Chapter 11-1

DIESEL FUEL SYSTEM

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INTRODUCTION

1 This Chapter details the Unit and Field repairs for the Fuel System fitted to Land Rover 90 and 110 vehicles with 2,5 litre diesel engines.

TABLE 1 SPECIAL TOOLS

Ser No (1)	Manufacturers Part No (2)	NSN/Part No where applicable (3)	Designation (4)
1	18G 1457	6MT2/5120-99-725-6475	DPS pump removing tool
2	18G 1458	6MT2/5120-99-725-6476	DPS pump timing tool
3	LST 107		Flywheel timing pin
4	RO 600964		Spanner, fuel tank unit

DPS FUEL INJECTION PUMP

Removal

2 To remove the DPS fuel injection pump proceed as follows:

2.1 Disconnect the battery leads and where applicable the leads from the radio batteries.

2.2 Refer to Chap 1 Para 59 and insert the flywheel timing pin (Table 1 Serial No 3).

2.3 Disconnect the fuel feed pipes (Fig 1 (1)) at the delivery valves (2) and at the fuel injectors and remove.

2.4 Disconnect the fuel inlet pipe (3), spill return pipe (4) and the electrical connection (5) from the solenoid.

2.5 Remove the oil filter adaptor assembly (6) to provide clearance for the pump to be drawn rearwards.

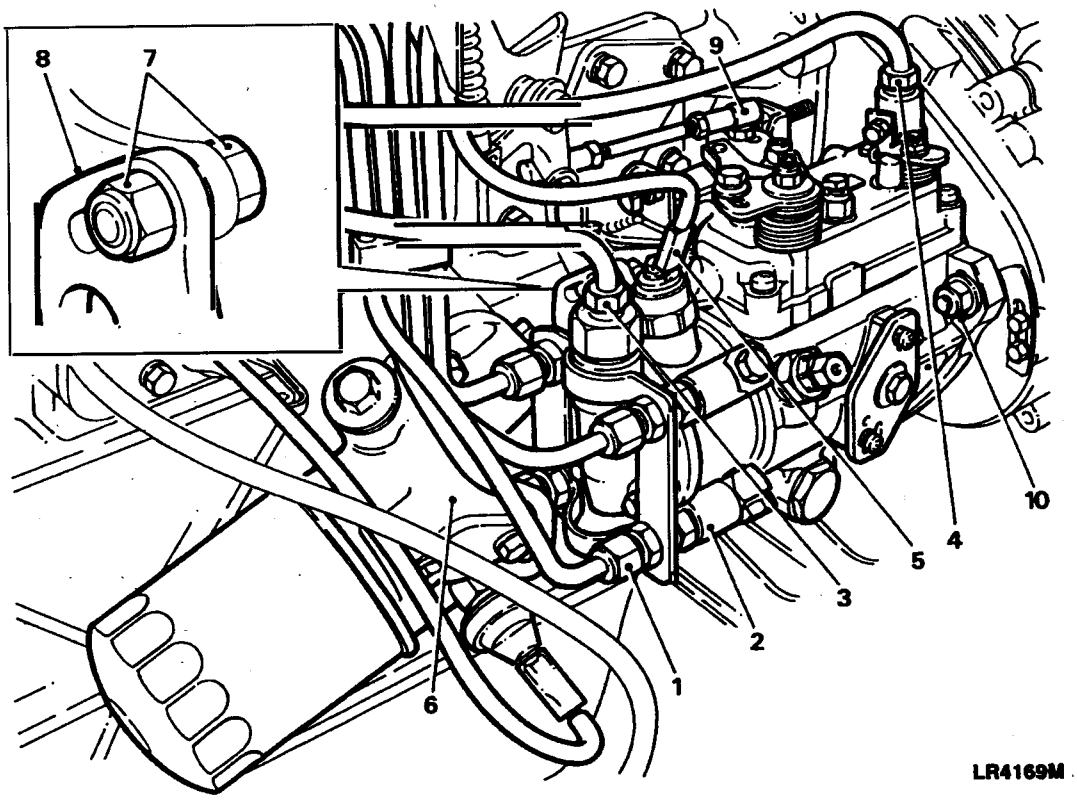
2.6 Remove the nut and bolt (7) securing the rear end of the pump to the support bracket (8).

2.7 Disconnect the throttle linkage at the ball pin (9) on the throttle lever.

2.8 Remove the inspection plate (Fig 2 (1)) from the front cover (2).

2.9 Using a suitable socket spanner, remove the nut (3) securing the pump pulley to the drive shaft (4).

2.10 Remove the two front cover securing bolts (5) complete with hose clip (6) and fit the outer part of special tool (7) (Table 1 Serial Number 1). When fitting the special tool two plain washers must be inserted between the tool and the cover to compensat for th gap.



1	Fuel feed pipes	6	Oil filter adaptor
2	Delivery valves	7	Nut and bolt
3	Fuel inlet pipe	8	Support bracket
4	Spill return pipe	9	Ball pin-throttle lever
5	Solenoid electrical connection	10	Securing nuts

Fig 1 DPS pump removal

2.11 Fit the centre part of the special tool and screw the 'Allen' screws into the DPS pump pulley. To centralise the tool adjust the thre side screws

2.12 Slacken off, but do not remove, the three nuts (Fig 1 (10)) securing the pump to the rear casing.

2.13 Screw in the centre bolt of the special tool in a clockwise dir ction to release the pump from the pulley. Remove the three securing nuts and withdraw the pump from the engine. Discard joint gasket.

2.14 Slacken off the centre bolt and leave the tool in position until the pump is refitted.

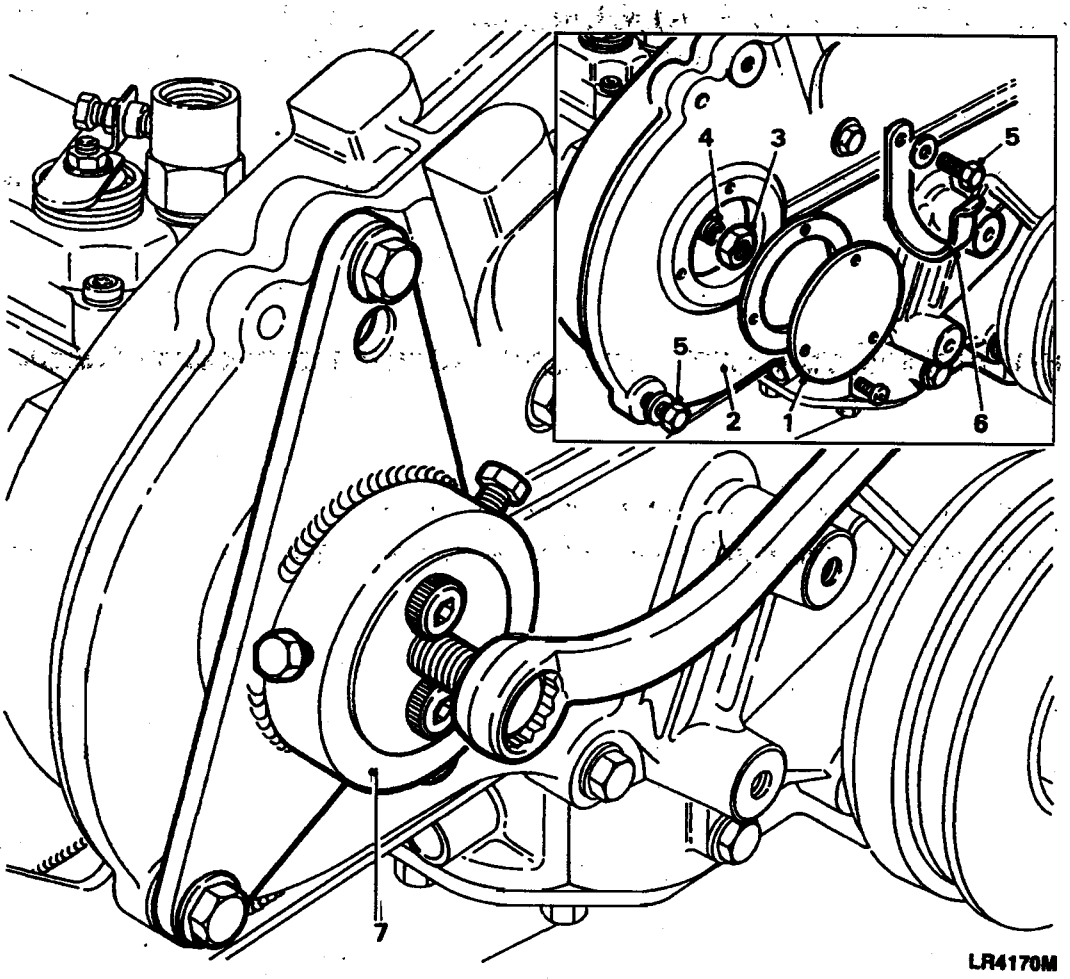
Dismantling

Special tools

3 Special tools for overhauling and testing the DPS injection pump are listed in AESP 2910-F-101-302 and ETS 06009.

Note ...

Before commencing dismantling, clean the exterior of the pump using a suitable proprietary cleaning fluid or kerosene.



1	Inspection plate	5	Securing bolts
2	Front cover	6	Hose clip
3	Nut-pulley retaining	7	Special tool
4	Drive shaft		

Fig 2 DPS pump timing pulley retaining tool

Timing cov r plate

4 To remove the timing cover plate proceed as follows:

4.1 Turn the pump on its side, timing cover plate (Fig 3 (14)) uppermost.

4.2 Loosen the plug (16) and using special tool bit CAV Part Number 7244-438 and a suitable socket, remove the two 'Torx' screws (17), shakeproof washers (18) and cover plate (14) from the pump housing (12). Discard the shakeproof washers (18).

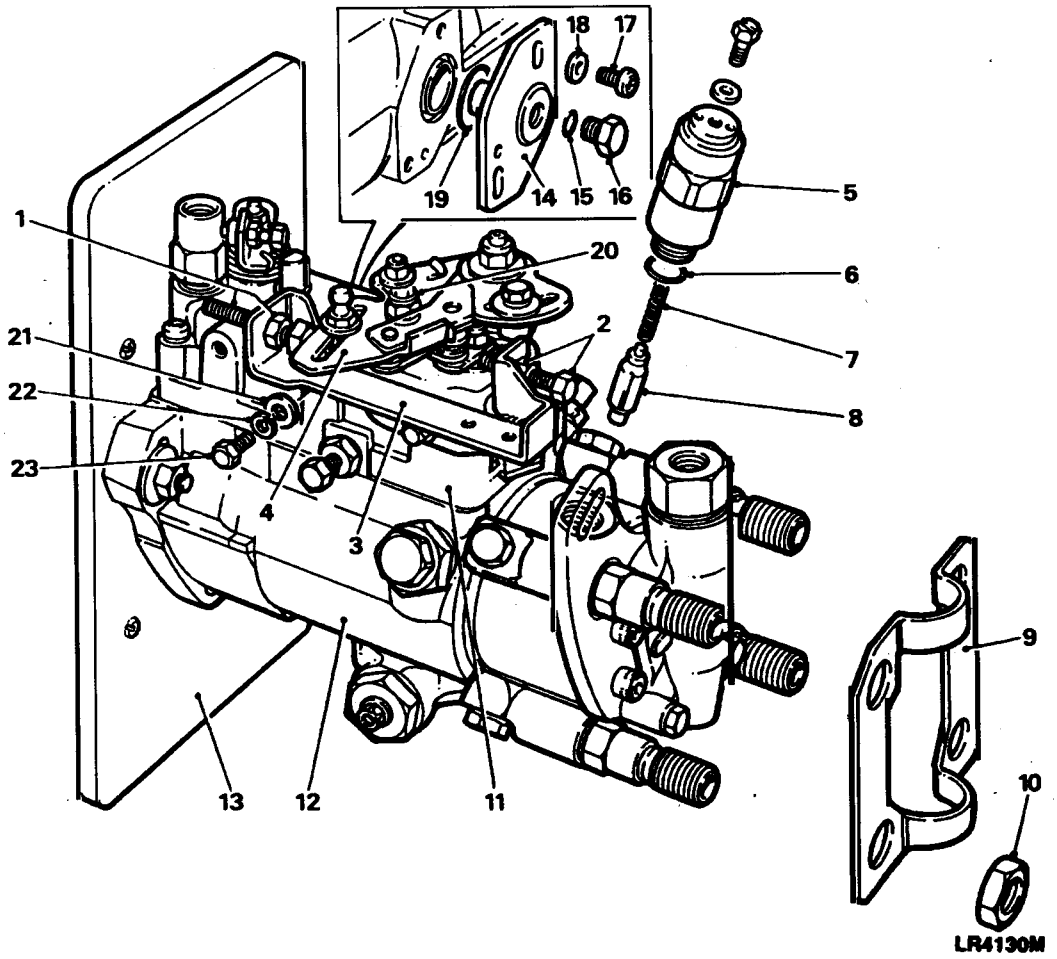
Note ...

Some earlier pumps were fitted with socket head screws (17). Remove using special tool CAV Part Number 7244-249.

4.3 Remove the plug (16) from the cover plate (14), detach and discard the 'O' ring seal (15).

4.4 Remove and discard the 'O' ring seal (19) from the recess in the pump housing.

4.5 Invert the pump and drain any remaining fuel into a suitable container.



1	Anti-stall screw washer and locknut	8	Plunger	17	'Torx' screw
2	Max. speed screw and locknut	9	Support bracket	18	Shakeproof washer
3	Throttle control bracket	10	Nut-support bracket	19	'O' ring seal
4	Throttle lever	11	Governor control cover	20	Vent screw
5	Solenoid	12	Pump housing	21	Washer
6	'O' ring seal	13	Mounting fixture	22	Spring washer
7	Spring	14	Timing cover plate	23	Set bolt
		15	'O' ring seal		
		16	Plug screw-cover plate		

Fig 3 Throttle control bracket, solenoid and timing cover plate ass mbly

Excess fuel linkage spring

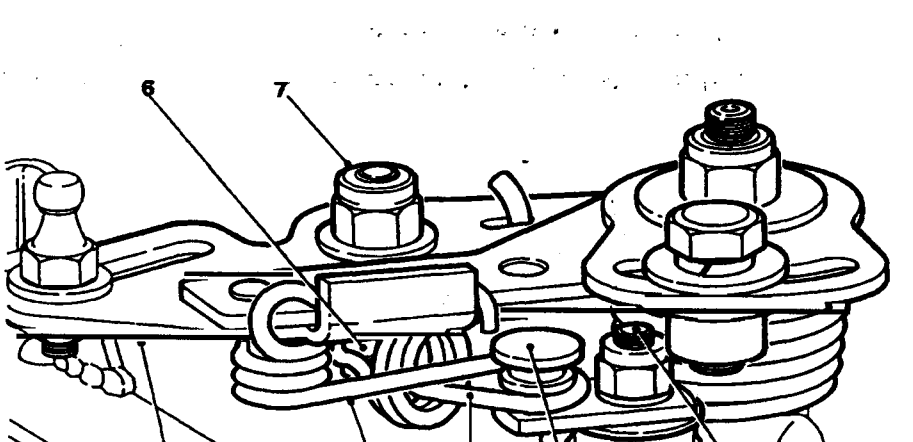
Note ...

To prevent undue loading on the excess fuel shaft, it is important to remove the linkage spring from the excess fuel plate pin before removing the throttle control bracket.

5 To remove the excess fuel linkage spring carry out the following:

5.1 Slacken the locknut (Fig 4 (7)) on the linkage spring stud (6). Push the long leg of the break-back spring (4) away from the excess fuel plate pin (2).

5.2 Using the special hook tool, CAV Part Number 7244-405, unhook the long nd of the linkage spring (3) from the pin (2).



1	Excess fuel shaft	5	Throttle lever
2	Pin-excess fuel plate	6	Stud-linkage spring
3	Linkage spring	7	Locknut
4	Break-back spring		

Fig 4 Location of linkage spring

Throttle control bracket and solenoid

6 To remove the throttle control bracket and solenoid proceed as follows:

6.1 Secure the pump housing (Fig 3 (12)) to the mounting fixture (13) CAV Part Number 7244-200 and clamp the fixture in a suitable vice with the governor control cover (11) uppermost.

6.2 To allow removal of the throttle control bracket (3), r strain the throttle lever (4) in-situ against the compression of its spring by pulling back the lever from the anti-stall screw (1) and fitting an 11mm socket over the vent screw (20). Release the lever when the socket is in position.

6.3 Remove the two set bolts (23), spring washers (22) and plain washers (21) and detach the throttle control bracket (3) from the governor control cover (11).

6.4 Unless the bracket is to be renewed, it should not be necessary to remove the anti-stall screw, washer and locknut (1) or the maximum speed screw and locknut (2).

6.5 Remove the solenoid (5) from the hydraulic head complete with the plunger (8) and spring (7). Remove and discard the 'O' ring seal (6) from the solenoid.

Note ...

The solenoid plunger and body are a matched assembly and should not be separated.

Back leakage adaptor

7 Pull the idling lever (Fig 6 (1)) clear to allow access to the back leakage adaptor, unscrew and remove the adaptor (Fig 5 (20)) from the governor control cover (13).

Throttle lever assembly

8 To dismantle the throttle lever assembly proceed as follows:

Note ...

Before dismantling the lever assembly, check that the top face of th indexing plate has been stamped with the letter 'X'. If not, mark th plate with a letter 'X' so that it can be re-fitted in the same position.

8.1 Remove the set bolt (1), spring washer (2) and plain washer (3) from the boss on the throttle lever assembly (5).

8.2 Unscrew the self locking nut (27) one complete turn. Then, while restraining the throttle lever against compression of the spring (10), remove the 11mm socket previously fitted to the vent screw body (16) and release the spring tension on the lever lifting the lever clear of the idling shaft. Detach the short end of the spring (7) from the linkage spring stud (18).

8.3 Remove the self locking nut (27) from the throttle shaft (12) and detach the plain washer (26) and indexing plate (4).

8.4 Remove the throttle lever assembly (5) from the shaft with spring (10) and then remove the short leg of the spring from the lever. Remove the cap washer (8) and packing ring (9) from the shaft (12).

8.5 Remove the throttle lever assembly (5), the locknut with int gral 'Belleville' washer (21), plain washer (22) and ball pin (23). Remove the self locking nut (25), plain washer (24) and stud (18).

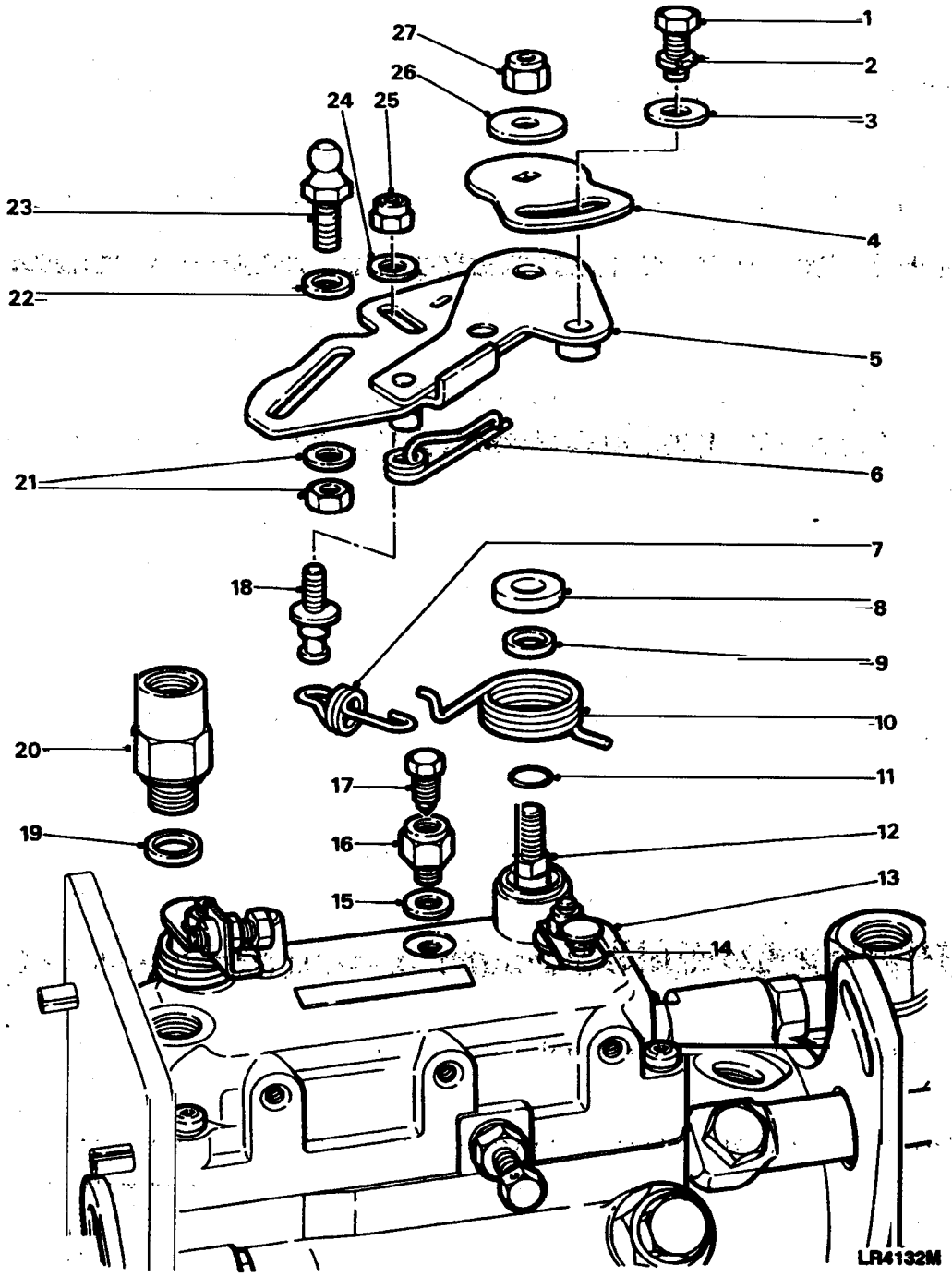


Fig 5 Throttle lever, vent screw and pressurising valve

Key to Fig 5

1	Set bolt	15	Copper washer
2	Spring washer	16	Vent screw body
3	Plain washer	17	Vent screw
4	Indexing plate	18	Stud-linkage spring
5	Throttle lever assembly	19	Washer
6	Break-back spring	20	Back leakage adaptor
7	Linkage spring	21	Locknut with compressible washer
8	Cap washer	22	Plain washer
9	Packing ring	23	Ball pin
10	Throttle lever spring	24	Plain washer
11	'O' ring seal	25	Self locking nut
12	Throttle shaft	26	Plain washer
13	Governor control cover	27	Self locking nut
14	Boss and pin-excess fuel plate		

8.6 Check the condition of the break-back spring (6), if it is n cessary to remove the spring from the throttle lever (5), squeeze both ends of the spring together then prise the coiled end of the spring from the locating pin.

Vent screw

9 Slacken the vent screw (17), unscrew and remove the vent screw body (16) from the governor control cover (13) and discard the copper washer (15).

Governor control cover

10 To remove the governor control cover carry out the following:

10.1 Remove the locknut (Fig 6 (23)), the maximum fuel adjustment screw (24) and the rubber sealing washer (22) from the governor control cover (14). Discard the sealing washer.

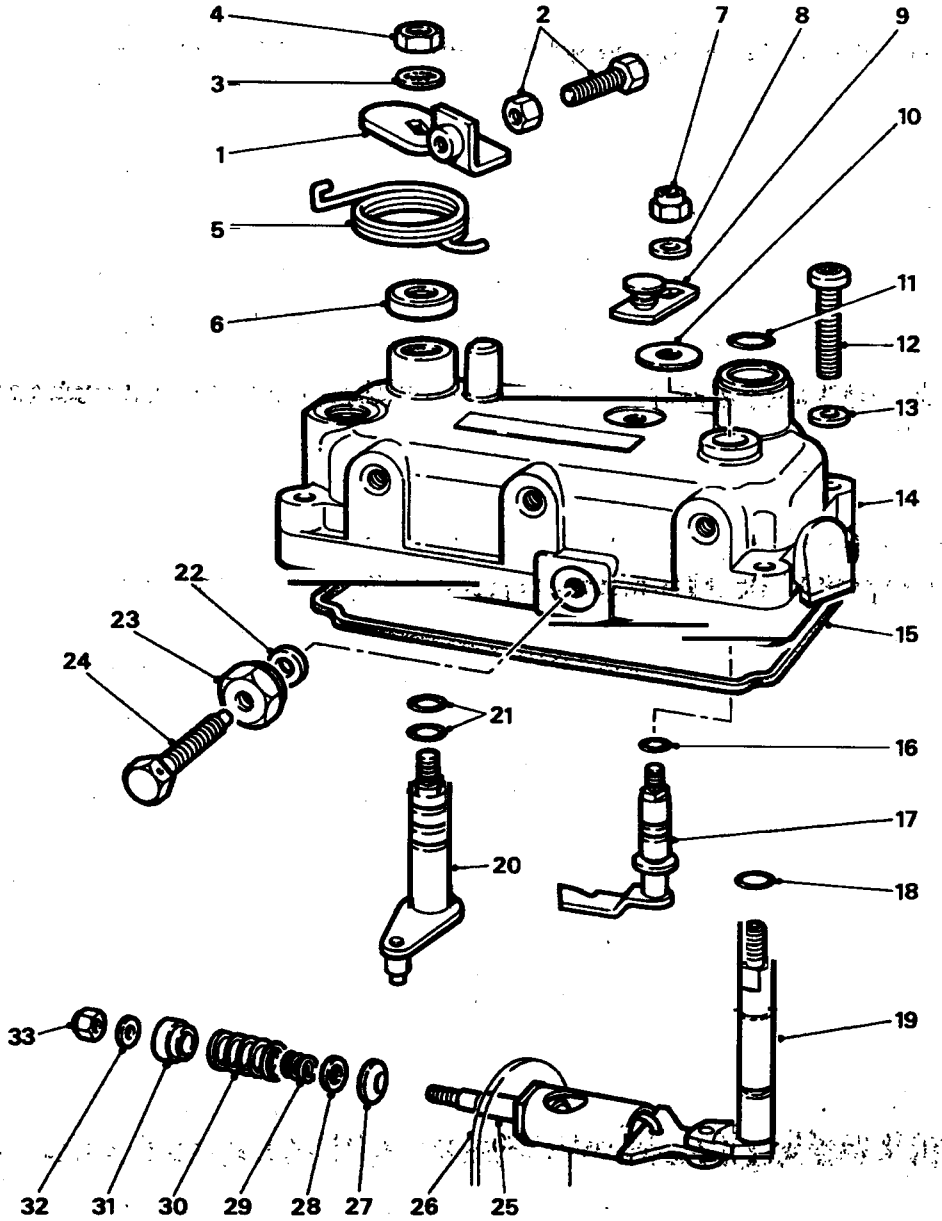
10.2 Remove the excess fuel shaft (17) the self locking nut (7), plain washer (8), plate (9) and plain washer (10).

10.3 Remove the locknut (4), and shakeproof washer (3) from the idling shaft (20), detach the idling lever (1), complete with idling adjustment screw and locknut (2), spring (5) and spring guide (6), discard the shakeproof washer.

10.4 Using socket adaptor CAV Part Number 7244-249, remove the four hexagon socket screws (12) together with washers (13).

10.5 Lift the governor control cover (14) away from the pump housing and at the same time, push down on the threaded end of the throttle shaft assembly (19), the shaft must be pressed through the cover to remain connected to the governor spring.

10.6 Push out the excess fuel shaft (17) and idling shaft (20) from the governor cover, remove the 'O' ring seals (16) and (22) from the shafts and discard. Remove and discard the 'O' ring seal (11) and the governor cover rubber seal (15).



1	Idling lever	12	Hexagon socket screw	23	Locknut
2	Idling adjustment screw and locknut	13	Washer	24	Max. fuel adjuster screw
3	Shakeproof washer	14	Governor control cover	25	End plug
4	Locknut	15	Rubber seal	26	Governor arm
5	Return spring	16	'O' ring seal	27	Pivot ball washer
6	Spring guide	17	Excess fuel shaft	28	Plain washer
7	S lf locking nut	18	'O' ring seal	29	Buffer spring
8	Plain washer	19	Throttle shaft assembly	30	Anti-stall spring
9	Excess fuel plate	20	Idling shaft	31	Spring abutment
10	Plain washer	21	'O' ring seals	32	Plain washer
11	'O' ring seal	22	Rubber washer	33	Self locking nut

Fig 6 Governor control cover

Throttle shaft assembly

Note ...

The throttle shaft assembly is a pre-loaded pack and should not be dismantled.

11 To remove the throttle shaft assembly proceed as follows:

11.1 Remove the self locking nut (33) from the threaded end of th end plug (25) and whilst restraining the end plug, remove the washer (32), spring abutment (31), anti-stall spring (30), buffer spring (29), plain washer (28), and pivot ball washer (27).

11.2 Pull out the end plug (25) with the throttle shaft assembly (19) from the governor arm (26). Remove and discard the 'O' ring seal (18) from the shaft.

Governor arm and control bracket

12 To remove the governor arm and control bracket proceed as follows:

12.1 From the control bracket (Fig 7 (20)) remove the scroll link plate spring retainer (7), spring (6), sleeve (8) and spacer (9). Discard the spring retainer (7).

12.2 Unlock both tab washers (18), tab washer (10), and remove studs (19) and hexagon headed screw (11). Discard all tab washers. Using special tool CAV Part Number 7244-247 remove the hexagon 'Panhead' screw (16).

12.3 Lift off the control bracket (20) complete with governor arm (21), metering valve (15) and spring linkage assembly. Detach the met ring valve from the linkage hook (13) and immerse in clean test oil.

12.4 Disengage the control bracket (20) from the governor arm (21) and dismantle the governor spring linkage from the governor arm in th following order:

12.4.1 Remove the self locking nut (1), the linkage nut (2), washer (3) and pivot ball washer (4) from the governor linkage arm (13).

12.4.2 Slowly release the compression on the linkage spring (12) and disengage the linkage hook from the governor arm (21) taking care not to lose the washer (5).

12.4.3 Slide the spring (12) and spring retainer (14) from th linkage hook (13).

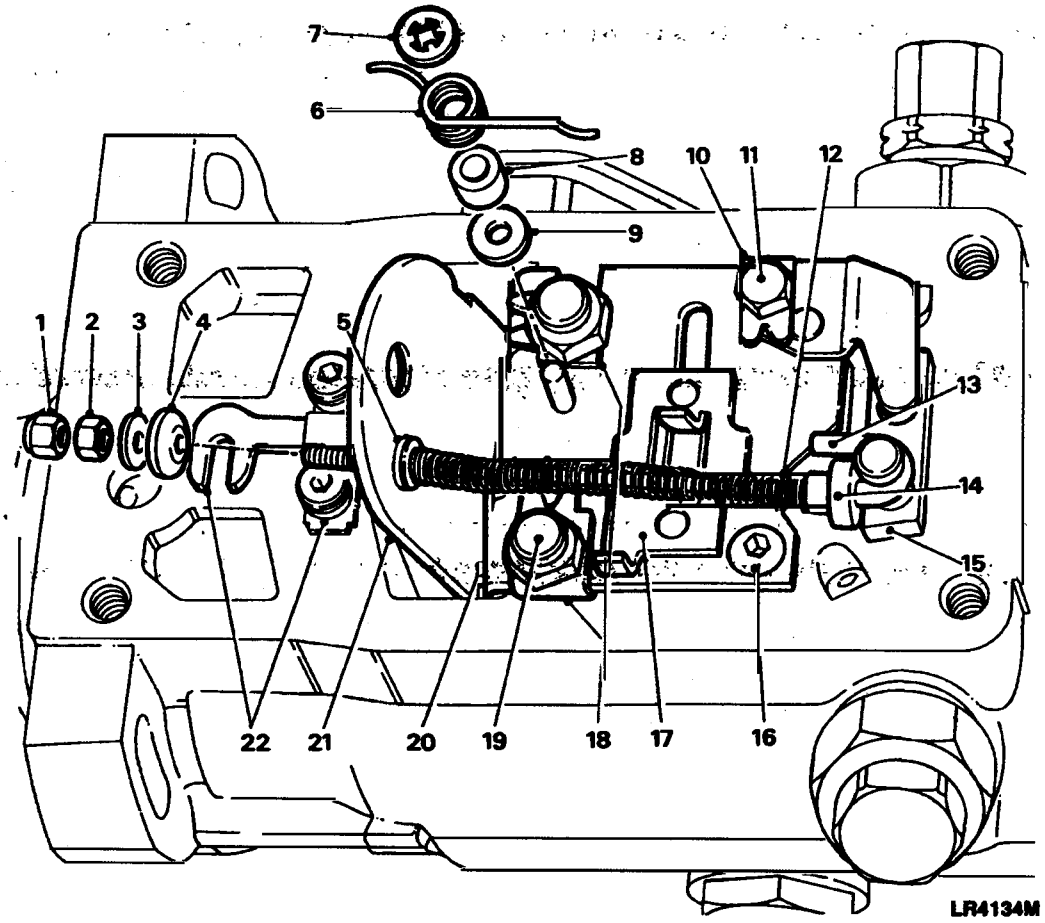
12.5 Using special tool CAV Part Number 7244-247, remove the two hexagon 'Panhead' screws and detach the idle actuator and guide bracket (22) from the pump housing.

End plate and regulating valve

13 To remove the end plate and regulating valve carry out the following:

13.1 Using special tool CAV Part Number 7244-401, remove the four bracket support nuts (Fig 3 (9)) and detach the support bracket (10) from the delivery valve holders.

13.2 Slacken the fuel inlet connection (Fig 8 (15)) in the end plate (7).



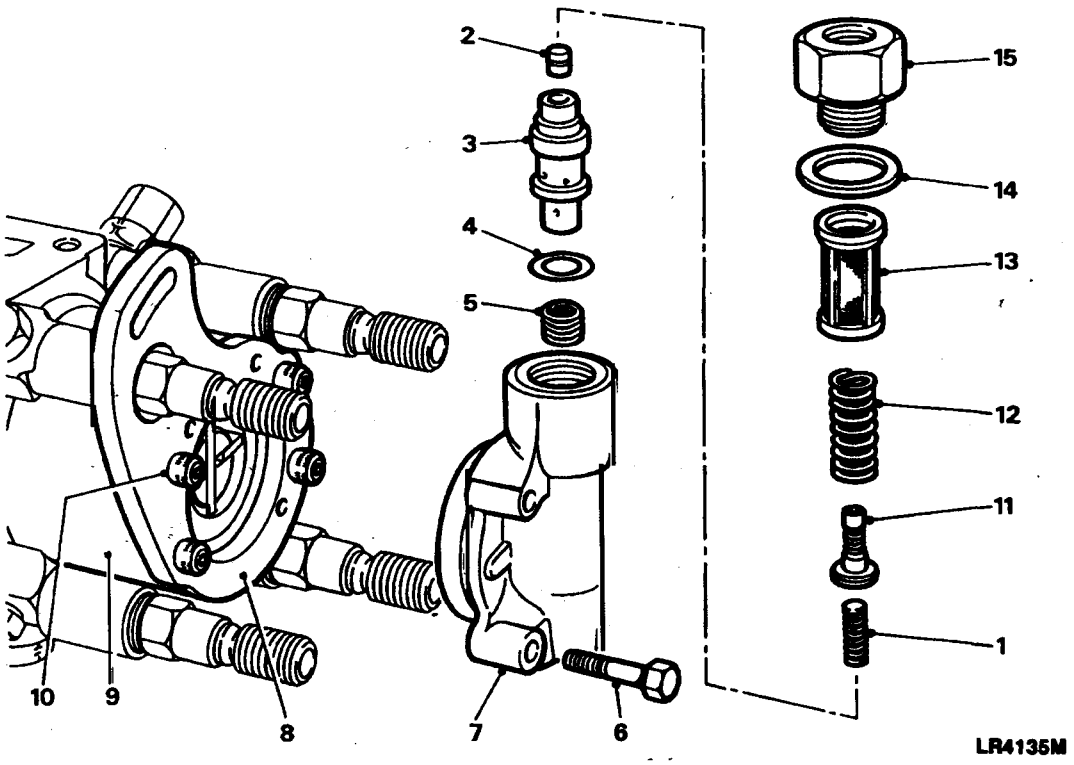
1	Self-locking nut	13	Linkage hook
2	Linkage nut	14	Spring retainer
3	Washer	15	Metering valve
4	Pivot ball washer	16	'Panhead' screw
5	Washer-linkage spring	17	Scroll link plate
6	Spring-scroll link plate	18	Tab washer
7	Spring retainer	19	Stud-control bracket
8	Sleeve	20	Control bracket
9	Spacer	21	Governor arm
10	Tab washer	22	Idling actuator and guide bracket with 'Panhead' screws
11	Hexagon headed screw		
12	Spring-governor linkage		

Fig 7 Governor control linkage

13.3 Unscrew the four hexagon headed screws (6) and carefully remove the end plate (7) from the hydraulic head (9).

13.4 Remove the fuel inlet connection (15), remove and discard the copper washer (14).

13.5 Invert the end plate (7) and remove the sleeve retaining spring (12), transfer pressure adjuster (11), filter (13), spring and peg assembly (1), regulating sleeve (3), piston (2), and piston retaining spring (5). Discard the sealing wash r (4).



1	Spring and peg assembly	9	Hydraulic head
2	Regulating piston	10	Socket screw
3	Regulating sleeve	11	Transfer pressure adjuster
4	Sealing washer	12	Spring-retaining sleev
5	Spring-piston retaining	13	Filter
6	Hexagon headed screw	14	Copper washer
7	End plate	15	Fuel inlet connection
8	Hydraulic head bracket		

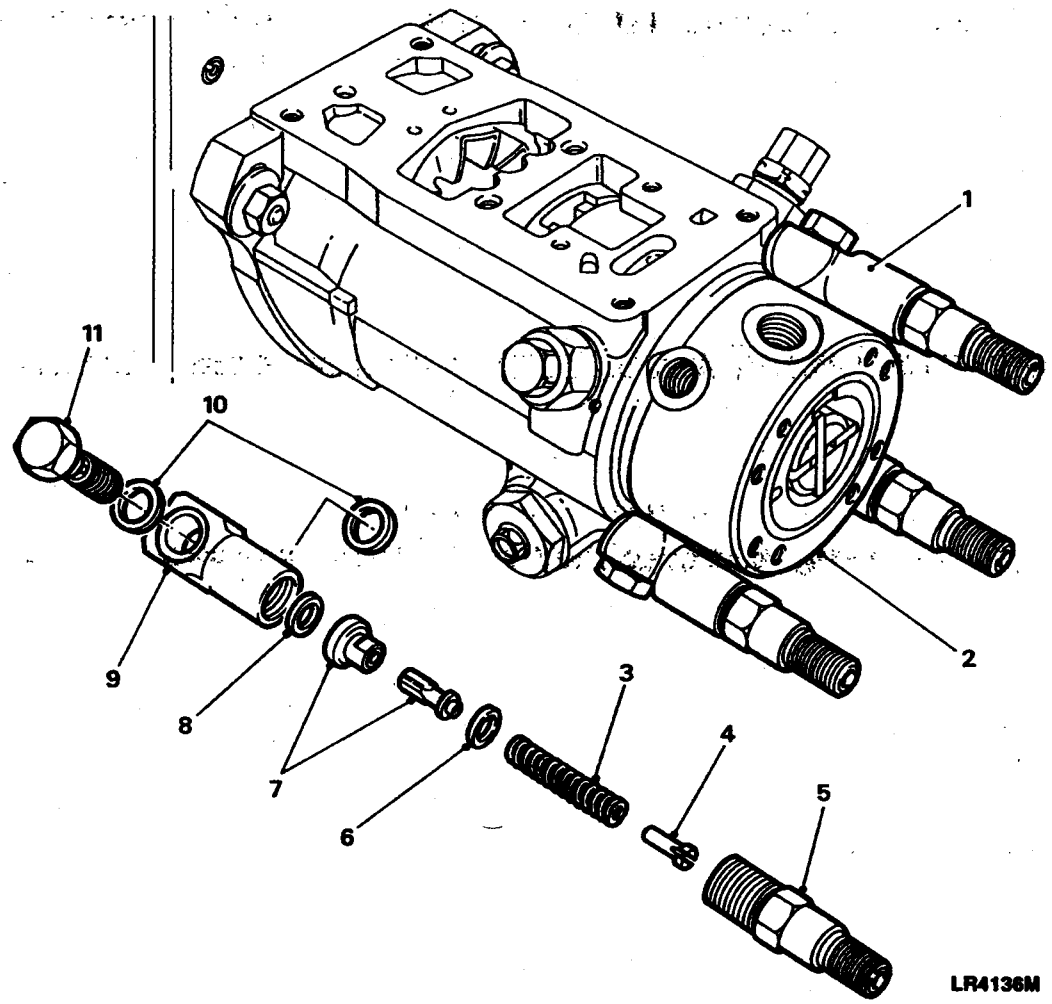
Fig 8 End plate and regulating valve assembly

13.6 Using socket adaptor CAV Part Number 7244-250 or a suitable alternative, remove the four socket head screws (10) and detach the hydraulic head bracket (9).

Delivery valve assemblies

14 Remove the banjo assemblies from the hydraulic head as follows:

14.1 Slacken and unscrew the banjo bolts (Fig 9 (11)) and remov each of the complete banjo assemblies (1) from the hydraulic head (2) noting their position and type relative to the letter of identification of the outlet holes. Discard the sealing washers (10).

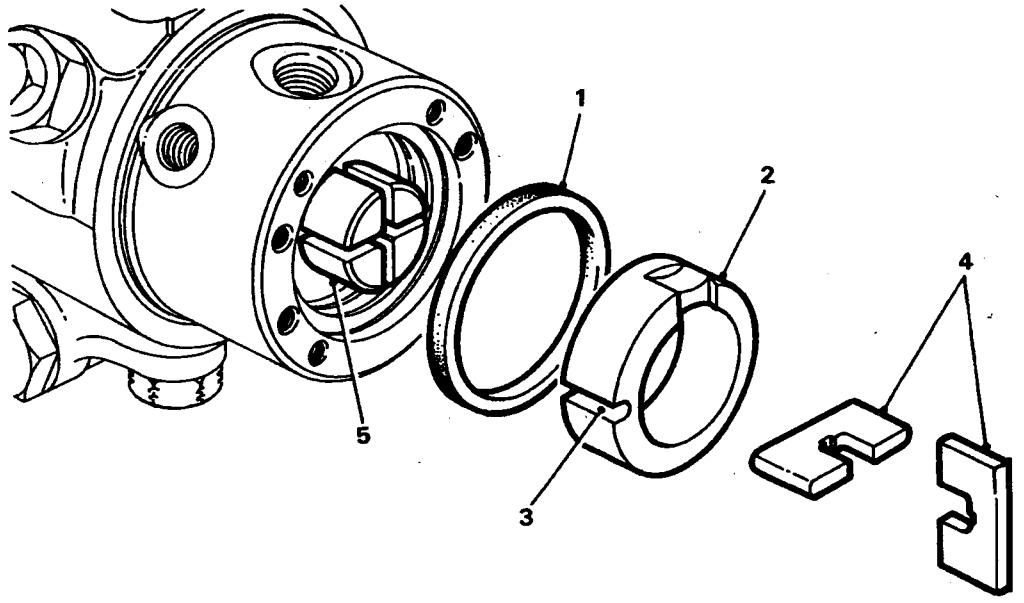


1	Banjo assembly	7	Delivery valve and body
2	Hydraulic head	8	Washer
3	Spring	9	Banjo connection
4	Spring peg	10	Washer
5	Delivery valve holder	11	Banjo bolt
6	Washer		

Fig 9 Delivery valve assemblies

14.2 Grip each banjo assembly (1) in the soft jaws of a vice. Remove th delivery valve holders (5) and detach the spring (3), spring peg (4) and withdraw the delivery valve assembly (7).

14.3 Remove and discard washer (6) from the valve body and washer (8) from inside the banjo connection.



1	Seal	4	Pump blades
2	Liner	5	Rotor
3	Rotation slot- shown in 9 o'clock position		

Fig 10 Transfer pump

Transfer pump

15 To remove the pump blades and slacken the rotor carry out the following:

15.1 Withdraw the pump blades (Fig 10 (4)), note the position of the direction of rotation slot in the transfer pump liner i.e. 9 o'clock when viewed from the transfer pump rotor end. Remove the liner (2) and seal (1), discard the seal.

15.2 Insert a suitable tommy bar of 4mm (0,157in) diameter through the governor aperture in the pump housing and through the hole in the drive shaft (Fig 11).

15.3 Insert special tool CAV Part Number 7044-889 into the slots in th rotor and, while restraining the drive shaft with the tommy bar, slacken the rotor by turning in the direction of pump rotation.

15.4 Remove the tommy bar and special tool and tighten the rotor finger tight.

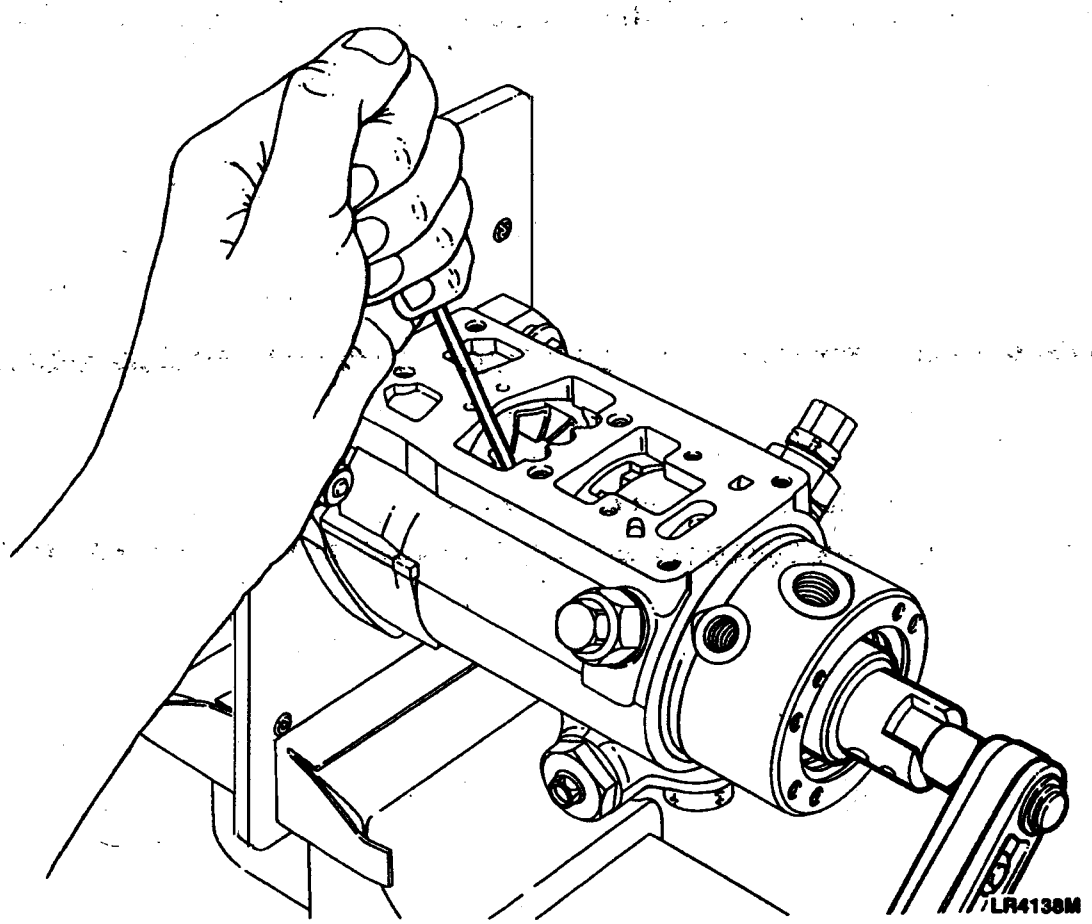


Fig 11 Slackening transfer pump rotor

Automatic advance mechanism

16 To remove the automatic advance mechanism carry out the following:

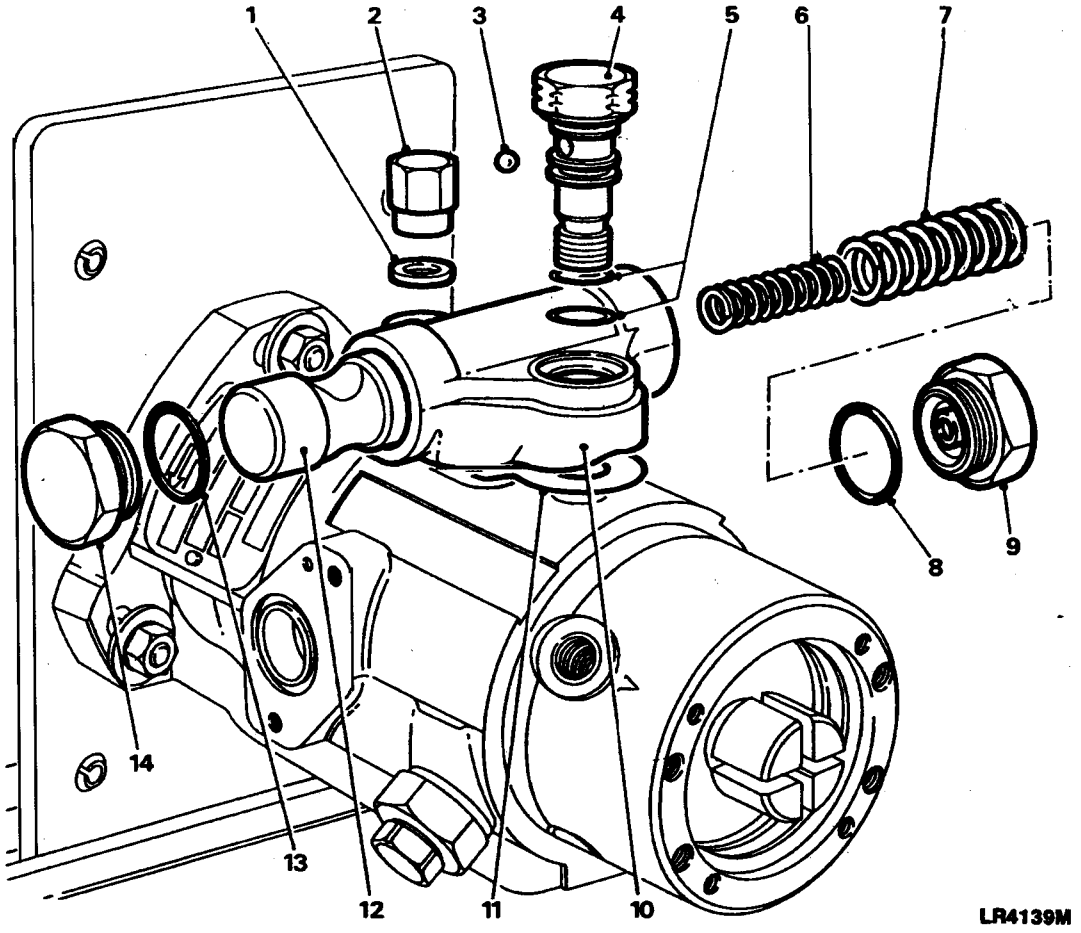
16.1 Invert the pump fixture so that the automatic advance housing (Fig 12 (10)) is uppermost.

16.2 Unscrew the pressure end plug (14) from the housing (10) and remove and discard the 'O' ring seal (13).

16.3 Remove the spring end cap (9) and discard 'O' ring seal (8), then withdraw the inner and outer springs (6) and (7).

16.4 Remove the cap nut (2), remove and discard 'Dowty' washer (1), remove the fuel banjo bolt (4) taking care to retain the steel balls (3). Remove and discard the two 'O' ring seals (5) from the banjo bolt.

16.5 Gently ease the auto-advance housing (10) complete with piston (12) from the pump body and remove and discard the housing gasket (11). Retain the piston in the auto-advance housing.

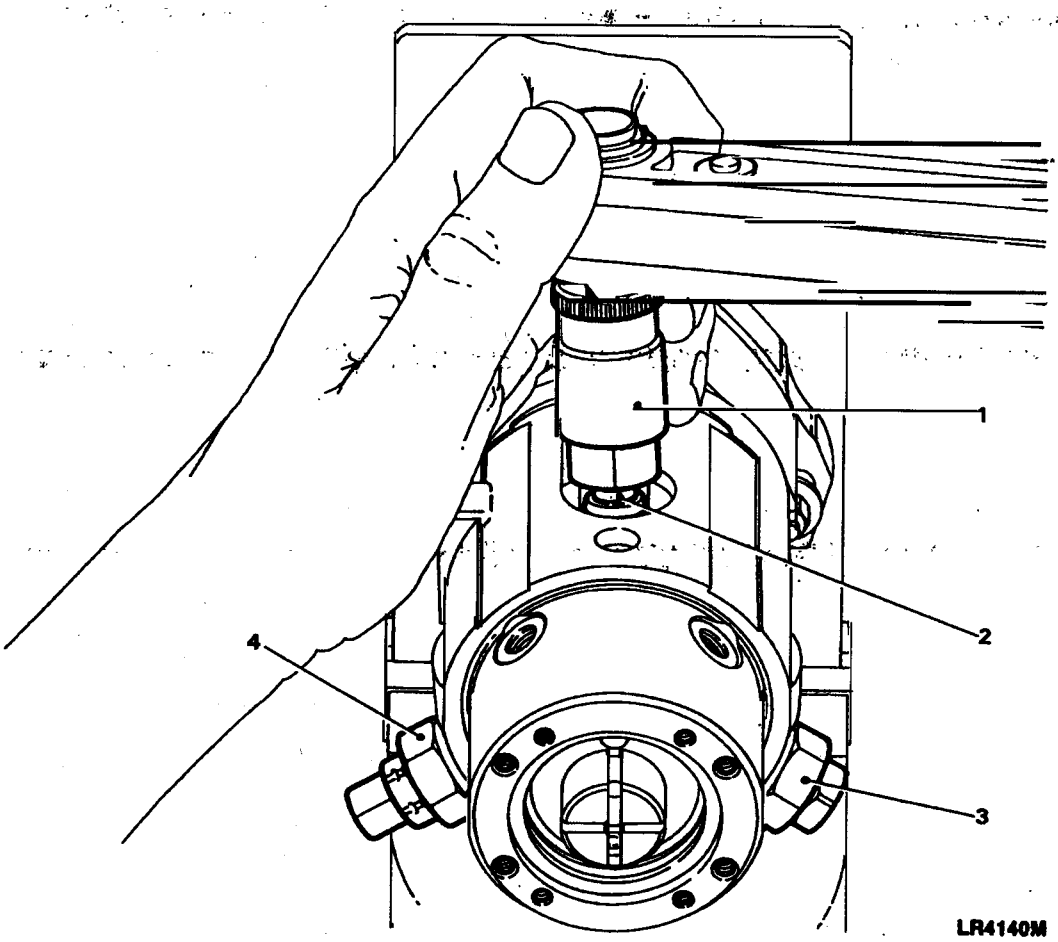


1	'Dowty' washer	8	'O' ring seal
2	Cap nut	9	Spring end cap
3	Steel ball	10	Auto-advance housing
4	Fuel feed banjo bolt	11	Gasket
5	'O' ring seals	12	Piston
6	Inner spring	13	'O' ring seal
7	Outer spring	14	Pressure end plug

Fig 12 Advance housing assembly

16.6 Using socket adaptor (Fig 13 (1)), CAV Part Number 7244-125B slack n the cam advance screw (2). Remove the tool and if necessary, lightly tap the cam advance screw to ensure the cam ring is not binding in the pump body before removing the screw.

16.7 Invert the mounting fixture so that the governor cover machined face is uppermost.



1 Socket adaptor
2 Cam advance screw
3 Rotor vent switch valve
4 Latch valve

Fig 13 Slackening the cam advance screw

Latch valve

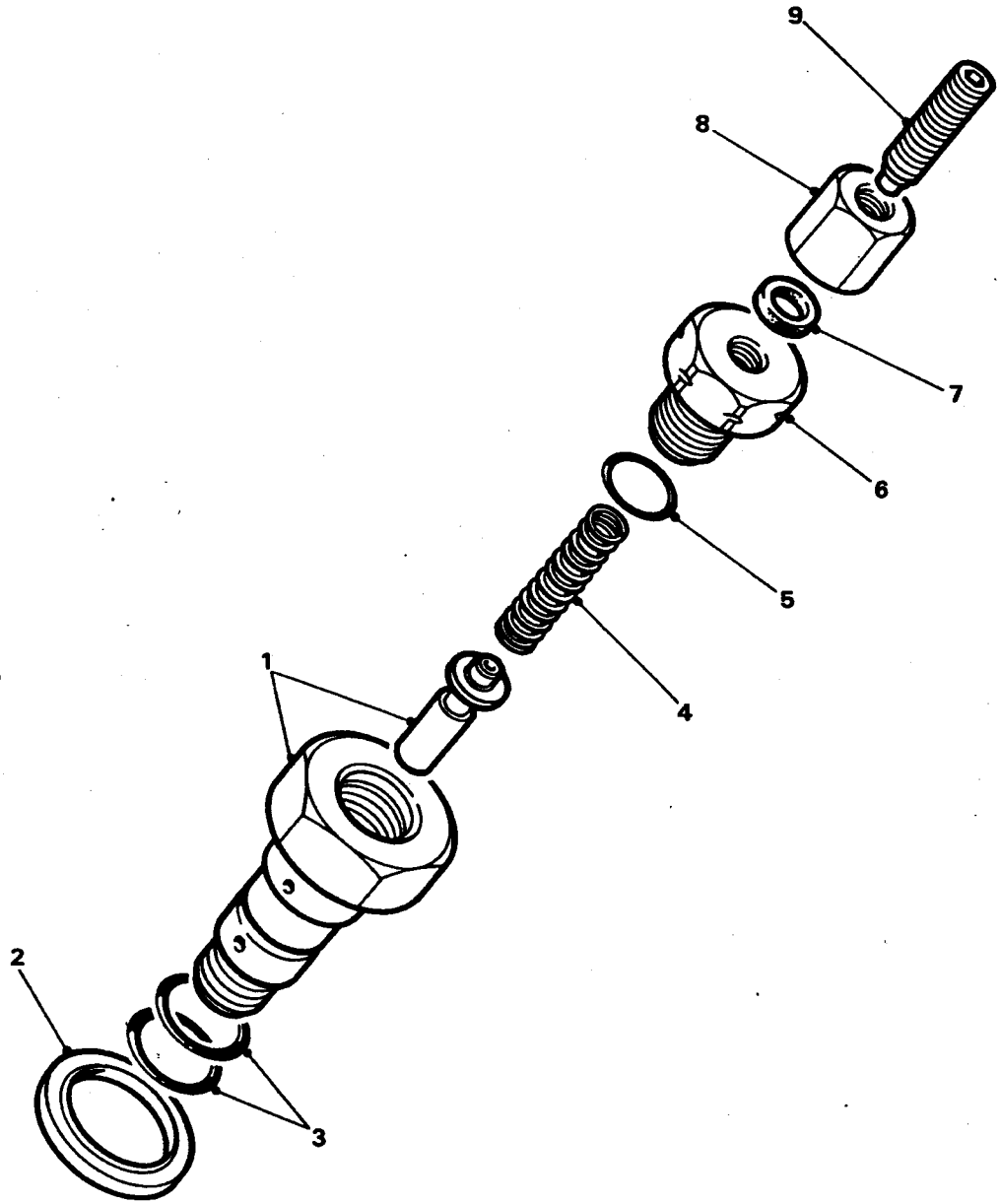
17 To remove and dismantle the latch valve carry out the following:

17.1 Slacken the locknut (Fig 14 (8)) and sleeve nut (6) in the valve body (1) then remove the latch valve assembly from the pump housing and discard th 'Dowty' seal (2) and two 'O' ring seals (3).

17.2 Remove the locknut (8), adjuster (9) and extract the valve spring (4) from the sleeve nut (6). Remove and discard the rubber washer (7).

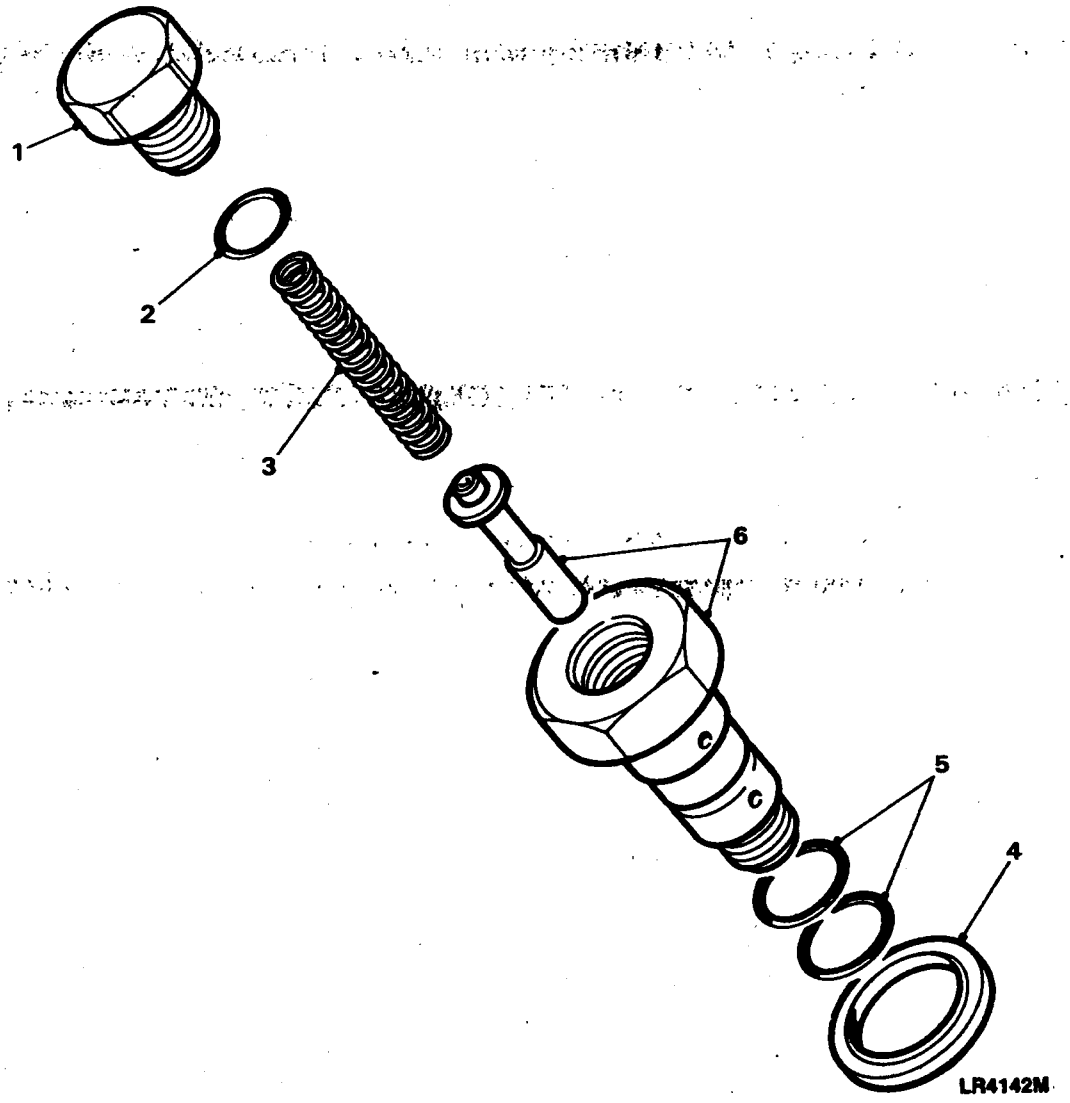
17.3 Remove the sleeve nut (6) from the valve body (1) and discard the 'O' ring seal (5).

17.4 Invert the valve body to bring the externally threaded end uppermost and gently tap to dislodge the valve from the body.



1	Valve and body	6	Sleeve nut
2	'Dowty' seal	7	Rubber washer
3	'O' ring seals	8	Locknut
4	Valve spring	9	Adjuster
5	'O' ring seal		

Fig 14 Latch valve assembly



1	Spring plug	4	'Dowty' seal
2	'O' ring seal	5	'O' ring seals
3	Spring	6	Valve and body

Fig 15 Rotor vent switch valve

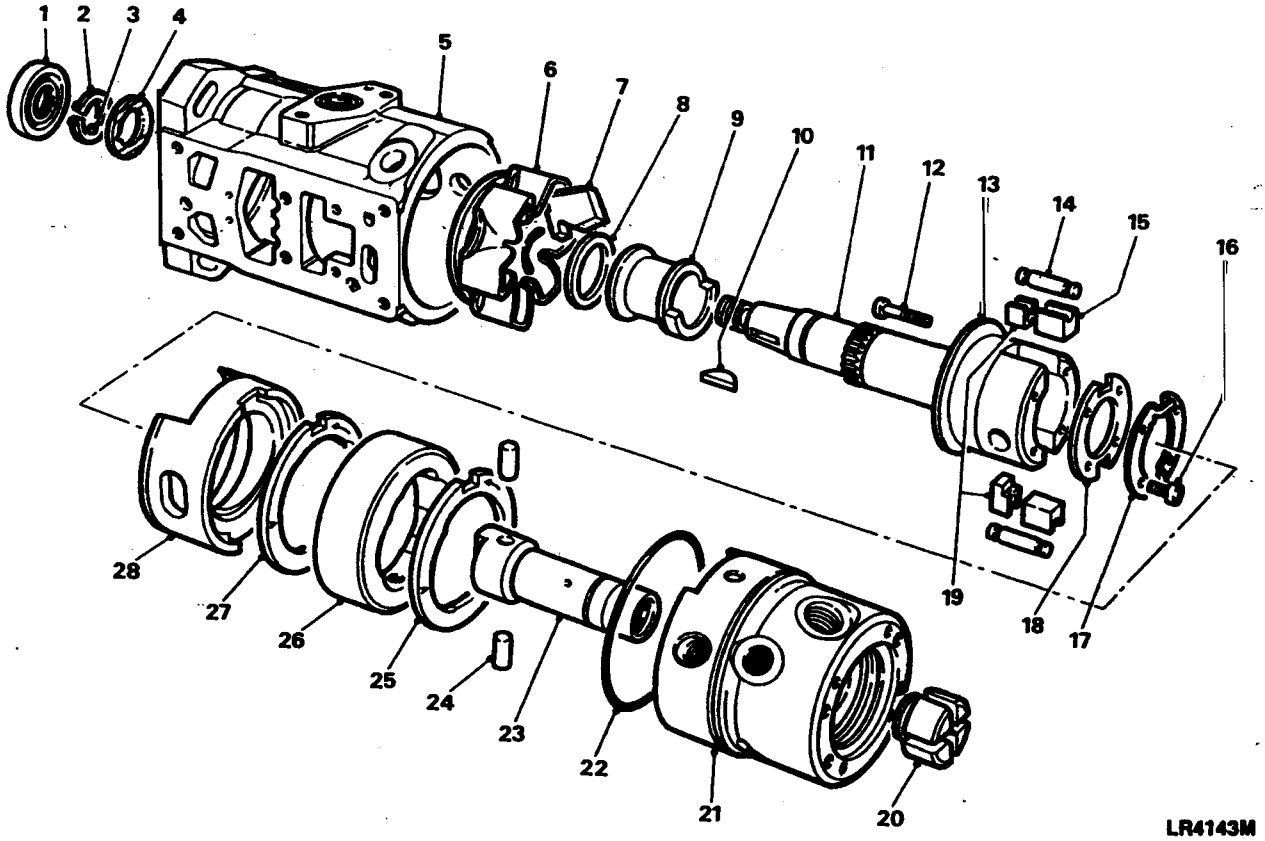
Rotor vent switch valve

18 To remove and dismantle the rotor vent switch valve proceed as follows:

18.1 Slacken the spring plug (Fig 15 (1)) in the valve body, then remove the assembly from the pump housing and discard the 'Dowty' seal (4), remove and discard the 'O' ring seals (5).

18.2 Remove the spring plug (1) and spring (3) from the valve and discard the 'O' ring seal (2) from the plug.

18.3 Invert the valve body (6) to bring the externally threaded end uppermost and gently tap to dislodge th valve from the body.



1	Oil seal	9	Thrust sleeve	19	Shoe spacers
2	Circlip	10	Drive key	20	Transfer pump rotor
3	Steel ball	11	Drive shaft	21	Hydraulic head
4	Thrust washer	12	'Torx' screw	22	'O' ring s al
5	Pump housing and bush assembly	13	Timing disc	23	Distributor rotor
6	Governor weight retainer	14	Roller	24	Plungers
7	Governor weight	15	Shoe	25	Rear scroll plate
8	Thrust washer	16	'Torx' screw	26	Cam ring
		17	Catch plate	27	Front scroll plat
		18	Shoe plate	28	Rear bearing

Fig 16 Pump housing, drive shaft assembly and hydraulic head

Hydraulic head

Note ...

Prior to removing the hydraulic head, turn the pump into a vertical position, head uppermost. This will ensure that the plungers do not fall out of the rotor during the removal of the hydraulic head.

19 To remove the hydraulic head and rotor assembly carry out the following:

19.1 Withdraw the hydraulic head (Fig 16 (21)) and rotor assembly from the pump housing (5) with a slight twisting motion in each direction. When clear of the housing, detach the rear scroll plate (25) noting the direction of the arrow and discard the 'O' ring seal (22).

19.2 The transfer pump rotor (20), previously slackened, should not be removed until the distributor rotor (23) and pump plungers (24) ar ready for examination. To retain the plungers in the rotor, fit plastic retainer, CAV Part Number 7174-62.

Pump housing and drive shaft assembly

20 To dismantle the pump housing and drive shaft assembly proceed as follows:

20.1 Turn the pump housing on the mounting fixture so that the governor machined face on the housing is at nine o'clock and rotate the drive shaft (Fig 16 (11)) to bring the rollers (14) and shoes (15) to the horizontal position.

20.2 Withdraw the cam ring (26) from the pump housing with a twisting motion and detach the front scroll plate (27), note the direction of the arrows on both cam ring and scroll plate.

Note ...

The rollers and shoes are matched and should be kept in their respective assemblies.

20.3 Rotate the drive shaft to dislodge one roller (14) and shoe assembly (15) into the well of the pump housing and remove the roller and shoe. Repeat the operation to remove the other roller and shoe assembly. Immerse the roller and shoe assemblies in clean test oil.

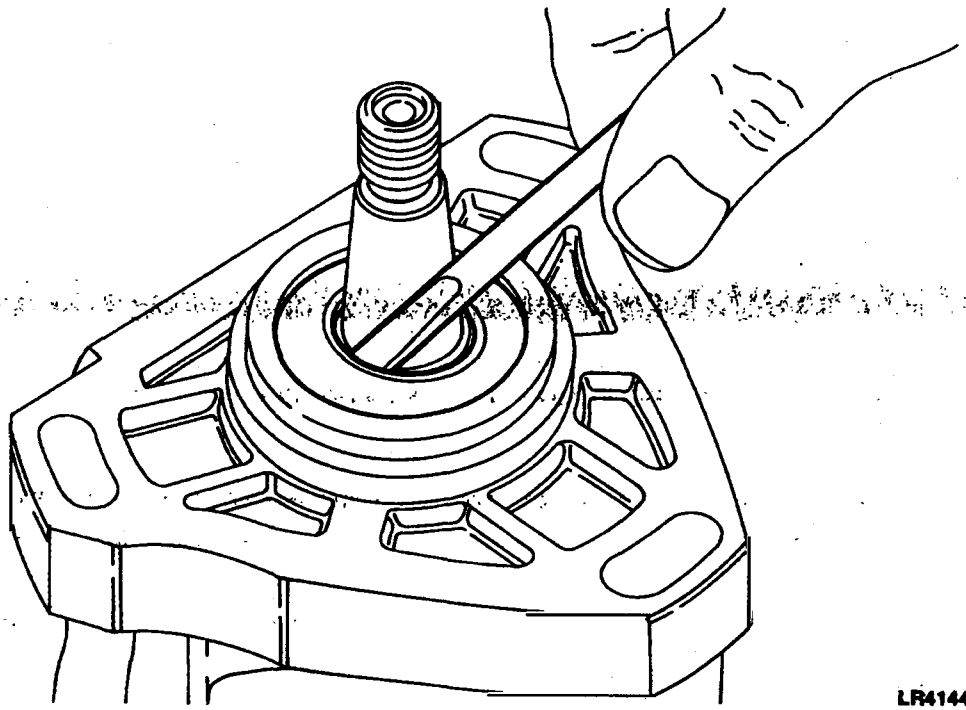


Fig 17 Removing drive end oil seal

20.4 Remove the pump housing from the mounting fixture and lay the housing on the bench drive end uppermost.

20.5 Remove the oil seal (1) from the housing using a screwdriver with a blade not exceeding 5mm width (Fig 17). Do not use the housing as a fulcrum, discard seal when removed.

20.6 Remove the circlip (Fig 16 (2)) from the drive shaft, tip out the thrust washer (4) and ball (3) into a suitable container to prevent loss.

20.7 Holding the drive shaft (11) at the rotor end lift the pump housing clear of the drive shaft and rear bearing (28), Fig 18 refers.

Note ...

The front drive shaft bearing bush must not be removed. If damaged, a new pump housing and bush assembly will be required.

20.8 Remove the rear bearing (Fig 16 (28)) and governor weight ass mbly from the drive shaft (11) and detach the thrust sleeve (9), washer (8) and governor weights (7) from the weight retainer (6).

20.9 Fit the drive shaft between the soft jaws of a vice and using special tool bit CAV Part Number 7244-437 and a suitable socket, remove the four 'Torx' screws (16) from the rear of the drive shaft and detach the catch plate (17) and shoe plate (18).

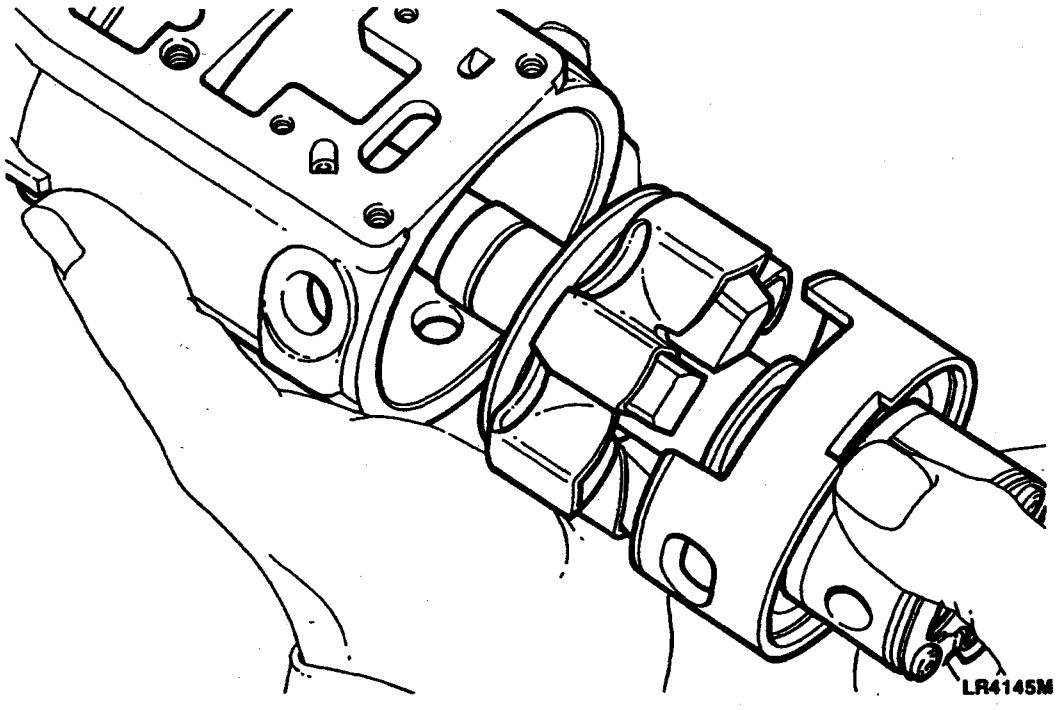


Fig 18 Removing pump housing from drive shaft

20.10 Before removing the timing disc (13) and shoe spacers (19), to assist with reassembly, electro etch the disc and drive shaft as follows:

20.10.1 Mark the timing disc with a vertical line in the same plane as the drive shaft key (Fig 19).

20.10.2 Mark the drive shaft with a letter 'L' on the unmachined surface adjacent to the long shoe spacer slot (Fig 19).

20.11 Using special tool, CAV Part Number 7244-439 and a suitable socket, remove the two 'Torx' screws (Fig 16 (12)) from the front of the drive shaft. Remove the timing disc (13) and shoe spacers (19). Unless damaged the drive key (10) need not be removed.

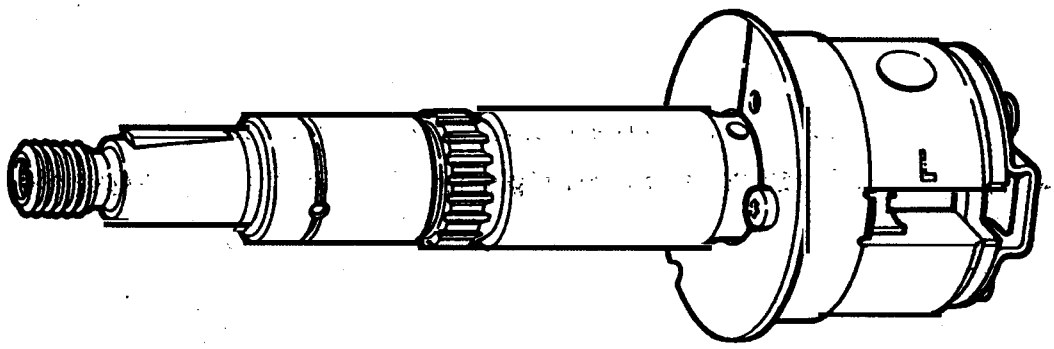


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Fig 19 Timing disc and drive shaft etching locations

Cleaning and Examination

Gen ral

21 The following information lists the possible defects and indicates the main items which may require replacement. Any internal parts of the unit that r quire cleaning should be cleaned using new test oil. The examination requirements listed are the minimum advisable.

Mated parts

22 If any part in a mated assembly is damaged or worn, the complete assembly must be renewed. The following items must be considered as mated parts:

Head and rotor assembly
Rollers and shoes
Delivery valves and bodies
Advance piston and body
Latch and rotor vent switch valves and bodies
Cam ring and scroll plates
Drive shaft housing and bush
Solenoid plunger and body

Examination

23 To examine the components proceed as follows:

23.1 Check for damage to internal and external threads, especially on the transfer and distributor rotor, hydraulic head, studs, inlet and outlet connections, and all connections and screws liable to be removed or torque loaded while the pump is on the engine.

23.2 Examine springs for distortion and fractures, in cases of fouling or malfunctioning, ensure that the correct spring is fitted.

23.3 Check for any signs of scoring, wear, corrosion or any other damage to machined surfaces, including the pump body and bush, drive shaft, rear bearing, hydraulic head bore, cam ring, scroll plates, end plates, auto-advance device location and end plate locating face.

23.4 Inspect for wear and damage to drive shafts, splines and associated parts. If the thrust faces of the housings are worn, check the drive shaft end float.

23.5 Examine all mechanical governor linkages, shafts, pivot points, arms and weights for wear and scoring. Ensure the correct number and type of governor weights are fitted.

Note ...

The utmost care must be taken when examining the pump plungers and bores. Plungers must only be removed from the bore if there is a need to inspect them and then only for the short time required to carry out the inspection. After examination ensure that each plunger is correctly replaced in the bore from which it was removed. Plungers and bores must be cleaned with clean test oil and assembled wet. The plungers should be retained in the bores with plastic retainer CAV Part Number 7174-62, or with suitable synthetic rubber tubing. The rotor must be assembled to the hydraulic head and the complete assembly immersed in a cover d bath of clean test oil until required for assembly.

23.6 Inspect the plungers and their respective bores for nicks, scratches, wear, corrosion or other damage.

23.7 Examine the transfer pump for chipped, broken or worn blades. Blades may be either carbon or resin bonded material, they are identified by the fact that resin bonded blades have a groove in the base of the central slot, carbon blades have no slot. The blades are not interchangeable, and replacement blades must be of the same type.

23.8 Inspect for damage to the roller and shoes. Examine roller surfaces and check for free rotation in the shoes. Roller and shoe assemblies must be kept together.

23.9 Check for valve wear or scoring. Pay special attention to the metering valve and its bore. Examine the metering valve for loosen ss of its pin. Check the regulating valve, latch and switch valves.

23.10 Check for defects in the delivery valves. Shake the assembly and listen for movement of the valve; this denotes a collapsed spring.

23.11 Inspect for defects in the cam box pressurising valve, particularly the the condition of the spring, valve and filter spring.

23.12 Examine for wear or distortion in the throttle, excess fuel and idle shafts: throttle and idling lever linkage.

23.13 Inspect all small orifices for blockage e.g., delivery valve bodies, latch valve and head locating fitting, clear any restriction with dry compressed air.

23.14 Ensure all electrical solenoid parts are clean, particularly the solenoid plunger and body valve seat.

Reassembly

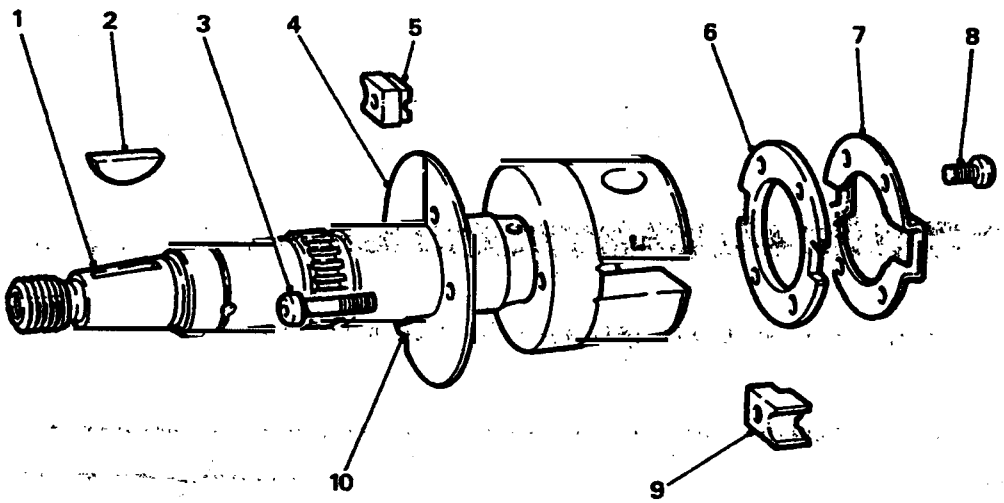
Drive shaft

24 To assemble the drive shaft carry out the following:

24.1 Locate the timing disc (Fig 20 (4)) with the two 'Torx' screws (3) to th head of the drive shaft (1) so that the vertical mark, etched on the disc during dismantling, is aligned with the drive key (2) on the drive shaft.

24.2 Fit the short and long spacers (5) and (9) to their respective slots in the head of the shaft. The long shoe spacer (9) should be fitted to the slot previously etched with the letter 'L'. The slots in the spacers must face outwards.

24.3 Hold the shoe spacers in position and secure the spacers and timing disc with the two 'Torx' screws. Using special tool bit CAV Part Number 7244-439 and a suitable socket tighten the screws to a torque of 2.8 Nm (25 lbf in).



1	Drive shaft	6	Shoe plate
2	Key-drive shaft	7	Catch plate
3	'Torx' screw	8	'Torx' screw
4	Timing disc	9	Long shoe spacer
5	Short shoe spacer	10	Timing disc notch

Fig 20 Drive shaft assembly

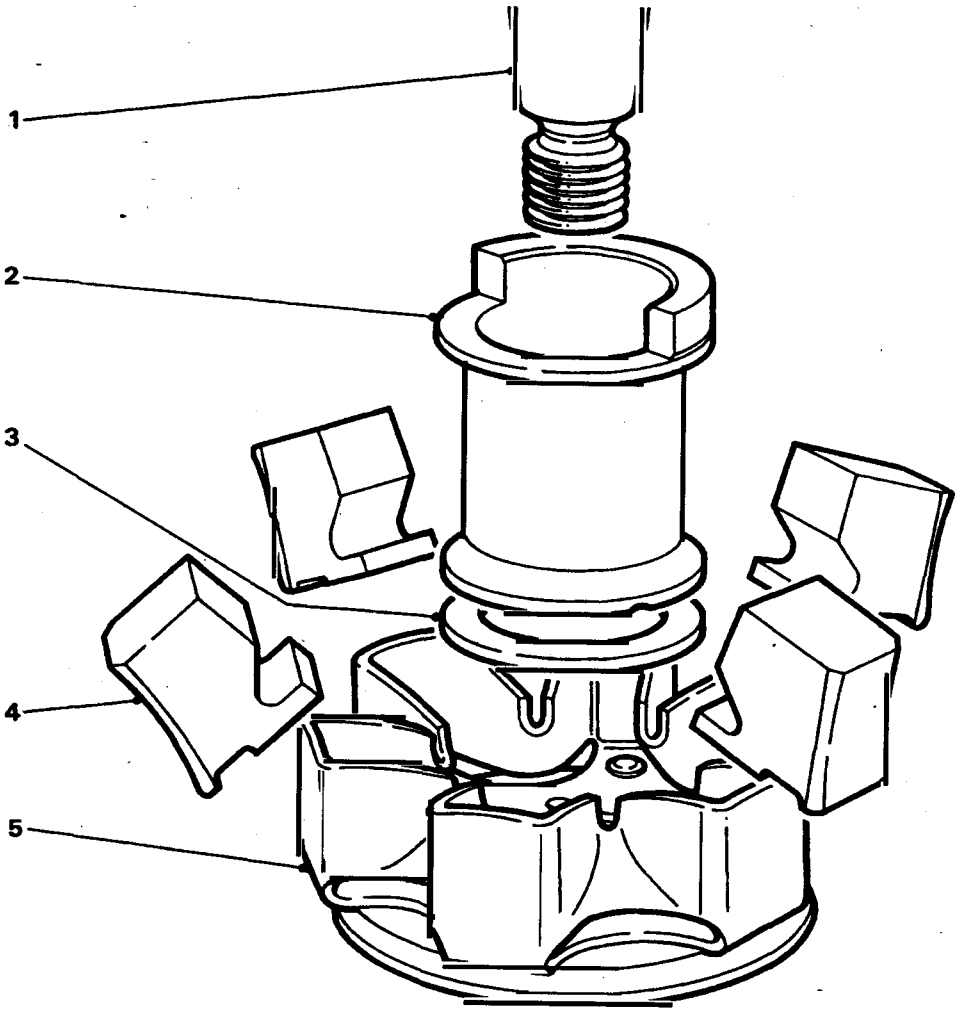
24.4 Fit the catch plate (7) against the shoe plate (6) and assemble both plates centrally against the head of the drive shaft (1) with the four 'Torx' screws (8). Tighten the screws to a torque of 4.0 Nm (35 lbf in) using special tool bit CAV Part Number 7244-437 and a suitable socket.

Governor weight assembly

25 To assemble the governor weights proceed as follows:

25.1 Lay the governor cush drive assembly on the bench with the weight retainer (Fig 21 (5)) uppermost.

25.2 Fit the four governor weights (4) in the retainer (5) in opposing pairs. The toes of the weights should face inwards and be in contact with the base of the retainer.



1 Drive shaft
2 Thrust sleeve
3 Thrust washer
4 Governor weight
5 Governor weight retainer and cush drive assembly

Fig 21 Governor weight assembly

25.3 Insert the thrust washer (3) into the toes of the weights followed by the thrust sleeve (2) tapered end first. Tilting the thrust sleeve to engage one with pair of weights while at the same time lifting the opposite pair, will facilitate entry of the thrust sleeve.

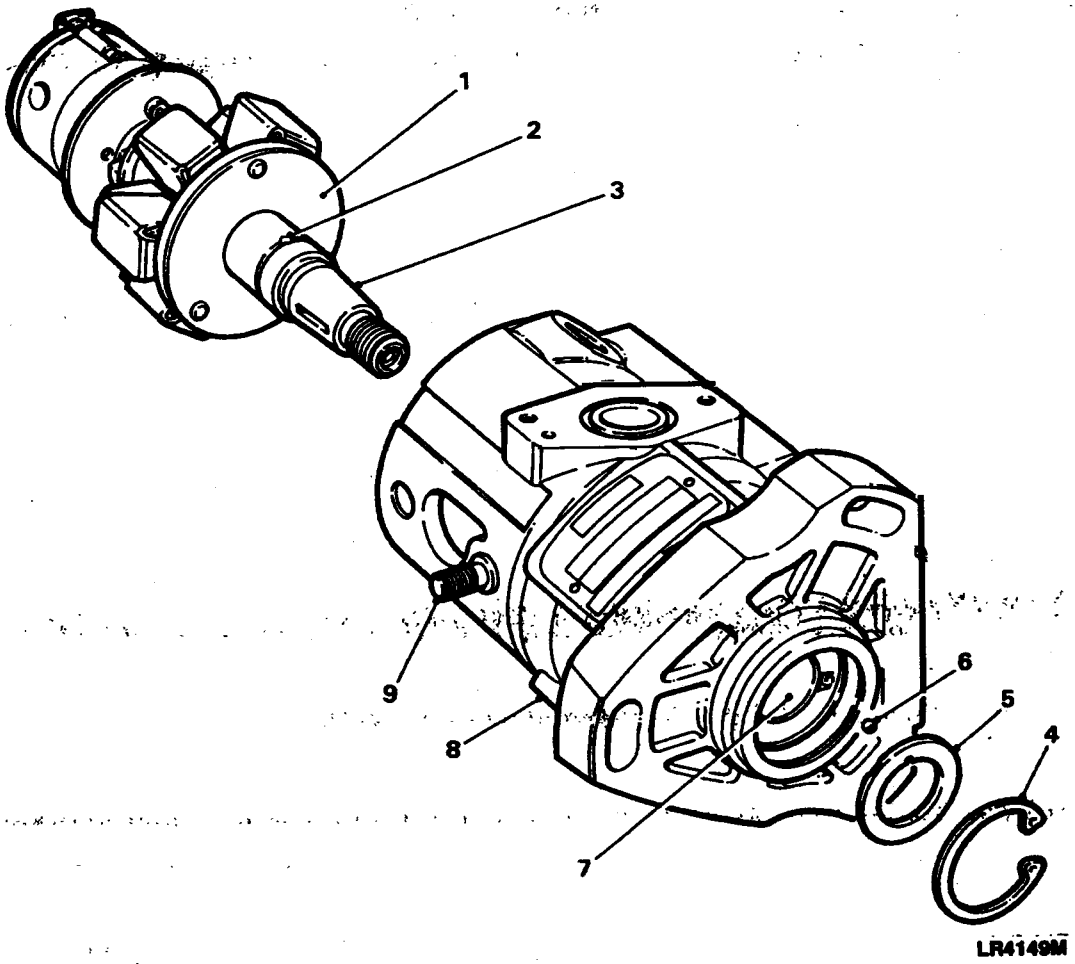
25.4 Fit the drive shaft assembly (1) through the thrust sleeve (2) and locate the splined teeth on the shaft with those on the splined hub of the cush drive (5).

Pump housing and drive shaft assembly

26 To assemble the pump housing and drive shaft proceed as follows:

Note ...

The front drive shaft bearing bush is supplied fitted to the pump housing as an assembly.



1	Governor weight assembly	6	Steel ball
2	Recess for steel ball	7	Drive shaft front bearing bush
3	Drive shaft	8	Pump housing
4	Circlip.	9	Auto-advance housing stud
5	Thrust washer.		

Fig 22 Pump housing and drive shaft assembly

26.1 Secure the pump housing (Fig 20 (10)) to the mounting plate CAV Part Number 7244-200.

26.2 If the auto-advance housing stud (9) has been removed, mount the fixture in a vice with the housing stud aperture uppermost, screw in a new stud and tighten to a torque of 6,8 Nm (60 lbf in).

26.3 Reposition the mounting fixture so that the governor cover machined face is uppermost.

26.4 Insert the drive shaft and governor weight assembly into the pump housing (8) and rotate the drive shaft (3) so that the steel ball recess (2) is uppermost.

26.5 Fit the steel ball (6) into the recess and fit the thrust washer (5) with the oil grooves in the washer facing towards the housing and the notch aligned with the steel ball. When fitted the notch in the washer should hold the ball captive.

26.6 Fit the circlip (4) in the groove on the shaft and position the open ends of the circlip either side of the steel ball in order to retain the assembly.

Checking drive shaft end float

27 To assist in checking the drive shaft end float, temporarily fit the rear bearing (Fig 25 (3)) to support the shaft, and proceed as follows:

27.1 Fit special adaptor tool (Fig 23 (4)) CAV Part Number 89559/11 to the threaded end of the drive shaft (2). Screw in the holder (5) CAV Part Number ST183 and fit dial indicator gauge (6) CAV Part Number 23764, or a suitable alternative. Adjust the stylus to contact the machined fac of th pump housing (1).

27.2 Push the drive shaft (2) inwards and zero the dial gauge. Pull the drive shaft outward and note the maximum reading on the gauge. The end float should be between 0,05 to 0,20mm (0.002 to 0.008in). If nec ssary, adjust the end float by selective assembly of the thrust washer (3) from the range available.

27.3 When the end float is correct, remove the rear bearing, then remov the pump housing from the mounting fixture and stand the housing upright on the bench.

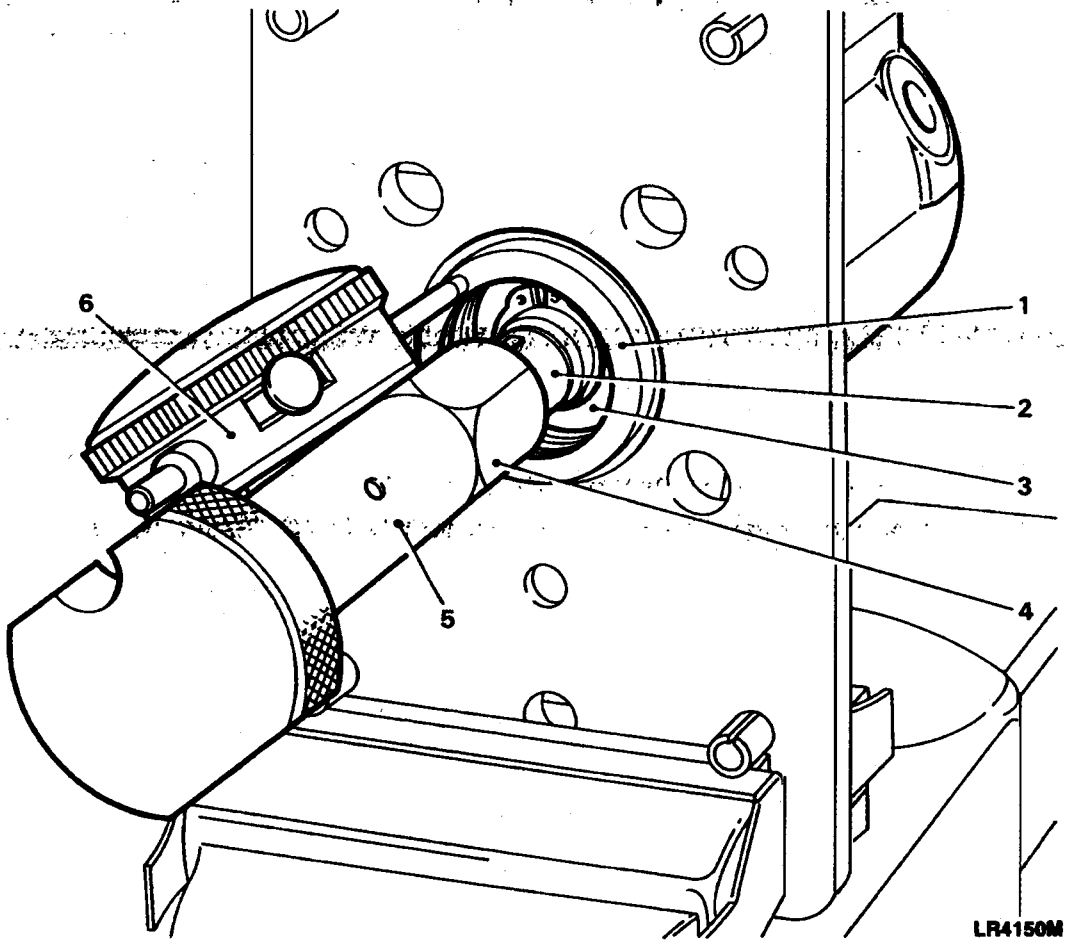
Drive shaft oil seal

28 To fit the drive shaft oil seal proceed as follows:

28.1 Fit the protection cap (Fig 24 (1)) of tool CAV Part Number 7244-445, over the threaded end of the drive shaft.

28.2 Immerse a new drive oil seal (2) in clean test oil. Slide the seal over the protection cap with the lip of the seal facing inwards towards the recess in the pump housing (3).

28.3 With the punch (1) of tool CAV Part Number 7244-445, drive th seal into the housing by tapping with a hide mallet until the tool abuts the end face of the pump housing spigot.



1	Pump housing	4	Adaptor tool
2	Drive shaft	5	Gauge holder
3	Thrust washer	6	Dial indicator and extension

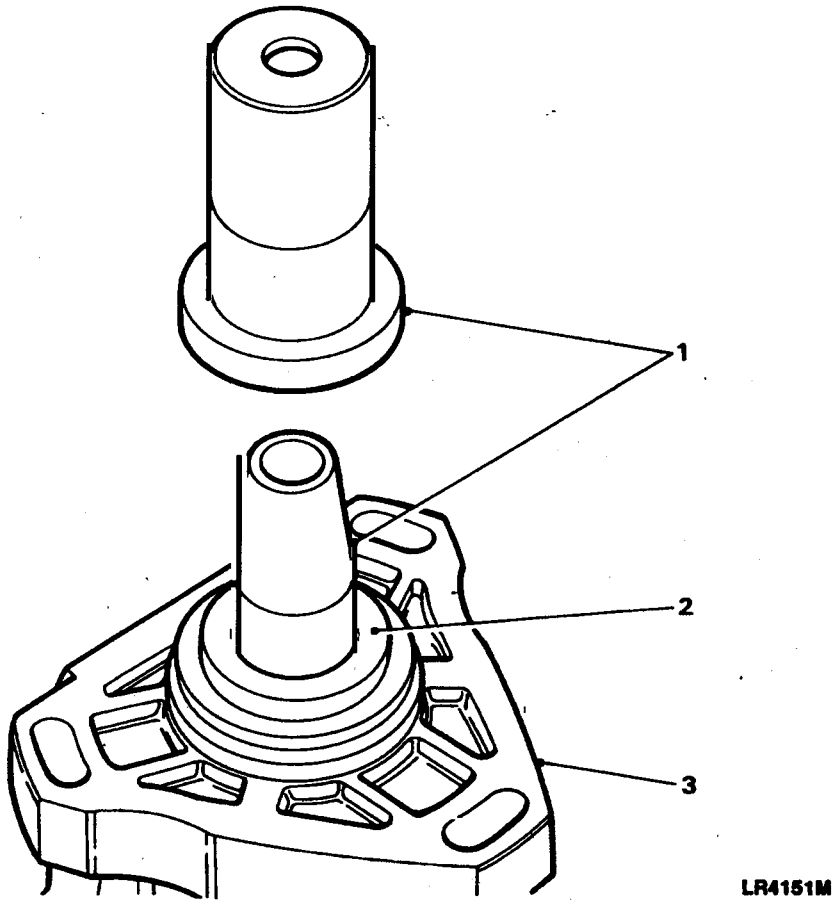
Fig 23 Checking drive shaft end float.

28.4 When correctly fitted, the outer face of the oil seal should be approximately 0,20mm (0.008in) below the spigot face. Check that the shaft rotates freely without excessive drag.

Rear bearing, cam and scroll plates

29 Refit the pump housing to the mounting fixture with the governor machined face at 9 o'clock and proceed as follows:

29.1 Fit the rear bearing (Fig 25 (3)) in the pump housing with the large cut-away section of the bearing towards the drive shaft and the axial slot in the bearing positioned at 3 o'clock to clear the auto-advance stud. Push the bearing fully home so that the chamfered edge abuts the shoulder within the pump housing.



1 Punch and protection cap 2 Oil seal 3 Pump housing

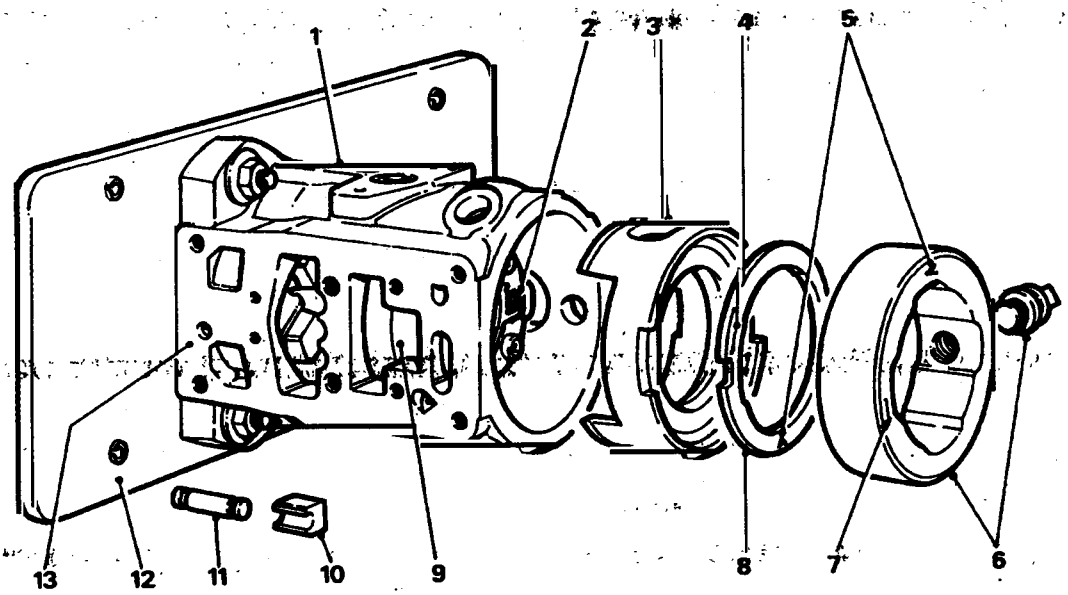
Fig 24 Fitting drive shaft oil seal

29.2 Using tool CAV Part Number 7244-277 or a suitable pair of tweezers, and keeping the matched shoes and rollers (2), (10) and (11) in their respective assemblies, insert them through the 'T' shaped aperture in th housing when the slots in the head of the drive shaft are in the horizontal position.

29.3 To prevent the shoes and rollers being dislodged, fit the first set at 9 o'clock and rotate the shaft 180° in a clock wise direction viewed from the open end of the housing. The opposite assembly can then be fitted.

Note ...

The cam and scroll plates are a matched assembly and can be identified by a grade letter etched on the side of the ring and plate. Also etched on the same two faces are arrows that indicate the direction of rotation when viewed from the drive shaft end.



1	Pump housing	7	Direction arrow-cam ring rotation
2	Shoe and roller assembled in drive head	8	Front scroll plate
3	Rear bearing	9	'T' shaped aperture in housing
4	Direction arrow-scroll plate rotation	10	Shoe) Matched
5	Grade letter	11	Roller) set
6	Cam ring and advance screw	12	Mounting plate
		13	Governor control face

Fig 25 Assembling rear bearing, scroll plate and cam ring

29.4 Insert the front scroll plate (8) into the recess in the rear bearing (3) with the arrow (4) on the plate (8) facing in the same direction as the arrow on the pump name plate.

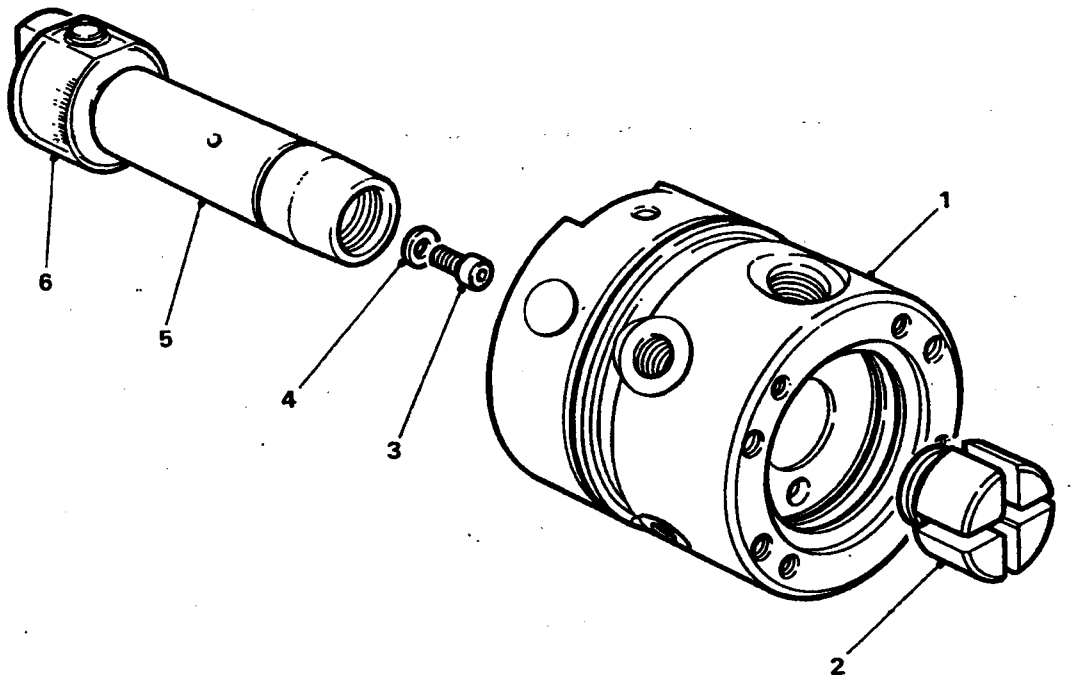
29.5 Ensure that the scroll plate (8) rotates freely and position the notch in the plate mid-way between the cut-away section in the rear bearing (3).

29.6 Fit the cam ring (6), with the arrow again facing in the same direction as the arrow on the name plate, align the threaded hole in the ring with the auto-advance aperture in the housing, and fit the cam advance screw (6) into the cam ring. Tighten finger tight only at this stage.

Hydraulic head

30 To fit the hydraulic head carry out the following:

30.1 Remove the transfer pump rotor (Fig 26 (2)) from the distributor rotor (5) and withdraw the rotor from the head (1). Ensure that the plastic retainer (6) remains in-situ to retain the plungers in the rotor.



1	Hydraulic head	4	Washer
2	Transfer pump rotor	5	Distributor rotor
3	Plug screw	6	Plastic retainer

Fig 26 Exploded view of hydraulic head

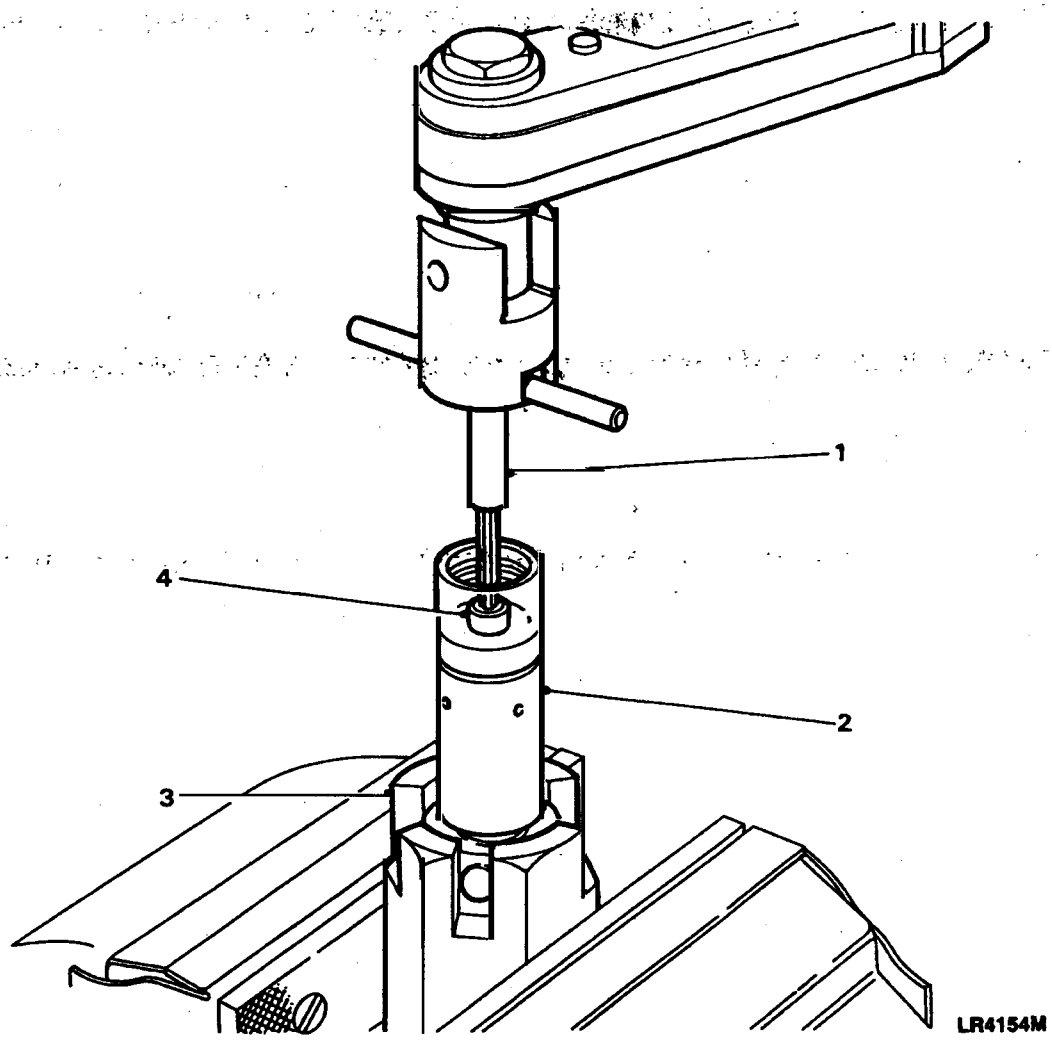
30.2 Check the plug screw (3) in the distributor rotor (5), if the screw has become loose in service, or has been removed, it will be necessary to fit a new screw and washer. The method is as follows:

30.2.1 Thoroughly degrease the threads of the rotor and plug screw, then lightly smear the threads of the screw (3) with 'Araldite' adhesive.

30.2.2 Using rotor holding tool CAV Part Number 7244-220 or a suitable alternative, clamp the tool upright in the jaws of a vice (Fig 27). Locate the tang of the rotor (2) in the holding tool (3) and fit the plug screw (4).

30.2.3 Using the spanner tool (1), CAV Part Number 7144-220 tighten the plug screw to a torque of 3,1 Nm (28 lbf in). Allow the 'Araldite' to harden for six hours at room temperature.

30.3 Refit the distributor rotor (Fig 26 (5)) to the hydraulic head (1) and screw in the transfer pump rotor (2), but do not tighten at this stage.



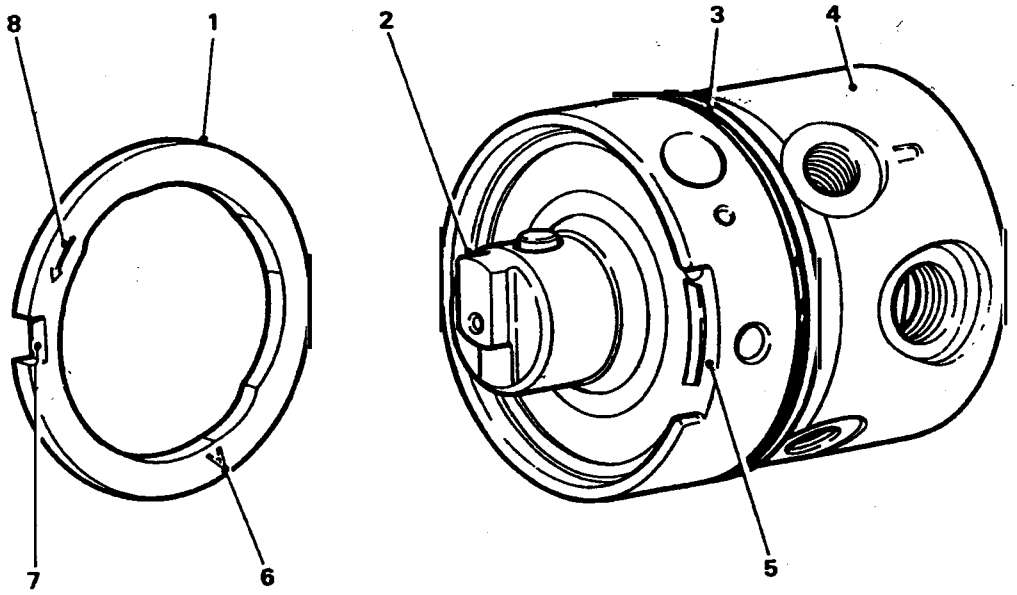
1	Spanner tool	3	Holding tool
2	Distributor rotor	4	Plug screw

Fig 27 Method of tightening rotor plug screw

30.4 Fit the rear scroll plate (Fig 28 (1)) into the recess in the hydraulic head, with the arrow facing in the same direction as the arrow on the pump nameplate, align the notch (7) in the scroll plate with the cut-away portion (5) in the hydraulic head (4).

30.5 Fit a new 'O' ring seal (3) to the groove in the hydraulic head and assemble the head into the pump housing as follows:

30.5.1 Turn the mounting fixture in the vice to position the pump housing governor machined face (Fig 29 (3)) uppermost.



1	Rear scroll plate	5	Cut-away section
2	Rotor tang	6	Matching letter
3	'O' ring seal	7	Notch-scroll plate
4	Hydraulic head	8	Direction arrow-scroll plate

Fig 28 Rear scroll plate and hydraulic head

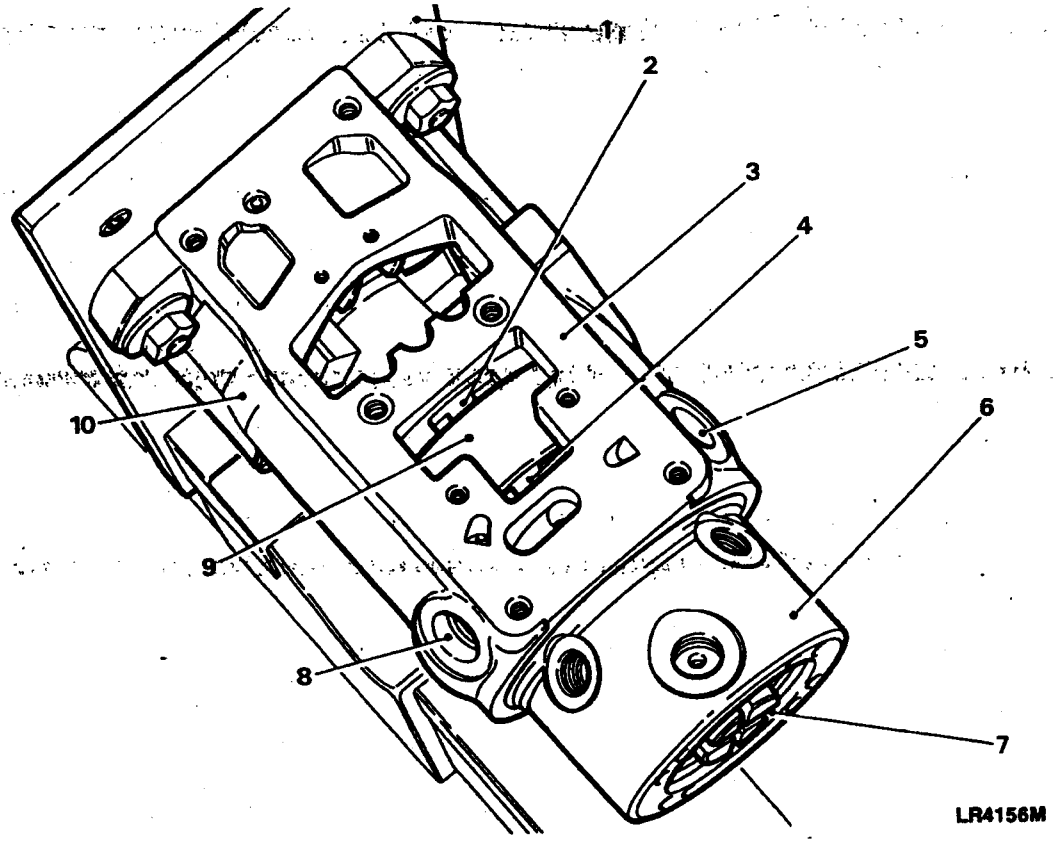
30.5.2 Remove the plastic plunger retainer from the rotor tang.

30.5.3 Rotate the drive shaft to bring the shoes into a horizontal position. Using tool CAV Part Number 7244-277 or a suitable alternative, move the shoe assemblies to their innermost positions.

30.5.4 Check the position of the tang slot location in the drive shaft and align the tang on the rotor to correspond.

30.5.5 Lubricate, with clean test oil, the portion of the hydraulic head (6) that fits in the pump housing (10) and keeping the rotor steady with the thumb to prevent rotation, insert the head into the housing with a rotating motion. Rotating the head during assembly will facilitate entry and prevent damage to the head seal.

30.5.6 When fitted, check that the tang drive has engaged fully by ensuring that the transfer pump rotor is in the innermost position, nearest the head sleeve and flush with the rear face of the hydraulic head.



1	Mounting fixture	6	Hydraulic head
2	Notch-front scroll plate	7	Transfer pump
3	Governor cover machined face	8	Locating hole-rotor vent switch valve
4	Notch-rear scroll plate	9	Cam ring
5	Locating hole-latch valve	10	Pump housing

Fig 29 Inserting the hydraulic head

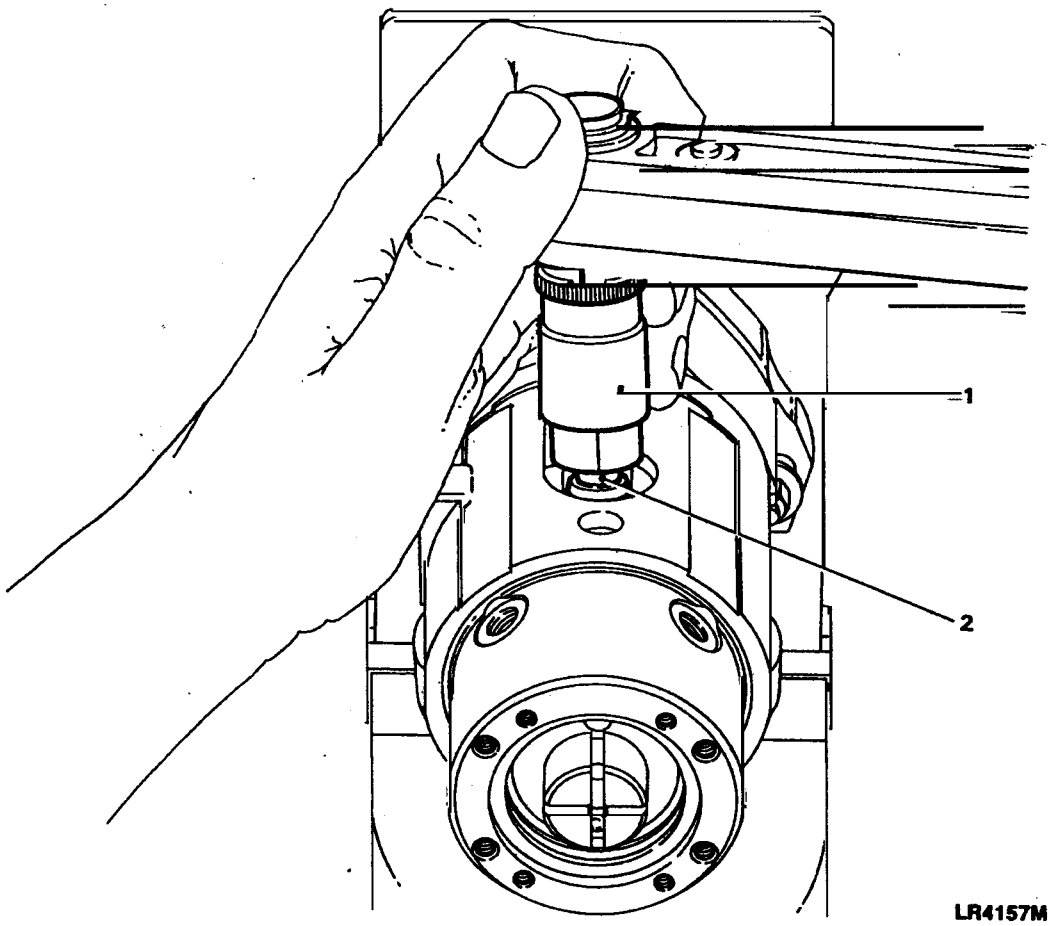
30.5.7 Align the locating holes in the head for the latch and rotor vent switch valves with their respective holes in the pump housing (5) and (8). In this position the metering valve port should be uppermost.

30.5.8 Check that the notches (2) and (4) in the scroll plates are positioned between the 'T' shaped aperture in the pump housing.

Automatic advance housing assembly

31 To fit the automatic advance housing invert the mounting fixture in the vice and proceed as follows:

31.1 Using socket adaptor CAV Part Number 7244-125B (Fig 30 (1)), tighten the cam advance screw (2) to a torque of 51,0 Nm (450 lbf in).



1 Socket adaptor

2 Cam advance screw

Fig 30 Tightening the cam advance screw

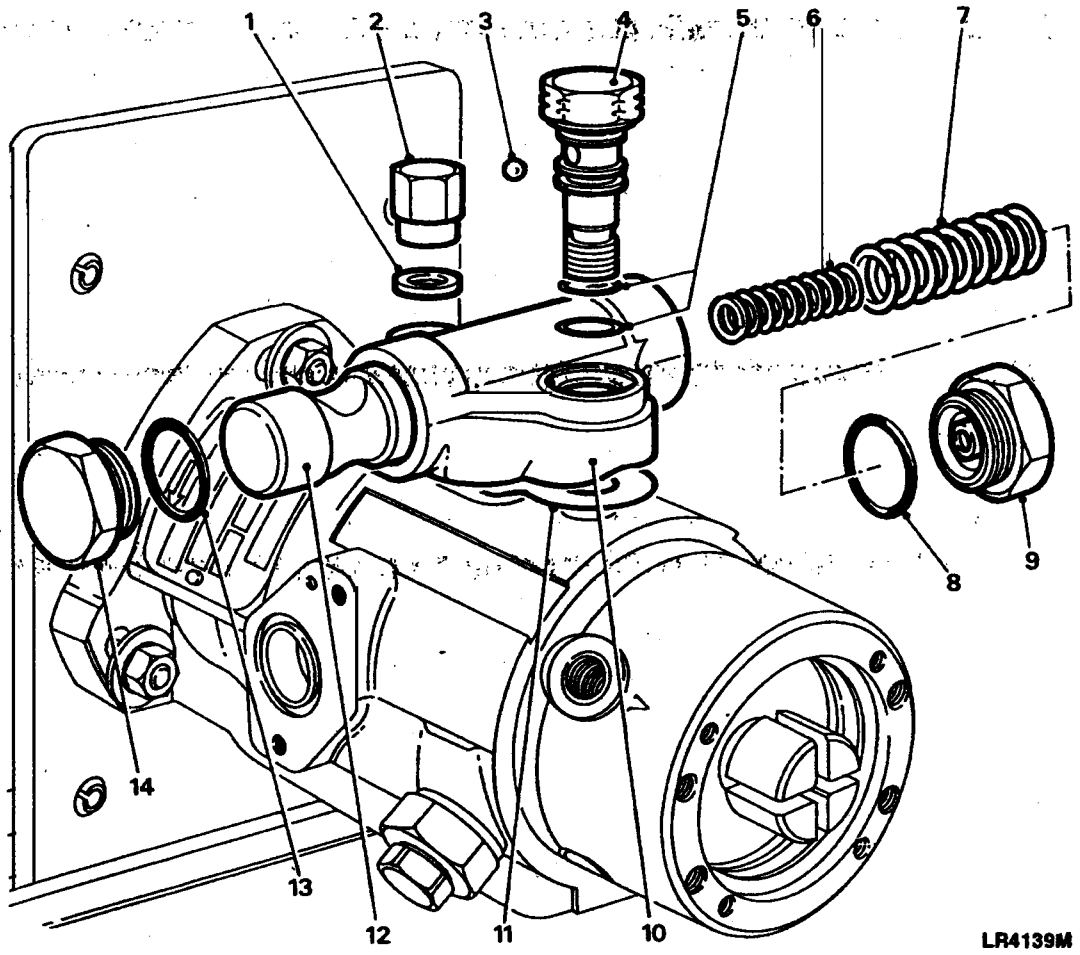
31.2 Remove the tool, check for freedom of movement and if the cam ring is binding, lightly tap the cam advance screw to ensure the cam ring is free in the pump housing.

31.3 Using protection sleeve CAV Part Number 7044-897, fit two new 'O' ring seals (Fig 31 (5)) to the fuel feed banjo bolt (4). Fit the steel ball (3) on its seat in the bolt (4) and insert the bolt and ball into the auto-advance housing (10) to retain the ball.

31.4 Fit a new gasket (11) to the auto-advance housing, ensuring that it is fitted the correct way round, with the straight edge furthest from the fuel feed banjo bolt.

Note ...

The piston and auto-advance housing are a matched pair.



1	'Dowty' oil seal	8	'O' ring seal
2	Cap nut	9	Spring end cap
3	Steel ball	10	Auto-advance housing
4	Fuel feed banjo bolt	11	Gasket
5	'O' ring seal	12	Piston
6	Inner spring	13	'O' ring seal
7	Outer spring	14	Pressure end plug

Fig 31 Advance housing assembly

31.5 Check that the blank (pressure) end of the piston (8) is towards the oil feed drilling end of the housing (11) and fit the advance unit to the pump housing by engaging the bore in the piston with the cam advance screw, finger tighten the banjo bolt (4).

31.6 Fit a new 'Dowty' seal (1) to the housing stud and screw on the cap nut (2) finger tight.

31.7 Progressively and evenly tighten both the banjo bolt and the cap nut. Tighten the banjo bolt to a torque of 40,0 Nm (350 lbf in) and the cap nut to a torque of 15,0 Nm (130 lbf in). Check that both cam ring and piston move freely.

31.8 Fit a new 'O' ring seal (13) to the pressure end plug (14), fit the end plug to the advance housing (10) and tighten to a torque of 28,0 Nm (250 lbf in).

31.9 Fit a new 'O' ring seal (8) to the spring end cap (9), fit the inner and outer springs (6) and (7) to the piston (12) in the advance housing (10) and secure with the end cap. Tighten the end cap to a torque of 28 Nm (250 lbf in).

31.10 Invert the mounting fixture in the vice so that the pump governor cover machined face is uppermost.

Note ...

Latch and rotor vent switch valves. When new, the valve and body of both the latch valve and rotor vent switch valve are supplied as a matched assembly fitted with plastic protection caps to retain the valve in-situ.

Latch valve assembly

32 If a new latch valve is being fitted remove the protection caps and proceed as follows:

32.1 Screw the adjuster (Fig 32 (9)) into the lock nut (8) and leave several threads exposed at the top of the nut. Fit a new rubber washer (7) in the recess in the locknut.

32.2 Using protection sleeve CAV Part Number 7144-18, fit two new 'O' ring seals (3) to the valve body (1).

32.3 Using protection sleeve CAV Part Number 7144-458C, fit a new 'O' ring seal (5) to the sleeve nut (6).

32.4 Fit the latch valve and body (1) with a new 'Dowty' seal (2) into its location in the pump housing. Tighten the valve body to a torque of 19 Nm (170 lbf in). Using tool CAV Part Number 7244-277, or a suitable pair of tweezers, check for free movement of the valve in the body.

32.5 Fit the spring (4) over the spigot end on the valve and screw on the sleeve nut (6).

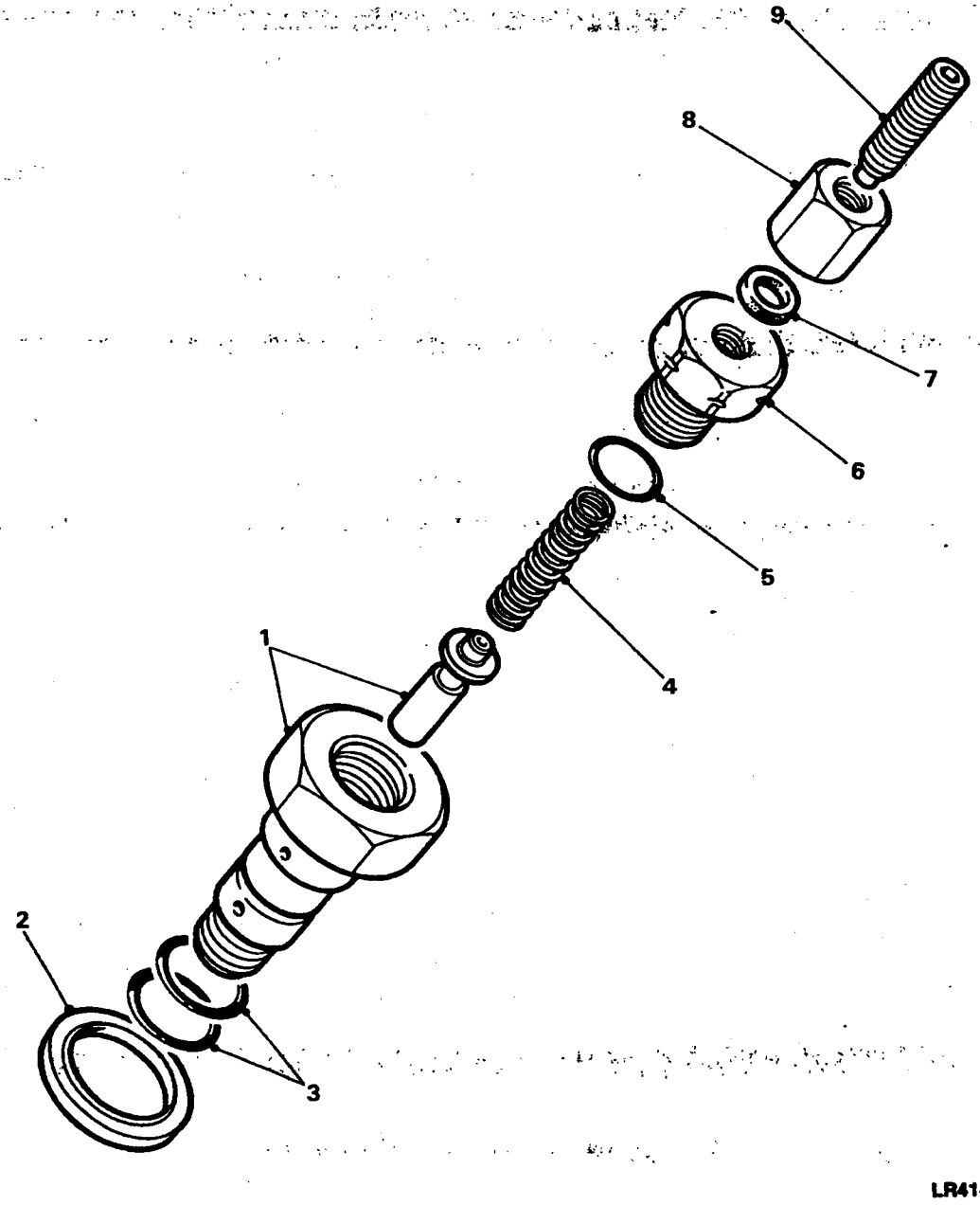
32.6 Engage the stem of the adjuster (9) with the spring (4) and screw the adjuster and locknut into the sleeve nut (6). Tighten the sleeve nut to a torque of 15,6 Nm (140 lbf in) followed by the adjuster locknut (8) to a torque of 4,5 Nm (40 lbf in).

Rotor vent switch valve

33 If a new vent switch valve is being fitted remove the protection caps and proceed as follows:

33.1 Using protection sleeve CAV Part Number 7144-458C, fit a new 'O' ring seal (Fig 33 (2)) to the spring plug (1).

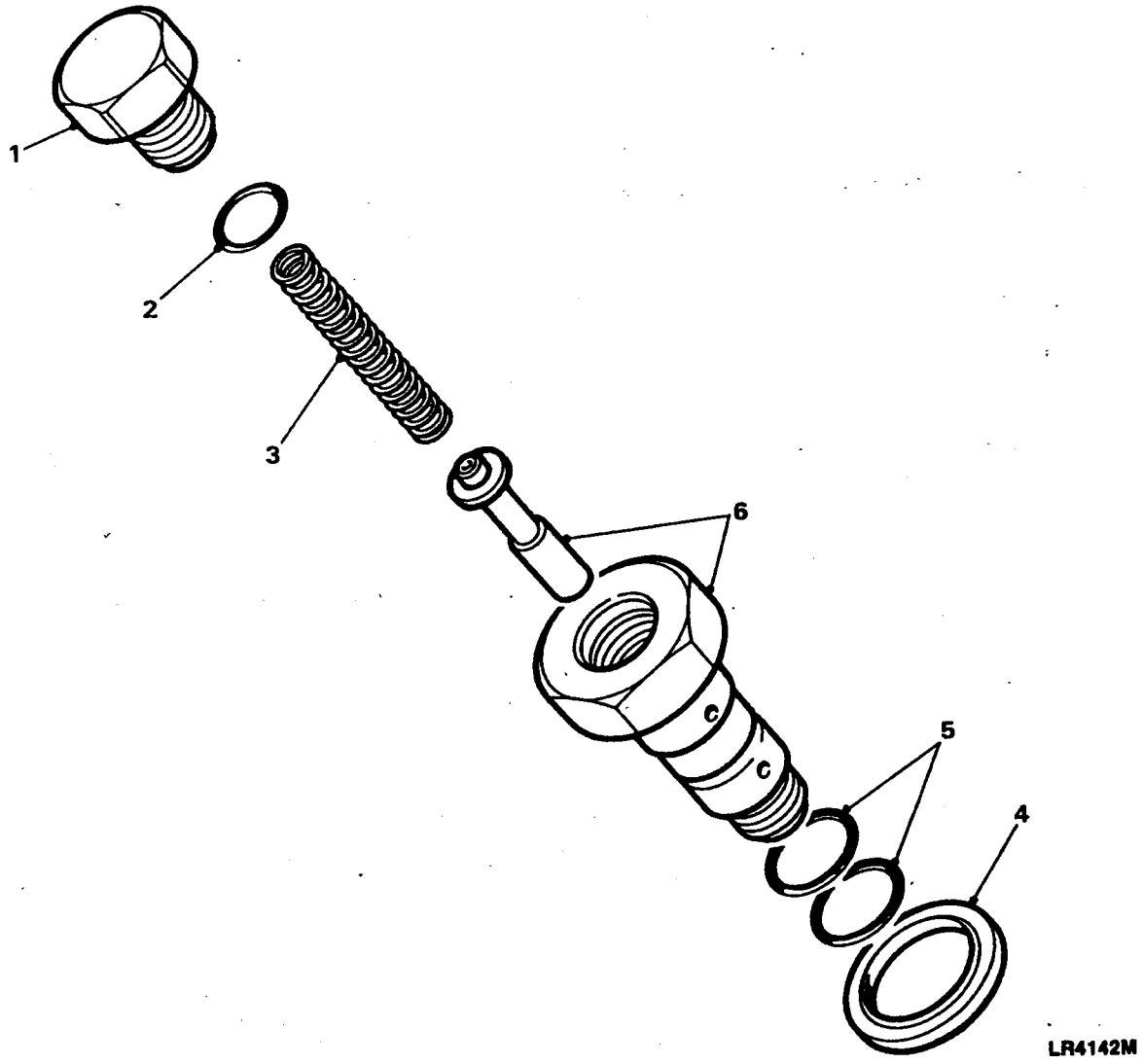
33.2 Fit two new 'O' ring seals (5) to the valve body (6) using protection sleeve CAV Part Number 7144-18.



1	Valve and body	6	Sleeve nut
2	'Dowty' seal	7	Rubber washer
3	'O' ring seals	8	Locknut
4	Valve spring	9	Adjuster
5	'O' ring seal		

Fig 32 Latch valve assembly

33.3 Fit the vent switch valve and body (6) With a new 'Dowty' seal (4) to its location in the pump housing. Tighten the valve body to a torque of 19Nm (170 lbf in).



1	Spring plug	4	'Dowty' seal
2	'O' ring seal	5	'O' ring seal
3	Spring	6	Valve and body

Fig 33 Rotor vent switch valve

33.4 Check for free movement of the valve in the body using tool CAV Part Number 7244-277 or a suitable pair of tweezers.

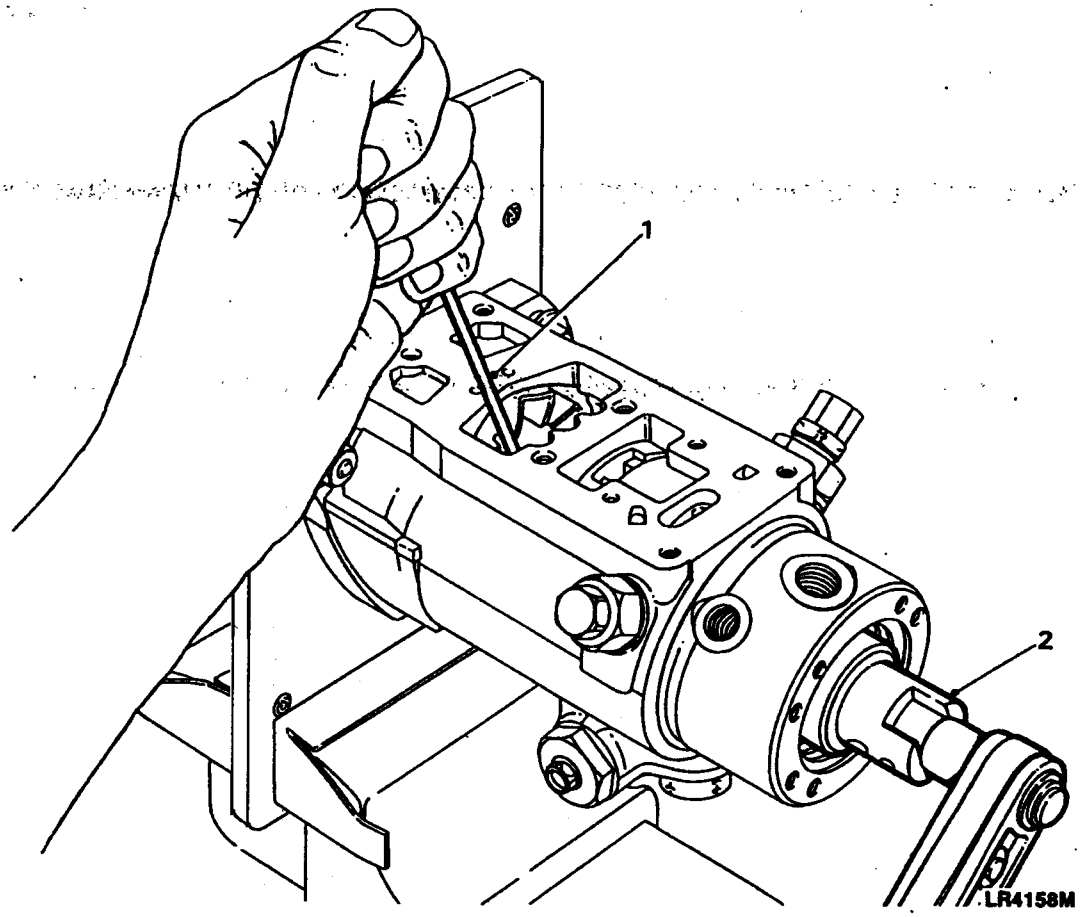
33.5 Insert the spring (3) into the valve body locating it on the spigot end of the valve and screw the plug (1) into the valve body. Tighten the spring plug to a torque of 15,6 Nm (140 lbf in).

Transfer pump

34 To prevent the drive shaft from turning, insert a suitable tommy bar of 4mm (0.157 in) diameter through the front aperture in the pump housing and through the hole in the drive shaft (Fig 34), then proceed as follows:

34.1 Using special tool CAV Part Number 7044-889 inserted in the rotor slots tighten the rotor, in the opposite direction to pump rotation, to a torque of 7,3 Nm (65 lbf in).

34.2 Fit the transfer pump blades and check that they slide freely in the slots of the rotor, then remove.



1 Tommy bar 2 Special tool

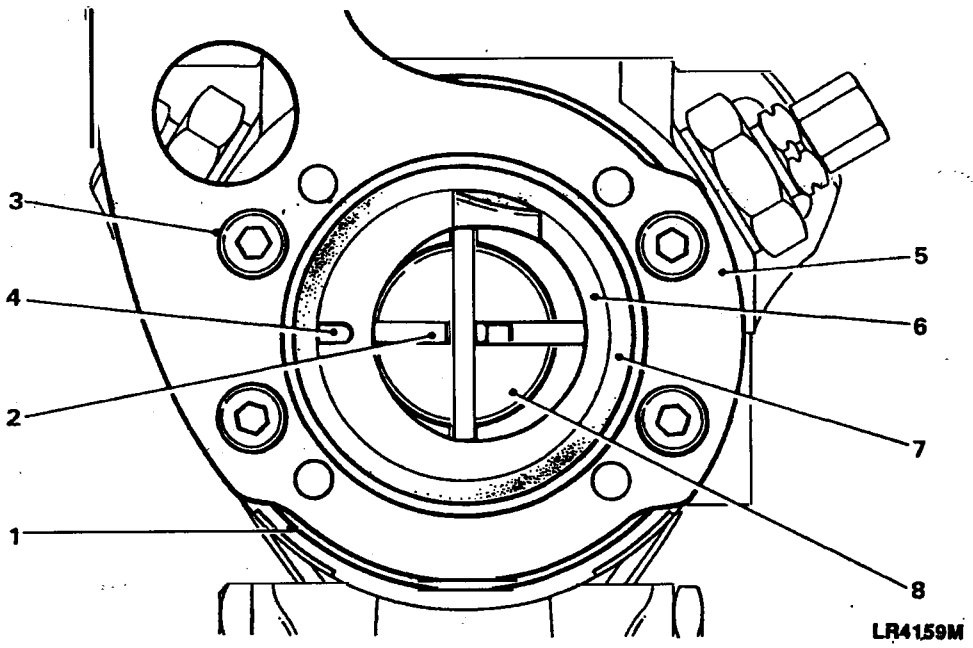
Fig 34 Tightening transfer pump rotor

34.3 Assemble the transfer pump liner (Fig 35 (7)) to the rotor head with the direction of rotation slot (4) in the side of the liner positioned at 9 o'clock, when viewed from the rotor end of the pump, and the cut-away side of the liner facing outwards.

34.4 Dip the blades in clean test oil and insert them in the slots in the rotor, check again that the blades move freely.

34.5 Lubricate the sealing ring (7) with clean test oil and fit to the recess between the liner and the head.

34.6 Position the hydraulic head bracket (5) onto the head with the elongated end pointing upwards at approximately 11 o'clock. Fit the four hexagon socket screws (3) and tighten each of the screws in a diagonal sequence to a torque of 14,0 Nm (120 lbf in).



1	Hydraulic head	5	Hydraulic head bracket
2	Transfer pump blades	6	Liner
3	Socket screw	7	Sealing ring
4	Liner rotation slot	8	Transfer pump rotor

Fig 35 Fitting rotor liner and head bracket

End plate and regulating valve assembly

35 To assemble the regulating valve proceed as follows:

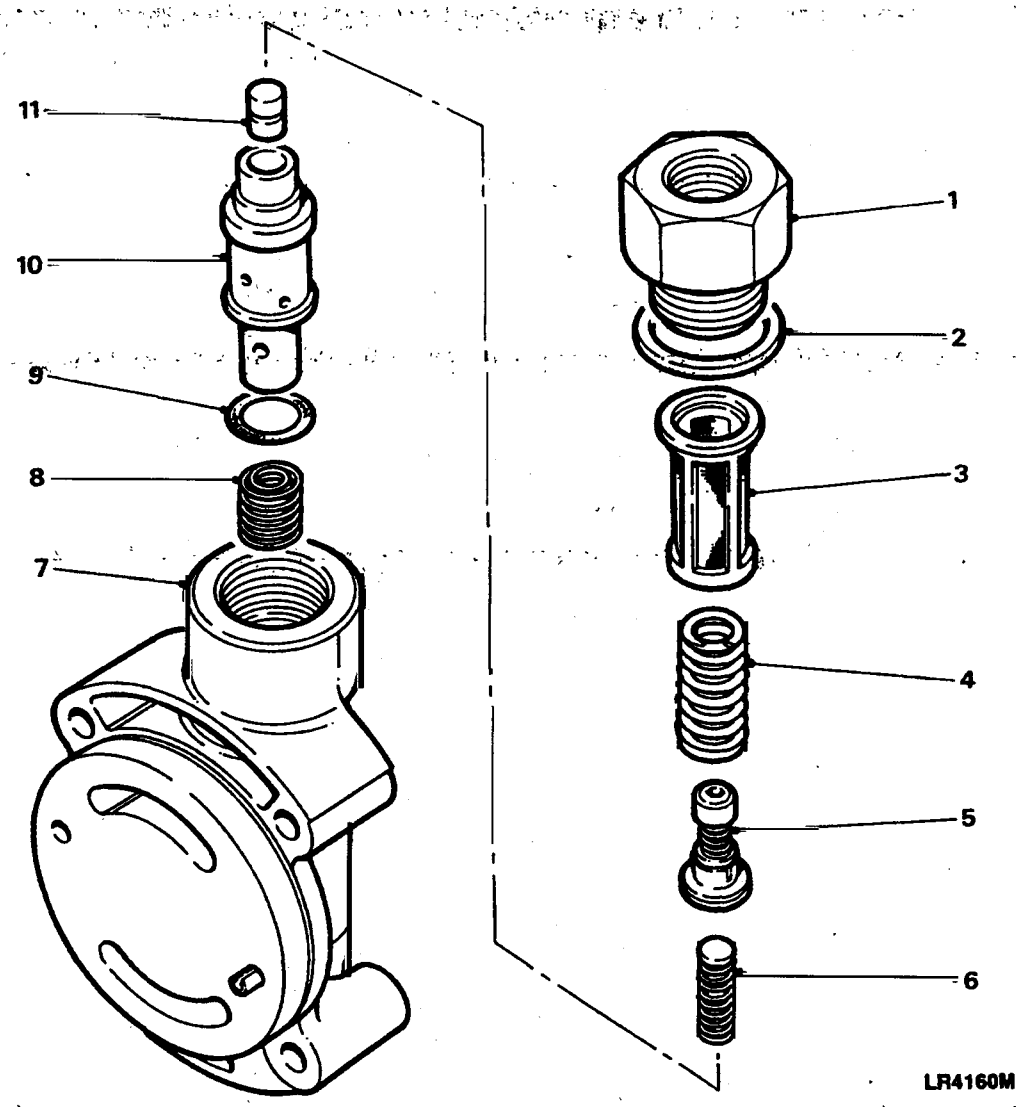
35.1 Insert into the open end of the regulating sleeve (Fig 36 (10)) the piston (11), spring and peg assembly (6) with peg uppermost, followed by the transfer pressure adjuster (5).

35.2 Fit the sleeve retaining spring (4) to the flange of the adjuster (5) and to retain the assembly, push the filter (3) into position against the shoulder of the sleeve.

35.3 Insert the piston retaining spring (8) into the well of the end plate (7), fit a new sealing washer (9) to the small diameter end of the regulating sleeve (10) and holding the valve assembly and end plate in a horizontal plane slide the valve into the end plate.

35.4 Fit the inlet connection (1) with a new copper washer (2) to the end plate (7), tighten finger tight only.

35.5 Fit the end plate assembly (Fig 37 (2)), with the fuel inlet connection uppermost to the hydraulic head ensuring that the dowel (5) on the inner face of the end plate engages with the slot (6) in the transfer pump liner.

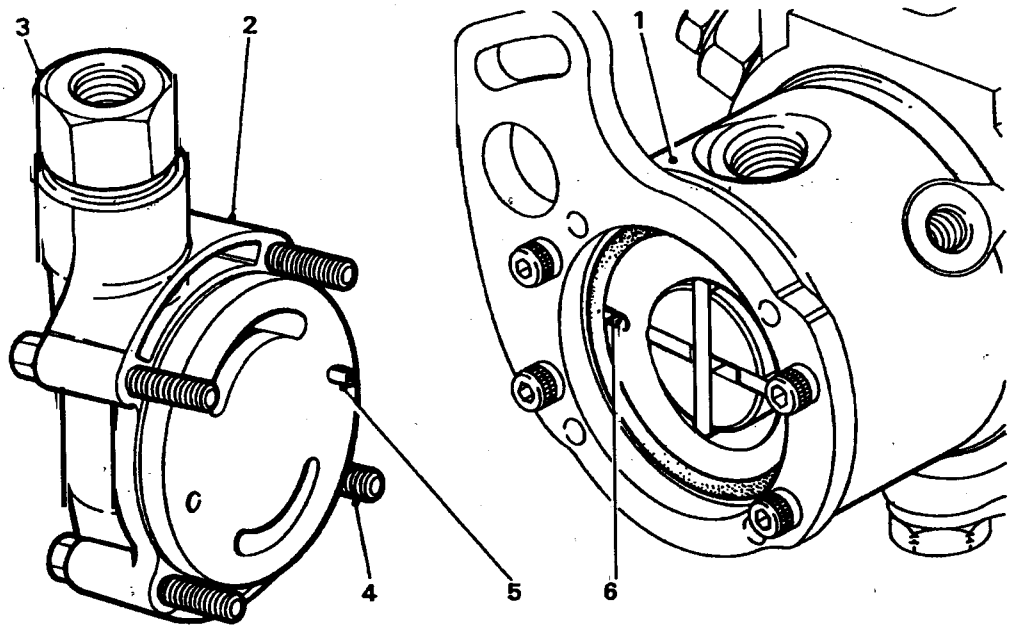


1	Fuel inlet connection	7	End plate
2	Washer	8	Spring-piston retaining
3	Filter	9	Sealing washer
4	Spring-retaining sleeve	10	Regulating sleeve
5	Transfer pressure adjuster	11	Regulating piston
6	Spring and peg assembly		

Fig 36 End plate and regulating valve

35.6 Fit the four hexagon headed screws (4) to the end plate and, whilst rotating the drive shaft to ensure that the drive remains free, tighten the screws in a diagonal sequence to a torque of 5,0 Nm (45 lbf in).

35.7 Tighten the fuel inlet connection (3) to a torque of 59 Nm (520 lbf in).



1	Hydraulic head	4	Hexagon headed screw
2	End plate	5	Dowel
3	Fuel inlet connection	6	Slot-transfer pump liner

Fig 37 Fitting the end plate assembly

Governor arm control bracket assembly

36 If removed, fit the idle actuator and guide bracket (Fig 38 (1)) with the two hexagonal 'Panhead' screws, tighten the screws to a torque of 1,7 Nm (151 lbf in). Assemble the governor spring linkage components to the linkag hook (7) as follows:

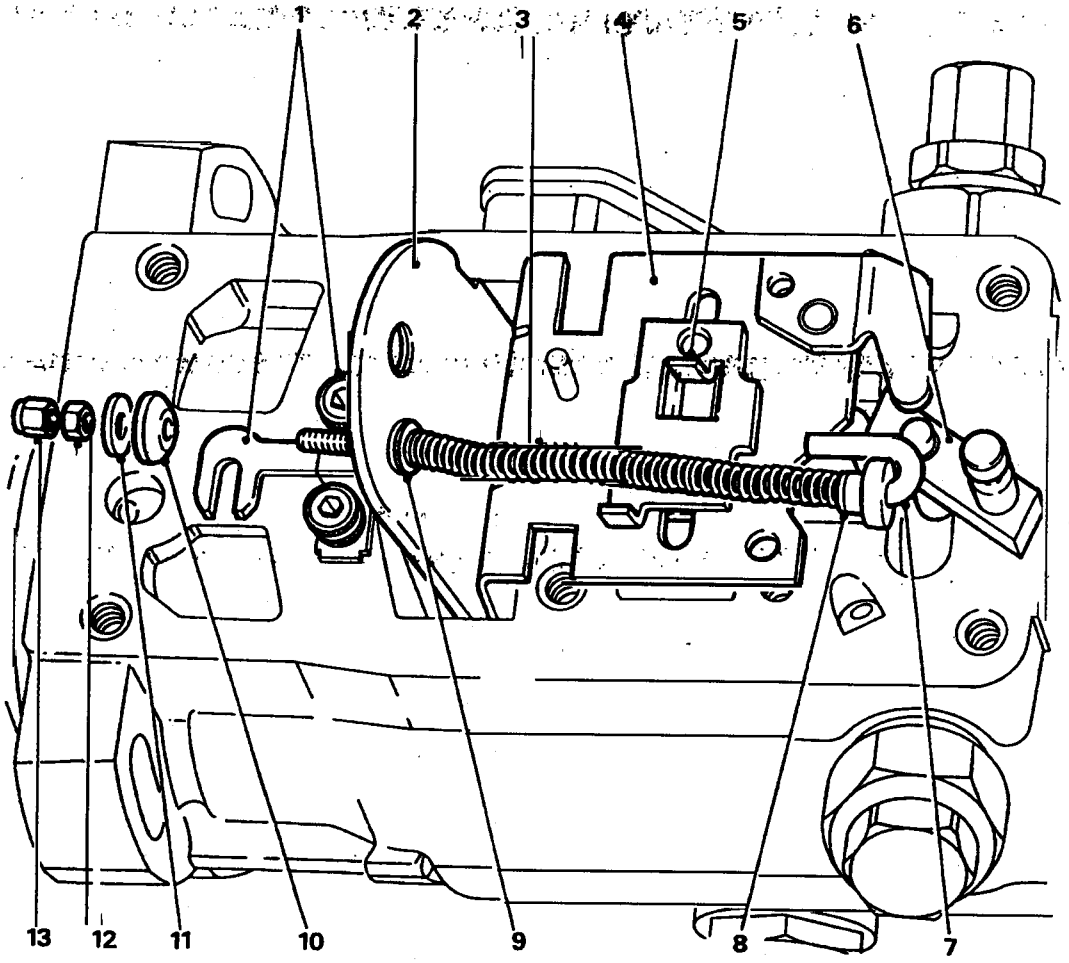
36.1 Slide the spring retainer (8) large end first, on the linkage hook (7) followed by the long spring (3) and fibre washer (9). Pass the stem of the hook through the small hole in the governor arm (2) and fit the pivot ball washer (10), washer (11), linkage nut (12) and locknut (13).

36.2 Insert the metering valve (6) into the bore in the hydraulic head.

Note ...

Before assembling the control arm and bracket, check that the notches in the front and rear scroll plates are centrally positioned between the 'T' shaped aperture in the pump housing. Also ensure that the step on the governor thrust sleeve is uppermost.

36.3 Engage the control bracket (4) with the governor arm (2) and position in the pump housing by placing the toes at the lower end of the governor arm on top of the step on the governor thrust sleeve. At the same time, align the legs on the link plate (5) to engage with the notches in the scroll plates.

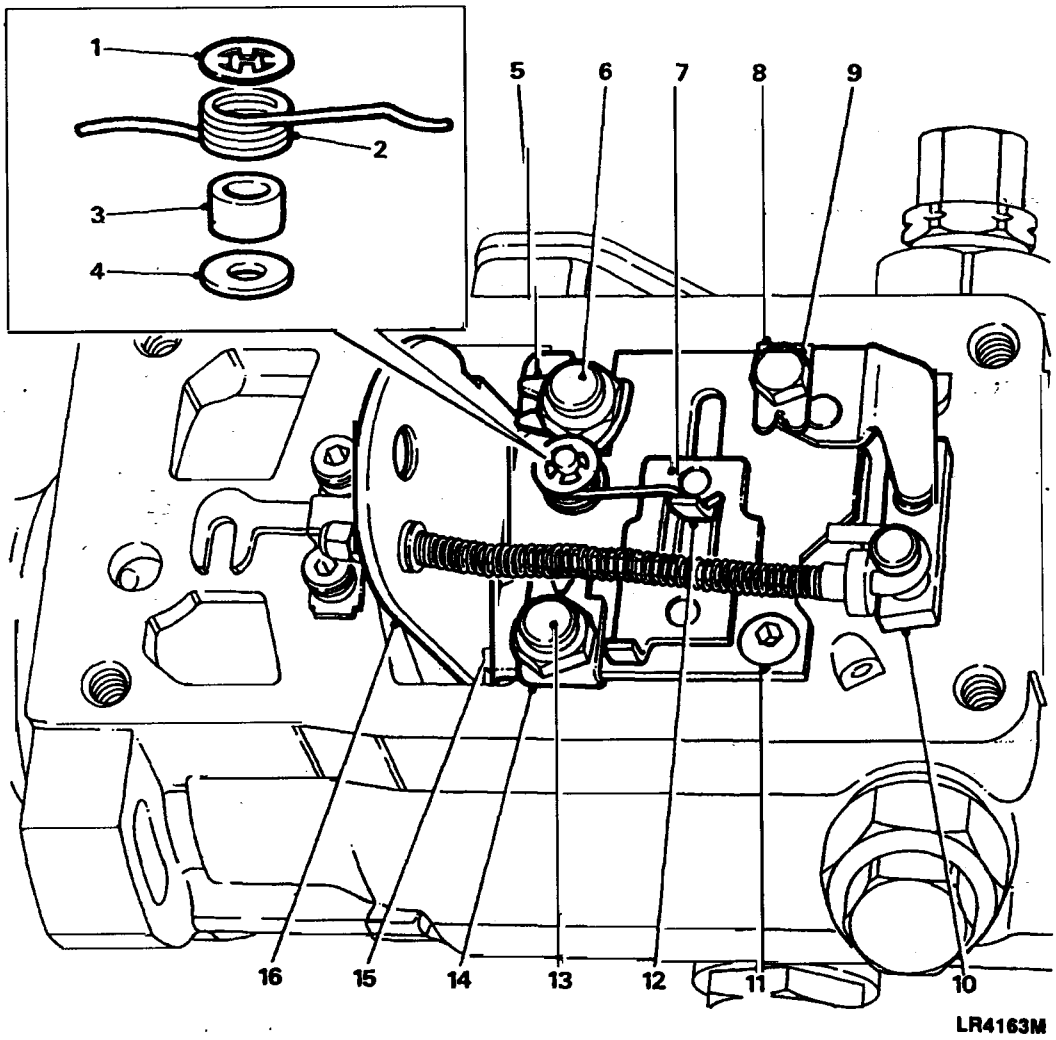


1	Idle actuator and guide bracket with screws	7	Linkage hook
2	Governor arm	8	Spring retainer
3	Linkage spring	9	Fibre washer
4	Control bracket	10	Pivot ball washer
5	Scroll link plate	11	Washer
6	Metering valve	12	Linkage nut
		13	Self locking nut

Fig 38 Assembling the governor control linkage

36.4 Position three new tab washers (Fig 39 (5), (8) and (14)) on the control bracket (15) with the two larger washers nearest the governor arm (16). Screw in the two studs (6) and (13), the hexagon headed screw (9) and 'Panhead' screw (11).

36.5 Tighten the studs to a torque of 6,8 Nm (60 lbf in) and the screws (9) and (11) to a torque of 2,3 Nm (20 lbf in). Lock the three tab washers on completion of tightening.



1	Spring retainer	9	Hexagon headed screw
2	Spring	10	Metering valve
3	Sleeve	11	'Panhead screw'
4	Spacer	12	Inner tongue-link plate
5	Large tabwasher	13	Stud-control bracket
6	Stud-control bracket	14	Large tabwasher
7	Scroll-link plate	15	Control bracket
8	Small tabwasher	16	Governor arm

Fig 39 Assembled governor control linkage

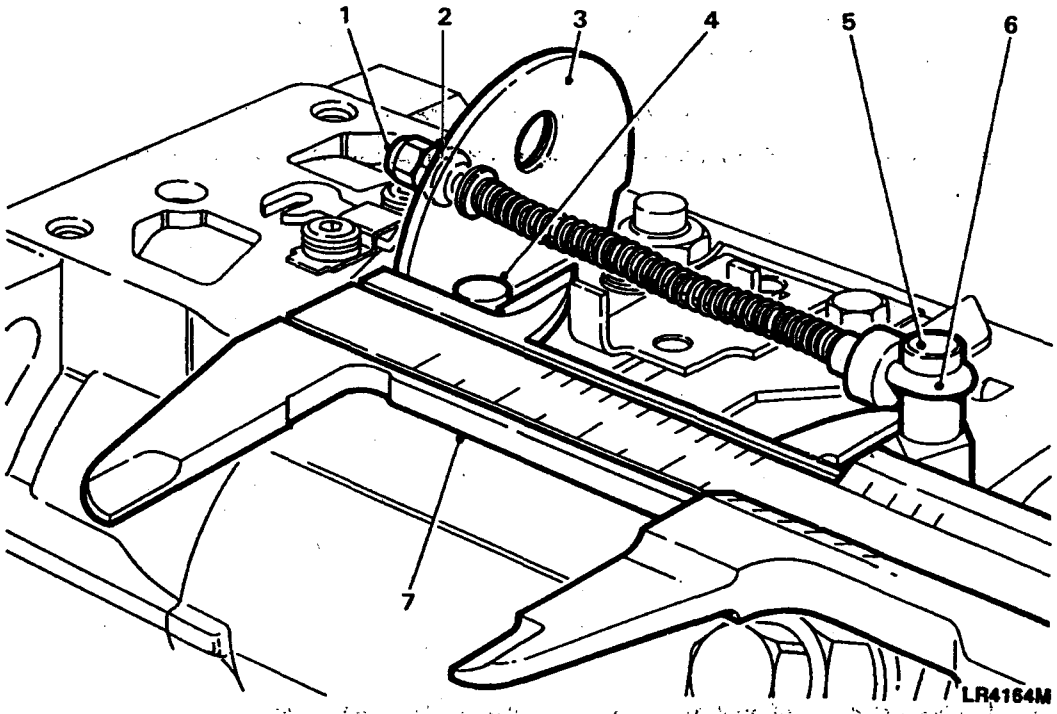
36.6 Attach the metering valve (10) to the linkage hook and ensure that the linkage moves freely.

36.7 Setting the governor linkage - To set the governor linkage proceed as follows:

36.7.1 Set the linkage length using a vernier gauge (Fig 40), so that the dimension as stated on the Test Plan is obtained measured inside between the diameters of the control bracket stud (4) and the metering valve linkage pin (5).

36.7.2 Ensure that the vernier gauge is held parallel to the axis of the pump and apply a light pressure to the governor arm (3) to hold the metering valve in the fully open position. Ensure that the measuring calliper does not enter the hook location groove on the metering valve pin and that the opposite leg of the calliper engages the rounded portion above the hexagon of the stud (4). Slacken the locknut (1) and adjust as necessary.

36.7.3 After completion of the setting, tighten the linkage locknut (1).

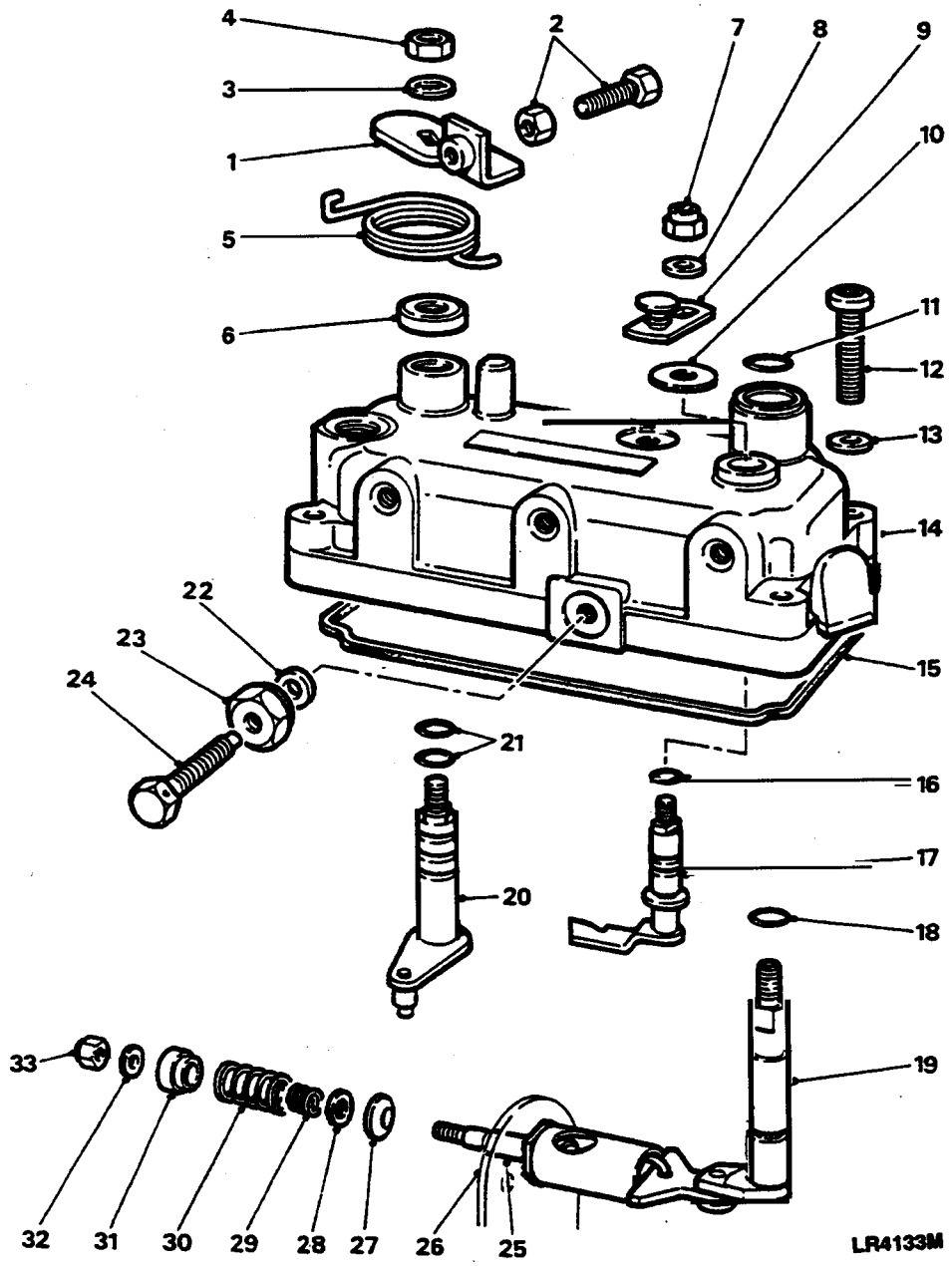


1	Self locking nut	5	Linkage pin– metering valve
2	Linkage adjuster nut	6	Linkage hook
3	Governor arm	7	Vernier gauge
4	Stud-control bracket		

Fig 40 Setting the governor linkage

36.8 Fit the spacer (Fig 39 (4)), sleeve (3) and spring (2) to the retaining pin on the control bracket (15). Tension the spring by hooking the short leg behind the stud (6) and abut the kink in the long leg against the inner tongue (12) on the link plate (7).

36.9 Secure the spring with a new spring retainer (1), pressing the retainer firmly against the sleeve (3).



1	Idling lever	12	Hexagon socket screw	23	Locknut
2	Idling adjustment screw and locknut	13	Washer	24	Max. fuel adjuster screw
3	Shakeproof washer	14	Governor control cover	25	End plug
4	Locknut	15	Rubber seal	26	Governor arm
5	Return spring	16	'O' ring seal	27	Pivot ball washer
6	Spring guide	17	Excess fuel shaft	28	Plain washer
7	Self locking nut	18	'O' ring seal	29	Buffer spring
8	Plain washer	19	Throttle shaft assembly	30	Anti-stall spring
9	Excess fuel plate	20	Idling shaft	31	Spring abutment
10	Plain washer	21	'O' ring seals	32	Plain washer
11	'O' ring seal	22	Rubber washer	33	Self locking nut

Fig 41 Governor control cover

Governor control cover

37 Para deleted.

Idling shaft and lever

38 To assemble the idling shaft and lever proceed as follows:

38.1 Using protection sleeve CAV Part Number 7144-458C over the threads of the idling shaft (Fig 41 (19)), fit two new 'O' ring seals (20) and pack the centre groove on the shaft with Shell 'Alvania R2' grease.

38.2 Inset the idling shaft (20) from the inside of the cover (13) and push the shaft into position. Fit the spring guide (6), over the top of the threaded end of the shaft followed by the return spring (5). Locate the large hooked end of the spring over the boss on the cover, fit the idling lever (1), complete with idling adjustment screw and locknut (2), and secure with shakeproof washer (3) and locknut (4). Tighten the nut to a torque of 3.4 Nm (30 lbf in.).

38.3 Using a suitable hooked tool tension the spring by engaging the small end of the spring behind the lever (Fig 41).

Excess fuel shaft

39 To assemble the excess fuel shaft carry out the following:

39.1 Using protection sleeve CAV Part Number 7244-442 over the threads of the excess fuel shaft (17), fit a new 'O' ring seal (16) to the lower groove on the shaft. Pack the upper groove with Shell 'Alvania R2' grease.

39.2 Insert the shaft (17) from the inside of the cover (14) and push into position. Position the lever in line with the drive shaft with its tip towards the tapered end.

39.3 Fit the plain washer (10), excess fuel plate (9) and retain with plain washer (8) and self locking nut (7). Tighten to a torque of 1.7 Nm (15 lbf in.).

Throttle shaft and anti-stall components

40 To fit the throttle shaft and anti-stall components proceed as follows:

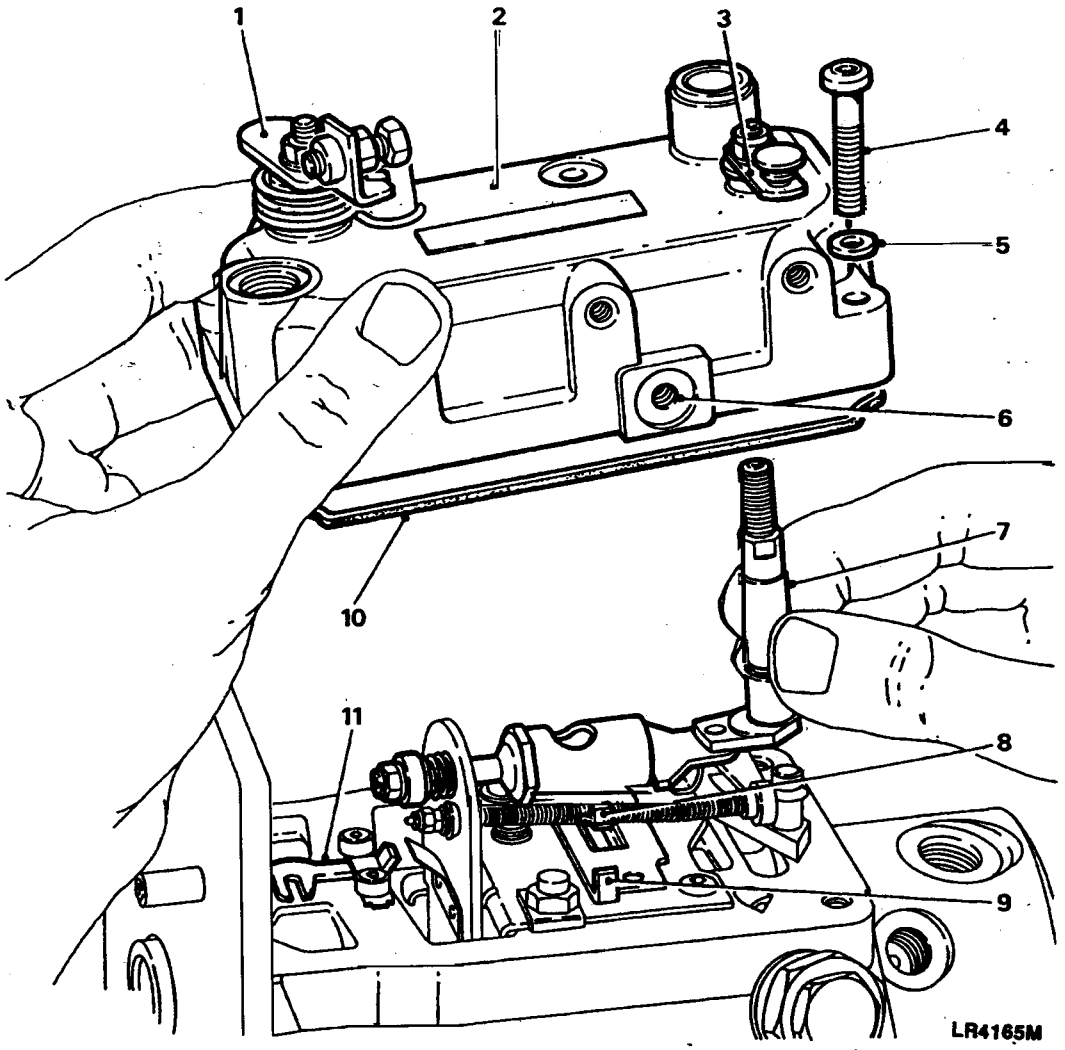
Note ...

The throttle shaft assembly is supplied as a complete pre-loaded pack and should not be dismantled.

40.1 Using protection sleeve CAV Part Number 7244-458C over the threads of the throttle shaft (19) fit a new 'O' ring seal (18) to the shaft.

40.2 Insert the threaded part of the end plug (25) through the hole in the governor arm (26) and assemble the anti-stall components to the end plug in the following order:

40.2.1 Pivot ball washer (27) with spherical side fitted against the governor arm (26), washer (28), buffer spring (29), anti-stall spring (30), spring abutment (31) small diameter towards spring, plain washer (32) and self locking nut (33). Nip the locknut to retain the assembly.



1	Idling lever	7	Throttle shaft
2	Governor control cover	8	Inner tongue) Scroll link
3	Plate-excess fuel lever	9	Outer tongue) plate
4	Hexagon socket screw	10	Rubber seal
5	Washer	11	Slot-idle actuator
6	Aperture-max. fuel adjuster		

Fig 42 Fitting the governor control cover

40.3 Fit the governor control cover rubber seal (Fig 42 (10)) to its groove in the cover.

40.4 Insert the throttle shaft (7) through the bore in the control cover and push the shaft into position. Lower the cover (2) towards the pump housing ensuring that the spigot on the underside of the idling shaft lever (1) engages with the slot in the idle actuator (11), at the same time, check that the lever on the exc ss fuel shaft (3) is positioned between the inner (8) and outer (9) tongues on the scroll link plate.

40.5 When the cover (2) is in place, rotate the excess fuel lever (3) in a clockwise direction and check for scroll link plate movement, viewed through the maximum fuel adjuster aperture (6). If the lever is correctly engaged, the outer tongue (9) on the scroll link plate will move inwards.

40.6 Fit the hexagon socket screws (4) with washers (5) and tighten uniformly to a torque of 4,0 Nm (35 lbf in).

Maximum fuel adjustment screw

41 Fit the maximum fuel adjustment screw as follows:

41.1 Screw the adjuster (Fig 41 (24)) into the locknut (23) and fit a new rubber washer (22) to the recess in the locknut.

41.2 Screw the adjuster into the cover approximately halfway down the threads on the screw and tighten the locknut to a torque of 3,4 Nm 30 lbf in.

Vent screw

42 Assemble the vent screw (Fig 43 (17)) to the body (16) and fit the assembly to the governor control cover (13) with a new copper washer (15). Tighten the body to a torque of 4,5 Nm (40 lbf in).

Throttle l ver assembly

43 Fit the throttle lever assembly as follows:

43.1 If removed fit the excess fuel shaft break-back spring (6) to the throttle lever (5), engage the hook end of the spring behind the tongue on the lev r and locate the coil on the spigot under the lever.

43.2 Using protective sleeve, CAV Part Number 7244-458C, over the threads of the throttle shaft (12) fit a new 'O' ring seal (11) to the recess in the boss on the cover (13).

43.3 Fit the packing ring (9) and cap washer (8) to the throttle shaft (12) and position the throttle lever spring (10) with the straight leg abutting against the excess fuel shaft boss (14) on the cover. Fit the crooked end of the spring to the small slot in the lever (5) and fit the lever to the throttl shaft.

Key to Fig 43

1	Set bolt	15	Copper washer
2	Spring washer	16	Vent screw body
3	Plain washer	17	Vent screw
4	Indexing plate	18	Stud-linkage spring
5	Throttle lever assembly	19	Washer
6	Break-back spring	20	Back leakage adaptor
7	Linkage spring	21	Locknut with compressible washer
8	Cap washer	22	Plain washer
9	Packing ring	23	Ball pin
10	Throttle lever spring	24	Plain washer
11	'O' ring seal	25	Self locking nut
12	Throttle shaft	26	Plain washer
13	Governor control cover	27	Self locking nut
14	Boss and pin-excess fuel plate		

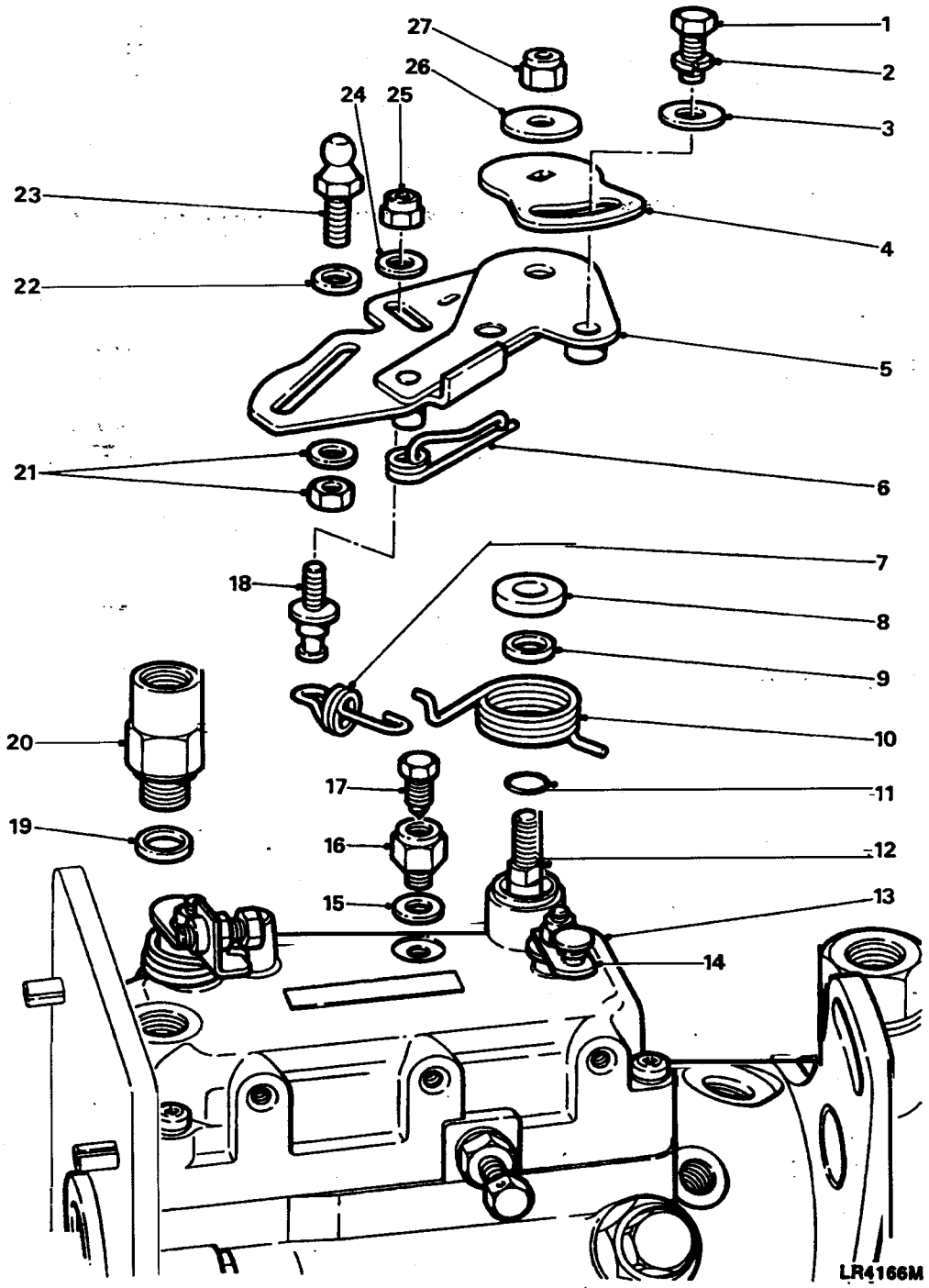


Fig 43 Throttle lever assembly, vent screw and pressurising valve

43.4 Pull the throttle shaft fully upwards and locate the indexing plate (4) on the shaft with the 'X' stamped on the plate uppermost. Secure the throttle lever assembly to the shaft with plain washer (26) and self locking nut (27), temporarily tighten to a torque 4,5 Nm (40 lbf in).

43.5 Fit the setbolt (1) with spring and plain washers (2) and (3) through the slot in the indexing plate (4) to the boss on the throttle lever (5). Screw in only two turns at this stage.

43.6 Fit the stud (18) in the transverse slot in the lever (5) and retain with washer (24) and self locking nut (25), do not tighten at this stage. Fit the shorter hook of the linkage spring (7) to the stud with its open end towards the throttle shaft.

43.7 To achieve sufficient lift on the lever (5) to clear the previously assembled idling lever, slacken the locknut (27) half a turn and pull back the throttle lever (5) against the compression of the spring. Retain in this position using a suitable 11mm socket fitted to the vent screw body (16). The socket should not be removed until after the throttle control bracket has been fitted.

43.8 Re-tighten the self locking nut (27) to a torque of 4.5 Nm (40 lbf in). Screw in the setbolt (1) and tighten to a torque of 5,6 Nm (50 lbf in).

43.9 Assemble the ball pin (23) and washer (22) to the long slot in the lever and secure with locknut and integral 'Belleville' washer (21).

Back leakage adaptor

44 To fit the back leakage adaptor (20), pull the idling lever clear and fit th adaptor with a new washer (19) to the cover (13). Tighten to a torque of 20 Nm (180 lbf in).

Delivery valve assemblies

45 To fit the delivery valves proceed as follows:

Note ...

The following procedure is the same for each of the delivery valves.

45.1 Fit a new washer (Fig 44 (17)) to the banjo connection (18), insert the delivery valve assembly (16) with the larger diameter end first, followed by the washer (15).

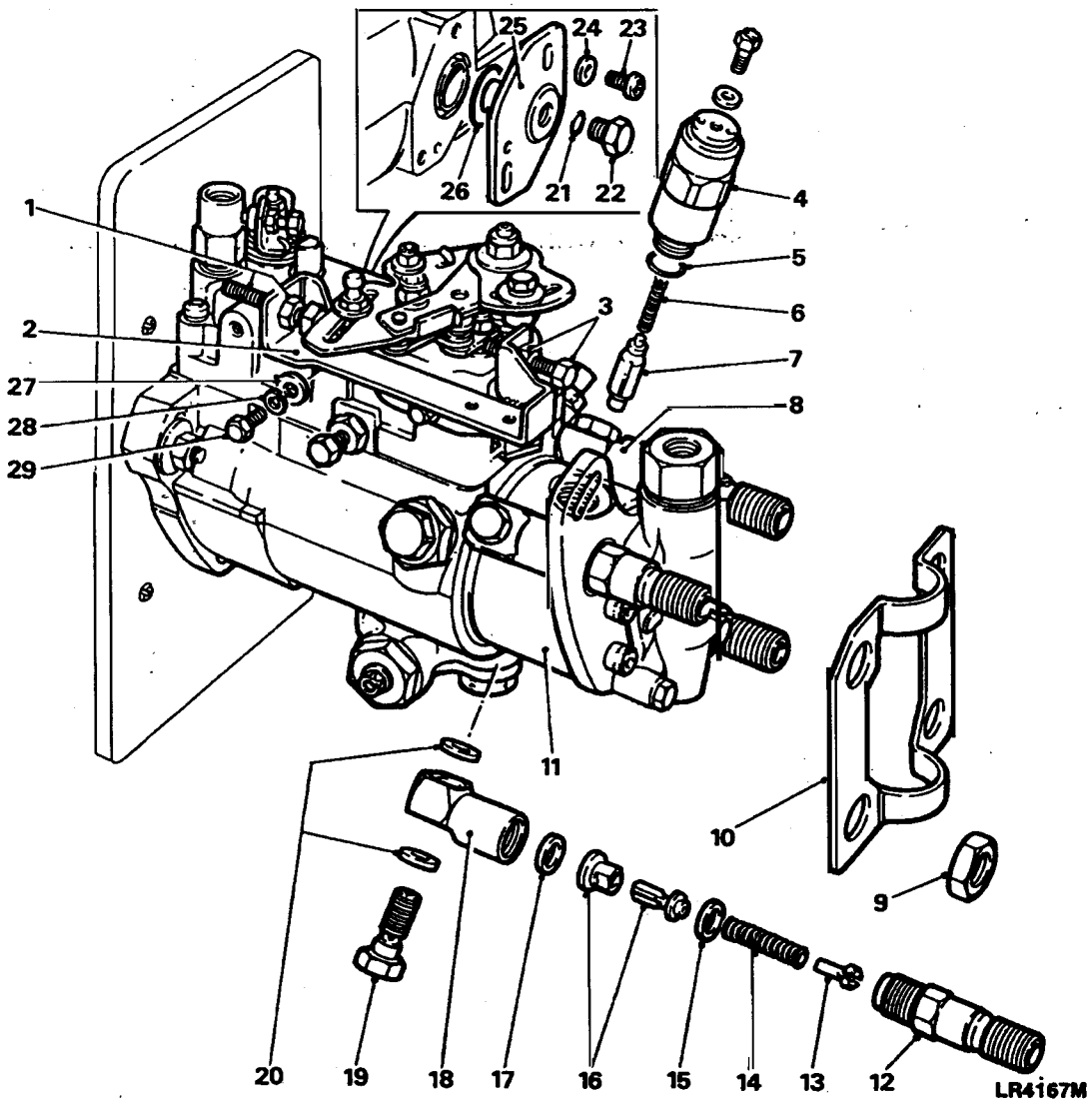
45.2 Place the shank of the spring peg (13) in the spring (14) and insert both, spring peg end first, into the delivery valve holder (12).

45.3 Screw the assembled valve holder into the banjo engaging the end of the spring on the spigot of the delivery valve (16). Holding the banjo connection (18) in the soft jaws of a vice, tighten the delivery valve holder to a torque of 41,0 Nm (360 lbf in).

45.4 Fit the assembled valves to the hydraulic head (11), in the positions noted during dismantling, with the banjo bolts (19) and new washers (20) positioned either side of the banjo, tighten finger tight only.

45.5 Fit the support bracket (10) to the delivery valve holders and secure, finger tight, with nuts (9).

45.6 Tighten the banjo bolts to a torque of 35,6 Nm (320 lbf in), and the support bracket nuts to a torque of 41,0 Nm (360 lbf in).



1	Anti-stall screw Washer and locknut	9	Nut-support bracket	20	Washers
2	Throttle control bracket	10	Support bracket	21	'O' ring seal
3	Max speed screw and locknut	11	Hydraulic head	22	Plug screw
4	Solenoid	12	Delivery valve holder	23	'Torx' screw
5	'O' ring seal	13	Spring peg	24	Shakeproof washer
6	Spring	14	Spring	25	Timing cover plate
7	Plunger	15	Washer	26	'O' ring seal
8	Banjo assembly	16	Delivery valve	27	Washer
		17	Washer	28	Spring washer
		18	Banjo connection	29	Set bolt
		19	Banjo bolt		

Fig 44 Throttle control bracket, solenoid and timing cover plate

Solenoid assembly

46 Using protection cap CAV Part Number 7044-897 fit a new 'O' ring seal (5) to the solenoid (4). Insert spring (6) in the plunger (7) and fit to the solenoid. Fit the solenoid assembly to the hydraulic head (11) and using a suitable socket spanner tighten to a torque of 15,0 Nm (130 lbf in).

Timing cover plate

47 Position a new 'O' ring seal (26) in the recess on the pump housing, fit the timing cover plate (25) and secure with 'Torx' screws (23) and shakeproof washers (24). Tighten the screws to a torque of 2,3 Nm (20 lbf in). Using protection sleeve CAV Part Number 1804-429, fit 'O' ring seal (21) to plug screw (22) and screw the plug in the cover. Tighten the plug screw to a torque of 4,5 Nm (40 lbf in).

Throttle control bracket

48 To fit the throttle control bracket proceed as follows:

48.1 Fit the anti-stall screw, washer and locknut (1) to the throttle control bracket (2) and the maximum speed screw and locknut (3).

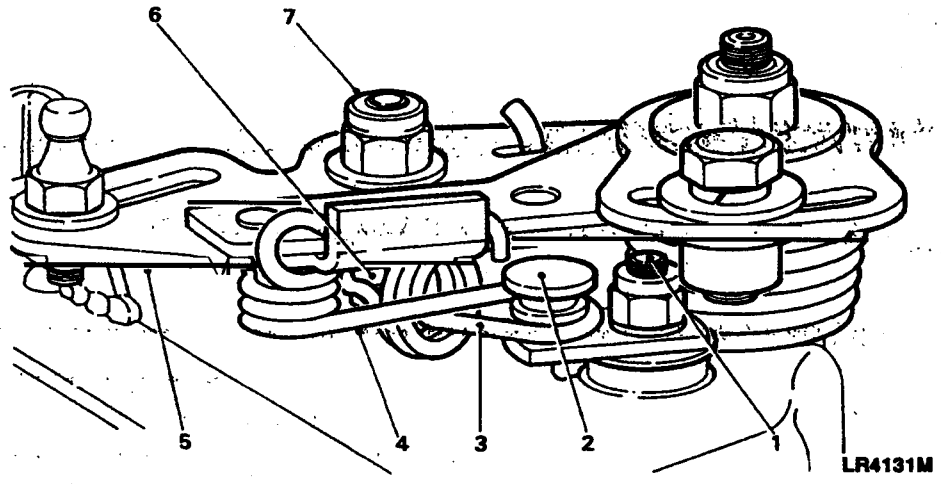
48.2 Pull the throttle lever clear and assemble the control bracket to the governor cover with the two set bolts (29) plain and spring washers (27) and (28). Tighten the bolts to a torque of 7,9 Nm (75 lbf in).

48.3 Remove the 11mm socket from the vent screw body.

Excess fuel linkage

49 Using a suitable hook tool, engage the longer hook of the linkage spring (Fig 45 (3)) with the lower annulus of the pin (2) on the excess fuel plate. Abut the long leg of the break-back spring (4) to the upper annulus of the pin (2) on the opposite side to the linkage pin.

50 To prevent the break-back spring becoming disengaged from the excess fuel pin when the throttle lever is operated, the stud (6) should be pushed forward in its slot towards the idling shaft and the locknut tightened to a torque of 4,5 Nm (40 lbf in).



1	Excess fuel shaft	5	Throttle lever
2	Pin-excess fuel plate	6	Stud-linkage spring
3	Linkage spring	7	Locknut-linkage spring
4	Break-back spring		

Fig 45 Location of linkage spring

TEST PLAN

General

51 For general conditions of testing and test rig requirements refer to AESP-2910-F-101-302. For testing the DPS fuel injection pump on Calibration fluid 'C' refer to AESP 2320-D-122-533 Section 2, Schedule 2.

Note ...

The following test plan must only be used for testing the DPS fuel injection pump fitted to Land Rover 2,5 litre non-turbo diesel engines.

Test conditions

52 The following conditions must be conformed to when carrying out the test:

52.1 Test oil: ISO 4113 at a temperature of 40 + or - 2°C.

52.2 Inlet feed pressure: 0,1 bar.

52.3 Nozzles: ISO 4010.

52.4 Nozzle opening pressure: 125 + 3 - 0 bar.

52.5 High pressure outlet connections: Original.

52.6 High pressure pipes: 6 x 2 x 600 mm (ISO 4093.1).

52.7 Test bench drive: HF 533 in unsupported position.

Setting excess fuel mechanism

53 Should the excess fuel mechanism require re-setting, the following procedure must be used:

53.1 Screw the anti-stall screw head out to 70 mm from the front mounting face of the pump housing.

53.2 Insert a 0,5 mm spacer between the anti-stall screw and the throttle lever.

53.3 Excess fuel linkage - push the excess fuel spindle round fully clockwise. Slide the excess fuel stud forward to take up all the slack in the linkage spring (DO NOT TENSION THE SPRING).

53.4 Remove 0,5 mm spacer.

ISO test procedure

Preparation

54 Before carrying out the test procedure the following observations and settings must be made.

54.1 All delivery readings (other than critical deliveries) to be taken over 500 shots, except test (7) using 100 shots, test (10) using 2000 shots and test (19) using 300 shots.

54.2 All special tools and adaptors required for testing the pump are listed in AESP 2910-F-101-302.

54.3 Where marked thus* use 30 seconds glass draining time and allow test oil to settle for 15 seconds before taking readings unless stated otherwis by the test bench manufacturers instructions.

54.4 Pump to be free from leaks both when stationary and running.

54.5 A 2,00 mm shim is fitted to the piston spring cap on assembly. No additional shimming is required.

54.6 Remove solenoid and connect transfer pressure gauge to the solenoid location, using adaptor.

54.7 Fully back off the maximum speed screw. Throttle to be fully open.

54.8 Set maximum fuel adjusting screw to protrude 16 mm above the surface of the locknut.

54.9 Screw transfer pressure adjuster fully out and then 1 1/2 turns in before commencing test.

54.10 Set latch valve adjuster until one thread is showing above the surface of the locknut.

54.11 Slacken throttle shaft locknut one half of a turn only.

54.12 Loosen the vernier plate screw, turn vernier plate fully anti-clockwise, and retighten screw and nut.

54.13 Fully back off idling screw.

54.14 Fit auto-advance gauge and set to zero.

Test

55 To test the pump carry out the tests listed in Table 1.

TABLE 2 FUEL PUMP TESTING

Note ...

Critical fuel deliveries are given in mm^3/stroke. Hence the tester must determine the number of strokes applicable in accordance with the test machine manufacturers instructions.

Test (1)	Operation (2)	rev/min (3)	Requirements (4)
1	Priming	200	Obtain delivery from all injectors, and back leak.
2	Stabilisation	2100	Run pump for 3 minutes to stabilise.
3	Transfer pressure	100	0,55 bar (8 lbf in^2) minimum.
4	Advance check	100	0^o to $1/2^o$ (0 to 0,4 mm).

(continued)

TABLE 2 FUEL PUMP TESTING (continued)

Test (1)	Operation (2)	rev/min (3)	Requirements (4)
5	Advance setting	1300	Adjust transfer pressure scr w to obtain advance of 4° (3,2 mm).
6	Transfer pressure	1300	3,8 to 4,8 bar (56 to 70 lbf in^2).
7	Back leakage	1500	15 to 40 cm^3 per 100 strokes time cycle. (Flow rate 225 to 600 cm^3 min).
8	Advance check	2000	7° to 7 1/2° (5,6 to 6,0 mm).
9	Maximum delivery setting: See Note Para 55	*2000	39,0 + or - 0,4 mm^3 stroke. Spread between lines not to exceed 4,0 mm^3 stroke.
Move throttle lever to anti-stall stop.			
10	Vernier plate setting	600	Using 2000 strokes (achieved through 4 x 500 strokes), slacken throttle shaft locknut by one half turn max. Loosen vernier plate screw and turn vernier plate clockwise until a delivery of 4 1/2 to 5 1/2 cm^3 is achieved. Retighten both locknut and screw before taking reading.
Move throttle lever to fully open position.			
11	Delivery check	2000	Record average delivery in cm^3.
12	Governor setting	2300	Set throttle by maximum speed adjustment screw to give average delivery of between 7,5 and 8,0 cm3. Lock stop screw.
13	Fuel delivery check	2460	Average delivery to be not more than 3,0 cm^3.
14	Delivery check	2000	With throttle set as at (12), average delivery not to be less than at (11), minus 0,5 cm^3.
Run machine down to 200 rev/min and stop.			
15	Throttle ball setting	0	Set throttle ball at furthest extremity of slot, to give 26 to 44 mm of movement between anti-stall stop and maximum speed stop.
Remove transfer pressure gauge, fit and energise solenoid, restart machine and vent as in (1).			
16	Fuel delivery check	2000	Delivery to be as at (14) + or - 1,0 cm^3.

(continued)

TABLE 2 FUEL PUMP TESTING (continued)

Test (1)	Operation (2)	rev/min (3)	Requirements (4)
Stop machine, remove advance pressure end plug, fit any advance test plug from 7244-435 series, and connect to pressure gauge using a suitable fuel connection.			
Move throttle to anti-stall stop, start machine and run to 600 rev/min before continuing test.			
17	Idling delivery	335	Set idle screw to give an average delivery of between 5,0 and 5,5 cm^3
18	Latch out valve setting	180	Screw latch valve adjuster fully in pressure gauge should read zero, then screw out until pressure gauge pointer starts to rise.
19	Excess fuel check	110	Average delivery to be 13,5 cm^3 minimum for 300 stroke time cycle. Check that the pressure gauge point r has returned to zero.
20	Latch out check	210	Ensure pressure gauge pointer has risen.
21	Solenoid shut-off	200	De-energise solenoid and wait for 5 seconds before operating the trip gear. Average delivery not to exceed 1,25 cm^3.
Remove test plug and refit pressure end plug.			
22	Timing	0	Use outlet 'V' (55 atm pressure). Offset value to + 45° on graduated scale.

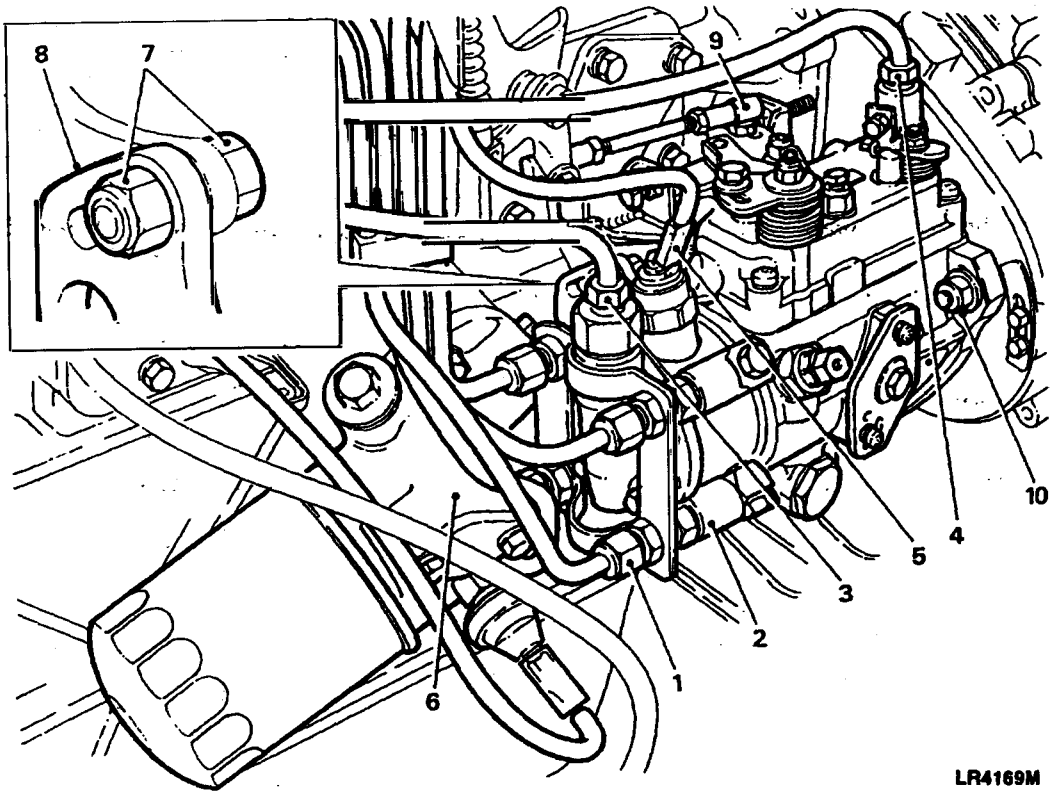
Refitting

56 To fit the DPS fuel injection pump proceed as follows:

56.1 Fit the pump with a new joint gasket to the rear cover, secure with the three nuts (Fig 46 (10)) and the single nut and bolt (7) to the support bracket (8), tighten finger tight only.

56.2 Remove the centre part of the special tool, fit the pulley retaining nut and tighten to a torque of 42 to 48Nm (31 to 35 lbf ft).

56.3 Check that the crankshaft has not moved. Remove the plug from the timing plate (Fig 47 (1)) on the side of the pump and insert the timing tool (2) (Table 1 Serial No 2). If necessary rotate the pump to ensure that the bottom groove on the centre pin of the tool is flush with the end of the tool as illustrated.



1	Fuel feed pipes	6	Oil filter adaptor
2	Delivery valves	7	Nut and bolt
3	Fuel inlet pipe	8	Support bracket
4	Spill return pipe	9	Ball pin-throttle lever
5	Solenoid electrical connection	10	Securing nuts

Fig 46 Refitting DPS pump

56.4 Evenly tighten the three nuts securing the pump to the cover and the single nut and bolt to the support bracket to a torque of 22 to 28 Nm (16 to 22 lbf ft).

56.5 If necessary align the timing pointer (3) with the scribed line (4) on the pump flange. If a new pump is being fitted and there is no line scribe one to coincide with the pointer.

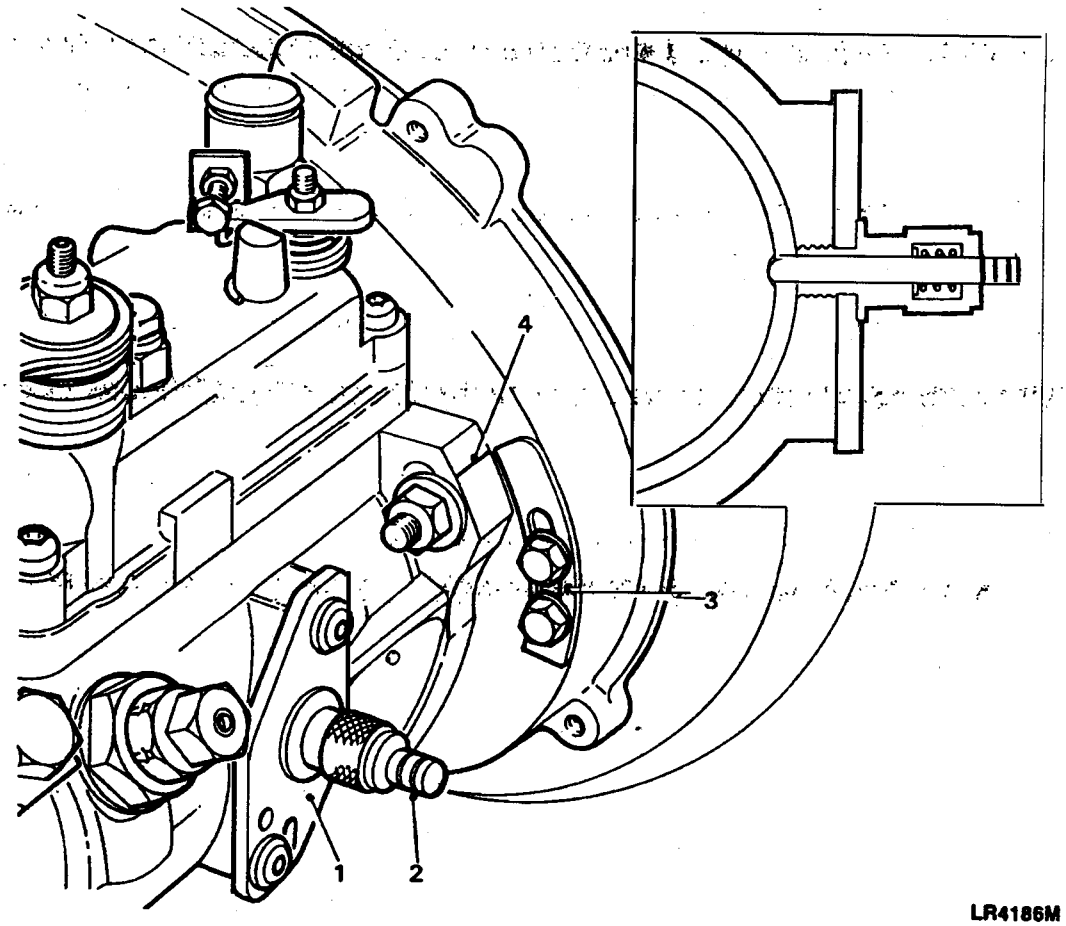
56.6 Remove the timing tool from the pump and refit the plug.

56.7 Remove the outer part of the special tool and refit the two front cover securing bolts and the inspection cover complete with hose clip, tighten the cover securing bolts to a torque of 22 to 28Nm (16 to 20.6 lbf ft).

56.8 Remove the flywheel timing pin (Table 1 Serial No 3) from the flywheel housing and refit the plug.

56.9 Refit the oil filter adaptor assembly (Fig 46 (6)) using a new joint gasket.

56.10 Connect the throttle link, to the ball pin (9) refit the fuel feed pipes (1), the fuel inlet pipe (3), spill return pipe (4) and the electrical connection to the solenoid (5).



1	Timing plate	3	Timing pointer
2	Timing tool	4	Scribed line

Fig 47 Timing tool inserted in DPS pump

56.11 Reconnect the vehicle battery leads and where applicable the radio battery leads.

FUEL INJECTORS

Special tools

57 Special tools for fuel injector overhaul and testing are included in ETS 06002.

Checking nozzle assemblies

WARNING ...

DO NOT ALLOW THE FUEL SPRAY TO CONTACT THE PERSON OTHERWISE INJURY MAY RESULT FROM SKIN PENETRATION

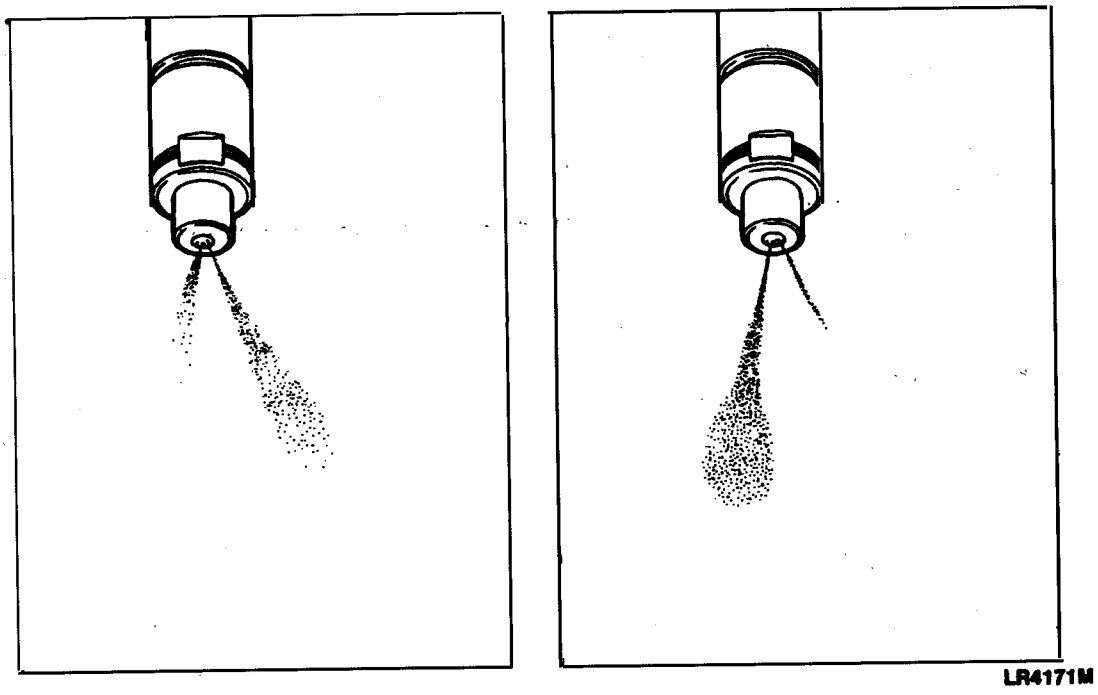


Fig 48 Fuel injector spray check on engine

General

58 When an injection nozzle is considered to be the cause of irregular running and loss of power, a quick check may be made by loosening the fu l feed pipe union nut on each nozzle in turn, whilst the engine is idling at approximately 1000 rev/min. If the injection nozzle assembly being checked has been operating properly, there will be a distinct reduction in engin speed accompanied by obvious roughness, but a faulty injection nozzle may make little or no difference to the engine note when its fuel feed pipe is loosened.

Spray check

59 To check the spray on a suspect nozzle assembly carry out the following:

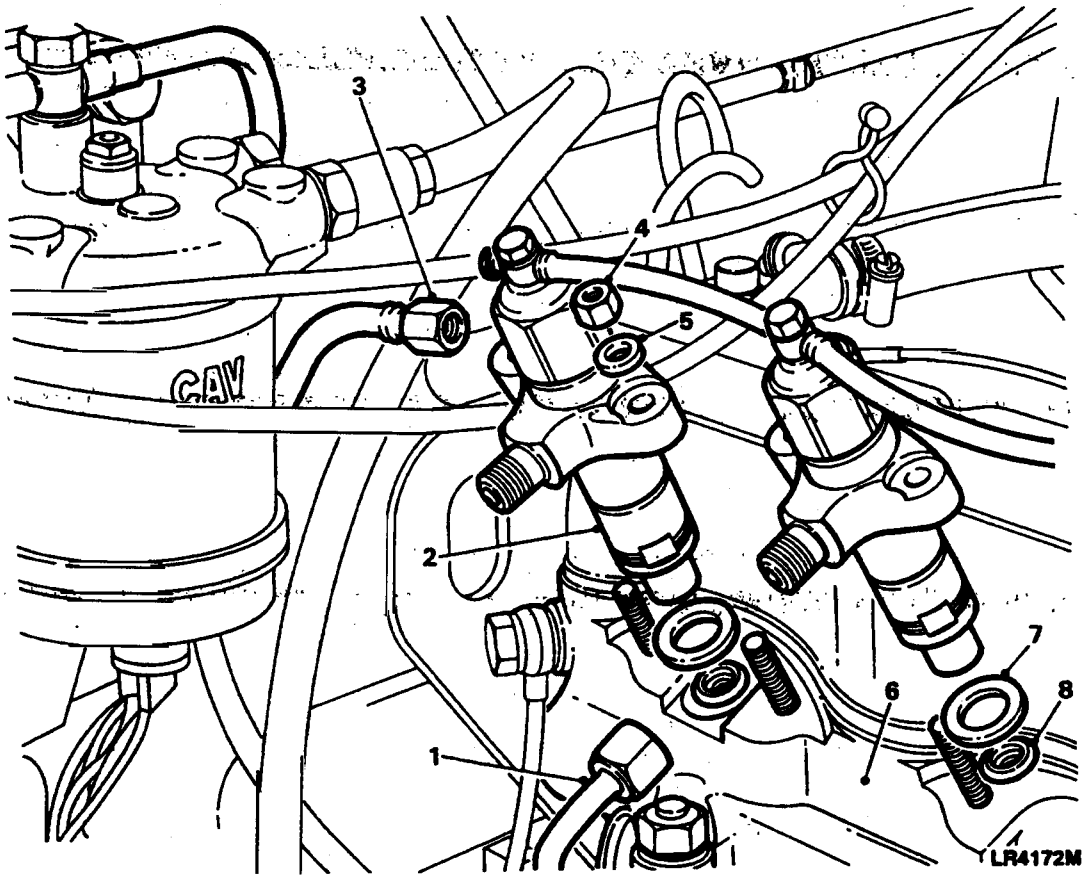
59.1 Remove the fuel spill rail pipes from the nozzles.

59.2 Disconnect the fuel feed pipe (injection pump to nozzle) from the nozzle to be checked and from the injection pump.

59.3 Release the fixing and withdraw the suspected injection nozzle assembly, reconnect the pipe and nozzle assembly to the injection pump in a position whereby fuel spray may be observed.

59.4 Loosen the union nuts securing the remaining fuel pipes to injection nozzles.

59.5 Whilst turning the engine over with the starter, observe the manner in which fuel issues from the nozzle and compare the spray form with the correct form as illustrated (Fig 48).



1	Fuel feed pipes	5	Washers
2	Injectors	6	Cylinder head
3	Spill return pipe	7	Copper washer
4	Securing nuts	8	Steel washer

Fig 49 Removal of injectors from cylinder head

59.6 Very little fuel should issue from the main spray hole with the engine turning over at starter speed but a fine spray comparable to that illustrated (Fig 48) should eject from the auxiliary spray hole.

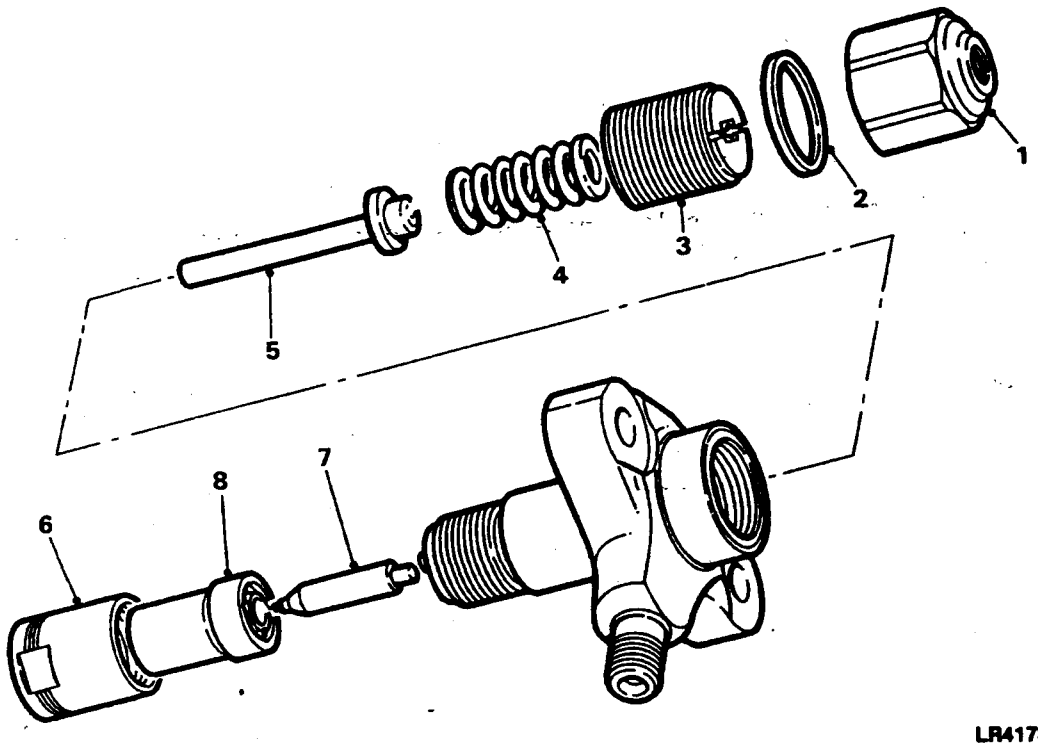
59.7 If the fuel is more in the form of a liquid jet or issues from the main pintle hole, then the nozzle and holder assembly should be removed for overhaul and a replacement unit fitted.

59.8 Refit the injector and tighten the securing nuts to a torque of 6 to 8 Nm (4.5 to 6 lbf ft). Refit the spill rail pipes with new washers fitted either side of the banjos and tighten the banjo bolts to a torque of 14 to 20 Nm (10.3 to 15 lbf ft).

Removal

60 The fuel injectors should be removed from the engine as a set attached to the spill rail.

60.1 Disconnect the fuel feed pipes (Fig 49 (1)) from the injectors (2) and the spill return pipe (3) from the injectors to the top of the fuel filter.



1	End cap	5	Valve spindle
2	Sealing washer	6	Cap nut
3	Adjusting screw	7	Nozzle valve
4	Pressure spring	8	Nozzle body

Fig 50 Exploded view of fuel injector

60.2 Remove the nuts (4) and washers (5) securing the injectors to the cylinder head (6) and withdraw the injectors from the engine.

60.3 Remove and discard the steel sealing washers (8) and the copper washers (7) from each of the injector locations.

Dismantling

61 To dismantle the injectors proceed as follows keeping the components from each assembly separate:

61.1 Disconnect the injectors from the spill rail.

61.2 Remove the combined locknut and end cap (Fig 50 (1)) and withdraw the sealing washer (2).

61.3 Unscrew the pressure adjusting screw (3), withdraw the pressure spring (4) and the valve spindle (5).

61.4 Unscrew the cap nut (6) and withdraw the nozzle valve (7) and body (8).

Cleaning and examination

62 Soak the component parts of each assembly in 'Shell Calibration Fluid' to loos n carbon deposits, but do not allow parts to become interchanged between assembli s. After soaking carry out the following:

62.1 Brush away all external carbon deposits using a brass wire brush and return the components to the fluid bath.

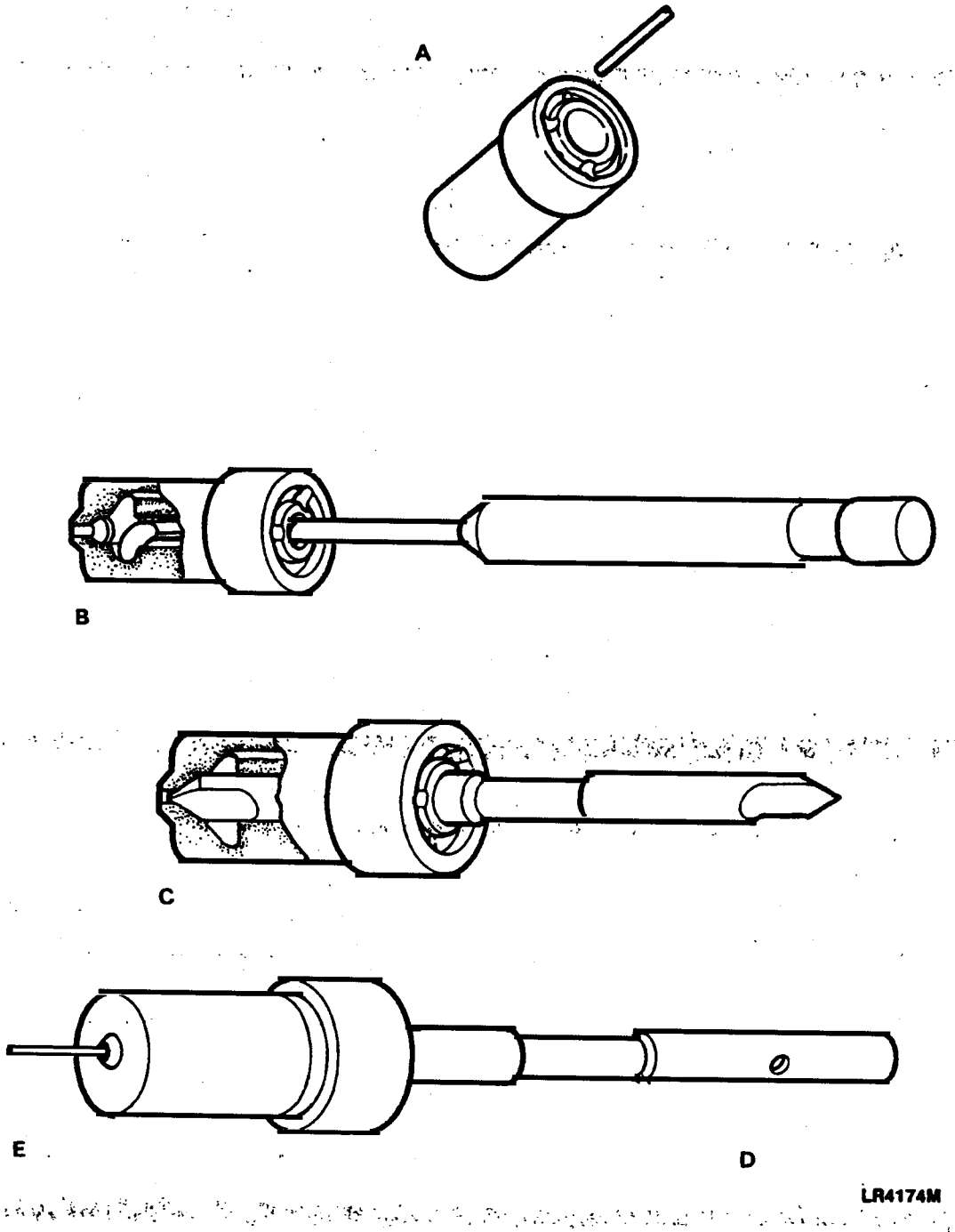


Fig 51 Cleaning fuel passages

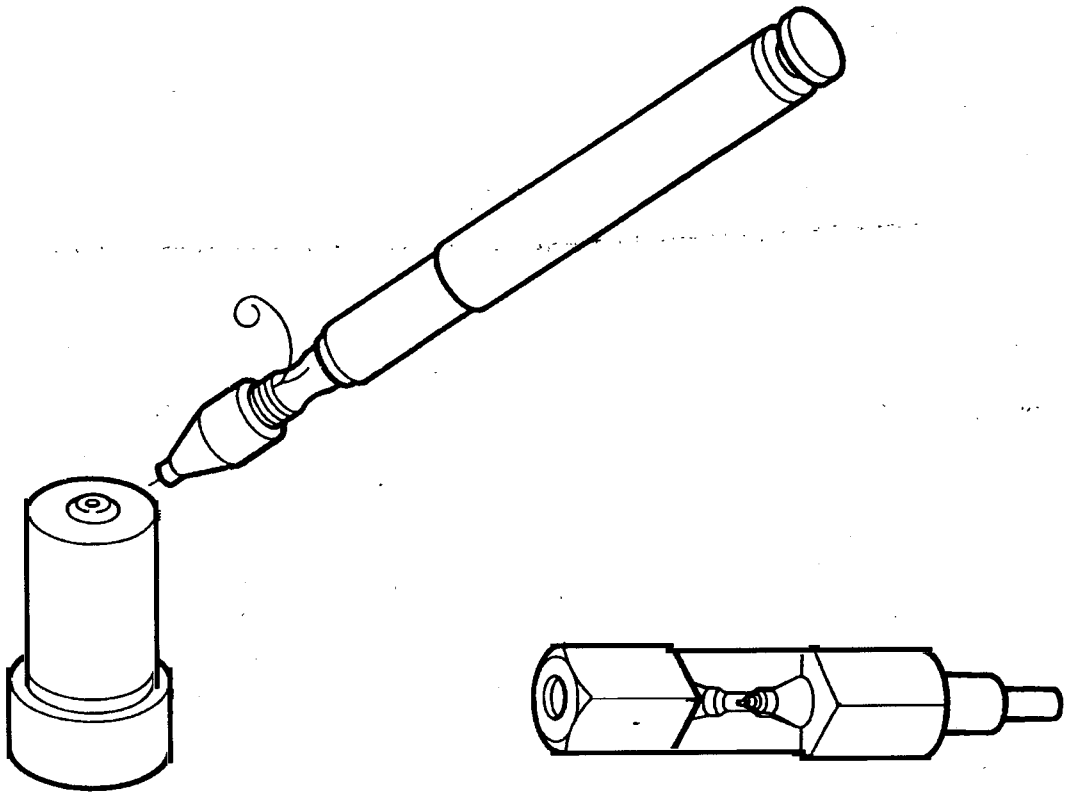


Fig 52 Cleaning nozzle

62.2 Particular care must be exercised when cleaning the pintle and seat of the nozzle valve to avoid scratching or scoring, which will result in spray distortion.

62.3 Clean the three fuel feed passages in the nozzle body (Fig 51 (A)) with a wire or drill of 1,5 mm (0.062 in) diameter.

62.4 Remove carbon deposits from the annular recess (B) in the nozzle body using the tool illustrated, or suitable alternative.

62.5 Remove carbon from the valve seat (C), using the appropriate tool with a rotary motion.

62.6 Using the correct size probe from the cleaning kit fitted to the pintle hole cleaner (D), insert the probe into the bore of the nozzle valve body and allow the end to extend through the main fuel outlet (E), rotate to remove carbon.

62.7 Carbon can be removed from the nozzle valve cone by inserting the valve into the tool illustrated (Fig 52) and rotating in alternate directions whilst pressing the valve inward.

62.8 If the nozzle is blued or the seating has a dull circumferential ring indicating pitting or wear the nozzle body and valve should be returned to the manufacturers and replacement parts fitted. Do not attempt to lap the nozzle valve to the body.

62.9 Clean the auxiliary spray hole using the special tool fitted with probing wire 0,20 mm (0.008 in) diameter. Allow only 1,5 mm (0.062 in) to extend from the chuck to minimise the possibility of the wire breaking while probing.

62.10 Examine the pressure faces of the nozzle body and nozzle holder for scoring or scratches. These faces must be perfectly smooth.

62.11 Secure the flushing tool Part number 18G109E to the testing outfit Part Number DX.710, fit the nozzle body, spray holes uppermost, to the flushing tool and vigorously pump test oil through the nozzle body to remove any particles of carbon remaining after probing and scraping.

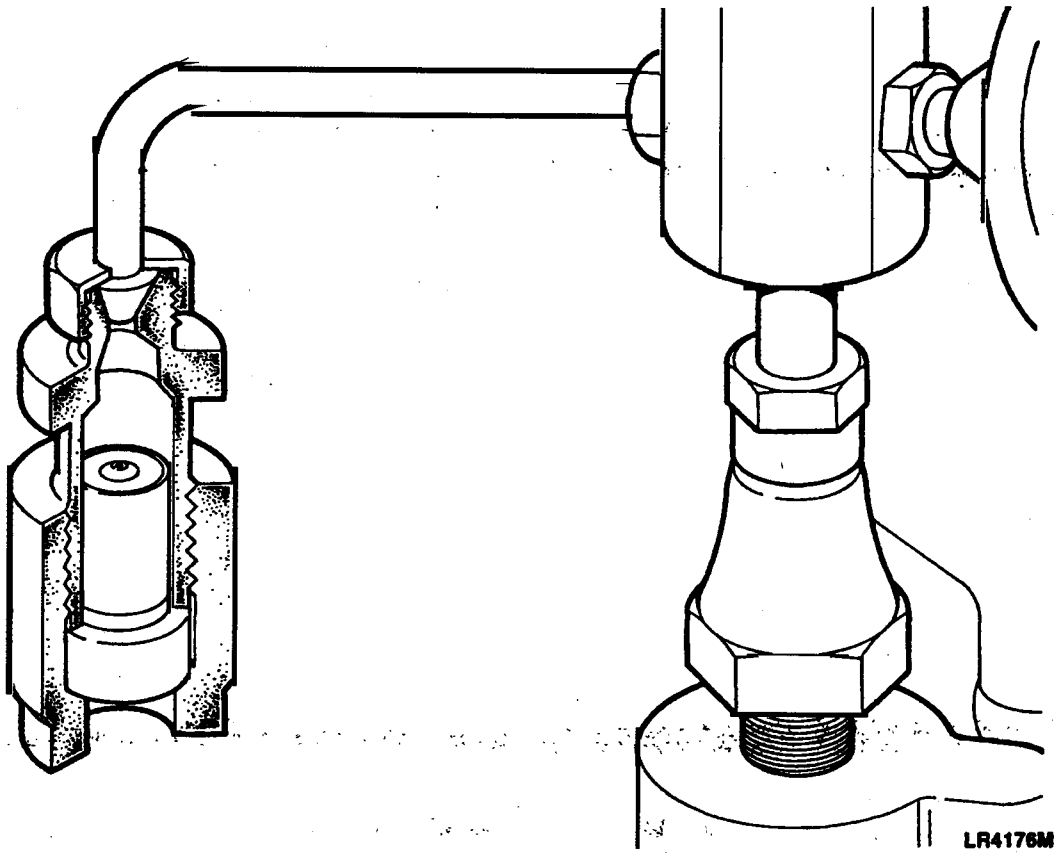


Fig 53 Flushing tool

Reassembly

63 To reassemble the injectors carry out the following:

63.1 Fit the nozzle valve to the nozzle and check for freedom of movement.

63.2 Immerse the nozzle body and valve in the fluid bath and assemble whilst submerged.

63.3 Wash the remaining components and reassemble in reverse order of removal.

Testing

General

64 To check a nozzle assembly and to ensure that it is functioning correctly, an Injector Tester Part Number DX.710 or suitable alternative is essential. A bench covered with linoleum or non-ferrous sheet metal is most suitable for mounting the tester, such a surface facilitates cleanliness which is ess ntial when checking injectors. Between the bench and tester, a tray, also of non-ferrous metal, should be positioned to prevent spilt fuel spreading.

65 The efficient operation of the injection nozzle assembly is dependent on four main conditions, as follows:

65.1 The nozzle valve must be open at 135 Atmospheres.

65.2 The rate of back leakage must be within 100 to 150 Atmospheres.

65.3 Seat tightness must be sufficient to prevent leakage.

65.4 Spray form must compare favourably with that shown in Fig 56.

66 Pressure setting, back leakage and seat tightness tests are made by coupling the injector direct to the pressure feed pipe on the test equipment, but a special adaptor must be fitted between the pipe and the injector assembly when testing for spray form. This adaptor increases the pressure of fuel to the injector sufficiently for the main and auxiliary spray form to be determined.

Test procedure

WARNING ...

THE INJECTION NOZZLE MUST NOT BE ALLOWED TO POINT TOWARDS THE OPERATOR WHEN SPRAYING AND THE HANDS MUST NEVER BE ALLOWED TO COME INTO CONTACT WITH THE SPRAY WHICH HAS A FORCE THAT CAN PENETRATE THE FLESH.

67 To test the injector carry out the following:

67.1 Remove the cap from the fluid container on the test unit and fill with 0,8 litre (1.5 pints) of 'Shell Calibration Fluid'.

67.2 Air vent the system by removing the vent screw, allow fluid to flow freely for a few seconds and replace the screw whilst the flow continues.

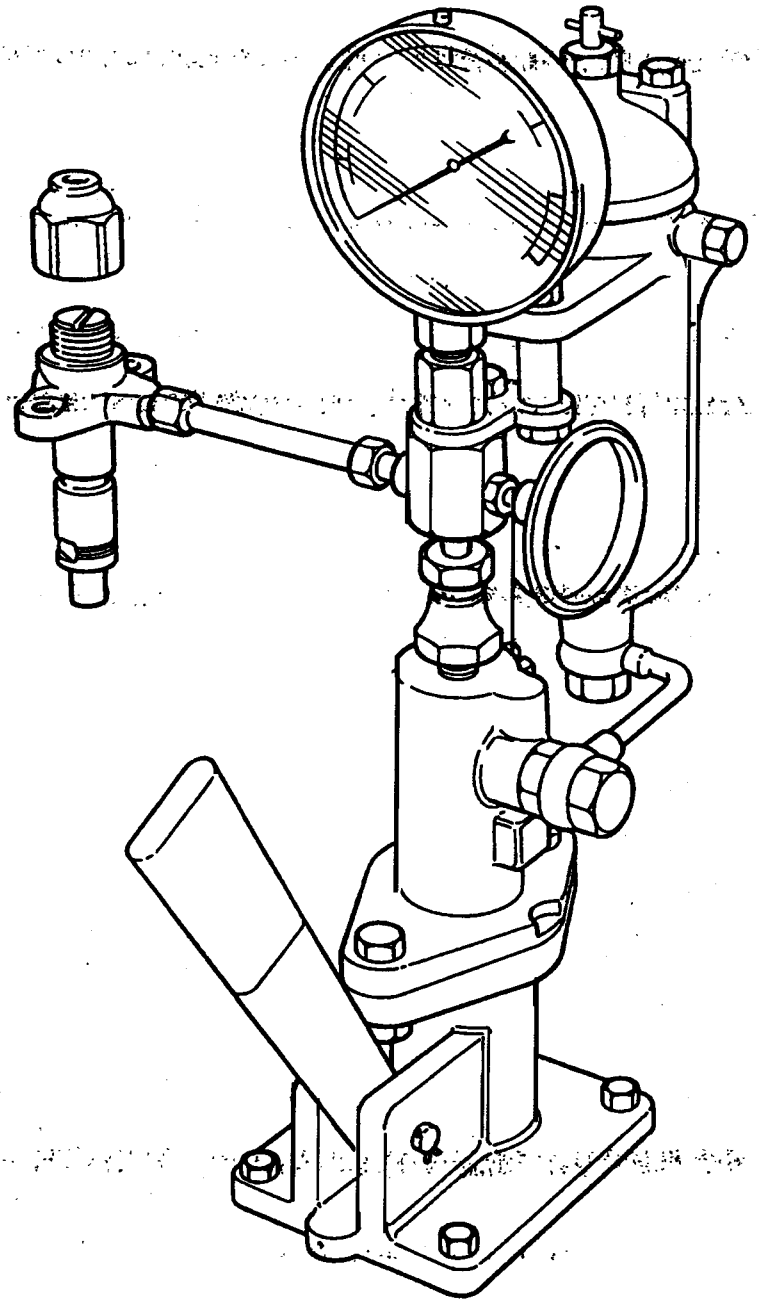
67.3 Operate the pump handle on the test unit until fluid flows from the pipe.

67.4 Connect the injector assembly to the pressure feed pipe with the nozzle pointing downwards. The length and bore of this pipe is important and replacement pipes must be approximately 75 mm (2.8 in) between the union nuts and of 3 mm (0.118 in) bore.

67.5 Close the check valve to keep the pressure gauge out of circuit and operate the hand lever several times to expel all air from the system.

67.6 Back leakage test – To carry out this test proceed as follows:

67.6.1 Adjust the injector to open at 160 to 170 atmospheres, raise the pressure as indicated on the gauge to just below this figure, rel ase the handle and time the pressure drop from 150 atmospheres down to 100 atmospheres.



LR4177M

Fig 54 Leak back test

67.6.2 This should be not less than 5 seconds for the original nozzle and not less than 7 seconds if a new nozzle is fitted, and not more than 36 seconds for either with the oil temperature at 10° to 21°C (50° to 70°F).

67.6.3 Check externally the top and bottom of the nozzle cap nut and pressure pipe union nuts for signs of fluid leakage. If leakage occurs at the nozzle cap nut, remove the nut and examine the pressure faces of the nozzle holder and nozzle body for presence of foreign matter or surface scoring.

67.6.4 A nozzle assembly showing no signs of leakage but having an excessive rate of pressure drop indicates a worn nozzle valve, if this condition is evident the nozzle valve and body should be renewed.

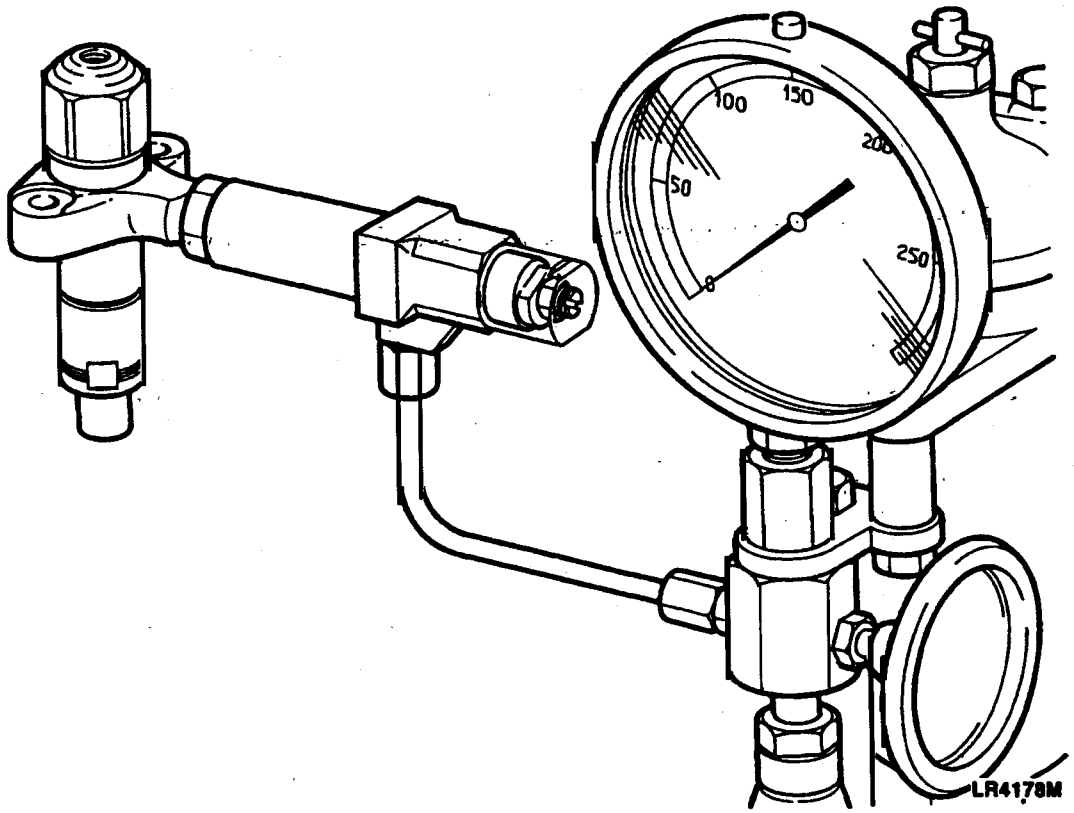


Fig 55 Spray check rig

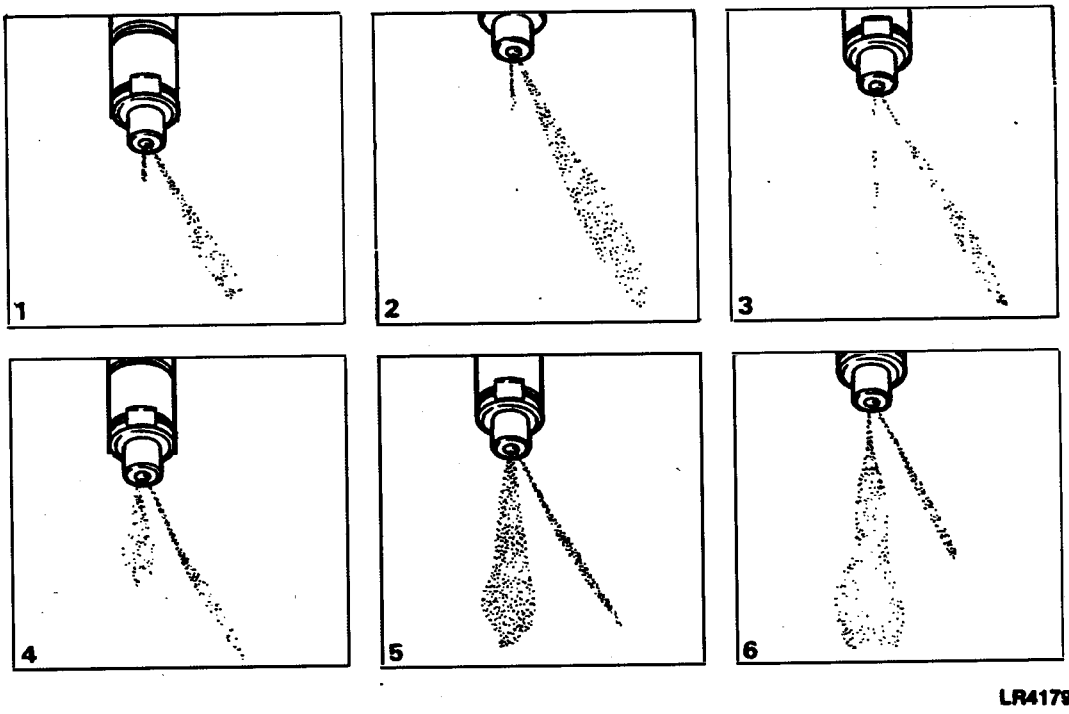


Fig 56 Spray form

67.7 Pressure setting - Adjust the operational opening pressure of the nozzle valve to 135 atmospheres.

67.8 Seat tightness - Wipe the bottom face of the injection nozzle dry and raise the pressure in the system to 125 atmospheres. A slight dampness on the bottom face is permissible, blob formation or dripping indicates a badly seating valve in which case the assembly should be dismantled for further examination.

67.9 Spray form - Fluid delivery to the injector assembly when testing the spray form must be characteristically similar to fuel delivery under normal operating conditions. To effect these conditions an adaptor CAV Part Number Y7044872 must be fitted between the injector and the pressure pipe. Fit the adaptor and carry out the spray form check as follows:

67.9.1 Connect the adaptor assembly to the pressure pipe.

67.9.2 Remove the end cap of the adaptor and adjust the opening pressure of the valve to 220 atmospheres.

67.9.3 Fit the injector to be tested to the adaptor.

67.9.4 With the check valve closed, operate the handle to expel air from the system. The auxiliary spray form should be tested at 60 strokes per minute and the main spray at 140 strokes per minute. Spray development from starting to running speeds are shown in Fig 56, refer to the illustration to compare with the spray form of the injectors under test.

67.9.5 Spray formation should be well formed and free from splits or distortion. A slight centre 'core' can be disregarded. Observe the main spray through 360° to ensure a uniform spray. When satisfactory, fit the combined locknut and end cap.

Refitting

68 To refit the injector assemblies to the engine proceed as follows:

68.1 Fit new steel sealing washers (Fig 49 (8)) to each of the injector locations in the cylinder head. To ensure that the washers are correctly fitted, use a length of thin welding wire to guide one washer only into each port with the domed side toward the injector.

68.2 Refit the injectors to the spill rail with new washers fitted each side of the banjos, tighten the banjo bolts to a torque of 14 to 20 Nm (10, 3 to 15 lbf ft), fit a new copper washer (7) to each injector and fit the assembled injectors and spill rail to the cylinder head.

68.3 Secure the injectors to the studs with the nuts (4) and washers (5) and tighten the nuts to a torque of 6 to 8 Nm (4.5 to 6 lbf ft).

68.4 Connect the fuel feed pipes (1) and spill return (3) taking care not to over tighten the union nuts.

FUEL LIFT PUMP

Removal

69 Remove the fuel lift pump from the engine complete with the side cover to which it is mounted.

Dismantling

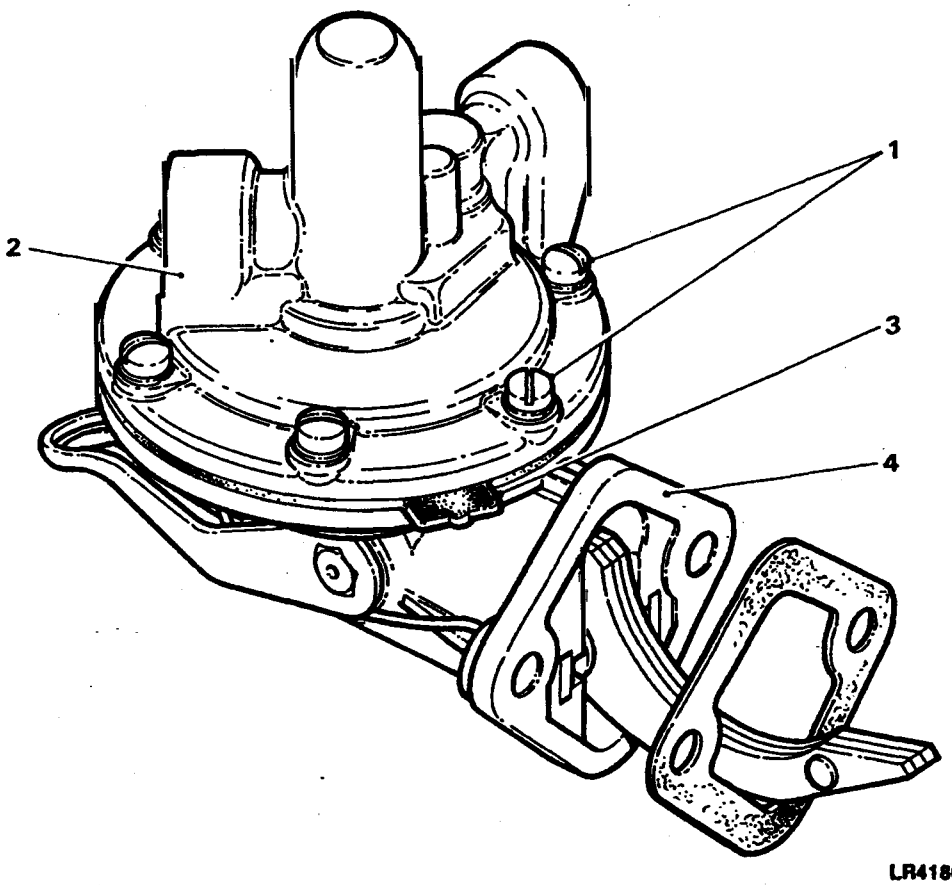
70 To dismantle the fuel lift pump carry out the following:

70.1 Remove the pump from the side cover and remove and discard the joint gasket.

70.2 Mark the upper and lower halves of the pump casing to ensure correct alignment on reassembly.

70.3 Remove the fixing screws (Fig 57 (1)) from the upper casing (2), and while pressing the diaphragm tab (3) against the pump lower casing (4), lift the upper casing clear.

70.4 If it is necessary to remove the valves (Fig 58 (1)) from the upper casing (2), note which way round they are fitted, and cut away the retaining stakes with a scraper. Warm the upper casing, and withdraw the valves.



1 Fixing screws
2 Upper casing
3 Diaphragm tab
4 Lower casing

Fig 57 Removing fuel lift pump upper casing

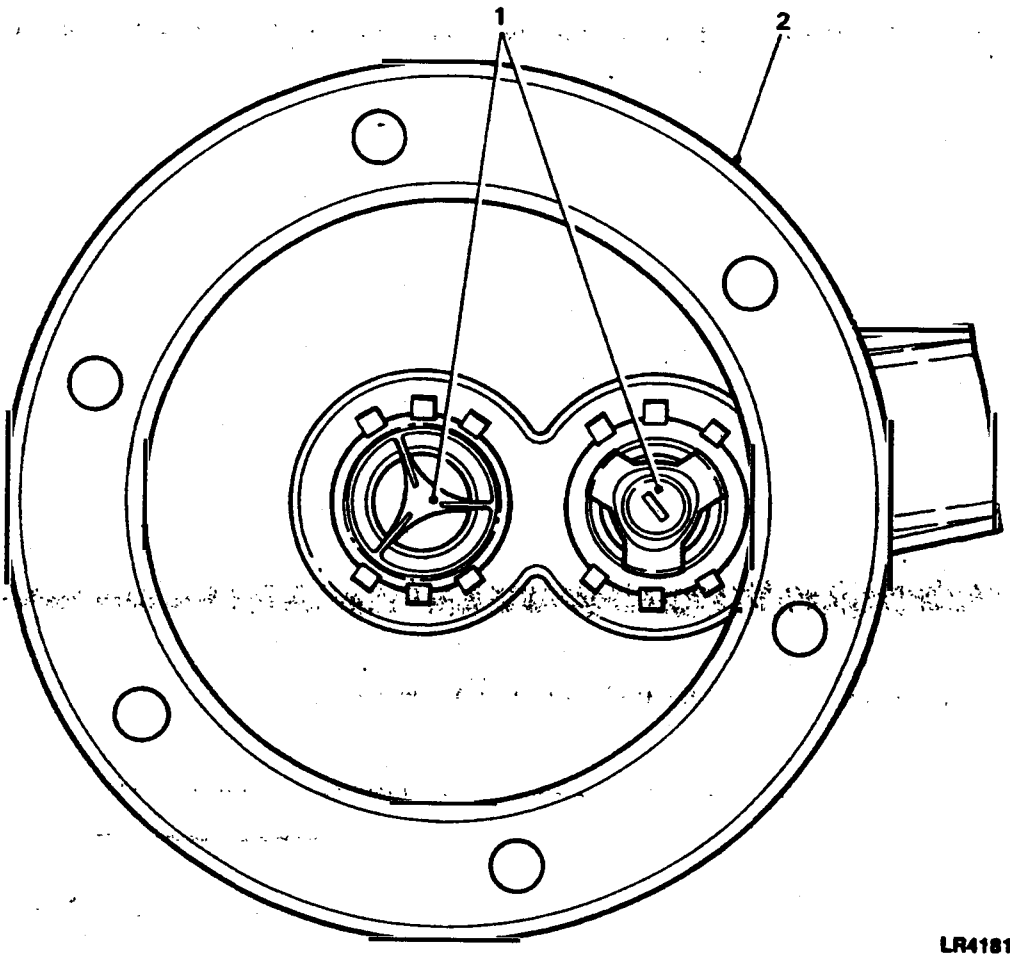
70.5 Whilst pressing down the metal part of the diaphragm assembly (Fig 59 (1)) turn through 90° in either direction and withdraw the diaphragm assembly and spring (2).

70.6 Unstake the oil seal housing (3) and lever out the oil seal and retainer.

70.7 Remove the staking from the rocker arm retainers (Fig 60 (1)), withdraw the retainers, rocker arm (2) and spring (3).

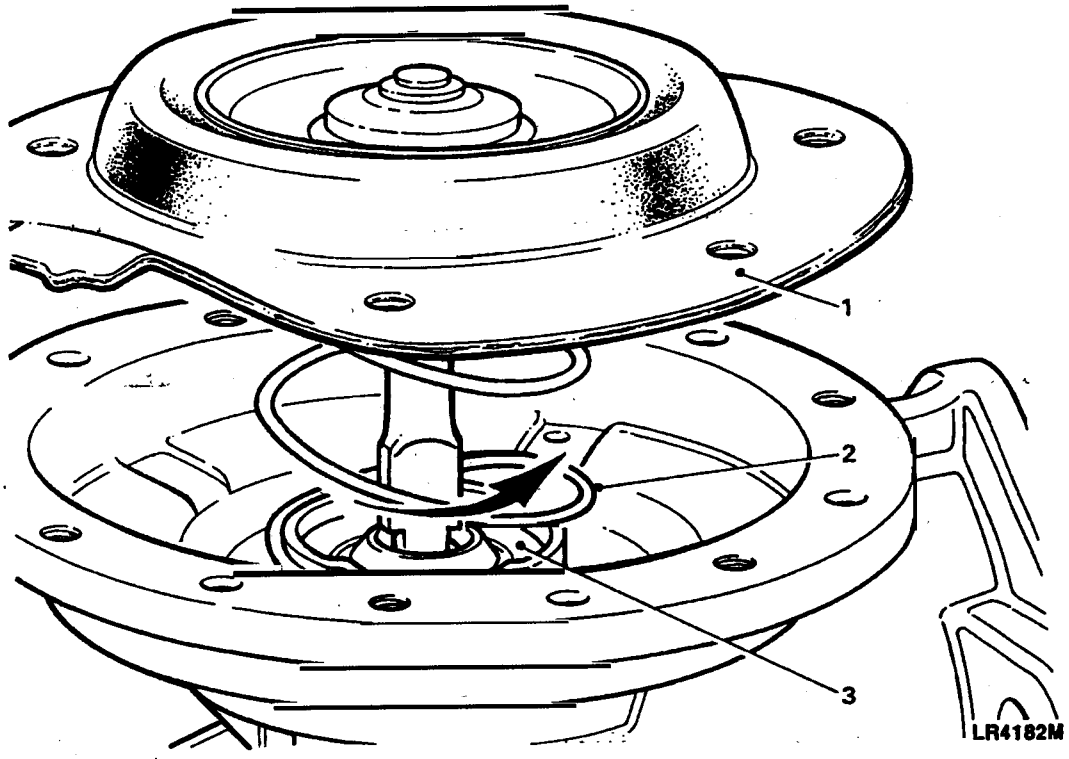
70.8 Withdraw the pin (4) and washers (5) to detach the operating link (6).

70.9 It is unlikely that the hand priming mechanism will ever require replacement, it can be removed by filing the hexagon each side of the operating lever and springing the lever clear.



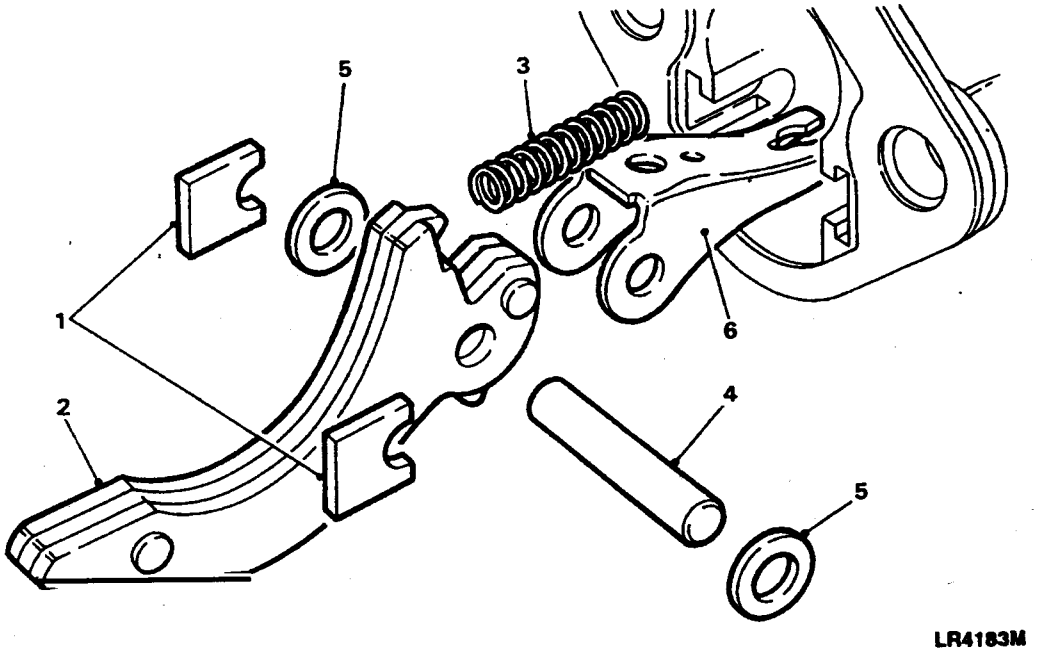
1 Valves 2 Upper casing

Fig 58 Removing valves from upper casing



1 Diaphragm assembly 2 Spring 3 Oil seal housing

Fig 59 Diaphragm assembly removal



1 Rocker arm retainers
2 Rocker arm
3 Spring
4 Pin
5 Washers
6 Operating link

Fig 60 Removing rocker arm

Cleaning

71 Thoroughly clean all the components in clean kerosene.

Examination

72 Examine the fuel lift pump components as follows:

72.1 Check the diaphragm assembly for signs of hardness, cracking or porosity.

72.2 Examine the rocker arm contact face, pivot pin, operating link and diaphragm pull rod slots for wear, evidence of slight wear is acceptable.

72.3 Springs gaskets and seals should be renewed.

Reassembly

73 Reassemble the fuel lift pump as follows:

73.1 Assemble the operating link (Fig 60 (6)) to the rocker arm (2) and retain with the pin (4) and washers (5). Fit the spring (3) to the rocker arm.

73.2 Fit the rocker assembly to the lower casing, fit the retainers (1) and secure by staking.

73.3 Fit the oil seal and its retainer to the lower casing and secure by staking.

73.4 Position the diaphragm return spring (Fig 59 (2)) in its location on the lower casing, place the diaphragm assembly (1) over the spring with the flattened end of the pull rod aligned with the slot in the operating lever. Push the metal portion of the diaphragm inwards, when the pull rod engages with the operating lever turn the diaphragm through 90° to lock.

73.5 If the valves have been removed from the upper casing, fit new ones ensuring that they are fitted the same way round as noted during dismantling. Stake the valves to retain them in position.

73.6 Place the upper casing half in position, aligning the marks made before dismantling. Fit the securing screws, but do not tighten; using the hand priming lever fully depress the diaphragm and tighten the screws. The diaphragm outer edges should be approximately flush with the outer edge of the pump joint faces when fitted.

Testing

74 To test the fuel lift pump proceed as follows:

74.1 Immerse the pump in a bath of clean kerosene and operate the hand priming lever several times to flush the pump.

74.2 Hold the pump clear of the bath and continue to operate the hand primer until the pump is empty, then place a finger over the inlet port and operate the hand primer several times. A distinct suction should be heard when the finger is removed from the inlet port, denoting a reasonable degree of suction has been developed.

74.3 Place a finger over the outlet port and again operate the hand primer. Air pressure should be felt for two or three seconds after movement of the priming mechanism has ceased.

74.4 Build up the air pressure in the pump again, and with a finger held firmly over the outlet port, submerge the pump completely in the kerosene bath, and check the joint face edges for signs of air leakage.

Refitting

75 Refitting the fuel lift pump is the reverse of the removal procedure, using new joint gaskets between the pump and side cover and the side cover and engine. Tighten the fuel lift pump securing nuts to a torque of 20 to 28 Nm (14.7 to 20.6 lbf ft) and the side cover securing bolts to a torque of 23 to 30 Nm (17 to 22 lbf ft).

FUEL TANKS

WARNINGS ...

(1) DANGER OF FIRE ALWAYS EXISTS WHEN WORKING ON OR REMOVING FUEL TANKS FROM VEHICLES. WORK MUST BE CARRIED OUT IN A WELL VENTILATED AREA.

(2) FIRE EXTINGUISHING EQUIPMENT MUST BE AVAILABLE AT ALL TIMES AND THE VEHICLE BATTERIES AND WHERE APPLICABLE THE RADIO BATTERIES MUST BE COMPLETELY DISCONNECTED.

(3) NOTICES SUCH AS "NO SMOKING", "HIGHLY FLAMMABLE VAPOUR", "RESTRICTED AREA" ETC. MUST BE DISPLAYED SO AS TO BE VISIBLE FROM ALL APPROACHES.

General

76 The position of the fuel tank differs between Land Rover 90 Diesel vehicles and Land Rover 110 Diesel vehicles. On Land Rover 90 the fu l tank is fitted on the right hand side of the vehicle, whereas on the Land Rover 110 the fuel tank is fitted at the rear of the vehicle and centrally mounted between the chassis members.

Removal

Side mounted fuel tank

77 To remove the side mounted fuel tank proceed as follows:

77.1 Disconnect both positive and negative leads from the vehicle battery and where applicable the radio batteries.

77.2 Drain the fuel tank into a clean container of suitable capacity.

77.3 Remove the right hand seat cushion and raise the locker lid.

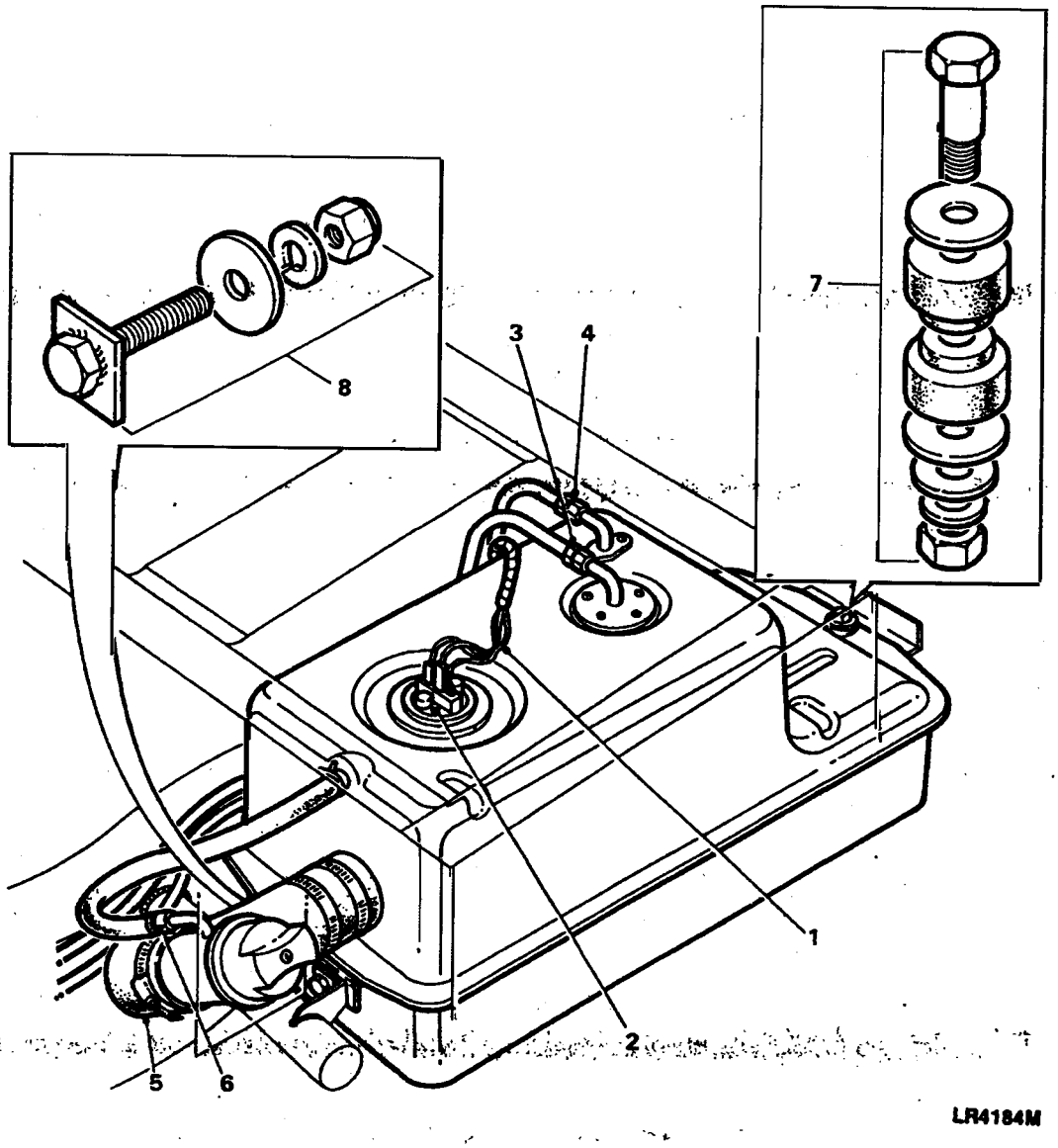
77.4 Disconnect the electrical connections (Fig 61 (1)) from the fuel level unit (2).

77.5 Detach the fuel feed pipe (3) from the outlet connection on top of the tank.

77.6 Detach the spill return pipe (4) from the connection on top the tank.

77.7 Slacken the clips at the tank connections of the filler (5) and breather (6) hoses and disconnect the hoses.

77.8 Detach the front (7) and rear (8) fixings and remove the tank from below the vehicle.



1	Electrical connection	5	Filler hose
2	Fuel level unit	6	Breather hose
3	Fuel feed pipe	7	Front fixings
4	Spill return pipe	8	Rear fixings

Fig 61 Side mounted fuel tank removal

Rear mounted fuel tank

78 To remove the rear mounted fuel tank proceed as follows:

78.1 Disconnect both positive and negative leads from the vehicle battery and where applicable the radio batteries.

78.2 Drain the fuel tank into a clean container of suitable capacity.

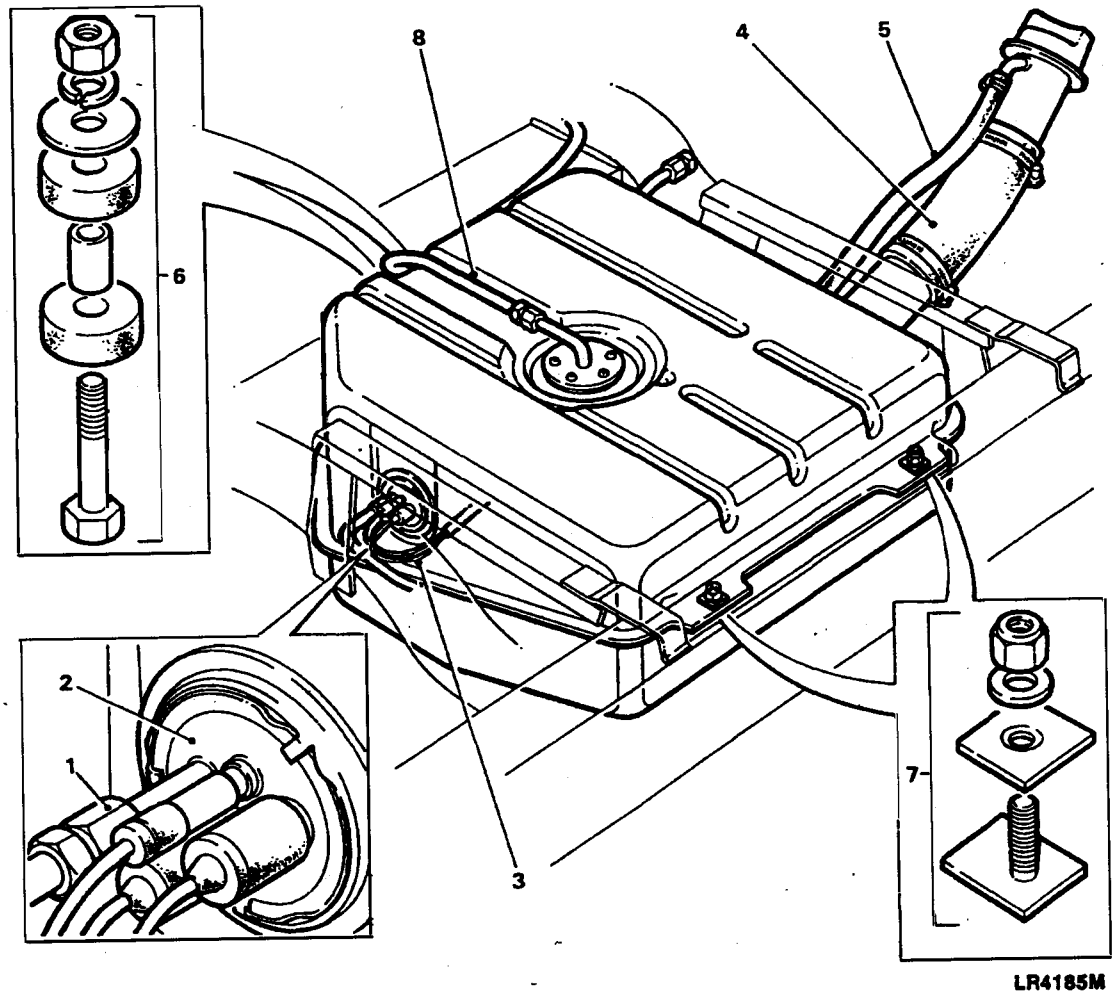
78.3 Disconnect the fuel feed pipe (Fig 62 (1)) from the outlet in the fuel level unit (2).

78.4 Disconnect the electrical connections (3) from the fuel level unit.

78.5 Slacken the clips at the tank connections of the filler (4) and breather (5) hoses and disconnect the hoses.

78.6 Support the fuel tank, remove the front (6) and rear (7) fixings and lower the tank to gain access to the spill return pipe (8).

78.7 Disconnect the spill return pipe and remove the fuel tank from below the vehicle.



1 Fuel feed pipe
2 Fuel level unit
3 Electrical connections
4 Filler hose
5 Breather hose
6 Front fixings
7 Rear fixings
8 Spill return pipe

Fig 62 Rear mounted fuel tank removal

Refitting

Side and rear fuel tanks

79 If a new tank is being fitted remove the fuel level unit, spill return elbow, fuel feed elbow (side tank only) and drain plug from the existing tank and fit them to the replacement tank, using new sealing washers and joint gaskets as applicable. Then fit the new tank in reverse order of the removal procedure.

FUEL LEVEL UNIT

Removal

Side mounted fuel tank

80 To remove the fuel level unit from side mounted fuel tanks carry out the following:

80.1 Disconnect both leads from the vehicle battery and where applicable the radio batteries.

80.2 If the level of fuel in the tank is high, drain off sufficient fuel to prevent it from overflowing when the level unit is removed.

80.3 Remove the right hand seat cushion and lift the locker lid.

80.4 Disconnect the electrical connections from the level unit.

80.5 Using special tool (Table 1 Serial No 4) remove the fuel level unit from the tank.

Rear mounted fuel tank

81 To remove the fuel level unit from rear mounted fuel tanks carry out the following:

81.1 Disconnect both leads from the vehicle battery and where applicable the radio batteries.

81.2 Drain off sufficient fuel to bring the level below the bottom of the fuel level unit aperture in the tank.

81.3 Disconnect the electrical connections and the fuel feed pipe from the fuel level unit.

81.4 Using special tool (Table 1 Serial No 4) remove the fuel level unit.

Refitting

82 To refit the fuel level unit on both side and rear mounted fuel tanks reverse the removal procedure.

FUEL SEDIMENTER

General

83 The fuel sedimenter is mounted on the right hand side of the chassis adjacent to the fuel tank on vehicles fitted with a side mounted fuel tank and on the left hand side of the chassis, again adjacent to the fuel tank, on vehicles fitted with a rear mounted fuel tank.

Removal/Refitting

84 The removal and refitting procedure for the sedimenters is self evident.

Cleaning

85 To clean the fuel sedimenters proceed as follows:

85.1 Disconnect the fuel inlet pipe from the sedimenter, raise pipe above level of tank and support in this position to prevent fuel draining from tank.

85.2 Support the sedimenter bowl, unscrew the bolt on top of the unit and remove the bowl.

85.3 Remove the element and clean all parts in kerosene.

85.4 Fit new seals, reassemble sedimenter and reconnect fuel inl t pipe.

85.5 Slacken off the drain plug, when diesel fuel free from air flows tighten the plug.

FUEL FILTER

86 The method of removal/installation of the fuel filter is self evident, when removing note should be made of the pipe connections to assist with installation.

PRIME FUEL SYSTEM

87 If the sedimenter or fuel filter have been dismantled and air has entered the system carry out the following:

87.1 Slacken the bleed pipe banjo bolt on top of the main fuel filter.

87.2 Operate the hand priming lever on the fuel lift pump until air free fuel emerges.

Note ...

Always ensure that the fuel pump lever is on the bottom of the operating cam when priming, otherwise maximum movement of the lever cannot be achieved.

87.3 Tighten the bleed pipe banjo bolt whilst fuel is still emerging.

88 If the DPS pump has been dismantled or renewed carry out the following:

88.1 Release the air vent screw (Fig 43 (17)) on the DPS pump governor control cover.

88.2 Operate the fuel lift pump hand priming lever until fuel free from air emerges.

88.3 Whilst fuel is still flowing retighten the air vent screw.

88.4 Start the engine in the normal way and check for leaks.

THROTTLE PEDAL ADJUSTMENT

89 If the throttle cable has been renewed it will be necessary to carry out the following adjustments:

89.1 Remove any slack in the cable by adjustment of the cable adjuster at the engine end.

89.2 Depress the throttle pedal, by hand, to the full extent of the DPS pump linkage and adjust the pedal stop screw to take up all clearance between the screw and scuttle panel.

89.3 Recheck to ensure that no strain is placed upon the pump linkage.

Chapter 11-2

3.5 L PETROL FUEL AND EXHAUST SYSTEM

CONTENTS

INTRODUCTION

1 This chapter details the Unit, Field and Base repairs for the Fuel System fitted to Land Rover 110 and 127 vehicles with 3.5 litre V8 petrol engines.

CARBURETTERS

Removal

2 To remove the carburetters proceed as follows:

2.1 Disconnect the battery leads and where applicable the leads from the radio batteries.

2.2 Remove the elbows from the carburetter intakes and air cleaner (Fig 1 (1)).

2.3 Remove the breather hoses and the clips (2) attaching the hoses to the side of the carburetter bodies.

2.4 Disconnect the throttle cable (7) from the left hand carburetter.

2.5 Disconnect the choke cable (4) from the left hand carburetter.

2.6 Disconnect the fuel spill return pipe (5) from the right hand carburetter.

2.7 Disconnect the vacuum advance pipe to the distributor (4)

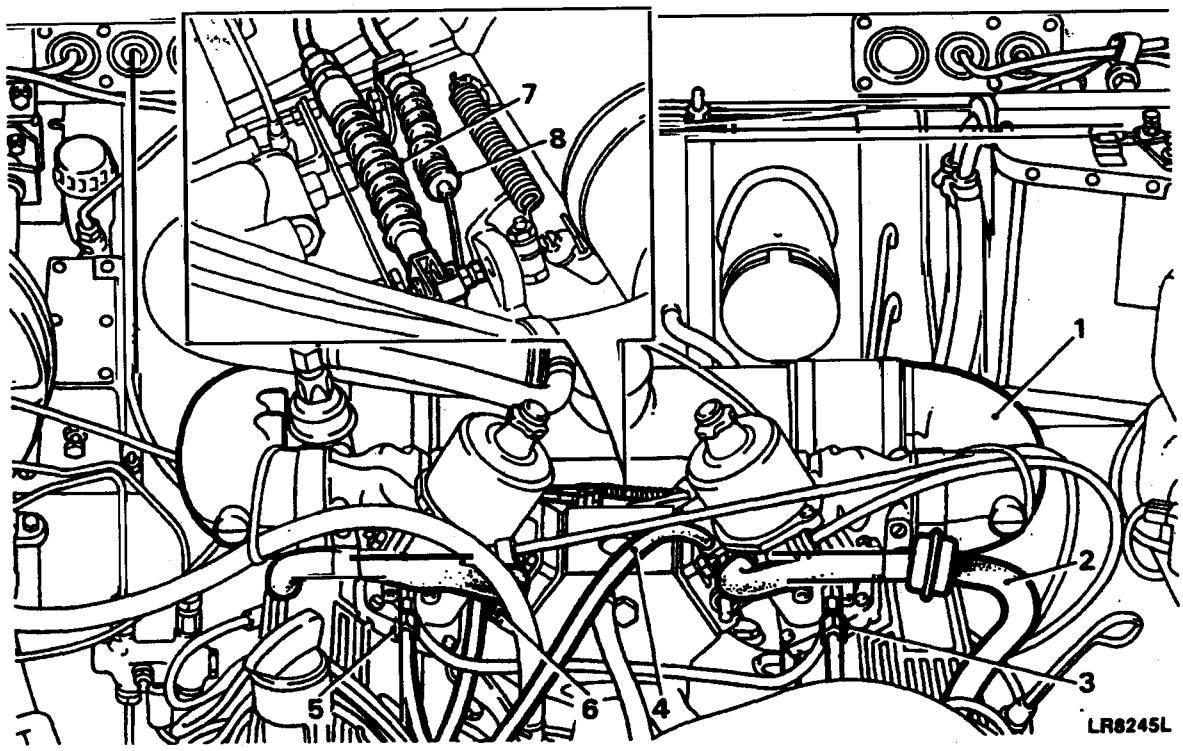
2.8 Disconnect the fuel supply pipe from the tank (3).Seal all pipe and hose ends to prevent the ingress of dirt or foreign matter.

2.9 Disconnect the interconnecting throttle linkages between the two carburetters.

2.10 Loosen the four flange nuts retaining each carburetter to the induction manifold (6).

2.11 Disconnect any clips, retaining pipes and cables to the carburetters noting their location for reassembly. Ensure that any disconnected pipes and cables are drawn clear to allow removal of the carburetters.

2.12 Remove the flange nuts and withdraw the carburetters.



1 Elbows
2 Breather pipe
3 Fuel supply pipe
4 Vacuum pipe
5 Spill return pipe
6 Flange nuts
7 Throttle cable
8 Choke cable

Fig 1 Carburetter removal

Dismantling

3 To dismantle a carburetter proceed as follows:

Note...

Before commencing dismantling, clean the exterior of the carburetter using a suitable proprietary cleaning fluid or kerosene.

3.1 Remove the two nuts and spring washers and withdraw the air intake adaptor and joint washer.

3.2 Unscrew and remove the piston damper assembly and drain the oil (Fig 2 (1)).

3.3 Remove the three screws (6) and lift-off the suction chamber (3) complete with piston (5) and spring (4).

3.4 Remove the spring clip from the top of the piston rod and withdraw the piston and spring.

3.5 Unscrew the fuel metering needle guide locking screw.(7) If the needle cannot be removed from the piston with the fingers, hold the needle as close to the piston as possible, in a soft jawed vice and with a sharp pull withdraw the needle, guide and spring assembly.

3.6 Remove the four screws and withdraw the float chamber cover plate (33) and sealing ring (34).

3.7 Remove the jet adjusting lever retaining screw and spring.(32)

3.8 Withdraw the jet complete (35) with the bi-metal lever (31) and separate the lever from the jet.

3.9 Unscrew and remove the float pivot spindle and plain washer (26), and remove the float (27).

3.10 Lift-out the float needle (30).

3.11 Unscrew and remove the float needle valve (29) and filter (28).

3.12 Unscrew and remove the jet bearing nut (36).

3.13 Invert the carburetter body to allow the jet bearing (37) to fall out. If the bearing sticks, carefully tap it out from the bridge side.

3.14 Remove the piston guide peg (10).

3.15 Remove the suction chamber-to-body sealing ring (11).

3.16 Unscrew and remove the mixture adjusting screw and seal (44). Use thin nosed pliers to finally withdraw the screw.

3.17 Bend-back the cam lever nut lock tabs and remove the nut and lock washer (18).

3.18 Remove the cam lever and spring (17).

3.19 Remove the end seal cover and seal (16).

3.20 Remove the two screws (22) and withdraw the cold start valve body and s al together with the valv spindle (14). Also collect the paper joint washer.

3.21 Note the position of the throttle levers and return spring.

3.22 Bend-back the lock washer tabs and remove the throttle lever nut (23).

3.23 Remove the lock washer, bush washer (21) and throttle actuating lever (24).

3.24 Release the throttle return spring (38) and remove the throttle adjusting lever (25) from the throttle butterfly spindle (42) and remove the return spring.

3.25 Hold the butterfly closed and mark the relationship of the butterfly to the carburetter flange.

3.26 Remove the butterfly two retaining screws (41) and withdraw the butterfly from the spindle.

3.27 Withdraw the throttle butterfly spindle (42) from the carburetter body together with the two seals (43).

Cleaning

4 Clean all components with petrol or de-natured alcohol ready for inspection. Do not use abrasives for the removal of stains or deposits.

Examination

5 To examine the components proceed as follows:

5.1 Examine the throttle spindle and bearings for excessive axial clearance.

5.2 Check the float needle and seating for wear and the float for punctures and renew if necessary.

5.3 Check the condition of all rubber seals, 'O' rings and joint washers and renew if necessary. The float cover plate seal must be renewed.

5.4 Examine the carburetter body for cracks and damage.

5.5 Ensure that the inside of the suction chamber is clean and fit the piston into the chamber without the spring. Hold the assembly horizontally and spin the piston. The piston should spin freely in the suction chamber without any tendency to stick.

5.6 Inspect the metering needle for wear, scores and distortion. Check also that it has the correct designation number.

5.7 Examine the bi-metal jet lever for cracks.

5.8 Check all springs for cracks and distortion.

Key to Fig 2

1	Piston damper	23	Throttle lever nut
2	Spring clip	24	Throttle actuating lever
3	Suction chamber	25	Throttle adjusting lever
4	Piston spring	26	Float pivot needle
5	Piston	27	Float
6	Retaining screws	28	Float needle seat filter
7	Needle locking screw	29	Float needle seat
8	Needle bias spring	30	Float needle
9	Throttle adjusting screw and seal	31	Bi- metal jet lever
10	Piston guide peg and screw	32	Jet retainer adjusting screw and spring
11	Sealing ring	33	Float chamber cover and retaining screws
12	Needle	34	Float chamber seal
13	Carburetter body	35	Jet assembly
14	Cold start valve spindle	36	Jet bearing nut
15	Starter assembly	37	Jet bearing
16	End cover and seal	38	Throttle return springs
17	Cam lever and spring	39	Throttle spindle seals
18	Cam lever nut and lock washer	40	Float chamber
19	'O' ring	41	Butterfly and screws
20	Paper washer	42	Throttle spindle
21	Bush washer	43	Throttle spindle seals
22	Screw	44	Mixture adjusting screw

Reassembly

Throttle butterfly

6 To reassemble the throttle butterfly proceed as follows:

6.1 Fit the throttle spindle (Fig 2 (42)) to the carburetter body and insert the throttle disc (41) into the spindle in its original position. Secure the disc with new screws and ensure that before tightening the throttle disc is correctly positioned and closes properly. Splay the split ends of the screws to prevent turning.

6.2 Fit new seals (43) to both ends of the throttle spindle ensuring that they are fitted the correct way round.

7. To assemble the cold start assembly proceed as follows:

7.1 Fit a new 'O' ring (Fig 3 (4)) to the valve body and assemble the valve spindle to the valve body (3).

7.2 Fit a new paper joint washer (3) to the valve noting that the half-moon cut-out in the washer has clearance for the top retaining screw.

7.3 Fit the starter assembly (Fig 2 (15)) to the carburetter body and secure with the two screws (22).

7.4 Fit the end seal and cover (16).

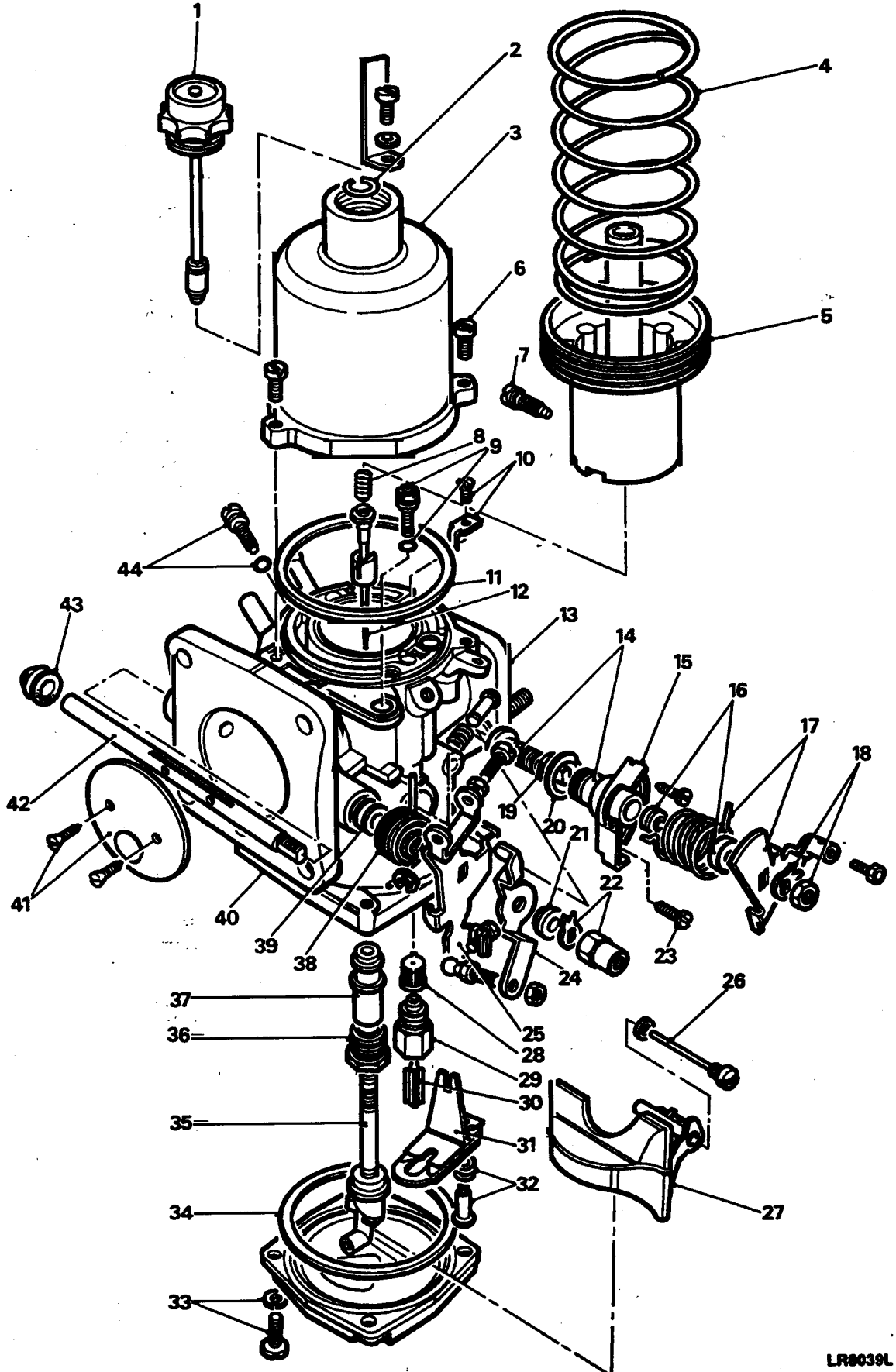
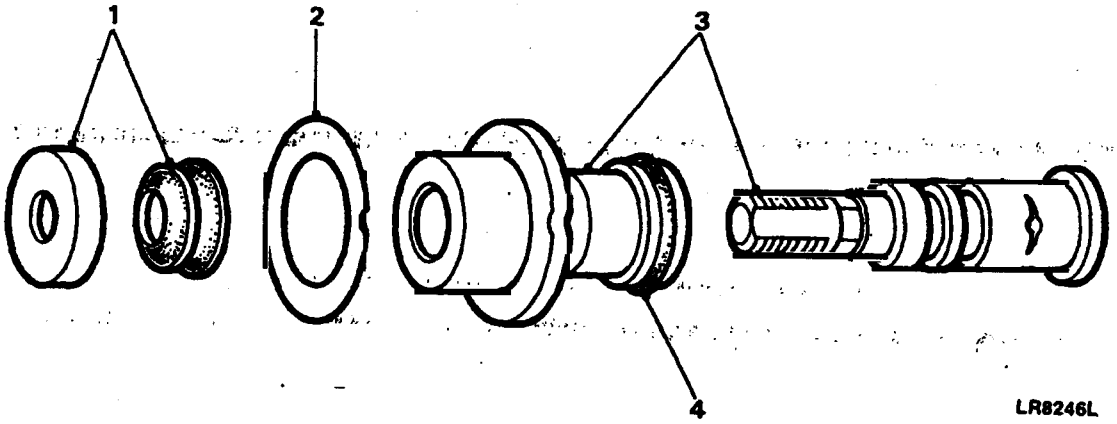


Fig 2 Exploded view of carburetter

7.5 Fit the return spring (17).

7.6 Fit the cam lever and the tension spring (17). Fit a new lock washer and secure with the nut and bend the tabs over a convenient flat (18).

7.7 Adjust the coils of the spring, if necessary, to prevent coil binding.



1 End seal and cover
2 Paper washer
3 Valve body
4 'O' ring

Fig 3 Cold start assembly

Throttle lever assembly

8 To assemble the throttle lever assembly proceed as follows:

8.1 Fit the return spring (Fig 4 (1)) so that the longest leg rests against the throttle adjusting screw housing.

8.2 Fit the throttle adjusting lever and lost motion assembly (2) and tension the return spring.

8.3 Fit the throttle actuating lever (4)

8.4 Fit the bush washer (Fig 2 (21)) and lock washer (Fig 2 (23)).

8.5 Fit and tighten the special nut and bend the lock tabs over a convenient flat (Fig 4 (3)).

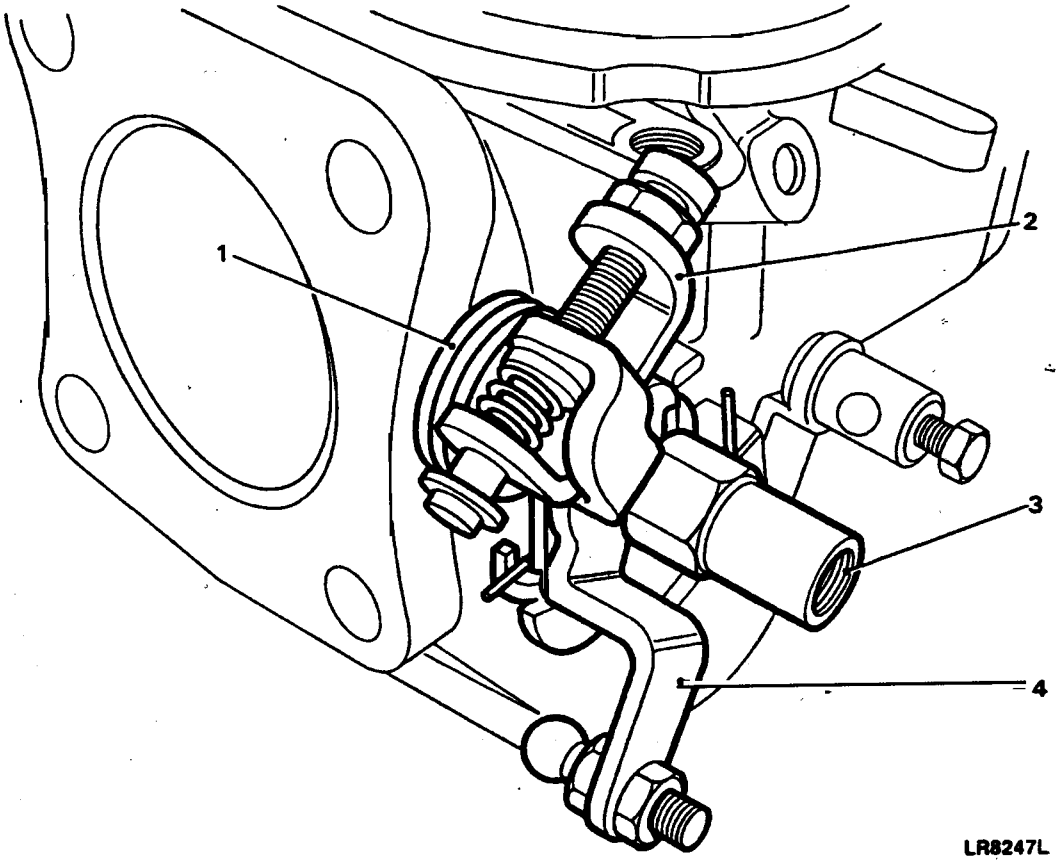
9 To assemble the jet and float assembly proceed as follows:

9.1 Fit the jet bearing (Fig 5 (7)), long end towards the float.

9.2 Fit the jet bearing nut (8).

9.3 Clean or renew the filter (5) and fit the float needle seat (4).

9.4 Fit the needle valve (3), spring loaded pin uppermost.



1 Return spring
2 Throttle adjusting leve
3 Special nut
4 Throttle actuating lever

Fig 4 Throttle lever assembly

9.5 Fit the float (1) and secure with the pivot pin (2).

9.6 Hold the carburetter in the inverted position so that the needle valve is closed by the weight of the float only. Check using a straight edge that the point on the float, arrowed on the illustration, is 1.0 to 1.5 mm (0.04 to 0.062 in) below the level of the float chamber face, dimension 'A' (Fig 6).

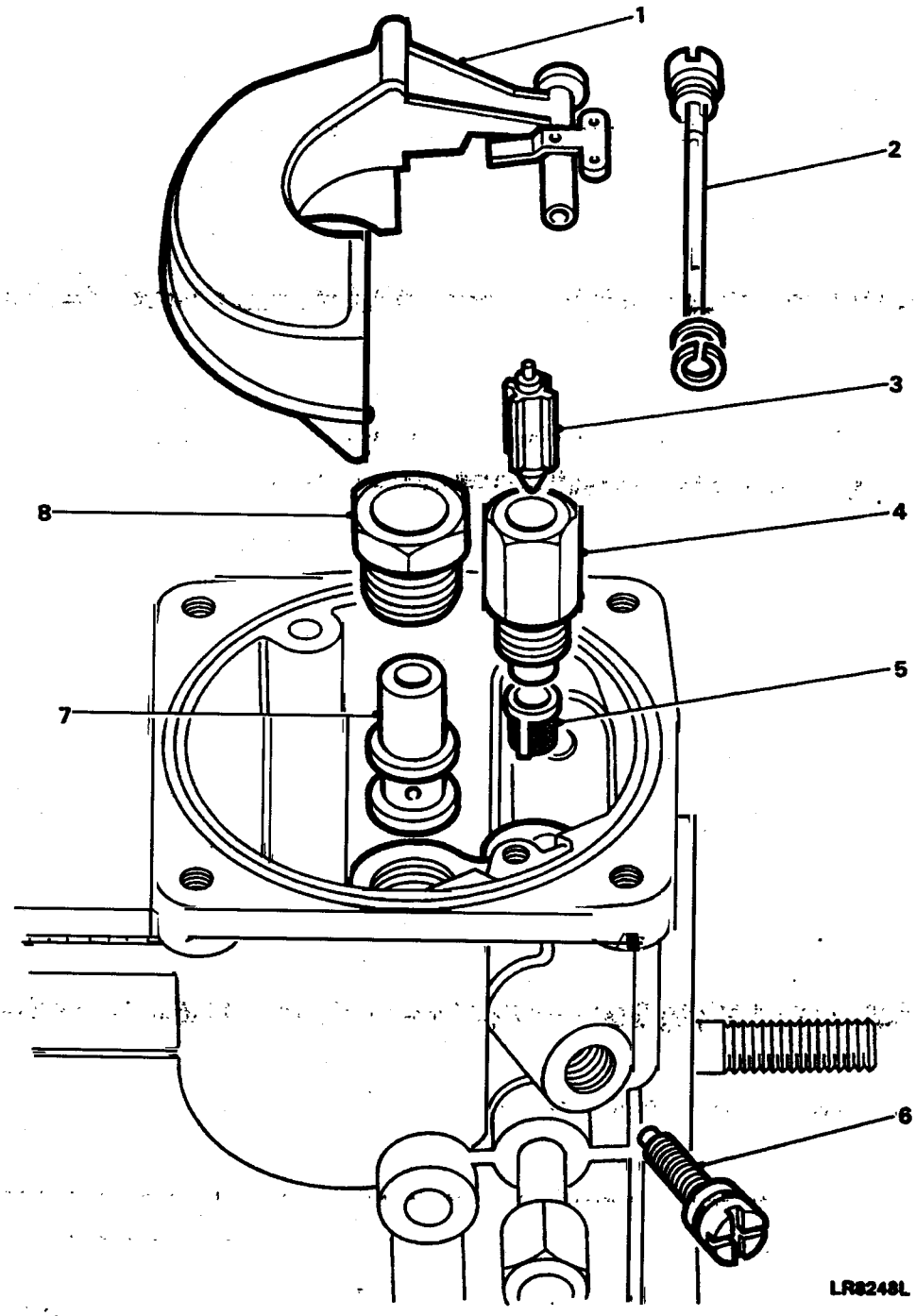
9.7 Adjust the float position by carefully bending the brass pad (1) until the correct dimension is achieved. After adjustment, check that the float pivots freely about the spindle.

9.8 Assemble the jet to the bi-metal jet lever (Fig 7 (1) and ensure that the jet head moves freely in the cut-out.

9.9 Fit the jet and bi-metal jet lever to the carburetter and secure with the spring loaded jet retaining screw (Fig 7 (2)).

9.10 Fit the mixture adjusting screw (Fig 5 (6)).

9.11 Adjust the mixture screw until the jet is flush with the carburetter bridge, then turn the screw a further three and one half turns clockwise (Fig 8 (1)).



1 Float
2 Pivot pin
3 Needle valve
4 Float needle seat
5 Filter
6 Mixture screw
7 Jet bearing
8 Jet bearing nut

Fig 5 Jet and float assembly

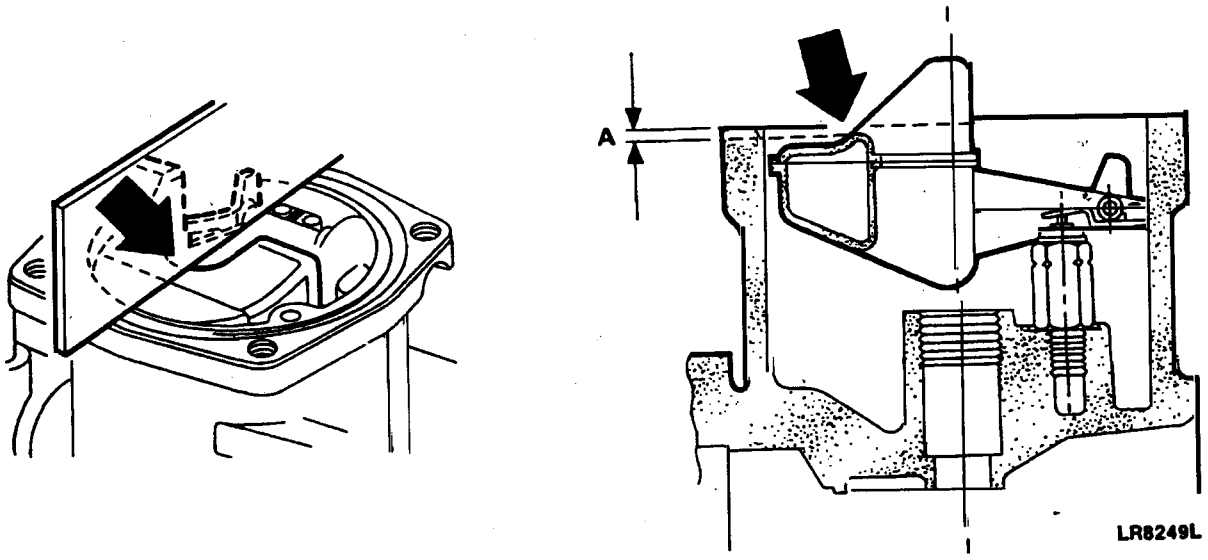
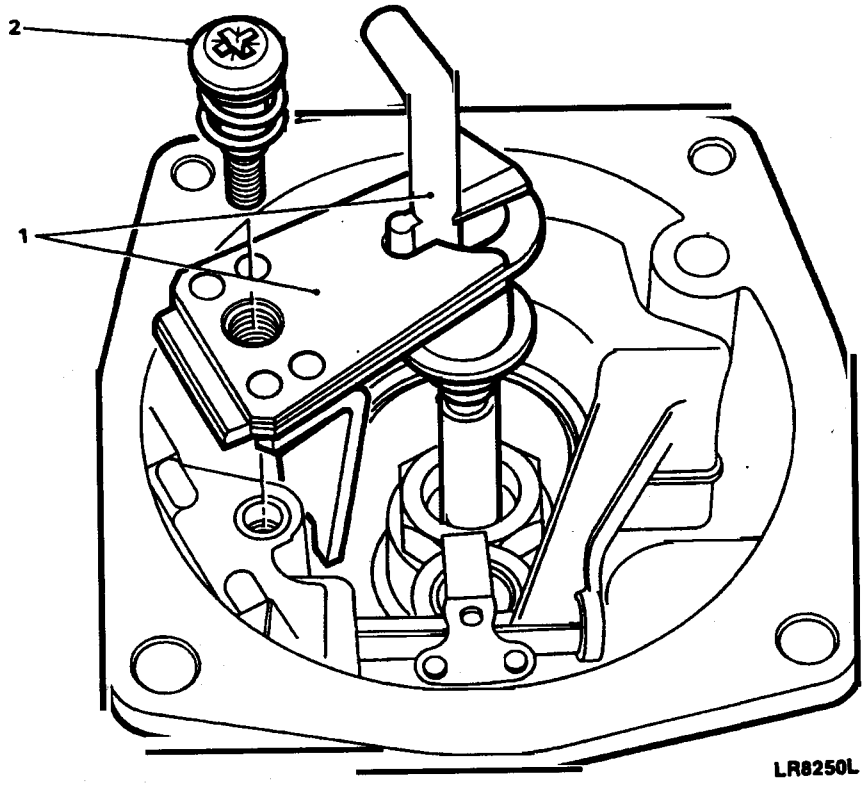


Fig 6 Float settings



1 Jet and bi-metal jet lever 2 Retaining screw

Fig 7 Fitting the jet

9.12 Using a new sealing ring (Fig 2 (34)), fit the float chamber cover, noting that it can only be fitted one way. Secure with the four screws and spring washers and evenly tighten (Fig 2(33).

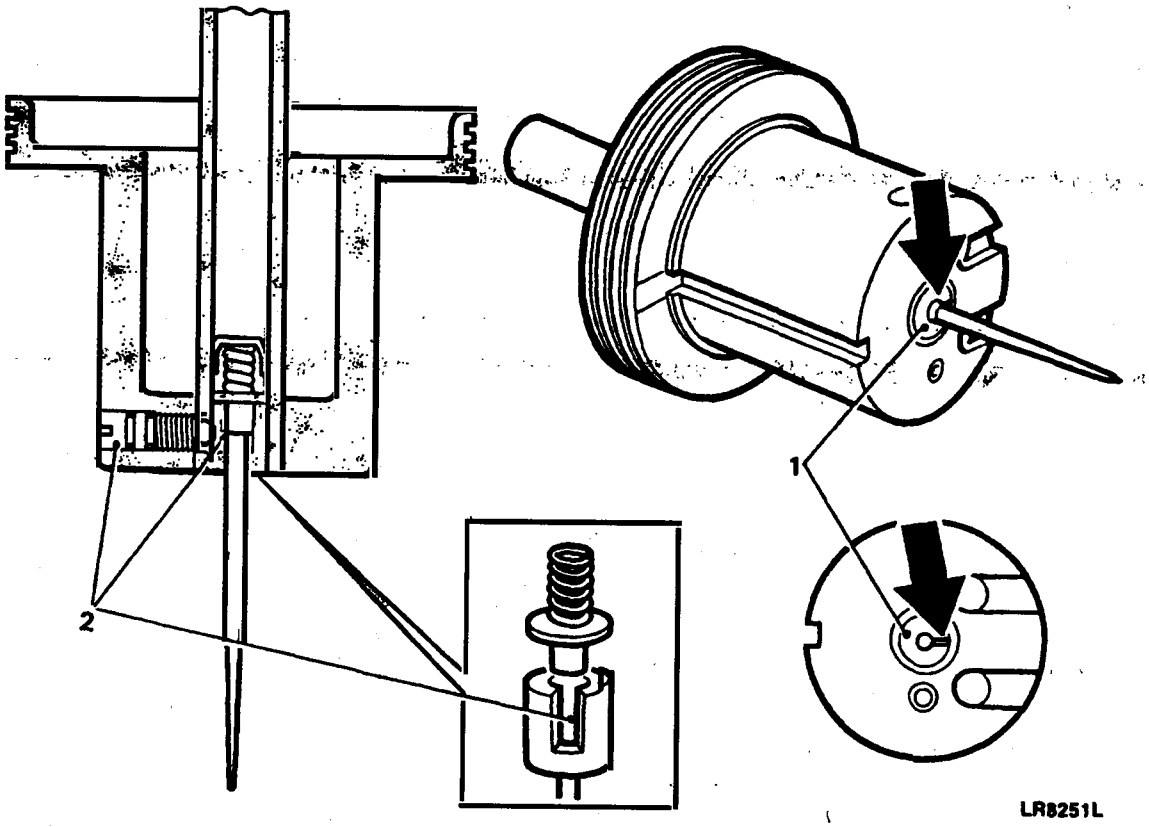


Fig 8 Setting the jet

Piston and suction chamber

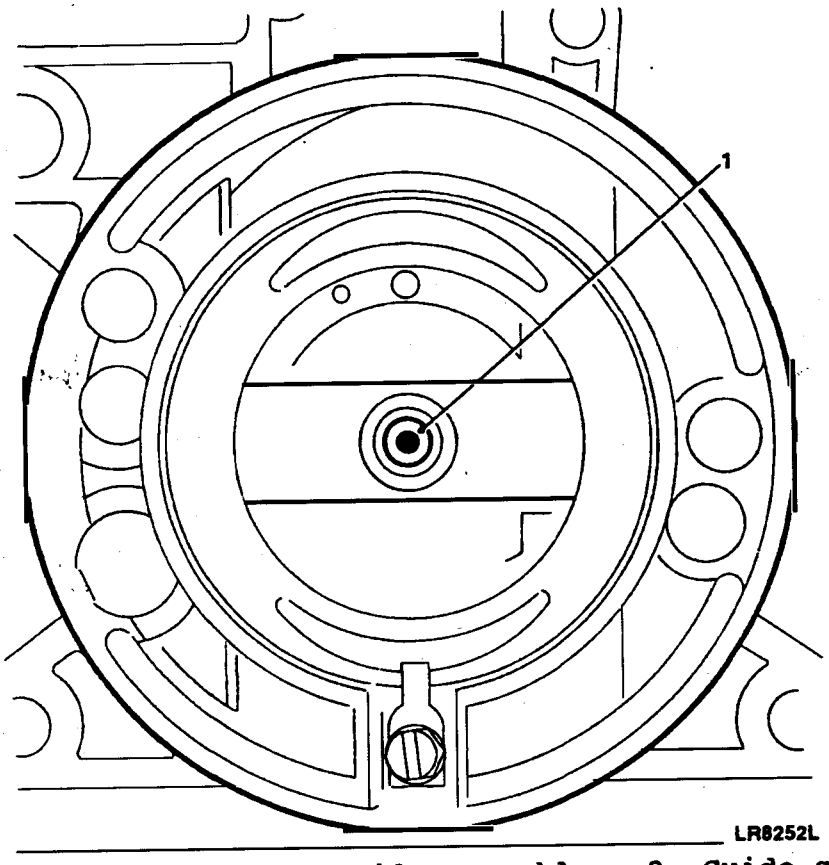
10 To assemble the piston and suction chamber proceed as follows:

10.1 Fit the needle, spring and guide assembly (Fig 9 (1)) to the piston ensuring that the etched arrow head on the needle locating guide is aligned between the piston transfer holes, as illustrated.

10.2 Secure and ensure that when the screw is tightened the guide is flush with the piston and that the screw locates in the guide slot (2).

10.3 Fit the piston key to the carburetter body using a new screw. Tighten the screw and splay the end.

10.4 Fit a new suction chamber sealing ring to the groove in the carburetter body.



1 Needle, spring and guide assembly 2 Guide slot

Fig 9 Piston and suction chamber

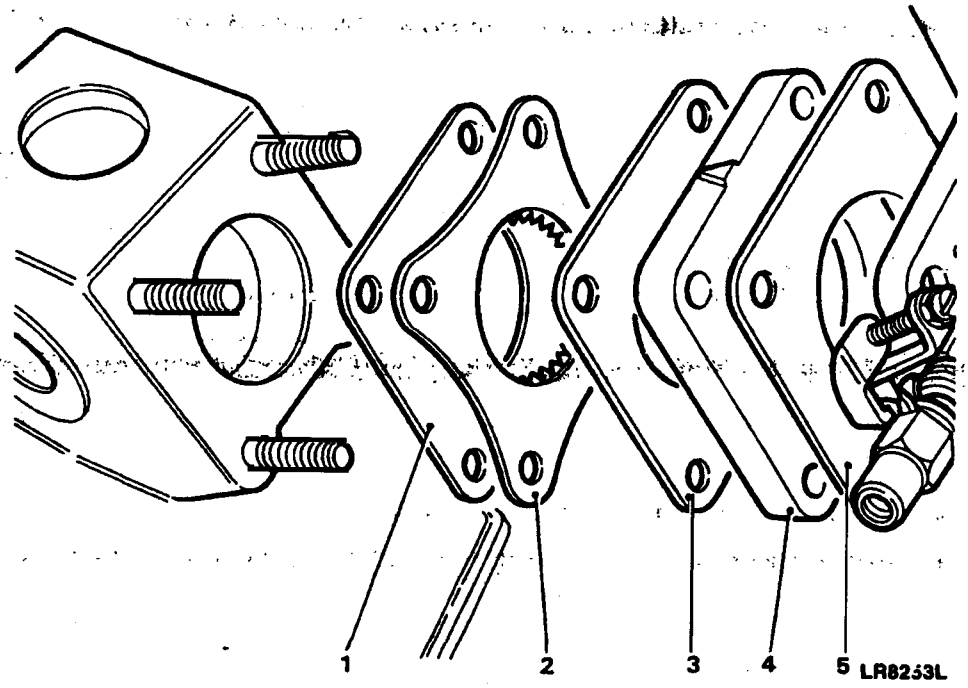
10.5 To prevent the piston spring being 'wound-up' during assembly, temporarily fit the piston and suction chamber less the spring to the body, and pencil mark the relationship of the chamber to the body. Remove the suction chamber and fit the spring to piston. Hold the suction chamber above the spring and piston, align the pencil marks and lower the chamber over the spring and piston, taking care not to rotate the suction chamber. Secure the chamber to the body with the three screws, tightening evenly and check that the piston moves freely.

10.6 Hold the piston at the top of its stroke and fit the spring clip.

10.7 Fit the piston damper.

10.8 Using a new joint washer, fit the air intake adaptor and secure with the two nuts and spring washers.

10.9 Fit the carburetters to the inlet manifold ensuring that the joint washers, deflector and insulator are fitted in the sequence illustrated. The insulator must be fitted with the arrow head uppermost and pointing inwards towards the manifold. Secure with the four nuts and spring washers and tighten evenly to the correct torque (Fig 10).



1 Joint washer
2 Deflector - internal teeth
3 Joint washer
4 Insulator
5 Joint washer

Fig 10 Manifold joints

10.10 Connect the linkages and top-up the carburetter dampers with a recommended oil to the top of the hollow piston rod (Fig 11).

10.11 Tune and adjust the carburetters.

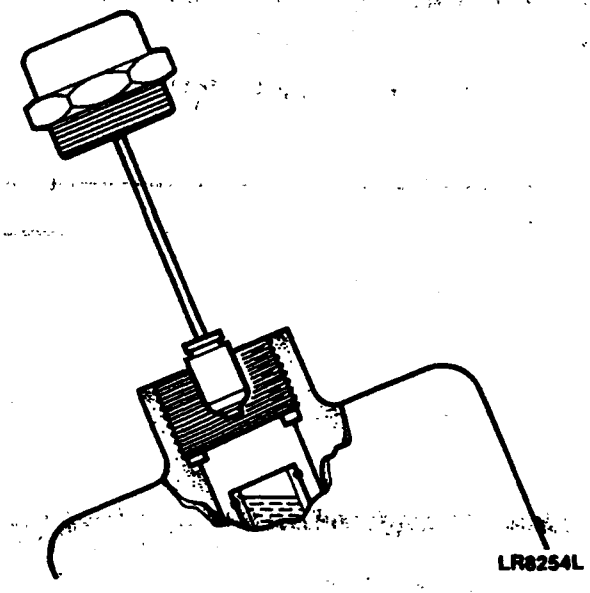


Fig 11 Dashpot

Tuning and Adjustments

Special tools

11 A carburetter balancer (605330 or B89) and non-dispersive infra-red exhaust gas analyser are the special tools necessary for tuning and adjustments.

General requirements prior to tuning carburetters

12 The following lists the general requirements prior to tuning the carburetters.

12.1 Accurate engine speed is essential during carburetter tuning, therefore the distributor pick up air gap and ignition timing must be checked together with the vacuum advance system.

12.2 Whenever possible the ambient air temperature of the tuning environment should be between 15° to 26°C (60° to 80°F). When checking engine speed, use an independent and accurate tachometer.

12.3 Idling adjustments should be carried out on a fully warmed up engine, that is, at least five minutes after the thermostat has opened. This should be followed by a run of one minute duration at an engine speed of approximately 2,500 rev/min before further adjustments or checks are carried out. This cycle may be repeated as often as required. It is important that the above cycle is adhered to, otherwise overheating may result and settings may be incorrect. The piston dampers must always be kept topped-up with the correct grade of oil.

12.4 Before any attempt is made to check settings, a thorough check should be carried out to ensure that the throttle linkage between the pedal and carburetters is free and has no tendency to stick. Ensure that the choke control lever is pushed fully down.

12.5 References to left and right hand are as from the drivers seat.

Tamper-proofing

13 To comply with E.C.E. regulations the idle speed and mixture adjusting screws must be tamper-proofed following any adjustments. A red blanking plug; Part number JZX 1258 must be fitted into the mixture screw recess and a red cap; Part number JZX 1197 fitted over the idle adjustment screw (throttle adjustment screw).

Carburetter balance

14 To balance the carburetters proceed as follows:

Note ...

The following instructions apply to both carburetters unless otherwise stated.

14.1 Before commencing the following instructions, remove the air cleaner, air intake elbows, mixture adjustment screw plug and mixture screw cap.

14.2 Using balancer 605330 (Fig 12). Disconnect the interconnecting link between the two carburetter intakes and ensure that there are no air leaks, if necessary, zero the gauge with the adjustment screw.

14.3 Start the engine, and if necessary allow it to reach normal operating temperature. If the needle moves to the right, decrease the air flow through the left hand carburetter by unscrewing the idle screw. Alternatively, increase the air flow through the right hand carburetter by screwing down the idle screw. Reverse the procedure if the pointer moves to the left. Reconnect the carburetter inter-connecting link.

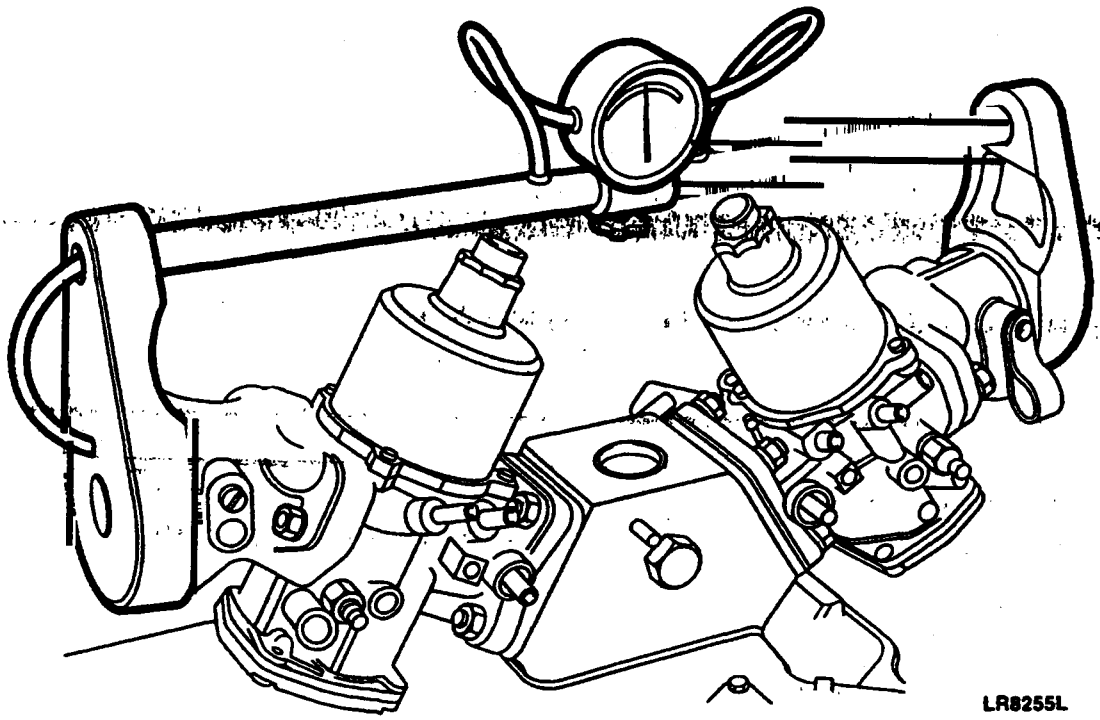


Fig 12 Tuning the carburetters using Balancer 605330

14.4 Using balancer B89 (Fig 13). Disconnect the inter-connecting throttle link between the two carburetters (Fig 16 (7)).

14.5 Back-off the idle adjusting screw on each carburetter, clear of the throttle lever (Fig 16 (13)).

14.6 Turn each throttle adjusting screw so that it touches the throttle lever, then turn the screws by equal amounts to achieve an approximate idle speed of 700 to 800 rev/min.

14.7 Press the balancer firmly over the carburetter intake (Fig 13). Press or withdraw the control on the side of the balancer to adjust the meter needle reading to approximately half scale, and note the reading.

14.8 Without altering the position of the balancer control, place the balancer on the second carburetter intake and adjust the idle screw as necessary to achieve the same reading.

14.9 Alternatively, adjust and check the balance of both carburetters until an idle speed of 700 to 800 rev/min is obtained.

14.10 Reconnect the throttle inter-connecting link, and again check the idle speed and balance.

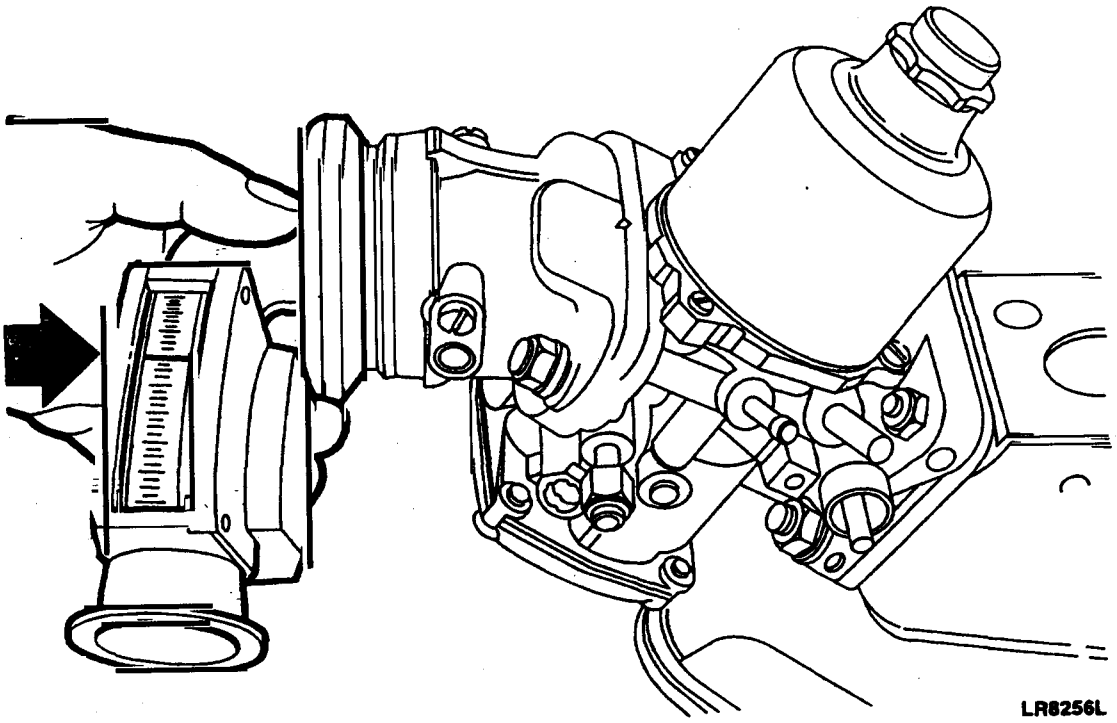


Fig 13 Tuning the carburetters using Balancer B89

Mixture setting

15 To set the mixture adjustments proceed as follows:

15.1 Ensure that the engine is still at normal operating temperature.

15.2 Mark the relationship of the suction chamber to the carburetter body, remove the retaining screws and lift off the suction chamber complete with pistons.

15.3 To achieve a datum setting for the mixture screw (Fig 14), turn it anti-clockwise until the jet is level with the carburetter bridge. Check by placing a straight edge across the bridge and adjust as necessary so that the jet just touches the straight edge (Fig 15).

15.4 Refit the suction chamber and piston, evenly tighten the retaining screws. Check that the piston moves freely without sticking. Top-up the piston damper.

15.5 Turn the mixture adjustment screw three and one half turns clockwise (Fig 14)

15.6 Insert the probe of an infra-red exhaust gas analyser as far as possible up the exhaust pipe, start the engine and allow a one and one half minute stabilisation period.

15.7 Adjust the mixture screw on both carburetters by equal amounts, rich or weak to achieve a CO reading of 0.5 to 2.5%.

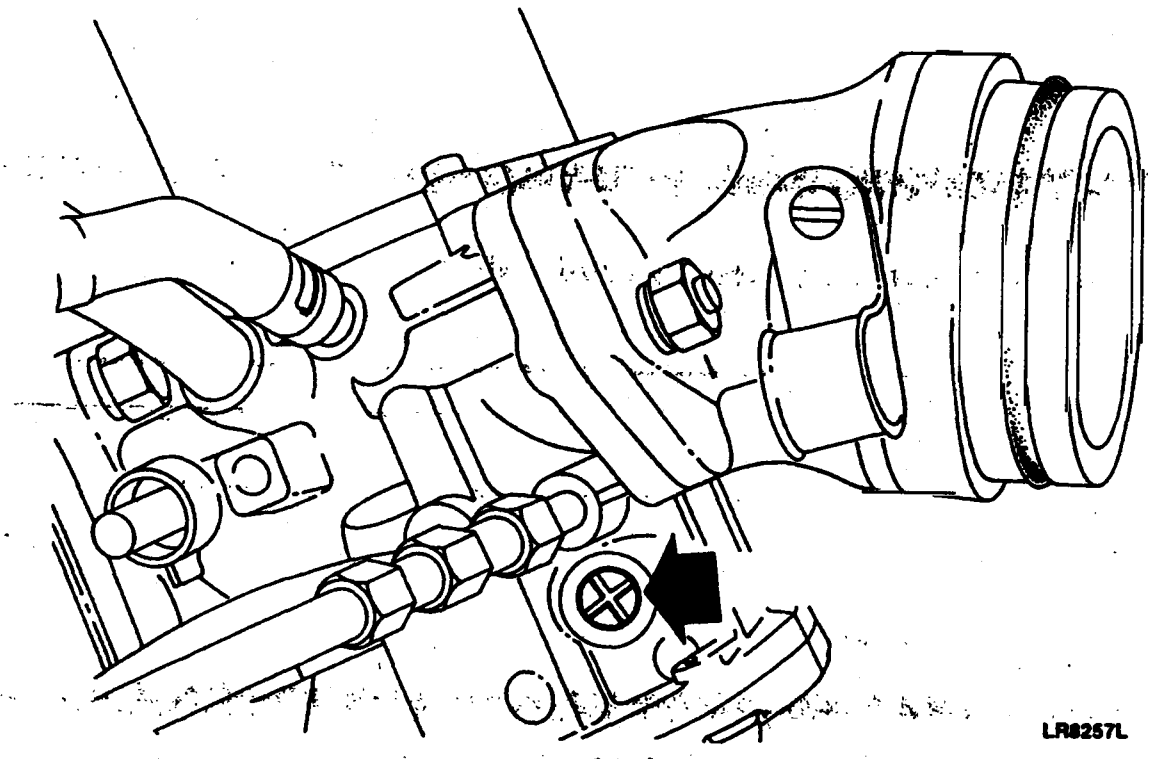


Fig 14 Mixture screw adjustments

15.8 If after approximately two minutes the CO level is not satisfactory run the engine at 2000 rev/min for one minute to stabilise the equipment, continue the setting procedure until a stable CO reading of 0.5 to 2.5% at an idle speed of 700-800 rev/min is obtained.

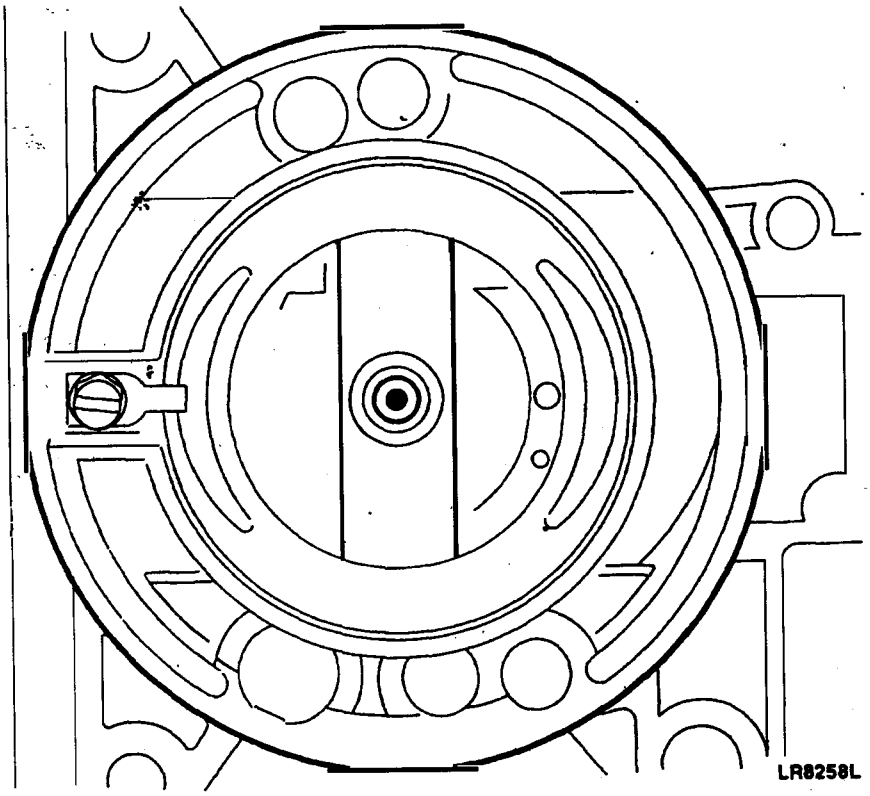


Fig 15 Mixture jet level

Idle speed and linkage adjustment

16 To adjust the idle speed and linkage proceed as follows:

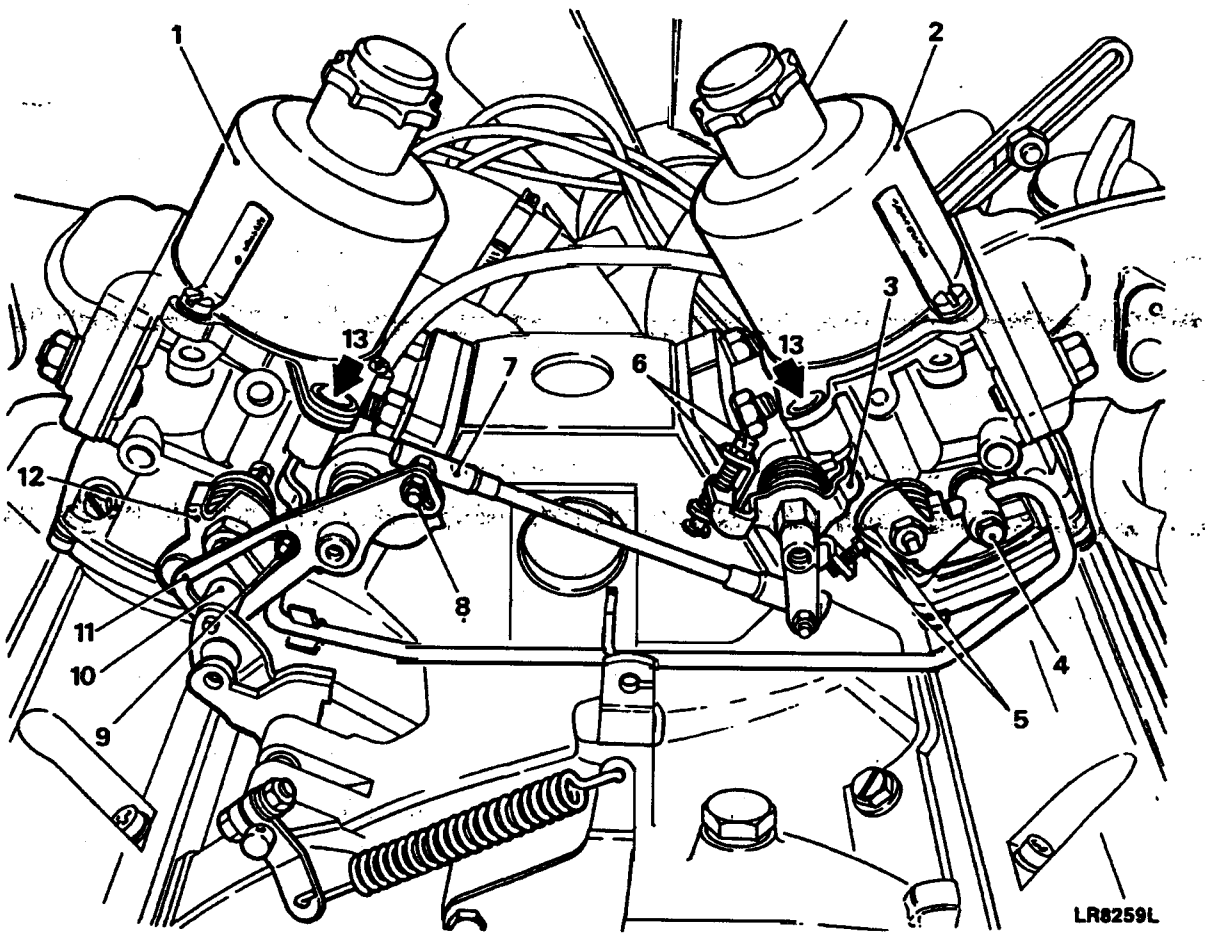
16.1 Check that the engine is at normal operating temperature.

16.2 Slacken the nut (Fig 16 (8)), at the left hand carburetter securing the inter-connecting link ball (7) to the throttle cam lever (11).

16.3 Disconnect the inter-connecting link (7) between the carburetters at the left hand carburetter (1).

16.4. At the right hand carburetter (2), release the lock nut and slacken off the lost motion adjustment screw (6), until it is well clear of the spring loaded pad.

16.5 If necessary adjust the idle screw to maintain the correct idle speed. Check the CO level and carburetter balance, adjust if required.



1	Left hand carburetter	8	Nut
2	Right hand carburetter	9	Fast idle screw
3	Throttle lever	10	Roller
4	Link rod screw	11	Cam lever
5	Fast idle screw	12	Fast idle cam
6	Lost motion adjustment screw	13	Idle adjusting screw
7	Inter-connecting link		

Fig 16 Carburetter linkages

16.6 Reconnect the inter-connecting link (7) to the left hand carburetter.

16.7 Hold the right hand throttle lever (3) against the idle screw stop and adjust the lost motion screw (6) until contact is made with the spring loaded pad, tighten the lock nut.

16.8 Check the idle speed and balance. Adjust the lost motion screw to restore balance if necessary.

16.9 Ensuring that the roller (10) is firmly seated in the lower corner of the cam lever (11), tighten the nut (8) which secures the inter-connecting link ball to the cam lever.

Fast idle adjustment

17 To adjust the fast idle speed proceed as follows:

17.1 Pull out the cold start control (choke) until the scribed line on the left hand fast idle cam (Fig 16 (8)) is in-line with the centre of the fast idle screw head (9).

17.2 Check that the scribed line on the right hand fast idle cam is similarly in-line with the fast idle screw head (5). If there is miss-alignment, slacken the fast idle cam link rod screw (4) at the right hand carburetter and move the cam until the scribed line coincides with the centre of the screw head. Tighten the cam rod screw.

17.3 Turn the fast idle screw clockwise (5), on each carburetter, until just clear of the cam.

17.4 Turn the fast idle screw of the leading (left-hand) carburetter down (clockwise) until a slight change in engine speed is noted.

17.5 Similarly turn the fast idle screw of the second carburetter (right-hand) down until a further slight change of engine speed is noted.

17.5 Adjust the fast idle screws of both carburetters by equal amounts to achieve a fast idle speed of 1100 to 1150 rev/min.

17.6 Tighten the fast idle screw lock-nut on both carburetters. Push the cold start (choke) fully home then pull it out again to its full extent and re-check the fast idle speed.

17.7 Fit the appropriate blanking plug and cap to the mixture screw recess and idle adjusting screw.

17.8 Fit the carburetter air intake elbows and air cleaner.

FUEL TANKS

General

18 When removing the fuel tanks it should be noted that both Land Rover 110 and 127 vehicles have rear mounted fuel tanks, only the 127 variant has the side mounted tank.

WARNINGS ...

(1) DANGER OF FIRE ALWAYS EXISTS WHEN WORKING ON OR REMOVING FUEL TANKS FROM VEHICLES. WORK MUST BE CARRIED OUT IN A WELL VENTILATED AREA.

(2) FIRE EXTINGUISHING EQUIPMENT MUST BE AVAILABLE AT ALL TIMES AND THE VEHICLE BATTERIES AND WHERE APPLICABLE THE RADIO BATTERIES MUST BE COMPLETELY DISCONNECTED.

(3) NOTICES SUCH AS "NO SMOKING", "HIGHLY FLAMMABLE VAPOUR", "RESTRICTED AREA" ETC. MUST BE DISPLAYED SO AS TO BE VISIBLE FROM ALL APPROACHES.

Removal

Rear mounted fuel tank

19 To remove the rear mounted fuel tank proceed as follows:

19.1 Remove the fuel tank drain plug and allow the fuel to drain into a suitable receptacle and refit the plug.

19.2 Working from the right-hand side of the vehicle disconnect the fuel feed pipe and spill return at the rubber connections (Fig 17 (2)).

19.3 Disconnect the fuel filler hose and breather hose from the tank (4).

19.4 Whilst, noting the cable colours, disconnect the electrical leads from the fuel gauge unit at the left-hand side of the vehicle (7).

19.5 If the vehicle is fitted with towing ball drop-plate with support bars the bars must be removed.

19.6 Remove the eight nuts and bolts securing the anti-roll bar to the chassis and push the roll bar down to provide access to the tank.

19.7 Remove the left-hand lashing eye to facilitate removal of the tank.

19.8 Place a support under the tank, preferably one which will enable the tank to be progressively lowered.

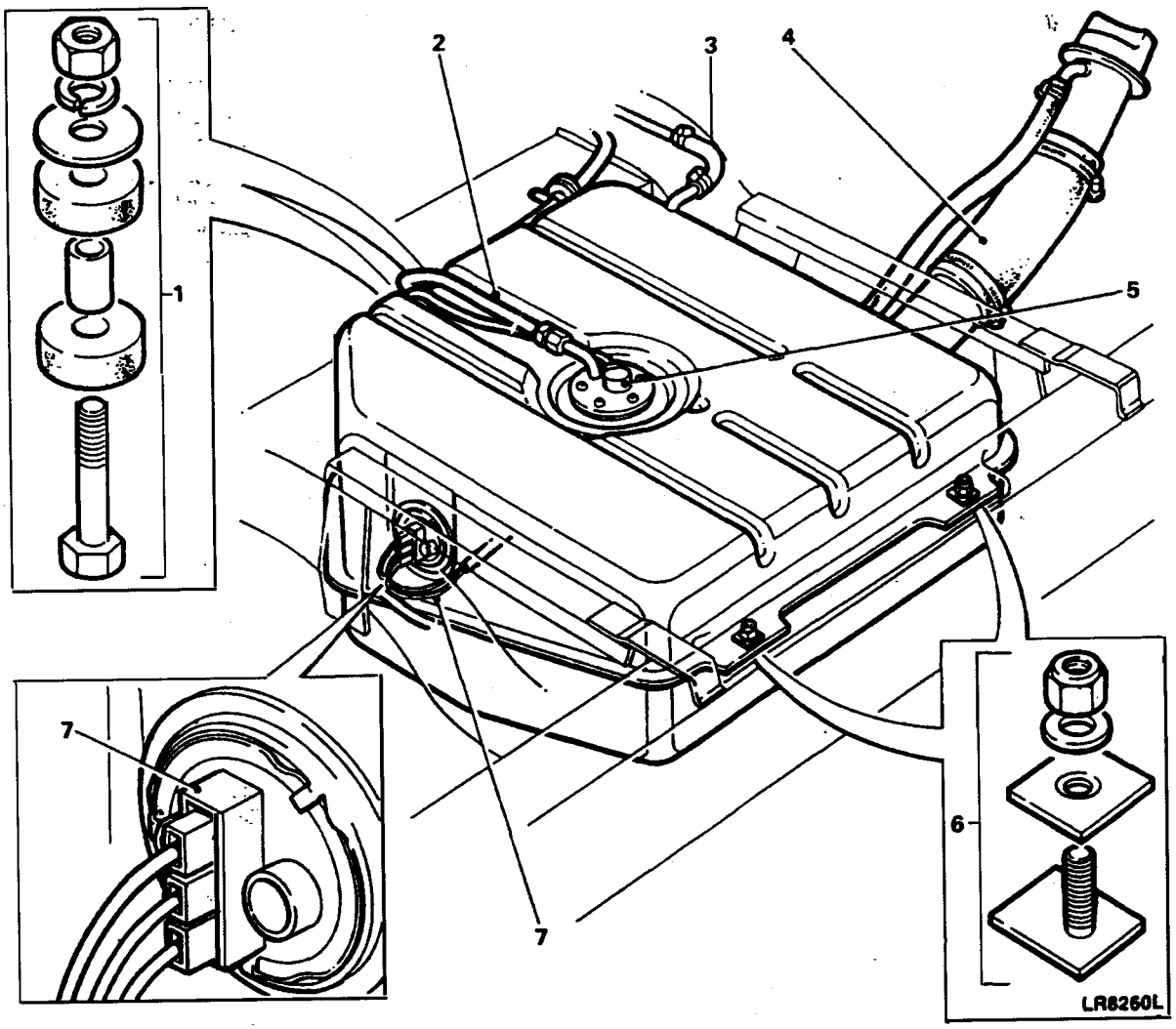
19.9 Remove the two nuts retaining the forward end of the tank (1).

19.10 Remove the two nuts securing the rear of the tank (6).

19.11 Carefully lower the tank sufficiently to enable the electrical leads to the fuel pump to be disconnected (5).

19.12 Finally remove the tank from the vehicle together with the pump and rear section of the fuel feed pipe.

19.13 Disconnect the rear section of the feed pipe from the pump.



1 Front fixings
2 Fuel supply pipe
3 Spill return pipes
4 Filler and breather pipes
5 Electrical connections
6 Rear fixings
7 Electrical connections

Fig 17 Rear mounted fuel tank removal

Side mounted fuel tank

20 To remove the side mounted fuel tank proceed as follows:

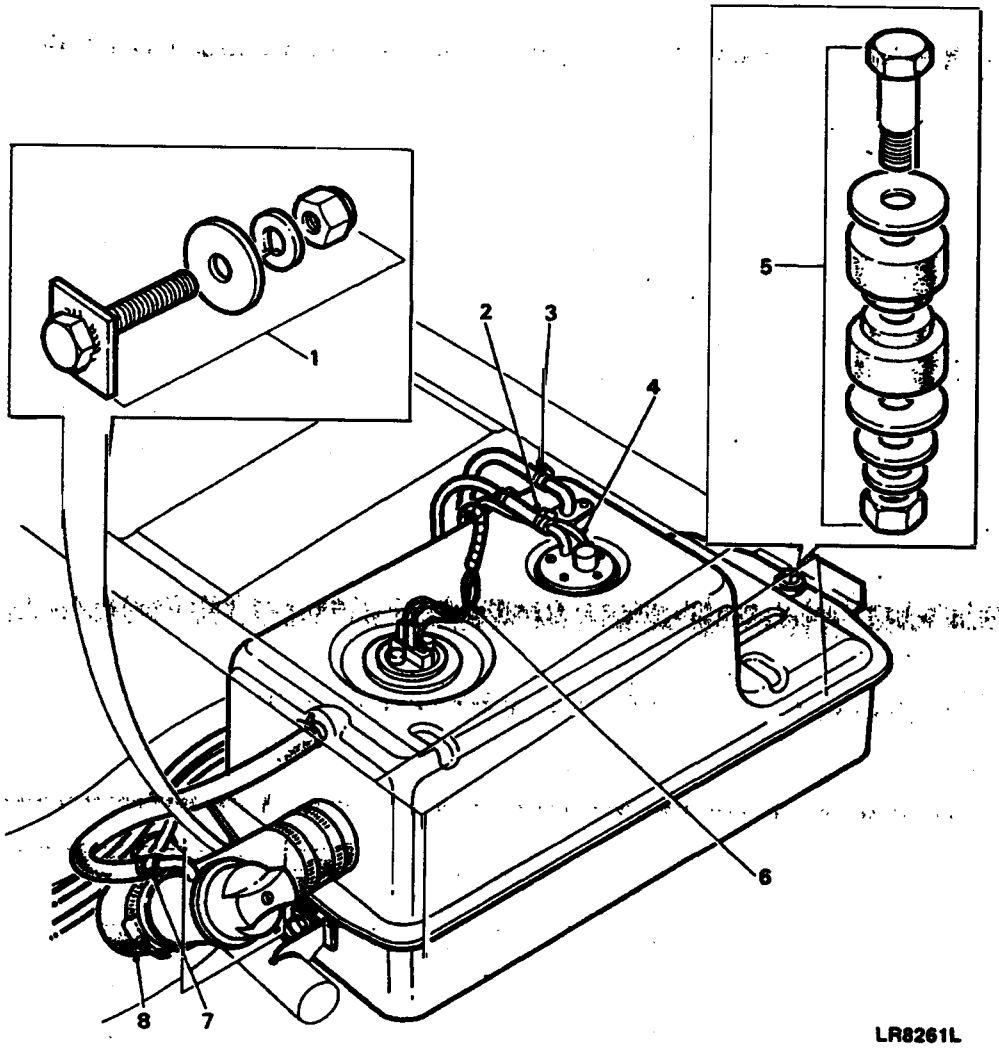
20.1 Move the vehicle to a well ventilated area and disconnect the batteries.

20.2 Remove the fuel tank drain plug and allow the fuel to drain into a suitable receptacle and refit the plug.

20.3 Remove the right hand seat cushion and raise the locker lid.

20.4 Disconnect the electrical connections from the fuel level unit (Fig 18 (6)).

20.5 Disconnect the electrical leads from the fuel pump (4).



1 Rear fixings
2 Fuel feed pipe
3 Spill return pipe
4 Electrical connections
5 Front fixings
6 Electrical connections
7 Breather hose
8 Filler hose

Fig 18 Side mounted fuel tank removal

20.6 Detach the fuel feed pipe from the outlet connection on top of the tank (2).

20.7 Detach the spill return pipe from the connection on top of the tank (3).

20.8 Slacken the clips at the tank connections of the filler (8) and breather hoses (7) and disconnect the hoses.

20.9 Detach the front (5) and rear fixings (1) and remove the tank from below the vehicle.

Fuel level unit

21 Rear mounted fuel tank. To remove the fuel level unit from rear mounted fuel tanks refer to Cat 522 Chap 11-1 Para 81.

22 Side mounted fuel tank. To remove the fuel level unit from side mounted fuel tanks refer to Cat 522 Chap 11-1 Para 80.

Fuel pump

23 To remove the fuel pump proceed as follows:

Note ...

The removal procedure for the fuel pump from both rear and side fuel tanks is identical. However, the rear tank has to be removed from the vehicle to allow fuel pump removal.

23.1 Remove the five retaining screws (Fig 19 (1)) and withdraw the fuel pump (3) and sealing ring (2) from the tank.

23.2 Cover the pump aperture in the tank to prevent the ingress of foreign matter.

Note ...

The fuel pump is a non-repairable item and in the event of failure must be replaced.

Refitting

Side and rear mounted fuel tanks

24 If a new tank is being fitted remove the fuel level unit, spill return elbow, fuel feed elbow (side tank only) and drain plug from the existing tank and fit them to the replacement tank, using new sealing washers and joint gaskets as applicable. Fit the new tank in reverse order of the removal procedure.

Fuel pump

25 To fit the fuel pump proceed as follows:

CAUTION ...

On some early models a modification was carried out to the fuel pump to prevent the possibility of the contacts earthing. These pumps can be identified by a black plastic tie clip as illustrated. If the fuel tank only is being renewed and the original pump is being refitted, ensure that the tie clip is correctly positioned.

25.1 Fit the pump into the tank with a new sealing ring (Fig 19 (2)) and secure with the five screws.(1)

Note...

On rear tanks the outlet pipe should be directed towards the front of the vehicle and the electrical connections to the rear. On side tanks the outlet pipe should be directed towards the left hand side of the vehicle and the electrical connections to the right.

FUEL FILTER

26 The procedure for removal/installation of the fuel filter is self evident, when removing note should be made of the pipe connections to assist with installation. For renewal of the paper element filter refer to Cat 201.

VAPOUR SEPARATOR

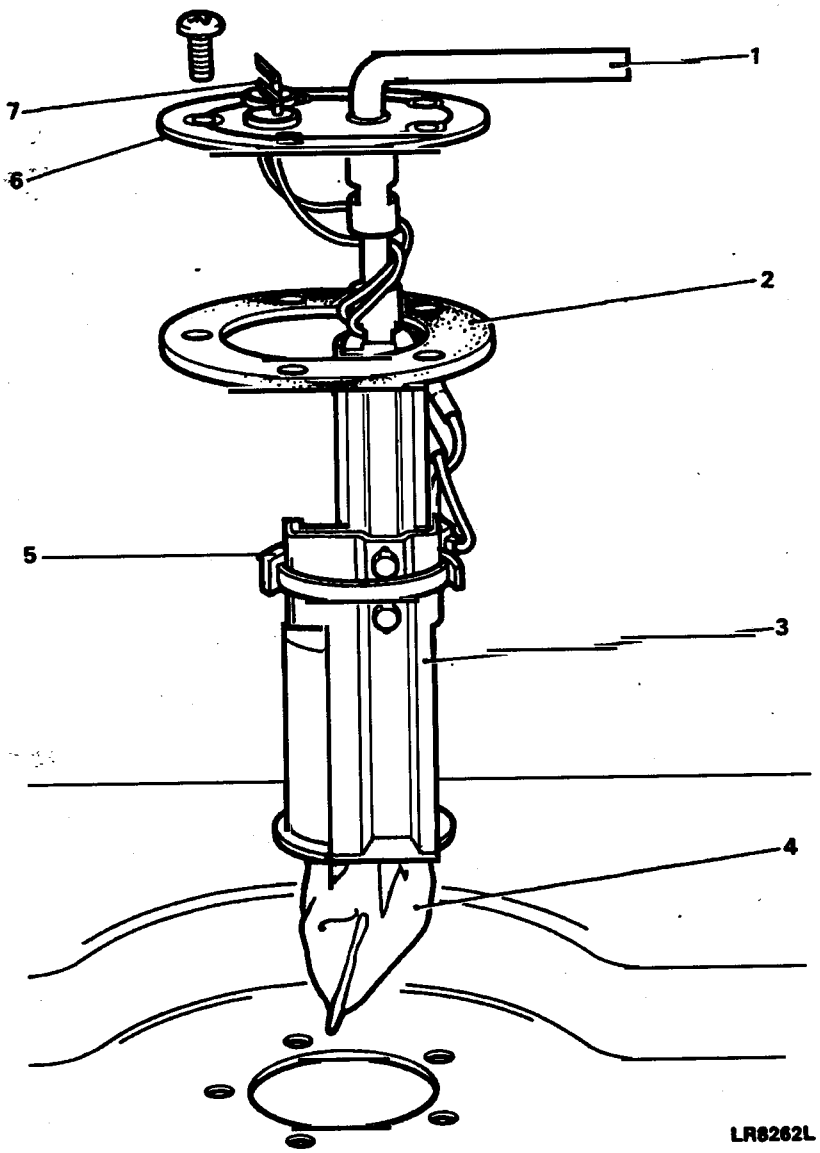
27 The vapour separator is a non-repairable item and in the event of failure must be replaced.

SOLENOID VALVE

28 The solenoid valve is a non-repairable item and in the event of failure must be replaced.

NON-RETURN VALVE

29 The non-return valve is a non-repairable item and in the event of failure must be replaced.



1 Retaining screws
2 Seal
3 Fuel pump

Fig 19 Fuel pump removal

EXHAUST SYSTEM

Removal

30 To remove the exhaust system proceed as follows:

WARNINGS ...

(1) THE EXHAUST SYSTEM COMPONENTS WILL BECOME EXTREMELY HOT WHEN THE ENGINE IS RUNNING. IN ORDER TO PREVENT THE POSSIBILITY OF SEVERE PERSONAL BURNING, ADEQUATE TIME MUST BE ALLOWED FOR THE SYSTEM TO COOL, BEFORE WORK IS UNDERTAKEN.

(2) ENSURE THE VEHICLE IS SAFELY POSITIONED ON RAMPS BEFORE ANY WORK IS ATTEMPTED FROM THE UNDERSIDE.

30.1 Remove the nuts (Fig 20 (1)) from the exhaust manifold studs.

30.2 Release the flanged plate (2) and separate the r.h. down tube (4) from the exhaust manifold flange.

30.3 Remove and discard the olive (3).

30.4 Repeat the procedure for separation of the l.h. down tube (22).

30.5 Support the exhaust system and remove the nuts (7),(16) and washers (8),(17) from the 'U' clamps bolts (10),(18).

30.6 Withdraw the 'U' clamp bolts from the clamp brackets.

30.7 Carefully remove the exhaust system from the support.

30.8 If necessary, remove the clamp brackets (9),(19) and rubber mountings (6),(20) from the chassis.

30.9 If required, the exhaust system can be separated at the following locations by the methods described:

30.9.1 Separate the r.h. down tube (4) from the r.h. 'Y' piece tube connection, located mid-way between the r.h. heatshield (23) and the 'Y' piece clamp (19). Remove the nuts, washers and 'U' clamp, and withdraw the down tube.

30.9.2 Separate the l.h. down tube (22) from the l.h. 'Y' piece tube connection, located beneath the l.h. heatshield (21). Remove the heatshield, nuts, washers and 'U' clamp and withdraw the down tube.

30.9.3 Separate the rear of the 'Y' piece tube from the first silencer tube connection. Remove the nuts (14), washers (13) and bolts (11), and withdraw the 'Y' piece tube connection. Remove and discard the olive (12).

30.9.4 Separate first and second silencers at th connection to the rear of the first silencer adopting the procedure instructed in Para 30.9.3.

Note ...

An extension tube (5) is fitted to the rear of the 'Y' piece tube to accommodate the increased chassis length of Land Rover 127 vehicles. The separation procedure is identical to that instructed in Para 30.9.3.

Refitting

31 To fit the exhaust system, reverse the removal procedures instructed in Para 30.

Note ...

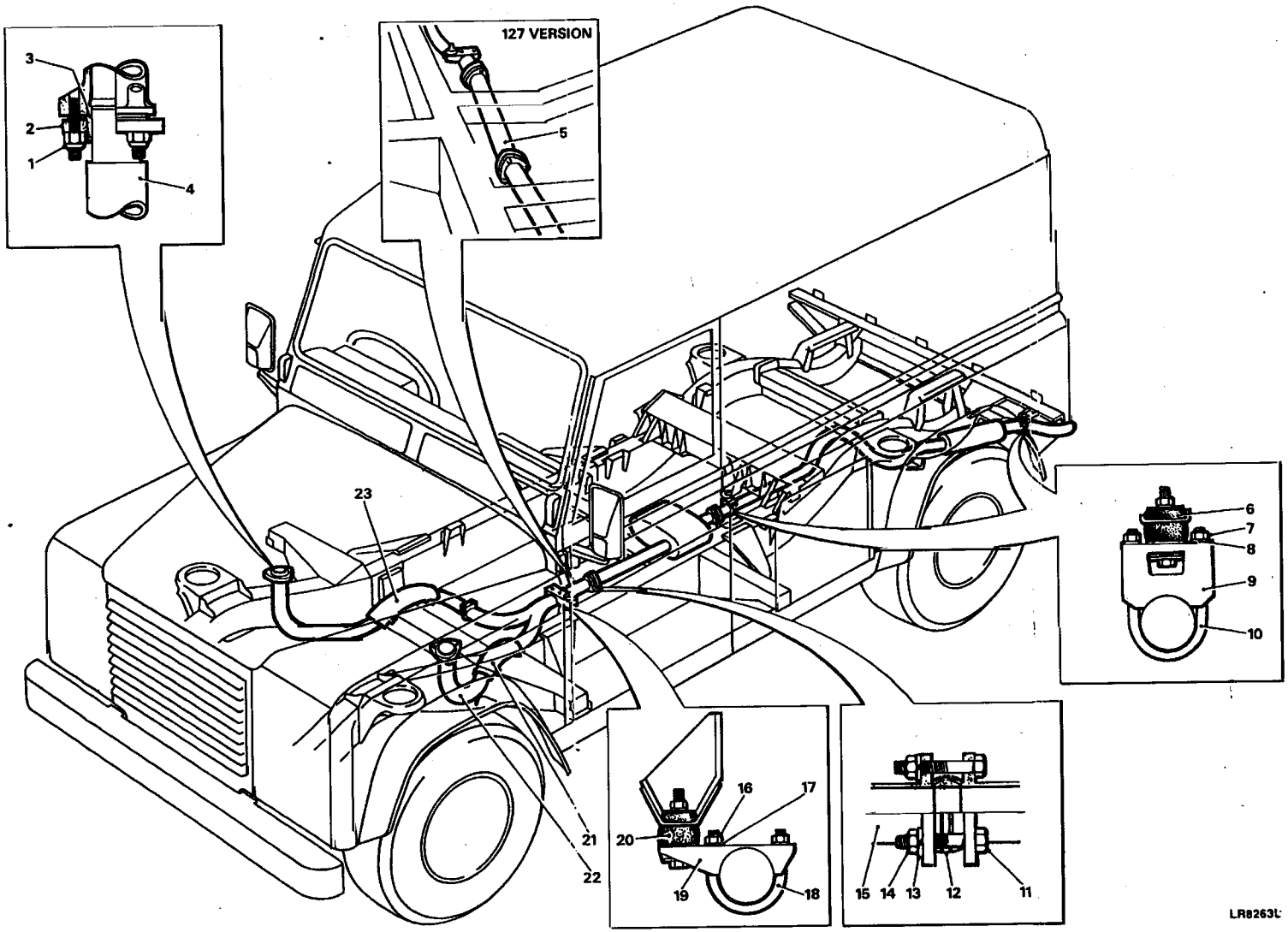
The type of tube jointing arrangement adopted, allows the exhaust system to be assembled loosely before securing to the vehicle. This enables easier fitting and ensures that no component is subjected to undue stress. Replace any discarded olives and also apply firegum putty to any separated tube connections referred to in Para 30.9.1 and 30.9.2 before reassembly.

WARNING ...

ENSURE THE VEHICLE IS SAFELY POSITIONED ON RAMPS BEFORE ANY WORK IS ATTEMPTED FROM THE UNDERSIDE.

Key to fig 20

1	Nut	13	Washer
2	Flange	14	Nut
3	Olive	15	'Y' piece tube
4	R.H. down tube	16	Nut
5	Extension tube	17	Washer
6	Rubber mounting	18	'U' clamp bolt
7	Nut	19	Bracket
8	Washer	20	Rubber mounting
9	Bracket	21	L.H. heat shield
10	'U' clamp bolt	22	L.H. down tube
11	Bolt	23	R.H. heat shield
12	Olive		



Exhaust system

Fig 20

Chapter 11-3

PULSAIR SYSTEM (DERATED ENGINES)

CONTENTS

INTRODUCTION

1 This chapter details the Unit and Field repairs for the pulsair system fitted to the derated 3.5 litre V8 engine installed in Land Rover 110 vehicles.

PULSAIR MANIFOLD

Removal

2 To remove the pulsair manifolds proceed as follows:

2.1 Release the hose clip (Fig 1 (1)) securing the hose (2) at the air intake elbow.

2.2 Pull the hose from the elbow.

2.3 Release the check valve (3) from the manifold.

2.4 Release the manifold (4) from the cylinder head.

2.5 Lift off the manifold.

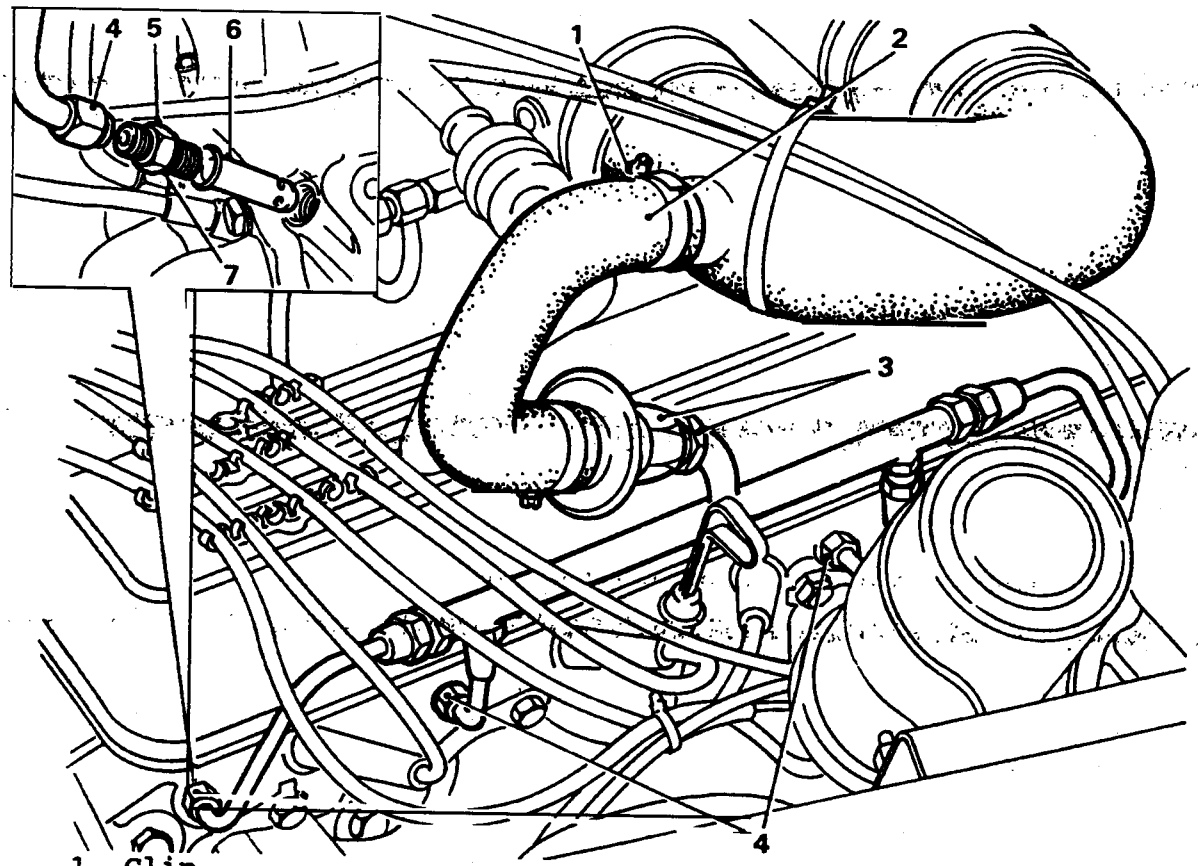
2.6 Remove the threaded inserts (5) from the cylinder head.

2.7 Using a piece of bent wire, retrieve the spargas tube (6) from the bottom of the insert bore.

Refitting

3 To refit the pulsair manifold reverse the removal procedure ensuring that the threaded double ended insert (7) is fitted with the plain shank nearest the cylinder head.

3.1 Run the engine and check for air leaks at the manifold.



1 Clip
2 Hose
3 Union
4 Manifold
5 Threaded insert
6 Spargas tube
7 Shank

Fig 1 Removal of the pulsair manifold

PULSAIR CHECK VALVE

Removal

4 To remove the pulsair check valve proceed as follows:

4.1 Disconnect the hose (Fig 2 (1)) from the check valve.

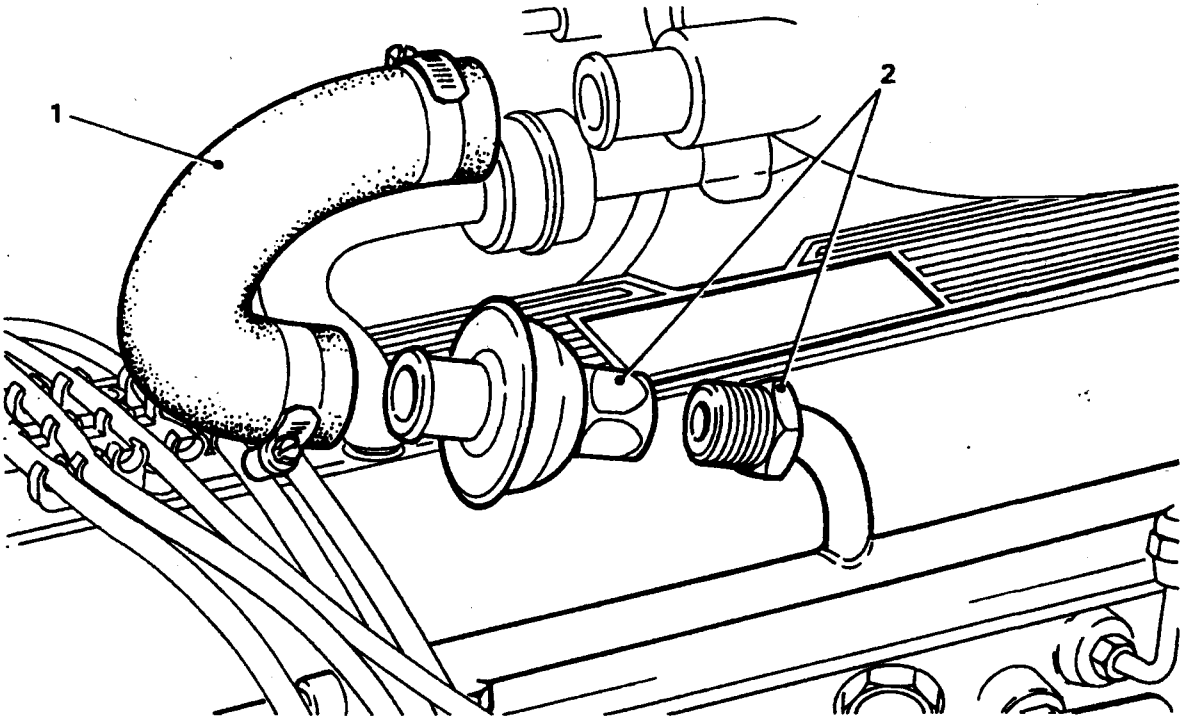
4.2 Using two open-ended spanners, one on the pulsair manifold hexagon to support the manifold, and the other to remove the valve anti-clockwise.

CAUTION ...

Do not impose any strain on the air manifold.

Examination

5 With the check valve removed, blow through the valve orally in both directions in turn. Air should only pass through the valve when blown from the hose connection end. Should air pass through the valve when blown from the air manifold end, the valve should be replaced.



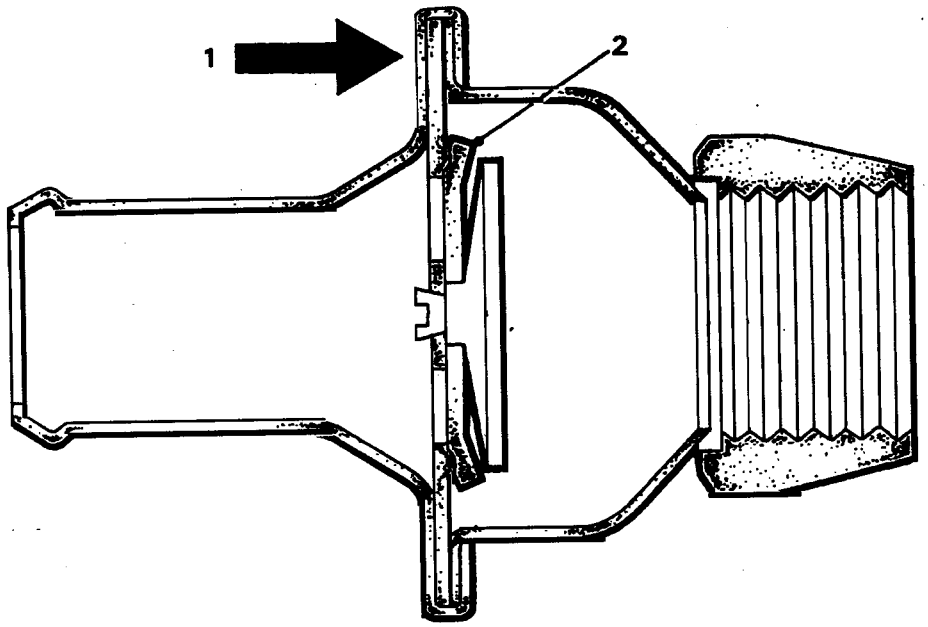
1 Hose

2 Union

Fig 2 Removal of the check valve

Refitting

6 Refitting the check valve is the reverse of the removal procedure.



1 Direction of flow

2 Valve diaphragm

Fig 3 Section through check valve