SERVICE MANUAL

L221 / L228
Tier 4B (final)
200 Series Skid Steer Loader

PIN NGM418237 and above; PIN NHM435463 and above

C227 / C232 / C237
Tier 4B (final)
200 Series Compact Track Loader

PIN NGM418237 and above; PIN NHM435463 and above

Part number 48068128
1st edition English
January 2018

NEW HOLLAND CONSTRUCTION

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Main control valve - Remove

C227	(Electro hydraulic controls)
C232	(Electro hydraulic controls)
C237 TIER 4B (FINAL) [NHM435463 -]	(Electro hydraulic controls)
L221	(Electro hydraulic controls)
L228	(Electro hydraulic controls)

⚠ WARNING

Burn hazard!
Before performing any service on the hydraulic system, you must allow it to cool. Hydraulic fluid temperature should not exceed 40 °C (104 °F).
Failure to comply could result in death or serious injury.

W3241A

⚠ WARNING

Pressurized hydraulic fluid can penetrate the skin and cause severe injuries.
Hydraulic fluid can also infect a minor cut or opening in the skin. Serious infection or reaction can result without immediate medical treatment. If injured by leaking fluid, see your doctor immediately.
Failure to comply could result in death or serious injury.

W3358A

⚠ WARNING

Pressurized system!
Never attempt to drain fluids or remove filters when the engine is running. Turn off the engine and relieve all pressure from pressurized systems before servicing the machine.
Failure to comply could result in death or serious injury.

W3905A

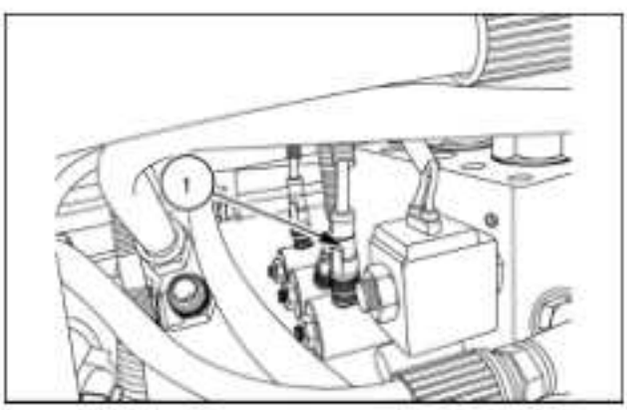
⚠ WARNING

Avoid injury! Always do the following before lubricating, maintaining, or servicing the machine.
1. **Disengage all drives.**
2. **Engage parking brake.**
3. **Lower all attachments to the ground, or raise and engage all safety locks.**
4. **Shut off engine.**
5. **Remove key from key switch.**
6. **Switch off battery key, if installed.**
7. **Wait for all machine movement to stop.**

Failure to comply could result in death or serious injury.

W3047A

1. Apply vacuum to the hydraulic reservoir.
2. Label and disconnect the four rear solenoid connections **(1)**.



1

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A. If there is voltage, then there is a short circuit to another voltage source in the engine relay A wiring in the vehicle harness (VE). Locate and repair the shorted conductor. Repair or replace the harness as required.

B. If there is no voltage, then continue to step **4**.

4. Check the engine relay A high side driver vehicle harness (VE) wiring for a short circuit.

   Disconnect the vehicle harness (VE) from the ECU at connector **X-012**.

   With the key in the OFF position, use a multimeter to perform the following continuity check for short circuit on the vehicle harness (VE) side :

From	To	Value
X-012 (Receptacle) pin 53	All pins in connector **X-012**	There should be no continuity.

   A. If there is continuity, then there is a short circuit in the engine relay A wiring in the vehicle harness (VE). Locate and repair the shorted conductor. Repair or replace the harness as required.

   B. If there is no continuity, then check the ECU for the appropriate service manual and re-flash, if necessary.

5. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Flex the harnesses involved to reveal intermittent breaks or shorts in the wiring concerned. Operate the machine while you monitor the display.

   A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

   B. If you do not find damage and the display indicates only normal readings, then erase the fault code and continue operation.

Wiring harnesses - Electrical schematic sheet 10 SH10-EH PUMP/HYDRAULICS (55.100.DP-C.20.E.10)
Wiring harnesses - Electrical schematic sheet 09 SH09-ENGINE F5C T4 (55.100.DP-C.20.E.09)
Wiring harnesses - Electrical schematic sheet 33 SH33-CHASSIS INTERFACE LG (55.100.DP-C.20.E.33)
Wiring harnesses - Electrical schematic sheet 35 SH35-CHASSIS INTERFACE MD (55.100.DP-C.20.E.35)

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To check for fault codes: Start and operate the machine.

A. Fault code **9153 – Timeout of CAN Message EEC1** is not recorded again. Go to step **4**.

B. Fault code **9153 – Timeout of CAN Message EEC1** is recorded again. There are one or two other CAN bus fault codes associated with **9151 – Bus-Warn at CAN-Bus No.1**. Go to step **4**.

C. Fault code **9153 – Timeout of CAN Message EEC1** is recorded along with multiple CAN data link faults such as **1051 – Timeout of CAN message EEC1** - **1063 – Timeout of CAN message EEC2**, and/or **3096 – CAN A Bus off failure**, **3179 – CAN communication failure between vehicle controller and ECU - BC2ECU2 message** and **3180 – CAN communication error between vehicle controller to ECU**. Go to **1051 - No CAN Communication With Engine Controller (55.640)** step 3.

4. Verify that the CAN bus circuit is functioning properly.

Connect the Electronic Service Tool to the service tool connector.

Turn the ignition switch ON.

Verify the connections to the ECU, the instrument cluster, the diagnostic connector, the UCM (if installed), and the optional Telematics unit are tight and secure. Check for CAN bus fault codes while wiggling the harness.

Turn the ignition switch OFF.

Disconnect the instrument cluster connector **X-C23**. Measure the resistance between **X-C23 (Receptacle) pin 5** and **X-C23 (Receptacle) pin 6** on the instrument cluster. The resistance should be between **108 Ω** and **132 Ω**.

Disconnect the ECU connector **X-012**. Measure the resistance between **X-012 (Receptacle) pin 24** and **X-012 (Receptacle) pin 25** on the ECU. The resistance should be between **108 Ω** and **132 Ω**.

A. All connections are secure. Both resistance measurements are within the specified range. OK to return the machine to service.

B. The harness is damaged or the connectors are loose or damaged. Repair or replace the harness or the connectors as required. Return to step **3** to confirm elimination of the fault.

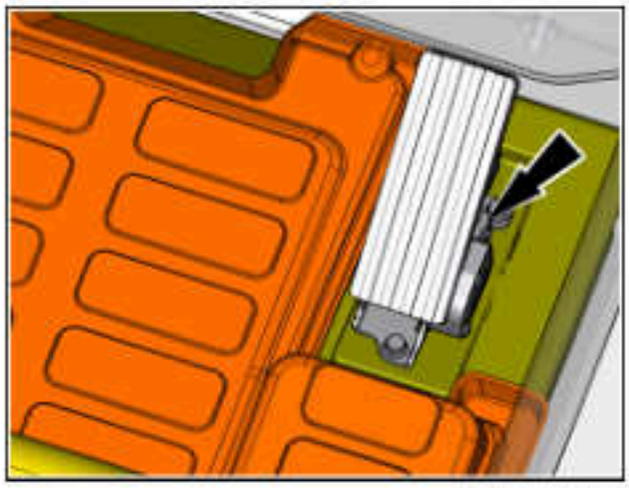
C. One or both resistance measurements are less than **108 Ω** or greater than **132 Ω**. Replace the control module that has the bad resistance value. Return to step **3** to confirm elimination of fault.

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Throttle pedal - Remove

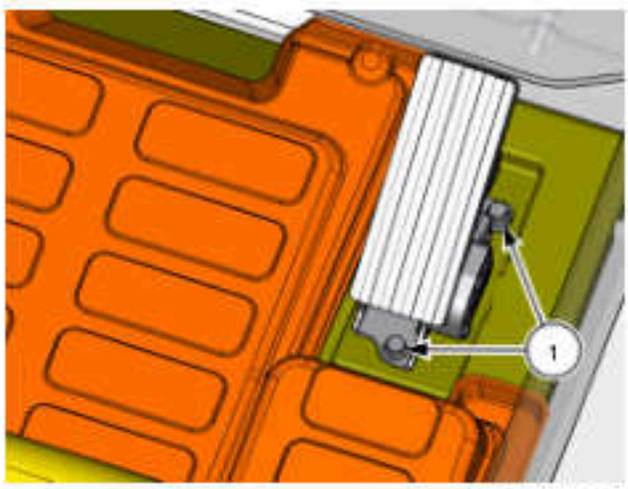
Prior operation:
Battery - Disconnect (55.302)

1. Disconnect the electrical harness from the foot pedal assembly.



RAPH175SLE17RDA 1

2. Remove the two bolts **(1)** that secure the foot pedal assembly to the floor plate.
3. Remove the foot pedal assembly from the machine.



RAPH175SLE17RDA 2

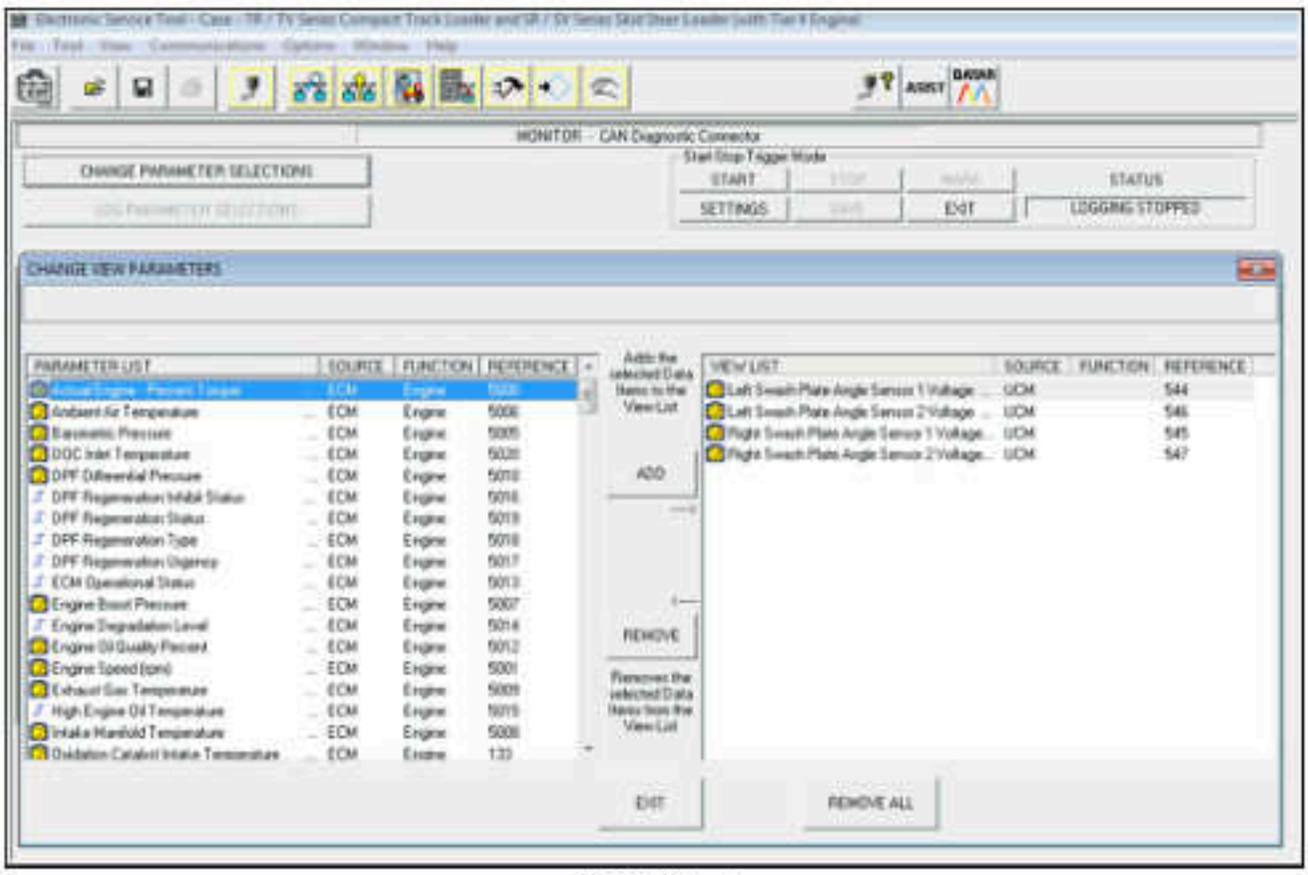
Next operation:
Throttle pedal - Install (55.525)

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Hydrostatic drive control sensors - Test - Swash plate angle sensor test and centering procedure

Prior operation:
Confirm that the joysticks are returning to the neutral position and there are no electrical issues with the joystick harness before checking the swash plate angle sensors.
Prior operation:
Place the machine on blocks or ensure that the machine is in an open area with adequate clearance to other objects.

NOTE: *This procedure is done using the Electronic Service Tool (EST) 'monitor' function.*



RAPH10SSLG270A 1

EST View Parameters List

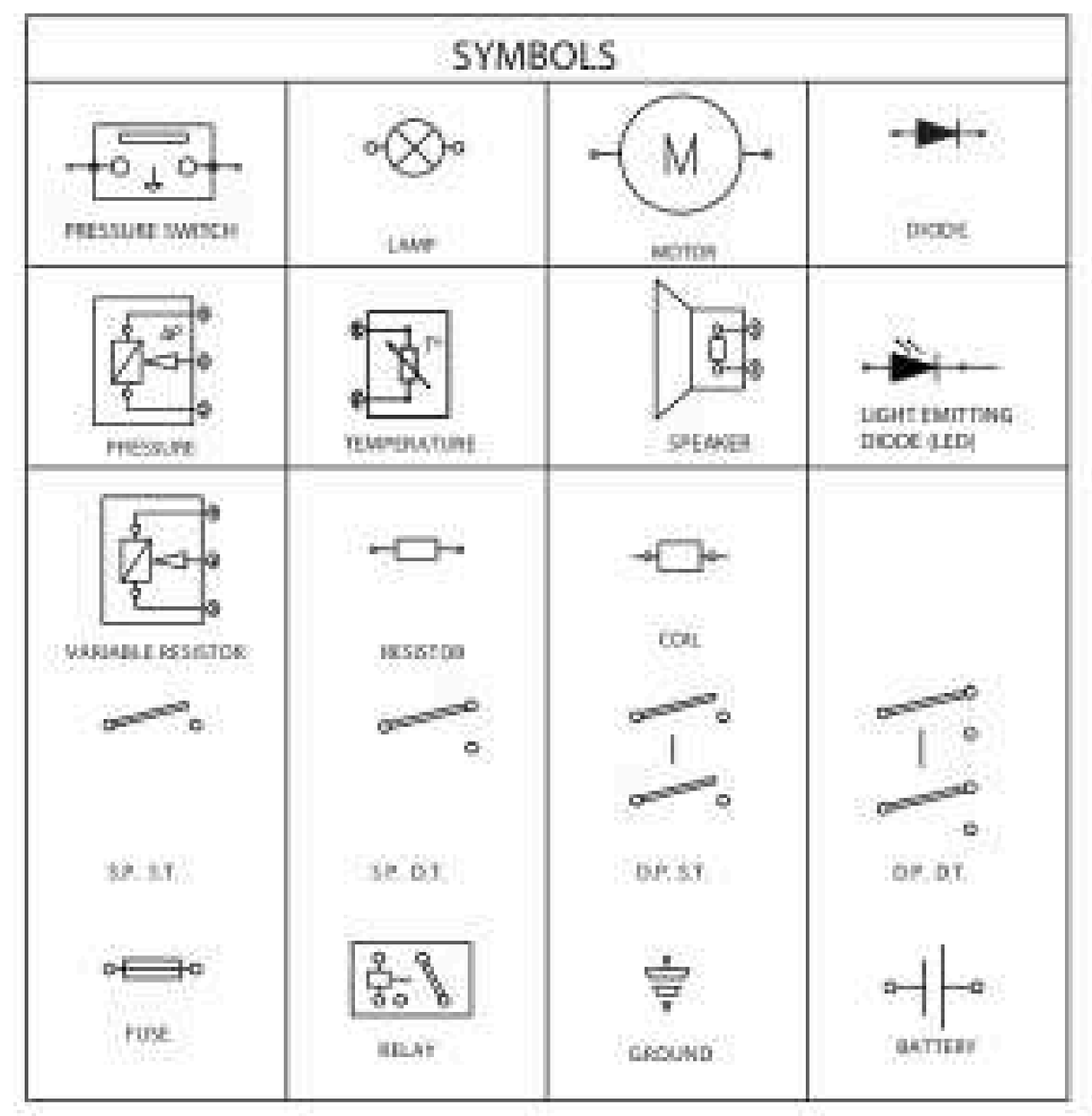
1. Connect the EST diagnostic connector to the test port of the machine to monitor the four Electro-Hydraulic (EH) parameters shown in the right-hand column of Figure **1**.

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Diagram
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SH02 - MAIN POWER DISTRIBUTION
SH03 - ACCESSORY POWER DISTRIBUTION
SH04 - IGNITION / CHARGING SYSTEM
SH05 - GROUNDING SYSTEM
SH06 - ENGINE F5C T4
SH07 - ENGINE F5C T4
SH08 - ENGINE F5C T4
SH09 - THROTTLE SENSORS
SH10 - ET PUMP / HYDRAULICS
SH11 - HYDRAULIC INTERLOCKS
SH12 - LOADER VALVE AND SENSORS
SH13 - BULKHEAD CONNECTION
SH14 - BULKHEAD CONNECTION
SH15 - BULKHEAD CONNECTION
SH16 - LEFT-HAND CAB CONSOLE
SH17 - LEFT NH CONTROL HANDLE
SH18 - RIGHT NH CONTROL HANDLE
SH19 - RIGHT NH CONTROL HANDLE
SH20 - UNIT CONTROL MODULE

Diagram
SH21 - UNIT CONTROL MODULE
SH22 - LAMPS
SH23 - INDICATORS
SH24 - EU LIGHT ADAPTER
SH25 - BOOM ROAD LIGHTS
SH26 - WIPERS / WASHERS
SH27 - INSTRUMENT CLUSTER
SH28 - HVAC
SH29 - RADIO
SH30 - UJM CONNECTORS
SH31 - MULTIFUNCTION CONNECTOR
SH32 - TELEMATICS
SH33 - MULTIFUNCTION JUMPER
SH34 - 2ND AUX
SH35 - DIAGNOSTIC CONNECTOR
SH36 - FUEL FILTER JUMPER
SH37 - CHASSIS INTERFACE X-900 / X-901
SH38 - CHASSIS INTERFACE
SH39 - CHASSIS INTERFACE X-900 / X-901 MD

SYMBOLS

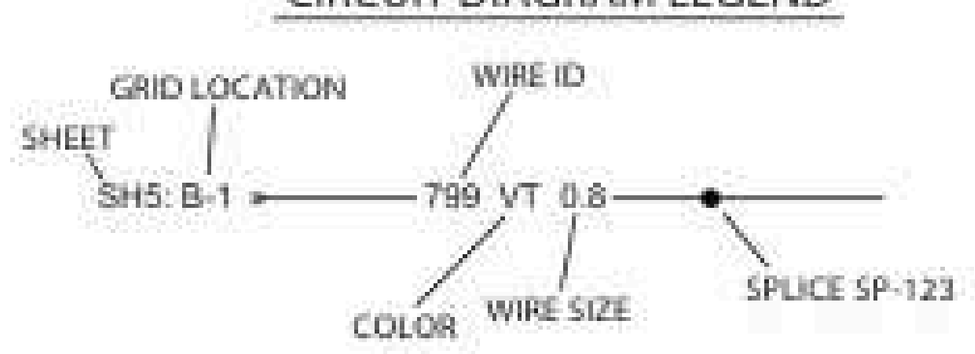


COLOR	ABBREVIATION
BLACK	BK
BLUE	BL
LIGHT BLUE	LB
BLACK/WHITE	BK/WH
GREEN	GN
LIGHT GREEN	LG
ORANGE	OR
PINK	PK
VIOLET	VT
RED	RD
GREY	GY
TAN	TN
WHITE	WH
YELLOW	YE

WIRE SIZE CHART

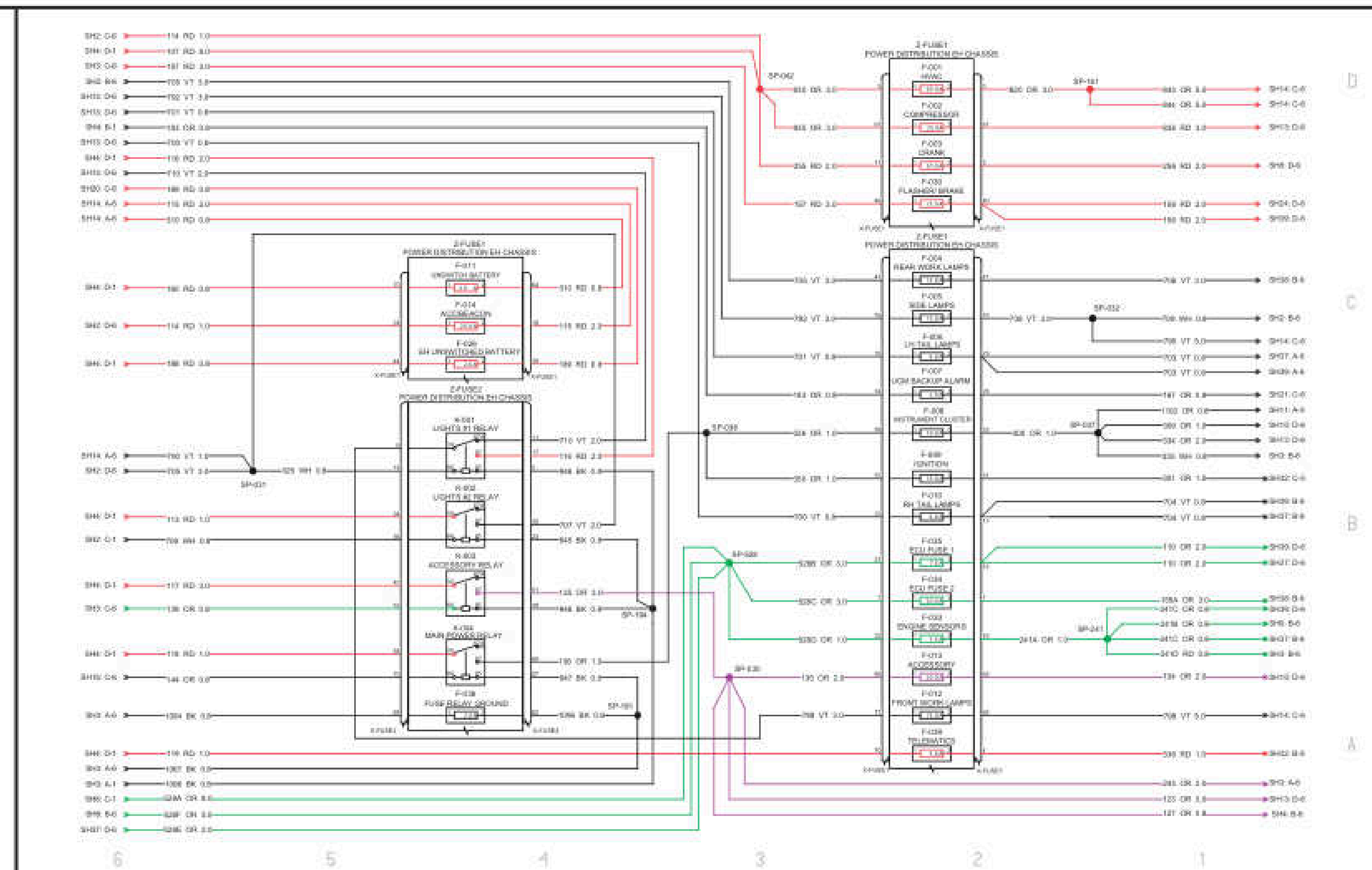
Sq. mm	AWG
0.5	20
0.8	18
1.0	16
2.0	14
3.0	12
5.0	10
8.0	8

CIRCUIT DIAGRAM LEGEND

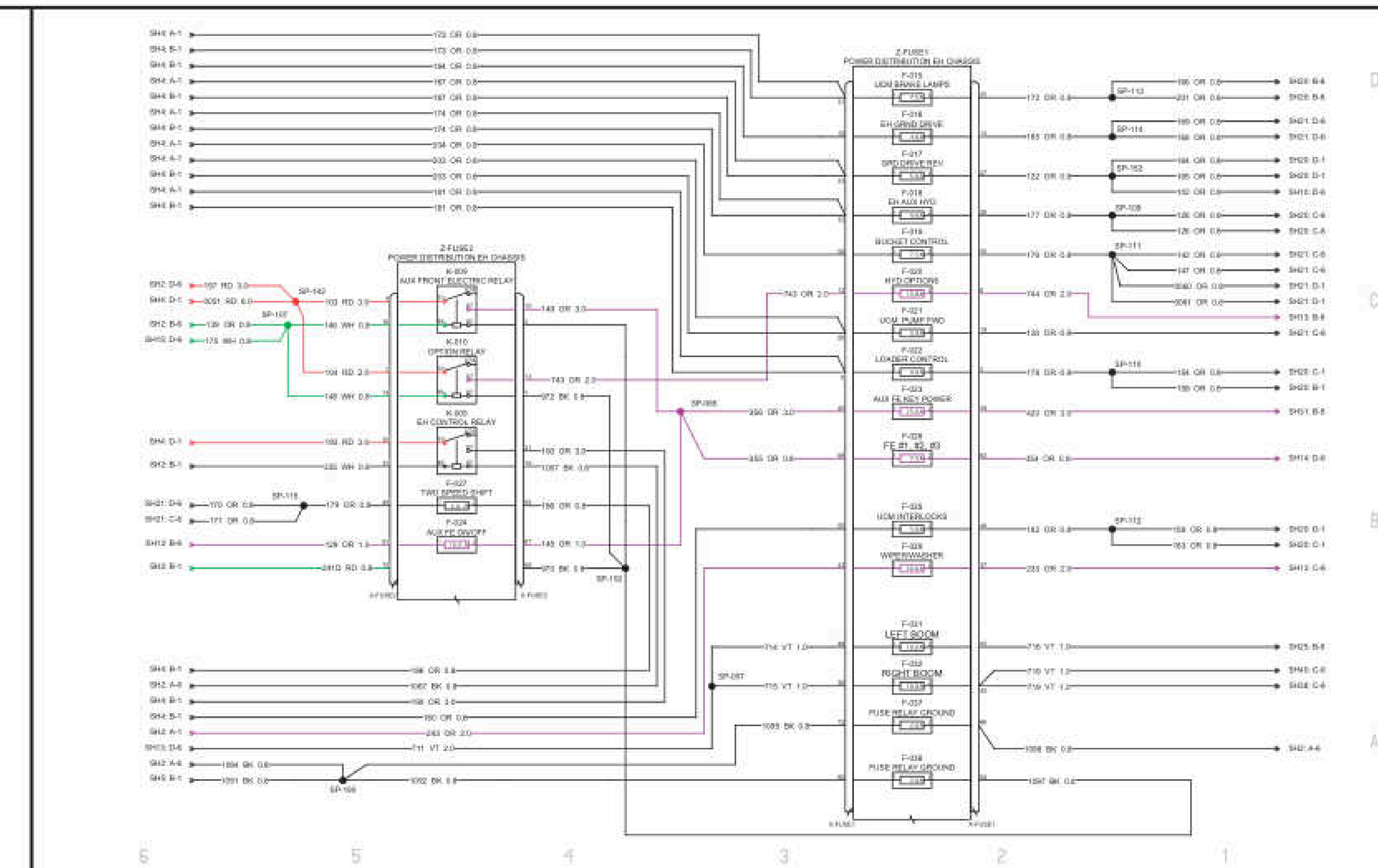


NOTE:
DIAGRAM SHOWN WITH VEHICLE PARKED & POWER OFF

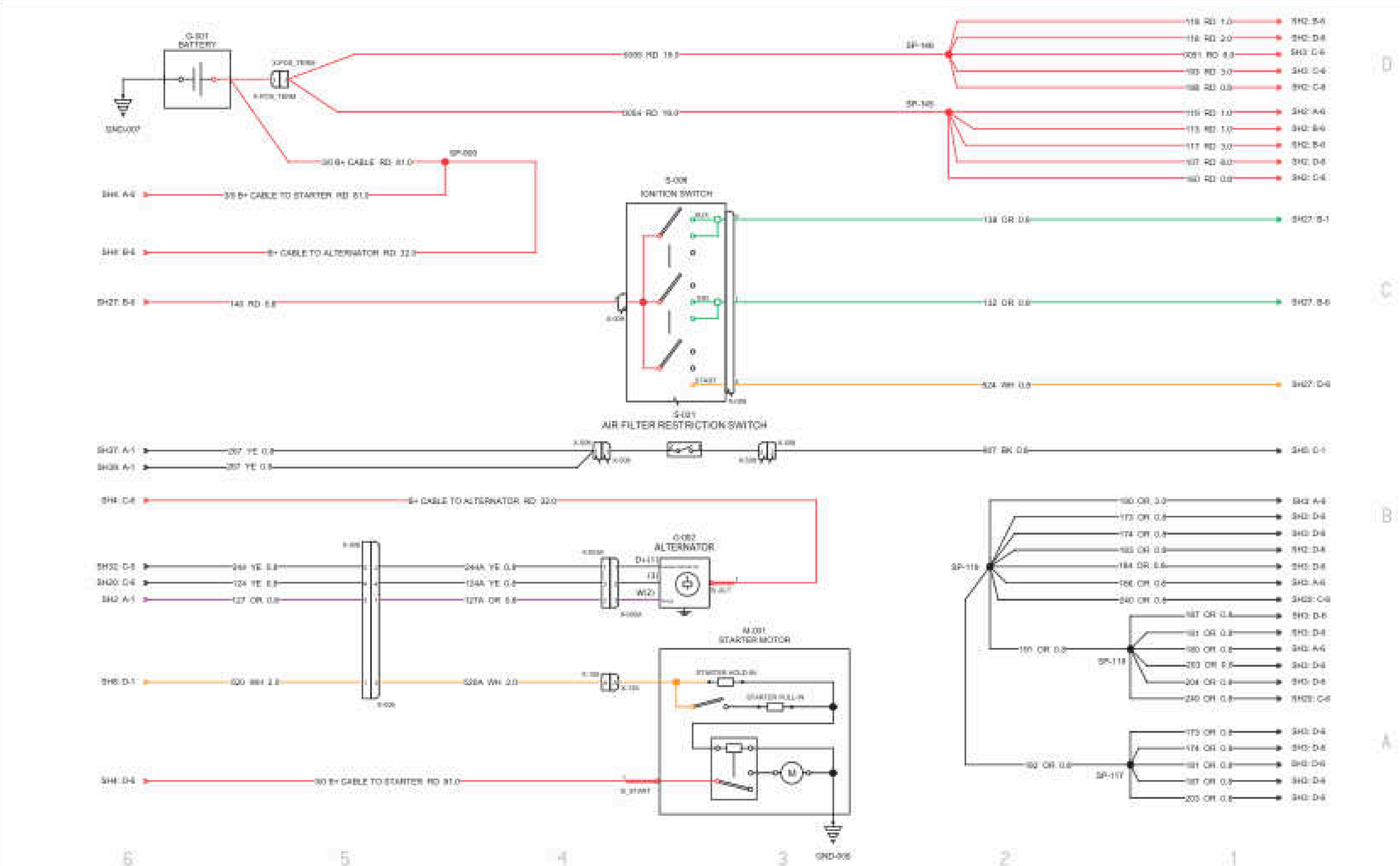
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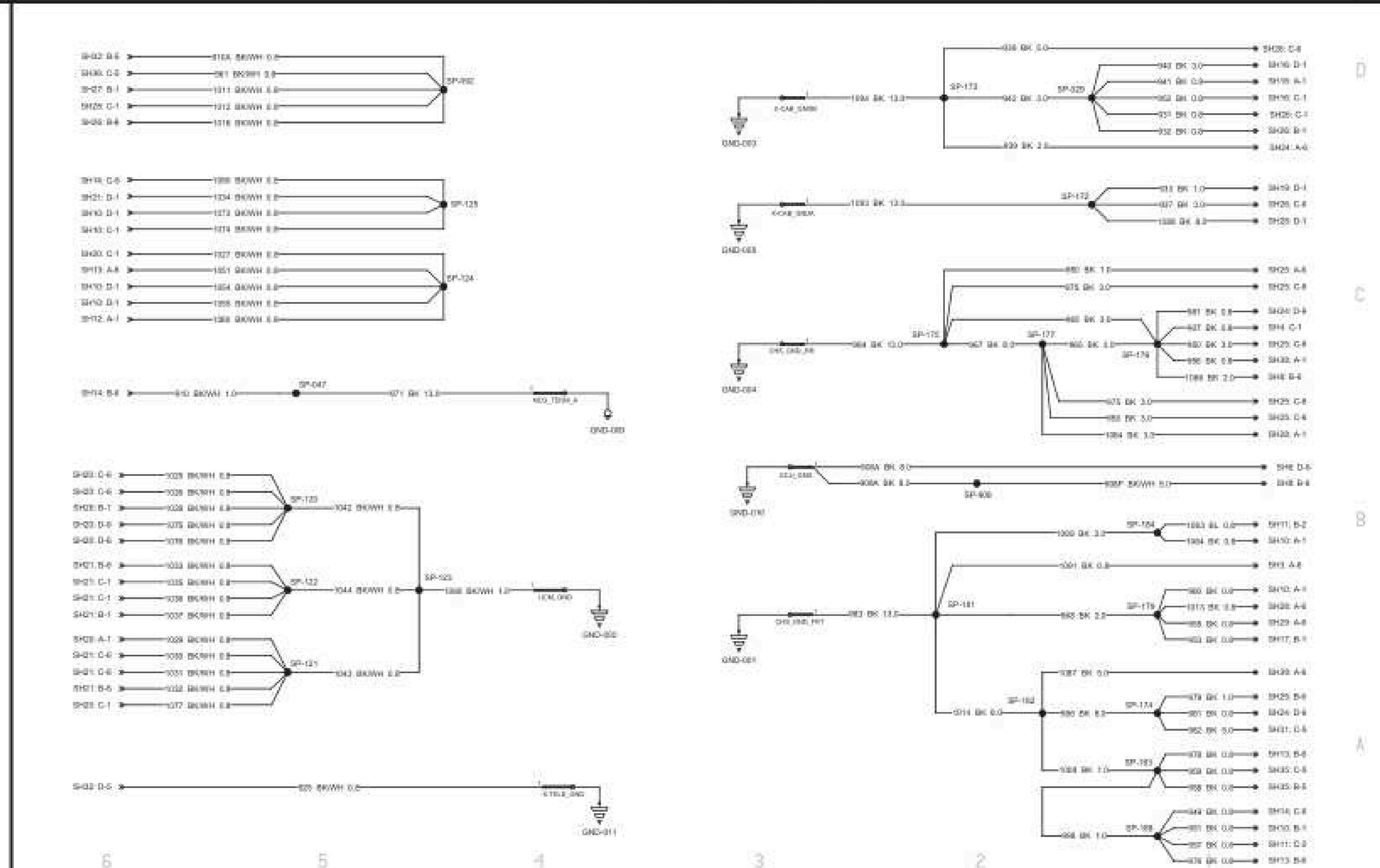
MAIN POWER DISTRIBUTION 2



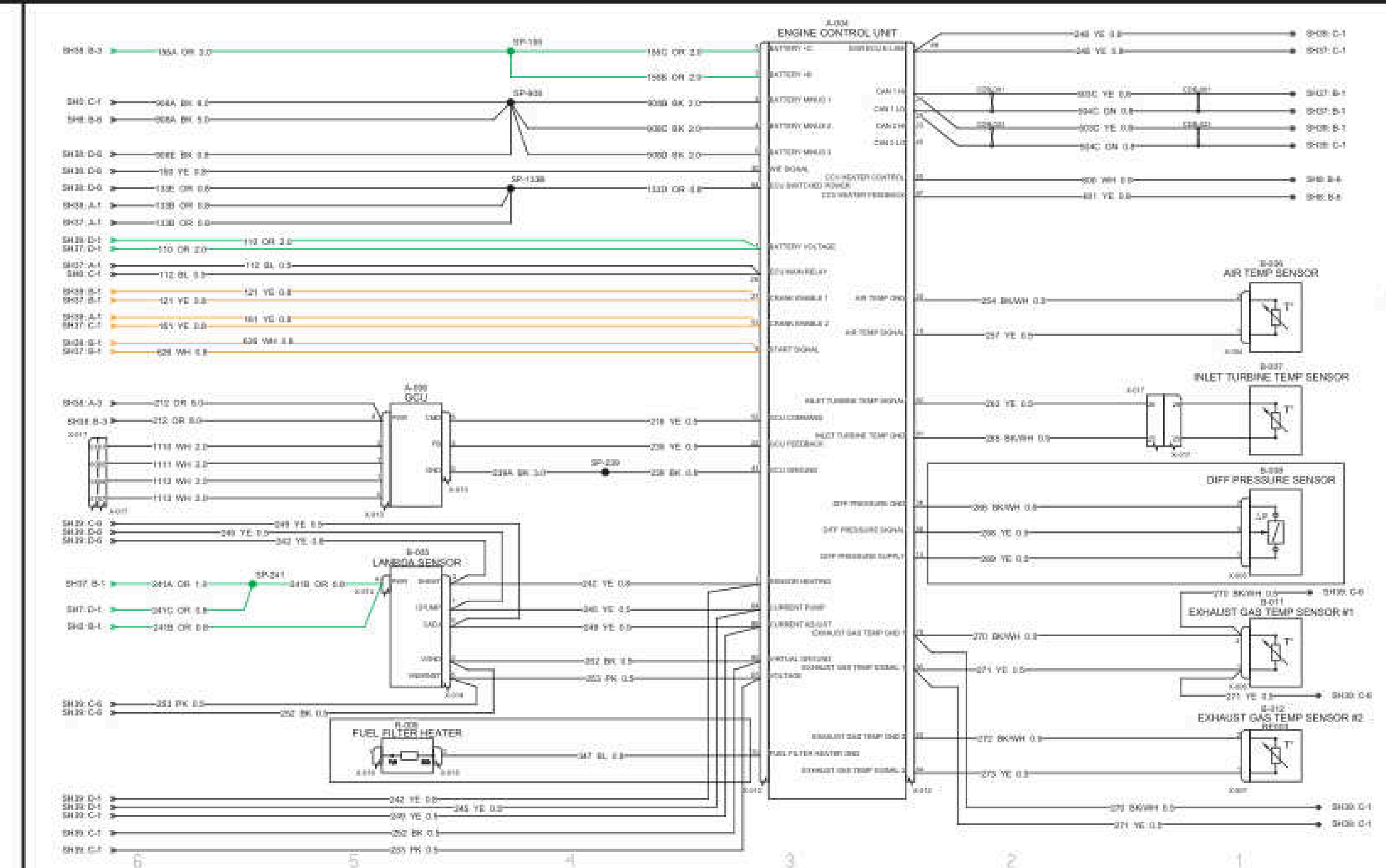
ACCESSORY POWER DISTRIBUTION 3



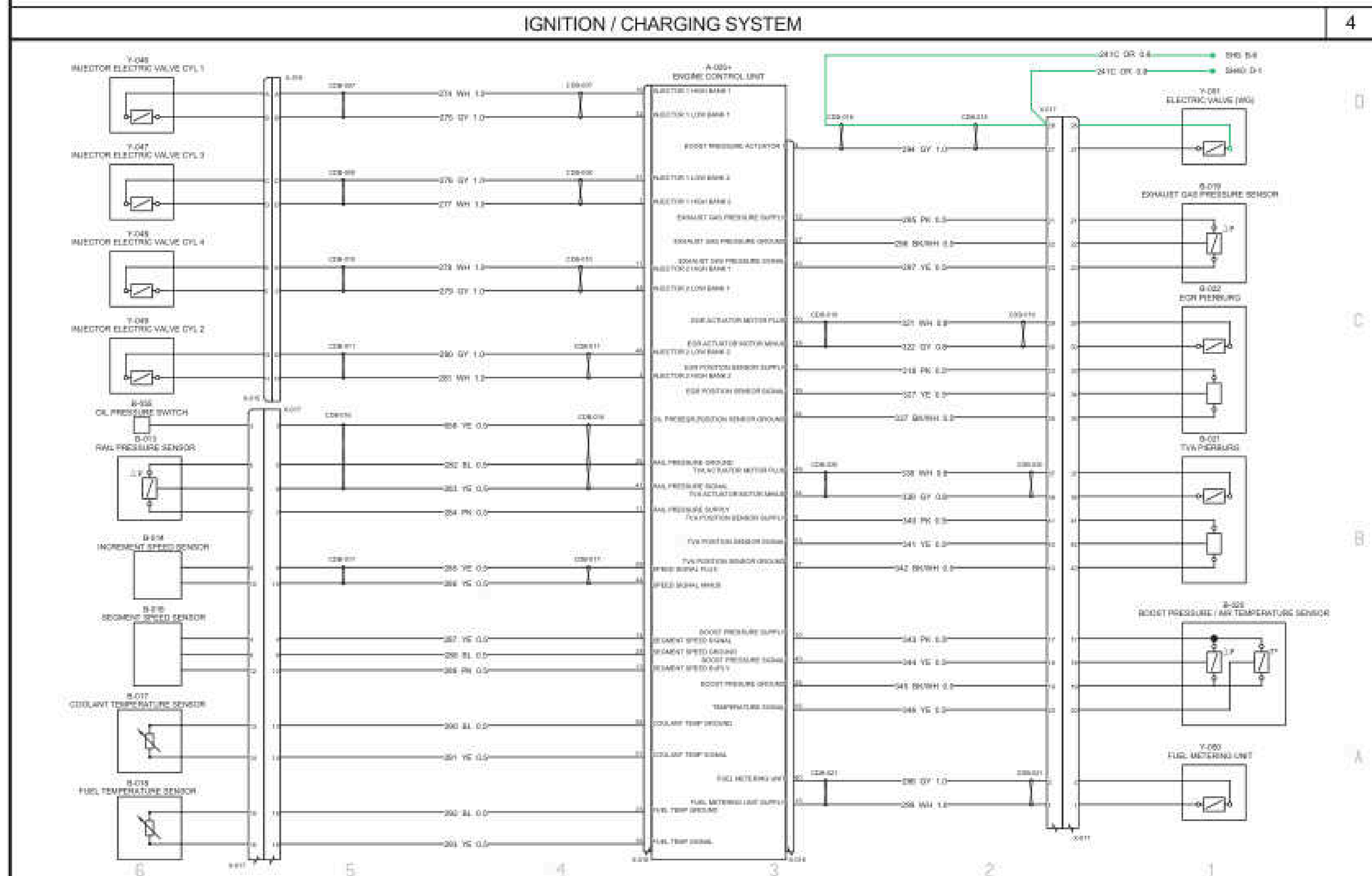
IGNITION / CHARGING SYSTEM 4



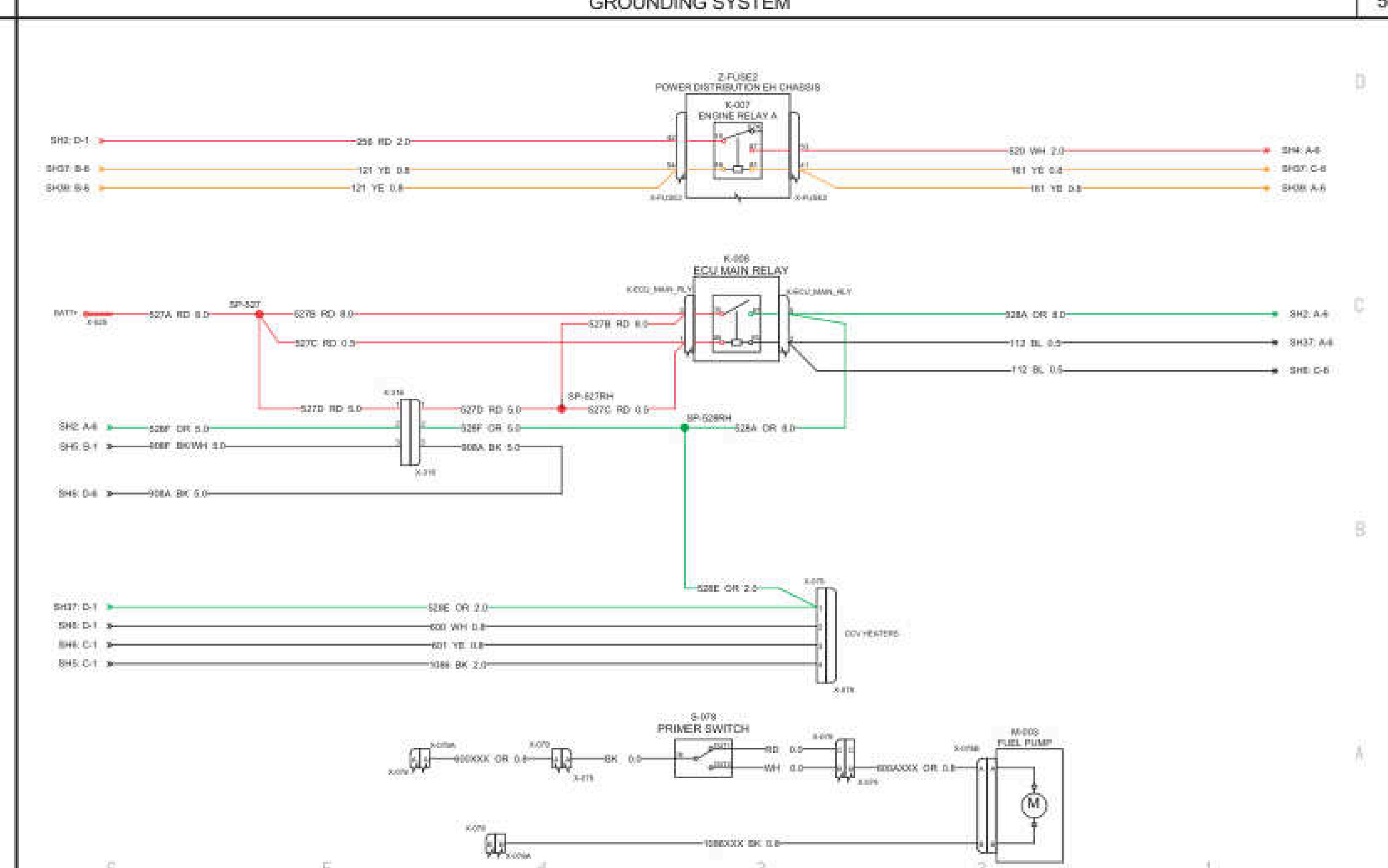
GROUNDING SYSTEM 5



ENGINE F5C T4 6



ENGINE F5C T4 7



ENGINE F5C T4 8

ELECTRICAL SCHEMATIC

TIER 4B (FINAL)
ELECTRO-HYDRAULIC (EH) CONTROLS

Skid Steer Loaders:
L221 - NGM418237 and above
L221 - NHM435463 and above
L228 - NGM418237 and above
L228 - NHM435463 and above

Compact Track Loaders:
C227 - NGM418237 and above
C227 - NHM435463 and above
C232 - NGM418237 and above
C232 - NHM435463 and above
C237 - NHM435453 and above

- BATTERY POWER
- STARTING SEQUENCE
- SWITCHED POWER
- POWER RELAY OUTPUT

RAC 48144048

RAC 48144048 S1S1

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