Open front screen

Service Manual

(Supplement)

525-50 RAF

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This manual is a supplement to the JCB 525-50 Loadall Service Manual. The information covers the 525-50RAF machines with the following serial numbers:

881917, 881918 (winterised)
881982 to 882006 (standard machines).

Note: Only those areas of the machine which are different from the standard 525-50 Loadall are dealt with here. For all other information refer to Loadall Service Manual 9803/3620.

Unless specified otherwise, all references to 'Service Manual' in this supplement are to be taken as meaning Loadall Service Manual 9803/3620.

Read the standard Service Manual and this Supplement completely and carefully to familarise yourself with the machine before carrying out any servicing procedures.

Care and Safety

Before carrying out any maintenance procedures on this machine, make sure you read the Care and Safety information in Section 2 of the Service Manual. The relevant information in that Section should be observed as well as any care and safety information contained in this supplement.

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Safety Notices

In this manual 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

⚠ DANGER

Study this Supplement and the Service Manual for the machine before carrying out any maintenance work on the machine. You must always understand and observe the relevant laws and regulations. If you are unsure about anything, ask your JCB Distributor.

Before carrying out any maintenance procedures on this machine, make sure you read the Care and Safety information in Section 2 of the Service Manual. The relevant information in that Section should be observed as well as any care and safety information contained in this supplement.

Safety Warnings

⚠ WARNING

Working Beneath the Machine

Make the machine safe before getting underneath 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

If the engine safety system trips whilst the machine is being used in a hazardous area, DO NOT ATTEMPT TO RE-START until advice has been obtained from the person in authority and the cause of the shutdown found and corrected.

0088

⚠ CAUTION

If the engine has been running previously, it will not be possible to reset the engine safety shutdown system for a period of at least 30 seconds after shutdown due to the high engine inlet system vacuum. DO NOT attempt to push the operating lever to the start/reset position against this vacuum as use of excessive force will cause severe damage to the valve mechanism.

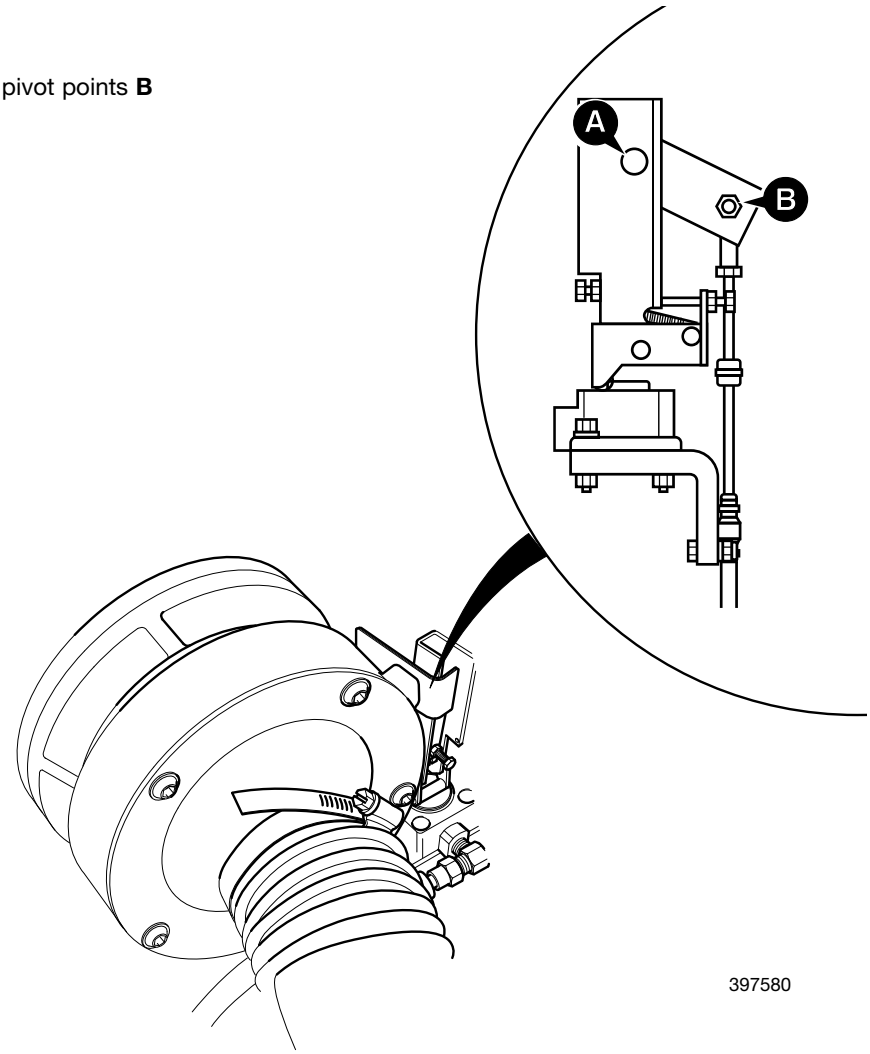
Contents

1 - 1 Service Schedules (Additional Items) 1 - 1

	Operation	Daily 10 Hr	Weekly 50 Hr	2 Weekly 100 Hr	6 Monthly 500 Hr	Yearly 1000 Hr	2 Yearly 2000 Hr
CATEGORY 'C' SAFETY SYSTEM							
Control Mechanism	Inspect			•	•	•	•
All Pivot Points	Oil			•	•	•	•
Emergency Stop	Test			•	•	•	•
Overspeed Setting	Check/Adjust				•	•	•
WEBASTO HEATER SYSTEM							
System	Inspect/Operate					•	•

Oiling

Lightly oil the shut-off valve spindle **A** and the pivot points **B** at the periods stated in the Service Schedules.



Warning Symbols

The following warning symbols may be found on the battery.

Symbol	Meaning
 A289230	Keep away from children.
 A289260	Shield eyes.
 A289280	No smoking, no naked flames, no sparks.
 A289250	Explosive Gas.
 A289240	Battery acid.
 A289270	Note operating instructions.

THIS MACHINE IS FITTED WITH A 24 VOLT ELECTRICAL SYSTEM WHICH IS POWERED BY TWO 12 VOLT BATTERIES WIRED IN SERIES.

⚠ CAUTION

Do not disconnect the battery while the engine is running, otherwise the electrical circuits may be damaged.
INT- 3- 1-14

⚠ WARNING

Understand the electrical circuit before connecting or disconnecting an electrical component. A wrong connection can cause injury and/or damage.
INT-3-1-4

⚠ DANGER

Battery electrolyte is toxic and corrosive. Do not breathe the gases given off by the battery. Keep the electrolyte away from your clothes, skin, mouth and eyes. Wear safety glasses.
INT-3-2-1/3

⚠ CAUTION

Damaged or spent batteries and any residue from fires or spillage should be put in a closed acid proof receptacle and must be disposed of in accordance with local environmental waste regulations.
INT-3-1-12

⚠ WARNING

Batteries give off an explosive gas. Do not smoke when handling or working on the battery. Keep the battery away from sparks and flames.

Battery electrolyte contains sulphuric acid. It can burn you if it touches your skin or eyes. Wear goggles. Handle the battery carefully to prevent spillage. Keep metallic items (watches, rings, zips etc) away from the battery terminals. Such items could short the terminals and burn you.

Set all switches in the cab to OFF before disconnecting and connecting the battery. When disconnecting the battery, take off the earth (-) lead first.

When reconnecting, fit the positive (+) lead first.

Re-charge the battery away from the machine, in a well ventilated area. Switch the charging circuit off before connecting or disconnecting the battery. When you have installed the battery in the machine, wait five minutes before connecting it up.

First Aid - Electrolyte

Do the following if electrolyte:

GETS INTO YOUR EYES

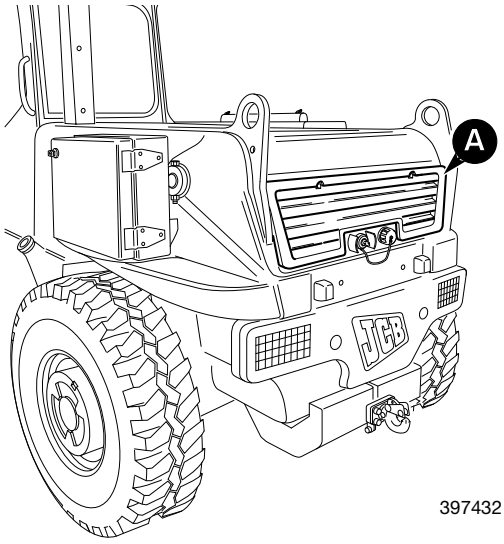
Immediately flush with water for 15 minutes, always get medical help.

IS SWALLOWED

Do not induce vomiting. Drink large quantities of water or milk. Then drink milk of magnesia, beaten egg or vegetable oil. Get medical help.

GETS ONTO YOUR SKIN

Flush with water, remove affected clothing. Cover burns with a sterile dressing then get medical help.
5-3-4-3/1



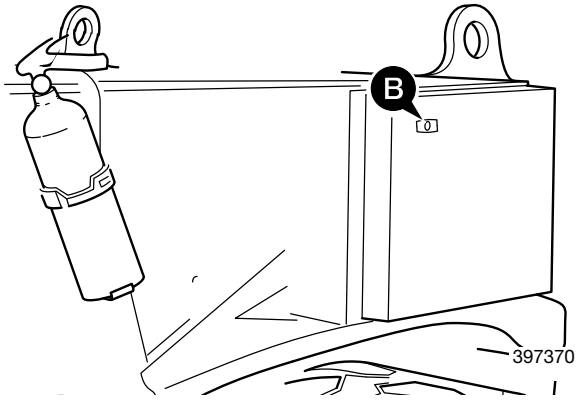
Checking the Electrolyte Level

Maintenance free batteries used in normal temperate climate applications should not need topping up. However, in certain conditions (such as prolonged operation at tropical temperatures or if the alternator overcharges) the electrolyte level should be checked as described below.

1 Remove the rear grille **A** or open the battery box door **B**, as appropriate.

⚠ WARNING

Keep metal watch straps, and any metal fasteners on your clothes, clear of the positive (+) battery terminal. Such items can short between the terminal and nearby metal work. If this happens you can get burned.
5-2-2-4



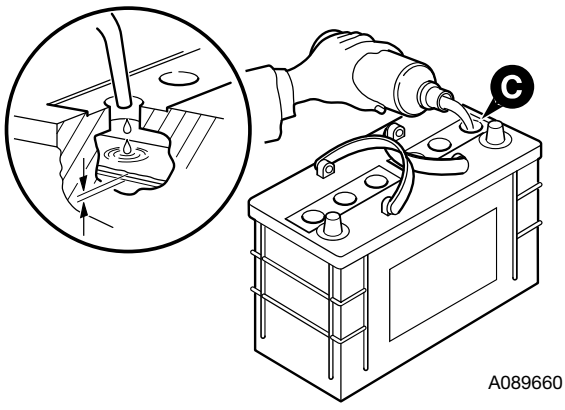
2 Disconnect and remove battery.

⚠ WARNING

Do not top the battery up with acid. The electrolyte could boil out and burn you.
2-3-4-6

3 Remove covers **C**. Look at the level in each cell. The electrolyte should be 6 mm (1/4 in) above the plates. Top up if necessary with distilled water or de-ionized water.

4 Refit battery, close and lock the rear grille/battery box door.



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Batteries	2 x 12 volts, negative earth
Cold Crank amps for 1 minute to 1.4 VPC at -18°C (0°F) I.E.C.	590
Reserve capacity (minutes) for 25 amp load	290
Alternator	Bosch 24V - 55A
Starter Motor	Bosch 24V LHS
Light Bulbs	
Headlights - dip	24V, 70 W
Headlights - main	24V, 70 W
Work lights	24V, 70 W Halogen
Front side lights	24V, 5 W
Stop/tail lights	24V,21/5 W
Turn indicators	24V, 21 W
Warning lights	24V, 1.2 W
Interior light	24V, 10 W
Search light	24V, 70 W

Fuse Identification

The electrical circuits are protected by fuses. The fuses are located in a fuse box inside the door. They are in three rows, labelled **A**, **B** and **C**. Each fuse position in each row is numbered. If a fuse blows, find out why before fitting a new one.

Row A

Fuse	Circuit	Rating
1	Brake lights	7.5
2	Panel warning lights, warning buzzer, instrument lights	5
3	L.H. sidelights, number plate light, trailer light (if fitted)	5
4	R.H. sidelights, number plate light, trailer light (if fitted)	5
5	Rear wash/wipe switch	5
6	Hazard warning lights	10
7	Interior light, beacon	5
8	Spare	-
9	Front wash/wipe switch, horn	7.5

Row B

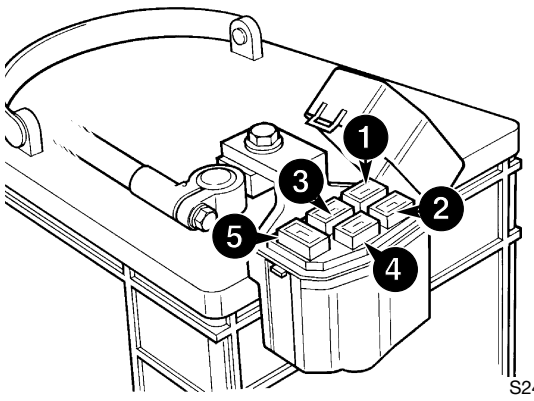
Fuse	Circuit	Rating
1	Junction box	5
2	Engine shut-off switch (ESOS)	5
3	Dipped beam	15
4	Main beam	15
5	Working lights	7.5
6	Indicators	5
7	Parking brake circuit	5
8	Heater	5
9	Spare	-

Row C

Fuse	Circuit	Rating
1	Spare	-
2	Load Moment Indicator	3
3	Forward/reverse switch, transmission dump relay	7.5
4	Rear fog light	3
5	Thermostart	15
6	4WS	7.5
7	Heated screen	25
8	Headlight flasher	10
9	Engine shutdown	5

Fuse links

	Circuit	Rating
1	Starter relay	60
2	Tracker, Radio, Hazard lights, Wipers	30
3	Lights relay	40
4	Starter switch	30
5	Not used	80



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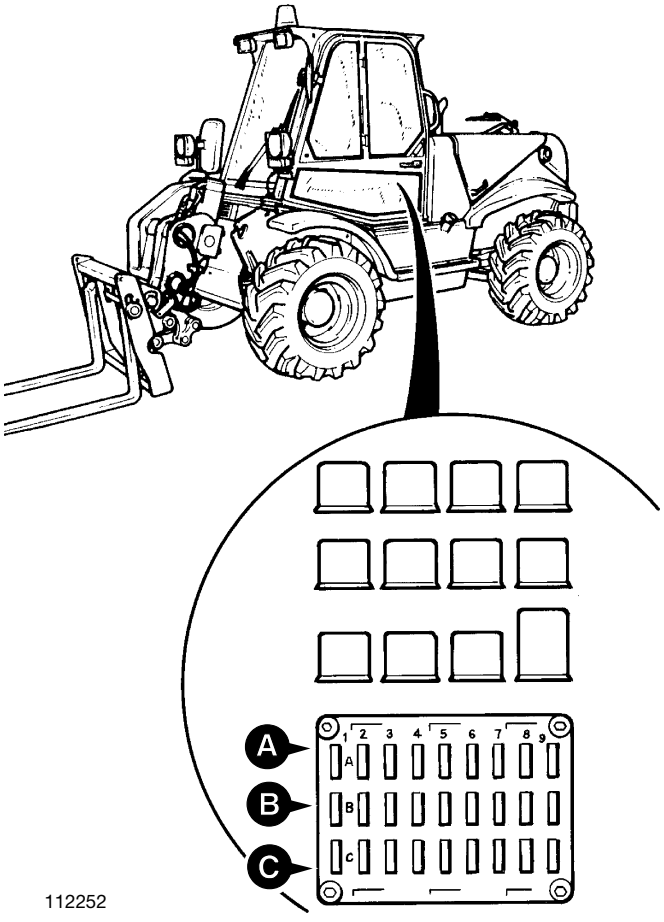

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Component Key (Sheet 1)

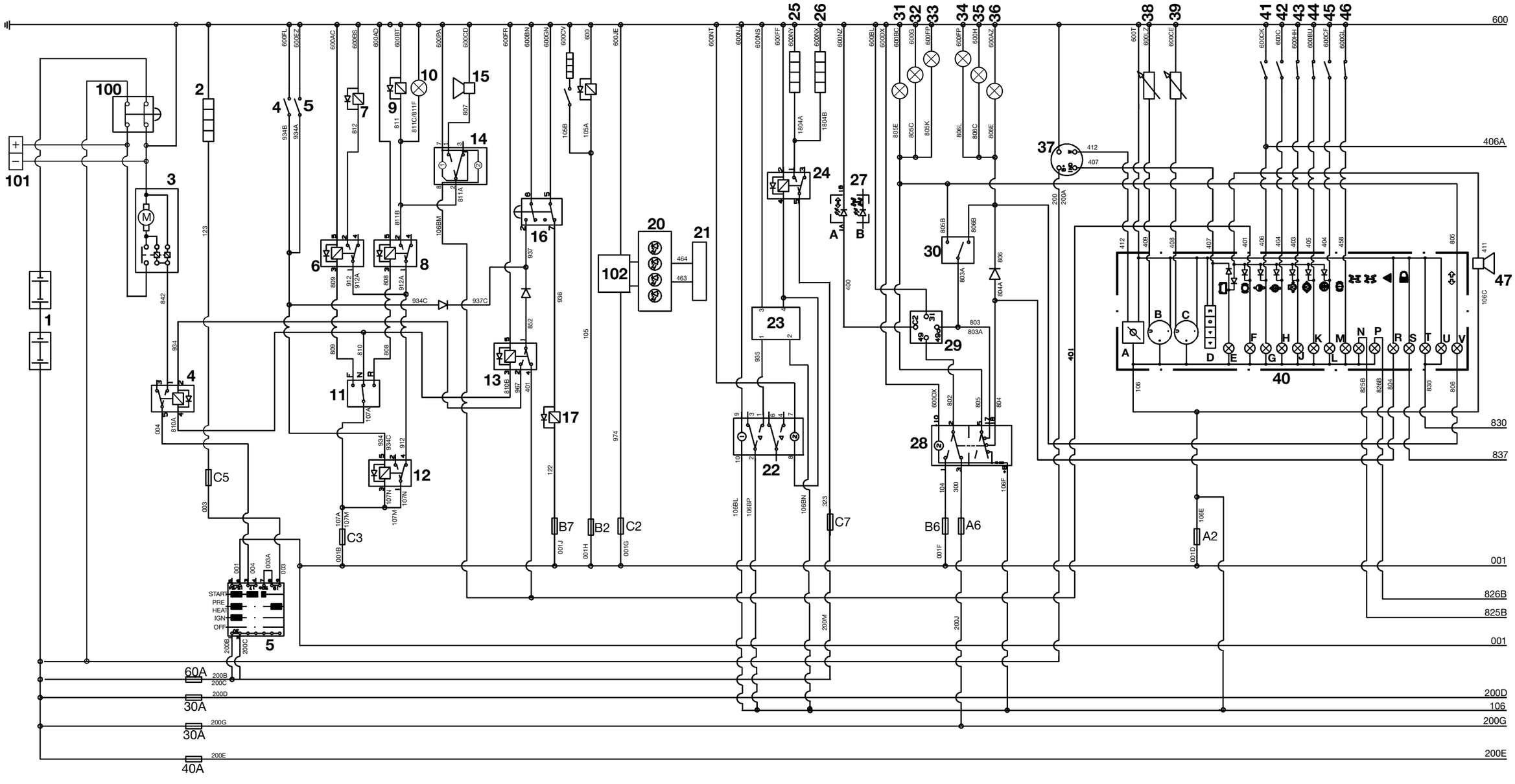
1 Batteries (two in series)
2 Starting aid
3 Starter motor
4 Neutral start relay
5 Ignition switch
6 Forward relay
7 Forward solenoid
8 Reverse relay
9 Reverse solenoid
10 Reverse light
11 Forward/reverse switch
12 Transmission dump relay
13 Park brake light relay
14 Reverse alarm mute relay
15 Reverse alarm
16 Park brake switch
17 Park brake solenoid
18 Cold start advance
19 E.S.O.S.
20 Load moment indicator (LMI)
21 LMI transducer
22 Heated screen switch
23 Heated screen timer
24 Heated screen relay
25 Heated side screen
26 Heated rear screen
27 Hazard/steer mode indicator unit
- **A** Hazard flasher indicator light
- **B** Steer mode indicator light (see Sheet 2 for connections)

28 Hazard switch
29 Hazard flasher unit
30 Indicator switch
31 Left hand front indicator
32 Left hand rear indicator
33 Left hand trailer indicator
34 Right hand trailer indicator
35 Right hand rear indicator
36 Right hand front indicator
36 Fuel gauge
37 Alternator
38 Water temperature sender
39 Fuel sender
40 Instrument panel
- **A** Tachometer
- **B** Water temperature gauge
- **C** Fuel gauge
- **D** Hourmeter
- **E** Battery charge warning light
- **F** Hand brake on warning light
- **G** Water temperature warning light
- **H** Transmission oil temperature warning light
- **J** Engine oil pressure warning light
- **K** Transmission oil pressure warning light
- **L** Air filter blocked warning light
- **M** Brake fault warning light
- **N** 2-wheel steer indicator light
- **P** 4-wheel steer indicator light
- **R** Hazard warning indicator light
- **S** Main beam on indicator light
- **T** Panel illumination
- **U** Panel illumination
- **V** Turn signal indicator light

41 Water temperature switch
42 Transmission oil temperature switch
43 Engine oil pressure switch
44 Transmission oil pressure switch
45 Air filter blocked switch
46 Brake pressure switch
47 Warning buzzer
100 Battery isolator switch
101 Intervehicle start socket
102 24V to 12V convertor

....continued

Sheet 1



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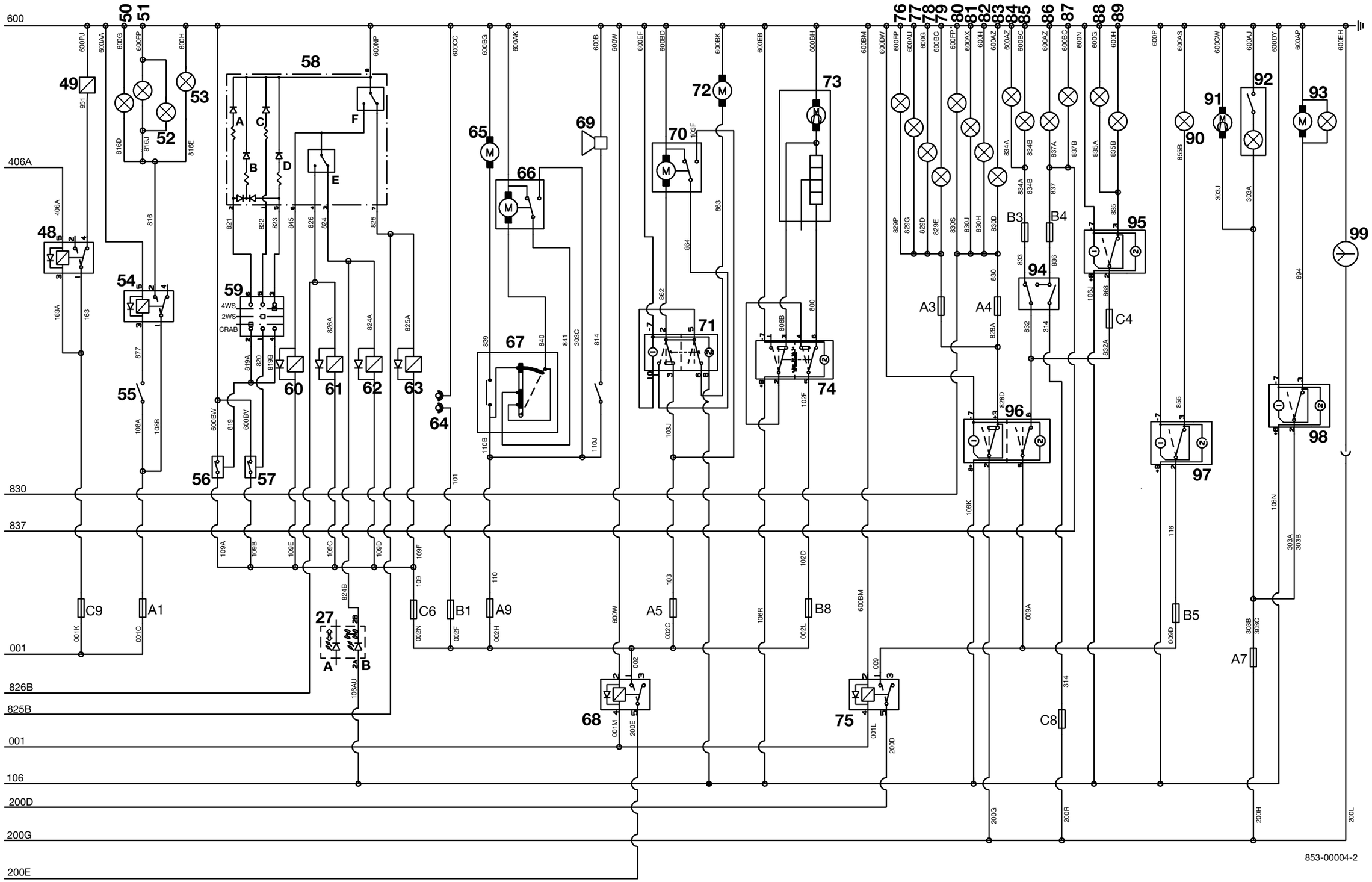
Sheet 2



853-00004-2

Component Key (Sheet 2)

27 Hazard/steer mode indicator unit
- **A** Flasher indicator light (see Sheet 1 for connections)
- **B** Steer mode indicator light

48 Shutdown relay
49 Shutdown solenoid
50 Left hand brake light
51 Left hand trailer brake light
52 Right hand trailer brake light
53 Right hand brake light
54 Brake light relay
55 Brake light switch
56 Proximity switch - front axle
57 Proximity switch - rear axle
58 Steer mode control unit
- **A** Crab steer relay
- **B** Four wheel/crab steer relay
- **C** Two wheel steer relay
- **D** Four wheel steer relay
- **E** 4WS/Crab selector
- **F** 2WS/4WS selector

59 Steer mode selector switch
60 AWS solenoid
61 4WS solenoid
62 Crab steer solenoid
63 2WS solenoid
64 Junction box
65 Front washer pump
66 Front wiper
67 Front wash/wipe switch
68 Ignition relay 2
69 Front horn
70 Rear wiper
71 Rear wash/wipe switch
72 Rear washer pump
73 Heater motor
74 Heater switch
75 Lights relay
76 Left hand trailer light
77 Left hand number plate light
78 Left hand tail light
79 Left hand side light
80 Right hand trailer light
81 Righft hand number plate light
82 Right hand tail light
83 Right hand side light
84 Right hand dipped beam
85 Left hand dipped beam
86 Right hand main beam
87 Left hand main beam
88 Left hand fog light
89 Right hand fog light
90 Left hand front worklight
91 Face level fan
92 Interior light
93 Beacon
94 Headlight flasher switch
95 Fog light switch
96 Road lights switch
97 Worklight switch
98 Beacon
99 Tracker

Introduction

The machine is fitted with a Load Moment Indicator (LMI).

The load moment indicator warns the operator when the machine is nearing its maximum working limit (ie. when it could tip forward). Sensors measure the load exerted on the rear suspension and send signals to the indicator. These sensors take the form of the top locating pins **B** on the rear suspension cylinders.

Testing procedures described in this section should be carried out on level ground with the road wheels in the straight ahead position.

When the load carried by the forks is within the maximum working limit in terms of weight and boom extension, the green LEDs **C** on the display unit illuminate.

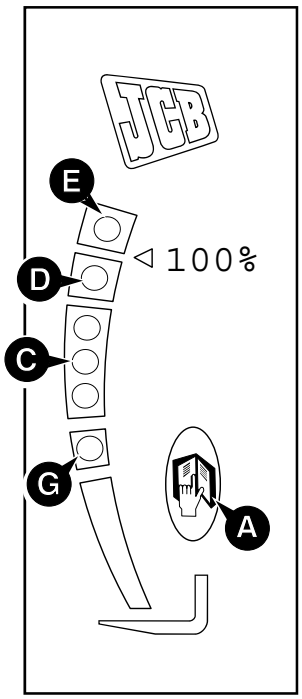
The three green LEDs illuminate progressively as the load increases and the amber LED **D** illuminates as the load nears the maximum working limit.

All LEDs flash as the load continues to approach the maximum working limit.

If the load exceeds the maximum working limit, the red LED **E** illuminates and an audible warning sounds.

If a system fault is detected, various combinations of LEDs indicate a fault code. See **Diagnostic Fault Codes**.

LED **G** remains on whenever power is supplied to the display box.



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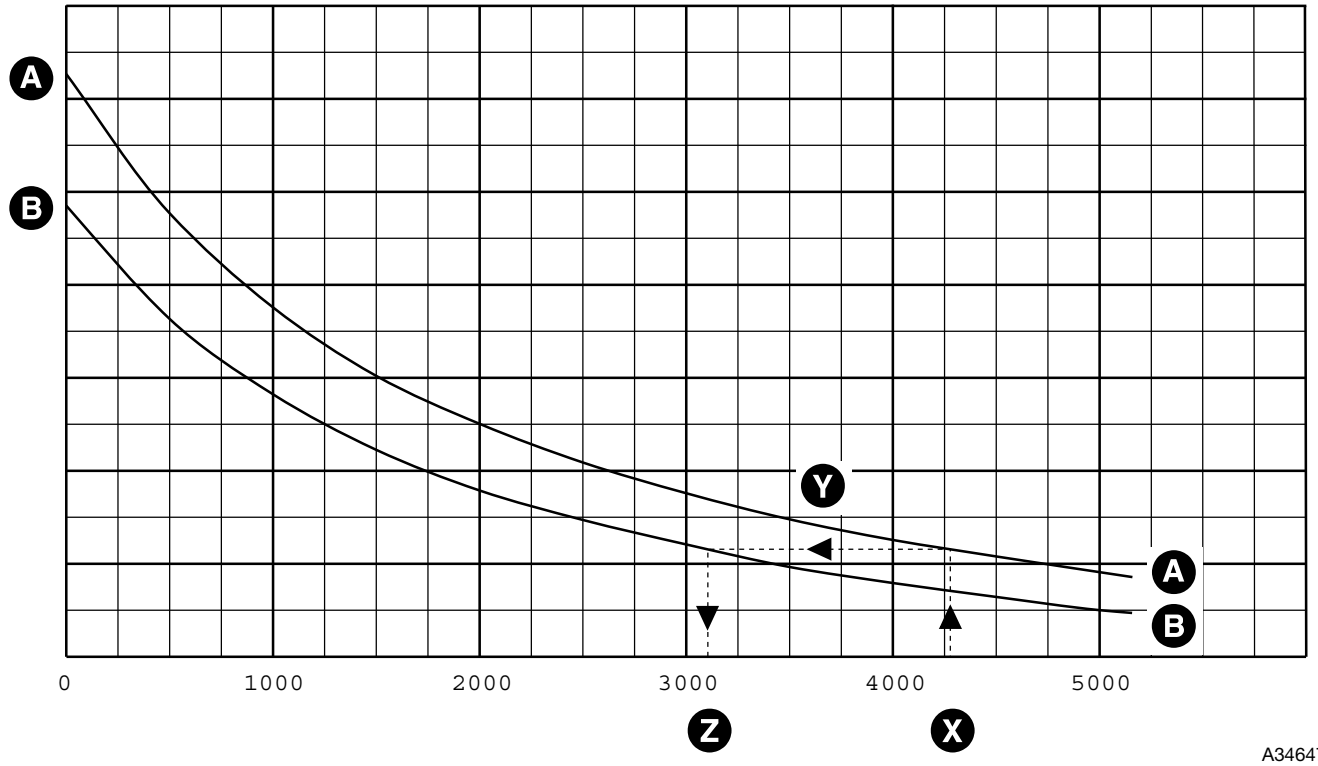
Load Chart (for example only)



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Calibration

The LED indications described are in addition to the green power-on LED **G** at the bottom of the display, which remains on whenever power is supplied to the display unit.

The display unit must be calibrated by setting the '100%' point using a known load and boom extension.

⚠ WARNING

During the following procedure, do not raise the load more than 600mm above ground level otherwise the machine may be able to tip forward at a dangerous angle. Keep all personnel clear of the front and rear of the machine.

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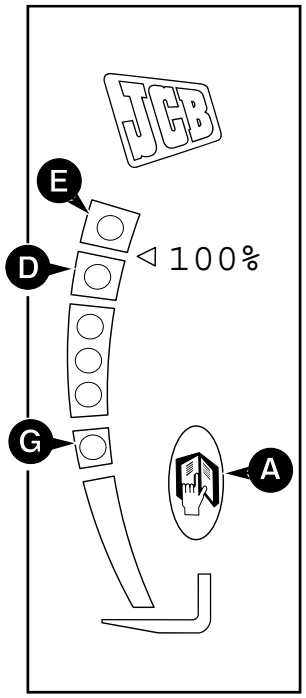

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1 Park the machine on firm level ground.

2 Turn the starter key to the OFF position. Press and hold display button **A**. Start the engine with button **A** held down. **Hold the button for approximately 30 seconds after the engine has started**. All display LEDs will illuminate during this time.

Note: if the button is release during this time, the entire process must be repeated.

After approximately 30 seconds, the display will show the red LED **E** only and the alarm will emit short intermittent bleeps.

3 Release button **A**.

4 With the boom fully retracted, pick up a load between 1800 kg and 2000 kg. Use either pallet forks loaded with a test weight, or a bucket filled with a high density material.

5 Slowly extend the boom. Keep the load close to the ground until the machine is balanced about the front axle with the rear wheels off the ground.

Note: If the following actions are not completed within a five minute period, the display will automatically leave the calibration mode and the memory will revert to the previous settings. If the transducer signal is out of range, the display will indicate the appropriate error code. Calibration cannot continue until the fault is rectified.

6 Press and release the display button **A**. The display will change to show the amber LED **D** and red LED **E** only.

7 Lower the load to the ground and measure the distance the boom is extended.

8 Refer to the correct load chart for the machine (this section).

9 Read up from the extension figure obtained at step 7 (example line X) to the tipping line AA.

10 Read horizontally (example line Y) to the maximum working limit line BB.

11 Read down to the horizontal axis to get the dimension for the boom extension (maximum working limit).

12 Draw a mark on the boom at the dimension obtained above. Raise and retract the boom to the mark drawn on the boom.

13 Press and release the display button. The display will revert to normal operation. The setting of the 100% position is now complete.

Diagnostic Fault Codes

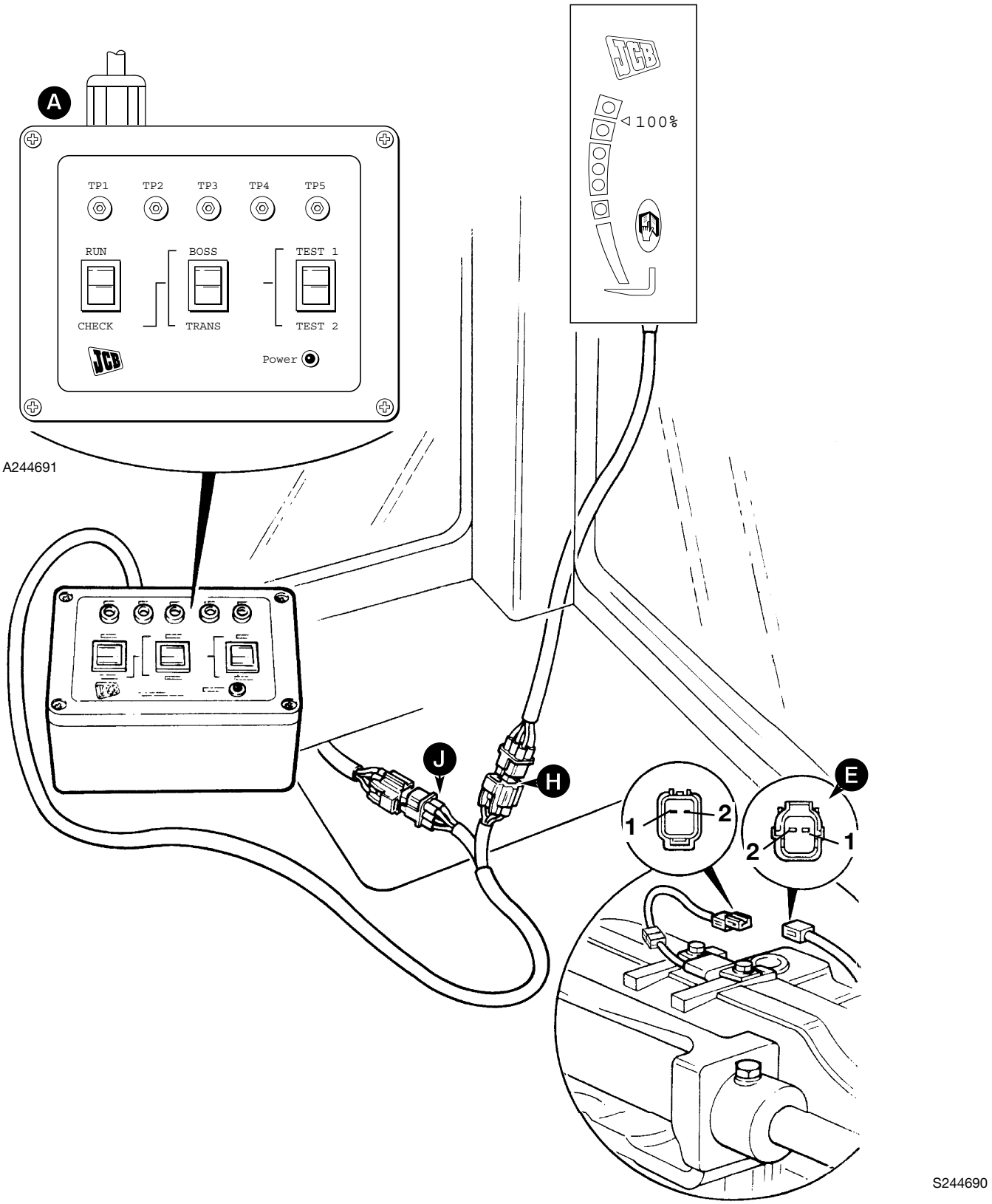
When the system detects a fault, the audible alarm sounds for approximately 10 seconds and various combinations of lights on the display indicate a fault code.

The alarm cancels after 10 seconds and all the lights on the display flash as long as the fault remains. Press and release the display button **A** to show the fault for a further 10 seconds. When the fault clears, the display returns to normal.

If any of the fault codes are displayed, switch the starter key off and 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 when fitting a new display box.

	FAULT CODE	POSSIBLE CAUSE	REMEDY
	**Fault Code 1** **Transducer signal fault**	Transducer not connected. Faulty harness. Faulty transducer.	Check transducer connection. Check for trapped or damaged wires. Check for water ingress. Replace transducer.
	**Fault Code 2** **Calibration out of range**	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 (70 Nm). 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**	Low battery voltage	Do supply voltage test at display box. Check battery voltage.


A
TP1
TP2
TP3
TP4
TP5
RUN
BOSS
TEST 1
CHECK
TRANS
TEST 2
Power
JCB
100%
A244691
J
H
E
1
2
2
1
S244690

Testing

Introduction

If the calibration procedure fails to rectify a problem, there are three main areas where faults can occur: the readout box, the transducer, and the machine electrical harness. The test box (892/00905) is designed to assist the service engineer to diagnose faults in the LMI system down to component level.

This unit should be used when the standard calibration procedure has been attempted and failed.

The test box contains five test points: TP 1 to TP 5 which allow currents in the circuits to be read as voltages by an AVO digital multimeter. The test points also allow continuity and open/short circuit tests to be made.

TP1 Earth
TP2 Readout box supply
TP3 Transducer supply
TP4 Transducer output (Signal)
TP5 Transducer output (voltage)

Test point TP4 reads signal current in the transducer return wire and converts this to a voltage which can be read by the multimeter.

Test point TP5 is a direct connection to the transducer return wire.

The Black lead of the multimeter should be connected to TP1 (earth) when testing voltages.

Note: When returning equipment under warranty, the results of the following tests MUST be stated.

The test box also contains three switches: TEST 1/TEST 2, TRANS/BOSS, RUN/CHECK to change settings for the various tests.

The box is connected between the four-pin plug and socket which connects the readout box to the machine wiring harness behind the instrument panel in the cab.

Before carrying out the tests make sure that:

(a) the machine is on level ground with the boom horizontal;
(b) the forks are fitted, with no load;
(c) the boom is fully retracted;
(d) two-wheel drive is engaged (if fitted) and the machine has been driven backwards and forwards several times with the wheels in the straight ahead position;
(e) the ignition switch is on, but the engine is not running.

Note: The readout display will be affected by extreme steer lock and axle angles.

Service Procedure

Remove the instrument panel and connect test box **A** as shown. The BOSS/TRANS switch should be set to the TRANS position for all tests on machines fitted with transducers.

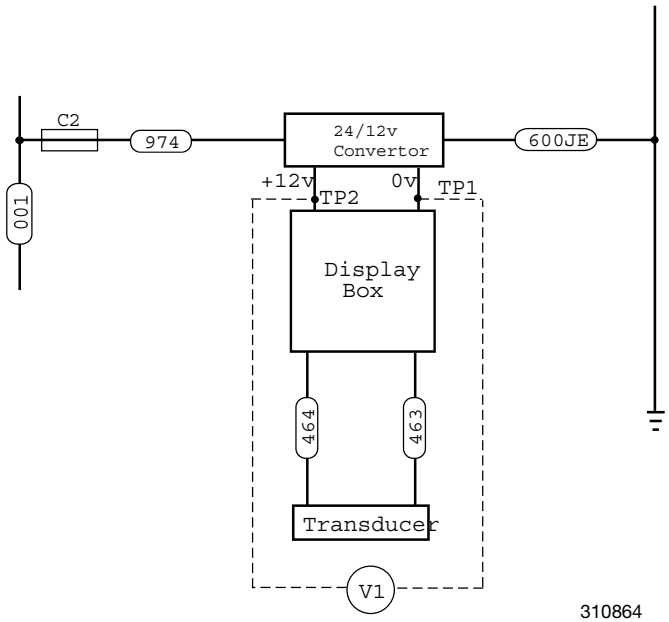
Test 1: Supply Voltage and Fuse Test (V1)

Test box settings: **RUN**
TRANS
TEST 1

1 Measure the voltage between TP1 and TP2
Expected reading: Convertor voltage **(11.0V to 15.0V).**

Note: As an additional test, LED **C** should be illuminated when the display box is receiving a supply voltage.

If the expected reading is not obtained, check the ignition is on, fuse C2, battery condition, test box connections and test harness. Rectify as required.



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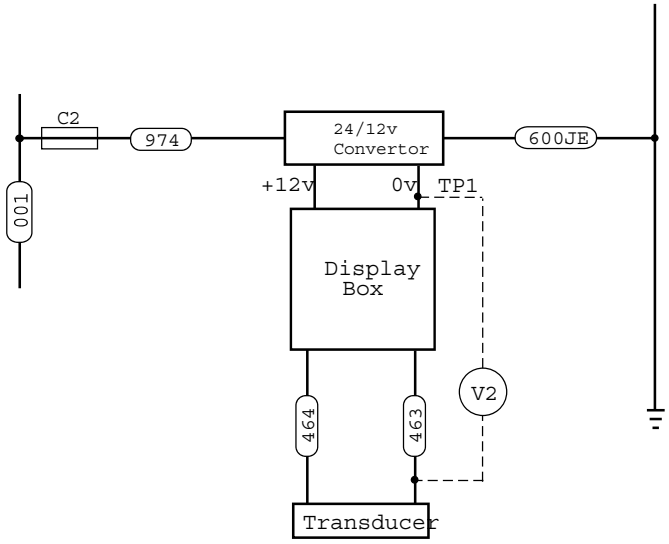
Test 2: Transducer Supply Test (V2)

Test box settings: **RUN**
TRANS
TEST 1

1 Measure the voltage between TP1 and TP3
Expected reading: Convertor voltage (**11.0V to 15.0V).**

If the expected reading is not obtained, check the ignition is on, fuse C2, battery condition, test box connections and test harness. Rectify as required.

If the expected reading is not obtained after the above checks, the display box should be renewed.



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