TIMING GEARS

1. Drain cooling system and lubricating oil.

2. Remove fan, water pump and alternator.

3. Remove crankshaft pulley retaining setscrew and remove pulley as follows:–

   Fit a suitable puller to the pulley and apply tension to the pulley.

   Tap the centre screw of the puller with a hammer, Fig. 1, until the pulley moves on the crankshaft.

   Remove the puller and tap the pulley back towards the block to free the tapered collar.

4. Remove the lubricating oil sump.

5. Remove timing gear cover, Fig. 2.

6. Release camshaft gear securing setscrew and fuel injection pump gear nut.

7. Remove the timing gears. The fuel injection pump gear can be removed with the special puller, Fig. 3.

8. Remove fuel injection pump from timing case.

9. Remove timing case, Fig. 4.

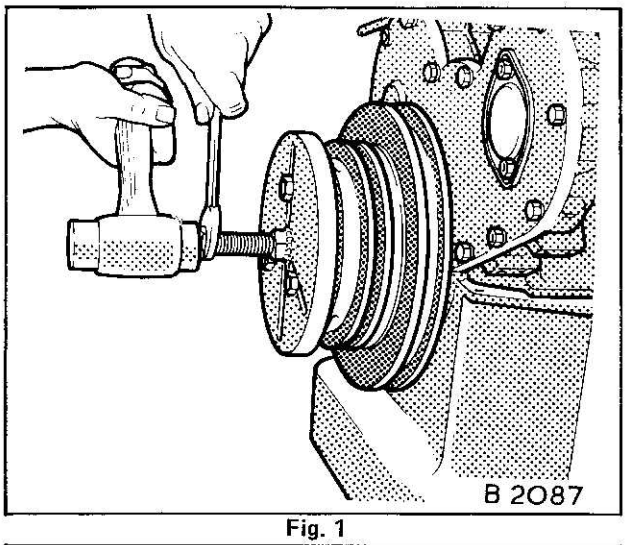

Fig. 1

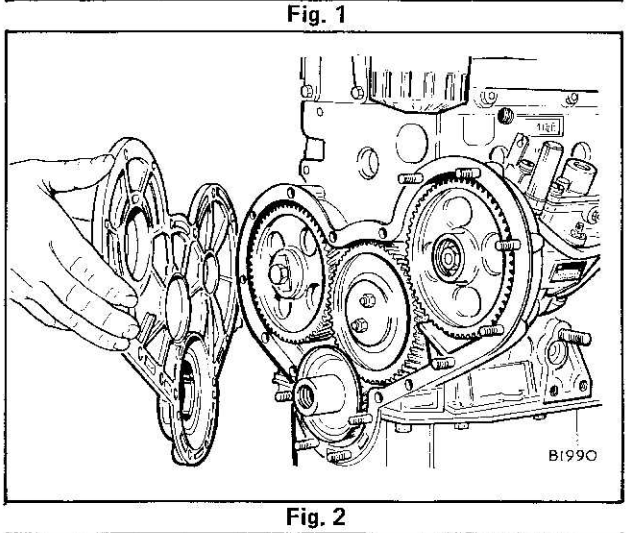

Fig. 2

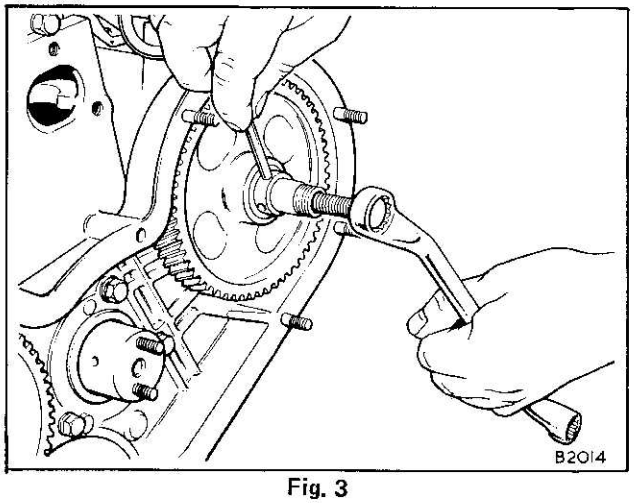

Fig. 3

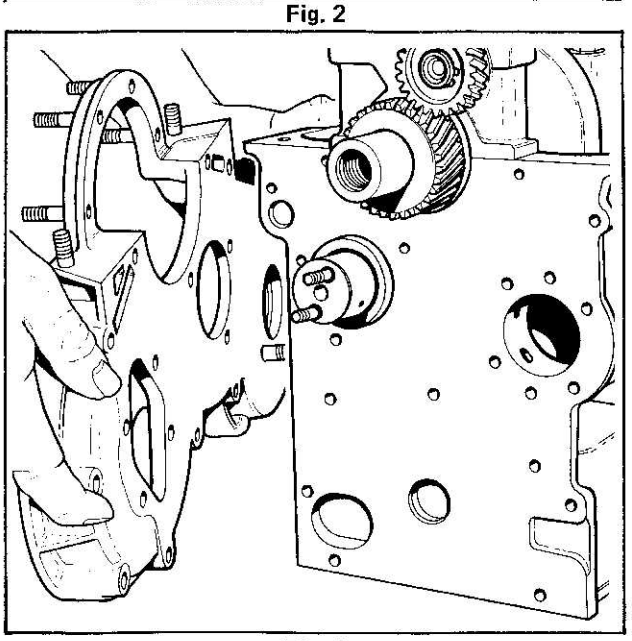
Fig. 4

ENGINE – 6.247

Timing Gears

Inspection

Clean and inspect the timing case and cover for cracks or damage. Inspect all gears, measure the idler gear and hub, renew if wear exceeds limits given in 'Data'.

To Renew the Front Oil Seal (Front Cover Removed)

Press out the old seal from the timing case cover using a suitable dolly and press, supporting the cover in the area of the seal bore.

Press in the new seal from the front of the timing case cover to the dimension given in Fig. 5.

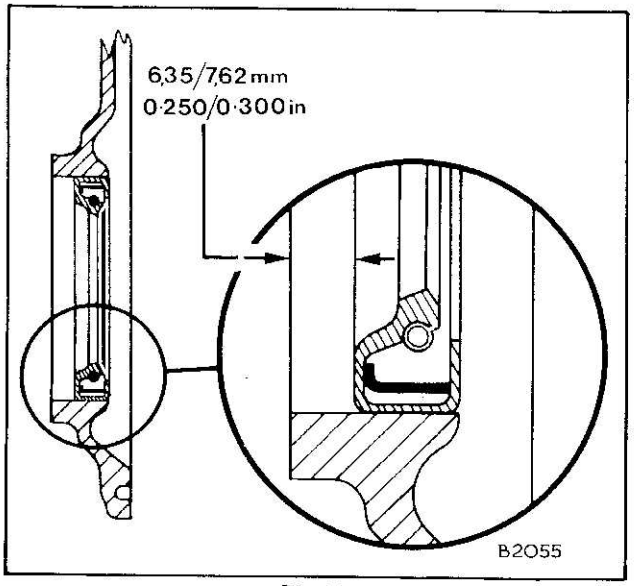

Fig. 5

To Refit Timing Case and Gears

1. Ensure that all parts are clean, fit the idler gear hub, Fig. 6.

2. Fit the timing case with a new gasket and secure with setscrews, ensuring the lower edge of the case is flush with the sump face of cylinder block. Fit the fuel injection pump to the timing case.

3. Fit the timing gears ensuring the timing marks are correctly aligned, Fig. 7, and tighten to torque given in 'Data'. If the cylinder head is fitted and the crankshaft and/or camshaft have to be turned, then the rocker assembly may have to be released.

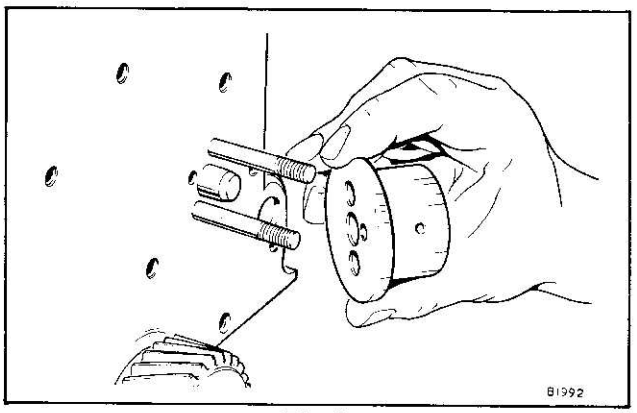

Fig. 6

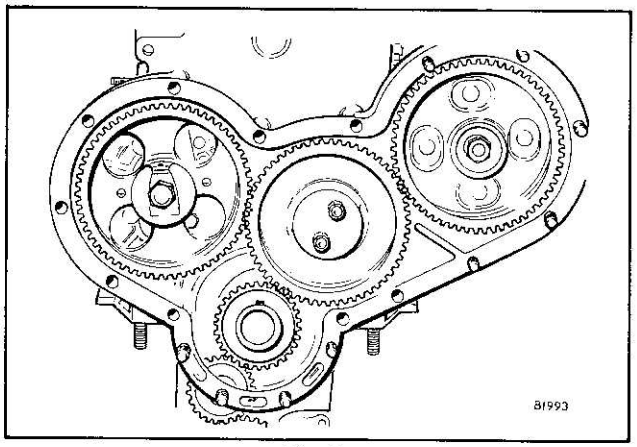

Fig. 7

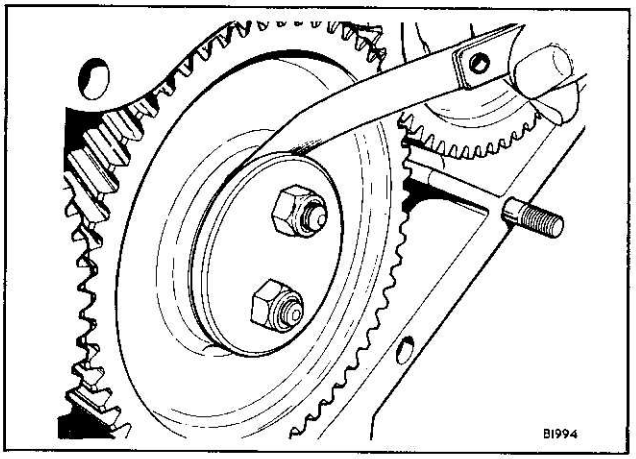

Fig. 8

4. Check idler gear end float, Fig. 8. See 'Data' for tolerances and check that there is at least 0,08 mm (0.003 in) backlash between all timing gears, Fig. 9.

5. Ensure that the oil deflector is in position, fit the timing gear cover with a new gasket and before tightening, temporarily position the crankshaft pulley to ensure correct location of oil seal and cover.

6. Refit lubricating oil sump, using new gaskets.

7. Refit crankshaft pulley.

8. Refit the water pump, alternator, cooling fan and pulley, and fill the cooling system.

9. Fill sump to correct level with approved oil.

10. Check the fuel injection pump timing.

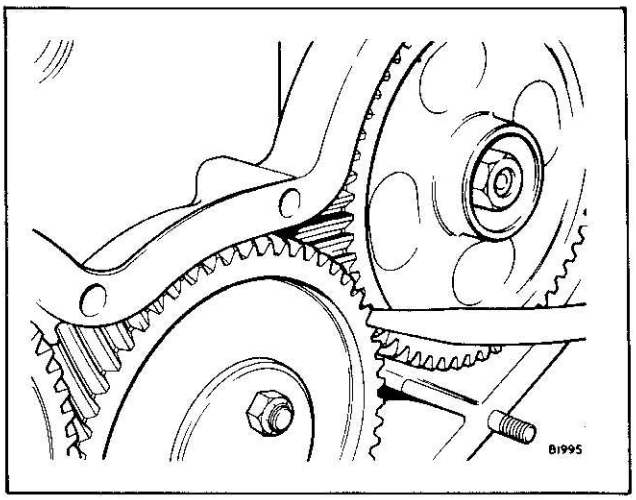

Fig. 9

To Remove Camshaft and Tappets

1. With the engine removed from the vehicle, drain lubricating oil and remove sump.

2. Remove timing gear cover and camshaft gear as detailed previously. Remove idler gear.

3. Remove fuel lift pump.

4. Remove rocker assembly and push rods.

5. Remove camshaft thrust plate, Fig. 10.

6. Invert engine and carefully remove camshaft (Fig. 11).

7. Remove tappets, Fig. 12.

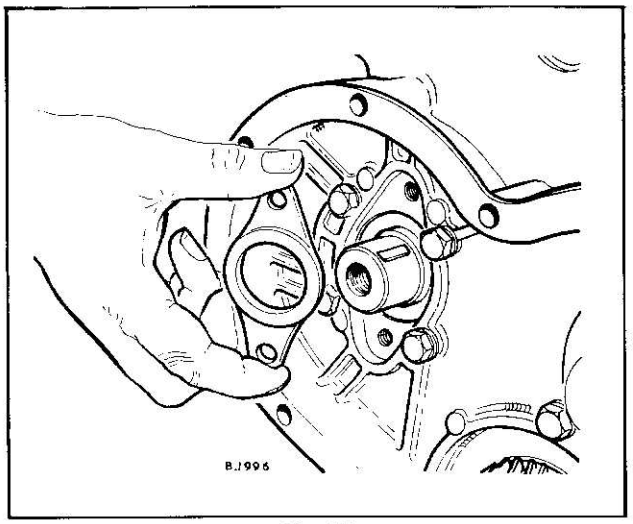

Fig. 10

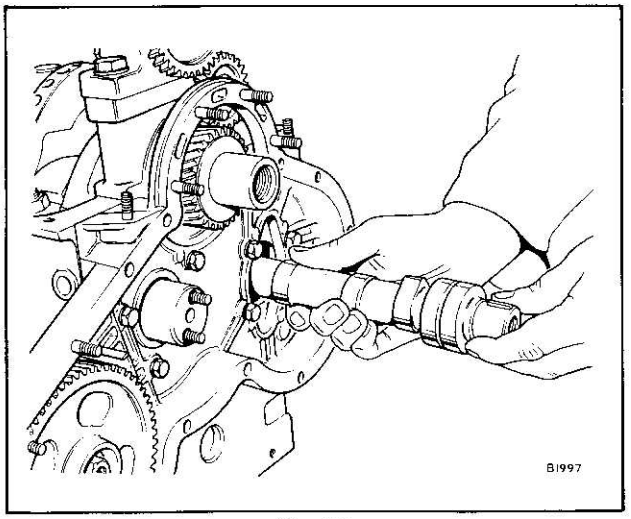

Fig. 11

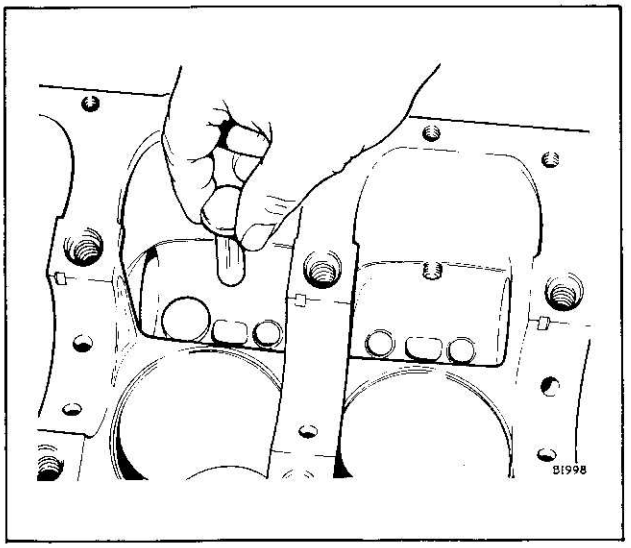

Fig. 12

Inspection

Check the camshaft for damage and the tappet contact faces for wear.

Check the camshaft journals, cams and tappets' diameters to the limits given in 'Data'.

Renew where necessary.

To Refit Camshaft and Tappets

1. Liberally oil and refit tappets, Fig. 12.
2. Oil and replace camshaft.
3. Fit thrust plate and tighten to torque given in 'Data'.
4. Fit camshaft gear with new tabwasher, tighten securing setscrew to correct torque and check end float to limits given in 'Data'. If correct, lock setscrew.
5. Fit idler gear ensuring that marked teeth are in mesh, Fig. 13
6. Fit push rods and rocker assembly and re-tighten cylinder head (Section A330).
7. Fit fuel lift pump.
8. Fit lubricating oil sump.

TIMING

Gear Timing Marks

On production, timing marks are stamped on the mating teeth of the crankshaft, idler, camshaft and fuel injection pump gears with No 1 piston at T.D.C. compression stroke, Fig. 13.

Due to the different speeds of rotation, the marked teeth of the idler gear will not necessarily mesh with the marked teeth of the other gears in this position after the initial setting.

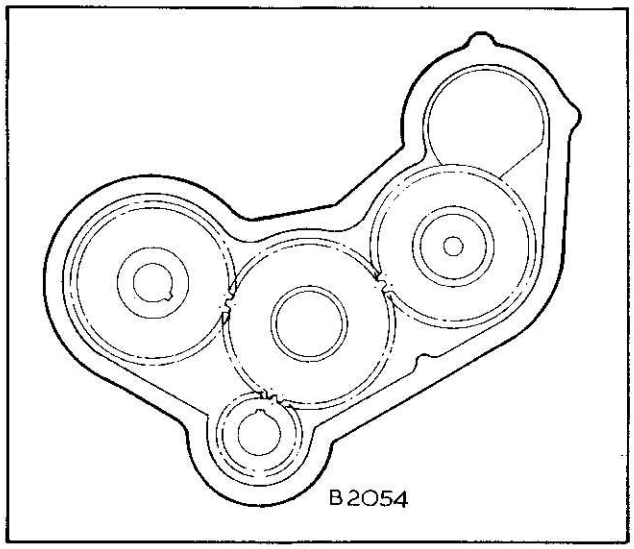

Fig. 13

Static Injection Timing

There are no timing marks on either the flywheel or crankshaft pulley. To enable the static injection timing to be checked, it is first necessary to determine T.D.C. using the valve drop method and a dial test indicator.

To determine T.D.C.

Remove rocker cover.

Turn engine until valves are rocking on number 6 cylinder.

Reset tappets of number 1 cylinder to: Inlet 1,02 mm (.040 in), exhaust 0,84 mm (.033 in).

Release adjusting screw of number 12 rocker, remove circlip and washer from rear of rocker shaft.

Slide number 12 rocker from shaft.

Depress valve cotter plate, remove cotters, plate and spring, and allow valve to drop onto piston. Wrap elastic band around the valve to prevent it dropping into the cylinder when engine is turned.

Assemble a D.T.I. to number 12 valve stem tip.

Rock the engine until the highest reading is obtained on D.T.I. dial, then set to zero.

Turn engine clockwise until valves are rocking on number 1 cylinder and have an equal valve nip, using feeler gauge of approximately 0,075 mm (.003 in).

The D.T.I. on number 12 valve should now read zero (T.D.C.) or be within 0,10 mm (.004 in) of zero (T.D.C.).

Note: If the checking procedure has been correctly carried out, the engine should be at T.D.C. $\pm 2\frac{1}{2}^{o}$ as equal valve nip is obtained on number 1 cylinder. If incorrect, remove the timing cover and reset timing gears.

There is no adjustment for valve timing. If the timing is incorrect, the gears are probably not in correct mesh—one tooth will give an error of 12^{o} at the flywheel. When the timing is found to be correct, reset the valve tip clearances on number 1 cylinder.

Refit the rocker cover.

Checking Fuel Injection Pump Timing

Fuel Pump Timing

With the clock gauge set up as previously described, disconnect the stop cable from the pump control lever.

The pump timing can be checked or set, using the fuel pump cam lift measuring tool PD158, as follows:—

Remove the rocker cover.

Turn the crankshaft in the normal direction of rotation, clockwise from the front, until No 1 piston is at T.D.C. compression stroke. In this position, the flywheel T.D.C. mark lines up with the timing pointer and the valves of No 6 cylinder are rocking, i.e. the period between the opening of the inlet valve and the closing of the exhaust valve.

Thorougly clean the top of the fuel injection pump.

Remove the top cover of the pump and fit the timing tool in position, Fig. 14, ensuring that the operating arm of the tool locates on the rear face of the cam ring, as shown in Fig. 15. Make sure that no dirt enters the pump when the top cover is removed.

Fit the dial indicator to the tool with the plunger resting on the arm and fix in position with the plunger depressed approximately 2,5 mm (0.1 in).

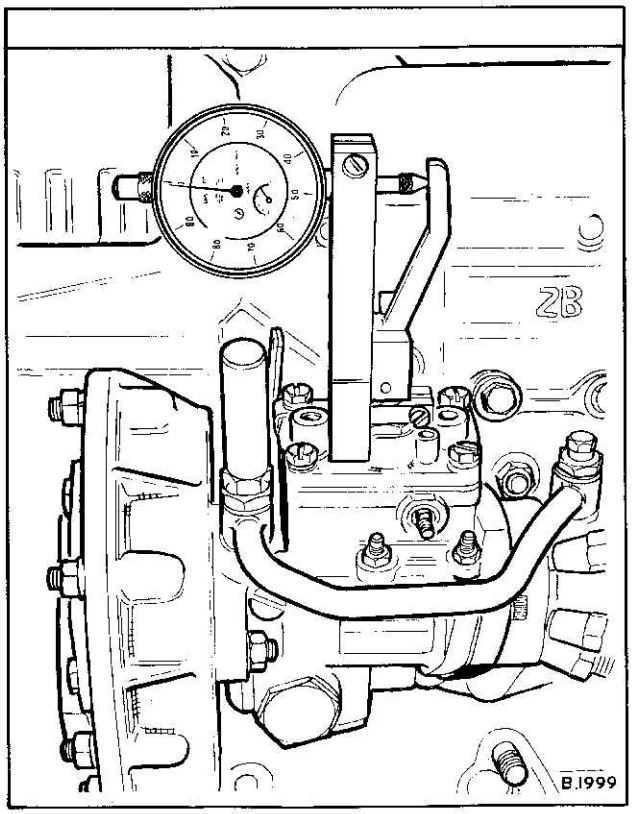

Fig. 14

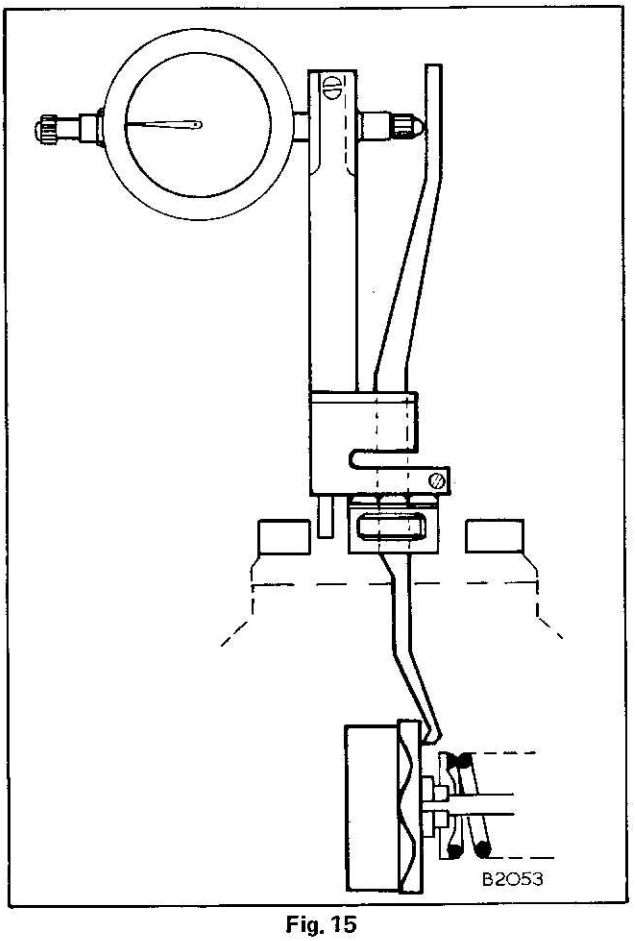

Fig. 15

Whilst observing the dial indicator, turn the crankshaft slowly anti-clockwise until the plunger reaches its maximum extension (i.e. nil cam lift) and zero the dial of the indicator at this point.

Check by continuing to turn the crankshaft anti-clockwise, until the full cam lift of 2,18/2,22 mm (0.0858/0.0874 in) is obtained.

Then turn the crankshaft back in a clockwise direction past the original nil cam lift position and continue until the plunger is depressed by 1,0 mm (0.0394 in), i.e. 1 mm cam lift. In this position, the crankshaft should be at 6° before T.D.C. and this can be checked at the flywheel as detailed under 'Crankshaft Timing Arrangement' above. If the timing is incorrect, it should be adjusted as detailed below.

Turn the crankshaft anti-clockwise a quarter of a turn and then clockwise until the crankshaft is positioned at 6° before T.D.C. as indicated at the flywheel.

Note: The 6° B.T.D.C. is the equivalent of 0,36 mm (0.014 in) valve movement B.T.D.C.

Release the pump securing nuts.

If the cam lift exceeds 1,0 mm (0.0394 in), turn the pump anti-clockwise (from the rear) until 1,0 mm cam lift is obtained and secure the pump.

If the cam lift is less than 1.0 mm (0.0394 in), turn the pump clockwise past the 1,0 mm lift point and then anti-clockwise to the 1,0 mm position and secure the pump. This method ensures that the backlash is taken up.

After setting the timing, turn the crankshaft anti-clockwise a quarter of a turn and then clockwise and recheck the timing. When the timing is correct, remove the timing tool and refit the pump top cover and pipes.

If the fuel pump flange timing mark is no longer in line with the mark on the setting case, remove the existing mark on the pump flange and scribe a thin line on the flange aligning with the mark on the timing case.

Refit the rocker cover.

Reconnect the stop control cable to the fuel pump lever ensuring that with the cable fully retracted the correct clearance of 1,25 mm (0.05 in) exists between the lever and its stop.

Bleed the fuel system.