Service Manual

Teletruk

From M/c No. 788001

PUBLISHED BY THE
TECHNICAL PUBLICATIONS DEPARTMENT
OF JCB AFTERMARKET TRAINING; ©
WOODSEAT, ROCESTER, STAFFORDSHIRE,
ST14 5BW, ENGLAND
Tel. ROCESTER (01889) 594700
PRINTED IN ENGLAND

Publication No. 9803/3400 Issue 16

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* Introduction - Zinc Plated Fasteners and Dacromet Fasteners

JCB Teletruks are assembled using an improved type of corrosion resistant finish. This type of finish is called Dacromet and replaces the original Zinc and Yellow plating used on earlier machines.

The two types of fasteners can be readily identified by colour and part number suffix as follows:

Fastener Type	**Colour**	**Part Number**
Zinc and Yellow	Golden finish	'Z' (e.g. 1315/3712Z)
Dacromet	Mottled silver finish	'D' (e.g. 1315/3712D)

Note: As the Dacromet fasteners have a lower torque setting than the Zinc and Yellow fasteners, the torque figures used must be relevant to the type of fasteners.

Note: A Dacromet bolt should not be used in conjunction with a Zinc and Yellow plated nut, as this could change the torque characteristics of the torque settings further. For the same reason, a Dacromet nut should not be used in conjunction with a Zinc and Yellow plated bolt.

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.

Metric Grade 8.8 Bolts

Bolt size		**Zinc Plated Fasteners**			**Dacromet Fasteners**		
Diameter	**Hexagon (A/F)**	**Torque Settings**			**Torque Settings**		
mm	mm	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
M6 x 1.0	10	12	1.2	9	9	0.9	7
M8 x 1.25	13	28	3.0	21	22.5	2.3	17
M10 x 1.5	17	56	5.7	42	47.5	4.8	35
M12 x 1.75	19	98	10	72	80	8.2	59
M14 x 2	22				133	13.6	98
M16 x 2	24	244	25	180	200	20.4	148
M18 x 2.5	27	350	36	258	278	28.4	205
M20 x 2.5	30	476	48	352	392	40	289
M24 x 3	36	822	84	607	675	69	498
M30 x 3.5	46	1633	166	1205	1348	138	994

UNF Grade 'S' Bolts

Bolt Size		Hexagon (A/F)	Torque Settings		
in	(mm)	in	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

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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Fluids, Capacities and Lubricants

ITEM	CAPACITY	FLUID/LUBRICANT	SPECIFICATION
Engine Oil NAT ASP			
* Up to SN892816	8.2 litres	**JCB 10W/30 Multigrade**	SAE10W/30 API CF4/SG
From SN892817	10 litres	**JCB Extreme Performance Engine Oil 15W/40**	CH4/SJ (ACES E5-B3-A3)
Turbo	10 litres	**JCB Extreme Performance Engine Oil 15W/40**	CH4/SJ (ACES E5-B3-A3)
LPG	8.2 litres	**JCB 10W/30 Multigrade**	SAE10W/30 API CF4/SG
Hydraulic System	55 litres	**JCB 15W/40 Multigrade** **JCB 10W/30 Multigrade**	API CF4/SG 15W/40 API CF4/SG 10W/30
Cooling System	5.5 litres Antifreeze 11 litres total coolant mixture	**JCB Universal Antifreeze/water** (see ***Coolant Mixtures***)	ASTM D3306-74
Fuel System	90 litres	Diesel oil *(see **Types of Fuel**)* Liquid Petroleum Gas (LPG) *(see **LPG Fuel System**)*	ASTM D975-66T Nos. 1D, 2D
Grease Points	-	**JCB Special HP or MPL Grease**	Lithium based, No. 2 consistency
Boom Runways	-	Waxoyl	-

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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 schedules are done to keep the machine in a safe and efficient working condition.

The schedules are based on machine running hours. Keep a regular check on the hourmeter readings. Do not use a machine which is due for a service. Make sure any defects found during the regular maintenance checks are rectified immediately.

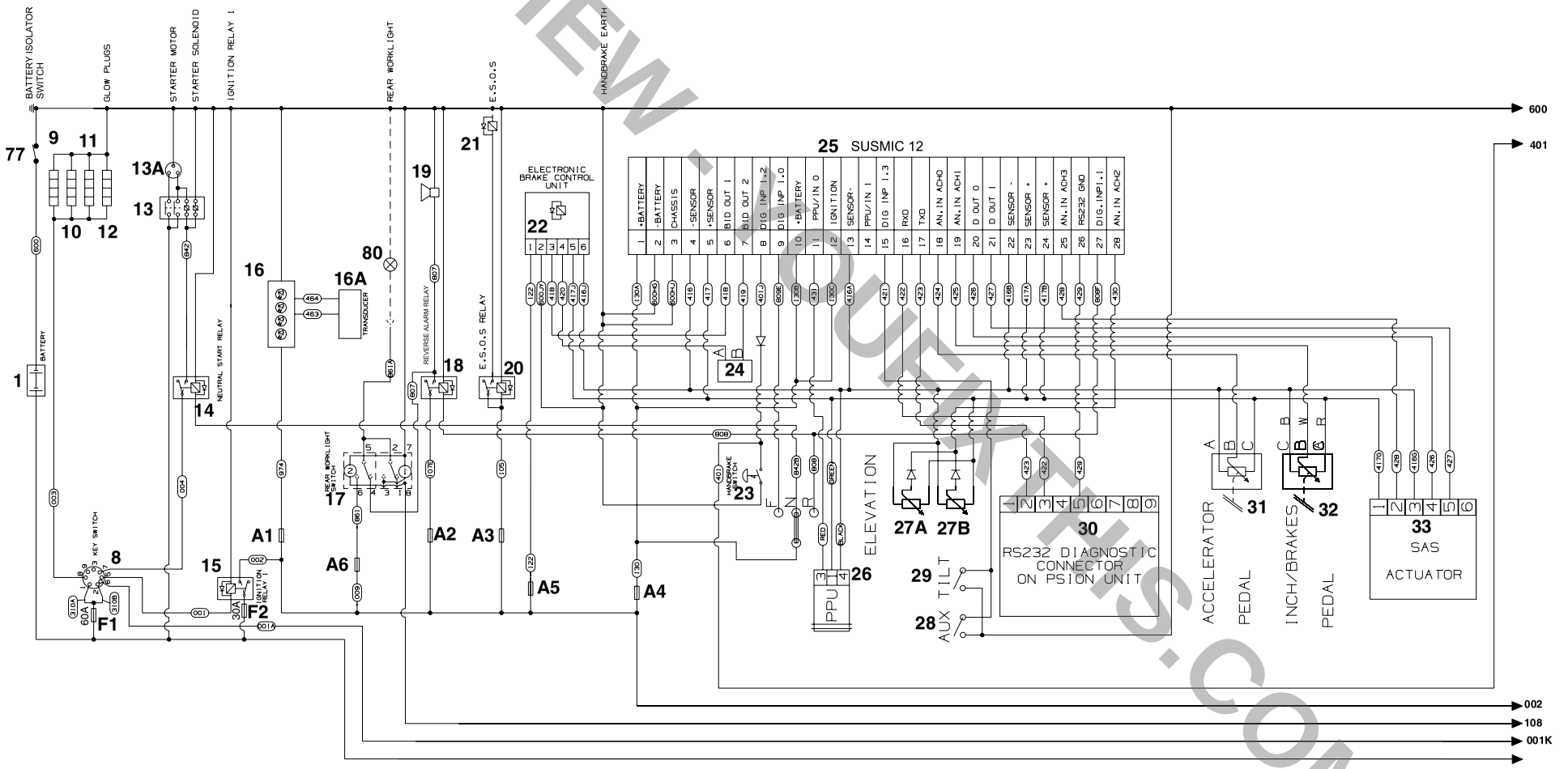
● = Initial 250 Hour Check Only ■ = Regular Maintenance Check

Pre-start Cold Checks Service Points and Fluid Levels	Operation	250 Hr	500 Hr	1000 Hr	2000 Hr
ENGINE (LPG and Diesel)					
Oil and Filter (see note)	- Change	●	■	■	■
Air Cleaner Dust Valve	- Clean		■	■	■
Air Cleaner Outer Element	- Change		■	■	■
Air Cleaner Inner Element	- Change				■
Fuel Filter (Diesel only)	- Change	●	■	■	■
Coolant Level	- Check	●	■	■	■
Antifreeze Strength	- Check	●	■	■	■
Air Cleaner Hose	- Security	●	■	■	■
Fuel Sedimenter (Diesel only)	- Drain	●	■	■	■
Fan Belt Tension/Condition	- Check	●	■	■	■
Valve Clearances (Diesel only)	- Check and Adjust			■	■
Engine Mount Security	- Check	●			■
Radiator Matrix	- Clean	●	■	■	■
Radiator Hose	- Condition	●	■	■	■
Spark Plugs (LPG only)	- Clean/Replace		■	■	■
Clean turbo charger impeller casing and turbo charger compressor casing			■	■	■
Fit new engine breather (HR build only)				■	■
Note: If operating under arduous conditions change the engine oil filter every 250 hours					
TRANSMISSION AND AXLES					
Wheel Nuts Security	- Check	●	■	■	■
Tyre Pressures and Condition	- Check	●	■	■	■
Rear Wheel Hub Bearings and Pins	- Check		■		■
Steer Linkage for Wear	- Check		■	■	■
Steer Spindle (4 Wheel Drive Option Only)	- Check			■	■
HYDRAULICS					
Suction Strainer Oil Sample/Change	- Clean				■
Oil Level	- Check	●	■	■	■
Oil Filter	- Change	●	■	■	■
Ram Piston Rods for Damage or Leakage	- Check	●	■	■	■
Hoses & Pipework - Damage or Leaks	- Check	●	■	■	■
Motor Mounting Bolts Security	- Check	●	■		■
Hydraulic Oil	- Change				■
ELECTRICS					
Wiring for Chafing	- Check	●	■	■	■
Battery Terminals for Condition and Tightness	- Check	●	■	■	■
BODY AND FRAMEWORK					
All Pivot Pins	- Check and Grease	●	■	■	■
All Hinges	- Grease	●	■	■	■
* Wear Pad Runways	- Waxoyl	●	■	■	■
Seat/Seat Belt Security and Condition	- Check	●	■	■	■
Bodywork for Damage	- Check	●	■	■	■
* Windscreen Washer Fluid Level	- Fill	●	■	■	■
Check boom rear wear pad mounting bolts for tightness (56Nm, 41lbf ft)		●	■	■	■

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Main Components Up To Serial No. 788643
(Diesel Engine, Single Pedal)



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Remove the Counterweight

⚠ WARNING

Lifting equipment must be of an approved type, of sufficient weight lifting capacity, and it must have a current inspection certificate. Failure of lifting equipment can result in severe injury.

* 12-4-1-8

1 Park the Teletruk on firm level ground.

2 Lower the boom and apply the park brake.

3 Turn the engine off and remove the ignition key.

4 If fitted, remove the LPG Tank (Refer to Engine Section K for details).

5 Tilt the Cab forwards (Refer to Access Procedures for Maintenance, this Section for details).

6 Install and secure two suitable eyebolts **A** using the two holes provided. Inspect eyebolts and fasteners for damage before use.

7 Using appropriate lifting equipment, support the counterweight.

8 Remove bolts **B** and washers **C** from the bottom of the counterweight.

9 Remove bolts **D** and washers **E** from the top of the counterweight.

10 Lift the counterweight clear, and store in a safe place.

11 Remove the lifting equipment and the two eye bolts **A** from the counterweight.

Replace the Counterweight

1 Install two lifting eyebolts **A** to the counterweight.

2 Using appropriate lifting equipment, lift the counterweight into position.

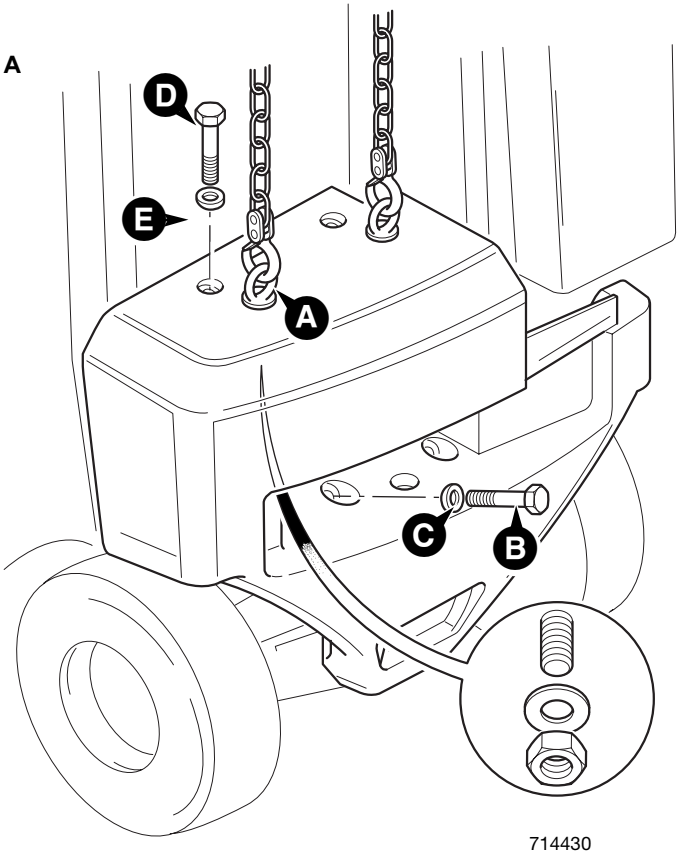
3 Install two washers **C** and bolts **B** and tighten.

4 Install two washers **D** and bolts **E** and tighten.

5 Remove lifting equipment from eyebolts **A**. Remove the eyebolts **A** from the counterweight.

6 Replace the LPG Tank (Refer to Engine Section K for details).

Note: The Load Moment Indicator must be recalibrated. (Refer to Section C).



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Remove the Carriage

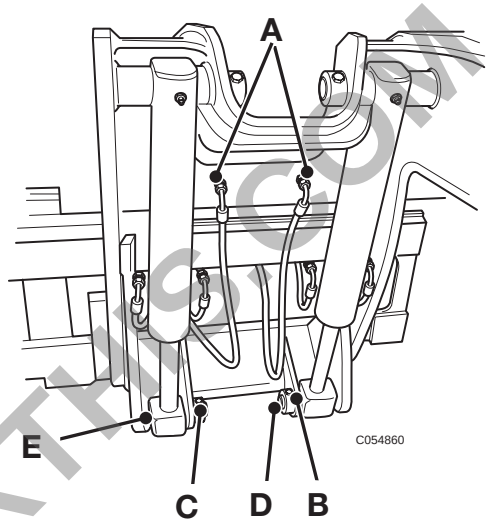
⚠ WARNING

Make the machine safe before getting beneath it. Park the machine on level ground. Make sure the engine is stopped, the parking brake is engaged and the transmission is in neutral. Disconnect the battery. Chock all four wheels.
5-3-2-1

⚠ WARNING

Lifting Equipment

You can be injured if you use faulty lifting equipment. Make sure that lifting equipment is in good condition. Make sure that lifting tackle complies with all local regulations and is suitable for the job. Make sure that lifting equipment is strong enough for the job.
INT-1-3-7



1 Extend boom and lower to its lowest position.

2 Make the machine safe by stopping the engine, removing the key, and chocking the wheels.

3 Ensure that all hydraulic pressure is released from the system by operating the tilt control lever.

4 Disconnect and plug hydraulic hoses **A** labelling each to ensure correct position on replacement.

5 Remove securing bolts **B** and **C** from pins **D** and **E**.

⚠ WARNING

Hydraulic Pressure

It is not possible to vent all residual pressure. Loosen the connection one full turn and allow the pressure to dissipate. Keep face and hands well clear of pressurised hydraulic oil and wear protective glasses.
HYD 4-3 .

Note: Assistance may be required.

6 Remove carriage.

Replace the Carriage

Replacement is a reversal of the removal procedure.

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Introduction

This section of the Manual is intended to REMIND the operator of basic safety requirements when operating industrial machinery. It is not a complete list of hazards that may exist when operating or maintaining the Teletruk.

SPECIFIC HAZARDS RELATING TO MAINTENANCE INSTRUCTIONS ARE DETAILED IN THE RELEVANT SECTIONS OF THIS MANUAL.

Safety First - Yours And Other People's

All industrial equipment can be hazardous. When a machine is properly maintained, it is a safe machine to work with. But when it is poorly maintained it can become a danger to you (the operator) and others.

In this Manual and on the machine you will find warning messages. Read and understand them. They tell you of potential hazards and how to avoid them. If you do not fully understand the warning messages, ask your supervisor or JCB Distributor to explain them.

But safety is not just a matter of responding to the warnings. All the time you are working on or with the machine you must be thinking what hazards there might be and how to avoid them.

Do not work with the machine until you are sure you can control it. Do not start any job until you are sure that you and those around you will be safe. If you are unsure of anything, about the machine or the job, ask someone who knows. Do not assume anything.

Remember
BE CAREFUL
BE ALERT
BE SAFE

INT-1-3-1/1

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Main Components Up To Serial No. 788643 (Diesel Engine, Single Pedal)

1 Battery
2 Auxiliary Valve Switch
3 Auxiliary Valve Relay
4 Auxiliary Valve
5 Auxiliary Valve Switch
6 Auxiliary Valve Relay
7 Auxiliary Valve Solenoid
8 Key Switch
9 Glow Plugs
10 Glow Plugs
11 Glow Plugs
12 Glow Plugs
13 Starter Solenoid
13A Starter Motor
14 Neutral Start Relay
15 Ignition Relay 1
16 Moment Load Indicator
16A Moment Load Indicator - Transducer
17 Rear Work Light Switch
18 Reverse Alarm Relay
19 Reverse Alarm Buzzer
20 Engine Shut Off Solenoid - Relay
21 Engine Shut Off Solenoid
22 Electronic Brake Control Unit
23 Park Brake Switch
24 Electric Displacement Control (Pump Swash Operation)
25 Susmic 12
26 Pulse Pick-up (Pump Speed Sensor)
27A Lift Sensor
27B Lower Sensor
28 Auxiliary Switch
29 Tilt Switch
30 Diagnostic Connector - Psion
31 Accelerator Pedal
32 Brake Pedal
33 Throttle Motor Actuator (Engine Revs)
34 Clock (IDC Internal)
35 Hourmeter (IDC Internal)
36 Water Temperature Switch
37 Transmission Oil Temperature Switch
38 Engine Oil Pressure Switch
39 Low Fuel Oil Level
40 Air Filter Vacuum Switch
42 Information Display Centre Buzzer
43 Head Light LED Mini Relay
44 Alternator
44A Alternator Resister
45 Horn Switch - Column
46 Horn Switch - Push
47 Horn
48 Front Work Light Switch
49 Beacon Switch
50 Beacon Motor
51 Hazard Switch
52 Indicator Switch
53 Directional Indicator LED Mini Relay
54 Flasher Unit
55 Brake Light Switch
56 Ignition Relay 2
58 Rear Wash/Wipe Switch
59 Rear Washer Motor
60 Rear Wiper Motor
61 Front Wash/ Wipe Switch
62 Front Wash Motor
63 Front Wiper Motor
64 Head Light Flash Switch
65 Road Lights Relay
66 Road Lights Switch
67 Dip Switch
68 Interior Light Switch
69 Radio
70 Speaker
71 Heater Blower Switch
72 Heater Blower Resistor
73 Heater Blower Motor
74 Face Fan Blower Switch
75 Face Fan Resistor
76 Face Fan Motor
77 Battery Isolator Switch

Lamps

80 Rear Work Light
81 Alternator Warning lamp
82 Hand Brake Warning lamp
83 Water Temperature Warning lamp
84 Transmission Oil Temperature Warning lamp
85 Engine Oil Pressure Warning lamp
86 Low Fuel Level Warning lamp
87 Air Filter Warning lamp
* **88** Hydraulic Oil Filter Bypass Warning lamp
89 Main Beam Warning lamp
90 Indicator Warning lamp
91 Right Hand Front Work Light
92 Left Hand Front Work Light
93 Beacon Lamp
94 Left Hand Indicator (Rear)
95 Hazard Switch Warning lamp
96 Left Hand Indicator (Front)
97 Right Hand Indicator (Front)
98 Right Hand Indicator (Rear)
99 Left Hand Brake Light
100 Right Hand Brake Light
101 Left Hand Main Beam
102 Right Hand Main Beam
103 Left Hand Dip Beam
104 Right Hand Dip Beam
105 Left Hand Tail Light
106 Left Hand Side Light
107 Right Hand Tail Light
108 Right Hand Side Light
109 **I**nterior Light

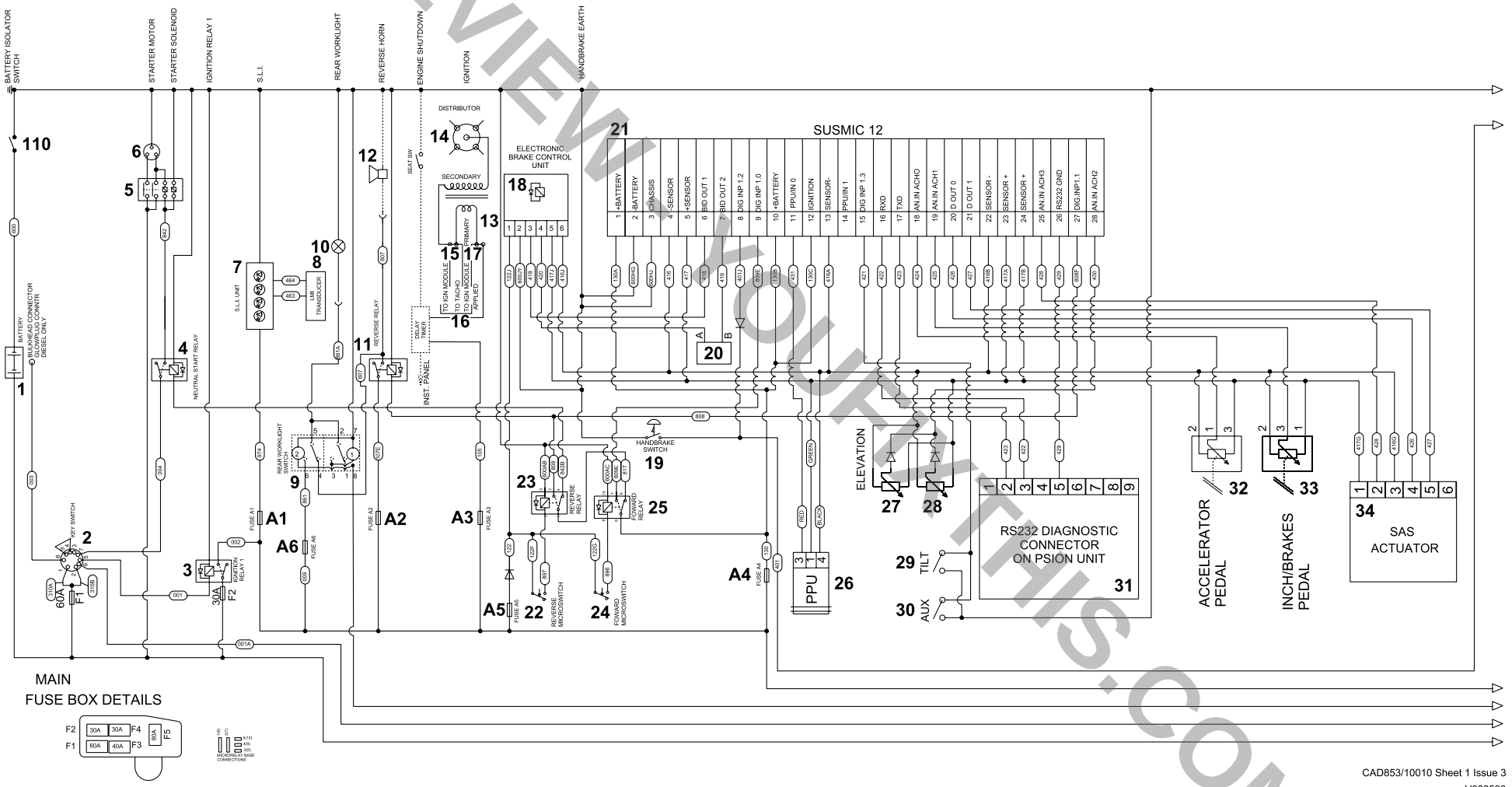
Primary Fuses

* F1 Key Switch
F2 Ignition Relay 1 Supply
* F3 Roadlights Relay Supply (optional)
F4 Starter Relay 2 Supply

Note: For bulb and fuse ratings see page C/1 - 1. (LEDs not service part)

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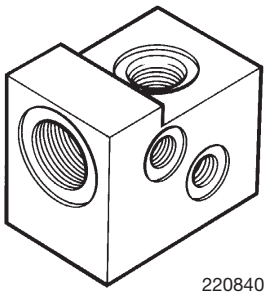
Main Components From Serial No 892344 (LPG Engine, Twin Pedal)



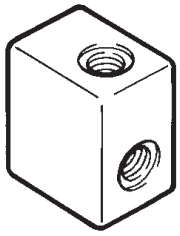
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Section E - Hydraulics

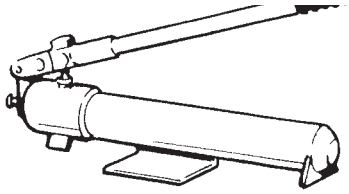


220840



S270650

892/00252 Test Block for A. R. V. - Husco valves
892/00923 Test Block for A. R. V.
- Commercial Hydraulic valves



193850

Hand Pump Equipment

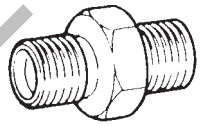
892/00223 Hand Pump
892/00137 Micro-bore Hose 1/4 in BSP x 5 metres
892/00274 Adapter 1/4 in M BSP x 3/8 in M BSP Taper
892/00262 1/4 in M BSP x 1/4 in F BSP x Test Point
892/00706 Test Probe
892/00278 Gauge 0 - 40 bar (0 - 600 lbf/in^2)
892/00279 Gauge 0 - 400 bar (0 - 6000 lbf/in^2)



188140

Bonded Washers

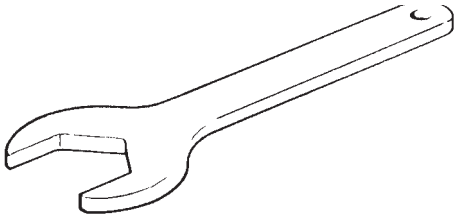
1406/0011 1/4 in BSP
1406/0018 1/2 in BSP
1406/0021 3/4 in BSP
1406/0029 1.1/4 in BSP



193860

Male Adapters - BSP x BSP

1606/0003 3/8 in x 1/4 in
1604/0003 3/8 in x 3/8 in
1606/0004 1/2 in x 1/4 in
1606/0007 1/2 in x 3/8 in
1604/0004 1/2 in x 1/2 in
1606/0008 3/4 in x 3/8 in
1606/0009 3/4 in x 1/2 in
1604/0006 3/4 in x 3/4 in



193930

Hexagon Spanners for Ram Pistons and End Caps

992/09300 55 mm A/F
992/09400 65 mm A/F
992/09500 75 mm A/F
992/09600 85 mm A/F

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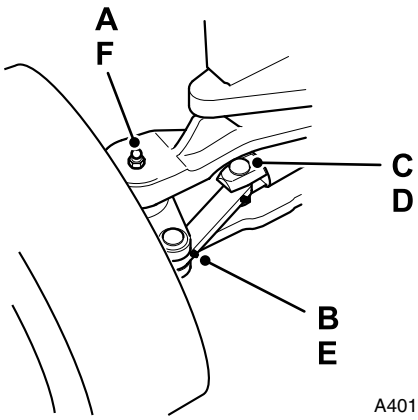
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Rear Axle

2 Wheel Drive Machines

The six grease points on the rear axle are as follows:

- **A** Left Stub Shaft (Every 500 Hrs only).
- **B** Left Steering Link Outer Pivot.
- **C** Left Steering Link Inner Pivot.
- **D** Right Steering Link Inner Pivot.
- **E** Right Steering Link Outer Pivot.
- **F** Right Stub Shaft (Every 500 Hrs only).

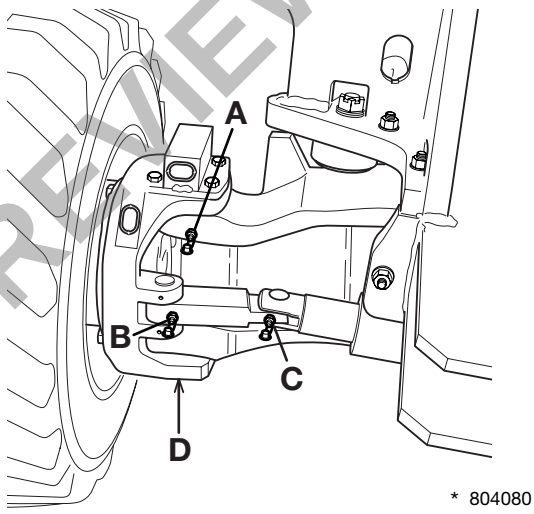


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4x4 Machines

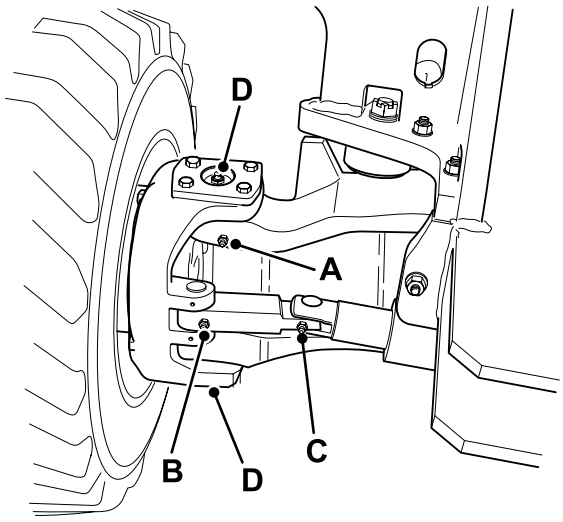
The eight grease points on the rear axle are as follows:

- **A** Stub Shaft (left and right).
- **B** Steering Link Outer Pivot (left and right).
- **C** Steering Link Inner Pivot (left and right).
- **D** Swivel trunnion bearings (left and right).



* 804080

3.0D 4x4



* 800450-V3

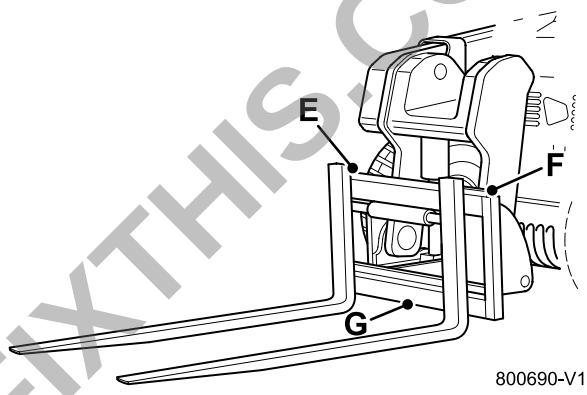
3.5D 4x4

Sideshift (Optional)

The two grease points on the sideshift mechanism (if fitted) are as follows:

- **E** Top Rail Right Side.
- **F** Top Rail Left Side.

Apply a smear of grease to the Bottom Rail **G**.



800690-V1

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Filter - Removal and Replacement

Removal

⚠ WARNING

Make the machine safe before getting beneath it. Park the machine on level ground. Make sure the engine is stopped, the parking brake engaged and the transmission is in neutral. Disconnect the battery. Chock both sides of all four wheels.

5-3-2-1/1

1 Extend and lower boom to its lowest position.

2 Make the machine safe by stopping the engine, removing the key, and chocking the wheels.

3 Open front cover (Refer to **Access Procedures for Maintenance**, Section B)

⚠ WARNING

Hydraulic Pressure

It is not possible to vent all residual pressure. Loosen the connection one full turn and allow the pressure to dissipate. Keep face and hands well clear of pressurized hydraulic oil and wear protective glasses.

4 Ensure that all hydraulic pressure is released from the system (By operating the lift lever).

5 Remove the old canister **A,** using a chain wrench if necessary.

Replacement

1 Ensure the filter head **B** is clean.

2 Using clean hydraulic oil, fill the new filter canister (allowing time for the oil to pass through the filter element) and lubricate seal **C.** (Seal **C** is not shown but is located between the canister **A** and the head **B**.)

3 Install the new filter canister hand tight only, and ensure it is clean and dry.

4 Start the machine and operate the boom controls to pressurize the system. Ensure the boom is left fully extended with the carriage on the ground.

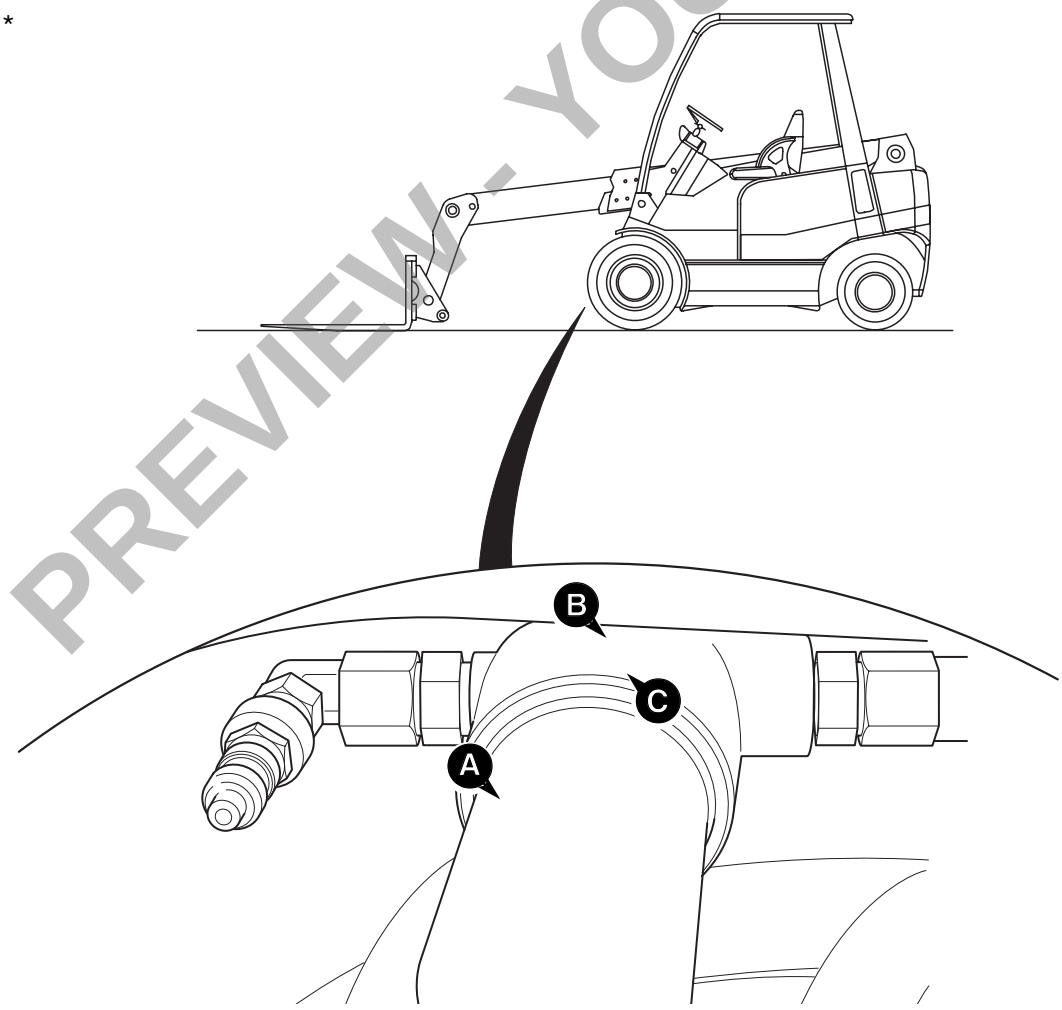
5 Stop the engine and remove the ignition key.

6 Inspect the filter canister for leaks.

7 Check the hydraulic oil level and top up if necessary.

8 Refit the front cover (Refer to Section B).

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Inspect the Forks

⚠ WARNING

Instead of forks, the Teletruk may be fitted with specialist lifting or handling equipment. Refer to the manufacturer"s inspection procedure if other equipment is fitted.
12-5-1-5

⚠ WARNING

Do not try to correct the alignment of fork tips by bending the forks or adding shims. Never repair damaged forks by heating or welding. Forks are made of special steel using special procedures. Always replace damaged forks.
12-5-1-6

1 Park the Teletruk on firm level ground.

2 Apply the park brake.

3 Raise the forks to allow inspection.

4 Stop the engine and remove the starter key.

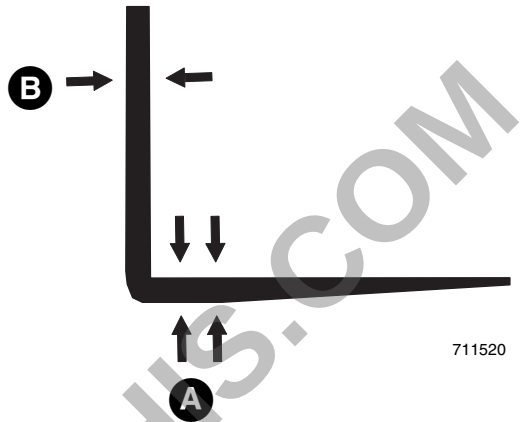
5 Inspect the forks as follows:

a Make sure there are no cracks or obvious damage such as twisting or bending.

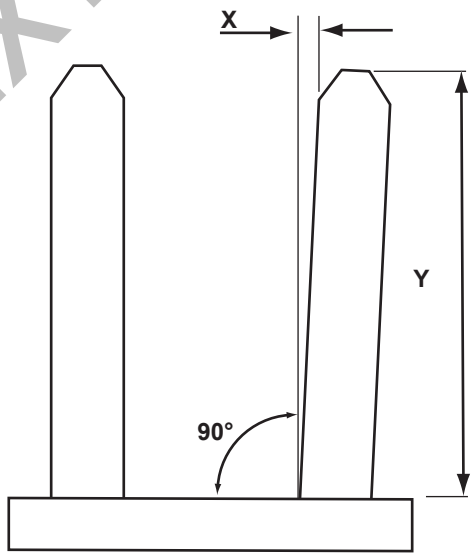
b Inspect the heel of the forks for wear. Distance **A** must be within 10% of distance **B**.

c Check that the fork tips are aligned. Tip alignment **X** must be within 3% of the fork length **Y**.

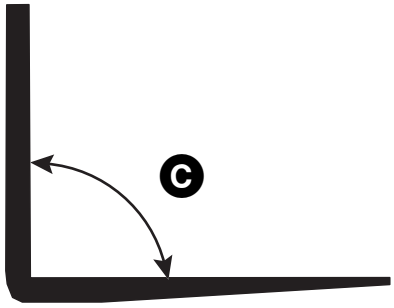
d Check the angle **C** of the fork upright to the fork plate. The angle must not exceed 93 degrees.



711520



711560



711540

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Main Components From No. 788644 Up to No. 892343* (Diesel Engine, Twin Pedal)

1 Battery
2 Key Switch
3 Glow Plugs
4 Glow Plugs
5 Glow Plugs
6 Glow Plugs
7 Starter Solenoid
8 Starter Motor
9 Neutral Start Relay
10 Ignition Relay 1
11 Moment Load Indicator
12 Moment Load Indicator - Transducer
13 Rear Work Light Switch
14 Rear Work Light
15 Reverse Alarm Relay
16 Reverse Alarm Buzzer
17 Engine Shut Off Solenoid
18 Reverse Microswitch
19 Reverse Relay
20 Forward Microswitch
21 Forward Relay
22 Electronic Brake Control Unit
23 Park Brake Switch
24 Electric Displacement Control (Pump Swash Operation)
25 Susmic 12
26 Pulse Pick-up (Pump Speed Sensor)
27 Lift Sensor
28 Lower Sensor
29 Auxiliary Switch
30 Tilt Switch
31 Diagnostic Connector - Psion
32 Accelerator Pedal
33 Brake Pedal
34 Throtle Motor Actuator (Engine Revs)
35 Hourmeter
36 Master Warning lamp
37 Alternator Warning lamp
38 Hand Brake Warning lamp
39 Water Temperature Warning lamp
40 Transmission Oil Temperature Warning lamp
41 Engine Oil Pressure Warning lamp
42 Low Fuel Level Warning lamp
43 Air Filter Warning lamp
44 Hydraulic Oil Filter Bypass Warning lamp
45 Main Beam Warning lamp
46 Indicator Warning lamp
47 Water Temperature Switch
48 Transmission Oil Temperature Switch
49 Engine Oil Pressure Switch
50 Low Fuel Level
51 Air Filter Vacuum Switch
53 Information Display Centre Buzzer
54 Head Light LED Mini Relay
55 Alternator
56 Engine Shut Down Solenoid
57 Horn Switch - Column
58 Horn Switch - Push
59 Horn
60 Front Work Light Switch
61 Right Hand Front Work Light
62 Left Hand Front Work Light
63 Beacon Switch
64 Beacon Motor/Light
65 Hazard Switch
66 Indicator Switch
67 Directional Indicator LED Mini Relay
68 Left Hand Indicator (Rear)
69 Left Hand Indicator (Front)
70 Right Hand Indicator (Front)
71 Right Hand Indicator (Rear)
72 Flasher Unit
73 Brake Light Switch
74 Ignition Relay 2
75 Left Hand Brake Light
76 Right Hand Brake Light
77 Rear Wash/Wipe Switch
78 Rear and Roof Washer Motor
79 Rear Wiper Motor
80 Front Wash/ Wipe Switch
81 Front Wash Motor
82 Front Wiper Motor
83 Head Light Flash Switch
84 Road Lights Relay
85 Road Lights Switch
86 Dip Switch
87 Left Hand Main Beam
88 Right Hand Main Beam
89 Left Hand Dip Beam
90 Right Hand Dip Beam
91 Left Hand Tail Light
92 Left Hand Side Light
93 Right Hand Tail Light
94 Right Hand Side Light
95 Interior Light and Switch
96 Radio
97 Speaker
98 Heater Blower Switch
99 Heater Blower Resistor
100 Heater Blower Motor
101 Face Fan Blower Switch
102 Face Fan Resistor
103 Face Fan Motor
104 Auxiliary 1 Valve Switch
105 Auxiliary 1 Valve Relay
106 Auxiliary 1 Valve Solenoid
107 Auxiliary 2 Valve Switch
108 Auxiliary 2 Valve Relay
109 Auxiliary 2 Valve Solenoid
110 Battery Isolator Switch

Primary Fuses

* **F1** Key Switch
F2 Ignition Relay 1 Supply
* **F3** Roadlights Relay Supply (optional)
F4 Starter Relay 2 Supply

Note: For bulb and fuse ratings see page C/1 - 2. (LEDs not service part)

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Starting Circuit Test

Before carrying out the voltmeter tests, check the battery condition (Refer to Battery Section C for details) and ensure that all connections are clean and tight.

To prevent the engine starting during tests, ensure that the battery isolater switch is on, and that the engine shut off solenoid lead is disconnected at the fuel pump.

Check the readings in the following sequence using a voltmeter. Unless otherwise stated, the readings must be taken with the starter switch in the "start" position and the transmission forward/reverse selector in neutral.

1 Connect the voltmeter across the battery terminals. Reading in the "start" position should be 10.0 V approximately. A low reading probably indicates a fault in the starter motor.

2 Connect the voltmeter between the starter main terminal **A** and the commutator end bracket **B**. In the "start" position, the reading should not be more than 0.5V below the read ing obtained in test 1.

3 Connect the voltmeter between the solenoid terminal **C** and a good earth. Minimum reading in the "start" position, 8.0V.

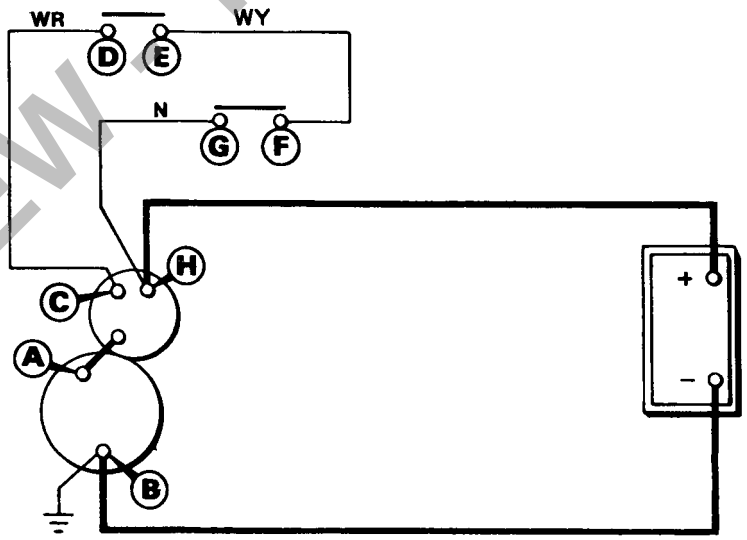
If the reading is less than specified, connect the voltmeter between the neutral start relay terminal **D** and earth. An increase in reading to 8.0V indicates a fault in the wiring from the start relay to the solenoid. If the reading between terminal **D** and earth is below 8.0V, connect the voltmeter between terminal **E** and earth. An increase in the reading to 8.0V indicates either a faulty start relay or a fault in the feed from the transmission selector switch to the relay solenoid. Check also the solenoid earth connection.

If the reading between **E** and the earth is less than 8.0V, the fault must be in either the starter switch (terminals **F** and **G**) or in the wiring between the solenoid, starter switch, and the start relay.

4 Connect the voltmeter between the battery negative and starter earth connection **B**. The reading in the "start" posi tion should be practically zero. If the reading is appreciably above zero, a high resistance in the earth lead or con nection is indicated.

5 Connect the voltmeter battery positive and the starter main terminal **A**. with the starter switch "off", the voltmeter should indicate battery voltage, but it should fall to practically zero when the switch is turned to the "on" position. If the reading is appreciably above zero, a high resistance is present in the insulated lead or in the solenoid. Connect the voltmeter between the battery positive and the solenoid connection **H**. If the voltmeter now reads zero with the switch closed, the fault is in the solenoid.

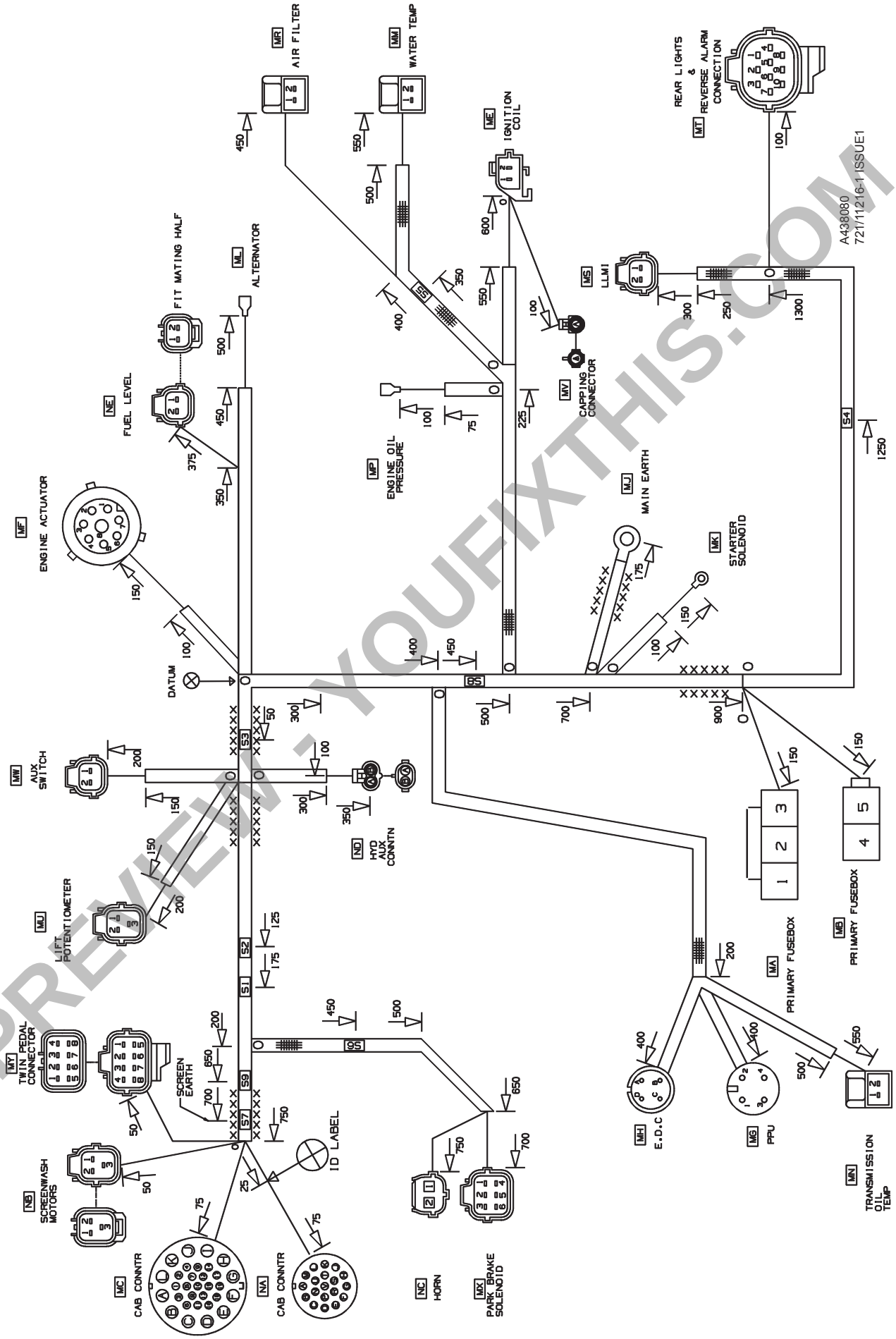
6 Finally reconnect the engine shut off solenoid lead.



* 08320A

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IT LPG, IT Twin Pedal LPG/Diesel, (M891847 to M892345) Mainframe Harness, page 1 of 2 - CAD 721/11216) Issue 1



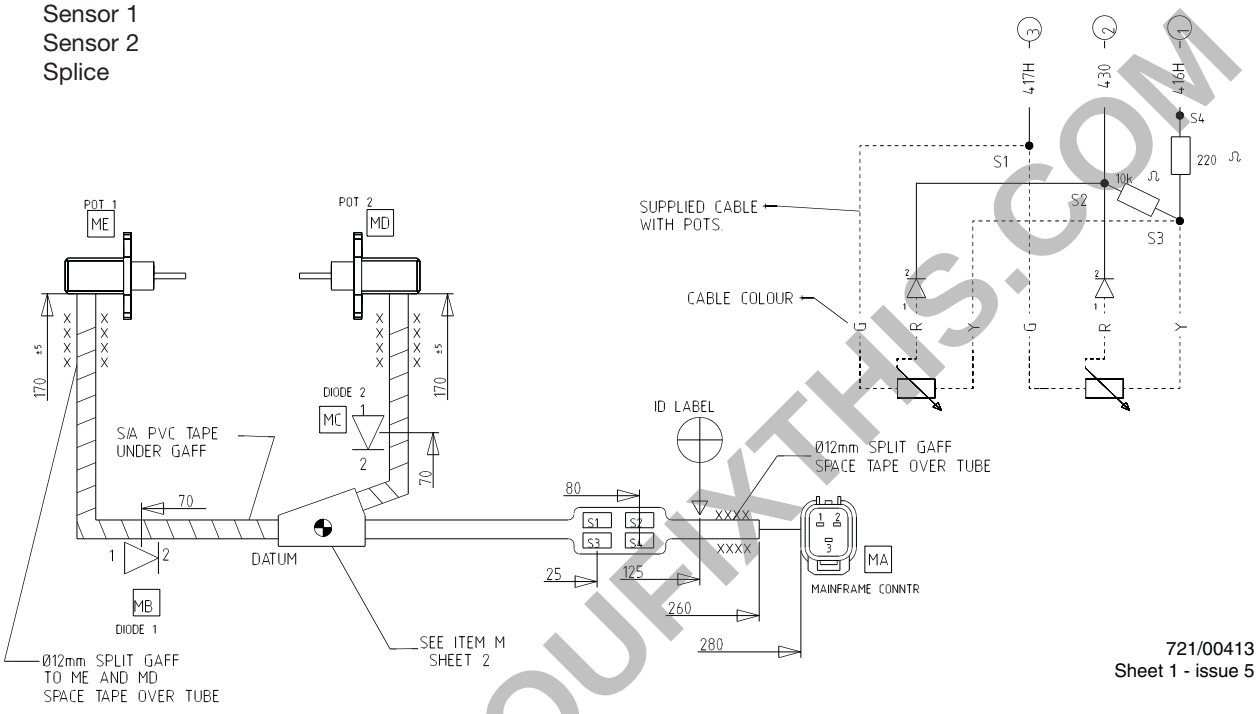
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Lift Sensor Harness - CAD 72100413 Issue 5*

Key to Connectors

MA 3 Way Plug
MB Diode 1
MC Diode 2
MD Sensor 1
ME Sensor 2
Splice



721/00413
Sheet 1 - issue 5

MA	3 WAY PLUG			A,B
TERM	WIRE	SIZE	DEST	TYPE
1	416H	1.0	S4	C,D
2	430	1.0	S2	C,D
3	417H	1.0	S1	C,D

MB	DIODE 1			E,F
TERM	WIRE	SIZE	DEST	TYPE
1	RED	1.0	ME	-
2	430A	1.0	S2	-

MC	DIODE 2			E,F
TERM	WIRE	SIZE	DEST	TYPE
1	RED	1.0	MD	-
2	430B	1.0	S2	-

MD	POT 1			G
TERM	WIRE	SIZE	DEST	TYPE
-	GREEN	1.0	S1	-
-	RED	1.0	MC	-
-	YELLOW	1.0	S3	-

ME	POT 2			G
TERM	WIRE	SIZE	DEST	TYPE
-	GREEN	1.0	S1	-
-	RED	1.0	MB	-
-	YELLOW	1.0	S3	-

S1	SPLICE 1			H,J
TERM	WIRE	SIZE	DEST	TYPE
-	417H	1.0	MA 3	-
-	GREEN	1.0	MD	-
-	GREEN	1.0	ME	-

S2	SPLICE 2			H,J
TERM	WIRE	SIZE	DEST	TYPE
-	430	1.0	MA 2	-
-	430A	1.0	MB	-
-	430B	1.0	MC	-
10k	RESISTOR		S3	-

S3	SPLICE 3			H,J
TERM	WIRE	SIZE	DEST	TYPE
-	YELLOW	1.0	MD	-
-	YELLOW	1.0	ME	-
220	RESISTOR		S4	-
10k	RESISTOR		S2	-

S4	SPLICE 4			H,J
TERM	WIRE	SIZE	DEST	TYPE
-	416H	1.0	MA 1	-
220	RESISTOR		S3	-

V001370
721/00413
Sheet 2 - issue 5

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Susmic Controller (cont)

NFPE Controller Error Codes

POWER Error
If this LED remains unlit, the controller has lost its supply from the ignition switch (engine running).

Remedy - check the ignition switch wiring and connections.

SYSTEM Error
If this LED remains unlit, there is an internal error.

MODE Error
If this LED flashes at a rate of approx. 10 flashes per second, or remains unlit, there is a software fault. The programming may have been lost or there may be a short-circuit in the external wiring.

Remedy - Check external wiring for short circuits.

STATUS Error
The following table lists the various flash patterns of this LED and their related errors.

Key to Flash Pattern
_ _ _ Long Flashes
. . . Short Flashes

Flash Pattern	Error	Action
_ . . .	Sensor supply voltage out of range	Check sensor supply voltage (5Volt) at sensors, sensor wiring and sensors
_____	Susmic Controller internal error	Renew controller (parts must be returned if under warranty)
_ _ . .	Brake Sensor signal incorrect	Check sensor, sensor wiring and connections Check sensor supply voltage (5Volt) at sensor Check brake sensor set-up procedure
. . _ .	Speed Sensor signal not picked up	Check speed sensor wiring and connections Check sensor supply voltage (5Volt) at sensor Check speed sensor set-up procedure
_ . _ .	Control Current error	Check pump control valve solenoid wiring and solenoid control circuits for open or short circuit
. _ _ .	Forward/Reverse Switch short-circuit	Check Forward/Reverse switch and wiring
_ _ _ .	Speed Sensor signal interrupted	Check sensor, sensor wiring and connector Check sensor supply voltage (5Volt) at sensor Check speed sensor set-up procedure
. . . _	Unloader Control	Check sensor supply (pins 9 and 22) short circuit (+) - min volune flow short circuit (-) - max volume flow open circuit - max volume flow
. _ . _	Internal error (kernal) Software	Download latest software or replace controller

Note:
. . _ . The speed sensor error will flash when the engine is not running and the ignition is switched on.

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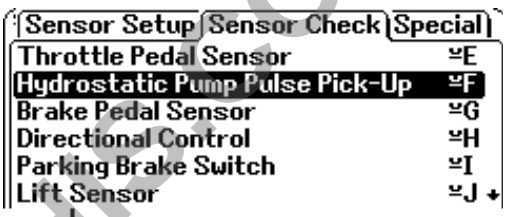
Sensor Check Procedures (continued)

Hydrostatic Pump PPU Sensor

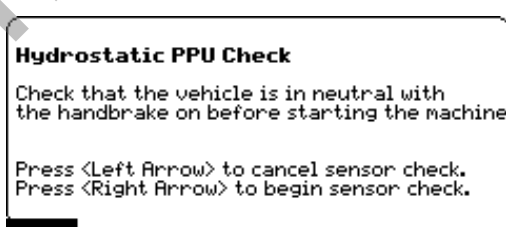
The PPU measures the engine/hydrostatic pump RPM. This procedure provides an approximate reading of engine Idle RPM and verification that the PPU is operating correctly.

Note: The Set-up procedure for PPU requires the engine to be running, in neutral the park brake on and the drive front wheels chocked. (Refer to Section B).The Susmic controller system will not respond to the directional control, service and parking brake inputs.

1 Display shows **Sensor Check** screen.
Select option by pressing ↓ ↑ and Enter
Note: Side arrow indicates additional options.

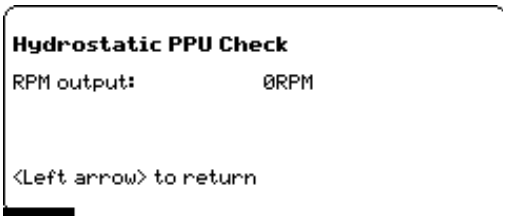


2 Display shows instructions. When complete press → to continue or ← to cancel.

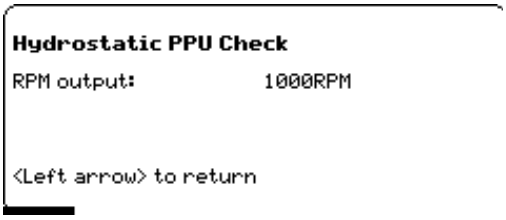


3 Screen flashes 'Waiting for Susmic.

4 Engine **'OFF'.** Display shows:



5 Start engine. Display shows engine idle RPM. (Increments of 100 RPM).
Press ← to continue.



6 'Bleep' confirms. Screen flashes 'Waiting for Susmic.

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3.5D 4x4 Machines Hydraulic Services Circuit

Component Key

The priority, steering and fan circuit is on page E/3-14, the hydraulic services circuit is on page E/3-16 and the transmission circuit is on page E/3-18. This component key is common to all three circuits. Those items shown in **bold** type are shown on this sheet. Some components have been duplicated, this is to enable the reader to appreciate how the various components fit into the circuit.

1 Filler/Breather
2 HydraulicTank
3A Suction Strainer - Fan Pump
3B Suction Strainer - Main/Steering Pumps
3C Suction Strainer - Transmission Charge Pump
4 Triple Pump
4A Fan Pump
4B Main/Steering Pump
4C Demand Pump
4D Steering Priority Valve
4E Steering Pressure Relief Valve
5A Test Point - Main/Steering Pump Pressure
5B Test Point
6 Unloader Valve
7 Steering Ram
8 Hydraulic Steering Unit
9 Valve Block
9A Main Relief Valve - 245 bar
9B Tilt/Crowd Spool
9C Extension Spool
9D Lift Spool
9E Auxiliary 1 Spool
9F Auxiliary 2 Spool
9G Auxiliary Relief Valve
9H Auxiliary Relief Valve
9J Auxiliary Relief Valve
9K Auxiliary Relief Valve
9L Auxiliary Relief Valve
9M Auxiliary Relief Valve
9N Auxiliary Relief Valve
9P Auxiliary Relief Valve
10A Tilt/Crowd Ram
10B Tilt/Crowd Ram
10C Hose Burst Check Valve
10D Hose Burst Check Valve
11 Compensation Ram
12A Lift Ram
12B Hose Burst Check Valve
13A Extension Ram
13B Hose Burst Check Valve
14A Quick Release Hoses (If fitted)
14B Quick Release Hoses (If fitted)
14C Quick Release Hoses (If fitted)
14D Quick Release Hoses (If fitted)
15 Auxiliary Ram 1 (If fitted)
16 Auxiliary Ram 2 (If fitted)
17 Fan
17A Relief Valve 120 bar
18 Fan Solenoid Valve
18A Relief Valve 80 bar
19 Transmission Pump Assembly
19A Transmission Pump
19B Charge Relief Valve
19C Forward/Reverse Direction Control
19D Multi-Function Valves
19E Charge Pump
20 Inch Valve
21 Test Point - Charge Pump Pressure
22 Check Valve - 3 Bar
23 Purge Valve
23A Test Point - Forward Loop Pressure
24 Filter
25 Flow Divider
26 Combined Brake/2-speed Valve
27 Front Right Hand Motor
28 Rear Right Hand Motor
29 Front Left Hand Motor
30 Rear Left Hand Motor
31 Cooler

X See page E/3-14 For continuation

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The following procedure should always be followed when restarting after either the pump or motor have been removed from the system.

⚠ WARNING

Disable the machine (all four wheels lifted off the ground, work function disconnected etc.), while carrying out this procedure

1 Check installation to ensure all hydraulic hoses are tight, and all bolts screws etc. are fitted and tight.

2 Check the fluid level in the hydraulic tank and if necessary top-up with clean, filtered (passed through a 10 micron filter) hydraulic fluid.

3 Fill the transmission pump housing by pouring filtered hydraulic fluid into the upper case drain port and replace drain plug.

4 Fit a 35 bar (500 lbf/in^2) pressure gauge in the charge pressures gauge port.

5 Disconnect electrical connections to the EDC at the pump control.

⚠ WARNING

Do not start engine unless pump is in the neutral position (0 degrees swashplate angle).

6 Slowly rotate engine on the starter until charge pressure starts to rise. Then start engine and run at minimum rev/min until charge pressure has been established.

7 Bleed excess air from the high pressure gauge ports and increase speed to normal rev/min.

Note: Charge pressure should be 23 bar (320 lbf/in^2) minimum. If not stop engine and determine cause.
If machine fails to drive reset the transmission as per Control Section D.

8 Stop engine and connect EDC electrical connections.

9 Start engine, checking that pump stays in neutral, and allow engine to run at normal speed.

10 Slowly check for forward and reverse machine operation. Continue to cycle between forward and reverse for at least 5 minutes.

* **Note:** Charge pressure should remain at 30 to 32 bar (429 to 450 lbf/in^2) minimum.

11 Stop engine, remove gauges and plug port.

12 Check the fluid level in the hydraulic tank and if required top-up with clean, filtered (passed through a 10 micron filter) hydraulic fluid.

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