



8.13 Checking the tension of the timing belt

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

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

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

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

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

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

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

tensioner-setting tool at the earliest opportunity.

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

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

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

18 On completion, reconnect the battery earth lead.

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



Tensioner

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

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

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

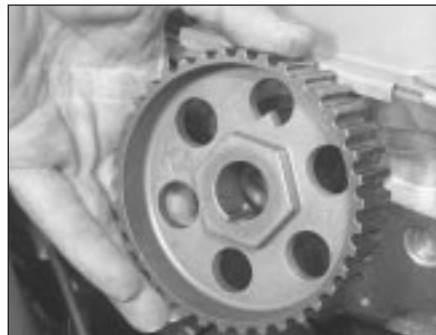
4 Check the condition of the tensioner, ensuring that it rotates smoothly on its bearings, with no signs of roughness or excessive free play. Renew the tensioner if in doubt about its condition.

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

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

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

8 Refit the timing belt upper cover on completion.



9.13a Refit the camshaft sprocket . . .

Camshaft sprocket

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

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

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

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

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

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

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

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

17 Refit the timing belt upper cover on completion.

Crankshaft sprocket

18 Remove the timing belt as described in Section 8.

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

20 Check the condition of the sprocket,



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

inspecting carefully for any wear grooves, pitting or scoring around the teeth.

21 Refit the thrustwasher with its curved side facing outwards, followed by the Woodruff key.

22 Lubricate the oil seal and the crankshaft sprocket with engine oil, then position the sprocket on the crankshaft with its thrust face facing outwards.

23 Using the auxiliary drivebelt pulley and its retaining bolt, draw the sprocket fully into position on the crankshaft. Remove the pulley.

24 Refit the timing belt as described in Section 8.

10 Camshaft oil seal - renewal



1 Remove the camshaft sprocket as described in the previous Section.

2 The oil seal is now accessible for removal. Note its direction of fitting, then using a suitable screwdriver or a tool with a hooked end to lever and extract the seal from its housing (but take care not to damage the housing with the tool) (see illustration).

3 Check that the housing is clean before fitting the new seal. Lubricate the lips of the seal and the running faces of the camshaft with clean engine oil. Carefully locate the seal over the camshaft, and drive it squarely into position using a suitable tube or a socket (see illustration). An alternative method of fitting is



10.2 Camshaft front oil seal removal

to draw it squarely into position using the old sprocket bolt and a suitable distance piece.

4 With the seal fully inserted in its housing, refit the camshaft sprocket as described in the previous Section.

11 Camshaft, rocker arms and tappets - removal, inspection and refitting



Removal

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

2 Refer to the appropriate earlier Sections in this Chapter, and remove the timing belt upper cover and the rocker cover.

3 On carburettor models, refer to Chapter 4A and remove the fuel pump. On models



10.3 Using a socket to tap the camshaft oil seal into place

equipped with a distributor ignition system, refer to Chapter 5B and remove the distributor. On PTE engines, refer to Chapter 4D and remove the camshaft position sensor.

4 On models equipped with distributorless ignition system, detach, unbolt and remove the ignition coil, its support bracket and the interference capacitor from the end of the cylinder head, as described in Chapter 5B.

5 Undo the retaining nuts and remove the guides, rocker arms and spacer plates (see illustrations). Keep the respective components in their original order of fitting by marking them with a piece of numbered tape, or by using a suitable sub-divided box.

6 Withdraw the hydraulic tappets, again keeping them in their original fitted sequence. The tappets should be placed in an oil bath while removed (see illustrations).

7 Unbolt and remove the lower cover beneath



11.5a Undo the rocker arm retaining nut ...



11.5b ... withdraw the guide ...



11.5c ... followed by the rocker arm ...



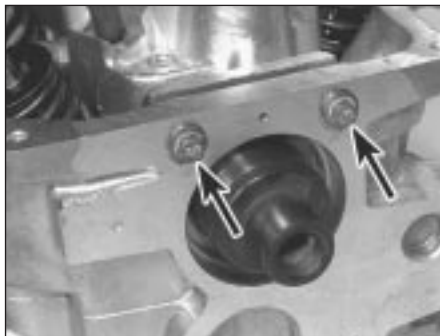
11.5d ... and spacer plate



11.6a Removing a hydraulic tappet



11.6b Store tappets in clearly-marked container filled with oil to prevent oil loss



11.10a Undo the two retaining bolts (arrowed) ...



11.10b ... and lift out the camshaft thrust plate



11.11a Pierce the centre of the blanking plug ...



11.11b ... and lever it out of the cylinder head

the crankshaft pulley, then with a spanner engaged on the crankshaft pulley bolt, turn the crankshaft over to set the engine at TDC for No 1 piston on compression (see Section 3).

8 Remove the camshaft sprocket as described in Section 9.

9 Extract the camshaft oil seal as described in Section 10.

10 Before removing the camshaft and its thrust plate, check and take note of the amount of camshaft endfloat, using a dial gauge or feeler gauges. With the camshaft endfloat measured and noted, unscrew the two retaining bolts and then extract the camshaft thrust plate from its pocket at the front end of the cylinder head (see illustrations).

11 On models with a distributorless ignition

system, at the rear end of the cylinder head, pierce the camshaft blanking plug with a suitable tool, and then lever it out of its aperture (see illustrations).

12 Withdraw the camshaft from the cylinder head at the rear (distributor/ignition coil) end (see illustration). Take care not to damage the bearings in the cylinder head as the shaft is withdrawn.

Inspection

13 Clean and inspect the various components removed for signs of excessive wear.

14 Examine the camshaft bearing journals and lobes for damage or wear. If evident, a new camshaft will be required.

15 Compare the previously-measured camshaft endfloat with that specified. If the

endfloat is outside of the specified tolerance, the thrust plate must be renewed.

16 The camshaft bearing bore diameters in the cylinder head should be measured and checked against the tolerances specified. A suitable measuring gauge will be required for this, but if this is not available, check for excessive movement between the camshaft journals and the bearings. If the bearings are found to be unacceptably worn, a new cylinder head is the only answer, as the bearings are machined directly into the head.

17 It is seldom that the hydraulic tappets are badly worn in the cylinder head bores but again, if the bores are found to be worn beyond an acceptable level, the cylinder head must be renewed.

18 If the contact surfaces of the cam lobes show signs of depression or grooving, they cannot be renovated by grinding, as the hardened surface will be removed and the overall length of the tappet(s) will be reduced. The self-adjustment point of the tappet will be exceeded as a result, so that the valve adjustment will be affected, resulting in noisy operation. Therefore, renewal of the camshaft is the only remedy in this case.

19 Inspect the rocker arm contact surfaces for excessive wear, and renew if necessary (see illustration).

Refitting

20 Refitting the camshaft and its associated components is a reversal of the removal procedure, but note the following special points.

21 Lubricate the camshaft bearings, the camshaft and the thrust plate with clean engine oil prior to fitting them. As the camshaft is inserted, take care not to damage the bearings in the cylinder head. Tighten the camshaft thrust plate retaining bolts to the specified torque. When the thrust plate bolts are tightened, make a final check to ensure that the camshaft endfloat is as specified.

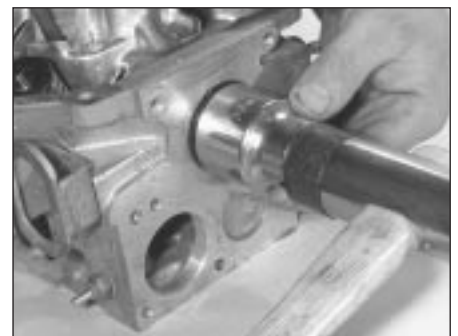
22 A new front oil seal must be fitted after the camshaft has been installed (see previous Section for details). It will also be necessary to insert a new blanking plug into the rear end of the cylinder head (where applicable). Drive it squarely into position so that it is flush with the head (see illustration).



11.12 Withdraw the camshaft from the cylinder head



11.19 Inspect the rocker arm contact points indicated for excessive wear



11.22 Driving a new blanking plug into position

- 23 Refer to the procedure in Section 9 when refitting the camshaft sprocket.
- 24 Refit and tension the timing belt as described in Section 8.
- 25 Lubricate the hydraulic tappets with hypoid oil before refitting them into their original locations in the cylinder head.
- 26 Lubricate and refit the rocker arms and guides in their original sequence, use new nuts and tighten them to the specified torque setting. It is essential, before each rocker arm is installed and its nut tightened, that the respective cam follower is positioned at its lowest point (in contact with the cam base circle). Turn the cam (using the crankshaft pulley bolt) as necessary to achieve this.
- 27 Refit the rocker cover as described in Section 4.
- 28 Refit the remaining components with reference to the relevant Sections in this Chapter or elsewhere in the manual.
- 29 On completion, reconnect the battery negative lead.

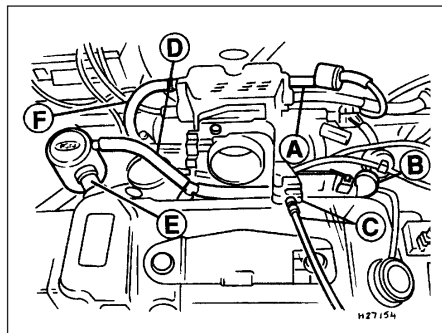
12 Cylinder head - removal and refitting



Removal

Note: The following procedure describes removal and refitting of the cylinder head complete with inlet and exhaust manifolds. If wished, the manifolds may be removed first, as described in the relevant Part of Chapter 4, and the cylinder head then removed on its own.

- 1 On fuel-injected engines, depressurise the fuel system as described in Chapter 4B or 4C.
- 2 Disconnect the battery negative (earth) lead (refer to Chapter 5A, Section 1).
- 3 Refer to Chapter 1 and drain the cooling system.



12.8 Vacuum hoses and throttle cable connections on the 1.6 litre EFI fuel injected engine

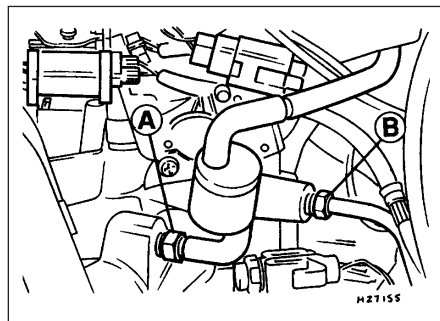
- A Hose to MAP sensor
B Crankcase ventilation breather hose
C Throttle cable and clip
D Oil trap hose and T-piece connector
E Hose to oil trap
F Hose to carbon canister solenoid valve

- 4 Remove the rocker cover as described in Section 4.
- 5 Disconnect the accelerator and choke cables as applicable (refer to the relevant Part of Chapter 4).
- 6 Loosen off the retaining clips and disconnect the upper coolant hose, the expansion tank hose and the heater hose from the thermostat housing. Also disconnect the heater hose from the inlet manifold.



Whenever you disconnect any vacuum lines, coolant or emissions hoses, wiring connectors and fuel lines, always label them clearly, so that they can be correctly reassembled. Masking tape and/or a touch-up paint applicator work well for marking items. Take instant photos, or sketch the locations of components and brackets.

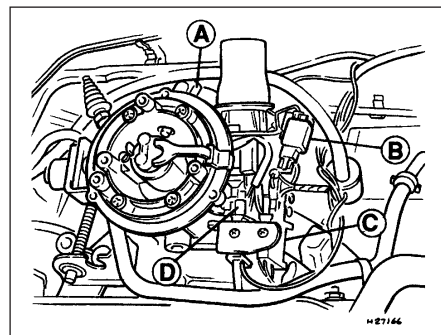
- 7 On CFI models, disconnect the heated coolant hose from the injector unit.
- 8 On EFI and SEFI models, disconnect the following (see illustration):
 - a) The MAP sensor vacuum hose from the inlet manifold upper section (EFI models).
 - b) The carbon canister solenoid valve vacuum hose from the inlet manifold upper section.
 - c) The oil trap vacuum hose at the "T" piece connector.
 - d) The brake servo vacuum hose from the inlet manifold upper section by pressing in the clamp ring and simultaneously pulling the hose free from the connection.
 - e) The coolant hose from the injector intermediate flange and at the thermostat housing.
- 9 Disconnect the following fuel supply/return hoses. Plug the hoses and connections, to prevent fuel spillage and the possible ingress of dirt.
 - a) On carburettor models, disconnect the fuel supply hose from the pump and the return hose from the carburettor.
 - b) On CFI models, pull free and detach the fuel return hose from the injection unit and the supply hose at the connector.



12.10 Vacuum hose to the MAP sensor (A) and the brake servo unit (B) on the 1.4 litre CFI fuel-injected engine

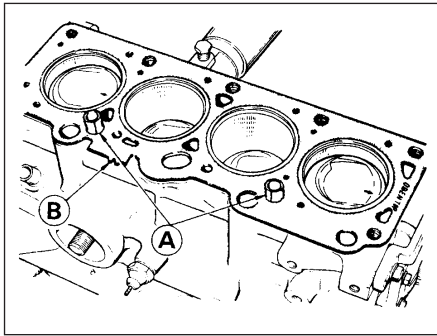
- c) On EFI and SEFI models, detach the fuel supply hose from the fuel rail or at the quick-release coupling (where fitted). Disconnect the return line from the fuel pressure regulator or at the quick-release coupling.
- 10 On CFI models, disconnect the brake servo vacuum hose from the inlet manifold, the MAP sensor vacuum hose from the sensor, and the carbon canister connecting hose at the injection unit (see illustration).
- 11 Noting their connections and routings, disconnect the wiring connectors or multi-plugs from the following items, where applicable:
 - a) Temperature gauge sender unit.
 - b) DIS ignition coil.
 - c) Coolant temperature sensor.
 - d) Cooling fan thermostatic switch.
 - e) Carburettor.
 - f) Radio earth lead.
 - g) Road speed sensor.
 - h) Fuel injector wiring loom.
 - i) Intake air temperature sensor.

- 12 On CFI models, detach the throttle control motor, throttle position sensor and injector lead multi-plugs (see illustration).
- 13 On models with a distributorless ignition system, where still attached, disconnect the HT leads from the DIS ignition coil and the spark plugs. On models with a distributor ignition system, remove the distributor as described in Chapter 5B.
- 14 Position the engine with No 1 piston at TDC on compression as described in Section 3.
- 15 Loosen off the timing belt tensioner retaining bolts, and move the tensioner to release the tension from the drivebelt. Support the belt, and move it clear of the camshaft sprocket.
- 16 Chock the rear wheels then jack up the front of the car and support it on axle stands (see "Jacking and Vehicle Support").
- 17 Unscrew the retaining nuts and detach the exhaust downpipe from the manifold. Remove the gasket; note that a new one must



12.12 Wiring connections to be detached on the 1.4 litre CFI fuel injected engine

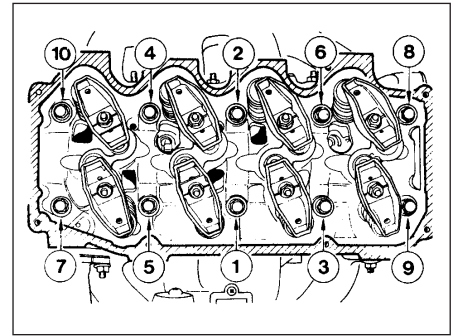
- A Coolant temperature sensor
B Throttle plate control motor
C Throttle position sensor
D Injector



12.21 Cylinder head location dowels (A) and gasket identification teeth (B)



12.27 Fit the cylinder head gasket with the "OBEN/TOP" marking upwards . . .



12.28 Cylinder head bolt tightening sequence

be fitted on reassembly. Tie the downpipe up to support it.

18 Before it is released and removed, the cylinder head must first have cooled down to room temperature (about 20°C).

19 Unscrew the cylinder head retaining bolts progressively in the reverse order to that shown for tightening (see illustration 12.28). The cylinder head bolts must be discarded and new bolts obtained for refitting the cylinder head.

20 Remove the cylinder head complete with its manifolds. If necessary, grip the manifolds and rock it free from the location dowels on the top face of the cylinder block. Do not attempt to tap it sideways or lever between the head and the block top face.

21 Remove the cylinder head gasket. This must always be renewed; it is essential that the correct type is obtained. Save the old gasket, so that the identification marks (teeth) can be used when ordering the new one (see illustration).

Preparation for refitting

22 The mating faces of the cylinder head and cylinder block must be perfectly clean before refitting the head. Use a hard plastic or wood scraper to remove all traces of gasket and carbon; also clean the piston crowns. Take particular care during the cleaning operations, as aluminium alloy is easily damaged. Also, make sure that the carbon is not allowed to enter the oil and water passages - this is particularly important for the lubrication system, as carbon could block the oil supply to the engine's components. Using adhesive tape and paper, seal the water, oil and bolt holes in the cylinder block.

HAYNES HINT To prevent carbon entering the gap between the pistons and bores, smear a little grease in the gap. After cleaning each piston, use a small brush to remove all traces of grease and carbon from the gap, then wipe away the remainder with a clean rag.

23 Check the mating surfaces of the cylinder block and the cylinder head for nicks, deep scratches and other damage. If slight, they

may be removed carefully with a file, but if excessive, machining may be the only alternative to renewal.

24 If warpage of the cylinder head gasket surface is suspected, use a straight-edge to check it for distortion. Refer to Part D of this Chapter if necessary.

25 Ensure that new cylinder head bolts are used when refitting and clean out the bolt holes in the block. Screwing a bolt into an oil-filled hole can (in extreme cases) cause the block to fracture, due to the hydraulic pressure.

Refitting

26 To prevent the possibility of the valves and pistons coming into contact as the head is fitted, turn the crankshaft over to position No 1 piston approximately 20 mm below its TDC position in the bore.

27 Locate the cylinder head gasket on the top face of the cylinder block, locating it over the dowels. Ensure that the gasket is fitted the correct way up, as indicated by its "OBEN-TOP" marking (see illustration).

28 Lower the cylinder head into position, ensuring that it fits over the locating dowels, then insert the new retaining bolts. Hand-tighten the bolts initially, then tighten them in the order shown in the four stages to the specified torque setting (see illustration). Where possible, use an angular torque setting gauge attachment tool for accurate tightening of stages three and four. Alternatively, after the first two stages, mark the bolt heads with a dab of quick drying paint, so that the paint spots all face the same direction. Now tighten all the bolts in the sequence to the Stage 3 setting, by tightening them through the specified angle. Finally, angle-tighten all the bolts through the Stage 4 angle.

29 The camshaft sprocket should be positioned so that its TDC index mark pointer is in alignment with the TDC index spot mark on the front end face of the cylinder head (see illustration 3.6b).

30 Now turn the crankshaft pulley to bring its TDC notch in alignment with the TDC (0) indicator on the front face of the timing belt cover, taking the shortest route (not vice-versa) (see illustration 3.6a).

31 Refit the timing belt over the camshaft sprocket, and then tension the belt as described in Section 8.

32 The remainder of the refitting procedure is a reversal of the removal process. Tighten all fastenings to their specified torque setting (where given). Refer to the appropriate Parts of Chapter 4 for details on reconnecting the fuel and exhaust system components, and to Chapter 5B for details on reconnecting the ignition system components. Ensure that all coolant, fuel, vacuum and electrical connections are securely made.

33 On completion, refill the cooling system and top-up the engine oil (see Chapter 1 and "Weekly Checks"). When the engine is restarted, check for any sign of fuel, oil and/or coolant leakages from the various cylinder head joints.

13 Sump - removal and refitting



Removal

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

2 Drain the engine oil as described in Chapter 1.

3 Chock the rear wheels then jack up the front of the car and support it on axle stands (see "Jacking and Vehicle Support"). Remove the auxiliary drivebelt lower cover from inside the right-hand wheel arch.

4 Where fitted, pull free the oxygen sensor lead multi-plug, and disconnect it. If the engine has been recently run, take particular care against burning when working in the area of the catalytic converter.

5 Undo the retaining nuts, and detach the exhaust downpipe from the manifold. The flange gasket must be renewed when reconnecting. Where applicable, also detach the downpipe at the rear of the catalytic converter, and release it from the front mounting.

6 On XR2i models, remove the front suspension crossmember as described in Chapter 10. On all models, undo the nut and



13.7 Removing the clutch cover plate

bolt(s) securing the gearchange mechanism stabiliser bar/exhaust forward mounting bracket (where fitted) and ease it out of the way.

7 Remove the starter motor as described in Chapter 5A, then undo the retaining bolts, and remove the clutch cover plate from the front face of the bellhousing (see illustration).

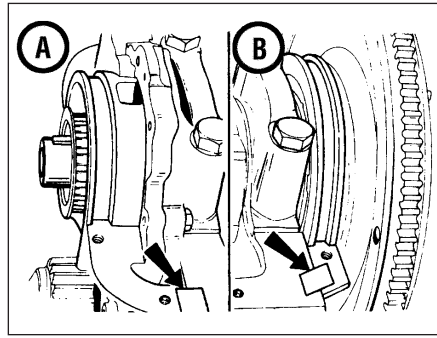
8 Progressively unscrew the sump retaining bolts and remove them. Support and lower the sump pan, taking care not to spill any oil remaining in it as it is removed. If the sump is stuck to the base of the crankcase, prise it free using a screwdriver, but take care not to damage the sump flange face. If it is really stuck in position, check first that all of the bolts are removed, then cut around the sump gasket with a sharp knife to help in freeing the joint.

9 After the sump is removed, further oil will almost certainly continue to drip down from within the crankcase, some old newspapers positioned underneath will soak up the spillage whilst the sump is removed.

10 Clean the sump of old oil and sludge, using paraffin or a suitable engine cleaner solution. Clean any traces of old gasket and sealer from the mating faces of the sump and the crankcase.

Refitting

11 Smear a suitable sealing compound onto the junctions of the crankcase-to-oil seal



13.11 Sealing compound application points prior to refitting the sump

A Crankcase-to-oil pump housing
B Crankcase-to-rear oil seal carrier

carrier at the rear and the crankcase-to-oil pump housing at the front on each side (see illustration).

12 Insert a new rubber seal in the groove in the rear oil seal carrier and the oil pump case. As an aid to correct sump alignment when refitting it, screw ten M6 studs into the cylinder block, in the positions circled in illustration 13.14.

13 Fit a new gasket over the studs. Fit the sump into position, ensuring that the raised spacers sit in the gasket. Insert the bolts into the available holes, and finger-tighten them only at this stage. Now remove the studs and fit the remaining bolts, again finger-tight.

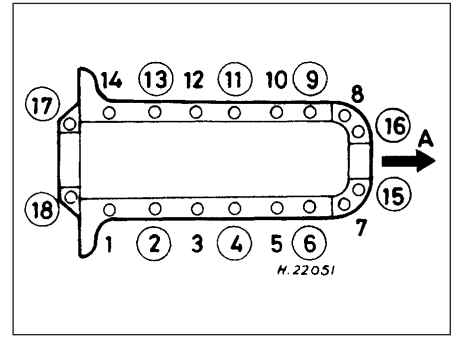
14 Tighten the sump bolts in a progressive, numerical sequence to the specified torque wrench setting (see illustration).

15 Fit the sump drain plug with a new sealing washer, and tighten it to the specified torque wrench setting.

16 Refit the clutch cover plate, the auxiliary drivebelt lower cover, the front suspension crossmember, the gearchange mechanism stabiliser bar/exhaust forward mounting bracket, and the starter motor with reference to the relevant Sections and Chapters of this manual as applicable.

17 Reconnect the exhaust downpipe as described in Chapter 4E.

18 On completion, lower the vehicle, and fill the engine with oil as described in Chapter 1. Reconnect the battery negative lead.



13.14 Sump bolt tightening sequence

A Crankshaft pulley end of engine
Circled numbers indicate locations of studs for correct sump alignment (see text)

14 Oil pump - removal and refitting



Removal

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

2 Remove the auxiliary drivebelt (see Chapter 1).

3 Remove the crankshaft pulley (Section 6), the timing belt covers (Section 7), the timing belt, crankshaft sprocket and thrustwasher (Sections 8 and 9), and the sump (Section 13).

4 Unscrew the retaining nut/bolts and remove the oil pick-up pipe (see illustration).

5 Unbolt and withdraw the oil pump from the front face of the engine. Clean the oil pump for inspection. Refer to Section 15 for the inspection procedures. The oil seal in the oil pump housing should always be renewed (Section 16).

Refitting

6 Before refitting the oil pump and the associated fittings, clean off the respective mating faces. A new oil pump gasket must be obtained, as well as the seals and gaskets for the other associated components to be refitted.

7 When refitting the oil pump, precautionary measures must be taken to avoid the possibility of damaging the new oil seal as it is engaged over the shoulder and onto its journal on the crankshaft. Extract the Woodruff key from the groove in the crankshaft, then cut a thin plastic guide which will furl over and protrude beyond the shoulder of the seal journal on the crankshaft (see illustration 14.9b). This will allow the seal to ride over the step, and avoid damaging the seal lip as it is pushed into position on the crankshaft.

8 If a new oil pump is being fitted or the old pump is to be re-used after cleaning and inspection, first prime the pump by squirting clean engine oil into it, and simultaneously rotating the drivegear a few times (see illustration).



14.4 Removing the oil inlet pipe



14.8 Prime the oil pump prior to fitting



14.9a Refit the oil pump

9 Align the pump gear flats with those on the crankshaft, then fit the oil pump. Check that the sump mating faces of the oil pump and the base of the crankcase are flush each side, then tighten the retaining bolts to the specified torque setting. Remove the protective guide (see illustrations).

10 Refit the oil pick-up tube to the oil pump, using a new gasket and tighten to the specified torque.

11 Slide the thrustwasher onto the front end of the crankshaft, then insert the Woodruff key into position in the groove in the crankshaft. The key must be located with its flat edge parallel with the line of the crankshaft, to ensure that the crankshaft sprocket slides fully into position as it is being refitted.

12 Refit the sump, crankshaft sprocket, the timing belt, timing belt cover and drivebelt pulley (as described in the appropriate earlier Sections of this Chapter). Refit and adjust the drivebelt as described in Chapter 1.

13 On completion, lower the vehicle and reconnect the battery negative terminal.

15 Oil pump - dismantling, inspection and reassembly



Dismantling

1 The oil pump fitted is a low-friction rotor-type, driven from the front end of the crankshaft. Where a high-mileage engine is



14.9b With the oil pump refitted, remove the protective guide (arrowed)

being reconditioned, it is recommended that a new oil pump is fitted.

2 To inspect the rotor assembly, first remove the pump from the engine (Section 14), then undo the retaining screws and remove the cover plate (see illustration). Remove the O-ring seal.

Inspection

3 Clean the rotors and the inside of the pump housing, then visually inspect the various components for signs of excessive wear and scoring. Check the pump components for wear using feeler gauges in the same manner as that described in Part A of this Chapter, Section 13. Refer to the Specifications at the start of this Chapter for specific details.

Reassembly

4 When reassembling the pump, ensure that the inner (driving) and outer (driven) rotors are located with the corresponding indented matchmarks facing the same way (see illustration).

16 Crankshaft oil seals - renewal



Front oil seal

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

2 Chock the rear wheels then jack up the

front of the car and support it on axle stands (see "Jacking and Vehicle Support").

3 Remove the auxiliary drivebelt as described in Chapter 1.

4 Remove the crankshaft pulley (Section 6), the timing belt covers (Section 7), the timing belt (Section 8) and crankshaft sprocket, Woodruff key and thrustwasher (Section 9).

5 The oil seal is now accessible for removal from the front face of the oil pump housing (see illustration). To withdraw the seal, a hooked tool will be required; if available, use Ford special tool No 21-096. Take care not to damage the oil pump housing during removal. As it is removed, note the fitted orientation of the seal in its housing.

6 Clean the oil pump housing and the crankshaft stub, then lubricate the lips of the new seal and the crankshaft front stub with clean engine oil.

7 The oil seal should be drawn into position using the Ford special tool No 21-093A. Failing this, use a tube of suitable diameter, with the crankshaft pulley bolt and washers. Do not hammer the seal into position. To protect the seal lips as it is fitted onto the crankshaft, cut a thin sheet of plastic to suit and furl it round the front of the crankshaft, over the journal shoulder.

8 When the seal is fully fitted, remove the special tool (or fabricated tool) and withdraw the plastic protector. Check that the crankshaft is still at the TDC position and refit the Woodruff key, thrustwasher and sprocket. Refit and tension the timing belt, then refit the timing belt cover and crankshaft pulley as described in the appropriate Sections earlier in this Chapter.

9 Refit and adjust the auxiliary drivebelt as described in Chapter 1.

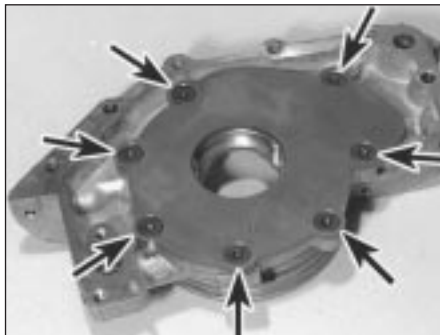
10 On completion, lower the vehicle and reconnect the battery.

Rear oil seal

11 With the engine or transmission removed from the vehicle for access, remove the clutch as described in Chapter 6.

12 Remove the flywheel/driveplate as described in Section 18.

13 If available, use Ford tool No 21-151 or a suitable clawed tool to extract the seal from



15.2 Oil pump cover plate retaining screws (arrowed)



15.4 Inner and outer rotor matchmarks (arrowed)



16.5 Crankshaft front oil seal - seen from below (arrowed)

its housing. If the seal housing is removed from the rear face of the engine, the seal can be removed as described in paragraph 18. As it is removed, note the direction of fitting, and take care not to damage the seal housing as the seal is extracted.

14 Clean the seal housing, the crankshaft rear flange face, and the flywheel/driveplate mating surfaces.

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

16 If Ford special service tool No 21-095 is available, lubricate the seal lips of the seal and its running face on the crankshaft with clean engine oil. Position the seal (correctly orientated) into the special tool, then draw the seal into the housing using two flywheel/driveplate securing bolts so that the seal is against the stop.

17 If the correct Ford service tool is not available, it will be necessary to remove the oil seal carrier housing. To do this, first remove the sump as described in Section 13, then unscrew the seal housing retaining bolts and remove the housing from the rear face of the crankcase.

18 Drive the old seal from the housing by carefully tapping it from its aperture using a suitable punch as shown (see illustration). As it is removed, note the direction of fitting, and take care not to damage the seal housing as the seal is extracted.

19 New gaskets will be required for the seal housing and sump during reassembly. Clean the mating faces of the seal housing, the crankcase and sump. Insert the new seal squarely into its housing. To avoid damaging the seal or the housing, place a flat piece of wood across the face of the seal, and carefully tap or draw the seal into place. Do not allow the seal to tilt in the housing as it is being fitted.

20 Lubricate the running surface on the crankshaft and the oil seal lip with clean engine oil. Locate a new gasket onto the rear face of the crankcase, and refit the oil seal housing and seal. To avoid damaging the lips of the seal as it is passed over the end of the crankshaft, cut a thin sheet of plastic to suit and furl it round the rear flange of the

crankshaft so that it protrudes, and press the seal over it. With the seal in position, withdraw the plastic protector. Centralise the seal on the shaft, check that the housing-to-sump flange faces are flush to the sump face on the base of the crankcase, then insert and tighten the housing retaining bolts to the specified torque.

21 Refit the sump with reference to Section 13.

22 Refit the flywheel/driveplate as described in Section 18.

23 Refit the clutch as described in Chapter 6.

24 Refit the engine or transmission, as applicable.

17 Engine/transmission mountings - renewal



1 The removal and refitting method for the transmission bearer and mountings is as described for HCS engines in Part A, Section 15. On XR2i models, it will be necessary to remove the front suspension crossmember first (refer to Chapter 10).

2 The engine right-hand mounting is significantly different to that fitted to HCS engines, in that it is a two-piece bracket, and its removal and refitting procedure is detailed below.

3 First of all support the engine/transmission assembly as described in Part A, Section 15, then unscrew and remove the two nuts securing the two halves of the mounting bracket assembly.

4 Unscrew and remove the three bolts securing the engine bracket section to the cylinder block (see illustration).

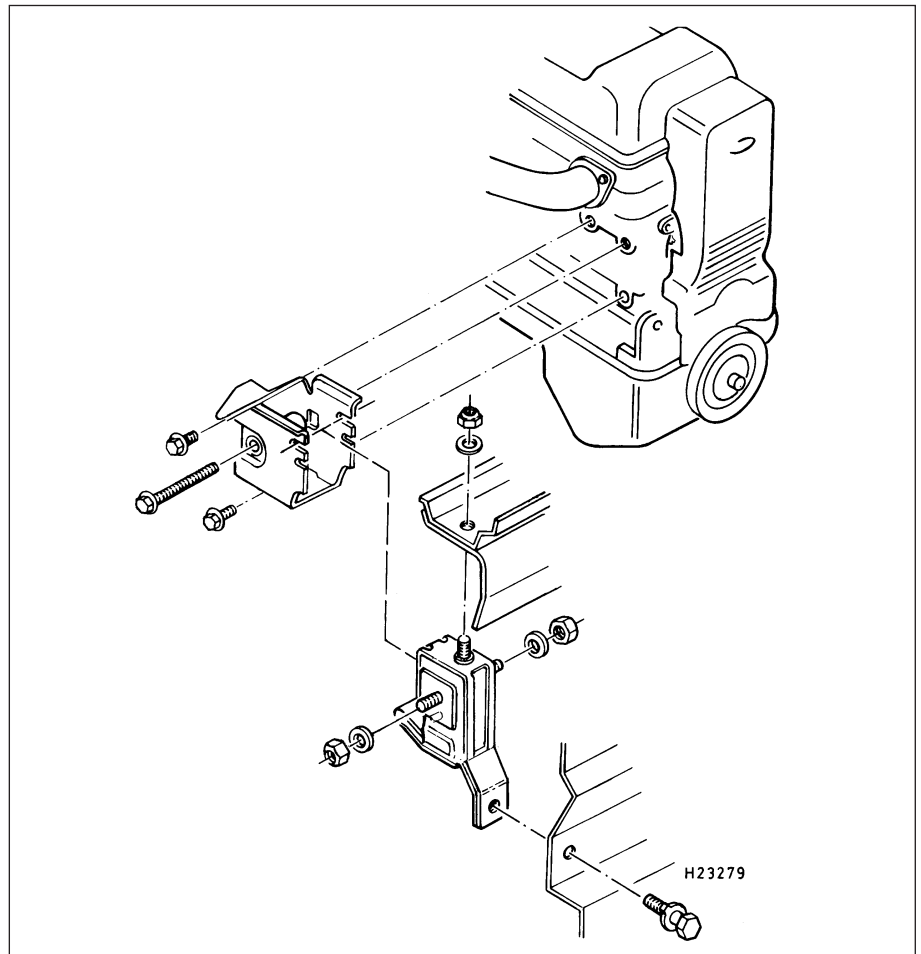
5 Unscrew and remove the mounting retaining nut and washer from their location near the suspension strut.

6 Unscrew and remove the mounting side bolt from under the right-hand wheel arch.

7 Refitting is a reversal of the removal procedure. Make sure when refitting engine/transmission mountings, that any washers and plates removed during the dismantling process are refitted in their original sequence. Do not fully tighten any mounting bolts until they are all located. As the mounting bolts and nuts are tightened, check that the mounting rubbers do not twist.



16.18 Rear oil seal removal



17.4 Exploded view of the right-hand engine mounting

18 Flywheel/driveplate - removal, inspection and refitting



Removal

1 Access to the flywheel (manual transmission) or driveplate (automatic transmission) is gained by first removing the transmission (Chapter 7A or B). On manual transmission models, remove the clutch (Chapter 6).

2 Unscrew and remove the six flywheel/driveplate retaining bolts, and carefully withdraw the flywheel/driveplate

from the rear face of the crankshaft. Take care not to drop the flywheel, as it is heavy. Note that the retaining bolts must be renewed when refitting.

Inspection

3 The inspection procedures for the flywheel/driveplate are the same as those described for the HCS engine in Part A of this Chapter, but note that the grinding procedures do not apply to automatic transmission models (the driveplate cannot be reground).

Refitting

4 Check that the mating faces of the

flywheel/driveplate and crankshaft are clean before refitting.

5 Smear the new retaining bolt threads with thread-locking compound. Fit the flywheel/driveplate into position on the rear end face of the crankshaft. Check that all of the bolt holes in the flywheel/driveplate are in exact alignment with the corresponding bolt holes in the crankshaft, then insert the **new** bolts and tighten them in a progressive sequence to the specified torque wrench setting.

6 Refit the clutch (manual transmission models) as described in Chapter 6.

7 Refit the transmission (according to type) as described in Chapter 7A or B.






Chapter 2 Part C:

Zetec engine in-car repair procedures

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Degrees of difficulty

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

2C

General

Engine type	Four-cylinder, in-line, double overhead camshafts
Engine code:	
1.6 litre models	L1G
1.8 litre models	RDB or RQC
Capacity:	
1.6 litre models	1597 cc
1.8 litre models	1796 cc
Bore:	
1.6 litre models	76.0 mm
1.8 litre models	80.6 mm
Stroke - all models	88.0 mm
Compression ratio:	
1.6 litre models	10.3:1
1.8 litre models	10.0:1
Firing order	1-3-4-2 (No 1 cylinder at timing belt end)
Direction of crankshaft rotation	Clockwise (seen from right-hand side of vehicle)

Cylinder head

Hydraulic tappet bore inside diameter	28.395 to 28.425 mm
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Camshafts and hydraulic tappets

Camshaft bearing journal diameter	25.960 to 25.980 mm
Camshaft bearing journal-to-cylinder head running clearance	0.020 to 0.070 mm
Camshaft endfloat	0.080 to 0.220 mm

Lubrication

Engine oil type/specification	See "Lubricants, fluids and tyre pressures"
Engine oil capacity	See "Lubricants, fluids and tyre pressures"
Oil pressure:	
Idling	1.3 to 2.5 bar
At 4000 rpm	3.7 to 5.5 bars
Oil pump clearances	Not specified