reassembly

7 Refit the rotors into the pump (in their original orientation), lubricate the rotors and the new O-ring seal with clean engine oil, and refit the cover. Tighten the retaining bolts to the specified torque wrench setting.

### 14 Crankshaft oil seals - renewal



#### Front oil seal

1 Remove the crankshaft pulley as described in Section 8.

2 Using a suitable claw tool, extract the oil seal from the timing chain cover, but take care not to damage the seal housing. As it is removed, note the fitted orientation of the seal in the cover.

3 Clean the oil seal housing in the timing chain cover. Lubricate the sealing lips of the new seal and the crankshaft stub with clean engine oil.

4 Locate the new seal into position so that it

is squarely located on the crankshaft stub and in the housing, and is correctly orientated. Drift it into position using a large socket, another suitable tool, or the old seal, until the new seal is flush with the edge of the timing chain cover.

5 Lightly lubricate the rubbing surface of the crankshaft pulley, then refit the pulley as described in Section 8.

#### Rear oil seal

6 Remove the flywheel as described in Section 16.

7 Using a suitable claw tool, lever the seal from the rear seal housing (taking care not to damage the housing). As it is removed, note the fitted orientation of the seal.

8 Clean the seal housing, the crankshaft rear flange face and the flywheel mating surface.

9 One of two possible methods may be used to insert the new oil seal, depending on the tools available.

10 If Ford service tool No 21-011 is available, lubricate the crankshaft flange and the oil seal inner lip with clean engine oil. Position the seal onto the service tool (ensuring correct orientation), then press the seal into its housing.

11 If the service tool is not available, remove the engine sump (Section 11), then unscrew the Torx-head bolts retaining the rear seal housing in position, and remove the seal housing from the rear face of the cylinder block. New gaskets will be required for both the seal housing and the sump when refitting. Clean the seal housing seat and the mating surfaces of the sump and the crankcase. To fit the seal squarely into its housing without damaging either component, place a flat block of wood across the seal, then carefully tap the seal into position in the housing (see illustration). Do not allow the seal to tilt as it is being fitted. Lubricate the crankshaft flange and the oil seal inner lip with clean engine oil, then with a new gasket located on the seal housing/crankcase face, fit the housing into position. Take care not damage the seal lips as it is passed over the crankshaft rear flange



14.11a Positioning the crankshaft rear oil seal in its housing



**14.11b** Fitting the rear oil seal housing with a new gasket in position on the rear face of the cylinder block



**15.8** Unscrew and remove the engine mounting side bolt (arrowed) from under the wheel arch



**15.9** Unscrew and remove the mounting retaining nut and washer from the suspension strut cup retaining plate

(see illustration). Centralise the seal on the shaft, then insert and tighten the housing retaining bolts to the specified torque setting. Refit the sump with reference to Section 11.  
**12** Check that the crankshaft rear flange and the flywheel mating faces are clean, then refit the flywheel as described in Section 16.

## 15 Engine/transmission mountings - inspection and renewal



### Inspection

- 1** The engine/transmission mountings seldom require attention, but broken or deteriorated mountings should be renewed immediately, or the added strain placed on the driveline components may cause damage or wear.
- 2** During the check, the engine/transmission must be raised slightly, to remove its weight from the mountings.
- 3** Chock the rear wheels then jack up the front of the car and support it on axle stands (see *"Jacking and Vehicle Support"*). Position a jack under the sump, with a large block of wood between the jack head and the sump, then carefully raise the engine/transmission just enough to take the weight off the mountings.
- 4** Check the mountings to see if the rubber is cracked, hardened or separated from the



**15.10** Undo the three bolts securing the mounting assembly to the cylinder block and withdraw the mounting

metal components. Sometimes, the rubber will split right down the centre.

- 5** Check for relative movement between each mounting's brackets and the engine/transmission or body (use a large screwdriver or lever to attempt to move the mountings). If movement is noted, lower the engine and check-tighten the mounting fasteners.

### Renewal

- 6** The engine mountings can be removed if the weight of the engine/transmission is supported by one of the following alternative methods.
- 7** Either support the weight of the assembly from underneath using a jack and a suitable piece of wood between the jack saddle and the sump or transmission (to prevent damage), or from above by attaching a hoist to the engine. A third method is to use a suitable support bar with end pieces which will engage in the water channel each side of the bonnet lid aperture. Using an adjustable

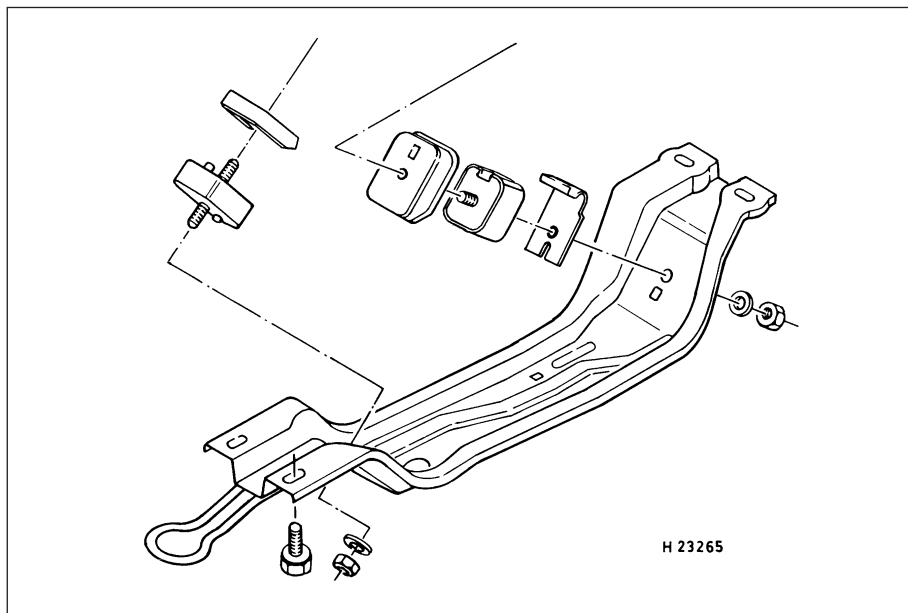
hook and chain connected to the engine, the weight of the engine and transmission can then be taken from the mountings.

### Engine right-hand mounting

- 8** Unscrew and remove the mounting side bolt from under the right-hand wheel arch (see illustration).
- 9** Unscrew and remove the mounting retaining nut and washer from the suspension strut cup retaining plate (see illustration).
- 10** Undo the three bolts securing the mounting unit to the cylinder block. The mounting unit and bracket can then be lowered from the engine (see illustration).
- 11** Unbolt and remove the mounting from its support bracket.

### Transmission bearer and mountings

- 12** Unscrew and remove the two nuts securing the mountings (front and rear) to the transmission bearer (see illustration).
- 13** Support the transmission bearer, then undo and remove the four retaining bolts from the floorpan, two at the front and two at the



**15.12** Exploded view of the transmission bearer mountings

rear, and lower the transmission bearer from the vehicle. Note plate fitment, as applicable, for reassembly.

**14** Unscrew the single nut securing each mounting and its retainer to the transmission support bracket, and remove. The transmission support brackets are fixed externally to the transmission casing and do not need to be removed for this operation.

### All mountings

**15** Refitting of all mountings is a reversal of removal. Make sure that the original sequence of assembly of washers and plates is maintained.

**16** Do not fully tighten any mounting bolts until they are all located. As the mounting bolts and nuts are tightened, check that the mounting rubbers do not twist.

## 16 Flywheel - removal, inspection and refitting



### Refitting

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

**2** Unscrew the six retaining bolts, and remove the flywheel from the rear end flange of the crankshaft - take care not to drop the flywheel, as it is heavy. A tool similar to that shown in illustration 16.5 can be fitted to prevent the flywheel/crankshaft from rotating as the bolts are removed. If on removal, the retaining bolts are found to be in poor condition (stretched threads, etc) they must be renewed.

### Inspection

**3** Inspect the starter ring gear on the flywheel for any broken or excessively-worn teeth. If evident, the ring gear must be renewed; this is a task best entrusted to a Ford dealer or a competent garage. Alternatively, obtain a complete new flywheel.

**4** The clutch friction surface on the flywheel must be carefully inspected for grooving or hairline cracks (caused by overheating). If these conditions are evident, it may be possible to have the flywheel surface-ground to renovate it, providing that the balance is not upset. Regrinding is a task for an automotive engineer. If surface-grinding is not possible, the flywheel must be renewed.

### Refitting

**5** Check that the mating faces of the flywheel



### 16.5 Tightening the flywheel retaining bolts to the specified torque

*Note the "peg" tool (arrowed) locking the ring gear teeth to prevent the flywheel/crankshaft from rotating*

and the crankshaft are clean before refitting. Lubricate the threads of the retaining bolts with engine oil before they are screwed into position. Locate the flywheel onto the crankshaft, and insert the bolts. Hand-tighten them initially, then tighten them in a progressive sequence to the specified torque wrench setting (**see illustration**).

**6** Refit the clutch as described in Chapter 6 and the transmission as described in Chapter 7A.

**Notes**






# Chapter 2 Part B:

## CVH and PTE engine in-car repair procedures

### Contents

Auxiliary drivebelt check and renewal . . . . .	See Chapter 1	Flywheel/driveplate - removal, inspection and refitting . . . . .	18
Camshaft oil seal - renewal . . . . .	10	General information . . . . .	1
Camshaft, rocker arms and tappets - removal, inspection and refitting . . . . .	11	Oil pump - dismantling, inspection and reassembly . . . . .	15
Compression test - description and interpretation . . . . .	2	Oil pump - removal and refitting . . . . .	14
Crankshaft oil seals - renewal . . . . .	16	Sump - removal and refitting . . . . .	13
Crankshaft pulley - removal and refitting . . . . .	6	Timing belt - removal, refitting and adjustment . . . . .	8
Cylinder head - removal and refitting . . . . .	12	Timing belt covers - removal and refitting . . . . .	7
Cylinder head rocker cover - removal and refitting . . . . .	4	Timing belt tensioner and sprockets - removal, inspection and refitting . . . . .	9
Engine oil and filter renewal . . . . .	See Chapter 1	Top Dead Centre (TDC) for No 1 piston - locating . . . . .	3
Engine oil level check . . . . .	See "Weekly Checks"	Valve clearances - general information . . . . .	5
Engine/transmission mountings - renewal . . . . .	17		

### 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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2B

### Specifications

#### General

Engine type . . . . .	Four-cylinder, in-line overhead camshaft
Engine code:	
1.4 litre CVH engine:	
Carburettor models . . . . .	FUF or FUG
CFI fuel injection models . . . . .	F6E
1.4 litre PTE engine . . . . .	F4A
1.6 litre CVH engine:	
Carburettor models . . . . .	LUH
EFI fuel injection models . . . . .	LJC or LJD
Turbo models . . . . .	LHA
Capacity:	
1.4 litre CVH and PTE engines . . . . .	1392 cc
1.6 litre CVH engine . . . . .	1596 cc
Bore:	
1.4 litre CVH and PTE engines . . . . .	77.24 mm
1.6 litre CVH engine . . . . .	79.96 mm
Stroke:	
1.4 litre CVH and PTE engines . . . . .	74.30 mm
1.6 litre CVH engine . . . . .	79.52 mm
Compression ratio:	
1.4 litre CVH carburettor engine . . . . .	9.5:1
1.4 litre CVH CFI fuel injection engine . . . . .	8.5:1
1.4 litre PTE engine . . . . .	9.5:1
1.6 litre CVH engine:	
Carburettor models . . . . .	9.5:1
EFI fuel injection models . . . . .	9.75:1
Turbo models . . . . .	8.0:1
Firing order . . . . .	1-3-4-2 (No 1 cylinder at timing belt end)
Direction of crankshaft rotation . . . . .	Clockwise (seen from right-hand side of vehicle)

Cylinder head

Hydraulic tappet bore inside diameter . . . . . 22.235 to 22.265 mm

Camshaft

Camshaft bearing journal diameter:

Bearing 1 . . . . . 44.75 mm

Bearing 2 . . . . . 45.00 mm

Bearing 3 . . . . . 45.25 mm

Bearing 4 . . . . . 45.50 mm

Bearing 5 . . . . . 45.75 mm

Camshaft bearing journal-to-cylinder head running clearance . . . . . 0.033 to 0.058 mm

Camshaft endfloat . . . . . 0.05 to 0.13 mm

Camshaft thrust plate thickness . . . . . 4.99 to 5.01 mm

Lubrication

Engine oil type/specification . . . . . See “Lubricants, fluids and tyre pressures”

Engine oil capacity . . . . . See “Lubricants, fluids and tyre pressures”

Oil pressure:

Idling . . . . . 1.0 bar

At 2000 rpm . . . . . 2.8 bars

Oil pump clearances:

Outer rotor-to-body . . . . . 0.060 to 0.190 mm

Inner rotor-to-outer rotor . . . . . 0.05 to 0.18 mm

Rotor endfloat . . . . . 0.014 to 0.100 mm

Torque wrench settings

	Nm	lbf ft
Oil pump to cylinder block . . . . .	19	14
Oil pump cover . . . . .	9	7
Oil pump pick-up to cylinder block . . . . .	9	7
Oil pump pick-up to pump . . . . .	9	7
Oil cooler threaded sleeve to cylinder block . . . . .	57	42
Rear oil seal housing . . . . .	9	7
Flywheel/driveplate bolts . . . . .	87	64
Cylinder head bolts:		
Stage 1 . . . . .	30	22
Stage 2 . . . . .	50	37
Stage 3 . . . . .	Angle-tighten a further 90°	
Stage 4 . . . . .	Angle-tighten a further 90°	
Crankshaft pulley bolt . . . . .	108	80
Camshaft thrust plate . . . . .	11	8
Camshaft toothed belt sprocket . . . . .	57	42
Timing belt tensioner . . . . .	18	13
Rocker studs in cylinder head . . . . .	20	15
Rocker arms . . . . .	27	20
Rocker cover . . . . .	7	5
Timing belt cover . . . . .	9	7
Sump:		
Stage 1 . . . . .	7	5
Stage 2 . . . . .	7	5
Engine mountings (CVH engines):		
Engine mounting (right-hand):		
Bolt to body (in wheel arch) . . . . .	41 to 58	30 to 43
Nut to body (by suspension strut) . . . . .	41 to 58	30 to 43
Bracket to cylinder block . . . . .	54 to 72	40 to 53
Rubber insulator to bracket . . . . .	71 to 95	52 to 70
Transmission mounting fasteners . . . . .	Refer to Chapter 7A or 7B	
Engine mountings (PTE engines):		
Engine mounting (right-hand):		
Bolt to body (in wheel arch) . . . . .	50	37
Nut to body (by suspension strut) . . . . .	64	47
Transmission mounting fasteners . . . . .	Refer to Chapter 7A or 7B	

**Note:** Refer to Part D of this Chapter for remaining torque wrench settings.



## 1 General information

### How to use this Chapter

This Part of Chapter 2 is devoted to repair procedures possible while the engine is still installed in the vehicle, and includes only the Specifications relevant to those procedures. Similar information concerning the 1.3 litre HCS engine, and the 1.6 and 1.8 litre Zetec engines, will be found in Parts A and C of this Chapter respectively. Since these procedures are based on the assumption that the engine is installed in the vehicle, if the engine has been removed from the vehicle and mounted on a stand, some of the preliminary dismantling steps outlined will not apply.

Information concerning engine/transmission removal and refitting, and engine overhaul, can be found in Part D of this Chapter, which also includes the Specifications relevant to those procedures.

### Engine description

The engine is a four-cylinder, in-line overhead camshaft type, designated CVH (Compound Valve angle, Hemispherical combustion chamber) or PTE (Pent roof, high Torque, low Emission). The PTE engine was introduced for 1994 and, apart from modifications to the cylinder head, camshaft and intake system, is virtually identical to the CVH engine it replaces. The engine is mounted transversely at the front of the vehicle together with the transmission to form a combined power unit.

The crankshaft is supported in five split-shell type main bearings within the cast-iron crankcase. The connecting rod big-end bearings are split-shell type, and the pistons are attached by interference-fit gudgeon pins. Each piston has two compression rings and one oil control ring.

The cylinder head is of light alloy construction, and supports the camshaft in five bearings. Camshaft drive is by a toothed composite rubber timing belt, which is driven by a sprocket on the front end of the crankshaft. The timing belt also drives the water pump, which is mounted below the cylinder head.

Hydraulic cam followers (tappets) operate the rocker arms and valves. The tappets are operated by pressurised engine oil. When a valve closes, the oil passes through a port in the body of the cam follower, through four grooves in the plunger and into the cylinder feed chamber. From the chamber, the oil flows to a ball-type non-return valve and into the pressure chamber. The tension of the coil spring causes the plunger to press against the valve, and so eliminates any free play. As the cam lifts the follower, the oil pressure in the pressure chamber is increased, and the non-return valve closes off the port feed chamber. This in turn provides a rigid link between the cam follower, the cylinder and the plunger. These then rise as

a unit to open the valve. The cam follower-to-cylinder clearance allows the specified quantity of oil to pass from the pressure chamber, oil only being allowed past the cylinder bore when the pressure is high during the moment of the valve opening. When the valve closes, the escape of oil will produce a small clearance, and no pressure will exist in the pressure chamber. The feed chamber oil then flows through the non-return valve and into the pressure chamber, so that the cam follower cylinder can be raised by the pressure of the coil spring, eliminating free play until the valve is operated again.

As wear occurs between the rocker arm and the valve stem, the quantity of oil that flows into the pressure chamber will be slightly more than the quantity lost during the expansion cycle of the cam follower. Conversely, when the cam follower is compressed by the expansion of the valve, a slightly smaller quantity of oil will flow into the pressure chamber than was lost.

A rotor-type oil pump is mounted on the timing cover end of the engine, and is driven by a gear on the front end of the crankshaft. A full-flow type oil filter is fitted, and is mounted on the side of the crankcase.

### 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) Rocker cover - removal and refitting.
- c) Timing belt - removal, refitting and adjustment.
- d) Camshaft oil seal - renewal.
- e) Camshaft - removal and refitting.
- f) Cylinder head - removal and refitting.
- g) Cylinder head and pistons - decarbonising.
- h) Crankshaft pulley - removal and refitting.
- i) Crankshaft oil seals - renewal.
- j) Oil filter renewal.
- k) Sump - removal and refitting.
- l) Flywheel - removal, inspection and refitting.
- m) Mountings - removal and refitting.

**Note:** It is possible to remove the pistons and connecting rods (after removing the cylinder head and sump) without removing the engine. However, this is not recommended. Work of this nature is more easily and thoroughly completed with the engine on the bench, as described in Chapter 2D.



3.6a Crankshaft pulley notch (arrowed) aligned with the TDC (0) mark on the timing belt cover

## 2 Compression test - description and interpretation

Refer to Section 2 in Part A of this Chapter.

## 3 Top Dead Centre (TDC) for No 1 piston - locating

1 Top dead centre (TDC) is the highest point of the cylinder that each piston reaches as the crankshaft turns. Each piston reaches its TDC position at the end of its compression stroke, and then again at the end of its exhaust stroke. For the purpose of engine timing, TDC on the compression stroke for No 1 piston is used. No 1 cylinder is at the timing belt end of the engine. Proceed as follows.

2 Remove the upper timing belt cover as described in Section 7.

3 Chock the rear wheels then jack up the front of the car and support it on axle stands (see "Jacking and Vehicle Support").

4 Undo the retaining bolts, and remove the cover from the underside of the crankshaft pulley.

5 Fit a spanner onto the crankshaft pulley bolt, and turn the crankshaft in its normal direction of rotation (clockwise, viewed from the pulley end) to the point where the crankshaft pulley timing notch is aligned with the TDC (0) timing mark on the timing belt cover.



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

6 Although the crankshaft is now in top dead centre alignment, with piston Nos 1 and 4 at the top of their stroke, the No 1 piston may not be on its compression stroke. To confirm that it is, check that the timing pointer on the camshaft sprocket is exactly aligned with the TDC mark on the front face of the cylinder head (see illustrations). If the pointer is not aligned, turn the crankshaft pulley one further



3.6b Camshaft sprocket timing mark aligned with the TDC mark on the front face of the cylinder head

complete turn, and all the markings should now align.

7 With the engine set at No 1 piston on TDC compression, refit the crankshaft pulley cover, lower the vehicle and refit the upper timing belt cover.

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



#### Removal

1 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).

2 Remove the air cleaner assembly and air inlet components as necessary for access as described in the relevant Part of Chapter 4. Disconnect the crankcase ventilation hose from the rocker cover.

3 Remove the timing belt upper cover as described in Section 7.

4 Referring to the relevant Part of Chapter 4 for details, disconnect the accelerator cable from the throttle linkage and from the adjuster bracket above the rocker cover. Position the cable out of the way.

5 Where applicable, disconnect the choke cable from the carburettor, referring to Chapter 4A for details.

6 Unscrew and remove the rocker cover retaining bolts and washers, then lift the cover from the cylinder head. Note that a new rocker cover gasket will be needed on refitting.

#### Refitting

7 Before refitting the rocker cover, clean the mating surfaces of both the cylinder head and the cover.

8 Locate the new gasket in position, then fit the cover retaining bolts and washers. Ensure that the grooves in the plate washers are facing upwards as they are fitted (see **illustrations**). Tighten the cover retaining bolts to the specified torque wrench setting. Refer to Chapter 4 for details on reconnecting the accelerator cable, choke cable, air inlet components and air cleaner (as applicable).

9 Refit the timing belt cover and reconnect the battery earth lead.

### 5 Valve clearances - general information

It is necessary for a clearance to exist between the tip of each valve stem and the valve operating mechanism, to allow for the expansion of the various components as the engine reaches normal operating temperature.

On most older engine designs, this meant that the valve clearances (also known as "tappet" clearances) had to be checked and adjusted regularly. If the clearances were allowed to be too slack, the engine would be very noisy, its power output would suffer, and its fuel consumption would increase. If the clearances were allowed to be too tight, the engine's power output would be reduced, and the valves and their seats could be severely damaged.

These engines employ hydraulic tappets which use the lubricating system's oil pressure to automatically take up the clearance between each camshaft lobe and its respective valve stem. Therefore, there is no need for regular checking and adjustment of the valve clearances. However, it is **essential** that only good-quality oil of the recommended viscosity and specification is used in the engine, and that this oil is always changed at the recommended intervals. If this advice is not followed, the oilways and tappets may become clogged with particles of dirt, or deposits of burnt (inferior) engine oil, so that the system cannot work properly; ultimately, one or more of the tappets may fail, and expensive repairs may be required.

On starting the engine from cold, there will be a slight delay while full oil pressure builds up in all parts of the engine, especially in the tappets; the valve components, therefore, may well "rattle" for about 10 seconds or so, and then quieten. This is a normal state of affairs, and is nothing to worry about, provided that all tappets quieten quickly and stay quiet.

After the vehicle has been standing for several days, the valve components may "rattle" for longer than usual, as nearly all the

oil will have drained away from the engine's top-end components and bearing surfaces. While this is only to be expected, care must be taken not to damage the engine under these circumstances - avoid high-speed running until all the tappets are refilled with oil and operating normally. With the vehicle stationary, hold the engine at no more than a fast idle speed (maximum 2000 to 2500 rpm) for 10 to 15 minutes, or until the noise ceases. Do not run the engine at more than 3000 rpm until the tappets are fully charged with oil and the noise has ceased.

If the valve components are thought to be noisy, or if a light rattle persists from the top end after the engine has warmed up to normal operating temperature, take the vehicle to a Ford dealer for expert advice. Depending on the mileage covered and the usage to which each vehicle has been put, some vehicles may be noisier than others; only a good mechanic experienced in these engines can tell if the noise level is typical for the vehicle's mileage, or if a genuine fault exists. If any tappet's operation is faulty, it must be renewed (Section 11).

### 6 Crankshaft pulley - removal and refitting



#### Removal

1 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).

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

3 Unbolt and remove the cover from the underside of the crankshaft pulley.

4 Remove the auxiliary drivebelt as described in Chapter 1.

5 If timing belt renewal is also intended, set the engine at TDC as described in Section 3 before removing the crankshaft pulley and retaining bolt.

6 To prevent the crankshaft from turning as the pulley bolt is loosened off, remove the starter motor as described in Chapter 5A, and then lock the starter ring gear using a suitable lever (see **illustration**).



4.8a Fitting a new gasket to the rocker cover



4.8b Rocker cover retaining bolts and plate washers



6.6 Using a suitable bar to lock the flywheel ring gear





6.7 Crankshaft pulley removal



7.3 Upper timing belt cover removal



7.5 Lower timing belt cover removal

7 Unscrew and remove the crankshaft pulley retaining bolt and its washer. Withdraw the pulley from the front end of the crankshaft (*see illustration*). If necessary, lever it free using a pair of diagonally-opposed levers positioned behind the pulley.

### Refitting

8 Refit in the reverse order of removal. Tighten the pulley retaining bolt to the specified torque setting, and refer to Chapter 1 for details on refitting the auxiliary drivebelt.

9 On completion, reconnect the battery negative lead.

## 7 Timing belt covers - removal and refitting



### Removal

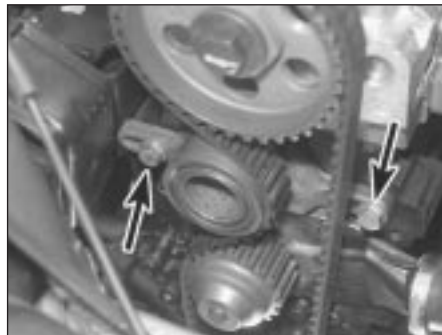
1 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).

2 Where applicable, undo the two bolts securing the power steering fluid pipe support clips and ease the pipe away from the upper cover.

3 Undo the two retaining bolts and remove the upper timing belt cover (*see illustration*).

4 Refer to the previous Section for details, and remove the crankshaft pulley.

5 Unscrew the two bolts securing the lower timing belt cover, and remove it (*see illustration*).



8.4 Timing belt tensioner retaining bolts (arrowed)



8.5 Timing belt removal



8.7 Sprocket and oil pump housing TDC marks in alignment

### Refitting

6 Refit in the reverse order of removal. Tighten the cover retaining bolts to the specified torque wrench setting.

7 On completion, reconnect the battery earth lead.

## 8 Timing belt - removal, refitting and adjustment



### Removal

1 Referring to the previous Sections for details, remove the rocker cover, the crankshaft pulley and the timing belt covers.

2 Check that the crankshaft is set with the No 1 piston at TDC (on its compression stroke) before proceeding. If necessary, refer to Section 3 for further details.

3 To check the timing belt for correct adjustment, proceed as described in paragraph 12 below. To remove the belt, proceed as follows.

4 Loosen off the two bolts securing the timing belt tensioner. Using a large screwdriver, prise the tensioner to one side to release the timing belt tension. Secure the tensioner in this position by retightening the bolts (*see illustration*).

5 If the original timing belt is to be refitted, mark it for direction of travel and also the exact tooth engagement positions on all

sprockets. Slip the belt from the camshaft, water pump and crankshaft sprockets (*see illustration*). Whilst the timing belt is removed, avoid any excessive movement of the sprockets, otherwise the piston crowns and valves may come into contact and be damaged.

6 If the belt is being removed for reasons other than routine renewal, check it carefully for any signs of uneven wear, splitting, cracks (especially at the roots of the belt teeth) or contamination with oil or coolant. Renew the belt if there is the slightest doubt about its condition. As a safety measure, the belt must be renewed as a matter of course at the intervals given in Chapter 1; if its history is unknown, the belt should be renewed irrespective of its apparent condition whenever the engine is overhauled.

### Refitting and adjustment

7 Before refitting the belt, check that the crankshaft is still at the TDC position, with the small projection on the belt sprocket front flange aligned with the TDC mark on the oil pump housing (*see illustration*). Also ensure that the camshaft sprocket is set with its TDC pointer aligned with the corresponding timing mark on the cylinder head (*see illustration 3.6b*). If necessary, adjust the sprockets slightly. As previously mentioned, avoid any excessive movement of the sprockets whilst the belt is removed.

8 Engage the timing belt teeth with the teeth



**8.13 Checking the tension of the timing belt**

of the crankshaft sprocket, and then pull the belt vertically upright on its right-hand run. Keep it taut, and engage it with the teeth of the camshaft sprocket. If the original belt is being refitted, check that the belt's direction of travel is correct, and realign the belt-to-sprocket marks made during removal, to ensure that the exact original engagement positions are retained. When the belt is fully fitted on the sprockets, check that the sprocket positions have not altered.

**9** Carefully manoeuvre the belt around the tensioner, and engage its teeth with the water pump sprocket, again ensuring that the TDC positions of the crankshaft and camshaft are not disturbed as the belt is finally located.

**10** Refit the lower timing belt cover, and tighten its retaining bolts to the specified torque setting. Refit the crankshaft pulley, and tighten its retaining bolt to the specified torque setting.

**11** To take up belt slack, loosen off the tensioner and move it towards the front of the car to apply an initial tension to the belt. Secure the tensioner in this position, then remove the flywheel ring gear locking device.

**12** Rotate the crankshaft through two full revolutions in (the normal direction of travel), returning to the TDC position (camshaft sprocket-to-cylinder head). Check that the crankshaft pulley notch is aligned with the TDC (0) mark on the lower half of the timing belt cover.

**13** Grasp the belt between the thumb and forefinger, at the midway point between the crankshaft and camshaft sprockets on the right-hand side. If the belt tension is correct, it should just be possible to twist the belt through 90° at this point (see illustration). To adjust the belt, loosen off the tensioner retaining bolts, move the tensioner as required using a suitable screwdriver as a lever, then retighten the retaining bolts. Rotate the crankshaft to settle the belt, then recheck the tension. It may take two or three attempts to get the tension correct. On completion, tighten the tensioner bolts to the specified torque wrench setting.

**14** It should be noted that this setting is approximate, and the belt tension should be rechecked by a Ford dealer with the special

tensioner-setting tool at the earliest opportunity.

**15** Refit the starter motor (refer to Chapter 5A).

**16** Refit the rocker cover (see Section 4) and the upper timing belt cover (see Section 7).

**17** Refit the auxiliary drivebelt, adjust its tension as described in Chapter 1, then refit the crankshaft pulley lower cover.

**18** On completion, reconnect the battery earth lead.

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



### Tensioner

**1** Set the engine at TDC for No 1 piston on compression as described in Section 3, then refer to Section 7 and remove the timing belt upper cover.

**2** Loosen off the two bolts securing the timing belt tensioner. Using a large screwdriver, prise the tensioner to one side to release the timing belt tension.

**3** Remove the two tensioner bolts, and withdraw the tensioner from behind the timing belt.

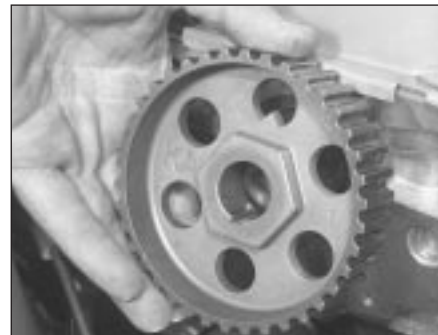
**4** Check the condition of the tensioner, ensuring that it rotates smoothly on its bearings, with no signs of roughness or excessive free play. Renew the tensioner if in doubt about its condition.

**5** To refit the tensioner, first check that the engine is still positioned at TDC for No 1 piston on compression, with both the camshaft and crankshaft sprocket timing marks correctly aligned as described in Section 3.

**6** Refit the tensioner, guiding it in position around the timing belt, and secure with the two bolts. Move the tensioner towards the front of the car, to apply an initial tension to the belt. Secure the tensioner in this position.

**7** Adjust the timing belt tension as described in Section 8, paragraphs 12 to 14.

**8** Refit the timing belt upper cover on completion.



**9.13a Refit the camshaft sprocket . . .**

### Camshaft sprocket

**9** Set the engine at TDC for No 1 piston on compression as described in Section 3, then refer to Section 7 and remove the timing belt upper cover.

**10** Loosen off the two bolts securing the timing belt tensioner. Using a large screwdriver, prise the tensioner to one side to release the timing belt tension. Slip the timing belt off the camshaft sprocket.

**11** Pass a bar through one of the holes in the camshaft sprocket to prevent the camshaft from rotating, then unscrew and remove the sprocket retaining bolt. Note that this bolt must be renewed when refitting the camshaft sprocket. Remove the sprocket, noting the Woodruff key fitted to the camshaft; if the key is loose, remove it for safekeeping.

**12** Check the condition of the sprocket, inspecting carefully for any wear grooves, pitting or scoring around the teeth.

**13** Install the Woodruff key, then fit the camshaft sprocket with a **new** retaining bolt. The threads of the bolt should be smeared with thread-locking compound prior to fitting. Tighten the retaining bolt to the specified torque wrench setting (see illustrations).

**14** Check that the engine is still positioned at TDC for No 1 piston on compression, with both the camshaft and crankshaft sprocket timing marks correctly aligned as described in Section 3.

**15** Slip the timing belt over the camshaft sprocket, then move the tensioner towards the front of the car to apply an initial tension to the belt. Secure the tensioner in this position.

**16** Adjust the timing belt tension as described in Section 8, paragraphs 12 to 14.

**17** Refit the timing belt upper cover on completion.

### Crankshaft sprocket

**18** Remove the timing belt as described in Section 8.

**19** The crankshaft sprocket can now be withdrawn. If it is a tight fit on the crankshaft, a puller or two large screwdrivers can be used to release its grip. Withdraw the thrustwasher and the Woodruff key from the crankshaft.

**20** Check the condition of the sprocket,



**9.13b . . . and tighten the retaining bolt to the specified torque whilst retaining the sprocket as shown**