Service Manual

JS 210 LC

110026 On

PUBLISHED BY THE
PRODUCT SUPPORT DEPARTMENT
OF JCB SERVICE :
23/7, MATHURA ROAD,
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Torque Settings

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

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
5/18	(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)	11/8	407	41.5	300
7/8	(22.2)	15/16	650	66.3	480
1	(25.4)	11/2	970	99.0	715
11/4	(31.7)	17/8	1940	198.0	1430
11/2	(38.1)	21/4	3390	345.0	2500

Metric Grade 8.8 Bolts

Bolt Size		Hexagon (A/F)		Torque Settings	
	(mm)	mm	Nm	kgf m	lbf ft
M5	(5)	8	7	0.7	5
M6	(8)	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		Torque Settings (for steel rivet nuts)		
	(mm)	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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It is most important that you read and understand this information and the publications referred to. Make sure all your colleagues who are concerned with lubricants read it too.

Hygiene

JCB lubricants are not a health risk when used properly for their intended purposes.

However, excessive or prolonged skin contact can remove the natural fats from your skin, causing dryness and irritation.

Low viscosity oils are more likely to do this, so take special care when handling used oils, which might be diluted with fuel contamination.

Whenever you are handling oil products you should maintain good standards of care and personal and plant hygiene. For details of these precautions we advise you to read the relevant publications issued by your local health authority, plus the following.

Storage

Always keep lubricants out of the reach of children.

Never store lubricants in open or unlabelled containers.

Waste Disposal

All waste products should be disposed of in accordance with all the relevant regulations.

The collection and disposal of used oil should be in accordance with any local regulations. Never pour used engine oil into sewers, drains or on the ground.

Handling

New Oil
There are no special precautions needed for the handling or use of new oil, beside the normal care and hygiene practices.

Used Oil
Used engine crankcase lubricants contain harmful contaminants.

Here are precautions to protect your health when handling used engine oil:

1 Avoid prolonged, excessive or repeated skin contact with used oil.

2 Apply a barrier cream to the skin before handling used oil.

3 Note the following when removing engine oil from skin:

- **a** Wash your skin thoroughly with soap and water.
- **b** Using a nail brush will help.
- **c** Use special hand cleansers to help clean dirty hands.
- **d** Never use petrol, diesel fuel, or paraffin for washing.

4 Avoid skin contact with oil soaked clothing.

5 Don't keep oily rags in pockets.
6 Wash dirty clothing before re-use.

7 Throwaway oil-soaked shoes.

First Aid - Oil

Eyes.
In the case of eye contact, flush with water for 15 minutes. If irritation persists, get medical attention.

Swallowing.
If oil is swallowed do not induce vomiting. Get medical **l**advice.

Skin.
In the case of excessive skin contact, wash with soap and water.

Spillage

Absorb on sand or a locally approved brand of absorbent granules. Scrape up and remove to a chemical disposal area.

Fires

Extinguish with carbon dioxide, dry chemical or foam. Fire-fighters should use self-contained breathing apparatus.

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Regular Maintenance and Lubrication Schedules

A poorly maintained machine is a hazard. Doing the regular maintenance and lubrication jobs listed in these schedules will help keep the machine in safe running order.

Apart from the daily jobs, the schedules are based on machine running hours. Keep a regular check on the hour meter reading. Do not use a machine which is due for a regular service. Rectify any defects found during regular maintenance before clearing the machine for use.

⚠ 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 level ground.

To prevent anyone starting the engine, remove the starter key. Disconnect the battery when you are not using electrical power. If you do not take these precautions you could be killed or injured.

8-3-1-1

Initial Precautions for New Machine Usage :-

⚠ CAUTION

If the machine is operated at full load before its initial run-in procedure is complete it may cause scuffing and seizing which can adversely effect the life of the machine.

8-3-1-5

A new machine is only dispatched when all inspection procedures are complete, but operating it under severe conditions from new will affect its performance and shorten its service life.

1 Carry out the daily inspection procedure.

2 Always warm up the machine (see **Warming-up** under **Using Your Machine).**

3 Check to see if the machine is running normally.

4 Avoid running or slewing the machine rapidly. '-

5 Avoid sudden shocks e.g. suddenly stopping the boom when lowering.

6 Where applicable, grease the front pins daily.

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Types of Fuel

Use good quality diesel fuel to get the correct power and performance from your engine. The recommended fuel specification is given below.

Cetane Number : 45 (minimum)
Viscosity : 2.5/4.5 centistokes at 40°C (104°F)
Density : 0.836/0.866 kg/litre (1.046/1.084 lb/pint)
Sulphur : 0.5% of mass (maximum)

Distillation : 85% at 350°C (662°F)

Cetane Number
Indicates ignition performance. Fuel with a low cetane number can cause cold start problems and affect combustion.

Viscosity
This is the resistance to flow. **If** this is outside limits, the engine performance can be affected.

Density
Lower density will reduce engine power. Higher density will increase both engine power and exhaust smoke.

Sulphur
High sulphur content can cause engine wear. (High sulphur fuel is not normally found in North America, Europe or Australia). If you have to use a high sulphur fuel you must also use a highly alkaline engine lubricating oil; or change the normal oil more frequently.

Distillation
This indicates the mixture of different hydrocarbons in the fuel. A high ratio of lightweight hydrocarbons can affect the combustion characteristics.

Low Temperature Fuels
Special winter fuels may be available for engine operation at temperatures below DoC (32°F). These fuels have a lower viscosity. They also limit wax formation in the fuel at low temperatures. (Wax forming in the fuel can stop the fuel flowing through the filter).
Flow improvers may also be available. These can be added to the fuel to reduce wax formation.

Advice
Consult your fuel supplier or JCB distributor concerning the suitability of any fuel you are not sure about. **If** you have to use non-standard fuels, contact your JCB distributor for advice on engine adjustments and oil change periods.

Fatty Acid Methyl Ester Fuels as a replacement for Diesel Fuels

Fuel resources such as Rape Methyl Ester and Soybean Methyl Ester, collectively known as Fatty Acid Methyl Esters are being used as alternatives and extenders for mineral oil. Fatty Acid Methyl Esters must conform to certain standards to be of acceptable quality, just as mineral oils do at present. Consult your JCB distributor for advice about the use of Fatty Acid Methyl Ester fuels, as improper application may impair engine performance.

Filling the Tank and Fuel Level Checking
For location of fuel tank refer to Identification of Machine Components at the end of this section

⚠ WARNING

Diesel fuel is flammable. Keep flames away from the machine. Do not smoke while fuelling the machine or working on the engine. Do not refuel with the engine running. There could be a fire and injury if you do not follow these precautions.
INT-3-2-2

1 Prepare the Machine
Park the machine on level ground. Lower the bucket to the ground.
2. Stop the Engine
Remove the starter key.
3 Filling the tank
a At the end of every working day, fill the tank with the correct type of fuel. This will prevent overnight condensation from developing in the fuel tank.
b We recommend that you lock the fuel cap to prevent theft and tampering.
c After filling, check the fuel level by looking at the fuel gauge.

Petrol

⚠ WARNING

Do not use petrol in this machine. Do not mix petrol with, the diesel fuel, in storage tanks the petrol could rise to the top and form flammable vapours.
INT-3-1-6

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Engine and Related Area (cont'd)

Problem	Cause	Remedy
Engine overheating (Water temperature reads too high)	Low coolant Water leakage Elongated or oil dirtied belt Defective radiator Broken fan Incorrect mixture of anti-freeze solution Defective thermostat Defective water pump Defective water sensor.	Refill. Repair. Clean or replace. Repair or replace. Replace. Replace. Replace. Replace. Replace.
Defective battery charge	Improper belt tension Wiring trouble Defective battery Defective regulator Defective alternator	Adjust. Repair. Replace. Replace. Replace.

***Refer to Engine Service Manual Publication No. 9803/2210**

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Periodic Replacement of Safety Related Components

Routinely replace important parts concemed with safety. It is difficult to determine by visual inspection or from operation the service life of specific parts, so routinely replace them as important parts every 2 years.

SAFETY PARTS CHART

Fuel System

Important Parts	Replacement Interval
Fuel Hose (Fuel Tank - Engine)	Every 2 years or every 4000 hours, whichever comes first
Fuel Hose (Fuel Filter - Injection Pump)	

Hydraulic System

Important Parts	Replacement Interval
Pump Exit Hose (Pump - Operation Valve)	Every 2 years or every 4000 hours, whichever comes first

Important Parts	Replacement Interval
Boom Ram Line Hose	Every 2 years or every 4000 hours, whichever comes first
Dipper Ram Line Hose	
Bucket Ram Line Hose	

If any abnormality is found with any of these parts before the replacement time, repair or replace as you would do normally.

When replacing the hoses, if the hose clamps are found to be deformed or cracked, replace the clamps at the same time as the hoses.

Regarding hydraulic hoses not included in the routine replacement of safety parts, carry out the inspection described below and re tighten, replace, etc, when any abnormality is found.

Note: Replace a-rings, gaskets at the same time as hoses.

Carry out inspection of the hydraulic hoses and fuel hoses at the routine inspection listed below.

Inspection Classification	Inspection Item
Start-up Inspection	• Fuel, Hydraulic hose connections, Oil Leakage from caulked parts .
Special Independent Inspection (Monthly Inspection)	• Fuel, Hydraulic hose connections, Oil Leakage from caulked parts • Fuel, Hydraulic hose damage (cracks, wear, picking) .
Special Independent Inspection (Yearly Inspection)	• Fuel, Hydraulic hose connections, all Leakage from caulked parts • Fuel, Hydraulic hose interference, squeezing, aging, twisting, damage (cracks, wear, picking)

Obtaining Replacement Parts

The machine's serial number is stamped on a data plate on the right hand side inside the cab. (See **Identifying Your Machine**). The data plate also shows the engine serial number. But remember if the e,ngine has been changed the serial number on the data plate may be wrong. Check on the engine itself.

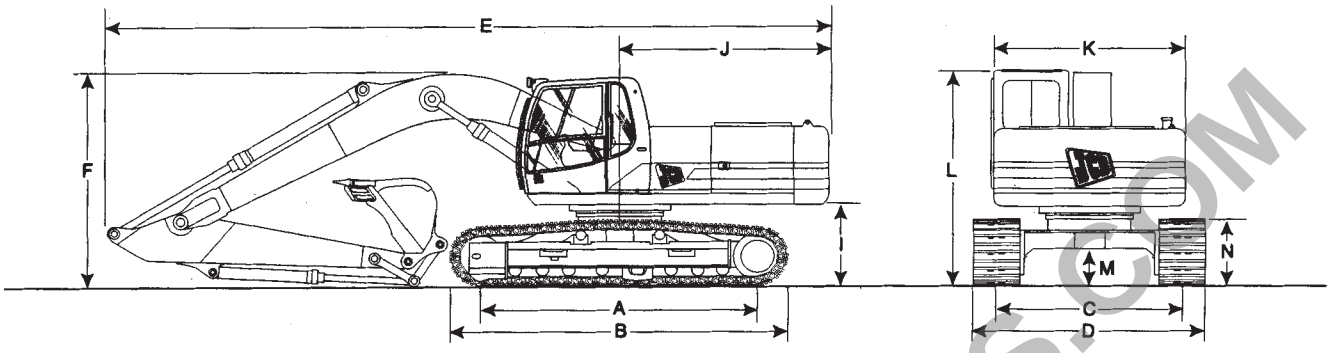
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Rivet Nut Tool Procedure

JS200/JS210/JS220

Monoboom

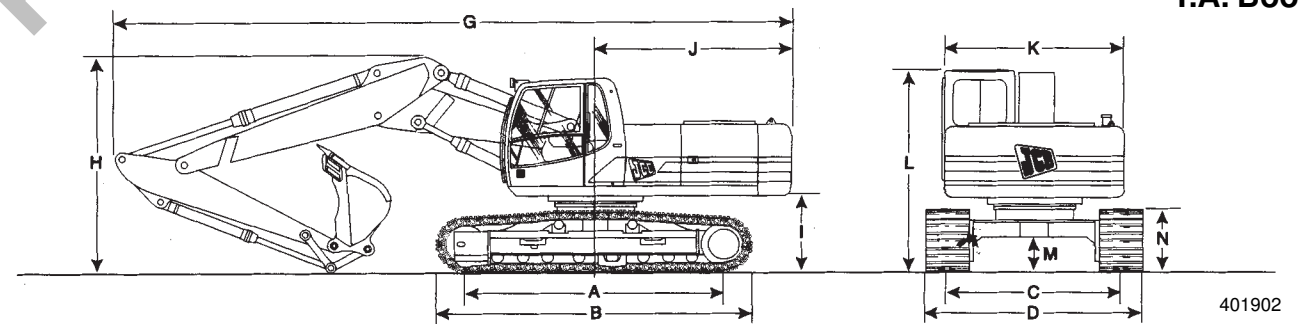


Dimensions in millimetres (ft. in)	SC	NC	LC
A Track length on ground	3370 (11 ft 1 in)	3370 (11 ft 1 in)	3660 (12 ft 0 in)
B Undercarriage overall length	4170 (13 ft 8 in)	4170 (13 ft 8 in)	4460 (14 ft 8 in)
C Track gauge	2200 (7 ft 2 in)	1990 (6 ft 6 in)	2390 (7ft 10 in)
D Width over tracks (500 shoes)	2700 (8 ft 10 in)	2490 (8 ft 2 in)	
D Width over tracks (600 shoes)	2800 (9 ft 2 in)	2590 (8 ft 6 in)	2990 (9 ft 10 in)
D Width over tracks (700 shoes)	2900 (9 ft 6 in)	2690 (8 ft 10 in)	3090 (10ft 2 in)
D Width over tracks (800 shoes)	- -	3190 (10ft 6 in)	
D Width over tracks (900 shoes)	- -	3290 (10ft 10 in)	

Dipper lengths	1.91 m	2.40 m	3.0 m
E Transport length with Monoboom	9570 (31 ft 5 in)	9560 (31 ft 4 in)	9440 (31 ft 0 in)
F Transport height with Monoboom	3055 (10ft 0 in)	3060 (10ft 0 in)	3025 (9 ft 11 in)
G Transport length with T.A. Boom	9598 (31 ft 6 in)	9573 (31 ft 5 in)	9499 (31 ft 2 in)
H Transport height with T.A. Boom	3128 (10 ft 3 in)	3065 (10 ft 1 in)	2913 (9 ft 7 in)

Dimensions in millimetres (ft in)	S/N/LC	
I Counterweight clearance	1066 (3 ft 6 in)	
J Tailswing radius	2825 (9 ft 3 in)	
K Width of superstructure	2549 (8 ft 4 in)	
L Height over cab	2946 (9 ft 8 in)	
M Ground clearance	486 (1 ft 7 in)	
N Track height	885 (2 ft 11 in)	

T.A. Boom



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HVAC Electrical Data

Flowchart reference	Wire function	Pin	Wire Colour
124	Switched battery +	10 on Unit connector	Black
C509	A/C Clutch relay	6 on Unit connector	Yellow / Red
C511	Relay coil power	86 on clutch relay	Red
C584	Fan control signal	4 on Unit connector	Green / White
C585	Relay out V batt +	1 on Unit connector	Green
E546	Press switch	2 on Unit connector	Orange
E548	Press switch	2 on Unit connector	Orange
E550	Watervalve actuator signal	5 on Unit connector	Blue
E551	Recirc actuator signal	7 on Unit connector	Blue / White
E554	A/C Clutch power	3 on Unit connector	White
E574	Actuator motor + 12V	9 on Unit connector	Blue / OranQe
E575	Batt + relay	4 on PWM /85 on batt relay	Brown

Pin out Functions and Voltages

Control Panel :

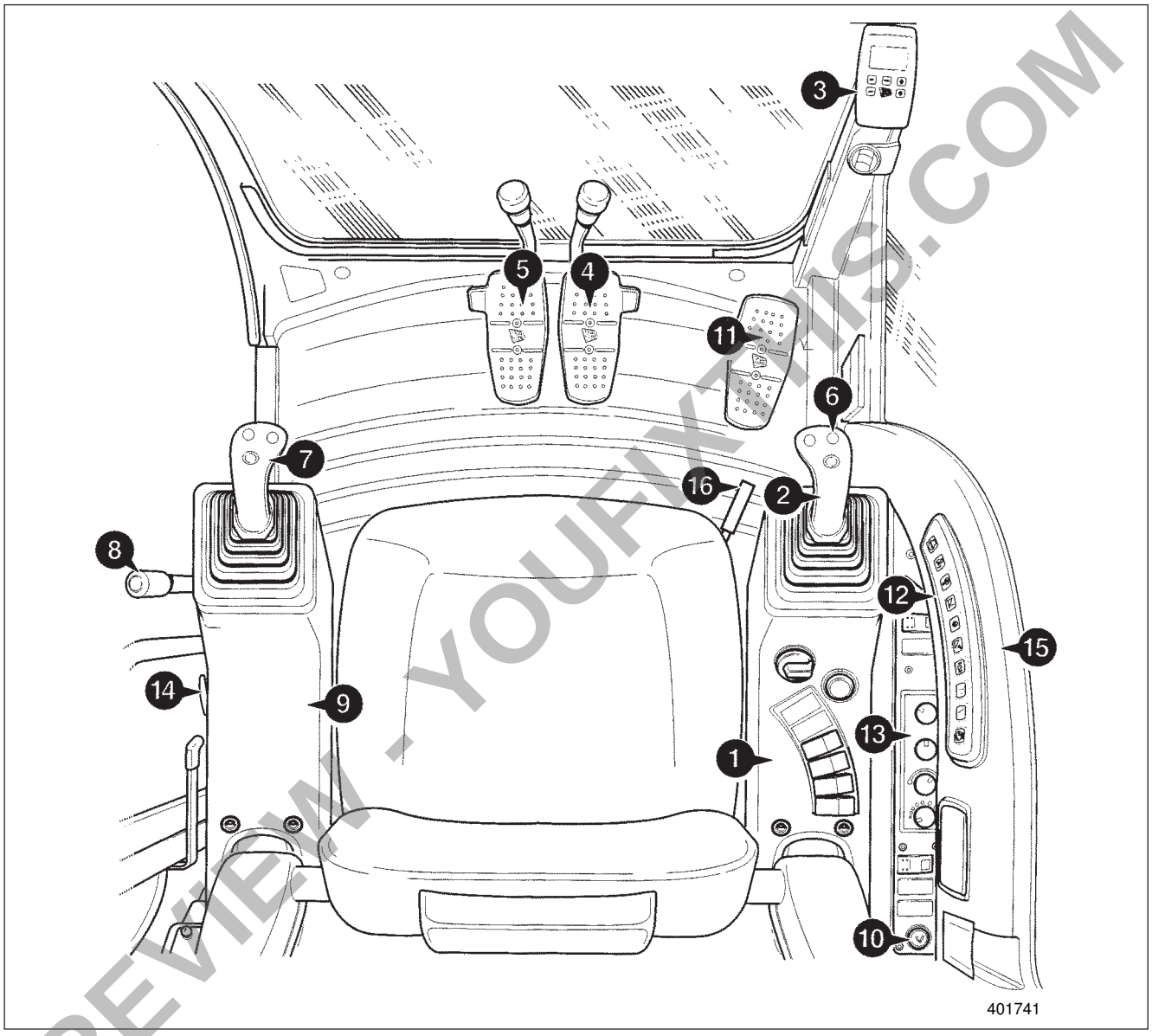
Pin #	Function	Notes
1	Sianal around	
2	+12V Dower from PWM	Should read -12.9V.
3	Switched +24V Dower from unit	Supplies Dower to backliaht LEDs.
4	Mode 1 output	Provides the output signal to the mode actuator. It should vary between 0 and 12 volts as the mode switch is adjusted.
5	Mode 2 output	Provides the output signal to the secondary mode actuator. It should vary between 0 and 12 volts as the mode switch is adjusted.
6	Recirc output	Provides the signal for the recirc/fresh air door actuator. It should vary between 0 volts and 12 volts, as the Fresh/Recirc switch is adjusted.
7	A/C clutch output a low volts with AC	Provides the output for the AC clutch relay. It provides output to the relay to activate the relay. With the relay connected, the output should be approximately 24 off. and .7 volts with the AC on.
8	Temperature potentiometer output	Provides the output signal for the blend door or the water valve. It should vary between 2.5 and 7 volts, when the temp potentiometer is adjusted.
9	Blower fan output	Provides the fan speed control signal to the PWM module. It should vary from 6 to 10 volts as the blower potentiometer is adjusted. Fully CCW the output is grounded.
10	NOT USED	
11	NOT USED	
12	NOT USED	

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Switches and Controls

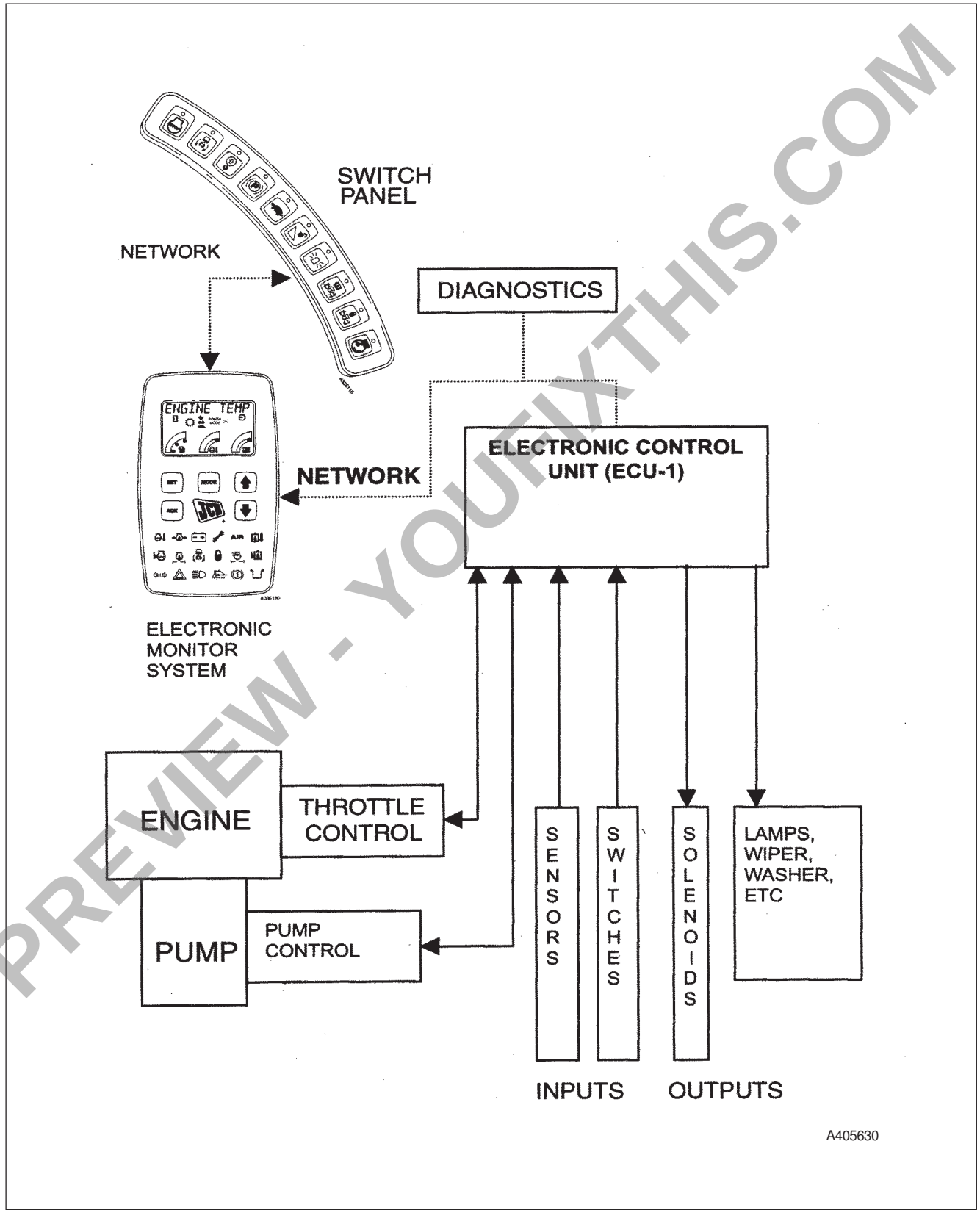
Location of Controls and Components



1 **Right Console**
2 **Right Excavator Joystick Control**
3 **Display Monitor (adjustable view)**
4 **Right Hand Track Control**
5 **Left Hand Track Control**
6 **Travel Speed Range Change Switch**
7 **Left Excavator Joystick Control**
8 **Control Lock Lever**
9 **Left Console**
10 **Cigarette lighter/ mobile phone charger**
11 **Optional Circuit Pedal (if fitted)**
12 **Fascia Switch Panel**
13 **Air Cond./Heater Controls**
14 **Interior light switch (Timed)**
15 **Facia Switch Panel**
16 **Seat/Console Slide Lever**

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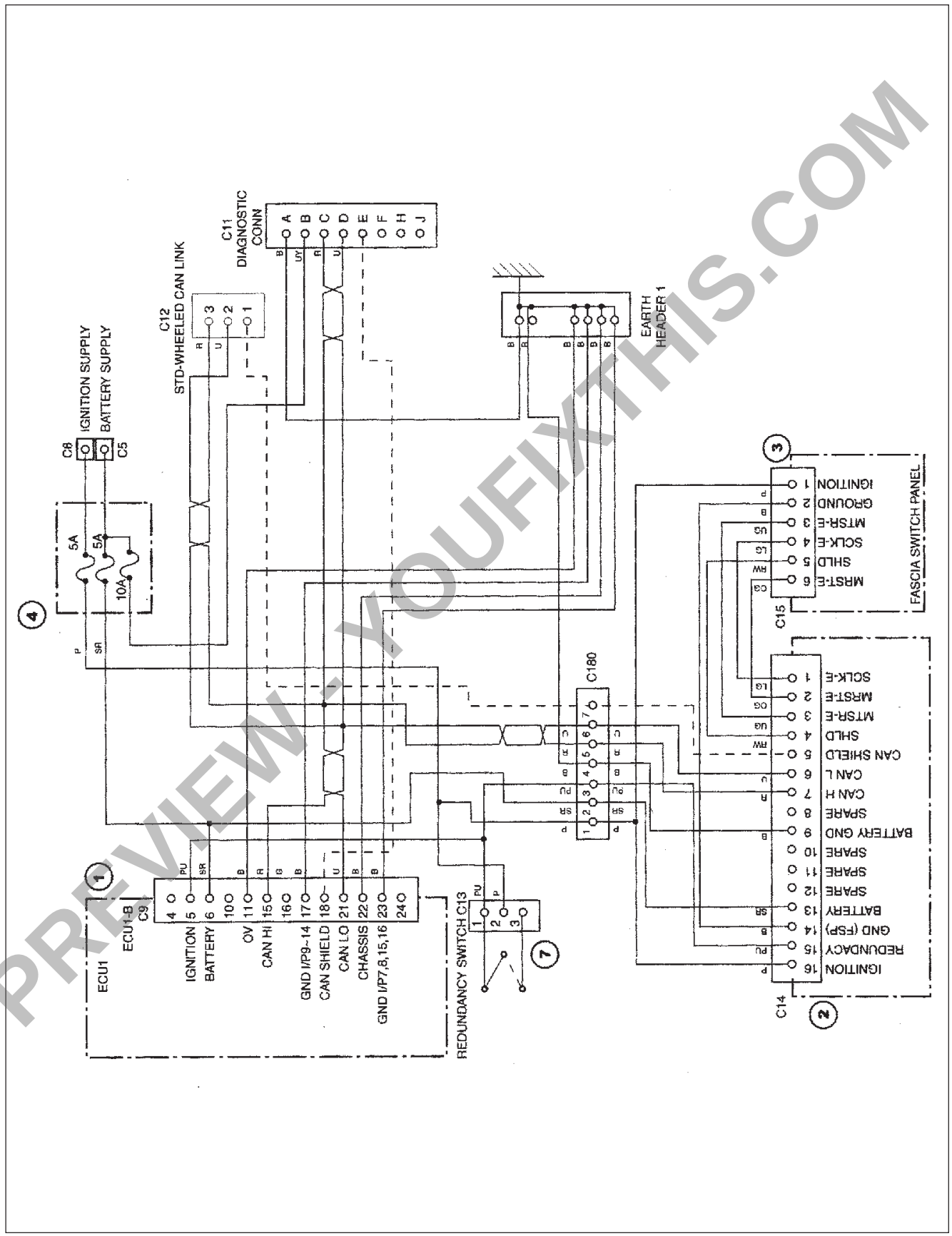
The AMS System



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ECU1/EMS/FACIA Power Supply and Network



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EMS Set+Mode (20 sec) Menu.
When the set and mode buttons on the EMS are pressed together for 20 seconds a sub menu structure appears, enabling JCB trained personnel to cancel the intermediate service warning, calibrate the throttle and override the engine speed sensor input to energise solenoids for testing purposes. The up/down arrows scrolls through the menu and the item is selected by pressing the “Ack” button. Pressing “set” at any time will return the operator to the normal display.
‘,,— Service off.
The intermediate service warning can be cancelled by entering this menu. To enter this menu the following procedure must be followed:
Press and hold the “Set” and “Mode” buttons on the EMS together for 20 seconds, until the “Service off” is displayed.
Press the “Ack” button. You are now in the “service off” routine and four zeros will appear in the display and you will be prompted to enter the JCB dealer code.
“0”000 Will be displayed and the left hand digit will be flashing. The up and down arrows are used to select the digit value and “Ack” to enter/accept the value and move to the next digit. When all digits are entered the final press of “Ack’ “- followed by a press of the “Set” button will extinguish the service indicator and record the service event. (hours, time and dealer code to the service history file).
Note: Information stored in the service history is available via the JCB Diagnostic tool. ~ Throttle calibration. ~
Throttle calibration is obtained via the Set + Mode (20 sec) menu on the EMS. The throttle calibration should be performed on
every new machine, when the throttle linkage parts are replaced or when the “No throttle” warning appears on the EMS. ,..-
To enter throttle calibration the following procedure must be followed:
‘ The engine must be started, and warmed up to normal operating temperatures.
Press and hold the “Set” and “Mode” buttons on the EMS simultaneously for 20 seconds, until the “Service off” message “- is displayed.
Use the scroll arrows until the “Calibrate” message is displayed.
Press the “Ack” button. You are now in the throttle calibration routine and the message “lower Limit” will appear in the display.
Rotate the throttle volume dial to the minimum position.
Press “Ack”. The “Upper Limit” message will then be displayed. ,-
Rotate the throttle volume dial to the maximum position.
Press “Ack”. The message “Working” will then be displayed and the engine will accelerate to maximum speed and slowly - reduce to idle speed. (This will take approximately 3 minutes).
When complete the engine will return to maximum revs and throttle control will be restored to the throttle volume dial. The EMS will revert to the normal display. . “-
Note: If the engine is stopped during the calibration, the “recalibrate” message is displayed and the procedure has to be restarted. If the throttle volume dial minimum and maximum values are the same, or the wrong way round, then “recalibrate” ~ is also displayed.
-..

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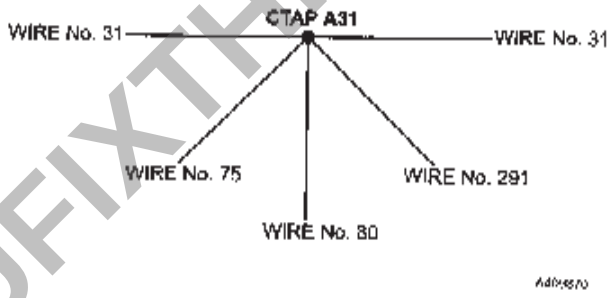
Cab Harness Data (cont'd)

Wire Number	Colour	Connector	Destination
240	BW	CTAP A47	C8
241	BW	C13	Earth Header 3
242	YR	C13	C10
243	-	-	-
244	-	-	-
245	BU	CTAP A165	C226
246	-		-
247	-	-	-
248	-	-	-
249	-	-	-
250	K	C200	C8
251	RW	C222	C8
252	GU	C201	C10
253	-	-	-
254	W	CTAP A259	C25
255	R	S/JOINT 12	C25
256	R	S/JOINT 12	C25
257	R	S/JOINT 12	C25
258	R	S/JOINT 12	C25
259	W	C25	C5
260	W	CTAP A259	C25
261	R	S/JOINT 12	C25
262	GB	S/JOINT 10	C25
263	N	S/JOINT 11	C25
264	RB	S/JOINT 9	C25
265	-	-	-
266	G	CTAP A55	C25
267	RG	CTAP A36	C25
268	LG	CTAP A284	C25
269	SR	S/JOINT 1	C25
270	UY	C11	C25
271	UR	S/JOINT 2	C25
272	P	CTAP A127	C25
273	-	-	-
274	-	-	-
275	R	S/JOINT 12	C6
276	-	-	-
277	-	-	-
278	-	-	-
279	-	-	-
280	BG	CTAP A36	C37
281	RG	CTAP A36	C200
282	RY	C2	C8
283	-	-	-
284	LG	C224	C33
285	GW	C225	C21
286	YR	C180	C21
287	UR	S/JOINT 2	C26
288	UR	S/JOINT 2	C226
289	RY	C225	C37
290	Y	C224	C225
291	R	C224	C37
292	G	CTAP A 55	C201
293	-	-	-
294	Y	C203	C202
295	G	C202	C37
296	-	-	-
297	BO	C224	Earth Header 4

Wire Number	Colour	Connector	Destination
298	BO	C203	Earth Header 4
299	BO	C224	Earth Header 4
300	-	-	-

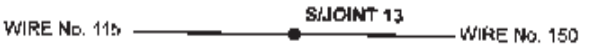
Splice - Example: CTAP A31

Splice Location	Wire No.	Wire Colour
A31	75	RG
A31	80	RG
A31	291	RG



Joint - Example: S/Joint 13

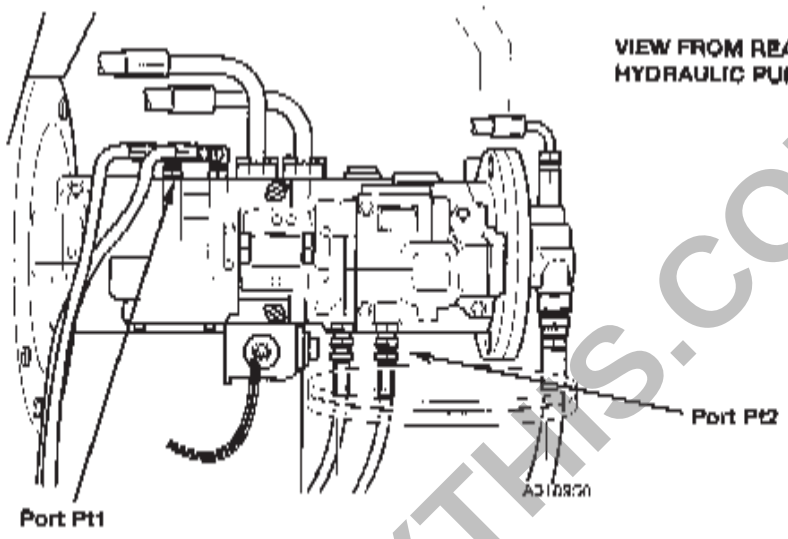
Joint Location	Wire No.	Wire Colour
13	115	RY
13	150	RY



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Test 001: Testing Negative Control Signal



- Fit test gauges (0 - 60 bar, 10 - 1000lb in^2) into hose connections to ports Pt1 + Pt2 with tee piece adapter
- Warm up machine hydraulic temperature to 50 °C (122 °F)

* This pressure will vary with oil temperature and engine speed.

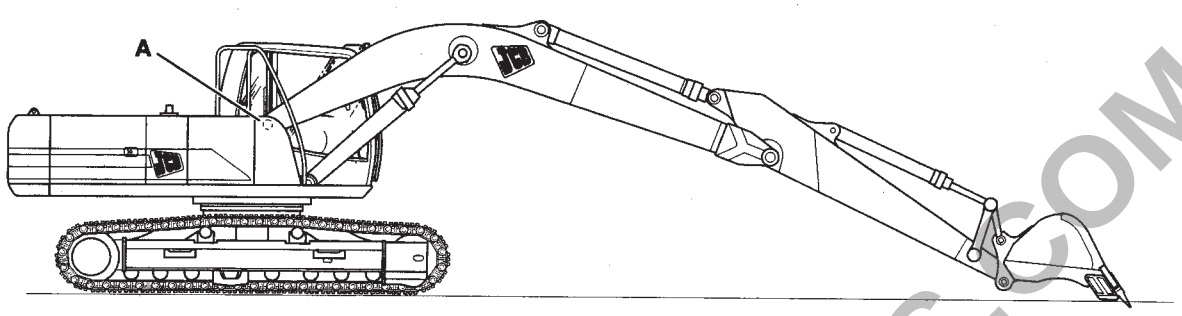
	(Expected Pressures) Port pt1	Port pt2
With max engine rpm's and no services selected record negative control pressure	30 - 35 bar* 435 - 507 lb in^2	(30 - 35 bar*) 435 - 507 lb in^2
Select and stall boom up service record pressure	(0 - 3 bar) 0 - 43.5 lb in^2	(0 - 3 bar) 0 - 43.5 lb in^2
Fully select boom down record pressure when service first selected	(30 - 35 bar) 435 - 507 lb in^2	(15 bar) 217.5 lb in^2
Select and stall bucket open service record pressure	(30 - 35 bar) 435 - 507 lb in^2	(0 - 3 bar) 0 - 43.5 lb in^2
Select and stall bucket close service record pressure	(30 - 35 bar) 435 - 507 lb in^2	(0 - 3 bar) 0 - 43.5 lb in^2
Select and stall dipper open service record pressure	(0 - 3 bar) 0 - 43.5 lb in^2	(0 - 3 bar) 0 - 43.5 lb in^2
Select and stall arm close service record pressure	(0 - 3 bar) 0 - 43.5 lb in^2	(0 - 3 bar) 0 - 43.5 lb in^2
Select and stall swing left service record pressure	(0 - 3 bar) 0 - 43.5 lb in^2	(30 - 35 bar) 435 - 507 lb in^2
Select and stall swing right service record pressure	(0 - 3 bar) 0 - 43.5 lb in^2	(30 - 35 bar) 435 - 507 lb in^2
Select and stall left hand track forward record pressure	(0 - 3 bar) 0 - 43.5 lb in^2	(30 - 35 bar) 435 - 507 lb in^2
Select and stall left hand track backwards record pressure	(0 - 3 bar) 0 - 43.5 lb in^2	(30 - 35 bar) 435 - 507 lb in^2
Select and stall right hand track forwards record pressure	(30 - 35 bar) 435 - 507 lb in^2	(0 - 3 bar) 0 - 43.5 lb in^2
Select and stall right hand track backwards record pressure	(30 - 35 bar) 435 - 507 lb in^2	(0 - 3 bar) 0 - 43.5 lb in^2

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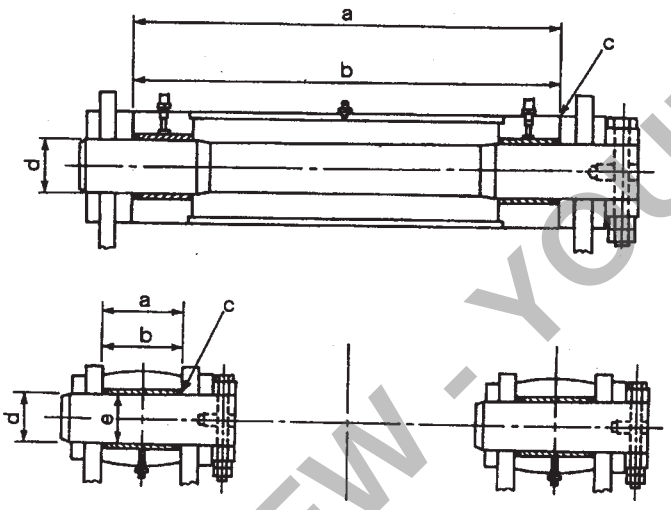
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Attachments



Boom and Slew Frame Installation A



Equipment Name	Part Name	Code	Standard Value (mm)		Standard Limit (mm)	
			JS200-JS220	JS240-JS260	JS200-JS220	JS240-JS260
1. Boom and slew frame installation	Slew frame	a	682	676	692	686
	Boom	b	681		679	
	Clearance	c	1.0-3.5	1.0-3.5	Shim for adjustment	
					KSP0268	KBV0474
	Pin	d	Ø90	Ø100	Ø89	Ø99
	Bushing (boom)	e	Ø90	Ø100	Ø91.5	Ø101.5
2. Boom ram and slew fram Installation	Slew frame	a	106	109	112	115
	Boom ram (dump end)	b	105	108	103	106
	Clearance	c	1.0-2.5	1.0-2.5	Shim for adjustment	
					KRV1197	KBW764
	Pin	d	Ø80	Ø90	Ø79	Ø89
	Bushing (boom ram)	e	Ø80	Ø90	Ø81.5	Ø91.5

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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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Introduction

This publication is designed for the benefit of JCB Distributor Service Engineers who are receiving, or have received, training by JCB Technical Training Department.

These personnel should have a sound knowledge of workshop practice, safety procedures, and general techniques associated with the maintenance and repair of hydraulic earthmoving equipment.

Renewal of oil seals, gaskets, etc., and any component showing obvious signs of wear or damage is expected as a matter of course. It is expected that components will be cleaned and lubricated where appropriate, and that any opened hose or pipe connections will be blanked to prevent excessive loss of hydraulic fluid and ingress of dirt. Finally, please remember above all else **SAFETY MUST COME FIRST!**

The manual is compiled in sections, the first three are numbered and contain information as follows:

1 = **General Information** - includes torque settings and service tools.
2 = **Care & Safety** - includes warnings and cautions pertinent to aspects of workshop procedures etc.
3 = **Routine Maintenance** - includes service schedules and recommended lubricants for all the machine.

The remaining sections are alphabetically coded and deal with Dismantling, Overhaul etc. of specific components, for example:

A = **Attachments**
B = **Body & Framework ...etc.**

The page numbering in each alphabetically coded section is not continuous. This allows for the insertion of new items in later issues of the manual.

Section contents, technical data, circuit descriptions, operation descriptions etc are inserted at the beginning of each alphabetically coded section.

All sections are listed on the front cover; tabbed divider cards align directly with individual sections on the front cover for rapid reference.

Where a torque setting is given as a single figure it may be varied by plus or minus 3%. Torque figures indicated are for dry threads, hence for lubricated threads may be reduced by one third.

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Rivet Nut Tool 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 hydraulic valve 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.**

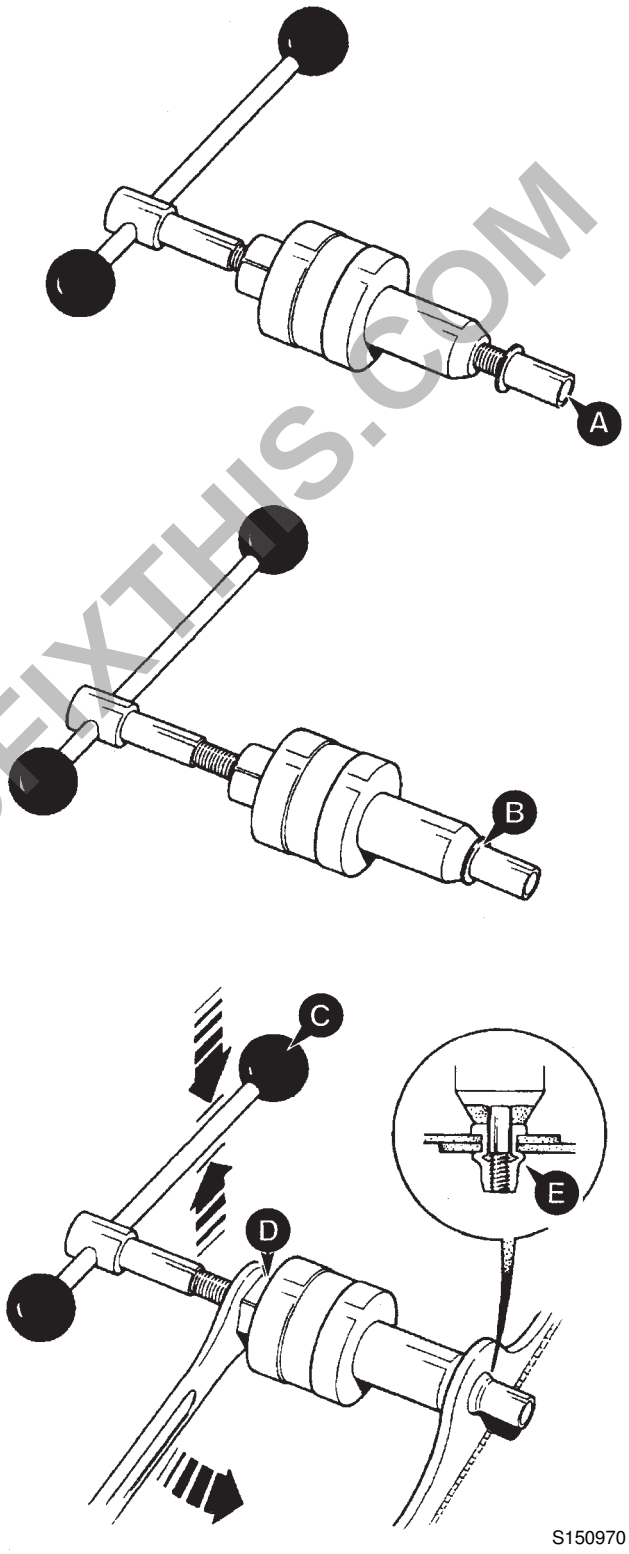
3 Wind the body of the installation tool down the threaded mandrel until it touches the head of the rivet nut, shown at **B.**

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.



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Specifications (all dimensions in mm)

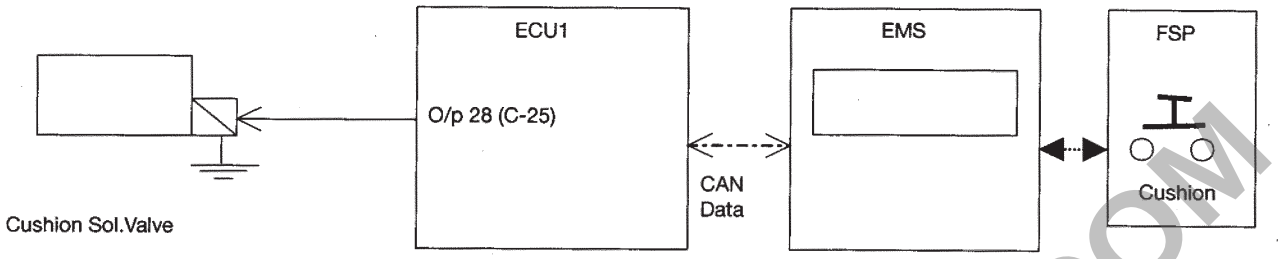
Rivet Nut Thread Diameter	Rivet Nut Outside Diameter	Material Thickness	Rivet Length (Total)	Drill Hole Dia.
M5	7	0.25 - 3.00	14.00	7.10
		3.00 - 5.50	17.00	
M6	9	0.50 - 3.00	16.00	9.10
		3.00 - 5.50	19.00	
M8	11	0.50 - 3.00	18.00	11.10
		3.00 - 5.50	21.00	
M10	13	1.00 - 3.50	23.00	13.10
		3.50 - 6.00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

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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Soft/Hard (Cushion)



Operation

The soft/hard mode allows the operator to select the response of the hydraulic circuits, soft being controlled and hard being fierce when de-selecting boom and dipper functions. Soft mode is the default setting when starting the machine.

To change to hard mode the operator must select the option by pressing cushion switch on the facia switch panel. Cushion solenoid output ECU O/pC 25 is energised.

The Hard mode is cancelled either by turning the ignition off, or by pressing the cushion switch for a second time.

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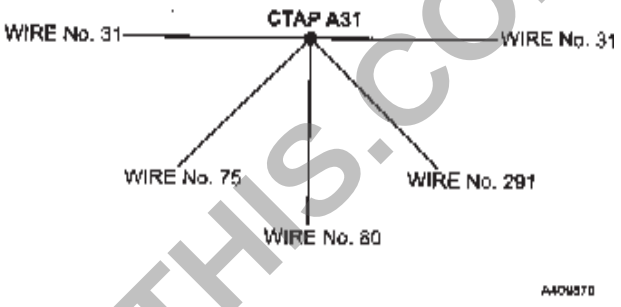
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Facia Link Harness Data

Wire Number	Colour	Connector	Destination
1	P	C18	C180
2	SR	C180	C49
3	PU	C14	C180
4	B	C41	C180
5	R	C14	C180
6	U	C14	C180
7	SCR	C180	C14
8	U	C180	C15
9	UK	C180	C15
10	UO	C18	C225
11	UW	C18	C225
12	YR	C18	C226
13	UY	C225	C24
14	Y	C225	C24
15	RS	C181	C49
16	RW	C181	C49
17	SR	CTAP A2	C14
18	B	CTAP A4	C223
19	B	CTAP A4	C49
20	P	CTAP A1	C14
21	B	CTAP A4	C14
22	P	CTAP A1	C24
23	P	CTAP A1	C24
24	B	CTAP A4	C24
25	P	CTAP A1	C24
26	P	CTAP A1	C15
27	B	C14	C15
28	UG	C14	C15
29	LG	C14	C15
30	RW	C14	C15
31	OG	C14	C15
32	-	-	-
33	-	-	-
34	U	C18	C225
35	GW	C18	C225
36	Y	CTAP A38	C225
37	RY	C223	C225
38	Y	C159	C223
39	P	CTAP A1	C49
40	Y	C40	C223
41	SR	CTAP A2	C49
42	R	CTAP A4	C18

Splice - Example: CTAP A31

Splice Location	Wire No.	Wire Colour
A31	75	RG
A31	80	RG
A31	291	RG



Joint - Example: S/Joint 13

Joint Location	Wire No.	Wire Colour
13	115	RY
13	150	RY



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Symptoms of Pressure Switch Failures

	Pressure switches that need to be closed when selected, to avoid the issues described.						
	Upper pilot	Travel	Auto mode	Boost	Boom up	Hammer	Slew
In Auto /one touch Idle, engine will not return to full RPM when service is selected	Closed when selected	Closed when selected	Closed when selected				
In Auto mode the engine fails to rise to full engine RPM when Boom or Dipper are fully selected.			Closed when selected				
Slow speed travel (Tortoise) does not work		Closed when selected					
2nd Stage MRV (Power boost) does not work in Auto mode. (**See Test 003 for testing Power Boost**)		Check to see it is ***NOT*** closed		Check closed when selected			
Slew does not slow down when operating slew and boom up in boom priority mode					Closed when selected		
Slew start up and slow down is very erratic and juddering.							Closed when selected

Note: See **Main Control Valve and Shuttle Valve** in **Circuit Descriptions** for location of Pressure Switches.

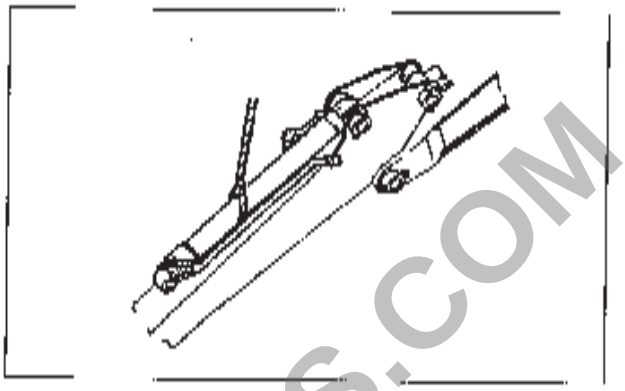
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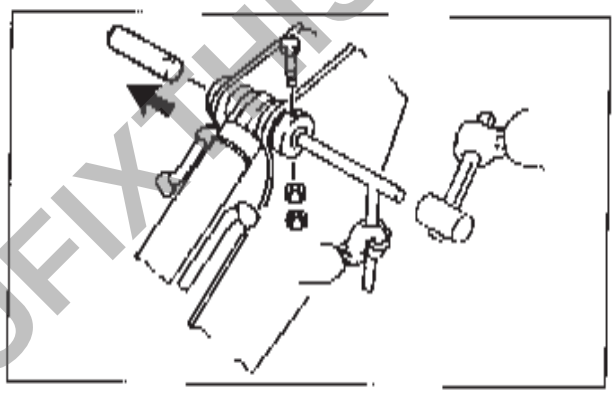
Bucket Ram (cont'd)

Removal (cont'd)

8 Attach a sling and lift the bucket ram.

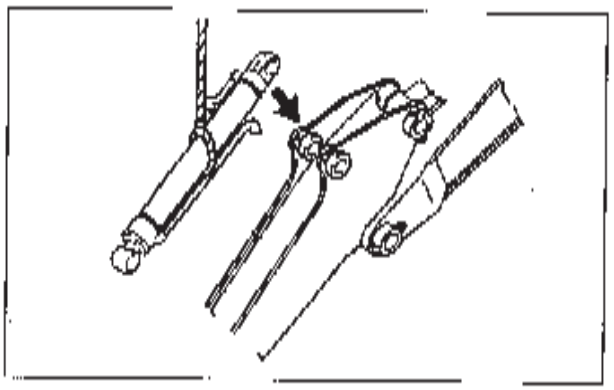


9 Remove the nuts and bolts. Push out the pin using a bar and hammer.



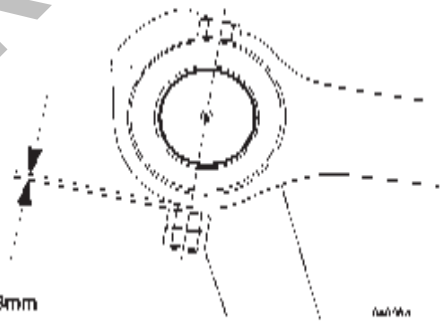
Installation

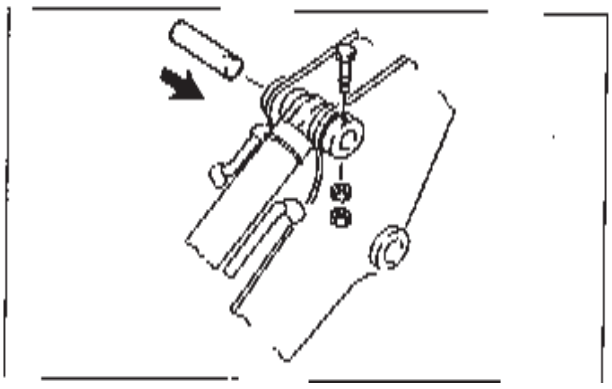
1 Attach a sling to the bucket ram and lift it into the dipper.



2 Install the pin, bolt and nuts.

Note: When checking or refitting JS machine pivot pins,the retaining nuts and bolts should not be fastened up tight to the pivot boss but must have approximately 3mm of play so that the pin is free from tension





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