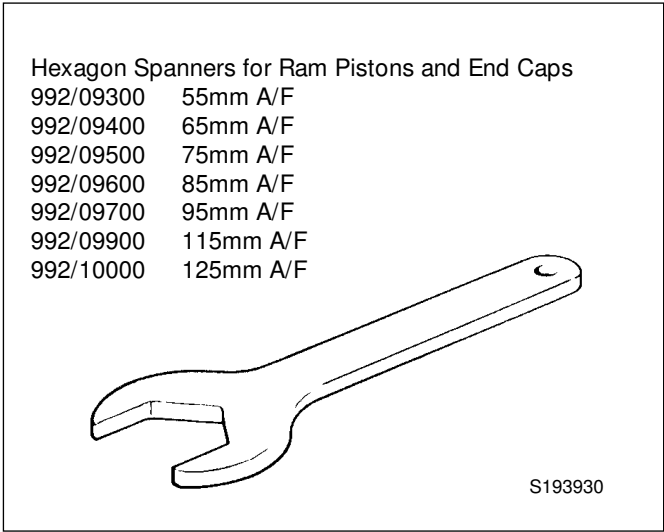
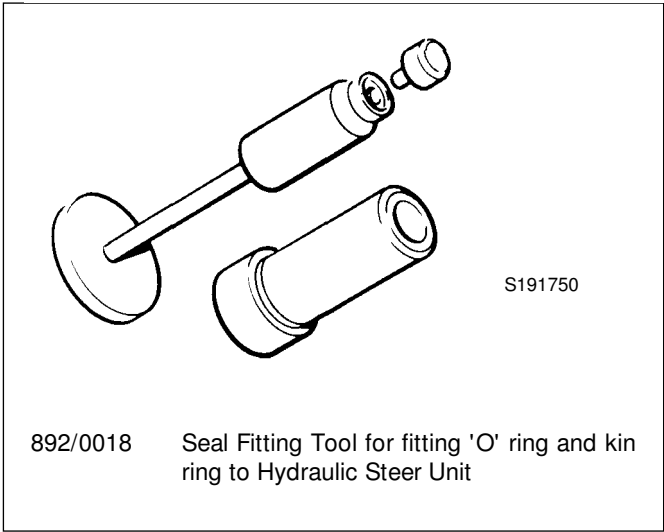


Contents	Page No.
Service Tools	1 - 1
Technical Data	
System Type	2 - 1
Basic System Operation	
2 Wheel Steer Machines	
- Steer System Schematics	3 - 1
- Hydraulic Operation	3 - 2
4 Wheel Steer Machines	
- Steer System Schematics	3 - 3
- Hydraulic Operation	3 - 4
- Electrical Operation	3 - 5
Circuit Descriptions	
Steer Unit Operation	
- 2 Wheel Steer Machines	4 - 1
- 4 Wheel Steer Machines	
4 Wheel Steer Mode	4 - 2
2 Wheel Steer Mode	4 - 13
Crab Steer Mode	4 - 14
Priority Valve Operation	5 - 1
Fault Finding	10 - 1
Service Procedures	
Steering System	
- Bleeding	20 - 1
- Pressure Testing	20 - 2
Proximity Switch - Setting	20 - 3
Steer Mode Valve - Checking Solenoid Operation	20 - 4
Priority Valve	
- Cleaning	20 - 5
- Standby Pressure Testing	20 - 6
Power Track Rod	
Removal and Replacement	30 - 1
Link Arms - Removal and Replacement	31 - 1
Rams - Dismantling and Assembly	32 - 1
Priority Valve	
Removal and Replacement	40 - 1
Dismantling and Assembly	40 - 1
Bleeding	40 - 1
Steer Mode Valve	
Removal and Replacement	45 - 1
Dismantling and Assembly	45 - 2
Hydraulic Steer Unit	
Removal and Replacement	50 - 1
Dismantling and Assembly	50 - 3



System Type

Full power hydrostatic with selectable 2-wheel, 4-wheel and crab steer modes on 4 wheel steer machines.
Oil supply from Main Hydraulic Pump via Priority Valve to Steer Unit Valve complete with Load Sensing and Integral Relief Valve.
Double acting power track rod rams mounted on axles.

2 Wheel Steer Machines

STEER UNIT - FIG 1

Model	200 OSPC		
- Volumetric Displacement	200 cc/rev		
- Relief Valve	Fitted		
- Check Valve	Fitted		
- Shock Valve	Fitted		
- Relief Valve Operating Pressure (at 1500 revs/min)	120 ± 3 bar	122 ± 3.5 kgf/cm ²	1740 ± 50 lbf/in ²
-Shock Valve Operating Pressure	175 - 190bar	178 - 199 kgf/cm ²	2538 - 2756 lbf/in ²

Model	250 OSPC		
- Volumetric Displacement	250 cc/rev		
- Relief Valve	Fitted		
- Check Valve	Fitted		
- Shock Valve	Not Fitted		
- Relief Valve Operating Pressure (at 1500 revs/min)	120 ± 3 bar	122 ± 3.5 kgf/cm ²	1740 ± 50 lbf/in ²

PRIORITY VALVE - FIG 2

-Stand by Pressure	7 bar	7.1 kgf/cm ²	102 lbf/in ²
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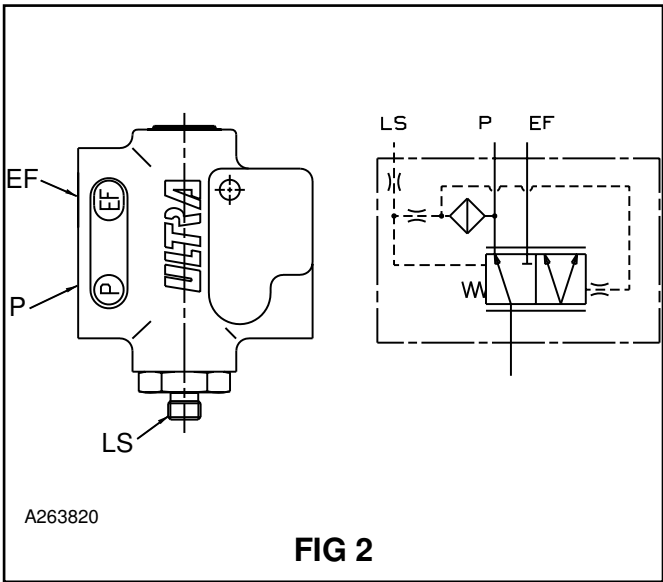
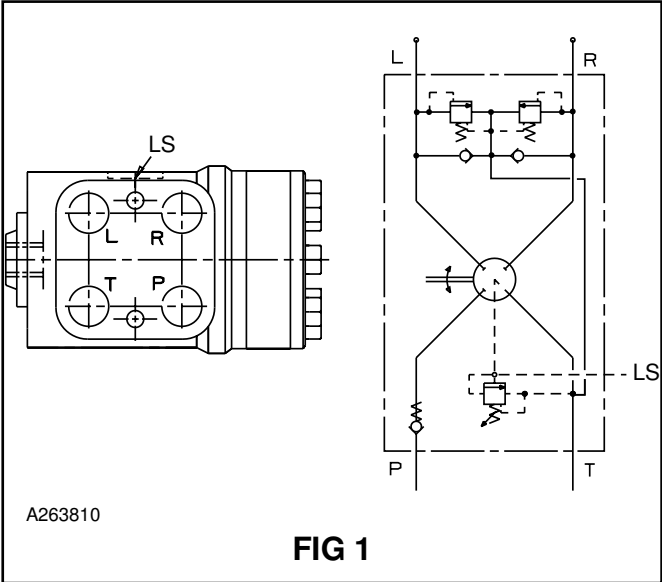
4 Wheel Steer Machines

STEER UNIT - FIG 1

Model	160 OSPC		
- Volumetric Displacement	160 cc/rev		
- Relief Valve	Fitted		
- Check Valve	Fitted		
- Shock Valve	Fitted		
- Relief Valve Operating Pressure (at 1500 revs/min)	120 ± 3 bar	122 ± 3.5 kgf/cm ²	1740 ± 50 lbf/in ²
- Shock Valve Operating Pressure	175 - 190bar	178 - 199 kgf/cm ²	2538 - 2756 lbf/in ²

PRIORITY VALVE - FIG 2

-Stand by Pressure	7 bar	7.1 kgf/cm ²	102 lbf/in ²
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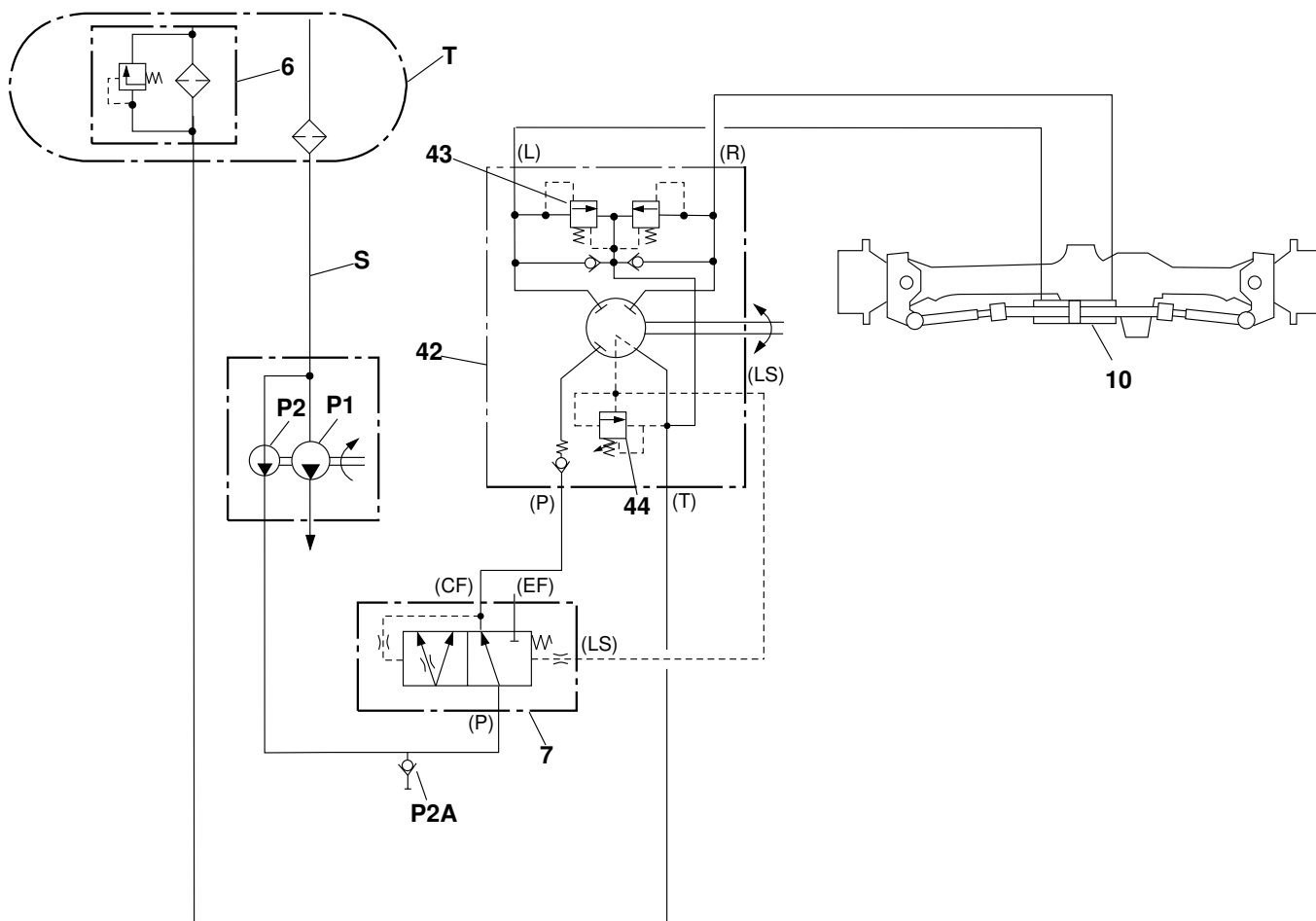
2 Wheel Steer Machines

Steer System Schematics

Component Key:

P1	Pump, Main Section
P2	Pump, Secondary Section
P2A	Pressure Test Point
S	Suction Line
T	Tank
6	In-tank Filter
7	Priority Valve
10	Front Power Track Rod Ram
42	Steer Unit
43	Shock Valve
44	Steer Unit Relief Valve

Note: Hydraulic component port identification letters are shown in parenthesis, e.g. (LS). The same letters will be stamped on the actual component.



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2 Wheel Steer Machines

Hydraulic Operation

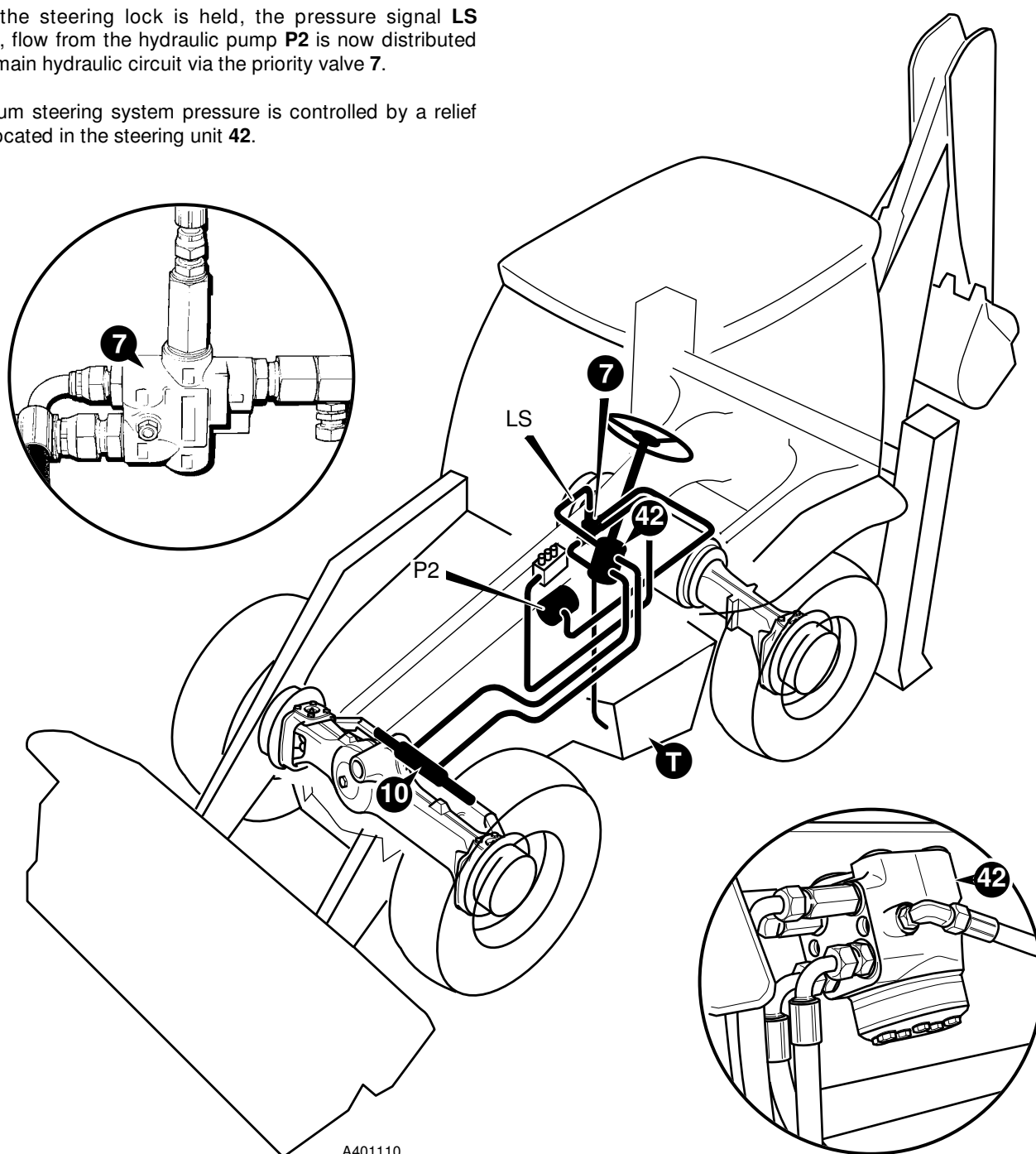
The main components of the steering system are the priority valve **7**, load sensing steer unit **42**, hydraulic tank **T** and the front power track rod ram **10**.

When the steering wheel is turned, a pressure demand is sensed at the priority valve **7** via load sensing line **LS**.

Oil from the hydraulic pump **P2** is then distributed via the priority valve to the steer unit **42**, which then directs the oil to the front power track rod ram **10** until the required steering lock is achieved.

When the steering lock is held, the pressure signal **LS** ceases, flow from the hydraulic pump **P2** is now distributed to the main hydraulic circuit via the priority valve **7**.

Maximum steering system pressure is controlled by a relief valve located in the steering unit **42**.



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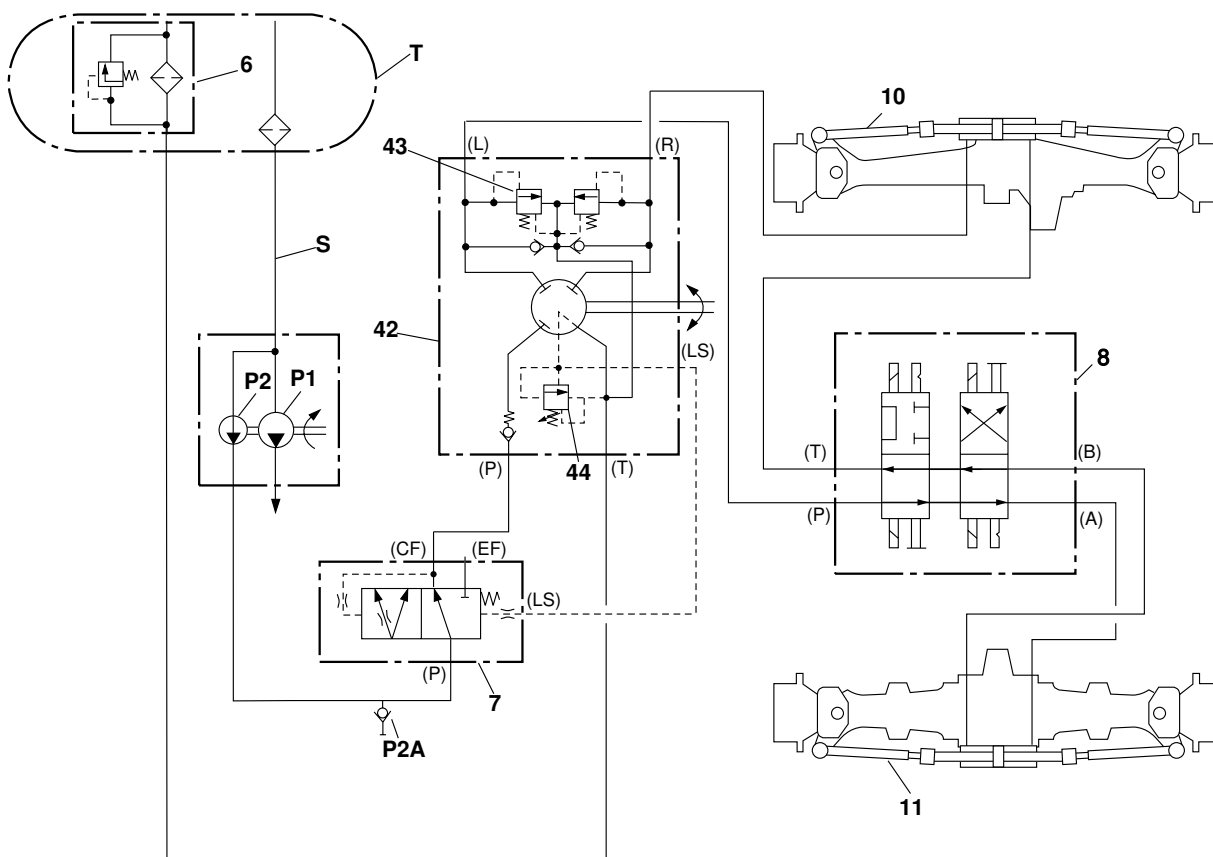
4 Wheel Steer Machines

Steer System Schematics

Component Key:

P1	Pump, Main Section
P2	Pump, Secondary Section
P2A	Pressure Test Point
S	Suction Line
T	Tank
6	In-tank Filter
7	Priority Valve
8	Steer Mode Control Valve
10	Front Power Track Rod Ram
11	Rear Power Track Rod Ram
42	Steer Unit
43	Shock Valve
44	Steer Unit Relief Valve

Note: Hydraulic component port identification letters are shown in parenthesis, e.g. (LS). The same letters will be stamped on the actual component.



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4 Wheel Steer Machines

Hydraulic Operation

The main components of the steering system are the priority valve **7**, load sensing steer unit **42**, hydraulic tank **T**, front power track rod ram **10** and rear power track rod ram **11**.

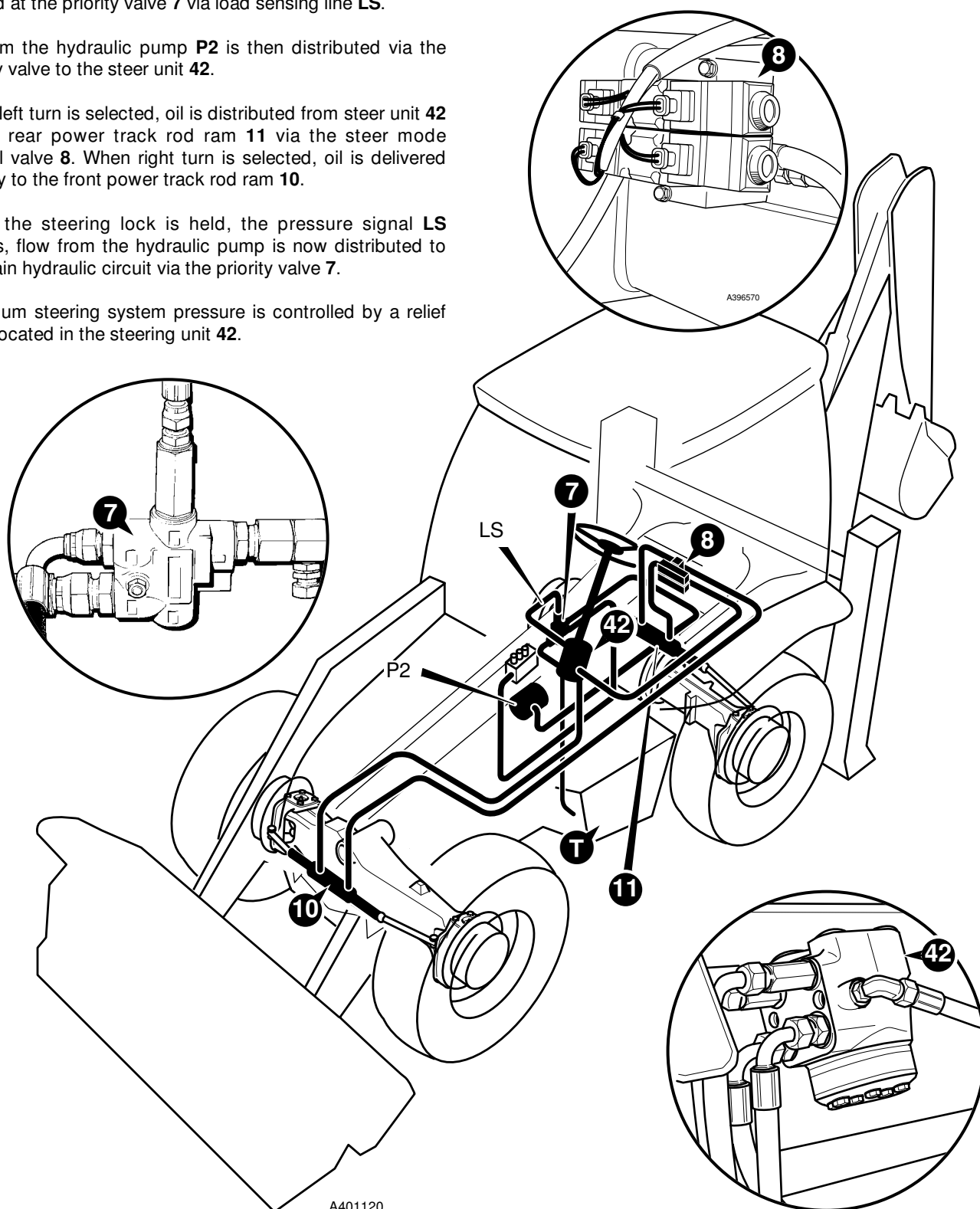
When the steering wheel is turned, a pressure demand is sensed at the priority valve **7** via load sensing line **LS**.

Oil from the hydraulic pump **P2** is then distributed via the priority valve to the steer unit **42**.

When left turn is selected, oil is distributed from steer unit **42** to the rear power track rod ram **11** via the steer mode control valve **8**. When right turn is selected, oil is delivered directly to the front power track rod ram **10**.

When the steering lock is held, the pressure signal **LS** ceases, flow from the hydraulic pump is now distributed to the main hydraulic circuit via the priority valve **7**.

Maximum steering system pressure is controlled by a relief valve located in the steering unit **42**.



4 Wheel Steer Machines

Electrical Operation

Three steering modes are available:

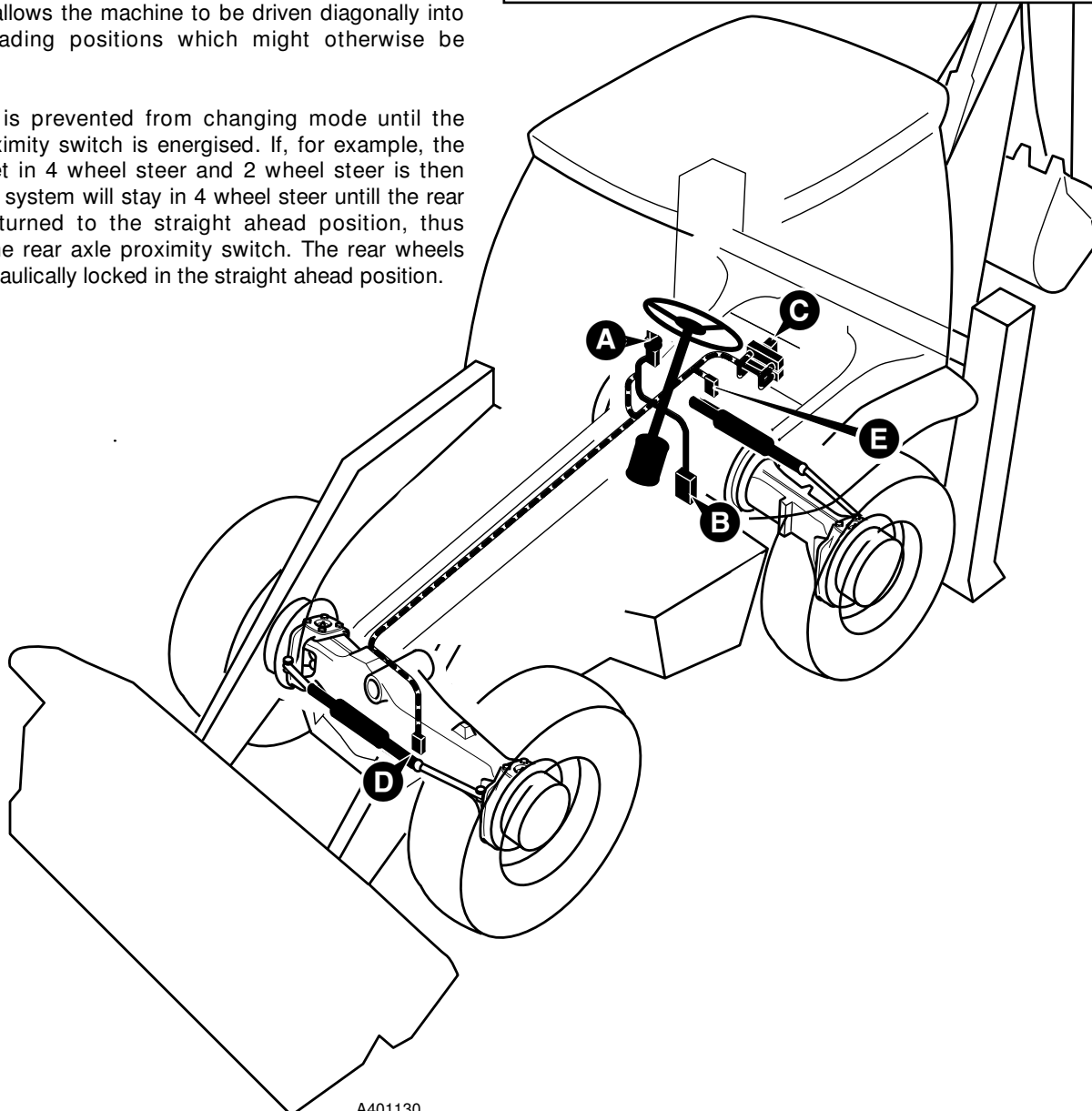
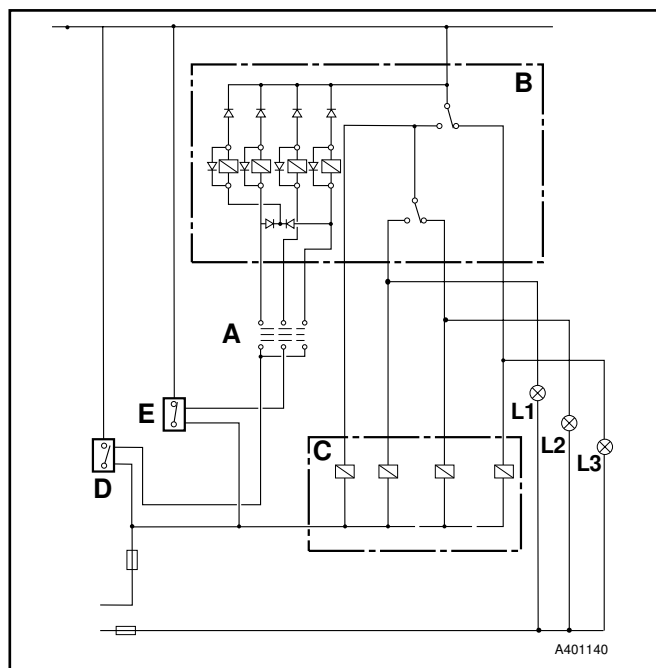
- 2 Wheel Steer (front axle)
- 4 Wheel Steer
- Crab Steer

The three modes are selected in the cab from a three position switch **A** which operates relays in the steer mode control unit **B**. The relays switch the energising supplies to the solenoid operated steer mode control valve **C**. Proximity switches on the front **D** and rear **E** axles signal when the wheels are in the straight ahead position.

Lights **L1**, **L2** or **L3** on the instrument panel illuminate to indicate the steer mode currently operative.

In 2 wheel steer mode only the front wheels are steered. In 4 wheel steer mode both axles are steered, giving a smaller turning circle and so improving manoeuvrability. The crab steer mode allows the machine to be driven diagonally into loading/unloading positions which might otherwise be inaccessible.

The system is prevented from changing mode until the relevant proximity switch is energised. If, for example, the system is set in 4 wheel steer and 2 wheel steer is then selected, the system will stay in 4 wheel steer until the rear wheels are turned to the straight ahead position, thus energising the rear axle proximity switch. The rear wheels are then hydraulically locked in the straight ahead position.



Steer Unit Operation
- 2 Wheel Steer Machines

On 2 wheel steer machines the hydraulic steer unit operation is identical to that described for the 4 wheel steer machines, except the unit pumps oil out directly to a power track rod ram fitted on the front axle only. Also, therefore the 2 wheel steer machines do not have a steer mode control valve.

Refer to, **Steer Unit Operation - 4 Wheel Steer Machines.**

Steer Unit Operation

- 4 Wheel Steer Machines

4 Wheel Steer Mode

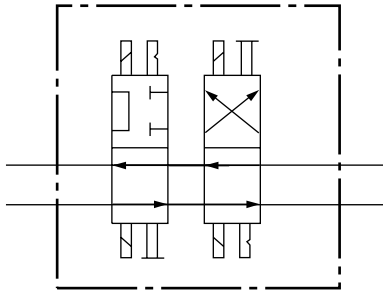
- Neutral

Flow from the priority valve enters the steering unit through the bottom right hand port past the non-return valve **43C**. When the steering wheel is stationary the inner spool **A** and sleeve **B** are held in the neutral position by the centring springs **K**. As the unit is 'closed centre' the flow from the pump is dead ended by the steering unit.

Component Key:

- A** Inner Spool
- B** Sleeve
- D** Stator
- K** Centring Springs
- X** Steer Mode Control Valve
- 43C** Non-Return Valve

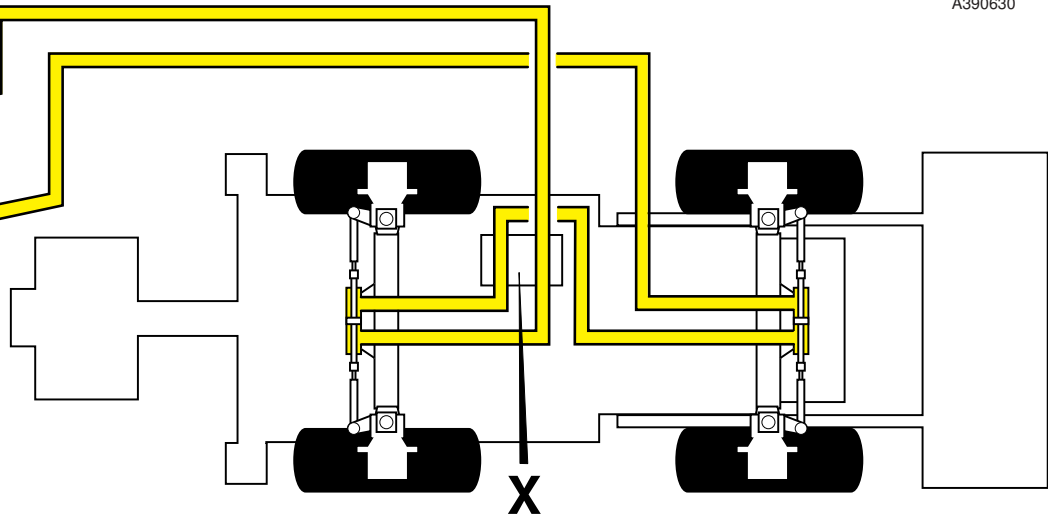
In 4 wheel steer mode the spools of the steer mode control valve **X** are configured as shown.



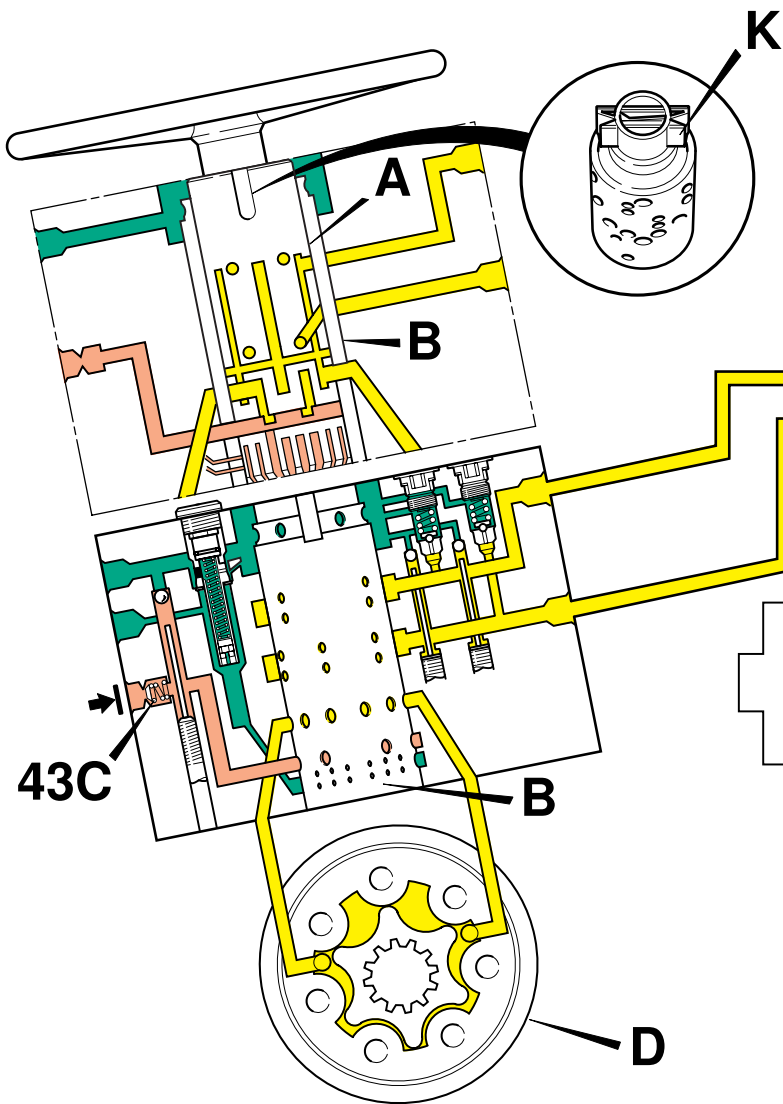
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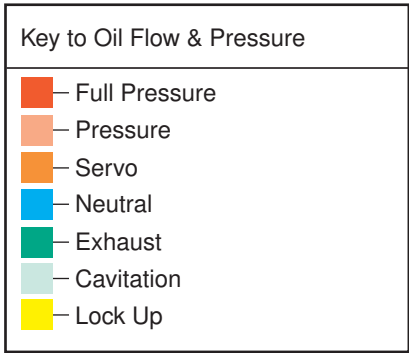
Key to Oil Flow & Pressure	
█	Full Pressure
█	Pressure
█	Servo
█	Neutral
█	Exhaust
█	Cavitation
█	Lock Up

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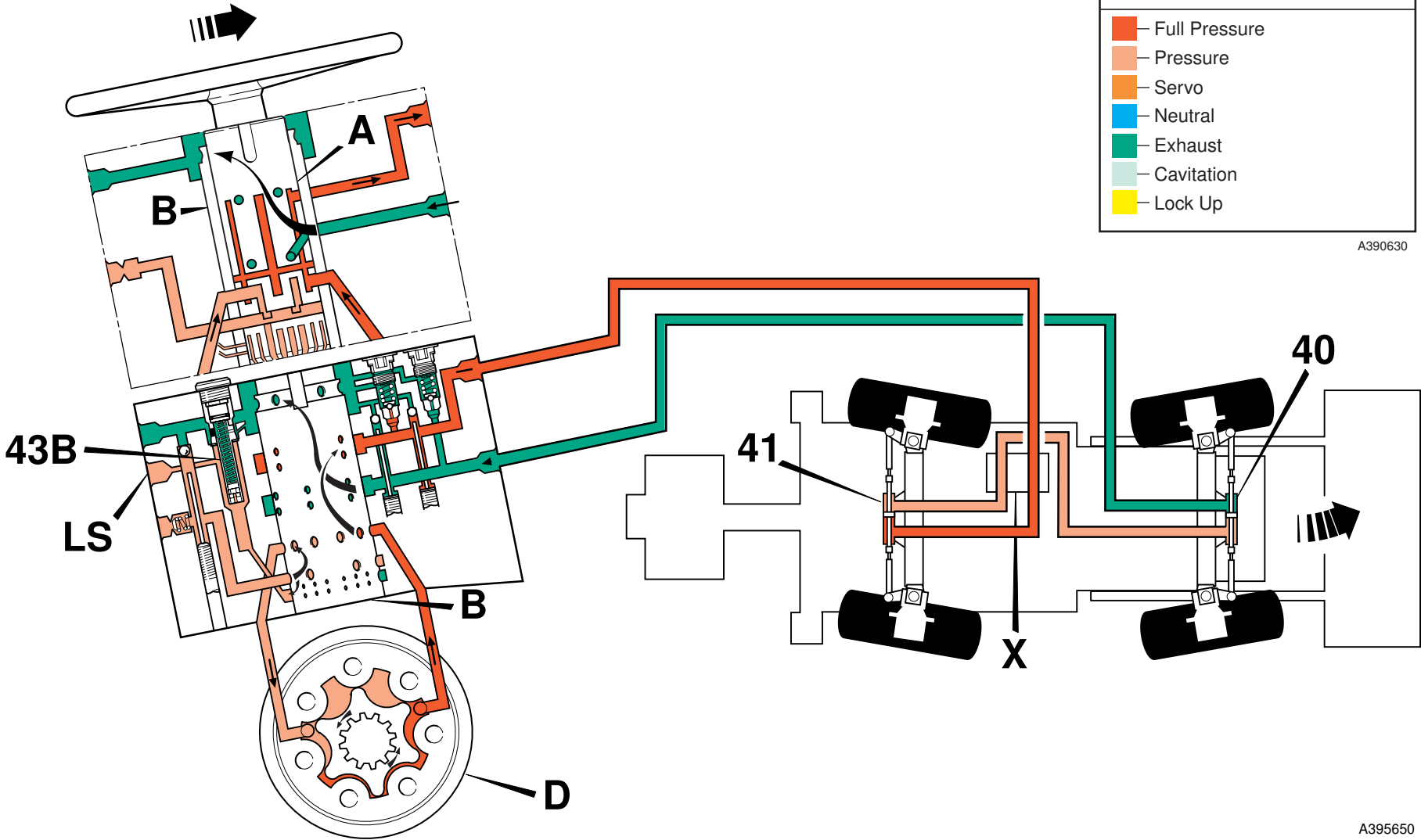


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Steer Unit Operation

- 4 Wheel Steer Machines

4 Wheel Steer Mode

- Left Turn

The illustration shows the flow through the steering unit in a left hand turn condition. Turning the steering wheel rotates the inner spool **A** a few degrees relative to the outer spool **B**, and sends a pressure signal to the relief valve **43B** and through the **LS** port back to the priority valve.

The relative movement between **A** and **B** directs pressure oil through 6 of the 12 holes in the bottom of sleeve **B**. The metering unit is linked to the spools by a cross pin. As the steering is operated the oil is diverted by inner spool **A** into the stator **D**.

The rotor lobes pump the oil out to one side of the rear power track rod ram **41** turning the rear wheels to the right. At the same time pressurised oil from the other side of the power track rod ram **41** is fed to the front power track rod ram **40**, hence turning the front wheels the required degree of left turn.

Component Key:

- A** Inner Spool
- B** Outer Spool
- D** Stator
- LS** Load Sensing Port
- X** Steer Mode Control Valve
- 40** Front Power Track Rod Ram
- 41** Rear Power Track Rod Ram
- 43B** Relief Valve

Steer Unit Operation

- 4 Wheel Steer Machines

4 Wheel Steer Mode

- Right Turn

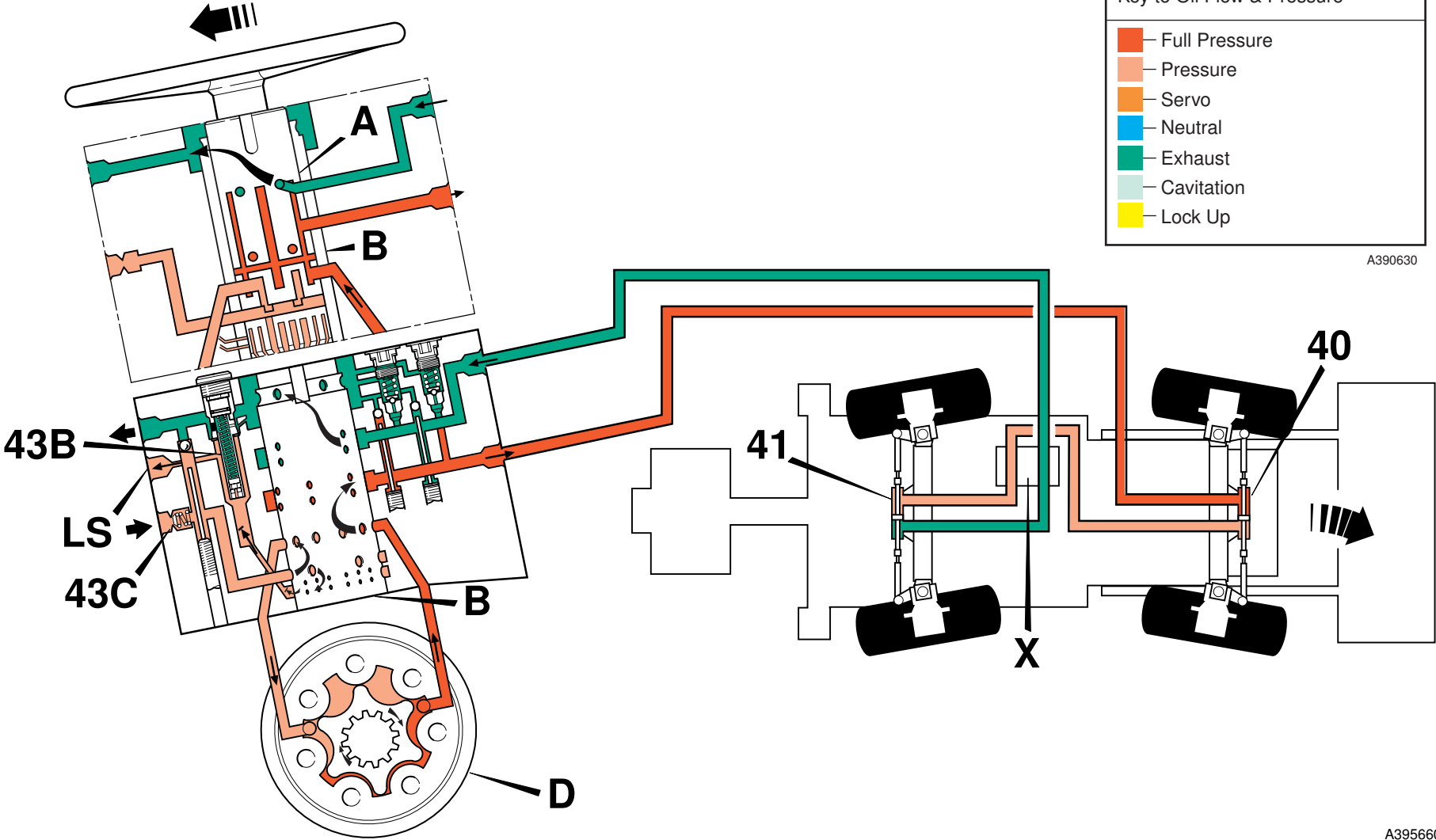
The illustration shows the flow through the steering unit in a right hand turn condition. The operation is identical to that described for a left hand turn, except that the oil is diverted by spool **A** to the other side of stator **D** and power track rod rams **40** and **41**.

Component Key:

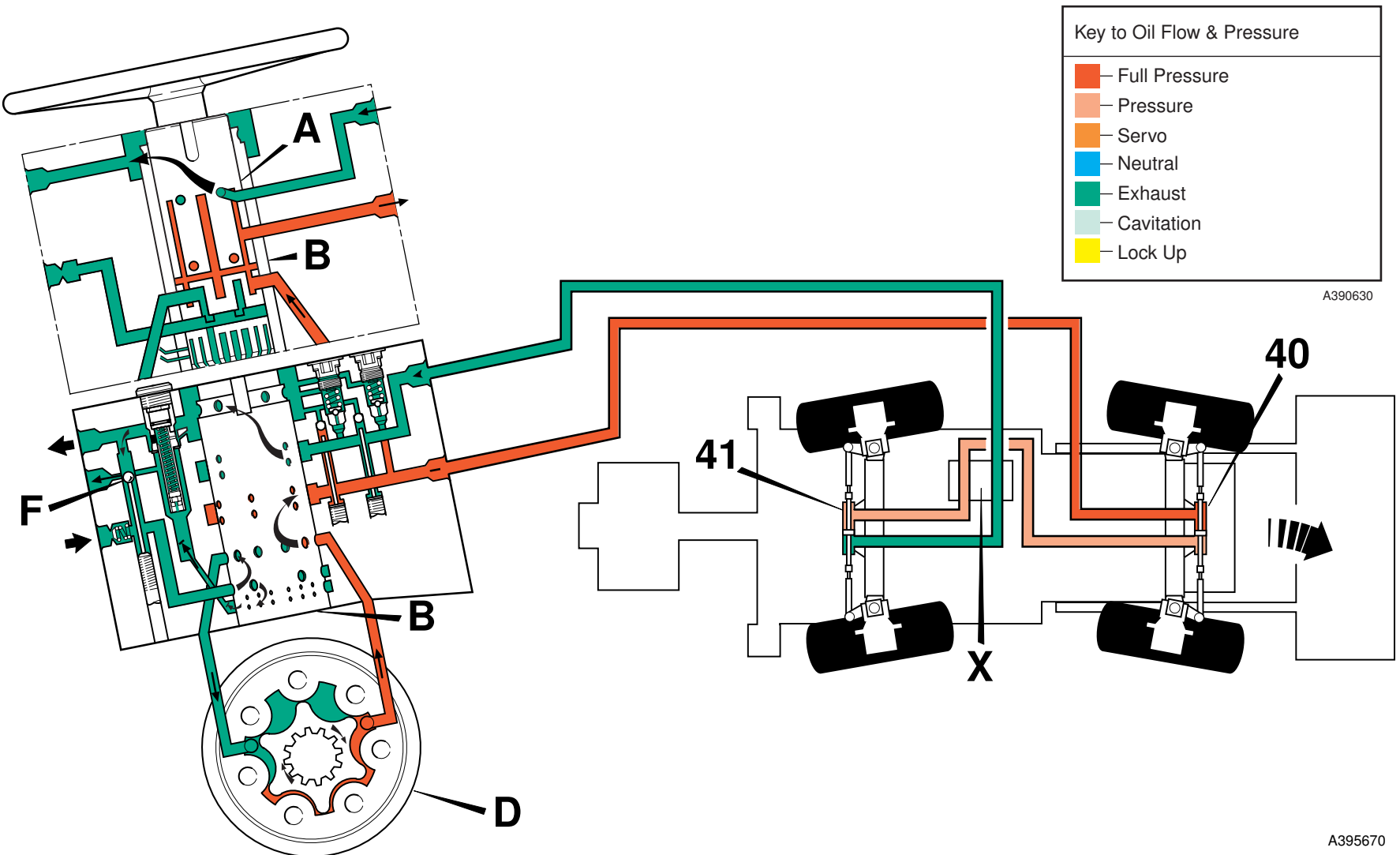
- A** Inner Spool
- B** Outer Spool
- D** Stator
- LS** Load Sensing Port
- X** Steer Mode Control Valve
- 40** Front Power Track Rod Ram
- 41** Rear Power Track Rod Ram
- 43B** Relief Valve
- 43C** Non-Return Valve

Key to Oil Flow & Pressure	
	Full Pressure
	Pressure
	Servo
	Neutral
	Exhaust
	Cavitation
	Lock Up

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Steer Unit Operation

- 4 Wheel Steer Machines

4 Wheel Steer Mode

- Right Turn, Unassisted

The illustration shows the circuit operation with the engine stopped. Turning the steering wheel rotates the inner spool **A** until the cross pin engages with and rotates outer sleeve **B**, metering oil to the stator **D**, and pumping it out to power track rod rams **40** and **41** under manual pressure only.

As there is no supply from the pump, oil from one side of the power track rod rams, supplemented by exhaust oil if necessary, is used to feed the other side via non-return valve **F**.

Component Key:

- A** Inner Spool
- B** Outer Spool
- D** Stator
- F** Non-Return Valve
- X** Steer Mode Control Valve
- 40** Front Power Track Rod Ram
- 41** Rear Power Track Rod Ram

Steer Unit Operation

- 4 Wheel Steer Machines

4 Wheel Steer Mode

- Shock Valve

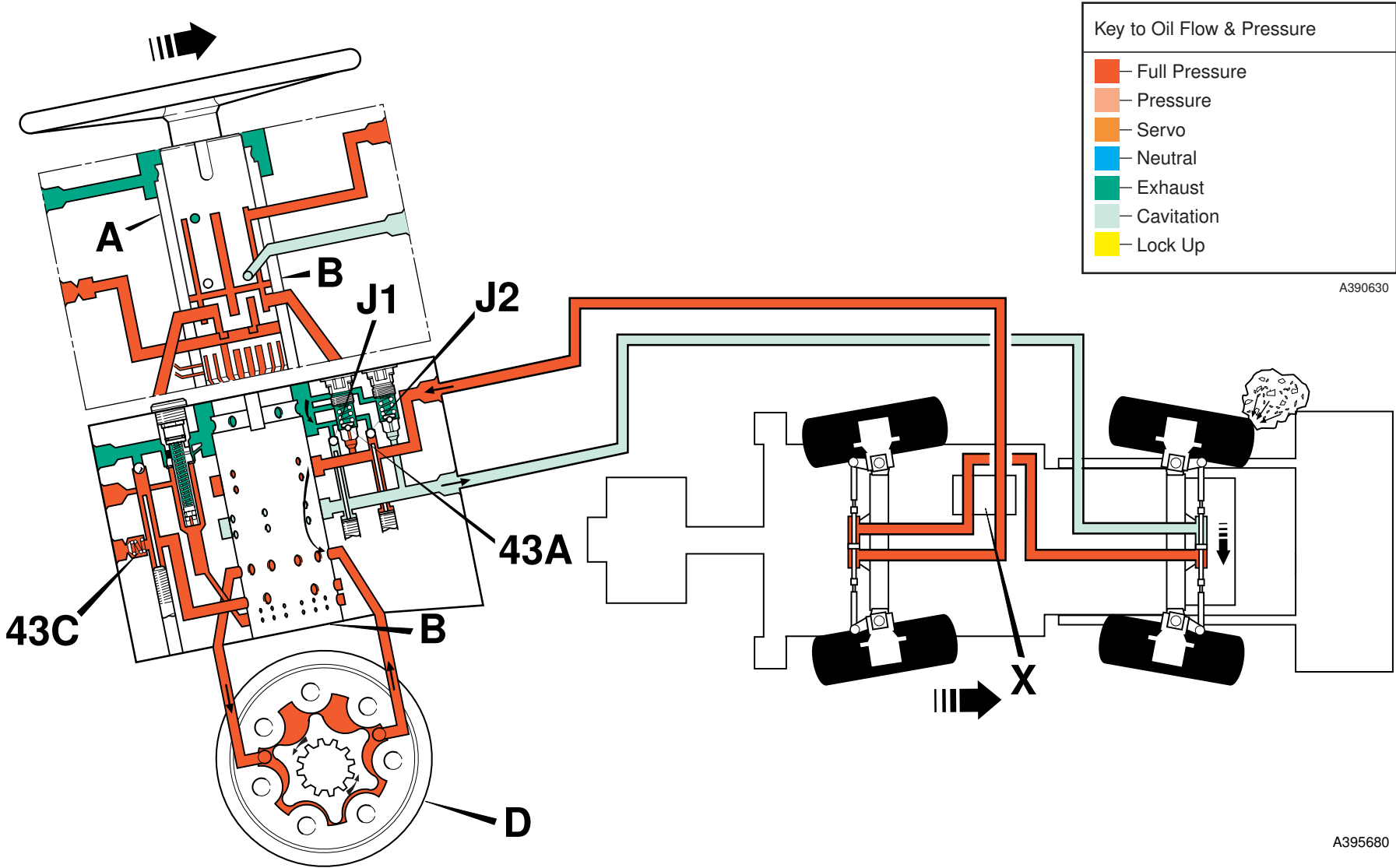
In normal operation oil flow from the pump enters the steering unit via the right hand port, opening a spring-loaded non-return valve **43C**. The flow is directed by the steering unit to achieve the desired turn (right hand shown).

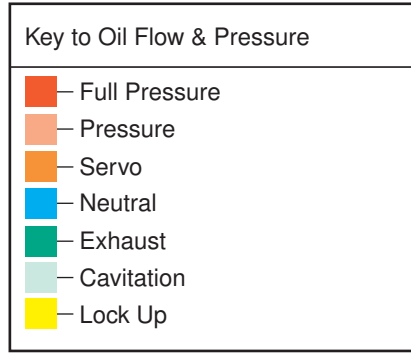
In the event of a pressure shock wave being generated in the system by an outside force, shock valve **43A** vents this pressure to exhaust preventing damage to the steering unit.

Non-return valve **J2** is held on its seat by the generated pressure and non-return valve **43C** closes to prevent the shock wave being fed back to the pump. Some of the excess flows via non-return valve **J1** to the opposite side of the power track rod ram to prevent cavitation occurring.

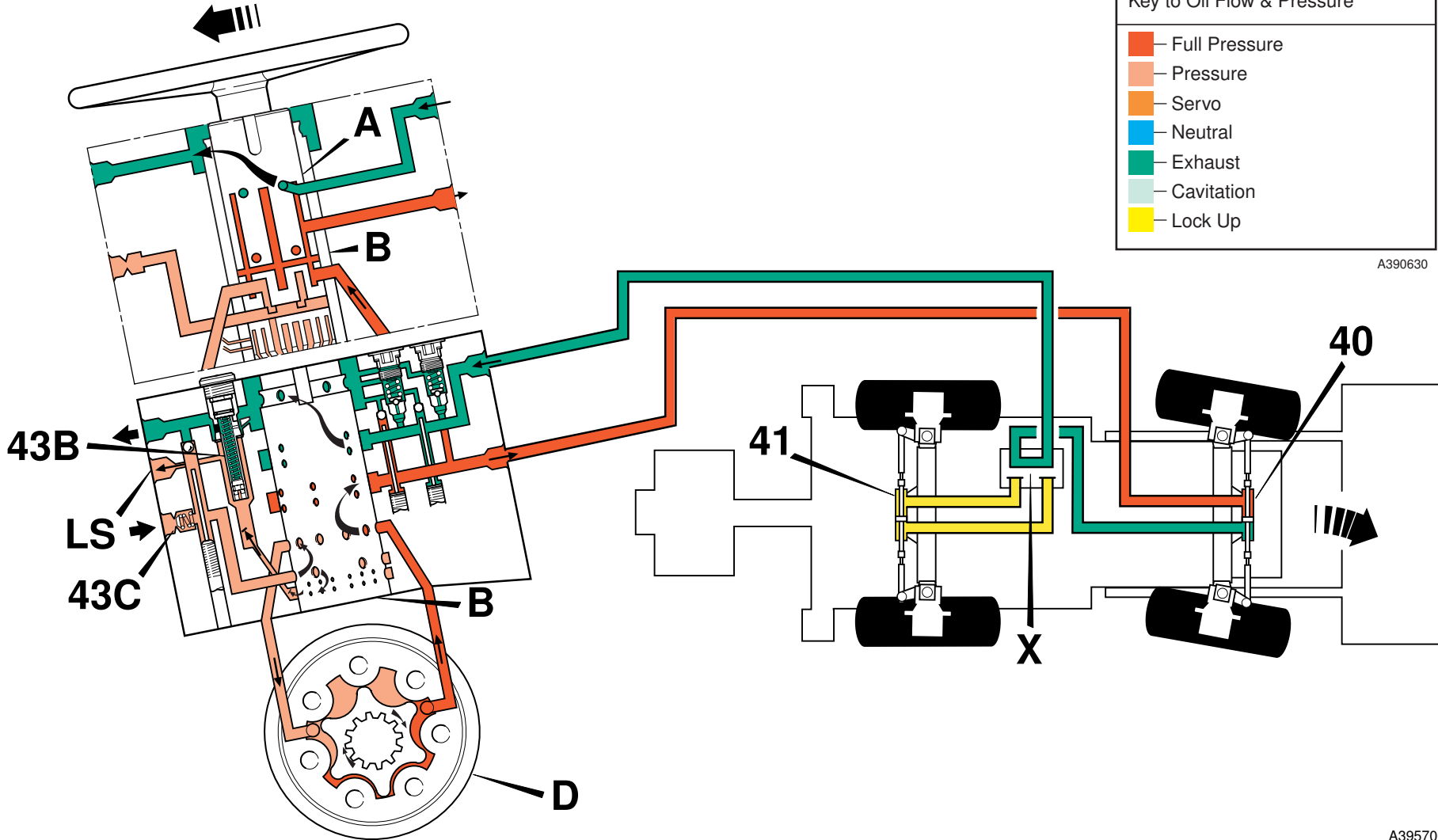
Component Key:

- A** Inner Spool
- B** Outer Spool
- D** Stator
- X** Steer Mode Control Valve
- J1** Non-Return Valve
- J2** Non-Return Valve
- 43A** Shock Valve
- 43C** Non-Return Valve





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Steer Unit Operation

- 4 Wheel Steer Machines

2 Wheel Steer Mode

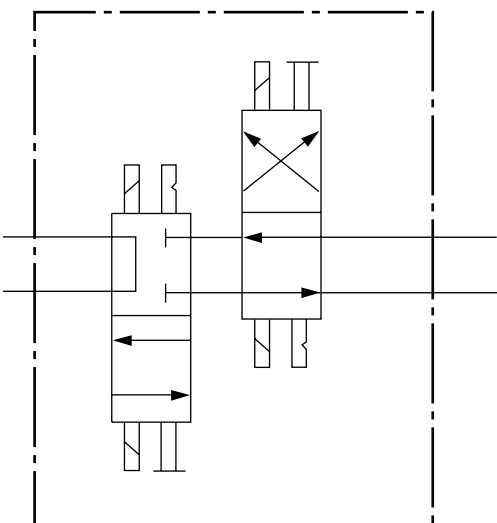
- Right Turn

The illustration shows the flow through the steering unit in a right hand turn condition. The operation is identical to that described for the 4 wheel steer mode, except the steer mode control valve **X** isolates the oil flow to the rear power track rod ram **41**, consequently the rotor lobes pump oil out to the front power track rod only. The rear wheels are held in the straight ahead position by the locked-up oil in the rear power track rod ram.

Component Key:

- A** Inner Spool
- B** Outer Spool
- D** Stator
- LS** Load Sensing Port
- X** Steer Mode Control Valve
- 40** Front Power Track Rod Ram
- 41** Rear Power Track Rod Ram
- 43B** Relief Valve
- 43C** Non-Return Valve

In 2 wheel steer mode the spools of the steer mode control valve **X** are configured as shown.



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Steer Unit Operation

- 4 Wheel Steer Machines

Crab Steer Mode

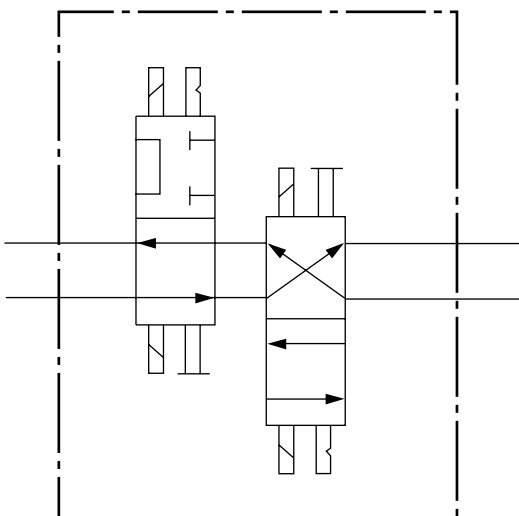
- Right Turn

The illustration shows the flow through the steering unit in a right hand turn condition. The operation is identical to that described for the 4 wheel steer mode, except the steer mode control valve **X** directs the pressurised oil from the front power track rod ram **40** to the other side of the rear power track rod ram **41**, hence turning the rear wheels in the same direction as the front wheels, causing the machine to crab to the right.

Component Key:

- A** Inner Spool
- B** Outer Spool
- D** Stator
- LS** Load Sensing Port
- X** Steer Mode Control Valve
- 40** Front Power Track Rod Ram
- 41** Rear Power Track Rod Ram
- 43B** Relief Valve
- 43C** Non-Return Valve

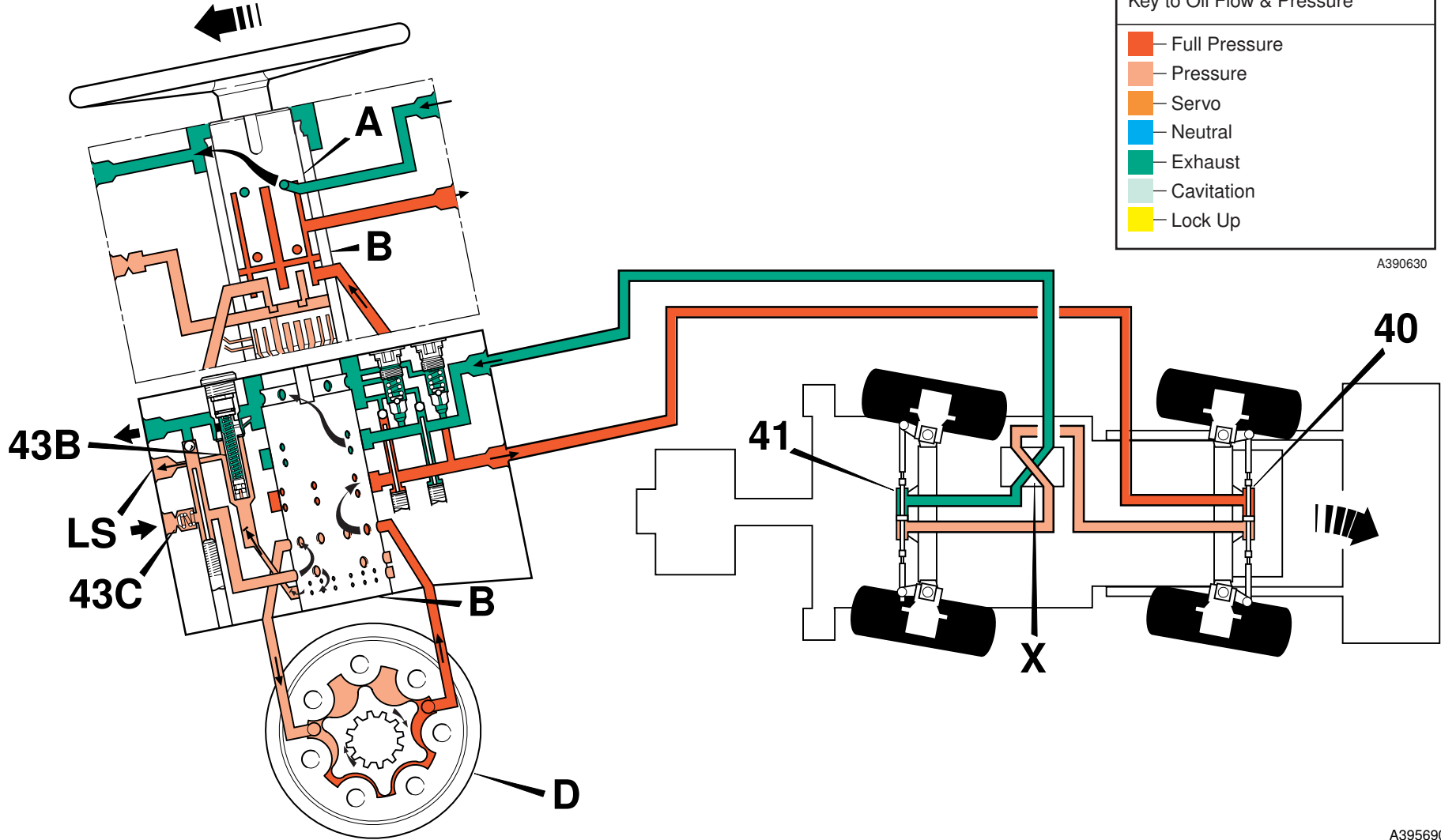
In crab steer mode the spools of the steer mode control valve **X** are configured as shown.



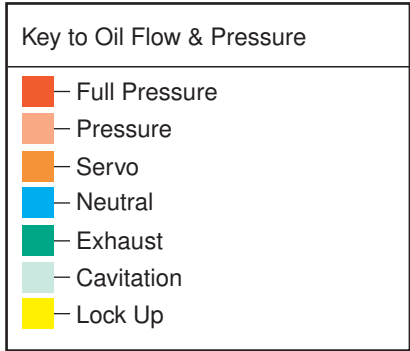
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Key to Oil Flow & Pressure	
	Full Pressure
	Pressure
	Servo
	Neutral
	Exhaust
	Cavitation
	Lock Up

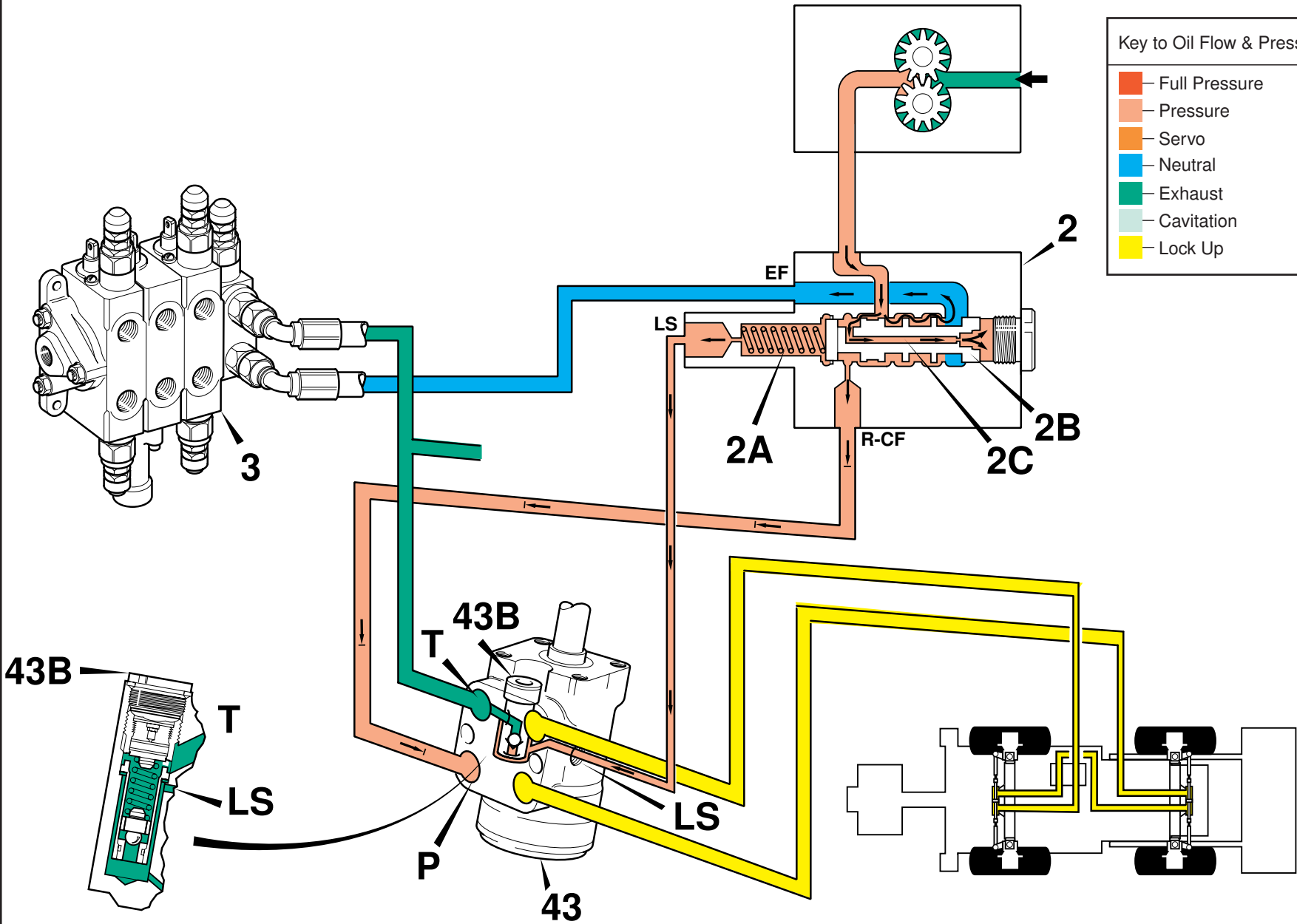
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Priority Valve Operation 1
- Neutral

When the steering is not being operated, flow to the steering circuit is dead ended by the closed centre steering unit **43** and no load is sensed in line **LS**. Pressure from the main pump to the priority valve is fed via a drilling **2C** to the rear of spool **2B**. The high pressure differential created across the spool causes it to move to the left against the force of the spring **2A**. This allows full pump flow to the loader control valve **3**.

Component Key:

- LS** Load Sensing Port
- P** From pump
- T** To Loader Valve
- 2** Priority Valve
- 2A** Spring
- 2B** Spool
- 2C** Drilling
- 3** Loader Valve
- 43** Steer Unit
- 43B** Relief Valve

Priority Valve Operation 2

- Turning

As the steering unit **43** is operated, pressure is applied to the spring end of the priority valve spool **2B** via sensing line **LS** from the steering unit.

This reduces the pressure differential across the spool, causing it to move to the right under spring force. This allows priority valve flow to the steering unit which directs the flow to the power track rod rams **40** and **41** until the required steering lock is reached. When the steering lock is held the pressure signal across the side port **LS** of the steering unit ceases, restoring the pressure differential across spool **2B**. The spool moves back to the left, allowing full pump flow to the loader control valve **3**.

Because the pump output is always greater than the flow required to operate the steering system, flow to the loader valve is never completely cut off.

Maximum steering system pressure is controlled by relief valve **43B**, located in the steering unit **43**.

Component Key:

- LS** Load Sensing Port
- P** From pump
- T** To Loader Valve
- 2** Priority Valve
- 2A** Spring
- 2B** Spool
- 2C** Drilling
- 3** Loader Valve
- 40** Front Power Track Rod Ram
- 41** Rear Power Track Rod Ram
- 43** Steer Unit
- 43B** Relief Valve



Fault Finding Contents**Introduction**

	Page No.	
Introduction	10 - 1	The purpose of this section is to help you trace hydraulic faults to a faulty unit (valve, actuator, ram etc). Once you have traced the faulty unit, refer to the appropriate dismantling, inspecting and test instructions given elsewhere in the steering section.
Steering wheel difficult to turn	10 - 1	
Steering wheel turns on its own	10 - 2	To help identify circuits, valves, rams etc mentioned in the fault finding procedures, refer to the hydraulic schematic diagrams (near the beginning of the Hydraulics Section).
Machine will not turn when the steering wheel turned.	10 - 2	
Steering fails to respond to selected mode (4WS Machines only)	10 - 3	
		- Before you begin fault finding, read the Safety information at the beginning of this manual. - Make simple checks before say, stripping a major component. - Make sure that the hydraulic fluid is at correct working temperature (50 °C, 122 °F). - What ever the fault, check the condition of the hydraulic fluid. Drain and replace if necessary. - Make any relevant electrical checks before moving on to the hydraulics. - Be sure to remove ALL contamination and if possible identify its origin. It may be part of a component from elsewhere in the circuit. - Replace any seals such as 'O' rings before re-assembling hydraulic components.

Fault	Probable Cause	Action
1 Steering wheel difficult to turn.	Tyres not inflated to correct pressure	Inflate tyres to correct pressure
	Insufficient hydraulic fluid.	Check for leaks and top up the hydraulic tank as required.
	Leaks in the relevant hoses or component connections	Check hoses and connections for leaks
	Air in the hydraulic system.	Bleed system - bleed the load sense line.
	Low pump flow.	Check pump flow, if required service or replace pump.
	Steer relief valve set incorrectly	Check pressure setting of steer unit relief valve, adjust as required.
	Worn or damaged parts in the steer control valve.	Remove and inspect.
		 continued

Fault	Probable Cause	Action
1 Steering wheel difficult to turn. (continued)	Priority valve not operating correctly Steer mode valve not operating correctly (4WS Machines only) Mechanical failure	Check if the priority valve is sticking, rectify as required. Check the load sense line from the steer unit to the priority valve for signs of leaking or poor connection. Check if spools sticking, rectify as required Check if solenoids operating, replace solenoids as required Check for damaged axle components, such as rams, trackrods, linkages etc.
2 Steering wheel turns on its own.	Dirt in the steer control unit (causing sleeves to stick open) Steer control valve centring springs damaged, broken or missing. Steer control valve - position of rotor to shaft slot incorrect.	Clean and inspect unit. Check steer unit. Refer to Hydraulic Steer Unit - Dismantling and Assembly. Correct as required.
3 Machine will not turn when the steering wheel turned.	Insufficient hydraulic fluid. Leaks in the relevant hoses or component connections Air in the hydraulic system. Low pump flow. Steer relief valve set incorrectly Worn or damaged parts in the steer control valve.	Check for leaks and top up the hydraulic tank as required. Check hoses and connections for leaks Bleed system - bleed the load sense line. Check pump flow, if required service or replace pump. Check pressure setting of steer unit relief valve, adjust as required. Remove and inspect.

Fault	Probable Cause	Action
3 Machine will not turn when the steering wheel turned (continued).	Priority valve not operating correctly Steer mode valve not operating correctly (4WS Machines only) Mechanical failure Steer column splined shaft not fully engaged in steer valve. Power track rod failure	Check if the priority valve is sticking, rectify as required. Check the load sense line from the steer unit to the priority valve for signs of leaking or poor connection. Check if spools sticking, rectify as required Check if solenoids operating, replace solenoids as required Check for damaged axle components, such as rams, trackrods, linkages etc. Check shaft engagement. Check power track rod for signs of damage, leaks etc.
4 Steering fails to respond to selected mode (4WS Machines only)	Selector switch faulty Proximity switches not operating correctly Steer mode valve not operating correctly Leaks in the relevant hoses or component connections Electrical failure	Check selector switch, replace as required Check setting of Proximity switches, reset or replace switches as required. Check if spools sticking, rectify as required Check if solenoids operating, replace solenoids as required. Check hoses and connections for leaks Check relevant electrical connectors, if problem still persists, do a wiring continuity check on relevant circuits.

Steering System - Bleeding

Whenever any hydraulic steering component is disconnected or removed the system must be bled as follows.

With the engine running, the following procedure must be carried out in the correct order that is laid down. You must not alter the order of selections and operations.

1 Select 2 Wheel Steer

- (a) Turn steering wheel to left, until front wheels are fully locked to the left.
- (b) Turn steering wheel to right, until front wheels are fully locked to the right.

2 Select 4 Wheel Steer

- (a) Turn steering wheel to left, until front wheels are fully locked to the left.

3 Select 2 Wheel Steer

- (a) Turn steering wheel to full right lock.
- (b) Turn steering wheel to full left lock.
- (c) Turn steering wheel to full right lock.

4 Select 4 Wheel Steer

- (a) Turn steering wheel to left, until the front wheels are fully locked to the left.

5 Select 2 Wheel Steer

- (a) Turn steering wheel to full right lock.
- (b) Turn steering wheel to full left lock.
- (c) Turn steering wheel to full right lock.

6 Select 4 Wheel Steer

- (a) Turn steering wheel to left, until front wheels are fully locked to the left.

7 Select 2 Wheel Steer

- (a) Turn steering wheel to full right lock.
- (b) Turn steering wheel to full left lock.
- (c) Turn steering wheel to full right lock.

8 Select 4 Wheel Steer

- (a) Turn steering wheel to left, until the front and rear wheels are fully locked.

Steering System - Pressure Testing

- 1 Park the machine on level ground, engage the parking brake and set the transmission to neutral. Lower the attachments to the ground. Stop the engine and remove the starter key.
- 2 Turn the steering wheel to the left and to the right several times to vent system pressure.

WARNING

Make the machine safe before working underneath it. Park the machine on level ground, lower the arms. Apply the parking brake, put the transmission in neutral and stop the engine. Chock both sides of all four wheels.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-1-2

- 3 Connect a 0-400 bar (0-6000 lbf/in²) pressure gauge to test adaptor **A**.

Note: The pressure test point for the steering circuit is fitted next to the priority valve as shown.

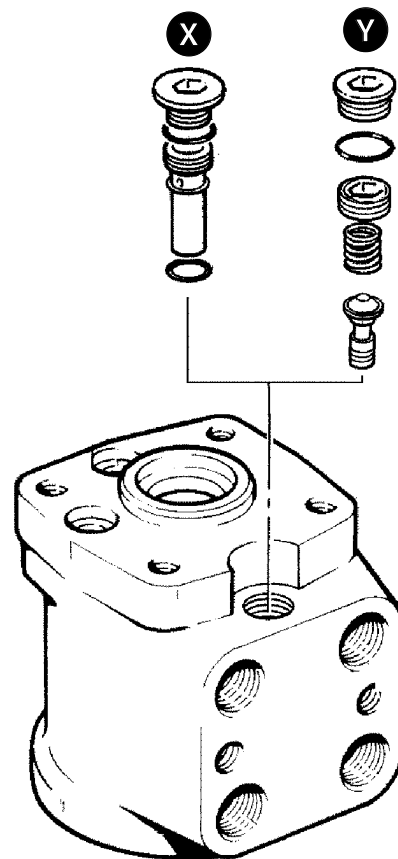
- 4 Run the engine at 1500 revs/min and turn the steering to full lock. Check the gauge reading which should equal the relief valve pressure, refer to **Technical Data**.

Note: The steering wheel must be held on full lock whilst the gauge reading is being checked.

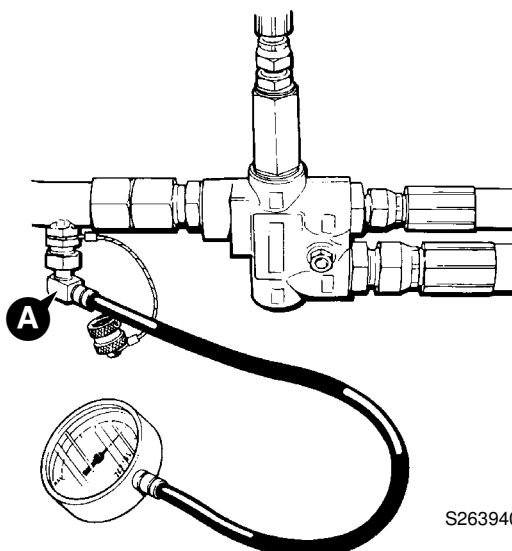
- 5 If necessary, adjust the pressure setting by removing plug **B**, on the hydraulic steer unit.
- 6 Adjust screw **C** using an 'allen key' until the correct pressure is shown on the gauge.

Note: Detail **X** shows a relief valve which has a 4 mm hexagon adjusting screw. Detail **Y** shows a valve which has a 6 mm hexagon adjusting screw.

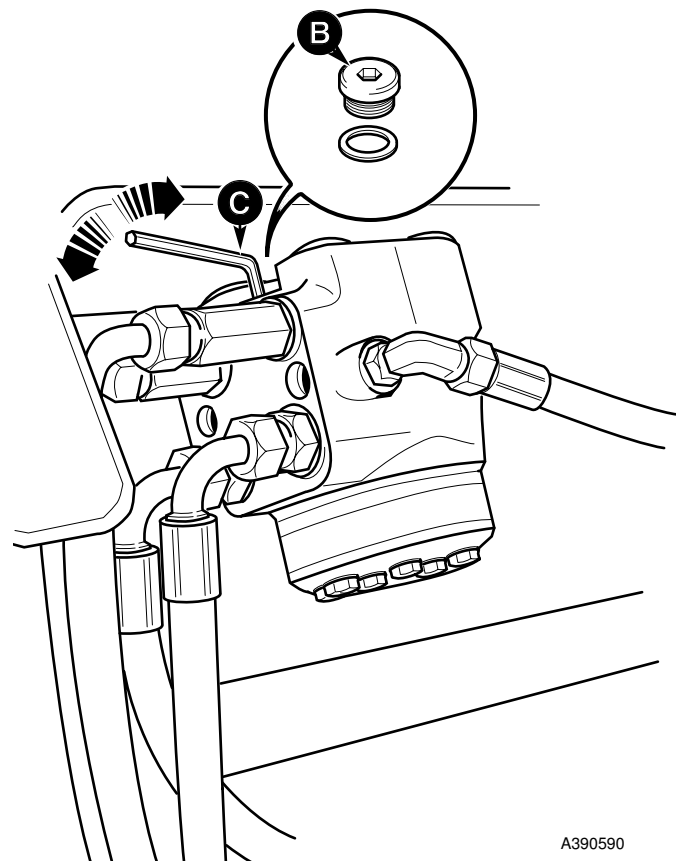
- 7 Refit plug **B**.



S212750



S263940



A390590

Proximity Switch - Setting

⚠ WARNING

Raised loader arms can drop suddenly and cause serious injury. Before working under raised loader arms, fit the loader arm safety strut.

GEN 3-2

Note: The proximity switch setting procedure is the same for both the front and rear axles. The illustration shows a typical rear axle.

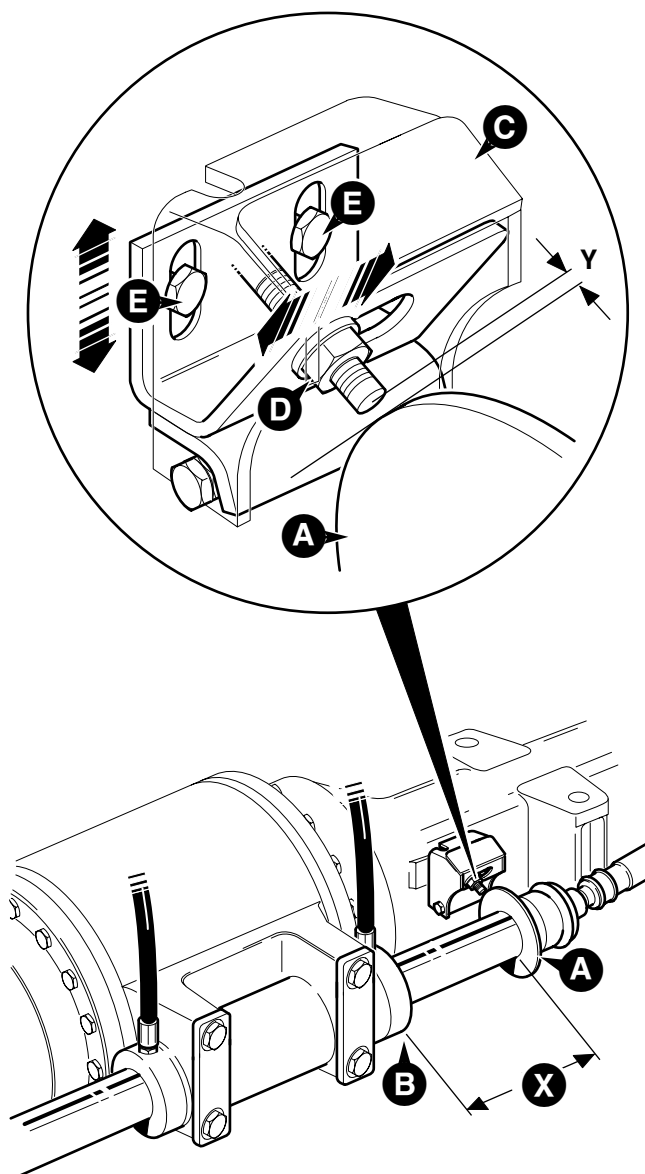
- 1 Align the wheels in the straight ahead position. Check if straight ahead by measuring the steering ram position.

Set the steering so that dimension **X** is equal both sides.

- 2 Remove the proximity switch cover **C**.
- 3 With the starter switch on, loosen the proximity switch lock nut **D** and slide the switch in line with the target disc **A**.
- 4 Loosen the bracket fixing bolts **E** and adjust the assembly up or down to bring the switch to the centre of the target disc. Tighten the fixing bolts **E**.

Make sure the light emitting diode (L.E.D.) is not illuminated (if it is then screw the switch out).

Now screw the proximity switch towards the target disc until the light emitting diode (L.E.D.) on the switch illuminates. Add a further 1 to 1.5 turns of the locknut. Tighten the locknut.



A258170

Steer Mode Valve
- Checking Solenoid Operation

The solenoids operate according to the steer mode that is selected.

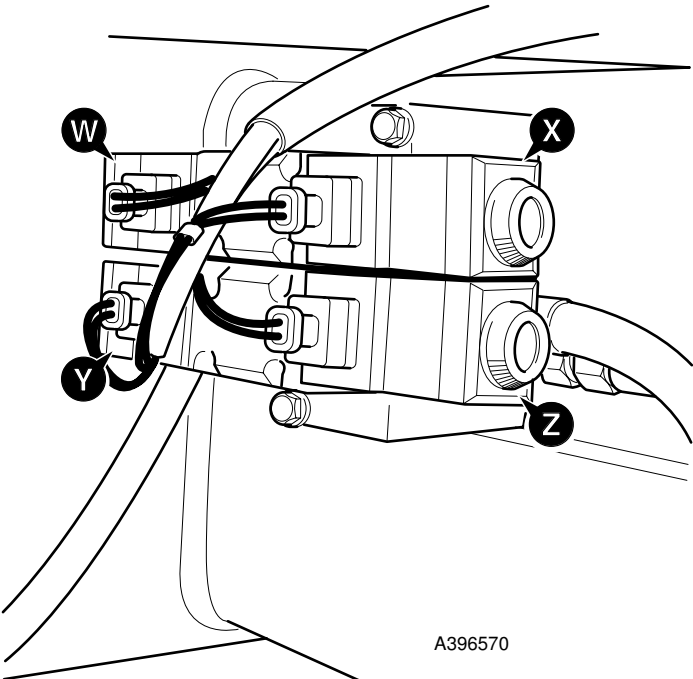
Mode:	Solenoid(s) Energised:
2 Wheel Steer	W
4 Wheel Steer	X, Z
Crab Steer	X, Y

Operation (energisation) of a solenoid can be easily detected by placing a steel object (e.g. screwdriver blade) close to the outer casing. A magnetic attraction of the steel object towards the solenoid indicates energisation.

If a solenoid is not energising carryout the following checks:

- 1 Check the fuse is intact. If not, renew and then check that all steer mode solenoid combinations function correctly.
- 2 If the fuse is intact remove the electrical connector from the malfunctioning solenoid(s) and check that the 12V supply is present across the connector pins. If not, check the supply circuit.
- 3 Check the solenoid coil resistance which should measure a few ohms (if unsure of the value compare with a known good solenoid).

Renew the solenoid if the reading indicates a short circuit (zero ohms) or open circuit (infinite resistance). If a reading somewhere between the two is obtained, reverse the two instrument probes and repeat for a valid check.



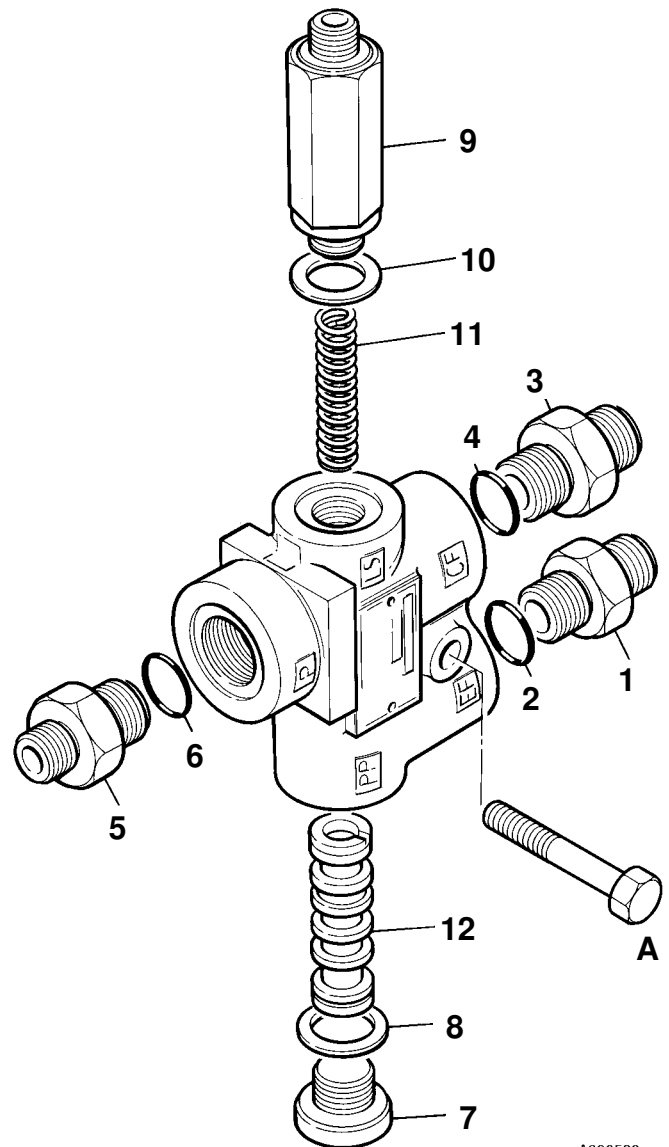
Priority Valve - Cleaning

The priority valve spool and spring may be removed for cleaning.

- 1 Remove the priority valve from the machine. Refer to **Priority Valve - Removal and Replacement**.
- 2 Unscrew adaptor **9** and extract the priority valve spring **11**.
- 3 Remove the blanking plug **7**. Press out the priority valve spool **12** using a nylon pin. Take care not to damage the bore of the valve.
- 4 Clean these components in clean paraffin paying particular attention to the orifices at each end of the spool. Dry off and lubricate with clean hydraulic fluid.
- 5 Refit the priority valve spool **12** making sure that the spring seat end of the spool faces towards the **LS** port. Refit blanking plug **7** and torque tighten.
- 6 Refit the priority valve spring **11** and adaptor **9** and torque tighten.
- 7 Refit the valve onto the machine. Refer to **Priority Valve - Removal and Replacement**.
- 8 Bleed the load sensing line. Refer to **Priority Valve - Bleeding**.

Torque Settings

Item	Nm	lbf ft
7	50	37
9	50	37



A390580

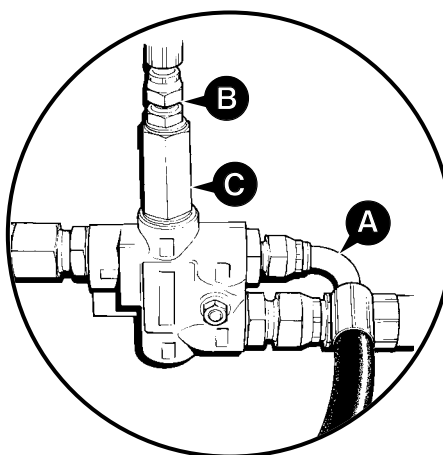
Priority Valve - Standby Pressure Testing

- 1 Disconnect hose **A** and install a 0 - 40 bar (0 - 580 lbf/in²) pressure test gauge into the valve port. Position the open end of hose **A** into a clean container in order to collect any oil drainage.
- 2 Disconnect hose **B** from load sensing port adaptor **C** and blank off.
- 3 Set the steering to neutral, i.e. do not turn the steering wheel, and start the engine. Gradually increase the engine speed to 1000 rev/min while checking the maximum pressure gauge reading which should be 5.9 to 8.7 bar (86 to 126 lbf/in²)

If the pressure is outside the limits try cleaning the priority valve, refer to **Priority Valve - Cleaning**.

If cleaning the valve does not rectify, check the hydraulic pump flow rate, refer to Section E **Main Pump - Flow and Pressure Testing**.

If the hydraulic pump flow and pressure tests are satisfactory, then the priority valve must be renewed.



Removal and Replacement

This procedure is for a typical power steering track rod removal and replacement.

⚠ WARNING

Make the machine safe before working underneath it. Park the machine on level ground, lower the arms. Apply the parking brake, put the transmission in neutral and stop the engine. Chock both sides of all four wheels.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-1-2

⚠ WARNING

Raised loader arms can drop suddenly and cause serious injury. Before working under raised loader arms, fit the loader arm safety strut.

GEN-3-2

Removal

- 1 Disconnect and cap hydraulic hoses to prevent loss of fluid and ingress of dirt. Label hoses for identification and correct refitting.
- 2 On 4WD machines remove the split pin and nut **A**. Remove the track rod ball joint from the wheel hub assembly.

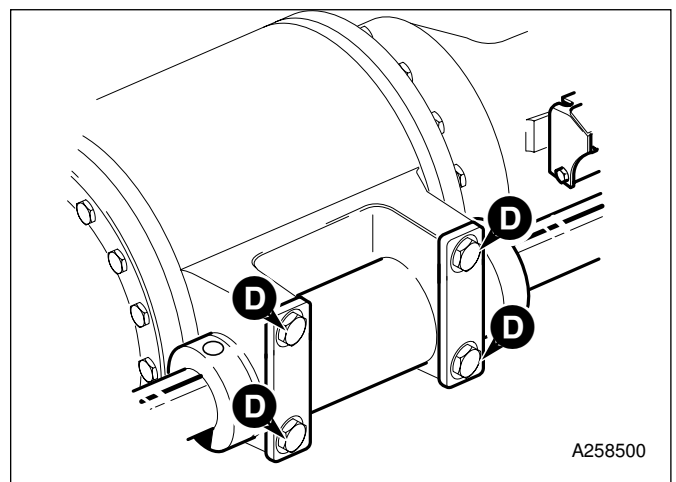
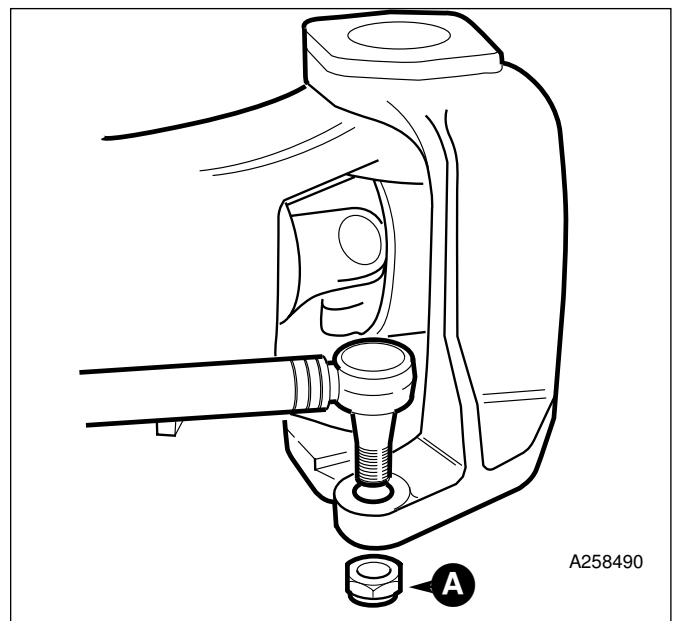
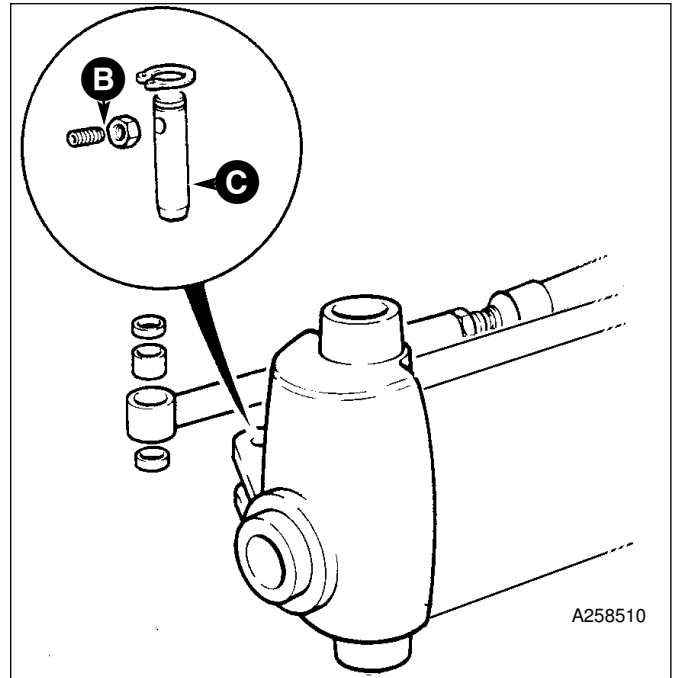
On 2WD machines, remove lock assembly **B** and pin **C** to remove the track rod pivot from the wheel hub assemblies.
- 3 Remove the four fixing bolts **D**.

Replacement

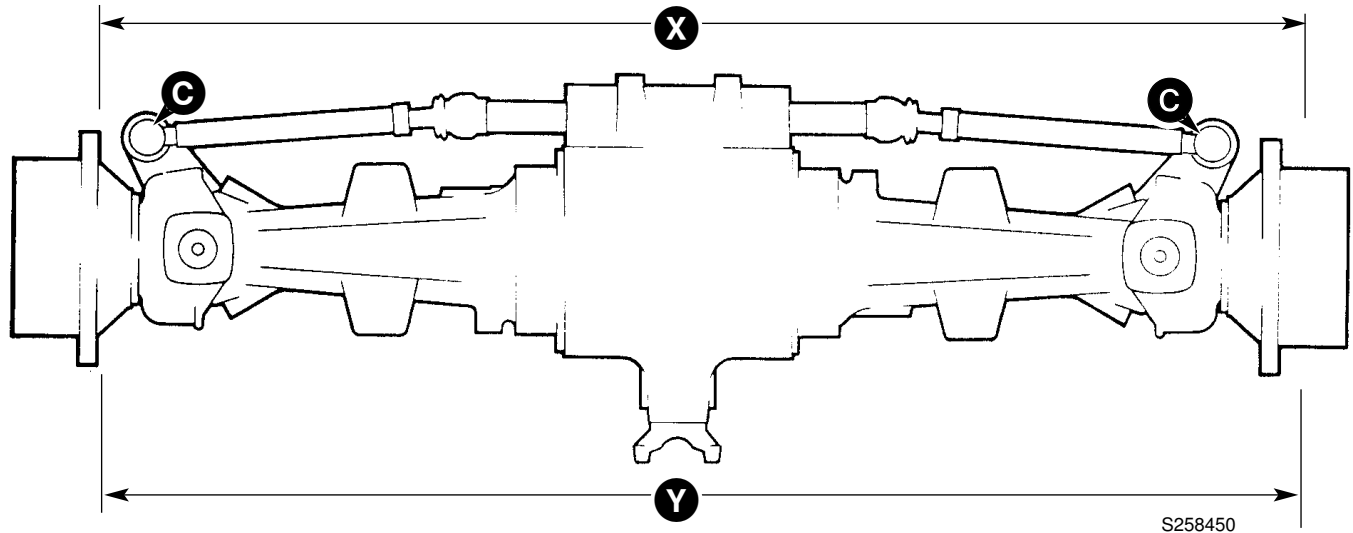
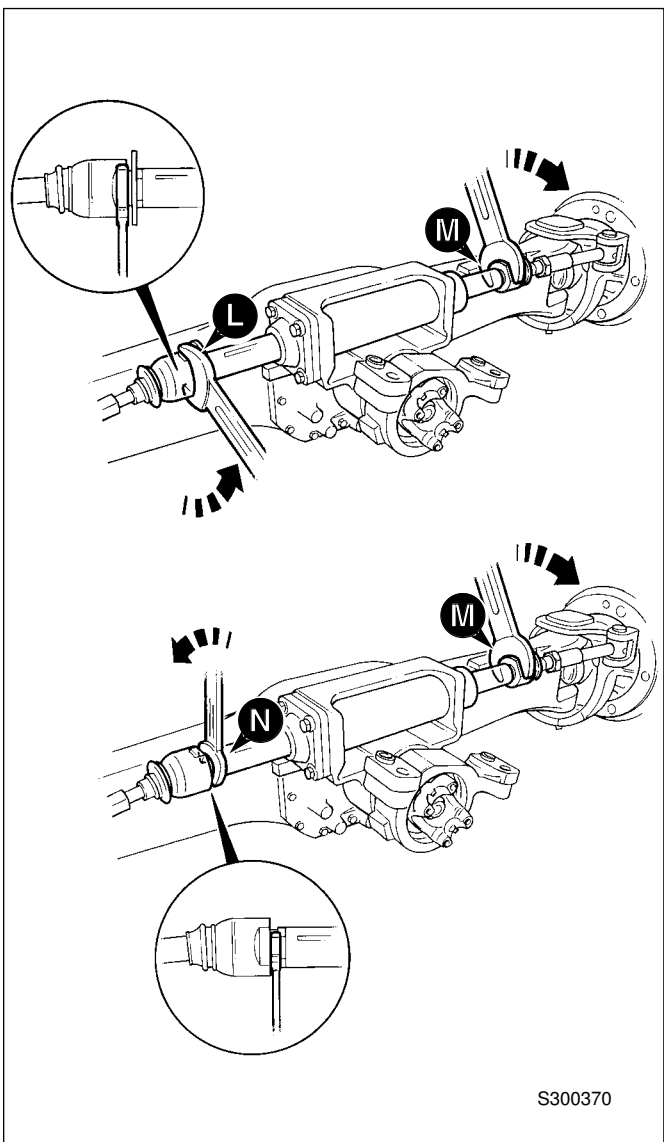
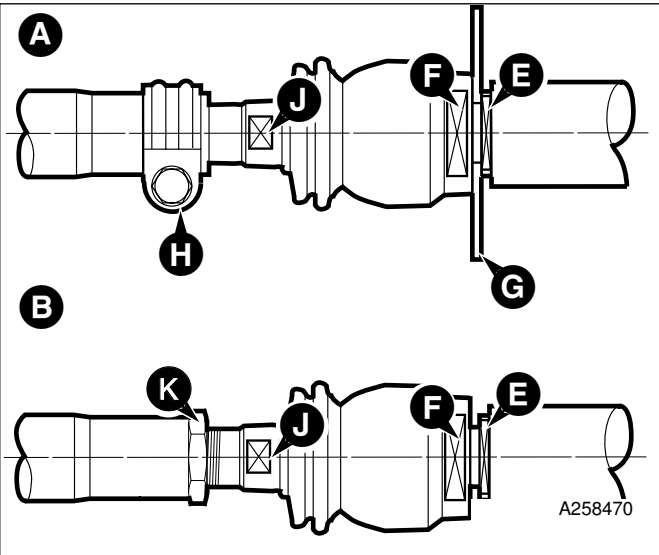
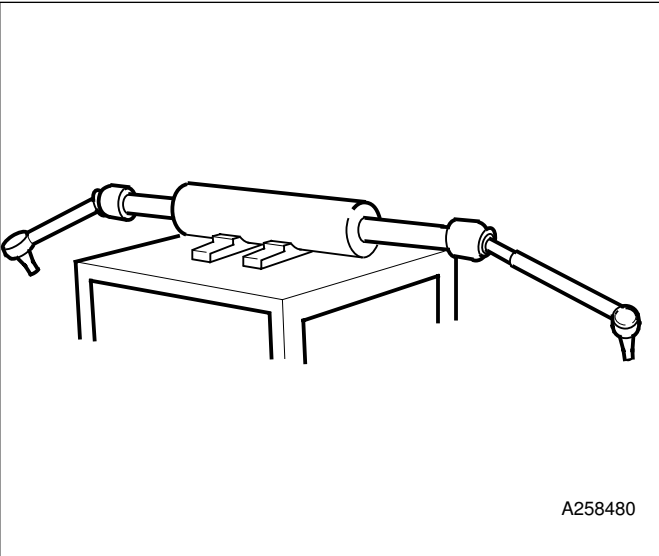
- 1 Replace the power track rod by reversing the removal procedure. On 4WD machines make sure that the split pin is fitted.
- 2 After connecting hoses check hydraulic fluid level, if necessary top up.
- 3 Bleed hydraulic steering system, refer to **Service Procedures, Steering System - Bleeding**.

Torque Settings

Item	Nm	kgf m	lbf ft
A			
D	620	63	457



Link Arms - Removal and Replacement



Link Arms - Removal and Replacement

Removal

- 1 Fix the assembly on a locally made strip/rebuild bench as shown.
- 2 Using two suitable open ended spanners at **L** and **M** react against each other until one ball joint unscrews.
- 3 Unscrew the ball joint **L** until an open ended spanner can be fitted on the rod **N**. Screw the ball joint against the spanner to secure the spanner and to prevent damage to the rod.
- 4 By reacting against the spanner at **N** and **M** undo the other ball joint.

Note 1: Flats at 'E' are:

2 Wheel drive machines - 32 mm A/F x 4 mm wide.

4 Wheel drive machines - 40 mm A/F x 4 mm wide.

Note 2: The piston rod operates at full length, any damage to the surface will cause fluid leaks. DO NOT attempt to grip the rod diameter with pipe grips etc.

- 5 Repeat the procedure for the remaining link arm assembly.
- 6 Where applicable remove the target disc **G**.

Note 3: If the inner or outer ball joints need to be renewed, then a replacement link arm assembly must be fitted.

Replacement

Replacement is the reverse of removal but note the following:

- 1 Remember to fit the target disc **G** (where applicable).
- 2 Use JCB Threadlocker & Sealer on the trackrod link arms.
- 3 If the link arms have been renewed, the wheel alignment must be checked as follows:
 - a Set the wheels to the straight ahead position and measure dimensions **X** and **Y** (at the outer edge of the wheel hub). Alignment is correct if the difference between **X** and **Y** is a maximum of 1 mm.
 - b To adjust the wheel alignment undo the lock nuts (**H** or **K** as applicable). Turn the threaded adjusters **J** equally to obtain the correct alignment. Tighten the lock nuts (**H** or **K** as applicable).

Note 4: AWS machines shown at **A**. 2 wheel steer machines shown at **B**.

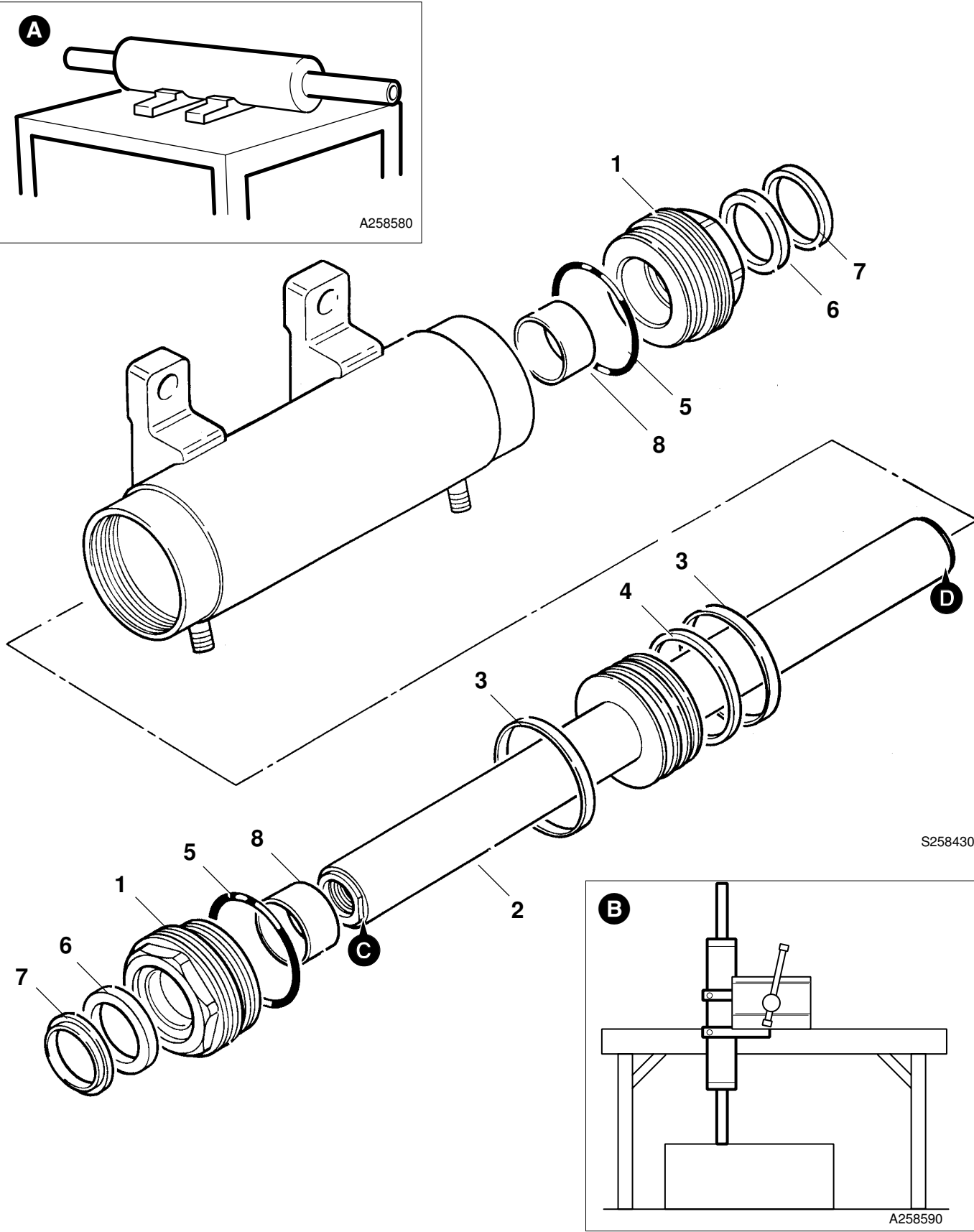
- 4 Check the proximity switch setting (where applicable). Refer to **Service Procedures, Proximity Switch - Setting**.

Torque Settings

2WS/4WD	C 180 Nm (132 lbf ft)	H 45/50 Nm (33/36 lbf ft)	E 240/260 Nm (177/184 lbf ft)
2WS/4WD	C 140/150 Nm (103/110 lbf ft)	K 300 Nm (221 lbf ft)	E 240/260 Nm (177/184 lbf ft)
AWS/4WD	C 270/280 Nm (199/206 lbf ft)	H 70/85 Nm (51/62 lbf ft)	E 450 Nm (331 lbf ft)
AWS/4WD	C 270/280 Nm (199/206 lbf ft)	K 390/410 Nm (287/302 lbf ft)	E 450 Nm (331 lbf ft)
2WS/2WD	C N/A	K 240/260 Nm (177/184 lbf ft)	E 240/260 Nm (177/184 lbf ft)

Rams

Dismantling and Assembly



Rams

Dismantling and Assembly

The numerical sequence shown on the illustration is intended as a guide to dismantling.

For assembly the sequence should be reversed.

Dismantling

- 1 Fix the ram assembly on a locally manufactured strip/rebuild bench as shown at **A**.
- 2 Remove both end caps, using a special spanner (refer to **Service Tools**). Pull the piston rod assembly from the cylinder.

Note 1: DO NOT allow the piston rod to come into contact with the cylinder bore. The cylinder bore may be damaged by careless dismantling.

- 3 Position the piston rod assembly on a bench in place of the ram cylinder. Remove the seal and wear rings from the piston head.

Note 2: The piston head cannot be removed from the rod. If there is damage to the rod or piston head, replace the complete assembly.

- 4 Carefully inspect the bore of the cylinder and the piston rod outer diameter for scoring, nicks and burrs. If such damage is visible the components must be renewed.

Note 3: If burrs are evident on the ends of the piston rod at positions **C** or **D** remove by careful filing.

Both end cap assemblies are the same, dismantle as follows:

- 5 Remove the 'O' ring **5**, end cap seal **6** and wiper seal **7**.
- 6 The bearing bush **8** can be renewed if necessary. However, time will be saved if a complete end cap and bush assembly is obtained.

Assembly

- 1 Clean the threads of the end caps and cylinder using a wire brush.
- 2 Use JCB Cleaner & Degreaser to ensure that all threads are free from grease, hydraulic oil and sealant. Allow 15 minutes for solvent to dry before applying JCB Threadlocker and Sealer (High Strength).

Ensure that lubricants used during assembly do not come into contact with the JCB Threadlocker and Sealer (High Strength).

- 3 Refer to Section E **Rams - JCB Ram Sealing Procedure** for the correct method of fitting seals to the end cap and piston head.
- 4 Clamp the cylinder vertically and lower the piston rod assembly in from the top, as shown at **B**. Take care not to allow the piston rod to come into contact with the cylinder bore. Be sure to engage the piston head new wear rings and seal carefully into the cylinder. If the piston head wear rings or seal are damaged during this stage, they must be renewed.
- 5 Apply JCB Activator to threads of the end caps and cylinder. Allow Activator to dry for 15 minutes before bringing into contact with the JCB Threadlocker and Sealer (High Strength).

Note 4: Neither the JCB Threadlocker and Sealer (High Strength) nor Activator must be allowed to contact seals, bearing rings or 'O' rings.

- 6 Apply JCB Threadlocker and Sealer (High Strength) to threads of the ends caps, fit new 'O' ring **5**.
- 7 Ensure that there are no burrs at the ends of the piston rod, see **Dismantling - Note 3**:
- 8 Fit an end cap over the piston rod. Apply light hand pressure to the cap to engage the gland seal on the piston rod. DO NOT use excessive force. Screw on the first end cap and then fix the assembly on the strip/rebuild bench as shown at **A**. Fit the remaining cap and then torque tighten both caps.

Note 5: If hydraulic oil contacts the uncured JCB Threadlocker and Sealer (High Strength) a weakening of the bond will result. Cure times vary according to the ambient temperature. Allow a minimum of 2 hours between assembly and filling the ram with oil.

Torque Settings

Item	Nm	kgf m	lbf ft
1	678	69.2	500

Note 6: Cold weather operation. When operating in conditions which are consistently below freezing, it is recommended that the track rod is operated slowly to its full extent in both directions before commencing normal working.

Removal and Replacement

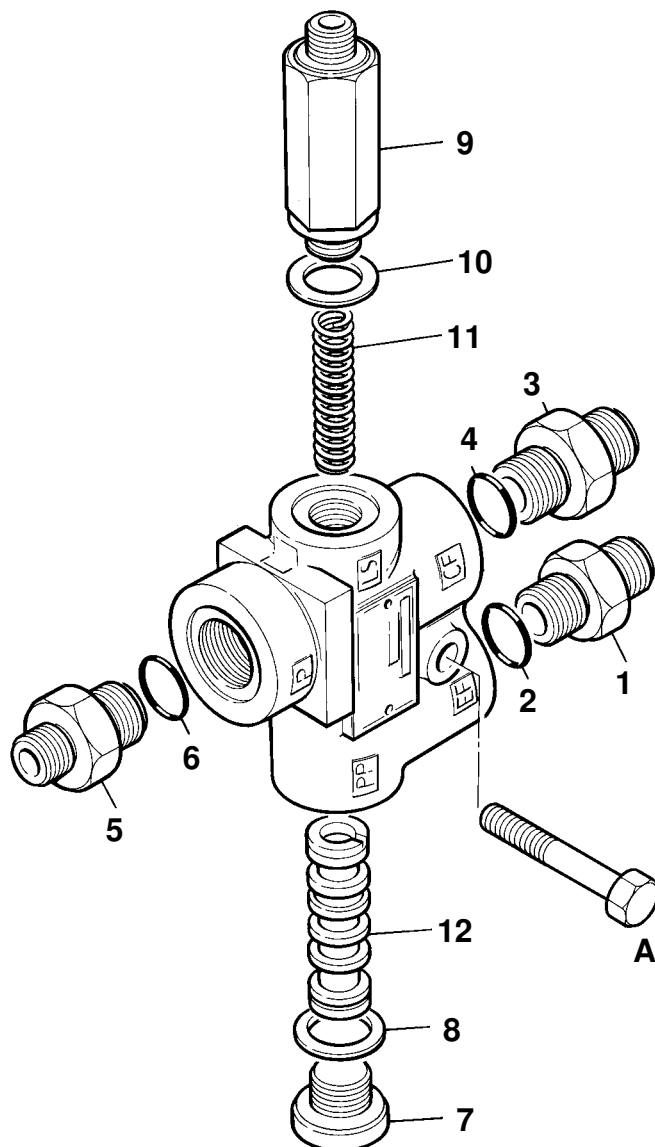
⚠ WARNING

Make the machine safe before getting beneath it. Lower the attachments to the ground; engage the parking brake; remove the starter key, disconnect the battery.

2-3-2-2

The priority valve is mounted on the right hand side chassis member, adjacent to the loader valve block. It is attached to the chassis member by one bolt **A**, and is accessible from underneath the machine.

When replacing always renew sealing 'O' rings **2**, **4**, **6**, and **10**.



A390580

Dismantling and Assembly

The numerical sequence shown on the illustration is intended as a guide to dismantling.

For assembly the sequence should be reversed.

Note 1: The priority valve is not serviceable beyond the removal of foreign matter (Refer to **Service Procedures, Priority Valve - Cleaning**). A faulty unit must be replaced.

Dismantling

Press out the spool item **12** using a nylon pin. Take care not to damage the bores of the valve.

Assembly

Make sure that spring seat of spool **12** faces toward **LS** connection.

Clean all parts in clean paraffin.

Lubricate all parts with hydraulic fluid.

Renew aluminium washers **8** and **10**.

Note 2: All hydraulic adapters that are installed together with a bonded sealing washer must also have JCB Threadseal applied to the threads of the adapter.

Torque Settings

Item	Nm	lbf ft
7	50	37
9	50	37

Bleeding

To bleed the **LS** line, start the engine, loosen the connection on the valve, turn and hold the steering wheel fully in either direction. When bubble free oil flows from the joint, tighten the connection.

Removal and Replacement

⚠ WARNING

Make the machine safe before working underneath it. Park the machine on level ground, lower the arms. Apply the parking brake, put the transmission in neutral and stop the engine. Chock both sides of all four wheels.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-1-2

⚠ DANGER

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11/1

Removal

- 1 Park the machine on level ground, engage the parking brake and set the transmission to neutral. Lower the attachments to the ground. Stop the engine and remove the starter key.
- 2 Turn the steering wheel to the left and to the right several times to vent system pressure.

Note 1: The steer mode valves assembly is fitted to a bracket which is mounted on the right hand side of the machine in front of the rear axle.

- 3 Disconnect the electrical solenoid connections. Label each connector before removal to ensure correct refitting. The wires should be identified **A**, **B**, **C** and **D** as shown.
- 4 Disconnect all hydraulic hoses from the steer mode valves assembly. Label the hoses to ensure correct refitting and cap the ends to prevent ingress of dirt.
- 5 Take hold of the steer mode valves assembly, loosen and remove bolts **E**. Lift the steer mode valves assembly and its retaining bracket from the machine.

Replacement

⚠ WARNING

Fine jets of hydraulic fluid at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic fluid leaks. Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of hydraulic fluid. If hydraulic fluid penetrates your skin, get medical help immediately.

INT-3-1-10/1

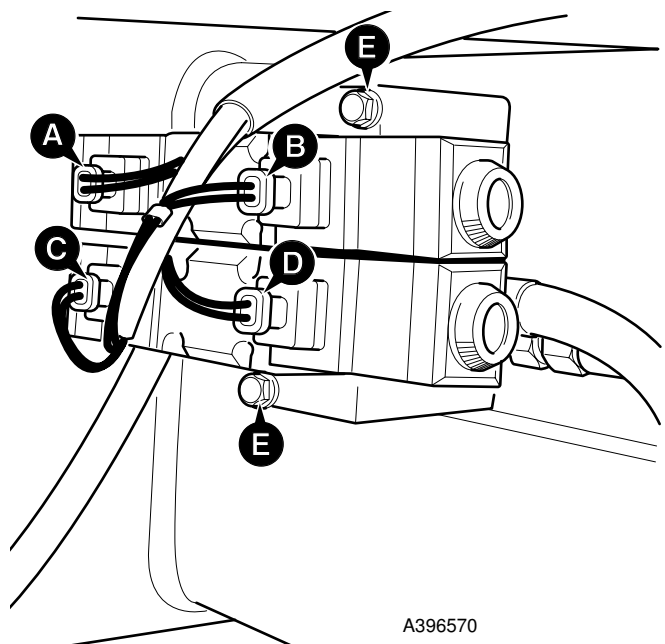
Replacement is a reversal of the removal sequence.

- 1 Make sure that the electrical solenoid connections are refitted in the correct position.
- 2 Make sure that the hoses are correctly installed. The hose connections from the steer mode valves assembly are as follows:

- P** - to hydraulic steer unit (L port)
- B** - to rear power track rod (left side)
- A** - to rear power track rod (right side)
- T** - to front power track rod (right side)

Note 2: The steer mode valves assembly ports should be stamped 'P', 'B', 'A' and 'T'. Left and right hand are as viewed from the rear of the machine.

- 3 Bleed the steering system, refer to **Service Procedures, Steering System - Bleeding**.



A396570

Dismantling and Assembly

The numerical sequence shown on the illustration is intended as a guide to dismantling.

For assembly the sequence should be reversed.

Dismantling

- 1 Before dismantling scratch an alignment mark **X** along the faces of the solenoid valves and the manifold block.

Note 1: Take care not to lose the detent balls **A** from items **16** and **18**.

Note 2: The illustration depicts a complete strip down, but to carry out specific servicing/repairs, e.g. renewal of one of the solenoids **3** and **6**, it is only necessary to dismantle the relevant components.

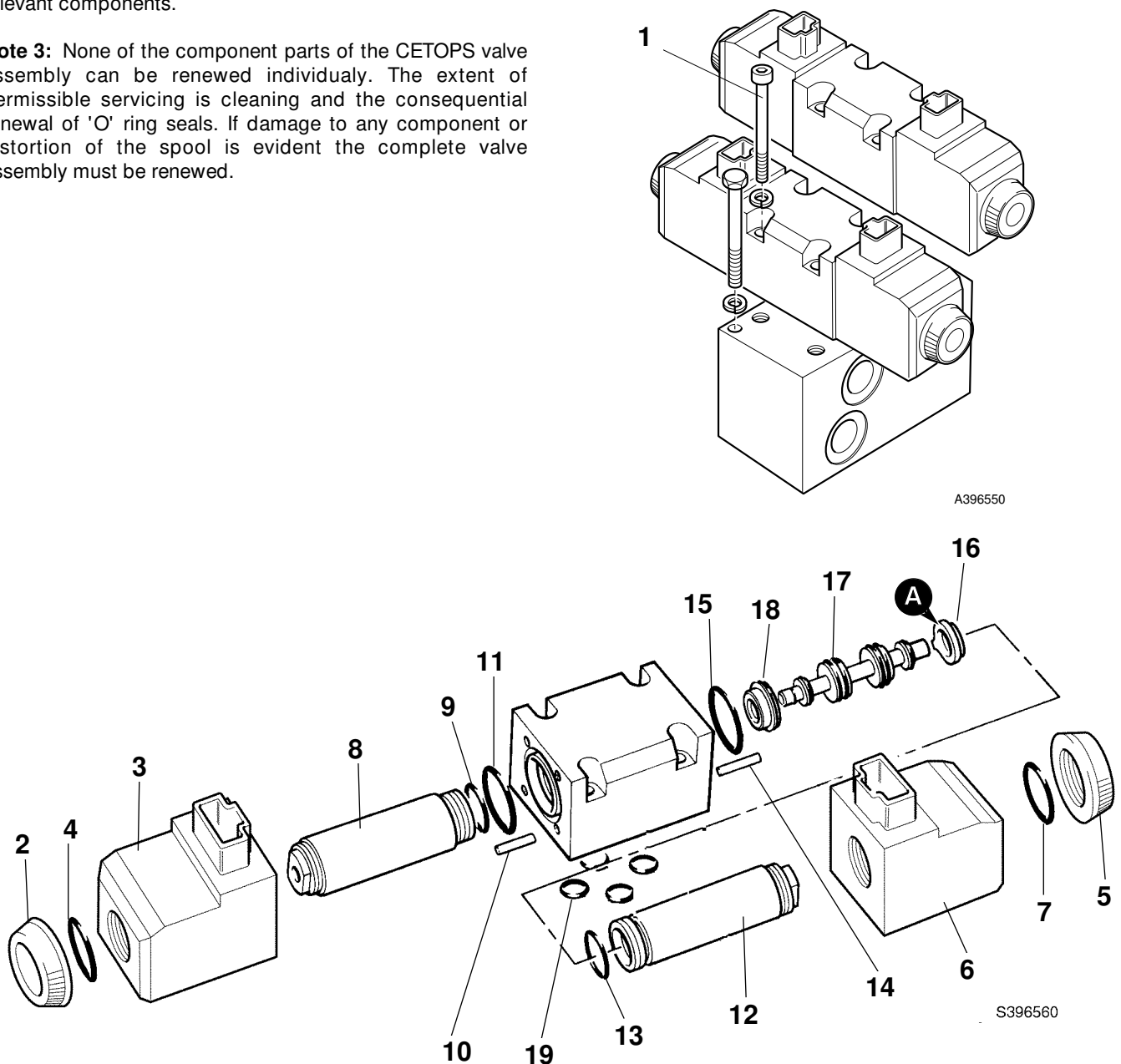
Note 3: None of the component parts of the CETOPS valve assembly can be renewed individually. The extent of permissible servicing is cleaning and the consequential renewal of 'O' ring seals. If damage to any component or distortion of the spool is evident the complete valve assembly must be renewed.

Assembly

- 1 Renew all 'O' rings.
- 2 Lubricate parts with JCB Special Hydraulic fluid before assembling.
- 3 Use the alignment marks **X** (see **dismantling**) to ensure that the solenoids and the manifold block are assembled correctly.

Torque Settings

Item	Nm	lbf in
1	7.1-9.1	63-80



Removal and Replacement

Removal

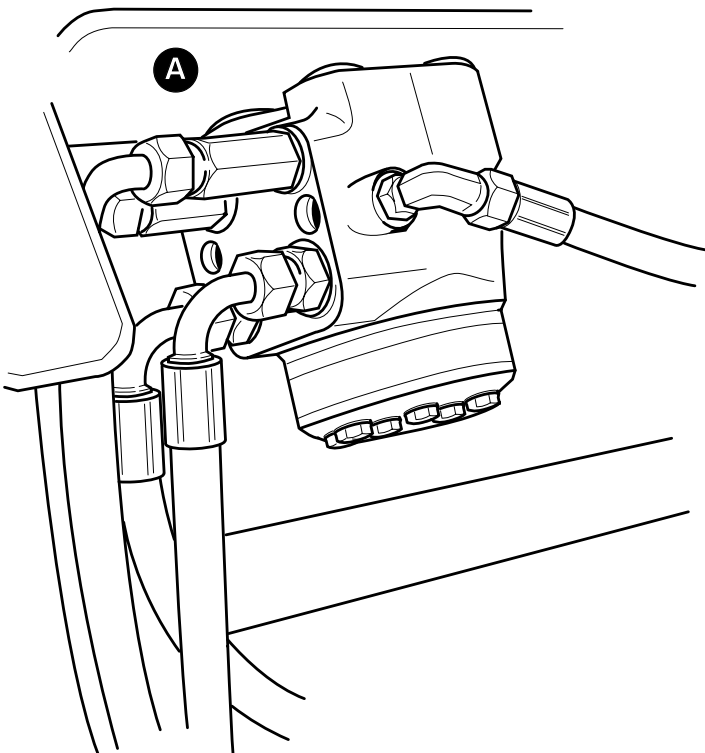
⚠ DANGER

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11/1

- 1 Park the machine on level ground, engage the parking brake and set the transmission to neutral. Lower the attachments to the ground. Stop the engine and remove the starter key.
- 2 Turn the steering wheel to the left and to the right several times to vent system pressure.
- 3 Disconnect and cap all hydraulic hoses from the steering unit as shown at **A**. Label the hoses to ensure correct refitting.
- 4 Get an assistant to hold the steering unit, and, working inside the cab, loosen and remove 4 bolts **B**. Lift the steering unit from the machine.



Replacement

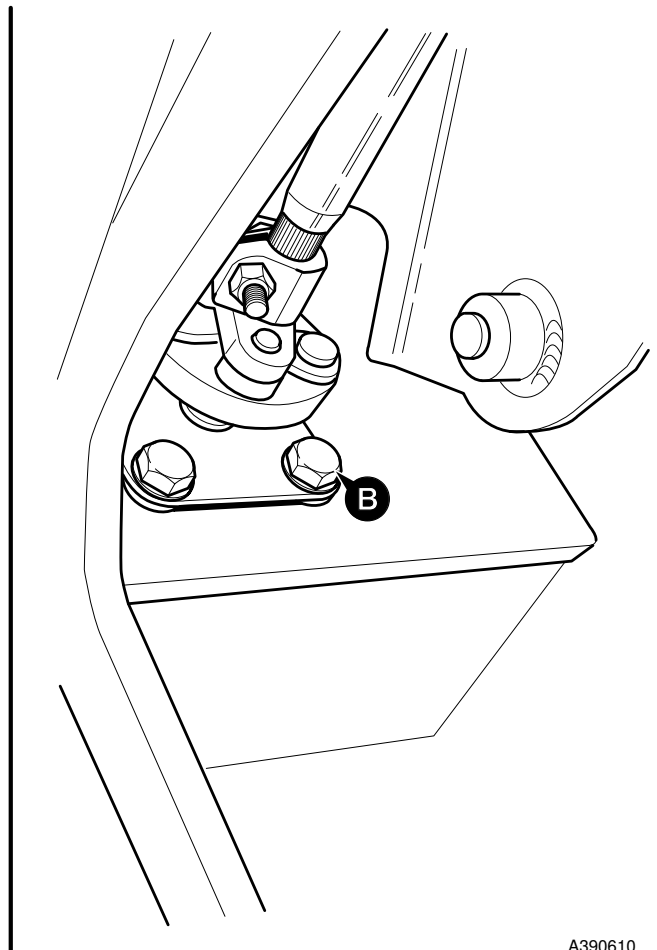
⚠ WARNING

Fine jets of hydraulic fluid at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic fluid leaks. Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of hydraulic fluid. If hydraulic fluid penetrates your skin, get medical help immediately.

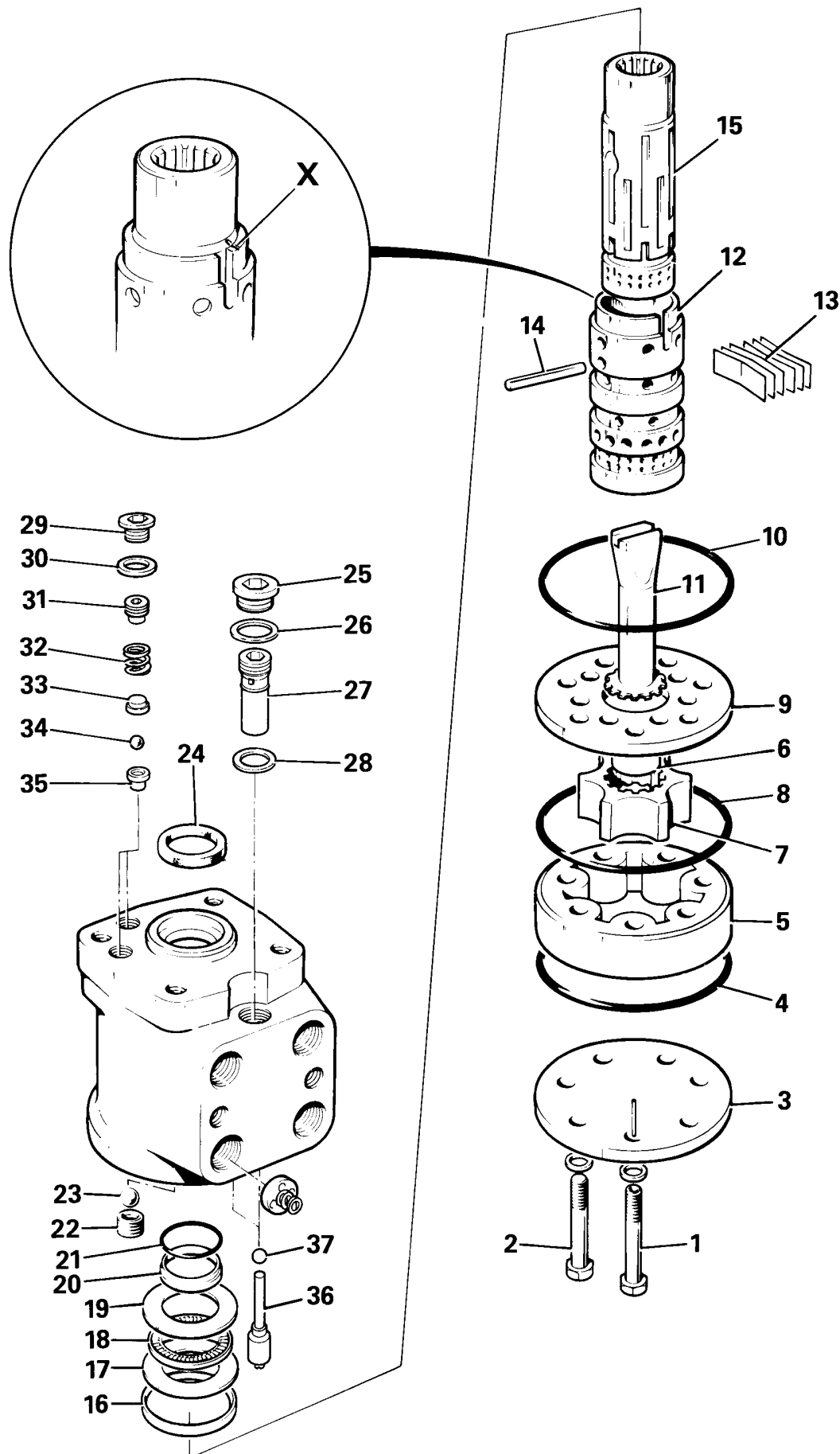
INT-3-1-10/1

- 1 Replacement is a reversal of the removal sequence. Make sure that the hoses are correctly installed.
- 2 Bleed the steering system. Refer to **Service Procedures, Steering System - Bleeding**.
- 3 If a new steering unit has been fitted then the system relief valve must be tested for correct pressure setting. Refer to **Service Procedures, Steering System - Pressure Testing**.

Note: All hydraulic adapters that are installed together with a bonded sealing washer must also have JCB Threadseal applied to the threads of the adapter.



A390610



S10221A

Dismantling and Assembly

The numerical sequence shown on the illustration is intended as a guide to dismantling.

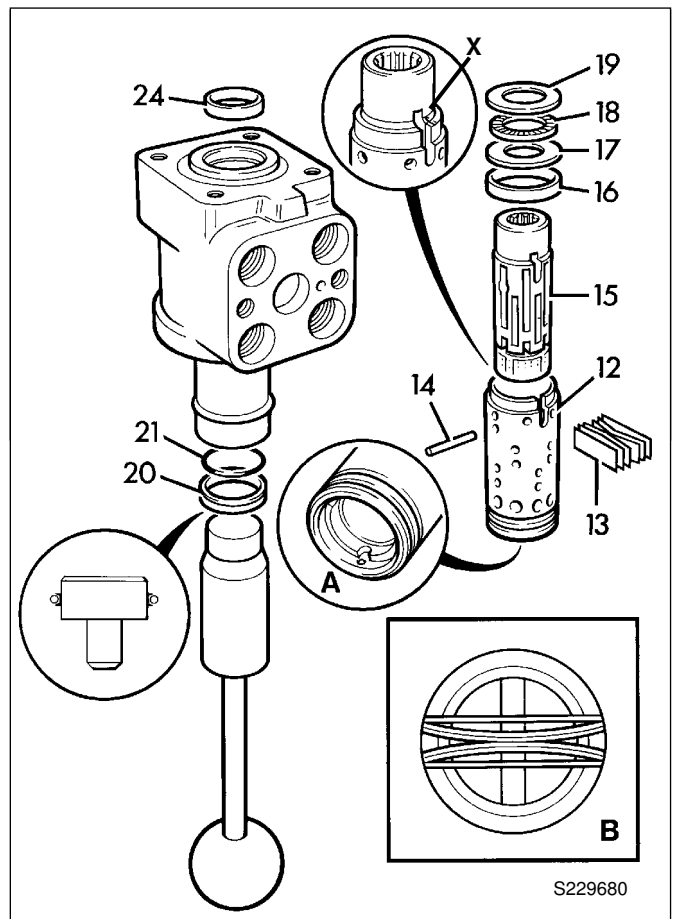
Note: 1 During manufacture, a small mark **X** will have been made on sleeve **12** and spool **15**, close to one of the slots for the centring springs **13**. Before removing the centring springs, check that this mark is visible; if not, make a new mark to ensure correct assembly.

Note: 2 Shock valves (items **29** to **35**) are pressure set during manufacture and the adjusting screw **31** secured with Loctite. Due to the difficulty of resetting the pressure it is recommended that the valves are not disturbed. If dismantling is unavoidable, however, measure and record the depth of adjusting screw **31** below the top face of the steering unit before removing the screw.

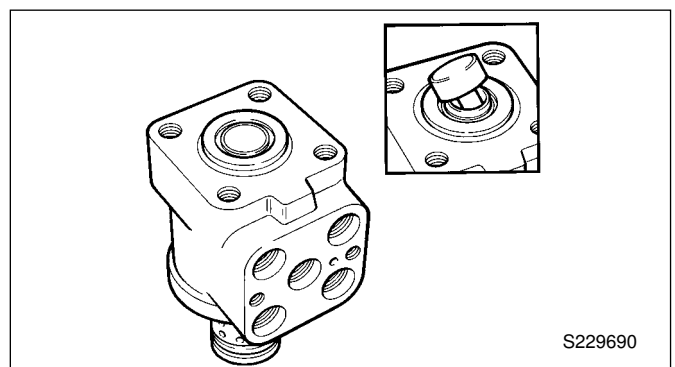
Note: 3 The unit illustrated in the following sequence represents a typical hydraulic steer valve. The relief valve (items **25** to **28**) and shock valves (items **29** to **35**) are not therefore shown in the following illustrations.

Assembly

- 1 Fit spool **15** into sleeve **12**, aligning slots for centring springs **13** and checking that the small marks **X** are aligned. Ensure that three slots in spool partially uncover three holes in sleeve, as at **A**.
- 2 Fit two flat centring springs **13** with four curved springs between them, as shown at **B**.
- 3 Fit seal **24** into steer unit body and insert sleeve of service tool 892/00180. Fit back up ring **20** and seal **21** onto plastic boss, and position on tool spindle, as shown.
- 4 Lower steering unit body and tool sleeve over tool spindle until plastic bush is flush with end of bore. Assemble sleeves **12** and **15** with cross pin **14** and centring springs **13**. Fit bearing components **16** to **19** with chamfered face of **17** facing away from bearing **18**.

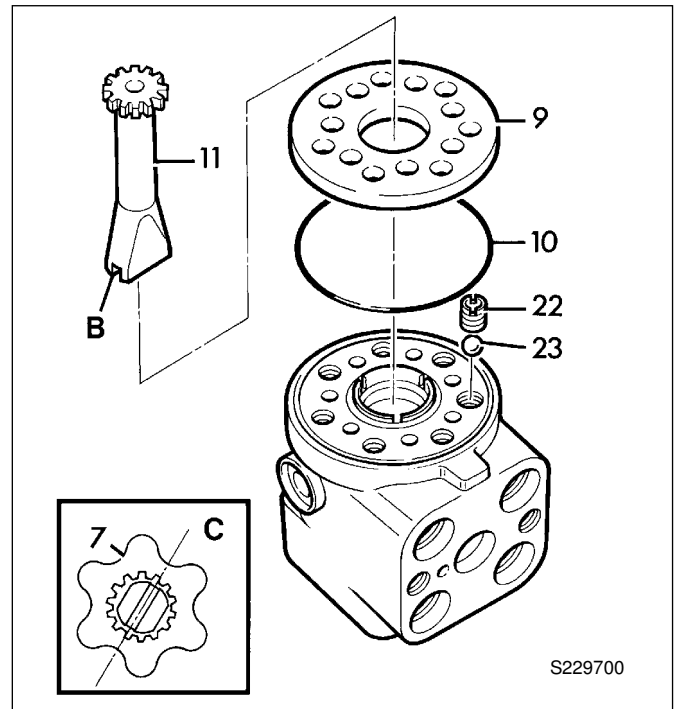


- 5 Remove body from tool leaving plastic bush in position, and lower body over assembled spool.
- 6 Apply downward pressure on body until plastic boss is forced out of bore, leaving seals correctly located.

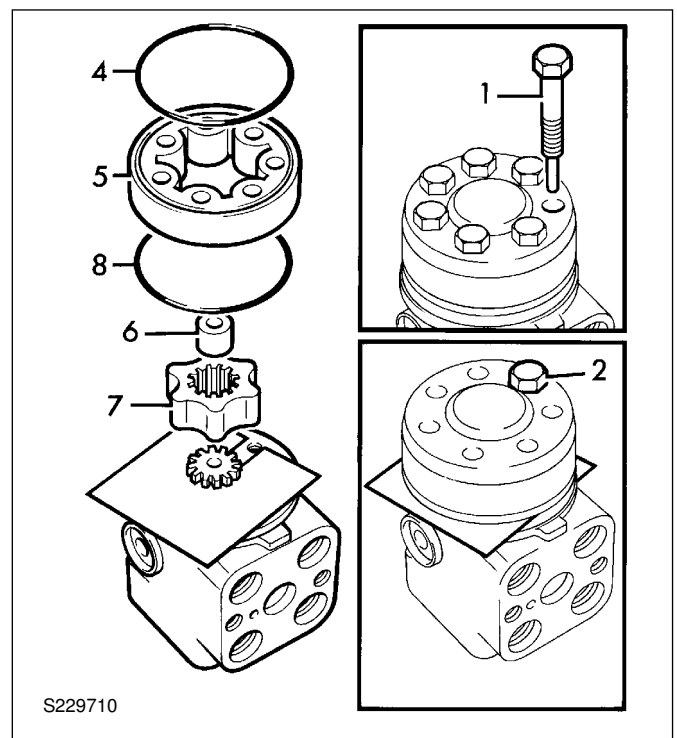


Assembly (Continued)

- 7 Invert unit and place on a suitable hollow support so that body does not rest on protruding sleeve, thus preventing displacement of the new seals. Place ball 23 into check valve hole and fit bush 22.
- 8 Fit new 'O' ring 10.
- 9 Fit distributor plate 9 ensuring that holes align. Locate shaft 11 onto cross-pin 14, noting position of slot. When rotor 7 is fitted, slot must align with hollows of rotor as shown at C.



- 10 Use a suitable piece of rigid flat material, 0.25mm (0.010 in.) thick, to support the shaft and ensure positive engagement with the splines of rotor 7.
- 11 Locate rotor onto shaft, ensuring alignment as at C. Fit spacing bush 6 into rotor.
- 12 Fit 'O' rings 4 and 8 each side of body 5, then position body over rotor.
- 13 Refit the end plate and fit at least one bolt 2 before removing support material.
- 14 Fit remaining bolts, ensuring that special bolt 1 is correctly located. Tighten all bolts to 29Nm (22 lbf ft).

**Pressure Relief Valve Cartridge**

After renewing the 'O' ring, torque tighten the cartridge to 50 Nm (37 lbf ft). The relief valve is preset, refer to **Technical Data** for the valve setting. The relief valve setting should be rechecked after fitting the steering unit to the machine. Refer to **Service Procedures, Steer System - Pressure Testing**.

Shock Valves

If the shock valves have been dismantled, clean the threads of adjusting screw 31 and the threads in the bore of the steering unit body using JCB Cleaner/Degreaser, allow to dry. Assemble seat 35, ball 34, cap 33 and spring 32 then coat threads of screw 31 with JCB Threadlocker and Sealer. Assemble screw to depth measured during dismantling then fit plug 29 and washer 30.