






# Chapter 2 Part A: 4-cylinder engine – in-car engine repair procedures

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## Degrees of difficulty

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

### General

Engine type	Four-cylinder, in-line, double-overhead camshafts
Engine codes:	
"M" series engines:	
Normally aspirated engines	M16 (20 HD)
Turbocharged engines	M16 (20 M4G)
"T" series engines:	
Normally aspirated engines	T16 (20 T4)
Turbocharged engines	T16 (20 T4) Turbo
Capacity	1994 cc
Bore	84.45 mm
Stroke	89.0 mm
Compression ratio:	
Normally aspirated engines	10.0:1
Turbocharged engines	8.5:1
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)
Timing belt tensioner spring free length ("T" series engines)	57.5 to 58.5 mm

### Cylinder head

Maximum gasket face distortion	0.1 mm
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### Camshafts and hydraulic tappets

Camshaft bearing running clearance:	
New	0.060 to 0.094 mm
Used	0.15 mm maximum
Camshaft endfloat ("T" series engines)	0.06 to 0.25 mm

### Lubrication

Engine oil type/specification	See Chapter 1
Engine oil capacity	See Chapter 1
Oil pressure:	
Idling	0.7 bar
Running	3.8 bar

## 2A•2 4-cylinder engine – in-car engine repair procedures

<b>Torque wrench settings</b>	<b>Nm</b>	<b>lbf ft</b>
Camshaft cover bolts:		
"M" series engines	10	7
"T" series engines	8	6
Camshaft sprocket bolts	65	48
Camshaft housing bolts	25	18
Timing belt tensioner bolt:		
"M" series engines	45	33
"T" series engines	30	22
Timing belt idler pulley bolt ("M" series engines):		
Up to 1989	25	18
1989 onwards	50	36
Cylinder head bolts ("M" series engines):		
Up to 1989:		
Stage 1	45	33
Stage 2	80	59
Stage 3	Angle-tighten a further 60°, or to 108 Nm (80 lbf ft) whichever comes first	
1989 onwards:		
Stage 1	45	33
Stage 2	80	59
Stage 3	Angle-tighten a further 90°	
Cylinder head bolts ("T" series engines):		
With MSPS stamped on bolt head:		
Stage 1	45	33
Stage 2	80	59
Stage 3	Angle-tighten a further 90°	
With KX stamped on bolt head:		
Stage 1	45	33
Stage 2	70	52
Stage 3	Angle-tighten a further 90°	
Inlet manifold nuts and bolts	25	18
Exhaust manifold nuts and bolts	45	33
Crankshaft pulley centre bolt	85	63
Crankshaft pulley-to-sprocket bolts	8	6
Oil pump housing bolts ("M" series engines)	6	4
Oil pump housing bolts ("T" series engines):		
M6 bolts	8	6
M10 bolts	45	33
Oil pump cover plate	6	4
Oil pick-up pipe-to-pump screws	8	6
Sump bolts:		
"M" series engines	8	6
"T" series engines:		
Stage 1	5	3
Stage 2	10	7
Flywheel bolts:		
"M" series engines	85	63
"T" series engines	110	81
Torque converter driveplate bolts	110	81
Transmission adaptor plate bolts:		
"M" series engines:		
Bolts below crankshaft centre-line	25	18
Bolts above crankshaft centre-line	45	33
"T" series engines	45	33
Rear oil seal carrier bolts	8	6
Main bearing cap	110	81
Crankpin (big-end) bearing cap bolts	55	41
Front engine mounting to transmission bracket	80	59
Front engine mounting bracket to transmission	40	30
Rear engine mounting bracket to transmission	40	30
Right-hand engine mounting through-bolt	45	33
Right-hand engine mounting to engine bracket	60	44
Right-hand engine mounting bracket to engine	25	18
Engine rear tie-bar to mounting bracket	75	55
Engine rear tie-bar mounting bracket bolts:		
M10 bolts	45	33
M12 bolts	85	63
Engine rear tie-bar through-bolt	85	63
Longitudinal support member to underbody	45	33
Engine snubber bracket to transmission	45	33

## 1 General information

### How to use this Chapter

1 This Part of Chapter 2 is devoted to repair procedures possible while the engine is still installed in the car, and includes only the Specifications relevant to those procedures. Similar information concerning the V6 engines will be found in Part B of this Chapter. Since these procedures are based on the assumption that the engine is installed in the car, if the engine has been removed and mounted on a stand, some of the preliminary dismantling steps outlined will not apply.

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

### Engine description

#### "M" series engine

3 The M16 engine fitted to Rover 820 models is a water-cooled, four-cylinder, double-overhead camshaft, four-stroke petrol engine, of 1994 cc capacity. The engine was fitted to Rover 820 models from 1986 until approximately October 1991.

4 The combined crankcase and cylinder block is of cast iron construction, and houses the pistons, connecting rods and crankshaft. The solid skirt cast aluminium alloy pistons have two compression rings and an oil control ring, and are retained on the connecting rods by fully floating gudgeon pins. To reduce frictional drag and piston slap, the gudgeon pin is offset to the thrust side of the piston. The forged steel connecting rods are attached to the crankshaft by renewable shell type big-end bearings. The crankshaft is carried in five main bearings, also of the renewable shell type. Crankshaft endfloat is controlled by thrust washers which are located on either side of the centre main bearing.

5 The twin overhead camshafts are located in the cylinder head, and each is retained in position by a housing bolted to the cylinder head upper face. The camshafts are supported by five bearing journals machined directly into the head and housings. Drive to the camshafts is by an internally-toothed rubber timing belt, from a sprocket on the front end of the crankshaft. An idler pulley and adjustable tensioner pulley are fitted to eliminate backlash and prevent slackness of the belt. The distributor rotor arm is attached to the rear of the exhaust camshaft, and on early models, the power steering pump is belt-driven from a sprocket attached to the rear of the inlet camshaft. On later models, the power steering is located at the front of the engine, and is belt-driven from a sprocket on the crankshaft.

6 The M16 engine utilizes four valves per cylinder, mounted at an inclined angle, and running in guides which are pressed into the cylinder head. The valves are of small diameter, to improve breathing efficiency and reduce valve mass. Each valve is opened by a hydraulic tappet, acted upon directly by the lobe of the camshaft, and closed by a single valve spring.

7 Blow-by gases from the crankcase are vented by a positive crankcase ventilation system back into the intake air stream for combustion. The system incorporates an oil separator, to return oil droplets to the sump, and a diverter valve, which channels the vapour to inlets on either side of the throttle valve, depending on manifold depression.

8 The pressed-steel sump is attached to the underside of the crankcase, and acts as a reservoir for the engine oil. The oil pump draws oil through a strainer attached to the pick-up pipe and submerged in the oil. The pump passes the oil along a short passage and into the full-flow filter, which is screwed onto the pump housing. The freshly filtered oil flows from the filter and enters the main cylinder block oil gallery, which feeds the crankshaft main bearings. Oil passes from the main bearings, through drillings in the crankshaft to the big-end bearings.

9 As the crankshaft rotates, oil is squirted from a hole in each connecting rod, to splash the thrust side of the pistons and cylinder bores.

10 A drilling from the main oil gallery feeds the cylinder head gallery, via a restrictor located just below the top face of the cylinder block. The cylinder head contains an oil gallery on each side, with drillings to lubricate each camshaft journal and hydraulic tappet bore. The oil then drains back into the sump via large drillings in the cylinder head and cylinder block.

11 On turbocharged engines, a take-off pipe from the main oil gallery feeds the turbocharger shaft bearings and then returns to the sump via an oil return pipe.

12 A pressure relief valve is incorporated in the oil pump housing, to maintain the oil pressure within specified limits.

#### "T" series engine

13 The T16 engine fitted to later Rover 820 and Vitesse models is a development of the "M" series unit and is similar in most areas. The engine was fitted to Rover 820 models from approximately October 1991 and is currently still in production.

14 The main differences between the two units is in the following areas.

15 The timing belt only drives the two camshafts; the water pump now being situated externally on the engine, behind the power steering pump, and driven (in conjunction with the power steering pump) by the auxiliary drive belt. The timing belt incorporates an automatic tensioner to maintain correct timing belt tension for virtually the life of the belt.

16 The semi-floating pistons are retained on the connecting rods by interference fit gudgeon pins.

17 The engine mountings have been revised to improve vibration resistance and power unit stability.

18 Other detail modifications have been incorporated, mainly in the area of ancillary component attachments, and these will be covered in greater detail where procedures in this Chapter are likely to be affected.

## 2 Repair operations possible with the engine in the vehicle

The following operations can be carried out without having to remove the engine from the car:

- (a) Compression pressure - testing.
- (b) Removal and refitting of the timing belt.
- (c) Removal and refitting of the camshaft and tappets.
- (d) Removal and refitting of the cylinder head.
- (e) Removal and refitting of the sump.
- (f) Removal and refitting of the big-end bearings.\*
- (g) Removal and refitting of the piston and connecting rod assemblies.\*
- (h) Removal and refitting of the oil pump.
- (i) Removal and refitting of the engine mountings.
- (j) Removal and refitting of the flywheel or driveplate (after first removing the transmission).

\* In extreme cases caused by a lack of necessary equipment, repair or renewal of piston rings, pistons, connecting rods and big-end bearings is possible with the engine in the vehicle. However, this practice is not recommended, because of the cleaning and preparation work that must be done to the components involved, and because of the amount of preliminary dismantling work required - these operations are therefore covered in Part C of this Chapter.

## 3 Compression test - description and interpretation



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

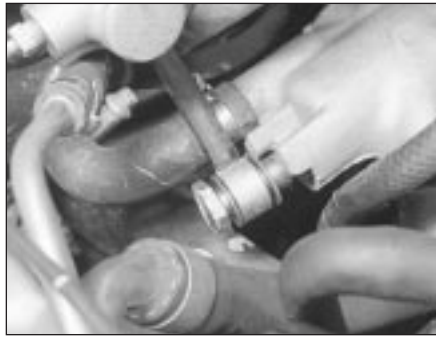
2 The engine must be fully warmed-up to normal operating temperature, the oil level must be correct, the battery must be fully charged, and the spark plugs must be removed. The aid of an assistant will also be required.







5.4 Release the hose clips and disconnect the two hoses from the fuel pipes



5.7 Undo the brake servo banjo hose union at the manifold



5.8 Disconnect the coolant hose from the right-hand end of the manifold

### Single-point fuel injection engines

#### Removal

- 1 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).
- 2 Refer to Chapter 4A, and remove the air cleaner air box.
- 3 Relieve the fuel system pressure as described in Chapter 4A, Section 5.
- 4 Release the hose clips and disconnect the two fuel hoses from the fuel pipes (see illustration).
- 5 Refer to Chapter 4A, Section 12, and remove the throttle body.
- 6 Refer to Chapter 1 and drain the cooling system.
- 7 Undo the brake servo banjo hose union at the manifold, and recover the two copper washers (see illustration).
- 8 Slacken the hose clip and disconnect the coolant hose from the right-hand end of the manifold (see illustration).
- 9 Disconnect the vacuum hoses from the left-hand end of the manifold, after noting their respective positions for reassembly.
- 10 Slacken the hose clip and disconnect the remaining coolant hose from the manifold.
- 11 Undo the bolt securing the manifold to the support bracket under the coolant hose outlet.
- 12 Undo the bolt securing the upper end of the stay bar to the manifold.
- 13 Apply the handbrake, jack up the front of the car and support it on axle stands.
- 14 Undo the manifold stay bar lower retaining bolt and remove the stay (see illustration).
- 15 Release the clip and disconnect the breather hose from the oil separator (see illustration).
- 16 Disconnect the breather hose from the lower end of the oil separator at the cylinder block, and at the sump outlet.
- 17 Disconnect the lead at the oil pressure switch and disconnect the pressure transducer lead at the wiring connector.
- 18 Unscrew the pipe union nut at the oil pressure switch adaptor.
- 19 Unscrew the bolt securing the oil pressure switch adaptor and oil separator to the cylinder block and remove the adaptor and oil separator.
- 20 Disconnect the wiring plug at the knock sensor on the cylinder block, and the two leads at the manifold heater temperature sensor under the manifold (see illustration). Move the wiring harness clear of the manifold.
- 21 Slacken the nine nuts and bolts securing the manifold to the cylinder head.
- 22 Remove all the bolts followed by the two nuts, then withdraw the manifold off the studs and remove it from the engine. Recover the manifold gasket.
- 23 Clean the manifold and cylinder head mating faces, and obtain a new gasket if the sealing lips of the original are damaged.

#### Refitting

- 24 Refitting is a reversal of removal; tighten

the manifold nuts and bolts in the sequence shown, to the specified torque (see illustration).

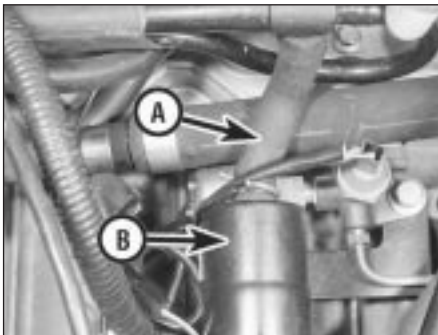
### Multi-point fuel injection engines

#### Removal

- 25 Remove the fuel injectors and fuel rail as described in Section 12 of either Chapter 4B, for "M" series, or Chapter 4C for "T" series.
- 26 Release the clip and disconnect the breather hose from the oil separator.
- 27 Disconnect the breather hose from the lower end of the oil separator and the sump outlet.
- 28 Disconnect the wires at the oil pressure switch, oil pressure transducer and knock sensor.



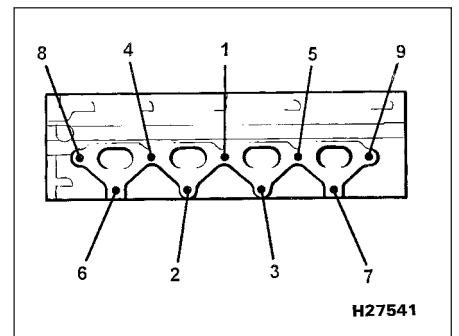
5.14 Undo the manifold stay bar lower retaining bolt (arrowed)



5.15 Disconnect the breather hose (A) from the oil separator (B)



5.20 Disconnect the leads at the manifold heater temperature sensor



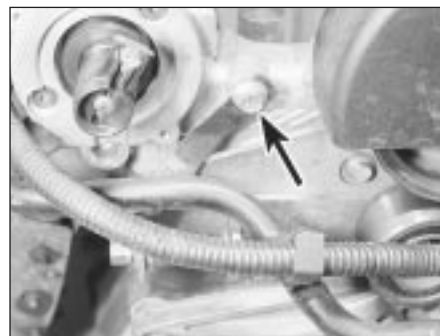
5.24 Inlet manifold nut and bolt tightening sequence



6.8a Undo the bolts securing the two halves of the manifold stove . . .



6.8b . . . and remove the stove outer half



6.9a Undo the bolt securing the bypass pipe to the cylinder head (arrowed) . . .

29 Slacken the nine nuts and bolts securing the manifold to the cylinder head.

30 Remove all the bolts, followed by the two nuts, then withdraw the manifold off the studs and remove it from the engine. Recover the manifold gasket.

31 Clean the manifold and cylinder head mating faces, and obtain a new gasket if the sealing lips of the original are damaged.

#### Refitting

32 Refitting is a reversal of removal; tighten the manifold nuts and bolts in the sequence shown, to the specified torque (see illustration 5.24).

### 6 Exhaust manifold - removal and refitting



**Note:** *Never work on or near a hot exhaust system and in particular, the catalytic converter (where fitted).*

#### Single-point fuel injection engines

##### Removal

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

2 Refer to Chapter 4A, Section 2, and remove the necessary air cleaner components to

provide access to the front and side of the engine.

3 Drain the cooling system as described in Chapter 1.

4 Remove the dipstick from the dipstick tube.

5 Remove the distributor cap and place it to one side.

6 Apply the handbrake, jack up the front of the car and support it on axle stands.

7 Undo the four bolts securing the exhaust front pipe flange to the manifold. Separate the flange and recover the gasket.

8 Undo the bolts on both sides securing the two halves of the manifold stove together, and remove the outer half (see illustrations).

9 Undo the bolt securing the heater bypass pipe to the cylinder head and to the main coolant pipe support bracket (see illustrations).

10 Slacken the clip securing the bypass pipe connecting hose to the thermostat housing.

11 Undo the five nuts and bolts securing the manifold to the cylinder head, noting that the upper nut also secures the bypass pipe bracket (see illustration).

12 Release the connecting hose from the thermostat housing, and withdraw the bypass pipe from the manifold stud.

13 Remove the manifold from the cylinder head, followed by the inner half of the stove and the manifold gasket.

14 Clean the manifold and cylinder head mating faces, and obtain a new gasket if the original is damaged.

#### Refitting

15 Refitting is a reversal of removal; tighten the manifold nuts and bolts starting with the upper two, then the lower centre, then the two outer, to the specified torque. Make sure that the inner half of the stove is in position before fitting the manifold.

#### Multi-point fuel injection engines

##### Normally-aspirated engines

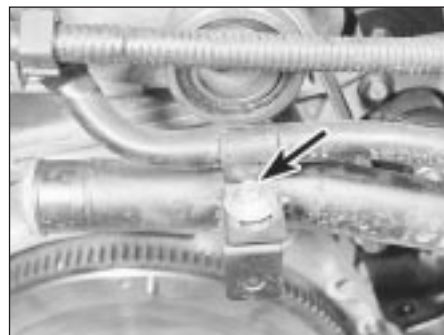
16 Refer to the procedures described above for single-point fuel injection engines, but ignore the instructions to remove the manifold stove, which is not fitted to models with multi-point fuel injection.

##### Turbocharged engines

17 Refer to Chapter 4B or 4C as applicable and remove the turbocharger.

18 Refer to the procedures described above for single-point fuel injection engines, but ignore the instructions to remove the manifold stove, which is not fitted to models with multi-point fuel injection.

### 7 Timing belt ("M" series) - removal, refitting and adjustment



6.9b . . . and to the main coolant pipe bracket (arrowed)



6.11 Undo the manifold nuts and bolts, noting that the upper nut also secures the bypass pipe bracket

**Note:** *Accurate adjustment of the timing belt entails the use of a tension checking gauge which is a Rover special tool. An approximate setting can be achieved using the method described in this Section, but the tension should be checked by a Rover dealer on completion.*

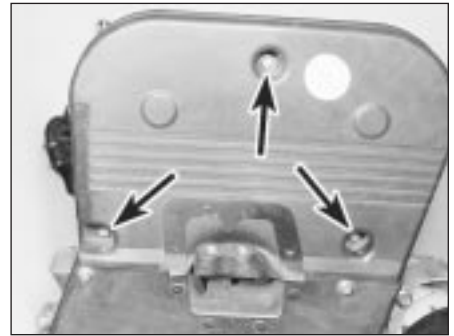
**Note:** *On early "M" series engines the crankshaft pulley and timing belt sprocket are a one-piece assembly secured by a single centre bolt. On later "M" series engines (with a front mounted power steering pump), the pulley and sprocket are two separate components secured by the centre retaining bolt and four additional bolts. As this difference significantly affects the timing belt procedures, identify the type being worked on before proceeding.*



7.6 Undo the bolts securing the power steering pipe support brackets (arrowed)



7.7 Undo the engine right-hand mounting through-bolt



7.9 Timing belt upper cover retaining bolts (arrowed)

### Early "M" series engines

#### Removal

- 1 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).
- 2 Slacken the right-hand front wheel nuts, jack up the front of the car and support it on axle stands. Remove the roadwheel.
- 3 Undo the three bolts and remove the access panel under the wheelarch.
- 4 Refer to Chapter 1 and remove the auxiliary drivebelt.
- 5 Position a jack and interposed block of wood under the sump, and just take the weight of the engine.
- 6 Undo the bolts securing the power steering pipe support brackets, and move the pipes

slightly to gain access to the right-hand engine mounting (see illustration).

- 7 Undo the engine mounting through-bolt, and recover the special nut. Note that the forked end of the nut plate locates over a stud on the body bracket (see illustration).
- 8 Undo the two bolts securing the engine mounting to its mounting bracket, and remove the mounting.

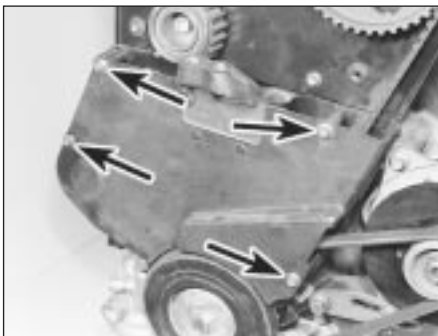
- 9 Raise the engine slightly, then undo the three bolts and lift off the timing belt upper cover (see illustration).
- 10 Undo the four bolts and remove the timing belt lower cover (see illustration).

- 11 Using a socket or spanner on the crankshaft pulley, turn the crankshaft in an anti-clockwise direction until the timing

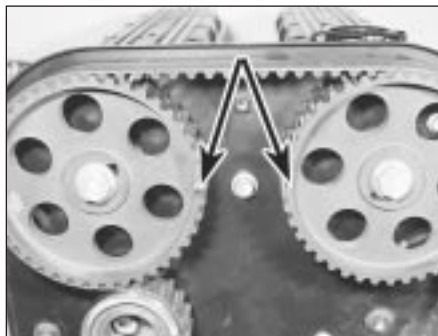
notches on the camshaft sprockets are facing each other and aligned horizontally (see illustrations). The notch on the crankshaft pulley should also be aligned with the edge of the metal bracket which forms the timing belt bottom cover (see illustration). In this position, the crankshaft is at 90° BTDC, with No 1 piston on its compression stroke.

- 12 If required, the crankshaft can be locked in this position, by inserting a dowel rod or drill through the hole in the transmission adaptor plate, near to the lower edge of the cylinder block on the front-facing side of the engine (see illustration). The dowel or drill will then engage with a corresponding hole in the flywheel.

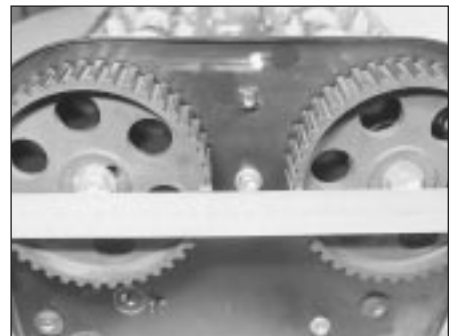
- 13 Undo the three bolts and remove the timing belt bottom cover (see illustration).



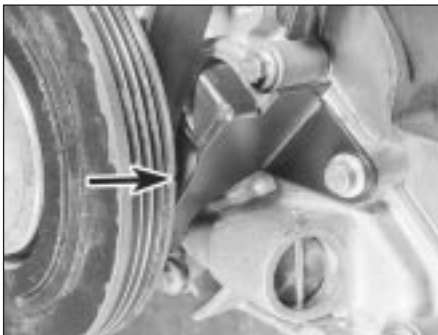
7.10 Timing belt lower cover retaining bolts (arrowed)



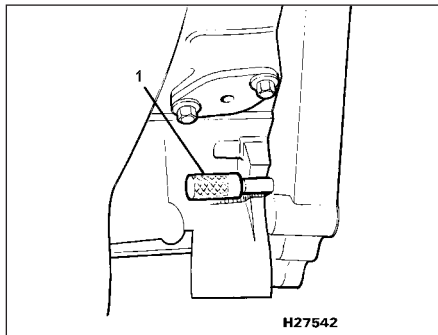
7.11a Turn the crankshaft to align the sprocket timing marks (arrowed) . . .



7.11b . . . then check their horizontal alignment with a straight edge



7.11c Crankshaft pulley timing notch (arrowed) aligned with timing belt bottom cover



7.12 Lock the crankshaft by inserting a dowel rod or drill (1) through the hole in the transmission adaptor plate



7.13 Removing the timing belt bottom cover





7.14 Removing the timing belt tensioner

14 Using an Allen key, undo the timing belt tensioner retaining bolt, and remove the tensioner (**see illustration**).

15 Slip the belt off the sprockets, and remove it from the engine.

16 If the timing belt is to be re-used, mark its running direction with an arrow in chalk, and store it on its edge while it is off the engine.

17 Check the belt for any sign of cracks or splits, particularly around the roots of the teeth. Renew the belt if wear is obvious, if there are signs of oil contamination, or if the belt has exceeded its service interval (see Chapter 1). Also renew the sprockets if they show any signs of wear or chipping of the teeth.

18 Check the tensioner and sprockets as described in Section 9.

19 Before refitting, check that the crankshaft is still at the 90° BTDC position, and that the timing marks on the two sprockets are still aligned.

### Refitting and adjustment

20 Engage the timing belt with the teeth of the crankshaft sprocket, and then pull the belt vertically upright on its straight, right-hand run. Keep it taut, and engage it over the exhaust camshaft sprocket, then the inlet camshaft sprocket.

21 Check that none of the sprockets have moved, then feed the belt around the idler pulley and engage it with the teeth of the water pump sprocket.

22 Fit the timing belt tensioner and secure with the retaining bolt, tightened finger-tight only at this stage.

23 Engage an Allen key with the hexagonal adjusting hole in the tensioner, and turn the tensioner body until there is moderate tension on the belt (**see illustration**). Hold the tensioner in this position, and tighten the retaining bolt.

24 Remove the locking pin (if used) from the transmission adaptor plate, and turn the crankshaft one complete turn clockwise, followed by one complete turn anti-clockwise, and re-align the timing marks.

25 Check that it is just possible to deflect the belt, using moderate hand pressure, by 19.0 mm at a point midway between the crankshaft and exhaust camshaft sprockets.



7.23 Tensioner hexagonal adjusting hole (arrowed)

Re-adjust the tension if necessary by slackening the tensioner retaining bolt, and repositioning the tensioner body with the Allen key. Recheck the tension again after turning the crankshaft one turn clockwise, then one turn anti-clockwise. It must be emphasised that this is only an approximate setting, and the tension should be checked by a dealer, using the Rover tension gauge, at the earliest opportunity.

26 Refit the timing belt bottom cover, turn the crankshaft to align the pulley timing mark with the edge of the bottom cover, and make a final check that the camshaft sprocket timing marks are still aligned.

27 Refit the timing belt upper and lower covers.

28 Refit the engine mounting to its bracket, lower the engine and secure the mounting to the body with the through-bolt and special nut.

29 Refer to Chapter 1 and refit the auxiliary drivebelt.

30 Refit the power steering pipe support brackets, the wheelarch access panel, and the roadwheel.

31 Lower the car to the ground, tighten the wheel nuts fully, and reconnect the battery.

### Later "M" series engines

#### Removal

32 Proceed as described in paragraphs 1 to 9 above.

33 Undo the four bolts and remove the timing belt centre cover.

34 Using a socket or spanner on the crankshaft pulley, turn the crankshaft in an anti-clockwise direction until the notches on the camshaft sprockets are facing each other and aligned horizontally. Insert a dowel rod or drill through the hole in the transmission adaptor plate, near to the lower edge of the cylinder block on the front-facing side of the engine (**see illustration 7.12**). The dowel or drill will then engage with a corresponding hole in the flywheel. If the dowel won't engage, turn the crankshaft through 180° and try again. With the dowel rod engaged and the camshaft notches aligned, the crankshaft is at 90° BTDC, with No 1 piston on its compression stroke. Temporarily remove the dowel rod.

35 Refer to Chapter 5, and remove the starter motor.

36 Using a socket and long handle, slacken the crankshaft pulley centre retaining bolt. Lock the flywheel ring gear, through the starter motor aperture, using a large screwdriver or similar tool to prevent the crankshaft rotating as the pulley bolt is undone. This operation will probably have moved the timing marks on the camshafts out of alignment, so re-align them, and fit the crankshaft dowel rod as described previously.

37 Remove the centre retaining bolt from the crankshaft pulley, then unscrew the four additional pulley bolts and remove the pulley.

38 Undo the bolts and remove the timing belt bottom cover.

39 Using an Allen key, undo the timing belt tensioner retaining bolt, and remove the tensioner.

40 Slip the belt off the sprockets, and remove it from the engine.

41 Check the timing belt, sprockets and tensioner as described in paragraphs 16 to 18.

42 Before refitting, check that the crankshaft is still at the 90° BTDC position, and that the timing marks on the two sprockets are still aligned.

### Refitting and adjustment

43 Engage the timing belt with the teeth of the crankshaft sprocket, and then pull the belt vertically upright on its straight, right-hand run. Keep it taut, and engage it over the exhaust camshaft sprocket, then the inlet camshaft sprocket.

44 Check that none of the sprockets have moved, then feed the belt around the idler pulley and engage it with the teeth of the water pump sprocket.

45 Fit the timing belt tensioner and secure with the retaining bolt, tightened finger-tight only at this stage.

46 Refit the timing belt bottom cover.

47 Remove the dowel rod from the crankshaft.

48 Refit the crankshaft pulley and secure with the centre bolt and four additional bolts, tightened to the specified torque. Hold the crankshaft using the same procedure as for removal to tighten the centre bolt.

49 Engage an Allen key with the hexagonal adjusting hole in the tensioner, and turn the tensioner body until there is moderate tension on the belt. Hold the tensioner in this position, and tighten the retaining bolt.

50 Turn the crankshaft one complete turn clockwise, followed by one complete turn anti-clockwise, and re-align the timing marks.

51 Check that it is just possible to deflect the belt, using moderate hand pressure, by 19.0 mm at a point midway between the crankshaft and exhaust camshaft sprockets. Re-adjust the tension if necessary by slackening the tensioner retaining bolt, and repositioning the tensioner body with the Allen key. Recheck the tension again after turning



the crankshaft one turn clockwise, then one turn anti-clockwise. It must be emphasised that this is only an approximate setting, and the tension should be checked by a dealer, using the Rover tension gauge, at the earliest opportunity.

52 The remainder of refitting is a reversal of removal.

## 8 Timing belt ("T" series) - removal, refitting and adjustment



### Removal

- 1 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).
- 2 Slacken the right-hand front wheel nuts, jack up the front of the car and support it on axle stands. Remove the roadwheel.
- 3 Undo the three bolts and remove the access panel under the wheelarch.
- 4 Refer to Chapter 1 and remove the auxiliary drivebelt.
- 5 Position a jack and interposed block of wood under the sump, and just take the weight of the engine.
- 6 Undo the bolts securing the power steering pipe support brackets, and move the pipes slightly to gain access to the right-hand engine mounting.
- 7 Undo the engine mounting through-bolt, and recover the special nut. Note that the forked end of the nut plate locates over a stud on the body bracket.
- 8 Undo the two bolts securing the engine mounting to its mounting bracket, and remove the mounting.
- 9 Raise the engine slightly, then undo the five bolts and lift off the timing belt upper cover (see illustration).
- 10 Undo the remaining five bolts and remove the timing belt centre cover.
- 11 Using a socket or spanner on the crankshaft pulley, turn the crankshaft in an anti-clockwise direction until the timing notches on the camshaft sprockets are facing each other and aligned horizontally. Insert a dowel rod or drill through the hole in the transmission adaptor plate, near to the lower edge of the cylinder block on the front-facing side of the engine (see illustration 7.12). The dowel or drill will then engage with a corresponding hole in the flywheel. If the dowel won't engage, turn the crankshaft through 180° and try again.
- 12 With the dowel rod engaged and the camshaft notches aligned, the crankshaft is at 90° BTDC, with No 1 piston on its compression stroke. Temporarily remove the dowel rod.
- 13 Refer to Chapter 5, and remove the starter motor.
- 14 Using a socket and long handle, slacken the crankshaft pulley centre retaining bolt. Lock the flywheel ring gear, through the starter motor aperture, using a large

screwdriver or similar tool to prevent the crankshaft rotating as the pulley bolt is undone. This operation will probably have moved the timing marks on the camshafts out of alignment, so re-align them, and fit the crankshaft dowel rod as described previously.

15 Remove the centre retaining bolt from the crankshaft pulley, then unscrew the four additional pulley bolts and remove the pulley.

16 Undo the three bolts and remove the timing belt bottom cover.

17 Slacken the timing belt tensioner centre bolt, move the tensioner away from the belt as far as it will go, then re-tighten the tensioner bolt.

18 Slip the belt off the sprockets, and remove it from the engine.

19 If the timing belt is to be re-used, mark its running direction with an arrow in chalk, and store it on its edge while it is off the engine.

20 Check the tensioner and sprockets as described in Section 9.

### Refitting and adjustment

21 Before refitting the belt, check that the crankshaft is still at the 90° BTDC position (dowel rod engaged) and that the timing marks on the two sprockets are still aligned.

22 Engage the timing belt with the teeth of the crankshaft sprocket, and then pull the belt vertically upright on its straight, right-hand run. Keep it taut, and engage it over the exhaust camshaft sprocket, then the inlet camshaft sprocket.

23 Check that none of the sprockets have moved, then feed the belt around the tensioner.

24 Refit the timing belt bottom cover.

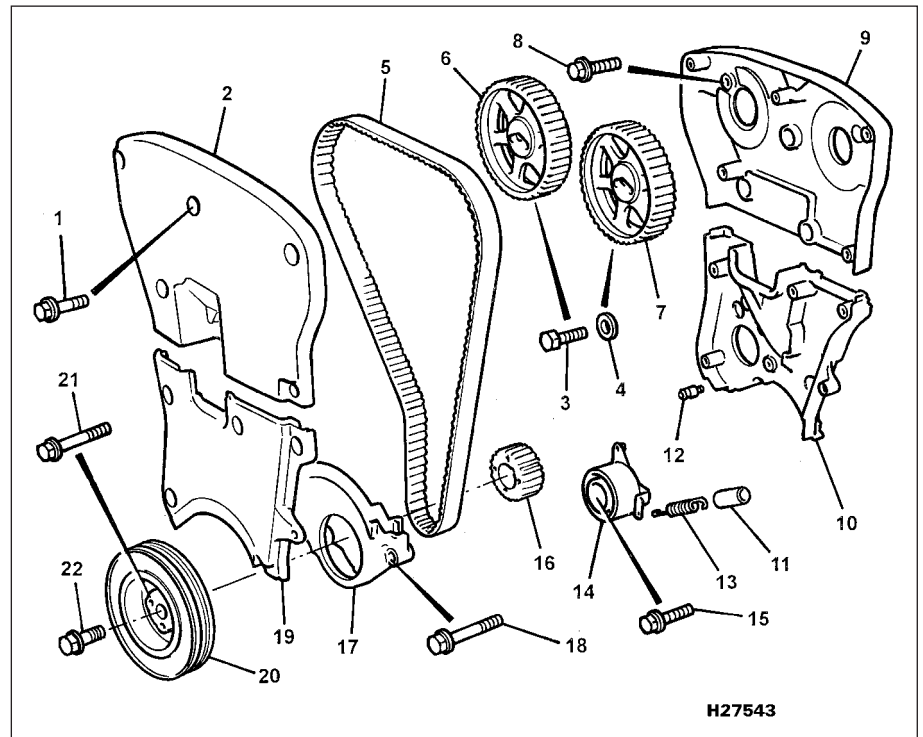
25 Remove the dowel rod from the crankshaft.

26 Refit the crankshaft pulley and secure with the centre bolt and four additional bolts, tightened to the specified torque. Hold the crankshaft using the same procedure as for removal to tighten the centre bolt.

27 Slacken the timing belt tensioner retaining bolt slightly and allow the tensioner to automatically tension the belt.

28 Using a torque wrench applied to the inlet camshaft sprocket retaining bolt, apply a load of 40 Nm, in an anti-clockwise direction, to take up all the slack in the timing belt. Hold this load, and tighten the tensioner retaining bolt to the specified torque.

29 The remainder of refitting is a reversal of removal.



8.9 Timing belt components as fitted to "T" series engines

- |                             |                          |                             |
|-----------------------------|--------------------------|-----------------------------|
| 1 Upper cover bolt          | 9 Upper backplate        | 16 Crankshaft sprocket      |
| 2 Upper cover               | 10 Lower backplate       | 17 Crankshaft cover         |
| 3 Camshaft sprocket bolt    | 11 Spring sleeve         | 18 Bottom cover bolt        |
| 4 Washer                    | 12 Anchorage bolt        | 19 Centre cover             |
| 5 Timing belt               | 13 Tensioner spring      | 20 Crankshaft pulley        |
| 6 Inlet camshaft sprocket   | 14 Timing belt tensioner | 21 Pulley-to-sprocket bolts |
| 7 Exhaust camshaft sprocket | 15 Tensioner bolt        | 22 Pulley centre bolt       |
| 8 Backplate bolt            |                          |                             |

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



### Tensioner

#### Removal

- 1 Remove the timing belt as described in Sections 7, or 8, according to engine type.
- 2 On the "M" series engine, the tensioner will have been removed together with the timing belt; proceed to paragraph 6.
- 3 On the "T" series engine, slacken the tensioner retaining bolt and allow the tensioner to move fully under the action of the spring.
- 4 Unhook the tensioner spring from the anchorage stud.
- 5 Remove the tensioner retaining bolt, lift off the tensioner and remove the spring.

#### Inspection

- 6 Spin the tensioner, and ensure that there is no roughness or harshness in the bearing. Also check that the endfloat is not excessive and there is no sign of free play. Check the surface of the tensioner for any signs of roughness, nicks or scoring which may damage the timing belt. Renew the tensioner if worn.
- 7 On "T" series engines, measure the free length of the tensioner spring. If the free length is greater than that specified, renew the spring.

#### Refitting

- 8 Refitting is a reversal of removal.

### Camshaft sprockets

#### Removal

- 9 Remove the timing belt as described in Sections 7, or 8, according to engine type.
- 10 Undo the retaining bolt securing each sprocket to its respective camshaft. To prevent the sprockets turning as the bolts are undone, either insert a large screwdriver through one of the sprocket holes and engage it with one of the backplate bolts behind, or make up a holding tool from scrap metal,

which is of a scissor shape, with a bolts at each end to engage with the holes in the sprocket.

- 11 Withdraw the two sprockets from the camshafts, noting that they are not identical, and should be marked INLET (or IN) and EXHAUST on their front faces to avoid confusion. If no marks are visible, make your own to identify each sprocket (see illustration).

#### Inspection

- 12 Check the condition of the sprockets, inspecting carefully for any wear grooves, pitting or scoring around the teeth, or any wear ridges which might cause damage to the timing belt. Make sure that the dowels are not worn and are not a loose fit in the camshaft or sprocket holes.

#### Refitting

- 13 Refitting is a reversal of removal. Ensure that the sprockets are fitted to their correct camshafts and tighten the retaining bolt to the specified torque.

### Crankshaft sprocket

#### Removal

- 14 Remove the timing belt as described in Sections 7, or 8, according to engine type.
- 15 Slide the sprocket off the front of the crankshaft ("T" series engines).

#### Inspection

- 16 Check the condition of the sprocket, inspecting carefully for any wear grooves, pitting or scoring around the teeth, or any wear ridges which might cause damage to the timing belt. Examine the Woodruff key and its groove and make sure it is a tight fit.

#### Refitting

- 17 Refitting is a reversal of removal.

## 10 Camshaft oil seals - renewal



**Note:** The use of an oil seal extractor which screws into the seal inside circumference is

preferable for this operation. These are available at most accessory shops and can often be hired from tool hire outlets. In the absence of this type of tool, an alternative (but less satisfactory) method of removal is described in the following procedure.

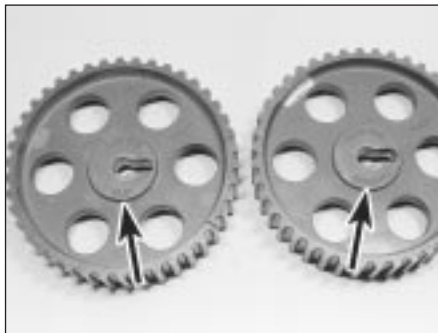
### Front oil seals

- 1 Remove the camshaft sprockets as described in the previous Section.
- 2 On early "M" series engines undo the retaining bolt using an Allen key, and remove the timing belt idler pulley. Recover the spacer behind the pulley (see illustration).
- 3 Undo the bolts and remove the backplate from the cylinder head (see illustration).
- 4 The oil seals are now accessible for removal. Punch or drill two small holes opposite each other in the oil seal. Screw a self-tapping screw into each hole and pull on the screws with pliers to extract the seal.
- 5 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, then carefully locate the seal over the camshaft and drive it squarely into position using a tube or a socket. Take great care not to turn over the lips of the seal as it is being fitted. An alternative method of fitting is to draw it squarely into position using the sprocket bolt and a distance piece.
- 6 With the seal fully inserted in its housing, refit the components removed for access then refit the camshaft sprockets as described in the previous Section.

### Rear oil seals

#### Exhaust camshaft oil seal

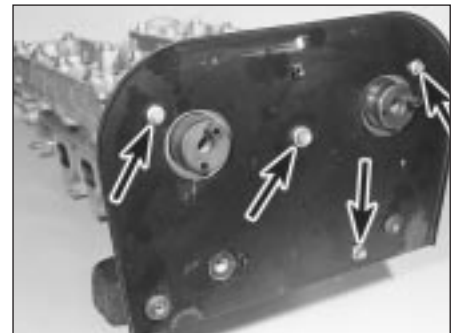
- 7 Refer to the relevant Part of Chapter 4 and remove the air cleaner assembly and intake trunking components as necessary for access.
- 8 Undo the two retaining bolts, withdraw the distributor cap, and place it to one side.
- 9 Undo the retaining Allen screw, and remove the distributor rotor arm.
- 10 Undo the two screws and remove the



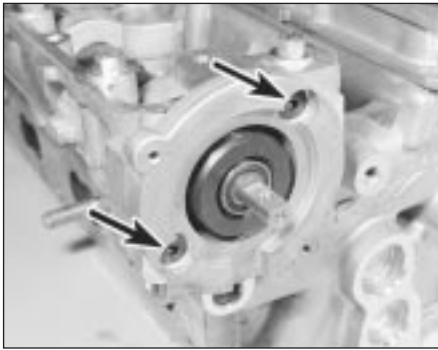
9.11 The camshaft sprockets are marked INLET (or IN) and EXHAUST on their front faces (arrowed)



10.2 Remove the timing belt idler pulley and recover the spacer (arrowed)



10.3 Undo the bolts (arrowed) and remove the backplate



**10.10 Undo the two screws (arrowed) and remove the distributor adaptor plate**

distributor adaptor plate from the cylinder head (see illustration).

**11** Punch or drill two small holes opposite each other in the seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal.

**12** Clean the seal location in the cylinder head; polish off any burrs or raised edges, which may have caused the seal to fail in the first place.

**13** Lubricate the lips of the new seal with clean engine oil and carefully locate the seal over the camshaft and into the cylinder head.

**14** Using a tubular drift which bears on the hard outer edge of the seal, drive the seal fully into the head until it contact the inner land.

**15** With the seal fully inserted in its housing, refit the components removed for access then refit the camshaft sprockets as described in the previous Section.

#### Inlet camshaft oil seal

**16** Refer to the relevant Part of Chapter 4 and remove the air cleaner assembly and intake trunking components as necessary for access.

**17** On cars with multi-point fuel injection, undo the throttle housing retaining nuts, withdraw the housing from the studs and move it aside. Undo the two bolts and remove the blanking plate or camshaft sensor (turbocharged engines) from the cylinder head (see illustration).

**18** On cars fitted with a rear-mounted power steering pump, remove the auxiliary drivebelt



**10.17 Undo the two bolts (arrowed) and remove the blanking plate**

as described in Chapter 1, remove the camshaft pulley, then withdraw the spacer behind the pulley. Undo the two nuts and two bolts, and remove the power steering pulley backplate.

**19** The seal can now be removed and refitted as described in paragraphs 11 to 15 above.

### 11 Camshafts and hydraulic tappets - removal, inspection and refitting

#### Removal

**1** Remove the timing belt as described in the Sections 7 or 8, according to engine type.

**2** Remove the camshaft sprockets as described in Section 9.

**3** On early "M" series engines, undo the bolt securing the timing belt idler pulley to the cylinder head using an Allen key (see illustration). Withdraw the pulley, noting that there is a spacing washer fitted between the pulley and cylinder head backplate.

**4** Undo the four bolts and remove the cylinder head backplate.

**5** Undo the two retaining bolts, withdraw the distributor cap, and place it to one side.

**6** Undo the retaining Allen screw, and remove the distributor rotor arm.

**7** Undo the two screws and remove the distributor adaptor plate from the cylinder head.

**8** On cars fitted with a rear-mounted power

steering pump driven off the inlet camshaft, remove the auxiliary drivebelt as described in Chapter 1, remove the camshaft pulley then withdraw the spacer behind the pulley. Undo the two nuts and two bolts, and remove the power steering pulley backplate.

**9** On cars fitted with a front-mounted power steering pump, undo the two bolts and remove the blanking plate or camshaft sensor (turbocharged engines) from the cylinder head.

**10** Remove the camshaft covers as described in Section 4.

**11** Slacken the ten bolts securing each camshaft housing to the cylinder head, then remove all the bolts except two on each housing at diagonally opposite corners. Make sure that the heads of the bolts left in position are at least 5.0 mm (0.2 in) clear of the housing face. Note that two types of retaining bolts are used to secure the camshaft housings. The three bolts on the inner edge of each housing nearest to the spark plugs are plain bolts, while all the rest are patch bolts. Patch bolts are of the micro-encapsulated type, having their threads fitted with a locking/sealing compound. Obtain new plain and patch bolts prior to reassembly.

**12** Using a plastic or hide mallet, carefully tap up each housing to release it from the locating dowels. When the housings are free, remove the remaining bolts and lift off the two housings (see illustration).

**13** Carefully lift out the camshafts, and remove the oil seals at each end. Identify each camshaft, inlet or exhaust, with a label after removal.

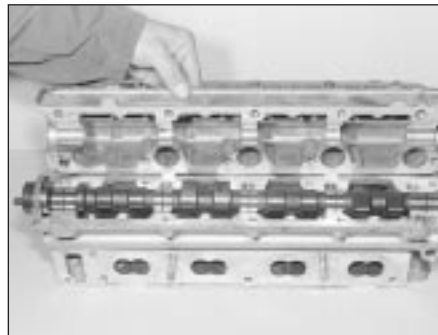
**14** Have a box ready with sixteen internal compartments, marked Inlet 1 to 8, and Exhaust 1 to 8, or mark a sheet of card in a similar way.

**15** Lift out each tappet in turn, and place it upside down in its respective position in the box or on the card (see illustration). If the tappets are difficult to remove by hand, use the rubber sucker end of a valve grinding tool to lift them out.

**16** Prior to reassembly, obtain new camshaft oil seals, a complete set of camshaft housing retaining bolts, and a tube of Loctite sealant 574.



**11.3 Undo the timing belt idler pulley bolt**



**11.12 Removing the exhaust camshaft housing**



**11.15 Lift out the tappets and keep them in order**



## Inspection

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

18 Examine the camshaft bearing journals and lobes for damage or wear. If evident, a new camshaft must be fitted or one that has been renovated by a company specialising in exchange components.

19 The camshaft bearing bore diameters in the cylinder head should be measured and checked against the tolerances specified. A gauge will be required for this but if not available, check for excessive movement between the camshaft journals and the bearings. Alternatively, the Plastigage method, described in Part C of this Chapter, for main and big-end bearing running clearance checks, can be used. If the bearings are found to be unacceptably worn, either a new camshaft or a new cylinder head is required as the bearings are machined directly in the head.

20 It is seldom that the hydraulic tappets are badly worn in the cylinder head bores but again, if the tappets are scored, or the bores are found to be worn beyond an acceptable level, either the tappet(s) or the complete cylinder head must be renewed.

21 If the contact surface of the cam lobes show signs of depression or grooving, note that 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 and they will then be noisy in operation. Therefore, renewal of the camshaft is the only remedy in this case.

## Refitting

22 Remove all traces of sealant from the camshaft housing retaining bolt holes in the



11.25 Fitting the camshaft oil seals

cylinder head, using an M8 x 1.25 mm tap. Alternatively, use one of the old bolts with two file grooves cut into its threads. Also ensure that there is no oil remaining at the bottom of the bolt holes.

23 Thoroughly lubricate the tappet bores in the cylinder head, and refit the tappets in their original positions.

24 Lubricate the camshaft journals and lobes, then place the camshafts in position. Temporarily place the sprockets over the ends of the camshafts, and position the camshafts in the cylinder head so that the sprocket timing marks are horizontal and towards each other.

25 Lubricate the sealing lips of the new oil seals, carefully ease them over the camshaft journals, and position them against the shoulder in the cylinder head (see illustration).

26 Apply a thin bead of Loctite sealant 574 to the camshaft housing-to-cylinder head mating face, then place both housings in position on the cylinder head (see illustration).

27 Fit new housing retaining bolts (3 plain bolts and 7 patch bolts for each housing) and tighten them in the order shown (see illustration). Note the locations of the two types of bolt.



11.26 Apply sealant to the camshaft housing mating face

28 The remainder of refitting is a reversal of removal. When the engine is finally started, be prepared for a considerable rattle from the tappets until they completely fill with oil. This may take a few minutes, and will be more pronounced if any of the tappets have been renewed.

## 12 Cylinder head - removal and refitting



**Warning:** Petrol is extremely flammable, so take extra precautions when disconnecting any part of the fuel system.

*Don't smoke, or allow naked flames or bare light bulbs in or near the work area. Don't work in a garage where a natural gas appliance (such as a clothes dryer or water heater) is installed. If you spill petrol on your skin, rinse it off immediately. Have a fire extinguisher rated for petrol fires handy, and know how to use it.*

### Single-point fuel injection engines

#### Removal

1 Drain the cooling system as described in Chapter 1.

2 Remove the air cleaner, air box and intake trunking as described in Chapter 4A.

3 Remove the timing belt as described in Section 7 or 8, according to engine type.

4 Remove the camshaft covers as described in Section 4.

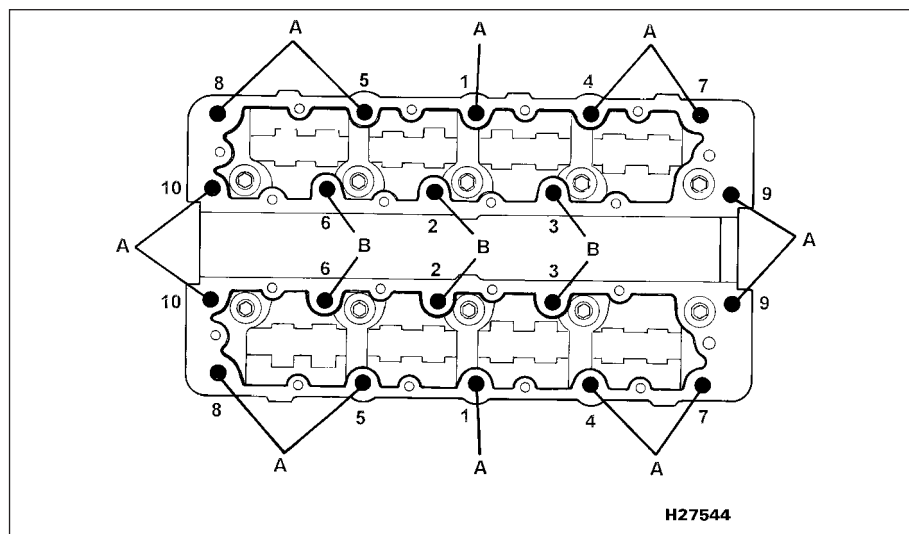
5 Undo the nuts and separate the exhaust front pipe from the manifold flange. Recover the gasket.

6 Slacken the clips and disconnect the radiator top hose, and the expansion tank hose at the thermostat housing.

7 Disconnect the wiring multiplug at the coolant temperature sensor.

8 Undo the brake servo vacuum hose banjo union bolt on the right-hand side of the inlet manifold, and recover the two copper washers.

9 Slacken the clip and disconnect the heater hose at the inlet manifold, behind the brake servo vacuum hose.



11.27 Camshaft housing retaining bolt identification and tightening sequence

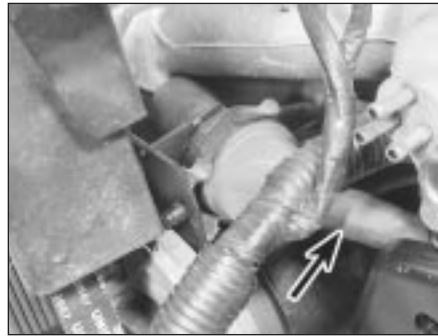
A Patch bolt locations

B Plain bolt locations

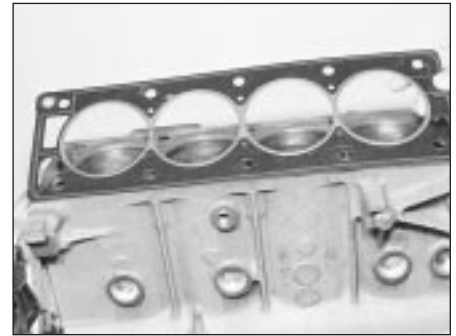




**12.13** Release the wiring harness clips from the bypass pipe



**12.17** Detach the hose from the diverter valve (arrowed)



**12.30** Locate a new cylinder head gasket over the dowels

**10** Undo the bolt securing the stay bar to the inlet manifold, below the heater hose.

**11** Slacken the clips and disconnect the heater bypass hose at the thermostat housing.

**12** Slacken the clip and disconnect the heater hose at the other end of the bypass pipe.

**13** Undo the bolts securing the bypass pipe to the exhaust manifold, cylinder head and main coolant pipe, release the clips securing the wiring harness, and remove the bypass pipe from the engine (**see illustration**).

**14** Slacken the clip and disconnect the coolant hose at the left-hand end of the inlet manifold.

**15** Disconnect the vacuum hoses from the inlet manifold, adjacent to the coolant hose. Mark the location of each hose as it is disconnected.

**16** Undo the bolt securing the support bracket to the inlet manifold, below the vacuum hoses.

**17** At the rear of the engine below the inlet manifold, release the wire clip and detach the breather hose from the top of the oil separator. Also detach the hose from the crankcase ventilation system diverter valve (**see illustration**).

**18** Disconnect the two wires to the inlet manifold heater temperature sensor, on the underside of the manifold, and the single lead to the manifold heater at the wiring connector.

**19** Slacken the accelerator cable locknuts, and unscrew the lower locknut off the outer

cable end. Open the throttle at the throttle cam, slip the cable end out of the cam slot, and remove the cable from the support bracket. Release the cable from the camshaft cover support bracket, and place it clear of the engine.

**20** On automatic transmission models, disconnect the kickdown cable, using the same procedure as for the accelerator cable.

**21** Disconnect the wiring multiplugs at the idle speed stepper motor, the fuel injector, and the throttle potentiometer. Move the wiring harness clear of the cylinder head.

**22** Place absorbent rags around the fuel filter outlet union banjo bolt on the left-hand side of the filter, then slowly unscrew the bolt to release the fuel system pressure. Remove the bolt and recover the two copper washers after the pressure has been released. Tape over the filter orifice and banjo union to prevent fuel loss and dirt ingress.

**23** Disconnect the fuel return hose at the pipe below the fuel filter.

**24** Remove the dipstick from the dipstick tube.

**25** On cars fitted with a rear-mounted power steering pump, extract the circlip from the end of the power steering pump drivebelt tension adjuster bolt. Slide the adjuster rearwards, and undo all the accessible bolts securing the adjuster bracket to the cylinder head. Now move the adjuster the other way, and undo the remaining bolts, then remove the adjuster assembly complete.

**26** Progressively slacken all the cylinder head

retaining bolts, in the reverse sequence to that shown (**see illustration 12.32c**). Remove the bolts when all have been slackened.

**27** With the help of an assistant, lift the cylinder head, complete with manifolds, off the engine. If the head is stuck, it can be carefully levered up using a large screwdriver between the cylinder block and the protruding cylinder head flanges. Do not insert the screwdriver under the head-to-block mating face. Place the head on blocks on the bench to protect the valves.

**28** Remove the cylinder head gasket from the block.

**29** Prior to refitting, ensure that the cylinder block and head mating faces are thoroughly clean and dry, with all traces of old gasket removed. Clean the threads of the retaining bolts, and remove any oil, water and thread sealer from the bolt holes.

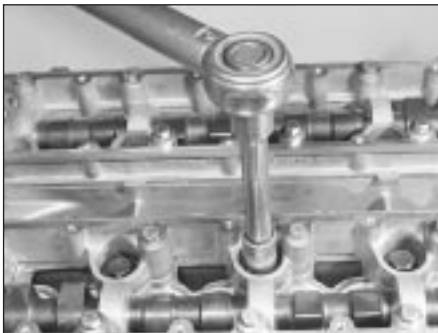
### Refitting

**30** Locate a new gasket over the dowels on the cylinder block (**see illustration**).

**31** Check that the crankshaft is still positioned at the 90° BTDC position, and that the timing marks on the camshaft sprockets are aligned.

**32** Lower the cylinder head assembly onto the gasket, and refit the retaining bolts. Working in the sequence shown, tighten the retaining bolts in stages, to the specified torque and angle settings given in the Specifications (**see illustrations**).

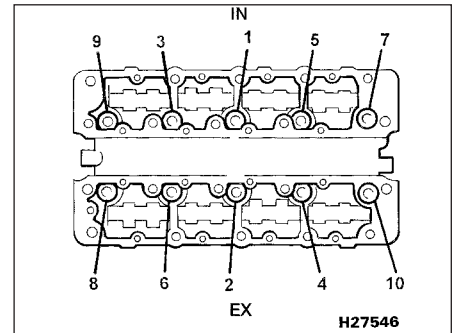
**33** The remainder of refitting is a reversal of



**12.32a** Tighten the cylinder head bolts to the specified torque . . .



**12.32b** . . . then angle-tighten the bolts to the specified angular setting



**12.32c** Cylinder head bolt tightening sequence

removal but refer to the relevant Sections and Chapters for adjustment details as necessary.

### Multi-point fuel injection engines

#### Removal

**34** Carry out the operations described in Paragraphs 1 to 8.

**35** On turbocharged engines remove the exhaust manifold as described in the relevant part of Chapter 4.

**36** Slacken the clip and disconnect the heater hose at the other end of the bypass pipe.

**37** Undo the bolts securing the bypass pipe to the exhaust manifold, cylinder head and main coolant pipe, and remove the bypass pipe.

**38** Slacken the clips and disconnect the two coolant hoses from the underside of the throttle housing.

**39** At the rear of the engine, disconnect the wiring multiplugs and leads at the crankshaft sensor, knock sensor, oil pressure switch and oil pressure transducer.

**40** Disconnect the main engine wiring loom multiplug(s) on the right-hand side valance as necessary, to enable part of the loom to be removed with the cylinder head.

**41** Check that all the wiring likely to impede removal of the cylinder head and its ancillaries has been disconnected, and the harness moved clear. It may be necessary to disconnect additional wiring, depending on options or additional equipment fitted.

**42** Disconnect the breather hoses from the oil separator.

**43** Open the throttle fully by hand, and slip the accelerator inner cable end out of the slot on the throttle lever.

**44** Slacken the outer cable locknuts, and unscrew the outer locknut, nearest to the cable end, fully. Remove the washer and rubber bush, then withdraw the cable from the support bracket.

**45** On automatic transmission models, disconnect the kickdown cable, using the same procedure as for the accelerator cable.

**46** Place absorbent rags around the fuel filter outlet union banjo bolt on the left-hand side of the filter, then slowly unscrew the bleed screw in the centre of the bolt to release the fuel system pressure. Tighten the bleed screw when the pressure has been released. Undo the outlet union banjo bolt, and recover the two copper washers. Tape over the filter orifice, and banjo union to prevent fuel loss and dirt entry.

**47** Unscrew the union nut and disconnect the fuel return hose at the fuel pressure regulator, on the left-hand side of the inlet manifold.

**48** Remove the dipstick from the dipstick tube.

**49** On cars fitted with a rear-mounted power steering pump, extract the circlip from the end of the power steering pump drivebelt tension

adjuster bolt. Slide the adjuster rearwards, and undo all the accessible bolts securing the adjuster bracket to the cylinder head. Now move the adjuster the other way, and undo the remaining bolts, then remove the adjuster assembly complete.

**50** Progressively slacken all the cylinder head retaining bolts, in the reverse sequence to that shown (see illustration 12.32c). Remove the bolts when all have been slackened.

**51** With the help of an assistant, lift the cylinder head, complete with manifolds, off the engine. If the head is stuck, it can be carefully levered up using a large screwdriver between the cylinder block and the protruding cylinder head flanges. Do not insert the screwdriver under the head-to-block mating face. Place the head on blocks on the bench to protect the valves.

**52** Remove the cylinder head gasket from the block.

**53** Prior to refitting, ensure that the cylinder block and head mating faces are thoroughly clean and dry, with all traces of old gasket removed. Clean the threads of the retaining bolts, and remove any oil, water and thread sealer from the bolt holes.

#### Refitting

**54** Locate a new gasket over the dowels on the cylinder block.

**55** Check that the crankshaft is still positioned at the 90° BTDC position, and that the timing marks on the camshaft sprockets are aligned.

**56** Lower the cylinder head assembly onto the gasket, and refit the retaining bolts. Working in the sequence shown, tighten the retaining bolts in stages, to the specified torque and angle settings given in the Specifications (see illustration 12.32c).

**57** The remainder of refitting is a reversal of removal but refer to the relevant Sections and Chapters for adjustment details as necessary.

### 13 Sump - removal and refitting



#### Removal

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

**2** Apply the handbrake, jack up the front of the car and support it on axle stands.

**3** Drain the engine oil as described in Chapter 1.

**4** Remove the exhaust front section with reference to the appropriate Part of Chapter 4.

**5** Undo the bolts securing the longitudinal support member to the underbody beneath the engine, and remove the member.

**6** Disconnect the crankcase breather



13.8 Sump special retaining bolt location

hose from the pipe stub on the side of the sump.

**7** Where applicable, release the turbocharger oil return hose from the sump.

**8** Slacken, then remove, the sump retaining bolts, noting that the corner bolt on the drain plug side at the flywheel end is longer than the rest, and has a flat washer and elongated washer in addition to the normal spring washer (see illustration).

**9** Withdraw the sump from the crankcase, tapping it from side to side with a hide or plastic mallet if it is stuck. Recover the sump gasket.

**10** If the oil pick-up tube and strainer are to be removed, undo the two bolts securing the tube flange to the crankcase, and the single bolt securing the support bracket to the main bearing cap (see illustration).

**11** Slide the support bracket from under the crankcase breather oil return pipe, and remove the pick-up pipe and tube from the crankcase. Recover the O-ring from the pick-up pipe flange.

**12** Clean the sump thoroughly, and remove all traces of old gasket and sealant from the mating faces of the sump and crankcase.

**13** If removed, clean the pick-up pipe, and the filter gauze in the strainer.

#### Refitting

**14** Place a new O-ring seal on the pick-up pipe flange, fit the pipe and strainer assembly, and secure with the retaining bolts,



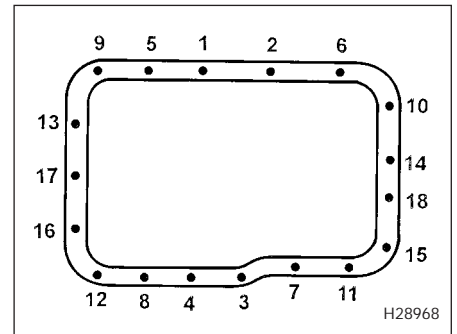
13.10 Undo the two pick-up pipe-to-crankcase bolts



13.14 Fit a new O-ring to the pick-up pipe flange



13.15 Apply sealant to the main bearing cap joints



13.16 Sump retaining bolt tightening sequence

tightened to the specified torque (see illustration).

15 Apply a bead of RTV sealant to the joint between Nos 1 and 5 main bearing caps and the edge of the crankcase (see illustration). Apply gasket sealant to the sump and crankcase mating faces, then place a new gasket in position.

16 Refit the sump, and tighten the retaining bolts progressively, and in sequence, to the specified torque (see illustration).

17 Refit the crankcase breather hose and turbocharger oil return hose.

18 Refit the exhaust front section as described in Chapter 4.

19 Refit the longitudinal support member.

20 Lower the car to the ground, reconnect the battery and fill the engine with oil as described in Chapter 1.

## 14 Oil pump - removal and refitting



### Removal

1 Remove the timing belt as described in Section 7 or 8 according to engine type. On "T" series engines also remove the timing belt tensioner as described in Section 9.

2 Drain the engine oil and remove the oil filter as described in Chapter 1.

3 On early "M" series engines, remove the starter motor as described in Chapter 5. Using

a socket and long handle, slacken the crankshaft pulley centre retaining bolt. Lock the flywheel ring gear, through the starter motor aperture, using a large screwdriver or similar tool to prevent the crankshaft rotating as the pulley bolt is undone. Remove the bolt and withdraw the pulley.

4 On later "M" series engines and all "T" series engines, withdraw the sprocket from the crankshaft.

5 Remove the Woodruff key from the slot in the crankshaft.

6 Unscrew the oil pipe unions on the side of the filter housing, then undo the bolt securing the oil pipe retaining clip and timing belt backplate to the crankcase (see illustration). Where fitted unscrew the oil cooler feed and return pipe unions from the pump housing.

7 Undo the retaining bolts and remove the timing belt lower backplate.

8 Undo the housing retaining bolts, and withdraw the assembly from the crankshaft and crankcase (see illustration). Recover the gasket.

### Refitting

9 Ensure that the pump housing and crankcase mating faces are thoroughly clean, with all traces of old gasket and sealer removed.

10 Apply a bead of RTV sealant to the vertical joint between the main bearing cap and the crankcase, and smear jointing compound to both faces of a new gasket. Place the gasket in position on the crankcase.

11 Lubricate the lip of the oil seal, then locate the pump housing in place.

12 Fit the retaining bolts, and tighten them to the specified torque.

13 Refit the timing belt lower backplate.

14 Reconnect the oil pipe and where applicable, the oil cooler unions, and refit the pipe support clip retaining bolt.

15 Place the Woodruff key in its crankshaft groove, then refit the crankshaft pulley, retaining bolt and washer.

16 Refit the crankshaft sprocket on later "M" series engines and all "T" series engines.

17 On early "M" series engines, refit the crankshaft pulley and tighten the retaining bolt to the specified torque. Prevent the crankshaft rotating using the same method as used for removal when tightening the bolt. Refit the starter motor as described in Chapter 5.

18 Refit the timing belt as described in Section 7 or 8 as applicable.

19 Fit a new oil filter, and fill the engine with oil as described in Chapter 1.

## 15 Oil pump - dismantling, inspection and reassembly



### Dismantling

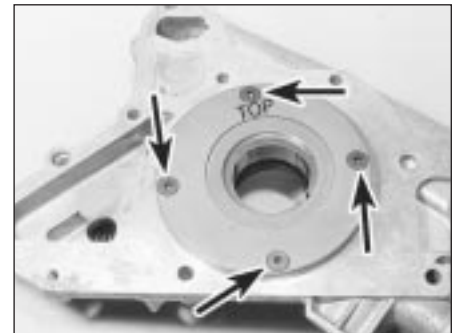
1 With the pump housing removed from the engine, undo the four Torx retaining bolts on the housing rear face, and lift off the pump cover (see illustration).



14.6 Undo the bolt securing the oil pipe retaining clip and timing belt backplate

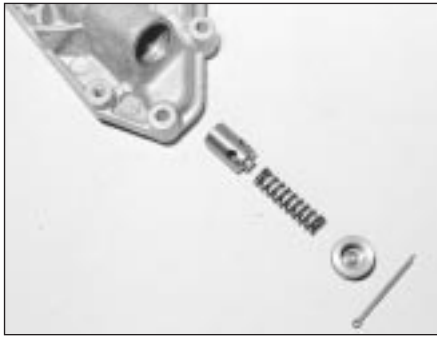


14.8 Oil pump housing retaining bolts (arrowed)



15.1 Oil pump cover retaining bolts (arrowed)





**15.2 Oil pressure relief valve components**

2 To remove the pressure relief valve components, extract the split pin and withdraw the plug cap, spring and relief valve plunger (see illustration).

3 Using a screwdriver, prise out the crankshaft front oil seal from the oil pump housing.

### Inspection

4 Inspect the condition of the inner and outer rotors for visual signs of scoring or wear ridges. Note that the pump internal parts are not available separately, and if there is any sign of wear, a complete new oil pump and housing assembly must be obtained.

5 Check the plunger for scoring or wear ridges, and renew if necessary. Also renew the plug cap O-ring if it shows signs of deterioration.

### Reassembly

6 Liberally lubricate the pump rotors to prime the pump, then refit the pump cover and secure with the four Torx bolts.

7 Lubricate the relief valve components with engine oil, then refit the plunger, spring and plug cap. Secure the cap with a new split pin.

8 Place a new oil seal in position, and carefully tap it home with the aid of a mallet, block of wood and the old oil seal.

### 16 Crankshaft oil seals - renewal



### Front oil seal

1 Remove the timing belt as described in Section 7 or 8, according to engine type.

2 On early "M" series engines, remove the starter motor as described in Chapter 5. Using a socket and long handle, slacken the crankshaft pulley centre retaining bolt. Lock the flywheel ring gear, through the starter motor aperture, using a large screwdriver or similar tool to prevent the crankshaft rotating as the pulley bolt is undone. Remove the bolt and withdraw the pulley.

3 On later "M" series engines and all "T" series engines, withdraw the sprocket from the crankshaft.

4 Remove the Woodruff key from the slot in the crankshaft.

5 Punch or drill two small holes opposite each other in the seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal.

6 Clean the seal housing, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.

7 Lubricate the lips of the new seal with clean engine oil and carefully locate the seal over the crankshaft and into the housing.

8 Using a tubular drift which bears on the hard outer edge of the seal, drive the seal into the housing until it is flush with the housing face.

9 Refit the Woodruff key to the crankshaft.

10 On later "M" series engines and all "T" series engines, refit the sprocket to the crankshaft.

11 On early "M" series engines, refit the crankshaft pulley and tighten the retaining bolt to the specified torque. Prevent the crankshaft rotating using the same method as used for removal when tightening the bolt. Refit the starter motor as described in Chapter 5.

12 Refit the timing belt as described in Section 7 or 8 as applicable.

### Rear oil seal

13 Remove the flywheel/driveplate as described in Section 17.

#### "M" series engines

14 Punch or drill two small holes opposite each other in the seal. Screw a self-tapping screw into each, and pull on the screws with pliers to extract the seal.

15 Clean the seal housing, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.

16 Lubricate the lips of the new seal with clean engine oil and carefully locate the seal on the end of the crankshaft.

17 Using a tubular drift which bears on the hard outer edge of the seal, drive the seal into the housing until it is flush with the housing face.

18 Clean off any surplus oil then refit the flywheel/driveplate as described in Section 17.

#### "T" series engines

19 Drain the engine oil as described in Chapter 1.

20 Slacken all the sump securing bolts in a progressive sequence, but do not slacken the three at the timing belt end.

21 Completely remove the two bolts at the other end, securing the sump to the oil seal carrier.

22 Undo the five bolts and carefully remove the oil seal carrier from the cylinder block dowels and crankshaft. Take great care not to damage the sump gasket as the carrier is removed.

23 Note that the oil seal carrier and the oil seal itself, are supplied as an assembly; the seal is not available separately.

24 Before refitting, inspect the sump gasket; if it was damaged in any way during removal it must be renewed.

25 Clean the end of the crankshaft, and polish off any burrs or raised edges, which may have caused the seal to fail in the first place.

26 Lubricate the lips of the new seal with clean engine oil and carefully locate the seal on the end of the crankshaft.

27 Push the oil seal carrier into position over the locating dowels and refit the retaining bolts. Progressively tighten the carrier bolts to the specified torque, starting with the two at the bottom, then the two in the centre, and finally the one at the top.

28 Tighten the sump bolts to the specified torque, in the correct sequence (see Section 13).

29 Refit the flywheel/driveplate as described in Section 17. Refill the engine with oil on completion of refitting, and check for leaks around the sump flange when the engine is run.

### 17 Flywheel/driveplate - removal, inspection and refitting



### Removal

1 With the engine removed from the car and separated from the transmission, or with the transmission removed as described in Chapter 7, remove the clutch assembly (manual transmission) as described in Chapter 6.

2 Where fitted, knock back the tabs of the locking plate, using a screwdriver or small chisel, and undo the six flywheel/driveplate retaining bolts. **Note that the retaining bolts are of the encapsulated type, incorporating a locking compound in their threads, and new bolts must be obtained for reassembly.**



**To prevent the flywheel turning, lock the ring gear teeth using a small strip of angle iron engaged in the teeth and against the adaptor plate dowel.**

3 Lift off the locking plate, then withdraw the flywheel/driveplate from the crankshaft. On automatic transmission models, recover the spacer from the end of the crankshaft.

### Inspection

4 Inspect the starter ring gear on the flywheel or driveplate for wear or broken teeth. If evident, the ring gear should be renewed. On automatic transmission models, the ring gear is bolted to the driveplate, and renewal is straightforward. On manual transmission models however, the ring gear is a shrink fit on the flywheel, and renewal entails drilling



the old ring then splitting it with a chisel. The new ring must then be heated so that it expands slightly, and allowed to cool when in position on the flywheel. As it cools, it contracts to a smaller diameter than the flywheel so as to provide a tight interference fit. The temperatures involved in this operation are critical to avoid damaging the ring gear, and the work should be carried out by a Rover dealer or motor engineering works.

5 The clutch friction surface on the flywheel should be checked for grooving or cracks, the latter being caused by overheating. If these conditions are evident, renewal of the flywheel is necessary.

6 On manual and automatic transmission models, check the condition of the reluctor ring teeth. If any are bent, broken, or in any way damaged, renew the ring, which is bolted to the flywheel or driveplate.

### Refitting

7 Refitting is a reversal of removal. Tighten the new bolts to the specified torque, then bend over the tabs of a new locking plate.

## 18 Engine/transmission mountings - inspection and renewal



### Inspection

1 The engine/transmission mountings seldom require attention, but broken or deteriorated mountings should be renewed immediately, or the added strain placed on the driveline components may cause damage or wear (see illustration).

2 During the check, the engine/transmission unit must be raised slightly, to remove its weight from the mountings.

3 Raise the front of the vehicle, and support it securely on axle stands. Position a jack under the sump, with a large block of wood between the jack head and the sump, then carefully raise the engine/transmission just enough to take the weight off the mountings.

4 Check the mountings to see if the rubber is cracked, hardened or separated from the metal components. Sometimes the rubber will split right down the centre.

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

### Renewal

#### Front mounting

6 Remove the battery as described in Chapter 5, then undo the retaining bolts and remove the battery tray.

7 Remove the air cleaner assembly as described in the relevant part of Chapter 4.

8 Undo the nut securing the mounting to the engine mounting bracket, and the two bolts securing the mounting to the front chassis member.

9 Using a jack and interposed block of wood, raise the engine slightly until the mounting stud can be withdrawn from the bracket, then remove the mounting from the car.

10 Renew the mounting if it shows any sign of damage, contamination or separation of the rubber-to-metal bond.

11 Refitting is a reversal of removal, but ensure that the small peg on the mounting top face engages with the hole in the bracket, and tighten the bolts and nut to the specified torque (Chapter 2, Part C).

#### Rear mounting

12 Remove the air cleaner assembly and air intake trunking as described in the relevant part of Chapter 4.

13 Jack up the front of the car and support it on axle stands.

14 Undo the bolts and remove the longitudinal support member from beneath the engine.

15 Support the engine and transmission

assembly on a jack with interposed block of wood.

16 Undo and remove all the nuts and bolts securing the mounting to its mounting bracket and chassis member, and the mounting bracket to the engine.

17 Withdraw the mounting bracket from below, followed by the mounting. If there is a spacer located between the mounting and mounting bracket, retain this for refitting with the existing mounting, but discard it if the mounting is being renewed.

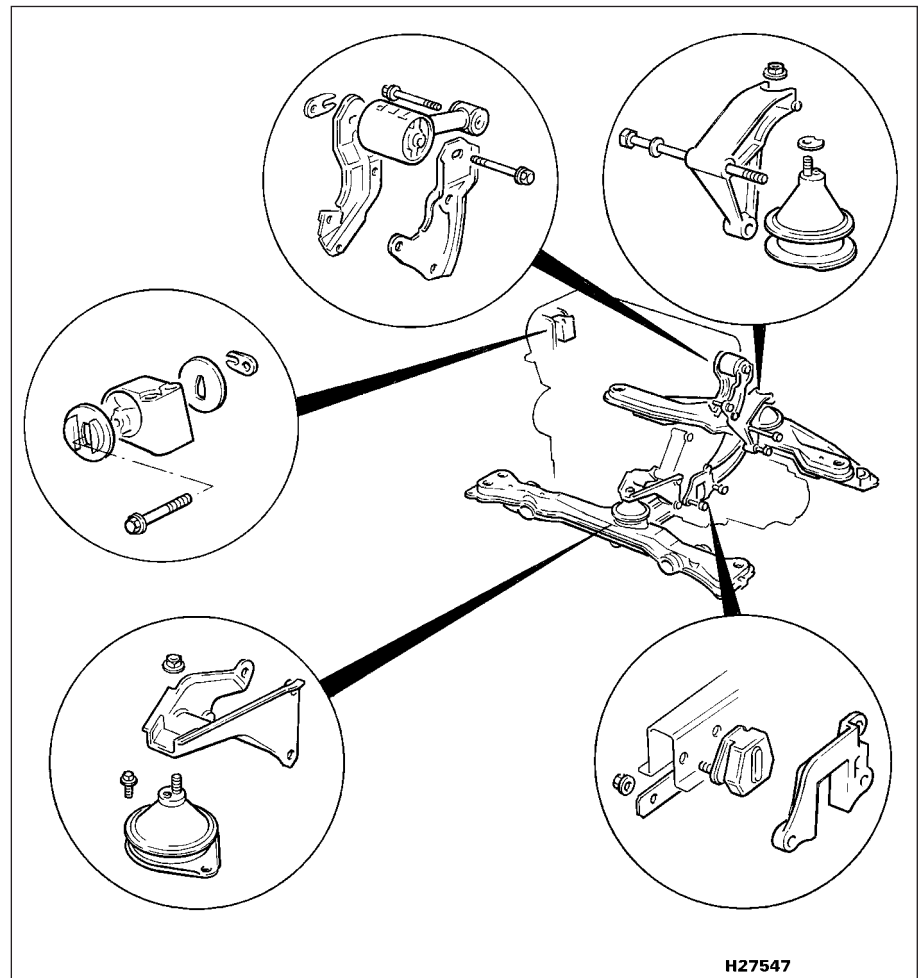
18 Renew the mounting if it shows any sign of damage, contamination or separation of the rubber-to-metal bond.

19 Refitting is a reversal of removal, but ensure that the small peg on the mounting top face engages with the hole in the bracket, and tighten the bolts and nut to the specified torque (Chapter 2, Part C).

#### Right-hand mounting

20 Position a jack and interposed block of wood under the sump, and just take the weight of the engine.

21 Undo the bolts securing the power steering pipe support brackets, and move the



18.1 Engine mounting components (manual transmission shown - automatic transmission similar)

pipes slightly to gain access to the right-hand mounting.

**22** Undo the mounting through-bolt, and recover the special nut. Note that the forked end of the nut plate locates over a stud on the body bracket.

**23** Undo the two bolts and remove the mounting and snubber plates from the bracket on the engine.

**24** Renew the mounting if it shows any sign of damage, contamination or separation of the rubber-to-metal bond.

**25** Refitting is a reversal of removal, but tighten the bolts to the specified torque (Chapter 2, Part C). Ensure that the mounting is correctly orientated when fitting, with its central casting web facing upwards.

### Rear tie-bar

**26** On cars equipped with single-point fuel injection, remove the air cleaner assembly as described in Chapter 4A.

**27** Drain the cooling system as described in Chapter 1, then disconnect the heater hoses and coolant hoses in the vicinity of the tie-bar as necessary to provide access.

**28** Undo the two through-bolts securing the tie-bar to its mounting brackets. Note that at the larger end of the tie-bar, the through-bolt

is retained by a forked nut which engages over a peg on the engine bracket.

**29** Using a screwdriver if necessary, prise the tie-bar from its brackets and remove it from the car.

**30** Renew the tie-bar if it shows any sign of damage, contamination or separation from the rubber-to-metal bond.

**31** Refitting is a reversal of removal, but ensure that the tie-bar is positioned with the word TOP, on the larger end of the bar, uppermost. Tighten the through-bolts to the specified torque (Chapter 2, Part C), then refit the air cleaner as described in Chapter 4A. Refill the cooling system as described in Chapter 1 on completion.

### Snubber

**32** Jack up the front of the car and support it on axle stands.

**33** Undo the retaining bolts and remove the longitudinal support member from under the engine.

**34** Undo the nuts and remove the backing plate and snubber from the longitudinal support member.

**35** If required, undo the nuts and bolts and remove the snubber bracket from the transmission adaptor plate.

**36** Renew the snubber if it shows any sign of

damage, contamination or separation of the rubber-to-metal bond. Check also for signs of wear on the snubber bracket, and renew if necessary.

**37** Refitting is a reversal of removal. Centralise the snubber in its bracket before tightening the bolts and nuts to the specified torque (Chapter 2, Part C).

### Lower tie-bar

**38** Jack up the front of the car and support it on axle stands.

**39** Undo the two through-bolts securing the tie-bar to its mounting brackets. Note that at the larger end of the tie-bar, the through-bolt is retained by a forked nut which engages over a peg on the mounting bracket.

**40** Using a screwdriver if necessary, prise the tie-bar from its brackets and remove it from the car.

**41** Renew the tie-bar if it shows any signs of damage, contamination or separation of the rubber-to-metal bond.

**42** Refitting is the reverse sequence to removal, but ensure that the tie-bar is positioned with the letters BTM, on the larger end of the bar, facing downwards, and tighten the through-bolts to the specified torque (Chapter 2, Part C).