Service Manual

TM200
TM270
TM300

PUBLISHED BY THE
TECHNICAL PUBLICATIONS DEPARTMENT
OF JCB SERVICE: ©
ROCESTER, STAFFORDSHIRE, ST14 5LS,
ENGLAND
Tel. ROCESTER (01889) 590312
PRINTED IN ENGLAND

Publication No. 9803/4225

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Safety Notices

In this publication and on the machine, there are safety notices. Each notice starts with a signal word. The signal word meanings are given below.

⚠ DANGER

Denotes an extreme hazard exists. If proper precautions are not taken, it is highly probable that the operator (or others) could be killed or seriously injured.
INT-1-2-1

⚠ WARNING

Denotes a hazard exists. If proper precautions are not taken, the operator (or others) could be killed or seriously injured.
INT-1-2-2

⚠ CAUTION

Denotes a reminder of safety practices. Failure to follow these safety practices could result in injury to the operator (or others) and possible damage to the machine.
INT-1-2-3

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TORQUE SETTINGS

Use only where no torque setting is specified in the text. Values are for dry threads and may be within three per cent of the figures stated. For lubricated threads the values should be REDUCED by one third.

UNF Grade 'S' Bolts

Bolt Size in	(mm)	Hexagon (A/F) in	Torque Settings Nm	kgf m	lbf ft
1/4	(6.3)	7/16	14	1.4	10
5/16	(7.9)	1/2	28	2.8	20
3/8	(9.5)	9/16	49	5.0	36
7/16	(11.1)	5/8	78	8.0	58
1/2	(12.7)	3/4	117	12.0	87
9/16	(14.3)	13/16	170	17.3	125
5/8	(15.9)	15/16	238	24.3	175
3/4	(19.0)	1 1/8	407	41.5	300
7/8	(22.2)	1 5/16	650	66.3	480
1	(25.4)	1 1/2	970	99.0	715
1 1/4	(31.7)	1 7/8	1940	198.0	1430
1 1/2	(38.1)	2 1/4	3390	345.0	2500

Metric Grade 8.8 Bolts

Bolt Size	(mm)	Hexagon (A/F) mm	Torque Settings Nm	kgf m	lbf ft
M5	(5)	8	7	0.7	5
M6	(6)	10	12	1.2	9
M8	(8)	13	28	3.0	21
M10	(10)	17	56	5.7	42
M12	(12)	19	98	10	72
M16	(16)	24	244	25	180
M20	(20)	30	476	48	352
M24	(24)	36	822	84	607
M30	(30)	46	1633	166	1205
M36	(36)	55	2854	291	2105

River Nut Bolts/Screws

Bolt Size	(mm)	Torque Settings (for steel rivet nuts) Nm	kgf m	lbf ft
M3	(3)	1.2	0.12	0.9
M4	(4)	3.0	0.3	2.0
M5	(5)	6.0	0.6	4.5
M6	(6)	10.0	1.0	7.5
M8	(8)	24.0	2.5	18.0
M10	(10)	48.0	4.9	35.5
M12	(12)	82.0	8.4	60.5

Note: All bolts used on JCB machines are high tensile and must not be replaced by bolts of a lesser tensile specification.

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Main Components and Switches

1 Battery
2 Thermostart
3 Starter Switch
4 Neutral Start Relay 1
5 Starter Solenoid
6 Starter Motor
7 Ignition Relay 1
8 Neutral Start Relay 2
9 Park Brake Switch
10 Diode
11 Forward/Reverse Switch
12 Forward Relay
13 Reverse Relay
14 Forward Solenoid
15 Reverse Solenoid
16 Dump Relay
17 Reverse Alarm
18 Speed Control Switch
19 Speed Control Relay
20 Speed Control Unit
21 Servo Cut-off Switch
22 Servo Arm Switch
23 Servo Cut-off Solenoid
24 Junction Box
25 E.S.O.S.
26 Hazard Switch
27 Flasher Relay
28 Direction Indicator Switch
29 Water Temperature Gauge
30 Water Temperature Sender
31 Oil Temperature Gauge
32 Oil Temperature Sender
33 Fuel Gauge
34 Fuel Sender
35 Hourmeter
36 Alternator
37 Warning Buzzer
38 Water Temperature Switch
39 Transmissions Oil Temperature Switch
40 Engine Oil Pressure Switch
41 Air Filter Vacuum Switch

Lamps

100 Reverse Light
101 LH Trailer Indicator
102 LH Front Indicator
103 LH Rear Indicator
104 RH Trailer Indicator
105 RH Front Indicator
106 RH Rear Indicator
107 Turn Signal
108 Park Brake Warning Light
109 Park Brake Warning Light
110 Park Brake Warning Light
111 Park Brake Warning Light
112 Alternator Warning Light
113 Water Temperature Warning Light
114 Transmission Oil Temperature Warning Light
115 Engine Oil Pressure Warning Light
116 Air Filter Warning Light
117 Hazard Warning Light
118 Main Beam Warning Light

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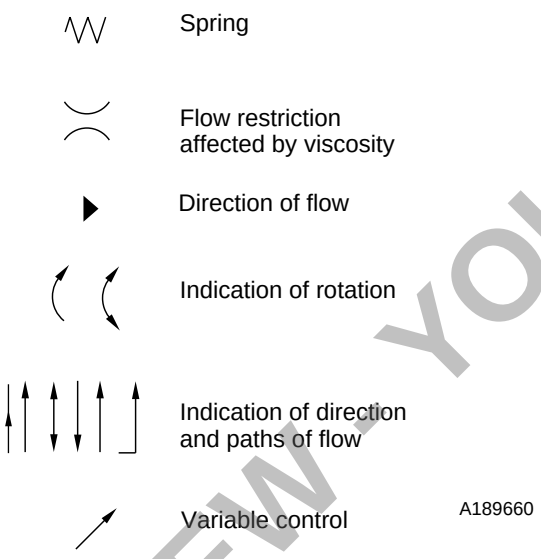
Introduction to Hydraulic Schematic Symbols

Complex hydraulic components and circuits can be described to the engineer by using graphical symbols. The following pages illustrate and give a brief description for some of the more common symbols used.

There are many symbols in use and it would be impossible to include them all here. However it should be noted that most are only variations or refinements on the basic principles explained here. If more detailed information is required you are recommended to obtain a copy of BS2917 or IS01219.

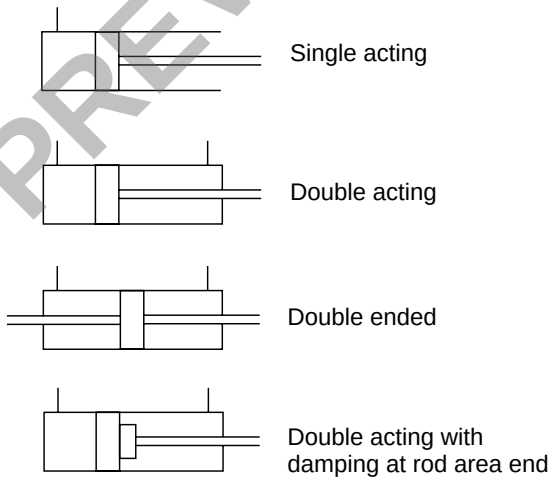
Once familiar with the symbols, the engineer can use hydraulic circuit diagrams as an aid to fault finding. It will be possible to see the complete hydraulic circuit and decipher the relationship between hydraulic components.

General (Basic & Functional Symbols)



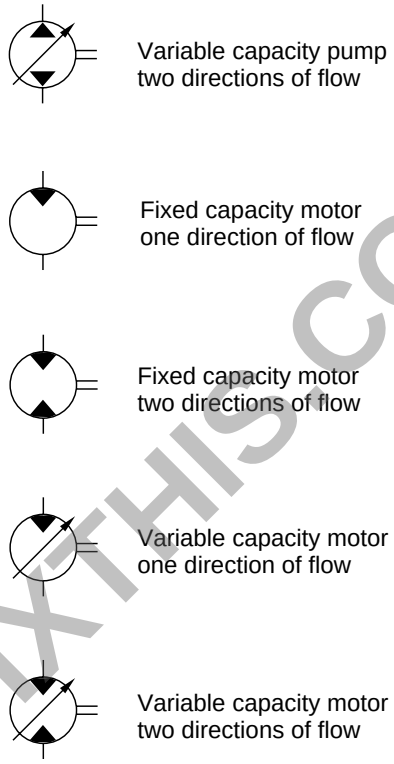
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Rams



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Pumps & Motors

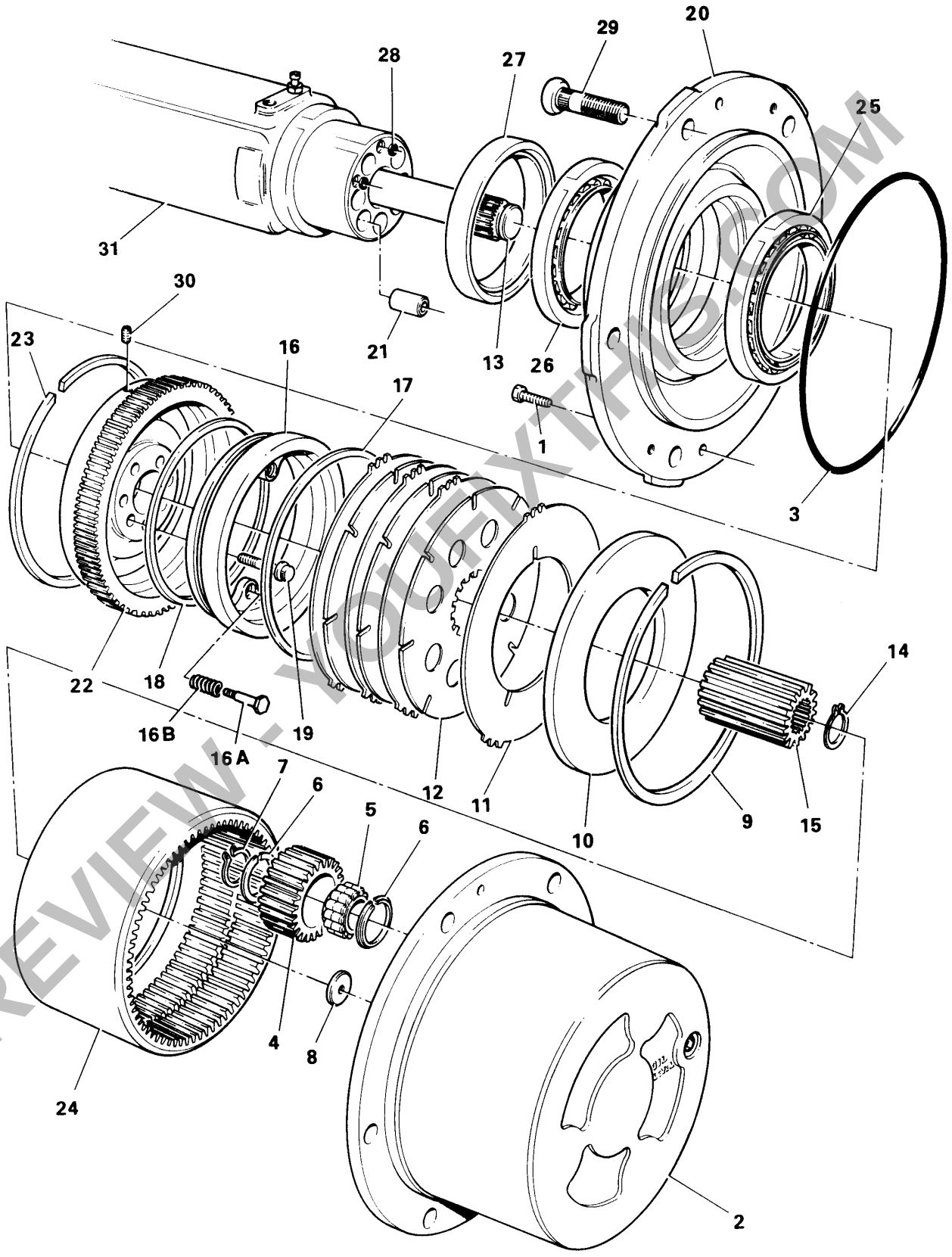


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Hubs, Driveshafts and Brakes - Dismantling



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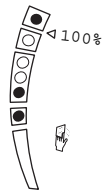
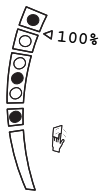
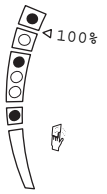
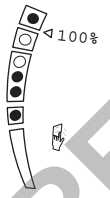
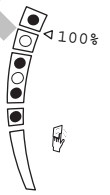
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Diagnostic Fault Codes

If any of the codes are displayed, switch the starter key off and then on again. Refer to the list of fault codes below if the fault does not clear

Note: A new display box will not be calibrated. Always calibrate the system if a new display box is fitted.

	**Fault Code 1** **Transducer signal fault**	Transducer not connected. Faulty harness. Faulty transducer.	Check the transducer connection. Check for trapped or damaged wiring. Check for water ingress. Replace transducer.
	**Fault Code 2** **Calibration out of range** Displayed during calibration procedure only	System is incorrectly calibrated. Transducer not fixed down correctly. Faulty transducer.	Re calibrate system. Check mounting surfaces are clean and flat. Check mounting bolts are not bottoming out. Check tightness of transducer mounting bolts (70Nm). Replace transducer.
	**Fault Code 3** **Calibration required**	System not calibrated.	Calibrate system.
	**Fault Code 4** **Display unit faulty**	The display box has detected an internal error.	Switch the starter key off and then on again. Replace the display box if the fault does not clear.
	**Fault Code 5** **Low battery voltage**	Battery voltage is below 9 volts	Do 12V supply test at display box. Check battery voltage

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Fault Finding

Before carrying out the checks listed 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.

A If the transmission is noisy, start at check 1.
B If the transmission is overheating, start at check 4.
C If the transmission will not pull, start at check 12.
D If there is no drive in one or both directions, start at check 17.
E If the transmission is jumping out of gear, start at check 29.
F If the transmission is sticking in gear, start at check 39.
G If ratios are 'crash changing', start at check 41.

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 NO: 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 pressure maintenance valve is free to operate.
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
10	Is transmission misaligned?	YES: Renew mountings and check position. NO: Check 'converter out' pressure and flow.
11	Are the pump bushes worn?	YES: Renew NO: Check converter for wear or cooler for restriction to flow.
12	Is the transmission not pulling in one direction only?	YES: Check 16 NO: Check 13
13	Is the transmission not pulling in both Forward and Reverse?	YES: Stall test machine, Check 14. NO: Check 16

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* **Note:** New engines DO NOT require a running-in period. The engine/machine should be used in a normal work cycle immediately; glazing of the piston cylinder bores, resulting in excessive oil consumption, could occur if the engine is gently run-in. Under no circumstances should the engine be allowed to idle for extended periods; (e.g. warming up without load). Engines of new machines are filled at the factory with JCB 10W/30 Multigrade oil. This oil should be drained after the first 100 hours operation and the engine filled with the appropriate recommended grade as shown in the lubrication chart. JCB 10W/30 Multigrade should also be used for the first 100 hours operation whenever a new or reconditioned engine is fitted to the machine. After the first 100 hours operation, it is essential that the 10W/30 oil is replaced by the lubricant recommended below.

ITEM	CAPACITY	FLUID/LUBRICANT	SPECIFICATION
Engine Oil -18 to 0° C -10 to 50° C	10.7 litres (2.4 UK gal)	JCB Torque Converter Fluid JCB 15W/40 Multigrade	API CD MIL-L-2104C
Gearbox **Syncro Shuttle** **Powershift**	 19 litres (4.2 UK gal) 13 litres (2.9 UK gal)	 JCB Special Transmission Fluid JCB Special Transmission Fluid	 Ford ESN-M2C 33G Ford ESN-M2C 33G
Transfer box	1.3 litres (0.3 UK gal)	JCB HD 90 Gear Oil	API-GL-5, MIL-L-2105C
Axles **(TM 200)** **(TM 270)**	 16 litres (3.6 UK gal) 20 litres (4.4 UK gal)	 JCB Special Gear Oil JCB Special Gear Oil	 Ford ESE-M2C 86B Ford ESE-M2C 86B
Hydraulic System **(TM200)** Up to 38° C Above 38°C **(TM270)** Up to 38° C Above 38°C	 63 litres (14.1 UK gal) 90 litres (20.2 UK gal)	 JCB Special Hydraulic Fluid JCB High Performance Hydraulic Fluid JCB Special Hydraulic Fluid JCB High Performance Hydraulic Fluid	 ISO 32 ISO 46 ISO 32 ISO 46
Cooling System	15.5 litres (3.5 UK gal)	Water/Anti-freeze (see **Coolant mixtures**)	ASTM D3306-74
Fuel System	90 litres (20.2 UK gal)	Diesel Oil (see **Types of Fuel**)	ASTM D975-66T Nos. 1D, 2D.
Grease Points consistency		JCB Special MPL Grease	Lithium based, No. 2
Wear Pad Runways		JCB Waxoyl	

Note: The total hydraulic system capacity depends on the equipment being used. Fill the system with all rams closed and watch the level indicator.

† The figure quoted is TOTAL system capacity. Use the **'MAX'** and **'MIN'** marks on the dipstick when refilling the system.

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Note: The 100 Hour Operations are carried out after the initial 100 Hours only.

†† **Note:** When operating in regions where ambient temperatures exceed 32° C (90 °F), change at 500 Hours

† **Note:** When operating in extreme conditions, change at **250** Hours

	Pre-start Cold Checks Service Points and Fluid Levels	**Operation**	**10 Hr**	**50 Hr**	**First 100 Hr**	**500 Hr**	**1000 Hr**	**2000 Hr**
	ENGINE							
	Generally for Leaks	- Check	☐					
	Oil level	- Check	☐		☐			
	Oil and Filter	† - Change			☐	☐	☐	☐
*	Oil and Filter (Tier 2 TM300 RJ Build)	- Change				☐	☐	☐
	Fuel Filter	- Drain		☐				
	Fuel Filter	† - Change			☐	☐	☐	☐
	Coolant Level and Antifreeze Strength	- Check	☐		☐	☐	☐	☐
	Air Cleaner Dust Valve	- Clean					☐	☐
	Air Cleaner Outer Element	- Change					☐	☐
	Air Cleaner Inner Element	- Change						☐
	Coolant	- Change						☐
	Fuel Sedimenter	- Drain		☐	☐			
	Fan Belt Tension/Condition	- Check		☐	☐	☐	☐	☐
*	Valve Clearances	- Check and Adjust					☐	
	Engine Mount Security	- Check			☐	☐	☐	☐
	Fuel System for Leaks and Contamination	- Check	☐		☐	☐	☐	☐
	TRANSMISSION AND AXLES							
	Hub Oil Levels	- Check			☐			
	Hub Oil	†† - Change					☐	☐
	Oil Filter	- Change			☐	☐	☐	☐
	Drive Axle(s) Oil Level	- Check			☐			
	Drive Axle(s) Oil	†† - Change					☐	☐
	Transmission Oil Level	- Check			☐	☐		
	Transmission Oil	- Change					☐	☐
	Transmission Strainer	- Clean					☐	☐
	Transfer Gearbox Oil Level	- Check				☐		
	Transfer Gearbox Oil	- Change			☐		☐	☐
	Axle Breather(s)	- Clean			☐			
	Drive Shaft/Prop. Shaft Security	- Check			☐	☐	☐	☐
	Drive Shaft/Prop. Shaft	- Lubricate			☐	☐	☐	☐
	Axle Mount Security	- Check			☐			
	Transmission Mount Security	- Check			☐			
	HYDRAULICS							
	Oil Filter	- Change			☐	☐	☐	☐
	Oil	- Sample/Change						☐
	Suction Strainer	- Clean						☐
	Oil Level	- Check	☐		☐	☐	☐	
	Hoses - Damage or Leaks	- Check		☐	☐	☐	☐	☐
	Rams - Condition	- Check			☐	☐	☐	☐
	Pipework - Damage or Leaks	- Check		☐	☐	☐	☐	☐

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Installing the Articulation Lock

⚠ WARNING

Make sure the articulation safety lock is fitted before transporting the machine. The articulation safety lock must also be fitted if you are inspecting and/or doing any maintenance work in the articulation danger zone.
16-3-1-3

On the Wheeled Loader, the articulation safety lock is stowed on the machine as illustrated at **A**. The articulation lock is fitted with the machine in a 'straight ahead' position.

1 Steer the machine to bring the front and rear wheels in a straight line.

2 Apply the parking brake, put the transmission in neutral and stop the engine.

3 Remove pins **B** and **C** and slot articulation lock into place, replace pin **B** at position **1**, and if possible, pin **C** at position **2**. If pin **C** will not fit, turn steering wheel slightly to align hole.

Removing the Articulation Lock

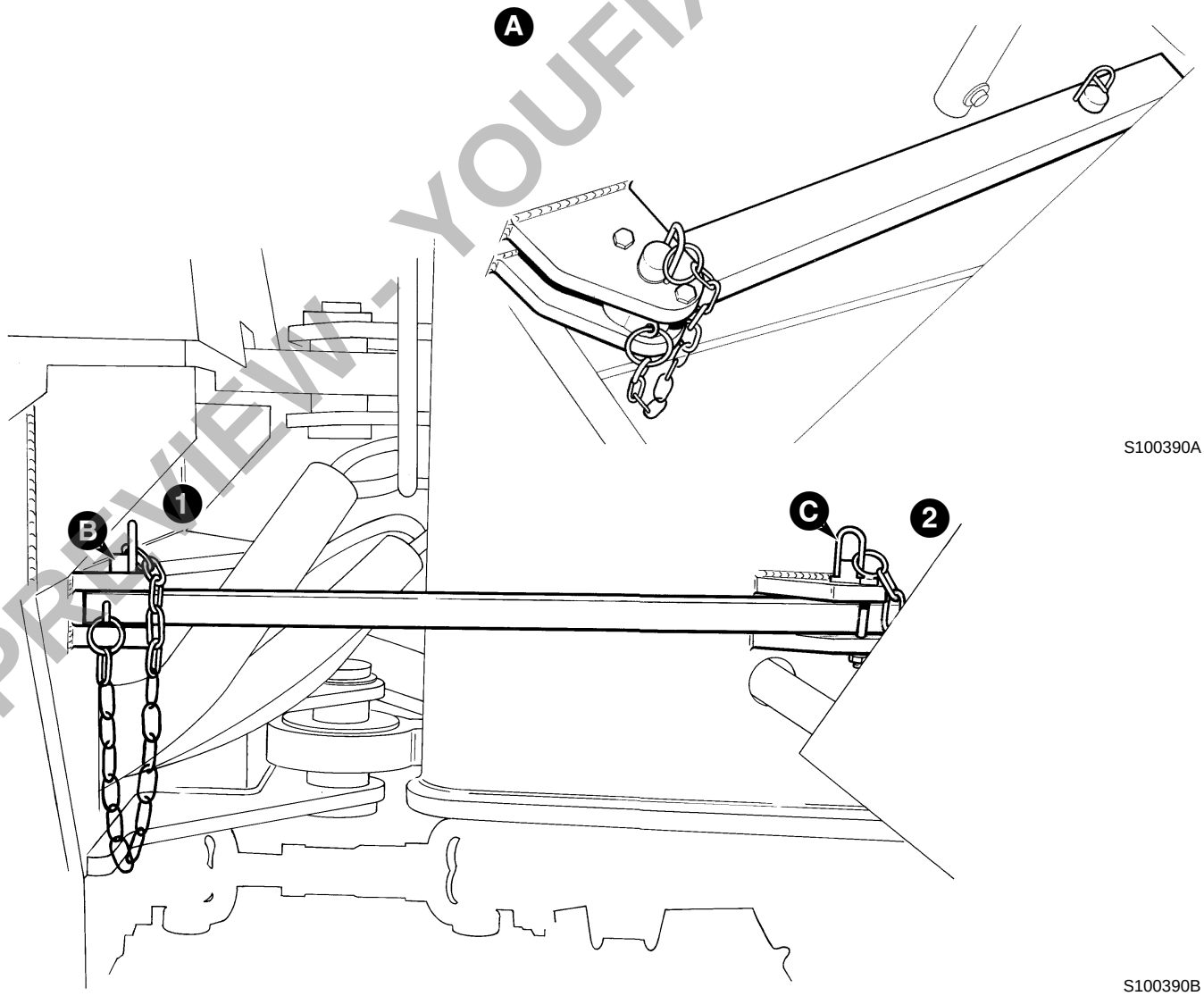
⚠ WARNING

Always make sure the articulation safety lock has been removed before attempting to drive the machine. The machine cannot be steered with the articulation lock fitted.
16-3-1-4

1 Remove pins **B** and **C**.

2 Return the articulation lock to its stowage position as shown at **A**.

3 Lock the articulation lock into its stowage position by replacing pins as shown at **A**.



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S100390B

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Draining the Fuel Sedimenter TM300

1 Open the engine cover and locate sedimenter .

⚠ CAUTION

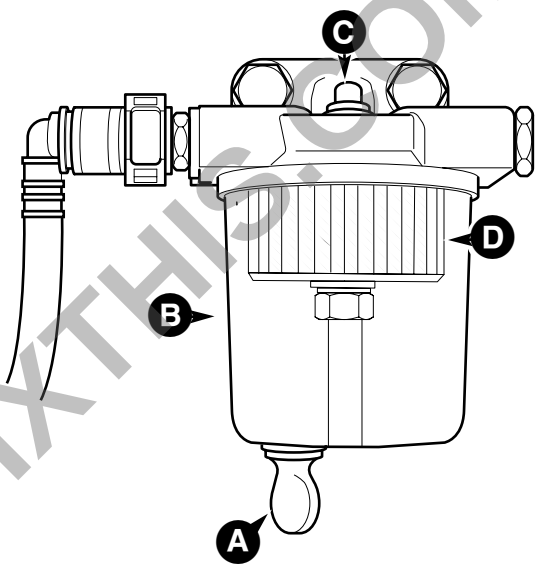
The engine no longer carries a mechanical lift pump. The fuel system now incorporates an electric pump built into the filter head. As this pump is fed from the machine's ignition circuit, it is most important that the ignition is turned off whenever the fuel system is being worked on.
0-1-0-4

2 Drain off any water in the bowl by turning tap **A.**

3 Make sure tap **A** is turned off and secure.

⚠ CAUTION

Running the engine with air in the system could damage the fuel injection pump. After maintenance, remove air from the system as detailed below.
2-3-3-7



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Changing the Sedimenter Filter TM300

Note: The fuel sedimenter assembly fitted to the TM300 now incorporates a paper and gauze filter element.

1 Hold the bolt **C** and unscrew the bowl **B**.

2 Remove the bowl

3 Remove the filter element (**D**).

4 Wash out the bowl with clean fuel.

5 Fit a new filter element.

6 Refit the bowl. Make sure the gasket is in good condition and positioned correctly.

Note: It is most important that the bolt **C** is held while the bowl is screwed onto it and that the bowl is not over tightened.

7 Screw the filter bowl onto the bolt **C** until the seal contacts the filter head. Tighten the bowl by hand a further ¼ of a turn.

8 Bleed the fuel system. See **Bleeding the Fuel System**.

9 Run the engine and check for leaks.

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Fitting Procedure

A 'Rivet Nut' is a one piece fastener installed 'blind' from one side of the machine body/framework. The rivet nut is compressed so that a section of its shank forms an 'upset' against the machine body/framework, leaving a durable thread (see illustrations).

Rivet nuts are fitted to various parts of the machine body and framework. They are used in a number of applications, for instance, hose clamp and cab floor plate retention etc.

Various sized rivet nuts are available, see the table below to determine the size of rivet nut to be used for particular applications.

If for any reason a new rivet nut requires fitting, then the correct installation procedure must be followed:

1 Drill a hole in the machine body/framework where the rivet nut is to be fitted. De-burr hole edges.

2 Screw the rivet nut onto the mandrel of the installation tool. The bottom of the mandrel should be in line with the bottom of the rivet nut, shown at **A**.

3 Wind the body of the installation tool down the threaded mandrel until it touches the head of the rivet nut, shown at **B**.

4 Insert the rivet nut (assembled to the tool) into the hole drilled in step **1**.

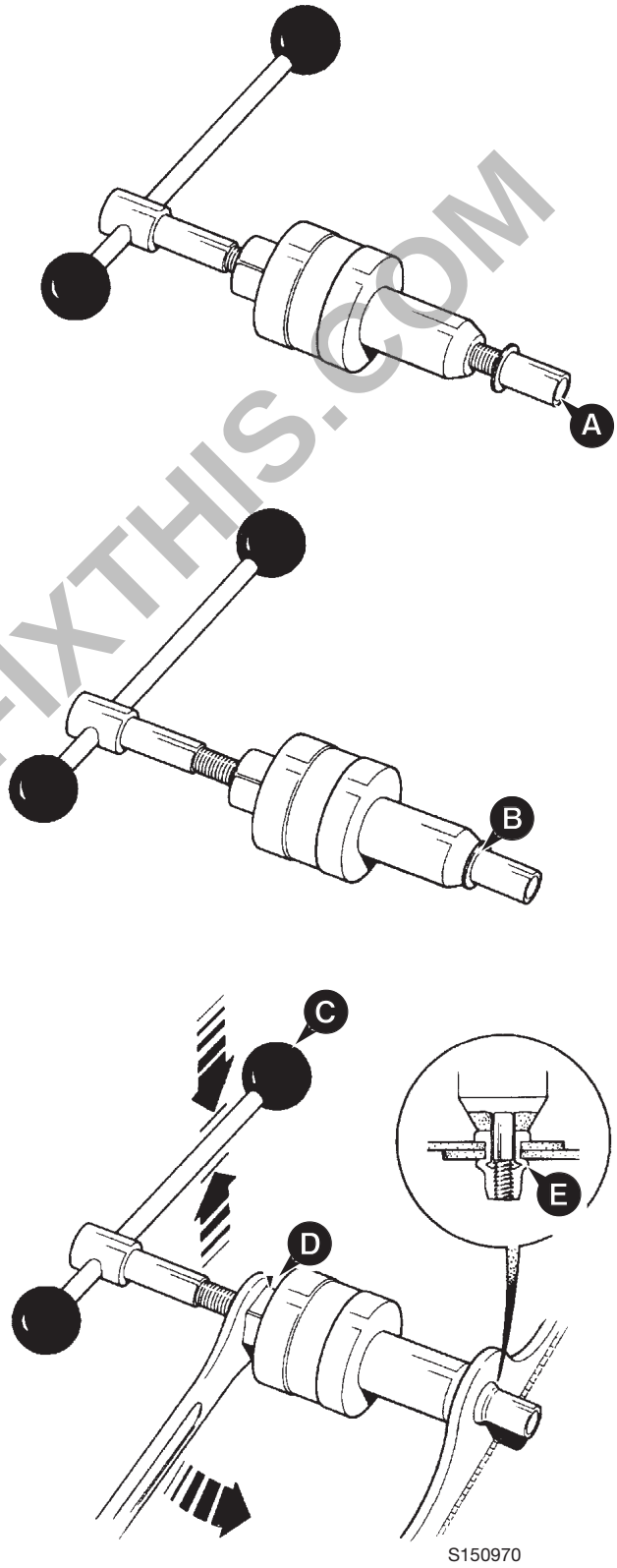
5 Hold handle **C** and at the same time draw the mandrel into the installation tool by turning nut **D**. The rivet nut will contract in length and form an 'upset' (smooth bulge) seating itself against the body/framework (see inset **E**).

Note: The thread of the rivet nut must not be stripped, take care when 'upsetting' the rivet nut.

6 Remove the installation tool.

Specifications (all dimensions in mm)

Rivet Nut Thread Diameter	Rivet Nut Outside Diameter	Material Thickness	Rivet Length (Total)	Drill Hole Dia.
M5	7	0.25 - 3.00 3.00 - 5.50	14.00 17.00	7.10
M6	9	0.50 - 3.00 3.00 - 5.50	16.00 19.00	9.10
M8	11	0.50 - 3.00 3.00 - 5.50	18.00 21.00	11.10
M10	13	1.00 - 3.50 3.50 - 6.00	23.00 26.00	13.10

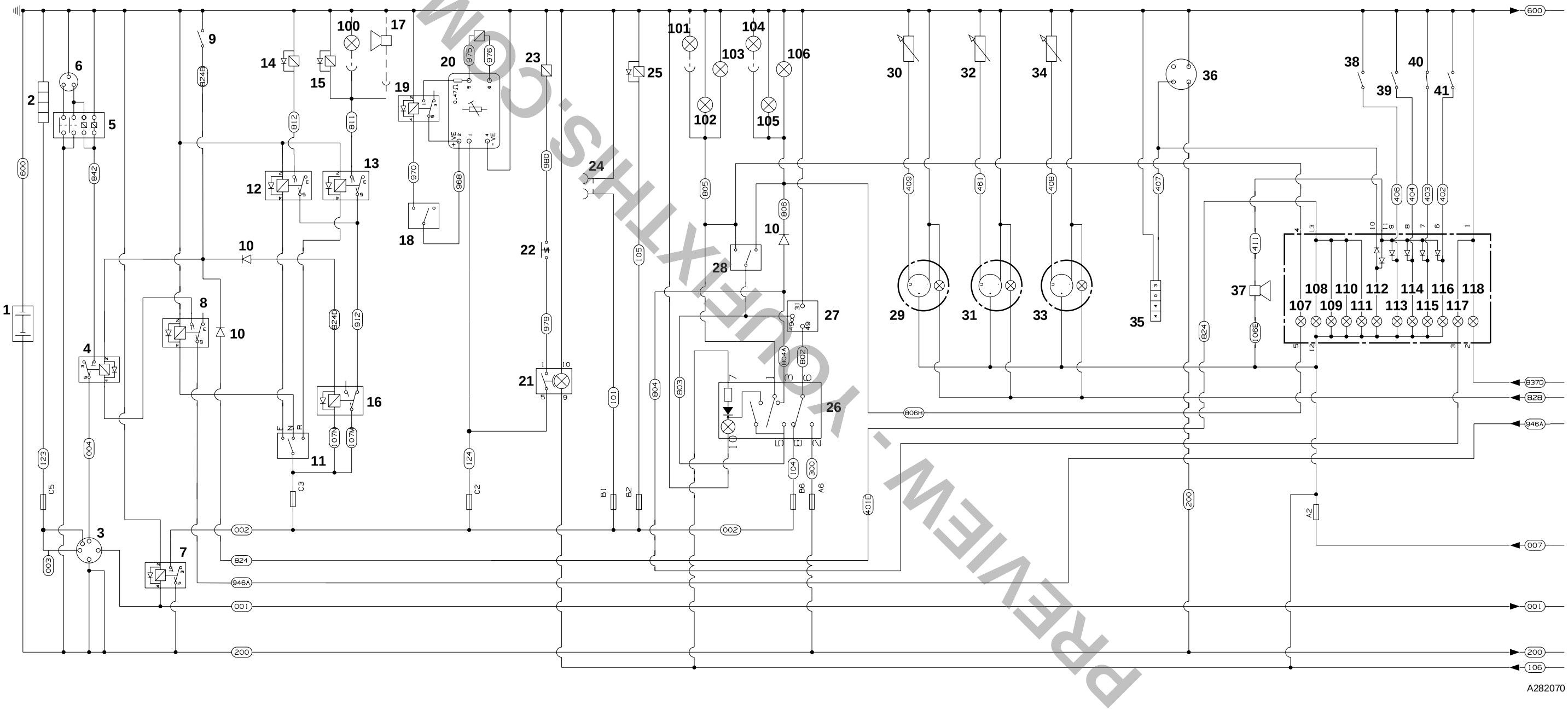


S150970

Note: In an emergency, and if no installation tool is available, it is possible to fit a rivet nut by using a nut and bolt the same thread diameter as the rivet nut being installed. However, this is not the recommended method.

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TM200

Pump

Type	Sunstrand AFGP 36L - 31805 (gear type)		
Flow at 2250 rpm	81 litres/min	17.80 UK gal/min	21.4 US gal/min

Relief Valve Operating Pressure	**bar**	**kgf/cm²**	**lbf/in²**
Main Relief Valve	207	211	3000
Auxiliary Relief Valves			
* Forward Tilt (G)	280	286	4060
Backward Tilt (F)	280	286	4060
Servo Pressure	30	30	435

Filter

Filtration Size	25 microns		
By-pass Pressure	1.05	1.07	15

Ram Dimensions	**Bore**	**Rod Dia**	**Stroke**
Steering	70	40	246
Tilt	120	70	285
Compensating	70	40	630
Lift	110	60	842
Extension	70	40	1200
Quickhitch	40	30	40

Hydraulic Tank

Capacity	63 litres	13.9 UK gal	16.6 US gal

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Hand Control Valve

Dismantling, Inspection and Assembly

Dismantling

1 Undo the three cap screws **1**. Lift off the joint mechanism assembly **2**.

2 Pull out the four valve capsule assemblies **3**.

3 Remove the six adaptors **16** from the ports. Note that the adaptors incorporate seals. .

Inspection

1 Inspect the underside of the wobble plate **5** for signs of excessive wear. If wear is evident the complete assembly **2** must be renewed.

2 Inspect the universal joint for signs of excessive play. If wear is evident the complete assembly **2** must be renewed.

3 Inspect the mating faces of plungers **6** and bushes **7** for signs of excessive wear. If wear is evident the valve capsule must be renewed as a complete assembly.

4 If the valve has been contaminated with debris be sure to remove it from all internal drillings. Carefully inspect the mating faces of spools **8** and body **9**. If scoring is evident the complete valve must be renewed.

Assembly

Assembly is the reverse dismantling but note the following:

1 The valve assembly is susceptible to malfunction and damage if it is contaminated with debris or dirt. Make sure that all components are clean and free from debris.

2 Renew all 'O' rings **14** and seals **15**.

3 Apply JCB HP Grease to the mating faces of wobble plate **5** and plungers **6**.

4 If the joint mechanism assembly **2** is to be renewed it must be adjusted correctly. With the assembly fixed in position, check the dimension **X**. The wobble plate **5** must be positioned so that it just makes contact with the top of the valve plungers. If there is a gap at **X**, or if the plate is depressing the plungers adjust as follows: Hold the collar **11** using a suitable rod located in hole **Y**. Slacken the lock nut **10** and then screw the collar **11** up or down as required. Tighten the lock nut **10**.

Torque Settings:

Item	Nm	Kgf m	lbf ft
1	**9**	**1**	**7**
10	**24**	**2**	**18**
16	**30**	**3**	**22**

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TM200

Front and Rear Axles

Note : It is essential that the correct ratio axle in relationship to the gearbox ratio is fitted to the machine. Do not fit a new axle with a different ratio to the axle being replaced.

Designation	PD55
Installation	Rigid pad mount
Weight (dry and without wheels)	280 kg (618 lb) approx.
Half (Axle) Shaft Braking/Type	3 friction plate, 4 counter plate (each half shaft)
Input Type	Yoke
Hub Reduction	5.4:1
Ratios	
Overall	16.2:1
Crownwheel and Pinion	3.0:1
Number of Teeth	
Crownwheel	33
Pinion	13

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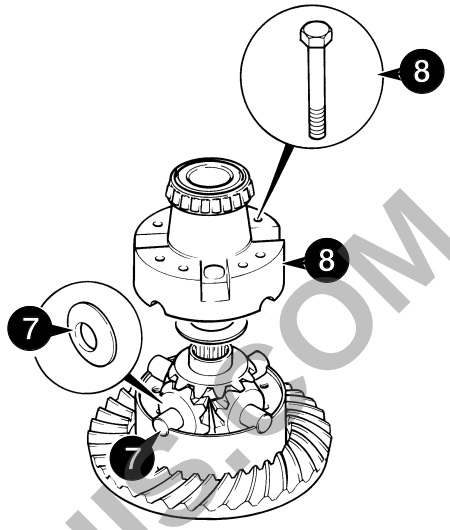
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Central Drive Head - Assembly (cont'd)

Note: The crown wheel and pinion are matched and should be renewed as a pair if either one is damaged or excessively worn. The two differential housing halves are also matched. Do not use unmatched halves. If required, fit a new crownwheel to the differential case half, torque tighten crownwheel retaining bolts to 166 Nm 122 lbf ft; 17 kgf m).

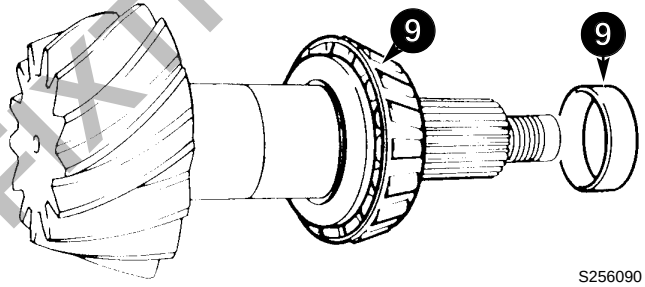
7 Assemble the differential gears and their spherical washers into the bottom half housing. Fit the differential bearing cones.

8 Position the top half housing onto the differential, aligning the match mark letters (see Note above). Apply JCB Threadlocker & Sealer to the threads of bolts, then fit and torque - tighten to 56 Nm (42 lbf ft, 6 kgf m). Check the gears for free rotation.



S256100

9 Fit the pinion inner bearing cone and a new collapsible spacer.

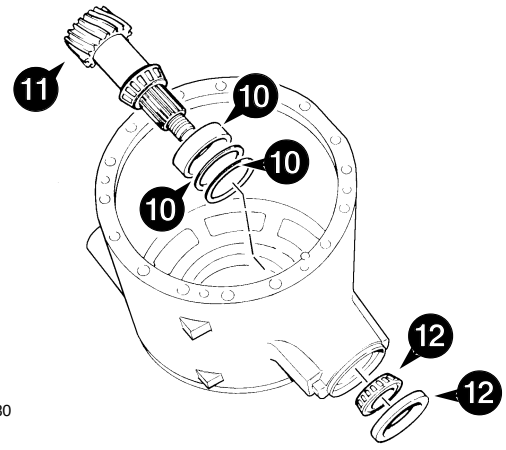


S256090

10 Fit the pinion inner bearing cup, together with the required thickness of shims to give correct pinion depth, see Pinion Depth, steps 1 to 6. To ensure the cup is fitted square, use a suitable puller assembly. Do not use a hammer. Fit the outer bearing cup.

11 Insert the pinion into its bore. (Before inserting, ensure that the pinion matches the crownwheel. The code numbers etched on the pinion end face and the crownwheel perimeter should be the same.

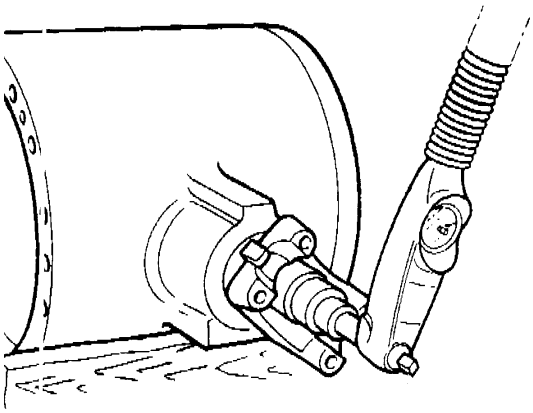
12 Fit the pinion outer bearing cone and the seal. Pack between the lips of the seal with grease before fitting.



S256080

13 Install the drive coupling yoke and secure with a new stake nut and washer. Tighten the stake nut (holding the yoke with Service Tool 892/00812) to achieve the correct rolling torque; see Step 14. If the nut is overtightened, the collapsible spacer must be renewed.

14 Measure the rolling torque, which should be 1.7-2.8 Nm(1.3-2.1 lbf ft; 0.17-0.28 kgf m). When the torque is correct, stake the nut to the pinion shaft using a square-ended staking tool.


S256130

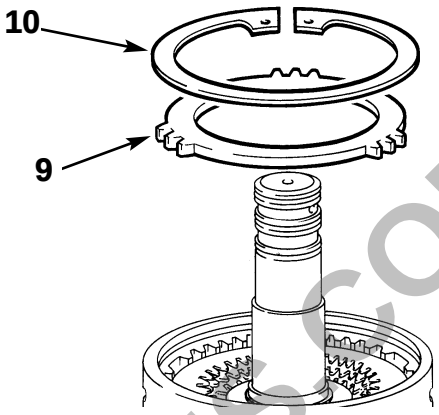
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Reverser Unit - Assembly (cont'd)

* **9** Fit the pressure (end) plate. Make sure that the prongs on the pressure plate DO NOT locate in the large grooves in the hub (the ones with drilled holes).

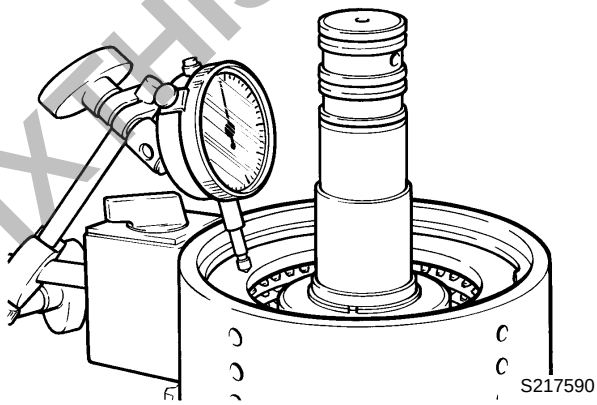
10 Fit the clutch friction/counter plates retaining circlip.



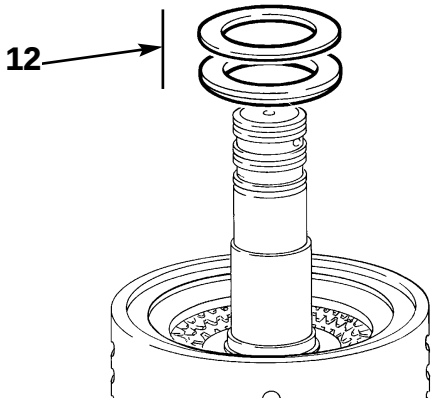
S217580

* **11** Using a dial test indicator as shown, measure the end float of the pressure (end) plate, which should be 3.1 to 4.4 mm (0.122 to 0.173 in). If necessary, fit shim between the retaining circlip and pressure (end) plate to correct end float inaccuracies.

Note: Later type shim has teeth on the outside diameter; the teeth prevent it from spinning during operation. If the shim removed from the clutch does not have teeth then discard it and use the new type shim.


S217590

12 Fit thrust washer and plastic type washer.



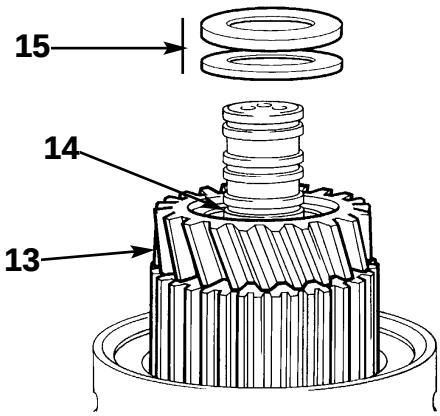
S217600

13 Fit gear and splined hub assembly.

Note: Prior to fitting gear, align teeth of clutch plates using a thin rod (screwdriver).

14 Fit needle roller bearing.

15 Fit plastic type washer and thrust washer.



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Solenoid Valve

Dismantling

Unscrew the knurled nut **2** and remove 'O' ring **3**, withdraw the solenoid **4** and 'O' ring **5**.

Hold the solenoid valve body **6** in a vice, using the spanner flats **A**, remove spindle **7** and 'O' ring **8**.

Pull out actuating pin **9**, spring **10**, spring retainer **11**, and spool **12**.

Inspect the spool and spool bore for signs of wear, nicks scratches etc.

Assembling

Assembly is reversal of the dismantle procedure.

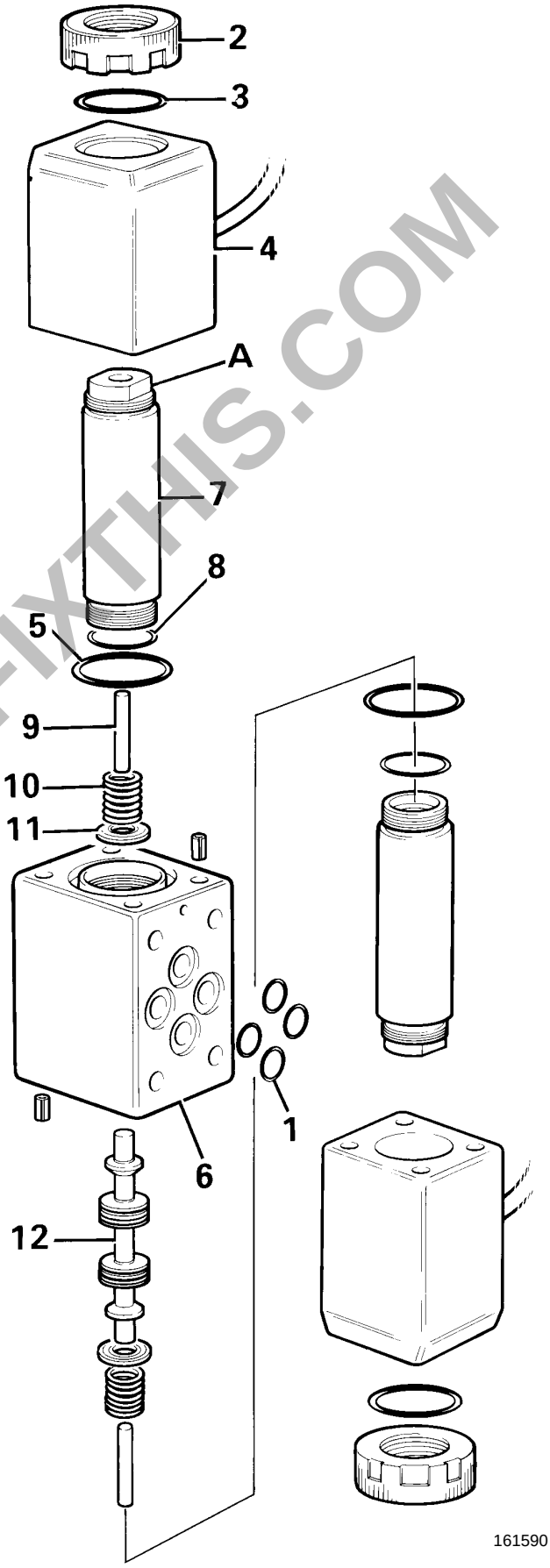
Renew all 'O' rings.

Lightly lubricate all parts with clean transmission fluid before assembling.

Check that the flying leads are secure and that the connectors are intact.

Torque Settings

Item	Nm	kgf m	lbf ft
2	10 to 15	1 to 1.5	8 to 10



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Dismantling (cont'd)

23 Position transmission vertically, standing on face of flywheel housing as shown.

CAUTION: The Powershift transmission weighs approximately 278 kg (613 lb) when dry. Suitable equipment must be used to manoeuvre the transmission into a vertical position.

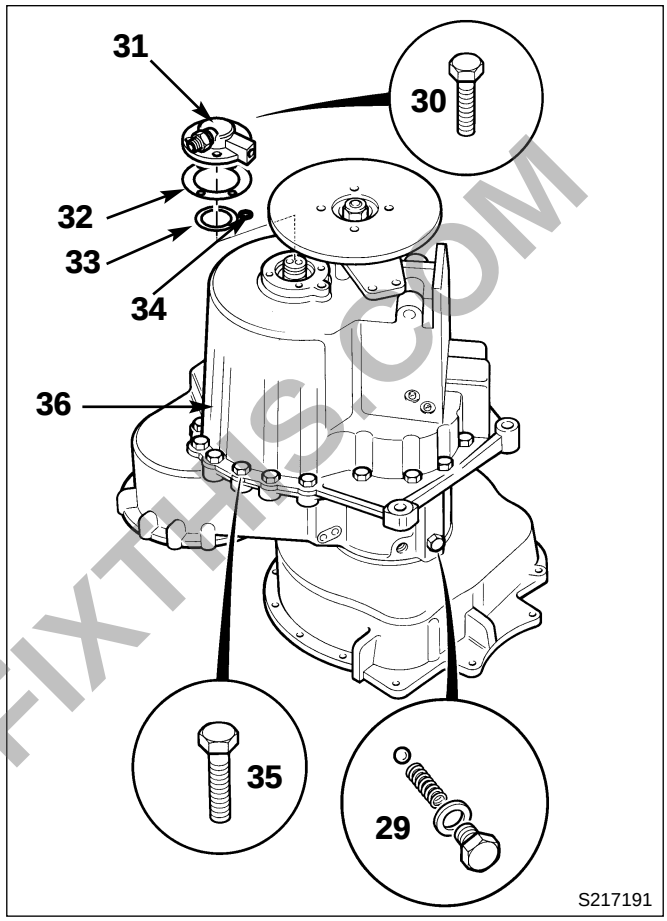
24 Remove the torque converter relief valve ball, tapered spring and sealing washer **29**.

25 Remove bolts **30** and remove the layshaft end cap **31**. Discard the sealing gasket **32**.

26 Remove the layshaft shim **33** and 'O' ring **34**.

27 Unscrew bolts **35** and separate the rear (output) end casing **36**. Sealant will hold the casings together, carefully tap the casing while gently levering apart at **X**, (shown at next step).

Note: Make sure that internal components remain seated in the front casing. If necessary, rotate the brake disc back and forth slightly to dislodge the internal components.



28 Remove and discard the three 'O' rings **37** (fitted next to the input and reverser clutch assemblies).

29 Tilt and lift out the layshaft assembly **T**.

Note: For reference, the clutch assemblies are identified as follows:

P = Reverser Clutch **Q** = Mainshaft
T = Layshaft **V** = Input Clutch

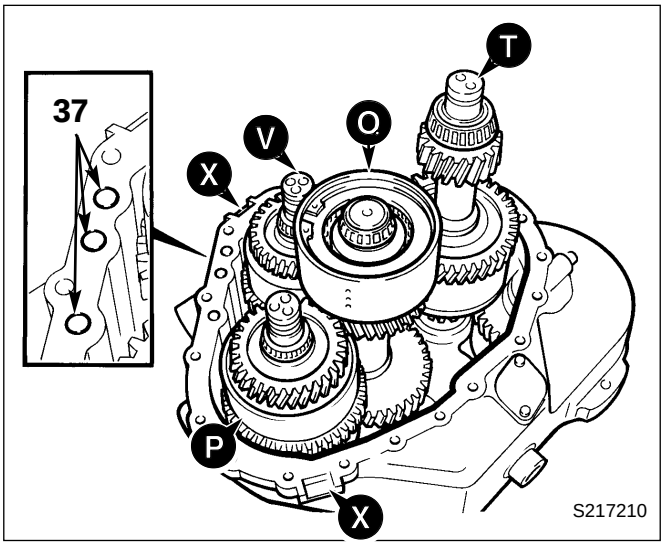
30 This step requires the help of an assistant. Have the assistant SLIGHTLY lift and tilt both the mainshaft and input clutch as shown; then tilt and lift out the reverser clutch **P**.

31 Slightly lift the input clutch and at the same time tilt and lift out the mainshaft **Q**.

32 Lift out the input clutch **V**.

Note: Retrieve shims **38** from casing for re-use, see complete assembly illustration at the begining of the dismantle procedure. Dismantling and assembly procedures for the shaft and clutch assemblies are given elsewhere in this manual.

The procedure for PS700 and PS750 differ, make sure you use the correct procedure.



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Caliper - Dismantling and Assembly

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

For assembly the sequence should be reversed.

⚠ WARNING

Brake pads generate dust which if inhaled, may endanger health. Wash off the caliper before commencing work. Clean hands thoroughly after work.
13-3-1-3

When Dismantling

To remove backing plate **7**, brake pad **8** and brake pad **9**, first lever pad **9** towards the centre of housing 1**8**. Then press backing plate **7** and brake pad **8** towards the housing and remove together through the brake disc slot. Separate brake pad **9** from rotor seal **10**. Remove brake pad **9**, rotor seal **10** and plain bearing **11** through the brake disc slot.

Remove rotor **12**, ball spacer **13** and ball bearings **14** through the aperture vacated by the removal of backing plate **7**. Take care not to lose the ball bearings.

Inspection

Ensure that all parts are free from excessive wear, damage or corrosion. Light scores or stains should be removed. Renew corroded or deeply scored parts.

When Assembling

Coat with silicone grease the spindle, ball pockets and surface of rotor **12**, the inside face of rotor seal **10** and the ball pockets of housing **18**.

Locate the small diameter of spring **5** around the outside of the 4 pins on lever **4**, and the large diameter of the spring outside the boss of housing **18**.

As an aid to assembly, smear the mating face of backing plate **7** with a non-hardening polyester urethane sealant (supplied with replacement brake pad kits) before bringing together pad **8** and backing plate **7**.

Align the flat on pad **9** with the flat on rotor seal **10**.

Prior to insertion, assemble 0-rings **16** and **17** onto mounting bushes **15** and lubricate with silicon grease.

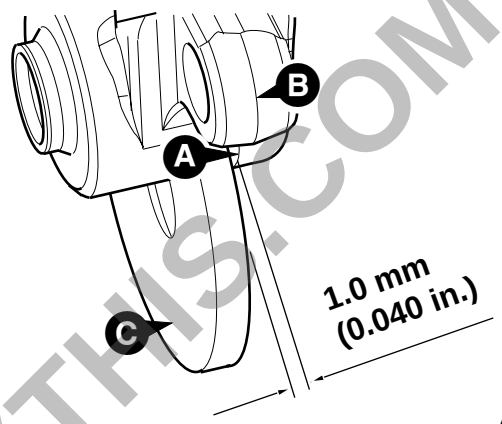
Note: The bushes can only be inserted into housing **18** from the direction shown.

Torque Settings

Item	Nm	kgf m	lbf ft
1	28	3	21

Checking Brake Pad Wear

With the parking brake engaged (Lever vertical), use feeler gauges to measure the gap between the rear face **A** of the caliper housing **B** and the face of brake disc **C**. A gap of 1mm (0.04in) or less indicates that the pads need renewing.



A234720

Renewing the Brake Pads

Renew pads when the thickness of friction material on either pad is 1mm (0.04in).

1 Remove the brake caliper. See **Caliper Removal and Replacement**.

2 Press backing plate **7** and brake pad **8** towards housing **18** and remove through brake disc slot.

3 Separate brake pad **9** from rotor seal **10** and remove through brake disc slot.

4 As an aid to assembly, smear the mating face of backing plate **7** with a non-hardening ployester urethane sealant (supplied with replacement brake pad kits) before bringing together pad **8** and backing plate **7** with their flats aligned.

5 Align the flat on pad **9** with the flat on rotor seal **10**.

6 Refit the brake caliper. See **Caliper Removal and Replacement**.

7 Adjust the parking brake. See **Adjusting the Parking Brake**.

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