



Section H

Steering

Service Manual - 527-58

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Publication No.
9813/0200-2



World Class
Customer Support



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Steering SYSTEM

Introduction

This topic contains information about a machine SYSTEM. The system has some devices that connect either mechanically, hydraulically or electrically. Make sure you are referring to the correct system. Refer to the applications table. [⇒ Related Topics \(□ H1-2\)](#).

Descriptions and procedures relate to the system and not the individual devices. For information about the devices refer to the relevant topics. [⇒ Related Topics \(□ H1-2\)](#)

This topic is intended to help you understand what the system does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

[⇒ Related Topics \(□ H1-2\)](#)

[⇒ Specifications \(□ H1-3\)](#)

[⇒ Steering Pump \(□ H1-3\)](#)

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[⇒ Re-phasing the Road Wheels \(□ H1-22\)](#)

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Related Topics

Table 1. Related Topics in This Publication

The table lists other topics in the manual that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text in this section contains cross references to this page to help you find the correct information. Some machines have different systems and devices. Make sure you refer to the correct topic, refer to <i>Section 1 - Applications</i> .		
Sections	Topic Titles	Sub Titles
1	Applications	ALL
1	Service Tools	ALL
2	ALL (Care and Safety) ⁽¹⁾	ALL
3	Hydraulic System	Checking the Hydraulic Fluid Level
3	Wheel Alignment	
E	Schematics	ALL
E	Main Pump	Specifications
E	Main Pump	Pressure and Flow Tests - Steering Section
F	Wheels and Tyres	Tyres and Tyre pressures
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H	⇒ Priority Valve (□ H5-1)	ALL
H	⇒ Manual Steer Mode SYSTEM (□ H2-1)	ALL
H	⇒ Auto Steer Mode SYSTEM (□ H3-1)	ALL
H	⇒ Power Track Rod (□ H6-1)	ALL
H	⇒ Steering Column (□ H7-1)	ALL
M	Loadall Monitoring System	ALL
M	Fault Code SYSTEM	ALL

(1) You must obey all of the relevant care and safety procedures.

Table 2. Service Tools

The table lists the service tools you will need to do some of the procedures in this topic. Make sure you have the correct service tools BEFORE you start the procedures	
Tool Part Number	Description
892/01268 ⁽¹⁾	Digital Pressure Gauge
892/01271 ⁽¹⁾	Hose for Pressure Gauge
892/00253 ⁽¹⁾	Hydraulic Pressure Test Kit and Relevant Adaptors

(1) Tool available from JCB Service, refer to Section 1 - Service Tools

Specifications

Steering Pump

Table 3. Steering Pump

Type	Gear pump
	The steering pump specifications are part of the main hydraulic pump specifications. ➔ Related Topics (H1-2)

Hydraulic Steering Unit

Steer unit with load sensing, complete with integral relief valve and shock valves.

Model Reference:	Eaton 160cc
Volumetric Displacement	160 cc/rev
Relief Valve Operating Pressure (at 1500 revs/min)	190 bar (193 kgf/cm ² , 2755 lbf/in ²)
Shock Valve Operating Pressure	250 bar (255 kgf/cm ² , 3625 lbf/in ²)

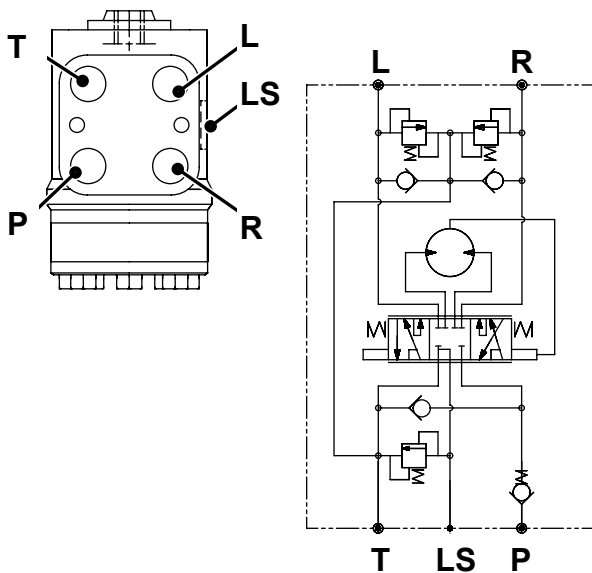


Fig 1.

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Priority Valve

Standby Pressure:	16 to 17 bar (16.3 to 17.3 kgf/cm ² , 232 to 246 lbf/in ²)
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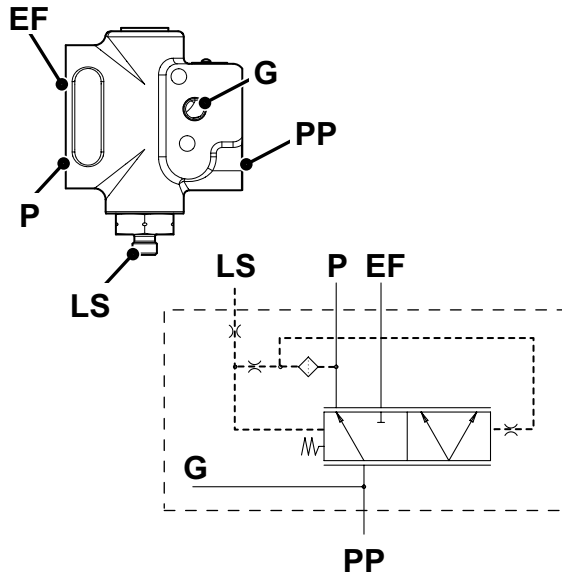


Fig 2.

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Operation Overview

There are four types of steering system installed on this machine. This topic describes the main steering system without steer mode options. This is a Permanent four wheel steer machine. The steer mode options and components are detailed in later topics.

- For Manual Steer Mode machines refer to [⇒ **Manual Steer Mode SYSTEM** \(□ H2-1\)](#)
- For Manual (Indicated) Steer Mode machines refer to [⇒ **Manual Steer Mode SYSTEM** \(□ H2-1\)](#)
- For Automatic Steer Mode machines refer to [⇒ **Auto Steer Mode SYSTEM** \(□ H3-1\)](#)

Component Location

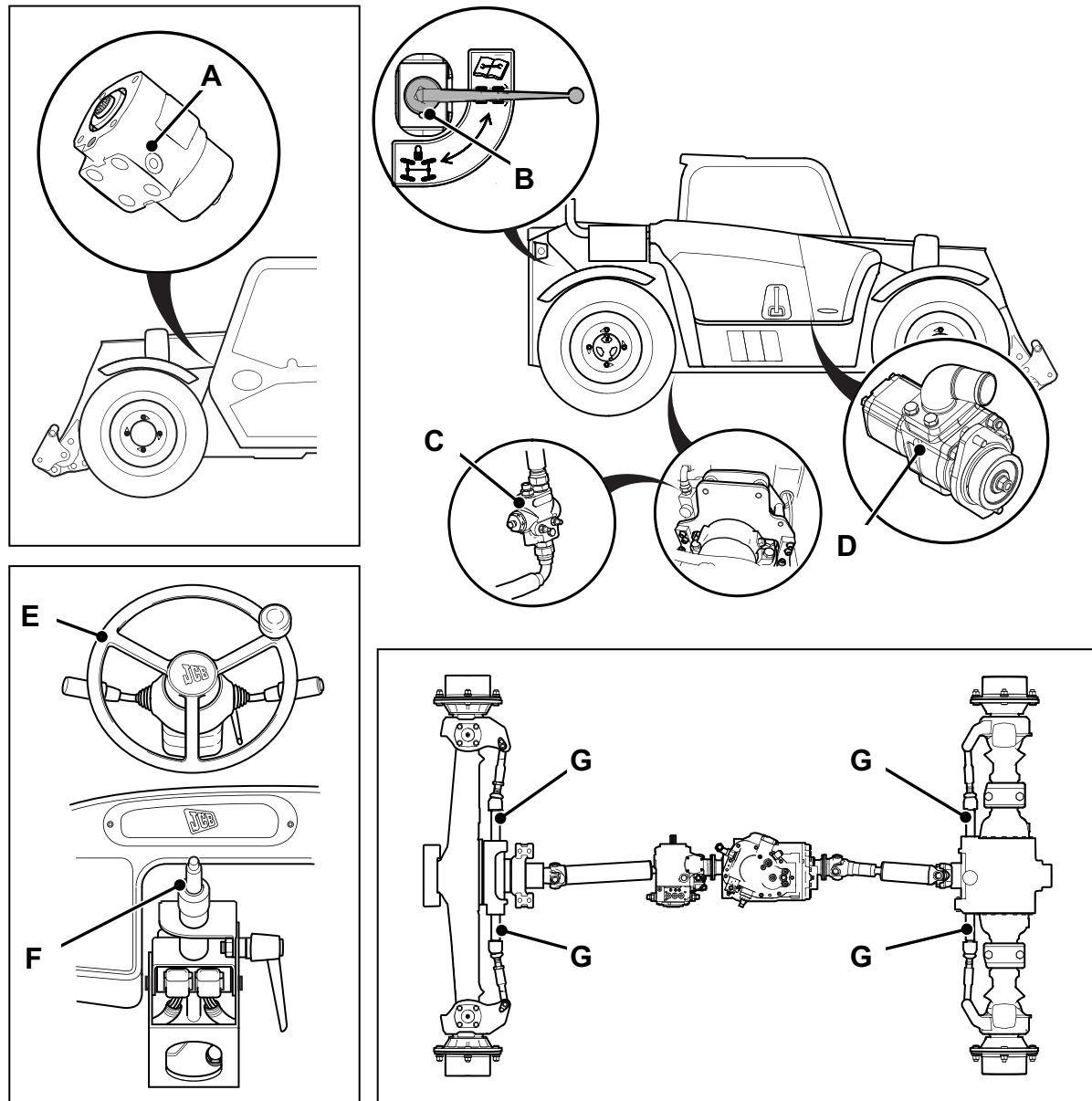


Fig 3. Component Location

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Component Key:	
A	Steer Unit
B	Steer Isolation Valve
C	Priority Valve

Component Key:	
D	Hydraulic Pump
E	Steering Wheel
F	Steering Column
G	Power Track Rods

⇒ [Fig 3. \(□ H1-6\)](#)

The main components of the permanent 4 wheel steering system are the priority valve **C**, load sensing steer unit **A**, steer isolation valve **B**, and double acting power track rod rams **G**.

When the steering wheel **E** is turned, the movement is transferred to the steer unit **A** via the steering column **F**. At the steer unit a pressure signal (demand) is generated in the load sense line from the steer unit to the priority valve. The priority valve **C** then directs oil from the hydraulic pump **D** to the steer unit **A**, which in turn directs the flow to the power track rods **G** on the axles.

When the steering lock is achieved, the pressure signal in the load sense line ceases. The priority valve then directs the oil from the hydraulic pump into the main hydraulic system for operation of the hydraulic services.

The maximum steering system pressure is set by a relief valve housed inside the steer unit **A**.

An isolation valve **B** is installed to isolate the rear wheels during the wheel alignment procedure. This valve is not used on machines with selectable steer modes.

For full details of hydraulic circuits, see **Section E-Hydraulic Schematics**. ⇒ [Related Topics \(□ H1-2\)](#)

Hydraulic Operation and Schematics

This diagram shows the permanent 4 Wheel Steer circuit. For diagrams of the different steer modes refer to the steer mode system topic. → [Related Topics](#) (H1-2)

Component Key:	
1	Hydraulic Pump
1a	Priority Valve
2	Steer Unit
2a	Steering System Relief Valve
3	Steer Isolation Valve
4	Power Track Rod - Front Axle
5	Power Track Rod - Rear Axle
6	Hydraulic Tank

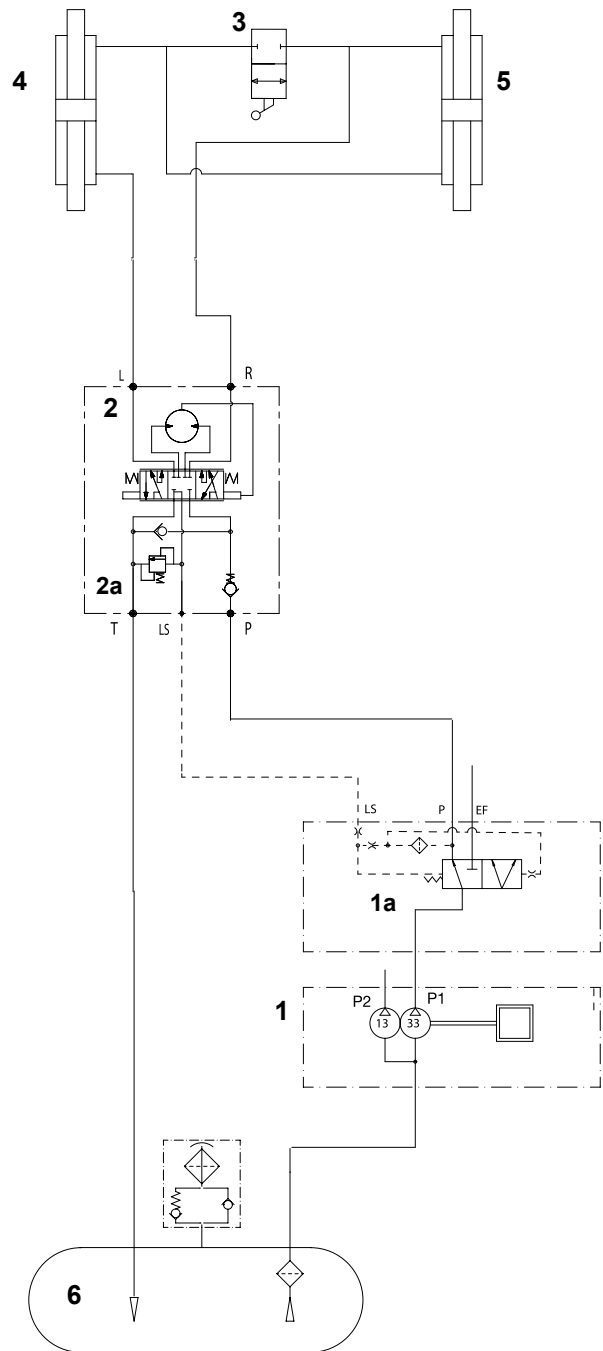


Fig 4.

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Priority Valve Operation

Neutral

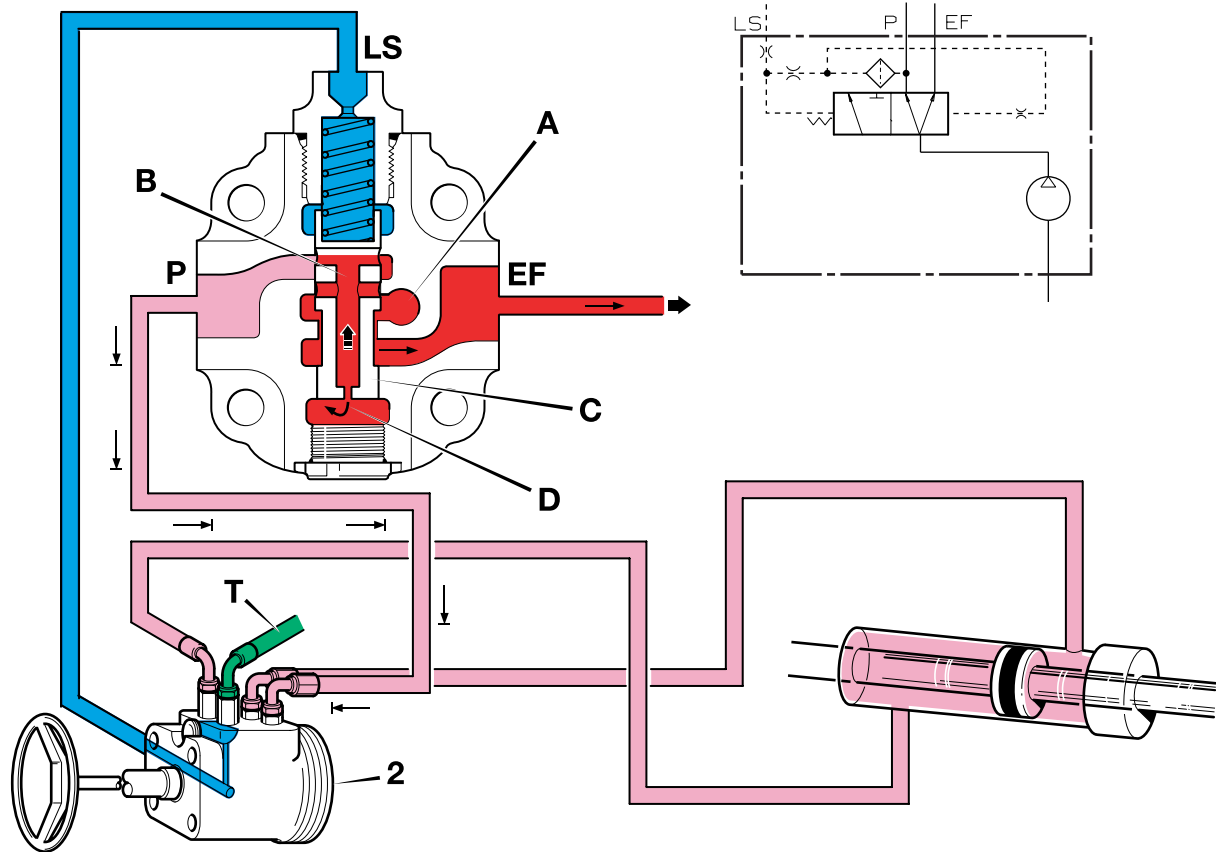


Fig 5.

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Note: The illustration is for the purpose of explanation only and is not necessarily an accurate pictorial representation of the valve.

The priority valve supplies hydraulic oil to the steering circuit on demand.

When the steering is not being operated, flow to the steering circuit is dead ended by the 'closed centre' steering unit **2**, and no pressure signal (demand) is generated in the load sense line **LS**. Pressure from the pump outlet at **A** is directed through orifice **B** and orifice **D**, onto the end of the priority valve spool **C**. This creates a large pressure difference across the spool, causing it to move up against the force of the spring. This allows the full pump flow to be directed through port **EF** back to tank (triple pump), or to the loader control valve (double pump) as applicable. See **Section E- Hydraulic Schematics**.

⇒ [Related Topics](#) ([H1-2](#))

Turning

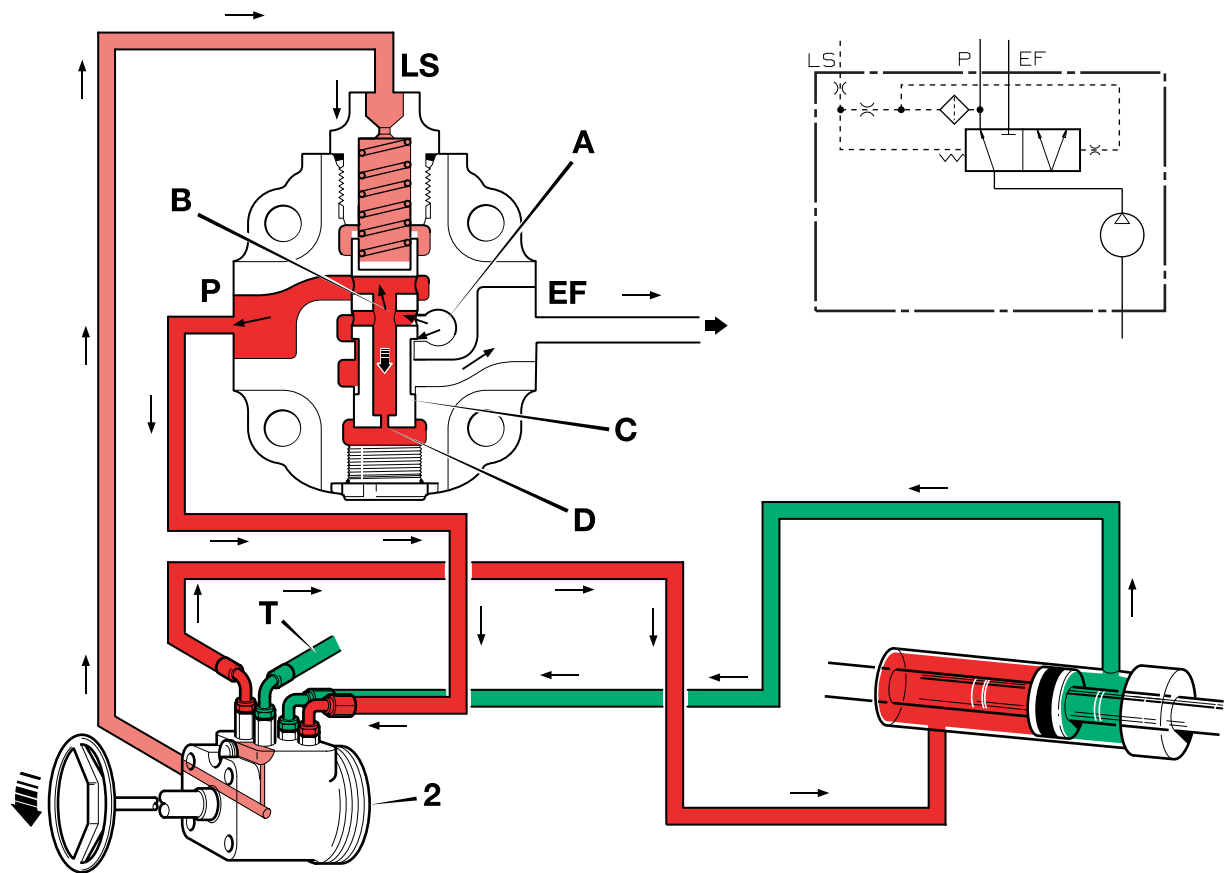


Fig 6.

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When the steering wheel is turned, a pressure signal (demand) is generated in the load sense line **LS** from the steering unit **2**.

The maximum steering system pressure is set by a relief valve housed inside the steering unit **2**.

Pressure is then applied to the spring end of the priority valve spool **C**. This reduces the pressure difference across the spool, causing it to move down under spring force. This allows some of the pump outlet flow at **A** to be directed through port **P** to the steering unit **2**, which in turn directs the flow to the corresponding steer rams to turn the wheels.

The excess flow goes through port **EF** back to tank (triple pump), or to the loader control valve (double pump) as applicable. See **Section E- Hydraulic Schematics**.

⇒ Related Topics ( H1-2)

When the steering reaches the required position, the pressure signal in the load sense line **LS** from the steering unit ceases, restoring the pressure difference across the spool **C**. The spool moves back up, allowing the full pump flow to be directed through port **EF** back to tank (triple pump), or to the loader control valve (double pump) as before.

Hose and Pipework

This diagram shows the permanent 4 Wheel Steer circuit. For diagrams of the different steer modes refer to the steer mode system topic. [➔ Related Topics \(H1-2\)](#)

Component Key:	
1	Rear Power Track Rod
2	Steer Isolation Valve
3	Steer Unit
4	Front Power Track Rod

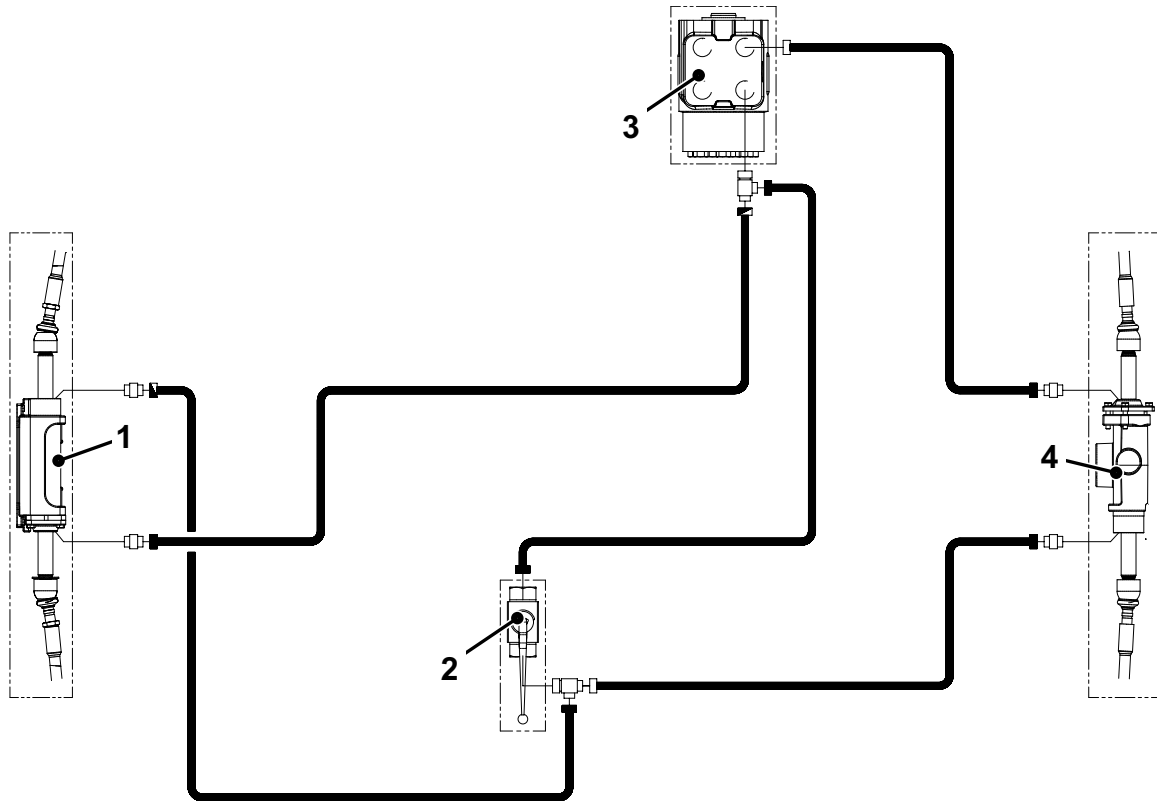


Fig 7.

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Fault Finding

The purpose of this section is to help you trace faults to a faulty unit (valve, actuator, ram, solenoid, proximity switch, etc.). Once you have located the fault, refer to the appropriate dismantling, inspecting and test instructions given elsewhere in the steering section.

To help identify circuits, switches, valves, rams etc. mentioned in the fault finding procedures, refer also to the electrical schematic diagrams in **Section 1 - Electrical Schematics** or the hydraulic schematic diagrams in **Section 1 - Hydraulic Schematics** as applicable.
⇒ [Related Topics \(H1-2\)](#)

- 1 Before you begin fault finding, read the Safety information at the beginning of this manual.
- 2 Make any relevant electrical checks before moving on to the hydraulics.
- 3 Make simple checks before say, stripping a major component.
- 4 Make sure that the hydraulic fluid is at correct working temperature (50 °C, 122 °F).
- 5 Whatever the fault, check the condition of the hydraulic fluid. Drain and replace if necessary.
- 6 Be sure to remove ALL contamination and if possible identify its origin. It may be part of a component from elsewhere in the circuit.
- 7 Replace any seals such as 'O' rings before re-assembling hydraulic components.

Note: The Transmission ECU will generate a fault code for some fault conditions, refer to **Section M - Fault Code SYSTEM**. ⇒ [Related Topics \(H1-2\)](#)

Tables

Fault Descriptions:

⇒ [Table 4. Steering wheel difficult to turn. \(H1-13\)](#)

⇒ [Table 5. Steering wheel turns on its own. \(H1-13\)](#)

⇒ [Table 6. Machine will not turn when the steering wheel turned. \(H1-14\)](#)

⇒ [Table 7. Steering 'drifts' out of phase during operation. \(H1-15\)](#)

⇒ [Table 8. Steering fails to respond to selected mode \(solenoid operated mode valve only\) \(H1-16\)](#)

Table 4. Steering wheel difficult to turn.

Possible Cause	Action
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.
Priority valve not operating correctly.	– Check if the priority valve is sticking (contamination) rectify as required. – Check the load sense line from the steer unit to the priority valve for signs of leaking or poor connection.
Steer mode valve not operating correctly.	– Check if spools sticking, rectify as required. – Check if solenoids operating, replace solenoids as required.
Mechanical failure.	Check for damaged axle components, such as rams, track rods, linkages, etc.

Table 5. Steering wheel turns on its own.

Possible Cause	Action
Dirt in the steer control unit (causing sleeves to stick open)	Clean and inspect unit.
Steer control valve centring springs damaged, broken or missing.	Check steer unit.
Steer control valve - position of rotor to shaft slot incorrect.	Correct as required. ➔ Hydraulic Steering Unit (□ H4-1)

Table 6. Machine will not turn when the steering wheel turned.

Possible Cause	Action
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.
Priority valve not operating correctly.	– Check if the priority valve is sticking (contamination) rectify as required. – Check the load sense line from the steer unit to the priority valve for signs of leaking or poor connection.
Steer mode valve not operating correctly.	– Check if spools sticking, rectify as required. – Check if solenoids operating, replace solenoids as required.
Mechanical failure.	Check for damaged axle components, such as rams, track rods, linkages etc.
Steer column splined shaft not fully engaged in steer valve.	Check shaft engagement.
Power track rod failure.	Check power track rod for signs of damage, leaks etc.
Electrical failure.	Check relevant electrical connectors, if problem still persists, do a wiring continuity check on relevant circuits.
Note: The Transmission ECU will generate a fault code for some fault conditions, refer to Section M - Fault Code SYSTEM . ➔ Related Topics (H1-2)	

Table 7. Steering 'drifts' out of phase during operation.

Action	Yes	No
1 Does steering go out of phase in less than four hours of continuous use?	Go to 2.	Ensure system is rephased after four hours of continuous use (see Operator's Handbook).
2 Does steering go out of phase by a small amount and drift no further when changing steer modes?	Go to 3	Go to 4
3 Ensure operator changes steer mode at low engine speed and observes 5 second delay between modes (see Operator's Handbook), OK now?	Done	Ensure power track-rod piston is centralised and wheel tracking is correct. Adjust alignment of steer proximity switches to optimise accuracy.
4 Bleed steering system to remove air. OK now?	Done	Go to 5
5 Possible leakage through anti-cavitation valve (if fitted). Bypass the anti-cavitation valve. OK now?	Done	Go to 6
6 Check both front and rear power track rods for internal leakage. ⇒ Checking for Internal Hydraulic Leakage (H1-17) Check correct seal/energising ring fitted, check the seal damage, scoring or bore ovality. Re-seal or renew faulty unit(s). OK now?	Done	Go to 7
7 Strip steer mode valve and inspect spool for scoring or damage. Renew valve if required. OK now?	Done	Go to 8
8 Check for contamination in the hydraulic system which can cause one of the already detailed problems. Is the system contaminated?	Filter the hydraulic system	It is likely that one of the preceeding tests was not conclusive. Go to 1.

Table 8. Steering fails to respond to selected mode (solenoid operated mode valve only)

Possible Cause	Action
Electrical failure. Note: The Transmission ECU will generate a fault code for some fault conditions, refer to Section M - Fault Code SYSTEM . ⇒ Related Topics (□ H1-2)	Check relevant electrical connectors, if problem still persists, do a wiring continuity check on relevant circuits.
Selector switch faulty.	Check selector switch, replace as required.
Proximity switches not operating correctly.	Check setting of proximity switches, reset or replace switches as required. ⇒ Related Topics (□ H1-2)
Steer mode relay not operating correctly	Renew relay.
Steer mode valve not operating correctly.	– Check if spools sticking, rectify as required. – Check if solenoids operating in accordance with mode selected. ⇒ Related Topics (□ H1-2)
Leaks in the relevant hoses or component connections.	Check hoses and connections for leaks.
ECU failure.	The ECU is normally a reliable component and failure is unlikely. Before renewing the ECU make sure that all relevant electrical connections and components are functioning correctly ⁽¹⁾ .

(1) Do not connect a test meter directly to the pins on the ECU.

Test Procedures

Checking for Internal Hydraulic Leakage

If hydraulic leaks occur at the steer mode valve or power track rods the steering system will go progressively out of phase, the more the steering is operated the further the front and rear wheels will 'drift' out of phase.

Note: Some drifting out of phase is normal over time and the system must be routinely re-phased. → [Re-phasing the Road Wheels \(□ H1-22\)](#).

If the system goes out of phase over short periods of time it is probable that there is hydraulic leakage. External leakage is obvious and may occur at track rod seals, relevant hoses, pipes and adaptors. Internal leakage can occur across power track rod piston seals or within the steer mode valve.

When identifying internal leakage proceed as follows;

For 4WS mode faults both front and rear track rods and the steer mode valve must be investigated individually for possible leakage.

For 2WS mode faults it is possible to identify if internal leakage is at the rear power track rod, or steer mode valve without first removing and dismantling components. Proceed as follows:

- 1 Stop the engine and remove the starter key. Disconnect the hydraulic hoses **A** at the rear power track rod. Fit an isolating ball valve **B** at each port on the track rod and then reconnect the hoses.
- 2 Open the ball valves. Start the engine and bleed the system. → [Bleeding the System \(□ H1-23\)](#)
- 3 Set the machine in 2-wheel steer mode and then close the ball valves **B**. Measure the length of one side of the track rod **C** and record the value.
- 4 Drive the machine, in a circle, in one direction, several times. Stop the machine and re-measure the track rod length. Compare the measurements.

If the track rod has moved then it can be assumed that there is internal leakage across the piston seals in the power track rod. This may be due to worn or

damaged seals, or due to a worn or damaged cylinder bore. → [Power Track Rod \(□ H6-1\)](#)

If the track rod has not moved it can be assumed there is internal leakage at the steer mode valve.

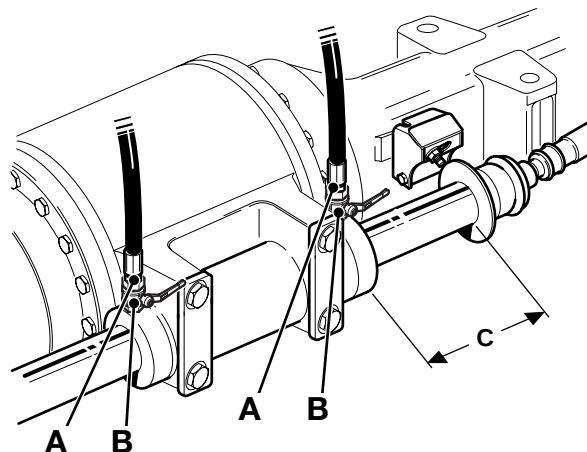


Fig 8. Typical Power Track Rod

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Checking Energiser Seals

If having repeated difficulty in steering the machine and routine fault finding indicates power track rod leakage, it is possible that the power track rod piston head rectangular section piston head seal may have been incorrectly installed i.e. twisted.

It will be necessary to check both front and rear power track rods.

- 1 Dismantle ram, remove piston seal **A** and check to see if energiser seal **B** has been installed twisted or rolled. Inspect the cylinder bore and piston rod for scoring, nicks and burrs.

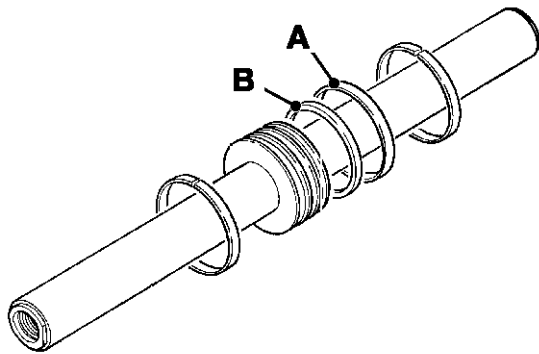


Fig 9.

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- 2 Assemble ram using new seals, make sure seal **B** is not twisted or rolled, check the white installation marks.

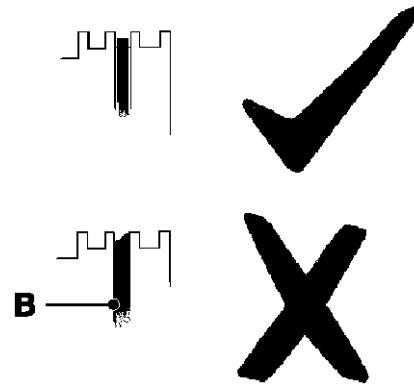


Fig 10.

9781-C1

To prevent damage to the seals when fitting the piston rod assembly into the cylinder, clamp the cylinder in the vertical position and lower the piston rod assembly into the cylinder. [⇒ Fig 11. \(□ H1-18\)](#)

- 3 Fit new wiper seals (not shown).
- 4 Refit the power track rod assembly.
- 5 Check tracking. [⇒ Power Track Rod \(□ H6-1\)](#)
- 6 Check for correct operation and steer phasing. Replenish hydraulic tank as required and check for leaks.

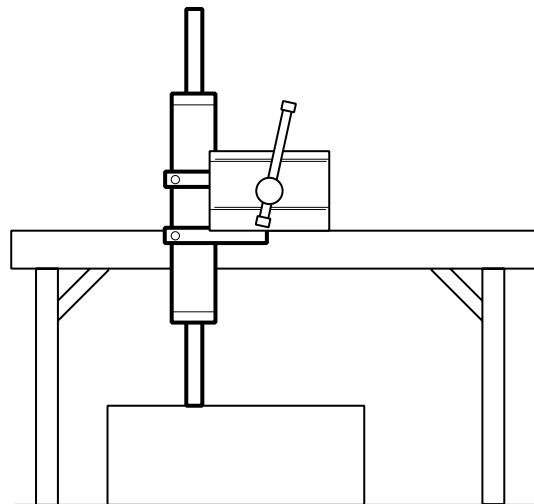


Fig 11.

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Hydraulic Pressure Tests

Standby Pressure

- 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 attachments to the ground. Apply the park brake, put the transmission in neutral and stop the engine. Block both sides of all four wheels.

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

GEN-4-1_1

- 3 Disconnect hose **A** from the steer valve **C** and install a 0 - 70 bar (0 - 1000 lbf/in²) pressure test gauge (892/01268) and 'T' piece between the hose **A** and the steer valve P port **B**.

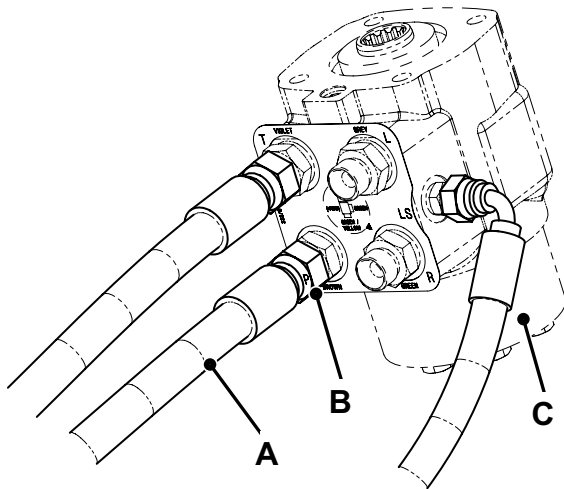


Fig 12.

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- 4 Set the steering to neutral, i.e. do not turn the steering wheel, and start the engine.

The pressure should be as stated in the specifications. [⇒ Priority Valve \(□ H1-4\)](#)

If the pressure is outside the limits try cleaning the priority valve. [⇒ Cleaning \(□ H5-5\)](#)

If cleaning the valve does not rectify, check the steering pump section flow rate and pressure, see **Section E - Hydraulics**. [⇒ Related Topics \(□ H1-2\)](#)

If the hydraulic pump flow and pressure tests are satisfactory, then the priority valve must be renewed. [⇒ Removal and Replacement \(□ H5-6\)](#)

Steering Pressure

- 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 attachments to the ground. Apply the park brake, put the transmission in neutral and stop the engine. Block both sides of all four wheels.

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

GEN-4-1_1

- 3 Disconnect hose **A** from the steer valve **C** and install a 0 - 70 bar (0 - 1000 lbf/in²) pressure test gauge (892/01268) and 'T' piece between the hose **A** and the steer valve P port **B**.
- 4 Run the engine at 1500 rpm and turn the steering wheel to full lock. Hold the wheel on full lock and check the gauge reading. This should be equal to the relief valve operating pressure.
[⇒ Specifications \(□ H1-3\)](#)
- 5 If necessary, adjust the pressure setting by removing plug **D** on the hydraulic steer unit.
- 6 Using an allen key, adjust the valve screw **E** until the correct pressure is shown on the gauge.

Note: The pressure adjusting screw **E** can be accessed through a cut-out at the base of the steering column after first removing the panels.

It may be necessary to remove the hydraulic steer unit if access is restricted.

- 7 Refit the plug **D**.

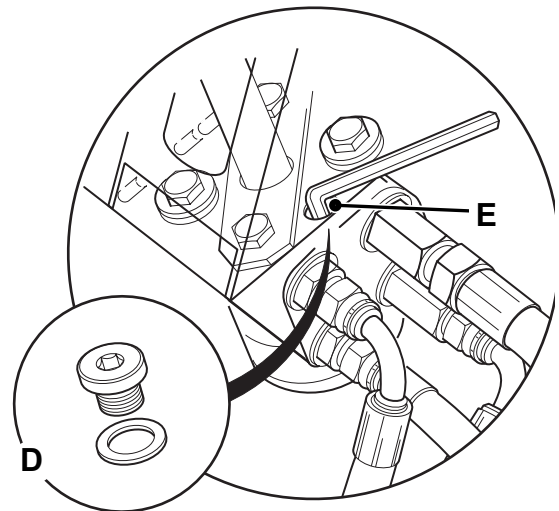
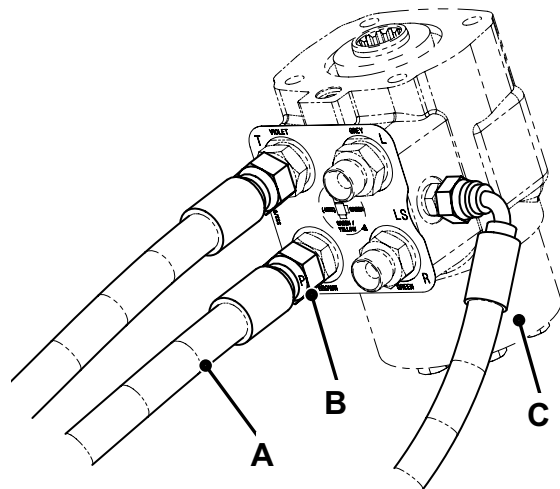


Fig 13.

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Steer Priority Valve - Cleaning

Refer to the Priority Valve device topic for cleaning procedure. [⇒ Priority Valve \(□ H5-1\)](#)

Re-phasing the Road Wheels

For this procedure refer to **Section 3 - Routine Maintenance**. [⇒ Related Topics \(□ H1-2\)](#)

Bleeding the System

Machines with Permanent Four Wheel Steer

If a steering system component has been replaced, e.g., a steer ram, or after a steering hose burst the following procedure must be followed:

- 1 Start the engine.
- 2 Carefully raise the front wheels just clear of the ground.
- 3 Stop the engine.
- 4 Move the setting lever **A** to the Unlocked position **U** as shown.

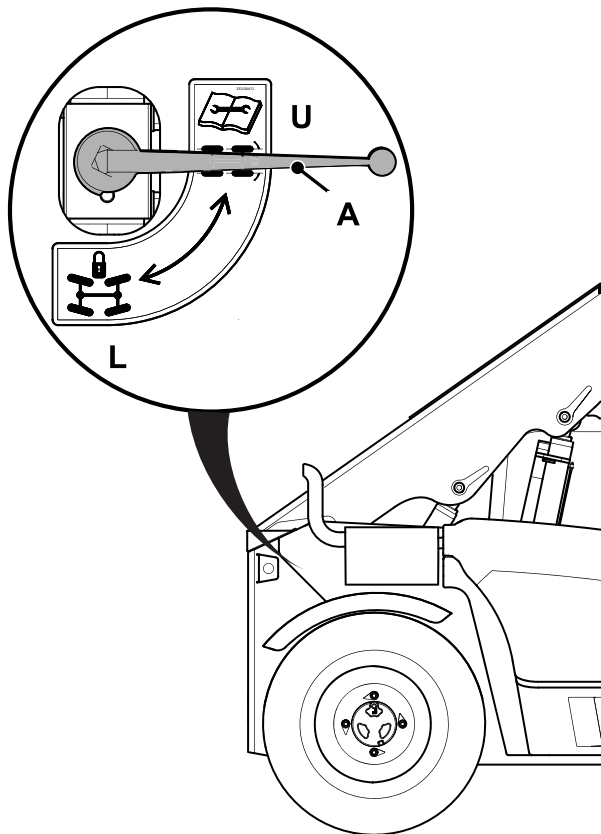


Fig 14.

C094630

- 5 Start the engine.
- 6 Turn the steering wheel to full left lock (only the rear wheels will move).
- 7 Stop the engine.
- 8 Disconnect the hydraulic hose from the rod side of the rear steer ram, draining the hydraulic fluid into a suitable container.
- 9 Start the engine.
- 10 Turn the steering wheel to full right lock.
- 11 Stop the engine.
- 12 Reconnect the rear steer ram rod side hose.
- 13 Start the engine.
- 14 Turn the steering wheel to full right lock.
- 15 Move setting lever **A** to the LOCK position **L** as shown.
- 16 Repeat steps 1 to 16 if necessary.
- 17 Lower the front wheels to the ground and stop the engine.
- 18 Top up the hydraulic fluid level as required.

Machines with Auto Steer Mode System

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.

Machines with Manual Steer Mode System

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

This procedure must be carried out in the correct order that is laid down. You must not alter the order of selections and operations.

- 1** Start the Engine.
- 2 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.
 - c** Turn steering wheel to left until front wheels are in the straight ahead position.
- 3 Select 4 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 in the straight ahead position.
- 4 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.
 - d** Turn steering wheel to left until front wheels are in the straight ahead position.
- 5 Select 4 Wheel Steer.**
 - a** Turn steering wheel to left, until the front wheels are fully locked to the left.
 - b** Turn steering wheel to right until front wheels are in the straight ahead position.
- 6 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.
 - d** Turn steering wheel to left until front wheels are in the straight ahead position.
- 7 Select 4 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 in the straight ahead position.
- 8 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.
 - d** Turn steering wheel to left until front wheels are in the straight ahead position.
- 9 Select 4 Wheel Steer.**

Turn steering wheel to left, until the front and rear wheels are fully locked.
- 10** Stop the engine and top up the hydraulic tank as required.



Section H1 - Steering Steering SYSTEM

Bleeding the System

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Manual Steer Mode SYSTEM

Introduction

This topic contains information about a machine SYSTEM. The system has some devices that connect either mechanically, hydraulically or electrically. Make sure you are referring to the correct system. Refer to the applications table. [⇒ Related Topics \(□ H2-2\)](#).

Descriptions and procedures relate to the system and not the individual devices. For information about the devices refer to the relevant topics. [⇒ Related Topics \(□ H2-2\)](#)

This topic is intended to help you understand what the system does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

[⇒ Related Topics \(□ H2-2\)](#)

[⇒ Operation Overview \(□ H2-3\)](#)

[⇒ Hydraulic Operation and Schematics \(□ H2-4\)](#)

[⇒ Electrical Operation and Schematics \(Indicated System Only\) \(□ H2-9\)](#)

[⇒ Fault Finding \(□ H2-12\)](#)

[⇒ Test Procedures \(□ H2-13\)](#)

[⇒ Bleeding the System \(□ H2-14\)](#)

[⇒ Re-phasing the Road Wheels \(□ H2-15\)](#)

[⇒ Proximity Switch - Setting \(Indicated machines Only\) \(□ H2-16\)](#)

Related Topics

Table 1. Related Topics in This Publication

The table lists other topics in the manual that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text in this section contains cross references to this page to help you find the correct information. Some machines have different systems and devices. Make sure you refer to the correct topic, refer to <i>Section 1 - Applications</i> .		
Sections	Topic Titles	Sub Titles
1	Applications	ALL
1	Service Tools	ALL
2	ALL (Care and Safety) ⁽¹⁾	ALL
3	Hydraulic System	Checking the Hydraulic Fluid Level
3	Wheel Alignment	
E	Main Pump	Specifications
E		Pressure and Flow Tests - Steering Section
F	Wheels and Tyres	Tyres and Tyre pressures
F	Transmission	Hydrostatic Transmission SYSTEM
H	⇒ Hydraulic Steering Unit (□ H4-1)	ALL
H	⇒ Priority Valve (□ H5-1)	ALL

(1) You must obey all of the relevant care and safety procedures.

Table 2. Service Tools

The table lists the service tools you will need to do some of the procedures in this topic. Make sure you have the correct service tools BEFORE you start the procedures	
Tool Part Number	Description
892/01268 ⁽¹⁾	Digital Pressure Gauge
892/01271 ⁽¹⁾	Hose for Pressure Gauge
892/00253 ⁽¹⁾	Hydraulic Pressure Test Kit and Relevant Adaptors

(1) Tool available from JCB Service, refer to Section 1 - Service Tools

Operation Overview

There are two types of manual steer mode system:

- Manual Steer Mode
- Manual (Indicated) Steer Mode.

Both systems are the same but the indicated system has proximity switches to indicate when the wheels are in the straight ahead position. [⇒ Electrical Operation and Schematics \(Indicated System Only\) \(□ H2-9\)](#)

Three steering modes are available:

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

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. The crab steer mode allows the machine to be driven diagonally.

Hydraulic Operation and Schematics

Operation - 2-Wheel Steer Selected

⇒ **Fig 1. (H2-4)**. With the spool of steer mode control valve **V** in the 2-wheel steer position there is a hydraulic connection between the steer unit **S** and the front power track rod **F**. (Steer mode control valve ports **T** and **P** are internally connected). The oil feed to the rear axle power track rod **R** is blocked by the spool assembly and the axle is held in the straight ahead position by the locked-up hydraulic oil in the track rod ram.

When the steering wheel is turned, only the front power track rod **F** is operated by the steering unit **S**.

If the steering wheel is turned to the left, the oil flow is reversed and the machine will turn in the opposite direction.

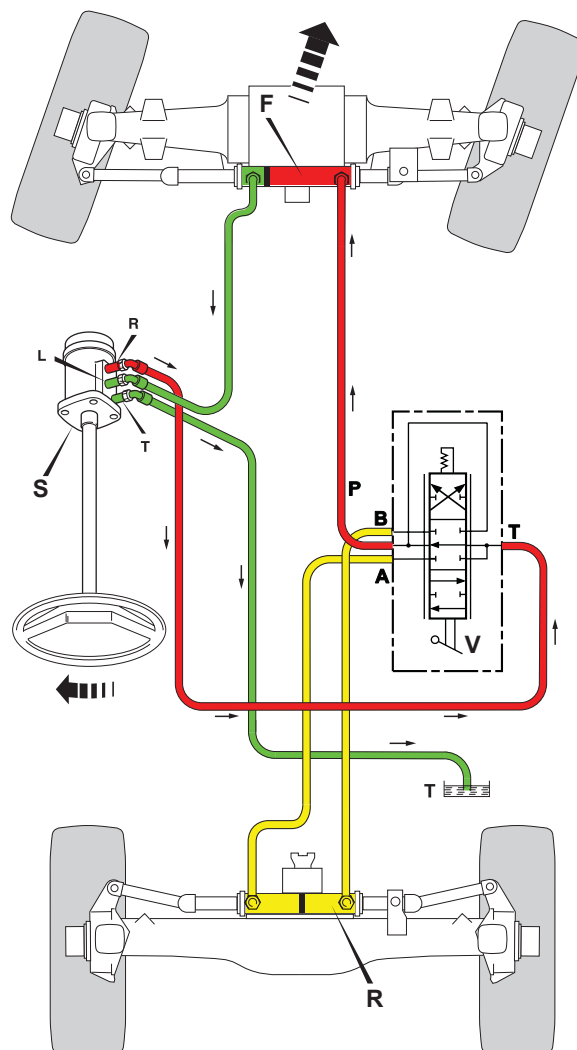


Fig 1. Typical Machine - Right turn shown

C093190

Operation - 4-Wheel Steer Selected

⇒ [Fig 2.](#) ([H2-5](#)). With the spool of steer mode valve **V** in the 4-wheel steer position there is a hydraulic connection between the steer unit **S** and the front and rear axle power track rods **F** and **R**. (Steer mode control valve ports **T** and **B** are internally connected, also ports **A** and **P**). When the steering wheel is turned (right turn shown), oil is fed to the rear power track rod **R** and the displaced oil is fed to the front power track rod **F** via the valve spool. The front power track rod turns the wheels in the opposite direction to the rear wheels and displaced oil returns to tank.

If the steering wheel is turned to the left, the oil flow is reversed and the machine will turn in the opposite direction.

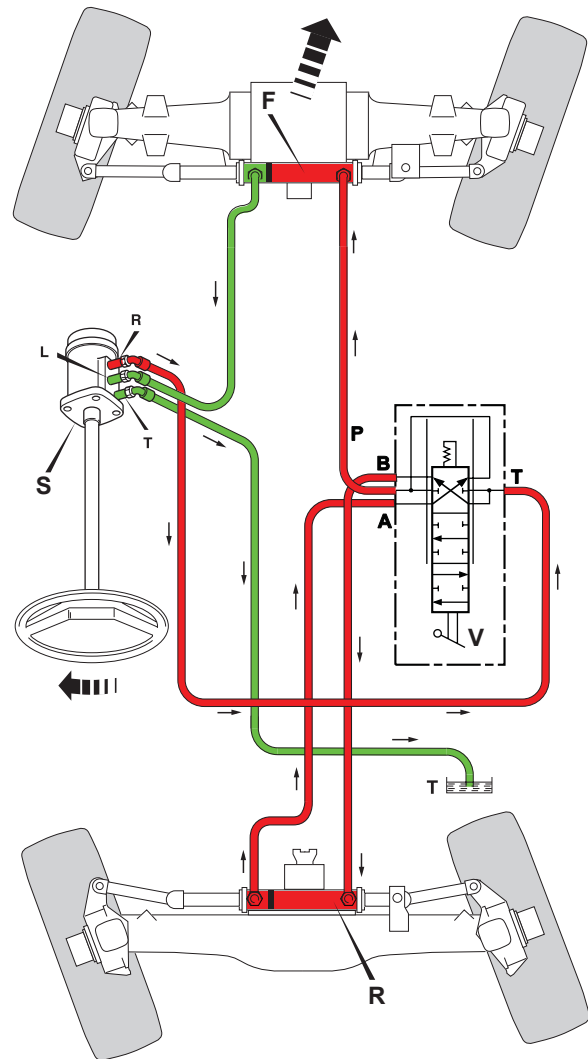


Fig 2. Typical Machine - Right turn shown

C093191

Operation - Crab Steer Selected

⇒ [Fig 3. \(H2-6\)](#). With the spool of steer mode valve **V** in the crab steer position there is a hydraulic connection between the steer unit **S** and the front and rear axle power track rods **F** and **R**. (Steer mode valve ports **T** and **A** are internally connected, also ports **B** and **P**). When the steering wheel is turned (right turn shown), oil is fed to the rear power track rod **R** and the displaced oil is fed to the front power track rod **F** via the valve spool. The front power track rod turns the wheels in the same direction as the rear wheels, causing the machine to crab to the right. Displaced oil returns to tank.

If the steering wheel is turned to the left, the oil flow is reversed and the machine will crab in the opposite direction.

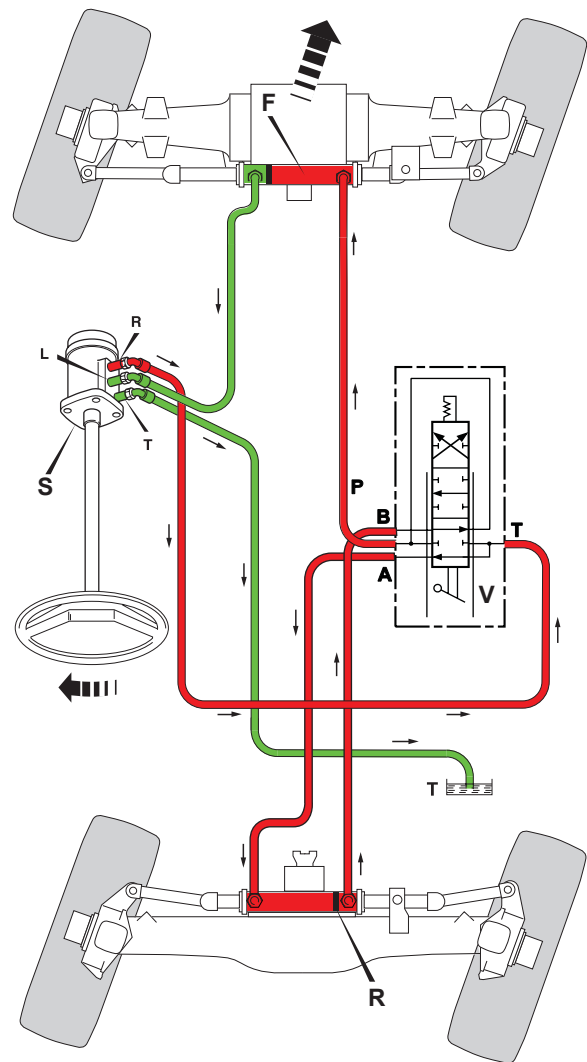


Fig 3. Typical Machine - Right turn shown

C093192

Schematics

Component Key:	
1	Hydraulic Pump
1a	Priority Valve
2	Steer Unit
2a	Steering System Relief Valve
3	Steer Mode Valve
4	Power Track Rod - Front Axle
5	Power Track Rod - Rear Axle
6	Hydraulic Tank

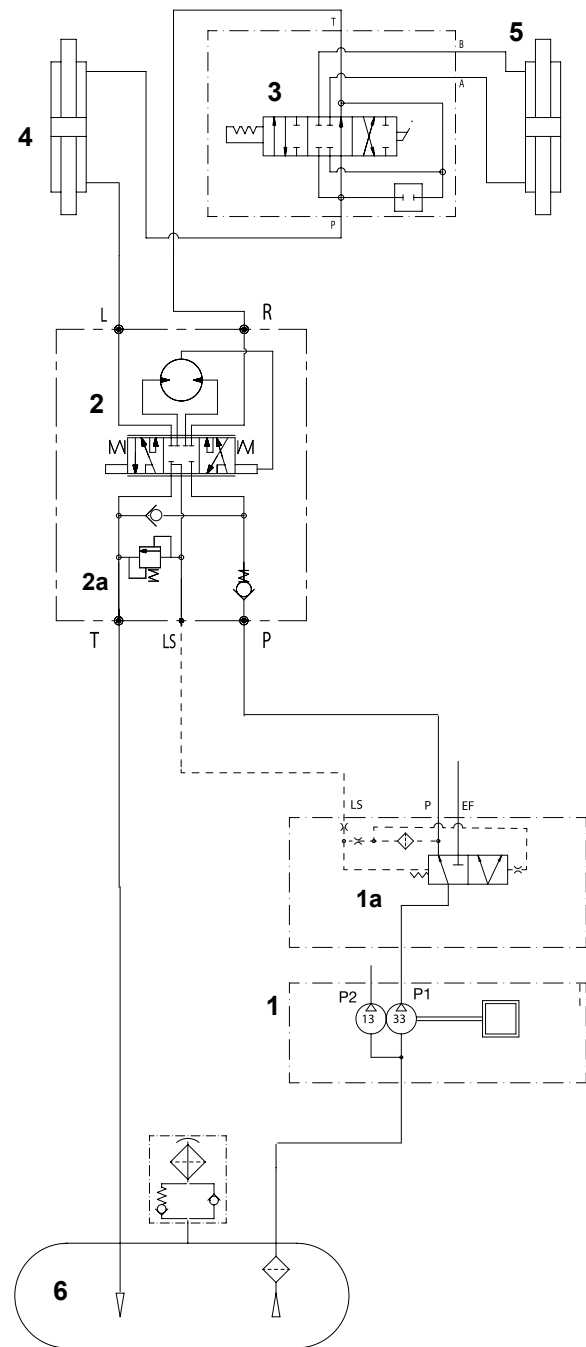


Fig 4.

C049350-C2

Hose and Pipework

Component Key:	
1	Rear Power Track Rod
2	Steer Mode Valve

Component Key:	
3	Steer Unit
4	Front Power Track Rod

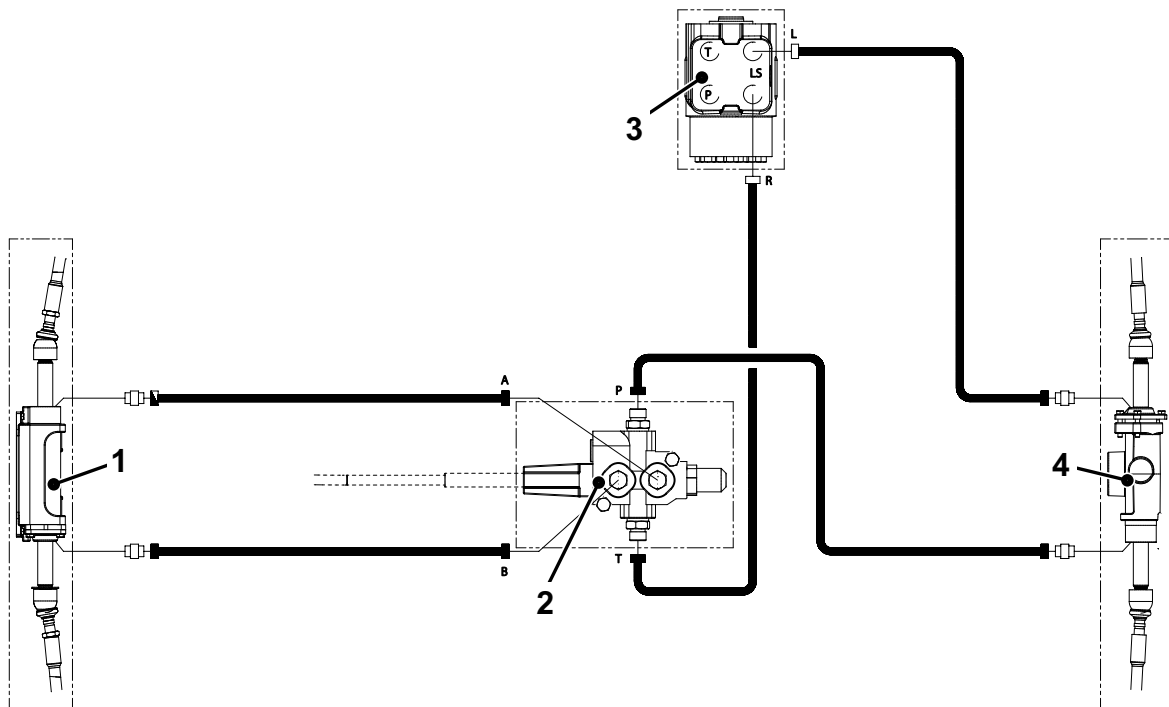


Fig 5.

C094850

Electrical Operation and Schematics (Indicated System Only)

Component Key: ➔ Fig 7. (H2-10) and ➔ Fig 8. (H2-11)	
C001/P01	Chassis Harness to Panel Harness Connector
C024	Rear Proximity Switch
C026	Front Proximity Switch
C046	Transmission ECU Connector J1
C047	Transmission ECU Connector J2
P14	LMS Connector J1
P15	LMS Connector J2
P20	Warning Light Cluster

Note: For ECU power supply and earths refer to **Section F - Hydrostatic Transmission SYSTEM** topic. ➔ [Related Topics \(H2-2\)](#)

Central to the indicated manual steer mode system is the transmission electronic control unit (ECU) **C046/C047**. The axle proximity switches **C024** and **C026** inform the ECU of the position of the steering trackrods. The ECU supplies a signal to the warning panel **P20** to illuminate the appropriate symbol **A** or **B**.

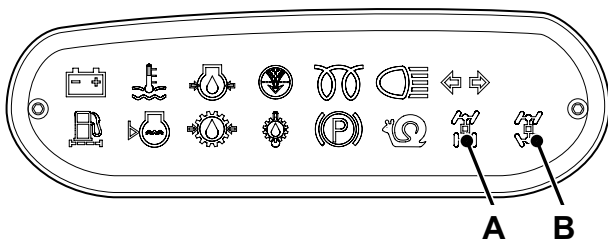


Fig 6. Warning Panel

C095880

The transmission ECU **C046/C047** will only allow the indicator lights to operate when the drive direction switches are set to neutral.

2 Wheel Steer Selected

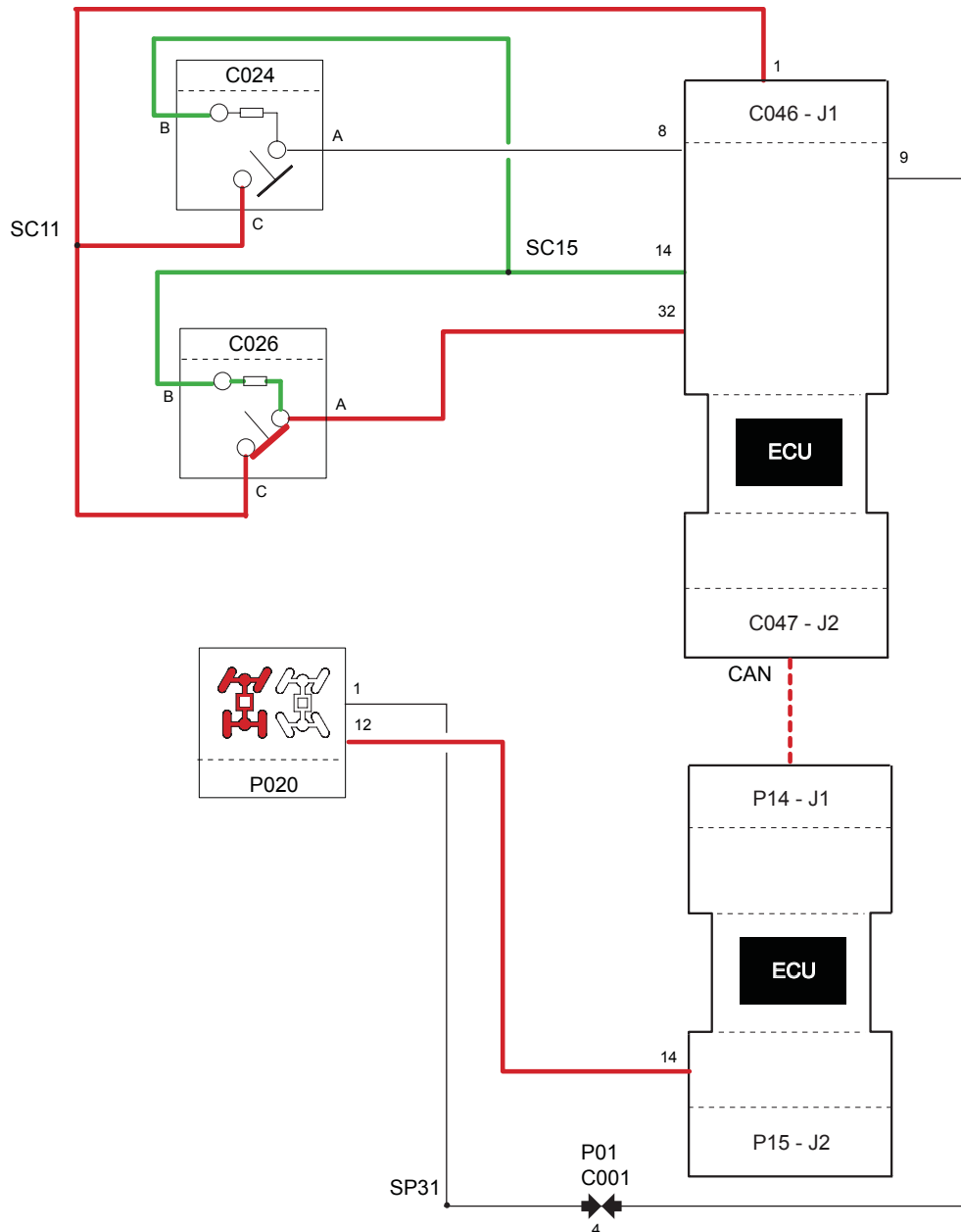


Fig 7.

C095870-C1

When 2 wheel steer is selected and the wheels are in the straight ahead position, the front proximity switch **C026** closes. The switch sends a signal to the ECU **C046/C047**. The ECU sends a CANbus message to the LMS ECU **P14/**

P15. The LMS ECU sends a signal to the warning panel **P020** to illuminate the 2 wheel steer icon.

4 Wheel Steer/Crab Steer Selected

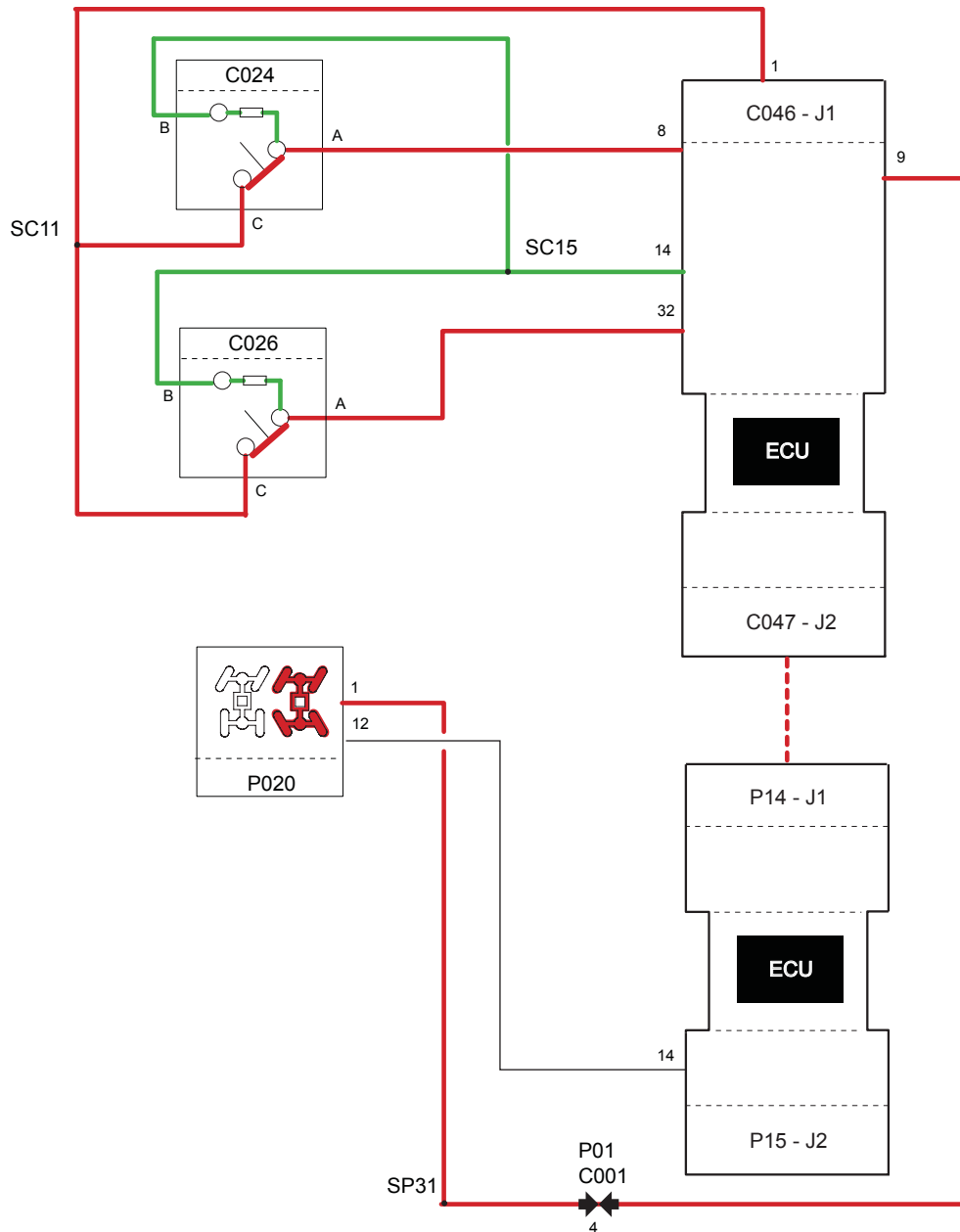


Fig 8.

C095870-C2

When 4 wheel steer/Crab Steer is selected and the wheels are all in the straight ahead position, the rear proximity switch **C024** and front proximity switch **C026** close. The switches send a signal to the ECU **C046/C047**. The ECU

sends a signal to the warning panel **P020** to illuminate the 4 wheel steer icon.

Fault Finding

Refer to the Steering SYSTEM topic for fault finding information. ➔ [Related Topics \(H2-2\)](#)

Test Procedures

Refer to the Steering SYSTEM topic for test procedures.

⇒ [Related Topics](#) ([□ H2-2](#))

Bleeding the System

Whenever any hydraulic steering component is disconnected or removed the system must be bled. Refer to the Steering system topic for the bleed procedure.

⇒ [Bleeding the System \(H1-23\)](#)

Re-phasing the Road Wheels

For this procedure refer to **Section 3 - Routine Maintenance**. [⇒ Related Topics \(H2-2\)](#)

Proximity Switch - Setting (Indicated machines Only)

WARNING

Never walk or work under raised equipment unless it is supported by a mechanical device. Equipment which is supported only by a hydraulic device can drop and injure you if the hydraulic system fails or if the control is operated (even with the engine stopped).

13-2-3-7

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

- 1 Align the wheels in the straight ahead position. Check by measuring the steering ram position, as shown. Set the steering so that dimension **X** is 129 mm. [⇒ Fig 9. \(□ H2-16\)](#)

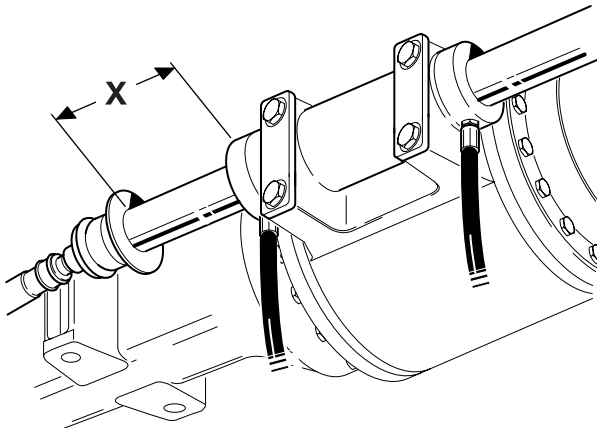


Fig 9.

300710

- 2 Remove the proximity switch **3** and cover.
- 3 Apply JCB threadlocker to the thread on the locknuts **2**.
- 4 Position the proximity switch **3** directly below the target disc **1** on the track rod.
- 5 Adjust the proximity switch until the dimension **Y** is 3 mm (0.1 in).
- 6 Torque tighten the locknuts **2**. [⇒ Table 3. Torque Settings \(□ H2-16\)](#)

- 7 Do a check of the dimension **Y**. If this is incorrect repeat steps **5** and **6**.

Table 3. Torque Settings

Item	Nm	kgf m	lbf ft
2	25	2.5	18.4

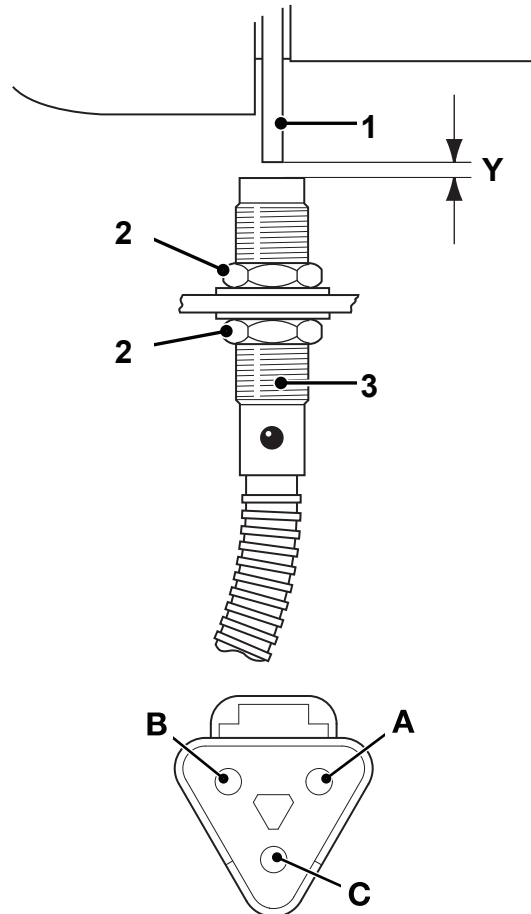


Fig 10.

A279920-1-C1

Table 4. Electrical Connections

Terminal	Wire Colour	Description
A	Blue	Signal
B	Black	Earth
C	Brown	Feed

Auto Steer Mode SYSTEM

Introduction

This topic contains information about a machine SYSTEM. The system has some devices that connect either mechanically, hydraulically or electrically. Make sure you are referring to the correct system. Refer to the applications table. [⇒ Related Topics \(□ H3-2\)](#).

Descriptions and procedures relate to the system and not the individual devices. For information about the devices refer to the relevant topics. [⇒ Related Topics \(□ H3-2\)](#)

This topic is intended to help you understand what the system does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

[⇒ Related Topics \(□ H3-2\)](#)

[⇒ Operation Overview \(□ H3-3\)](#)

[⇒ Hydraulic Operation and Schematics \(□ H3-4\)](#)

[⇒ Operation - 2-Wheel Steer Selected \(□ H3-4\)](#)

[⇒ Operation - 4-Wheel Steer Selected \(□ H3-5\)](#)

[⇒ Operation - Crab Steer Selected \(□ H3-6\)](#)

[⇒ Schematics \(□ H3-7\)](#)

[⇒ Electrical Operation and Schematics \(□ H3-10\)](#)

[⇒ 2 Wheel Steer Selected \(□ H3-11\)](#)

[⇒ 4 Wheel Steer Selected \(□ H3-14\)](#)

[⇒ Crab Steer Selected \(□ H3-16\)](#)

[⇒ Test Procedures \(□ H3-17\)](#)

[⇒ Bleeding the System \(□ H3-18\)](#)

[⇒ Re-phasing the Road Wheels \(□ H3-19\)](#)

[⇒ Proximity Switch - Setting \(□ H3-20\)](#)

Related Topics

Table 1. Related Topics in This Publication

The table lists other topics in the manual that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text in this section contains cross references to this page to help you find the correct information. Some machines have different systems and devices. Make sure you refer to the correct topic, refer to <i>Section 1 - Applications</i> .		
Sections	Topic Titles	Sub Titles
1	<i>Applications</i>	ALL
2	ALL (Care and Safety) ⁽¹⁾	ALL
3	<i>Hydraulic System</i>	<i>Checking the Hydraulic Fluid Level</i>
3	<i>Wheel Alignment</i>	
E	<i>Systems and Schematics</i>	ALL
F	<i>Transmission</i>	<i>Hydrostatic Transmission SYSTEM</i>
H	⇒ Steering SYSTEM (□ H1-1)	ALL

(1) You must obey all of the relevant care and safety procedures.

Operation Overview

Three steering modes are available:

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

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. The crab steer mode allows the machine to be driven diagonally.

The system is prevented from changing mode until all the wheels are in the straight ahead position. This is detected by proximity sensors on the front and rear axles. If the system is set in 4-wheel steer and 2-wheel steer is selected, the system will stay in 4-wheel steer until the rear wheels are turned to the straight ahead position. The rear wheels are then hydraulically locked in the straight ahead position.

Note: *The illustrations shown are for the purpose of circuit explanation only. Actual installations may not be as shown.*

Hydraulic Operation and Schematics

Operation - 2-Wheel Steer Selected

⇒ **Fig 1.** (H3-4). With the spools of steer mode control valve **V** in the 2-wheel steer position (solenoid **A** energised) there is a hydraulic connection between the steer unit **S** and the front power track rod **F**. The oil feed to the rear axle power track rod **R** is blocked by the spool assembly and the axle is held in the straight ahead position by the locked-up hydraulic oil in the track rod ram.

When the steering wheel is turned, only the front power track rod **F** is operated by the steering unit **S**.

If the steering wheel is turned to the left, the oil flow is reversed and the machine will turn in the opposite direction.

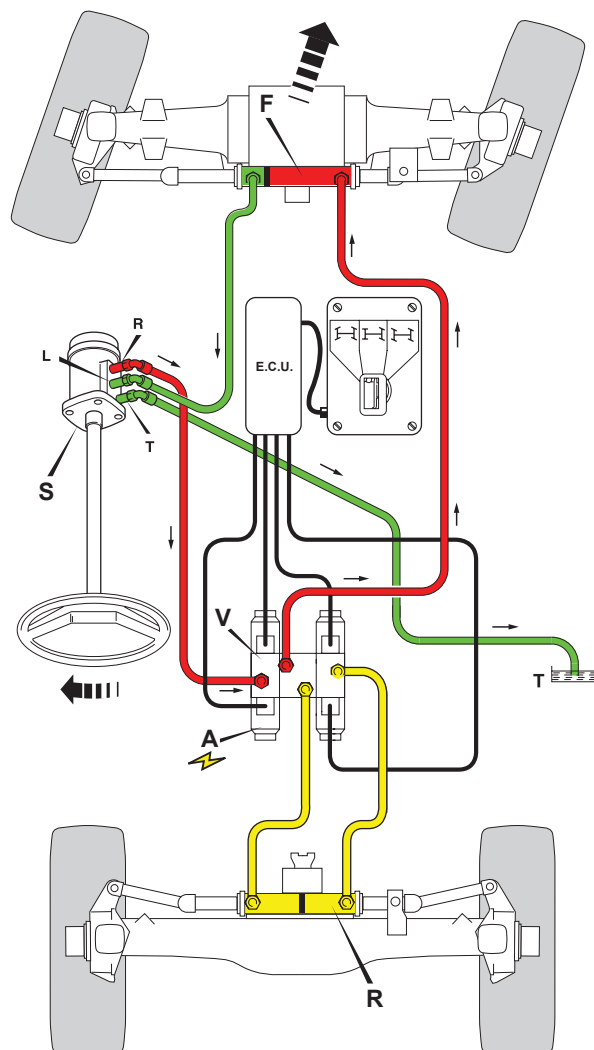


Fig 1. Typical Machine - Right turn shown

C093060

Operation - 4-Wheel Steer Selected

⇒ **Fig 2.** (□ **H3-5**). With the spools of steer mode valve **V** in the 4-wheel steer position (solenoids **B** and **D** energised) there is a hydraulic connection between the steer unit **S** and the front and rear axle power track rods **F** and **R**. When the steering wheel is turned (right turn shown), oil is fed to the rear power track rod **R** and the displaced oil is fed to the front power track rod **F** via the valve spools. The front power track rod turns the wheels in the opposite direction to the rear wheels and displaced oil returns to tank.

If the steering wheel is turned to the left, the oil flow is reversed and the machine will turn in the opposite direction.

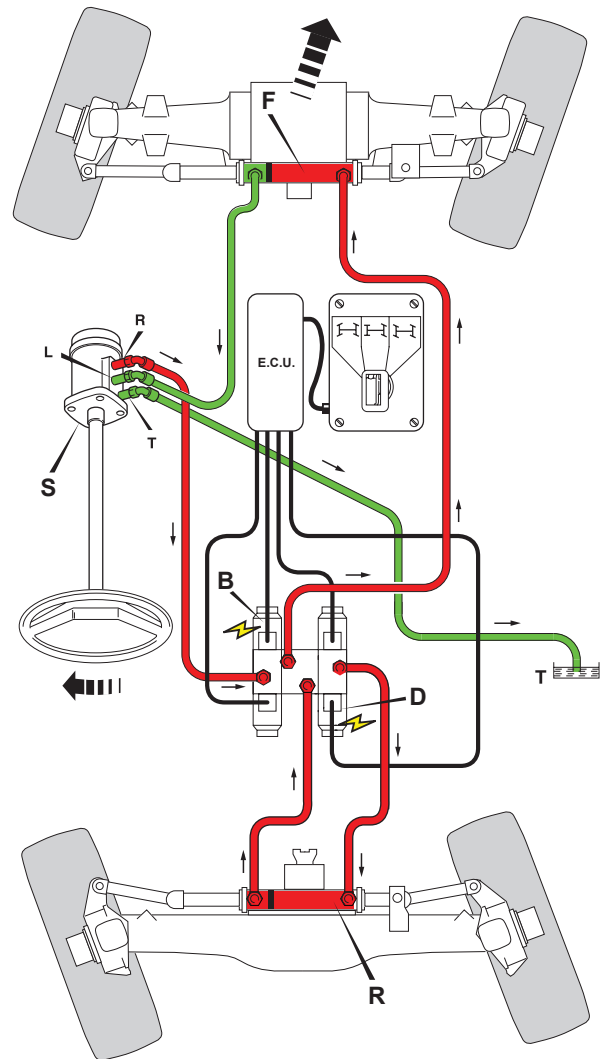


Fig 2. Typical Machine - Right turn shown

C093061

Operation - Crab Steer Selected

⇒ **Fig 3.** (H3-6). With the spools of steer mode valve **V** in the crab steer position (solenoids **B** and **C** energised) there is a hydraulic connection between the steer unit **S** and the front and rear power track rods **F** and **R**. When the steering wheel is turned (right turn shown), oil is fed to the rear power track rod **R** and the displaced oil is fed to the front power track rod **F** via the valve spools. The front power track rod turns the wheels in the same direction as the rear wheels, causing the machine to crab to the right. Displaced oil returns to tank.

If the steering wheel is turned to the left, the oil flow is reversed and the machine will crab in the opposite direction.

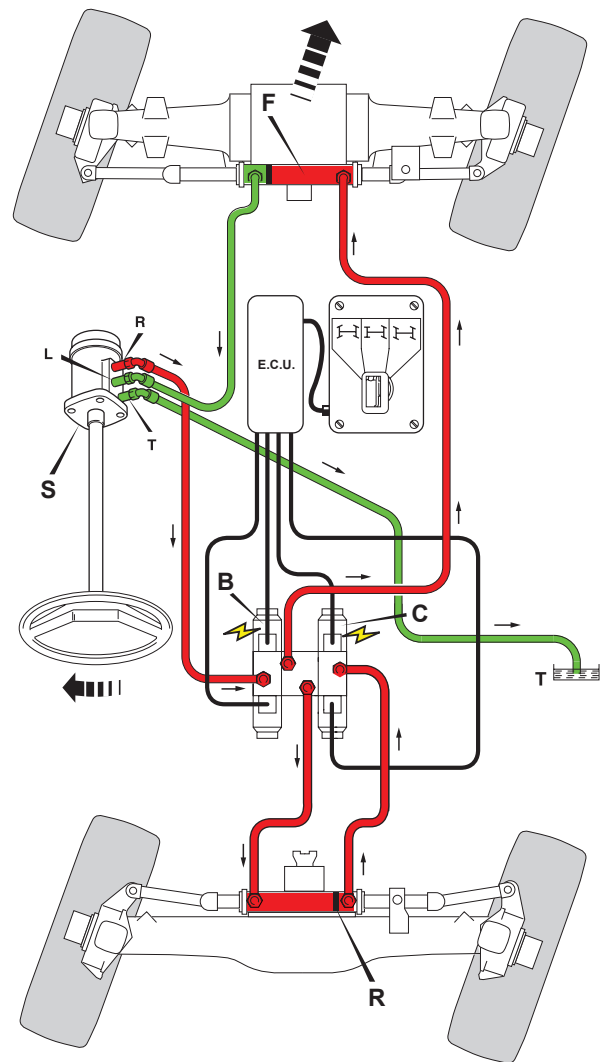
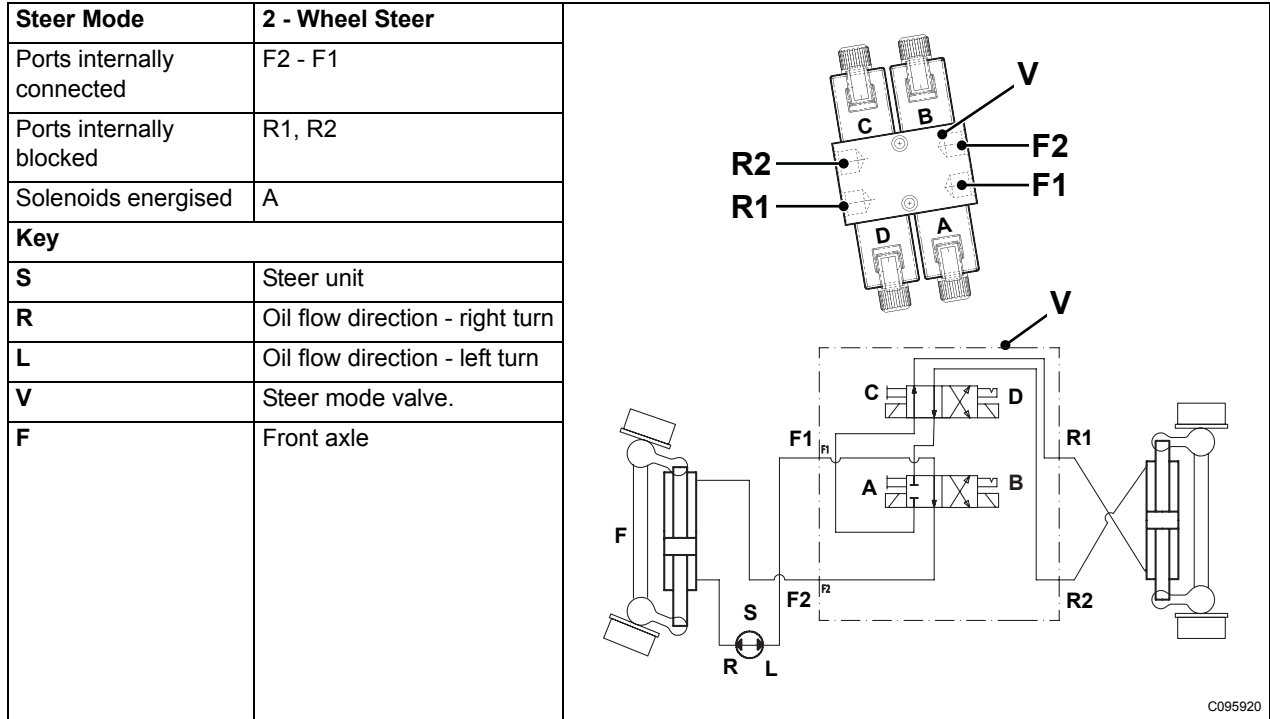


Fig 3. Typical Machine - Right turn shown

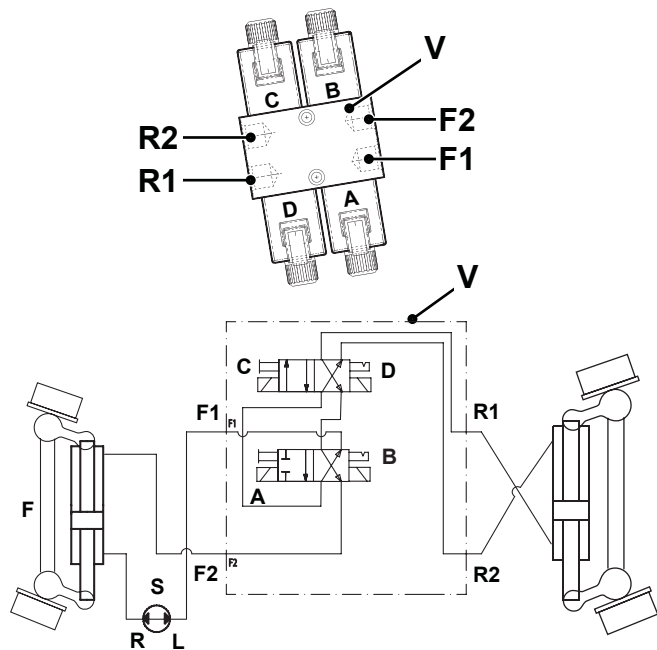
C093062

Schematics

Note: The steer mode valve spools have mechanical detents. Loss of electrical power to the valve solenoid coils will not cause the system to change steer mode suddenly.

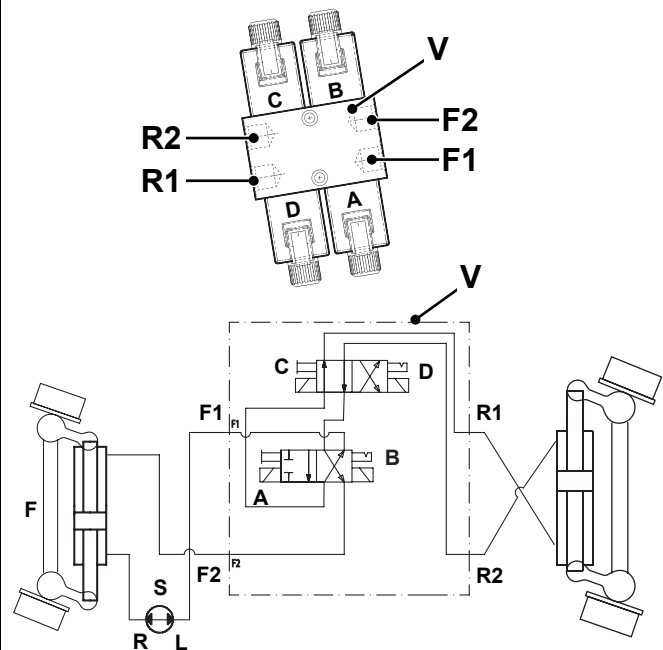


Steer Mode	4 - Wheel Steer
Ports internally connected	F1 - R2 F2 - R1
Ports internally blocked	-
Solenoids energised	B, D
Key	
S	Steer unit
R	Oil flow direction - right turn
L	Oil flow direction - left turn
V	Steer mode valve.
F	Front axle



C095920-C1

Steer Mode	Crab Steer
Ports internally connected	F1 - R1 F2 - R2
Ports internally blocked	-
Solenoids energised	B, C
Key	
S	Steer unit
R	Oil flow direction - right turn
L	Oil flow direction - left turn
V	Steer mode valve.
F	Front axle



C095920-C2

Hose and Pipework

Component Key:	
1	Rear Power Track Rod
2	Steer Mode Valve

Component Key:	
3	Steer Unit
4	Front Power Track Rod

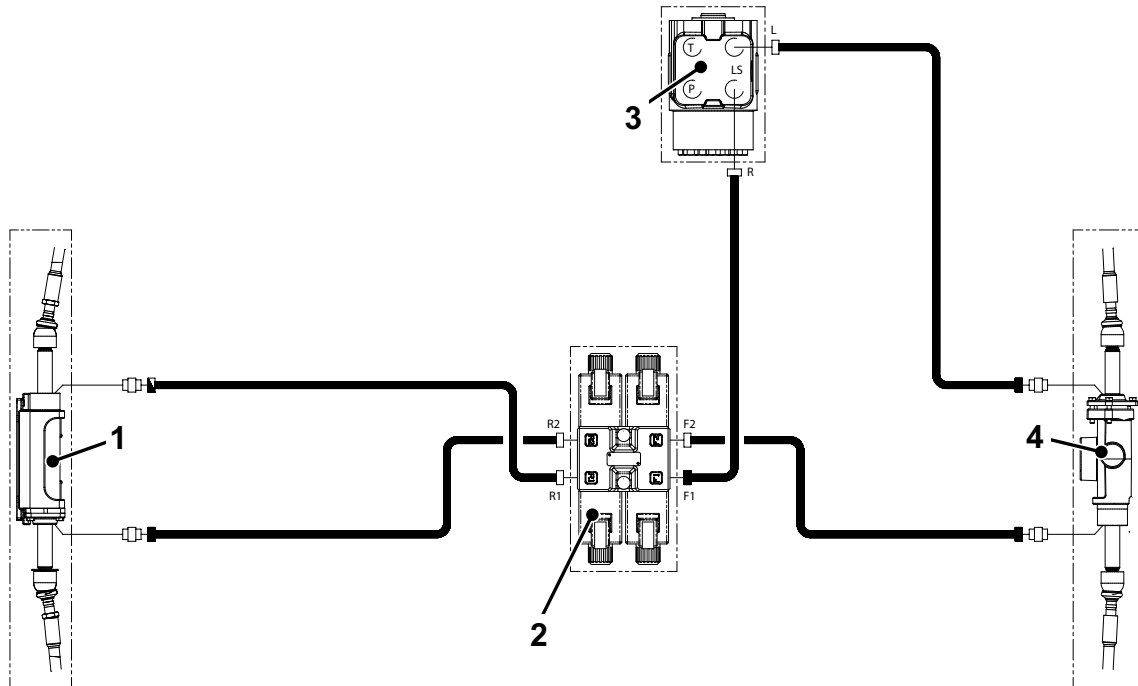


Fig 4.

C094860

Electrical Operation and Schematics

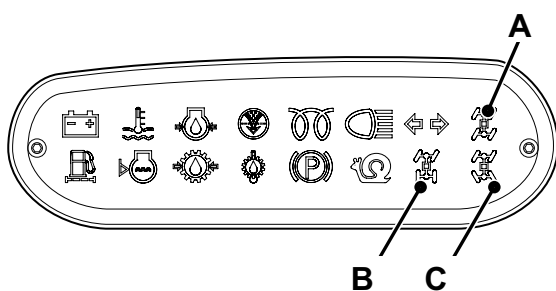
Component Key: → Fig 6. (H3-12) , → Fig 7. (H3-14) and → Fig 8. (H3-16)	
C001/P01	Chassis Harness to Panel Harness Connector
C024	Rear Proximity Switch
C026	Front Proximity Switch
C028	Steer Solenoid A
C029	Steer Solenoid B
C030	Steer Solenoid C
C031	Steer Solenoid D
C046	Transmission ECU Connector J1
C047	Transmission ECU Connector J2
P14	LMS Connector J1
P15	LMS Connector J2
P20	Warning Light Cluster
P20	Steer Mode Switch

Note: The steer mode valve spools have mechanical detents. Loss of electrical power to the valve solenoid coils will not cause the system to change steer mode suddenly. Faulty electrical connections to the solenoid coils (energising the coil) could cause the steer mode to change suddenly with no operator input.

Note: For ECU power supply and earths refer to **Section F - Hydrostatic Transmission SYSTEM** topic. → [Related Topics \(H3-2\)](#)

Central to the steer mode system is the electronic control unit (ECU) **C046/C047**. When the operator selects a steer mode using the cab mounted selector switch **P20**, the ECU energises the relevant solenoids **A,B,C** or **D** on the steer mode valve.

Indicator LED's **A, B** or **C** on the instrument panel illuminate to show the steer mode currently operative.



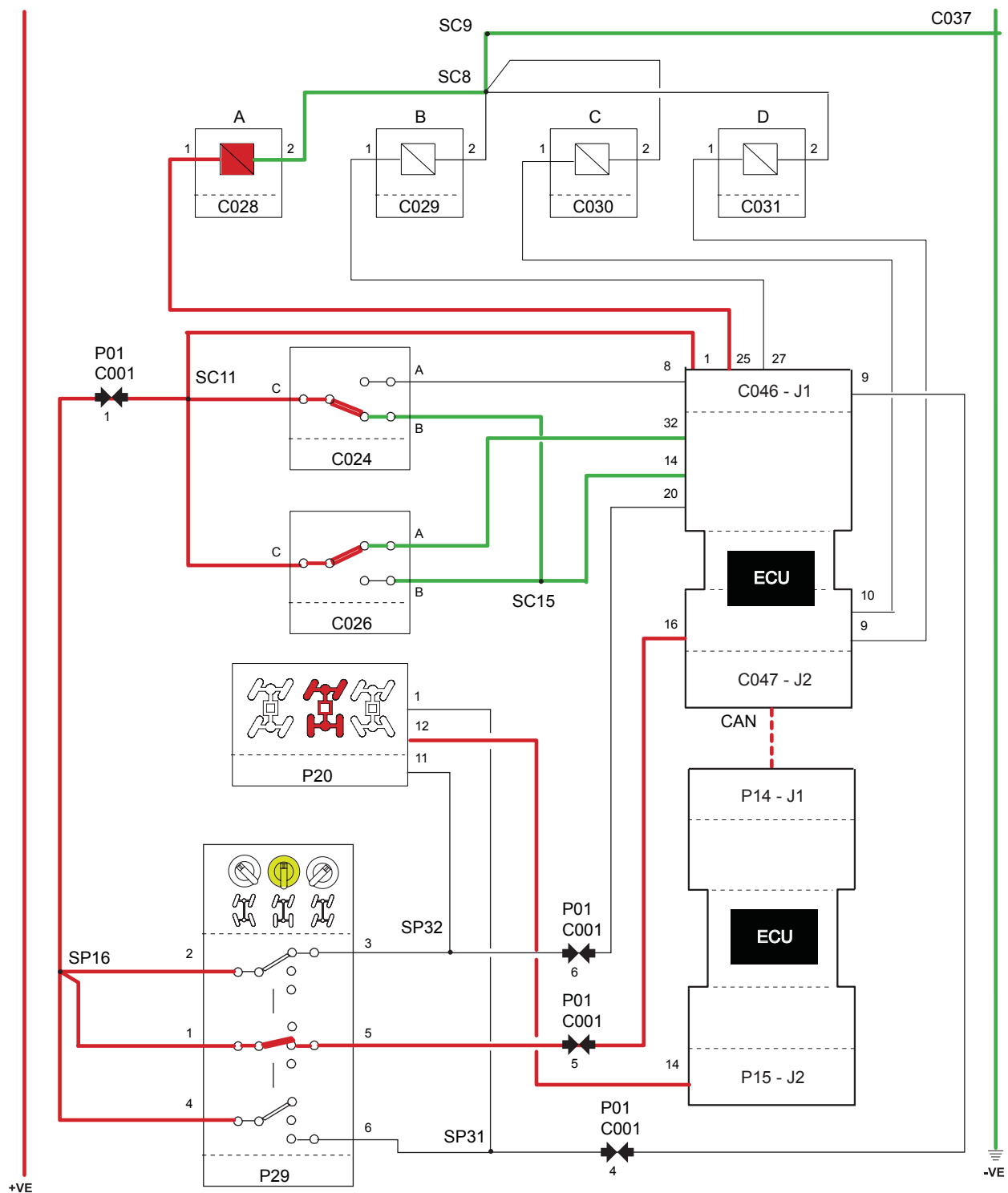
C094710-C1

Fig 5. Instrument Panel

2 Wheel Steer Selected

⇒ [Fig 6. \(H3-12\)](#)

When the steer mode switch is set to the 2 wheel steer position it sends a signal to the ECU **C046/C047**. The ECU **C046/C047** sends power to the steer mode solenoid **C028**. The ECU also sends a CANbus message to the LMS ECU **P14/P15** which in turn sends a signal to the warning light panel **P20**.



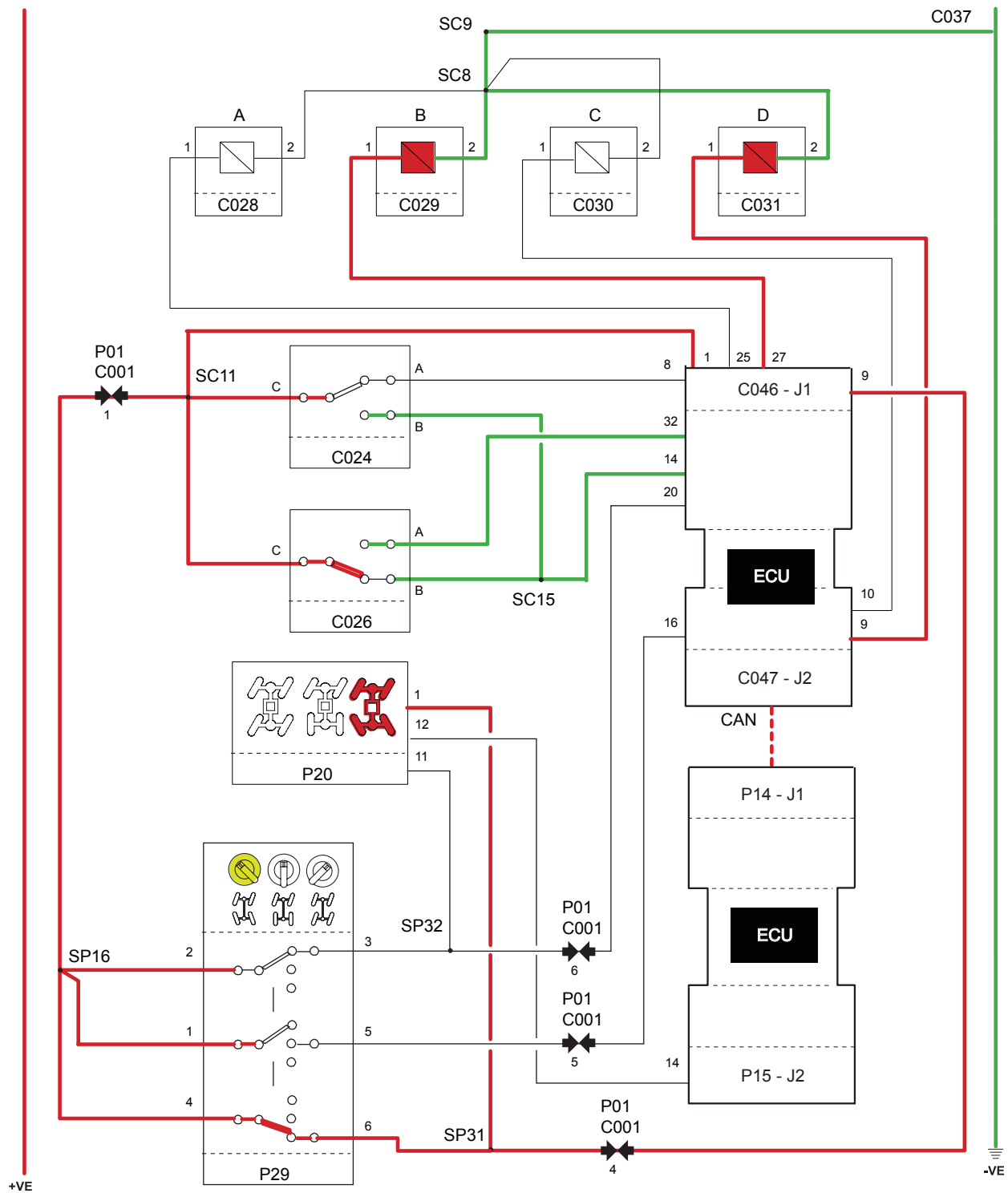
C095930

Fig 6.

4 Wheel Steer Selected

⇒ [Fig 7. \(H3-14\)](#)

When the steer mode switch is set to the 4 wheel steer position it sends a signal to the ECU **C046/C047**. The ECU **C046/C047** sends power to the steer mode solenoids **C029** and **C031** and the warning light panel **P20**.



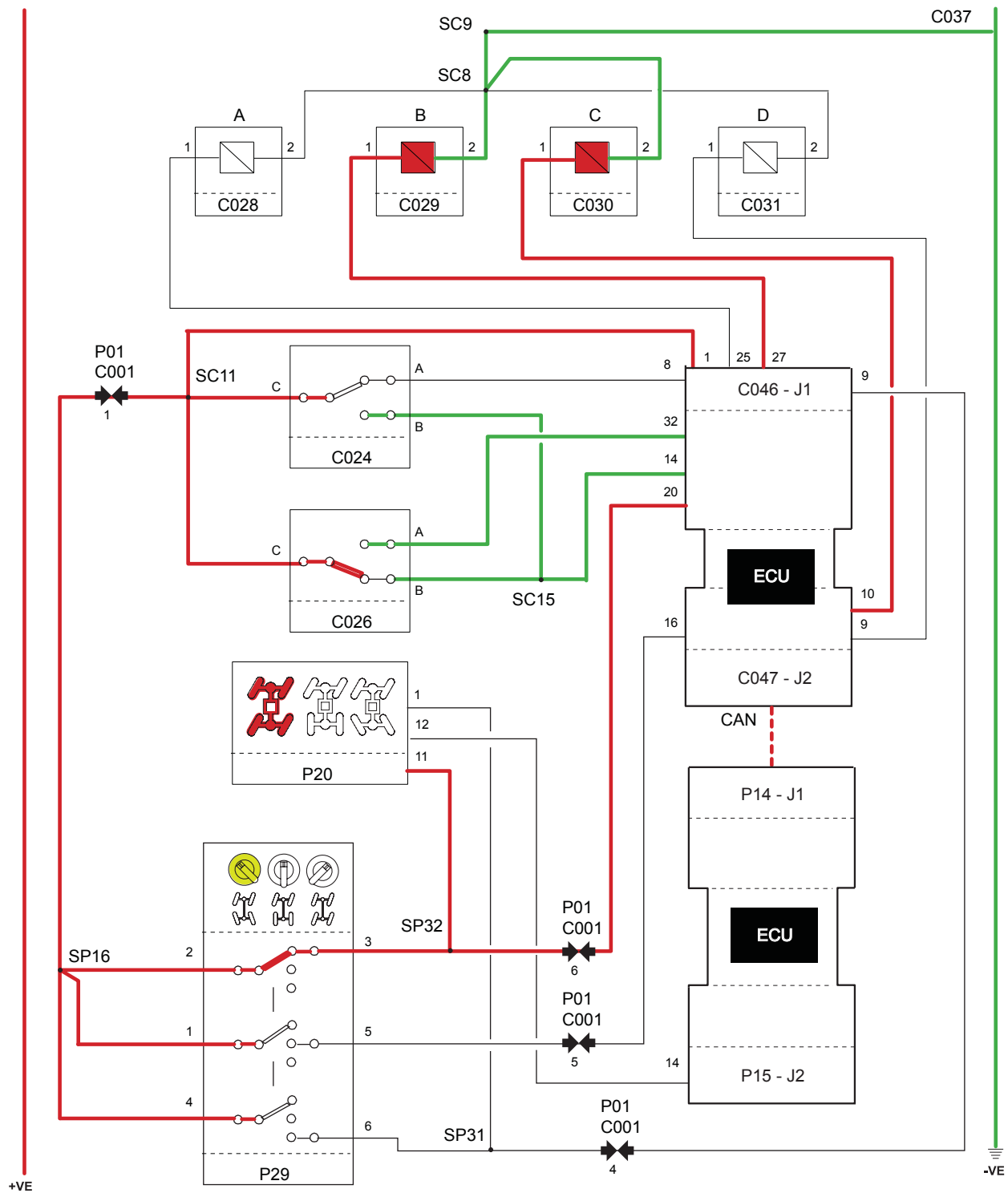
C095930-C1

Fig 7. 4 Wheel Steer Selected

Crab Steer Selected

⇒ [Fig 8. \(H3-16\)](#)

When the steer mode switch is set to the crab steer position it sends a signal to the ECU **C046/C047**. The ECU **C046/C047** sends power to the steer mode solenoids **C029** and **C030** and the warning light panel **P20**.



C095930-C2

Fig 8. Crab Steer Selected

Test Procedures

Steer Mode Valve - Checking Solenoid Operation

Note: Machines may be fitted with different types of steer mode solenoid valve.

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

Mode:	Solenoid(s) Energised:
2 Wheel Steer	A
4 Wheel Steer	B, C
Crab Steer	B, D

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 carry out 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.

Note: The electrical connectors at the steer mode valve solenoids are identical. Before uncoupling any of the connectors be sure to label them A, B, C or D as applicable. If it is suspected that the connectors have been fitted to the wrong solenoids see the electrical connection data for wire number identification. Refer to the Auto Steer

Mode SYSTEM topic for electrical connectors. [⇒ Related Topics \(H3-2\)](#)

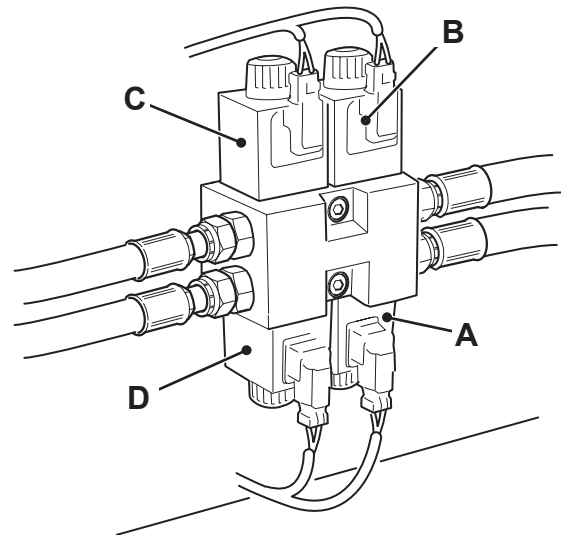


Fig 9. Steer Mode Solenoid Valve

C044170-C2

Bleeding the System

Whenever any hydraulic steering component is disconnected or removed the system must be bled. Refer to the Steering system topic for the bleed procedure.

⇒ [Bleeding the System \(H1-23\)](#)

Re-phasing the Road Wheels

For this procedure refer to **Section 3 - Routine Maintenance**. [⇒ Related Topics \(H3-2\)](#)

Proximity Switch - Setting

WARNING

Never walk or work under raised equipment unless it is supported by a mechanical device. Equipment which is supported only by a hydraulic device can drop and injure you if the hydraulic system fails or if the control is operated (even with the engine stopped).

13-2-3-7

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

- 1 Align the wheels in the straight ahead position. Check by measuring the steering ram position, as shown. Set the steering so that dimension **X** is 129 mm. [⇒ Fig 10. \(□ H3-20\)](#)

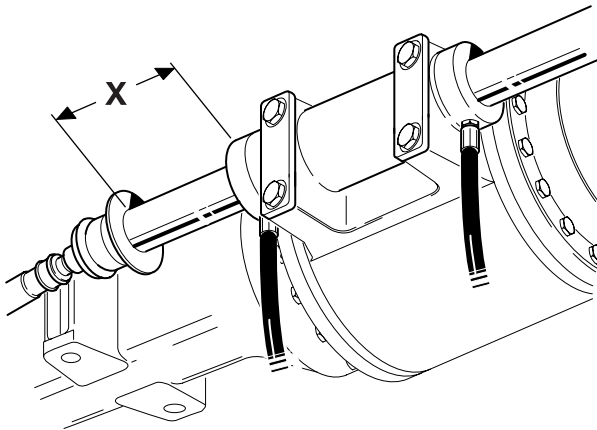


Fig 10.

300710

- 2 Remove the proximity switch **3** and cover.
- 3 Apply JCB threadlocker to the thread on the locknuts **2**.
- 4 Position the proximity switch **3** directly below the target disc **1** on the track rod.
- 5 Adjust the proximity switch until the dimension **Y** is 3 mm (0.1 in).
- 6 Torque tighten the locknuts **2**. [⇒ Table 2. Torque Settings \(□ H3-20\)](#)

- 7 Do a check of the dimension **Y**. If this is incorrect repeat steps **5** and **6**.

Table 2. Torque Settings

Item	Nm	kgf m	lbf ft
2	25	2.5	18.4

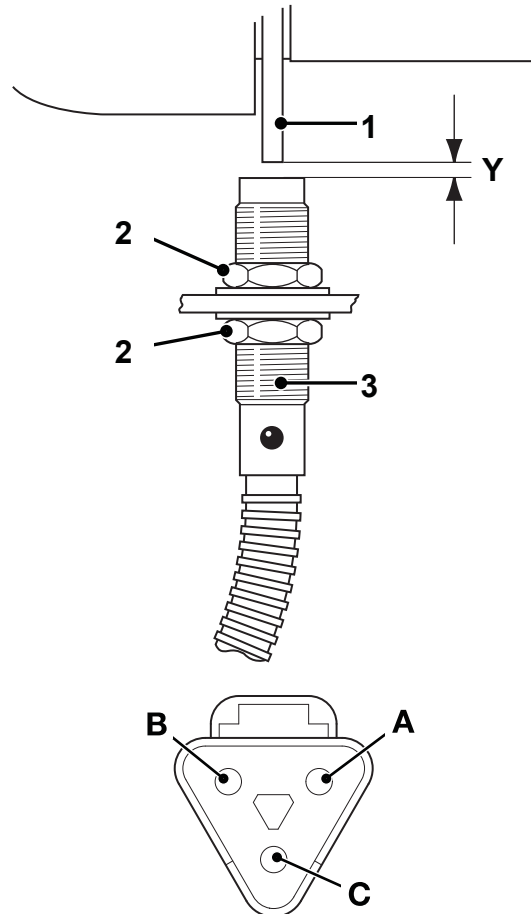


Fig 11.

A279920-1-C1

Table 3. Electrical Connections

Terminal	Wire Colour	Description
A	Blue	Signal
B	Black	Earth
C	Brown	Feed

Hydraulic Steering Unit

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device. Refer to the applications table.

Descriptions and procedures relate to the device and not related systems. For information about the systems refer to the relevant topics.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

[⇒ Related Topics \(!\[\]\(fee2cf1b4e911a36481719eb4dba7ae3_img.jpg\) H4-2\)](#)

[⇒ Hydraulic Operation and Schematics \(!\[\]\(4ba257e8092543bf03a7edc57c3beae1_img.jpg\) H4-3\)](#)

[⇒ Removal and Replacement \(!\[\]\(f0cbfdc1261d9ef3249bb3434002fe76_img.jpg\) H4-4\)](#)

[⇒ Removal \(!\[\]\(4f9b3c68f5ae044696f87a3924ccd5cf_img.jpg\) H4-4\)](#)

[⇒ Replacement \(!\[\]\(79e06214067bdb5b59865fb8fd052c24_img.jpg\) H4-4\)](#)

Related Topics

Table 1. Related Topics in This Publication

The table lists other topics in the manual that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text in this section contains cross references to this page to help you find the correct information. Some machines have different systems and devices. Make sure you refer to the correct topic, refer to <i>Section 1 - Applications</i> .		
Sections	Topic Titles	Sub Titles
1	<i>Applications</i>	ALL
2	ALL (Care and Safety) ⁽¹⁾	ALL
3	<i>Hydraulic System</i>	<i>Checking the Hydraulic Fluid Level</i>
H	⇒ Steering SYSTEM (□ H1-1)	⇒ Bleeding the System (□ H1-23)
H	⇒ Steering SYSTEM (□ H1-1)	⇒ Test Procedures (□ H1-17)

(1) You must obey all of the relevant care and safety procedures.

Hydraulic Operation and Schematics

Item	⇒ Fig 1. (□ H4-3)
A	Hydraulic Steering Unit
B	Shock Valves (if fitted)
C	Check Valve
D	Steer Valve
E	Steering System Relief Valve
L	Left Feed/Return Port
LS	Load Sense Port
P	Valve inlet
R	Right Feed/Return Port
T	Return Line

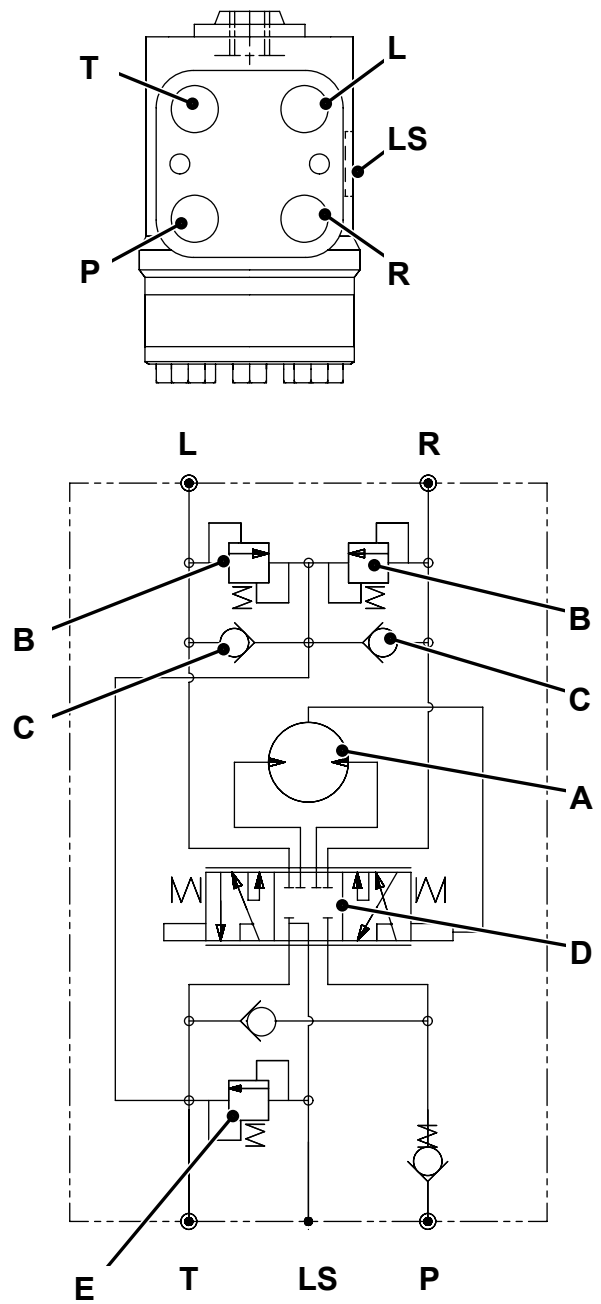


Fig 1.

A263810-C3

Removal and Replacement

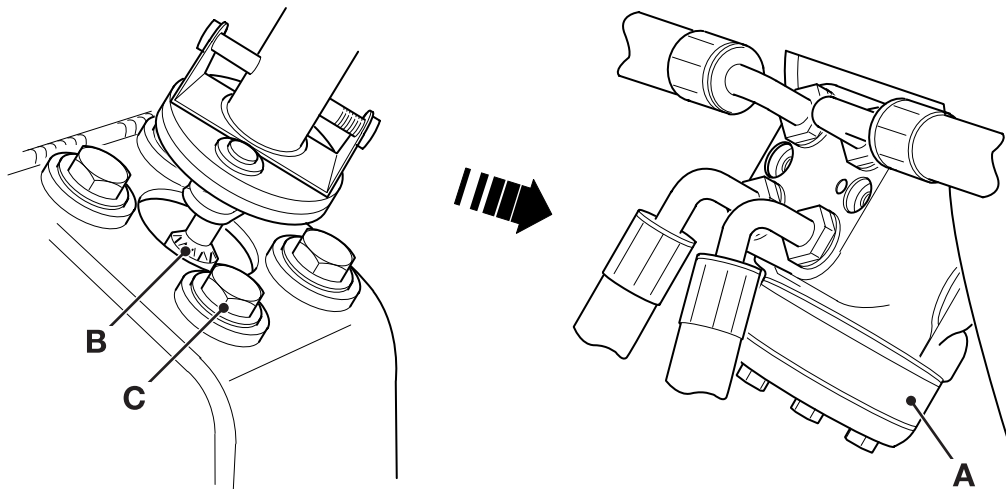


Fig 2.

A268450-1

Removal

- 1 Park the machine and make it safe. Release the hydraulic pressure. Obey the general safety procedures, see **Section 2 - General Procedures**.
[⇒ Related Topics \(□ H4-2\)](#)
- 2 Turn the steering wheel to the left and to the right several times to vent system pressure. Ensure that the steering wheel is in the straight ahead position.
- 3 Disconnect the hydraulic hoses to steering unit **A**, labelling them to aid reconnection. Plug the ports and hoses to prevent the ingress of dirt and excessive loss of hydraulic oil.
- 4 Mark the orientation of steering unit **A** to splined shaft **B**.
- 5 Remove bolts **C** (4 off) from inside the cab. At the same time have an assistant support steering unit **A** beneath the machine.
- 6 Withdraw steering unit **A**.

- Torque tighten fixing bolts **C**. [⇒ Torque Settings \(□ H4-5\)](#).

Make sure that the hoses are refitted in the correct positions.

If the hydraulic adaptors have been removed make sure to torque tighten. [⇒ Fig 3. \(□ H4-5\) ⇒ Torque Settings \(□ H4-5\)](#)

Note: The steering unit is spring loaded to the neutral position (i.e. straight ahead). Make sure the steering wheel is in the straight ahead position when re-connecting splined shaft **B**.

- Before driving the machine, bleed the steering system. [⇒ Bleeding the System \(□ H1-23\)](#)
- If a new steering unit has been fitted then the system relief valve must be tested for correct pressure setting. [⇒ Test Procedures \(□ H1-17\)](#)

Replacement

Replacement is the opposite of the removal procedure.

During the replacement procedure do this work also:

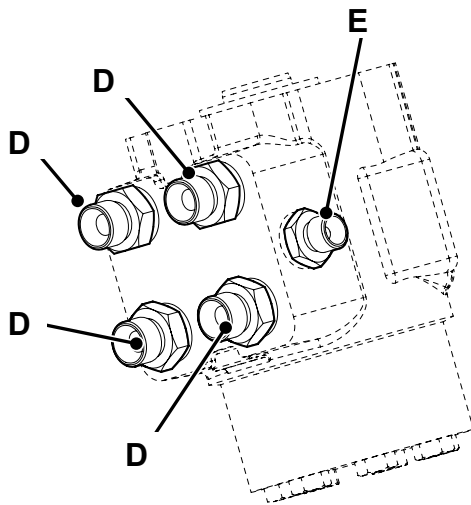


Fig 3.

C106210

Table 2. Torque Settings

Item	Nm	kgf m	lbf ft
C	45	4.6	33
D	48	4.9	35.5
E	14	1.4	10.3



Section H4 - Steering Hydraulic Steering Unit

Removal and Replacement

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Priority Valve

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device. Refer to the applications table.

Descriptions and procedures relate to the device and not related systems. For information about the systems refer to the relevant topics.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

[⇒ Related Topics \(!\[\]\(b0ab14488da37eb6a72fab3eb6f78377_img.jpg\) H5-2\)](#)

[⇒ Hydraulic Operation and Schematics \(!\[\]\(8644172607175eee910cef2cac965dc2_img.jpg\) H5-3\)](#)

[⇒ Cleaning \(!\[\]\(5aa441988e929eed3f2a1d652706e24e_img.jpg\) H5-5\)](#)

[⇒ Removal and Replacement \(!\[\]\(effbfff77f55a125b70251e81f4c3235_img.jpg\) H5-6\)](#)

[⇒ Removal \(!\[\]\(4a304f0321c7c217c4934cff23fb37f4_img.jpg\) H5-6\)](#)

[⇒ Replacement \(!\[\]\(cb0fee3b2d7afb4fccb53f91cf450063_img.jpg\) H5-6\)](#)

Related Topics

Table 1. Related Topics in This Publication

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Sections	Topic Titles	Sub Titles
1	<i>Applications</i>	ALL
2	ALL (Care and Safety) ⁽¹⁾	ALL
3	<i>Hydraulic System</i>	<i>Checking the Hydraulic Fluid Level</i>
H	⇒ Steering SYSTEM (□ H1-1)	ALL

(1) You must obey all of the relevant care and safety procedures.

Hydraulic Operation and Schematics

Neutral

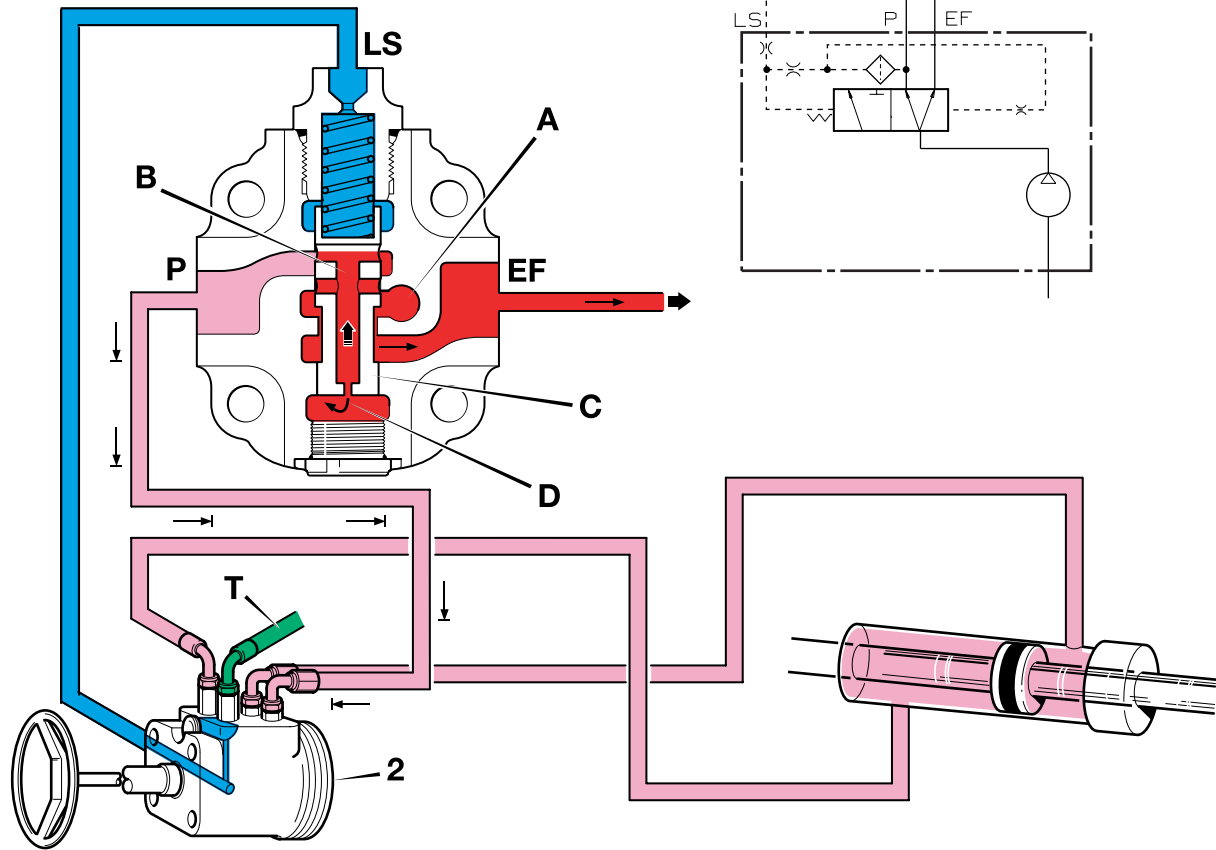


Fig 1. Gearpump type valve shown

A308181-C2

Note: The illustration is for the purpose of explanation only and is not necessarily an accurate pictorial representation of the valve.

The priority valve supplies hydraulic oil to the steering circuit on demand.

When the steering is not being operated, flow to the steering circuit is dead ended by the 'closed centre' steering unit **2**, and no pressure signal (demand) is generated in the load sense line **LS**. Pressure from the pump outlet at **A** is directed through orifice **B** and orifice **D**, onto the end of the priority valve spool **C**. This creates a large pressure difference across the spool, causing it to move up against the force of the spring. This allows the full pump flow to be directed through port **EF** back to tank. For more information on the system please see the steering SYSTEM topic. [⇒ Operation Overview \(H1-5\)](#)

Turning

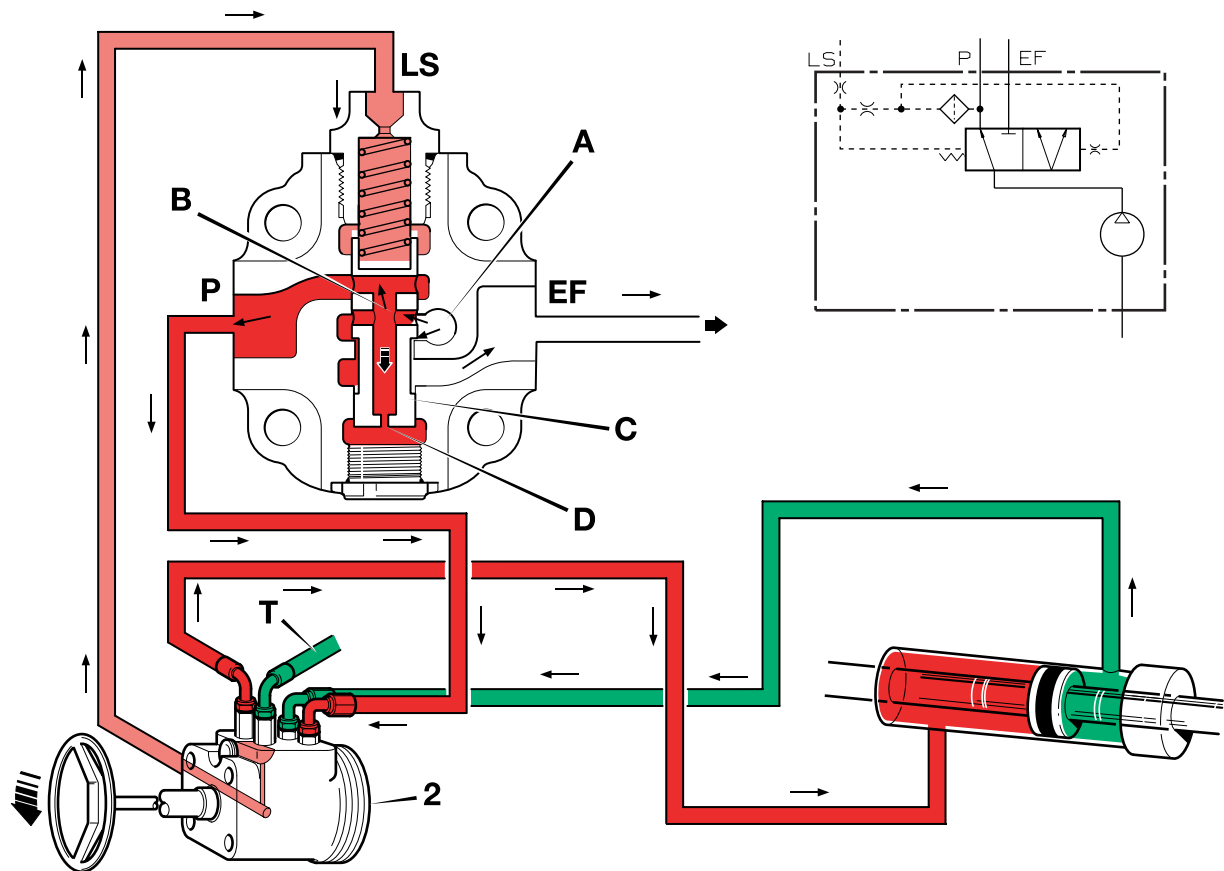


Fig 2. Gearpump type valve shown

A313610-C2

When the steering wheel is turned, a pressure signal (demand) is generated in the load sense line **LS** from the steering unit **2**.

Pressure is then applied to the spring end of the priority valve spool **C**. This reduces the pressure difference across the spool, causing it to move down under spring force. This allows some of the pump outlet flow at **A** to be directed through port **P** to the steering unit **2**, which in turn directs the flow to the corresponding steer rams to turn the wheels.

The excess flow goes through port **EF** back to tank. For more information on the system please see the steering SYSTEM topic. [⇒ Operation Overview \(H1-5\)](#)

When the steering reaches the required position, the pressure signal in the load sense line **LS** from the steering unit ceases, restoring the pressure difference across the spool **C**. The spool moves back up, allowing the full pump flow to be directed through port **EF** back to tank.

The maximum steering system pressure is set by a relief valve housed inside the steering unit **2**.

Cleaning

- 1 Park the machine and make it safe. Obey the care and safety procedures. [⇒ Related Topics \(□ H5-2\)](#)

WARNING

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

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

GEN-4-1_1

- 2 Remove the priority valve from the machine. [⇒ Removal and Replacement \(□ H5-6\)](#)
- 3 Unscrew adaptor **F** and extract the priority valve spring **C** and shims **D** and **E**.

Note: Make sure to keep the shims **D** and **E** and label them to make sure they are replaced in the correct order.

- 4 Remove the blanking plug **A** and extract the priority valve spool **B**. Take care not to damage the bore of the valve.
- 5 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.
- 6 Refit the priority valve spool **B** making sure that the spring seat end of the spool faces towards the LS port. Refit blanking plug **A** and torque tighten.
- 7 Refit the priority valve spring **C** and shims **D** and **E**.
- 8 Replace the adaptor **F** and torque tighten.
- 9 Reconnect the hose to the load sensing port, and bleed the load sense line as described below:

Start the engine, loosen the connection on the valve, then turn and hold the steering wheel fully in either direction. When bubble free oil seeps from the joint, tighten the connection.

- 10 Check the hydraulic fluid level. [⇒ Related Topics \(□ H5-2\)](#)

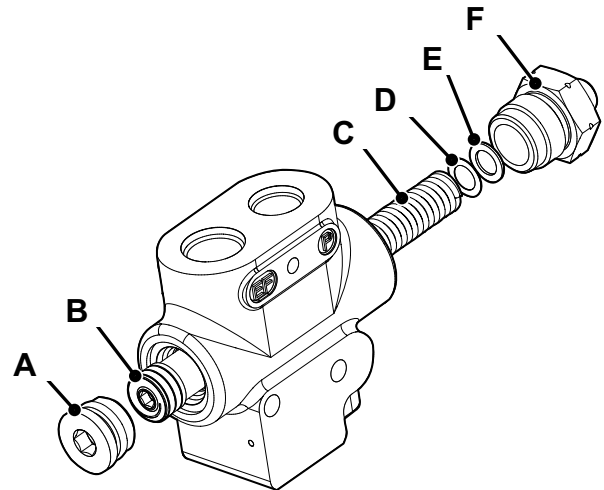


Fig 3.

C094160

Table 2. Torque settings

Item	Nm	Kgf m	lbf ft
A	75 - 81	7.6 - 8.3	55 - 60
F	100 - 105	10.2 - 10.7	74 - 77

Removal and Replacement

The priority valve assembly is not serviceable beyond the removal of foreign matter. → [Cleaning \(H5-5\)](#)

A faulty unit must be replaced.

Removal

- 1 Park the machine and make it safe. Obey the care and safety procedures. → [Related Topics \(H5-2\)](#)

WARNING

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

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

GEN-4-1_1

- 2 Disconnect hoses **A**, **B** and **E**. Blank off the hoses to prevent loss of fluid and ingress of dirt.
- 3 Remove the nuts, bolts and washers **D** and lift the priority valve assembly **C** away from the machine.

Replacement

Replacement is the opposite of the removal procedure.

During the replacement procedure do this work also:

- Torque tighten bolts **D**. → [Table 3. Torque Settings \(H5-6\)](#)
- Check the hydraulic fluid level. → [Related Topics \(H5-2\)](#)

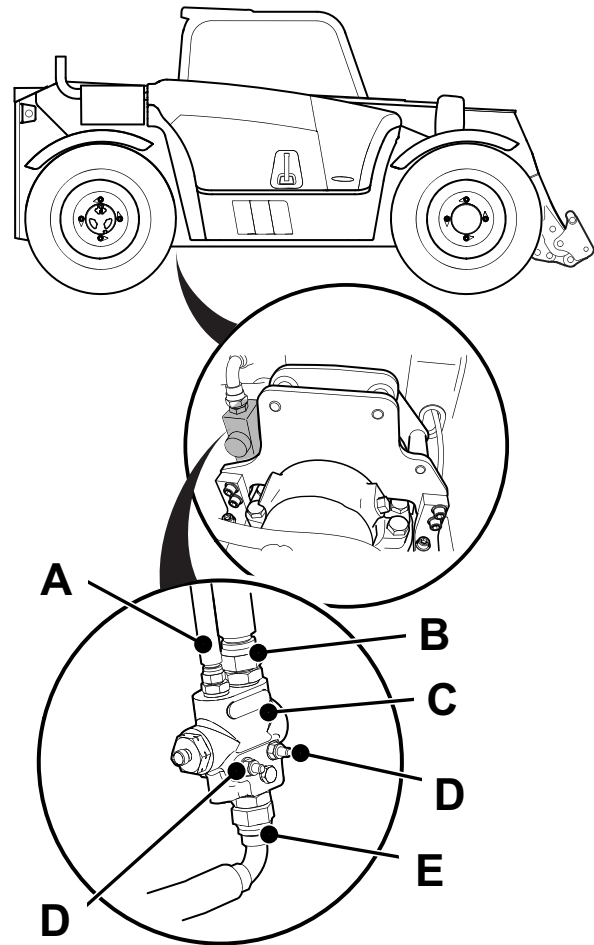


Fig 4.

C095840-C1

Table 3. Torque Settings

Item	Nm	kgf m	lbf ft
D	24	2.4	17.7

Power Track Rod

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device. Refer to the applications table.

Descriptions and procedures relate to the device and not related systems. For information about the systems refer to the relevant topics.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

[⇒ Related Topics \(!\[\]\(5089d549bd5af430aa197ded06da9e4e_img.jpg\) H6-2\)](#)

[⇒ Removal and Replacement \(!\[\]\(d447a39d466d76c338e0c282e090b13b_img.jpg\) H6-3\)](#)

[⇒ Removal \(!\[\]\(4924db801212cbdeeeb8d4ec3fb4cef8_img.jpg\) H6-3\)](#)

[⇒ Replacement \(!\[\]\(b8bb5434880f645ebaa66bec084c8df9_img.jpg\) H6-3\)](#)

[⇒ Link Arms \(!\[\]\(69bfc53a331255a776a72d846e0f36cc_img.jpg\) H6-5\)](#)

[⇒ Dismantle and Assemble \(!\[\]\(46a68b268293e131dbc319d81200050a_img.jpg\) H6-7\)](#)

Related Topics

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Sections	Topic Titles	Sub Titles
1	<i>Applications</i>	ALL
2	ALL (Care and Safety) ⁽¹⁾	ALL
3	<i>Routine Maintenance</i>	ALL
E	<i>Ram Dismantle and Assemble</i>	ALL
H	⇒ Steering SYSTEM (□ H1-1)	ALL

(1) You must obey all of the relevant care and safety procedures.

Removal and Replacement

Removal

Carry out the general safety procedures detailed under **Section 2 - General Procedures**. [➔ Related Topics \(□ H6-2\)](#)

WARNING

A raised and badly supported machine can fall on you. Position the machine on a firm, level surface before raising one end. Ensure the other end is securely chocked. Do not rely solely on the machine hydraulics or jacks to support the machine when working under it.

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

GEN-1-1

Before commencing work clean the area around the axle and power track rod.

Note: *Figure 1 shows the axles removed from the machine for illustration purposes only, it is not necessary to remove the axles from the machine for this procedure.*

- 1 As appropriate, use suitable lifting gear to raise the front or rear wheels off the ground and block the chassis. Remove the left front or right rear wheel as applicable.
- 2 **Front Axle:** Disconnect hoses **A** and **B** and then remove adaptor **C**. Blank off the hoses and plug the adaptor at **A** and the port vacated by adaptor **C** to prevent the ingress of dirt.

Rear Axle: Disconnect the hoses **E** from the power track rod **D**. Blank both open ends to prevent the ingress of dirt. Plug the track rod open ports.

Note: *At this point, if the power track rod is to be dismantled, loosen the track rod link arms, while the track rod is still securely clamped.* [➔ Link Arms \(□ H6-5\)](#)

- 3 Remove screw **F** and pin **G** at each end of the axle and separate the link arms **H** from their mounting points. Discard the two web seals seated in the eye of each link arm.
- 4 Make alignment marks on the cylinder flange and end cover of the power track rod, and on the housing flange of the axle.
- 5 Remove the four mounting screws **M**.

- 6 **Front Axle:** Using suitable jacks, support both ends of the axle and then remove mounting nuts **K** at both ends. Leave bolts **J** in position.

Lower the jack at the left end sufficient to make room for removal of the power track rod. Using a soft-faced hammer, gently tap the closed end of the track rod cylinder to the left and out of its mounting.

Rear Axle: Use a suitable jack to raise the left end of the axle so as to swivel the right end down to make room for removal of the power track rod. Using a soft-faced hammer, gently tap the closed end of the track rod cylinder to the right and out of its mounting.

Replacement

Replacement is the opposite of the removal procedure.

During the replacement procedure do this work also:

- Grease and renew the two web seals in each link arm eye, making sure they are fitted correctly and fully seated.
- Make sure that the feed port on the rear axle power track rod is positioned as shown at **L**.
- Grease the machined external shoulders of the power track rod and install by tapping with a soft-faced hammer on the mounting flange.
- Take care to align the marks made at step 4. during removal.
- Before driving the machine, bleed the steering system. [➔ Bleeding the System \(□ H1-23\)](#)

Table 2. Torque Settings

Item	Nm	kgf m	lbf ft
F	56	5.7	41
K	690	70	509
M	166	17	122

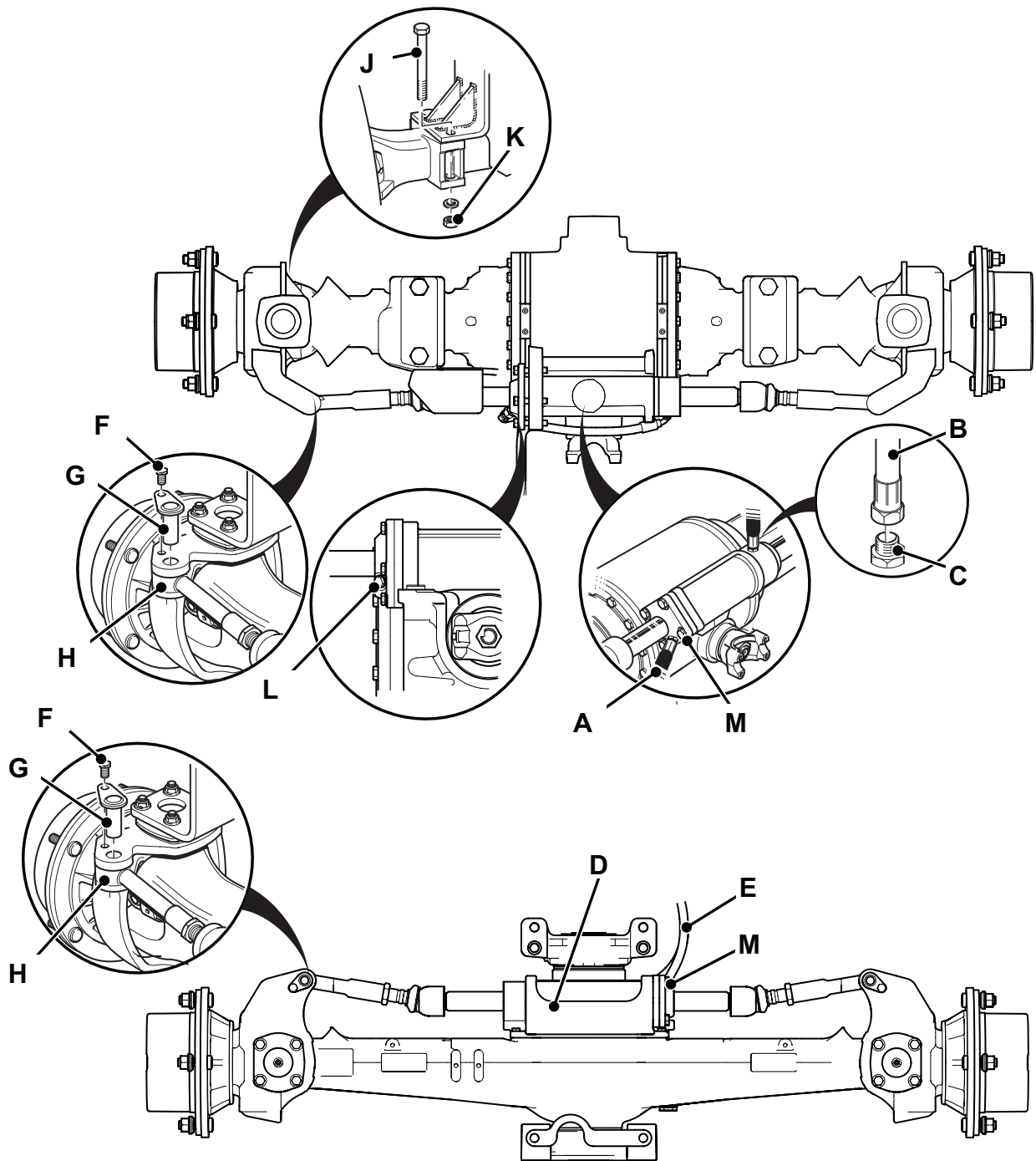


Fig 1.

C094170-C5

Link Arms

Removal

If the power track rod ram is to be dismantled, or the link arms replaced, proceed as follows:

- 1 Fix the assembly on a locally made strip/rebuild bench. → [Fig 2.](#) ([H6-5](#))

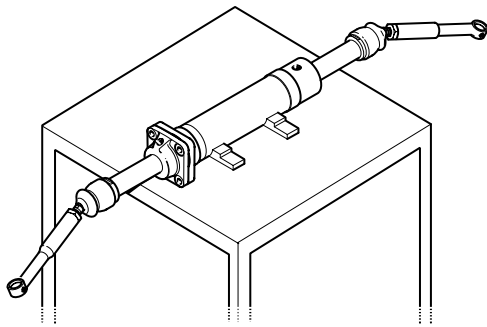


Fig 2.

A311980

- 2 Use two suitable open ended spanners at **A** and **B** reacting against each other until one ball joint unscrews. For the purposes of explanation assume the ball joint at **A** has unscrewed.
- 3 Unscrew the ball joint until an open ended spanner can be fitted on rod **C**. Screw the ball joint against the spanner to secure it and to prevent damage to the rod.

Note: 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.

- 4 By reacting against the spanner at **C** undo the other ball joint at **D**.

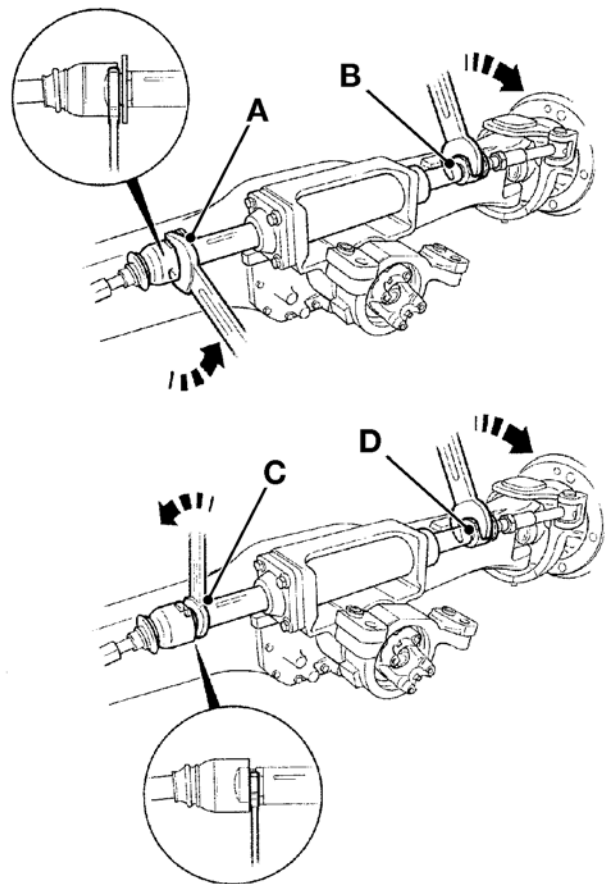


Fig 3.

300370-1

- 5 Where applicable remove target disc **E**.

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

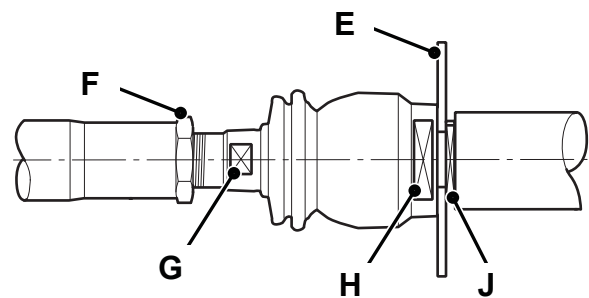


Fig 4.

A311970-1-C1

Replacement

Note: If the power track rod ram is to be dismantled, carry out the procedure before replacing/renewing the link arms.
⇒ [Dismantle and Assemble \(□ H6-7\)](#)

Replacement is the reverse of removal but note the following:

- 1 Remember to fit target disc **E** (where applicable).
- 2 Use JCB Threadlocker and Sealer on the first three threads of the inner ball joint where it screws into the end of the track rod.
- 3 If the link arms have been renewed, the wheel alignment must be checked. ⇒ [Fig 5. \(□ H6-6\)](#)

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.

To adjust the wheel alignment undo the lock nuts **F**. Turn the threaded adjusters **G** equally to obtain the correct alignment. Tighten the lock nuts **F**.

- 4 Check the target disc and proximity switch setting (where applicable). ⇒ [Manual Steer Mode SYSTEM \(□ H2-1\)](#) or ⇒ [Auto Steer Mode SYSTEM \(□ H3-1\)](#)

Table 3. Torque Settings

Item	Nm	kgf m	lbf ft
H/J	240 - 260	24 - 26	177 - 192
G/F	240 - 260	24 - 26	177 - 192

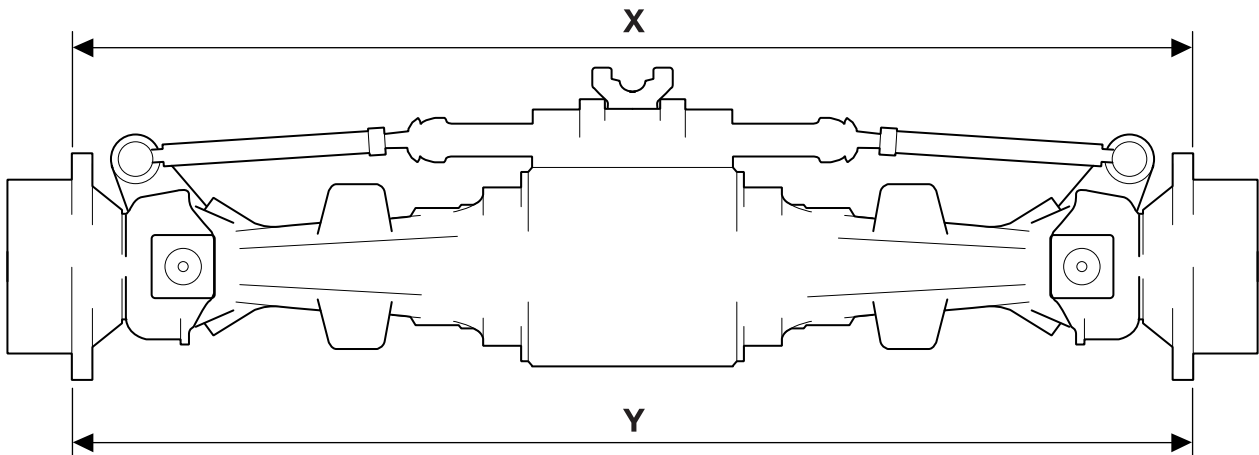


Fig 5.

A318960-1

Dismantle and Assemble

Rams

⇒ [Fig 7. \(□ H6-8\)](#)

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

The assembly procedure is the opposite of the dismantling procedure.

Dismantle

- 1 Fix the ram assembly on a locally manufactured strip/rebuild bench. ⇒ [Fig 8. \(□ H6-8\)](#)
- 2 If not already done, remove the two steering link arms **A** and **B**. ⇒ [Fig 7. \(□ H6-8\)](#) ⇒ [Removal and Replacement \(□ H6-3\)](#)
- 3 Remove end cap **2** and then pull the piston rod assembly **5**, **6**, **7**, **8** and **9** from the cylinder.

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

- 4 Position the piston rod assembly on the bench in place of the ram cylinder. Remove and discard the wear rings **6**, **7** and seal **8**/energising ring **9**.

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

- 5 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.

Assemble

- 1 Use a JCB Cleaner and Degreaser to ensure that all threads are free from grease, hydraulic oil and old JCB Multi-Gasket. Allow 15 minutes for solvent to dry before applying fresh JCB Multi-Gasket.

Ensure that lubricants used during assembly do not come into contact with JCB Multi-Gasket.

- 2 Ensure that piston rod seals **10** and wiper rings **11** are fitted correctly into the closed end of cylinder **3** and also into cover **2** along with cover seal **12**.

It is very important that energiser ring **9** is not twisted. Failure to carry out the installation correctly could lead to hydraulic fluid leakage between the two sides of the power track rod and consequential steering problems. ⇒ [Fig 6. \(□ H6-7\)](#) - after installation check that three white marks are visible on the outside diameter arrowed before installing seal **8**.

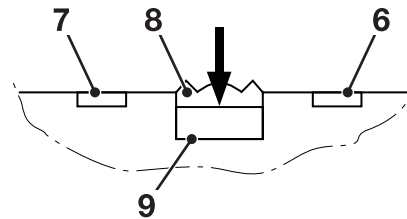


Fig 6.

768900-1

- 3 Before installing piston rod assembly **5**, **6**, **7**, **8** and **9** apply grease to piston seal **8** and to the surfaces of the piston rod.
- 4 Clamp the cylinder vertically and lower the piston rod assembly in from the top, see, making sure its orientation is correct, i.e. with piston sleeve **C** nearest the closed end of the cylinder. ⇒ [Fig 9. \(□ H6-8\)](#) 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 seals carefully into the cylinder. If the piston head wear rings or seals are damaged during this stage, they must be renewed.

Note: 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.

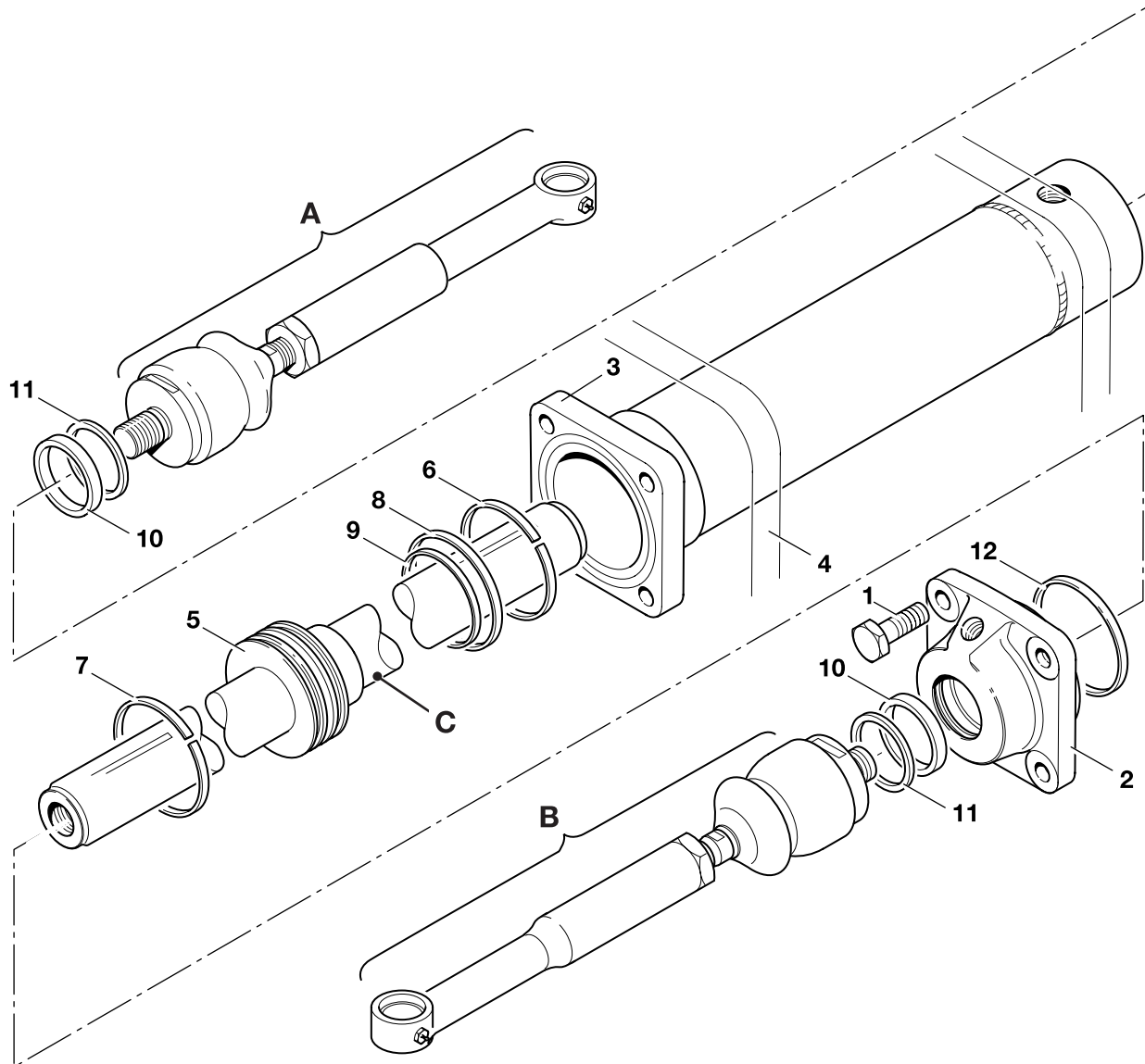


Fig 7. Dismantle and Assemble

A312060-1

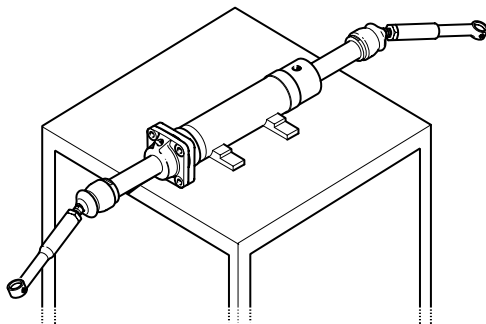


Fig 8.

A311980

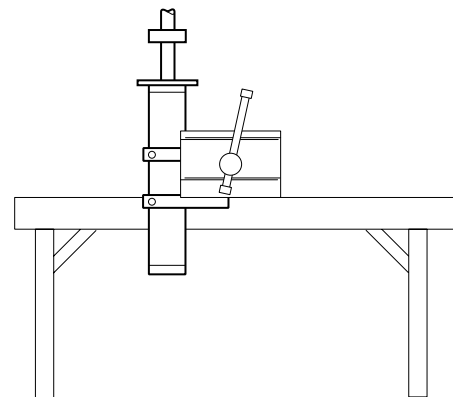


Fig 9.

768920

Steering Column

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device. Refer to the applications table.

Descriptions and procedures relate to the device and not related systems. For information about the systems refer to the relevant topics.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

[⇒ Related Topics \(!\[\]\(ce820ecab2808b2d79d0fe6314259fb6_img.jpg\) H7-2\)](#)

[⇒ Removal and Replacement \(!\[\]\(9d6dd2f00807bf61e1fd4316b032ad57_img.jpg\) H7-3\)](#)

[⇒ Steering Wheel \(!\[\]\(fa72161dbbced6456aa18701a7b06cf0_img.jpg\) H7-3\)](#)

[⇒ Steering Column Switches \(!\[\]\(eeeb56cdb6d7a3d6931259c5ebc8a05f_img.jpg\) H7-4\)](#)

[⇒ Steering Column \(!\[\]\(2f4f15aded74ba624b73b0bb0049feb7_img.jpg\) H7-6\)](#)

Related Topics

Table 1. Related Topics in This Publication

The table lists other topics in the manual that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text in this section contains cross references to this page to help you find the correct information. Some machines have different systems and devices. Make sure you refer to the correct topic, refer to <i>Section 1 - Applications</i> .		
Sections	Topic Titles	Sub Titles
1	<i>Applications</i>	ALL
2	ALL (Care and Safety) ⁽¹⁾	ALL

(1) You must obey all of the relevant care and safety procedures.

Removal and Replacement

Steering Wheel

Removal

- 1 Mark the position of the steering wheel **E** on the splined shaft **F**.
- 2 Prise the steering wheel centre cap **A** from the wheel **E**.
- 3 Remove the steering wheel securing nut **B**.
- 4 Retrieve the washer **C**.
- 5 Pull the steering wheel **E** off the splined shaft **F**.
- 6 Make sure to retain key **D**.

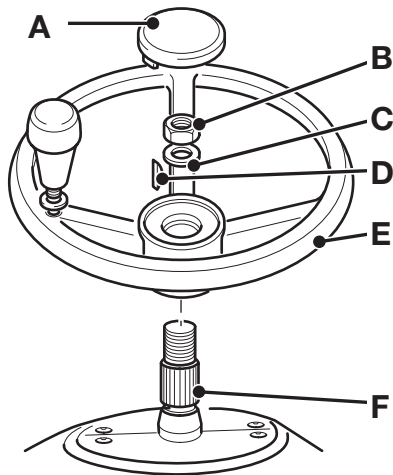


Fig 1.

770320-C1

Replacement

Replacement is the opposite of the removal procedure.

During the replacement procedure do this work also:

- If key **D** becomes damaged during the removal procedure, replace with a new key.
- Make sure that the steering wheel lines up with the marks created when removing.

Steering Column Switches

Removal

- 1 Park the machine and make it safe. Obey the care and safety procedures. [⇒ Related Topics \(H7-2\)](#)
- 2 Remove the steering wheel. [⇒ Steering Wheel \(H7-3\)](#)
- 3 Remove the two screws on the top of the steering column upper surround **C**.
- 4 Remove the two button head screws **A**, remove the steering column lower surround.
- 5 Remove the two button head screws **B** and remove the steering column upper surround.
- 6 Remove the steering column switch retaining plate screw **D**.
- 7 Lift off the switch retaining plate **E** if fitted.
- 8 Remove the switch covers **F**.
- 9 Disconnect the harness connectors at **J**.
- 10 Unscrew the retaining screw **K** from the switch collar **G**.

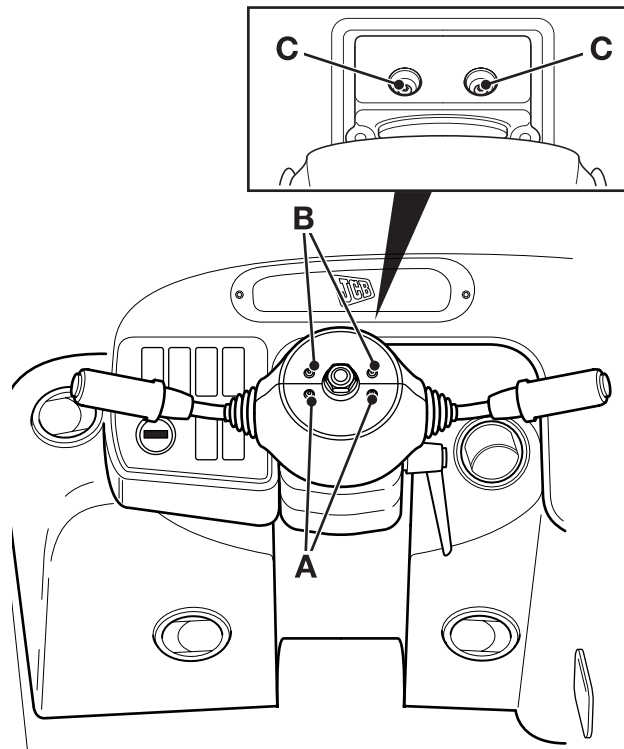


Fig 2.

445611-C2

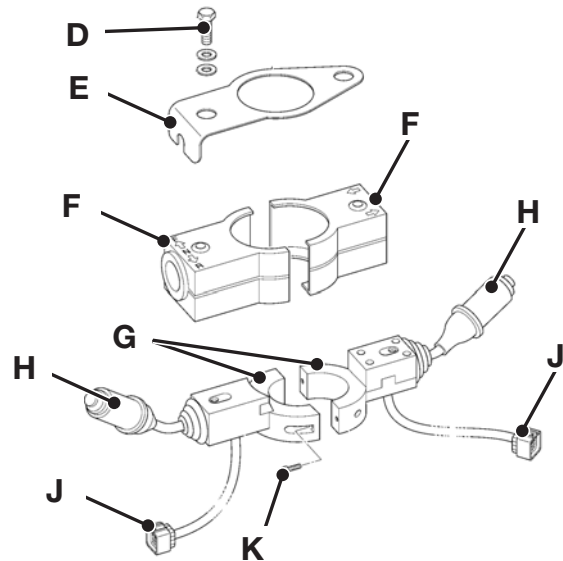


Fig 3.

C054520

11 Pull the column switches **H** away from the column.

Replacement

Replacement is the opposite of the removal procedure.

During the replacement procedure do this work also:

- Make sure that the transmission lever securing bolt **L** has 2 washers installed as shown.

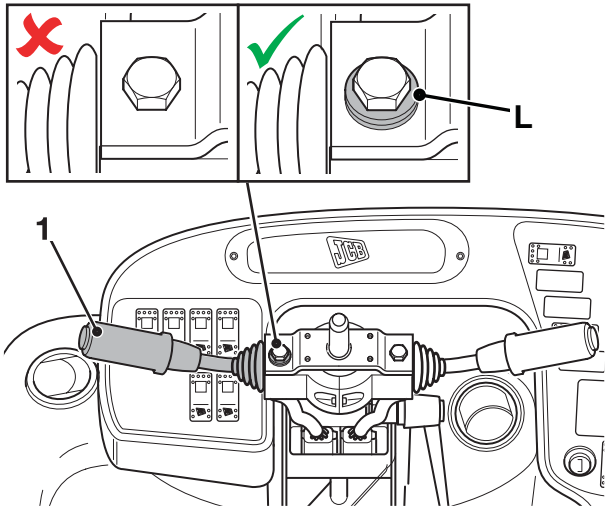


Fig 4.

C045380-1-C1

Steering Column

Note: There are two types of steering column. Type **X** is tilt adjustable and type **Y** is tilt and height adjustable. The removal and replacement procedures are the same for both types.

Removal

- 1 Park the machine and make it safe. Obey the care and safety procedures. → [Related Topics \(H7-2\)](#)
- 2 Remove the steering wheel and steering column surround. → [Steering Wheel \(H7-3\)](#)
- 3 Remove the column switches. → [Steering Column Switches \(H7-4\)](#)

Important: The electrical connectors **A** and **B** are the same. Record the position of the connectors.

- 4 Remove the electrical connectors **A** and **B**.
- 5 Put aligned marks on the steering shaft **D** and column **E**.
- 6 Remove clips **F** and pins **G**.
- 7 Hold the steering column assembly and remove the lever lock **C** (if fitted)
- 8 Lift the column assembly clear of the cab.

Replacement

Replacement is the opposite of the removal procedure.

During the replacement procedure do this work also:

- Align the marks on the steering shaft and steering column (step 5).
- Engage the steering shaft splines **H** with the steer valve internal spline.
- Put electrical connectors **A** and **B** in their correct positions.

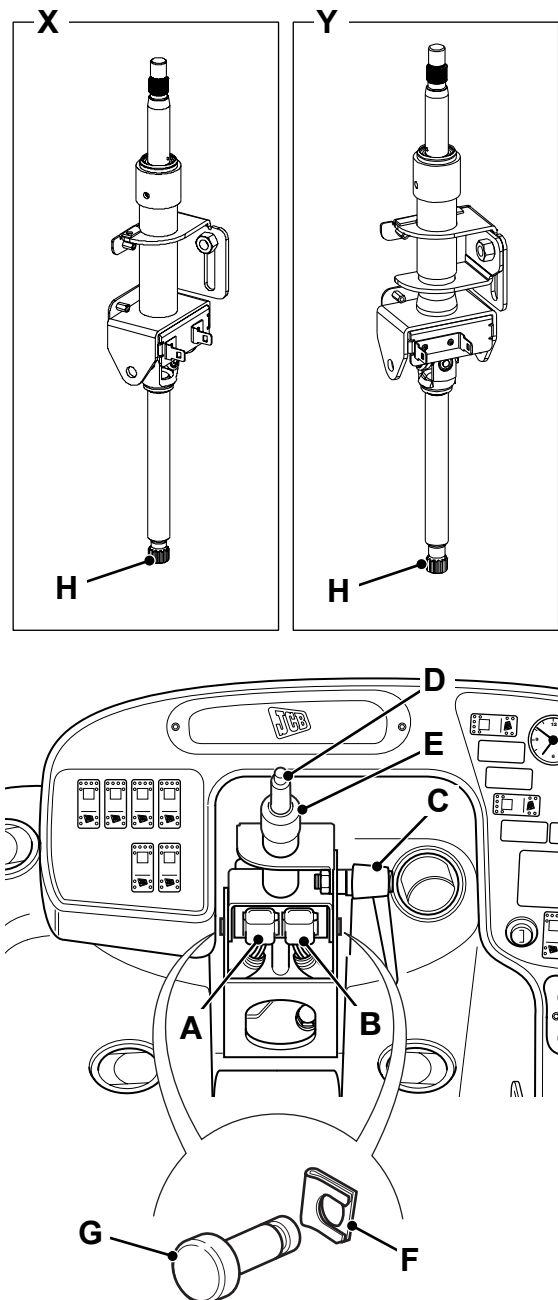


Fig 5.

C045420

Manual Steer Mode Valve

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device. Refer to the applications table.

Descriptions and procedures relate to the device and not related systems. For information about the systems refer to the relevant topics.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

[⇒ Related Topics \(!\[\]\(7fd65f65fc0b6791cf7fbd42ae8069a8_img.jpg\) H8-2\)](#)

[⇒ Removal and Replacement \(!\[\]\(0f6aa2a0983c59439ece9809b385c976_img.jpg\) H8-3\)](#)

[⇒ Dismantle and Assemble \(!\[\]\(8cb427162659ecbca69b5be29d5ff78b_img.jpg\) H8-5\)](#)

Related Topics

Table 1. Related Topics in This Publication

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Sections	Topic Titles	Sub Titles
1	<i>Applications</i>	ALL
2	ALL (Care and Safety) ⁽¹⁾	ALL
3	<i>Hydraulic System</i>	<i>Checking the Hydraulic Fluid Level</i>
3	<i>Access Panels</i>	<i>Undershields</i>
H	⇒ Steering SYSTEM (H1-1)	ALL
H	⇒ Manual Steer Mode SYSTEM (H2-1)	ALL

(1) You must obey all of the relevant care and safety procedures.

Removal and Replacement

Removal

- 1 Park the machine and make it safe. Fit the boom safety strut. Obey the care and safety procedures → [Related Topics](#) (□ H8-2)
- 2 Remove the chassis undershield. Refer to **Section 3 - Access Panels**. → [Related Topics](#) (□ H8-2)
- 3 Put a label on the hydraulic hoses to aid replacement.
- 4 Disconnect and cap the four hydraulic hoses **A** from the steer mode valve **B**.

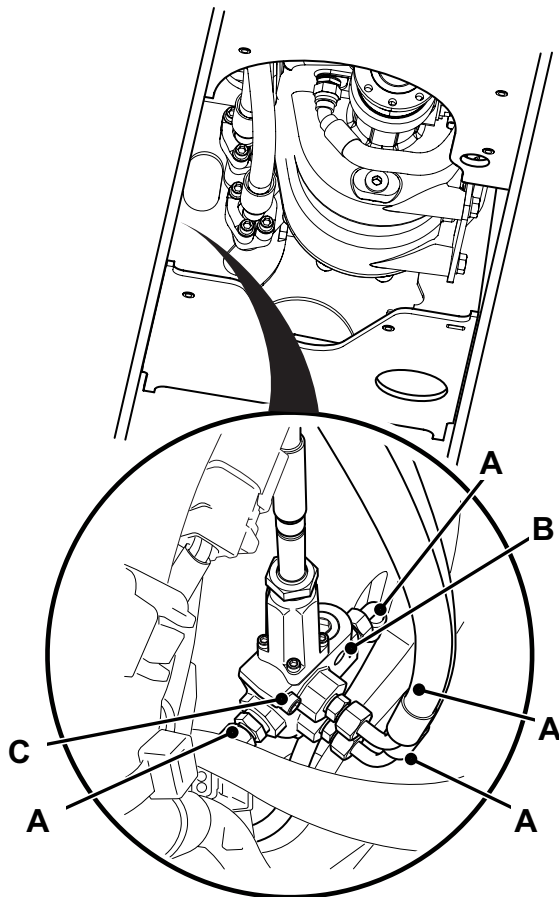


Fig 1.

C094910-C2

- 5 Remove the fasteners **C** securing the steer mode valve **B** to the chassis.
- 6 Remove the steer mode selector control handle **F** (located inside the cab).

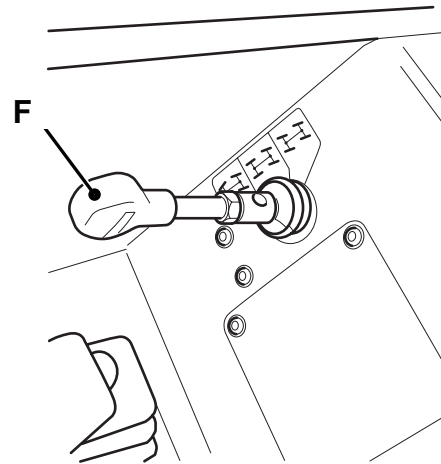


Fig 2.

C067540-C2

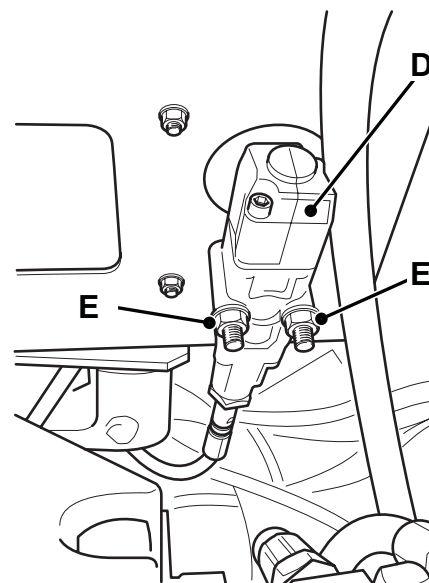


Fig 3.

C067610-C2

- 7 Remove the nuts **E** securing the steer mode selector unit **D** to the cab.
- 8 The steer mode selector unit, operating cable and valve can now be removed from the machine as a complete assembly.

Note: Before removing the steer mode valve assembly from the machine, observe the routing of the operating cable.

Replacement

Replacement is the opposite of the removal procedure.

During the replacement procedure do this work also:

- Make sure that the hoses are fitted in the correct position.
- Bleed the steering system. [⇒ Bleeding the System \(□ H1-31\)](#)
- Check the hydraulic fluid level. [⇒ Related Topics \(□ H8-2\)](#)

Dismantle and Assemble

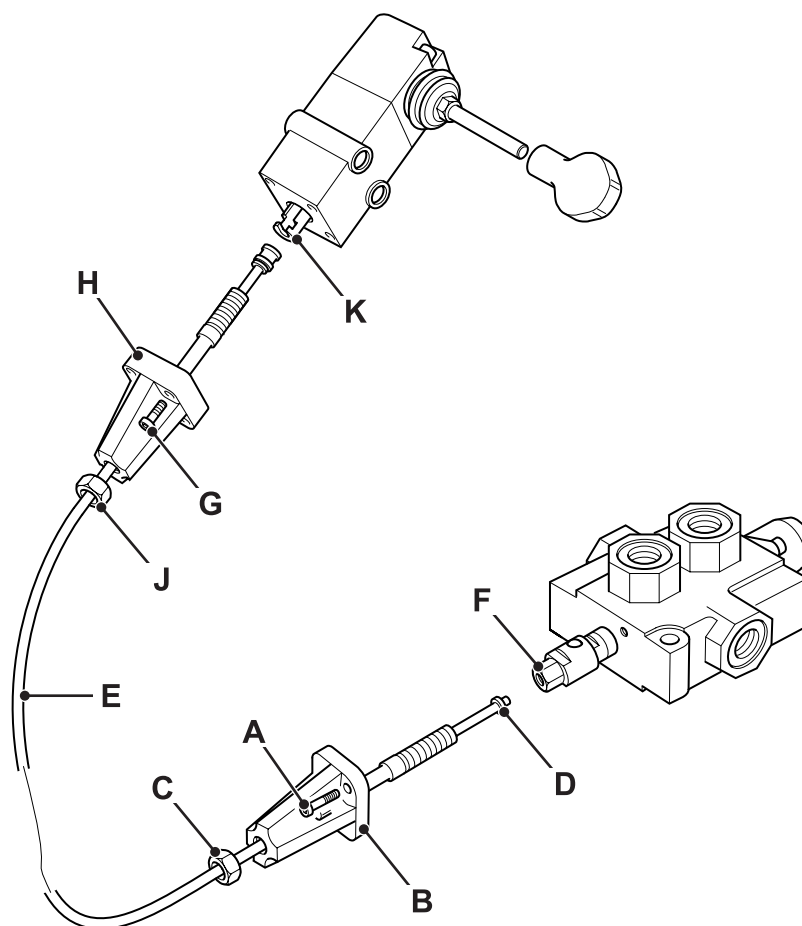


Fig 4.

805030-1

Dismantle

- 1 Remove the steer mode valve assembly from the machine. [➔ Removal \(□ H8-3\)](#)
- 2 Remove screws **A** from endcap **B**.
- 3 Undo locknut **C**. Rotating the locknut and endcap **B** counter-clockwise (so that the parts travel away from the valve) until they disengages the operating cable thread.
- 4 Undo locknut **D** and disconnect operating cable **E** from valve adaptor **F**.
- 5 Remove screws **G** from endcap **H**.
- 6 Undo locknut **J**. Rotating the locknut and endcap **H** counter-clockwise (so that the parts travel away from the valve) until they disengages the operating cable thread.
- 7 Disengage operating cable **E** from the steer mode selector **K**

Assemble

Assembly is the opposite of the Dismantling procedure.

During the assembly procedure do this work also:

- Before connecting the operating cable to the valve, set locknut **D** as shown. → [Fig 5.](#) ([H8-6](#)) In this position the locknut can be used as a guide as to how far to wind the operating cable into valve adaptor **F**.

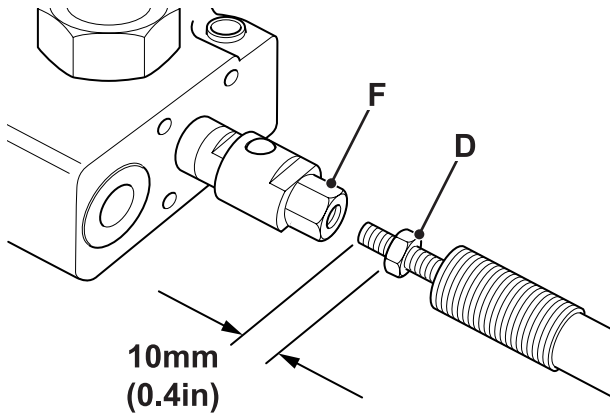


Fig 5.

805040-1

Apply JCB Threadlocker and Sealer to screws **A** and **G**.

Auto Steer Mode Valve

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device. Refer to the applications table.

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This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

[⇒ Related Topics \(!\[\]\(cd9d0704c249be5c9161bfdf10f39607_img.jpg\) H9-2\)](#)

[⇒ Removal and Replacement \(!\[\]\(1ac07df3f1292d2ef4f76373df7eeb4c_img.jpg\) H9-3\)](#)

[⇒ Dismantle and Assemble \(!\[\]\(34dc7389c65dd2e95174695130acc51b_img.jpg\) H9-4\)](#)

Related Topics

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2	ALL (Care and Safety) ⁽¹⁾	ALL
3	<i>Hydraulic System</i>	<i>Checking the Hydraulic Fluid Level</i>
B	<i>Fuel Tank</i>	ALL
H	⇒ Steering SYSTEM (□ H1-1)	ALL
H	⇒ Auto Steer Mode SYSTEM (□ H3-1)	ALL

(1) You must obey all of the relevant care and safety procedures.

Removal and Replacement

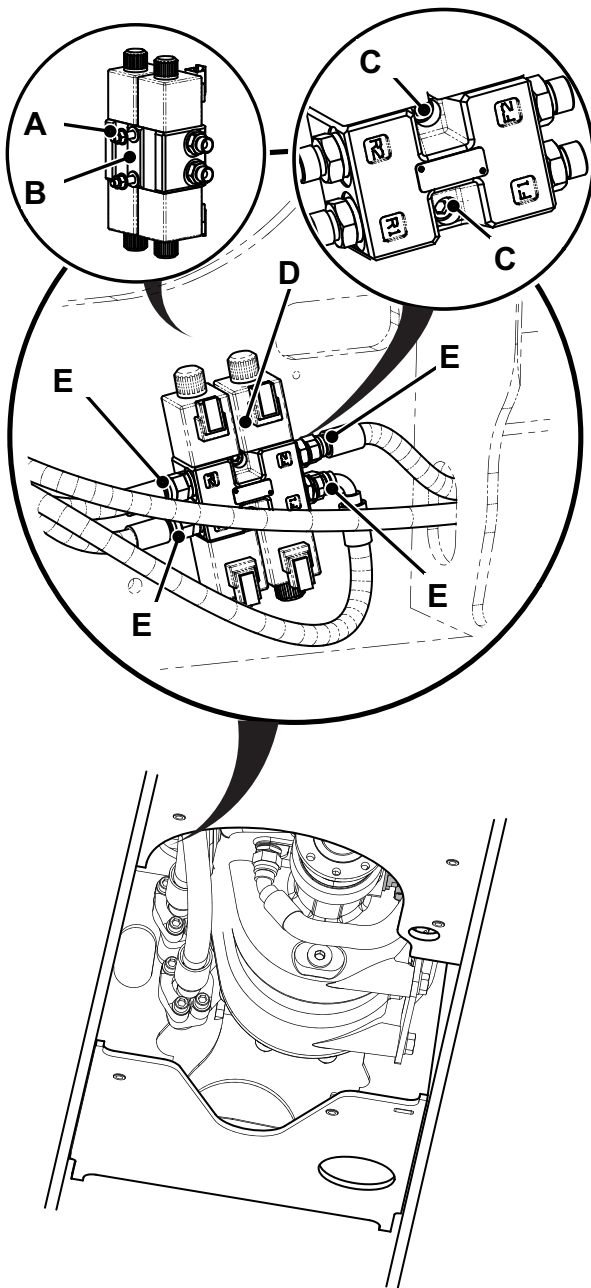


Fig 1.

C094910-C3

- 3 Remove the fuel tank. Refer to **Section B - Fuel Tank**. [⇒ Related Topics \(□ H9-2\)](#)
- 4 Put a label on the hydraulic hoses **E** and electrical connectors to aid replacement.
- 5 Disconnect and cap the four hydraulic hoses **E** from the steer mode valve **D**.
- 6 Disconnect the electrical solenoid connections.
- 7 Take hold of the steer mode valve assembly, and remove screws **C** and nuts **A**. Lift the steer mode valve assembly from the machine.

Note: Make sure to retain the spacers **B** installed between the steer mode valve and the chassis.

Replacement

Replacement is the opposite of the removal procedure.

During the replacement procedure do this work also:

- Make sure that the hoses are fitted in the correct position.
- Make sure that the electrical solenoid connections are refitted in the correct position.
- Make sure that the steer mode valve is installed in the correct position - F ports are pointing to the front of the machine and R ports are pointing to the rear.
- Torque tighten the screws **C** and nuts **A**. [⇒ Torque Settings \(□ H9-3\)](#)
- Bleed the steering system. [⇒ Bleeding the System \(□ H1-31\)](#)
- Check the hydraulic fluid level. [⇒ Related Topics \(□ H9-2\)](#)

Table 2. Torque Settings

Item	Nm	kgf m	lbf ft
C	22	2.2	16.2

Removal

- 1 Park the machine and make it safe. Fit the boom safety strut. Obey the care and safety procedures [⇒ Related Topics \(□ H9-2\)](#)
- 2 Remove the chassis undershield. Refer to **Section 3 - Access Panels**. [⇒ Related Topics \(□ H9-2\)](#)

Dismantle and Assemble

Note: The solenoid valves are non-serviceable parts. Faulty valves must be renewed. The following procedure details removing and replacing a valve fitted at the manifold block. The procedure is identical for all the valves (2 or 4 valve assemblies depending on machine variant). The procedure assumes that the complete valve and manifold block assembly has been removed from the machine.

Dismantle

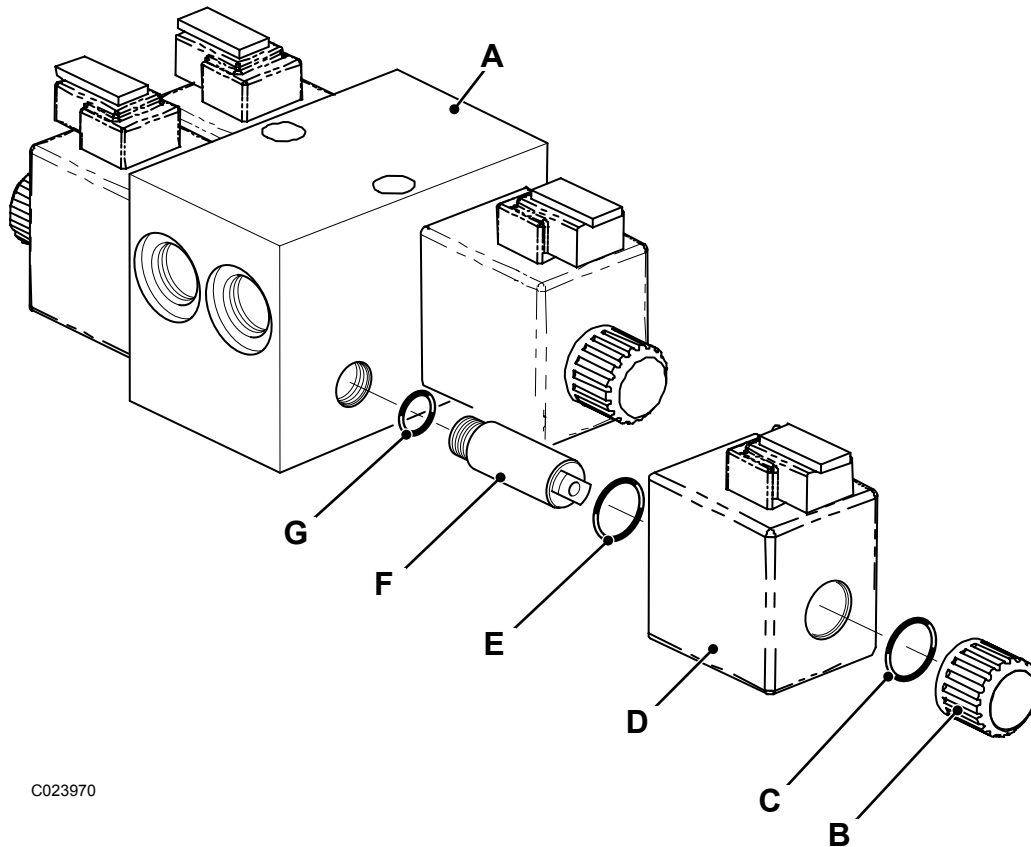
- 1 Unscrew the knurled cap **B** and pull off the solenoid coil **D**. Retrieve 'O' rings **C** and **E**.
- 2 Using a suitable open ended spanner unscrew the valve stem **F** from the manifold block **A**. Retrieve 'O' ring **G**.

Assemble

- 1 Make sure that all components are perfectly clean. If contamination is suspected make sure that all the oilways in the manifold block **A** are clear of debris.
- 2 Renew all 'O' rings.
- 3 Lubricate parts with JCB Special Hydraulic fluid before assembling.

Table 3. Torque Settings

Item	Nm	lbf in
F	22-24	16.2-17.7



C023970

Fig 2.

C023970