Service Manual

Side Engine Loadalls

Section 1 - General Information

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Section F - Transmission

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Fluids, Lubricants and Capacities

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).*

Table 3.

ITEM	CAPACITY Litres (UK Gal)	FLUID/LUBRICANT	INTERNATIONAL SPECIFICATION
Fuel Tank	125 (27.5)	Diesel Oil	⇒ *Types of Fuel (3-47)*
Engine (Oil)			
- A Series	10 (2.2)	JCB High Performance Engine Oil 10W/30. Minus15°C to Plus 40°C (5°F to 104°F)	SAE10W/30, ACEA E2/B2/A2, API CF-4/SG
		JCB High Performance Engine Oil 15W/40. Minus10°C to Plus 50°C (14°F to 122°F)	SAE15W/40, ACEA E2/B2/A2, API CF-4/SG
- R Series	10 (2.2)	JCB Extreme Performance Engine Oil 15W40	SAE15W/40, ACEA E5/B3/A3, API CH-4/SJ
Engine (Coolant)	23.5 (5.2)	JCB Four Seasons Antifreeze and Summer Coolant/Water. ⇒ *Coolant Mixtures (3-12)*	ASTM D3306, BS6580
Gearbox			
- RJ type engine and 4 speed gearbox	19 (4.2 Dry)	JCB Extreme Performance Transmission Fluid (SAE 10W). Below 40ºC (104ºF)	SAE10W, Q8 EL4117, Friction modified oils must not be used (eg. Dexron ATF type
	17 (3.7 Wet)	JCB Extreme Performance Transmission Fluid (SAE 30). Above 40ºC (104ºF)	SAE30, Q8 EL4118, Friction modified oils must not be used (eg. Dexron ATF type
- All other types	23 (5.0 Dry)	JCB Extreme Performance Transmission Fluid (SAE 10W). Below 40ºC (104ºF)	SAE10W, Q8 EL4117, Friction modified oils must not be used (eg. Dexron ATF type
	21 (4.6 Wet)	JCB Extreme Performance Transmission Fluid (SAE 30). Above 40ºC (104ºF)	SAE30, Q8 EL4118, Friction modified oils must not be used (eg. Dexron ATF type
Front Axle			
- Housing	19 (4.2)	JCB High Performance Gear Oil Plus	API-GL-4 Must be suitable for use with limited slip differentials (LSD).
- Hubs (x 2)	2 (0.46)		
Rear Axle			
- Housing	18 (3.9)	JCB High Performance Gear Oil Plus	API-GL-4 Must be suitable for use with limited slip differentials (LSD).
- Hubs (x 2)	2 (0.46)		
Brake System	1.4 (0.3)	JCB High Performance Hydraulic Fluid 15. DO NOT USE ORDINARY BRAKE FLUID	ISO VG15

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Service Schedules

A badly maintained machine is a danger to the operator and the people working around him. Make sure that the regular maintenance and lubrication jobs listed in the service schedules are done to keep the machine in a safe and efficient working condition.

⚠ WARNING

Maintenance must be done only by suitably qualified and competent persons. Before doing any maintenance make sure the machine is safe. It should be correctly parked on firm level ground.

To prevent anyone starting the engine, remove the starter key. Disconnect the battery and block the wheels when you are working beneath the machine.

If you do not take these precautions you could be killed or injured.

9-3-1-1

Apart from the daily jobs, the schedules are based on machine running hours. Keep a regular check on the hourmeter readings to correctly gauge service intervals. Do not use a machine which is due for a service. Make sure any defects found during the regular maintenance checks are rectified immediately.

Calendar equivalents:

Every 10 Hours = Daily

Every 50 Hours = Weekly

Every 500 Hours = Six Months

Every 1000 Hours = Yearly

Every 2000 Hours = 2 Years

Every 6000 Hours = 6 Years

Note: *Services should be carried out at either the hourly interval or calendar interval, whichever occurs first.*

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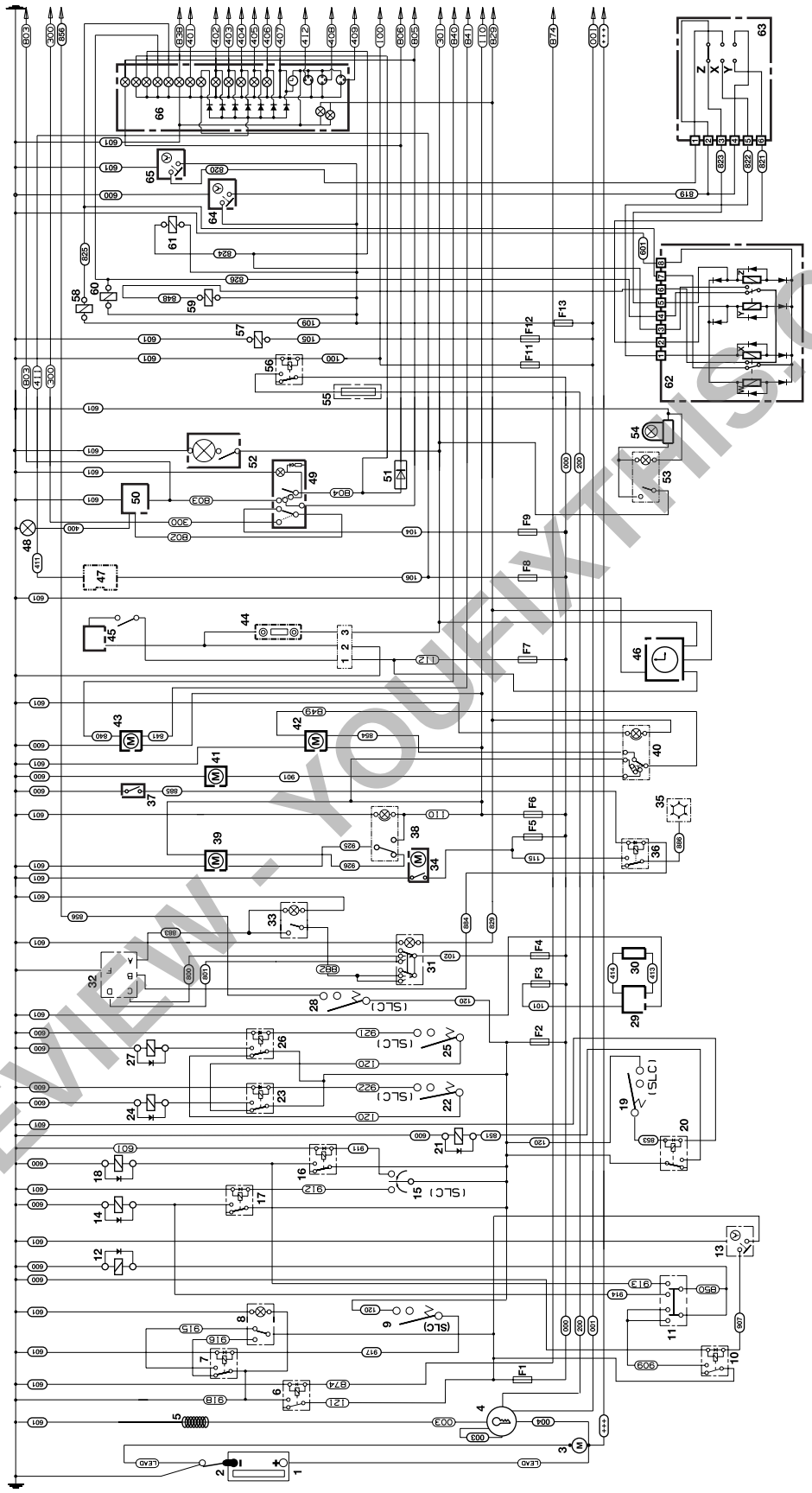


Fig 21. 530-70 From SN 767001 to 768836 (Sheet 1 of 2)

⇒ *Component Key (C-28)*
⇒ *Fig 22. (C-31)*, for Sheet 2 of 2.

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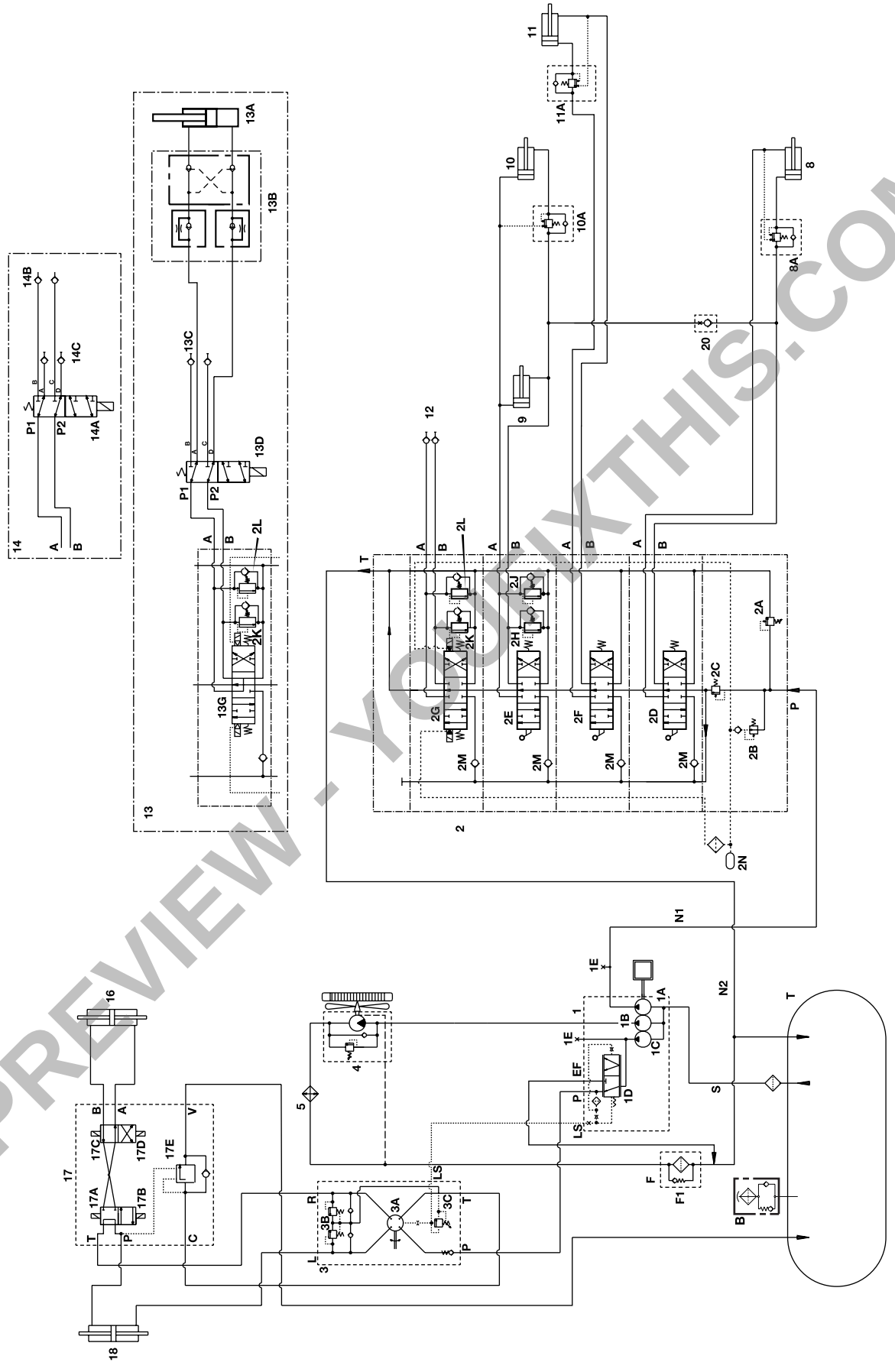


Fig 8. 530-70 Construction Machines (Up to SN 770616)

⇒ Component Key (E-41)

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Dismantling, Inspection and Assembly

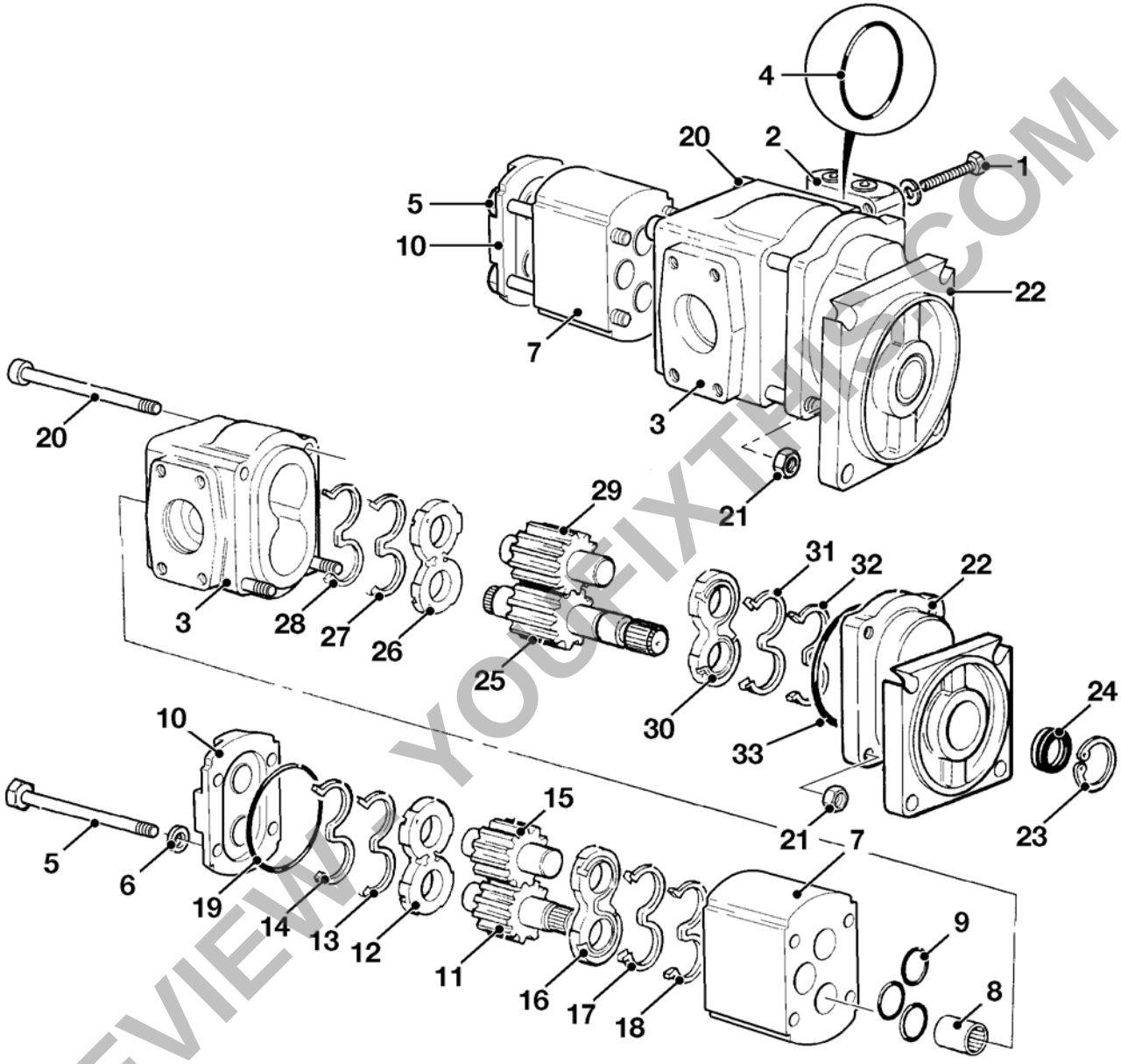


Fig 34.

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Table 2. Torque Settings - UNF Grade 'S' Fasteners

Bolt Size		Hexagon (A/F)	Condition 1			Condition 2		
in.	mm	in.	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
1/4	6.3	7/16	11.2	1.1	8.3	10.0	1.0	7.4
5/16	7.9	1/2	22.3	2.3	16.4	20.0	2.0	14.7
3/8	9.5	9/16	40.0	4.1	29.5	36.0	3.7	26.5
7/16	11.1	5/8	64.0	6.5	47.2	57.0	5.8	42.0
1/2	12.7	3/4	98.00	10.0	72.3	88.0	9.0	64.9
9/16	14.3	13/16	140.0	14.3	103.2	126.0	12.8	92.9
5/8	15.9	15/16	196.0	20.0	144.6	177.0	18.0	130.5
3/4	19.0	1 1/8	343.0	35.0	253.0	309.0	31.5	227.9
7/8	22.2	1 15/16	547.0	55.8	403.4	492.0	50.2	362.9
1	25.4	1 1/2	814.0	83.0	600.4	732.0	74.6	539.9
1 1/8	31.7	1 7/8	1181.0	120.4	871.1	1063.0	108.4	784.0
1 1/4	38.1	2 1/4	1646.0	167.8	1214.0	1481.0	151.0	1092.3

Table 3. Torque Settings - Metric Grade 8.8 Fasteners

Bolt Size		Hexagon (A/F)	Condition 1			Condition 2		
ISO Metric Thread	mm	mm	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
M5	5	8	5.8	0.6	4.3	5.2	0.5	3.8
M6	6	10	9.9	1.0	7.3	9.0	0.9	6.6
M8	8	13	24.0	2.4	17.7	22.0	2.2	16.2
M10	10	17	47.0	4.8	34.7	43.0	4.4	31.7
M12	12	19	83.0	8.5	61.2	74.0	7.5	54.6
M16	16	24	205.0	20.9	151.2	184.0	18.8	135.7
M20	20	30	400.0	40.8	295.0	360.0	36.7	265.5
M24	24	36	690.0	70.4	508.9	621.0	63.3	458.0
M30	30	46	1372.0	139.9	1011.9	1235.0	125.9	910.9
M36	36	55	2399.0	244.6	1769.4	2159.0	220.0	1592.4

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Table 1. Pre-start Cold Checks

Service Points and Fluid Levels	Operation	10 Hr	50 Hr	100 Hr(1)	500 Hr	1000 Hr	2000 Hr
ENGINE							
Coolant Quality and Level	- Check	☐	☐	☐	☐	☐	
Cooling System	- Drain and Refill						☐
Oil level	- Check	☐	☐	☐			
Oil and Filter (A Series engines)(2)	- Change			☐	☐	☐	☐
Oil and Filter (R Series engines)(2)	- Change				☐	☐	☐
Air Cleaner Dust Valve(3)	- Change				☐	☐	☐
Air Cleaner Outer Element(3)	- Change				☐	☐	☐
Air Cleaner Inner Element	- Change						☐
Fuel Sedimenter	- Drain and clean		☐	☐	☐	☐	☐
Fuel Filter	- Drain		☐	☐	☐	☐	☐
Fuel Filter (A Series engines)	- Change			☐	☐	☐	☐
Fuel Filter (R Series engines)	- Change				☐	☐	☐
Fan Belt Tension/Condition	- Check		☐	☐	☐	☐	☐
Engine Mount Security (A Series engines)	- Check			☐	☐	☐	☐
Engine Mount Security (R Series engines)	- Check				☐	☐	☐
Fuel System for Leaks and Contamination	- Check	☐	☐	☐	☐	☐	☐
Radiator	- Clean				☐	☐	☐
Valve Clearances(4)	- Check and Adjust					☐	☐
TRANSMISSION, AXLES AND STEERING							
Transmission Mount Security	- Check			☐			
Transmission Oil Level	- Check	☐	☐	☐	☐		
Transmission Oil(5)	- Change					☐	☐
Transmission Filter	- Change			☐	☐	☐	☐
Axle Mount Security	- Check			☐			
Axle Oil Level	- Check		☐	☐			
Axle Oil	- Change				☐	☐	☐
Hub Oil Level	- Check		☐				
Hub Oil(6)	- Change			☐	☐	☐	☐

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Cleaning The Machine

Undershield Removal and Replacement

When cleaning around the engine and radiator, debris will be released more easily if the undershields are removed.

⚠ WARNING

You will be working close into the machine for these jobs. Lower the attachments if possible. Remove the starter key and disconnect the battery. This will prevent the engine being started. Make sure the park brake is engaged.

Block all four wheels before getting under the machine.

2-3-2-1

1 Working under the engine compartment, support each of the three undershields **1-A** in turn and remove the bolts **1-B**. Lower the undershields to the ground.

2 Remove all straw, grass, wood shavings and any other debris from the engine, exhaust and radiator area. ⇒ *General Machine Cleaning (3-14)*.

3 Refit the undershields, ensuring that lips **1-C** on the two smaller undershields are located above the frame before fitting bolts **1-B**.

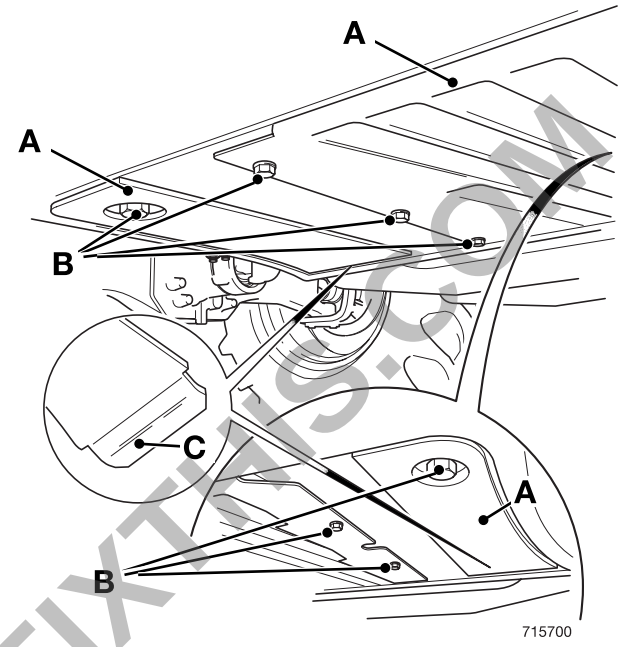


Fig 1.

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Checking the Mainframe Harness

Note: *The following checks should be carried out with the park brake in the in the OFF position.*

1 Chock the road wheels.

2 Remove Fuse 12 to prevent the engine starting.

3 Release the parkbrake.

4 Clean the area around the mainframe harness connection to the ECU and remove the connector.

5 Check the condition of the connector and socket. Check the condition of the rubber seal in the mainframe harness connector.

6 Switch ON the ignition, select a gear and, with the help of an assistant, hold the transmission dump button in the ON position.

Check for battery voltage on the pins of the harness connector using pin **16** as an earth. Identify the correct pins for each gear selection. ⇨ ***Mainframe Harness Connector Plug Voltage Readings (F-89)***.

7 If the lamp illuminates where indicated (Y), the integrity of the harness, switches and power supply to the ECU is proven.

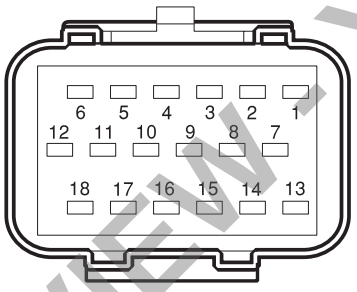


Fig 51. Mainframe Harness Connector Plug

Note: *Depending on machine specification, there may be no electrical connections to pins **6**, **8**, **11** and **14**.*

Note: *The ECU is powered by pins **17** and **18** (+V) and earthed by pins **15** and **16**.*

Table 23. Forward Gears

PIN	F1	F2	F3	F4
1	Y	Y	Y	Y
2	-	-	Y	Y
3	-	-	-	Y
4	Y	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	Y	Y	Y	Y
10	-	Y	-	-
11	-	-	-	-
12	Y	Y	Y	Y
13	Y	Y	Y	Y
14	-	-	-	-
15	-	-	-	-
16	-	-	-	-
17	Y	Y	Y	Y
18	Y	Y	Y	Y

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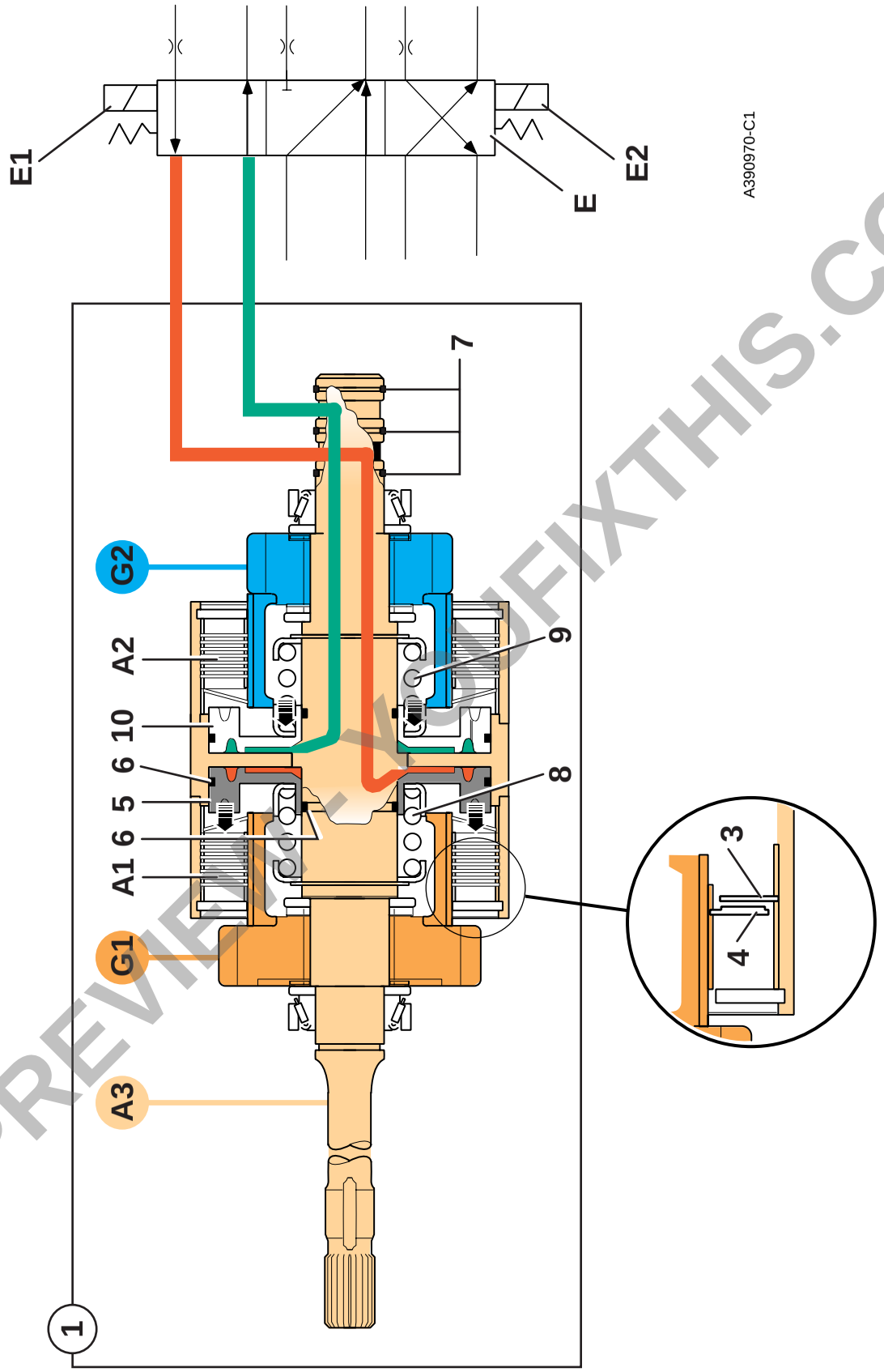


Fig 28. Forward and Reverser Clutch Operation

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⚠ WARNING

To avoid burning, wear protective gloves when handling hot components. To protect your eyes, wear goggles when using a wire brush to clean components.

HYD-1-3

⚠ WARNING

Arc Welding

To prevent the possibility of damage to electronic components, disconnect the battery and the alternator before arc-welding on the machine or attached implements.

If the machine is equipped with sensitive electrical equipment, i.e. amplifier drivers, electronic control units (E.C.U.s), monitor displays, etc., then disconnect them before welding. Failure to disconnect the sensitive electrical equipment could result in irreparable damage to these components.

Parts of the machine are made from cast iron; welds on cast iron can weaken the structure and break. Do not weld cast iron. Do not connect the welder cable or apply any weld to any part of the engine.

Always connect the welder earth (ground) cable to the same component that is being welded, i.e. boom or dipper, to avoid damage to pivot pins, bearings and bushes. Attach the welder earth (ground) cable no more than 0.6 metres (2 feet) from the part being welded.

INT-3-1-15_2

⚠ WARNING

Counterweights

Your machine may be fitted with counterweights. They are extremely heavy. Do not attempt to remove them.

INT-3-2-5

⚠ WARNING

Turning the Engine

Do not try to turn the engine by pulling the fan or fan belt. This could cause injury or premature component failure.

0094

⚠ WARNING

Accumulators

The accumulators contain hydraulic fluid and gas at high pressure. Prior to any work being carried out on systems incorporating accumulators, the system pressure must be exhausted by a JCB distributor, as the sudden release of the hydraulic fluid or gas may cause injury.

INT-3-1-17

⚠ WARNING

An exploding tyre can kill. Inflated tyres can explode if over-heated or over-inflated. Follow the instructions given when inflating the tyres. Do not cut or weld the rims. Use a tyre/wheel specialist for all repair work.

2-3-2-7_2

⚠ WARNING

Jacking

A machine can roll off jacks and crush you unless the wheels have been blocked. Always block the wheels at the opposite end of the machine that is to be jacked. Do not work underneath a machine supported only by jacks. Always support a jacked-up machine on axle stands before working underneath it.

INT-3-2-8

⚠ WARNING

Under no circumstances must the engine be run with the transmission in gear and only one driving wheel jacked clear of the ground, since the wheel on the ground will move the machine.

INT-3-1-16

⚠ WARNING

Wheels and tyres are heavy. Take care when lifting or moving them.

Store with care to ensure that they cannot fall and cause injury.

13-3-1-7_1

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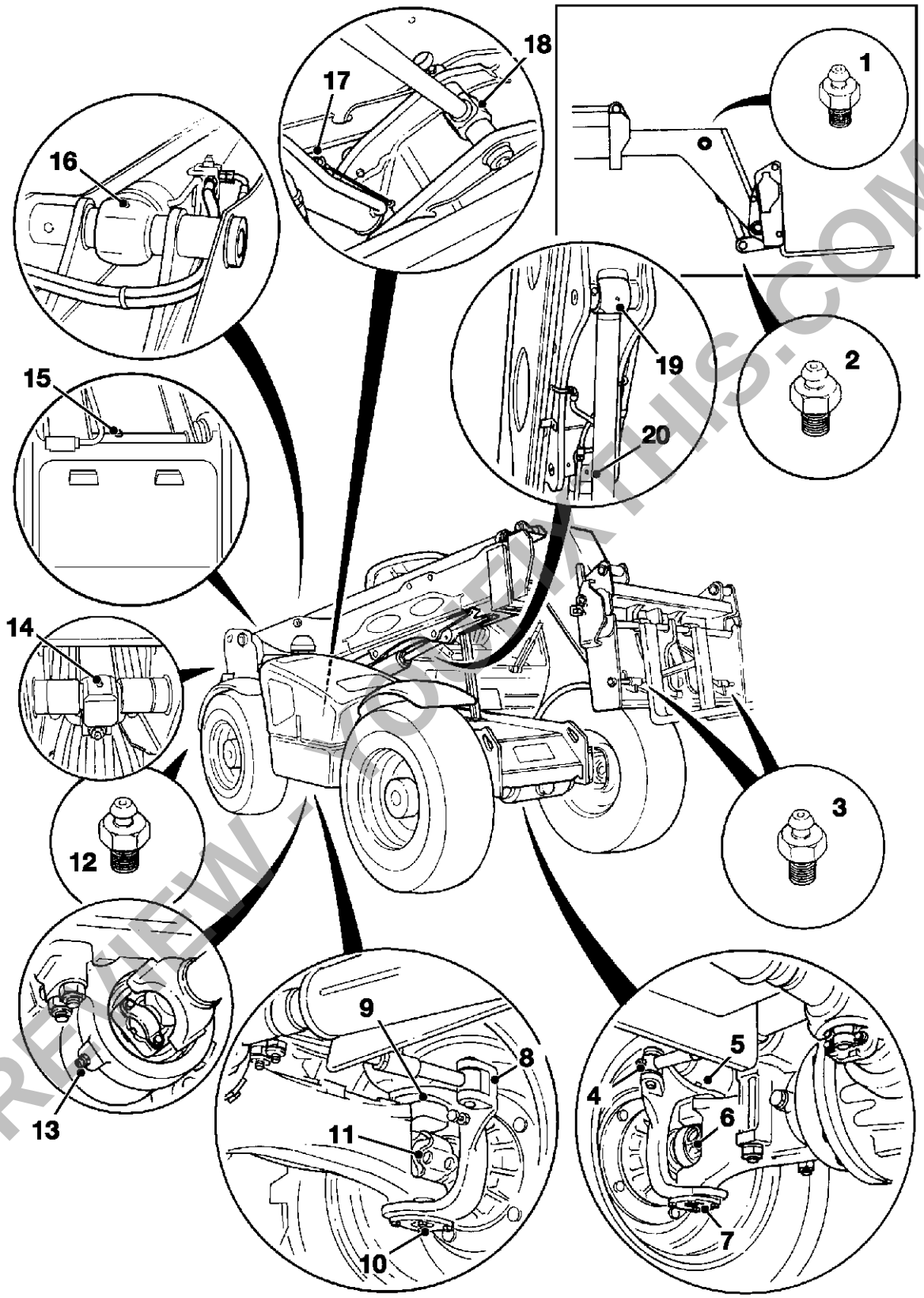


Fig 7. 533-105, 535-95

Note: *533-105:* ***⇒ Fig 8. (🗋 3-23)****.*

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Charging

This procedure is industry recommended practice for refilling air conditioning systems with refrigerant.

Evacuate the system beforehand to 740mm (29 in) of mercury.

1 Close all valves and connect the manifold as shown. Connect the blue hose **23-A** to system low pressure and the red hose **23-B** to system high pressure. Connect the yellow hose **23-C** to the refrigerant cylinder **23-D**.

2 Invert single valve cylinder on the scales **23-E** and zero the scale reading

Note: *Some refrigerant cylinders have separate valves for gas and liquid. Be sure to connect to the liquid port when following the above procedure.*

Note: *Refrigerant can be used either in gas or liquid form. If recharging with gas follow the manufacturers instructions and recharge only via the low pressure port. Do not use liquid refrigerant at the low pressure port.*

3 Slowly open the high pressure valve and allow the vacuum to draw-in refrigerant to the specified weight for the system. Refer to ***Technical Data***.

Add refrigerant until the scales **23-E** indicate the specified weight for the system or the weight obtained when the system refrigerant was previously recovered.

Note: *To speed up the process a thermostatically controlled thermal blanket **23-F** can be used around the replenishing cylinder.*

4 Close all valves and remove the equipment.

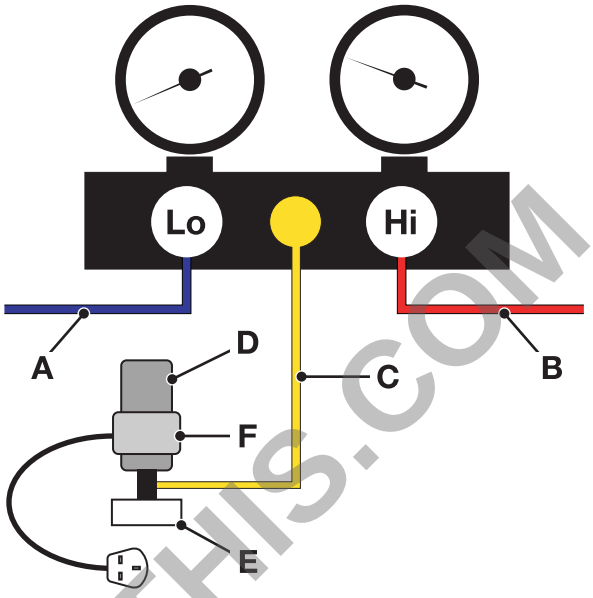


Fig 23. Charging

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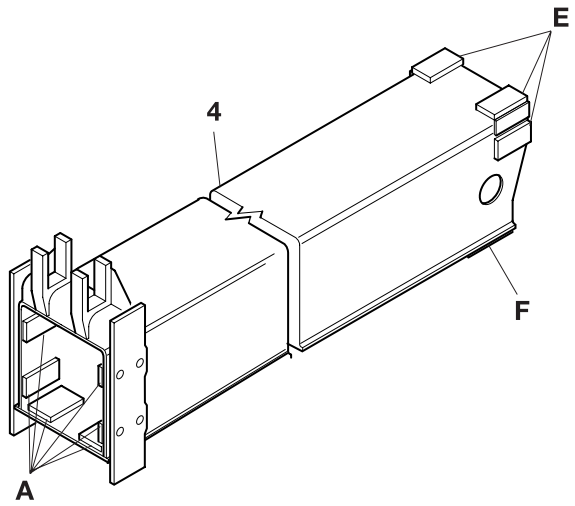


Fig 109. Outer Boom Assembly

10 Main Boom - Final Assembly

a Insert the second intermediate boom /inner boom assembly into the first intermediate boom/outer boom assembly.

b Shim the remaining wear pads. ⇒ ***Boom Shimming (B-108)***.

c Place hoses and tracking on to the pipe assembly. Connect the hoses to the steels on the pipe assembly. Torque to 33Nm (25 lbf ft).

d Pull the loose hose ends of the inner boom hose assembly 10 out of the back of the inner boom 2 (where they were stowed for safety at step l of Inner Boom Assembly) and position them up and over the top of the outer boom 5.

e Carefully insert the main pipe assembly **90-7** and support arm **90-6** sub assembly (see step 4) into the inner boom, making sure that the slots on the insides of the support arm wear blocks **110-25** engage with the slide plate **110-D** on the bottom of the inner ram **110-1**. Continue to push the assembly in, until it is approximately half way in to the inner boom **110-1**. Make sure the pipe and support arm sub-assembly is adequately supported.

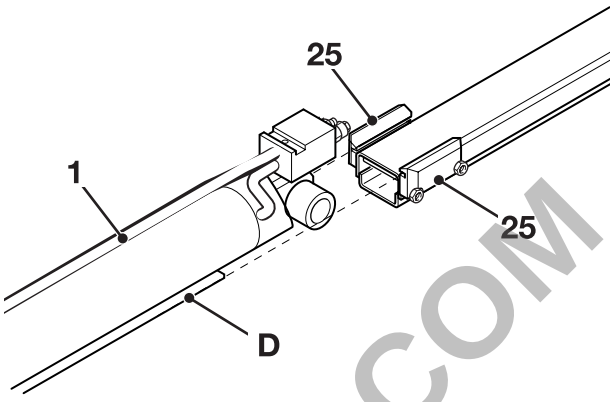


Fig 110.

f Connect the six connectors of the main hose assembly **111-11**, working from the inside outwards, to their related connectors at the rear of pipes **111-15** on the main pipe assembly **111-7**. Make sure the hoses do not twist during this step.

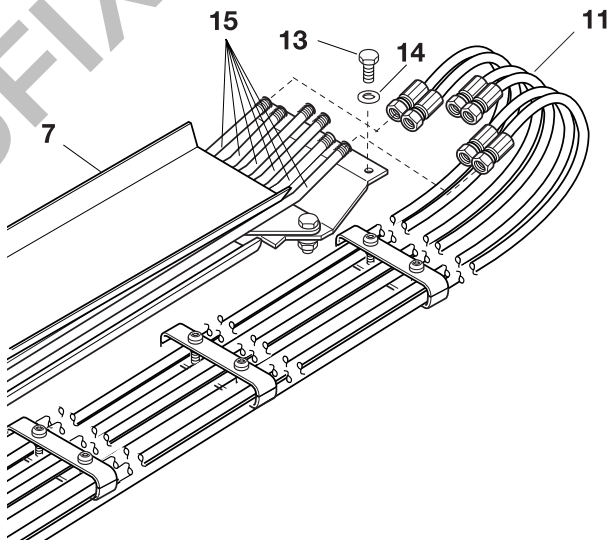


Fig 111.

g Connect the six hoses of the inner boom hose assembly **112**-10 to the two hose connection points on the inner ram and the four hose connection points on the inner boom pipe assembly **112-8**, working from the inner connection points outwards. Torque tighten the six connections to 33 Nm (24.3 lbf ft).

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76 Forward relay
77 Forward Hi/Lo relay
78 Forward Hi solenoid
79 Forward Lo solenoid
80 Drive interlock relay
81 Drive shaft relay
82 Layshaft solenoid
83 Mainshaft solenoid
84 Transmission dump relay
85 2nd auxiliary relay
86 2nd auxiliary solenoid
87 Hitch/boom hydraulics solenoid
88 Hitch switch
89 Joystick isolation switch/lamp
90 Extend switch
91 Extend solenoid
92 Retract switch
93 Retract solenoid
94 Auxiliary A/B switch
95 Auxiliary A solenoid
96 Auxiliary B solenoid
97 Transmission dump push button
98 Steer mode control unit
- A Four wheel/crab steer relay
- B Two wheel steer relay
- C Crab steer relay
- D Four wheel steer relay

99 Steer mode selector switch
- X Two wheel steer
- Y Crab steer
- Z Four wheel steer

100 2WS solenoid
101 4WS solenoid
102 AWS solenoid
103 Crab steer solenoid
104 Proximity switch - front axle
105 Proximity switch - rear axle
131 Fan reverse switch(2)
132 Fan reverse solenoid(2)
133 Fan reverse horn(2)

(1) Diode indicated () not fitted to 3-speed machines.
(2) Optional fan reversing circuit.

Fig 35. Optional fan reversing circuit

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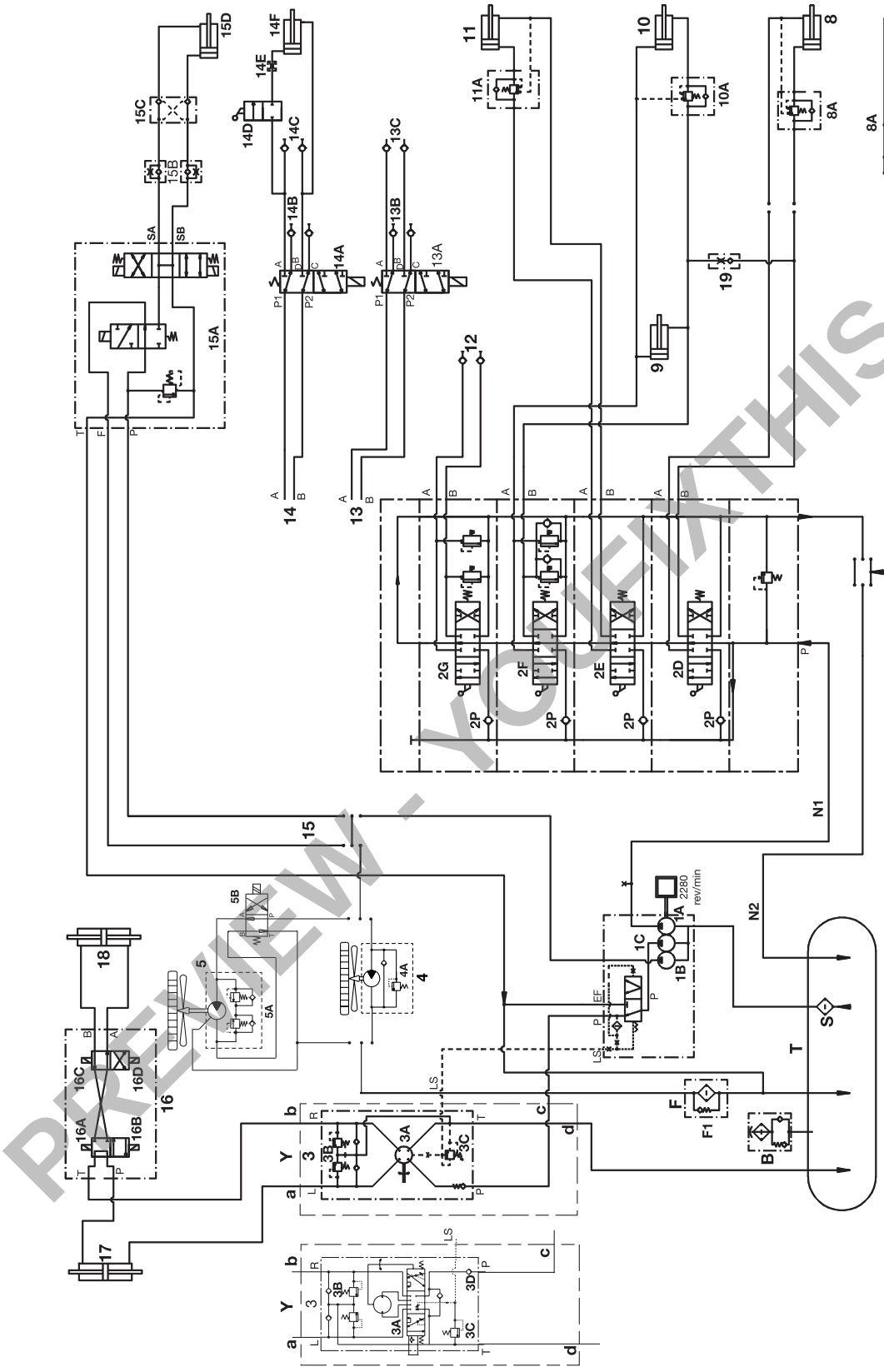


Fig 18. 540-70 Construction Machines with Manual Auxiliary Controls (From SN 775402)

⇒ *Component Key (E-70)*

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Pressure Compensator Valves Operation

No Service Selected (All Spools in Neutral)

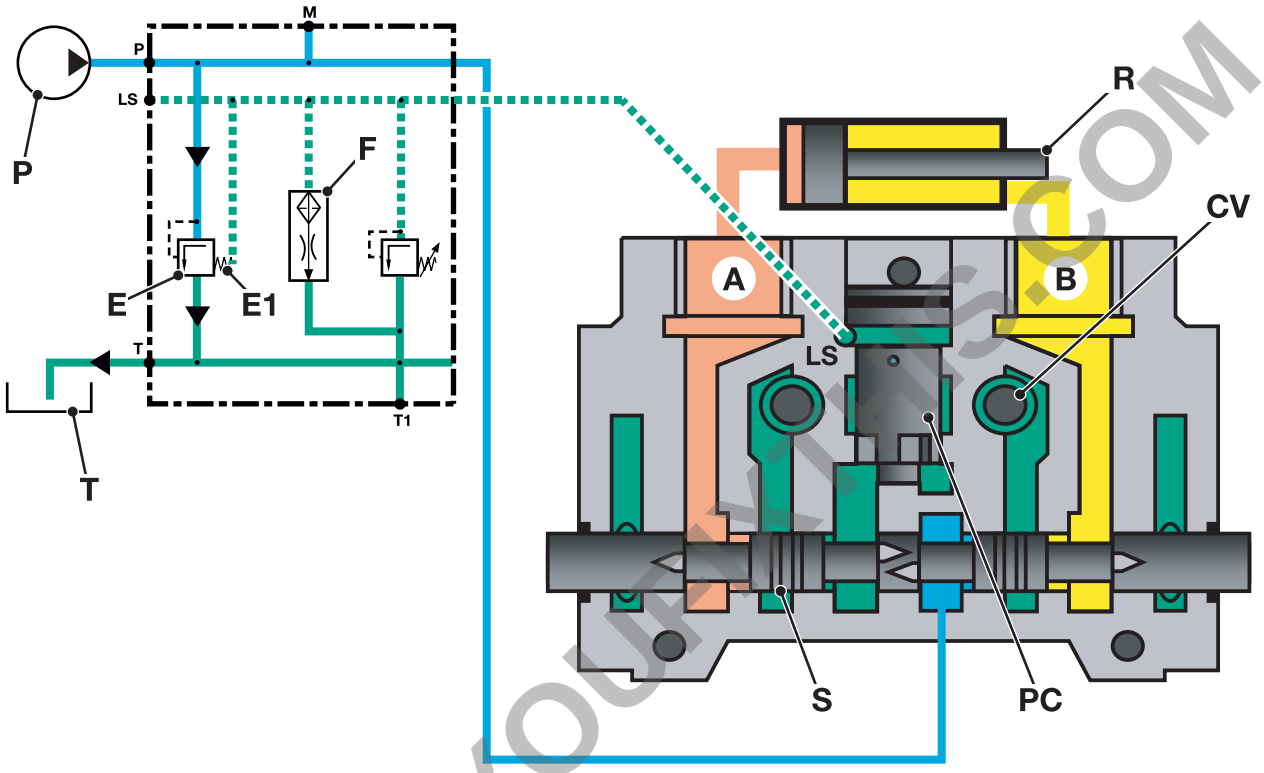


Fig 75. No Service Selected (All Spools in Neutral)

With the spools in the neutral position oil from the pump **P** flows to each service spool **S** and is dead ended. This generates sufficient pressure (about 15bar) to overcome the spring **E1** and oil flows across the flushing valve spool assembly **E** to tank **T**. Any load acting on the service ram **R** is held by the service spool **S**.

Oil in the load sense gallery **LS** is vented to tank across the flow regulator valve **F**, at approximately 0.7 l/min. This allows the load sense pressure to decay when no service is selected. If the flow regulator valve is blocked, a reduced flow rate will be evident.

The pressure compensator valve **PC** and load hold check valves **CV** are closed.

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Inspection

1 Examine the primary components for scoring, damage, wear, distortion, uneven surface (i.e. polished or pitted areas) and scratches. Replace all damaged parts.

2 Examine the components for burrs. Give special attention to the traversing diameters, locking pin holes and mounting chamfers. If minor burrs are seen, remove them by polishing with a fine grade abrasive paper.

3 ⇨ *Fig 163. (E-238)*. Examine pivot bushes **22** for signs of wear or damage. Renew if necessary.

Note: *If a cylinder is damaged it must be renewed. New piston seals will fail after only a short period of time if the cylinder is worn or damaged.*

Assembly

Reseal the Pistons and Seal Housings

Make sure all seals and rings are renewed.

Before installation, apply a small quantity of hydraulic oil to all seals and "O" rings.

Reseal the Inner Cylinder Piston

1 ⇨ *Fig 166. (E-241)*. Insert wear ring item **17D** into the piston inner bore.

2 Insert the "O" ring **17B** then inner retainer **17C**.

3 Insert wear ring **17A**.

4 Fit outer seals **17E, 17F** and **17G** to the outside of the piston **17**.

5 Fit wear ring item **17H**.

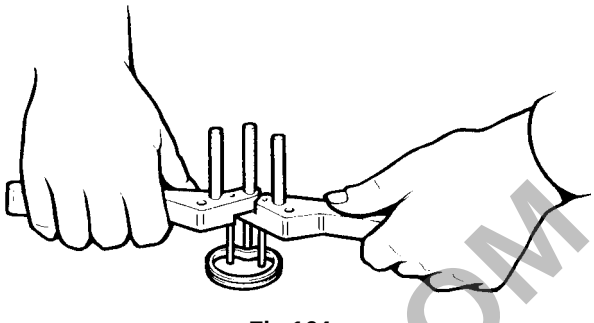


Fig 164.



Fig 165.

Reseal the Centre Cylinder Seal Housing

1 ⇨ *Fig 166. (E-241)*. Insert "O" ring **7A** into seal housing **7**.

2 Insert wear rings **7B** and **7C** into seal housing **7**.

3 Insert seal **7D** into seal housing **7** using seal fitting tool as shown ⇨ *Fig 164. (E-239)*, ⇨ *Fig 165. (E-239)*. (see ⇨ *JCB Ram Sealing Procedure (E-243)*. for the correct procedure using seal fitting tool).

4 Using a press push wiper seal **7E** squarely into the seal housing **7** with the rubber facing outwards from the housing.

Reseal the Inner Cylinder Seal Housing

1 ⇨ *Fig 166. (E-241)*. Insert wear rings **5A** and **5B** into the piston side **1** of the seal housing **5**.

2 Fit "O" ring and retaining ring **5C** into seal housing.

3 Fit wear rings **5D** and **5E** into the rod side **2** of the seal housing **5**.

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perform the test again, watching the pressure gauge carefully.

4 If the converter relief valve opens at a pressure higher than specified then the valve is faulty. A low opening pressure indicates a leaking pump to casing seal or a faulty converter relief valve.

5 Stop engine, remove test gauges and load valve. Refit hoses to original position.

Bypassing the Converter Relief Valve

⇒ *Fig 37. (F-52)*.

During some powershift pressure and oil flow tests it is advisable to temporarily bypass the converter relief valve. If the relief valve opens during the following tests it will cause false results.

Converter Out Pressure/Oil Cooler Flow Rate

Converter in Pressure

Lubrication Pressure

Torque Converter Stall Test

Important: *Before bypassing the torque converter relief valve make sure that the mainline pressure is as shown in* ***Technical Data****, see `****Mainline Pressure****'. Make sure that the transmission oil filter is fitted.*

To temporarily bypass the relief valve (prevent the valve from opening) proceed as follows:

1 Stop the engine and undo the relief valve (shown at **Z**).

2 Carefully remove the spring **N**.

3 Obtain a suitable plug, drill and tap the centre and fit a locking bolt **R** as shown at **Y**.

4 Fit the plug assembly to the relief valve housing and hold the ball **S** on its seat by screwing in bolt **R** as shown at **Y**. Torque tighten the bolt to approximately 30 Nm (22 lbf ft).

Important: *The torque converter can be damaged when the converter relief valve is bypassed. To avoid damage proceed as follows:*

Before starting the engine make sure that the transmission oil temperature is above 50 °C. Do not run the engine at more than 2000 rev/min for more than 1 minute.

When testing is complete be sure to remove the plug assembly and refit the spring and cover/plug as shown at **Z**.

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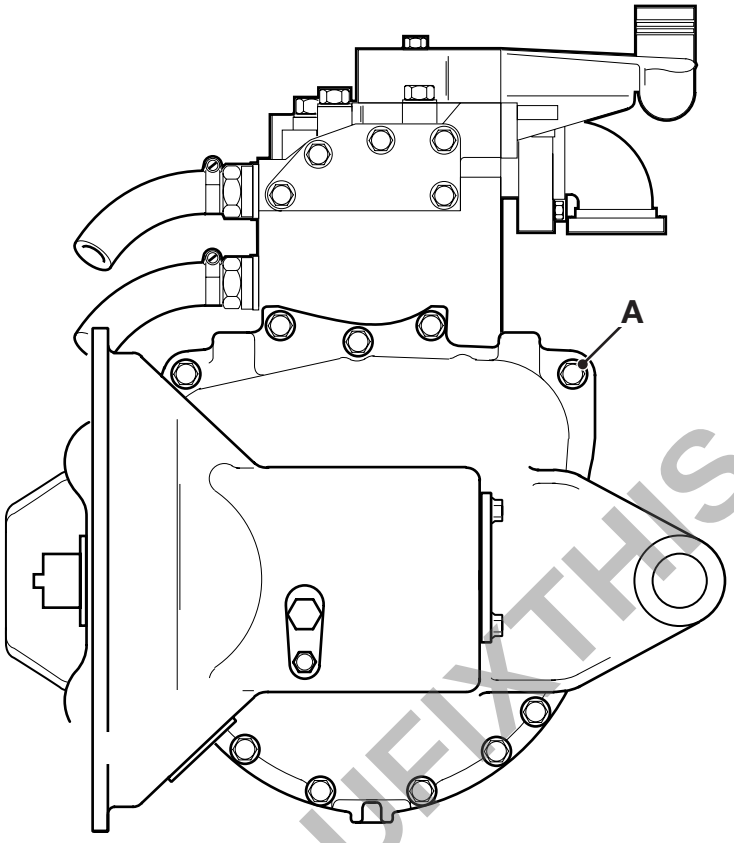


Fig 81. Bevel Gearbox

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return to tank. Should the ram tend to cavitate, this pressure is lost and valve **3A** closes, dead ending the return flow and preventing cavitation occurring. ⇨ *Fig 49. (H-33)*

– Other machines - direct to tank, as shown on the main illustration.

When the ram(s) reach full stroke, the pump flow is dead ended, a higher pressure signal is felt at relief valve **2B** which opens to route excess oil back to tank.

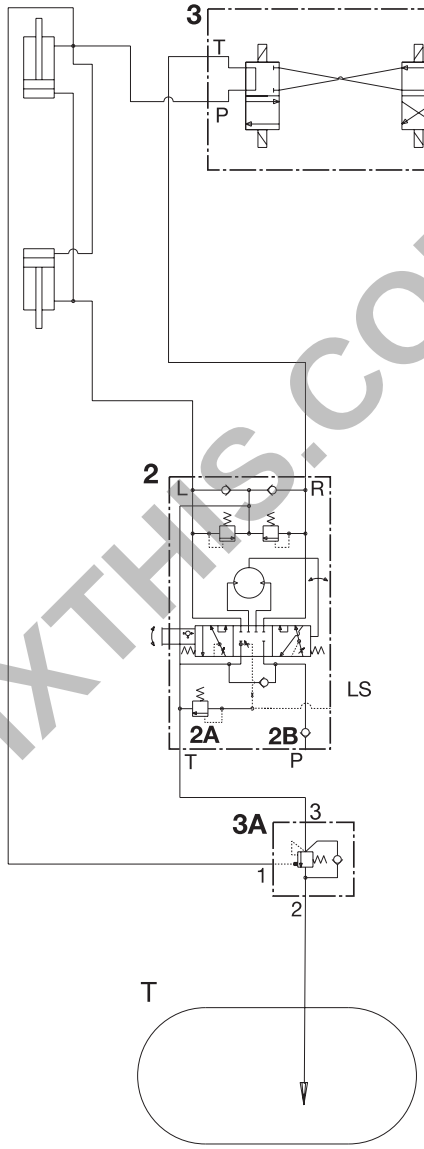


Fig 49. Remote Mounted Anti-cavitation Valve (540-170, 550-170, 5508 Only)

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