

TIMING COVER

FRONT COVER PLATE (Removal for inspection purposes)

Tool required: FR 101

The plate can be removed with the engine in situ as follows:-

1. Disconnect the battery.
2. Remove the fan belt.
3. Use tool FR 101 to hold the crankshaft pulley while removing the pulley securing bolt, then remove the pulley/torsional vibration damper assembly.

CAUTION; Remove the damper with care to avoid damage to the 'V' belt groove, the deflector or the damper mounting.

Remove by applying hand load to one side of the damper whilst giving the other side a sharp rap with a soft faced hammer.

4. Remove the bolts securing the front cover plate and pull it clear.
5. Refitting is the reverse procedure, but it is important to fit the crankshaft pulley securing bolt as follows:

Apply Loctite to the threads of the crankshaft pulley bolt, hold the pulley with tool FR 101 and tighten the bolt to the correct torque.

TIMING BELT

Remove

Tools required: MS 1517, FR 101.

The timing belt can be removed in situ by first carrying out the following two operations.

1. Disconnect the battery.

2. Drain the cooling system, remove the bonnet, bonnet closing panel and radiator.

3. Remove the fan belt.

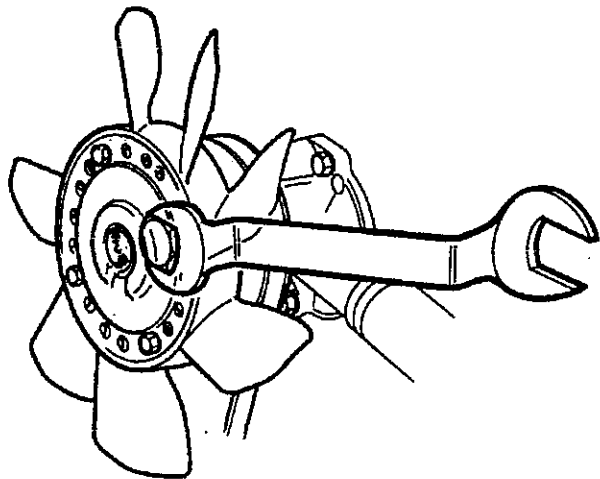


Fig.1 Using tool MS 1517 to release fan assembly

4. Remove the fan by using special tool MS 1517 to release the nut retaining the fan assembly

NOTE; nut has left hand thread.

If the special tool is unavailable unscrew the nuts securing the fan to the viscous coupling, slide the fan rearwards to gain access to the nut behind the coupling, release the left hand thread nut and unscrew the coupling to lift the fan clear.

5. Remove the water pump.
6. Use tool FR 101 to hold the crankshaft pulley while removing the pulley securing bolt, then remove the pulley/torsional vibration damper assembly.
7. Remove the front cover plate.
8. Temporarily fit the crankshaft pulley bolt and rotate the crankshaft clockwise until the timing marks on each gear are aligned with the arrows cast in the front cover.

NOTE: On 14J engines the pop mark on the injection pump pulley is the timing mark.

15J engines use the scribed line next to the 'F' mark.

9. Release the tensioner fixing nuts and move the tensioner to release the timing belt tension. Remove the tensioner.

CAUTION: If the belt is to be refitted, mark its direction of rotation with chalk or other soft substance before removal.

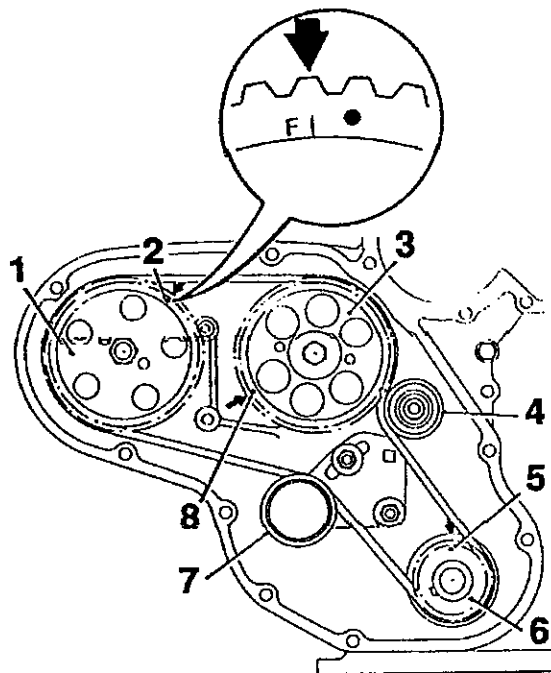


Fig.2 Timing Marks

1. Injector pump pulley
 2. Injector pump timing marks
 3. Camshaft pulley
 4. Idler pulley
 5. Crankshaft timing marks
 6. Crankshaft pulley
 7. Timing belt tensioner
 8. Camshaft timing marks
10. Carefully withdraw the belt from the pulleys taking care not to rotate the pulleys.

NOTES RE STORAGE AND HANDLING OF TIMING BELTS.

Correct storage and handling of timing belts is very important, and the following points must be observed.

1. A timing belt is constructed with a reinforcement of glass fibre running circumferentially inside it. Do not attempt to lever a belt on or off its pulleys as this may damage the glass fibre; use finger pressure only.
2. Timing belts must be stored flat and circular; never hang on a peg.
3. A timing belt must be renewed if contaminated with oil, fuel or other detrimental fluids.
4. Correct tensioning procedures are essential.
5. Do not crimp or bend to a diameter of less than 25mm (1 in).
6. Timing belt pulleys have a smooth finish to prolong belt life. If a new wheel is being fitted, make sure it has no burrs or rough surfaces.

TIMING PULLEYS, FRONT COVER AND SEALS

Remove

Tools required: 18G 1464, 18G 1457

The timing pulleys and the front cover can be removed with the engine in situ by first removing the timing belt as described in the section "Timing Belt - removal", then proceed as described from '1' below.

Make sure the timing marks on the injection pump, camshaft and crankshaft pulleys are aligned (see fig.2) before removing the timing belt.

CAUTION: Do not rotate the crankshaft, camshaft or fuel injection pump whilst the timing belt is removed.

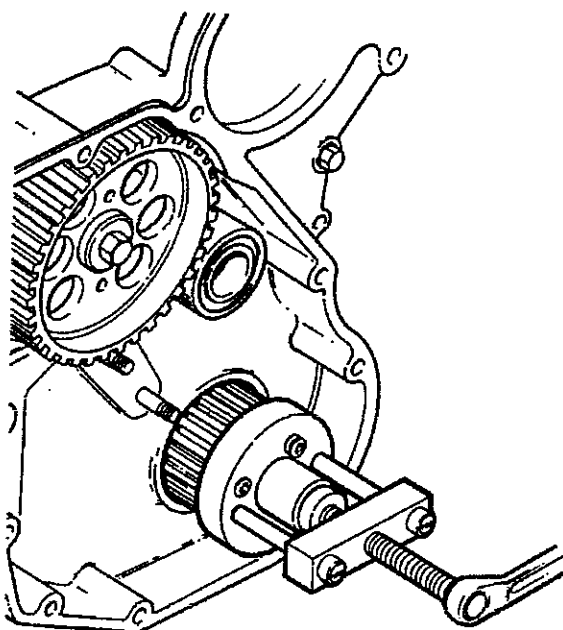


Fig.3 Crankshaft pulley removal with 18G 1464

1. Withdraw the crankshaft pulley using tools 18G 1464/2, 18G 1464/4 and button 18G 1464/6.

NOTE: Two keys are fitted to the crankshaft.

2. Remove and discard the oil seal behind the crankshaft pulley.

CAUTION: Do not damage the aluminium cover.

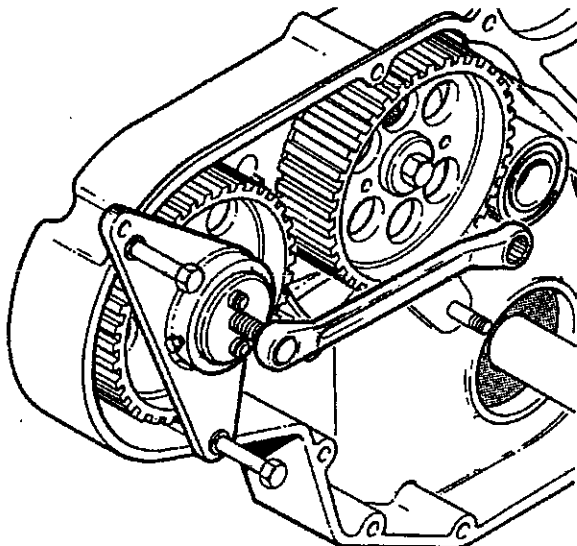


Fig.4 Injection pump pulley removal with 18G 1457

3. Remove the stiff nut securing the injection pump pulley, and withdraw the pulley using tool 18G 1457.

NOTE: The oil seal behind the pulley is an integral part of the injection pump.

4. Remove the bolt securing the camshaft gear retaining plate. Withdraw the bolt together with the washer, small 'O' ring seal, retaining plate and large 'O' ring seal, noting the relative locations for re-assembly.

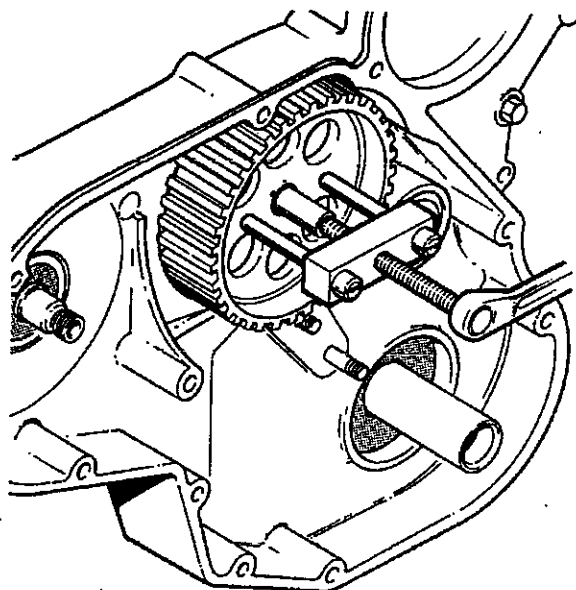


Fig.5 Camshaft pulley removal with 18G 1464

5. Withdraw the camshaft pulley using tool 18G 1464/2/6.
6. Remove and discard the oil seal behind the camshaft pulley without damaging the aluminium front cover.

If the front cover is to be removed, proceed as follows:

7. Remove the three nuts attaching the injection pump to the front cover.
8. Drain the engine oil and remove the sump.

9. Remove the bolts and Allen screw attaching the front cover to the block, and ease the cover from its dowel locations.
10. Remove and discard the gaskets. Note the gasket located on the tensioner mounting bolts.

Fitting front cover and pulleys

Tools required: 18G 1456, 18G 1482, LST 107, 18G 1458, MS 1517, FR 101.

1. Make sure all joint faces are clean and free of old gasket material, then fit a new joint gasket, triangular gasket and water gallery gasket.
2. Fit and secure the front cover with two bolts and an Allen screw. Apply Loctite to the Allen screw

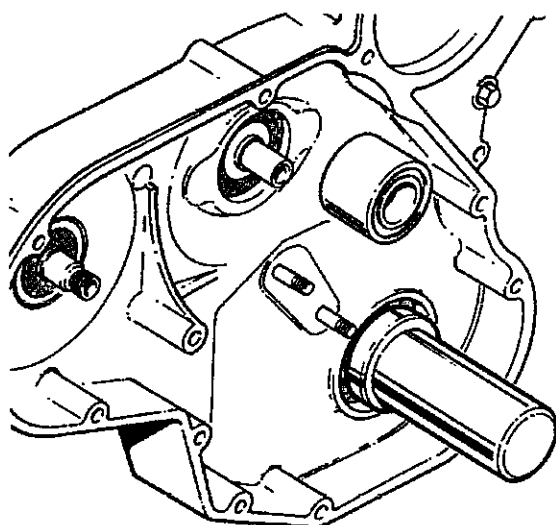


Fig.6 Fitting crankshaft seal with 18G 1456

3. Lubricate the lip of a new crankshaft oil seal, then drive it into position using tool 18G 1456. The seal must be fitted with its lip side leading, and be positioned flush with the front face of the cover.
4. Ensure the two keys are fitted to the crankshaft then use a suitable tubular drift to drive the crankshaft pulley into position.

NOTE: The pulley is fitted with the timing dot outwards.

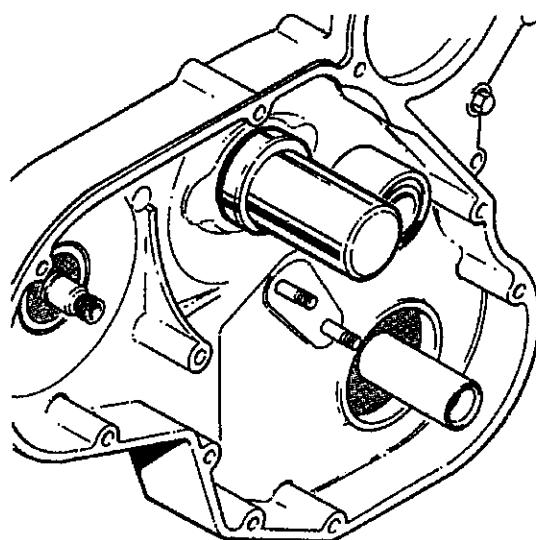


Fig.7 Fitting camshaft seal with 18G 1482

5. Lubricate the lip of a new camshaft seal, then drive it into position using tool 18G 1482. Fit the seal with its lip side leading, and flush with the front face of the cover.
6. Restrain the camshaft from moving rearwards, and fit the camshaft pulley in the following way:
 - a. Fit the woodruff key to the camshaft, and lubricate the thrust and seal faces of the camshaft pulley

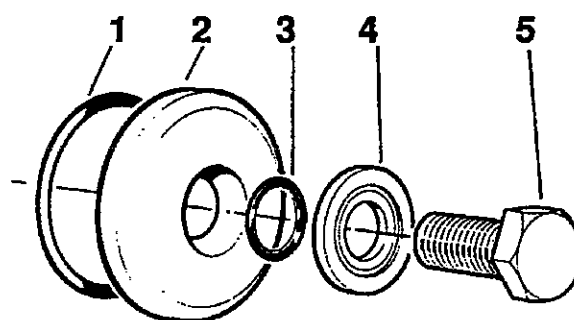


Fig.8 Camshaft pulley fixing

1. 'O' ring
2. Retaining Plate
3. 'O' ring
4. Washer
5. Bolt

- b. Position the camshaft pulley, and use the centre bolt with a large flat washer (not the fitted retaining plate) to draw the pulley onto the camshaft. Then remove the bolt, fit to it the retaining plate washer, new 'O' rings and plain washer as illustrated. Refit the bolt, tightening it to the correct torque.
7. Fit the three washers and nuts which hold the injection pump to the front cover.
8. Ensuring that the woodruff key is correctly located, fit the injection pump pulley and tighten the stiff nut to the correct torque.

Timing

The camshaft and the injection pump are both timed to the crankshaft using a specific exhaust valve peak position of number one cylinder. This is known as the 'E.P.' position, which is determined by a slot in the flywheel being aligned with a hole in the flywheel housing.

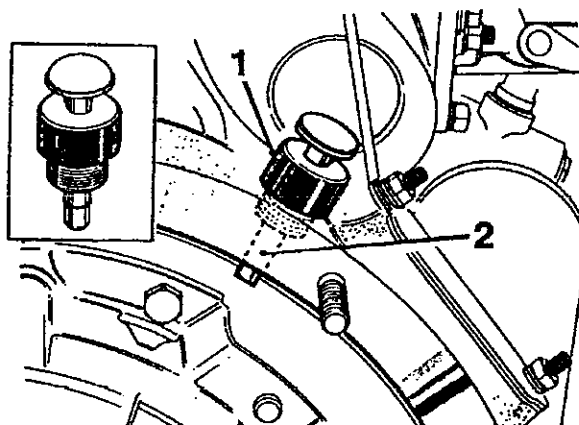


Fig.9 Timing pin LST 107 fitted to flywheel housing

1. LST 107 body
2. LST 107 pin

A special tool LST 107 is used to locate the crankshaft at the E.P. position. The body of the tool locates in the hole in the flywheel housing, and the pin in the tool will drop into the slot in the flywheel at the E.P. position.

Fitting the timing belt

1. Fit the body of tool LST 107, then temporarily fit the crankshaft pulley bolt and turn the engine clockwise until the tool pin drops into the E.P. slot. The timing dot on the crankshaft pulley will now align with the corresponding mark in the front cover.

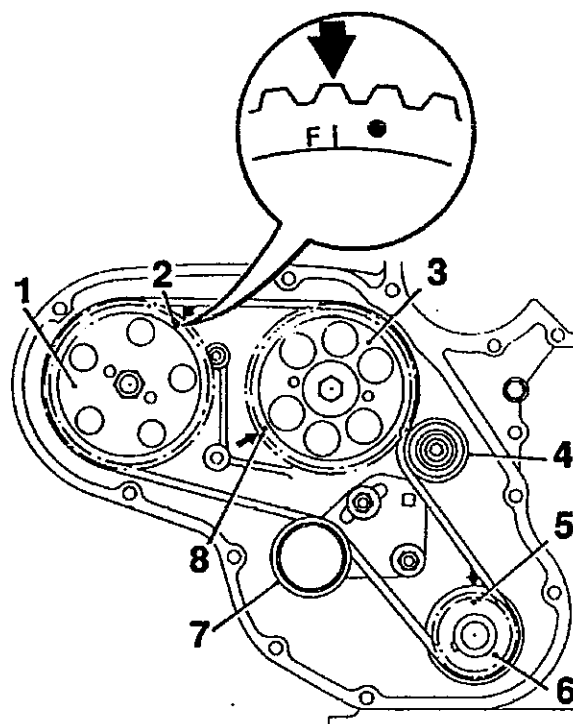


Fig.10 Timing marks

1. Injector pump pulley
2. Injector pump timing marks
3. Camshaft pulley
4. Idler pulley
5. Crankshaft timing marks
6. Crankshaft pulley
7. Timing belt tensioner
8. Camshaft timing marks

2. Turn the injection pump pulley to align the timing marks:
14J engines - pop mark
15J engines - scribed line adjacent to the 'F' mark
3. Turn the camshaft pulley until the timing dot aligns with the cast arrow inside the front cover.

4. Carefully fit the timing belt, using only hand pressure to ease it on to the pulleys. Fit it first over the crankshaft pulley and whilst keeping the belt under tension by hand, run the belt under the idler pulley and over the camshaft pulley. Should the belt not quite mate with the grooves, turn the camshaft pulley the required amount. Feed the belt over the injection pump pulley and, if necessary, turn the pulley slightly to locate the belt.
5. Fit the timing belt tensioner and loosely secure with its washers and nuts.
6. Withdraw the special tool timing pin LST 107 from the flywheel slot.

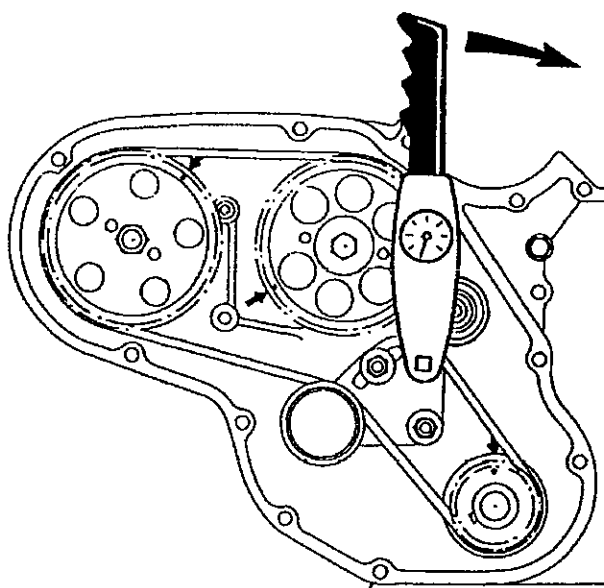


Fig.11 Adjusting belt tension using direct scale read-off torque wrench

7. Using a direct scale read-off torque wrench (not a break-action type) in a vertical position, insert the drive peg into into the square hole in the tensioner base plate. Apply a load of 10.5 to 13 Nm (8 to 10 lb.ft.) if a new belt, or 9 to 11 Nm (6.5 to 8 lb.ft) if an old belt and, whilst maintaining this loading, tighten the two tensioner clamping nuts to 22 to 28 Nm (17 to 20 lbf.ft).
8. Rotate the engine clockwise two complete revolutions, then slacken the two tensioner clamping nuts and repeat the tensioning operation described above.

NOTE: Failure to repeat the tensioning procedure in this way will result in incorrect belt tension and may lead to premature belt failure.

9. Check that all the timing marks align - crankshaft, camshaft and timing pulleys. If there is any misalignment the foregoing timing procedure must be repeated.

Timing the injection pump

10. Locate the E.P. position using tool LST 107; ensure that No. 1 cylinder exhaust valve is fully open..

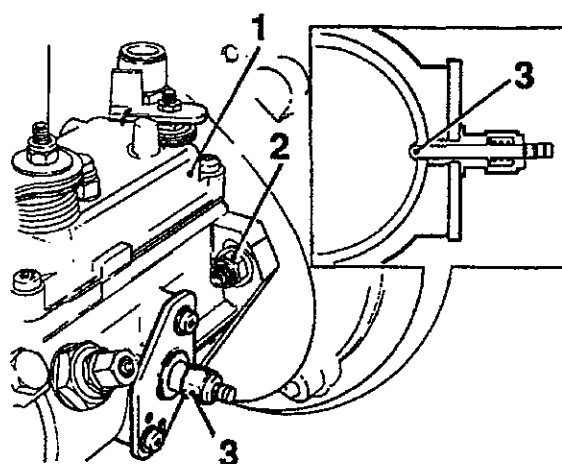


Fig.12 Injection pump timing

1. Injection pump
2. Injection pump mounting nut
3. Timing tool 18G 1458

11. Remove the plug from the side of the injection pump and fit tool 18G 1458.
12. Slacken the three forward pump mounting nuts, the bolt at the rear bracket, (if vacuum pump is fitted at this stage) and the injector pipe unions. Turn the pump in clockwise and anti-clockwise directions, and it will be seen that the tool plunger will move inward and then outward again. Turn the pump until the tool plunger reaches its maximum inward position.
13. Tighten the pump three forward mounting nuts, the bolt at the rear bracket (if fitted at this stage) and the injector pipe unions.

14. Remove tool 18G 1458 and refit the plug to the pump. Remove timing pin LST 107 and refit the plug to the flywheel housing.
15. Remove the crankshaft pulley bolt.

Completion of front end rebuild

16. Fit the front cover plate.
17. Fit the torsional vibration damper to the crankshaft. Apply Loctite to the crankshaft pulley bolt, hold the pulley with tool FR 101 and tighten the bolt to the correct torque.
18. Fit the water pump using a new gasket.
19. Fit the fan using MS 1517.
20. Fit the fan belt and adjust to the correct tension.
21. Fit the sump (if removed) and fill the engine with the correct grade of oil (See cylinder block section for correct sump fitting procedure).

Dependent on the amount of overhaul work that has been carried out, if the work has been done with the engine in situ, some or all of the following operations will be necessary:

22. *Fit the radiator and connect the hoses.*
23. *Fit the bonnet closing panel and the bonnet.*
24. *Fill the cooling system.*
25. *Connect the battery.*
26. *Start the engine and run until normal temperature is reached. Check the coolant level and top up as necessary*

Refit

12. Locate a new steel sealing washer into the injector bore, with the raised corrugation uppermost. (A piece of welding wire or a thin bladed screwdriver may be helpful to guide the washer into its correct position.)
13. Apply a light coating of grease to the copper sealing washer and position it in the injector bore. Fit the injector, secure with the nuts and washers and progressively tighten the nuts to the correct torque.
14. Refit the spill rails and injector feed pipes.
15. Start the engine and check for leaks.

INJECTION PUMP

The camshaft and the injection pump are both timed using a specific exhaust valve peak position of number one cylinder; this is known as the 'E.P' position.

The 'E.P' position is determined by a mark on the crankshaft pulley being aligned with a mark on the timing cover plate or, more positively, by a slot in the flywheel being aligned with a hole in the flywheel housing. A special tool LST 107 is used to align the flywheel position.

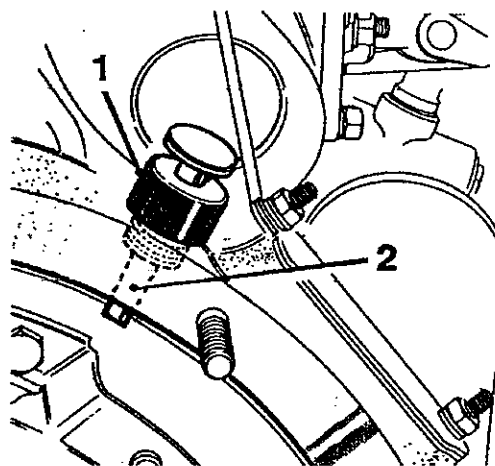


Fig 3 Timing pin LST 107 fitted to flywheel housing

1. LST 107 body
2. LST 107 pin

To use LST 107, locate the body of the tool in the hole in the flywheel housing and turn the engine over until the tool pin drops into the slot in the flywheel. Check that number one exhaust valve is fully open; if so, the engine is now correctly at the 'E.P' position for timing purposes. If No. 1 exhaust valve is not open, turn the crankshaft one complete revolution and realign the 'EP' position with tool LST 107.

WARNING: Do not attempt to turn the engine with tool LST 107 in place, as the tool will be damaged beyond repair.

Remove

Tools required: 18G 1457, LST 107

1. Disconnect the battery.
2. Turn the engine to the 'E.P' position with No. 1 exhaust valve fully open.
3. Disconnect and remove the fuel injection pipes.
4. Disconnect the fuel inlet and return pipes.
5. Release the throttle cable and disconnect the stop solenoid cable.
6. Remove the engine vacuum pump to release the injection pump rear mounting bracket.
7. Remove the rubber plug from the timing cover plate.

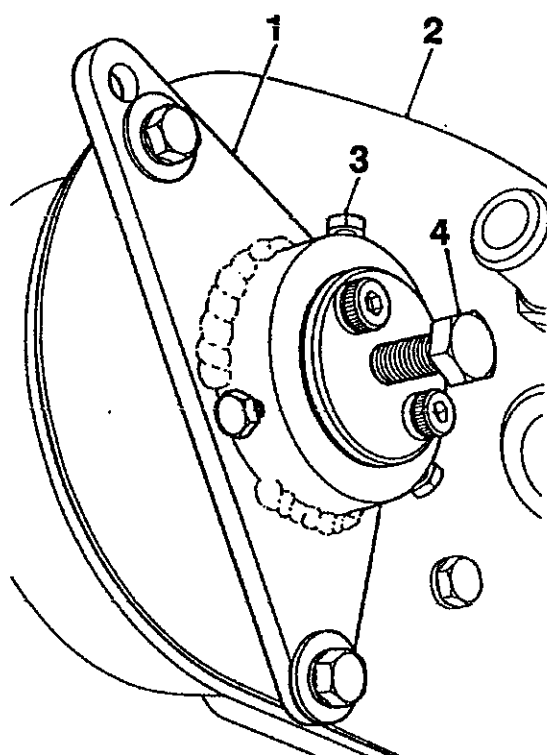


Fig 4 Tool 18G 1457 in position

1. 18G 1457
2. Timing cover plate
3. Attaching screws
4. Centre bolt

8. Remove the injector pump pulley nut; screw the centre bolt of tool 18G 1457 outwards then fit the tool as illustrated. The attaching screws must be tightened progressively and evenly to ensure the pulley cannot turn.

NOTE: DO NOT rotate the engine after this point until the pump is refitted securely and the tool is removed.

9. Remove the three nuts and washers which secure the pump to the timing cover.
10. Use the centre bolt of tool 18G 1457 to push the injection pump rearwards free of its pulley, then lift the pump clear. Screw the tool centre bolt outwards.

Refit

Tools required: 18G 1457, 18G 1458, LST 107

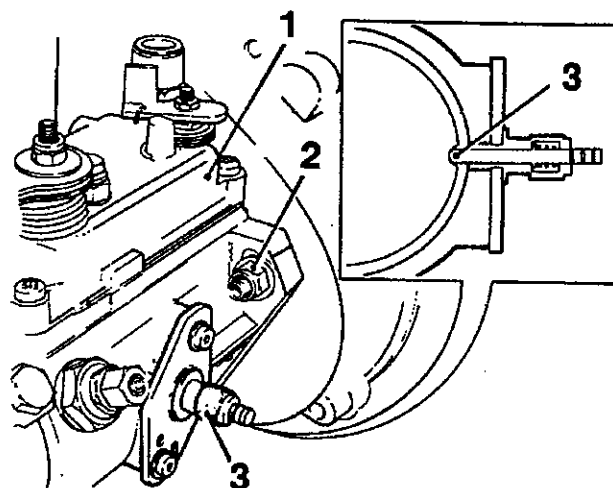


Fig 5 Tool 18G 1458 in position

1. Fuel injection pump
2. Pump securing nut
3. Tool 18G 1458

11. Clean the injection pump and timing cover faces.
12. Remove the blanking plug from the injection pump casing and fit timing tool 18G 1458 as illustrated. Turn the pump drive shaft until the spring loaded plunger of the tool drops into the groove in the pump. The pump is now timed to the 'E.P' position.
13. Offer up the pump to the timing cover aperture, ensuring that the drive shaft key and the pulley keyway are aligned. Loosely secure the pump to the timing cover with three nuts and washers.
14. Remove tool 18G 1457 and fit the pump pulley securing nut, tightening it to the correct torque. Refit the timing cover plate rubber plug.

15. Check that the engine is still at the 'E.P' position, then rotate the pump slightly in clockwise and anti-clockwise directions whilst observing the plunger of timing tool 18G 1458, until the plunger is in its maximum inward position. Tighten the three pump securing nuts.
16. Remove flywheel timing pin tool LST 107, remove pump timing tool 18G 1458 and refit the blanking plug.
17. Refit the vacuum pump with new gaskets, at the same time securing the pump rear mounting bracket.
18. Refit the throttle cable, ensuring that the pump mechanism is up against the anti-stall screw. Refit the stop solenoid cable.

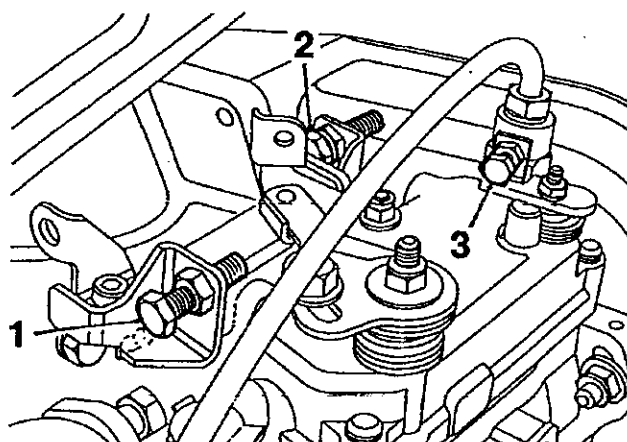


Fig 6 Injection pump adjusting points

1. Maximum speed screw
 2. Anti-stall screw
 3. Idling speed screw
19. Reconnect the fuel inlet and outlet pipes and refit the fuel injection pipes.
 20. Reconnect the battery and start the engine. If the engine fails to start, bleed the system.
 21. When normal running temperature has been reached, check the idle speed and adjust the idle speed screw if necessary.

FUEL LIFT PUMP

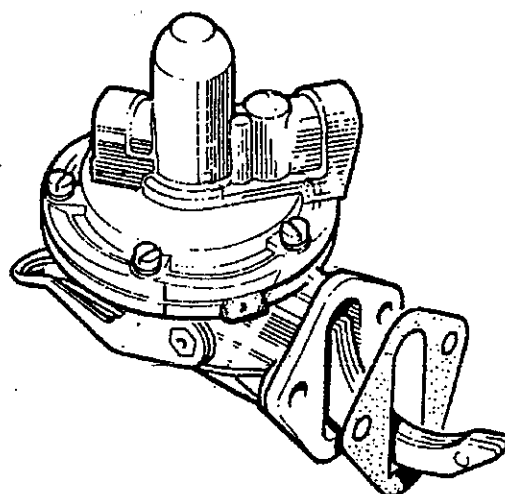


Fig 7 Fuel lift pump.

Remove

1. Disconnect the fuel pipes at the pump.
2. Remove the fixings and withdraw the pump from the engine.

Overhaul

1. Mark the upper and lower halves of the pump casing to ensure correct alignment on reassembly. Remove the top half securing screws and, while pressing the diaphragm tab against the pump body, lift the top clear.
2. Ease the diaphragm from the body, slightly depress the metal part of the diaphragm and turn through 90° to allow the spring to push the diaphragm clear.
3. File the peening marks from the oil seal housing, lever out the seal and retainer.
4. Remove the rocker arm retainers, rocker arm, rocker arm pin and washers. Detach the operating link and withdraw the spring.
5. Inspect all parts for damage, wear or corrosion, renew the diaphragm assembly if any sign of hardening, cracking or porosity is present.