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Electrics

Service Manual - 527-58

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Section 2 - Care and Safety
Section 3 - Routine Maintenance
Section B - Body and Framework
Section C - Electrics
Section E - Hydraulics
Section F - Transmission
Section G - Brakes
Section H - Steering
Section K - Engine
Section M - Electronic Data Systems



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Fuses and Relays

Introduction

This topic contains information for identification and location of fuses and relays. Use the information together with the electrical schematics given in the topics.

The fuse and relays are identified together with their connector numbers. The connector numbers are referred to in other sections of this manual.

⇒ *Fuses (C1-2)*
⇒ *Link Box Fuses (C1-3)*
⇒ *Relays (C1-4)*

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Fuses

For fuse details, refer to ***Section 3 - Routine Maintenance***.

Link Box Fuses

For fuse details, refer to ***Section 3 - Routine Maintenance***.

Relays

For relay details, refer to ***Section 3 - Routine Maintenance***.

Schematics

Introduction

This topic contains electrical schematics for the complete system. Detailed schematics for individual systems are given throughout the manual.

Use the schematics together with the correct electrical harness drawings to see connector pin details. ***Refer to Section C***.

⇨ *Electrical Schematic (C2-2)*

Electrical Schematic

Sheets

Note: *Sheet 1 is not included as it only contains an index to the other sheets.*

⇨ *Sheet 2 - Engine (C2-3)*
⇨ *Sheet 3 - Transmission 1 (C2-4)*
⇨ *Sheet 4 - Transmission 2 (C2-5)*
⇨ *Sheet 5 - Hand Throttle (C2-6)*
⇨ *Sheet 6 - Varispeed (C2-7)*
⇨ *Sheet 7 - Hydraulic Control 1 (C2-8)*
⇨ *Sheet 8 - Hydraulic Control 2 (C2-9)*
⇨ *Sheet 9 - Hydraulic Control 3 (C2-10)*
⇨ *Sheet 10 - SRS (C2-11)*
⇨ *Sheet 11 - LLMI (C2-12)*
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⇨ *Sheet 17 - Washer Wiper (C2-18)*
⇨ *Sheet 18 - HVAC (C2-19)*
⇨ *Sheet 19 - Roadlights 1 (C2-20)*
⇨ *Sheet 20 - Roadlights 2 (C2-21)*
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⇨ *Sheet 22 - Brake Lamps (C2-23)*
⇨ *Sheet 23 - Direction Indicators (C2-24)*
⇨ *Sheet 24 - Parkbrake (C2-25)*
⇨ *Sheet 25 - ICE and Auxiliary (C2-26)*
⇨ *Sheet 26 - CANbus (C2-27)*

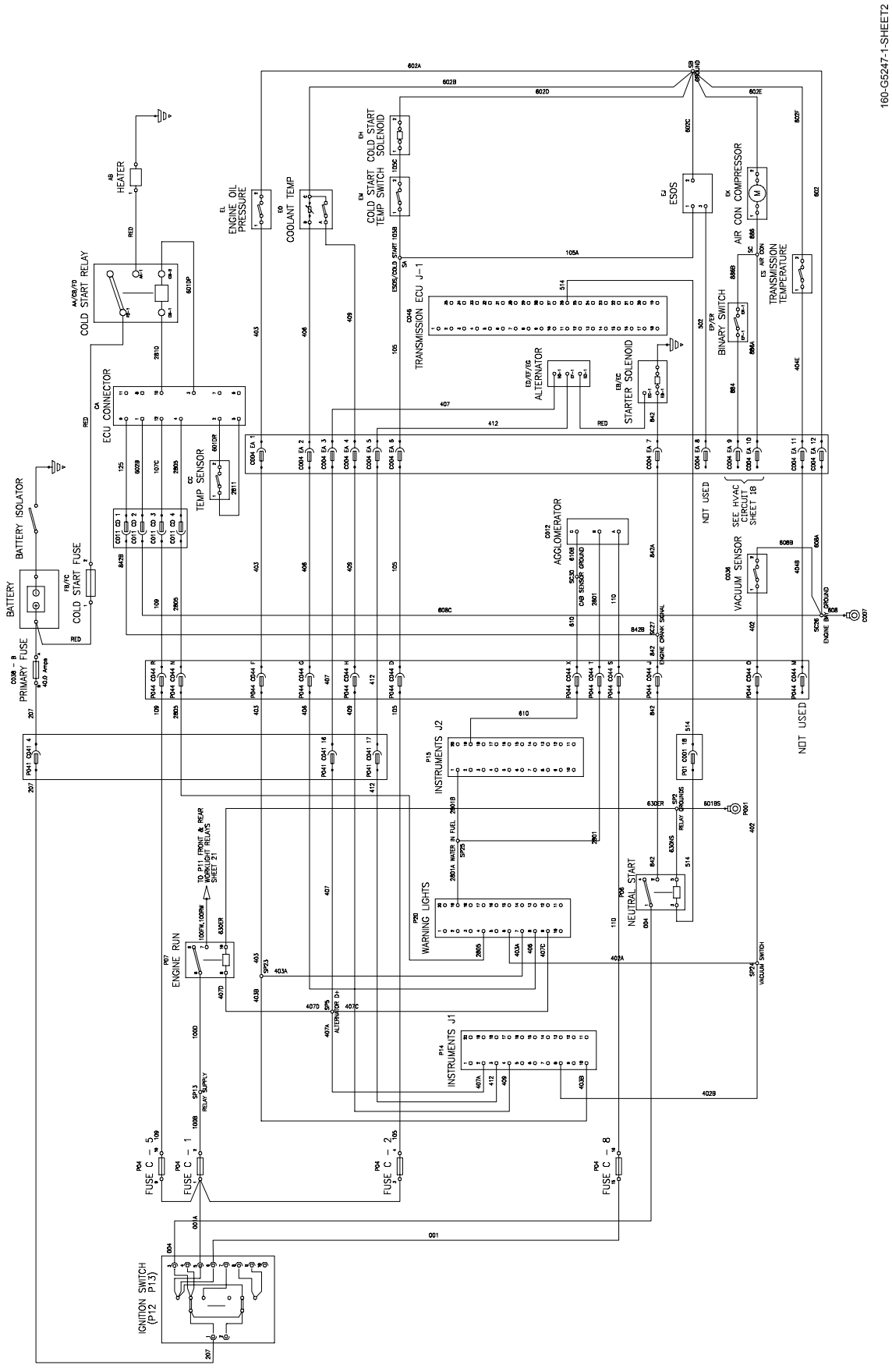


Fig 1. Sheet 2 - Engine

⇒ *Component Keys (C2-28)* | ⇒ *Sheets (C2-2)*

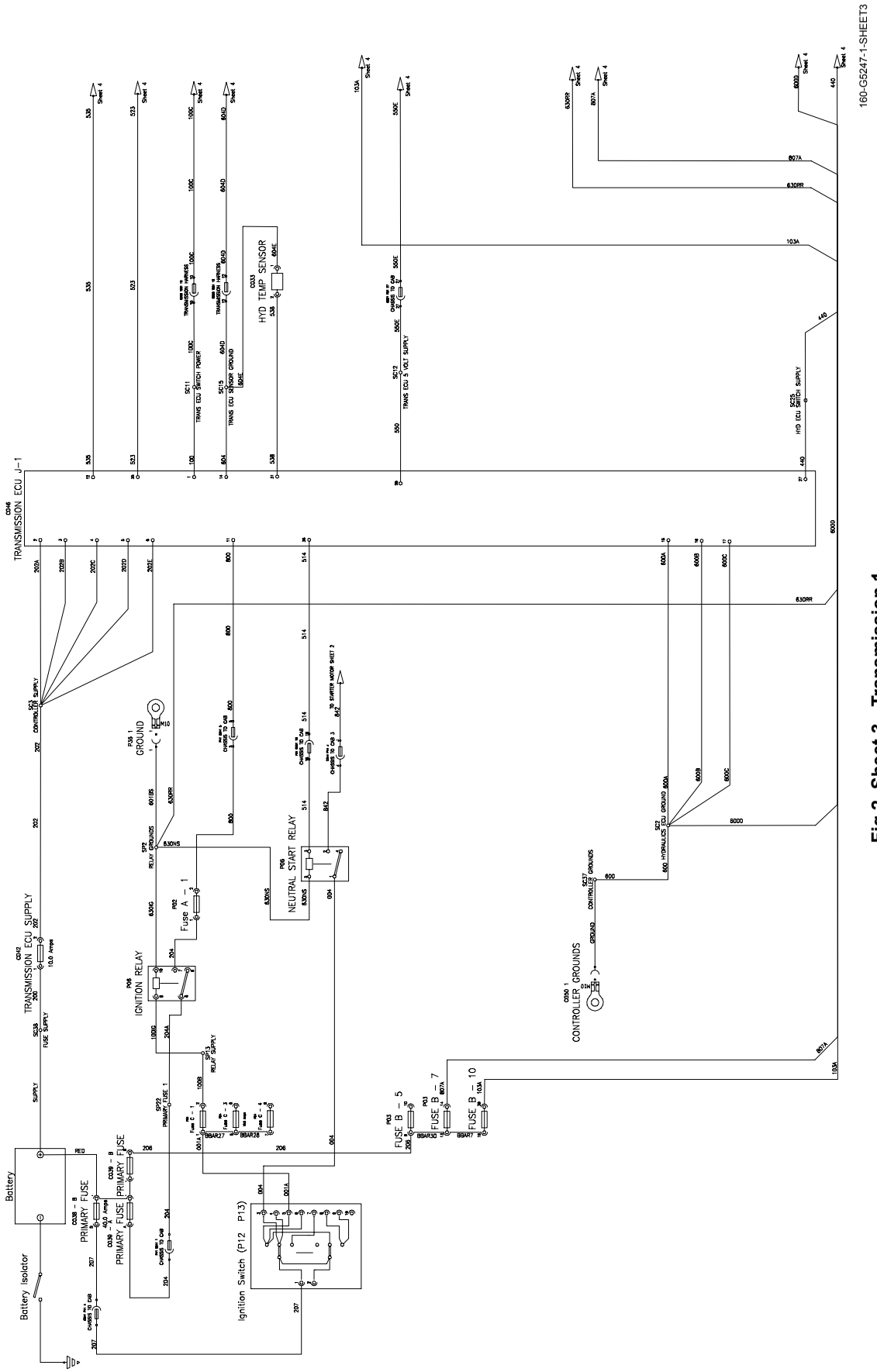
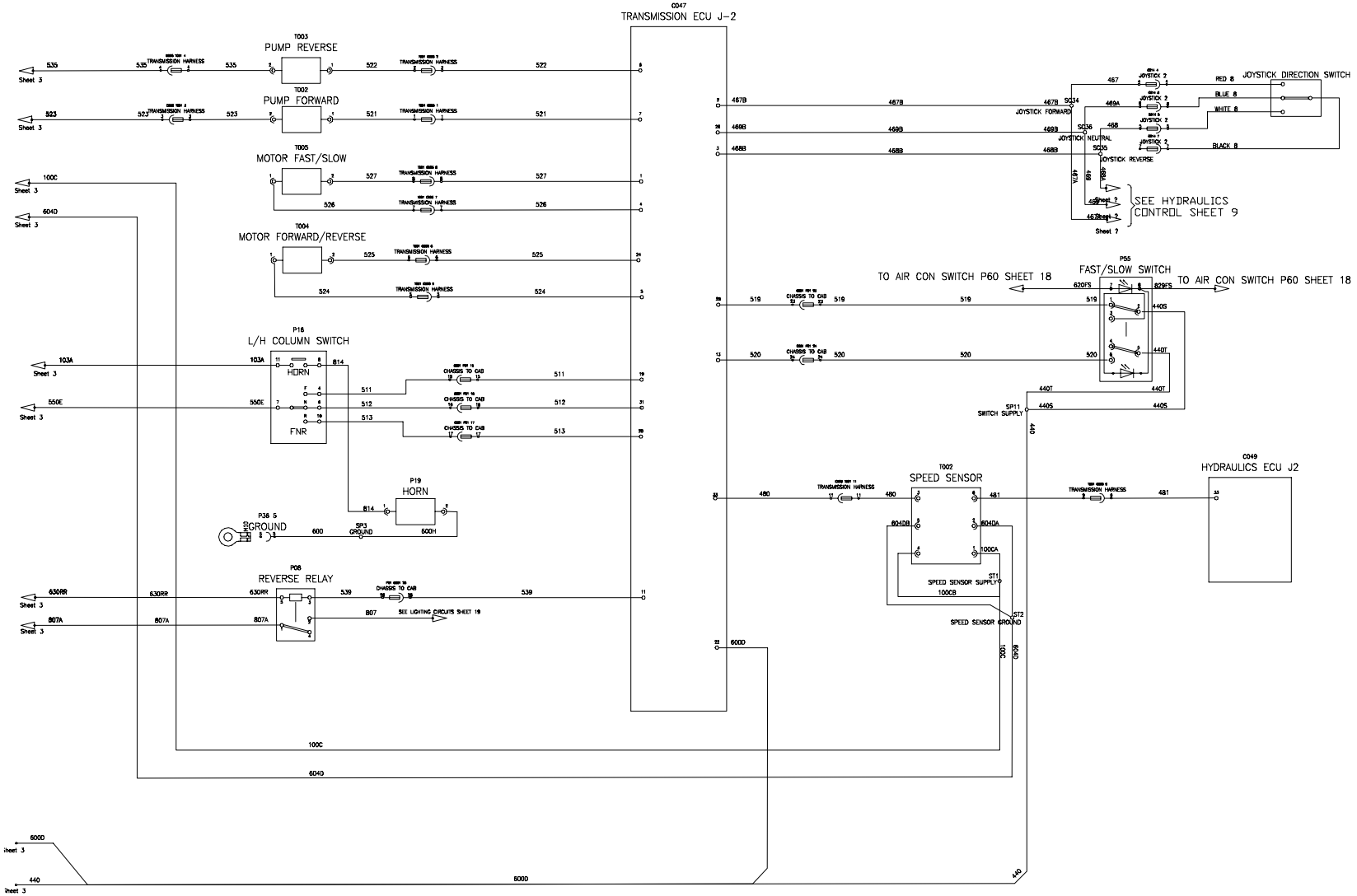


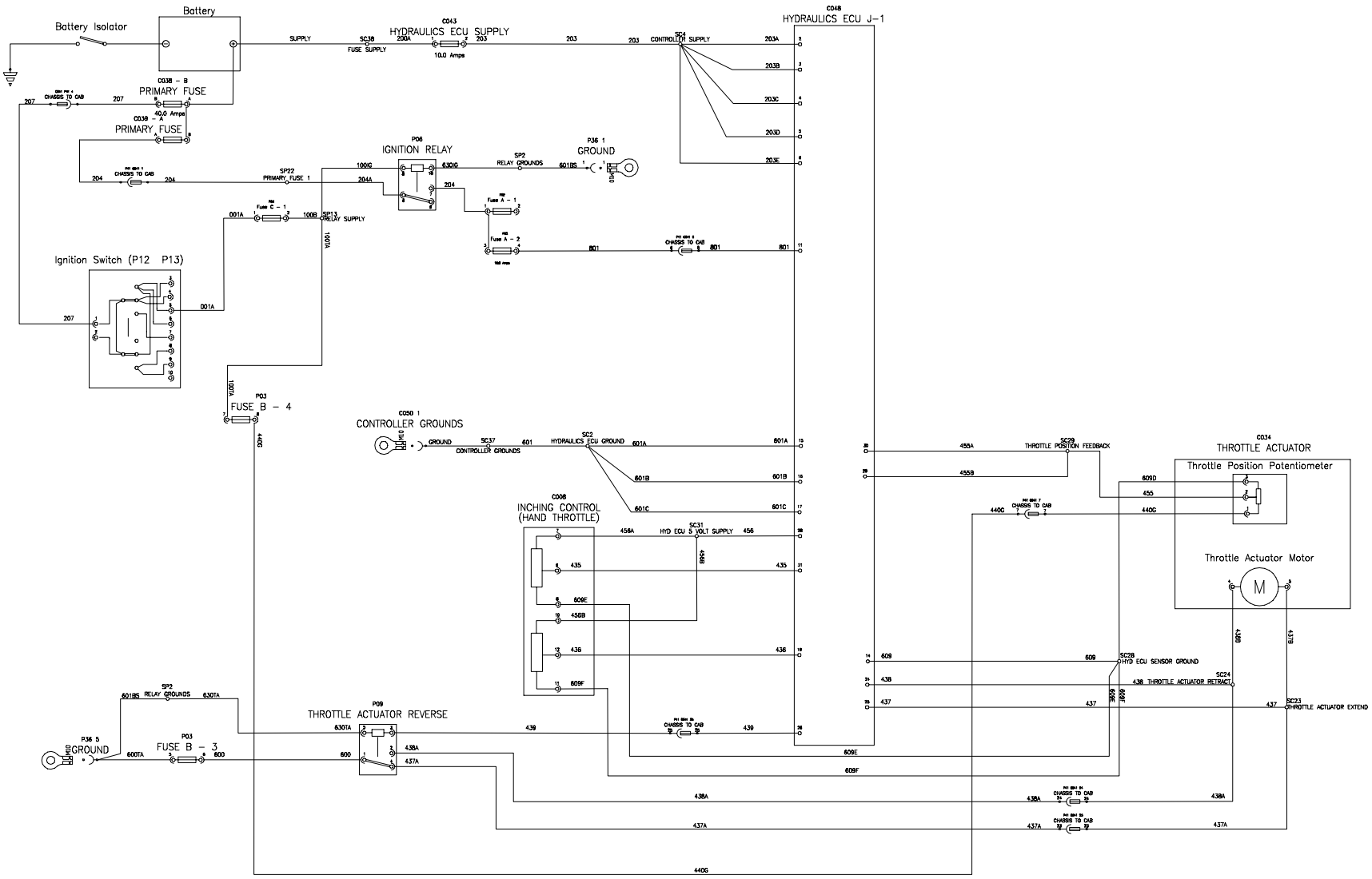
Fig 2. Sheet 3 - Transmission 1



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Fig 3. Sheet 4 - Transmission 2

⇒ *Component Keys (C2-28)*	⇒ *Sheets (C2-2)*



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Fig 4. Sheet 5 - Hand Throttle

⇒ *Component Keys (C2-28)* | ⇒ *Sheets (C2-2)*

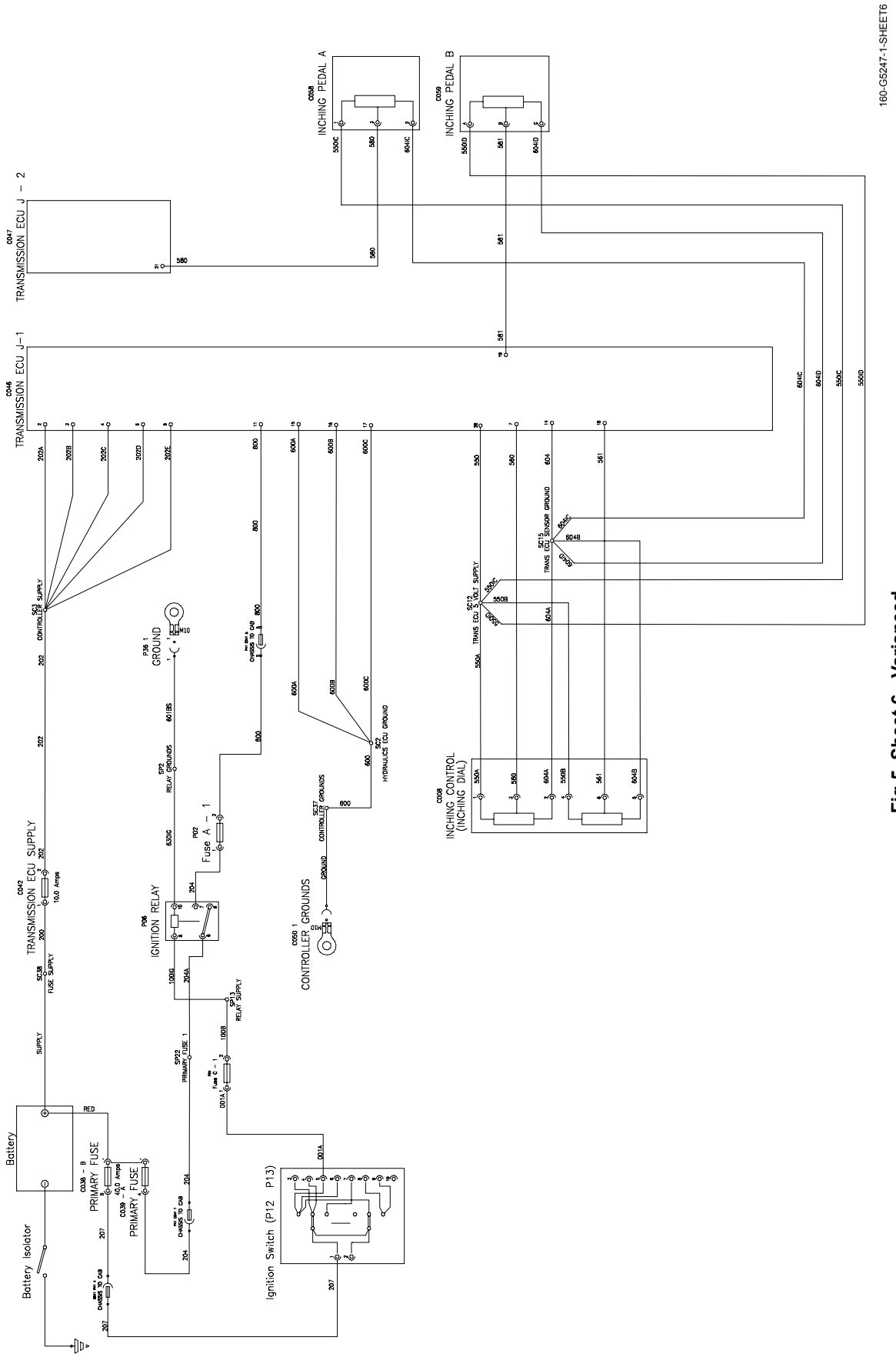


Fig 5. Sheet 6 - Varispeed

⇒ *Component Keys (C2-28)* | ⇒ *Sheets (C2-2)*

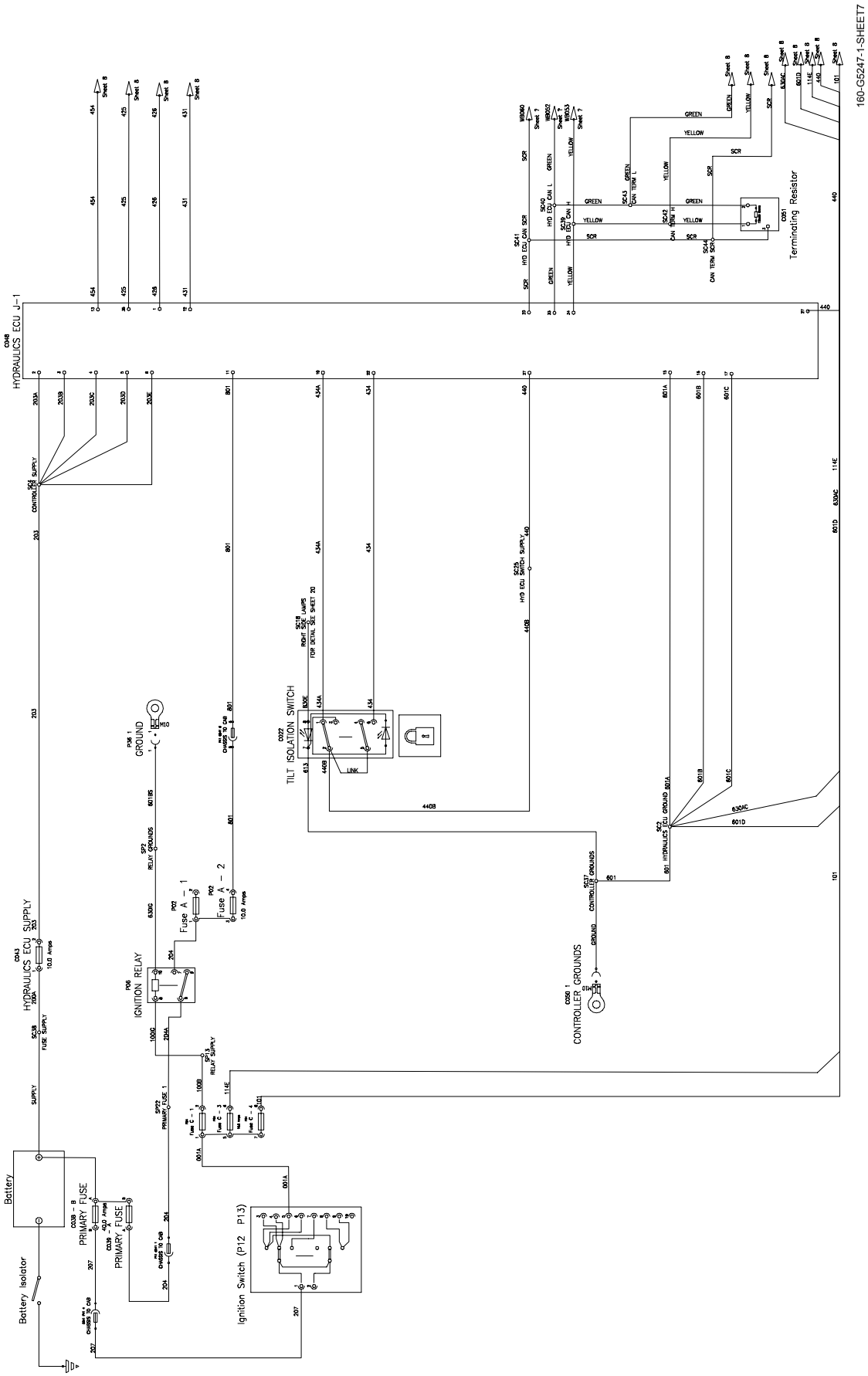


Fig 6. Sheet 7 - Hydraulic Control 1

⇒ Component Keys (C2-28) | ⇒ Sheets (C2-2)

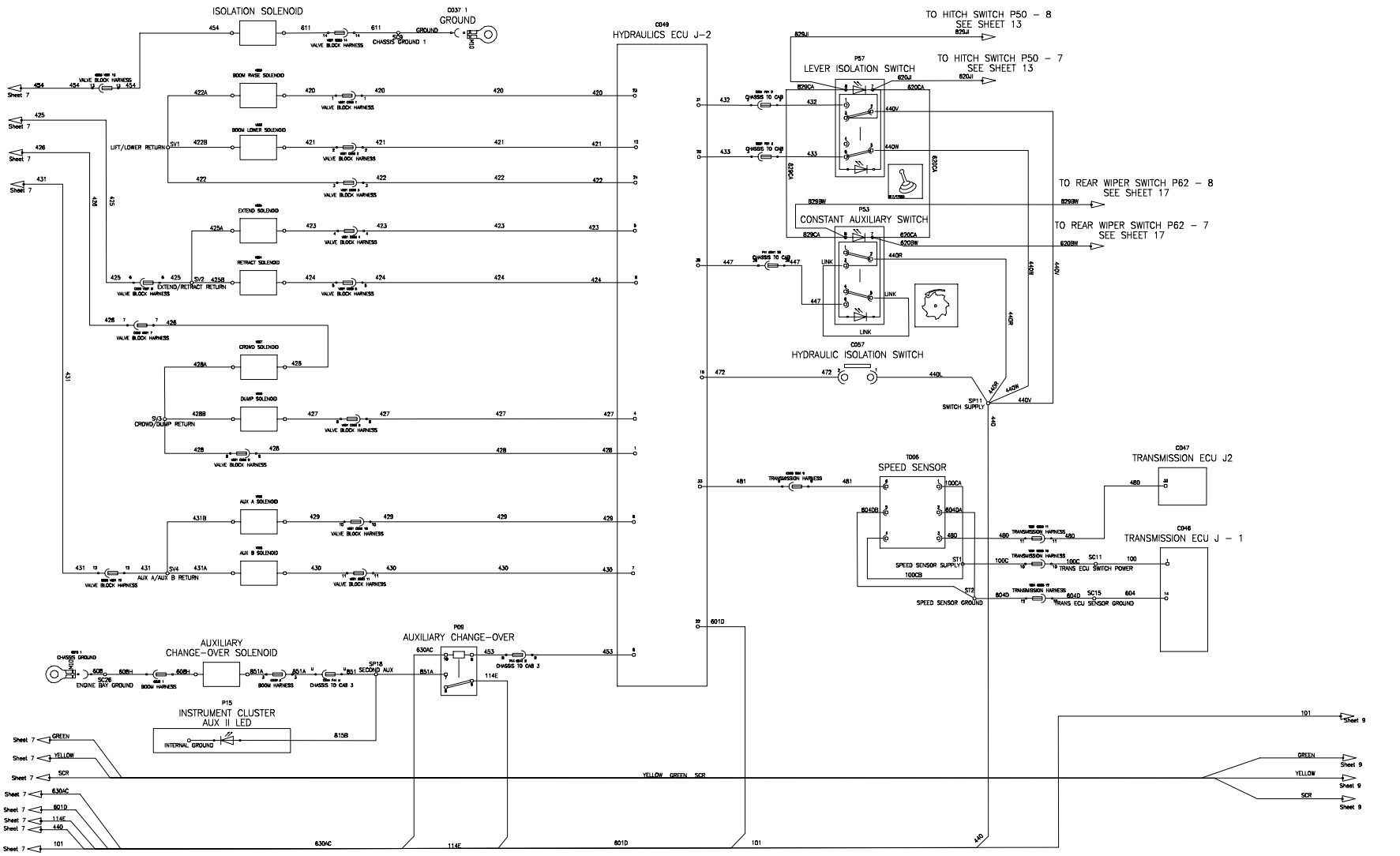


Fig 7. Sheet 8 - Hydraulic Control 2

⇒ *Component Keys (C2-28)* | ⇒ *Sheets (C2-2)*

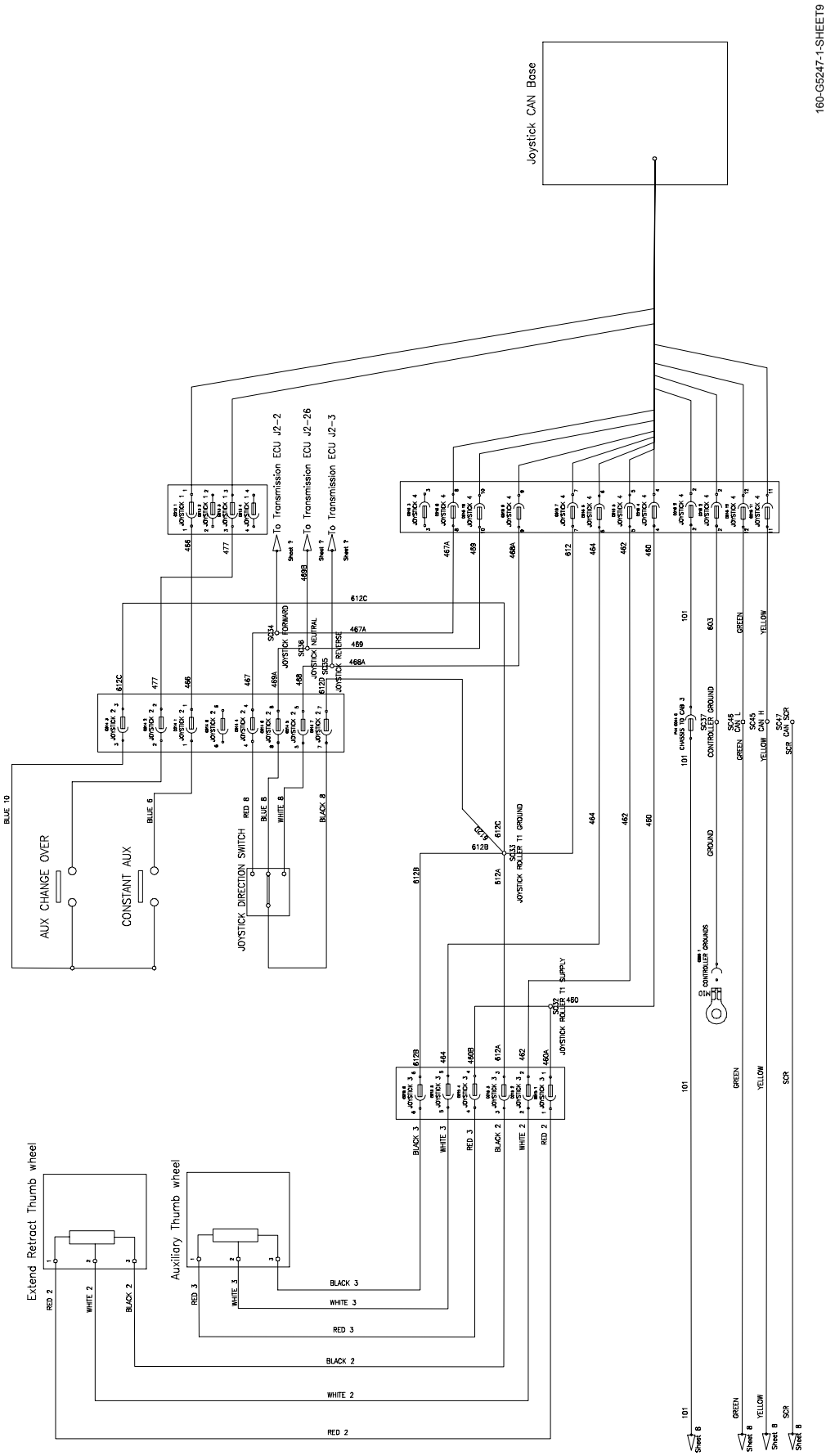
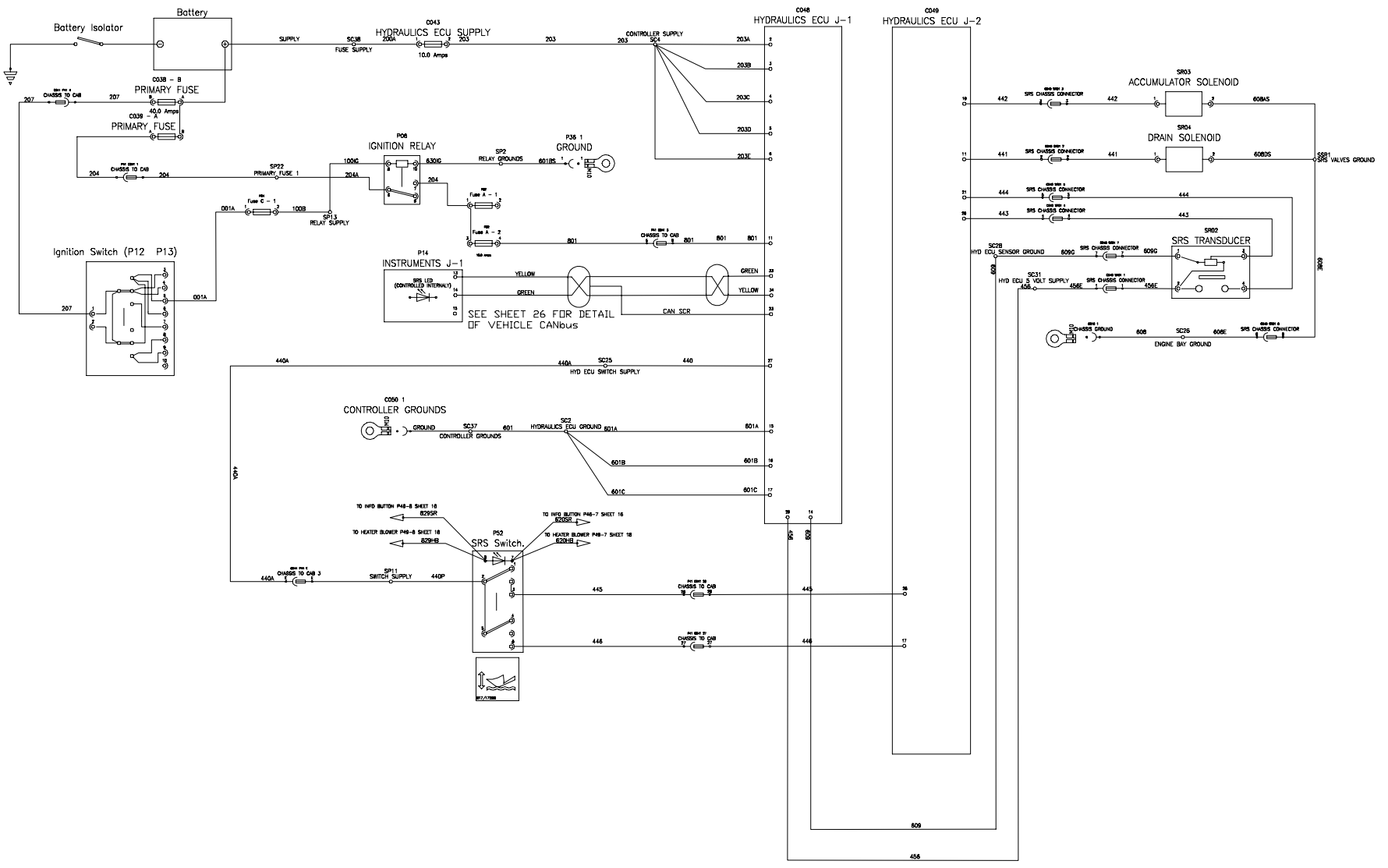


Fig 8. Sheet 9 - Hydraulic Control 3

⇒ Component Keys (C2-28) | ⇒ Sheets (C2-2)



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Fig 9. Sheet 10 - SRS

⇒ *Component Keys (C2-28)*	⇒ *Sheets (C2-2)*

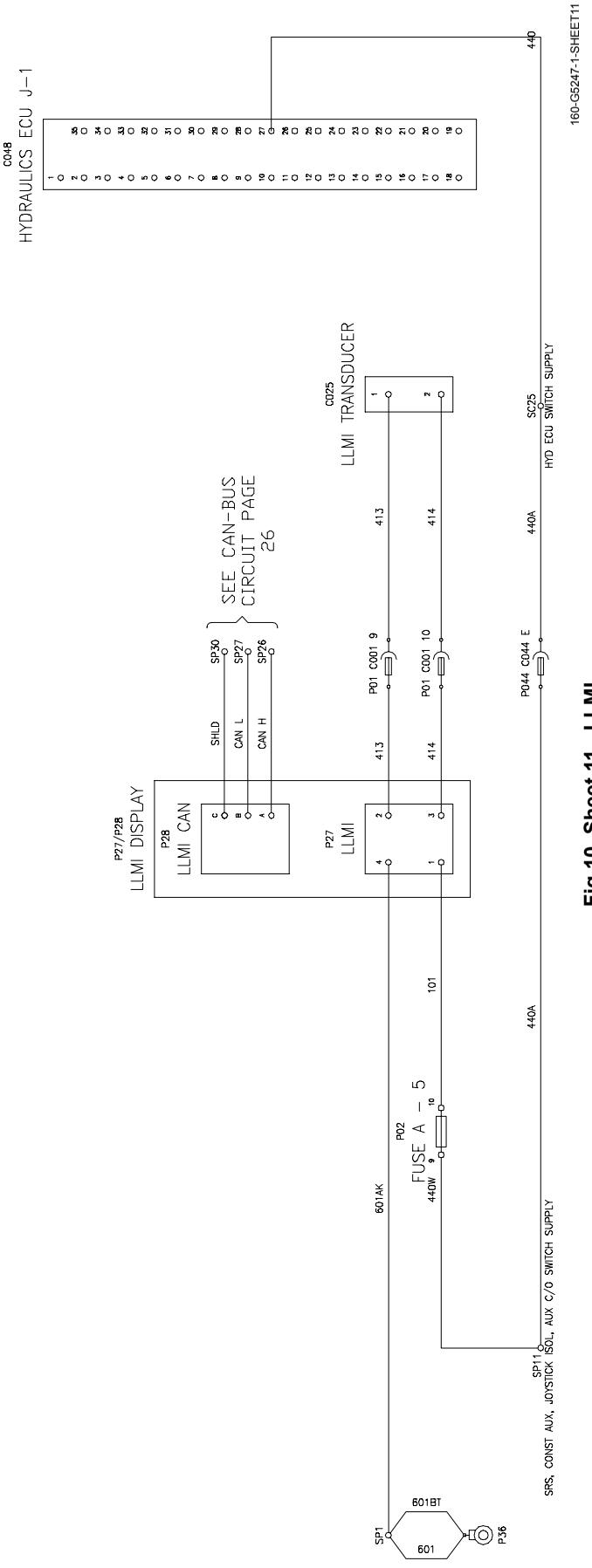
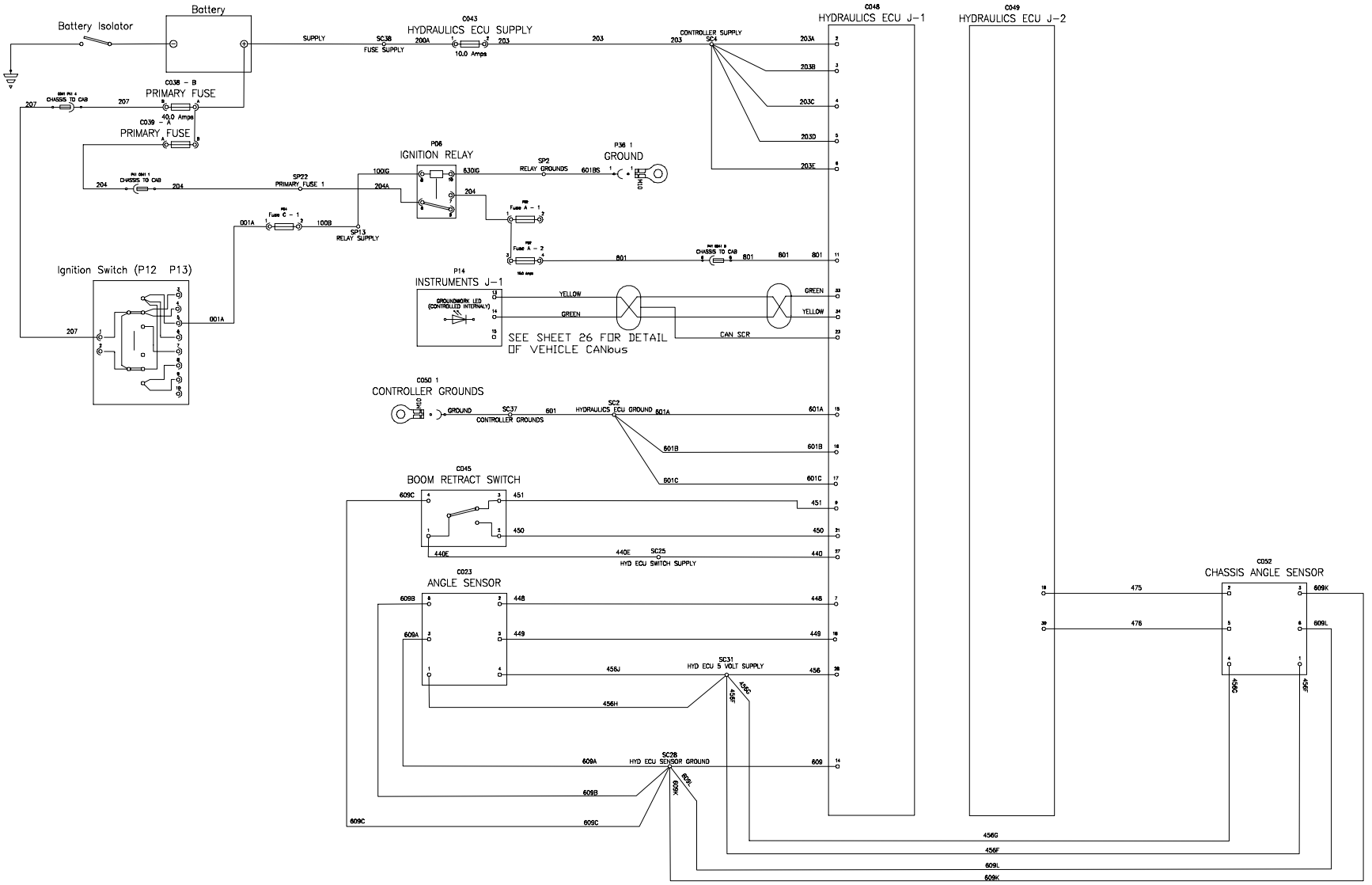


Fig 10. Sheet 11 - LLMI

⇒ *Component Keys (C2-28)* | ⇒ *Sheets (C2-2)*



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Fig 11. Sheet 12 - LLMC

⇒ *Component Keys (🗋 C2-28)*	⇒ *Sheets (🗋 C2-2)*

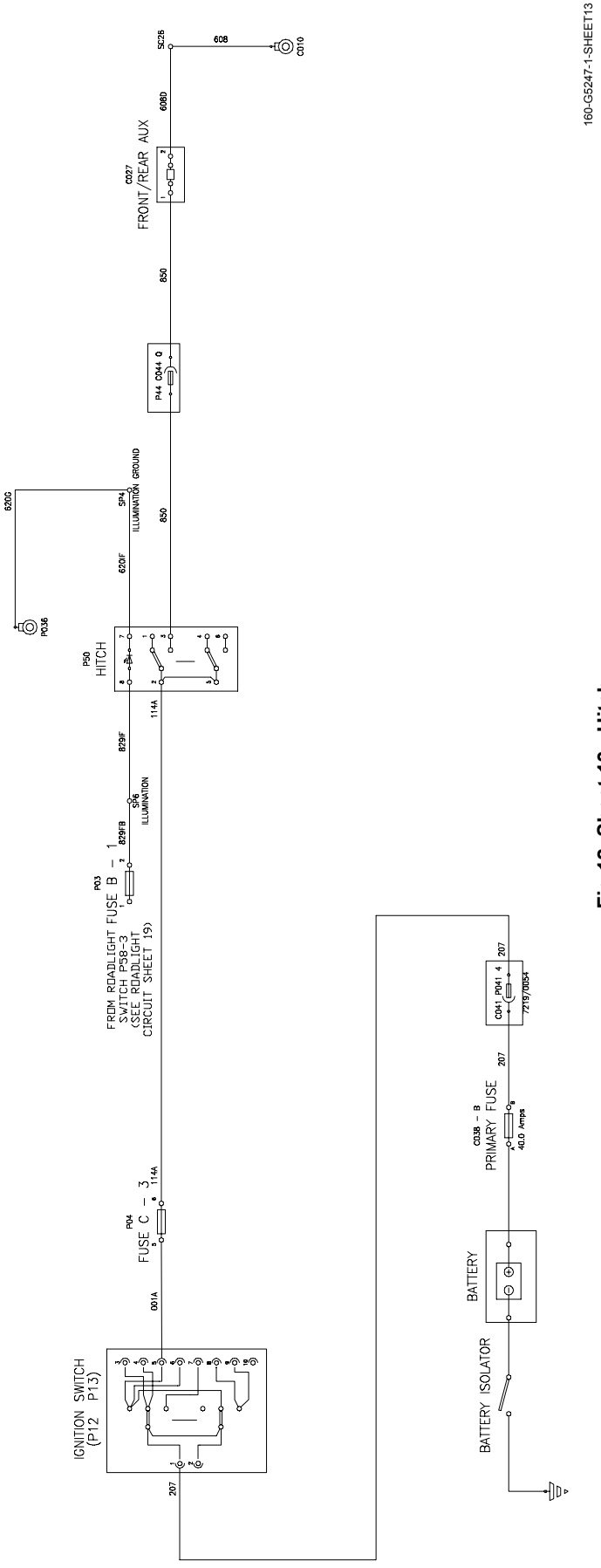


Fig 12. Sheet 13 - Hitch

⇒ *Component Keys (C2-28)* | ⇒ *Sheets (C2-2)*

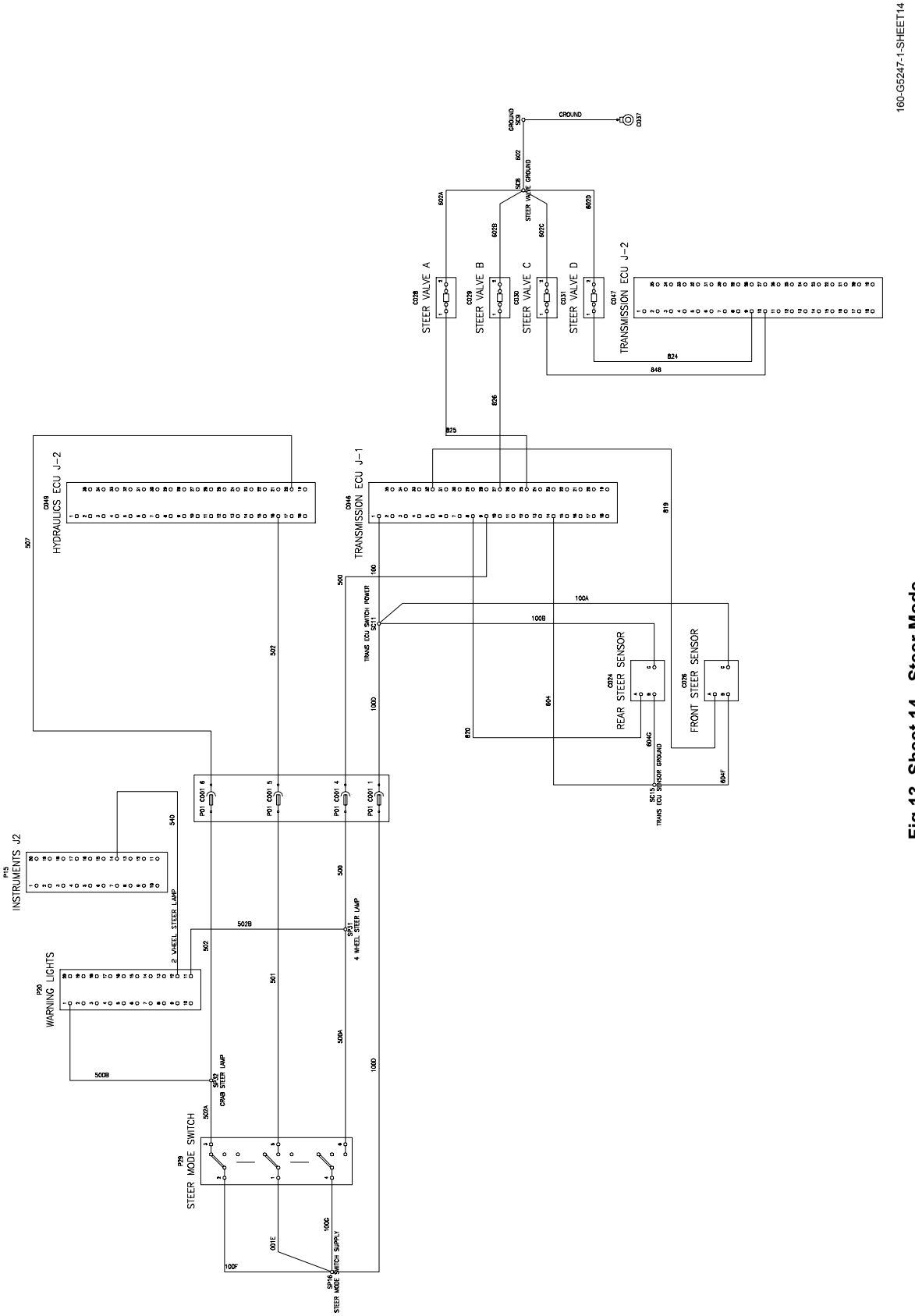


Fig 13. Sheet 14 - Steer Mode

⇒ Component Keys (C2-28) | ⇒ Sheets (C2-2)

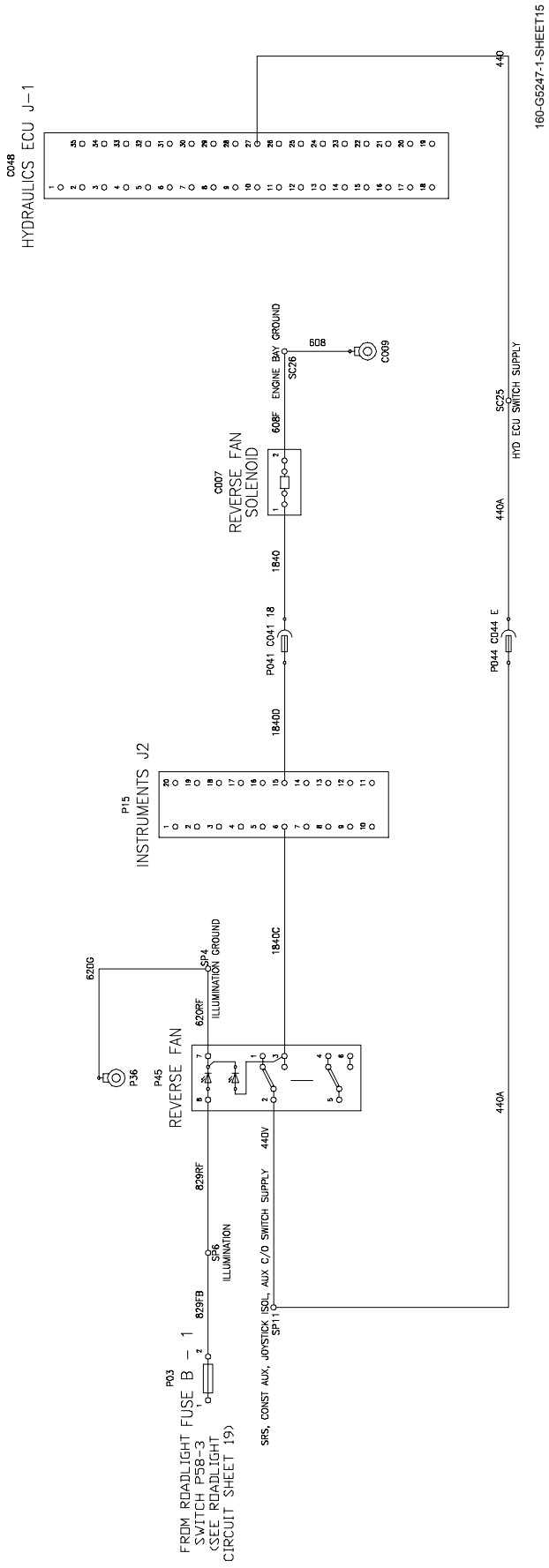
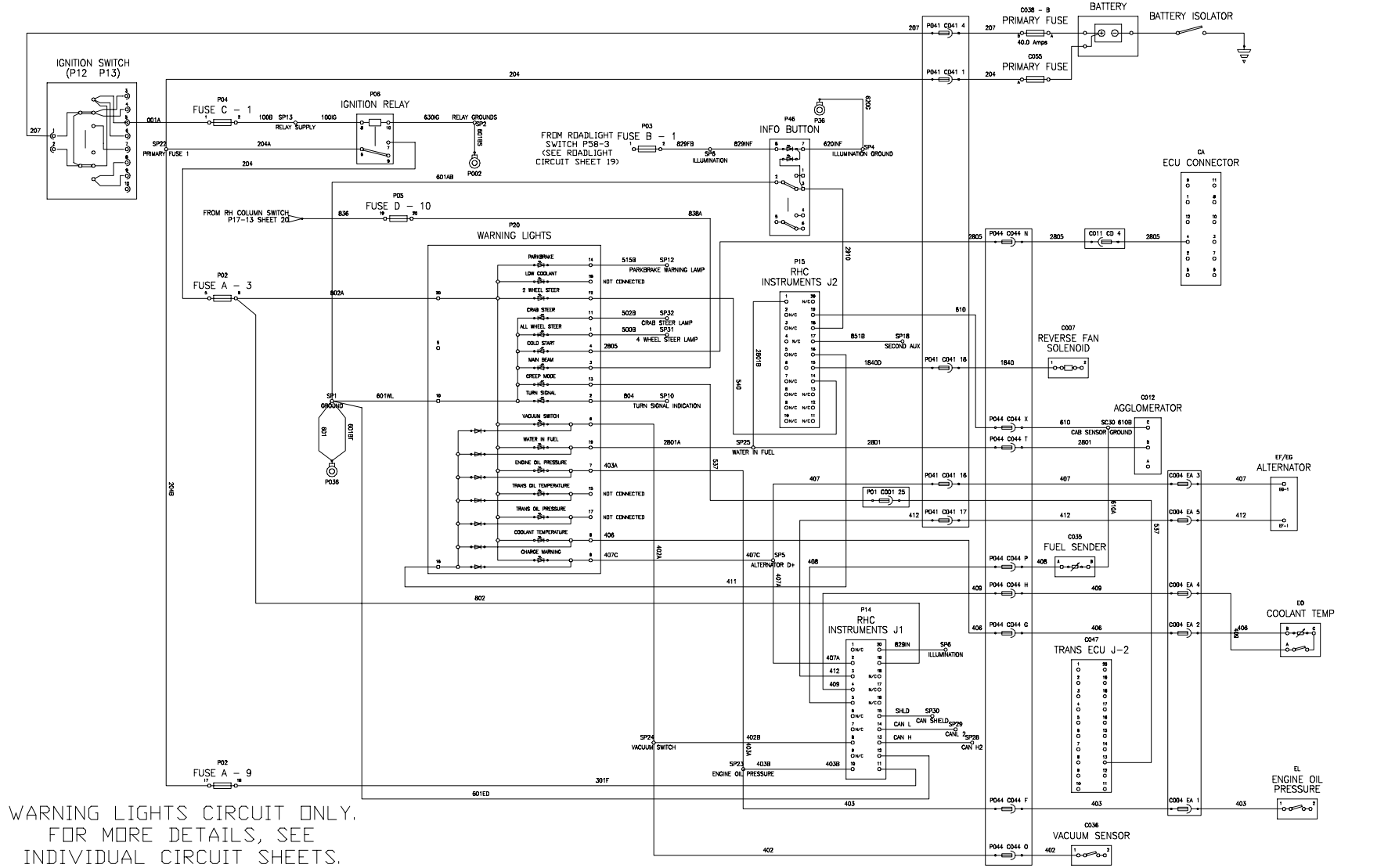


Fig 14. Sheet 15 - Reverse Fan

⇒ *Component Keys (C2-28)* | ⇒ *Sheets (C2-2)*



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Fig 15. Sheet 16 - Instruments

⇒ *Component Keys (🗋 C2-28)*	⇒ *Sheets (🗋 C2-2)*

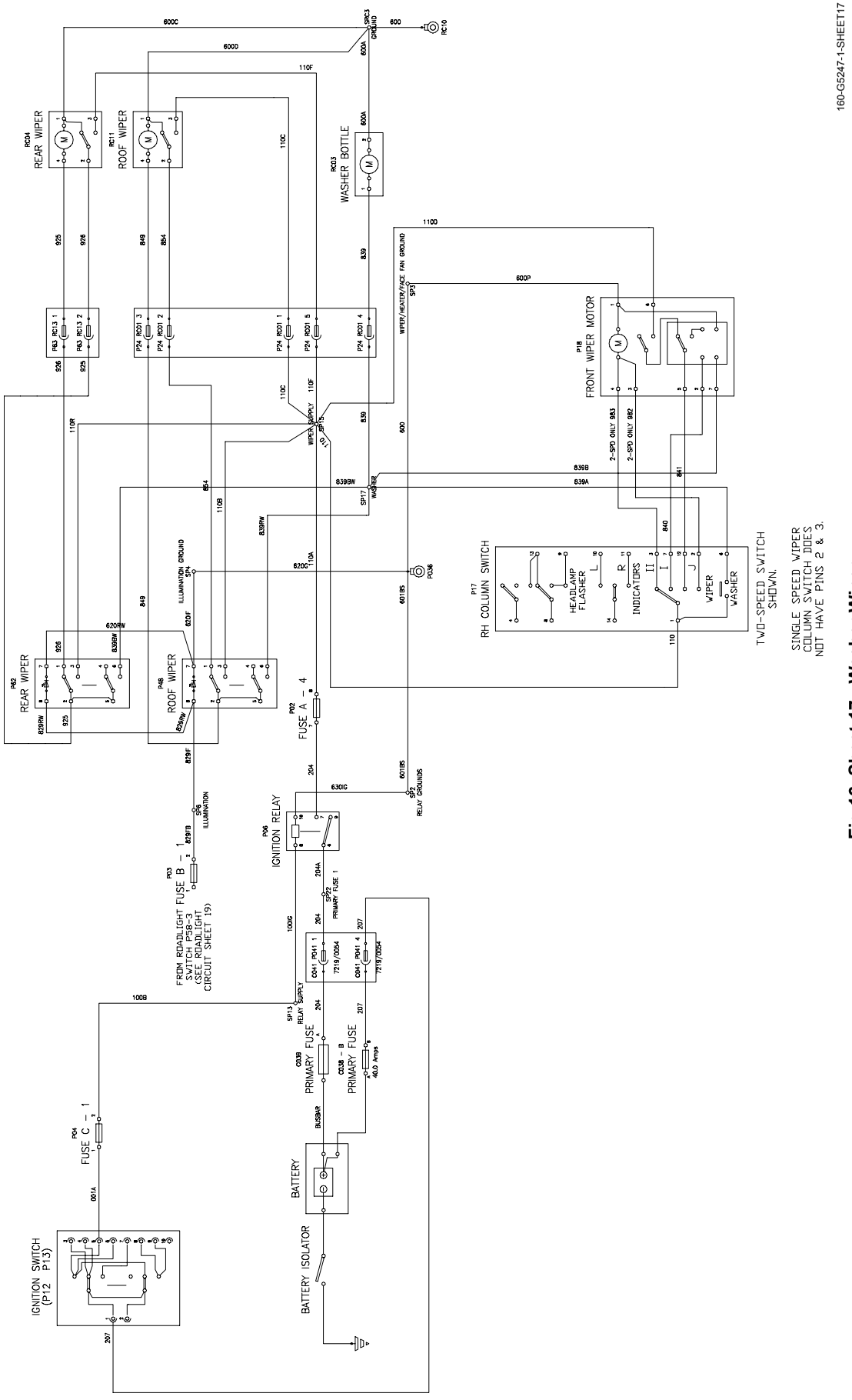
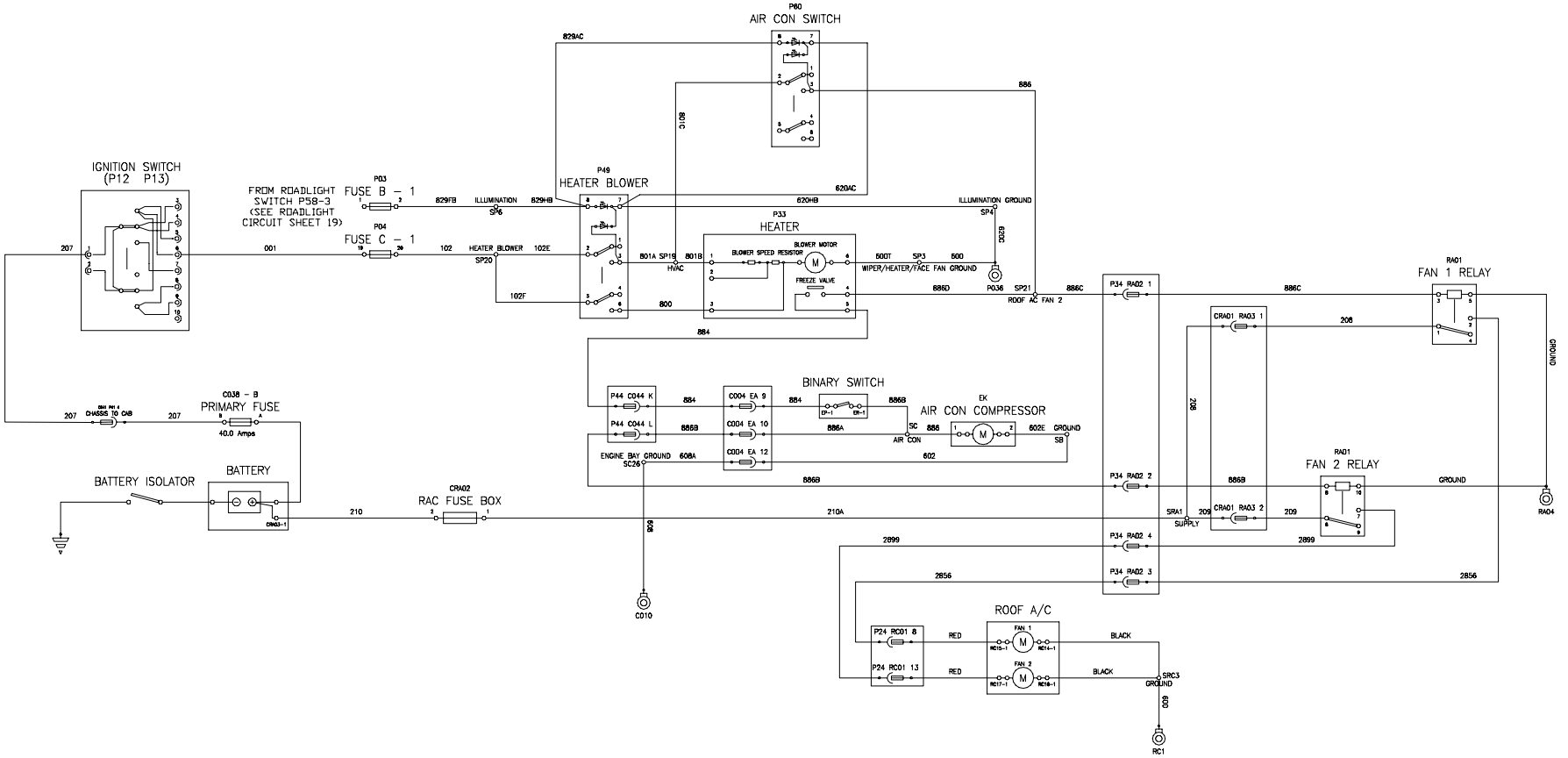


Fig 16. Sheet 17 - Washer Wiper

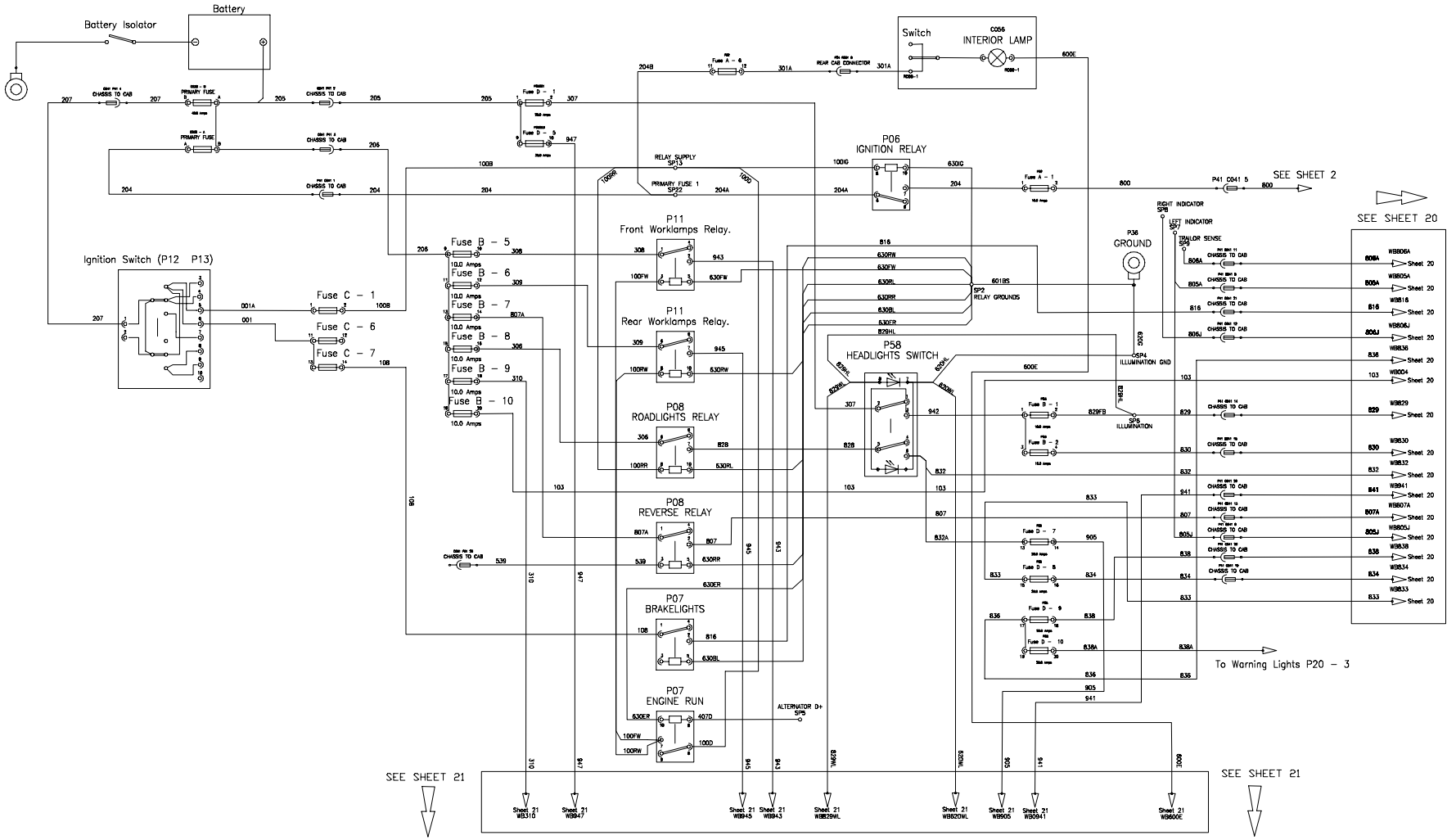
⇒ Component Keys (C2-28) | ⇒ Sheets (C2-2)



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Fig 17. Sheet 18 - HVAC

⇒ *Component Keys (C2-28)*	⇒ *Sheets (C2-2)*



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Fig 18. Sheet 19 - Roadlights 1

⇒ *Component Keys (C2-28)*	⇒ *Sheets (C2-2)*

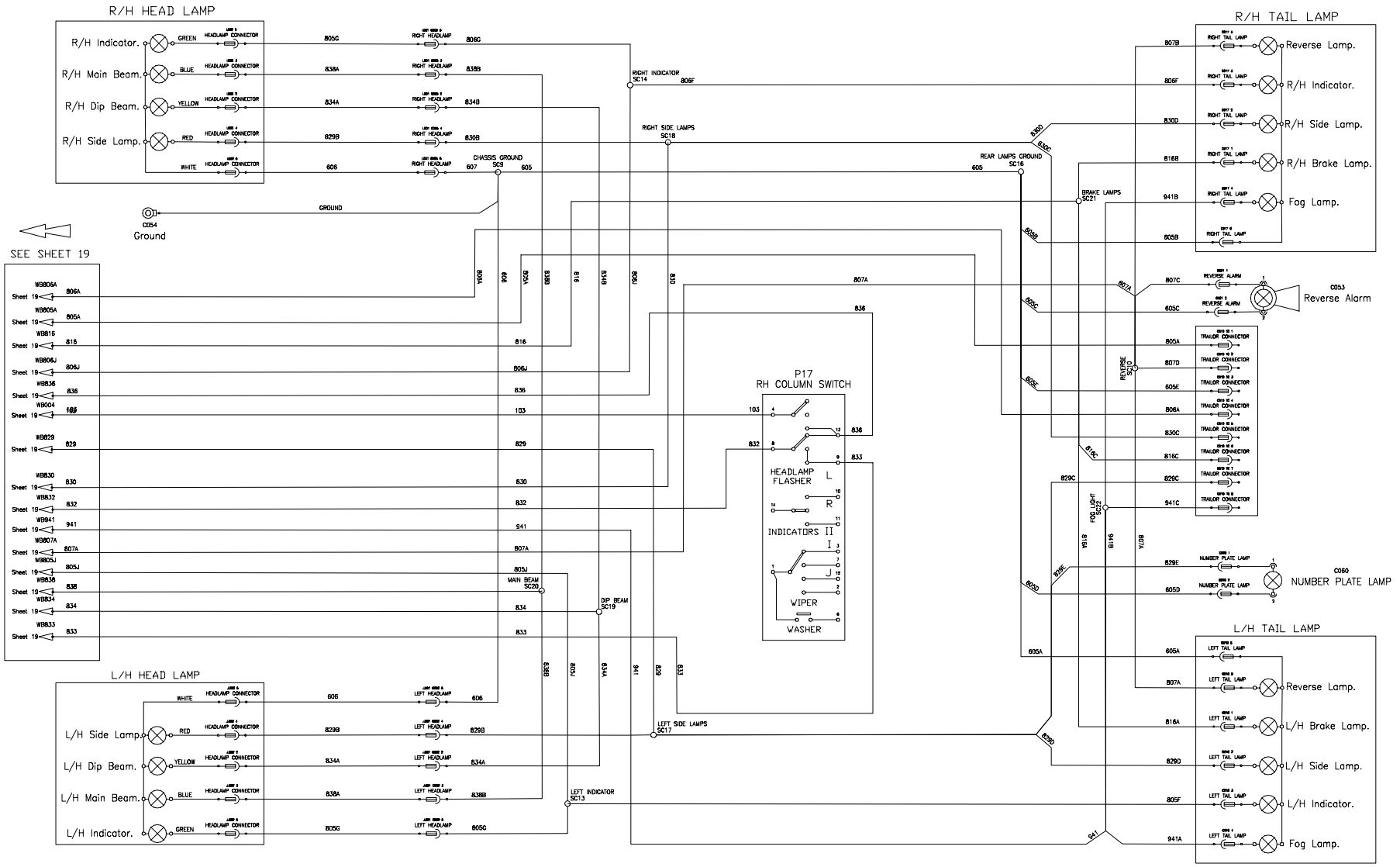


Fig 19. Sheet 20 - Roadlights 2

⇒ *Component Keys (C2-28)*	⇒ *Sheets (C2-2)*

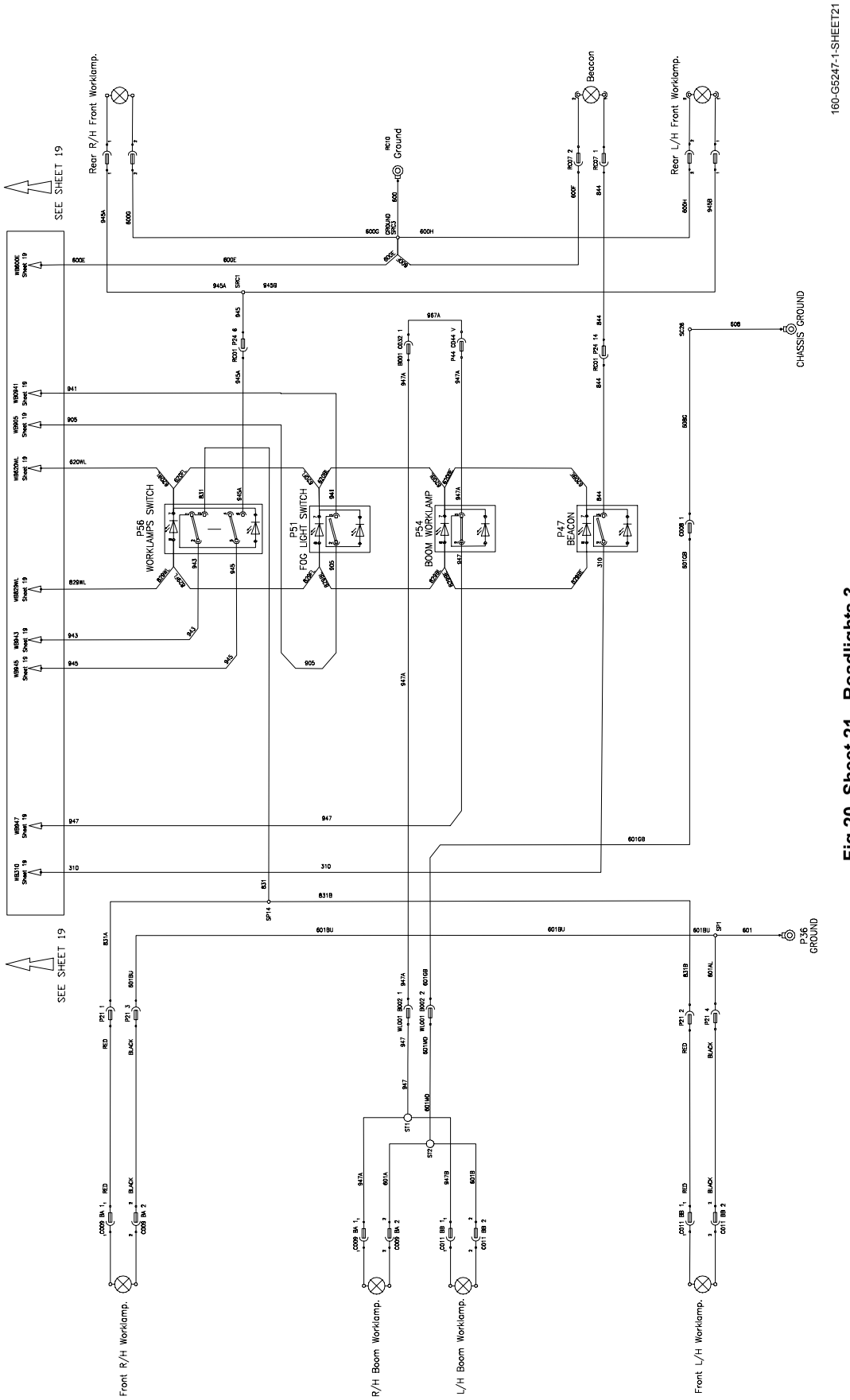
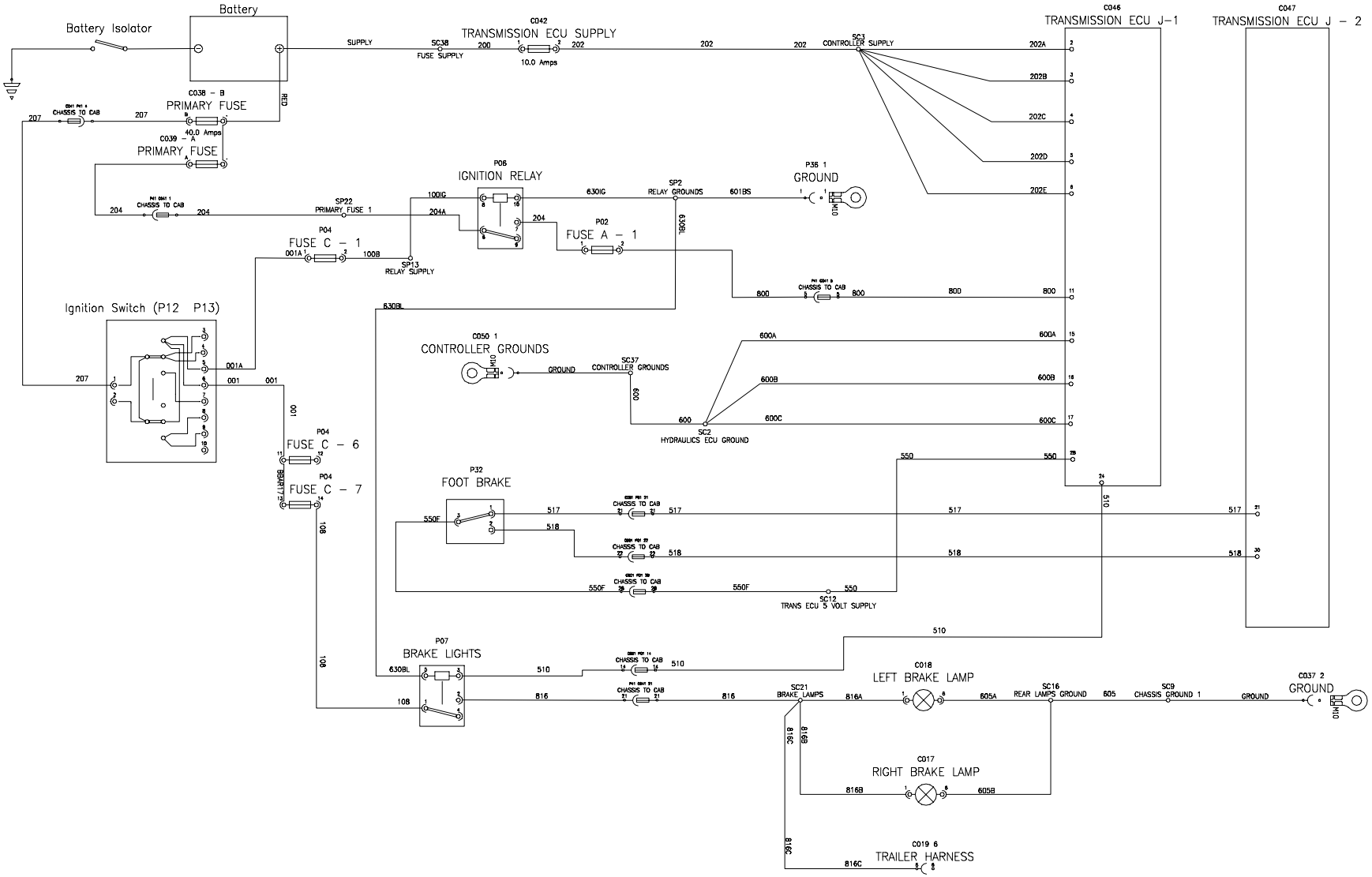


Fig 20. Sheet 21 - Roadlights 3

⇒ *Component Keys (C2-28)* | ⇒ *Sheets (C2-2)*



160-G5247-1-SHEET22

Fig 21. Sheet 22 - Brake Lamps

⇒ *Component Keys (C2-28)*	⇒ *Sheets (C2-2)*

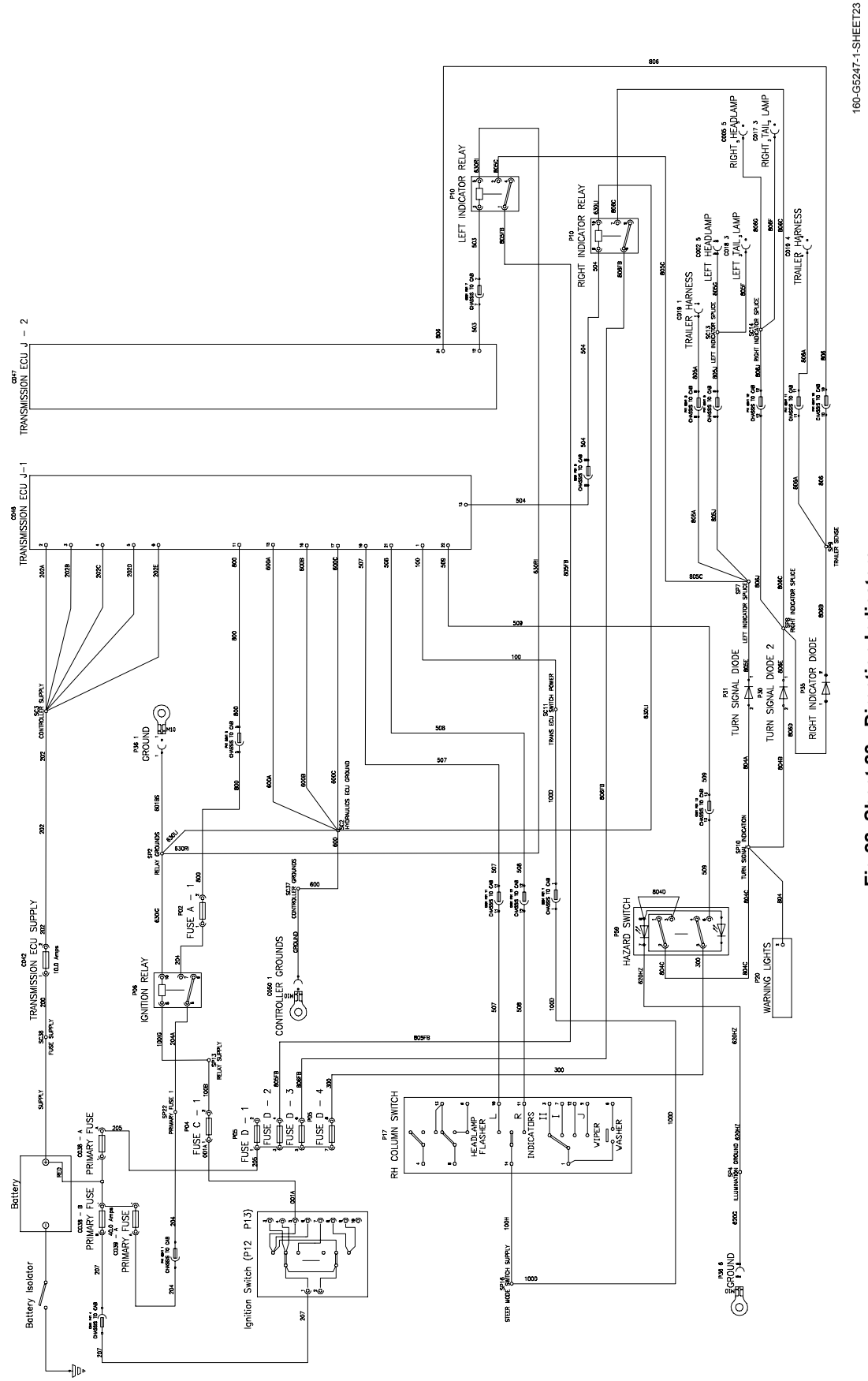


Fig 22. Sheet 23 - Direction Indicators

⇒ *Component Keys (C2-28)* | ⇒ *Sheets (C2-2)*

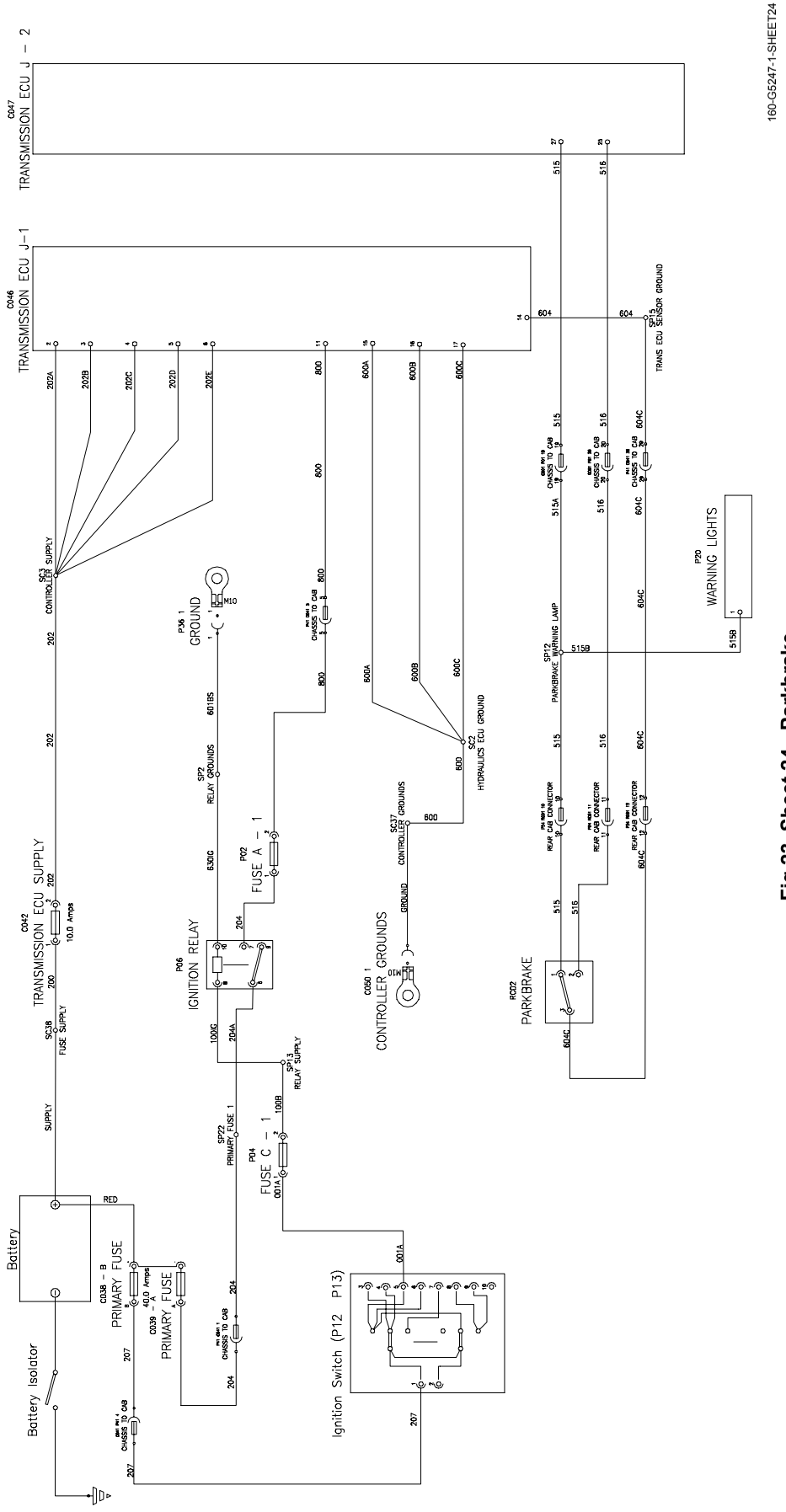


Fig 23. Sheet 24 - Parkbrake

⇒ *Component Keys (C2-28)* | ⇒ *Sheets (C2-2)*

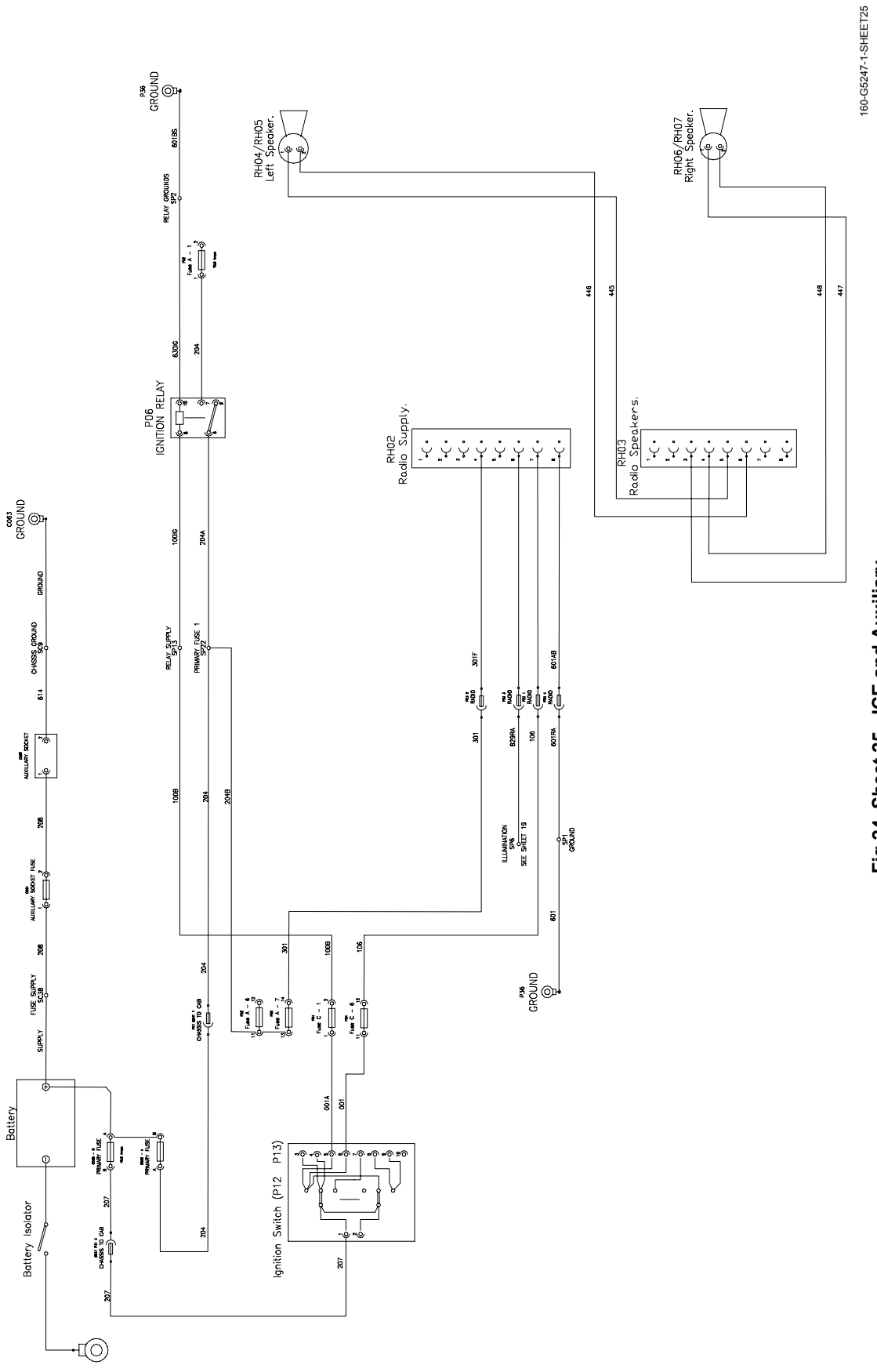


Fig 24. Sheet 25 - ICE and Auxiliary

⇒ Component Keys (C2-28) | ⇒ Sheets (C2-2)

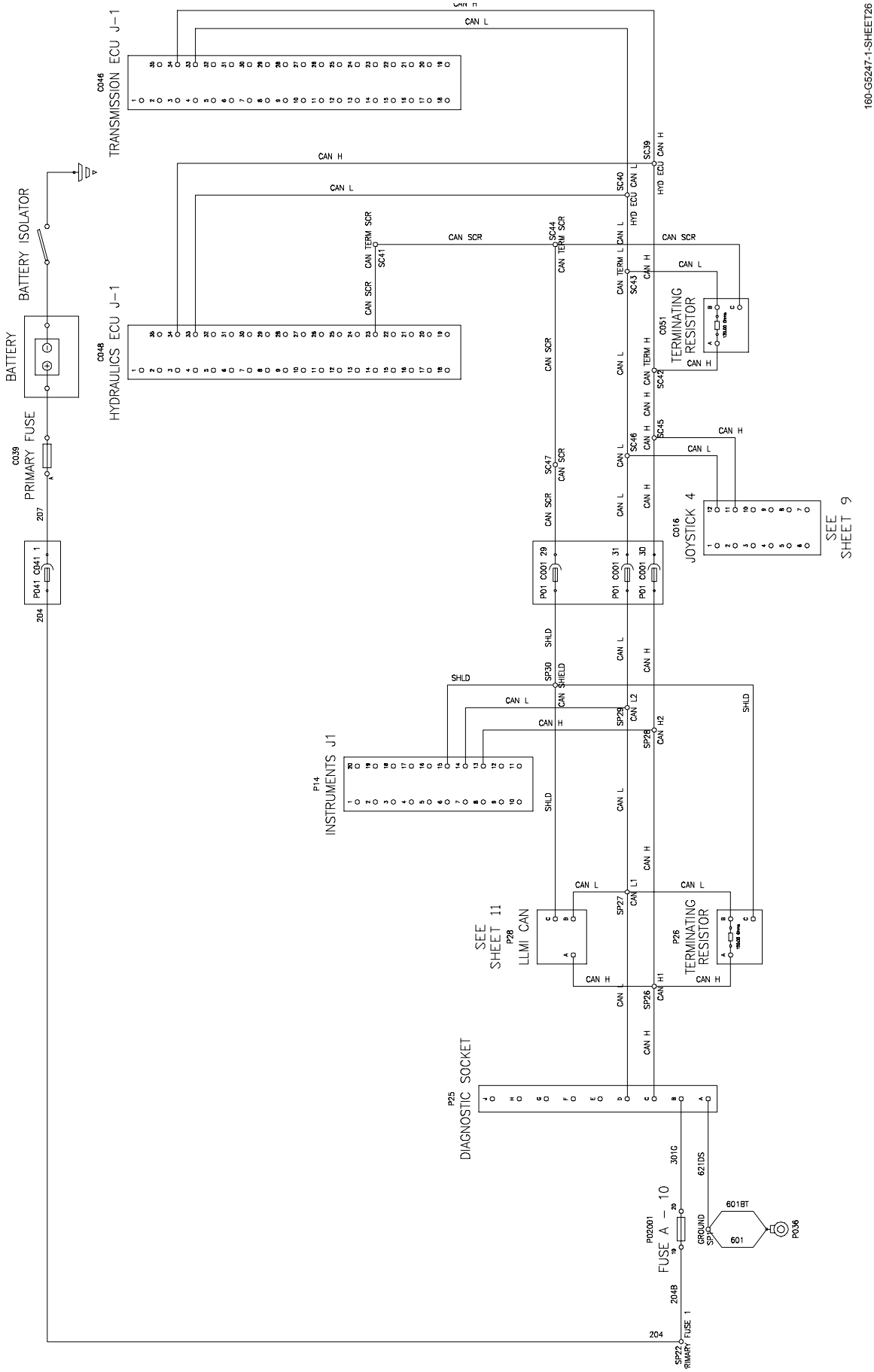


Fig 25. Sheet 26 - CANbus

⇒ Component Keys (C2-28) | ⇒ Sheets (C2-2)

Component Keys

⇒ *Table 1. 'P' Panel Harness (C2-28)*
⇒ *Table 2. 'E' Engine Harness (C2-29)*
⇒ *Table 3. 'RC' Rear Cab Harness (not Air Con) (C2-29)*
⇒ *Table 4. 'RC' Rear Cab Harness (with Air Con) (C2-29)*
⇒ *Table 5. 'C' Chassis Harness (C2-29)*
⇒ *Table 6. 'T' Transmission Harness (C2-30)*
⇒ *Table 7. 'L' Lights Harness (C2-30)*
⇒ *Table 8. 'SR' SRS Lift Ram Harness (C2-30)*
⇒ *Table 9. 'RA' Roof Air Con Panel Harness (C2-30)*
⇒ *Table 10. 'CRA' Roof Air Con Chassis Harness (C2-30)*
⇒ *Table 11. 'V' Valve Block Harness (C2-30)*
⇒ *Table 12. 'C' Cold Start Harness (C2-30)*
⇒ *Table 13. 'B' Boom Harness (C2-30)*

Table 1. 'P' Panel Harness

Key to Connectors:	
P01	Panel Harness to Chassis Harness Connector 1
P02	Fuse Box A and Primary Fuse 1
P03	Fuse Box B and Primary Fuses 2 and 3
P04	Fuse Box C and Primary Fuse 4
P05	Fuse Box D and Primary Fuse 2
P06	Neutral Start Relay
P06	Ignition Relay
P07	Brakelights Relay
P07	Engine Running Relay
P08	Reverse Relay
P08	Road Lights Relay
P09	Throttle Actuator Reverse Relay
P09	Auxiliary Change Over Relay
P10	Left Indicator Relay
P10	Right Indicator Relay
P11	Front Work Lamps Relay
P11	Rear Work Lamps Relay
P12	Ignition Switch
P13	Ignition Switch
P14	Instruments (LMS) Connector 1
P15	Instruments (LMS) Connector 2
P16	L/H Column Switch
P17	R/H Column Switch
P18	Front Wiper
P19	Horn
P20	Warning Light Cluster
P21	Front Work Lights
P22	Face Level Fan
P23	Radio Connector
P24	Panel Harness to Rear Cab Harness Connector
P25	Diagnostic Socket
P26	CANbus Terminating Resistor
P27	LLMI
P28	LLMI CANbus
P29	Steer Mode Switch
P30	Turn Signal Diode 2
P31	Turn Signal Diode 1
P32	Foot Brake
P33	Heater
P34	Roof Air Conditioning
P35	Right Indicator Diode
P36	Earth
P41	Panel Harness to Chassis Harness Connector 2
P44	Panel Harness to Chassis Harness Connector 3
P45	Reverse Fan Switch
P46	Info Switch
P47	Beacon Switch
P48	Roof Wiper Switch
P49	Heater Fan Switch
P50	Tow Hitch Switch
P51	Fog Light Switch
P52	SRS Switch
P53	Constant Auxiliary Switch
P54	Boom Work Lamp Switch
P55	Fast/Slow Switch
P56	Work Lights
P57	Control Lever Isolation Switch
P58	Headlights Switch
P59	Hazard Lights Switch
P60	Air Conditioning Switch
P61	Aux Out
P62	Rear Wiper Switch
P63	Panel Harness to Rear Cab Harness Connector 2

Table 2. 'E' Engine Harness

Key to Connectors:	
E001	Chassis Harness Connector
E002	Starter Solenoid
E003	Charge Lead
E004	Charge Lead
E005	`W' Terminal
E006	D+
E007	Cold Start Solenoid
E008	Engine Shut-Off Solenoid (ESOS)
E009	Air Conditioning Compressor
E010	Engine Oil Pressure Switch
E011	Cold Start Temperature Switch
E012	Engine Coolant Temperature Switch
E013	Binary Pressure Switch (Air Conditioning)
E014	Binary Pressure Switch (Air Conditioning)
E015	Transmission Temperature Switch

Table 3. 'RC' Rear Cab Harness (not Air Con)

Key to Connectors:	
RC01	Panel Harness
RC02	Parkbrake
RC03	Washer Bottle
RC04	Rear Wiper
RC05	R/H Rear Worklamp
RC06	L/H Rear Worklamp
RC07	Beacon
RC08	Interior Lamp +ve
RC09	Interior Lamp - ve
RC10	Earth
RC11	Roof Wiper
RC12	Air Suspension Seat
RC13	Panel Harness 2

Table 4. 'RC' Rear Cab Harness (with Air Con)

RC01	Panel Harness
RC02	Parkbrake
RC03	Washer Bottle
RC04	Rear Wiper
RC05	R/H Rear Worklamp
RC06	L/H Rear Worklamp
RC07	Beacon
RC08	Interior Lamp +ve
RC09	Interior Lamp - ve
RC10	Earth
RC11	Roof Wiper
RC12	Air Suspension Seat
RC13	Panel Harness 2
RC14	Roof AC Fan 1 Earth
RC15	Roof AC Fan 1
RC16	Roof AC Fan 2 Earth
RC17	Roof AC Fan 2

Table 5. 'C' Chassis Harness

Key to Connectors:	
C001	Chassis Harness to Panel Harness Connector 1
C002	Left Head Lamp
C003	Chassis Harness to Valve Block Harness Connector
C004	Chassis Harness to Engine Harness Connector
C005	Right Head Lamp
C006	Chassis Harness to Transmission Harness connector
C007	Reverse Fan Solenoid
C008	Inching Control
C010	Chassis Earth
C011	Chassis Harness to Cold Start Harness Connector
C012	Agglomerator (Water in Fuel)
C013	Joystick Connector 1
C014	Joystick Connector 2
C015	Joystick Connector 3
C016	Joystick Connector 4
C017	Right Tail Lamp
C018	Left Tail Lamp
C019	Chassis Harness to Trailer Harness Connector
C020	Number Plate Lamp
C021	Reverse Alarm
C022	Tilt Lock Switch
C023	Angle Sensor
C024	Rear Steer Sensor
C025	LLMI Transducer
C026	Front Steer Sensor
C027	Front/Rear Auxiliary
C028	Steer Valve A
C029	Steer Valve B
C030	Steer Valve C
C031	Steer Valve D
C032	Chassis Harness to Boom Harness Connector
C033	Hydraulic Temperature Sensor
C034	Throttle Actuator
C035	Fuel Sender

C036	Air Filter Vacuum Sensor
C037	Earth
C038	Primary Fuse (Blue)
C039	Primary Fuse (Grey)
C040	SRS
C041	Chassis Harness to Panel Harness Connector 2
C042	Transmission ECU Supply
C043	Hydraulic Control ECU Supply
C044	Chassis Harness to Panel Harness Connector 3
C045	Boom Retract Switch
C046	Transmission ECU J1
C047	Transmission ECU J2
C048	Hydraulic Control ECU J1
C049	Hydraulic Control ECU J2
C050	Controller Earths
C051	CANbus Terminator
C052	Chassis Angle Sensor
C054	Auxiliary Socket
C055	Auxiliary Socket Fuse
C056	Auxiliary Fuse Supply
C057	Hydraulic Isolation Switch
C058	Inching Pedal A
C059	Inching Pedal B

Table 6. 'T' Transmission Harness

Key to Connectors:	
T001	Chassis Connector
T002	Pump Forward Solenoid
T003	Pump Reverse Solenoid
T004	Motor Forward/Reverse Solenoid
T005	Motor Fast/Slow Solenoid
T006	Speed Sensor

Table 7. 'L' Lights Harness

Key to Connectors:	
L001	Chassis Connector
L002	Headlamp Connector

Table 8. 'SR' SRS Lift Ram Harness

SR01	Chassis Connector
SR02	SRS Transducer
SR03	Accumulator Solenoid
SR04	Drain Solenoid

Table 9. 'RA' Roof Air Con Panel Harness

Key to Connectors:	
RA01	Fan 1 and 2 Relay
RA02	Panel Connector
RA03	Chassis Connector
RA04	Earth

Table 10. 'CRA' Roof Air Con Chassis Harness

Key to Connectors:	
CRA01	Fan 1 and 2 Relay
CRA02	Roof Air Conditioning Fuse Box
CRA03	+ve Battery Connection

Table 11. 'V' Valve Block Harness

Key to Connectors:	
V001	Chassis Connector
V002	Boom Lower Solenoid
V003	Boom Raise Solenoid
V004	Boom Retract Solenoid
V005	Boom Extend Solenoid
V006	Carriage Dump (Tilt) Solenoid
V007	Carriage Crowd (Tilt) Solenoid
V008	Auxiliary B Solenoid
V009	Auxiliary A Solenoid
V010	Isolation Solenoid

Table 12. 'C' Cold Start Harness

Key to Connectors:	
CA	E.C.U. Connector
CB	Relay Connector
CC	Temperature Sensor
CD	Chassis Harness Connector

Table 13. 'B' Boom Harness

Key to Connectors:	
B001	Chassis Harness Connector
B002	Worklights
B003	Auxiliary Changeover Solenoid

Electrical Harness SYSTEM

Introduction

This topic contains information about a machine SYSTEM. The system has some devices that connect either mechanically, hydraulically or electrically. Make sure you are referring to the correct system. Refer to the applications table. ⇨ *Related Topics (C3-2)*.

Descriptions and procedures relate to the system and not the individual devices. For information about the devices refer to the relevant topics. ⇨ *Related Topics (C3-2)*

This topic is intended to help you understand what the system does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇨ *Related Topics (C3-2)*
⇨ *Earth Points (C3-3)*
⇨ *Wire Numbers and Functions (C3-6)*
⇨ *Harness Interconnections and Drawings (C3-8)*
- ⇨ *Interconnections (C3-8)*
- ⇨ *Harness Identification (C3-9)*
- ⇨ *Drawings (C3-11)*

⇨ *Test Procedures (C3-48)*
- ⇨ *How to Use a Multimeter (C3-48)*
- ⇨ *Measuring DC Voltage (C3-49)*
- ⇨ *Measuring Resistance (C3-49)*
- ⇨ *Measuring Continuity (C3-50)*
- ⇨ *Measuring Frequency (C3-50)*
- ⇨ *Testing a Diode or a Diode Wire (C3-51)*

⇨ *Wiring Harness Repair (C3-52)*

Related Topics

Table 1. Related Topics in This Publication

The table lists other topics in the manual that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text in this section contains cross references to this page to help you find the correct information. Some machines have different systems and devices. Make sure you refer to the correct topic, refer to ***Section 1 - Applications***.		
Sections	**Topic Titles**	**Sub Titles**
1	Applications	ALL
2	ALL (Care and Safety)(1)	ALL
1	***Service Tools***	ALL
C	***⇨ Fuses and Relays (C1-1)***	ALL
C	***⇨ Schematics (C2-1)***	ALL
C	***⇨ Battery Charging SYSTEM (C4-1)***	ALL
C	***⇨ Alternator (C5-1)***	ALL
C	***⇨ Battery (C6-1)***	ALL

(1) You must obey all of the relevant care and safety procedures.

Table 2. Service Tools

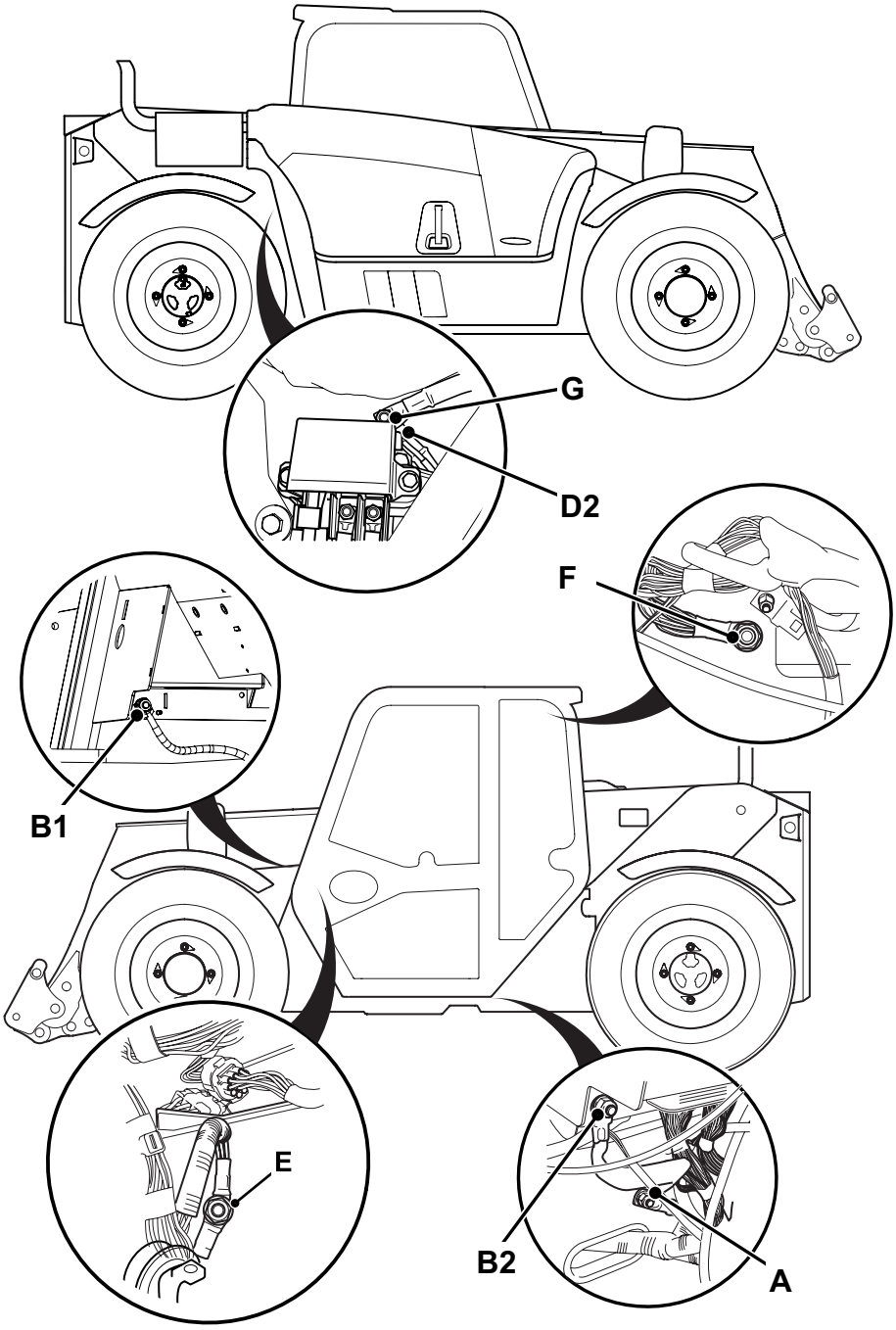
The table lists the service tools you will need to do some of the procedures in this topic. Make sure you have the correct service tools BEFORE you start the procedures	
Tool Part Number	**Description**
892/00298(1)	Fluke Meter 85
or	AVO 2002
or	AVO 2003
892/00350(1)	Butane Heater assembly
892/00349(1)	Crimp tool
892/00351(1)	Splice 0.5-1.5 mm (Red)
892/00352(1)	Splice 1.5-2.5 mm (Blue)
892/00353(1)	Splice 3.0-6.0 mm (Yellow)

(1) Tool available from JCB Service, refer to Section 1 - Service Tools

Earth Points

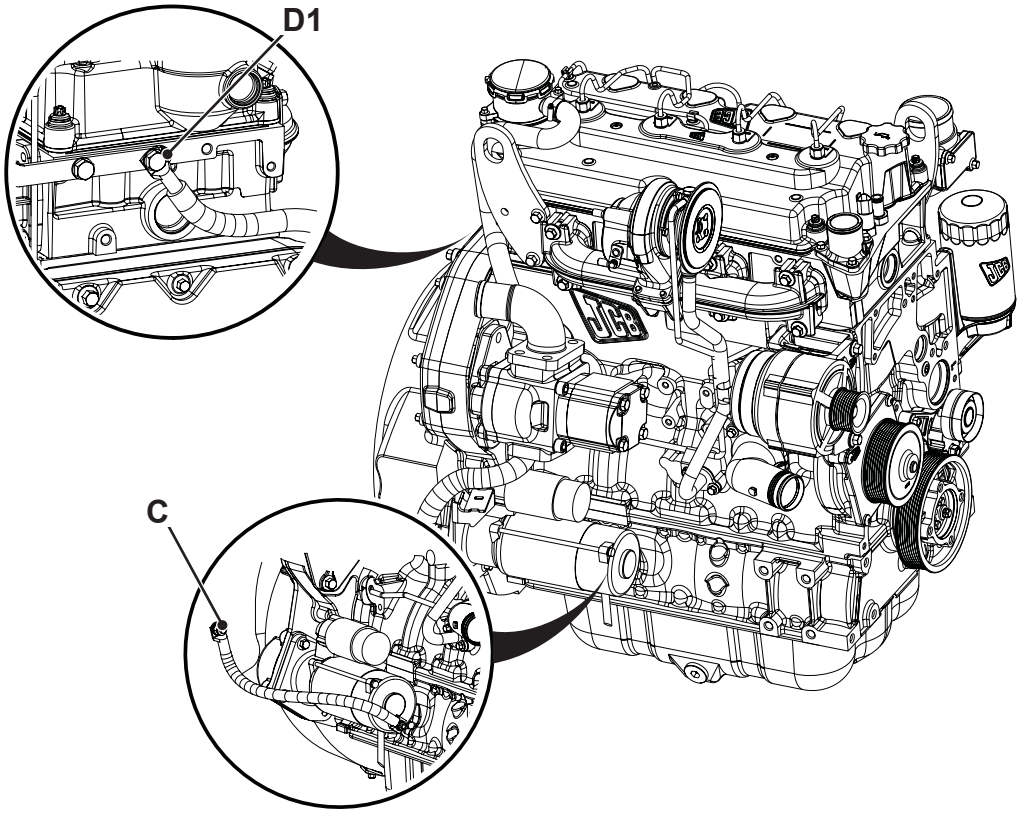
⇒ *Fig 1. (C3-4)* and ⇒ *Fig 2. (C3-5)*. The illustrations show the machine electrical earth point locations. This can be useful when tracing electrical faults, typically when several electrical devices are malfunctioning.

Item	Description	Access
A	Earth cable, battery to chassis.	Under cab, and battery compartment.
B1	Earth strap, cab to chassis - cab side	Remove - external lower front panel from cab.
B2	Earth strap, cab to chassis - chassis side	Under cab, and battery compartment.
C	Earth cable, starter motor to chassis.	Inside engine compartment.
D1	Earth cable, engine block to chassis - Engine Block side	Inside engine compartment, cable bolted to engine at the rear of the cylinder block.
D2	Earth cable, engine block to chassis - Chassis side	Inside engine compartment, cable bolted to the chassis.
E	Earth point, cab harness	Remove cab instrument panels. Access required to the cab frame on the right side of the steering column.
F	Earth point, cab rear harness.	Remove cab roof lining.
G	Earth point, chassis harness.	Inside engine compartment.



C096470

Fig 1. Earth Points



C096420-C1

Fig 2. Engine Earth Points

Wire Numbers and Functions

This section details the allocation of wire numbers and the identification of wires in the wiring harness.

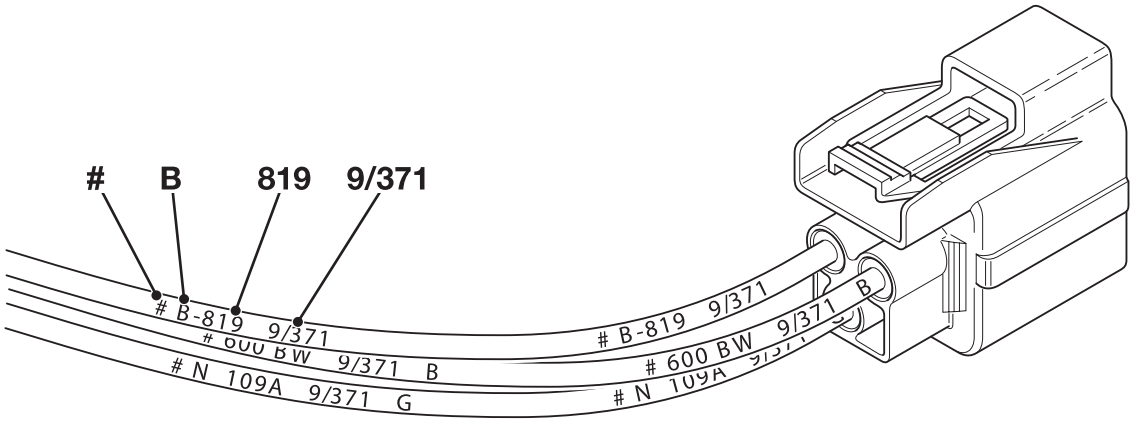


Fig 3. Typical Wire and Harness Number

⇨ *Fig 3. (C3-6)*. The illustration shows a typical connector and wires. Each wire has an individual identification number permanently marked on it, at regular intervals along it's length.

The number stamped on the wire identifies the following:

Table 3. Wire and Harness Number Identification

Ident. No.	Description
#	The **#** indicates the start of the identification number. It is always printed to the left of the identification number.
B	If applicable - The colour of the flying lead that the harness wire should mate with. For instance, if wire **819** from harness 719/37100 mated with a flying lead coloured black (colour code **B**) then the number printed on the wire would be **B**-819 9/371.
819	The wire's unique identification number. The wire functions and numbers allocated to them are consistent through out the JCB range of products. ⇨ *Wire Numbers and Functions (C3-6)*.
9/371	If applicable - The part number of the harness that the wire originates from. If the harness part number is 719/37100, the number printed on the harness wires will be **9/371** (71 and 00 are common numbers and therefore deleted).

Wires 000-199

These numbers are reserved for ignition feeds, heater start circuits and start circuits. These can be further categorised by:

- Wires **000 - 099** are allocated to unfused ignition feeds.
- Wires **100 - 199** are allocated to fused ignition feeds.

Note: *Feeds via ignition relays are classed as ignition feeds.*

Wires 200-399

These numbers are reserved for battery feeds, They can be further categorised by:

- Wires **200 - 299** are allocated to unfused battery feeds.
- Wires **300 - 399** are allocated to fused battery feeds.

Wires 400-599

These numbers are reserved for instruments, i.e. alternators to tachos, temperature switches to warning lights, etc. and signal wires used in electronic systems.

Wires 600-799

These numbers are used for earth wires. When the number is printed onto a wire **A** it is prefixed by the Earth symbol **B**. ⇨ *Fig 4. (C3-7)*. This symbol is printed onto the wire, it may however be omitted from harness drawings.

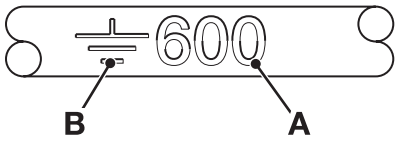


Fig 4.

Where a load is switched negative, the wire number from the load to the switch shall be different to that of the wire from the switch to the earth.

Wires 800-999

These numbers are reserved for switched supplies to electrical loads, i.e. to lights, etc.

Wires In Splices

The main input wire is allocated with a wire number and a suitable description, i.e. Wire **640** earth splice to earth. The additional wires in the splice are allocated the same wire number and a postfix, i.e. **640A**, **640B**, etc. ⇨ *Fig 5. (C3-7)*.

Note: *The letters I, O, Q and S are not used.*

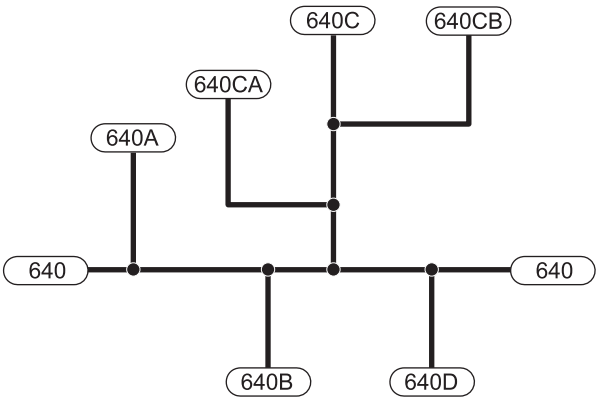


Fig 5.

General Points

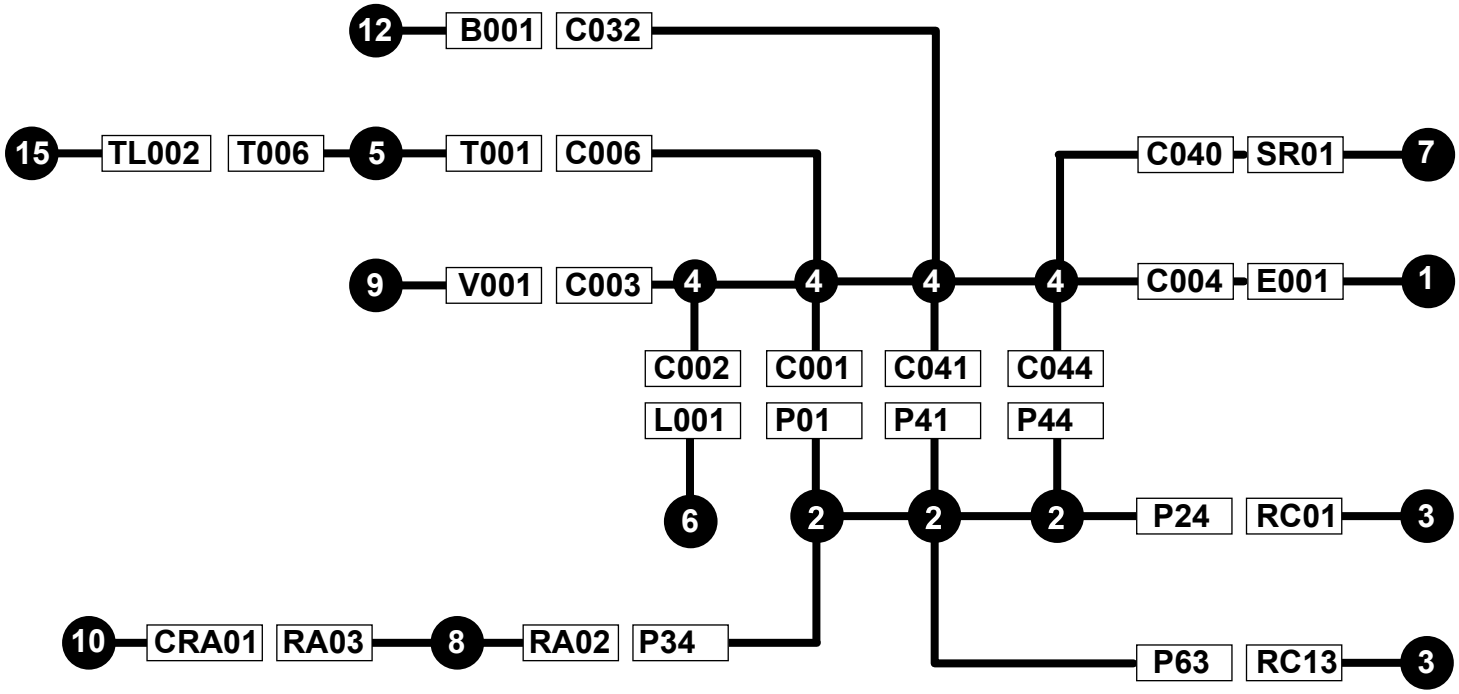
1 Wires continue to have the same number even after passing through a connector block to another harness.

2 If all the numbers in a category have been allocated, then the category is re-used with an additional prefix '1', i.e. 1832.

Harness Interconnections and Drawings

Interconnections

⇨ *Harness Identification (C3-9)*



C094980-C2

Fig 6.

Harness Identification

⇨ *Interconnections (C3-8)*

Harness No.		Issue	Remarks	Drawing
1	**Engine**			
	332/E6812	1		⇨ C3-12)
Main components connected to this harness:			Alternator	
			Starter motor	
			Cold start solenoid	
			Engine shut-off solenoid	
			Air conditioning compressor (if fitted)	
2	**Panel/Cab**			
	721/G6201	1		⇨ C3-14)
Main components connected to this harness:			Console instruments	
			Console switches	
			Console warning lamps	
			Steering column switches	
			Starter switch	
			Heater	
			Fuses and Relays	
			Front wiper motor	
			Load moment indicator (LMI)	
3	**Rear Cab**			
	721/G6947	2	Rear Cab Harness - Machines Without Air Conditioning	⇨ C3-21)
	721/G6948	2	Rear Cab Harness - Machines With Air Conditioning	⇨ C3-23)
Main components connected to this harness:			A/C condenser cooling fans	
			Park brake switch	
			Roof wiper	
			Rear wiper	
			Rear work lights	
4	**Chassis**			
	721/G6391	2	Chassis Harness	⇨ C3-25)
Main components connected to this harness:			Air Filter Vacuum Switch	
			LMI transducer	
			Steer proximity switches	
			Smooth ride components	
			Fuel Sender	
			Steer mode valve (if fitted)	
			Engine speed sensor (if fitted)	
			Transmission ECU	
			Hydraulic Control ECU	
			Hand Throttle and Varispeed (if fitted)	
5	**Transmission**			

	721/G5105	1	Transmission Harness for 20, 25 and 34 kph machines	⇨ C3-29)
	721/F8548	1	Transmission Harness for 40 kph machines	⇨ C3-30)
6	**Lights**			
	721/F8560	2	Front Lights	⇨ C3-31)
7	**SRS Lift Ram Harness (if fitted)**			
	721/F8551	1		⇨ C3-32)
8	**Roof Air Conditioning Panel Harness (if fitted)**			
	721/G4412	1	Additional Panel Harness for machines with Air Conditioning	⇨ C3-33)
9	**Valve Block Harness**			
	721/F8550	2	Control Valve Block Solenoids Harness	⇨ C3-35)
10	**Roof Air Conditioning Chassis Harness (if fitted)**			
	721/G4411	1	Additional Chassis Harness for machines with Air Conditioning	⇨ C3-34)
11	**Cold Start Harness**			
	721/11975	1		⇨ C3-37)
12	**Boom Harness**			
	721/F8555	1	Non LLMC Machines	⇨ C3-39)
			LLMC machines up to October 2010	
	721/H5810	1	LLMC machines from October 2010	⇨ C3-40)
13	**Cold Start Link Harness**			
	718/G9926	1		⇨ C3-41)
14	**Auxiliary Harness**			
	721/F8557	2	Non LLMC Machines	⇨ C3-42)
			LLMC machines up to October 2010	
	721/H8668	1	LLMC machines from October 2010	⇨ C3-43)
15	**Speed Sensor Link Harness**			
	721/C3727	1		⇨ C3-44)
16	**Livelink Harnesses**			
	721/C1358	1	Livelink Panel Harness	⇨ C3-45)
	721/C1357	1	Livelink Chassis Harness	⇨ C3-47)

Drawings

Drawings are reproduced from production electrical harness drawings. Each harness drawing includes tables showing wire connections and destinations for all the connectors on the harness.

Engine - CAD 332/E6812 Issue 1

⇒ *Fig 7. (C3-13)*

Key to Connectors:

E001 Chassis Harness Connector
E002 Starter Solenoid
E003 Charge Lead
E004 Charge Lead
E005 `W' Terminal
E006 D+
E007 Cold Start Solenoid
E008 Engine Shut-Off Solenoid (ESOS)
E009 Air Conditioning Compressor
E010 Engine Oil Pressure Switch
E011 Cold Start Temperature Switch
E012 Engine Coolant Temperature Switch
E013 Binary Pressure Switch (Air Conditioning)
E014 Binary Pressure Switch (Air Conditioning)
E015 Transmission Temperature Switch

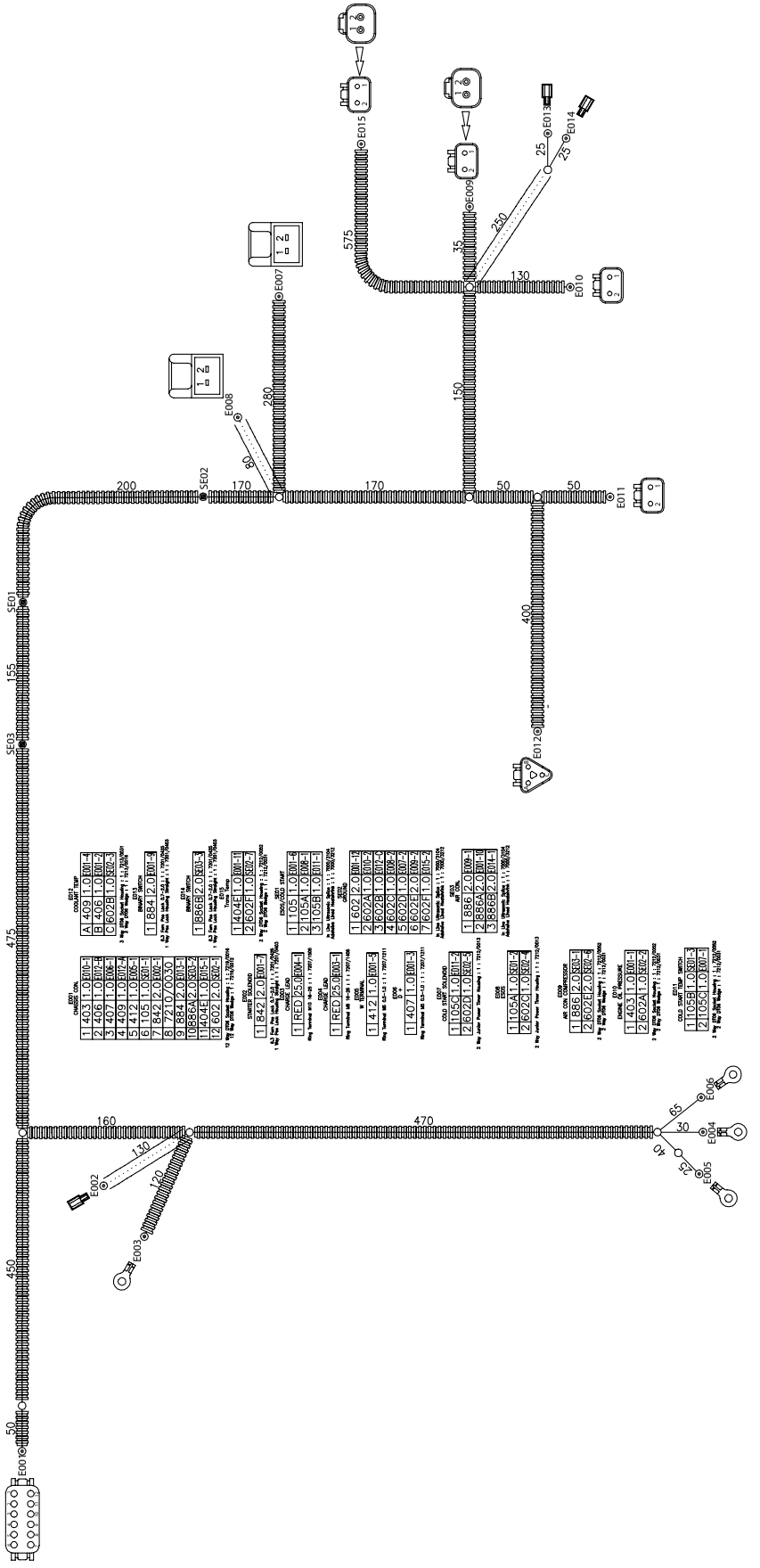


Fig 7.

⇒ *Engine - CAD 332/E6812 Issue 1* (C3-12)

Panel/Cab - CAD 721/G6201 Issue 1

⇒ *Fig 13. (C3-20)*

Key to Connectors:

P01	Panel Harness to Chassis Harness Connector 1
P02	Fuse Box A and Primary Fuse 1
P03	Fuse Box B and Primary Fuses 2 and 3
P04	Fuse Box C and Primary Fuse 4
P05	Fuse Box D and Primary Fuse 2
P06	Neutral Start Relay
P06	Ignition Relay
P07	Brakelights Relay
P07	Engine Running Relay
P08	Reverse Relay
P08	Road Lights Relay
P09	Throttle Actuator Reverse Relay
P09	Auxiliary Change Over Relay
P10	Left Indicator Relay
P10	Right Indicator Relay
P11	Front Work Lamps Relay
P11	Rear Work Lamps Relay
P12	Ignition Switch
P13	Ignition Switch
P14	Instruments (LMS) Connector 1
P15	Instruments (LMS) Connector 2
P16	L/H Column Switch
P17	R/H Column Switch
P18	Front Wiper
P19	Horn
P20	Warning Light Cluster
P21	Front Work Lights
P22	Face Level Fan
P23	Radio Connector
P24	Panel Harness to Rear Cab Harness Connector
P25	Diagnostic Socket
P26	CANbus Terminating Resistor
P27	LLMI
P28	LLMI CANbus
P29	Steer Mode Switch
P30	Turn Signal Diode 2
P31	Turn Signal Diode 1
P32	Foot Brake
P33	Heater
P34	Roof Air Conditioning
P35	Right Indicator Diode
P36	Earth
P41	Panel Harness to Chassis Harness Connector 2
P44	Panel Harness to Chassis Harness Connector 3
P45	Reverse Fan Switch
P46	Info Switch
P47	Beacon Switch
P48	Roof Wiper Switch
P49	Heater Fan Switch
P50	Tow Hitch Switch
P51	Fog Light Switch
P52	SRS Switch
P53	Constant Auxiliary Switch
P54	Boom Work Lamp Switch
P55	Fast/Slow Switch
P56	Work Lights
P57	Control Lever Isolation Switch
P58	Headlights Switch
P59	Hazard Lights Switch
P60	Air Conditioning Switch
P61	Aux Out
P62	Rear Wiper Switch
P63	Panel Harness to Rear Cab Harness Connector 2

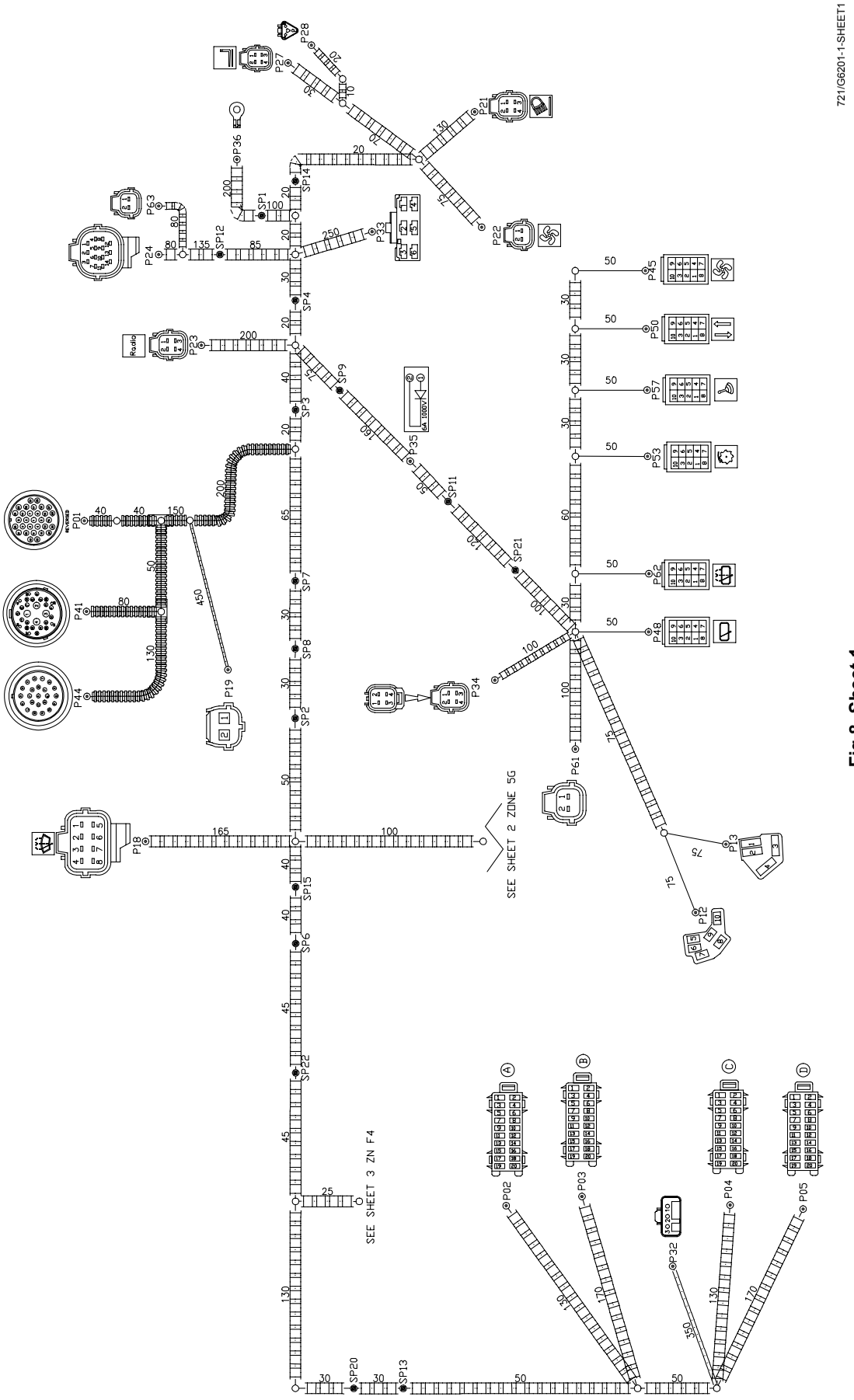


Fig 8. Sheet 1

⇒ *Panel/Cab - CAD 721/G6201 Issue 1 (C3-14)*

721-G6201-1-SHEET2

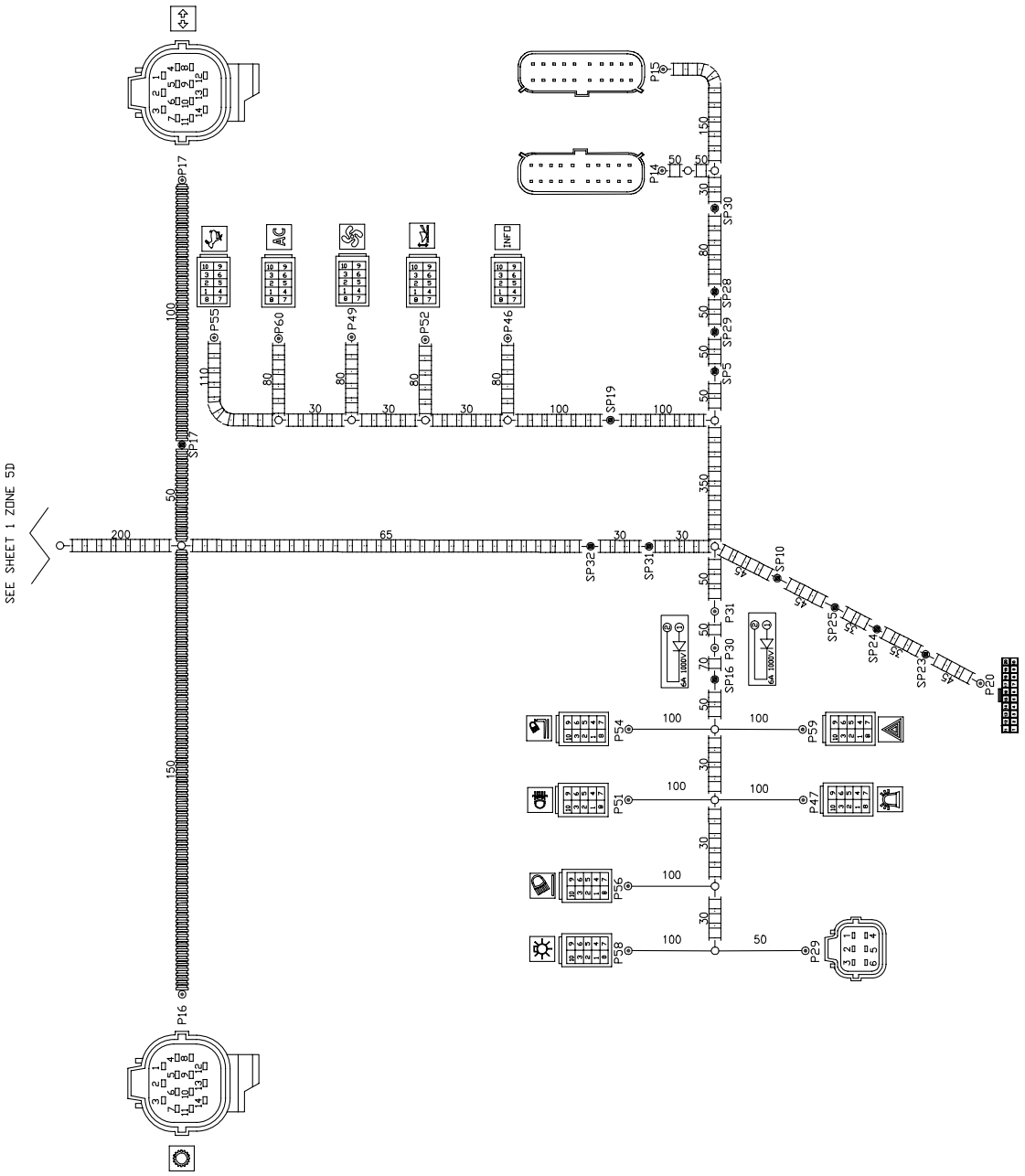


Fig 9. Sheet 2

⇒ *Panel/Cab - CAD 721/G6201 Issue 1 (C3-14)*

721-G6201-1-SHEET3

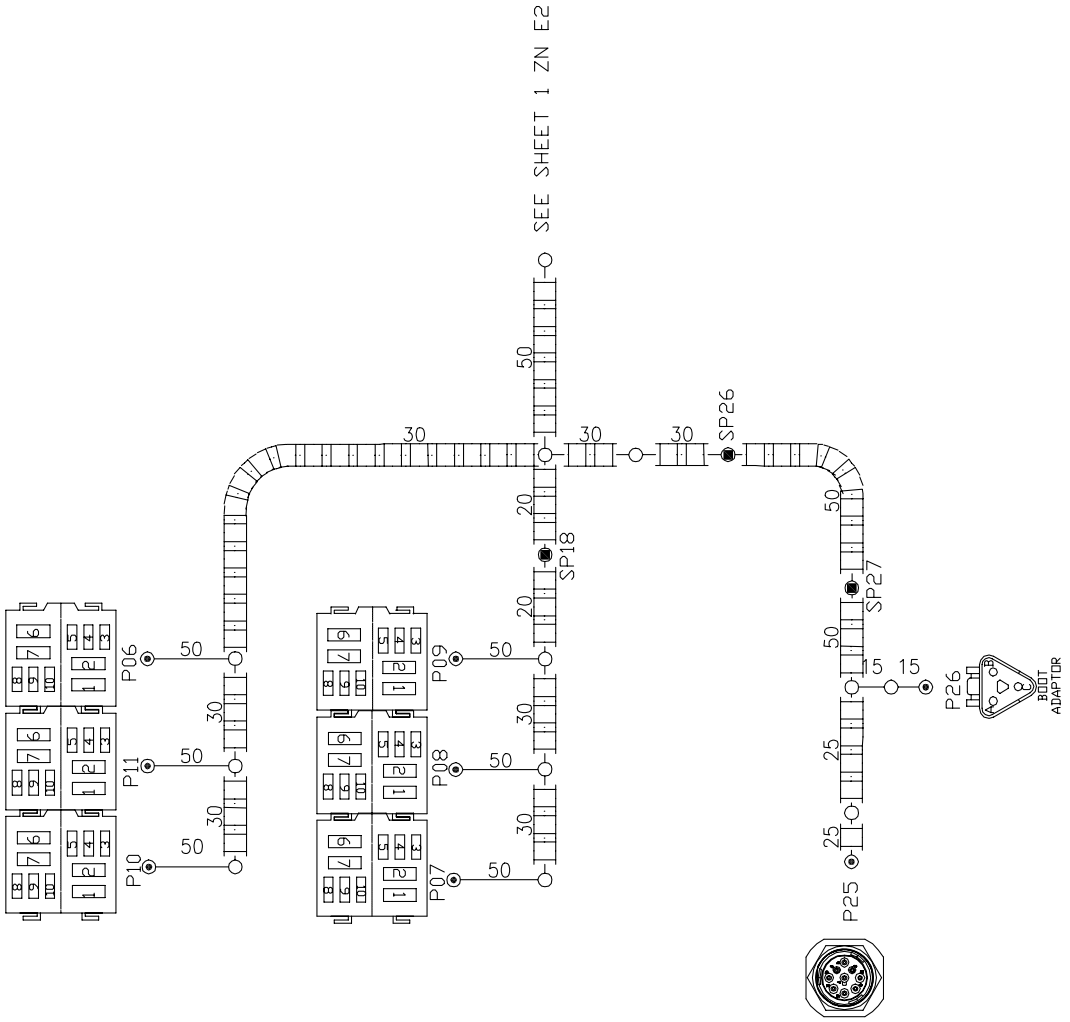
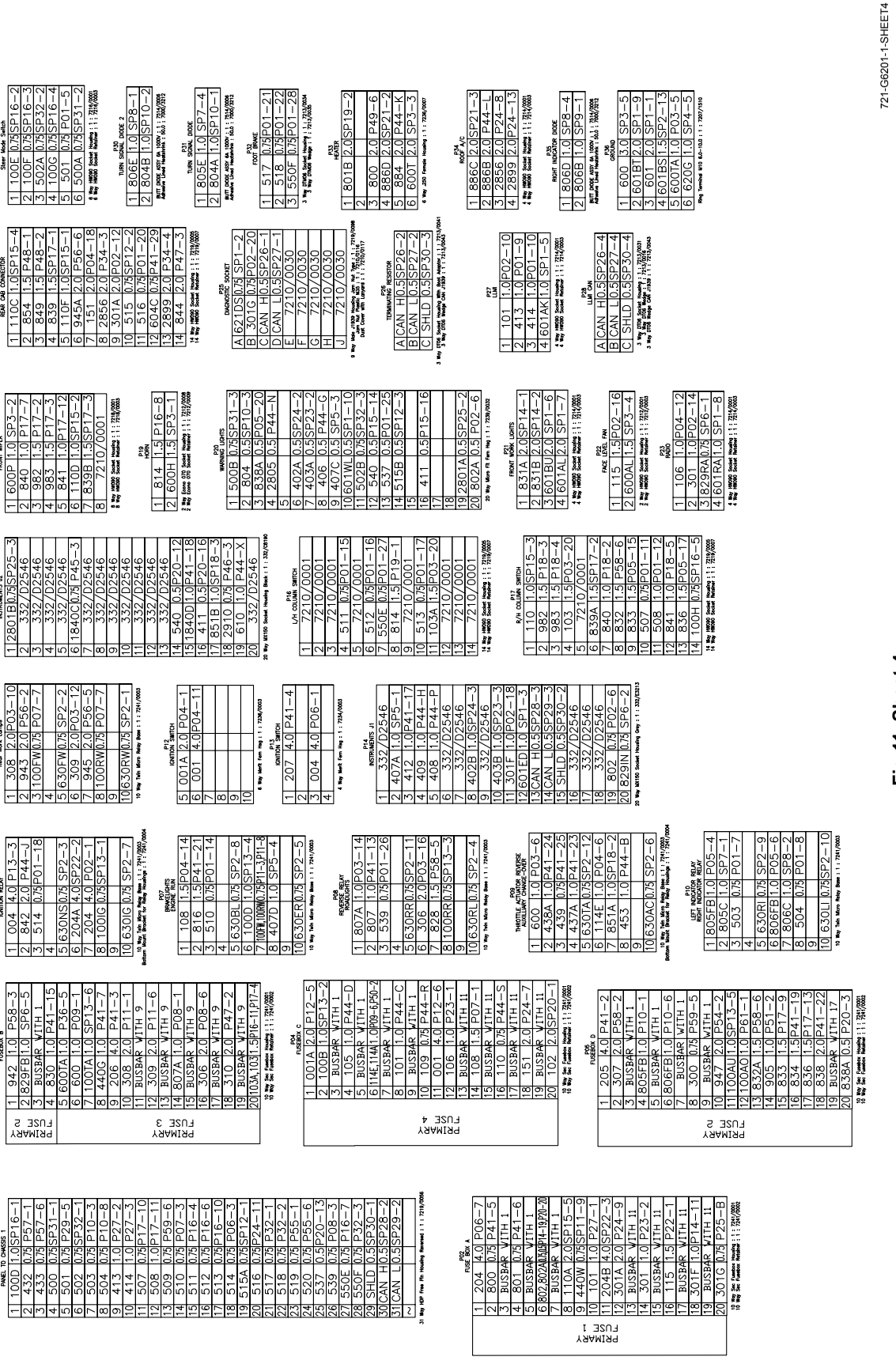


Fig 10. Sheet 3

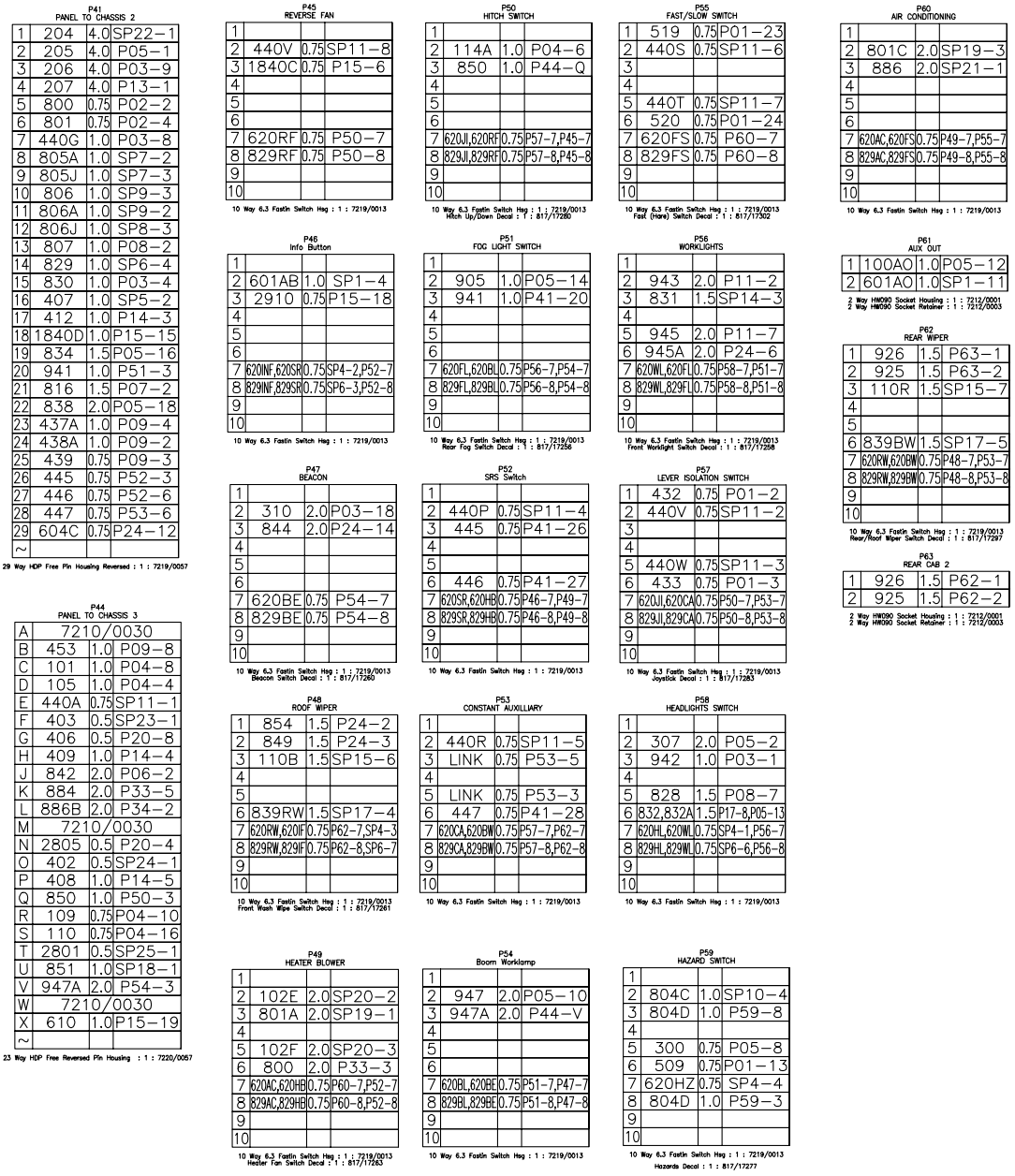
⇒ *Panel/Cab - CAD 721/G6201 Issue 1 (C3-14)*



721-G6201-1-SHEET4

Fig 11. Sheet 4

⇒ *Panel/Cab - CAD 721/G6201 Issue 1 (C3-14)*



721-G6201-1-SHEET5

Fig 12. Sheet 5

⇒ *Panel/Cab - CAD 721/G6201 Issue 1 (C3-14)*

SP1
GROUND

1	601	2.0	P36−3
2	621DS	0.75	P25−A
3	601ED	1.0	P14−12
4	601AB	1.0	P46−2
5	601AK	1.0	P27−4
6	601BU	2.0	P21−3
7	601AL	2.0	P21−4
8	601RA	1.0	P23−4
9	601BT	2.0	P36−2
10	601WL	0.5	P20−10
11	601AO	1.0	P61−2
12			

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

SP2
RELAY GROUNDS

1	630RW	0.75	P11−10
2	630FW	0.75	P11−5
3	630NS	0.75	P06−5
4	630RL	0.75	P08−10
5	630ER	0.75	P07−10
6	630AC	0.75	P09−10
7	630IG	0.75	P06−10
8	630BL	0.75	P07−5
9	630RI	0.75	P10−5
10	630LI	0.75	P10−10
11	630RR	0.75	P08−5
12	630TA	0.75	P09−5
13	601BS	1.5	P36−4

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

SP3
WIPER/HEATER/FACE FAN GROUND

1	600H	1.5	P19−2
2	600P	1.0	P18−1
3	600T	2.0	P33−6
4	600AL	1.5	P22−2
5	600	3.0	P36−1

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

SP4
ILLUMINATION GROUND

1	620HL	0.75	P58−7
2	620INF	0.75	P46−7
3	620IF	0.75	P48−7
4	620HZ	0.75	P59−7
5	620G	1.0	P36−6
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			

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

SP5
ALTERNATOR D+

1	407A	1.0	P14−2
2	407	1.0	P41−16
3	407C	0.5	P20−9
4	407D	1.0	P07−8

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

SP6
ILLUMINATION

1	829RA	0.75	P23−3
2	829IN	0.75	P14−20
3	829INF	0.75	P46−8
4	829	1.0	P41−14
5	829FB	1.0	P03−2
6	829HL	0.75	P58−8
7	829IF	0.75	P48−8
8			
9			
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19			

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

SP7
LEFT INDICATOR SPLICE

1	805C	1.0	P10−2
2	805A	1.0	P41−8
3	805J	1.0	P41−9
4	805E	1.0	P31−1

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

SP8
RIGHT INDICATOR SPLICE

1	806E	1.0	P30−1
2	806C	1.0	P10−7
3	806J	1.0	P41−12
4	806D	1.0	P35−1

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

SP9
TRAILER SENSE

1	806B	1.0	P35−2
2	806A	1.0	P41−11
3	806	1.0	P41−10

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

SP10
TURN SIGNAL INDICATION

1	804A	1.0	P31−2
2	804B	1.0	P30−2
3	804	0.5	P20−2
4	804C	1.0	P59−2

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

SP11
SRS, CONST AUX, JOYSTICK ISOL
AUX C/O SWITCH SUPPLY

1	440A	0.75	P44−E
2	440V	0.75	P57−2
3	440W	0.75	P57−5
4	440P	0.75	P52−2
5	440R	0.75	P53−2
6	440S	0.75	P55−2
7	440T	0.75	P55−5
8	440V	0.75	P45−2
9	440W	0.75	P02−9

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

SP12
PARKBRAKE WARNING LAMP

1	515A	0.75	P01−19
2	515	0.75	P24−10
3	515B	0.5	P20−14

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

SP13
RELAY SUPPLY

1	100IG	0.75	P06−8
2	100B	1.0	P04−2
3	100RR	0.75	P08−8
4	100D	1.0	P07−6
5	100AU	1.0	P05−11
6	100TA	1.0	P03−7

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

SP14
FRONT WORK LIGHTS

1	831A	2.0	P21−1
2	831B	2.0	P21−2
3	831	1.5	P56−3

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

SP15
WIPER SUPPLY

1	110F	1.0	P24−5
2	110D	1.0	P18−6
3	110	1.0	P17−1
4	110C	1.0	P24−1
5	110A	2.0	P02−8
6	110B	1.5	P48−3
7	110R	1.5	P62−3

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

SP16
STEER MODE SWITCH SUPPLY

1	100D	1.0	P01−1
2	100E	0.75	P29−1
3	100F	0.75	P29−2
4	100G	0.75	P29−4
5	100H	0.75	P17−14

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

SP17
WASHER

1	839	1.5	P24−4
2	839A	1.5	P17−6
3	839B	1.5	P18−7
4	839RW	1.5	P48−6
5	839BW	1.5	P62−6

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

SP18
SECOND AUX

1	851	1.0	P44−U
2	851A	1.0	P09−7
3	851B	1.0	P15−17

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

SP19
HVAC

1	801A	2.0	P49−3
2	801B	2.0	P33−1
3	801C	2.0	P60−2
4			

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

SP20
HEATER BLOWER

1	102	2.0	P04−20
2	102E	2.0	P49−2
3	102F	2.0	P49−5

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

SP21
ROOF AC FAN 2

1	886	2.0	P60−3
2	886D	2.0	P33−4
3	886C	2.0	P34−1

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

SP22
PRIMARY FUSE 1

1	204	4.0	P41−1
2	204A	4.0	P06−6
3	204B	4.0	P02−11

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

SP23
ENGINE OIL PRESSURE

1	403	0.5	P44−F
2	403A	0.5	P20−7
3	403B	1.0	P14−10

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

SP24
VACUUM SWITCH

1	402	0.5	P44−O
2	402A	0.5	P20−6
3	402B	1.0	P14−8

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

SP25
WATER IN FUEL

1	2801	0.5	P44−T
2	2801A	0.5	P20−19
3	2801B	0.75	P15−1

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

SP26
CAN H1

1	CAN	H	0.5	P25−C
2	CAN	H	0.5	P26−A
3	CAN	H	0.5	SP28−1
4	CAN	H	0.5	P28−A

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

SP27
CANL 1

1	CAN	L	0.5	P25−D
2	CAN	L	0.5	P26−B
3	CAN	L	0.5	SP29−1
4	CAN	L	0.5	P28−B

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

SP28
CAN H2

1	CAN	H	0.5	SP26−3
2	CAN	H	0.5	P01−30
3	CAN	H	0.5	P14−13

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

SP29
CANL 2

1	CAN	L	0.5	SP27−3
2	CAN	L	0.5	P01−31
3	CAN	L	0.5	P14−14

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

SP30
CAN SHIELD

1	SHLD		0.5	P01−29
2	SHLD		0.5	P14−15
3	SHLD		0.5	P26−C
4	SHLD		0.5	P28−C

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

SP31
4 WHEEL STEER LAMP

1	500	0.75	P01−4
2	500A	0.75	P29−6
3	500B	0.75	P20−1

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

SP32
CRAB STEER LAMP

1	502	0.75	P01−6
2	502A	0.75	P29−3
3	502B	0.75	P20−11

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

721-G6201-1-SHEET6

Fig 13. Sheet 6

⇒ *Panel/Cab - CAD 721/G6201 Issue 1 (C3-14)*

Rear Cab (Not Air Conditioning) - CAD 721/ G6947 Issue 2

⇒ *Fig 14. (C3-22)*

Key to Connectors:

RC01	Panel Harness
RC02	Parkbrake
RC03	Washer Bottle
RC04	Rear Wiper
RC05	R/H Rear Worklamp
RC06	L/H Rear Worklamp
RC07	Beacon
RC08	Interior Lamp +ve
RC09	Interior Lamp - ve
RC10	Earth
RC11	Roof Wiper
RC12	Air Suspension Seat
RC13	Panel Harness 2

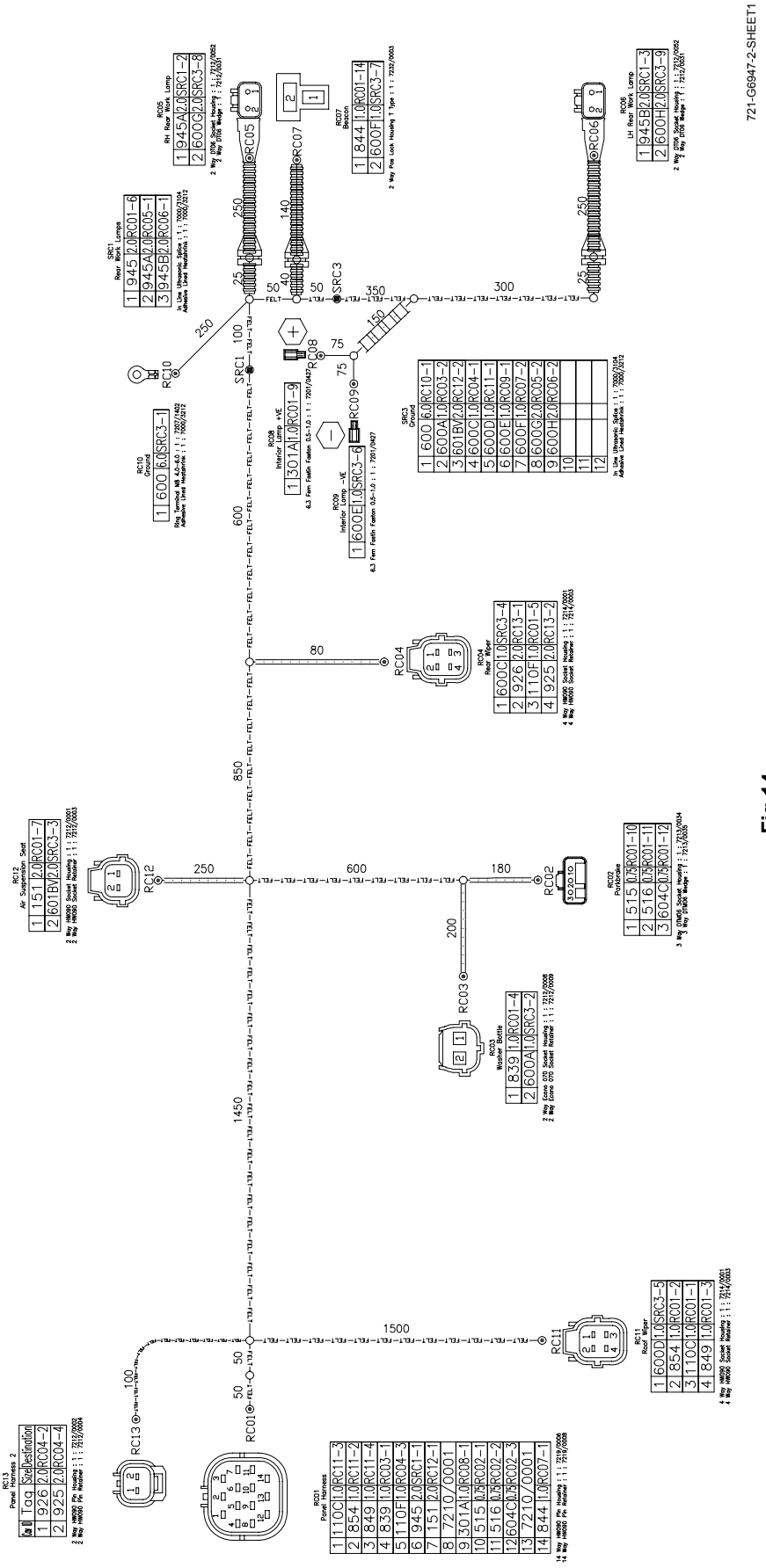


Fig 14.

⇒ *Rear Cab (Not Air Conditioning) - CAD 721/G6947 Issue 2 (C3-21)*

Rear Cab (With Air Conditioning) - CAD 721/ G6948 Issue 2

⇒ *Fig 15. (C3-24)*

Key to Connectors:

RC01	Panel Harness
RC02	Parkbrake
RC03	Washer Bottle
RC04	Rear Wiper
RC05	R/H Rear Worklamp
RC06	L/H Rear Worklamp
RC07	Beacon
RC08	Interior Lamp +ve
RC09	Interior Lamp - ve
RC10	Earth
RC11	Roof Wiper
RC12	Air Suspension Seat
RC13	Panel Harness 2
RC14	Roof AC Fan 1 Earth
RC15	Roof AC Fan 1
RC16	Roof AC Fan 2 Earth
RC17	Roof AC Fan 2

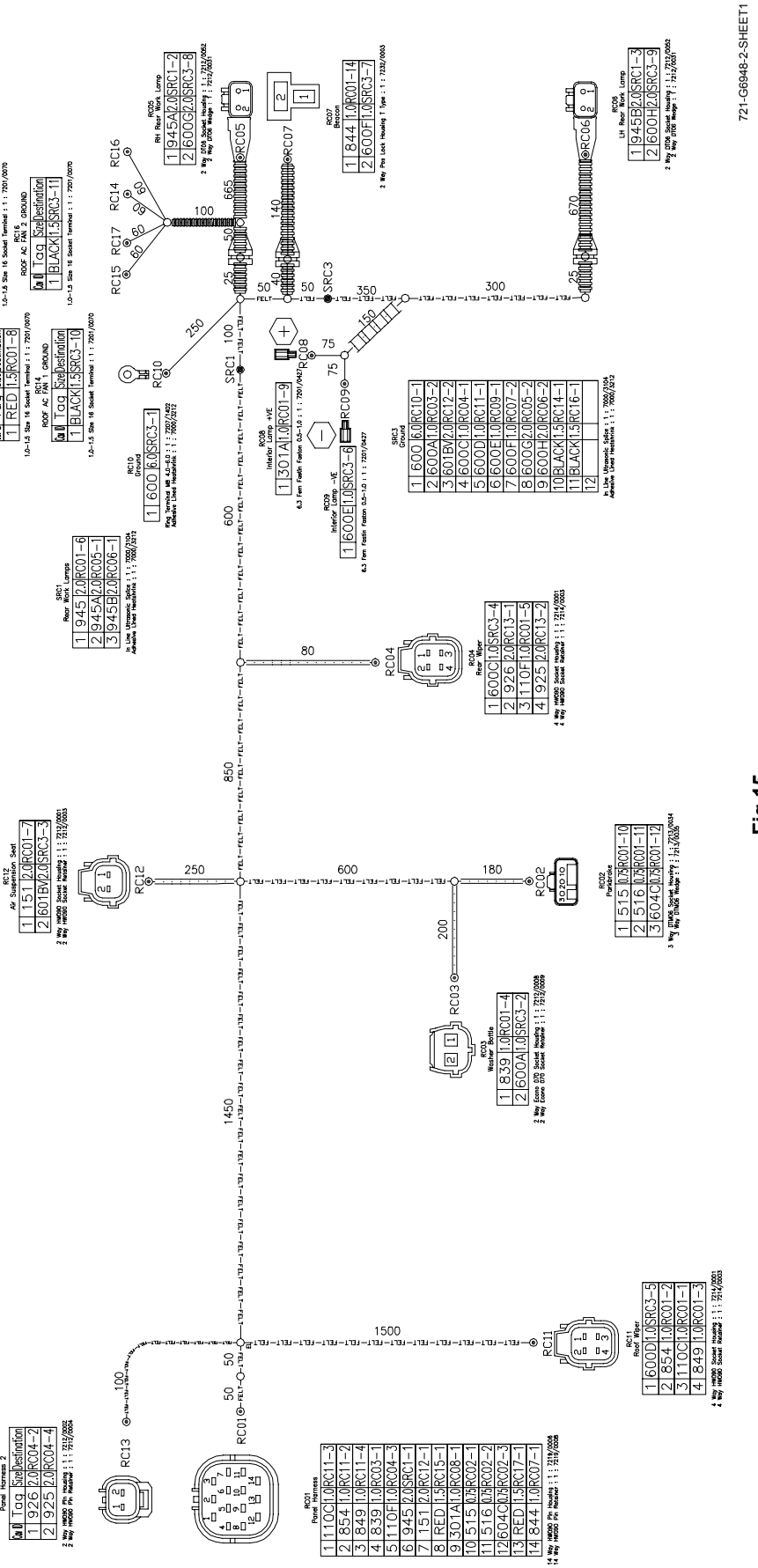


Fig 15.

⇒ *Rear Cab (With Air Conditioning) - CAD 721/G6948 Issue 2 (C3-23)*

Chassis - CAD 721/G6391 Issue 2

⇒ *Fig 16. (C3-26)*

Key to Connectors:

C001	Chassis Harness to Panel Harness Connector 1
C002	Left Head Lamp
C003	Chassis Harness to Valve Block Harness Connector
C004	Chassis Harness to Engine Harness Connector
C005	Right Head Lamp
C006	Chassis Harness to Transmission Harness connector
C007	Reverse Fan Solenoid
C008	Inching Control
C010	Chassis Earth
C011	Chassis Harness to Cold Start Harness Connector
C012	Agglomerator (Water in Fuel)
C013	Joystick Connector 1
C014	Joystick Connector 2
C015	Joystick Connector 3
C016	Joystick Connector 4
C017	Right Tail Lamp
C018	Left Tail Lamp
C019	Chassis Harness to Trailer Harness Connector
C020	Number Plate Lamp
C021	Reverse Alarm
C022	Tilt Lock Switch
C023	Angle Sensor
C024	Rear Steer Sensor
C025	LLMI Transducer
C026	Front Steer Sensor
C027	Front/Rear Auxiliary
C028	Steer Valve A
C029	Steer Valve B
C030	Steer Valve C
C031	Steer Valve D
C032	Chassis Harness to Boom Harness Connector
C033	Hydraulic Temperature Sensor
C034	Throttle Actuator
C035	Fuel Sender
C036	Air Filter Vacuum Sensor
C037	Earth
C038	Primary Fuse (Blue)
C039	Primary Fuse (Grey)
C040	SRS
C041	Chassis Harness to Panel Harness Connector 2
C042	Transmission ECU Supply
C043	Hydraulic Control ECU Supply
C044	Chassis Harness to Panel Harness Connector 3
C045	Boom Retract Switch
C046	Transmission ECU J1
C047	Transmission ECU J2
C048	Hydraulic Control ECU J1
C049	Hydraulic Control ECU J2
C050	Controller Earths
C051	CANbus Terminator
C052	Chassis Angle Sensor
C054	Auxiliary Socket
C055	Auxiliary Socket Fuse
C056	Auxiliary Fuse Supply
C057	Hydraulic Isolation Switch
C058	Inching Pedal A
C059	Inching Pedal B

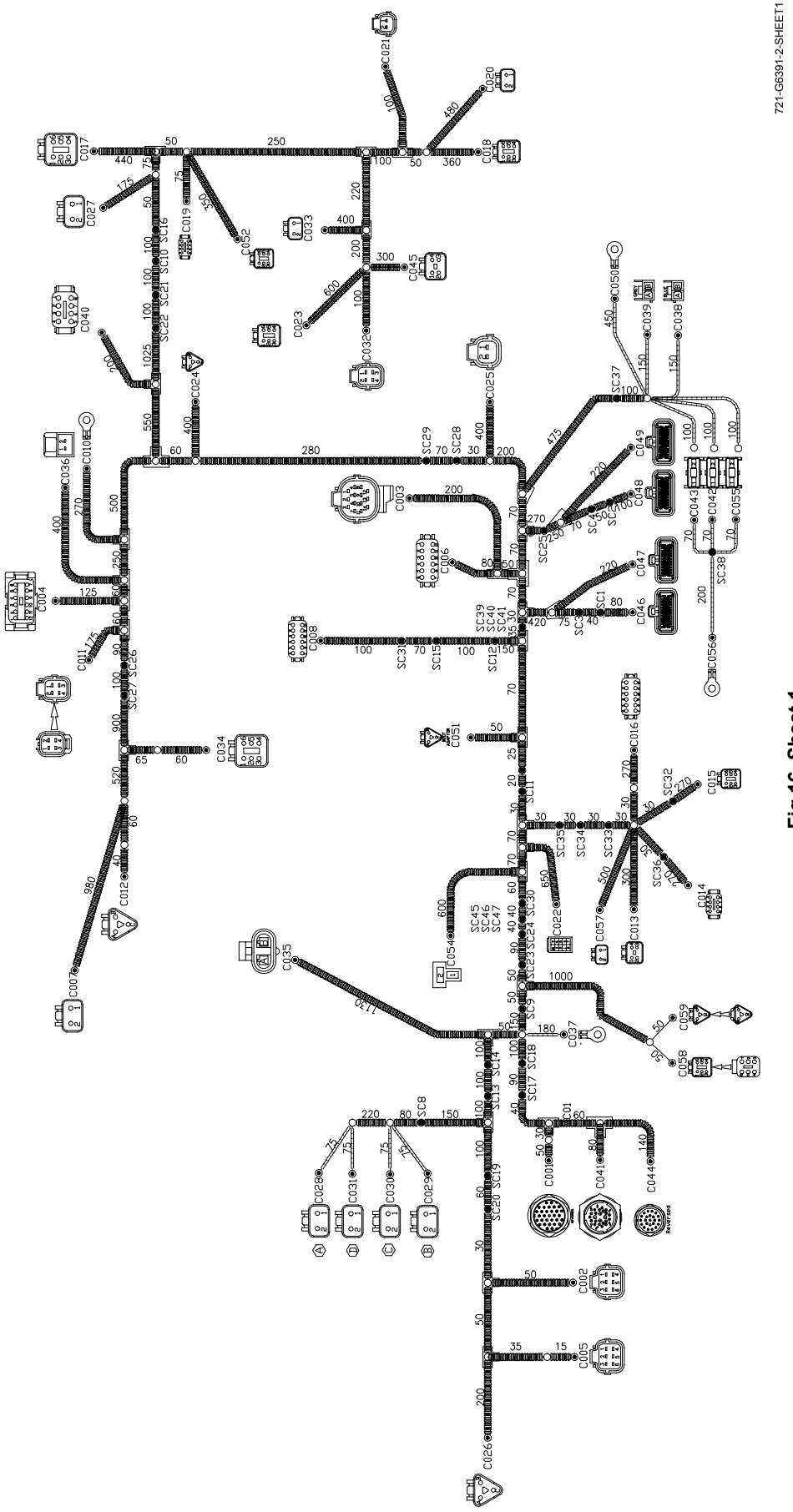


Fig 16. Sheet 1

⇒ *Chassis - CAD 721/G6391 Issue 2 (C3-25)*

C001
CHASSIS TO CAB

Cav ID	Tag	Size	Destination	Cav ID	Tag	Size	Destination
1	100D	1.0	SC11-5	17	513	1.0	C047-20
2	432	1.0	C049-31	18	514	1.0	C046-26
3	433	1.0	C049-20	19	515	1.0	C047-27
4	500	1.0	C046-9	20	516	1.0	C047-25
5	501	1.0	C047-16	21	517	1.0	C047-18
6	502	1.0	C046-20	22	518	1.0	C047-30
7	503	1.0	C047-12	23	519	1.0	C047-28
8	504	1.0	C046-13	24	520	1.0	C047-13
9	413	0.75	C025-1	25	537	1.0	C047-23
10	414	0.75	C025-2	26	539	1.0	C047-11
11	507	1.0	C046-10	27	550E	0.75	SC12-4
12	508	1.0	C046-21	28	550F	0.75	SC12-5
13	509	1.0	C046-22	29	CAN SCR	0.5	SC47-1
14	510	1.0	C046-24	30	CAN H	0.5	SC45-1
15	511	1.0	C047-19	31	CAN L	0.5	SC46-1
16	512	1.0	C047-31	32	7210/0030		

31 Way HDP Bulkhead Socket Housing Reversed : 1 : 7219/0055
Size 24 Lockwasher : 1 : 7210/0047
Size 24 Plastic Jam Nut : 1 : 7210/0048

C002
LEFT HEADLAMP

Cav ID	Tag	Size	Destination
1	7210/0001		
2	834A	2.0	SC19-2
3	838A	2.0	SC20-2
4	829B	1.0	SC17-2
5	805G	1.0	SC13-2
6	606	2.0	SC9-4

6 Way HW090 Socket Housing : 1 : 7216/0001
6 Way HW090 Socket Retainer : 1 : 7216/0003

C003
VALVE BLOCK HARNESS

Cav ID	Tag	Size	Destination
1	420	1.0	C049-23
2	421	1.0	C049-12
3	422	1.0	C049-24
4	423	1.0	C049-5
5	424	1.0	C049-9
6	425	1.0	C048-35
7	426	1.0	C048-1
8	427	1.0	C049-4
9	428	1.0	C049-1
10	429	1.0	C049-8
11	430	1.0	C049-7
12	431	1.0	C048-12
13	454	1.0	C048-13
14	611	1.0	SC9-6

14 Way HW090 Socket Housing : 1 : 7219/0005
14 Way HW090 Socket Retainer : 1 : 7219/0007

C004
ENGINE HARNESS

Cav ID	Tag	Size	Destination
1	403	1.0	C044-F
2	406	1.0	C044-G
3	407	1.0	C041-16
4	409	1.0	C044-H
5	412	1.0	C041-17
6	105	1.0	C044-D
7	842A	2.0	SC27-2
8	7210/0030		
9	884	2.0	C044-K
10	886B	2.0	C044-L
11	404B	1.0	C044-M
12	608A	2.0	SC26-2

12 Way DT04 Pin Housing : 1 : 7219/0015
12 Way DT04 Wedge : 1 : 7219/0010

C005
RIGHT HEADLAMP

Cav ID	Tag	Size	Destination
1	7210/0001		
2	834B	1.0	SC19-3
3	838B	2.0	SC20-3
4	830B	2.0	SC18-2
5	806G	1.0	SC14-2
6	607	2.0	SC9-5

6 Way HW090 Socket Housing : 1 : 7216/0001
6 Way HW090 Socket Retainer : 1 : 7216/0003

C006
TRANSMISSION HARNESS

Cav ID	Tag	Size	Destination
1	521	1.0	C047-7
2	522	1.0	C047-6
3	523	1.0	C046-35
4	535	1.0	C046-12
5	524	1.0	C047-5
6	525	1.0	C047-24
7	526	1.0	C047-4
8	527	1.0	C047-1
9	481	1.0	C049-33
10	100C	0.75	SC11-4
11	480	1.0	C047-33
12	604D	0.75	SC15-5

12 Way DT06 Socket Housing : 1 : 7219/0016
12 Way DT06 Wedge : 1 : 7219/0012

C007
REVERSE FAN SOLENOID

Cav ID	Tag	Size	Destination
1	1840	1.0	C041-18
2	608F	1.0	SC26-7

2 Way DT06 Socket Housing : 1 : 7213/0052
2 Way DT06 Wedge : 1 : 7212/0031

C008
INCHING CONTROL

Cav ID	Tag	Size	Destination
1	550A	0.75	SC12-2
2	604A	0.75	SC15-2
3	560	0.75	C046-7
4	550B	0.75	SC12-3
5	604B	0.75	SC15-3
6	561	0.75	C046-18
7	456A	0.75	SC31-2
8	609E	0.75	SC28-6
9	435	0.75	C048-31
10	456B	0.75	SC31-3
11	609F	0.75	SC28-7
12	436	0.75	C048-19

12 Way DT06 Socket Housing : 1 : 7219/0016
12 Way DT06 Wedge : 1 : 7219/0012

C010
CHASSIS GROUND

Cav ID	Tag	Size	Destination
1	608	6.0	SC26-1

Ring Terminal M10 4.0-6.0 : 1 : 7207/1502
Adhesive Lined Heatshrink : 1.0 : 7000/3212

C011
COLD START HARNESS

Cav ID	Tag	Size	Destination
1	842B	2.0	SC27-3
2	608C	1.0	SC26-4
3	109	1.0	C044-R
4	2805	1.0	C044-N

4 Way HW090 Socket Housing : 1 : 7213/0001
4 Way HW090 Socket Retainer : 1 : 7214/0003

C012
AGGLOMERATOR

Cav ID	Tag	Size	Destination
A	110	0.75	C044-S
B	2801	0.75	C044-T
C	610B	0.75	SC30-3

3 Way DT06 Socket Housing : 1 : 7213/0031
3 Way DT06 Wedge : 1 : 7213/0016

C013
JOYSTICK 1

Cav ID	Tag	Size	Destination
1	466	0.75	C014-1
2	7210/0030		
3	477	1.0	C014-2
4	7210/0030		

4 Way DT06 Socket Housing : 1 : 7214/0025
4 Way DT06 Wedge : 1 : 7214/0016

C014
JOYSTICK 2

Cav ID	Tag	Size	Destination
1	466	0.75	C013-1
2	477	1.0	C013-3
3	612C	0.75	SC33-4
4	467	0.75	SC34-1
5	468	0.75	SC35-1
6	7210/0030		
7	612D	0.75	SC33-5
8	469A	0.75	SC36-2

8 Way DT06 Socket Housing : 1 : 7218/0013
8 Way DT06 Wedge : 1 : 7218/0009

C015
JOYSTICK 3

Cav ID	Tag	Size	Destination
1	460A	0.75	SC32-2
2	462	0.75	C016-5
3	612A	0.75	SC33-2
4	460B	0.75	SC32-3
5	464	0.75	C016-6
6	612B	0.75	SC33-3

6 Way DT06 Socket Housing : 1 : 7216/0018
6 Way DT06 Wedge : 1 : 7216/0016

C016
JOYSTICK 4

Cav ID	Tag	Size	Destination
1	101	2.0	C044-C
2	603	2.0	SC37-4
3	7210/0030		
4	460	0.75	SC32-1
5	462	0.75	C015-2
6	464	0.75	C015-5
7	612	0.75	SC33-1
8	467A	0.75	SC34-2
9	468A	0.75	SC35-2
10	469	0.75	SC36-1
11	CAN H	0.5	SC45-2
12	CAN L	0.5	SC46-2

12 Way DT06 Socket Housing : 1 : 7219/0016
12 Way DT06 Wedge : 1 : 7219/0012

C017
RIGHT TAIL LAMP

Cav ID	Tag	Size	Destination
1	816B	1.5	SC21-3
2	830D	1.0	SC18-4
3	806F	1.0	SC14-3
4	941B	1.0	SC22-3
5	807B	1.0	SC10-3
6	605B	2.0	SC16-3

6 Way DT06 Socket Housing : 1 : 7216/0018
6 Way DT06 Wedge : 1 : 7216/0016

C018
LEFT TAIL LAMP

Cav ID	Tag	Size	Destination
1	816A	1.5	SC21-2
2	829D	1.0	SC17-4
3	805F	1.0	SC13-3
4	941A	1.0	SC22-2
5	807A	1.0	SC10-2
6	605A	2.0	SC16-2

6 Way DT06 Socket Housing : 1 : 7216/0018
6 Way DT06 Wedge : 1 : 7216/0016

C019
TRAILER HARNESS

Cav ID	Tag	Size	Destination
1	805A	1.0	C041-8
2	807D	1.0	SC10-5
3	605E	2.0	SC16-6
4	806A	1.0	C041-11
5	830C	1.0	SC18-3
6	816C	1.5	SC21-4
7	829C	1.0	SC17-3
8	941C	1.0	SC22-4

8 Way DT06 Socket Housing : 1 : 7218/0013
8 Way DT06 Wedge : 1 : 7218/0009

C020
NUMBER PLATE LAMP

Cav ID	Tag	Size	Destination
1	829E	1.0	SC17-5
2	605D	1.0	SC16-5

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Wedge : 1 : 7212/0031

C021
REVERSE ALARM

Cav ID	Tag	Size	Destination
1	807C	1.0	SC10-4
2	605C	1.0	SC16-4

2 Way HW090 Socket Housing : 1 : 7213/0001
2 Way HW090 Socket Retainer : 1 : 7212/0003

C022
TILT LOCK SWITCH

Cav ID	Tag	Size	Destination
1	434A	0.75	C048-10
2	440B_LINK	0.75	SC25-3,007Z-5
3			
4			
5	LINK	0.75	C022-2
6	434	0.75	C048-22
7	613	1.0	SC37-5
8	830E	0.75	SC18-5
9			
10			

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

C023
ANGLE SENSOR

Cav ID	Tag	Size	Destination
1	456H	0.75	SC31-7
2	448	0.75	C048-7
3	609A	0.75	SC28-2
4	456J	0.75	SC31-8
5	449	0.75	C048-18
6	609B	0.75	SC28-3

6 Way DT06 Socket Housing : 1 : 7216/0018
6 Way DT06 Wedge : 1 : 7216/0016

C024
REAR STEER SENSOR

Cav ID	Tag	Size	Destination
A	820	0.75	C046-8
B	604G	0.75	SC15-8
C	100B	0.75	SC11-3

3 Way DT06 Socket Housing : 1 : 7213/0031
3 Way DT06 Wedge : 1 : 7213/0016

C025
LLMI TRANSDUCER

Cav ID	Tag	Size	Destination
1	413	0.75	C001-9
2	414	0.75	C001-10

2 Way HW090 Socket Housing : 1 : 7213/0001
2 Way HW090 Socket Retainer : 1 : 7212/0003

C026
FRONT STEER SENSOR

Cav ID	Tag	Size	Destination
A	819	0.75	C046-32
B	604F	0.75	SC15-7
C	100A	0.75	SC11-2

3 Way DT06 Socket Housing : 1 : 7213/0031
3 Way DT06 Wedge : 1 : 7213/0016

C027
FRONT/REAR AUX

Cav ID	Tag	Size	Destination
1	850	1.5	C044-Q
2	608D	1.5	SC26-5

2 Way DT06 Socket Housing : 1 : 7213/0052
2 Way DT06 Wedge : 1 : 7212/0031

C028
STEER VALVE A

Cav ID	Tag	Size	Destination
1	825	1.0	C046-25
2	602A	1.0	SC8-2

2 Way DT06 Socket Housing : 1 : 7213/0052
2 Way DT06 Wedge : 1 : 7212/0031

C029
STEER VALVE B

Cav ID	Tag	Size	Destination
1	826	1.0	C046-27
2	602B	1.0	SC8-3

2 Way DT06 Socket Housing : 1 : 7213/0052
2 Way DT06 Wedge : 1 : 7212/0031

C030
STEER VALVE C

Cav ID	Tag	Size	Destination
1	848	1.0	C047-10
2	602C	1.0	SC8-4

2 Way DT06 Socket Housing : 1 : 7213/0052
2 Way DT06 Wedge : 1 : 7212/0031

C031
STEER VALVE D

Cav ID	Tag	Size	Destination
1	824	1.0	C047-9
2	602D	1.0	SC8-5

2 Way DT06 Socket Housing : 1 : 7213/0052
2 Way DT06 Wedge : 1 : 7212/0031

C032
BOOM HARNESS

Cav ID	Tag	Size	Destination
1	947	2.0	C044-V
2	608G	2.0	SC26-8
3	851	1.5	C044-U
4	608H	2.0	SC26-9

4 Way HW090 Socket Housing : 1 : 7214/0001
4 Way HW090 Socket Retainer : 1 : 7214/0003

C033
HYD TEMP. SENSOR

Cav ID	Tag	Size	Destination
1	604E	0.75	SC15-6
2	538	0.75	C046-31

2 Way DT06 Socket Housing : 1 : 7213/0052
2 Way DT06 Wedge : 1 : 7212/0031

C034
THROTTLE ACTUATOR

Cav ID	Tag	Size	Destination
1	440G	0.75	C041-7
2	455	0.75	SC29-1
3	609D	0.75	SC28-5
4	438B	1.0	SC24-3
5	437B	1.0	SC23-3
6	7210/0030		

6 Way DT06 Socket Housing : 1 : 7216/0018
6 Way DT06 Wedge : 1 : 7216/0016

C035
FUEL SENDER

Cav ID	Tag	Size	Destination
1	408	0.75	C044-P
2	610A	0.75	SC30-2

2 Way MPack 150 Fem Hsg : 1 : 7212/0014
2 Way MPack 150 Fem Rat : 1 : 7212/0015

C036
VACUUM SENSOR

Cav ID	Tag	Size	Destination
1	402	0.75	C044-O
2	608B	0.75	SC26-3

2 Way Junior Power Timer Housing : 1 : 7212/0013

C037
GROUND

Cav ID	Tag	Size	Destination
1	GROUND	4.0	SC9-1

Ring Terminal M10 4.0-6.0 : 1 : 7207/1502
Adhesive Lined Heatshrink : 1.0 : 7000/3212

C038
PRIMARY FUSE

Cav ID	Tag	Size	Destination
A	205	4.0	C041-2
B	207	4.0	C041-4

2 Way Fem Hsg Pri Fuse Blue : 1 : 7232/0008

C039
PRIMARY FUSE GREY

Cav ID	Tag	Size	Destination
A	204	4.0	C041-1
B	206	4.0	C041-3

2 Way Fem Hsg Pri Fuse Grey : 1 : 7232/0009

C040
SRS

Cav ID	Tag	Size	Destination
1	456E	0.75	SC31-4
2	441	1.0	C049-11
3	442	1.0	C049-10
4	443	1.0	C049-29
5	444	1.0	C049-21
6	7210/0030		
7	609G	0.75	SC28-8
8	608E	1.5	SC26-6

8 Way DT06 Socket Housing : 1 : 7218/0013
8 Way DT06 Wedge : 1 : 7218/0009

C041
CHASSIS TO CAB

Cav ID	Tag	Size	Destination	Cav ID	Tag	Size	Destination
1	204	4.0	C039-A	16	407	1.0	C004-3
2	205	4.0	C038-A	17	412	1.0	C004-5
3	206	4.0	C039-B	18	1840	1.0	C007-1
4	207	4.0	C038-B	19	834	2.0	SC19-1
5	800	1.0	C046-11	20	941	1.0	SC22-1
6	801	1.0	C048-11	21	816	1.5	SC21-1
7	440G	0.75	C034-1	22	838	2.0	SC20-1
8	805A	1.0	C019-1	23	437A	1.0	SC23-2
9	805J	1.0	SC13-1	24	438A	1.0	SC24-2
10	806	1.0	C047-34	25	439	1.0	C048-26
11	806A	1.0	C019-4	26	445	1.0	C049-28
12	806J	1.0	SC14-1	27	446	1.0	C049-17
13	807	1.0	SC10-1	28	447	1.0	C049-35
14	829	2.0	SC17-1	29	604C	1.0	SC15-4
15	830	2.0	SC18-1	~			

29 Way HDP Bulkhead Reversed Socket Housing : 1 : 7219/0054
Size 24 Lockwasher : 1 : 7210/0047
Size 24 Plastic Jam Nut : 1 : 7210/0048

C042
TRANSMISSION ECU SUPPLY

Cav ID	Tag	Size	Destination
1	200	2.0	SC38-2
2	202	2.0	SC3-1

2 Way UnMs Fuse Holder : 1 : 716/30359
10A ATO Fuse : 1 : 716/00705

C043
HYDRAULICS ECU SUPPLY

Cav ID	Tag	Size	Destination
1	201	2.0	SC38-3
2	203	2.0	SC4-1

2 Way UnMs Fuse Holder : 1 : 716/30359
10A ATO Fuse : 1 : 716/00705

C044
CHASSIS TO CAB CONNECTOR 3

Cav ID	Tag	Size	Destination	Cav ID	Tag	Size	Destination
A	452	1.0	C049-25	N	2805	1.0	C011-4
B	453	1.0	C049-6	O	402	0.75	C036-1
C	101	2.0	C016-1	P	408	0.75	C035-1
D	105	1.0	C004-6	Q	850	1.5	C027-1
E	440A	1.0	SC25-2	R	109	1.0	C011-3
F	403	1.0	C004-1	S	110	0.75	C012-A
G	406	1.0	C004-2	T	2801	0.75	C012-B
H	409	1.0	C004-4	U	851	1.5	C032-3
J	842	2.0	SC27-1	V	947	2.0	C032-1
K	884	2.0	C004-9	W	7210/0030		
L	886B	2.0	C004-10	X	610	1.0	SC30-1
M	404B	1.0	C004-11	~			

23 Way HDP Bulkhead Reversed Socket Housing : 1 : 7220/0052
Size 24 Lockwasher : 1 : 7210/0047
Size 24 Plastic Jam Nut : 1 : 7210/0048

C045
BOOM RETRACT SWITCH

Cav ID	Tag	Size	Destination
1	440E	0.75	SC25-4
2	450	1.0	C048-21
3	451	1.0	C048-9
4	609C	0.75	SC28-4

4 Way DT06 Socket Housing : 1 : 7214/0035
4 Way DT06 Wedge : 1 : 7214/0016

C046
TRANSMISSION ECU J-1

Cav ID	Tag	Size	Destination	Cav ID	Tag	Size	Destination
1	100	1.0	SC11-1	19	581	0.75	C059-B
2	202A	1.0	SC3-2	20	502	1.0	C001-6
3	202B	1.0	SC3-3	21	508	1.0	C001-12
4	202C	1.0	SC3-4	22	509	1.0	C001-13
5	202D	1.0	SC3-5	23	332/U1483		
6	202E	1.0	SC3-6	24	510	1.0	C001-14
7	560	0.75	C008-3	25	825	1.0	C028-1
8	820	0.75	C024-A	26	514	1.0	C001-18
9	500	1.0	C001-4	27	826	1.0	C029-1
10	507	1.0	C001-11	28	550	1.0	SC12-1
11	800	1.0	C041-5	29	332/U1483		
12	535	1.0	C006-4	30	332/U1483		
13	504	1.0	C001-8	31	538	0.75	C033-2
14	604	1.0	SC15-1	32	819	0.75	C026-A
15	600A	1.0	SC1-2	33	CAN L	0.5	SC40-2
16	600B	1.0	SC1-3	34	CAN H	0.5	SC39-2
17	600C	1.0	SC1-4	35	523	1.0	C006-3
18	561	0.75	C008-6	36	332/U1483		

35 WAY AMPSEAL FEM HSG BLACK : 1 : 332/P8042
Cavity Seal AMPSEAL : 1 : 332/U1483
SKT TERM GOLD PLT : 1 : 770854-3

C047
TRANSMISSION ECU J-2

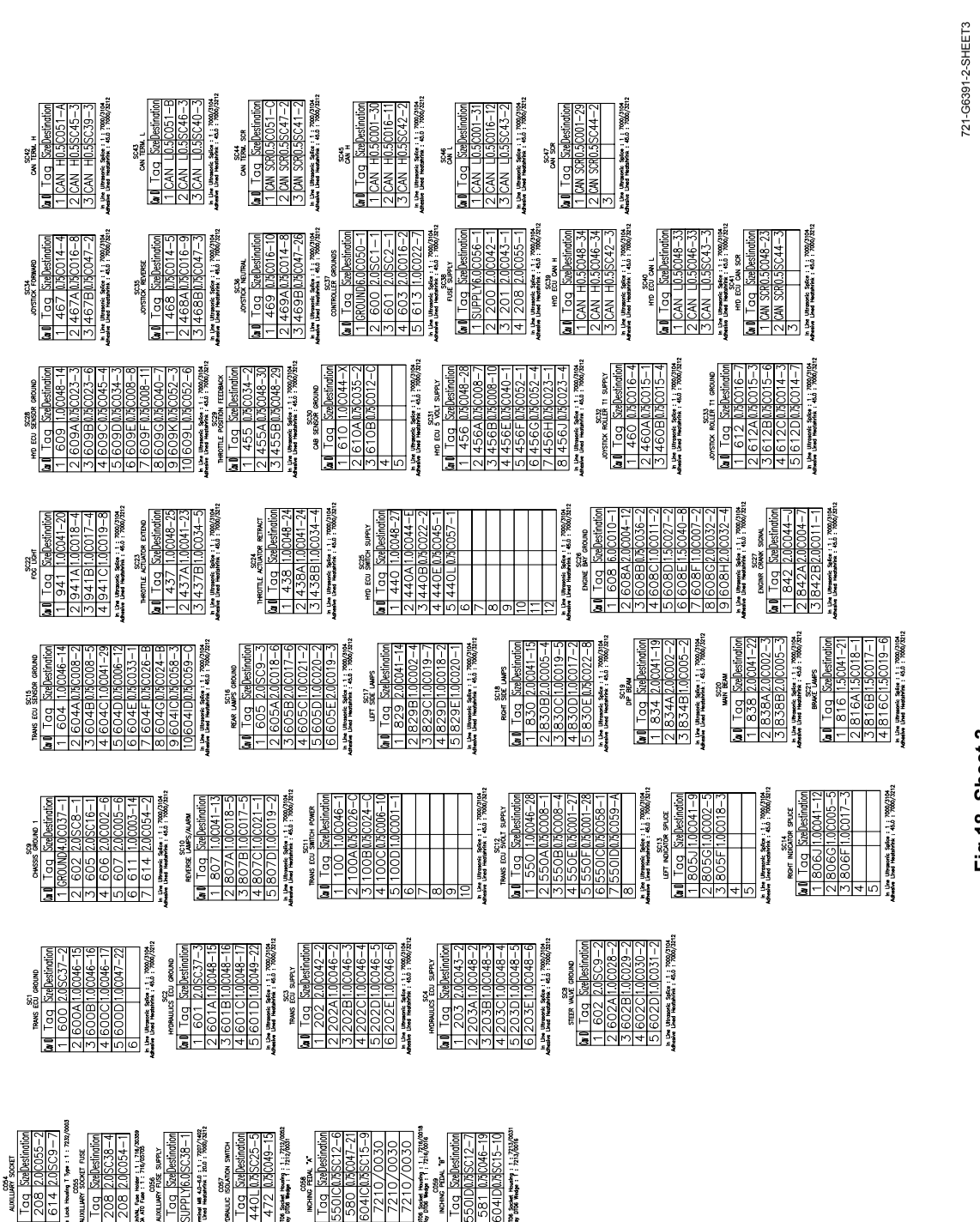
Cav ID	Tag	Size	Destination	Cav ID	Tag	Size	Destination
1	527	1.0	C006-8	19	511	1.0	C001-15
2	467B	0.75	SC34-3	20	513	1.0	C001-17
3	468B	0.75	SC35-3	21	580	0.75	C058-2
4	526	1.0	C006-7	22	600D	1.0	SC1-5
5	524	1.0	C006-5	23	537	1.0	C001-25
6	522	1.0	C006-2	24	525	1.0	C006-6
7	521	1.0	C006-1	25	516	1.0	C001-20
8	332/U1483			26	469B	0.75	SC36-3
9	824	1.0	C031-1	27	515	1.0	C001-19
10	848	1.0	C030-1	28	519	1.0	C001-23
11	539	1.0	C001-26	29	332/U1483		
12	503	1.0	C001-7	30	518	1.0	C001-22
13	520	1.0	C001-24	31	512	1.0	C001-16
14	332/U1483			32	332/U1483		
15	332/U1483			33	480	1.0	C006-11
16	501	1.0	C001-5	34	806	1.0	C041-10
17	332/U1483			35	332/U1483		
18	517	1.0	C001-21	36	332/U1483		

35 WAY AMPSEAL PIN HSG NATURAL : 1 : 332/P8043
SKT TERM GOLD PLT : 1 : 770854-3
Cavity Seal AMPSEAL : 1 : 332/U1483

721-G6391-2-SHEET2

Fig 17. Sheet 2

⇒ *Chassis - CAD 721/G6391 Issue 2 (C3-25)*



721-G6391-2-SHEET3

Fig 18. Sheet 3

⇒ *Chassis - CAD 721/G6391 Issue 2* (C3-25)

20, 25, 34 kph Machines Transmission Harness - CAD 721/G5105 Issue 1

⇒ *Fig 19. (C3-29)*

Key to Connectors:

T001 Chassis Connector
T002 Pump Forward Solenoid
T003 Pump Reverse Solenoid
T004 Motor Forward/Reverse Solenoid
T005 Motor Fast/Slow Solenoid
T006 Speed Sensor

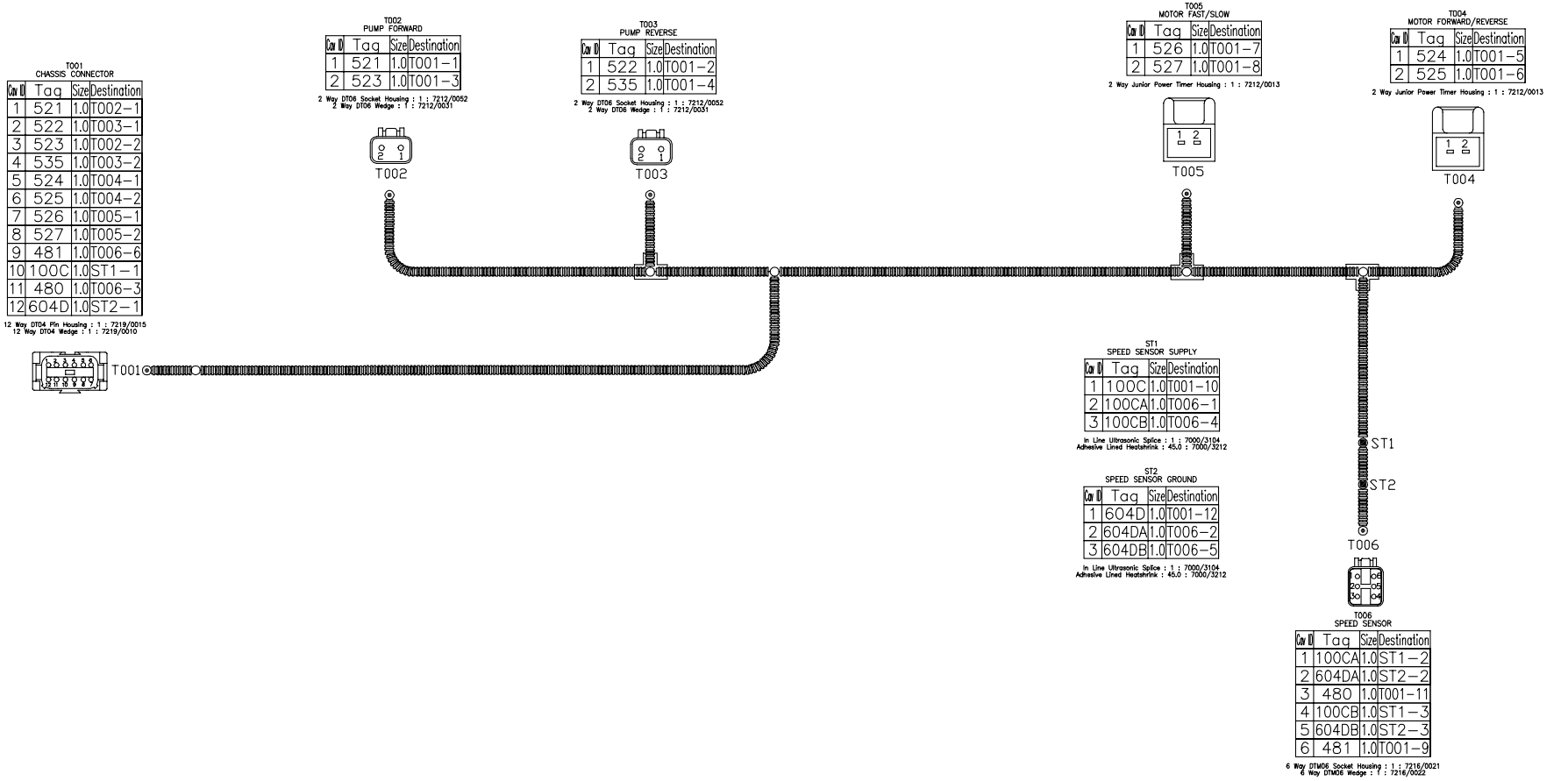


Fig 19.

⇒ *20, 25, 34 kph Machines Transmission Harness - CAD 721/G5105 Issue 1 (C3-29)*

40 kph Machines Transmission Harness - CAD 721/F8548 Issue 1

⇒ *Fig 20. (C3-30)*

Key to Connectors:

T001	Chassis Connector
T002	Pump Forward Solenoid
T003	Pump Reverse Solenoid
T004	Motor Forward/Reverse Solenoid
T005	Motor Fast/Slow Solenoid
T006	Speed Sensor

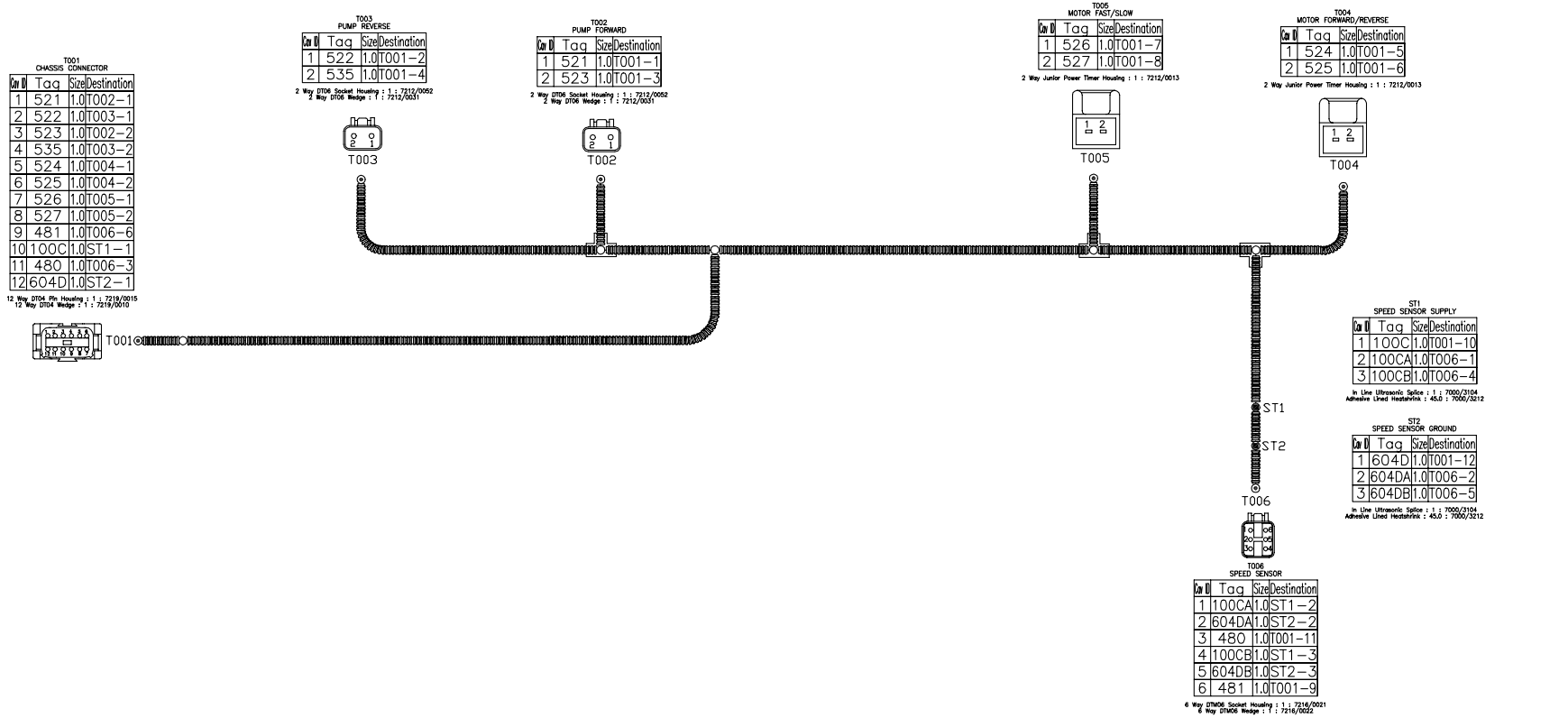


Fig 20.

⇒ *40 kph Machines Transmission Harness - CAD 721/F8548 Issue 1 (C3-30)*

Lights Harness - CAD 721/F8560 Issue 2

⇒ *Fig 21. (C3-31)*

Key to Connectors:

L001 Chassis Connector

L002 Headlamp Connector

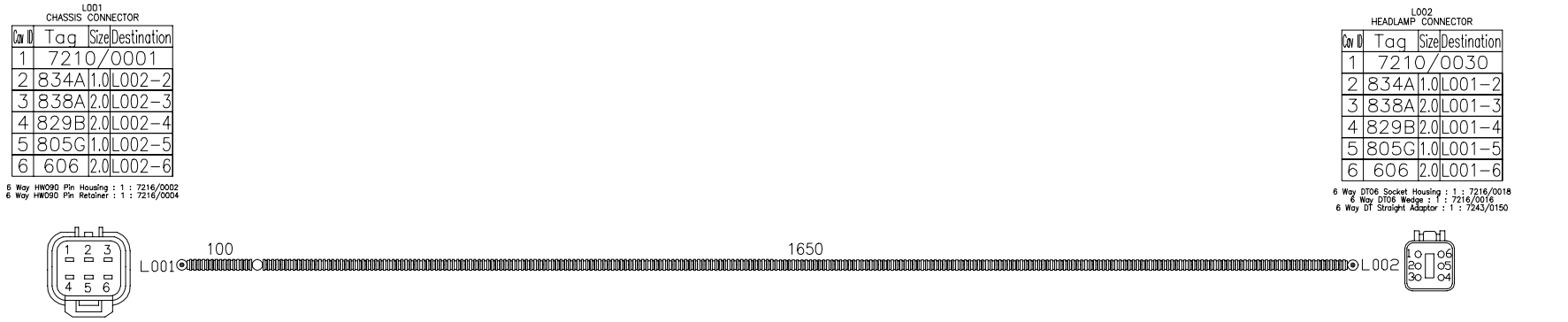


Fig 21.

⇒ *Lights Harness - CAD 721/F8560 Issue 2 (C3-31)*

SRS Lift Ram Harness - CAD 721/F8551 Issue 1

⇒ *Fig 22. (C3-32)*

Key to Connectors:

SR01 Chassis Connector
SR02 SRS Transducer
SR03 Accumulator Solenoid
SR04 Drain Solenoid

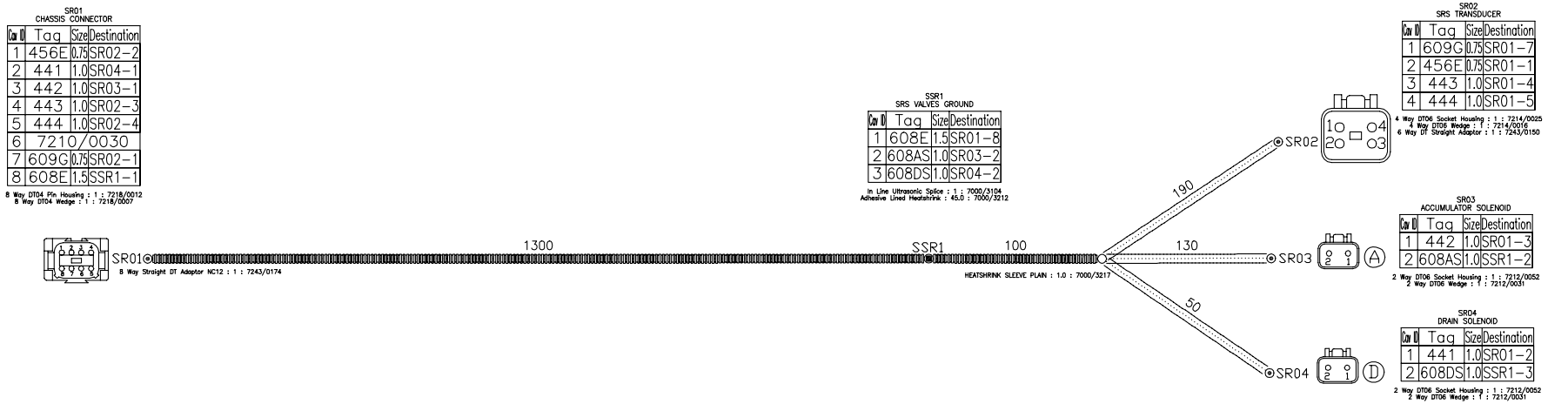


Fig 22.

⇒ *SRS Lift Ram Harness - CAD 721/F8551 Issue 1 (C3-32)*

Roof Air Conditioning Panel Harness - CAD 721/G4412 Issue 1

⇨ *Fig 23. (C3-33)*

Key to Connectors:

RA01 Fan 1 and 2 Relay
RA02 Panel Connector
RA03 Chassis Connector
RA04 Earth

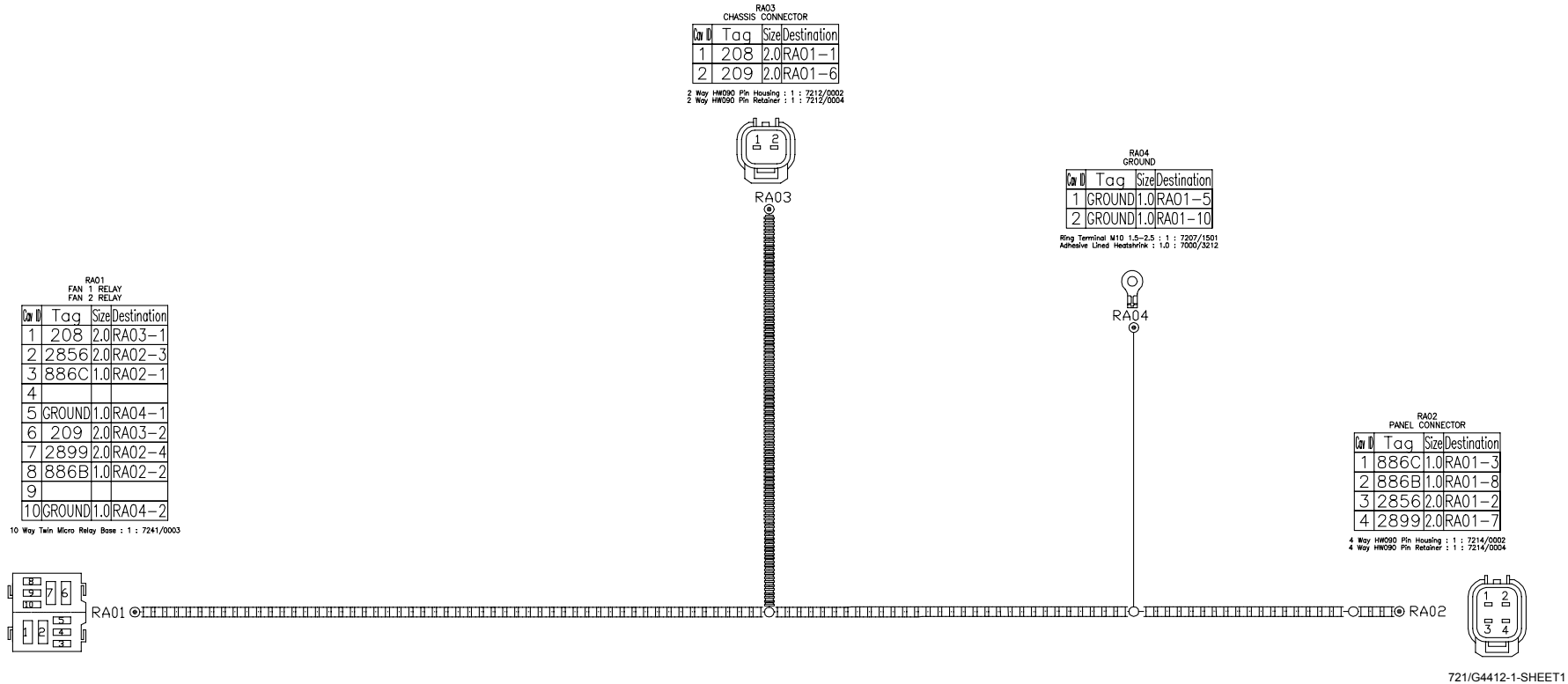


Fig 23.

⇨ *Roof Air Conditioning Panel Harness - CAD 721/G4412 Issue 1 (C3-33)*

Roof Air Conditioning Chassis Harness - CAD 721/G4411 Issue 1

⇨ *Fig 24. (C3-34)*

Key to Connectors:

CRA01 Fan 1 and 2 Relay

CRA02 Roof Air Conditioning Fuse Box

CRA03 +ve Battery Connection



Fig 24.

⇨ *Roof Air Conditioning Chassis Harness - CAD 721/G4411 Issue 1 (C3-34)*

Valve Block Harness - CAD 721/F8550 Issue 2

⇒ *Fig 25. (C3-36)*

Key to Connectors:

V001	Chassis Connector
V002	Boom Lower Solenoid
V003	Boom Raise Solenoid
V004	Boom Retract Solenoid
V005	Boom Extend Solenoid
V006	Carriage Dump (Tilt) Solenoid
V007	Carriage Crowd (Tilt) Solenoid
V008	Auxiliary B Solenoid
V009	Auxiliary A Solenoid
V010	Isolation Solenoid

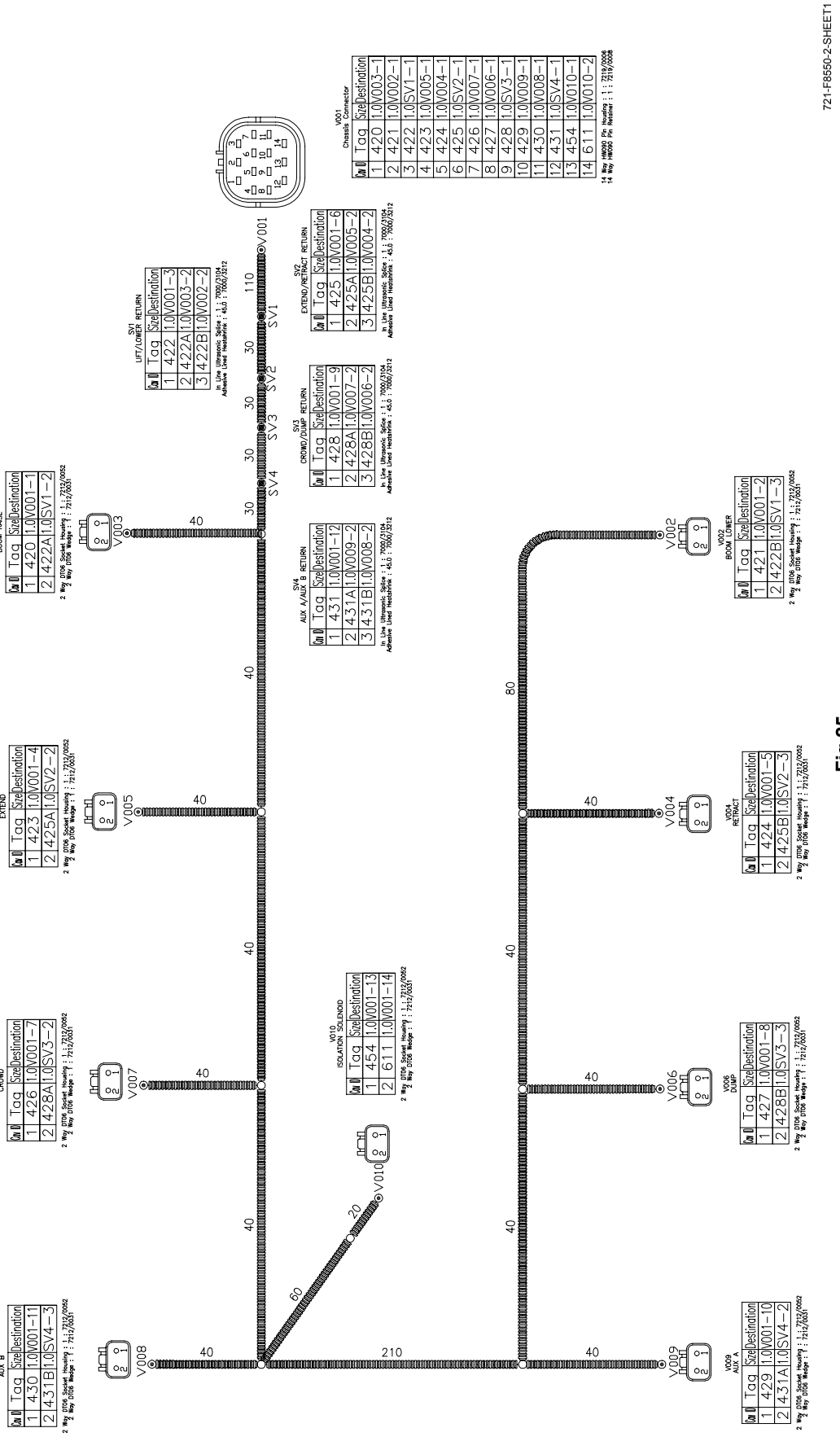


Fig 25.

⇒ *Valve Block Harness - CAD 721/F8550 Issue 2 (C3-35)*

Cold Start System - CAD 721/11975 Issue 1

⇨ *Fig 26. (C3-38)*

Key to Connectors:

CA	E.C.U. Connector
CB	Relay Connector
CC	Temperature Sensor
CD	Chassis Harness Connector

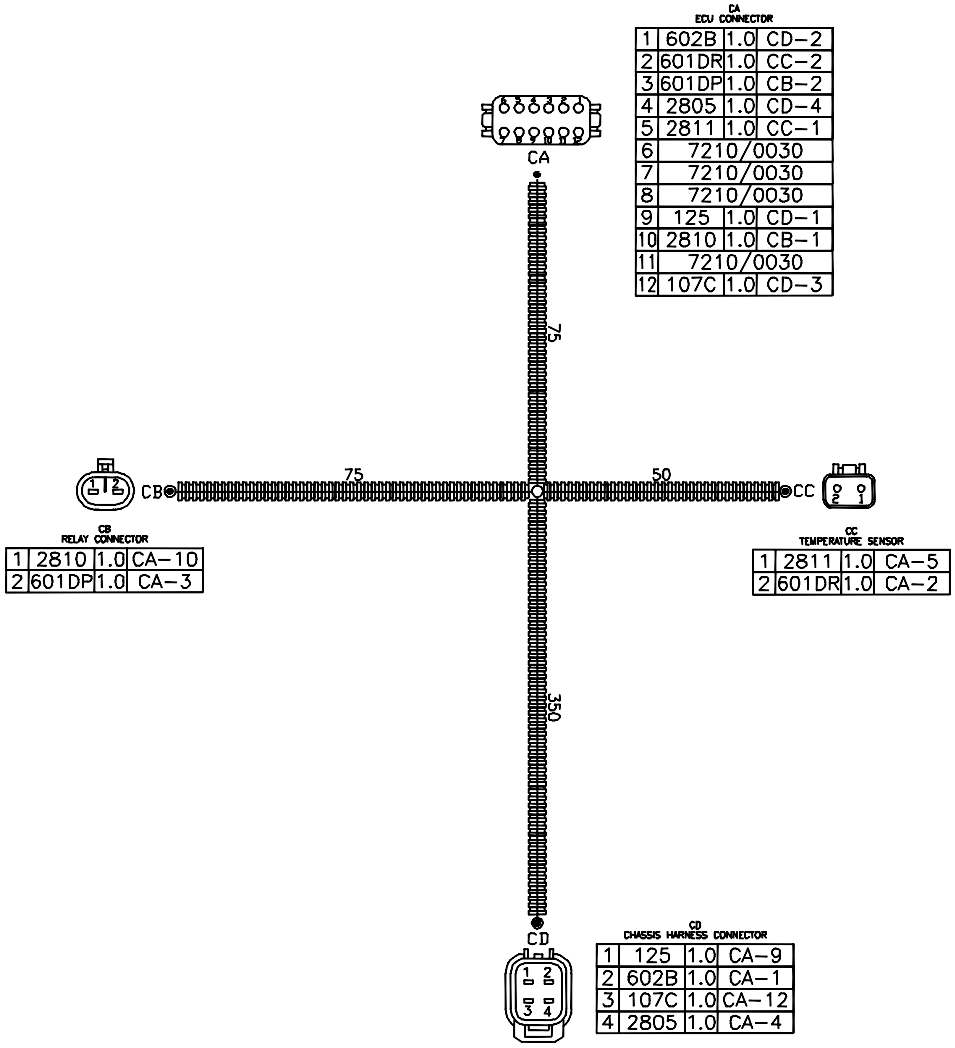


Fig 26.

⇨ *Cold Start System - CAD 721/11975 Issue 1 (C3-37)*

Boom Harness - CAD 721/F8555 Issue 1

⇒ *Fig 26. (C3-38)*

Key to Connectors:

B001 Chassis Harness Connector

B002 Worklights

B003 Auxiliary Changeover Solenoid

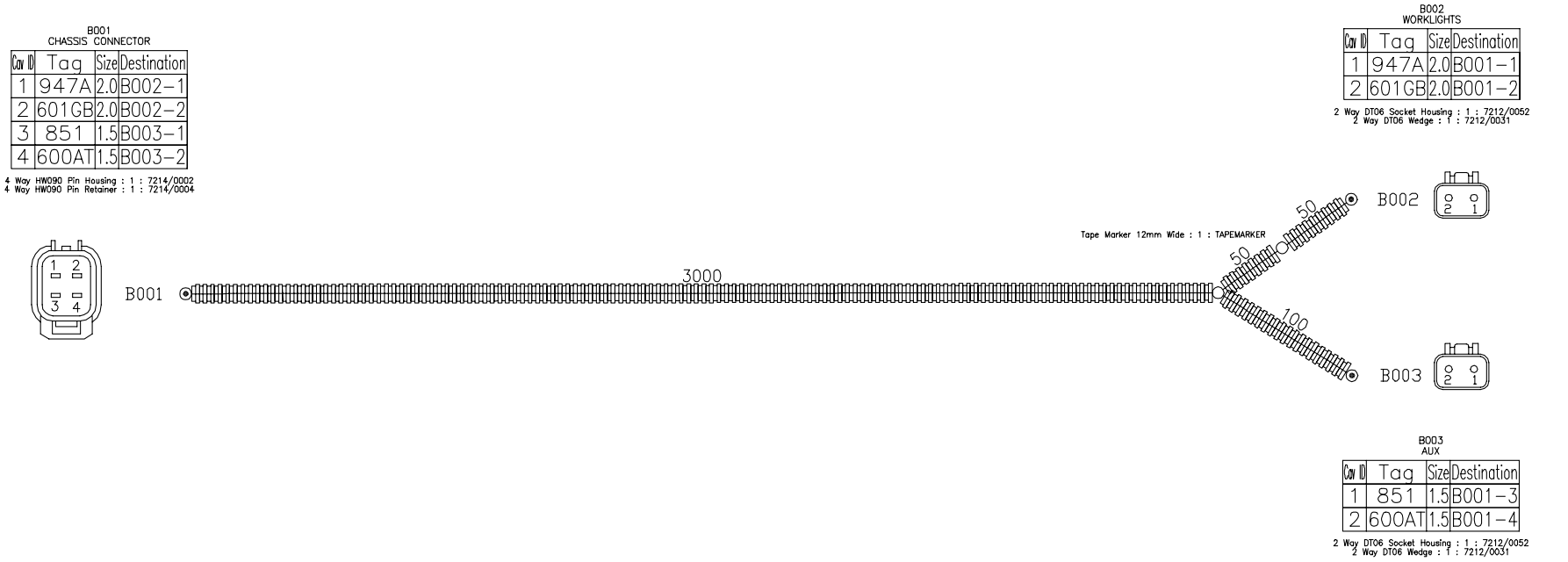


Fig 27.

⇒ *Boom Harness - CAD 721/F8555 Issue 1 (C3-39)*

Boom Harness - CAD 721/H5810 Issue 1

⇒ *Fig 28. (C3-40)*

Key to Connectors:

B001	Chassis Harness Connector
B002	Worklights
B003	Auxiliary Changeover Solenoid
B004	Boom Retract Switch
B005	Chassis Connector

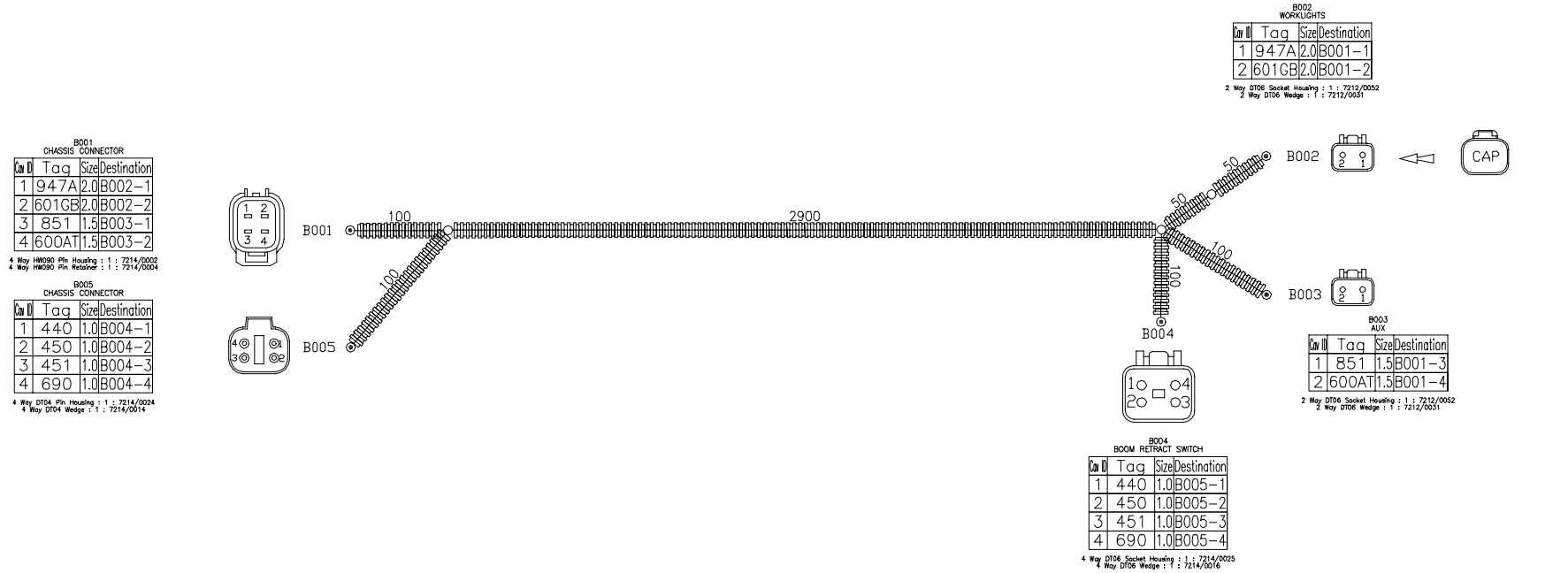
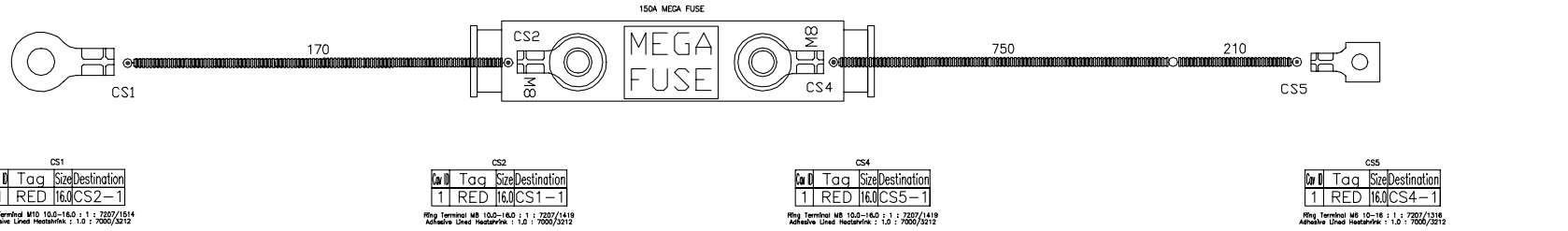


Fig 28.

⇒ *Boom Harness - CAD 721/H5810 Issue 1 (C3-40)*

Cold Start Link Harness - CAD 718/G9926
Issue 1

⇒ *Fig 29. (C3-41)*



718/G9926-1-SHEET1

Fig 29.

⇒ *Cold Start Link Harness - CAD 718/G9926 Issue 1 (C3-41)*

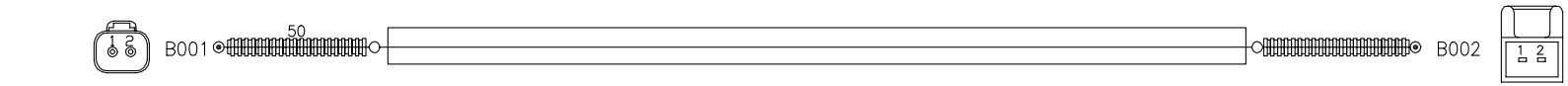
Auxiliary Harness - CAD 721/F8557 Issue 2

⇒ *Fig 30. (C3-42)*

Key to Connectors:

B001 Boom Connector

B002 Auxiliary Connector



2 Way Straight DT Adaptor : 1 : 7243/0137

B001
Boom Connector

Cav ID	Tag	Size	Destination
1	PWR	1.5	B002-1
2	GND	1.5	B002-2

2 Way DT04 Pin Housing : 1 : 7212/0051
2 Way DT04 Wedge : 1 : 7212/0029

2 Way Straight JPT Interface : 1 : 7243/0136
2 Way 90 Deg JPT Interface : 1 : 7210/0046

B002
Aux Connector

Cav ID	Tag	Size	Destination
1	PWR	1.5	B001-1
2	GND	1.5	B001-2

2 Way Junior Power Timer Housing : 1 : 7212/0013

Fig 30.

⇒ *Auxiliary Harness - CAD 721/F8557 Issue 2 (C3-42)*

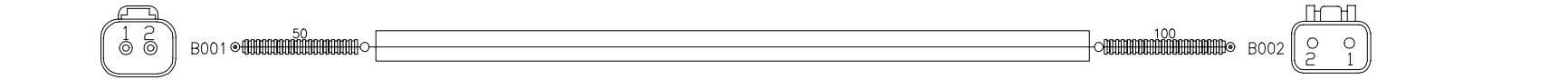
Auxiliary Harness - CAD 721/H8668 Issue 1

⇒ *Fig 31. (C3-43)*

Key to Connectors:

B001 Boom Connector

B002 Auxiliary Connector



2 Way Straight DT Adaptor : 1 : 7243/0137

B001
Boom Connector

Cav ID	Tag	Size	Destination
1	PWR	1.5	B002-1
2	GND	1.5	B002-2

2 Way DT04 Pin Housing : 1 : 7212/0051
2 Way DT04 Wedge : 1 : 7212/0029

2 Way Straight DT Adaptor : 1 : 7243/0137
2 WAY DT 90 DEG ADAPTOR NC08 : 1 : 7243/0002

B002
Aux Connector

Cav ID	Tag	Size	Destination
1	PWR	1.5	B001-1
2	GND	1.5	B001-2

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Wedge : 1 : 7212/0031

721-H8668-1-SHEET1

Fig 31.

⇒ *Auxiliary Harness - CAD 721/H8668 Issue 1 (C3-43)*

Speed Sensor Link Harness - CAD 721/C3727 Issue 1

⇨ *Fig 32. (C3-44)*

Key to Connectors:

TL001 Speed Sensor Connector

TL002 Transmission Harness Connector

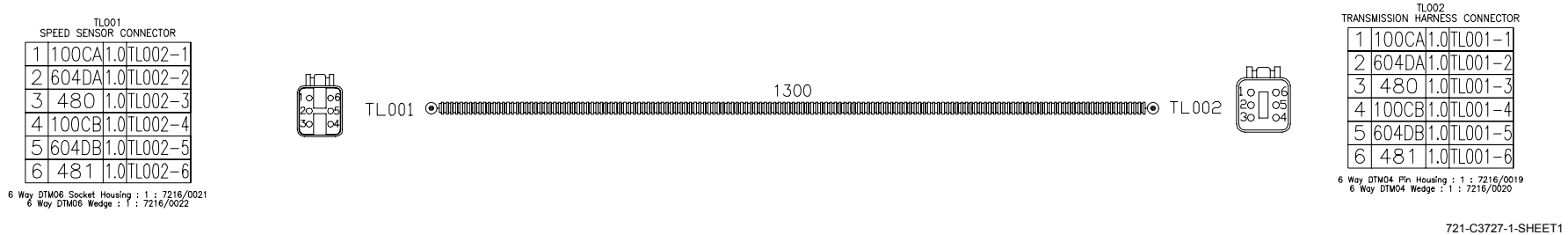


Fig 32.

⇨ *Speed Sensor Link Harness - CAD 721/C3727 Issue 1 (C3-44)*

Livelink Panel Harness - CAD 721/C1358 Issue 1

⇨ *Fig 33. (C3-46)*

Key to Connectors:

LL001	Livelink ECU
LL002	CANbus
LL003	Ignition Supply
LL009	Chassis Harness Connector

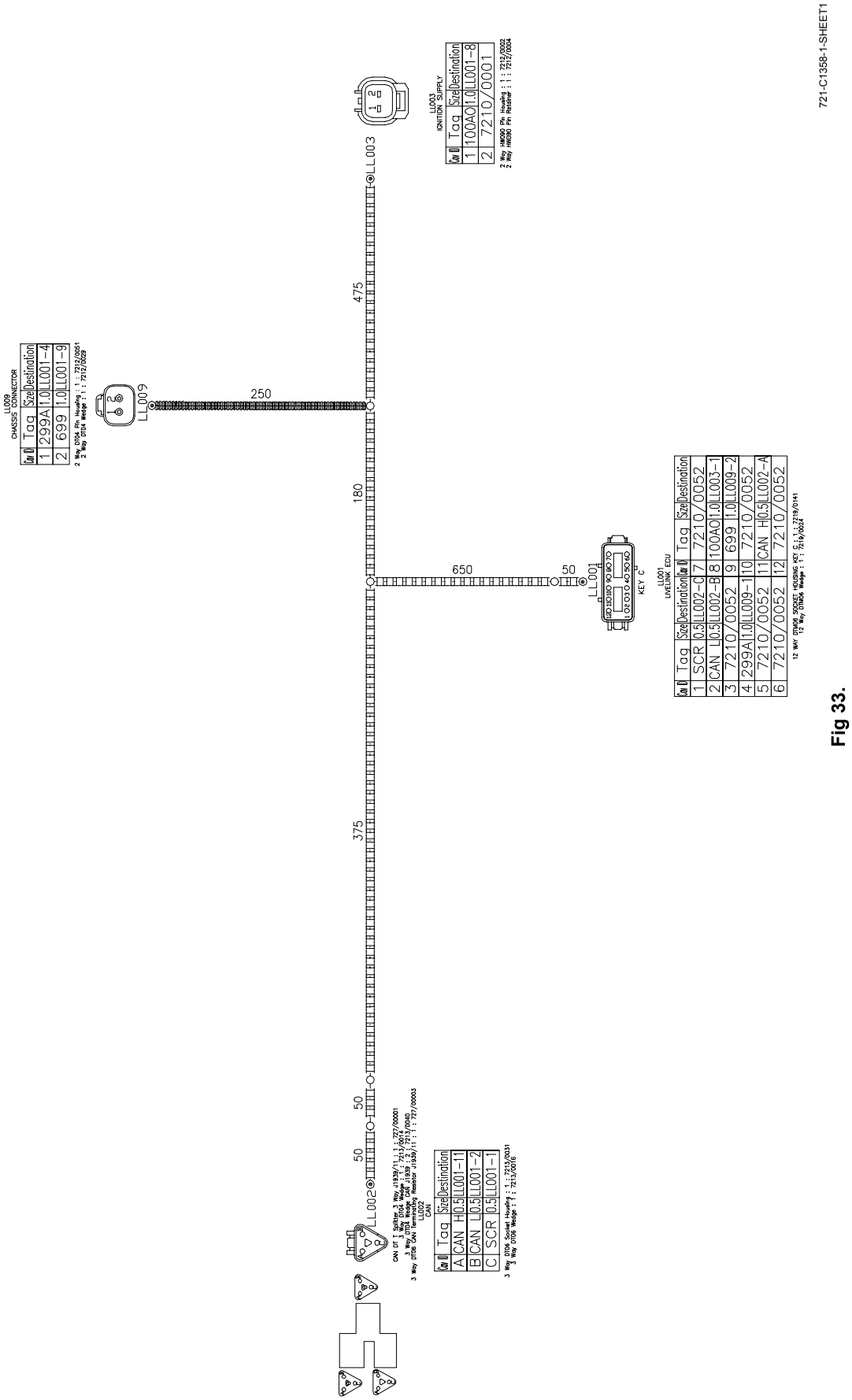


Fig 33.

⇒ *Livelink Panel Harness - CAD 721/C1358 Issue 1 (C3-45)*

Livelink Chassis Harness - CAD 721/C1357 Issue 1

⇨ *Fig 34. (C3-47)*

Key to Connectors:

LL004 Battery Fuse + VE

LL005 Battery Fuse - VE

LL006 Battery + VE

LL007 Battery - VE

LL008 Panel Harness Connector

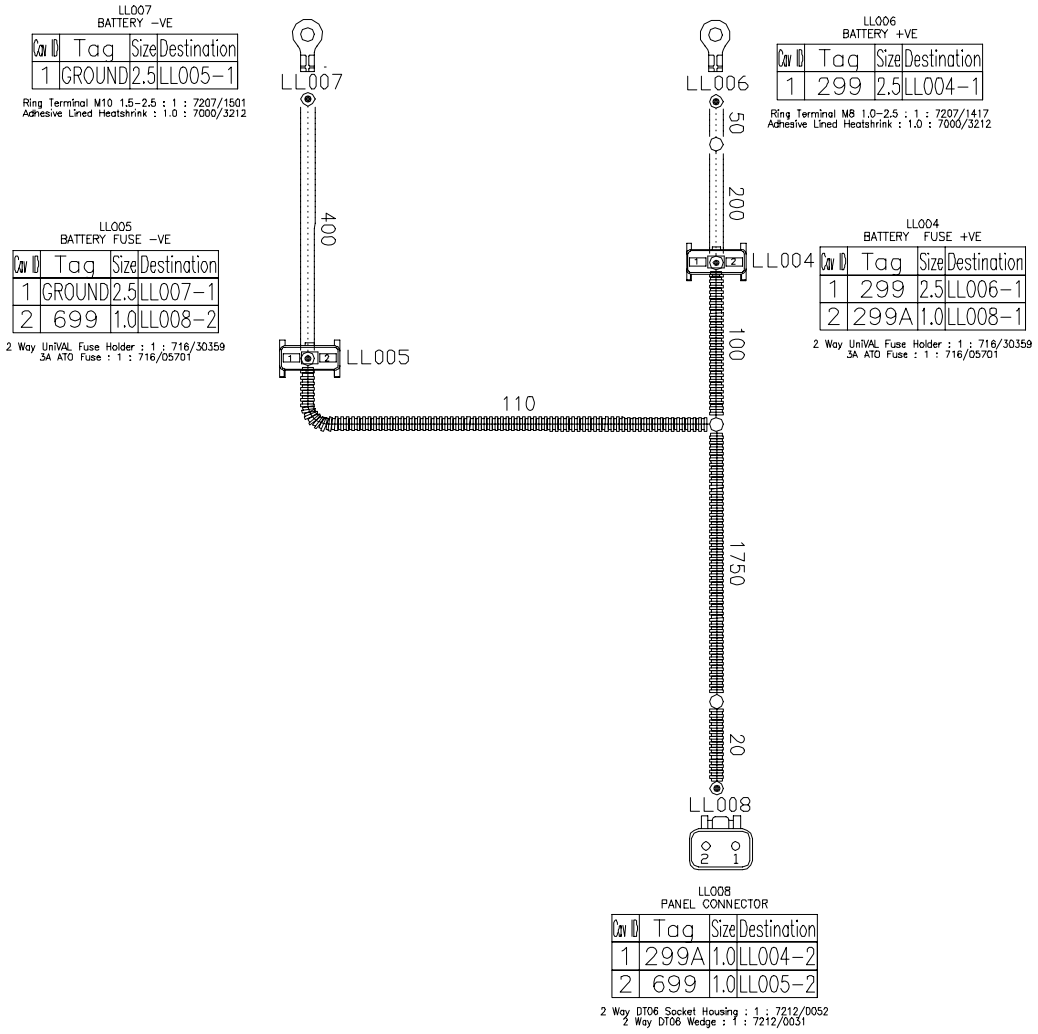


Fig 34.

⇨ *Livelink Chassis Harness - CAD 721/C1357 Issue 1 (C3-47)*

Test Procedures

How to Use a Multimeter

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.

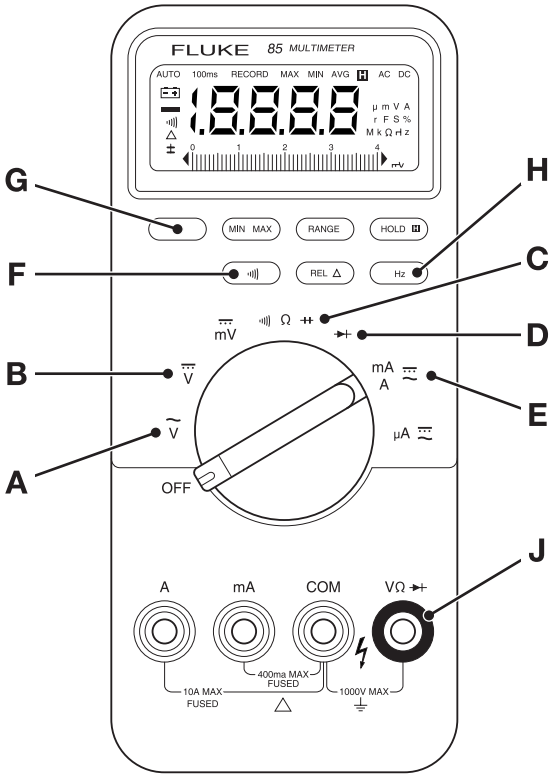


Fig 35. FLUKE 85

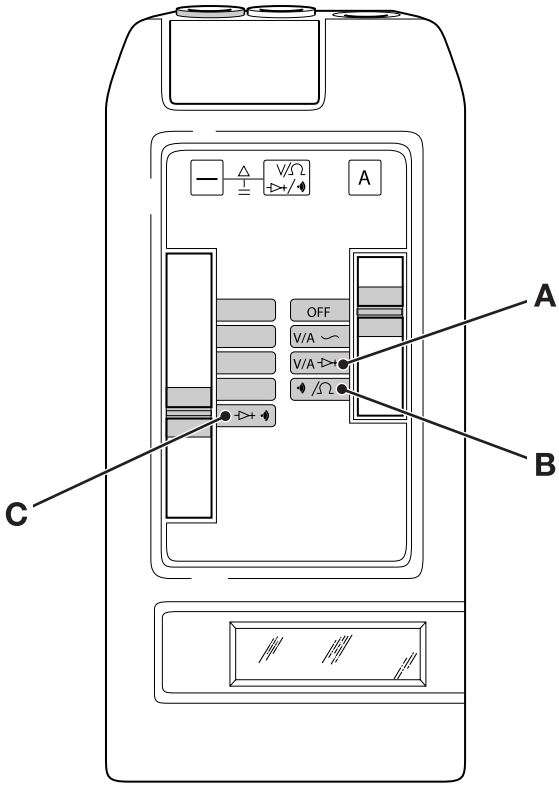


Fig 36. AVO 2003

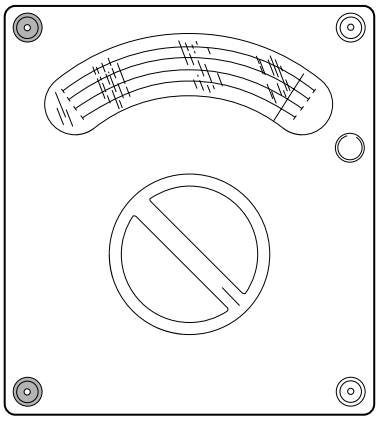


Fig 37. A Typical Analogue Meter

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 **35-B**.

b On the AV0 2003.

Move the right slider switch to position **36-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 **35-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 **35-G** to change the reading to Ω. Touch the meter lead probes together and press the **REL**[3] 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 **36-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 **35-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 **35-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 AV0 2003.

Move the right hand slider switch to position **36-B**, and the left hand slider switch to position **36-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 **35-J**.

3 Turn the selector switch to position **35-A** and depress **35-G** repeatedly until **35-F** is highlighted on the top row of the display.

4 Press button **35-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 **35-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 **36-A**, and the left hand slider switch to position **36-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 kΩ, 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 300-400Ω, if it reads less than this the diode is faulty.

Wiring Harness Repair

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 4. 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 4. (C3-52)*, the dimension is 7mm.

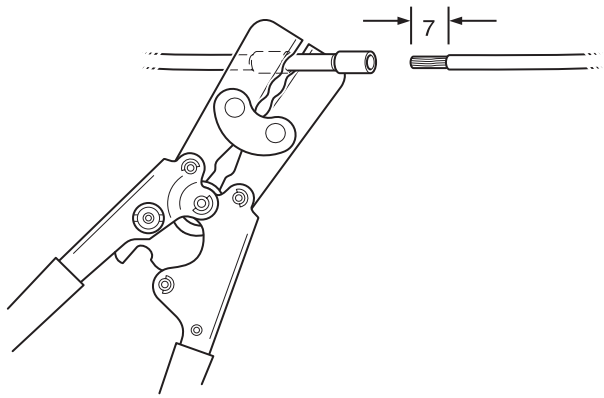


Fig 38.

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 38. (C3-52)*. 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 39. (C3-53)*.

a Remove the cap **40-A** from the end of the disposable gas cartridge **40-B**.

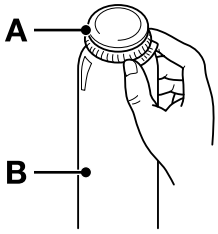


Fig 39.

b Before assembling the gas cartridge to the reflector element **41-C**, turn the red ring **41-D** to the left, (in the direction of the minus sign marked on the ring).

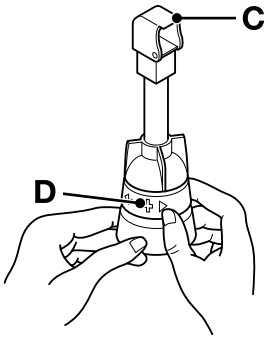


Fig 40.

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 clasped firmly together. ⇨ *Fig 41. (C3-53)*. A click will be heard.

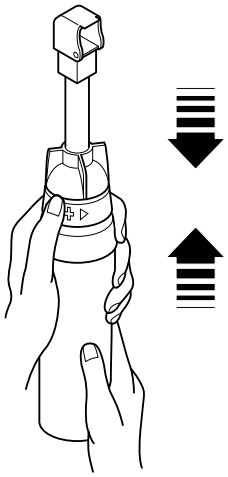


Fig 41.

d Turn the small ring **42-E** so that the air holes at **42-F** are completely closed.

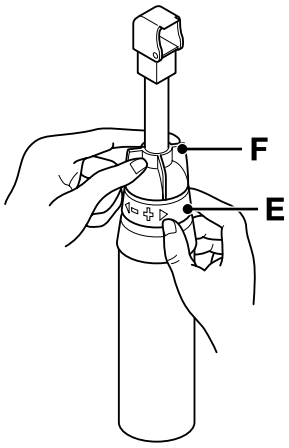


Fig 42.

e Turn the red ring **43-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.*

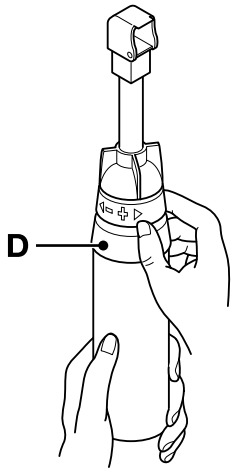


Fig 43.

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 **44-E** until the air holes at **44-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.*

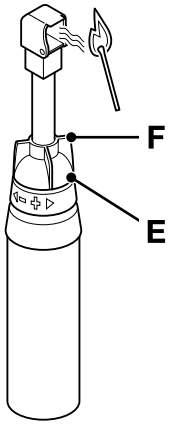


Fig 44.

g The heater can be used in two modes:

i Side wings **45-G** down, reflector head completely open. In this mode the infra-red heat waves are dominant (recommended for the light coloured plastic splices).

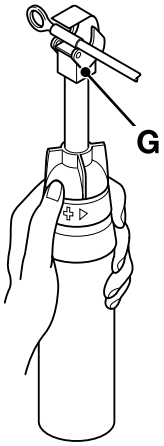


Fig 45.

ii Side wings **46-G** up, reflector head opening reduced. In this mode the heating is done only by the hot gas (use for dark coloured plastic splices).

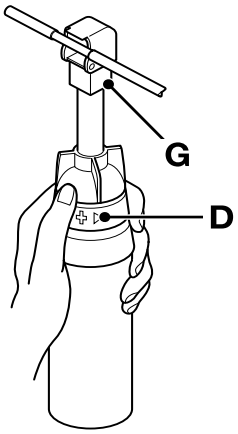


Fig 46.

h To switch off the heater, turn the red ring **46-D** to the left (in the direction of the minus sign).

Battery Charging SYSTEM

Introduction

This topic contains information about a machine SYSTEM. The system has some devices that connect either mechanically, hydraulically or electrically. Make sure you are referring to the correct system. Refer to the applications table. ⇨ *Related Topics (C4-2)*.

Descriptions and procedures relate to the system and not the individual devices. For information about the devices refer to the relevant topics. ⇨ *Related Topics (C4-2)*

This topic is intended to help you understand what the system does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇨ *Related Topics (C4-2)*

⇨ *Specifications (C4-3)*

⇨ *Operation Overview (C4-4)*

⇨ *Electrical Operation and Schematics (C4-6)*

⇨ *Test Procedures (C4-7)*

- ⇨ *Charging Circuit Test (C4-7)*
- ⇨ *Alternator Charging Test (C4-8)*

Related Topics

Table 1. Related Topics in This Publication

The table lists other topics in the manual that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text in this section contains cross references to this page to help you find the correct information. Some machines have different systems and devices. Make sure you refer to the correct topic, refer to ***Section 1 - Applications***.		
Sections	**Topic Titles**	**Sub Titles**
1	***Applications***	ALL
2	ALL (Care and Safety)(1)	ALL
B	***Cab***	***Instrument Panels***
C	***⇨ Fuses and Relays (C1-1)***	ALL
C	***⇨ Electrical Harness SYSTEM (C3-1)***	ALL
C	***⇨ Alternator (C5-1)***	ALL
C	***⇨ Battery (C6-1)***	ALL

(1) You must obey all of the relevant care and safety procedures.

Table 2. Service Tools

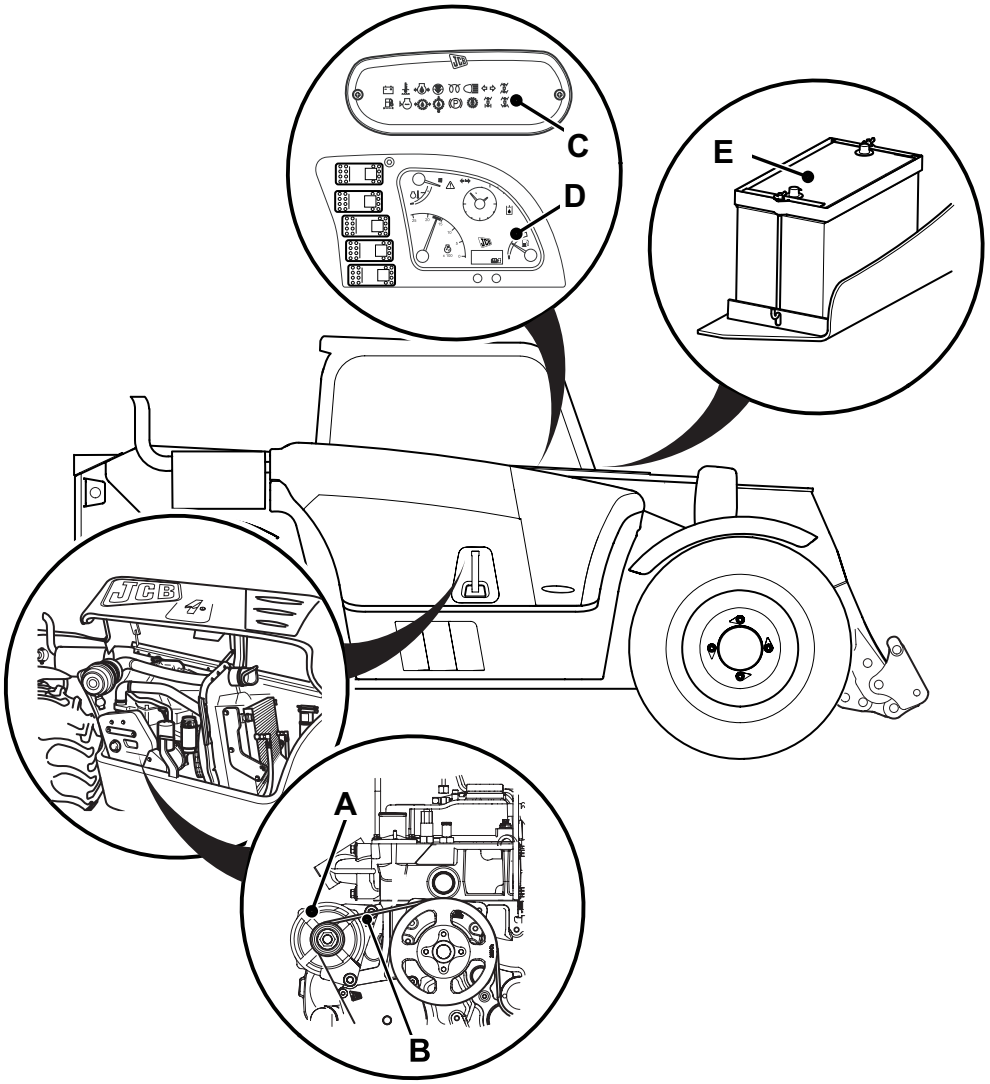
The table lists the service tools you will need to do some of the procedures in this topic. Make sure you have the correct service tools BEFORE you start the procedures	
Tool Part Number	**Description**
892/00298(1)	Fluke Meter 85
892/00285(1)	100 amp Shunt
	AVO 2002
	AVO 2003

(1) Tool available from JCB Service, refer to Section 1 - Service Tools

Specifications

System Type	12 Volt, negative earth	
Battery	- Cold crank amps	1000
	- Amp Hours (AH)	120
Alternator	95 Amp nominal output	

Operation Overview



C093970-C3

Fig 1.

Item	Description
A	Alternator
B	Front End Accessory Drive Belt (FEAD)
C	Centre Display Panel
D	LMS Display Panel
E	Battery

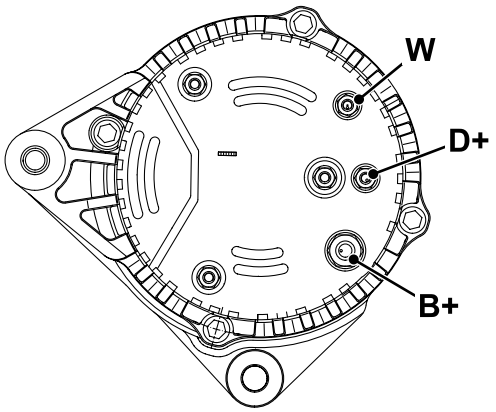
The positive terminal of the battery is connected to the machine primary fuses, the starter motor and alternator. two connections supply primary fuses.

The negative terminal of the battery is connected to the chassis of the machine to provide an “earth” for the electrical systems and devices.

When the engine is running the front end accessory drive belt (FEAD) drives the alternator. The power generated keeps the battery charged which in turn feeds all the electrical devices and systems.

At the rear of the alternator are three terminals.

– The **W** terminal supplies a signal to the loadall monitoring system (LMS).
– The **D+** terminal supplies a splice which supplies power to the LMS ECU and the centre warning light cluster. If there is a charging fault this signal will operate a warning light on the centre display panel.
– The **B+** terminal returns the charge to the battery via a common connection on the starter motor relay switch terminal.



C066910

Fig 2.

Electrical Operation and Schematics

The harness connector pin numbers are shown on the schematic.

Key	
A	Alternator
B	Battery
B+	Alternator Terminal
C004/E001	Chassis Harness to Engine Harness Connector
C038	Primary Fuse 1
C039	Primary Fuse 2

Key	
D+	Alternator Terminal
E002	Starter motor
P14	LMS display connector J1
P20	Centre Display Panel
P41/C041	Panel Harness to Chassis Harness Connector 2
W	Alternator Terminal

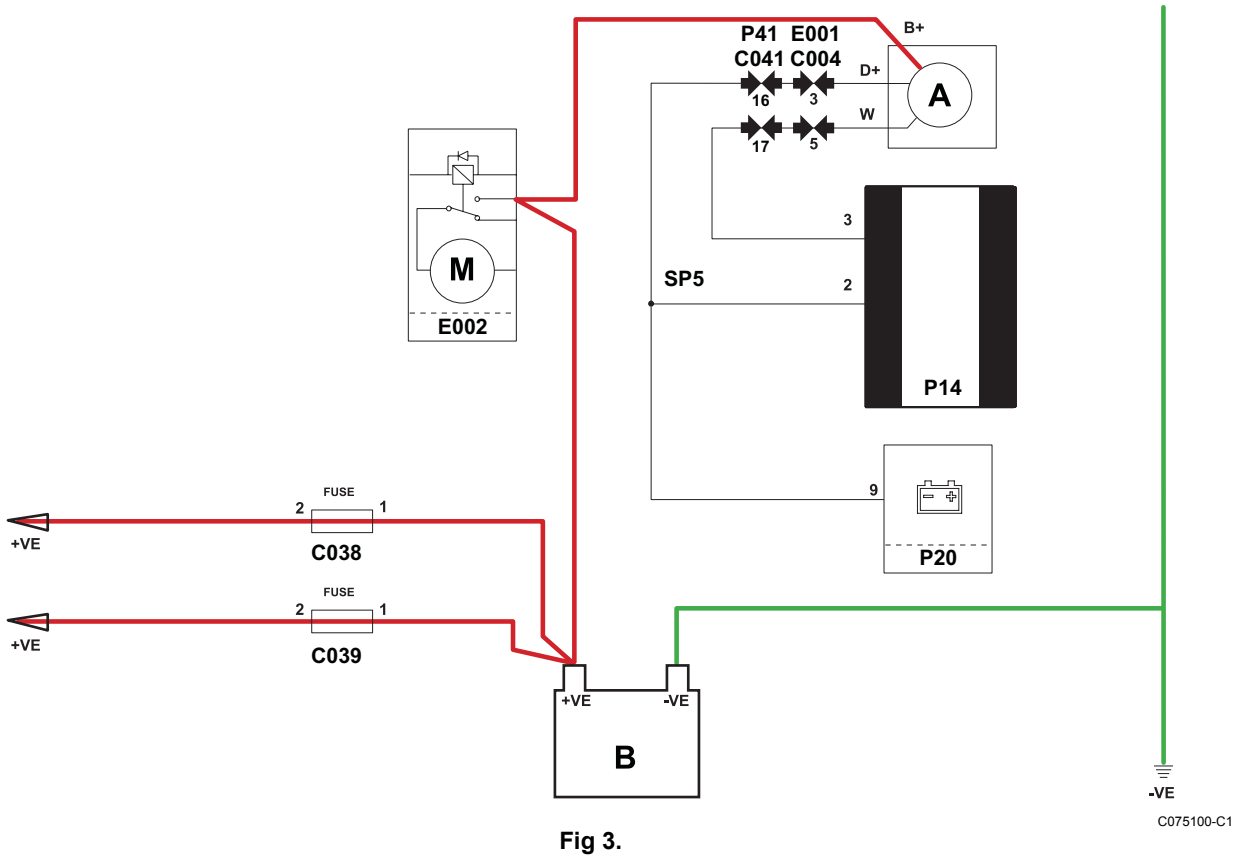


Fig 3.

Test Procedures

Charging Circuit Test

1 Ensure that all battery and alternator connections are in place, secure and making good metal - to - metal contact, especially the 'earth' connections to chassis and engine.

2 Adjust the alternator drive belt tension if necessary and make sure that the battery is well charged.

3 Turn the start switch to the ON position.

'Oil pressure' and 'No charge' warning lights should glow. If any light fails, ⇨ *Check 1 (C4-7)*.

4 Start the engine; all warning lights should extinguish rapidly.

If the 'No charge' warning light remains ON, ⇨ *Check 2 (C4-7)*.

If the oil pressure warning remains on stop engine Immediately and investigate the engine lubrication system.

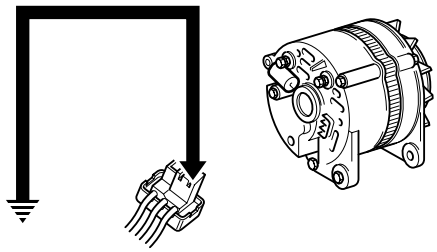
Check 1

With start switch 'ON' try the heater motor and screen wiper.

If they operate normally, check the warning light bulb for blown filament.

Simultaneous failure of all items indicates a fault at the start switch. Check for cable disconnection before condemning the switch itself.

If the 'No charge' warning bulb is in good order, withdraw the triple plug from the back of the alternator. Make a temporary connection between the SMALL terminal in the plug and earth as shown below. If the 'No charge' warning bulb still fails to light, check the cable for continuity. If the bulb now lights, check the alternator for a defective regulator. ⇨ *Alternator Charging Test (C4-8)*



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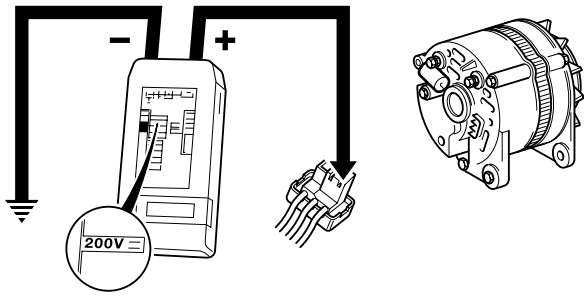
Fig 4.

Check 2

Note: *The following checks should be made using an analogue (moving pointer) type meter.*

1 Stop the engine and turn the starter switch to OFF.

2 Withdraw the alternator plug and connect the test meter between the large terminals and 'earth'. With the meter set to measure 12V DC, the meter should show battery voltage. If the reading is zero, check the cables for continuity, particularly at the starter terminals.



332690-1

Fig 5.

If the voltage is correct, check the alternator. ⇨ *Alternator Charging Test (C4-8)*

Alternator Charging Test

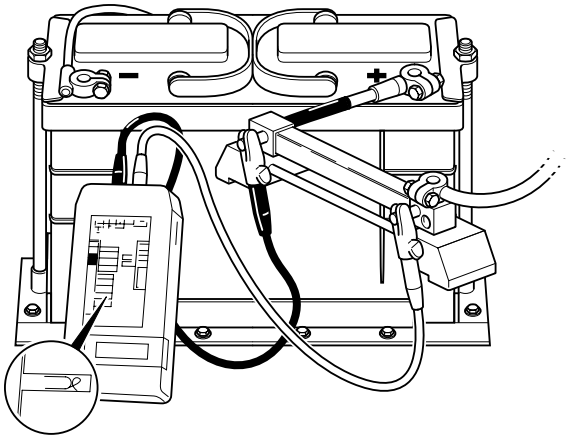


Fig 6.

1 Ensure that all battery and alternator connections are in place, secure and making good metal - to - metal contact, especially the 'earth' connections to chassis and engine.

2 Make sure that the alternator drive belt tension is correctly adjusted.

3 If the battery is in a fully charged condition, switch on the working lights for 3 minutes before commencing the test. Alternatively, operate the starter for a few moments with the engine shut off solenoid (ESOS) fuse removed. Refer to ***Section 1 - Fuses and Relays.*** ⇨ *Related Topics (C4-2)*.

4 Install a 100 amp open - type shunt between the battery positive lead and the battery positive terminal.

5 Connect a multimeter positive lead to machine side of the shunt and negative lead to battery side of the shunt.

6 Connect the leads to the meter and set the meter to the relevant range as follows.

AVO 2002
- Red lead to volts (middle) socket on meter.
- Black lead to negative on meter.
- RH slider to DC voltage.
- LH slider. ⇨ *Fig 6. (C4-8)*.

AVO 2003
- Red lead to amps socket (marked A) on the meter.
- Black lead to negative on meter.
- RH slider to DC voltage
- LH slider to 200 Shunt

FLUKE 85
- Red lead to volts socket (marked V) on meter.
- Black lead to COM socket on meter.
- Set dial to mV.

7 Start the engine and run at maximum speed (see ⇨ *Specifications (C4-3)*). Meter should show maximum alternator output in Amps (see ⇨ *Specifications (C4-3)*).

Note: *The meter reading should be taken as soon as possible after starting the engine, as the charging current will fall rapidly.*

8 A zero reading indicates failure of the alternator and may be caused by one of the following conditions. These are listed in the order of probability.

a Defective suppression capacitor.

b Dirty slip rings or worn brushes.

c Defective regulator.

d Defective rectifier.

e Open or short - circuited field (rotor) windings.

f Open or short - circuited power (stator) windings.

9 To check for fault a, disconnect the capacitor and repeat the charging test. Renew the capacitor if necessary.

10 To check for faults b and c, remove the regulator and brush box assembly. Check the condition of the brushes and, if necessary, clean the slip rings using extra-fine glass paper. The regulator may only be checked by substitution.

11 Faults d, e, and f may be checked only by removing and dismantling the alternator for further testing.

Alternator

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device. Refer to the applications table.

Descriptions and procedures relate to the device and not related systems. For information about the systems refer to the relevant topics.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇨ *Related Topics (C5-2)*
⇨ *Specifications (C5-3)*
⇨ *Electrical Operation and Schematics (C5-4)*
⇨ *Removal, Inspection and Replacement (C5-5)*
⇨ *Removal (C5-5)*
⇨ *Inspection (C5-5)*
⇨ *Replacement (C5-6)*
⇨ *Dismantle and Assemble (C5-7)*
⇨ *Renewing the Voltage Regulator and Brushes (C5-7)*
⇨ *Renewing the Drive Pulley (C5-7)*

Related Topics

Table 1. Related Topics in This Publication

The table lists other topics in the manual that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text in this section contains cross references to this page to help you find the correct information. Some machines have different systems and devices. Make sure you refer to the correct topic, refer to ***Section 1 - Applications***.

Sections	Topic Titles	Sub Titles
1	Applications	ALL
2	Care and Safety	ALL
3	Routine Maintenance	ALL
C	⇨ *Battery Charging SYSTEM (C4-1)*	ALL

Specifications

Type	12V 95amp Alternator (Unfiltered)
No Load Speed	1100 rpm
Maximum Speed -	
Permanent	15000 rpm
Intermittent	18000 rpm
Weight	5.7 Kg

Electrical Operation and Schematics

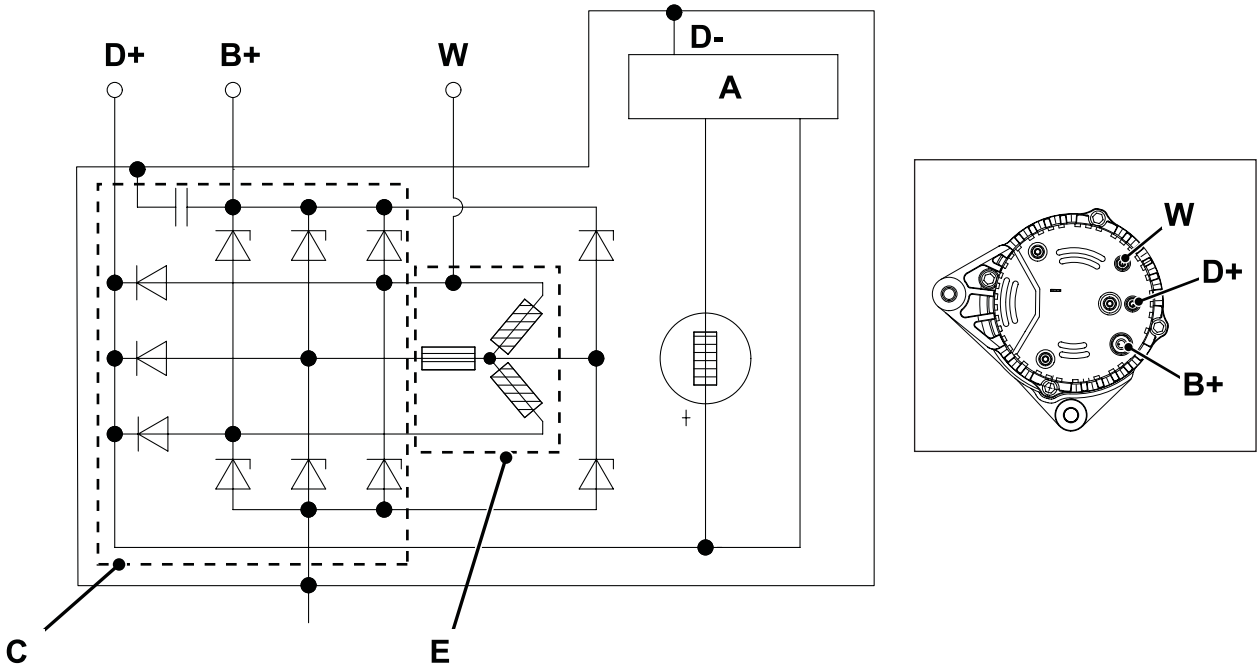
The alternator is a three phase generator having a rotating field winding and static power windings.

When the start switch is turned on, current from the battery flows by way of the 'No Charge' warning light to the field winding. This creates a magnetic field which supplements the residual magnetism in the rotor poles. When the engine is started, the engine driven accessory drive belt drives the rotor and alternating current is generated in the power windings as they are cut by the rotating magnetic field.

Output is controlled by a solid state regulator and rectifier. The regulator varies the field current in accordance with electrical demand. The rectifier converts the AC output from the alternator to a DC supply for the machine battery.

The alternator brushes and regulator/rectifier can be replaced. If the alternator bearings or windings are defective the alternator must be replaced with a new one.

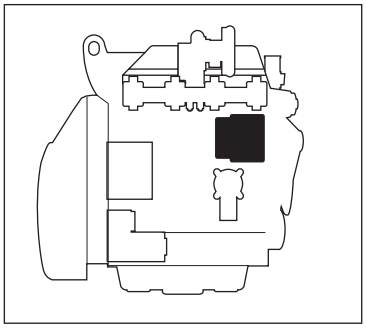
Key	⇨ *Fig 1. (C5-4)*
A	Voltage Regulator
B	W Alternator Terminal
C	Rectifier
D+	D+ Alternator Terminal
D-	D- Alternator Terminal
E	Alternator Windings
W	W Alternator Terminal



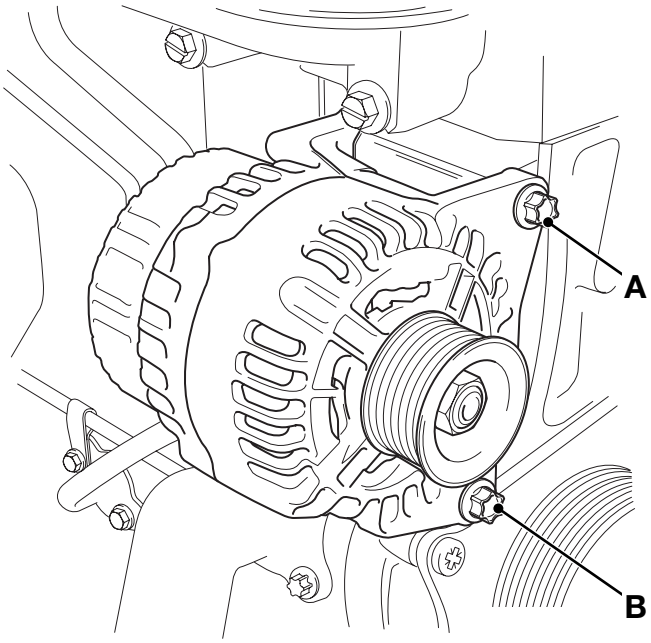
C066940

Fig 1.

Removal, Inspection and Replacement



743750-C1



743750-C1

Fig 2.

Removal

1 Disconnect the negative (-) lead followed by the positive (+) lead from the battery terminals.

2 Remove the alternator (accessory) drive belt, see ***Section 3 - Routine Maintenance***. ⇨ ***Related Topics (C5-2)***.

3 Disconnect the electrical leads from the alternator terminals. Label the leads to ensure they are refitted in the correct positions on assembly.

4 Undo the bolts **2-A** and **2-B**. Lift the alternator away from the cylinder block mounting.

Inspection

1 Check the brushes for wear. Renew the brushes if the length is less than 8 mm (0.3 in), see ⇨ ***Dismantle and Assemble (C5-7)***

Replacement

Replacement is the opposite of the removal procedure. During the replacement procedure do this work also:

- It is not necessary to adjust the position of the alternator in order to tension the drive belt, as the accessory drive belt arrangement is self-tensioning.
- Torque tighten bolts **2-A** and **2-B**, ⇨ *Table 2. Torque Settings (C5-6)*.
- Be sure to reconnect the electrical leads to the alternator in the correct positions. Clean the connections and torque tighten the nuts.

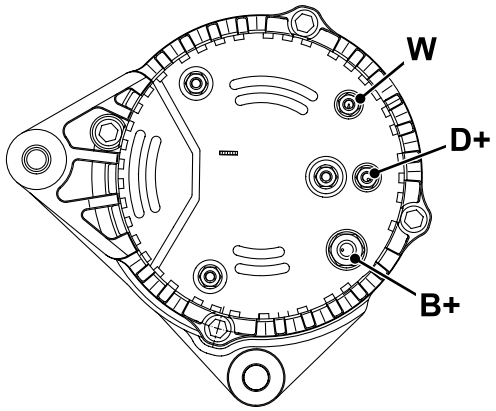


Fig 3.

Table 2. Torque Settings

Item	Nm	kgf m	lbf ft
2-A, **2-B**	47	4.8	34.7
B+	9 - 13	0.9 - 1.3	6.6 - 9.5
D+	2.7 - 3.8	0.3 - 0.38	2 - 2.8
W	2.7 - 3.8	0.3 - 0.38	2 - 2.8

Dismantle and Assemble

Renewing the Voltage Regulator and Brushes

1 The voltage regulator and brush set is a combined assembly. Renew the assembly as follows:

a Carefully remove the protective cover **4-A**.

b Withdraw and discard the existing voltage regulator and brushes assembly **4-B** and fit new assembly.

c Refit the protective cover **4-A**.

Renewing the Drive Pulley

1 Renew the drive pulley as follows:

a Undo nut **4-D** and remove washer **4-E**. Using suitable pullers, withdraw the pulley **4-C** from the shaft. Take care to retain the woodruff key **4-F**.

b Fit new drive pulley onto shaft, locating the key **4-F**.

c Refit the washer and tighten the nut **4-D**.

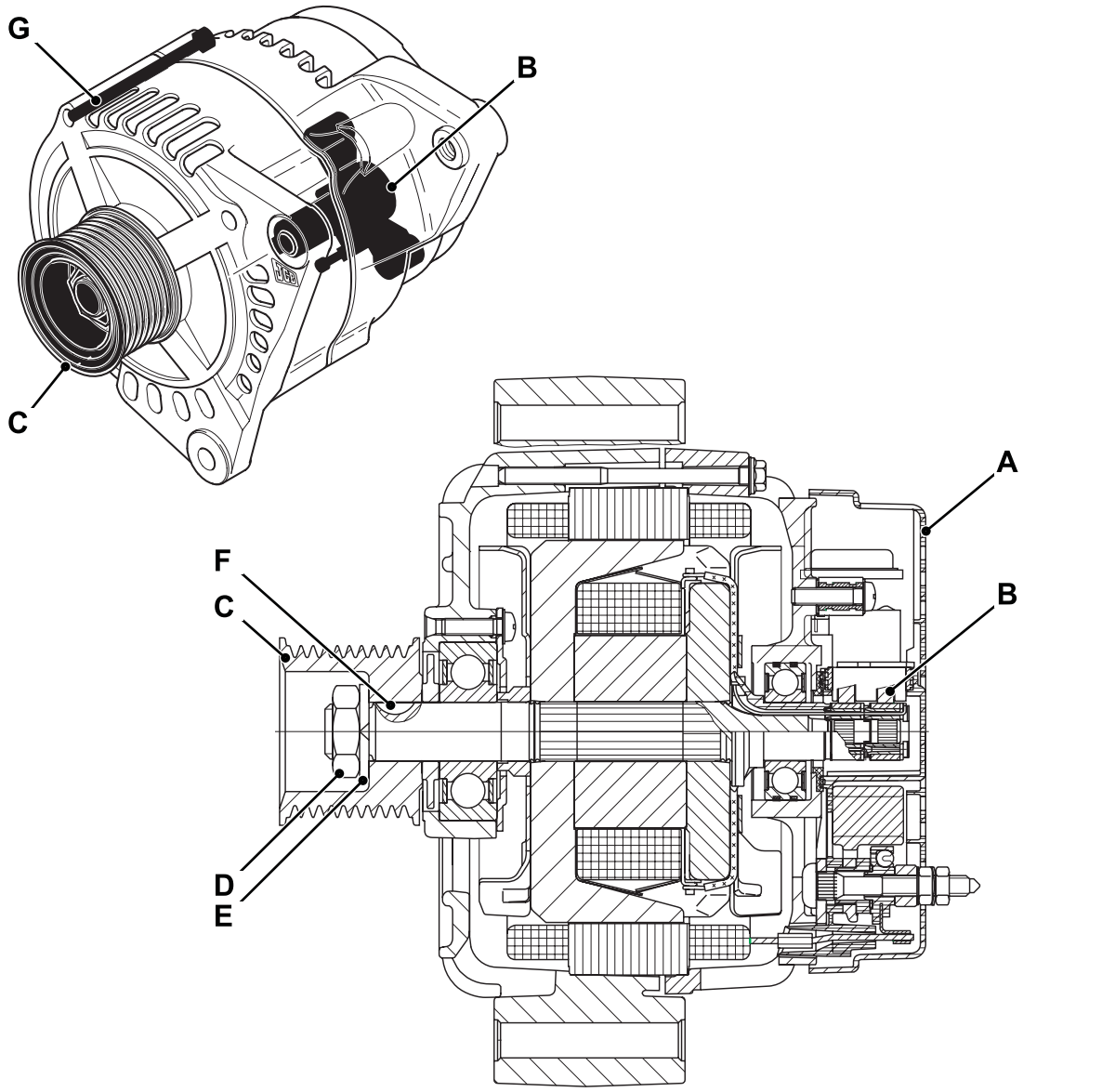


Fig 4. Alternator

Component Key:

A Cover - brushes
B Regulator and brush assembly
C Drive pulley
D Nut - drive pulley
E Washer - drive pulley
F Woodruff key -drive pulley
G Tie bolts

Battery

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device. Refer to the applications table.

Descriptions and procedures relate to the device and not related systems. For information about the systems refer to the relevant topics.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇨ *Related Topics (C6-2)*
⇨ *Maintenance (C6-3)*
⇨ *Test Procedures (C6-6)*
⇨ *Battery Load Testing (C6-6)*
⇨ *Specific Gravity Testing (C6-7)*
⇨ *Disconnection and Connection (C6-8)*
⇨ *Removal and Replacement (C6-9)*
⇨ *Removal (C6-9)*
⇨ *Replacement (C6-9)*

Related Topics

Table 1. Related Topics in This Publication

The table lists other topics in the manual that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text in this section contains cross references to this page to help you find the correct information. Some machines have different systems and devices. Make sure you refer to the correct topic, refer to ***Section 1 - Applications*****.**		
Sections	**Topic Titles**	**Sub Titles**
1	***Applications***	ALL
1	***Service Tools***	ALL
2	ALL (Care and Safety)(1)	ALL
3	***Routine Maintenance***	***Electrics***

(1) You must obey all of the relevant care and safety procedures.

Table 2. Service Tools

The table lists the service tools you will need to do some of the procedures in this topic. Make sure you have the correct service tools BEFORE you start the procedures	
Tool Part Number	**Description**
993/85700(1)	Battery Tester
	Hydrometer

(1) Tool available from JCB Service, refer to Section 1 - Service Tools

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:

⚠ 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

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

Battery

T3-061

⚠ 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.

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

5-3-4-12

⚠ CAUTION

Do not disconnect the battery while the engine is running, otherwise the electrical circuits may be damaged.

INT-3-1-14

⚠ WARNING

Electrical Circuits

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

INT-3-1-4

⚠ DANGER

Electrolyte

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

INT-3-2-1_3

⚠ CAUTION

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

INT-3-1-12

⚠ WARNING

Battery Gases

Batteries give off explosive gases. Keep flames and sparks away from the battery. Do not smoke close to the battery. Make sure there is good ventilation in closed areas where batteries are being used or charged. Do not check the battery charge by shorting the terminals with metal; use a hydrometer or voltmeter.

INT-3-1-8

Warning Symbols

The following warning symbols may be found on the battery.

Symbol	Meaning
 A289230-1	Keep away from children.
 A289260-1	Shield eyes.
 A289280	No smoking, no naked flames, no sparks.
 A289250	Explosive Gas.
 A289240	Battery acid.
 A289270	Note operating instructions.

First Aid - Electrolyte

Do the following if electrolyte:

Gets into your eyes

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

Is swallowed

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

Gets onto your skin

Flush with water, remove affected clothing. Cover burns with a sterile dressing then get medical help.

Test Procedures

Battery Load 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 **1-A** to OFF.

2 Set rocker switch **1-B** to the battery voltage (12V).

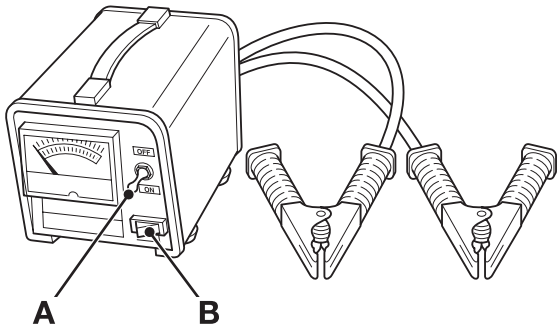
3 Connect the red flying lead to the battery positive (+) terminal and the black flying lead to the battery negative (-) terminal.

4 Set the CHECK/LOAD switch **1-A** to CHECK to read the battery no-load voltage which should be at least 12.4 volts.

5 Set the CHECK/LOAD switch **1-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 3. Fault Diagnosis (C6-6)*, if the foregoing tests are unsatisfactory.



239510-1

Fig 1. Battery Tester

Table 3. 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 4. 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

Disconnection and Connection

Battery Disconnection/Connection

T3-019_3

⚠ WARNING

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

5-2-2-4

Disconnection

1 Get access to the battery. See ***Access Panels***.

2 Remove the leads. Disconnect the earth (-) terminal first.

Connection

1 Check the battery.

a If the terminal is dirty, clean the post.

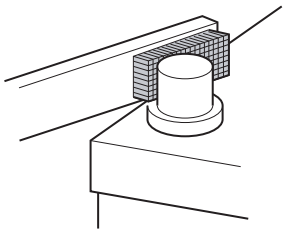


Fig 2.

b If the terminal post is corroded and generates white powder wash the terminal with hot water. If considerable corrosion is detected, clean with a wire brush or abrasive paper.

c After cleaning, apply a thin coat of petroleum jelly to the terminal.

2 Re-connect the leads. Connect the earth (-) terminal last.

3 Close and lock the access panels.

Removal and Replacement

⚠ CAUTION

Do not disconnect the battery while the engine is running, otherwise the electrical circuits may be damaged.

INT-3-1-14

⚠ WARNING

Battery Terminals

The machine is negatively earthed. Always connect the negative pole of the battery to earth.

When connecting the battery, connect the earth (-) lead last.

When disconnecting the battery, disconnect the earth (-) lead first.

INT-3-1-9

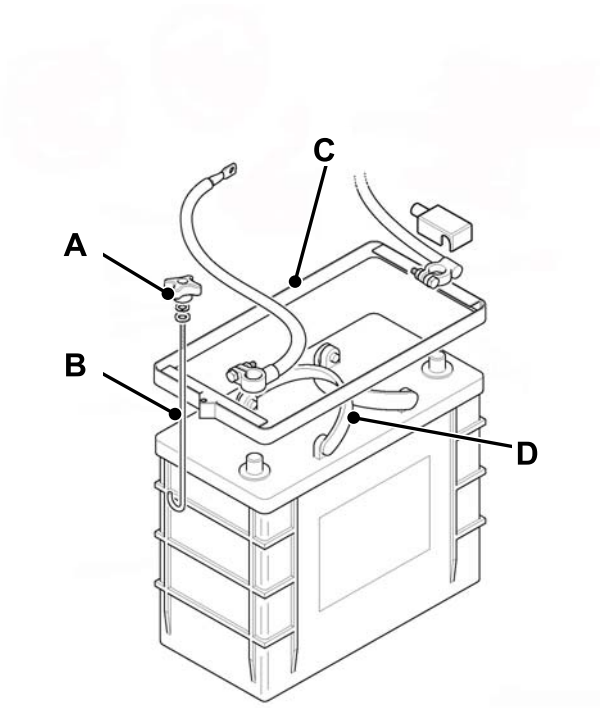
Removal

1 Follow the procedure for disconnection of the battery. see ***Battery Disconnection - Section 3***. ⇨ *Related Topics (C6-2)*

2 Make sure that all battery connection wires are clear of battery top cover.

3 Disconnect battery clamp **C** by removing handnut and washers **A** and lifting clamp **C** clear of battery. Alternatively slacken nut and unhook swing bolt **B** from lower mounting.

4 Using handles **D** remove battery from compartment ensuring that you do not use the access cover to support the weight of the battery.



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Fig 3.

Replacement

Replacement is the opposite of the removal procedure.

Reconnect the battery. Obey the correct procedure. ⇨ *Disconnection and Connection (C6-8)*

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