SERVICE

SERVICE MANUAL SUPPLEMENT

LOADALL RANGE SERVO HYDRAULICS

This supplement covers the servo hydraulic control system which is available as an option for the 525B-HL and the 530B-HL.

It deals only with those features of Servo machines which differ from the standard build. Therefore it should be read in conjunction with Service Manual 9803/3350.

This supplement covers the following Servo machines :

530B-HL from Machine No. 581641.

525B-HL from Machine No. 273492.

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TECHNICAL DATA

Loadall Models	525B-HL, 530B-HL
Proportional valve block pressure settings (525B-HL):	
Inlet module relief valve	220 bar (3190 lbf/in^2)
Tilt valve positive load modules	140 bar (2030 lbf/in^2) **A** port (Tilt ram eye end) 220 bar (3190 lbf/in^2) **B** port (Tilt ram dump end)
Auxiliary valve positive load modules	145 bar (2100 lbf/in^2) **A** port (Left-hand aux. connector) 145 bar (2100 lbf/in^2) **B** port (Right-hand aux. connector)
Proportional valve block pressure settings (530 B-HL):	
Inlet module relief valve	See Note
Tilt valve positive load modules	138 bar (2000 lbf/in^2) **A** port (Tilt ram dump end) 280 bar (4060 lbf/in^2) **B** port (Tilt ram eye end)
Auxiliary valve positive load modules	138 bar (2000 lbf/in^2) **A** port (Left-hand aux. connector) 138 bar (2000 lbf/in^2) **B** port (Right-hand aux. connector)

Note: On the 530B-HL the system pressure is limited by the Stabiliser Relief Valve and not the inlet module relief valve. The Stabiliser Relief Valve is set at 241 bar (3500 lbf/in^2). To render the inlet module relief valve inoperative the manufacturer has set it at a pressure which is higher than the Stabiliser Relief Valve setting. (See Section 2, page 1 - 5 of this supplement for resetting the inlet module relief valve after dismantling.)

GENERAL DESCRIPTION

On machines fitted with this system all the loader actions are controlled by a single lever **A** which operates an electro - hydraulic, proportional control valve block **B**, mounted on the boom pivot plate.

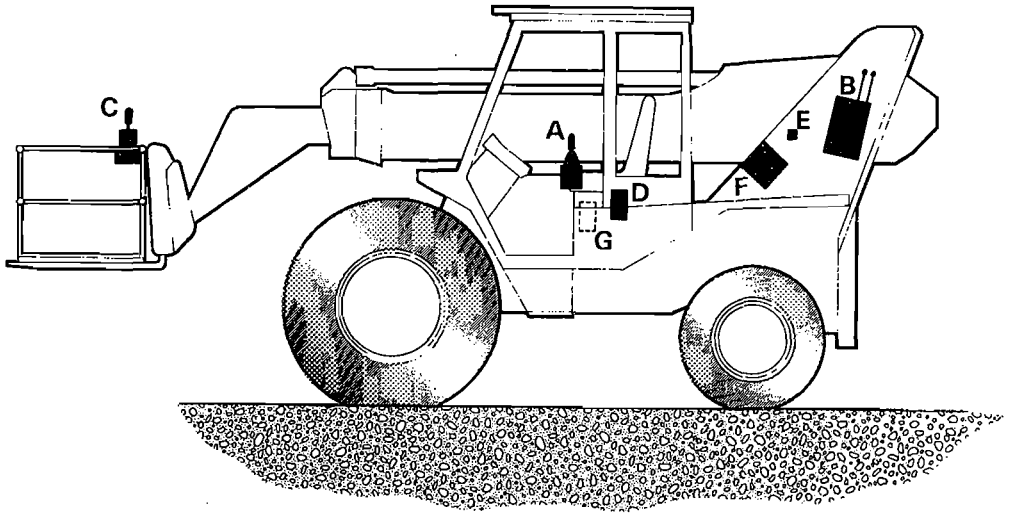
As an extra option, the loader raise/lower and extend/ retract movements (but not tilt) can also be controlled by remote levers **C** on a boom-mounted man platform. Machines with this option are also provided with a hand throttle **D**.

The speed of loader actions is proportional to the degree of lever movement (as well as engine speed). The auxiliary service, when provided, is operated by a rocker switch and does not have proportional control.

Machines with servo controls also have a modified Safe Load Indicator, which automatically prevents the loader being moved into an unstable condition. As a futher safety measure, machines with the remote facility are also provided with an emergency stop button on the man platform. This cuts off all electrical power to the system and also de-energises a dump valve **E**. When the dump valve is de-energised, the hydraulic pressure in the valve block is reduced to a level which is insufficient to operate the system. In this condition, the loader can be manually retracted and lowered by means of levers on the valve block (provided the dump valve is manually held closed).

The system electrical relays are located in a terminal box **F** (530B - HL) or **G** (525B - HL).

The valves and terminal block **F** are protected by a cover assembly which incorporates access panels for the control valve hand levers and the dump valve.



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PROPORTIONAL VALVE BLOCK

The following description applies to the three valve sections which control the loader movements (raise/ lower, extend/retract and tilt). These give proportional control of the rams, depending on the amount of lever movement. The fourth valve section in the block operates the auxiliary service and does not give proportional control. The only physical difference between this section and the other three is that it does not incorporate an electronic unit **D** or a position transducer **E**.

Each valve section consists of a main valve **A** and an electric actuator **B**. The control lever **C** sends an electrical signal to the electronic unit **D** in the actuator. The size of the signal depends on the position of the lever.

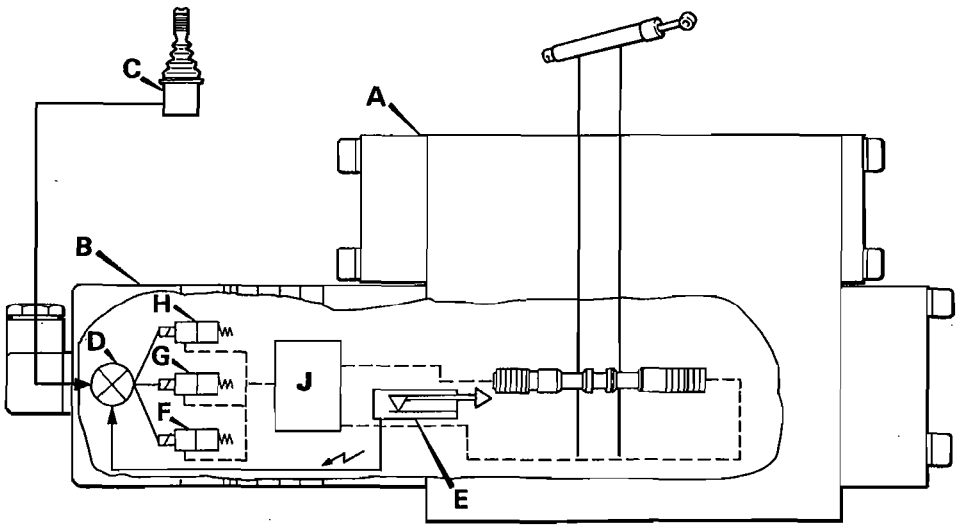
The electronic unit also receives a signal from the valve spool position tranducer **E**. The size of this signal depends on the position of the spool in its bore.

The two signals are compared. If there is a difference, solenoid valve **F** or **G** is energised to direct oil to one or other end of the spool via the hydraulic amplifier **J**. The spool will therefore move along its bore, progressively opening the main ports of the valve.

As the spool moves towards its required position, the difference between the two signals decreases. When the difference between the two signals reaches zero (ie when the spool reaches its required position) the solenoid valve de-energises and the spool stops moving.

Hydraulic amplifier **J** converts the relatively small oil signals from the solenoid valves into an oil flow which is large enough to move the spool rapidly along its bore.

Solenoid valve **H** determines the speed of spool movement. If the difference between the two signals is greater than a predetermined amount, this valve energises to increase the oil signal, thus speeding up spool movement



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PROPORTIONAL VALVE BLOCK

Dismantling and Assembly

The information on this page concerns the breaking down of the complete valve block into its major units - ie the four valve sections, the pump module and the end plate.

Note that spools etc can be removed without dismantling the valve section from the block. The valve block should normally need to be dismantled only in the event of leakage at the joints or to renew a faulty housing.

Dismantling

Note: Record the relative positions of the individual sections, to assist correct reassembly. Also make a note of the hose connections to ensure correct reconnection.

Slacken nuts **1** in diagonal sequence to prevent possible distortion of the valve housings.

Assembly

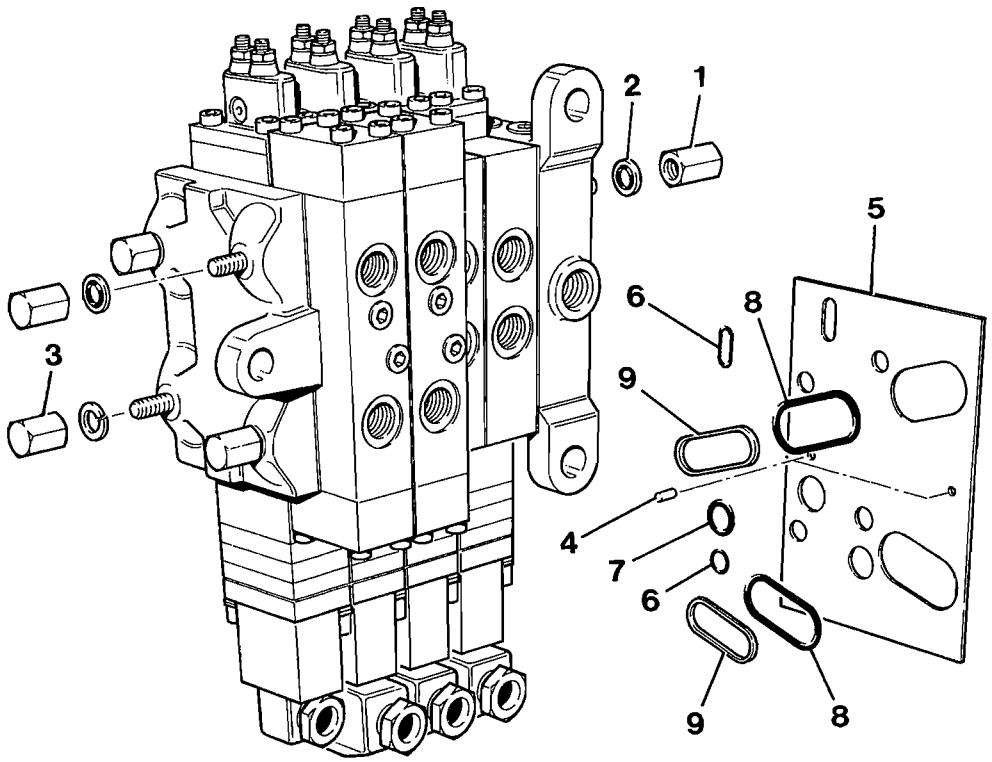
The illustration shows a typical sealing arrangement between adjacent housings. Renew all 'O' rings. Ensure that the dowel pins **4** are in position and that the shim seals **5** are fitted the correct way round (to line up with the drillings in the housings).

Tighten nuts **1** evenly and in diagonal sequence to prevent distortion of the valve housings. Torque - tighten the nuts to the figure shown. When the correct torque on all four nuts has been achieved, check that the valve spools are free to move in their bores.

On 530 B-HL only, ensure that the make-up valve is connected between the 'A' port on the lift valve section and the 'B' port on the tilt valve section. Make sure that the valve is connected such that the flow arrow marked on it points towards the 'B' port on the tilt valve section.

Torque Settings

Item	Nm	kgf m	lbf ft
1	80	8.16	59



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INLET MODULE

Port **A** is connected externally to the pump outlet and internally to the inlets of the main valve sections **B1** - **B4** . With the loader system at 'rest', ie with no load applied, the spool is held in the closed position by spring **C**.

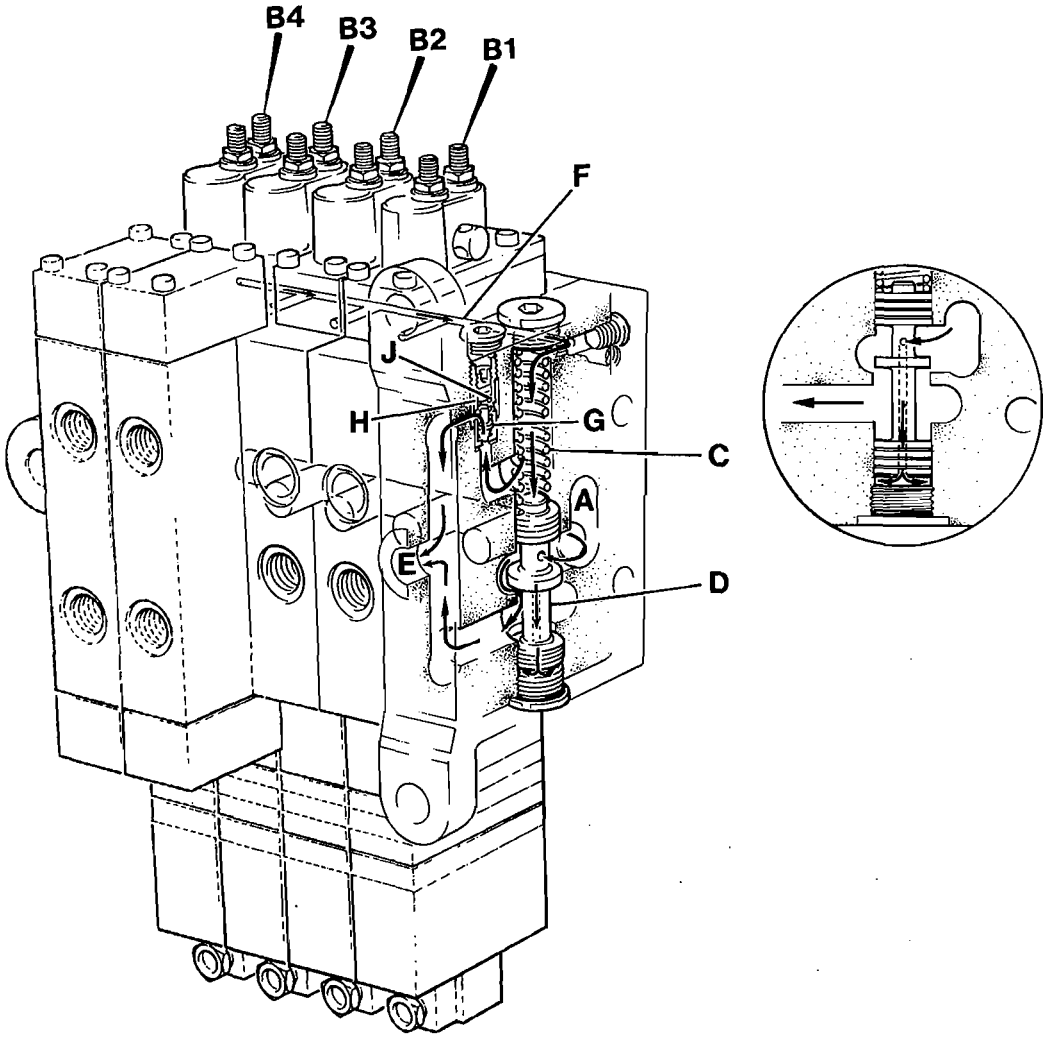
Oil from the pump enters at **A** and is fed through the drilling in spool **D** to the end of the bore. Oil pressure therefore moves the spool against the force of the spring to connect port **A** to tank via port **E**. Therefore pressure in port **A** (and therefore at the main valve section inlets) equals the pressure created by the force of the spring.

When the system is under load, the pressure set up by spring **C** is supplemented by a load sensing signal **F**. (This signal will be the largest of the four load sensing signals from the main valve sections, see page 1 - 6.) In this condition the pressure in port **A** will equal the load sensing signal pressure plus the pressure created by the force of the spring.

Pressure Limiting

The load sensing signal is fed to one end of spool **G** in relief valve **H**. When the signal exceeds the setting of spring **J**, the spool moves in its bore to connect the load sensing signal to tank. Pressure is therefore limited by the setting of spring **J**.

Note: On 530B-HL machines only, this relief valve is rendered inoperative. See Technical Data in this supplement (Section 1, page 1 - 1).



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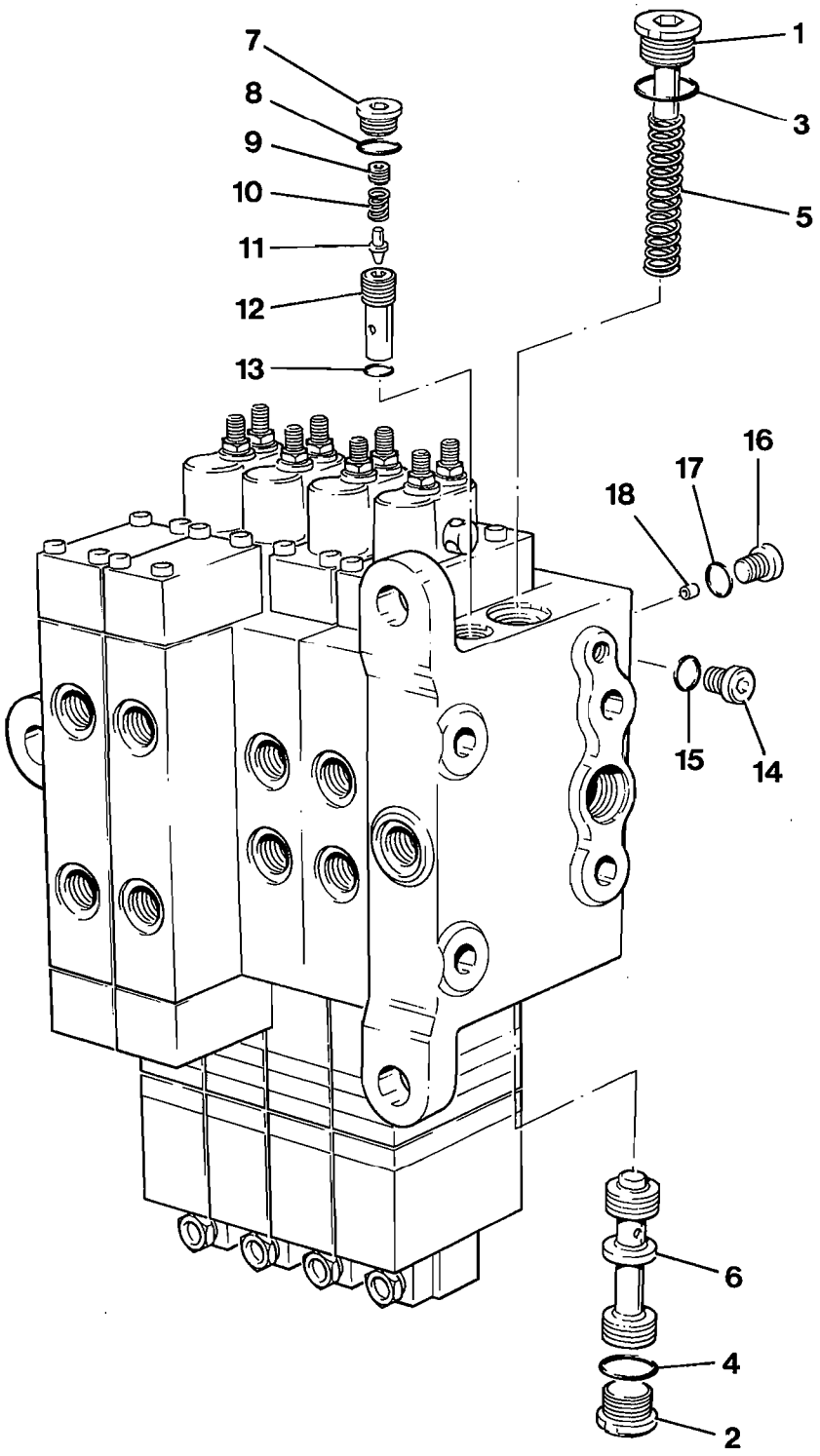
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INLET MODULE

Dismantling and Assembly

Dismantling

Unscrew plugs **1** and **2** alternately by small amounts, so as to release the force of spring **5** gradually.

To remove the relief valve cartridge **12** it will be necessary to wind in the adjuster **9** to give sufficient depth for the Allen key.

Note: *Do not attempt to dismantle spool* **6** *into its* component parts. It is renewable only as a complete unit.

Plug **14** and 'O' ring **15**, although provided on a new valve, will have been omitted to allow connection of the Load Sensing line.

Assembly

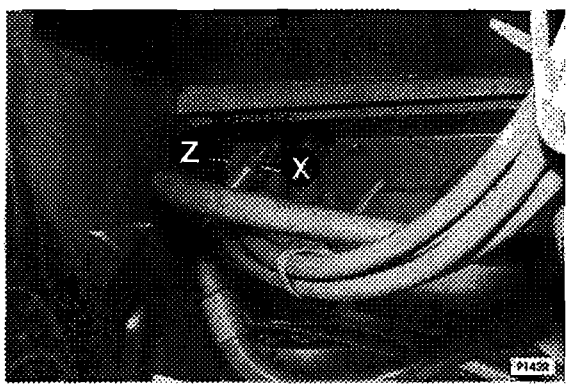
Renew all 'O' rings

Note: The spools are matched to their housings and should not be interchanged. The spools and housings have indentification numbers etched on their outer surfaces. If a spool or housing is damaged, renew both items as an assembly.

Ensure that all orifices are clear before reassembling the unit.

Ensure that the spool **6** is inserted the right way round (see illustration). When fitting plugs **1** and **2**, make sure both of them are engaged before before tightening either of them fully.

Note: On 530B-HL machines only, system pressure is limited by the Stabiliser Relief Valve. The inlet module relief valve adjuster **9** should therefore be wound fully in.



Pressure Setting

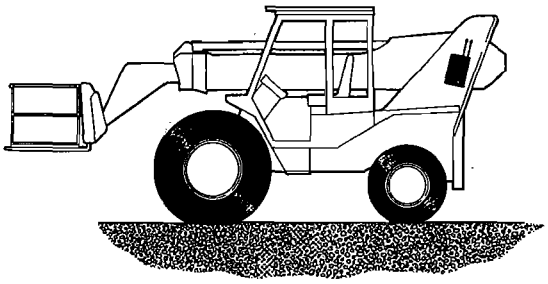
Connect a 0 - 400 bar (0 - 6000 lbf/ft^2) pressure gauge to test point **X** (530B-HL) or **Y** (525B-HL).

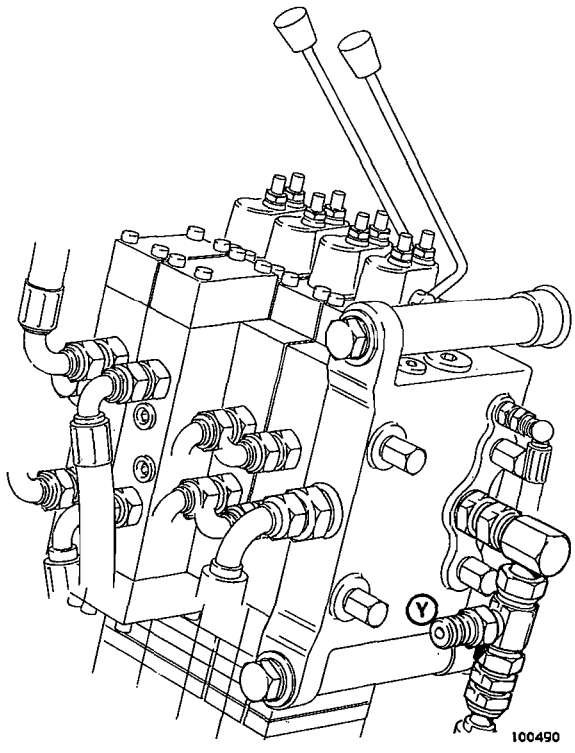
Run the engine at full speed, lower the boom and hold the ram fully closed while checking the maximum gauge reading, which should be as stated in Technical Data.

Adjust, if necessary, as follows:

530B-HL. Adjust the Stabiliser Relief Valve **Z**, clockwise to increase the pressure or anticlockwise to decrease the pressure.

525B-HL. Remove plug **7.** Turn adjuster **9** clockwise to raise the pressure or anticlockwise to lower the pressure. Refit plug **7.**





MAIN VALVE SECTION

The main valve spool **G** is moved along its bore by the electric actuator (or the hand lever on the raise/lower and extend /retract valve sections). Oil from the inlet module enters through port **A,** passes through the drillings in pressure compensator spool **B** and out to the ram via port **C** or **D**. Oil returning from the ram flows to tank via the other port (**C** or **D**) and the appropriate port **E**.

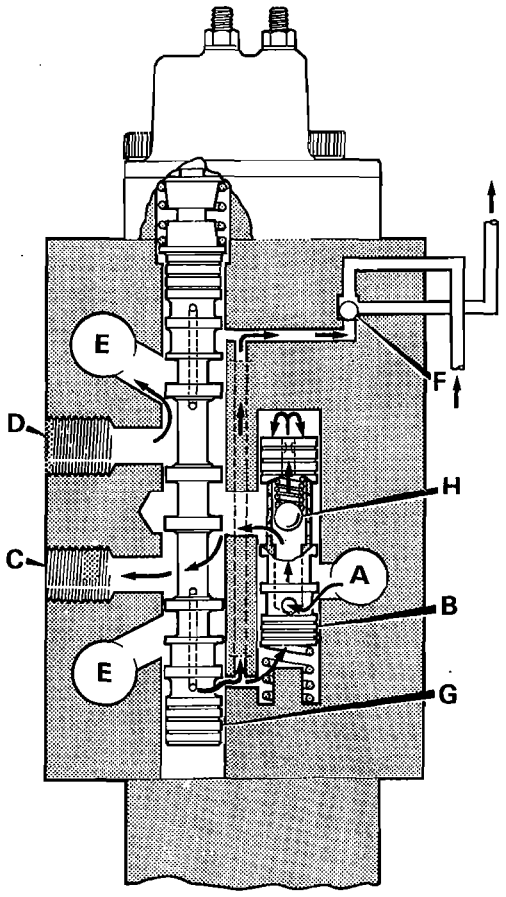
The outlet pressure (or 'load pressure') is sensed through drillings in the main spool and fed to the shuttle valve **F** as a load sensing signal. If the load sensing signal from this valve section is greater than those from the other three, the shuttle valve will connect it to the inlet module. If not, the shuttle valve will remain closed as shown. (This means that the inlet module will control the pressure at **A** in all four main valve sections to suit the greatest load; see page 1 - 3.)

The pressure compensator compensates for variations in load and system pressure to maintain a constant flow to the ram for a given position of the main spool. System pressure is applied to the top of the compensator spool via a drilling. If system pressure rises, tending to increase the flow, the spool moves downwards. This increases the pressure drop across the spool so as to maintain the flow constant.

The load pressure is fed to the bottom end of the compensator spool via drillings in the main spool **G**. If the load pressure rises, tending to decrease the flow, the compemsator spool moves further upwards. This decreases the pressure drop across the compensator spool so as to maintain the flow constant.

The check valve **H** prevents oil flowing back from the ram into the main pressure line.

Note: There are two types of main valve sections and there are two of each type. Both types operate as described above, but the 'tilt' and 'auxiliary' valves have an additional section incorporating what are known as 'positive load modules', see page1 - 9.



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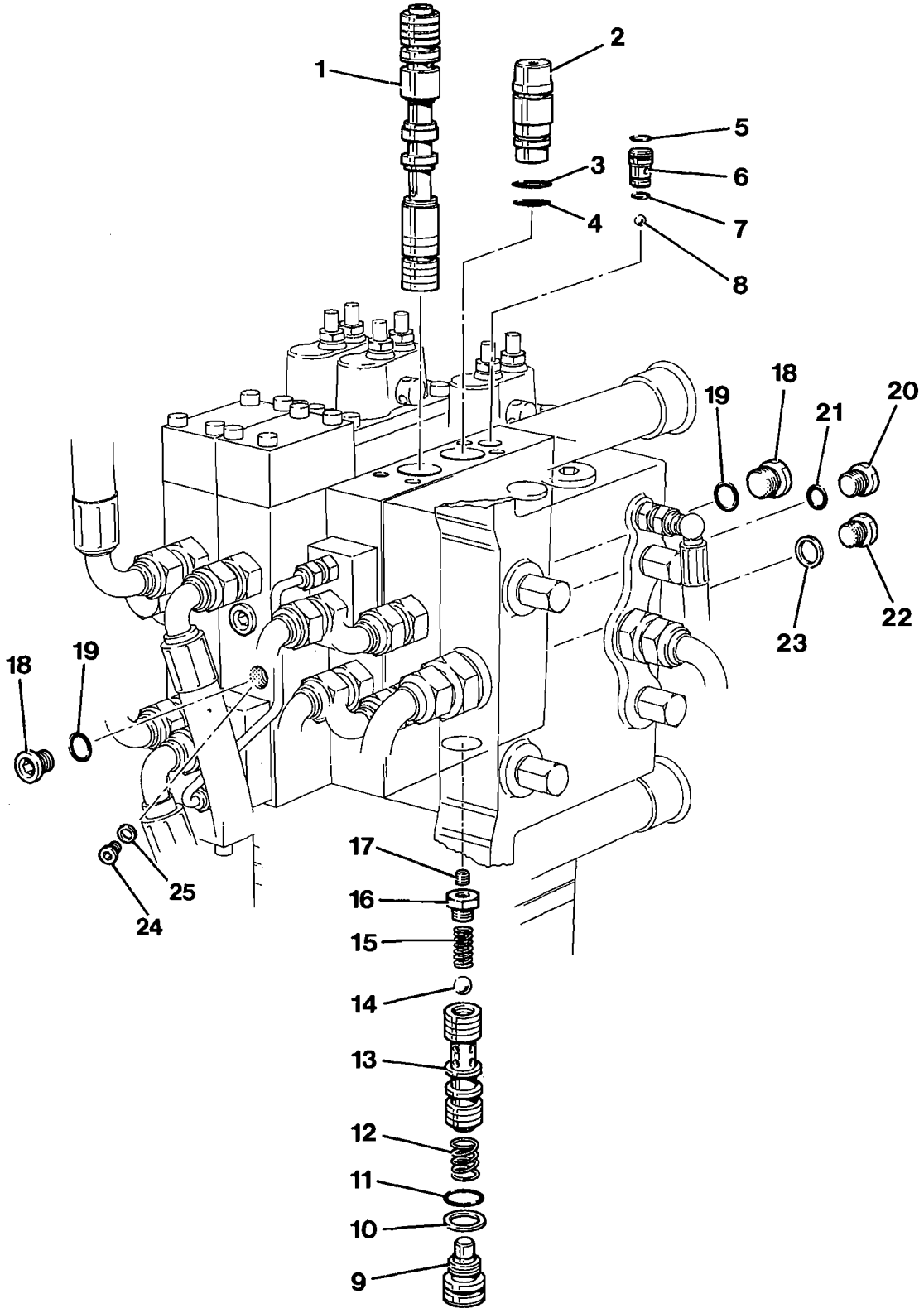
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MAIN VALVE SECTION

Dismantling and Assembly

Note: Both types of valve section are shown. The components of both types are identical, but the wider type of section has an extra plug **20** and 'O' ring **21**.

Dismantling

The main spool **1** is coupled to the mechanical actuator and will be withdrawn when that assembly is removed, see page 1-14.

The ends of plugs **2** and **6** are drilled and tapped to accept an M5 screw or sliding hammer attachment, which should be used for removal.

Assembly

Note: The spools are matched to their housings and should not be interchanged. The spools and housings have indentification numbers etched on their outer surfaces. If a spool or housing is damaged, renew both items as an assembly.

Ensure that all orifices are clear before reassembling the unit.

The compensator spool assembly **13, 14, 15, 16,** and **17** is renewable only as a complete unit.

Renew all 'O' rings on assembly. Ensure that 'O' ring **11** and back-up ring **10** are installed in the correct order as shown.

POSITIVE LOAD MODULE

The tilt and auxiliary main valve sections incorporate what are known as a 'positive load module' in each load line. A positive load module combines the functions of a pressure relief valve and an anti-cavitation valve.

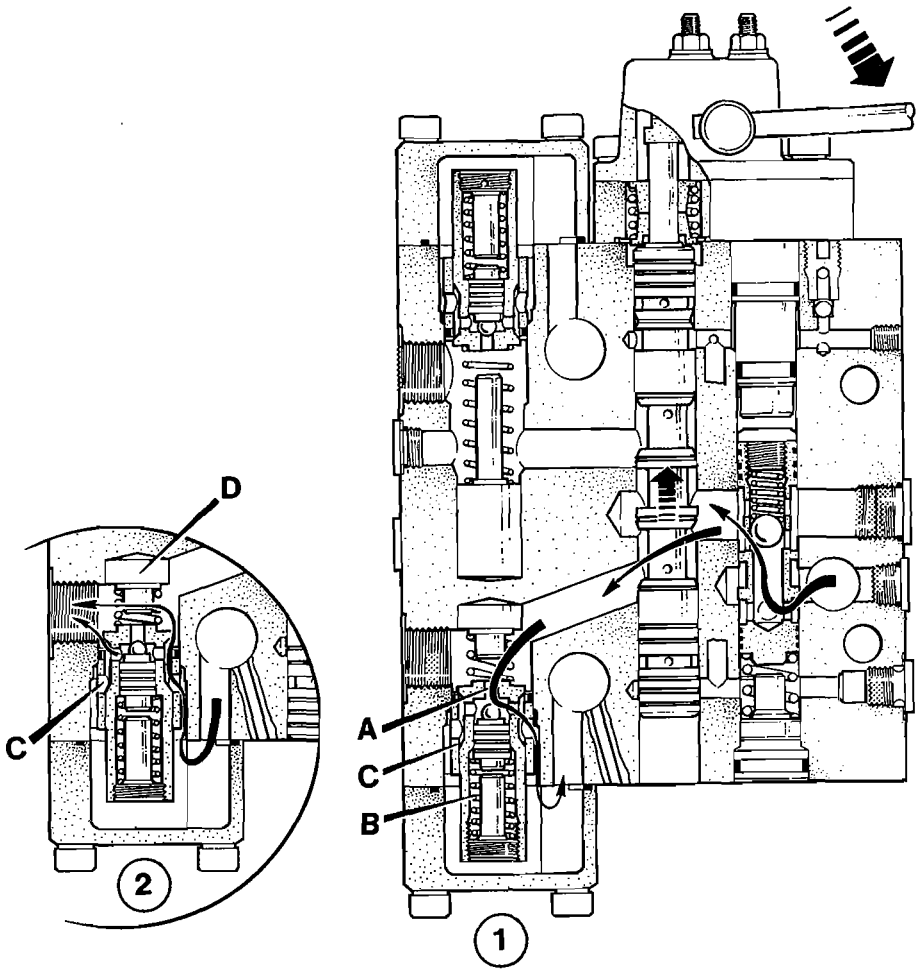
Pressure Relief (View 1)

Oil pressure in the load line is sensed via a drilling in the relief valve seat **A**. If the pressure is sufficient to overcome the force of spring **B** the valve will open, connecting the load line to tank via drillings in the valve bushing and the suction piston **C**.

Therefore the setting of spring **B** determines the maximum pressure that can be generated in the load line.

Anti-Cavitation (View 2)

If the pressure in the load line falls below tank pressure the relief valve assembly will be forced towards the end stop **D**. Oil will then flow from the tank into the load line, via the drillings in the suction piston **C** and the relief valve bushing.



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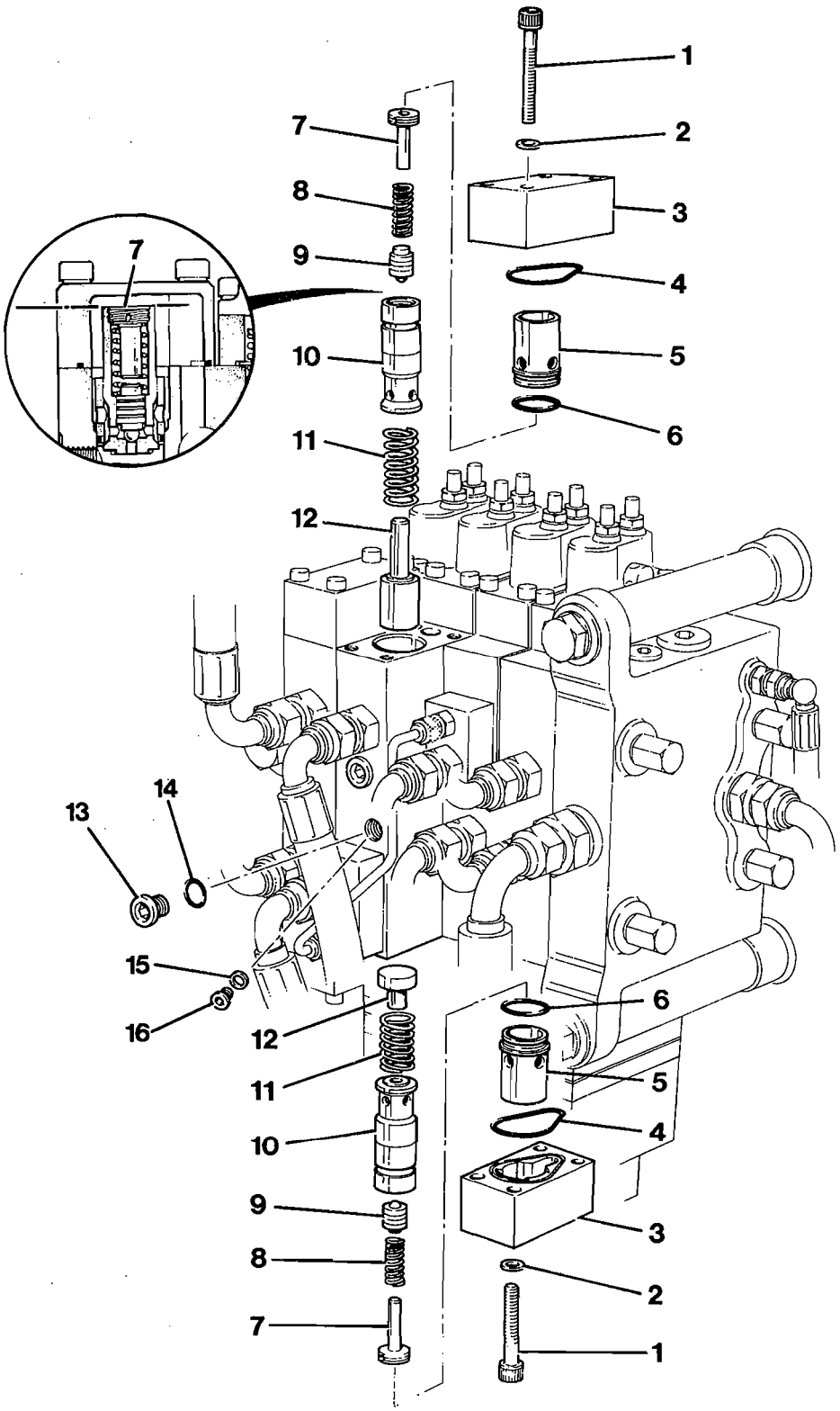
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POSITIVE LOAD MODULE

Dismantling and Assembly

When Dismantling

Note that the two relief valve assemblies **7** to **10** are identical, but may have different settings. Make a note of which end 'A' or 'B' each valve is removed from, to ensure correct reassembly. ('A' and 'B' are marked on the valve block.)

Assembly

Ensure that all orifices in the relief valves and the bushings **5** are clear. Coat all internal surfaces with hydraulic oil before assembly.

Note: The two end stops **12** and their springs **11** are different at each end of the housing. The end stop with the thicker flange, together with the longer spring, should be inserted in the 'A' end of the housing.

Relief Valve Setting

Adjustment can be made without operating the system.

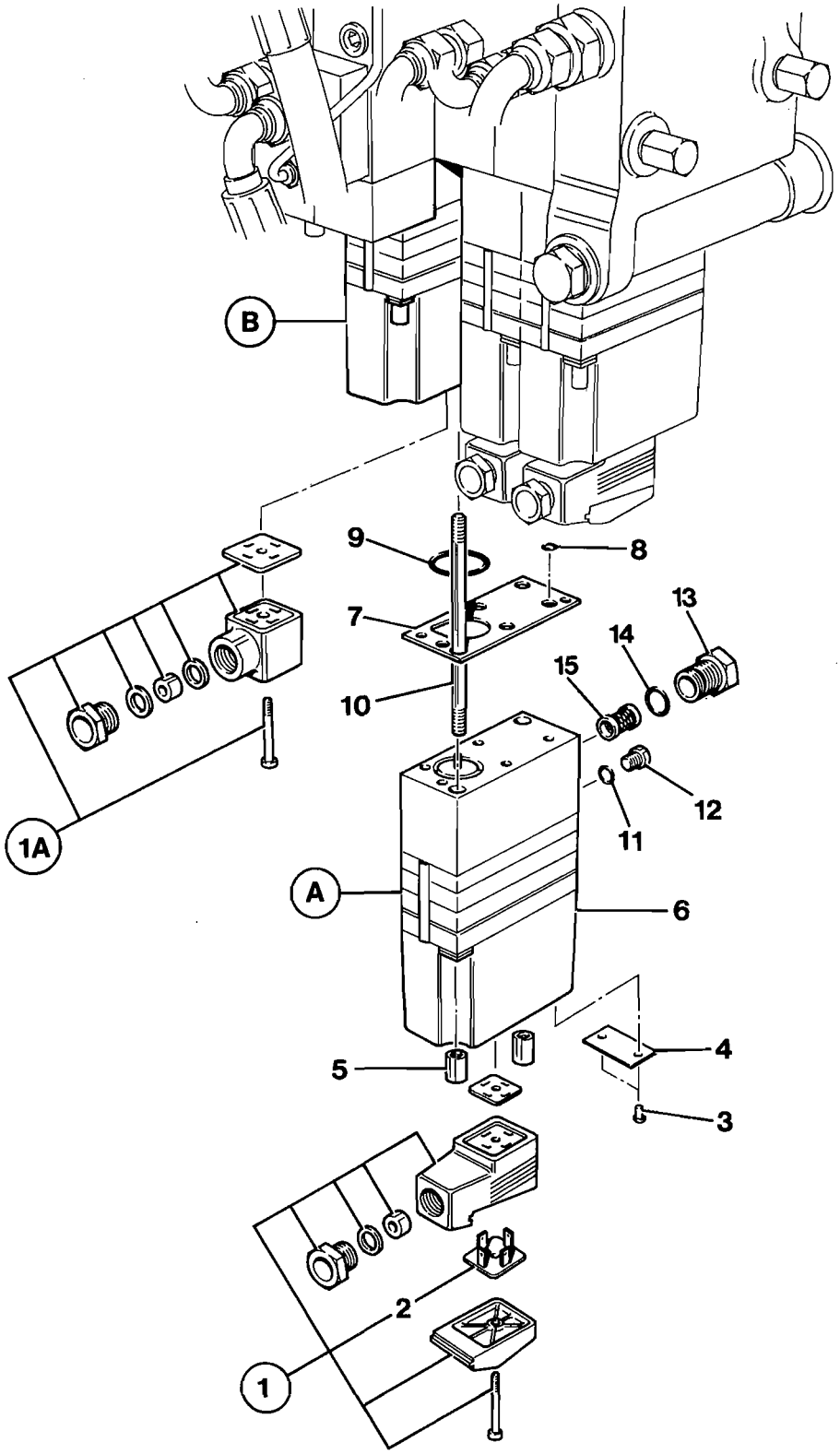
WARNING: Release any trapped pressure in the load lines, by setting the starter switch to 'on' and operating the control lever a few times without the engine running.

Remove the cover **3**.

Withdraw the relief valve and screw the adjuster **7** in or out to alter the setting. With the adjuster flush with the bushing as shown, the valve is set to open at 50 bar (725 lbf/in^2). Each complete turn of the adjuster changes the setting by 35 bar (500 lbf/in^2).

Turning the adjuster clockwise increases the setting and turning it anti-clockwise decreases the setting.

See Technical Data for the required settings.



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ELECTRIC ACTUATOR UNIT

Dismantling and Assembly

Note: There are two types of electric actuator unit, **A** and **B**. Type **A** is a proportional control device and type **B** is an on - off device. The type **B** actuator is installed on the auxiliary valve section only.
Do not interchange the plug assemblies **1** and **1A**.

Dismantling

The actuator can only be dismantled to the extent shown on the illustration. Do not attempt to dismantle the main assembly **6** any further.

Assembly

Clean the filter **13** before refitting it. Renew all 'O' rings. Ensure all orifices are clear.

Note: Before reconnecting the plug assembly **1** smear its top surface with petroleum jelly, to keep out moisture and prevent corrosion.