Service Manual

3DX Backhoe Loader

Publication No.

550/42426-1

Issued by JCB Technical Publications, JCB Aftermarket Training, Woodseat, Rocester, Staffordshire, ST14 5BW, England. Tel +44 1889 591300 Fax +44 1889 591400

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Service Tools

Tool detail reference

Section B- Body and Framework

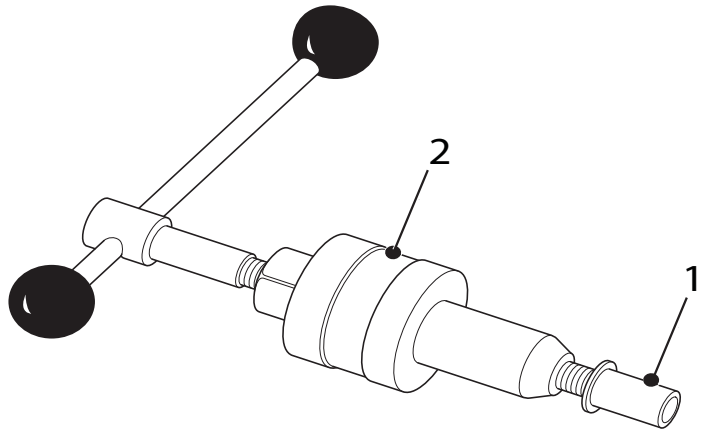

Fig 8.

826/01099	M6 x 16 mm Rivet Nut
826/01101	M6 x 19 mm Rivet Nut
826/01102	M8 x 18 mm Rivet Nut
826/01103	M8 x 21 mm Rivet Nut
826/01104	M10 x 23 mm Rivet Nut
826/01105	M10 x 26 mm Rivet Nut

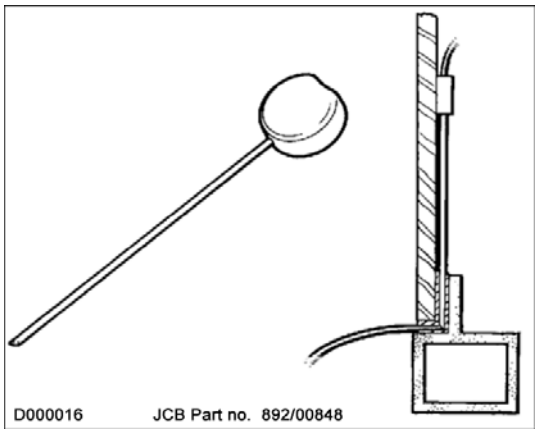

Fig 9.

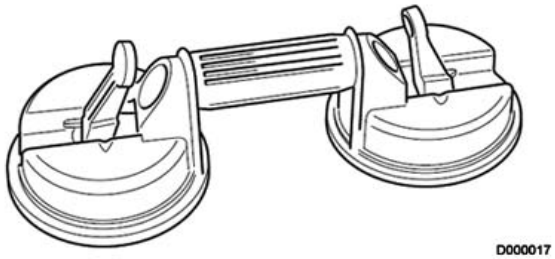

Fig 10.

Section 2

Care and Safety

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Maintenance Safety

⚠ WARNING

Communications

Bad communications can cause accidents. If two or more people are working on the machine, make sure each is aware of what the others are doing. Before starting the engine make sure the others are clear of the danger areas; examples of danger areas are: the rotating blades and belt on the engine, the attachments and linkages, and anywhere beneath or behind the machine. People can be killed or injured if these precautions are not taken.

INT-3-1-5

⚠ WARNING

Repairs

If your machine does not function correctly in any way, get it repaired straight away. Neglect of necessary repairs could result in an accident or affect your health. Do not try to do repairs or any other type of maintenance work you do not understand. To avoid injury and/or damage get the work done by a specialist engineer.

GEN-1-5_2

⚠ WARNING

Metal Splinters

You can be injured by flying metal splinters when driving metal pins in or out. Use a soft faced hammer or copper pin to remove and fit metal pins. Always wear safety glasses.

INT-3-1-3_2

⚠ WARNING

Fluid Under Pressure

Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear protective glasses. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

INT-3-1-10_2

⚠ WARNING

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before connecting or removing any hydraulic hose, residual hydraulic pressure trapped in the service hose line must be vented. Make sure the hose service line has been vented before connecting or removing hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11_2

⚠ WARNING

Petrol

Do not use petrol in this machine. Do not mix petrol with the diesel fuel; in storage tanks the petrol will rise to the top and form flammable vapours.

INT-3-1-6

⚠ WARNING

Diesel Fuel

Diesel fuel is flammable; keep naked flames away from the fuel system. Do not smoke while refuelling or working on the fuel system. Do not refuel with the engine running. There could be a fire and injury if you do not follow these precautions.

INT-3-2-2_1

⚠ WARNING

Oil

Oil is toxic. If you swallow any oil, do not induce vomiting, seek medical advice. Used engine oil contains harmful contaminants which can cause skin cancer. Do not handle used engine oil more than necessary. Always use barrier cream or wear gloves to prevent skin contact. Wash skin contaminated with oil thoroughly in warm soapy water. Do not use petrol, diesel fuel or paraffin to clean your skin.

INT-3-2-3

⚠ CAUTION

It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants.

Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use authorised waste disposal sites.

INT-3-2-14

Cleaning the Machine

Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower the attachments to the ground and stop the engine.

Clean the machine using water and/or steam. Do not allow mud, debris etc to build upon the machine, pay particular attention to the following areas:

1 Backhoe hoses passing through mainframe

2 Around twin slew rams.

3 Kingpost slide rails

4 Kingpost hose tray and bottom ‘shelf’.

5 Recess between slew ram and kingpost casting

Stabiliser cavities can become clogged when operating in soft / wet ground conditions. Remove and clean away all debris that may have built up.

Do not allow mud to build up on the engine and transmission. Make sure the radiator grille is not clogged up ⇨ ***Fig 1. (🗋 3-2)***.

⚠ WARNING

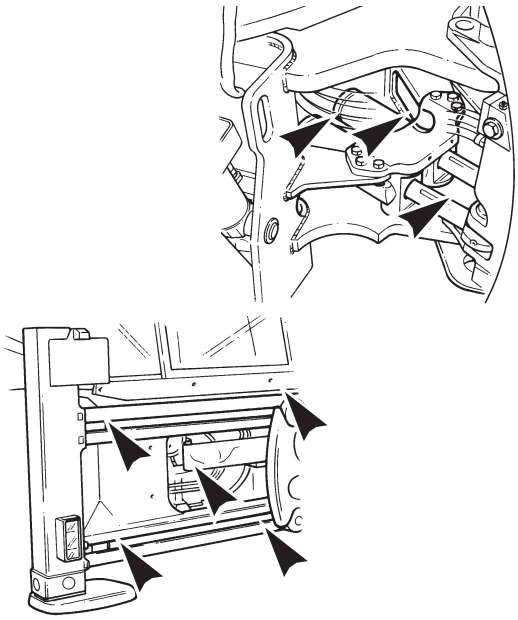
Airborne particles of light combustible material such as straw, grass, wood shavings, etc. must not be allowed to accumulate within the engine compartment or in the propshaft guards (when fitted). Inspect these areas frequently and clean at the beginning of each work shift or more often if required. Before opening the engine cover, ensure that the top is clear of debris

5-3-1-12_3

Avoid using neat detergent - always dilute detergents as per the manufacturer's recommendations, otherwise damage to the paint finish may occur.

It is important to note that excessive power washing can cause damage to the seals or bearings. Take care during routine machine washing not to direct high power water jets directly at oil seals or universal joints.

Note: *The machine must always be greased after pressure washing or steam cleaning.*



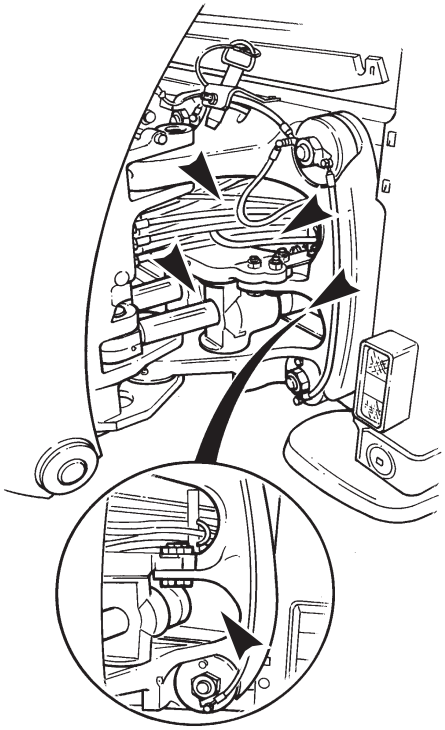


Fig 1.

Service Schedules

	Operation	10	50	100(1)	500	1000	2000	6000
Door - Fit and Catches	- Check			☐	☐	☐	☐	☐
Cab Seat - Operation ⇨ ***Check the Seat and Seat Belt (93)***	- Check			☐	☐	☐	☐	☐
Front Mudguards - Security (if fitted)	- Check			☐	☐	☐	☐	☐
Windscreen Washer Fluid Level.	- Check	☐	☐	☐	☐	☐	☐	☐
Boom Lock Engagement ⇨ ***Boom and Slew Locks (1-40)***.	- Check	☐	☐	☐	☐	☐	☐	☐
Condition of Paintwork ⇨ ***Check the Machine Body and Structure (93)***.	- Check			☐	☐	☐	☐	☐
Stabiliser Legs (Sideshift) ⇨ ***Stabiliser Legs (Sideshift Machines Only) (133)***.	- Check / Adjust		☐	☐	☐	☐	☐	☐
Machine Generally ⇨ ***Cleaning the Machine (89)***.	- Check / Clean	☐	☐	☐	☐	☐	☐	☐
Power Sideshift Wear Pads ⇨ ***Greasing (95)***.	- Grease	☐	☐	☐	☐	☐	☐	☐
Power Sideshift Wear Pads ⇨ ***Wear Pads (133)***.	- Check					☐	☐	☐
Power Sideshift Chain ⇨ ***Power Sideshift (100)***.	- Lubricate		☐	☐	☐	☐	☐	☐
Power Sideshift Chain Tension.	- Check / Adjust			☐	☐	☐	☐	☐

(1) First 100 Hours Service only, to be completed by your JCB Distributor.
(2) If operating under arduous conditions, change the engine oil and filter every 250 hours.
(3) The oil service interval will be affected if there is a high sulphur content in the fuel. Refer to Fuel System for more information.
(4) If operating in dusty working environments, change more frequently. Change the inner element whenever the outer element is being changed.
(5) If the engine is difficult to start or the engine has poor performance, fit new filters. For the water separator filter, use a 30 micron filter for normal conditions and a 150 micron filter for cold climate (-10°C, 14°F).
(6) Jobs which should only be done by a specialist.
(7) After a major transmission repair, the new oil should be run to operating temperature and changed again to remove any contamination which entered during the repair. Change the oil and filter after a further 100 hours if the oil was heavily contaminated because of, or from the failure (e.g. water contamination).
(8) Check for leaks every 50 hours, check level if leaking.
(9) After a hub repair, the new oil should be run to operating temperature and changed again to remove any contamination which entered during the repair. Change the oil again after a further 100 hours to remove any bedding-in wear. This is particularly important if new brake plates have been fitted.
(10) The axles and driveshafts are factory greased with a high performance grease, if during service a standard grease is used, then the interval must be reduced to every 50 hours, contact your JCB Distributor for advice.
(11) Check the hydraulic fluid level with the loader and backhoe in the travel position.

Backhoe

A-Standard Dipper - 27 Grease Points

Note: *Figure shows a typical boom and dipper arrangement* ⇨ ***Fig 8. (🗋 3-22)***

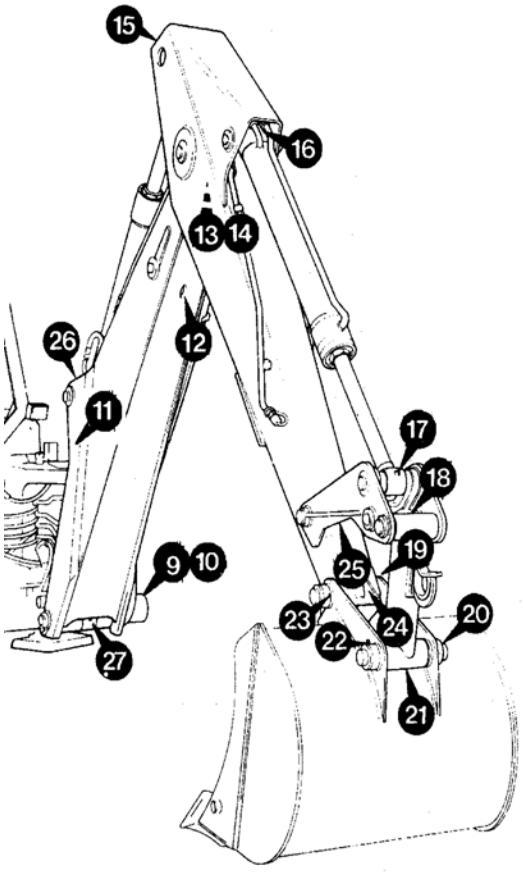


Fig 8.

Changing the Drive Belt

1 Get access to the drive belt. Refer to ***Front End Accessory Drive Belt, Introduction***.

2 Use a 16mm (5/8 in.) socket located on the hexagon spigot nut **D**, carefully rotate the tensioner against the spring force in direction **E**. Do not use excessive force or the tensioner will be damaged.

3 Keep holding the tensioner against the spring force and lift the belt off the tensioner pulley **F**.

4 Slowly release the spring force by rotating the tensioner unit in the opposite direction.

5 Before fitting a new belt, check that the tensioner roller and fan pulley rotate smoothly and that there is no play in the bearings.

6 Fit the new drive belt around the pulleys. ⇨ ***Fig 23. (3-31)***.

7 Use a 16mm (5/8 in.) socket located on the hexagon spigot nut **D**, carefully rotate the tensioner against the spring force in direction **E**. Do not use excessive force or the tensioner will be damaged.

8 Keep holding the tensioner against the spring force and lift the belt around the tensioner pulley **F**.

Changing the Engine Fuel Filter Element

Mechanical Fuel Injection System

1 Get access to the Engine Fuel Filter. Refer to **Water Separator and Engine Fuel Filter, Introduction**.

2 Thoroughly clean the outside of the filter housing and around the filter head.

3 Loosen the drain tap **A** and allow the fuel to drain into a suitable container.

4 Mark the pipes prior to removal to ensure they are refitted in the correct position. Press fuel coupling release button **B** and disconnect fuel lines **C** and **D**.

5 Release the filter strap retaining screw E and lift the filter clear.

6 Install new filter element **F**. Make sure that the black dot G is aligned with the locating hole **H** in the strap. Torque tighten the filter strap retaining screw **E** to 24 Nm (17.7 lbf ft).

7 Reconnect the fuel lines **C** and **D**.

8 Bleed the fuel system. Refer to **Bleeding the System**.

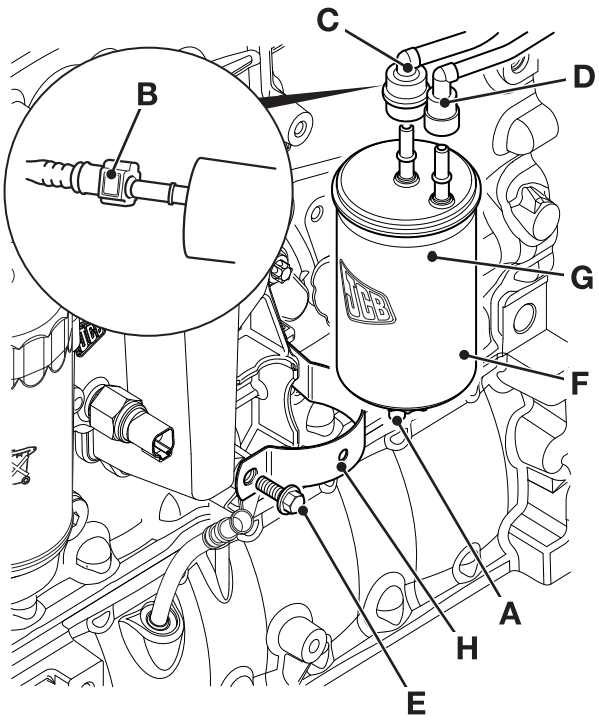


Fig 32.

4 Refit the radiator grille.

Note: *Machines with air conditioning have a condenser matrix fitted in front of the oil cooler, the fins of the condenser matrix may get clogged. In this case, clean the tubes/fins of the condenser matrix as described above.*

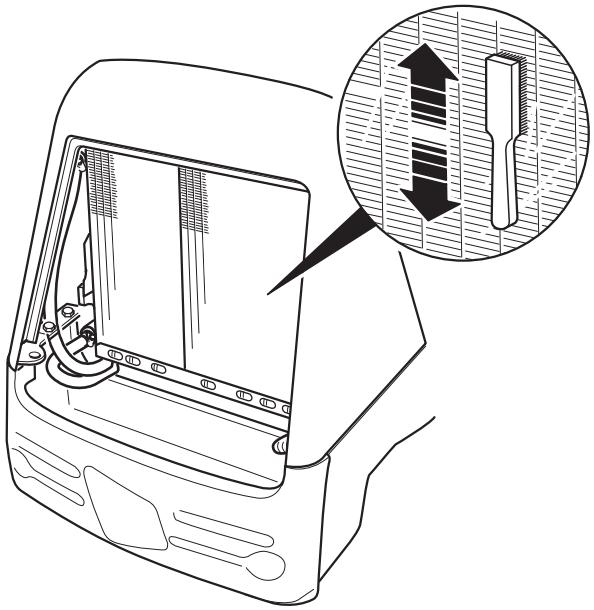


Fig 46.

Section A

Attachments

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Torque Settings

External Components

⇒ *Fig 6. (3-7)*

Table 2.

Item	Description	Quantity	Nm	lbf ft
A	Side plate mounting bolts/nuts (earlier models)	2	580	428
A1	Side plate mounting screws (Later models)	2	580	428
B	Side plate mounting screws	8	580	428
C	Side plate mounting screws	6	340	250
D	Side plate mounting screws (upper) M24 x 50	4	580	430
E	Side plate mounting screws (lower) M24 x 90	8	580	430

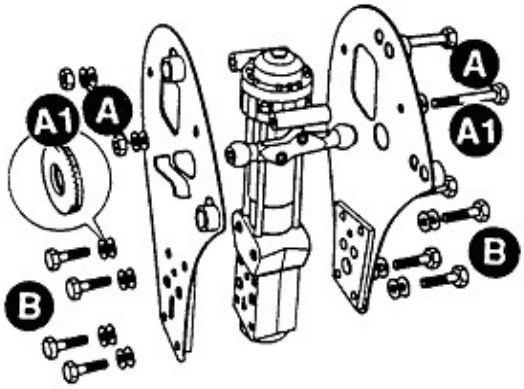

Fig 6.

Side Plates

Removal

1 Mount the Hammer Master on the rock breaker support stand. Support each side plate on lifting hooks inserted in the pivot pin holes ⇨ *Fig 15. (3-17)*.

2 Remove the two sets of pivot plate securing nuts **A**. washers **B**,**C** and Bolts **D**.Remove and retain spacers **F**.

3 Remove the eight securing screws **E** and washers **B**, one side at a time.

4 Remove the side plates. taking care not to damage the swivel couplings.

Installing

Important: *Clean all parts before installing.*

Installing is a reversal of the removal procedure. Ensure that the spacers **F** are in place and that the washers **B** face towards each other as shown. Finger-tighten the nuts **A** and screws **E** and then insert two pivot pins in to the pivot pin bushes (to ensure correct side plate alignment). Torque tighten the nuts and screws. Evenly and in stages, to 580 Nm (428 lbf ft). Finally, remove the two pivot pins.

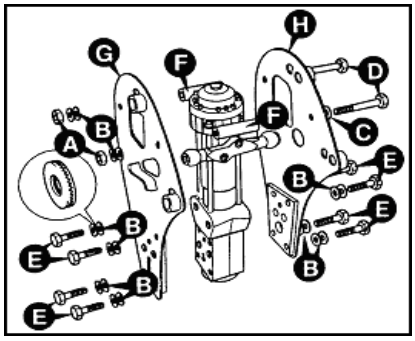

Fig 15.

Front Head

Dismantling and Assembly

Dismantling

1 Removing the accumulator, the tie rods, the valve body and the cylinder.

2 Remove thrust ring **A.**

3 Remove upper tool bushing **B** using a suitable puller. If the bushing is tight apply heat to the lower end of front head **D**. Remove locating pin **C**.

4 Check all parts for damage. Carefully remove minor blemishes ⇨ *Fig 24. (🗋 3-27)*.

5 Check the upper tool bushing for excessive wear if the internal diameter at any point exceeds 70 mm, renew the bushing.

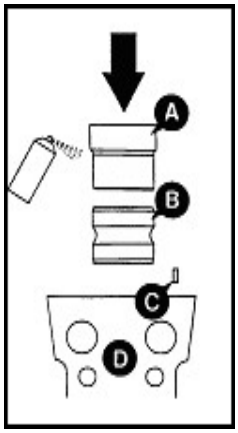

Fig 24.

Assembly

1 Insert upper tool bushing **B** into front head **D**.

2 Install thrust ring **A** and locating pin **C**.

3 Install the cylinder, the valve body, the tie rods and the accumulators.

a Always use the special lifting tools when moving the glass. Use a lifting strap to hold large panes of glass in position. ⇨ *Fig 12. (B-6)*.

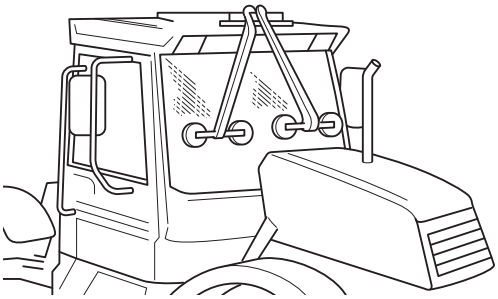

Fig 12. Typical M/c. Installation

b Sit the bottom edge of the glass on the spacer blocks ⇨ *Fig 13. (B-6)*.

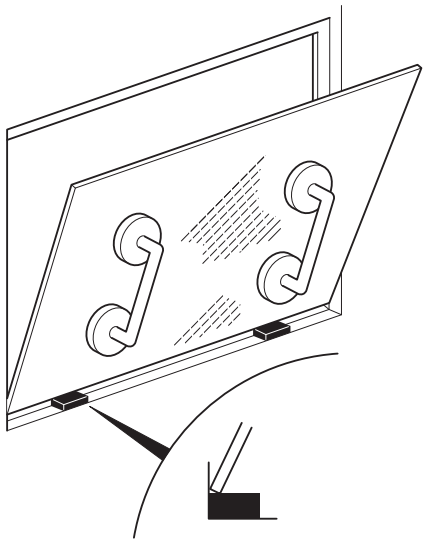

Fig 13.

c Make sure that the glass is correctly positioned, then gently press around the edges of the glass and ensure full adhesive contact is achieved. Do not press too hard or too much adhesive will squeeze out.

3 Make the inside seal smooth:

a Wearing surgical gloves, dip your finger in a soapy water solution.

b Use your finger to make the inside seal smooth.

4 All exposed edges must be sealed using Black Polyurethane Sealant (see ***Sealing and Retaining Compounds***, Section 1).

Important: *Use extreme caution when wiping the inside of the new glass - pushing too hard on the inside of the glass will affect the integrity of the bonded seal.*

5 Clean the glass after installation:

a Small amounts of sealant can be cleaned from the glass using the 'Active Wipe 205'.

b Large amounts of excess sealant should be left to 'cure' and then cut off with a sharp knife.

Note: *On completion of the glass replacement procedures, the sealant 'curing' time is 30 minutes. This means that the machine can be driven and used after 30 minutes, but it must not be used during the curing period of 30 minutes.*

c Clean the glass using a purpose made glass cleaner

6 On completion of the glass installation procedures tidy the work area:

a Remove all broken glass from the cab area.

b Remove the protective covers from the cab seat and control pedestals.

c Renew all safety and instructional labels so that the new installation conforms with the original cab installation.

Fuel Tank

Removal and Replacement

⚠ 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

Removal

1 Disconnect the battery.

2 Working underneath the RH side of the machine, carefully remove the drain plug **A** and drain the fuel tank contents into a suitable clean container. When empty disconnect suction hose **B**.

⚠ WARNING

Diesel Fuel

Diesel fuel is flammable; keep naked flames away from the fuel system. Do not smoke while refuelling or working on the fuel system. Do not refuel with the engine running. There could be a fire and injury if you do not follow these precautions.

INT-3-2-2_1

3 Remove the plastic trim **C** below the front RH corner of the cab to gain access to the top of the fuel level sender **D**. Uncouple the electrical harness from connector **E** and disconnect the fuel return pipe from pipe stub **F**.

4 Remove bolts **G** securing the rear fender extension (if fitted).

5 Support the fuel tank with suitable lifting equipment, then unscrew mounting bolts **H** and carefully lift the tank away from the machine.

Replacement

Replacement is a reversal of the removal sequence, but note the following:

If a new fuel tank is being fitted, remove the fuel level sender **D** from the old tank and fit to the new tank. .

Renew the O-ring on the drain plug **A**, and apply JCB Thread locker and Sealer to the threads before fitting. Torque tighten the plug.

Apply JCB High Strength Thread locker to the threads of mounting bolts **H** before fitting. Torque tighten the bolts.

Refill the tank with clean fuel. Make sure all connections are tight and check for leaks.

On completion, prime the fuel system, see ***Section 3, Routine Maintenance***.

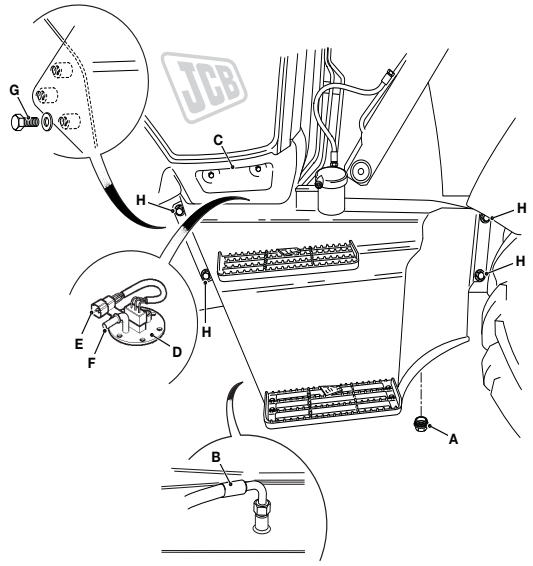

Fig 23.

Table 4. Torque Settings

Item	Nm	lbf ft	kgf m
A	85 - 100	63 - 74	8.7 - 10.2
H	83	61	8.5

Boom

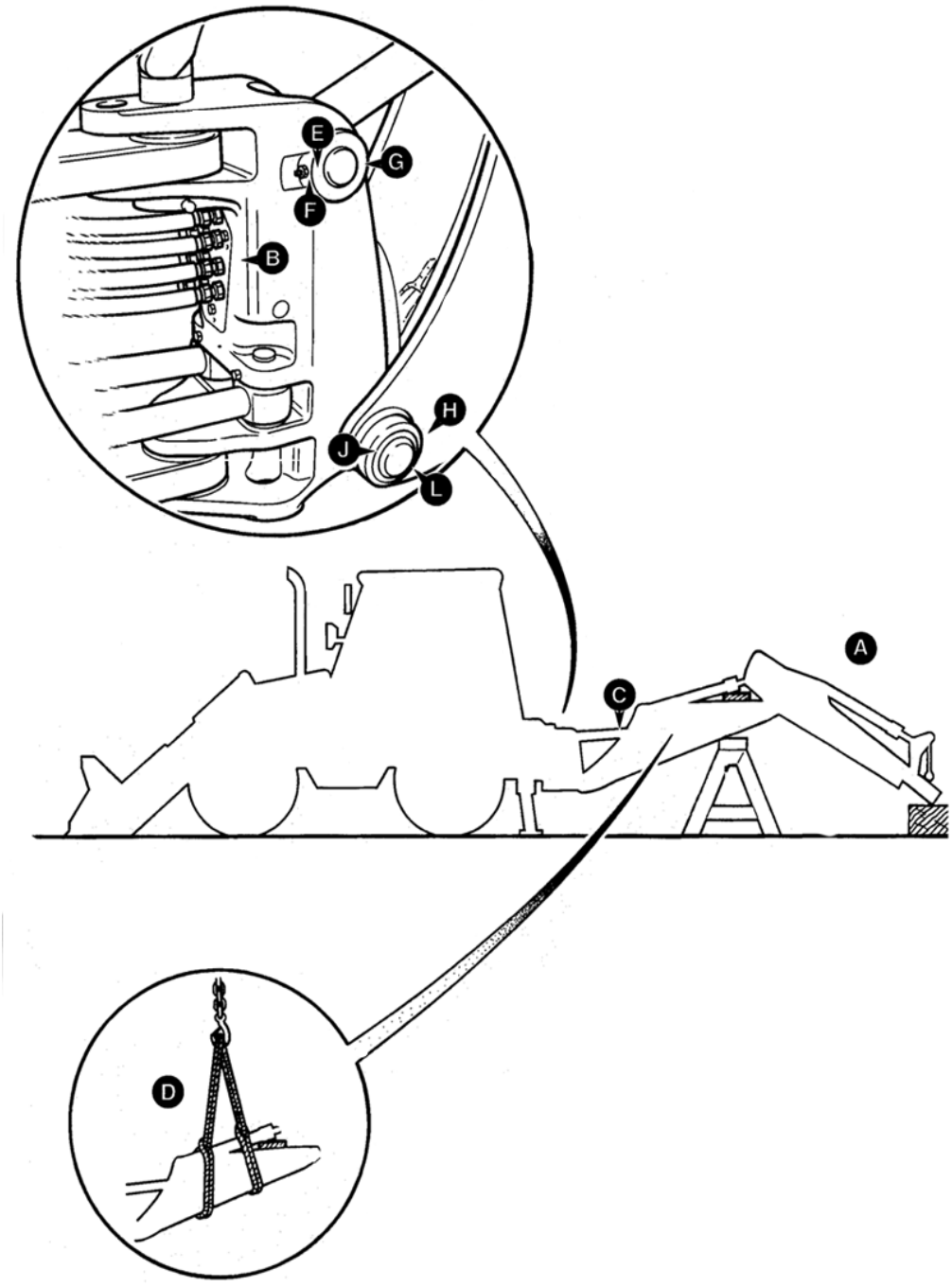

Fig 30.

Section C

Electrics

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Specific Gravity Testing

The specific gravity of the electrolyte gives an idea of the state of charge of the battery. Readings should be taken using a hydrometer, when the electrolyte temperature is 15°C (60°F). If the battery has recently been on charge, wait approximately one hour (or slightly discharge the battery) to dissipate the surface charge before testing.

Readings should be as tabulated and should not vary between cells by more than 0.04. A greater variation indicates an internal fault on that particular cell.

If the electrolyte temperature is other than 15°C (60°F) a 'correction factor' must be applied to the reading obtained. Add 0.07 per 10°C (18°F) if the temperature is higher than 15°C (60°F) and subtract the same if the temperature is lower.

Table 2. Specific Gravity at 15°C (60°F)

	Fully Charged	Half Discharged	Fully Discharged
Ambient temperature up to 27°C (80°F)	1.270 - 1.290	1.190 - 1.210	1.110 - 1.130
Ambient temperature above 27°C (80°F)	1.240 - 1.260	1.170 - 1.190	1.090 - 1.110

Panel harness 4 WD

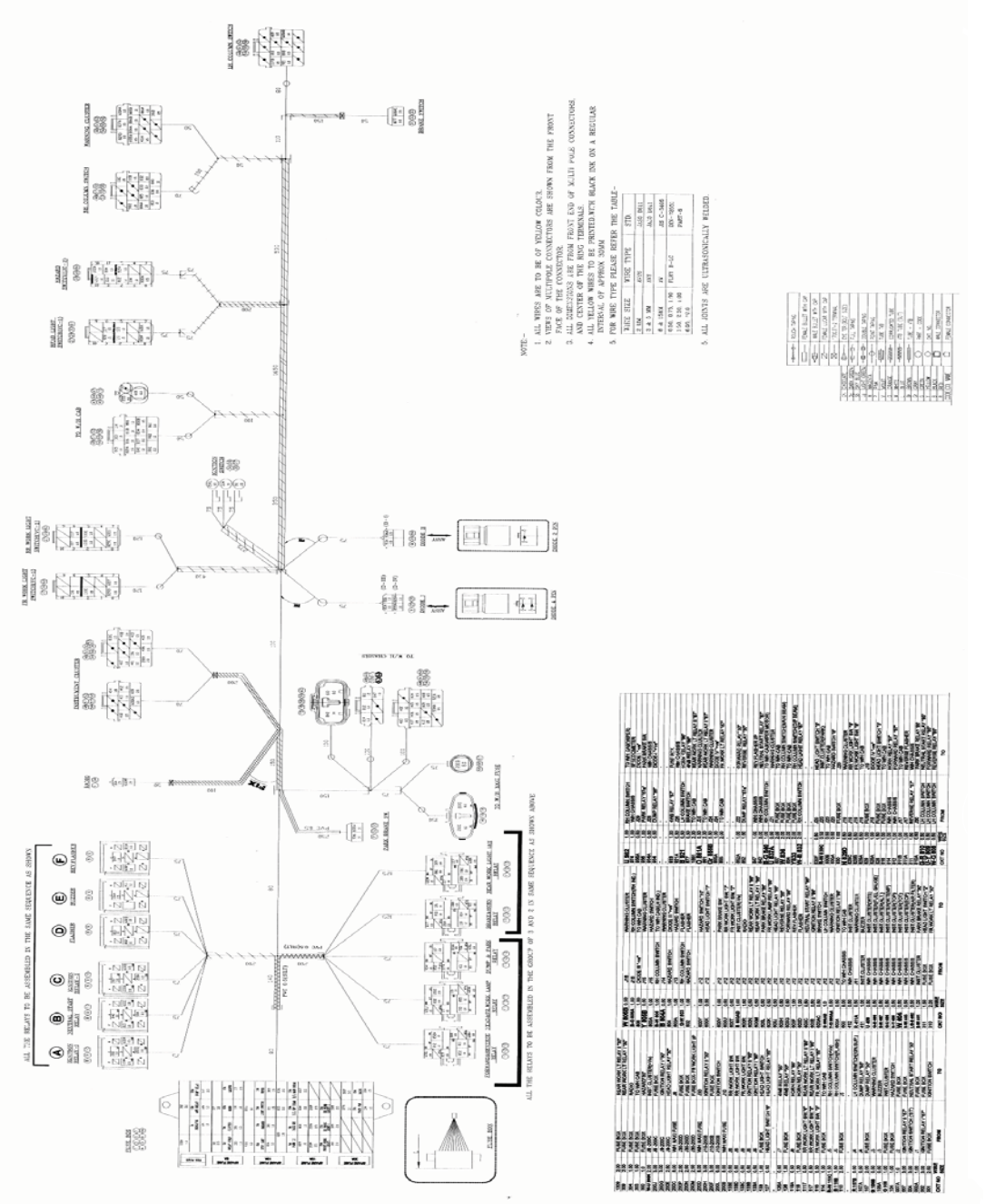


Fig 19.

Dismantle and Assemble

Loader Valve Controls

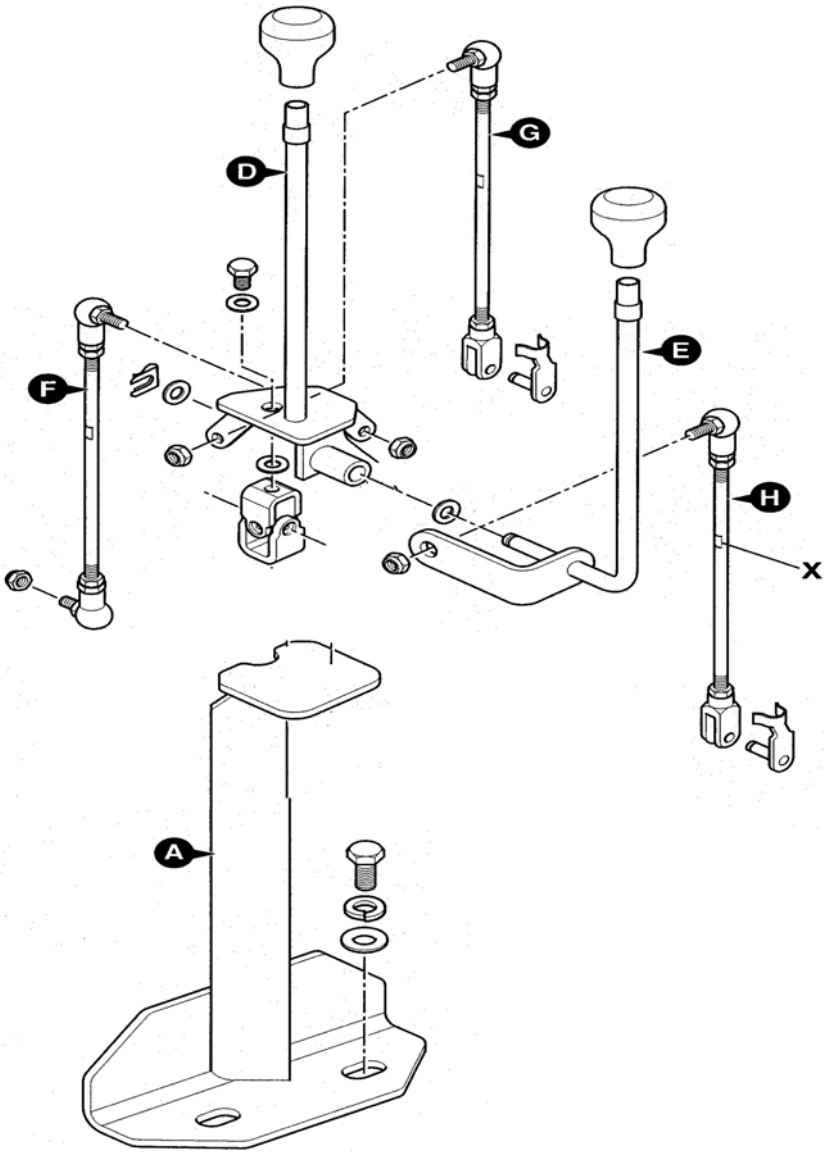
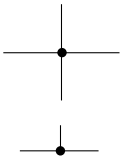
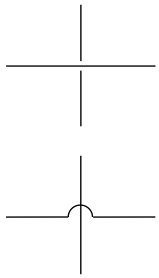
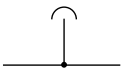
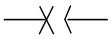
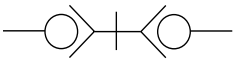
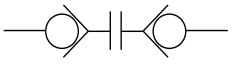
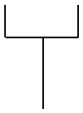
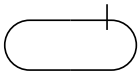
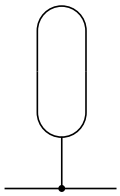
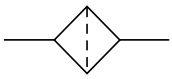
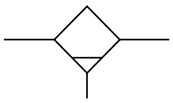
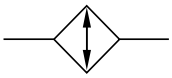
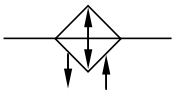
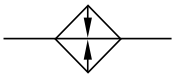


Fig 2.

Contents **Page No.**

Table 7. Energy Transmissions and Conditioning

	Working line, return or feed
	Pilot control
	Drain lines
	Flexible pipe
	Line junction
	Crossing lines
	Air bleed
	Line plugged, also pressure test point
	Line plugged with take off line
	Quick release couplings - connected
	Quick release couplings - disconnected
	Reservoir - return line above fluid level

	Reservoir - return line below fluid level
	Header tank
	Pressure sealed tank
	Accumulator
	Filter or strainer
	Water trap
	Cooler - with no indication of coolant flow
	Cooler - indicating direction of coolant flow
	Heater

Hydraulic Speed Control (HSC)

The following procedure can be used to establish if the hydraulic speed control facility is working correctly.

Make sure that the hydraulic oil is at working temperature, i.e. 50°C (122°F).

Lower the backhoe bucket and loader shovel to rest on the ground; stop the engine; operate the control levers to vent residual hydraulic pressure.

1 Connect a 0 - 400 bar (0 - 6000 lbf/in^2) pressure gauge to the hydraulic test point **A** at the loader valve as shown.

2 With the engine running at 1500 revs/min, slowly operate arms raise, the pressure should be approximately 138 bar (2000 lbf/in^2).

3 Make sure that the HSC rocker switch (mounted on the console) is in the OFF position. Raise the arms slowly and select the rocker switch to ON, the arms should raise slower.

4 Make sure that the HSC rocker switch (mounted on the console) is in the OFF position. Raise the arms slowly and press the button on the loader control knob, the arms should raise slower.

5 If the loader arms fail to respond, then check the HSC hydraulic and electrical circuits for any faults.

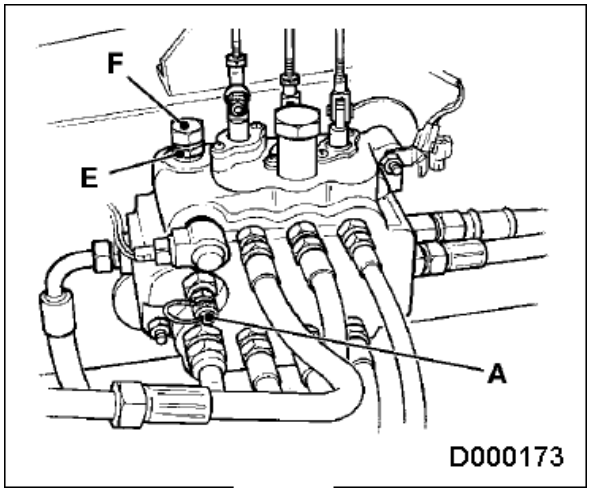


Fig 15.

Ram	Cylinder Dia. (mm)	Rod Dia. (mm)	Total Displacement - mm/10 minutes @ 69 bar (1000 lb/in²)	138 bar (2000 lb/in²)	207 bar (3000 lb/in²)
Backhoe:					
Boom	110	60	8	26	52
Boom	120	65	6	22	44
Boom	130	70	5	19	37
Boom	140	75	5	16	32
Dipper	100	60	10	34	70
Dipper	110	65	8	28	57
Extending Dipper	70	40	19	66	96
Loader:					
Shovel	70	40	10	33	68

Using the figures above, a graph can be plotted and the maximum amount of movement determined. See the next page for a working example.

1 Using the figures given in the table, plot a graph for the ram to be tested. **Example:** Boom Ram 110 x 60, see ⇨ *Fig 32. (📄 E-28)*.

2 Check the pressure in the ram (induced by the applied load). In this example the pressure on the gauge reads 107 bar; 1500 lb/in².

3 Draw a vertical line from the pressure reading to the plotted graph line. Where the vertical line intercepts the graph line, draw a horizontal line and read the permitted ram displacement. In this example the permitted maximum displacement is 18 mm.

Relief Valve Pressure Test

If the hose burst protection valve has been stripped and cleaned, then pre-set the valve as detailed in step 1. The pressure test procedure is described in steps 2 to 6.

1 Pre-set the relief valve:

a Remove cap **B** and its copper washer. Using an Allen key, turn the adjusting screw anti-clockwise to remove all tension.

b Using your fingers, turn the adjusting screw clockwise until a soft force (resistance) is felt.

c Using an Allen key, turn the adjusting screw a further $2^{1}/_{4}$ turns to pre-set the relief valve. Refit the cap and washer.

2 Remove hose **G** from port C2. Cap and plug the hose and valve port adapter (the valve port adapter MUST be plugged, otherwise the test procedure will not work).

3 Remove hose **J** from port V2. Plug the hose but DO NOT cap the valve port adapter.

4 Remove plug **A** and in its place fit a 0-400 bar (0-6000 lbf/in^2) pressure gauge connected to a hand pump.

5 Use the hand pump to increase the pressure. When the pressure reaches the setting of the relief valve, oil will escape from port V2, shown at **K**. Note the maximum gauge reading (the setting of the hose burst relief valve) which should be 250 bar (3625 lbf/in^2).

6 If necessary, adjust the pressure setting as follows:

a Remove cap **B** and its copper washer.

b Using an Allen key, turn the adjusting screw clockwise to increase the pressure or anti-clockwise to decrease the pressure. For information; one full turn of the relief valve adjusting screw is equivalent to approximately 110 bar (1595 lbf/in^2).

c Replace the cap and washer.

d Repeat pressure test, adjust as necessary.

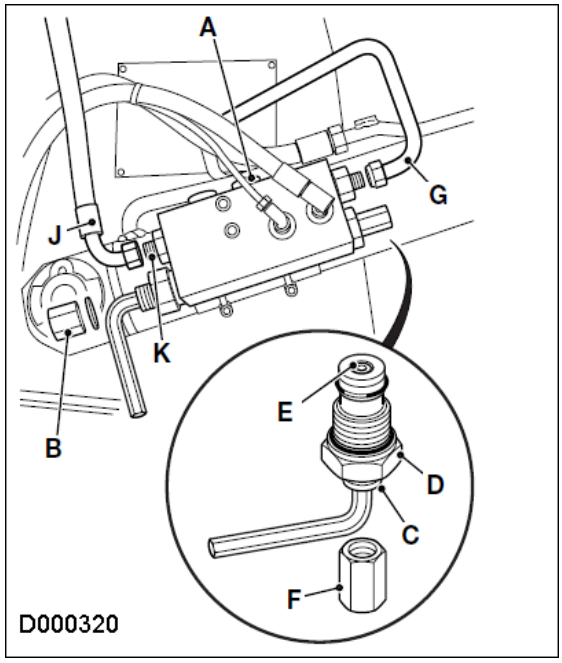


Fig 39.

Table 16.

Fault	Probable Cause	Action
Leaking Oil Seal (Control Valves)	Paint or dirt on the seal face.	Remove the seal and clean.
	The back pressure in the valve circuit is excessively high.	Check circuit pressures, adjust if possible. Otherwise investigate thoroughly.
	Spool damaged.	Dismantle. Inspect all parts. Renovate or renew as necessary.
	The seal is not secured.	Clean the seal and tighten the retaining bolts to the correct torque.
	The seal is cut or damaged.	Fit a new seal.

Table 17.

Fault	Probable Cause	Action
Ram creep	Associated ram or pipe lines from ram leaking.	Check and rectify as required.
	Check valve malfunctioning (if fitted), e.g. stabiliser circuit.	Test check valve, rectify as required.
	Associated valve section spools leaking.	Rectify, check for contamination.
	Associated ARV leaking.	Rectify, check for contamination.

Table 18.

Fault	Probable Cause	Action
Hydraulic oil becomes too hot.	Oil cooler obstructed.	Remove debris from cooler fins.
	Restriction in neutral circuit lines.	Check hoses, replace as necessary.
	Hydraulic filter clogged and by-pass valve not working.	Change hydraulic filter.

Table 19.

Fault	Probable Cause	Action
Steering fails to operate or stiff to operate.	Tyres not inflated to correct Pressure.	Inflate tyres to correct Pressure.
	Insufficient hydraulic fluid.	Check for leaks and top up as required.
	Low pump flow.	Check pump flow, if required service or replace pump.
	Leak in the relevant hoses or component connection.	Check hoses and for connection for leaks.
	Steer relief valve set incorrectly.	Check pressure setting of steer unit relief valve, adjust as required.

Table 20.

Fault	Probable Cause	Action
Steering fails to operate or stiff to operate (Cont.).	Priority valve not operating correctly.	Check if the priority valve is sticking, rectify as required.

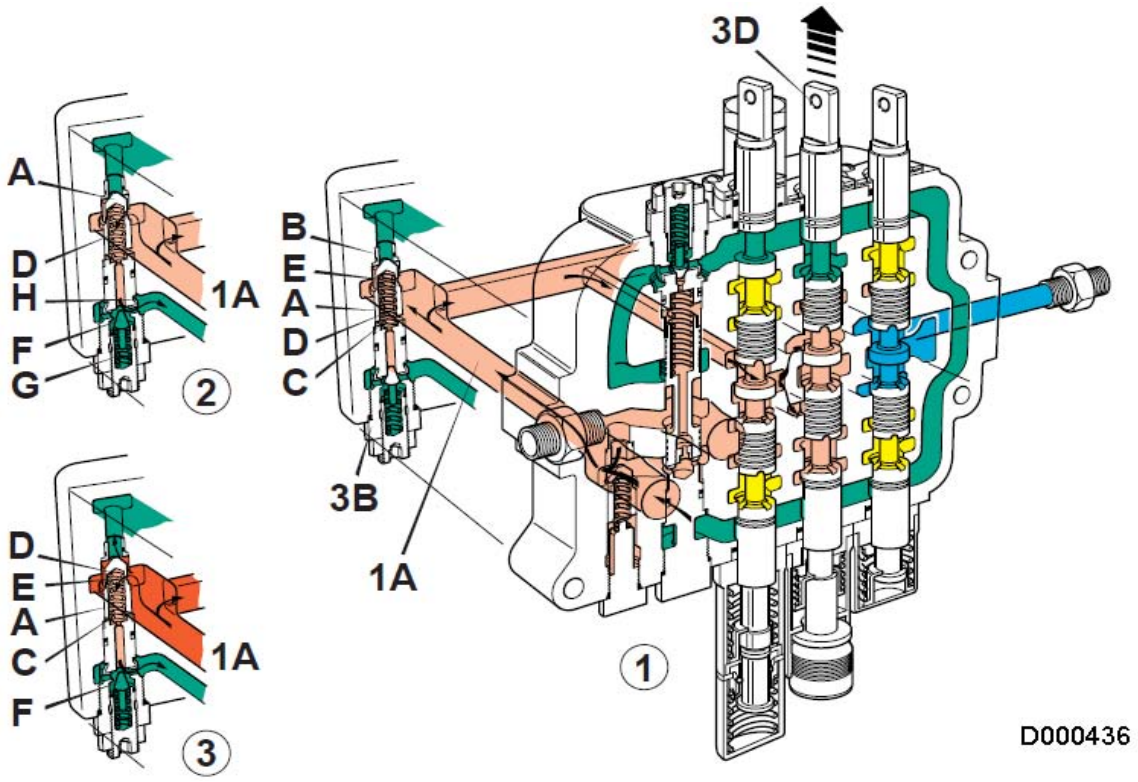


Fig 47.

See also ⇨ ***Table 21. Key to Oil Flow and Pressure (E-50)***.

Main Relief Valve (MRV)

Make sure that the hydraulic oil is at working temperature, i.e. 50°C (122°F).

Lower the backhoe bucket and loader shovel to rest on the ground; stop the engine; operate the control levers to vent residual hydraulic pressure.

1 Connect a 0 - 400 bar (0 - 6000 lbf/in^2) pressure gauge to pressure test connector **A** on the loader valve, (refer to ***Service Tools***).

2 With the engine running at 1500 revs/min, check M.R.V. pressure by raising or lowering the loader arms until the rams are fully open or closed and noting the maximum gauge reading. **CAUTION**: Do not select 'float'. The maximum pressure should be as stated in ***Technical Data***.

Note: *The rams must be 'held' open or closed when reading gauge.*

3 If the pressure is incorrect, loosen locknut **D** and adjust screw **C**. Turn it clockwise to increase pressure and anti-clockwise to decrease the pressure. When the pressure is correct, tighten the locknut and check the pressure again. Adjust as required.

Lock Up

The main relief valve (M.R.V.) 3B, situated in the loader valve block, provides control of both loader and excavator pressures ⇨ *Fig 54. (E-66)*.

1 Valve at Rest

The illustration 1 shows a loader service selected by spool 3D causing pressure to rise in the service line and back through the loader valve to the pump via line 1**A**. The service is operating under light load and the pressure is not sufficient to cause any response in the M.R.V.

The main plunger **A** is held on its seat **B** by the combined effect of spring **C** and the pump pressure which enters chamber **D** through the small drilling **E**. Pump pressure outside the chamber is not high enough to lift the plunger off its seat.

2 Pilot Valve Opens

If, as shown in view 2, pump pressure rises high enough to force the pilot valve **F** from its seat (against spring G), the pressure in chamber **D** is vented into the exhaust gallery H.

3 Valve Moves off its seat

In view 3, pump pressure at 1**A** has risen to the setting of the main relief valve but pressure in chamber **D** has not risen because the seat orifice of pilot valve **F** is larger than small drilling **E** and oil is unable to fill the chamber as quickly as it is being exhausted.

Pressure acting on the upper faces of main plunger **A** is therefore greater than the combined force of spring **C** and the pressure in chamber **D**. The plunger then moves off its seat, allowing pressure to be released to the exhaust gallery.

As the pump pressure decreases, the pilot valve is able to reseat and pressure in chamber **D** assists spring **C** to force the main plunger **A** back onto its seat.

Table 30.

Component Key:	
A	Main Plunger
B	Valve Seat
C	Spring
D	Chamber
E	Drilling
F	Pilot Valve
G	Spring
H	Exhaust Gallery
1A	Pump Inlet
3B	Main Relief Valve
3D	Shovel Ram Spool

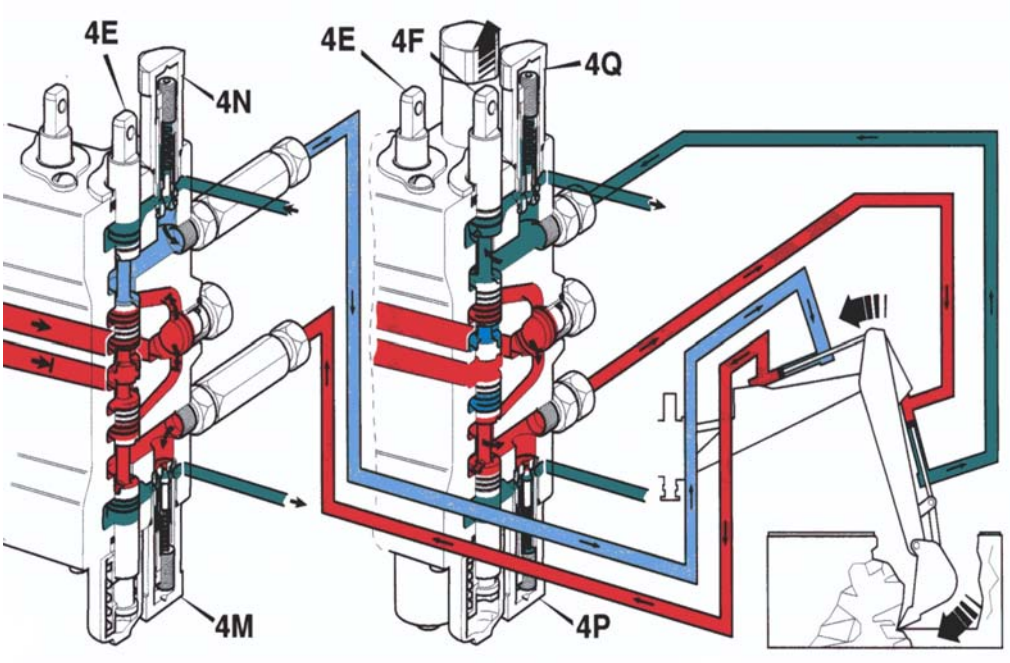


Fig 63.

Auxiliary Relief Valve Operation

A.R.V's are positioned in the excavator valve block in order to relieve excessive pressure in the services as shown in the figure.

Valve at Rest

Illustration 1 of shows the service is in neutral and there are no excessive forces acting on the equipment.

The force of spring **D** acting through Collar **C** keeps the poppet B firmly held on its seat.

Chamber **J** is connected to the exhaust gallery via small drilled holes **H**, this means the pressure in the chamber will always be at Exhaustive pressure.

The ARV pressure setting is adjustable by means of spring **D** and adjusting screw **E**. Turning the screw clockwise compresses the spring and therefore, increases the pressure setting and conversely, turning the screw anti-clockwise releases the spring which decreases the pressure.

Pilot Valve opens

Illustration 2 of ⇒ *Fig 64. (E-78)* shows the Pressure in the service gallery **A** has reached the setting of the ARV.

The pressure on the service side of the poppet is high enough to overcome the force of spring **D** so poppet **B** lifts off its seat. Oil in the chamber **J** is displaced through small drilled holes **H**.

Service pressure at **A** is now released into exhaust gallery **K**.

Gear pump

Table 39.

Hydraulic Pumps (Parker)		
Model/ Reference	Double Pump (9-81377-3DX)	
Rotation	Anti-clockwise	
Mounting	Chassis (driveshaft driven)	
Flow at 2200 rev/mm and system pressure at 500 C	Litres/mm	UK gal/min
Pump Section 1(mounting flane end)	45.5	10
Pump Section 2	45.5	10
Maximum Working Pressure	see- Relief valve Operating Pressures	

Table 40.

Hydraulic Pumps (Parker)	**3DX(Onwards)**	
Model/ Reference	Double Pump (onwards)	
Rotation	Anti-clockwise	
Mounting	Gearbox	
Flow at 2200 rev/mm and system pressure at 500C	Litres/mm	UK gal/min
Pump Section 1	45.5	10
Pump Section 2	45.5	10
Maximum Working Pressure	see- Relief valve Operating Pressures	

9 If no pressure can be raised (see step 8) at the valve inlet, remove the A.R.V. assembly and install anti-cavitation lock-out bung **6** in the port marked '**RV**', make sure that the bung O-ring face seal **D** is facing out. Re-fit the A.R.V. assembly.

Note: *The anti-cavitation lock-out bung seals and locks the A.R.V. anti-cavitation function. The bung is only suitable for the test block application and must NEVER be fitted to the valve block.*

The bung can be extracted using a 3/8 - UNC threaded bolt.⇨ *Fig 82. (E-97)*

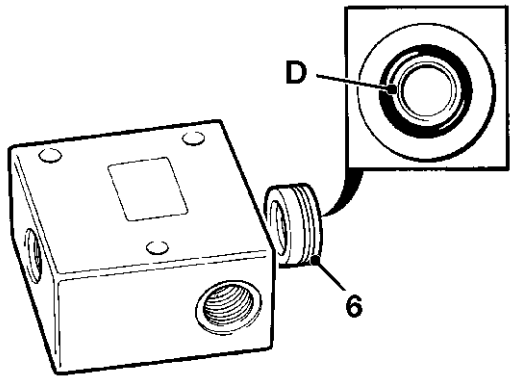


Fig 82.

10 Release the A.R.V. adjusting screw lock nut (see note): ⇨ *Fig 83. (E-97)*

Engage the nut at the end of setting body **2** using the slot in special spanner **4**, turn the nut anti-clockwise to release the A.R.V. adjusting screw lock nut.

Note: *Remember, it will not be possible to release the lock nut if there is not approximately 172 bar (2500 lbf/in²) pressure at the valve inlet.*

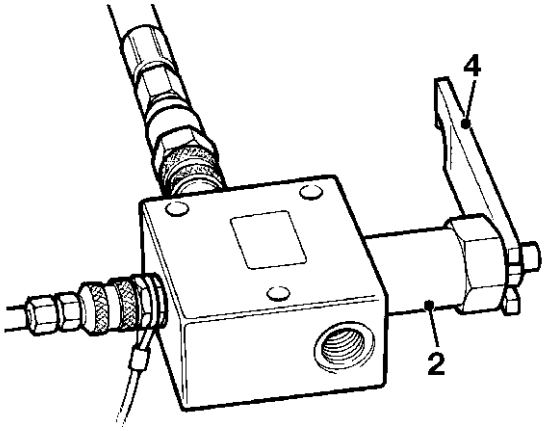


Fig 83.

11 Insert an allen key into adjusting pin **3** (T-Bar type shown). Push the adjusting pin down and make sure it has engaged with the A.R.V. adjusting screw.

Rotate the T-bar clockwise to increase the pressure setting and anti-clockwise to decrease the pressure setting.

After adjustment, use the slot in spanner **4** to lock the A.R.V. adjusting screw lock nut (see note).

Note: *Remember, pressure must be maintained at the valve inlet to ensure the lock nut is tightened*

.⇨ *Fig 84. (E-97)*.

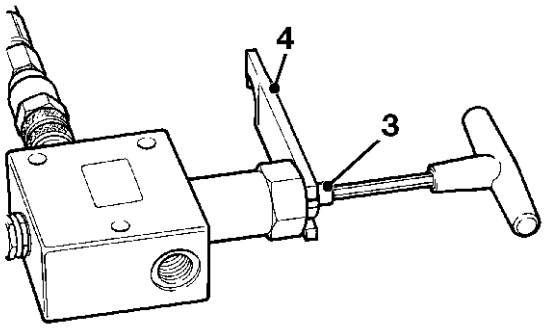


Fig 84.

Hydraulic Pump

Removal and Replacement

The following Procedure describes removal and replacement of a double section pumu.

Removal

⚠ WARNING

Working Under the Machine
Make the machine safe before getting beneath it. Ensure that any fitments on the machine are secure; engage the park brake, remove the starter key, disconnect the battery.

INT-3-3-8_2

1 Remove the propshaft, refer to ***Section F, Transmission, Propshaft- Removal and Replacement.***

2 Drain the hydraulic fluid from the hydraulic tank.

3 Remove flange bolts **B** (4 off) and disconnect the pump inlet hose flange from the pump body. Blank off all exposed connections to prevent ingress of dirt.

4 Disconnect the pump outlet hoses **C** and **D** from the elbow fittings. Blank off all exposed connections to prevent ingress of dirt.

⚠ WARNING

This component is heavy. It must only be removed or handled using a suitable lifting method and device.

BF-4-1_1

5 Secure the pump using a sling around the pump body, remove the pump mounting bolts **E** and carefully withdraw the pump clear of the gearbox.

Replacement

Replacement is the reverse of the removal procedure.

1 Clean off all traces of gasket compound from the pump and gearbox mounting faces. Apply a thin bead of JCB Muligasket to the gearbox mounting face.

2 Locate the splined shaft of the pump into the gearbox. Apply JCB Thread locker and Sealer to bolts **E** and secure the pump flange to the gearbox mounting face.

3 Reconnect the pump outlet hoses **C** and **D** to the elbow fittings.

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

4 Reconnect the pump inlet hose flange to the pump body with bolts **B** (4 off).

5 Fit the propshaft, refer to ***Section F, Transmission Propshafts - Removal and Replacement.***

6 Fill the system to the correct level with recommended hydraulic fluid, see ***Section 3, Maintenance - Lubricants and Capacities.***

Note: *Replace the suction strainer and return line filter after fitting a new or serviced pump.*

7 After fitting a new or serviced pump and before starting the engine screw the main relief valve out. Run the engine and check for leaks, also check the main relief valve (MRV) operating pressure. Refer to service procedures, pressure testing - M.R.V

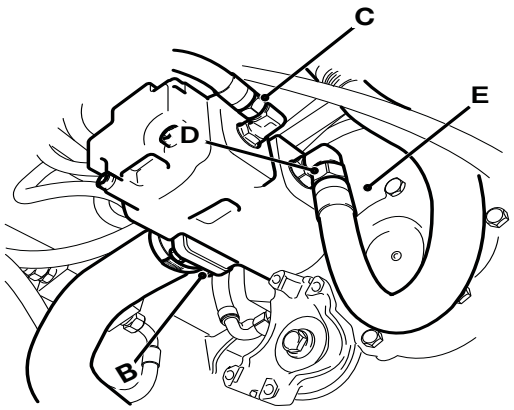


Fig 93.

All or any of the above points may result in possible problems with the valve.

Dismantling

Remove the lever linkage from the tang (lever) end of the spool ⇒ *Fig 99. (E-116)*.

When removing 'O' rings and seals, use an appropriately rounded tool that WILL NOT cause any damage to the spool or seal grooves. For instance, item 5, which is a wiper seal and is a press fit in the counterbore.

Care must be taken to ensure that the spool 19 is not damaged when removing it from the valve block.

Hold the spool in a suitable clamp, unscrew bolt 9 and remove spring 11 with cups 10 and 12.

Check for surface contamination on the under side of the seal plates 4 and 13. Clean if necessary. Check for the flatness of the seal plate. If found to be bent - replace with new (any work previously carried out on this valve may have resulted in the bending of the seal plate).

Assembly

Renew wiper seals 5 and 14 and `O' rings 6, 15 and 18.

When fitting bolt 9, clean the threads thoroughly using a degreaser, leave it for minutes then apply a small quantity of Loctite to the threads of the spool.

Re-connect the lever mechanism to the tang (lever) end of the spool.

Run the engine and inspect the valve for external leaks.

Torque Settings

Item	Nm	kgf m	lbf ft
7	6.1 - 7.5	0.62 - 0.76	4.5 - 5.5
9	9.5 - 10.9	0.97 - 1.11	7 - 8

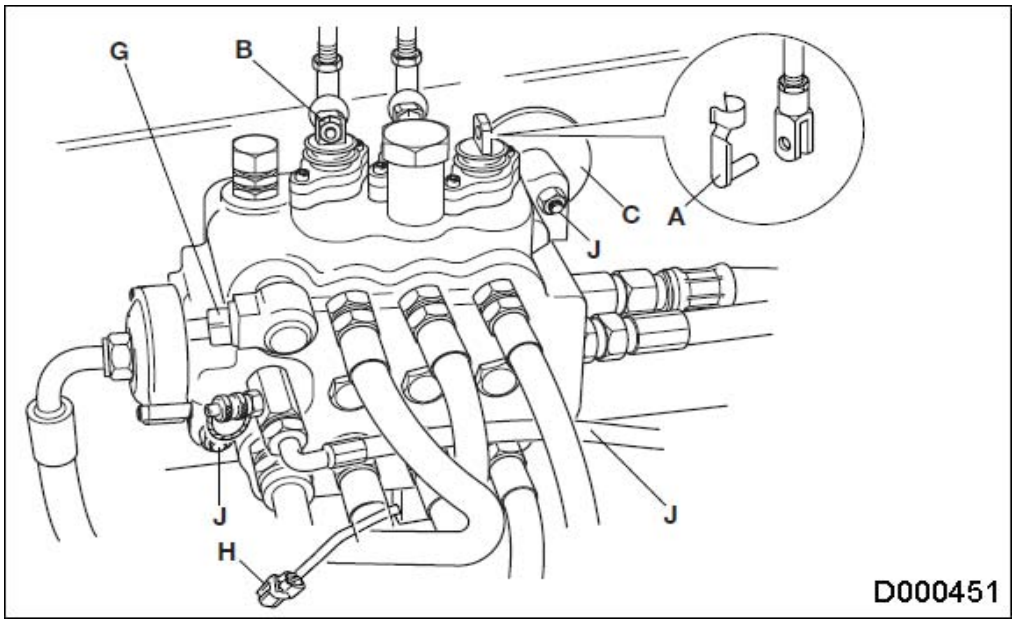
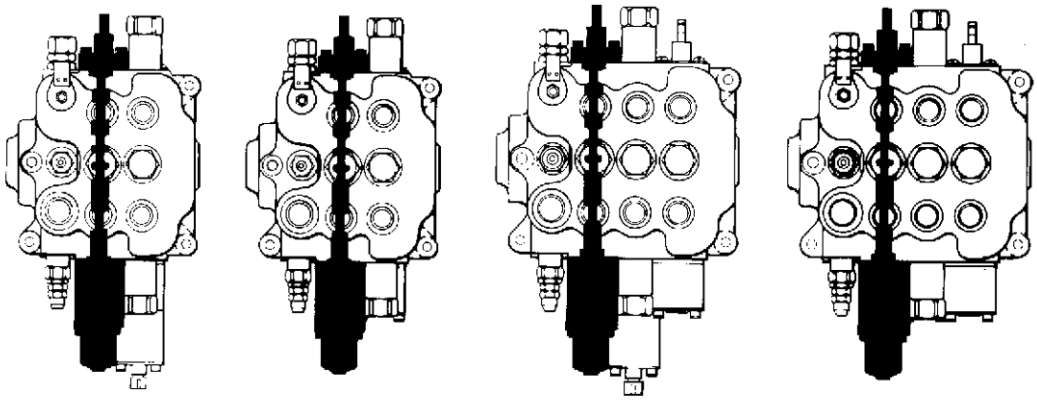


Fig 106.



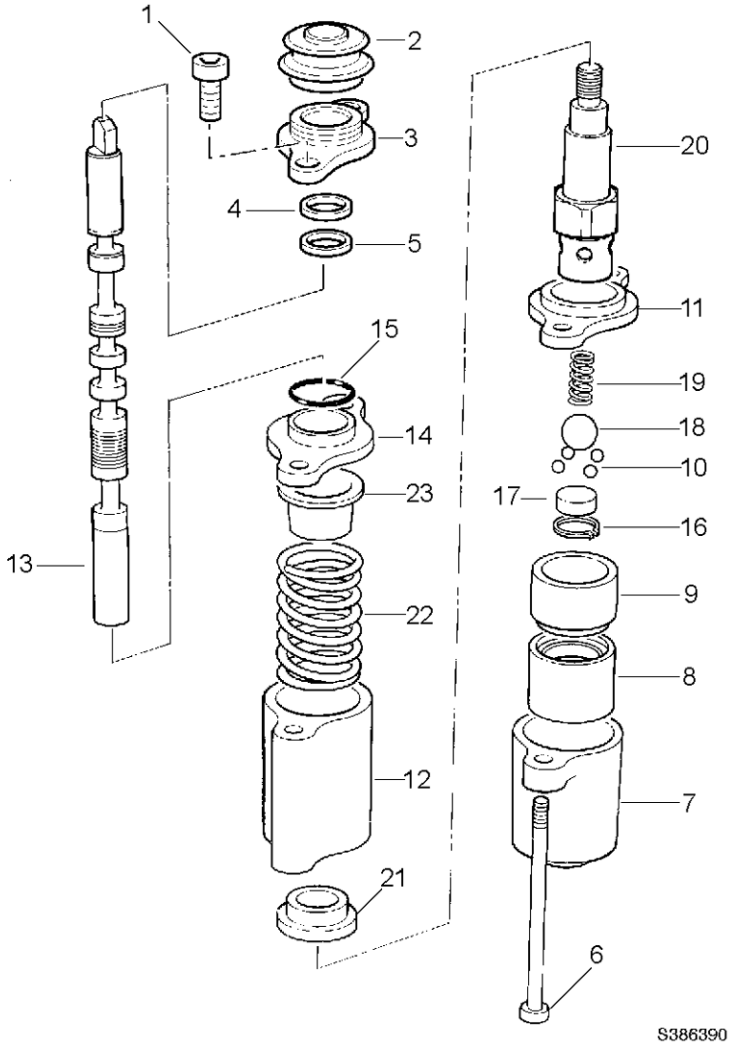


Fig 112. Float Spool

Hydraclamp Valve (Sideshift Machines)

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

For assembly the sequence should be reversed.

The following points MUST be avoided when dismantling and assembling the valve:

- **Contamination**
- **Damage to poppet and seat**
- **Damage to seal grooves**

All or any of the above points may result in possible problems with the valve.

When removing 'O' rings and seals, use an appropriately rounded tool that WILL NOT cause any damage to the seal grooves. Discard ALL 'O' rings DO NOT use worn or damaged items.

Note that the hydraclamp comprises two separate valve assemblies; 1) the check valve assembly (items **1** to **8**); 2) the solenoid assembly (items **11** to **14**).

Dismantle

Loosen nut **1** (turn anti-clockwise) and then remove the check valve assembly from the valve block. If required, the check valve assembly can be dismantled into its component parts (items **1** to **8**).

Inspect the valve components for scratches, nicks or any other type of damage, particularly on the poppet and seat faces. Replace with new if required.

Assemble

Renew all 'O' rings. The parts microfiche will identify the correct seal kit part numbers for items **2**, **2A**, **4**, **6**, **10** and **14**.

Fit seal **2A** with the recess towards `O' ring **2**, as shown at **A**.

Lubricate parts with JCB Hydraulic Fluid before assembling. Make sure that all the parts move freely.

Ensure that the small drilling through the centre of item **3**, is clear.

Do not over-tighten the solenoid assembly, it may affect the operation of the solenoid, use the spanner flats and torque tighten to figure indicated in the table below (items **11** and **13**).

Check the operation of the electric hydraclamp, refer to ***Circuit Descriptions, Excavator Valve - Manual Control - Hydraclamp Valve Operation***.

Table 58. Torque Settings

Item	Nm	kgf m	lbf ft
1	13.5	1.4	10
3	24.5	2.5	18
5	13.5	1.4	10
11	5.5	0.5	4
13	24.5	2.5	18

1 Park the machine on firm level ground. Engage the parking brake and set the transmission to neutral.

2 Raise the loader arms to give access to the lift ram pivot pins **C**. The loader arms must be supported, use a tool as shown.

⚠ WARNING

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before connecting or removing any hydraulic hose, residual hydraulic pressure trapped in the service hose line must be vented. Make sure the hose service line has been vented before connecting or removing hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11_2

3 Switch off the engine and vent residual hydraulic pressure from the loader end by operating the loader controls back and forth several times.

Note: *If a hose burst protection valve is fitted on the ram, the system will not vent. Extreme caution must be used when releasing hydraulic connections - release the connections one turn and allow the pressure to dissipate.*

4 Label and then remove the lift ram hoses **A**. Plug and cap all open orifices to prevent loss of fluid and ingress of dirt.

⚠ WARNING

This component is heavy. It must only be removed or handled using a suitable lifting method and device.

BF-4-1_1

5 Fasten lifting straps to the lift ram, make sure that the weight of the ram is supported by the sling.

6 Remove pivot pin retaining bolt **B** and then remove the pivot pin **C**.

7 Remove pivot pin retaining bolt **D**.

8 Remove klipring **E** and shim **F** from both sides of ram, use slide hammer kit (service tool 993/68100) to remove pivot pin **G**.

9 Remove the lift ram.

Replacement

Replacement is a reversal of the removal sequence.

⚠ WARNING

Fluid Under Pressure

Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear protective glasses. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

INT-3-1-10_2

Coat pivot pins with anti-rust lubricant.

Make sure that the head of item **D** is on the engine side.

Coat mainframe bores with grease.

Assembly sequence for shim **F** and klipring:

1st	shim
2nd	ram
3rd	shim (as required)
4th	klipring

Pivot pins with M24 pin extractor hole:

1st	spacer
2nd	ram
3rd	shim (as required)
4th	klipring

All klipring installations to have a maximum end float of 2mm (0.080 in).

When Assembling

Make sure that spring seat of spool 14 faces toward LS connection.

Clean all parts in clean paraffin.

Lubricate all parts with hydraulic fluid.

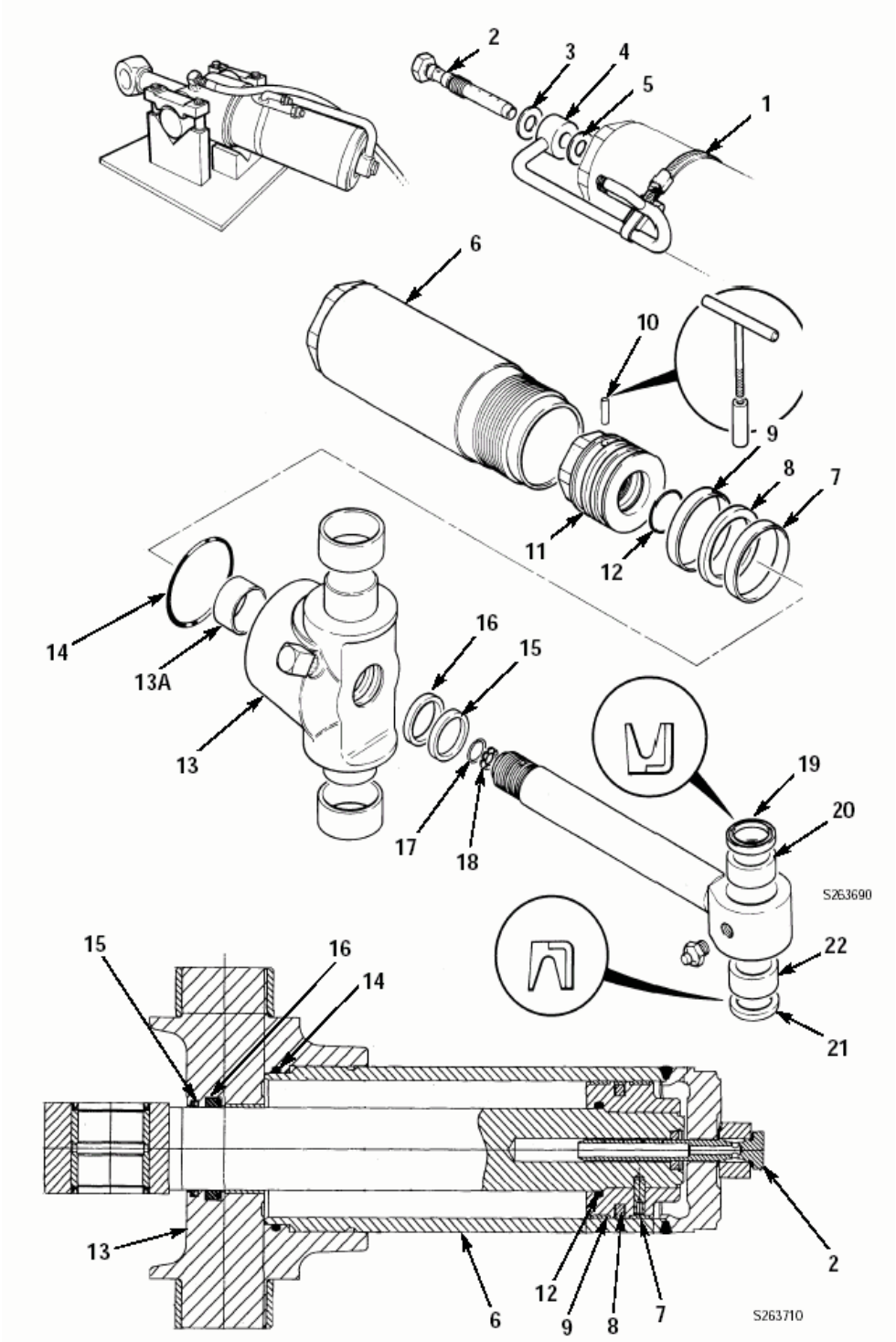
Renew aluminium washers 8 and 12.

Note: *All hydraulic adapters that are installed together with a bonded sealing washer must also have sealant (Loctite 577)applied to the threads of the adapter*.

Torque Settings

Item	Nm	**lbf ft**
7	50	37
11	50	37

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


2
3
4
5
1
6
10
9
8
7
11
12
14
13A
16
15
13
17
18
19
20
S263690
22
21
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16
14
13
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12
9
8
7
2
S263710

Fig 143.

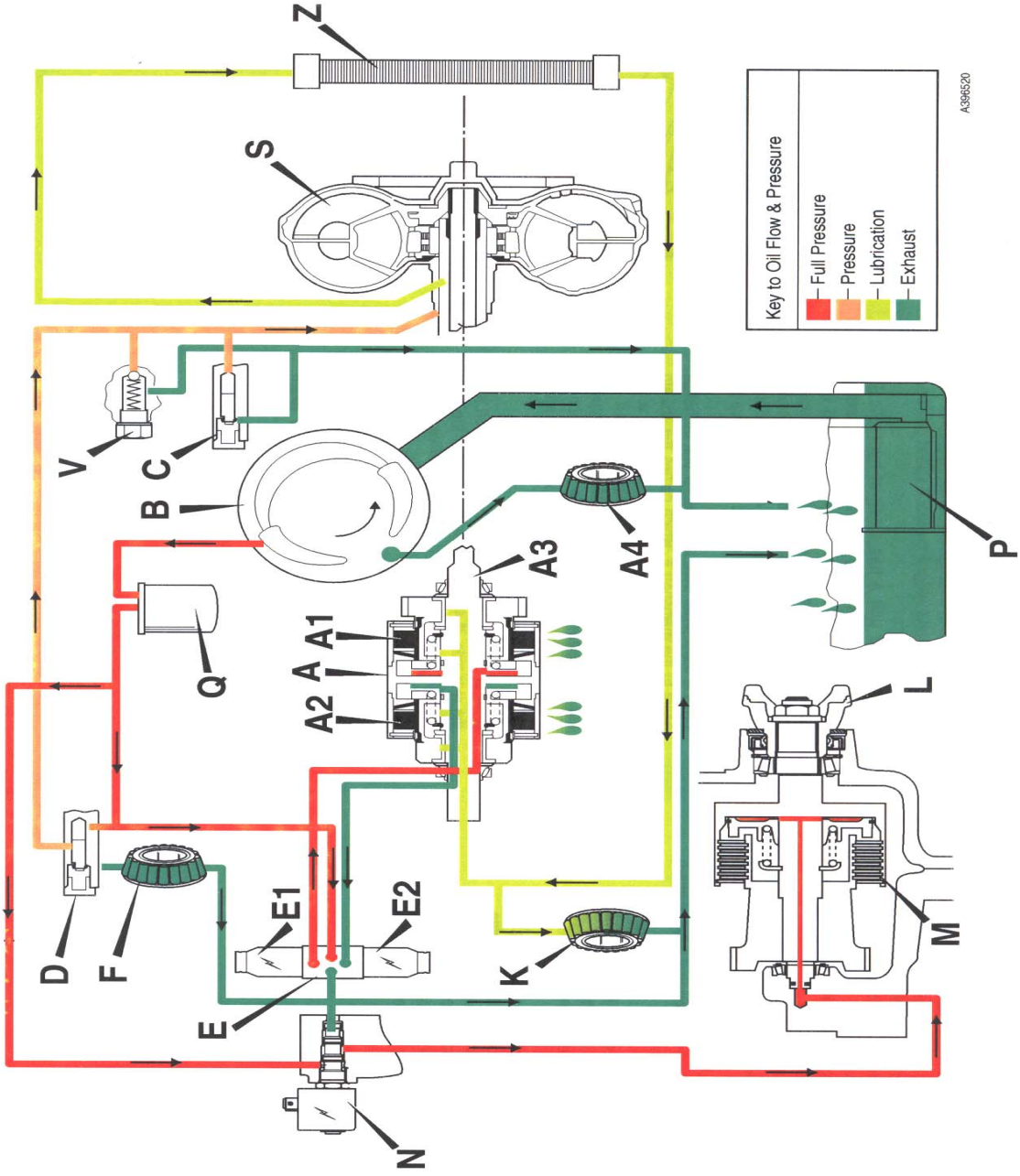
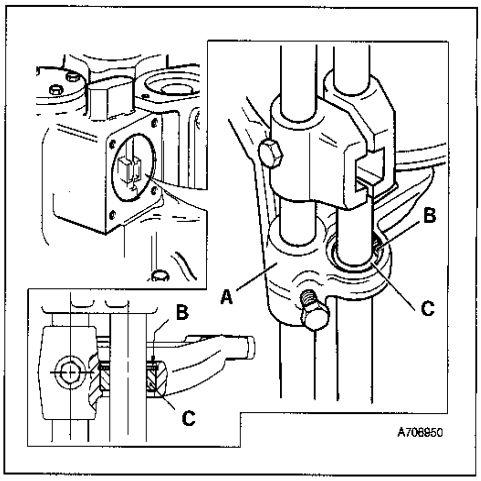
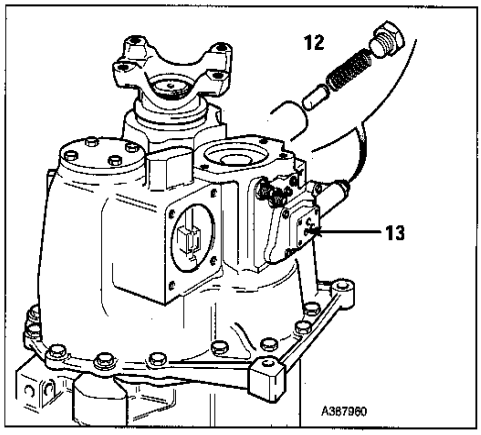


Fig 3.

Hydraulic and Electrical Operation

Oil from the pump B is fed through an internal passage via the filter to pressure maintenance valve D, which maintains pressure to the solenoid valve E for clutch selection. Excess oil from the maintenance valve flows back through the casing to the torque converter S. Oil enters the converter between the converter hub and the stator support, and leaves between the Reverser Shaft and Pump Drive Shaft. Pressure in the converter is controlled by a regulating valve C which dumps oil from the converter line back to the sump.





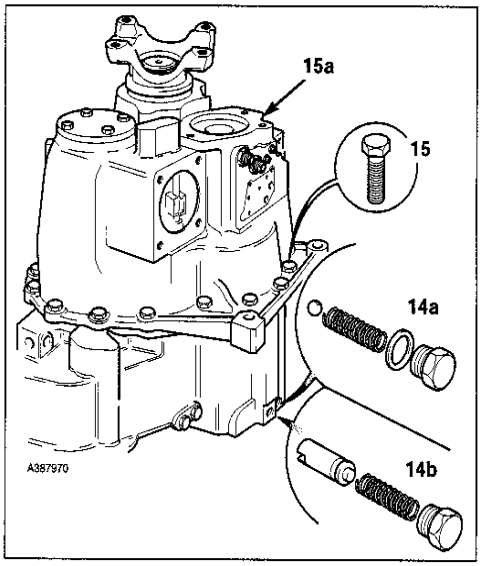


Fig 10.

16 Unscrew selector detent plugs ⇨ *Fig 11. (15)*.

17 Remove selector detent balls and springs.

18 Unscrew selector fork retaining screws and lift out selector rods.

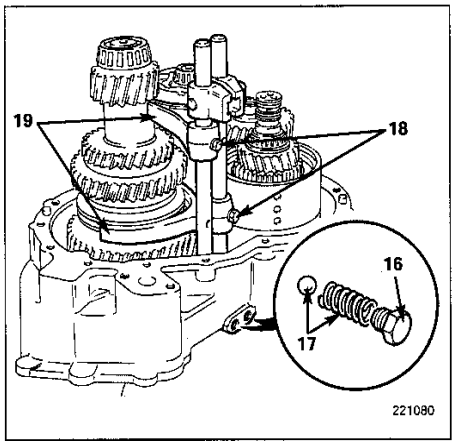
19 Note that the selector forks are not interchangeable. Mark the forks to ensure they are replaced correctly. Remove selector forks.

20 Push out the interlock plunger on disassembly.

Blocking Pin Type Synchro

21 Lift off the 3rd/4th synchro hub. Note positions for refitting with mating cups .

22 Lift out layshaft assembly.



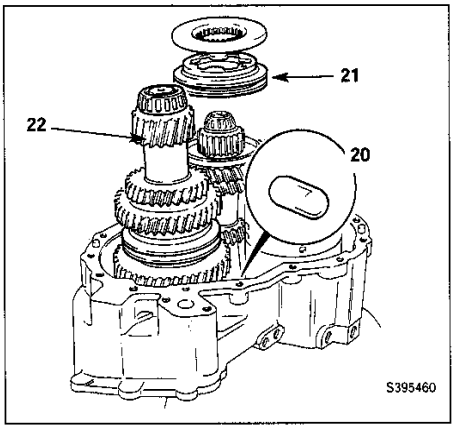
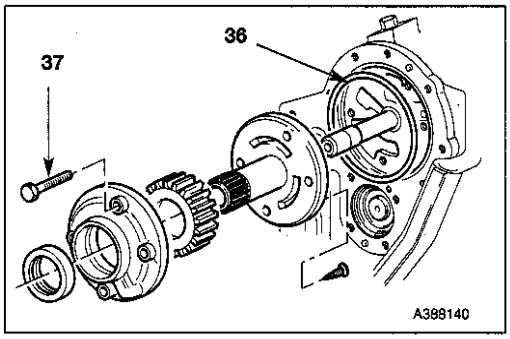
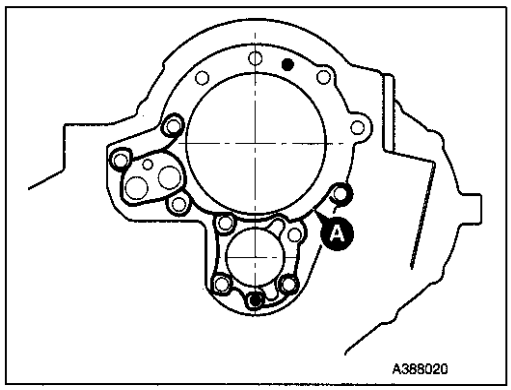


Fig 11.

38 Apply a bead of Sealant to the mating face of the gearbox cover as shown at A. Refit the torque converter housing. Apply Loctite to the 12 bolts and tighten to 56 Nm (42 lbf ft).





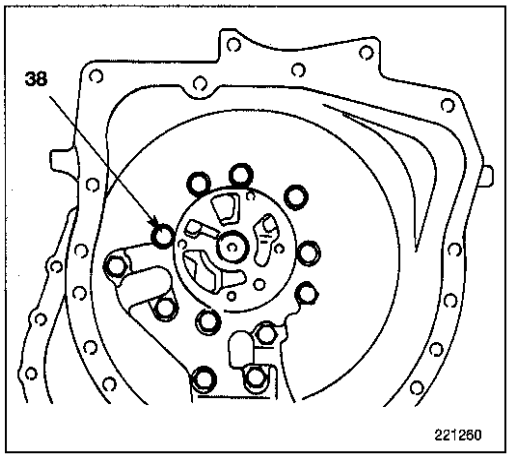


Fig 24.

Gearbox Assembly (cont'd)

39 ⇨ *Fig 25. (26)* Fit torque converter pressure relief valve assembly 39a; Fit the valve ball and spring. Ensure that larger diameter of spring is located securely over the spigot on the plug. Use a new sealing washer, Loctite to the plug, then tighten.

Fit the torque converter pressure regulating valve assembly 39b; Fit the spool and spring. Apply JCB Threadlocker and Sealer to the plug, then tighten.

40 Using a new gasket mount pressure maintenance valve onto casing. Apply Loctite to bolts and tighten to 10 Nm (7.4 lbf ft)

Note: *To avoid contamination of sealant printed on gasket face keep in protective wrapper until needed.*

41 Assemble pressure maintenance valve spool and spring into adaptor block. Apply Loctite to plug, fit and tighten. Do not overtighten as damage to the aluminium housing could result

42 Fit new `O' rings around ports on mating face of solenoid valve. Mount solenoid valve onto pressure maintenance valve, ensuring that port 'P' aligns with metering orifice in the pressure maintenance valve body. Apply Loctite to capscrews and tighten to 5Nm (3.7 lbf ft).

43 Fit the 4 wheel drive solenoid valve. Fit the hydraulic pipe 43a.

12 Apply a thin bead of Sealant to the 4WD mating face of the gearbox front case. Fit the case P, apply loctite to bolts D and progressively torque tighten to 56 Nm, 46 lbf ft.

13 The 4WD clutch and its associated components are manufactured using a `setright' system. Provided that components have been assembled correctly, the shaft end float will be 0.01 to 0.16 mm (0.0004 to 0.006 in).

Rotate the shaft by hand and ensure that it runs smoothly. Pull the shaft up and down to detect any excessive end float. If there is excessive end float or the shaft runts roughly, dismantle the unit and check for correct assembly.

14 Fit a new Oil seal M, fit the output yoke E, and flanged bolt F. Torque tighten the bolt to 395 Nm: 291 lbf ft.

Pressure Testing the 2/4WD Clutch

1 Assemble the 2/4 wheel drive clutch, as described in `Assembly'.

2 Check the clutch pack end float and adjust as required (see Assembly).

3 Using special tool 993/59300, insert the adaptor A into the oil gallery in the end of the 2/4 wheel drive clutch shaft as shown. Hold the adaptor in position with clamp B ⇨ *Fig 33. (🗋 35)*.

4 Use a hand pump to pressurise the clutch assembly until gear, item 5 can be turned by hand. Note the pressure gauge reading - DO NOT EXCEED 200 lb/in2 (13.8 bar).

5 If the pressure gauge reading is between 125 - 135 lbf/in2 (8.6 - 9.3 bar) then the clutch is operating correctly and can be fitted in the transmission.

6 If however the pressure gauge reading is above 135 lbf/in2 (9.3 bar) then check the clutch for assembly defects, especially the clutch pack end float (the shim may not be to the correct thickness). -test after checkin for(andrectifying)assembly defects.

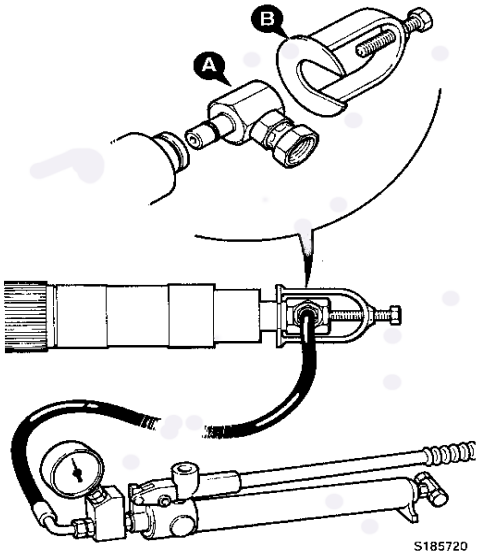


Fig 33.

PTFE (Polytetrafluoroethylene) Piston Ring Seals

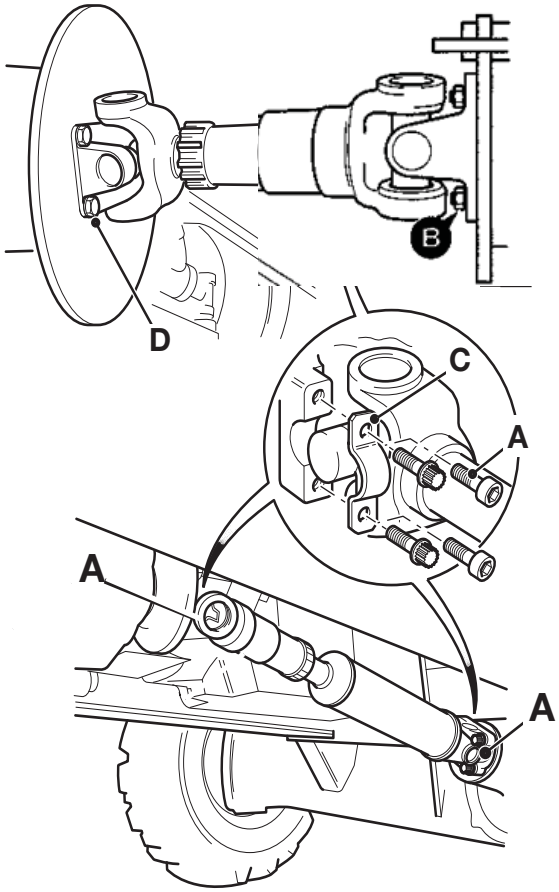
Fitting Procedure

⇨ *Fig 34. (🗋 36)* Wind the PTFE piston ring seal around your finger as shown, so that the seal forms a 'coil'.

Smear the seal with grease and then fit the seal to the shaft.

Make sure that the seal sits below or flush with the outer diameter of the shaft. If necessary, use finger pressure as shown to make the seal flush with the shaft.

Note: If the seal is not set below or flush with the outer diameter of the shaft, then the seal will 'cut' when the shaft is fitted to its mating component.


B
D
C
A
A
A

4 Tap the drive shaft outer bearing 28 into position in the hub swivel drive shaft bore.

5 Fit new oil seal 27. Pack grease between lips of seal.

6 Fit drive shaft 26, taking care to locate inner end into splines of differential gears.

7 Press new trunnion oil seals 24 into position followed by bearings 25. Grease bearing and oil seal before fitting to axle.

Note: *In the following step, take care not to damage seal 24 when tightening the trunnion bolts.*

8 Locate hub swivel 23 and fit top and bottom trunnions. Apply loctite to threads of trunnion bolts 21 (8-off). Finger tighten all bolts, then sequentially tighten them to bring the two trunnions together. Torque to 98 Nm (72 lbf ft, 10.0 kgf m).

9 Locate hub swivel 23 and fit top and bottom trunnions. Apply loctite to threads of trunnion bolts 21 (8-off). Finger tighten all bolts, then sequentially tighten them to bring the two trunnions together. Torque to 98 Nm (72 lbf ft, 10.0 kgf m).

10 Connect the track rod and steering cylinder to the axle steer knuckles.

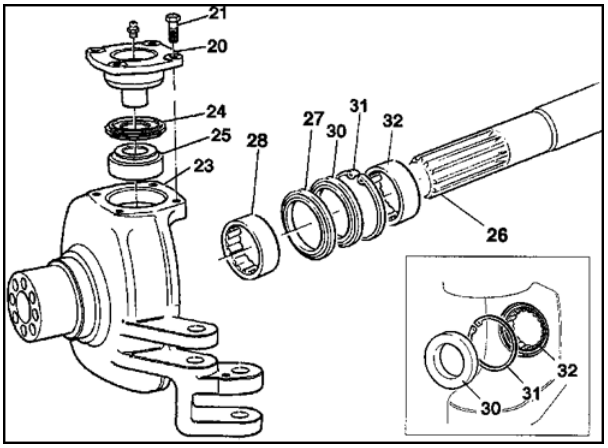


Fig 48.

Drive Head

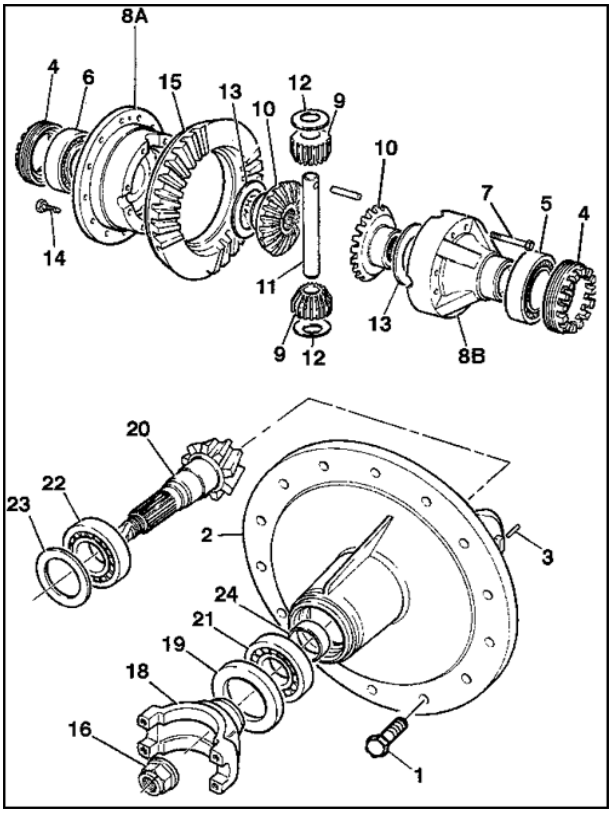


Fig 49.

Drive Head - Dismantling

1 Drain the oil from the drive head. Remove the propshaft ⇨ *Fig 49. (🗋 55)*.

2 To remove the drive head it is necessary to withdraw both drive shafts from the axle.

3 Remove the drive head carrier screws 1. Mark the installation position of drive head carrier 2 relative to the axle housing.

4 Remove the drive head carrier from the axle housing.

5 Pull out the roll pins 3 and remove the castle nuts 4. Remove the outer races of bearings 5 and 6 from the drive head carrier bores.

6 Remove inner bearing races of 5 and 6.

7 Remove differential assembly 8 from carrier.

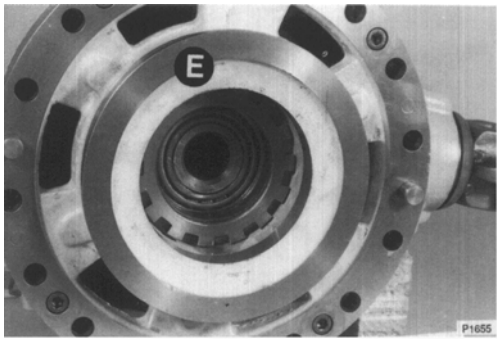


Fig 59.

8 Remove and discard seals **F** and **G**. Inspect the housing bore for damage and scoring. Nicks or cuts in the seals may be responsible for loss of brake fluid ⇨ *Fig 59. (65)*.

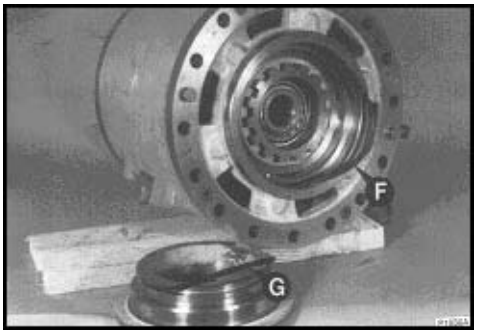


Fig 60.

Brakes - Assembly

1 Fit new seals **F** and **G**. Make sure they seat squarely in their grooves ⇨ *Fig 60. (65)*.

2 Carefully press the piston **E** all the way into its housing.

3 Assemble the friction plates and counterplates onto the carrier. **K** if the original brake pack is being re-used, return the plates to their original positions (see 'Dismantling', Step 3) Soak new friction plates in JCB Special Axle Oil before assembly. Fit circlip.

4 Locate the three reaction pins **D** into their grooves, securing them with grease. Push the pins fully into their location holes in the housing.

5 Install one counterplate **B** into the housing, then the brake pack. then the other counterplate. Ensure that the chamfered end of the brake carrier **C** faces away from the drive head. Return re-used counterplates to their original positions. Push the brake pack fully home.

6 Apply JCB Multigasket to the mating face of the drive head. Locate the axle arm onto the drive head, with the embossed word `TOP' on the axle arm uppermost.

7 Fit bolts **A** and torque tighten to 244 Nm (176 lbf ft, 24.9 kgf m).

Note: *Check the grade of bolts fitted. Grade 8.8 should be tightened to 244 Nm grade 12.9 should be tightened to 400 Nm.*

Hub and Drive Shaft

Dismantling and assembly of the rear axle hub and driveshaft is the same as for the front axle hub and driveshaft.

Component Key- PD70 Axle Hub

Table 9.

Item	Description	Quantity per Hub
2	Planet Gear Carrier	1
3	`O' ring	1
4	Planet Gear	3
5	Bearing - planet gear	3
6	Circlip - `L' section	6
7	Circlip - internal	3
8	Thrust Pad	1
9	Circlip - external	1
10	Verbus Ripp Bolts	8
11	Bearing Carrier	1
12	Dowel	8
13	Annulus Carrier	1
14	Circlip - internal	1
15	Annulus Ring	1
16	Bearing - outer	1
17	Bearing - inner	1
18	Combination Oil Seal	1
19	Dirt Shield	1
20	Driveshaft	1

Transmission

Fault Finding

Synchro Shuttle Gearbox

Before carrying out the checks listed hereunder, the machine should, if possible, be operated to determine the fault area (s), and bring the systems to their normal working temperatures.

Ensure that the correct quantity and grade of oil is used and that there are no obvious leaks.

1 If the transmission is noisy, start at check 1.

2 If the transmission is overheating, start at check 4.

3 If the transmission will not pull, start at check 12.

4 If there is no drive in one or both directions, start at check 17.

5 If the transmission is jumping out of gear, start at check 29.

6 If the transmission is sticking in gear, start at check 39.

7 If ratios are 'crash changing', start at check 41.

Table 10.

Sr.No.	CHECK		ACTION
1	Is there noise when selecting direction?	YES:	Check 3
		NO:	Check 2
2	Is there noise when running with direction selector in neutral and ratio selector in 1st	YES:	Check 9
			Check 19
3	Is there air in the hydraulic system?	YES:	Continue running to expel air.
		NO:	Check 4
4	Is the fluid level correct?	YES:	Check 5
		NO:	Check level only when machine is cold and top-up as required
5	Are the oil passages restricted?	YES:	Clear the restriction.
		NO:	Check 6
6	Is the suction strainer restricted?	YES:	Remove and clean strainer.
		NO:	Check 7
7	Is pump pressure as specified?	YES:	Check 9
		NO:	Check clutch press. Maintenance valve is free
8	When flow testing pump, is output low?	YES:	Renew pump.
		No:	Check converter sprag clutch for wear or slip.
9	Does the noise continue when direction selector is in forward or reverse?	YES:	Check 10
		No:	Check 11

Pressurised oil is directed to piston C via ports 3 and 2. The piston moves, against spring D, to press the friction/ counter plates of clutch pack B together, thus driving the output yoke E.

Synchro Shuttle Gearbox Forward/Reverse Clutch Operation

The forward/reverse clutch unit 1 transfers drive from the input shaft A3 to either gear G1 or gear G2 depending on which of the two clutches (A1 or A2) is engaged, giving forward or reverse drive. When neither clutch is engaged, neutral is selected ⇒ *Fig 87. (83)*.

The clutches are of the wet, multi-plate type.

The clutch housings and input shaft are a one piece assembly A3. The assembly is permanently driven by the engine via the torque converter. Clutch counter plates 3 are also permanently driven via meshing teeth inside the clutch housings.

Clutch friction plates 4 are meshed with the gear/plate carriers (G1 and G2).

In the diagram, clutch A1 is engaged. The counter plates 3 and friction plates 4 are pressed together by hydraulically actuated piston 5. Drive is then transmitted from the input shaft to the gear G1.

Clutch A2 is disengaged and no drive is transmitted to gear/plate carrier G2. The gear is also free to rotate on the input shaft assembly.

Actuation of the hydraulic pistons 10 and 5 is controlled via three position solenoid valve E.

When neutral is selected, solenoids E1 and E2 are deactivated and the flow of pressurised oil to the clutches is blocked. Springs 8 and 9 move the pistons away from the clutch plates and oil from both pistons is vented to the sump.

When either forward or reverse is selected, the solenoid valve E diverts pressurised oil via cross drillings inside the input shaft A3 to the appropriate clutch (piston 10 or 5) in the unit. Pressure from the other clutch is vented to the sump via the solenoid valve spool. Oil is prevented from leaking by seals 6 on the pistons and ring seals 7 on the input shaft A3.

The valve E is shown using symbols.

2/4 Wheel Drive Clutch Operation

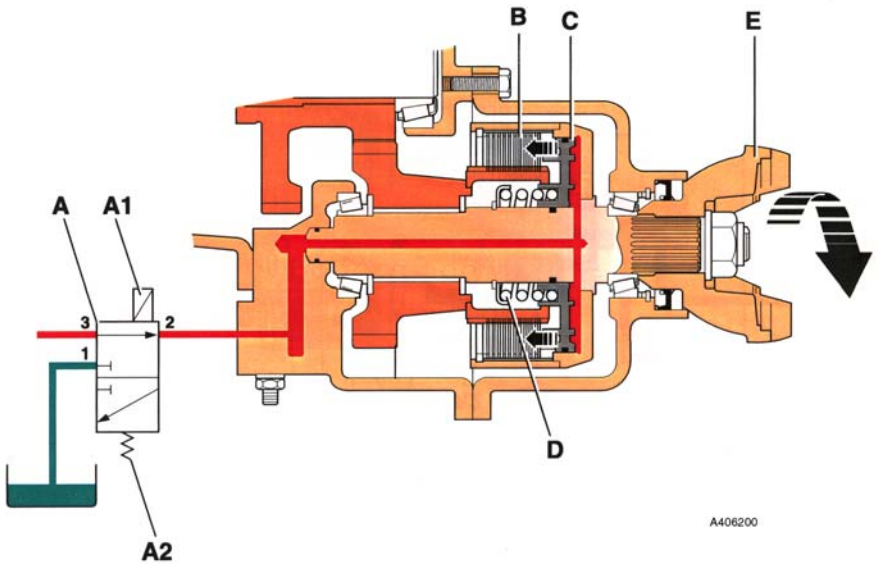


Fig 90.

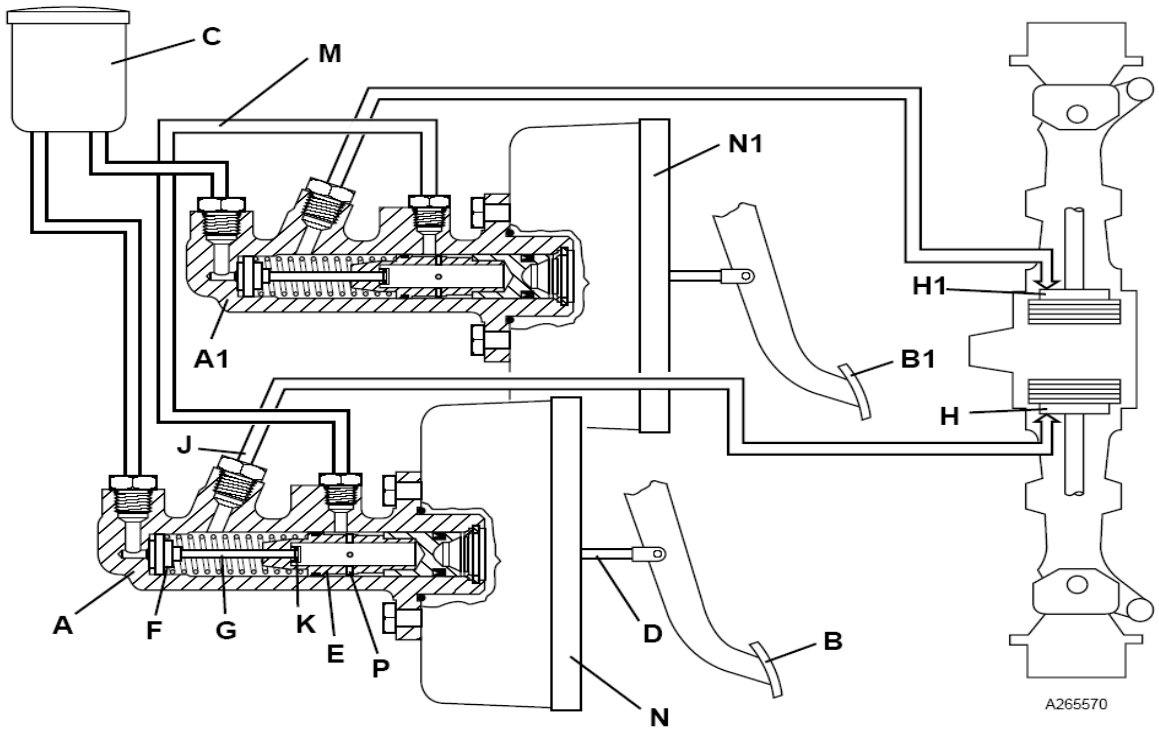


Fig 1. Compensating Master Cylinder

Fig 2.

4 Start the engine and raise the attachments to the appropriate travelling position ⇒ *Fig 5. (📄 G-16)*.

5 Select fourth gear.

6 Push down hard on foot brake pedal 4.

7 Select forward drive 5.

⚠ WARNING

If the machine starts to move during the following test, immediately apply the foot brake and reduce the engine speed.

2-2-5-1

Test the parking brake as follows:

8 Move the parking brake lever fractionally forward until the warning light 6 is just extinguished.

9 Slowly release the foot brake pedal 4.

10 If the machine has not moved, use the accelerator pedal to gradually increase the engine speed to 1500 RPM. The machine should not move.

11 Do not do this test for longer than 20 seconds.

12 Reduce the engine speed to idle and select neutral 5.

13 Return the park brake lever 1 to the fully on position from its partially applied position.

14 Lower attachments and stop the engine.

If you have any queries concerning this test procedure or parking brake adjustment, consult your local JCB distributor.

⚠ WARNING

Do not use a machine with a faulty park brake.

3-2-3-10_2

⚠ WARNING

Non approved modifications to drive ratios, machine weight or wheel and tire sizes may adversely affect the performance of the park brake.

3-2-3-11U

Section H

Steering

Service Manual - 3DX Backhoe Loader

Publication No.
550/42426-1

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4 Clean these components in clean paraffin paying particular attention to the orifices at each end of the spool. Dry off and lubricate with clean hydraulic fluid.

5 Refit the priority valve spool 12 making sure that the spring seat end of the spool faces towards the LS port. Refit blanking plug 7 and torque tighten.

6 Refit the priority valve spring 11 and adaptor 9 and torque tighten ⇒ *Fig 6. (H-7)*.

7 Refit the valve onto the machine. Refer to Priority Valve - Removal and Replacement.

8 Bleed the load sensing line. Refer to Priority Valve - Bleeding.

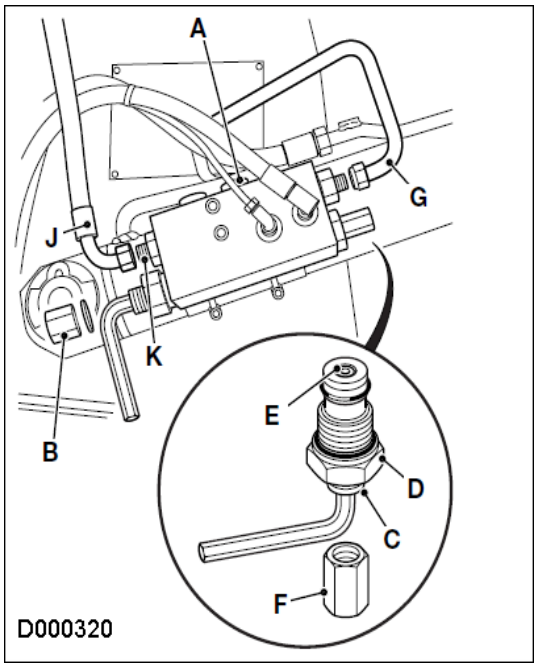

Fig 6.

Steering

Hydraulic Steer Unit

Hydraulic Steer Unit

Removal

WARNING

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before connecting or removing any hydraulic hose, residual hydraulic pressure trapped in the service hose line must be vented. Make sure the hose service line has been vented before connecting or removing hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11_2

1 Park the machine on level ground, engage the parking brake and set the transmission to neutral. Lower the attachments to the ground. Stop the engine and remove the starter key.

2 Turn the steering wheel to the left and to the right several times to vent system pressure.

3 Disconnect and cap all hydraulic hoses from the steering unit as shown at A. Label the hoses to ensure correct refitting.

Get an assistant to hold the steering unit, and, working inside the cab, loosen and remove 4 bolts B. Lift the steering unit from the machine.

Replacement

WARNING

Fluid Under Pressure

Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear protective glasses. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

INT-3-1-10_2

1 Replacement is a reversal of the removal sequence. Make sure that the hoses are correctly installed.

2 Bleed the steering system. Refer to Service Procedures, Steering System - Bleeding.

3 If a new steering unit has been fitted then the system relief valve must be tested for correct pressure setting. Refer to Service Procedures, Steering System - Pressure Testing.

Note: *All hydraulic adaptors that are installed together with a bonded sealing washer must also have applied to the threads of the adaptor.*

Steering

Power Track Rod

Removal and Replacement

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

⚠ WARNING

Make the machine safe before working underneath it. Park the machine on level ground, lower the 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

⚠ WARNING

The loader arm safety strut must be fitted before any work is done beneath raised loader arms. Make sure the shovel is empty, then fit the safety strut as instructed below.

GEN-1-7

Removal

1 Disconnect and cap hydraulic hoses to prevent loss of fluid and ingress of dirt. Label hoses for identification and correct refitting ⇒ *Fig 32. (H-27)*.

2 On 4WD machines remove the split pin and nut **A**. Remove the track rod ball joint from the wheel hub assembly.

On 2WD machines, remove lock assembly **B** and pin **C** to remove the track rod pivot from the wheel hub assemblies.

3 Remove the four fixing bolts **D**.

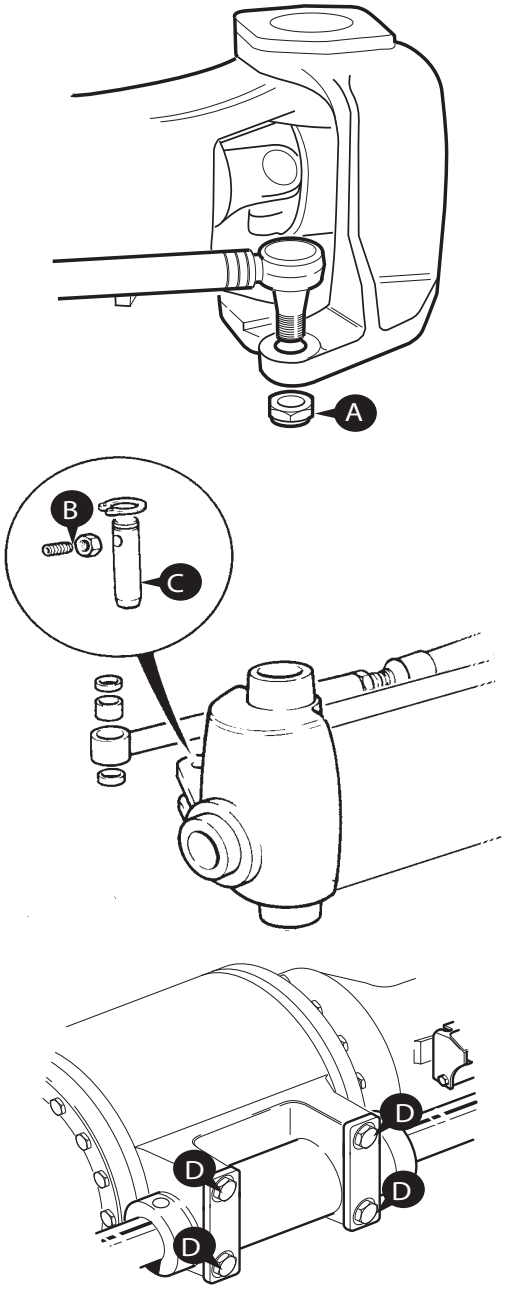

Fig 32.

Table 12.

Fault	Probable Cause	Action
Steering wheel turns on its own.	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.	Refer to ***Hydraulic Steer Unit - Dismantle and Assemble***. Correct as required.