

Electrics

Service Manual - JS Auto Range - Tracked Excavators - JCB Engine

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Basic System Operation

Circuit Symbols

TC-013

The following notations are used in the description circuit, drawings.

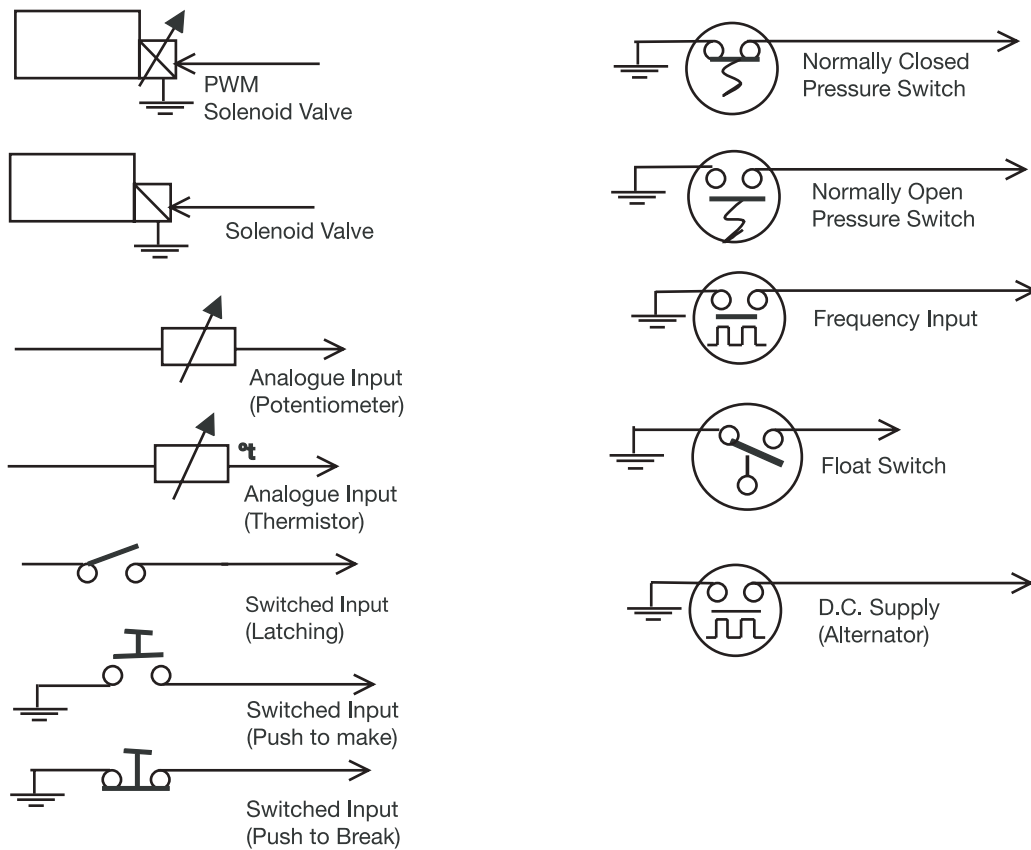


Fig 1.

C005310GB-2

Inputs and Outputs

The letters i/p and o/p refer to input and output.

The letters in brackets i.e. (C-21) refer to the connector and pin number.

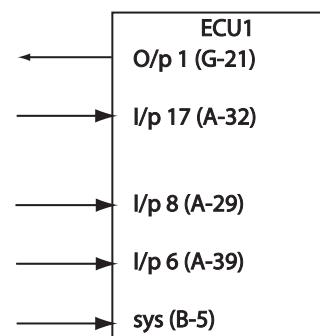


Fig 2.

C001660-2



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Schematic Diagram

JS115-145

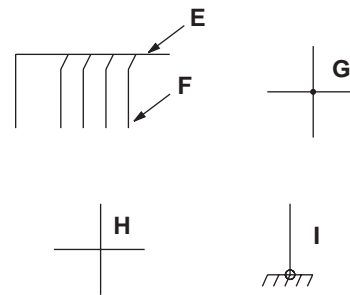
The item numbers in the following table are identified on the wiring schematics in this section. ⇒ [Fig 12. \(□ C-10\)](#).

Item	Part Number	Description
1	332/K6848	Electronic control unit 1
2	332/K4244	Electronic monitor system
3	701/80369	Facia switch panel
5	716/30155	Throttle dial
6	701/80184	Key switch
7	701/80214	Switch (redundancy)
8	332/K6274	ATC
9	332/J3834	Heater
10	332/K4895	Controller (ATC)
10	332/K4896	Controller (Heater)
11	701/E0034	Switch body
12	701/E8826	Switch cap (worklamp)
13	332/L6105	Power Socket (12v)
14	717/K4986	Radio
15	701/80215	Limit switch (lever)
16	701/E0041	Switch (cab light)
18	700/43900	Work lamp
19	700/50022	Work lamp
20	332/J0670	Breaker pilot switch
21	25/222892	LH Lever switch
22	25/222892	RH Lever switch
23	717/C5944	Volt dropper
25	714/40289	Wiper
26	6900/0587	Room lamp
27	716/30205	Battery relay
28	332/F3103	Battery
32	332/J4523	Valve block solenoid
35	332/J0670	Pilot switch, upper
36	332/J0671	Pilot switch, travel
37	332/J0669	Pilot switch
40	717/07700	Travel alarm

Item	Part Number	Description
41	333/J3309	Pump
42	20/925546	Refuel pump
43	333/J2693	Lower wiper
44	332/S4197	Beacon
45	320/08563	Air con compressor
46	30/925618	Air con binary switch
47	717/20152	Horn
48	JHN0160	Washer bottle
50	716/30129	Temperature sensor
51	701/80328	Overheat switch
52	333/J2937	Fuel level sensor
53	331/13929	Coolant level switch
54	JNH0070	Air filter clog switch
55	701/80192	Overload pressure switch
56	332/J0671	Pilot switch, auto mode
57	332/J2971	Pilot switch, auto boost
58	701/E0001	Switch (radio mute)
59	701/E0034	Switch (heated seat)
60	332/K6199	Heated seat
61	332/K2446	Direction control valve
64	721/10455	Harness hammer
65	701/11632	Harness
66	701/E0223	Switch body
67	701/E0032	Switch body
68	721/10458	Harness Ham/Aux merged
71	25/222397	Proportional Solenoid
72	333/J7614	Harness - main
73	333/J7613	Harness - cab
74	333/J7614	Harness - facia ATC
74	333/J7616	Harness - facia Heater
77	JHR0174	Relay
78	701/80310	Switch refueling pump
79	721/11451	Harness - low flow
80	717/C5945	Volt Dropper 15A
81	701/47400	Battery Isolator

Item	Part Number	Description
82	265/00893	Battery Isolator Relay 24V Cover
83	333/S5959	Relay 24V Relay
85	332/J9681	Cab PCB
	716/C9471	Ambient Temp Sensor
	333/J3630	Throttle Actuator
	333/J3672	Throttle Position Sensor
	320/09522	RPM Sensor

Note: Items 64 to 68 are part numbers for the bridging harnesses and switches for the option switch in the right hand console



A408581

Fig 4.

- E Multiple cables
- F Single cables
- G Cables joined
- H Cable not joined
- I Earth cables

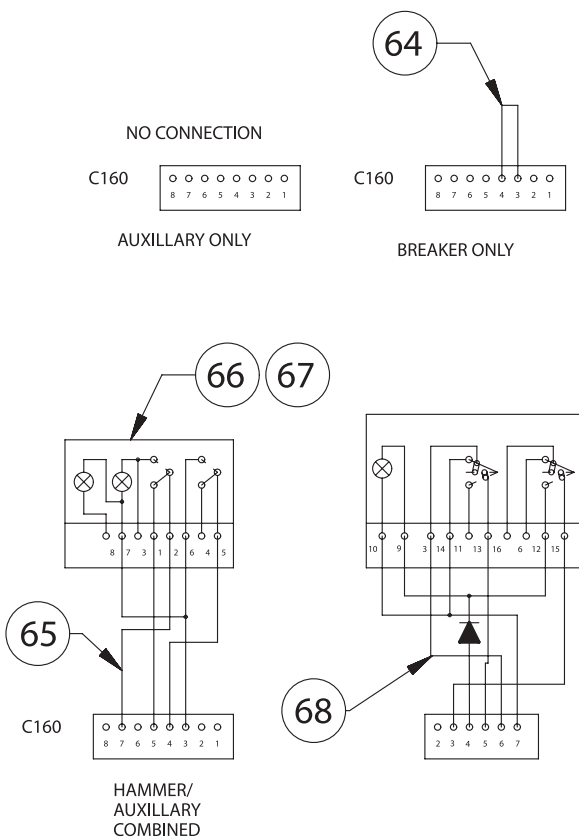


Fig 3.

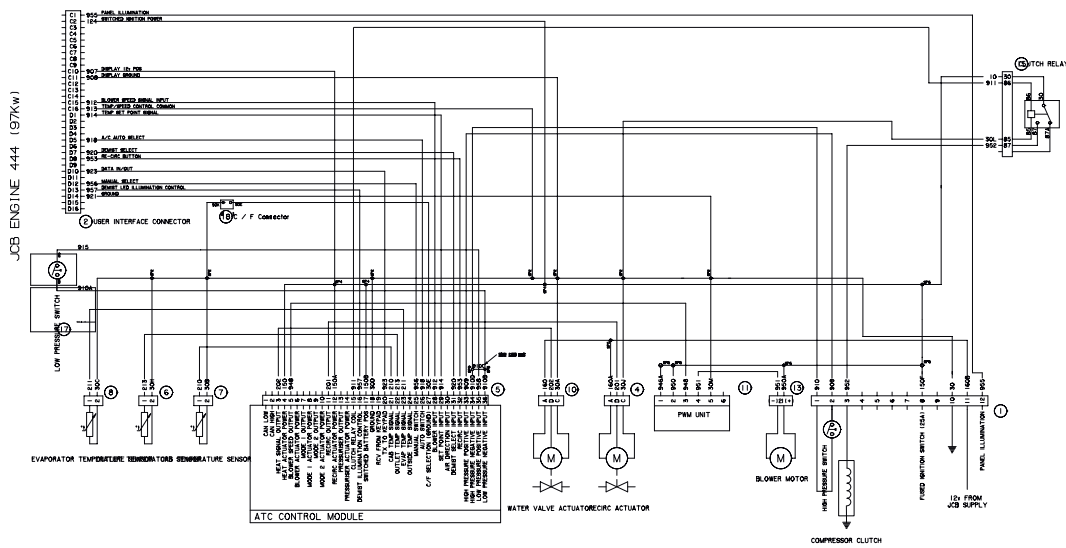


Fig 5. 333/J6805 - Issue 1 - Sheet 2 - ATC Schematic

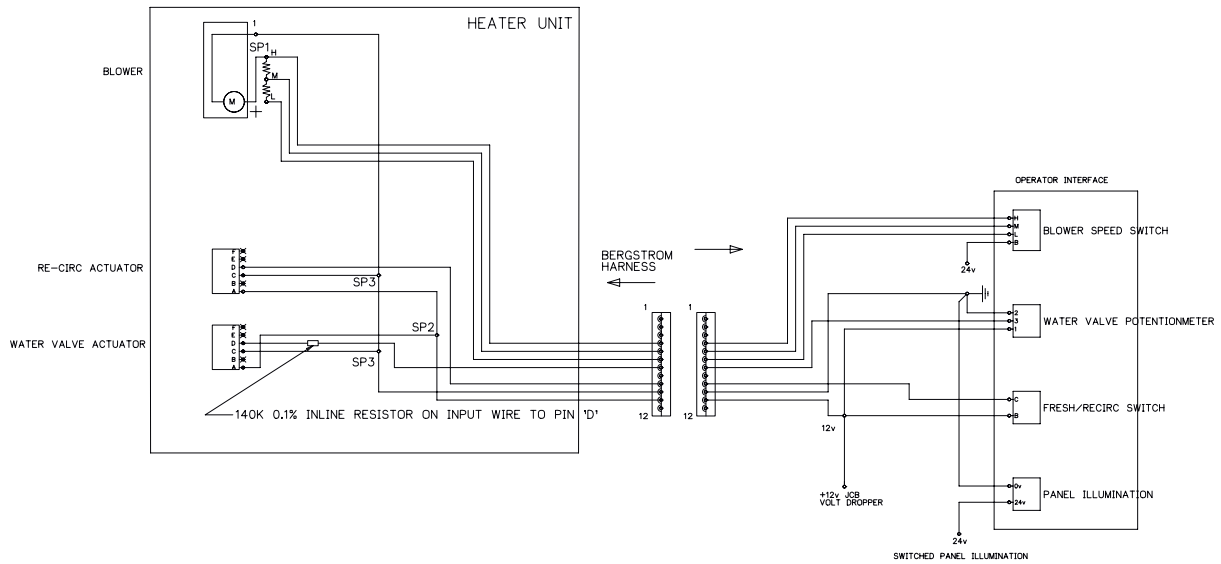


Fig 6. 333/J6805 - Issue 1 - Sheet 2 - Heater Schematic

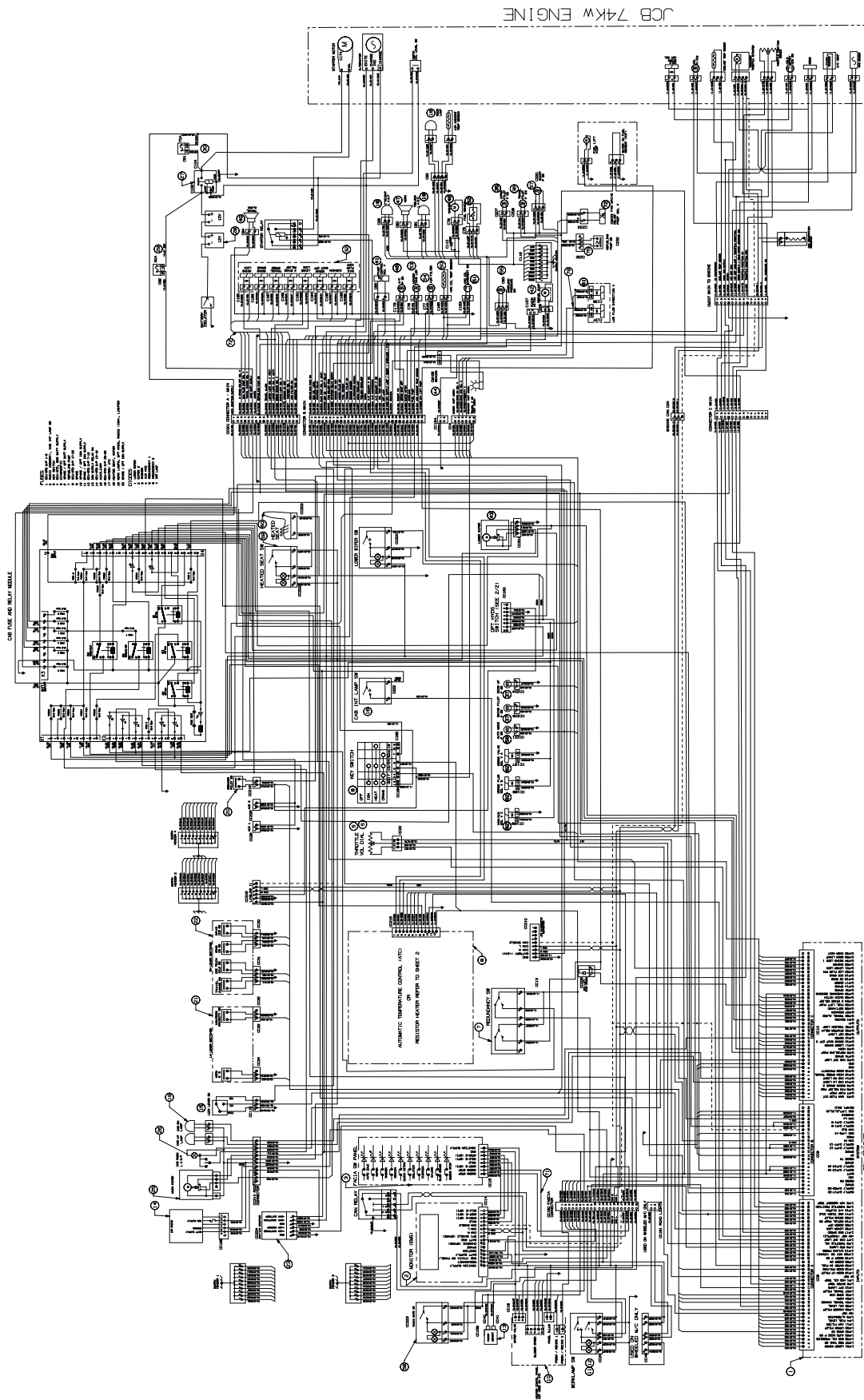


Fig 7. 333/J6805 - Issue 1 - Sheet 1

JS160-JS220

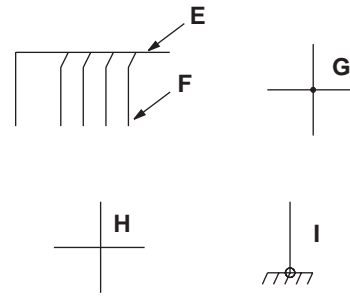
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3	701/80369	Facia switch panel
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7	701/80214	Switch (redundancy)
8	332/K6274	ATC
9	332/J3834	Heater
10	332/K4895	Controller (ATC)
10	332/K4896	Controller (Heater)
11	701/E0034	Switch body
12	701/E8826	Switch cap (worklamp)
13	332/L6105	Power Socket (12v)
14	717/K4986	Radio
15	701/80215	Limit switch (lever)
16	701/E8906	Switch (cab light)
18	700/43900	Work lamp
19	700/50022	Work lamp
20	332/J0670	Breaker pilot switch
21	25/221094	LH Lever switch
22	25/221095	RH Lever switch
23	717/C5944	Volt dropper
25	6900/0624	Wiper
26	6900/0587	Room lamp
27	716/30205	Battery relay
28	332/F3103	Battery
32	25/222203	Valve block 8 station
35	332/J0670	Pilot switch, upper
36	332/J0671	Pilot switch, travel
37	332/J0669	Pilot switch
40	717/07700	Travel alarm
41	333/J0818	Pump JS160
41	333/J4187	Pump JS200
42	20/925675	Refuel pump

Item	Part Number	Description
43	215/11950	Lower wiper
44	332/S4197	Beacon
45	123/04999	Air con compressor
46	30/926997	Air con binary switch
47	717/20152	Horn
48	JHN0160	Washer bottle
50	716/30129	Temperature sensor
51	701/80328	Overheat switch
52	333/J2937	Fuel level sensor
53	331/13929	Coolant level switch
54	JNH0070	Air filter clog switch
55	701/80192	Overload pressure switch
56	332/J0671	Pilot switch, auto mode
57	332/J2971	Pilot switch, auto boost
58	701/E0001	Switch (radio mute)
59	701/E0034	Switch (heated seat)
60	332/K6199	Heated seat
61	JRJ0343	Direction control valve
62	25/220536	Valve, solenoid
63	25/222887	Priority valve (w/cutter)
		Priority valve (grab rotate)
64	721/10455	Harness hammer
65	701/11632	Harness
66	701/E0223	Switch body
67	701/E0032	Switch body
68	721/10458	Harness Ham/Aux merged
72	25/222397	Harness - main JS160
72	332/J2881	Harness - main JS200
73	332/J2885	Harness - cab
74	332/K2452	Harness - facia ATC
74	332/K2461	Harness - facia Heater
77	JHR0174	Relay
78	701/80310	Switch refueling pump
79	721/11451	Harness - low flow
80	717/C5945	Volt Dropper 15A
81	701/47400	Battery Isolator
82	265/00893	Battery Isolator Relay 24V Cover
83	333/S5959	Relay 24V Relay

Item	Part Number	Description
84	717/20359	Relay Box
85	332/J9681	Cab PCB
86	717/20359	POD BOX

Note: Items 64 to 68 are part numbers for the bridging harnesses and switches for the option switch in the right hand console



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Fig 9.

- E Multiple cables
- F Single cables
- G Cables joined
- H Cable not joined
- I Earth cables

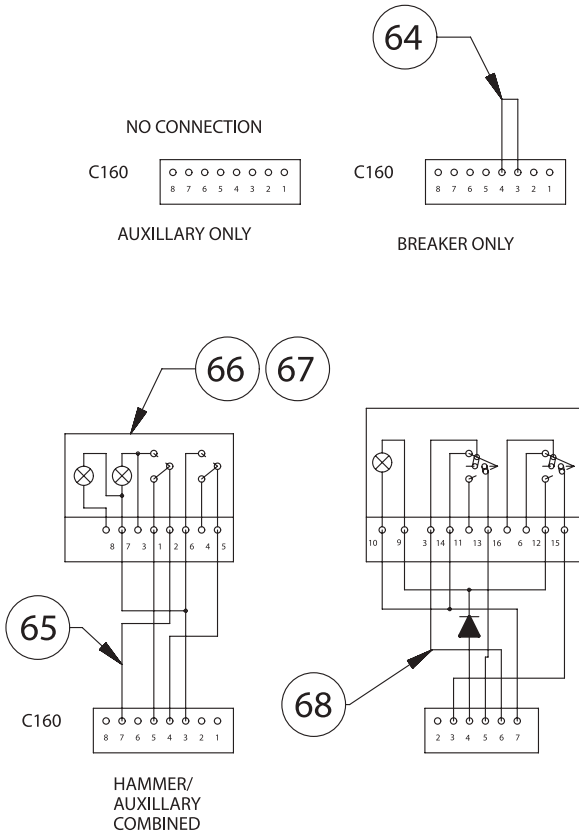


Fig 8.

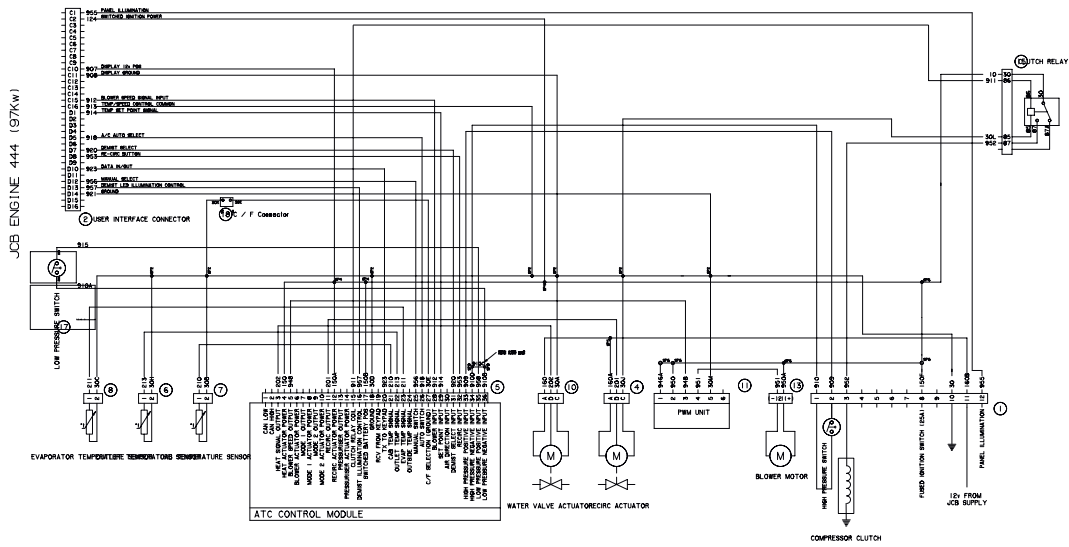


Fig 10. 332/K4939 - Issue 4 - Sheet 2 - ATC Schematic

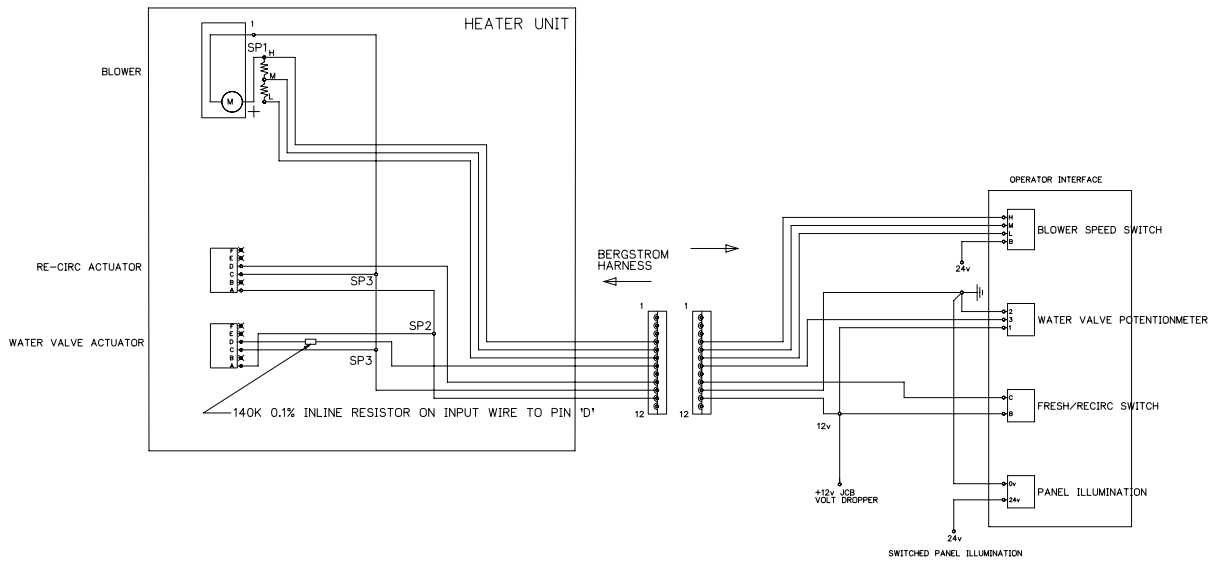


Fig 11. 332/K4939 - Issue 4 - Sheet 2 - Heater Schematic

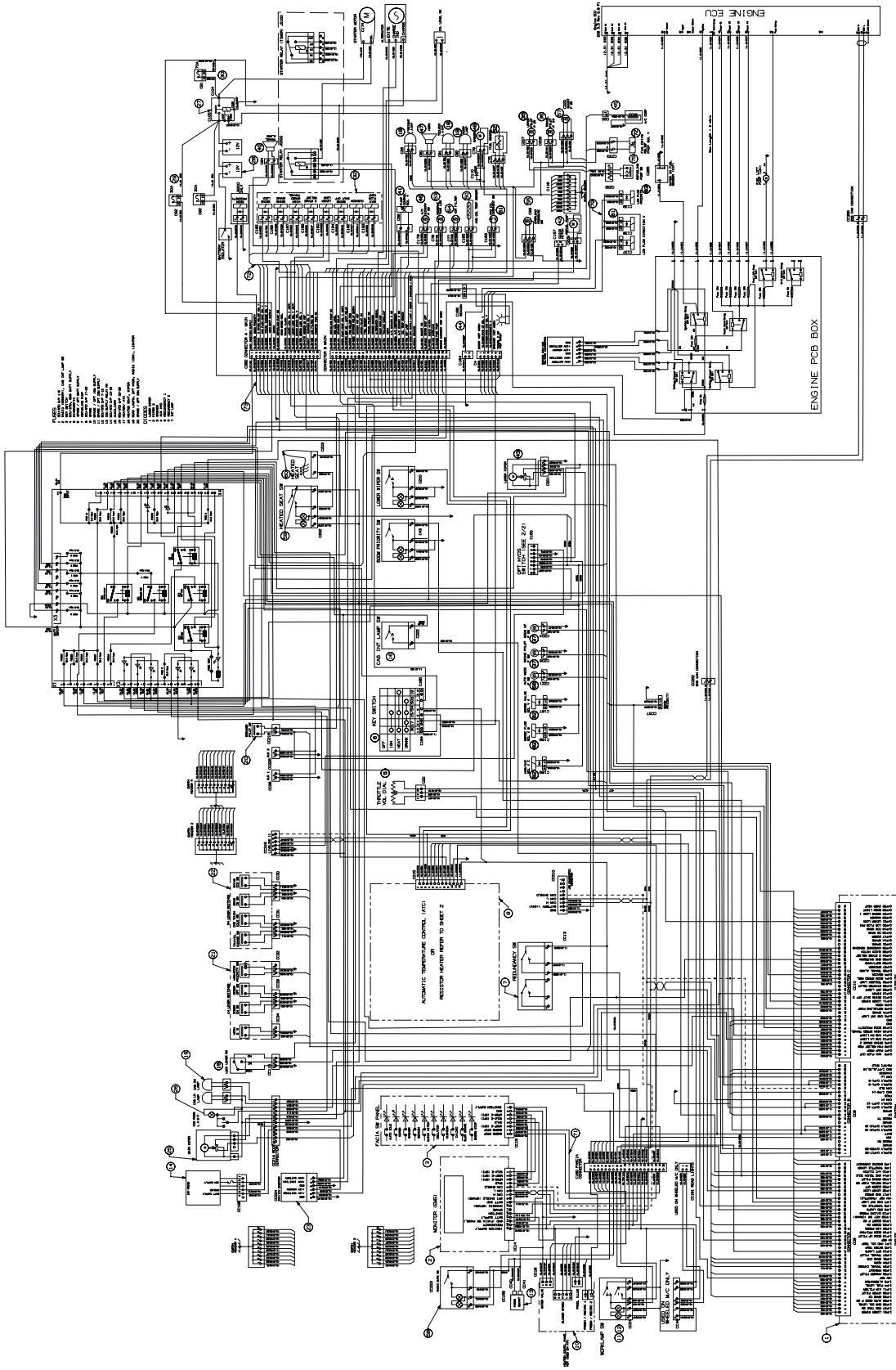


Fig 12. 332/K4939 - Issue 4 - Sheet 1

A.M.S (Advanced Management System)

Operation

The JCB A.M.S system is a whole machine electronic control system. The system controls engine speed, pump power, transmission, excavator functions, lights, wiper, auxiliary circuits, warning lamps, etc. The system is a 'CAN BUS' system which links Electronic Control Units (ECUs) on the vehicle. This stands for 'Controlled Area Network' and uses a special cable in the vehicle harness which consists of two signal wires twisted together covered by a metal foil to prevent any electrical interference. These signal wires form the CAN -BUS. The CAN - BUS is used to send text and fault codes between the ECUs. The electronic units receive inputs from switches and sensors and drive outputs such as solenoids, lamp bulbs and motors. The outputs of the ECUs are rated to the current requirement of the actuator.

The system comprises of the following main electronic components.

- A** Electronic Control Unit -1 (ECU-1)
- B** Electronic Monitoring System (EMS)
- C** Fascia switch panel (FSP).
- D** Engine Control Module (ECM)
JS160-220 Models only.

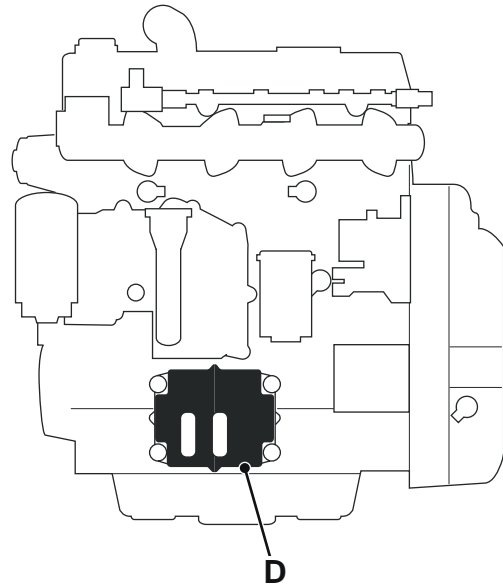


Fig 14. JS160-220

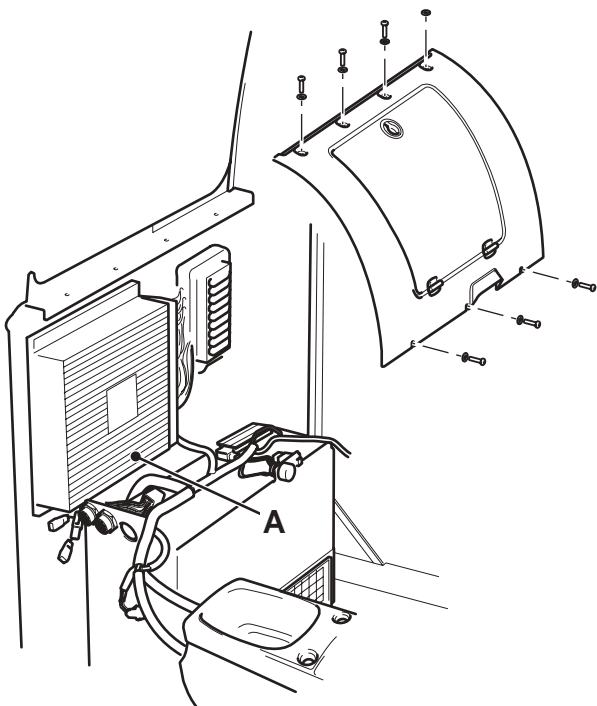


Fig 13.

C030670-C3

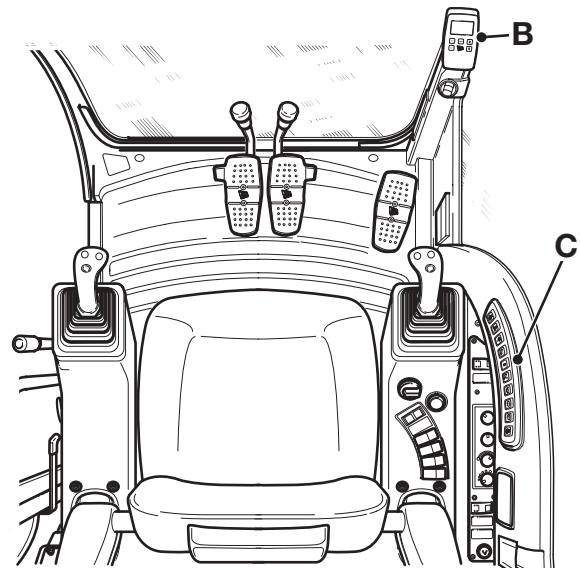


Fig 15.

401741-C4

T006140-1

The AMS System

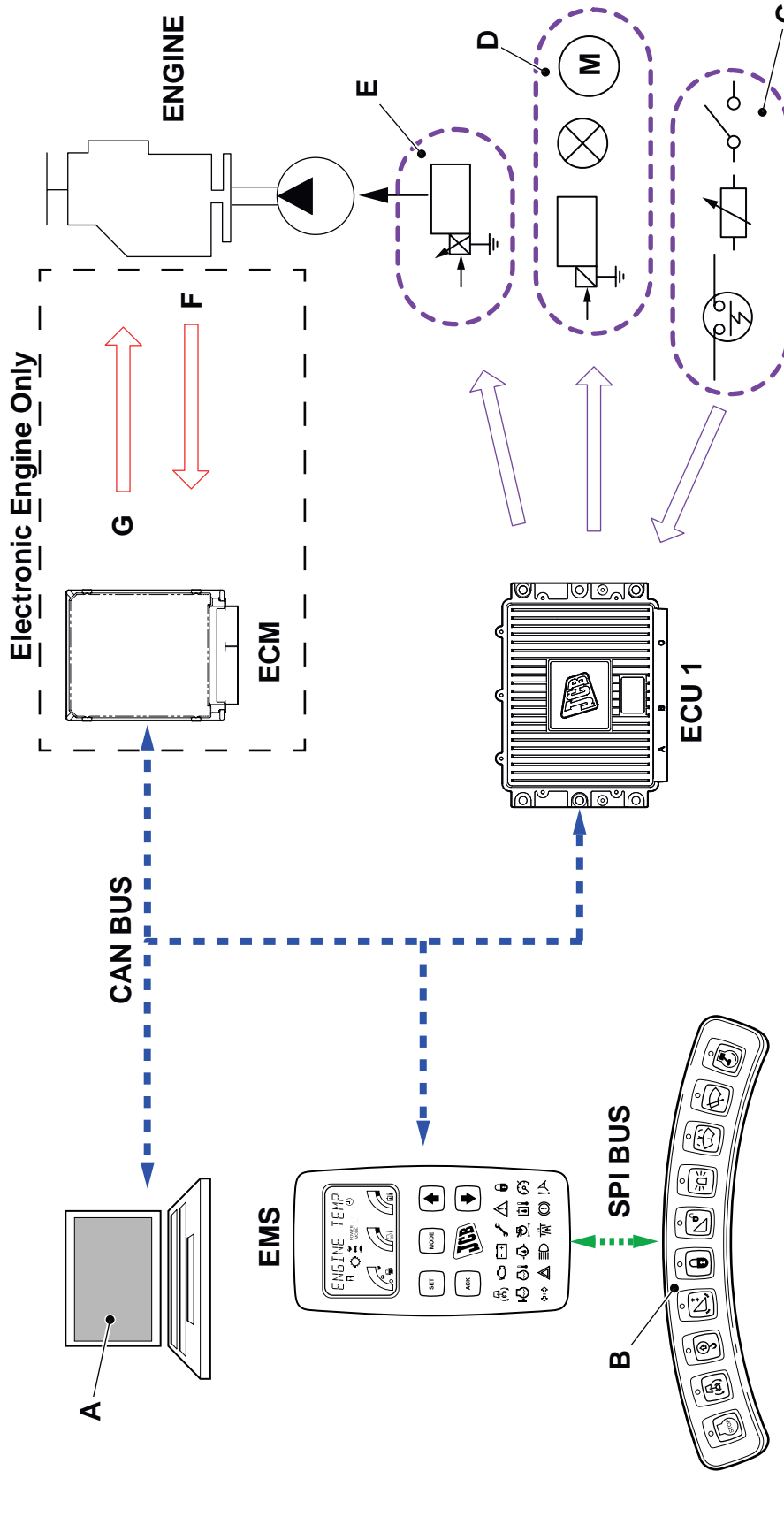


Fig 16.

Key

- A Diagnostic port
- B Facia switch panel
- C Switches and sensors
- D Solenoid, lamps and motors
- E Pump solenoid
- F Inputs from switches and solenoids
- G Outputs to injectors and motors

Circuit Concepts

Inputs

There are two main types of input, Digital and Analogue.

Digital type inputs are on/off type inputs (i.e. switches) and can be Low side inputs or High side inputs. Low side inputs are inputs that provide a ground to the ECU. High side inputs are inputs that provide a positive feed to the ECU.

Analogue Inputs are sensor type inputs that provide a varying type input to the ECU, this input could be a resistance or frequency type input.

Digital inputs (on/off switch type inputs)

- 1 Low side input. The low side input is the most frequently used input on the A.M.S system. The low side input can be in the form of rocker switches or pressure switches.

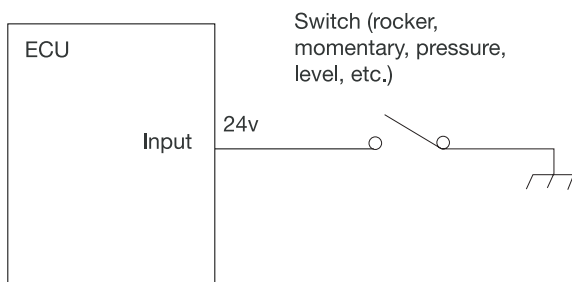


Fig 17.

C007170GB-2

- 2 High side input. The high side input is used on circuits that require a positive feed when the ignition is switched off, i.e. sidelights or hazard lights. The high side input is also used on the engine preheat circuit.

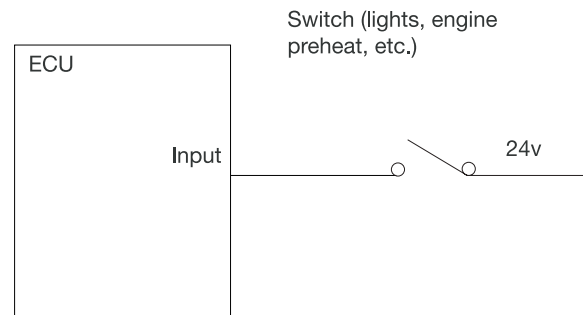


Fig 18.

C007180GB-2

Analogue input (i.e. sensor type inputs)

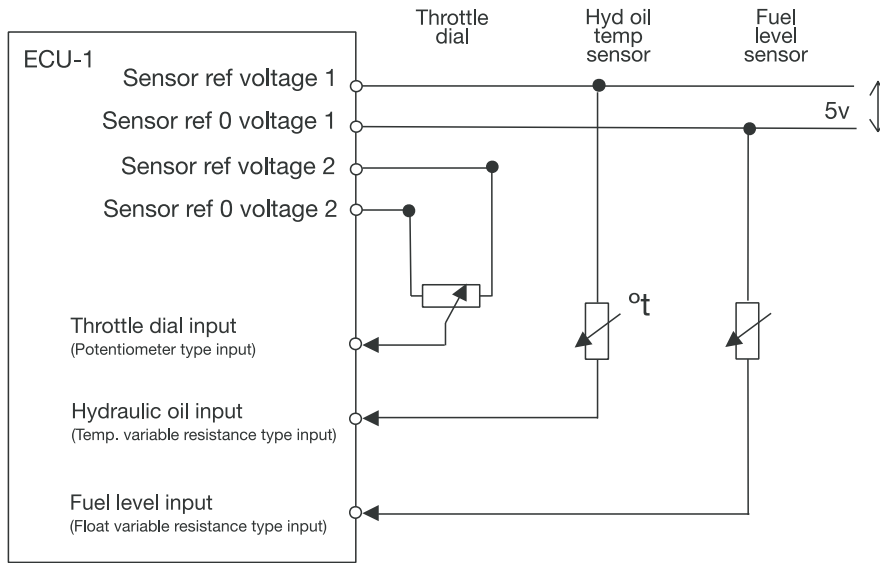


Fig 19.

C045960GB-2

Outputs

There are three main types of outputs Low side output, High side output and Modulated output.

In the Low side output circuit the actuator (solenoid, relay etc.) which is being driven already has a positive feed available, the ECU then provides the ground side of the circuit.

In the High side output circuit the actuator which is being driven already has a ground available, the ECU provides the positive side of the circuit.

In the Modulated Output circuit the ECU provides a PWM (Pulse Width Modulation) signal to a proportional valve. As the ECU varies the duty cycle of the signal the proportional valve will select more or less depending on the change in duty cycle.

- 1 Low side output. Circuits using low side output are pre heat relay, stop solenoid relay and work lights.

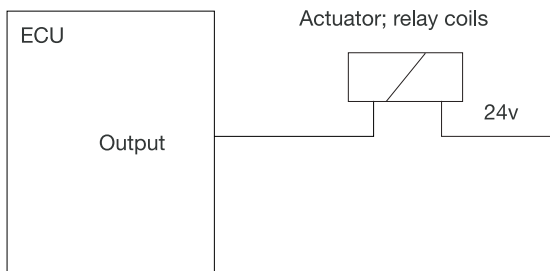


Fig 20.

C007220GB-2

- 2 High side output. The high side output is used to operate solenoids, bulbs and horn.

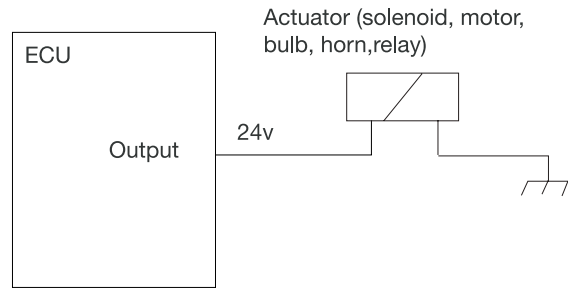


Fig 21.

C007230GB-2

- 3 Modulated outputs. Circuits using the modulated output are throttle control, pump control and boom priority.

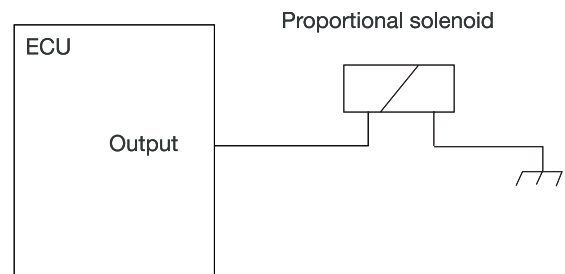


Fig 22.

C007240GB-2

Pulse Width Modulation (PWM)

Ohms law states that, the amount of current flow in a circuit is determined by the voltage, and the resistance. A 24v circuit with a resistance of 6 ohms, would draw a current of 4 amps. This would be the case for a standard solenoid, which is either on or off.

Once the voltage is applied to the circuit, it is present 100% of the time. This would be known as a 100% duty cycle. Therefore the circuit will draw 4 amps constantly.

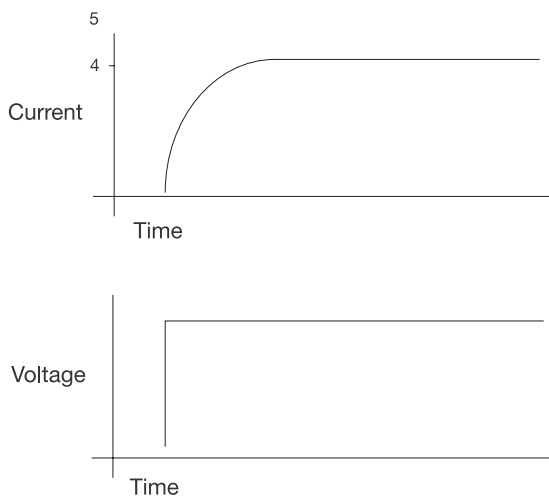


Fig 23.

C007260GB-2

The graph A although unstable would give a current rating of three amps. To stabilize the current in the circuit, the frequency would need to be increased. If the time scale on the graph A was one second, the frequency would be 4Hz (Hertz (cycles per second)). The graph B shows the same duty cycle, but at a higher frequency of 32 Hz. The proportional solenoids fitted to JS machines operate at a frequency of 75 Hz.

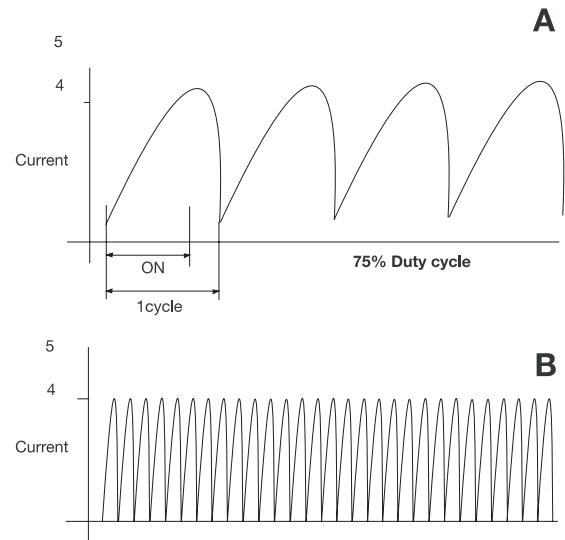


Fig 24.

C007270GB-2

A proportional solenoid requires differing amounts of current, depending on its condition. As the coil has a fixed resistance, changing the current rating can be done in either of two ways,

- 1 Having lots of different resistors switched in and out of the circuit at different times to change the current flowing.
- 2 To change the duty cycle of the solenoid.

It is easier, more economical, and more reliable to change the duty cycle of the circuit, especially using today's computer/ controller technology.

The duty cycle is the amount of time a component is switched on compared to the time it is switched off. If a solenoid is on for three seconds, then off for one second, on for three, off for one etc. this would be a 75% duty cycle.

ECU 1 Supply to Output Drivers

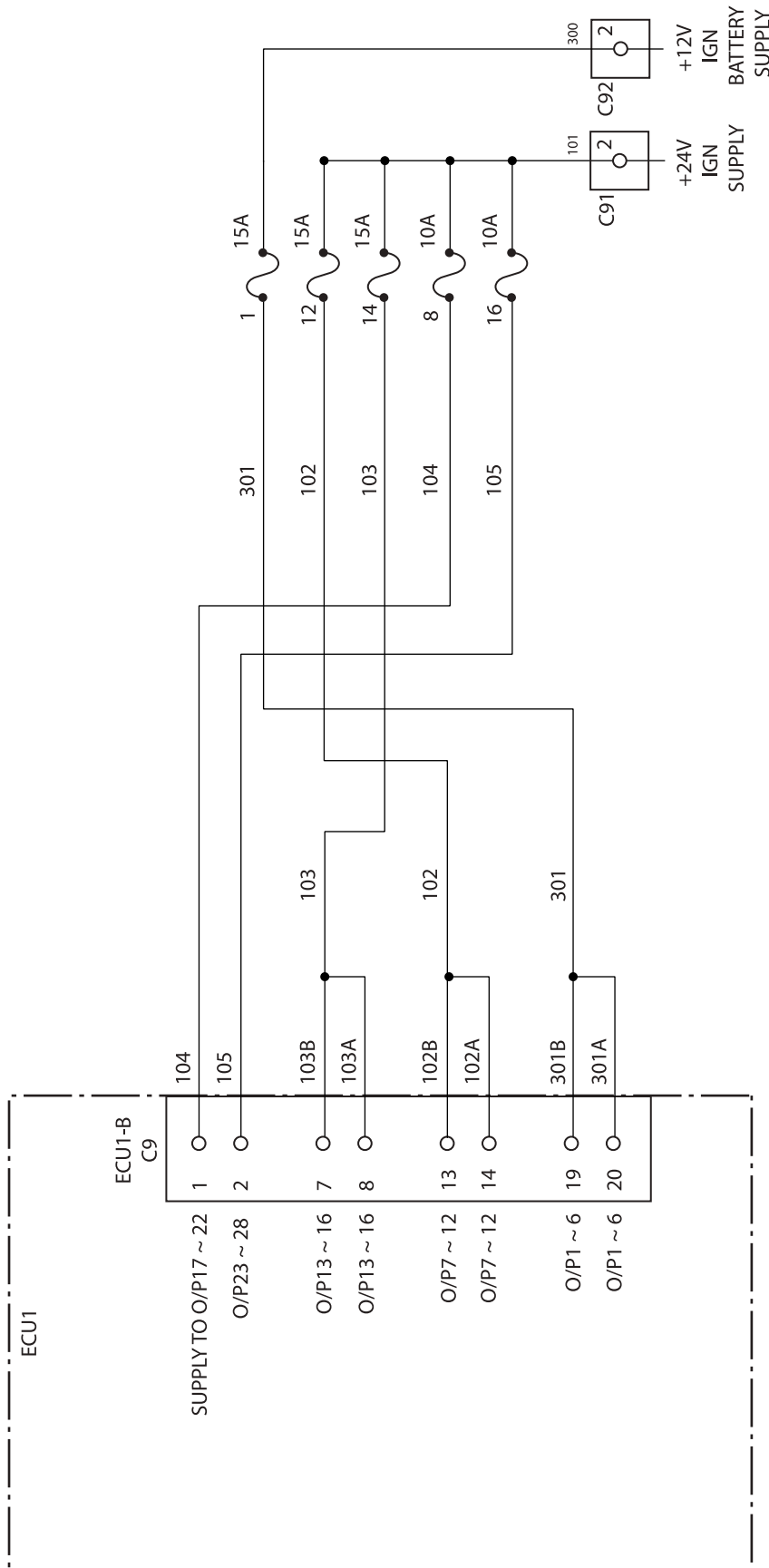


Fig 25.



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Engine Throttle Control

Operation - JS115-145

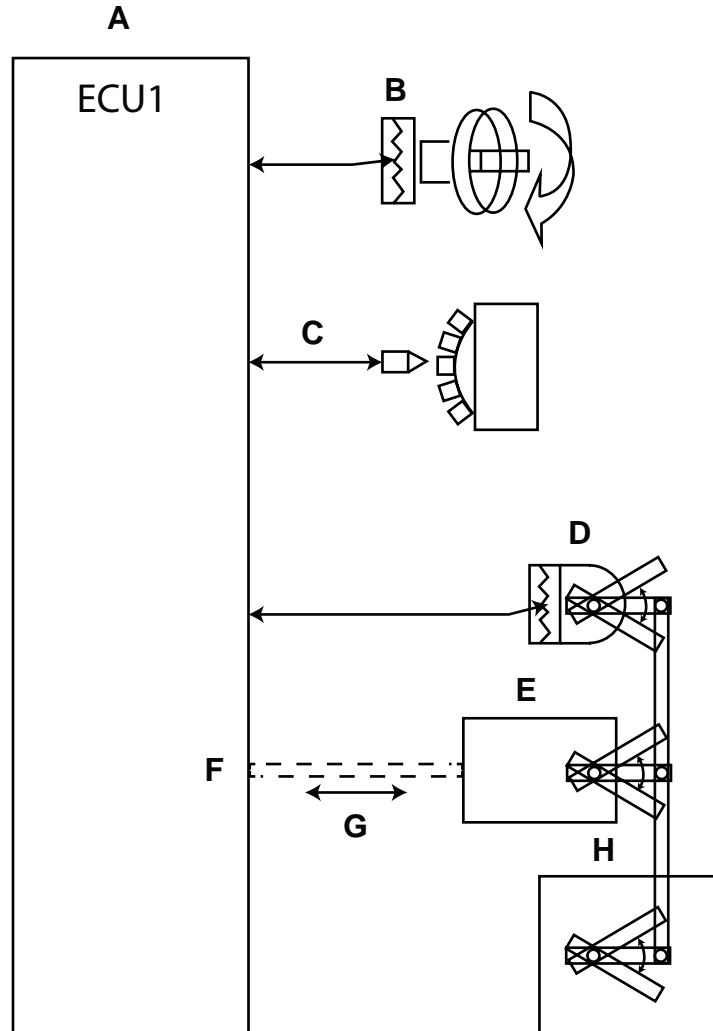


Fig 26.

Table 1.

Item	Description
A	ECU1
B	Throttle Dial
C	Engine Speed Sensor
D	Throttle Position Sensor

Item	Description
E	Throttle Actuator
F	CAN Bus
G	CAN Messages
H	Fuel Pump

The JCB 74kW Tier 3 444 Dieselmix engine has a mechanically controlled fuel pump **H**. A throttle actuator **E** is required to control the fuel pump. This actuator is controlled by a CAN message **G** from the main vehicle controller **A** (ECU1) in response to the throttle dia **B** or engine speed sensor. **C** (during heavy loading). Throttle position feedback comes from an independent throttle position sensor **D** during calibration.

When the operator turns the throttle dial in the cab to request an engine speed the ECU1 transmits an 'Actuator_Command' CAN message to the throttle actuator. The throttle actuator changes position in response to the 'Actuator_Command' CAN message, affecting the fuel pump position and the throttle sensor position. A CAN message is sent back from the actuator to confirm that position.

The PWM signal supplied to the actuator by the ECU1 is determined by:

- Throttle dial position.
- Mode selected.
- Auto idle / one touch idle selected or not.

The system has a self checking facility, when starting the machine and can be calibrated by service personnel. → [Throttle Calibration \(C-124\)](#). This should be performed every 50 hours.

When the throttle system is calibrated, the throttle dial has to be moved between minimum and maximum positions, this gives the ECU the operating parameters of the dial. From the calibration process the ECU has the operating range of the throttle dial and the corresponding positions for the actuator.

If the machine is switched off before completing calibration, when the machine is restarted then EMS will display the message 'Calibrate' and throttle calibration will have to be done again.

Throttle Control Circuit

If the engine is started with the throttle dial above the full speed position, the engine will start at idle. No engine speed control will then be possible until the operator turns the throttle dial to a position which is lower than the full speed position. The throttle control will then function as normal.

If the operator stops the engine from full speed then the throttle actuator will ramp down over a two second time period, reducing the engine rpm before stopping.

If the operator has selected the one touch idle function before stopping the engine, then when the engine is restarted the throttle control will still be in one touch idle function (i.e. the ECU remembers that one touch idle was selected).

Operation - JS160-220

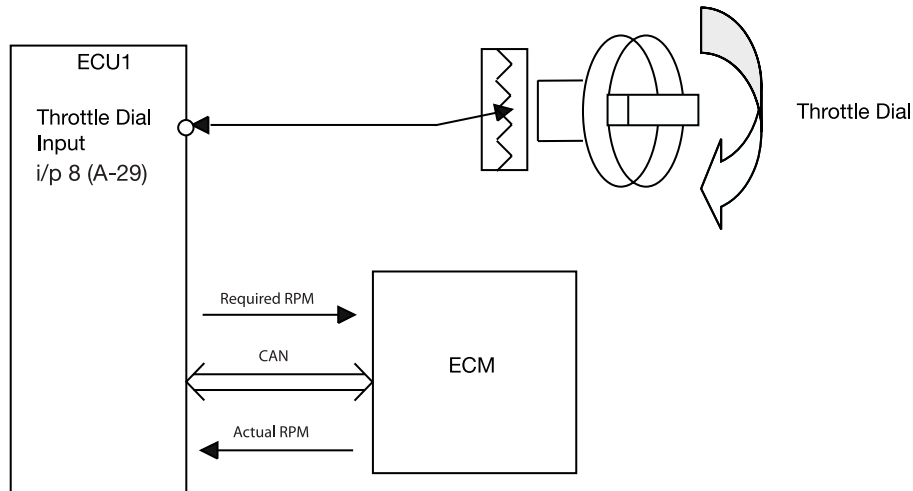


Fig 27.

The maximum rev/min value for each mode is specified in software. The maximum rev/min value is used as A mode maximum. E mode maximum is 100 rev/min less than A mode maximum. P & L mode maximum is 200 rev/min less than A mode maximum ⇒ [Fig 28.](#) ([□ C-22](#)).

During calibration the ECU noted the maximum and minimum positions of the throttle position sensor. The maximum point became A mode maximum. When the working mode is selected the ECU will scale the full deflection of the throttle dial (0~5v) to adjust the engine speed between the idle position and the maximum speed for the particular mode selected.

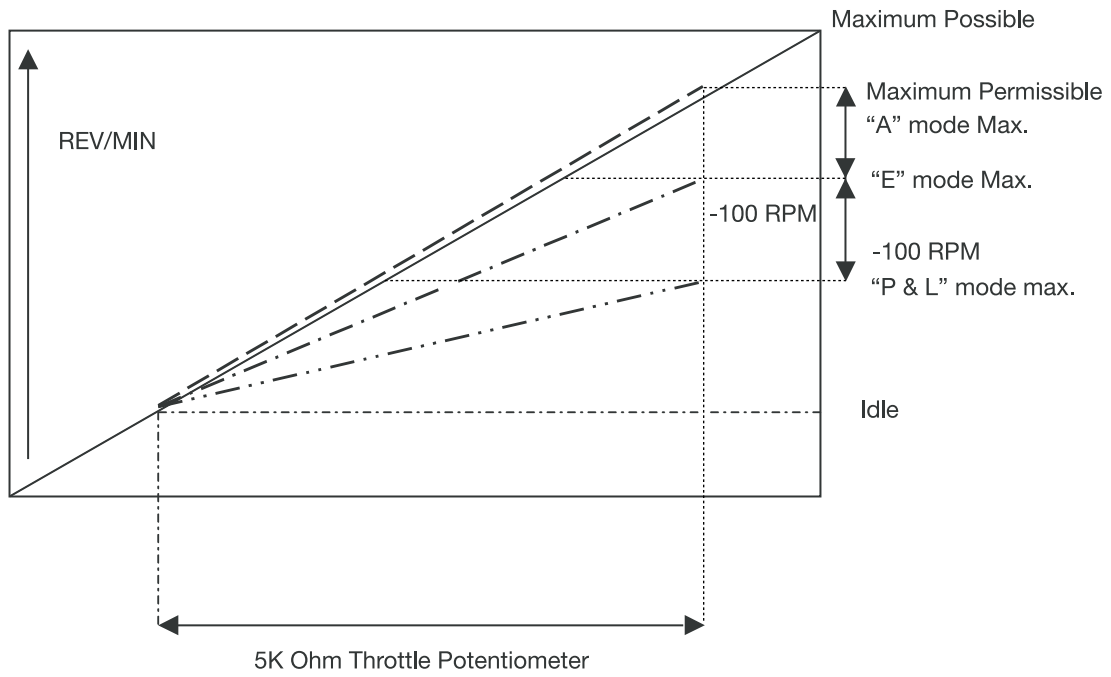


Fig 28.

Engine Throttle Control for Each Mode

Operation

The machine can operate in one of four different modes, depending upon the application required. The modes are selected by the "MODE" button on the EMS. The EMS displays the selected mode alongside the power mode legend. Selecting the different modes has the effect of setting the maximum possible engine speed for each working mode. Successive presses of the mode switch will cycle through the different modes in the order as shown below.

Note: The last operating mode when the machine was stopped will be restored when the machine is restarted.

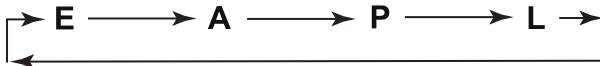


Fig 29.

E	Economy
A	Auto
P	Precision
L	Lifting

"A" Auto Mode

In Auto mode the EMS displays "AUTO" and the letter "A" next to the power mode icon. The engine is allowed to operate over its selected rev range as defined by its programmed rev limit. The maximum rev limit is the same as the maximum permissible engine revolutions.

When in auto mode the auto idle feature is permanently active, if the throttle dial position is changed, the engine speed will not change until either the travel pressure switch (i/p 27), the upper pressure switch (i/p 26) or the auto mode pressure switch (i/p 25) are closed.

When the upper pressure switch is closed the engine speed will rise to full speed less 100 rpm (or in proportion to the throttle target input if less than 100%). When the upper pressure switch re-opens the engine speed will remain at this position for 3 seconds and then drop to idle.

When the auto mode pressure switch is closed, the engine speed will rise to the full available engine speed. When the auto mode pressure switch re-opens the engine speed will

drop to the full speed less 100 rpm for three seconds and then down to idle.

When the travel pressure switch is closed, the engine speed will rise to the full available engine speed. When the travel pressure switch re-opens the engine speed will remain at full for three seconds, then will drop to the full speed less 100 rpm for the pre-set auto idle time, after which it will drop to idle

"E" Economy mode.

In standard mode the EMS displays "ECONOMY" and the letter "E" next to the power mode icon. The engine is allowed to operate over its selected rev range as defined by its programmed rev limit in direct proportion to the throttle input. However the maximum rev limit of 100 rpm less than the maximum permissible is imposed. Thus for a full throttle potentiometer setting the engine revolutions is 100 lower than it would be in the auto mode.

"P" Precision

In Precision mode the EMS displays "PRECISION" and the letter "P" next to the power mode icon. The engine is allowed to operate over its selected rev range as defined by its programmed rev limit in direct proportion to the throttle input. However the maximum rev limit of 200 rev/min less than the maximum permissible is imposed. Thus for a full throttle potentiometer setting the engine revolutions is 200 lower than it would be in the auto mode, the same as it is for lifting mode.

"L" Lifting mode

In Lifting mode the EMS displays "LIFTING" and the letter "L" next to the power mode icon. The engine is allowed to operate over its selected rev range as defined by its programmed rev limit in direct proportion to the throttle input. However the maximum rev limit of 200 rev/min. less than the maximum permissible is imposed. Thus for a full throttle potentiometer setting the engine revolutions is 200 lower than it would be in the auto mode, the same as it is for precision mode.

The engine speed will vary according to the following characteristic: → Fig 30. (□ C-24)

Table 2.

Machine	Auto	Economy	Auto Idle	Idle
JS115-JS145	2200 rpm	2050 rpm	1100 rpm	950 rpm
JS160-JS180	2050 rpm	1950 rpm	1150 rpm	900 rpm
JS200-JS220	2050 rpm	1950 rpm	1150 rpm	900 rpm

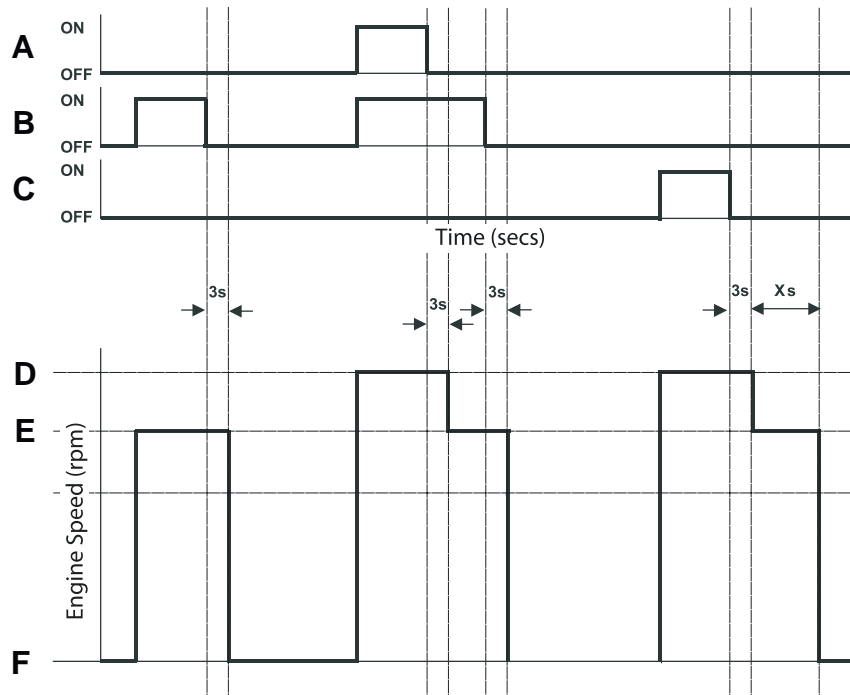


Fig 30.

Table 3.

Item	Auto Mode Pressure Switch
A	Auto Pressure Switch
B	Upper Pressure Switch
C	Travel Pressure Switch
D	Full Auto
E	Economy
F	Idle (or auto idle if enabled or in Auto mode)

Pump Control for Each Mode

Operation

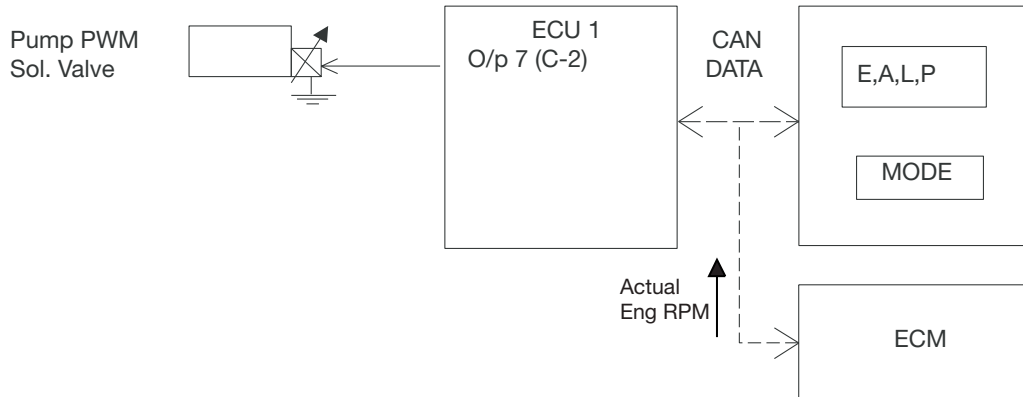


Fig 31.

The machine can operate in four different modes, depending upon the type of work required ⇒ [Engine Throttle Control \(C-19\)](#). The pump output horsepower is varied by means of a PWM signal to the pump control solenoid valve which varies for each mode.

Tier III machines are required to reduce the "range band" "X to Y" (pump milliamps) ⇒ [Fig 33. \(C-27\)](#), to improve engine stability dependant on specific factors which include:

- Barometric Pressure
- Fuel Temperature
- Air Intake Temperature
- Air Conditioning
- Engine and Hydraulic Temperature

These conditions are monitored by ECU1. Engine power and pump power are then varied to suit the operating conditions.

Each of the above factors has a value calculated by ECU1 of between 0 and 1. All values are then calculated to give a dynamic control factor (DCF) of 0 to 1 which will determine the pump output power and will vary the pump mA to suit.

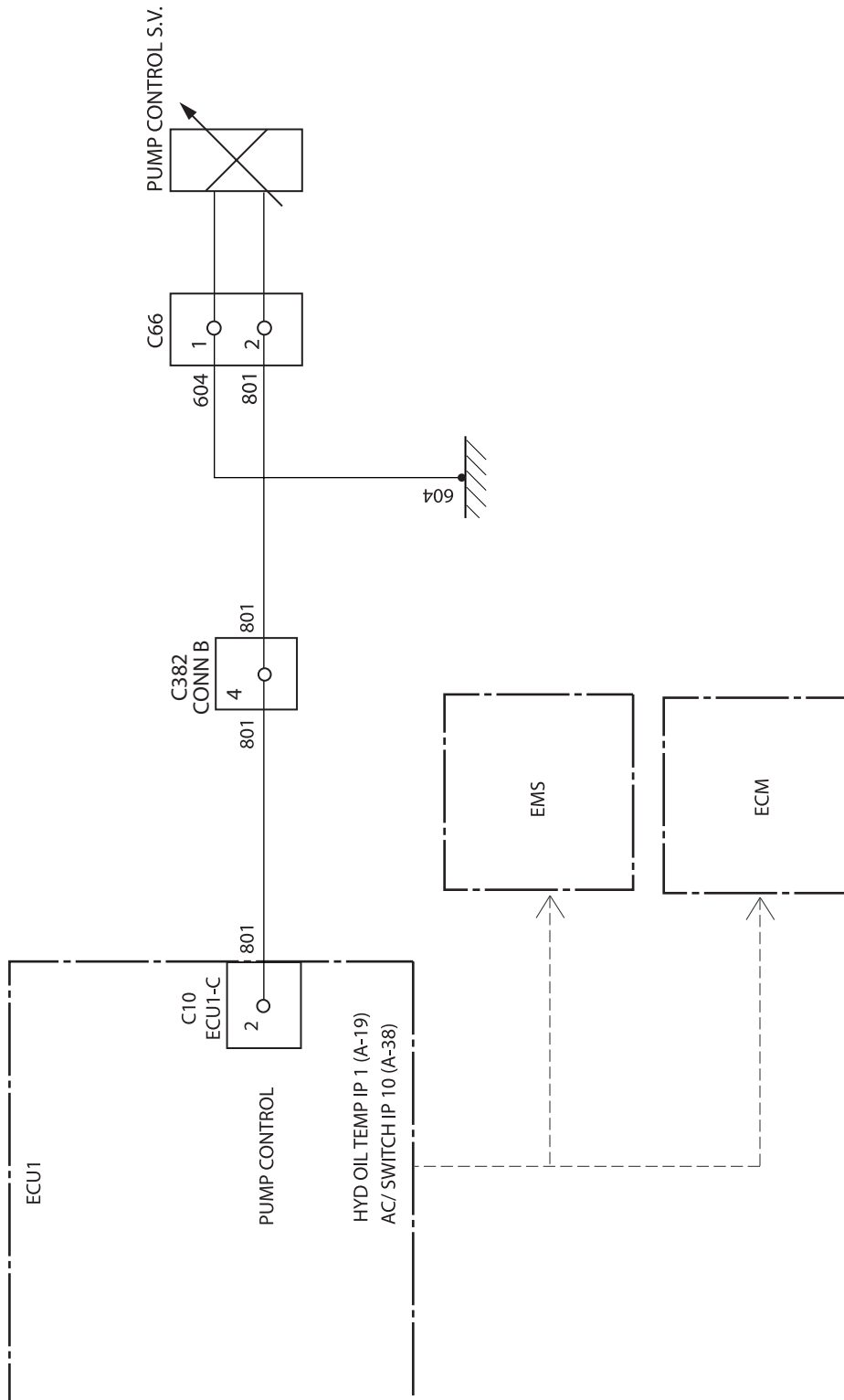


Fig 32.

"A" Auto Mode

The pump control signal varies with engine speed according to the figure below:

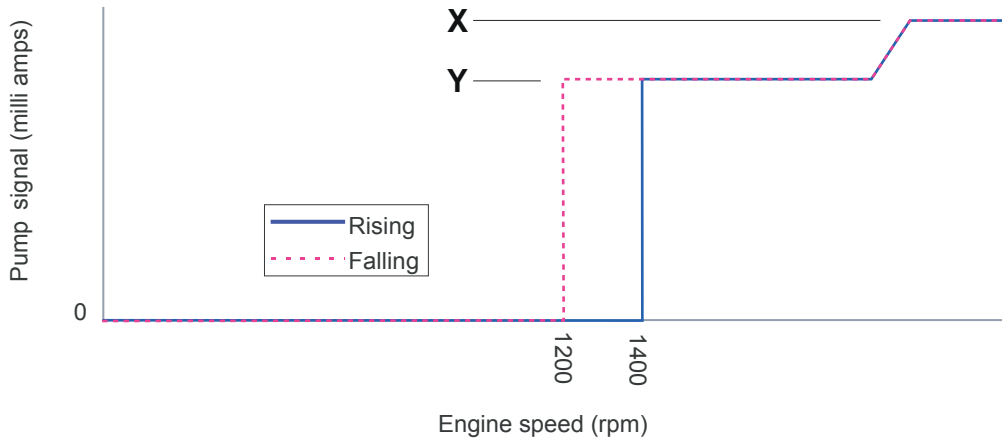


Fig 33. Pump Control for DCF of 1 (normal conditions) in "A" mode

Table 4.

	JS115	JS130	JS145	JS160/JS180	JS200-220
X	575 (2200rpm)	570 (2200rpm)	565 (2200rpm)	650 (2050rpm)	650 (2050rpm)
Y	590 (2050rpm)	590 (2050rpm)	590 (2050rpm)	500 (1950rpm)	411 (1950rpm)

"E" Economy mode

The pump control signal varies with engine speed according to the figure below:

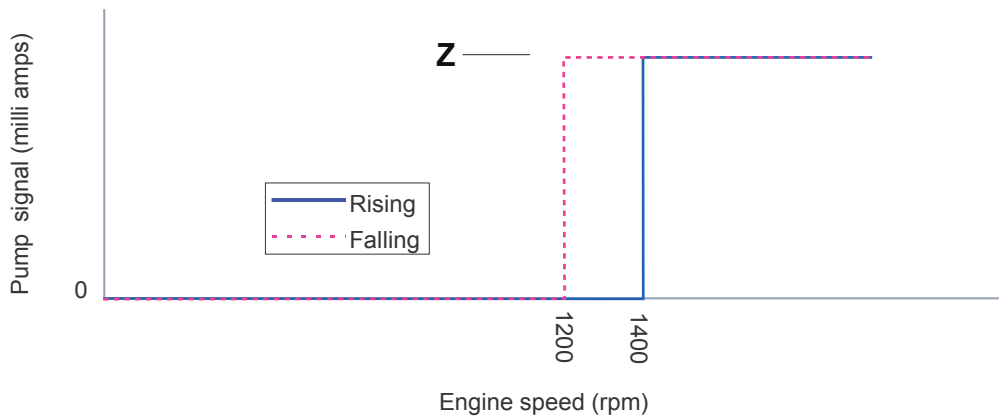


Fig 34. "E" mode

Table 5.

	JS115	JS130	JS145	JS160/JS180	JS200-220
Z	500	500	500	500	365

"L" Lifting mode & "P" Precision mode

JS115-220 The pump control signal is set to zero PWM percent, regardless of engine speed.

RPM Setting Selection

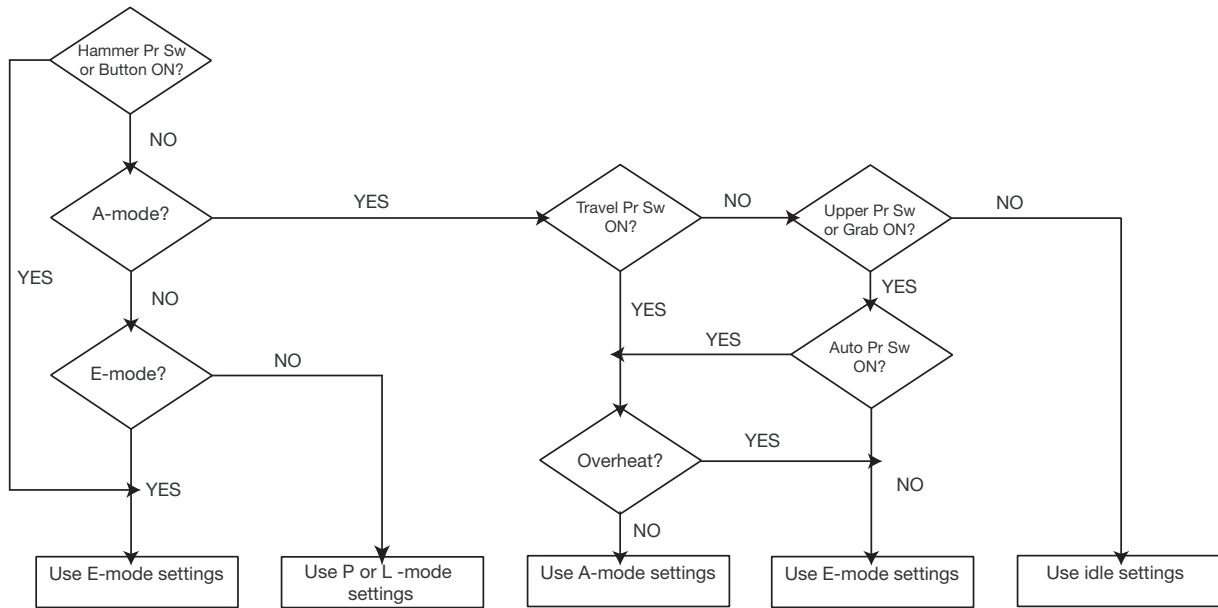


Fig 35.

mA Setting Selection

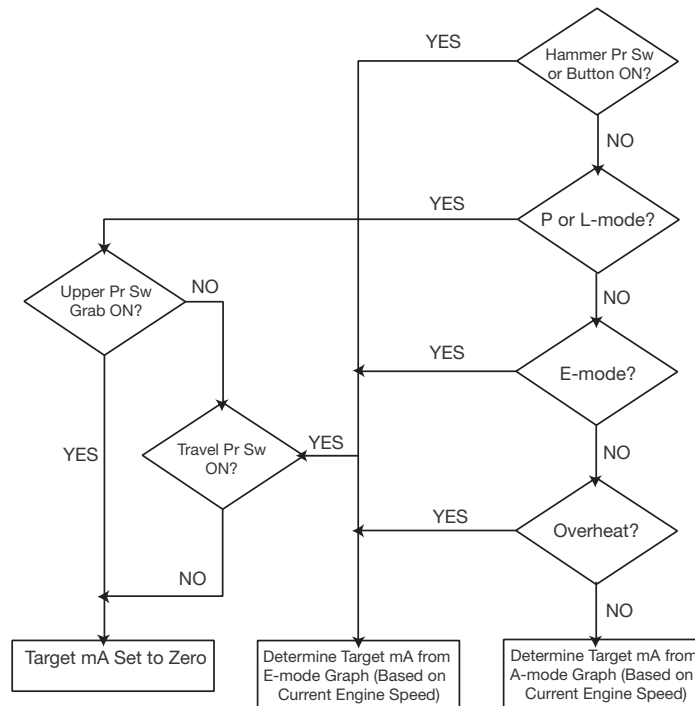


Fig 36.

Hardware Sensing

Operation

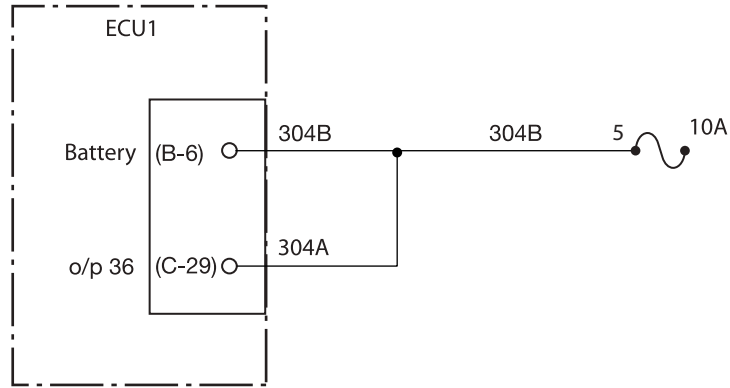


Fig 37.

Due to changes in operation of some machine systems and harness from January 06 the ECU1 needs to know what system is fitted to operate the correct outputs. To sense this, machines built from January 06 have permanent live feed to the ECU1 o/p 36 (C-29).

All machines described in this manual will have this input fitted.

Auto Boost Pressure

Operation

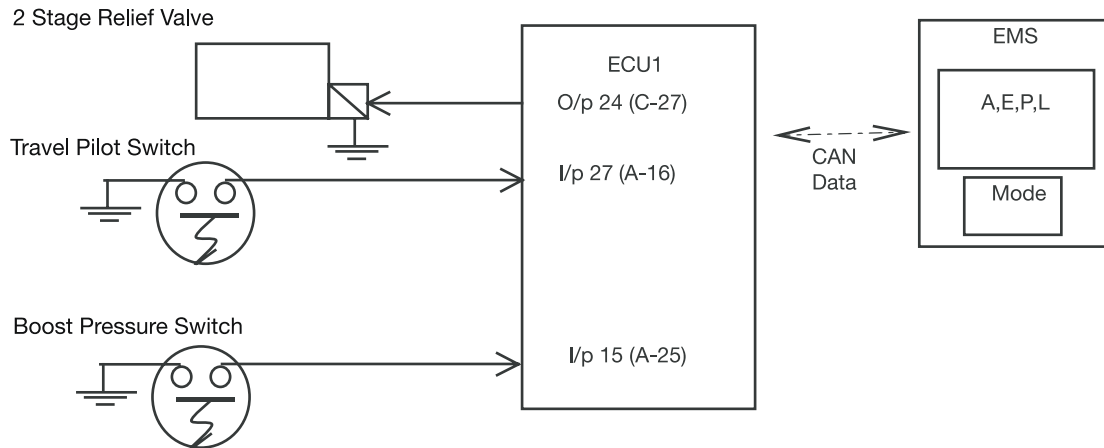


Fig 38.

C049920-1

The auto pressure boost function is only available when the excavator is in auto mode. By default it is not available in precision and economy mode and is permanently on (although not indicated on the EMS) in lifting mode.

In auto mode, when the boost pressure switch is closed the 2 stage relief valve, ECU1 o/p 24 (C-27) is energised (according to the logic diagram, → Fig 39. (□ C-31)). This allows a pressure increase in the excavating hydraulic circuit thus generating extra digging force.

If the boost pressure switch is seen for less than 1.5 seconds then the 2 stage relief valve is energised until the boost pressure switch is de-energised, then the logic sequence is reset and will allow the sequence to be started over again.

If the boost pressure switch is seen for more than 1.5 seconds then the 2 stage relief valve should stay open for a further 1.5 seconds. The valve cannot be re-energised for 9 seconds after the end of the last activation

However during travel operation (denoted by the travel pilot switch input) the 2 stage relief valve is energised. If the boost pressure switch is closed when the travel pressure switch is valid, the solenoid will remain energised

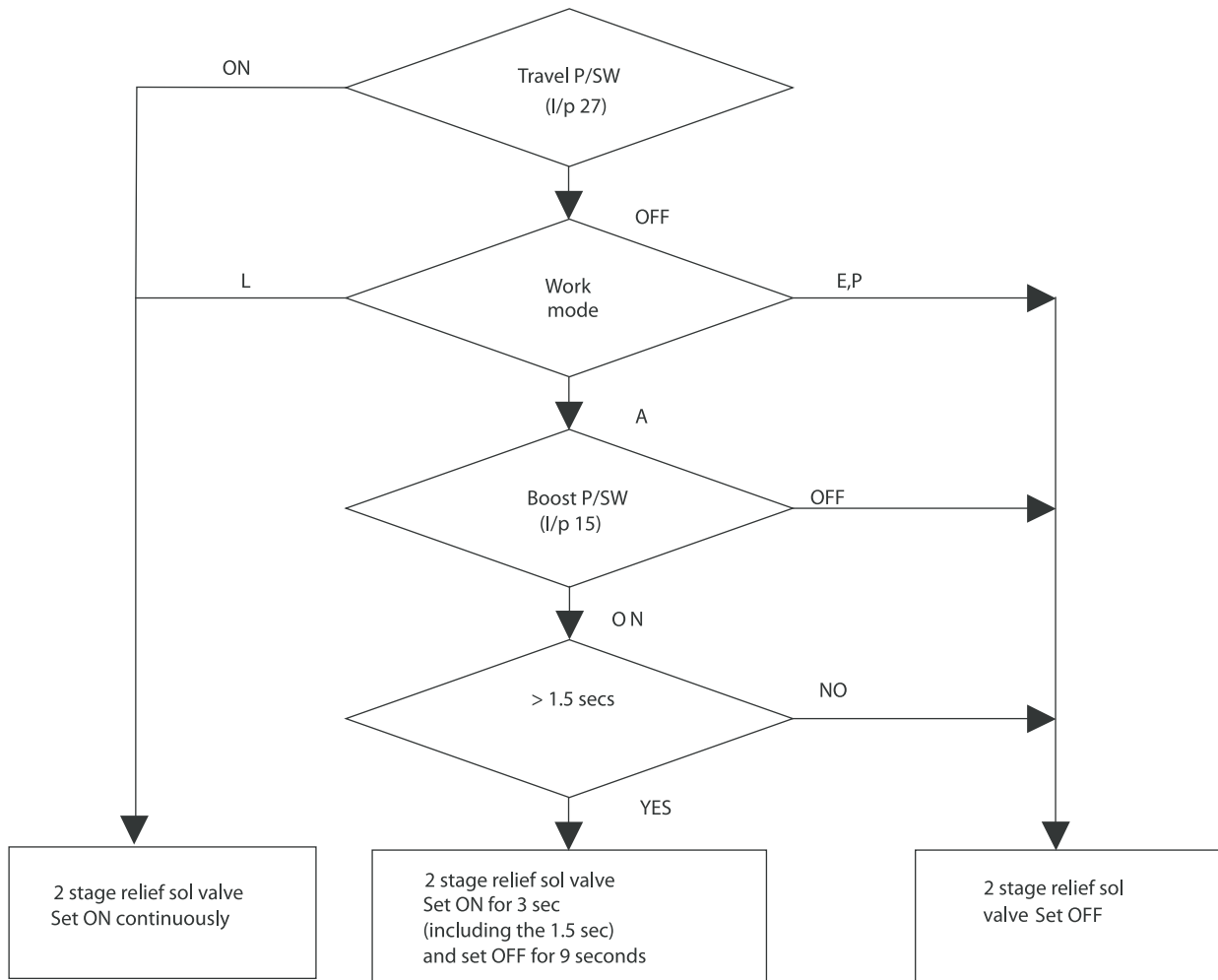


Fig 39.

C005400GB

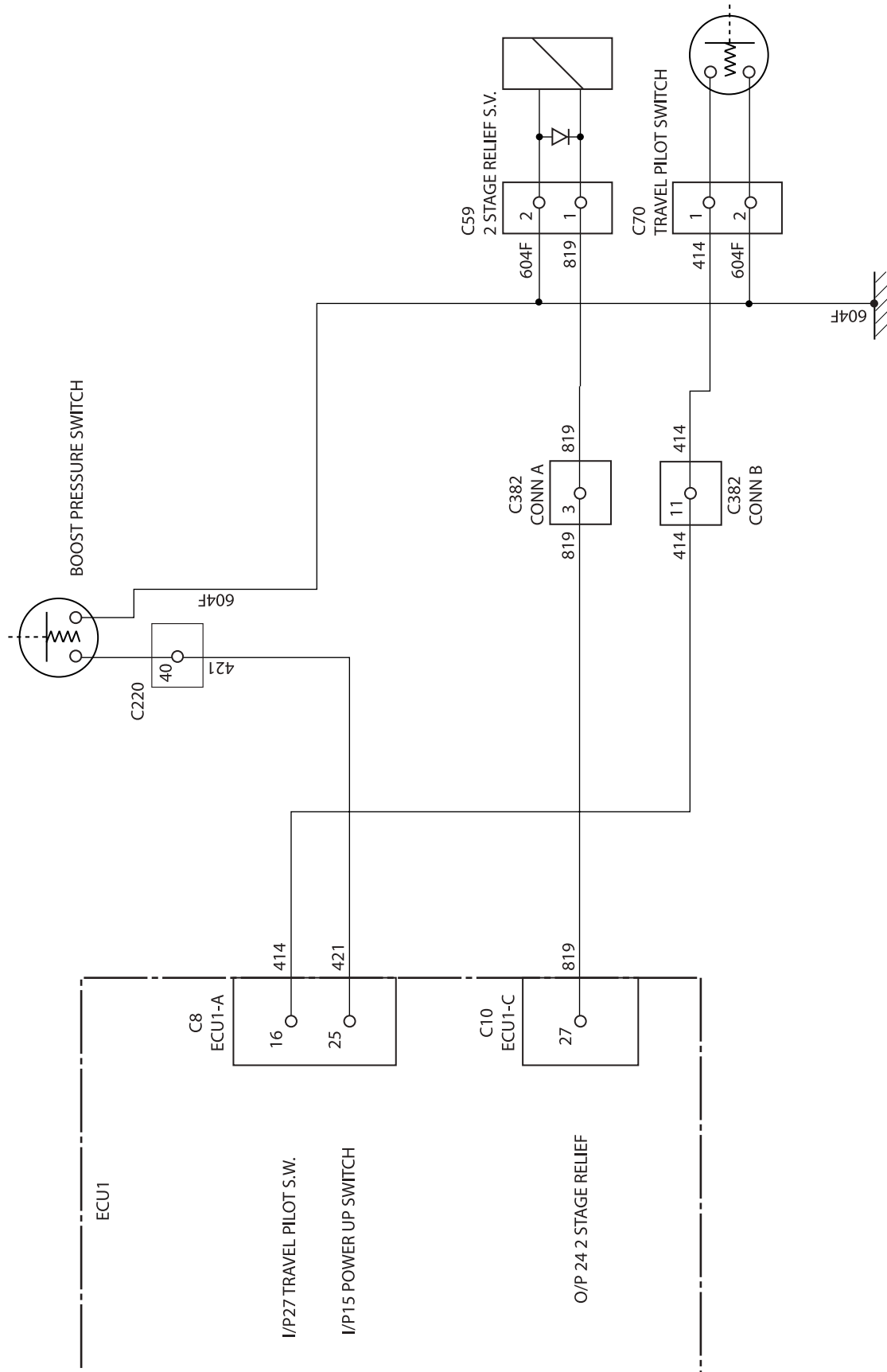


Fig 40.

Engine Oil Level Warning

Operation

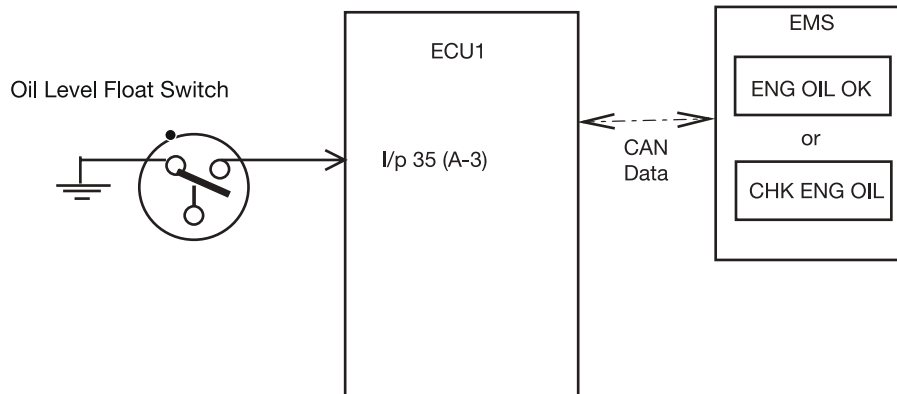


Fig 41.

The oil level float switch is positioned in the side of the engine.

When the engine oil level is at an acceptable level, the float switch is closed, applying an earth to the ECU1 i/p 35 (A-3)

When the engine oil level drops below the acceptable level, the float switch is opened, removing the earth from the i/p.

The i/p is only checked on machine ignition on.

The oil level check should occur before other machine or engine faults are raised.

When the EMS receives a CAN message from the ECU1 indicating that the oil level is OK, the EMS displays the message "ENG OIL OK" for 5 seconds.

When the EMS receives a CAN message from the ECU1 indicating that the oil level is low, the EMS displays the message "CHK ENG OIL" for 5 seconds and the buzzer sounds for 1.5 seconds.

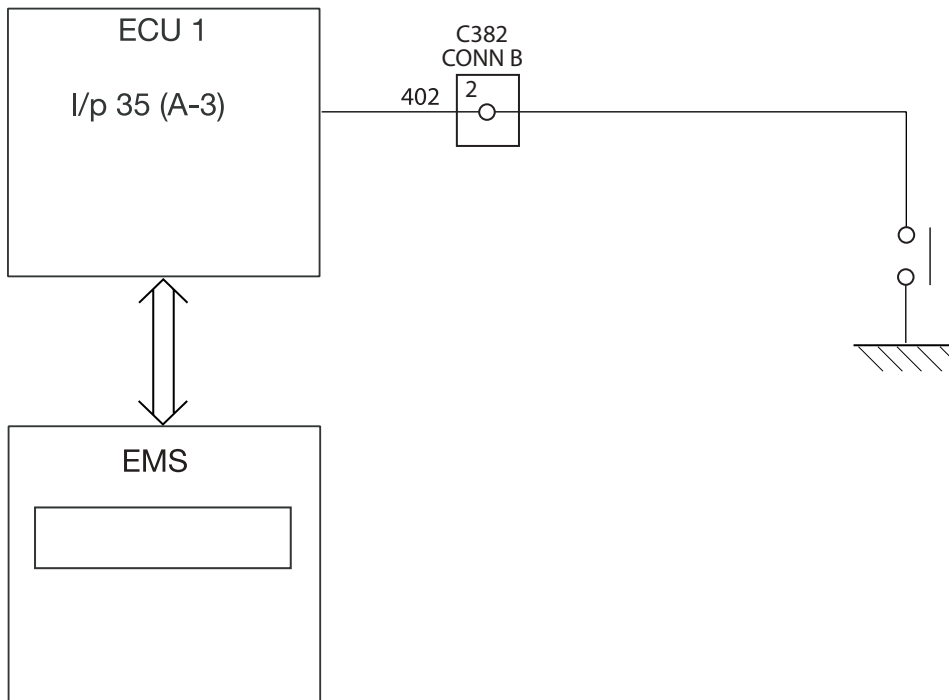


Fig 42.

Engine Automatic Warm Up

Operation

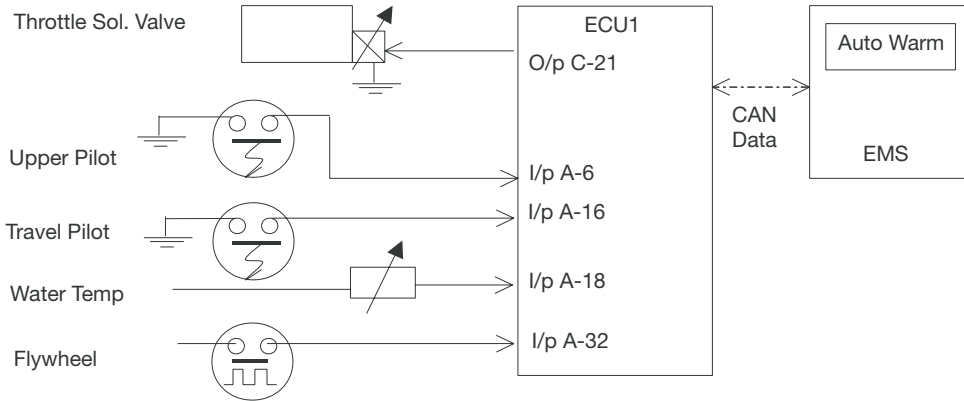


Fig 43. JS115-145

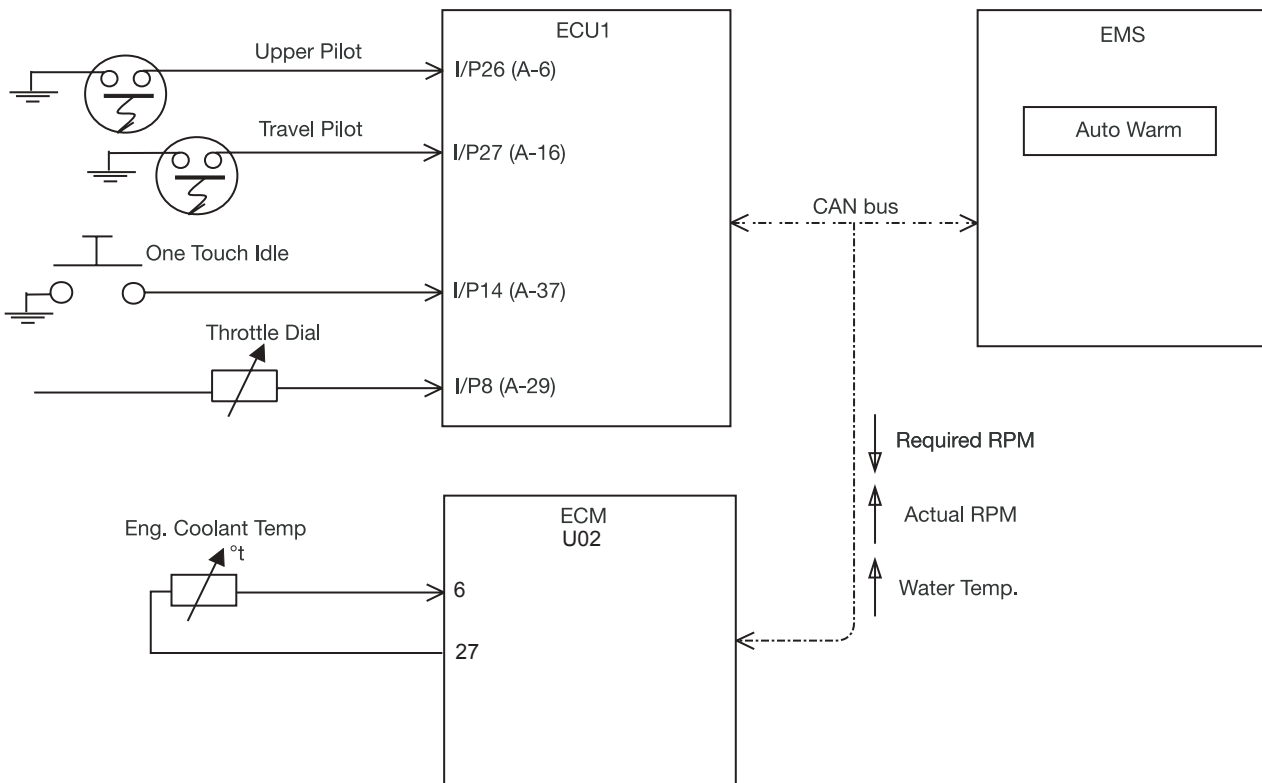


Fig 44. JS160-220

This feature allows the engine to quickly warm up to normal operating temperature if the vehicle is not being used.

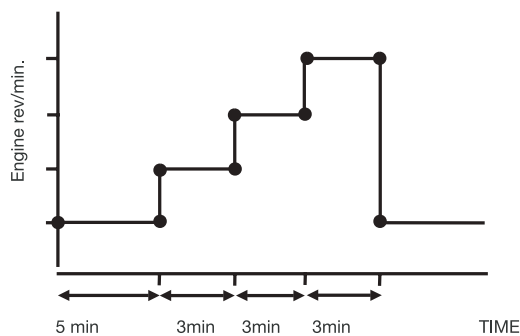
Automatic warm up will only be performed 15 seconds after the engine is started and provided the following conditions are satisfied:

- 1 Water temperature is less than 50 °C engine coolant temperature is sent from the ECM via the CAN bus (JS160-220) or direct to ECU1 i/p A18 (JS115-145).
- 2 Upper pilot pressure switch is off (excavator services not selected) i/p28 (A-6).
- 3 Travel pilot pressure switch is off (travel service not selected) i/p27 (A-16).
- 4 If the throttle volume input changes during auto warm up then the auto warm up function is cancelled.

When auto warm is activated the EMS will display the message "AUTO WARM".

JS160-220 - The ECU1 will send a RPM target message to the ECM so that the engine will run at the throttle dial setting for 5 minutes, the engine revs are then increased in 300 rev/min. steps in 3 minute intervals up to the maximum of 1800 rev/min.

After 3 minutes of running at 1800 rev/min. the engine revs will return to the throttle dial setting. If during the automatic warm up sequence any of the required conditions change i.e. engine water temperature reaches 50 °C or the operator moves the throttle dial or selects an excavator service auto warm will stop.



C005450GB-2

Fig 45. Example of auto warm up cycle if machine is started at idle

Engine Automatic Idle

Operation

When auto idle function has been selected via the switch on the Facia Switch Panel (FSP) the engine will return automatically to the auto idle setting if no services have been selected for 5 seconds (default). This time can be varied between 5 and 30 seconds via the set menu on the EMS.

A second press of this switch will disable the function. If the Auto, Upper, Travel and Boom lower pilot switches have been inactive for the preset time period, the automatic idle function will operate and the engine revs will drop to the auto idle value. The EMS will display the message "LOW IDLE".

The engine revs can be increased by pressing the Auto idle switch on FSP, or by the change of state of the pilot switches (i.e. if excavator/travel service is selected). When released from Auto Idle the engine revs return to the setting of the throttle dial. By default Automatic idle is off.

The auto idle function is permanently active in Auto mode. The auto idle switch FS10 is disabled when in Auto mode.

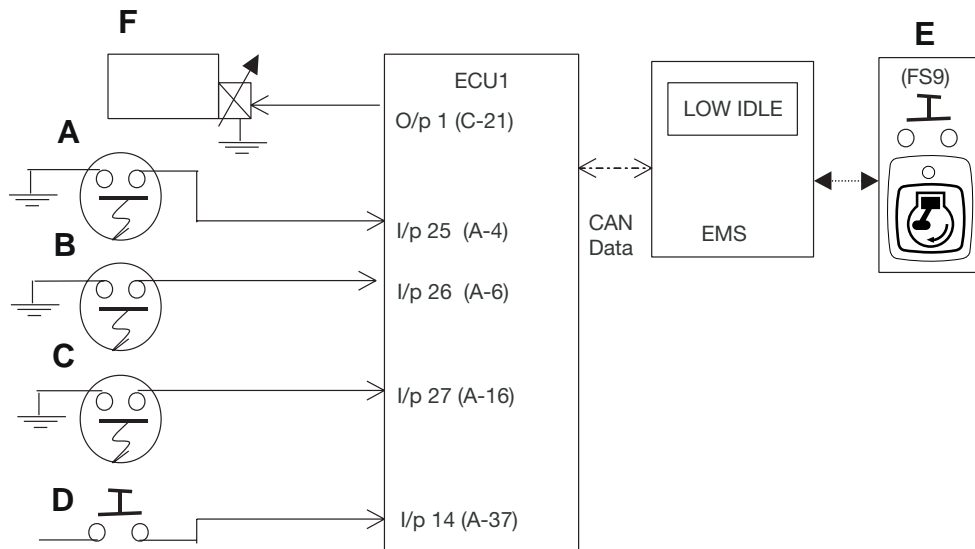


Fig 46. JS115-145

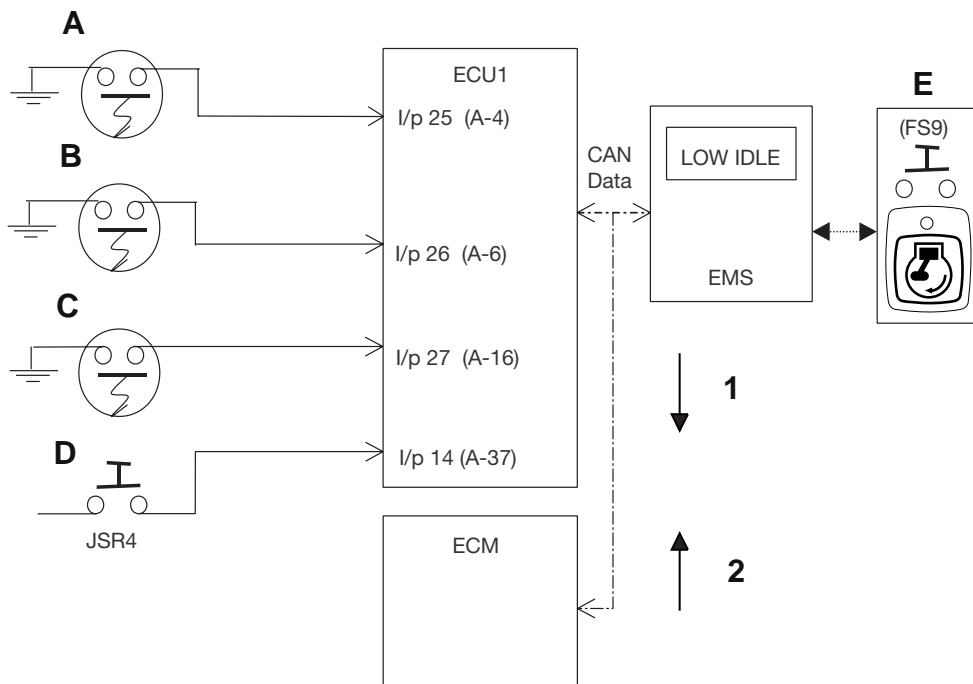


Fig 47. JS160-220

- A** Auto Pressure Switch
- B** Upper Pilot Switch
- C** Travel Pilot Switch
- D** One Touch Idle (RH Controller)
- E** Auto Idle Switch (FSP)
- F** Throttle Solenoid Valve (JS115-145)
- 1** Required Engine RPM
- 2** Actual Engine RPM

Engine One Touch Idle

Operation

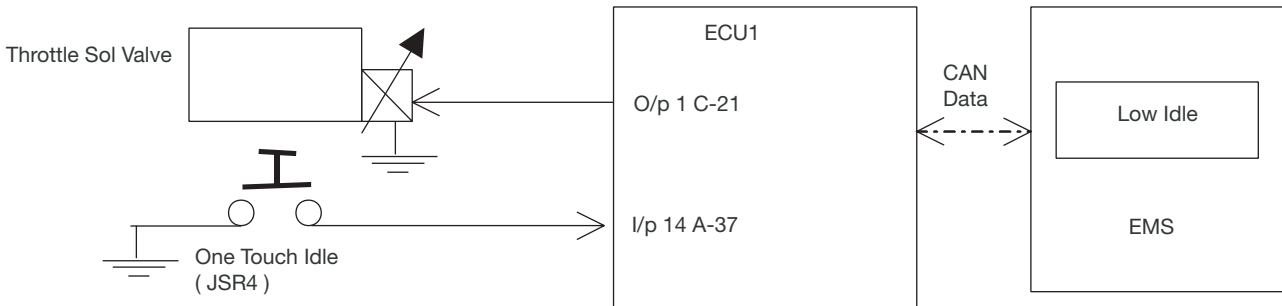


Fig 48. JS115-145

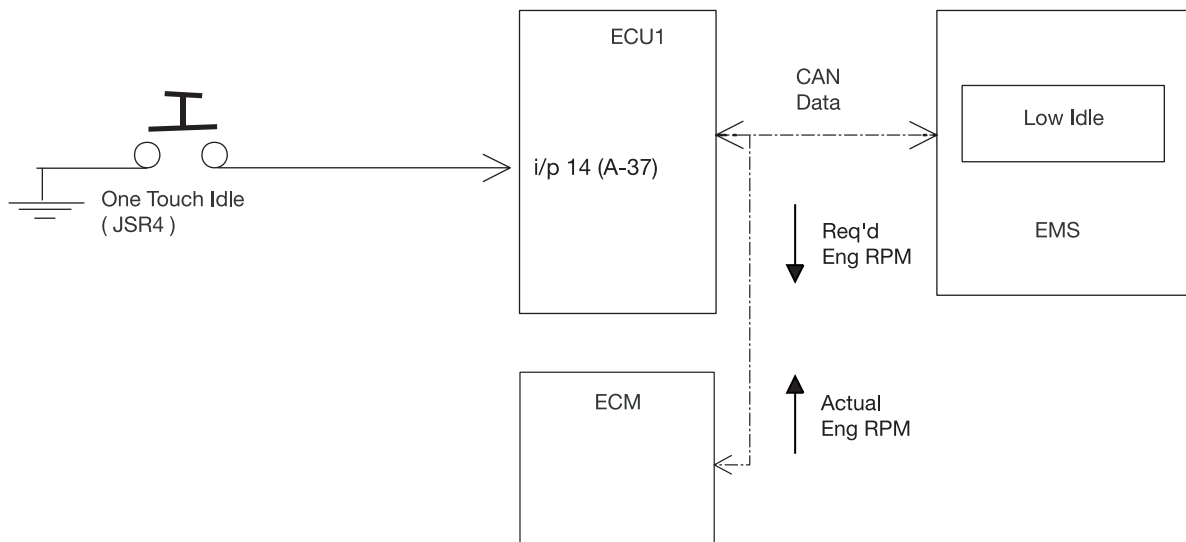


Fig 49. JS160-200

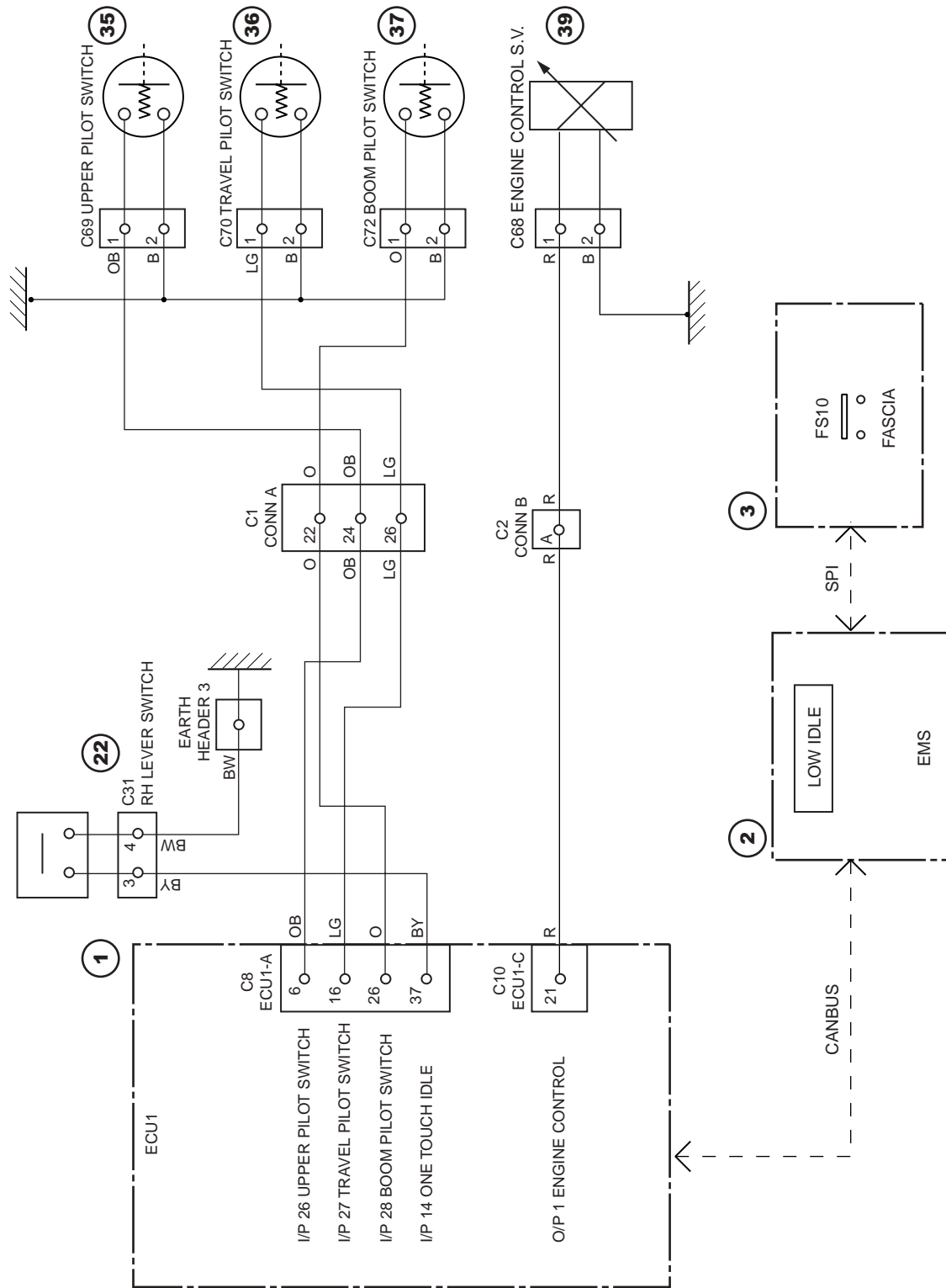
C027250GB-2

When one-touch idle is selected via the button on the right hand controller the engine will return to the low idle setting, regardless of any other input, the EMS will display the "LOW IDLE" message to confirm selection.

A second press of this switch will disable the function and the engine revs will return to the setting of the throttle dial.

The status of the one touch idle is retained when switching the ignition off (e.g. If one touch idle is selected and the ignition turned off, when the vehicle is started again one touch idle is automatically activated).

Engine Auto Idle and One Touch Idle



A346090

Fig 50. JS115-145

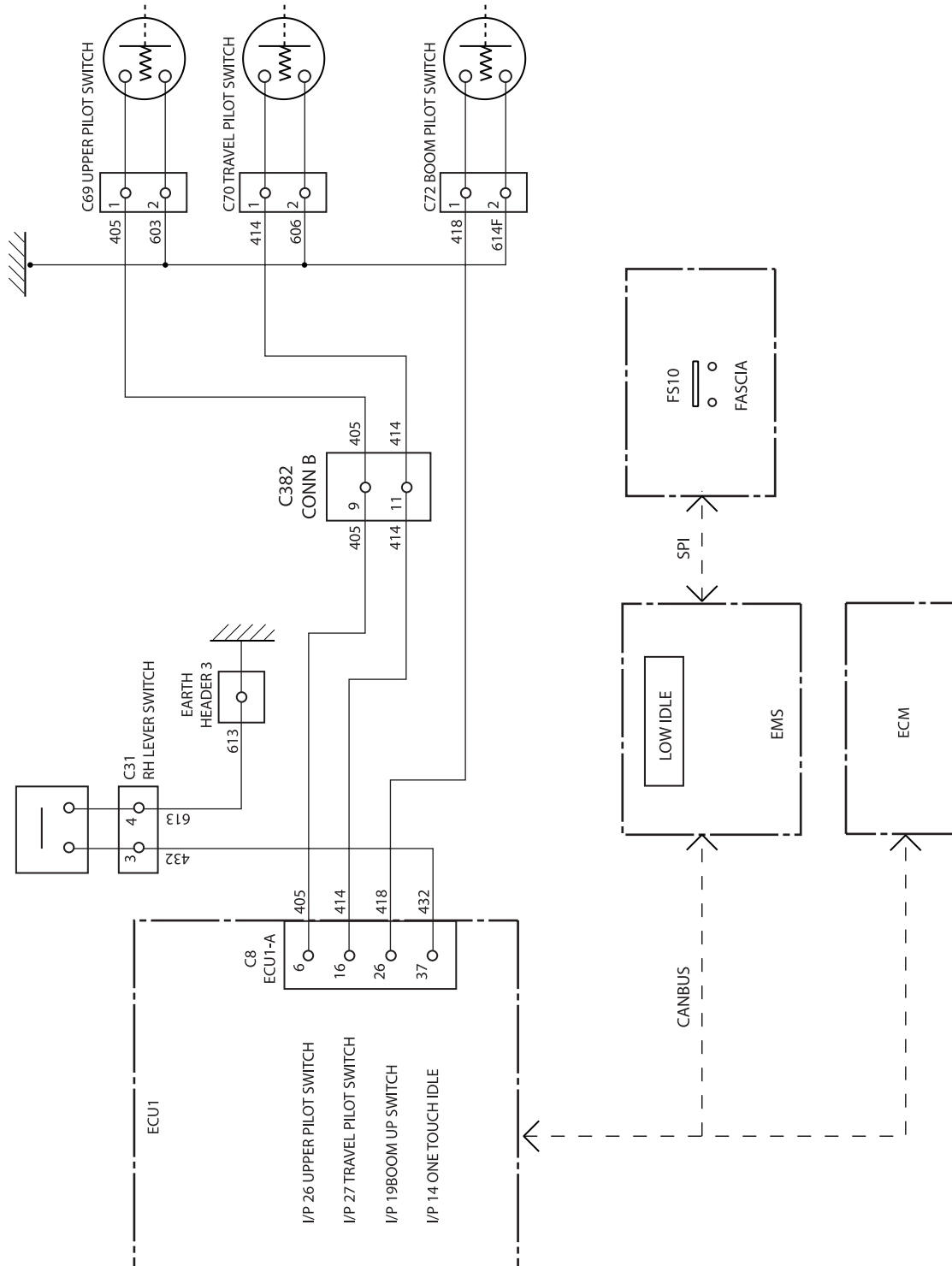


Fig 51. JS160-220



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Engine Start/Stop - JS160-220

Engine ECM Feed

The engine ECM power is fed via the Engine PCB box and voltage converter to reduce the voltage from 24v to 12 volts.

The engine PCB box has a permanent battery feed to pin B and an ignition feed to pin A. The permanent feed at pin B is fed to the 2 Voltage dropper relays **1** and **2** only (VDR1 and VDR2). When the ignition is switched on, the ignition feed is fed via the engine shutdown relay to pin A then internally to switch the VDR1 and ignition sense relays on. The permanent feed at VDR1 crosses the now closed relay and sends 24v to pin 1 and 2 of the voltage dropper. 12v is now output at pins 4 and 5 (joined). The 12 volts is available to:

- 1** The energised ignition sense relay to feed pins X (water in fuel sensor) and pin L which feeds pin 44 of the ECM with the ignition feed.
- 2** Switches on the power hold relay which is earthed by pin 2 of the ECM via pin M. This in turn powers pins N, P, R, and S which supply power to the engine ECM pins 49, 53, 57, 60 via individual fuses.
- 3** Switches the fuel lift pump relay which is earthed by the engine ECM pin 40 via pin U. Feed power to the fuel lift pump via pin T.

Note: If the engine is not started the fuel lift pump will only run for 20 seconds before the earth to the relay is cut.

- 4** The grid heater relay (not used on JS).
- 5** Switches the VDR2 allowing the 24v battery supply voltage to cross and join the 24v feed from VDR1.

If the ignition is switched off power to VDR1 and the ignition sense relay is lost. Power to the voltage converter is lost on VDR1 but power from VDR2 continues to power the voltage converter and 12v systems. Power is lost at pin 44 of the ECM indicating the ignition as been turned off. 15 seconds after the ignition is turned off the earth signal to the power hold relay is cut at the pin 2 of the ECM. The power hold relay de-energises shutting down the 12 volt signal to the rest of the circuits.

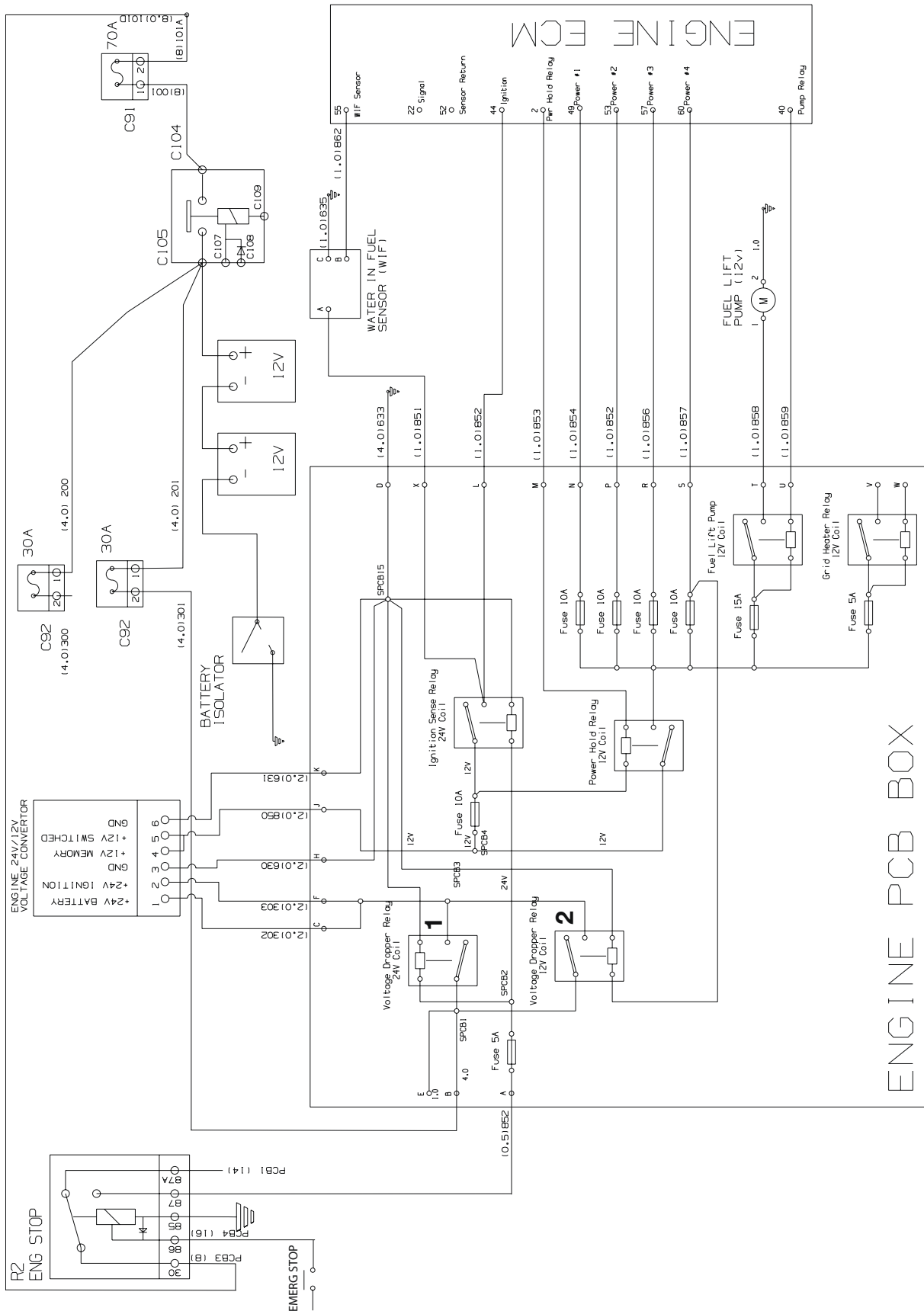


Fig 52.

Engine Cranking

Operation

When the ignition key is turned to the crank position 24 v is sent from pin 7 to the starter relay.

The start relay is earthed via the lever lock switch. If the lever lock is down the earth signal to the relay is lost so engine cranking will not occur.

With the lever lock up, the start relay will switch allowing 24v from the main fuse link to flow over the relay to engage the starter motor solenoid and initiate cranking. An HT supply to the starter motor is supplied direct from the battery relay to power the starter motor.

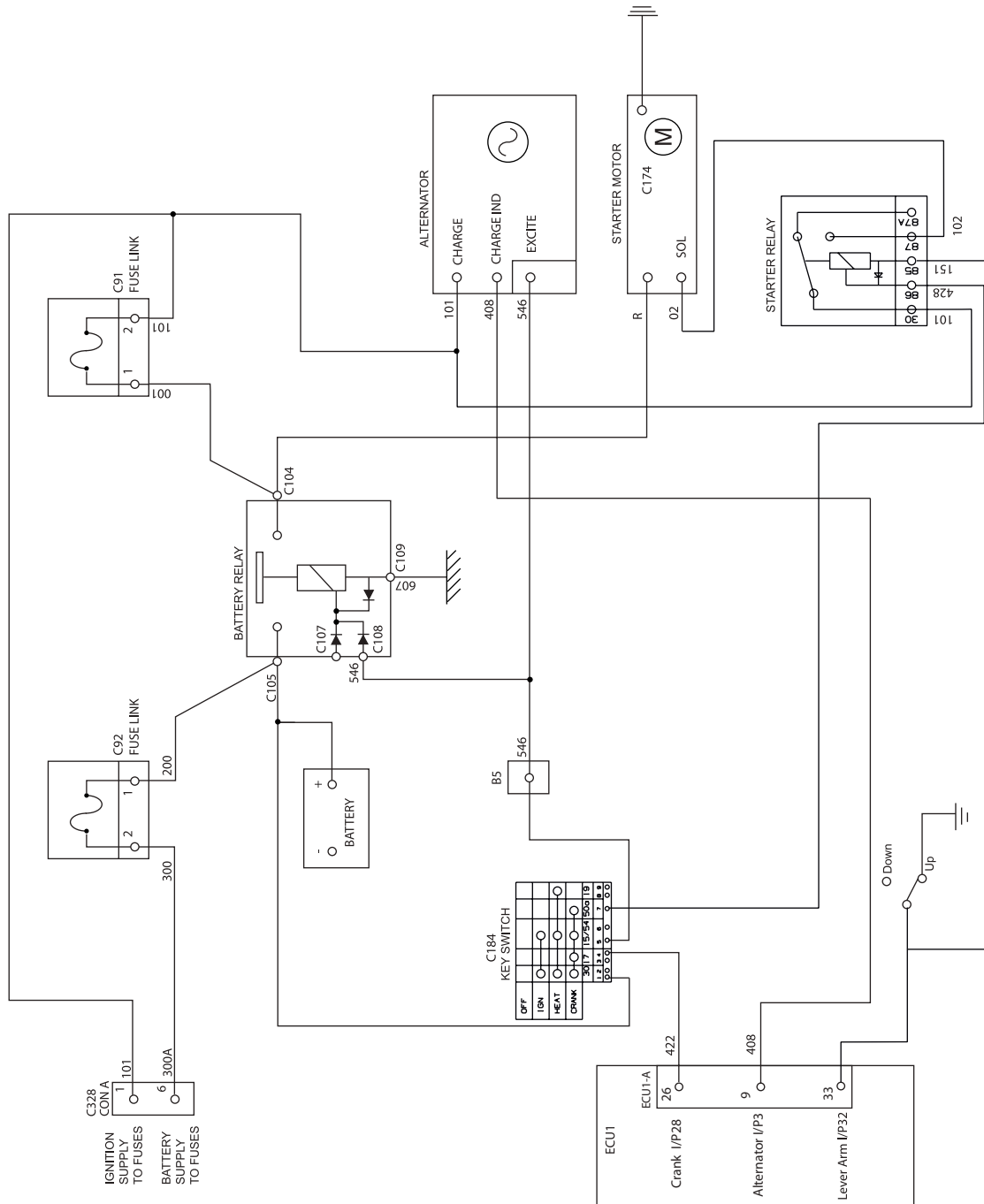


Fig 53. Engine Cranking

Alternator/ No Charge Warning - JS115-145

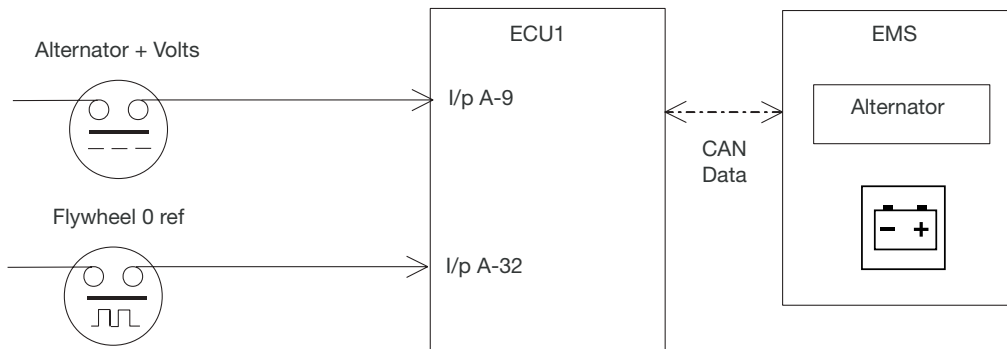


Fig 54.

Operation

The output of the alternator is monitored by the ECU1 and a warning alarm sounded if the output voltage falls below a set value.

When the value of the alternator input (Ecu1 I/p A-9) falls below 23 volts or above 32 volts, the ECU1 sends a CAN message to the EMS which in turn illuminates the warning lamp.

If the engine is running, as detected by the flywheel input (I/p A-32) then the internal buzzer on the EMS is sounded and the message "Alternator" is displayed in addition to the warning light.

Alternator/No Charge Warning - JS160-220

Operation

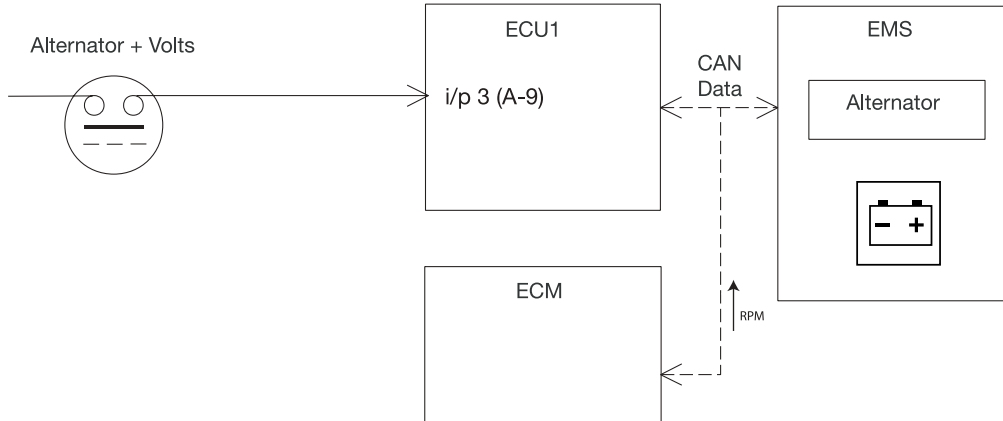


Fig 55.

C030360GB-2

With the ignition on 24 volts is sent to the alternator excite pin.

Once the engine is started a 24 – 32 v charge indication signal is send to the ECU1 pin A9.

The alternator also outputs on the charge wire 101 to operate the machines electrical circuits and charge the batteries.

The output of the alternator is monitored by the ECU1 and a warning alarm sounded if the output voltage falls below a set value.

When the value of the alternator input, ECU1 i/p 3 (A-9) falls below 23 volts or above 32 volts, the ECU1 sends a CAN message to the EMS which in turn illuminates the warning lamp.

If the engine is running, as detected by the RPM message from the ECM, then the internal buzzer on the EMS is sounded and the message "ALTERNATOR" is displayed in addition to the warning light.



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Limp Mode system

Operation

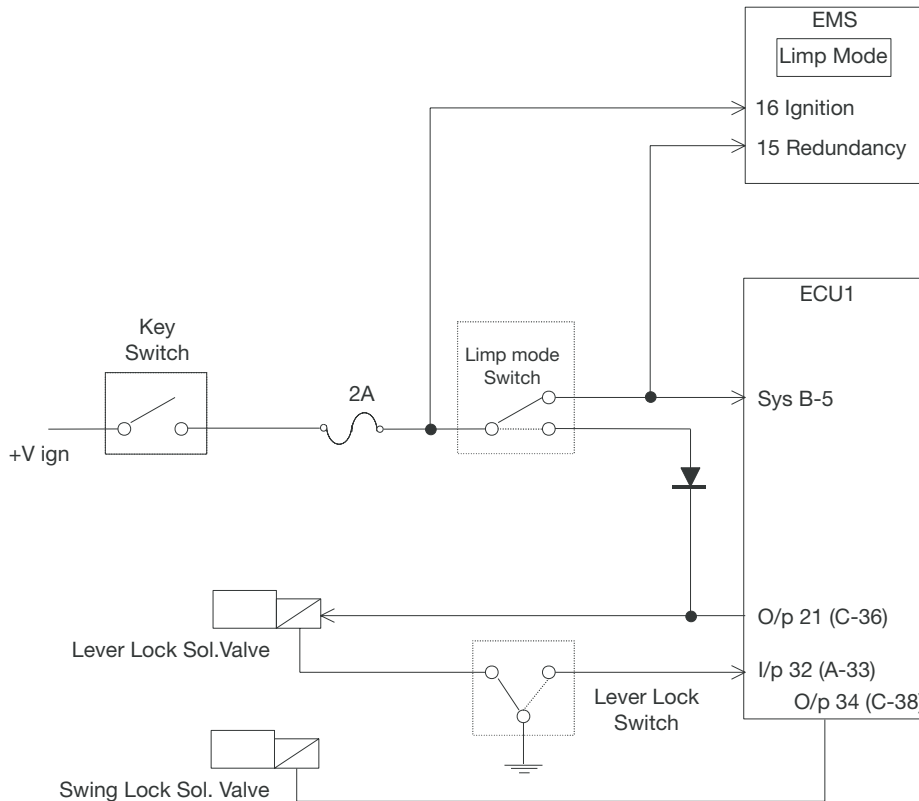


Fig 56.

In the event of a ECU1 failure, the redundancy switch allows the function of:

- 1 Lever lock
- 2 Swing lock

In the normal position, the redundancy switch feeds the ignition voltage to the ECU1 and the redundancy i/p of the EMS.

The lever lock and swing lock functions are fed from the ECU1 o/p 21 (C-36).

The lever lock and swing lock functions are fed from the redundancy switch via a diode.

The EMS will permanently display a "LIMP HOME" message and all bar graph bars will illuminate together and flash on/off at half second intervals. The buzzer will sound, this can be cancelled by pressing the ACK button.

The engine will run at the default engine speed (approx. 1600 rpm).

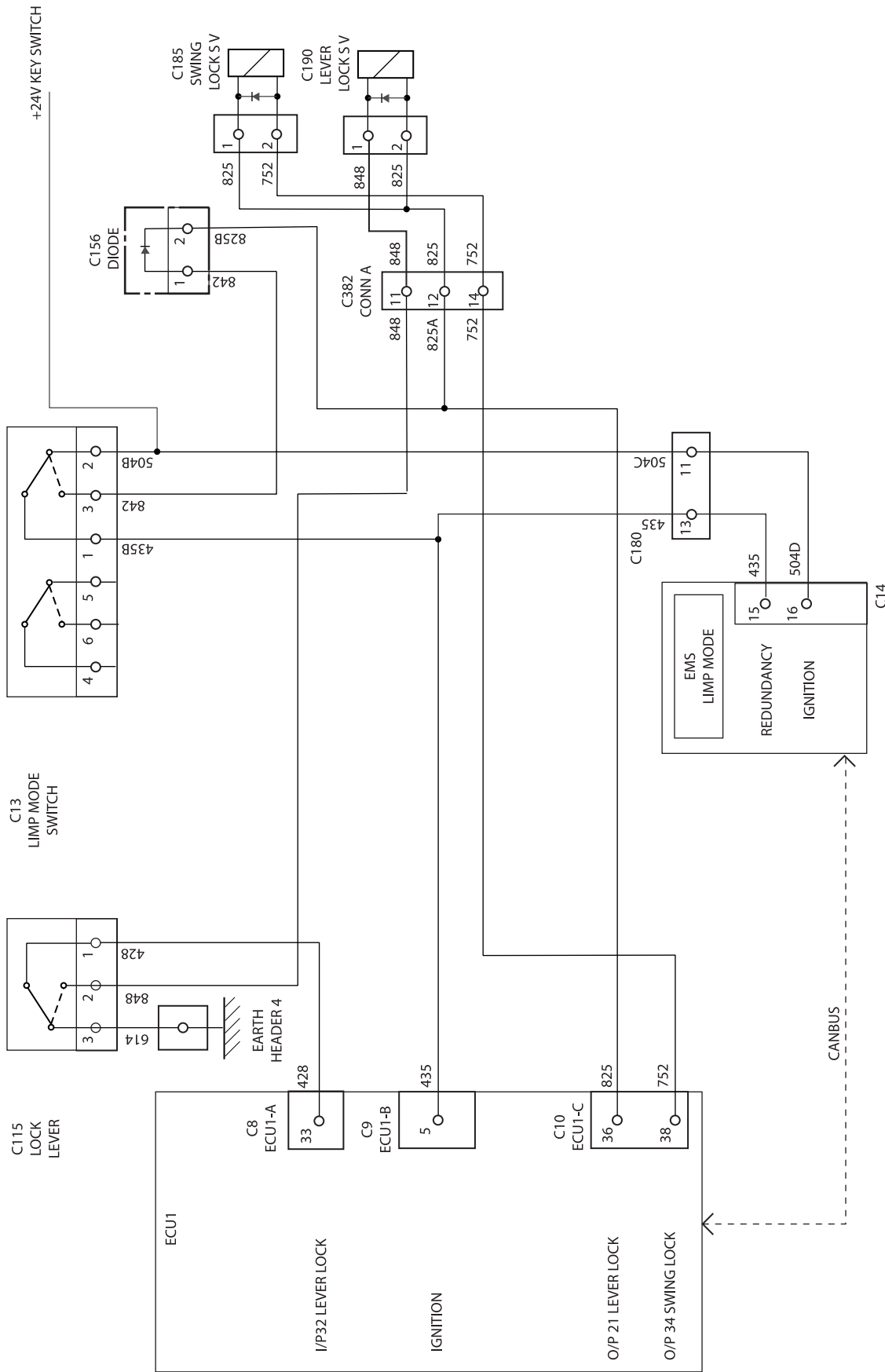


Fig 57.

Lever Lock

Operation

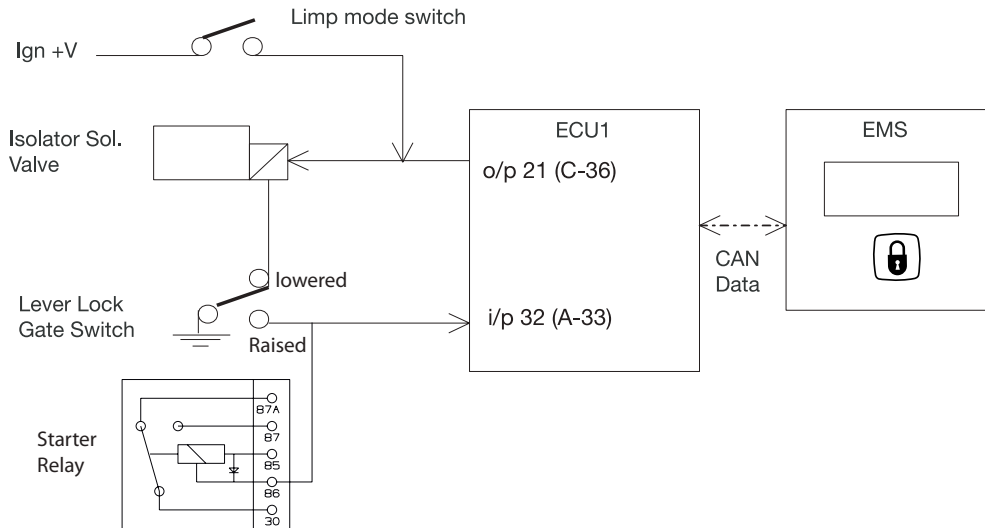


Fig 58.

The machine is equipped with a control lock lever, which has to be raised to exit the cab and lowered before any hydraulic operation of the machine is possible.

Engine start is disabled unless the lever lock arm is raised. If the ignition is switched on and the lever lock arm is raised, the engine shutdown remains off and the engine will start. If cranking is attempted while the lever lock arm is down, the LIFT_LEVER message is displayed on the EMS and the servo isolator LED will flash on the EMS for the duration of the cranking.

When the control lever lock is in the lowered position there is no ground available to ECU1 i/p 32 (A-33) or the starter relay. This causes the o/p 21 (C-36) to the isolator valve to be energised and when a ground is available through the lever lock switch, operation of the excavator controls is possible.

When the lever lock is raised to the upright position the ground circuit for the solenoid is no longer complete. There is a ground input to ECU1 i/p 32 (A-33) and the lever lock warning light is illuminated.

In limp mode the lever lock solenoid valve is supplied directly from the limp mode switch.



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Servo Isolator

Operation

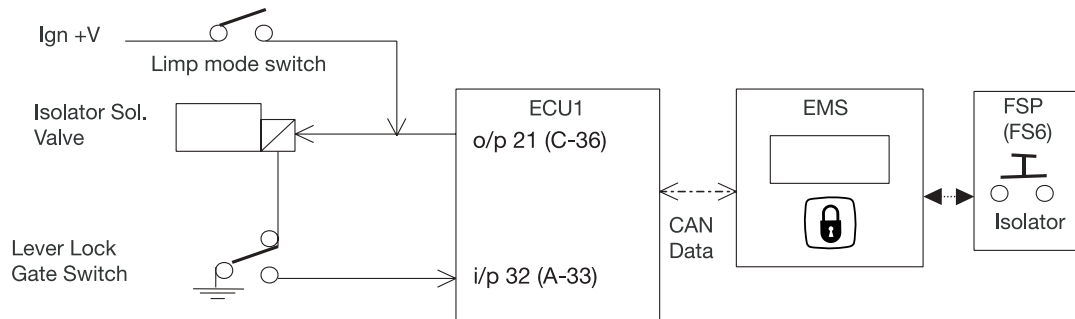


Fig 59.

C005540GB-2

The operator has the ability to isolate the excavator controls by pressing the isolator switch on the facia switch panel.

When the Isolator switch is pressed both the warning lamp and the switch status indicator are illuminated. ECU1 now de-energises the output to the isolator solenoid valve o/p 21 (C-36).

A second press of the isolator switch extinguishes both the warning lamp and the switch status indicator. ECU1 now energises the isolator output o/p 21 (C-36) and provided the lever lock is in the correct position, operation of the excavator controls is possible

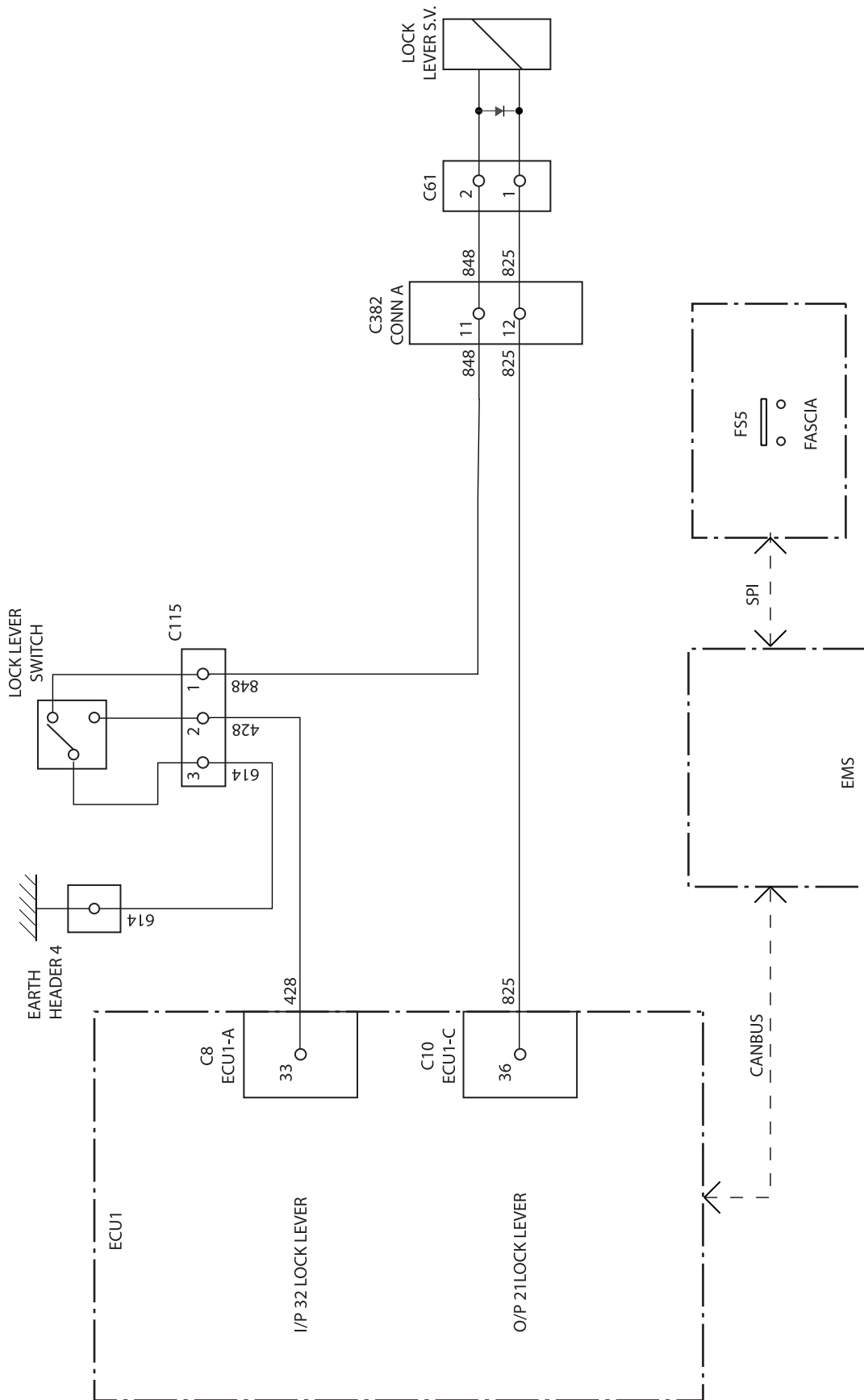


Fig 60. Lever Lock and Servo Isolator

Wiper

Operation

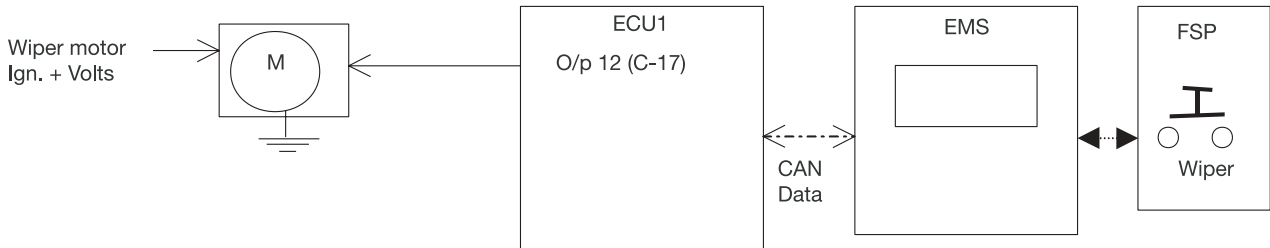


Fig 61.

C027300GB-2

The wiper has three modes of operation, intermittent, permanently on and off. Timing for the intermittent function is performed by ECU1, and can be varied via the set menu on the EMS.

When the wiper switch on the Facia Switch Panel (FSP) is pressed once o/p 12 (C-17) on ECU1 is pulsed for 0.5 seconds to start the wiper stroke. A hold on contact within the motor assembly retains power for the return stroke of the blade. A time delay of variable seconds is activated before the output is energised again, thus giving intermittent operation.

A second press of the switch enables the wiper to operate continuously and the output is permanently energised.

A third press of the switch disables wiper operation.

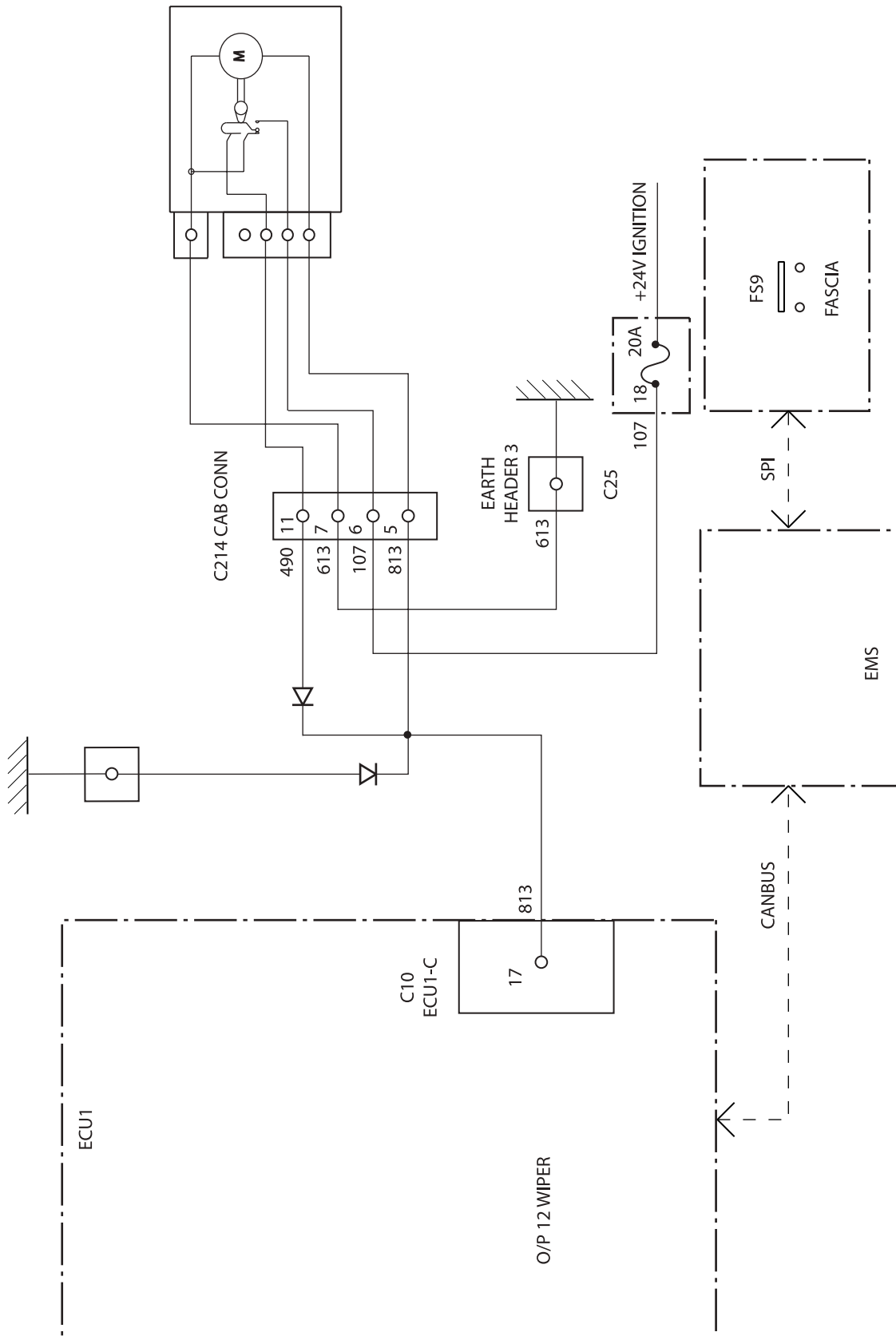


Fig 62.

Lower Wiper (option)

Operation

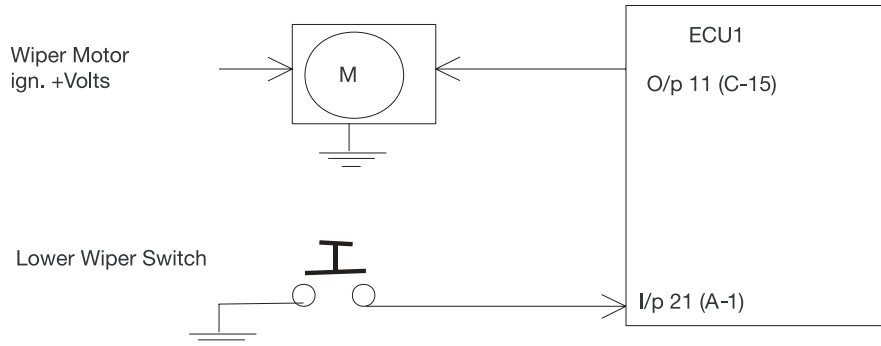


Fig 63.

C027310GB-2

The lower wiper is a customer selected option and is fitted to the lower glass panel at the front of the operator's cab.

The wiper has three modes of operation intermittent, continuous and off. Timing for the intermittent function is performed by ECU1. The same timer as utilised for the standard wiper is used to synchronise both wipers together.

When the lower wiper button is operated the ECU1 output number o/p 11 (C-15) is energised to start the wiper stroke. A hold on contact within the motor assembly retains power for the return stroke of the blade. A time delay equal to that set for the main wiper is activated before the output is energised again, giving intermittent operation.

A second press of the switch enables the wiper to operate continuously and the output is permanently energised.

A third press of the switch disables wiper operation.

Note: If the upper (main) wiper is energised then the lower wiper output is energised at the same time, synchronising both wipers.

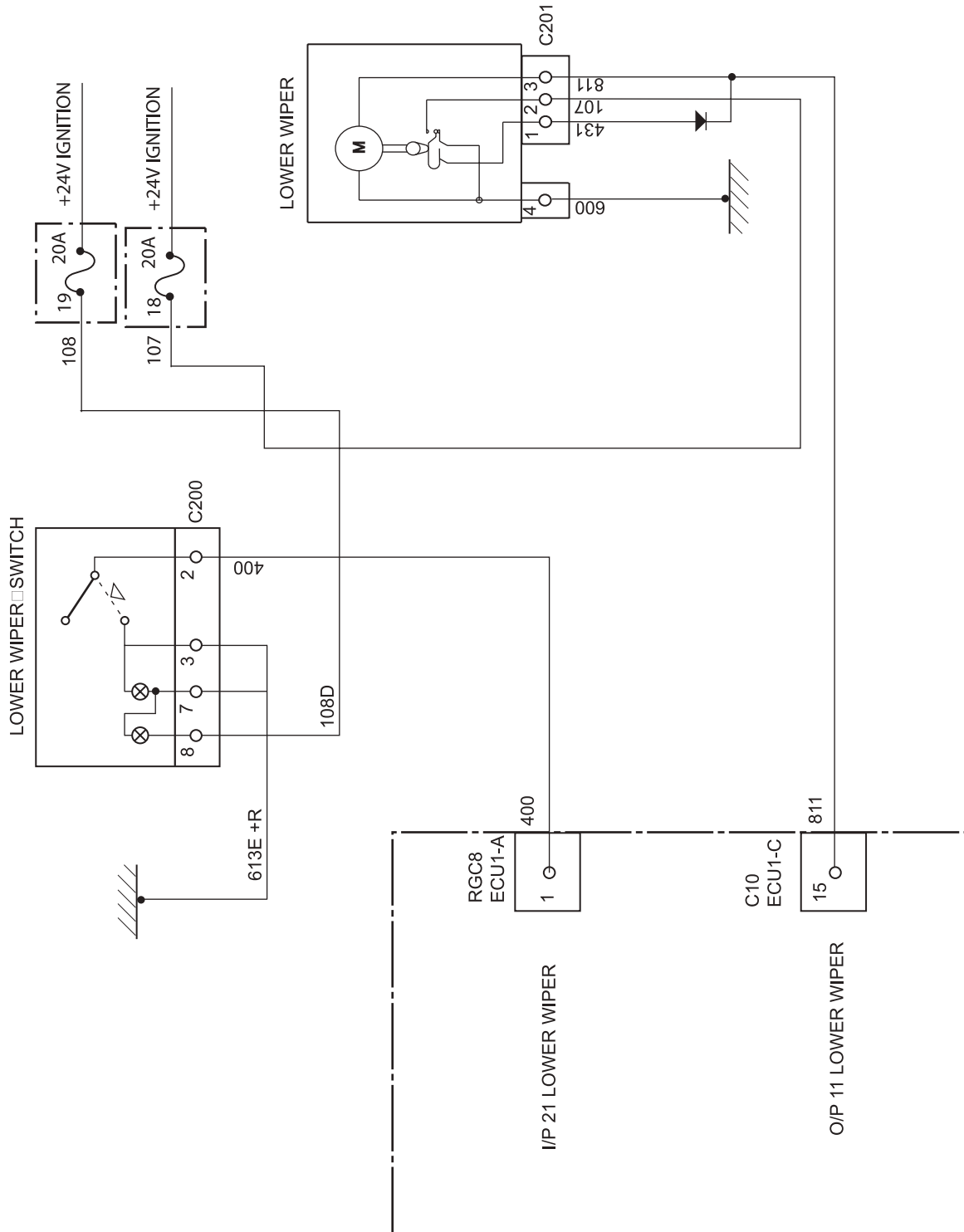


Fig 64.

Washer

Operation

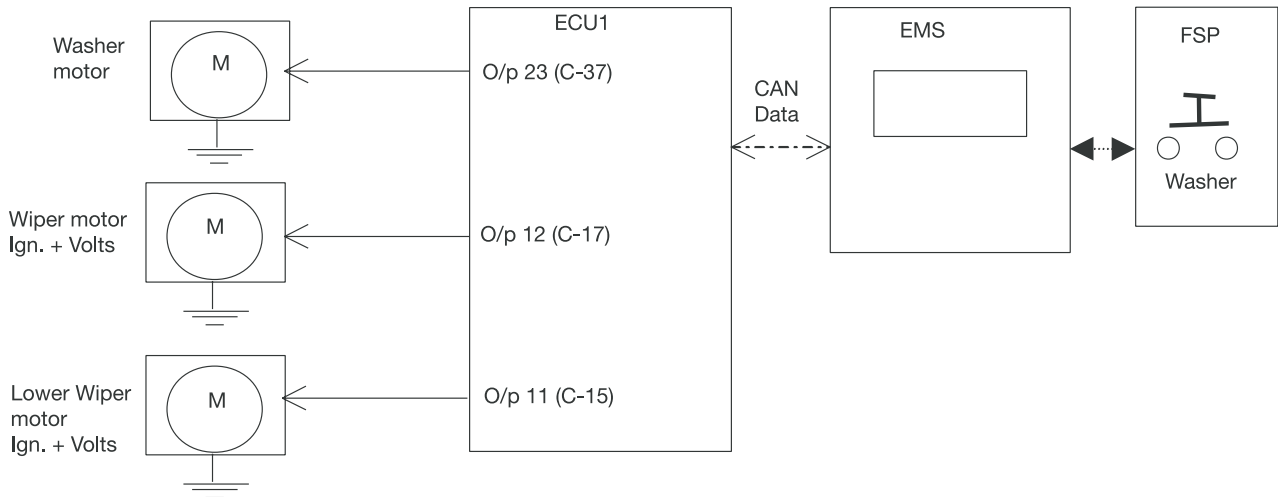


Fig 65.

C027320GB-2

When the washer switch on the facia switch panel is pressed the ECU1 operates the output o/p 23 (C-37) to the washer pump. The ECU output is only energised whilst the facia switch is pressed.

Whenever the washer output is energised the wiper output ECU1 o/p 12 (C-17) is also energised. When the washer switch is released the wiper will do three additional strokes and then turn itself off.

If the lower wiper has been selected as an option, when the washer button is pressed, both the upper and lower wipers are energised.

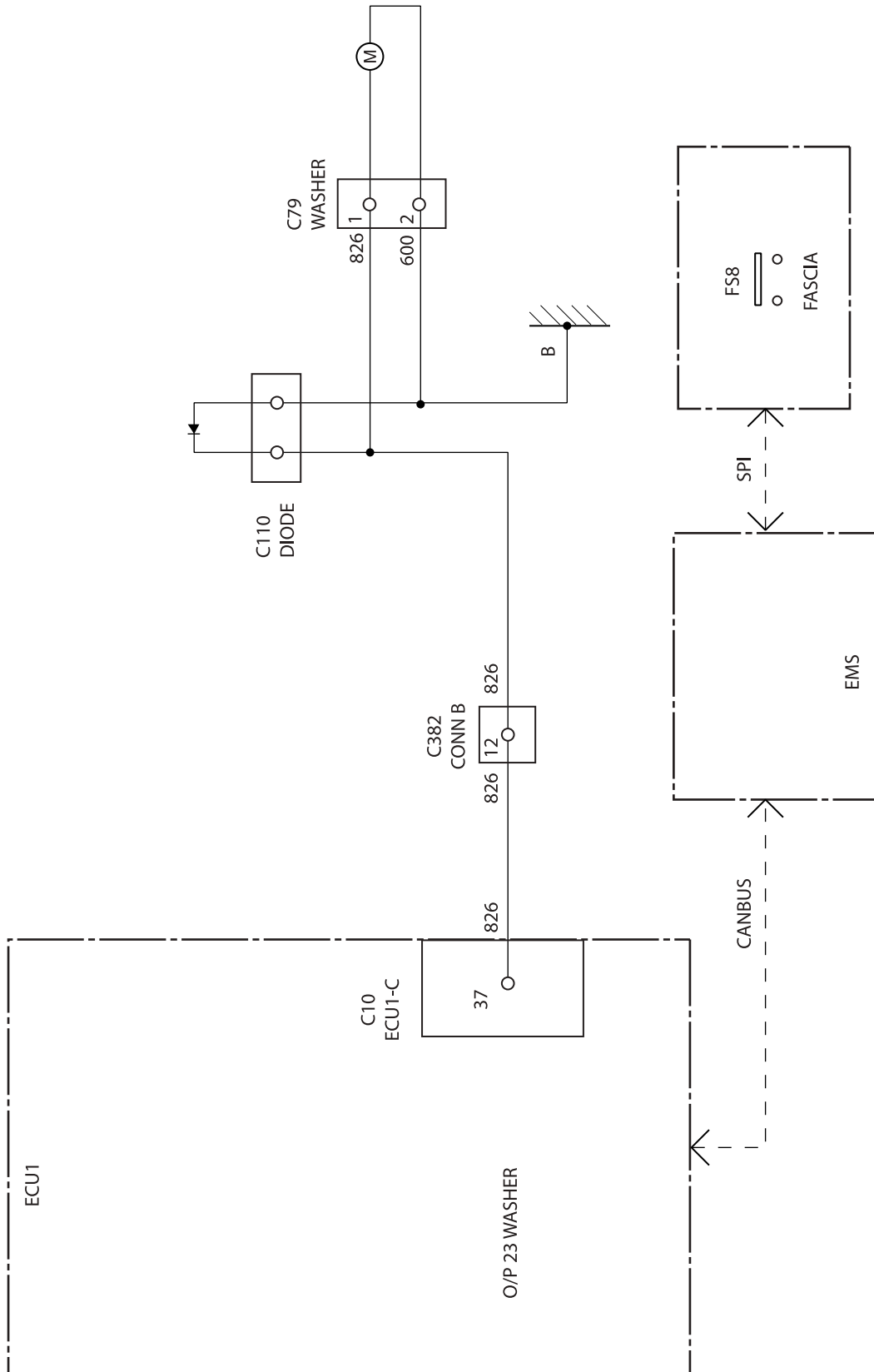


Fig 66.

Horn

Operation

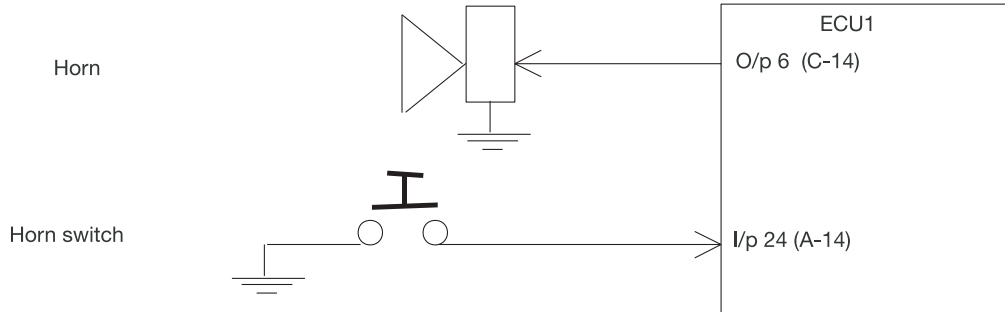


Fig 67.

C028390GB-2

When the left joystick rear button is pressed, input ECU1 i/p 24 (A-14) is selected the horn output ECU1 o/p 6 (C-14) is energised whilst the button is pressed.

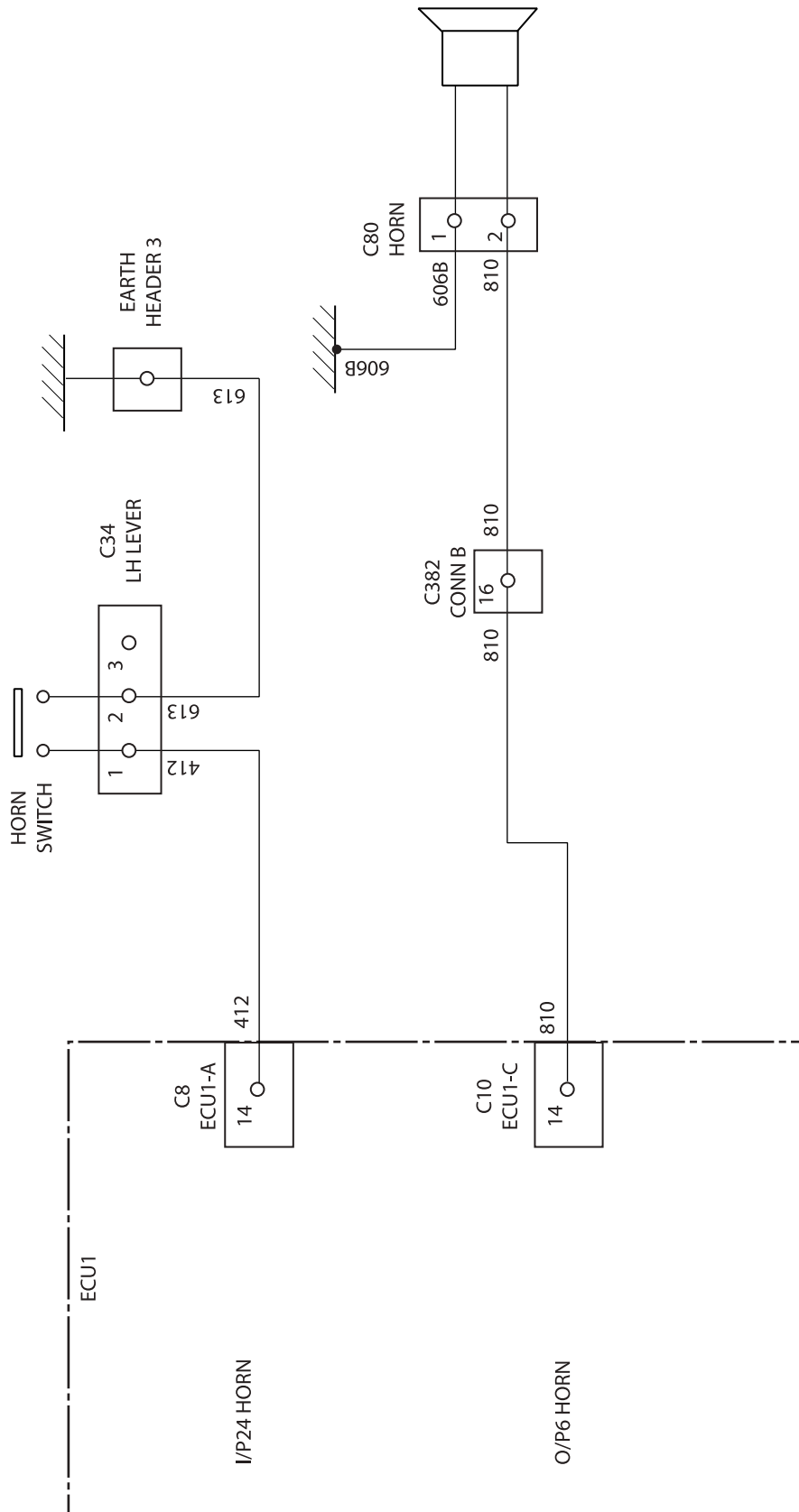


Fig 68.

Travel Alarm

Operation

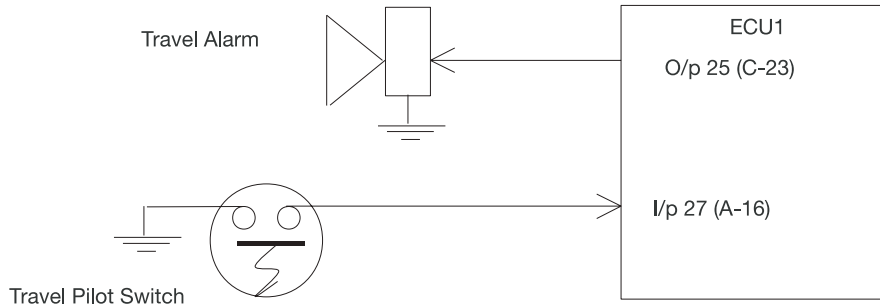


Fig 69.

C005590GB-2

The travel alarm is available as an option on the tracked machines. Whenever travel movement is requested travel pressure switch ECU1 i/p 27 (A-16) is selected. When this input is grounded the travel alarm output ECU1 o/p 25 (C-23) is energised.

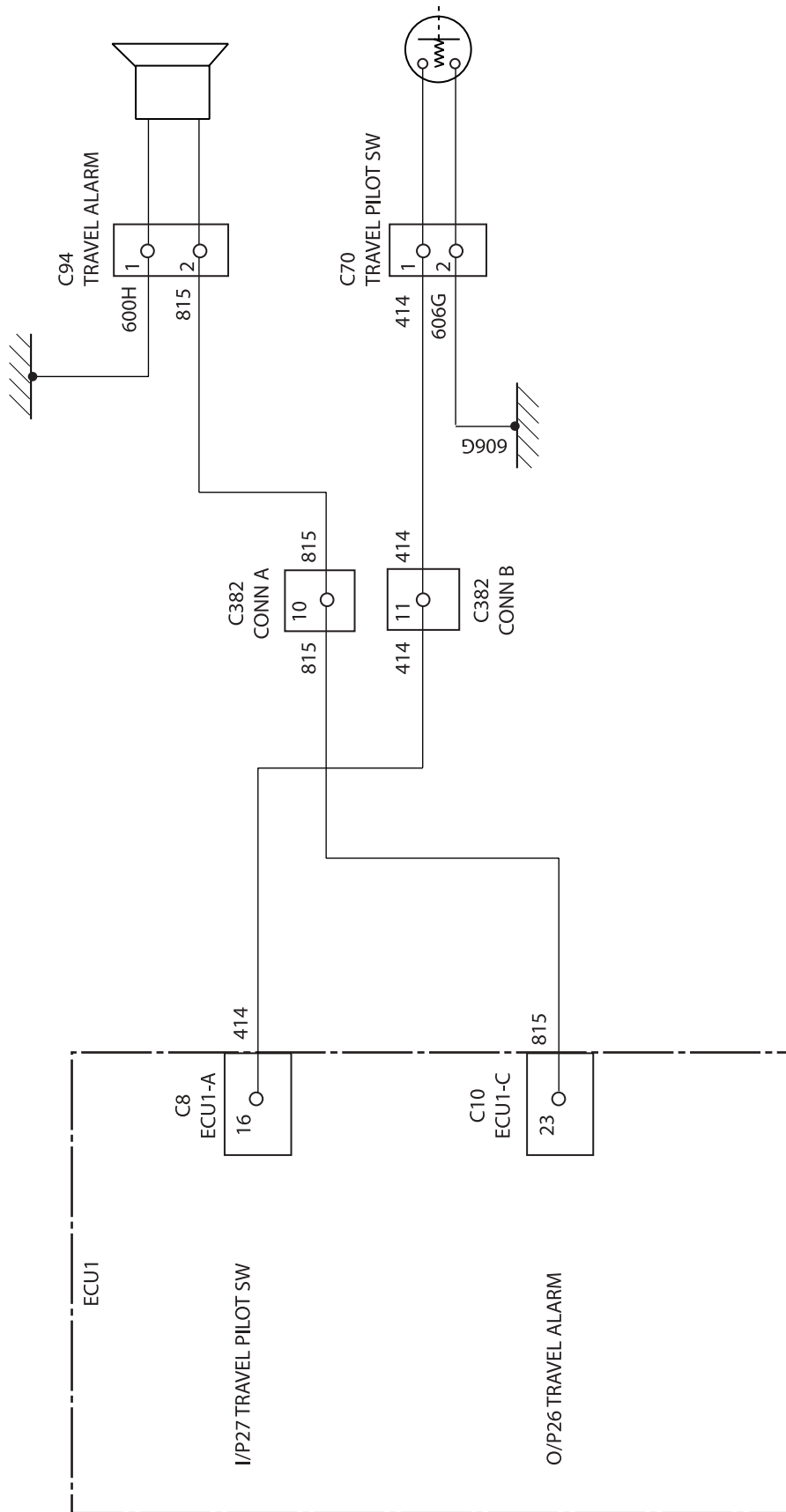


Fig 70.

Soft/Hard (Cushion)

Operation

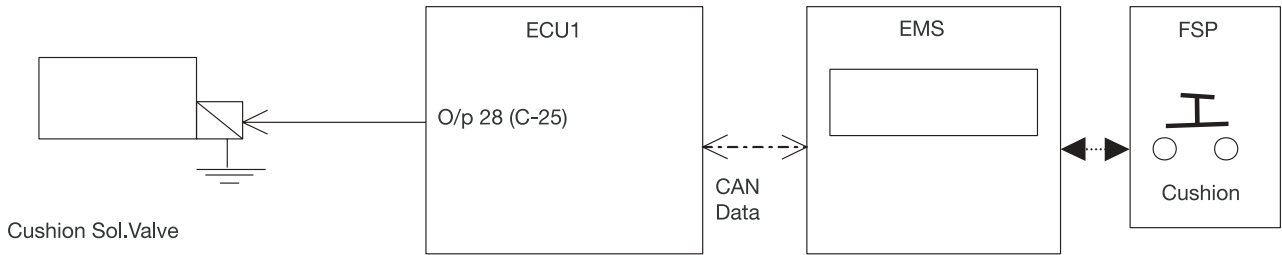


Fig 71.

C005600GB-2

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/p 28 (C-25) is energised.

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

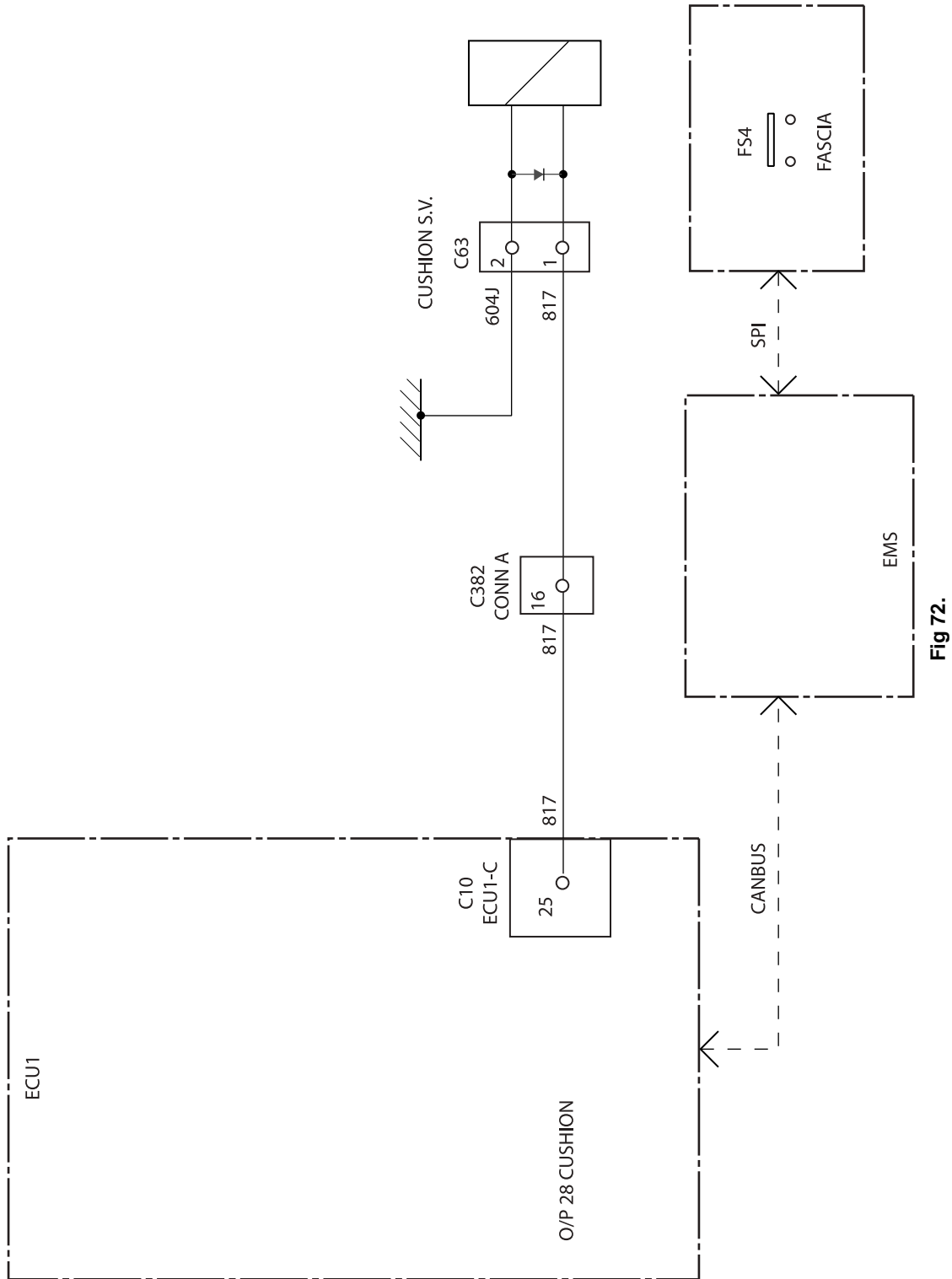


Fig 72.

Slew Brake (100%)

Operation

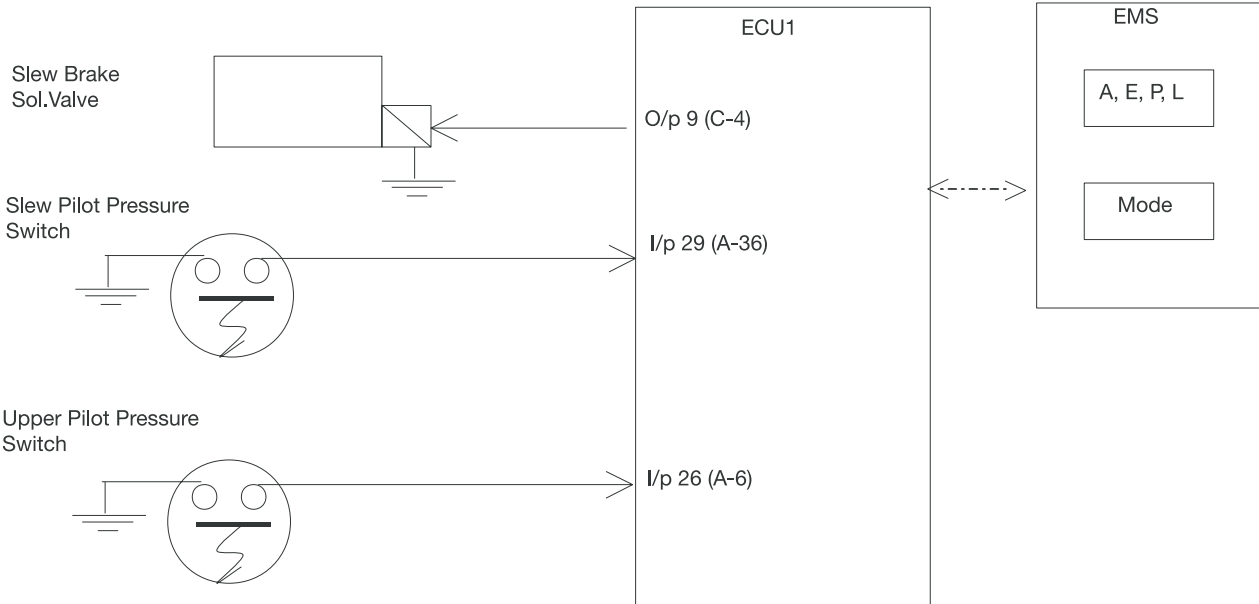


Fig 73.

C028410GB-2

The slew parking brake holds the current slew position of the machine and prevents slew drift.

This is the default operation with the engine running.

The operator signals for slew movement by moving the left hand joystick. This results in the slew pilot pressure switch being activated. This signals the ECU1 to energise the slew parking brake solenoid valve, thus enabling slew.

The slew pilot pressure switch is de-activated, by returning the joysticks to neutral, and the upper structure comes to a stop using a hydrostatic brake (cross lines relief valve). If this condition exists for 5 seconds then the slew parking brake solenoid is de-energised. Thus applying the slew brake.

To prevent any damage to the slew brake occurring when excavating the slew brake solenoid will remain energised and the slew brake remain off, if the upper pilot pressure switch is activated or re-activated within 5 seconds of the slew pressure switch closing.

If however the upper pilot pressure switch remains de-activated for 5 seconds or longer, the slew brake solenoid will de-energise (brake on). The slew brake solenoid will remain de-energised until the slew pilot pressure switch is activated.

When L mode (lifting) is selected, the upper pilot pressure switch is ignored and 100% brake applied. When the slew pilot switch is energised the slew parking brake is lifted.

By Default Slew parking brake is automatically applied at start up.



Section C - Electrics Basic System Operation

Slew Brake (100%)

Slew Pilot SW i/p29(A-36)	Upper Pilot SW i/p26(A-6)	Slew Parking Brake Sol Valve o/p9(C-4)	Machine Working Mode
✘	✘	✘ (=100% brake)	A, E, and P
✓	✘	✓ (=0% brake)	A, E, and P
✘ Less than 5 Sec	✘	✓ (=0% brake)	A, E, and P
✘ Greater or equal to 5 sec	✘	✘ (=100% brake)	A, E, and P
✘	✓	✓ (=0% brake)	A, E, and P
✓	✓	✓ (=0% brake)	A, E, and P
✘	✓	✘ (=100% brake)	L
✓	✓	✓ (=0% brake)	L
✓	✘	✓ (=0% brake)	L

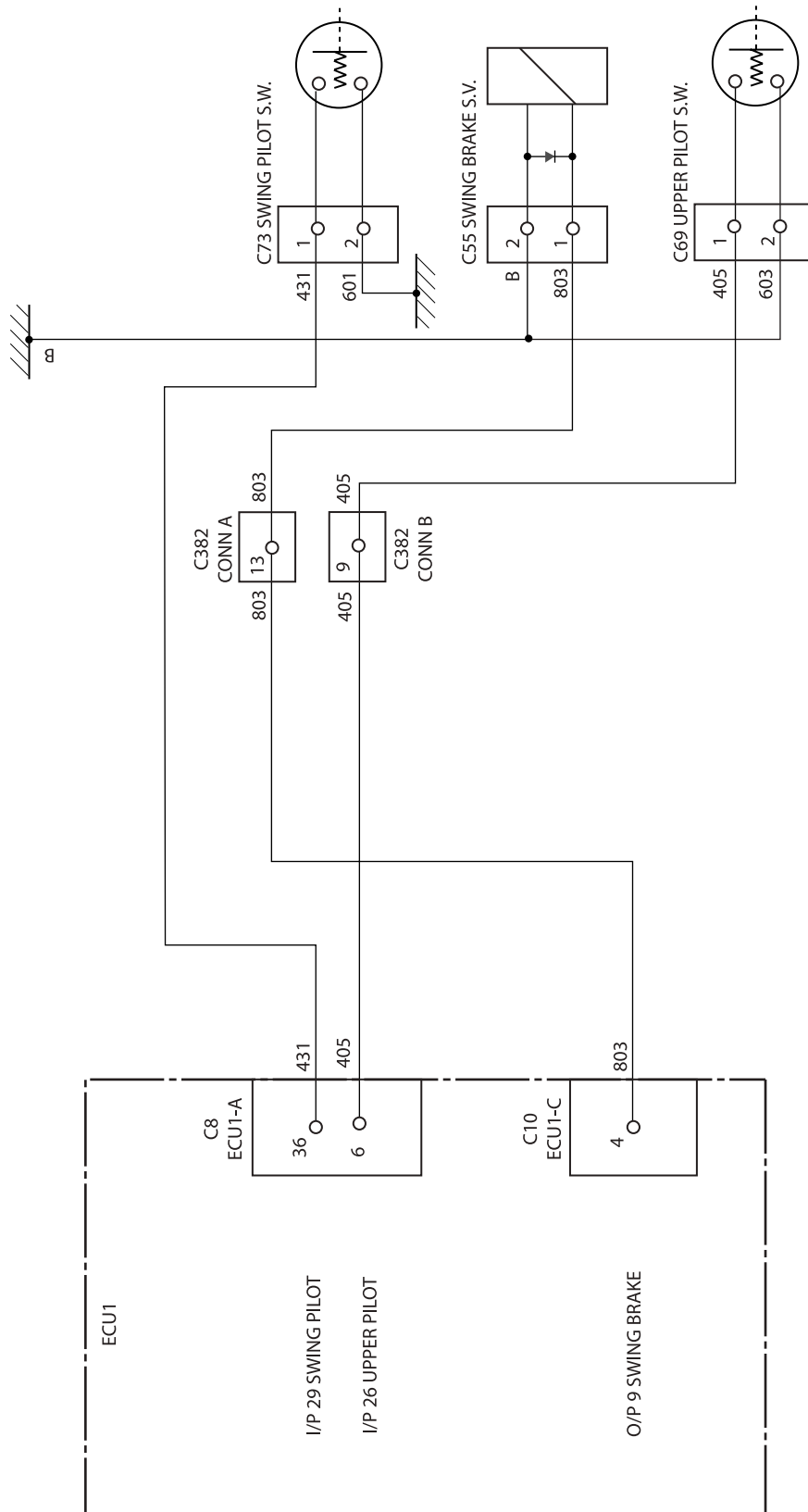


Fig 74.



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Slew lock (100% Slew Brake)

Operation

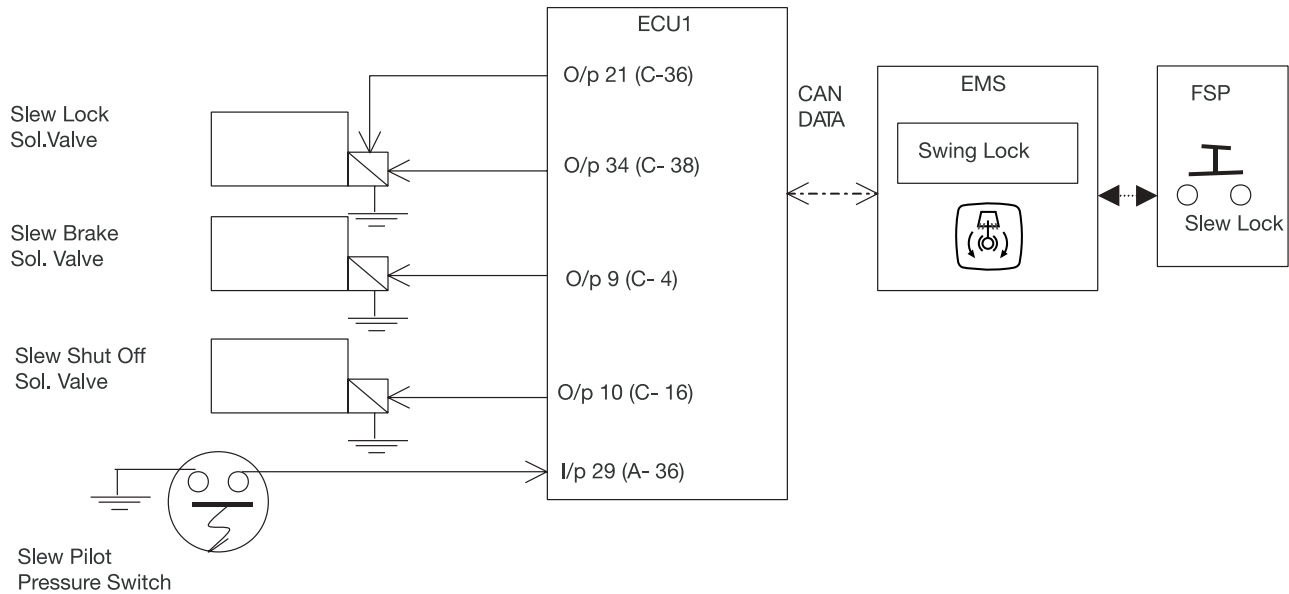


Fig 75.

C028430GB-2

The slew lock prevents any slew operation of the machine, even if the LH joystick is moved. It acts as 100% slew parking brake and disables the slew pilot circuit, by applying equal pressure on either side of the slew spool in the main valve block (slew shut off).

The lock is operated by pressing the slew lock switch on the fascia switch panel. When pressed the status indicator illuminates. The EMS displays the message "SWING LOCK", and the warning light illuminates. The EMS transmits the slew lock request to the ECU1 via the CAN communications link. The slew shut off solenoid is energised (effectively isolating the joysticks) and slew parking brake solenoids is left de-energised by the ECU1.

5 seconds after the Slew Lock button is pressed the slew lock solenoid is energised, opening the slew brake cylinder to tank and applying 100% braking force.

The slew lock is de-activated by a second press of the fascia switch. This causes the switch status indicator and the EMS warning lamp to be extinguished. The ECU1 de-energises the slew lock and slew shut off solenoid valves. The slew parking brake will not be re-energised until an input from the slew pilot pressure switch is seen.

By Default upon start slew lock is automatically disengaged.

Swing Lock	Swing Pilot Psw	Swing Lock Sol Valve	Swing Parking Brake Sol Valve	Swing shut off Sol Valve
FS2	i/p29(A-36)	o/p8 (C-3)	o/p9 (C-4)	o/p10 (C-16)
✗	✓	✗	✓	✗
✓	★	✗	✗ (=100% brake)	✓
✓ + 5 Sec	★	✓	✗ (=100% brake)	✓

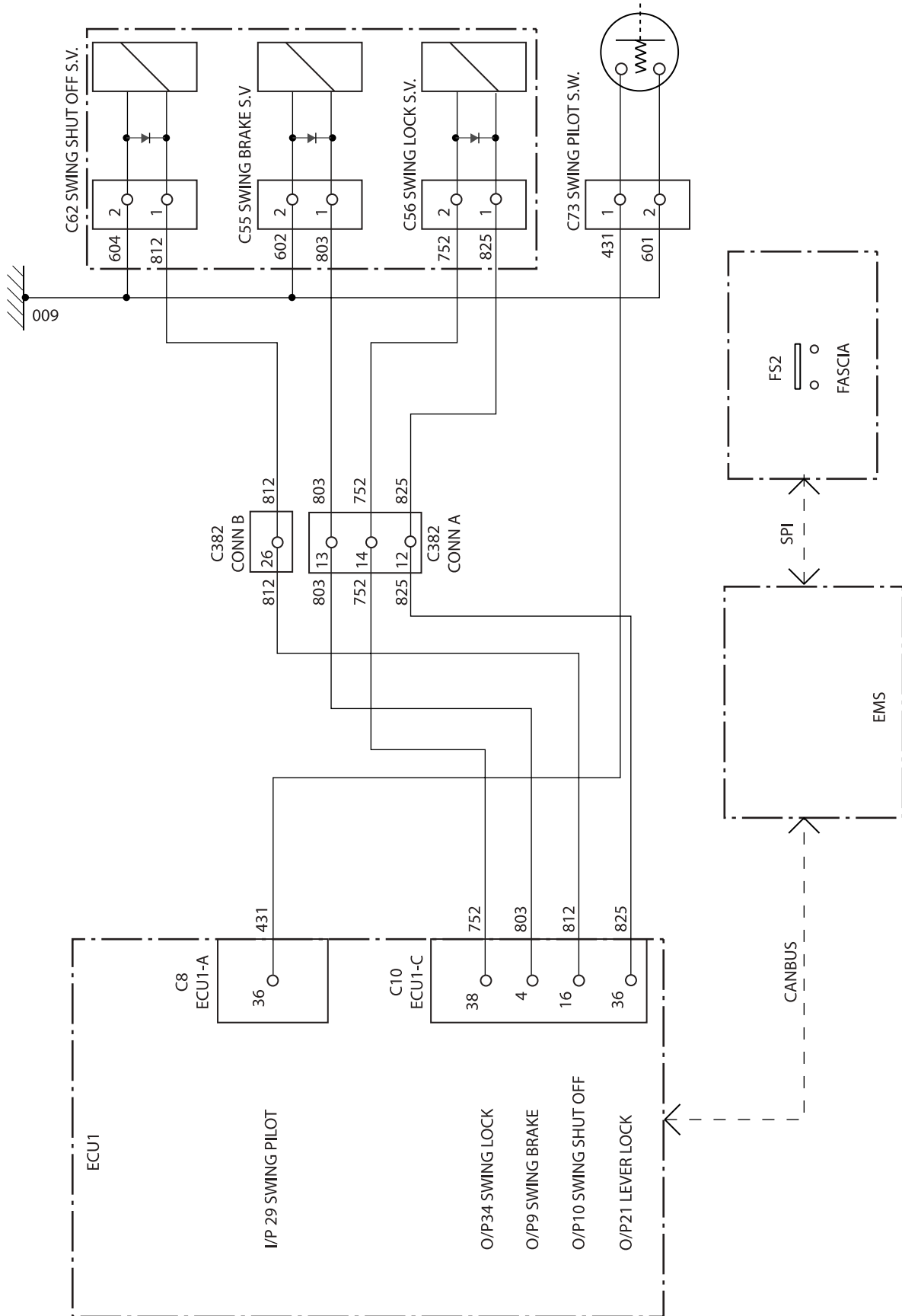


Fig 76.

Slew Brake Solenoid Valve Failure

Operation

In the event of slew brake solenoid or the slew pressure switch failing, the slew brake will still operate. The pilot signal from the hand controller passes through the shuttle block and enters the slew brake valve via port A. When the pressure overcomes the slew brake shuttle, the signal passes through the slew brake valve via port B and is directed to the slew brake. When sufficient pressure is raised the slew brake is lifted.

The slew operation will tend to be notchy, as the brake on and off timing will depend upon the position of the slew joystick.

Note: *This operation is only to be used to make the machine safe i.e. to slew the machine into a safe position, for transportation to a place where an appropriate repair can be carried out.*

3-Speed Travel

Operation

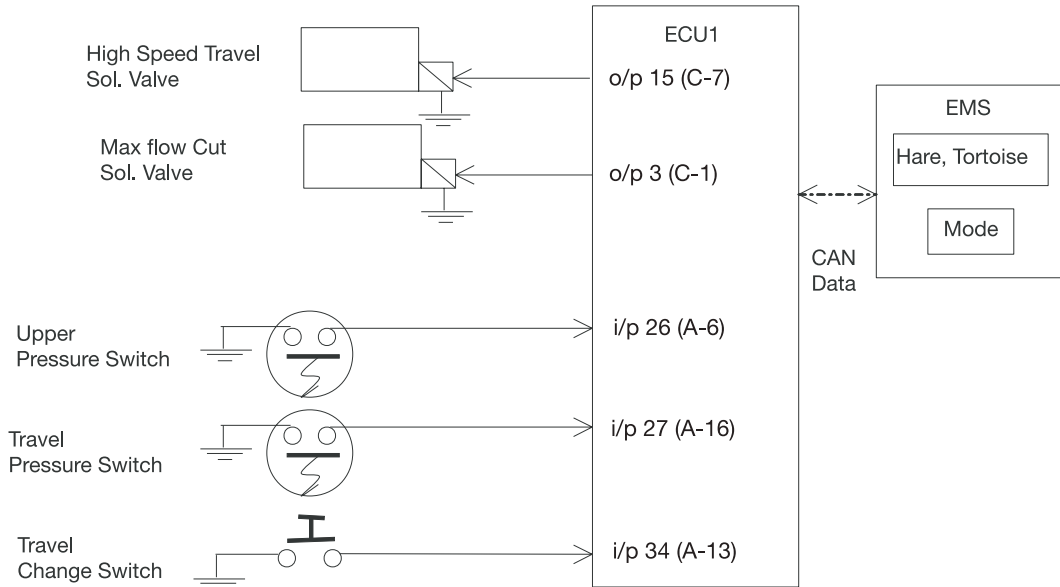


Fig 77.

C005630GB-2

Using a combination of two solenoids (high speed travel solenoid and max flow cut solenoid), pump flow and swash plate position of the travel motor are used to give three travel speeds. The selected travel speed is indicated on the EMS as either a Hare (High), double arrow (Middle), or Tortoise (Low) and is changed by successive presses of the travel change switch. The current operating mode of the machine alters the logic in which the solenoids operate.

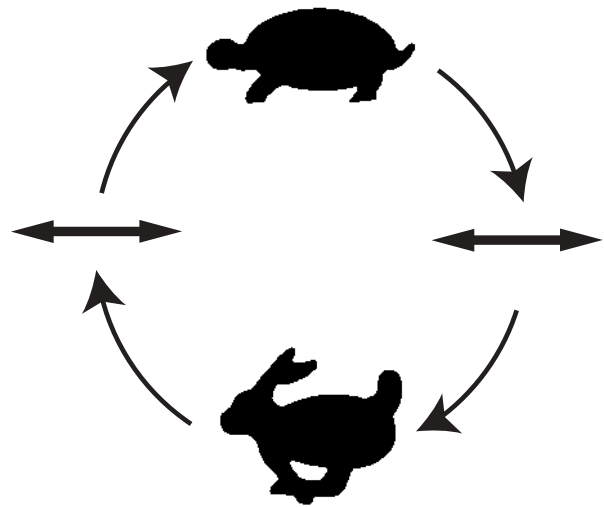
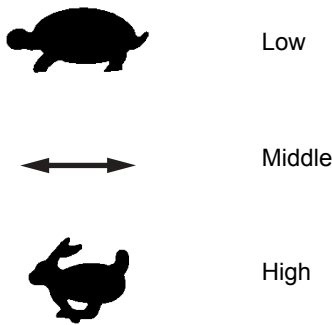


Fig 78.

C075600



Note: The last selected travel speed when machine is stopped is re-instated when the machine is restarted.

"E" Economy, "P" Precision & "A" Auto Modes

At the mid travel speed the motor swash plate is in the maximum swash position (low speed) and the pump is at the standard setting. The max flow cut and high speed travel solenoids are de-energised and the statuses of the travel and upper pressure switches are ignored. The EMS displays the "Arrow" gear icon.

When the travel change switch ECU1 i/p 34 (A-13) is pressed the EMS displays the "Hare" gear icon. The high speed travel solenoid is energised, ECU1 o/p 15 (C-7), thus moving the swash plate to the minimum swash position (high speed). The pressure switch inputs are ignored. The machine is now in the high speed travel mode.

When the travel change switch is pressed again the EMS displays the "Tortoise" gear icon. The machine is now in low speed mode. The high speed travel solenoid, ECU1 o/p (C-7) is de energised. If the travel pressure switch is activated i.e. travel selected, ECU1 i/p 27 (A-16) then the Max flow cut solenoid is energised, ECU1 o/p 3 (C-1) and the pump is put in "Q cut "mode. The max flow cut solenoid is only energised whilst the travel pressure switch is activated. The input from the upper pressure switch is ignored. The next successive press of the travel change switch, ECU1 i/p 34 (A-13) selects the mid travel speed and the EMS displays the "Arrow" gear icon.

Relationship between Travel Modes A / E + P, travel motor swash plate position and Pump "Q max cut output"

Travel Speed	High Speed Travel Solenoid Output ECU 1 o/p 15 (C- 7)	Q Max Cut Solenoid Output ECU 1 o/p 3 (C-1)
Creep (Tortoise)	OFF	On (24v) only when travel pressure switch has been selected i.e. travel selected
Middle (Arrow)	OFF	OFF
High (Hare)	ON (24v)	OFF

"L" Lifting Mode

In the mid travel speed the motor swash plate is in the maximum swash position (low speed), the high speed travel solenoid, ECU1 o/p 15 (C-7) is de-energised. When only the travel pressure switch ECU1 i/p 27 (A-16) is selected, the max flow cut solenoid, ECU1 o/p 3 (C-1) is de-energised. When the upper pressure switch, ECU1 i/p 26 (A-6) only is selected, the max flow cut solenoid valve is energised, thus setting the pump to the "Q -cut" setting. If both the travel pressure switch, ECU1 i/p 27 (A-16) and the upper pressure switch, ECU1 i/p 26 (A-6) are selected, the max flow cut solenoid, ECU1 o/p 3 (C-1) remains energised, thus leaving the pump in "Q cut" mode. The EMS displays the "Arrow" gear icon.

When the travel change switch, ECU1 i/p 15 (C-7) is pressed, the EMS displays the "Hare" gear icon. The high speed travel solenoid, ECU1 o/p 15 (C-7) is energised, moving the travel motor swash plate to minimum swash position (high speed). When only the travel pressure switch, ECU1 i/p 27 (A-16) is selected, the max flow cut solenoid, ECU1 o/p 3 (C-1) is de-energised. When the upper pressure switch, ECU1 i/p 26 (A-6) is selected, the max flow cut solenoid valve is energised, thus setting the pump to the "Q -cut" setting. If both the travel pressure switch, ECU1 i/p 27 (A-16) and the upper pressure switch, ECU1 i/p 26 (A-6) are selected, the max flow cut solenoid, ECU1 o/p 3 (C-1) remains energised, thus leaving the pump in "Q cut" mode.

When the travel change switch is pressed again the EMS displays the "Tortoise" gear icon. The high speed travel solenoid, ECU1 o/p 15 (C-7) is de energised, thus the swash plate is set to the high swash position (low speed). The Max flow cut solenoid, ECU1 o/p 15 (C-1) is energised, thus putting the pump in "Q cut" mode. The machine is now in low speed mode. The operation of the travel pressure switch, ECU1 i/p 27 (A-16) and the upper pressure switch ECU1 i/p 26 (A- 6) are ignored.

The next successive press of the travel change switch, ECU1 i/p 34 (A-13) selects the mid travel speed and the EMS displays the "Arrow" gear icon.

L mode and travel combination

- Middle speed travel only - pump standard.
- Excavating only - Q max cut
- Travel & excavating - Q max cut

- High speed travel only - pump standard.
- Excavating only - Q max cut
- Travel & excavating - Q max cut

- Creep speed travel only - Q max cut
- Excavating only - Q max cut
- Travel & excavating - Q max cut

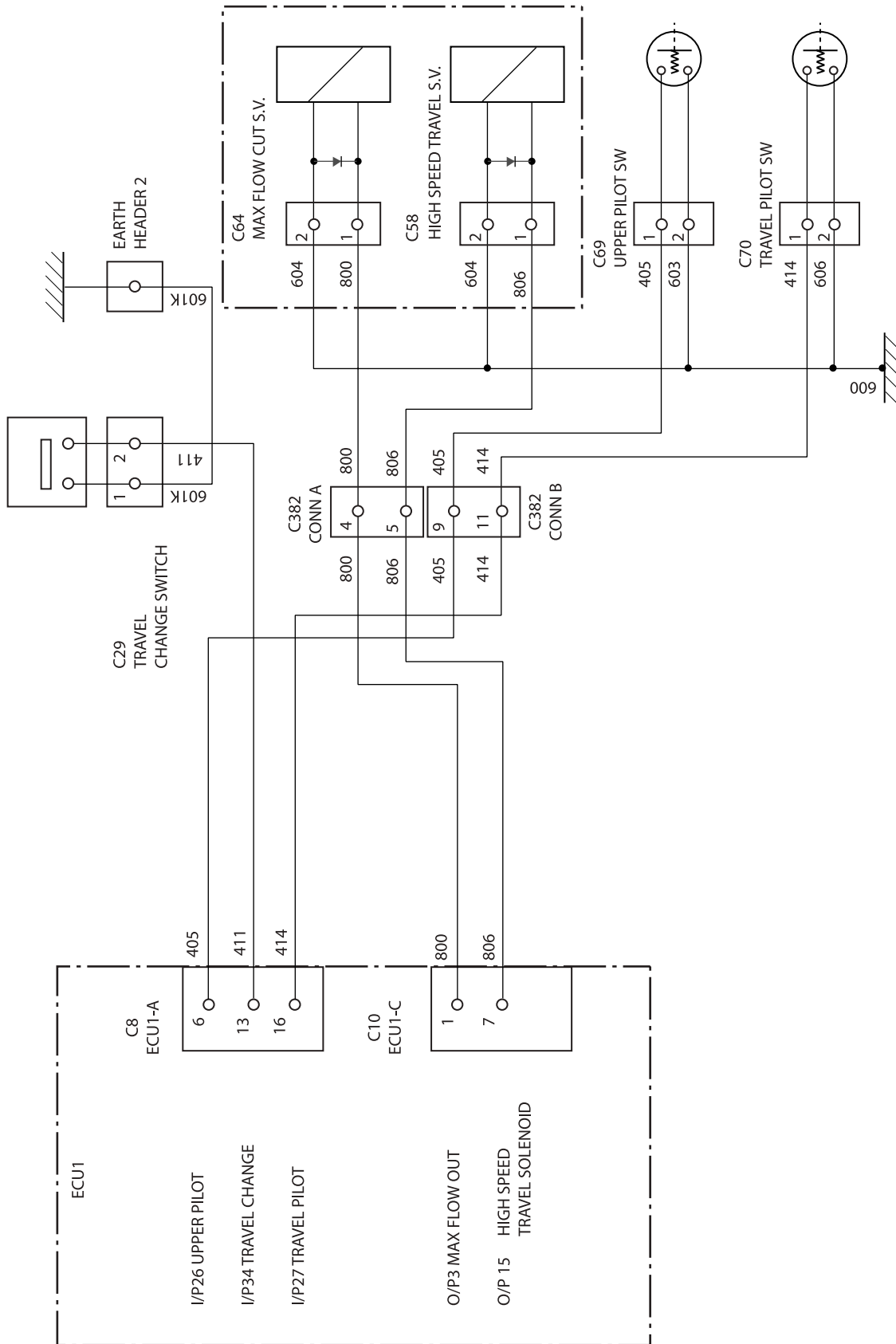


Fig 79.



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Work Lamps

Operation

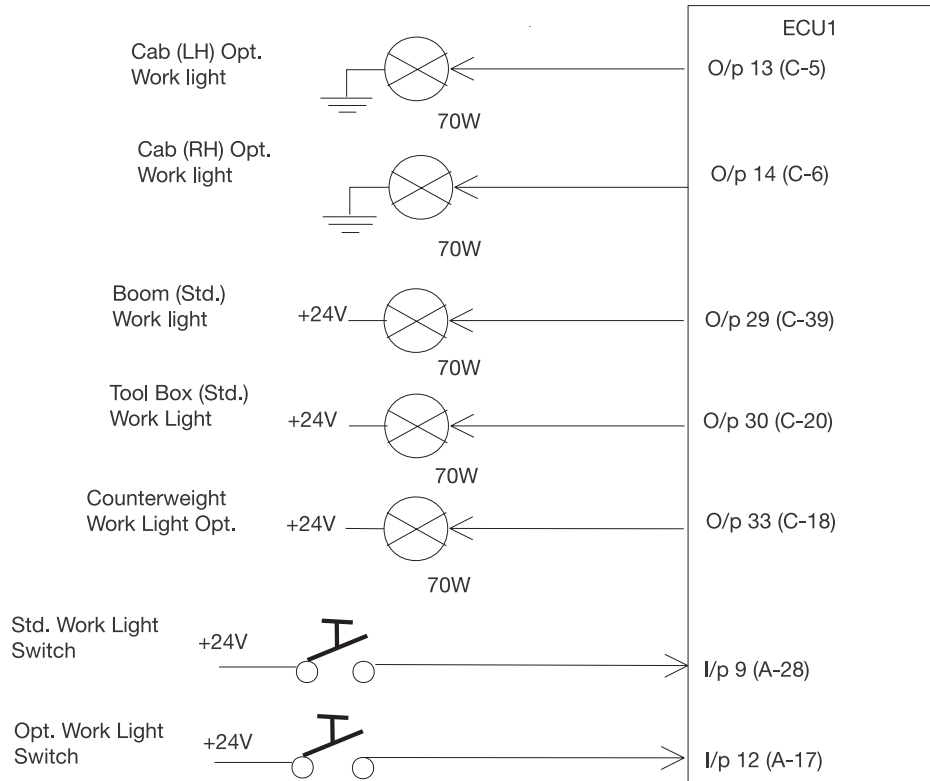


Fig 80.

C028460GB-2

Work lamps are located on the boom and front body (tool box) of the machine. An optional set of three additional work lamps can be fitted to the cab and counter weight.

The switch is returned by pressing in the reverse direction boom and tool box work lamps and the optional work lamps are extinguished.

When the work light switch is moved to the first position, the input i/p 9 (A-28) to the ECU1 is selected. This in turn enables outputs to be turned on to the Boom, ECU1 o/p 29 (C-39) and lower front body (Tool Box), ECU1 o/p 30 (C-20).

A second press of the same switch selects ECU1 i/p 12 (A-17) and i/p (A-28) which in turn energises the second optional set of cab work lamps, ECU1 o/p 13 (C-5) and o/p 14 (C-6) and counter weight, ECU1 o/p 33 (C-18), if they are fitted and provided that these options have been selected in the machine setup tool.

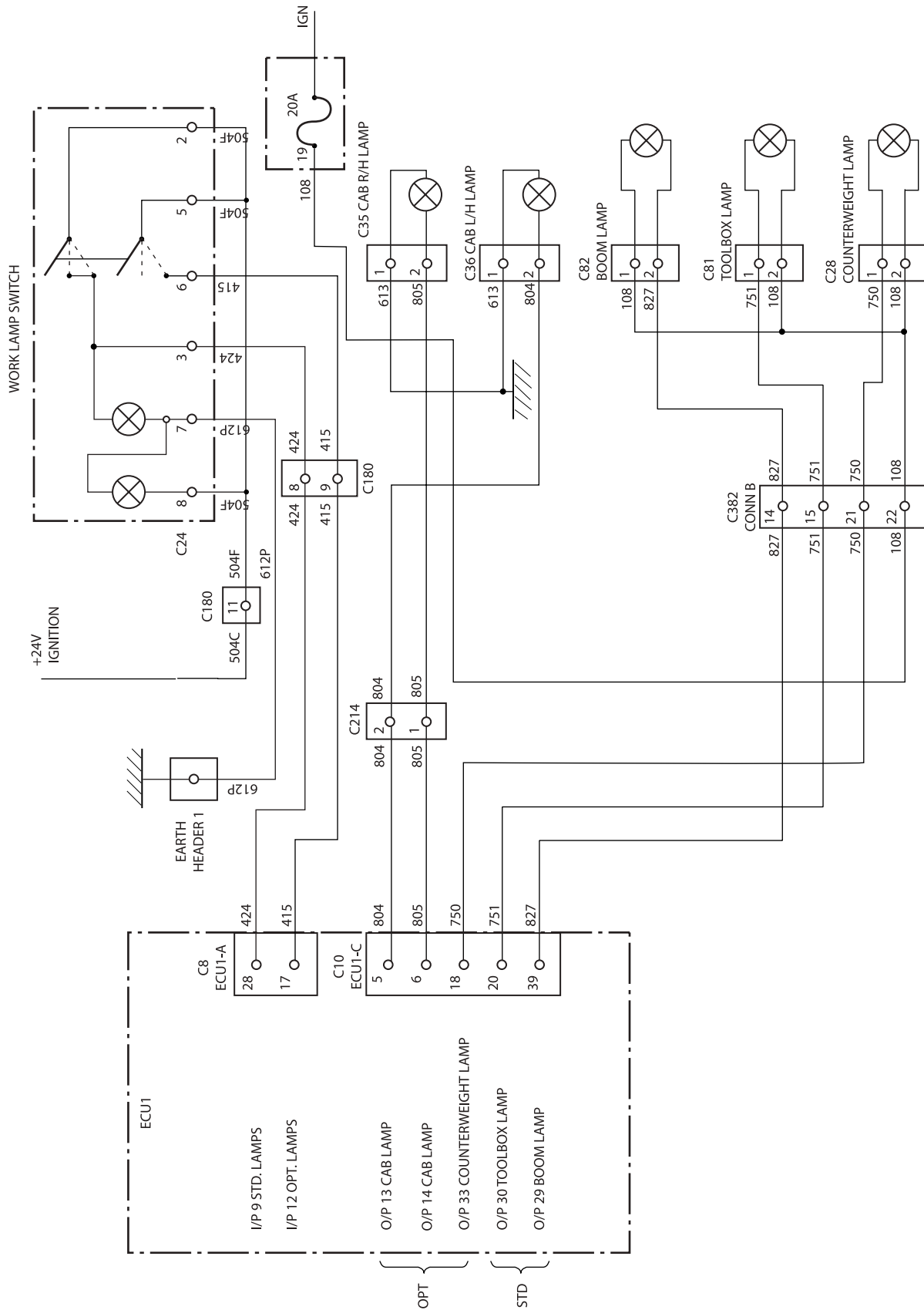


Fig 81.

Viscous Fan

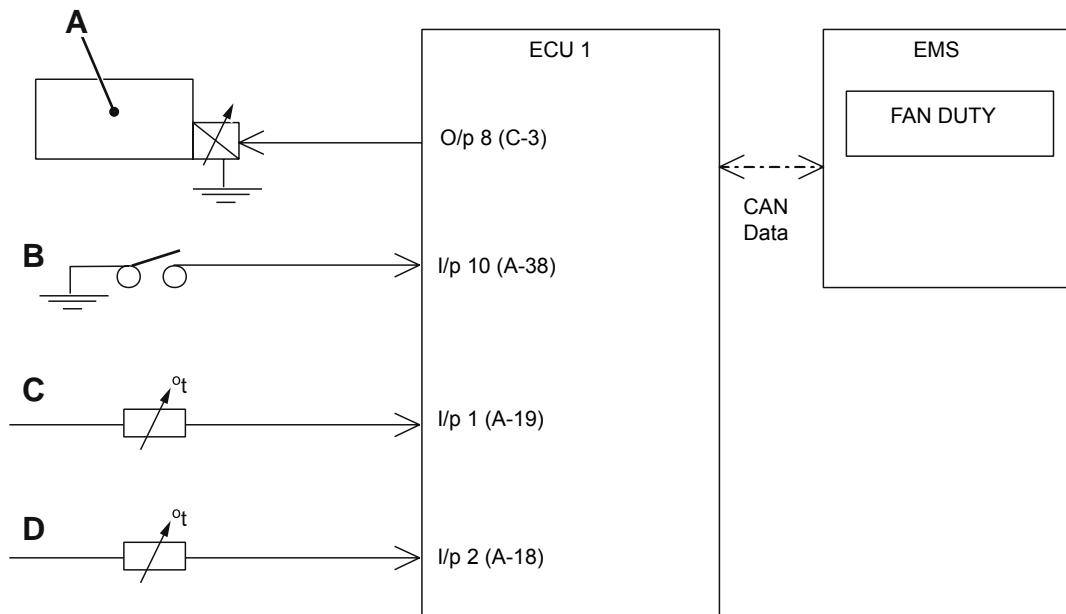


Fig 82.

865670

- A Viscous fan solenoid
- B A/C switch
- C Hydraulic oil temperature
- D Engine coolant temperature

Operation

The cooling pack temperature is controlled by an electromagnetically controlled viscous coupling fan. The electromagnetic clutch which drives the fan speed is controlled by a PWM signal from the ECU1.

Engine water and hydraulic oil temperature are monitored by the ECU1. As their temperatures change, the ECU1 will vary the PWM signal to the electromagnetic clutch. This changes the speed of the fan. As the temperature increases the PWM signal will decrease to drive the fan faster. If the PWM signal is lost to the electromagnetic clutch the fan will run at full speed.

The output PWM signal will drive the fan RPM to that set by the highest temperature as determined by the graph.
⇒ Fig 83. (□ C-82).

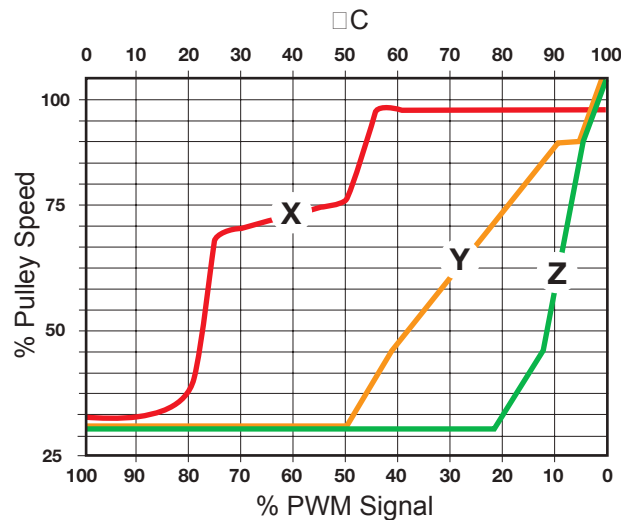


Fig 83.

823271

X = Fan Speed +/-50rpm.

Y = Oil Temperature.

Z = Water Temperature.

Fuel Level Sensor/Warning

Operation

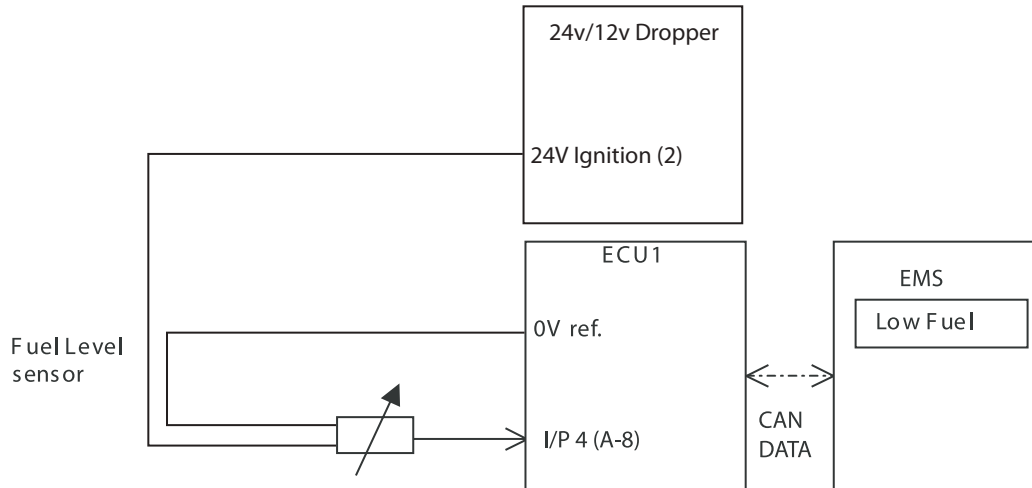


Fig 84.

A level sensor is fitted in the fuel tank to measure the level of fuel in the tank.

The level sensor consists of a rod surrounded by a tube and a micro controller and resistance emulator. The rod and tube act as a capacitor. Depending on the fuel level, the remaining air volume between the rod and the tube varies. The resultant capacitive change is recorded and processed by the micro controller. The emulator converts the capacitance into a resistance which can be used by the operator display.

The fuel level is displayed to the operator by means of a bar graph gauge. The actual values can be displayed via the EMS SET+MODE menu. Both the actual value and bar graph values should be an average of consecutive readings to provide a degree of dampening to prevent false readings.

Text warnings are provided for both reserve fuel and low fuel conditions. Low fuel is also backed up by a flashing bar graph.

The low fuel condition must be present for one consecutive minute before the "LOW FUEL" warning is displayed.

The reserve fuel condition must be present for one consecutive minute before the "RES FUEL" warning is displayed.



Section C - Electrics Basic System Operation

Fuel Level Sensor/Warning

Bar No	Symbol	Level Height From Full	Ohms	EMS Action
0	Empty	Greater Than 646	Greater than 107.5	Flashing Bar graph + "LOW FUEL"
1		646	Greater than 102.5	"RES FUEL"
2		612	Greater than 97.5	
3		578	Greater than 92.5	
4		544	Greater than 87.5	
5		510	Greater than 82.5	
6		476	Greater than 77.5	
7		442	Greater than 72.5	
8		408	Greater than 67.5	
9		374	Greater than 62.5	
10	Half	340	Greater than 57.5	
11		306	Greater than 52.5	
12		272	Greater than 47.5	
13		238	Greater than 52.5	
14		204	Greater than 37.5	
15		170	Greater than 32.5	
16		136	Greater than 27.5	
17		102	Greater than 22.5	
18		68	Greater than 17.5	
19		34	Greater than 12.5	
20	Full	0	Less than 12.5	

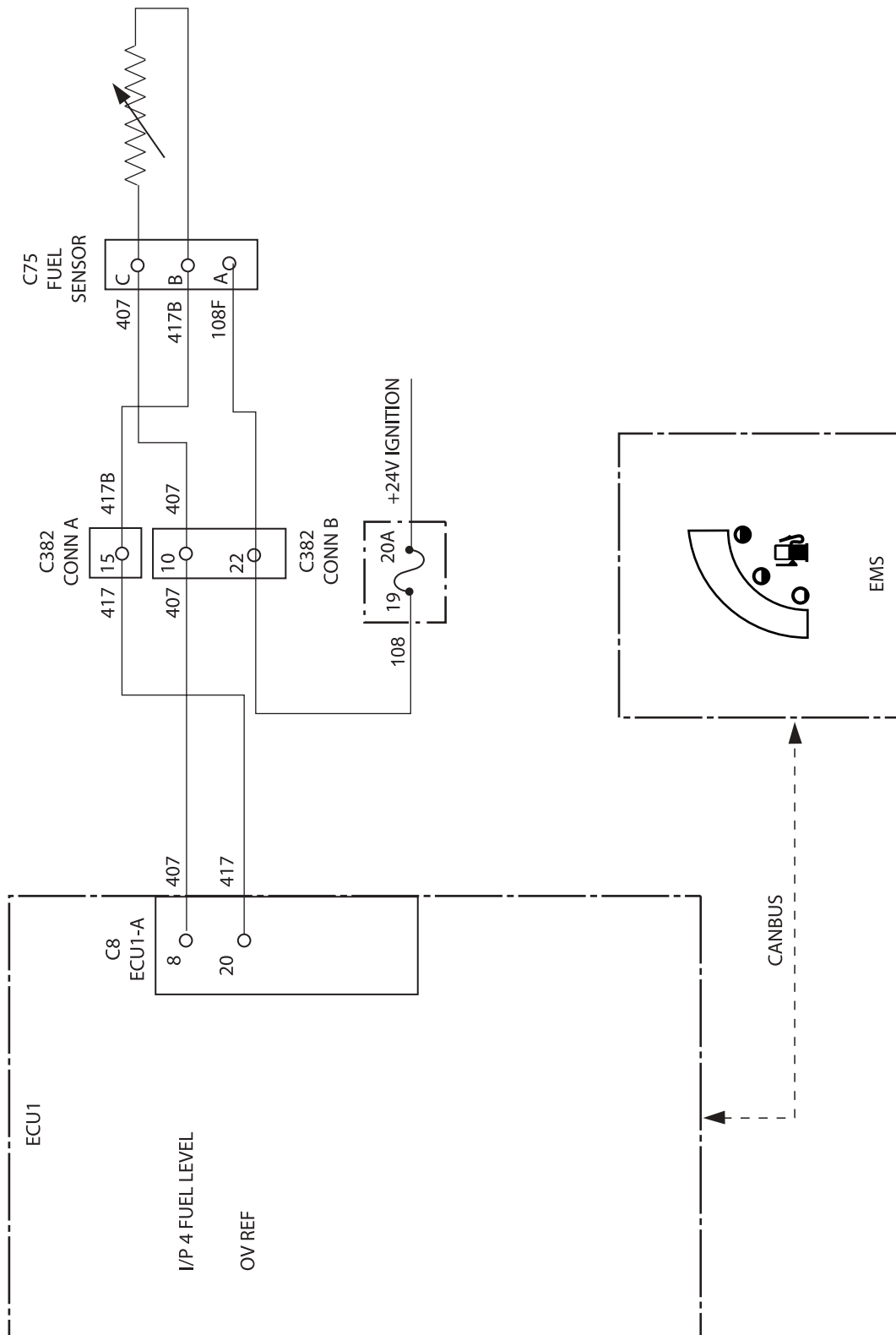


Fig 85.

Engine Temperature Sensor/Warning

Operation

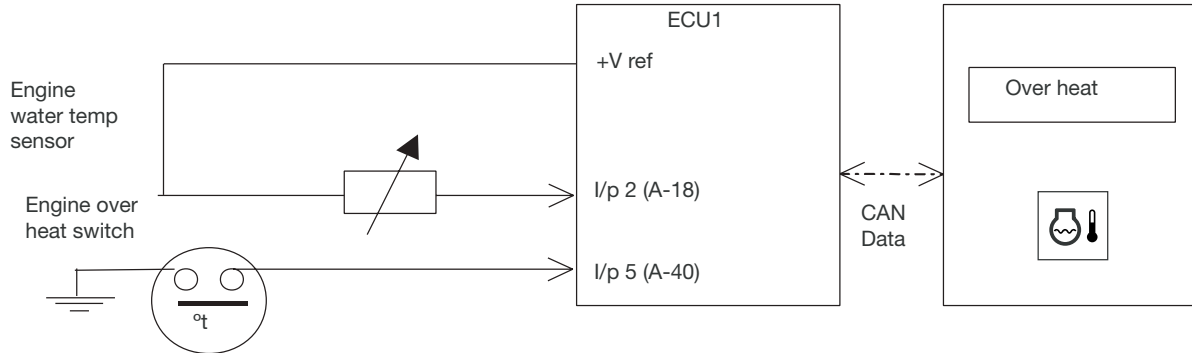


Fig 86. JS115-145

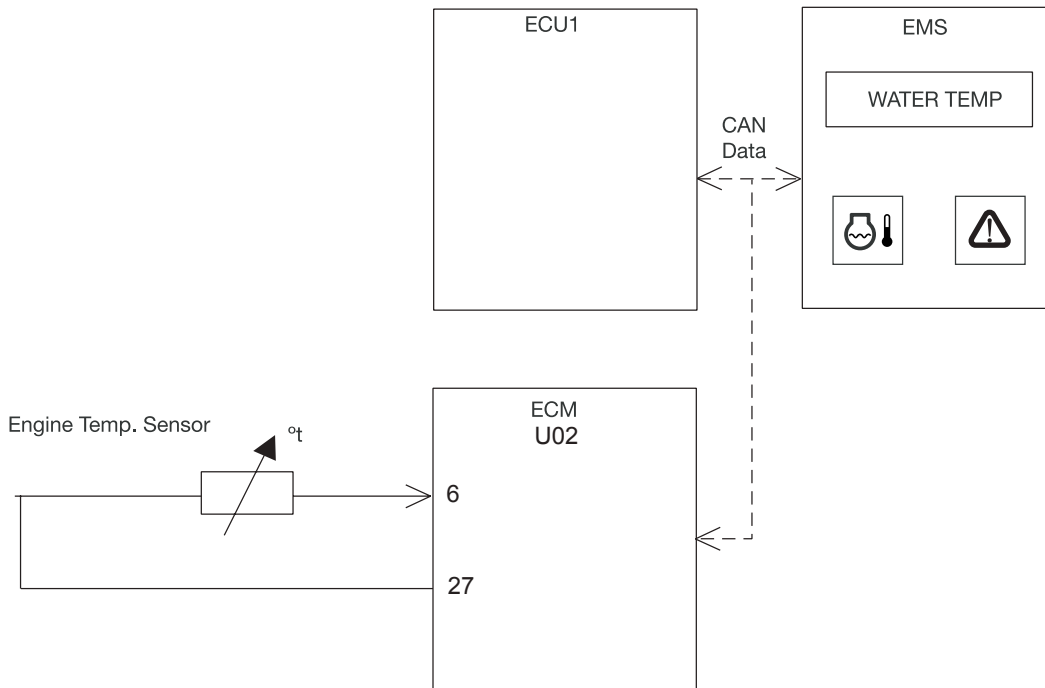


Fig 87. JS160-220

The engine is fitted with a thermistor sensor and thermal switch to measure the water temperature. The engine temperature (in °C) is sent from the ECM to the ECU1 via the CAN bus (JS160-220) or direct to the ECU1 (JS115-145). The temperature is displayed to the operator by

means of a bar graph gauge. The actual values can be displayed via the EMS's SET+MODE menu.



Engine Temperature Sensor/Warning

- When the temperature rises to 101 °C the water temp LED is illuminated on the EMS.
- At above 130 °C the operating mode changes to "E" if in "A".
- At above 105 °C the bar graph will flash on-off, the audible alarm will sound, and the "WATER TEMP" will be displayed on the EMS. The audible warning can be cancelled by pressing ACK button on the EMS.
- At above 108 C the caution LED will illuminate and "LOW POWER" will be displayed on the EMS. This indicates that the ECM has limited engine output to 50% of maximum.

The over heat switch is included as a safety measure in case of the thermistor failure. If this input is grounded then the EMS will illuminate the water temp LED, the bar graph will flash on-off, the audible alarm will sound, "WATER TEMP" will be displayed on the EMS and the mode changes to "E" if in "A". The audible warning can be cancelled by pressing the "ACK" button on the EMS.

The engine water temperature bar graph gauge operates as follows, → [Table 6.](#) ([□ C-87](#)).

Table 6.

Auto Tier 3										
Bar No	Colour	Temp On	Temp Off	Water Temp LED	Caution LED	Reduces to E Mode	Flashing Bar graph	Buzzer	WATER TEMP	LOW POWER
1	Green	50	48							
2	Green	60	58							
3	Green	70	68							
4	Green	75	73							
5	Green	78	76							
6	Green	81	79							
7	Green	84	82							
8	Green	88	86							
9	Green	92	90							
10	Green	98	97							
11	Green	101	100							
12	Green	103	102							
13	Green	105	104							
14	Green	107	106							
15	Green	110	109							
16	Green	99	97							
17	Red	111	110						□	
18	Red	113	112	□		□			□	□
19	Red	114	113	□	□	□			□	□
20	Red	116	115	□	□	□	□	□	□	□

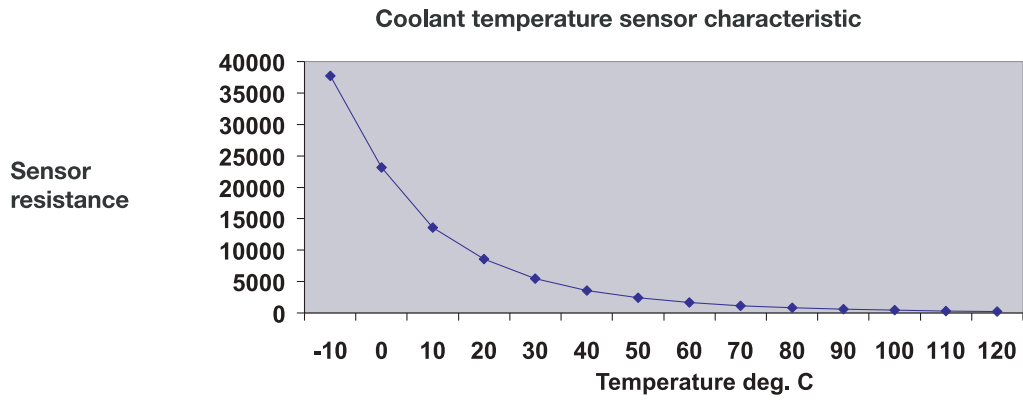


Fig 88.

C005670GB-2

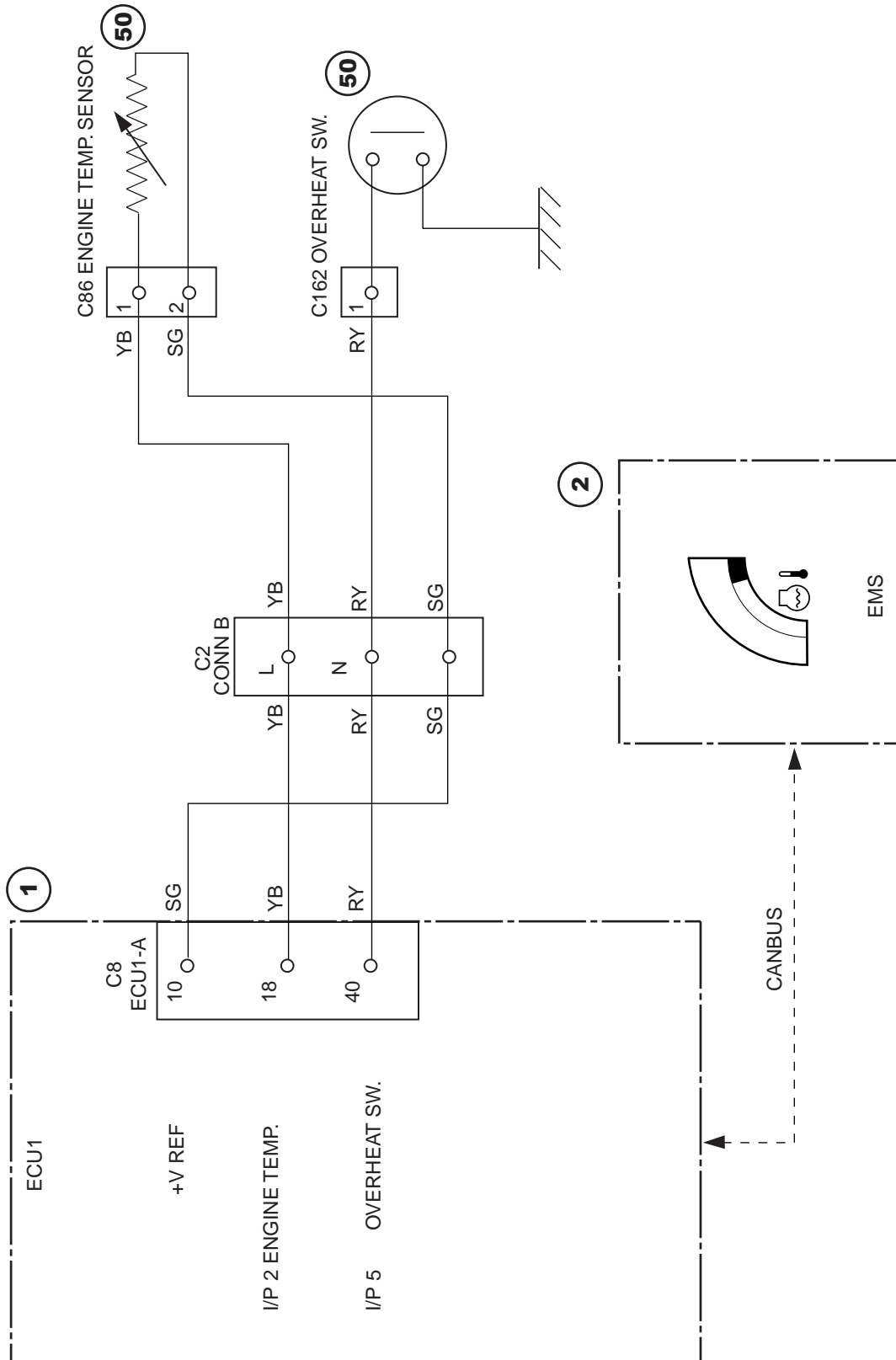


Fig 89. JS115-145

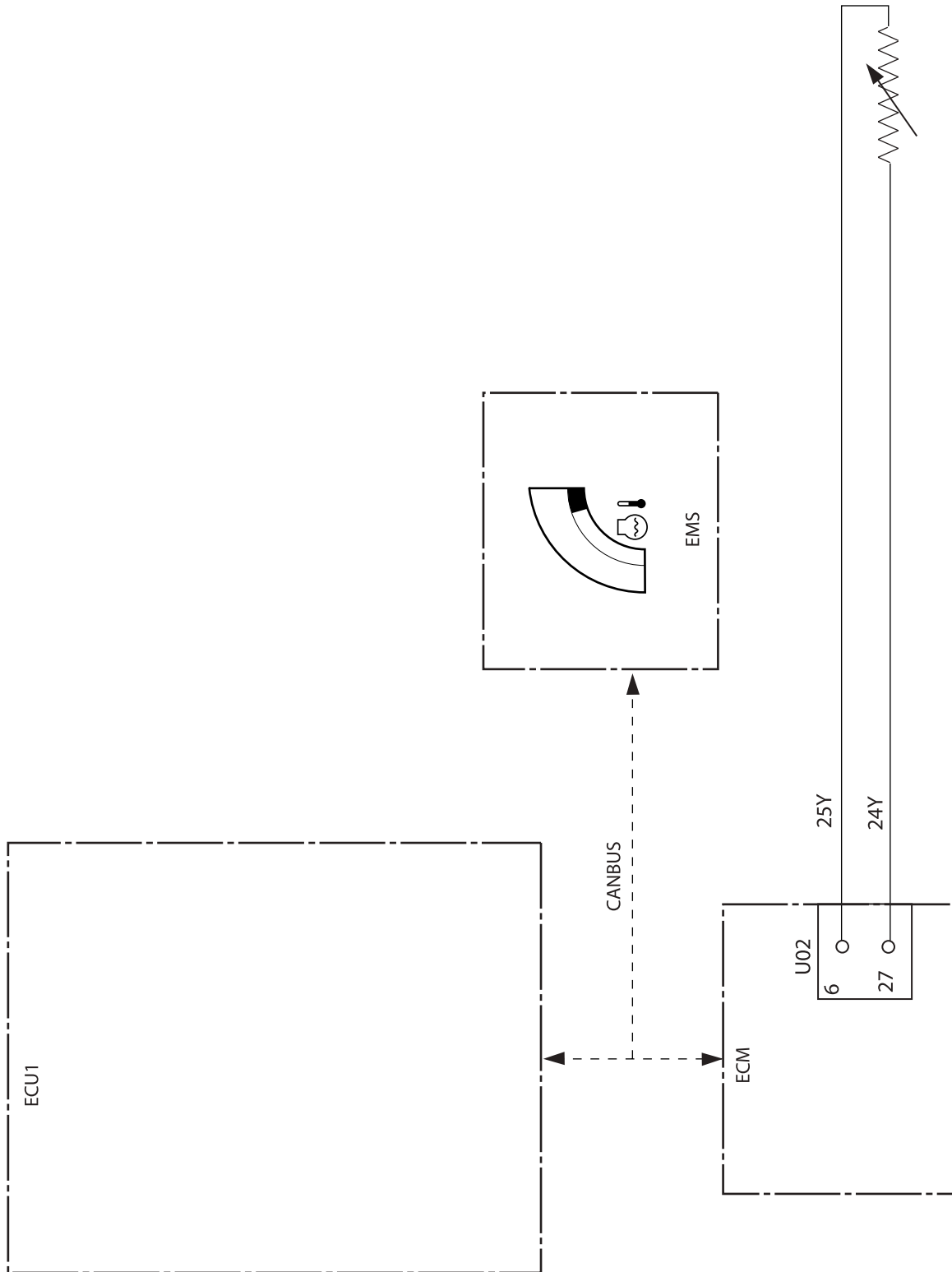


Fig 90. JS160-220

Coolant Level Warning

Operation

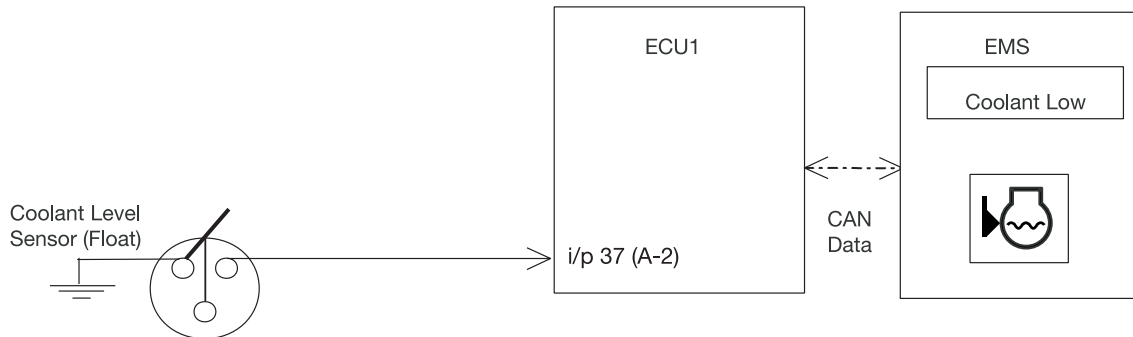


Fig 91.

C005680GB-2

A float switch is fitted to the engine coolant reservoir. When the reservoir is empty the float switch ECU1 i/p 37 (A-2) is connected to ground. This causes the EMS to alarm. The buzzer sounds for 1.5 seconds, a "COOLANT LOW" message is displayed on the EMS and flashing low coolant level LED illuminates for 5 seconds. This is followed by a repetitive message and constant LED on.

Air Filter Blocked Warning

Operation

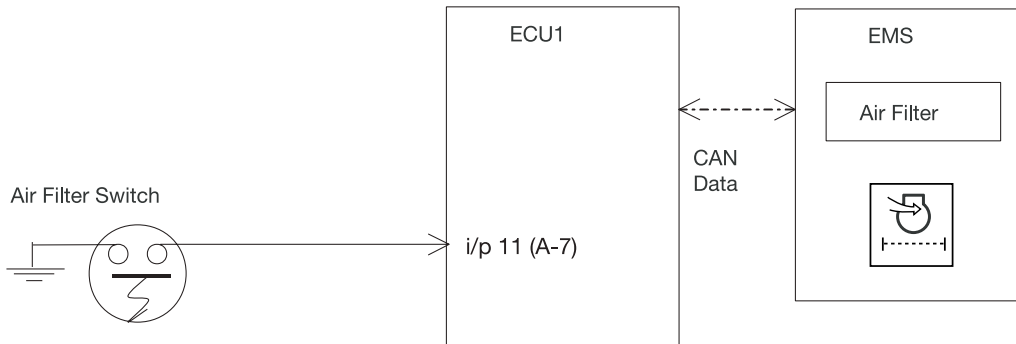


Fig 92.

C005690GB-2

A pressure switch is fitted to the engine air filter. When the filter is blocked the pressure increases, thus triggering the switch and the ECU1 i/p 11 (A-7) is connected to ground. This causes the EMS to alarm. The buzzer sounds for 1.5 seconds, a "AIR FILTER" message is displayed on the EMS and a flashing engine air filter blocked LED illuminates for 5 seconds. This is followed by a repetitive message and constant LED on.

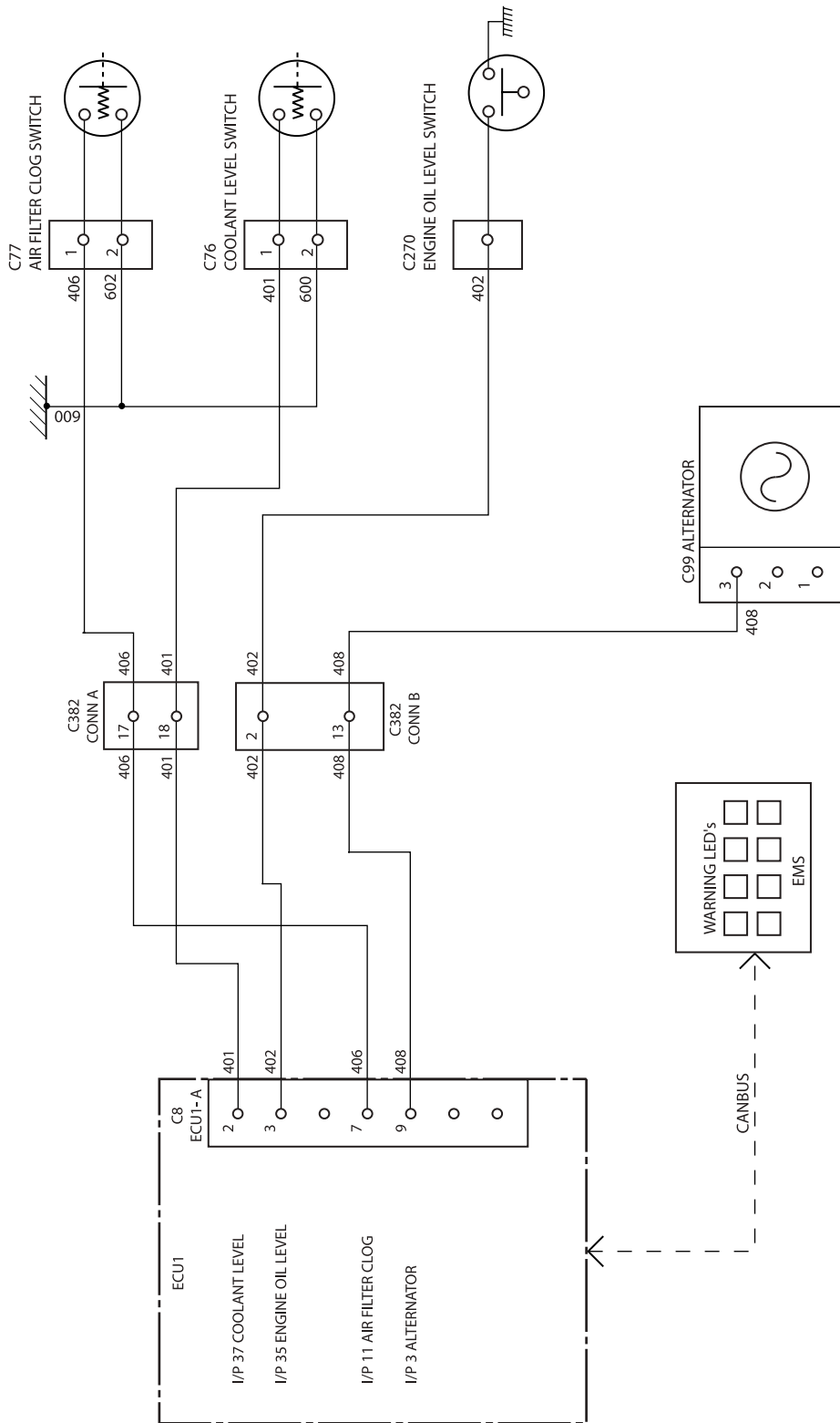


Fig 93. Warning Indicator Lamps

Hydraulic Temperature Sensor/Warning

Operation

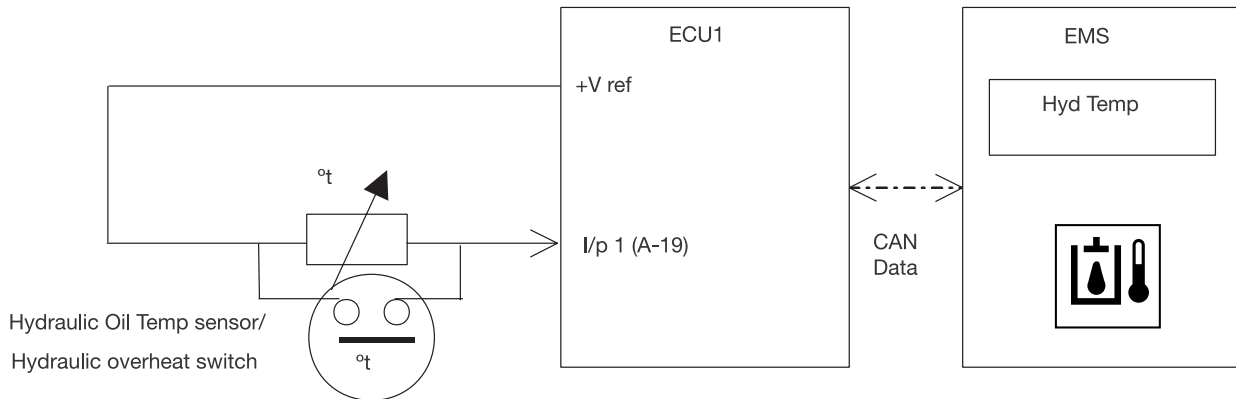


Fig 94.

C005700GB-2

The hydraulic system is fitted with a thermistor and a thermal switch to measure temperatures. The temperature is displayed to the operator by means of a bar graph gauge. The actual values can be displayed via the EMS's SET and MODE menu.

When the hydraulic oil temperature reaches 97°C the EMS will illuminate the warning lamp. If the temperature continues to rise the bar graph will flash on-off and an audible warning and "HYD.TEMP" message will be given. The audible warning can be cancelled by pressing the "ACK" button on the EMS.



The overheat switch is included as a safety measure in case of the thermistor failure. If this input is grounded then the EMS will illuminate the warning lamp, sound the audible alarm and display the overheat message. The audible warning can be cancelled by pressing the "ACK" button on the EMS.

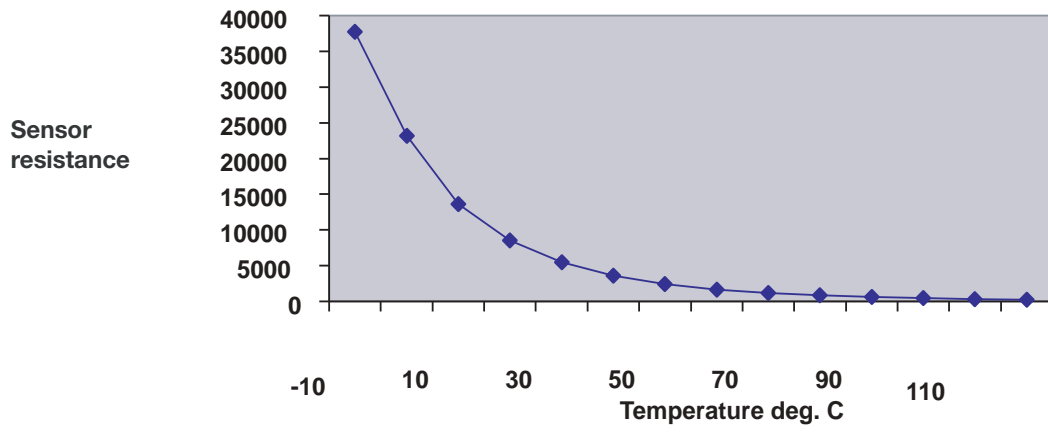
Note: When the temperature reaches 98°C the pump should be lowered to E mode.



Section C - Electrics Basic System Operation

Hydraulic Temperature Sensor/Warning

Auto Tier 3										
Bar No	Colour	Temp On	Temp Off	HYD OIL LED	Caution LED	Pump reduces to E Mode	Flashing Bar graph	Buzzer	HYD TEMP message	OVERHEAT message
1	Green	0	-2							
2	Green	10	8							
3	Green	20	18							
4	Green	30	28							
5	Green	40	38							
6	Green	50	48							
7	Green	60	58							
8	Green	70	68							
9	Green	75	73							
10	Green	80	78							
11	Green	85	83							
12	Green	90	88							
13	Green	92	91							
14	Green	94	93							
15	Green	95	94							
16	Green	96	95	<input type="checkbox"/>						
17	Red	97	96	<input type="checkbox"/>		<input type="checkbox"/>			<input type="checkbox"/>	
18	Red	98	97	<input type="checkbox"/>		<input type="checkbox"/>			<input type="checkbox"/>	
19	Red	99	98	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	
20	Red	100	99	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overheat switch		101	99	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



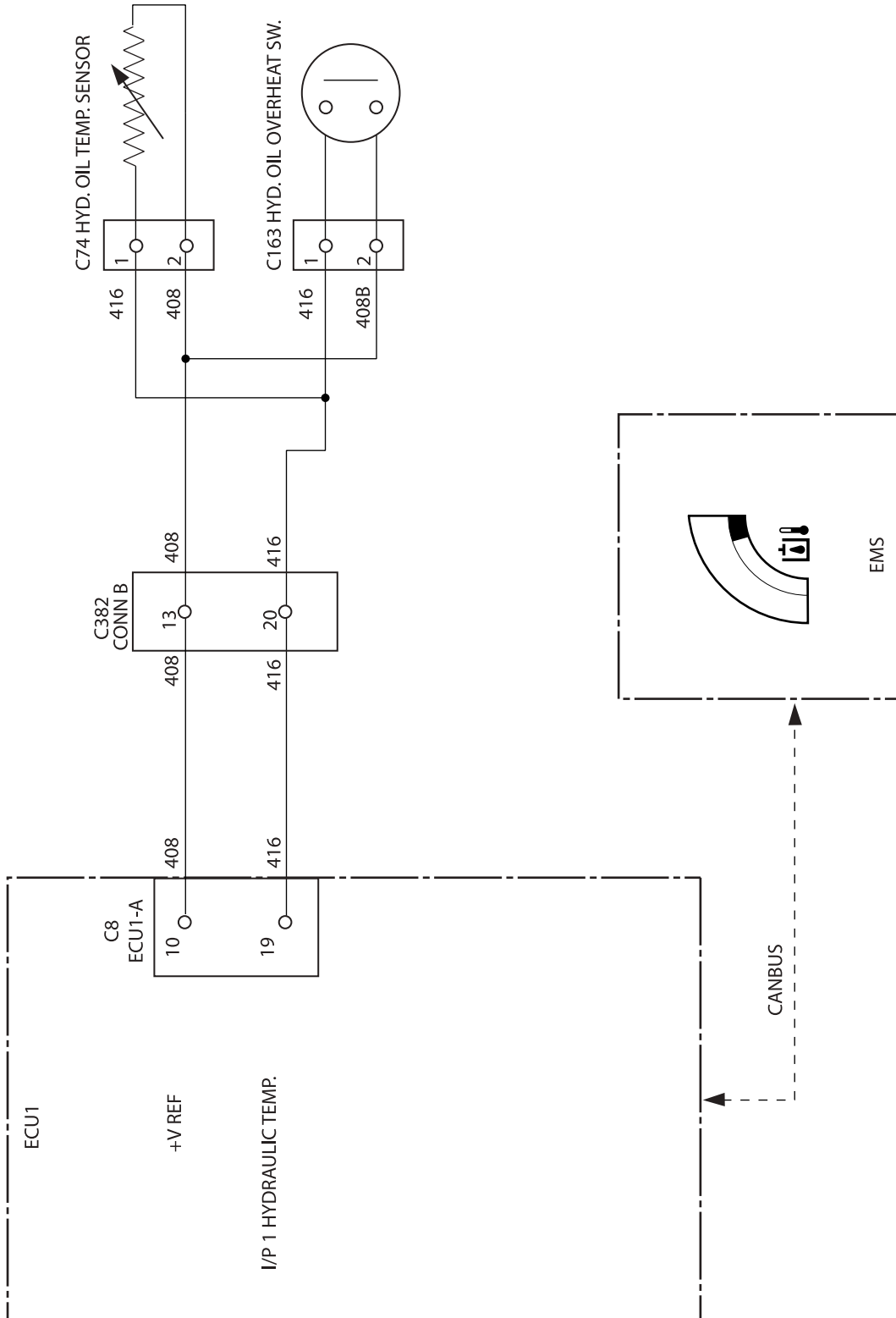


Fig 95.

Quick hitch (option)

Operation

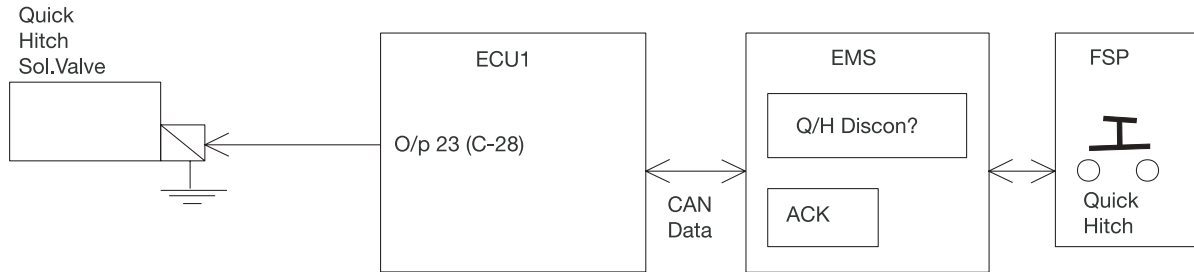


Fig 96.

C005730GB-2

WARNING

When using Quick Hitch Type 2, the attachment can become unexpectedly disengaged from the Quick Hitch, when any of the following occurs:

Power failure to the Electronic Control Unit (ECU).

When the redundancy switch is engaged.

If an electrical component in the Quick Hitch system should fail.

0178

The Quick hitch option allows the operator to quickly change the attachment from within the cab.

There are two types that can be fitted and they operate in different ways.

Quick hitch type 1 Q/H off = output is switched on
Q/H on = output is switched off

Quick hitch type 2 Q/H off = output is switched off
Q/H on = output is switched on

The system can be enabled and switched between types via the SET + MODE (20 seconds) menu:

SET + MODE (20 secs)	Scroll to Q/H option
QH ENABLE?	ACK
QH ON	Scroll up/down to toggle between ON and OFF, ACK
QH TYPE?	ACK
QH TYPE 1	Scroll up/down to toggle between type 1 and 2 ACK

When the quick hitch switch is activated the EMS will display the "Q/H DISCON?" message to verify the switch operation and the switch status indicator will illuminate.

If the "ACK" switch on the EMS is not pressed within 5 seconds then the display reverts to normal and the switch status indicator is extinguished.

The solenoid valve will only be energised/de-energised once the "ACK" button on the EMS is activated. This is included as a safety feature to prevent accidental operation of the quick hitch system.

Once the "ACK" button is pressed the EMS displays the message "Q/H DISCON" and the ECU1 o/p 23 (C-28) is de-energised (type 1) or energised (type 2). The buzzer is sounded while the quick hitch is disconnected.

To reconnect quick hitch press "ACK". The EMS will display "Check Q/H" instructing the operator to visually check the quick hitch attachment is securely connected. Press "ACK" again to switch off buzzer.

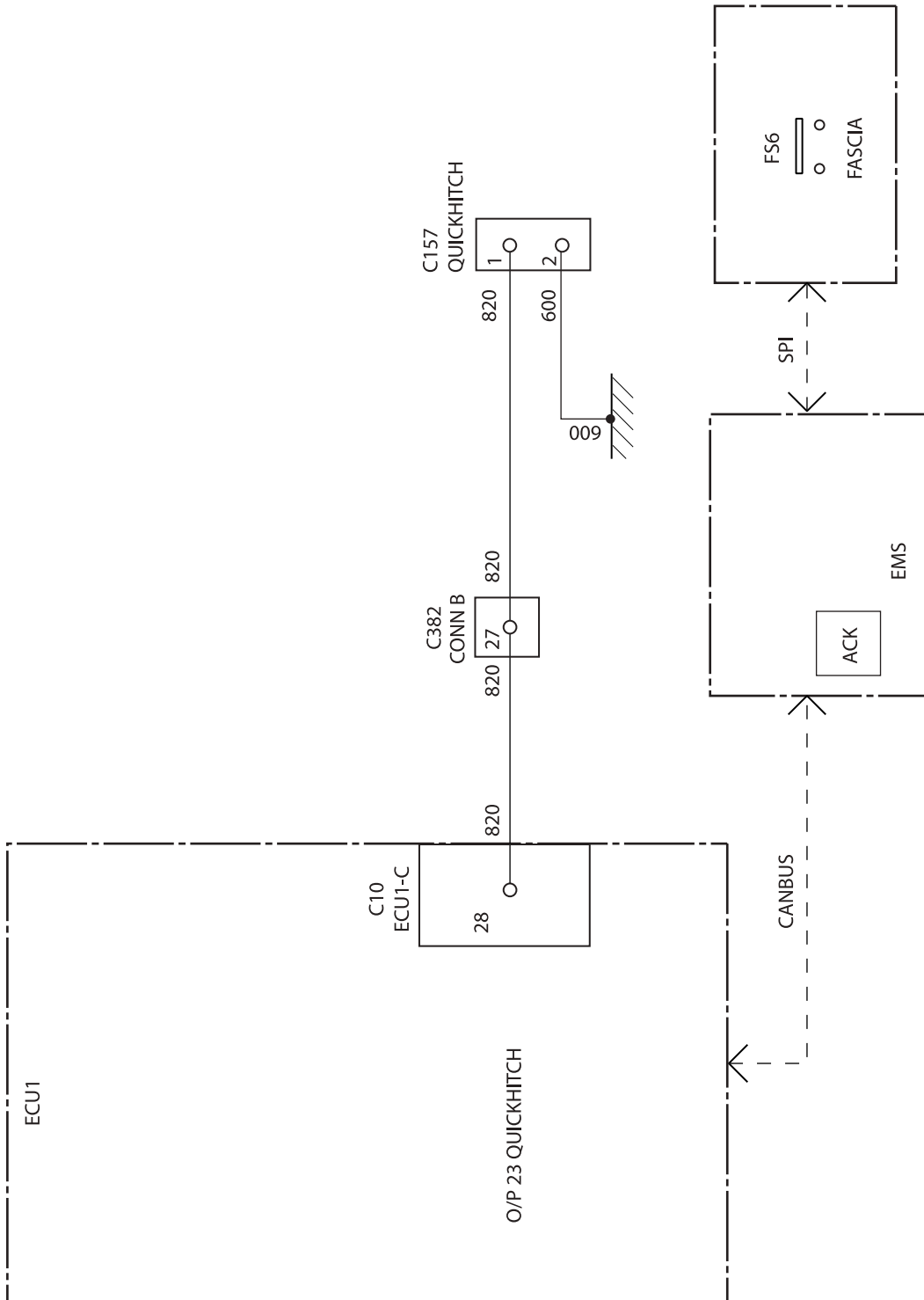


Fig 97.

Overload Caution (option)

Operation

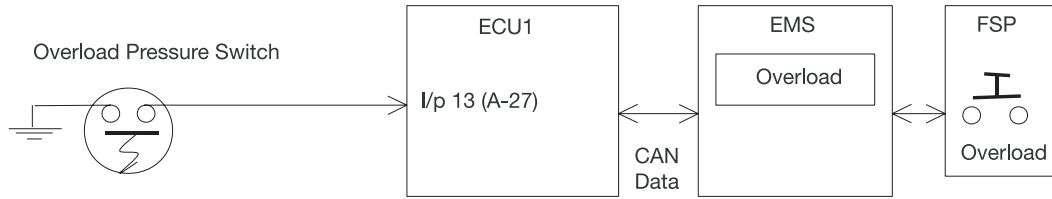


Fig 98.

C049770GB-2

Overload caution is used as a warning to the operator that the machine is lifting a mass which is exceeding the safe load capacity of the machine. An overload is indicated after the overload pressure switch, ECU1 i/p 13 (A-27) has been activated.

By default the overload override option is not enabled in A (Auto), E (Economy) & P (Precision) modes until the overload switch is selected. When selecting the overload switch on the facia switch panel the EMS displays the acknowledge message "OVERLOAD ON" and the status LED illuminates. A second press of the switch disables the overload override function and the status LED is extinguished.

When entering L (Lifting) Mode, the overload override warning system is automatically activated. The status indicator for FS6 illuminates. The operation of overload switch will cancel the overload warning system.

If a overload condition is reached whilst the overload function is selected, the EMS will display "OVERLOAD" and the buzzer will sound.

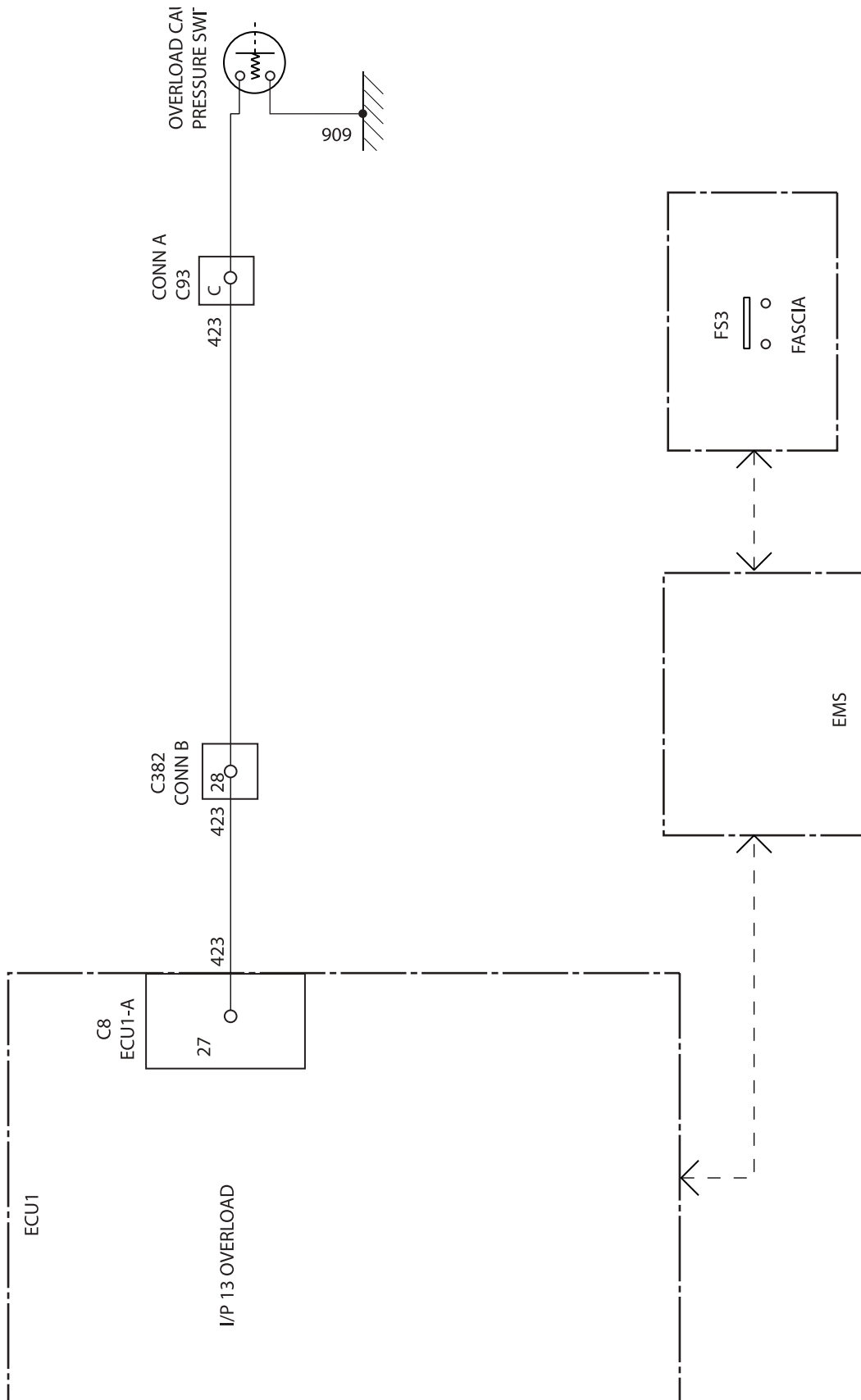


Fig 99.

Beacon

Operation

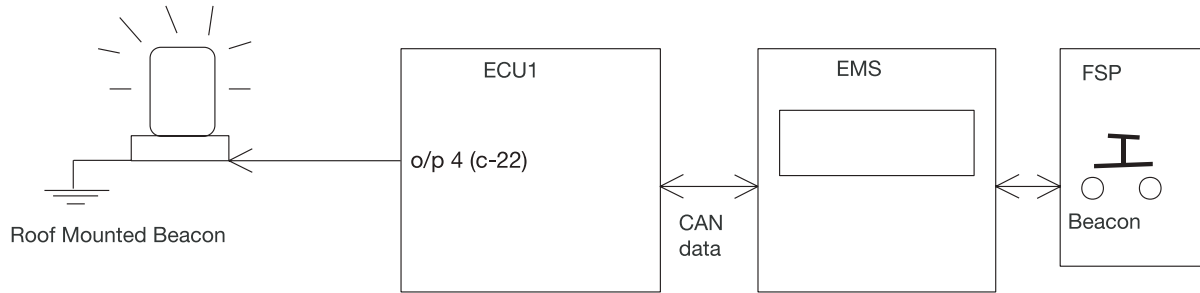


Fig 100.

Beacon is activated by pressing the beacon switch on the facia switch panel and ECU1 o/p 4 (C-22) is switched on.

Beacon operation is cancelled by a second press of the facia switch thus disabling the ECU1 output and extinguishing the status LED.

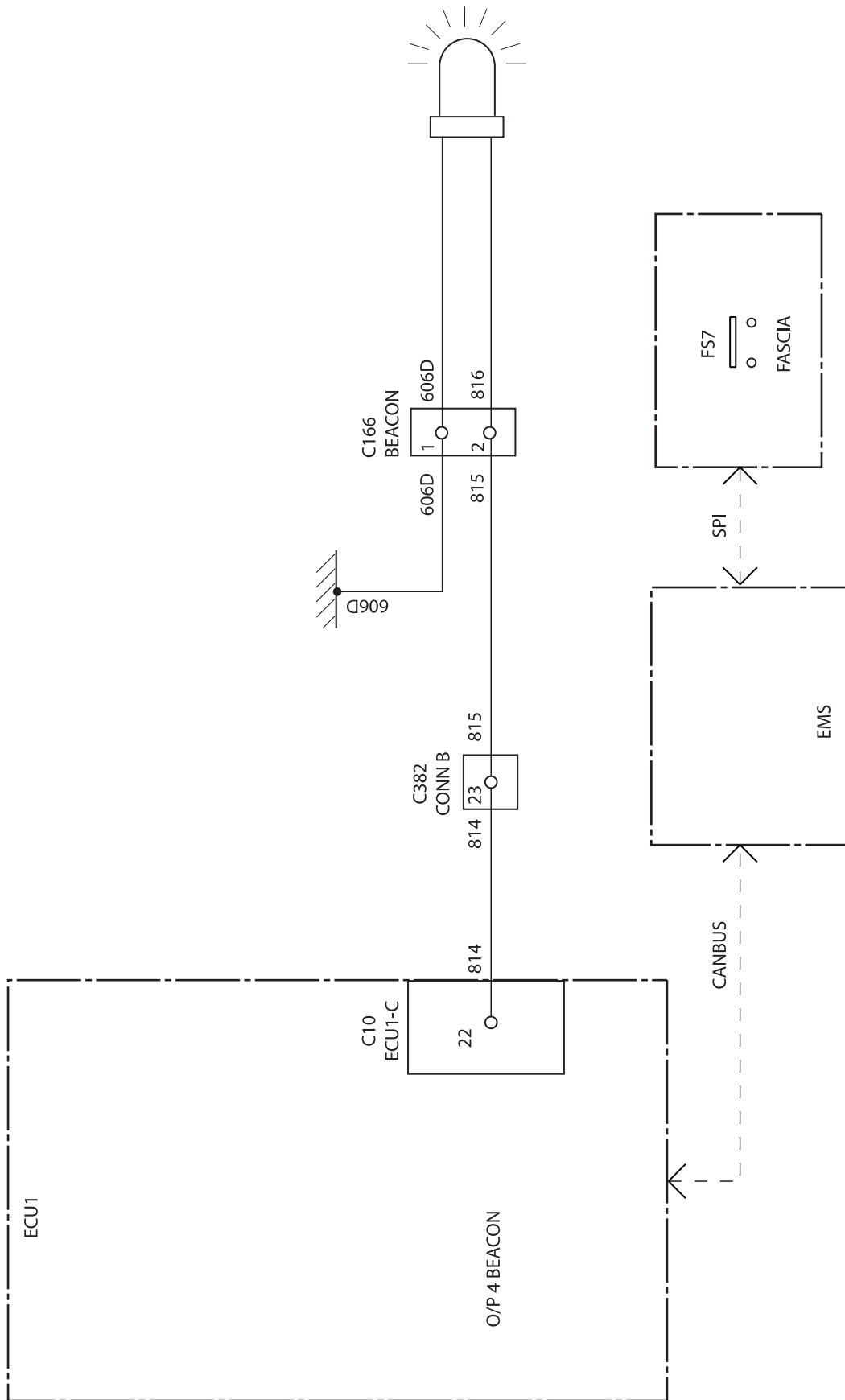


Fig 101.

Hammer Only

Operation

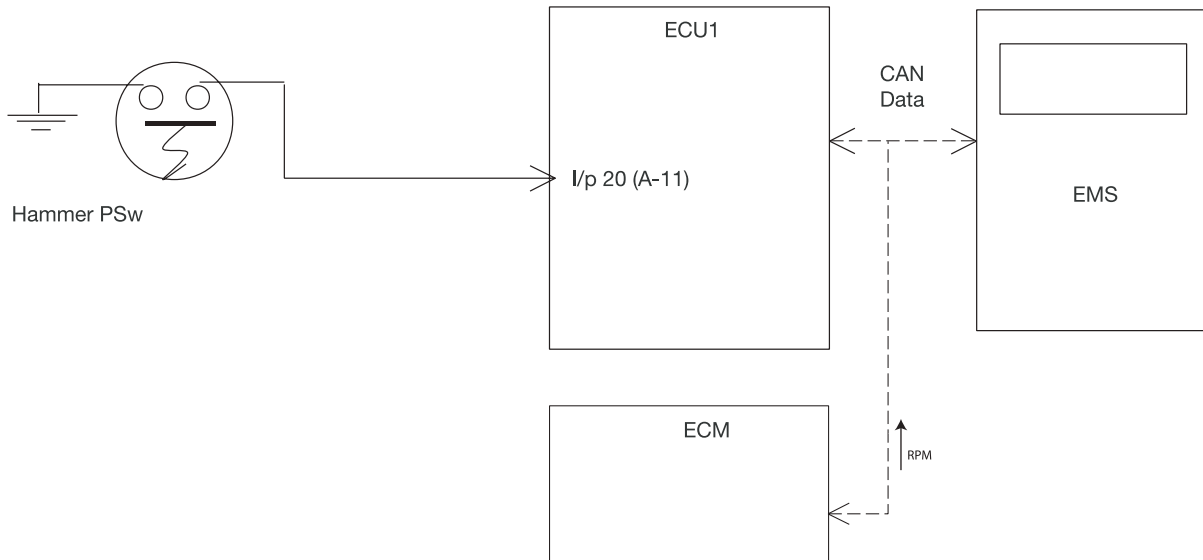


Fig 102.

C030430GB-1

The hammer is operated by pressing the foot pedal forward which supplies a pilot pressure signal to close the pressure switch and operate the option spool in the main control valve (MCV). When the pressure switch is closed, ECU 1 i/p 20 (A-11) senses the grounding of the pressure switch, which reduces the engine rpm to a level preset in the SET menu.

The throttle potentiometer normally increases/decreases the engine rpm from idle to max engine speed but will not exceed the preset hammer value, regardless of its position. The maximum "hammer revs" (engine rpm) can be set by the operator via the SET menu on the EMS. The up and down buttons will increase/decrease the rev/min value, by 25 rpm for each press. Whatever value is set by the operator is stored and becomes the new default value. The original default value for "Hammer RPM" is 1200 rev/min.

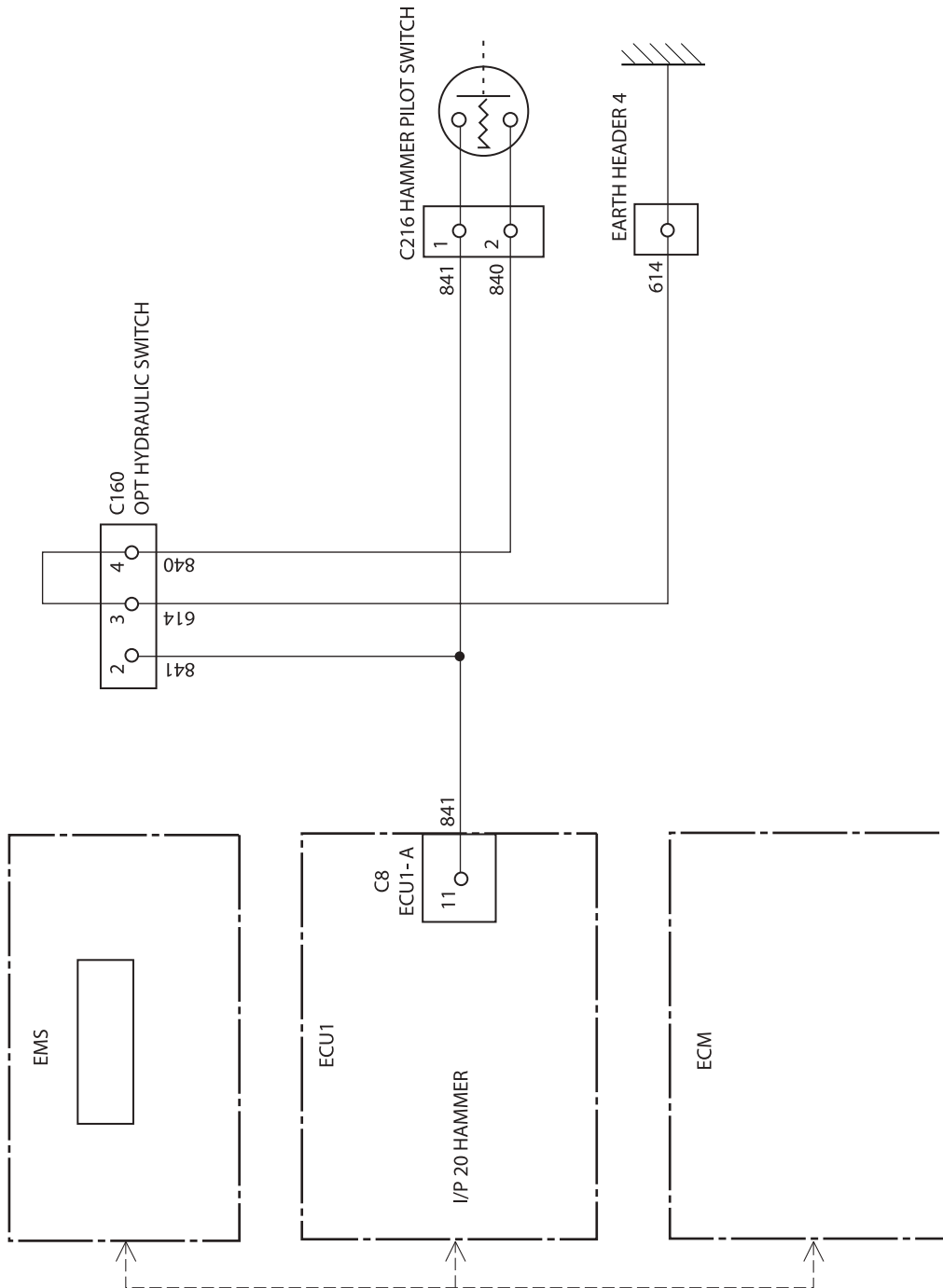


Fig 103. Hammer Only

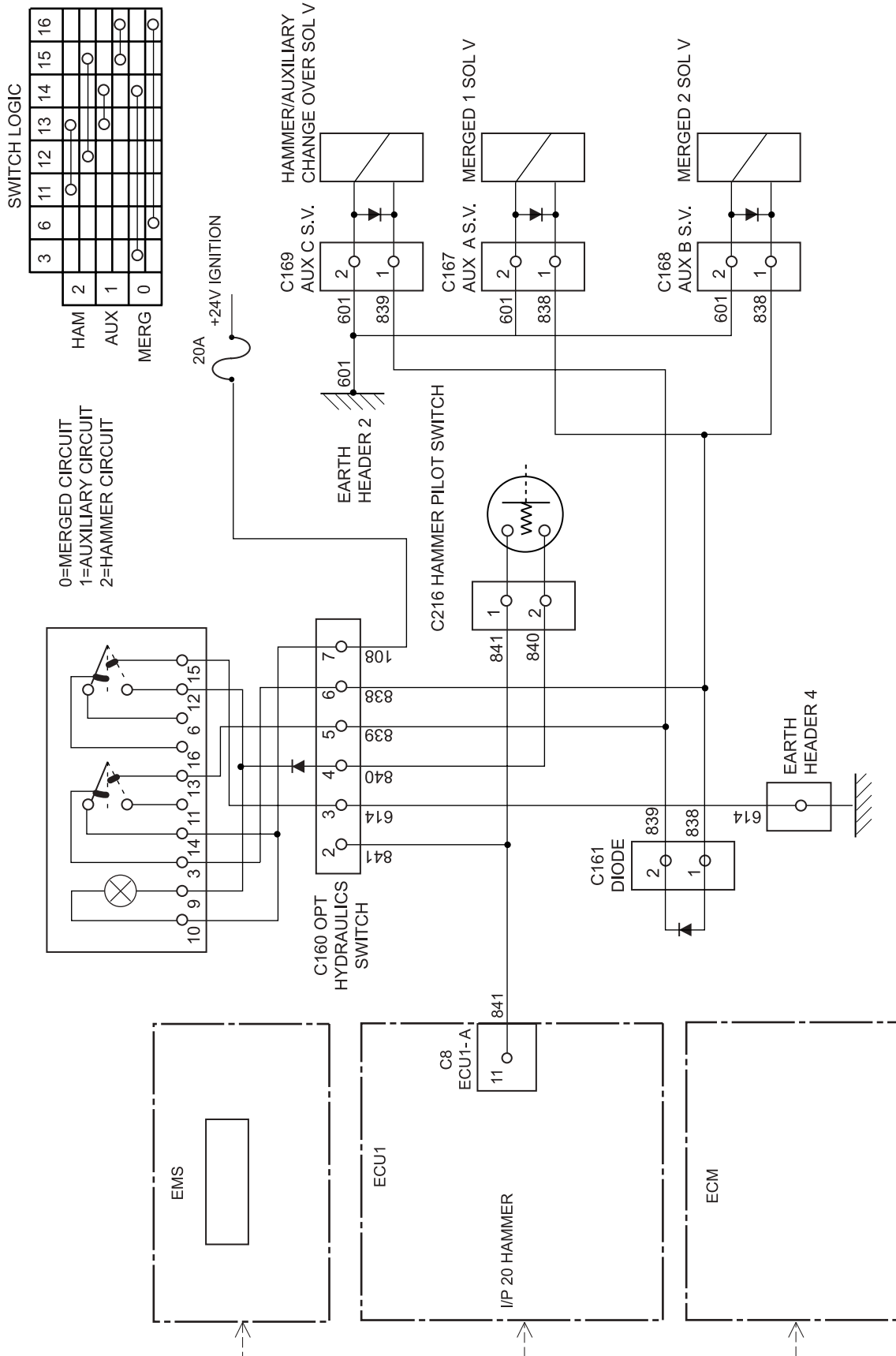


Fig 104. Combined Hammer/Auxiliary/Merged



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Scrap Magnet Option

Operation

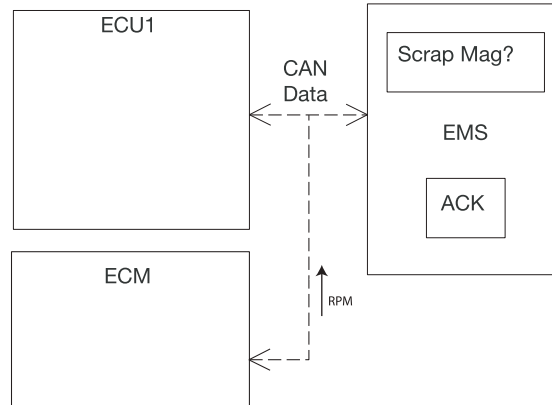


Fig 105.

C030460GB-2

When a scrap handling magnet attachment is fitted to the machine, the high voltage required for its operation is supplied by an engine driven generator. If the minimum engine rpm is too low, the supply voltage to the magnet may decrease to the point where any material on the magnet may drop off. To prevent this the machine has the capability to set the minimum engine speed so that it doesn't fall below a predetermined level whilst the scrap magnet is being used.

The feature can be switched on or off and the minimum rpm set via the SET menu of the EMS by the "SCRAP MAG" option. When this feature is enabled the throttle volume potentiometer is re-scaled so that in the minimum position the engine rpm is that pre-set through the following procedure.

Set the Minimum Engine RPM for Scrap Magnet Use

Press the SET and MODE buttons on the EMS for 5 seconds then use the scroll buttons until "SCRAP MAG" is displayed.

Press the ACK button (this will alternate the function on/off). Set the display to "ON", the display will change between "MAG ON" and "MAG OFF").

Press the 'ACK' button, the display will change to "RPM 1000". Pressing the scroll buttons will then change the

rpm. value in 50 rpm. increments (allowable range to be the low idle setting to S mode full engine speed setting for the particular model). The default setting for the minimum engine speed is 1000 rpm.

The rpm setting of this feature is stored and is used each time the machine is used whilst the scrap magnet function is enabled. The scrap magnet option is switched off through the EMS SET menu.

If a target value less than the machines idle rpm is selected, then the machine will default to the original Idle setting.



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Cab Interior Lamp

Operation

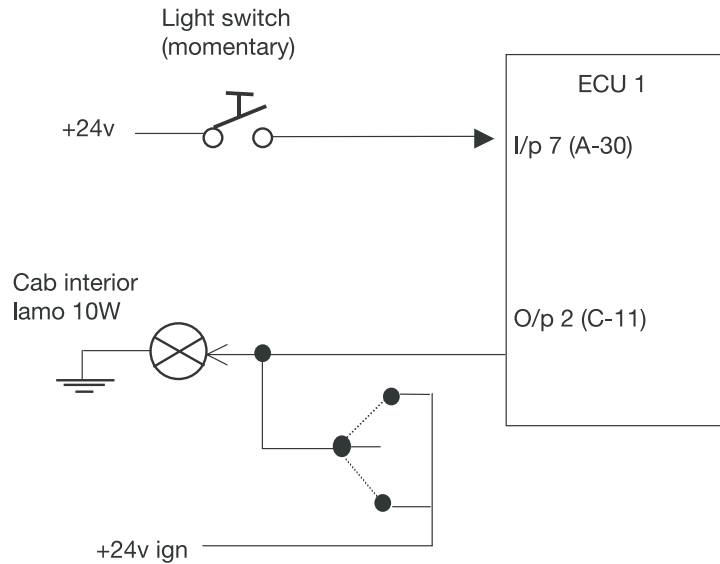


Fig 106.

C005790GB-2

A switch near the cab door can be pressed to switch on the cab interior light for access to the machine in the dark. The input i/p 7 (A-30) activates the ECU1 when the ignition is switched off. When the light switch is pressed the cab light will be switched on for 5 minutes or until a second press of the light switch within the 5 minute period.

The cab interior light has an integral override switch to switch on the lamp independently of the ECU1.

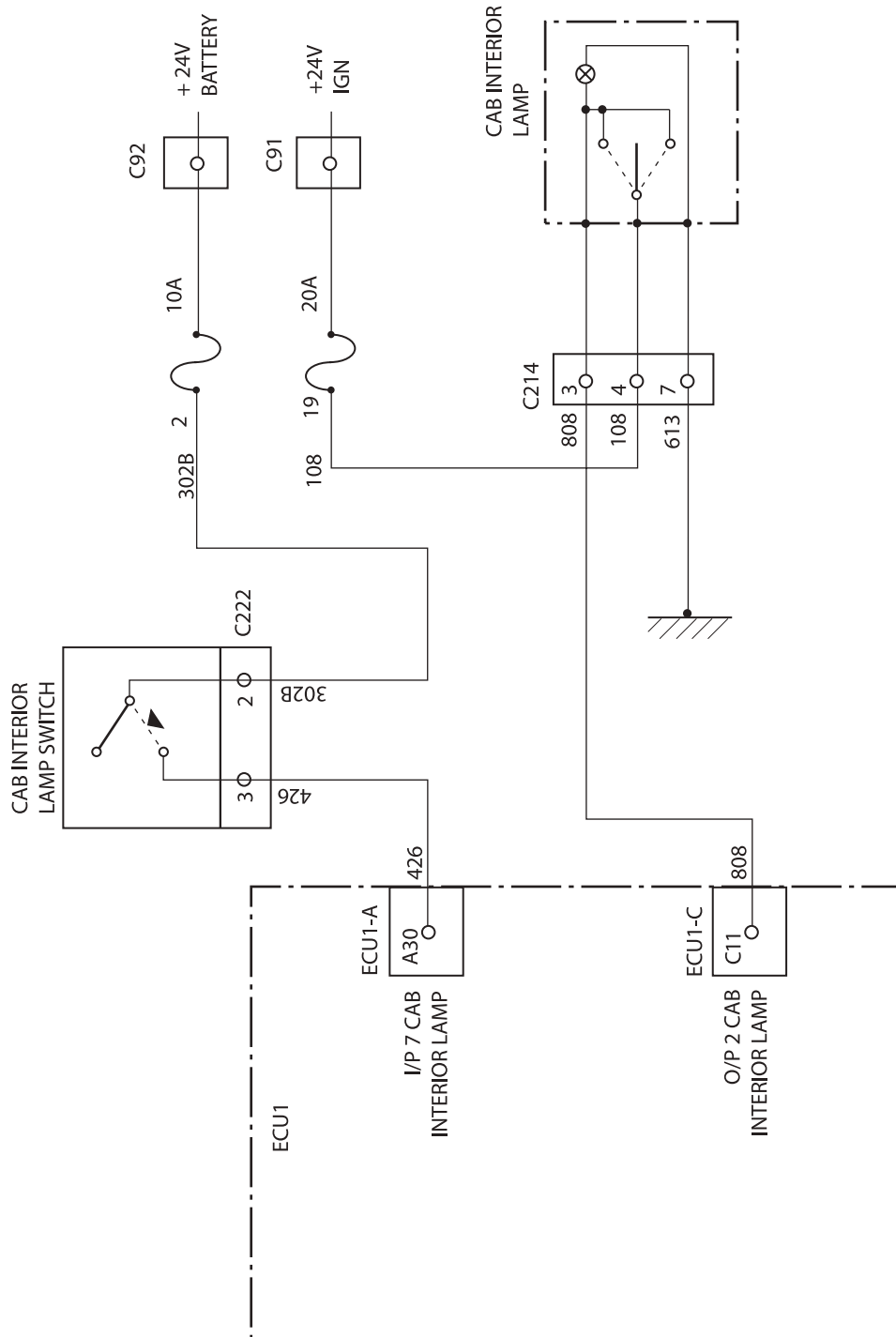


Fig 107.

Refuelling Pump

Operation

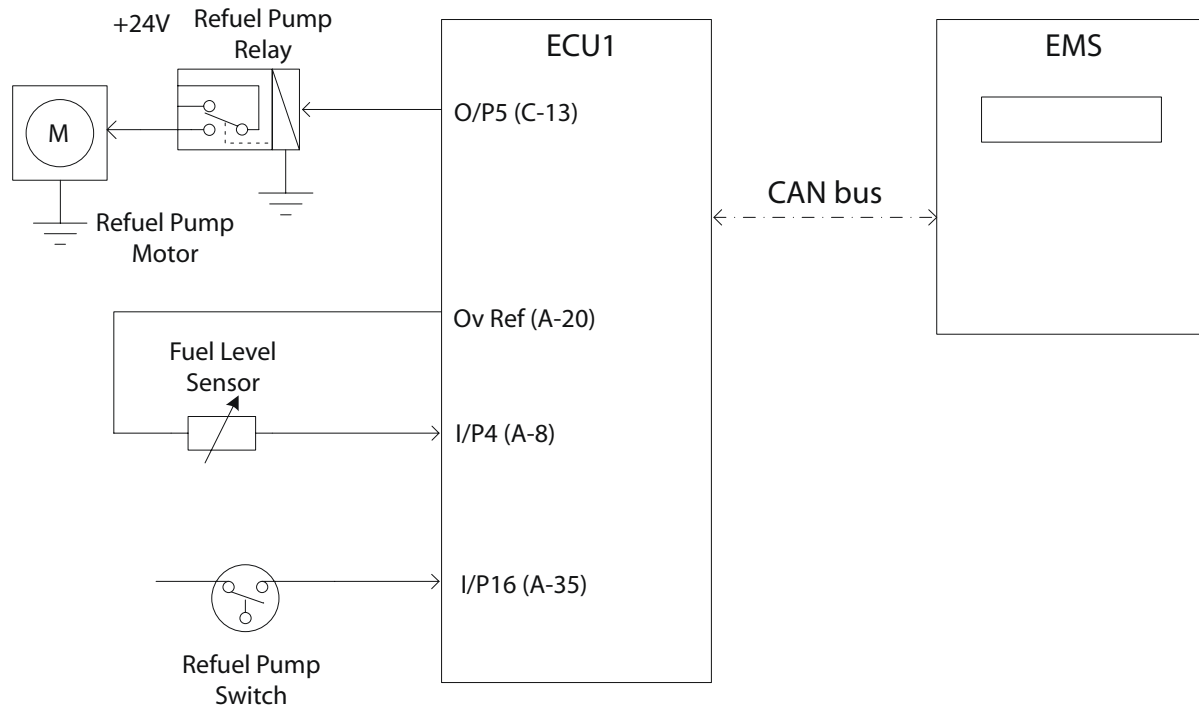


Fig 108.

C030500GB-3

ECU1 Requirements

A refuelling pump can also be installed on the machine. This pump can be used in two different modes: automatic or manual.

Note: The refuel pump feature is only present when the machine is fitted with a new harness. If the machine is not fitted with a new harness the input and output pins used for this feature are assigned to other functions

Automatic Mode

A short press of the fuel pump momentary switch is used to turn on and off the fuel pump's automatic mode. When the refuelling pump switch is pressed, a high (+V_{batt}) is measured at the input to the ECU1. When the button is released, the input is open circuit and a 'low' will be measured by the ECU1. If the button is held for less than 2 seconds, then this falling edge will trigger the refuelling pump feature into automatic mode. While in automatic mode, the output to the refuelling pump relay is energized. The fuel level input is monitored during this functionality. When the fuel level reaches the Max Refuel Level, the fuel pump output is turned off. The filtering that is normally used to smooth out fuel level readings is not used in this case so that there is no delay in the fuel level reading.

If a second falling edge is detected on the fuel pump input, then the feature is de-activated and the fuel pump output is turned off.

Note: If any errors are present on the fuel level sensor, then the refuel pump's automatic mode is not allowed.

Default Max Refuel Level Parameter

The position of the Fuel Sensor varies on different machines. Therefore, the accuracy of the sensed level when the machine is on a slope, varies by machine. There is an ability to vary the default maximum refuel level (in Automatic refuel mode) dependant on machine type. The addition of this parameter enables this level to be specified during 'Vehicle Setup'. This parameter should only be adjusted during 'Vehicle Setup'.

Max Auto Refuel Level - Menu Option

Where refuelling a machine on a slope is unavoidable (despite JCB recommendations), the machine operator can adjust the maximum auto refuel level using an option in the SET menu. The menu option functions as shown.

The value is initially set during 'Vehicle Setup' using the 'Default max refuel level' parameter. Subsequent changes to the value using the SET menu are retained on ignition restart but are overwritten again by the 'Vehicle Setup' tool. The menu option allows changes in 5% steps within a range of 50 to 100%.

To prevent running the refuel pump dry, the following limitation is also applied:

If the refuel pump output has been on for a specified time without any change to the fuel level in the tank, then the refuel pump output turns off. The auto refuel run-dry time-out can be varied as large machines (with large fuel tanks) have slow changing fuel level indications. A software parameter specifies this time in seconds. This time is specified during 'Vehicle Setup' dependant on model.

Manual Mode

If, at any time, the refuelling pump input is pressed and held for more than 2 seconds, then the refuelling pump will be in manual mode. This mode allows the user to manually add fuel to the tank. Once in manual mode, the refuelling pump output is turned on. The output remains on until the refuelling switch has been released. At this point the output will turn off and the refuelling feature will be off.

Note: If manual mode is entered from automatic mode, then automatic mode is NOT resumed when the switch is released.

Wake-up

The refuelling pump switch is connected to one of the wake-up inputs on the ECU1. If the ECU1 is in a 'WAKE-UP' state this feature will operate normally.

Limitations

The fuel pump feature will be off if the system is in a 'CRANKING' or a 'RUNNING' state. If the output is on when either of these states is entered, then the output and feature will be turned off.

Also, the refuelling pump input is ignored while in either of these states. If the refuelling pump input is pressed when the system enters a 'KEY-ON' state from a 'RUNNING' or 'CRANKING' state, then the following falling edge should be ignored. If the vehicle's redundancy switch has been turned on, the fuel pump feature can still be activated as a wake-up input. In this case, the EMS will notify the ECU1 that the system is in redundancy mode and this feature will be disabled.

Heated Seat

Operation

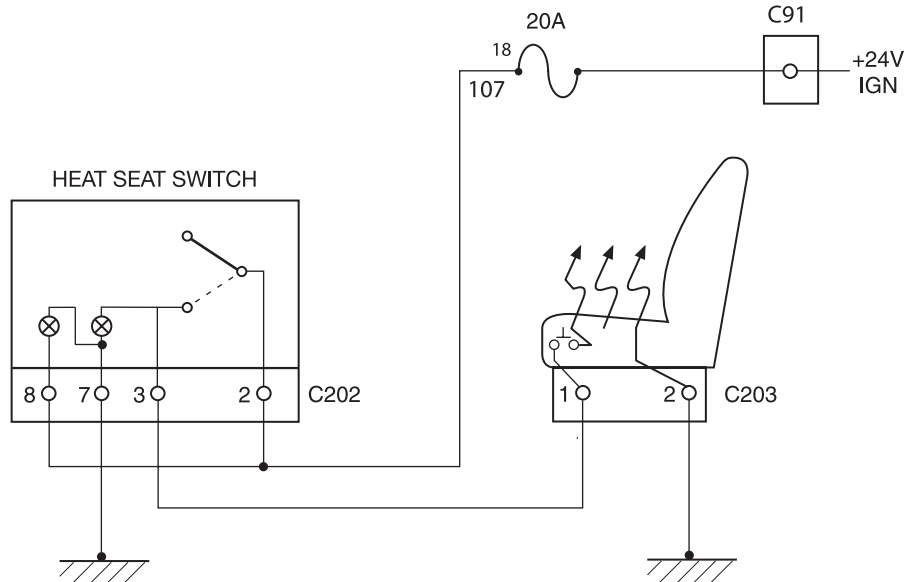


Fig 109.

When the heated seat switch is selected, an electrical current passes over the seat thermostat to the heating element. The element will then warm the seat.

The thermostat is set to 20°C - ON and 30°C - OFF.

On initial starting when the heated seat switch is selected, the heated seat element will turn on only if the thermostat is below 30°C. Once the thermostat reaches 30°C the heater will turn off. The element will only be re-heated if the thermostat temperature falls below 20°C.

24 to 12 Volt Converter, Radio and Power Socket

Operation

The machine is fitted with a voltage converter, which provides power to the radio and power socket. The dropper is situated on top of the cab heater assembly. The converter is fed by a permanent battery supply via fuse No 2 to pin 1 of the converter and a switched feed via fuse No 19 to pin 2 of the converter. Both these incoming feeds are 24-volt.

The voltage is then reduced and gives out a permanent 12-volt feed on pin 4 and a switched 12-volt supply on pin 5. Pin 3 is the earth wire for the unit.

Radio

The radio has a permanent 12-volt supply from pin 4 of the voltage converter to pin 5 of the radio. The permanent supply is to retain the memory in the radio.

The 12-volt switched supply to power the radio is fed from pin 5 of the voltage converter to pin 2 of the radio via a rocker switch (Mute button) in the right hand console of the cab. Operating the mute button simply turns off the power supply to the radio.

Power Socket

The power socket, is fed from the switched feed only.

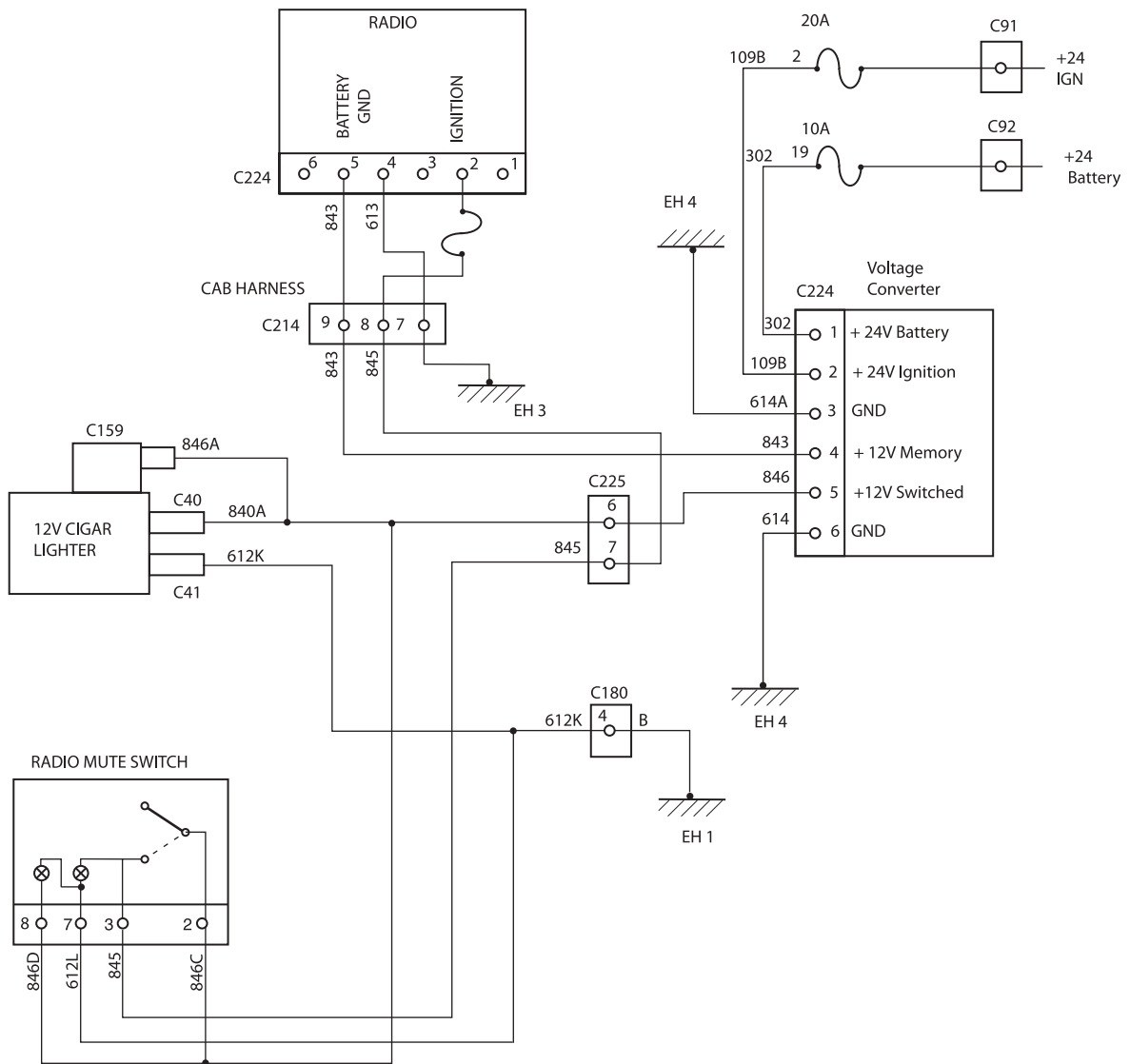


Fig 110.



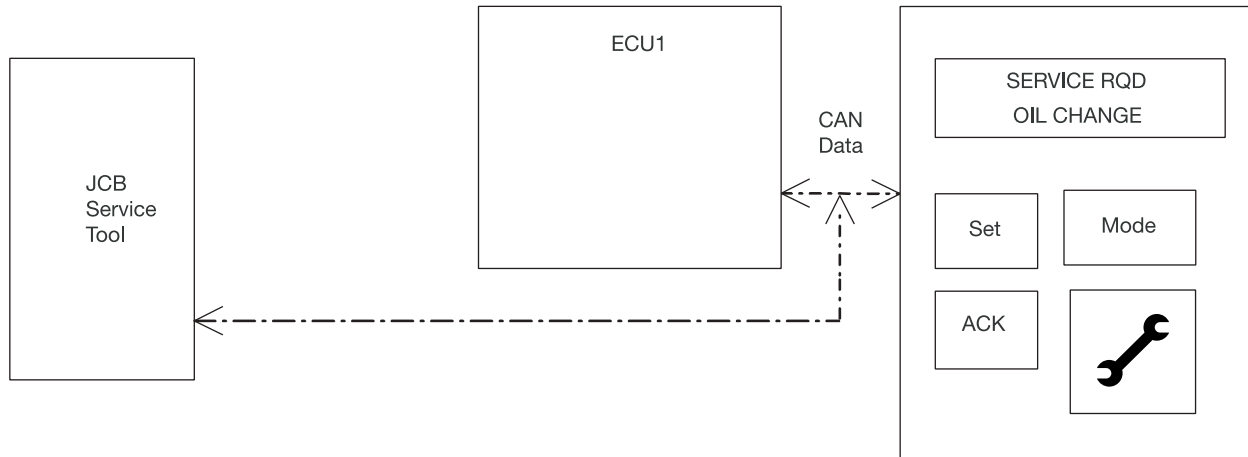
Section C - Electrics Basic System Operation

24 to 12 Volt Converter, Radio and Power Socket

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Service Required Warning

Operation



C005800GB-2

Fig 111.

The service warning LED in the EMS will illuminate (no buzzer) when the next service or oil change is due, according to the service schedule. The EMS also displays "SERVICE RQD" and/or "OIL CHANGE". The total elapsed time will be decided by the recorded hours on the hour meter.

Oil change intervals can be set to 250 or 500 hour intervals in "vehicle setup":

Oil change intervals can be set to 125, 250 or 500 hour intervals in the EMS SET+MODE (20 sec) Menu.

125 hours	the oil change message is displayed at 125 hours and at every subsequent 125 hour intervals including minor and major service points.
250 hours	the oil change message is displayed at minor and major service points.
500 hours	the oil change message is only displayed at major service points.

Minor service intervals occur every 250 hours with the first occurring at 250 hours. At the minor service intervals the service warning LED will flash and a "SERVICE RQD" message will be displayed on the EMS until the ACK button is pressed. Once the operator has pressed the

"ACK" button, the EMS will set the time for the next minor service event to 500 hours from the time when the "ACK" button was pressed. When the oil change interval is set for 125 or 250 hours, and additional repetitive "OIL CHANGE" message is displayed and cancelled as above.

Major service intervals occur every 500 hours with the first occurring at 500 hours. At the major service intervals the service warning LED will flash and a "SERVICE RQD" message will be displayed on the EMS from 20 hours before the preset 500 hour time has been reached. The warning can be cleared by the operator by pressing the "ACK" button but will re-occur every time the ignition is switched ON until reset by JCB service engineer. 20 hours after the 500 hour pre-set time has been reached an error is written to the error log indicating that the service has been missed. An additional repetitive "OIL CHANGE" message is displayed and cancelled as below.

The major service warning can be cancelled in one of two ways:

- 1 Through the JCB approved service tool.
- 2 Through the EMS Set + Mode (20 sec) menu



Cancellation of the Service indicator

JCB Service personnel will be able to cancel the main service indicator by entering the dealer code from the SET+MODE menu structure.

When the Service sub menu is reached and entered the dealer will be prompted to enter a four digit code by the use of the "Up/Down" keys and the "ACK" button. The required

digit will flash until the ACK button is pressed, after which the next digit will flash until all of the digits have been entered. Once the code is entered and the set button pressed the service warning is cancelled and the code saved in memory. The saved data will be updated at the next service interval by the newly entered dealer code.

Note: The dealer entered code can be accessed only by Factory service engineers with the service tool software.

Step	Action	Remark
1	SET + MODE (20 seconds)	
2	SERVICE OFF	
3	ACK	
4	0 0 0 0	
5	Press "Up/Down" to select digit "ACK" to accept selection & move to next digit	Repeat step 5 until all five digits entered
6	Eg. 1 2 3 4	
7	Press "SET" to enter and save code Reset service warning & extinguish warning lamp.	
8	Return to SET + MODE menu.	
9	SERVICE OFF	



EMS Set Menu

When the SET button on the EMS is pressed a sub menu structure appears, enabling the operator to customise the machine operations and confirm the local time/date. The following functions are available: The up/down arrows

scroll 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.

INT WIPER S	X	Intermittent wiper speed. Scroll keys to increase/decrease the delay between strokes time. "ACK" to accept new value.
LANGUAGE		Language can be changed between one and up to four languages, the languages are installed at machine set up.
DATE	XX-XX-XXXX	The current date. Use the scroll keys to increase the value. "ACK" to move to the month section. Repeat until the year is entered "ACK" to return to menu.
CLOCK	12/24? 24	Clock format the arrow keys select 12/24 hour format. "ACK" to accept format then the current time is displayed.
	XX:XX	Use the scroll keys to set the current time. "ACK" to accept value.
SLEW_PRIOR	XX	(JS200W models) Slew Priority. When selected the boom has priority over slew. Slew speed is reduced. Priority 1 gives slow slew, 10 gives full speed slew. The boom up and slew pressure switches must both be selected for this feature to operate.
HAMMER HOUR	XXXXX - - XXXX	The total hours that the hammer pressure switch has been activated is displayed on the left of the display (Up to 99,999 Max.) and the digits on the right which flash represent the hours accumulated since the last hammer service (up to 9,999 max.) The four flashing digits can be reset by pressing the "ACK" button. This Item will only be displayed if previously selected in set up tool Reset Hrs? A further press of the "ACK" button will set the hours since service to zero.
HAMMER RPM	RPM XXXX	The maximum hammer revs allowed. Use the scroll keys to set the desired rpm. Increments/decrements in 50 rev/min. "ACK" to accept the new value.
REFUEL LVL	XX	Allow the fuel tank to be filled with fuel to a preset percentage, 50-100%
AUTO IDLE T	XX	Auto idle delay time. Scroll keys increase/decrease the delay time. "ACK" to accept new delay time.

EMS Set + Mode Menu

When the SET and MODE buttons on the EMS are pressed together a sub menu appears, enabling the technician to view more detailed data on the machine and

to set option configurations. The following functions are available:

MODEL NAME	Displays the model type.
HRDWARE VER	Displays the hardware version
SFTWARE VER	Displays the software version.
SCRAP MAG	The current status of the scrap magnet function is displayed. The up arrows changes the status to "ON" and the down arrows change it to "OFF". If the "ACK" is pressed the display shows the scrap magnet rev/min.
SENSOR VOLT	Displays the sensor circuit voltage in volts.
BATT VOLTS	Displays the battery voltage in volts.
ALT VOLTS	Displays the alternator output voltage in volts.
THRATTLE POT	Displays the throttle volume dial value in Ohms
FUEL LEVEL	Displays the fuel level sensor value in%
FAN DUTY	Displays the current duty cycle of the fan control solenoid in %." On machines with a Viscous Clutch Fan, this menu item shows the duty cycle (in %) of the PWM output from the ECU1 to the fan, 100% = idling and 0% = fully on.
BAROMETER	Displays the current barometric pressure in kPa
WATER TEMP	Displays the current engine coolant temperature in °C
HYD TEMP	Displays the current hydraulic oil temperature in °C
PILOT SWTCH	Displays the status of the pressure switches. Use the scroll keys to go through the following switches, the current status will be displayed: TRAVEL Travel Pressure switch status AUTO Auto mode Pressure switch status BOOST Boost Pressure switch status BOOM Boom Pressure switch status UPPER Upper Pressure switch status SLEW Slew Pressure switch status HAMMER⁽¹⁾ Hammer Pressure switch status
PUMP AMPS	Displays the current duty cycle of the pump control solenoid in mA
RPM VALUE	Displays the current value of the engine speed in RPM.
SERIAL NO	Displays the serial number.

(1) If enabled



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
OIL CHG INT	The oil change interval can be set to "0", "1" or "2". 0 = 500 hour oil change (less than 0.2% sulphur), 1 = 250 hour oil change (0.2% - 0.4% sulphur), 2 = 125 hour oil change (more than 0.4% sulphur).
FAN TEST?	When selected this menu option will cause the fan to run at a fixed (predetermined) speed regardless of machine temperatures.
OVERRIDE?	When selected this function enables outputs to solenoids even when the engine is off, for testing purposes.
KEROSEN ENG	Press ACK. Use the scroll buttons to turn either "ON" or "OFF". Press ACK.
QH ENABLE?	Up or down arrows enable/disable function. "ACK" enters a configuration menu.
QH TYPE?	Up or down arrows change between type 1 or type 2. "ACK" to accept selection and return.
HAM WARNING ⁽¹⁾	The hammer warning can be set "ON" or "OFF"
HRSEPWR MON	When selected this function will log information on engine speed, pump milliamps and mode over a selectable period up to 15 mins and display the data as a graph.
CALIBRATION	Throttle calibration. 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.

(1) Only When enabled

Service Off

The 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).

The intermediate service warning can be cancelled by pressing the "ACK" button on the EMS.

Note: Information stored in the service history is available via the JCB Diagnostic tool.

Solenoid Override

Machine Controlled functions.

When the ignition is energised and the engine is not running, (which the ECU can detect by either of the following inputs: engine oil pressure and/or engine speed sensor input) then the following functions are allowed:

- | | | |
|---|-----------------|--|
| a | Wiper | |
| b | Washer | |
| c | Horn | |
| d | Indicators | |
| e | Headlight flash | |
| f | Work lamps | Buzzer will sound but can be cancelled by "ACK") |
| g | Side lights | Buzzer will sound but can be cancelled by "ACK") |
| h | Headlights | Buzzer will sound but can be cancelled by "ACK") |
| i | Beacon | Buzzer will sound but can be cancelled by "ACK") |

With the ignition on but the engine not started all solenoids with the exception of the ESOS solenoids are de energised to reduce battery drain and to reduce engine load whilst cranking.

For maintenance purposes an override facility is incorporated to safely operate the solenoid outputs whilst the engine is not operating. This feature, once enabled, is automatically cancelled by switching the ignition off and then back on. To enter the override facility the following procedure must be followed:

- 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 "OVER-RIDE?" message is displayed.
- Press the "ACK" button. You are now in the solenoid over-ride function. This is confirmed by the message "OVER-RIDE?" and internal buzzer will sound. The solenoids can now be operated as though the engine was running.

Horse Power Control Data Logging Facility

When selected this function will log information on engine speed, pump milliamps and mode over a selectable period up to 15 mins and display the data as a graph.

- 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 "HRSEPWR MON" message is displayed.
- Press the "ACK" button. You are now in the datalog function. This is confirmed by the message "MINUTES 1".
- The time period for logging can now be adjusted from 1 to 15 minutes using the arrow keys.
- Press 'ACK' to start recording, the EMS will display "RUNNING" When complete the display will return to normal.
- The results of this test are then viewed through the Servicemaster, Data logging application using a laptop.

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 "T VOL MIN" will appear in the display.
- Rotate the throttle volume dial to the minimum position.
- Press "ACK". The "T VOL MAX" message will then be displayed.
- Rotate the throttle volume dial to the maximum position.
- Press "ACK".
- When complete throttle control will be restored to the throttle volume dial. "CAL DONE" is displayed. 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.

Fault Finding

JCB Servicemaster

Introduction

Servicemaster is a gateway application allowing a large number of vehicle support applications to be linked using one familiar interface. The interface acts as a graphical tool for selecting the target vehicle from a database of vehicle families and triggering the particular service tool application desired. This removes the need for a user to 'remember' every individual service tool available and select which one is intended for a particular machine.

The interface also provides several key features that will accompany all JCB projects, a multi language editing tool that provides a means of individual text string translation for all JCB applications and the means to select a localised language translation for each JCB application.

The contents of this document aim to explain to you, the user, how to operate this application and to make most of its functionality.



Fig 112.

C065910

Using Servicemaster

The Servicemaster application consists of a database of records relating vehicle product ranges and service tool applications. At most, any one product range has one application for each of the service tool modules. In the image the selected vehicle range is the 'Heavy Products' range of excavators. → [Fig 112.](#) ([□ C-125](#)). The application buttons (or icons) visible below the vehicle images are gateways to the individual service tool applications. The user need only to decide which type of tool is required for the task at hand, click the respective icon and the service tool will be opened.

Product Range Selectors	Use the two arrow icons to toggle through the database list of product ranges supported by Servicemaster.
Application Buttons	These buttons access the underlying service tool applications available for the selected product range
System Menus	Functions are accessed by clicking the right mouse button anywhere on the main form.

Selecting Service Tool Applications

Service tool applications are selected by firstly locating and selecting from the list of product ranges the range which contains the vehicle that is to be worked on. The service tool applications which are available to the product range selected are made accessible by clicking on one of the icons that will be displayed on the lower portion of the main screen.

Only those applications which are supported by the CFE will have a visible icon. As and when new applications are made available by software vendors they can be included into the product range by updating the product range database.

Table 7.



C001750

Vehicle Setup

Operating parameter settings, Option/Attachment control, Alternative language support, Model/Serial number identification.



C001760

Data Logging

Running data collection, Operating data, Statistics, Device error log recording. → [HPDataLogs](#) (□ C-139).



C001770

Service History

Service/Engine hour records, Service dealership codes. → [Using HP Service History](#) (□ C-146).



C031160

Flash Loader

ECU Reprogramming and software update/revision capability.



C001790

Diagnostics

ECU I/O (input and output) testing and diagnostics.



C031170

Technical Data

Short cut to technical data spread sheet for machine performance and setting. CD3 needs to be installed



C031170

JS Fault Finding Guide

Short cut to JS fault finding guide. Fault finding guide on CD3 will need to be installed.



C031170

Electrical Error Codes

Short cut to electrical error codes. CD3 needs to be installed.

JS Machine Pages



Fig 113.

C065920

Vehicle Setup Icon

Selecting this icon will open the vehicle setup tool which is used to enable circuits or functions such as additional working lights, hammer circuit, stabilizers and boom priority which are additional to the basic machine.

Note: It should be noted that if a circuit or function is not enabled in the setup tool then it will not operate.

Diagnostics Icon

Selecting this icon will open the diagnostic tool which allows the engineer to test a significant amount of functions on the machine including solenoid operation, engine speed and pump control signal. The diagnostic functions are grouped into Engine and Drive systems, Hydraulic system, Electrical system and Vehicle and CAN Information sections.

A list of the available circuits in each category will be shown when selecting a functional section. Each item in the list can be selected for viewing while the diagnostic tool is operating. To view a circuit diagram, click in the check box area to the left of the item in the list. When checked, the circuit diagram will be shown in the right hand side of the window. When an item is unchecked, the circuit diagram will be closed.

Service History Icon

Selecting this icon will open the service history tool. This tool displays a service log of completed and missed services. It is also possible to add an additional service comment such as "pressures reset" to the service log. The service log can also be printed out or exported to a floppy disk.

Data Logger Icon

Selecting this icon will open the data-logging tool. This tool stores and displays information on electrical faults and error codes. This tool also logs and displays information on machine operation i.e. the numbers of hours the machine has spent in each of the working modes, the number of hours the machine has been tracking, swinging and excavating. Error logs can also be reset.

Flashloader Icon

Selecting this icon will open the programming tool which is used to input new software to machines with ECU software version 8 and onwards.



Fig 114.

C065930

HP Flashloader Icon

Selecting this icon will open the programming tool which is used to input new software to machines with ECU software prior to version 8.

Fault Finding Guide Icon

Selecting this icon will open the JS Fault Finding guide which is located on the JCB Service Information Pack DVD, if not installed during Servicemaster 2 set up. This guide gives useful information on test procedures and fault finding on JS hydraulic and electrical systems.

Technical Data

Selecting this icon will open a pdf document containing various JS machine technical data.

Electrical Error Codes

This shows all electrical error codes sent from the ECU's

System Menus

System menu functions are accessed by pressing the right mouse button anywhere on the main Servicemaster form.

Manage Applications	Opens the configure applications form which allows the user to add, delete, update information relating to the applications supported by product ranges.
Multi Lingual Support	Opens a text editing tool used to control application text strings which can be translated into almost any WINDOWS supported language
DLA Programmer	Opens an application for the reprogramming of the DLA module.
Properties	Used to define various options and settings used by the Servicemaster application.
About Box	Shows software version, date, developers information etc.

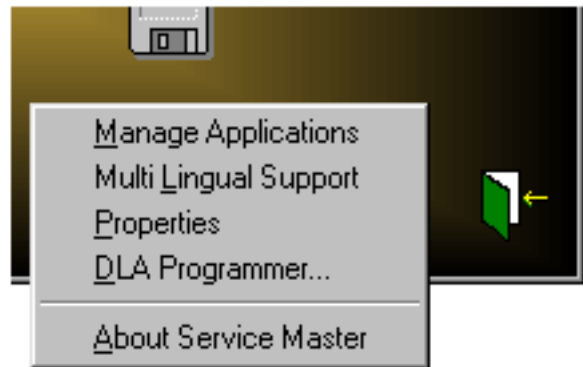


Fig 115.

357800

HPSetup Overview

HPSetup is part of a suite of software modules designed for the Advanced Management System (AMS). The task of HPSetup is to ensure that the vehicle can be configured out in the field or as it leaves the production line as per customer requirements. It includes the ability to set various vehicle attachment options for differing vehicle functions/design and the programming of alternative languages into the EMS so the operator can view information in his/her native tongue.

Features

Vehicle profile read and write functionality, offering the ability to modify the vehicles fitted options.

Data Link Adaptor (DLA) utilising the J1939 CAN Bus standard interface.

Application multi language support, options provided to allow the PC application to operate in many different languages. Note this is not the same as alternative languages used in the EMS module. In this instance we refer to the PC applications switching from a standard English test to another language of choice.

Using HPSetup

In order to operate this software correctly it must have been installed using the JCB Servicemaster Installation disk to ensure the correct files, databases and resources have been initialised.

- 1 Connecting to the vehicle.
- 2 Starting HPSetup.
- 3 Setting up a Vehicle Profile.
- 4 Writing Vehicle Profile.
- 5 Reading current Vehicle Profile.
- 6 Closing.
- 7 Options.

1 Connecting the Data Link Adaptor (DLA)

The DLA supplied to JCB and related dealerships is the only tool required to connect to the vehicles onboard CAN data network.

You will require a PC and all JCB applications installed and a free Parallel port, serial port or USB.

- Connect the DLA to your computer.
- Attach the second cable in between the DLA and the on vehicle service connector, located in this diagram.
- Power up the vehicle (optional, the power may be permanent).
- Ensure that the power on LED is illuminated.

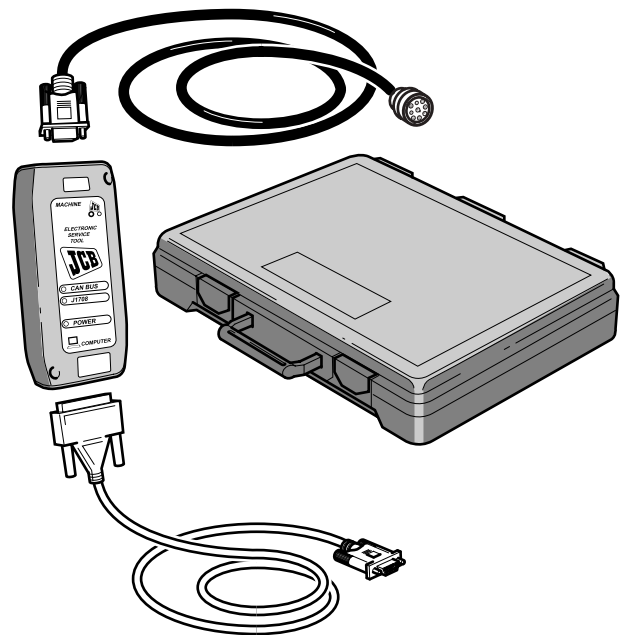


Fig 116.

A406130

2 Starting HPSetup

To open the HPSetup Application:

- 1 Boot PC into WINDOWS
- 2 Start the JCB Servicemaster CFE
- 3 Select the Heavy Products Range of Excavators
- 4 Click the icon to open the HPSetup application

The HPSetup tool when opened takes several seconds to open because it must search the vehicle network and detect the presence of each ECU attached and identify them. As soon as network analysis is complete then the main form will come into view.

There are also many error checks made with respect to the operation of the DLA, should any issues with DLA errors be encountered you will need to read DLA Trouble Shooting.

HPSetup should now be ready for use.

3 Setting Up A Vehicle Profile

The Vehicle Profile (VP) information sent to the machine requires the user to select the following data fields,

Model Number	Drop down list of currently supported machines from which the user is to select one particular value. This selection in turn controls the number and type of options available (and some default settings which cannot be changed) for that particular model.
Serial Number	Must be completed before the VP can be written to the vehicle.
Build Date	Date the machine was first programmed.
Alternative Languages	Pre-defined display text used on EMS.
Models Options	List of fitted options on vehicle, as required to complete customer requirements. (see guidelines)

The Options installed on the vehicle may then be selected using the check boxes (being checked defines the option as 'Installed'). The "Custom Options" checkbox allows the user to configure the options outside of the normal guidelines for what devices are implemented on particular machines. In general Wheeled and Tracked machines have several distinct options available that are not always available on the other. The "Custom Options" checkbox allows these to be over-written on demand, use of this option should only be made under instruction from JCB Heavy Products Engineering.

Build date is once programmable only, on leaving the production line (actual build) further writes will be ignored.

After setting up the VP, the user must now select the alternative languages files which are to be sent to the EMS module for storage. The EMS is able to select an alternative operating language apart from English (the default language in all JCB machines).

Click the left mouse button or select the "Next" button, on the languages tab sheet. Use the country drop down list box to display the list of alternative languages supported by HPSetup. The text boxes below the country list box display up to three alternative languages that will be stored into the EMS. → [Table 9. Language Cross Reference \(C-136\)](#).

An option has been provided to program the languages independently of programming the complete vehicle VP, this way it is somewhat simpler to update language text when moving the vehicle from one location to another.

The VP is now ready to be written.

Click on the "Write" button (or F12) to have the current VP written to the machine. The diagnostics messages received during read and write operations are displayed in the canvas area provided. Verifying the write can be done by clicking the "Read" button (F11). This reads the data back from the ECU1 (it does not however read the contents of the alternative language tables). Check the values read back against your original settings.



Fig 117.

C031190-1

4 Writing Vehicle Profile <F12>

The user can program the vehicle connected using the "Write" button at any time (or pressing F12 key). Several programming checks are made to ensure all required values are made (Model Type, Languages etc.) to ensure the data written will not make any invalid conditions in the vehicle system.

The "Write" button is disabled if the network connection is not available, try the **Connect** button first if this is the case.

5 Reading Vehicle Profile <F11>

On occasion it may be necessary for the VP to be read back from ECU1 to check settings or pre-load current settings ready for updating because of new options being fitted to the vehicle.

Connect vehicle to the PC via the DLA, power up the vehicle and then run HPSetup.

Click the "Read" button.

When the data has been read from ECU1 it is stored back into the data entry boxes on the Vehicle Setup and Languages tab sheets.

Note: It is not possible to extract the contents of the EMS Language tables from the EMS.



Fig 118.

C031200

6 Closing HPSetup

Closing HPSetup is performed using normal WINDOWS based methods of menu selection and/or the clicking of the "close" icon in the upper right corner of the window title bar.

7 Options - Multi Language Support

From the utilities menu, choose "Select Language" to select the Language of the country the visual text for the PC Application (HPSetup) needs to be translated. This function allows HPSetup to be operated by users from many countries, thus reducing the need to make many customised setup service tool applications.

Any language files supplied as part of the HPSetup tool will be automatically detected by the software and displayed in the selection box. Representations are made by National Flag and some text identifying (region or dialect) belonging to the country selected. Typically this allows several regional dialects of any single country to be selected.

As soon as a new flag is selected all WINDOWS based text is translated using the translation text files.



Fig 119.

C031210

Guidelines for Setting Up a Vehicle Using the Set Up Tool

Select the options according to the following guidelines

Travel Alarm:	For all USA tracked machines or machines fitted with the option travel alarm.
Overload Caution:	For all machines with Hose Burst Check Valves (HBCV) option.
Quick Hitch:	Machines equipped with quick hitch option.
Lower Wiper:	For all machines equipped with lower wiper option
Grab Rotate:	For wheeled machines with low flow pipework without priority valve.
Weed Cutter A/Bucket:	For wheeled machines with low flow pipework with priority valve.
Low Flow:	For tracked machines with low flow pipework (any spec).
Stabilisers (non Auto Wh):	For all wheeled machines equipped with stabilisers.
Add. Work Lamps:	Machines equipped with additional cab and counterweight lamps (including JS130HD).
Full Flow Lines:	For all machines equipped with full flow pipework (breaker, auxiliary, combined or merged pump circuits).
Boom priority:	For machine equipped with boom priority option (future option).
Custom Options:	This allows all above options to be specified for any machine. This to be used for sales specials only.
Dozer (non Auto Wh.):	For XO wheeled and all tracked machines equipped with dozer blade option.
Dig End Isolate:	For wheeled machines equipped with the dig end isolation option fitted. (This is standard on Auto wheeled machines)
Refuelling Pump:	For all machines equipped with the refuelling pump option.
Hydraulic Fan:	For all machines equipped with the hydraulic fan option.
Cruise Control:	For all machines equipped with the cruise control option. (Travel Option is a pre-requisite)
Viscous Clutch Fan:	For all machines equipped with the viscous clutch fan option.
Auto Wh. Frt. Stabs:	For Auto wheeled machines equipped with the front stabiliser option.
Auto Wh. Rear Stabs:	For Auto wheeled machines equipped with the rear stabiliser option.
Auto Wh. Frt. Dozer:	For Auto wheeled machines equipped with the front dozer option (and rear dozer or stabilisers).
Auto Wh. Rear Dozer:	For Auto wheeled machines equipped with the rear dozer option (and front dozer or stabilisers).
Auto Wh. Travel:	For Auto wheeled machines equipped with the travel option. (This is a standard option)
Auto Wh. L/H Drive:	For Auto wheeled left hand drive machines.
250 hr Oil Change:	For machines in areas with poor fuel quality.
Auto Wh. Buzzer:	For Auto wheeled machines.
Fuel Filter Sensor:	For Isuzu engine machines.

Alternative Language Cross Reference

Language tables programmed into the EMS module are selected using the following table. Pre-defined languages are automatically loaded when the user selects the destination territory (country). Up to three languages (in addition to English) may be stored in the EMS modules, each of which is operator selectable using EMS menu functions.

Table 8. Abbreviation Guide

Country	Abr	Country	Abr
Africa	AF	Italy	IT
Austria	AT	Latin America	LA
Belgium	BE	Luxembourg	LU
Bosnia/Croatia	BA / HR	Netherlands	NL
Canada	CA	Norway	NO
Czech Rep.	CZ	Poland	PL
Denmark	DK	Portugal	PT
East Europe	EE	Russia	RU
Finland	FI	Spain	ES
France	FR	Sweden	SE
Germany	DE	Switzerland	CH
Greece	GR	Turkey	TR
Iceland	IS	UK	UK
Ireland	IE	USA	US
Israel	IL	Hungarian	HU
⇒ Table 9. Language Cross Reference (□ C-136).			

Table 9. Language Cross Reference

Language	Country Abbreviation																																	
	AF	AT	BE	BA	HR	CA	CZ	DK	EE	FI	FR	DE	GR	IS	IS	IE	IL	IT	LA	LU	NL	NO	PL	PT	RU	ES	SE	CH	TR	UK	US	HU		
English	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Czech						□																												
Danish							□																											
Dutch																					□													
Finnish																																		
Flemish																																		
French	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	
German		□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	
Greek																																		
Icelandic															□																			
Italian																			□															
Norwegian																																		
Polish																																		
Portuguese																																		
Spanish																																		
Swedish																																		
Turkish																																		
Hungarian																																		
Croatian																																		
Russian																																		

● Default Language □ Alternative Language

For explanation of country abbreviations. → [Table 8. Abbreviation Guide \(C-135\)](#).

DLA Port Configuration

Servicemaster 2 can be configured to communicate through specified ports on the laptop.

- 1 From any Servicemaster 2 screen click the "Utilities" tab, scroll down and click "DLA setup" ⇒ [Fig 120.](#) (□ C-137).



Fig 120.

C065920

Or select "DLA" from the drop down menu and then double click the "COM port Chooser" icon ⇒ [Fig 121.](#) (□ C-137).



Fig 121.

868630

- 2 A dialogue box is displayed. Choose the type of device required and then click "Apply".



Fig 122.

868640

- 3 If the "Parallel/Serial" option is selected a second dialogue box will appear. The communication ports that Servicemaster 2 will communicate through and the order in which it will try and communicate will be displayed in the window ⇒ [Fig 123.](#) (□ C-138).

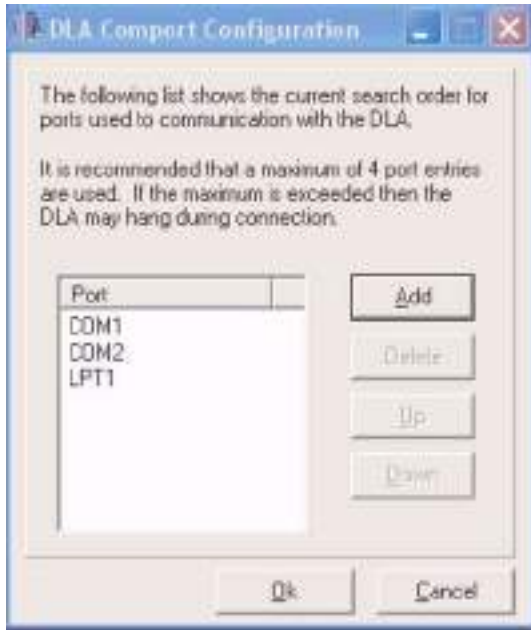


Fig 123.

C043730

- 4 To add a new communication port to the list click "Add". Enter the new port number as required. [⇒ Fig 124. \(□ C-138\)](#)

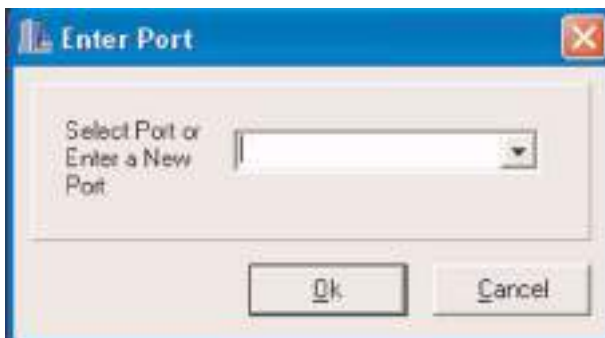


Fig 124.

C043740

Note: It is recommended that no more than four ports are identified in the list, as this may cause Servicemaster to hang when connecting to a vehicle.

Data Link Adaptor

The DLA is a universal device for connecting several data communications mediums to the PC via a single piece of hardware. HPSetup uses the J1939 CAN specification for on vehicle network and communications. Being one of the cheapest methods to connect the PC to the vehicle bus the DLA has proven its ability in applications such as diagnostics, data logging and vehicle setup procedure tools like HPSetup. Power for the DLA is taken from the vehicle power supply via the 15 way connector so it requires no internal source of power and is self regulating up to +40V, giving great protection and versatility because it can be connected to most forms of automotive machinery operating between 5 and 40V DC. Once connected to the PC the DLA is auto detected and initialised by software eliminating any need for the user to determine port settings, data transfer rates.

DLA Trouble Shooting

Failure of the software to initialise the DLA will prevent any read/write operations. This section will help debug the error and get the DLA working. Follow this list of checks to perform to help diagnose the problem.

- 1 Cables, ensure that the correct cables are used between the PC/DLA/On-Vehicle connector.
- 2 Inspect cables for possible damage, replace if necessary.
- 3 Check that good firm connections have been made between all devices.
- 4 Power up the vehicle and make sure the power LED on the DLA is ON, if the LED is not illuminated there may be a problem with the power supplied to the unit or the DLA regulator system is not working. To check the power to the DLA unplug the DLA from the vehicle, use a digital multi-meter to check the voltage between pins 6 and 8. There should be a minimum of 12 V DC (or IGNITION Voltage, see vehicle specifications) between these two pins. Suspect the vehicle power supply if there is not, else the DLA should be replaced because of a problem with it's internal circuitry.
- 5 With the Vehicle power ON, start HPSetup application and visually observe the CAN activity LED and note the error message displayed by the PC. If the LED does not flash off/ON several times after it has been initialised by the PC then there is probably a hardware

problem with the DLA. Replace the DLA. Error messages displayed by the DLA driver software often indicates the origin of the problem. It may help to power down the vehicle, wait a few seconds and then retry establishing connection.

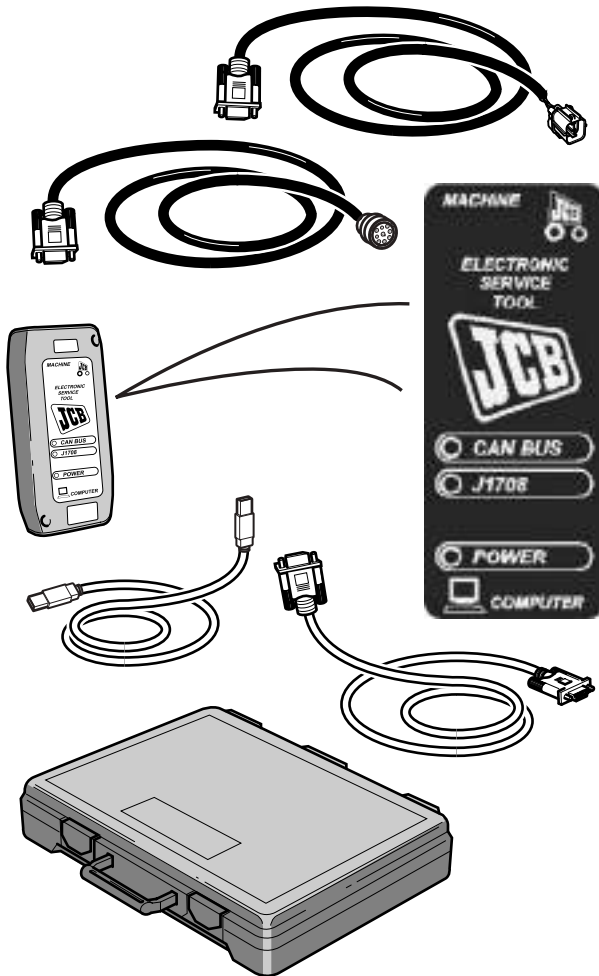


Fig 125.

A406132

HPDataLogs

HPDataLogs is an application designed to extract, compile and present operating data taken from a JS Excavators operating the Advanced Management System (AMS). The application software connects a PC to the On-Vehicle network via the DLA (Data Link Adapter) and provides a simple means of requesting data from the network nodes (ECU1, EMS and/or ECW1).

Data collected includes operating hours for particular vehicle functions, hydraulic and coolant statistics. A secondary function on the application is to download additional information taken from 'run time' logging, here the Operator places AMS into a mode to collect running information for 15 minutes at a time. The application allows this data to be downloaded, displayed and printed.

Starting HPDataLogs

- 1 Connect DLA to vehicle On-Board Service connector and to the Personal Computer that will run the HPDataLogs application.
- 2 Open JCB Servicemaster
- 3 Select the Heavy Products Range of Excavators
- 4 Click the Data logging icon. → [Selecting Service Tool Applications](#) (□ C-126).
- 5 The main HP data logging screen will open.

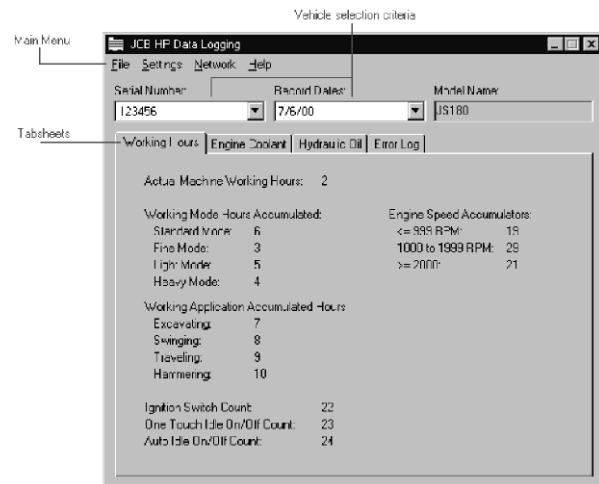


Fig 126.

6_14

User Functions

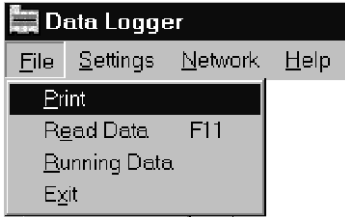


Fig 127.

C001840

Allows the operator to print the current selected data logs

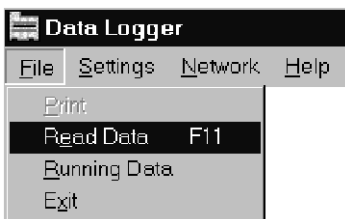


Fig 128.

C001850

Allows the operator to read the current data logs from the vehicle. After downloading AMS automatically clears old records ready for next vehicle use. F11 is the shortcut key to this function.

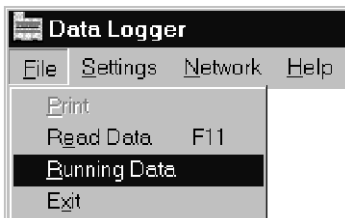


Fig 129.

C001860

Running data recorded during the operation of the vehicle can be view, downloaded, printed using this feature.

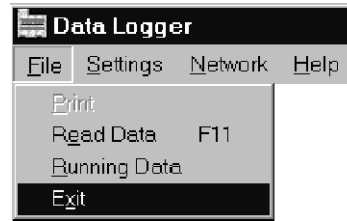


Fig 130.

C001870

Allows the operator to close the application.



Fig 131.

C001880

Change the language used for written text in the application and return to the Servicemaster CFE.



Fig 132.

C001890

View on-vehicle network node status.



Fig 133.

C001900

View help file.

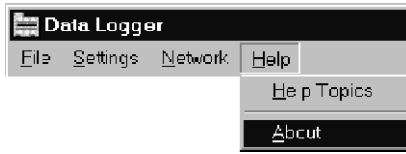


Fig 134.

C001910

View about box and application information.

Database Selection Criteria

Record sets belonging to vehicle data logs, past and present can be selected using the following controls.



Fig 135.

VAN12

Allows the operator to select from the database the list of records belonging to a specific vehicle using it's serial number as the index field. Set this field first.



Fig 136.

VAN13

Data logs belonging to the selected Vehicle serial number are further filtered by selecting the date on which the logs were downloaded.

Tab Box Options

The TAB fields to select the Data Log information which you wish to view.



Fig 137.

6_16

- Working Hours** Shows accumulated operating hours for vehicle functions.
- Engine Coolant** Shows accumulated operating hours in several temperature ranges and data logs of critical events.
- Hydraulic Oils** Shows accumulated operating hours in several temperature ranges and data logs of critical events.
- Error Logs** View list of Error Logs reported during the selected period.

Working Hours

Details actual vehicle working hours accumulated for various operating conditions.

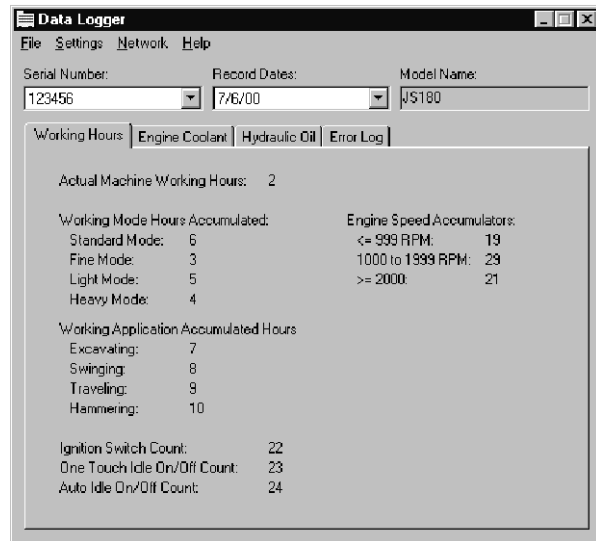


Fig 138.

^_17A

Engine Coolant

Details engine coolant operating conditions and accumulated operating hours within defined temperature ranges.

- Date** Date of the event.
- Duration** Time in minutes of the event.
- Machine Hours** Actual engine hours at which the event took place.

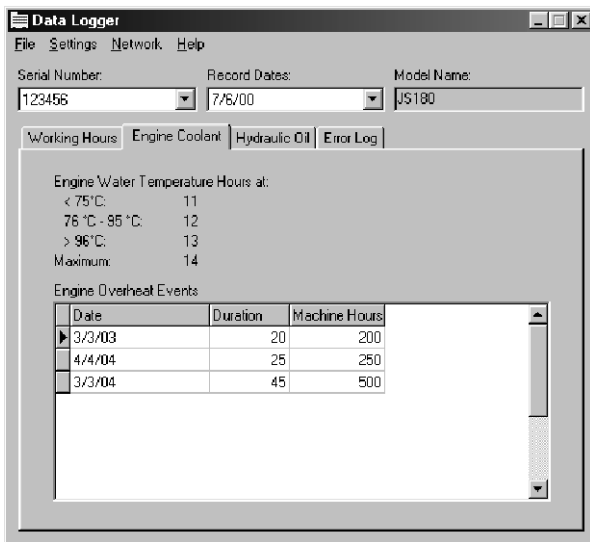


Fig 139.

6_17B

Hydraulic Oil

Details hydraulic oil operating conditions since last service and accumulated operating hours within defined temperature ranges.

- Date** Date of the event.
- Duration** Time in minutes of the event.
- Machine Hours** Actual engine hours at which the event took place.

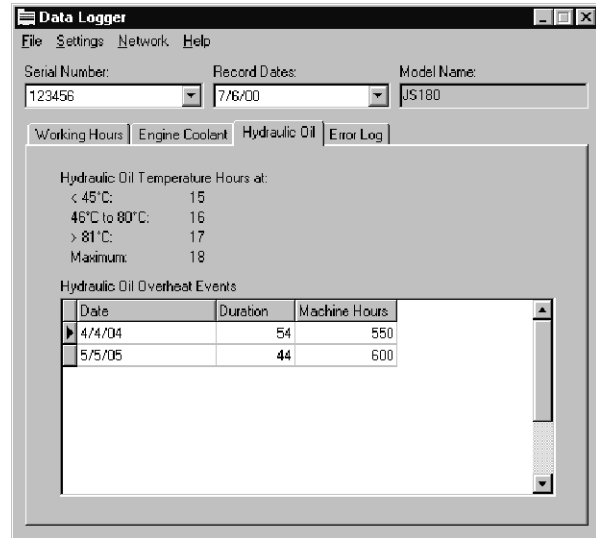


Fig 140.

6_17C

Error Logs

Various error events are recorded and saved as logs for future analysis by service and engineering personnel. Any error logs detected and uploaded from the vehicle can be displayed in the error log tab sheet.

- Error Types** Details the type of error event logged.
- Engine Hours** Engine hours at the time the error event occurred.
- Duration (min)** Time in minutes of the error event. May be blank or zero depending on the type of error, some events do not require a duration parameter.
- Output Number** Identifies the hardware output using the system/schematic circuit ID.

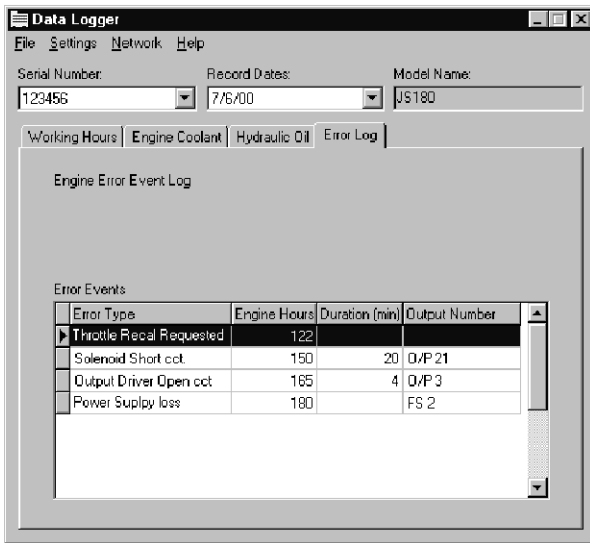


Fig 141.

6_17D

HP Control Monitoring

Horse power control monitoring is used to record operating conditions during the 15 minutes prior to the recording

being stopped by the vehicle operator. The graph displays the pump PWM and RPM against time.

The running data logs are retained until the next time the user requests running data to be recorded.

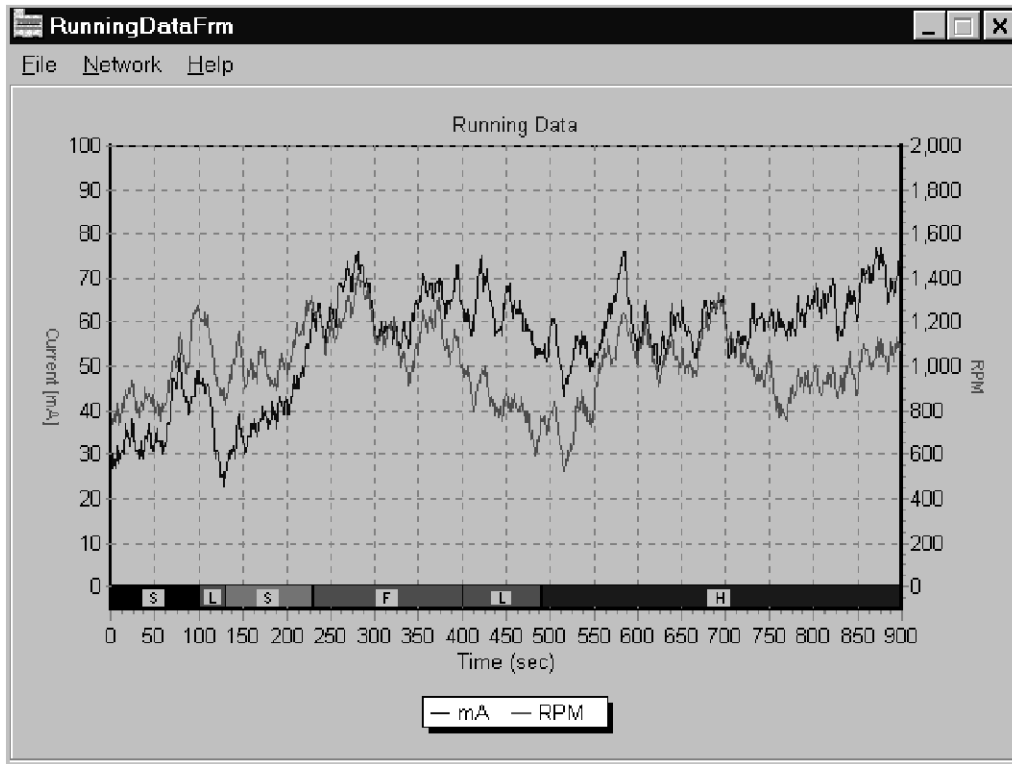


Fig 142.

6_18

Downloading the Running Data

- 1 Select and open the running data form from the HPDLog applications main menu bar.
- 2 Using the menu options on the running data form now open, select the Read function, alternatively use the F11 key.



Fig 143.

6_18A

Exporting Data

The running data form may be exported to a string delimited text file for importing into another Windows based application.



Fig 144.

6_18B

Printing Reports

The running data form can be printed out as a document suitable for distribution or fax purposes.

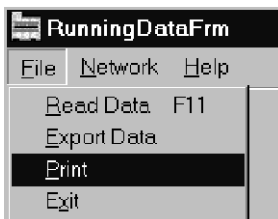


Fig 145.

6_16C

User Input

Zoom: The operator can use the left mouse button to drag on an area of the graph, this area will be zoomed in when the left button is released. To do this the user places the mouse pointer to the upper left part of the area of the graphic which is to be zoomed in, press and hold down the left mouse button and drag the cursor over the area to be highlighted. Keep dragging the mouse until you reach the bottom right of the target area and release the left mouse button. The selected area will then be zoomed into.

Service History

The Service history tool is an application designed to retrieve and display Service history records stored by AMS. Simple functionality makes the tool ideal for quick referencing of stored data, additionally import, export and printing facilities make information exchange between service and JCB service departments very easy.

Several forms of service history events are recorded by the EMS module,

<p>Scheduled Service Events</p>	<p>Where at pre-defined intervals the Service LED on the EMS display is triggered and the service indicator is acknowledged by the operator. These events are generally for must do service operations as specified in the service manual.</p>
<p>Unscheduled Service Events</p>	<p>Are those events that may develop due to changes to the specification of the machine or the repair of some system function, system or component. These unscheduled events are 'added' to the EMS list of service history events by the service engineer responsible for the service.</p>

This application is responsible for reading, writing, printing, import, export and control of the service history records taken from any HP vehicle.

Using HP Service History

HP service can be used as a stand-alone application or through the JCB Servicemaster CFE.

- 1 Connect Vehicle/DLA/PC using the supplied cables.
- 2 Power up the vehicle.
- 3 Run HPSetup.

Open using the Servicemaster CFE.

Open Servicemaster CFE.

Click on the "Service History icon". ⇒ [Selecting Service Tool Applications \(C-126\)](#).

Opening using Windows.

Click WINDOWS "Start" button on toolbar. Select "RUN... menu item". Use the browse button to locate "HPService.exe". Click OK after selecting the file.

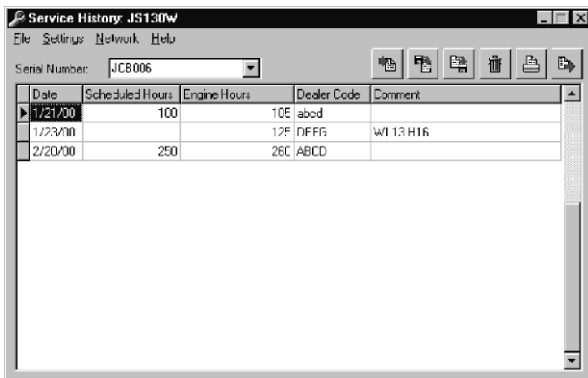


Fig 146.

6JUL1

The HP service application will open and look like that shown.

Allows the user to select from the database the service history for any vehicle that has been connected to it and downloaded.	 6JUL3
Load service history list from vehicle attached to PC. ⇒ Load Service History (C-147) .	 6JUL4
Import service history exported from another service history user. ⇒ Import Service History (C-147) .	 6JUL5
Export service history, exports the current service history record set to file for another user to import. ⇒ Export Service History (C-147) .	 6JUL6
Delete service history, deletes the current list of entries from the Database. ⇒ Delete Service History (C-148) .	 6JUL7
Print Service Record the current service history. ⇒ Printing Service History (C-148) .	 6JUL8
Add Service Record, allows the user to insert a record into the current Vehicle service history. A special option for Services which are not pre-planned. ⇒ To Add A Service Record (C-148) .	 6JUL9

Load Service History

Service history records can be taken from the vehicle by clicking on the "Load service History" button. → [Using HP Service History \(C-146\)](#).

The list of service history records are then stored in the local database in a chronological order, as shown below.

Scheduled Hours	Current Engine Hours	Dealer Code
250	210	AAAA
250	550	AAAA
300	762	BBBB
500	1124	CCCC

Fig 147.

6JUL10

In the example above four SH records have been saved from the vehicle detailing the service interval, current engine hours at the time of service and the dealer code of the service centre who performed the service.

Should the module recording the SH ever be replaced the service history manager safely keeps this data and will append the new records from the replaced module. But this will only be true as long as the serial number of the vehicle is not changed and engine hours are 'set' to approximately the old number of engine hours prior to exchange.

Import Service History

The service history manager provides tools for Importing and exporting individual SH records from one personal computer to another, this makes the task of sharing information very easy over a largely distributed computer system.

To import a file the user simply clicks on the "Import Service History" button and then use the dialogue box to locate the file that is to be imported. → [Using HP Service History \(C-146\)](#).

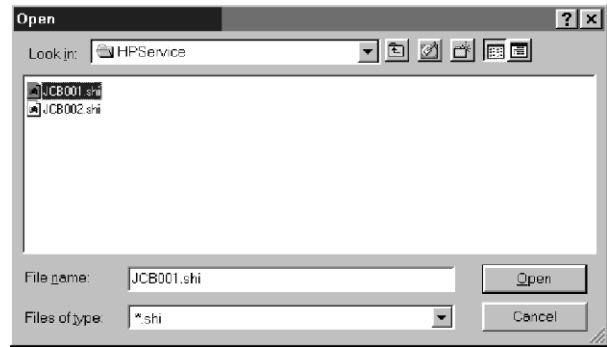


Fig 148.

VAN38

All Import/Export files have the .shi extension.

After importing the file it is displayed in the usual SH grid.

Export Service History

The currently displayed list of service history records can be exported to a file for distribution to other users who are interested with any of the information stored in the records.

To export service history records, select from the vehicle serial number list the serial number belonging to the vehicle that is to be exported. Click the export service history button to open the 'Save as...' dialogue box, (shown below). Enter or select a file name (for over-writing) that is to receive the exported data. → [Using HP Service History \(C-146\)](#).



Fig 149.

VAN37

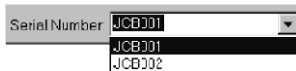
The click the 'Save' button to have the table contents exported.

Printing Service History

The service history of any vehicle can be printed using the default printer settings of the PC running the application.

How to Print Service History:

Use the vehicle serial number selection box to select a set of History Records.



6JUL3

Fig 150.

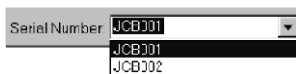
Click the "Print" button. [⇒ Using HP Service History \(□ C-146\).](#)

Delete Service History

The currently selected vehicle service history may be deleted at any time.

How to Delete a Service History:

Use the vehicle serial number selection box to select a set of History Records.



6JUL3

Fig 151.

Click the "Delete" button. [⇒ Using HP Service History \(□ C-146\).](#)

Add Service History Record

At some point in time a vehicle may undergo some form of service operation that is outside of the normal preset service intervals. This option allows the service engineer to include into the vehicles current service history list an entry for a non-scheduled service event. The special significance of this event is two fold, firstly because the scheduled hours are 'unscheduled' then we must set the service interval to zero and because we have the ability to enter text into the comments field the service engineer can associate text with the unscheduled service event.

To Add A Service History Record

Connect the vehicle, power up and make sure the PC has logged onto the vehicle network.

Click the "Add Service History Record" button. [⇒ Using HP Service History \(□ C-146\).](#)

In the form below enter the dealership code and a comment (up to 30 characters maximum) relating to the nature of the unscheduled service.



6JUL11

Fig 152.

Click the "OK" button to send the record to the vehicles internal service history table. The "OK" button is only enabled when valid data is entered into the dealer code and comment fields.

Closing HPService

To close HPService use the exit menu item on the HPService main window menu bar.

FLASH Programming Application

"FLASHLOADER" Training Guide

This application is primarily based on a generic FLASH programming design which requires little information back from the module that is to be programmed other than it's source address (SA) utilises the DLA to link to the on-vehicle CAN network to obtain network node information and to pass the FLASH program application code.

To limit use to the JCB Heavy Products application operator selections have been limited to programming the ECU1, EMS and the ECUW. Other operator input is restricted to supplying the file names for applications that are to be written to the individual network nodes.

Using FLASHECU

Preparation

- 1 Connect DLA to PC and to the on-vehicle connector using the DLA cables provided.
- 2 Power up vehicle with engine off and check vehicle is operational.

Opening FLASHECU application

- 1 Open the JCB Servicemaster desktop.
- 2 Select the Heavy Products JS Excavator product range
- 3 Click on the flash icon shown below.



Fig 153.

C065580

- 4 The application should open as shown



Fig 154.

C065930

Select ECU module icon to be programmed.



Fig 155.

C065950

Use the browse buttons or type into the text input box the name of the file to be programmed into the ECU module.

Programming FLASH

Only those ECU modules detected on the network can be programmed. After selecting the application to program into FLASH click the "Start" button. Confirm if appropriate. FLASH programming will begin immediately.

The progress bar indicates FLASH programming progress.

Stop Programming

The "Stop" button terminates programming at any time, the side effect of this will be that any embedded code already existing prior to reprogramming will be corrupted. The "Stop" button is only to be used if the 'progress' of the FLASH function stalls, then the FLASH program will be interrupted to bring the target ECU into program mode once again.

The following message indicates an error occurred during programming. "redo" the flash loading procedure



C065980

Fig 156.

The following message indicates that programming has been completed successfully.



C065990

Fig 157.

Introduction to the Diagnostics Tool

The diagnostics window provides a framework for analysing each functional section of the vehicle. It does this by requesting and collecting data from the vehicle network using the DLA (Data Link Adapter). The data after filtering and interpretation is then used to display the current real time state of I/O, running data values etc. of the particular function control circuit under observation. Because the diagnostics tool adds little overhead to the CAN Bus or loading on the ECU nodes it operates unnoticed, thus retaining a high degree of real time efficiency.

For information on using this diagnostic tool see the following sections:

- 1 Connecting to the Vehicle
- 2 Starting Diagnostic Mode
- 3 Analysing Circuits
- 4 Stopping Diagnostic Mode
- 5 Language Preferences

The status bar located at the bottom of the diagnostic tool window shows some CAN network information. The CAN address of each of the modules (if present) are shown in the ECU, ECUW and EMS sections. The red and green indicator lights turn on when there are messages received or sent by the diagnostic software.

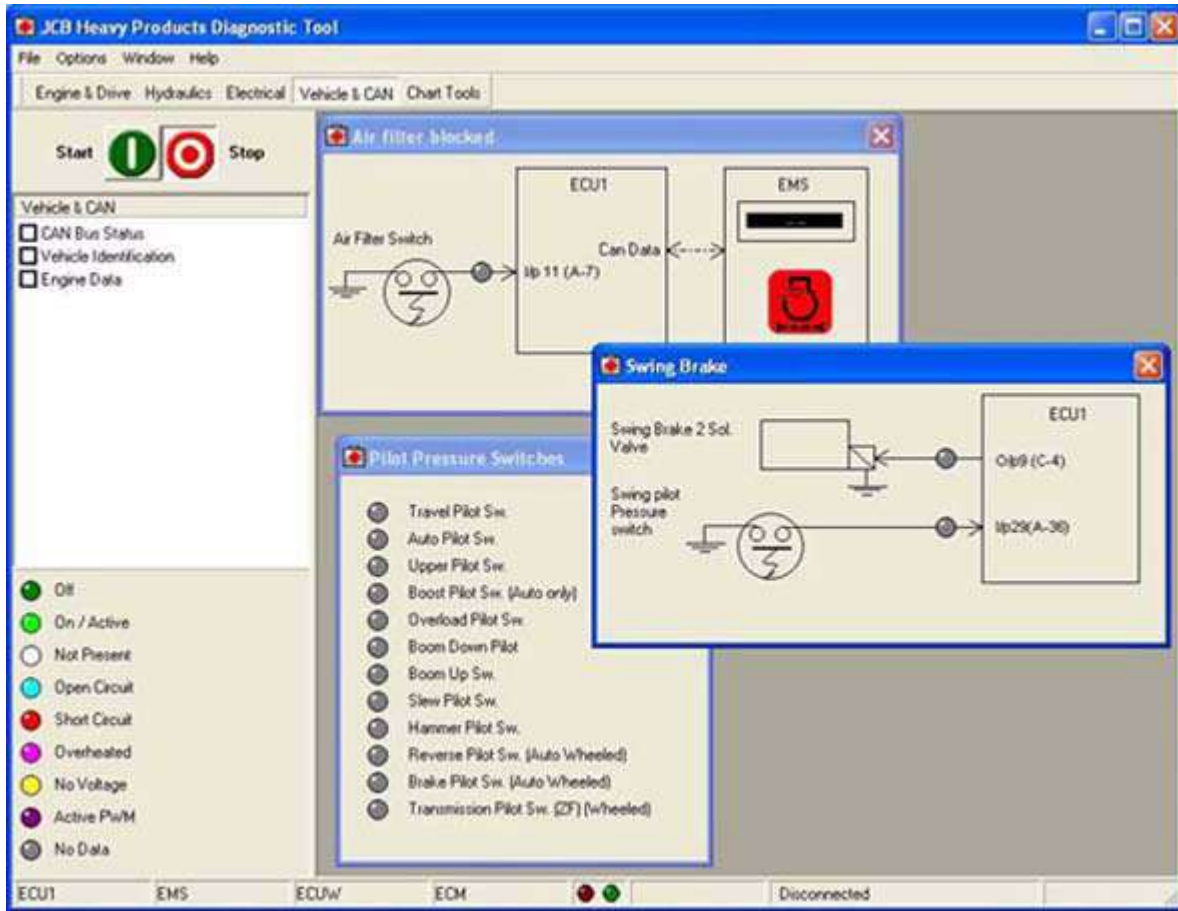


Fig 158.

C066000

Connecting to the Vehicle

The DLA supplied to JCB and related dealerships is the only tool required to connect to the vehicle's onboard CAN network.

You will require a PC with Windows and a parallel printer port, serial port or USB. A cable is supplied with the DLA and is specifically designed for this application.

Connect the DLA to your computer's port using the cable supplied with the DLA.

Attach the second cable between the DLA and the on vehicle service connector **A**.

Power up the vehicle.

Ensure that the power LED on the DLA is illuminated.

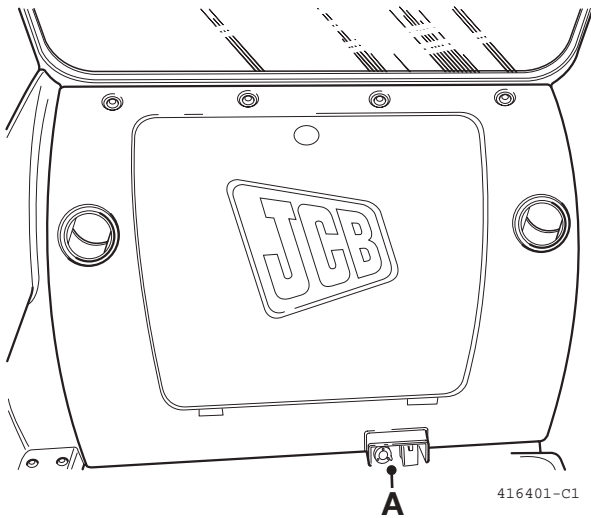


Fig 159.

406410-C1

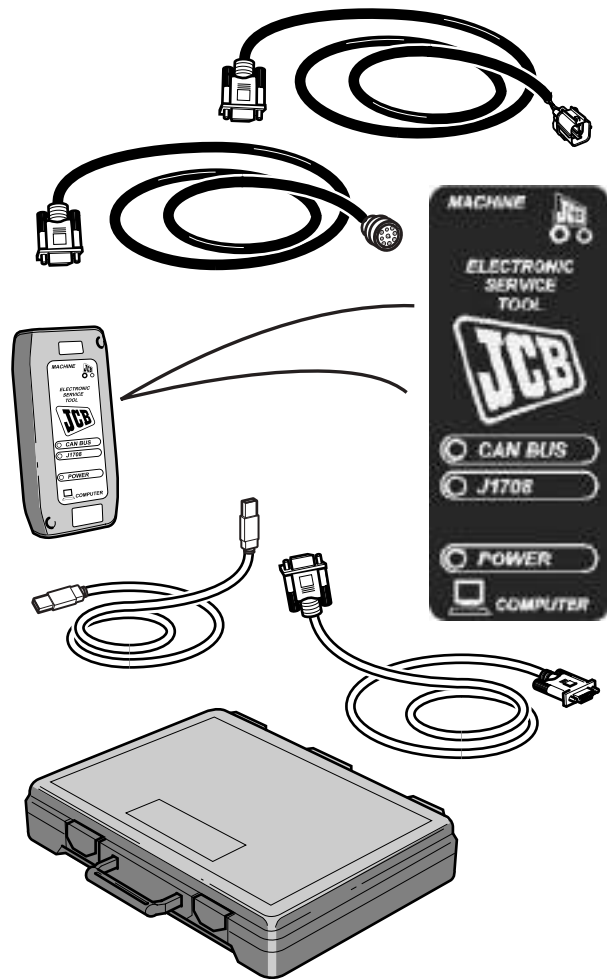


Fig 160.

A406132

Starting Diagnostic Mode

To start the diagnostic mode, press the green "Start" button, or select "Start Diagnostics" from the "Options" menu.



Fig 161.

C066010

When the diagnostic mode is started:

the diagnostic software checks the vehicle model number and installed options and displays only the diagnostic functions that are available on the vehicle.

starts the real time monitoring of the vehicle's systems.

all of the circuit diagram windows are continuously refreshed with the current values.

Note: If the DLA is not connected to the computer or it is not powered, you will see an error message when starting the diagnostics mode. You will be asked to retry or cancel. If you click "Cancel", the diagnostic mode will start but will not be able to show any real time information from the vehicle. If you press "Retry", after connecting and turning on the DLA, the diagnostic mode will start and the real time information will be shown.

Circuit Diagrams

The circuit diagrams provide you with real time information while the diagnostic software is running. The state or level of all inputs and outputs of each functional circuit are shown and continually updated as the conditions on the vehicle change. This information allows for quick troubleshooting of the vehicle. There are two example circuit diagrams below showing the style of the diagnostic information.

The horn diagram shows the state (on/off) of the horn switches and the state of the output that drives the horn.

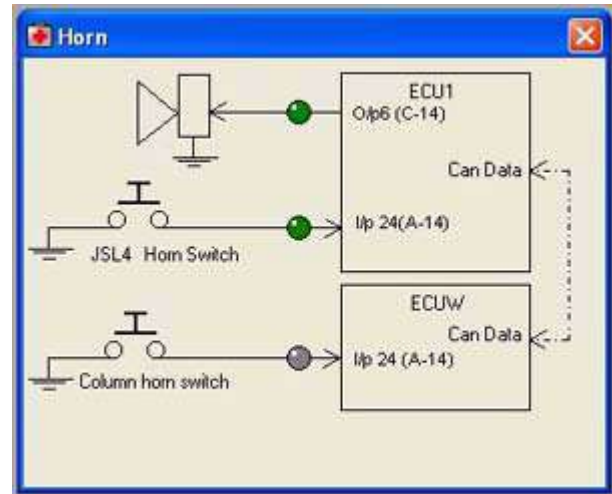


Fig 162.

C066030

The fuel level diagram shows the current fuel level in %.

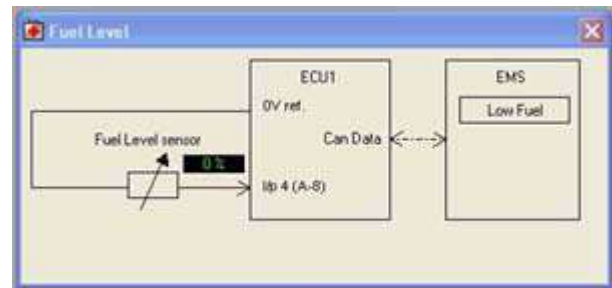











Fig 163.

C066040

Indicator Lights (LEDs)

is also visible in the lower left hand corner of the main HP Diagnostics window.

The indicator lights in the diagnostic circuit diagrams will appear in one of the states (colours) below. This colour key

-  Off (Dark Green) - the input or output is off or inactive.
-  On / Active (Light Green) - the input or output is on or activated.
-  Not Present (White) - this option is not available on this machine
-  Open Circuit (Aqua) - the output is in an open circuit condition indicating that there is nothing connected to the output (PWM and High Side outputs only).
-  Short Circuit (Red) - the output is in a short circuit condition indicating that the output is connected directly to the battery or earth ground (PWM and High Side outputs only).
-  Overheated (Fusia) - the output has registering an overheat condition
-  No Voltage (Yellow) - the output circuit does not have battery power indicating that a fuse may be open (PWM and High Side outputs only).
-  Active PWM (Purple) - the output is on.
-  No Data (Grey) - no data is being received by the ECU.

Stopping Diagnostic Mode

To stop the diagnostic mode, press the red "Stop" button or select "Stop Diagnostics" from the "Options" menu.



Fig 164.

C066020

Stopping diagnostic mode will stop the real time monitoring of the vehicle and disengage the DLA from the CAN network. The circuit diagram windows are not refreshed with new values.

Language Setting

Select "Preferences" from the "Options" menu to view the preferences dialogue. To change the language used by the diagnostic tool software, select the desired language from the list of supported languages.

All language files supplied as part of the diagnostic tool will be automatically detected by the software and displayed in the selection box. Representations are made by national flag and some text identifying (region or dialect) belonging to the country. This allows several regional dialects of any single country to be made available.

As soon as a new language is selected and the "OK" button is pressed, all of the program's text is translated (changed) using the selected language file.

Electrical Fault Text Messages Displayed on the EMS.

Electrical fault error code.

Electrical errors are displayed immediately on the EMS with an alarm buzzer. Pressing "ACK" stops the buzzer and cause the messages to become repetitive.

Note: 1 Open circuits can only be detected when the output has been turned off. Open circuits are indicated by 100 series codes.

Note: 2 Short circuit conditions can only be detected when the output is turned on. Short circuits are indicated by a 200 series code.

Note: 3 Open circuits, short circuits and no voltage detections cannot be done on the low side drivers.

Note: 4 See Harness Data

Error Codes	Error String	Description
101	CRANK	A crank signal was not detected by the ECU1.
102	FUEL	The fuel sensor is open-circuit
103	EN TMP	The engine temperature sensor is open-circuit.
104	HYD TMP	The hydraulic temperature sensor is open-circuit.
105	SET PT	The throttle set potentiometer is open-circuit.
106	SENS PT	The throttle sense potentiometer is open-circuit.
107	OIL SW	The oil pressure switch is reporting oil pressure is present when the engine is not running.
108	FLYWHEEL	The flywheel sensor is reporting an engine speed even though the engine is not running.
109	ALT	The alternator is reporting a voltage even when the engine is not running.
110	THR SOL	The throttle solenoid is open-circuit. This can only be detected when the engine is not running.
111	BOOM SP	The boom lower speed regulation output is open-circuit.
113	MAX FLW	"The max flow solenoid is open-circuit. For JS200W machines, this error can only be detected when the engine is not running due to the fact that this is a proportional valve on these machines.
115	BOOM	The boom priority solenoid is open-circuit.
116	FL PMP	The refuel pump output is open-circuit.
117	HORN	The horn output is open-circuit.
118	HYD PMP	"The hydraulic pump is open-circuit. Because this is a proportional valve, this error can only be detected when the engine is not running. "
119	SLW LCK	The slew lock solenoid is open-circuit.
120	HYD FAN	The hydraulic fan output is open-circuit. This can only be detected when the engine is not running.
121	SLW BRK	The slew brake solenoid is open-circuit.
122	SLW ST	The slew shut off solenoid is open-circuit.
127	TL CHNG	The travel change solenoid is open-circuit.
128	WASHER	The washer motor is open-circuit.
129	DOZER	The dozer solenoid is open-circuit.

Error Codes	Error String	Description
130	GRB CW	The grab/rotate clockwise solenoid is open-circuit.
131	GRB CCW	The grab/rotate counter-clockwise solenoid is open-circuit.
132	LW FLOW	The low flow solenoid is open-circuit.
133	ISOL	The hydraulic isolator solenoid is open-circuit.
135	2 STAGE	The 2nd stage relief solenoid is open-circuit.
136	QK HTCH	The quick hitch solenoid is open-circuit.
138	HAMMER	The hammer solenoid is open-circuit.
139	CUSHION	The hard/soft cushion solenoid is open-circuit.
142	ENG SD	The engine shutdown output is open-circuit.
143	GLW PLG	The glow plugs output is open-circuit.
156	TL FLW3	The travel flow 3 solenoid is open-circuit.
157	TL FLW2	The travel flow 2 solenoid is open-circuit.
158	GR CHNG	The M2 or gear change solenoid is open-circuit.
159	BRKE LT	The brake light output is open-circuit.
160	AXLE LK	The axle lock solenoid is open-circuit.
161	STAB UP	The stabilizer up solenoid is open-circuit.
162	STAB DN	The stabilizer down solenoid is open-circuit.
163	STAB LH	The stabilizer left solenoid is open-circuit.
164	STAB RH	The stabilizer right solenoid is open-circuit.
165	CRUISE	The cruise control solenoid is open-circuit.
166	DIG ISL	The dig end isolation solenoid is open-circuit.
167	PRK BK	The M1 or park brake solenoid is open-circuit.
168	DRV ISL	The drive isolate solenoid is open-circuit.
202	FUEL	The fuel level sensor is short-circuit.
203	EN TMP	The engine temperature sensor is short-circuit.
204	HYD TMP	The hydraulic temperature sensor is short-circuit.
205	SET PT	The throttle set potentiometer is short-circuit.
206	SENS PT	The throttle sense potentiometer is short-circuit.
210	THR SOL	The throttle solenoid is short-circuit. This can only be detected when the engine is not running.
211	BOOM SP	The boom lower speed regulation output is short-circuit.
212	INT LT	The interior light is short-circuit.
213	MAX FLW	"The max flow solenoid is short-circuit. For JS200W machines, this error can only be detected when the engine is not running due to the fact that this is a proportional valve on these machines.
214	BEACON	The beacon output is short-circuit.
215	BOOM PR	The boom priority solenoid is short-circuit.
216	FL PMP	The refuel pump solenoid is short-circuit.

Error Codes	Error String	Description
217	HORN	The horn output is short-circuit.
218	HYD PMP	"The hydraulic pump is short-circuit. Because this is a proportional valve, this error can only be detected when the engine is not running."
219	SLW LCK	The slew lock solenoid is short-circuit.
220	HYD FAN	The hydraulic fan solenoid is short-circuit. The fault can only be detected when the engine is not running.
221	SLW BRK	The slew brake solenoid is short-circuit.
222	SLW ST	The slew shut off solenoid is short-circuit.
223	LW WIPR	The lower wiper motor is short-circuit.
224	WIPER	The wiper motor is short-circuit.
225	LH CAB LT	The boom work light is short-circuit.
226	RH CAB LT	The toolbox work light is short-circuit.
227	TL CHNG	The travel change solenoid is short-circuit.
228	WASHER	The washer motor is short-circuit.
229	DOZER	The dozer solenoid is short-circuit.
230	GRB CW	The grab/rotate clockwise solenoid is short-circuit.
231	GRB CCW	The grab/rotate counter-clockwise solenoid is short-circuit.
232	LW FLOW	The low flow solenoid is short-circuit.
233	ISOL	The isolator solenoid is short-circuit.
234	EMG STP	The engine stop solenoid is short-circuit.
235	2 STAGE	The 2nd stage relief solenoid is short-circuit.
236	QK HTCH	The quick hitch solenoid is short-circuit.
237	TL ALRM	The travel alarm output is short-circuit.
238	HAMMER	The hammer solenoid is short-circuit.
239	CUSHION	The hard/soft cushion solenoid is short-circuit.
240	BOOM LT	The boom work light is short-circuit.
241	TLBX LT	The toolbox work light is short-circuit.
242	ENG SD	The engine shutdown solenoid is short-circuit.
243	GLW PLG	The glow plugs are short-circuit.
244	CNT LT	The counter-weight work light is short-circuit.
245	LH IND	The LH turn indicator is short-circuit.
246	LH SIDE	The LH sidelight is short-circuit.
247	LH FOG	The LH fog light is short-circuit.
248	LH MAIN	The LH main beam is short-circuit.
249	LH DIP	The LH dip beam is short-circuit.
250	RH IND	The RH turn indicator is short-circuit.
251	RH SIDE	The RH sidelight is short-circuit.
252	RH FOG	The RH fog light is short-circuit

Error Codes	Error String	Description
253	RH MAIN	The RH main beam is short-circuit.
254	RH DIP	The RH dip beam is short-circuit.
255	HZD LED	The hazard LED is short-circuit.
256	TL FLW3	The travel flow 3 solenoid is short-circuit.
257	TL FLW2	The travel flow 2 solenoid is short-circuit.
258	GR CHNG	The M2 or gear change solenoid is short-circuit.
259	BRKE LT	The brake light output is short-circuit.
260	AXLE LK	The axle lock solenoid is short-circuit.
261	STAB UP	The stabilizer up solenoid is short-circuit.
262	STAB DN	The stabilizer down solenoid is short-circuit.
263	STAB LH	The stabilizer left solenoid is short-circuit.
264	STAB RH	The stabilizer right solenoid is short-circuit.
265	CRUISE	The cruise control solenoid is short-circuit.
266	DIG ISL	The dig end isolate solenoid is short-circuit.
267	PRK BK	The M1 or park brake solenoid is short-circuit.
268	DRV ISL	The drive isolate solenoid is short-circuit.
300	EC1 CAN	The ECU1 module is no longer communicating on the CAN bus.
301	ECW CAN	The ECUW module is no longer communicating on the CAN bus.
302	THRT CAL	The difference between the minimum and maximum calibration points for the throttle dial pot is less than 100 A/D points.
304	THRT CAL	The throttle dial pot is greater than 10% but the engine is still running at the idle position. This condition must exist for at least 15 seconds before it is reported. This error does not exist on machines fitted with an EEC.

Fault Finding Without Using the JCB Servicemaster Diagnostic Tool

Introduction

The AMS system is designed so that all of the components that are connected to the system are able to communicate with each other. This means not only are the machine hours displayed on the Electronic Monitor (EMS) but also they are recorded in the Electronic Control Unit 1 (ECU-1).

Changing Machine Components

Under such circumstances where fault diagnosis is not possible by using the JCB Servicemaster diagnostic tool then the following actions must be taken in circumstances where a change of the Electronic Control Unit 1 (ECU-1) and/or the Electronic Monitor System (EMS) is unavoidable.

- 1 If either a new ECU-1 or new EMS. is fitted to either a new or old machine, the machines working hours will pass automatically to the new units and upgrade them when the machines ignition is switched on.

Note: This includes stock machines with over 1 hour recorded by the AMS system.

- 2 Only under extreme circumstances should either the ECU-1 or the EMS be transferred to a machine with lower working hours than the donor machine. The effect of this would be to automatically transfer the higher hours information to the recipient machine.

Note: This process is not reversible.

- 3 When either an ECU-1. or EMS is changed on a machine, the machine system must be set up again using the Set Up Service Tool. Without this action some options previously active would not function and the throttle system would not be calibrated.
- 4 To remove the EMS unit, carefully pull the unit away from the fascia panel. The unit is held in place by a retaining seal only and is a tight fit, do not attempt to lever the unit out as this could cause damage to the the E.MS and the fascia panel. Re-assembly is a reversal of this procedure.
- 5 To access the ECU-1,remove the seven panel screws from the panel behind the seat and remove panel.

- 6 To remove the ECU-1, remove the three Allen screws which fasten the computers to a frame. To remove the machine harnesses from the computers, undo the Allen screw integral to each connector. Re-assembly is a reversal of this procedure.

Note: On the ECU-1 the identification letters for the individual harness connectors and the fixed harness connections on the computer itself, are the cast letters (A,B,C) on the body of the computer.This is vital when identifying connectors and pins during fault diagnosis.

- 7 The Facia Switch Panel (FSP) is not affected by any changes of other components.

The system comprises of the following main electronic components.

- | | |
|----------|---|
| A | Electronic Control Unit -1 (ECU-1) |
| B | Electronic Monitoring System (EMS) |
| C | Fascia switch panel (FSP). |
| D | Engine Control Module (ECM)
JS160-220 Models only. |

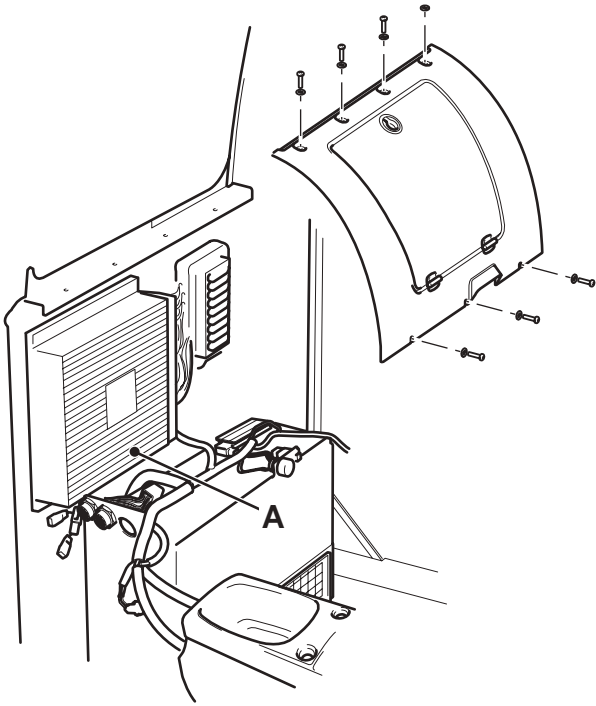


Fig 165.

C030670-C3

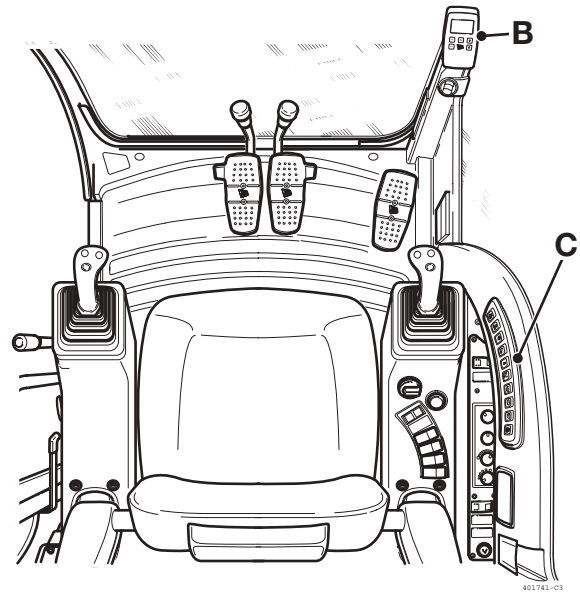


Fig 167.

401741-C4

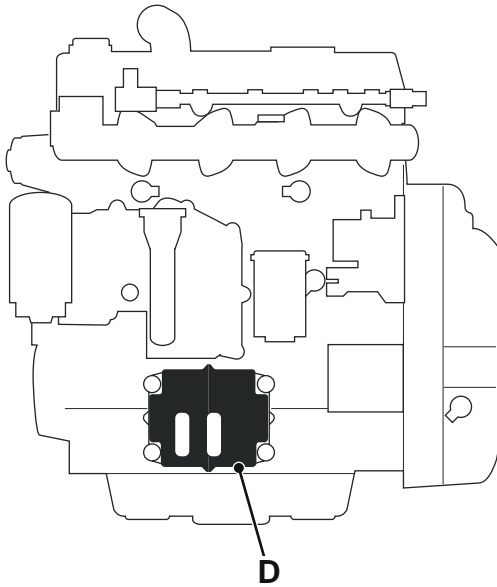


Fig 166. JS160-220

Fault Diagnosis (General)

Note: The method of testing the EMS, and ECU-1 input and output voltages is shown in Section C Service procedures.

Permanent Battery Supply (Ignition Off)

ECU-1 permanent battery supply can be measured at harness Connector B, Pin 6 (24 v+).

EMS permanent battery supply can be measured at the harness Connector, Pin 13 (24 v +).

Ignition On

E.CU-1 ignition supply can be measured at harness Connector B, Pin 5 (24 v +).

E.CU-1 output voltages can be measured at harness Connector B, Pins 1, 2, 7, 8, 13, 14, 19, 20.

EMS ignition supply can be measured at the harness Connector, Pin 16 (24 v +).

Ground Tests.

E.CU-1 grounds can be tested at harness Connector B, Pins 11,17, 23, and harness Connector C, Pins 9, 10.

E.MS grounds can be tested at the harness Connector, Pins 14, 17, 18.

Can - Bus Network Tests.

If all 3 travel mode symbols flash together, this would indicate a Can - Bus Network problem, use the Harness Tests and the Unit Tests to identify the faulty component.

Harness Tests.

Check for continuity between:

EMS harness Connector Pin 6 and ECU1. harness Connector B, Pin 21.

Check for continuity between EMS harness Connector Pin 7 and ECU1 harness Connector B, Pin 15.

Check the resistance between Pin 7 and Pin 8 at the -

Diagnostic Connector where the Data Link Adaptor Service Tool connects to the machine **B**. The value should be 60 ohms, + / - 5 ohms.

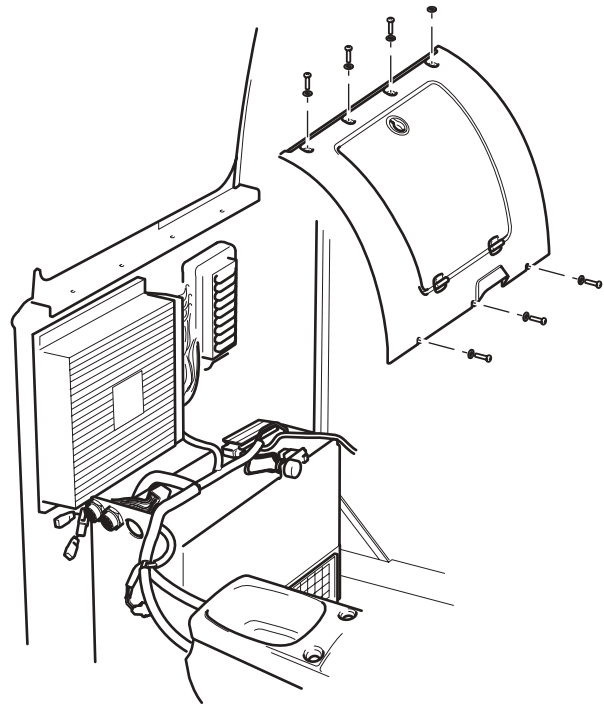


Fig 168.

Unit Tests.

Check the resistance between Pin 6 and Pin 7 on the EMS. unit, the reading should be 120 ohms + / - 10 ohms.

Check the resistance between Pin 15 and Pin 21 on the ECU-1 unit connector **B**, the reading should be 120 ohms + / - 0 ohms.

Fault Finding Without Using the JCB Servicemaster Diagnostic Tool

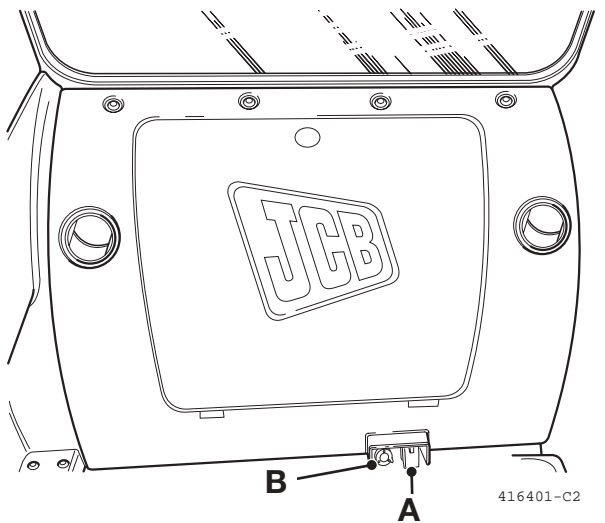


Fig 169.

Fault Diagnosis ECU-1

If the engine turns over but will not start, change to "Limp Mode" and if the machine starts the ECU-1 may have failed. This check assumes all other "Engine Failure To Start" checks have been completed.

If there is a failure of the ECU-1 unit, the machine can be moved by using the "LIMP MODE" Switch **A** located behind the seat.

Note: The machine will only run at engine idle r.p.m. and should only be operated in this mode to allow the machine to be moved to a safe position for repairs. The machine does not function in the same manner as earlier models fitted with a Redundancy Switch.

To test the ECU-1, several individual circuits can be used to identify ECU-1 failure. These are basic circuits which do not require the use of solenoids but are actuated by the use of a single switch.

- Horn circuit
- Wiper circuit
- Washer circuit
- Travel alarm circuit (American Machines Only)
- Work lights circuit

The individual circuit can then be checked by testing the ECU-1 input and output voltages. The method of testing

the input and output voltages is shown in, Section C Service Procedures.

ECU-1. stores the following data log Information:

- Hydraulic Overheating.
- Engine Overheating.
- No Throttle.
- Throttle Re-calibration.
- Air Filter Blocked.
- Low Air Pressure.
- Low Engine Oil Pressure.

If the ECU-1 is changed the data log Information stored in it will not be transferred to the new unit, therefore if possible the data log Information must be downloaded before the changes take place.

EMS Failure.

When the machine is started all 18 warning indicator lamps should "flash" for approximately 1 second and the elements within the monitors Liquid Crystal Display (LCD) should come on for the same time period.

If there is a failure of the EMS unit, the machine can be moved by using the "LIMP MODE" switch **A** located behind the seat.

Note: The machine will only run at engine idle r.p.m. and should only be operated in this mode to allow the machine to be moved to a safe position for repairs. The machine does not function in the same manner as earlier models fitted with a Redundancy Switch.

The EMS stores the following data log Information:

- Limp Mode Use.
- Alternator Low Charge Warning.
- Circuit Driver Errors (Open Circuits, Short Circuits, No Voltage.)

If the EMS is changed the data log Information stored in it will not be transferred to the new unit, therefore if possible the data log Information must be downloaded before the changes take place.

Fault Diagnosis - Facia Switch Panel (FSP)

When the ignition is switched ON check all of the switch buttons LED's function for 1 second.

If not, conduct tests using the **JCB Servicemaster Diagnostic Tool**. (Section C)

Confirm +24v ignition supply is on pin 1 of the FSP connector. Confirm earth on pin 2 of the FSP connector.

Carefully remove the facia switch panel **C** using a thin bladed screw driver to lever out the unit from the cab panel.

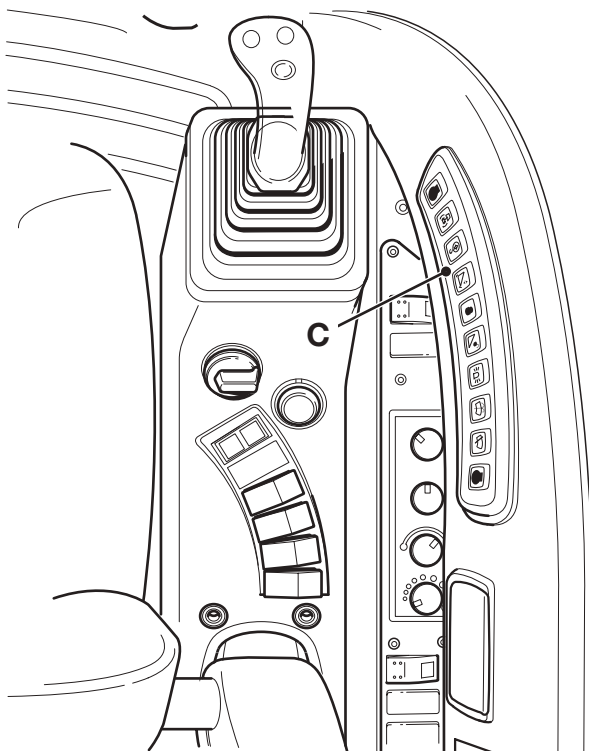


Fig 170.

C002050

Service Procedure

Testing of ECU Inputs + Outputs

TC-014_2

Remove panel behind drivers seat, for access to the ECU
A.

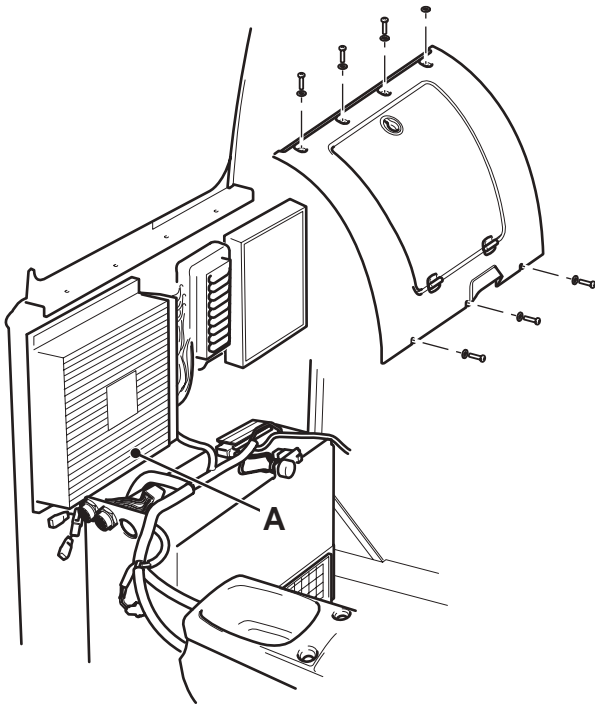


Fig 171.

C030670-C1

Care should be taken when testing the inputs + outputs of the ECU to ensure that correct test method is used to determine if the ECU is functioning normally.

Note: Inputs/outputs should be checked with engine running or in solenoid override mode, refer to **Section C, EMS Set+Mode (20 sec) Menu.**

Testing Low Side Input

With the switch open the meter will read 0v.

With the switch closed the meter will read 24-28v.

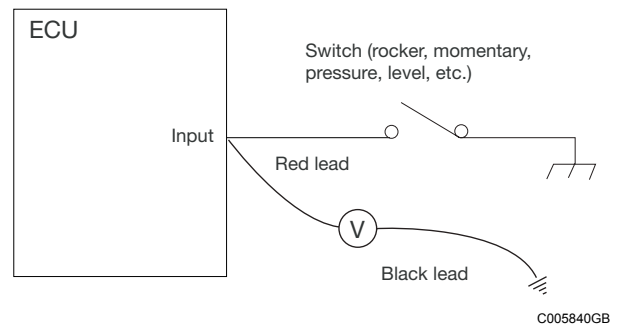


Fig 172.

Testing High Side Input

With the switch open the meter will read 0v.

With the switch closed the meter will read 24-28v.

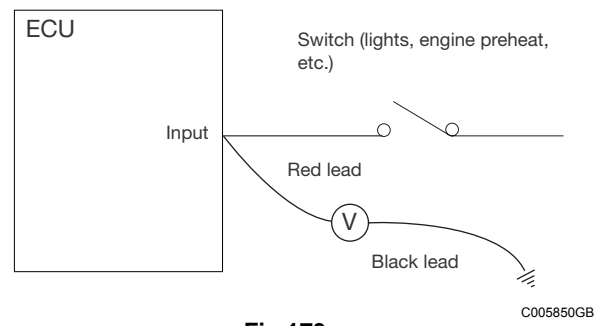


Fig 173.

Testing Low Side Output

With the output off the meter will read 0v.

With the output on the meter will read 24-28v.

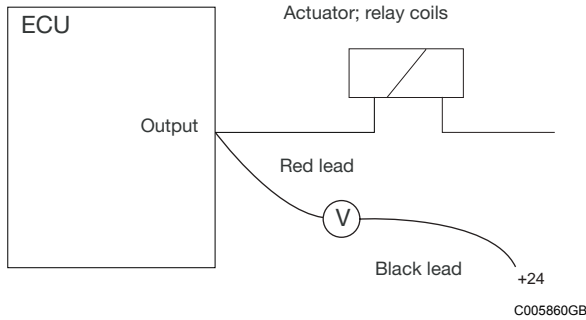


Fig 174.

Testing High Side Output

With the output off the meter will read 0v.

With the output on the meter will read 24-28v.

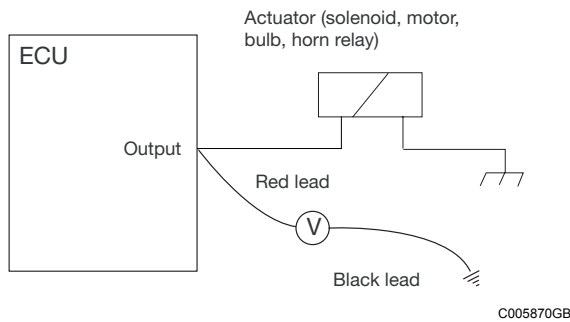


Fig 175.

The ECU is internally configured to give short circuit protection and detection of short circuit / open circuit, this is done by internal resistors. This internal configuration can give some confusing results when testing the outputs on the ECU.

Voltage at point A:

Solenoid connected output off = 0.1 V approx.

Solenoid connected output on = battery voltages nominal.

Solenoid disconnected output off = reduced voltage (15 V - 22 V).

Solenoid disconnected output on = battery voltage nominal.

Shorted to ground = 0 V.

Shorted high (to positive) = battery voltage.

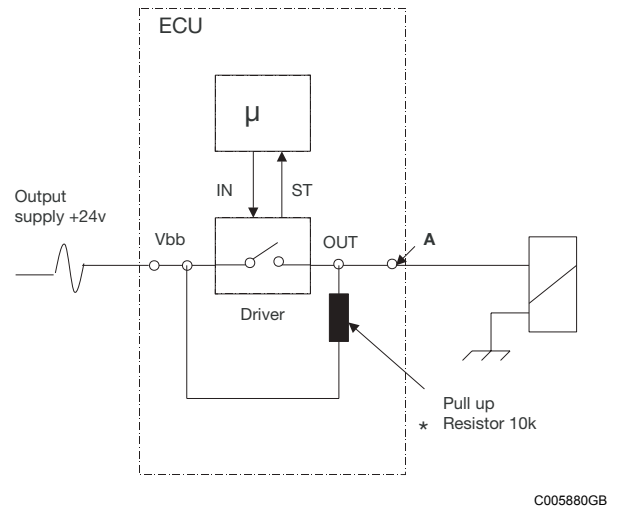


Fig 176.

Using a Multimeter

TC-002

In order to obtain maximum benefit from the fault finding information contained in Section C it is important that the technician fully understands the approach to fault finding and the use of the recommended test equipment, in this case a FLUKE 85 or AVO 2003 digital multimeter, or a moving pointer (analogue) multimeter. The approach is based on a fault finding check list. In tracing the fault from the symptoms displayed you will be directed to make measurements using a multimeter.

These instructions are intended to cover the use of the recommended multimeters.

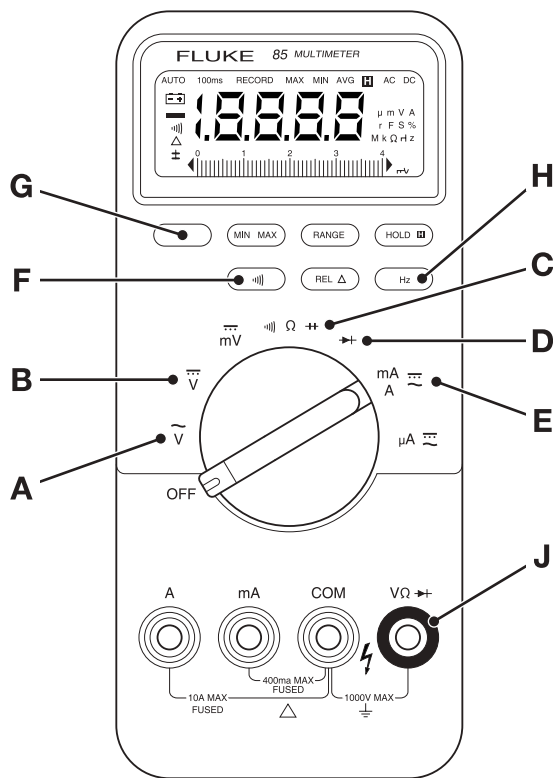


Fig 177. FLUKE 85

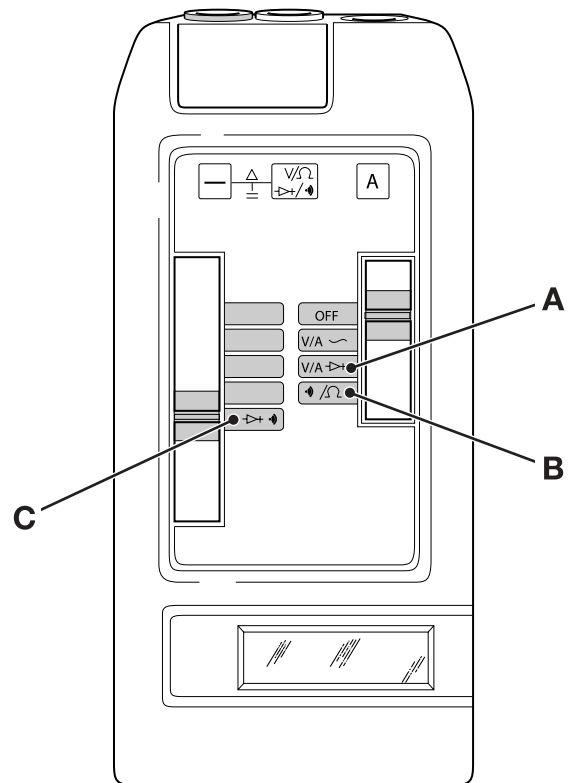


Fig 178. AVO 2003

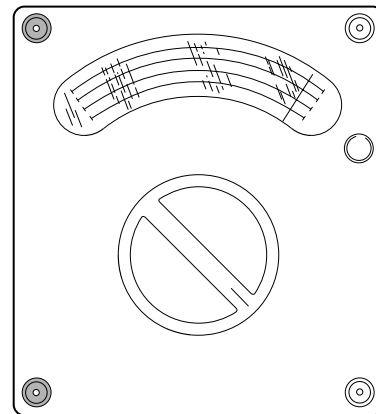


Fig 179. A Typical Analogue Meter

- 1 Make sure that the test leads are plugged into the correct sockets. The black test lead should be

plugged into the black socket (sometimes, this socket is also marked by a "-", or "E" or marked as "COMMON" or "COM"). The red test lead should be plugged into the red socket marked with "+", "V" or "Ω".

- 2 When making measurements ensure that the test probes have a good clean contact with bare metal, free from grease, dirt, and corrosion as these can cause a false reading.
- 3 When measuring voltage: Make sure that the correct range is selected, that is set the selector to a value equal to or greater than that you are about to measure. e.g. If asked to measure 12 Volts, set the selector to the 12V range. If there is no 12V range, set the selector to the next range higher, 20V for instance. If the meter is set to a range that is too low, it may be damaged. e.g. setting to the 2V range to measure 12V.

Measuring DC Voltage

- 1 Select the correct range on the multimeter.
 - a On the FLUKE 85.
Turn the switch to position **177-B**.
 - b On the AV0 2003.
Move the right slider switch to position **178-A**, and the left hand slider switch to the appropriate range.
 - c On an analogue meter.
Turn the dial to the appropriate DC Volts range.
- 2 Connect the black probe to the nearest available suitable earth point, usually this will be the starter motor earth, the battery negative, or the chassis. Connect the red probe to the wire or contact from which you are measuring the voltage.

Measuring Resistance

- 1 Make sure there is no power to the part of the circuit you are about to measure.
- 2 Connect one probe at one end of the component or wire to be checked and the other probe at the other end. It does not matter which way round the two probes are placed.
- 3 Select the correct range on the multimeter.
 - a On the FLUKE 85.
 - i Turn the switch to position **177-C** and check that the W sign at the right hand side of the display window is on. If the F sign is on instead, press the blue button **177-G** to change the reading to Ω. Touch the meter lead probes together and press the **REL³** key on the meter to eliminate the lead resistance from the meter reading.
 - b On the AV0 2003.
 - i Move the right hand slider switch to position **178-B**, and the left hand slider switch to the appropriate Ohms (Ω) range.
 - c On an analogue meter.
 - i Move the dial to the appropriate Ohms (Ω) range.

Measuring Continuity

- 1 Make sure there is no power to the part of the circuit you are checking for continuity.
- 2 Connect one probe to one end of the component or wire to be checked and the other probe to the other end. It does not matter which way round the two probes are placed.
- 3 Select the correct range on the multimeter.

a On the FLUKE 85.

Turn the switch to position **177-C** and check that the beeper symbol appears at the left hand side of the display window. If the F sign is on instead, press the button labelled **177-F** in the meter drawing.

If there is continuity in the circuit, the beeper will sound. If there is no continuity (open circuit), the beeper will not sound.

b On the AVO 2003.

Move the right hand slider switch to position **178-B**, and the left hand slider switch to position **178-C**.

If there is continuity (i.e. very low resistance) between two points the buzzer will sound.

c On an analogue meter.

Turn the dial to the lowest Ohms (Ω) range.

If there is continuity (i.e. very low resistance) between two points the needle will move across fully (or almost fully) to the right hand side of the scale.

Measuring Frequency

The AVO 2003 and the analogue meter are not capable of measuring frequency, therefore a Fluke 85 digital multimeter must be used.

- 1 Insert the black plug into the COM socket on the meter and attach the probe to the nearest suitable earth point on the chassis, for example, the battery negative terminal.
- 2 Insert the red probe into socket **177-J**.
- 3 Turn the selector switch to position **177-A** and depress **177-G** repeatedly until **177-F** is highlighted on the top row of the display.
- 4 Press button **177-H** once.
- 5 Touch or connect the red probe to the frequency source to be measured. Press and hold button if an average reading is required.

Testing a Diode or a Diode Wire

A diode wire is a diode with male connector fitted on one end and a female connector fitted on the other end. The diode is sealed in heatshrink sleeving.

1 To test a Diode or a Diode Wire

a On the FLUKE 85.

- i Turn the switch to position **177-D**.
- ii Press the **HOLD** button and check that the **H** sign appears at the top right hand side of the display window.
- iii Connect the black probe to the end of the diode with a band or to the male connector of the diode wire. Connect the red probe to the other end of the diode or diode wire. If the beeper does not sound the diode or diode wire is faulty.
- iv Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or diode wire. If the beeper sounds or the meter does not read **O.L.**, the diode or diode wire is faulty.
- v Press the **HOLD** button and check that the **H** sign disappears from the right hand side of the display window.

b On the AV0 2003.

- i Move the right hand slider to position **178-A**, and the left hand slider switch to position **178-C**.
- ii Connect the black probe to the end of the diode marked with a band, or to the male connector of the diode wire, the red probe should be connected to the other end of the diode or diode wire. If the Avometer does not buzz the diode is faulty.
- iii Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or

diode wire. If the Avometer does not read "1" the diode is faulty.

c On an analogue meter.

- i Select the Ohms 1000s (1k) range.

Connect the black probe to the end of the diode marked with a band, or to the male connector of the diode wire, the red probe should be connected to the other end of the diode or diode wire. The meter should read 20-400 k Ω , if it reads more than this the diode is faulty.

- ii Select the Ohms 100s range.

Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or diode wire. The meter should read 300-400 Ω , if it reads less than this the diode is faulty.

Battery

TC-001_5

Maintenance

To ensure that the battery provides optimum performance the following steps should be observed:

- 1 Make sure that the electrical connections are clean and tight. Smear petroleum jelly on connectors to prevent corrosion.
- 2 When applicable - never allow the electrolyte level to fall below the recommended level - 6 mm (1/4 in) above the plates. Use only distilled water for topping up.
- 3 Keep the battery at least three quarters charged, otherwise the plates may become sulphated (hardened) - this condition makes recharging the battery very difficult.

Extra precautions must be taken when bench charging maintenance free batteries, they are more prone to damage by overcharging than the standard type of battery:

- Never boost-charge a maintenance free battery (if fitted).
- Never charge a battery at a voltage in excess of 15.8 Volts.
- Never continue to charge a battery after it begins to gas.

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 to OFF before disconnecting and connecting the battery. When disconnecting the battery, take off the earth (-) 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.

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

5-3-4-12

Testing

This test is to determine the electrical condition of the battery and to give an indication of the remaining useful 'life'.

Before testing ensure that the battery is at least 75% charged (SG of 1.23 to 1.25 for ambient temperature up to 27°C).

Ensure that the battery is completely disconnected from the vehicle.

Connect up the battery tester as follows:

- 1 Set the CHECK/LOAD switch **180-A** to OFF.
- 2 Set rocker switch **180-B** to the battery voltage (12V).
- 3 Connect the red flying lead to the battery positive (+) terminal and the black flying lead to the battery negative (-) terminal.

- 4 Set the CHECK/LOAD switch **180-A** to CHECK to read the battery no-load voltage which should be at least 12.4 volts.
- 5 Set the CHECK/LOAD switch **180-A** to LOAD and hold down for 5-10 seconds until the meter reading stabilises. The reading should be at least 9 volts.

Note: Do not hold the switch in the LOAD position for more than 10 seconds.

- 6 → [Table 10. Fault Diagnosis \(C-172\)](#), if the foregoing tests are unsatisfactory.

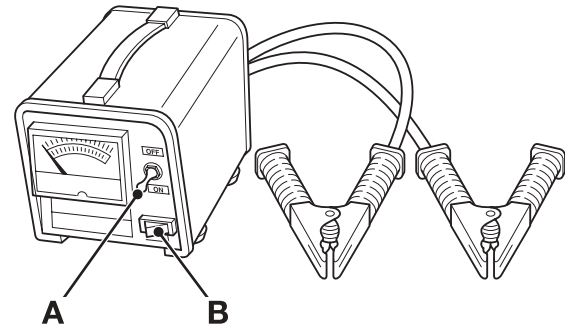


Fig 180. Battery Tester

Table 10. Fault Diagnosis

Battery Tester Readings	Remedy
1 CHECK: 0 - 12.6 Volts LOAD: less than 6 Volts	Renew battery
2 CHECK: 6 - 12.4 Volts LOAD: less than 9 Volts and falls steadily but remains in yellow zone.	Recharge and re-test. If tests still unsatisfactory renew battery.
3 CHECK: less than 10 Volts LOAD: less than 3 Volts	Indicates battery has been over-discharged and unlikely to recover. Renew battery.
4 CHECK: more than 11 Volts LOAD: 6 - 10 Volts steady	Charge battery which will probably recover.

Specific Gravity Testing

The specific gravity of the electrolyte gives an idea of the state of charge of the battery. Readings should be taken using a hydrometer, when the electrolyte temperature is 15°C (60°F). If the battery has recently been on charge, wait approximately one hour (or slightly discharge the battery) to dissipate the surface charge before testing.

Readings should be as tabulated and should not vary between cells by more than 0.04. A greater variation indicates an internal fault on that particular cell.

If the electrolyte temperature is other than 15°C (60°F) a 'correction factor' must be applied to the reading obtained. Add 0.07 per 10°C (18°F) if the temperature is higher than 15°C (60°F) and subtract the same if the temperature is lower.

Table 11. Specific Gravity at 15°C (60°F)

	Fully Charged	Half Discharged	Fully Discharged
Ambient temperature up to 27°C (80°F)	1.270 - 1.290	1.190 - 1.210	1.110 - 1.130
Ambient temperature above 27°C (80°F)	1.240 - 1.260	1.170 - 1.190	1.090 - 1.110

Wiring Harness Repair

TC-004

Introduction

Instances do occur where it is necessary to incorporate auxiliary electrical components into existing electrical circuits and, although unlikely with present wiring harnesses, repair or replace specific individual wires within a harness. This will also apply to other machines in addition to those of manufacture.

To ensure that either the inclusion of an auxiliary electrical component or a repair within a harness is completed to an acceptable standard it is strongly recommended that the following tools, equipment and procedures are always used. Note that JCB harnesses have an International Protection rating of 67 (I.P.67).

The sheath covering of the recommended splice is heat shrunk onto the original wire insulation. This results in a seal and corresponding joint to IP 67 specifications.

CAUTION

When installing Auxiliary Electrical Components always ensure that the additional load rating is suitable for that particular circuit. It is unacceptable to simply increase the fuse rating as this can cause overloading and consequential failure of wiring, along with failure of integral circuit components, which the fuse is protecting.

ELEC-2-1

WARNING

In addition to the warnings incorporated into this procedure, extreme care should be taken when handling the gas heating tool to ensure that the flame does not damage or set fire to any items in the vicinity of the repair, i.e. other wires, floor panels, floor mats, sound proofing, paintwork, etc. This tool should not be used in any restricted location prohibiting the use of "Naked Flames" or where risk of explosive gas or similar safety parameters apply. No other heat source should be used to attempt a sealed joint.

ELEC-2-2

CAUTION

When the heater is in use, the reflector and the air coming out are extremely hot. Keep away to avoid accidental burns. Do not touch the reflector until it has had time to cool down after switching off. If flame reappears at the reflector when the heater is in use, the catalytic element is damaged or used up. Stop work immediately and replace the heater.

ELEC-2-3

Repair Procedure

Table 12. Tools Required

Part No.	Description	Qty
892/00350	Butane Heater assembly	1
892/00349	Crimp tool	1
892/00351	Splice 0.5-1.5 mm (Red)	50
892/00352	Splice 1.5-2.5 mm (Blue)	50
892/00353	Splice 3.0-6.0 mm (Yellow)	50

- 1 Cut the wire and remove the protective insulation for a suitable distance dependent upon the size of wire and splice to be used. For the splices detailed in [⇒ Table 12. \(C-174\)](#), the dimension is 7mm.

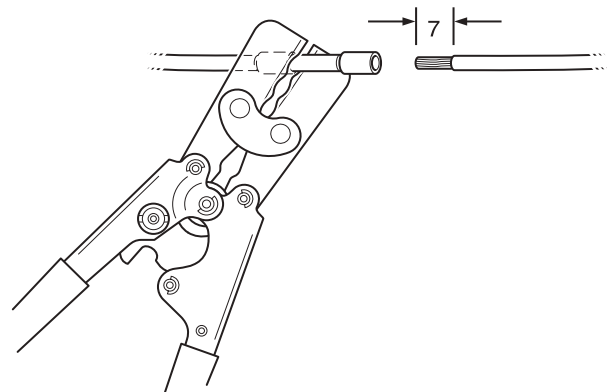


Fig 181.

- 2 Using the correct sized splice, attach the new section of wire required or auxiliary flying lead to the existing harness and secure using the crimp tool. [⇒ Fig 181. \(C-174\)](#). Note that each of the splices detailed is colour-coded to make size and range

readily visible. They are secured using the corresponding size and matching colour-coded jaws of the crimp tool to ensure joint security. This tool also incorporates a ratchet closing mechanism which will not release until the splice is fully closed to the correct compression size.

- 3 With the Butane heater assembly, seal the connection. ⇒ [Fig 182.](#) ([C-175](#)).
 - a Remove the cap **183-A** from the end of the disposable gas cartridge **183-B**.

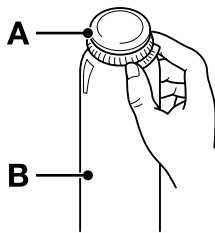


Fig 182.

- b Before assembling the gas cartridge to the reflector element **184-C**, turn the red ring **184-D** to the left, (in the direction of the minus sign marked on the ring).

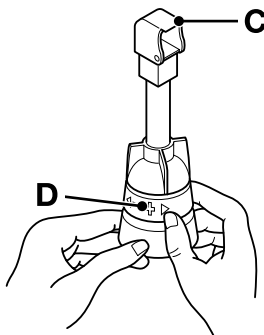


Fig 183.

- c Position the tube hanging down from inside the reflector assembly into the hole at the top of the gas cartridge. Then press the gas cartridge up into the reflector assembly as far as possible until the two elements are clamped firmly together. ⇒ [Fig 184.](#) ([C-175](#)). A click will be heard.

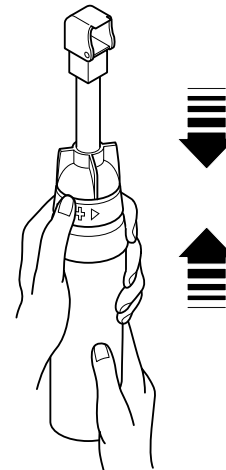


Fig 184.

- d Turn the small ring **185-E** so that the air holes at **185-F** are completely closed.

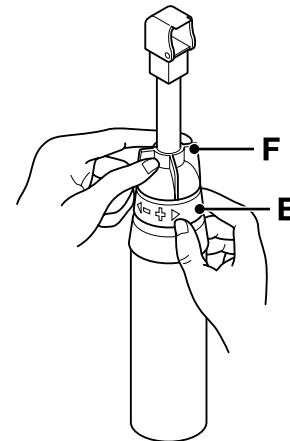


Fig 185.

- e Turn the red ring **186-D** to the right (in the direction of the plus sign) in order to turn on the gas.

Important: Before turning the heater on, make sure that the cartridge is not hotter than the reflector element. This may occur if the cartridge is held in the hand for a long time. The temperature difference between the cartridge and the reflector element may cause long yellow flames to appear on ignition.

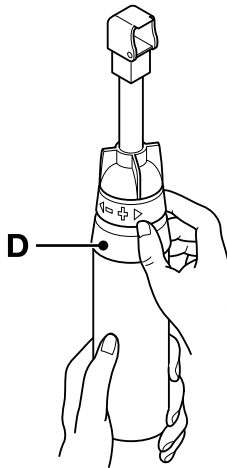


Fig 186.

- f Hold the heater vertically and, using a match or cigarette lighter, light the gas as shown.

Hold the heater vertically for 1 to 2 minutes until the catalytic reaction occurs. This is indicated when the blue flame fades and the ceramic element glows red. Then turn the small ring **187-E** until the air holes at **187-F** are completely open. The tool is ready for use.

Note: The fact that the sound of liquid cannot be heard when the cartridge is shaken does not mean it is empty. No sound will be heard even when the cartridge is full.

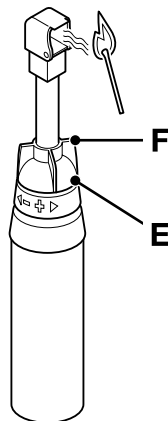


Fig 187.

- g The heater can be used in two modes:

- i Side wings **188-G** down, reflector head completely open. In this mode the infra-red heat waves are dominant (recommended for the light coloured plastic splices).



Fig 188.

- ii Side wings **189-G** up, reflector head opening reduced. In this mode the heating is done only by the hot gas (use for dark coloured plastic splices).

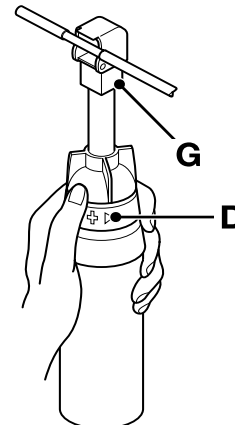


Fig 189.

- h To switch off the heater, turn the red ring **189-D** to the left (in the direction of the minus sign).

Harness Data

Harness Interconnection

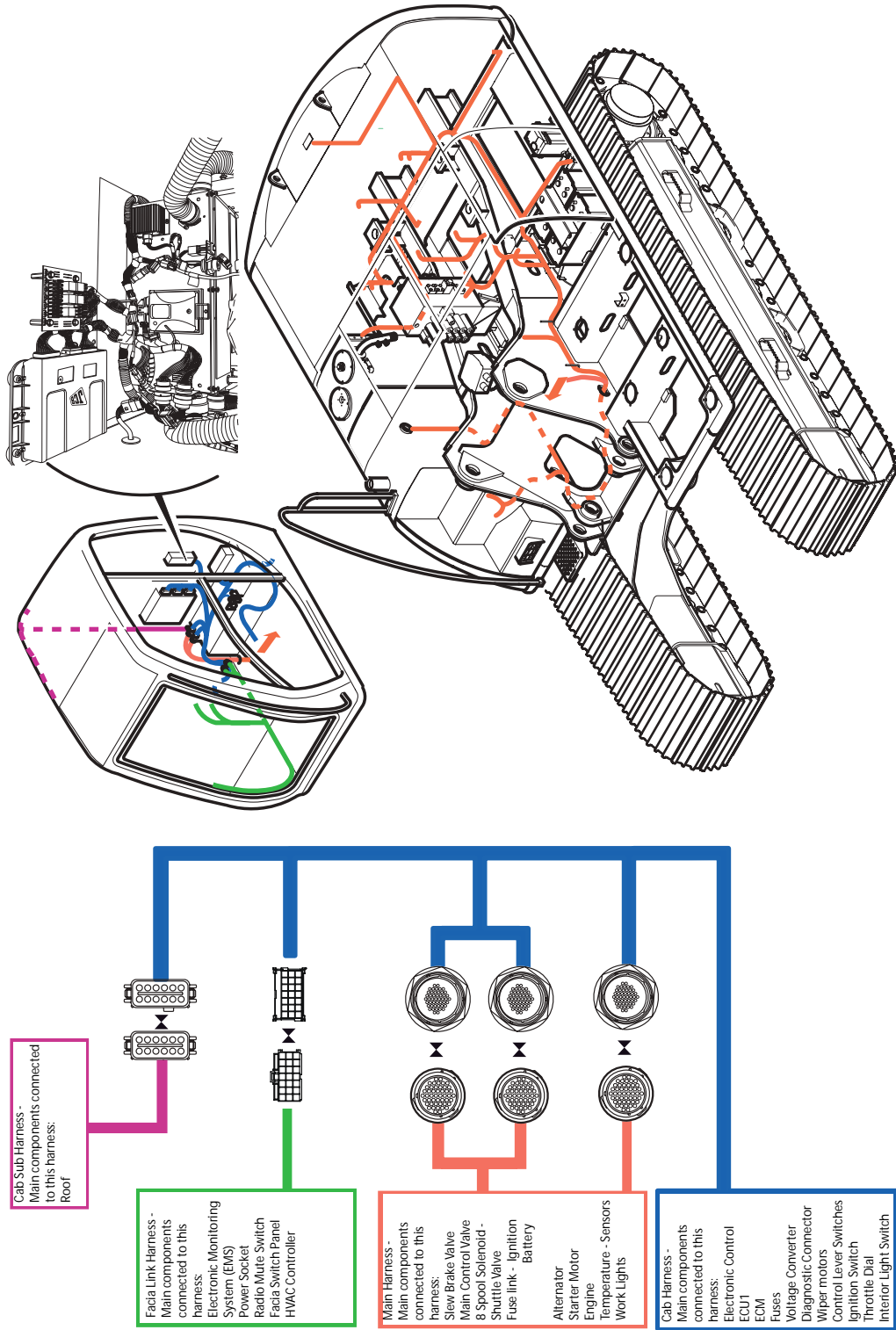


Fig 190. Harness Location and Interconnection

Main Harness JS115-145

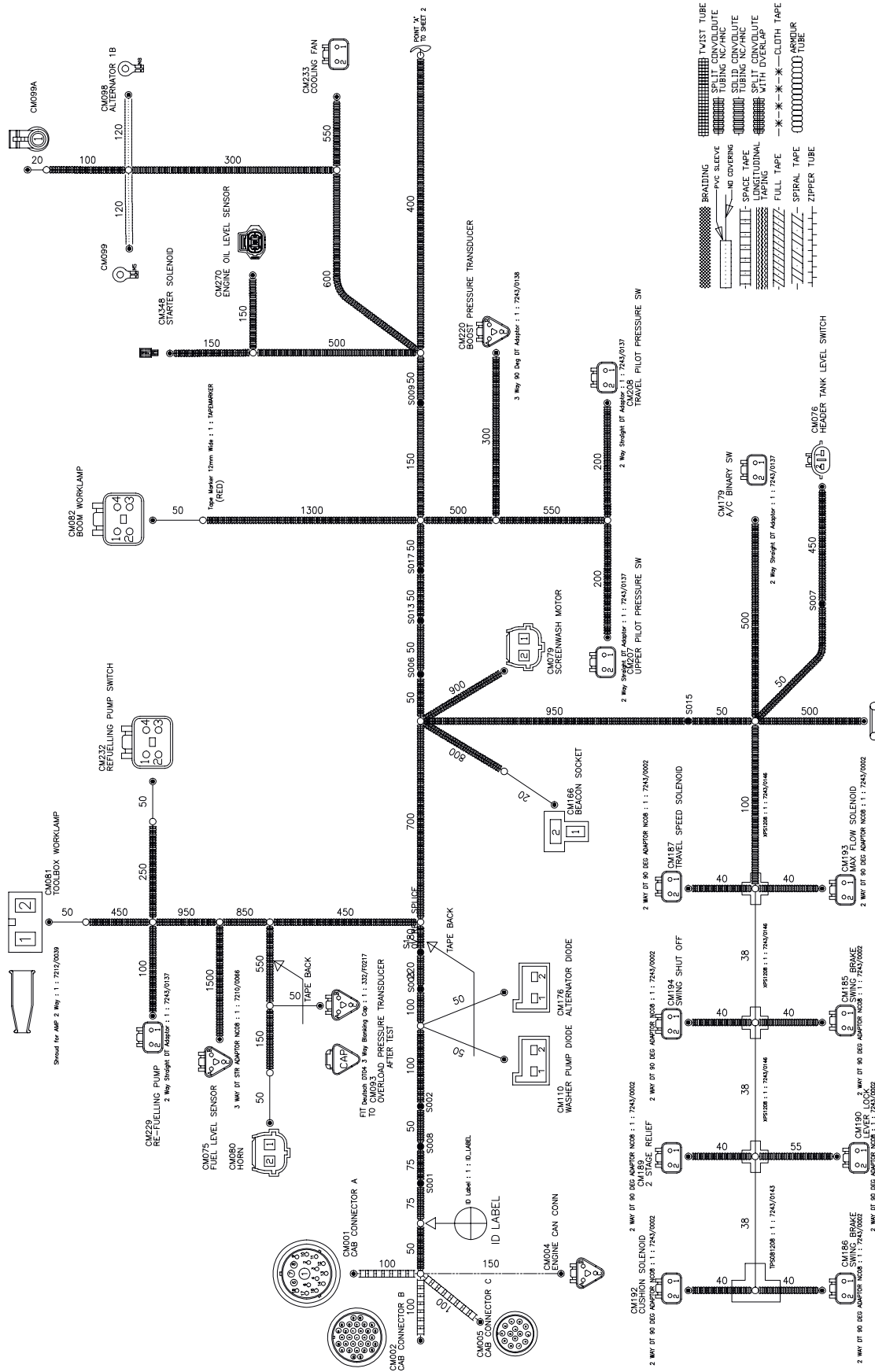


Fig 191. 333/J7614 issue 1



Section C - Electrics Harness Data

Main Harness JS115-145

14 Way HDP Bulkhead Socket Housing (Plug) Size 18 Rev : 1 : 332/S2212

CM005
CAB

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST	
A	450	1.0	CM003-B	1	7210.0	CM030
B	855	1.0	CM003-C	1	7210.0	CM030
C	450	0.5	CM003-D	1	7210.0	CM030
D	103	1.0	CM003-E	1	7210.0	CM030
E	450	0.5	CM003-F	1	7210.0	CM030
F	450	0.5	CM003-G	1	7210.0	CM030
G	450	0.5	CM006-B	1	7210.0	CM030

CM007
ZAV LIFT PUMP

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST	
1	855	3.0	CM002-311	2	615.0	CM116-7

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Weepe : 1 : 7217/0051

CM008
REL LIFT PUMP

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	3015	0.5	CM001-8	2	3010	1.0	CM232-3

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM009
ALTERNATOR EXCITE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	545	0.5	CM176-1	3	545	0.5	CM002-5
2	545	0.5	CM108-1	4	545	1.0	CM270-2

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM010
SCREEN MOTOR

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	826	0.5	CM002-2	3	826	1.0	CM079-1
2	826	0.5	CM110-2				

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM011
108 IGNITION SPRIE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	108	2.0	CM002-2	5	108	0.5	CM093-A
2	108	0.5	CM081-2	6	108	0.5	CM075-A
3	108	1.0	CM082-1	7	108	0.5	CM028-2
4	108	0.5	CM220-A	8	108	1.0	CM006-A

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM012
EARTH SPRIE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	602	0.5	CM186-2	3	602	2.0	CM116-4
2	602	0.5	CM077-2	4	602	0.0	CM076-2

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM013
EARTH SPRIE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	606	2.0	CM116-9	7	606	0.5	CM279-2
2	606	0.5	CM093-B	8	606	0.5	CM208-1
3	606	1.0	CM080-1	9	606	0.5	CM008-C
4	606	1.0	CM079-2	10	606	0.5	CM082-4
5	606	1.0	CM166-2	11			
6	606	0.5	CM110-1				

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM014
EARTH SPRIE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	604	0.5	CM187-2	5	604	1.0	CM192-2
2	604	0.5	CM189-2	6	604	0.75	CM066-1
3	604	0.5	CM193-2	7	604	1.0	CM116-6
4	604	1.0	CM194-2	8	604	1.0	CM157-2

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM015
EARTH SPRIE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	600	3.0	CM001-7	4	600	0.5	CM220-B
2	600	2.0	CM116-1	5	600	0.5	CM233-2
3	600	2.0	CM116-8	6	600	4.0	CM16A-1

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM016
ALTERNATOR SIGNAL SPRIE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	408	0.5	CM002-13	3	408	0.5	CM107-1
2	408	1.0	CM099-1				

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM017
IGNITION SPRIE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	107	0.5	CM091-2	3	107	0.5	CM333-B
2	107	0.5	CM098-1	4	107	0.5	CM001-1

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM018
5V SPRIE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	47	1.0	CM002-20	3	47	0.5	CM163-1
2	47	1.0	CM185-1				

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM019
HPO OIL TEMP SPRIE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	409	0.5	CM185-2	3	409	0.5	CM163-2
2	409	0.5	CM002-8	4	409	0.5	CM003-F

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM020
LOCK/ISOLATE SPRIE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	825	0.5	CM001-12	3	825	0.5	CM190-1
2	825	0.5	CM185-1				

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM021
OV REF SPRIE

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
1	47	0.5	CM001-19	3	47	1.0	CM003-H
2	47	1.0	CM075-B	4			

In Line Ultrasonic Splice : 4.5 : 7060/3212
Adhesive Lined Heatshrink : 4.5 : 7060/3212

CM003
CONN

CELL TAG	CSA	DEST	RELI TAG	CSA	DEST		
A	433	0.5	CM002-8	11	417	1.0	CM1-3
B	450	1.0	CM005-A	1	453	0.5	CM005-E
C	103	1.0	CM005-B	1	7210.0	CM030	
D	612	2.0	CM176-2	1	612	1.0	CM004-C
E	454	0.5	CM002-9	1	454	0.5	CM004-B
F	409	0.5	CM002-4	1	409	1.0	CM004-A
G	1855	1.0	CM005-B	1	1455	0.5	CM005-F

14 Way HDP Bulkhead Socket Housing (Plug) Size 18 Rev : 1 : 332/S2204
Size 18 Lockwasher : 1 : 7210/0120

14 Way HDP Bulkhead Socket Housing (Plug) Size 18 Rev : 1 : 332/S2204
Size 18 Lockwasher : 1 : 7210/0120

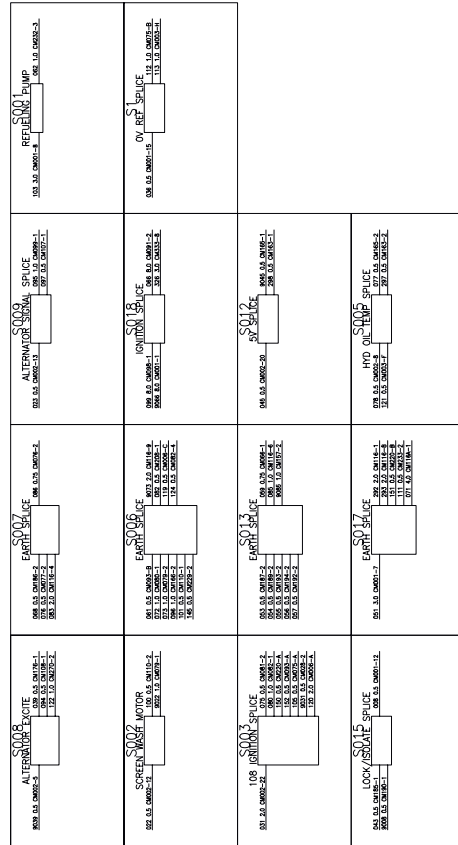
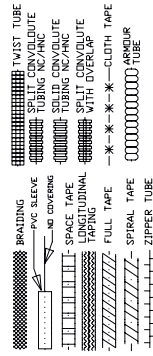


Fig 194. 333/J7614 issue 1

Main Harness JS160-JS180

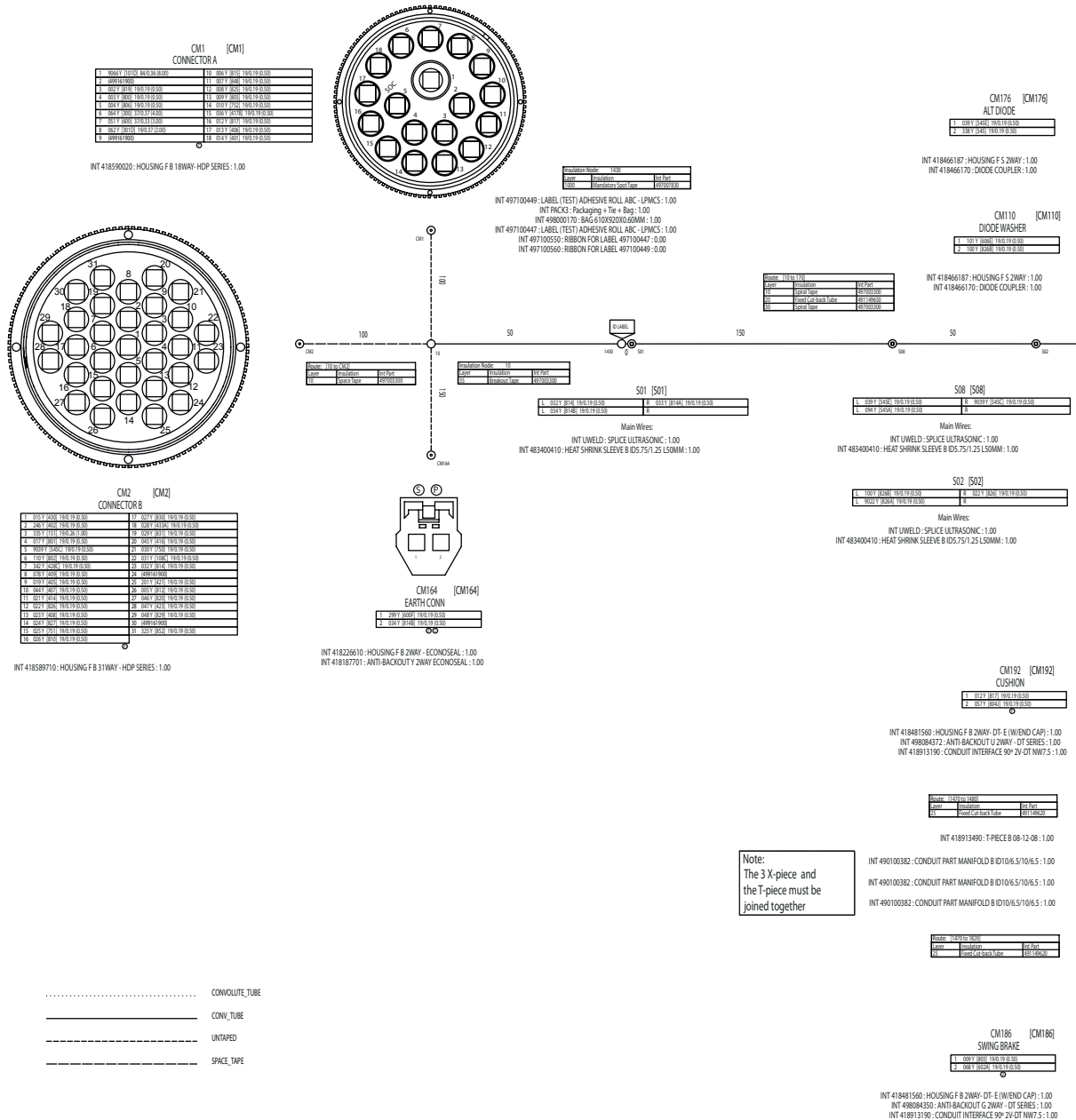


Fig 196. Main Harness A JS160/JS180 332/K6040 - Issue 3

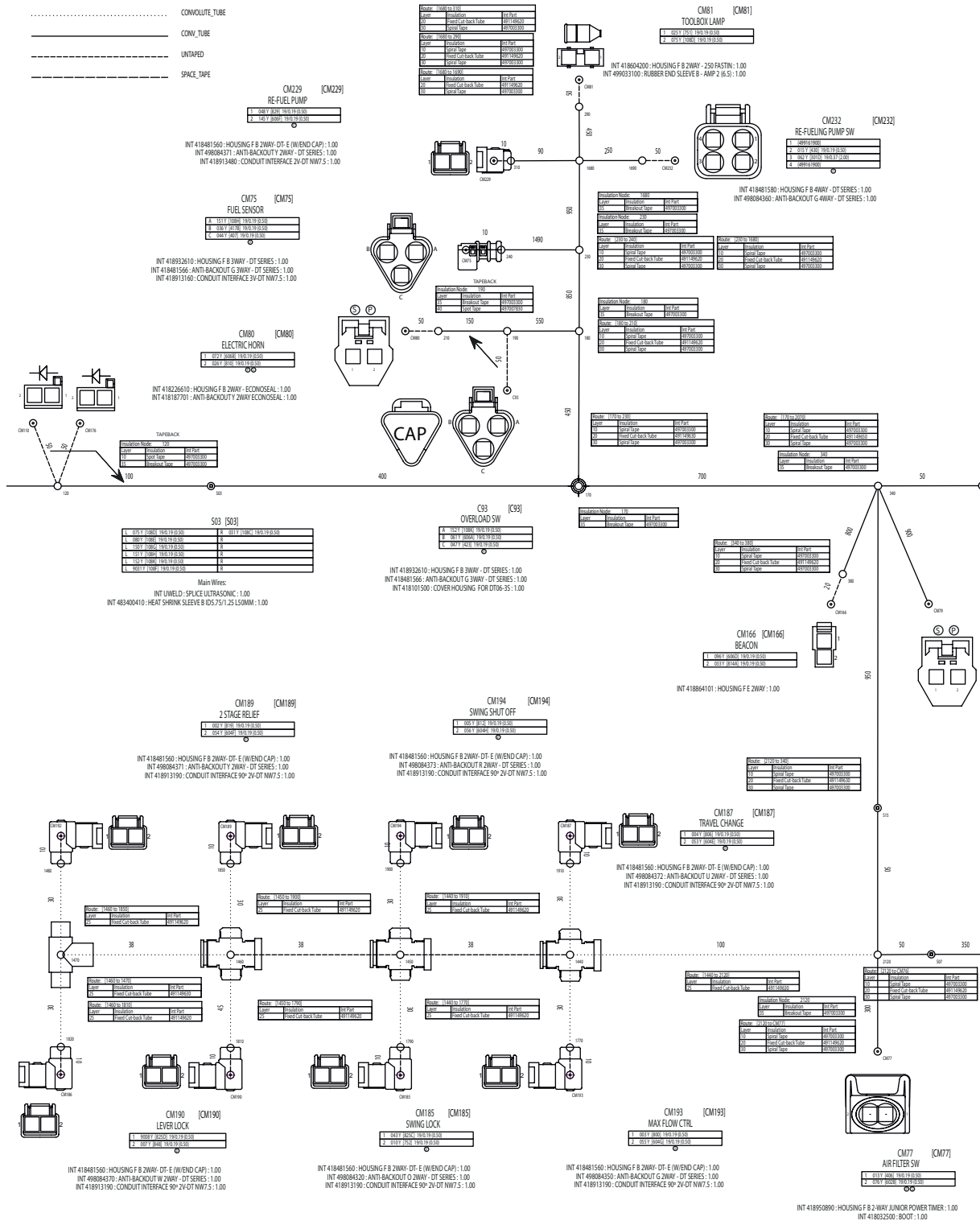


Fig 197. Main Harness B JS160/JS180 332/K6040 - Issue 3

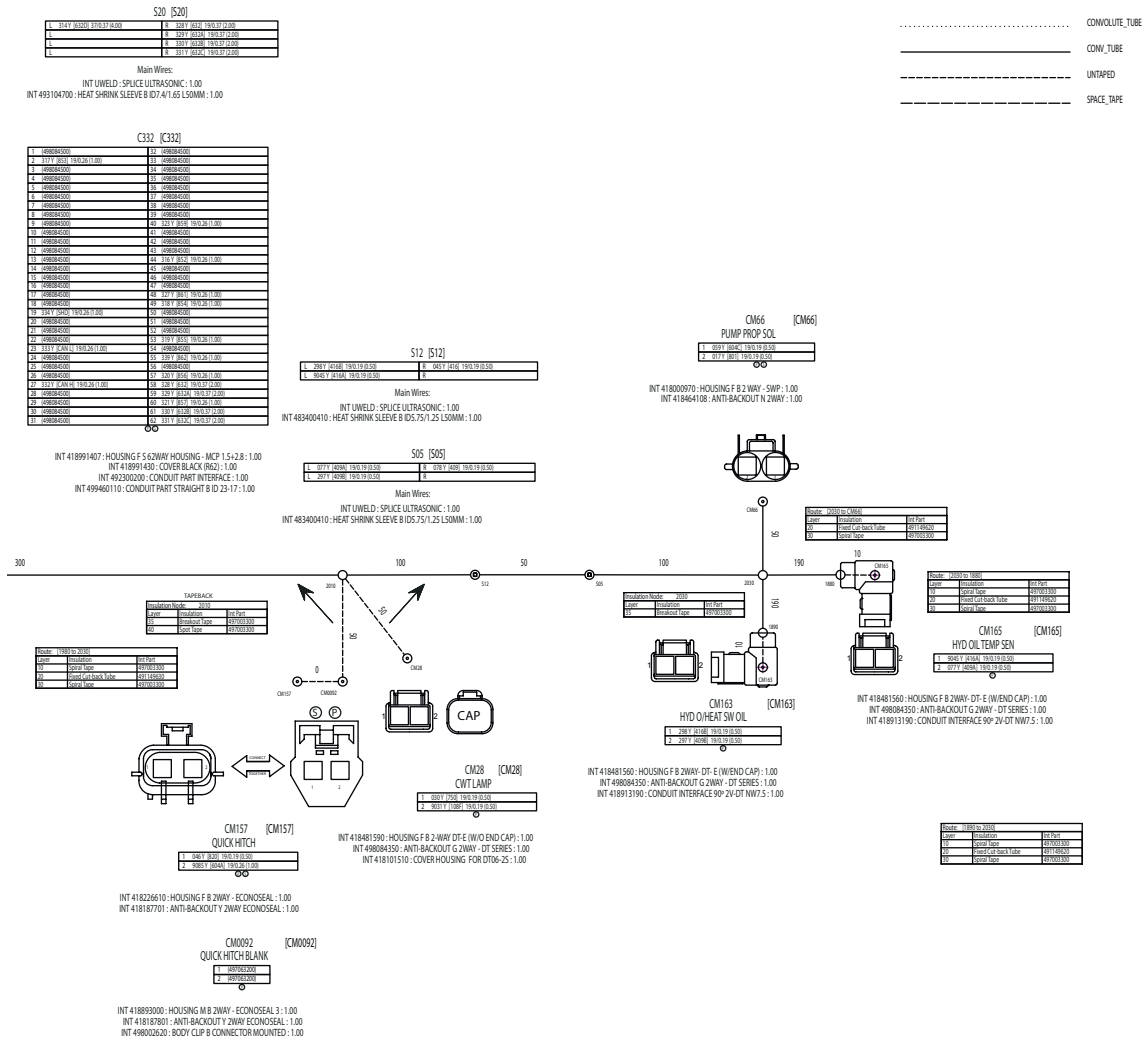


Fig 200. Main Harness E JS160/JS180 332/K6040 - Issue 3



Section C - Electrics Harness Data

Main Harness JS160-JS180

Part No.	INT Part	Qty Name	Color	Type	Length	From	Pin 1	Loc 2	to	Pin 2	INT Term 1	CUST Term 1	INT Seal	INT Term 2	CUST Term 2	INT Seal 2	
002	76.532Z011	819	Y	19/0.19 (0.50)	2925	GMT CONNECTOR A	3	2 / H	CM189 2 STAGE RELIEF	1	10 / D	414186600	7201/0105	-	-	414186600	7201/0105
003	76.532Z011	800	Y	19/0.19 (0.50)	2850	GMT CONNECTOR A	4	2 / B	CM183 MAX FLOW CTRL	1	13 / B	414186600	7201/0105	-	-	414186600	7201/0105
004	76.532Z011	806	Y	19/0.19 (0.50)	2850	GMT CONNECTOR A	5	2 / F	CM187 TRAVEL CHANGE	1	13 / D	414186600	7201/0105	-	-	414186600	7201/0105
005	76.532Z011	807	Y	19/0.19 (0.50)	2840	GMT CONNECTOR A	6	2 / B	CM184 SWING LOCK	1	13 / G	414186600	7201/0105	-	-	414186600	7201/0105
006	76.532Z011	815	Y	19/0.19 (0.50)	4685	GMT CONNECTOR A	2	26 / D	CM184 TRAVEL ALARM	2	26 / D	414186600	7201/0105	-	-	414186600	7201/0105
007	76.532Z011	848	Y	19/0.19 (0.50)	2940	GMT CONNECTOR A	11	3 / H	CM190 LEVER LOCK	2	9 / B	414186600	7201/0105	-	-	414186600	7201/0105
008	76.532Z011	825	Y	19/0.19 (0.50)	2945	GMT CONNECTOR A	12	3 / H	CM185 SWING LOCK	2	15 / D	414186600	7201/0105	-	-	414186600	7201/0105
009	76.532Z011	803	Y	19/0.19 (0.50)	2985	GMT CONNECTOR A	13	3 / H	CM185 SWING BRAKE	1	18 / B	414186600	7201/0105	-	-	414186600	7201/0105
010	76.532Z011	752	Y	19/0.19 (0.50)	2690	GMT CONNECTOR A	14	3 / H	CM185 SWING LOCK	2	11 / B	414186600	7201/0105	-	-	414186600	7201/0105
011	76.532Z011	817	Y	19/0.19 (0.50)	2985	GMT CONNECTOR A	16	3 / H	CM197 CUSHION	1	17 / B	414186600	7201/0105	-	-	414186600	7201/0105
012	76.532Z011	406	Y	19/0.19 (0.50)	3010	GMT CONNECTOR A	17	3 / G	CM197 AR FILTER SW	1	15 / B	414186600	7201/0105	-	-	414186600	7201/0105
014	76.532Z011	401	Y	19/0.19 (0.50)	3110	GMT CONNECTOR A	18	3 / G	CM197 RESERVE TANK SW	1	15 / C	414186600	7201/0105	-	-	414186600	7201/0105
015	76.532Z011	430	Y	19/0.19 (0.50)	3560	GMT CONNECTOR B	1	2 / E	CM232 RE-FUELING PUMP SW	2	14 / H	414186600	7201/0105	-	-	414186600	7201/0105
017	76.532Z011	801	Y	19/0.19 (0.50)	4795	GMT CONNECTOR B	4	2 / E	CM232 RE-FUELING PUMP SW	2	33 / G	414186600	7201/0105	-	-	414186600	7201/0105
019	76.532Z011	405	Y	19/0.19 (0.50)	3340	GMT CONNECTOR B	9	2 / E	CM232 RE-FUELING PUMP SW	2	17 / C	414186600	7201/0105	-	-	414186600	7201/0105
021	76.532Z011	414	Y	19/0.19 (0.50)	3390	GMT CONNECTOR B	11	2 / E	CM232 RE-FUELING PUMP SW	2	17 / C	414186600	7201/0105	-	-	414186600	7201/0105
022	76.532Z011	826	Y	19/0.19 (0.50)	395	GMT CONNECTOR B	11	2 / E	CM232 RE-FUELING PUMP SW	2	17 / C	414186600	7201/0105	-	-	414186600	7201/0105
023	76.532Z011	408	Y	19/0.19 (0.50)	3045	GMT CONNECTOR B	13	2 / D	CM232 RE-FUELING PUMP SW	2	17 / C	414186600	7201/0105	-	-	414186600	7201/0105
024	76.532Z011	827	Y	19/0.19 (0.50)	3340	GMT CONNECTOR B	14	2 / D	CM232 RE-FUELING PUMP SW	2	17 / C	414186600	7201/0105	-	-	414186600	7201/0105
025	76.532Z011	831	Y	19/0.19 (0.50)	3340	GMT CONNECTOR B	15	2 / D	CM232 RE-FUELING PUMP SW	2	17 / C	414186600	7201/0105	-	-	414186600	7201/0105
026	76.532Z011	810	Y	19/0.19 (0.50)	2210	GMT CONNECTOR B	16	2 / D	CM232 RE-FUELING PUMP SW	2	17 / C	414186600	7201/0105	-	-	414186600	7201/0105
027	76.532Z011	830	Y	19/0.19 (0.50)	4905	GMT CONNECTOR B	17	2 / E	CM19 A/C BINARY SW	1	20 / F	414186600	7201/0105	-	-	414186600	7201/0105
028	76.532Z011	434	Y	19/0.19 (0.50)	3915	GMT CONNECTOR B	18	2 / E	CM19 A/C BINARY SW	1	20 / F	414186600	7201/0105	-	-	414186600	7201/0105
029	76.532Z011	833	Y	19/0.19 (0.50)	4905	GMT CONNECTOR B	19	2 / E	CM19 A/C BINARY SW	1	20 / F	414186600	7201/0105	-	-	414186600	7201/0105
030	76.532Z011	750	Y	19/0.19 (0.50)	4545	GMT CONNECTOR B	21	2 / E	CM28 ONT LAMP	1	31 / F	414186600	7201/0105	-	-	414186600	7201/0105
031	76.532Z011	1086	Y	19/0.19 (0.50)	5985	GMT CONNECTOR B	22	2 / E	CM28 ONT LAMP	1	31 / F	414186600	7201/0105	-	-	414186600	7201/0105
032	76.532Z011	814	Y	19/0.19 (0.50)	185	GMT CONNECTOR B	23	2 / D	CM28 ONT LAMP	1	31 / F	414186600	7201/0105	-	-	414186600	7201/0105
033	76.532Z011	814A	Y	19/0.19 (0.50)	185	GMT CONNECTOR B	23	2 / D	CM28 ONT LAMP	1	31 / F	414186600	7201/0105	-	-	414186600	7201/0105
034	76.532Z011	814B	Y	19/0.19 (0.50)	225	GMT EARTH CONN	2	4 / D	S01	1	5 / F	414359300	7201/0150	492091006	-	-	-
036	76.532Z011	417B	Y	19/0.19 (0.50)	3810	GMT CONNECTOR A	15	3 / H	CM15 FUEL SENSOR	1	10 / H	414186600	7201/0105	-	-	414186600	7201/0105
039	76.532Z011	540E	Y	19/0.19 (0.50)	230	CM15 ALT DIODE	1	7 / C	S08	1	7 / F	414114800	-	-	-	-	-
043	76.532Z011	804E	Y	19/0.19 (0.50)	1980	CM15 ALT DIODE	1	7 / C	S08	1	7 / F	414114800	-	-	-	-	-
044	76.532Z011	407	Y	19/0.19 (0.50)	3810	GMT CONNECTOR B	10	2 / E	CM15 FUEL SENSOR	1	10 / H	414186600	7201/0105	-	-	414186600	7201/0105
045	76.532Z011	416	Y	19/0.19 (0.50)	4580	GMT CONNECTOR B	20	2 / E	CM15 FUEL SENSOR	1	31 / G	414186600	7201/0105	-	-	414186600	7201/0105
046	76.532Z011	820	Y	19/0.19 (0.50)	4545	GMT CONNECTOR B	27	2 / E	CM157 QUICK HIGH	1	30 / E	414186600	7201/0105	-	-	414186600	7201/0105
047	76.532Z011	823	Y	19/0.19 (0.50)	1980	GMT CONNECTOR B	28	2 / D	CM157 QUICK HIGH	1	30 / E	414186600	7201/0105	-	-	414186600	7201/0105
048	76.532Z011	829	Y	19/0.19 (0.50)	1380	GMT CONNECTOR B	29	2 / D	CM157 QUICK HIGH	1	30 / E	414186600	7201/0105	-	-	414186600	7201/0105
051	49926201	800	Y	37/0.33 (1.00)	1845	GMT CONNECTOR A	7	2 / H	CM17	1	16 / G	414186726	7201/0104	-	-	-	-
053	76.532Z011	804E	Y	19/0.19 (0.50)	1290	S15	1	15 / H	CM187 TRAVEL CHANGE	2	13 / D	-	-	-	-	414186600	7201/0105
054	76.532Z011	804E	Y	19/0.19 (0.50)	1340	S15	1	15 / H	CM189 2 STAGE RELIEF	2	13 / D	-	-	-	-	414186600	7201/0105
055	76.532Z011	804E	Y	19/0.19 (0.50)	1290	S15	1	15 / H	CM183 MAX FLOW CTRL	2	13 / B	-	-	-	-	414186600	7201/0105
056	76.532Z011	804A	Y	19/0.19 (0.50)	1315	S15	1	15 / G	CM184 SWING SHUT OFF	2	11 / D	-	-	-	-	414186600	7201/0105
057	76.532Z011	804A	Y	19/0.19 (0.50)	1395	S15	1	15 / G	CM184 SWING SHUT OFF	2	11 / D	-	-	-	-	414186600	7201/0105
058	76.532Z011	804A	Y	19/0.19 (0.50)	1395	S15	1	15 / G	CM184 SWING SHUT OFF	2	11 / D	-	-	-	-	414186600	7201/0105
061	76.532Z011	808A	Y	19/0.19 (0.50)	1840	CM15 OVERLOAD SW	8	11 / F	S06	1	15 / H	414186600	7201/0105	-	-	414186600	7201/0105
062	49926201	3010	Y	37/0.33 (1.00)	3560	GMT CONNECTOR A	8	2 / G	CM232 RE-FUELING PUMP SW	3	14 / H	414186726	7201/0104	-	-	414186600	7201/0105
063	76.5311	811	Y	37/0.33 (1.00)	330	CM18 FUSELIGN BATT SW	3	2 / C	CM185 BATT RELAY	1	19 / C	414333300	7201/0079	-	-	414186600	7201/0105
064	76.5311	812	Y	37/0.33 (1.00)	4140	CM18 FUSELIGN BATT SW	4	2 / C	CM185 BATT RELAY	1	19 / C	414333300	7201/0079	-	-	414186600	7201/0105
065	76.5311	801	Y	84/0.36 (8.00)	370	CM18 FUSELIGN IGN SW	1	25 / B	CM18A IGN	1	25 / C	414333300	7201/0078	-	-	414186600	7201/0105
066	76.5311	811A	Y	84/0.36 (8.00)	1680	CM18 FUSELIGN IGN SW	2	25 / B	CM18A IGN	1	25 / C	414333300	7201/0078	-	-	414186600	7201/0105
067	76.532Z011	802A	Y	19/0.19 (0.50)	340	CM185 SWING BRAKE	2	8 / E	S07	1	15 / D	414186600	7201/0105	-	-	414186600	7201/0105
068	49926201	804E	Y	37/0.33 (1.00)	1340	CM185 SWING BRAKE	2	8 / E	S07	1	15 / D	414186600	7201/0105	-	-	414186600	7201/0105
072	76.532Z011	808B	Y	19/0.19 (0.50)	1985	CM18 ELECTRIC HORN	1	18 / G	S07	1	15 / D	414186600	7201/0105	-	-	414186600	7201/0105
073	76.532Z011	808C	Y	19/0.19 (0.50)	1985	CM18 ELECTRIC HORN	1	18 / G	S07	1	15 / D	414186600	7201/0105	-	-	414186600	7201/0105
075	76.532Z011	1086	Y	19/0.19 (0.50)	3185	S03	2	9 / F	CM17 DOORBOO LAMP	2	13 / J	-	-	-	-	414186600	7201/0105
076	76.532Z011	804E	Y	19/0.19 (0.50)	1980	CM17 DOORBOO LAMP	2	9 / F	CM17 DOORBOO LAMP	2	13 / J	-	-	-	-	414186600	7201/0105
077	76.532Z011	409A	Y	19/0.19 (0.50)	335	S05	1	30 / C	CM185 HYD OIL TEMP SEN	2	34 / F	-	-	-	-	414186600	7201/0105
078	76.532Z011	409	Y	19/0.19 (0.50)	4630	GMT CONNECTOR B	8	2 / E	S05	1	31 / G	414186600	7201/0105	-	-	414186600	7201/0105
079	76.532Z011	1086	Y	19/0.19 (0.50)	2685	S03	2	9 / F	CM17 DOORBOO LAMP	1	18 / H	-	-	-	-	414186600	7201/0105
081	76.532Z011	803	Y	19/0.19 (0.50)	1380	CM15 EARTH HEADER	5	24 / F	CM157 QUICK HIGH	1	30 / E	414186726	7201/0104	-	-	414186600	7201/0105
082	76.532Z011	808C	Y	19/0.19 (0.50)	1640	S06	1	16 / H	CM185 PILOT PR-SW TRAVEL	1	17 / D	-	-	-	-	414186600	7201/0105
083	49926201	802	Y	19/0.26 (1.00)	3160	S07	1	15 / D	CM116 EARTH HEADER	4	24 / F	-	-	-	-	414186600	7201/0105
085	76.532Z011	804	Y	19/0.26 (1.00)	2010	CM15 EARTH HEADER	6	24 / F	S07	1	15 / D	414186726	7201/0104	-	-	414186600	7201/0105
086	76.532Z011	802E	Y	19/0.19 (0.50)	1385	S07	1	15 / D	CM185 RESERVE TANK SW	1	16 / H	414186726	7201/0104	-	-	414186600	7201/0105
094	76.532Z011	545A	Y	19/0.19 (0.50)	3930	S08	1	7 / F	CM188 BATT RELY COIL 2	1	20 / B	-	-	-	-	414186600	7201/0105
095	76.532Z011	1086	Y	19/0.19 (0.50)	1185	S09	1	18 / G	CM189	1	20 / J	-	-	-	-	414186600	7201/0105
096	76.532Z011	804D	Y	19/0.19 (0.50)	965	CM185 BEACON	1	13 / E	S06	1	15 / H	414001001	7201/0062	-	-	-	-

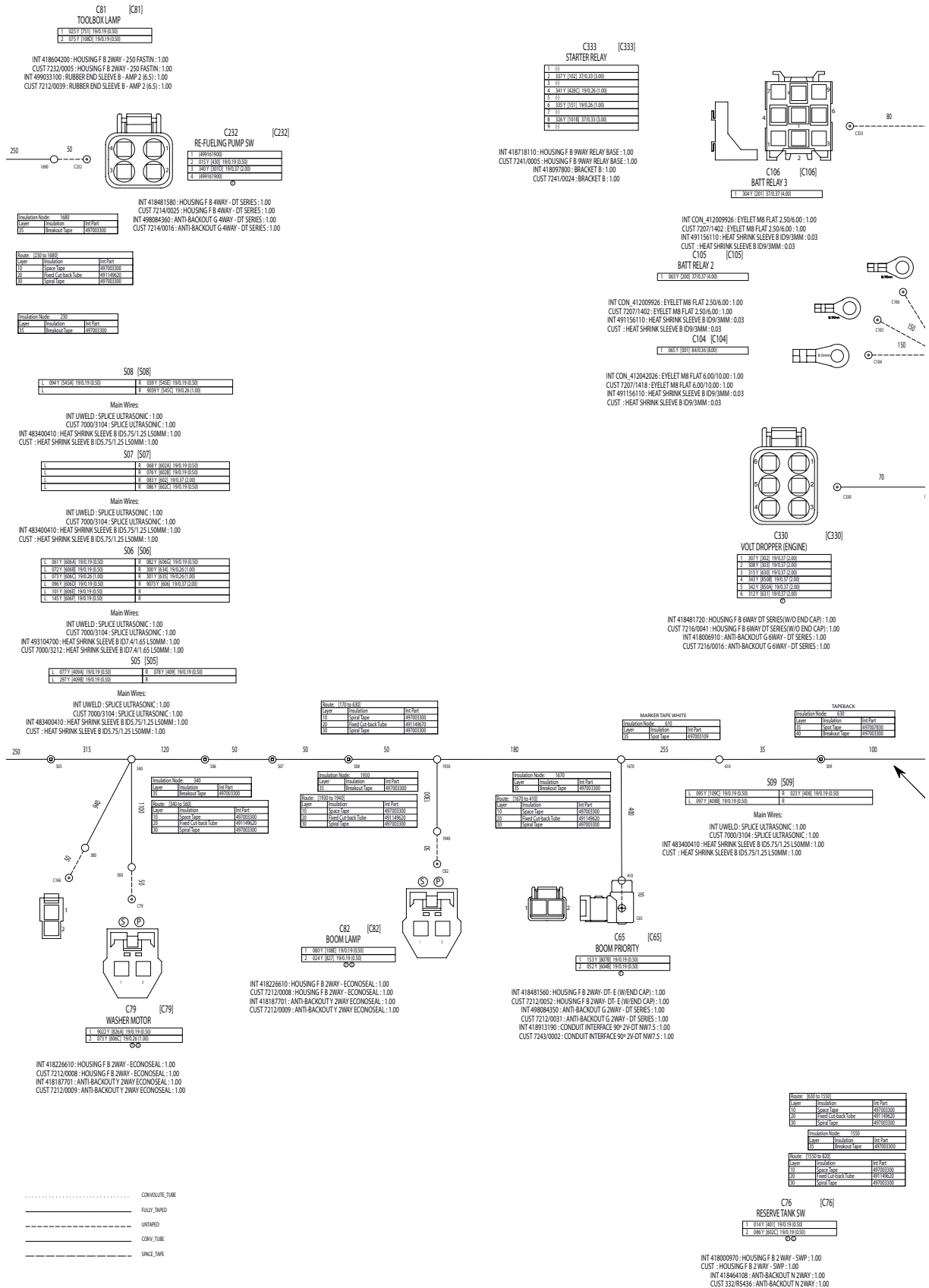


Fig 203. Main Harness B JS200/JS210/JS220 332/J2881 - Issue 4

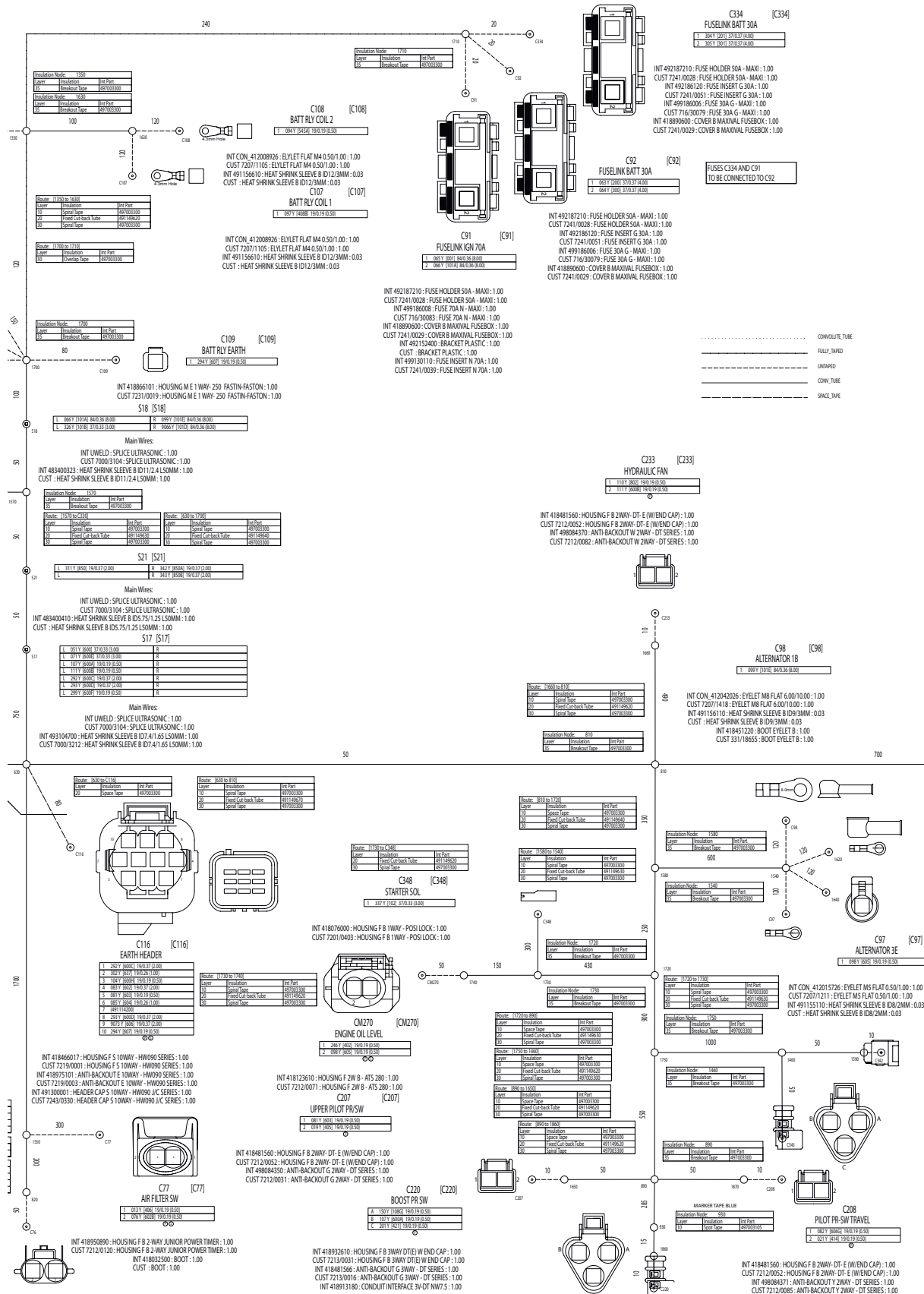
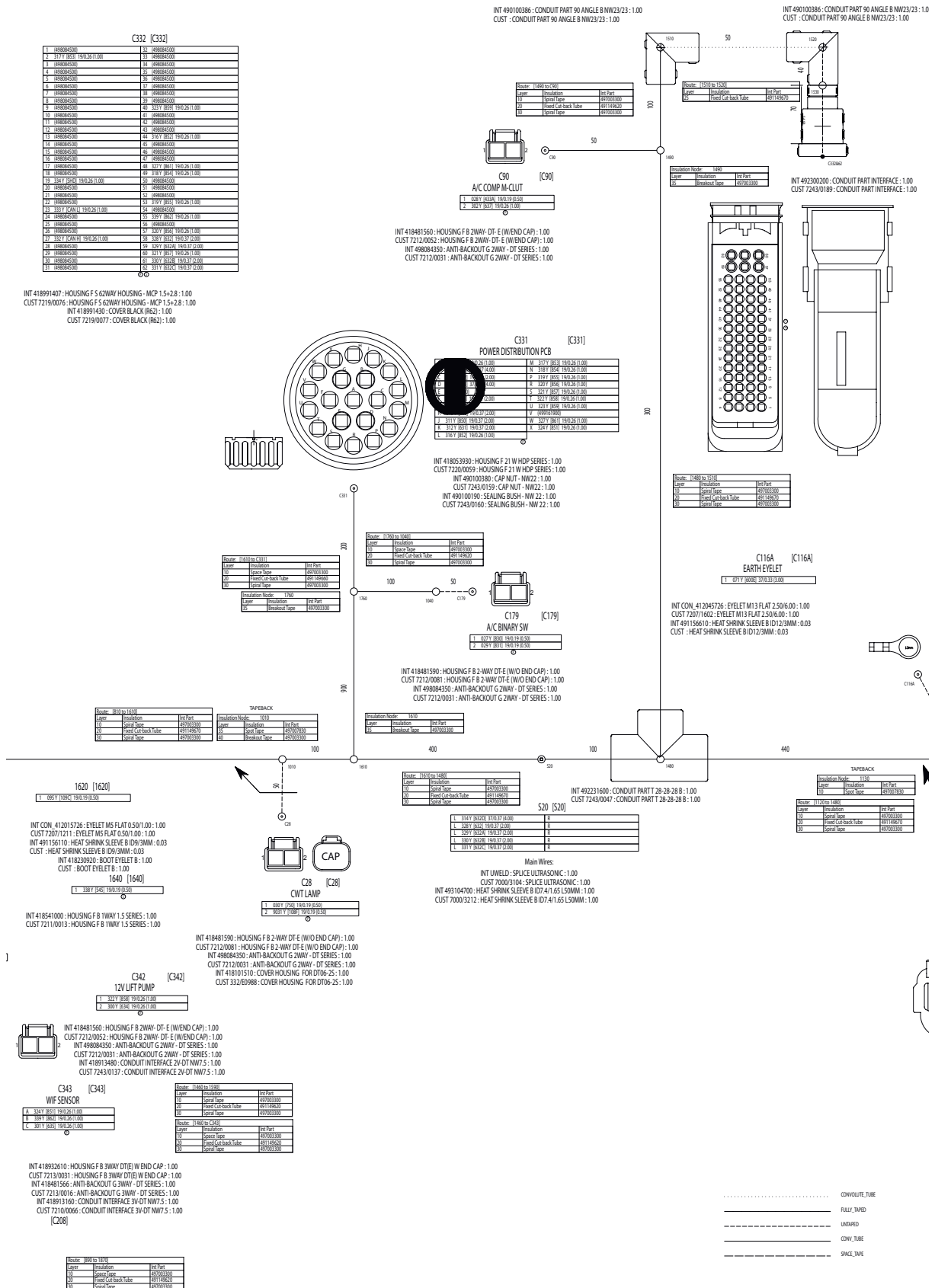


Fig 204. Main Harness C JS200/JS210/JS220 332/J2881 - Issue 4



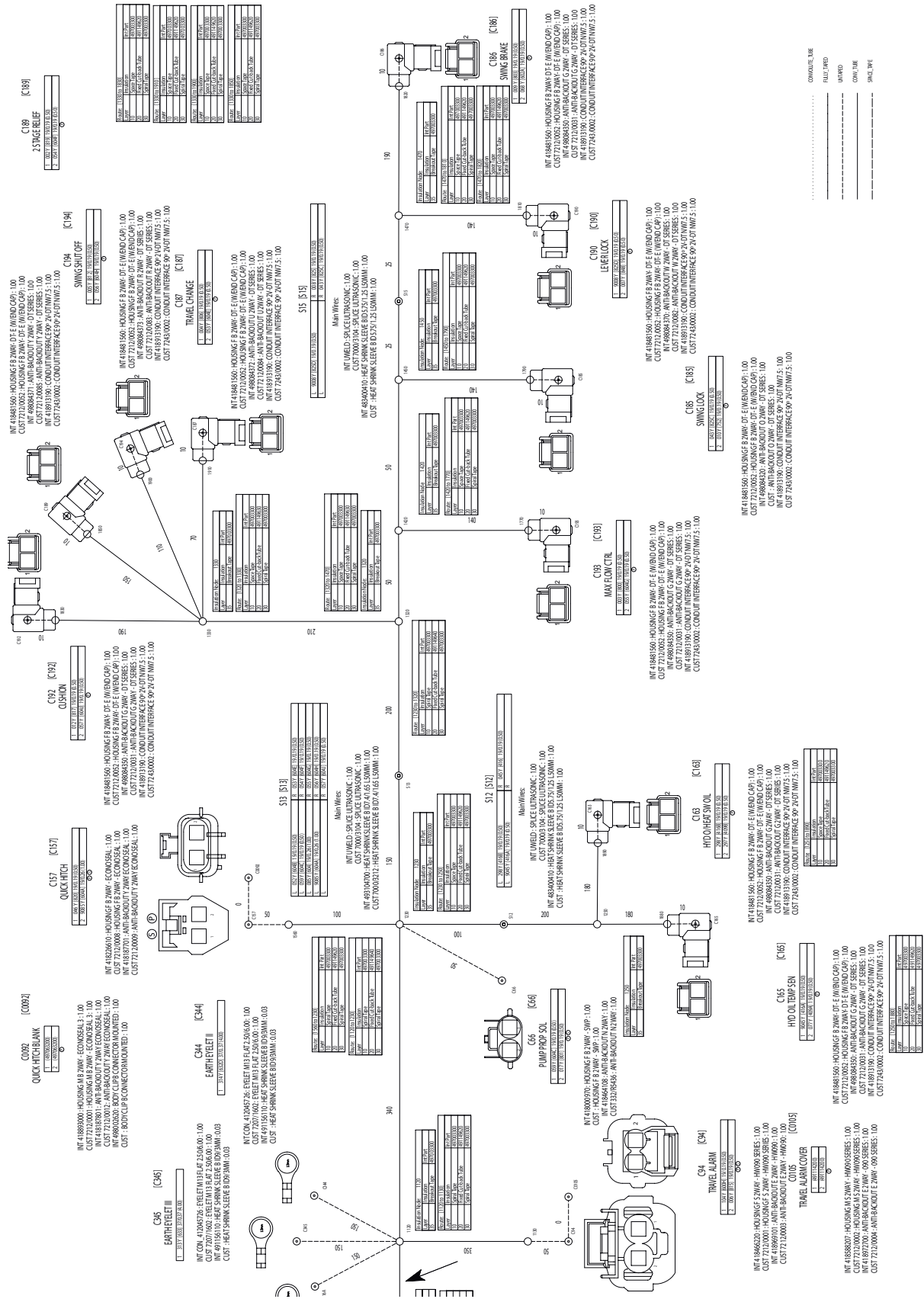


Fig 206. Main Harness E JS200/JS210/JS220 332J2881 - Issue 4



Section C - Electrics Harness Data

Main Harness JS200-JS220

Wire	INT	Part	Tag Name	Color	Type	Length	From	Pin 1	Loc 1	To	Pin 2	Loc 2	INT Term 1	CUST Term 1	INT Seal 1	INT Term 2	CUST Term 2	INT Seal 2
002	7675302W11	819		Y	1910 19 050	5315	C11 CONNECTOR A	9	17/G	C19 2 STAGE RELAY	1	32/G	414186600	72010105	-	414186600	72010105	-
003	7675302W11	800		Y	1910 19 050	5145	C11 CONNECTOR A	4	17/G	C19 MAX FLOW CTRL	1	30/C	414186600	72010105	-	414186600	72010105	-
004	7675302W11	806		Y	1910 19 050	5235	C11 CONNECTOR A	5	17/G	C197 TRAILER CHANGE	1	32/F	414186600	72010105	-	414186600	72010105	-
005	7675302W11	815		Y	1910 19 050	5235	C11 CONNECTOR B	36	17/G	C194 SWINGING SHUT OFF	1	32/F	414186600	72010105	-	414186600	72010105	-
006	7675302W11	815		Y	1910 19 050	4695	C11 CONNECTOR A	2	17/G	C194 EARTH ALARM	2	36/B	414186600	72010105	-	414186600	72010105	49228007
007	7675302W11	848		Y	1910 19 050	5245	C11 CONNECTOR A	11	17/G	C190 LEVER LOCK	2	33/C	414186600	72010105	-	414186600	72010105	-
008	7675302W11	815		Y	1910 19 050	5055	C11 CONNECTOR A	12	17/G	S15	8	33/E	414186600	72010105	-	414186600	72010105	-
009	7675302W11	803		Y	1910 19 050	5235	C11 CONNECTOR A	13	17/G	C196 SWING BRAKE	1	34/C	414186600	72010105	-	414186600	72010105	-
010	7675302W11	723		Y	1910 19 050	5195	C11 CONNECTOR A	14	17/G	C195 SWING LOCK	2	37/B	414186600	72010105	-	414186600	72010105	-
011	7675302W11	817		Y	1910 19 050	5305	C11 CONNECTOR A	16	17/G	C192 CUSHION	1	31/H	414186600	72010105	-	414186600	72010105	-
012	7675302W11	406		Y	1910 19 050	4445	C11 CONNECTOR A	17	17/F	C17 AB FILTER SW	1	14/A	414186600	72010105	-	414186600	72010105	49148600
014	7675302W11	401		Y	1910 19 050	4415	C11 CONNECTOR A	18	17/F	C19 RESERVE TANK SW	1	12/A	414186600	72010105	-	414004895	332192441	49200070
015	7675302W11	430		Y	1910 19 050	5380	C11 CONNECTOR B	4	17/B	C192 R PULVING PUMP SW	2	8/H	414186600	72010105	-	414186600	72010105	-
017	7675302W11	801		Y	1910 19 050	4645	C11 CONNECTOR B	4	17/B	C194 COMP M CLUT	2	37/C	414186600	72010105	-	414004895	332192441	49200070
019	7675302W11	405		Y	1910 19 050	4625	C11 CONNECTOR B	9	17/B	C197 UPPER PLOT PR SW	2	15/B	414186600	72010105	-	414186600	72010105	-
021	7675302W11	414		Y	1910 19 050	4625	C11 CONNECTOR B	11	17/B	C198 PLOT PR SW TRAVEL	2	19/A	414186600	72010105	-	414186600	72010105	-
022	7675302W11	826		Y	1910 19 050	445	C11 CONNECTOR B	12	17/B	S02	8	41/C	414186600	72010105	-	414186600	72010105	-
023	7675302W11	408		Y	1910 19 050	5230	C11 CONNECTOR B	13	17/B	S09	8	12/D	414186600	72010105	-	414186600	72010105	-
024	7675302W11	827		Y	1910 19 050	5245	C11 CONNECTOR B	14	17/B	C193 BOM LAMP	2	9/C	414186600	72010105	-	414359300	72010150	49209106
025	7675302W11	751		Y	1910 19 050	4175	C11 CONNECTOR B	15	17/B	C191 TO B LAMP	1	7/I	414186600	72010105	-	414073926	72010427	-
026	7675302W11	810		Y	1910 19 050	5310	C11 CONNECTOR B	16	17/B	C196 ELECTRIC HORN	2	13/G	414186600	72010105	-	414359300	72010150	49209106
027	7675302W11	830		Y	1910 19 050	4365	C11 CONNECTOR B	17	17/B	C179 A BINARY SW	1	23/E	414186600	72010105	-	414186600	72010105	-
028	7675302W11	4334		Y	1910 19 050	4195	C11 CONNECTOR B	18	17/B	C194 A COMP M CLUT	1	23/H	414186600	72010105	-	414186600	72010105	-
029	7675302W11	631		Y	1910 19 050	4365	C11 CONNECTOR B	19	17/B	C179 A BINARY SW	2	23/E	414186600	72010105	-	414186600	72010105	-
030	7675302W11	750		Y	1910 19 050	5265	C11 CONNECTOR B	20	17/B	C192 C LAMP	1	21/C	414186600	72010105	-	414186600	72010105	-
031	7675302W11	1096		Y	1910 19 050	525	C11 CONNECTOR B	22	17/B	S03	8	15/D	414186600	72010105	-	414186600	72010150	49209106
032	7675302W11	409		Y	1910 19 050	525	C11 CONNECTOR B	23	17/B	S08	8	15/D	414186600	72010105	-	414186600	72010150	49209106
033	7675302W11	816A		Y	1910 19 050	5230	C196 BEZEL	2	61/C	S01	8	41/D	414186600	72010105	-	414186600	72010105	-
034	7675302W11	816B		Y	1910 19 050	5280	C196 BATTERY	2	21/C	S01	8	13/D	414359300	72010150	49209106	-	-	-
036	7675302W11	4178		Y	1910 19 050	4230	C11 CONNECTOR A	15	17/G	C19 FUEL SENSOR	8	4/H	414186600	72010105	-	414186600	72010105	-
039	7675302W11	545E		Y	1910 19 050	1420	C194 T DIODE	4	17/F	S08	8	15/E	414186600	72010105	-	414186600	72010105	-
043	7675302W11	632C		Y	1910 19 050	4365	C11 CONNECTOR B	8	33/F	C195 SWING LOCK	2	31/B	414186600	72010105	-	414186600	72010105	-
044	7675302W11	407		Y	1910 19 050	4680	C11 CONNECTOR B	10	17/B	C19 FUEL SENSOR	8	4/H	414186600	72010105	-	414186600	72010105	-
045	7675302W11	416		Y	1910 19 050	4680	C11 CONNECTOR B	20	17/B	S12	8	29/D	414186600	72010105	-	414186600	72010105	-
046	7675302W11	820		Y	1910 19 050	4245	C11 CONNECTOR B	27	17/B	C157 QUICK HITCH	1	28/F	414186600	72010105	-	414359300	72010150	49209106
047	7675302W11	408		Y	1910 19 050	5260	C11 CONNECTOR B	28	17/B	C193 BOM LAMP	1	6/F	414186600	72010105	-	414262661	72010105	-
048	7675302W11	829		Y	1910 19 050	5230	C11 CONNECTOR B	29	17/B	C192 R FUEL PUMP	1	41/I	414186600	72010105	-	414186600	72010105	-
051	49926260	600		Y	3710 37 030	5200	C11 CONNECTOR A	7	11/G	S17	1	14/E	414186726	72010104	-	414186726	72010104	-
052	7675302W11	604B		Y	1910 19 050	5110	S13	1	28/E	C19 ROOM PRIORITY	2	11/C	-	-	-	-	-	-
053	7675302W11	604E		Y	1910 19 050	520	S13	1	28/E	C197 TRAILER CHANGE	2	32/E	-	-	-	-	-	-
054	7675302W11	604F		Y	1910 19 050	610	S13	1	28/E	C198 2 STAGE RELAY	2	32/E	-	-	-	-	-	-
055	7675302W11	604G		Y	1910 19 050	440	S13	1	28/E	C19 MAX FLOW CTRL	2	30/C	-	-	-	-	-	-
056	7675302W11	604H		Y	1910 19 050	520	S13	1	28/E	C194 SWINGING SHUT OFF	2	32/F	-	-	-	-	-	-
057	7675302W11	604I		Y	1910 19 050	650	S13	1	28/E	C192 CUSHION	2	31/H	-	-	-	-	-	-
058	7675302W11	604C		Y	1910 19 050	230	S13	1	28/E	C194 COMP M CLUT	2	37/C	-	-	-	-	-	-
059	7675302W11	606A		Y	1910 19 050	445	S06	2	51/F	C197 UPPER PLOT PR SW	1	7/I	-	-	-	-	-	-
063	7675311W11	200		Y	3710 37 030	535	C19 FUEL SENS BATT 30A	1	17/H	C105 BATT RELAY 2	1	11/H	414303600	72010079	-	414303600	72010079	-
064	7675311W11	300		Y	3710 37 030	5345	C11 CONNECTOR A	6	17/F	C19 FUEL SENS BATT 30A	2	17/H	414186726	72010104	-	414186726	72010104	-
065	7675312W11	001		Y	84026 8300	535	C19 FUEL SENS BATT 30A	1	16/H	C104	1	11/G	414303400	72010078	-	414303400	72010078	-
066	7675312W11	002		Y	84026 8300	535	C19 FUEL SENS BATT 30A	1	16/H	C104	1	11/G	414303400	72010078	-	414303400	72010078	-
068	7675302W11	602A		Y	1910 19 050	5340	C196 SWING BRAKE	2	34/C	S07	8	8/F	414186600	72010105	-	414186600	72010105	-
071	49926260	600E		Y	3710 37 030	2710	C116 EARTH HEATER	1	24/F	S17	1	14/E	414186726	72010104	-	414186726	72010104	-
072	7675302W11	609B		Y	1910 19 050	2670	C196 ELECTRIC HORN	1	37/G	S06	8	17/F	414359300	72010150	49209106	-	-	
073	7675302W11	609C		Y	1910 19 050	1365	C19 WIPER MOTOR	3	17/B	S06	8	17/F	414359300	72010150	49209106	-	-	
074	7675302W11	610		Y	1910 19 050	445	S09	2	51/F	C191 TO B LAMP	2	7/I	-	-	-	-	-	-
076	7675302W11	603B		Y	1910 19 050	2710	C17 AB FILTER SW	2	14/A	S07	8	8/F	414186600	72010105	-	414186600	72010105	49148600
077	7675302W11	409A		Y	1910 19 050	5315	S05	1	17/E	C165 HYD OIL TEMP SEN	2	27/A	-	-	-	-	-	-
078	7675302W11	409		Y	1910 19 050	1255	C11 CONNECTOR B	8	17/B	S05	8	15/E	414186600	72010105	-	414186600	72010105	-
080	7675302W11	408E		Y	1910 19 050	5270	S09	2	51/D	C193 BOM LAMP	1	6/F	414186600	72010105	-	414303300	72010150	49209106
081	7675302W11	603		Y	1910 19 050	5295	C116 EARTH HEADER	5	14/C	C197 UPPER PLOT PR SW	1	15/B	41206426	72000000	49228007	414186600	72010105	-
082	7675302W11	60																

S01

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	846	0.5 C180-6	6	846E	0.5 C309-2
2	846C	0.5 C0016-2	7		
3	846D	0.5 C0016-8	8		
4	846B	0.5 410-1	9		
5	846F	1.0 380-2	10		

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7060/3212

S02

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	504D	0.5 430-2	7	504K	1.5 370-B
2	504E	0.5 C0007-13	8	504C	2.0 C180-11
3	504F	0.5 C0003-2	9		
4	504H	0.5 C0003-8	10		
5	504J	0.5 C0005-11	11		
6			12		

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7060/3212

S04

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	612K	0.5 C309-1	8	612T	1.0 380-1
2	612L	0.5 C0016-7	9	612J	2.0 C180-14
3			10	612V	2.0 C0001-4
4	612S	0.5 C0007-9	11		
5	612P	0.5 C0003-7	12		
6	612N	0.5 C0003-5	13		
7	612M	0.5 430-1	14		

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7060/3212

S05

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	CAN	H.0.5 C180-15	3	CAN	H.0.5 C0001-3
2	CAN	H.0.5 C0007-7	4		

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7060/3212

S06

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	CAN	L.0.5 C180-16	3	CAN	L.0.5 C0001-1
2	CAN	L.0.5 C0007-6	4		

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7060/3212

C0007
MONITOR EMS

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	553	0.5 C0005-4	9	612S	0.5 S04-4
2	552	0.5 C0005-6	10	7210	0.015
3	661	0.5 C0008-3	11	7210	0.015
4	550	0.5 C0009-5	12	110	0.75 C180-10
5	SCR	0.5 C180-17	13	504E	0.5 S02-2
6	CAN	L.0.5 S06-2	14	610	0.5 C0005-2
7	CAN	H.0.5 S05-2	15	435A	0.5 C180-13
8	7210	0.015	16	304B	0.5 C180-12

16 Way Econo Female Hsg : 1 : 7210/0080
16 Way Econo Fem Retainer : 1 : 7210/0081

C0016
RADIO MUTE SWITCH

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1			6		
2	846C	0.5 S01-2	7	612L	0.5 S04-2
3	845	0.5 C180-7	8	846D	0.5 S01-3
4			9		
5			10		

10 Way 6.3 Fastin Switch Hsg : 1 : 7219/0013

C180
CAB LINK 1

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	836	0.5 420-1	12	304B	0.5 C0007-16
2	835	1.0 380-3	13	435A	0.5 C0007-15
3	834	1.5 370-L	14	612J	2.0 S04-9
4	833	1.5 370-M	15	CAN	H.0.5 S05-1
5	832	1.5 370-H	16	CAN	L.0.5 S06-1
6	846	0.5 S01-1	17	SCR	0.5 C0007-5
7	845	0.5 C0016-3	18	837	0.5 C0005-7
8	424	0.5 C0003-3	19	818A	0.5 C0005-8
9	415	0.5 C0003-6	20	852	2.0 C001-8
10	110	0.75 C0007-12	21	855	2.0 C0001-2
11	504C	2.0 S02-8	~		

21 Way Junior Power Timer Fem Hsg Slate : 1 : 332/R5917
21 Way Junior Power Timer Sec Lock : 1 : 332/R5927

C0001
CAN RELAY

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	CAN	L.0.5 S06-3	6		
2	855	2.0 C180-21	7		
3	CAN	H.0.5 S05-3	8	852	2.0 C180-20
4	612V	2.0 S04-10	9		
5			~		

9 Way Mini Relay Housing : 1 : 7241/0005

370
BLOWER SPEED SWITCH

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
B	504K	1.5 S02-7	L	834	1.5 C180-3
C			M	833	1.5 C180-4
H	832	1.5 C180-5	~		

5 Way 6.3 Fem Hsg Heater Switch : 1 : 7235/0006

380
WATER VALVE

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	612K	1.0 S04-8	3	835	1.0 C180-2
2	846F	1.0 S01-5	~		

3 Way Fastin Faston Housing : 1 : 7233/0013

410
FRESH/RECIRC 2

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	846B	0.5 S01-4			

1 Way Pos Lock Housing Straight : 1 : 7201/0403

420
FRESH/RECIRC 1

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	836	0.5 C180-1			

1 Way Pos Lock Housing Straight : 1 : 7201/0403

430
PANEL ILLUM

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	612M	0.5 S04-7	2	504D	0.5 S02-1

2 Way Pos Lock Housing T Type : 1 : 7232/0003

C0003
WORKLAMP-SW

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	504F	0.5 S02-3	7	612P	0.5 S04-5
3	424	0.5 C180-8	8	504H	0.5 S02-4
4			9		
5	612N	0.5 S04-6	10		

10 Way 6.3 Fastin Switch Hsg : 1 : 7219/0013

C0005
FACIA SW PANEL

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	504H	0.5 S02-5	5	550	0.5 C0007-4
2	610	0.5 C0007-14	6	552	0.5 C0007-2
3	861	0.5 C0007-3	7	837	0.5 C180-18
4	553	0.5 C0007-1	8	818A	0.5 C180-19

8 Way Fem Hsg CPC Circular : 1 : 7218/0027

C309
POWER SOCKET

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	612K	0.5 S04-1	2	846E	0.5 S01-6

2 Way Pos Lock Housing T Type : 1 : 7232/0003

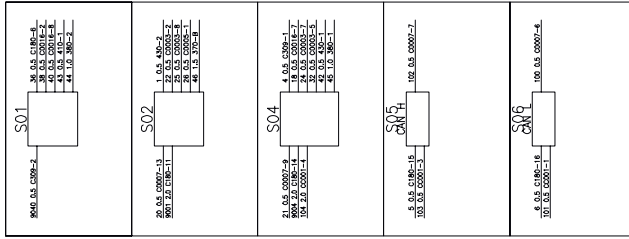


Fig 209. Machines with Heater 333/J7618 issue 1



Section C - Electrics Harness Data

Fascia Link Harness

Wire ID	Qty	Color	CSA	Length	Multicone ID	From	To	Pin	Description	Terminal 1	Terminal 2	Seat 1	Seat 2
1	5040	Y	0.5	460		430	S02	1	PANEL ILLUM	7201/0466	-	-	-
3	433A	Y	0.5	1150		C0007	C180	13	MONITOR EMS	7201/0176	332/85955	7210/0032	-
4	612K	Y	0.5	700		C309	S04	1	POWER SOCKET	7201/0466	-	-	-
5	6AM H	Y	0.5	1070		M001	C180	15	CAN LNK 1	332/85955	-	-	-
6	6AM L	G	0.5	1040		M001	S06	16	CAN LNK 1	332/85955	-	-	-
7	5SP	Y	0.5	1150		M001	C0007	17	CAN LNK 1	332/85955	-	-	-
8	801	Y	0.5	1670		C0005	C180	18	FACIA SW PANEL	7201/0149	7201/0176	-	-
9	808A	Y	0.5	1670		C0005	C180	19	FACIA SW PANEL	7201/0149	7201/0176	-	-
10	808	Y	0.5	1520		420	C180	1	FRESH/RECIRC.1	7201/0466	-	-	-
11	835	Y	1.0	1520		380	C180	3	WATER VALVE	7201/0466	-	-	-
12	834	Y	1.0	1520		370	C180	3	BLOWER SPEED SWITCH	7201/0466	-	-	-
13	424	Y	0.5	1290		C0003	C180	8	WORKAMP-SW	7201/0466	332/85956	-	-
14	415	Y	0.5	1290		C0003	C180	8	WORKAMP-SW	7201/0466	332/85955	-	-
17	612L	Y	0.5	600		C0016	S04	9	RADIO MUTE SWITCH	7201/0466	332/85955	-	-
20	504E	Y	0.5	380		C0007	S02	2	MONITOR EMS	7201/0176	-	7210/0032	-
21	612S	Y	0.5	300		C0007	S04	3	MONITOR EMS	7201/0176	-	7210/0032	-
22	504F	Y	0.5	250		C0003	S02	4	WORKAMP-SW	7201/0466	-	-	-
24	612P	Y	0.5	330		C0003	S04	5	WORKAMP-SW	7201/0466	-	-	-
25	504H	Y	0.5	250		C0003	S02	4	WORKAMP-SW	7201/0466	-	-	-
26	504I	Y	0.5	640		C0005	S02	5	FACIA SW PANEL	7201/0466	-	-	-
27	610	Y	0.5	1020		C0005	C0007	14	FACIA SW PANEL	7201/0149	7201/0176	-	7210/0032
28	661	Y	0.5	1020		C0005	C0007	3	FACIA SW PANEL	7201/0149	7201/0176	-	7210/0032
29	553	Y	0.5	1020		C0005	C0007	4	FACIA SW PANEL	7201/0149	7201/0176	-	7210/0032
30	550	Y	0.5	1020		C0005	C0007	4	FACIA SW PANEL	7201/0149	7201/0176	-	7210/0032
31	552	Y	0.5	1020		C0005	C0007	2	FACIA SW PANEL	7201/0149	7201/0176	-	7210/0032
32	612N	Y	0.5	330		C0003	S04	6	WORKAMP-SW	7201/0466	-	-	-
34	833	Y	1.5	1520		370	M	4	BLOWER SPEED SWITCH	7201/0466	332/85956	-	-
35	832	Y	1.5	1520		370	H	4	BLOWER SPEED SWITCH	7201/0466	332/85956	-	-
36	846	Y	0.5	1520		C180	S01	5	CAN LNK 1	332/85955	-	-	-
37	845	Y	0.5	1520		C0016	S01	7	RADIO MUTE SWITCH	7201/0466	-	-	-
38	846C	Y	0.5	100		C0016	S01	2	RADIO MUTE SWITCH	7201/0466	-	-	-
40	846D	Y	0.5	100		C0016	S01	3	RADIO MUTE SWITCH	7201/0466	-	-	-
42	612M	Y	0.5	530		430	S04	1	PANEL ILLUM	7201/0466	-	-	-
43	846F	Y	0.5	330		410	S01	4	FRESH/RECIRC.2	7201/0466	-	-	-
44	846F	Y	1.0	330		380	S01	5	WATER VALVE	7201/0466	-	-	-
45	612T	Y	1.0	570		380	S01	5	WATER VALVE	7201/0466	-	-	-
46	504K	Y	1.5	490		370	B	1	BLOWER SPEED SWITCH	7201/0466	-	-	-
47	110	Y	0.75	1150		C180	C0007	12	CAN LNK 1	332/85955	-	-	-
100	6AM L	Y	0.5	110		C0007	S06	2	MONITOR EMS	7201/0176	7210/0032	-	-
101	6AM L	Y	0.5	220		C0001	S06	3	CAN L	7201/0013	-	-	-
102	6AM H	Y	0.5	80		C0007	S05	2	CAN H	7201/0176	-	-	-
103	6AM H	Y	0.5	250		C0001	S05	3	CAN H	7201/0013	-	-	-
104	612V	Y	2.0	130		C0001	S04	10	CAN RELAY	7201/0045	-	-	-
105	855	Y	2.0	980		C0001	C180	21	CAN RELAY	7201/0045	-	-	-
106	852	Y	2.0	980		C0001	C180	20	CAN RELAY	7201/0045	-	-	-
9001	504C	Y	2.0	1030		S02	C180	11	CAN LNK 1	-	-	-	-
9002	304B	Y	0.5	1150		C0007	C180	12	CAN LNK 1	-	-	-	-
9004	612J	Y	2.0	950		S04	C180	14	CAN LNK 1	-	-	-	-
9140	846E	Y	0.5	100		S01	C309	2	POWER SOCKET	-	-	-	-

Fig 210. Machines with Heater 333/J7618 issue 1

VeSys Harness - Bill of Materials
 Drawing Title HARNESS FASCIA HTR
 Drawing No. 333/J7618
 Drawing Issue 1
 Drawing Revision 01
 Design Stage PRODUCTION
 Description HARNESS FASCIA HTR
 Report Created 20th Jun 12 ID:41an

Part No.	Qty	Length	Description
176927.639.070	4	N/A	TAPE DN CLIP
332/85917	1	N/A	21 Moy Junior Power Tiner Fen Hsg Slate
332/85927	14	N/A	0.5-1.0 JPT Tiner Fen Term
332/85955	1	N/A	TAPE DN CLIP
4981/23017	1	N/A	In Line Ultrasonic Splice
7000/3212	5	285.0	Adhesive Lined Heatshrink
7201/0067	5	N/A	0.5-2.5 DPK3 Fen Term
7201/0045	3	N/A	0.75-2.0 Econo 070 Gold Fen Term
7201/0149	8	N/A	Amplite Socket Term Size 20 DF
7201/0403	12	N/A	0.5 Econo Fen Term Std Tight
7201/0451	13	N/A	6.3 Fen Fastin Faston 0.5-1.0 Dimple
7201/0466	6	N/A	6.3 Fen Pos Lock 0.5-1.0
7201/0049	3	N/A	Econo Wire Seal 0.5-1.5 Green
7210/0032	12	N/A	16 Moy Econo Fen Retainer
7210/0080	1	N/A	10 Moy 6.3 Fastin Switch Hsg
7210/0051	2	N/A	2 Moy Pos Lock Housing T Type
7222/0003	2	N/A	3 Moy Fastin Faston Housing
7232/0013	1	N/A	0.5 Thin Wall Wire 100 Brg C
7241/0005	1	N/A	0.5 Thin Wall Wire 100 Brg C
7250/0050	29	2310.0	0.5 Thin Wall Wire 100 Brg C
7250/0050	4	160.0	1.0 Thin Wall Wire 100 Brg C
7250/0100	3	2420.0	1.5 Thin Wall Wire 100 Brg C
7250/0150	4	5050.0	2.0 Thin Wall Wire 100 Brg C
7250/0500	4	3040.0	5.0 Thin Wall Wire 100 Brg C
8127/1758	1	103.0	Front Worklight Switch Bracket

S05
CAN 14

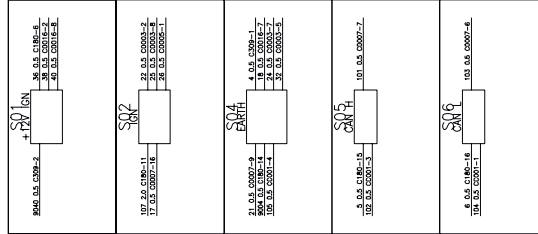
CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	CAN H.O.5	C180-15	3	CAN H.O.5	CC001-3
2	CAN H.O.5	C0007-7	4		

In Line Ultrasonic Splice : 1 ; 7000/3104
Adhesive Lined Heatshrink : 45.0 ; 7000/3212

S06
CAN L

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	CAN L.O.5	C180-18	3	CAN L.O.5	CC001-1
2	CAN L.O.5	C0007-6	4		

In Line Ultrasonic Splice : 1 ; 7000/3104
Adhesive Lined Heatshrink : 45.0 ; 7000/3212



C180
CAB LINK 1

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1			12	305B	0.5C0007-13
2			13	435A	0.5C0007-13
3			14	12J	0.5S04-7
4			15	CAN H.O.5	S05-1
5			16	CAN L.O.5	S06-1
6	846	0.5S01-1	17	SCR	0.5C0007-5
7	845	0.5C0016-3	18	837	0.5C0005-7
8	424	0.5C0003-3	19	818A	0.5C0005-8
9	415	0.5C0003-6	20	852	1.0C0001-8
10	110	0.75C0007-12	21	855	1.0C0001-2
11	504C	12.0S02-1	~		

21 Way Junior Power Timer Fern Hsg Slete : 1 ; 332/R6917
21 Way Junior Power Timer Sec Lock : 1 ; 332/R6927

C309
POWER SOCKET

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	612K	0.5S04-1	2	846E	0.5S01-4

2 Way Pos Lock Housing T Type : 1 ; 7232/0003

S01
437
CAN

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	846	0.5C180-6	3	846D	0.5C0016-8
2	846C	0.5C0016-2	4	846E	0.5C309-2

In Line Ultrasonic Splice : 1 ; 7000/3104
Adhesive Lined Heatshrink : 45.0 ; 7000/3212

S02
CAN

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	504C	2.0C180-11	4	504H	0.5C0003-8
2	504E	0.5C0007-16	5	504J	0.5C0005-1
3	504F	0.5C0003-2	6		

In Line Ultrasonic Splice : 1 ; 7000/3104
Adhesive Lined Heatshrink : 45.0 ; 7000/3212

S04
EARTH

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	612K	0.5C309-1	5	612P	0.5C0003-7
2	612L	0.5C0016-7	6	612N	0.5C0003-5
3			7	612J	0.5C180-14
4	612S	0.5C0007-9	8	612I	0.5C0001-4

In Line Ultrasonic Splice : 1 ; 7000/3104
Adhesive Lined Heatshrink : 45.0 ; 7000/3212

C0003
WORKLAMP-SW

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1			6	415	0.5C180-9
2	504F	0.5S02-3	7	612P	0.5S04-5
3	424	0.5C180-8	8	504H	0.5S02-4
4			9		
5	612N	0.5S04-6	10		

10 Way 6.3 Fastin Switch Hsg : 1 ; 7219/0013

C0005
FACIA SW PANEL

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	504J	0.5S02-5	5	550	0.5C0007-4
2	610	0.5C0007-14	6	552	0.5C0007-2
3	661	0.5C0007-3	7	837	0.5C180-18
4	553	0.5C0007-1	8	818A	0.5C180-19

8 Way Fern Hsg CPC Circular : 1 ; 7219/0027

C0007
MONITOR EMS

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	553	0.5C0005-4	9	612S	0.5S04-4
2	552	0.5C0005-6	10	7210	0.0015
3	661	0.5C0005-3	11	7210	0.0015
4	550	0.5C0005-5	12	110	0.75C180-10
5	SCR	0.5C180-17	13	505B	0.5C180-12
6	CAN L.O.5	S06-2	14	610	0.5C0005-2
7	CAN H.O.5	S05-2	15	435A	0.5C180-13
8	7210	0.0015	16	504E	0.5S02-2

16 Way Econo Female Hsg : 1 ; 7210/0080
16 Way Econo Fern Retainer : 1 ; 7210/0081

C0016
RADIO MUTE SWITCH

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	846G	0.5S01-2	7	612I	0.5S04-2
3	845	0.5C180-7	8	846D	0.5S01-3
4			9		
5			10		

10 Way 6.3 Fastin Switch Hsg : 1 ; 7219/0013

C0001
CAN RELAY

CELL TAG	CSA	DEST	CELL TAG	CSA	DEST
1	CAN L	0.5S06-3	6		
2	855	1.0C180-21	7		
3	CAN H	0.5S05-3	8	852	1.0C180-20
4	612I	0.5S04-8	9		
5			~		

9 Way Mini Relay Housing : 1 ; 7241/0005



Fig 212. Machines with ATC 333/J7616 issue 1

Wire ID	Log	Color	CSA	Length	MultiCore ID	From	Pin	To	Pin	Terminal 1	Seal 1	Terminal 2	Seal 2
1	855	Y	1.0	980		C180	21	C0001	2	332/R5955	-	7201/0044	-
3	435A	Y	0.5	1150		C0007	15	C180	13	7201/0176	7210/0032	332/R5955	-
4	167X	Y	0.5	700		C359	1	S04	1	7201/0466	-	-	-
5	CAN H	Y	0.5	1070		MC01	15	S05	1	332/R5955	-	-	-
6	CAN L	G	0.5	1040		MC01	16	S06	1	332/R5955	-	-	-
8	187	Y	0.5	1670		C0005	7	C180	18	7201/0149	-	332/R5955	-
9	818A	Y	0.5	1670		C0005	8	C180	19	7201/0149	-	332/R5955	-
13	424	Y	0.5	1280		C0003	3	C180	8	7201/0451	-	332/R5955	-
14	415	Y	0.5	1280		C0003	6	C180	9	7201/0451	-	332/R5955	-
17	504F	Y	0.5	380		C0007	16	S02	2	7201/0176	7210/0032	-	-
18	167L	Y	0.5	600		C0016	7	S04	2	7201/0451	-	-	-
21	162S	Y	0.5	300		C0007	9	S04	4	7201/0176	-	-	-
22	504F	Y	0.5	290		C0003	2	S02	3	7201/0451	-	-	-
24	167P	Y	0.5	330		C0003	7	S04	5	7201/0451	-	-	-
25	504H	Y	0.5	290		C0003	8	S02	4	7201/0451	-	-	-
26	504J	Y	0.5	640		C0005	1	S02	5	7201/0149	-	-	-
27	610	Y	0.5	1020		C0005	2	C0007	14	7201/0149	-	7201/0176	7210/0032
28	661	Y	0.5	1020		C0005	3	C0007	3	7201/0149	-	7201/0176	7210/0032
29	553	Y	0.5	1020		C0005	4	C0007	4	7201/0149	-	7201/0176	7210/0032
30	550	Y	0.5	1020		C0005	5	C0007	4	7201/0149	-	7201/0176	7210/0032
31	552	Y	0.5	330		C0005	6	C0007	2	7201/0149	-	7201/0176	7210/0032
32	167N	Y	0.5	330		C0003	5	S04	6	7201/0451	-	-	-
36	846	Y	0.5	1550		C180	6	S01	1	332/R5955	-	332/R5955	-
37	845	Y	0.5	1550		C0016	3	C180	7	7201/0451	-	-	-
38	846C	Y	0.5	100		C0016	2	S01	2	7201/0451	-	-	-
40	846D	Y	0.5	100		C0016	8	S01	3	7201/0451	-	-	-
42	110	Y	0.75	1150		C180	10	C0007	12	332/R5955	-	7201/0067	-
100	182	Y	1.0	980		C0001	8	C180	20	7201/0044	-	332/R5955	-
101	CAN H	Y	0.5	80		S05	2	C0007	7	-	-	7201/0176	7210/0032
102	CAN H	Y	0.5	290		S05	3	C0001	3	-	-	7201/0176	7210/0032
103	CAN L	Y	0.5	110		S06	2	C0007	6	-	-	7201/0176	7210/0032
104	CAN L	Y	0.5	220		C0001	4	S04	8	7201/0044	-	-	-
105	627	Y	0.5	130		C0001	5	C0007	5	7201/0176	-	332/R5955	-
106	528	Y	0.5	1150		MC01	1	C180	17	7201/0176	-	332/R5955	-
107	504C	Y	2.0	1030		S07	1	C180	11	-	-	332/R5955	-
9002	305B	Y	0.5	1150		C0007	13	C180	12	7201/0176	7210/0032	332/R5955	-
9004	162J	Y	0.5	950		S04	7	C180	14	-	-	332/R5955	-
9040	1946E	Y	0.5	100		S01	4	C309	2	-	-	7201/0466	-

Fig 213. Machines with ATC 333/J7616 issue 1

VeSys Harness - Bill of Materials
 Drawing Title FASCIA HARNESS ATC
 Drawing No. 333/J7616
 Drawing Issue 1
 Drawing Revision 01
 Project Name ?
 Design Stage PRODUCTION
 Description FASCIA HARNESS ATC
 Report Created 13th Feb 12 3: 28pm

Part No.	Qty	Length	Description
242/00290	5	N/A	FIR TREE CABLE TIE M8 165 LG
332/R5917	1	N/A	21 Way Junior Power Timer Fem Hsg Slate
332/R5927	1	N/A	21 Way Junior Power Timer Sec Lock
332/R5955	15	N/A	0.5-1.0 JPT Timer Fem Term
332/R5956	1	N/A	1.5-2.5 JPT Timer Fem Term
7000/3104	5	N/A	In Line Ultrasonic Splice
7000/3212	2	225.0	Adhesive Lined Heatshrink
7201/0013	3	N/A	0.5-1.0 MDK1 Fem Term
7201/0044	1	N/A	0.5-1.0 DFK3 Fem Term
7201/0067	1	N/A	0.75-2.0 Econo 07D Gold Fem Term
7201/0149	8	N/A	Amplite Socket Term Size 20 DF
7201/0176	12	N/A	6.3 Fem Fastin Faston 0.5-1.0 Dimple
7201/0451	10	N/A	0.5 Econoseal Fem Term Gld
7210/0015	2	N/A	Econo Wire Seal 0.5-1.0 Lock
7210/0032	12	N/A	Econo Wire Seal 0.5-1.5 Green
7210/0080	1	N/A	16 Way Econo Female Hsg
7210/0081	1	N/A	8 Way Econo CPC Circular
7218/0027	1	N/A	10 Way 6.3 Fastin Switch Hsg
7219/0013	2	N/A	2 Way Pos Lock Housing T Type
7232/0003	1	N/A	9 Way Mini Relay Housing
7241/0005	31	22220.0	0.5 Thin Wall Wire 100 Deg C
7250/0050	1	11500.0	1.0 Thin Wall Wire 100 Deg C
7250/0075	2	1960.0	2.0 Thin Wall Wire 100 Deg C
7250/0100	1	1030.0	N/A
817/17258	1	N/A	Front Worklight Switch Decal

JS160-200

Connector Location

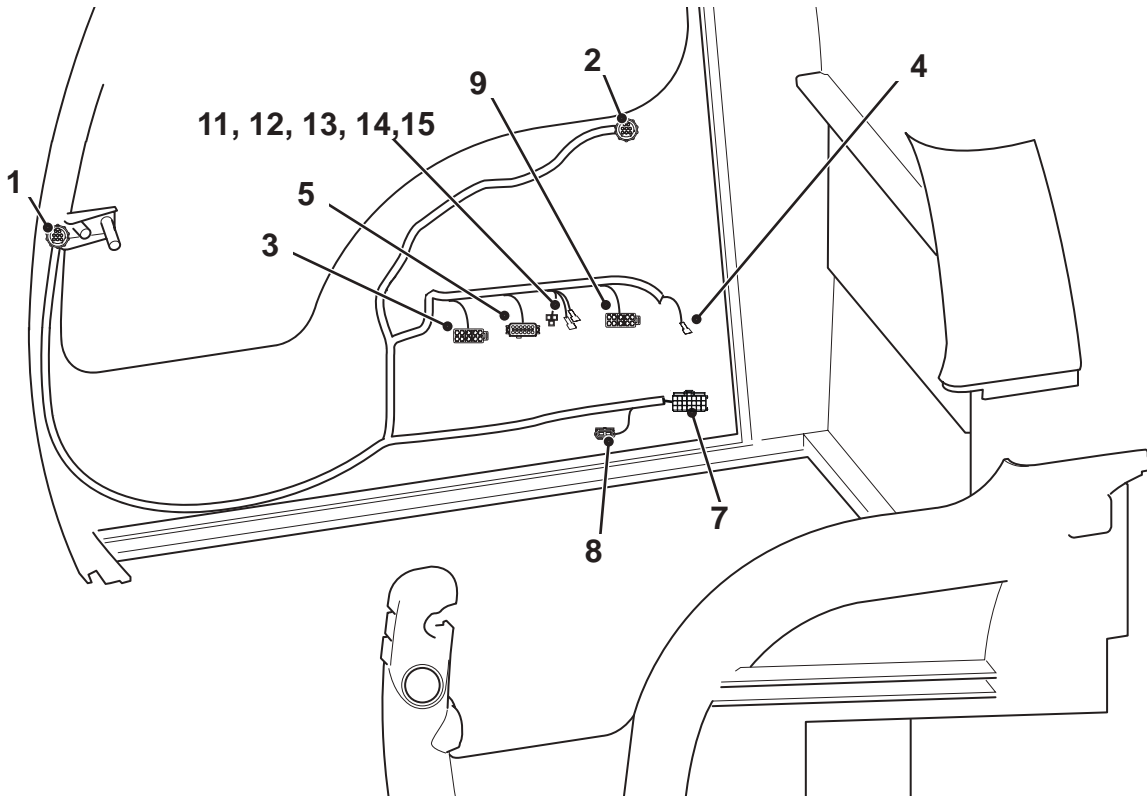


Fig 214.

A407772

Connector Identification

Table 13.

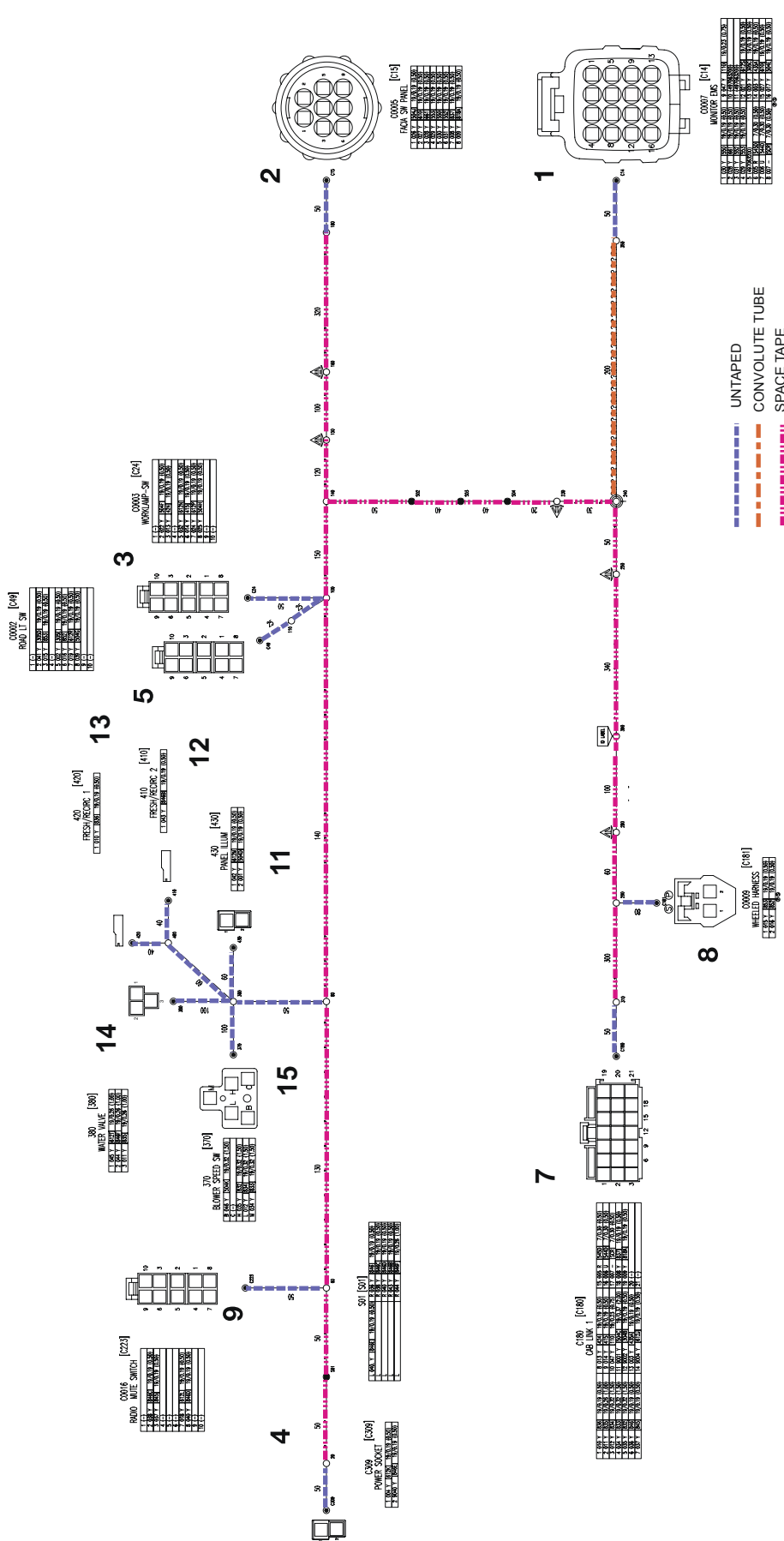
Item	Connector	Function	Location
1	C14	Monitor EMS	⇒ Fig 215. (□ C-203) & ⇒ Fig 216. (□ C-204)
2	C15	Facia Switch Panel	⇒ Fig 215. (□ C-203) & ⇒ Fig 216. (□ C-204)
3	C24	Worklamp Switch	⇒ Fig 215. (□ C-203) & ⇒ Fig 216. (□ C-204)
4	C309	Power Socket	⇒ Fig 215. (□ C-203) & ⇒ Fig 216. (□ C-204)
5	C49	Road Light Switch (Red Marker -Tape)	⇒ Fig 215. (□ C-203) & ⇒ Fig 216. (□ C-204)
7	C180	Cab 1 (Cab Harness connection)	⇒ Fig 215. (□ C-203) & ⇒ Fig 216. (□ C-204)
8	C181	Wheeled Harness	⇒ Fig 215. (□ C-203) & ⇒ Fig 216. (□ C-204)
9	C223	Radio Mute switch	⇒ Fig 215. (□ C-203) & ⇒ Fig 216. (□ C-204)
11	430	Panel Illumination	⇒ Fig 215. (□ C-203) (heater only)
12	410	Fresh/Recirc. 2	⇒ Fig 215. (□ C-203) (heater only)



Section C - Electrics Harness Data

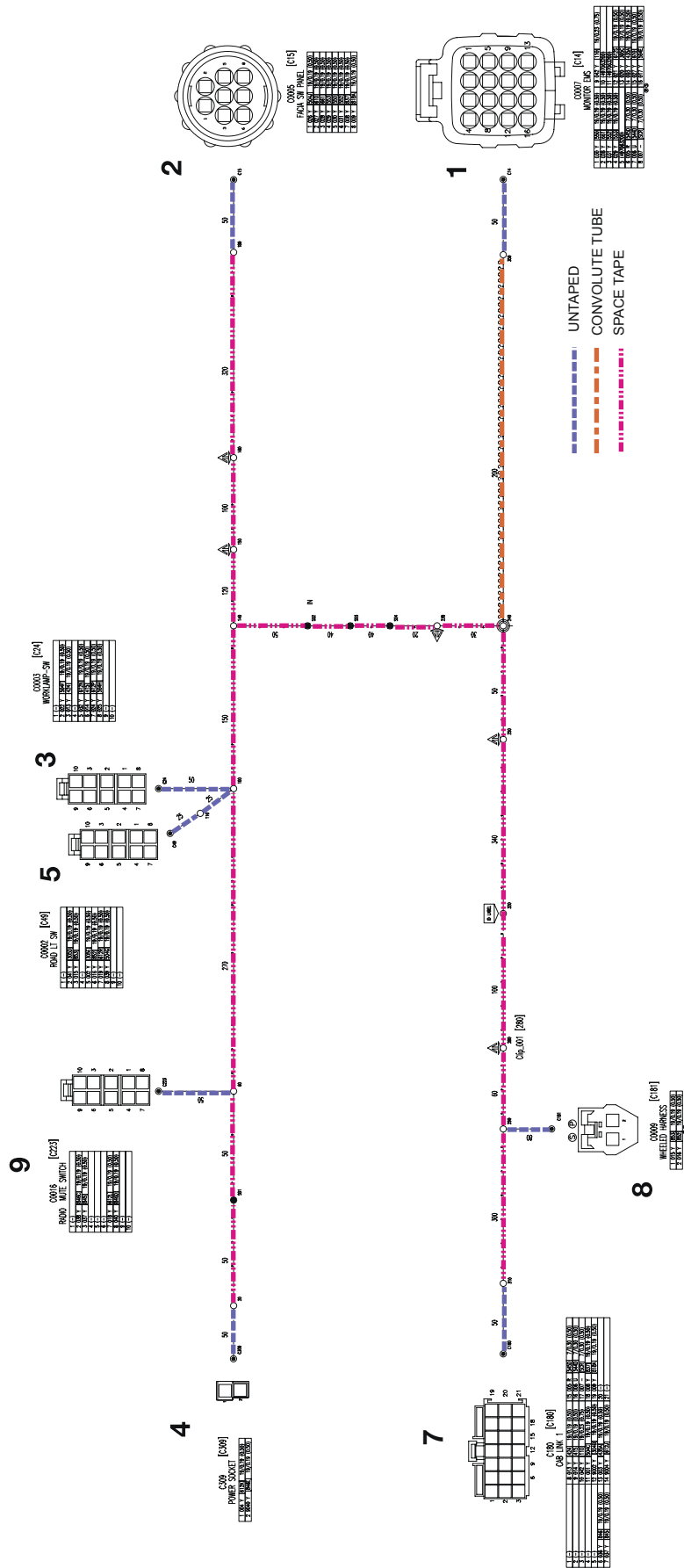
Fascia Link Harness

13	420	Fresh/Recirc. 1	⇒ Fig 215. (□ C-203) (heater only)
14	380	Water Valve	⇒ Fig 215. (□ C-203) (heater only)
15	370	Blower Speed Switch	⇒ Fig 215. (□ C-203) (heater only)



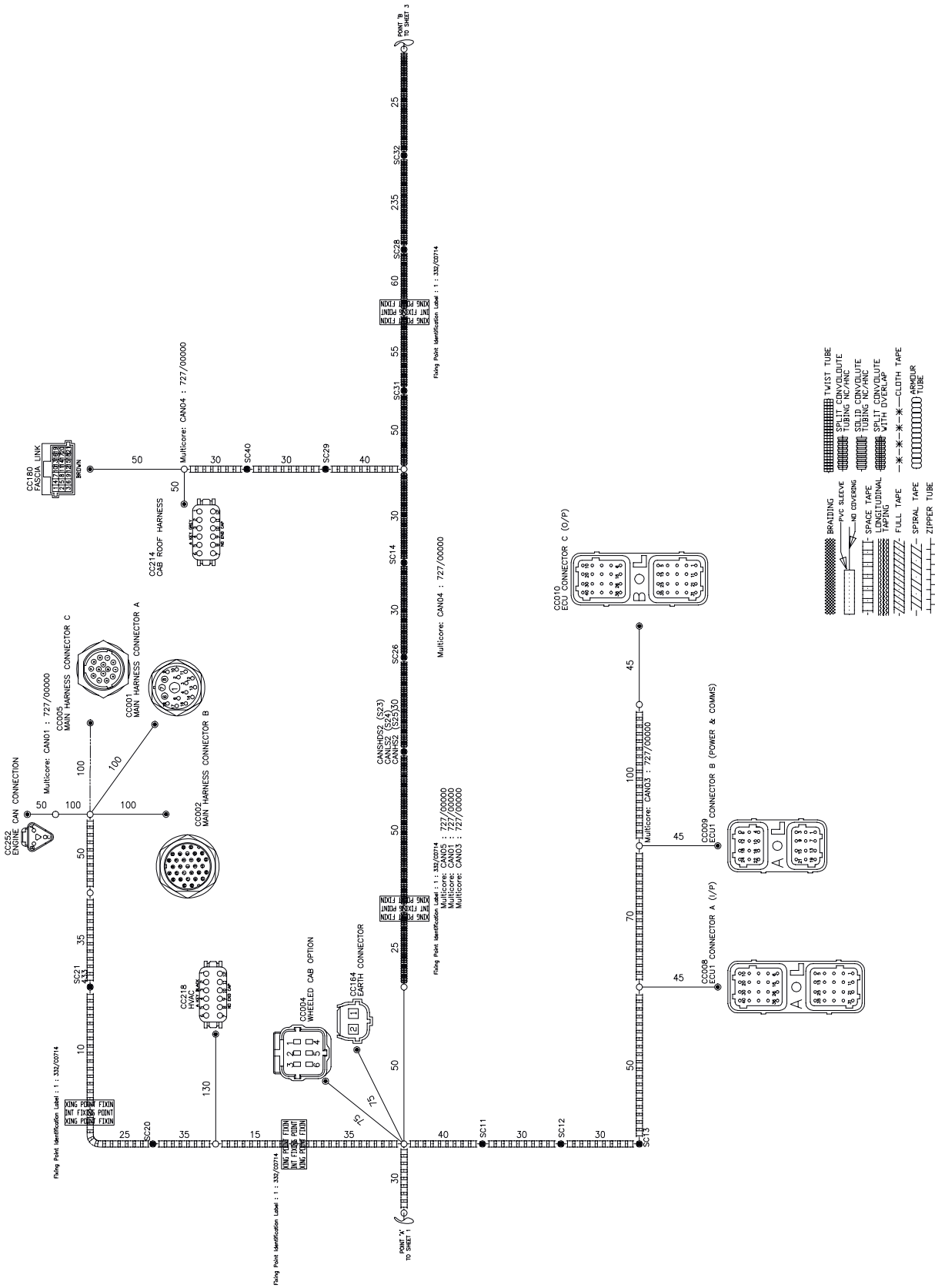
T056290

Fig 215. Machines with Heater 332/K2461 issue 2



T056280

Fig 216. Machines with ATC 332/K2452 issue 2



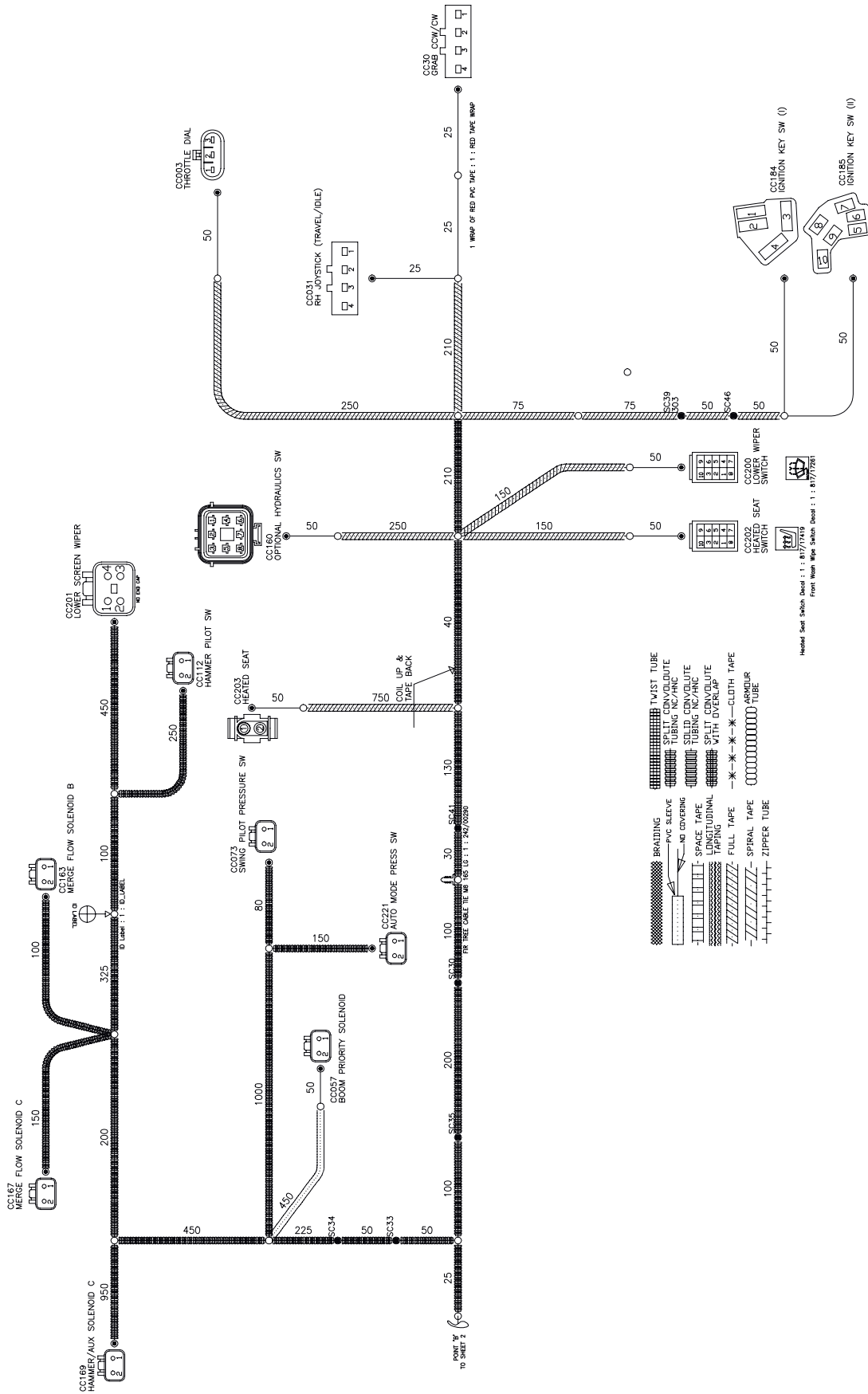


Fig 219. 333/J7613 issue 1

CC0032 LH JOSTICK - HAMMER			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	613A0.5	6C175-2	
2	613A0.5	6C175-2	

3 Way C Type Female Housing : 1 : 7233/0016

CC0033 LH JOSTICK - HAMMER			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	612H0.5	6C173-8	
2	612H0.5	6C173-8	

3 Way C Type Female Housing : 1 : 7233/0016

CC0034 LH JOSTICK - HORN SW			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	613A0.5	6C175-5	
2	613A0.5	6C175-5	

3 Way C Type Female Housing : 1 : 7233/0016

CC0035 INTERIOR LIGHT SW			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	302B0.5	5SC02-3	
2	302B0.5	5SC02-3	

10 Way 6.3 Fastin Switch Hsg : 1 : 7219/0013

CC115 LEVER LOCK			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	848.0	5SC001-1	
2	422B0.5	5SC45-2	

3 Way Econo 070 Socket Retainer : 1 : 7213/0026

CC173 EARTH HEATER 1			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	612L3.0	5SC028-3	
2	612D0.5	5SC009-1	

10 WAY FEMALE HEADER CORN : 1 : 7239/0041

CC173 EARTH HEATER 2			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	601G10.5	6C163-2	
2	601H0.5	6C167-2	

10 WAY FEMALE HEADER CORN : 1 : 7239/0041

CC173 EARTH HEATER 3			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	613A0.5	6C031-1	
2	613A0.5	6C032-2	

10 WAY FEMALE HEADER CORN : 1 : 7239/0041

CC173 EARTH HEATER 4			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	614B0.5	6C115-3	
2	614B0.5	6C115-3	

10 WAY FEMALE HEADER CORN : 1 : 7239/0041

CC0011 DIAGNOSTIC CONNECTOR			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
A	612H0.5	6C173-8	
B	305.1	6C0338-8	

9 Way Male J1939 Housing Jam Nut Type : 1 : 7219/0098
Jam Nut Plastic M35 : 1 : 7210/0116
AC10 Dust Cover with Lanyard (Optional) : 1 : 7210/0117

CC0013 RELAY HOUSING			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	604B1.0	5SC05-1	
2	604B1.0	5SC05-1	

10 Way 6.3 Fastin Switch Hsg : 1 : 7219/0013

CC224 12V VOLT SENSOR			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	502A0.5	5SC02-2	
2	108B0.5	5SC32-6	

6 Way D106 Soc Hsg, NO END CAP : 1 : 7216/0041
6 Way D106 Wedge : 1 : 7216/0042

CC219 AUX 2 SENSORS			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	601A2.0	5SC01-1	
2	601A2.0	5SC01-1	

2 Way Econo 070 Socket Retainer : 1 : 7212/0069

CC226 AUX 2 SENSORS			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	601E0.5	5SC01-2	
2	601E0.5	5SC01-2	

2 Way Econo 070 Socket Retainer : 1 : 7212/0069

CC339 PUMP			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	842A0.5	5SC04-2	
2	822B0.5	5SC18-2	

12 Way Junior Power Timer Fem Hsg Stake : 1 : 332/R5922
12 Way Junior Power Timer Soc Lock : 1 : 332/R5929

CC340 PEB XT			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	107.0	5SC31-1	
2	829.0	5SC002-2	

8 Way DFK1 Fem Hsg Red : 1 : 332/R5933

CC339 PUMP			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	842A0.5	5SC04-2	
2	822B0.5	5SC18-2	

12 Way Junior Power Timer Fem Hsg Stake : 1 : 332/R5922
12 Way Junior Power Timer Soc Lock : 1 : 332/R5929

CC340 PEB XT			
CELL TAG	CSA	DEST	CELL TAG CSA DEST
1	107.0	5SC31-1	
2	829.0	5SC002-2	

8 Way DFK1 Fem Hsg Red : 1 : 332/R5933

Fig 220. 333/J7613 issue 1

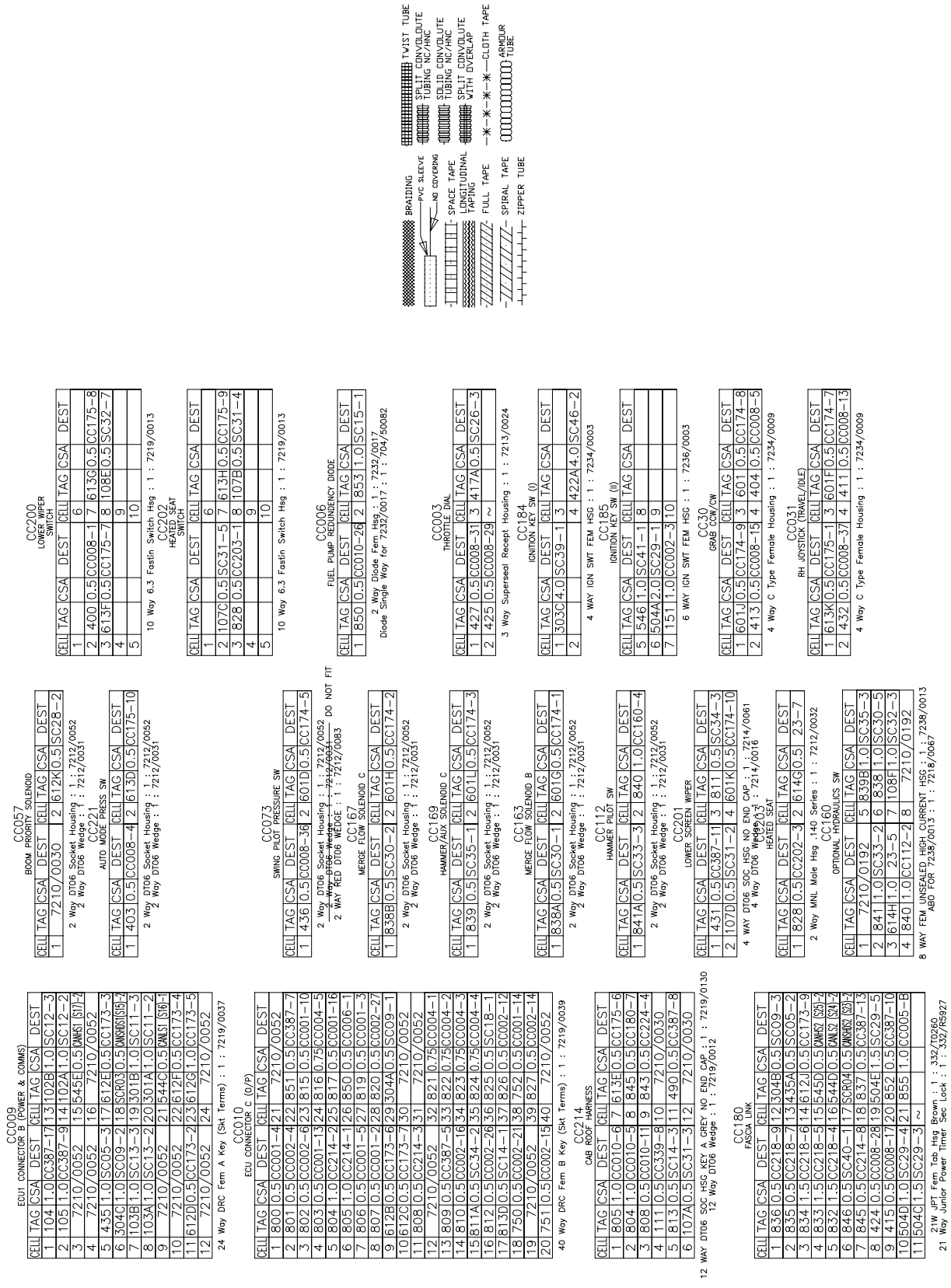


Fig 221. 333/J7613 issue 1



Section C - Electrics Harness Data

Cab Harness JS115-145

<p>SC01 EARTH SPLICE 1</p> <p>9106 2.0 C0174-4 175 0.5 C0184-1 175 0.5 C0184-2 245 2.0 C0224-1</p>	<p>SC21 CAN SHIELD SPICE 1 (S15)</p> <p>565 0.5 C0318-9 272 0.5 C0218-3 272 0.5 C0218-4 272 0.5 C0218-5</p>	<p>SC34 811</p> <p>131 0.5 C0382-15 292 0.5 C0210-15</p>	<p>SC35 839</p> <p>017 0.5 C0184-1 210 0.5 C0339-4</p>	<p>SC12 109</p> <p>158 1.0 C0384-4 093 1.0 C0208-13</p>
<p>SC02 BATTERY BH SPLICE</p> <p>9284 0.5 C0224-2 284 0.5 C0224-1</p>	<p>CAN SHIELD SPICE 2 (S23)</p> <p>225 0.5 C0311-3 272 0.5 C0218-3 272 0.5 C0218-4 272 0.5 C0218-5</p>	<p>SC29 504</p> <p>272 2.0 C0184-6 9127 1.5 C0313-2 139 1.0 C0313-7 292 1.0 C0218-19</p>	<p>SC30 836</p> <p>038 0.5 C0184-1 086 0.5 C0187-1 136 0.5 C0202-24 211 0.5 C0339-2</p>	<p>SC13 103</p> <p>264 1.0 C0384-2 084 1.0 C0208-8 084 1.0 C0208-7 137 1.0 C0208-9</p>
<p>SC04 REDUNDANCY ON SPLICE</p> <p>118 0.5 C0339-4 265 0.5 C0339-1</p>	<p>CAN SHIELD SPICE 1 (S17)</p> <p>563 0.5 C0318-4 272 0.5 C0218-3 272 0.5 C0218-4 272 0.5 C0218-5</p>	<p>SC40 846</p> <p>301 1.0 C0218-11 390 0.5 C0224-5</p>	<p>SC41 IGNITION SIGNAL ON</p> <p>048 1.0 C0318-3 049 1.0 C0202-5</p>	<p>SC46</p> <p>108 4.0 C0184-4 041 0.5 C0208-26</p>
<p>SC05 REDUNDANCY OFF SPLICE</p> <p>987 1.0 C0313-1 138 0.5 C0180-13 266 1.0 C0384-2</p>	<p>CAN SHIELD SPICE 2 (S25)</p> <p>223 0.5 C0311-3 272 0.5 C0218-3 272 0.5 C0218-4 272 0.5 C0218-5</p>	<p>IGNITION SPLICE 107</p> <p>595 0.5 C0340-1 292 0.5 C0218-2 292 0.5 C0218-3 292 0.5 C0218-4 292 0.5 C0218-5</p>	<p>SC45 828</p> <p>116 0.75 C0115-2 086 0.5 C0208-33 114 0.5 C0208-21</p>	<p>SC15 FUEL PUMP</p> <p>172 1.0 C0202-31 119 1.0 C0208-2 121 1.0 C0218-4</p>
<p>SC06 IGNITION ± SPLICE</p> <p>987 2.0 C0218-1 268 2.0 C0224-2</p>	<p>CAN SHIELD SPICE 1 (S16)</p> <p>564 0.5 C0318-4 272 0.5 C0218-3 272 0.5 C0218-4 272 0.5 C0218-5</p>	<p>SC28 612</p> <p>048 1.0 C0301-7 9059 3.0 C0173-1</p>	<p>SC39 303</p> <p>115 4.0 C0184-1 160 1.0 C0338-1</p>	
<p>SC14</p> <p>131 0.5 C0397-12 262 0.5 C0339-12 107 0.5 C0310-17</p>	<p>CAN SHIELD SPICE 2 (S26)</p> <p>223 0.5 C0311-3 272 0.5 C0218-3 272 0.5 C0218-4 272 0.5 C0218-5</p>	<p>IGNITION SPLICE 108</p> <p>036 2.0 C0202-22 267 2.0 C0340-4 292 0.5 C0218-2 292 0.5 C0218-3</p>	<p>SC11 301</p> <p>089 1.0 C0208-20 088 1.0 C0208-19</p>	<p>SC16</p> <p>262 1.0 C0338-7 113 2.0 C0201-8</p>

Fig 223. 333/J7613 issue 1

Engine Harness JS115-145

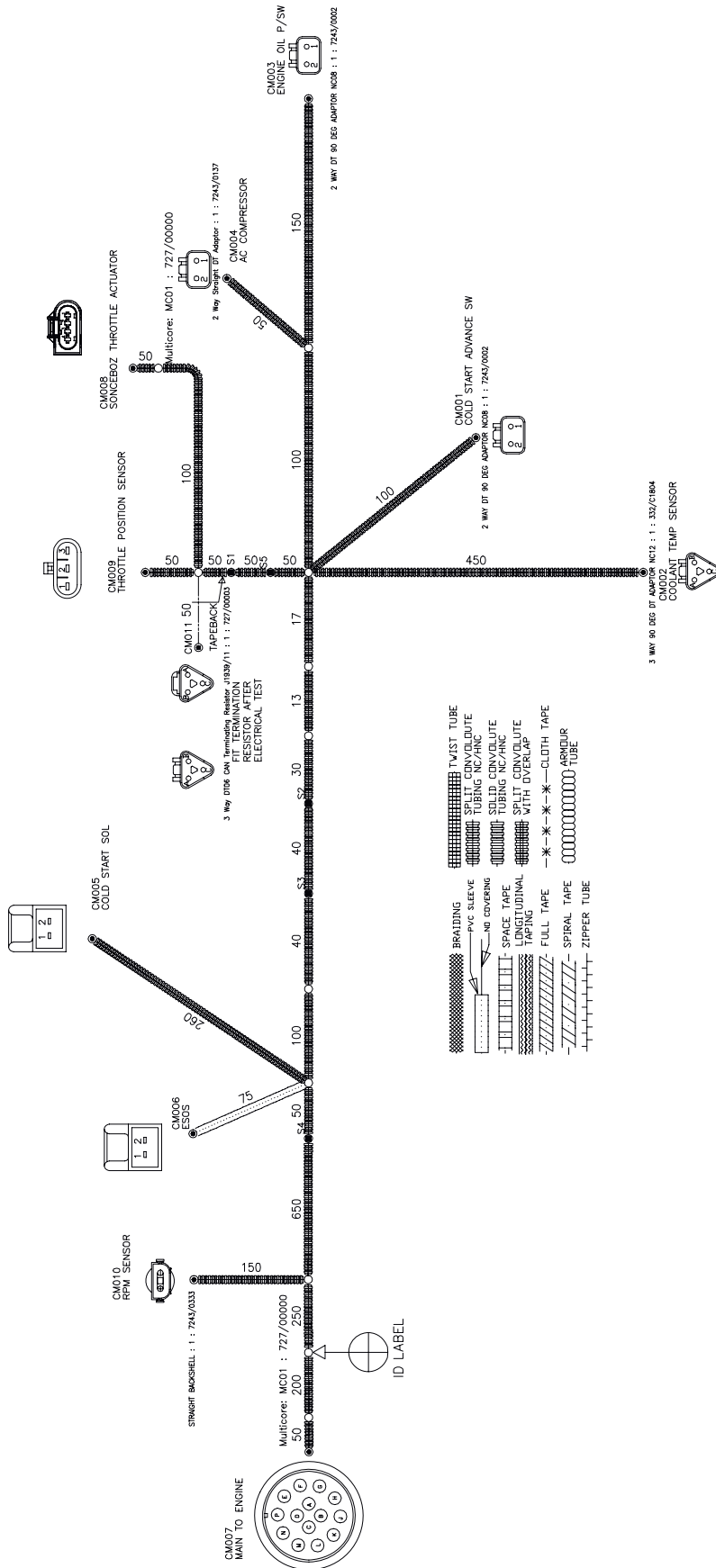


Fig 225. 333/J7615 issue 1

Cab Harness JS160-JS220 (Includes Engine Harness)

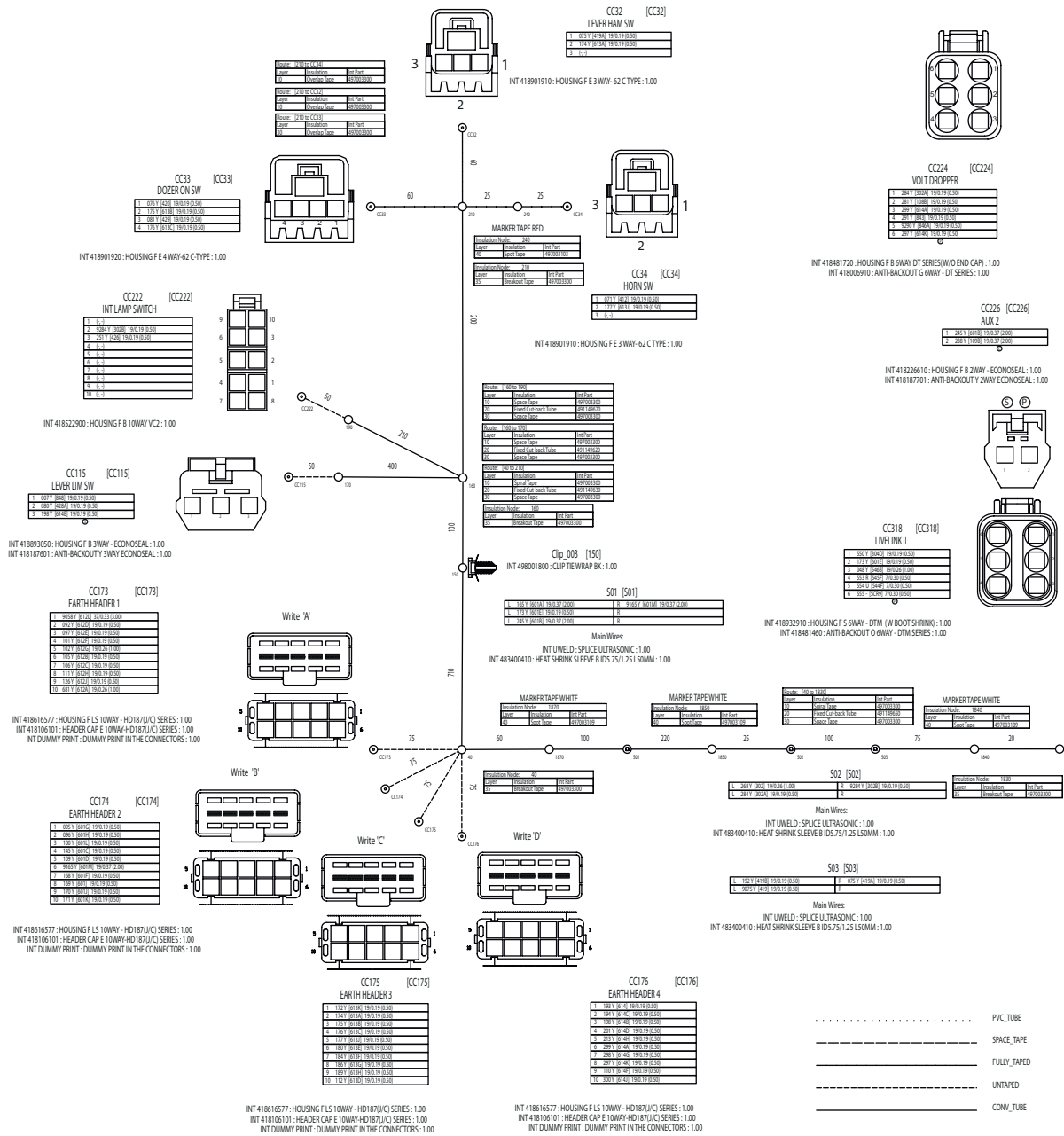


Fig 227. Cab Harness A 332/J2885 issue 4

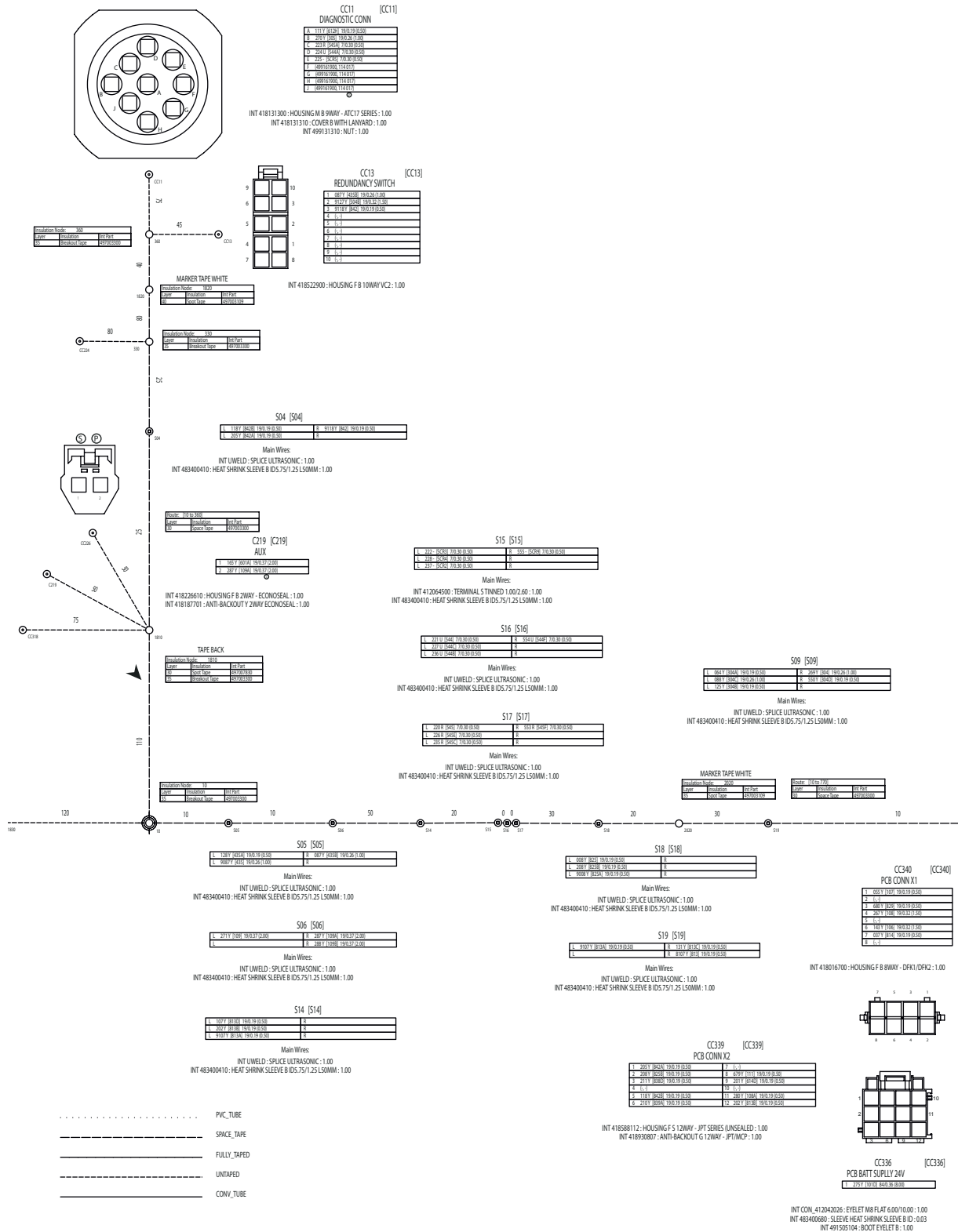


Fig 228. Cab Harness B 332/J2885 issue 4

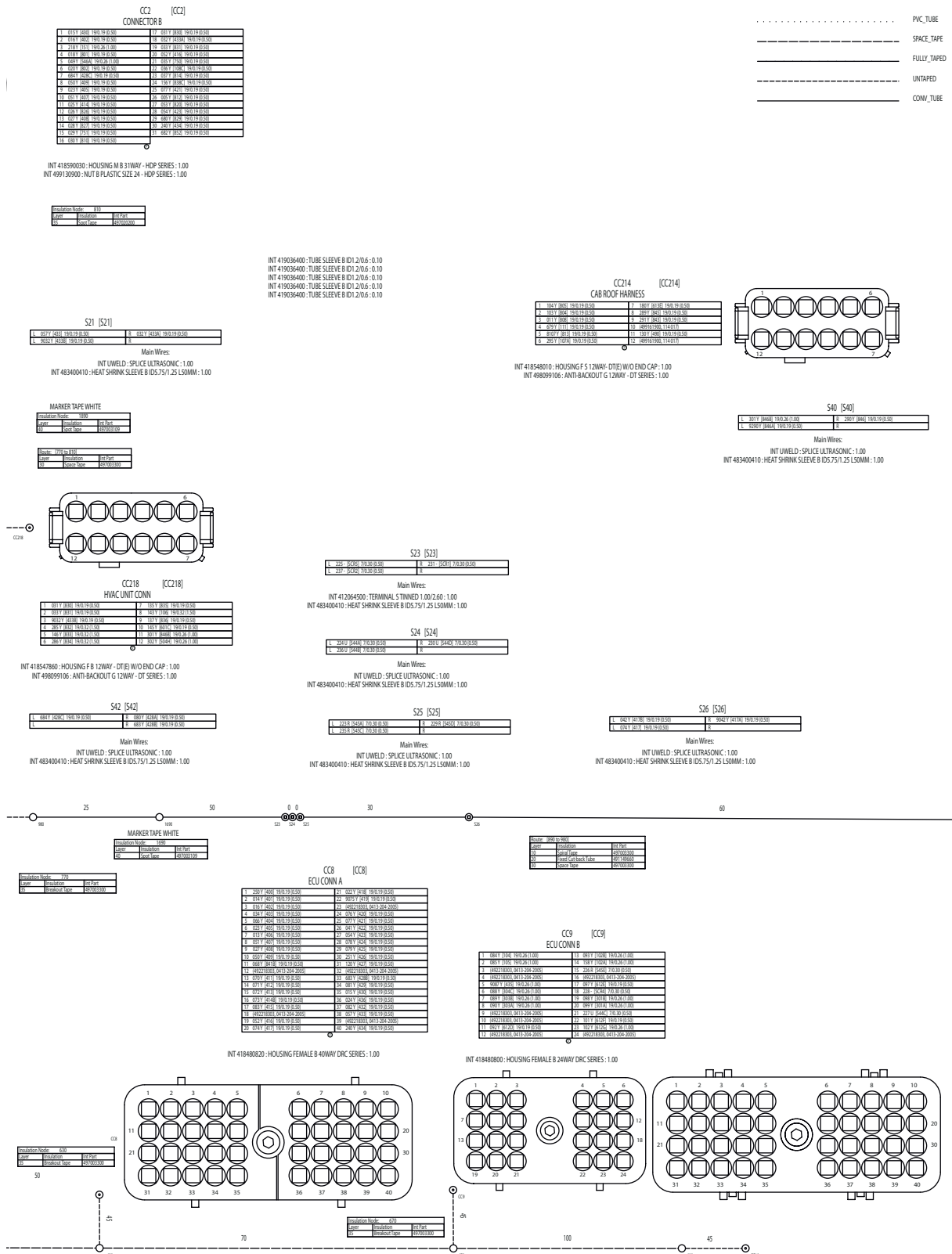


Fig 230. Cab Harness D 332/J2885 issue 4

