






# Chapter 2 Part B:

## CVH engines

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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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2B

### Specifications

#### General

Engine type	Four-cylinder, in-line overhead camshaft
Capacity:	
1.1 litre	1117 cc
1.3 litre	1296 cc
1.4 litre	1392 cc
1.6 litre	1597 cc
Bore:	
1.1 litre	73.96 mm
1.3 and 1.6 litre	79.96 mm
1.4 litre	77.24 mm
Stroke:	
1.1 litre	64.98 mm
1.3 litre	64.52 mm
1.4 litre	74.30 mm
1.6 litre	79.52 mm
Compression ratio:	
All except 1.6 litre Turbo	9.5:1
1.6 litre Turbo	8.3:1
Firing order	1-3-4-2 (No 1 at timing belt end)

#### Cylinder block

Material	Cast iron
Number of main bearings	5
Cylinder bore (diameter):	
1.1 litre:	
Standard (1)	73.94 to 73.95 mm
Standard (2)	73.95 to 73.96 mm
Standard (3)	73.96 to 73.97 mm
Standard (4)	73.97 to 73.98 mm
Oversize (A)	74.23 to 74.24 mm
Oversize (B)	74.24 to 74.25 mm
Oversize (C)	74.25 to 74.26 mm

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### Cylinder bore (diameter) (continued):

#### 1.3 and 1.6 litre:

Standard (1) .....	79.94 to 79.95 mm
Standard (2) .....	79.95 to 79.96 mm
Standard (3) .....	79.96 to 79.97 mm
Standard (4) .....	79.97 to 79.98 mm
Oversize (A) .....	80.23 to 80.24 mm
Oversize (B) .....	80.24 to 80.25 mm
Oversize (C) .....	80.25 to 80.26 mm

#### 1.4 litre:

Standard (1) .....	77.22 to 77.23 mm
Standard (2) .....	77.23 to 77.24 mm
Standard (3) .....	77.24 to 77.25 mm
Standard (4) .....	77.25 to 77.26 mm
Oversize (A) .....	77.51 to 77.52 mm
Oversize (B) .....	77.52 to 77.53 mm
Oversize (C) .....	77.53 to 77.54 mm

### Main bearing shell inner diameter:

Standard .....	58.011 to 58.038 mm
Undersize 0.25 mm .....	57.761 to 57.788 mm
Undersize 0.50 mm .....	57.511 to 57.538 mm
Undersize 0.75 mm .....	57.261 to 57.288 mm

## Crankshaft

### Main bearing journal diameter:

Standard .....	57.98 to 58.00 mm
Undersize 0.25 mm .....	57.73 to 57.75 mm
Undersize 0.50 mm .....	57.48 to 57.50 mm
Undersize 0.75 mm .....	57.23 to 57.25 mm

### Main bearing running clearance

0.011 to 0.058 mm

### Thrustwasher thickness:

Standard .....	2.301 to 2.351 mm
Oversize .....	2.491 to 2.541 mm

### Crankshaft endfloat

0.09 to 0.30 mm

### Crankpin (big-end) diameter:

#### 1.1 engines:

Standard .....	42.99 to 43.01 mm
Undersize 0.25 mm .....	42.74 to 42.76 mm
Undersize 0.50 mm .....	42.49 to 42.51 mm
Undersize 0.75 mm .....	42.24 to 42.26 mm
Undersize 1.00 mm .....	41.99 to 42.01 mm

#### 1.3, 1.4 and 1.6 engines:

Standard .....	47.89 to 47.91 mm
Undersize 0.25 mm .....	47.64 to 47.66 mm
Undersize 0.50 mm .....	47.39 to 47.41 mm
Undersize 0.75 mm .....	47.14 to 47.16 mm
Undersize 1.00 mm .....	46.89 to 46.91 mm

### Big-end bearing running clearance

0.006 to 0.060 mm

## Camshaft

### Number of bearings

5

### Drive

Toothed belt

### Thrust plate thickness

4.99 to 5.01 mm

### Camshaft bearing diameter:

1 .....	44.75 mm
2 .....	45.00 mm
3 .....	45.25 mm
4 .....	45.50 mm
5 .....	45.75 mm

### Camshaft endfloat

0.05 to 0.15 mm

## Pistons and piston rings

### Diameter 1.1 litre:

Standard 1 .....	73.910 to 73.920 mm
Standard 2 .....	73.920 to 73.930 mm
Standard 3 .....	73.930 to 73.940 mm
Standard 4 .....	73.940 to 73.950 mm
Standard service .....	73.930 to 73.955 mm
Oversize 0.29 mm .....	74.210 to 74.235 mm
Oversize 0.50 mm .....	74.460 to 74.485 mm

## Pistons and piston rings (continued)

### Diameter - 1.3 and 1.6 litre:

Standard 1	79.910 to 79.920 mm
Standard 2	79.920 to 79.930 mm
Standard 3	79.930 to 79.940 mm
Standard 4	79.940 to 79.950 mm
Standard service	79.930 to 79.955 mm
Oversize 0.29 mm	80.210 to 80.235 mm
Oversize 0.50 mm	80.430 to 80.455 mm

### Diameter - 1.4 litre:

Standard 1	77.190 to 77.200 mm
Standard 2	77.200 to 77.210 mm
Standard 3	77.210 to 77.220 mm
Standard 4	77.220 to 77.230 mm
Standard service	77.210 to 77.235 mm
Oversize 0.29 mm	77.490 to 77.515 mm
Oversize 0.50 mm	77.710 to 77.735 mm

Piston-to-bore clearance	0.010 to 0.045 mm
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### Piston ring end gap:

#### 1.1 litre:

Compression rings	0.25 to 0.45 mm
Oil control ring	0.20 to 0.40 mm

#### 1.3, 1.4 and 1.6 litre:

Compression rings	0.30 to 0.50 mm
Oil control ring	0.40 to 1.40 mm

## Connecting rod

### Big-end bore diameter:

1.1 litre	46.685 to 46.705 mm
1.3, 1.4 and 1.6 litre	50.890 to 50.910 mm

Small-end bore diameter	20.589 to 20.609 mm
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### Big-end bearing shell inside diameter:

#### 1.1 litre:

Standard	43.016 to 43.050 mm
Undersize 0.25 mm	42.766 to 42.800 mm
Undersize 0.50 mm	42.516 to 42.550 mm
Undersize 0.75 mm	42.266 to 42.300 mm
Undersize 1.00 mm	42.016 to 42.050 mm

#### 1.3, 1.4 and 1.6 litre:

Standard	47.916 to 47.950 mm
Undersize 0.25 mm	47.666 to 47.700 mm
Undersize 0.50 mm	47.416 to 47.450 mm
Undersize 0.75 mm	47.166 to 47.200 mm
Undersize 1.00 mm	46.916 to 46.950 mm

Big-end bearing running clearance	0.006 to 0.060 mm
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## Cylinder head

Material	Light alloy
Maximum permissible cylinder head distortion (over entire length)	0.15 mm

### Minimum combustion chamber depth after skimming:

1.1 litre	18.22 mm
1.3 and 1.6 litre	19.60 mm
1.4 litre	17.40 mm

Valve seat angle	45°
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Valve seat width	1.75 to 2.32 mm
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### Seat cutter:

Upper correction angle	18°
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#### Lower correction angle:

1.1 litre	80° (inlet), 70° (exhaust)
1.3, 1.4 and 1.6 litre	75° (inlet), 70° (exhaust)

### Valve guide bore:

Standard	8.063 to 8.094 mm
Oversize 0.2 mm	8.263 to 8.294 mm
Oversize 0.4 mm	8.463 to 8.494 mm

## Valves - general

Operation	Rocker arms and hydraulic cam followers
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### Valve timing:

#### 1.1 litre and 1.3 litre:

Inlet valve opens	13° ATDC
Inlet valve closes	28° ABDC

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### Valve timing (1.1 litre and 1.3 litre) (continued):

Exhaust valve opens .....	30° BBDC
Exhaust valve closes .....	15° BTDC
1.4 litre:	
Inlet valve opens .....	15° ATDC
Inlet valve closes .....	30° ABDC
Exhaust valve opens .....	28° BBDC
Exhaust valve closes .....	13° BTDC
1.6 litre (except carburettor versions 1986 onwards):	
Inlet valve opens .....	8° ATDC
Inlet valve closes .....	36° ABDC
Exhaust valve opens .....	34° BBDC
Exhaust valve closes .....	6° BTDC
1.6 litre (carburettor versions - 1986 onwards):	
Inlet valve opens .....	4° ATDC
Inlet valve closes .....	32° ABDC
Exhaust valve opens .....	38° BBDC
Exhaust valve closes .....	10° BTDC

### Valve lift:

Inlet:	
1.1, 1.3 and 1.4 litre .....	9.56 mm
1.6 litre .....	10.09 mm
Exhaust:	
1.1, 1.3 and 1.4 litre .....	9.52 mm
1.6 litre .....	10.06 mm
Valve spring free length .....	47.2 mm

### Inlet valve

#### Length:

1.1 litre .....	135.74 to 136.20 mm
1.3 and 1.6 litre .....	134.54 to 135.0 mm
1.4 litre .....	136.29 to 136.75 mm

#### Head diameter:

1.1 litre .....	37.9 to 38.1 mm
1.3 and 1.6 litre .....	41.9 to 42.1 mm
1.4 litre .....	39.9 to 40.1 mm

#### Stem diameter:

Standard .....	8.025 to 8.043 mm
0.20 mm oversize .....	8.225 to 8.243 mm
0.40 mm oversize .....	8.425 to 8.443 mm

Valve stem clearance in guide .....	0.020 to 0.063 mm
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### Exhaust valve

#### Length:

1.1 litre .....	132.62 to 133.08 mm
1.3 litre .....	131.17 to 131.63 mm
1.4 litre .....	132.97 to 133.43 mm
1.6 litre .....	131.57 to 132.03 mm

#### Head diameter:

1.1 litre .....	32.1 to 32.3 mm
1.3 litre .....	33.9 to 34.1 mm
1.4 litre .....	33.9 to 34.1 mm
1.6 litre .....	36.9 to 37.1 mm

#### Valve stem diameter:

Standard .....	7.999 to 8.017 mm
0.20 mm oversize .....	8.199 to 8.217 mm
0.40 mm oversize .....	8.399 to 8.417 mm

Valve stem clearance in guide .....	0.046 to 0.089 mm
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### Lubrication

Oil filter .....	Champion C104
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#### Oil pump type:

Pre-1986 .....	Gear type driven by crankshaft
1986 onwards .....	Rotor type driven by crankshaft

#### Minimum oil pressure at 80°C (176°F):

At 750 rpm .....	1.0 bar (14.5 lbf/in <sup>2</sup> )
At 2000 rpm .....	2.8 bar (40.6 lbf/in <sup>2</sup> )
Oil pressure warning lamp operates .....	0.3 to 0.5 bar (4.3 to 7.2 lbf/in <sup>2</sup> )

**Lubrication (continued)**

Relief valve opens .....	4.0 bar (58 lbf/in <sup>2</sup> )
Oil pump clearances (rotor type pump only):	
Outer rotor to body .....	0.060 to 0.190 mm
Inner to outer rotor .....	0.050 to 0.180 mm
Rotor endfloat .....	0.014 to 0.100 mm

**Torque wrench settings**

	Nm	lbf ft
Main bearing caps .....	90 to 100	66 to 74
Connecting rod bolts .....	30 to 36	22 to 26
Oil pump to crankcase .....	8 to 11	6 to 8
Oil pump cover bolts .....	8 to 11	6 to 8
Oil pump pick-up tube to block .....	17 to 23	12 to 17
Oil pump pick-up tube to pump .....	8 to 11	6 to 8
Oil cooler threaded sleeve to block .....	55 to 60	40 to 44
Rear oil seal carrier bolts .....	8 to 11	6 to 8
Sump with multi-piece gasket:		
Stage 1 .....	8 to 11	6 to 8
Stage 2 .....	8 to 11	6 to 8
Sump with one-piece gasket:		
Stage 1 .....	5 to 8	4 to 6
Stage 2 .....	5 to 8	4 to 6
Flywheel to crankshaft .....	82 to 92	60 to 68
Torque converter drive plate to crankshaft .....	80 to 88	59 to 65
Crankshaft pulley bolt .....	100 to 115	74 to 85
Cylinder head bolts:		
Stage 1 .....	25	18
Stage 2 .....	55	40
Stage 3 .....	Tighten by a further 90°	Tighten by a further 90°
Stage 4 .....	Tighten by a further 90°	Tighten by a further 90°
Camshaft thrust plate .....	9 to 13	7 to 10
Camshaft sprocket bolt .....	54 to 59	40 to 43
Timing belt tensioner bolts .....	16 to 20	12 to 15
Rocker arm studs in head:		
Plain stud .....	10 to 15	7 to 11
Stud with nylon insert .....	18 to 23	13 to 17
Rocker arm nut .....	25 to 29	18 to 21
Rocker cover screws .....	6 to 8	4 to 6
Timing belt cover bolts .....	9 to 11	7 to 8
Sump drain plug .....	21 to 28	15 to 21
Engine to manual transmission .....	35 to 45	26 to 33
Engine to automatic transmission .....	30 to 50	22 to 37
Right-hand engine mounting to body .....	41 to 58	30 to 43
Right-hand engine mounting bracket to engine .....	76 to 104	56 to 77
Right-hand engine mounting rubber insulator to brackets .....	41 to 58	30 to 43
Front transmission mounting bracket to transmission (pre-1986 models) .....	41 to 51	30 to 38
Front and rear transmission mounting bolts (pre-1986 models) .....	52 to 64	38 to 47
Transmission mountings to transmission (1986 models onwards) .....	80 to 100	59 to 74
Transmission support crossmember to body (1986 models onwards) .....	52	38
Oil pressure switch .....	18 to 22	13 to 16

2B

**1 General information**

The 1.1 litre, 1.3 litre, 1.4 litre and 1.6 litre CVH (Compound Valve angle, Hemispherical combustion chambers) engines are of four cylinder in-line overhead camshaft type, mounted transversely, together with the transmission, at the front of the car (**see illustrations**).

The crankshaft is supported in five main bearings within a cast iron crankcase.

The cylinder head is of light alloy

construction, supporting the overhead camshaft in five bearings. Camshaft drive is by a toothed composite rubber belt, driven from a sprocket on the crankshaft.

The distributor (where applicable) is driven from the rear (flywheel) end of the camshaft by means of an offset dog.

The cam followers are of hydraulic type, which eliminates the need for valve clearance adjustment. If the engine has been standing idle for a period of time, or after overhaul, when the engine is started up, valve clatter may be heard. This is a normal condition and will gradually disappear within a few minutes

of starting up as the cam followers are pressurised with oil.

The water pump is mounted on the timing belt end of the cylinder block and is driven by the toothed belt.

A gear or rotor type oil pump is mounted on the timing belt end of the cylinder block and is driven by a gear on the front end of the crankshaft.

A full-flow oil filter of throw-away type is located on the side of the crankcase.

An engine oil cooler is located under the oil filter on fuel-injection and automatic transmission models.

## 2 Major operations possible with the engine in the car

The following work can be carried out without having to remove the engine:

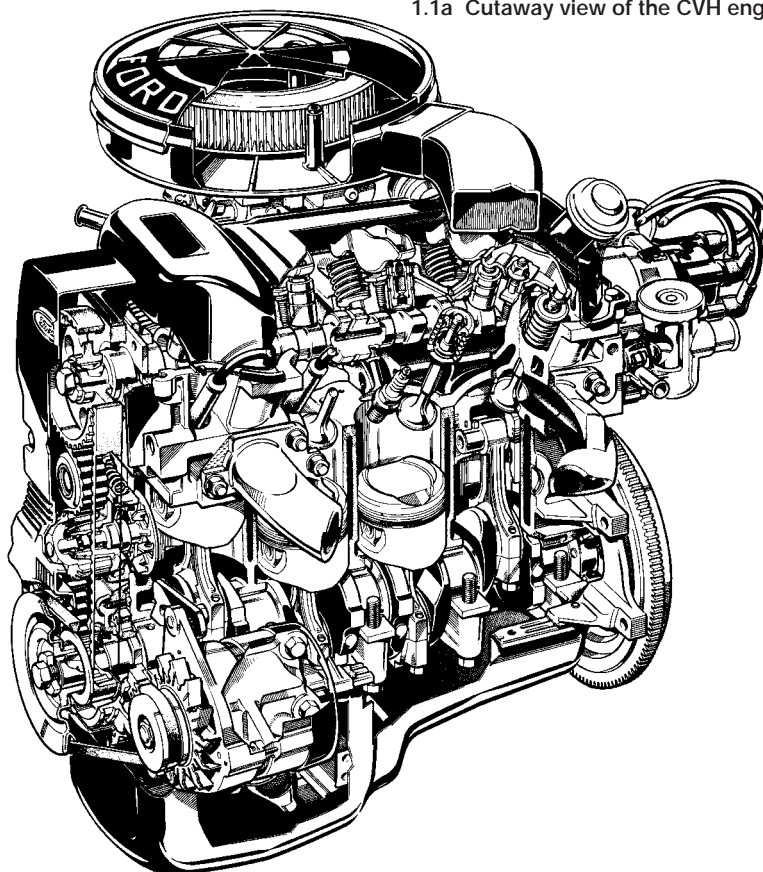
- a) Timing belt - renewal.
- b) Camshaft oil seal - renewal.
- c) Camshaft - removal and refitting.
- d) Cylinder head - removal and refitting.
- e) Crankshaft front oil seal - renewal.
- f) Sump - removal and refitting.
- g) Piston/connecting rod - removal and refitting.
- h) Engine/transmission mountings - removal and refitting.

## 3 Major operations requiring engine removal

The following work can only be carried out after removal of the engine from the car:

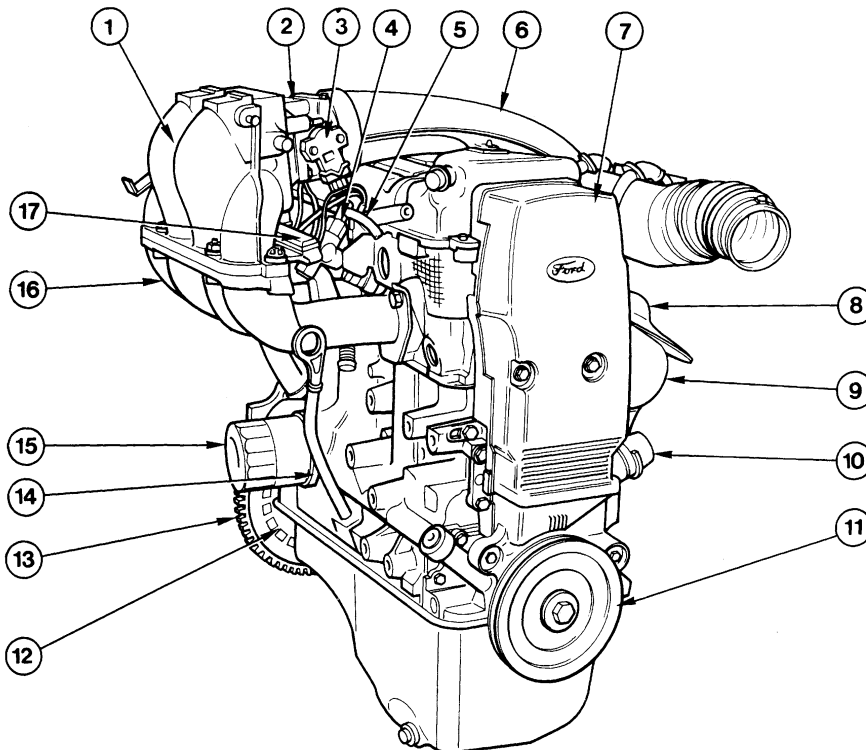
- a) Crankshaft main bearings - renewal.
- b) Crankshaft - removal and refitting.
- c) Flywheel - removal and refitting.
- d) Crankshaft rear oil seal - renewal.
- e) Oil pump - removal and refitting.

1.1a Cutaway view of the CVH engine



1.1b 1.6 litre EFI engine

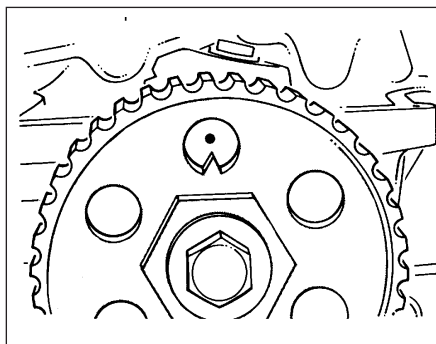
- 1 Inlet manifold (upper)
- 2 Throttle housing
- 3 Throttle position sensor
- 4 Fuel rail
- 5 Fuel hose
- 6 Air inlet duct
- 7 Timing belt cover
- 8 Exhaust heat shield
- 9 Exhaust manifold
- 10 Coolant inlet pipe
- 11 Crankshaft pulley
- 12 Flywheel ribs
- 13 Flywheel
- 14 Oil cooler
- 15 Oil filter
- 16 Inlet manifold (lower)
- 17 Fuel injection wiring harness







4.3a Crankshaft pulley notch (arrowed) aligned with TDC (0) mark on belt cover scale



4.3b Camshaft sprocket at TDC position



4.4a Where a two-piece timing belt cover is fitted, undo the bolts . . .

## 4 Timing belt - removal, refitting and adjustment

### Removal

**Note:** From April 1988 (build code JG) a modified timing belt tensioner incorporating a larger diameter tensioner roller was introduced, and from October 1988 an improved timing belt was used. When renewal of the timing belt becomes necessary, only the latest, improved timing belt must be used (the older type will no longer be available). On models produced before April 1988 this will also entail renewal of the tensioner roller.

1 Disconnect the battery negative lead.  
2 Release the alternator mounting and adjuster link bolts, push the alternator in towards the engine and slip the drivebelt off the pulleys.

3 Using a spanner on the crankshaft pulley bolt, turn the crankshaft until the notch on the pulley is aligned with the TDC (0) mark on the timing belt cover scale. On models with a distributor, now remove the distributor cap and check that the rotor arm is pointing towards the No 1 cylinder HT lead segment in the cap. If the rotor arm is pointing towards the No 4 cylinder segment, turn the crankshaft through another complete turn and realign the pulley notch with the TDC mark. On EFI engine models (see Chapter 4, Part D), check

that the timing mark on the camshaft sprocket is opposite the TDC mark on the cylinder head (see illustrations).

4 On early models unscrew the four bolts and remove the one-piece timing belt cover. On later models fitted with a two-piece cover, unscrew the two upper bolts and remove the top half, then unscrew the two lower bolts. The lower half cannot be removed at this stage (see illustrations).

5 Undo the bolts and remove the right-hand engine splash shield.

6 Using a ring spanner unscrew the crankshaft pulley retaining bolt. Remove the starter motor as described in Chapter 5, Part A and lock the flywheel ring gear with a cold chisel or similar tool to prevent the crankshaft rotating (see illustration). Remove the pulley, followed by the timing belt cover lower half on later models.

7 Slacken the two bolts which secure the timing belt tensioner and, using a large screwdriver, prise the tensioner to one side to relieve the tautness of the belt (see illustration). If the tensioner is spring-loaded, tighten one of the bolts to retain it in the slackened position.

8 If the original belt is to be refitted, mark it for direction of travel and also the exact tooth positions on all three sprockets.

9 Slip the timing belt off the camshaft, water pump and crankshaft sprockets.

### Refitting

10 Before refitting the belt, check that the crankshaft is still at TDC (the small projection on the belt sprocket front flange in line with the TDC mark on the oil pump housing) and that the timing mark on the camshaft sprocket is opposite the TDC mark on the cylinder head (see illustrations). Adjust the position of the sprockets slightly, but avoid any excessive movement of the sprockets while the belt is off, as the piston crowns and valve heads may make contact.

11 Engage the timing belt with the teeth 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. Check that the positions of the sprockets have not altered (see illustration).

12 Wind the belt round the camshaft sprocket, around and under the tensioner and over the water pump sprocket.

13 Refit the crankshaft pulley and tighten the bolt, using the same procedure as used previously to stop the crankshaft turning. On later models make sure that the timing belt cover lower half is placed in position before refitting the pulley.

### Adjustment

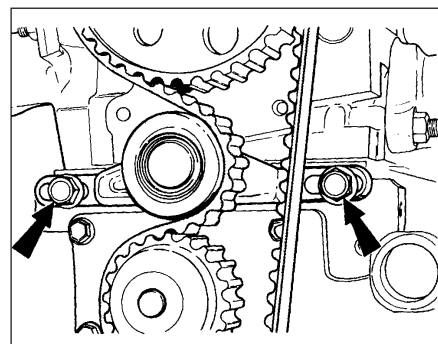
**Note:** Accurate adjustment of the timing belt entails the use of Ford special tools. An approximate setting can be achieved using the



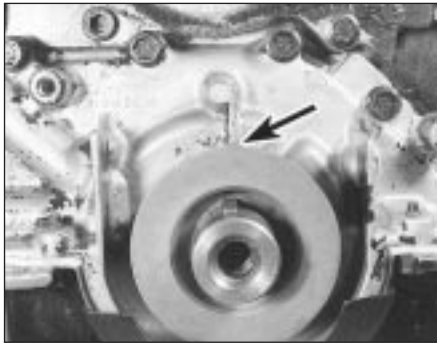
4.4b . . . and remove the upper half



4.6 Using a stout bar to lock the flywheel ring gear



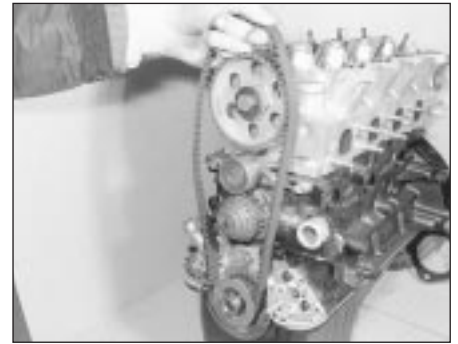
4.7 Timing belt tensioner retaining bolts (arrowed)



**4.10a Crankshaft sprocket projection (arrowed) aligned with TDC mark on oil pump housing**



**4.10b . . . and camshaft sprocket timing mark aligned with TDC mark on cylinder head**



**4.11 Place the timing belt in position**

method described in this Section, but the tension should be checked by a dealer on completion.

**14** To adjust the belt tension, slacken 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.

**15** Rotate the crankshaft clockwise through two complete revolutions, then return to the TDC position. Check that the camshaft sprocket is also at TDC as previously described.

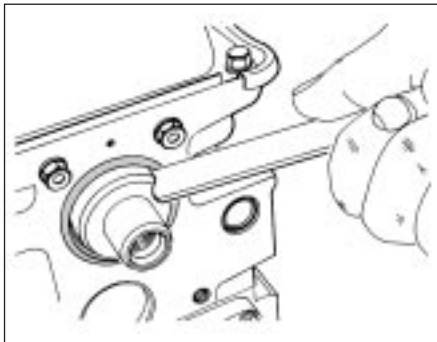
**16** Grasp the belt between thumb and forefinger at a point midway between the crankshaft and camshaft sprocket on the straight side of the belt. When the tension is correct it should just be possible to twist the belt through 90° at this point. Slacken the tensioner and using a large screwdriver as a lever, move it as necessary until the tension is correct. Tighten the tensioner bolts, rotate the camshaft to settle the belt, then recheck the tension. It will probably take two or three attempts to achieve success.

**17** It must be emphasised that this is an approximate setting only and should be rechecked by a Ford dealer at the earliest opportunity.

**18** Refit the starter motor, engine splash shield, distributor cap and timing belt cover/s.

**19** Refit the alternator drivebelt and adjust its tension as described in Chapter 1.

**20** Reconnect the battery.



**5.4 Removing the camshaft oil seal**

## 5 Oil seals - renewal

### Camshaft oil seal

**Note:** Thread locking compound will be required to coat the camshaft sprocket bolt on refitting.

**1** Disconnect the battery negative lead.

**2** Release the timing belt from the camshaft sprocket, as described in Section 4.

**3** Pass a bar through one of the holes in the camshaft sprocket to anchor the sprocket while the retaining bolt is unscrewed. Remove the sprocket.

**4** Using a suitable tool, hooked at its end, prise out the oil seal (see illustration).

**5** Apply a little grease to the lips of the new seal and draw it into position using the sprocket bolt and a suitable distance piece.

**6** Refit the sprocket, tightening the bolt to the specified torque wrench setting. Thread locking compound should be applied to the threads of the bolt.

**7** Refit and tension the timing belt (Section 4).

**8** Reconnect the battery.

### Crankshaft front oil seal

**9** Disconnect the battery negative lead.

**10** Release the alternator mounting and adjuster link bolts, push the alternator in towards the engine and slip the drivebelt from the pulleys.

**11** Unbolt and remove the timing belt cover. On models with a two-piece cover only the upper half can be removed at this stage.

**12** Locate a spanner onto the crankshaft pulley bolt and turn the crankshaft over in its normal direction of travel until the timing marks of the crankshaft sprocket and cylinder head are in alignment.

**13** You will now need to remove the crankshaft pulley. To prevent the crankshaft turning, place the vehicle in gear and have an assistant apply the brakes or unbolt and remove the starter motor so that the flywheel ring gear can be jammed with a cold chisel or suitable implement. Unbolt the crankshaft pulley and remove it with its thrustwasher. Where a two-piece timing belt cover is fitted, remove the lower half.

**14** Slacken the belt tensioner bolts, lever the tensioner to one side and retighten the bolts. With the belt slack, it can now be slipped from the sprockets. Before removing the belt note its original position on the sprockets (mark the teeth with quick-drying paint), also its direction of travel.

**15** Withdraw the crankshaft sprocket. If it is tight you will need to use a special extractor, but due to the confined space available you may need to lower the engine from its mounting on that side. Before resorting to this, try levering the sprocket free using screwdrivers. If the mounting is to be disconnected refer to Part A of this Chapter.

**16** Remove the dished washer from the crankshaft, noting that the concave side is against the oil seal.

**17** Using a suitably hooked tool, prise out the oil seal from the oil pump housing.

**18** Grease the lips of the new seal and press it into position using the pulley bolt and suitable distance piece made from a piece of tubing.

**19** Fit the thrustwasher (concave side to oil seal), the belt sprocket and the pulley to the crankshaft. On models with a two-piece timing belt cover, place the lower half in position before refitting the pulley.

**20** Fit and tension the timing belt by the method described in Section 4.

**21** Fit the timing belt cover.

**22** Refit and tension the alternator drivebelt (Chapter 1).

**23** Remove the starter ring gear jamming device (if fitted), refit the starter motor and reconnect the battery.

## 6 Camshaft - removal and refitting

### Carburettor engines

**Note:** Thread locking compound will be required to coat the camshaft sprocket bolt on refitting.

#### Removal

**1** Disconnect the battery negative lead.

**2** Refer to the relevant Part of Chapter 4 and remove the air cleaner and the fuel pump.

**3** Disconnect the throttle and where fitted the





6.12 Removing the camshaft sprocket



6.13a Unscrew the camshaft thrust plate bolts . . .



6.13b . . . and withdraw the thrust plate

choke cable ends from the carburettor linkage, then undo the bolts and move the cable support bracket to one side.

**4** Where applicable, refer to Chapter 5, Part B and remove the distributor.

**5** Remove the timing belt cover-to-cylinder head attachment bolts.

**6** Disconnect the crankcase ventilation hoses at the rocker cover, undo and remove the bolts and washers and remove the rocker cover.

**7** Unscrew the securing nuts and remove the rocker arms and guides. Keep the components in their originally installed sequence by marking them with a piece of numbered tape or by using a suitably sub-divided box.

**8** Withdraw the hydraulic cam followers, again keeping them in their originally fitted sequence.

**9** Slacken the alternator mounting and adjuster link bolts, push the alternator in towards the engine and slip the drivebelt from the pulleys.

**10** Unbolt and remove the timing belt cover (top half only on later models with two-piece cover) and turn the crankshaft to align the timing mark on the camshaft sprocket with the one on the cylinder head.

**11** Slacken the bolts on the timing belt tensioner, lever the tensioner against the tension of its coil spring (if fitted) and retighten the bolts. With the belt now slack, slip it from the camshaft sprocket.

**12** Pass a rod or large screwdriver through one of the holes in the camshaft sprocket to lock it and unscrew the sprocket bolt. Remove the sprocket (see illustration).



6.14 Withdrawing the camshaft



7.4 Disconnecting the hose from the thermostat housing - carburettor engine

**13** Extract the two bolts and pull out the camshaft thrustplate (see illustrations).

**14** Carefully withdraw the camshaft from the distributor end of the cylinder head (see illustration).

### Refitting

**15** Refitting the camshaft is a reversal of removal, but observe the following points.

**16** Lubricate the camshaft bearings before inserting the camshaft into the cylinder head.

**17** It is recommended that a new oil seal is always fitted after the camshaft has been installed (see preceding Section). Apply thread locking compound to the sprocket bolt threads. Tighten the bolt to the specified torque.

**18** Fit and tension the timing belt, as described in Section 4.

**19** Oil the hydraulic cam followers with hypoid type transmission oil before inserting them into their original bores.

**20** Refit the rocker arms and guides in their original sequence, use new nuts and tighten to the specified torque. It is essential that before each rocker arm is installed and its nut tightened, the respective cam follower is positioned at its lowest point (in contact with cam base circle). Turn the camshaft (by means of the crankshaft pulley bolt) as necessary to achieve this.

**21** Use a new rocker cover gasket, and to ensure that a good seal is made, check that its location groove is clear of oil, grease and any portions of the old gasket. A length of sealant should be applied to the gasket recess where the cover engages under the timing belt cover.

When in position tighten the cover retaining screws to the specified torque setting.

**22** Refit the remainder of the components with reference to their relevant Chapters. Do not forget the timing belt cover bolts.

### Fuel injection engines

**Note:** Thread locking compound will be required to coat the camshaft sprocket bolt on refitting.

### Removal

**23** Disconnect the battery negative lead.

**24** Where necessary, disconnect any hoses and wiring restricting access to the timing belt cover and/or the rocker cover. If necessary, refer to the relevant Part(s) of Chapters 4 and 5 for details.

**25** On XR3i and Cabriolet models with mechanical (Bosch K-Jetronic) fuel injection, disconnect the inlet air hose between the fuel distributor and throttle housing and position it out of the way.

**26** On RS Turbo models disconnect the inlet air hose and the small connecting hose at the inlet air duct, then undo the two bolts and remove the air duct from the rocker cover.

**27** Proceed as described in paragraphs 4 to 14 inclusive.

### Refitting

**28** Proceed as described in paragraphs 15 to 22 inclusive.

## 7 Cylinder head - removal and refitting



### Carburettor engines

#### Removal

**Note:** The cylinder head must only be removed when the engine is cold. New cylinder head bolts and a new gasket must be used on refitting.

**1** Disconnect the battery earth lead.

**2** Remove the air cleaner (Chapter 4, Part A).

**3** Drain the cooling system (Chapter 1).

**4** Disconnect the coolant hoses from the thermostat housing, automatic choke and inlet manifold as applicable (see illustration).



7.5 Disconnect the choke cable from the linkage clamp (arrowed) - carburettor engine

5 Disconnect the throttle and where fitted the choke cable ends from the carburettor linkage, then undo the bolts and move the cable support bracket to one side (see illustration).

6 Disconnect the fuel pipe from the fuel pump (see illustration).

7 Disconnect the vacuum servo hose (where fitted) from the inlet manifold (see illustration).

8 Where fitted, disconnect the fuel return pipe from the carburettor (see illustration).

9 Disconnect the remaining vacuum hoses at the carburettor and inlet manifold, noting their locations (see illustration).

10 Disconnect the leads from the temperature sender unit, ignition coil, anti-run-on valve solenoid and where applicable, carburettor electric choke and back bleed solenoid (see illustrations).



7.8 Fuel return pipe location (arrowed) - 1.4 litre carburettor engine



7.10a Disconnect the lead at the temperature sender . . .



7.6 Disconnect the fuel feed pipe at the pump - carburettor engine

11 Unbolt the exhaust downpipe from the manifold by unscrewing the flange bolts. Support the exhaust pipe by tying it up with wire.

12 Release the alternator mounting and adjuster link bolts, push the alternator in towards the engine and slip the drivebelt from the pulleys.

13 Unbolt and remove the timing belt cover (upper cover only on later models).

14 Slacken the belt tensioner bolts, lever the tensioner to one side against the pressure of the coil spring (if fitted) and retighten the bolts.

15 With the timing belt now slack, slip it from the camshaft sprocket.

16 Disconnect the leads from the spark plugs and unscrew and remove the spark plugs.

17 Remove the rocker cover.

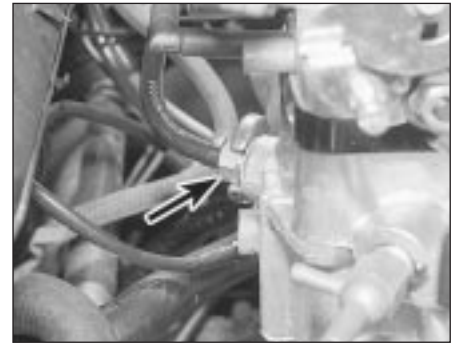
18 Unscrew the cylinder head bolts,



7.9 Vacuum hose attachments at the inlet manifold - 1.4 litre carburettor engine



7.10b . . . anti-run-on valve and back bleed solenoid (if fitted) - 1.4 litre carburettor engine



7.7 Disconnect the brake servo vacuum hose (arrowed) - 1.4 litre carburettor engine

progressively and in the sequence shown (see illustration). Discard the bolts, as new ones must be used at reassembly.

19 Remove the cylinder head and manifolds.

**HAYNES**  
**HINT** Use the manifolds if necessary as levers to rock the head from the block. Do not attempt to tap the head sideways off the block as it is located on dowels, and do not attempt to lever between the head and the block or damage will result.

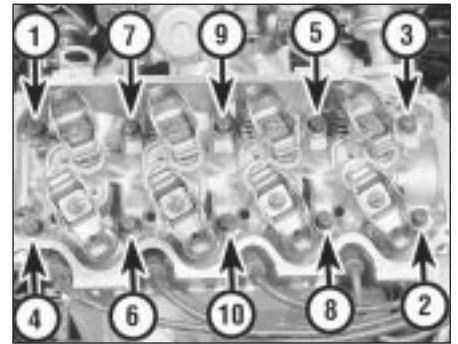
### Refitting

20 Before installing the cylinder head, make sure that the mating surfaces of head and block are perfectly clean with the head locating dowels in position. Clean the bolt holes free from oil. In extreme cases it is possible for oil left in the holes to crack the block due to hydraulic pressure.

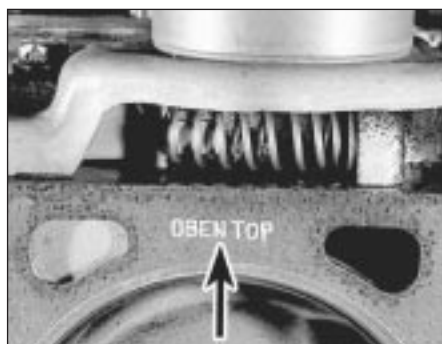
21 Turn the crankshaft to position No 1 piston about 20 mm (0.8 in) before it reaches TDC.

22 Place a new gasket on the cylinder block and then locate the cylinder head on its dowels. The upper surface of the gasket is marked OBEN-TOP (see illustration).

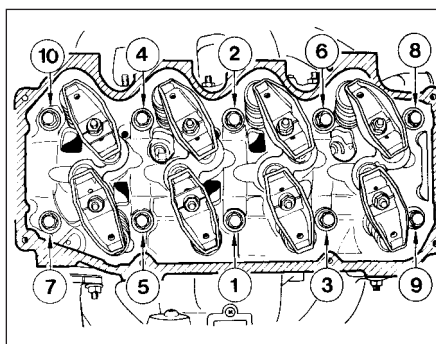
23 Install and tighten the new cylinder head bolts, tightening them in four stages (see Specifications). After the first two stages, the bolt heads should be marked with a spot of quick-drying paint so that the paint spots all face the same direction. Now tighten the bolts



7.18 Cylinder head bolt removal sequence



**7.22** The upper surface of the cylinder head gasket is marked OBEN-TOP (arrowed)



**7.23a** Cylinder head bolt tightening sequence



**7.23b** Tightening the cylinder head bolts

(Stage 3) through 90° (quarter turn) followed by a further 90° (Stage 4). Tighten the bolts at each stage only in the sequence shown before going on to the next stage. If all the bolts have been tightened equally, the paint spots should now all be pointing in the same direction (see illustrations).

**24** Fit the timing belt (Section 4).

**25** Refitting and reconnection of all other components is a reversal of dismantling, with reference to the relevant Chapter.

**26** Refill the cooling system (Chapter 1).

### Fuel injection engines

**Note:** The cylinder head must only be removed when the engine is cold. New cylinder head bolts and a new gasket must be used on refitting.

#### XR3i and Cabriolet models with mechanical (Bosch K-Jetronic) fuel injection

**27** Disconnect the battery negative lead.

**28** Disconnect the inlet air hose at the throttle housing.

**29** Drain the cooling system (Chapter 1).

**30** Disconnect the crankcase ventilation hoses from the inlet manifold and rocker cover.

**31** Disconnect the coolant hoses from the thermostat housing, inlet manifold and inlet manifold intermediate flange.

**32** Disconnect the throttle cable from the throttle housing.

**33** Relieve the fuel system pressure by *slowly* loosening the fuel feed pipe union at the warm-up regulator (see illustration). Absorb fuel leakage in a cloth. Reference to the fuel-injection system layout in Chapter 4, Part B, or D, as applicable will assist in identification of the relevant components where necessary.

**34** Disconnect the vacuum servo hose from the inlet manifold.

**35** Disconnect the two fuel pipe unions at the warm-up regulator, the single pipe to the cold start valve and the four injector feed pipes at the fuel distributor (see illustration). Recover the sealing washers located on each side of the banjo unions and seal all disconnected pipes and orifices to prevent dirt ingress.

**36** Disconnect the vacuum hoses at the throttle housing after marking their locations to aid refitting.

**37** Disconnect the wiring multi plugs at the cold start valve, warm-up regulator, and auxiliary air device, then disconnect the throttle valve stop earth cable (see illustration).

**38** Disconnect the leads from the spark plugs and remove the distributor cap. Disconnect the distributor multi plug.

**39** The remainder of the removal and the refitting sequence is the same as described for carburettor engines in paragraphs 11 to 26 inclusive.

#### 1.4 CFI (Central Fuel Injection) and 1.6 EFI (Electronic Fuel Injection) engines

**40** Disconnect the battery negative lead.

**41** Disconnect all relevant hoses, pipes and

wiring to facilitate cylinder head removal, with reference to the appropriate Sections of Chapters 4 and 5.

**42** Disconnect the throttle cable as described in Chapter 4, Part C or Part D, as applicable.

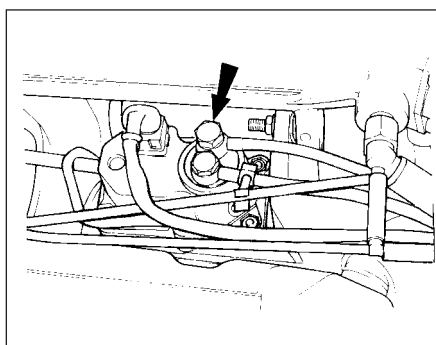
**43** The remainder of the removal and the refitting sequence is the same as described for carburettor engines in paragraphs 11 to 26 inclusive.

#### RS Turbo models

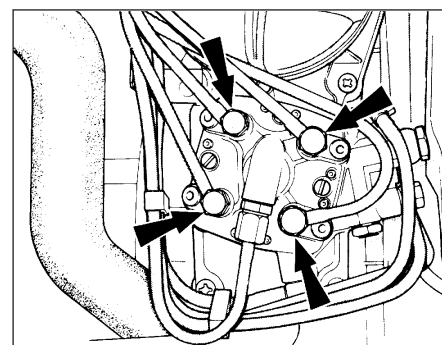
**44** Disconnect the battery negative lead.

**45** Drain the cooling system as described in Chapter 1.

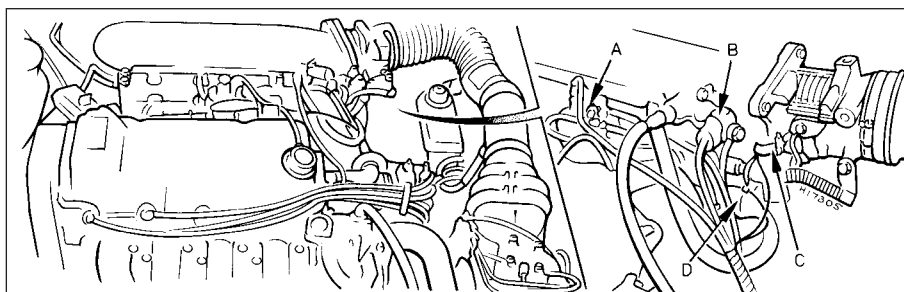
**46** Disconnect the inlet air hose and the connecting hose at the inlet air duct, then undo the two bolts and remove the air duct



**7.33** Fuel feed pipe union at the warm-up regulator - XR3i and Cabriolet



**7.35** Injector pipe unions at the fuel distributor - XR3i and Cabriolet

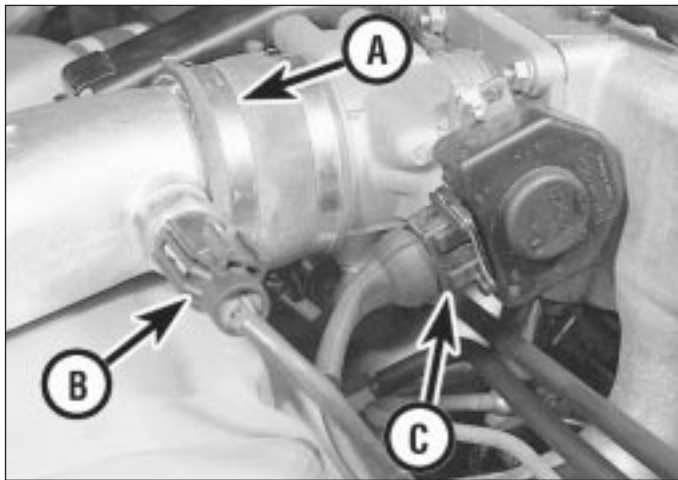


**7.37** Wiring connections on the fuel-injection system - XR3i and Cabriolet

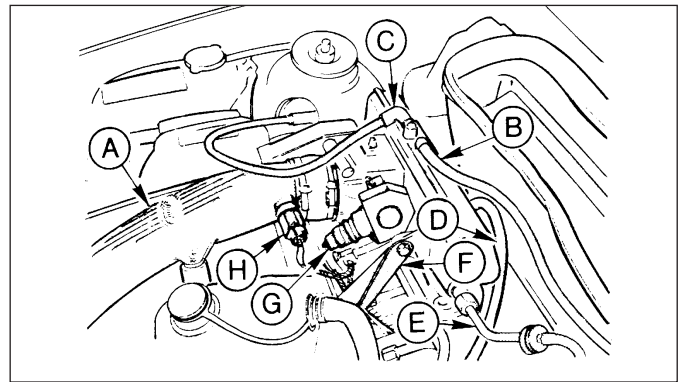
A Warm-up regulator  
B Cold start valve

C Throttle valve stop earth cable  
D Auxiliary air device





**7.46** Air inlet duct connecting hose clip (A) charge air temperature sensor multi-plug (B) and throttle position sensor multi-plug (C) on RS Turbo models



**7.49** Wiring connections and hose attachments on the fuel-injection system - RS Turbo

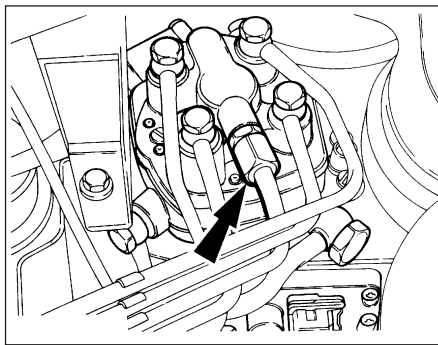
- |                                    |  |
|------------------------------------|--|
| A Inlet air duct                   | F Mounting bracket                         |
| B Vacuum hose                      | G Throttle position sensor multi-plug      |
| C Crankcase ventilation valve hose | H Charge air temperature sensor multi-plug |
| D Auxiliary air device hose        |  |
| E Vacuum servo hose                |  |

from the rocker cover. Disconnect the sensor multi plugs (see illustration).

**47** Disconnect the coolant hoses from the thermostat housing, inlet manifold and inlet manifold intermediate flange.

**48** Disconnect the crankcase ventilation hose at the rocker cover and the two vacuum hoses from the inlet manifold. Release the hoses from their clips.

**49** Disconnect the brake servo vacuum hose at the inlet manifold (see illustration).



**7.52** Cold start valve union on fuel distributor - RS Turbo

**50** Disconnect the throttle cable from the throttle housing.

**51** Remove the turbocharger (Chapter 4, Part B).

**52** Relieve the fuel system pressure by slowly loosening the cold start valve union on the top of the fuel distributor (see illustration). Absorb fuel leakage in a cloth. Reference to the fuel-injection system layout in Chapter 4, Part B will assist in identification of the relevant components where necessary.

**53** Disconnect the fuel pipes at the fuel injectors and at the cold start valve (see illustration). Recover the sealing washers located on each side of the banjo unions and seal all disconnected pipes and orifices to prevent dirt ingress. Move the fuel pipes clear of the cylinder head.

**54** Disconnect the wiring multi plugs at the temperature gauge sender unit, ignition coil, throttle position sensor, solenoid control valve, coolant temperature sensor, thermo-time switch, cold start valve and auxiliary air device.

**55** Disconnect the leads from the spark plugs and remove the distributor cap.

**56** The remainder of the removal and the refitting sequence is the same as described for carburettor engines in paragraphs 12 to 26 inclusive.

## 8 Sump - removal and refitting

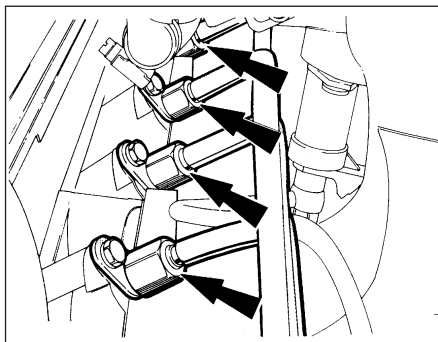
**Note:** New gaskets and sealing strips must be used on refitting.

### Removal

- 1 Disconnect the battery negative lead.
- 2 Drain the engine oil.
- 3 Remove the starter motor as described in Chapter 5, Part A.
- 4 Apply the handbrake, jack up the front of the car and support it on stands (see "Jacking and Vehicle Support").
- 5 Unbolt and remove the cover plate from the clutch housing (see illustration).
- 6 Unbolt and remove the engine splash shield at the crankshaft pulley end (see illustration).
- 7 Unscrew the sump securing bolts progressively and remove them.
- 8 Remove the sump and peel away the gaskets and sealing strips.

### Refitting

- 9 Make sure that the mating surfaces of the sump and block are clean, then fit new end sealing strips into their grooves and stick new



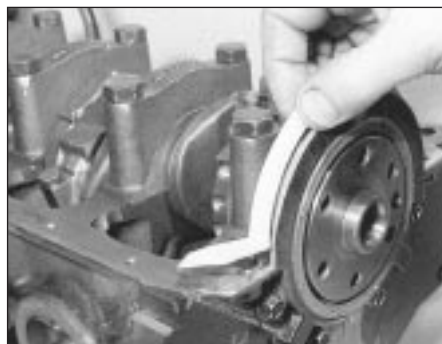
**7.53** Fuel pipe connections at the fuel injectors - RS Turbo



**8.5** Remove the clutch housing cover plate



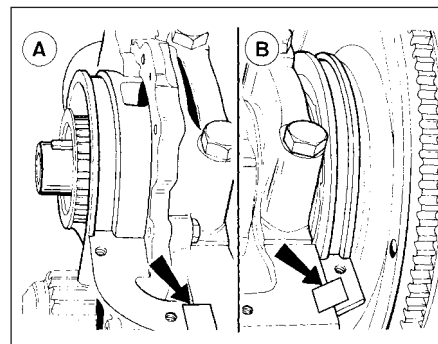
**8.6** And the right-hand engine splash shield



8.9a Fitting the sump sealing strips . . .



8.9b . . . followed by the side gaskets with their ends overlapped



8.9c Apply sealer to the areas shown when fitting a one piece sump gasket

A Oil pump housing-to-block joint  
B Rear oil seal carrier-to-block joint

side gaskets into position using thick grease. The ends of the side gaskets should overlap the seals. On later models a one-piece sump gasket is used. Before fitting, apply sealer to the joints of the cylinder block and rear oil seal carrier, and cylinder block and oil pump housing (four locations). Without applying any further sealer, locate the gasket into the grooves of the oil seal carrier and oil pump housing (**see illustrations**). To retain the gasket insert two or three studs into the cylinder block if necessary and remove them once the sump is in place.

10 Offer up the sump, taking care not to displace the gaskets and insert the securing bolts. Tighten the bolts in two stages to the final torque given in the Specifications.

11 Refit the cover plate to the clutch housing and refit the engine splash shield.

12 Refit the starter motor.

13 Fill the engine with oil and reconnect the battery.

## 9 Pistons/connecting rods - removal and refitting



**Note:** A piston ring compressor tool will be required for this operation.

### Removal

1 Remove the sump, as described in Section 8, and the cylinder head, as described in Section 7.

2 Check that the connecting rod and cap have adjacent numbers at their big-end to indicate their position in the cylinder block (No 1 nearest timing cover end of engine) (**see illustration**).

3 Bring the first piston to the lowest point of its throw by turning the crankshaft pulley bolt and then check if there is a wear ring at the top of the bore. If there is, it should be removed using a scraper, but do not damage the cylinder bore.

4 Unscrew the big-end bolts and remove them.

5 Tap off the big-end cap. If the bearing shell is to be used again, make sure that it is retained with the cap. Note the two cap positioning roll pins.

6 Push the piston/rod out of the top of the block, again keeping the bearing shell with the rod if the shell is to be used again.

7 Repeat the removal operations on the remaining piston/rod assemblies.

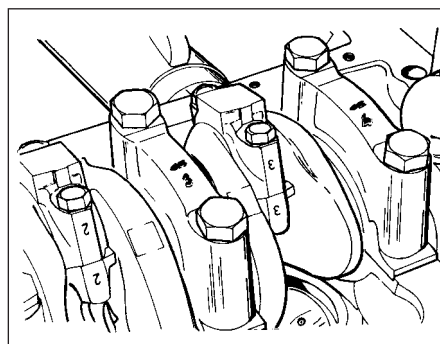
8 Dismantling a piston/connecting rod is covered in Section 13.

### Refitting

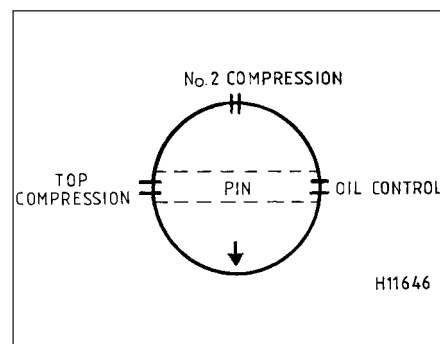
9 To refit a piston/rod assembly, have the piston ring gaps staggered as shown (**see illustrations**). Oil the rings and apply a piston ring compressor. Compress the piston rings.

10 Oil the cylinder bores.

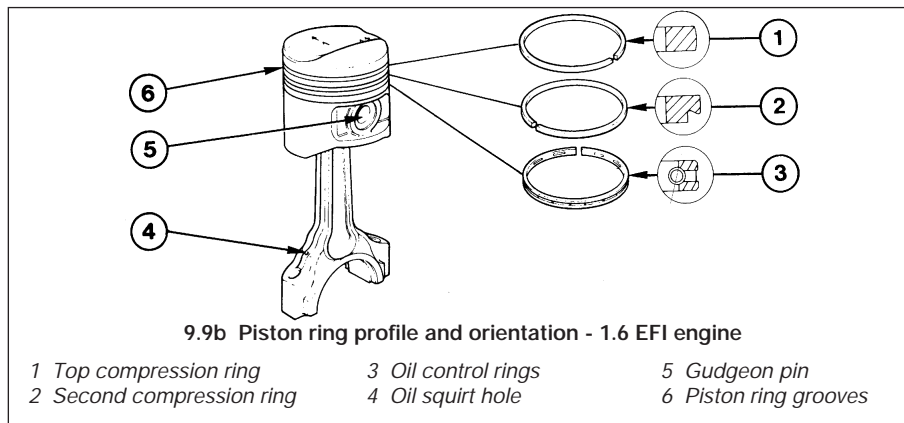
11 Wipe clean the bearing shell seat in the connecting rod and insert the shell (**see illustration**).



9.2 Connecting rod and main bearing identification numbers



9.9a Piston ring end gap positioning diagram - all except 1.6 EFI engines



9.9b Piston ring profile and orientation - 1.6 EFI engine

1 Top compression ring  
2 Second compression ring

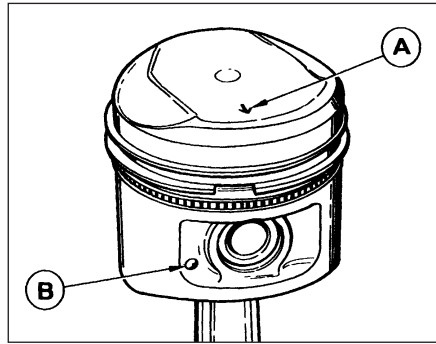
3 Oil control rings  
4 Oil squirt hole

5 Gudgeon pin  
6 Piston ring grooves





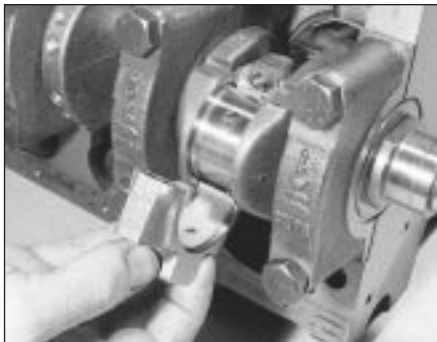
9.11 Fitting the bearing shell in the connecting rod



9.13a Arrow (A) or cast nipple (B) faces the timing belt end of the engine when installed



9.13b Installing a piston/connecting rod assembly



9.16a Fitting the big-end cap to the connecting rod



9.16b Tightening the big-end cap bolts to the specified torque

15 Wipe the bearing shell seat in the big-end cap clean and insert the bearing shell .

16 Lubricate the bearing shell with oil then fit the cap, aligning the numbers on the cap and the rod, screw in the bolts and tighten them to the specified torque setting (see illustrations).

17 Repeat the operations on the remaining pistons/connecting rods.

18 Refit the sump (Section 8) and the cylinder head (Section 7). Refill the engine with oil and coolant.

## 10 Engine/transmission mountings - removal and refitting

Refer to Part A, Section 11.

## 11 Engine/transmission - removal and separation

**Note:** Suitable lifting tackle will be required for this operation.

### Carburettor engines

#### Removal

1 The engine is removed complete with the transmission in a downward direction and then withdrawn from under the front of the car.

2 Disconnect the battery negative lead.

3 Place the transmission in fourth gear on four-speed manual transmission models or reverse gear on the five-speed unit, to aid adjustment of the gearchange linkage when

refitting. On models produced from February 1987 onwards, place the transmission in second gear on four-speed versions, or fourth gear on five-speed versions.

4 Refer to Chapter 11 and remove the bonnet.  
5 Refer to Chapter 4, Part B and remove the air cleaner.

6 Refer to Chapter 1 and drain the cooling system.

7 Disconnect the radiator top and bottom hoses and the expansion tank hose at the thermostat housing.

8 Disconnect the heater hoses from the automatic choke, thermostat housing and inlet manifold as applicable.

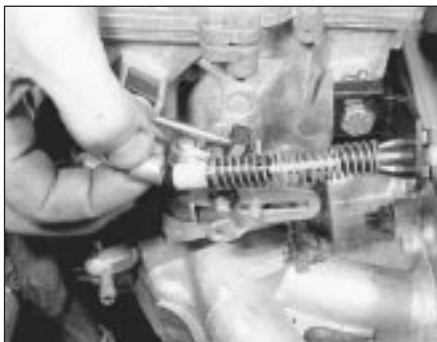
9 Disconnect the throttle cable and where fitted the choke cable ends from the carburettor throttle levers (see illustration). Unbolt the cable support bracket and move the bracket and cable(s) to one side.

10 Disconnect the fuel feed pipe from the fuel pump and plug the pipe. Where fitted disconnect the fuel return hose at the carburettor.

11 Disconnect the brake servo vacuum hose from the inlet manifold.

12 Disconnect the leads from the following electrical components:

- Alternator (see illustration).
- Cooling fan temperature switch and temperature sender (see illustrations).
- Oil pressure switch (see illustration).
- Reversing lamp switch (see illustration).
- Anti-run-on valve solenoid (see illustration) and back bleed solenoid (where applicable).



11.9 Disconnecting the throttle cable end (1.3 litre carburettor engine)



11.12a Disconnecting the alternator multi-plug . . .



11.12b . . . cooling fan switch . . .



11.12c ... temperature sender ...



11.12d ... oil pressure switch ...



11.12e ... reversing lamp switch ...

f) Electric choke (where applicable).

g) Ignition coil.

h) Distributor (see illustration).

i) Starter motor solenoid (see illustration).

13 Unscrew the speedometer drive cable from the transmission and release the breather hose (see illustration).

14 Disconnect the transmission earth strap.

15 On manual transmission models disconnect the clutch cable from the release lever and from the transmission support.

16 Disconnect the exhaust downpipe from the manifold flange and support the system to avoid undue strain.

17 Apply the handbrake, jack up the front of the car and support it on stands to provide sufficient clearance beneath it to remove the engine/transmission from below. A distance of

686 mm (27.0 in) is recommended between the floor and the bottom edge of the front panel.

18 Disconnect the exhaust system from its flexible mountings and remove the system complete.

19 On manual transmission models disconnect the gearchange rod from the transmission selector shaft by releasing the clamp bolt and withdrawing the rod (see illustration). Tie the rod to the stabiliser and then where fitted, unhook the tension spring. Unscrew the single bolt and disconnect the stabiliser from the transmission housing, noting the washer fitted between the stabiliser trunnion and the transmission.

20 On automatic transmission models refer to Chapter 7, Part B, and disconnect the starter inhibitor switch wiring, the selector

cable and the downshift linkage.

21 Remove the driveshafts from the transmission using the procedure described in Chapter 8 for each driveshaft.

22 On pre-1986 models equipped with an anti-roll bar, undo the two bolts each side securing the anti-roll bar mounting clamps and remove the clamps.

23 On 1986 models onwards, undo the three bolts each side securing the anti-roll bar mounting plates to the body (see illustration).

24 On automatic transmission models undo the transmission fluid cooler pipes and withdraw the pipes. Plug the unions to prevent dirt ingress.

25 Unbolt the right-hand and left-hand engine splash shields and remove them from under the car (see illustrations).



11.12f ... anti-run-on valve solenoid ...



11.12g ... distributor ...



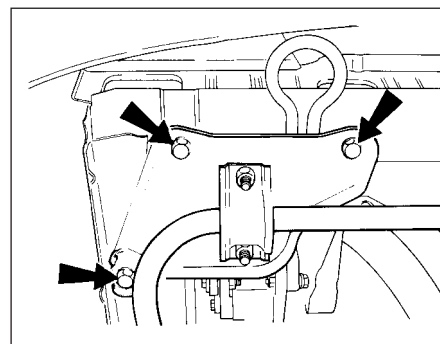
11.12h ... and starter motor connections on the 1.3 litre carburettor engine



11.13 Disconnect the speedometer cable (arrowed) at the transmission



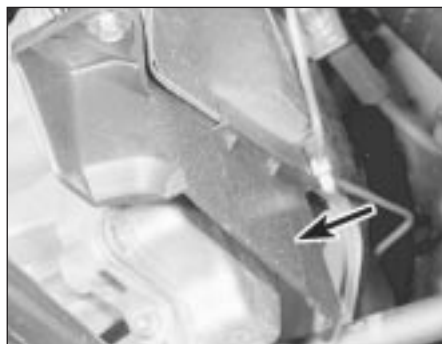
11.19 Disconnect the gearchange rod at the selector shaft clamp



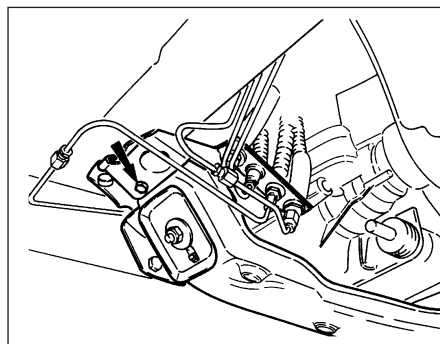
11.23 Anti-roll bar mounting plate attachments - 1986 models onwards



**11.25a Remove the right-hand splash shield . . .**



**11.25b . . . and left-hand splash shield (arrowed)**



**11.26 Anti-lock Braking System (ABS) pipe bracket retaining bolt location (arrowed)**

**26** On cars equipped with an Anti-lock Braking System (ABS) undo the hydraulic pipe mounting bracket bolt (**see illustration**). Remove the modulator clamp bolt and pivot bolt each side and tie the modulator to the underbody (see Chapter 9).

**27** Connect a suitable hoist to the engine using chains and the lifting brackets on the cylinder head.

**28** Just take the weight of the engine/transmission assembly so that the tension is relieved from the mountings.

**29** Unbolt the rear right-hand engine mounting (complete with coolant hose support on early models) from the side member and from the inner wing panel (**see illustrations**).

**30** On pre-1986 models unbolt the left-hand front and rear transmission mountings from

their brackets and remove the front mounting and anti-roll bar support plates from the body on both sides (**see illustrations**).

**31** On 1986 models onwards undo the nuts and bolts securing the transmission support crossmember to the body (**see illustration**). The crossmember is removed with the engine/transmission assembly.

**32** Carefully lower the engine/transmission and withdraw it from under the car. To ease the withdrawal operation, lower the engine/transmission onto a crawler board or a sheet of substantial chipboard placed on rollers or lengths of pipe (**see illustration**).

#### **Separation (manual transmission models)**

**33** Unscrew and remove the starter motor

bolts and remove the starter.

**34** Unbolt and remove the clutch cover plate from the lower part of the clutch bellhousing.

**35** Unscrew and remove the bolts from the clutch bellhousing-to-engine mating flange.

**36** Withdraw the transmission from the engine. Support its weight so that the clutch assembly is not distorted while the input shaft is still in engagement with the splined hub of the clutch driven plate.

#### **Separation (automatic transmission models)**

**37** Unscrew and remove the starter motor bolts and remove the starter motor.

**38** Undo the two bolts and remove the torque converter cover plate.

**39** Working through the cover plate aperture,



**11.29a Rear right-hand engine mounting attachment (arrowed) at side member . . .**



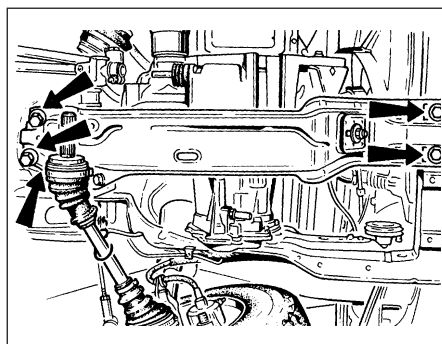
**11.29b . . . and at the inner wing panel**



**11.30a Detach the left-hand front (arrowed) . . .**



**11.30b . . . and left-hand rear transmission mountings on pre-1986 models**



**11.31 Transmission support crossmember bolt locations - 1986 models onwards**



**11.32 Removing the engine/transmission assembly from under the car**





**11.66 Air cleaner retaining bolts (arrowed) on RS Turbo models**

unscrew and remove the four nuts securing the driveplate to the torque converter. For this to be accomplished it will be necessary to progressively turn the crankshaft for access to each nut in turn. Unscrew the nuts in a progressive manner, one turn at a time until removed.

**40** Unscrew and remove the engine-to-transmission flange bolts and then separate the two units, but take care not to catch the torque converter studs on the driveplate. The torque converter is only loosely attached, so keep it in position in the transmission housing during and after removal of the transmission.

## Fuel injection engines

### Removal

#### XR3i and Cabriolet models with mechanical (Bosch K-Jetronic) fuel injection

**41** The engine is removed complete with the transmission in a downward direction and then withdrawn from under the front of the car.

**42** Disconnect the battery negative lead.

**43** Place the transmission in fourth gear on four-speed models or reverse gear on the five-speed unit to aid adjustment of the gearchange linkage when refitting. On models produced from February 1987 onwards, place the transmission in second gear on four-speed versions, or fourth gear on five-speed versions.

**44** Remove the bonnet (Chapter 11).

**45** Drain the cooling system (Chapter 1).

**46** Remove the air inlet hose between the fuel distributor and throttle housing.

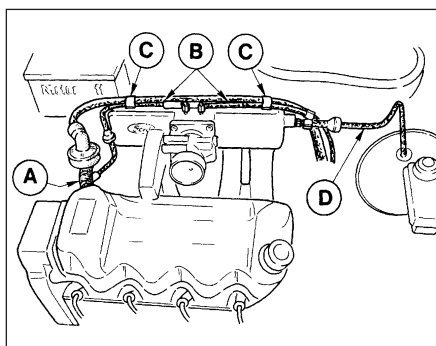
**47** Disconnect the radiator top and bottom hoses and the expansion tank hose at the thermostat housing.

**48** Disconnect the heater hoses from the thermostat housing, and the three-way connection fitting on the oil cooler.

**49** Disconnect the throttle cable end from the throttle lever and unbolt the cable bracket from the throttle housing.

**50** Relieve the fuel system pressure by *slowly* loosening the fuel feed pipe union at the warm-up regulator. Absorb fuel leakage in a cloth. Reference to the fuel-injection system layout in Chapter 4, Part B will assist in identification of the relevant components where necessary.

**51** Disconnect the vacuum servo hose from the inlet manifold.



**11.70 Vacuum and breather hose connections - RS Turbo**

*A Crankcase ventilation hose at rocker cover*

*B Vacuum hoses at inlet manifold*

*C Retaining clips*

*D Vacuum servo hose*

**52** Disconnect the two fuel pipe unions at the warm-up regulator, the single pipe to the cold start valve and the four injector feed pipes at the fuel distributor. Recover the sealing washers located on each side of the banjo unions and seal all disconnected pipes and orifices to prevent dirt ingress.

**53** Disconnect the leads from the following electrical components:

- a) Alternator.*
- b) Cooling fan temperature switch.*
- c) Oil pressure sender.*
- d) Reversing lamp switch.*
- e) Ignition coil.*
- f) Distributor.*
- g) Starter motor solenoid.*
- h) Cold start valve.*
- j) Warm-up regulator.*
- k) Auxiliary air device.*
- l) Throttle valve stop earth cable.*

**54** Unscrew the speedometer drive cable from the transmission and release the breather hose.

**55** Disconnect the transmission earth strap.

**56** Disconnect the clutch cable from the release lever and from the transmission support.

**57** The remainder of the removal procedure is the same as described previously for carburettor engines in paragraphs 16 to 32 inclusive.

### 1.4 CFI (Central Fuel Injection) and 1.6 EFI (Electronic Fuel Injection) engines

**58** Proceed as described in paragraphs 41 to 49 inclusive, ignoring the reference to the fuel distributor.

**59** Disconnect all relevant hoses, pipes and wiring to facilitate engine removal, with reference to the relevant Parts of Chapters 4 and 5.

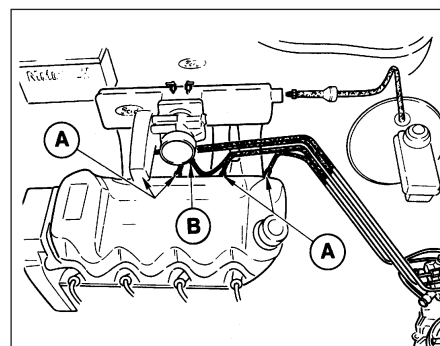
**60** Proceed as described in paragraphs 54 to 57 inclusive.

### RS Turbo models

**61** Disconnect the battery negative lead.

**62** Place the transmission in reverse gear to aid adjustment of the gearchange linkage when refitting. On models produced from February 1987 onwards, place the transmission in fourth gear.

**63** Remove the bonnet (Chapter 11).



**11.74 Fuel pipe connections - RS Turbo**

*A Fuel injectors*

*B Cold start valve*

**64** Drain the cooling system (Chapter 1).

**65** Disconnect the air inlet hose and connecting hose at the inlet air duct. Disconnect the charge air temperature sensor multi plug, undo the two bolts securing the air duct to the rocker cover and remove the duct.

**66** Undo the two bolts and remove the air cleaner assembly from the fuel distributor (see illustration).

**67** Disconnect the radiator top and bottom hoses at the thermostat housing, radiator and turbocharger return pipe as applicable.

**68** Disconnect the heater hoses from the thermostat housing, three-way connector piece and inlet manifold as applicable.

**69** Remove the turbocharger (Chapter 4, Part B).

**70** Disconnect the crankcase ventilation hose at the rocker cover and the two vacuum hoses from the top of the inlet manifold (see illustration). Release the hoses from their clips.

**71** Disconnect the vacuum servo hose from the inlet manifold.

**72** Disconnect the hose at the solenoid control valve.

**73** Disconnect the throttle cable at the throttle housing.

**74** Relieve the fuel system pressure by *slowly* loosening the cold start valve union on the top of the fuel distributor. Absorb fuel leakage in a cloth (see illustration).

**75** Disconnect the fuel pipes at the fuel injectors and at the cold start valve. Recover the sealing washers located on each side of the banjo unions and seal all disconnected pipes and orifices to prevent dirt ingress.



**11.76 Coolant temperature sensor (A) thermo-time switch (B) and auxiliary air device (C) multi-plugs on RS Turbo models**

Move the fuel pipes clear of the engine.

**76** Disconnect the wiring multi plugs at the temperature gauge sender unit, ignition coil, throttle position sensor, solenoid control valve, coolant temperature sensor, thermo-time switch, cold start valve, oil pressure switch and auxiliary air device (**see illustration**).

**77** Disconnect the speedometer cable from the transmission and the fuel computer multi-plug (where fitted).

**78** Disconnect the transmission earth strap.

**79** Disconnect the clutch cable from the release lever and from the transmission support.

**80** The remainder of the removal procedure is the same as described previously for carburettor engines in paragraphs 17 to 32 inclusive.

### Separation (all models)

**81** Separation from the manual or automatic transmission is as described previously for carburettor engines.

## 12 Engine - complete dismantling



**1** The need for dismantling will have been dictated by wear or noise in most cases. Although there is no reason why only partial dismantling cannot be carried out to renew such items as the oil pump or crankshaft rear oil seal, when the main bearings or big-end bearings have been knocking and especially if the vehicle has covered a high mileage, then it is recommended that a complete strip-down is carried out and every engine component examined as described in Section 13.

**2** Position the engine so that it is upright and safely chocked on a bench or other convenient working surface. If the exterior of the engine is very dirty it should be cleaned before dismantling, using paraffin and a stiff brush or a water-soluble solvent.

**3** Remove the alternator, the mounting bracket and exhaust heat shield, and the adjuster link (**see illustration**).



**12.3 Removing the alternator heat shield**

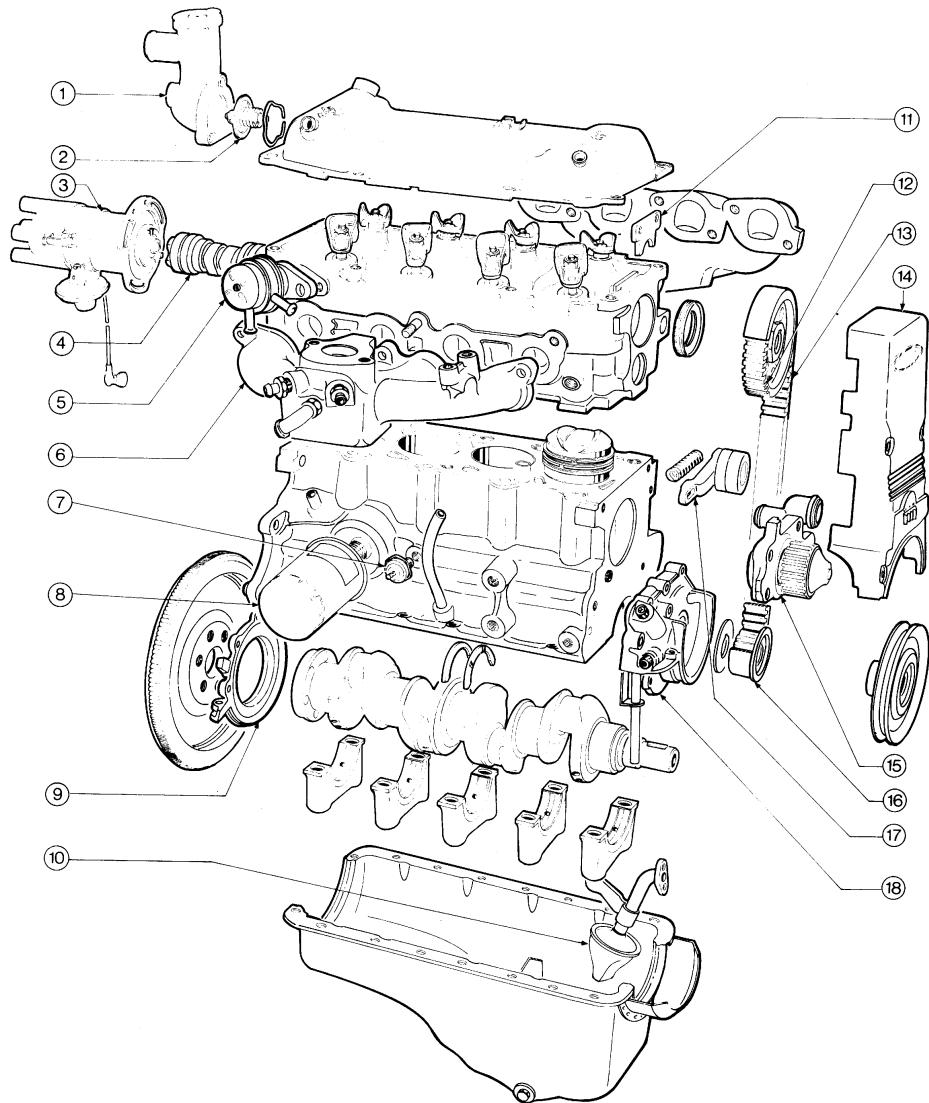
**4** Disconnect the heater hose from the water pump.

**5** Drain the engine oil and remove the filter and oil cooler where applicable.

**6** Jam the flywheel starter ring gear to prevent the crankshaft turning and unscrew the crankshaft pulley bolt. Remove the pulley.

**12.7 Exploded view of the engine**

- 1 Thermostat housing
- 2 Thermostat
- 3 Distributor
- 4 Camshaft
- 5 Fuel pump
- 6 Inlet manifold
- 7 Oil pressure switch
- 8 Oil filter
- 9 Oil seal retainer
- 10 Oil pump pick-up tube and strainer
- 11 Camshaft thrust plate
- 12 Camshaft belt sprocket
- 13 Timing belt
- 14 Timing belt cover (one-piece type)
- 15 Water pump
- 16 Crankshaft belt sprocket
- 17 Timing belt tensioner
- 18 Oil pump







12.13 Remove the rocker cover



12.25 Unscrew the oil pressure switch

7 Unbolt and remove the timing belt cover (4 bolts) (see illustration). Note that the cover is in two halves on later models.

8 Slacken the two bolts on the timing belt tensioner, lever the tensioner against its spring pressure where applicable and tighten the bolts to lock it in position.

9 With the belt now slack, note its running direction and mark the mating belt and sprocket teeth with a spot of quick-drying paint. This is not necessary if the belt is being renewed.

10 Disconnect the spark plug leads and, where applicable, remove the distributor cap complete with HT leads (if not already done).

11 Unscrew and remove the spark plugs.

12 Disconnect the crankcase ventilation hose from its connector on the crankcase.

13 Remove the rocker cover (see illustration).

14 Unscrew the cylinder head bolts in the sequence shown in illustration 7.18 and discard them. New bolts must be used at reassembly.

15 Remove the cylinder head complete with manifolds.

16 Turn the engine on its side. Do not invert it as sludge in the sump may enter the oilways. Remove the sump bolts, withdraw the sump and peel off the gaskets and sealing strips.

17 Remove the bolts from the clutch pressure plate in a progressive manner until the pressure of the assembly is relieved and then remove the cover, taking care not to allow the friction plate to fall to the floor.

18 Unbolt and remove the flywheel. The bolt holes are offset so it will only fit one way.

19 Remove the engine adapter plate.

20 Unbolt and remove the crankshaft rear oil seal retainer.

21 Unbolt and remove the timing belt tensioner and take out the coil spring. (This spring is not used on all models).

22 Unbolt and remove the water pump.

23 Remove the belt sprocket from the crankshaft using the hands or if tight, a two-legged puller. Take off the thrustwasher.

24 Unbolt the oil pump and pick-up tube and remove them as an assembly.

25 Unscrew and remove the oil pressure switch (see illustration).

26 Turn the crankshaft so that all the pistons are half-way down the bores, and feel if a wear ridge exists at the top of the bores. If so, scrape the ridge away, taking care not to damage the bores.

27 Inspect the big-end and main bearing caps for markings. The main bearings should be marked 1 to 5 with a directional arrow pointing to the timing belt end. The big-end caps and connecting rods should have adjacent matching numbers. Number 1 is at the timing belt end of the engine. Make your own marks if necessary.

28 Unscrew the bolts from the first big-end cap and remove the cap. The cap is located on two roll pins, so if the cap requires tapping off make sure that it is not tapped in a sideways direction.

29 Retain the bearing shell with the cap if the shell is to be used again.

30 Push the piston/connecting rod out of the

top of the cylinder block, again retaining the bearing shell with the rod if the shell is to be used again.

31 Remove the remaining pistons/rods in a similar way.

32 Remove the main bearing caps, keeping the shells with their respective caps if the shells are to be used again. Lift out the crankshaft.

33 Take out the bearing shells from the crankcase, noting the semi-circular thrustwashers on either side of the centre bearing. Keep the shells identified as to position in the crankcase if they are to be used again.

34 Prise down the spring arms of the crankcase ventilation baffle and remove it from inside the crankcase just below the ventilation hose connection.

35 The engine is now completely dismantled and each component should be examined as described in Section 13 before reassembling.

## 13 Examination and renovation

### Crankshaft, bearings, cylinder bores and pistons

1 Refer to Section 13 in Part A of this Chapter. The information applies equally to the CVH engine, except that standard sized crankshafts are unmarked and the following differences in the piston rings should be noted.

2 The top rings are coated with molybdenum. Avoid damaging the coating when fitting the rings to the pistons.

3 The lower (oil control) ring must be fitted so that the manufacturer's mark is towards the piston crown, or the groove towards the gudgeon pin. Take care that the rails of the oil control ring abut without overlapping.

### Timing sprockets and belt

4 It is very rare for the teeth of the sprockets to wear, but attention should be given to the tensioner idler pulley. It must turn freely and smoothly, be ungrooved and without any shake in its bearing. Otherwise renew it.

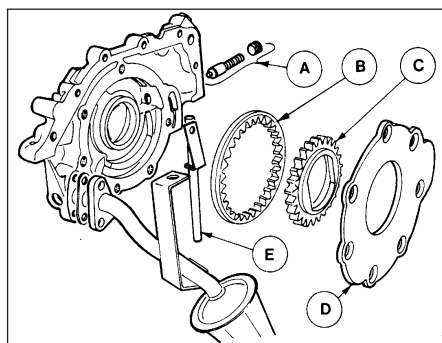
5 Always renew the coil spring (if fitted) in the tensioner. If the engine has covered 36 000 miles (60 000 km) then it is essential that a new belt is fitted, even if the original one appears in good condition.

### Flywheel

6 Refer to Section 13 in Part A of this Chapter.

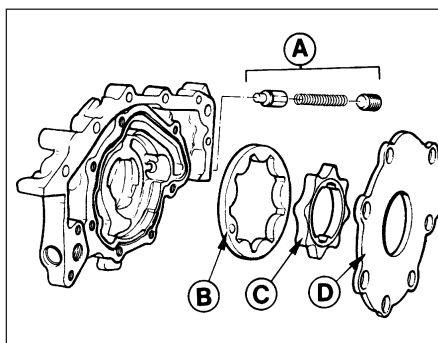
### Oil pump

7 The oil pump on pre-1986 models is of gear type incorporating a crescent shape spacer. From 1986 onwards a low friction rotor type is fitted. Although no wear limit tolerances are specified for the gear type pump, if on inspection there is obvious wear between the gears, or signs of scoring or wear ridges, the pump should be renewed (see illustrations). Similarly if a high mileage engine is being reconditioned it is recommended that a new pump is fitted. Inspection of the rotor type pump is covered in Section 13, in Part A of this Chapter.



13.7a Gear type oil pump

A Pressure relief valve  
B Driven gear  
C Driving gear  
D Oil pump cover  
E Return pipe



13.7b Rotor type oil pump

A Pressure relief valve  
B Outer rotor  
C Inner rotor  
D Oil pump cover

### Oil seals and gaskets

**8** Renew the oil seals in the oil pump and in the crankshaft rear oil seal retainer as a matter of routine at time of major overhaul. It is recommended that the new seals are drawn into these components using a nut and bolt and distance pieces, rather than tapping them into position, to avoid distortion of the light alloy castings.

**9** Renew the camshaft oil seal after the camshaft has been installed.

**10** Always smear the lips of a new oil seal with grease, and check that the small tensioner spring in the oil seal has not been displaced during installation.

**11** Renew all gaskets by purchasing the appropriate engine set, which usually includes the necessary oil seals.

### Crankcase

**12** Refer to Section 13 in Part A of this Chapter.

### Camshaft and bearings

**13** Examine the camshaft gear and lobes for damage or wear. If evident, a new camshaft must be purchased, or one which has been built-up, such as are advertised by firms specialising in exchange components.

**14** The bearing internal diameters in the cylinder head should be checked against the Specifications if a suitable gauge is available, otherwise check for movement between the camshaft journal and the bearing. If the bearings are proved to be worn, then a new cylinder head is the only answer as the bearings are machined directly in the cylinder head.

**15** Check the camshaft endfloat by temporarily refitting the camshaft and thrust plate. If the endfloat exceeds the specified tolerance, renew the thrust plate.

### Cam followers

**16** It is seldom that the hydraulic type cam followers (tappets) wear in their cylinder head bores. If the bores are worn then a new cylinder head is called for.

**17** If the cam lobe contact surface shows signs of a depression or grooving, grinding out the wear surface will not only remove the hardened surface of the follower but may also

reduce its overall length to a point where the self-adjusting capability of the cam follower is exceeded and valve clearances are not taken up, with consequent noisy operation.

**18** Cam followers cannot be dismantled so if they become worn after high mileage, they must be renewed. On refitting, it is only necessary to smear the outside surfaces with clean engine oil, as they are self priming and will fill with engine oil once the engine is running, although initial operation may be noisy until primed.

### Cylinder head and rocker arms

**19** The usual reason for dismantling the cylinder head is to decarbonise and to grind in the valves. Reference should therefore be made to Section 14 in addition to the dismantling operations described here.

**20** Remove the inlet and exhaust manifolds and their gaskets (Chapter 4, Part E) also the thermostat housing (Chapter 3).

**21** Unscrew the nuts from the rocker arms and discard the nuts. New ones must be fitted at reassembly.

**22** Remove the rocker arms and the hydraulic cam followers, keeping them in their originally fitted sequence. Keep the rocker guide and spacer plates in order.

**23** The camshaft need not be withdrawn but if it is wished to do so, first remove the thrust plate and take the camshaft out from the rear of the cylinder head.

**24** The valve springs should now be compressed. A standard type of compressor will normally do the job, but a forked tool (Part No 21-097) can be purchased or made up to engage on the rocker stud using a nut and distance piece to compress it.

**25** Compress the valve spring and extract the split collets. Do not overcompress the spring, or the valve stem may bend. If it is found when screwing down the compressor tool that the spring retainer does not release from the collets, remove the compressor and place a piece of tubing on the retainer so that it does not impinge on the collets and place a small block of wood under the head of the valve. With the cylinder head resting flat down on the bench, strike the end of the tubing a sharp blow with a hammer. Refit the compressor and compress the spring.

**26** Extract the split collets and then gently release the compressor and remove it.

**27** Remove the valve spring retainer, the spring and the valve stem oil seal. Withdraw the valve.

**28** Valve removal should commence with No 1 valve (nearest timing belt end). Keep the valves and their components in their originally installed order by placing them in a piece of card which has holes punched in it and numbered 1 to 8.

**29** To check for wear in the valve guides, place each valve in turn in its guide so that approximately one third of its length enters the guide. Rock the valve from side to side. If any more than the slightest movement is possible, the guides will have to be reamed (working from the valve seat end) and oversize stemmed valves fitted. If you do not have the necessary reamer (Tool No 21-071 to 21-074), leave this work to your Ford dealer.

**30** Examine the valve seats. Normally the seats do not deteriorate, but the valve heads are more likely to burn away, in which case new valves can be ground in as described in the next Section. If the seats require recutting, use a standard cutter, available from most accessory or tool stores.

**31** Renewal of any valve seat which is cracked or beyond recutting is definitely a job for your dealer or motor engineering works.

**32** If the rocker arm studs must be removed for any reason, a special procedure is necessary. Warm the upper ends of the studs with a blow-lamp flame (not a welder) before unscrewing them. Clean out the cylinder head threads with an M10 tap and clean the threads of oil or grease. Discard the old studs and fit new ones, which will be coated with adhesive compound on their threaded portion or will have a nylon locking insert. Screw in the studs without pausing, otherwise the adhesive will start to set and prevent the stud seating.

**33** If the cylinder head mating surface is suspected of being distorted, it can be checked and surface ground by your dealer or motor engineering works. Distortion is possible with this type of light alloy head if the bolt tightening method is not followed exactly, or if severe overheating has taken place.

**34** Check the rocker arm contact surfaces for wear. Renew the valve springs if they have been in service for 50 000 miles (80 000 km) or more.

**35** Commence reassembly of the cylinder head by fitting new valve stem oil seals (see illustration).

**36** Oil No 1 valve stem and insert the valve into its guide (see illustration).

**37** Fit the valve spring (closer coils to cylinder head), then the spring retainer (see illustrations).

**38** Compress the spring and engage the split collets in the cut-out in the valve stem. Hold them in position while the compressor is gently released and removed (see illustration).



13.35 Using a socket to install a valve stem oil seal



13.36 Inserting a valve into its guide



13.37a Fit the valve spring . . .



13.37b . . . and spring retainer

13.38 Compress the spring and fit the  
collets

**39** Repeat the operations on the remaining valves, making sure that each valve is returned to its original guide or new valves have been fitted, into the seat into which it was ground.

**40** Once all the valves have been fitted, support the ends of the cylinder head on two wooden blocks and strike the end of each valve stem with a plastic or copper-faced hammer, just a light blow to settle the components.

**41** Fit the camshaft (if removed) and a new oil seal as described in Section 6.

**42** Smear the hydraulic cam followers with hypoid type transmission oil and insert them into their original bores (see illustration).

**43** Fit the rocker arms with their guides and spacer plates, use new nuts and tighten to the specified torque. It is important that each rocker arm is installed only when its particular cam follower is at its lowest point (in contact with the cam base circle) (see illustrations).

**44** Refit the exhaust and inlet manifolds and the thermostat housing, using all new gaskets.

## 14 Cylinder head and pistons - decarbonising



**1** With the cylinder head removed as described in Section 7, the carbon deposits should be removed from the combustion surfaces using a blunt scraper. Take great care as the head is of light alloy construction and avoid the use of a rotary (power-driven) wire brush.

**2** Where a more thorough job is to be carried out, the cylinder head should be dismantled as described in Section 13 so that the valves may be ground in, and the ports and combustion spaces cleaned and blown out after the manifolds have been removed.

**3** Before grinding in a valve, remove the carbon and deposits completely from its head and stem. With an inlet valve this is usually quite easy, simply a case of scraping off the soft carbon with a blunt knife and finishing with a wire brush. With an exhaust valve, the deposits are very much harder and those on the valve head may need a rub on coarse emery cloth to remove them. An old woodworking chisel is a useful tool to remove the worst of the valve head deposits.

**4** Make sure that the valve heads are really clean, otherwise the rubber suction cup grinding tool will not stick during the grinding-in operations.

**5** Before starting to grind in a valve, support the cylinder head so that there is sufficient clearance under it for the valve stem to project fully without being obstructed, otherwise the valve will not seat properly during grinding.

**6** Take the first valve and apply a little coarse grinding paste to the bevelled edge of the valve head. Insert the valve into its guide and apply the suction grinding tool to its head. Rotate the tool between the palms of the hands in a back-and-forth rotary movement until the gritty action of the grinding-in process disappears. Repeat the operation with fine paste and then wipe away all trace of grinding

paste and examine the seat and bevelled edge of the valve. A matt silver mating band should be observed on both components, without any sign of black spots. If some spots do remain, repeat the grinding-in process until they have disappeared. A drop or two of paraffin applied to the contact surfaces will speed the grinding process, but do not allow any paste to run down into the valve guide. On completion, wipe away every trace of grinding paste using a paraffin-moistened cloth.

**7** Repeat the operations on the remaining valves, taking care not to mix up their originally fitted sequence.

**8** An important part of the decarbonising operation is to remove the carbon deposits from the piston crowns. To do this (engine in vehicle), turn the crankshaft so that two pistons are at the top of their stroke and press some grease between the pistons and the cylinder walls. This will prevent carbon particles falling down into the piston ring grooves. Plug the other two bores with rag.

**9** Cover the oilways and coolant passages with masking tape and then using a blunt scraper, remove all the carbon from the piston crowns. Take great care not to score the soft alloy of the crown or the surface of the cylinder bore.

**10** Rotate the crankshaft to bring the other two pistons to TDC and repeat the operations.

**11** Wipe away the circles of grease and carbon from the cylinder bores.

**12** Clean the top surfaces of the cylinder block by careful scraping.



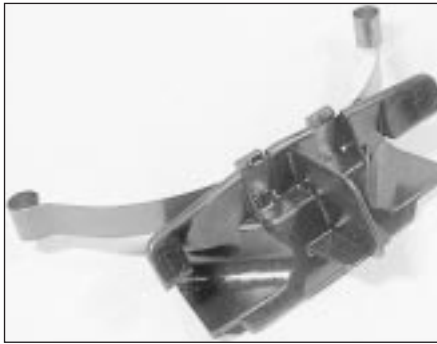
13.42 Fitting a cam follower to its bore



13.43a Fit the rocker arm spacer plate . . .

13.43b . . . followed by the rocker arm and  
guide





15.1 Crankcase ventilation baffle



15.2 Inserting a main bearing shell into the crankcase



15.3 Locating the crankshaft thrustwashers on the centre main bearing

## 15 Engine - reassembly



**Note:** Ensure that all necessary new oil seals and gaskets have been obtained before starting the reassembly procedure.

1 With everything clean and parts renewed where necessary, commence reassembly by inserting the ventilation baffle into the crankcase. Make sure that the spring arms engage securely (see illustration).

2 Insert the bearing half shells into their seats in the crankcase, making sure that the seats are perfectly clean (see illustration).

3 Stick the semi-circular thrustwashers on either side of the centre bearing with thick grease. Make sure that the oil channels face

outwards (see illustration).

4 Oil the bearing shells and carefully lower the crankshaft into position.

5 Insert the bearings shells into the main bearing caps, making sure that their seats are perfectly clean. Oil the bearings and install the caps in their correct numbered location and with the directional arrow pointing towards the timing belt end of the engine (see illustrations).

6 Tighten the main bearing cap bolts to the specified torque.

7 Check the crankshaft endfloat. Ideally a dial gauge should be used, but feeler blades are an alternative if inserted between the face of the thrustwasher and the machined surface of the crankshaft balance web, having first prised the crankshaft in one direction and then the other

(see illustration). Provided the thrustwashers at the centre bearing have been renewed, the endfloat should be within specified tolerance. If it is not, oversize thrustwashers are available (see Specifications).

8 The pistons/connecting rods should now be installed. Although new pistons may have been fitted to the rods by your dealer or supplier due to the special tools needed, it is worth checking to ensure that with the piston crown arrow or cast nipple in the piston oil cut-out pointing towards the timing belt end of the engine, the F mark on the connecting rod or the oil ejection hole in the rod big-end is as shown (see illustration).

9 Oil the cylinder bores and install the pistons/connecting rods (Section 9).

10 Fit the oil pressure switch.

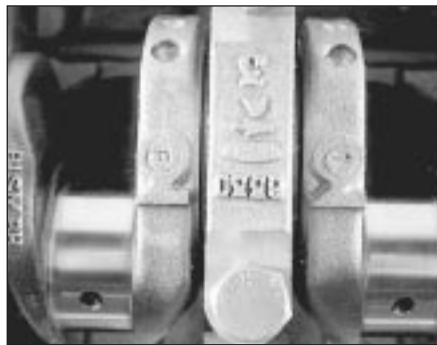
11 Before fitting the oil pump, action must be taken to prevent damage to the pump oil seal from the step on the front end of the crankshaft. First remove the Woodruff key and then build up the front end of the crankshaft using adhesive tape to form a smooth inclined surface to permit the pump seal to slide over the step without its lip turning back or the seal spring being displaced during installation (see illustration).

12 If the oil pump is new, pour some oil into it before installation in order to prime it and rotate its driving gear a few turns (see illustration).

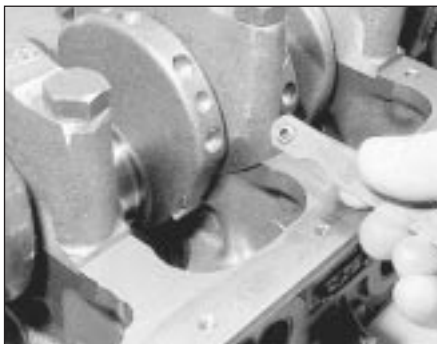
13 Align the pump gear flats with those on the crankshaft and install the oil pump complete with new gasket. Tighten the bolts to the specified torque.



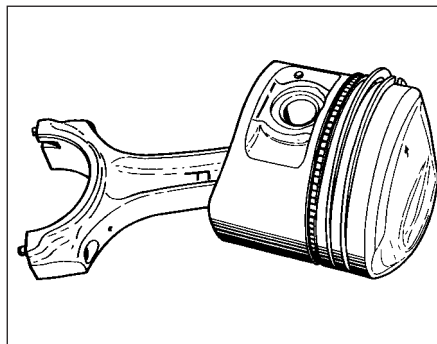
15.5a Fit the caps to their correct numbered locations . . .



15.5b . . . with the arrows on the caps pointing toward the timing belt end



15.7 Checking crankshaft endfloat with a feeler blade



15.8 Piston/connecting rod orientation



15.11 Using masking tape to eliminate the step on the crankshaft



15.12 Priming the oil pump prior to fitting



15.15 Fitting the oil pump pick-up tube



15.16 Fit the timing belt guide with its concave side towards the pump

14 Remove the adhesive tape and tap the Woodruff key into its groove.

15 Bolt the oil pump pick-up tube into position (see illustration).

16 To the front end of the crankshaft, fit the thrustwasher (belt guide) so that its concave side is towards the pump (see illustration).

17 Fit the crankshaft belt sprocket. If it is tight, draw it into position using the pulley bolt and a distance piece. Make sure that the belt retaining flange on the sprocket is towards the front of the crankshaft and the nose of the shaft has been smeared with a little grease before fitting (see illustration).

18 Install the water pump using a new gasket and tightening the bolts to the specified torque (see illustration).

19 Fit the timing belt tensioner and its coil

spring (where fitted). Lever the tensioner fully against spring pressure and temporarily tighten the bolts.

20 Using a new gasket, bolt on the rear oil seal retainer, which will have been fitted with a new oil seal and the seal lips greased (see illustration).

21 Engage the engine adapter plate on its locating dowels and then offer up the flywheel. It will only go on in one position as it has offset holes. Insert new bolts and tighten to the specified torque (see illustrations). The bolts should be pre-coated with thread sealant.

22 Fit the clutch and centralise it (refer to Chapter 6).

23 With the engine resting on its side (not inverted unless you are quite sure that the

pistons are not projecting from the block), fit the sump, gaskets and sealing strips as described in Section 8.

24 Fit the cylinder head as described in Section 7, using new bolts. Refit the manifolds (see illustrations).

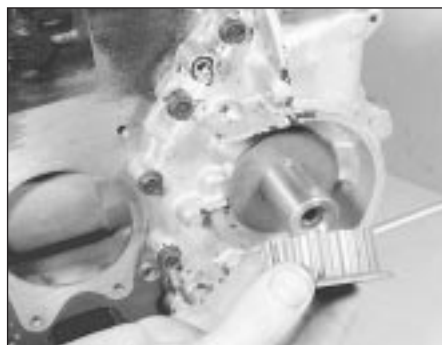
25 Install and tension the timing belt as described in Section 4.

26 Using a new gasket, fit the rocker cover.

27 Reconnect the crankcase ventilation hoses between the rocker cover and the crankcase (see illustrations).

28 Screw in a new set of spark plugs, correctly gapped, and tighten to the specified torque - this is important. If the specified torque is exceeded, the plugs may be impossible to remove (see Chapter 1).

29 Fit the timing belt cover.



15.17 Fitting the crankshaft sprocket with the flange outward



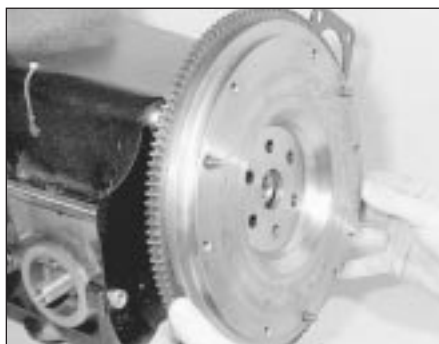
15.18 Fitting the water pump



15.20 Crankshaft rear oil seal retainer with new seal prior to fitting



15.21a Locate the adapter plate on the dowels . . .

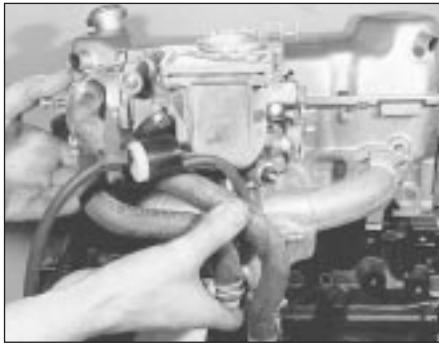


15.21b . . . fit the flywheel to the crankshaft



15.24a Fit the inlet manifold gasket . . .





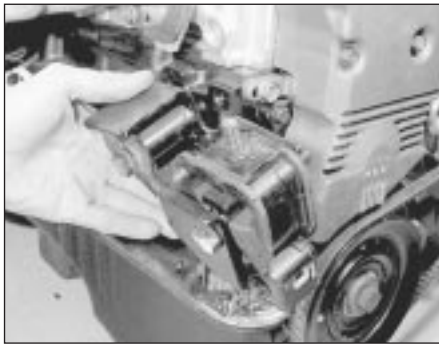
15.24b ... and manifold



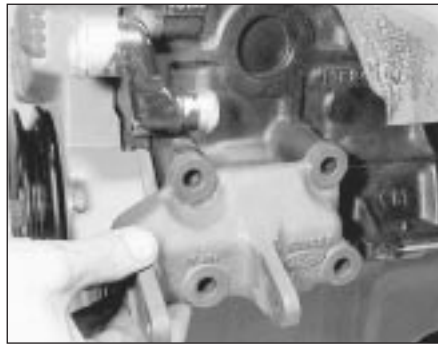
15.27a Connecting the crankcase rear ventilation hose ...



15.27b ... and the front hose



15.32 Fitting the right-hand engine mounting



15.33 Fitting the alternator mounting bracket

30 Fit the crankshaft pulley and tighten the bolt to the specified torque while the flywheel ring gear is locked to prevent it turning.

31 Smear the sealing ring of a new oil filter with a little grease, and screw it into position using hand pressure only. Where applicable, refit the oil cooler at the same time.

32 Install the engine mounting brackets, if removed (**see illustration**).

33 Refit the ancillaries. The alternator bracket and alternator (Chapter 5, Part A), the fuel pump, where applicable (Chapter 4, Part A), the thermostat housing (Chapter 3), and the distributor (Chapter 5, Part B) (**see illustration**).

34 Fit the distributor cap and reconnect the HT leads.

35 Check the tightness of the oil drain plug and insert the dipstick.

transmission input shaft with molybdenum disulphide grease and then, supporting the weight of the transmission, connect it to the engine by passing the input shaft through the splined hub of the clutch plate until the transmission locates on the dowels. Screw in the bolts and tighten to the specified torque. Refit the clutch cover plate and the starter motor.

4 On automatic transmission models ensure that the torque converter is fully seated on the transmission, then locate the transmission on the engine dowels while at the same time guiding the torque converter studs through the holes in the driveplate. Screw in the engine-to-transmission bolts and tighten to the specified torque. Turn the crankshaft to provide access to each of the torque converter studs in turn, then fit and tighten the nuts. Refit the cover plate and the starter motor.

### Installation

5 First check that the engine sump drain plug is tight and then, where applicable refit the selector shaft cap nut (removed to drain the manual transmission oil) together with its spring and interlock pin (**see illustration**). Apply sealer to the cap nut threads when refitting (**see Specifications Chapter 7, Part A**).

6 Manoeuvre the engine/transmission under the vehicle and attach the lifting hoist. Raise the engine/transmission carefully until the right-hand rear mounting can be engaged. Refit the mounting nut and bolt but loosely only at this stage.

7 On pre-1986 models refit the front mounting and anti-roll bar support plates, then refit the left-hand front and rear mountings loosely only.

8 On 1986 models onwards, refit the transmission support crossmember.

9 Lower the hoist and let the power unit rest on its mountings. Ensure that none of the mountings are under strain, then tighten all the mounting nuts and bolts to the specified torque and remove the hoist.

10 The driveshafts and suspension arms should now be refitted using the procedure described in Chapter 8.

11 Refit the anti-roll bar clamps and mounting plates as applicable.

12 On cars equipped with an Anti-lock Braking System (ABS), refit the modulators, drivebelts and the pipe mounting bracket, then adjust the modulator drivebelt tension as described in Chapter 9.

13 Refit the engine splash shields.

14 On automatic transmission models reconnect the fluid cooler pipes, then reconnect and adjust the selector cable and downshift linkage as described in Chapter 7, Part B.

15 On manual transmission models reconnect and adjust the gearchange linkage using the procedure described in Chapter 7, Part A.

16 On RS Turbo models refer to Chapter 4, Part B and refit the turbocharger.

17 Refit the exhaust system and bolt the downpipe to the manifold.



16.5 Fitting the selector shaft cap nut, spring and interlock pin

## 16 Engine/transmission - reconnection and installation



1 This is a direct reversal of removal and separation from the transmission. Take care not to damage the radiator or front wings during installation.

### Reconnection

2 Make sure that the engine adapter plate is correctly located on its dowels.

3 On manual transmission models check that the clutch driven plate has been centralised as described in Chapter 6. Smear the splines of the

18 Check that everything has been reconnected underneath, then lower the car to the ground.

19 Where applicable reconnect the clutch operating cable.

20 Reconnect the transmission earth strap and speedometer cable.

21 Reconnect the coolant and heater hoses.

22 Reconnect the accelerator cable and where fitted the choke cable and adjust as described in Chapter 4, Part A.

23 Reconnect all fuel and vacuum hoses and pipes with reference to the relevant Part of Chapter 4 where necessary. Use screw type hose clips to secure any hoses originally retained with crimped clips. On fuel-injection models use new sealing washers on each side of the banjo unions.

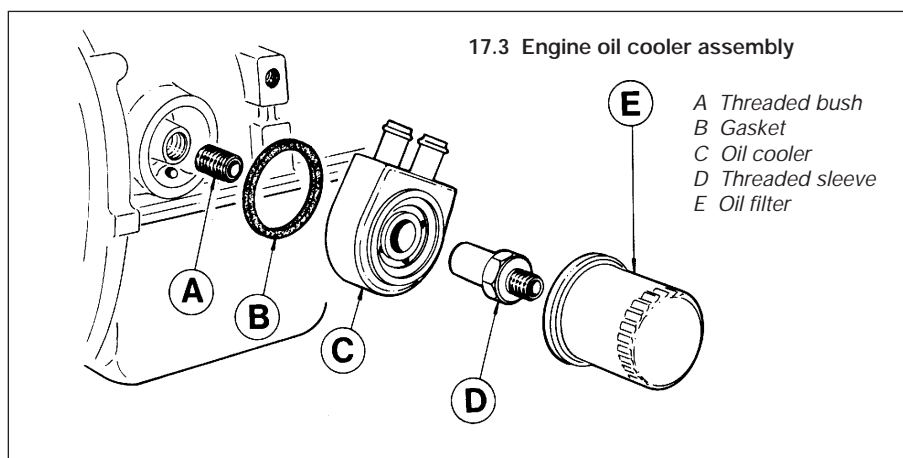
24 Reconnect all electrical wiring with reference to Chapters 3, 4, 5 and 12 and to any notes made during removal.

25 Fill up with engine oil, transmission oil or fluid and coolant, then reconnect the battery.

26 Refit the bonnet and the air cleaner or on RS Turbo models the inlet air duct.

27 Once the engine is running check the dwell angle, timing, idle speed and mixture as described in Chapter 1.

28 If a number of new internal components have been installed, run the vehicle at a restricted speed for the first few hundred miles to allow time for the new components to bed in. It is also recommended that with a new or rebuilt engine, the engine oil and filter are changed at the end of the running-in period.



## 17 Engine oil cooler - removal and refitting

**Note:** Suitable sealant will be required on refitting - see text.

### Removal

1 Remove the engine oil filter (Chapter 1).

2 Note the angle at which the coolant hoses are set, then disconnect the hoses and plug their ends to minimise coolant loss. If necessary, drain the coolant (Chapter 1).

3 Using a ring spanner or socket, undo and remove the threaded sleeve (**see illustration**).

4 Remove the oil cooler and its gasket.

5 Should the threaded bush come out with the threaded sleeve, or if it is removed for other reasons, it should be renewed.

### Refitting

6 Clean the threads of the female connection in the cylinder block, then commence refitting

by screwing a new threaded bush into the cylinder block.

7 Apply Omnifit Activator "Rapid" (to Ford Specification SSM-998-9000-AA) to the exposed threads of the bush and to the internal threads of the threaded sleeve.

8 Apply **one drop** of Omnifit Sealant "300 Rapid" (to Ford Specification SSM-4G-9003-AA) to the threads of the bush. **Do not** use more than one drop, as there is risk of contaminating the oil system.

9 Fit the oil cooler over the threaded bush using a new gasket, and secure it in position (remember the angle of the coolant pipes) with the threaded sleeve, tightening it to the specified torque.

10 Fit the new oil filter (Chapter 1).

11 Reconnect the coolant hoses, top-up the oil and coolant to their correct levels, and then run the engine to normal operating temperature and check for leaks. On completion, allow the engine to cool and recheck oil and coolant levels.

