Chapter 2 Part B:
DOHC engine procedures

Contents

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 

Specifications

Note: *All specifications as for 2.0 litre SOHC engines, unless shown otherwise*

General

Type (all models)	Four-cylinder, in-line, water-cooled, transversely mounted. Double belt-driven overhead camshafts, acting on hydraulic valve lifters
Manufacturer's engine codes:	
20 XEJ	2.0 litre (1998 cc)
C20 XE	2.0 litre (1998 cc) + catalyst
X20 XEV	2.0 litre (1998 cc) + catalyst. 'Ecotec' type engine
Compression ratio:	
20 XEJ and C20 XE	10.5 : 1
X20 XEV	10.8 : 1
Maximum power:	
20 XEJ and C20 XE	110 kW (150 bhp) at 6000 rpm
X20 XEV	100 kW (136 bhp) at 5400 rpm
Maximum torque:	
20 XEJ	196 Nm at 4800 rpm
C20 XE	
Up to model year 1993	196 Nm at 4800 rpm
1993-on	196 Nm at 4600 rpm
X20 XEV	185 Nm at 4000 rpm

Cylinder Head

Overall height of cylinder head (sealing surface to sealing surface):	
20 XEJ and C20 XE	135.58 to 135.68 mm
X20 XEV	134.00 mm
Installation height of valve guide:	
20 XEJ and C20 XE	10.70 to 11.00 mm
X20 XEV	13.70 to 14.00 mm

Camshaft

Camshaft bearing journal diameter (all models)	27.939 to 27.960 mm
Camshaft bearing diameter in housing (all models)	28.000 to 28.021 mm
Cam lift:	
20 XEJ and C20 XE	9.5 mm
X20 XEV	10.0 mm
Maximum permissible radial run-out:	
20 XEJ and C20 XE	0.04 mm
X20 XEV	0.06 mm
Endfloat (all models)	0.040 to 0.144 mm

Valves and guides	Inlet	Exhaust
Overall length - production (mm):		
20 XEJ and C20 XE	105.0	105.0
X20 XEV	102.0	92.0
Overall length - service (mm):		
20 XEJ and C20 XE	104.6	104.6
X20 XEV	101.7	91.8
Head diameter (mm):		
20 XEJ and C20 XE	33.0 ± 0.1	29.0 ± 0.1
X20 XEV	32.0 ± 0.1	29.0 ± 0.1
Stem diameter (mm):		
20 XEJ and C20 XE		
Standard	6.955 to 6.970	6.945 to 6.960
0.075 mm oversize	7.030 to 7.045	7.020 to 7.035
0.150 mm oversize	7.105 to 7.120	7.095 to 7.110
0.250 mm oversize	7.205 to 7.220	7.195 to 7.210
X20 XEV		
Standard	5.955 to 5.970	5.945 to 5.960
0.075 mm oversize	6.030 to 6.045	6.020 to 6.035
0.150 mm oversize	6.105 to 6.120	6.095 to 6.110
Valve guide bore (mm):		
20 XEJ and C20 XE		
Standard	7.000 to 7.015	
0.075 mm oversize	7.075 to 7.090	
0.150 mm oversize	7.150 to 7.165	
0.250 mm oversize	7.400 to 7.415	
X20 XEV		
Standard	6.000 to 6.012	
0.075 mm oversize	6.075 to 6.090	
0.150 mm oversize	6.150 to 6.165	
Valve seat angle (all models)	44° 40’	

Lubrication system	
Lubricant capacity	See Chapter 1 Specifications
Oil pressure at idle (engine warm):	
20 XEJ and C20 XE	2.5 bar
X20 XEV	1.5 bar

Torque wrench settings	Nm	lbf ft
***Note**: Use new bolts (or nuts, if applicable), where asterisked (*).*		
Alternator to cylinder block bracket	35	26
Brake servo line to inlet manifold	20	15
Camshaft bearing cap to cylinder head (M6)	10	7
Camshaft bearing cap to cylinder head (M8)	20	15
Camshaft bearing cap to head (X20 XEV)	8	6
Camshaft pulley to camshaft (1993-on models):		
Stage 1	50	37
Stage 2	Angle tighten by 60°	
Stage 3	Angle tighten by 15°	
Coolant pipe to cylinder block	20	15
Cover to cylinder head (M6 bolts)	9	7
Cover to cylinder head (M8 nuts)	22	16
Cover to exhaust manifold (X20 XEV)	5	4
Crankshaft pulse pick-up	6	4
Exhaust manifold to cylinder head *	22	16
Exhaust pipe to adapter	12	9
Inlet manifold support to cylinder block	25	18
Intermediate shaft bracket to cylinder block	55	41
Knock sensor to cylinder block	20	14
Oil cooler lines to adapter/oil cooler	30	22
Oil filter to oil pump	15	11
Oil dipstick flange to cylinder block	25	18
Oil pump safety valve	30	22
Oil pump, threaded adapter	23	17
Power steering pump to support	25	18
Spark plug lead cover to cylinder head cover:		
20 XEJ and C20 XE	8	6
X 20 XEV	6	4

Torque wrench settings (continued)	Nm	lbf ft
Starter to cylinder block	45	33
Starter support to cylinder block	25	18
Temperature regulator plug (M20) *	30	22
Timing belt cover	8	6
Timing belt drive gear to crankshaft: *		
Stage 1	250	184
Stage 2	Angle tighten by between 40° and 50°	
Timing belt guide roller bracket to block	25	18
Timing belt guide roller to bracket	25	18
Timing belt guide roller to cylinder block:		
Engines up to 1993		
Stage 1	25	18
Stage 2	Angle tighten by 45°	
Stage 3	Angle tighten by 15°	
1993-on engines	25	18
Transfer box bracket to cylinder block	60	44
Transmission to cylinder block	60	44

1 General

This part of Chapter 2 describes procedures that are specific to the DOHC engine. It should be read in conjunction with Part A.

The lower engine is basically the same as the 2.0 litre SOHC. However the pistons are attached to the connecting rods by gudgeon pins, which are fully floating, and are secured by circlips.

Both camshafts on these engines are driven from the crankshaft by one toothed composite rubber belt. Each cylinder has four valves (two inlet and two exhaust), operated directly from the camshafts by hydraulic self-adjusting valve lifters. One camshaft operates the inlet valves, and the other operates the exhaust valves.

DOHC models are fitted with a remotely mounted oil cooler.

The distributor is driven directly from the exhaust camshaft.

2 Engine - removal and refitting

Removal

1 Carry out procedure in Chapter 2A, noting the following differences.
2 With the car safely raised, remove the engine undershield.
3 The fuel hoses need to be disconnected from the fuel rail.
4 Disconnect coolant hoses from the cylinder block and cylinder head. Also disconnect the oil cooler pipe unions from the oil pump.
5 Unbolt the right-hand driveshaft centre bearing support bracket from the rear of the cylinder block.

Refitting

6 Refitting the engine is similar to the procedure in Chapter 2A. The exceptions being, replacement of the right-hand driveshaft centre bearing support bracket at the rear of the cylinder block and retightening the securing bolts.
7 Replace the undershield.

3 Engine/transmission mountings - renewal

The procedure for replacing the engine/transmission is similar to SOHC models, see Chapter 2A. However this engine is fitted with an undershield that needs to be removed before replacing the mounts. Do not forget to replace the undershield before lowering the car.

4 Timing belt, sprockets and belt tensioner and idler pulleys - removal, refitting and adjustment

Note: *The timing belt should be renewed on refitting. A two-legged puller may be required to remove the crankshaft sprocket*

Removal

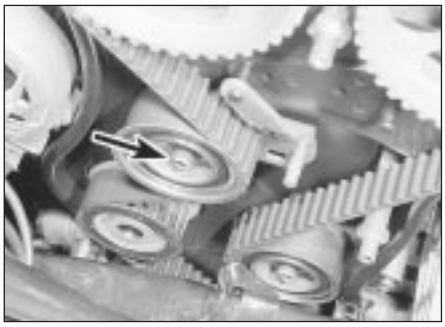
1 Disconnect the battery negative lead.
2 Disconnect the air cleaner trunking from the airflow meter, then remove the cover and the air cleaner element from the air cleaner. If desired, for improved access, the complete air cleaner assembly can be removed, as described in Chapter 4B.
3 Remove the power steering pump drivebelt, as described in Chapter 10.
4 Remove the alternator drivebelt, as described in Chapter 5.
5 Remove the three securing screws, and withdraw the outer timing belt cover. Recover the rubber grommets from the screw holes in the cover if they are loose.
6 Turn the crankshaft using a Torx socket on the crankshaft sprocket bolt, until the timing marks on the camshaft sprockets are aligned with the notches in the camshaft cover. The notch in the crankshaft pulley should also be aligned with the pointer on the rear timing belt cover **(see illustrations)**.
7 Extract the six securing bolts using a splined bit, and withdraw the crankshaft pulley **(see illustration)**. If necessary, counterhold the crankshaft using a socket on the crankshaft sprocket bolt. If the engine is in the vehicle, the crankshaft can be prevented from turning by having an assistant engage first gear and depress the brake pedal. Alternatively, the flywheel ring gear teeth can be jammed using a large screwdriver or similar tool. Before removing the pulley, check that the timing marks are still aligned.

4.6A Camshaft sprocket TDC mark aligned with notch in camshaft cover

4.6B . . .and notch in crankshaft pulley aligned with pointer on rear timing belt cover (circled)

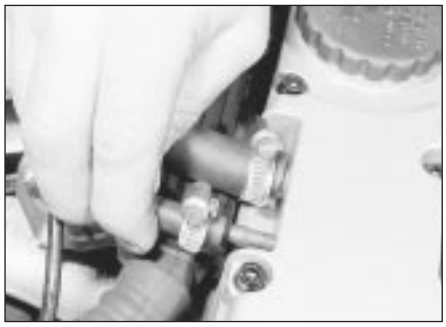
4.7 Crankshaft pulley and securing bolts viewed through right-hand wheel arch

8 Loosen the securing bolt and release the timing belt tensioner pulley, then slide the belt from the sprockets and pulleys **(see illustration)**.
9 If desired, the sprockets, tensioner and idler pulleys, and the rear timing belt cover can be removed as follows, otherwise go on to paragraph 27.
10 To remove the camshaft sprockets, first disconnect the breather hoses from the camshaft cover **(see illustration)**.
11 Extract the two securing bolts and remove the spark plug cover **(see illustration)**, then disconnect the HT leads from the spark plugs, and unclip them from the end of the camshaft cover. If necessary, mark the HT leads for position, to avoid confusion when refitting.
12 Unscrew the twenty securing bolts and withdraw the camshaft cover **(see illustration)**.



4.8 Timing belt tensioner pulley securing bolt (arrowed)

13 Recover the one-piece rubber gasket **(see illustration)**.
14 Prevent the relevant camshaft from turning by holding it with a spanner on the flats provided in front of No 1 cam lobe, and unscrew the camshaft sprocket bolt **(see illustration)**.
15 Withdraw the sprocket from the end of the camshaft, then repeat the procedure for the remaining camshaft sprocket.
16 Remove the crankshaft sprocket. It will be necessary to prevent the crankshaft from turning by bolting a metal bar to the sprocket using two of the crankshaft pulley bolts, or by jamming the flywheel ring gear teeth. A Torx socket will be required to unscrew the sprocket bolt - take care, as the bolt is very tight. If necessary, use a two-legged puller to remove the sprocket. Recover the thrustwashers from the end of the crankshaft, and from under the bolt head.



4.10 Disconnecting a breather hose from the rear of the camshaft cover

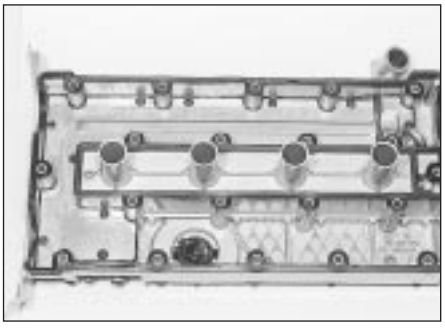
17 To remove the belt tensioner pulley, simply unscrew the securing bolt from the centre of the pulley, then withdraw the pulley complete with mounting plate **(see illustration)**. Recover the spacer sleeve from the pulley bolt.
18 To remove the belt idler pulley, unscrew the securing bolt from the centre of the pulley, then withdraw the pulley and recover the spacer sleeve from the pulley bolt.
19 The rear timing belt cover can now be removed after unscrewing the upper and middle studs for the timing belt outer cover screws. Note that the upper stud simply unscrews from the cylinder head, but the middle stud is secured by a bolt. Unscrew the two upper and single lower right-hand rear belt cover securing bolts, and withdraw the rear belt cover **(see illustrations)**.

Refitting

20 Refit the rear timing belt cover using a reversal of the removal procedure.
21 Refit the belt idler and tensioner pulleys, noting that the spacer sleeves should be fitted with their smaller diameters against the pulleys **(see illustration)**. Do not fully tighten the tensioner pulley bolt at this stage.
22 Refit the thrustwasher to the end of the crankshaft, then refit the crankshaft sprocket.

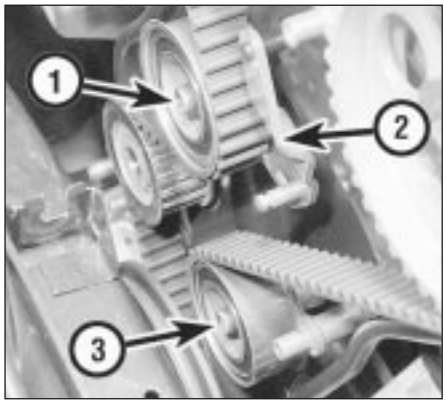
4.11 Removing the spark plug cover

4.12 Unscrewing a camshaft cover securing bolt

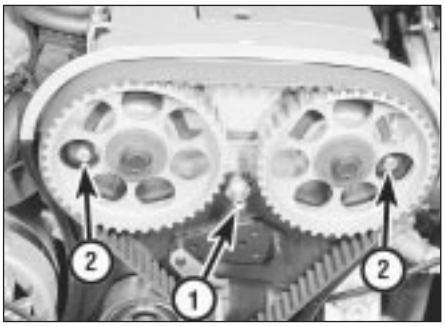


4.13 Camshaft cover removed to show one-piece rubber gasket

4.14 Spanner positioned to counterhold exhaust camshaft

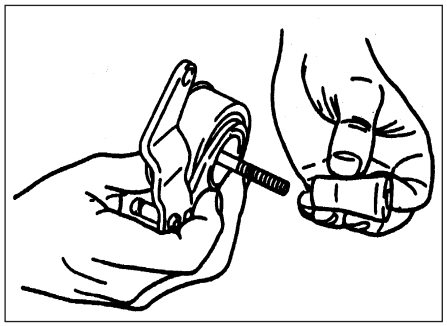


4.17 Timing belt pulley components
1 Tensioner pulley securing bolt
2 Tensioner pulley mounting plate
3 Idler pulley securing bolt



4.19A Timing belt outer cover screw upper stud (1) and rear belt cover upper securing bolts (2)

4.19B Rear timing belt cover lower right-hand securing bolt



4.21 Belt tensioner pulley and spacer sleeve. Note that smaller diameter of spacer sleeve fits against pulley

Apply a little grease to the threads of the securing bolt, and tighten it to the specified torque in the two stages given in the Specifications. Ensure that the thrustwasher is in place under the bolt head, and prevent the crankshaft from turning as during removal.

23 Refit the camshaft sprockets. Ensure that the locating pins on the ends of the camshafts engage with the holes in the sprockets and with the sprocket timing marks facing forwards. Then tighten the securing bolts to the specified torque in the two stages given in the Specifications. Prevent the camshafts from turning as during removal.

24 Check the condition of the camshaft cover rubber gasket and renew if necessary, then refit the camshaft cover and tighten the securing bolts **(see illustration)**.

25 Refit the HT leads to the spark plugs (ensuring that they are refitted to their correct cylinders), then clip the leads to the end of the camshaft cover. Refit the spark plug cover and tighten the securing bolts.

26 Reconnect the breather hose to the camshaft cover.

27 Temporarily refit the crankshaft pulley, and ensure that the crankshaft pulley and camshaft sprocket timing marks are still aligned as described in paragraph 6. Then fit a new timing belt around the sprockets and pulleys, starting at the crankshaft sprocket.

28 Refit the crankshaft pulley, and tighten the securing bolts to the specified torque. If necessary, prevent the crankshaft from turning as during removal.

4.24 Tightening a camshaft cover securing bolt

29 Adjust the timing belt tension, as described from paragraph 35 onwards.

30 Refit the outer timing belt cover, ensuring that the rubber grommets are in place in the screw holes, and tighten the securing screws.

31 Refit the alternator drivebelt and adjust the drivebelt tension, as described in Chapter 5.

32 Refit the power steering pump drivebelt and adjust the drivebelt tension, as described in Chapter 10.

33 Refit the air cleaner components as applicable, referring to Chapter 4B, if necessary.

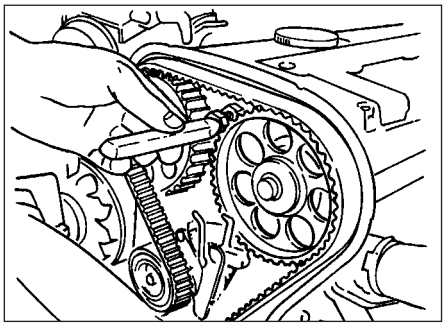
34 Reconnect the battery negative lead.

Adjustment

Note: *The manufacturers specify the use of special adjustment wrench Vauxhall tool No KM-666 for adjusting the timing belt tension. If access to this tool cannot be obtained an approximate adjustment can be achieved using the method described in this Section. However it is emphasised that the vehicle should be taken to a dealer at the earliest possible opportunity to have the tension adjusted using the special tool. Do not drive the vehicle over any long distance until the belt tension has been adjusted by a dealer*

Approximate adjustment

35 No checking of timing belt adjustment is specified, and the following adjustment procedure applies to a newly fitted belt. The adjustment must be carried out with the engine cold.



4.44 Working anti-clockwise from the TDC mark on the exhaust camshaft sprocket, mark the seventh tooth on the sprocket

36 With the timing belt cover removed and the tensioner pulley bolt slackened, ensure that the TDC marks on the camshaft sprockets and the crankshaft pulley are aligned as described in paragraph 6. If necessary, turn the crankshaft to achieve alignment.

37 Have an assistant press the tensioner pulley against the belt until the belt can just be twisted through 45°, using moderate pressure with the thumb and forefinger, on the longest belt run between the exhaust camshaft sprocket and the belt idler pulley.

38 Have the assistant hold the tensioner pulley in position, and tighten the tensioner pulley bolt to the specified torque in the two stages given in the Specifications.

39 Turn the crankshaft clockwise through two complete revolutions, and check that, with the crankshaft pulley TDC mark aligned with the pointer on the rear timing belt cover, the TDC marks on the camshaft sprockets are still aligned with the notches in the camshaft cover.

40 Proceed as described in paragraphs 30 to 34, inclusive.

41 Have the belt tension adjusted by a Vauxhall dealer using the manufacturer's special tool at the earliest opportunity.

Adjustment using Vauxhall special tool (KM-666)

42 Proceed as described in paragraphs 35 and 36.

43 Fit the special tool KM-666 to the belt tensioner pulley mounting plate, in accordance with the tool manufacturer's instructions.

44 Working anti-clockwise from the TDC mark on the exhaust camshaft sprocket, mark the seventh tooth on the sprocket **(see illustration).**

45 Turn the crankshaft clockwise until this tooth is aligned with the TDC notch in the camshaft cover. The crankshaft must be turned evenly and without jerking, to prevent the timing belt from jumping off the sprockets and pulleys.

46 Tighten the tensioner pulley bolt to the specified torque in the two stages given in the Specifications.

47 Remove the special tool.

48 Turn the crankshaft clockwise until the TDC marks on the camshaft sprockets are aligned with the notches in the camshaft cover, and check that the crankshaft pulley TDC mark is aligned with the pointer on the rear timing belt cover.
49 Proceed as described in paragraphs 30 to 34 inclusive.

5 Timing belt, with automatic adjuster - removal, refitting and adjustment

Removal

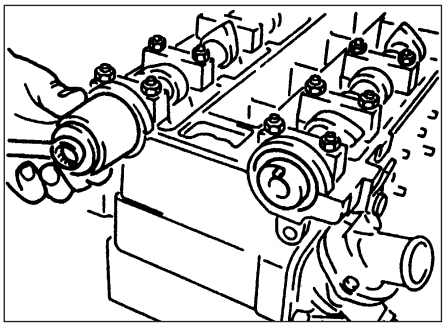
1 The operations are essentially the same as described in Section 4, except that the tensioner pulley incorporates an automatic adjuster that simplifies the procedure as follows.
2 To release the belt tension before removal, unscrew the timing belt tensioner pulley securing bolt slightly then, with a large screwdriver (or similar tool) inserted in the slot on the tensioner arm, turn the tensioner arm until the timing belt is slack. Tighten the securing bolt slightly to hold the tensioner in this position.

Refitting

3 To refit the timing belt, first ensure that the coolant pump is correctly positioned by checking that the lug on the coolant pump flange is aligned with the corresponding lug on the cylinder block. If this is not the case, slacken the coolant pump mounting bolts slightly and move the pump accordingly. Tighten the bolts to the specified torque on completion (see Chapter 3).
4 Refit the timing belt as described in Section 4, then tension it as follows.

Adjustment

5 Slacken the tensioner pulley securing bolt and move the tensioner arm anti-clockwise, until the tensioner pointer lies at its stop. Tighten the tensioner pulley securing bolt to hold the tensioner in this position.
6 Turn the crankshaft through two complete revolutions in the normal direction of rotation and check that with the crankshaft pulley TDC mark aligned with the pointer on the rear timing belt cover, the TDC marks on the camshaft sprockets are still aligned with the notches in the camshaft cover.
7 Slacken the tensioner pulley securing bolt once again and move the tensioner arm clockwise, until the tensioner pointer is aligned with the notch in the tensioner. In the first few hours of operation a new belt will be subjected to 'settling-in', (known as the running-in procedure). If you are refitting a used belt (one that has been 'run-in'), align the pointer to approximately 4 mm to the left of the notch, refer to Section 14 in Chapter 2A. Tighten the tensioner pulley securing bolt securely. Turn the crankshaft through one complete revolution in the normal direction of rotation and check that the crankshaft and camshaft timing marks still align, then refit the remainder of the components as described in Section 4.
8 With the timing belt adjustment set in this way, correct tension will always be maintained by the automatic tensioner and no further checking or adjustment will be necessary.



6.5 Using the camshaft sprocket bolt, washer, and a tube to fit a new camshaft front oil seal

6 Camshaft front oil seal - removal and refitting

Note: A *new timing belt should be used on refitting*

Removal

1 The camshaft front oil seals may be renewed with the engine in the vehicle without removing the camshafts as follows.
2 Remove the timing belt and the relevant camshaft sprocket(s), as described in Section 4.
3 Punch or drill a small hole in the centre of the now-exposed oil seal. Screw in a self-tapping screw, and pull on the screw with pliers to extract the seal.
4 Clean the oil seal seat with a wooden or plastic scraper.
5 Turn the camshaft until the locating peg for the camshaft sprocket is uppermost, then lubricate the lips of a new camshaft front oil seal with a little grease, and fit the oil seal, using a tube or socket of similar diameter with a washer and the camshaft sprocket bolt. Screw the camshaft sprocket bolt into the end of the camshaft to draw the oil seal into position on its shoulder **(see illustration)**.
6 Where applicable, repeat the procedure on the remaining camshaft oil seal.

Refitting

7 Refit the camshaft sprockets, the timing belt and tension the timing belt as described in Sections 4 and 5.

7 Camshafts - removal, inspection and refitting

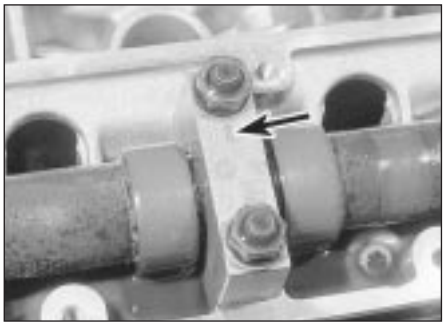
Note: A *new timing belt should be used on refitting*

Removal

1 Remove the timing belt and the relevant camshaft sprockets, as described in Section 4.
2 If the exhaust camshaft is to be removed, unscrew the two securing bolts and remove the distributor from the end of the cylinder head, referring to Chapter 5, if necessary.
3 Check the camshaft bearing caps for identification marks, and if none are present, make corresponding marks on the bearing caps and the top surface of the cylinder head using a centre punch. Note the orientation of the bearing caps before removal, as they must be refitted in exactly the same positions from which they are removed **(see illustration)**.
4 Loosen the relevant camshaft bearing cap nuts by half a turn, then loosen all the nuts by a further half turn and so on (this is necessary to slowly relieve the tension in the valve springs). Note that the exhaust camshaft rear bearing cap that also supports the distributor is secured by four nuts **(see illustration)**.
5 Remove the bearing cap nuts and the bearing caps, then carefully lift the relevant camshaft from the cylinder head without jerking.
6 Repeat the procedure for the remaining camshaft if desired.

Inspection

7 With the camshaft(s) removed, examine the bearing surfaces in the cylinder head and bearing caps for signs of obvious wear or



7.3 Camshaft bearing cap. Note position of identification mark (arrowed)

7.4 Exhaust camshaft rear bearing cap securing nuts (arrowed)

pitting. If evident, the cylinder head and all bearing caps must be renewed as a matched set, as there is no provision for refacing if the bearing caps cannot be renewed individually.
8 The camshaft(s) should show no marks or scoring on the journal or cam lobe surfaces. if evident, renew the camshaft(s).
9 It is advisable to renew the camshaft front oil seal(s) as a matter of course. Prise the old seal(s) from the front of the camshaft(s) and discard them.

Refitting

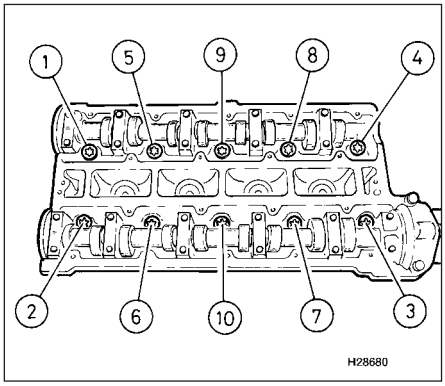
10 Begin refitting by liberally coating the contact faces of the hydraulic valve lifters and the camshaft(s) with molybdenum disulphide paste.
11 Coat the mating faces of the front and rear bearing caps with sealing compound and refit the bearing caps in their original positions as noted during removal.
12 Tighten the camshaft bearing cap nuts to the specified torque in half-turn stages, as when loosening the nuts. Note that when refitting the exhaust camshaft, the two smaller rear bearing cap securing nuts should be tightened after all the main camshaft bearing cap nuts have been tightened. Note also that the two smaller nuts should be tightened to a lower torque wrench setting than the main nuts.
13 Turn the camshaft until the locating peg for the camshaft sprocket is uppermost, then lubricate the lips of a rear camshaft front oil seal with a little grease, and fit the oil seal, using a tube or socket of similar diameter with a washer and the camshaft sprocket bolt. Screw the camshaft sprocket bolt into the end of the camshaft to draw the oil seal into position on its shoulder.
14 Repeat the procedure for the remaining camshaft.
15 Refit the distributor with reference to Chapter 5. Fit a new timing belt and the camshaft sprockets, then adjust the timing belt as described in Section 4 or 5, as applicable.

8 **Cylinder head** - removal and refitting (engine in vehicle)

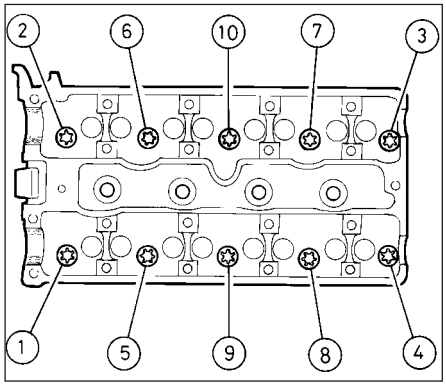
Note: *The engine must be cold when the cylinder head is removed.* **Do not** *remove the cylinder head from a hot engine. New cylinder head bolts, a new cylinder head gasket and a new timing belt must be used on refitting.*
The torque settings (as shown in Chapter 2A) are only applicable to latest specification head bolts, available from Vauxhall. Earlier type or alternative make, head bolts may require different torques. Consult your supplier

Removal

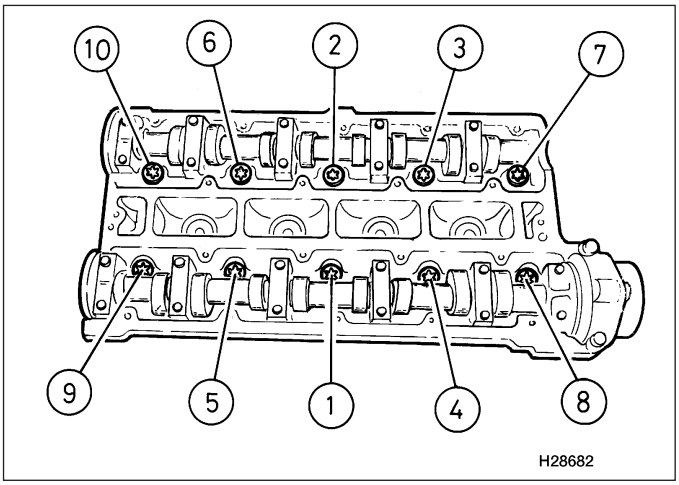
1 Disconnect the battery negative lead.
2 Drain the cooling system, as described in Chapter 3.
3 Remove the front section of the exhaust system, as described in Chapter 4C.
4 The cylinder head can be removed complete with the inlet manifold, or the inlet manifold can be detached from the cylinder head before removal, with reference to Chapter 4B. If no work is to be carried out on the inlet manifold, it can be unbolted from the cylinder head and supported to one side out of the way, thus avoiding the need to disconnect the relevant hoses, pipes and wiring.
5 If the cylinder head is to be removed complete with the inlet manifold, disconnect all relevant hoses, pipes and wiring from the inlet manifold and associated components, referring to Chapter 4B, and unbolt the manifold support bracket from the manifold. Loosen the alternator mountings with reference to Chapter 5, then unbolt the upper alternator mounting from the inlet manifold.
6 If the inlet manifold is to be left in the engine compartment, continue as follows, otherwise go on to paragraph 17.
7 Disconnect the wiring plug from the airflow meter, and the breather hose from the air box on the throttle body. Disconnect the air cleaner trunking and remove the airflow meter/air box assembly from the throttle body. Refer to Chapter 4B if necessary.
8 Disconnect the end of the throttle cable from the throttle valve lever, then unbolt the throttle cable support bracket and remove it from the inlet manifold.
9 Unscrew the two earth lead securing nuts from the fuel rail (one at each end of the rail) and disconnect the three earth leads.
10 Disconnect the wiring plug from the throttle position switch.
11 Pull up on the wiring harness housing, and disconnect the wiring plugs from the fuel injectors by compressing the retaining clips. Move the wiring harness housing to one side.
12 Disconnect the two breather hoses from the rear of the camshaft cover.
13 Loosen the alternator mountings, with reference to Chapter 5, then unbolt the upper alternator mounting from the inlet manifold.
14 Unbolt the manifold support bracket from the manifold.
15 Make a final check to ensure that all necessary hoses, pipes and wires have been disconnected, then unscrew the securing nuts and lift the inlet manifold from the cylinder head. Ensure that the manifold is properly supported, taking care not to strain any of the hoses, pipes and wires, etc., which are still connected.
16 Recover the manifold gasket from the cylinder head.
17 Remove the timing belt, camshaft sprockets, and timing belt tensioner and idler pulleys, as described in Section 4.
18 Unscrew the upper and middle studs for the timing belt outer cover screws. Note that the upper stud simply unscrews from the cylinder head, but the middle stud is secured by a bolt.
19 Unscrew the two upper rear timing belt cover securing bolts from the cylinder head.
20 Remove the distributor cap and HT leads with reference to Chapter 5.
21 Disconnect the distributor wiring plug.
22 Disconnect the coolant hose from the left-hand end of the cylinder head.
23 Unscrew the bolt securing the crankcase breather tube bracket to the end of the cylinder head.
24 Disconnect the radiator top hose from the thermostat housing, and disconnect the wiring plugs from the temperature gauge sender and the coolant temperature sensor (both situated in the thermostat housing).
25 Make a final check to ensure that all relevant hoses, pipes and wires have been disconnected.
26 On X20 XEV models, remove the camshaft, as described in Section 7.
27 Using a Torx socket, and working in the order shown **(see illustrations)**, loosen all the cylinder head bolts by a quarter of a turn, then loosen all the bolts by half a turn, and finally loosen and remove the bolts. Recover the washers. Note that the loosening sequence on X20 XEV differs to other DOHC engines.
28 Lift the cylinder head from the cylinder block. If necessary, tap the cylinder head gently with a soft-faced mallet to free it from the block, but do not lever at the mating faces. Note that the cylinder head is located on dowels.



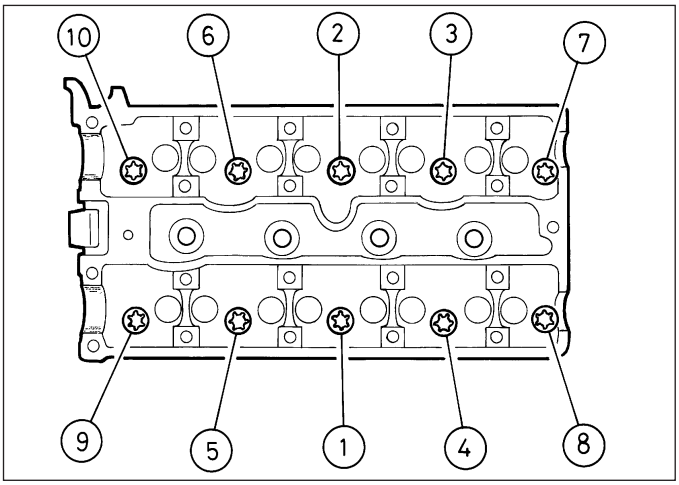
8.27A Cylinder head bolt loosening sequence - (20 XEJ and C 20 XE engines)



8.27B Cylinder head bolt loosening sequence - (X 20 XEV engines)



8.36A Cylinder head bolt tightening sequence - 20 XEJ and C 20 XE engines



8.36B Cylinder head bolt tightening sequence - X 20 XEV engines

29 Recover the cylinder head gasket and discard it.

30 Clean the cylinder head and block mating faces by careful scraping. Take care not to damage the cylinder head, which is made of light alloy and is easily scored. Cover the coolant passages and other openings with masking tape or rag, to prevent dirt and carbon falling in. Mop out all the oil from the bolt holes; if oil is left in the holes, hydraulic pressure could crack the block when the bolts are refitted.

31 If desired, the cylinder head can be dismantled and inspected as described in Section 10.

Refitting

32 Begin refitting by locating a new gasket on the block so that the word "OBEN" or "TOP" is uppermost at the timing belt end of the engine.

33 With the mating faces scrupulously clean, locate the cylinder head on the block so that the positioning dowels engage in their holes.

34 Temporarily refit the crankshaft pulley and the camshaft sprockets, and ensure that the timing marks are still positioned as they were before the timing belt was removed (see Section 4).

35 Fit the new cylinder head bolts, ensuring that the washers are in place under their heads, and screw the bolts in by hand as far as possible.

36 Tighten the bolts in the order shown **(see illustrations)**. Note that the tightening sequence on X20 XEV differs to other DOHC engines. Tighten the bolts in the four stages given in the Specification (see Chapter 2A, as 2.0 litre) - i.e. tighten all bolts to the Stage 1 torque, then tighten all bolts to Stage 2 and so on **(see illustrations)**.

37 Further refitting is a reversal of the removal procedure, remembering the following points.

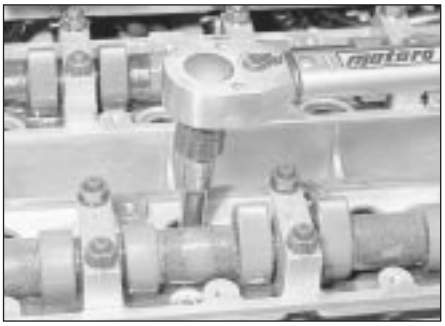
38 Refit the timing belt tensioner and idler pulleys, camshaft sprockets and a new timing belt as described in Section 4, and tension the timing belt as described in Sections 4 and 5.

39 Where applicable, refit the inlet manifold to the cylinder head with reference to Chapter 4B, using a new gasket.

40 Refit the front section of the exhaust system as described in Chapter 4C, using a new gasket.

41 Refit the upper alternator mounting to the inlet manifold (where applicable), then adjust the alternator drivebelt tension, as described in Chapter 5.

42 Refill the cooling system, (Chapter 3).



8.36C Tighten the cylinder head bolts to the specified torque . . .

8.36D . . .and then through the specified angle

43 On completion, check that all relevant hoses, pipes and wires, etc., have been reconnected.

44 When the engine is started, check for signs of leaks.

45 Once the engine has reached normal operating temperature, check and if necessary adjust the mixture (where applicable) with reference to Chapter 4B.

9 Cylinder head - removal and refitting (engine removed)

Note: *New cylinder head bolts, a new cylinder head gasket, and a new timing belt must be used on refitting.*

The torque settings (as shown in Chapter 2A) are only applicable to latest specification head bolts, available from Vauxhall. Earlier type or alternative make, head bolts may require different torques. Consult your supplier.

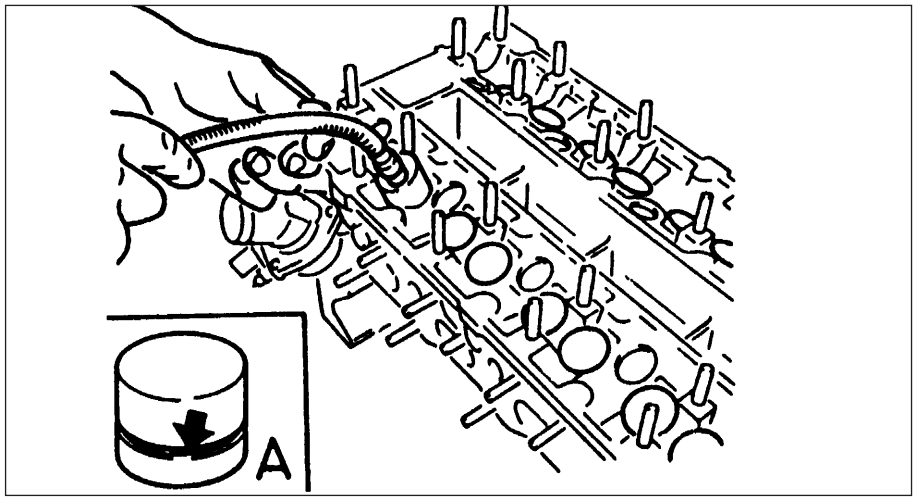
Warning: The exhaust valves fitted to 20 XEJ and C 20 XE models are fitted with sodium to improve their heat transfer. Sodium is a highly reactive metal, which will ignite or explode spontaneously on contact with water (including water vapour in the air). These must NOT be disposed of with ordinary scrap. Seek advice from a Vauxhall dealer or your Local Authority, if the valves are to be disposed.

Removal

1 The cylinder head can be removed complete with the inlet manifold, or the inlet manifold can be detached from the cylinder head before removal, with reference to Chapter 4B.

2 Proceed as described in Section 8, paragraphs 17 to 19 inclusive.

3 If not already done, remove the distributor cap and HT leads, referring to Chapter 5.



10.5 Remove the hydraulic valve lifters using a rubber plunger. Inset (A) shows valve lifter upright, with oil groove (arrowed) at bottom

4 Unscrew the bolt securing the crankcase breather tube bracket to the end of the cylinder head.
5 Make a final check to ensure that all relevant hoses, pipes and wires have been disconnected.
6 Continue as described in Section 8, paragraphs 26 to 31.

Refitting

7 Proceed as described in Section 8, paragraphs 32 to 38 inclusive but in addition note the following.
8 On completion, check that all relevant hoses, pipes and wires, etc., have been reconnected.

10 Cylinder head - dismantling and reassembly

Dismantling

1 With the cylinder head removed as described in Section 8, clean away all external dirt.
2 If not already done, remove the thermostat housing and thermostat as described in Chapter 3, and remove the manifolds as described in Chapters 4B and 4C.
3 Remove the spark plugs (if not already done), and remove the distributor with reference to Chapter 5.
4 Remove the camshafts as described in Section 7.
5 Remove the hydraulic valve lifters from their bores using a rubber suction plunger tool - do not invert the cylinder head to remove the valve lifters. Keep the valve lifters upright at all times (oil groove at bottom **(see illustration)**), and immerse them in order of removal in a container of clean engine oil until they are to be refitted.
6 To remove the valve components, continue as described in Chapter 2A, Section 22, paragraphs 3 to 7 inclusive.
7 The cylinder head and valves can be inspected for wear and damage as described in Chapter 2A, Section 23.

Reassembly

8 With all components cleaned, refit the valve components as described in Chapter 2A, Section 22, paragraphs 10 to 19 inclusive.
9 Refit the hydraulic valve lifters to the cylinder head in their original positions. Liberally oil the valve lifter bores, and if new lifters are being fitted, initially immerse each one in a container of clean engine oil and compress it (by hand) several times to charge it.
10 Refit the camshafts, as described in Section 7.
11 Refit the spark plugs if desired, and refit the distributor with reference to Chapter 5.
12 Where applicable, refit the manifolds and/or the thermostat and housing.
13 Refit the cylinder head, as described in Sections 8 and 9, as applicable.

11 Valve lifters - general

Although the valve lifters on these engines cannot be dismantled they should be carefully inspected for obvious signs of wear on the contact faces. Also check the valve lifter oil holes for obstructions and for any signs of oil sludge build-up. If excessive wear is evident (this is unlikely), all the valve lifters must be renewed as a set.

12 Crankshaft front oil seal - renewal

1 The procedure is similar to SOHC models (see Chapter 2A), noting the following points.
2 The spacer ring (if fitted), from the end of the crankshaft, must be removed, before refitting.
3 After fitting the new seal, coat the oil pump mating face of the spacer ring with sealing compound, then push the spacer ring onto the end of the crankshaft, until it is seated against the oil pump.
4 The timing belt should be renewed.
5 Refit the rear timing belt cover and the timing belt, as described in Section 4. Adjust it as described in Section 4 and 5.

13 Sump - removal and refitting

***Note**: Sump gaskets, cannot be reused. Ensure that new gaskets are obtained before removing the sump*

Removal

1 The procedure is similar to SOHC models (see Chapter 2A), with the following variations.
2 The engine undershield must be removed.
3 Remove both the cork gaskets and clean all sealing surfaces, scrupulously.

Refitting

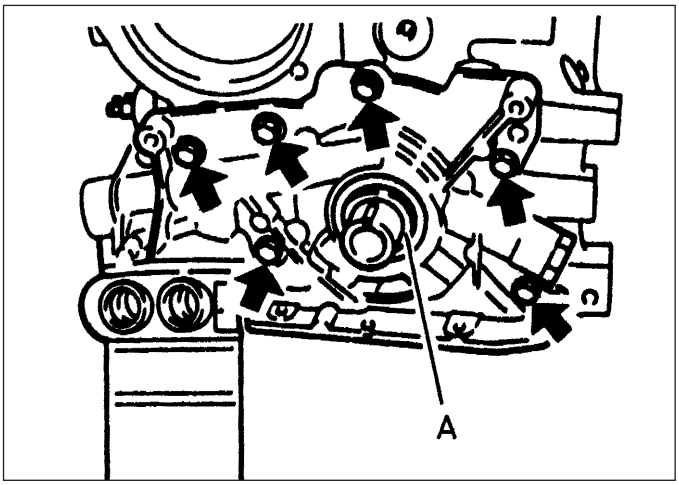
4 Locate a new gasket on the cylinder block, if necessary applying a little sealing compound to hold it in place.
5 Locate the remaining new gasket on the sump baffle, but do not use sealing compound.

14 Oil pump - removal and refitting

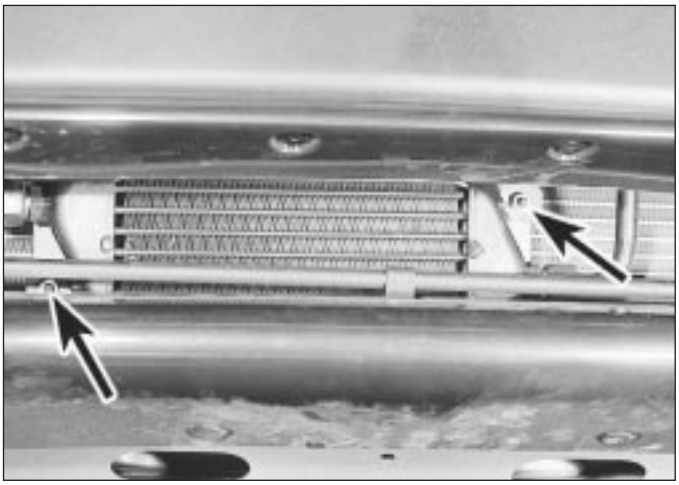
Removal

1 Apart from the following variations, the procedure is the same as for SOHC models.
2 If the engine is still in the vehicle, disconnect the oil cooler pipe unions from the oil pump, and move the pipes to one side out

14.2 Oil cooler pipe unions at oil pump



14.3 Oil pump securing bolts (arrowed) and crankshaft spacer ring (A)



15.1 Oil cooler viewed through front spoiler. Securing nuts arrowed

of the way **(see illustration)**.

3 Remove the spacer ring from the end of the crankshaft **(see illustration)**.

Refitting

4 Coat the oil pump mating face of the spacer ring with sealing compound, then push the spacer ring onto the end of the crankshaft until it is seated against the oil pump.

5 The timing belt should be renewed, see Sections 4 and 5, for details.

6 Remember also to reconnect the oil cooler pipes to the oil pump, and tighten the unions.

15 Oil cooler - removal and refitting

Removal

1 To gain sufficient access to remove the oil cooler, the radiator must be removed (as described in Chapter 3). Alternatively, the front bumper can be removed, as described in Chapter 11 **(see illustration)**.

2 With the appropriate component(s) removed for access, unscrew the oil cooler pipe unions from the oil cooler. Be prepared for oil spillage, and plug the open ends of the pipes, to prevent further oil leakage and dirt ingress.

3 Unscrew the two securing nuts, and withdraw the oil cooler from its mounting brackets.

Refitting

4 Refitting is a reversal of removal, but on completion, check and if necessary top-up the engine oil level, as described in Chapter 1.