

Camshaft and hydraulic adjusters

Drive	Chain
Number of bearings	5
Endfloat:	
Standard	0.055 to 0.139 mm
Service limit	0.20 mm
Camshaft lobe height:	
Phase I and Phase II models:	
Inlet:	
SR20Di and SR20De engines	37.920 to 38.110 mm
SR20DE engines	38.408 to 38.598 mm
Exhaust (all engines)	37.920 to 38.110 mm
Phase III models:	
Inlet:	
SR20De engines	37.433 to 37.623 mm
SR20DE engines	37.989 to 38.179 mm
Exhaust (all engines)	37.309 to 37.499 mm
Bearing journal outer diameter	27.935 to 27.955 mm
Camshaft cylinder head bearing journal internal diameter	28.000 to 28.021 mm
Camshaft journal-to-bearing clearance:	
Standard	0.045 to 0.086 mm
Service limit	0.12 mm
Camshaft run-out:	
Standard	Less than 0.02 mm
Service limit	0.1 mm
Hydraulic adjuster outer diameter	16.980 to 16.993 mm
Hydraulic adjuster cylinder head bore internal diameter	17.000 to 17.020 mm
Hydraulic adjuster-to-cylinder head clearance	0.007 to 0.040 mm

Torque wrench settings

	Nm	lbf ft
Big-end bearing cap nuts:		
Stage 1	15	11
Stage 2 (if an angle tightening gauge is available)	Angle-tighten by 60 to 65°	
Stage 2 (if an angle-tightening gauge is not available)	40	30
Camshaft bearing cap bolts:		
Exhaust camshaft left-hand end bearing cap bolts	22	16
All other bolts	11	8
Camshaft sprocket retaining bolts	147	108
Centre member bolts	88	65
Crankshaft pulley bolt	147	108
Cylinder head bolts:		
Main bolts:		
Stage 1	39	29
Stage 2	78	58
Fully slacken all the bolts, then tighten through:		
Stage 3	39 ± 5	29 ± 4
Stage 4	Angle-tighten by 90 to 100°	
Stage 5	Angle-tighten by a further 90 to 100°	
6 mm bolts	7	5
Cylinder head cover nuts	10	7
Engine-to-transmission fixing bolts:		
Bolts less than 45 mm long	35	26
Bolts 55 mm long, and longer	75	55
Flywheel/driveplate bolts	88	65
Front engine/transmission mounting bolts:		
Mounting bracket-to-engine bolts	49	36
Mounting-to-centre member bolts - Estate models	55	41
Through-bolt	70	52
Left-hand engine/transmission mounting:		
Through-bolt	49	36
Mounting-to-transmission bolts	49	36
Main bearing cap bolts:		
Phase I and Phase II models:		
Stage 1	35	26
Stage 2 (if an angle tightening gauge is available)	Angle-tighten by 45 to 50°	
Stage 2 (if an angle-tightening gauge is not available)	78	58

Torque wrench settings (continued)

	Nm	lbf ft
Main bearing cap bolts (continued):		
Phase III models:	13	10
Stage 1	Angle-tighten by 75 to 80°	
Stage 2		
Fully slacken all the bolts, then tighten through:		
Stage 3	38	28
Stage 4	Angle-tighten by 30 to 35°	
Oil cooler centre bolt	39	29
Oil pressure relief valve bolt	65	48
Oil pump:		
Cover retaining screws	5	4
Cover retaining bolt	8	6
Regulator valve bolt	60	44
Rear engine/transmission mounting:		
Mounting-to-centre member bolts	55	41
Through-bolt	69	51
Mounting bracket retaining bolts	69	51
Rear oil seal housing bolts	8	6
Right-hand engine/transmission mounting:		
Mounting bracket-to-engine bolts	49	36
Mounting-to-engine mounting bracket bolts	55	41
Through-bolt	49	36
Sump drain plug	35	26
Sump nuts and bolts:		
Aluminium sump:		
Numbers 1 to 16 in tightening sequence	18	13
Numbers 17 and 18 in tightening sequence	7	5
Pressed-steel sump bolts	7	5
Timing chain cover bolts	7	5
Timing chain front guide bolts	16	12
Timing chain rear guide pivot bolt	16	12
Timing chain tensioner nuts	8	6
Timing chain top guide bolts	18	13

1 General information

Using this Chapter

Chapter 2 is divided into three Parts; A, B and C. Repair operations that can be carried out with the engine in the car are described in Parts A (1.6 litre engine) and B (2.0 litre engine). Part C covers the removal of the engine/transmission as a unit, and describes the engine dismantling and overhaul procedures.

Note that, while it may be possible physically to overhaul items such as the piston/connecting rod assemblies while the engine is in the car, such tasks are not normally carried out as separate operations. Usually, several additional procedures (not to mention the cleaning of components and of oilways) have to be carried out. For this reason, all such tasks are classed as major overhaul procedures, and are described in Part C of this Chapter.

In Parts A and B, the assumption is made that the engine is installed in the car, with all ancillaries connected. If the engine has been removed for overhaul, the preliminary dismantling information which precedes each operation may be ignored.

Note: In certain Sections of this Chapter references are made to Phase I, Phase II and Phase III models according to year of production. This classification has been necessary where modifications to the model range affect the repair procedure being described. The Phases relate to the model years as follows:

Phase I - 1990 to June 1993

Phase II - June 1993 to October 1996

Phase III - October 1996 to September 1999

Engine description

The 2.0 litre (1998 cc) engine is from the SR series of Nissan engines. It is of the sixteen-valve, in-line four-cylinder, double overhead camshaft (DOHC) type, mounted transversely at the front of the car, with the transmission attached to its left-hand end.

The crankshaft runs in five main bearings. Thrustwashers are fitted to No 3 main bearing (upper half) to control crankshaft endfloat.

The connecting rods rotate on horizontally-split bearing shells at their big-ends. The pistons are attached to the connecting rods by gudgeon pins, which are an interference fit in the connecting rod small-end eyes, and retained by circlips. The aluminium-alloy pistons are fitted with three piston rings - two compression rings and an oil control ring.

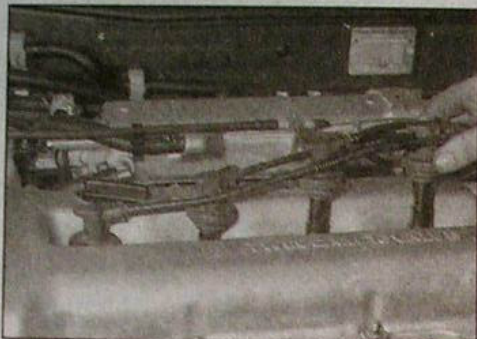
The cylinder block is made of cast-iron, and

the cylinder bores are an integral part of the block. On this type of engine, the cylinder bores are sometimes referred to as having dry liners.

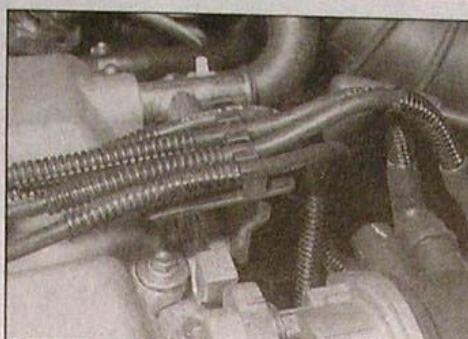
The inlet and exhaust valves are each closed by coil springs, and operate in guides pressed into the cylinder head; the valve seat inserts are also pressed into the cylinder head, and can be renewed separately if worn.

The camshaft is driven by a timing chain, and operates the sixteen valves via followers. The followers are situated directly below the camshafts. Valve clearances are adjusted automatically by hydraulic adjusters. The camshafts rotate directly in the cylinder head.

Lubrication is by means of an oil pump, which is driven off the right-hand end of the crankshaft. It draws oil through a strainer located in the sump, and then forces it through an externally-mounted filter into galleries in the cylinder block/crankcase. From there, the oil is distributed to the crankshaft (main bearings) and camshaft. The big-end bearings are supplied with oil via internal drillings in the crankshaft, while the camshaft bearings also receive a pressurised supply. The camshaft lobes and valves are lubricated by splash, as are all other engine components. On some models, an oil cooler is fitted, to help keep the oil temperature constant under arduous operating conditions.



4.1a Disconnect the HT leads from the plugs ...



4.1b ... then free the leads from the clip, and position them clear of the cylinder head cover

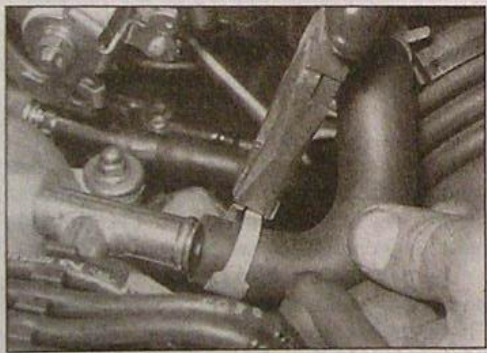


4.2a Release the retaining clips and disconnect the breather hoses from the right-hand ...

Repair operations possible with the engine in the car

11 The following work can be carried out with the engine in the car:

- a) Compression pressure - testing.
- b) Cylinder head cover - removal and refitting.
- c) Timing chain cover - removal and refitting.
- d) Timing chain - removal and refitting.
- e) Timing chain tensioners, guides and sprockets - removal and refitting.
- f) Camshaft and followers - removal, inspection and refitting.
- g) Cylinder head - removal and refitting.
- h) Cylinder head and pistons - decarbonising (refer to Part C of this Chapter).



4.2b ... and left-hand end of the cover

- i) Sump - removal and refitting.
- j) Oil pump - removal, overhaul and refitting.
- k) Crankshaft oil seals - renewal.
- l) Engine/transmission mountings - inspection and renewal.
- m) Flywheel/driveplate - removal, inspection and refitting.

2 Compression test - description and interpretation

Refer to Chapter 2, Part A, Section 2.

3 Top dead centre (TDC) for No 1 piston - locating

Refer to Chapter 2, Part A, Section 3.

4 Cylinder head cover - removal and refitting

Removal

1 Disconnect the HT leads from the plugs, and free them from their retaining clips on the top of the cover (see illustrations).

2 Release the retaining clips, and disconnect the breather hoses from the rear of the cover (see illustrations).

3 Slacken the retaining clips, and disconnect the oil separator hose from its union on the head cover, and the hose from the base of the separator. Undo the retaining bolts, and remove the separator from the front of the cylinder head (see illustrations).

4 Work in the reverse of the sequence shown in illustration 4.11c, slacken and remove the cylinder head cover retaining nuts and washers.

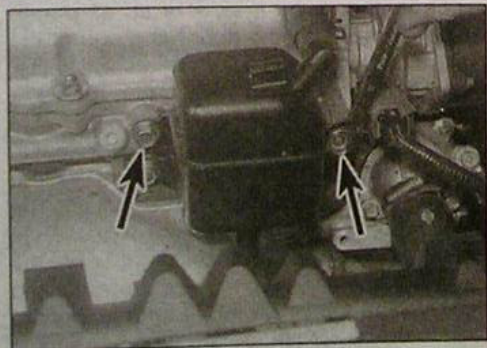
5 Lift off the cylinder head cover. Recover the rubber seal from the outer edge of the cover, and the circular seal from each of the cover spark plug holes and the centre cover stud hole.

6 Inspect the cover seals for signs of damage and deterioration, and renew as necessary.

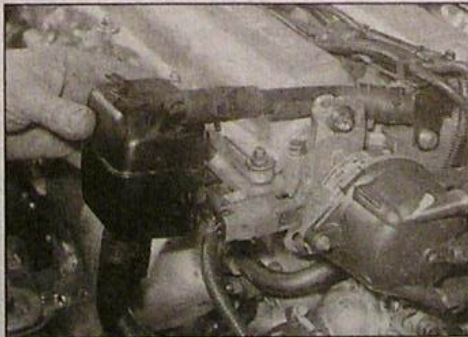
Refitting

7 Carefully clean the cylinder head and cover mating surfaces, and remove all traces of oil. Apply a bead of sealant to the three semi-circular cut-outs in the cylinder head (see illustration).

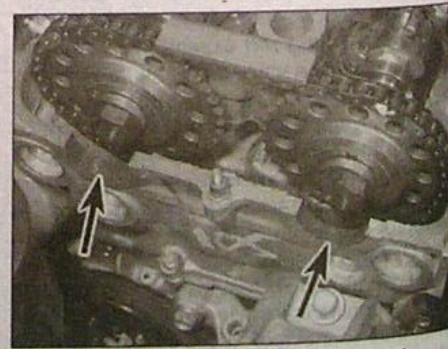
8 Fit the rubber seal to the cylinder head cover groove, ensuring that it is correctly located along its entire length, and install the four spark plug hole seals and the stud hole



4.3a Undo the two retaining bolts (arrowed) ...



4.3b ... then detach the hoses and remove the oil separator from the front of the cylinder head



4.7 On refitting, apply sealant to the cylinder head semi-circular cut-outs (arrowed)



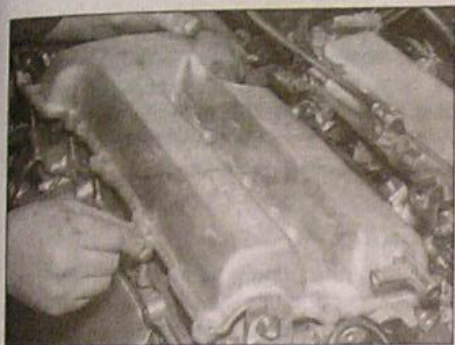
4.8a Fit the rubber seal to the head cover groove ...



4.8b ... and fit the seals to each of the spark plug holes and the centre stud hole



4.9 Apply sealant to the area each side of the seal around the camshaft bearing cap cut-out



4.10 Refit the cylinder head cover, taking care not to disturb the seals



4.11a Fit the rubber seal to each stud ...

seal (see illustrations). If necessary, the seals can be held in position using a smear of suitable sealant.

9 Apply a bead of sealant to the cover seal, approximately 1 cm either side of the left-hand exhaust camshaft bearing cap circular cut-out edges (see illustration).

10 Carefully refit the cylinder head cover to the engine, taking great care not to displace any of the rubber seals (see illustration).

11 Make sure that the cover is correctly seated, then install the retaining nuts, washers and rubbers. Referring to illustration 4.11c, seat the cover in position, then lightly tighten

the centre nut (No 1) and the four corner nuts in the following sequence; 10, 11, 13 and 8. Working in the specified sequence, tighten all the retaining nuts to the specified torque (see illustrations).

12 Reconnect the breather hoses to the cylinder head cover, and secure them in position with the retaining clips.

13 Reconnect the hose to the base of the separator, then refit the separator to the front of the cylinder head and securely tighten its retaining bolts. Connect the separator hose to the cover, and secure it in position with its retaining clip.

14 Connect the HT lead caps to the correct spark plugs, and clip the leads back into the retaining clips. Reconnect the battery negative lead.

5 Crankshaft pulley - removal and refitting

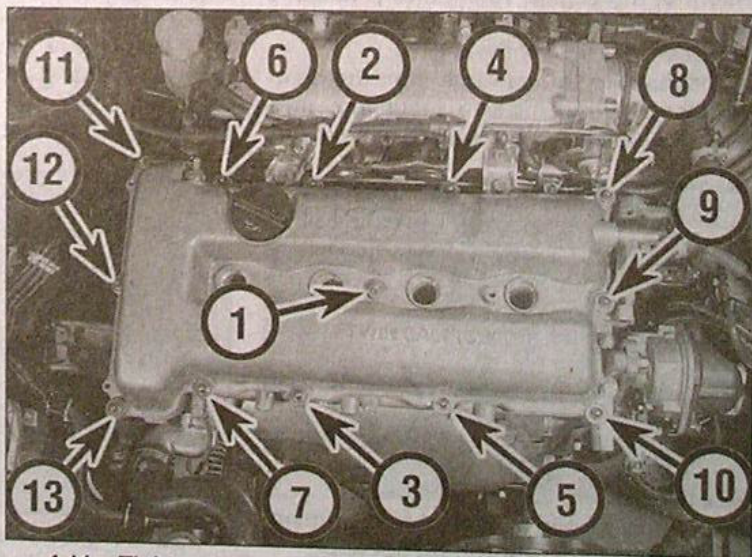
Refer to Chapter 2, Part A, Section 5. If the pulley is a tight fit on the crankshaft, it may be necessary to use a puller to free it. The crankshaft pulley has threaded holes for the puller to be screwed into.

6 Timing chain cover - removal and refitting

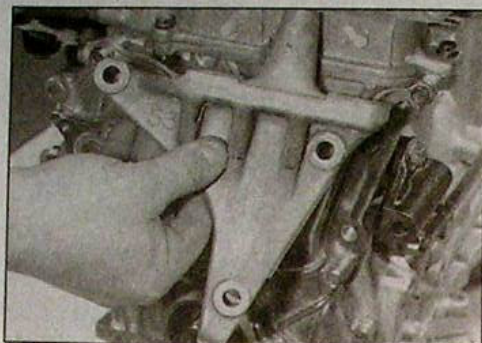
Note: If the timing chain cover is to be removed without disturbing the cylinder head, there is a slight risk of oil leakage from chain cover-to-cylinder head joint after refitting. Bearing in mind this information, it is up to the individual owner to decide whether or not it is worth renewing the head gasket when the chain cover is removed.



4.11b ... followed by the washer and nut



4.11c Tighten the cylinder head cover nuts in the specified sequence



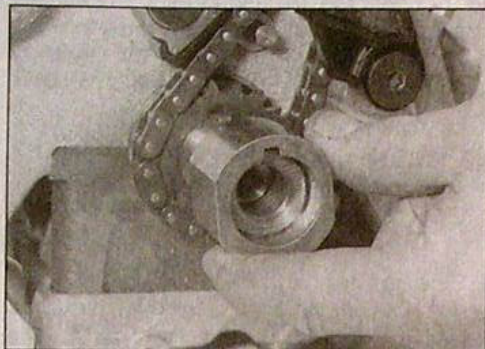
6.8 Removing the right-hand engine/transmission mounting bracket from the engine



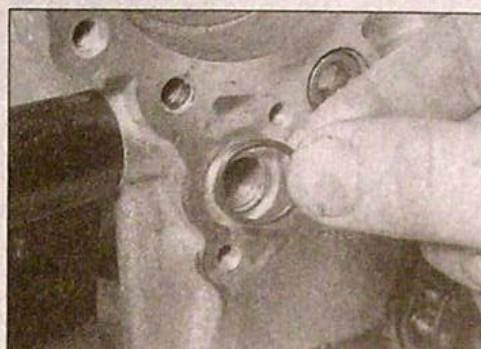
6.14a Lever out the crankshaft oil seal with a large flat-bladed screwdriver ...



6.14b ... and tap the new one into position using a suitable socket



6.17 Align its slot with the Woodruff key, and slide on the oil pump drive spacer



6.18 Fit a new O-ring to the cylinder block oil gallery recess

Removal

- 1 Remove the crankshaft pulley as described in Section 5.
- 2 Remove both sumps and the oil pump pick-up/strainer as described in Section 12.
- 3 Remove the power steering pump as described in Chapter 10.
- 4 Remove the coolant pump pulley as described in Chapter 3.
- 5 Remove the alternator as described in Chapter 5.
- 6 Place a jack with interposed block of wood beneath the main bearing ladder to take the weight of the engine. Alternatively, attach a hoist or support bar to the engine lifting eyes and take the weight of the engine.
- 7 Unscrew the through-bolt from the right-hand engine/transmission mounting, then undo the retaining bolts and remove the

mounting assembly from the engine compartment. Recover the rubbers fitted to the mounting bracket, if they are loose.

8 Undo the retaining bolts, and remove the right-hand engine/transmission mounting bracket from the engine (see illustration).

9 Slacken and remove the timing chain cover retaining bolts, not forgetting the three top bolts securing the cylinder head to the cover. Note the correct fitted location of each bolt, as the bolts are of different lengths.

10 Slide the timing chain cover off the end of the crankshaft, and manoeuvre it out of the engine compartment. Remove the O-ring from the oil gallery, and discard it.

11 If the cover locating dowels are a loose fit, remove them and store them with the cover for safe-keeping.

12 Note the correct fitted position of the

timing chain oil jet in the cylinder block; if it is loose, remove it and store it with the cover.

13 Slide the oil pump drive spacer off the end of the crankshaft. If it is loose, remove the Woodruff key from the crankshaft, and store it with the spacer for safe-keeping.

Refitting

14 Prior to refitting, it is recommended that the crankshaft oil seal be renewed. Carefully lever the old seal out of the cover, using a large flat-bladed screwdriver. Fit the new seal to the cover, making sure that its sealing lip is facing inwards. Drive the seal into position until it seats on its locating shoulder, using a suitable tubular drift, such as a socket, which bears only on the hard outer edge of the seal (see illustrations).

15 Ensure that the cover and crankcase mating surfaces are clean and dry.

16 Refit the Woodruff key (where removed) to the crankshaft groove.

17 Align the oil pump drive spacer groove with the key, then slide the spacer onto the crankshaft (see illustration).

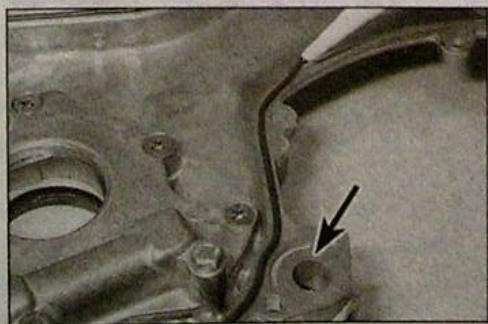
18 Ensure that the locating dowels are in position in the crankcase, and fit a new O-ring to the oil gallery recess (see illustration). Also make sure that the timing chain oil jet is in position.

19 Apply a thin coat of suitable sealant to timing cover crankcase mating surface. **Note:** Do not apply sealant to the area around the cover oil gallery and groove (see illustration). If the cylinder head is in position, also apply sealant to the upper face of the cover.

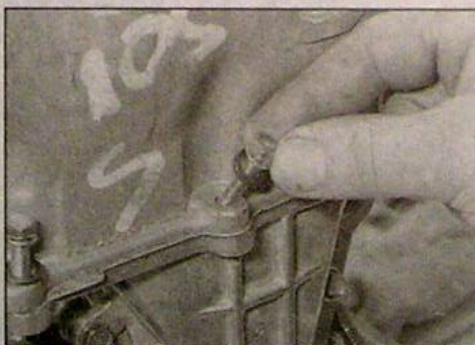
20 Offer up the cover, and position the oil pump inner rotor so that it will engage with the drive spacer as the cover is refitted. Slide the cover over the end of the crankshaft, taking great care not to damage the oil seal lip, and seat it on its locating dowels.

21 Refit the cover retaining bolts in their original locations, and tighten them evenly and progressively to the specified torque setting.

22 Fit the three 6 mm bolts securing the cylinder head to the chain cover, and tighten them to the specified torque setting (see illustration).



6.19 Apply a bead of sealant to the timing chain cover as shown. Do not apply sealant to the area around the cover oil gallery and groove (arrowed)



6.22 Refit the three bolts securing the cover to the cylinder head and tighten them to the specified torque

23 Refit the right-hand engine/transmission mounting bracket to the engine, and tighten its retaining bolts to the specified torque. Fit the rubbers to the body mounting bracket (where removed), ensuring that their pins are correctly seated in the bracket holes, and fit the mounting, tightening its retaining bolts to the specified torque setting.

24 Align the right-hand mounting with its body bracket, then insert the through-bolt and tighten its nut to the specified torque setting. Remove the jack from underneath the engine.

25 Refit the oil pump pick-up/strainer and sump as described in Section 12.

26 Refit the cylinder head cover as described in Section 4.

27 Refit the alternator as described in Chapter 5.

28 Refit the coolant pump pulley, and securely tighten its retaining bolts.

29 Refit the power steering pump as described in Chapter 10.

30 Refit the crankshaft pulley as described in Section 5.

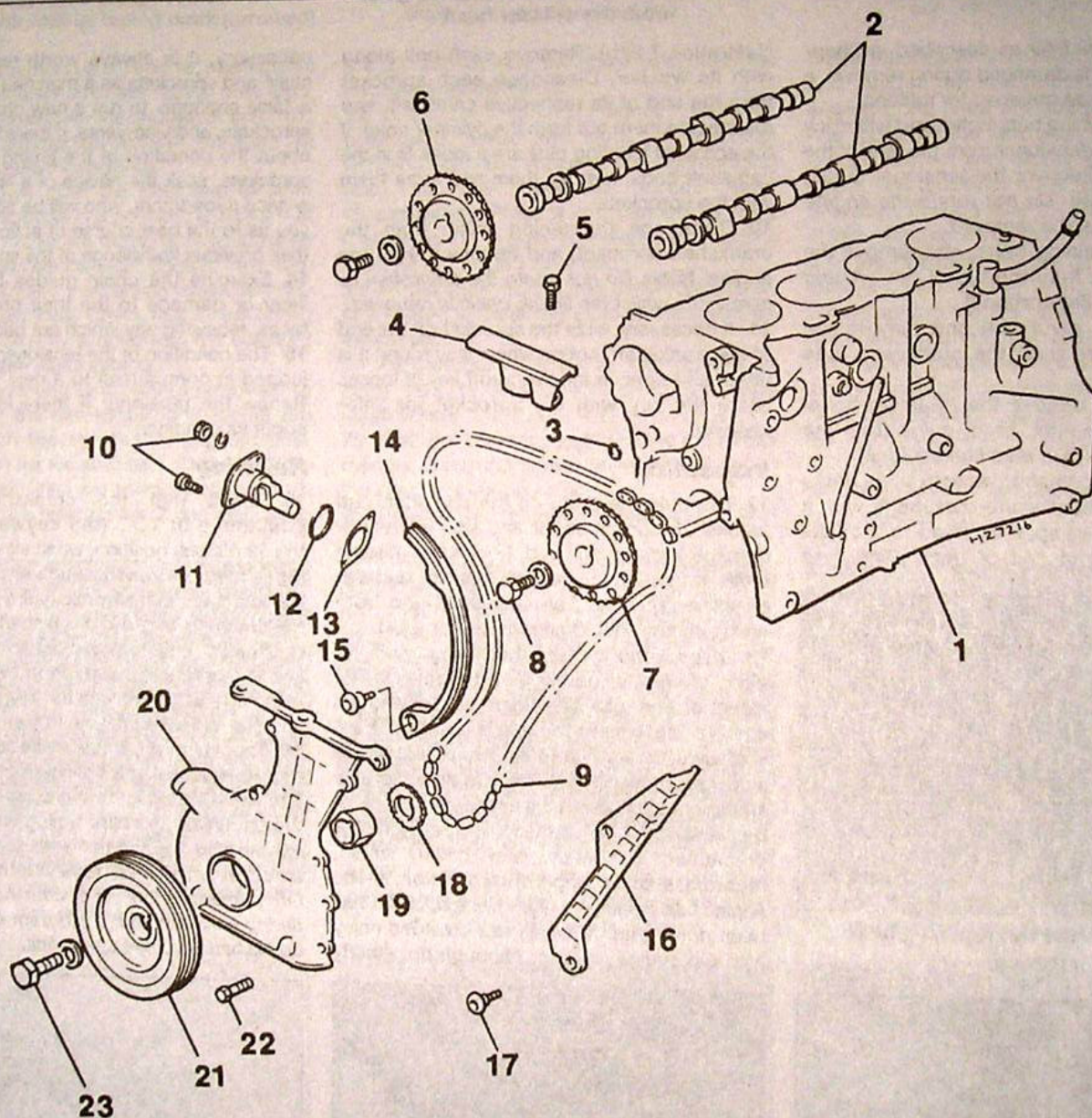
7 Timing chain - removal and refitting

Removal

1 Position No 1 cylinder at TDC on its compression stroke as described in Section 3.

2 Remove the cylinder head cover as described in Section 4.

3 Remove the timing chain cover as described in Section 6 (see illustration).



7.3 Exploded view of timing chain and associated components

- 1 Cylinder block
- 2 Camshafts
- 3 O-ring
- 4 Chain top guide
- 5 Chain top guide bolt
- 6 Inlet camshaft sprocket

- 7 Exhaust camshaft sprocket
- 8 Camshaft sprocket bolt
- 9 Timing chain
- 10 Chain tensioner nut and bolt
- 11 Chain tensioner
- 12 O-ring
- 13 Gasket
- 14 Chain rear guide
- 15 Chain rear guide pivot bolt
- 16 Chain front guide
- 17 Chain front guide bolt
- 18 Crankshaft sprocket

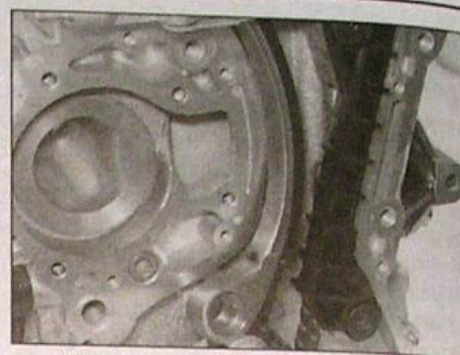
- 19 Oil pump drive spacer
- 20 Timing chain cover
- 21 Crankshaft pulley
- 22 Timing chain cover bolt
- 23 Crankshaft pulley bolt



7.6a Undo the two bolts ...



7.6b ... and remove the chain top guide from the cylinder head



7.7 Removing the chain rear guide

4 Remove the oil filter as described in Chapter 1. If the filter is damaged during removal, a new one should be obtained for refitting.

5 Undo the retaining nuts/bolts, and withdraw the timing chain tensioner from the rear of the cylinder head. Recover the tensioner O-ring and gasket. **Note:** Do not rotate the engine whilst the tensioner is removed.

6 Undo the retaining bolts, and remove the chain top guide from the top of the cylinder head caps (see illustrations).

7 Unscrew the pivot bolt and remove the chain rear guide from the crankcase (see illustration).

8 Slacken and remove the retaining bolts, and remove the chain front guide from the side of the crankcase (see illustrations).

9 Slacken the camshaft sprocket retaining bolts, whilst retaining the camshafts with a large open-ended spanner fitted to the flats on the right-hand end of each shaft (see

illustration 7.22b). Remove each bolt along with its washer. Disengage each sprocket from the end of its respective camshaft, and manoeuvre them out from the cylinder head. If the sprocket locating pins are a loose fit in the camshaft ends, remove them and store them with the sprockets.

10 Disengage the timing chain from the crankshaft sprocket, and remove it from the engine. **Note:** Do not rotate the crankshaft or camshafts whilst the timing chain is removed.

11 If necessary, slide the sprocket off the end of the crankshaft, noting which way round it is fitted, and remove the Woodruff key (if loose). Store the key with the sprocket for safekeeping.

Inspection

12 Examine the teeth on the camshaft and crankshaft sprockets for any sign of wear or damage such as chipped, hooked or missing teeth. If there is any sign of wear or damage on either sprocket, all sprockets and both timing chains should be renewed as a set.

13 Inspect the links of the timing chain for signs of wear or damage on the rollers. The extent of wear can be judged by checking the amount by which the chain can be bent sideways; a new chain will have very little sideways movement. If there is an excessive amount of side play in the timing chain, it must be renewed. Note that it is a sensible precaution to renew the timing chain, regardless of its apparent condition, if the engine has covered a high mileage, or if it has been noted that the chain has sounded noisy with the engine running. Although not strictly

necessary, it is always worth renewing the chain and sprockets as a matched set, since it is false economy to run a new chain on worn sprockets, and vice-versa. If there is any doubt about the condition of the timing chains and sprockets, seek the advice of a Nissan dealer service department, who will be able to advise you as to the best course of action, based on their previous knowledge of the engine.

14 Examine the chain guides for signs of wear or damage to the their chain contact faces, renewing any which are badly marked.

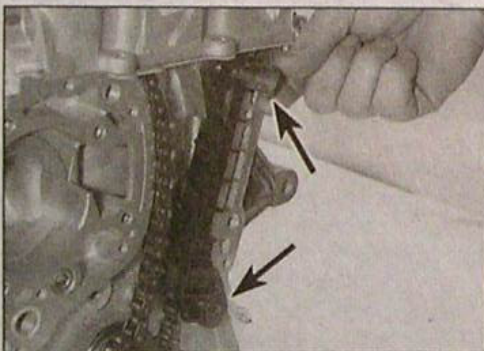
15 The condition of the tensioner can only be judged in comparison to a new component. Renew the tensioner if there is any doubt about its condition.

Refitting

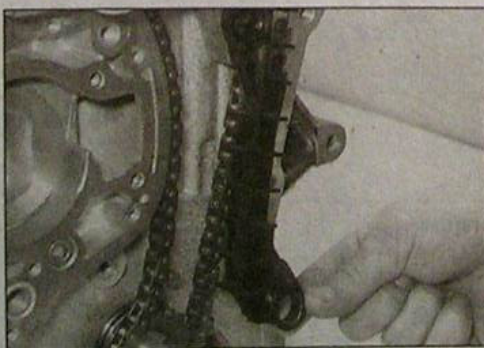
16 Check that the crankshaft is still positioned at TDC (the keyway will be in the 12 o'clock position, when viewed from the right-hand end of the engine) and refit the Woodruff key to the crankshaft groove.

17 Ensuring that the crankshaft sprocket is positioned the correct way round, with its timing mark facing away from the crankcase, then align its groove with the key, and slide the sprocket onto the crankshaft (see illustration).

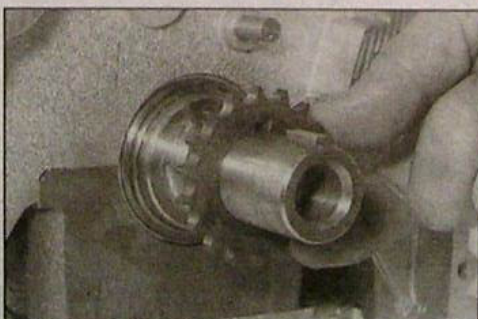
18 The timing chain has three coloured links, one for each of the sprocket timing marks. The two links which are closest together are the camshaft sprocket timing links; the third link should be aligned with the crankshaft sprocket timing mark (see illustration). **Note:** On some models, the camshaft sprocket timing links are also a different colour to the crankshaft sprocket timing link.



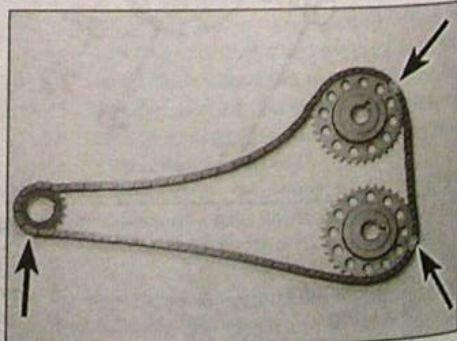
7.8a Undo the two retaining bolts (arrowed) ...



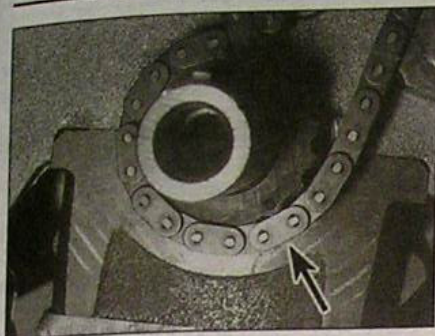
7.8b ... and remove the timing chain front guide



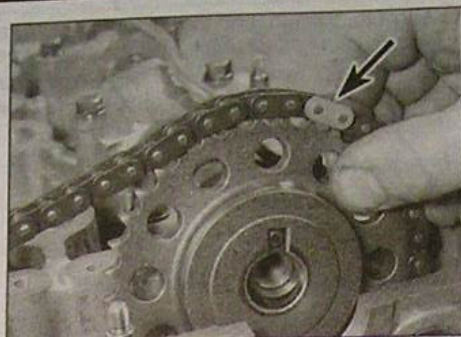
7.17 Slide the crankshaft sprocket into position, making sure that it is the correct way round



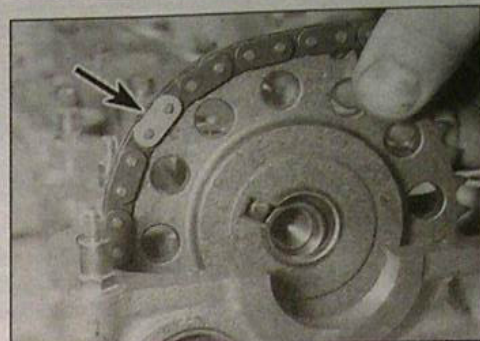
7.18 Timing chain and sprocket timing marks and coloured links (arrowed)



7.19 Engage the timing chain with the crankshaft sprocket, aligning the correct coloured link with its timing mark (arrowed)



7.20a Engage the exhaust camshaft sprocket with the chain, aligning its timing mark with the coloured link . . .



7.20b . . . then install the inlet camshaft sprocket, aligning its mark with the coloured link (arrowed)

19 Bearing in mind paragraph 18, making sure that the coloured links are facing outwards, engage the chain with the crankshaft sprocket, aligning its appropriate link with the sprocket timing mark (see illustration).

20 Manoeuvre both the inlet and exhaust camshaft sprockets into position, ensuring that their timing marks are facing outwards. **Note:** Both sprockets are identical. Engage them with the chain, aligning their timing marks with the coloured chain links. Check that all the timing marks are correctly aligned with the coloured chain links (see illustrations).

21 Fit the locating pins (where removed) to the ends of the camshafts, and locate the sprockets on the camshafts, aligning their cut-outs with the locating pins. Check that the coloured chain links are correctly aligned with each sprocket's timing mark. If not, disengage

the sprocket(s) from the chain, and make the necessary adjustments.

22 With the timing marks correctly positioned, install the camshaft sprocket retaining bolts and washers, and tighten them both to the specified torque (see illustrations). Prevent the camshafts from rotating as this is done by holding them with a spanner on the flats provided.

23 Fit the chain front guide to the crankcase, and tighten its retaining bolts to the specified torque setting.

24 Fit the chain rear guide, and tighten its pivot bolt to the specified torque (see illustration).

25 Refit the chain top guide to the top of the cylinder head, and tighten its retaining bolts to the specified torque setting.

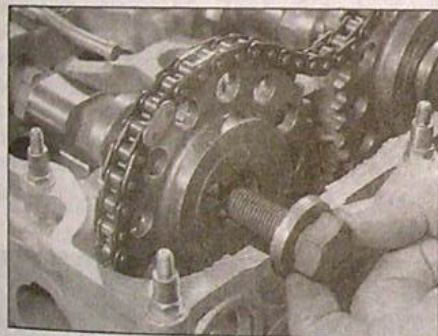
26 Release the plunger detent lever, then

press the tensioner plunger into its housing, and hold it in the retracted position by engaging the hook with the plunger pin. Fit a new gasket to the tensioner, making sure that it is the correct way round, then fit a new O-ring to the tensioner body groove. Install the tensioner, making sure that it is fitted with its arrow pointing away from the cylinder head (see illustrations). Fit the tensioner nuts and washers, and tighten them to the specified torque setting. As the nuts are tightened, the hook will automatically disengage from the pin, and the plunger will be released.

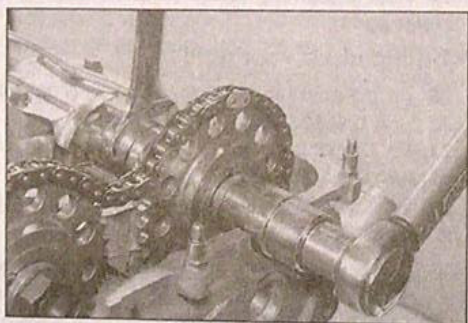
27 Fit a new oil filter and replenish the engine oil as described in Chapter 1.

28 Refit the timing chain cover as described in Section 6.

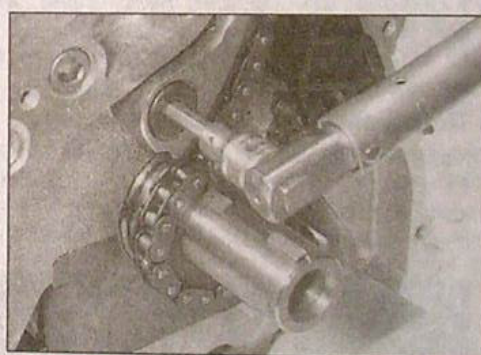
29 Refit the cylinder head cover as described in Section 4.



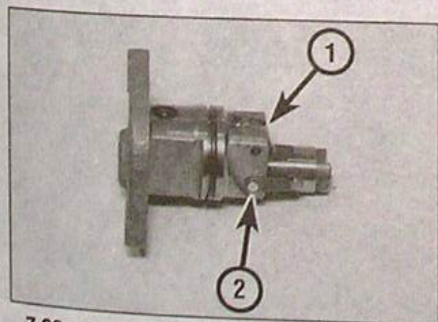
7.22a Install the sprocket retaining bolts and washers . . .



7.22b . . . and tighten them to the specified torque setting - note the spanner holding the camshaft against rotation



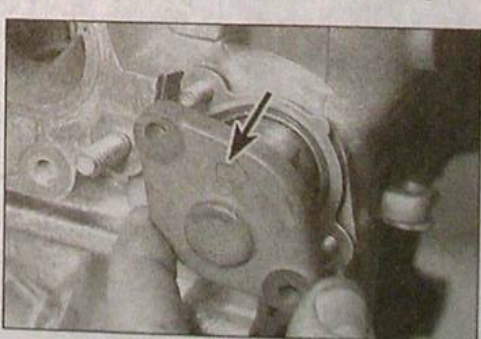
7.24 Tighten the rear chain guide pivot bolt to the specified torque setting



7.26a Depress the detent lever (1), then push the plunger back into its housing and hold it in position with the hook (2)



7.26b Fit a new O-ring and gasket to the tensioner, making sure that the gasket is fitted the correct way round



7.26c Fit the tensioner to the cylinder head, making sure that its arrow (arrowed) is pointing away from the cylinder head

8 Timing chain tensioner, guides and sprockets - removal, inspection and refitting



Removal

Timing chain tensioner

1 Drain the engine oil and remove the filter as described in Chapter 1. If the filter is damaged during removal, a new filter must be obtained for refitting.

2 Unscrew the two retaining nuts and washers, and remove the timing chain tensioner from the rear of the cylinder head. Recover the tensioner gasket and O-ring.
Note: Do not rotate the engine whilst the chain tensioner is removed.

Timing chain front guide

3 Remove the timing chain cover as described in Section 6.

4 Remove the timing chain tensioner as described in paragraphs 1 and 2.

5 Slacken and remove the retaining bolts, and remove the chain front guide from the side of the cylinder block.

Timing chain rear guide

6 Remove the timing chain cover as described in Section 6.

7 Remove the chain tensioner as described in paragraphs 1 and 2.

8 Unscrew the pivot bolt, and remove the chain rear guide from the cylinder block.

Timing chain top guide

9 Remove the cylinder head cover as described in Section 4.

10 Undo the two retaining bolts, and remove the guide from the top of the cylinder head.

Timing chain sprockets

Note: Refer to the note at the start of Section 9.

11 Remove the timing chain and camshaft sprockets as described in Section 7. If the chain is being left in position (see note at the

start of Section 9), unbolt the sprockets from the camshafts as described in paragraph 9 of Section 7; mark each sprocket for identification purposes, to ensure that it is refitted in its original position.

Inspection

12 Refer to Section 7.

Refitting

Timing chain tensioner

13 Ensure that the tensioner and cover mating surfaces are clean and dry.

14 Release the plunger detent arm, then press the tensioner plunger into its housing and hold it in the retracted position by engaging the hook with the plunger pin (see illustration 7.26a).

15 Fit a new gasket to the tensioner, making sure that it is the correct way round, then fit a new O-ring to the tensioner groove (see illustration 7.26b).

16 Install the tensioner, making sure that it is fitted with its arrow pointing away from the cylinder head (see illustration 7.26c). Fit the tensioner nuts and washers, and tighten them to the specified torque setting. As the nuts are tightened, the hook will automatically disengage from the pin, and the plunger will be released.

Timing chain front guide

17 Fit the guide to the cylinder block, and tighten its retaining bolts to the specified torque.

18 Fit the chain tensioner as described in paragraphs 13 to 16.

19 Refit the timing chain cover as described in Section 6.

Timing chain rear guide

20 Fit the guide to the crankcase, and tighten its pivot bolt to the specified torque.

21 Fit the chain tensioner as described in paragraphs 13 to 16.

22 Refit the timing chain cover as described in Section 6.

Timing chain top guide

23 Fit the guide to the top of the cylinder head, and tighten its retaining bolts to the specified torque.

24 Refit the cylinder head cover as described in Section 4.

Timing chain sprockets

25 Refit the timing chain and sprockets as described in Section 7.

26 If the chain was not removed, ensure that the sprockets are fitted to the relevant camshafts, and engage them with the chain so the marks made prior to removal are correctly aligned. Fit the sprocket retaining bolts and washers, and tighten them to the specified torque as described in Section 7.

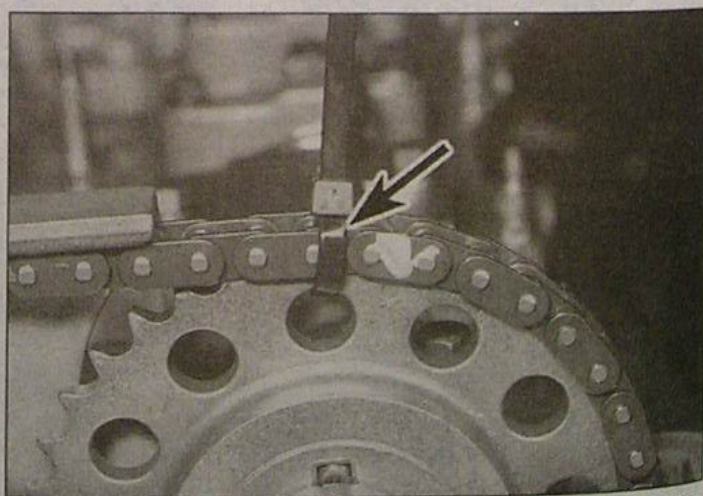
9 Camshafts - removal, inspection and refitting



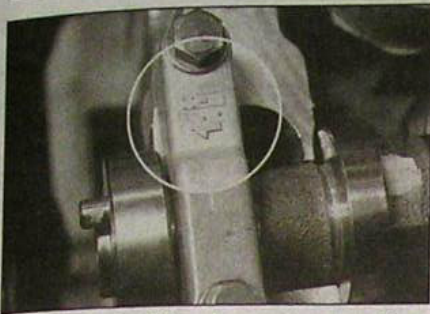
Note: Although the following text recommends that the timing chain is removed, this is only necessary if the manufacturer's timing chain marks are to be used on refitting. If the engine is positioned with No.1 cylinder at TDC on compression (see Section 3) it will be seen that the camshaft sprocket timing marks are correctly positioned, although they will not be aligned with the timing chain coloured links (see Section 7). Alignment marks can be made between the camshaft sprocket marks and relevant chain links by the owner; these marks can be used on refitting to ensure that the camshaft sprockets and chain are correctly mated. If this method is to be used, great care must be taken to ensure that the camshaft sprockets are fitted in their original positions on refitting. As an extra precaution, to ensure that the sprockets and chain stay correctly mated, it would be wise to tie each sprocket to the chain (see illustrations). This method requires extra care and thought on behalf of the owner, but means that the timing chain cover can be left in position.



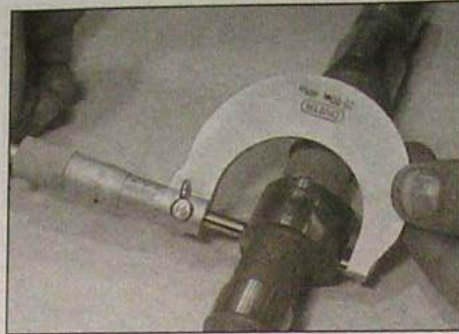
9.0a If the camshafts are to be removed without removing the timing chain, alignment marks must be made between the sprockets and chain . . .



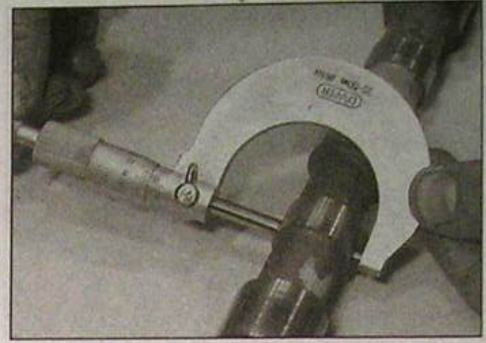
9.0b . . . as an added precaution, the sprockets can be tied to the chain (cable-tie used here, arrowed) to ensure that they stay correctly mated



9.3 Camshaft bearing caps are each marked with an arrow (circled) to indicate their correct fitted direction



9.9 Measuring camshaft lobe height



9.11 Measuring camshaft bearing journal diameter

Removal

- 1 Remove the distributor as described in Chapter 5.
- 2 Remove the timing chain and camshaft sprockets as described in Section 7. If the chain is being left in position (see note at the start of this Section), make the alignment marks and unbolt the sprockets from the camshafts as described in paragraph 9 of Section 7.
- 3 With the exception of the exhaust camshaft right-hand end bearing cap, all other bearing caps are all similar and it will be necessary to make suitable identification marks on each cap prior to removal. The caps all have an arrow cast into their upper surface indicating their correct fitted direction (all arrows should point towards the timing chain end of the engine). The inlet camshaft caps are marked with a capital I, to distinguish them from the exhaust camshaft caps (see illustration). Using a scribe or a suitable marker pen, number each cap in some way as to indicate its correct fitted position, with No 1 at the timing chain end. This will avoid the possibility of installing the caps in the wrong positions on refitting.
- 4 Working in the reverse of the sequence shown in illustration 9.24, evenly and progressively slacken the exhaust camshaft bearing cap retaining bolts by one turn at a time, to relieve the pressure of the valve springs on the bearing caps gradually and evenly. Once the valve spring pressure has been relieved, the bolts can be fully unscrewed and removed. Note the correct fitted position of each bolt as it is removed, the bolts are of three different lengths.
- 5 Remove the oil pipe from the top of the bearing caps, and the baffle plate from the top of No 2 bearing cap. Lift off the camshaft bearing caps, and lift the exhaust camshaft out of the head.
- 6 Repeat paragraphs 4 and 5 and remove the inlet camshaft and bearing caps from the head (note that there is no baffle plate fitted).

Inspection

- 7 Inspect the cam bearing surfaces of the head and the bearing caps. Look for score marks and deep scratches. Check the camshaft lobes for heat discolouration (blue appearance), score marks, chipped areas or flat spots.

8 Camshaft run-out can be checked by supporting each end of the camshaft on V-blocks, and measuring any run-out at the centre of the shaft using a dial gauge. If the run-out exceeds the specified limit, a new camshaft will be required.

9 Measure the height of each lobe with a micrometer, and compare the results to the figures given in the Specifications at the start of this Chapter (see illustration). If damage is noted or wear is excessive, new camshaft(s) must be fitted.

10 The camshaft bearing oil clearance should then be checked. There are two possible ways of checking this - the first method is by direct measurement (see paragraphs 11 and 16), and the second by the use of a product called Plastigauge (see paragraphs 12 to 16).

11 If the direct measurement method is to be used, fit the bearing caps to the head, using the marks made on removal to ensure that they are correctly positioned. Fit the oil pipe to the top of the caps, and tighten the retaining bolts to the specified torque in the sequence shown in illustration 9.24. Measure the diameter of each bearing cap journal and compare the measurements obtained with the results given in the Specifications at the start of this Chapter. If any journal is worn beyond the service limit, the cylinder head must be renewed. The camshaft bearing oil clearance can then be calculated by subtracting the camshaft bearing journal diameter from the bearing cap journal diameter (see illustration).

12 If the second method is to be used, clean the camshafts, the bearing surfaces in the cylinder head and the bearing caps with a clean, lint-free cloth, then lay the camshafts in place in the cylinder head.

13 Cut strips of Plastigauge and lay one piece on each bearing journal, parallel with the camshaft centreline. Ensuring that the camshafts are not rotated at all, refit both camshafts as described in paragraphs 19 to 25, ignoring the remark about applying sealant to the bearing cap.

14 Now unscrew the bolts as described in paragraph 4, and carefully lift off the oil pipe and bearing caps, again making sure that the camshafts are not rotated.

15 To determine the oil clearance, compare

the crushed Plastigauge (at its widest point) on each journal to the scale printed on the Plastigauge container.

16 Compare the results to this Chapter's Specifications. If the oil clearance is greater than specified, measure the diameter of the cam bearing journal with a micrometer. If the journal diameter is less than the specified limit, renew the camshaft and recheck the clearance. If the clearance is still too great, replace the cylinder head and bearing caps with new parts.

Refitting

17 Ensure that each of the followers is correctly engaged with its hydraulic adjuster and guide plate which is fitted to one of its two valves.

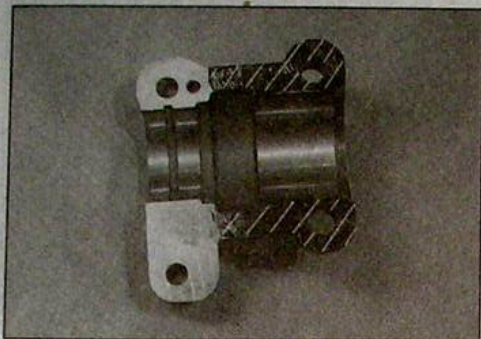
18 Liberally oil the cylinder head camshaft bearings with clean engine oil.

19 Refit the camshafts to their correct locations in the cylinder head. The exhaust camshaft is easily distinguished by the distributor drive slot on its left-hand end.

20 Check that the crankshaft is still positioned at TDC (the keyway will be in the 12 o'clock position, when viewed from the right-hand end of the engine). Position each camshaft so that its No 1 cylinder lobes are pointing away from their valves. With the shafts in this position, the sprocket locating pin in the inlet camshaft's right-hand end will be in the 10 o'clock position when viewed from the right-hand end of the engine, while that of the exhaust camshaft will be in the 12 o'clock position (see illustration).



9.20 Lay the camshafts in the cylinder head, positioning the locating pins (arrowed) as shown



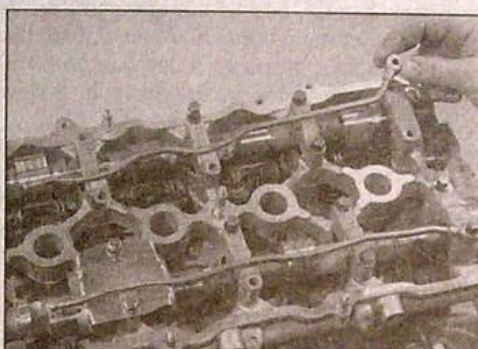
9.21 Apply sealant to the exhaust camshaft bearing cap, as indicated by the shaded area



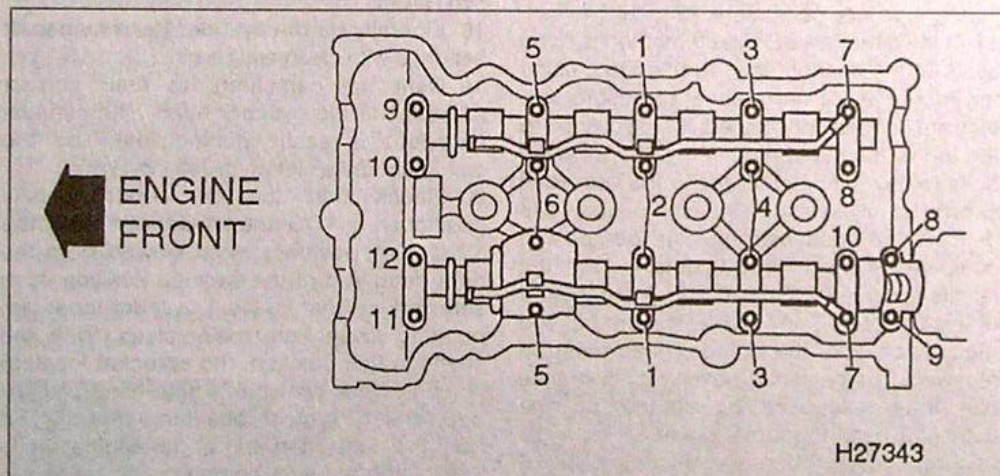
9.22 Fit the bearing caps, using the marks made prior to removal to ensure that each is correctly positioned



9.23a Fit the baffle plate to No 2 exhaust camshaft bearing cap ...



9.23b ... then install the oil pipes and bearing cap bolts



9.24 Camshaft bearing cap bolt tightening sequence



10.3a Lift out the follower ...



10.3b ... and remove the hydraulic adjuster from the cylinder head

21 Ensure that the bearing cap and head mating surfaces are completely clean, unmarked and free from oil. Apply a smear of suitable sealant to exhaust camshaft left-hand end bearing cap mating surface as shown (see illustration).

22 Using the marks made on removal, refit the bearing caps to their original locations, making sure that the arrow on each cap is pointing towards the timing chain end of the engine (see illustration).

23 Fit the baffle plate to No 2 exhaust camshaft bearing cap, and refit the oil pipe to the top of each set of caps. Refit the bearing cap bolts to their original locations, and screw in all bolts by hand only (see illustrations).

24 Working in the sequence shown, evenly and progressively tighten the inlet camshaft bearing cap bolts by one turn at a time until the caps touch the cylinder head (see illustration). Then tighten all the bolts to the specified torque setting. Work only as described to impose the pressure of the valve springs gradually and evenly on the bearing caps.

25 Repeat paragraph 24 and tighten the exhaust camshaft bearing cap bolts to the specified torque setting.

26 Refit the timing chain and sprockets as described in Section 7.

27 If the chain was not removed, ensure that the sprockets are fitted to the relevant camshafts, and engage them with the chain so the marks made prior to removal are correctly aligned. Fit the sprocket retaining bolts and washers, and tighten them to the specified torque as described in Section 7.

28 Refit the distributor as described in Chapter 5.

10 Camshaft followers and hydraulic adjusters - removal, inspection and refitting

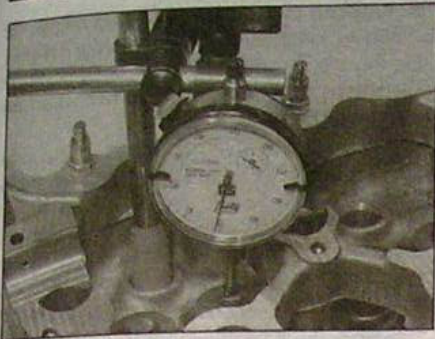
Removal

1 Remove the camshafts as described in Section 9.

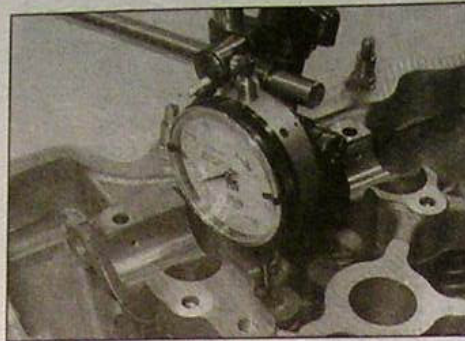
2 Obtain sixteen small, clean plastic containers, and number them 1 to 16. Alternatively, divide a larger container into sixteen compartments.

3 Lift the first follower away from the head, withdraw the hydraulic adjuster from the cylinder head bore, and store the components in their respective positions in the container (see illustrations). **Note:** Ensure that each adjuster is stored the correct way up; if it is stored on its side or upside-down, air will enter the adjuster, making it necessary to bleed the adjuster prior to installation (see paragraphs 13 and 14). Remove the shim and follower guide from the top of the valves, and store each with its respective adjuster.

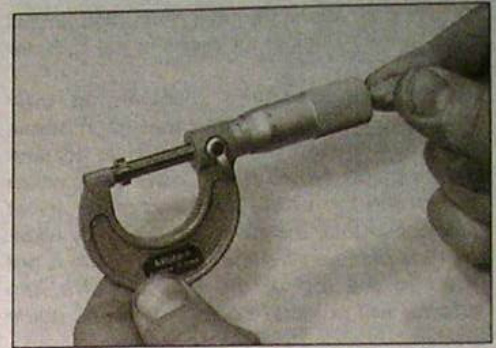
4 Repeat paragraph 3 and remove all the remaining followers, adjusters, follower guides and shims. Do not interchange the cam followers or adjusters, as the rate of wear on reassembly will be increased.



10.9a Position a dial test indicator on the follower contact surface of the guide, and zero the gauge ...



10.9b ... then carefully pivot the indicator around to rest on the shim, and note the reading obtained



10.10 Using a micrometer to measure shim thickness

Inspection

5 Inspect the cam follower camshaft lobe contact surfaces for signs of wear or damage. If the followers are worn, it is likely that the camshaft lobes are also worn (see Section 9). Renew worn followers as necessary.

6 Check the hydraulic adjuster and cylinder head bearing surfaces for signs of wear or damage. If the necessary measuring equipment is available, the amount of wear can be assessed by direct measurement. Measure the outer diameter of each adjuster, and the internal diameter of its cylinder head bore. The adjuster-to-bore clearance can then be calculated by subtracting the adjuster diameter from the head bore. Compare all measurements with those given in the Specifications at the start of this Chapter, and renew worn components as necessary.

7 Inspect the follower guides for signs of wear or damage, and renew as necessary.

Refitting

8 Prior to refitting, the thickness of each shim should be checked for suitability. This is especially important if new valves and/or seats have been fitted, or if the valves have been reground. The shim thicknesses are checked as described in paragraphs 9 to 11. If no work has been carried out on the cylinder head, and it is not wished to check the shim thicknesses, proceed as described in paragraph 12 onwards.

9 Fit the follower guide to the top of its original valve (this is most important - see paragraph 16). Attach a dial test indicator to the cylinder head, and position its probe on the follower contact surface of the guide. Zero the dial test indicator, then carefully lift the probe, and swivel the indicator squarely around; position the probe so that it contacts the end of the other valve stem which the follower will act on, ie. the second valve from that cylinder (see illustrations). **Note:** Ensure that the indicator is not tilted as it is moved, as this will affect the reading obtained. Measure the height difference between the tip of the valve stem and the follower contact surface of the follower guide and note this down on a piece of paper. To check the indicator has not tilted as it is moved, swivel it back around and

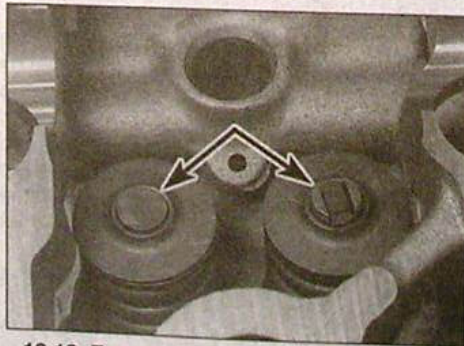
position its probe on the follower guide; the gauge reading should be zero. Repeat this procedure for each pair of inlet and exhaust valves on each cylinder, and record the measurement obtained.

10 Using the above measurements, select a suitable thickness shim for each pair of valves. The shim should be the same thickness as the measurement obtained, although Nissan do give a tolerance of ± 0.025 mm. **Note:** Shims are available in thicknesses between 2.800 mm and 3.200 mm, in steps of 0.025 mm. The shim size is stamped on the bottom face of the shim (eg. 2875 indicates the shim is 2.875 mm thick), but it is advisable to use a micrometer to measure the true thickness of any shim removed, as it may have been reduced by wear (see illustration).

11 Fit each shim to its respective valve, ensuring that it is fitted with its marked face facing downwards.

12 If the shim thicknesses are not being checked, refit the follower guides and shims to their original valves, making sure that the shims are fitted with their marked faces downwards (see illustration).

13 Prior to refitting the hydraulic adjusters, check that each one is free of air. To do this, with the adjuster standing upright, push down on the adjuster plunger and check that it does not move. If the plunger moves approximately 1 mm or more, this indicates the presence of air in the adjuster. If air is present in the adjuster, or if new adjusters are being fitted, the air must be bled from them as follows.

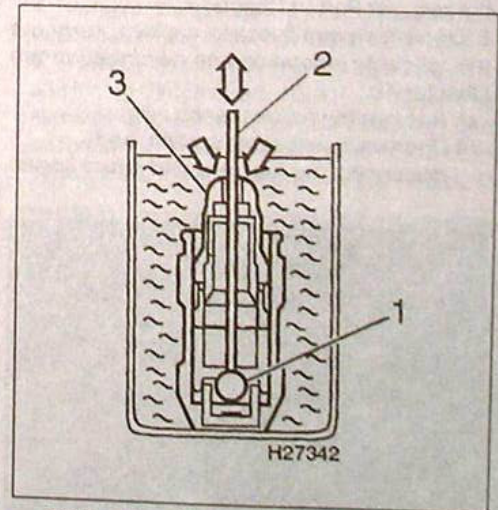


10.12 Ensure that the shim and follower guide (arrowed) are correctly located in their respective valves



Warning: The adjusters will not bleed themselves of air when the engine is running. If they are installed with air trapped in them, they will not function correctly, and will be noisy in operation.

14 Obtain a small container which is taller than the adjuster, and a suitable length of welding rod which passes down through the hole in the adjuster plunger. Fill the container with clean engine oil of the specified type and grade (see Chapter 1), and stand the adjuster upright in the container so that it is completely submerged in the oil. Pass the rod down through the adjuster plunger hole, and gently depress the adjuster ball valve (see illustration). With the ball valve depressed, slowly move the adjuster plunger in and out; this should bleed the trapped air from the ball valve chamber. When air bubbles cease to appear from the top of the adjuster, release the plunger then remove the rod and allow the ball valve to close. **Note:** Ensure that the ball valve remains open whilst the plunger is released. Remove the adjuster from the oil bath, and recheck it as described in paragraph 13.



10.14 Bleeding a hydraulic adjuster. Submerge the adjuster in oil, then depress the ball valve (1) with a suitable rod (2) and slowly move the plunger (3) in and out until air bubbles cease to appear

15 Once all adjusters have been bled, install them in their original locations in the cylinder head.

16 Refit the camshaft followers in their original locations, ensuring that each one is correctly engaged with the hydraulic adjuster and its guide. **Note:** The follower ends which rest on the top of the shim and guide are of different widths; the shim end is slightly wider than the guide end. If the follower guide is not fitted to the top of the correct valve, the follower will not seat correctly into the guide groove.

17 Refit the camshafts as described in Section 9.

11 Cylinder head - removal and refitting



Note: Refer to the note at the start of Section 9.



To aid refitting, make notes on the locations of all relevant brackets and the routing of hoses and cables before removal.

Removal

1 Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).

2 Drain the cooling system as described in Chapter 1.

3 Remove the camshafts as described in Section 9.

4 Note that the following text assumes that the cylinder head will be removed with both inlet and exhaust manifolds attached; this is easier, but makes it a bulky and heavy assembly to handle. If it is wished to remove the manifolds first, proceed as described in the relevant Part of Chapter 4.

5 On single-point injection engines, carry out the following operations as described in the Chapter 4B.

- Remove the air cleaner housing.
- Depressurise the fuel system, and disconnect the fuel feed and return hoses

from the throttle body (plug all openings, to prevent loss of fuel and entry of dirt into the fuel system).

- Disconnect the accelerator cable.
- Disconnect the relevant electrical connectors from the throttle body, inlet manifold and associated components.
- Disconnect the vacuum servo unit hose, coolant hose(s) and all the other relevant/breather hoses from the manifold and associated valves.
- Remove the inlet manifold support bracket(s).
- Disconnect the exhaust front pipe from the manifold.

6 On multi-point injection engines, carry out the following operations as described in Chapter 4C.

- Remove the air cleaner inlet duct.
- Depressurise the fuel system, and disconnect the fuel feed and return hoses from the fuel rail (plug all openings, to prevent loss of fuel and entry of dirt into the fuel system).
- Disconnect the accelerator cable.
- Disconnect the relevant electrical connectors from the throttle housing, inlet manifold and associated components. Free the wiring from the manifold, and position it clear of the cylinder head so that it does not hinder removal.
- Disconnect the vacuum servo unit hose, coolant hose(s) and all the other relevant/breather hoses from the manifold and associated valves.
- Remove the inlet manifold support bracket(s).
- Disconnect the exhaust front pipe from the manifold.

7 On automatic transmission models, disconnect the kickdown cable from the throttle body/housing as described in Chapter 7B.

8 Slacken the retaining clip and disconnect the coolant hoses from the back of the coolant pump, the heater matrix and, where necessary, the oil cooler. Also disconnect the radiator hoses from the front of the cylinder head.

9 On Phase I multi-point injection models, remove the starter motor as described in Chapter 5, then slacken and remove the bolt securing the cylinder head coolant pipes to the rear of the block.

10 Referring to Chapter 5, disconnect the wiring connectors from the distributor, ignition HT coil and the power transistor unit. Free the wiring loom from any relevant retaining clips, so that it is free from the cylinder head and will not hinder the removal procedure. Also undo the retaining bolts and disconnect all the relevant earth leads from the head and inlet manifold.

11 Undo the two retaining bolts, and free the alternator mounting bracket from the head.

12 Slacken and remove the 6 mm bolts from the timing chain end of the cylinder head (if not already done), and one from the front of the head (see illustration).

13 Working in the **reverse** of the sequence shown in illustration 11.25a, progressively slacken the ten main cylinder head bolts by half a turn at a time, until all bolts can be unscrewed by hand.

14 Lift out the cylinder head bolts and recover the washers, noting which way round they are fitted.

15 Lift the cylinder head away; seek assistance if possible, as it is a heavy assembly (especially if complete with manifolds). Remove the gasket from the top of the block. If the locating dowels are a loose fit in the block, remove them and store them with the head for safe-keeping. Also note the correct fitted locations of the oil jets in the cylinder block; if they are loose, remove them and store them with the head.

16 If the cylinder head is to be dismantled for overhaul, refer to Part C of this Chapter.

Preparation for refitting

17 The manufacturers recommend that the cylinder head bolts are measured, to determine whether renewal is necessary. Measure the length of each bolt (without the washer fitted) from the base of the head to the end of the shank. If all of the bolts are less than 158.2 mm in length they may be re-used, however if any one bolt is greater than 158.2 mm in length, all of the bolts should be renewed as a complete set. Considering the stress which the cylinder head bolts are under, it is highly recommended that they are renewed, regardless of their apparent condition.

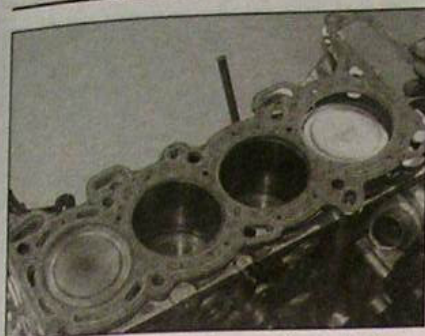
18 The mating faces of the cylinder head and cylinder block/crankcase must be perfectly clean before refitting the head. Use a hard plastic or wood scraper to remove all traces of gasket and carbon; also clean the piston crowns. Take particular care, as the surfaces are damaged easily. Also, make sure 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 any of the engine's components. Using adhesive tape and paper, seal the water, oil and bolt holes in the cylinder block/crankcase. 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. Clean all the pistons in the same way.

19 Check the mating surfaces of the cylinder block/crankcase 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.

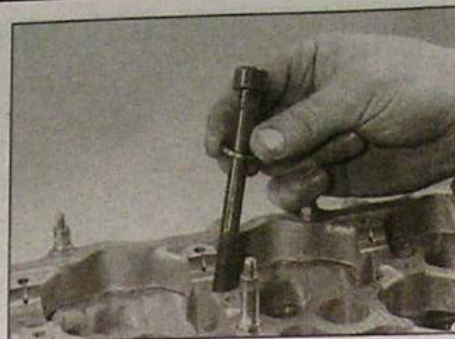
20 If warpage of the cylinder head gasket surface is suspected, use a straight-edge to check it for distortion. Refer to Part C of this Chapter if necessary.



11.12 Do not forget the small 6 mm bolts which are fitted to the front of the cylinder head



11.22 Fit a new gasket to the cylinder block, aligning it with the locating dowels



11.24 Lubricate the threads and washers, and screw the head bolts into position

Refitting

21 Wipe clean the mating surfaces of the cylinder head and cylinder block/crankcase. Check that the two locating dowels and oil jets are correctly fitted to the cylinder block.

22 Fit a new gasket to the cylinder block/crankcase surface, aligning it with the locating dowels (see illustration).

23 With the aid of an assistant, carefully refit the cylinder head assembly to the block, aligning it with the locating dowels.

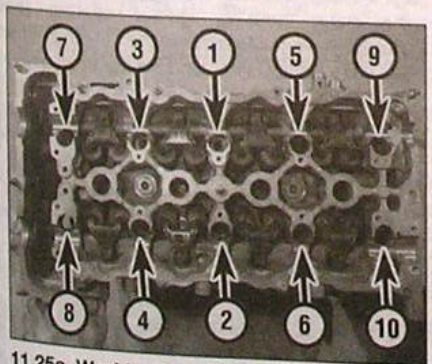
24 Apply a smear of clean oil to the threads, and to the underside of the heads, of the cylinder head bolts. Fit the washer to each head bolt, and carefully enter each bolt into its relevant hole (do not drop them in) and screw in, by hand only, until finger-tight (see illustration).

25 Working progressively and in the sequence shown, tighten the ten main cylinder head bolts to their Stage 1 torque setting, using a torque wrench and suitable socket (see illustrations).

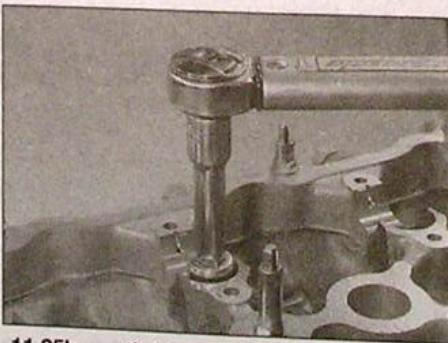
26 Once all the bolts have been tightened to their Stage 1 setting, go around again in the specified sequence and tighten them to the specified Stage 2 torque setting.

27 Leave the bolts a minute then, working in the reverse of the specified sequence, progressively slacken the head bolts by half a turn at a time, until all bolts can be unscrewed by hand.

28 Tighten all bolts again by hand, then go around again in the specified sequence and tighten the bolts to the specified Stage 3 torque setting.



11.25a Working in the sequence shown ...



11.25b ... tighten the cylinder head bolts through the specified torque settings ...

36 Working as described in the relevant Part of Chapter 4, carry out the following tasks:

- Refit all disturbed wiring, hoses and control cable(s) to the inlet manifold and fuel system components.
- Refit the inlet manifold support bracket(s).
- Reconnect and adjust the accelerator cable.
- Reconnect the exhaust system front pipe to the manifold.
- Refit the air cleaner housing and/or inlet duct (as applicable).

37 On automatic transmission models, reconnect and adjust the kickdown cable as described in Chapter 7B.

38 Refit the camshafts as described in Section 9.

12 Sump - removal and refitting



Removal

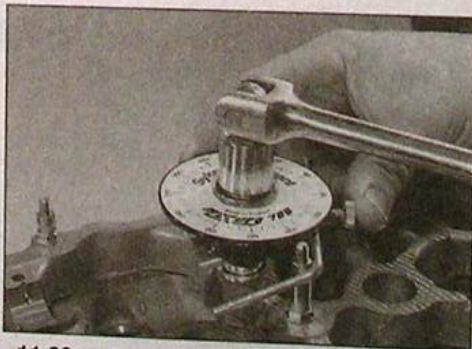
1 Apply the handbrake, then jack up the front of the car and support it on axle stands (see *Jacking and vehicle support*). Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).

2 Slacken and remove the retaining screws, and remove the plastic undershields from beneath the engine.

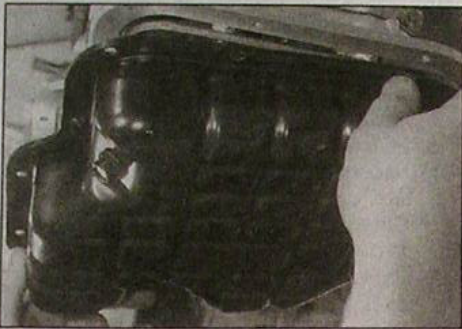
3 Drain the engine oil, then clean and refit the engine oil drain plug, tightening it to the specified torque. If the engine is nearing its service interval when the oil and filter are due for renewal, it is recommended that the filter is also removed, and a new one fitted. After reassembly, the engine can then be refilled with fresh oil. Refer to Chapter 1 for further information.

4 Remove the exhaust system front pipe as described in the relevant Part of Chapter 4.

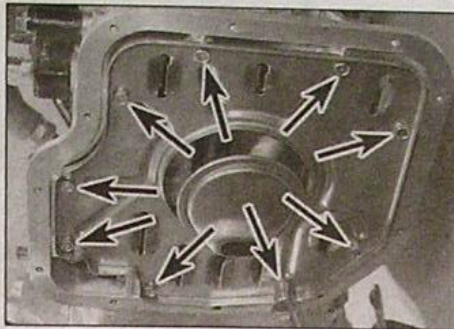
5 Working in the reverse of the sequence shown in illustration 12.31, progressively slacken and remove all the retaining bolts securing the small pressed-steel sump to the base of the main aluminium sump. Break the



11.29 ... and then through the specified angle tightening stages as described in the text



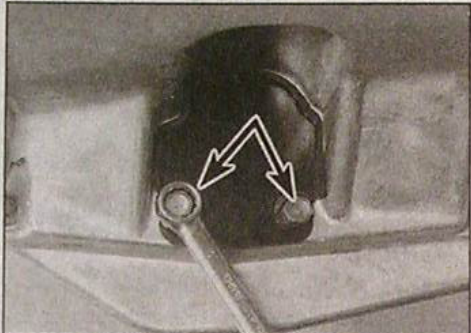
12.5 Removing the small pressed-steel sump



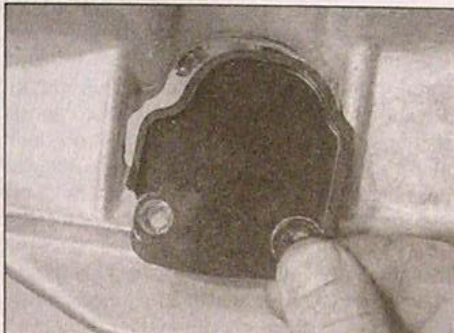
12.6a Unscrew the retaining bolts (arrowed) ...



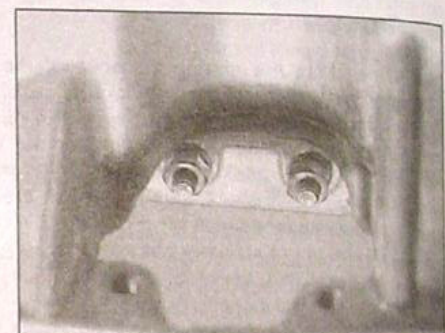
12.6b ... and remove the baffle plate from the base of the aluminium sump



12.12a Undo the two retaining bolts (arrowed) ...



12.12b ... and remove the cover plate from the sump flange ...



12.12c ... to gain access to the two retaining nuts

joint by striking the sump with the palm of your hand, and withdraw the steel sump from underneath the vehicle (see illustration).

6 Undo the retaining bolts and remove the baffle plate from the base of the aluminium sump (see illustrations).

7 Place a jack with interposed block of wood beneath the transmission to take the weight of the unit. Alternatively, attach a hoist or support bar to the engine, and take the weight of the engine.

8 On manual transmission models, using a suitable marker pen, mark the outline of the front engine/transmission through-bolt on the mounting bracket, to use as a guide on refitting. Slacken and remove the nut, and withdraw the through-bolt from the mounting.

9 On all models, slacken and remove the nut and through-bolt from the rear engine/transmission mounting.

10 Slacken and remove the four bolts and washers securing the centre member to the vehicle body, and lower the assembly away from the engine. Recover the stopper ring which is fitted between the rear engine/transmission mounting and its bracket.

11 On models with air conditioning, slacken and remove the bolts securing the compressor lower mounting bracket to the aluminium sump. **Note:** It is not necessary to remove the compressor.

12 Undo the two bolts and remove the small cover plate from the sump flange, to gain access to two of the sump retaining nuts (see illustrations).

13 Working in the **reverse** of the sequence shown in illustration 12.21, slacken and remove the nuts and bolts securing the aluminium sump to the base of the cylinder block.

14 Unscrew the two bolts securing the sump

flange to the transmission housing. The bolts can then be screwed into the threaded holes directly above their original locations, and used as jacking bolts to release the sump from the cylinder block. Screw both bolts until they contact the cylinder block surface, then evenly and progressively tighten the bolts whilst ensuring that the sump comes squarely away from the base of the cylinder block (see illustration).

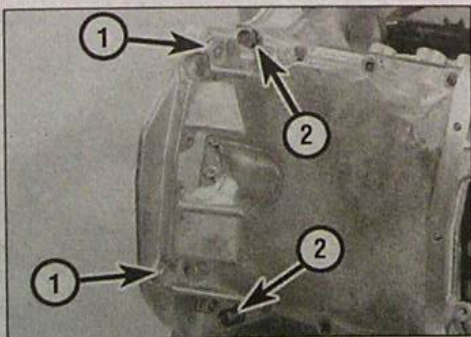
15 Remove the aluminium sump, and unscrew the jacking bolts (see illustration). **Note:** On automatic transmission models, it may be necessary to disconnect the selector cable from the transmission to gain the necessary clearance required to allow the sump to be removed. See Chapter 7B for further information.

16 While the sump is removed, undo the retaining bolts and remove the oil pump pick-up/strainer and baffle plate from the base of the main bearing ladder casting (see illustrations). Recover the O-ring fitted between the strainer and timing chain cover, and wash the strainer in a suitable solvent. Check the strainer mesh for signs of clogging or splitting, renewing the pick-up pipe/strainer assembly if it is damaged in any way.

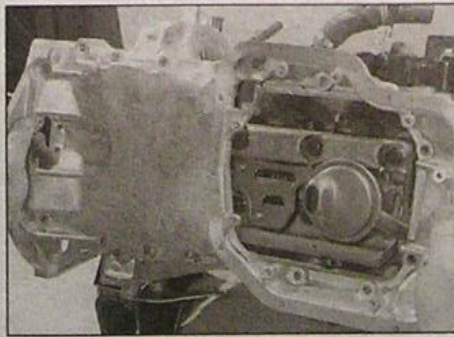
17 Check the centre member mounting rubbers for signs of damage and deterioration, and renew if necessary.

Refitting

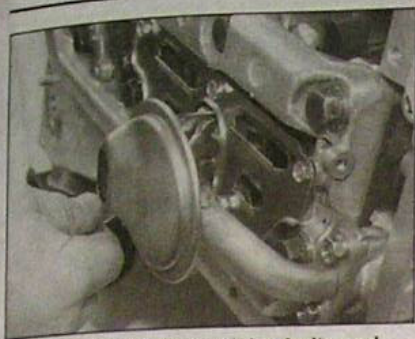
18 Clean all traces of sealant from the mating surfaces of the cylinder block/crankcase and sumps, then use a clean rag to wipe out the sump and the engine's interior.



12.14 Unscrew the bolts from the sump flange holes (1) and screw them into the sump locations (2) ...



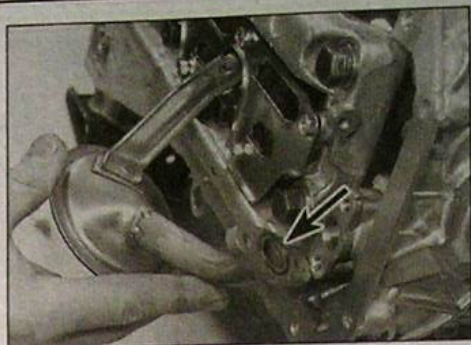
12.15 ... to release the aluminium sump from the base of the cylinder block



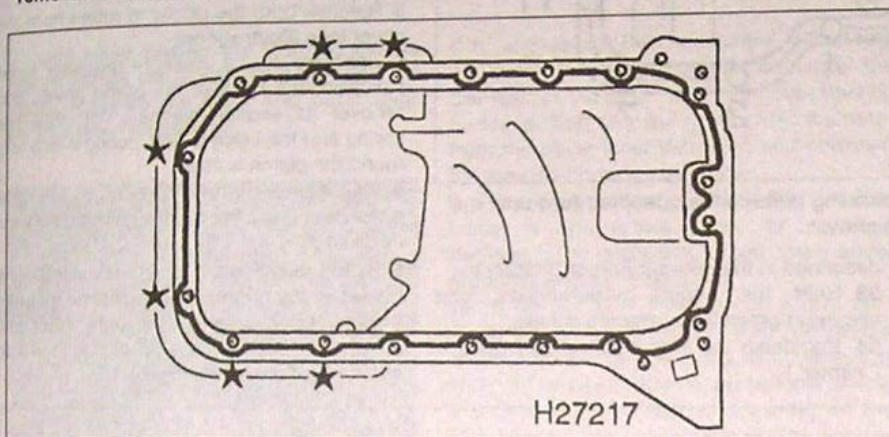
12.16a Undo the retaining bolts and remove the oil pump pick-up/strainer ...



12.16b ... and baffle plate from the engine



12.19 On refitting, fit a new O-ring (arrowed) to the oil pump pick-up/strainer



12.20 Apply a bead of sealant to the mating surface of the aluminium sump as shown. Note that the bead should go around the outside of all bolt holes marked with a star, and around the inside of all others

19 Fit a new O-ring to the recess in the top of the pick-up/strainer, and fit the strainer to the base of the timing cover (see illustration). Securely tighten the strainer bolts. Refit the baffle plate to the main bearing ladder casting and securely tighten its retaining bolts

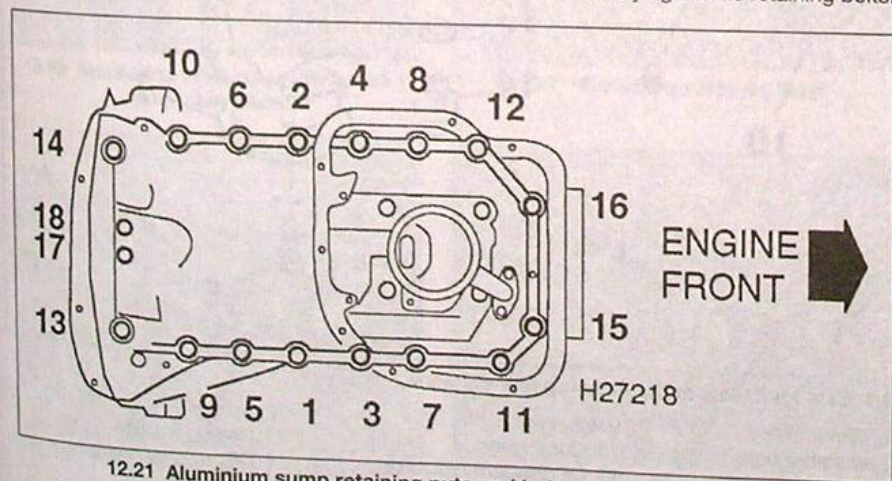
20 Ensure that the sump and cylinder block/crankcase mating surfaces are clean and dry. Apply a continuous bead of suitable sealant to the mating surface of the aluminium sump as shown (see illustration).

21 Offer up the sump, and locate it on the

cylinder block. Refit the sump retaining nuts and bolts, tightening them by hand only. Working in the sequence shown (see illustration), tighten all the nuts and bolts to their specified torque settings.

22 Refit the two bolts securing the sump flange to the transmission housing, and tighten them securely. Where necessary, reconnect the selector cable to the automatic transmission as described in Chapter 7B.

23 Fit the small cover plate to the sump flange, and securely tighten its retaining bolts.



12.21 Aluminium sump retaining nuts and bolts tightening sequence



12.30 Apply a bead of sealant to the pressed-steel sump flange ...

24 On models with air conditioning, refit the compressor mounting bolts and tighten them securely.

25 Ensure that all the mounting rubbers are in position, and refit the stopper ring to the rear engine/transmission mounting bracket. Manoeuvre the centre member into position, aligning it with the engine mountings, and refit its mounting bolts and washers. Tighten the centre member mounting bolts to the specified torque.

26 On models with manual transmission, refit the through-bolt and nut to the front engine/transmission mounting. Position the engine/transmission so that the front mounting through-bolt is correctly aligned with the mark made prior to removal, then tighten the bolt to the specified torque setting.

27 Refit the through-bolt to the rear engine/transmission mounting, and tighten its nut to the specified torque setting.

28 Remove the jack from underneath the transmission.

29 Refit the baffle plate to the base of the aluminium sump, and securely tighten its retaining bolts.

30 Ensure that the sump mating surfaces are clean and dry. Apply a continuous bead of suitable sealant to the mating surface of the small pressed-steel sump (see illustration). Apply the sealant to the groove in the centre of the mating surface between the holes, and around the inner edge of each bolt hole (see illustration 12.12 in Part A).

13 Oil pump - removal, inspection and refitting

Removal

1 The oil pump is an integral part of the timing chain cover (see illustration). Remove the cover as described in Section 6.

Inspection

2 Unscrew the retaining screws and bolt, and remove the pump cover from the rear of the timing chain cover (see illustration).

3 Remove both the oil pump rotors from the cover (see illustrations).

4 Unscrew the oil pressure regulator valve cap from the base of the pump cover, and recover its sealing washer. Withdraw the spring and the valve piston, noting which way round the piston is fitted.

5 Inspect the pump rotors, regulator valve piston and the cover for obvious signs of wear or damage.

6 Fit the rotors to the cover and, using feeler blades of the appropriate thickness, measure the clearance between the outer rotor and cover, and between the tip of the inner and outer rotor (see illustrations).

ENGINE
FRONT

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12.31 ... then fit the sump and tighten its retaining bolts to the specified torque in the sequence shown

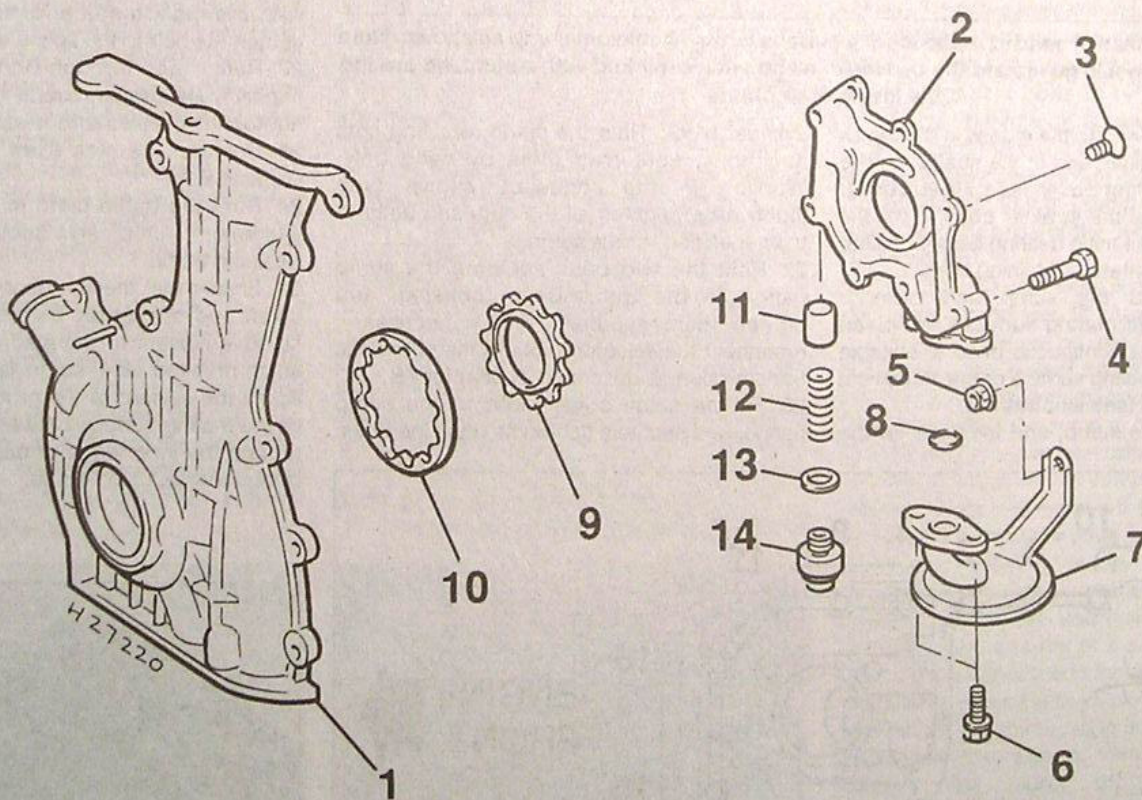
31 Offer up the sump and refit its retaining bolts, tightening them by hand only. Working in the sequence shown (see illustration), tighten the bolts to the specified torque.

32 Refit the exhaust system front pipe as

described in the relevant Part of Chapter 4.

33 Refit the engine undershields, and securely tighten their retaining screws.

34 Replenish the engine oil as described in Chapter 1.



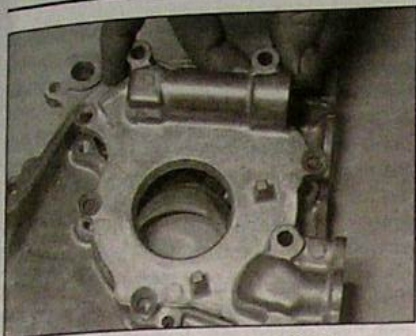
13.1 Exploded view of the oil pump components

- 1 Timing chain cover
- 2 Oil pump cover
- 3 Oil pump cover screw
- 4 Oil pump cover bolts

- 5 Pick-up/strainer nut
- 6 Pick-up/strainer bolts
- 7 Pick-up/strainer
- 8 O-ring

- 9 Inner rotor
- 10 Outer rotor
- 11 Oil pressure regulator valve piston

- 12 Spring
- 13 Sealing washer
- 14 Oil pressure regulator valve cap

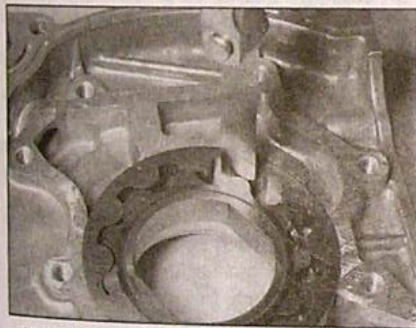


13.2 Remove the pump cover ...

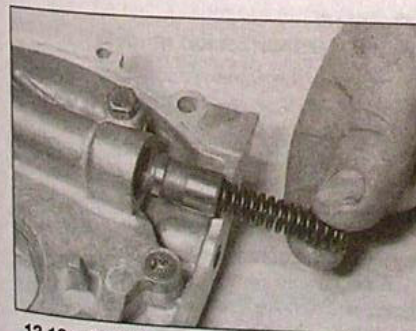
7 Using feeler blades and a straight-edge placed across the top of the cover and the rotors, measure the inner and outer gear endfloat (see illustration).



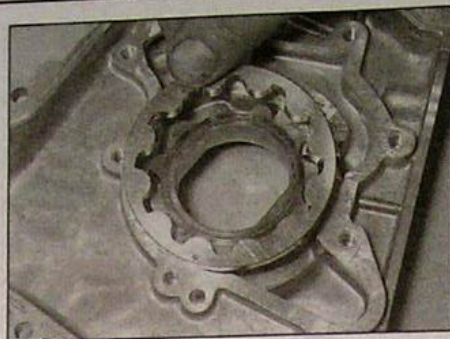
13.6a Measuring outer rotor-to-body clearance



13.6b Measuring inner rotor tip-to-outer rotor clearance



13.13a Refit the pressure regulator valve piston and spring ...

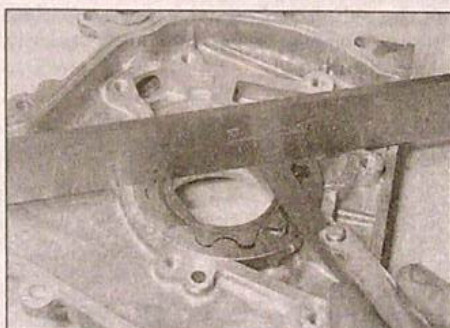


13.3a ... and withdraw the outer ...

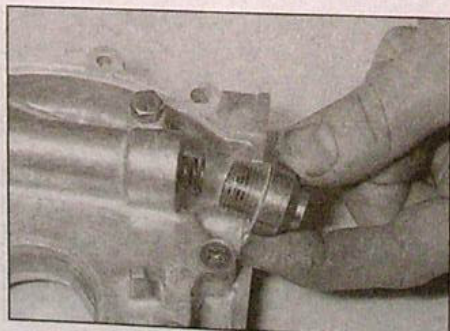
8 If access to the necessary measuring equipment can be gained, measure the diameter of the inner rotor and cover bearing surfaces. Subtract the rotor outer diameter from the cover inner diameter, and calculate the rotor-to-housing clearance.

9 If any measurement is outside the specified limits, or the rotors, valve or cover is damaged, the complete timing chain cover assembly should be renewed.

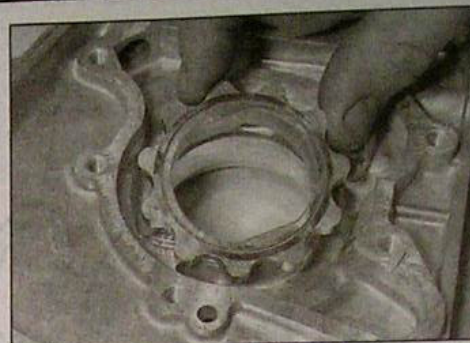
10 If the pump is found to be worn, also check the oil pressure relief valve. The valve is located in the oil filter housing, which is mounted onto the rear of the cylinder block. Unscrew the valve bolt from the top of the filter housing, and recover the sealing washer, spring and ball. Examine all components for signs of wear or damage, and renew as necessary. On refitting, fit the ball and spring to the housing. Fit a new sealing washer to the



13.7 Measuring rotor endfloat



13.13b ... then fit the valve bolt and sealing washer ...



13.3b ... and inner rotors from the timing chain cover

valve bolt, then refit the bolt, tightening it to the specified torque setting.

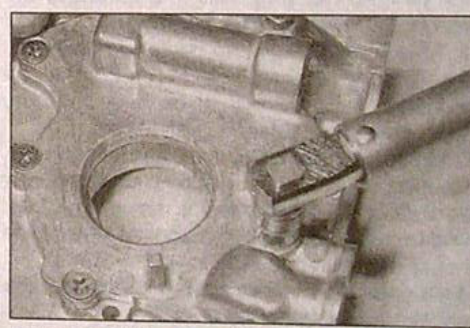
11 Lubricate the rotors with clean engine oil, and refit them to the pump body. Ensure that the inner rotor is fitted with its flange towards the cover.

12 Ensure that the mating surfaces are clean and dry, and refit the pump cover. Fit the cover retaining bolt and screws, and tighten them to the specified torque settings (see illustration).

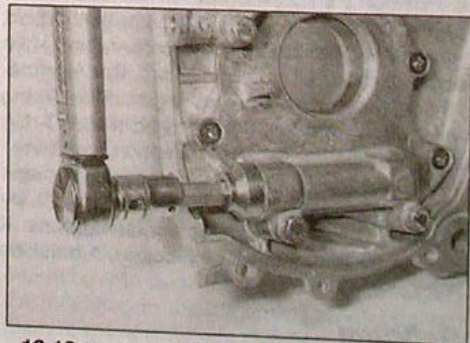
13 Fit the pressure regulator valve piston, ensuring that it is the correct way round, and install the spring. Fit a new sealing washer to the valve bolt, and tighten the bolt to the specified torque setting (see illustrations).

Refitting

14 Refit the timing chain cover as described in Section 6.



13.12 Refit the pump cover, and tighten its bolts and screws to their specified torque settings



13.13c ... and tighten it to the specified torque setting

21 Remove the jack from underneath the engine, and refit the battery and tray as described in Chapter 5A.

Front mounting - Phase I and Phase II Saloon and Hatchback manual transmission models

22 If not already done, apply the handbrake, then jack up the front of the car and support it on axle stands (see *Jacking and vehicle support*). Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual) then undo the retaining screws and remove the undershields from beneath the engine/transmission.

23 Using a suitable marker pen, mark the outline of the front engine/transmission through-bolt on the mounting bracket, to use as a guide on refitting.

24 Place a jack beneath the engine, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the engine.

25 Slacken and remove the nut and through-bolt from mounting.

26 Undo the retaining bolts, and remove the mounting bracket from the front of the engine.

27 Check carefully for signs of wear or damage on all components, and renew them where necessary. If renewal of the mounting rubber is necessary, press the original out from the centre member, and install the new rubber; coat the rubber with soapy water (or washing-up liquid) to ease installation.

28 On refitting, fit the mounting bracket to the engine, and tighten its retaining bolts to the specified torque.

29 Refit the through-bolt to the mounting, and lightly tighten its nut. Position the engine/transmission so that the front mounting through-bolt is correctly aligned with the mark made prior to removal, then tighten it to the specified torque setting.

30 Remove the jack from underneath the transmission.

31 Refit the undershield, tighten its fasteners securely, then lower the vehicle to the ground and reconnect the battery.

Front mounting - Phase I and Phase II Estate manual transmission models and all Phase III models

32 Carry out the operations described above in paragraphs 22 to 25.

33 Undo the two retaining bolts, and remove the mounting assembly from the centre member.

34 If necessary, undo the retaining bolts and remove the mounting bracket from the front of the engine.

35 Check carefully for signs of wear or damage on all components, and renew them as necessary.

36 On refitting, where removed, fit the mounting bracket to the engine, and tighten its retaining bolts to the specified torque.

37 Fit the mounting to the centre member, and tighten its retaining bolts to the specified torque.

38 Fit the through-bolt to the mounting, and lightly tighten its nut.

39 Position the engine/transmission so that the front mounting through-bolt is correctly aligned with the mark made prior to removal,

then tighten the through-bolt to the specified torque setting.

40 Remove the jack from underneath the transmission.

41 Refit the undershield, tighten its fasteners securely, then lower the vehicle to the ground and reconnect the battery.

Rear mounting

42 If not already done, apply the handbrake, then jack up the front of the car and support it on axle stands (see *Jacking and vehicle support*). Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).

43 Slacken and remove the through-bolt from the rear engine/transmission mounting.

44 Undo the bolts securing the mounting bracket in position, and manoeuvre it away from the engine/transmission. Recover the stopper ring which is fitted between the mounting bracket and mounting.

45 Undo the two retaining bolts, and remove the mounting assembly from the centre member.

46 Check carefully for signs of wear or damage on all components, and renew them where necessary.

47 On reassembly, fit the rear mounting to the centre member, and tighten its retaining bolts to the specified torque.

48 Refit the stopper ring, then install the mounting bracket and tighten its retaining bolts to the specified torque.

49 Align the rear mounting with its bracket, then insert the through-bolt and tighten its nut to the specified torque setting.

50 Lower the vehicle to the ground and reconnect the battery.

is fitted (see illustration). If the cover plate dowels are a loose fit in the block, remove them and store them with the plate for safe-keeping.

Driveplate - automatic transmission models

5 Remove the transmission as described in Chapter 7B.

6 Lock the driveplate as described in paragraph 2.

7 Slacken and remove the driveplate retaining bolts along with the driveplate retaining plate. Remove the driveplate, and recover the collar which is fitted between the driveplate and crankshaft.

8 If necessary, remove the cover plate from the cylinder block, noting which way round it is fitted. If the cover plate dowels are a loose fit in the block, remove them and store them with the plate for safe-keeping.

Inspection

9 On manual transmission models, examine the flywheel for scoring of the clutch face, and for wear or chipping of the ring gear teeth. If the flywheel's clutch mating surface is deeply scored, cracked or otherwise damaged, the flywheel must be renewed. However, it may be possible to have it surface-ground; seek the advice of a Nissan dealer or engine reconditioning specialist. If the ring gear is badly worn or has missing teeth, it must be renewed. This job is best left to a Nissan dealer or engine reconditioning specialist. The temperature to which the new ring gear must be heated for installation is critical and, if not done accurately, the hardness of the teeth will be destroyed.

10 On automatic transmission models, check the torque converter driveplate carefully for signs of distortion, and for any hairline cracks around the bolt holes or radiating outwards from the centre. Inspect the ring gear teeth for signs of wear or chipping. If any sign of wear or damage is found, the driveplate must be renewed.

Refitting

Flywheel - manual transmission models

11 Install the locating dowels (where removed) and refit the cover plate to the cylinder block.

12 Clean the mating surfaces of the flywheel and crankshaft.

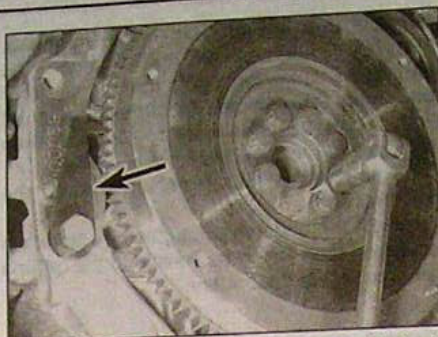
13 Offer up the flywheel, and refit the retaining bolts.

14 Lock the flywheel using the method employed on dismantling, and tighten the retaining bolts to the specified torque.

15 Refit the clutch as described in Chapter 6. Remove the locking tool, and refit the transmission as described in Chapter 7A.

Driveplate - automatic transmission models

16 Install the locating dowels (where removed) and refit the cover plate to the cylinder block.



16.3 Note the use of the home-made tool (arrowed) to prevent rotation as the flywheel bolts are slackened

17 Clean the mating surfaces of the driveplate and crankshaft.

18 Refit the collar to the rear of the driveplate, and position the assembly on the end of the crankshaft.

19 Install the retaining bolts and retaining plate.

20 Lock the driveplate using the method employed on dismantling, and tighten the retaining bolts to the specified torque.

21 Remove the locking tool, and refit the transmission as described in Chapter 7B.

17 Engine/transmission mountings - inspection and renewal

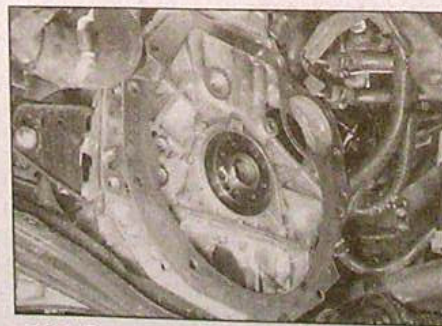
Inspection

1 If improved access is required, apply the handbrake, then jack up the front of the car and support it on axle stands (see *Jacking and vehicle support*).

2 Check the mounting rubber to see if it is cracked, hardened or separated from the metal at any point; renew the mounting if any such damage or deterioration is evident.

3 Check that all the mounting's fasteners are securely tightened; use a torque wrench to check if possible.

4 Using a large screwdriver or a crowbar, check for wear in the mounting by carefully levering against it to check for free play. Where this is not possible, enlist the aid of an assistant to move the engine/transmission back and



16.4 Removing the cover plate from the end of the cylinder block

forth, or from side to side, while you watch the mounting. While some free play is to be expected even from new components, excessive wear should be obvious. If excessive free play is found, check first that the fasteners are correctly secured, then renew any worn components as described below.

Renewal

Right-hand mounting

5 Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).

6 Place a jack beneath the engine, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the engine.

7 Unscrew the nut and through-bolt, then undo the retaining bolts and remove the right-hand mounting from the engine compartment. Recover the rubbers which are fitted to each side of the body mounting bracket.

8 If necessary, undo the retaining bolts and remove the mounting bracket from the engine.

9 Check carefully for signs of wear or damage on all components, and renew them where necessary.

10 On refitting, fit the mounting bracket (where removed) to the engine, and tighten its retaining bolts to the specified torque.

11 Fit the rubbers to the body mounting bracket, ensuring that their pins are correctly seated in the bracket holes. Fit the mounting to the top of the mounting bracket, and tighten its retaining bolts to the specified torque setting.

12 Insert the through-bolt, and tighten its nut to the specified torque setting. Remove the jack from underneath the engine.

13 Reconnect the battery negative terminal.

Left-hand mounting

14 Remove the battery and tray as described in Chapter 5A.

15 Place a jack and block of wood beneath the transmission, and raise the jack to take the weight of the transmission.

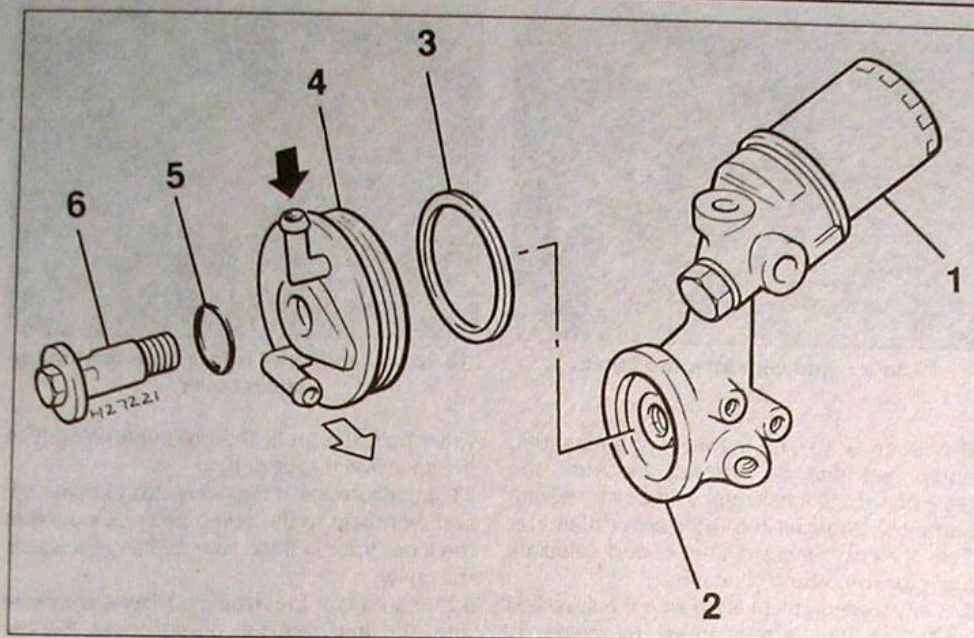
16 Slacken and remove the through-bolt, then undo the three bolts securing the mounting to the transmission and manoeuvre it out of position. Recover the rubbers from each side of the mounting bracket. If necessary, unbolt the mounting bracket from the engine compartment.

17 Check carefully for signs of wear or damage on all components, and renew them where necessary.

18 On refitting, fit the mounting bracket (where removed) and securely tighten its retaining bolts.

19 Refit the rubbers to the mounting bracket, ensuring that their pins are correctly seated in the bracket holes, and manoeuvre the mounting into position. Fit the bolts securing the mounting to the transmission, and tighten them to the specified torque setting.

20 Insert the through-bolt, and tighten its nut to the specified torque setting.



14.1 Oil cooler components (arrows indicate the flow of coolant through cooler)

1 Oil filter
2 Oil filter housing

3 Sealing ring
4 Oil cooler

5 O-ring
6 Centre bolt

14 Oil cooler - removal and refitting

Removal

1 The oil cooler (where fitted) is mounted onto the oil filter housing, which is bolted to the rear of the block (see illustration).

2 To gain access to the cooler, firmly apply the handbrake, then jack up the front of the vehicle and support it on axle stands. Disconnect the battery negative lead.

3 Drain the cooling system as described in Chapter 1. Alternatively, clamp the oil cooler coolant hoses directly above the cooler pipes, and be prepared for some coolant loss as the hoses are disconnected.

4 Release the hose clips, and disconnect the coolant hoses from the oil cooler.

5 Using a dab of paint or a suitable marker pen, make alignment marks between the cooler and oil filter housing.

6 Position a suitable container beneath the oil cooler, then unscrew the oil cooler centre bolt. Allow the oil to drain into the container, then remove the oil cooler from the engine. Recover the cooler sealing ring and the O-ring from the centre bolt. Discard both the O-ring and seal; new ones must be used on refitting.

7 Inspect the oil cooler for signs of damage, and check that it is free from obstructions by blowing down through its coolant unions. If the cooler is damaged or blocked, it must be renewed.

Refitting

8 Fit a new sealing ring to the rear of the cooler, and fit a new sealing ring to the centre bolt.

9 Refit the cooler to the oil filter housing, aligning the marks made prior to removal, and install the centre bolt. Tighten the centre bolt to the specified torque setting.

10 Reconnect the coolant hoses to the oil cooler, and secure them in position with their retaining clips.

11 Lower the vehicle to the ground, and refill/top-up the cooling system and engine oil as described in Chapter 1 (as applicable). Start the engine, and check the oil cooler for signs of leakage.

15 Crankshaft oil seals - renewal

Right-hand (timing chain cover) oil seal

1 Remove the crankshaft pulley as described in Section 5.



15.7 Removing the crankshaft left-hand oil seal

2 Carefully lever the oil seal out of position, using a large flat-bladed screwdriver, taking care not to damage the oil pump gears or timing cover.

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

4 Lubricate the lips of the new seal with a smear of grease and offer up the seal, ensuring that its sealing lip is facing inwards. Carefully ease the seal into position, taking care not to damage its sealing lip. Drive the seal into position until it seats on its locating shoulder, using a suitable tubular drift, such as a socket, which bears only on the hard outer edge of the seal. Take care not to damage the seal lips during fitting. Note that the seal lips should face inwards.

5 Wash off any traces of oil, then refit the crankshaft pulley as described in Section 5.

Left-hand (flywheel/driveplate) oil seal

6 Remove the flywheel/driveplate as described in Section 16.

7 Taking care not to mark either the crankshaft or any part of the cylinder block/crankcase, lever the seal evenly out of its housing using a large flat-bladed screwdriver (see illustration).

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

9 Lubricate the lips of the new seal and the crankshaft shoulder with grease, then offer up the seal to the cylinder block/crankcase.

10 Ease the sealing lip of the seal over the crankshaft shoulder by hand only, and press the seal evenly into its housing until its outer flange seats evenly on the housing lip. If necessary, a soft-faced mallet can be used to tap the seal gently into place.

11 Wash off any traces of oil, then refit the flywheel/driveplate as described in Section 16.

16 Flywheel/driveplate - removal, inspection and refitting

Removal

Flywheel - manual transmission models

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

2 Prevent the flywheel from turning by locking the ring gear teeth with a similar arrangement to that shown in illustration 16.3. Alternatively, bolt a strap between the flywheel and the cylinder block/crankcase.

3 Slacken and remove the flywheel retaining bolts, and remove the flywheel (see illustration). Do not drop it, as it is very heavy.

4 If necessary, remove the cover plate from the cylinder block, noting which way round it






Chapter 2 Part B:

2.0 litre 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

Engine (general)

Designation	SR
Engine code:	
Single-point injection models	SR20Di
Multi-point injection models:	
Phase I models	SR20DE
Phase II and Phase III low-specification models	SR20De
Phase II and Phase III high-specification models	SR20DE
Capacity	1998 cc
Bore	86.0 mm
Stroke	86.0 mm
Direction of crankshaft rotation	Clockwise (viewed from right-hand side of vehicle)
No 1 cylinder location	At timing chain end of block
Firing order	1-3-4-2
Compression ratio:	
Phase I and Phase II models	9.8 : 1
Phase III models	10.0 : 1
Cylinder compression pressures (approximate):	
Standard	12.5 bar
Minimum	10.5 bar
Maximum difference between cylinders (all models)	1.0 bar

Lubrication system

Oil pump type	Gear-type, driven off crankshaft right-hand end
Minimum oil pressure at normal operating temperature:	
At idle	Not less than 0.78 bar
At 3000 rpm:	
SR20Di and SR20De engines	4.0 bar
SR20DE engines	4.5 bar
Oil pump clearances:	
Outer rotor-to-cover clearance	0.11 to 0.20 mm
Inner rotor tip-to-outer gear clearance	Less than 0.18 mm
Outer gear endfloat	0.05 to 0.11 mm
Inner gear endfloat	0.05 to 0.09 mm
Inner gear flange-to-cover bearing surface clearance	0.045 to 0.091 mm