

## CONTENTS

Operation	Operation No.	Page No.
Camshaft—Remove and refit: L.H. ....	12.13.02	12—4
R.H. ....	12.13.03	
Camshaft bearings—Remove and refit .....	12.13.13	12—5
Camshaft cover and seals—Remove and refit .....	12.29.42	12—6
Camshaft oil feed pipe—Remove and refit .....	12.60.83	12—7
Connecting rod bearings—Remove and refit .....	12.17.16	12—6
Crankshaft damper and pulley—Remove and refit .....	12.21.01	12—5
Crankshaft front oil seal—Remove and refit .....	12.21.14	12—5
Cylinder head—Overhaul .....	12.29.19	12—13
Cylinder head—Remove and refit .....	12.29.11	12—8
Cylinder head gasket—Remove and refit .....	12.29.02	12—9
Cylinder pressures—Check .....	12.25.01	12—3
Deglazing cylinder bores .....		12—21
Description .....		12—3
Drive plate—Remove and refit .....	12.53.13	12—12
Engine—Dismantle and reassemble .....	12.41.05	12—16
Engine and gearbox assembly—Remove and refit .....	12.37.01	12—10
Engine mounting—front set—Remove and refit .....	12.45.04	12—8
Engine mounting—rear spring—Remove and refit .....	12.45.26	12—8
Fault finding .....		12—4
Flywheel—Remove and refit .....	12.53.07	12—12
Main bearings—Remove and refit .....	12.21.39	12—5
Oil filter assembly—Remove and refit .....	12.60.01	12—7
Oil pick-up strainer—Remove and refit .....	12.60.20	12—10
Oil pressure relief valve—Remove and refit .....	12.60.56	12—7
Oil pressure switch—Remove and refit .....	12.60.50	12—7
Oil pump—Overhaul .....	12.60.32	12—15
Oil pump—Remove and refit .....	12.60.26	12—10
Oil sump—Remove and refit .....	12.60.44	12—9

## ENGINE—6 Cylinder

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Operation	Operation No.	Page No.
Piston and connecting rod—Overhaul .....	12.17.10	12—13
Piston and connecting rod—Remove and refit .....	12.17.01	12—13
Tappets—Adjust .....	12.29.48	12—6
Timing chain—Adjust .....	12.65.44	12—7
Timing chains—Remove and refit .....	12.65.14	12—11
Timing chain tensioner—Remove and refit .....	12.65.28	12—12
Timing cover—Remove and refit .....	12.65.01	12—11
Torque wrench settings .....	.....	12—3

## TORQUE WRENCH SETTINGS

## SECTION 12

**NOTE:** Set the torque wrench to the mean of the figures quoted unless otherwise specified.

Early cars prior to } Engine 8L137746 — (4.2); 8A14210 — (3.4)  
Later cars from }

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
ENGINE				
Cam cover (domed nuts) — early cars .....	$\frac{1}{2}$ in U.N.F. nut	6,7 to 8,1	0,69 to 0,83	5 to 6
— later cars .....	$\frac{1}{2}$ in U.N.F. nut	9,5 to 11	0,98 to 1,12	7 to 8
Camshaft bearing caps .....	$\frac{5}{8}$ in U.N.F. nut	12,2 max.	1,24 max.	9.0 max.
Connecting rod big-end .....	$\frac{3}{8}$ in U.N.F. bolt	48,4 to 50,8	4,93 to 5,18	35.7 to 37.5
Crankshaft front end .....	$\frac{3}{4}$ in U.N.F. bolt	170 to 203	17,29 to 20,73	125 to 150
Cylinder head nuts: check/reset .....	$\frac{7}{8}$ in U.N.F. nut	70,5 to 73,2	7,19 to 7,47	52 to 54
initial assembly .....	$\frac{7}{8}$ in U.N.F. nut	67,8 to 70,5	6,92 to 7,19	50 to 52
Distributor clamp bolt .....	$\frac{1}{2}$ in trapped nut	5,7 max.	0,58 max.	4.2 max.
Fan drive assembly securing bolt .....	$\frac{3}{8}$ in U.N.F. bolt	40,7 max.	4,15 max.	30 max.
Flywheel .....	$\frac{7}{8}$ in U.N.F. bolt	85,9 to 90,4	8,76 to 9,22	63.4 to 66.6
Gemi hose clips (up to No. 16) .....	4 mm thread	0,34 to 0,68	0,04 to 0,07	0.25 to 0.50
Main bearing caps .....	$\frac{1}{2}$ in U.N.F. bolt	93 to 97,6	9,46 to 9,96	68.4 to 72
Power assisted steering pump to mounting bracket .....	$\frac{3}{8}$ in U.N.C. nut	50,2 max.	5,12 max.	37.0 max.
Pulleys to crank damper .....	$\frac{5}{8}$ in U.N.F. bolt	16,3 to 20,3	1,66 to 2,07	12 to 15
Sealing cap, CO sampling adaptor .....	$\frac{7}{8}$ in U.N.F.	8,5 to 10,2	0,86 to 1,03	6.3 to 7.5
Torque converter .....	$\frac{3}{8}$ in U.N.F. bolt	47,5 max.	4,84 max.	35.0 max.
ENGINE MOUNTINGS				
Front mounting bracket to beam .....	$\frac{5}{8}$ in U.N.F. nut	19,0 to 24,4	1,94 to 2,48	14 to 18
Rear mounting bracket to body fixing .....	$\frac{5}{8}$ in U.N.F. nut	10,8 to 13,6	1,1 to 1,38	8 to 10
	$\frac{5}{8}$ in U.N.F. bolt	19,0 to 24,4	1,94 to 2,48	14 to 18
	$\frac{3}{4}$ in U.N.F. bolt	36,7 to 43,4	3,74 to 4,42	27 to 32
Rear mounting peg .....	$\frac{1}{2}$ in U.N.F. nut	33,9 to 40,7	3,46 to 4,14	25 to 30
Rear rubbers .....	$\frac{3}{8}$ in U.N.F. nut	36,7 to 43,4	3,74 to 4,42	27 to 32
Strengthening plate assembly to body .....	M8 setscrew	16,3 to 19,0	1,66 to 1,93	12 to 14
Tie-bolts .....	$\frac{1}{2}$ in U.N.F. nut	33,9 to 40,7	3,46 to 4,14	25 to 30

## DESCRIPTION

The 6-cylinder engine fitted to Series III Jaguar and Daimler cars is developed directly from the 3.4 litre unit introduced with the Jaguar XK 120 car in 1948; although superficially very similar, these two engines now have few parts in common and none of the accessories fitted to the current engines are interchangeable with those of the early units. The basic design of the engine has, however, remained unchanged, and the latest units retain chain-driven twin-overhead camshafts, seven main bearings and a stroke of 106 mm (4.173 in) which were incorporated in the first production engines.

Major changes have been made in recent years to the arrangements for fuel supply and the reduction of undesirable emissions, and a redesigned, electronically triggered ignition system is fitted to the 4.2L Series III cars; these items are dealt with fully in the appropriate sections of the manual, but the necessity for the removal of fuel injection and emission control equipment before certain operations can be carried out on the engine will be found to have affected certain of the repair operations in this section, when compared with the instructions for similar operations in earlier publications.

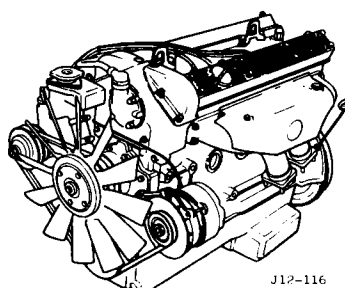


Fig. 1

## CYLINDER PRESSURES

## Check

12.25.01

Set the transmission selector at 'P'—automatic transmission cars only.

Run the engine until normal operating temperature is reached. Switch off the engine.

Remove the h.t. cable from the ignition coil.

Remove all sparking plugs.

Fit an approved pressure gauge (1, Fig. 2) at one plug hole and with the throttle held fully open, crank the engine with the starter motor. Note the highest steady pressure reading achieved and repeat at each plug hole in turn.

The reading taken at each cylinder must not differ from the reading taken at any other cylinder by more than 0,35 kgf/cm<sup>2</sup> (5 lbf/in<sup>2</sup>).

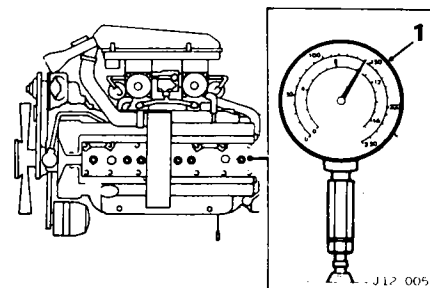


Fig. 2

## FAULT FINDING

The location and rectification of faults in the fuel system, emission control and ignition systems is detailed in the sections of the manual dealing with these components; the emission control section includes basic engine checks which are repeated below.

### BASIC ENGINE CHECKS

POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
Low battery condition	Check the battery condition with a hydrometer. Re-charge, clean and secure the terminals, or renew as necessary. (If the battery is serviceable but discharged, trace and rectify the cause of flat battery, e.g. short circuit or insufficient charge from the alternator.)
Start system deficient	If the starter fails to turn the engine briskly, check the engagement circuit and connections. Check and clean the main starter circuit and connections.
Poor compressions	Check compressions with a proprietary tester. If compressions are low or uneven, check/adjust valve clearances and re-test. If compressions are still unsatisfactory, remove the cylinder head for further examination and rectification. NEVER turn the crankshaft when the head is removed, or the valves and pistons will be damaged when the head is replaced.
Exhaust system leaking or blocked	Check and rectify as necessary.
Faults on areas of the vehicle other than the engine	Check for binding brakes, slipping clutch, etc.
Air leaks at the inlet manifold	Check the inlet manifold/cylinder head joint. Re-make with a new gasket if necessary. Check the manifold tappings for leaks; seal as necessary.
Cooling system blocked or leaking	Flush the system and check for blockage. Check the hoses and connections for security and leakage. Renew as necessary. Check the thermostat, and renew if faulty.
Cylinder head gasket leaking	Check the cylinder block/head joint for signs of leakage. Renew the gasket if necessary.

### CAMSHAFT

**Remove and refit—Left-hand**  
**Right-hand**

**12.13.02**  
**12.13.03**

Service tools: Top timing chain adjuster tool JD 2B; valve timing gauge C 3993

#### Removing

Remove the camshaft covers.  
Remove the nuts (1, Fig. 3) securing the breather housing to the front of the cylinder head and withdraw the housing.

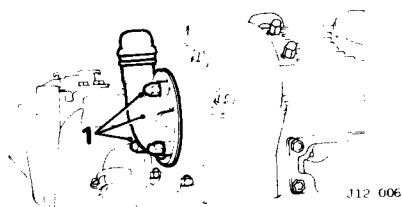


Fig. 3

Slacken the nut on the idler sprocket shaft. Knock down the tabs and remove the two camshaft sprocket retaining bolts (1, Fig. 4). Rotate the engine until the valve timing gauge (1, Fig. 5) can be fitted to the slot in the camshaft, remove the remaining camshaft bolts. Use service tool JD 2B (2, Fig. 4), turned in a clockwise direction, to slacken the camshaft chain.

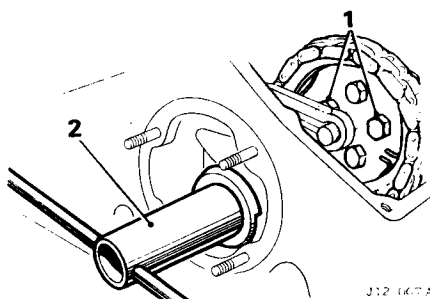


Fig. 4

**CAUTION:** Do not rotate the engine with the camshafts disconnected.

Slide the sprocket up the support bracket.

**NOTE:** Mark 'fit' holes in the adjuster plates.

Progressively slacken the camshaft bearing cap nuts, starting with the centre cap and working outwards; lift off the bearing caps. Note the mating marks on each bearing cap (2, Fig. 5).

**NOTE:** If the same shell bearings are being refitted, note their location to ensure that they are fitted in the original position.

Lift the camshaft from the cylinder head.

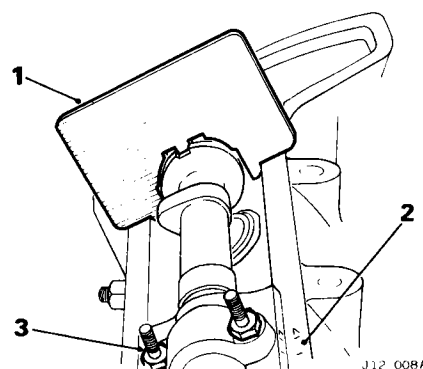


Fig. 5

## Refitting

Fit the camshaft shell bearings.  
Fit the camshaft in the bearings so that the keyway in the front flange is uppermost.  
Fit the bearing caps to their respective positions and fit 'D' washers, spring washers and nuts.  
Tighten down the bearing caps evenly, commencing with the centre cap.  
Tighten the nuts (3, Fig. 5) to correct torque.  
Align camshaft using timing gauge C 3993.  
Locate the camshaft sprocket on the camshaft and ensure that the 'fit' holes line up. Fit one bolt on the lock plate.

**NOTE:** If all the preceding instructions have been followed, valve timing will be correct.  
Rotate the engine and fit remaining bolts to the camshaft sprocket. Turn up the tabs.  
Using tool JD 2B, tension the top timing chain until slight flexibility remains in the chain on both outer sides of the camshaft sprockets. The chain **MUST NOT** be dead tight.  
Check the tappet adjustment.  
Securely tighten the locknut.  
Replace the camshaft covers and breather housing.

## CAMSHAFT BEARINGS (Complete set)

### Remove and refit 12.13.13

Follow the procedure detailed under 'Camshaft—Remove and refit—12.13.02 or 12.13.03', above.

## CRANKSHAFT DAMPER AND PULLEY

### Remove and refit 12.21.01

#### Removing

Remove the central bolt securing the Torquator unit and fan to the water pump pulley; collect the washer and remove the unit.  
Remove the steering pump belt, compressor belt (on cars fitted with air conditioning only) and alternator belt.  
Knock back the locking tabs (1, Fig. 6) at the pulley bolts, turning the crankshaft to improve access to the tabs.

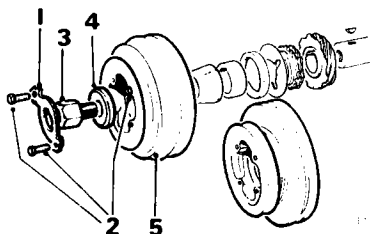


Fig. 6

Remove the four bolts (2, Fig. 6) securing the crankshaft pulley to the torsional damper. Recover the locking ring and remove the outlet pulleys.

Remove the large bolt (3, Fig. 6) securing the torsional damper and recover the large plain washer (4, Fig. 6).

Strike the damper (5, Fig. 6) with a hide mallet and remove it from the crankshaft.

#### Inspection

Examine the rubber portions of the damper for signs of deterioration and, if necessary, fit a new damper.

Examine the pulley and damper grooves for wear. Drive belts must not bottom in the grooves.

#### Refitting

Reverse the removal operations, fitting new tab washers and tightening the bolts to the correct torque.

Correctly tension the drive belts.

## CRANKSHAFT FRONT OIL SEAL

### Remove and refit 12.21.14

#### Removing

Remove the crankshaft damper and pulley.

If the cone (1, Fig. 7) has not drawn clear with the torsional damper, prise the slot open and draw it from the crankshaft. Recover the Woodruff key.

Remove the oil sump.

Draw the distance piece from the crankshaft and discard.

Prise the oil seal (2, Fig. 7) from the front timing cover recess, taking great care not to damage the surface of the crankshaft or the oil seal recess.

Remove oil flinger, if fitted, by cutting into the notches.

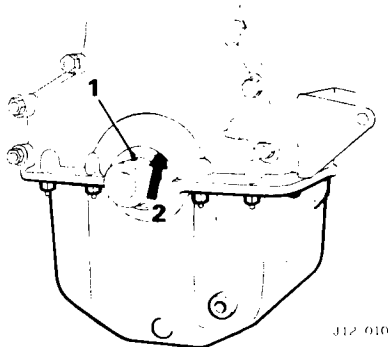


Fig. 7

#### Refitting

Fit a new oil seal dry, as supplied and locate it in the timing cover recess, open side inwards.  
Check the 'O' ring seal in the new distance piece, lubricate with clean engine oil and fit distance piece onto crankshaft.

Fit the oil sump.

Fit the Woodruff key in the crankshaft and fit the cone.

Fit the crankshaft damper and pulley.

## MAIN BEARINGS

### Remove and refit (set) — Engine 12.21.39 in situ

#### Removing

Remove the oil pump and pipes (1, Fig. 8).

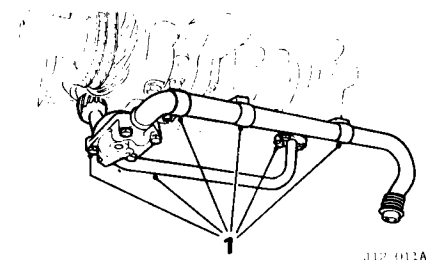


Fig. 8

Withdraw the bolts (1, Fig. 9) securing the rear main bearing cap and discard the washers. Note the corresponding numbers (2, Fig. 9) on the bearing cap and crankcase.

Withdraw the upper half of the bearing shell.

Liberally coat the replacement bearing shells with clean engine oil and locate in the crankcase and bearing cap. Ensure that the lugs on the bearing shell locate correctly.

Secure the bearing cap using bolts and a new flat washer.

Tighten the bolts to the correct torque.

Repeat operations to renew shells on the four intermediate main bearing caps. Continue by removing the bolts securing the centre main bearing cap. Discard the bearing shells and thrust washers.

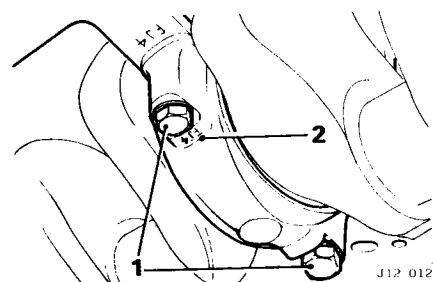


Fig. 9

Liberally coat the replacement bearing shells and two new thrust washers with clean engine oil and locate the shells in the crankcase and bearing cap. Ensure that the lugs on the bearing shell locate correctly.

continued

Locate the thrust washers (1, Fig. 10) on either side of the bearing cap, white metal side outwards, and secure the cap using bolts and new flat washers.

Tighten the bolts (2, Fig. 10) to the correct torque.

Set the crankshaft to T.D.C. No. 6 cylinder (front) firing, and remove distributor cap.

Remove the setscrew and remove the distributor.

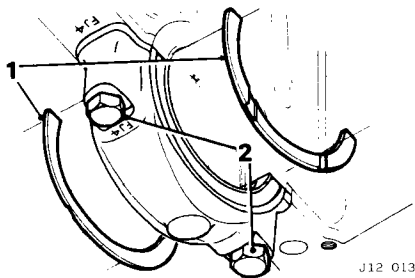


Fig. 10

Remove the bolts (1, Fig. 11) securing the front main bearing cap and manoeuvre the cap clear. Discard the bearing shells.

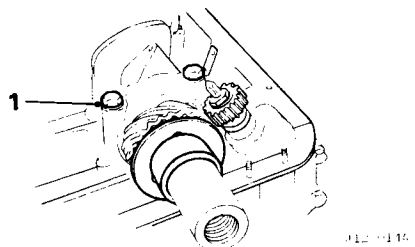


Fig. 11

## Refitting

Liberally coat the replacement bearing shells with clean engine oil and locate the shells in the crankcase and bearing cap.

Ensure that the lugs on the bearing shell locate correctly.

Secure the bearing cap, using the bolts and new flat washers.

Tighten the bolts to the correct torque.

Refit the oil pump and pipes (1, Fig. 8).

## CAMSHAFT COVERS AND SEALS

### Remove and refit

12.29.42

#### Removing

Disconnect the battery.

Disconnect the plug leads.

Cars fitted with air conditioning only

**WARNING: On no account must any portion of the air conditioning system be disconnected by anyone other than a qualified refrigeration engineer. Blindness can result if the gas contained within the system comes into contact with the eyes.**

Depressurise the fuel system.

Release the inlet and outlet petrol pipe union nuts at the fuel cooler. Plug the inlet petrol pipe to prevent fuel syphon.

On 3.4 litre cars only, detach the hot air duct (1, Fig. 12) early models only.

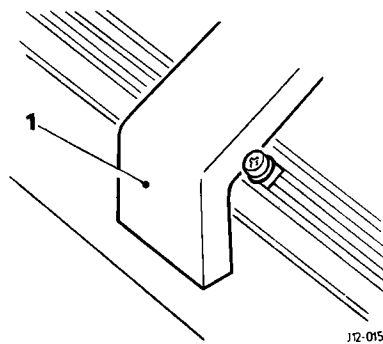


Fig. 12

Remove the 11 nuts and one screw (1, Fig. 13) securing the cover to the head. Remove the cover.

Detach the gasket (2, Fig. 13) from the cover and prise the cover seal (3, Fig. 13) from the head. Clean the joint surfaces of the cover and head.

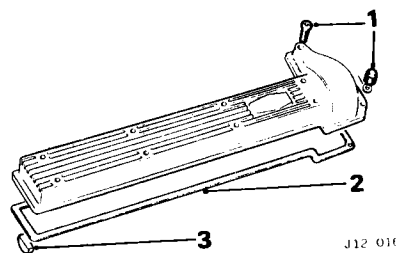


Fig. 13

#### Refitting

Smear the camshaft cover seal (3, Fig. 13) with sealant and replace it in the head.

Fit a new gasket to the head and replace the cover; tighten the attachment nuts and screw, to the figure quoted in the data sheet.

Replace the hot air duct on 3.4 litre cars only.

Refit the petrol pipes to the fuel cooler and replace the cooler on air-conditioned cars.

Reconnect the plug leads, reconnect the battery.

## CONNECTING ROD BEARINGS

### Remove and refit (set) — Engine in situ

12.17.16

#### Removing

Remove the oil sump.

Turn the engine until one big-end bearing is at bottom dead centre.

Remove the connecting rod cap, noting that corresponding cylinder numbers on the connecting rod and cap are on the same side (1, Fig. 14).

Lift the connecting rod from the crank pin and withdraw the bearing shells (2, Fig. 14).

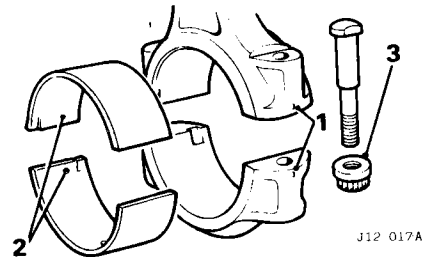


Fig. 14

#### Inspection

Check the crank pin for signs of overheating, scoring or transfer of bearing metal. If the crank pin is suspect in any way, the engine must be removed and the crankshaft rectified, or renewed as necessary.

#### Refitting

Liberally coat the replacement bearing shells with clean engine oil and locate in the connecting rod and cap.

Secure the connecting rod cap, ensuring that the marks coincide.

Tighten the connecting rod nuts (3, Fig. 14) to the correct torque.

Repeat operations to change bearings on the remaining five journals, then replace the oil sump.

## TAPPETS

### Adjust

12.29.48

Service tool: Valve timing gauge C 3993

**CAUTION: If checking valve clearances with the cylinder head removed from the engine, the camshafts must be fitted and checked one at a time. If one camshaft is rotated while the other is in position, fouling is likely between inlet and exhaust valves.**

If necessary remove the camshaft covers.

Rotate the camshafts and record the clearance between the back of each cam in turn, and the respective tappet, using a feeler gauge as shown (1, Fig. 15). Clearance to be as detailed in group 05. If adjustment is necessary, proceed with operations below as appropriate.

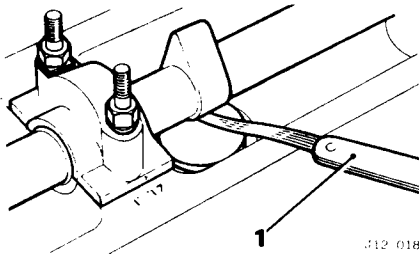


Fig. 15

If the cylinder head is on the engine, before removing the last securing bolt, rotate the engine until the valve timing gauge C 3993 can be located in the front flange of each camshaft (1, Fig. 16).

If necessary, disconnect the sprockets from the camshafts.

**CAUTION:** Do not rotate the engine while the camshaft sprockets are disconnected.

When the cylinder head is on the engine and the camshaft sprockets disconnected, ensure that no piston is at T.D.C. otherwise valve/piston fouling could occur.

Remove the camshaft bearing caps (2, Fig. 16) and lift the camshaft clear.

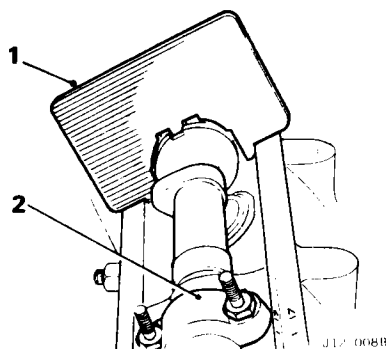


Fig. 16

Remove each tappet, taking careful note of its location. Remove and check the adjusting pad. **NOTE:** Subtract the appropriate valve clearance from the dimension obtained above and select suitable adjusting pads which equal this new dimension. Adjusting pads are available rising in 0.03 mm (0.001 in) sizes from 2.16 to 2.79 mm (0.085 to 0.110 in) and are etched on the surface with a letter 'A' to 'Z', each letter indicating an increase in size of 0.03 mm (0.001 in).

Fit selected adjusting pads and fit the tappets. Fit the camshaft bearing caps and nuts.

**NOTE:** If the cylinder head is on the engine, locate the camshaft using gauge C 3993 before tightening the bearing cap nuts. Tighten the bearing cap nuts to the correct torque. Connect the camshaft sprockets. Refit the camshaft covers.

## OIL FILTER ASSEMBLY

### Remove and refit

12.60.01

#### Removing

From beneath the car disconnect the oil pressure switch lead. Separate the filter housing from the pipe to the sump by releasing the two hose clips (1, Fig. 17). Catch any spilled oil. Release the nut (2, Fig. 17) connecting the camshaft oil feed to the filter housing. Unscrew and withdraw the four setscrews (3, Fig. 17) securing the filter housing to the crankcase casting. Withdraw the filter and housing. Remove and discard the gasket (4, Fig. 17). Detach the canister (5, Fig. 17) and thoroughly clean the housing.

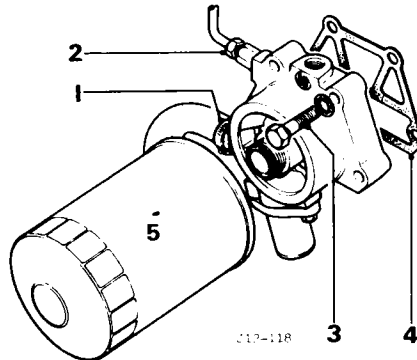


Fig. 17

#### Refitting

Fit a new gasket and reverse above operations as appropriate. Fit a new canister, smearing the seal with engine oil and screwing the canister into place by hand only. Run the engine and check for oil leaks. Check the oil level, and top up as necessary.

## OIL PRESSURE SWITCH

### Remove and refit

12.60.50

See 88 25 08/2.

## OIL PRESSURE RELIEF VALVE

### Remove and refit

12.60.56

#### Removing

From beneath the car, remove the two set bolts (1, Fig. 18) securing the relief valve to the filter head and withdraw the cap (2, Fig. 18), spring (3, Fig. 18), and valve (4, Fig. 18). Collect washer (5, Fig. 18) from the cap.

#### Refitting

Fit a new 'O' ring (6, Fig. 18) to the valve body and replace in the filter head. Insert the valve and spring, place the washer in the cap and refit to the filter head.

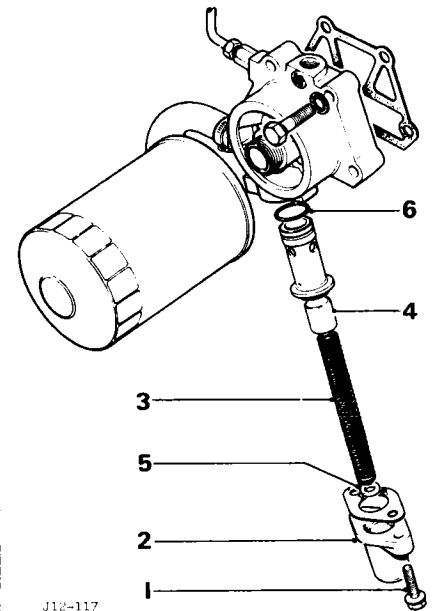


Fig. 18

## CAMSHAFT OIL FEED PIPE

### Remove and refit

12.60.83

#### Removing

Remove the union nut (1, Fig. 19) at the oil filter housing. Remove the banjo bolts (2, Fig. 19) at the rear of each camshaft. Manoeuvre the oil feed pipe clear. Thoroughly clean out the pipe.

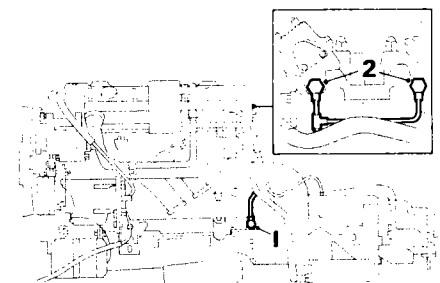


Fig. 19

#### Refitting

Ensure that the copper seals are in good condition and refit the banjo bolts.

## TIMING CHAIN

### Adjust

12.65.44

Service tool: Timing chain adjuster tool JD 2B

Release the clip (1, Fig. 20) securing the crankcase breather pipe to the breather. Remove the dome head nuts (2, Fig. 20) securing the breather housing. Note the position of the clips and brackets fitted.

*continued*

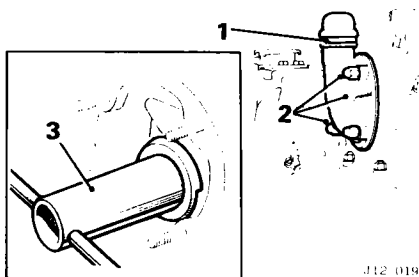


Fig. 20

Withdraw the breather housing and filter gauze.

Slacken the locknut and use tool JD 2B (3, Fig. 20) to tension the top chain. Rotate the tool in an anti-clockwise direction and DO NOT use undue force.

Tighten the locknut and refit the breather housing and all brackets and clips removed.

## ENGINE MOUNTING—FRONT SET

**Remove and refit** 12.45.04

### Removing

Remove the air cleaner assembly.

Remove the nuts from above and below the rubber mounting pads on both sides of the engine (1, Fig. 21).

Carefully raise the engine, using a trolley jack with a wooden block between the jack head and the sump, to release the weight from the mountings.

**NOTE:** Avoid fouling the fan and cowl

Remove the bolts (2, Fig. 21) securing the mounting brackets to the engine and withdraw the mounting brackets.

Collect the packing pieces and lift out the rubber mountings.

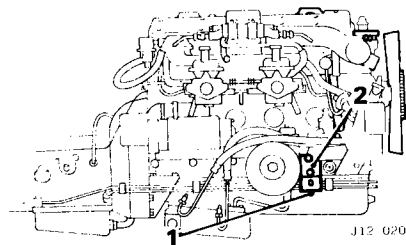


Fig. 21

### Refitting

Place replacement mountings in position on the chassis brackets, fitting the insulator between the rubber and the beam on R.H. mountings on 3.4 litre cars only. Replace the spring washers and nuts; tighten the nuts by hand only.

Replace the mounting brackets on the engine, fitting new insulator pads between the brackets and rubber mountings; fit two insulators between the bracket and the rubber mounting on 3.4 litre air-conditioned cars only. Replace the plain washer and Cleveloc nuts, but do not tighten the nuts. Lower the jack.

Tighten the attachment bolts and nuts at the brackets to the correct torque and finally tighten the mounting nuts.

Replace the air cleaner.

## ENGINE MOUNTING—REAR SPRING

**Remove and refit** 12.45.26

Service tool: Engine support tool MS 53(A)

### Removing

Disconnect the battery.

Position service tool MS 53(A) (1, Fig. 22) across the rear engine lifting eye (2) and set the hook to support the engine.

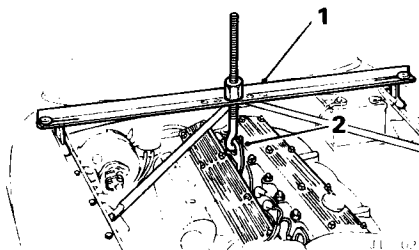


Fig. 22

Jack up the front of the car and place it on two stands.

Disconnect the intermediate exhaust pipe (1, Fig. 23) from the down pipe, remove the sealing olive. Remove the tie plate between the transmission and sump.

Place the jack (2, Fig. 23) with a suitable wooden block under the mounting plate and remove the four setscrews (3, Fig. 23) and washers; lower the jack and remove the rear mounting assembly; collect the spacers and remove the spring.

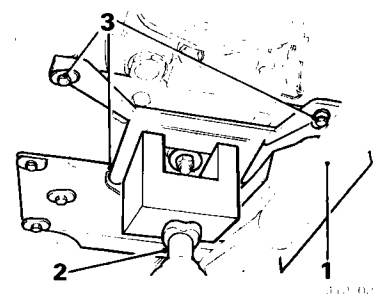


Fig. 23

### Refitting

Fit the spring and inner spacers to the mounting assembly and raise it into position on the jack; fit the rear spacers, place washers on the setscrews, insert and tighten.

Lower the jack.

Fit the centre spacer and replace the tie plate. Reconnect the exhaust pipe, using sealant at the joints; remove the car from the stands and remove tool MS 53(A).

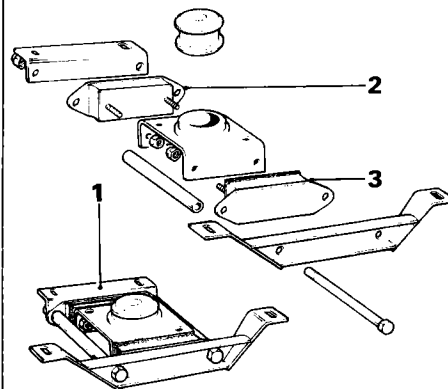


Fig. 24

## ENGINE MOUNTING—REAR—FRONT AND REAR RUBBERS

**Remove and refit** 12.45.24  
12.45.25

Detach the mounting (1, Fig. 24) as above, and dismantle to release the front and rear rubbers (2 and 3, Fig. 24).

## CYLINDER HEAD

**Remove and refit** 12.29.11

Service tools: Top timing chain adjuster tool JD 2B; valve timing gauge C 3993

### Removing

Depressurize the fuel injection system on 4.2 litre cars and drain the cooling system, retaining the coolant for refill.

Detach the wiring and air-conditioning system pipes (if fitted) from the valance to dash ties, remove the bolts at valances, slacken the bolts at dash and swing the ties across the car. Disconnect the coolant hoses.

**WARNING:** Do not disconnect any refrigerant hoses. Blindness can result if the gas contained within the system comes into contact with the eyes.

Remove the camshaft covers and seals.

Remove the dome headed nuts securing the breather housing, detach the hose and remove the housing.

Remove the bolt securing dipstick tube from model 66 automatic transmission to the inlet manifold.



Detach the down-pipes from the exhaust manifolds.

Disconnect and plug the fuel hoses from the fuel cooler, if fitted.

Disconnect the h.t. leads and remove the harness from the head; separate the temperature transmitter lead and detach the earth lead from the manifold.

Remove the air cleaner; detach the air-flow meter hoses and remove the meter; remove the air cleaner and detach the fuel hoses on 3.4 litre cars; disconnect the throttle and kick-down cables.

Disconnect the heater pipes and remove the camshaft oil feed pipes by detaching the banjo bolts at the rear of the head.

Jack up the front of the car and place it on two stands.

Turn the crankshaft until the two camshaft timing notches are below the camshafts, then remove the two accessible bolts (1, Fig. 26) from each camshaft flange; turn the crank through one complete revolution and release the remaining bolts, but leave one bolt in position in each flange.

Slacken the locknut on the idler sprocket shaft.

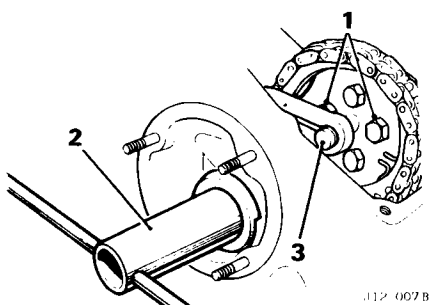


Fig. 26

Use service tool JD 2B (2, Fig. 26) to slacken top timing chain tension by pressing on to serrated adjuster plate and rotating the tool in a clockwise direction.

Remove the remaining bolts.

**CAUTION:** The engine **MUST NOT** be rotated while the camshaft sprockets are disconnected and the cylinder head is in place.

Draw the sprockets from the camshafts and slide the sprockets up the support brackets (3, Fig. 26).

**NOTE:** Mark 'fit' holes in the adjuster plates.

Remove the fourteen cylinder head domed nuts and six nuts securing the front of the cylinder head, working out from the centre. Recover the two lifting brackets.

Lower the vehicle from the stands and carefully lift the cylinder head assembly from the cylinder block.

**NOTE:** As the valves in the fully open position protrude below the cylinder head joint face, the cylinder head **must not** be placed joint face downwards directly on a flat surface; support the cylinder head on wooden blocks, one at each end.

Thoroughly clean the joint faces of the cylinder head and block.

## Refitting

Fit a new gasket, dry, on the cylinder block ensuring that the side marked 'TOP' is uppermost.

Ensure that No. 6 cylinder (front) is at T.D.C. position, with the distributor rotor arm pointing approximately forward along the engine.

Rotate the camshafts until the timing gauge

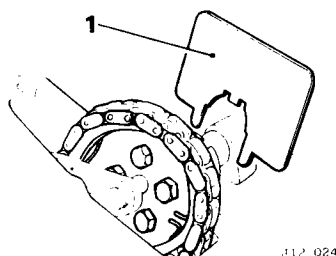


Fig. 27

C 3993 (1, Fig. 27) can be located in the slots in the front flanges.

**CAUTION:** Ensure that the inlet and exhaust valves do not foul each other.

Lower the cylinder head into position on the cylinder block.

Fit the spark plug lead bracket and lifting brackets to appropriate cylinder head studs.

Place the washers on the cylinder head studs and fit the fourteen large cylinder head domed nuts.

Fit six nuts and washers to secure the forward end of the cylinder head.

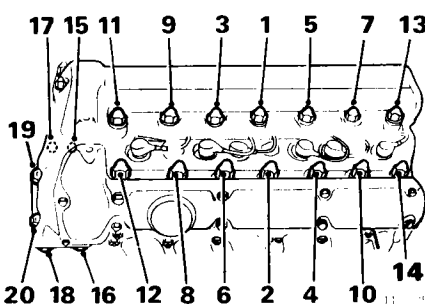


Fig. 28

Tighten the large nuts, in the order shown in Fig. 28, to the correct torque.

Fully tighten the six small nuts.

**CAUTION:** Do not rotate the engine or camshaft until the camshaft sprockets have been connected.

Locate the sprockets on the camshaft flanges and ensure that both holes in each flange are in alignment with the 'fit' holes in the adjuster plates.

**NOTE:** If necessary, remove the circlip, disengage the serrations and re-position the adjuster plate as necessary. Refit the circlip.

Secure each adjuster plate to the camshaft, using two bolts and lockplates.

Rotate the engine until the remaining holes on each camshaft are accessible and fit the bolts. Turn up the tabs.

Tension the timing chain by using service tool JD 2B rotated in an anti-clockwise direction. See Fig. 29.

**NOTE:** When correctly tensioned there should be slight flexibility on both outer sides of the chain.

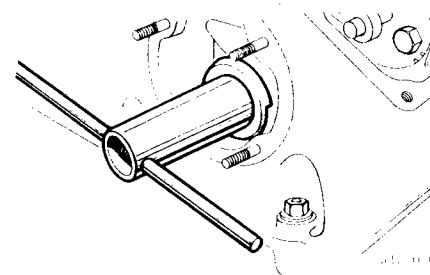


Fig. 29

Securely tighten the locknut.

Ensure that No. 6 cylinder is at T.D.C. firing (with the pointer opposite 'O' on the timing scale) and re-check the position of the camshafts using gauge C 3993.

Reverse the removal operations as appropriate, to complete the reassembly.

Re-check ignition timing as appropriate.

Carry out an exhaust emission check where required by legislation.

## CYLINDER HEAD GASKET

**Remove and refit** 12.29.02

### Removing

Follow the procedure given for removal of the cylinder head (12.29.11). Check the cylinder head and the faces of the cylinder block and liners for damage that caused, or was the result of, gasket failure; rectify as necessary.

## OIL SUMP

**Remove and refit** 12.60.44

### Removing

Remove the front suspension.

Drain engine oil.

Remove the two nuts and lock washers securing the oil return pipe.

Remove the nuts, bolts and washers securing the transmission oil cooler pipe clips — cars fitted with automatic transmission only.

Remove the setscrews and lock washers (1, Fig. 30) and four nuts and lock washers (2, Fig. 30) securing the oil sump.

*continued*

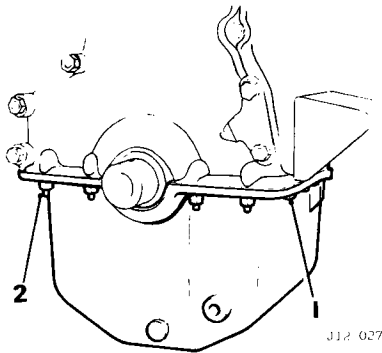


Fig. 30

Remove the four setscrews and washers (1, Fig. 31) securing the intake strainer box. Clean out the sump pan and strainer. Thoroughly clean all traces of gaskets and seals from the sump, taking great care not to damage the alloy surfaces. Thoroughly clean the mating surface of the cylinder block

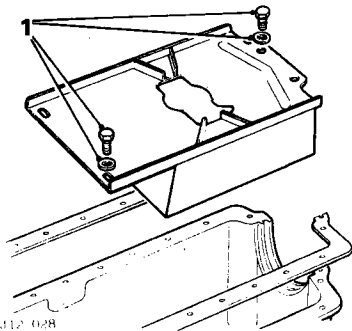


Fig. 31

#### Refitting

Fit the strainer box and secure using four set-screws and lock washers. Ensure that the 'O' ring seal is fitted to the oil return pipe. Fit the new oil seal dry, as supplied and locate in groove in the sump. **DO NOT** trim the ends, but press the seal into the groove until the ends are flush. Apply RTV sealant compound to both sides of the sump face at the seal aperture joint. Lightly grease the new gaskets and locate on the sump. Offer the sump into position and secure it using twenty-six setscrews — short setscrew at front right-hand corner — four nuts and spring washers torque tightening to 20 Nm (15 lbf.ft.)

#### NOTE:

- Ensure that the oil return pipe locates in the sump. Secure using two nuts and lock washers.
  - Ensure that the front oil seal locates correctly in the groove.
  - Locate the transmission oil cooler pipe brackets on the relevant setscrews — cars fitted with automatic transmission only.
- Refit the front suspension.  
Pour 8.25 litres (14.5 Imp. pints) of recommended oil into the engine.  
Run the engine, check the oil level, and adjust as necessary.

### OIL PICK-UP STRAINER

#### Remove and refit

12.60.20

#### Removing

Remove the oil sump.  
Remove the four setscrews and spring washers (1, Fig. 31) securing the strainer box.

#### Clean

Wash the suction strainer gauze in clean paraffin or petrol, and dry thoroughly. Clean out the sump.

#### Refitting

Secure the strainer box in position, using four setscrews and spring washers.  
Refit the oil sump.

### OIL PUMP

#### Remove and refit

12.60.26

#### Removing

Remove the oil sump.  
Detach the suction and delivery pipe clips (1, Fig. 32) from the brackets. Knock back the tabs and remove the setscrews (2, Fig. 32) securing the delivery pipe. Pull both pipes from the oil pump. Knock back the tabs and remove the setscrews (3, Fig. 32) securing the oil pump. Recover the pipe bracket and drive coupling (4, Fig. 32).

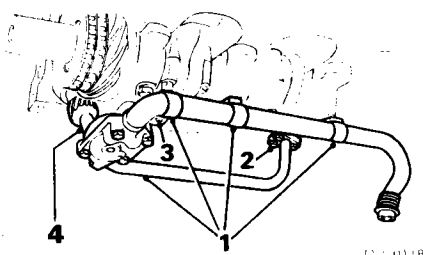


Fig. 32

#### Refitting

Check the condition of the 'O' ring seals and, if necessary, fit new ones. Locate the drive coupling on the oil pump and secure the pump using three setscrews, tab washer and pipe bracket. Turn up the tabs. Fit the delivery pipe on a new gasket, turn up the tabs. Locate the suction pipe and secure the clips to the brackets. Ensure that the pipe intake is on the centre line of the engine.  
Refit the oil sump.

### ENGINE AND GEARBOX ASSEMBLY

#### Remove and refit

12.37.01

Service tools: Engine support tool MS 53(A); lifting eye C 37851

#### Removing

Remove the bonnet.  
Drain the coolant and conserve for refill.  
Drain the oil from the engine.  
Detach the radiator hoses and remove the radiator and lower cowl.  
Remove R.H. harness cover from the inner wing and disconnect the headlamps at the snap connectors.  
Detach the hoses from the valance to bulkhead ties, remove the bolts to valances and slacken the bolts to bulkhead; swing the ties across the car.  
Detach the fuel pipes from the cooler (if fitted) and plug them, detach the fuel feed from the carburettors on 3.4 litre cars.  
Detach the wiring from the compressor; remove the belt and support the detached compressor alongside the engine. **DO NOT SEPARATE REFRIGERANT HOSES FROM THE COMPRESSOR.**  
Detach the wiring from the alternator.  
Disconnect the exhaust down-pipes from the manifolds.  
Remove the engine earth lead.  
Separate the transmission oil cooler from the valance.  
Remove the air cleaner.  
Disconnect the air-flow meter wiring and remove the air-flow meter and bracket on 4.2 litre cars.  
Disconnect and plug the fuel supply pipe.  
Remove the power steering pump from the engine (do not disconnect the hoses) and tie to adjacent wheel arch valance.  
Disconnect the wiring, hoses, vacuum pipes and throttle cable from the engine.  
Disconnect the injector harness, earth lead and starter lead.  
Lift the fresh air intake out of position and remove the heater hose and water valve.  
Fit engine support tool MS 53(A) and jack up the front of the car; place it on two stands.  
Remove rear and intermediate heat shields.  
Detach the tie from between the sump and transmission.  
Place the head of the trolley jack under the rear engine mounting and raise it to release the load from the mounting; remove the four bolts and detach the mounting. Collect the spacers.  
Remove the four bolts securing the propeller shaft to drive flange, disconnect the shaft and speedometer drive from the gearbox; detach the selector control. Lift the car and remove the stands.  
Detach the front lifting eye from the two R.H. studs and replace with lifting eye C 37851, secured by head nuts on the second row of studs from the front of the engine; engage lifting tackle with eye.  
Place the trolley jack, with a suitable wooden block on the head, under the gearbox.

Remove the securing nuts from both forward engine mountings.  
Carefully raise the engine on the jack and lifting tackle and move it forward to clear the rack housing, then lower the jack slightly and hoist the engine clear of the body.

### Refitting

Lower the engine and gearbox into the car; position the trolley jack under the car with a wooden block on the head.  
Carefully lower the unit, and locate the gearbox on the trolley jack head; move the unit back (observing clearance of steering rack housing) and align engine to mountings.  
Insert the correct packing pieces at the front mountings, fit and tighten the mounting nuts.  
Fit engine support tool MS 53(A) and withdraw the lifting tackle.  
Remove the lifting eye C 37851 and replace the standard lifting eye.  
Remove the jack from under the gearbox, jack up the front of the car and place it on two stands.  
Reconnect the speedometer drive, gear selector and propeller shaft.  
Raise the rear mounting into position on the jack, insert spacers and secure in position with four bolts.  
Fit the sump to the gearbox tie, replace the intermediate and rear heat shields, lower the car from the stands and detach the support tool.  
Replace the detached items by reversing the removal sequence; replace or renew the coolant, refill the engine sump and check the fluid levels in power steering and brake reservoirs, and transmission. Bleed the clutch on manual transmission cars.  
Replace the bonnet and check emissions where required.

### TIMING COVER

**Remove and refit** 12.65.01

#### Removing

Remove the engine and gearbox assembly.  
Remove the gearbox from the engine and place the engine on an approved engine stand.  
Remove the cylinder head, using operations from Cylinder head—remove and refit—12 29 11 as appropriate.  
Remove the water pump.  
Remove the crankcase breather.  
Remove the torsional damper (1, Fig. 36), cone (2, Fig. 36) and crankshaft Woodruff key.  
Remove the timing gear cover (3, Fig. 36) and recover the timing pointer (4, Fig. 36).  
Recover the distance piece (5, Fig. 36) and front oil seal (6, Fig. 36).

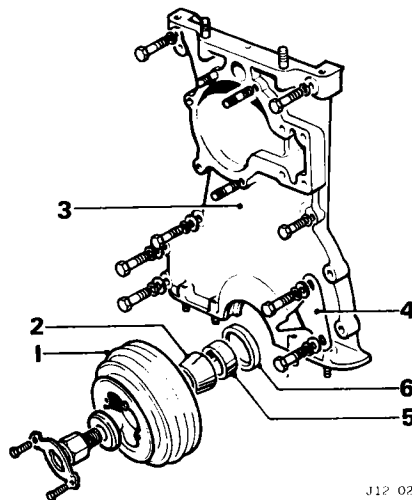


Fig. 36

#### Refitting

Thoroughly clean all mating faces, taking care not to damage the alloy casting.  
Reverse the removal operations, using new gaskets, 'O' rings and seals.

### TIMING CHAINS

**Remove and refit** 12.65.14

#### Removing

Remove the timing cover.  
Remove the oil thrower (1, Fig. 37—if fitted) from the crankshaft.

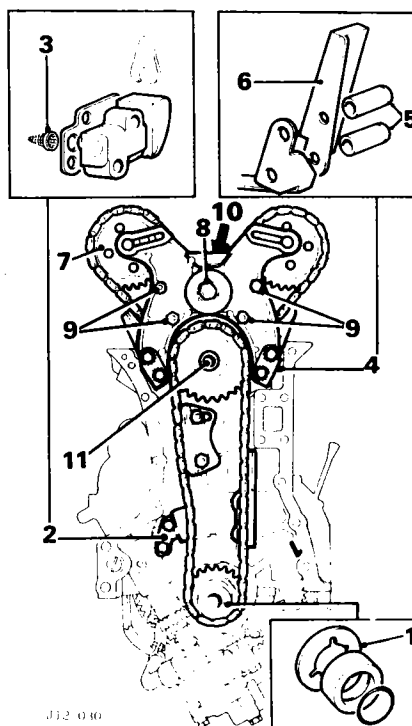


Fig. 37

Remove the setscrews (2, Fig. 37) securing the bottom timing chain tensioner and chain guides. Recover the conical filter (3, Fig. 37) behind tensioner.

Slacken the four setscrews and shakeproof washers (4, Fig. 37) securing the top timing chain assembly. Do not remove the setscrews at this stage.

Withdraw the crankshaft timing sprocket and chain assembly. Recover the distance pieces (5, Fig. 37), top timing chain dampers (6, Fig. 37) and top timing chain retainer.

Disengage the camshaft sprockets (7, Fig. 37) from the top chain.

Remove the nut and serrated washer (8, Fig. 37) from the idler shaft and withdraw the serrated plate, plunger and spring.

Remove the four nuts and serrated washers (9, Fig. 37) securing the front mounting bracket to the rear mounting bracket.

Separate the brackets.

Remove the timing chains from the intermediate and idler sprockets.

Draw the idler shaft (10, Fig. 37), idler sprocket and bush from the rear mounting bracket.

Remove the circlip and press the intermediate shaft from the rear mounting bracket. Recover the intermediate sprockets, bush and shim.

#### Inspection

Examine the timing chains for signs of damage or wear.

Examine all sprockets for signs of damage or wear.

Examine all dampers and the chain tensioner for signs of damage or excessive wear.

Examine the idler sprocket bush and intermediate sprocket bush for signs of wear.

**NOTE:** If the timing chains or sprockets show signs of excessive wear or are damaged in any way, all sprockets and the chains should be renewed.

#### Refitting

Fit the eccentric idler shaft (1, Fig. 38) to the hole in the front mounting bracket.

Fit the spring and plunger (2, Fig. 38) in the bracket and locate the serrated plate (3, Fig. 38) on the shaft. Loosely secure using serrated washer and nut (4, Fig. 38).

Fit the idler sprocket (5, Fig. 38) (21 teeth) to the idler shaft.

Fit the intermediate sprocket (6, Fig. 38), large gear forward, on the intermediate shaft; fit shim in rear mounting bracket, ensuring that the roll-pin engages in the slot, and retain the shaft with the circlip.

Locate the top timing chain (longer) on the small intermediate sprocket, and lower timing chain on the large sprocket.

Loop the top chain beneath the idler sprocket and secure the top mounting bracket to the rear mounting bracket using four nuts and serrated washers (7, Fig. 38).

Fit four long setscrews (8, Fig. 38) and spring washers to the front mounting bracket and fit

continued

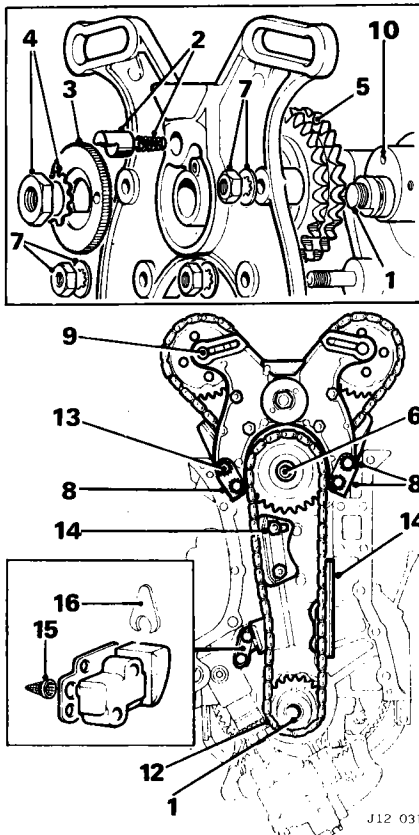


Fig. 38

the dampers, chain support plate and distance pieces to the setscrews.

Equalize the loops of the top timing chain, and locate the camshaft sprockets in the loops (9, Fig. 38).

Rotate the eccentric idler shaft (10, Fig. 38) to lift the idler sprocket to the highest position between the camshaft sprockets.

Ensure that the Woodruff key is fitted to the crankshaft.

Locate the crankshaft sprocket (11, Fig. 38) on the shaft, but do not slide it fully home at this stage.

Loop the bottom timing chain (12, Fig. 38) beneath the crankshaft sprocket, tap the sprocket fully home and locate the assembly. Tighten the four setscrews (13, Fig. 38) to retain the assembly.

Fit the bottom timing chain guides (14, Fig. 38) but do not tighten the setscrews at this stage. Fit the conical filter (15, Fig. 38) in the hole in the cylinder block.

Screw the slipper into the tensioner until the dimension of 3,2 mm (0.125 in) exists between slipper and body.

Locate the tensioner on shims as necessary to ensure that the slipper runs central on the chain and secure using two setscrews and lockplate. Place slip gauge or distance card (16, Fig. 38) supplied with new tensioner between slipper and body of tensioner to maintain dimension of 3,2 mm (0.125 in) and adjust the intermediate damper to touch the chain. Tighten the setscrews and turn up tabs of the lockplate.

Remove the slip gauge and top chain or the tensioner slipper to release the ratchet.

Position the oil thrower on the crankshaft. Refit the timing cover.

## TIMING CHAIN TENSIONER

Remove and refit

12.65.28

### Removing

Remove the timing cover.

Remove the setscrews and locking plate securing the tensioner. Recover the tensioner and shim (1, Fig. 39).

Remove the conical filter (2, Fig. 39) from the cylinder block.

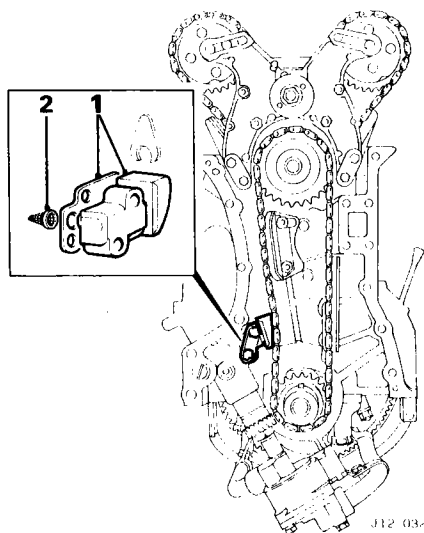


Fig. 39

### Refitting

Thoroughly clean the conical filter and fit to the cylinder block.

Screw the slipper into the tensioner and fit the distance card supplied with new tensioner or 3,2 mm (0.125 in) slip gauge between the slipper and body.

Locate the tensioner on shims as necessary to ensure that the slipper runs central on the chain and secure it using two setscrews and lockplate.

Slacken the setscrews securing the intermediate damper and set it into light contact with the chain. Tighten the screws and re-lock.

Remove the slip gauge and tap the chain or tensioner slipper to release the ratchet.

## FLYWHEEL

Remove and refit

12.53.07

### Removing

Remove the clutch assembly.

Knock down the locking plate tabs and remove ten bolts (1, Fig. 40).

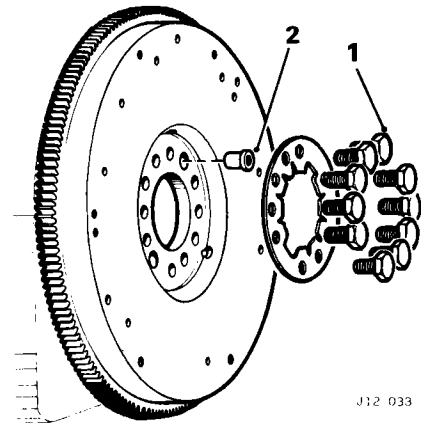


Fig. 40

Remove the flywheel from the crankshaft, using drawbolts through the dowels (2, Fig. 40).

**NOTE:** On later vehicles dowels are not fitted.

### Refitting

Locate the dowels where fitted in the crankshaft and tap them fully home through the flywheel.

Fit the locking plate and secure the flywheel using ten bolts. Tighten to the correct torque. Turn up the tabs.

Refit the clutch assembly.

## DRIVE PLATE

Remove and refit

12.53.13

### Removing

Remove the torque converter.

Knock down the locking plate tabs and remove ten bolts (1, Fig. 41).

Remove the drive plate from the crankshaft using drawbolts through the dowels (2, Fig. 41).

**NOTE:** On later vehicles dowels are not fitted.

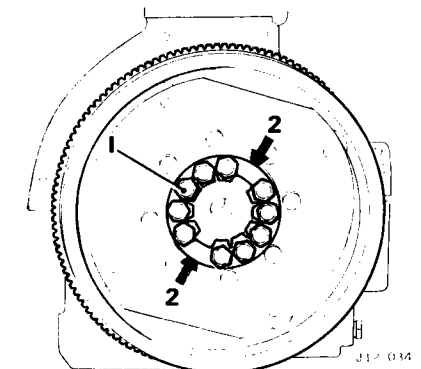


Fig. 41

### Refitting

Locate the dowels where fitted in the crankshaft and tap them fully home through the drive plate.

Fit the locking plate and secure the drive plate, using ten bolts. Tighten to the correct torque. Turn up the tabs.

Refit the torque converter.

## PISTON AND CONNECTING ROD

## Remove and refit—engine set 12.17.01

Service tool: Piston ring clamp 18G 55A

## Removing

Remove the engine and gearbox assembly.  
Remove the gearbox and place the engine on an approved engine stand.  
Remove the cylinder head.  
Remove the oil sump.  
Remove the nuts (1, Fig. 42) from the connecting rod bolts.  
Remove the connecting rod cap (2, Fig. 42), noting corresponding cylinder numbers (3, Fig. 42) on the connecting rod and cap. Number 1 cylinder at rear of engine.

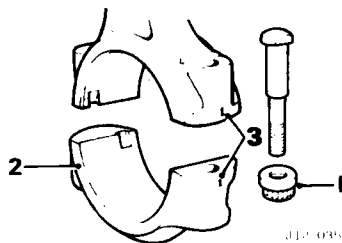


Fig. 42

Remove the connecting rod bolt (4, Fig. 42) and withdraw the piston and connecting rod from the top of the cylinder bore.  
Repeat operations to remove pistons on each cylinder, then continue with piston refitting.

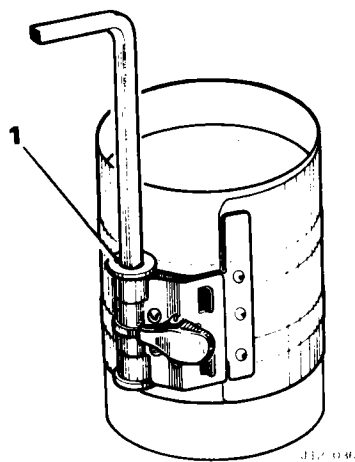


Fig. 43

## Refitting

**NOTE:** If the original pistons and connecting rods are being fitted, they must be replaced in the cylinder bore from which they were removed.

If new pistons and connecting rods are being fitted they should be stamped with the number of the bore in which they are to be installed. Number 1 cylinder is at the rear of the engine. Fit service tool 18G 55A (1, Fig. 43) to a piston, and fully compress the piston rings.

Enter the piston into the cylinder bore, ensuring that stamped 'FRONT' on the piston is towards the front of the engine.

Fit bearing shells to connecting rod and cap, liberally coating them with clean engine oil.

Fit cap to connecting rod, ensuring that the cylinder numbers stamped on each part are on the same side.

Tighten the connecting rod nuts to the correct torque.

Repeat for each cylinder in turn.

Refit the oil sump.

Refit the cylinder head.

Refit the engine and gearbox assembly.

## PISTON AND CONNECTING ROD

## Overhaul 12.17.10

**NOTE:** Pistons are supplied complete with gudgeon pins. As pins and pistons are matched assemblies it is not permissible to interchange component parts.

## Overhaul

Remove the piston and connecting rods.

Remove the circlips.

Push the gudgeon pin out of the piston.

Withdraw the connecting rod.

## Refitting

Fit the gudgeon pin (1, Fig. 44) in the piston.

**CAUTION:** Connecting rods must be refitted to pistons in such a way that when installed in the engine the word 'FRONT' on the piston crown faces the front of the engine and the chamfer on the big-end eye faces the crank pin radius.

Align the small-end (2, Fig. 44) with the end of the gudgeon pin and push the pin home.

Use new circlips (3, Fig. 44) to retain the gudgeon pin.

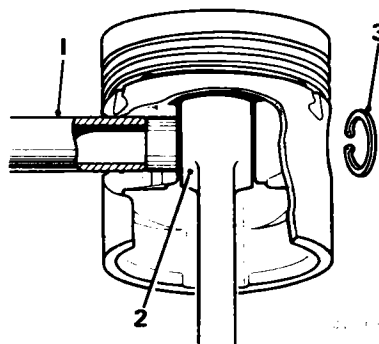


Fig. 44

**NOTE:** The gudgeon pin is a push fit in the piston at 20°C (68°F). Fit will vary with ambient temperature.

Three piston rings are fitted, as follows:

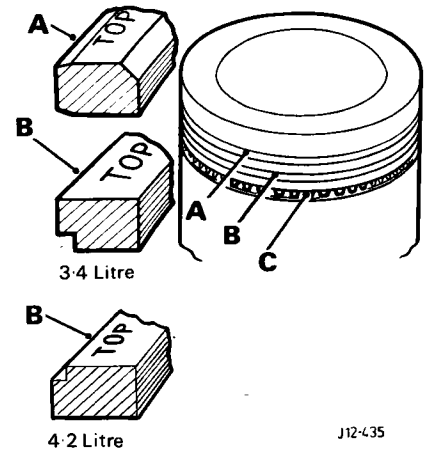


Fig. 45

A. Top ring—compression.

B. Second ring—compression.

C. Bottom ring—oil control.

Both top and second rings have tapered peripheries and are marked 'TOP' to ensure correct fitting. In addition, the top ring has a chrome plated periphery and is also cargraph coated. This coating is coloured RED and must not be removed. The bottom ring consists of an expander sandwiched between two rails.

Check the piston ring gap in the bore. Push the ring to a point midway down the bore, check that the ring is square and measure the gap—see Engine Data.

Fit the bottom ring ensuring that the expander ends are not overlapping.

Fit the second and top rings ensuring that they are fitted the correct way up.

Position the rings so that the gaps are staggered around the periphery of the piston.

Check the side clearance of the rings in the piston groove—see Engine Data.

Check the connecting rods for alignment on a suitable jig.

Check the bore of the small-end bush—see Engine Data.

**CAUTION:** If the small-end bush is worn beyond acceptable limits, a service exchange connecting rod must be fitted. It is NOT advisable to renew the bushes as specialized equipment is needed to hone the bushes to finished size. Refit the pistons and connecting rods.

## CYLINDER HEAD

## Overhaul 12.29.19

Service tools: Valve spring compressor JD 6118C; valve timing gauge C 3993

Remove the cylinder head.

## Dismantling

Remove the inlet and exhaust manifolds from the cylinder head. Discard the gasket and thoroughly clean the mating faces, taking great care not to damage the castings.

continued

Remove the four bearing caps from each camshaft. Note the mating marks (1, Fig. 46) on each bearing cap.

Lift out the camshafts.

Withdraw the tappets and lay them out in order to ensure the correct replacement.

Remove the adjusting pads from each valve stem, and place them with their respective tappets.

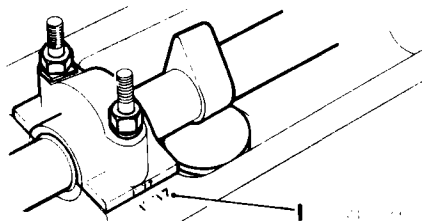


Fig. 46

- A. 31 mm (1 1/4 in)
- B. 31 mm (1 1/4 in)
- C. 96 mm (3 25/32 in)
- D. 111 mm (4 3/8 in)
- E. 152 mm (6 in)
- F. 76 mm (3 in)
- G. 203 mm (8 in)

Make up a wooden block to the dimensions given (Fig. 47) and use it to support the valves.

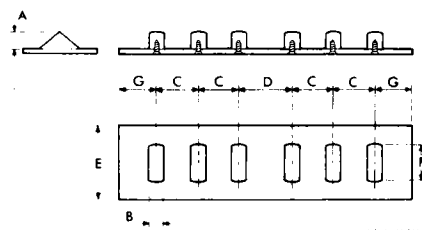


Fig. 47

Compress the valve spring using service tool JD 6118C and extract the cotters, see Fig. 48. Remove the collars, valve springs and spring seats. Repeat for the remaining five cylinders.

## NOTE:

- a. Remove the oil seal from the stem of the inlet valves before removing the spring seat.
- b. Valves are numbered and must be replaced in original locations. No. 1 cylinder being at the flywheel end of the engine.

Remove all traces of carbon from the combustion chambers, and deposits from the induction and exhaust ports. Great care must be taken to avoid damaging the head, use worn emery cloth and paraffin only.

## Valve guides

Check the clearance between the valve guide and stem, this should be 0.025 to 0.10 mm (0.001 to 0.004 in). When removing a worn guide, care must be taken to identify each individual guide to its bore in the cylinder head. Replacement guides are available in the three following sizes, and have identification grooves machined in the shank as noted below.

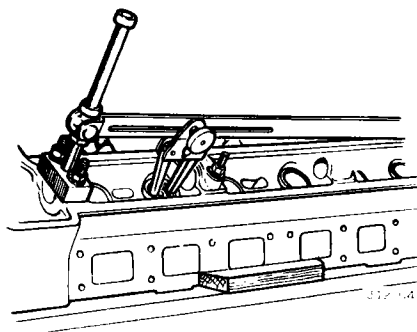


Fig. 48

**NOTE:** Valve guides, when fitted during initial engine assembly, are to the following dimensions and may be fitted in mixed form.

- Standard (no identification)  
12.73 to 12.75 mm (0.501 to 0.502 in).
- 1st oversize (one machined groove)  
12.78 to 12.80 mm (0.503 to 0.504 in).
- 2nd oversize (two machined grooves)  
12.85 to 12.88 mm (0.506 to 0.507 in).
- 3rd oversize (three machined grooves)  
12.98 to 13.00 mm (0.511 to 0.512 in).

When new guides are to be fitted, they should always be one size larger than the old guide. Standard and 1st oversize valve guides may be replaced in the following manner: Immerse the head in boiling water for 30 minutes.

Using a piloted drift, drive the guide out of the head from the combustion chamber end.

Coat the new valve guide with graphite grease and refit the circlip.

Heat the cylinder head.

Using a piloted drift, drive in the guide (1, Fig. 49) from the top until the circlip is seated in the groove.

**CAUTION:** This procedure is not recommended owing to the difficulty of establishing truth with the centre of the valve seat; it should not be attempted unless comprehensive machine shop facilities are available. A replacement cylinder head should be considered as an alternative.

**NOTE:** If a 2nd oversize guide is to be replaced the cylinder head bore must be reamed to the following dimension.

- 12.95 mm + 0.012 mm—0.005 mm (0.510 + 0.0005 in—0.0002 in).

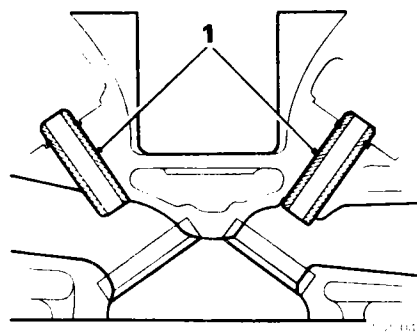


Fig. 49

## Valve seats

Examine the valve seats for pitting or excess wear. If the seats are damaged past reclamation by approved refacing procedures, the seat inserts may be replaced.

**CAUTION:** This procedure is not recommended owing to the difficulty of removing the old valve seat and the risk of damage to the cylinder head; it should not be attempted unless comprehensive machine shop facilities are available. A replacement cylinder head should be considered as an alternative.

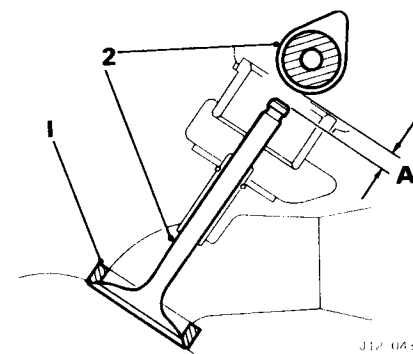


Fig. 50

Remove the inserts by machining, leaving approximately 0.25 mm (0.010 in) of metal which can easily be removed by hand without damaging the cylinder head.

Measure the diameter of the insert recess in the cylinder head.

Grind down outside diameter of the new insert to a dimension 0.08 mm (0.003 in) larger than the insert recess.

Heat the cylinder head for half an hour from cold at a temperature of 150°C (300°F).

Fit the insert (1, Fig. 50) ensuring that it beds evenly in the recess.

Renew or reface valves as necessary.

Correct valve seat angles are:

Inlet	Exhaust
44 1/2 degrees	44 1/2 degrees

## Valves

Check the valve stems for distortion or wear, renew the valves with stems worn in excess of 0.08 mm (0.003 in), see section 05 book 1.

Using a suitable suction tool, grind the valves into their respective seats.

If new valve inserts have been fitted, the clearance 'A' between valve stem and cam (2, Fig. 50) must be checked; this should be 8.13 mm (0.320 in) plus the valve clearance. The dimension must be taken between the valve stem and the back of the cam. Should this dimension not be obtained, metal must be ground from the valve seat of the insert.

**NOTE:** Only suitable grinding equipment should be used.

## Tappet guides

Examine the tappets and tappet guides for wear. The diametrical clearance between the tappet and tappet guide should be 0.02 to 0.05 mm (0.0008 to 0.0019 in).

**CAUTION:** The following procedure is not recommended owing to the difficulty of removing the old tappet guide and the risk of damage to the cylinder head; it should not be attempted unless comprehensive machine shop facilities are available. A replacement cylinder head should be considered as an alternative.

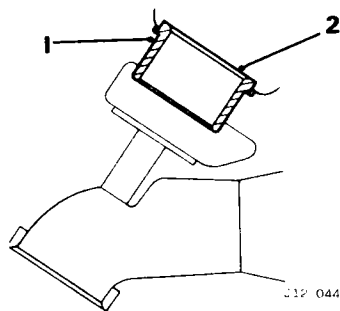


Fig. 51

Remove the old tappet guide (1, Fig. 51) by boring out until the guide collapses. Take great care not to damage the guide bore in the cylinder head.

Carefully measure the diameter of the tappet guide bore at room temperature 20°C (68°F).

Grind down the outside diameter of the replacement tappet guide to a dimension 0.089 mm (0.0035 in) larger than the tappet guide bore diameter measured above.

Grind the same amount from the 'lead-in' at the bottom of the tappet guide. The reduction in diameter from the adjacent diameter should be 0.089 to 0.16 mm (0.0037 to 0.0062 in).

Heat the cylinder head in an oven for half an hour from cold at a temperature of 150°C (300°F).

Fit the tappet guide, ensuring that the lip at the top of the guide beds evenly in the recess in the top of the cylinder head, see 2, Fig. 51.

Allow the cylinder head to cool, then ream the tappet guide bore to the diameter of 34.925 mm + 0.018 mm - 0.000 mm (1.375 in + 0.007 in - 0.000 in).

It is essential that, when reamed, the tappet guide bore is concentric with the valve guide bore.

#### Adjusting pads

Examine the adjusting pads (1, Fig. 52) for signs of indentation.

Renew, if necessary, with appropriate size when making valve clearances adjustment on reassembly.

#### Valve springs

Test the valve springs for pressure either by checking against Valve Spring Data or against a new spring.

### Reassembling

Examine the valves for pitting, burning or distortion, and reface or renew valves as necessary. Also reface the valve seats in the cylinder head and grind the valves to their respective seats using a suction valve tool. When refacing valves or seat inserts do not remove more metal than is necessary to clean up the facings. Refit the valves in the order removed and place the cylinder head on the wooden blocks.

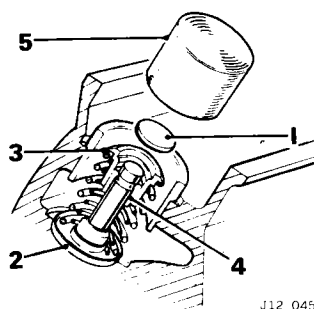


Fig. 52

Refit the valve spring seats (2, Fig. 52) and refit the inlet valve guide oil seals.

Refit the springs and collars (3, Fig. 52).

Compress the springs using service tool JD 6118C and fit the split cotters (4, Fig. 52). Tap the valve stems to ensure that the cotters are seated.

Fit the adjusting pads and tappets (5, Fig. 52) to their respective valves.

**CAUTION:** Camshafts must not be rotated independently.

Fit the camshaft shell bearings, locate one camshaft and secure the bearing cap nuts working from the centre outwards. Tighten the nuts to the correct torque.

Check the tappet adjustment.

Remove the camshaft fitted previously after checking, and fit the remaining camshaft.

Check the tappet adjustment.

Fit adjustment pads as required and fit camshafts, lining each up using service tool C 3993.

### OIL PUMP

#### Overhaul

12.60.32

#### Dismantling

Remove the oil pump.

Unscrew the four bolts and detach the bottom cover.

Withdraw the inner and outer rotors from the oil pump body.

**NOTE:** Do not attempt to separate the inner rotor from the shaft.

### Inspection

Thoroughly clean all components.

Check that the clearance between the lobes of the inner and outer rotors (1, Fig. 53) does not exceed 0.15 mm (0.006 in).

Check that the clearance between outer rotor and pump body (1, Fig. 54) does not exceed 0.25 mm (0.010 in).

Check that the end-float of the rotors (1, Fig. 55) does not exceed 0.06 mm (0.0025 in).

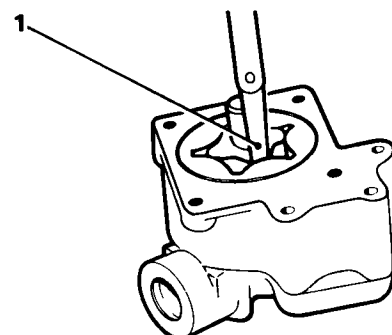


Fig. 53

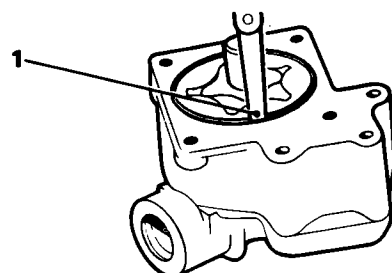


Fig. 54

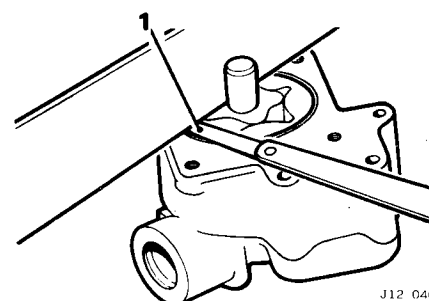


Fig. 55

**NOTE:** If necessary the outer rotor and/or body may be lapped on a surface plate to rectify.

Examine all components for signs of scoring or wear.

Ensure that the inner rotor is tight on the drive shaft.

**NOTE:** Inner rotor drive shaft and outer rotor are only available as an assembly.

Renew the 'O' ring seals in the pump body.

#### Reassembling

Assemble the inner rotor to the body.

Assemble the outer rotor to the body ensuring that the chamfered end is inserted first.

Secure the bottom cover using four bolts and lock washers.

Fit the oil pump.

## ENGINE

**Dismantle and reassemble 12.41.05**  
**Deglazing cylinder bores see page 12—21**

**Service tools:** Oil seal pre-sizing tool JD 17B; timing chain adjuster tool JD 2B; piston ring compressor 38 U3; valve timing gauge C 3993.

Drain the engine oil. For plug see item 1, Fig. 56.

Remove the torque converter—cars fitted with automatic transmission only.

Remove the clutch assembly—cars fitted with manual transmission only.

Secure the engine to an approved engine stand.

### Dismantling

Remove the distributor cap (2, Fig. 56); pull the vacuum pipe from the capsule.

Remove the ignition coil bracket from the engine.

Note the connection and remove the engine cable harness.

Slacken the clips (3, Fig. 56) on the coolant pipes at the front of the engine.

Remove the two screws (4, Fig. 56) securing the hot air duct on 3.4 litre cars only.

Remove the four plain nuts (5, Fig. 56) and spring washers securing the fan and Torquatrol unit to the water pump pulley.

Remove the air-conditioning compressor (6, Fig. 56) and bracket (7, Fig. 56)—cars fitted with air-conditioning only.

Remove the alternator and bracket (8, Fig. 56).

Remove the power assisted steering pump and bracket (9, Fig. 56).

Remove the nut securing the automatic transmission unit filler tube bracket (10, Fig. 56)—cars fitted with automatic transmission only.

### Cars fitted with exhaust gas recirculation only

Release the union nut at the E.G.R. system 'Y' piece (11, Fig. 56).

Remove the setscrew at the rear of the cylinder block securing the E.G.R. system supply pipe (12, Fig. 56).

Remove the camshaft oil feed pipe banjo bolts (13, Fig. 56).

Remove the ten dome headed nuts (14, Fig. 56) and two cross-head screws securing each camshaft cover.

Remove the dome headed nuts (1, Fig. 57) securing the crankcase breather.

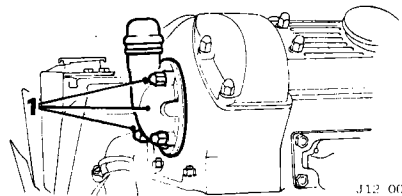


Fig. 57

Slacken the locknut and use tool JD 2B (1, Fig. 58) to slacken the top timing chain. Rotate the tool in a clockwise direction.

Knock down the tabs at the camshaft sprockets and remove the two bolts (2, Fig. 58) from each.

Rotate the engine to gain access to the remaining bolts and remove.

**CAUTION:** Engine **MUST NOT** be rotated with the camshaft sprockets disconnected and the cylinder head in place.

Draw the sprockets from the camshafts and slide the sprockets up the support brackets.

**NOTE:** Mark 'fit' holes in the adjuster plates.

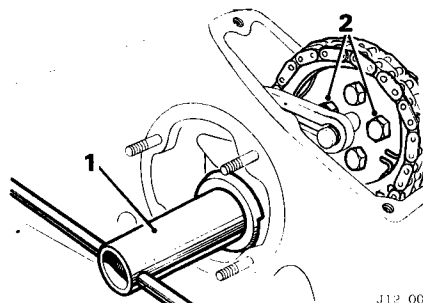


Fig. 58

Remove the fourteen cylinder head domed nuts and six nuts securing the front of the cylinder head working out from the centre.

Recover the two lifting brackets. Lift the h.t. leads clear.

Carefully lift the cylinder head assembly from the cylinder block.

**NOTE:** As the valves in the fully open position protrude below the cylinder head joint face, the cylinder head **MUST NOT** be placed joint face downwards directly on a flat surface; support the cylinder head on wooden blocks, one at each end.

Remove and discard the gasket, clean the face of the block.

On the flywheel on manual transmission cars, or the drive plate on automatic transmission cars, tap down the lock plate tabs and remove the bolts. Remove the drive plate/flywheel from the crankshaft using draw-bolts through the dowels.

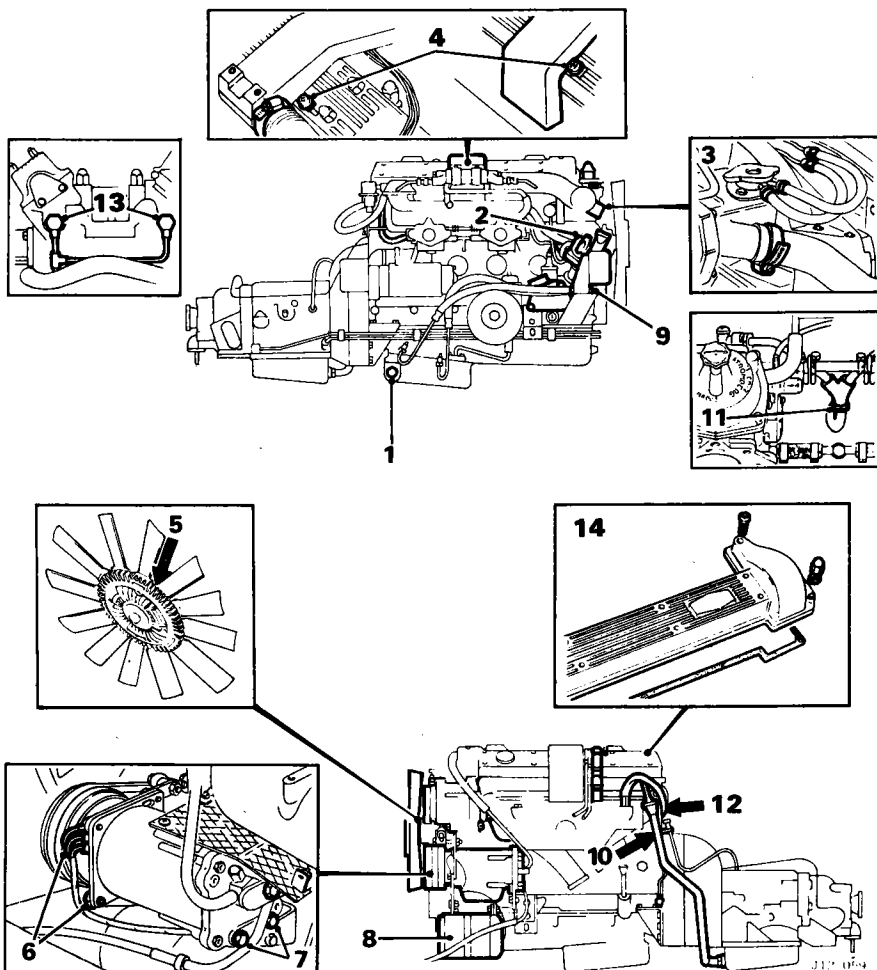


Fig. 56



Knock back the locking tabs (1, Fig. 59) on the crankshaft pulley bolts. Remove the four bolts (2, Fig. 59) securing the pulley(s) to the torsional damper. Recover the locking ring and remove the outer pulleys. Remove the large bolt (3, Fig. 59) securing the

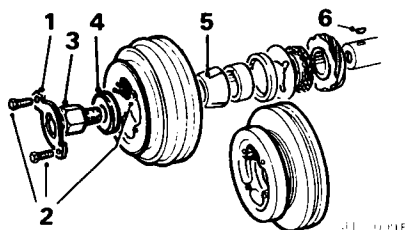
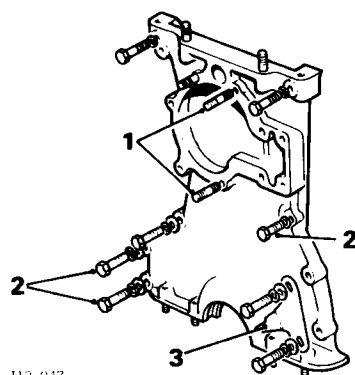


Fig. 59

torsional damper and recover the large plain washer (4, Fig. 59).

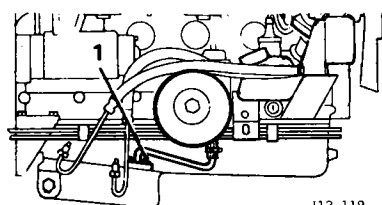
Strike the damper with a hide mallet to break the taper, and remove it from the crankshaft. Remove the cone (5, Fig. 59) and extract the Woodruff key (6, Fig. 59) from the crankshaft.



J12 047

Fig. 60

Remove the bolts, nuts and spring washers (1, Fig. 60) securing the water pump. Remove the water pump and clean all traces of gasket from the mating faces. Unscrew the oil filter canister from the housing. Slacken the hose clips on the oil return pipe to the sump.



J12-119

Fig. 61

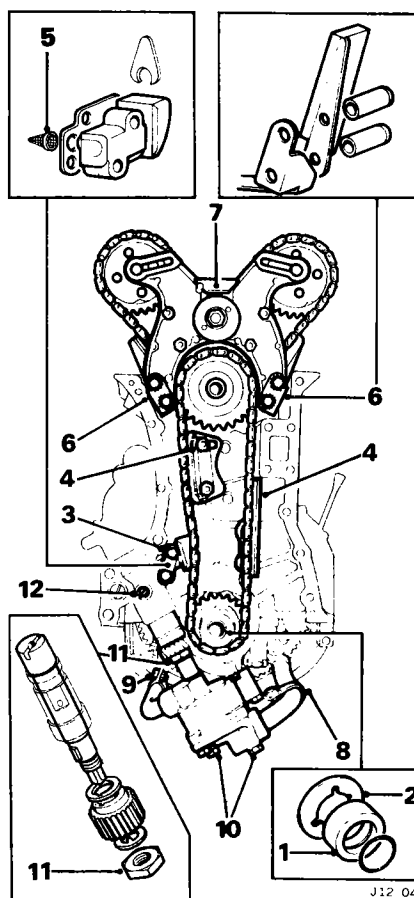
Remove the four setscrews and spring washers securing the oil filter housing to the cylinder block. Pull the housing from the return pipe and clean all traces of gasket from the mating faces.

Remove the two nuts and shakeproof washers (1, Fig. 61) and lift the return pipe from the oil sump. Check the condition of the 'O' ring seal and renew it if necessary.

Remove the setscrew, plain and spring washers and lift the distributor from the cylinder block.

Twist the dipstick tube from the cylinder block. Remove the camshaft oil feed pipe banjo bolt. Slacken the nuts, bolts and washers and draw the transmission oil cooler pipes from the brackets—cars fitted with automatic transmission only.

Remove the four nuts and spring washers, and all setscrews and spring washers securing the oil sump. Note the location of cooler pipe brackets—cars fitted with automatic transmission only.



J12 048

Fig. 62

Remove the setscrews and special washers (2, Fig. 60) and carefully prise the timing chain cover from the engine. Recover the timing pointer (3, Fig. 60).

Remove and discard the gasket and crankshaft oil seal.

Draw the distance piece (1, Fig. 62) from the crankshaft, check the condition of 'O' ring seal, and renew if necessary. Recover the oil thrower (2, Fig. 62) if fitted.

Remove the setscrews securing the lower timing chain tensioner (3, Fig. 62) and chain guides (4, Fig. 62). Recover the conical filter (5, Fig. 62) behind the tensioner.

Slacken the four setscrews and shakeproof washers (6, Fig. 62) securing the upper timing chain assembly. Do not remove the setscrews at this stage.

Withdraw the crankshaft timing gear and chain assembly (7, Fig. 62), carry out the overhaul.

Remove the self locking nuts, bolts and washers and pull the suction pipe (8, Fig. 62) from the oil sump.

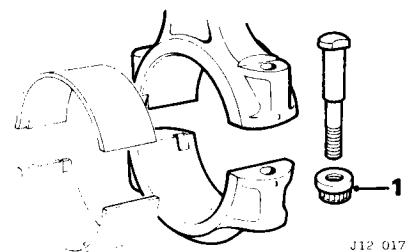
Knock down the tabs, remove the self locking nut, washer and bolt, and pull the delivery pipe (9, Fig. 62) from the oil sump.

Knock down the tabs and remove the three bolts (10, Fig. 62) securing the oil pump. Draw the oil pump clear and recover the drive coupling.

Knock down the tab washer and remove the nut (11, Fig. 62) securing the distributor drive gear.

Draw the gear and thrust washer from the shaft; remove the shaft and key.

If necessary, remove the locating grub screw (12, Fig. 62) and drift the distributor drive shaft bush downwards from the cylinder block.



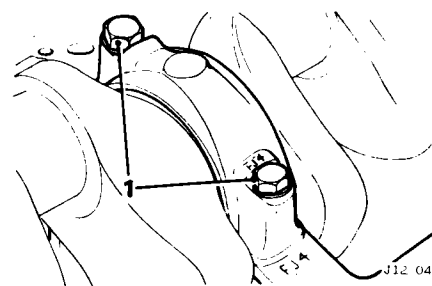
J12 017B

Fig. 63

Remove the special nuts (1, Fig. 63) securing the connecting rod bearing caps; remove the caps together with the shell bearings.

Pass the pistons up through the bores.

Remove the crankshaft rear oil seal assembly cap screws. Remove and discard the oil seal.



J12 049

Fig. 64

Remove the main bearing bolts (1, Fig. 64) and washers, noting the position of the oil pipe brackets. Remove the bearing caps.

Remove the two Allen screws securing the lower half of the rear oil seal. Prise out the seal. Remove the three Allen screws securing the upper half of the rear oil seal. Prise out the seal.

Lift the crankshaft from the cylinder block.

Recover the bearing shells.

continued

## Inspection

**CAUTION:** Ensure that all components are scrupulously clean, blow out all oil galleries in the crankcase, crankshaft and camshaft with clean, dry compressed air.

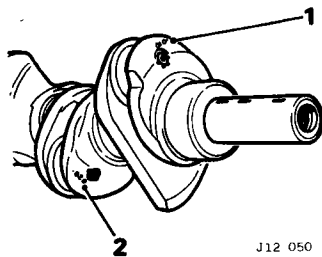


Fig. 65

Early engines prior to engine nos:-

8A15562	All 3.4
8L168437	R o W except
8L147650	UK and Europe

**a. Crankshaft.** Regrinding of the crankshaft is generally recommended when wear or ovality in excess of 0.08 mm (0.003 in) is found. Grinding may be undertaken to a limit of 0.51 mm (0.020 in). Grinding beyond the limit of 0.51 mm (0.020 in) is not recommended and in such circumstances a new crankshaft must be obtained. Oversizes of journals are stamped in the adjacent web at the forward end of the crankshaft. 1.—Main journal. 2.—Crankpin. See Fig. 65

Later engines from engine nos:

8A15562	All 3.4
8L168437	R o W except
8L147650	UK and Europe

The crankshaft of the above engines are specially hardened and cannot be reground.

**b. Cylinder Block.** Check the top face of the cylinder block for truth. Check that the main bearing caps have not been filed and that the bearing bores are in alignment. Should the caps show damage or the bearing housing misaligned, the caps must be re-machined and the bearing housings line bored. Remove the cylinder head studs (1, Fig. 66). Check the area around the studs holes for flatness (2, Fig. 66). Skim any raised areas flush with the joint face to ensure a perfectly flat sur-

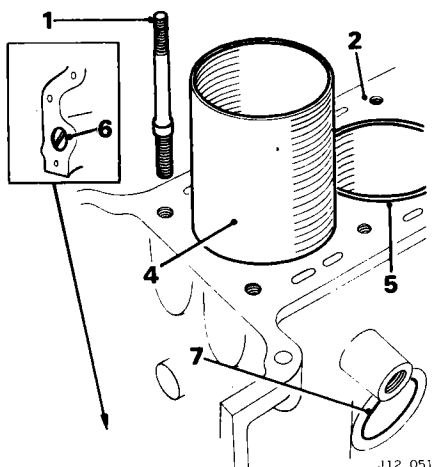


Fig. 66

face. Reboring is normally recommended when the ovality exceeds 0.15 mm (0.006 in). Reboring beyond the limit of 0.51 mm (0.020 in) is not recommended. Oversize pistons are available of this size, see group 05. If the bores will not clean out at 0.51 mm (0.020 in) new liners and standard size pistons should be fitted.

Press out the worn liners (Fig. 67) from below. Before fitting a new liner, lightly smear the cylinder walls with jointing compound to a point halfway down the bore and also smear the top outer surface of the liner (4, Fig. 66). Press in the new liners flush with the top face of the cylinder block (5, Fig. 66). Dry liners are fitted in engine manufacture to early 4.2 litre blocks, but not normally to 3.4 litre blocks.

Bore out and hone the liners to suit the grade of pistons to be fitted. (See piston grades below). See Bore Deglazing page 12—21.

Following reboring, the blanking plugs in the main oil gallery (6, Fig. 66) should be removed and the cylinder block oilways and crankcase interior thoroughly cleaned.

When dry, coat the interior of the crankcase with an oil- and heat-resisting paint.

Check all core plugs (7, Fig. 66) fitted to the cylinder block and renew any which show signs of leaking.

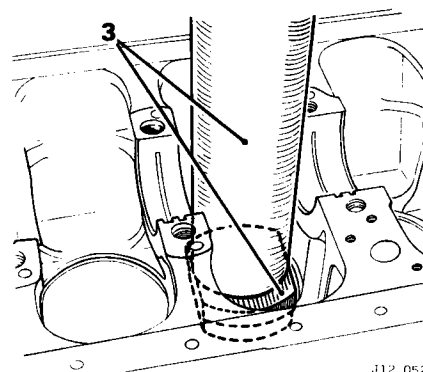


Fig. 67

## c. Piston and connecting rod

### Piston grades

The following selective grades are available in standard size pistons only. When ordering standard size pistons the identification letter of the selective grade should be clearly stated. Pistons are stamped on the crown with the letter identification and the cylinder block is also stamped on the top face adjacent to the bores.

### Grade Identification

Letter	For cylinder bore size
	3.4 Litre      4.2 Litre
F	82,989 to 82,997 mm (3.2673 to 3.2676 in)
G	83,000 to 83,007 mm (3.2677 to 3.2680 in)
H	83,010 to 83,017 mm (3.2681 to 3.2684 in)
	92,075 to 92,0826 mm (3.6250 to 3.6253 in)
	92,0852 to 92,0928 mm (3.6254 to 3.6257 in)
	92,0953 to 92,1029 mm (3.6258 to 3.6261 in)

'S' pistons are 82,995 to 83,020 mm (3.2675 to 3.2685 in) dia. across bottom of skirt for 3.4 litre engines and 92,080 to 92,105 mm (3.6252 to 3.6262 in) dia. across bottom of skirt for 4.2 litre engines.

Measure exact dimension, at right angles to the gudgeon pin, and hone the bores to 0.018 to 0.033 mm (0.0007 to 0.0013 in) more than this measured dimension when fitting 'S' pistons.

Always use new circlips on assembly.

Gudgeon pins are graded by colour coding (red or green). For identification purposes the colour coding is also indicated on the gudgeon pin hole boss on the pistons.

## Oversize pistons

Oversize pistons are available in + 0.51 mm (0.020 in) only.

There are no selective grades in oversize pistons as grading is necessary purely for factory production methods. For reboring the cylinder see the instructions given above.

If connecting rods have been in use for very high mileage, or if bearing failure has been experienced, it is desirable to renew the rod(s) owing to the possibility of fatigue.

The connecting rods fitted to an engine should not vary one with another by more than 3.5 grammes (2 drams). The alignment should be checked on an approved connecting rod alignment jig.

If alignment is incorrect, an exchange rod should be fitted.

The big-end bearings are of the precision shell type and under no circumstances should they be hand-scraped or the bearing cap filed.

The small-ends are fitted with steel-backed phosphor-bronze bushes which are a press fit in the connecting rod. After fitting, the bush should be bored, reamed and honed to a diameter of 22.225 to 22.23 mm (0.875 to 0.8752 in). Always use new connecting bolts and nuts at overhauls.

Before fitting new big-end bearings, the crankpins must be examined for damage or the transfer of bearing metal.

When a new connecting rod is fitted, although the small-end bush is reamed to the correct dimensions, it may be necessary to hone the bush to achieve the correct gudgeon pin fit.

**d. General.** Remove the oil suction strainer in the sump and clean thoroughly. Inspect all components for damage.

## Reassembling

**NOTE:** Before refitting the crankshaft the rear oil seal must be offered up and sized correctly. Before fitting the seal halves into the housing grooves, brush a thin coat of red Hermetite into both grooves for 25 mm (1 inch) from the joint face on opposite halves (from leading edge of seal on both).

Carefully tap the new rear oil seal halves (1, Fig. 68) on side face to narrow section and press into the grooves in the seal housings (2, Fig. 68). Use a hammer handle (3, Fig. 68) to roll the seal into the housing until the ends do not protrude. DO NOT cut the ends of the seal. Use a knife or similar tool to ensure that no loose strands are proud.

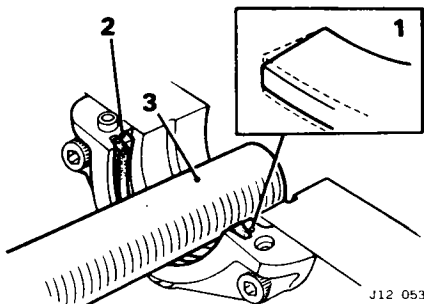


Fig. 68

Assemble the two halves of the seal and secure using two socket head screws (1, Fig. 69). Fit the rear main bearing cap without bearings and tighten the bolts to torque quoted in data sheet.

Assemble the rear oil seal housing to the cylinder block using three socket head screws.

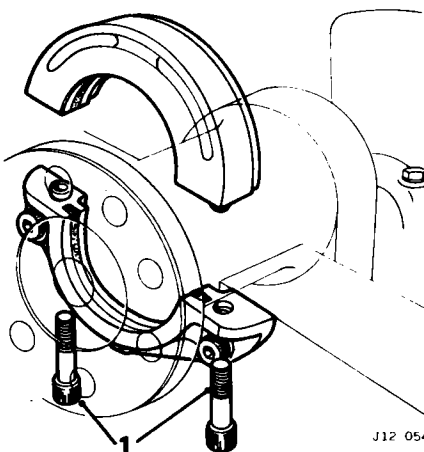


Fig. 69

Smear a small quantity of colloidal graphite around the inside surface of the oil seal and insert the sizing tool JD 17B (1, Fig. 70).

Press the tool inwards and rotate it until fully home. Withdraw the tool by pulling and twisting at the same time.

Remove and separate the rear main bearing oil seal housing and remove the rear main bearing cap (2, Fig. 70).

Check the distributor drive shaft bush for wear, and, if necessary, renew it.

Tap the bush in from the bottom of the crankcase ensuring that the locating holes line up.

Fit the locating peg.

Fit the main bearing shells in the cylinder block, lay the crankshaft in position and fit the rear oil seal housing.

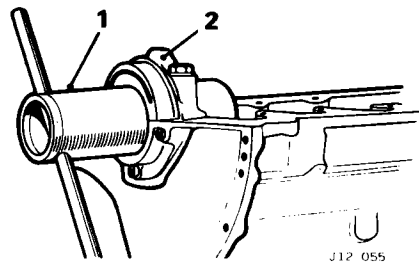


Fig. 70

Fit new thrust washers (1, Fig. 71) to centre main bearing cap, white metal side outwards. Fit the cap to the cylinder block.

Check the crankshaft end-float which should be 0.10 to 0.15 mm (0.004 to 0.006 in).

**NOTE:** Thrust washers are supplied in two sizes, standard and 0.10 mm (0.004 in) oversize and should be selected to bring the end-float within required limits. Oversize washers are stamped .004 on the steel face.

Fit the main bearing shells and caps with the numbers on the caps corresponding with the numbers on the cylinder block (2, Fig. 71).

Fit the main bearing bolts, locating the oil pipe brackets as noted, and lock washer and tighten to the correct torque.

Test the crankshaft for free rotation.

Fit the Woodruff key to the inner slot and tap oil pump/distributor drive gear into position.

Fit the pistons and connecting rods to cylinder bores and secure to crankshaft using special nuts. Check the crankshaft for free rotation.

**CAUTION:** Ensure that the pistons are fitted with 'FRONT' on each crown towards the front of the cylinder block.

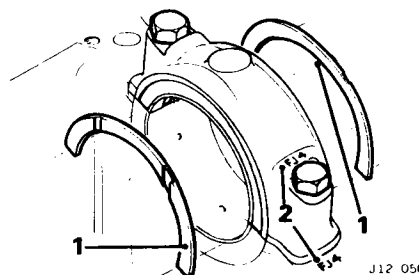


Fig. 71

Turn the crankshaft to accurately set pistons 1 and 6 to T.D.C.

Place the distributor drive shaft in position with the offset slot as shown (1, Fig. 72).

Slightly withdraw the shaft and fit Woodruff key (2, Fig. 72), thrust washer (3, Fig. 72) and drive gear (4, Fig. 72) on shaft.

Maintaining correct slot position, press the shaft into gear, ensuring that the keyway engages correctly.

Fit the pegged tab washer (5, Fig. 72) and secure it with plain nut (6, Fig. 72).

Check the end-float of the shaft. The clearance should be 0.10 to 0.15 mm (0.004 to 0.006 in).

If no clearance exists, renew drive gear. In emergency, the thrust washer can be reduced. Locate the lower timing chain dampers (7, Fig. 72) and loosely fasten.

Fit the Woodruff key to the second slot.

Offer the top and bottom timing chain assembly and chain sprockets (8, Fig. 72) into position and secure using four setscrews and locking washers (9, Fig. 72).

Position the damper in light contact with the chain and secure it.

Screw the slipper of the chain tensioner into the body casting. Fit the slip gauge or distance card (10, Fig. 72) supplied with the new tensioner to maintain a clearance of 3.17 mm (0.125 in) between slipper and body.

Locate the conical filter (11, Fig. 72) in the cylinder block.

Secure the chain tensioner to the cylinder block using two setscrews (12, Fig. 72) and lock-washers. Fit the shims as required to ensure that the slipper runs central on the chain.

Set the adjustable damper (13, Fig. 72) into light contact with the chain and secure it.

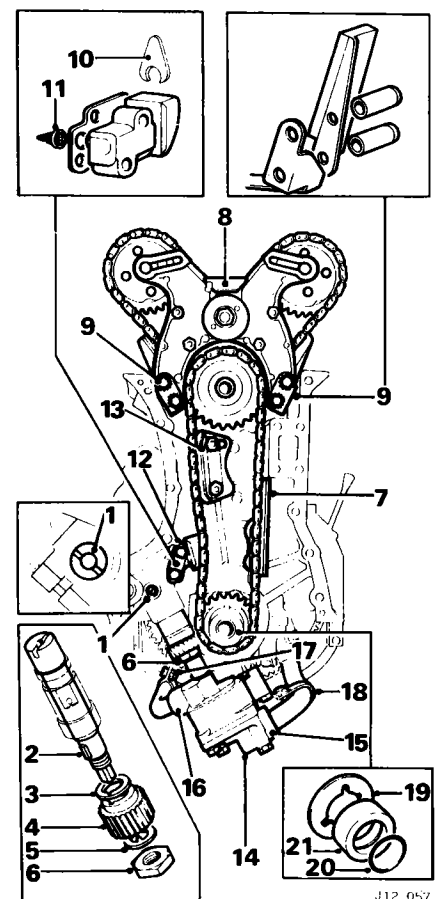


Fig. 72

Remove the slip gauge or distance card, lightly tap to release ratchet.

Locate the coupling on the oil pump (14, Fig. 72) and secure it to the front main bearing cap. Fit the lockplates and pipe bracket.

Ensure that the 'O' ring seal is fitted in the oil pump suction (15, Fig. 72) and delivery ports (16, Fig. 72).

Use a new gasket and fit the delivery pipe between the oil pump and cylinder block.

Secure the pipe clip (17, Fig. 72).

Fit the oil suction pipe and secure the pipe clips (18, Fig. 72).

continued

**NOTE:** Locate the pipe on the main bearing cap brackets so that the intake end is on the centre line of the engine.

Fit the oil thrower (19, Fig. 72) at the timing chain sprocket, if originally fitted.

Use new gaskets smeared with grease and fit the timing cover. Fit the ignition timing pointer. Liberally coat a new front oil seal with engine oil and locate it in the timing cover recess, open side inwards.

Check the 'O' ring seal (20, Fig. 72) in the distance piece (21, Fig. 72) and fit on to the crankshaft.

Use new gaskets smeared with grease and fit the oil sump. Locate the transmission oil cooler pipe brackets on cars fitted with automatic transmission only.

**CAUTION:** Ensure that the short setscrew is fitted at the front right-hand corner.

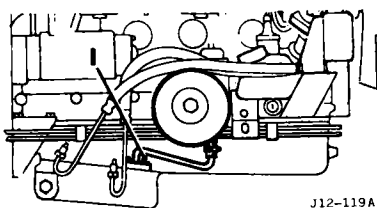


Fig. 73

Fit a new 'O' ring seal on the oil return pipe and secure it to the sump using two plain nuts and spring washers (1, Fig. 73).

Using a new gasket lightly smeared with grease, fit the oil filter housing. Locate the oil return pipe hose, oil feed pipe to camshafts and oil cooler hoses, if fitted.

Secure the housing to the block using four setscrews and shakeproof washers.

Tighten the hose clips and replace the oil pressure transmitter and pedestal.

Smear the seal of the new canister with engine oil and screw it into place by hand only. DO NOT OVERTIGHTEN.

Fit the water pump, omitting the lower right-hand bolt if the car is to Federal emission control specification.

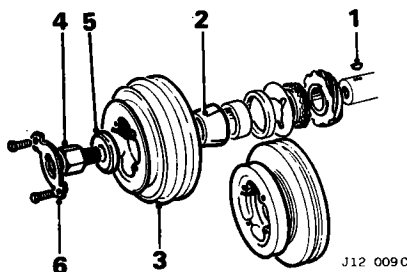


Fig. 74

Fit the Woodruff key (1, Fig. 74) to the forward slot in the crankshaft and fit the damper cone (2, Fig. 74).

Fit the Woodruff key in the damper cone and fit the torsional damper (3, Fig. 74). Secure with the large bolt (4, Fig. 74) and plain washer (5, Fig. 74).

Fit the crankshaft pulley(s) and secure using four setscrews and lockplate (6, Fig. 74).

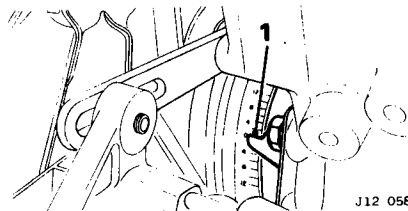


Fig. 75

Accurately set No. 1 and No. 6 pistons at T.D.C. and adjust the position of the ignition timing pointer (1, Fig. 75).

Locate flywheel/drive plate on the crankshaft and tap the dowels through. Secure using ten bolts on the new lockplate.

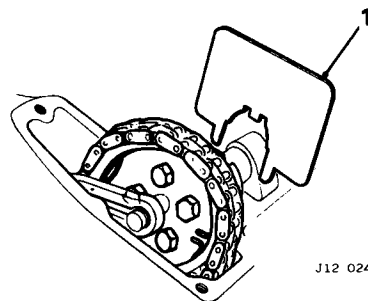


Fig. 76

Fit a new cylinder head gasket, dry, ensuring that the side marked 'TOP' is uppermost.

Check that No. 6 (front) cylinder is at T.D.C. Carefully rotate the camshafts and set with gauge C 3993 (1, Fig. 76).

**CAUTION:** Ensure that the valves do not foul each other.

Fit the cylinder head, complete with manifolds, to the cylinder block.

**CAUTION:** The engine MUST NOT be rotated until the camshaft sprockets are connected.

Fit the spark plug lead carrier brackets and lift-eyes to the appropriate studs and fit plain washers to the rest.

Fit and tighten the fourteen large dome headed nuts to the correct torque.

Fit the six nuts and spring washers across the front of the cylinder head.

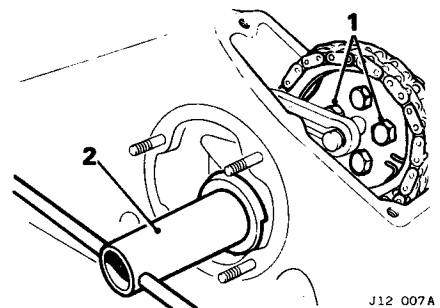


Fig. 77

Locate the camshaft sprockets on the camshafts, remove the circlips and pull the adjuster plates forward to disengage the serrations.

Rotate the adjuster plates until the 'fit' holes line up exactly with the tapped holes in the camshafts.

Fit one bolt at each camshaft.

Rotate the engine to afford access to the remaining holes and fit the bolts (1, Fig. 77). Lock the bolts at both camshafts.

Tension the top timing chain using special tool JD 2B (2, Fig. 77) until there is slight flexibility on the outer sides of the chain. Tighten the locknut.

Complete the reassembly by reversing the early dismantling operations as appropriate.

## DEGLAZING CYLINDER BORES

Should it be necessary to deglaze cylinder bores due to excessive oil consumption, the following procedure must be observed. This is the only deglazing method approved by Jaguar Service:

### Equipment

- GBD 89 mm (3.5 in) diameter 80 grit silicon carbide flex hone tool. The Flex Hone Tool is colour coded orange at the hone end of the tool.
- Variable speed electric drill, which must be capable of running at 750 rev/min unladen.

### Method

- Remove engine and dismantle as per Repair Operation 12.41.05.

**NOTE:** It is NOT necessary to dismantle the cylinder head.

- Position the dismantled cylinder block so that The Flex Hone Tool can be inserted vertically. Tape over water and oil galleries on cylinder block top face.
- Lubricate each cylinder using clean engine oil.
- Secure the Flex Hone Tool in drill.
- The Flex Hone Tool must be revolving when inserted OR removed from each cylinder, and must not be stopped and restarted during the deglazing cycle.

Using a vertical stroking motion (with flex hone already revolving), hone for 45 seconds at the rate of 2 strokes per second.

THE DURATION OF HONING TIME AND THE NUMBER OF STROKES PER SECOND MUST BE STRICTLY OBSERVED TO GIVE THE CORRECT BORE FINISH AND CROSS-HATCH SPECIFICATION.

This method has been developed and evaluated on Service cylinder blocks, and when strictly adhered to, will produce the required bore finish.

6. Cleaning:

- a. Remove oil gallery plugs and flush out oilways with suitable cleaning solvent. Replace plugs.
- b. Using soapy water, thoroughly brush cylinder bores AND crankcase.
- c. Brush the bores and crankcase with clean water.
- d. Wipe each bore with clean white cloth/tissue. Wipe all main bearing journals similarly.  
Repeat process until cloth/tissue can be removed clean.

CLEANLINESS CANNOT BE OVERSTRESSED

**IMPORTANT**

Even though excess oil consumption is diagnosed, IT MAY NOT BE NECESSARY to deglaze cylinder bores.

If there is no measurable bore wear and the cylinder walls have a surface finish as illustrated, it will only be necessary to replace pistons and/or piston rings.

