

Chapter 2 Part A: SOHC engines

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Degrees of difficulty

Easy , suitable for novice with little experience 	Fairly easy , suitable for beginner with some experience 	Fairly difficult , suitable for competent DIY mechanic 	Difficult , suitable for experienced DIY mechanic 	Very difficult , suitable for expert DIY or professional 
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Specifications

1.3 litre engine

General

Engine type	Four-cylinder, in-line, single overhead camshaft
Firing order	1-3-4-2
Engine code	JCT
Bore	79.02 mm
Stroke	66.00 mm
Cubic capacity	1294 cc
Compression ratio	9.0:1
Compression pressure at starter motor speed	11 to 13 bar
Maximum continuous engine speed	5800 rpm
Maximum engine power (DIN)	44 kW at 5700 rpm
Maximum engine torque (DIN)	98 Nm at 3100 rpm

Cylinder bore diameter

Standard class 1	79.000 to 79.010 mm
Standard class 2	79.010 to 79.020 mm
Standard class 3	79.020 to 79.030 mm
Standard class 4	79.030 to 79.040 mm
Oversize class A	79.510 to 79.520 mm
Oversize class B	79.520 to 79.530 mm
Oversize class C	79.530 to 79.540 mm
Standard service	79.030 to 79.040 mm
Oversize 0.5	79.530 to 79.540 mm
Oversize 1.0	80.030 to 80.040 mm

2A•2 SOHC engines

Crankshaft

Endfloat	0.08 to 0.28 mm (0.003 to 0.011 in)
Main bearing running clearance	0.010 to 0.064 mm
Main bearing journal diameter:	
Standard	56.970 to 56.990 mm
Undersize 0.25	56.720 to 56.740 mm
Undersize 0.50	56.470 to 56.490 mm
Undersize 0.75	56.220 to 56.240 mm
Undersize 1.00	55.970 to 55.990 mm
Main bearing thrustwasher thickness:	
Standard	2.30 to 2.35 mm
Oversize	2.50 to 2.55 mm
Big-end bearing running clearance	0.006 to 0.060 mm
Big-end bearing journal diameter:	
Standard	51.980 to 52.000 mm
Undersize 0.25	51.730 to 51.750 mm
Undersize 0.50	51.480 to 51.500 mm
Undersize 0.75	51.230 to 51.250 mm
Undersize 1.00	50.980 to 51.000 mm

Pistons and piston rings

Piston diameter:	
Standard class 1	78.965 to 78.975 mm
Standard class 2	78.975 to 78.985 mm
Standard class 3	78.985 to 78.995 mm
Standard class 4	78.995 to 79.005 mm
Standard service	78.990 to 79.015 mm
Service oversize 0.5	79.490 to 79.515 mm
Service oversize 1.0	79.990 to 80.015 mm
Piston ring end gap:	
Top	0.300 to 0.500 mm
Centre	0.300 to 0.500 mm
Bottom	0.400 to 1.400 mm

Auxiliary shaft

Endfloat	0.050 to 0.204 mm (0.002 to 0.008 in)
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Cylinder head

Valve seat angle	44° 30' to 45° 00'
Service correction cutter*:	
Upper correction angle	30°
Lower correction angle:	
Inlet	75°
Exhaust	62.5°
Valve seat width	1.5 to 2.0 mm
Valve guide bore:	
Standard	8.063 to 8.088 mm
Oversize 0.2	8.263 to 8.288 mm
Oversize 0.4	8.463 to 8.488 mm

*Not for use with hardened valve seats

Camshaft

Endfloat	0.104 to 0.204 mm (0.004 to 0.008 in)
Thrust plate thickness	3.98 to 4.01 mm (0.156 to 0.158 in)
Bearing journal diameter:	
Front	41.987 to 42.013 mm
Centre	44.607 to 44.633 mm
Rear	44.987 to 45.013 mm

Valves

Valve clearance (cold engine):	
Inlet	0.20 ± 0.03 mm (0.008 ± 0.001 in)
Exhaust	0.25 ± 0.03 mm (0.010 ± 0.001 in)
Valve timing:	
Inlet opens	22° BTDC
Inlet closes	54° ABDC
Exhaust opens	64° BBDC
Exhaust closes	12° ATDC
Valve spring free length	47.00 mm (1.85 in)

Inlet valve stem diameter:	
Standard	8.025 to 8.043 mm
Oversize 0.2	8.225 to 8.243 mm
Oversize 0.4	8.425 to 8.443 mm
Oversize 0.6	8.625 to 8.643 mm
Oversize 0.8	8.825 to 8.843 mm
Exhaust valve stem diameter:	
Standard	7.999 to 8.017 mm
Oversize 0.2	8.199 to 8.217 mm
Oversize 0.4	8.399 to 8.417 mm
Oversize 0.6	8.599 to 8.617 mm
Oversize 0.8	8.799 to 8.817 mm

Lubrication system

Oil type	Multigrade engine oil, viscosity range SAE 10W/30 to 20W/50 to API SG/CD or better
Oil capacity:	
With filter	3.75 litres (6.6 pints)
Without filter	3.25 litres (5.7 pints)
Oil filter	Champion C102
Oil pump clearances:	
Outer rotor to body	0.153 to 0.304 mm (0.006 to 0.012 in)
Inner rotor to outer rotor	0.050 to 0.200 mm (0.002 to 0.008 in)
Rotor endfloat	0.039 to 0.104 mm (0.002 to 0.004 in)

Torque wrench settings

	Nm	lbf ft
Main bearing cap bolts	88 to 102	65 to 75
Big-end bearing cap nuts	40 to 47	30 to 35
Crankshaft pulley bolt:		
Strength class 8.8	55 to 60	41 to 44
Strength class 10.9	100 to 115	74 to 85
Camshaft sprocket bolt	45 to 50	33 to 37
Auxiliary shaft sprocket bolt	45 to 50	33 to 37
Flywheel bolts	64 to 70	47 to 52
Oil pump bolts	17 to 21	13 to 15
Oil pump cover bolts	9 to 13	7 to 10
Sump bolts:		
Stage 1	1 to 2	0.7 to 1.5
Stage 2	6 to 8	4 to 6
Stage 3 (after running engine for 20 minutes)	8 to 10	6 to 7
Sump drain plug	21 to 28	15 to 21
Oil pressure warning lamp switch	12 to 15	9 to 11
Valve adjustment ball-pin locknuts:		
7 mm thick nuts	45 to 50	33 to 37
8 mm thick nuts	50 to 55	37 to 41
Cylinder head bolts:		
Splined type bolts:		
Stage 1	40 to 55	30 to 41
Stage 2	50 to 70	37 to 52
Stage 3 (after 20 minutes)	73 to 83	54 to 61
Stage 4 (after running engine for 15 minutes at 1000 rpm)	95 to 115	70 to 85
Torx type bolts:		
Stage 1	35 to 40	26 to 30
Stage 2	70 to 75	52 to 55
Stage 3 (after 5 minutes)	Tighten through a further 90°	
Camshaft cover bolts:		
Stage 1	6 to 8	4 to 6
Stage 2	2 to 3	1.5 to 2
Stage 3	6 to 8	4 to 6
Stage 4	6 to 8	4 to 6
Timing cover bolts	13 to 17	10 to 13
Timing belt tensioner bolts:		
Models with tensioner spring:		
Spring bolt	17 to 21	13 to 15
Pivot bolt	20 to 25	15 to 18
Models without tensioner spring		
Oil pick-up tube/strainer-to-oil pump bolts	11 to 14	8 to 10
Oil pick-up tube/strainer-to-cylinder block bolts	17 to 21	13 to 15

2A•4 SOHC engines

1.6 litre engine

General

Engine type	Four-cylinder, in-line, single overhead camshaft	
Firing order	1-3-4-2	
Engine codes	LCS, LCT, LSD and LSE	
	LCS and LCT	LSD and LSE
Bore	87.67 mm	81.32 mm
Stroke	66.00 mm	76.95 mm
Cubic capacity	1593 cc	1597 cc
Compression ratio	9.2 : 1	9.5 : 1
Compression pressure at starter motor speed	11 to 13 bar	11 to 13 bar
Maximum continuous engine speed	5800 rpm	5950 rpm
Maximum engine power (DIN)	55 kW at 5300 rpm	55 kW at 4900 rpm
Maximum engine torque (DIN)	120 Nm at 2900 rpm	123 Nm at 2900 rpm

Cylinder bore diameter

	LCS and LCT	LSD and LSE
Standard class 1	87.650 to 87.660 mm	81.300 to 81.310 mm
Standard class 2	87.660 to 87.670 mm	81.310 to 81.320 mm
Standard class 3	87.670 to 87.680 mm	81.320 to 81.330 mm
Standard class 4	87.680 to 87.690 mm	81.330 to 81.340 mm
Oversize class A	88.160 to 88.170 mm	81.810 to 81.820 mm
Oversize class B	88.170 to 88.180 mm	81.820 to 81.830 mm
Oversize class C	88.180 to 88.190 mm	81.830 to 81.840 mm
Standard service	87.680 to 87.690 mm	81.330 to 81.340 mm
Oversize 0.5	88.180 to 88.190 mm	81.830 to 81.840 mm
Oversize 1.0	88.680 to 88.690 mm	82.330 to 82.340 mm

Crankshaft

Specifications as for 1.3 litre engine except for the following:

Main bearing thrustwasher thickness from 1987:

Standard	2.28 to 2.33 mm
Oversize	2.48 to 2.53 mm

Pistons and piston rings

Piston diameter:	LCS and LCT	LSD and LSE
Standard class 1	87.615 to 87.625 mm	81.265 to 81.275 mm
Standard class 2	87.625 to 87.635 mm	81.275 to 81.285 mm
Standard class 3	87.635 to 87.645 mm	81.285 to 81.295 mm
Standard class 4	87.645 to 87.655 mm	81.295 to 81.305 mm
Standard service	87.640 to 87.665 mm	81.290 to 81.315 mm
Service oversize 0.5	88.140 to 88.165 mm	81.790 to 81.815 mm
Service oversize 1.0	88.640 to 88.665 mm	82.290 to 82.315 mm
Piston ring end gap:		
Top	0.300 to 0.500 mm	0.300 to 0.500 mm
Centre	0.300 to 0.500 mm	0.300 to 0.500 mm
Bottom	0.400 to 1.400 mm	0.400 to 1.400 mm

Auxiliary shaft

Endfloat	0.050 to 0.204 mm (0.002 to 0.008 in)
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Cylinder head

Specifications as for 1.3 litre engine

Camshaft

Specifications as for 1.3 litre engine except for the following:

Endfloat:

Engine codes LCS, LCT and LSE	0.104 to 0.204 mm (0.004 to 0.008 in)
Engine code LSD	0.090 to 0.170 mm (0.003 to 0.007 in)

Valves

Specification as for 1.3 litre engine

Lubrication system

Specifications as for 1.3 litre engine

Torque wrench settings

Specification as for 1.3 litre engine

1.8 litre engine**General**

Engine type	Four-cylinder, in line, single overhead camshaft
Firing order	1-3-4-2
Engine codes	REB and RED
Bore	86.20 mm
Stroke	76.95 mm
Cubic capacity	1796 cc
Compression ratio	9.5:1
Compression pressure at starter motor speed	11 to 13 bar
Maximum continuous engine speed	5850 rpm
Maximum engine power (DIN)	66kW at 5400 rpm
Maximum engine torque (DIN)	140 Nm at 3500 rpm

Cylinder bore diameter

Standard class 1	86.180 to 86.190 mm
Standard class 2	86.190 to 86.200 mm
Standard class 3	86.200 to 86.210 mm
Standard class 4	86.210 to 86.220 mm
Oversize class A	86.690 to 86.700 mm
Oversize class B	86.700 to 86.710 mm
Oversize class C	86.710 to 86.720 mm
Standard service	86.210 to 86.220 mm
Oversize 0.5	86.710 to 86.720 mm
Oversize 1.0	87.210 to 87.220 mm

Crankshaft

Specifications as for 1.3 litre engine except for the following:

Main bearing thrustwasher thickness from 1987:

Standard	2.28 to 2.33 mm
Oversize	2.48 to 2.53 mm

Pistons and piston rings

Piston diameter:

Standard class 1	86.145 to 86.155 mm
Standard class 2	86.155 to 86.165 mm
Standard class 3	86.165 to 86.175 mm
Standard class 4	86.175 to 86.185 mm
Standard service	86.170 to 86.195 mm
Service oversize 0.5	86.670 to 86.695 mm
Service oversize 1.0	86.170 to 86.195 mm

Piston ring end gap:

Top	0.300 to 0.500 mm
Centre	0.300 to 0.500 mm
Bottom	0.400 to 1.400 mm

Auxiliary shaft

Endfloat	0.050 to 0.204 mm (0.002 to 0.008 in)
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Cylinder head and camshaft

Specifications as for 1.3 litre engine

Valves

Specifications as for 1.3 litre engine except for the following:

Valve clearance (cold engine):

Inlet	0.20 ± 0.03 mm (0.008 ± 0.001 in)
Exhaust	0.25 ± 0.03 mm (0.010 ± 0.001 in)

Valve timing:

Inlet opens	24° BTDC
Inlet closes	64° ABDC
Exhaust opens	70° BBDC
Exhaust closes	18° ATDC

Lubrication system

Specifications as for 1.3 litre engine

Torque wrench settings

Specifications as for 1.3 litre engine

2.0 litre engine**General**

Engine type	Four-cylinder, in-line, single overhead camshaft
Firing order	1-3-4-2
Engine codes	NES and NET (carburettor, except P100), NRB and N4A (fuel injection), and NAE (P100)
Bore	90.82 mm
Stroke	76.95 mm
Cubic capacity	1993 cc
Compression ratio:	
All except engine code NAE	9.2:1
Engine code NAE	8.2:1
Compression pressure at starter motor speed:	
All except engine code NAE	11 to 13 bar
Engine code NAE	10 to 12 bar
Maximum continuous engine speed:	
Engine code NES	5850 rpm
Engine codes NET and NAE	5800 rpm
Engine codes NRB and N4A	6050 rpm
Maximum engine power (DIN):	
Engine codes NES and NET	77kW at 5200 rpm
Engine codes NRB and N4A	85kW at 5500 rpm
Engine code NAE	57kW at 4500 rpm
Maximum engine torque (DIN):	
Engine codes NES and NET	157 Nm at 4000 rpm
Engine codes NRB and N4A	160 Nm at 4000 rpm
Engine code NAE	143 Nm at 2800 rpm

Cylinder bore diameter

Standard class 1	90.800 to 90.810 mm
Standard class 2	90.810 to 90.820 mm
Standard class 3	90.820 to 90.830 mm
Standard class 4	90.830 to 90.840 mm
Oversize class A	91.310 to 91.320 mm
Oversize class B	91.320 to 91.330 mm
Oversize class C	91.330 to 91.340 mm
Standard service	90.830 to 90.840 mm
Oversize 0.5	91.330 to 91.340 mm
Oversize 1.0	91.830 to 91.840 mm

Crankshaft

Specifications as for 1.3 litre engine except for the following:

Main bearing thrustwasher thickness:

All except engine codes NES, NET, NRB and N4A from 1987:

Standard	2.30 to 2.35 mm
Oversize	2.50 to 2.55 mm

Engine codes NES, NET, NRB and N4A from 1987:

Standard	2.28 to 2.33 mm
Oversize	2.48 to 2.53 mm

Pistons and piston rings

Piston diameter:

Standard class 1	90.765 to 90.775 mm
Standard class 2	90.775 to 90.785 mm
Standard class 3	90.785 to 90.795 mm
Standard class 4	90.795 to 90.805 mm
Standard service:	
Up to 1985	90.780 to 90.805 mm
From 1985	90.790 to 90.815 mm
Service oversize 0.5:	
Up to 1985	91.280 to 91.305 mm
From 1985	91.290 to 91.315 mm
Service oversize 1.0:	
Up to 1985	91.780 to 91.805 mm
From 1985	91.790 to 91.815 mm

Piston ring end gap:

Top:	
Up to 1985	0.038 to 0.048 mm
From 1985	0.400 to 0.600 mm
Centre:	
Up to 1985	0.038 to 0.048 mm
From 1985	0.400 to 0.600 mm
Bottom	0.400 to 1.400 mm

Auxiliary shaft

Endfloat	0.050 to 0.204 mm (0.002 to 0.008 in)
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Cylinder head

Specifications as for 1.3 litre engine

Valves

Specifications as for 1.3 litre engine except for the following:

Valve clearance (cold engine):

Inlet	0.20 ± 0.03 mm (0.008 ± 0.001 in)
Exhaust	0.25 ± 0.003 mm (0.010 ± 0.001 in)

Valve timing:

	All except code NAE	Engine code NAE
Inlet opens	24° BTDC	18° BTDC
Inlet closes	64° ABDC	58° ABDC
Exhaust opens	70° BBDC	70° BBDC
Exhaust closes	18° ATDC	6° ATDC

Lubrication system

Specifications as for 1.3 litre engine

Torque wrench settings

Specifications as for 1.3 litre engine except for the following:

Crankshaft pulley bolt:

	Nm	lbf ft
Fuel injection models up to 1987	115 to 130	85 to 96
Fuel injection models from 1987	100 to 115	74 to 85

1 General information

The engine is of a four-cylinder, in-line, single overhead camshaft type, mounted at the front of the vehicle and available in 1.3, 1.6, 1.8 and 2.0 litre versions.

The crankshaft incorporates five main bearings. Thrustwashers are fitted to the centre main bearing in order to control crankshaft endfloat.

The camshaft is driven by a toothed belt and operates the slightly angled valves via cam followers which pivot on ball-pins.

The auxiliary shaft which is also driven by the toothed belt, drives the distributor, oil pump and fuel pump.

The cylinder head is of crossflow design with the inlet manifold mounted on the left-hand side and the exhaust manifold mounted on the right-hand side.

Lubrication is by means of a bi-rotor pump which draws oil through a strainer located inside the sump, and forces it through a full-flow filter into the engine oil galleries where it is distributed to the crankshaft, camshaft and auxiliary shaft. The big-end bearings are supplied with oil via internal drillings in the crankshaft. The undersides of the pistons are supplied with oil from drillings in the big-ends. The distributor shaft is intermittently supplied with oil from the drilled auxiliary shaft. The camshaft followers are supplied with oil via a

drilled spray tube from the centre camshaft bearing.

A semi-closed crankcase ventilation system is employed whereby piston blow-by gases are drawn into the inlet manifold via an oil separator and control valve.

2 Engine oil and filter - renewal

Refer to Chapter 1, Section 8.

3 Valve clearances - checking and adjustment

Refer to Chapter 1, Section 23.

4 Crankcase ventilation system - inspection and maintenance

Refer to Chapter 1, Section 35.

5 Compression test

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

2 The engine must be at operating temperature, the battery must be fully charged and the spark plugs must be removed. The services of an assistant will also be required.

3 Disable the ignition system by disconnecting the coil LT feed. Fit the compression tester to No 1 spark plug hole. (The type of tester which screws into the spark plug hole is to be preferred.)

4 Have the assistant hold the throttle wide open and crank the engine on the starter. Record the highest reading obtained on the compression tester.

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

6 Desired pressures are given in the Specifications. If the pressure in any cylinder is low, introduce a teaspoonful of clean engine oil into the spark plug hole and repeat the test.

7 If the addition of oil temporarily improves the compression pressure, this indicates that bore, piston or piston ring wear was responsible for the pressure loss. No improvement suggests that leaking or burnt valves, or a blown head gasket, may be to blame.

8 A low reading from the two adjacent cylinders is almost certainly due to the head gasket between them having blown.

9 On completion of the test, refit the spark plugs and reconnect the coil LT feed.



6 Major operations possible with the engine in the vehicle

The following operations can be carried out without removing the engine from the vehicle:

- Removal and servicing of the cylinder head
- Removal of the camshaft after removal of the cylinder head
- Removal of the timing belt and sprockets
- Removal of the sump
- Removal of the oil pump
- Removal of the pistons and connecting rods
- Removal of the big-end bearings
- Removal of the engine mountings
- Removal of the clutch and flywheel
- Removal of crankshaft front and rear oil seals
- Removal of the auxiliary shaft

7 Major operations requiring engine removal

The following operations can only be carried out after removing the engine from the vehicle:

- Removal of the crankshaft main bearings
- Removal of the crankshaft

8 Method of engine removal



Warning: Vehicles equipped with air conditioning: Components of the air conditioning system may

obstruct work being undertaken on the engine, and it is not always possible to unbolt and move them aside sufficiently, within the limits of their flexible connecting pipes. In such a case, the system should be discharged by a Ford dealer or air conditioning specialist. The refrigerant is harmless under normal conditions, but in the presence of a naked flame (or a lighted cigarette) it forms a highly toxic gas. Liquid refrigerant spilled on the skin will cause frostbite. If refrigerant enters the eyes, rinse them with a diluted solution of boric acid and seek medical advice immediately.

The engine may be lifted out either on its own, or together with the manual gearbox/automatic transmission. Unless work is to be carried out on the manual gearbox/automatic transmission, it is recommended that the engine is removed on its own. Where automatic transmission is fitted, the engine should where possible be removed on its own due to the additional weight of the transmission.

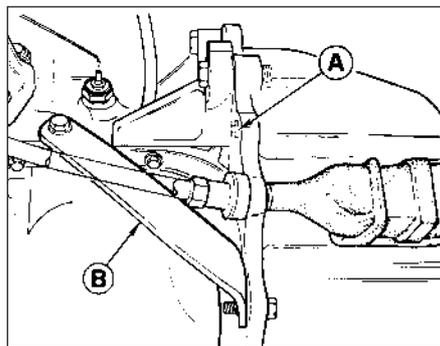
9 Engine - removal leaving manual gearbox in vehicle



Note: The air conditioning system should always be discharged by a Ford dealer or air conditioning specialist.

Note: Refer to the warning in Section 8 before proceeding. A suitable hoist and lifting tackle will be required for this operation.

- Disconnect the battery negative lead.
- Remove the bonnet.
- On carburettor models remove the air cleaner.
- On fuel injection models, disconnect the crankcase ventilation hose from the air inlet hose, then disconnect the air inlet hose from the throttle body. Depress the locking clip on the airflow meter wiring plug and disconnect the plug (pulling on the plug, not the wiring), then release the four securing clips and lift off the air cleaner lid with the airflow meter and air inlet hose.
- Remove the four retaining clips and unscrew the two retaining screws, then withdraw the upper section of the cooling fan shroud from the radiator. Unclip and remove the lower section of the shroud.
- Remove the thermo-viscous cooling fan as described in Chapter 3.
- Drain the cooling system.
- Disconnect the upper radiator hose and where applicable, the expansion tank hose from the thermostat housing.
- Disconnect the coolant hoses from the coolant pump, and where applicable from the inlet manifold and automatic choke. Unclip the coolant hose from the bracket on the exhaust manifold hot air shroud/heat shield, or the camshaft cover, as applicable.
- On carburettor models, where applicable disconnect the vacuum pipe from the engine management module.
- Disconnect the brake servo vacuum pipe from the inlet manifold.
- On carburettor models, disconnect the fuel hoses from the carburettor and where applicable the mechanical fuel pump and plug the ends of the hoses to minimise petrol spillage. Remember to take adequate fire precautions.
- On fuel injection models, disconnect the fuel feed line from the fuel pressure regulator, then disconnect the fuel supply hose from the



9.25 Engine adapter plate bolt (A) and engine-to-gearbox brace (B)

fuel rail. Position a suitable container beneath the pressure regulator, then slowly loosen the fuel feed union to relieve the pressure in the fuel lines before disconnecting the union. Take adequate fire precautions. Plug the ends of the hoses to minimise petrol spillage.

14 Disconnect the throttle cable, and where applicable remove its bracket.

15 Disconnect the HT lead from the ignition coil.

16 Disconnect the wiring from the following components as applicable depending on model:

Alternator
Starter motor
Distributor
Oil pressure warning lamp switch
Temperature gauge sender
Engine coolant temperature sensor
Automatic choke
Automatic choke pull-down solenoid
Carburettor anti-dieselling valve
Inlet manifold heater
Carburettor stepper motor
Fuel injection harness
Dipstick

17 Where applicable, detach the power steering pump from the cylinder block and move it to one side.

18 Unscrew and remove the top engine-to-gearbox bolts which are accessible from the engine compartment. Note the location of the earth strap on one of the bolts.

19 Note the location of the earth strap on the rear inlet manifold stud, then remove the nut and disconnect the strap.

20 Apply the handbrake (if not already done), jack up the front of the vehicle and support on axle stands (see "Jacking and Vehicle Support").

21 Drain the engine oil into a suitable container.

22 Remove the starter motor.

23 Remove the exhaust downpipe.

24 Unscrew the nuts or bolts, as applicable, securing the engine mountings to the crossmember. Recover the washers.

25 Unscrew and remove the remaining engine-to-gearbox bolts, and remove the bolt from the engine adapter plate (see illustration).

26 Remove the two securing bolts and disconnect the engine-to-gearbox brace from the engine and gearbox.

27 Working inside the vehicle, place a wooden block under the clutch pedal to raise it fully against its stop which will hold the automatic adjuster pawl clear of the toothed quadrant.

28 Disconnect the clutch cable from the clutch release arm, and pass the cable through the bellhousing. Where applicable, remove the clip securing the clutch cable to the right-hand engine mounting bracket. Note the cable routing for use when refitting.

29 Lower the vehicle to the ground, and support the gearbox with a trolley jack, using a block of wood between the jack and the gearbox to spread the load.

30 Make a final check to ensure that all relevant wires, pipes and hoses have been disconnected to facilitate engine removal.

31 Attach a suitable hoist to the engine lifting brackets located at the front and rear of the cylinder head, and carefully take the weight of the engine. The engine should be supported horizontally, ie do not allow it to tilt front to rear.

32 Raise the engine until the engine mountings are clear of the crossmember then pull the engine forwards to disconnect it from the gearbox. Ensure that the gearbox is adequately supported, and take care not to strain the gearbox input shaft. It may be necessary to rock the engine a little to release it from the gearbox.

33 Once clear of the gearbox, lift the engine from the vehicle, taking care not to damage the radiator fins.

10 Engine - removal leaving automatic transmission in vehicle

Note: Refer to the warning in Section 8 before proceeding. A suitable hoist and lifting tackle will be required for this operation.

1 Proceed as described in Section 9, paragraphs 1 to 17 inclusive, but additionally, where applicable, disconnect the kickdown cable from the carburettor/inlet manifold.

2 Unscrew and remove the top engine-to-transmission bolts which are accessible from the engine compartment. Note the location of the earth strap, vacuum pipe bracket, and transmission dipstick tube bracket.

3 Proceed as described in Section 9, paragraphs 20 to 24 inclusive.

4 Working through the starter motor aperture, unscrew the four torque converter-to-driveplate nuts. It will be necessary to turn the crankshaft, using a suitable spanner on the crankshaft pulley bolt, in order to gain access to each nut in turn through the aperture.

5 Unscrew and remove the remaining engine-to-transmission bolts, and remove the bolt from the engine adapter plate. Where applicable pull the blanking plug from the adapter plate.

6 Remove the two securing bolts and disconnect the engine-to-transmission brace from the engine and transmission.

7 Lower the vehicle to the ground, and support the transmission with a trolley jack, using a block of wood between the jack and the transmission to spread the load.

8 Proceed as described in Section 9, paragraphs 30 and 31.

9 Raise the engine until the engine mountings are clear of the crossmember, then pull the engine forwards to disconnect it from the transmission. Ensure that the torque converter is held firmly in place in the transmission housing, otherwise it could fall out resulting in fluid spillage and possible damage. It may be necessary to rock the engine a little to release it from the transmission.

10 Once clear of the transmission lift the engine from the vehicle, taking care not to damage the radiator fins.

11 Engine/manual gearbox assembly - removal and separation

Note: Refer to the warning in Section 8 before proceeding. A suitable hoist and lifting tackle will be required for this operation.

Removal

1 Proceed as described in Section 9, paragraphs 1 to 17 inclusive.

2 Note the location of the earth strap on the rear inlet manifold stud, then remove the nut and disconnect the strap.

3 Working inside the vehicle, unscrew the gear lever knob and remove the centre console. Where a full length console is fitted, it is only necessary to remove the front tray.

4 Detach the outer gaiter from the retaining frame and withdraw it over the gear lever.

5 Unscrew the securing screws on early models, or release the clips on later models, and remove the gaiter retaining frame and inner gaiter.

6 Using a suitable Torx key, remove the screws securing the gear lever to the gearbox extension housing, and withdraw the gear lever. Note how the base of the gear lever locates over the selector shaft.

7 Jack up the vehicle and support on axle stands (see "Jacking and Vehicle Support"). Ensure that there is sufficient working room beneath the vehicle.

8 To improve access, disconnect the exhaust downpipe from the manifold and remove the exhaust system.

9 Remove the propeller shaft.

10 Where applicable bend back the locktabs, then unscrew the two bolts in each case securing the two anti-roll bar U-clamps to the vehicle underbody. Lower the anti-roll bar as far as possible.

11 Proceed as described in Section 9, paragraphs 27 and 28.

12 Drain the engine oil into a container.

13 Unscrew the nuts or bolts, as applicable, securing the engine mountings to the crossmember. Recover the washers.

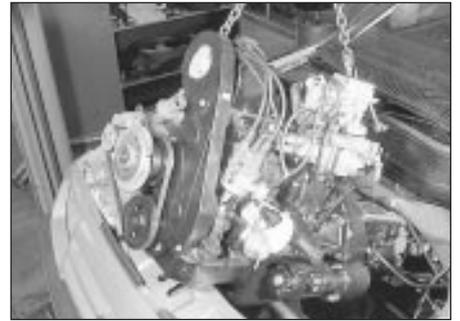
14 Disconnect the wiring from the reversing lamp switch.

15 Remove the retaining circlip, and withdraw the speedometer cable from the gearbox extension housing.

16 Support the gearbox with a trolley jack, using a block of wood between the jack and the gearbox to spread the load.

17 Unscrew the four bolts securing the gearbox crossmember to the vehicle underbody. Unscrew the central bolt securing the crossmember to the gearbox and remove the crossmember. Note the position of the earth strap, where applicable. Recover the mounting cup and where applicable the exhaust mounting bracket and heat shield.

18 Make a final check to ensure that all relevant wires, pipes and hoses have been disconnected to facilitate removal of the engine/gearbox assembly.



11.20 Lifting the engine/gearbox assembly from the vehicle

19 Attach a suitable hoist to the engine lifting brackets located at the front and rear of the cylinder head. Arrange the lifting tackle so that the engine/gearbox assembly will assume a steep angle of approximately 40° to 45° as it is being removed.

20 Raise the engine/gearbox so that the engine mountings are clear of the crossmember, then ease the assembly forwards, at the same time lowering the trolley jack which is supporting the gearbox. Lift the assembly from the vehicle, taking care not to damage surrounding components (see illustration).

21 With the engine/gearbox assembly removed, temporarily reconnect the anti-roll bar to the underbody if the vehicle is to be moved.

Separation

22 To separate the engine from the gearbox, proceed as follows.

23 Remove the starter motor.

24 Support the engine and gearbox horizontally on blocks of wood.

25 Unscrew the two securing bolts and disconnect the engine-to-gearbox brace from the engine and gearbox.

26 Unscrew and remove the engine-to-gearbox bolts, noting the location of the earth strap, and remove the bolt from the engine adapter plate.

27 Pull the engine and gearbox apart, taking care not to strain the gearbox input shaft. It may be necessary to rock the units slightly to separate them.

12 Engine/automatic transmission assembly - removal and separation

Note: Refer to the warning in Section 8 before proceeding. A suitable hoist and lifting tackle will be required for this operation. Any suspected faults in the automatic transmission should be referred to a Ford dealer or automatic transmission specialist before removal of the unit, as the specialist fault diagnosis equipment is designed to operate with the transmission in the vehicle.

Removal

1 Proceed as described in Section 9, paragraphs 1 to 17 inclusive, but additionally,

2A•10 SOHC engines

where applicable disconnect the kickdown cable from the carburettor/inlet manifold.

2 Note the location of the earth strap on the rear inlet manifold stud, then remove the nut and disconnect the strap.

3 Jack up the vehicle and support on axle stands (see "*Jacking and Vehicle Support*"). Ensure that there is sufficient working room beneath the vehicle.

4 To improve access, disconnect the exhaust downpipe from the manifold and remove the exhaust system.

5 Remove the propeller shaft.

6 Where applicable bend back the locktabs, then unscrew the two bolts, in each case securing the two anti-roll bar U-clamps to the vehicle underbody. Lower the anti-roll bar as far as possible.

7 Unscrew the unions and disconnect the fluid cooler pipes from the transmission. Plug the open ends of the pipes and the transmission to prevent dirt ingress and fluid leakage. Remove the fluid cooler pipe bracket from the engine mounting bracket, and place it to one side.

8 Remove the two clips securing the selector rod, and detach the selector rod from the manual selector lever, and the selector lever on the transmission.

9 Disconnect the kickdown cable from the lever on the transmission, and where applicable, detach the cable from the bracket on the transmission. On C3 type transmissions it will be necessary to unscrew the locknut in order to remove the cable from the bracket. Withdraw the cable from the vehicle.

10 Disconnect the wiring from the starter inhibitor/reversing lamp switch and where applicable, on A4LD type transmissions, the kickdown solenoid and the lock-up clutch.

11 Remove the securing screw, and disconnect the speedometer cable from the transmission extension housing. Plug the opening in the transmission to prevent dirt ingress.

12 Disconnect the vacuum pipe from the vacuum diaphragm unit, and unclip the pipe from its securing bracket on the transmission housing where applicable.

13 Drain the engine oil into a suitable container.

14 Unscrew the nuts or bolts, as applicable, securing the engine mountings to the crossmember. Recover the washers.

15 Support the transmission with a trolley jack, using a block of wood to spread the load.

16 Unscrew the four bolts securing the transmission crossmember to the vehicle underbody. Note the position of the earth strap, where applicable. Unscrew the central bolt securing the crossmember to the transmission and remove the crossmember. Recover the mounting cup and where applicable the exhaust mounting bracket.

17 Make a final check to ensure that all relevant wires, pipes and hoses have been disconnected to facilitate removal of the engine/transmission assembly.

18 Attach a suitable hoist to the engine lifting brackets located at the front and rear of the cylinder head. Arrange the lifting tackle so that the engine/transmission assembly will assume a steep angle of approximately 40° to 45° as it is being removed.

19 Raise the engine/transmission so that the engine mountings are clear of the crossmember, then ease the assembly forwards, at the same time lowering the trolley jack which is supporting the transmission. Lift the assembly from the vehicle, taking care not to damage surrounding components.

20 With the engine/transmission assembly removed, temporarily reconnect the anti-roll bar to the underbody if the vehicle is to be moved.

Separation

21 To separate the engine from the transmission, proceed as follows.

22 Remove the starter motor.

23 Support the engine and transmission horizontally on blocks of wood.

24 Working through the starter motor aperture, unscrew the four torque converter-to-driveplate nuts. It will be necessary to turn the crankshaft using a suitable spanner on the crankshaft pulley bolt in order to gain access to each nut in turn through the aperture.

25 Unscrew the two securing bolts and disconnect the engine-to-transmission brace from the engine and transmission.

26 Unscrew and remove the engine-to-transmission bolts, noting the locations of the earth strap, vacuum pipe bracket, and transmission dipstick tube bracket. Remove the bolt from the engine adapter plate, and where applicable pull the blanking plug from the adapter plate.

27 Pull the engine and transmission apart, ensuring that the torque converter is held firmly in place in the transmission housing, otherwise it could fall out resulting in fluid spillage and possible damage. It may be necessary to rock the units slightly to separate them.

13 Engine - refitting (manual gearbox in vehicle)

1 Reverse the procedure described in Section 9, noting the following points:

2 Before attempting to refit the engine, check that the clutch friction disc is centralised. This is necessary to ensure that the gearbox input shaft splines will pass through the splines in the centre of the friction disc.

3 Check that the clutch release arm and bearing are correctly fitted and lightly grease the input shaft splines.

4 Check that the engine adapter plate is correctly positioned on its locating dowels.

5 Refit the exhaust downpipe.

6 Reconnect the clutch cable to the release arm, ensuring that it is routed as noted during removal.

7 Fill the engine with the correct grade and quantity of oil.

8 Fill the cooling system.

9 Check and if necessary adjust the tension of the alternator and where applicable the power steering pump drivebelt(s).

10 Adjust the throttle cable.

14 Engine - refitting (automatic transmission in vehicle)

1 Reverse the procedure described in Section 10, noting the following points:

2 Check that the engine adapter plate is correctly positioned on its locating dowels.

3 As the torque converter is only loosely engaged in the transmission, care must be taken to prevent the torque converter from falling out forwards. When the torque converter hub is fully engaged with the fluid pump drivegear in the transmission, distance "A" in illustration 2.24 of Chapter 7B must be as specified. Incorrect installation of the torque converter will result in damage to the transmission.

4 As the engine is installed, guide the torque converter studs through the holes in the driveplate, noting that on the C3 type transmission, the torque converter fluid drain plug must line up with the opening in the driveplate (see illustration 2.25 in Chapter 7B). When the engine is positioned flush with the engine adapter plate and the transmission housing, check that the torque converter is free to move axially a small amount before refitting and tightening the engine-to-transmission bolts.

5 Do not tighten the torque converter-to-driveplate nuts until the lower engine-to-transmission bolts have been fitted and tightened.

6 Refit the exhaust downpipe.

7 Fill the engine with the correct grade and quantity of oil.

8 Fill the cooling system.

9 Check and if necessary adjust the tension of the alternator and where applicable the power steering pump drivebelt(s).

10 Adjust the throttle cable.

11 Where applicable, adjust the kickdown cable.

15 Engine/manual gearbox assembly - reconnection and refitting

1 Reverse the procedure described in Section 11, noting the following points.

2 Before attempting to reconnect the engine to the gearbox, check that the clutch friction disc is centralised. This is to ensure that the gearbox input shaft splines will pass through the splines in the centre of the friction disc.

3 Check that the clutch release arm and bearing are correctly fitted, and lightly grease the input shaft splines.



17.4 Withdrawing an engine mounting

- 4 Check that the engine adapter plate is correctly positioned on its locating dowels.
- 5 Refit the propeller shaft.
- 6 Refit the exhaust system.
- 7 Reconnect the clutch cable to the release arm, ensuring that it is routed as noted during removal.
- 8 Fill the engine with the correct grade and quantity of oil.
- 9 Fill the cooling system.
- 10 Check and if necessary top-up the gearbox oil level.
- 11 Check and if necessary adjust the tension of the alternator and where applicable the power steering pump drivebelt(s).
- 12 Adjust the throttle cable.

16 Engine/automatic transmission assembly - reconnection and refitting

- 1 Reverse the removal procedure described in Section 12, noting the following points.
- 2 Check that the engine adapter plate is correctly positioned on its locating dowels.
- 3 As the torque converter is only loosely engaged in the transmission, care must be taken to prevent the torque converter from falling out forwards. When the torque converter hub is fully engaged with the fluid pump drivegear in the transmission, distance "A" in illustration 2.24 of Chapter 7B must be as shown. Incorrect installation of the torque converter will result in damage to the transmission.
- 4 As the engine and transmission are reconnected, guide the torque converter studs through the holes in the driveplate, noting that on the C3 type transmission, the torque converter fluid drain plug must line up with the opening in the driveplate (see illustration 2.25 in Chapter 7B). When the engine is positioned flush with the engine adapter plate and the transmission housing, check that the torque converter is free to move axially a small amount before refitting and tightening the engine-to-transmission bolts.
- 5 Do not tighten the torque converter-to-driveplate nuts until the lower engine-to-transmission bolts have been fitted and tightened.
- 6 Reconnect and adjust the selector rod.
- 7 Refit the propeller shaft.

- 8 Refit the exhaust system.
- 9 Fill the engine with the correct grade and quantity of oil.
- 10 Fill the cooling system.
- 11 Check and if necessary top-up the transmission fluid level.
- 12 Check and if necessary adjust the tension of the alternator and where applicable the power steering pump drivebelt(s).
- 13 Adjust the throttle cable.
- 14 If applicable, adjust the kickdown cable.

17 Engine mountings - renewal

- 1 The engine mountings incorporate hydraulic dampers and must be renewed if excessive engine movement is evident.
- 2 Working in the engine compartment, unscrew the central nuts securing the engine mounting brackets to the tops of the mountings. Recover the washers where applicable.
- 3 Remove the two bolts or the central nut and washer (as applicable) in each case securing the mountings to the crossmember.
- 4 Raise the engine using a hoist and lifting tackle attached to the engine lifting brackets on the cylinder head, or a jack with an interposed block of wood under the sump, until the mountings can be withdrawn (see illustration).
- 5 Fit the new mountings, then lower the engine onto them.
- 6 Fit the bolts or the nuts and washers (as applicable) securing the mountings to the crossmember, and tighten them.
- 7 Fit and tighten the central nuts, and washers if applicable, securing the engine mounting brackets to the tops of the mountings.

18 Engine dismantling, examination, renovation and reassembly - general information

Dismantling

- 1 It is best to mount the engine on a dismantling stand but if this is not available, stand the engine on a strong bench at a comfortable working height. Failing this, it will have to be stripped down on the floor.
- 2 Cleanliness is most important, and if the



18.10a Removing the right-hand engine mounting bracket

engine is dirty, it should be cleaned with paraffin while keeping it in an upright position.

- 3 Avoid working with the engine directly on a concrete floor, as grit presents a real source of trouble.
- 4 As parts are removed, clean them in a paraffin bath. However, do not immerse parts with internal oilways in paraffin as it is difficult to remove, usually requiring a high pressure hose. Clean oilways with nylon pipe cleaners.
- 5 It is advisable to have suitable containers available to hold small items according to their use, as this will help when reassembling the engine and also prevent possible losses.
- 6 Always obtain a complete set of new gaskets for use during engine reassembly, but retain the old gaskets with a view to using them as a pattern to make a replacement if a new one is not available.
- 7 Where possible, refit securing nuts, bolts and washers to their locations after removing the relevant components. This will help to protect the threads and will also prevent losses.
- 8 Retain unserviceable components in order to compare them with the new parts supplied.
- 9 Suitable splined sockets will be required for removal of the oil pump bolts, the timing belt tensioner bolts on early models (up to mid-1985), and the cylinder head bolts on early models (up to early 1984) and a size T55 Torx socket will be required to remove the cylinder head bolts on later models (from early 1984).
- 10 Before dismantling the main engine components the following externally mounted ancillary components can be removed, with reference to the relevant Chapters of this Manual and the relevant Sections of this Chapter, where applicable:
 - Inlet manifold (and carburettor, where applicable)*
 - Exhaust manifold*
 - Fuel pump and operating pushrod (where applicable)*
 - Alternator*
 - Distributor, HT leads and spark plug*
 - Coolant pump, thermostat and housing*
 - Temperature gauge sender and oil pressure warning lamp switch*
 - Oil filter*
 - Dipstick*
 - Engine mounting brackets (see illustration)*
 - Crankcase ventilation valve and oil separator*
 - Clutch*
 - Alternator mounting bracket (see illustration)*



18.10b Removing the alternator mounting bracket



19.3 TDC pointer on camshaft sprocket backplate aligned with indentation on cylinder head

Examination and renovation

11 With the engine completely stripped, clean all the components and examine them for wear. Each part should be checked, and where necessary renewed or renovated as described in the relevant Sections. Renew main and big end shell bearings as a matter of course, unless it is known that they have had little wear and are in perfect condition.

12 If in doubt as to whether to renew a component which is still just serviceable, consider the time and effort which will be incurred should it fail at an early date. Obviously the age and expected life of the vehicle must influence the standards applied.

13 Gaskets, oil seals and O-rings must all be renewed as a matter of routine. Flywheel and Torx type cylinder head bolts must be renewed because of the high stresses to which they are subjected.

14 Take the opportunity to renew the engine core plugs while they are easily accessible. Knock out the old plugs with a hammer and chisel or punch. Clean the plug seats, smear the new plugs with sealant and tap them squarely into position.

Reassembly

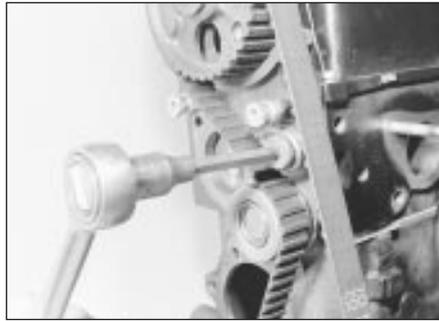
15 To ensure maximum life with minimum trouble from a rebuilt engine, not only must everything be correctly assembled, but it must also be spotlessly clean. All oilways must be clear, and locking washers and spring washers must be fitted where indicated. Oil all bearings and other working surfaces thoroughly with clean engine oil during assembly.

16 Before assembly begins, renew any bolts or studs with damaged threads.

17 Gather together a torque wrench, oil can, clean rag, and a set of engine gaskets and oil seals, together with a new oil filter.

18 If they have been removed, new Torx type cylinder head bolts and new flywheel bolts will be required.

19 After reassembling the main engine components, refit the ancillary components listed, referring to the appropriate Chapters where necessary. Delicate items such as the alternator and distributor may be left until after the engine has been refitted if preferred.



19.4 Loosening the timing belt tensioner spring bolt using a splined socket - models up to mid-1985

20 If the crankcase ventilation oil separator was removed, apply a liquid sealing agent to its tube before pressing it into the cylinder block.

19 Timing belt and sprockets - removal and refitting

Note: Refer to the warning in Section 8 before proceeding. On models from mid-1985 (without a timing belt tensioner spring) the belt tension should be checked using Ford special tool No 21-113 after refitting. On models up to mid-1985 (with a tensioner spring), a suitable splined socket will be required for the tensioner spring bolt. A suitable puller may be required to remove the sprockets.

Removal

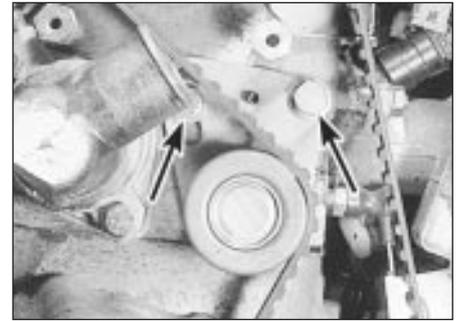
1 If the engine is in the vehicle, carry out the following operations:

- Disconnect the battery negative lead
- Remove the thermo-viscous cooling fan
- Remove the coolant pump/alternator/power-steering pump drivebelt(s)
- For improved access, remove the radiator and disconnect the radiator top hose from the thermostat housing

2 Unscrew the three securing bolts and washers and withdraw the timing cover. Note the position of the fourth bolt above the crankshaft pulley which can be left in place.

3 Using a socket on the crankshaft pulley bolt, turn the engine clockwise until the TDC (top dead centre) mark on the crankshaft pulley is aligned with the pointer on the crankshaft front oil seal housing (see illustration 16.2a of Chapter 5) and the pointer on the camshaft sprocket backplate is aligned with the indentation on the cylinder head (see illustration).

4 On models up to mid-1985 (with a tensioner spring), loosen the timing belt tensioner spring bolt using the special splined socket (see illustration), then loosen the tensioner pivot bolt. If necessary for improved access, remove the thermostat housing. Press the tensioner against the spring tension and tighten the pivot bolt to retain the tensioner in the released position.



19.5 Timing belt tensioner bolts (arrowed) - models from mid-1985

5 On models from mid-1985 (without a tensioner spring), loosen the timing belt tensioner bolts (see illustration) and move the tensioner away from the belt. If necessary to improve access, remove the thermostat housing.

6 Mark the running direction of the belt if it is to be re-used, then slip it off the camshaft sprocket.

7 Slacken the crankshaft pulley bolt. Prevent the crankshaft from turning by engaging top gear (manual gearbox only) and having an assistant apply the brake pedal hard, or by removing the starter motor and jamming the ring gear teeth with a lever. Alternatively, if the pulley has peripheral bolt holes, screw in a couple of bolts and use a lever between them to jam it. Do not allow the crankshaft to turn very far, or piston/valve contact may occur.

8 Remove the bolt and washer and withdraw the pulley. If the pulley will not come off easily, refit the bolt part way and use a puller (see illustration). A puller will almost certainly be required on fuel-injection models.

9 Remove the guide washer from in front of the crankshaft sprocket, then remove the timing belt (see illustration). Do not kink it or get oil on it if it is to be re-used.

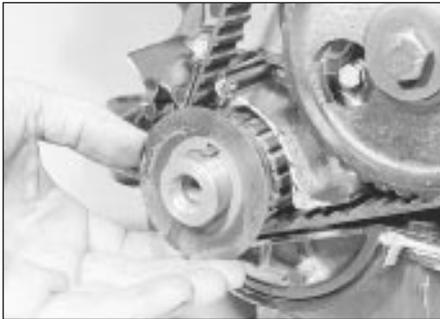
10 If desired, the sprocket can be removed as follows, otherwise proceed to paragraph 21.

11 Remove the crankshaft sprocket, refitting the bolt part way and using a puller if necessary (see illustration).

12 Unscrew the auxiliary shaft sprocket bolt while holding the sprocket stationary with a screwdriver inserted through one of the holes.



19.8 Using a puller to remove a pressed type crankshaft pulley



19.9 Removing the guide washer from the crankshaft



19.11 Removing the crankshaft sprocket



19.13 Removing the auxiliary shaft sprocket

13 Remove the auxiliary shaft sprocket, refitting the bolt part way and using a puller if necessary (see illustration).

14 Hold the camshaft sprocket stationary using a home-made tool similar to that shown (in illustration 18.17 in Part C of this Chapter) with two bolts engaged in the sprocket holes, and unscrew the bolt and washer. Alternatively, remove the camshaft cover and hold the camshaft using a spanner on the boss behind the No 6 valve cam.

15 Remove the camshaft sprocket, refitting the bolt part way and using a puller if necessary, then remove the backplate, noting which way round it is fitted (see illustrations).

16 If desired, the camshaft oil seal can be removed using self-tapping screws and a pair of grips. A new seal can be fitted using a suitable tube drift to press it into place. Lubricate the seal lips with clean engine oil before installation.

Refitting

17 Refit the sprockets as follows.

18 Fit the camshaft sprocket backplate, as noted during removal, then fit the sprocket. Insert the bolt, hold the camshaft or sprocket

as during removal, and tighten the bolt to the specified torque. Where applicable, refit the camshaft cover.

19 Fit the auxiliary shaft sprocket with the ribs towards the engine. Fit the sprocket bolt and tighten it to the specified torque, counterholding the sprocket with a bar through one of the holes.

20 Fit the crankshaft sprocket, chamfered side inwards.

21 Fit the timing belt over the crankshaft sprocket, but do not engage it with the other sprockets yet. Be careful not to kink the belt. If the old belt is being refitted, observe the previously noted running direction.

22 Refit the guide washer and the crankshaft pulley. Fit the bolt and washer and tighten just enough to seat the pulley, being careful not to turn the crankshaft.

23 Make sure that the TDC pointer on the camshaft sprocket backplate is still aligned with the indentation on the cylinder head.

24 Make sure that the TDC mark on the crankshaft pulley is still aligned with the pointer on the oil seal housing. If necessary, turn the crankshaft by the shortest possible

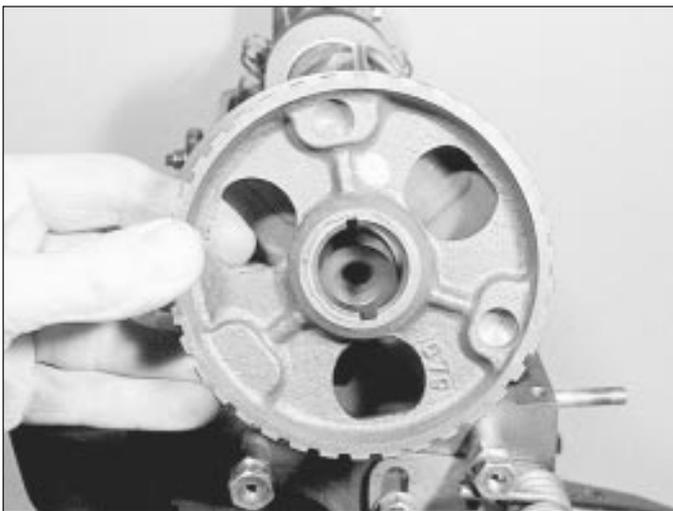
route to align the marks.

25 If the distributor is fitted, turn the auxiliary shaft sprocket so that the rotor arm points to the No 1 HT segment position in the distributor cap.

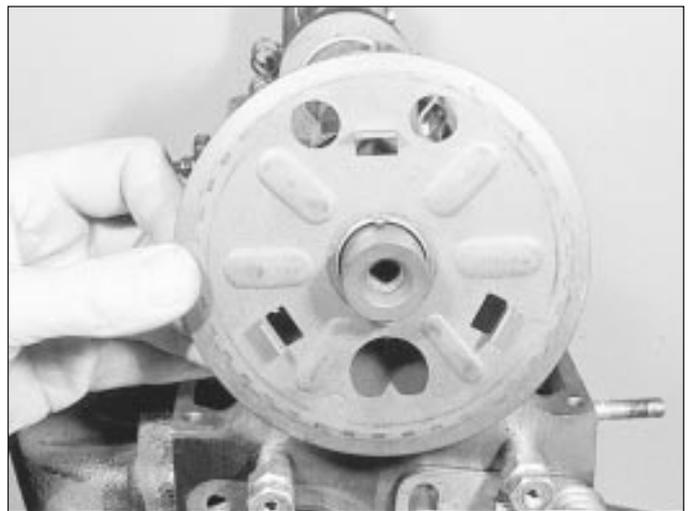
26 Fit the timing belt over the sprockets and round the tensioner.

27 On models up to mid-1985 (with a tensioner spring), slacken the pivot bolt, and allow the tensioner roller to rest against the belt. Using a socket on the crankshaft pulley bolt, turn the crankshaft through two complete revolutions in a clockwise direction, to bring No 1 cylinder back to TDC. Tighten the tensioner pivot bolt and then the spring bolt to the specified torque. Do not turn the crankshaft anti-clockwise with the belt tensioner released. Proceed to paragraph 33.

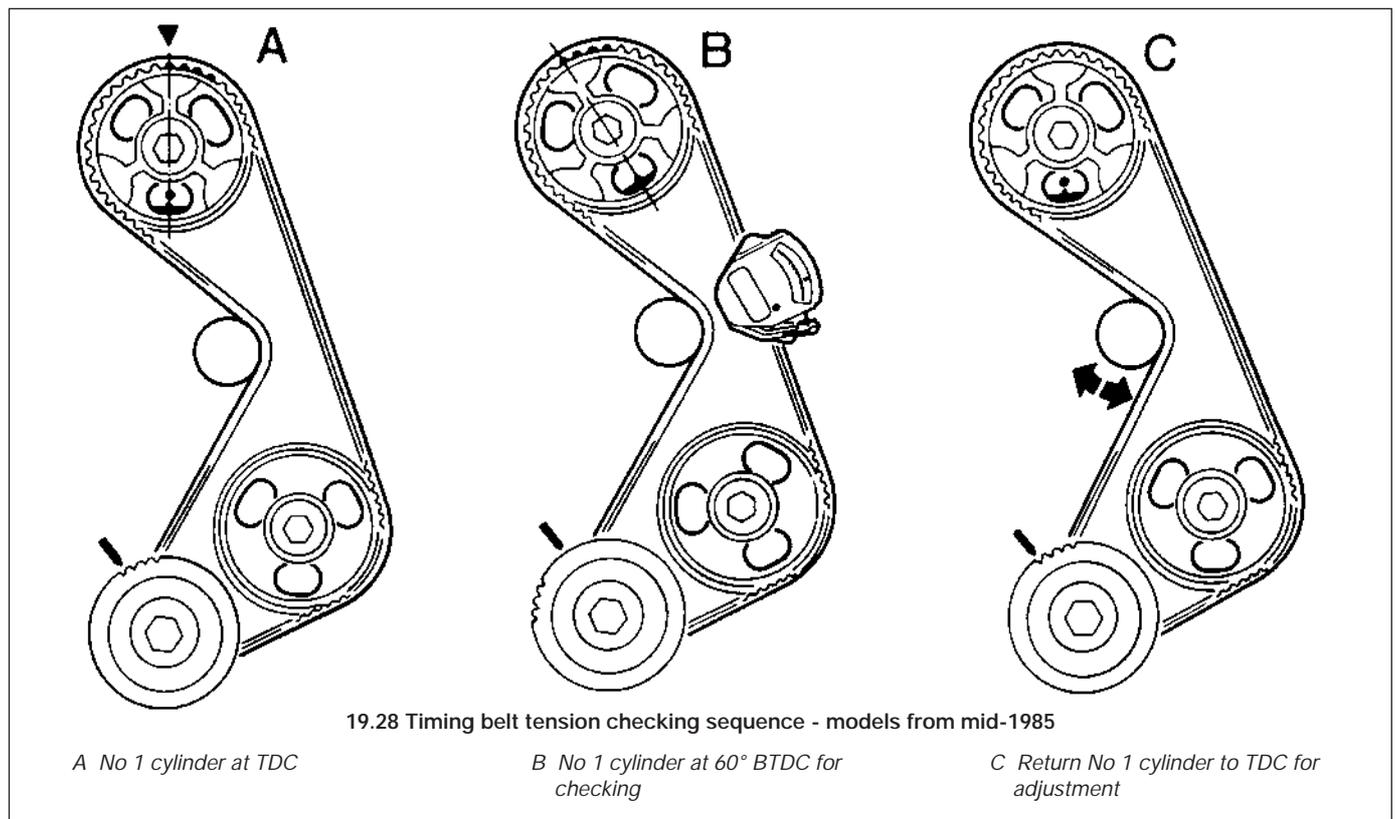
28 On models from mid-1985 (without a tensioner spring), move the tensioner to tension the belt roughly and nip up the tensioner bolts. Using a socket on the crankshaft pulley bolt, turn the crankshaft through two complete revolutions in a clockwise direction (to bring No 1 cylinder back to TDC), then turn the crankshaft 60°



19.15a Removing the camshaft sprocket . . .



19.15b . . . and backplate



anti-clockwise (No 1 cylinder at 60° BTDC) (see illustration).

29 The belt tension should now be checked by applying Ford tension gauge, tool No 21-113 to the longest belt run. Desired gauge readings are:

Used belt - 4 to 5
New belt - 10 to 11

If the tension gauge is not available, a rough guide is that the belt tension is correct when the belt can be twisted 90° in the middle of the longest run with the fingers, using moderate pressure (see illustration). In this case, the vehicle should be taken to a Ford dealer so that the belt tension can be checked using the special gauge at the earliest opportunity.

30 If adjustment of belt tension is necessary, turn the crankshaft clockwise to bring No 1 cylinder to TDC, then slacken the tensioner

bolts and move the tensioner to increase or decrease the belt tension. Tighten the tensioner bolts to the specified torque.

31 Turn the crankshaft 90° clockwise past TDC, then anti-clockwise back to the 60° BTDC position (No 1 cylinder at 60° BTDC). Check the belt tension again.

32 Repeat the procedure given in paragraphs 30 and 31 until the belt tension is correct.

33 Tighten the crankshaft pulley bolt to the specified torque, preventing the crankshaft from turning as described in paragraph 7 (see illustration).

34 Refit the timing cover and tighten its bolts.

35 If the engine is in the vehicle, reverse the operations described in paragraph 1.

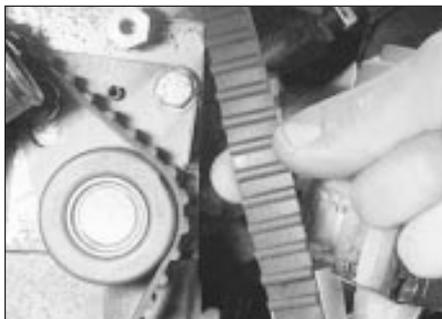
36 When the engine is next started, check the ignition timing is correct.

20 Cylinder head - removal and refitting (engine in vehicle)

Note: Refer to the warning in Section 8 and the note at the beginning of Section 21 before proceeding.

Removal

- 1 Disconnect the battery negative lead.
- 2 Drain the cooling system.
- 3 Disconnect the coolant hose from the thermostat housing.
- 4 Disconnect the wiring from the temperature gauge sender.
- 5 Disconnect the HT leads from the spark plugs and from the clips on the camshaft cover and remove the spark plugs.
- 6 On carburettor models, remove the air cleaner.
- 7 The cylinder head can be removed either with or without the manifolds. If desired, the inlet manifold can be unbolted and moved to one side, leaving the wires, hoses, pipes and cables connected, but care must be taken not to strain any of the wires, hoses, pipes or cables.
- 8 Unscrew the three securing nuts and disconnect the exhaust downpipe from the manifold flange. Recover the gasket.
- 9 Disconnect the coolant hose from the clip on the exhaust manifold hot air shroud, and if desired, remove the exhaust manifold.
- 10 If the inlet manifold is to be removed with the cylinder head, disconnect all relevant



19.29 Twisting the timing belt to assess its tension



19.33 Holding a pressed type crankshaft pulley with two bolts and a lever while tightening the bolt



21.11 Fitting a new cylinder head gasket

wires, hoses, pipes and cables, otherwise, unbolt the manifold and move it to one side, ensuring that it is adequately supported.

11 If not already done, unclip any wires and hoses from the camshaft cover, noting their locations for use when refitting, and on fuel injection models unbolt the bracing strut securing the inlet manifold to the right-hand side of the cylinder head.

12 If desired, remove the thermostat and housing, and the temperature gauge sender.

13 Proceed as described in Section 21 for cylinder head removal.

Refitting

14 With the cylinder head refitted as described in Section 21, proceed as follows.

15 Where applicable, refit the temperature gauge sender and the thermostat and housing.

16 Refit the manifolds and/or reconnect all wires, hoses, pipes and cables, as applicable.

17 Reconnect the exhaust downpipe to the manifold, using a new gasket.

18 Refit the coolant hose to the clip on the exhaust manifold hot air shroud.

19 Refit the spark plugs and reconnect the HT leads.

20 Reconnect the temperature gauge sender wiring.

21 Reconnect the coolant hoses to the thermostat housing.

22 Fill the cooling system.

23 If not already done, refit any hoses and wires to the camshaft cover, as noted during removal, and on fuel injection models refit the inlet manifold bracing strut. If splined type cylinder head bolts have been used, leave these operations until the bolts have been finally tightened after running the engine.

24 Refit the air cleaner on carburettor models.

25 Reconnect the battery negative lead.

26 If splined type cylinder head bolts have been used, start the engine and run it at 1000 rpm for 15 minutes, then stop the engine, remove the air cleaner and the camshaft cover as described previously, and finally tighten the cylinder head bolts to the fourth stage (see Specifications). Refit the camshaft cover on completion, then refit any hoses and wires, and on fuel injection models the inlet manifold bracing strut. Refit the air cleaner.

21 Cylinder head - removal and refitting (engine removed)

HAYNES HINT Tap a stuck cylinder head free with a wooden mallet. Do not insert a lever into the head joint as this may damage the mating faces.

Note: Up to early 1984, splined type cylinder head bolts were used, and from early 1984, size T55 Torx bolts were used. Torx type bolts must always be renewed after slackening. The two types of bolts are interchangeable, but only in complete sets - the two types must not be mixed on the same engine. A suitable special socket will be required for removal of the bolts, and a new cylinder head gasket must be used when refitting.

Removal

1 With the manifolds removed, proceed as follows.

2 Remove the timing belt.

3 Where applicable, disconnect the breather hose from the camshaft cover.

4 Unscrew the ten securing bolts and remove the camshaft cover and gasket. Take care not to lose the spacer plates which fit under the bolt heads, where applicable.

5 Using the relevant special socket, unscrew the ten cylinder head bolts half a turn at a time in the reverse order to that shown for tightening.

6 With the bolts removed, lift the cylinder head from the block. If the cylinder head is stuck, tap it free with a wooden mallet. Place the cylinder head on blocks of wood to prevent damage to the valves.

7 Recover the gasket.

Refitting

8 Commence refitting as follows.

9 With the cylinder head supported on blocks of wood, check and if necessary adjust the

valve clearances. This work is easier to carry out on the bench rather than in the vehicle.

10 Turn the crankshaft so that No 1 piston is approximately 20 mm (0.8 in) before TDC. This precaution will prevent any damage to open valves.

11 Make sure that the mating faces of the cylinder block and cylinder head are perfectly clean, then locate the new gasket on the block making sure that all the internal holes are aligned (see illustration). Do not use jointing compound.

12 Turn the camshaft so that the TDC pointer on the camshaft sprocket backplate is aligned with the indentation on the front of the cylinder head.

13 Lower the cylinder head onto the gasket. The help of an assistant will ensure that the gasket is not dislodged.

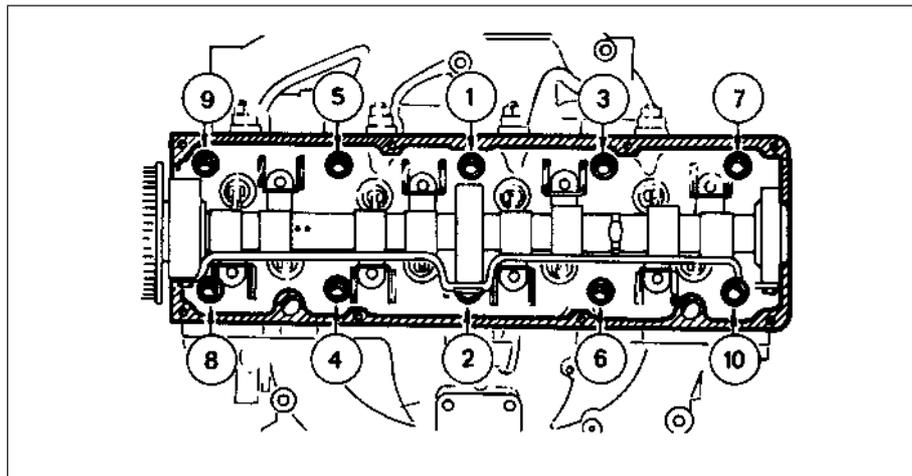
14 Lightly oil the cylinder head bolt threads and heads, then insert the bolts into their locations in the cylinder head. Note that if the original bolts were of the Torx type, new bolts must be used when refitting.

15 Using the relevant special socket, tighten the bolts in the correct sequence (see illustration) to the stages given in the Specifications. Note that the bolt tightening stages are different for splined and Torx type bolts. If splined type bolts are used, they must be finally tightened to the fourth stage after the engine has been run for 15 minutes (see Specifications).

16 Check the condition of the camshaft cover gasket and renew if necessary. Fit the gasket to the camshaft cover, ensuring that the locating tabs and dovetails are correctly located, then refit the camshaft cover and tighten the securing bolts in the order shown (see Chapter 1, Section 23), ensuring that the spacer plates are in position under the bolt heads, where applicable.

17 Where applicable, reconnect the breather hose to the camshaft cover.

18 Refit the timing belt.



21.15 Cylinder head bolt tightening sequence



22.2a Compressing a valve spring



22.2b Removing a valve spring and cap



22.2c Removing a valve

22 Cylinder head - dismantling and reassembly



Note: A valve spring compressor will be required during this procedure. New valve stem oil seals should be used on reassembly.

Dismantling

- 1 With the cylinder head removed, remove the camshaft.
- 2 Using a valve spring compressor, compress one of the valve springs until the split collets can be removed from the groove in the valve stem. Release the compressor and remove the cap and spring, identifying them for location. If the cap is difficult to release, do not continue to tighten the compressor, but gently tap the top of the tool with a hammer. Always make sure that the compressor is firmly located on the valve head and the cap. Withdraw the valve (**see illustrations**).
- 3 Repeat the procedure given in paragraph 2 for the remaining valves, keeping all components identified for location so that they can be refitted in their original positions.
- 4 Prise the valve stem oil seals from the tops of the valve guides (**see illustration**).
- 5 Unscrew the cam follower ball-pins from the cylinder head, keeping them identified for location.

Reassembly

- 6 Commence reassembly by refitting the cam follower ball-pins to their original locations, where applicable.
- 7 Lubricate the valve stems and guides with SAE 80/90 hypoid oil, then insert the valves into their original guides.
- 8 Wrap a thin layer of adhesive tape over the collet groove of each valve, then smear the new oil seals with a little SAE 80/90 hypoid oil and slide them down the valve stems onto the guides. If necessary use a suitable metal tube to press the oil seals into the guides. Remove the adhesive tape.
- 9 Working on each valve in turn, fit the valve spring and cap, then compress the spring using the valve spring compressor and fit the split collets to the groove in the valve stem. Release the compressor and tap the end of the valve stem with a soft-faced mallet to

settle the components. If the original components are being refitted, ensure that they are refitted in their original locations.

- 10 Refit the camshaft.

23 Cylinder head - inspection and renovation



Note: On engines fitted with hardened valve seats for use with unleaded petrol, valve and valve seat grinding and recutting cannot be carried out without the use of specialist equipment. Consult a Ford dealer for further advice.

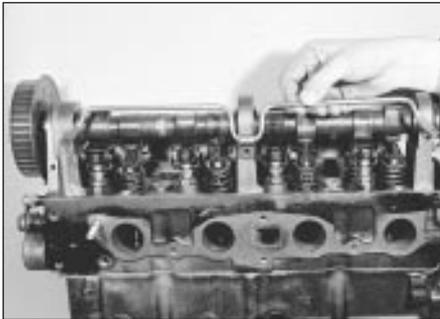
- 1 This operation will normally only be required at comparatively high mileages. However, if persistent pre-ignition ("pinking") occurs and performance has deteriorated even though the engine adjustments are correct, de-carbonizing and valve grinding may be required.
- 2 With the cylinder head removed, use a scraper to remove the carbon from the combustion chambers and ports. Remove all traces of gasket from the cylinder head surface, then wash it thoroughly with paraffin.
- 3 Use a straight edge and feeler blade to check that the cylinder head surface is not distorted. If it is, it must be resurfaced by a suitably equipped engineering works.
- 4 If the engine is still in the vehicle, clean the piston crowns and cylinder bore upper edges, but make sure that no carbon drops between the pistons and bores. To do this, locate two of the pistons at the top of their bores and seal off the remaining bores with paper and



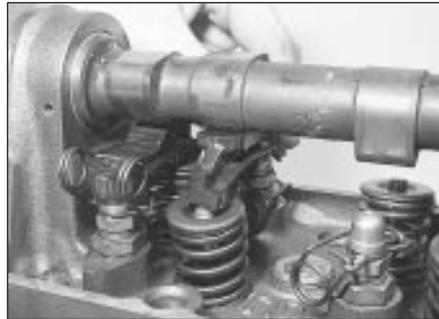
22.4 Removing a valve stem oil seal

masking tape. Press a little grease between the two pistons and their bores to collect any carbon dust; this can be wiped away when the piston is lowered. To prevent carbon build-up, polish the piston crown with metal polish, but remove all traces of the polish afterwards.

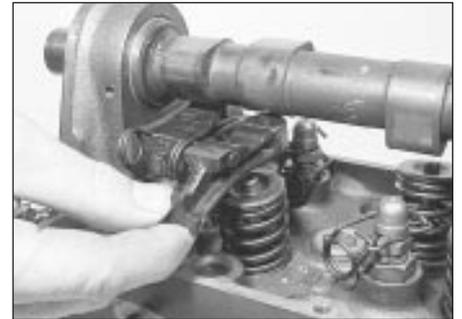
- 5 Examine the heads of the valves for pitting and burning, especially the exhaust valve heads. Renew any valve which is badly burnt. Examine the valve seats at the same time. If the pitting is very slight, it can be removed by grinding the valve heads and seats together with coarse, then fine, grinding paste.
- 6 Where excessive pitting has occurred, the valve seats must be recut or renewed by a suitably equipped engineering works.
- 7 Valve grinding is carried out as follows. Place the cylinder head upside down on a bench on blocks of wood.
- 8 Smear a trace of coarse carborundum paste on the valve seat face and press a suction grinding tool onto the valve head. With a semi-rotary action, grind the valve head to its seat, lifting the valve occasionally to redistribute the grinding paste. When a dull matt even surface is produced on the mating surface of both the valve seat and the valve, wipe off the paste and repeat the process with fine carborundum paste as before. A light spring placed under the valve head will greatly ease this operation. When a smooth unbroken ring of light grey matt finish is produced on the mating surface of both the valve and seat, the grinding operation is complete.
- 9 Scrape away all carbon from the valve head and stem, and clean away all traces of grinding compound. Clean the valves and seats with a paraffin soaked rag, then wipe with a clean rag.
- 10 If the guides are worn they will need reboring for oversize valves or for fitting guide inserts. The valve seats will also need recutting to ensure that they are concentric with the stems. This work should be entrusted to a Ford dealer or local engineering works.
- 11 Check that the free length of the valve springs is as specified, and renew if necessary. Do not renew individual springs; if any springs are excessively worn, renew all the springs as a set.



24.4 Withdrawing the camshaft oil supply tube



24.5 Note how the cam follower retaining springs are fitted



24.6 Removing a cam follower

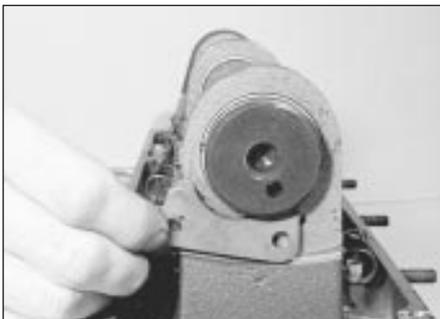
24 Camshaft and cam followers - removal, inspection and refitting

2A

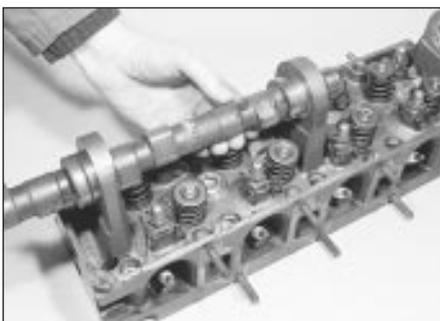
Note: A new camshaft oil seal should be used when refitting the camshaft.

Removal

- 1 Remove the cylinder head.
- 2 Hold the camshaft stationary using a suitable spanner on the cast boss behind the No 6 valve cam, and unscrew the camshaft sprocket bolt and washer.
- 3 Remove the camshaft sprocket, using a suitable puller if necessary, and withdraw the sprocket backplate, noting which way round it is fitted.
- 4 Remove the three securing bolts and



24.7 Unscrew the securing bolts and remove the camshaft thrustplate



24.8 Withdrawing the camshaft

withdraw the camshaft oil supply tube (see illustration).

- 5 Note how the cam follower retaining springs are fitted, then unhook them from the cam followers (see illustration).
- 6 Loosen the locknuts and back off the ball-pin adjuster nuts until the cam followers can be removed (see illustration). Note their locations for use when refitting. It will be necessary to rotate the camshaft during this operation.
- 7 Unscrew the two bolts and remove the camshaft thrustplate from the rear bearing housing (see illustration).
- 8 Carefully withdraw the camshaft from the rear of the cylinder head taking care not to damage the bearings (see illustration).
- 9 Prise the oil seal from the front bearing in the cylinder head (see illustration).

Inspection

- 10 Examine the surfaces of the camshaft journals and lobes, and the cam followers for wear. If wear is excessive, considerable noise would have been noticed from the top of the engine when running, and a new camshaft and followers must be fitted.
- 11 Check the camshaft bearings for wear, and if necessary have them renewed by a Ford dealer.
- 12 Check the camshaft oil supply tube for obstructions, making sure the jet holes are clear.

Refitting

- 13 Commence refitting by driving a new oil seal into the cylinder head front bearing, using



24.9 Prising out the camshaft oil seal

a suitable tube drift or socket (see illustration). Smear the seal lip with clean engine oil.

- 14 Lubricate the camshaft, bearings and thrustplate with SAE 80/90 hypoid oil, then carefully insert the camshaft from the rear of the cylinder head, taking care not to damage the bearings.
- 15 Locate the thrustplate in the camshaft groove, then insert and tighten the bolts.
- 16 Using a dial test indicator if available, or feeler blades, check that the camshaft endfloat is within the limits given in the Specifications. If not, renew the thrustplate and re-check. If this does not bring the endfloat within limits, the camshaft must be renewed.
- 17 Lubricate the ball-pins with SAE 80/90 hypoid oil, then refit the cam followers to their original locations, and refit the retaining springs as noted during removal. It will be necessary to rotate the camshaft during this operation.
- 18 Fit the oil supply tube and tighten the bolts.
- 19 Fit the camshaft sprocket backplate, as noted during removal.
- 20 Fit the camshaft sprocket, then insert and tighten the bolt (with washer in place) to the specified torque, holding the camshaft stationary as described in paragraph 2.
- 21 With the cylinder head supported on blocks of wood, adjust the valve clearances. This work is easier to carry out on the bench rather than in the vehicle.
- 22 Refit the cylinder head.



24.13 Fitting a new camshaft oil seal using a socket



25.4 Unscrew the auxiliary shaft cover securing bolts and remove the cover



25.5a Unscrew the auxiliary shaft thrustplate securing screws and remove the thrustplate



25.5b Withdraw the auxiliary shaft

25 Auxiliary shaft - removal, inspection and refitting



Note: A new gasket should be used when refitting the auxiliary shaft cover (see text).

Removal

- 1 Remove the timing belt and the auxiliary shaft sprocket.
- 2 Remove the distributor.
- 3 Remove the mechanical fuel pump and operating pushrod (where applicable).
- 4 Unscrew the three securing bolts and remove the auxiliary shaft cover (see illustration).
- 5 Unscrew the cross-head screws, using an impact screwdriver if necessary, remove the thrustplate and withdraw the auxiliary shaft from the cylinder block (see illustrations).
- 6 Cut the cover gasket along the top of the crankshaft front oil seal housing and scrape off the gasket.

Inspection

- 7 Examine the shaft for wear and damage, and renew it if necessary.
- 8 If desired, the oil seal in the cover can be renewed as follows.
- 9 Support the cover on blocks of wood and drive out the old oil seal. Drive the new seal into place using a suitable metal tube or socket (see illustrations). The sealing lip must face towards the cylinder block. Smear the sealing lip with clean engine oil before installation.



25.9a Driving out the auxiliary shaft cover oil seal



25.9b Using a socket to fit a new auxiliary shaft cover oil seal

Refitting

- 10 Commence refitting by lubricating the auxiliary shaft journals with clean engine oil, then insert the shaft into the cylinder block.
- 11 Locate the thrustplate in the shaft groove, then insert the crosshead screws and tighten them with an impact screwdriver.
- 12 Using a dial test indicator (if available), or feeler blades, check that the auxiliary shaft endfloat is within the limits given in the Specifications. If not, renew the thrustplate and re-check. If this does not bring the endfloat within limits, the auxiliary shaft must be renewed.
- 13 Cut out the relevant section of a new gasket, and locate it on the cylinder block, then refit the auxiliary shaft cover and tighten the securing bolts.
- 14 Where applicable, refit the fuel pump.
- 15 Refit the distributor.
- 16 Refit the auxiliary shaft sprocket and the timing belt.

26 Flywheel/driveplate - removal, inspection and refitting



Note: The manufacturers recommend that the flywheel/driveplate securing bolts are renewed after slackening. Suitable thread-locking agent will be required to coat the bolt threads.

Removal

- 1 If the engine is in the vehicle, remove the clutch or the automatic transmission, as applicable.

- 2 Prevent the flywheel/driveplate from turning by jamming the ring gear teeth or by bolting a strap between the flywheel/driveplate and the cylinder block.

- 3 Make alignment marks on the flywheel/driveplate and the end of the crankshaft, so that the flywheel/driveplate can be refitted in its original position.

- 4 Unscrew the securing bolts and withdraw the flywheel/driveplate. *Do not drop it, it is very heavy.* Note that on models with A4LD type automatic transmission, the driveplate may be secured with one or two reinforcing plates depending on model.

- 5 The engine adapter plate may now be withdrawn from the dowels if required (see illustration).

Inspection

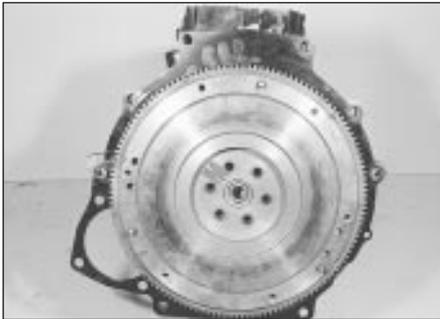
- 6 With the flywheel/driveplate removed, the ring gear can be examined for wear and damage.

- 7 If the ring gear is badly worn or has missing teeth it should be renewed. The old ring can be removed from the flywheel/driveplate by cutting a notch between two teeth with a hacksaw and then splitting it with a cold chisel. Wear eye protection when doing this.

- 8 Fitting of a new ring gear requires heating the ring to 400°F (204°C). This can be done by polishing four equally spaced sections of the gear, laying it on a heat resistant surface (such as fire bricks) and heating it evenly with a blow lamp or torch until the polished areas turn a light yellow tinge. Do not overheat, or the hard wearing properties will be lost. The gear has a



26.5 Withdrawing the engine adaptor plate



26.10 Flywheel located on crankshaft

chamfered inner edge which should fit against the shoulder on the flywheel. When hot enough, place the gear in position quickly, tapping it home if necessary, and let it cool naturally without quenching in any way.

Refitting

9 Commence refitting of the flywheel/driveplate by refitting the engine adapter plate to the dowels on the rear of the cylinder block, where applicable.

10 Ensure that the mating faces are clean, then locate the flywheel/driveplate on the rear of the crankshaft, aligning the previously made marks (see illustration).

11 Coat the threads of the securing bolts with a liquid thread-locking agent, then insert the bolts. Note that the manufacturers recommend the use of new bolts. Where applicable refit the reinforcing plate(s) on models with A4LD type automatics



26.12 Use a strap to prevent the flywheel turning as its securing bolts are tightened

12 Prevent the flywheel/driveplate from turning as described in paragraph 2, then tighten the securing bolts to the specified torque in a diagonal sequence (see illustration).

13 If the engine is in the vehicle, refit the clutch or the automatic transmission, as applicable.

27 Crankshaft front oil seal - renewal



Note: A new gasket will be required for refitting if the old seal housing is removed during this procedure.

1 Remove the timing belt and the crankshaft sprocket.

2 If an oil seal removal tool is available, the oil seal can be removed at this stage. It may also be possible to remove the oil seal by drilling

the outer face and using self-tapping screws and a pair of grips.

3 If the oil seal cannot be removed as described in paragraph 2, remove the sump and the auxiliary shaft sprocket, then unbolt the oil seal housing and the auxiliary shaft front cover. Recover the gasket. The oil seal can then be driven out from the inside of the housing (see illustrations).

4 Clean the oil seal housing, then drive in a new seal using a suitable metal tube or socket. Make sure that the seal lip faces into the engine and lightly smear the lip with clean engine oil (see illustration).

5 Where applicable, refit the oil seal housing and the auxiliary shaft front cover, using a new gasket, and tighten the bolts. Using a straight edge, ensure that the bottom face of the oil seal housing is aligned with the bottom face of the cylinder block before finally tightening the bolts (see illustrations). Refit the auxiliary shaft sprocket and refit the sump.

6 Refit the crankshaft sprocket and timing belt.

28 Crankshaft rear oil seal - renewal



1 Remove the flywheel/driveplate and the engine adapter plate.

2 Extract the oil seal using an oil seal removal tool if available. It may also be possible to remove the oil seal by drilling the outer face and using self-tapping screws and a pair of grips (see illustration).

2A



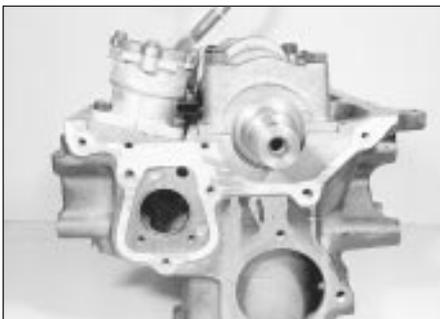
27.3a Removing the crankshaft front oil seal housing



27.3b Driving the crankshaft front oil seal from the housing



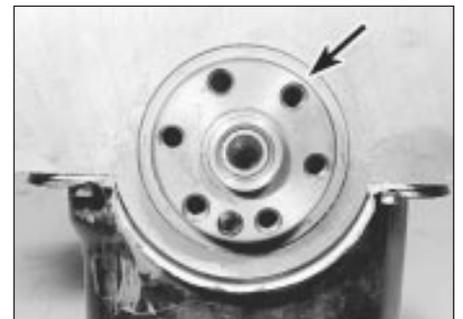
27.4 Using a socket to fit a new crankshaft front oil seal



27.5a Crankshaft front oil seal housing/auxiliary shaft cover gasket located on front of cylinder block



27.5b Checking the alignment of the crankshaft front oil seal housing



28.2 Crankshaft rear oil seal location (arrowed)



29.9a Make up wooden blocks to fit the front suspension turrets and support a metal bar . . .



29.9b . . . which will support the engine



29.10 Unscrew the front crossmember securing bolts

3 Clean the oil seal housing, then drive in a new seal using a suitable metal tube or socket. Make sure that the seal lip faces into the engine and lightly smear the lip with clean engine oil.

4 Refit the engine adapter plate and the flywheel/driveplate.

29 Sump - removal and refitting



Note: *New gaskets and sealing strips will be required for refitting, and sealing compound will be required to coat the gasket faces.*

Removal

- 1 If the engine is in the vehicle, proceed as follows, otherwise proceed to paragraph 12.
- 2 Disconnect the battery negative lead.

3 Apply the handbrake, jack up the front of the vehicle and support on axle stands (see "Jacking and Vehicle Support").

4 Drain the engine oil into a container.

5 Remove the starter motor, if necessary.

6 Unscrew the nuts or bolts, as applicable, securing the engine mountings to the crossmember.

7 Working in the engine compartment, unscrew the bolt securing the intermediate shaft to the steering column, swivel the clamp plate to one side, and disconnect the intermediate shaft.

8 Where applicable, detach the brake lines from the crossmember.

9 Support the engine using a hoist, or a bar and blocks of wood resting on the suspension turrets (see illustrations). Attach the lifting tackle to the engine lifting brackets on the cylinder head. If using a support bar, the engine may be lifted slightly by using the bar

as a lever before resting it on the wooden blocks.

10 Support the front crossmember with a trolley jack, then unscrew the bolts securing the crossmember to the underbody (see illustration).

11 Lower the crossmember just enough to give sufficient clearance to remove the sump (see illustrations).

12 Unscrew the twenty-three securing bolts and withdraw the sump (see illustration). If the sump is stuck, carefully tap it sideways to free it. Do not prise between the mating faces. Note that if the engine has been removed, it is preferable to keep the engine upright until the sump has been removed to prevent sludge from entering the engine internals.

13 Recover the gaskets and sealing strips.

14 Thoroughly clean the mating faces of the cylinder block and sump.

Refitting

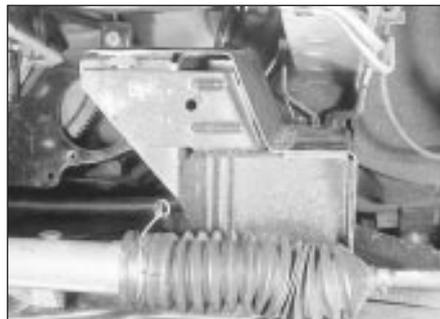
15 Commence refitting by applying sealing compound (available from a Ford dealer) to the corners of the front and rear rubber sealing strip locations in the cylinder block, then press the sealing strips into the grooves in the rear main bearing cap and the crankshaft front oil seal housing (see illustrations).

16 Apply a little sealing compound to the mating face of the cylinder block, then place the sump gaskets in position, ensuring that the end tabs locate correctly beneath the rubber sealing strips (see illustration).

17 Locate the sump on the gaskets and loosely fit the securing bolts.



29.11a Lower the suspension . . .



29.11b . . . to give sufficient clearance for sump removal



29.12 Unscrew the securing bolts and withdraw the sump



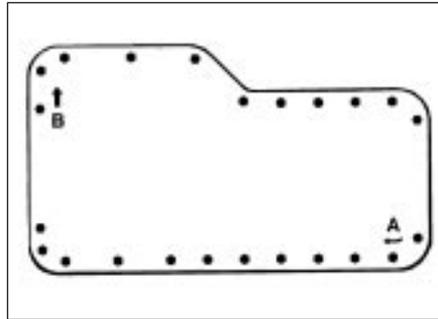
29.15a Apply sealing compound . . .



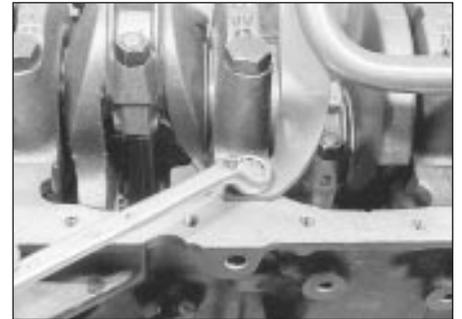
29.15b . . . then fit the rubber sealing strips



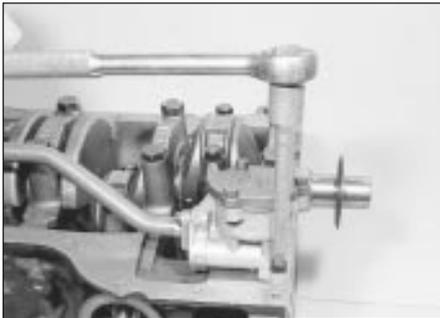
29.16 Locate the sump gasket end tabs beneath the rubber sealing strips



29.18 Sump bolt tightening sequence - refer to text



30.2 Unscrewing the oil pick-up tube securing bolt



30.3 Unscrewing an oil pump securing bolt



30.4 Withdrawing the oil pump driveshaft

18 Tighten the bolts in the correct sequence (see illustration) noting the two stages given in the Specifications. Tighten to the first stage in a clockwise sequence starting at point "A", then tighten to the second stage in a clockwise sequence starting at point "B". Tighten to the third stage after the engine has been running for twenty minutes.

19 If the engine is in the vehicle proceed as follows.

20 Carefully lift the crossmember with the jack, then refit the securing bolts and tighten to the specified torque.

21 Withdraw the jack, then lower the engine and remove the lifting tackle.

22 Where applicable, refit the brake lines to the crossmember.

23 Ensure that the front wheels are pointing straight ahead and that the steering wheel is centred, then reconnect the intermediate shaft to the steering column. Secure the clamp plate with the bolt.

24 Refit the engine mounting bolts and

tighten to the specified torque.

25 Refit the starter motor.

26 Lower the vehicle to the ground.

27 Ensure that the sump drain plug is fitted, then fill the engine with the correct quantity and grade of oil. If necessary, renew the oil filter before filling the engine with oil.

28 Reconnect the battery negative lead.

29 Start the engine and check for leaks around the sump, and where applicable the oil filter. When the engine is started, there may be a delay in the extinguishing of the oil pressure warning lamp while the system pressurises.

30 Run the engine for twenty minutes then stop the engine and tighten the sump bolts to the third stage given in the Specifications, starting at the point "A" shown and working clockwise.

31 Check the oil level.

32 Dispose of any old engine oil safely. Do not pour it down a drain - this is illegal and causes pollution.

30 Oil pump - removal and refitting



Removal

1 Remove the sump.

2 Unscrew the bolt securing the pick-up tube and strainer to the cylinder block (see illustration).

3 Using a suitable splined socket, unscrew the two securing bolts and withdraw the oil pump and strainer (see illustration).

4 If desired, the hexagon-shaped driveshaft can be withdrawn, but note which way round

it is fitted (see illustration). The driveshaft engages with the lower end of the distributor driveshaft.

5 Thoroughly clean the mating faces of the oil pump and cylinder block.

Refitting

6 Commence refitting by inserting the oil pump driveshaft into the cylinder block in its previously noted position.

7 Prime the pump by injecting oil into it and turning it by hand.

8 Fit the pump, insert the securing bolts, and tighten them to the specified torque.

9 Fit the pick-up tube securing bolt and tighten it.

10 Refit the sump.

31 Oil pump - dismantling, inspection and reassembly



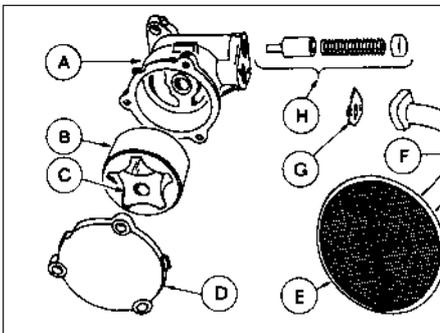
Note: A new pressure relief valve plug and pick-up tube gasket will be required for reassembly.

Dismantling

1 If oil pump wear is suspected, check the cost and availability of new parts and the cost of a new pump. Examine the pump as described in this Section and then decide whether renewal or repair is the best course of action.

2 Unbolt the pick-up tube and strainer. Recover the gasket.

3 Unscrew the three securing bolts and remove the oil pump cover (see illustration).



31.3 Exploded view of the oil pump

- A Body
- B Outer rotor
- C Inner rotor
- D Cover
- E Strainer
- F Pick-up tube
- G Gasket
- H Pressure relief valve
- I Pressure relief valve plug



31.10a Checking the oil pump outer rotor-to-body clearance

4 Mark the rotor faces so that the rotors can be refitted in their original positions, then lift the rotors from the pump body.

5 Remove the pressure relief valve plug by piercing it with a punch and levering it out, then withdraw the spring and plunger.

6 Thoroughly clean all parts in petrol or paraffin and wipe dry using a non-fluffy rag.

Reassembly and inspection

7 Commence reassembly by lubricating the relief valve plunger. Fit the plunger and spring.

8 Fit a new relief valve plug, flat side outwards and seat it with a drift until it is flush with the pick-up mating face.

9 Lubricate the rotors and fit them. Note the marks made when dismantling, if applicable.

10 The necessary clearances may now be checked using a machined straight edge (a good steel rule) and a set of feeler blades. The critical clearances are between the lobes of the centre rotor and convex faces of the outer rotor; between the outer and pump body; and between both rotors and the end cover plate (endfloat). The desired clearances are given in the Specifications (see illustrations).

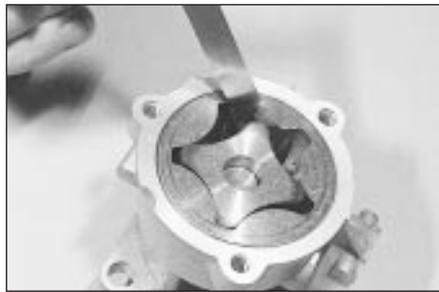
11 Endfloat can be measured by placing a straight edge across the pump body and measuring the clearance between the two rotors and the straight edge using feeler blades (see illustration).

12 New rotors are only available as a pair. If the rotor-to-body clearance is excessive, a complete new pump should be fitted.

13 Refit the pump cover and tighten the securing bolts.

14 Fit the pick-up tube and strainer, using a new gasket.

15 Temporarily insert the driveshaft into the pump and make sure that the rotors turn freely.



31.10b Checking the oil pump inner-to-outer rotor clearance

16 Prime the pump before refitting.

32 Pistons and connecting rods - removal and refitting

Removal

1 Remove the sump and the cylinder head.

2 Check the big-end bearing caps for identification marks and if necessary use a centre-punch to identify the caps and corresponding connecting rods (see illustration).

3 Turn the crankshaft so that No 1 crankpin is at its lowest point, then unscrew the nuts and tap off the bearing cap. Keep the bearing shells in the cap and connecting rod.

4 Using the handle of a hammer, push the piston and connecting rod up the bore and withdraw from the top of the cylinder block. Loosely refit the cap to the connecting rod.

5 Repeat the procedure in paragraphs 3 and 4 on No 4 piston and connecting rod, then turn the crankshaft through half a turn and repeat the procedure on Nos 2 and 3 pistons and connecting rods.

Refitting

6 Commence refitting as follows.

7 Clean the backs of the bearing shells and the recesses in the connecting rods and big-end caps.

8 Press the bearing shells into the connecting rods and caps in their correct positions and oil them liberally. Note that the lugs in corresponding shells must be adjacent to each other (see illustration).

9 Lubricate the cylinder bores with clean engine oil.



31.11 Checking the oil pump rotor endfloat

10 Fit a piston ring compressor to No 1 piston, then insert the piston and connecting rod into No 1 cylinder (see illustration). With No 1 crankpin at its lowest point, drive the piston carefully into the cylinder with the wooden handle of a hammer, and at the same time guide the connecting rod onto the crankpin. Make sure that the arrow on the piston crown is facing the front of the engine.

11 Oil the crankpin, then fit the big-end bearing cap in its previously noted position, and tighten the nuts to the specified torque.

12 Check that the crankshaft turns freely.

13 Repeat the procedure given in paragraphs 11 to 13 inclusive on the remaining pistons.

14 Refit the cylinder head and the sump.

33 Pistons and connecting rods - examination and renovation

1 Examine the pistons for ovality, scoring, and scratches. Check the connecting rods for wear and damage. The connecting rods carry a letter indicating their weight class; all the rods fitted must be of the same class.

2 The gudgeon pins are an interference fit in the connecting rods, and if new pistons are to be fitted to the existing connecting rods, the work should be carried out by a Ford dealer who will have the necessary tooling. Note that the oil splash hole in the connecting rod must be located on the right-hand side of the piston (the arrow on the piston crown faces forwards).

3 If new rings are to be fitted to the existing pistons, expand the old rings over the top of the pistons. The use of two or three old feeler blades will be helpful in preventing the rings dropping into empty grooves. Note that the oil control ring is in three sections.



32.2 Big-end cap and connecting rod identification numbers



32.8 The bearing shell lugs (arrowed) must be adjacent to each other



32.10 Fitting a piston ring compressor



33.4 Checking a piston ring gap at the top of the cylinder bore

4 Before fitting the new rings to the pistons, insert them into the cylinder bore and use a feeler blade to check that the end gaps are within the specified limits (see illustration).

5 Clean out the piston ring groove using a piece of old piston ring as a scraper. Be careful not to scratch the aluminium surface of the pistons. Protect your fingers - piston ring edges are sharp.

6 Fit the oil control ring sections with the spreader ends abutted opposite the front of the piston. The side ring gaps should be 25 mm (1.0 in) either side of the spreader gap. Fit the tapered lower compression ring with the "TOP" mark towards the top of the piston and the gap 150° from the spreader gap, then fit the upper compression ring with the gap 150° on the other side of the spreader gap. Note that the compression rings are coated with a molybdenum skin which must not be damaged. Note also that the compression rings are made of cast iron, and will snap if expanded too far.

34 Crankshaft and main bearings - removal and refitting

Removal

1 With the engine removed from the vehicle, remove the timing belt, crankshaft sprocket, auxiliary shaft sprocket and the flywheel/driveplate.

2 Remove the pistons and connecting rods. If no work is to be done on the pistons and connecting rods, there is no need to push the pistons out of the cylinder bores.

3 Unbolt the crankshaft front oil seal housing and the auxiliary shaft front cover and remove the gasket.



34.8 Removing a thrustwasher from the centre main bearing

4 Remove the oil pump and pick-up tube.
5 Check the main bearing caps for identification marks and if necessary use a centre-punch to identify them (see illustration).

6 Before removing the crankshaft, check that the endfloat is within the specified limits by inserting a feeler blade between the centre crankshaft web and the thrustwashers (see illustration). This will indicate whether or not new thrustwashers are required.

7 Unscrew the bolts and tap off the main bearing caps complete with bearing shells. If the thrustwashers are to be re-used identify them for location. Recover the sealing wedges from either side of the rear bearing cap.

8 Lift the crankshaft from the crankcase and remove the rear oil seal. Recover the remaining thrustwashers (see illustration).

9 Extract the bearing shells, keeping them identified for location (see illustration).

Refitting

10 Commence refitting as follows.

11 Wipe the bearing shell locations in the crankcase with a soft, non-fluffy rag.

12 Wipe the crankshaft journals with a soft, non-fluffy rag.

13 If the old main bearing shells are to be renewed (not to do so is a false economy, unless they are virtually new) fit the five upper halves of the main bearing shells to their location in the crankcase.

14 Identify each main bearing cap and place in order. The number is cast on to the cap and on intermediate caps an arrow is marked which points towards the front of the engine.

15 Wipe each cap bearing shell location with a soft non-fluffy rag.

16 Fit the bearing half shell onto each main bearing cap.

17 Apply a little grease to each side of the centre main bearing so as to retain the thrustwashers.

18 Fit the upper halves of the thrustwashers into their grooves either side of the main bearing. The slots must face outwards.

19 Lubricate the crankshaft journals and the upper and lower main bearing shells with clean engine oil and locate the rear oil seal (with lip lubricated) on the rear of the crankshaft.

20 Carefully lower the crankshaft into the crankcase.

21 Lubricate the crankshaft main bearing journals again, and then fit No 1 bearing cap. Fit the two securing bolts but do not tighten yet.

22 Make sure that the mating faces are clean, then apply sealant (Loctite 518 or equivalent) to the areas on the rear main bearing cap shown (see illustration).

23 Fit the rear main bearing cap. Fit the two securing bolts but as before do not tighten yet.

24 Apply a little grease to either side of the centre main bearing cap so as to retain the thrustwashers. Fit the thrustwashers with the tag located in the groove and the slots facing outwards (see illustration).

25 Fit the centre main bearing cap and the two securing bolts, then refit the intermediate main bearing caps. Make sure that the arrows point towards the front of the engine.

26 Lightly tighten all main bearing cap securing bolts and then fully tighten in a progressive manner to the specified torque wrench setting.

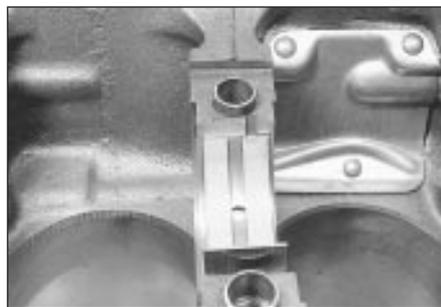
27 Check that the crankshaft rotates freely. Some stiffness is to be expected with new



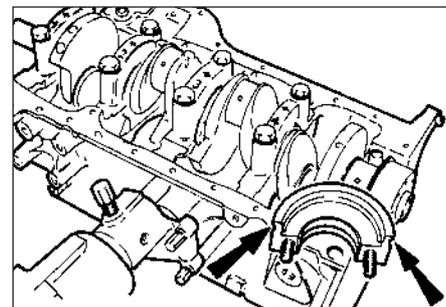
34.5 Main bearing cap identification marks. The arrow points to the front of the engine



34.6 Checking crankshaft endfloat



34.9 Extract each main bearing shell



34.22 Coat the arrowed areas of the rear main bearing cap with sealant



34.24 Fitting a thrustwasher to the centre main bearing cap

components, but there must be no tight spots or binding.

28 Check that the crankshaft endfloat is within the specified limits by inserting a feeler blade between the centre crankshaft web and the thrustwashers.

29 Make sure that the rear oil seal is fully located onto its seating. Coat the rear main bearing cap sealing wedges with sealing compound, then press them into position using a blunt screwdriver with the rounded red face towards the cap (**see illustration**).

30 Refit the oil pump and pick-up tube.

31 Refit the crankshaft front oil seal housing and the auxiliary shaft front cover using a new gasket, and tighten the securing bolts. Smear the lip of the oil seal with clean engine oil before fitting; and using a straight edge, ensure that the bottom face of the oil seal housing is aligned with the bottom face of the cylinder block before finally tightening the bolts.

32 Refit the pistons and connecting rods.

33 Refit the flywheel/driveplate and the auxiliary shaft sprocket, crankshaft sprocket, and timing belt.

35 Crankshaft and bearings - examination and renovation

1 Examine the bearing surfaces of the crankshaft for scratches or scoring and, using a micrometer, check each journal and crankpin for ovality. Where this is found to be in excess of 0.0254 mm (0.001 in) the crankshaft will have to be reground and undersize bearings fitted.

2 Crankshaft regrinding should be carried out by a suitable engineering works, who will normally supply the matching undersize main and big-end shell bearings.

3 Note that undersize bearings may already have been fitted, either in production or by a previous repairer. Check the markings on the backs of the old bearing shells, and if in doubt take them along when buying new ones. Production undersizes are also indicated by paint marks as follows:

White line on main bearing cap - parent bore 0.40 mm oversize

Green line on crankshaft front counterweight - main bearing journals 0.25 mm undersize

Green spot on counterweight - big-end bearing journals 0.25 mm undersize



34.29 Fitting a sealing wedge to the rear main bearing cap

4 If the crankshaft endfloat is more than the maximum specified amount, new thrustwashers should be fitted to the centre main bearings. These are usually supplied together with the main and big-end bearings on a reground crankshaft.

5 An accurate method of determining bearing wear is by the use of Plastigage. The crankshaft is located in the main bearings (and big-end bearings if necessary) and the Plastigage filament located across the journal which must be dry. The cap is then fitted and the bolts/nuts tightened to the specified torque. On removal of the cap the width of the filaments is checked against a scale which shows the bearing running clearance. This clearance is then compared with that given in the Specifications (**see illustration**).

6 If the spigot bearing in the rear of the crankshaft requires renewal, extract it with a suitable puller. Alternatively fill it with heavy grease and use a close fitting metal dowel driven into the centre of the bearing. Drive the new bearing into the crankshaft with a soft metal drift.

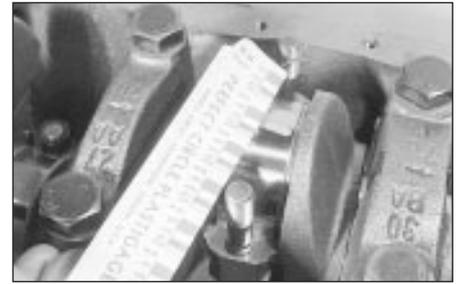
36 Cylinder block and bores - examination and renovation

1 The cylinder bores must be examined for taper, ovality, scoring and scratches. Start by examining the top of the bores; if these are worn, a slight ridge will be found which marks the top of the piston ring travel. If the wear is excessive, the engine will have had a high oil consumption rate accompanied by blue smoke from the exhaust.

2 If available, use an inside dial gauge to measure the bore diameter just below the ridge and compare it with the diameter at the bottom of the bore, which is not subject to wear. If the difference is more than 0.152 mm (0.006 in), the cylinders will normally require reboring with new oversize pistons fitted.

3 Proprietary oil control rings can be obtained for fitting to the existing pistons if it is felt that the degree of wear does not justify a rebore. However, any improvement brought about by such rings may be short-lived.

4 If new pistons or piston rings are to be fitted to old bores, deglaze the bores with abrasive paper or a "glaze buster" tool. The object is to produce a light cross-hatch pattern to assist



35.5 Checking the width of the filament against the scale of the packet

the new rings to bed in.

5 If there is a ridge at the top of the bore and new piston rings are being fitted, either the top piston ring must be stepped ("ridge dodger" pattern) or the ridge must be removed with a ridge reamer. If the ridge is left, the piston ring may hit it and break.

6 Thoroughly examine the crankcase and cylinder block for cracks and damage and use a piece of wire to probe all oilways and waterways to ensure that they are unobstructed.

37 Initial start-up after overhaul or major repair

1 Make a final check to ensure that everything has been reconnected to the engine and that no rags or tools have been left in the engine bay.

2 Check that oil and coolant levels are correct.

3 Start the engine. This may take a little longer than usual as fuel is pumped up to the engine.

4 Check that the oil pressure light goes out when the engine starts.

5 Run the engine at a fast tickover and check for leaks of oil, fuel or coolant. Also check power steering and transmission fluid cooler unions, where applicable. Some smoke and odd smells may be experienced as assembly lubricant burns off the exhaust manifold and other components.

6 Bring the engine to normal operating temperature, then check the ignition timing and the idle speed (where applicable) and mixture.

7 If splined type cylinder head bolts have been used, stop the engine after it has been running for 15 minutes, then remove the crankshaft cover and tighten the cylinder head bolts to the fourth stage given in the Specifications, in the correct order.

8 When the engine has completely cooled, re-check the oil and coolant levels, and check, and if necessary adjust, the valve clearances.

9 If new bearings, pistons etc have been fitted, the engine should be run-in at reduced speeds and loads for the first 500 miles (800 km) or so. It is beneficial to change the engine oil and filter after this mileage.